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Order Number: 10338209
Date: June 26, 2014
Model: 001D8088-1

Electromagnetic Compatibility Test Report

For

Chamberlain Group Inc.

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Order Number: 10338209
Model Number: 001D8088-1
Client Name: Chamberlain Group Inc.

Page 2 of 47

Test Report Details

Tests Performed By: **UL LLC**
333 Pfingsten Rd.
Northbrook, IL 60062

Tests Performed For: **Chamberlain Group Inc.**
845 Larch Av
Elmhurst, IL 60126

Applicant Contact: **Hank Sieradzki**
Phone: **(630) 993-6564**
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Test Report Date: **June 26, 2014**

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

Product standards **47 CFR Part 15, Subpart C, RSS-210, RSS-Gen**

Model Number: **001D8088**

EUT Category: **Wireless Device**

Testing Start Date: **May 21, 2014**

Date Testing Complete: **June 24, 2014**

Overall Results: **Compliant**

UL LLC reports apply only to the specific samples tested under stated test conditions. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. UL LLC shall have no liability for any deductions, inferences or generalizations drawn by the client or others from UL LLC issued reports. 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.

This report may contain test results that are not covered by the NVLAP or A2LA accreditation. The scope of accreditation is limited to the specific tests that are listed on the NVLAP and/or A2LA websites referenced at the end of this report.

Report Directory

1.0	GENERAL - Product Description	4
1.1	Equipment Description	4
1.2	Device Configuration During Test	4
1.2.1	Equipment Used During Test:	4
1.2.2	Input/Output Ports:	4
1.2.3	Power Interface:	5
1.3	EUT Configurations	5
1.4	EUT Operation Modes	5
1.5	Rational for EUT Configuration	5
2.0	Summary	5
2.1	Deviations from standard test methods	5
2.2	Device Modifications Necessary for Compliance	5
2.3	Reference Standards	6
2.4	Results Summary	7
3.0	Calibration of Equipment Used for Measurement	8
4.0	EMISSIONS TEST RESULTS	8
4.1	Test Conditions and Results – MAINS TERMINAL – CONDUCTED EMISSIONS	9
4.2	Test Conditions and Results – DIGITAL RADIATED EMISSIONS	12
4.3	Test Conditions and Results – SPURIOUS EMISSIONS (Antenna Conducted and Radiated)	15
4.4	Test Conditions and Results – MAXIMUM PEAK OUTPUT POWER	31
4.5	Test Conditions and Results – Dwell Time and Duty Cycle Correction	33
4.6	Test Conditions and Results – NUMBER OF HOPPING FREQUENCIES	35
4.7	Test Conditions and Results – 20DB BANDWIDTH & 99% BANDWIDTH	37
4.8	Test Conditions and Results – Carrier Frequency Separation	40
Appendix A		44
Test Setup Photos		44
Appendix B		45
Test Equipment		45
Appendix C		46
Accreditations and Authorizations		46

Report Revision History

Revision Date	Description	Revised By	Revision Reviewed By
-			

1.0 G E N E R A L - Product Description

1.1 Equipment Description

The Equipment Under Test is a Garage Door Operator (CDO) with 900MHz FHSS Transceiver.

1.2 Device Configuration During Test

1.2.1 Equipment Used During Test:

Use	Product Type	Manufacturer	Model	Comments
EUT	Garage Door Opener	Chamberlain	001D8088-1	None
AE	Pushbutton control	Chamberlain	Generic	None
AE	Photo-Eyes	Chamberlain	Generic	None
Note: EUT – Equipment Under Test, AE – Auxiliary/Associated Equipment, or SIM – Simulator (Not Subjected to Test)				

1.2.2 Input/Output Ports:

Port #	Name	Type*	Cable Max. >3m (Y/N)	Cable Shielded (Y/N)	Comments
0	Enclosure	N/E	—	—	None
1	Mains	AC	N	N	None
2	Pushbutton Control	I/O	Y	N	None
3	Edge Sensor Cable	I/O	Y	N	None
Note: AC = AC Power Port DC = DC Power Port N/E = Non-Electrical I/O = Signal Input or Output Port (Not Involved in Process Control) TP = Telecommunication Ports					

1.2.3 Power Interface:

Mode # /Rated	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
1	120	-	-	AC - 60Hz	1	

1.3 EUT Configurations

Mode #	Description
1	EUT was setup on 80 cm support, connected to power source and set to transmit in specific mode.
2	EUT was placed on bench top, connected to power. The 900MHz RF output was terminated into standard RF connector and it was connected to spectrum analyzer.

1.4 EUT Operation Modes

Mode #	Description
1	EUT in TX Mode on either low, middle or high channels.
2	EUT set to RX mode scanning all periodic transmitter frequency and 900MHz FHSS transmitter frequency for signals.

1.5 Rational for EUT Configuration

Mode #	Description
1	It was configured with gear up, typical ceiling mount configuration

2.0 Summary

The tests listed in the Summary of Testing section of this report have been performed and the results recorded by UL LLC in accordance with the procedures stated in each test requirement and specification. The applicant determined the list of tests performed were applicable to the Equipment Under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.

2.1 Deviations from standard test methods

None

2.2 Device Modifications Necessary for Compliance

None

Order Number: 10338209
Model Number: 001D8088-1
Client Name: Chamberlain Group Inc.

Page 6 of 47

2.3 Reference Standards

Standard Number	Standard Name	Standard Date
RSS-210	Spectrum Management and Telecommunications Radio Standards Specification Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment	Issue 8
RSS-Gen	Spectrum Management and Telecommunications Radio Standards Specification General Requirements and Information for the Certification of Radio Apparatus	Issue 3
47 CFR Part 15	Radio Frequency Devices	2012
Additional guidance used: FCC Document: DA 00-705		

2.4 Results Summary

Requirement – Test	References	Result (Compliant / Non-Compliant)*
Mains Terminal – Conducted Emissions	47 CFR Part 15.107, 15.207 RSS-Gen 7.2.4	Compliant
Digital Radiated Emissions	47 CFR Part 15.109	Compliant
Spurious Emissions (Antenna Conducted and Radiated)	47 CFR Part 15.247(d) RSS-210, A8.5 RSS-Gen 7.2.5	Compliant
Bandedge Compliance	47 CFR Part 15.247(d) RSS-210, A8.5	Compliant
Carrier Frequency Separation	47 CFR Part 15.247(a)(1) RSS-210, A8.1(b)	Compliant
Number of Hopping Frequencies	47 CFR Part 15.247(a)(1)(i) RSS-210, A8.1(c)	Compliant
Dwell time and Duty Cycle	47 CFR Part 15.247(a)(1)(i) RSS-210, A8.1(c)	Compliant
20dB Bandwidth and 99% Bandwidth	47 CFR Part 15.247(a)(2) RSS-210, A8.1(a) RSS-Gen, 4.6.1	Compliant
Maximum Peak Output Power	47 CFR Part 15.247(b)(2) RSS-210, A8.4(1)	Compliant

Test Engineer:



Bartlomiej Mucha (Ext.41216)
WiSE Staff Engineer
Wireless, Interoperability, payment Security, & EMC
Verification Services

Reviewer:



Michael Ferrer(Ext.41312)
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Wireless, Interoperability, payment Security, & EMC
Verification Services

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL.

3.0 Calibration of Equipment Used for Measurement

All test equipment and test accessories are calibrated on a regular basis. The maximum time between calibrations is one year or the manufacturers' recommendation, whichever is less.

All test equipment calibrations are traceable to the National Institute of Standards and Technology (NIST); therefore, all test data recorded in this report is traceable to NIST.

4.0 EMISSIONS TEST RESULTS

The emissions tests were performed according to following regulations:

----- US -----
47 CFR Part 15

----- Canada -----
RSS-210 and RSS-Gen

Unless specified otherwise in the individual Methods, the tests shall be conducted under the following ambient conditions. Confirmation of these conditions shall be verified at the time the test is conducted.

Ambient Temperature, °C	22.5 ± 2.5	Relative Humidity, %	45 ± 15	Barometric Pressure, mBar	950 ± 150
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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)

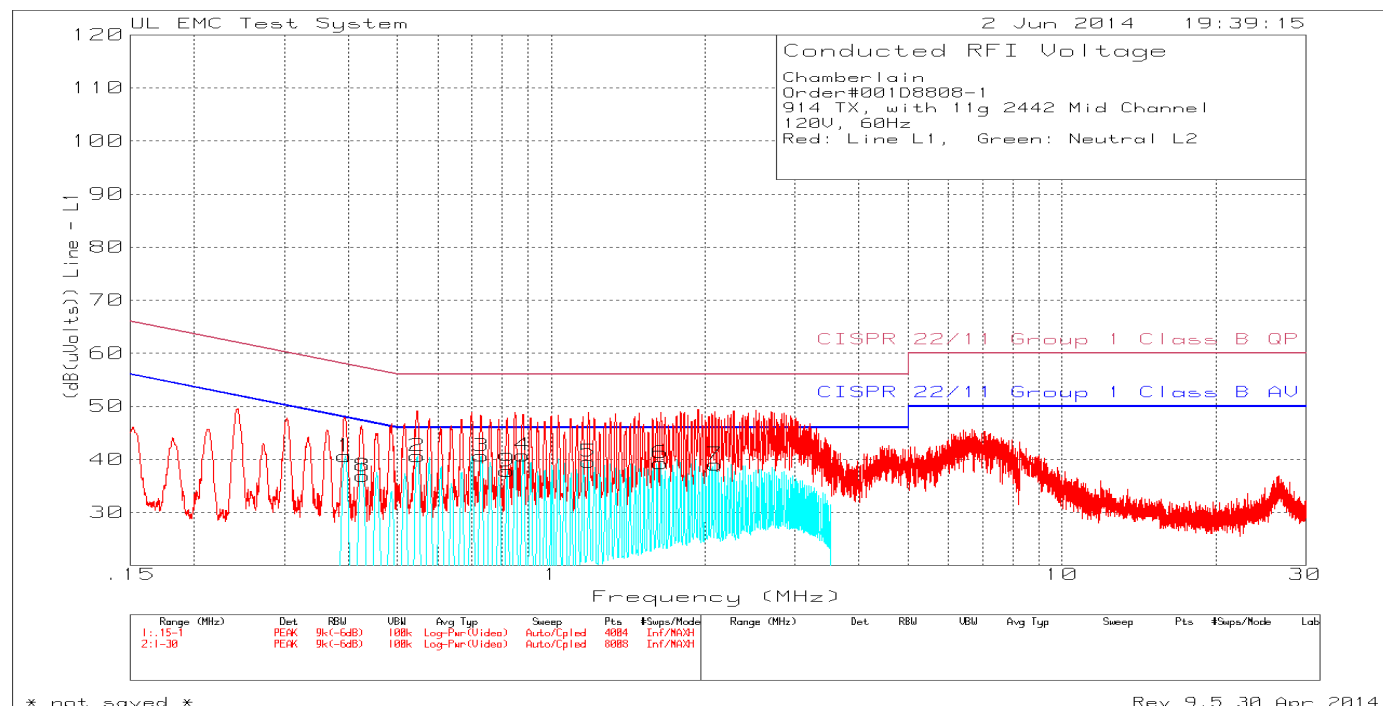
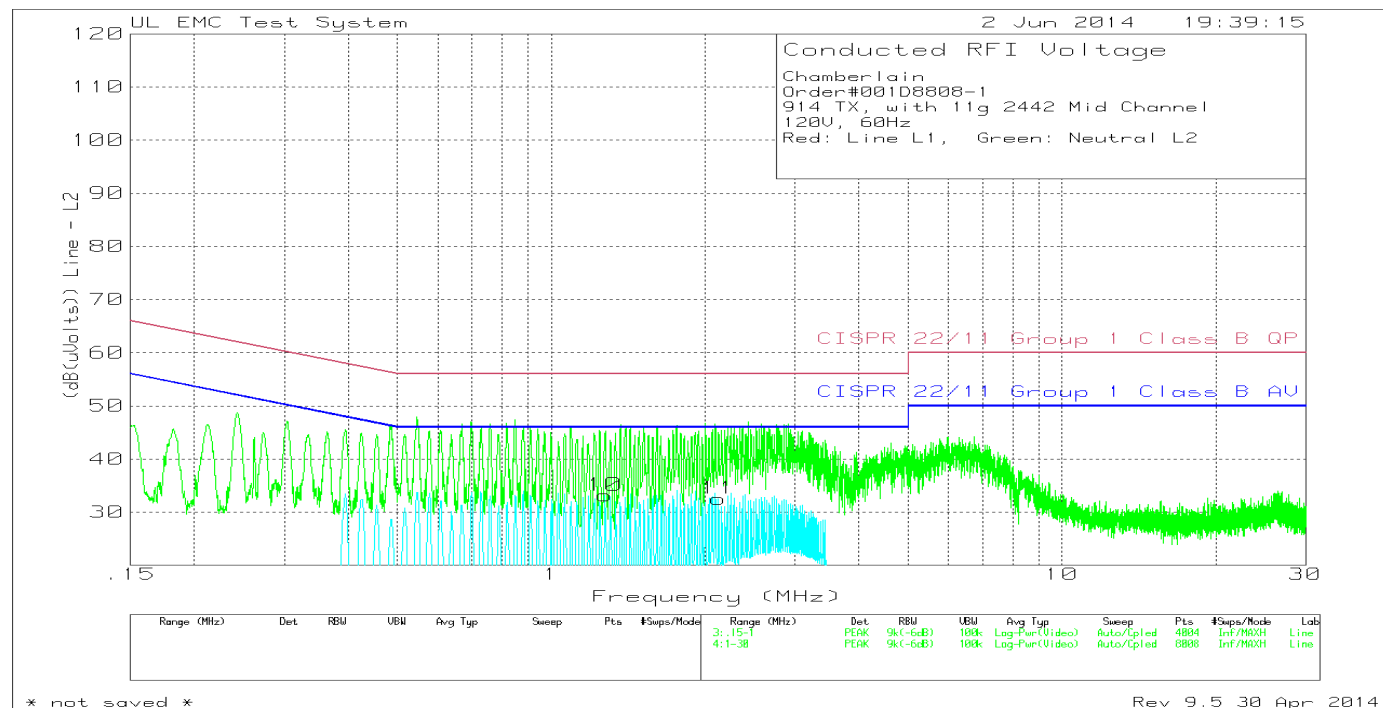
4.1 Test Conditions and Results – MAINS TERMINAL – CONDUCTED EMISSIONS

Test Description	Measurements were made on a ground plane. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on mains lines were made at the output of the AMN.	
Basic Standard	47 CFR Part 15.207, RSS-Gen 7.2.4	
UL LPG	80-EM-S0026	
	Frequency range on each side of line	Measurement Point
Fully configured sample scanned over the following frequency range	150kHz to 30MHz	Mains
Limits - Class B		
Frequency (MHz)	Limit (dB μ V)	
	Quasi-Peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50
Supplementary information: None		

Table 1 Conducted Emissions EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	1 and 2
Supplementary information: None		

Figure 1 Conducted Emissions Graph (TX Middle Channel / with WiFi Active)



Order Number: 10338209
 Model Number: 001D8088-1
 Client Name: Chamberlain Group Inc.

Table 2 Conducted Emissions Data Points (TX)

Chamberlain											
Order#001D8808-1											
914 TX, with 11g 2442 Mid Channel											
120V, 60Hz											
Red: Line L1, Green: Neutral L2											
Marker No.	Test Frequency MHz	Meter Reading dBuV	Detector	LISN Factor dB	Path Factor dB	Level dBuV	Limit 47 CFR Part 15.207 QP dBuV	Margin dB	Limit 47 CFR Part 15.207 AV dBuV	Margin dB	
Line 1											
1	0.39426	29.79	Av	0.1	10.7	40.59	57.97	-17.38	47.97	-7.38	
2	0.54726	29.96	Av	0.1	10.6	40.66	56	-15.34	46	-5.34	
3	0.72951	30.07	Av	0	10.6	40.67	56	-15.33	46	-5.33	
4	0.88026	30.08	Av	0.1	10.6	40.78	56	-15.22	46	-5.22	
8	0.42801	26.09	Av	0.1	10.7	36.89	57.29	-20.4	47.29	-10.4	
9	0.81951	27.1	Av	0.1	10.6	37.8	56	-18.2	46	-8.2	
5	1.1845	28.89	Av	0.1	10.6	39.59	56	-16.41	46	-6.41	
6	1.639	28.6	Av	0.1	10.6	39.3	56	-16.7	46	-6.7	
7	2.0935	28.33	Av	0.1	10.6	39.03	56	-16.97	46	-6.97	
Line 2											
10	1.2745	22.45	Av	0.1	10.6	33.15	56	-22.85	46	-12.85	
11	2.125	21.82	Av	0.1	10.6	32.52	56	-23.48	46	-13.48	
Av - CISPR average detection											

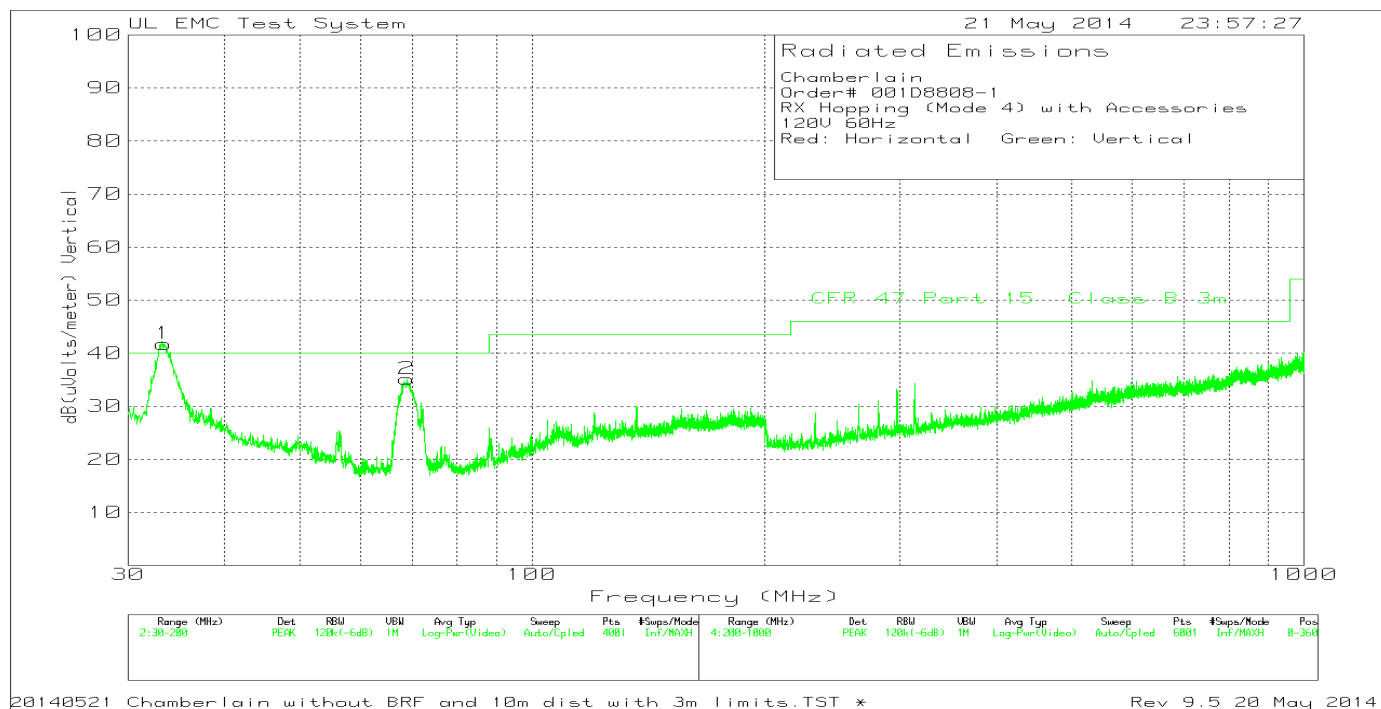
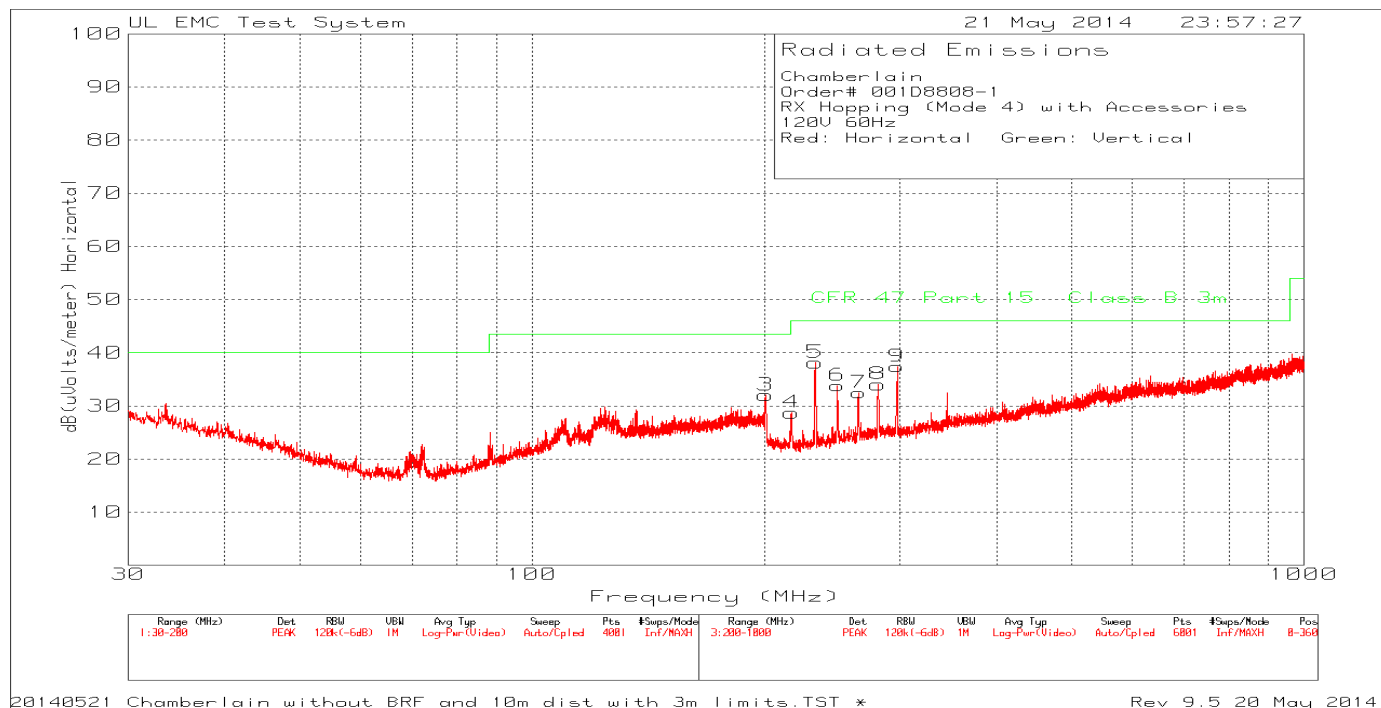
4.2 Test Conditions and Results – DIGITAL RADIATED EMISSIONS

Test Description	Measurements were made in a 10-meter semi-anechoic chamber that complies to CISPR 16/ANSI C63.4:2003. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 10meter or 3 meter as noted. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in both horizontal and vertical polarities. Final measurements (quasi-peak or average as noted) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4-meters. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.	
Basic Standard	47 CFR Part 15.109 / ICES-003	
UL LPG	80-EM-S0029	
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30MHz – 5GHz	10 meter
	1GHz – 5GHz	3 meter
Limits - Class B		
Frequency (MHz)	Limit (dBμV/m)	
	Limit - Detector	Average
30 – 88	40.00 QP	NA
88 – 216	43.52 QP	NA
216 – 960	46.02 QP	NA
960 – 1,000	53.98 QP	NA
1,000 – 5,000	74 PK	54
Supplementary information: For below 1GHz measurements levels were extrapolated to 3 meter distance. Actual measurements below 1GHz were conducted at 10 meter distance. Above limits are at 3m distance.		

Table 3 Radiated Emissions EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	2
Supplementary information: None		

Figure 2 Receive Mode 30MHz-1GHz Radiated Emissions Graph



Order Number: 10338209
 Model Number: 001D8088-1
 Client Name: Chamberlain Group Inc.

Table 4 Receive Mode 30MHz-1GHz Radiated Emissions Data Points

Chamberlain												
Order# 001D8808-1												
RX Hopping (Mode 4) with Accessories												
120V 60Hz												
Red: Horizontal Green: Vertical												
Trace Markers												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Cable Factor dB	10m to 3m Factor dB	Level dBuV/m	47 CFR Part 15.109 Class B	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	33.315	44.98	PK	16.4	-30.1	10.5	41.78	40	1.78	0-360	99	V
2	68.845	48.46	PK	6.2	-30	10.5	35.16	40	-4.84	0-360	249	V
3	200.6667	36.92	PK	11.4	-26.8	10.5	32.02	43.52	-11.5	0-360	299	H
4	216.9333	34.06	PK	10.9	-26.7	10.5	28.76	46.02	-17.26	0-360	400	H
5	233.0666	43.34	PK	10.9	-26.6	10.5	38.14	46.02	-7.88	0-360	299	H
6	248.7999	38.04	PK	11.9	-26.6	10.5	33.84	46.02	-12.18	0-360	199	H
7	265.3332	36	PK	12.4	-26.4	10.5	32.5	46.02	-13.52	0-360	400	H
8	280.6665	36.98	PK	12.9	-26.3	10.5	34.08	46.02	-11.94	0-360	299	H
9	297.1998	40.02	PK	13.1	-26.2	10.5	37.42	46.02	-8.6	0-360	299	H
PK - Peak detector												
Radiated Emission Data												
	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Cable Factor dB	10m to 3m Factor dB	Level dBuV/m	47 CFR Part 15.109 Class B	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
	33.0285	40.4	QP	16.5	-30.1	10.5	37.3	40	-2.7	349	100	V
	68.0575	42.12	QP	6.1	-30	10.5	28.72	40	-11.28	274	241	V
QP - Quasi-Peak detector												

4.3 Test Conditions and Results – SPURIOUS EMISSIONS (Antenna Conducted and Radiated)

Test Description	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section15.205(c)). For Radiated Emissions above 1GHz the RBW/VBW=1MHz/3MHz for Peak Measurements and RBW/VBW 1MHz/10Hz for Average measurements.		
Basic Standard	47 CFR Part 15.247(d) RSS-210, A8.5 RSS-Gen 7.2.1 and 7.2.3		
	Frequency range	Measurement Point	
Fully configured sample scanned over the following frequency range	30MHz – 1GHz	3 meter distance and / or antenna port	
Fully configured sample scanned over the following frequency range	1GHz – 10GHz	3 meter distance and / or antenna port	
Limits (Antenna Conducted)			
All emissions must be 20dB below the level of the fundamental frequency. For all antenna port measurements the SA input was changed to 75 Ohms			
Limits (Radiated – Restricted Bands Only)			
Frequency (MHz)	Limit (dBµV/m)		
	Quasi-Peak	Limit - detector	
	General Emissions	Fundamental	Spurious
30 – 88	40.00 QP	-	-
88 – 216	43.52 QP	-	-
216 - 960	46.02 QP	-	-
960 - 1000	53.98 QP	-	-
1,000 - 25,000	-	-	74PK, 54AV
Supplementary information: Below 1GHz, spectrum was checked. All emissions related to the transmitter below 1GHz are not in the restricted band therefore only antenna conducted limits apply (20dB below the peak level of the fundamental). For below 1GHz measurements levels were extrapolated to 3 meter distance. Actual measurements below 1GHz were conducted at 10 meter distance. Above limits are at 3m distance.			

Table 5 SPURIOUS EMISSIONS EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1 and 2	1 and 2
Supplementary information: None		

Figure 3 30MHz-10GHz Antenna Port Spurious Emissions Plot TX Mode, Low Channel.

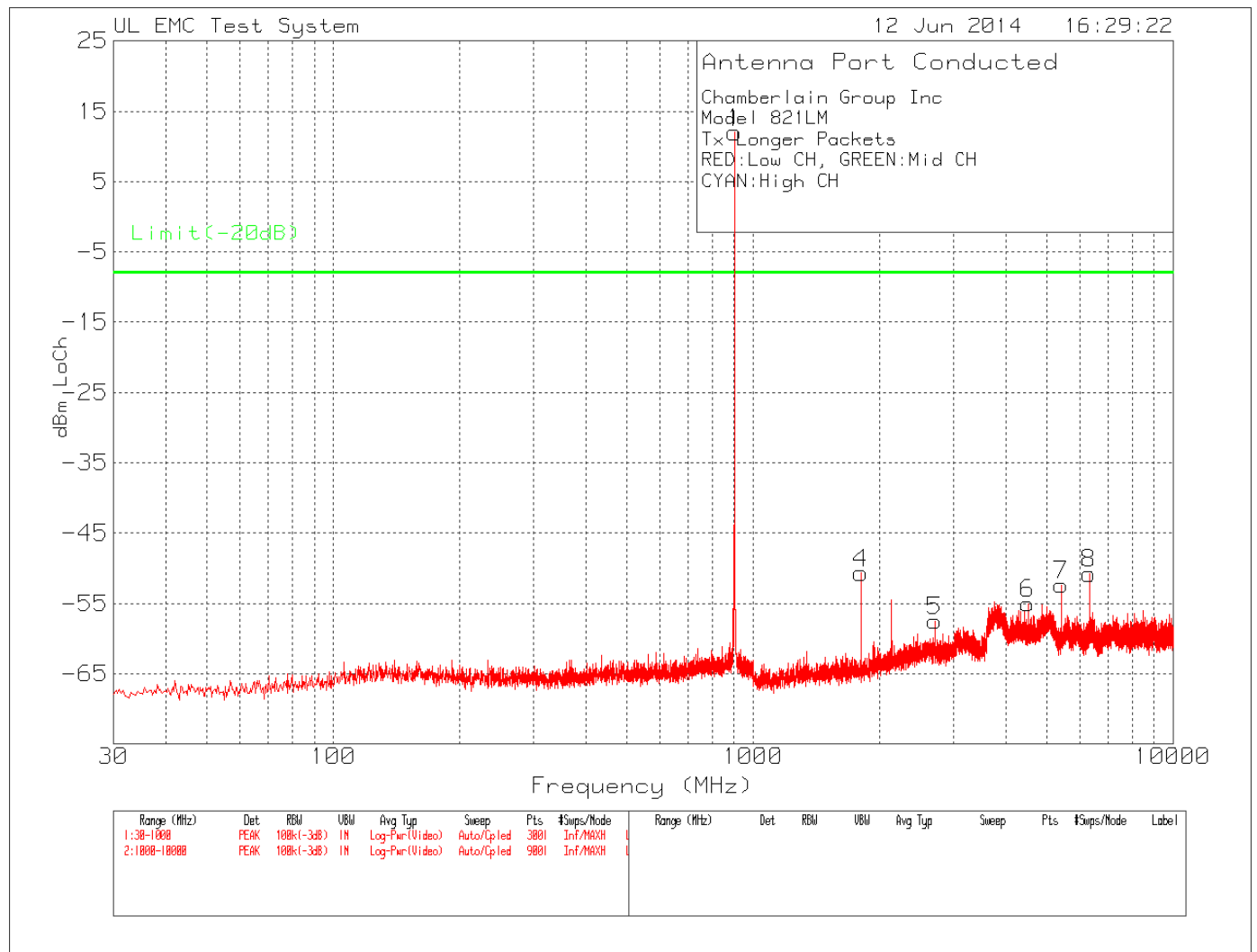


Figure 4 30MHz-10GHz Antenna Port Spurious Emissions Plot TX Mode, Middle Channel.

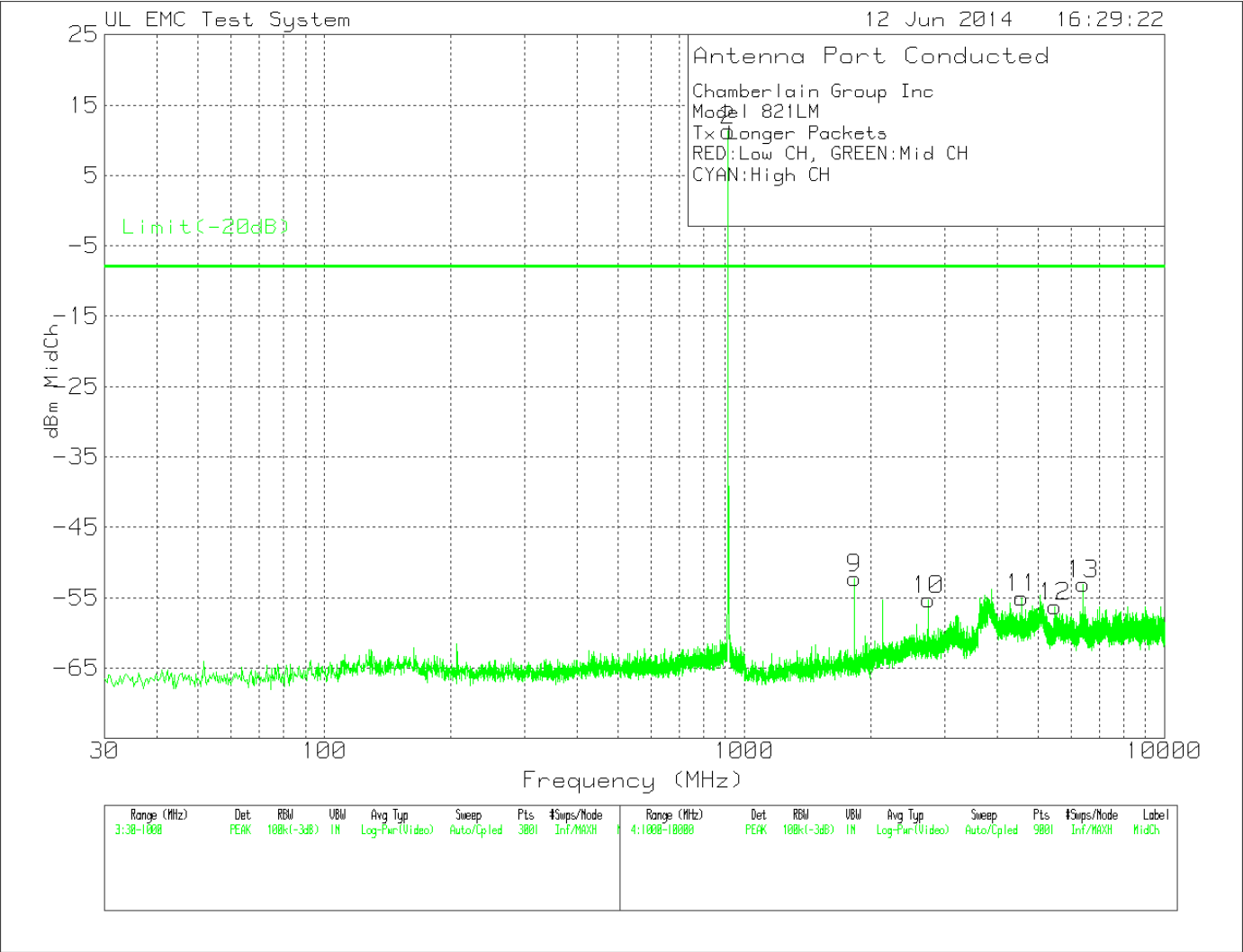
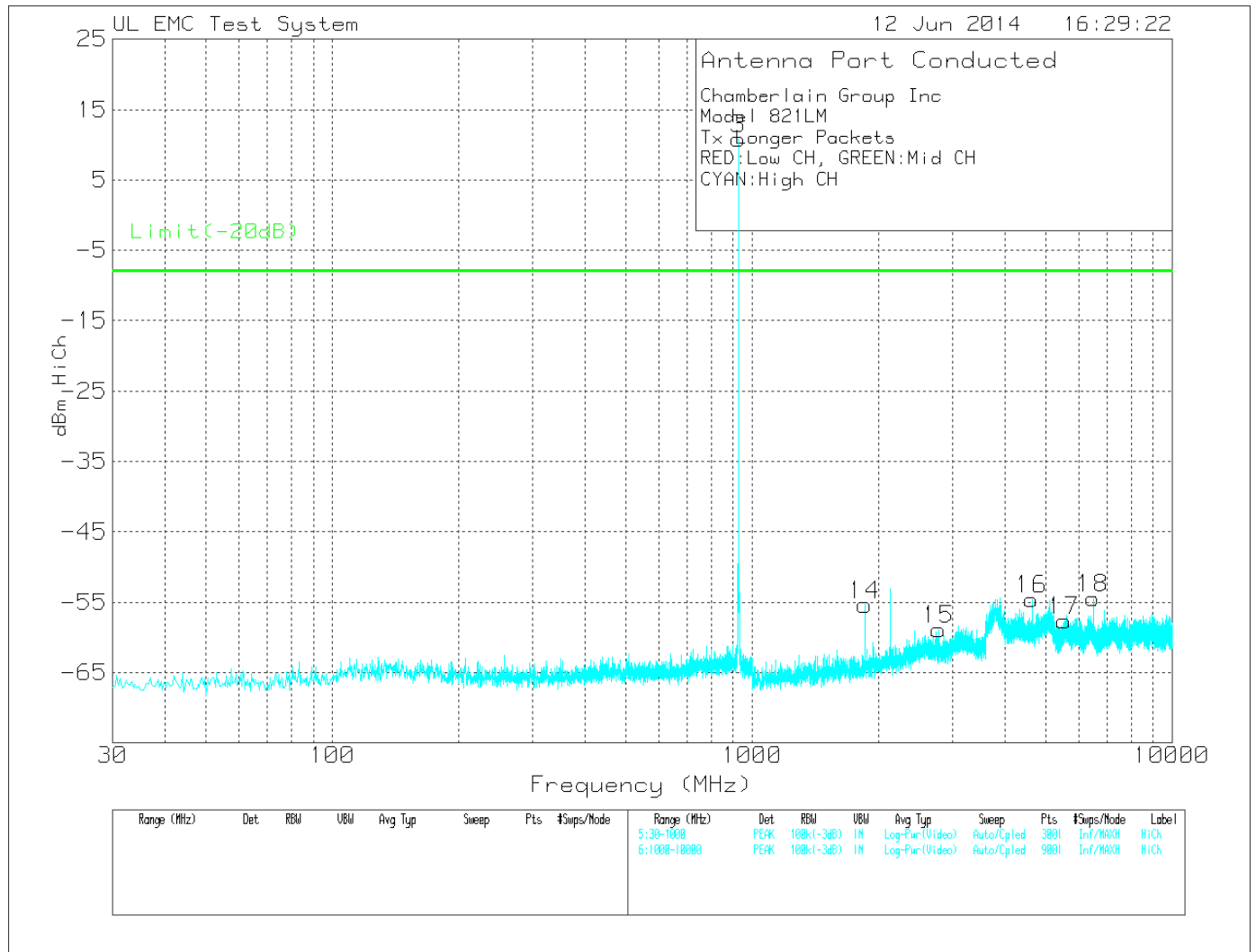


Figure 5 30MHz-10GHz Antenna Port Spurious Emissions Plot TX Mode, High Channel.



Order Number: 10338209
 Model Number: 001D8088-1
 Client Name: Chamberlain Group Inc.

Table 6 Spurious Emissions Tabular Data for Low, Middle and High Channels

Chamberlain Group Inc							
Model 821LM							
Tx Longer Packets							
Marker No.	Test Frequency MHz	Meter Reading dBm	Detector	Cable Factor dB	Level dBm	Limit dBm	Margin (dB)
Low Channel							
1	902.1908	1.8	PK	10.2	12	-	-
4	1805	-60.95	PK	10.3	-50.65	-8	-42.65
5	2707	-67.99	PK	10.5	-57.49	-8	-49.49
6	4511	-65.82	PK	10.8	-55.02	-8	-47.02
7	5413	-63.26	PK	10.9	-52.36	-8	-44.36
8	6316	-61.66	PK	10.9	-50.76	-8	-42.76
Middle Channel							
2	914.6391	1.13	PK	10.2	11.33	-	-
9	1829	-62.64	PK	10.4	-52.24	-8	-44.24
10	2744	-65.75	PK	10.5	-55.25	-8	-47.25
11	4573	-65.8	PK	10.8	-55	-8	-47
12	5488	-67.13	PK	10.9	-56.23	-8	-48.23
13	6403	-63.96	PK	10.9	-53.06	-8	-45.06
HiCh 30 - 1000MHz							
3	926.6024	0.63	PK	10.2	10.83	-	-
14	1854	-65.75	PK	10.4	-55.35	-8	-47.35
15	2780	-69.4	PK	10.5	-58.9	-8	-50.9
16	4633	-65.41	PK	10.8	-54.61	-8	-46.61
17	5532	-68.46	PK	10.8	-57.66	-8	-49.66
18	6487	-65.45	PK	11	-54.45	-8	-46.45
PK - Peak detector							

Figure 6 Band Edge Antenna Port Plot TX Mode, Low & High Channel, Short Packet

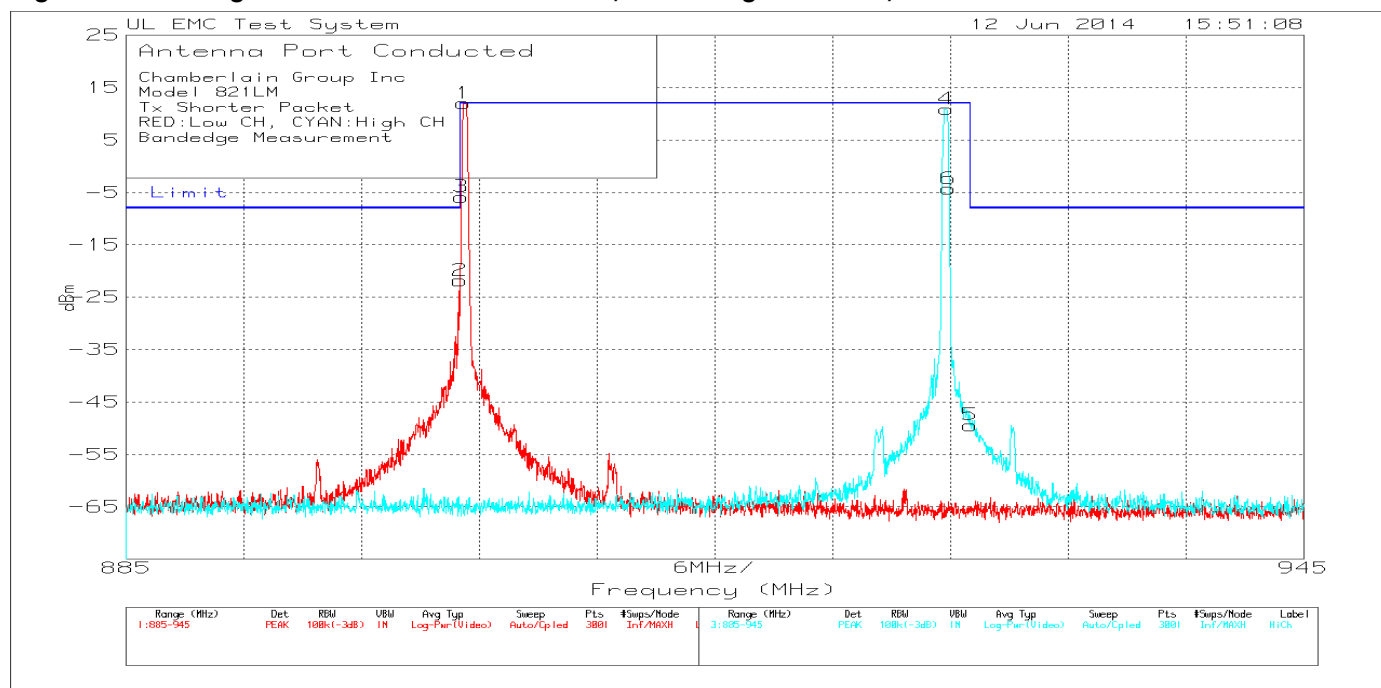


Table 7 Band Edge Antenna Port Mode, Low & High Channels, Short Packet

Chamberlain Group Inc							
Model 821LM							
Tx Shorter Packet							
RED:Low CH, CYAN:High CH							
Bandedge Measurement							
Trace Markers							
Marker No.	Test Frequency MHz	Meter Reading dBm	Detector	Cable Factor dB	Level dBm	Limit dBm	Margin dB
Low Channel							
1	902.19	1.81	PK	10.2	12.01	-	-
2	902	-32	PK	10.2	-21.8	-7.99	-13.81
3	902.06	-16.06	PK	10.2	-5.86	-	-
High Channel							
4	926.8	0.69	PK	10.2	10.89	-	-
5	928	-59.64	PK	10.2	-49.44	-7.99	-41.45
6	926.92	-14.47	PK	10.2	-4.27	-	-
PK - Peak detector							

Figure 7 Band Edge Antenna Port Plot TX Mode, Low & High Channel, Long Packet

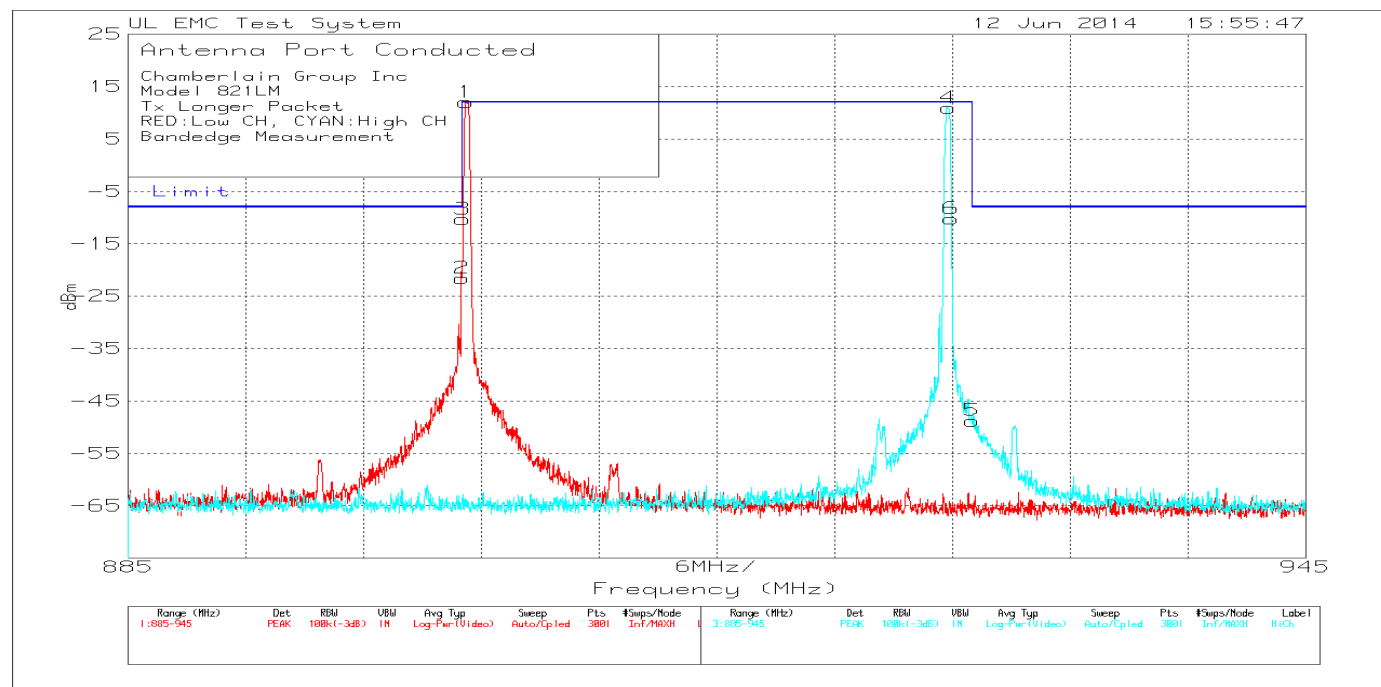


Table 8 Band Edge Antenna Port Mode, Low & High Channels, Long Packet

Chamberlain Group Inc							
Model 821LM							
Tx Longer Packet							
RED:Low CH, CYAN:High CH							
Bandedge Measurement							
Trace Markers							
Marker No.	Test Frequency MHz	Meter Reading dBm	Detector	Cable Factor dB	Level dBm	Limit dBm	Margin dB
Low Channel							
1	902.2	1.85	PK	10.2	12.05	-	-
2	902	-31.76	PK	10.2	-21.56	-7.95	-13.61
3	902.04	-20.5	PK	10.2	-10.3	-	-
High Channel							
4	926.8	0.74	PK	10.2	10.94	-	-
5	928	-58.96	PK	10.2	-48.76	-7.95	-40.81
6	926.94	-20.41	PK	10.2	-10.21	-	-
PK - Peak detector							

Figure 8 Band Edge Antenna Port Plot TX Mode, Hopping

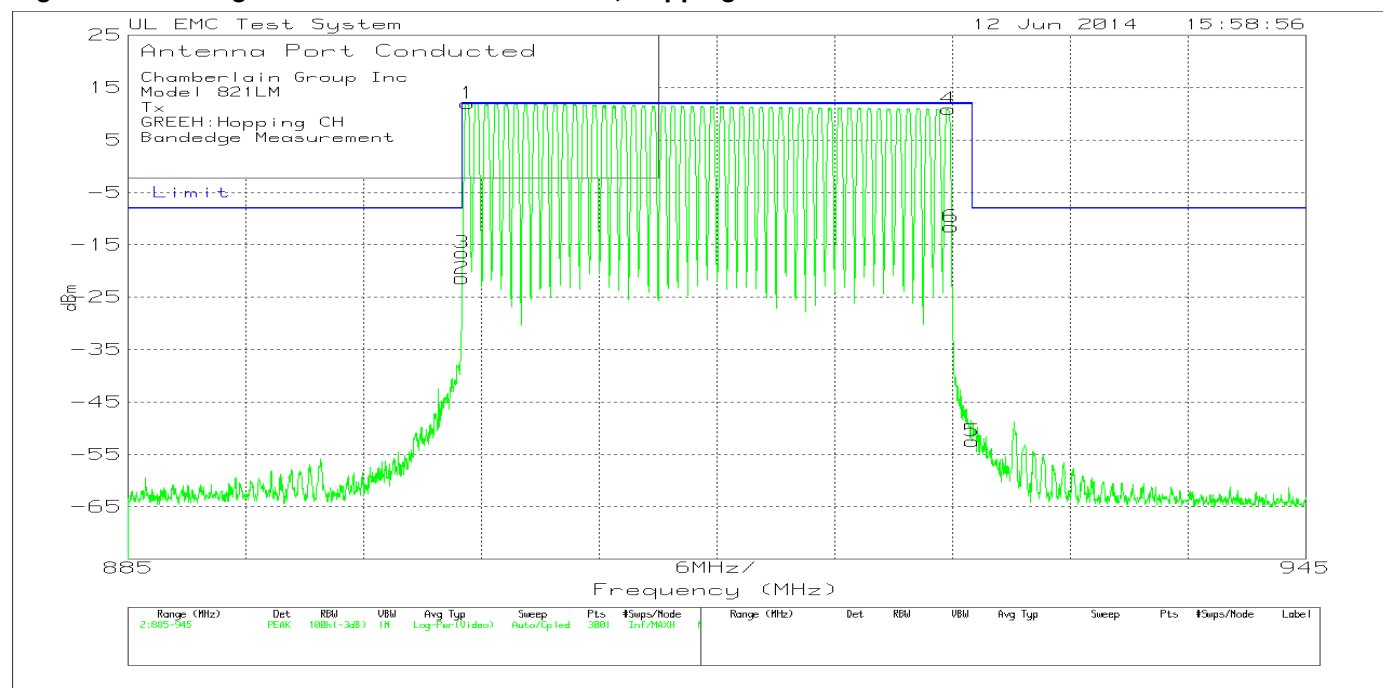
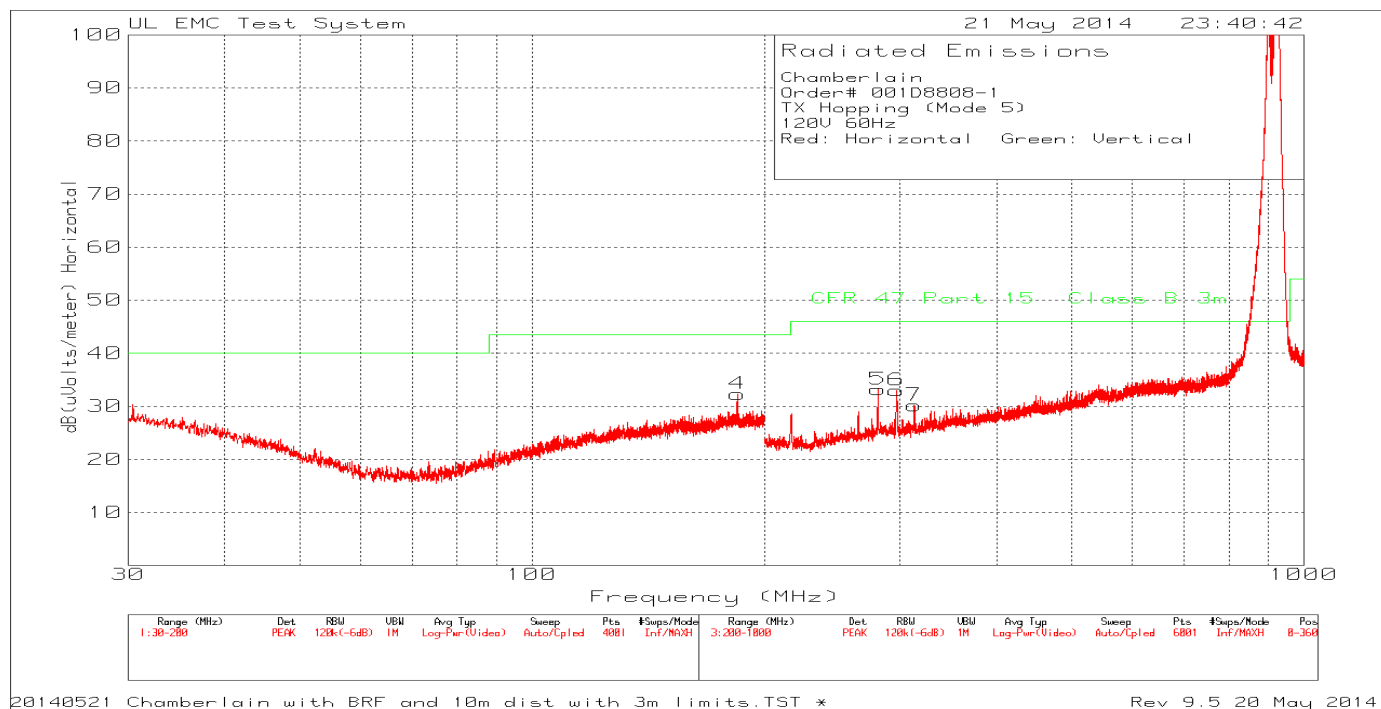
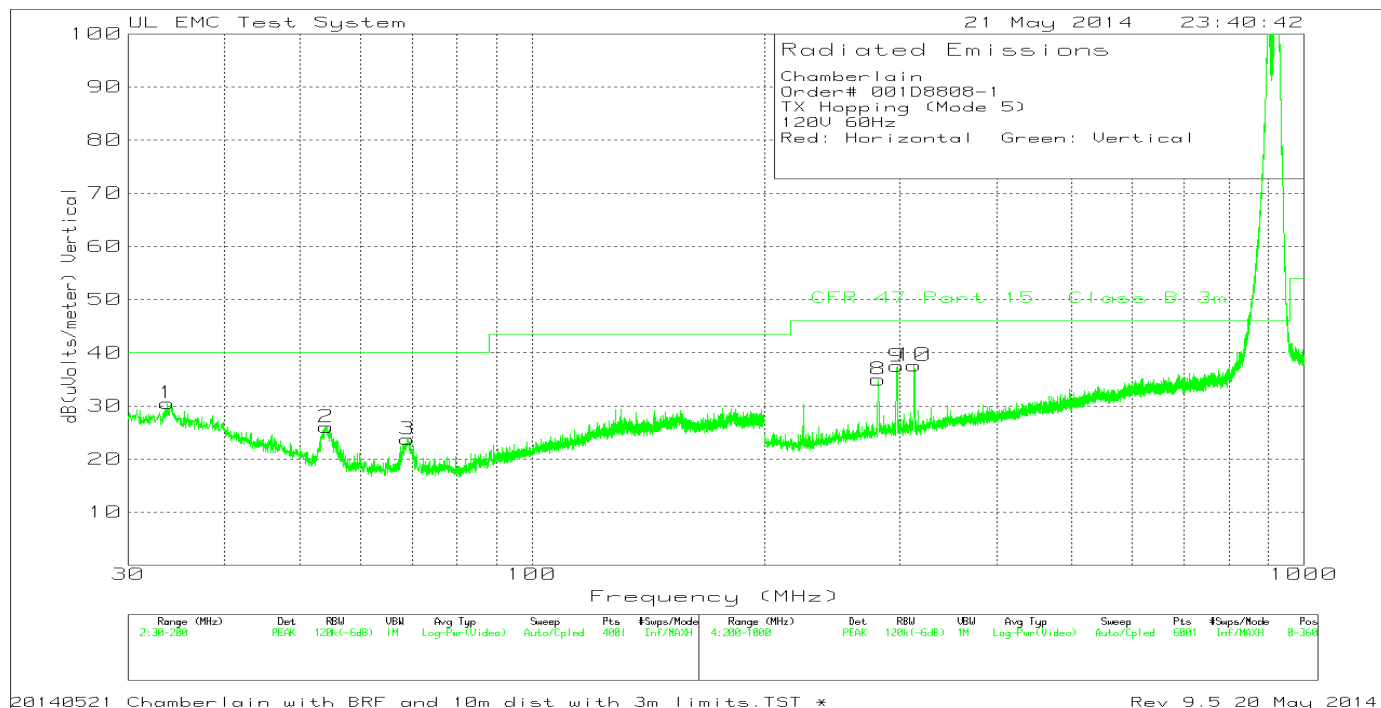


Table 9 Band Edge Antenna Port Mode, Low & High Channels, Long Packet

Chamberlain Group Inc							
Model 821LM							
Tx							
Marker No.	Test Frequency MHz	Meter Reading dBm	Detector	Cable Factor dB	Level dBm	Limit dBm	Margin (dB)
Low Side							
1	902.3	1.79	PK	10.2	11.99	-	-
2	902	-31.61	PK	10.2	-21.41	-8.01	-13.4
3	902.02	-26.7	PK	10.2	-16.5	-	-
High Side							
4	926.8	0.7	PK	10.2	10.9	-	-
5	928	-62.69	PK	10.2	-52.49	-8.01	-44.48
6	926.94	-21.77	PK	10.2	-11.57	-	-
PK - Peak detector							

Figure 9 30MHz – 1GHz Radiated Emissions Graph TX Hopping



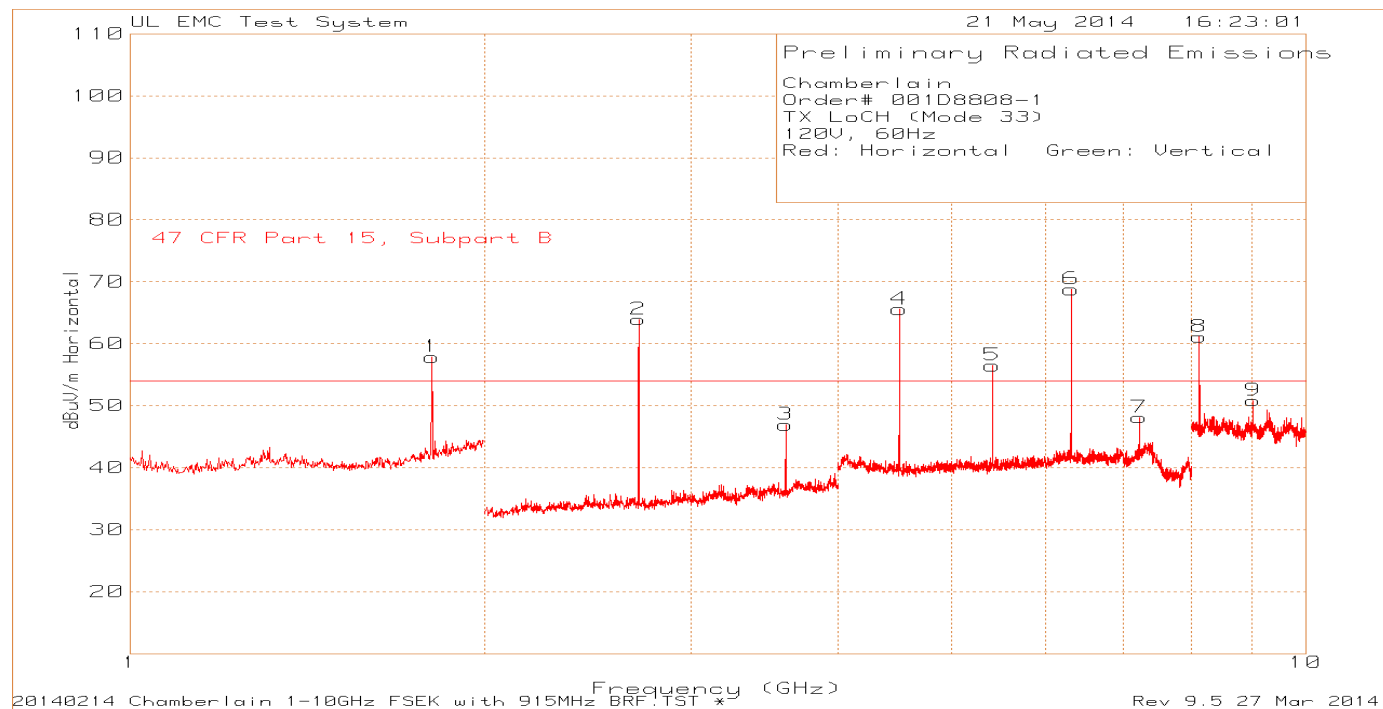
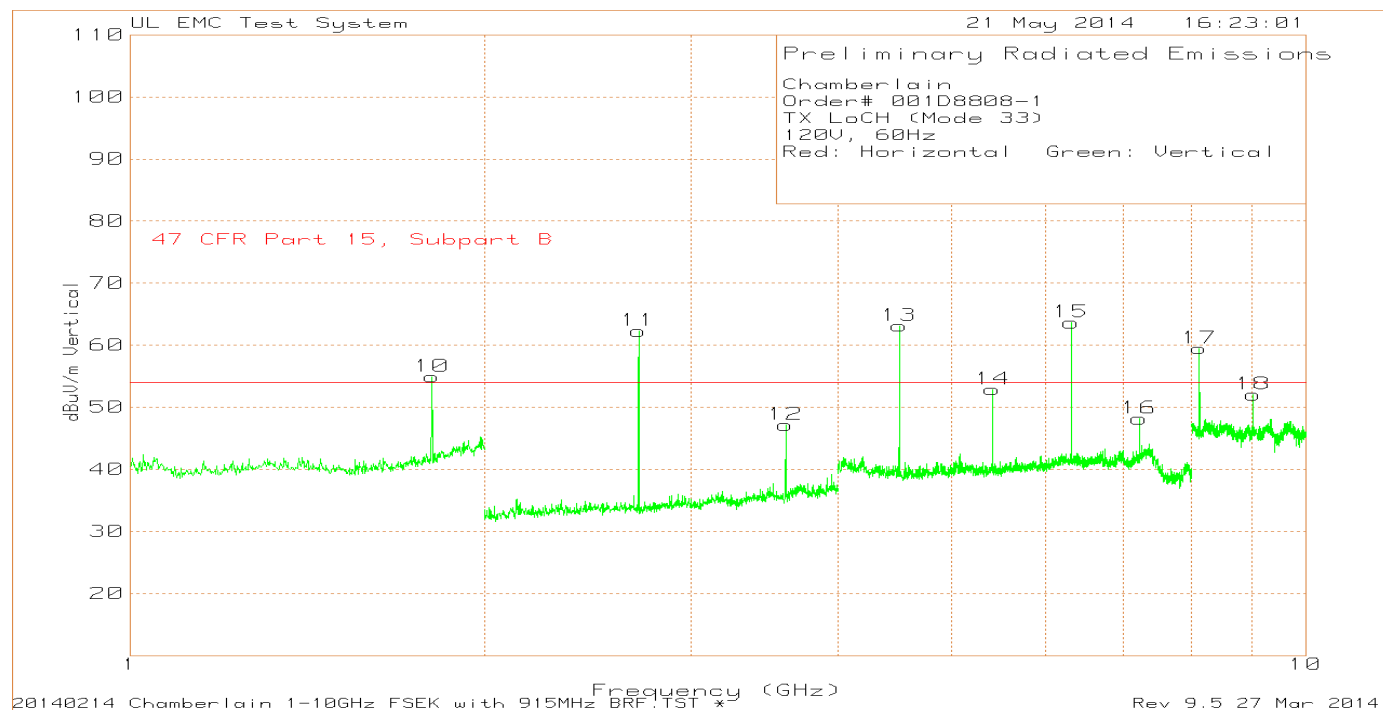
* Area between 850MHz to 950MHz is an attenuation product of the Band Reject Filter. The whole area is outside of the restricted bands therefore there is no radiated limits applicable.

Order Number: 10338209
 Model Number: 001D8088-1
 Client Name: Chamberlain Group Inc.

Table 10 30MHz – 1GHz Radiated Emissions Data Points TX Hopping

Chamberlain													
Order# 001D8808-1													
TX Hopping (Mode 5)													
120V 60Hz													
Red: Horizontal Green: Vertical													
Trace Markers													
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Cable Factor dB	BRF dB	10m to 3m Factor dB	Level dBuV/m	Limit 47 CFR Part 15.209 dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
4	184.53	34.95	PK	16	-29.1	0	10.5	32.35	43.52	-11.17	0-360	250	H
1	33.6975	33.7	PK	16.4	-30.1	0	10.5	30.5	40	-9.5	0-360	99	V
2	54.1825	37.02	PK	8.5	-30	0	10.5	26.02	40	-13.98	0-360	249	V
3	69.015	37.05	PK	6.2	-30	0	10.5	23.75	40	-16.25	0-360	249	V
5	280.9331	35.8	PK	13	-26.3	0.2	10.5	33.2	46.02	-12.82	0-360	199	H
6	296.7998	35.42	PK	13.1	-26.2	0.2	10.5	33.02	46.02	-13	0-360	199	H
7	312.7997	32.17	PK	13.3	-26	0.2	10.5	30.17	46.02	-15.85	0-360	199	H
8	281.0665	37.57	PK	13	-26.3	0.2	10.5	34.97	46.02	-11.05	0-360	100	V
9	297.1998	39.87	PK	13.1	-26.2	0.2	10.5	37.47	46.02	-8.55	0-360	100	V
10	312.7997	39.59	PK	13.3	-26	0.2	10.5	37.59	46.02	-8.43	0-360	100	V
PK - Peak detector													

Figure 10 Low Channel 1GHz – 10GHz Radiated Emissions Graph



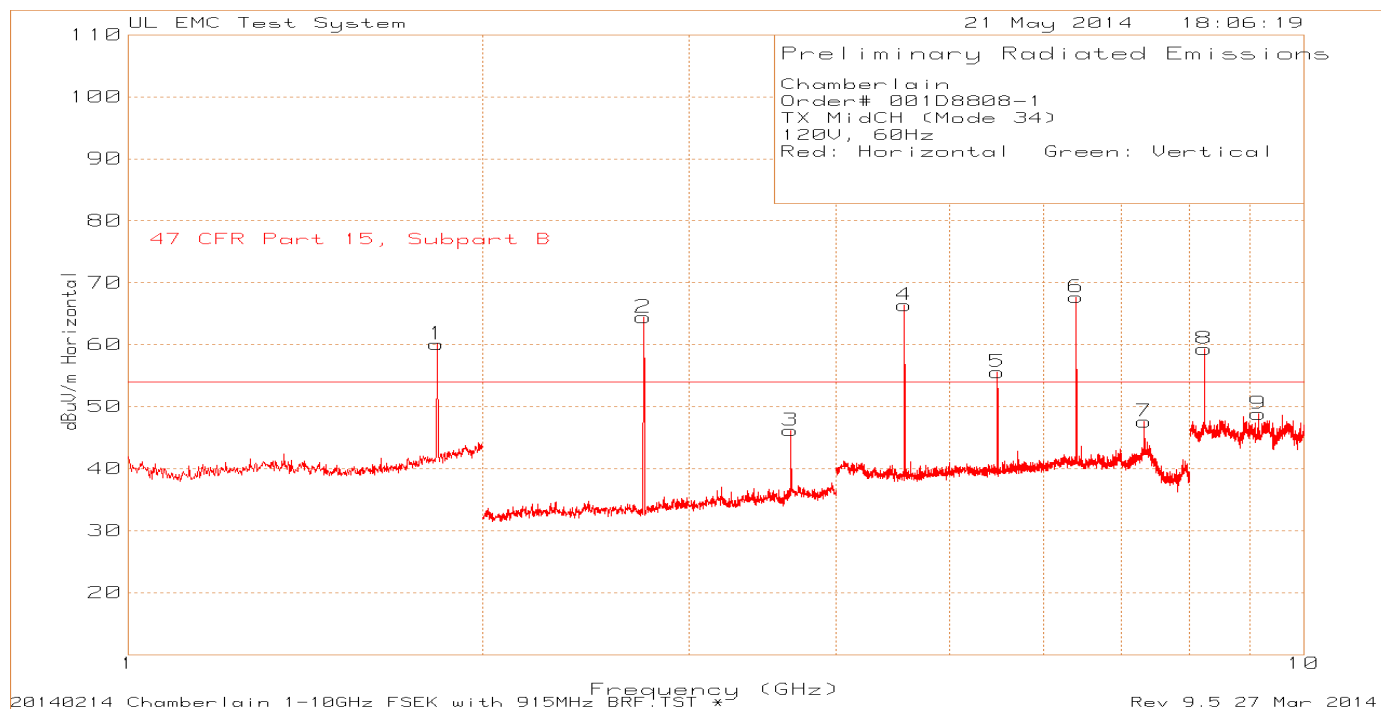
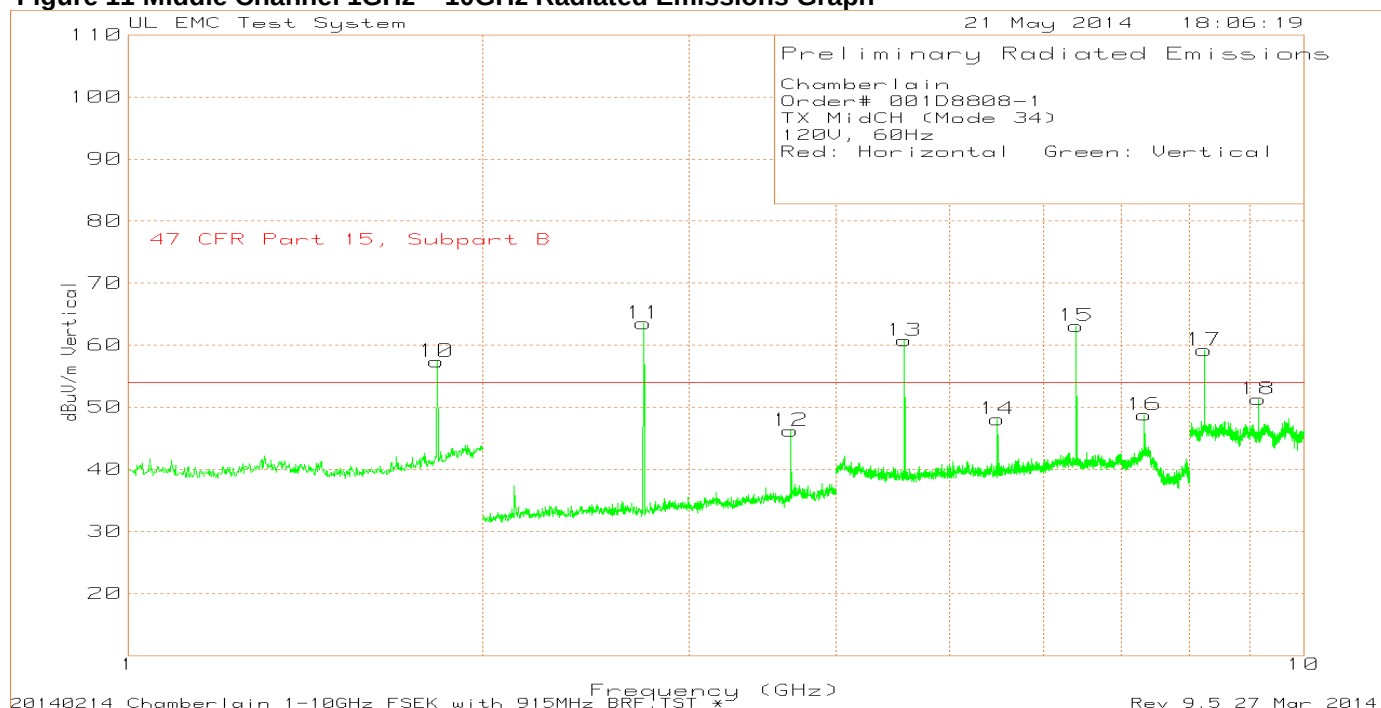
Order Number: 10338209
 Model Number: 001D8088-1
 Client Name: Chamberlain Group Inc.

Page 26 of 47

Table 11 Low Channel 1GHz – 10GHz Radiated Emissions Data Points

Chamberlain Order# 001D8808-1 TX LoCH (Mode 33) 120V, 60Hz Red: Horizontal Green: Vertical Trace Markers												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	BRF dB	Cable Factor dB	Level dBuV/m	Limit 47 CFR Part 15.209 dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	1.8056	81.06	PK	29.9	0.4	-53.52	57.84	54	3.84	0-360	100	H
2	* 2.7067	92.51	PK	22.1	0	-50.69	63.92	54	9.92	0-360	100	H
3	* 3.6096	74.14	PK	23.2	0	-50.39	46.95	54	-7.05	0-360	100	H
4	* 4.5113	89.43	PK	27.8	0	-51.68	65.55	54	11.55	0-360	100	H
5	* 5.4127	77.73	PK	27.9	0	-49.13	56.5	54	2.5	0-360	100	H
6	6.3162	86.42	PK	29.2	0	-46.82	68.8	54	14.8	0-360	100	H
7	7.2196	64.57	PK	29.8	0	-46.26	48.11	54	-5.89	0-360	100	H
8	* 8.1201	73.47	PK	36.2	0	-48.57	61.1	54	7.1	0-360	100	H
9	* 9.023	62.77	PK	36.1	0	-48.02	50.85	54	-3.15	0-360	149	H
10	1.8056	78.16	PK	29.9	0.4	-53.52	54.94	54	0.94	0-360	149	V
11	* 2.7067	90.89	PK	22.1	0	-50.69	62.3	54	8.3	0-360	100	V
12	* 3.6096	74.36	PK	23.2	0	-50.39	47.17	54	-6.83	0-360	100	V
13	* 4.5103	87.01	PK	27.8	0	-51.68	63.13	54	9.13	0-360	100	V
14	* 5.4147	74.09	PK	27.9	0	-49.11	52.88	54	-1.12	0-360	100	V
15	6.3152	81.29	PK	29.2	0	-46.82	63.67	54	9.67	0-360	100	V
16	7.2196	64.63	PK	29.8	0	-46.26	48.17	54	-5.83	0-360	100	V
17	* 8.1201	71.86	PK	36.2	0	-48.57	59.49	54	5.49	0-360	149	V
18	* 9.023	63.97	PK	36.1	0	-48.02	52.05	54	-1.95	0-360	100	V
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band												
PK - Peak detector												
Radiated Emission Data												
	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	DC Factor dB	Cable Factor dB	Level dBuV/m	Limit 47 CFR Part 15.209 dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
	* 2.7065	91.87	PK	22.1	0	-50.68	63.29	74	-10.71	288	100	H
	* 2.7067	82.95	LnAv	22.1	-24.95	-50.69	29.41	54	-24.59	288	100	H
	* 3.609	75.07	PK	23.2	0	-50.4	47.87	74	-26.13	293	100	H
	* 3.609	65.09	LnAv	23.2	-24.95	-50.4	12.94	54	-41.06	293	100	H
	* 4.511	89	PK	27.8	0	-51.68	65.12	74	-8.88	359	100	H
	* 4.5112	79.75	LnAv	27.8	-24.95	-51.68	30.92	54	-23.08	359	100	H
	* 5.4131	78.6	PK	27.9	0	-49.12	57.38	74	-16.62	348	100	H
	* 5.4135	68.84	LnAv	27.9	-24.95	-49.12	22.67	54	-31.33	348	100	H
	* 8.1196	75.67	PK	36.2	0	-48.57	63.3	74	-10.7	349	125	H
	* 8.1201	65.14	LnAv	36.2	-24.95	-48.57	27.82	54	-26.18	349	125	H
	* 9.0221	68.35	PK	36.1	0	-48.02	56.43	74	-17.57	308	103	H
	* 9.0223	56.75	LnAv	36.1	-24.95	-48.02	19.88	54	-34.12	308	103	H
	* 2.7069	91.6	PK	22.1	0	-50.69	63.01	74	-10.99	293	124	V
	* 2.7068	82.7	LnAv	22.1	-24.95	-50.69	29.16	54	-24.84	293	124	V
	* 3.6091	75.71	PK	23.2	0	-50.4	48.51	74	-25.49	278	117	V
	* 3.6089	66.17	LnAv	23.2	-24.95	-50.4	14.02	54	-39.98	278	117	V
	* 4.5114	86.98	PK	27.8	0	-51.68	63.1	74	-10.9	6	100	V
	* 4.5112	77.67	LnAv	27.8	-24.95	-51.68	28.84	54	-25.16	6	100	V
	* 5.4132	75.18	PK	27.9	0	-49.12	53.96	74	-20.04	16	100	V
	* 5.4135	65.34	LnAv	27.9	-24.95	-49.12	19.17	54	-34.83	16	100	V
	* 8.1198	74.55	PK	36.2	0	-48.57	62.18	74	-11.82	283	101	V
	* 8.1201	64	LnAv	36.2	-24.95	-48.57	26.68	54	-27.32	283	101	V
	* 9.0218	68.61	PK	36.1	0	-48.02	56.69	74	-17.31	314	101	V
	* 9.0223	56.75	LnAv	36.1	-24.95	-48.02	19.88	54	-34.12	314	101	V
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band												
PK - Peak detector												
LnAv - Linear (voltage) average detector												

Figure 11 Middle Channel 1GHz – 10GHz Radiated Emissions Graph



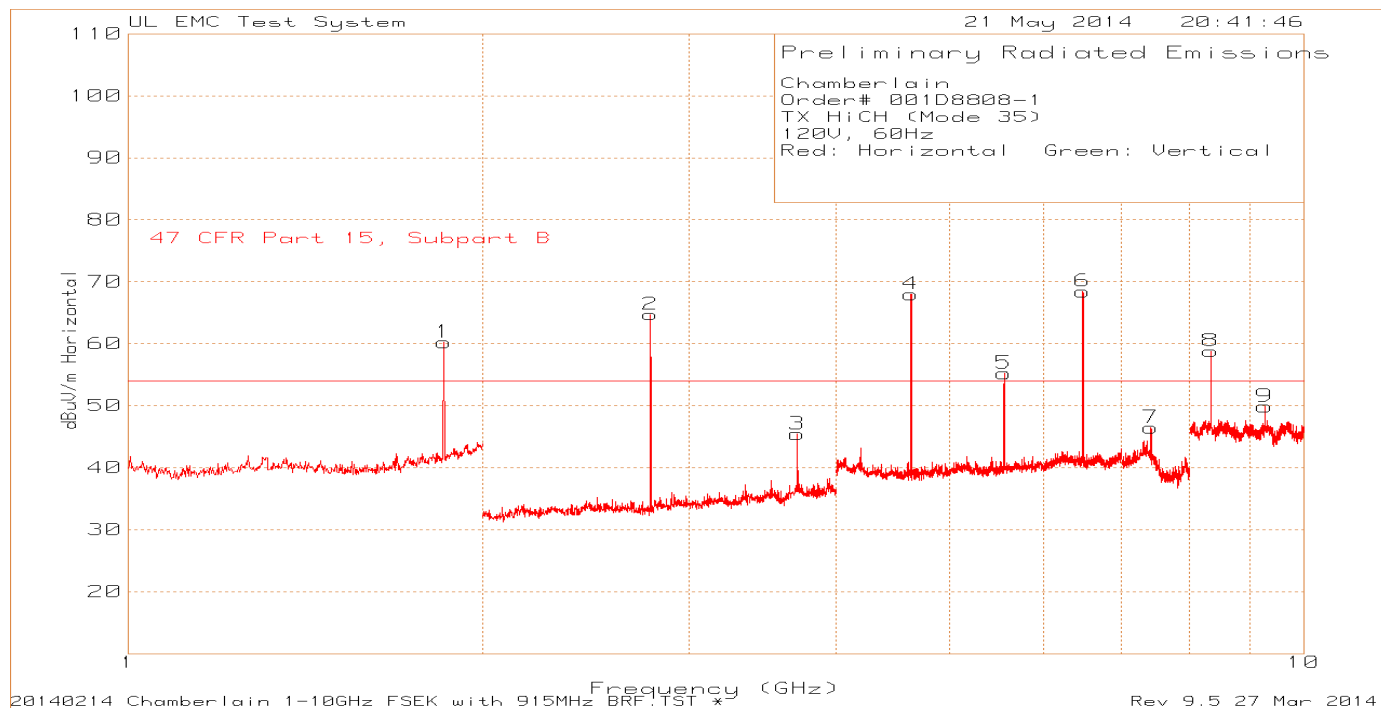
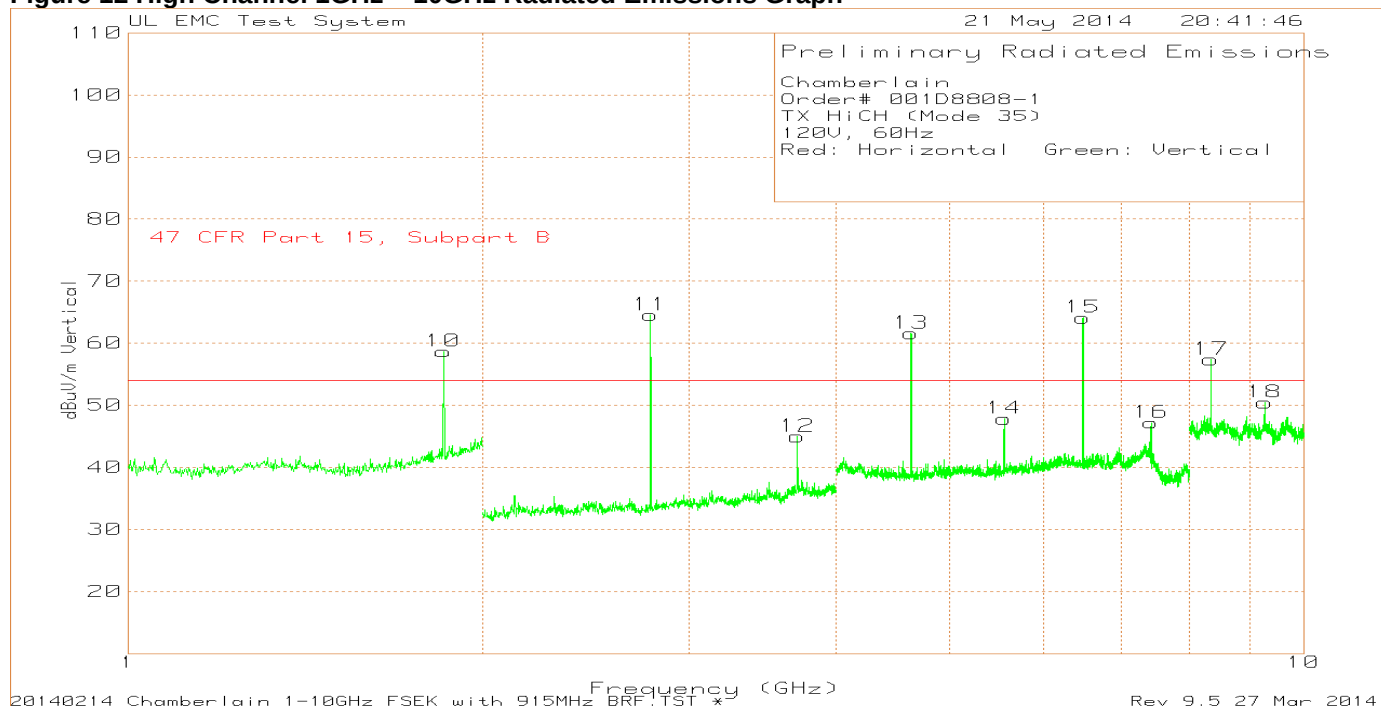
Order Number: 10338209
 Model Number: 001D8088-1
 Client Name: Chamberlain Group Inc.

Page 28 of 47

Table 12 Middle Channel 1GHz – 10GHz Radiated Emissions Data Points

Chamberlain Order# 001D8808-1 TX MidCH (Mode 34) 120V, 60Hz Red: Horizontal Green: Vertical Trace Markers												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	BRF dB	Cable Factor dB	Level dBuV/m	Limit 47 CFR Part 15.209 dBuv/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	1.8297	83	PK	30.2	0.4	-53.52	60.08	54	6.08	0-360	101	H
2	* 2.7447	93	PK	22.1	0	-50.67	64.43	54	10.43	0-360	100	H
3	* 3.6597	71.79	PK	23.4	0	-49	46.19	54	-7.81	0-360	100	H
4	* 4.5743	90.23	PK	27.7	0	-51.56	66.37	54	12.37	0-360	100	H
5	5.4887	76.74	PK	28.1	0	-49.24	55.6	54	1.6	0-360	100	H
6	6.4032	85.5	PK	29.2	0	-47.02	67.68	54	13.68	0-360	100	H
7	* 7.3177	62.73	PK	30.6	0	-45.71	47.62	54	-6.38	0-360	100	H
8	* 8.2322	69.93	PK	36.4	0	-46.99	59.34	54	5.34	0-360	100	H
9	* 9.1491	61.99	PK	36.3	0	-49.44	48.85	54	-5.15	0-360	149	H
10	1.8297	80.27	PK	30.2	0.4	-53.52	57.35	54	3.35	0-360	149	V
11	* 2.7447	92.09	PK	22.1	0	-50.67	63.52	54	9.52	0-360	100	V
12	* 3.6597	71.8	PK	23.4	0	-49	46.2	54	-7.8	0-360	100	V
13	* 4.5743	84.62	PK	27.7	0	-51.56	60.76	54	6.76	0-360	100	V
14	5.4887	69.21	PK	28.1	0	-49.24	48.07	54	-5.93	0-360	100	V
15	6.4032	80.91	PK	29.2	0	-47.02	63.09	54	9.09	0-360	100	V
16	* 7.3197	63.89	PK	30.6	0	-45.71	48.78	54	-5.22	0-360	100	V
17	* 8.2322	69.77	PK	36.4	0	-46.99	59.18	54	5.18	0-360	149	V
18	* 9.1491	64.45	PK	36.3	0	-49.44	51.31	54	-2.69	0-360	99	V
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band												
PK - Peak detector												
Radiated Emission Data												
	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	DC Factor dB	Cable Factor dB	Level dBuV/m	Limit 47 CFR Part 15.209 dBuv/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
	* 2.7441	93.29	PK	22.1	0	-50.67	64.72	74	-9.28	281	100	H
	* 2.7442	84.46	LnAv	22.1	-24.95	-50.67	30.94	54	-23.06	281	100	H
	* 4.574	90.3	PK	27.7	0	-51.56	66.44	74	-7.56	346	100	H
	* 4.5737	81.12	LnAv	27.7	-24.95	-51.56	32.31	54	-21.69	346	100	H
	* 7.3182	65.81	PK	30.6	0	-45.71	50.7	74	-23.3	276	100	H
	* 7.3179	54.78	LnAv	30.6	-24.95	-45.71	14.72	54	-39.28	276	100	H
	* 8.2322	74.08	PK	36.4	0	-46.99	63.49	74	-10.51	255	109	H
	* 8.2326	63.55	LnAv	36.4	-24.95	-46.99	28.01	54	-25.99	255	109	H
	* 9.1479	66.03	PK	36.3	0	-49.43	52.9	74	-21.1	0	100	H
	* 9.1473	53.97	LnAv	36.3	-24.95	-49.43	15.89	54	-38.11	0	100	H
	* 2.7441	92.64	PK	22.1	0	-50.67	64.07	74	-9.93	0	105	V
	* 2.7443	83.76	LnAv	22.1	-24.95	-50.67	30.24	54	-23.76	0	105	V
	* 4.5739	84.96	PK	27.7	0	-51.56	61.1	74	-12.9	276	100	V
	* 4.5737	75.56	LnAv	27.7	-24.95	-51.56	26.75	54	-27.25	276	100	V
	* 7.3175	66.16	PK	30.6	0	-45.71	51.05	74	-22.95	282	100	V
	* 7.3179	54.56	LnAv	30.6	-24.95	-45.71	14.5	54	-39.5	282	100	V
	* 8.2323	72.63	PK	36.4	0	-46.99	62.04	74	-11.96	277	120	V
	* 8.2326	61.82	LnAv	36.4	-24.95	-46.99	26.28	54	-27.72	277	120	V
	* 9.147	68.31	PK	36.3	0	-49.43	55.18	74	-18.82	321	100	V
	* 9.1473	57.06	LnAv	36.3	-24.95	-49.43	18.98	54	-35.02	321	100	V
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band												
PK - Peak detector												
LnAv - Linear (voltage) average detector												

Figure 12 High Channel 1GHz – 10GHz Radiated Emissions Graph



Order Number: 10338209
 Model Number: 001D8088-1
 Client Name: Chamberlain Group Inc.

Page 30 of 47

Table 13 High Channel 1GHz – 10GHz Radiated Emissions Data Points

Chamberlain												
Order# 001D8808-1												
TX HiCH (Mode 35)												
120V, 60Hz												
Red: Horizontal Green: Vertical												
Trace Markers												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	BRF dB	Cable Factor dB	Level dBuV/m	Limit 47 CFR Part 15.209 dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	1.8557	82.61	PK	30.6	0.4	-53.4	60.21	54	6.21	0-360	100	H
2	* 2.7808	93	PK	22.2	0	-50.48	64.72	54	10.72	0-360	99	H
3	* 3.7077	70.82	PK	23.5	0	-48.91	45.41	54	-8.59	0-360	99	H
4	* 4.6343	91.83	PK	27.7	0	-51.53	68	54	14	0-360	100	H
5	5.5608	76.39	PK	28.3	0	-49.49	55.2	54	1.2	0-360	100	H
6	6.4872	86.69	PK	29.1	0	-47.36	68.43	54	14.43	0-360	100	H
7	* 7.4137	61.9	PK	31	0	-46.45	46.45	54	-7.55	0-360	100	H
8	* 8.3403	70.73	PK	36.5	0	-48.41	58.82	54	4.82	0-360	100	H
9	9.2673	61.33	PK	36.4	0	-47.87	49.86	54	-4.14	0-360	100	H
10	1.8537	81.19	PK	30.5	0.4	-53.41	58.68	54	4.68	0-360	149	V
11	* 2.7808	92.81	PK	22.2	0	-50.48	64.53	54	10.53	0-360	100	V
12	* 3.7077	70.37	PK	23.5	0	-48.91	44.96	54	-9.04	0-360	100	V
13	* 4.6323	85.4	PK	27.7	0	-51.52	61.58	54	7.58	0-360	101	V
14	5.5608	69.02	PK	28.3	0	-49.49	47.83	54	-6.17	0-360	101	V
15	6.4892	82.36	PK	29.1	0	-47.35	64.11	54	10.11	0-360	101	V
16	* 7.4157	62.79	PK	30.9	0	-46.48	47.21	54	-6.79	0-360	101	V
17	* 8.3403	69.28	PK	36.5	0	-48.41	57.37	54	3.37	0-360	100	V
18	9.2693	61.89	PK	36.4	0	-47.85	50.44	54	-3.56	0-360	100	V
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band												
PK - Peak detector												
Radiated Emission Data												
	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Duty Cycle Factor dB	Cable Factor dB	Level dBuV/m	Limit 47 CFR Part 15.209 dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
	* 2.7804	93.26	PK	22.2	0	-50.49	64.97	74	-9.03	278	100	H
	* 2.7802	84.36	LnAv	22.2	-24.95	-50.49	31.12	54	-22.88	278	100	H
	* 4.6334	92.02	PK	27.7	0	-51.53	68.19	74	-5.81	344	100	H
	* 4.6337	82.81	LnAv	27.7	-24.95	-51.53	34.03	54	-19.97	344	100	H
	* 8.3402	73.7	PK	36.5	0	-48.4	61.8	74	-12.2	258	107	H
	* 8.3406	63.06	LnAv	36.5	-24.95	-48.41	26.2	54	-27.8	258	107	H
	9.2667	65.97	PK	36.4	0	-47.87	54.5	74	-19.5	0	105	H
	9.2672	54.03	LnAv	36.4	-24.95	-47.87	17.61	54	-36.39	0	105	H
	* 2.7803	93.68	PK	22.2	0	-50.49	65.39	74	-8.61	0	107	V
	* 2.7802	84.79	LnAv	22.2	-24.95	-50.49	31.55	54	-22.45	0	107	V
	* 4.6335	85.87	PK	27.7	0	-51.53	62.04	74	-11.96	270	100	V
	* 4.6337	76.62	LnAv	27.7	-24.95	-51.53	27.84	54	-26.16	270	100	V
	* 8.3402	75.23	PK	36.5	0	-48.4	63.33	74	-10.67	288	118	V
	* 8.3406	64.66	LnAv	36.5	-24.95	-48.41	27.8	54	-26.2	288	118	V
	9.2678	66.4	PK	36.4	0	-47.86	54.94	74	-19.06	318	100	V
	9.2673	54.5	LnAv	36.4	-24.95	-47.87	18.08	54	-35.92	318	100	V
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band												
PK - Peak detector												
LnAv - Linear (voltage) average detector												

4.4 Test Conditions and Results – MAXIMUM PEAK OUTPUT POWER

Test Description	For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.	
Basic Standard	47 CFR Part 15.247(b)(2) RSS-210, A8.4(2)	
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	902MHz – 928MHz	Antenna Conducted
Limits		
Frequency (MHz)	Limit mW	
	Peak	
902 - 928	1000 (30dBm – gain of Antenna over 6dBi)	
Supplementary information: None		

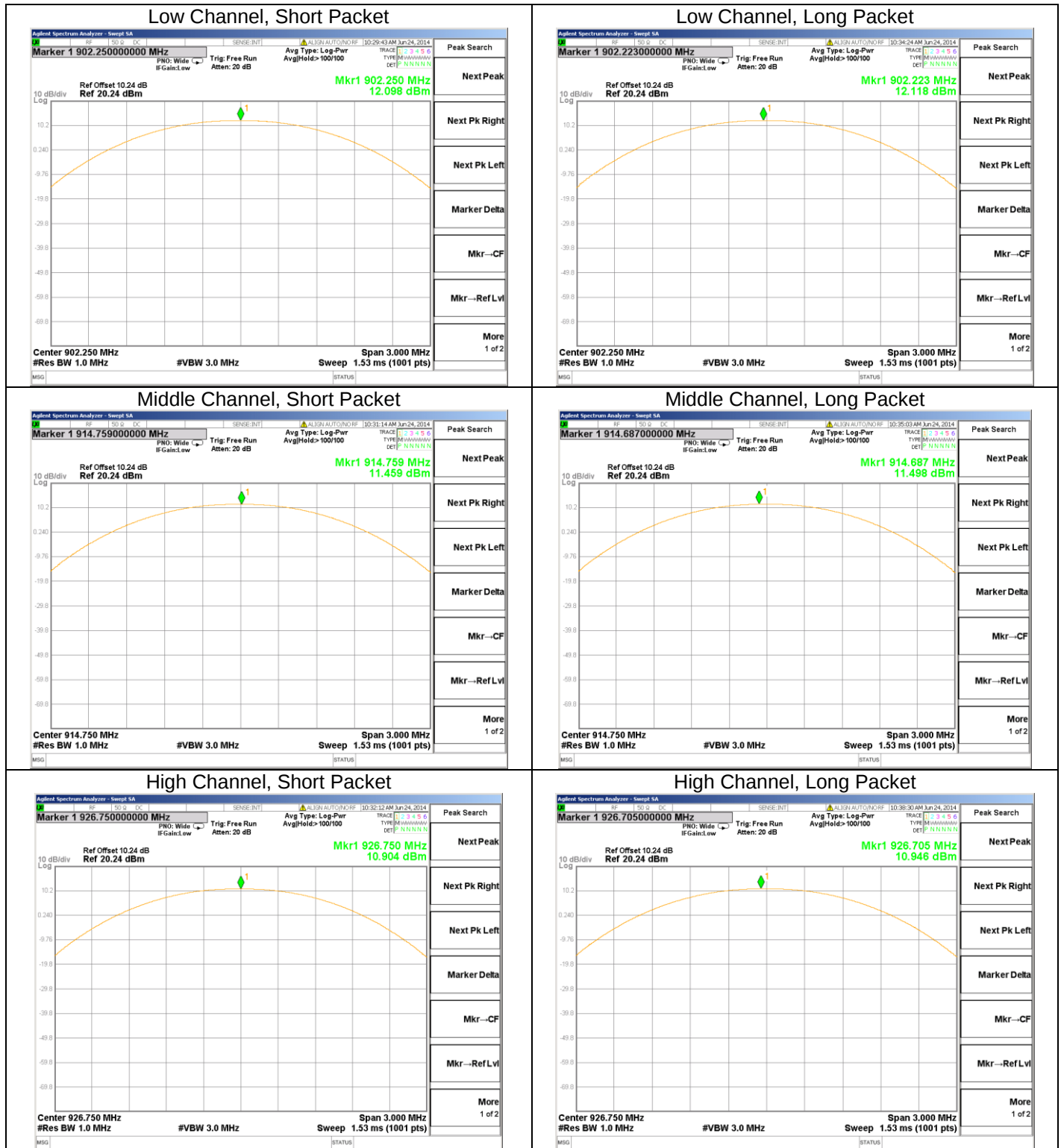
Table 14 Maximum Peak Output Power EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	2	1
Supplementary information: None		

Table 15 Maximum Peak Output Power Results

Channel	Limit (dBm)	Power dBm	Power mW
Low Channel, Short Packet	30	12.098	16.211
Middle Channel, Short Packet	30	11.459	13.993
High Channel, Short Packet	30	10.904	12.314
Low Channel, Long Packet	30	12.118	16.285
Middle Channel, Long Packet	30	11.498	14.119
High Channel, Long Packet	30	10.946	12.434

Figure 13 Maximum Peak Output Power Graph



4.5 Test Conditions and Results – Dwell Time and Duty Cycle Correction

Test Description	For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.
Basic Standard	47 CFR Part 15.247(a)(1)(i) RSS-210, A8.1(d)

Table 16 Dwell Time Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	2	1
Supplementary information: Duty cycle also measured/calculated for use in radiated spurious measurements		

Table 17 Dwell Time Results

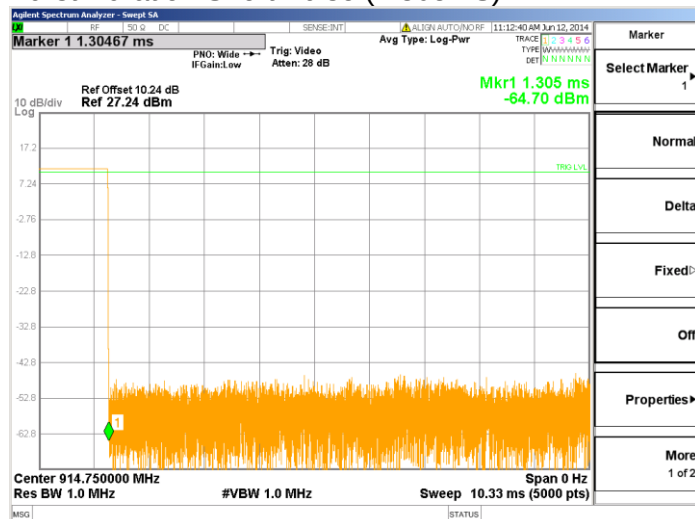
Mode	Number of Channels	Maximum Time Allowed in 20s.	Measured Dwell Time in 20s.
TX Hopping	50	0.4s	0.10906s

Table 18 Duty Cycle Correction Factor

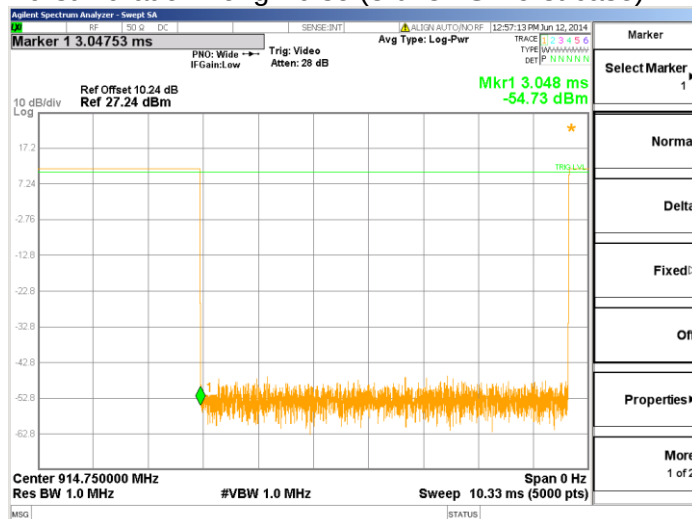
Mode	Number of TX in 100mS	TX Duration in 100mS	Duty Cycle Correction (dB) $20 \times \log\left(\frac{TX (ms)}{100ms}\right)$
TX Hopping Short Packet	1	1.305	-37.69
TX Hopping Long Packet	1	3.048	-30.32
Per the operational descriptions there is a rare worst case possibility where transmission may take 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.			

Figure 14 Dwell Time Graphs

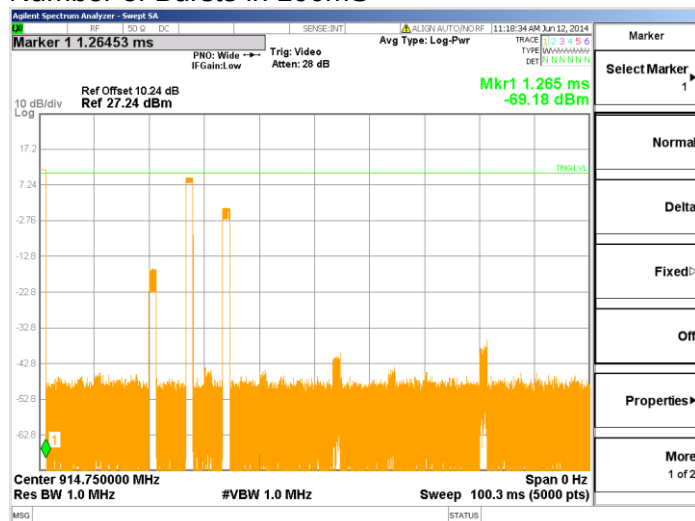
Burst Duration Short Pulse (1.305mS)



Burst Duration Long Pulse (3.048mS worst case)

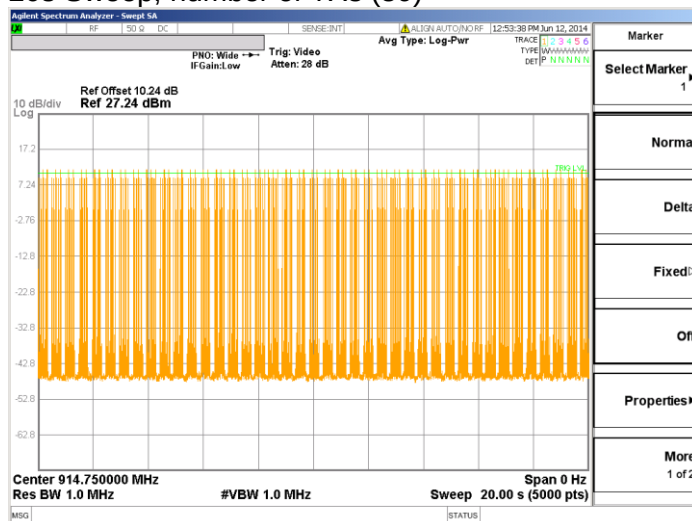


Number of Bursts in 100mS



In 100mS only single pulse on the same frequency is transmitted. This is independent of short or long pulses.

20s Sweep, number of TXs (89)



The number of transitions plots show only the single channel. It was checked that the number of transitions was the same on other channels do to equal channel use. The total number of transitions counted in 20s is: 89. Total maximum transmit time: 109.06mS within 20s.

4.6 Test Conditions and Results – NUMBER OF HOPPING FREQUENCIES

Test Description	For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz. Frequency hopping systems operating in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.	
Basic Standard	47 CFR Part 15.247(a)(1)(i) RSS-210, A8.1(d)	

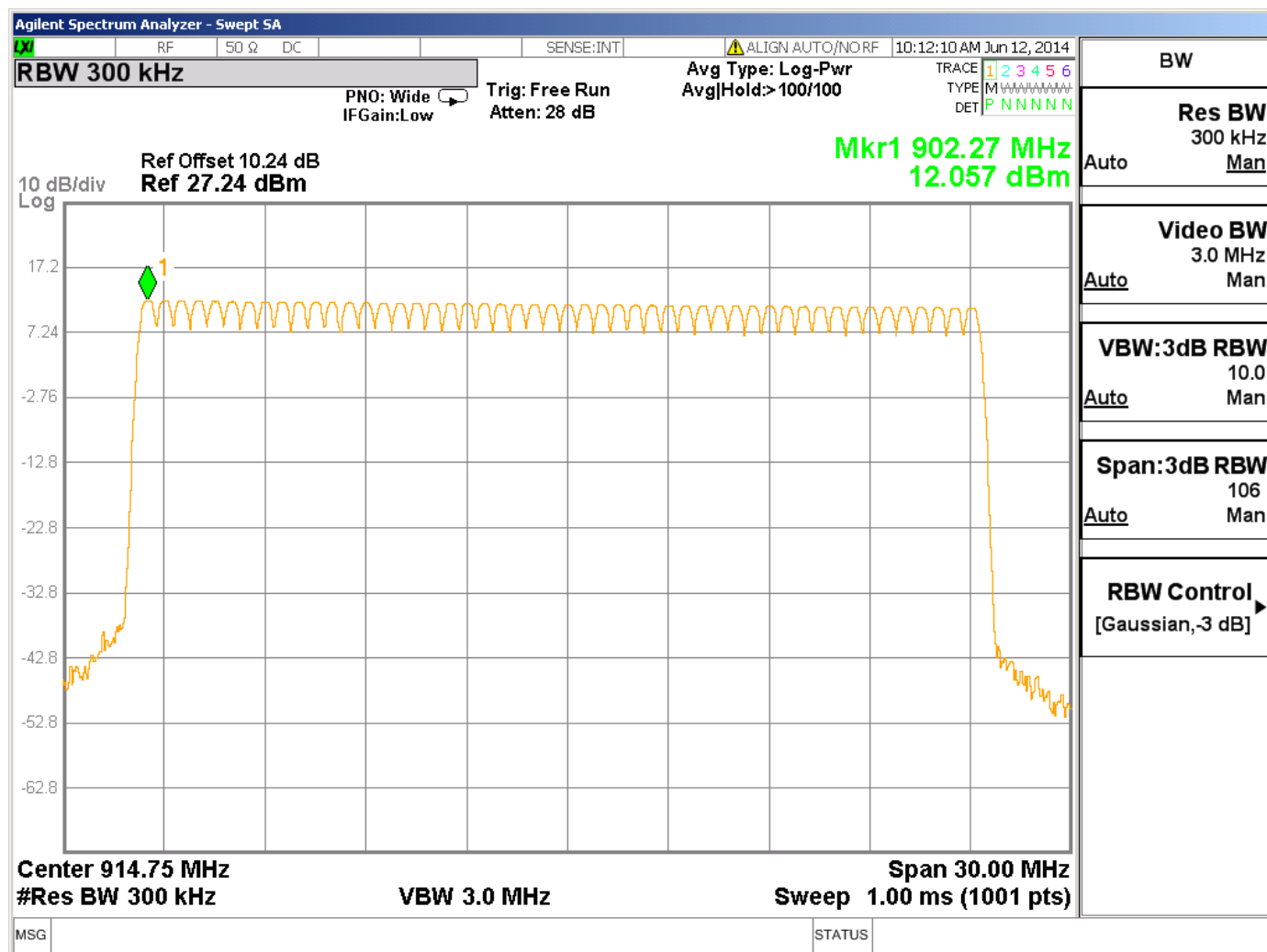
Table 19 Number of Hopping Frequencies Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	2	1
Supplementary information: None		

Table 20 Number of Hopping Frequencies Results

Mode	Number of Channels	Minimum Number Required
TX, Hopping	50	50

Figure 15 Number of Hopping Frequencies Graphs



4.7 Test Conditions and Results – 20DB BANDWIDTH & 99% BANDWIDTH

Test Description	For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.	
Basic Standard	47 CFR Part 15.247(a)(1)(i) RSS-210, A8.1(b)	

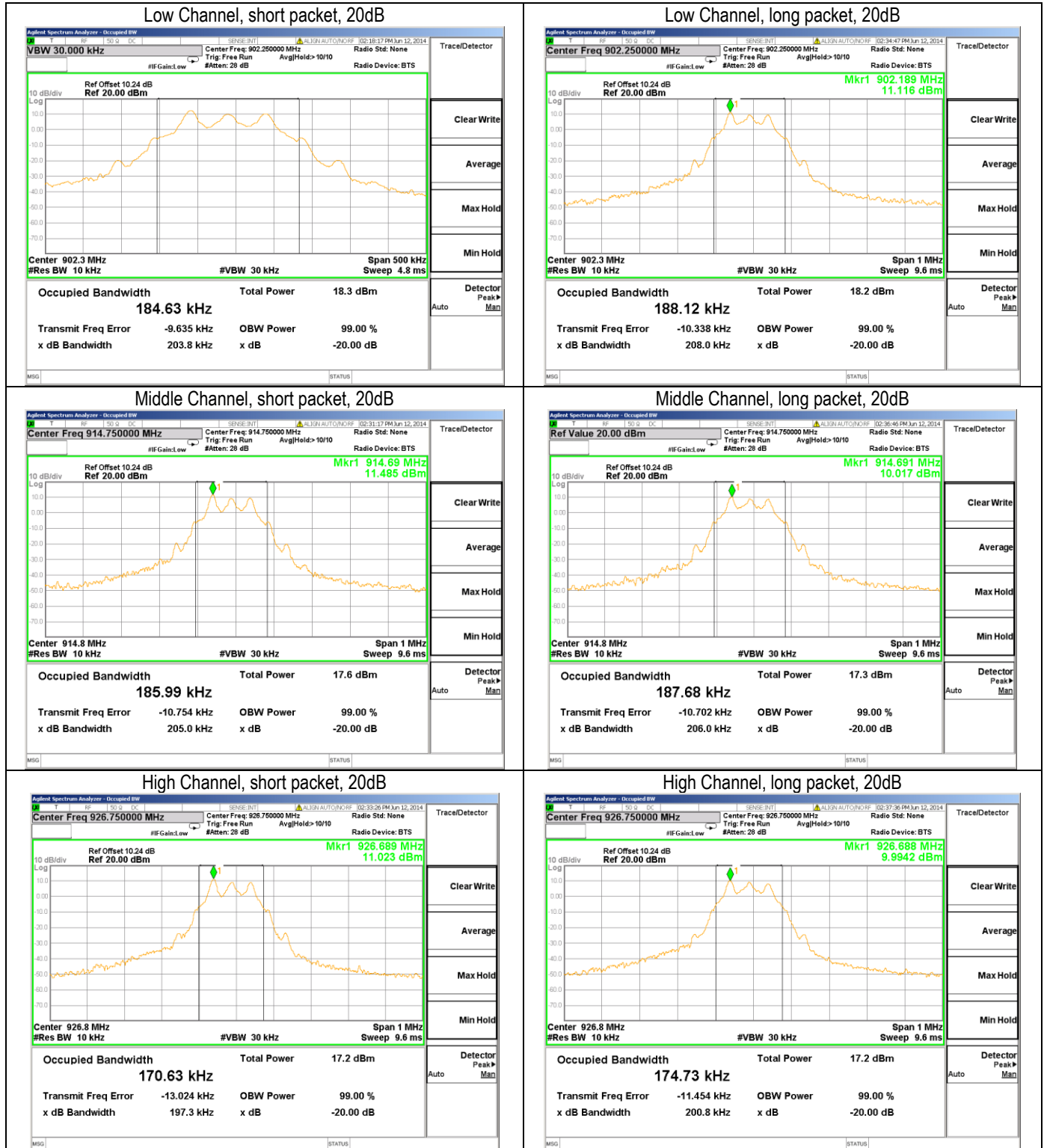
Table 21 20dB Bandwidth Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	2	1
Supplementary information: None		

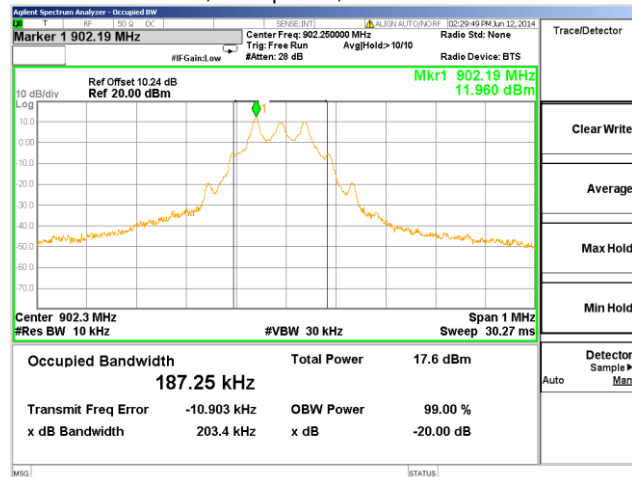
Table 22 20dB Bandwidth Results

Mode	Channel	20dB Bandwidth kHz	99% Bandwidth kHz
TX, Short Packet	Low	203.8	187.25
	Middle	205.0	186.84
	High	197.3	171.46
TX, Long Packet	Low	208.0	188.65
	Middle	206.0	188.74
	High	200.8	174.75

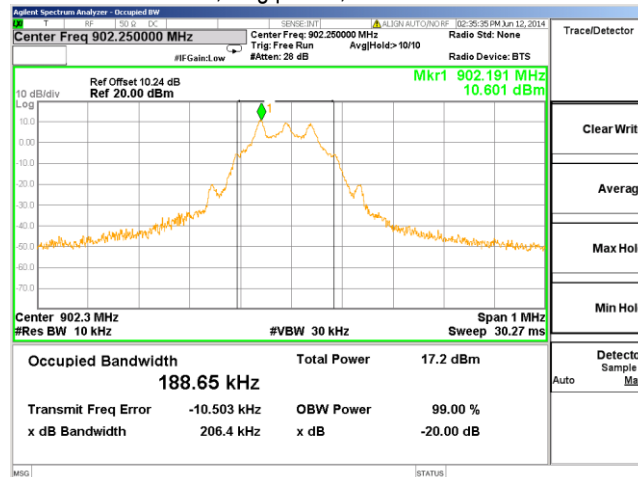
Figure 16 20dB Bandwidth Graphs & 99% Power Bandwidth Graphs



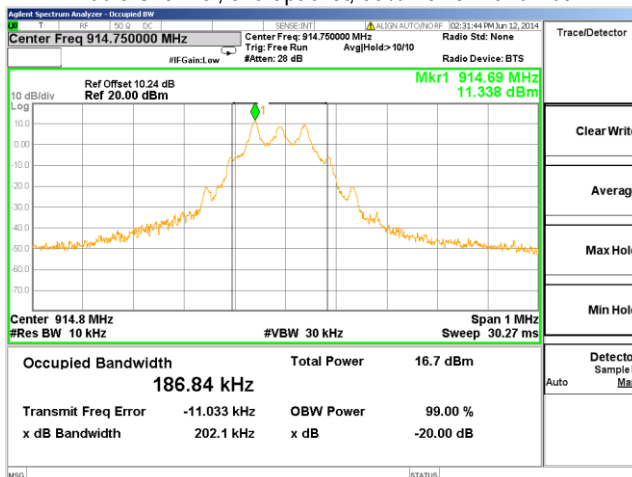
Low Channel, short packet, 99% Power Bandwidth



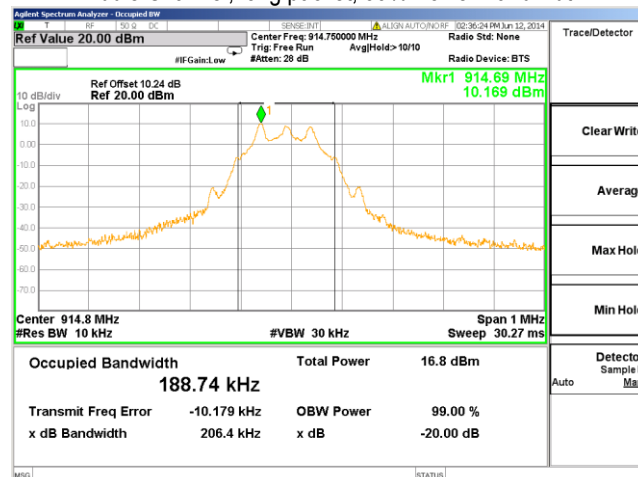
Low Channel, long packet, 99% Power Bandwidth



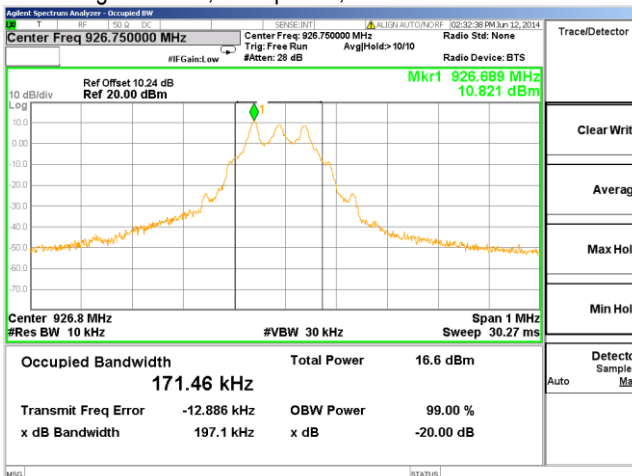
Middle Channel, short packet, 99% Power Bandwidth



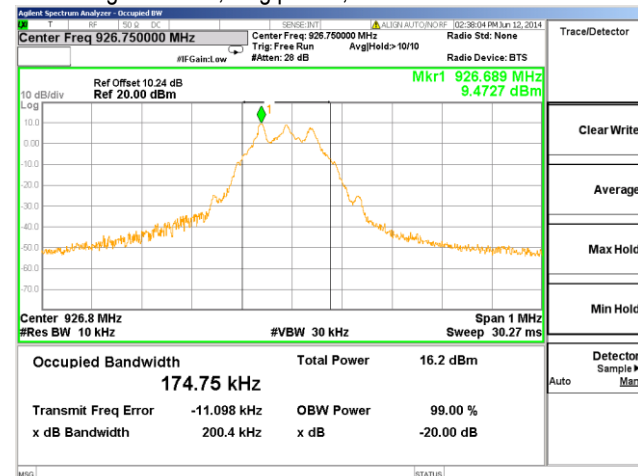
Middle Channel, long packet, 99% Power Bandwidth



High Channel, short packet, 99% Power Bandwidth



High Channel, long packet, 99% Power Bandwidth



4.8 Test Conditions and Results – Carrier Frequency Separation

Test Description	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.	
Basic Standard	47 CFR Part 15.247(a)(1) RSS-210, A8.1(b)	

Table 23 Carrier Frequency Separation Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	2	1
Supplementary information: Separation frequencies were measured for each channel and then averaged.		

Table 24 Carrier Frequency Separation Results

Mode	Channel	Carrier Frequency Separation Limit	Channel Separation
TX Hopping	Low Side	> 20dB Bandwidth (aprx. 200kHz)	495.40kHz
	Middle		501.57kHz
	High Side		498.70kHz

Figure 17 Carrier Frequency Separation Graph bottom channels

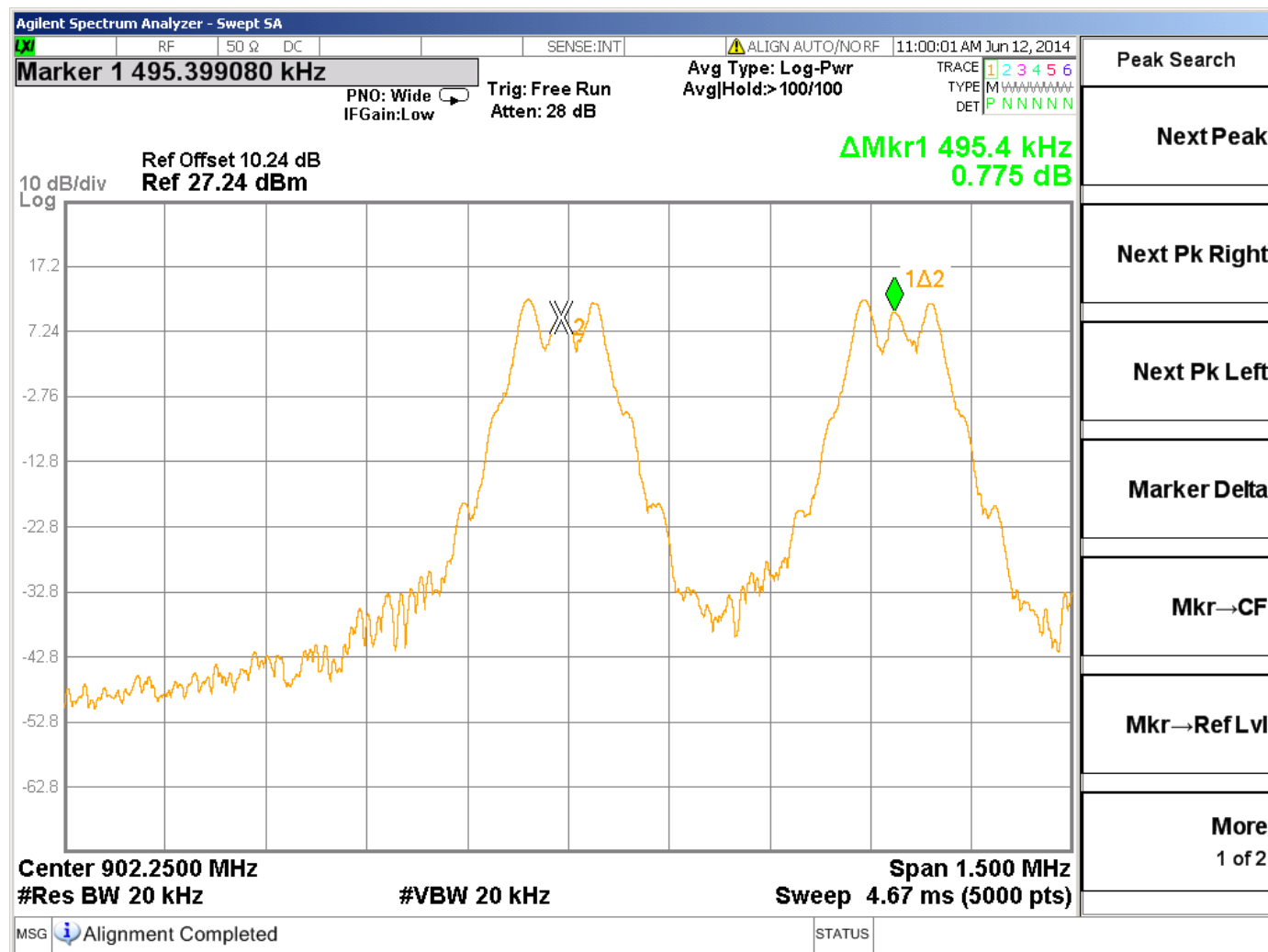


Figure 18 Carrier Frequency Separation Graph Middle Channels

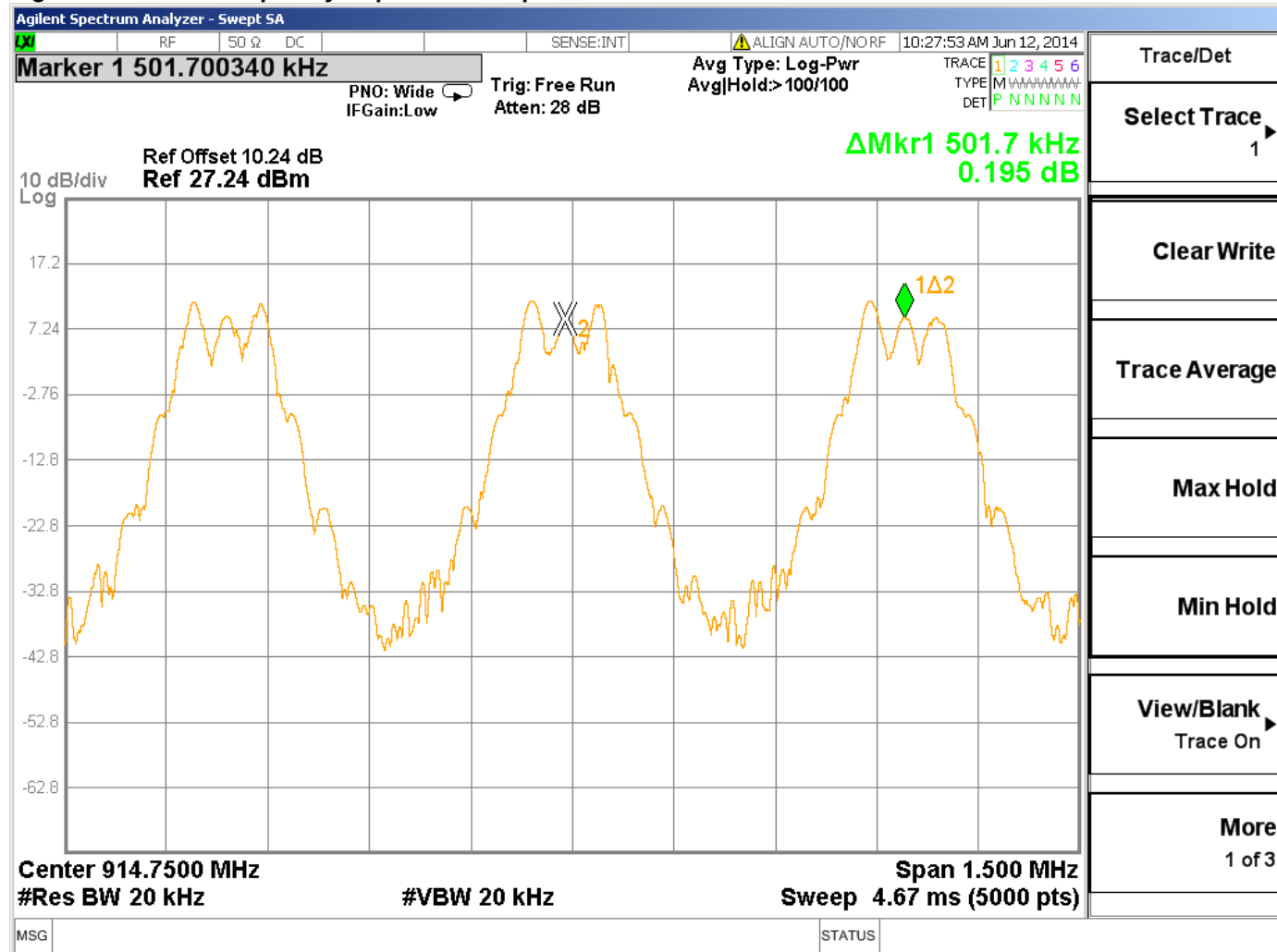
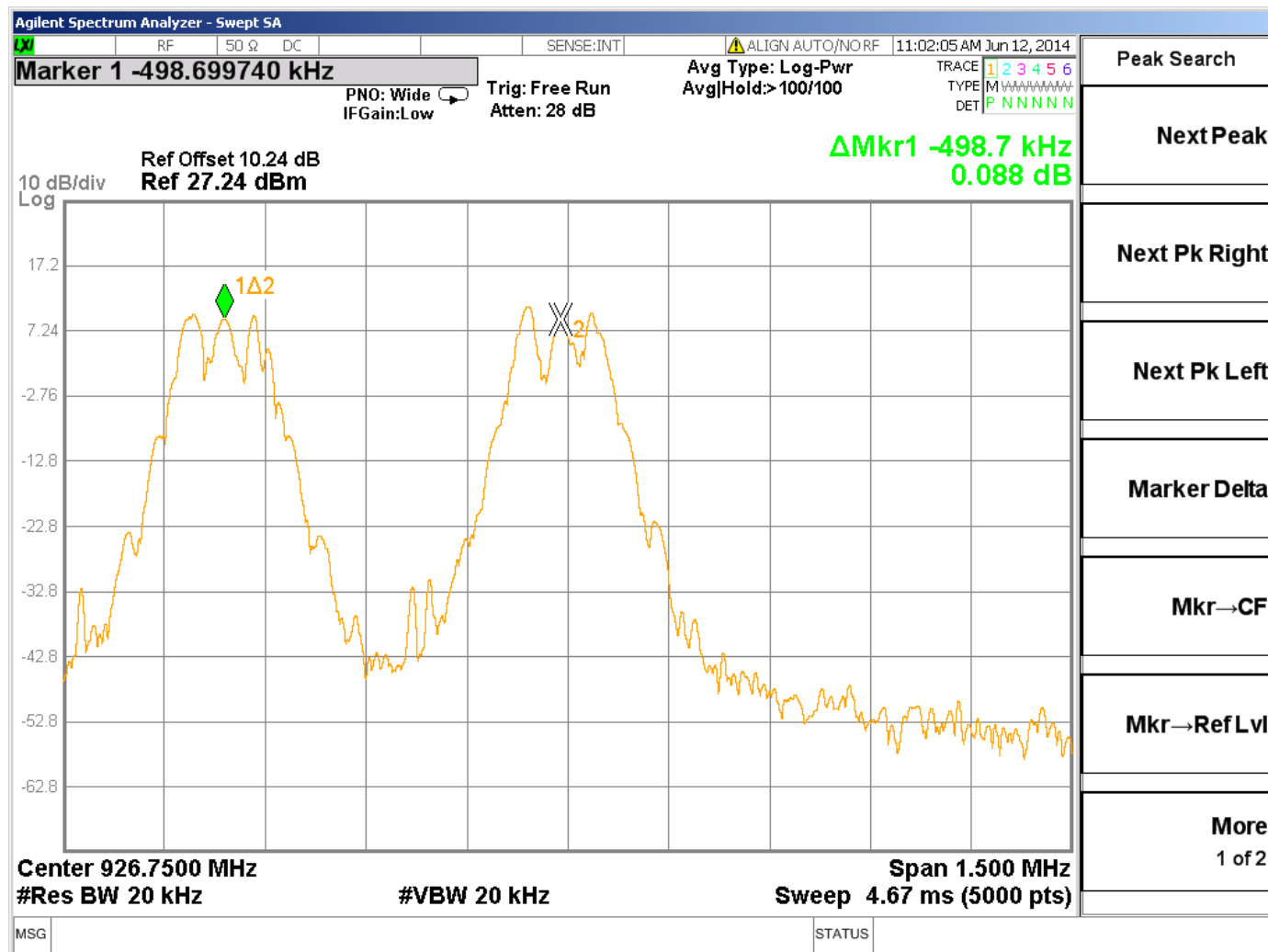


Figure 19 Carrier Frequency Separation Graph high Channels



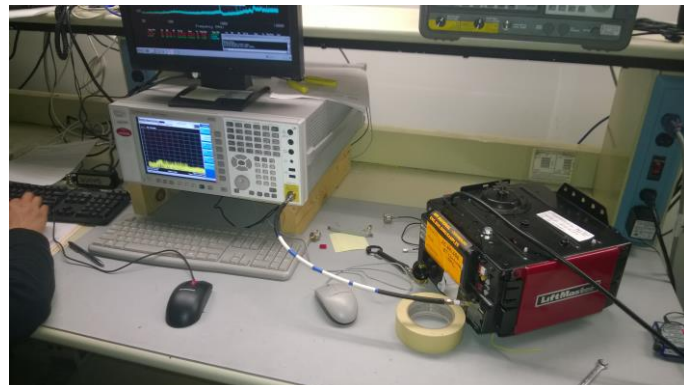
Appendix A

Test Setup Photos

Line Conducted Emissions



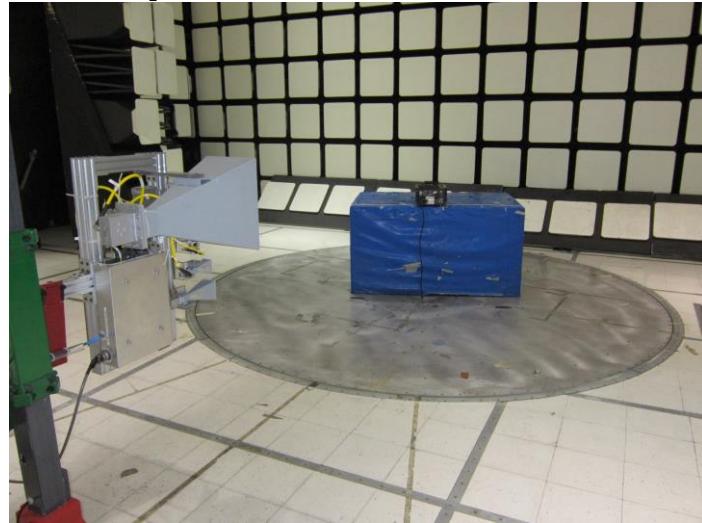
Antenna Port Emissions



Radiated Spurious Emissions above below 1GHz



Radiated Spurious Emissions above 1GHz



Order Number: 10338209
 Model Number: 001D8088-1
 Client Name: Chamberlain Group Inc.

Page 45 of 47

Appendix B

Test Equipment

Conducted Emissions

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due Date
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC4328	20131217	20141231
Transient Limiter	Electro-Metrics	EM7600-2	EMC4224	N/A	N/A
HighPass Filter	Solar Electronics	2803-150	885551	N/A	N/A
Attenuator	HP	8494B	2831A00838	N/A	N/A
LISN - L1	Solar	8602-50-TS-50-N	EMC4052	20140115	20150116
LISN - L2	Solar	8602-50-TS-50-N	EMC4064	20140115	20150116

Radiated Emissions – 10-Meter Chamber

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due Date
EMI Test Receiver	Rohde & Schwarz	ESU	EMC4323	20131220	20141231
Bicon Antenna	Chase	VBA6106A	EMC4078	20140401	20150401
Log-P Antenna	Chase	UPA6109	EMC4313	20131003	20141003
Spectrum Analyzer	Rhode & Schwarz	FSEK	EMC4182	20131226	20141231
Antenna Array	UL	BOMS	EMC4276	20130912	20140930

Antenna Port Conducted Emissions

Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
Spectrum analyzer	Agilent	N9030A	EMC4360	20131221	20141221
Cable and Attenuator	-	-	-	*	*
* measured at the time of testing					

Appendix C

Accreditations and Authorizations



NVLAP Lab code: 100414-0

NVLAP: The National Institute of Standards and Technology (NIST) administers the National Voluntary Laboratory Accreditation Program (NVLAP). NVLAP is comprised of laboratory accreditation programs (LAPs) which are established on the basis of requests and demonstrated need. Each LAP includes specific calibration and/or test standards and related methods and protocols assembled to satisfy the unique needs for accreditation in a field of testing or calibration. NVLAP accredits public and private laboratories based on evaluation of their technical qualifications and competence to carry out specific calibrations or tests. Accreditation criteria are established in accordance with the U.S. Code of Federal Regulations (CFR, Title 15, Part 285), NVLAP Procedures and General Requirements, and encompass the requirements of ISO/IEC 17025. For a full scope listing see <http://ts.nist.gov/standards/scopes/1004140.htm>



FCC: Details of the measurement facilities used for these tests have been filed with the Federal Communications Commission's Laboratory in Columbia, Maryland (Ref. No. 91044).



Industry Canada Industrie Canada

Industry of Canada: Accredited by Industry Canada for performance of radiated measurements. Our test site complies with RSP 100, Issue 7, Section 3.3. File #: IC 2180A



VCCI: Accepted as an Associate Member to the VCCI. The measurement facilities detailed in this test report have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. Registration Nos.: A0140.



ICASA: ICASA (Independent Communications Authority of South Africa) has appointed UL as a Designated Test Laboratory to test Telecommunications equipment for type approval in compliance with CISPR 22 to assist in fulfilling its mandate under section 54(1) of the Telecommunications Act, 1996 (Act 103 of 1996).



NIST/CAB: Validated by the European Commission as a U.S. Conformity Assessment Body (CAB) of the U.S.-EU Mutual Recognition Agreement (MRA) for the Electromagnetic Compatibility - Council Directive 2004/108/EC, Annex III (2-3). Also validated for the Telecommunication Equipment-Council Directive 99/5/EC, Annex III and IV, Identification Number: 0983.

NIST/CAB: Provisioned to act as a U.S. Conformity Assessment Body (CAB) under Appendix B, Phase I Procedures, of the Asia Pacific Economic Cooperation (APEC) MRA between the American Institute in Taiwan (AIT) and the United States. Our laboratory is considered qualified to test equipment subject to the applicable EMC regulations of the Chinese Taipei Bureau of Standards, Metrology and Inspection (BSMI) which require testing to CNS 13438 (CISPR 22).

NIST/CAB: Recognized by the Infocomm Development Authority of Singapore (IDA) under the Asia Pacific Economic Cooperation Mutual Recognition Agreement (APEC MRA). Our laboratory is provisionally designated to act as a Conformity Assessment Body (CAB) under Appendix B, Phase I Procedures, of the APEC MRA. Our scope of designation includes IDA TS EMC (CISPR 22), IEC 61000-4-2, -4-3, -4-4, -4-5, and -4-6

