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Date:	04 November 2009
Model:	OL1010

Electromagnetic Compatibility Test Report

For

Chamberlain Group Inc.

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Underwriters Laboratories Inc.
333 Pfingsten Rd.
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Test Report Details

Tests Performed By: **Underwriters Laboratories Inc.
333 Pfingsten Rd.
Northbrook, IL 60062**

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

Applicant Contact: **Hank Sieradzki**
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Test Report Date: **25 September 2009**

Product Type: **Short Range Wireless Device**

Product standards: **FCC Part 15, Subpart C, 15.247, RSS-Gen, RSS-210**

Model Number: **OL1010**

Sample Serial Number: **NA**

EUT Category: **Frequency Hopping Spread Spectrum Transceiver**

Testing Start Date: **October 15, 2009**

Date Testing Complete: **October 26, 2009**

Overall Results: Compliant

Underwriters Laboratories Inc. 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. Underwriters Laboratories Inc. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from Underwriters Laboratories Inc. issued reports. This report shall not be used to claim, constitute or imply product certification, approval, or endorsement by NVLAP, NIST, A2LA, or any agency of the US government.

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Report Revision History

Revision Date	Description	Revised By	Revision Reviewed By
None			

1 GENERAL - Product Description

1.1 Equipment Description

The equipment Under Test is a wireless storage locking device operating in the 902MHz – 928MHz band.

1.2 Device Configuration During Test

1.2.1 Equipment Used During Test:

Use	Product Type	Manufacturer	Model	Comments
EUT	Wireless Locking device	Chamberlain Group Inc.	OL1010	The EUT model number was changed after the device was tested. The original model number was OL1000.

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	Antenna	-	N	N	¼ wavelength wire directly soldered to the board.

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	6	-	-	DC		4xAA batteries

1.3 EUT Configurations

Mode #	Description
1	EUT was configured with special test software allowing it to operated in various modes.

1.4 EUT Operation Modes

Mode #	Description
1	EUT in Receive Mode hopping
2	EUT in Transmit Mode (Voice Packet) on either Low, Middle or High channels
3	EUT is Transmitting hopping on all channels

2 Summary

The tests listed in the Summary of Testing section of this report have been performed and the results recorded by Underwriters Laboratories Inc. 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

2.3 Reference Standards

Standard Number	Standard Name	Standard Date
FCC Part 15, Subpart C, 15.247	Code of Federal Regulations, Part 15, Radio Frequency Devices	2009
RSS-210, Issue 7	Low-Power License-Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment	June 2007
RSS-Gen, Issue 2	General Requirements and Information for the Certification of Radiocommunication Equipment	June 2007

2.4 Results Summary

Requirement – Test	References	Result (Compliant / Non-Compliant)*
Conducted Emissions - mains	47 CFR Part 15.207	N/A EUT battery operated only
	RSS-Gen 7.2.2	
Radiated Emissions - Digital	47 CFR Part 15.109	Compliant
	RSS-Gen 7.2.3	
Spurious Emissions (Radiated and Antenna Conducted)	47 CFR Part 15.247(d)	Compliant
	RSS-210 A8.5	
	RSS-Gen 7.2.1 and 7.2.3	
Bandedge Compliance	47 CFR Part 15.247(d)	Complaint
	RSS-210 A8.5	
Carrier Frequency Separation	47 CFR Part 15.247(a)(1)	Complaint
	RSS-210 A8.1(b)	
Number of Hopping Frequencies/Channels	47 CFR Part 15.247(a)(1)(i)	Compliant
	RSS-210 A8.1(c)	
Dwell Time and Duty Cycle Factor	47 CFR Part 15.247(a)(1)(i)	Complaint
	RSS-210 A8.1(c)	
20dB Bandwidth	47 CFR Part 15.247(a)(1)(i)	Compliant
	RSS-210 A8.1(c)	
Maximum Peak Output Power	47 CFR Part 15.247(b)(2)	Compliant
	RSS-210 A8.4(1)	
99% Occupied Bandwidth	RSS-Gen 4.6	Compliant

Test Engineer:



Bartłomiej Mucha (Ext.41216)
 Senior Project Engineer
 International EMC Services
 Conformity Assessment Services-

Reviewer:



Jack L. Steiner(Ext.42307)
 Section Manager
 International EMC Services
 Conformity Assessment Services

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

3 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 EMISSIONS TEST RESULTS

The emissions tests were performed according to following regulations:

----- United States -----

Code of Federal Regulations Title 47	Part 15, Subpart B and C, Radio Frequency Devices
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----- Canada -----

Industry Canada	Spectrum Management and Telecommunications Radio Standards Specifications
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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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4.1 Test Conditions and Results – RADIATED EMISSIONS

Test Description	Measurements were made in a 10-meter semi-anechoic chamber that complies to CISPR 16/ANSI C63.4. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 10-meter 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	FCC Part 15, Subpart C, 15.209 RSS-Gen 7.2.3	
UL LPG	80-EM-S0029	
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30MHz – 1GHz	10 m distance
	1GHz – 10GHz	3m distance
Limits - Class B		
Frequency (MHz)	Limit (dBµV/m)	
	Quasi-Peak (10 m distance)	Average (3m distance)
30 - 88	29.54	NA
88 - 216	33.06	NA
216 - 960	35.56	NA
960 – 1,000	43.52	NA
1,000 – 10,000	NA	54
Supplementary information: None		

Table 1 Radiated Emissions EUT Configuration Settings

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

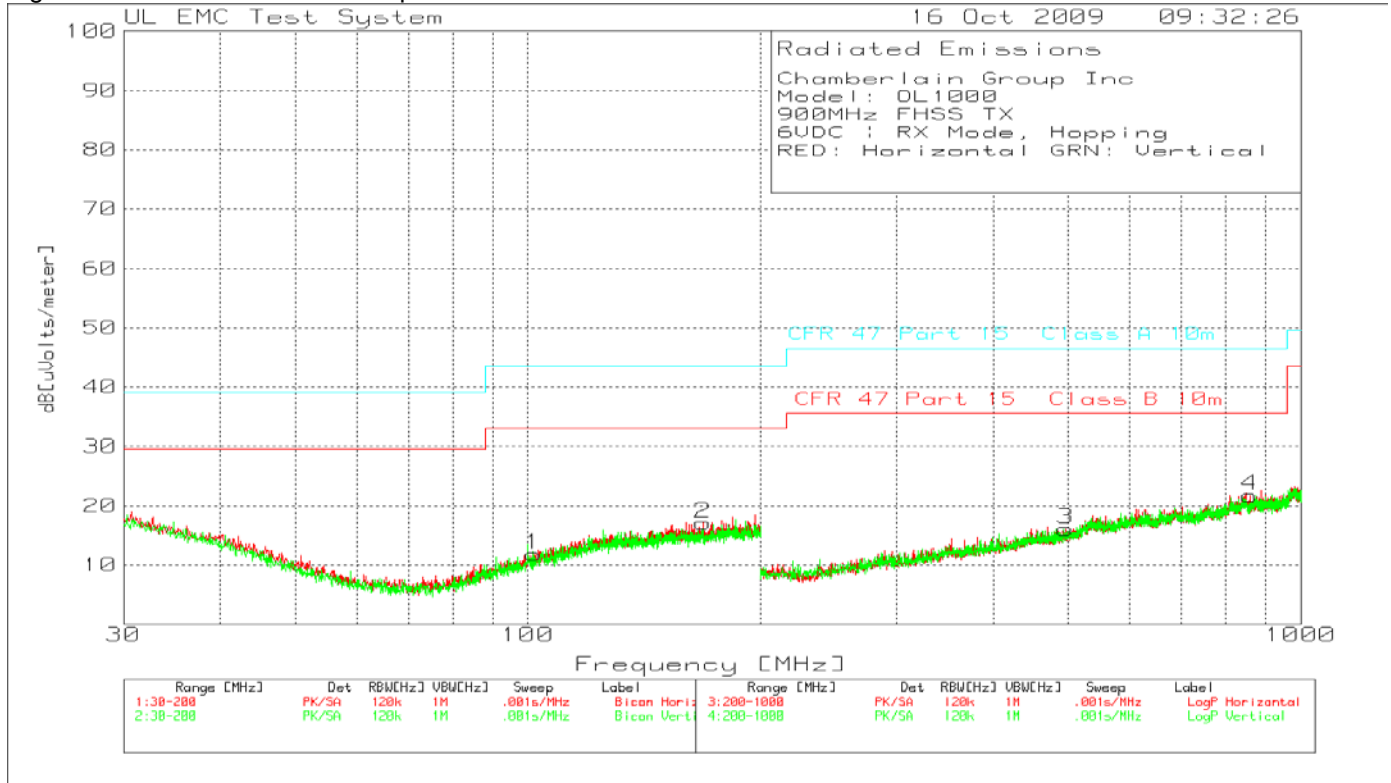
Table 2 Radiated Emissions Test Equipment

Description	Manufacturer	Model	Identifier
EMI Test Receiver	Rohde & Schwarz	ESU	EMC4323
Bicon Antenna	Chase	VBA6106A	EMC4078
Log-P Antenna	Chase	UPA6109	EMC4313
Spectrum Analyzer	Rhode & Schwarz	FSEK	EMC4182
Antenna Array	UL	BOMS	EMC4276

Figure 1 Test setup for Radiated Emissions



Figure 2 Radiated Emissions Graph 30MHz – 1GHz



* Do to large margin between peak scan data and the limit final quasi-peak measurements were considered not required.

Table 3 Radiated Emissions Data Points 30MHz – 1GHz

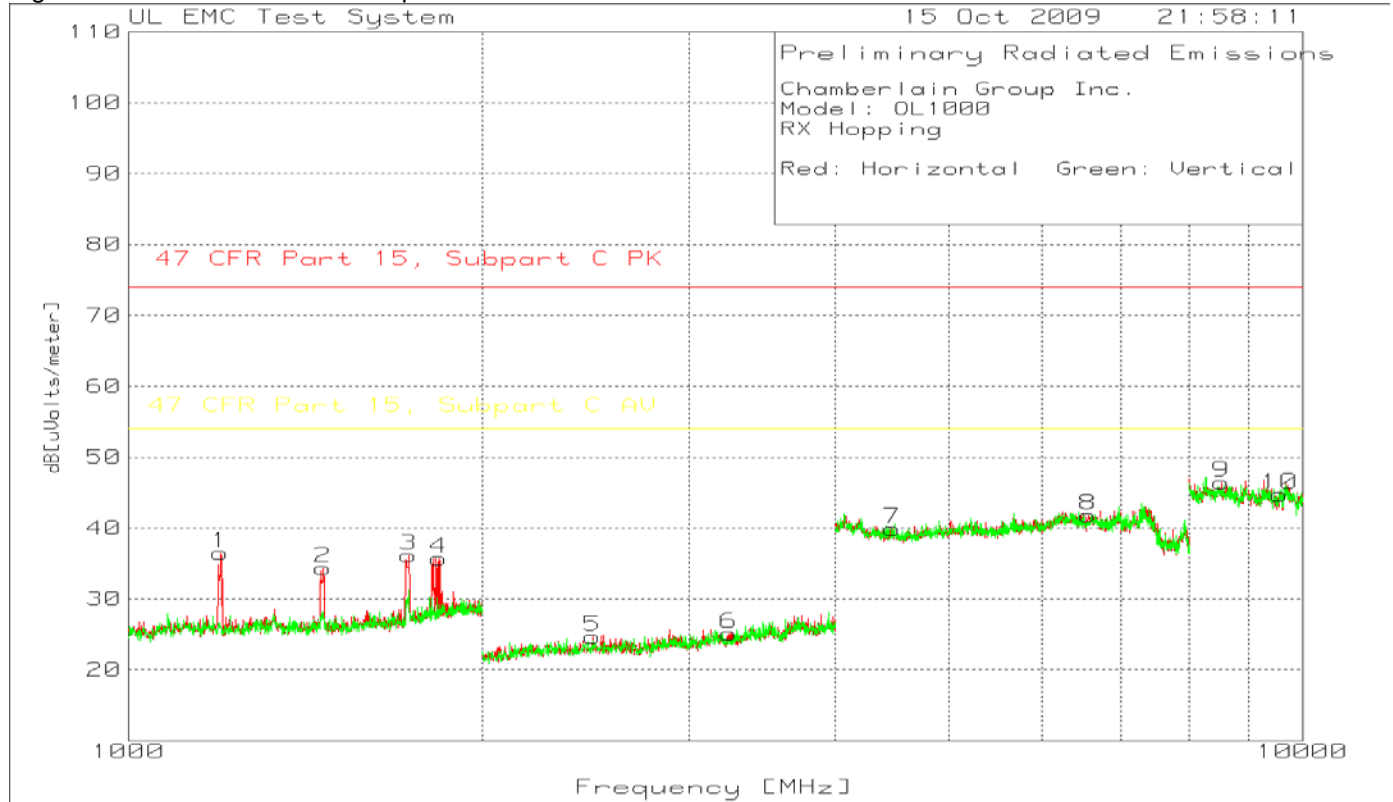
Chamberlain Group Inc
 Model: OL1000
 900MHz FHSS TX
 6VDC | RX Mode, Hopping
 RED: Horizontal GRN: Vertical

Test No.	Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3	4	5	6
1	101.7041	31.11 pk	-30.1	10.8	11.81	-	-	43.5	33.1	-	-
		Height:400		Margin [dB]		-	-	-31.69	-21.29	-	-
2	168.5657	32.07 pk	-30.1	15.1	17.07	-	-	43.5	33.1	-	-
		Height:400		Margin [dB]		-	-	-26.43	-16.03	-	-
3	496.0693	30.36 pk	-31.8	17.5	16.06	-	-	46.4	35.6	-	-
		Height:303		Margin [dB]		-	-	-30.34	-19.54	-	-
4	859.2938	31.32 pk	-31.7	22.1	21.72	-	-	46.4	35.6	-	-
		Height:99		Margin [dB]		-	-	-24.68	-13.88	-	-

LIMIT 3: CFR 47 Part 15 Class A 10m
 LIMIT 4: CFR 47 Part 15 Class B 10m

PK - Peak detector
 QP - Quasi-Peak detector

Figure 3 Radiated Emissions Graph 1GHz – 10GHz



* The requirement is to test the EUT up to 5GHz in receive / digital mode, however the EUT was scanned to 10GHz. There were no emissions recorded from the EUT in receive mode. Emissions shown in plot are not from EUT.

4.2 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)).			
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 m or 10 m distance as noted in data 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.				
Limits (Radiated – Restricted Bands Only)				
Frequency (MHz)	Limit (dBµV/m)			
	Quasi-Peak Limits		Average	
	3 m distance	10 m distance	Fundamental	3m distance
30 – 88	40	29.54	-	-
88 – 216	43.52	33.06	-	-
216-960	46.02	35.56	-	-
960-1000	53.97	43.52	-	-
1,000-25,000	-		-	54
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). Radiated Emissions in frequency range of 30MHz to 1000MHz were conducted at 10 meter distance.				

Table 4 SPURIOUS EMISSIONS EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	2 & 3
Supplementary information: None		

Table 5 SPURIOUS CONDUCTED EMISSIONS Test Equipment

Test Equipment Used			
Description	Manufacturer	Model	Identifier
Spectrum Analyser	Agilent	E7405A	EMC4242
Attenuator with Cable	Pasternak	10dB	none

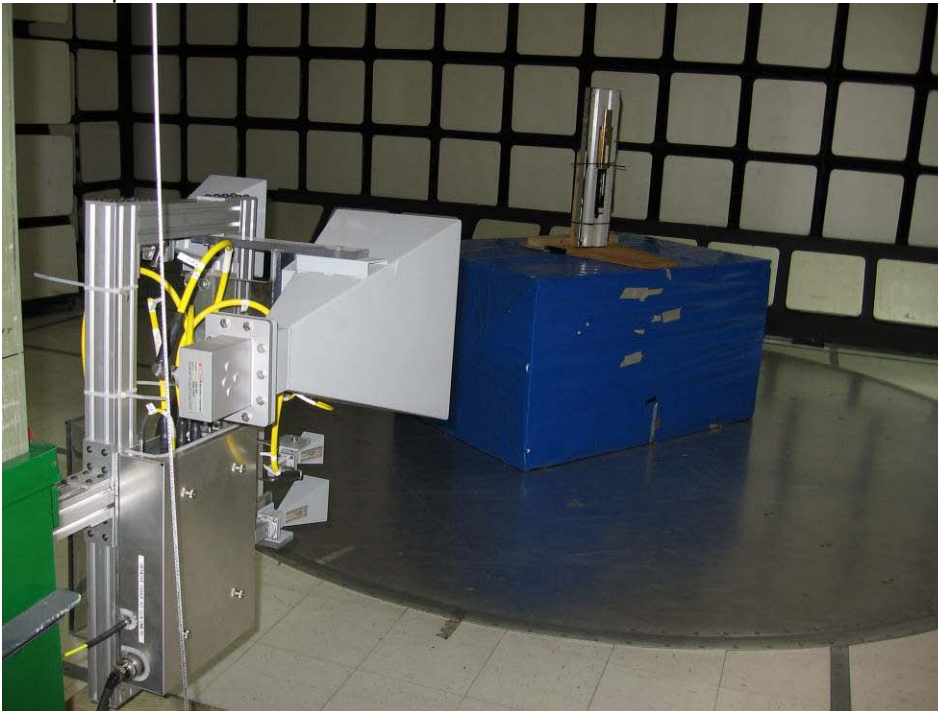
Table 6 SPURIOUS RADIATED EMISSIONS Test Equipment

Test Equipment Used			
Description	Manufacturer	Model	Identifier
EMI Test Receiver	Rohde & Schwarz	ESU	EMC4323
Bicon Antenna	Chase	VBA6106A	EMC4078
Log-P Antenna	Chase	UPA6109	EMC4313
Spectrum Analyzer	Rhode & Schwarz	FSEK	EMC4182
Antenna Array	UL	BOMS	EMC4276

Test setup for SPURIOUS EMISSIONS – Antenna conducted

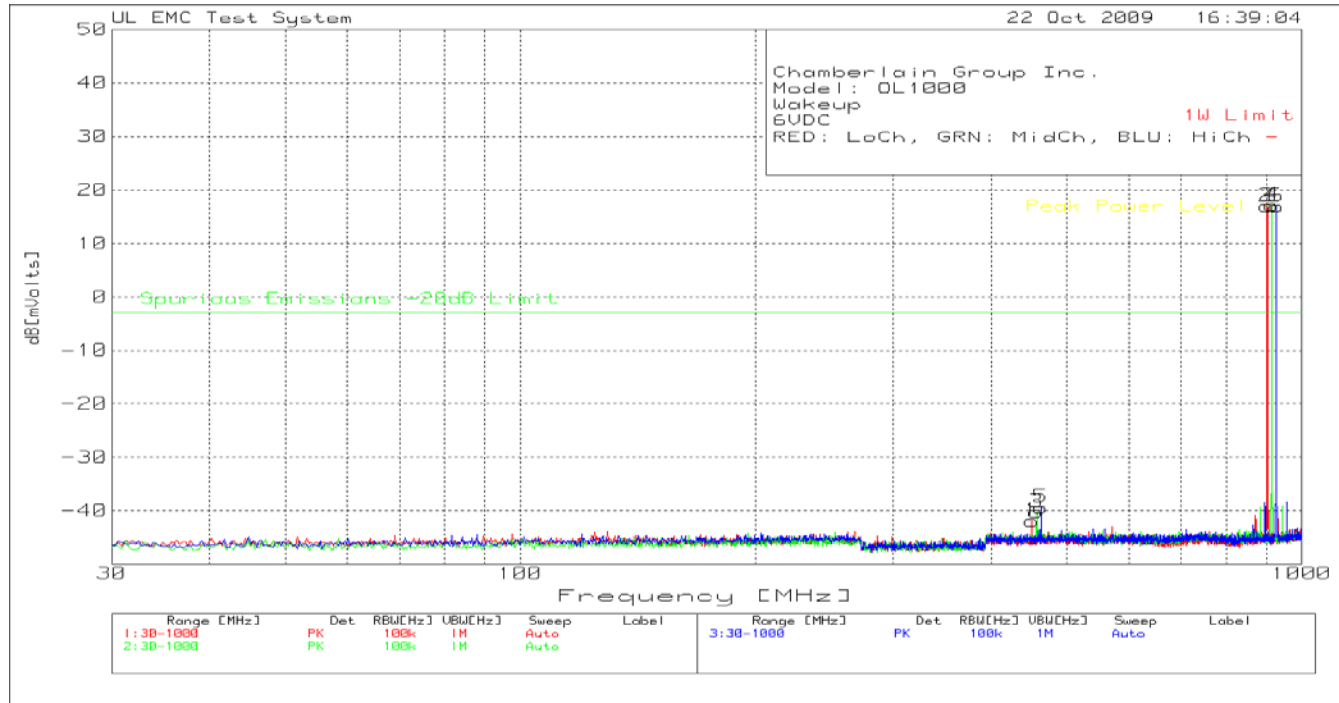


Test setup for SPURIOUS EMISSIONS – Radiated



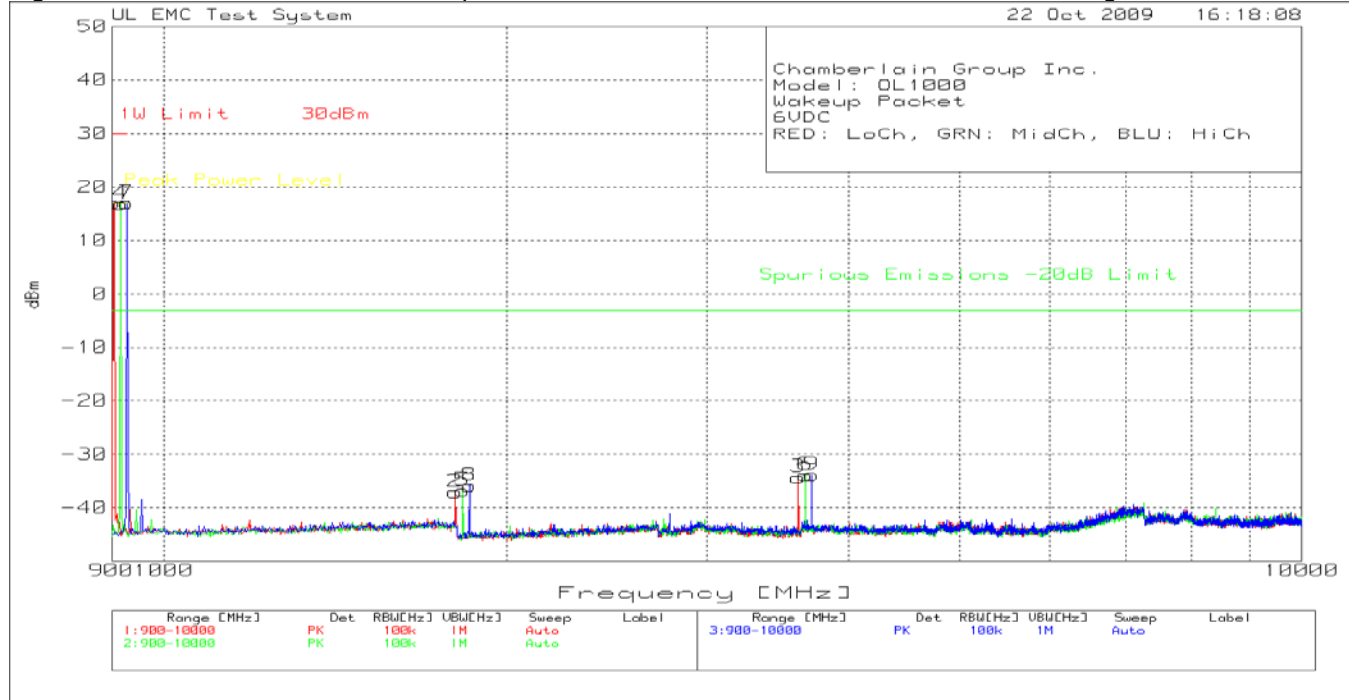
* Radiated Emissions Setup shown for above 1GHz.

Figure 4 30MHz-1GHz Antenna Port Spurious Emissions Plots TX Mode, Low, Middle and High Channels.



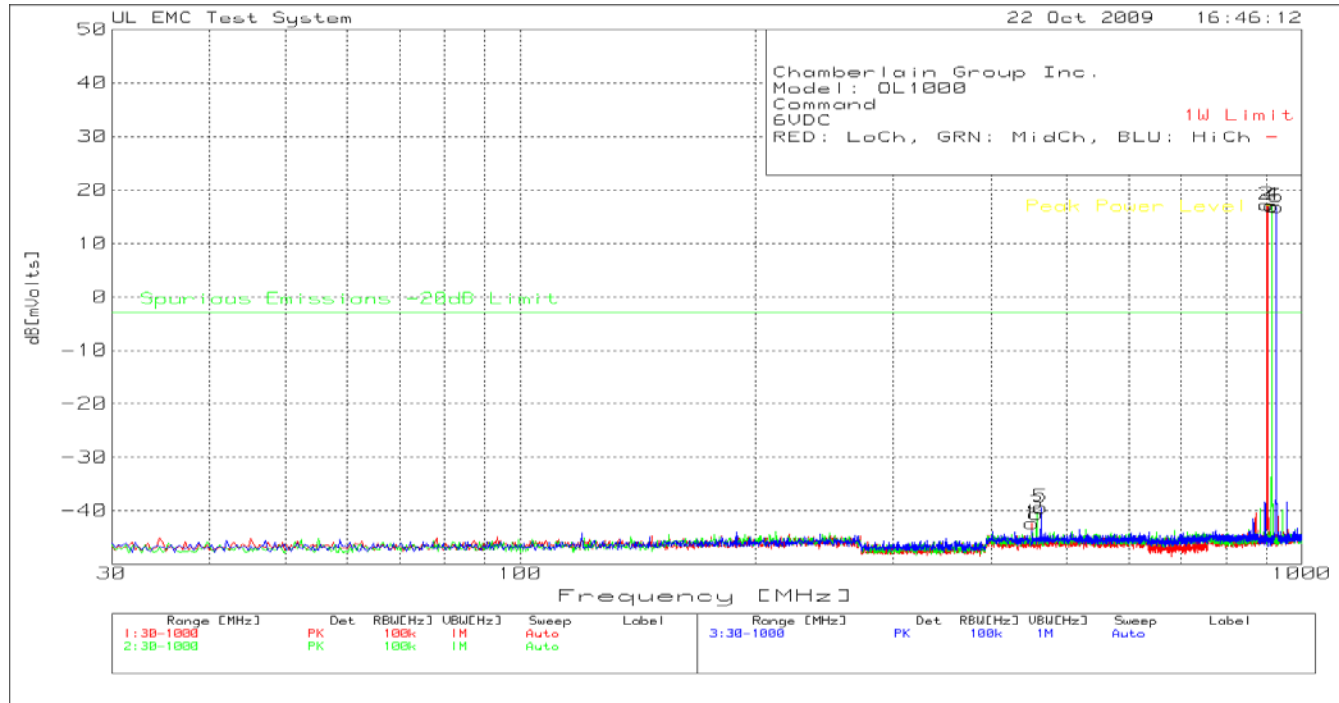
* There were no emissions within 20dB of the limit recorded.

Figure 5 1GHz-10GHz Antenna Port Spurious Emissions Plots TX Mode, Low, Middle and High Channels.



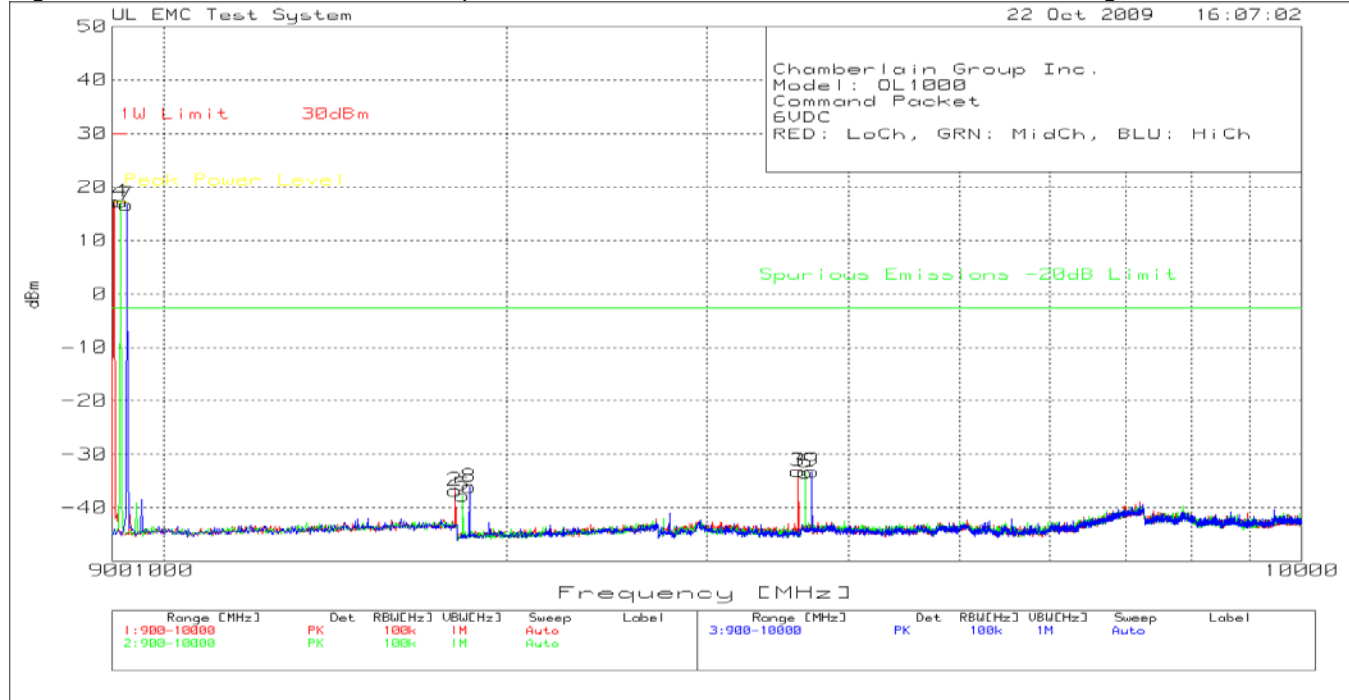
* There were no emissions within 20dB of the limit recorded

Figure 6 30MHz-1GHz Antenna Port Spurious Emissions Plots TX Mode, Low, Middle and High Channels.



* There were no emissions within 20dB of the limit recorded.

Figure 7 1GHz-10GHz Antenna Port Spurious Emissions Plots TX Mode, Low, Middle and High Channels.



* There were no emissions within 20dB of the limit recorded

Figure 8 Radiated Spurious Emissions below 1GHz, 30MHz – 1GHz TX Low Channel

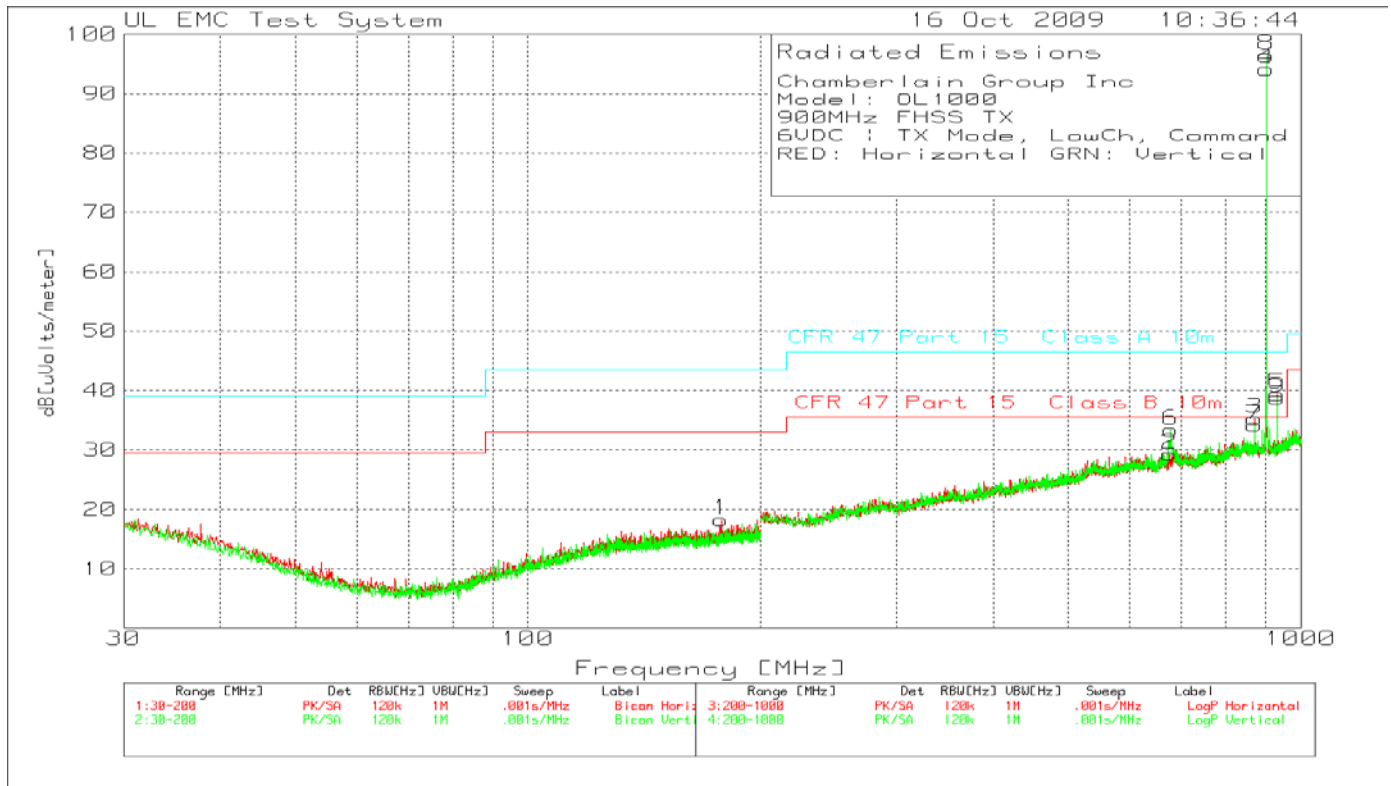


Table 7 Radiated Spurious Emissions below 1GHz, 30MHz – 1GHz TX Low Channel

Chamberlain Group Inc
 Model: OL1000
 900MHz FHSS TX
 6VDC | TX Mode, LowCh, Command
 RED: Horizontal GRN: Vertical

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit 3	Margin 3 [dB]	Limit 4	Margin 4 [dB]	Height [cm]	Polarity	Comments
1	177.8261	32.56	pk	-30	15.7	18.26	43.5	-25.24	33.1	-14.84	400	Horz	Note 1
2	677.0153	30.5	pk	-21.3	20.1	29.3	46.4	-17.1	35.6	-6.3	200	Horz	Note 2
3	872.3518	34.7	pk	-22	22.6	35.3	46.4	-11.1	35.6	-3	99	Horz	Note 2
4	902.465	93.21	pk	-21.9	22.8	94.11	46.4	47.71	35.6	58.51	99	Horz	Fundamental TX Freq.
5	932.3118	38.45	pk	-22	22.9	39.35	46.4	-7.05	35.6	3.75	399	Horz	Note 2
6	679.4137	34.36	pk	-21.2	20.2	33.36	46.4	-13.04	35.6	-2.24	200	Vert	Note 2
7	872.3518	33.62	pk	-22	22.6	34.22	46.4	-12.18	35.6	-1.38	402	Vert	Note 2
8	902.465	95.54	pk	-21.9	22.8	96.44	46.4	50.04	35.6	60.84	402	Vert	Fundamental TX Freq.
9	932.3118	37.85	pk	-22	22.9	38.75	46.4	-7.65	35.6	3.15	402	Vert	Note 2

Note 1: Sufficinet Margin, measurement not required.

Note 2: Product of the transmitter, not in restricted band, radiated emissions limits not applicable.

LIMIT 3: CFR 47 Part 15 Class A 10m

LIMIT 4: CFR 47 Part 15 Class B 10m

PK - Peak detector

QP - Quasi-Peak detector

Figure 9 Radiated Spurious Emissions below 1GHz, 30MHz – 1GHz TX Middle Channel

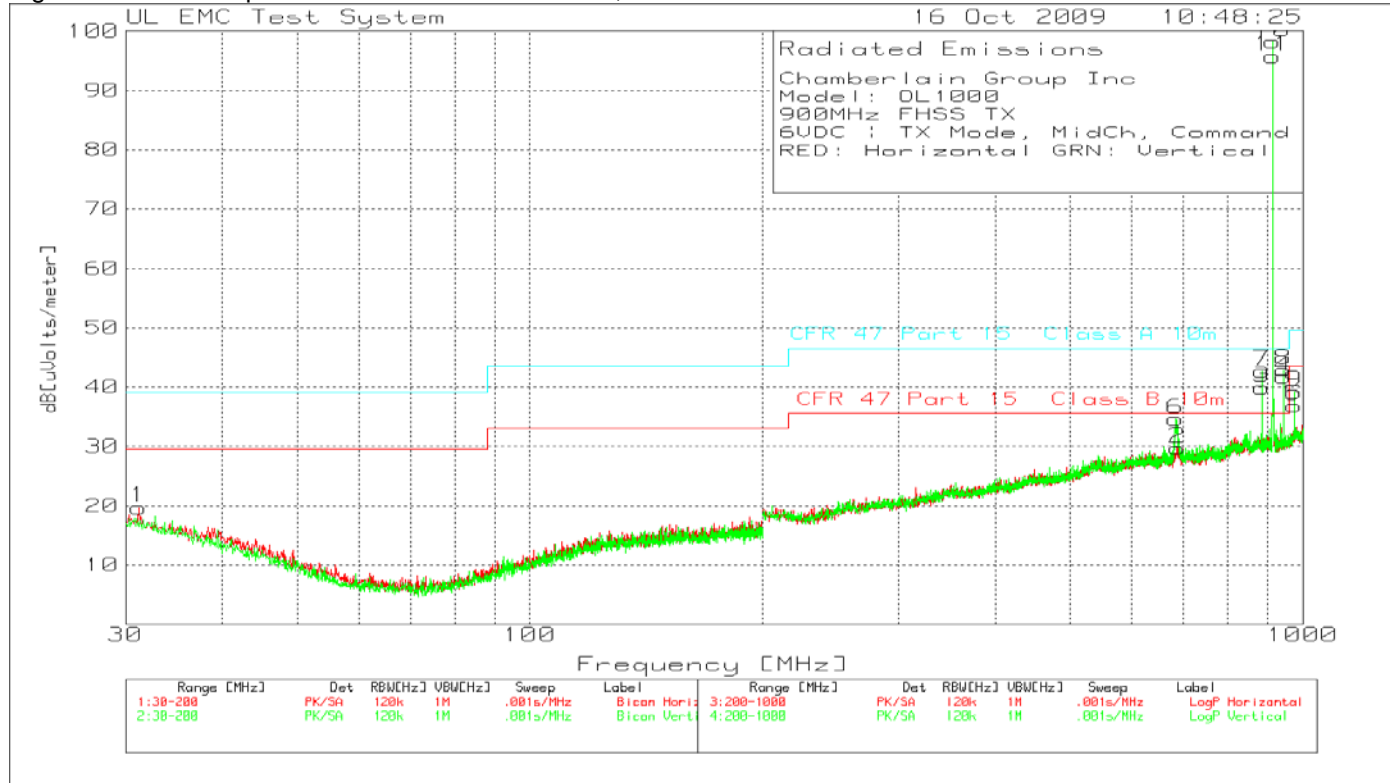


Table 8 Radiated Spurious Emissions below 1GHz, 30MHz – 1GHz TX Middle Channel

Chamberlain Group Inc
 Model: OL1000
 900MHz FHSS TX
 6VDC | TX Mode, MidCh, Command
 RED: Horizontal GRN: Vertical

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit 3	Margin 3 [dB]	Limit 4	Margin 4 [dB]	Height [cm]	Polarity	Comments
1	31.1894	32.69	pk	-30.4	17.4	19.69	39.1	-19.41	29.6	-9.91	250	Horz	Note 1
2	689.0073	30.01	pk	-21.2	20.9	29.71	46.4	-16.69	35.6	-5.89	302	Horz	Note 2
3	884.8767	39.38	pk	-21.9	22.4	39.88	46.4	-6.52	35.6	4.28	99	Horz	Note 2
4	944.8368	40.52	pk	-21.8	23	41.72	46.4	-4.68	35.6	6.12	99	Horz	Note 2
5	974.95	34.04	pk	-21.3	24.1	36.84	49.5	-12.66	43.5	-6.66	201	Horz	See Table below
11	914.7235	94.94	pk	-21.8	22.6	95.74	46.4	49.34	35.6	60.14	99	Horz	Fundamental TX Freq.
6	685.543	35.1	pk	-21.2	20.7	34.6	46.4	-11.8	35.6	-1	200	Vert	Note 2
7	884.8767	42.23	pk	-21.9	22.4	42.73	46.4	-3.67	35.6	7.13	200	Vert	Note 2
8	944.8368	41.69	pk	-21.8	23	42.89	46.4	-3.51	35.6	7.29	403	Vert	Note 2
9	974.95	36.41	pk	-21.3	24.1	39.21	49.5	-10.29	43.5	-4.29	299	Vert	See Table Below
10	914.7235	97.43	pk	-21.8	22.6	98.23	46.4	51.83	35.6	62.63	403	Vert	Fundamental TX Freq.

Note 1: Sufficient Margin, measurement not required.

Note 2: Product of the transmitter, not in restricted band, radiated emissions limits not applicable.

Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit 3	Margin 3 [dB]	Limit 4	Margin 4 [dB]	Height [cm]	Polarity
974.6978	35.71	qp	-21.3	24.1	38.51	49.5	-10.99	43.5	-4.99	349	Vert
974.6978	29.82	qp	-21.3	24.1	32.62	49.5	-16.88	43.5	-10.88	100	Horz

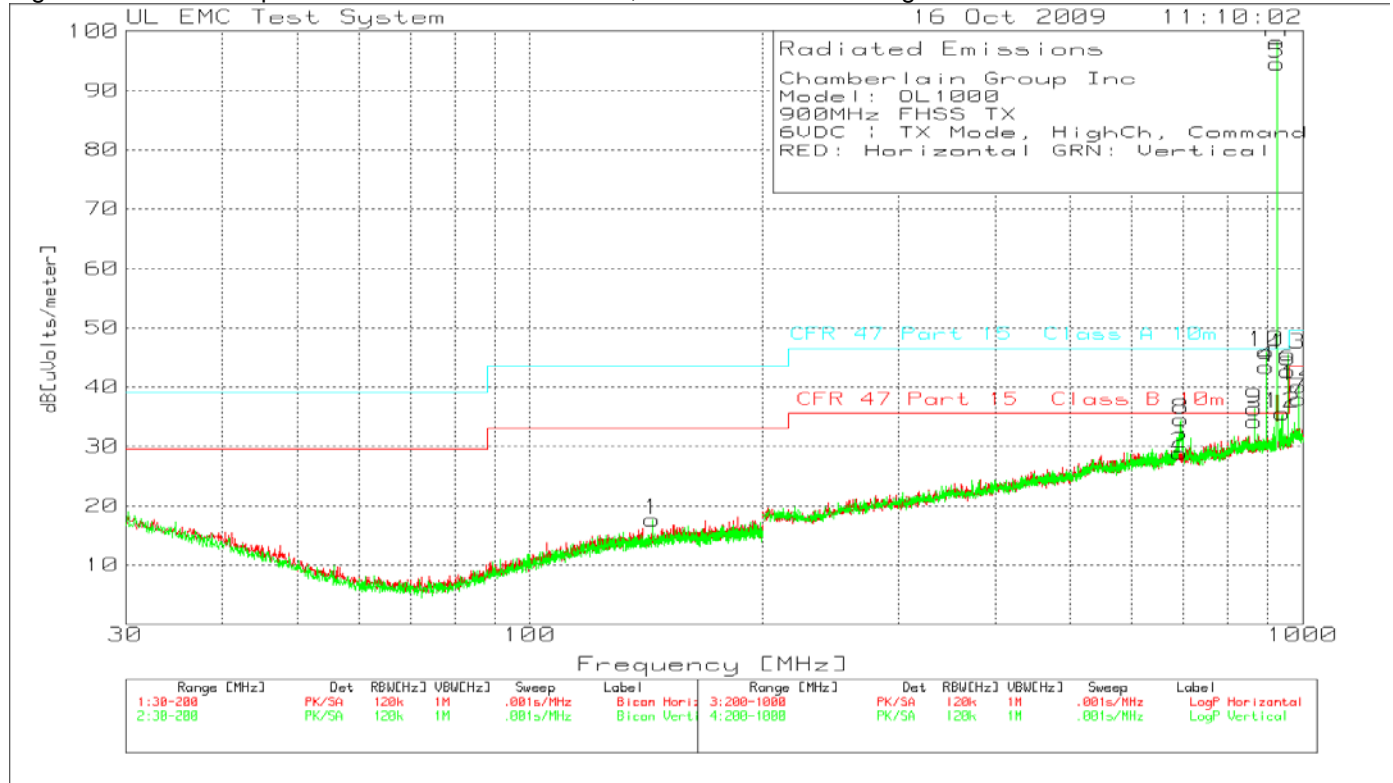
LIMIT 3: CFR 47 Part 15 Class A 10m

LIMIT 4: CFR 47 Part 15 Class B 10m

PK - Peak detector

QP - Quasi-Peak detector

Figure 10 Radiated Spurious Emissions below 1GHz, 30MHz – 1GHz TX High Channel



Chamberlain Group Inc
 Model: OL1000
 900MHz FHSS TX
 6VDC | TX Mode, HighCh, Command
 RED: Horizontal GRN: Vertical

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB[uVolts/meter]	Limit 3	Margin 3 [dB]	Limit 4	Margin 4 [dB]	Height [cm]	Polarity	Comments
1	144.013	33.2	pk	-30.1	14.6	17.7	43.5	-25.8	33.1	-15.4	100	Vert	Note 1
2	693.8041	29.6	pk	-21.3	20.6	28.9	46.4	-17.5	35.6	-6.7	401	Horz	Note 2
3	866.7555	33.91	pk	-22.1	22.4	34.21	46.4	-12.19	35.6	-1.39	100	Horz	Note 2
4	896.8688	42.8	pk	-22.1	22.7	43.4	46.4	-3	35.6	7.8	401	Horz	Note 2
5	926.7155	93.41	pk	-21.7	22.8	94.51	46.4	48.11	35.6	58.91	200	Horz	Fundamental TX Freq.
6	956.8288	41.33	pk	-21.6	23	42.73	46.4	-3.67	35.6	7.13	200	Horz	Note 2
7	986.942	35.1	pk	-21.2	24.1	38	49.5	-11.5	43.5	-5.5	200	Horz	See table below
8	695.1366	35.46	pk	-21.4	20.5	34.56	46.4	-11.84	35.6	-1.04	199	Vert	Note 2
9	866.7555	36.04	pk	-22.1	22.4	36.34	46.4	-10.06	35.6	.74	399	Vert	Note 2
10	896.8688	45.36	pk	-22.1	22.7	45.96	46.4	-.44	35.6	10.36	399	Vert	Note 2
11	926.982	97.03	pk	-21.7	22.8	98.13	46.4	51.73	35.6	62.53	399	Vert	Fundamental TX Freq.
12	941.3724	34.2	pk	-21.6	23	35.6	46.4	-10.8	35.6	0	399	Vert	Note 2
13	956.8288	44.19	pk	-21.6	23	45.59	46.4	-.81	35.6	9.99	399	Vert	Note 2
14	986.942	37.25	pk	-21.2	24.1	40.15	49.5	-9.35	43.5	-3.35	300	Vert	See table below

Note 1: Sufficient Margin, measurement not required.

Note 2: Product of the transmitter, not in restricted band, radiated emissions limits not applicable.

Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB[uVolts/meter]	Limit 3	Margin 3 [dB]	Limit 4	Margin 4 [dB]	Azimuth [deg]	Height [cm]	Polarity
986.6976	34.94	qp	-21.2	24.1	37.84	49.5	-11.66	43.5	-5.66	327	213	Horz
986.6976	38.21	qp	-21.2	24.1	41.11	49.5	-8.39	43.5	-2.39	11	151	Vert

LIMIT 3: CFR 47 Part 15 Class A 10m

LIMIT 4: CFR 47 Part 15 Class B 10m

PK - Peak detector

QP - Quasi-Peak detector

Figure 11 Radiated Spurious Emissions above 1GHz, Low Channel

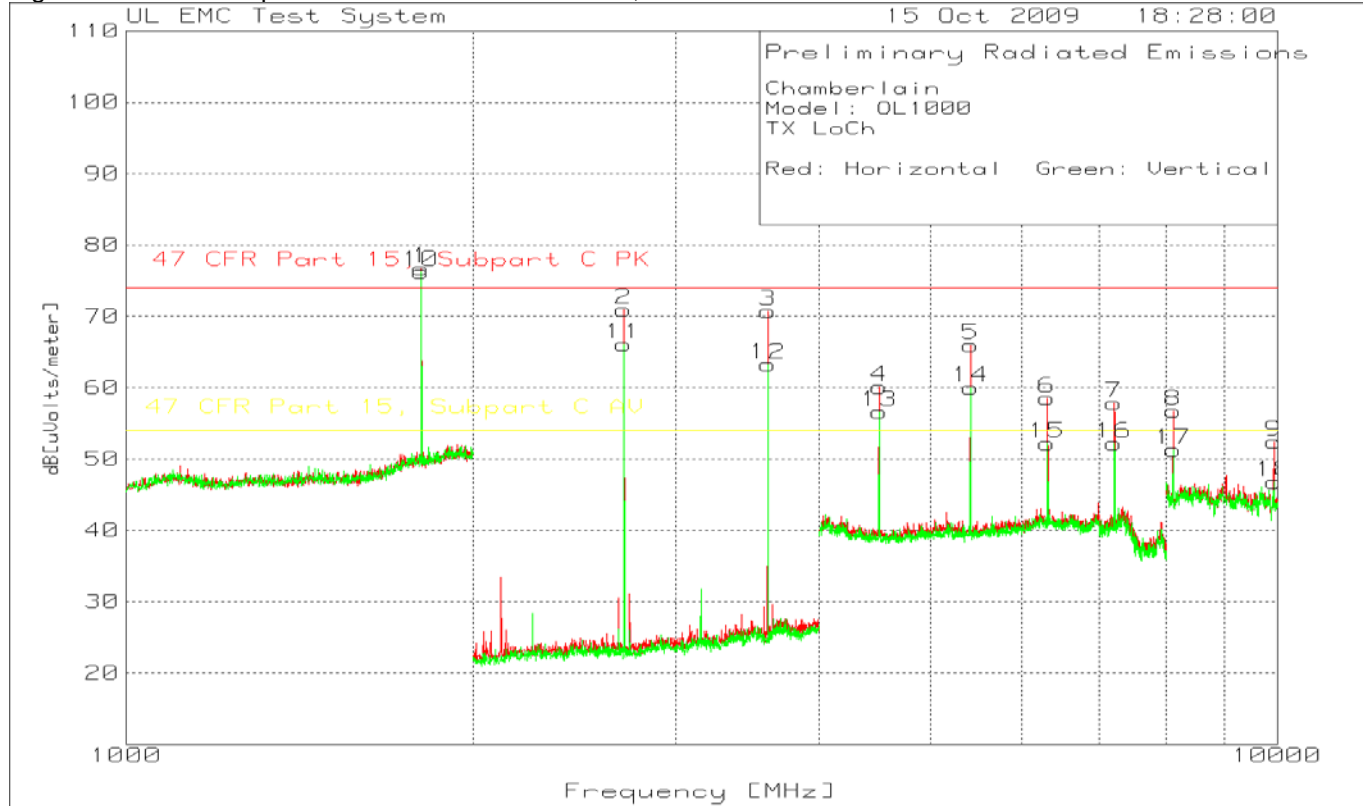


Table 9 Radiated Spurious Emissions above 1GHz, Low Channel

Chamberlain

Model: OL1000

TX LoCh

Red: Horizontal Green: Vertical

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit 1	Margin 1[dB]	Limit 2	Margin 2[dB]	Height [cm]	Polarity	Comments
1	1804.805	46.11	pk	3.59	27	76.7	74	2.7	54	22.7	150	Horz	Note 2
2	2706.707	100.12	pk	-51.23	22.1	70.99	74	-3.01	54	16.99	149	Horz	See table below
3	3609.61	98.49	pk	-50.95	23.2	70.74	74	-3.26	54	16.74	100	Horz	See table below
4	4509.673	84.83	pk	-52.5	27.8	60.13	74	-13.87	54	6.13	150	Horz	See table below
5	5414.276	88.27	pk	-50.15	27.9	66.02	74	-7.98	54	12.02	100	Horz	See table below
6	6316.211	77.35	pk	-48.02	29.2	58.53	74	-15.47	54	4.53	100	Horz	Note 2
7	7218.145	75.15	pk	-47.08	29.8	57.87	74	-16.13	54	3.87	100	Horz	Note 2
8	8120.24	70.44	pk	-49.9	36.2	56.74	74	-17.26	54	2.74	200	Horz	See table below
9	9927.856	66.48	pk	-50.48	36.4	52.4	74	-21.6	54	-1.6	100	Horz	Note 1
10	1804.805	45.61	pk	3.59	27	76.2	74	2.2	54	22.2	100	Vert	Note 2
11	2706.707	95.19	pk	-51.23	22.1	66.06	74	-7.94	54	12.06	200	Vert	See table below
12	3609.61	90.98	pk	-50.95	23.2	63.23	74	-10.77	54	9.23	200	Vert	See table below
13	4509.673	81.27	pk	-52.5	27.8	56.57	74	-17.43	54	2.57	100	Vert	See table below
14	5411.608	82.33	pk	-50.19	27.9	60.04	74	-13.96	54	6.04	150	Vert	See table below
15	6316.211	71.03	pk	-48.02	29.2	52.21	74	-21.79	54	-1.79	100	Vert	Note 2
16	7218.145	69.53	pk	-47.08	29.8	52.25	74	-21.75	54	-1.75	100	Vert	Note 2
17	8120.24	65.05	pk	-49.9	36.2	51.35	74	-22.65	54	-2.65	200	Vert	See table below
18	9927.856	60.92	pk	-50.48	36.4	46.84	74	-27.16	54	-7.16	150	Vert	Note 1

Note 1: Sufficinet Margin, measurement not required.

Note 2: Product of the transmitter, not in restricted band, radiated emissions limits not applicable.

LIMIT 1: 47 CFR Part 15, Subpart C PK
 LIMIT 2: 47 CFR Part 15, Subpart C AV

pk - Peak detector
 qp - Quasi-Peak detector
 av - Average detector
 avlg - Average log detector
 ave - Average detector

Chamberlain Group Inc.

Model: OL1000

TX LoCh

Red: Horizontal Green: Vertical

Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	RBW/VBW	Gain/Loss Factor [dB]	Transducer Factor [dB]	DC Factor dB	Level dB[uVolts/meter]	Limit 1	Margin 1 [dB]	Limit 2	Margin 2 [dB]	Margin 6 [dB]	Azimuth [degs]	Height [cm]	Polarity
2706.6323	98.5	pk	1MHz/1MHz	-51.23	22.1	0	69.37	74	-4.63			69.37	309	109	Horz
2706.7164	86.79	av	1MHz/10MHz	-51.23	22.1	-32.26	25.4			54	-28.6	57.66	309	109	Horz
3608.8707	98.86	pk	1MHz/1MHz	-50.95	23.2	0	71.11	74	-2.89			71.11	2	100	Horz
3608.9489	86.82	av	1MHz/10MHz	-50.95	23.2	-32.26	26.81			54	-27.19	59.07	2	100	Horz
4510.3685	84.8	pk	1MHz/1MHz	-52.51	27.8	0	60.09	74	-13.91			60.09	20	108	Horz
4511.2583	63.81	av	1MHz/10MHz	-52.5	27.8	-32.26	6.85			54	-47.15	39.11	20	108	Horz
5413.3747	88.83	pk	1MHz/1MHz	-50.17	27.9	0	66.56	74	-7.44			66.56	33	102	Horz
5413.3928	76.75	av	1MHz/10MHz	-50.17	27.9	-32.26	22.22			54	-31.78	54.48	33	102	Horz
8119.6874	71.89	pk	1MHz/1MHz	-49.89	36.2	0	58.2	74	-15.8			58.2	299	100	Horz
8120.0721	59.34	av	1MHz/10MHz	-49.89	36.2	-32.26	13.39			54	-40.61	45.65	299	100	Horz
2706.8447	96.42	pk	1MHz/1MHz	-51.23	22.1	0	67.29	74	-6.71			67.29	2	107	Vert
2706.7365	81.76	av	1MHz/10MHz	-51.23	22.1	-32.26	20.37			54	-33.63	52.63	2	107	Vert
3608.8557	94.66	pk	1MHz/1MHz	-50.95	23.2	0	66.91	74	-7.09			66.91	331	179	Vert
3608.9639	82.87	av	1MHz/10MHz	-50.95	23.2	-32.26	22.86			54	-31.14	55.12	331	179	Vert
4510.4299	87.77	pk	1MHz/1MHz	-52.51	27.8	0	63.06	74	-10.94			63.06	2	103	Vert
4511.1874	70	av	1MHz/10MHz	-52.5	27.8	-32.26	13.04			54	-40.96	45.3	2	103	Vert
5413.5301	83.74	pk	1MHz/1MHz	-50.17	27.9	0	61.47	74	-12.53			61.47	341	193	Vert
5413.3918	71.67	av	1MHz/10MHz	-50.17	27.9	-32.26	17.14			54	-36.89	49.4	341	193	Vert
8120.6072	68.66	pk	1MHz/1MHz	-49.9	36.2	0	54.96	74	-19.04			54.96	17	192	Vert
8119.9579	56.01	av	1MHz/10MHz	-49.89	36.2	-32.26	10.06			54	-43.94	42.32	17	192	Vert

LIMIT 1: 47 CFR Part 15, Subpart C PK

LIMIT 2: 47 CFR Part 15, Subpart C AV

pk - Peak detector
 qp - Quasi-Peak detector
 av - Average detector

Figure 12 Radiated Spurious Emissions above 1GHz, Middle Channel

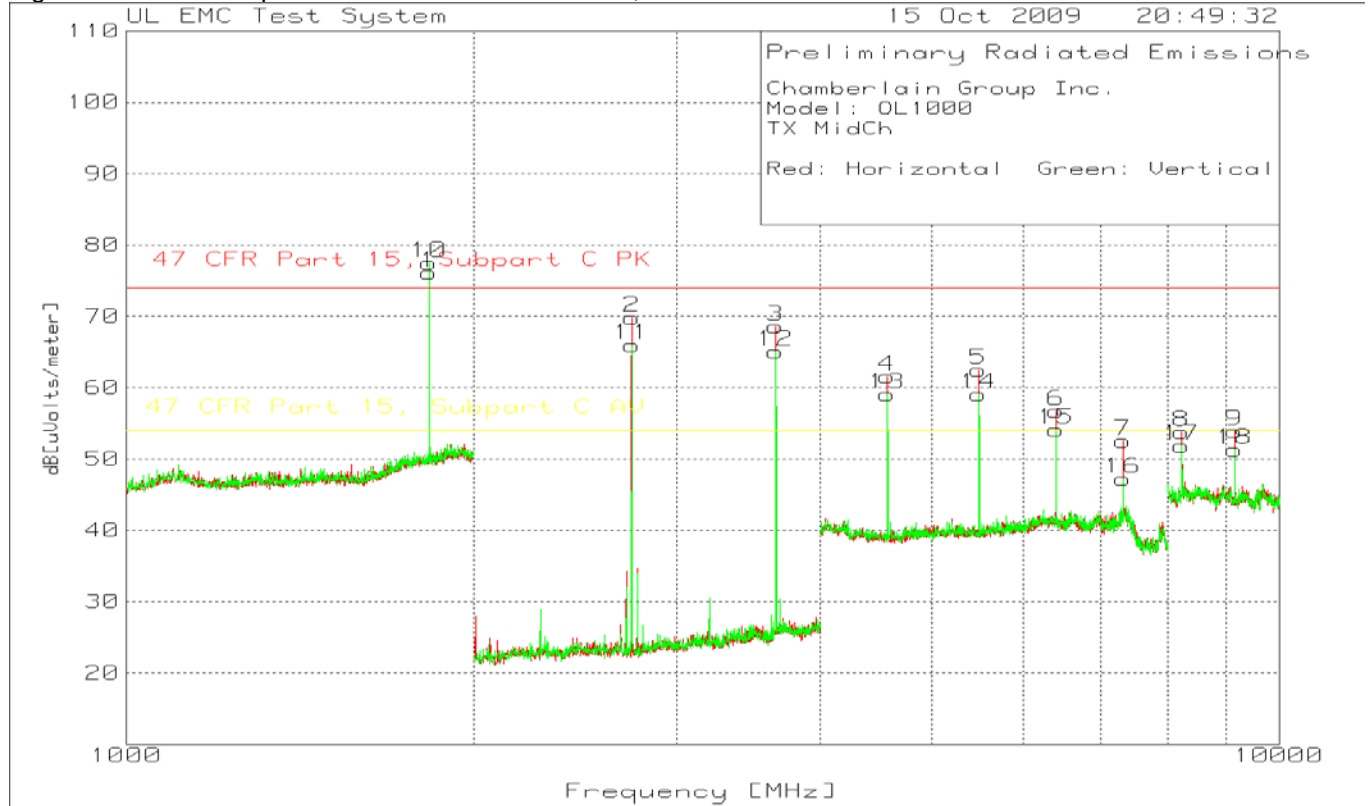


Table 10 Radiated Spurious Emissions above 1GHz, Middle Channel

Chamberlain Group Inc.

Model: OL1000

TX MidCh

Red: Horizontal Green: Vertical

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit 1	Margin 1 [dB]	Limit 2	Margin 2 [dB]	Height [cm]	Polarity	Comments
1	1829.83	45.31	pk	3.59	27.2	76.1	74	2.1	54	22.1	150	Horz	Note 2
2	2744.745	98.91	pk	-51.2	22.1	69.81	74	-4.19	54	15.81	150	Horz	See table below
3	3659.66	94.81	pk	-49.64	23.4	68.57	74	-5.43	54	14.57	100	Horz	See table below
4	4571.047	86.3	pk	-52.46	27.7	61.54	74	-12.46	54	7.54	100	Horz	See table below
5	5488.993	84.61	pk	-50.24	28.1	62.47	74	-11.53	54	8.47	100	Horz	Note 2
6	6404.27	75.45	pk	-47.94	29.2	56.71	74	-17.29	54	2.71	100	Horz	Note 2
7	7319.546	68.34	pk	-46.37	30.6	52.57	74	-21.43	54	-1.43	100	Horz	See table below
8	8232.465	66.15	pk	-48.8	36.4	53.75	74	-20.25	54	-.25	150	Horz	See table below
9	9150.301	68.4	pk	-50.77	36.3	53.93	74	-20.07	54	-.07	100	Horz	See table below
10	1829.83	46.75	pk	3.59	27.2	77.54	74	3.54	54	23.54	100	Vert	Note 2
11	2744.745	95.09	pk	-51.2	22.1	65.99	74	-8.01	54	11.99	200	Vert	See table below
12	3659.66	91.32	pk	-49.64	23.4	65.08	74	-8.92	54	11.08	150	Vert	See table below
13	4573.716	83.9	pk	-52.47	27.7	59.13	74	-14.87	54	5.13	100	Vert	See table below
14	5488.993	81.23	pk	-50.24	28.1	59.09	74	-14.91	54	5.09	100	Vert	Note 2
15	6404.27	72.86	pk	-47.94	29.2	54.12	74	-19.88	54	.12	150	Vert	Note 2
16	7319.546	63.03	pk	-46.37	30.6	47.26	74	-26.74	54	-6.74	100	Vert	See table below
17	8232.465	64.24	pk	-48.8	36.4	51.84	74	-22.16	54	-2.16	200	Vert	See table below
18	9150.301	65.77	pk	-50.77	36.3	51.3	74	-22.7	54	-2.7	100	Vert	See table below

Note 1: Sufficient Margin, measurement not required.

Note 2: Product of the transmitter, not in restricted band, radiated emissions limits not applicable.

LIMIT 1: 47 CFR Part 15, Subpart C PK

LIMIT 2: 47 CFR Part 15, Subpart C AV

pk - Peak detector

qp - Quasi-Peak detector

av - Average detector

avlg - Average log detector

ave - Average detector

Chamberlain Group Inc.
 Model: OL1000
 TX MidCh
 Red: Horizontal Green: Vertical

Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	RBW/VBW	Gain/Loss Factor [dB]	Transducer Factor [dB]	DC Factor dB	Level dB[uVolts/meter]	Limit 1	Margin 1 [dB]	Limit 2	Margin 2 [dB]	Azimuth [degs]	Height [cm]	Polarity
2744.0621	98.77	pk	1MHz/1MHz	-51.22	22.1	0	69.65	74	-4.35			308	105	Horz
2744.2725	86.98	av	1MHz/10Hz	-51.22	22.1	-32.26	25.6			54	-28.4	308	105	Horz
3658.7605	95.89	pk	1MHz/1MHz	-49.67	23.4	0	69.62	74	-4.38			3	102	Horz
3658.9409	84.1	av	1MHz/10Hz	-49.67	23.4	-32.26	25.57			54	-28.43	3	102	Horz
4573.1493	87.38	pk	1MHz/1MHz	-52.46	27.7	0	62.62	74	-11.38			8	101	Horz
4573.6242	61.68	av	1MHz/10Hz	-52.47	27.7	-32.26	4.65			54	-49.35	8	101	Horz
7318.509	74.64	pk	1MHz/1MHz	-46.36	30.6	0	58.88	74	-15.12			36	101	Horz
7317.7575	61.42	av	1MHz/10Hz	-46.36	30.6	-32.26	13.4			54	-40.6	36	101	Horz
8232.2435	68.72	pk	1MHz/1MHz	-48.8	36.4	0	56.32	74	-17.68			0	151	Horz
8232.478	56.3	av	1MHz/10Hz	-48.8	36.4	-32.26	11.64			54	-42.36	0	151	Horz
9147.8567	69.37	pk	1MHz/1MHz	-50.77	36.3	0	54.9	74	-19.1			0	103	Horz
9147.2615	55.07	av	1MHz/10Hz	-50.77	36.3	-32.26	8.34			54	-45.66	0	103	Horz
2744.3637	96.15	pk	1MHz/1MHz	-51.21	22.1	0	67.04	74	-6.96			2	198	Vert
2744.2375	84.43	av	1MHz/10Hz	-51.22	22.1	-32.26	23.05			54	-30.95	2	198	Vert
3659.008	90.05	pk	1MHz/1MHz	-49.66	23.4	0	63.79	74	-10.21			326	177	Vert
3658.984	78.01	av	1MHz/10Hz	-49.66	23.4	-32.26	19.49			54	-34.51	326	177	Vert
4573.7435	87.05	pk	1MHz/1MHz	-52.47	27.7	0	62.28	74	-11.72			0	108	Vert
4573.6653	64.45	av	1MHz/10Hz	-52.47	27.7	-32.26	7.42			54	-46.58	0	108	Vert
7317.7705	68.47	pk	1MHz/1MHz	-46.36	30.6	0	52.71	74	-21.29			315	112	Vert
7317.8547	55.98	av	1MHz/10Hz	-46.36	30.6	-32.26	7.96			54	-46.04	315	112	Vert
8232.1934	68.55	pk	1MHz/1MHz	-48.81	36.4	0	56.14	74	-17.86			20	182	Vert
8232.512	56.21	av	1MHz/10Hz	-48.8	36.4	-32.26	11.55			54	-42.45	20	182	Vert
9146.9519	65.15	pk	1MHz/1MHz	-50.78	36.3	0	50.67	74	-23.33			71	111	Vert
9147.1142	52.96	av	1MHz/10Hz	-50.78	36.3	-32.26	6.22			54	-47.78	71	111	Vert

LIMIT 1: 47 CFR Part 15, Subpart C PK
 LIMIT 2: 47 CFR Part 15, Subpart C AV

pk - Peak detector
 qp - Quasi-Peak detector
 av - Average detector
 avlg - Average log detector
 ave - Average detector

Figure 13 Radiated Spurious Emissions above 1GHz, High Channel

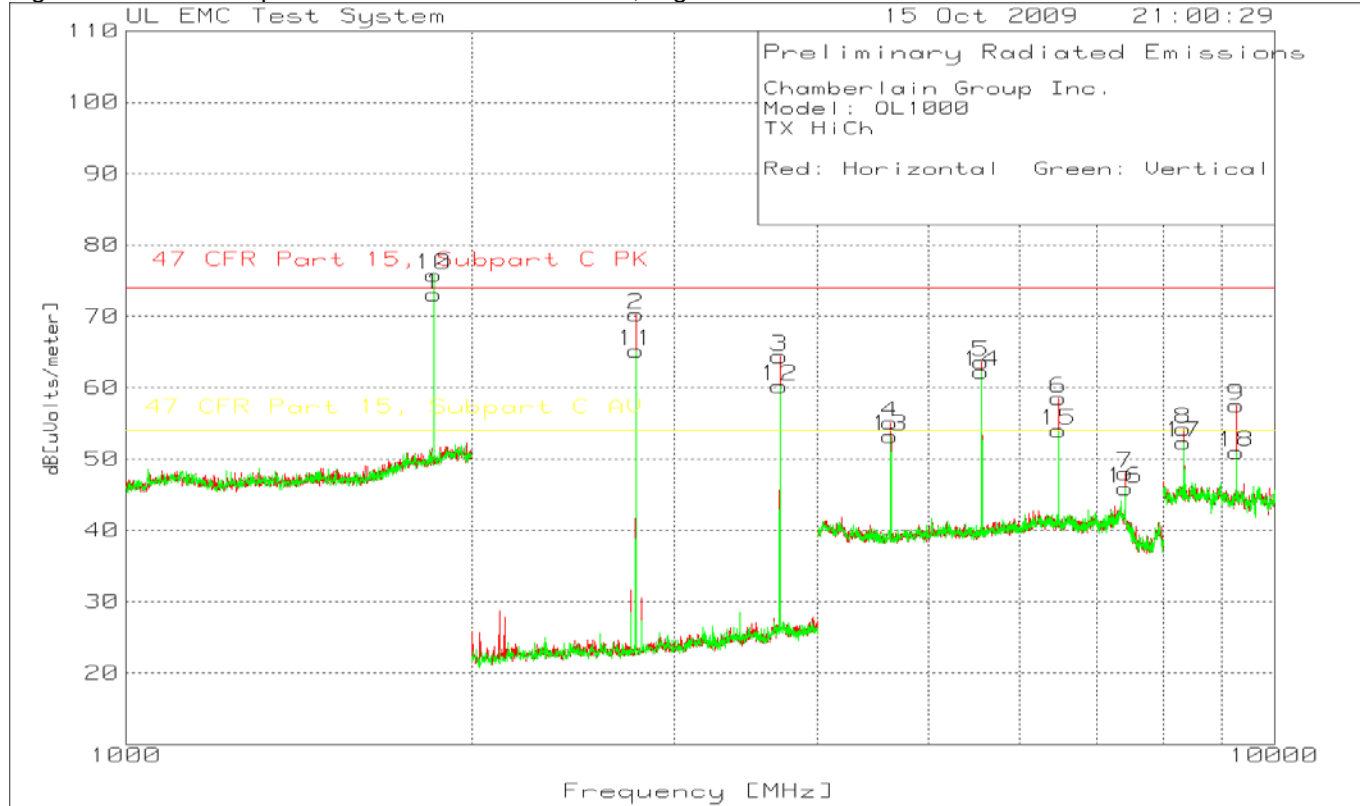


Table 11 Radiated Spurious Emissions above 1GHz, High Channel

Chamberlain Group Inc.
 Model: OL1000
 TX HiCh
 Red: Horizontal Green: Vertical

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit 1	Margin 1 [dB]	Limit 2	Margin 2 [dB]	Height [cm]	Polarity	Comments
1	1853.854	41.9	pk	3.74	27.4	73.04	74	-9.6	54	19.04	200	Horz	Note 2
2	2780.781	99.14	pk	-51.03	22.2	70.31	74	-3.69	54	16.31	150	Horz	See table below
3	3707.708	90.42	pk	-49.54	23.5	64.38	74	-9.62	54	10.38	100	Horz	See table below
4	4632.422	79.78	pk	-52.32	27.7	55.16	74	-18.84	54	1.16	101	Horz	See table below
5	5561.041	85.86	pk	-50.52	28.3	63.64	74	-10.36	54	9.64	101	Horz	Note 2
6	6486.991	77.7	pk	-48.32	29.1	58.48	74	-15.52	54	4.48	101	Horz	Note 2
7	7415.61	64.44	pk	-47.43	31	48.01	74	-25.99	54	-5.99	150	Horz	Note 1
8	8340.681	67.75	pk	-50.02	36.5	54.23	74	-19.77	54	.23	150	Horz	See table below
9	9270.541	70.45	pk	-49.38	36.4	57.47	74	-16.53	54	3.47	100	Horz	Note 2
10	1853.854	44.65	pk	3.74	27.4	75.79	74	1.79	54	21.79	100	Vert	Note 2
11	2780.781	94.05	pk	-51.03	22.2	65.22	74	-8.78	54	11.22	100	Vert	See table below
12	3707.708	86.28	pk	-49.54	23.5	60.24	74	-13.76	54	6.24	150	Vert	See table below
13	4632.422	77.8	pk	-52.32	27.7	53.18	74	-20.82	54	-.82	100	Vert	See table below
14	5561.041	84.52	pk	-50.52	28.3	62.3	74	-11.7	54	8.3	100	Vert	Note 2
15	6486.991	73.25	pk	-48.32	29.1	54.03	74	-19.97	54	.03	150	Vert	Note 2
16	7415.61	62.28	pk	-47.43	31	45.85	74	-28.15	54	-8.15	150	Vert	Note 1
17	8340.681	65.88	pk	-50.02	36.5	52.36	74	-21.64	54	-1.64	150	Vert	See table below
18	9266.533	63.94	pk	-49.39	36.4	50.95	74	-23.05	54	-3.05	150	Vert	Note 2

Note 1: Sufficient Margin, measurement not required.

Note 2: Product of the transmitter, not in restricted band, radiated emissions limits not applicable.

LIMIT 1: 47 CFR Part 15, Subpart C PK
 LIMIT 2: 47 CFR Part 15, Subpart C AV

pk - Peak detector
 qp - Quasi-Peak detector
 av - Average detector
 avlg - Average log detector
 ave - Average detector

Chamberlain Group Inc.
 Model: OL1000
 TX HiCh
 Red: Horizontal Green: Vertical

Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	RBW/VBW	Gain/Loss Factor [dB]	Transducer Factor [dB]	DC Factor dB	Level dB[uVolts/meter]	Limit 1	Margin 1[dB]	Limit 2	Margin 2[dB]	Azimuth [degs]	Height [cm]	Polarity
2780.0671	98.08	pk	1MHz/1MHz	-51.01	22.2	0	69.27	74	-4.73			306	104	Horz
2780.2475	86.42	av	1MHz/10Hz	-51.02	22.2	-32.26	25.34			54	-28.66	306	104	Horz
2780.1453	95.59	pk	1MHz/1MHz	-51.01	22.2	0	66.78	74	-7.22			0	201	Vert
2780.2234	82.57	av	1MHz/10Hz	-51.02	22.2	-32.26	21.49			54	-32.51	0	201	Vert
3706.6904	86.99	pk	1MHz/1MHz	-49.5	23.5	0	60.99	74	-13.01			328	191	Vert
3706.9669	74.69	av	1MHz/10Hz	-49.51	23.5	-32.26	16.42			54	-37.58	328	191	Vert
3706.7625	92.94	pk	1MHz/1MHz	-49.51	23.5	0	66.93	74	-7.07			0	105	Horz
3706.9188	81.12	av	1MHz/10Hz	-49.51	23.5	-32.26	22.85			54	-31.15	0	105	Horz
4633.2976	86.57	pk	1MHz/1MHz	-52.32	27.7	0	61.95	74	-12.05			0	100	Horz
4633.6824	69.09	av	1MHz/10Hz	-52.33	27.7	-32.26	12.2			54	-41.8	0	100	Horz
4633.4238	88.63	pk	1MHz/1MHz	-52.33	27.7	0	64	74	-10			17	103	Vert
4633.6824	65.48	av	1MHz/10Hz	-52.33	27.7	-32.26	8.59			54	-45.41	17	103	Vert
8340.3497	69.52	pk	1MHz/1MHz	-50.01	36.5	0	56.01	74	-17.99			0	121	Horz
8340.4699	56.88	av	1MHz/10Hz	-50.01	36.5	-32.26	11.11			54	-42.89	0	121	Horz
8341.0351	67.84	pk	1MHz/1MHz	-50.02	36.5	0	54.32	74	-19.68			305	148	Vert
8340.5661	55.56	av	1MHz/10Hz	-50.02	36.5	-32.26	9.78			54	-44.22	305	148	Vert

LIMIT 1: 47 CFR Part 15, Subpart C PK
 LIMIT 2: 47 CFR Part 15, Subpart C AV

pk - Peak detector
 qp - Quasi-Peak detector
 av - Average detector

4.3 Test Conditions and Results – BAND EDGE COMPLIANCE

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 Section 15.205(c)).	
Basic Standard	47 CFR Part 15.247(d) RSS-210, A8.5	
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	902MHz – 928MHz	Antenna Conducted
Limits		
Measurement Type		
Conducted	Antenna Conducted – 20dB below the fundamental	
Radiated	Radiated only required if emissions are in the restricted band	
Supplementary information: Only Antenna Conducted Measurements required. No restricted bands close to the allocated frequency band.		

Table 12 Band Edge Compliance EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	2 and 3
Supplementary information: None		

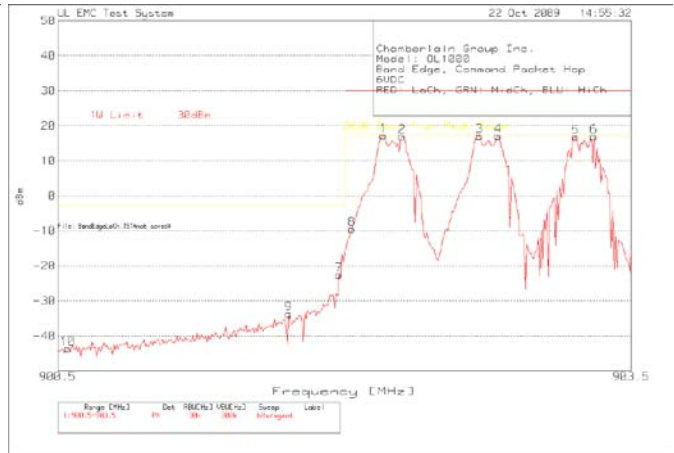
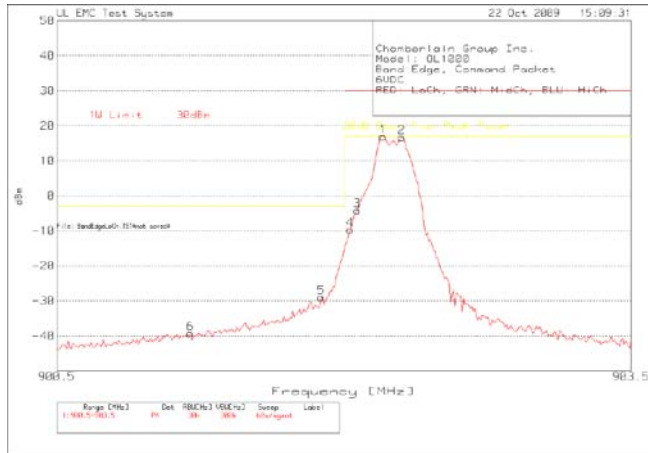
Table 13 Band Edge Compliance Test Equipment

Test Equipment Used			
Description	Manufacturer	Model	Identifier
Spectrum Analyser	Agilent	E7405A	EMC4242
Attenuator with Cable	Pasternak	10dB	none
DC Block	JFW	50DB-037	None

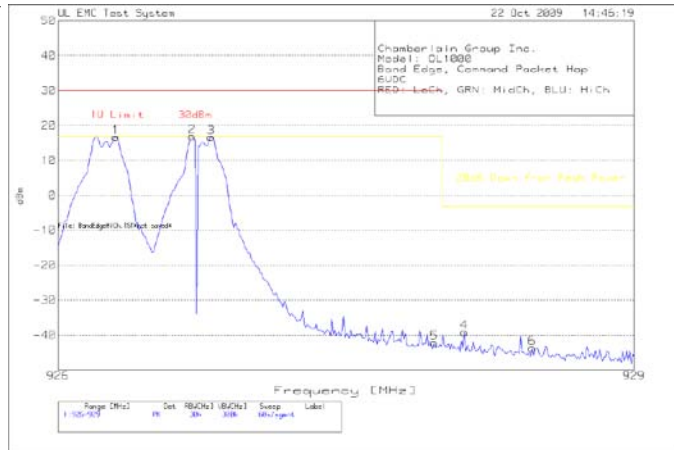
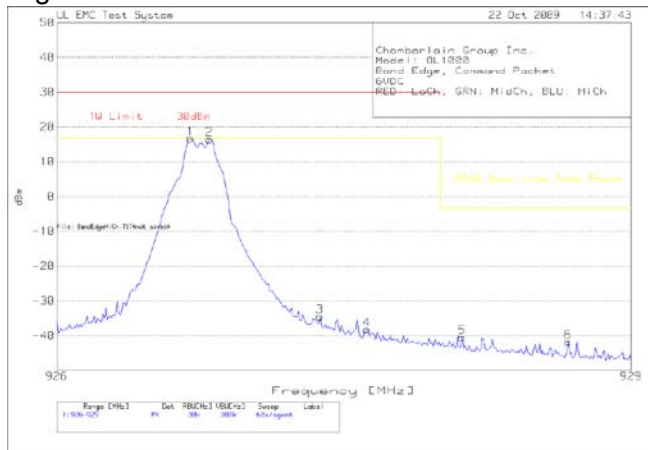
Test setup for Band Edge Compliance – Conducted



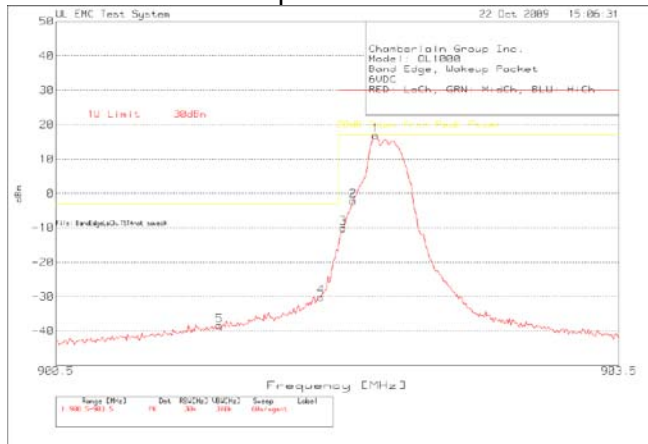
Figure 14 Conducted Band Edge Compliance Graph
 Low Channel Command



High Channel Data



Low Channel Wakeup



High Channel Wakeup

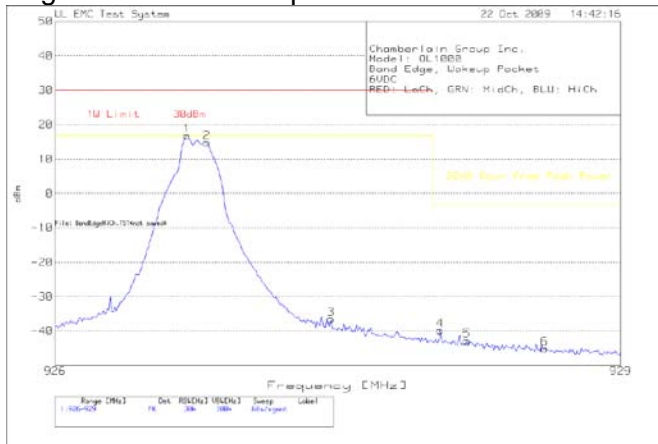


Table 14 Band Edge Compliance Data Points
 Low Channel Command, Single Channel

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dBm	Limit 1	Margin 1 [dB]	Limit 2	Margin 2 [dB]	Comments
1	902.2025	113.31	pk	10.6	-107	16.91	30	-13.09			In-Band
2	902.3	113.1	pk	10.6	-107	16.7	30	-13.3			In-band
3	902.0675	92.14	pk	10.6	-107	-4.26	30	-34.26			In-Band
4	902.03	86.71	pk	10.6	-107	-9.69	30	-39.69			In-Band
5	901.88	67.42	pk	10.6	-107	-28.98	0	-28.98	-3.1	-25.88	Out-Of-Band
6	901.1975	57.07	pk	10.6	-107	-39.33	0	-39.33	-3.1	-36.23	Out-Of-Band

LIMIT 1: 1W Limit 30dBm

LIMIT 2: 20dB Down from Peak Power

PK - Peak detector

Low Channel Command, Hopping

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dBm	Limit 1	Margin 1 [dB]	Limit 2	Margin 2 [dB]	Comments
1	902.2025	113.6	pk	10.6	-107	17.2	30	-12.8			In-band
2	902.3	113.35	pk	10.6	-107	16.95	30	-13.05			In-band
3	902.705	113.53	pk	10.6	-107	17.13	30	-12.87			In-band
4	902.8025	113.46	pk	10.6	-107	17.06	30	-12.94			In-band
5	903.2075	113.15	pk	10.6	-107	16.75	30	-13.25			In-band
6	903.305	113.32	pk	10.6	-107	16.92	30	-13.08			In-band
7	901.97	73.95	pk	10.6	-107	-22.45	0	-22.45	-2.8	-19.65	Out-Of-Band
8	902.0375	86.93	pk	10.6	-107	-9.47	30	-39.47			In-band
9	901.7075	62.73	pk	10.6	-107	-33.67	0	-33.67	-2.8	-30.87	Out-Of-Band
10	900.5525	52.79	pk	10.6	-107	-43.61	0	-43.61	-2.8	-40.81	Out-Of-Band

LIMIT 1: 1W Limit 30dBm

LIMIT 2: 20dB Down from Peak Power

PK - Peak detector

Low Channel Wakeup, Single Channel

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dBm	Limit 1	Margin 1 [dB]	Limit 2	Margin 2 [dB]	Comments
1	902.2025	113.3	pk	10.6	-107	16.9	30	-13.1			In-Band
2	902.0825	94.29	pk	10.6	-107	-2.11	30	-32.11			In-Band
3	902.03	86.38	pk	10.6	-107	-10.02	30	-40.02			In-Band
4	901.91	66.36	pk	10.6	-107	-30.04	0	-30.04	-3.1	-26.94	Out-Of-Band
5	901.37	57.95	pk	10.6	-107	-38.45	0	-38.45	-3.1	-35.35	Out-Of-Band

LIMIT 1: 1W Limit 30dBm

LIMIT 2: 20dB Down from Peak Power

PK - Peak detector

High Channel Command, Single Channel

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dBm	Limit 1	Margin 1 [dB]	Limit 2	Margin 2 [dB]	Comments
1	926.6975	113.05	pk	10.6	-107	16.65	30	-13.35			In-Band
2	926.795	112.83	pk	10.6	-107	16.43	30	-13.57			In-Band
3	927.3725	61.98	pk	10.6	-107	-34.42	30	-64.42			In-Band
4	927.62	58.16	pk	10.6	-107	-38.24	30	-68.24			In-Band
5	928.115	55.89	pk	10.6	-107	-40.51	0	-40.51	-3.4	-37.11	Out-Of-Band
6	928.67	54.58	pk	10.6	-107	-41.82	0	-41.82	-3.4	-38.42	Out-Of-Band

LIMIT 1: 1W Limit 30dBm
 LIMIT 2: 20dB Down from Peak Power
 PK - Peak detector

High Channel Command, Hopping

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dBm	Limit 1	Margin 1 [dB]	Limit 2	Margin 2 [dB]	Comments
1	926.3	113.01	pk	10.6	-107	16.61	30	-13.39			In-Band
2	926.6975	113.21	pk	10.6	-107	16.81	30	-13.19			In-Band
3	926.795	113	pk	10.6	-107	16.6	30	-13.4			In-Band
4	928.115	57.22	pk	10.6	-107	-39.18	0	-39.18	-3.3	-35.88	Out-Of-Band
5	927.9575	54.21	pk	10.6	-107	-42.19	30	-72.19			In-Band
6	928.4675	52.75	pk	10.6	-107	-43.65	0	-43.65	-3.3	-40.35	Out-Of-Band

LIMIT 1: 1W Limit 30dBm
 LIMIT 2: 20dB Down from Peak Power
 PK - Peak detector

High Channel Wakeup, Single Channel

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dBm	Limit 1	Margin 1 [dB]	Limit 2	Margin 2 [dB]	Comments
1	926.6975	113.15	pk	10.6	-107	16.75	30	-13.25			In-Band
2	926.8025	111.2	pk	10.6	-107	14.8	30	-15.2			In-Band
3	927.4625	59.93	pk	10.6	-107	-36.47	30	-66.47			In-Band
4	928.04	56.6	pk	10.6	-107	-39.8	0	-39.8	-3.3	-36.5	Out-Of-Band
5	928.1825	53.62	pk	10.6	-107	-42.78	0	-42.78	-3.3	-39.48	Out-Of-Band
6	928.595	51.29	pk	10.6	-107	-45.11	0	-45.11	-3.3	-41.81	Out-Of-Band

LIMIT 1: 1W Limit 30dBm
 LIMIT 2: 20dB Down from Peak Power
 PK - Peak detector

4.4 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. See section 4.7 for 20dB bandwidth measurements.
Basic Standard	47 CFR Part 15.247(a)(1) RSS-210, A8.1(b)

Table 15 Carrier Frequency Separation Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	3
Supplementary information: Separation frequencies were measured for each channel and then averaged.		

Table 16 Carrier Frequency Separation Test Equipment

Test Equipment Used			
Description	Manufacturer	Model	Identifier
Spectrum Analyser	Agilent	E7405A	EMC4242
Attenuator with Cable	Pasternak	10dB	none
DC Block	JFW	50DB-037	None

Table 17 Carrier Frequency Separation Results

Mode	Channel	Carrier Frequency Separation Limit	Channel Separation MHz
TX Hopping	Low Side	> 20dB Bandwidth	0.499100
	Middle		0.499200
	High Side		0.524200
	Overall Average		0.500696

Figure 15 Test Setup for Carrier Frequency Separation



Figure 16 Carrier Frequency Separation Graphs

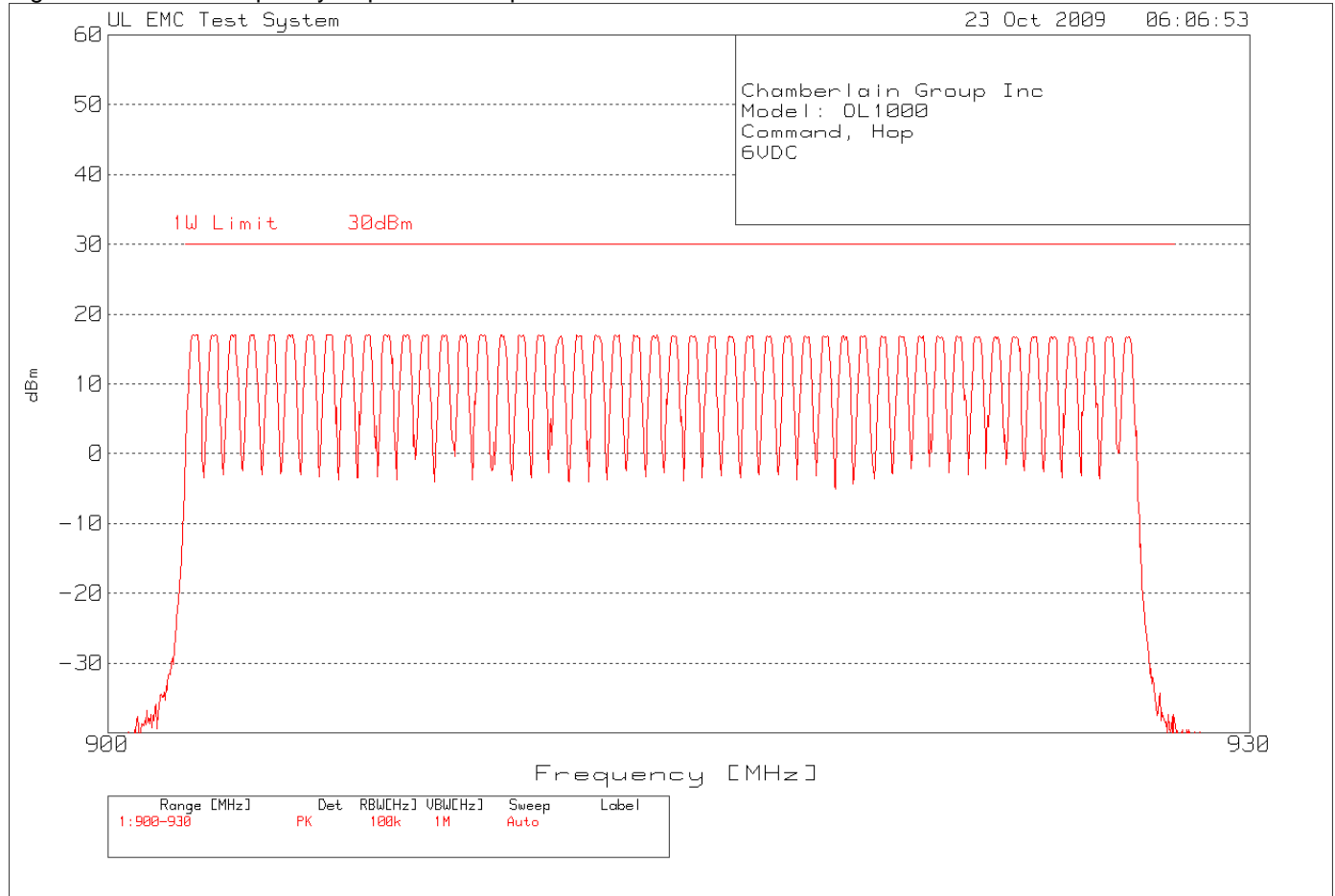


Table 18 Carrier Frequency Separation (Frequency List)

#	Frequency MHz	#	Frequency MHz	#	Frequency MHz	#	Frequency MHz	#	Frequency MHz
1	902.2463	11	907.2629	21	912.2546	31	917.2463	41	922.2879
2	902.7454	12	907.7621	22	912.7537	32	917.7454	42	922.7621
3	903.2446	13	908.2363	23	913.2529	33	918.2446	43	923.2612
4	903.7438	14	908.7604	24	913.777	34	918.7438	44	923.7854
5	904.2429	15	909.2346	25	914.2512	35	919.2679	45	924.2596
6	904.7421	16	909.7338	26	914.7504	36	919.7671	46	924.7587
7	905.2413	17	910.2829	27	915.2496	37	920.2912	47	925.2579
8	905.7404	18	910.7571	28	915.7488	38	920.7903	48	925.782
9	906.2396	19	911.2562	29	916.2729	39	921.2895	49	926.2562
10	906.7388	20	911.7554	30	916.7471	40	921.7887	50	926.7804

4.5 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.
Basic Standard	47 CFR Part 15.247(a)(1)(i) RSS-210, A8.1(c)

Table 19 Number of Hopping Frequencies Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	3
Supplementary information: None		

Table 20 Number of Hopping Frequencies Test Equipment

Test Equipment Used			
Description	Manufacturer	Model	Identifier
Spectrum Analyser	Agilent	E7405A	EMC4242
Attenuator with Cable	Pasternak	10dB	none
DC Block	JFW	50DB-037	None

Table 21 Number of Hopping Frequencies Results

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

Test Setup for Number of Hopping Frequencies



Figure 17 Number of Hopping Frequencies Graphs

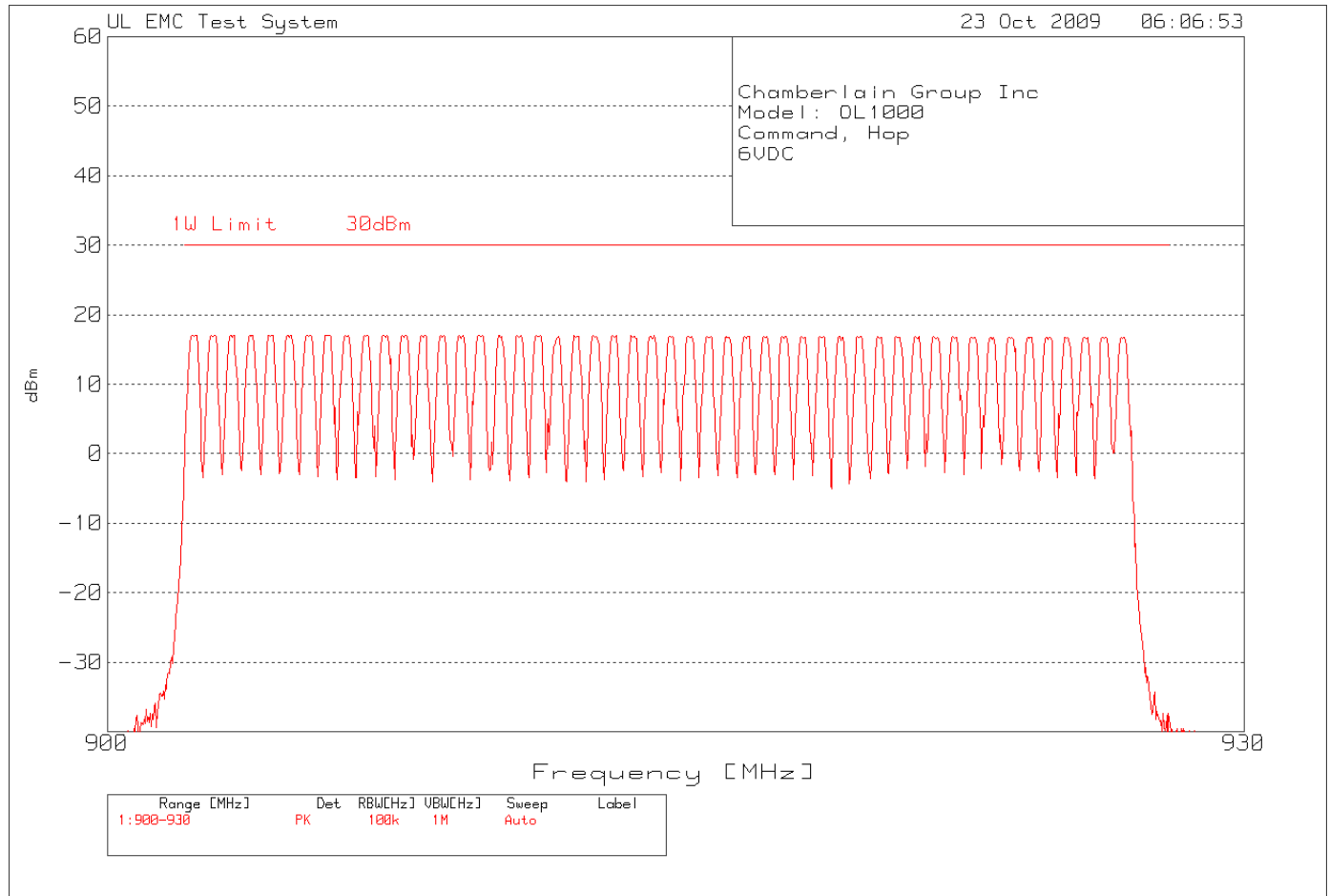


Table 22 Number of Hopping Channels (Frequency List)

#	Frequency MHz	#	Frequency MHz	#	Frequency MHz	#	Frequency MHz	#	Frequency MHz
1	902.2463	11	907.2629	21	912.2546	31	917.2463	41	922.2879
2	902.7454	12	907.7621	22	912.7537	32	917.7454	42	922.7621
3	903.2446	13	908.2363	23	913.2529	33	918.2446	43	923.2612
4	903.7438	14	908.7604	24	913.777	34	918.7438	44	923.7854
5	904.2429	15	909.2346	25	914.2512	35	919.2679	45	924.2596
6	904.7421	16	909.7338	26	914.7504	36	919.7671	46	924.7587
7	905.2413	17	910.2829	27	915.2496	37	920.2912	47	925.2579
8	905.7404	18	910.7571	28	915.7488	38	920.7903	48	925.782
9	906.2396	19	911.2562	29	916.2729	39	921.2895	49	926.2562
10	906.7388	20	911.7554	30	916.7471	40	921.7887	50	926.7804

4.6 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(c)

Table 23 Dwell Time Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	3
Supplementary information: Duty cycle also measured/calculated for use in radiated spurious measurements		

Table 24 Dwell Time Test Equipment

Test Equipment Used			
Description	Manufacturer	Model	Identifier
Spectrum Analyser	Agilent	E7405A	EMC4242
Attenuator with Cable	Pasternak	10dB	none
DC Block	JFW	50DB-037	None

Table 25 Dwell Time Results

Mode	Number of Channels	Maximum Time Allowed in 20s.	Measured Dwell Time in 20s.
TX Hopping Low Channel	50	0.400s	83.13mS

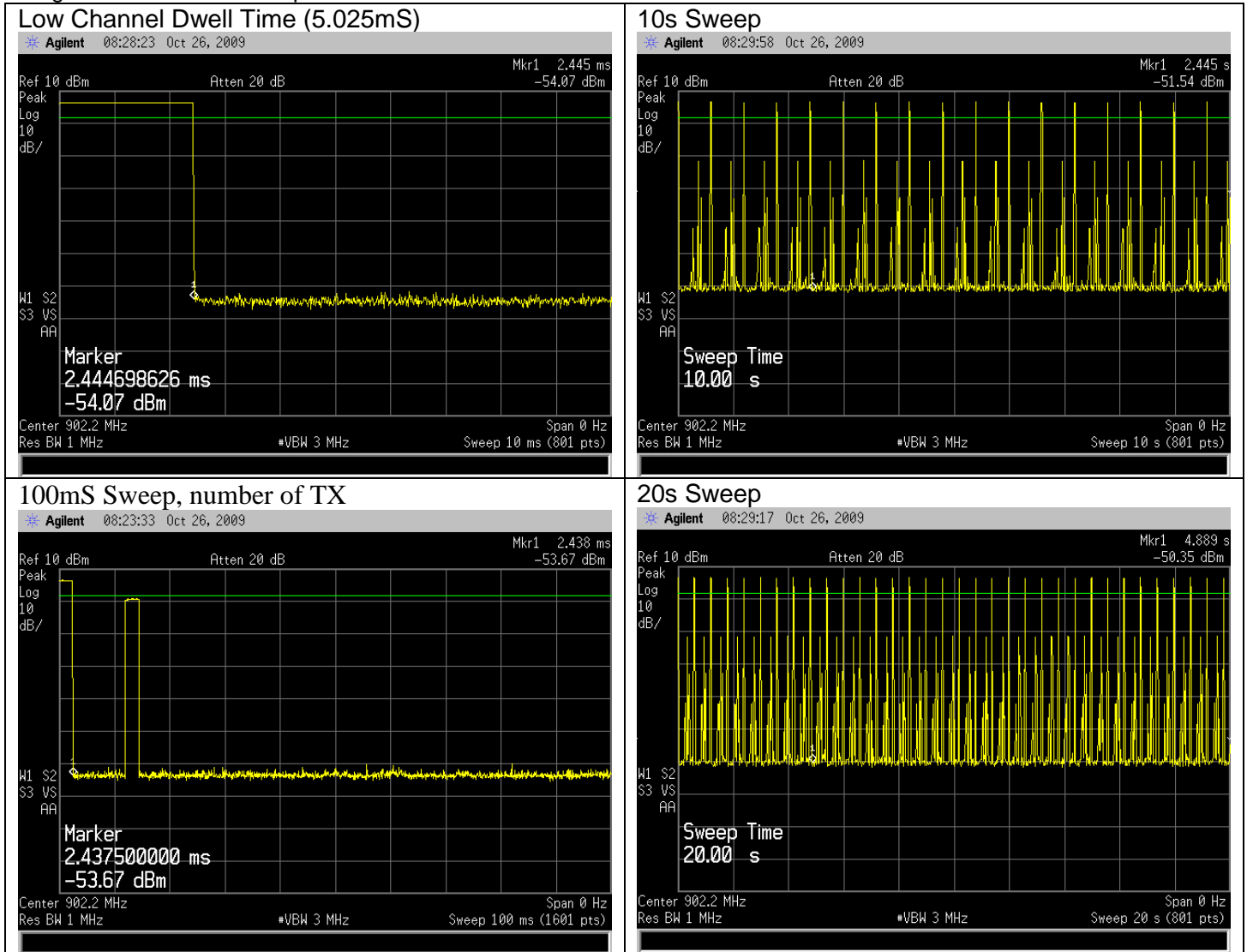
Table 26 Duty Cycle Correction Factor

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 Low Channel	1	2.445	-32.23

Figure 18 Test Setup for Dwell Time



Figure 19 Dwell Time Graphs



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: 34. Total maximum transmit time: 83.13ms within 20s.

4.7 Test Conditions and Results – 20DB 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(c)		

Table 27 20dB Bandwidth Configuration Settings

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

Table 28 20dB Bandwidth Test Equipment

Test Equipment Used			
Description	Manufacturer	Model	Identifier
Spectrum Analyser	Agilent	E7405A	EMC4242
Attenuator with Cable	Pasternak	10dB	none
DC Block	JFW	50DB-037	None

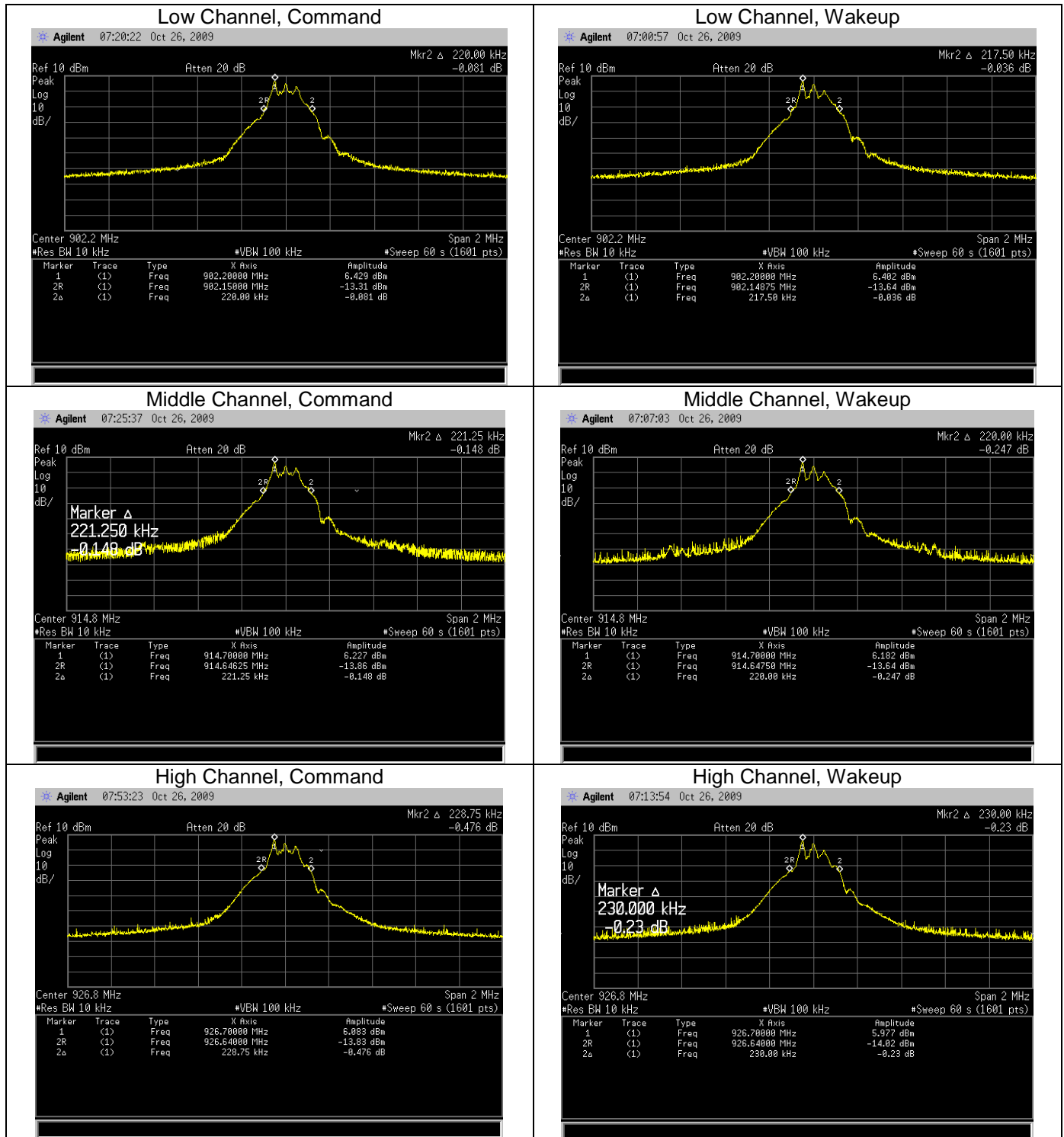
Table 29 20dB Bandwidth Results

Mode	Channel	20dB Bandwidth	
		Command	Wakeup
TX	Low	220.000kHz	217.500kHz
	Middle	225.250kHz	220.000kHz
	High	228.750kHz	230.000kHz

Test Setup for 20dB Bandwidth



Figure 20 20dB Bandwidth Graphs



4.8 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. For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.	
Basic Standard	47 CFR Part 15.247(b)(2) RSS-210, A8.4(1)	
	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 30 Maximum Peak Output Power EUT Configuration Settings

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

Table 31 Maximum Peak Output Power Test Equipment

Test Equipment Used			
Description	Manufacturer	Model	Identifier
Spectrum Analyser	Agilent	E7405A	EMC4242
Attenuator with Cable	Pasternak	10dB	none
DC Block	JFW	50DB-037	None

Table 32 Maximum Peak Output Power Results Command

Channel	Declared Antenna Gain (dBi)	Limit (dBm)	Power dBm	Power mW
Low Channel	5.14	30	16.89	48.8652359
Middle Channel	5.14	30	16.77	47.5335226
High Channel	5.14	30	16.59	45.6036916

Table 33 Maximum Peak Output Power Results Wakeup

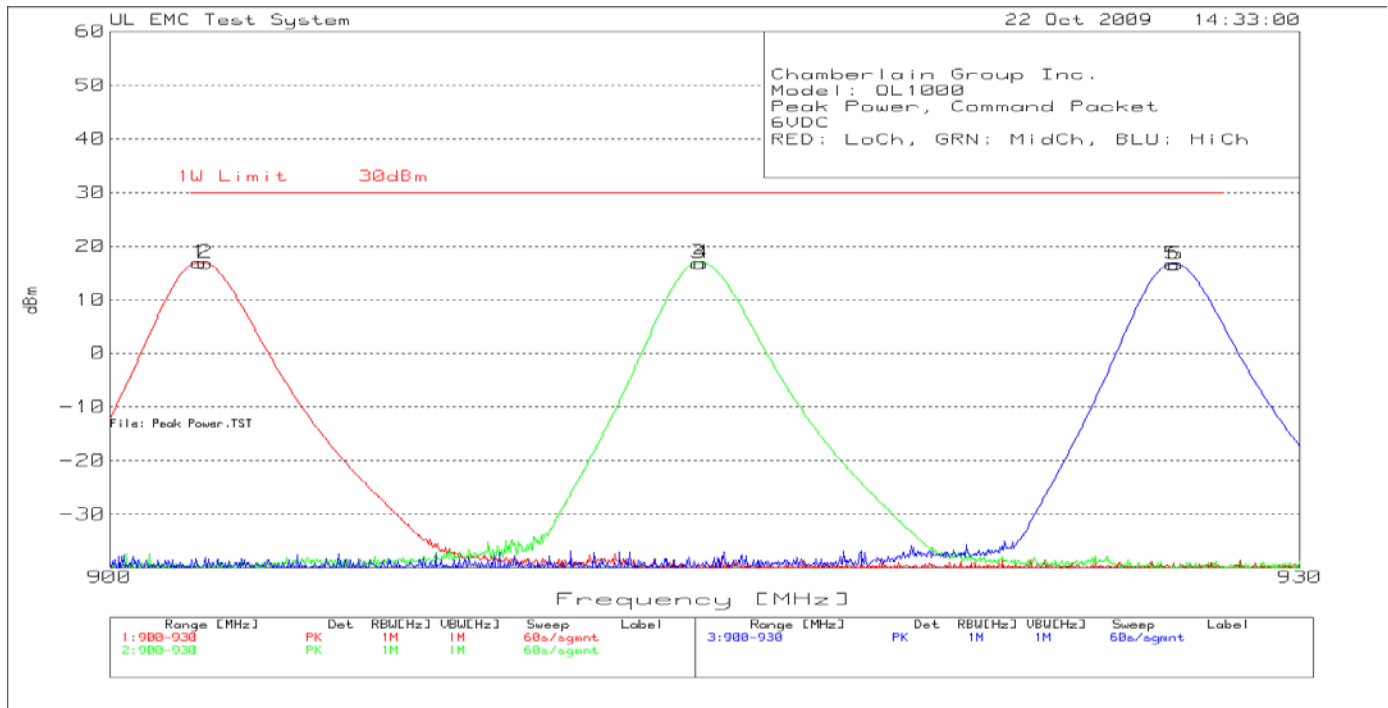
Channel	Declared Antenna Gain (dBi)	Limit (dBm)	Power dBm	Power mW
Low Channel	5.14	30	16.90	48.9778819
Middle Channel	5.14	30	16.75	47.3151259
High Channel	5.14	30	16.57	45.3941617

Test setup for Maximum Peak Output Power



Figure 21 Maximum Peak Output Power Graph

Command



Wakeup

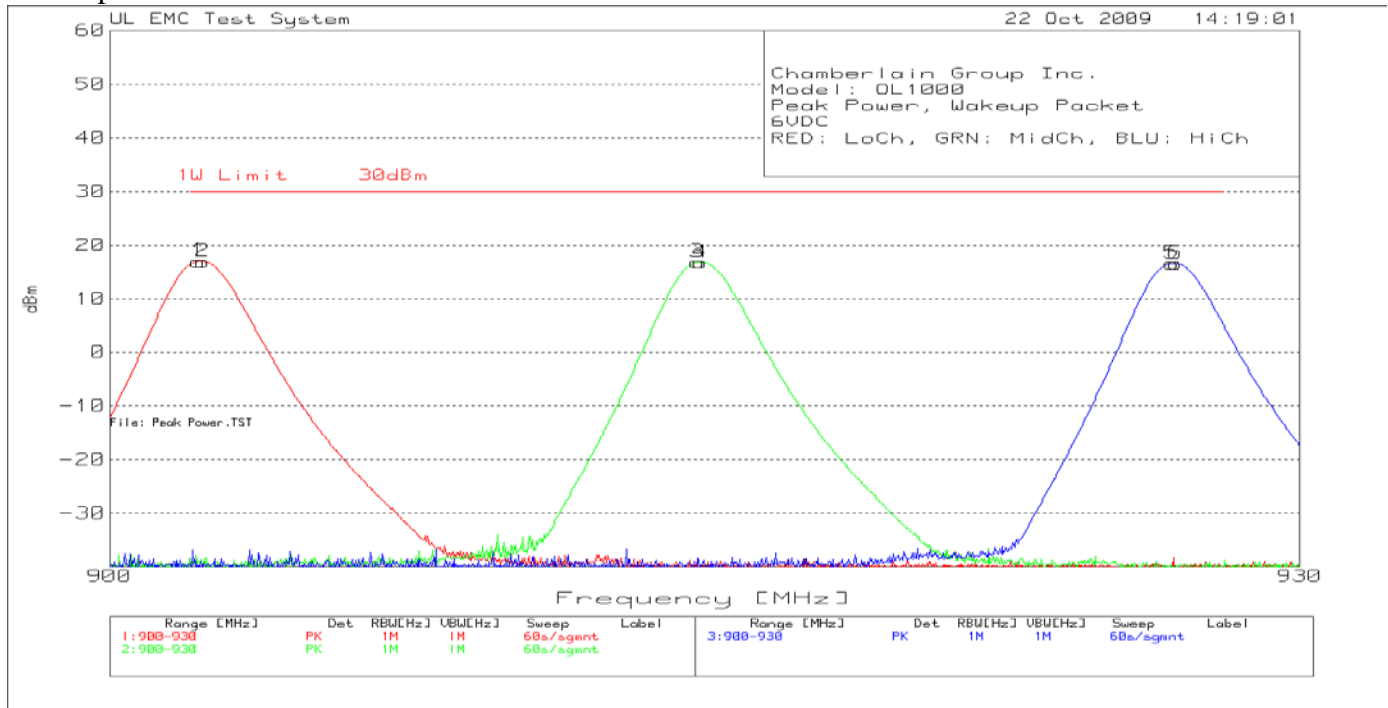


Table 34 Maximum Peak Output Power Emissions Data Points

Chamberlain Group Inc.
 Model: OL1000
 Peak Power, Command Packet
 6VDC
 RED: LoCh, GRN: MidCh, BLU: HiCh

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dBm	Limit 1	Margin 1[dB]
1	902.2213	113.29	pk	10.6	-107	16.89	30	-13.11
2	902.371	113.24	pk	10.6	-107	16.84	30	-13.16
3	914.7255	113.17	pk	10.6	-107	16.77	30	-13.23
4	914.7879	113.17	pk	10.6	-107	16.77	30	-13.23
5	926.7554	112.99	pk	10.6	-107	16.59	30	-13.41
6	926.8303	112.99	pk	10.6	-107	16.59	30	-13.41

LIMIT 1: 1W Limit 30dBm
 PK - Peak detector

Chamberlain Group Inc.
 Model: OL1000
 Peak Power, Wakeup Packet
 6VDC
 RED: LoCh, GRN: MidCh, BLU: HiCh

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dBm	Limit 1	Margin 1[dB]
1	902.1963	113.3	pk	10.6	-107	16.9	30	-13.1
2	902.3087	113.29	pk	10.6	-107	16.89	30	-13.11
3	914.7005	113.15	pk	10.6	-107	16.75	30	-13.25
4	914.7629	113.14	pk	10.6	-107	16.74	30	-13.26
5	926.718	112.97	pk	10.6	-107	16.57	30	-13.43
6	926.8178	112.97	pk	10.6	-107	16.57	30	-13.43

LIMIT 1: 1W Limit 30dBm
 PK - Peak detector

4.9 Test Conditions and Results – 99% Bandwidth

Test Description	When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emissions bandwidth, as calculated or measured. The transmitter shall be operated at its maximum carrier power measured under normal test condition.
Basic Standard	RSS-Gen, 4.6

Table 35 20dB Bandwidth Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	2 & 3
Supplementary information: None		

Table 36 20dB Bandwidth Test Equipment

Description	Manufacturer	Model	Identifier
Spectrum Analyzer	Agilent	E7405A	EMC4242
Attenuator w/ Cable	Pasternek	10dB	None
DC Block	JFW	50DB-037	None

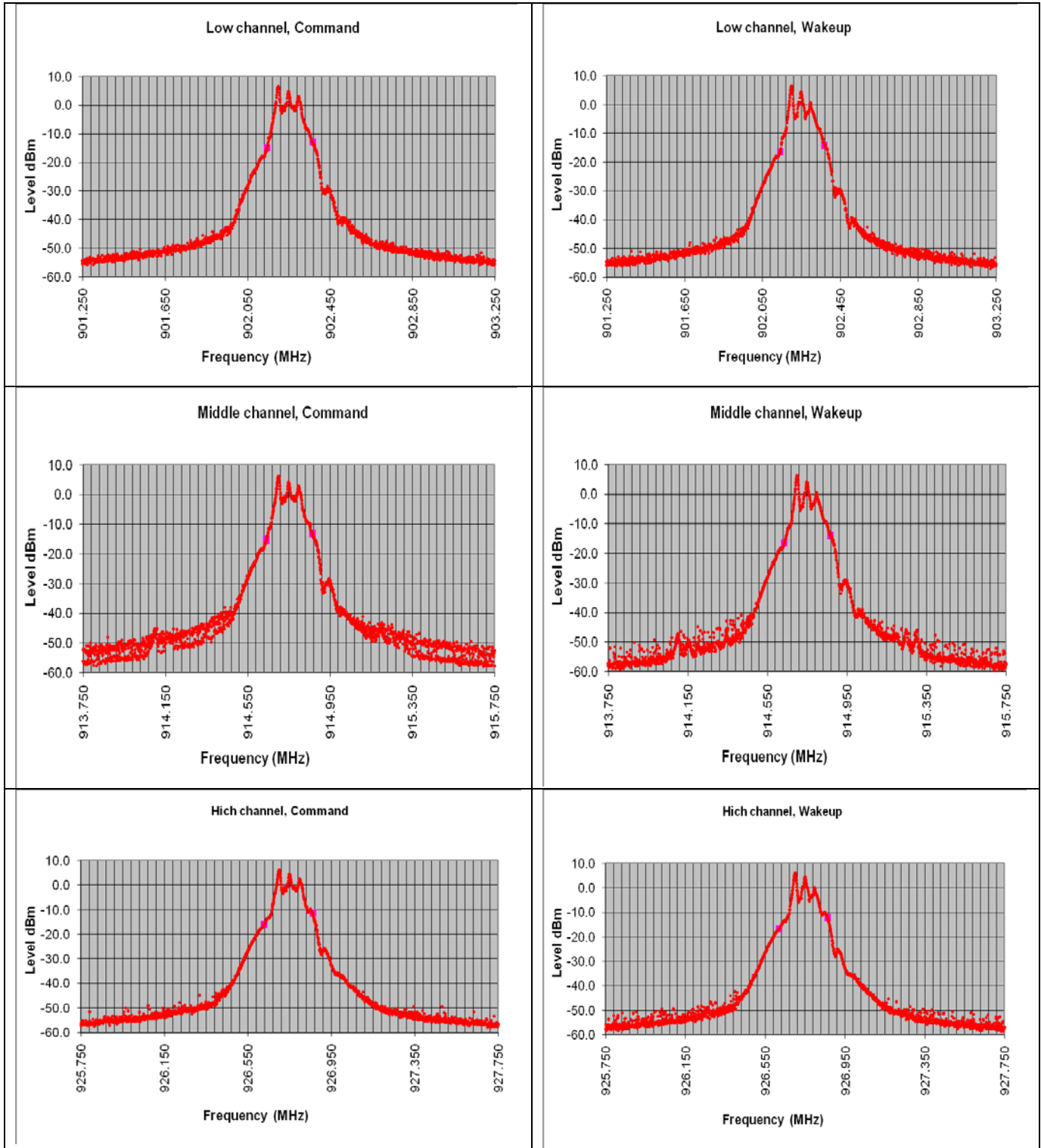
Table 37 20dB Bandwidth Results

Mode	Channel	99% Power Bandwidth (kHz)	
		Command	Wakeup
TX	Low	218.750	227.500
	Middle	222.500	231.250
	High	231.250	241.250

Test Setup for 99% Bandwidth



Figure 22 - 99% Power Bandwidth Plots



Job : 1101173150 Project #: 09NK15075
Model Number: OL1010
Client Name: Chamberlain Group Inc.

File #: MC3181

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FCC ID: HBWOVX1

5 IMMUNITY TEST RESULTS

The immunity tests were not performed nor required.

Appendix A

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/ts/htdocs/210/214/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 2180



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.: Radiated Emissions R-621, Conducted Emissions C-642.



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 89/336/EEC, Article 10 (2). 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

