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Project Number:	09NK15074
File Number:	MC3181
Date:	November 13, 2009
Model:	R1000

Electromagnetic Compatibility Test Report

For

Chamberlain Group Inc.

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Test Report Details

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

Tests Performed For: **Chamberlain Group Inc.
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Applicant Contact: **Hank Sieradzki**
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Test Report Date: **November 13, 2009**

Product Type: **900MHz Low Power Transceiver**

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

Model Number: **R1000**

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

Testing Start Date: **October 19, 2009**

Date Testing Complete: **October 28, 2009**

Overall Results: Compliant

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Report Revision History

Revision Date	Description	Revised By	Revision Reviewed By
none			

1.0 GENERAL - Product Description

1.1 Equipment Description

The Equipment Under Test (EUT) is a 900MHz wireless transceiver used as a extender to the Overlock transceiver series.

1.2 Device Configuration During Test

1.2.1 Equipment Used During Test:

Use	Product Type	Manufacturer	Model	Comments
EUT	Low Power Transceiver	Chamberlain Group Inc.	R1000	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	AC/DC Adapter
2	Antenna	O	N	N	¼ wave – length wire
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 O = Other					

1.2.3 Power Interface:

Mode # /Rated	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
1	6VDC	-	-	DC	-	Internal Battery
2	120V	-	-	60Hz	1	External AC/DC

1.3 EUT Configurations

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

1.4 EUT Operation Modes

Mode #	Description
1	EUT in Receive Mode, Hopping
2	EUT in Transmit Mode (Command Packet or Wakeup Packet) on either Low, Middle or High Channels
3	EUT Transmitting in hopping mode (Command) on all channels.

2.0 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	Compliant
	RSS-Gen 7.2.2	
Radiated Emissions - Digital	47 CFR Part 15.209	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

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Any information and documentation involving UL Mark services are provided on behalf of Underwriters Laboratories Inc. (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:

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

Code of Federal Regulations Title 47	Part 15, Subpart B & 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 – 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	FCC Part 15, Subpart C, 15.207 RSS-Gen 7.2.2	
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 (dBμV)	
	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 #
2	1	3
Supplementary information: None		

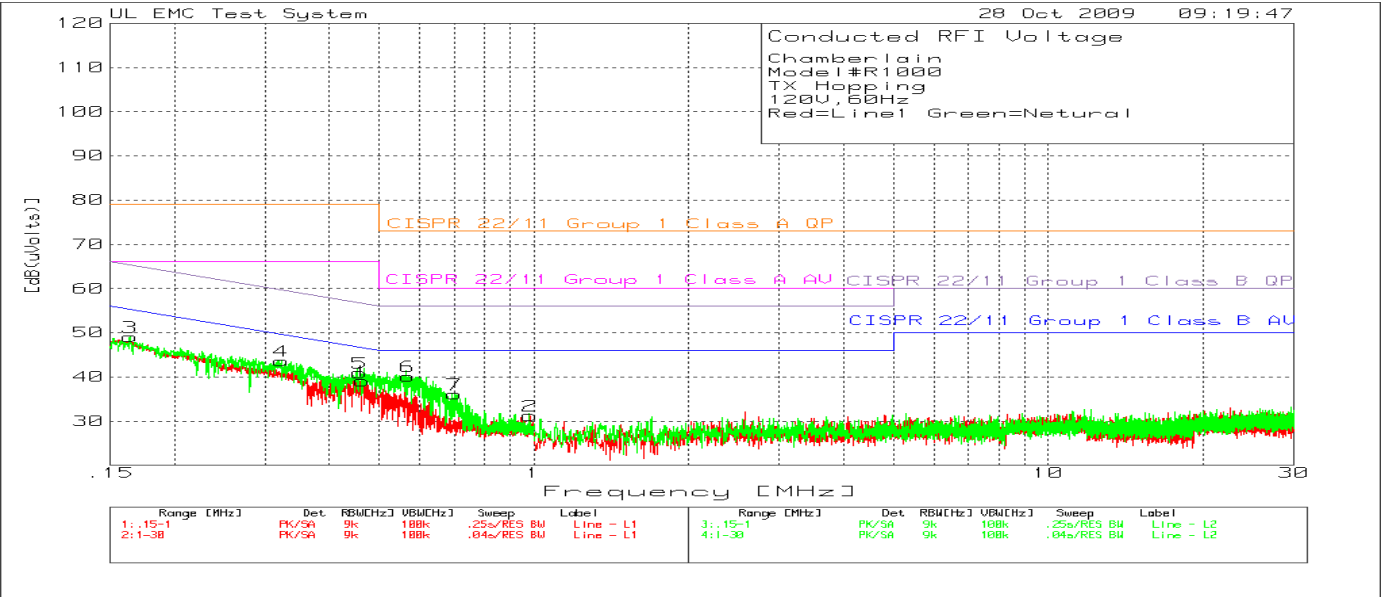
Table 2 Conducted Emissions Test Equipment

Description	Manufacturer	Model	Identifier
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC4328
Transient Limiter	Electro-Metrics	EM7600-2	EMC4224
HighPass Filter	Solar Electronics	2803-150	885551
Attenuator	HP	8494B	2831A00838
LISN - L1	Solar	8602-50-TS-50-N	EMC4052
LISN - L2	Solar	8602-50-TS-50-N	EMC4064
FILE USED FOR TESTING			
CISPR 22_11 w_ Dongle Line 1and2.TST			

Figure 1 Test Setup for Conducted Emissions



Figure 2 Conducted Emissions Graph



No differences recorded in conducted emission noise between transmit mode and receive mode. Only TX mode data provided.

Table 3 Conducted Emissions Data Points

Chamberlain
Model#R1000
TX Hopping
120V,60Hz
Red=Line1 Green=Neutral

No.	Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB(uVolts)]	Limit:1	2	3	4	5	6
Line 1 - Line											
1	.46426	28.09 pk	10.6	.4	39.09	79	66	56.6	46.6	-	-
				Margin [dB]		-39.91	-26.91	-17.51	-7.51	-	-
2	.9811	20.55 pk	10.5	.2	31.25	73	60	56	46	-	-
				Margin [dB]		-41.75	-28.75	-24.75	-14.75	-	-
Line 2 - Neutral											
3	.1638	33.82 pk	13.5	1.7	49.02	79	66	65.3	55.3	-	-
				Margin [dB]		-29.98	-16.98	-16.28	-6.28	-	-
4	.32242	32.25 pk	10.7	.6	43.55	79	66	59.6	49.6	-	-
				Margin [dB]		-35.45	-22.45	-16.05	-6.05	-	-
5	.45874	29.93 pk	10.6	.4	40.93	79	66	56.7	46.7	-	-
				Margin [dB]		-38.07	-25.07	-15.77	-5.77	-	-
6	.56895	29.29 pk	10.5	.3	40.09	73	60	56	46	-	-
				Margin [dB]		-32.91	-19.91	-15.91	-5.91	-	-
7	.70251	25.35 pk	10.5	.2	36.05	73	60	56	46	-	-
				Margin [dB]		-36.95	-23.95	-19.95	-9.95	-	-

LIMIT 1: CISPR 22/11 Group 1 Class A QP
LIMIT 2: CISPR 22/11 Group 1 Class A AV
LIMIT 3: CISPR 22/11 Group 1 Class B QP
LIMIT 4: CISPR 22/11 Group 1 Class B AV

PK - Peak detector

4.2 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 – 10GHz	(3 meter or 10 meter)	
Limits - Class B			
Frequency (MHz)	Limit (dBμV/m)		
	Quasi-Peak 10 meter	Quasi-Peak 3 meter	Average
30 - 88	29.54	40	NA
88 - 216	33.06	43.52	NA
216 - 960	35.56	46.02	NA
960 – 1,000	43.52	53.97	NA
1,000 – 10,000	NA	NA	54 (3 meter distance)
Supplementary information: None			

Table 4 Radiated Emissions EUT Configuration Settings

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

Table 5 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 3 Test setup for Radiated Emissions

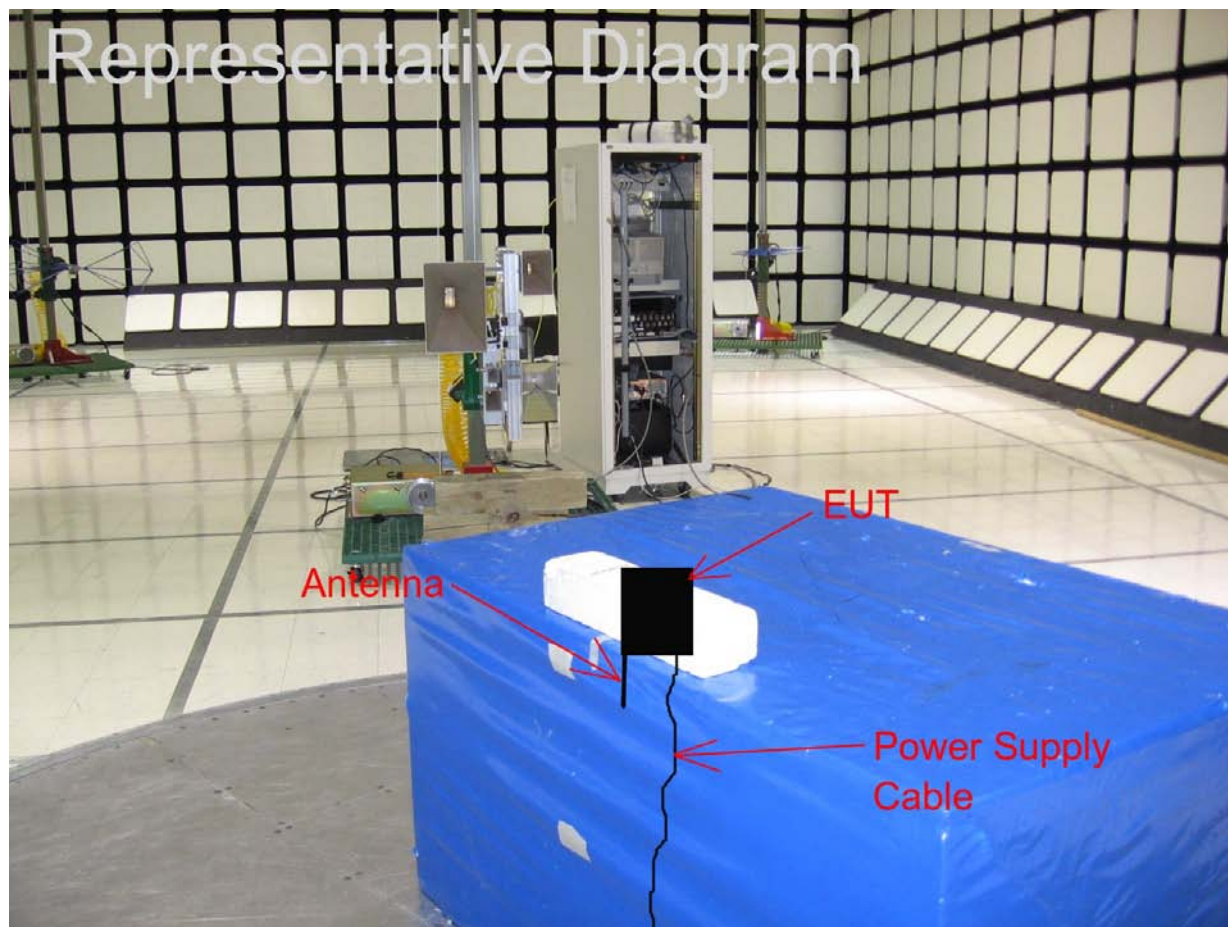


Table 6 Radiated Emissions Data Points 30MHz–200MHz (10m distance) & 200MHz–1GHz (3m distance), RX

Chamberlain Group Inc.
Model: R1000
RX, (#14)
120V/60Hz
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 2	Margin 2[dB]	Limit 4	Margin 4[dB]	Height [cm]	Polarity
1	59.99	34.65	pk	-30.3	6.8	11.15	30	-18.85	29.6	-18.45	100	Vert
2	77.1514	30.93	pk	-30.3	6.7	7.33	30	-22.67	29.6	-22.27	100	Vert
3	159.9001	32.16	pk	-30.1	15.1	17.16	30	-12.84	33.1	-15.94	100	Vert

LIMIT 2: CISPR Class B 10 m
LIMIT 4: CFR 47 Part 15 Class B 10m

PK - Peak detector
QP - Quasi-Peak detector

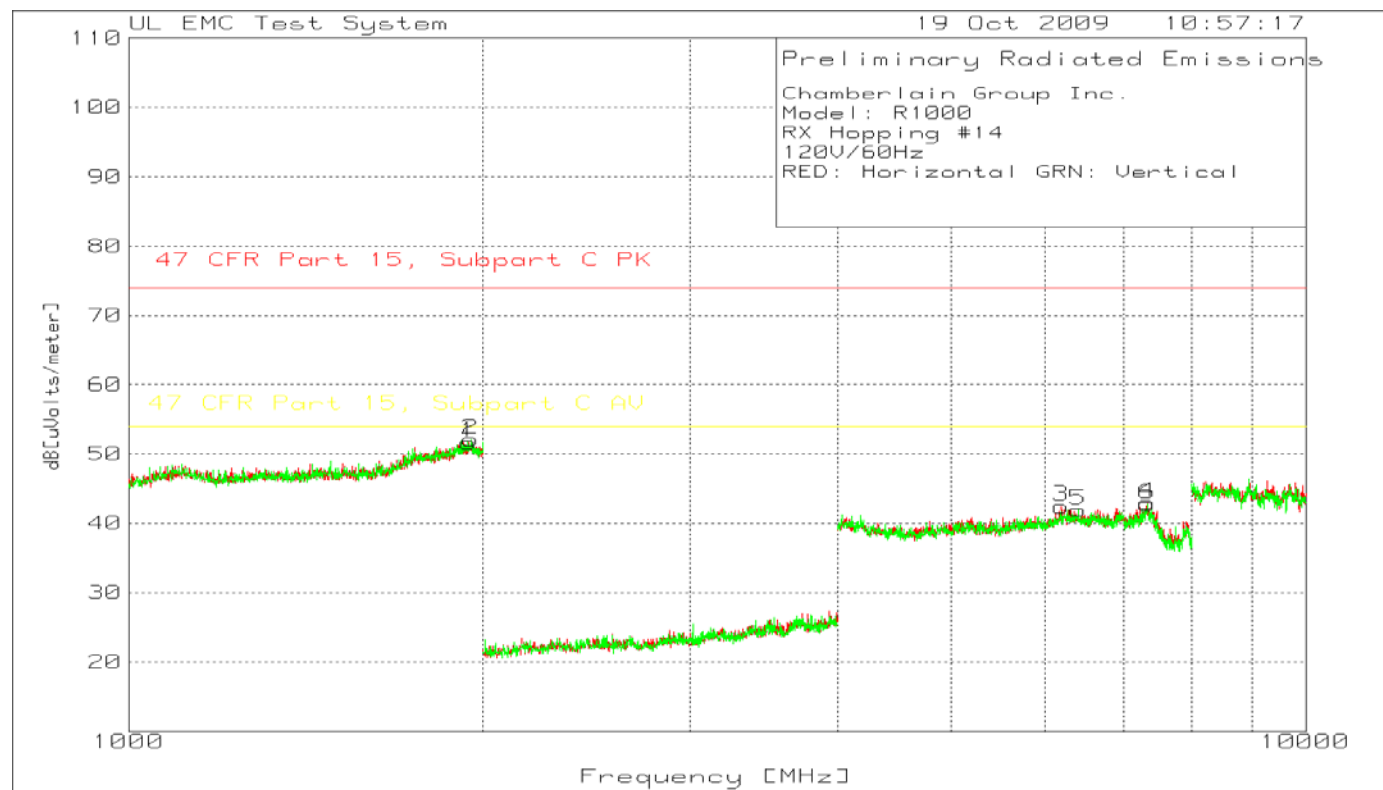
Chamberlain Group Inc.
Model: R1000
RX, (#14)
120V/60Hz
RED: Horizontal GRN: Vertical

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit 2	Margin 2[dB]	Height [cm]	Polarity
1	856.8954	14.97	pk	3.5	23.2	41.67	46	-4.33	101	Horz
2	929.9134	14.8	pk	3.7	23.6	42.1	46	-3.9	400	Horz
3	856.8954	14.4	pk	3.5	23.2	41.1	46	-4.9	400	Vert
4	879.547	15.24	pk	3.5	23.1	41.84	46	-4.16	200	Vert
5	929.9134	14.69	pk	3.7	23.6	41.99	46	-4.01	400	Vert

LIMIT 2: CFR 47 Part 15 Class B 3m

PK - Peak detector
QP - Quasi-Peak detector

Figure 5 Radiated Emissions Graph 1GHz – 10GHz, RX



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)).		
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	10 meter / 3 meter distance as noted / 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 (10 meter)	Average (3 meter)	
	General Emissions	Fundamental	Spurious
30 – 88	29.54	-	-
88 – 216	33.06	-	-
216-960	35.56	-	-
960-1000	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).			

Table 7 SPURIOUS EMISSIONS EUT Configuration Settings

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

Table 8 SPURIOUS CONDUCTED EMISSIONS Test Equipment

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

Table 9 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

Job #: 1001173156 Project #: 09NK15074
Model Number: R1000
Client Name: Chamberlain Group Inc.

File #: MC3181

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Test setup for SPURIOUS EMISSIONS – Antenna conducted



Test setup for SPURIOUS EMISSIONS – Radiated

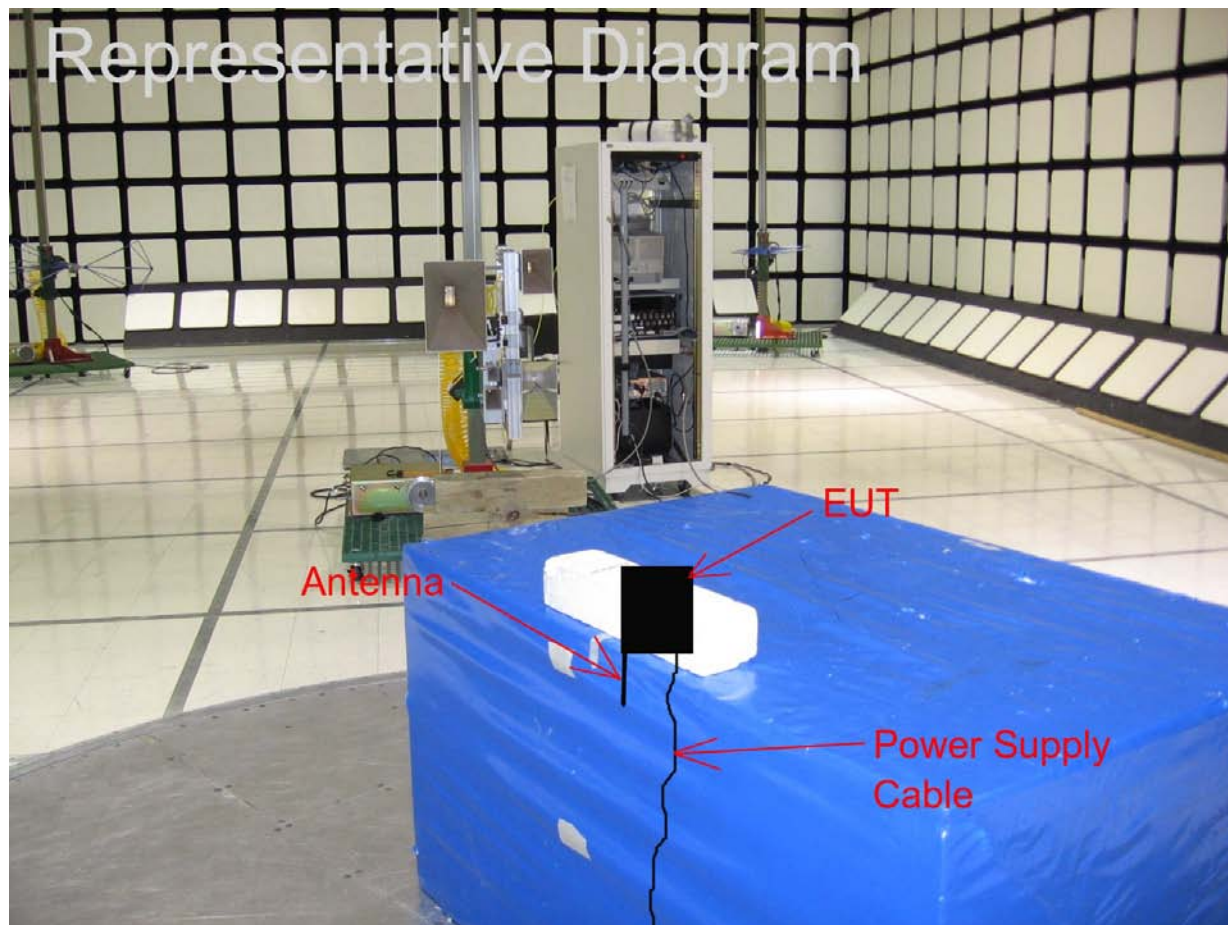
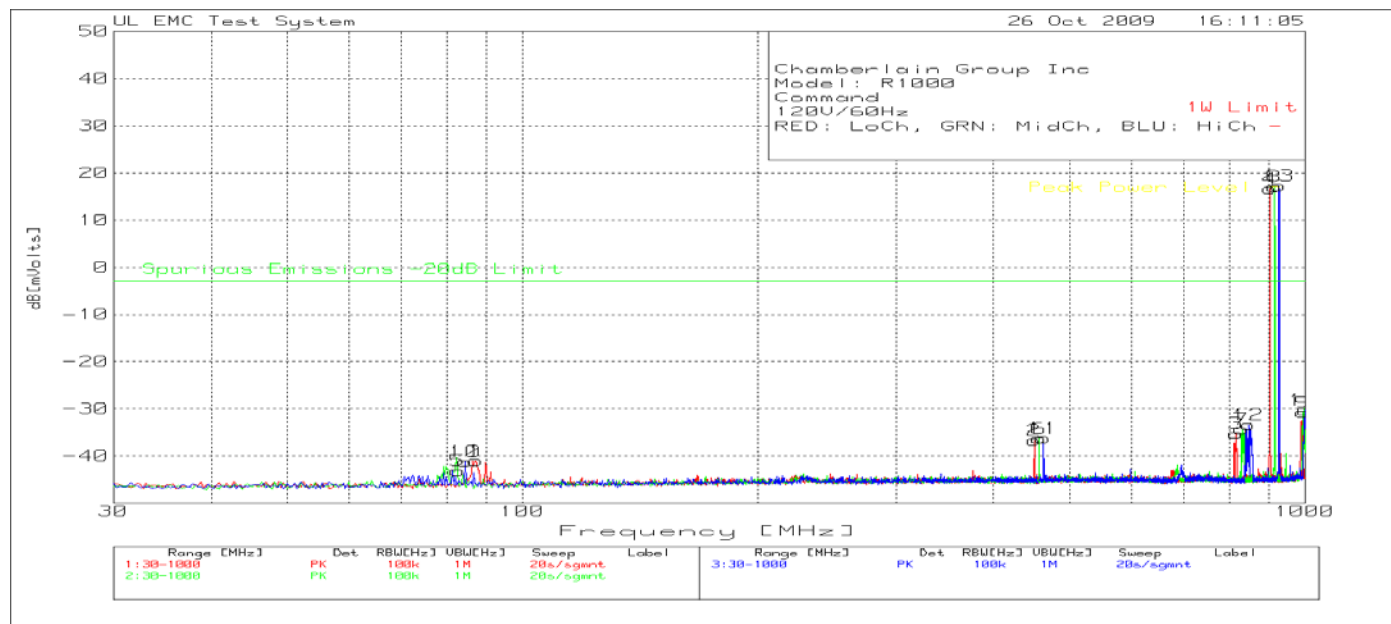
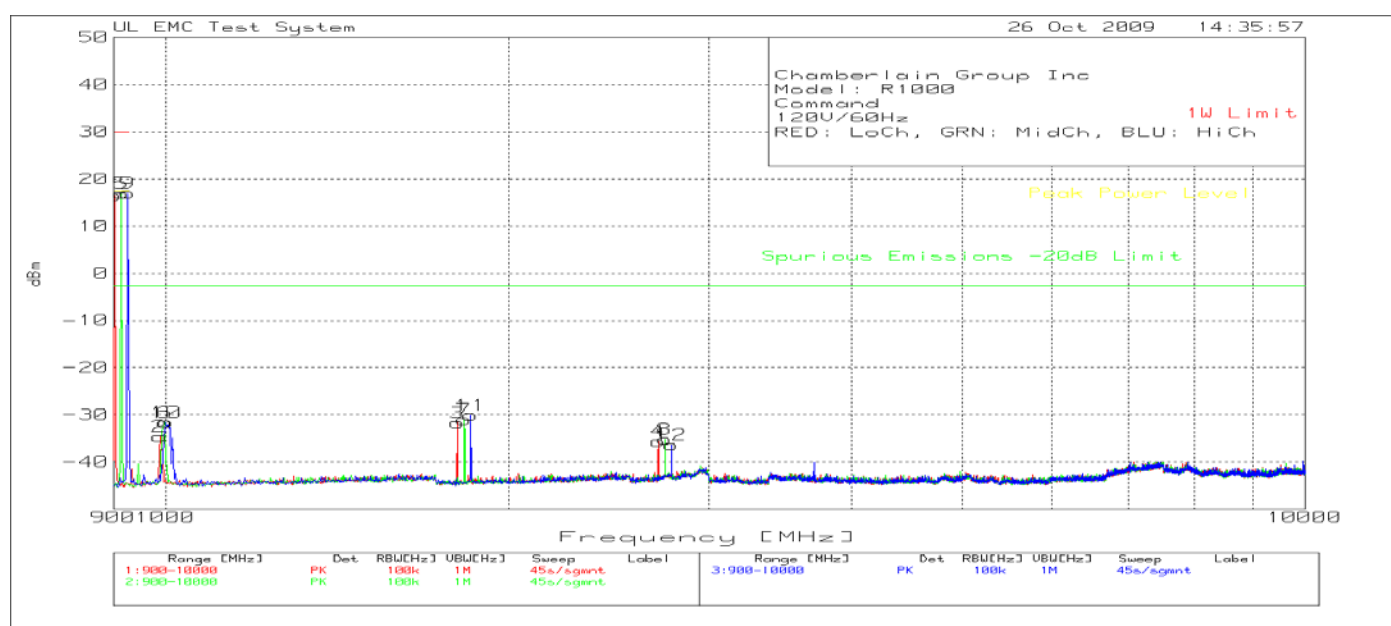


Figure 6 30MHz-1GHz Antenna Port Spurious Emissions, TX Mode, Low, Middle and High Channels, Command



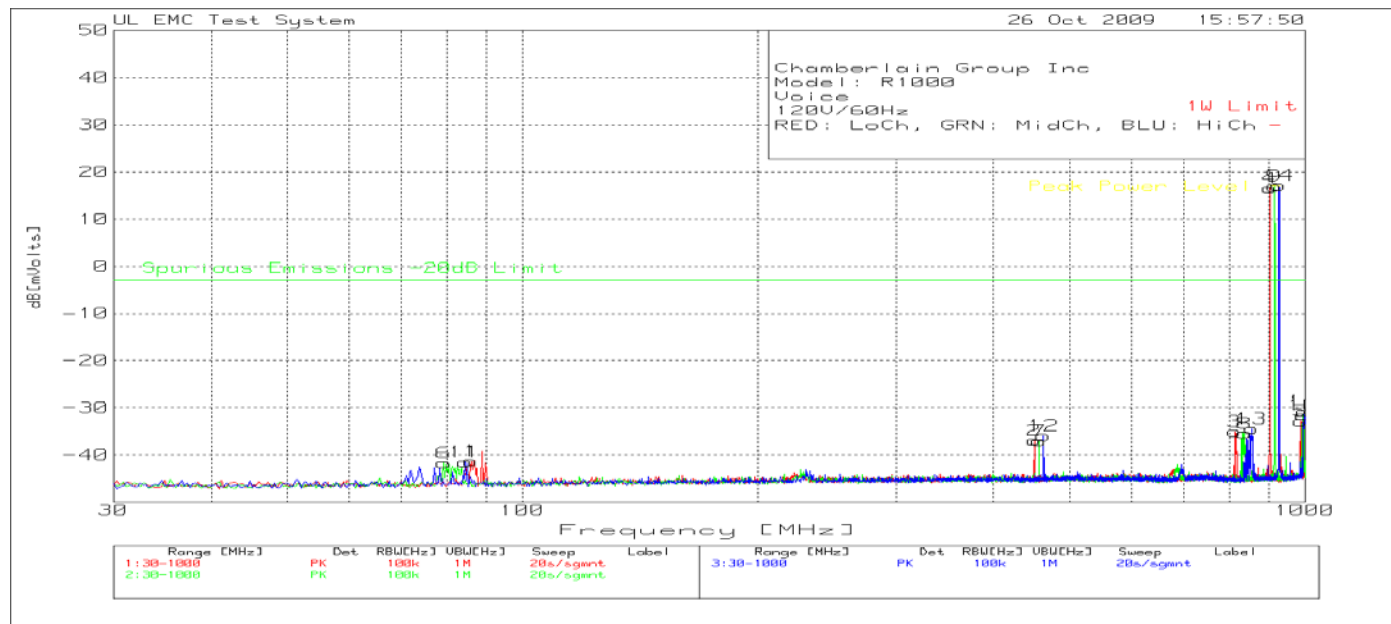
* There were no emissions within 20dB of the limit recorded.

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



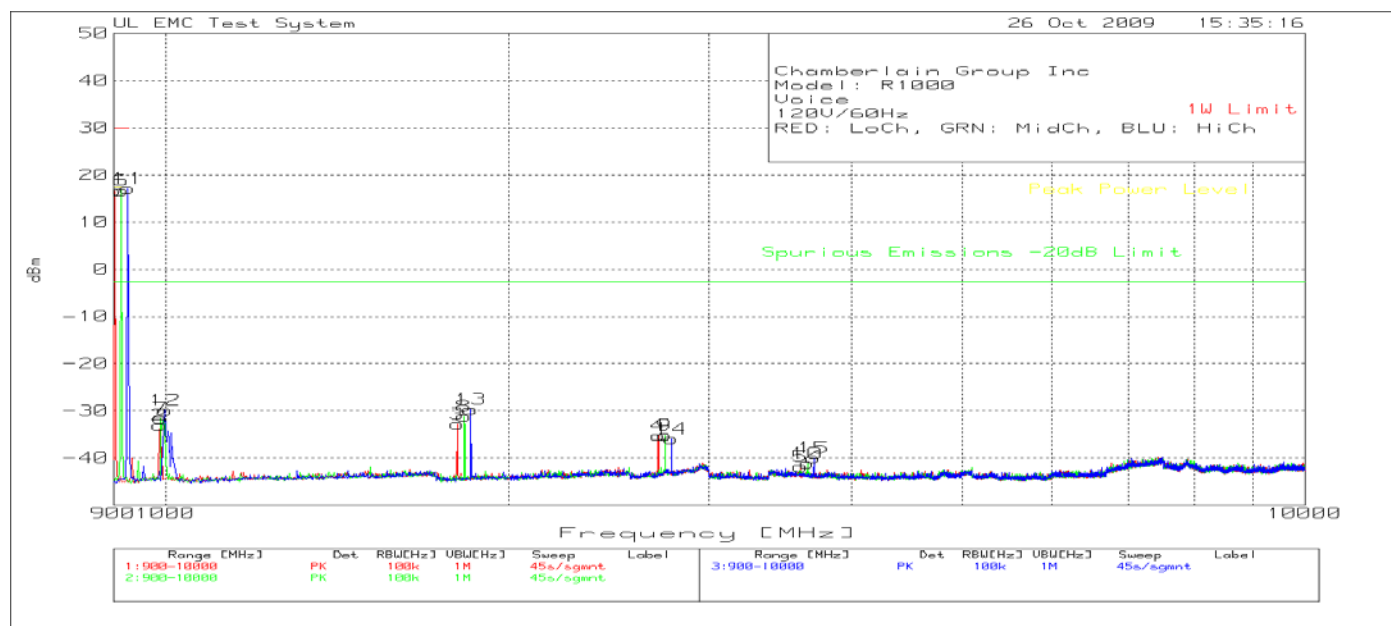
* There were no emissions within 20dB of the limit recorded.

Figure 8 30MHz-1GHz Antenna Port Spurious Emissions, TX Mode, Low, Middle and High Channels, Voice



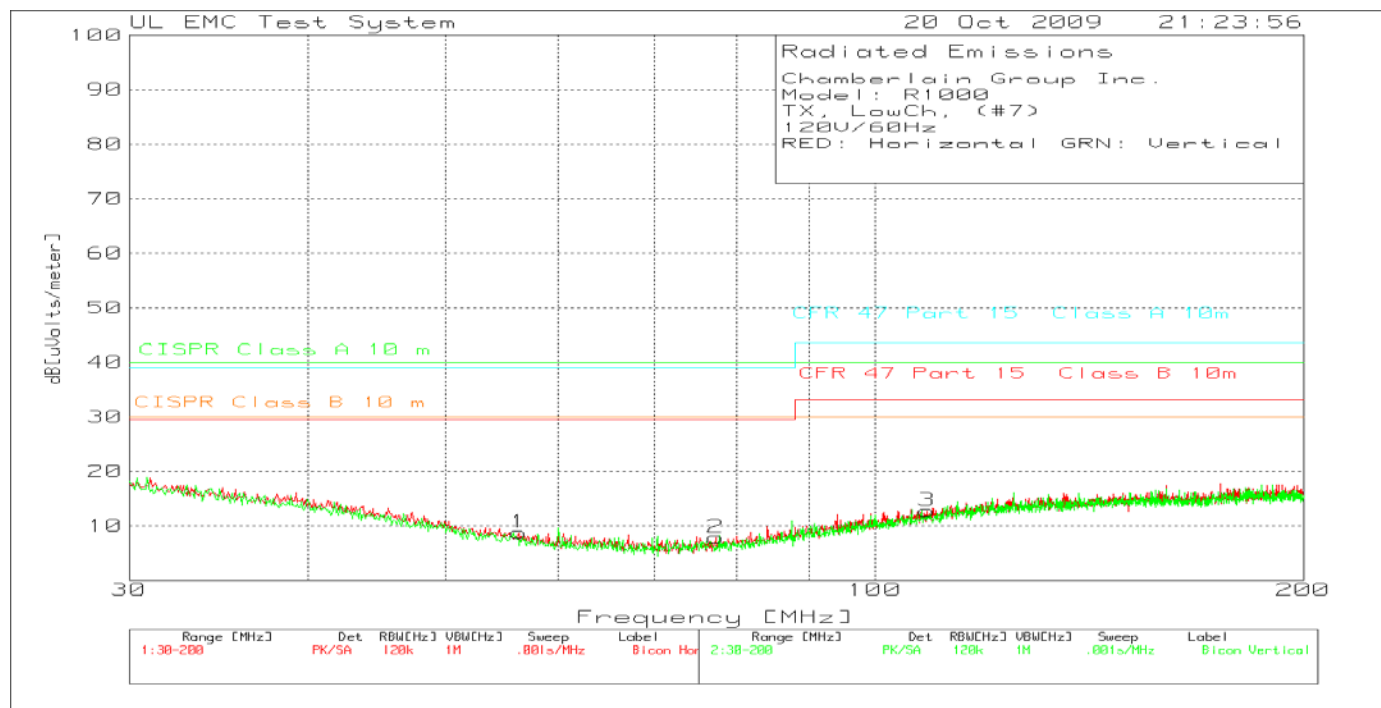
* There were no emissions within 20dB of the limit recorded.

Figure 9 1GHz-10GHz Antenna Port Spurious Emissions, TX Mode, Low, Middle and High Channels, Voice



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

Figure 10 Radiated Spurious Emissions 30MHz-200MHz, Low Channel



*No emissions close to the limit recorded.

Figure 11 Radiated Spurious Emissions 200MHz – 1GHz, Low Channel

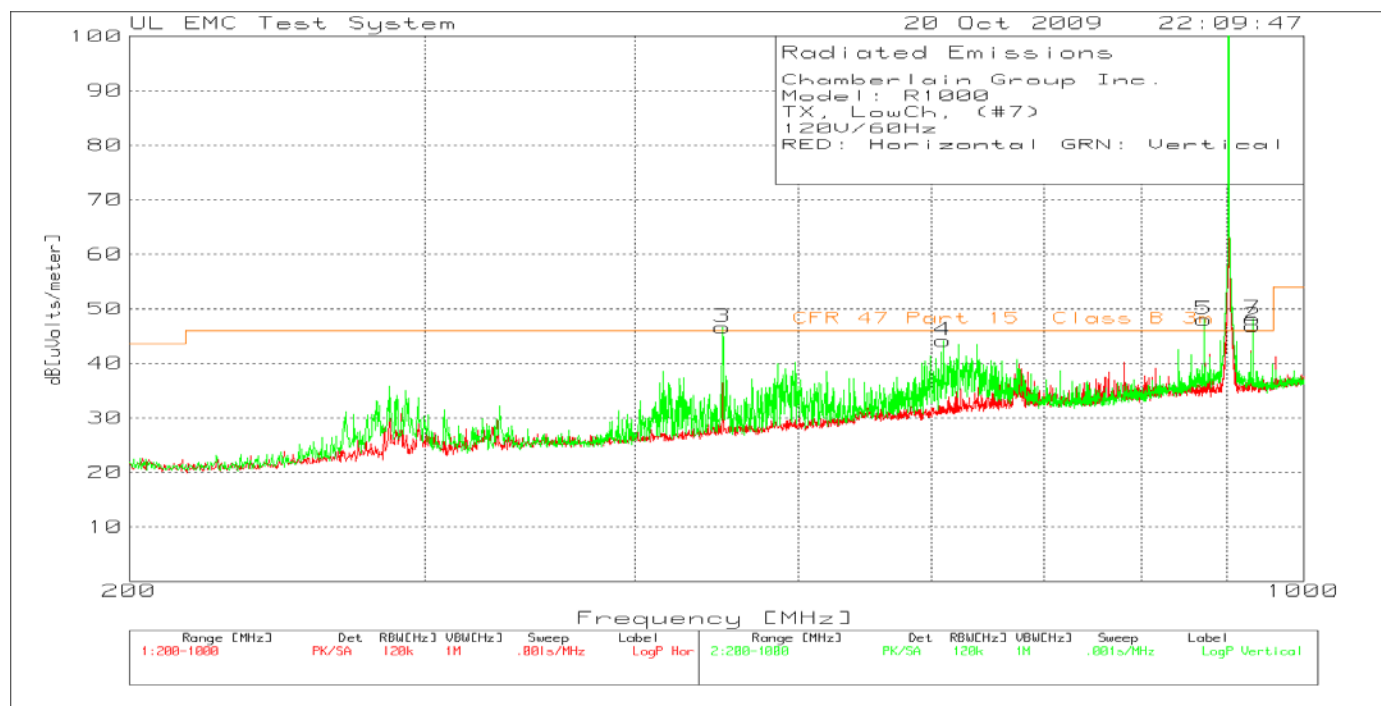


Table 10 Radiated Spurious Emissions 200MHz - 1GHz, Low Channel

Chamberlain Group Inc.
Model: R1000
TX, LowCh, (#7)
120V/60Hz
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 2	Margin 2 [dB]	Height [cm]	Polarity	Comments
1	902.3318	82.02	pk	3.5	23.1	108.62	46	62.62	200	Horz	Fundamental TX Freq.
2	932.5783	19.67	pk	3.7	23.6	46.97	46	.97	200	Horz	Note 2
3	451.0326	26.91	pk	2.4	17.4	46.71	46	.71	101	Vert	Note 2
4	610.3931	21.35	pk	2.9	20	44.25	46	-1.75	101	Vert	See table below
5	872.3518	21.51	pk	3.5	23	48.01	46	2.01	101	Vert	Note 2
6	902.465	86.47	pk	3.5	23.1	113.07	46	67.07	101	Vert	Fundamental TX Freq.
7	932.3118	20.86	pk	3.7	23.6	48.16	46	2.16	101	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.

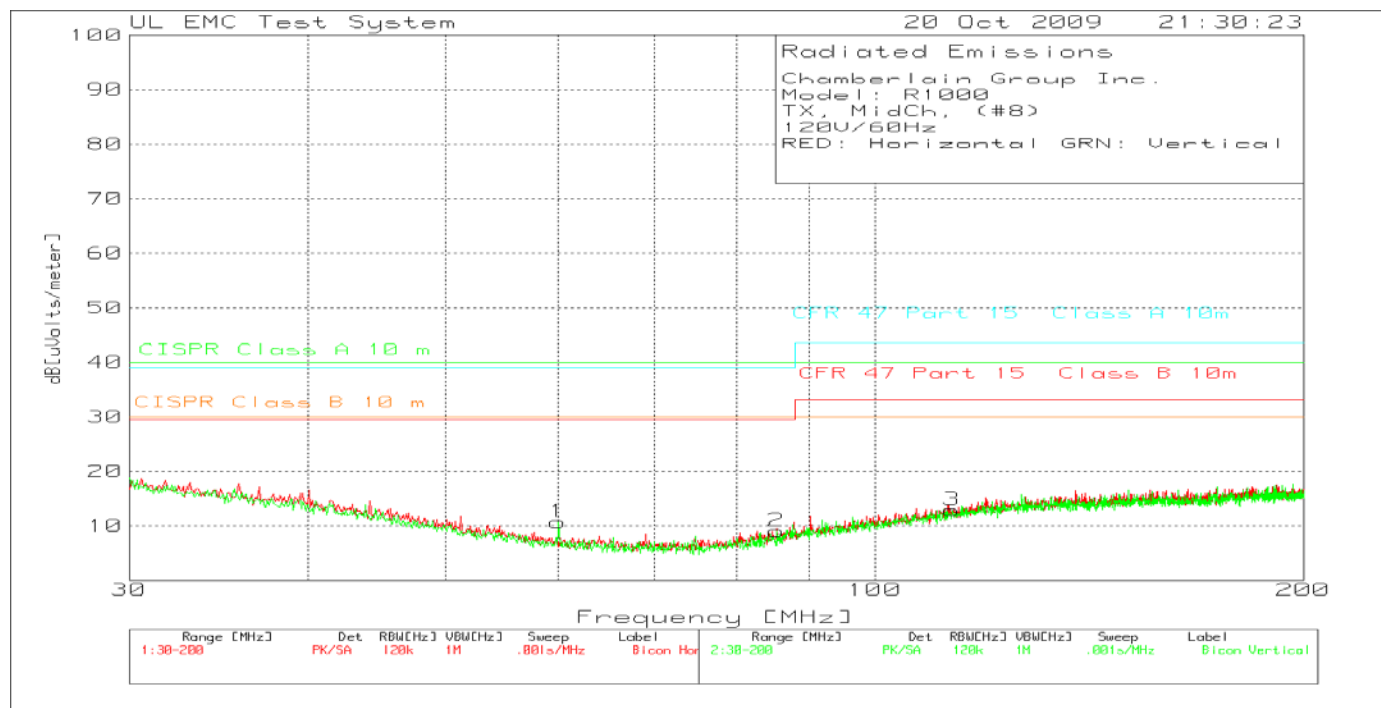
Chamberlain Group Inc.
Model: R1000
TX, LowCh, (#7)
120V/60Hz
RED: Horizontal GRN: Vertical

Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit 2	Margin 2 [dB]	Azimuth [degrees]	Height [cm]	Polarity
612.288	9.6	qp	3	20	32.6	46	-13.4	42	105	Vert

LIMIT 2: CFR 47 Part 15 Class B 3m

PK - Peak detector
QP - Quasi-Peak detector

Figure 12 Radiated Spurious Emissions 30MHz-200MHz, Middle Channel



*No emissions close to the limit recorded.

Figure 13 Radiated Spurious Emissions 200MHz – 1GHz, Middle Channel

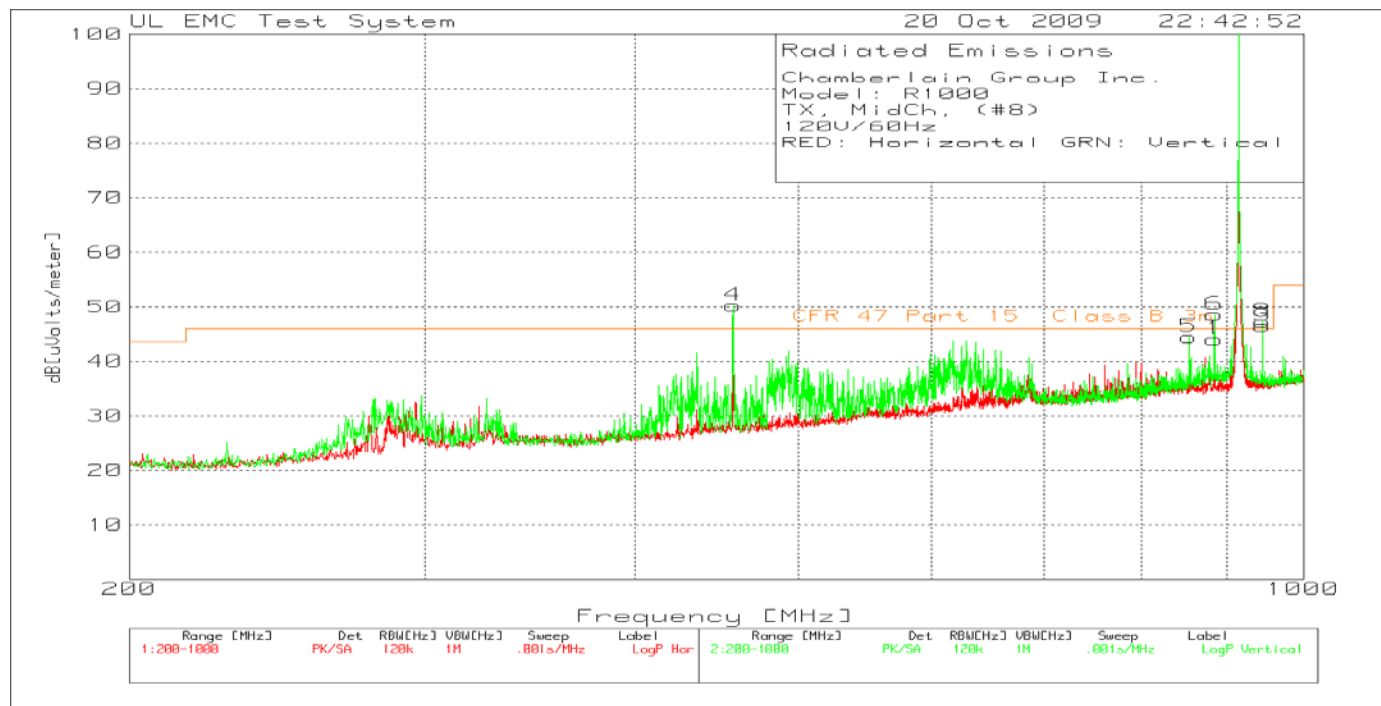


Table 11 Radiated Spurious Emissions 200MHz - 1GHz, Middle Channel

Chamberlain Group Inc.
Model: R1000
TX, MidCh, (#8)
120V/60Hz
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 2	Margin 2[dB]	Height [cm]	Polarity	Comments
1	884.8767	17.31	pk	3.6	23.2	44.11	46	-1.89	200	Horz	Note 2
2	914.99	81.72	pk	3.6	23.3	108.62	46	62.62	200	Horz	Fund. TX Freq.
3	944.8368	19.19	pk	3.7	23.6	46.49	46	.49	200	Horz	Note 2
4	457.4284	30.28	pk	2.5	17.5	50.28	46	4.28	101	Vert	Note 2
5	854.7635	17.79	pk	3.5	23.2	44.49	46	-1.51	101	Vert	Note 2
6	884.8767	21.79	pk	3.6	23.2	48.59	46	2.59	101	Vert	Note 2
7	914.7235	86.02	pk	3.6	23.3	112.92	46	66.92	101	Vert	Fund. TX Freq.
8	944.8368	20.03	pk	3.7	23.6	47.33	46	1.33	101	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.

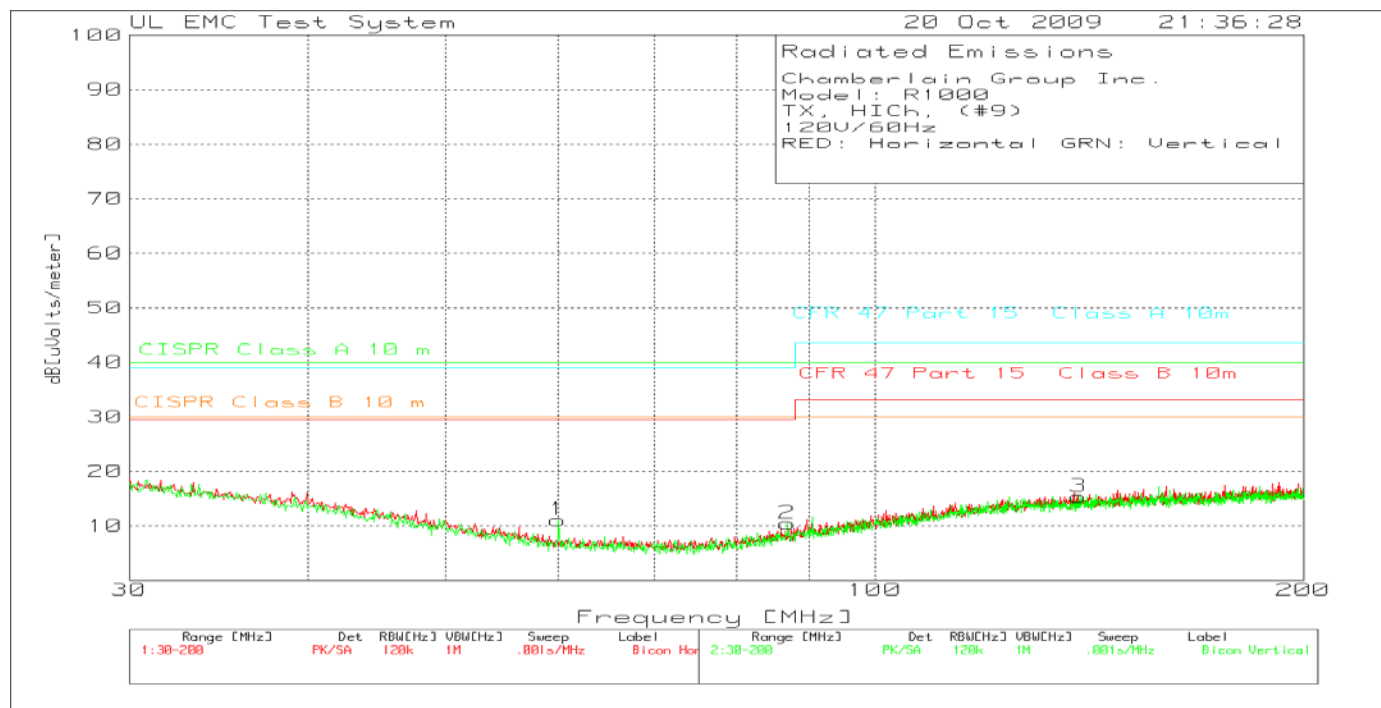
LIMIT 1: NONE

LIMIT 2: CFR 47 Part 15 Class B 3m

PK - Peak detector

QP - Quasi-Peak detector

Figure 14 Radiated Spurious Emissions 30MHz-200MHz, High Channel



*No emissions close to the limit recorded.

Figure 15 Radiated Spurious Emissions 200MHz – 1GHz, High Channel

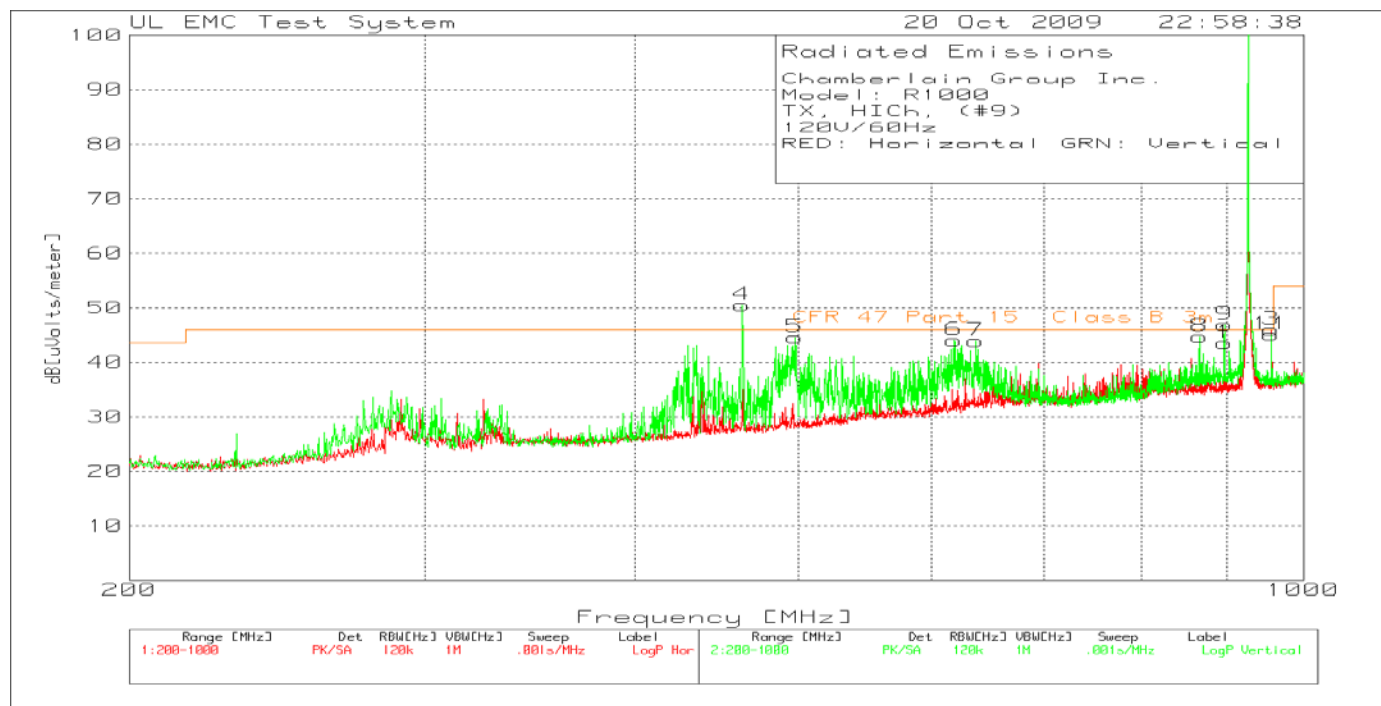


Table 12 Radiated Spurious Emissions 200MHz - 1GHz, High Channel

Chamberlain Group Inc.
Model: R1000
TX, HICH, (#9)
120V/60Hz
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/m eter]	Limit 2	Margin 2[dB]	Height [cm]	Polarity	Comments
1	896.8688	16.9	pk	3.5	23.1	43.5	46	-2.5	201	Horz	Note 2
2	926.7155	82.32	pk	3.6	23.5	109.42	46	63.42	201	Horz	Fund. TX Freq.
3	956.8288	18.62	pk	3.7	23.7	46.02	46	.02	201	Horz	Note 2
4	463.2911	30.48	pk	2.5	17.6	50.58	46	4.58	100	Vert	Note 2
5	497.6682	23.92	pk	2.6	18.1	44.62	46	-1.38	100	Vert	Note 3
6	618.9207	20.98	pk	2.9	20.2	44.08	46	-1.92	100	Vert	Note 3
7	638.1079	20.33	pk	3	20.6	43.93	46	-2.07	100	Vert	Note 3
8	866.7555	18.16	pk	3.5	23	44.66	46	-1.34	100	Vert	Note 2
9	896.8688	20.35	pk	3.5	23.1	46.95	46	.95	100	Vert	Note 2
10	926.982	85.34	pk	3.7	23.5	112.54	46	66.54	100	Vert	Fund. TX Freq.
11	956.8288	17.65	pk	3.7	23.7	45.05	46	-.95	100	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.
Note 3: Product of the transmitter, not in restricted band, duty cycle can be used to increase the margin.

LIMIT 2: CFR 47 Part 15 Class B 3m

PK - Peak detector
QP - Quasi-Peak detector

Figure 16 Radiated Spurious Emissions above 1GHz, Low Channel

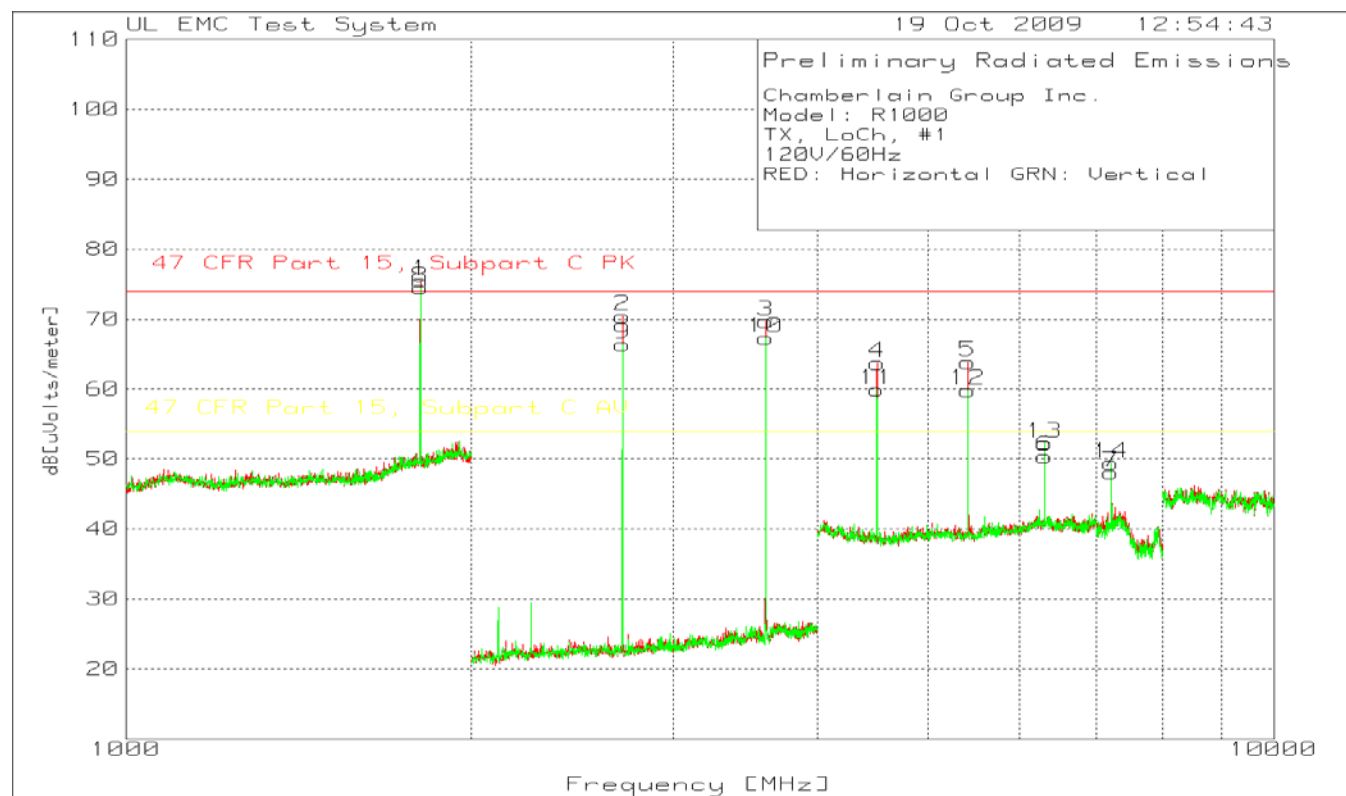


Table 13 Radiated Spurious Emissions above 1GHz, Low Channel, Table

Chamberlain Group Inc.

Model: R1000

TX, LowCh, (#7)

120V/60Hz

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 1	Margin 1[dB]	Limit 2	Margin 2[dB]	Height [cm]	Polarity	Comments
1	1804.805	43.91	pk	3.59	27	74.5	74	.5	54	20.5	150	Horz	Note 2
2	2706.707	98.28	pk	-51.23	22.1	69.15	74	-4.85	54	15.15	100	Horz	See table below
3	3609.61	97.26	pk	-50.95	23.2	69.51	74	-4.49	54	15.51	100	Horz	See table below
4	4509.673	88.03	pk	-52.5	27.8	63.33	74	-10.67	54	9.33	100	Horz	See table below
5	5414.276	80.42	pk	-50.15	27.9	58.17	74	-15.83	54	4.17	100	Horz	See table below
6	6316.211	75.2	pk	-48.02	29.2	56.38	74	-17.62	54	2.38	100	Horz	Note 2
7	7218.145	65.25	pk	-47.08	29.8	47.97	74	-26.03	54	-6.03	100	Horz	Note 2
8	1804.805	44.18	pk	3.59	27	74.77	74	.77	54	20.77	150	Vert	Note 2
9	2706.707	95.22	pk	-51.23	22.1	66.09	74	-7.91	54	12.09	150	Vert	See table below
10	3609.61	93.05	pk	-50.95	23.2	65.3	74	-8.7	54	11.3	150	Vert	See table below
11	4512.342	83.88	pk	-52.5	27.8	59.18	74	-14.82	54	5.18	150	Vert	See table below
12	5411.608	81.25	pk	-50.19	27.9	58.96	74	-15.04	54	4.96	150	Vert	See table below
13	6316.211	66.91	pk	-48.02	29.2	48.09	74	-25.91	54	-5.91	200	Vert	Note 2
14	7218.145	66.37	pk	-47.08	29.8	49.09	74	-24.91	54	-4.91	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

av - Average detector

Chamberlain Group Inc.
Model: R1000
TX, LoCh, #7
120V/60Hz
RED: Horizontal GRN: 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 [deg]	Height [cm]	Polarity
2706.8978	100.3	pk	1MHz/1MHz	-51.23	22.1	0	71.17	74	-2.83			187	102	Horz
2706.6814	93.23	av	1MHz/10Hz	-51.23	22.1	-26	38.1			54	-15.9	187	102	Horz
2707.1403	98.78	pk	1MHz/1MHz	-51.22	22.1	0	69.66	74	-4.34			80	122	Vert
2706.6513	79.6	av	1MHz/10Hz	-51.23	22.1	-26	24.47			54	-29.53	80	122	Vert
3608.5401	95.72	pk	1MHz/1MHz	-50.95	23.2	0	67.97	74	-6.03			169	148	Vert
3608.8888	89.22	av	1MHz/10Hz	-50.95	23.2	-26	35.47			54	-18.53	169	148	Vert
3609.6343	98.6	pk	1MHz/1MHz	-50.95	23.2	0	70.85	74	-3.15			212	103	Horz
3608.9128	91.36	av	1MHz/10Hz	-50.95	23.2	-26	37.61			54	-16.39	212	103	Horz
4511.5561	92.21	pk	1MHz/1MHz	-52.5	27.8	0	67.51	74	-6.49			3	104	Horz
4511.0992	68.94	av	1MHz/10Hz	-52.5	27.8	-26	18.24			54	-35.76	259	104	Horz
4511.489	87.78	pk	1MHz/1MHz	-52.5	27.8	0	63.08	74	-10.92			221	111	Vert
4511.1283	71.26	av	1MHz/10Hz	-52.5	27.8	-26	20.56			54	-33.44	221	111	Vert
5413.3958	83.97	pk	1MHz/1MHz	-50.17	27.9	0	61.7	74	-12.3			191	166	Vert
5413.3236	76.72	av	1MHz/10Hz	-50.17	27.9	-26	28.45			54	-25.55	191	166	Vert
5414.3607	87.16	pk	1MHz/1MHz	-50.15	27.9	0	64.91	74	-9.09			0	117	Horz
5413.3868	70.79	av	1MHz/10Hz	-50.17	27.9	-26	22.52			54	-31.48	45	117	Horz

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 17 Radiated Spurious Emissions above 1GHz, Middle Channel, Table

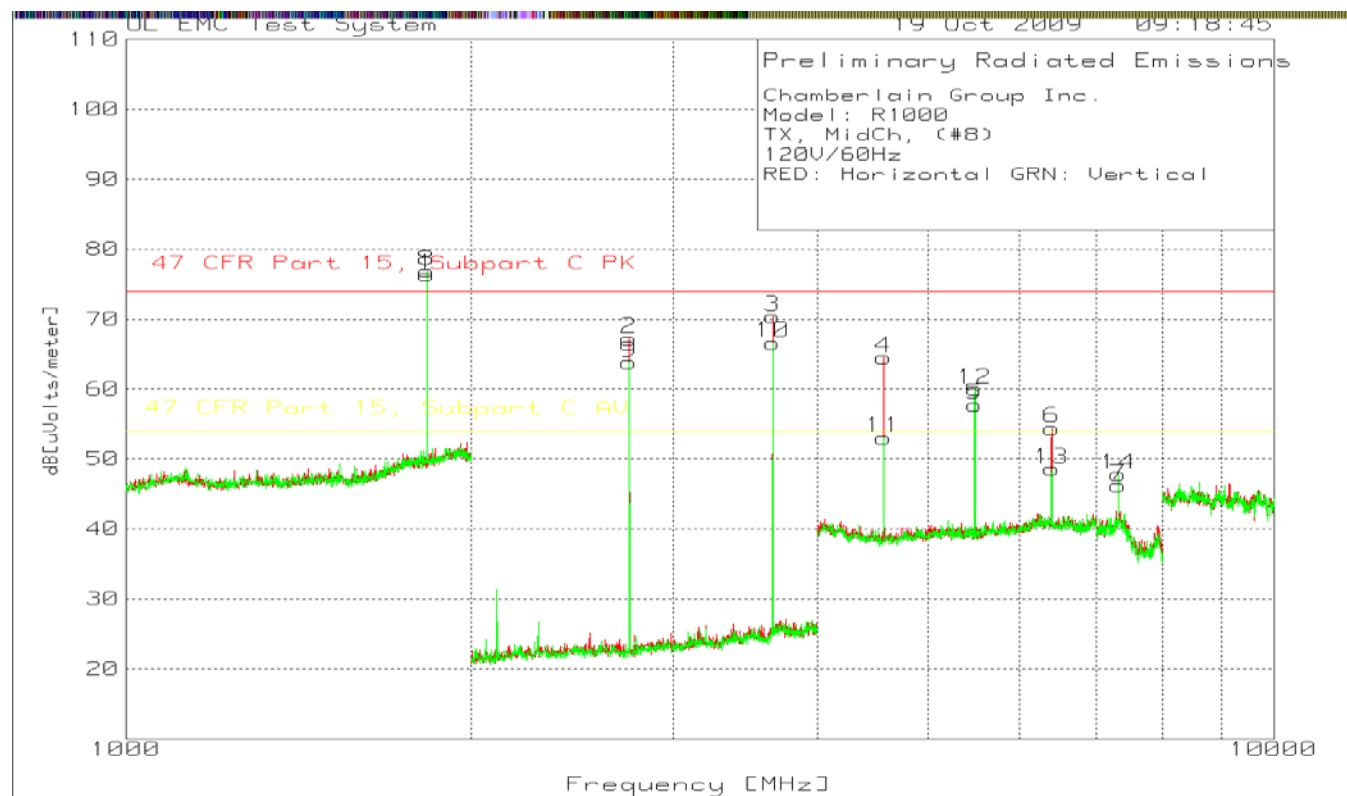


Table 14 Radiated Spurious Emissions above 1GHz, Middle Channel, Table

Chamberlain Group Inc.
Model: R1000
TX, MidCh, (#8)
120V/60Hz
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 1	Margin 1[dB]	Limit 2	Margin 2[dB]	Height [cm]	Polarity	Comments
1	1829.83	45.56	pk	3.59	27.2	76.35	74	2.35	54	22.35	100	Horz	Note 2
2	2744.745	96.3	pk	-51.2	22.1	67.2	74	-6.8	54	13.2	101	Horz	See table below
3	3659.66	96.61	pk	-49.64	23.4	70.37	74	-3.63	54	16.37	101	Horz	See table below
4	4573.716	89.27	pk	-52.47	27.7	64.5	74	-9.5	54	10.5	100	Horz	See table below
5	5488.993	79.91	pk	-50.24	28.1	57.77	74	-16.23	54	3.77	100	Horz	Note 2
6	6404.27	73.18	pk	-47.94	29.2	54.44	74	-19.56	54	.44	100	Horz	Note 2
7	7319.546	62.01	pk	-46.37	30.6	46.24	74	-27.76	54	-7.76	100	Horz	Note 1
8	1829.83	46.13	pk	3.59	27.2	76.92	74	2.92	54	22.92	150	Vert	Note 2
9	2744.745	92.9	pk	-51.2	22.1	63.8	74	-10.2	54	9.8	150	Vert	See table below
10	3659.66	92.87	pk	-49.64	23.4	66.63	74	-7.37	54	12.63	150	Vert	See table below
11	4571.047	77.81	pk	-52.46	27.7	53.05	74	-20.95	54	-.95	100	Vert	See table below
12	5488.993	82.14	pk	-50.24	28.1	60	74	-14	54	6	150	Vert	Note 2
13	6404.27	67.33	pk	-47.94	29.2	48.59	74	-25.41	54	-5.41	100	Vert	Note 2
14	7319.546	63.58	pk	-46.37	30.6	47.81	74	-26.19	54	-6.19	100	Vert	Note 1

Note 1: Sufficient Margin, maximized measurements not needed.

Note 2: Not 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

Chamberlain Group Inc.

Model: R1000

TX, MidCh, #8

120V/60Hz

RED: Horizontal GRN: 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
2744.2475	98.11	pk	1MHz/1MHz	-51.22	22.1	0	68.99	74	-5.01			192	100	Horz
2744.1964	91.13	av	1MHz/10Hz	-51.22	22.1	-26	36.01			54	-17.99	189	100	Horz
2744.6924	99.73	pk	1MHz/1MHz	-51.2	22.1	0	70.63	74	-3.37			89	118	Vert
2744.2084	88.83	av	1MHz/10Hz	-51.22	22.1	-26	33.71			54	-20.29	150	157	Vert
3658.7826	95.05	pk	1MHz/1MHz	-49.67	23.4	0	68.78	74	-5.22			170	164	Vert
3658.9269	88.72	av	1MHz/10Hz	-49.67	23.4	-26	36.45			54	-17.55	170	163	Vert
3659.4549	96.76	pk	1MHz/1MHz	-49.65	23.4	0	70.51	74	-3.49			212	100	Horz
3658.9319	90.31	av	1MHz/10Hz	-49.67	23.4	-26	38.04			54	-15.96	101	100	Horz
4573.984	93.5	pk	1MHz/1MHz	-52.47	27.7	0	68.73	74	-5.27			0	104	Horz
4573.6653	64.6	av	1MHz/10Hz	-52.47	27.7	-26	13.83			54	-40.17	139	106	Horz
4573.5481	90.03	pk	1MHz/1MHz	-52.47	27.7	0	65.26	74	-8.74			56	111	Vert
4573.638	67.25	av	1MHz/10Hz	-52.47	27.7	-26	16.48			54	-37.52	218	100	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 18 Radiated Spurious Emissions above 1GHz, High Channel, Table

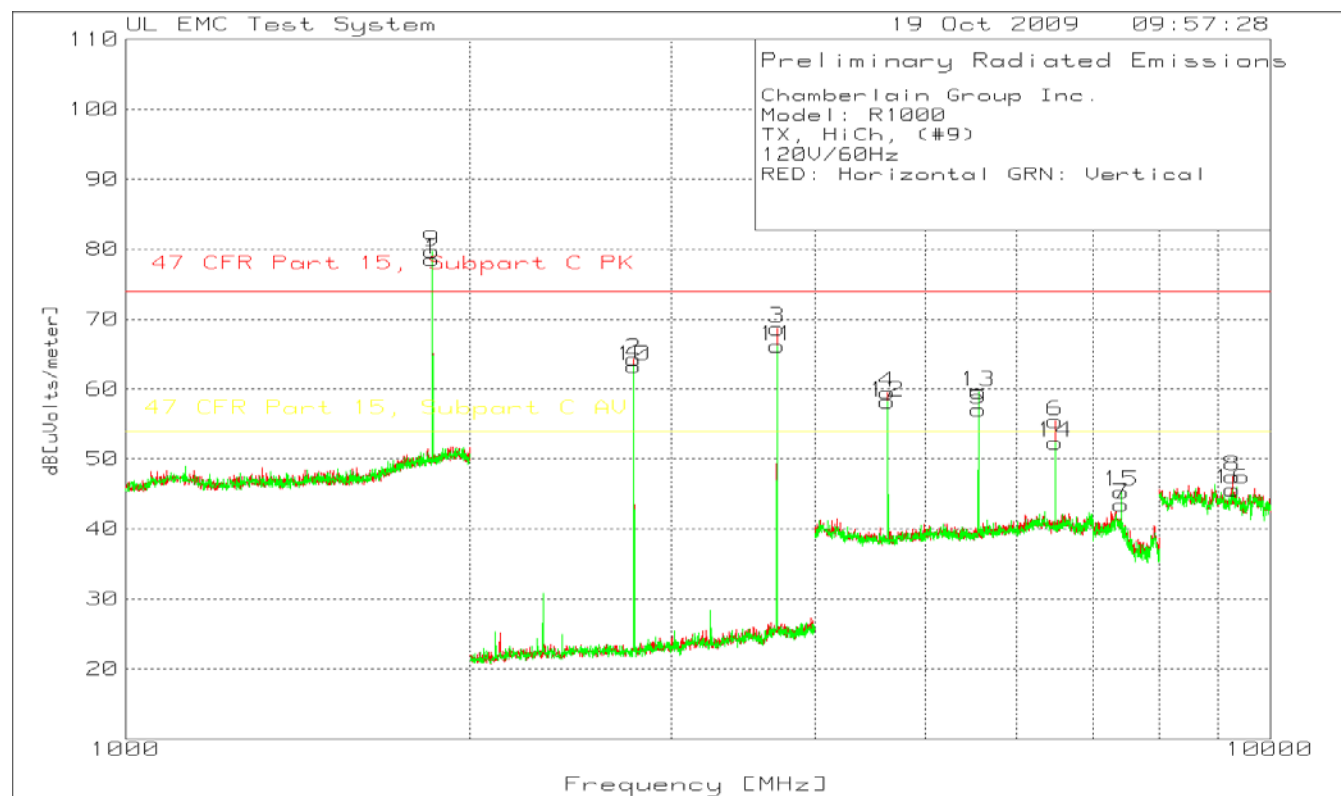


Table 15 Radiated Spurious Emissions above 1GHz, High Channel, Table

Chamberlain Group Inc.

Model: R1000

TX, HiCh, (#9)

120V/60Hz

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 1	Margin 1[dB]	Limit 2	Margin 2[dB]	Height [cm]	Polarity	Comments
1	1853.854	47.39	pk	3.74	27.4	78.53	74	4.53	54	24.53	150	Horz	Note 2
2	2780.781	93.1	pk	-51.03	22.2	64.27	74	-9.73	54	10.27	100	Horz	See table below
3	3707.708	94.73	pk	-49.54	23.5	68.69	74	-5.31	54	14.69	100	Horz	See table below
4	4632.422	84.14	pk	-52.32	27.7	59.52	74	-14.48	54	5.52	199	Horz	See table below
5	5561.041	79.24	pk	-50.52	28.3	57.02	74	-16.98	54	3.02	150	Horz	Note 2
6	6486.991	74.64	pk	-48.32	29.1	55.42	74	-18.58	54	1.42	101	Horz	Note 2
7	7415.61	59.91	pk	-47.43	31	43.48	74	-30.52	54	-10.52	101	Horz	Note 1
8	9266.533	60.5	pk	-49.39	36.4	47.51	74	-26.49	54	-6.49	100	Horz	Note 2
9	1853.854	48.56	pk	3.74	27.4	79.7	74	5.7	54	25.7	150	Vert	Note 2
10	2780.781	92.1	pk	-51.03	22.2	63.27	74	-10.73	54	9.27	150	Vert	See table below
11	3707.708	92.19	pk	-49.54	23.5	66.15	74	-7.85	54	12.15	150	Vert	See table below
12	4632.422	82.78	pk	-52.32	27.7	58.16	74	-15.84	54	4.16	150	Vert	See table below
13	5561.041	81.84	pk	-50.52	28.3	59.62	74	-14.38	54	5.62	150	Vert	Note 2
14	6489.66	71.52	pk	-48.27	29.1	52.35	74	-21.65	54	-1.65	100	Vert	Note 2
15	7415.61	61.76	pk	-47.43	31	45.33	74	-28.67	54	-8.67	100	Vert	Note 1
16	9270.541	58.63	pk	-49.38	36.4	45.65	74	-28.35	54	-8.35	200	Vert	Note 2

Note 1: Sufficient Margin, maximized measurements not needed.

Note 2: Not 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

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 [deg]	Height [cm]	Polarity
2779.7024	94.47	pk	1MHz/1MHz	-51.01	22.2	0	65.66	74	-8.34			142	100	Horz
2780.2054	87.14	av	1MHz/10Hz	-51.01	22.2	-26	32.33			54	-21.67	143	100	Horz
2780.5271	98.27	pk	1MHz/1MHz	-51.02	22.2	0	69.45	74	-4.55			104	118	Vert
2780.2234	87.62	av	1MHz/10Hz	-51.02	22.2	-26	32.8			54	-21.2	151	156	Vert
3706.7174	94.72	pk	1MHz/1MHz	-49.5	23.5	0	68.72	74	-5.28			180	161	Vert
3706.9489	88.3	av	1MHz/10Hz	-49.51	23.5	-26	36.29			54	-17.71	178	161	Vert
3706.7776	95.64	pk	1MHz/1MHz	-49.51	23.5	0	69.63	74	-4.37			101	101	Horz
3706.9489	89.32	av	1MHz/10Hz	-49.51	23.5	-26	37.31			54	-16.69	100	100	Horz
4633.499	92.43	pk	1MHz/1MHz	-52.33	27.7	0	67.8	74	-6.2			75	109	Vert
4633.6513	73.15	av	1MHz/10Hz	-52.33	27.7	-26	22.52			54	-31.48	215	111	Vert
4633.6423	93	pk	1MHz/1MHz	-52.33	27.7	0	68.37	74	-5.63			0	100	Horz
4633.6212	69.49	av	1MHz/10Hz	-52.33	27.7	-26	18.86			54	-35.14	147	101	Horz

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

4.4 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 Section15.205(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 16 Band Edge Compliance EUT Configuration Settings

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

Table 17 Band Edge Compliance Test Equipment

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

Job #: 1001173156 Project #: 09NK15074
Model Number: R1000
Client Name: Chamberlain Group Inc.

File #: MC3181

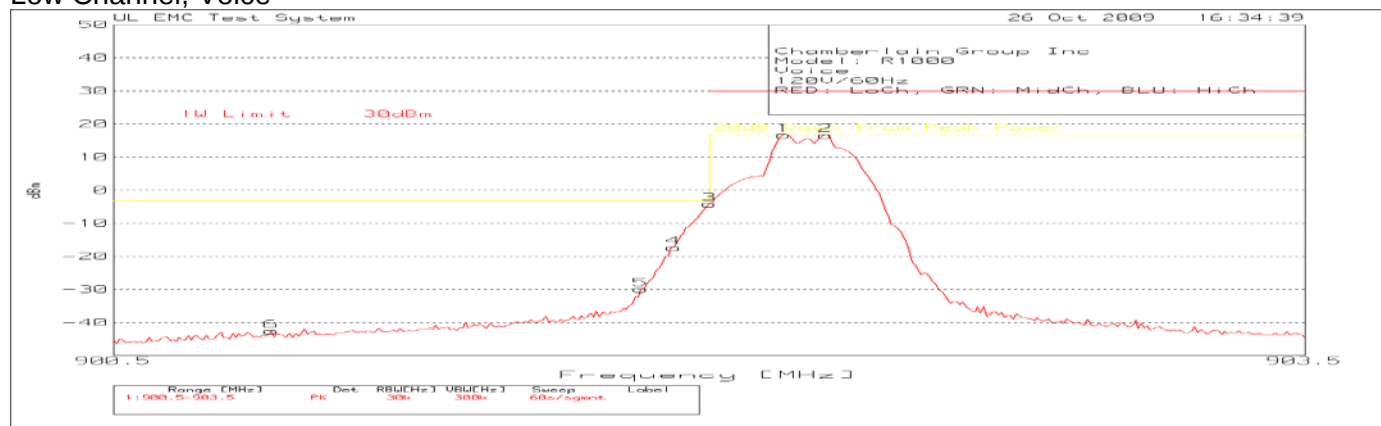
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Test setup for Band Edge Compliance – Conducted

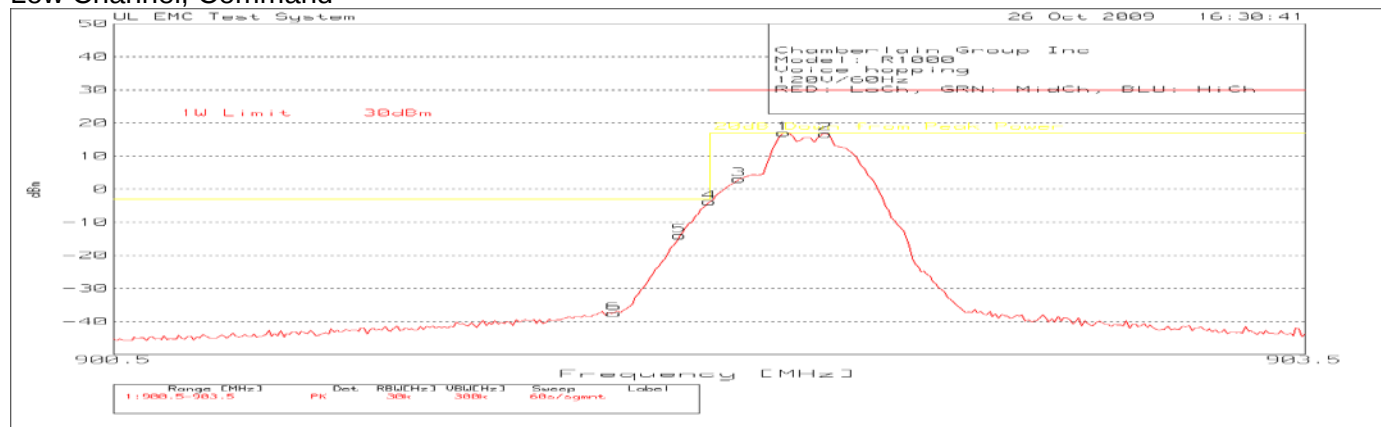


Figure 19 Conducted Band Edge Compliance Graph, Low Channel

Low Channel, Voice



Low Channel, Command



Low Channel, Voice, Hopping

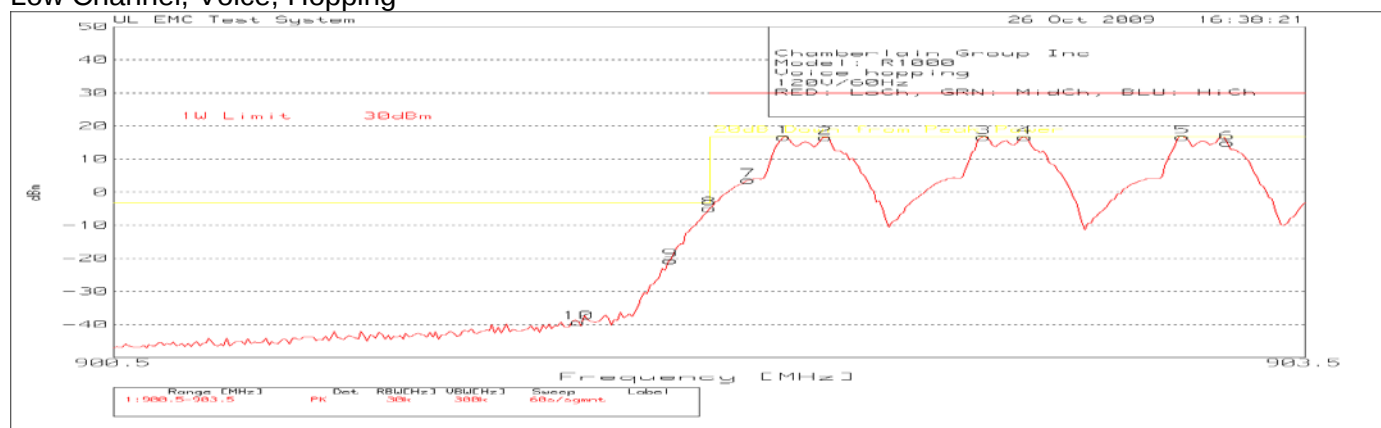


Table 18 Band Edge Compliance Data Points, Low Channel

Low Channel, Voice

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dBm	Limit:1	2	3	4	5	6
1	902.1875	113.12 pk	10.6	-107	16.72	30	16.7	-	-	-	-
				Margin [dB]		-13.28	.02	-	-	-	-
2	902.2925	113.01 pk	10.6	-107	16.61	30	16.7	-	-	-	-
				Margin [dB]		-13.39	-.09	-	-	-	-
3	902	92.26 pk	10.6	-107	-4.14	30	-3.3	-	-	-	-
				Margin [dB]		-34.14	-.84	-	-	-	-
4	901.91	79.11 pk	10.6	-107	-17.29	0	-3.3	-	-	-	-
				Margin [dB]		-17.29	-13.99	-	-	-	-
5	901.8275	66.48 pk	10.6	-107	-29.92	0	-3.3	-	-	-	-
				Margin [dB]		-29.92	-26.62	-	-	-	-
6	900.8975	53.83 pk	10.6	-107	-42.57	0	-3.3	-	-	-	-
				Margin [dB]		-42.57	-39.27	-	-	-	-

Low Channel, Command

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dBm	Limit:1	2	3	4	5	6
1	902.1875	113.36 pk	10.6	-107	16.96	30	17	-	-	-	-
				Margin [dB]		-13.04	-.04	-	-	-	-
2	902.2925	113.13 pk	10.6	-107	16.73	30	17	-	-	-	-
				Margin [dB]		-13.27	-.27	-	-	-	-
3	902.075	99.5 pk	10.6	-107	3.1	30	17	-	-	-	-
				Margin [dB]		-26.9	-13.9	-	-	-	-
4	902	92.63 pk	10.6	-107	-3.77	30	-3	-	-	-	-
				Margin [dB]		-33.77	-.77	-	-	-	-
5	901.925	82.45 pk	10.6	-107	-13.95	0	-3	-	-	-	-
				Margin [dB]		-13.95	-10.95	-	-	-	-
6	901.76	58.95 pk	10.6	-107	-37.45	0	-3	-	-	-	-
				Margin [dB]		-37.45	-34.45	-	-	-	-

Low Channel, Voice, Hopping

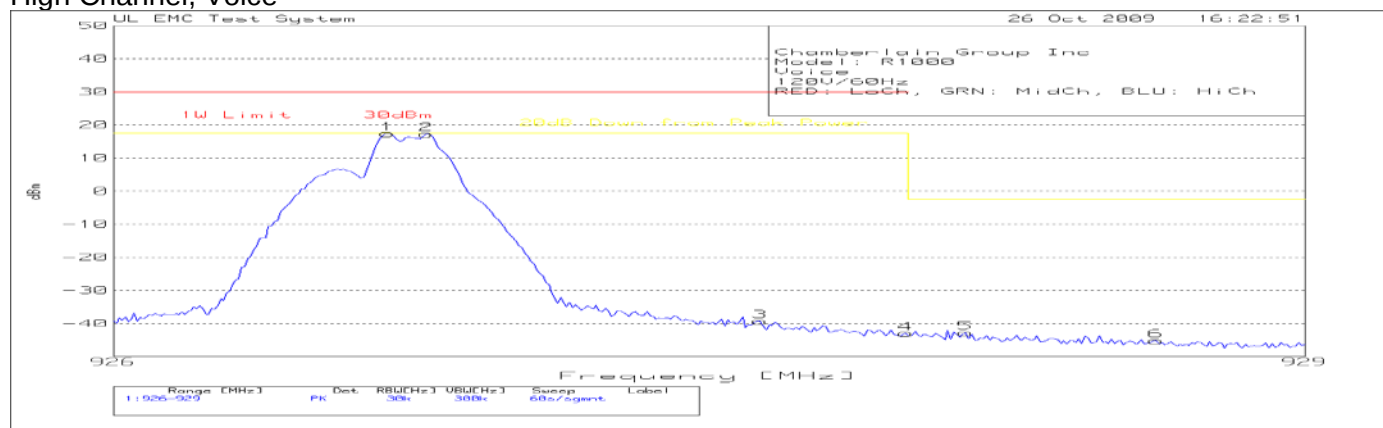
No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dBm	Limit:1	2	3	4	5	6
1	902.1875	113.14 pk	10.6	-107	16.74	30	16.7	-	-	-	-
				Margin [dB]		-13.26	.04	-	-	-	-
2	902.2925	112.97 pk	10.6	-107	16.57	30	16.7	-	-	-	-
				Margin [dB]		-13.43	-.13	-	-	-	-
3	902.69	113.11 pk	10.6	-107	16.71	30	16.7	-	-	-	-
				Margin [dB]		-13.29	.01	-	-	-	-
4	902.795	113 pk	10.6	-107	16.6	30	16.7	-	-	-	-
				Margin [dB]		-13.4	-.1	-	-	-	-
5	903.1925	113.13 pk	10.6	-107	16.73	30	16.7	-	-	-	-
				Margin [dB]		-13.27	.03	-	-	-	-
6	903.305	111.28 pk	10.6	-107	14.88	30	16.7	-	-	-	-
				Margin [dB]		-15.12	-1.82	-	-	-	-
7	902.0975	100.05 pk	10.6	-107	3.65	30	16.7	-	-	-	-
				Margin [dB]		-26.35	-13.05	-	-	-	-
8	902	91.54 pk	10.6	-107	-4.86	30	-3.3	-	-	-	-
				Margin [dB]		-34.86	-1.56	-	-	-	-
9	901.9025	75.76 pk	10.6	-107	-20.64	0	-3.3	-	-	-	-
				Margin [dB]		-20.64	-17.34	-	-	-	-
10	901.67	57.14 pk	10.6	-107	-39.26	0	-3.3	-	-	-	-
				Margin [dB]		-39.26	-35.96	-	-	-	-

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

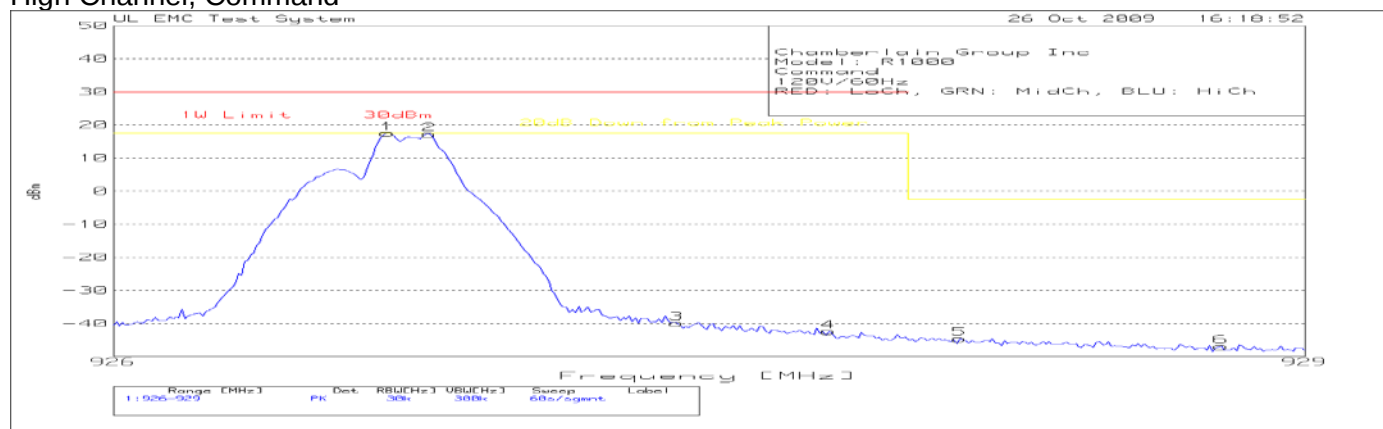
***All frequencies below 902MHz are out-of-band and must have negative margin compared to limit 2. All frequencies above 902MHz are in-band and only limit 1 applies.**

Figure 20 Conducted Band Edge Compliance Graph, High Channel

High Channel, Voice



High Channel, Command



High Channel, Voice, Hopping

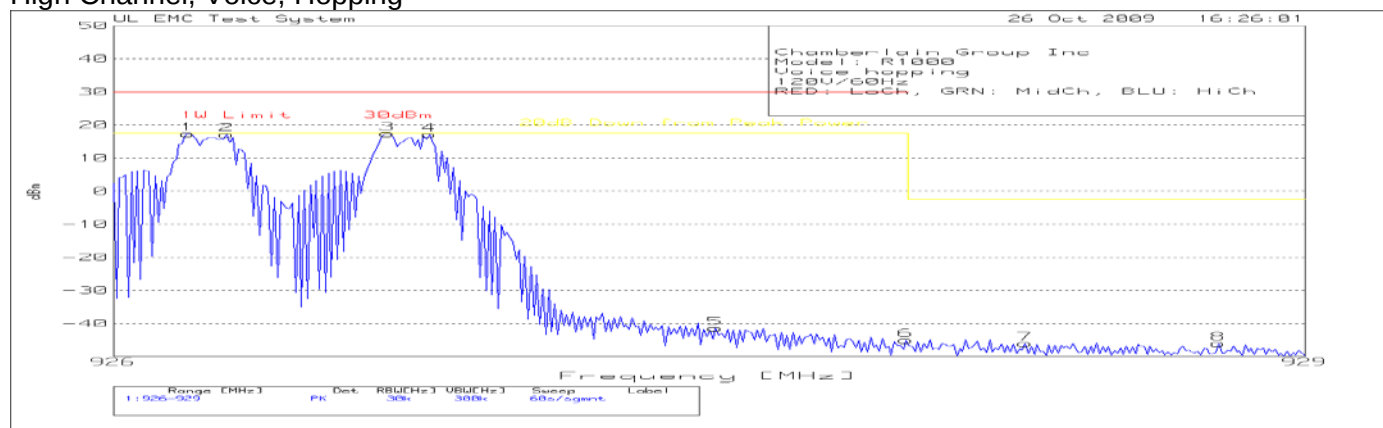


Table 19 Band Edge Compliance Data Points, High Channel

High Channel, Voice

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dBm	Limit:1	2	3	4	5	6
1	926.69	113.85 pk	10.6	-107	17.45	30	17.5	-	-	-	-
				Margin [dB]		-12.55	-0.05	-	-	-	-
2	926.7875	113.7 pk	10.6	-107	17.3	30	17.5	-	-	-	-
				Margin [dB]		-12.7	-0.2	-	-	-	-
3	927.6275	57.09 pk	10.6	-107	-39.31	30	17.5	-	-	-	-
				Margin [dB]		-69.31	-56.81	-	-	-	-
4	927.995	53.42 pk	10.6	-107	-42.98	30	17.5	-	-	-	-
				Margin [dB]		-72.98	-60.48	-	-	-	-
5	928.145	53.62 pk	10.6	-107	-42.78	0	-2.5	-	-	-	-
				Margin [dB]		-42.78	-40.28	-	-	-	-
6	928.625	51.25 pk	10.6	-107	-45.15	0	-2.5	-	-	-	-
				Margin [dB]		-45.15	-42.65	-	-	-	-

High Channel, Command

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dBm	Limit:1	2	3	4	5	6
1	926.69	113.89 pk	10.6	-107	17.49	30	17.5	-	-	-	-
				Margin [dB]		-12.51	-0.01	-	-	-	-
2	926.795	113.64 pk	10.6	-107	17.24	30	17.5	-	-	-	-
				Margin [dB]		-12.76	-0.26	-	-	-	-
3	927.4175	56.59 pk	10.6	-107	-39.81	30	17.5	-	-	-	-
				Margin [dB]		-69.81	-57.31	-	-	-	-
4	927.8	54.02 pk	10.6	-107	-42.38	30	17.5	-	-	-	-
				Margin [dB]		-72.38	-59.88	-	-	-	-
5	928.13	51.84 pk	10.6	-107	-44.56	0	-2.5	-	-	-	-
				Margin [dB]		-44.56	-42.06	-	-	-	-
6	928.79	49.56 pk	10.6	-107	-46.84	0	-2.5	-	-	-	-
				Margin [dB]		-46.84	-44.34	-	-	-	-

High Channel, Voice, Hopping

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dBm	Limit:1	2	3	4	5	6
1	926.1875	113.73 pk	10.6	-107	17.33	30	17.5	-	-	-	-
				Margin [dB]		-12.67	-0.17	-	-	-	-
2	926.285	113.57 pk	10.6	-107	17.17	30	17.5	-	-	-	-
				Margin [dB]		-12.83	-0.33	-	-	-	-
3	926.69	113.83 pk	10.6	-107	17.43	30	17.5	-	-	-	-
				Margin [dB]		-12.57	-0.07	-	-	-	-
4	926.795	113.48 pk	10.6	-107	17.08	30	17.5	-	-	-	-
				Margin [dB]		-12.92	-0.42	-	-	-	-
5	927.515	55 pk	10.6	-107	-41.4	30	17.5	-	-	-	-
				Margin [dB]		-71.4	-58.9	-	-	-	-
6	927.995	51.41 pk	10.6	-107	-44.99	30	17.5	-	-	-	-
				Margin [dB]		-74.99	-62.49	-	-	-	-
7	928.295	50.4 pk	10.6	-107	-46	0	-2.5	-	-	-	-
				Margin [dB]		-46	-43.5	-	-	-	-
8	928.7825	50.38 pk	10.6	-107	-46.02	0	-2.5	-	-	-	-
				Margin [dB]		-46.02	-43.52	-	-	-	-

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

*All frequencies above 928MHz are out-of-band and must have negative margin compared to limit 2. All frequencies below 928MHz are in-band and only limit 1 applies.

4.5 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 4.8 for 20dB data.
Basic Standard	47 CFR Part 15.247(a)(1) RSS-210, A8.1(b)

Table 20 Carrier Frequency Separation Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
2	1	3
Supplementary information: Separation frequencies were measured for each channel and then averaged.		

Table 21 Carrier Frequency Separation Test Equipment

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

Table 22 Carrier Frequency Separation Results

Mode	Channel	Carrier Frequency Separation Limit	Channel Separation MHz
TX Hopping	Low Side	> 20dB Bandwidth (aprx. 210kHz)	0.4992
	Middle		0.4492
	High Side		0.4992
	Overall Average		0.499678

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Test Setup for Carrier Frequency Separation

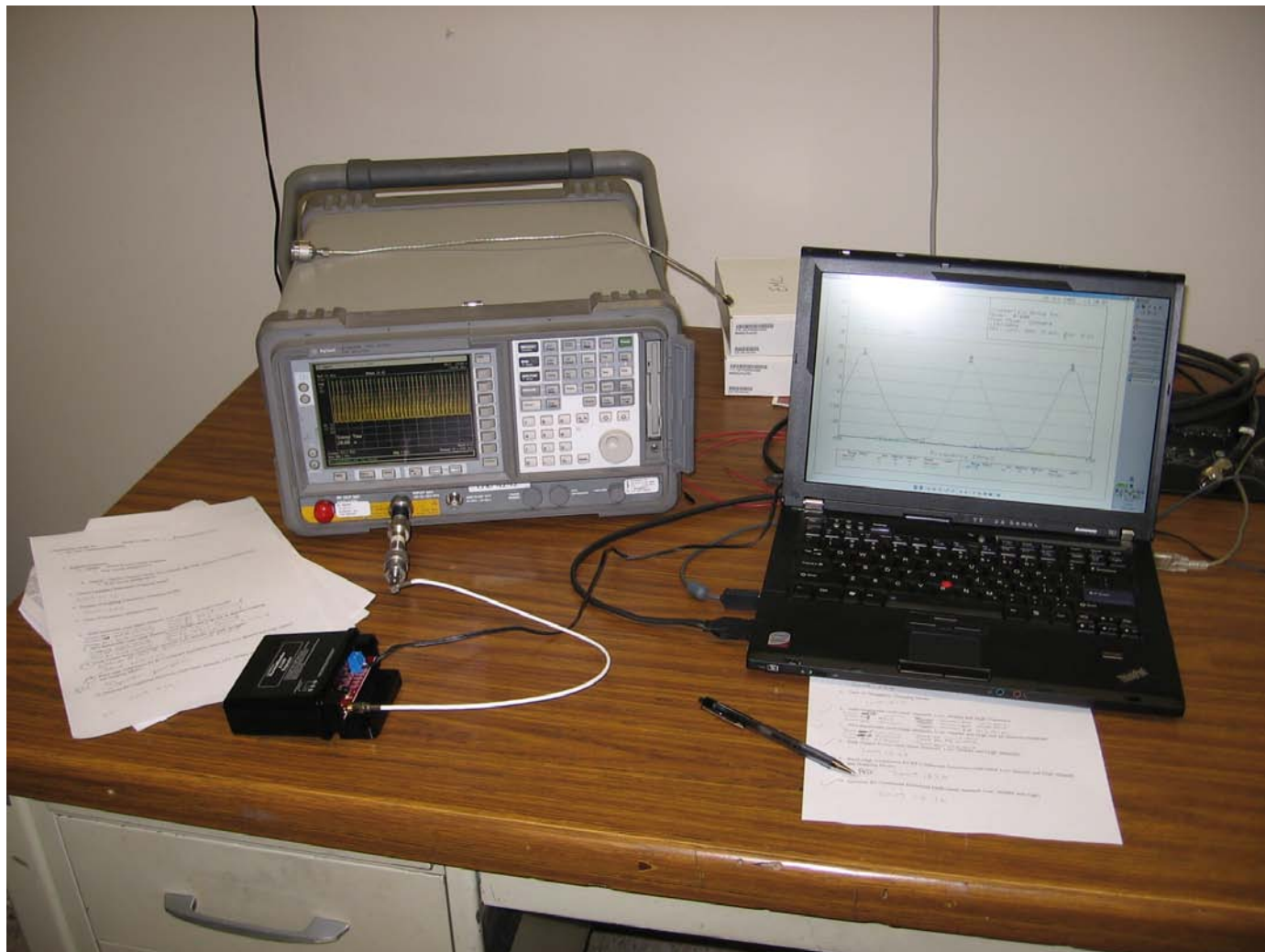


Figure 21 Carrier Frequency Separation Graphs

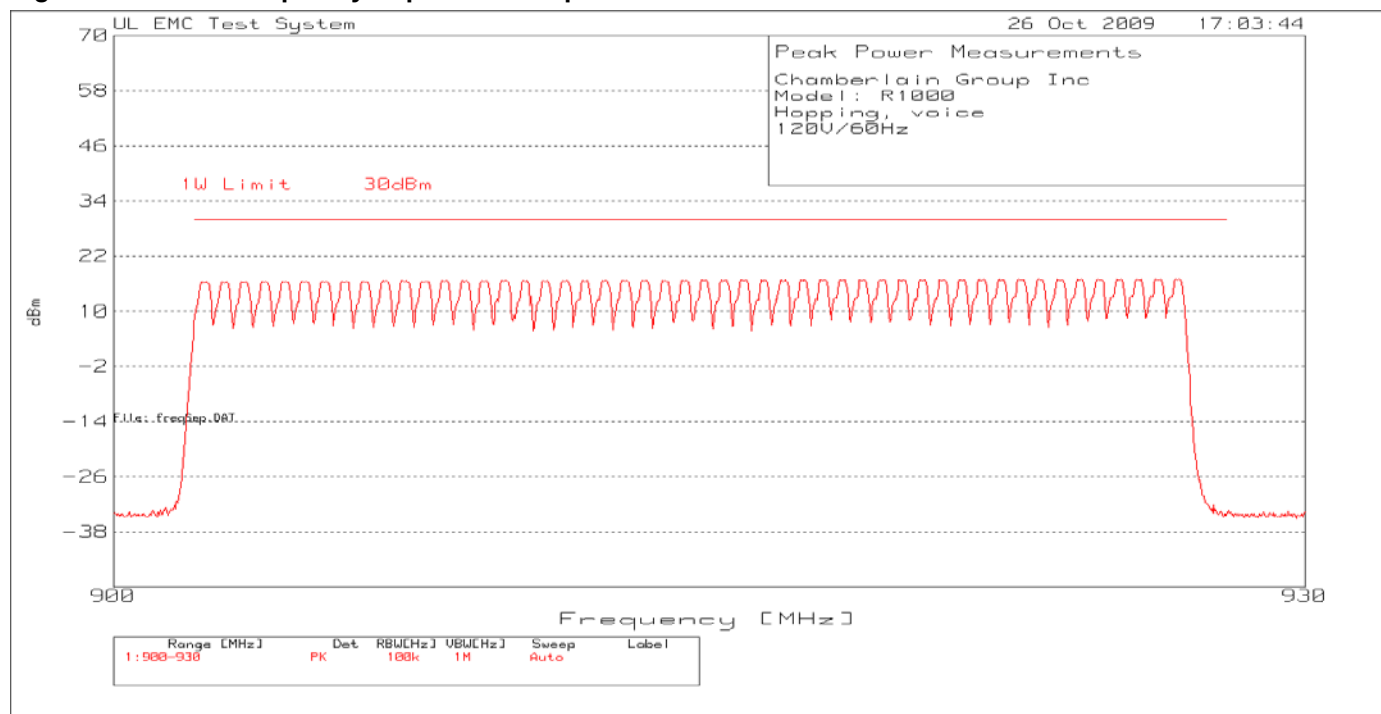


Table 23 Carrier Frequency Separation (Frequency List)

#	Frequency MHz	#	Frequency MHz	#	Frequency MHz	#	Frequency MHz	#	Frequency MHz
1	902.2712	11	907.2629	21	912.2546	31	917.2712	41	922.2629
2	902.7704	12	907.7621	22	912.7537	32	917.7704	42	922.7621
3	903.2696	13	908.2612	23	913.2779	33	918.2696	43	923.2612
4	903.7687	14	908.7604	24	913.777	34	918.7687	44	923.7604
5	904.2679	15	909.2596	25	914.2512	35	919.2679	45	924.2596
6	904.7671	16	909.7587	26	914.7504	36	919.7671	46	924.7587
7	905.2662	17	910.2454	27	915.2496	37	920.2662	47	925.2579
8	905.7654	18	910.7571	28	915.7737	38	920.7903	48	925.7446
9	906.2646	19	911.2562	29	916.2729	39	921.2646	49	926.2562
10	906.7637	20	911.7429	30	916.772	40	921.7637	50	926.7554

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

Table 24 Number of Hopping Frequencies Configuration Settings

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

Table 25 Number of Hopping Frequencies Test Equipment

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

Table 26 Number of Hopping Frequencies Results

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

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Test Setup for Number of Hopping Frequencies



Figure 22 Number of Hopping Frequencies Graphs

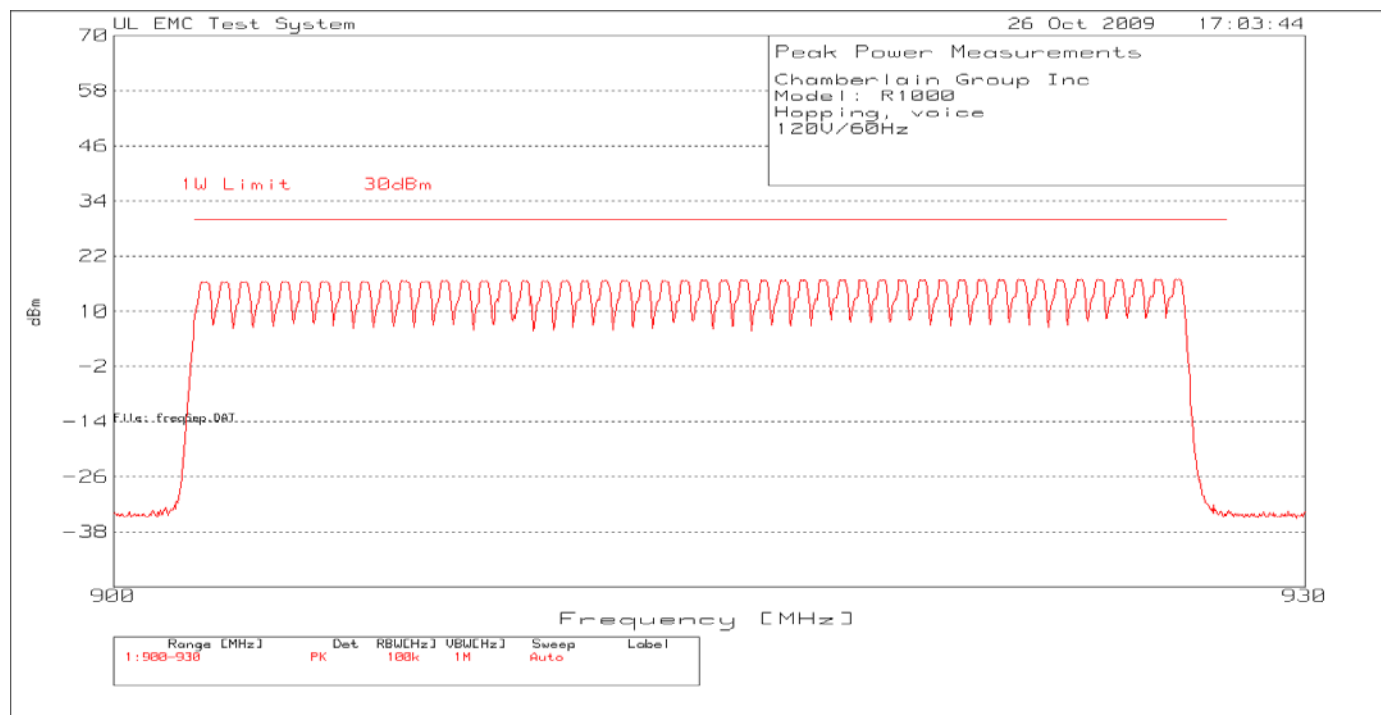


Table 27 Number of Hopping Channels (Frequency List)

#	Frequency MHz	#	Frequency MHz	#	Frequency MHz	#	Frequency MHz	#	Frequency MHz
1	902.2712	11	907.2629	21	912.2546	31	917.2712	41	922.2629
2	902.7704	12	907.7621	22	912.7537	32	917.7704	42	922.7621
3	903.2696	13	908.2612	23	913.2779	33	918.2696	43	923.2612
4	903.7687	14	908.7604	24	913.777	34	918.7687	44	923.7604
5	904.2679	15	909.2596	25	914.2512	35	919.2679	45	924.2596
6	904.7671	16	909.7587	26	914.7504	36	919.7671	46	924.7587
7	905.2662	17	910.2454	27	915.2496	37	920.2662	47	925.2579
8	905.7654	18	910.7571	28	915.7737	38	920.7903	48	925.7446
9	906.2646	19	911.2562	29	916.2729	39	921.2646	49	926.2562
10	906.7637	20	911.7429	30	916.772	40	921.7637	50	926.7554

4.7 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 28 Dwell Time Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
2	1	3
Supplementary information: Duty cycle also measured/calculated for use in radiated spurious measurements		

Table 29 Dwell Time Test Equipment

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

Table 30 Dwell Time Results

Mode	Number of Channels	Maximum Time Allowed in 20s.	Measured Dwell Time in 20s.
TX Hopping Low Channel	50	0.400s	170.75mS

Table 31 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	5.022mS	26dB

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Test Setup for Dwell Time



Figure 23 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: 170.75mS within 20s.

4.8 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 32 20dB Bandwidth Configuration Settings

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

Table 33 20dB Bandwidth Test Equipment

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

Table 34 20dB Bandwidth Results

Mode	Channel	20dB Bandwidth in kHz	
		Voice	Wakeup
TX	Low	231.250	232.500
	Middle	223.750	225.000
	High	205.000	196.250

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Test Setup for 20dB Bandwidth

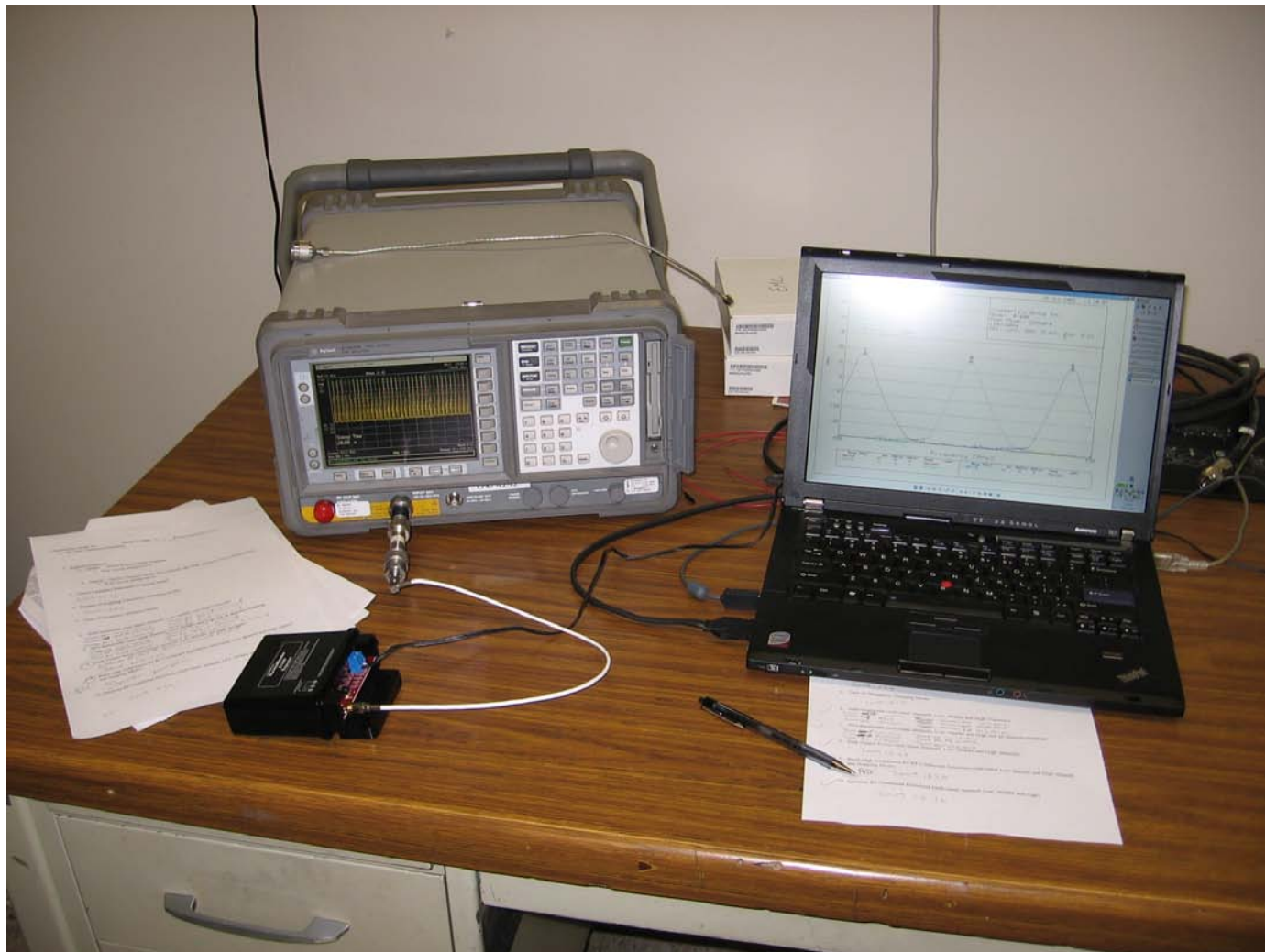
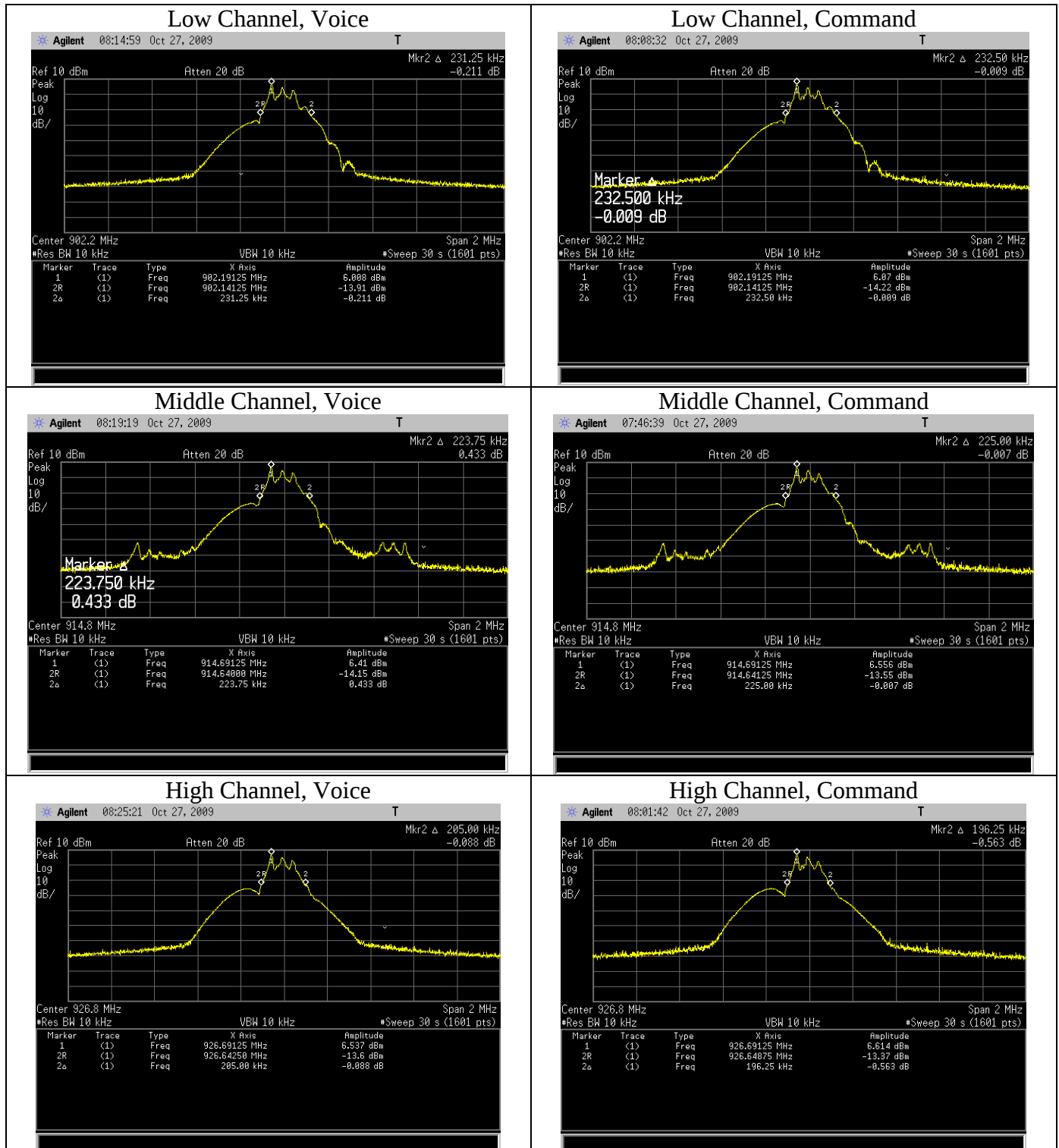


Figure 24 20dB Bandwidth Graphs



4.9 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(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 35 Maximum Peak Output Power EUT Configuration Settings

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

Table 36 Maximum Peak Output Power Test Equipment

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

Table 37 Maximum Peak Output Power Results

Channel	Declared Antenna Gain (dBi)	Limit (dBm)	Power dBm	Power mW
Low Channel Voice	5.14	30	16.83	48.1948
Middle Channel Voice	5.14	30	17.18	52.2396
High Channel Voice	5.14	30	17.34	54.2001
Low Channel Command	5.14	30	16.95	49.5450
Middle Channel Command	5.14	30	17.34	54.2001
High Channel Command	5.14	30	17.44	55.4626

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Test setup for Maximum Peak Output Power

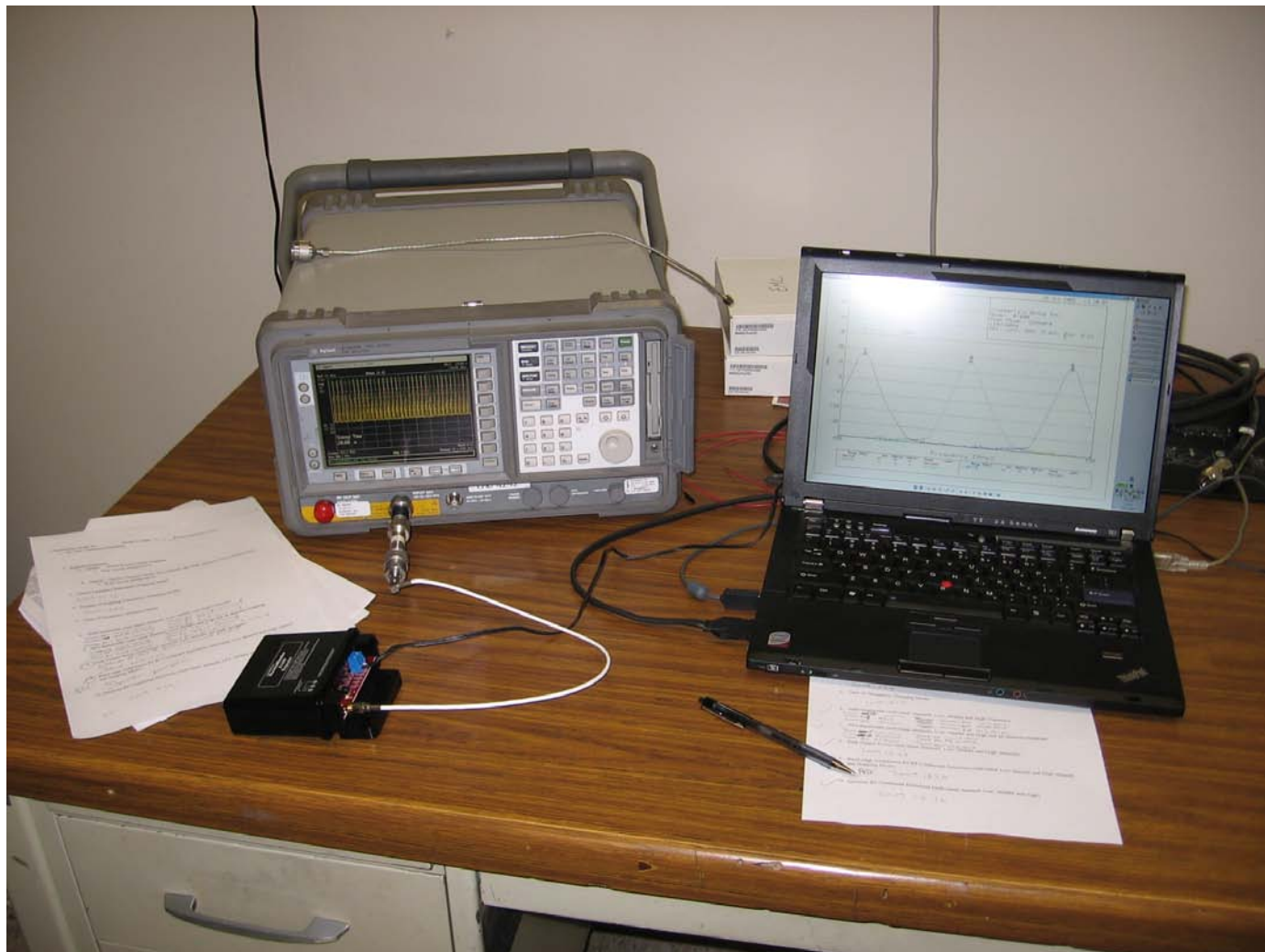


Figure 25 Maximum Peak Output Power Graph - Voice

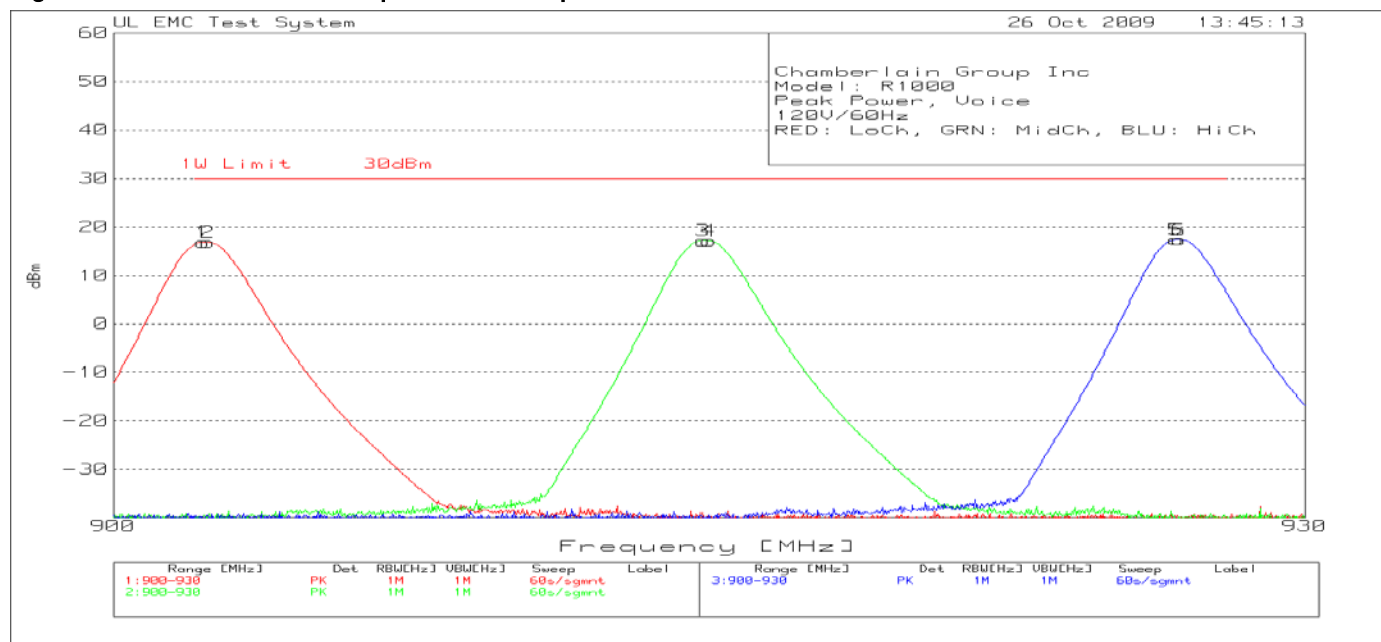


Figure 26 Maximum Peak Output Power Graph - Command

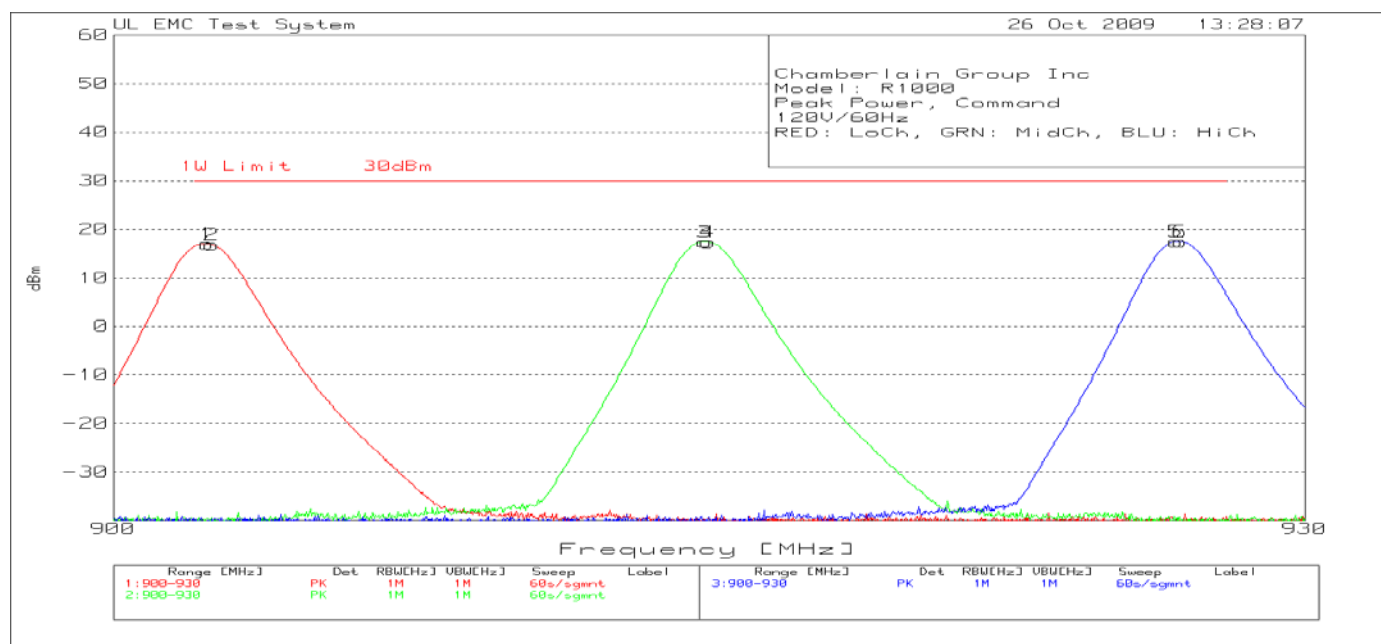


Table 38 Maximum Peak Output Power Emissions Data Points, Voice

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dBm	Limit:1	2	3	4	5	6
=====											
Low Channel											
1	902.2213	113.2 pk	10.6	-107	16.8	30	-	-	-	-	-
				Margin [dB]		-13.2	-	-	-	-	-
2	902.3461	113.23 pk	10.6	-107	16.83	30	-	-	-	-	-
				Margin [dB]		-13.17	-	-	-	-	-
Middle Channel											
3	914.7255	113.58 pk	10.6	-107	17.18	30	-	-	-	-	-
				Margin [dB]		-12.82	-	-	-	-	-
4	914.8752	113.54 pk	10.6	-107	17.14	30	-	-	-	-	-
				Margin [dB]		-12.86	-	-	-	-	-
High Channel											
5	926.718	113.74 pk	10.6	-107	17.34	30	-	-	-	-	-
				Margin [dB]		-12.66	-	-	-	-	-
6	926.7929	113.74 pk	10.6	-107	17.34	30	-	-	-	-	-
				Margin [dB]		-12.66	-	-	-	-	-

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

Table 39 Maximum Peak Output Power Emissions Data Points, Command

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dBm	Limit:1	2	3	4	5	6
=====											
Low Channel											
1	902.3211	113.35 pk	10.6	-107	16.95	30	-	-	-	-	-
				Margin [dB]		-13.05	-	-	-	-	-
2	902.4459	113.19 pk	10.6	-107	16.79	30	-	-	-	-	-
				Margin [dB]		-13.21	-	-	-	-	-
Middle Channel											
3	914.7629	113.74 pk	10.6	-107	17.34	30	-	-	-	-	-
				Margin [dB]		-12.66	-	-	-	-	-
4	914.8503	113.73 pk	10.6	-107	17.33	30	-	-	-	-	-
				Margin [dB]		-12.67	-	-	-	-	-
High Channel											
5	926.7055	113.84 pk	10.6	-107	17.44	30	-	-	-	-	-
				Margin [dB]		-12.56	-	-	-	-	-
6	926.8178	113.83 pk	10.6	-107	17.43	30	-	-	-	-	-
				Margin [dB]		-12.57	-	-	-	-	-

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

4.10 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 40 20dB Bandwidth Configuration Settings

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

Table 41 20dB Bandwidth Test Equipment

Description	Manufacturer	Model	Identifier
Spectrum Analyzer	Agilent	E7405A	EMC4242
Attenuator w/ Cable	Pasternek	10dB	None

Table 42 20dB Bandwidth Results

Mode	Channel	99% Power Bandwidth (kHz)	
		Voice	Command
TX	Low	268.750	271.250
	Middle	281.250	292.500
	High	302.500	310.000

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Test Setup for 99% Bandwidth

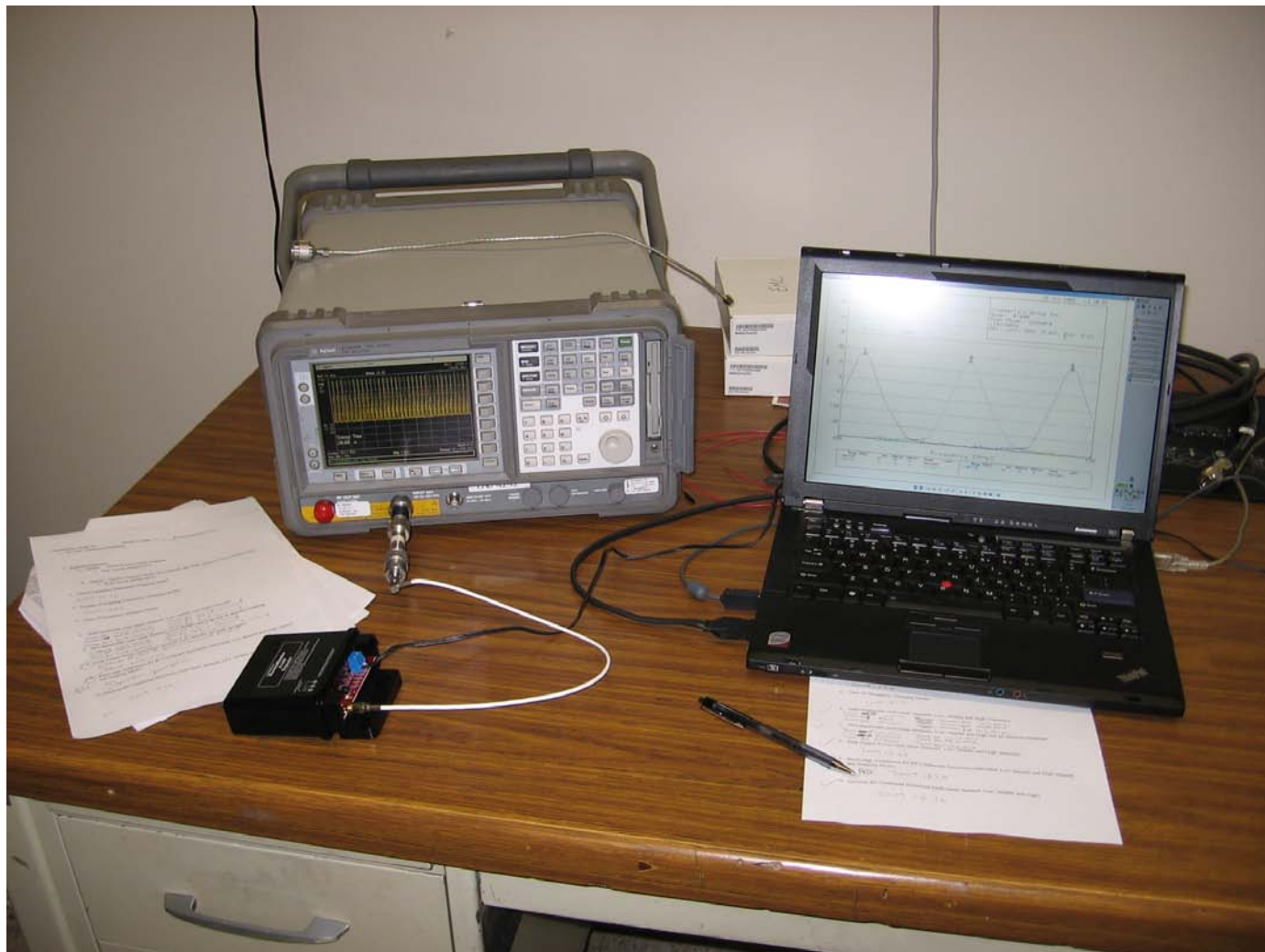
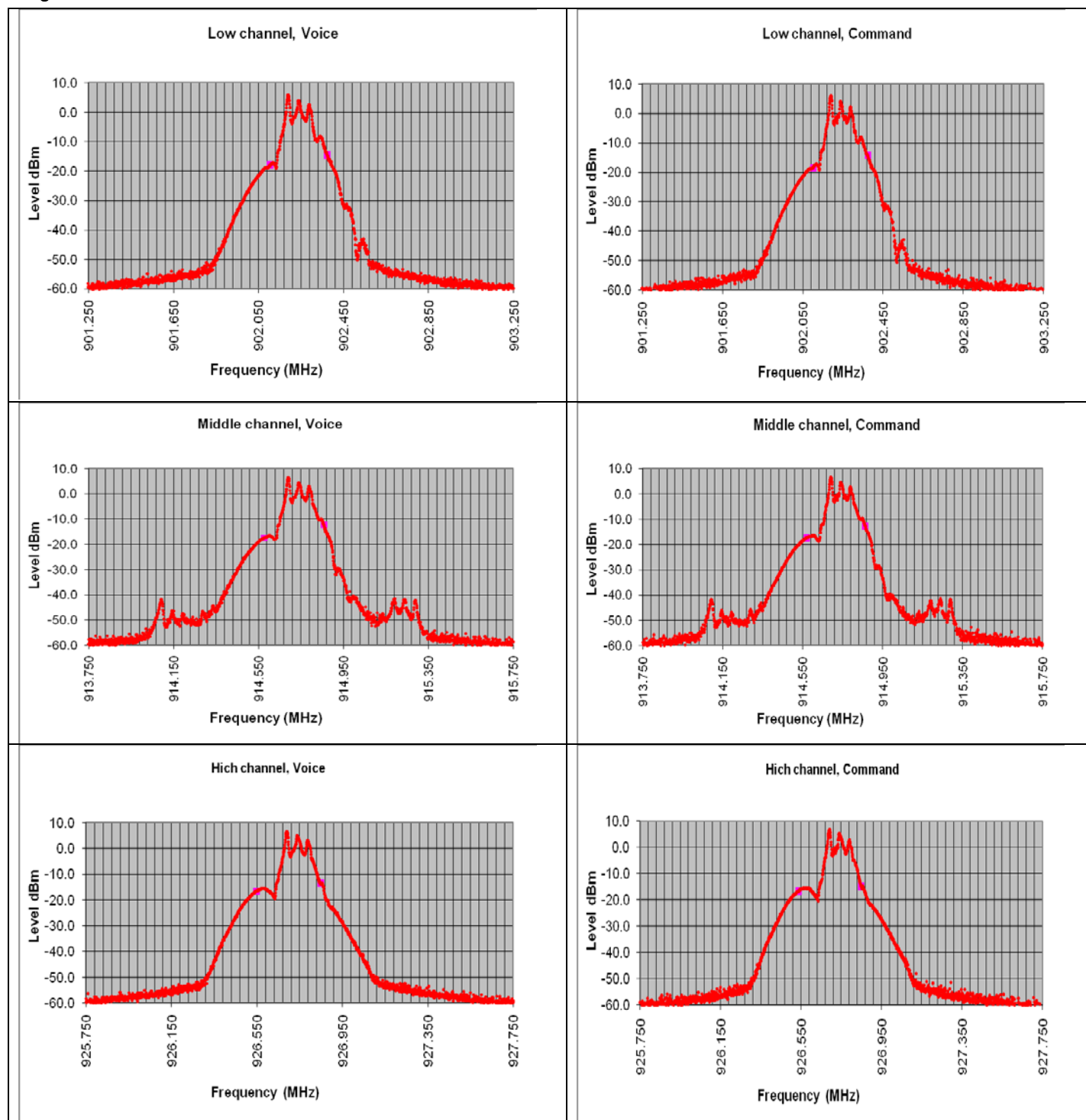


Figure 27 - 99% Power Bandwidth Plots



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5.0 IMMUNITY TEST RESULTS

The immunity tests was not conducted nor is required by the standard.

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

