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Job Number: 1101166193
Project Number: 09NK13492 Rev. 1
File Number: MC3181
Date: 25 September 2009
Model: NTD

Electromagnetic Compatibility Test Report

For

Chamberlain Group Inc.

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Job : 110116193 Project #: 09NK13492 Rev.1 File #: MC3181
Model Number: NTD
Client Name: Chamberlain Group Inc.

Page 2 of 53

FCC ID: HBWNTD

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 Intercom**

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

Model Number: **NTD**

Sample Serial Number: **NA**

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

Testing Start Date: **September 14, 2009**

Date Testing Complete: **September 16, 2009**

Overall Results: **Compliant**

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Report Directory

1.0	GENERAL - Product Description.....	4
1.1	Equipment Description	4
1.2	Device Configuration During Test	4
1.2.1	Equipment Used During Test:.....	4
1.2.2	Input/Output Ports:.....	4
1.2.3	Power Interface:.....	5
1.3	EUT Configurations	5
1.4	EUT Operation Modes.....	5
2.0	Summary	5
2.1	Deviations from standard test methods.....	5
2.2	Device Modifications Necessary for Compliance	5
2.3	Reference Standards	5
2.4	Results Summary	6
3.0	Calibration of Equipment Used for Measurement	7
4.0	EMISSIONS TEST RESULTS.....	7
4.1	Test Conditions and Results – RADIATED EMISSIONS.....	8
4.2	Test Conditions and Results – SPURIOUS EMISSIONS (Antenna Conducted and Radiated)	12
4.3	Test Conditions and Results – BAND EDGE COMPLIANCE	27
4.4	Test Conditions and Results – Carrier Frequency Separation.....	32
4.5	Test Conditions and Results – NUMBER OF HOPPING FREQUENCIES.....	35
4.6	Test Conditions and Results – Dwell Time and Duty Cycle Correction	37
4.7	Test Conditions and Results – 20DB BANDWIDTH	40
4.8	Test Conditions and Results – MAXIMUM PEAK OUTPUT POWER	43
4.9	Test Conditions and Results – 99% Bandwidth	47
5.0	IMMUNITY TEST RESULTS	51
Appendix A		52
	Accreditations and Authorizations.....	52

Report Revision History

Revision Date	Description	Revised By	Revision Reviewed By
2009/10/27	Rev.1 - Minor Editorial Corrections	Bart Mucha	Jack Steiner

1.0 G E N E R A L - Product Description

1.1 Equipment Description

The equipment Under Test is a wireless intercom device operating in the 900MHz band.

1.2 Device Configuration During Test

1.2.1 Equipment Used During Test:

Use	Product Type	Manufacturer	Model	Comments
EUT	Wireless Intercom	Chamberlain Group Inc.	NTD	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	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

2.0 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 15.107	N/A EUT battery operated only
	RSS-Gen 7.2.2	
Radiated Emissions - Digital	47 CFR Part 15.109	Compliant
	RSS-Gen 7.2.1	
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:



Bartlomiej 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.

3.0 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 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 (dB μ V/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		

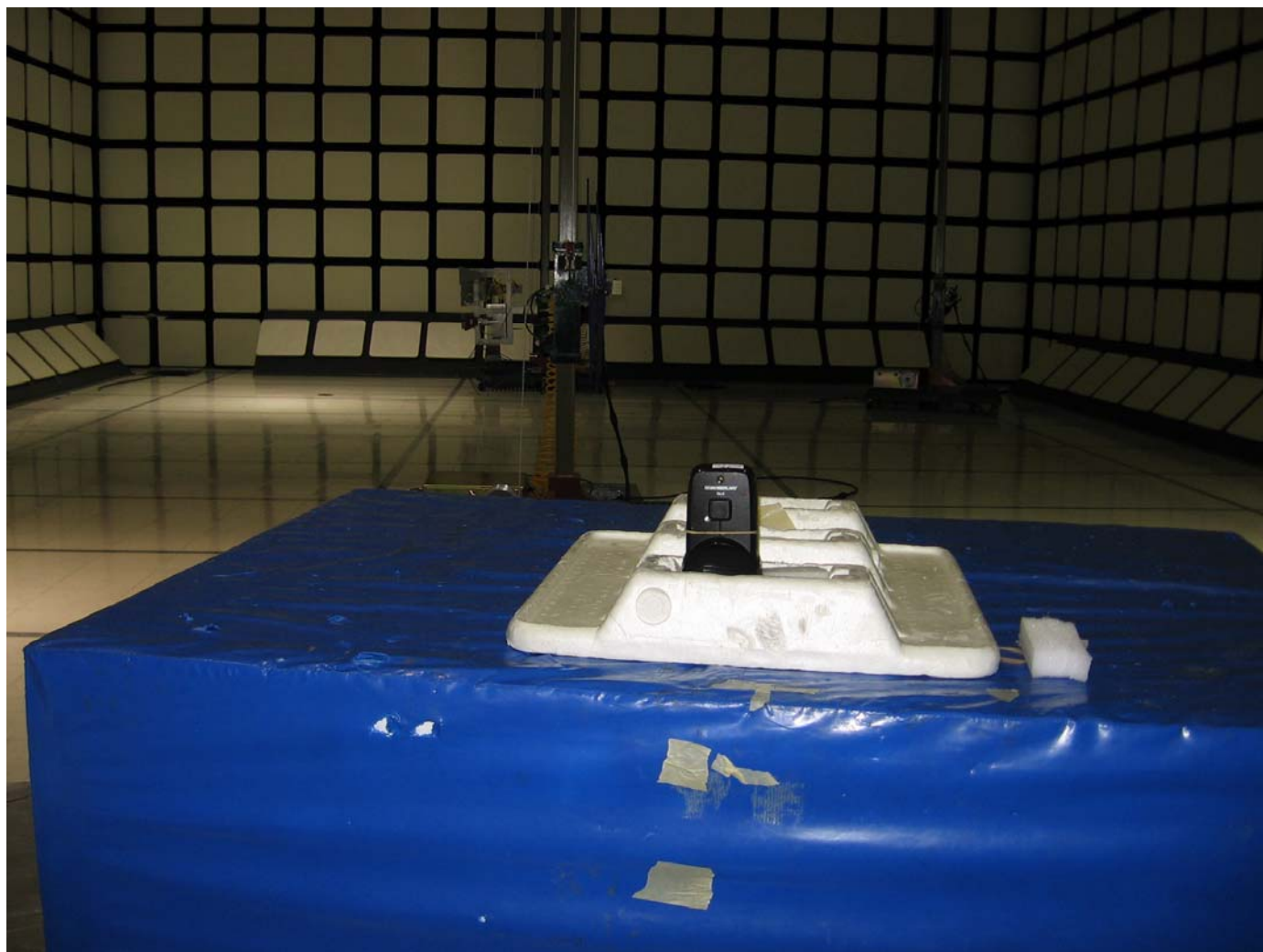
Table 1 Radiated Emissions EUT Configuration Settings

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

Table 2 Radiated Emissions Test Equipment

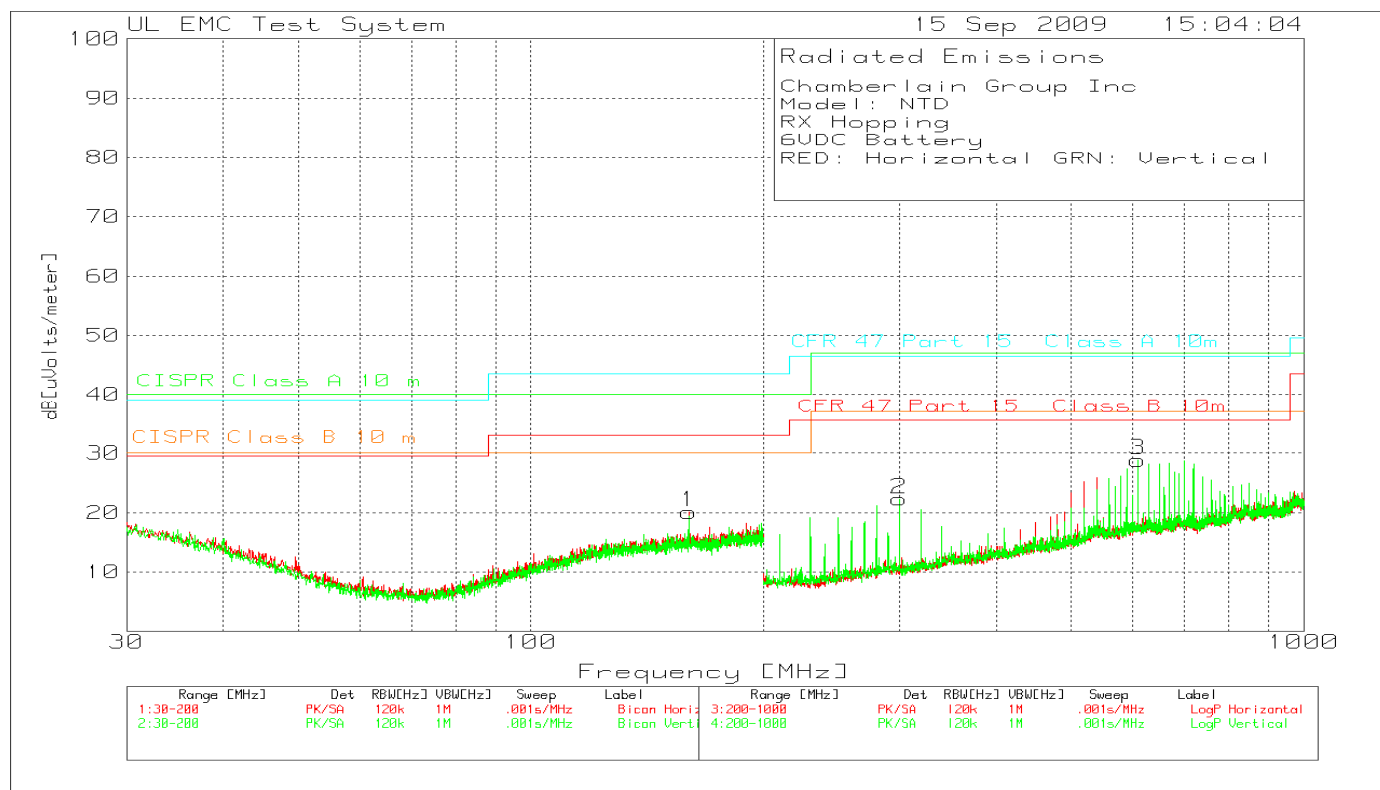
Description	Manufacturer	Model	Identifier
EMI Test Receiver	Rohde & Schwarz	ESU	EMC4323
Bicon Antenna	Chase	VBA6106A	EMC4078
Log-P Antenna	Chase	UPA6109	EMC4313
Spectrum Analyzer	Rhode & Schwarz	FSEK	EMC4182
Antenna Array	UL	BOMS	EMC4276

Figure 1 Test setup for Radiated Emissions



*Test setup photo shows configuration at 3m distance.

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.

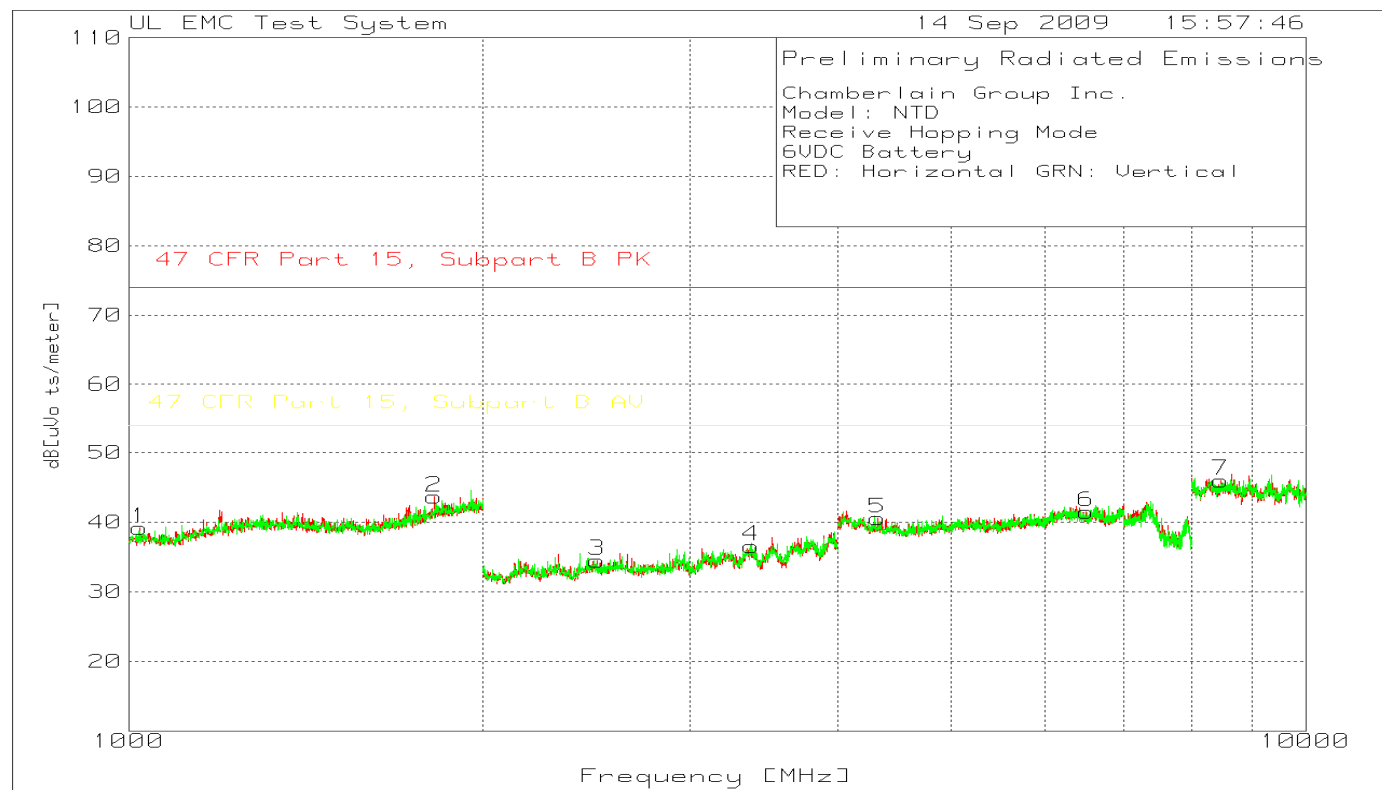
Table 3 Radiated Emissions Data Points 30MHz – 1GHz

Chamberlain Group Inc
Model: NTD
RX Hopping
6VDC Battery
RED: Horizontal GRN: Vertical

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uV/m]	Limit 3	Margin 3[dB]	Limit 4	Margin 4[dB]	Height [cm]	Polarity
1	160.07	35.11	pk	-30.1	15.1	20.11	43.5	-23.39	33.1	-12.99	400	Horz
2	299.9334	42.3	pk	-33	13	22.3	46.4	-24.1	35.6	-13.3	100	Vert
3	610.1266	40.38	pk	-31.4	19.9	28.88	46.4	-17.52	35.6	-6.72	302	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 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.

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	Spurious
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 200MHz 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

Job : 110116193
Model Number:
Client Name:

Project #: 09NK13492 Rev.1
NTD
Chamberlain Group Inc.

File #: MC3181

Page 14 of 53

FCC ID: HBWNTD

Test setup for SPURIOUS EMISSIONS – Antenna conducted



Test setup for SPURIOUS EMISSIONS – Radiated

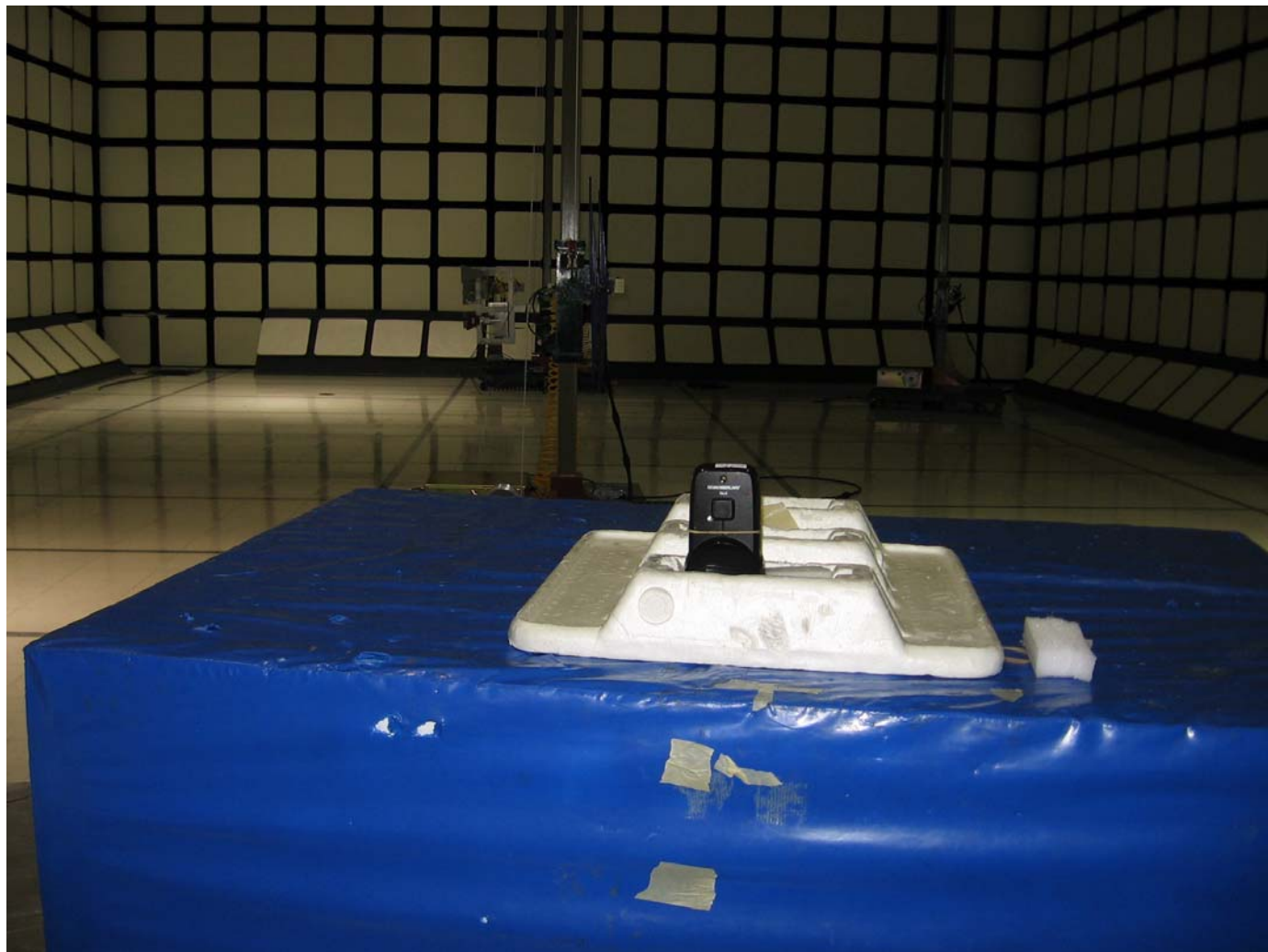
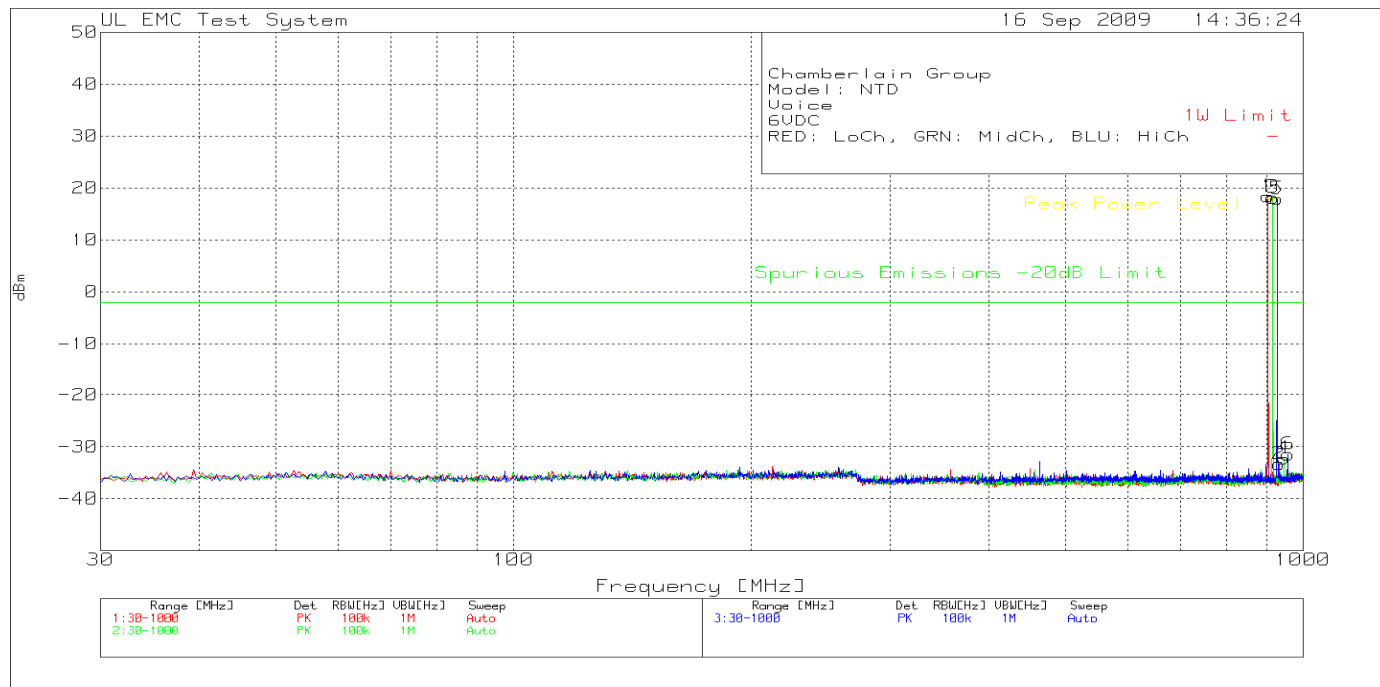
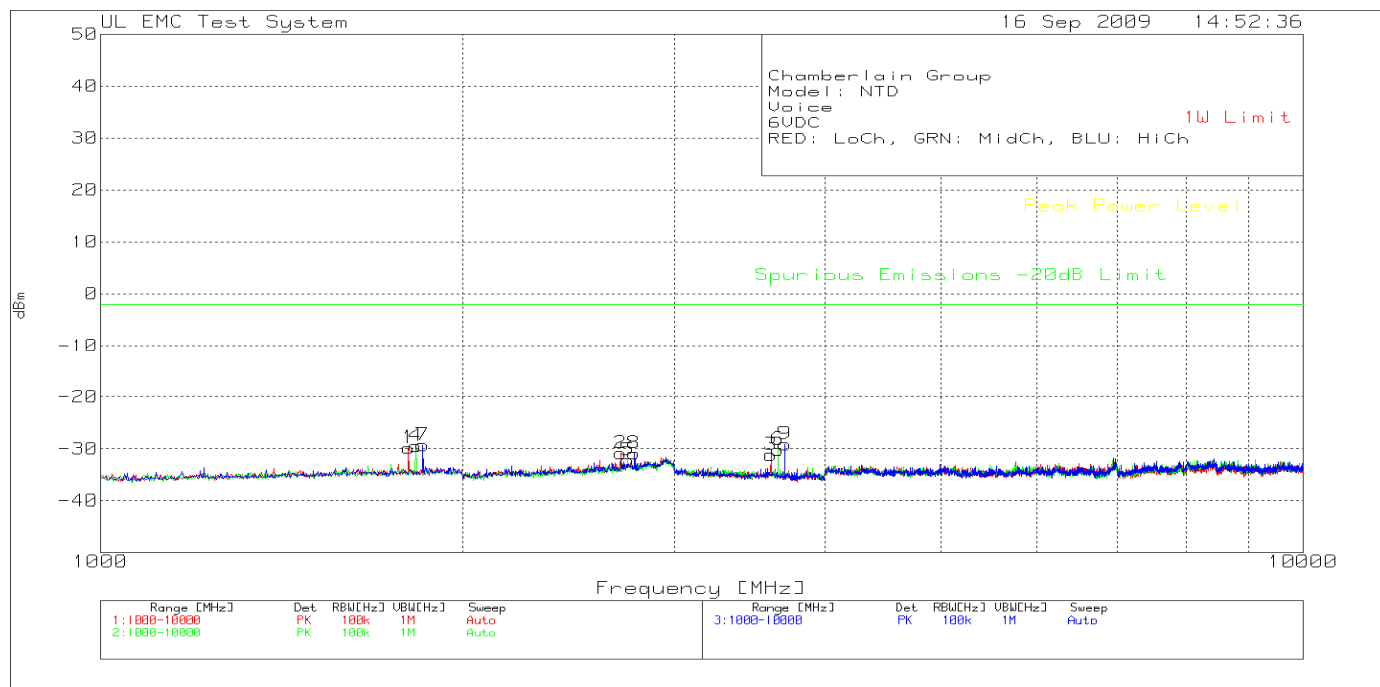


Figure 4 30MHz-1GHz Antenna Port Spurious Emissions Plots TX Mode, Low, Middle and High Channels.



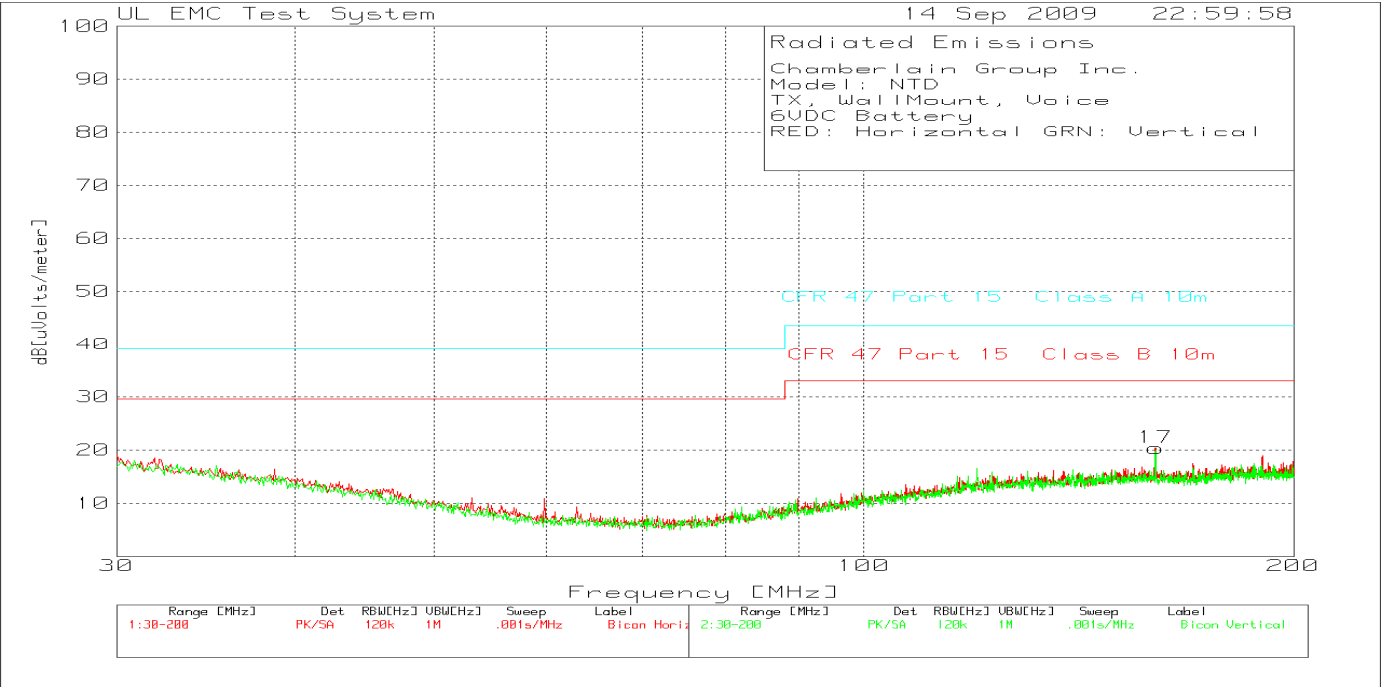
* There were no emissions within 20dB of the limit recorded.

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



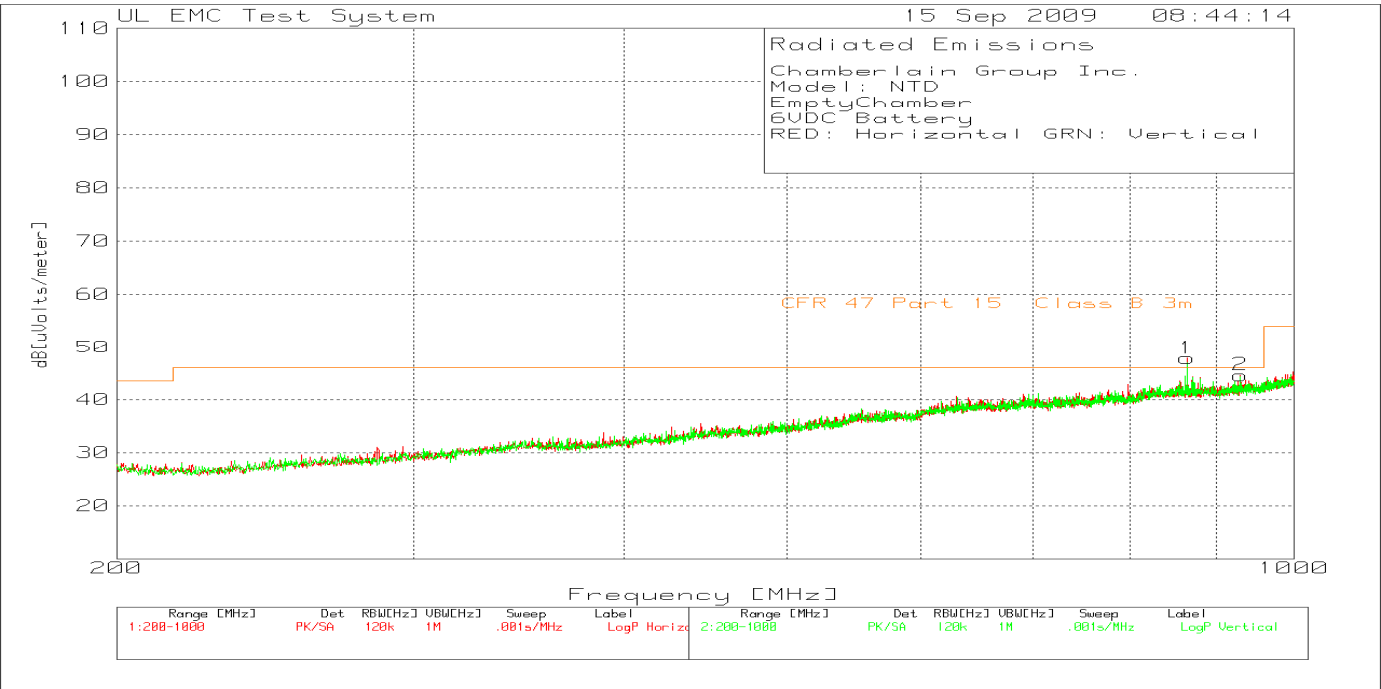
* There were no emissions within 20dB of the limit recorded

Figure 6 Radiated Spurious Emissions below 1GHz, 30MHz – 200MHz TX Hopping

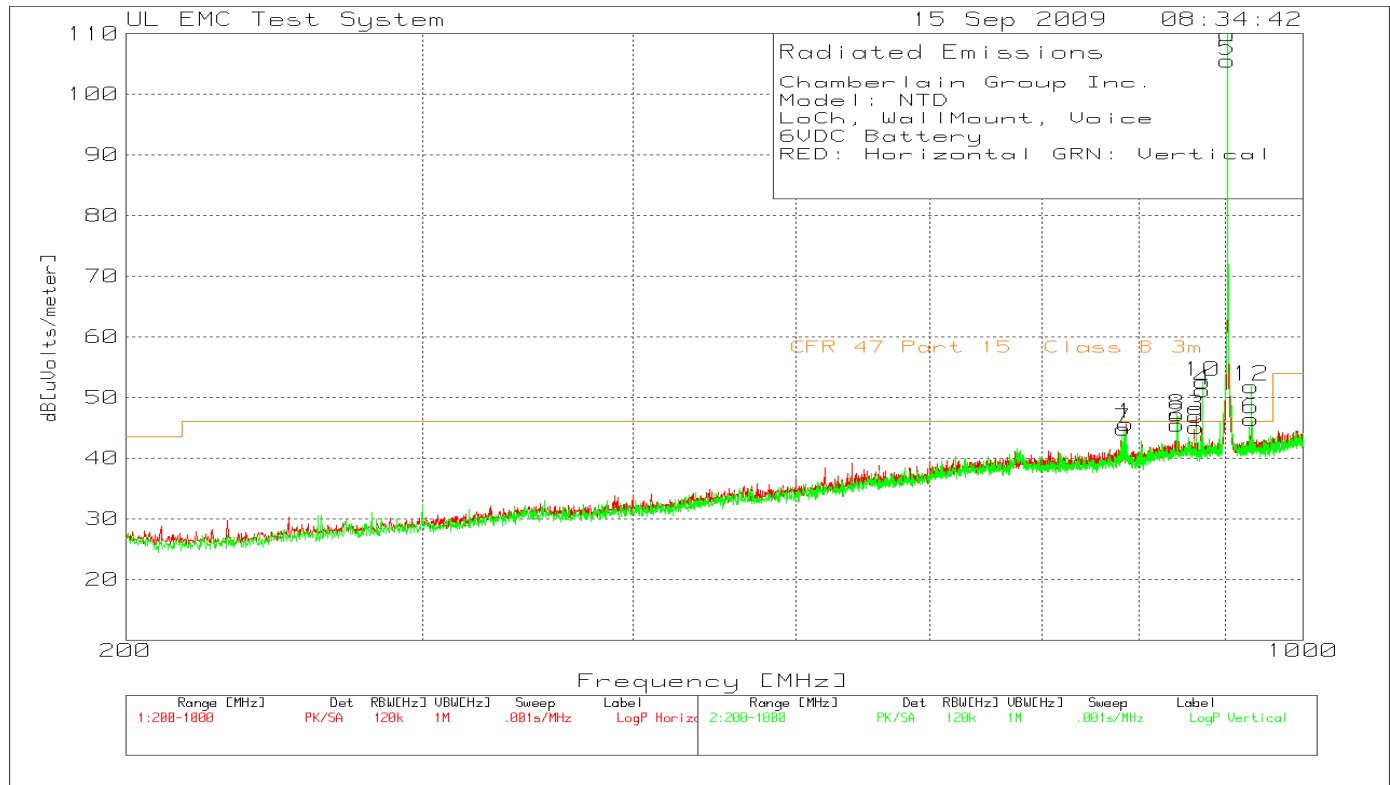


*No emissions within 6dB of the limit recorded.

Figure 7 Radiated Spurious Emissions below 1GHz, 200MHz – 1GHz Ambient Scan



1	864.3571	Frequencies not from EUT
2	929.9134	

Figure 8 Radiated Spurious Emissions below 1GHz, 200MHz – 1GHz TX Low Channel

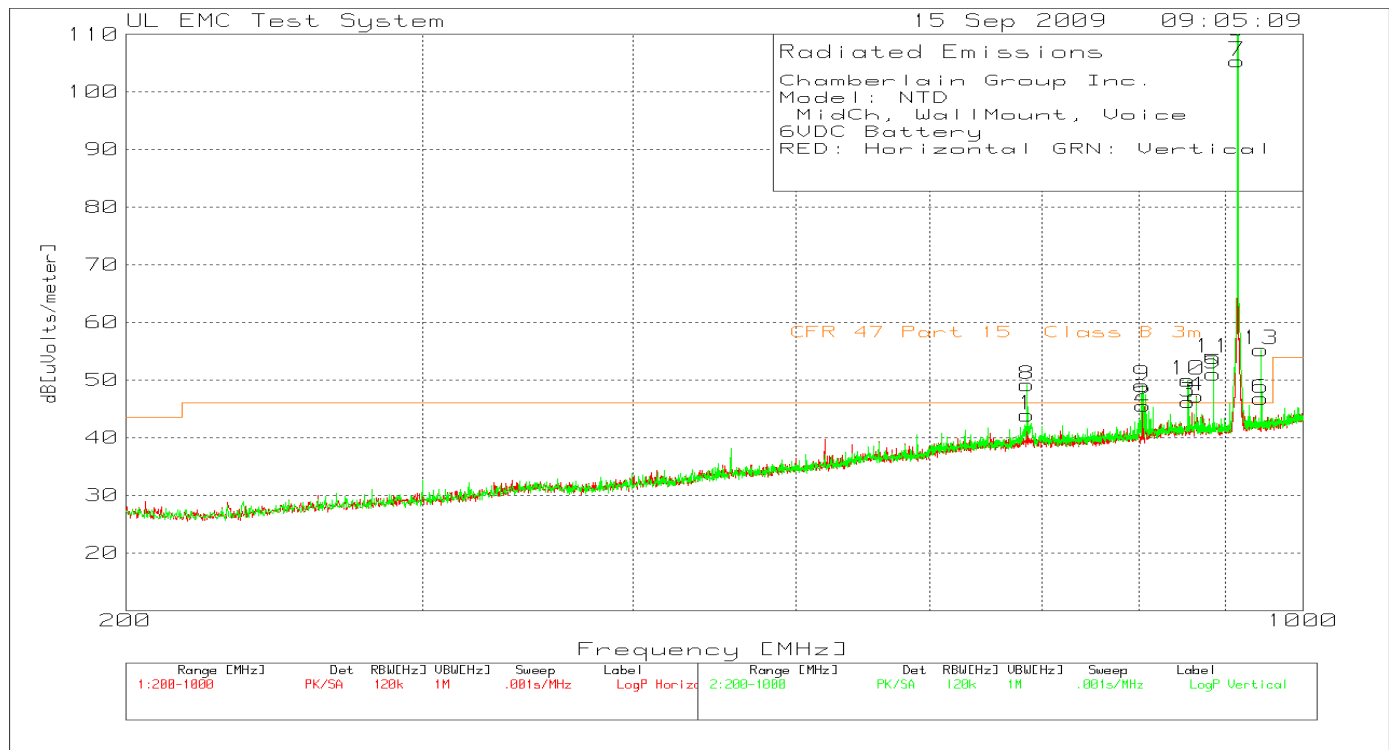
Chamberlain Group Inc.
Model: NTD
LoCh, WallMount, Voice
6VDC Battery
RED: Horizontal GRN: Vertical

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	784.9434	20.38	pk	3.4	21.9	45.68	46	-.32	100	Horz	Note 1
2	842.2385	19.17	pk	3.5	22.9	45.57	46	-.43	151	Horz	Note 1
3	864.3571	20.5	pk	3.5	23	47	46	1	100	Horz	Not from EUT
4	872.3518	24.72	pk	3.5	23	51.22	46	5.22	151	Horz	Note 1
5	902.1985	78.96	pk	3.5	23.1	105.56	46	59.56	201	Horz	TX Frequency
6	932.3118	19.19	pk	3.7	23.6	46.49	46	.49	201	Horz	Note 1
7	782.545	19.67	pk	3.3	21.9	44.87	46	-1.13	150	Vert	Note 1
8	842.2385	20.79	pk	3.5	22.9	47.19	46	1.19	201	Vert	Note 1
9	864.3571	18.65	pk	3.5	23	45.15	46	-.85	100	Vert	Note 1
10	872.3518	26.14	pk	3.5	23	52.64	46	6.64	201	Vert	Note 1
11	902.465	83.35	pk	3.5	23.1	109.95	46	63.95	100	Vert	TX Frequency
12	932.3118	24.56	pk	3.7	23.6	51.86	46	5.86	100	Vert	Note 1

Note 1: Spurious Product of the Transmitter, not in restricted band, Radiated Emissions Limits do not apply.

LIMIT 2: CFR 47 Part 15 Class B 3m

Figure 9 Radiated Spurious Emissions below 1GHz, 200MHz – 1GHz TX Middle Channel



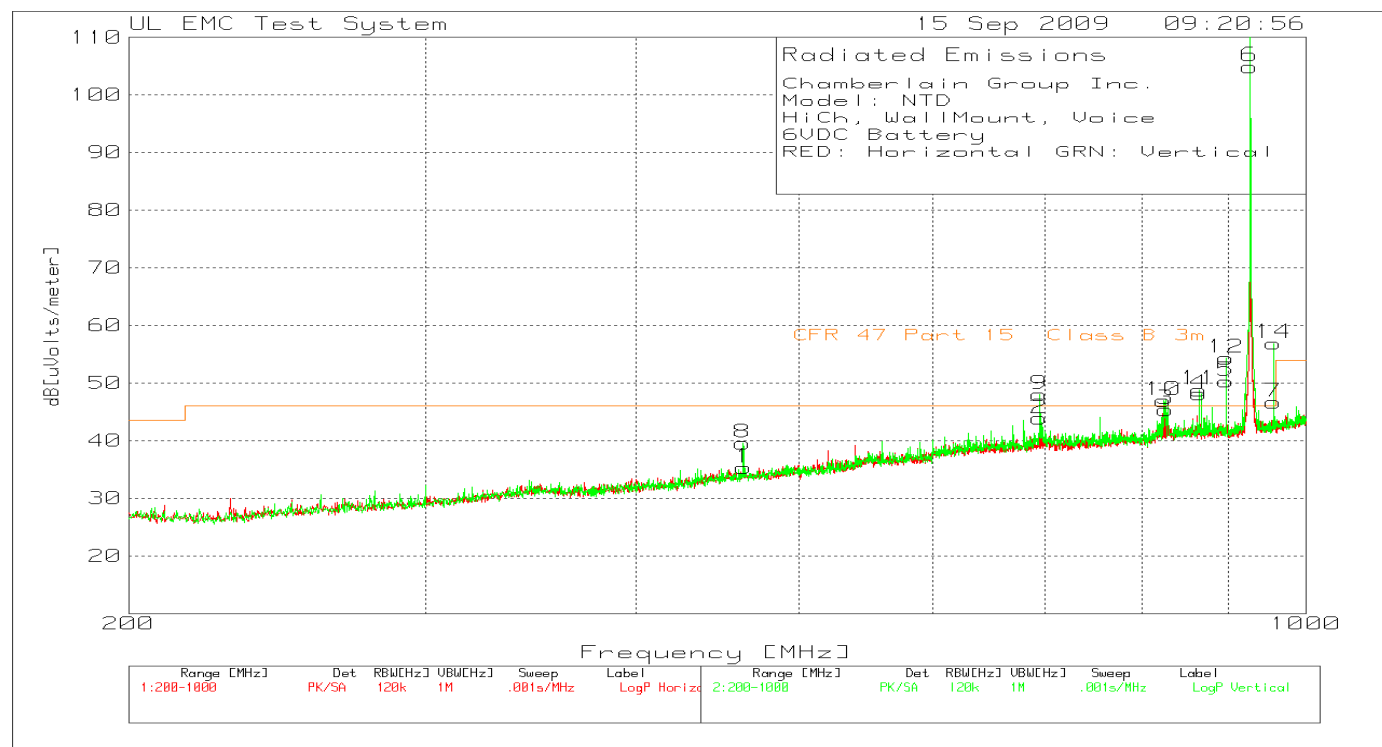
Chamberlain Group Inc.
Model: NTD
MidCh, WallMount, Voice
6VDC Battery
RED: Horizontal GRN: Vertical

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	686.0759	19.77	pk	3.3	20.9	43.97	46	-2.03	100	Horz	Note 1
2	803.8641	20.4	pk	3.2	22	45.6	46	-.4	100	Horz	Note 1
3	855.03	19.56	pk	3.5	23.2	46.26	46	.26	151	Horz	Note 1
4	864.3571	20.72	pk	3.5	23	47.22	46	1.22	100	Horz	Not form EUT
5	884.8767	24.29	pk	3.6	23.2	51.09	46	5.09	151	Horz	Note 1
6	944.8368	19.55	pk	3.7	23.6	46.85	46	.85	200	Horz	Note 1
7	914.7235	78.46	pk	3.6	23.3	105.36	46	59.36	200	Horz	TX Frequency
8	686.0759	24.99	pk	3.3	20.9	49.19	46	3.19	150	Vert	Note 1
9	802.5316	23.81	pk	3.3	22	49.11	46	3.11	150	Vert	Note 1
10	854.7635	23.34	pk	3.5	23.2	50.04	46	4.04	201	Vert	Note 1
11	884.8767	27.11	pk	3.6	23.2	53.91	46	7.91	201	Vert	Note 1
12	914.7235	84.11	pk	3.6	23.3	111.01	46	65.01	100	Vert	TX Frequency
13	944.8368	27.98	pk	3.7	23.6	55.28	46	9.28	100	Vert	Note 1

Note 1: Spurious Product of the Transmitter, not in restricted band, Radiated Emissions Limits do not apply.

LIMIT 2: CFR 47 Part 15 Class B 3m

PK - Peak detector
QP - Quasi-Peak detector

Figure 10 Radiated Spurious Emissions below 1GHz, 200MHz – 1GHz TX High Channel

Chamberlain Group Inc.
Model: NTD
HiCh, WallMount, Voice
6VDC Battery
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	463.5576	15.24	pk	2.5	17.6	35.34	46	-10.66	151	Horz	Sufficient Margin
2	695.1366	19.5	pk	3.2	21.2	43.9	46	-2.1	201	Horz	Note 1
3	825.4497	19.13	pk	3.5	22.8	45.43	46	-.57	250	Horz	Note 1
4	864.3571	21.66	pk	3.5	23	48.16	46	2.16	151	Horz	Not from EUT
5	896.8688	23.74	pk	3.5	23.1	50.34	46	4.34	151	Horz	Note 1
6	926.7155	77.82	pk	3.6	23.5	104.92	46	58.92	201	Horz	TX Frequency
7	956.8288	19.3	pk	3.7	23.7	46.7	46	.7	100	Horz	Note 1
8	463.2911	19.48	pk	2.5	17.6	39.58	46	-6.42	100	Vert	Sufficient Margin
9	695.1366	23.62	pk	3.2	21.2	48.02	46	2.02	151	Vert	Note 1
10	823.3178	20.77	pk	3.4	22.8	46.97	46	.97	201	Vert	Note 1
11	864.3571	22.34	pk	3.5	23	48.84	46	2.84	251	Vert	Not from EUT
12	896.8688	27.72	pk	3.5	23.1	54.32	46	8.32	100	Vert	Note 1
13	926.982	84.43	pk	3.7	23.5	111.63	46	65.63	100	Vert	TX Frequency
14	956.8288	29.52	pk	3.7	23.7	56.92	46	10.92	100	Vert	Note 1

Note 1: Spurious Product of the Transmitter, not in restricted band, Radiated Emissions Limits do not apply.

LIMIT 2: CFR 47 Part 15 Class B 3m

PK - Peak detector

QP - Quasi-Peak detector

Figure 11 Radiated Spurious Emissions above 1GHz, Low Channel

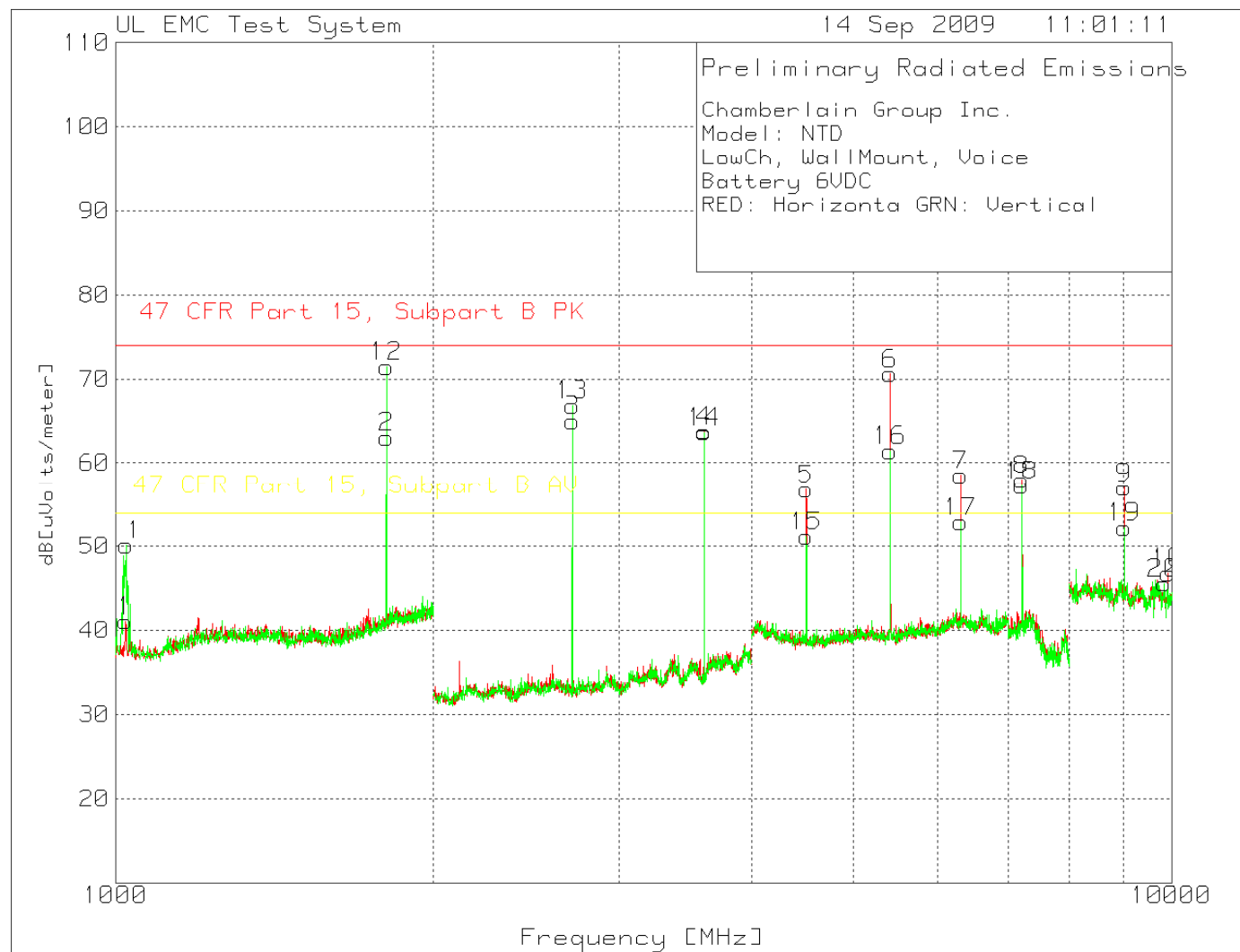


Table 7 Radiated Spurious Emissions above 1GHz, Low Channel

Chamberlain Group Inc.
Model: NTD
LowCh, WallMount, Voice
Battery 6VDC
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	1022.022	60.26	pk	-45.77	26.6	41.09	74	-32.91	54	-12.91	100	Horz	Note 2
2	1804.805	76.43	pk	-43.45	30.1	63.08	74	-10.92	54	9.08	200	Horz	Note 1
3	2706.707	84.16	pk	-41.25	22.1	65.01	74	-8.99	54	11.01	101	Horz	See table below
4	3609.61	81.53	pk	-40.94	23.2	63.79	74	-10.21	54	9.79	101	Horz	Note 2
5	4509.673	81.52	pk	-52.5	27.8	56.82	74	-17.18	54	2.82	100	Horz	Note 2
6	5414.276	92.85	pk	-50.15	27.9	70.6	74	-3.4	54	16.6	100	Horz	See table below
7	6316.211	77.37	pk	-48.02	29.2	58.55	74	-15.45	54	4.55	150	Horz	Note 1
8	7218.145	75.24	pk	-47.08	29.8	57.96	74	-16.04	54	3.96	100	Horz	Note 1
9	9022.044	70.82	pk	-49.92	36.1	57	74	-17	54	3	150	Horz	Note 2
10	9927.856	60.89	pk	-50.48	36.4	46.81	74	-27.19	54	-7.19	150	Horz	Note 1
11	1023.023	69.31	pk	-45.77	26.6	50.14	74	-23.86	54	-3.86	101	Vert	Note 2
12	1804.805	84.82	pk	-43.45	30.1	71.47	74	-2.53	54	17.47	101	Vert	Note 1
13	2706.707	86	pk	-41.25	22.1	66.85	74	-7.15	54	12.85	150	Vert	See table below
14	3609.61	81.41	pk	-40.94	23.2	63.67	74	-10.33	54	9.67	150	Vert	Note 2
15	4509.673	75.87	pk	-52.5	27.8	51.17	74	-22.83	54	-2.83	101	Vert	Note 2
16	5414.276	83.71	pk	-50.15	27.9	61.46	74	-12.54	54	7.46	150	Vert	Note 2
17	6316.211	71.7	pk	-48.02	29.2	52.88	74	-21.12	54	-1.12	150	Vert	Note 1
18	7218.145	74.55	pk	-47.08	29.8	57.27	74	-16.73	54	3.27	101	Vert	Note 1
19	9022.044	66.05	pk	-49.92	36.1	52.23	74	-21.77	54	-1.77	101	Vert	Note 2
20	9831.663	59.9	pk	-50.71	36.4	45.59	74	-28.41	54	-8.41	149	Vert	Note 1

Note 1: Spurious Product of the Transmitter, not in restricted band, Radiated Emissions Limits do not apply.

Note 2: Sufficient peak margin based on pre-scan peak data. EUT has 26dB duty cycle correction factor applicable to average limit.

LIMIT 1: 47 CFR Part 15, Subpart B PK

LIMIT 2: 47 CFR Part 15, Subpart B AV

pk - Peak 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
2706.6513	83.48	pk	1MHz/1MHz	-41.25	22.1	0	64.33	74	-9.67	X	X	0	106	Horz
2706.6513	76.64	av	1MHz/10Hz	-41.25	22.1	-26	31.49	x	X	54	-22.5	0	106	Horz
5413.7144	92.12	pk	1MHz/1MHz	-50.16	27.9	0	69.86	74	-4.14	X	X	0	114	Horz
5413.7144	84.06	av	1MHz/10Hz	-50.16	27.9	-26	35.8	X	x	54	-18.2	0	114	Horz
2706.5461	89.13	pk	1MHz/1MHz	-41.25	22.1	0	69.98	74	-4.02	X	X	21	143	Vert
2706.5461	82.43	av	1MHz/10Hz	-41.25	22.1	-26	37.3	x	x	54	-16.7	21	143	Vert

LIMIT 1: 47 CFR Part 15, Subpart B PK

LIMIT 2: 47 CFR Part 15, Subpart B AV

pk - Peak detector

av - Average detector

Figure 12 Radiated Spurious Emissions above 1GHz, Middle Channel

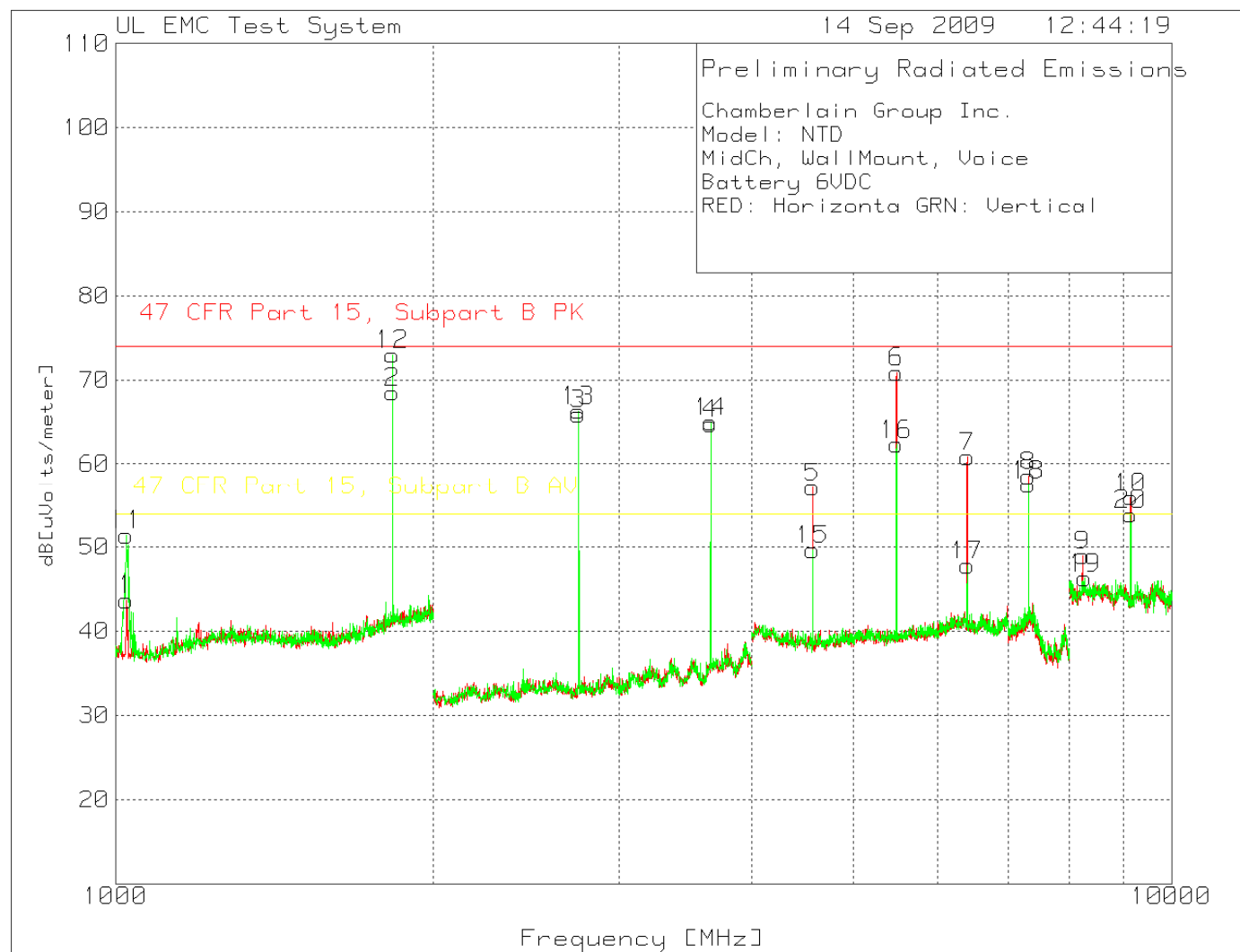


Table 8 Radiated Spurious Emissions above 1GHz, Middle Channel

Chamberlain Group Inc.

Model: NTD

MidCh, WallMount, Voice

Battery 6VDC

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	1024.024	62.88	pk	-45.76	26.6	43.72	74	-30.28	54	-10.28	150	Horz	Note 2
2	1829.83	81.34	pk	-43.13	30.3	68.51	74	-5.49	54	14.51	150	Horz	Note 1
3	2744.745	84.54	pk	-40.73	22.1	65.91	74	-8.09	54	11.91	101	Horz	See table below
4	3659.66	81.02	pk	-39.66	23.4	64.76	74	-9.24	54	10.76	101	Horz	See table below
5	4573.716	81.93	pk	-52.47	27.7	57.16	74	-16.84	54	3.16	101	Horz	Note 2
6	5488.993	93.04	pk	-50.24	28.1	70.9	74	-3.1	54	16.9	101	Horz	See table below
7	6404.27	79.58	pk	-47.94	29.2	60.84	74	-13.16	54	6.84	101	Horz	Note 1
8	7319.546	74.3	pk	-46.37	30.6	58.53	74	-15.47	54	4.53	101	Horz	Note 2
9	8232.465	61.37	pk	-48.8	36.4	48.97	74	-25.03	54	-5.03	150	Horz	Note 2
10	9150.301	70.43	pk	-50.77	36.3	55.96	74	-18.04	54	1.96	100	Horz	Note 2
11	1024.024	70.61	pk	-45.76	26.6	51.45	74	-22.55	54	-2.55	100	Vert	Note 2
12	1829.83	85.82	pk	-43.13	30.3	72.99	74	-1.01	54	18.99	100	Vert	Note 1
13	2744.745	84.95	pk	-40.73	22.1	66.32	74	-7.68	54	12.32	200	Vert	See table below
14	3659.66	81.25	pk	-39.66	23.4	64.99	74	-9.01	54	10.99	150	Vert	See table below
15	4573.716	74.44	pk	-52.47	27.7	49.67	74	-24.33	54	-4.33	101	Vert	Note 2
16	5488.993	84.44	pk	-50.24	28.1	62.3	74	-11.7	54	8.3	150	Vert	Note 1
17	6404.27	66.57	pk	-47.94	29.2	47.83	74	-26.17	54	-6.17	101	Vert	Note 1
18	7319.546	73.23	pk	-46.37	30.6	57.46	74	-16.54	54	3.46	101	Vert	Note 2
19	8280.561	58.75	pk	-48.85	36.4	46.3	74	-27.7	54	-7.7	100	Vert	Note 2
20	9146.293	68.37	pk	-50.8	36.3	53.87	74	-20.13	54	-1.13	100	Vert	Note 2

Note 1: Spurious Product of the Transmitter, not in restricted band, Radiated Emissions Limits do not apply.

Note 2: Sufficient peak margin based on pre-scan peak data. EUT has 26dB duty cycle correction factor applicable to average limit.

LIMIT 1: 47 CFR Part 15, Subpart B PK

LIMIT 2: 47 CFR Part 15, Subpart B AV

pk - Peak 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 [degrees]	Height [cm]	Polarity
2744.2255	84.63	pk	1MHz/1MHz	-40.75	22.1	0	65.98	74	-8.02	X	X	169	101	Horz
2744.2255	77.89	av	1MHz/10Hz	-40.75	22.1	-26	33.24	X	X	54	-20.76	169	101	Horz
3658.8647	82.48	pk	1MHz/1MHz	-39.67	23.4	0	66.21	74	-7.79	X	X	0	103	Horz
3658.8647	75.39	av	1MHz/10Hz	-39.67	23.4	-26	33.12	X	X	54	-20.88	0	103	Horz
5488.1523	92.15	pk	1MHz/1MHz	-50.22	28.1	0	70.03	74	-3.97	X	X	348	109	Horz
5488.1523	85.01	av	1MHz/10Hz	-50.22	28.1	-26	36.89	X	X	54	-17.11	348	109	Horz
2744.0752	87.67	pk	1MHz/1MHz	-40.75	22.1	0	69.02	74	-4.98	X	X	21	140	Vert
2744.0752	81	av	1MHz/10Hz	-40.75	22.1	-26	36.35	X	X	54	-17.65	21	140	Vert
3659.1363	84.12	pk	1MHz/1MHz	-39.66	23.4	0	67.86	74	-6.14	X	X	21	161	Vert
3659.1363	76.77	av	1MHz/10Hz	-39.66	23.4	-26	34.51	X	X	54	-19.49	21	161	Vert

LIMIT 1: 47 CFR Part 15, Subpart B PK

LIMIT 2: 47 CFR Part 15, Subpart B AV

pk - Peak detector

av - Average detector

Figure 13 Radiated Spurious Emissions above 1GHz, High Channel

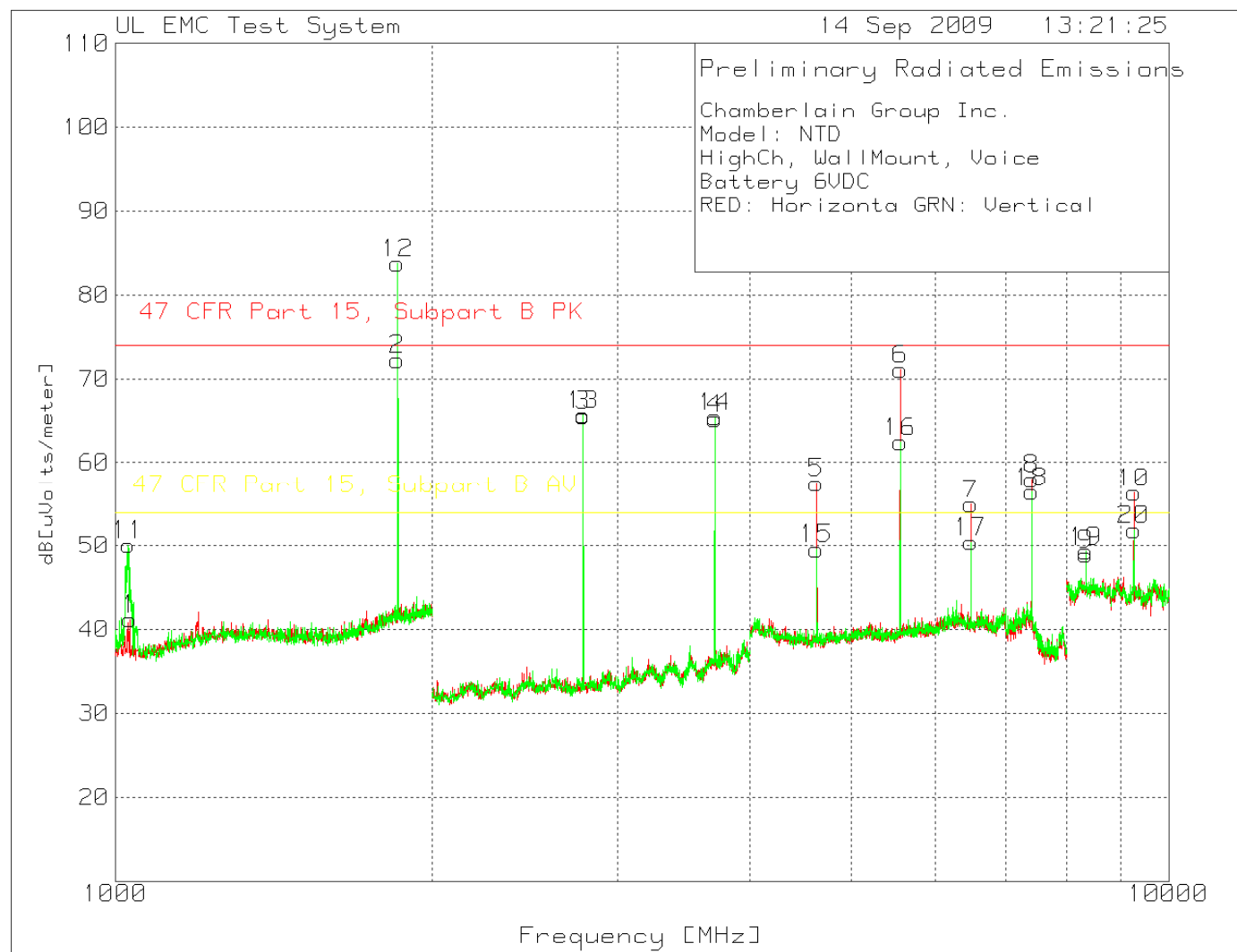


Table 9 Radiated Spurious Emissions above 1GHz, High Channel

Chamberlain Group Inc.
Model: NTD
HighCh, WallMount, Voice
Battery 6VDC
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	1032.032	60.27	pk	-45.66	26.6	41.21	74	-32.79	54	-12.79	150	Horz	Note 2
2	1853.854	85	pk	-43.24	30.5	72.26	74	-1.74	54	18.26	150	Horz	Note 1
3	2780.781	83.96	pk	-40.57	22.2	65.59	74	-8.41	54	11.59	100	Horz	See table below
4	3707.708	81.55	pk	-39.82	23.5	65.23	74	-8.77	54	11.23	100	Horz	See table below
5	4632.422	82.16	pk	-52.32	27.7	57.54	74	-16.46	54	3.54	101	Horz	Note 2
6	5561.041	93.32	pk	-50.52	28.3	71.1	74	-2.9	54	17.1	101	Horz	See table below
7	6486.991	74.18	pk	-48.32	29.1	54.96	74	-19.04	54	.96	101	Horz	Note 1
8	7415.61	74.44	pk	-47.43	31	58.01	74	-15.99	54	4.01	101	Horz	Note 2
9	8340.681	62.45	pk	-50.02	36.5	48.93	74	-25.07	54	-5.07	200	Horz	Note 2
10	9266.533	69.33	pk	-49.39	36.4	56.34	74	-17.66	54	2.34	101	Horz	Note 1
11	1029.029	69.17	pk	-45.69	26.6	50.08	74	-23.92	54	-3.92	100	Vert	Note 2
12	1853.854	96.5	pk	-43.24	30.5	83.76	74	9.76	54	29.76	100	Vert	Note 1
13	2780.781	84.04	pk	-40.57	22.2	65.67	74	-8.33	54	11.67	200	Vert	See table below
14	3707.708	81.77	pk	-39.82	23.5	65.45	74	-8.55	54	11.45	150	Vert	See table below
15	4632.422	74.21	pk	-52.32	27.7	49.59	74	-24.41	54	-4.41	150	Vert	Note 2
16	5561.041	84.65	pk	-50.52	28.3	62.43	74	-11.57	54	8.43	150	Vert	Note 1
17	6486.991	69.65	pk	-48.32	29.1	50.43	74	-23.57	54	-3.57	100	Vert	Note 1
18	7415.61	72.86	pk	-47.43	31	56.43	74	-17.57	54	2.43	100	Vert	Note 2
19	8340.681	62.81	pk	-50.02	36.5	49.29	74	-24.71	54	-4.71	150	Vert	Note 2
20	9266.533	64.86	pk	-49.39	36.4	51.87	74	-22.13	54	-2.13	100	Vert	Note 1

Note 1: Spurious Product of the Transmitter, not in restricted band, Radiated Emissions Limits do not apply.

Note 2: Sufficient peak margin based on pre-scan peak data. EUT has 26dB duty cycle correction factor applicable to average limit.

LIMIT 1: 47 CFR Part 15, Subpart B PK

LIMIT 2: 47 CFR Part 15, Subpart B AV

pk - Peak 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
2780.3938	85.22	pk	1MHz/1MHz	-40.55	22.2	0	66.87	74	-7.13	X	X	172	118	Horz
2780.3938	78.05	av	1MHz/10Hz	-40.55	22.2	-26	33.27	X	X	54	-20.73	172	118	Horz
3706.8758	82.36	pk	1MHz/1MHz	-39.8	23.5	0	66.06	74	-7.94	X	X	358	102	Horz
3706.8758	75.38	av	1MHz/10Hz	-39.8	23.5	-26	33.08	X	X	54	-20.92	358	102	Horz
5560.3637	93.97	pk	1MHz/1MHz	-50.53	28.3	0	71.74	74	-2.26	X	X	339	101	Horz
5560.3637	87.1	av	1MHz/10Hz	-50.53	28.3	-26	38.87	X	X	54	-15.13	339	101	Horz
2780.3747	86.61	pk	1MHz/1MHz	-40.55	22.2	0	68.26	74	-5.74	X	X	81	138	Vert
2780.3747	79.56	av	1MHz/10Hz	-40.55	22.2	-26	35.21	X	X	54	-18.79	81	138	Vert
3707.1453	83.39	pk	1MHz/1MHz	-39.8	23.5	0	67.09	74	-6.91	X	X	16	174	Vert
3707.1453	75.9	av	1MHz/10Hz	-39.8	23.5	-26	33.6	X	X	54	-20.4	16	174	Vert

LIMIT 1: 47 CFR Part 15, Subpart B PK

LIMIT 2: 47 CFR Part 15, Subpart B AV

pk - 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 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 10 Band Edge Compliance EUT Configuration Settings

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

Table 11 Band Edge Compliance Test Equipment

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

Test setup for Band Edge Compliance – Conducted



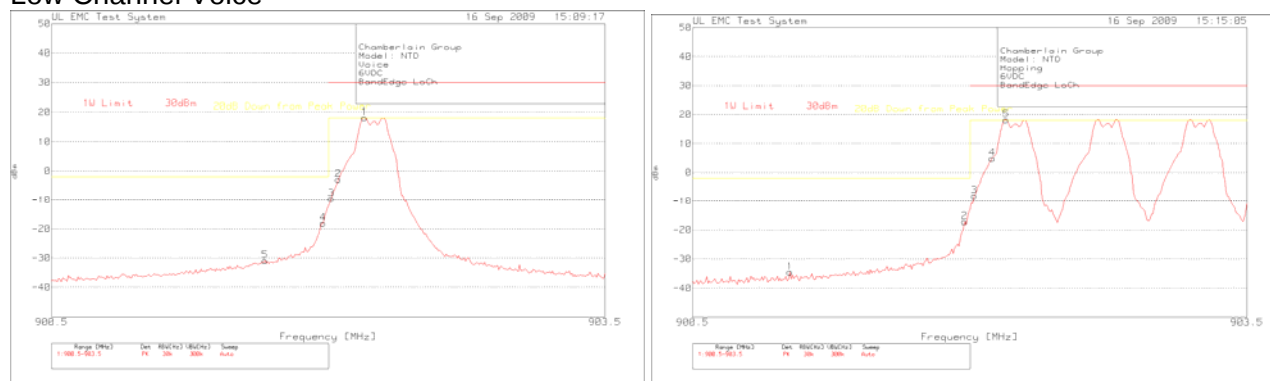
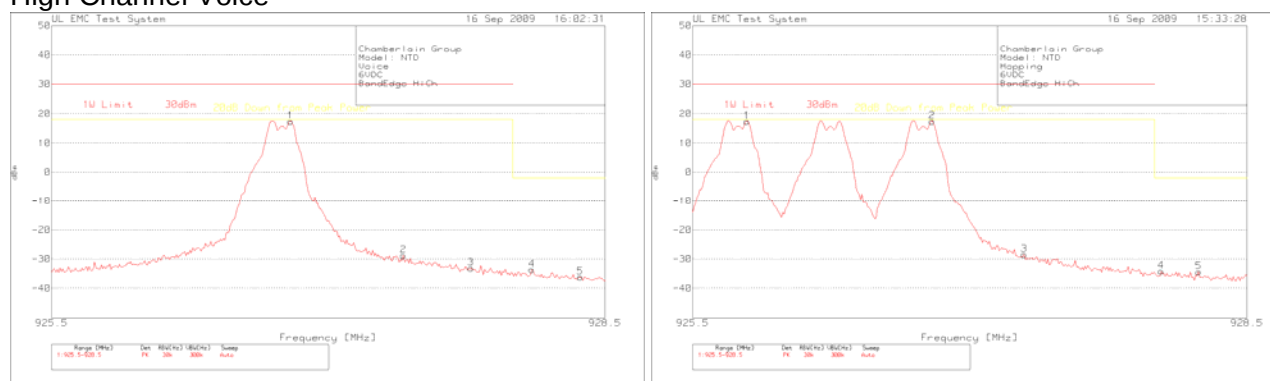
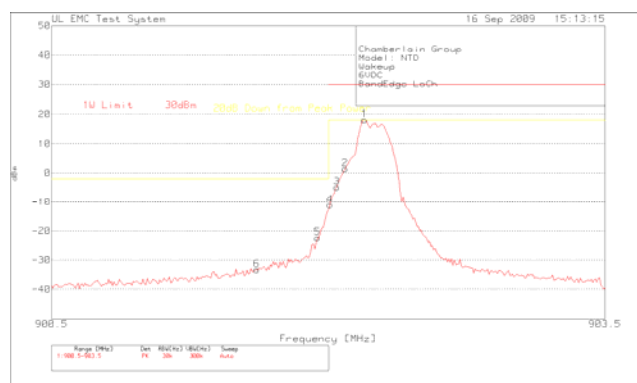
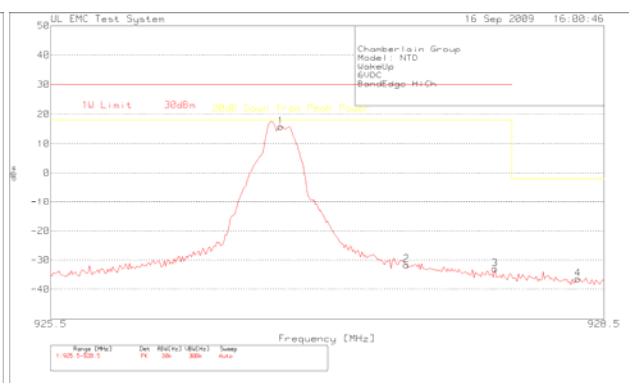
Figure 14 Conducted Band Edge Compliance Graph**Low Channel Voice****High Channel Voice****Low Channel Wakeup****High Channel Wakeup**

Table 12 Band Edge Compliance Data Points

Low Channel Voice, 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	902.195	114.82	pk	10.3	-107	18.12	30	-11.88	18	.12	In-band
2	902.0525	93.79	pk	10.3	-107	-2.91	30	-32.91	18	-20.91	In-band
3	902.015	87.16	pk	10.3	-107	-9.54	30	-39.54	18	-27.54	In-band
4	901.97	78.64	pk	10.3	-107	-18.06	0	-18.06	-2	-16.06	
5	901.655	65.83	pk	10.3	-107	-30.87	0	-30.87	-2	-28.87	

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

Low Channel Voice, 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	901.025	62.21	pk	10.3	-107	-34.49	0	-34.49	-2	-32.49	Out-of-Band
2	901.97	79.52	pk	10.3	-107	-17.18	0	-17.18	-2	-15.18	Out-of-Band
3	902.0225	88.66	pk	10.3	-107	-8.04	30	-38.04	18	-26.04	In-band
4	902.12	101.58	pk	10.3	-107	4.88	30	-25.12	18	-13.12	In-band
5	902.195	114.91	pk	10.3	-107	18.21	30	-11.79	18	.21	In-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	902.195	114.81	pk	10.3	-107	18.11	30	-11.89	18	.11	In-band
2	902.09	98.12	pk	10.3	-107	1.42	30	-28.58	18	-16.58	In-band
3	902.045	91.85	pk	10.3	-107	-4.85	30	-34.85	18	-22.85	In-band
4	902.0075	85.68	pk	10.3	-107	-11.02	30	-41.02	18	-29.02	In-band
5	901.94	74.29	pk	10.3	-107	-22.41	0	-22.41	-2	-20.41	Out-of-Band
6	901.61	63.39	pk	10.3	-107	-33.31	0	-33.31	-2	-31.31	Out-of-Band

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

High Channel Voice, 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	926.7938	114.1	pk	10.3	-107	17.4	30	-12.6	18	- .6	Out-of-Band
2	927.405	67.93	pk	10.3	-107	-28.77	30	-58.77	18	-46.77	In-band
3	927.7725	63.56	pk	10.3	-107	-33.14	30	-63.14	18	-51.14	In-band
4	928.1025	63.03	pk	10.3	-107	-33.67	0	-33.67	-2	-31.67	Out-of-Band
5	928.365	60.47	pk	10.3	-107	-36.23	0	-36.23	-2	-34.23	Out-of-Band

LIMIT 1: 1W Limit 30dBm

LIMIT 2: 20dB Down from Peak Power

pk - Peak detector

High Channel Voice, 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	925.7925	114.08	pk	10.3	-107	17.38	30	-12.62	18	- .62	In-band
2	926.7938	114.16	pk	10.3	-107	17.46	30	-12.54	18	- .54	In-band
3	927.2925	68.21	pk	10.3	-107	-28.49	30	-58.49	18	-46.49	In-band
4	928.035	62.54	pk	10.3	-107	-34.16	0	-34.16	-2	-32.16	Out-of-Band
5	928.2375	62.28	pk	10.3	-107	-34.42	0	-34.42	-2	-32.42	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	926.745	112.47	pk	10.3	-107	15.77	30	-14.23	18	-2.23	In-band
2	927.4275	65.09	pk	10.3	-107	-31.61	30	-61.61	18	-49.61	In-band
3	927.9075	63.66	pk	10.3	-107	-33.04	30	-63.04	18	-51.04	In-band
4	928.3575	60.27	pk	10.3	-107	-36.43	0	-36.43	-2	-34.43	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 13 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 14 Carrier Frequency Separation Test Equipment

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

Table 15 Carrier Frequency Separation Results

Mode	Channel	Carrier Frequency Separation Limit	Channel Separation
TX Hopping	Low Side	> 20dB Bandwidth	0.4991MHz
	Middle		0.4991MHz
	High Side		0.4992MHz
	Overall Average		0.4991MHz

Test Setup for Carrier Frequency Separation



Figure 15 Carrier Frequency Separation Graphs

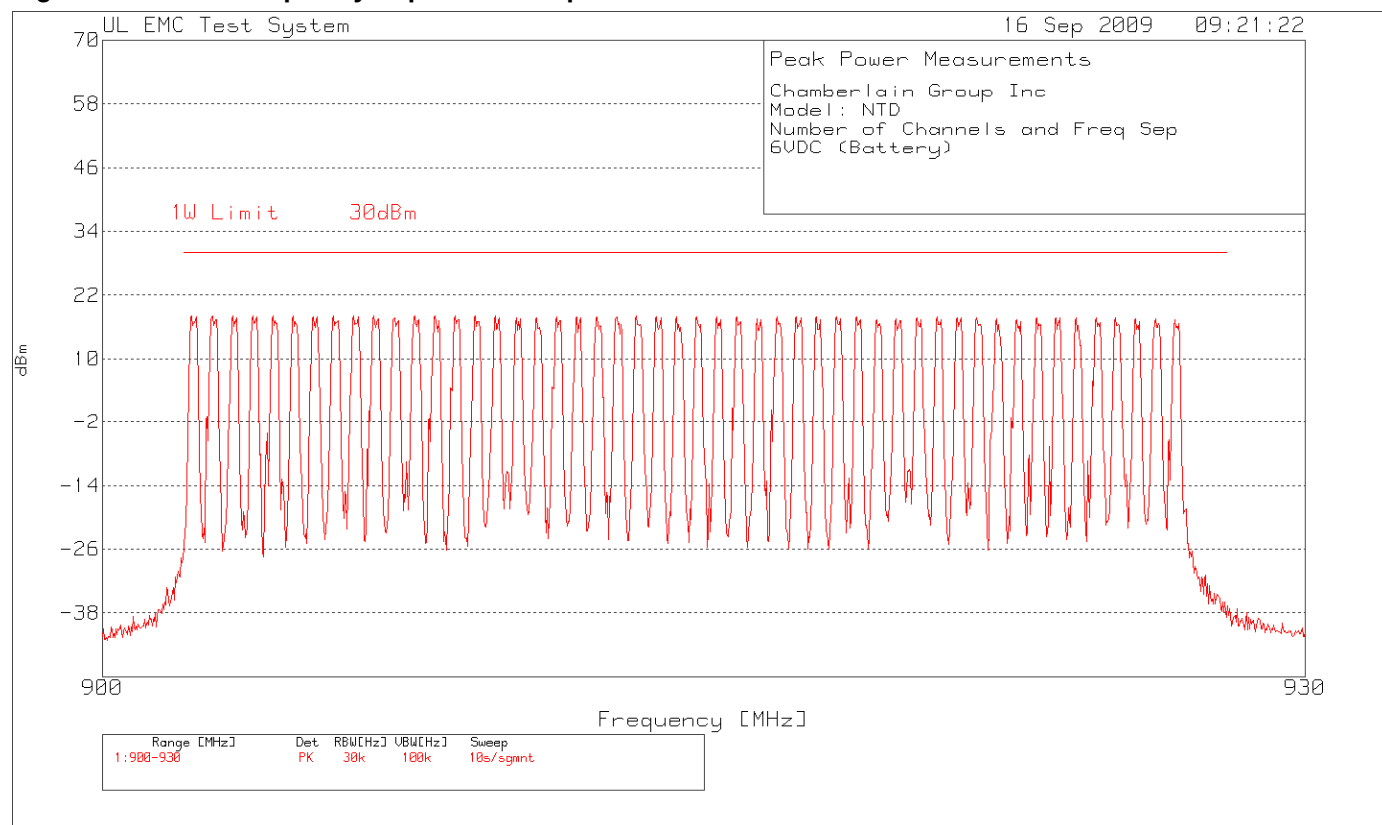


Table 16 Carrier Frequency Separation (Frequency List)

#	Frequency MHz	#	Frequency MHz	#	Frequency MHz	#	Frequency MHz	#	Frequency MHz
1	902.2463	11	907.2379	21	912.2546	31	917.2463	41	922.2629
2	902.7454	12	907.7371	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	908.7354	24	913.7521	34	918.7438	44	923.7604
5	904.2429	15	909.2471	25	914.2512	35	919.2429	45	924.2596
6	904.7421	16	909.7338	26	914.7504	36	919.7421	46	924.7587
7	905.2413	17	910.2579	27	915.2496	37	920.2662	47	925.2579
8	905.7404	18	910.7571	28	915.7488	38	920.7654	48	925.7571
9	906.2396	19	911.2562	29	916.2479	39	921.2646	49	926.2562
10	906.7388	20	911.7554	30	916.7471	40	921.7637	50	926.7554

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 17 Number of Hopping Frequencies Configuration Settings

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

Table 18 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 19 Number of Hopping Frequencies Results

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

Test Setup for Number of Hopping Frequencies



Figure 16 Number of Hopping Frequencies Graphs

Table 20 Number of Hopping Channels (Frequency List)

#	Frequency MHz	#	Frequency MHz	#	Frequency MHz	#	Frequency MHz	#	Frequency MHz
1	902.2463	11	907.2379	21	912.2546	31	917.2463	41	922.2629
2	902.7454	12	907.7371	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	908.7354	24	913.7521	34	918.7438	44	923.7604
5	904.2429	15	909.2471	25	914.2512	35	919.2429	45	924.2596
6	904.7421	16	909.7338	26	914.7504	36	919.7421	46	924.7587
7	905.2413	17	910.2579	27	915.2496	37	920.2662	47	925.2579
8	905.7404	18	910.7571	28	915.7488	38	920.7654	48	925.7571
9	906.2396	19	911.2562	29	916.2479	39	921.2646	49	926.2562
10	906.7388	20	911.7554	30	916.7471	40	921.7637	50	926.7554

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 21 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 22 Dwell Time Test Equipment

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

Table 23 Dwell Time Results

Mode	Number of Channels	Maximum Time Allowed in 20s.	Measured Dwell Time in 20s.
TX Hopping Low Channel	50	0.400s	170.85mS

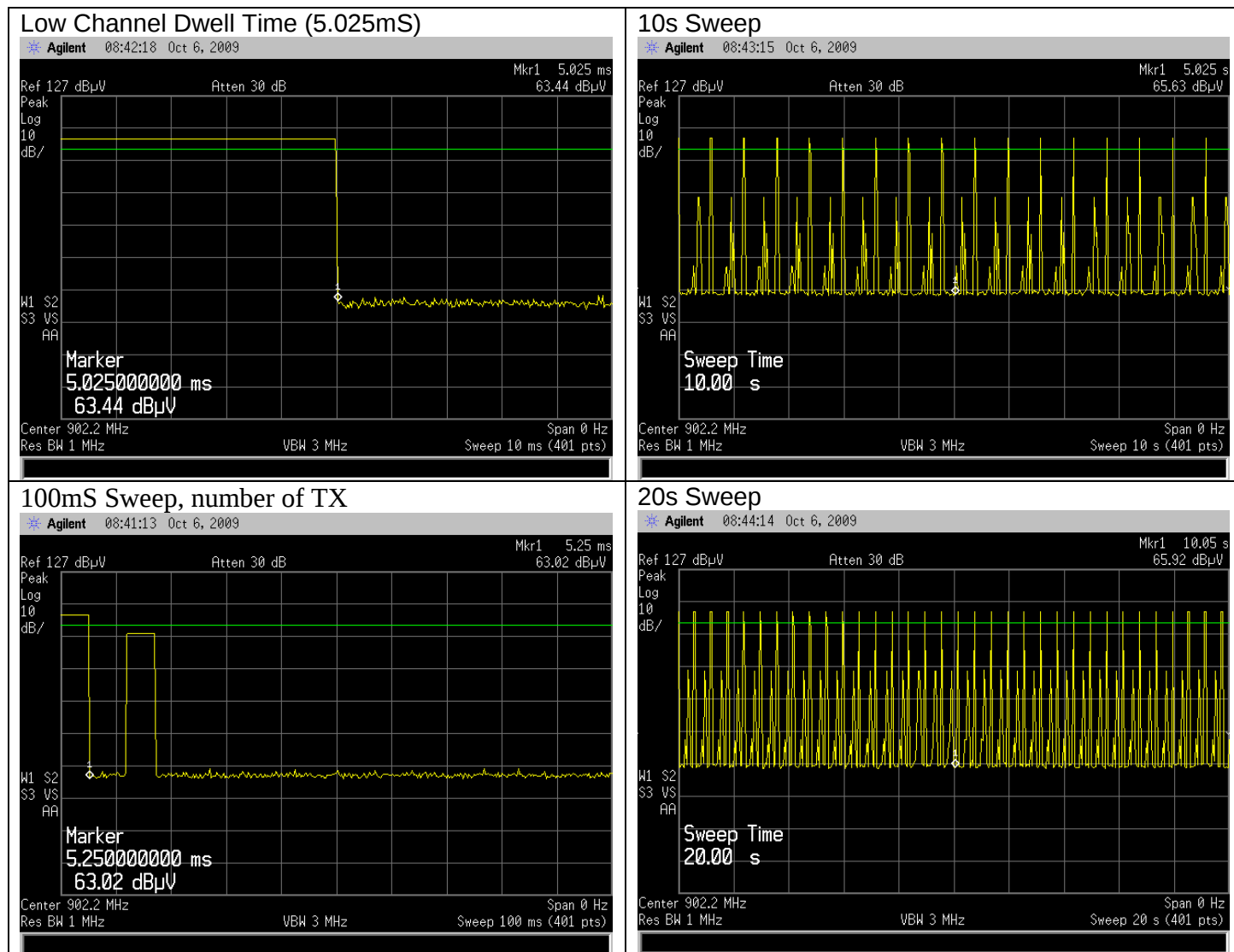
Table 24 Duty Cycle Correction Factor

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	5.025mS	-26dB

Figure 17 Test Setup for Dwell Time



Figure 18 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: 170.85ms 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 25 20dB Bandwidth Configuration Settings

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

Table 26 20dB Bandwidth Test Equipment

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

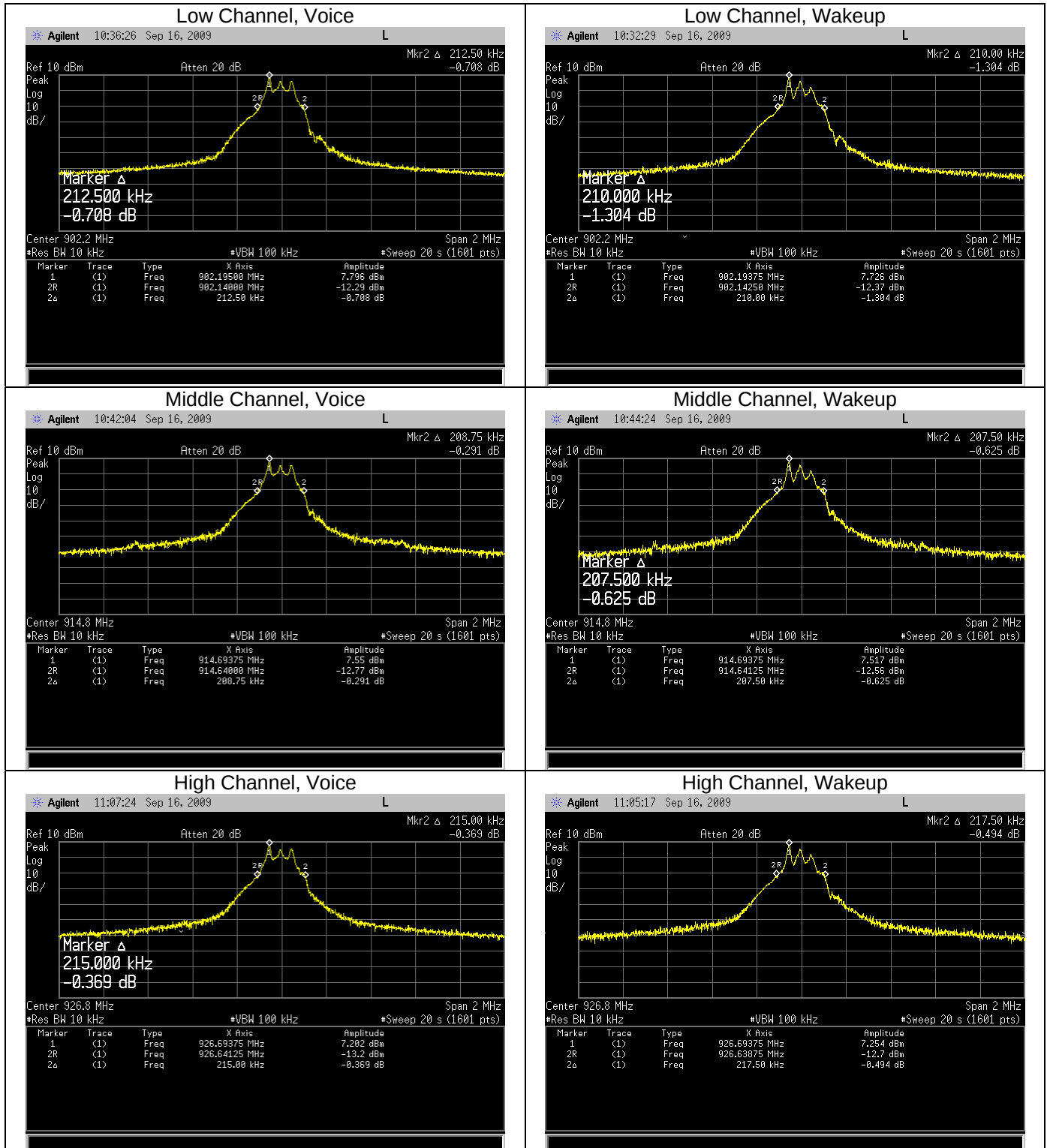
Table 27 20dB Bandwidth Results

Mode	Channel	20dB Bandwidth	
		Voice	Wakeup
TX	Low	212.50kHz	210.00kHz
	Middle	208.75kHz	207.50kHz
	High	215.00kHz	217.50kHz

Test Setup for 20dB Bandwidth



Figure 19 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 28 Maximum Peak Output Power EUT Configuration Settings

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

Table 29 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 30 Maximum Peak Output Power Results Voice

Channel	Declared Antenna Gain (dBi)	Limit (dBm)	Power dBm	Power W
Low Channel	5.14	30	18.00	0.0631
Middle Channel	5.14	30	17.79	0.0601
High Channel	5.14	30	17.48	0.0560

Table 31 Maximum Peak Output Power Results Wakeup

Channel	Declared Antenna Gain (dBi)	Limit (dBm)	Power dBm	Power W
Low Channel	5.14	30	18.01	0.0632
Middle Channel	5.14	30	17.82	0.0605
High Channel	5.14	30	17.53	0.0566

Test setup for Maximum Peak Output Power



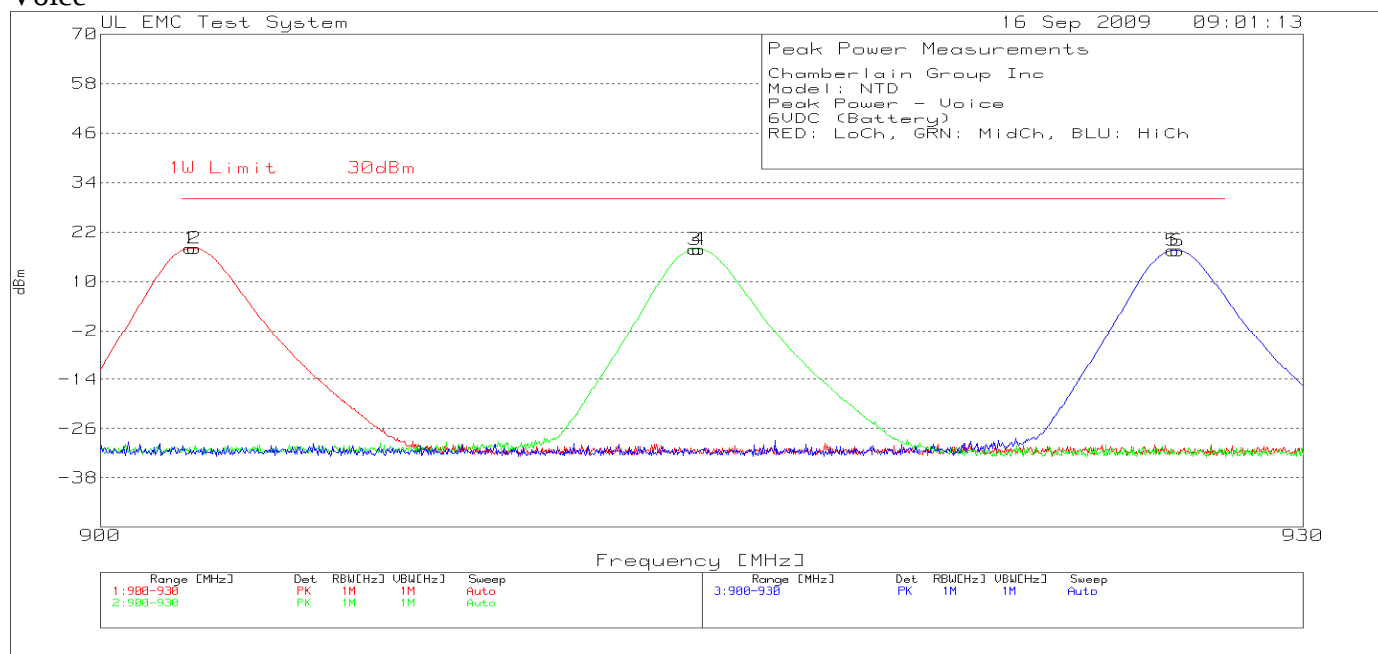
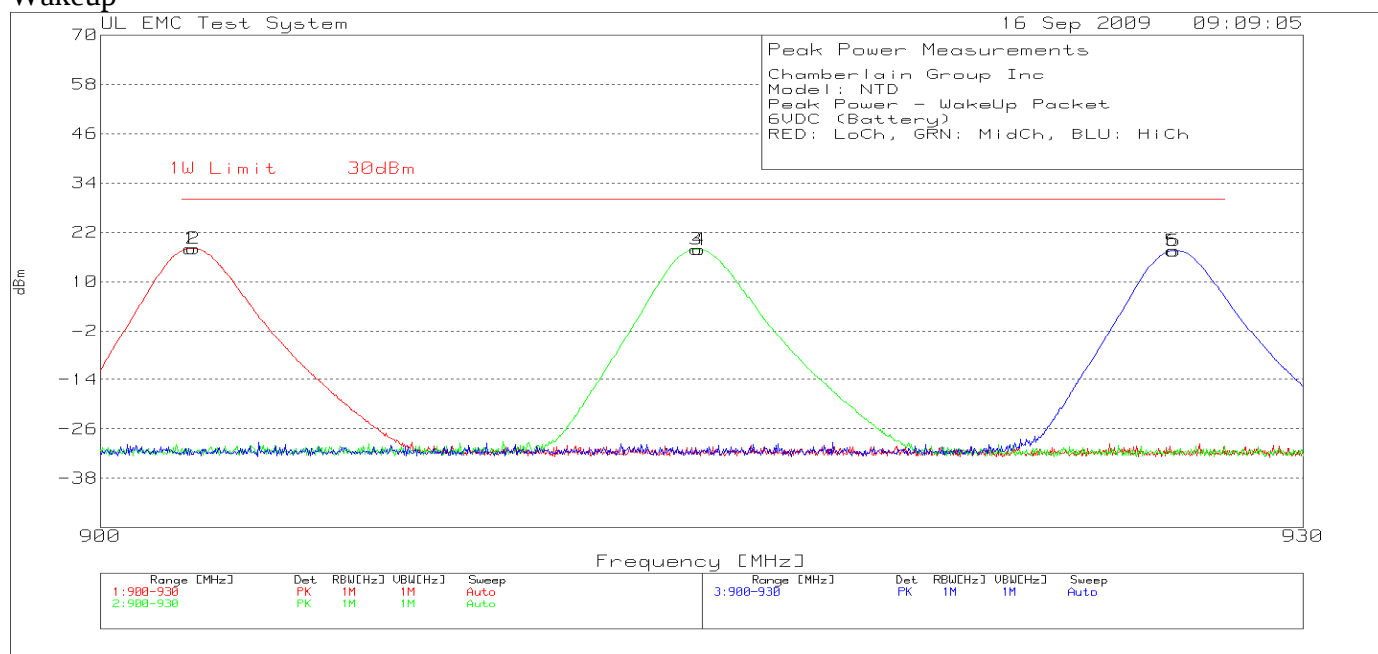
Figure 20 Maximum Peak Output Power Graph**Voice****Wakeup**

Table 32 Maximum Peak Output Power Emissions Data Points

Chamberlain Group Inc
Model: NTD
Peak Power - Voice
6VDC (Battery)
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	902.2088	114.7	pk	10.3	-107	18	30	-12
2	902.3087	114.7	pk	10.3	-107	18	30	-12
3	914.7005	114.49	pk	10.3	-107	17.79	30	-12.21
4	914.8128	114.48	pk	10.3	-107	17.78	30	-12.22
5	926.7055	114.18	pk	10.3	-107	17.48	30	-12.52
6	926.8303	114.16	pk	10.3	-107	17.46	30	-12.54

LIMIT 1: 1W Limit 30dBm

pk - Peak detector

Chamberlain Group Inc
Model: NTD
Peak Power - WakeUp Packet
6VDC (Battery)
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	114.71	pk	10.3	-107	18.01	30	-11.99
2	902.2837	114.7	pk	10.3	-107	18	30	-12
3	914.7379	114.52	pk	10.3	-107	17.82	30	-12.18
4	914.8128	114.5	pk	10.3	-107	17.8	30	-12.2
5	926.693	114.22	pk	10.3	-107	17.52	30	-12.48
6	926.7304	114.23	pk	10.3	-107	17.53	30	-12.47

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 33 20dB Bandwidth Configuration Settings

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

Table 34 20dB Bandwidth Test Equipment

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

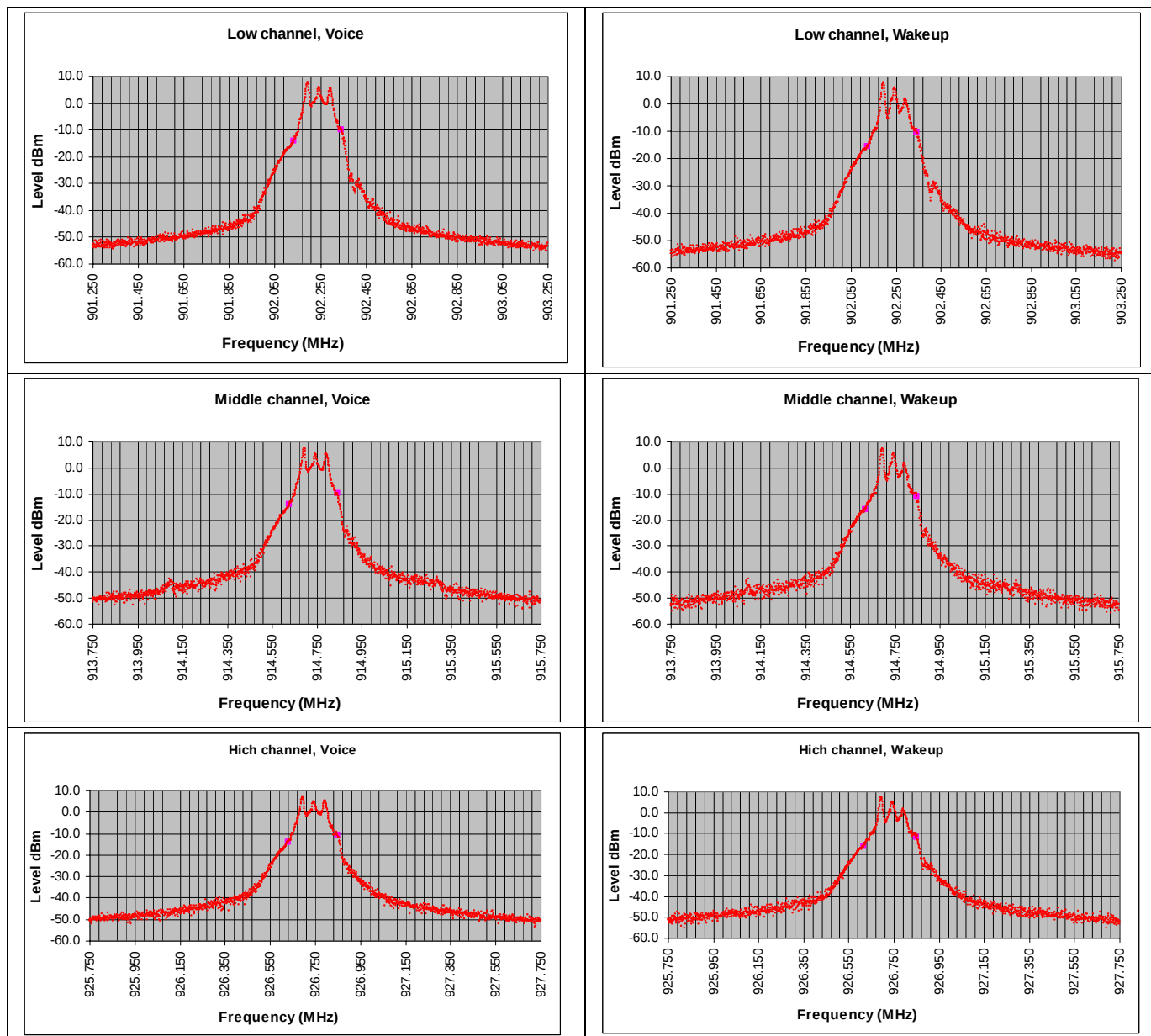
Table 35 20dB Bandwidth Results

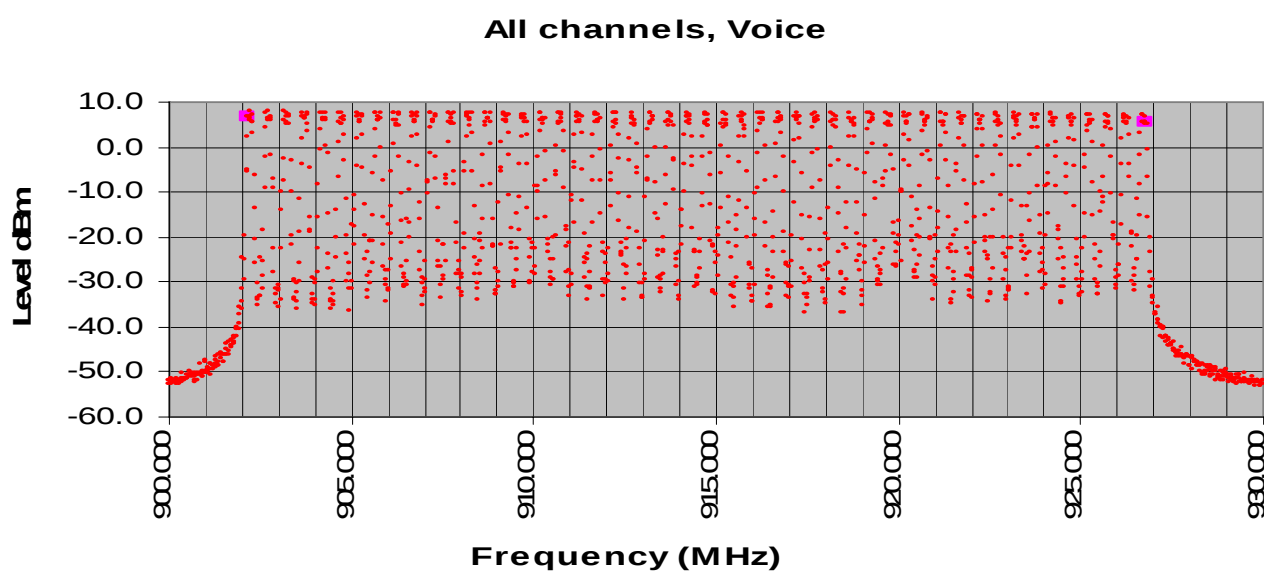
Mode	Channel	99% Power Bandwidth (kHz)	
		Voice	Wakeup
TX	Low	206.250	220.000
	Middle	213.750	227.500
	High	218.750	231.250
	All Channels Hopping	24,581.250	

Test Setup for 20dB Bandwidth



Figure 21 - 99% Power Bandwidth Plots





5.0 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

