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October 29, 2001

Chamberlain Group Inc.
Attn: Mr. Hank Sieradzki
845 Larch Ave
Elmhurst, IL 60126

UL Reference: File MC3181, Project 01NK44622

Subject: EMC Test and Measurement Report for
Model G412-315LM Super-regenerative Receiver

Dear Mr. Sieradzki:

We have provided with this letter your EMC Test Report for the above referenced model. The product was determined to comply with the requirements noted in the report.

Please review the attached report and direct any questions or comments to me. Samples were returned to your attention.

We appreciate your interest in UL's EMC Services, and encourage you to contact us in the future should you need EMC test services. This closes Project 01NK44622.

Best regards,

Reviewed by:

A handwritten signature in black ink that reads 'Bart Mucha'.

Bart Mucha (Ext 41216)
Associate Project Engineer
International EMC Services

A handwritten signature in black ink that reads 'Jack Steiner'.

Jack Steiner
Engineering Group Leader
International EMC Services

REPORT DIRECTORY

SECTION TITLE

GENERAL

- 1.0 General Product Description
- 1.1 Model Differences
- 1.2 Environmental Conditions in Test Lab
- 1.3 Calibration Details of Equipment Used for Measurement
- 1.4 EUT (Equipment Under Test) Configuration
- 1.5 EUT Operating Mode
- 1.6 Device Modifications

EMISSIONS

- 2.0 Emissions Test Regulations
 - Conducted Voltage
 - Radiated Electric Field Emissions

IMMUNITY

- 3.0 Immunity Test Regulations

CONCLUSION

- 4.0 General Remarks
- 4.1 Summary

APPENDICIES

- A Test Setups (Photos, Diagrams and Drawings)
- B Test Data

1.0 GENERAL PRODUCT DESCRIPTION

The EUT (Equipment Under Test) was a super-regenerative receiver model: G412-315LM for use with garage door openers.

1.0.1 Equipment Mobility:

Wall, Ceiling-mount

1.0.2 Test Voltage and Frequency:

<u>Voltage (V)</u>	<u>Frequency (Hz)</u>
120	60

1.1 MODEL DIFFERENCES

Any other model(s) represented by the models tested in this investigation will be documented by the manufacturer.

1.2 ENVIRONMENTAL CONDITIONS IN TEST LAB

Temperature:	20-25 °C
Relative Humidity:	30-60% RH
Atmospheric Pressure:	860-1060 mbar

1.3 CALIBRATION OF EQUIPMENT USED FOR MEASUREMENT

All test equipment and test accessories are calibrated on a regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, 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.

1.4 EUT CONFIGURATION(s)

See Appendix A for individual set-up configuration(s). In addition to the EUT, the following peripheral devices and/or cables were connected during the measurement:

Device	Manufacturer	Model	Serial #	FCC ID
Super – regenerative Receiver	Chamberlain	G412-315LM (PCB assembly 1A5573)	-	-
24VAC Adapter	LZR Electronics	AA-2420	-	-
GDO simulator	Chamberlain	1160LM	2912C00774	-

Cable	Manufacturer	Length	Type	Shield Type	Shield Termination
I/O	-	5M	CL2X	None	none

1.5 EUT OPERATING MODE(s)

The equipment under test was operated during the measurements under the following conditions:

The Receiver was tested in two modes:

IDLE – for Radiated Emissions and Conducted Emissions

COHERED – for Radiated Emissions Only (there was no difference in conducted emissions when compared to IDLE mode)

1.6 DEVICE MODIFICATIONS

The following modifications were necessary for compliance:

None.

2.0 EMISSIONS TEST REGULATIONS

The EUT was considered to be a Class B device.

Emissions testing was performed according to the following regulations:

47 CFR Part 15 Subpart B: 2000 + ANSI C63.4 - 1992

CONDUCTED VOLTAGE EMISSIONS

Test Location

Ground Plane (Test Station 3)

UL Procedure

3014ANBK-LPG-001

Test Instruments

Spectrum Analyzer / Quasi-peak Adapter

Advantest Model 3261A Spectrum Analyzer No. EMC4084
Model R3551 Preselector No. EMC4088

Line Impedance Stabilization Networks (LISNs)

SOLAR Model 8602-50-TS-50-N S/N 963903 No. EMC4064
SOLAR Model 8602-50-TS-50-N S/N 963904 No. EMC4065

Transient Limiter

Electro – Metrics Model: EM-7600-2 No. EMC4224

Frequency Range on each line

450 kHz to 30MHz

Test Results

The requirements are:
MET

Remarks

See App. B for complete test results.

RADIATED ELECTRIC FIELD EMISSIONS

Test Location

10 Meter Semi-Anechoic Chamber

UL Procedure

3014ANBK-LPG-002

Test Instruments

Spectrum Analyzer / Quasi-peak Adapter / Preamplifier / Preselector

Hewlett Packard Model 8566B Spectrum Analyzer

Model 85650A Quasi-peak Adapter

Miteq AM-3A-000110-N Preamp No. FCA4003, EMC4016, EMC4151

Model 85685A RF Preselector No. EMC4015

Antennas

Chase EMC Ltd., Biconical Antenna Model VBA6106A

S/N 1246

Chase EMC Ltd., Log Periodic Antenna Model UPA6108

S/N 1120

Frequency Range of Measurement

30MHz-1000MHz

Measurement Distance

10 meters

Test Results

The requirements are:

MET

Remarks

See App. B for complete test results.

3.0 IMMUNITY TEST REGULATIONS

Immunity testing was not performed per the request of the manufacturer.

4.0 GENERAL REMARKS

Sample Receipt Date : October 16, 2001

Test Dates

Start : October 18, 2001

End : October 22, 2001

4.1 SUMMARY

The requirements according to the technical regulations are:

MET

Underwriters Laboratories Inc.
333 Pfingsten Road
Northbrook, IL 60062 USA

Test Engineer:



Bart Mucha (Ext 41216)
Associate Project Engineer
International EMC Services

Reviewed by:



Jack Steiner
Engineering Group Leader
International EMC Services

APPENDIX A

PHOTOS



**Radiated Emissions
10M Chamber**



**Conducted Emissions
GP3**

APPENDIX B

TEST DATA

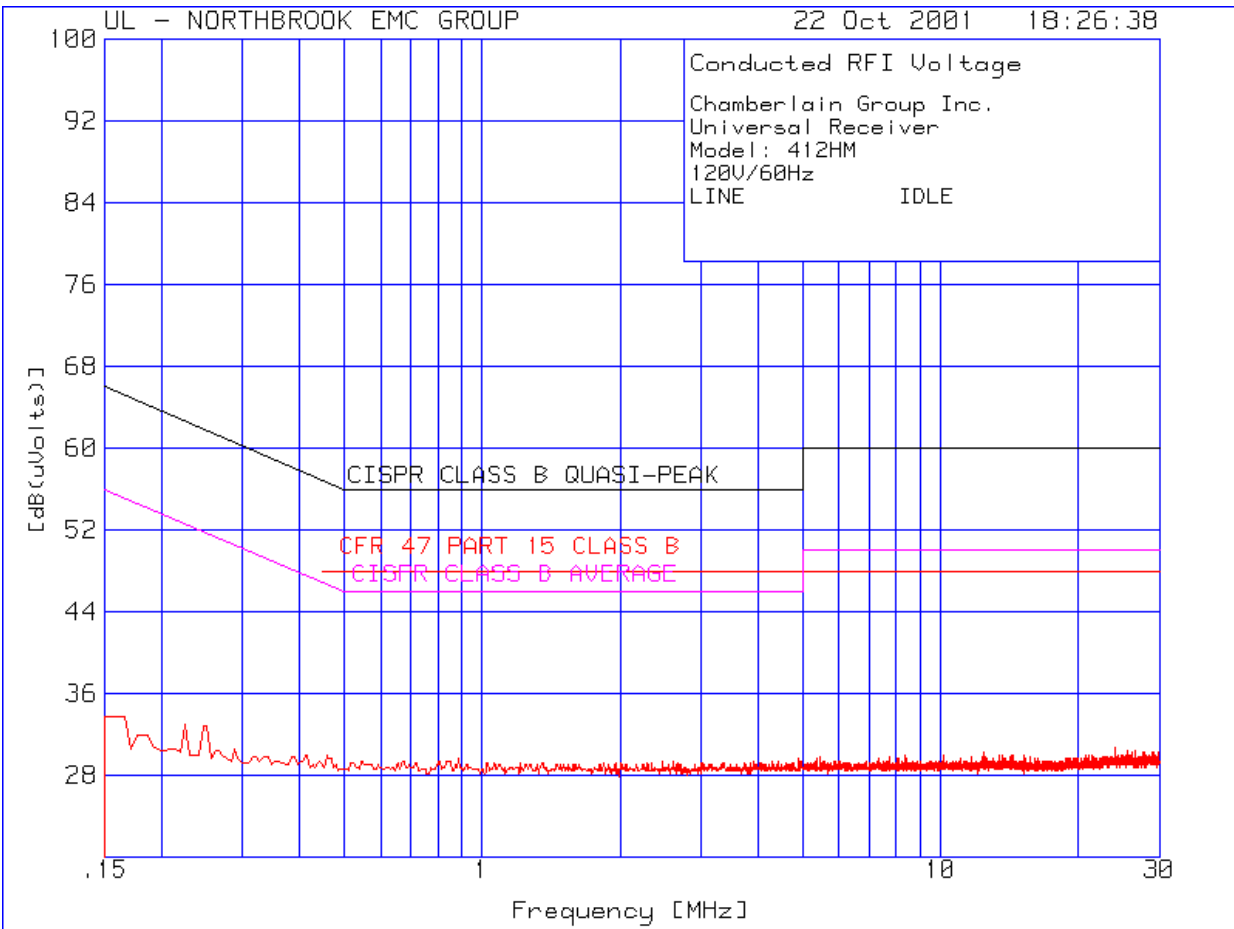
EMISSIONS

Conducted Voltage
Radiated Electric Field Emissions

UNDERWRITERS LABORATORIES INC.
Conducted Emissions

Date Tested: 22 October 2001

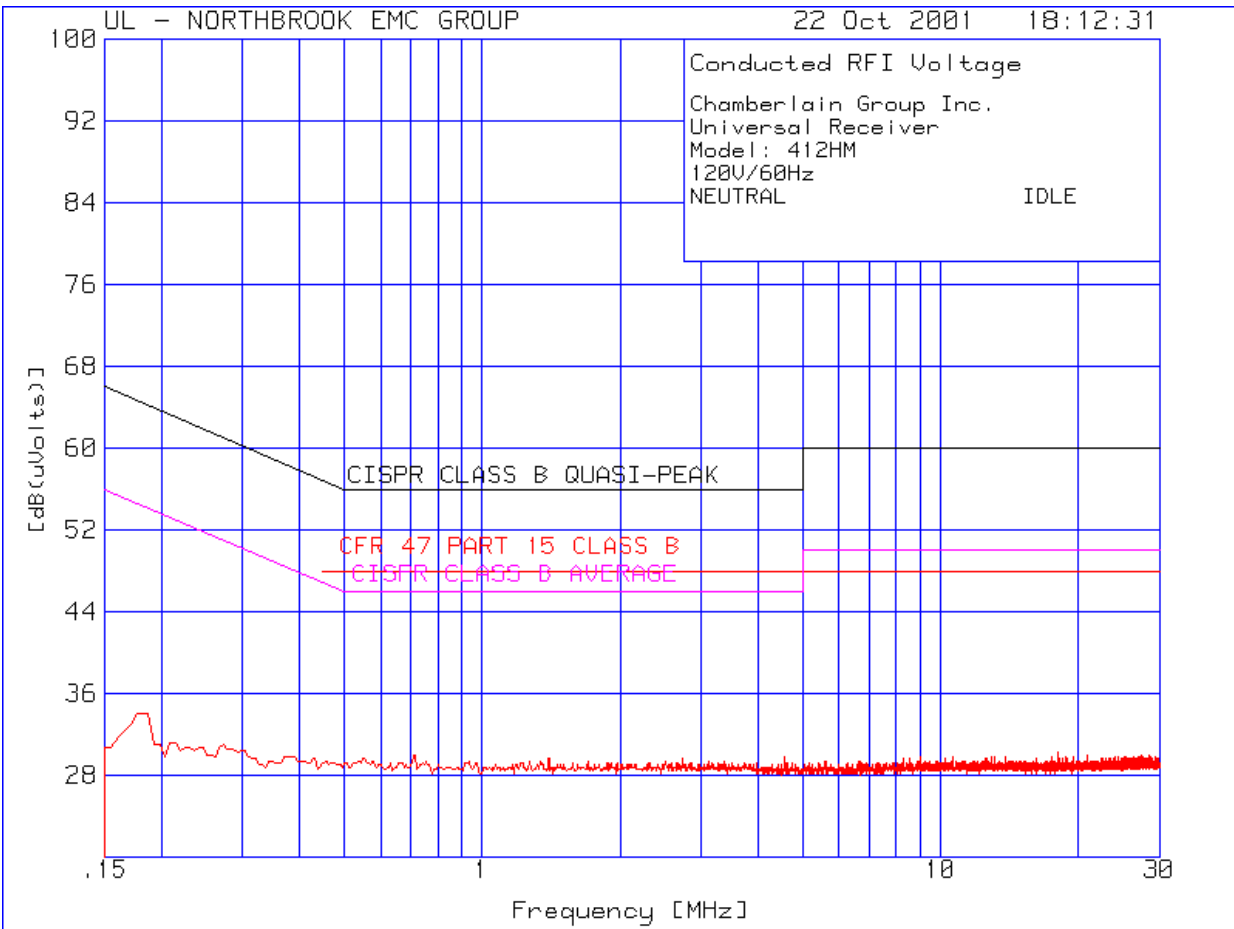
Manufacturer : Chamberlain Gropup Inc.
Equipment Under Test : G412-315LM Super-regenerative Receiver
Requirement : CFR 47 Part 15 Class B
Detection Mode : Quasi-peak (qp) or Peak (pk) or Average (ave)
Bandwidth : 200 Hz for measurements 9 kHz to 150 kHz
9 kHz for measurements 150 kHz to 30 MHz
Line : L1



UNDERWRITERS LABORATORIES INC.
Conducted Emissions

Date Tested: 22 October 2001

Manufacturer : Chamberlain Gropup Inc.
Equipment Under Test : G412-315LM Super-regenerative Receiver
Requirement : CISPR Class B
Detection Mode : Quasi-peak (qp) or Peak (pk) or Average (ave)
Bandwidth : 200 Hz for measurements 9 kHz to 150 kHz
9 kHz for measurements 150 kHz to 30 MHz
Line : L2

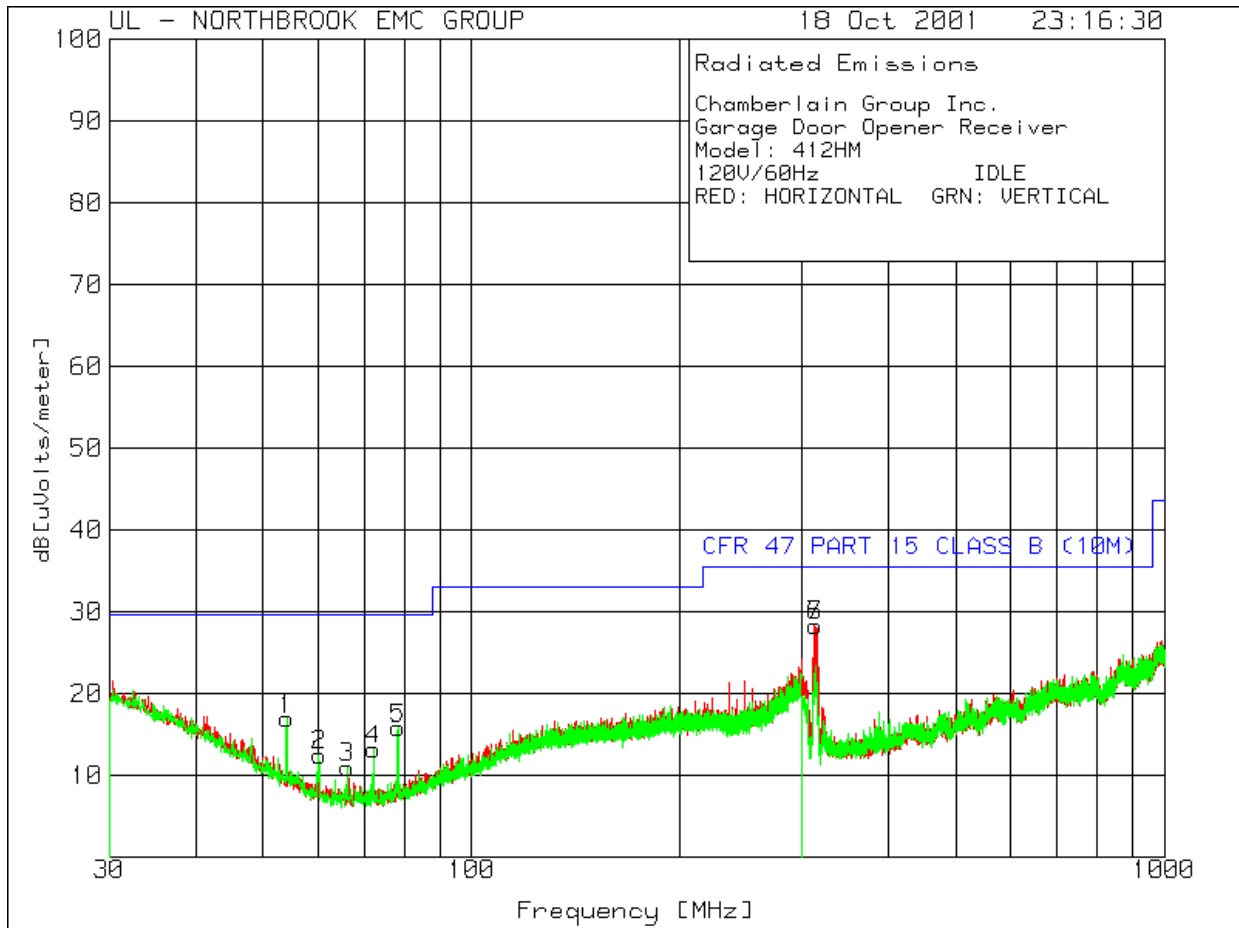


UNDERWRITERS LABORATORIES INC.
Radiated Emissions

Date Tested: 18 October 2001

Manufacturer : Chamberlain Gropup Inc.
Equipment Under Test : G412-315LM Super-regenerative Receiver
Requirement : CFR 47 Part 15 Class B
Detection Mode : Quasi-peak (qp)
Bandwidth : 120 kHz
Measurement Distance : 10 meter
Antenna Type : 30 - 300 MHz, Biconical
300 - 1000 MHz, Log-Periodic

IDLE



Chamberlain Group Inc.
Garage Door Opener Receiver
Model: 412HM
120V/60Hz IDLE
RED: HORIZONTAL GRN: VERTICAL

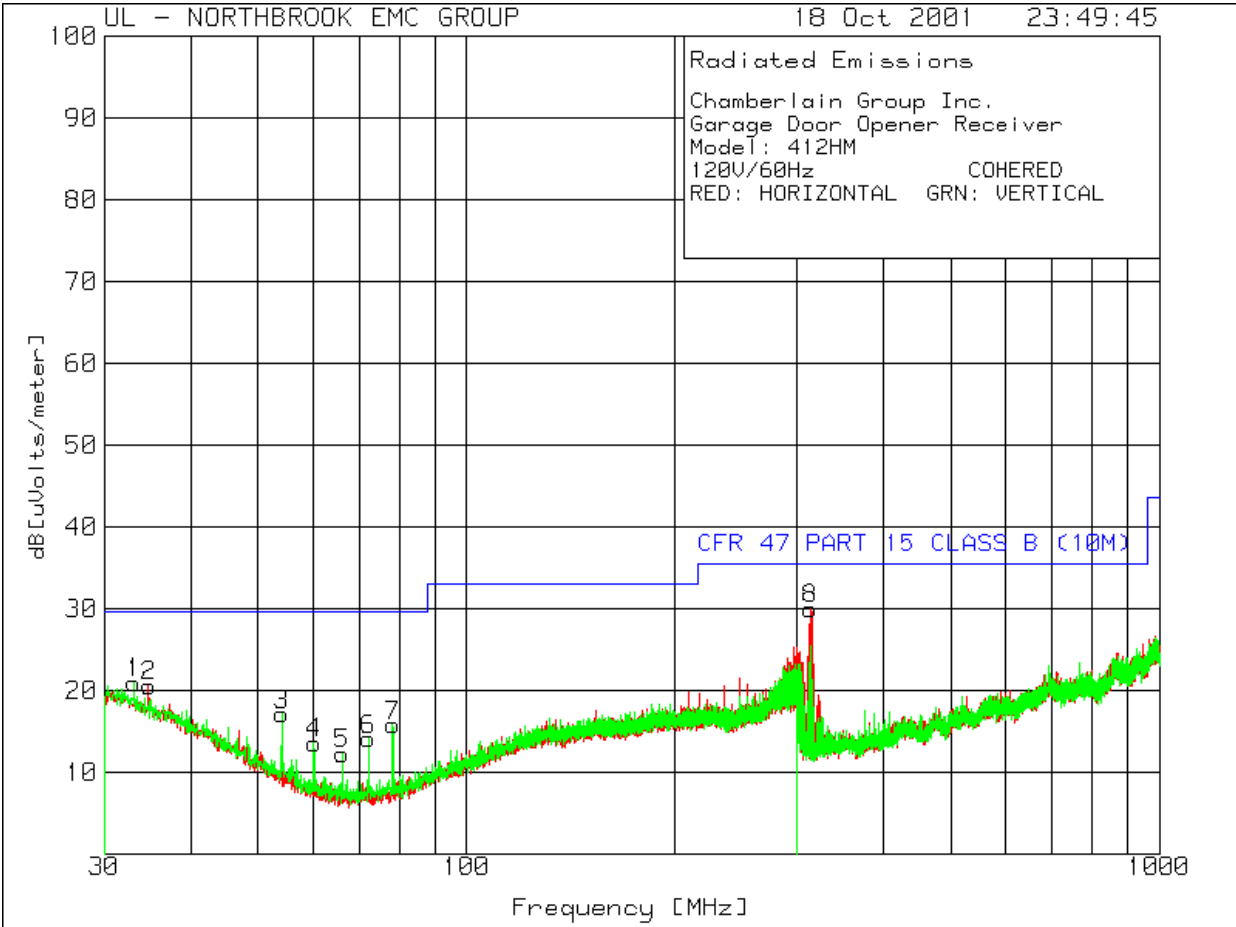
Test No.	Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3	4
1	54.0794	36.6 pk	-28.4	8.7	16.9	N/A	N/A	N/A	29.5
	Azimuth: 85	Height:101	Vert	Margin [dB]		N/A	N/A	N/A	-12.6
2	60.1499	34 pk	-28.6	7.1	12.5	N/A	N/A	N/A	29.5
	Azimuth: 239	Height:101	Vert	Margin [dB]		N/A	N/A	N/A	-17
3	66.1866	33.3 pk	-28.8	6.5	11	N/A	N/A	N/A	29.5
	Azimuth: 286	Height:101	Vert	Margin [dB]		N/A	N/A	N/A	-18.5
4	72.2233	35.5 pk	-29	6.7	13.2	N/A	N/A	N/A	29.5
	Azimuth: 0	Height:301	Vert	Margin [dB]		N/A	N/A	N/A	-16.3
5	78.2263	37.7 pk	-29.2	7.3	15.8	N/A	N/A	N/A	29.5
	Azimuth: 0	Height:301	Vert	Margin [dB]		N/A	N/A	N/A	-13.7
6	312.9403	46.7 pk	-32.8	14.4	28.3	N/A	N/A	N/A	35.6
	Azimuth: 0	Height:299	Horz	Margin [dB]		N/A	N/A	N/A	-7.3
7	312.9403	46.7 pk	-32.8	14.4	28.3	N/A	N/A	N/A	35.6
	Azimuth: 0	Height:299	Horz	Margin [dB]		N/A	N/A	N/A	-7.3

Test	Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3	4
	54.1338	35.01 qp	-28.4	8.7	15.31	N/A	N/A	N/A	29.5
	Azimuth: 196	Height:196	Vert	Margin [dB]		N/A	N/A	N/A	-14.19
	60.1477	30.44 qp	-28.6	7.1	8.94	N/A	N/A	N/A	29.5
	Azimuth: 232	Height:282	Vert	Margin [dB]		N/A	N/A	N/A	-20.56
	66.1699	30.4 qp	-28.8	6.5	8.1	N/A	N/A	N/A	29.5
	Azimuth: 150	Height:304	Vert	Margin [dB]		N/A	N/A	N/A	-21.4
	72.1848	33.68 qp	-29	6.7	11.38	N/A	N/A	N/A	29.5
	Azimuth: 102	Height:179	Vert	Margin [dB]		N/A	N/A	N/A	-18.12
	78.1983	36.49 qp	-29.2	7.3	14.59	N/A	N/A	N/A	29.5
	Azimuth: 47	Height:365	Vert	Margin [dB]		N/A	N/A	N/A	-14.91
	312.918	45.91 qp	-32.8	14.4	27.51	N/A	N/A	N/A	35.6
	Azimuth: 314	Height:281	Horz	Margin [dB]		N/A	N/A	N/A	-8.09

LIMIT 1: NONE
LIMIT 2: NONE
LIMIT 3: NONE
LIMIT 4: CFR 47 PART 15 CLASS B (10M)

pk - Peak detector
qp - Quasi-Peak detector

COHERED



Chamberlain Group Inc.
 Garage Door Opener Receiver
 Model: 412HM
 120V/60Hz COHERED
 RED: HORIZONTAL GRN: VERTICAL

Test No.	Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level Factor [dB]	Limit:1 [dB]	2	3	4
1	33.1027	30.7 pk	-27	17.3	21	N/A	N/A	N/A	29.5
	Azimuth: 37	Height:100	Vert	Margin [dB]		N/A	N/A	N/A	-8.5
2	34.7215	31.1 pk	-27.2	16.7	20.6	N/A	N/A	N/A	29.5
	Azimuth: 0	Height:301	Horz	Margin [dB]		N/A	N/A	N/A	-8.9
3	54.0794	36.8 pk	-28.4	8.7	17.1	N/A	N/A	N/A	29.5
	Azimuth: 166	Height:100	Vert	Margin [dB]		N/A	N/A	N/A	-12.4
4	60.1499	35.1 pk	-28.6	7.1	13.6	N/A	N/A	N/A	29.5
	Azimuth: 0	Height:301	Vert	Margin [dB]		N/A	N/A	N/A	-15.9
5	66.1529	34.6 pk	-28.8	6.5	12.3	N/A	N/A	N/A	29.5
	Azimuth: 0	Height:301	Vert	Margin [dB]		N/A	N/A	N/A	-17.2
6	72.1559	36.4 pk	-29	6.7	14.1	N/A	N/A	N/A	29.5
	Azimuth: 0	Height:301	Vert	Margin [dB]		N/A	N/A	N/A	-15.4
7	78.1589	37.7 pk	-29.2	7.3	15.8	N/A	N/A	N/A	29.5
	Azimuth: 0	Height:301	Vert	Margin [dB]		N/A	N/A	N/A	-13.7
8	313.8146	48.4 pk	-32.8	14.4	30	N/A	N/A	N/A	35.6
	Azimuth: 0	Height:299	Horz	Margin [dB]		N/A	N/A	N/A	-5.6

Test	Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level Factor [dB]	Limit:1 [dB]	2	3	4
	33.1331	23.12 qp	-27	17.3	13.42	N/A	N/A	N/A	29.5
	Azimuth: 152	Height:169	Vert	Margin [dB]		N/A	N/A	N/A	-16.08
	34.3695	22.78 qp	-27.1	16.8	12.48	N/A	N/A	N/A	29.5
	Azimuth: 159	Height:274	Horz	Margin [dB]		N/A	N/A	N/A	-17.02
	54.134	30.17 qp	-28.4	8.7	10.47	N/A	N/A	N/A	29.5
	Azimuth: 270	Height:273	Vert	Margin [dB]		N/A	N/A	N/A	-19.03
	60.1538	30.89 qp	-28.6	7.1	9.39	N/A	N/A	N/A	29.5
	Azimuth: 216	Height:217	Vert	Margin [dB]		N/A	N/A	N/A	-20.11
	66.1776	29.19 qp	-28.8	6.5	6.89	N/A	N/A	N/A	29.5
	Azimuth: 204	Height:240	Vert	Margin [dB]		N/A	N/A	N/A	-22.61
	72.1854	34.9 qp	-29	6.7	12.6	N/A	N/A	N/A	29.5
	Azimuth: 316	Height:359	Vert	Margin [dB]		N/A	N/A	N/A	-16.9

78.1983	37.73 qp	-29.2	7.3	15.83	N/A	N/A	N/A	29.5
Azimuth: 73	Height:388	Vert	Margin [dB]		N/A	N/A	N/A	-13.67
313.7726	48.86 qp	-32.8	14.4	30.46	N/A	N/A	N/A	35.6
Azimuth: 293	Height:284	Horz	Margin [dB]		N/A	N/A	N/A	-5.14

LIMIT 1: NONE
LIMIT 2: NONE
LIMIT 3: NONE
LIMIT 4: CFR 47 PART 15 CLASS B (10M)

pk - Peak detector
qp - Quasi-Peak detector