UL International EMC Services
333 Pfingsten Road
Northbrook, Illinois 60062-2096
(800) 873-8536
Fax No. (847) 272-8864
http://www.ul.com/emc/

October 24, 2001

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

UL Reference: File MC3181, Project 01NK44624

Subject: EMC Test and Measurement Report for
Model G535-315LM 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 01NK44624.

Best regards,

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

Reviewed by:

Jack Steiner
Engineering Group Leader
International EMC Services

EMC – TEST REPORT

Issue Date: October 24, 2001

Ö **EMISSIONS**

IMMUNITY

Test Report File No.	:	MC3181
Project No.	:	01NK44624
Model / Type	:	G535-315LM
Kind of Product	:	Super-regenerative Receiver
Applicant	:	Chamberlain Group Inc.
License Holder	:	Chamberlain Group Inc.
Address	:	845 Larch Ave
	:	Elmhurst, IL 60126
	:	
Manufacturer	:	Same as Applicant
	:	
	:	
	:	
Test Result	:	**COMPLIANT**

This report without appendices consists of 9 pages. Appendix A contains test photos, and Appendix B contains original test data. The data contained in this report reflects only the items tested in the configurations and mode of operations described. An attempt has been made to arrange the EUT, with the equipment provided, into a test configuration which maximizes the observed emissions of the EUT while simulating, as close as practical, a typical end-use installation.

Underwriters Laboratories Inc. 333 Pfingsten Rd. Northbrook, IL 60062
Fax: (847) 272-8864

REPORT DIRECTORY

SECTION TITLE

1.0 GENERAL PRODUCT DESCRIPTION

The EUT (Equipment Under Test) was a super-regenerative receiver model: G535-315LM for use with garage door openers.

1.0.1 Equipment Mobility:

Wall, Ceiling-mount

1.0.2 Test Voltage and Frequency:

Voltage (V)	Frequency (Hz)
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	G535-315LM (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 19, 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:

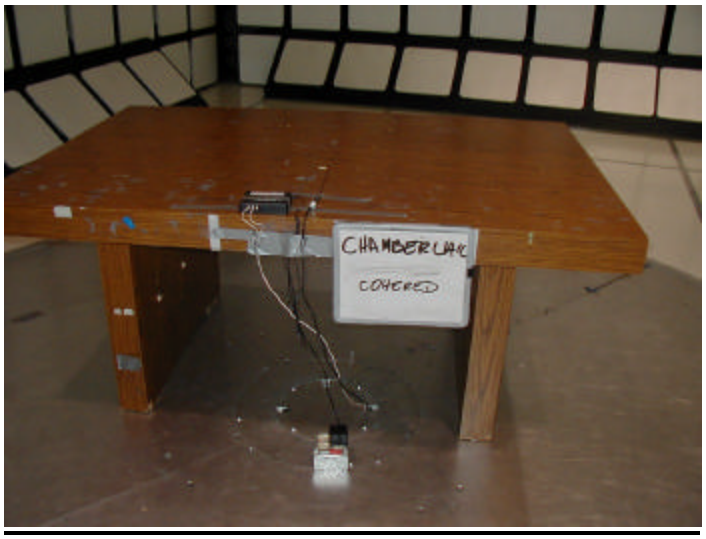
Bart Mucha (Ext 41216)
Associate Project Engineer
International EMC Services

Reviewed by:

Jack Steiner
Engineering Group Leader
International EMC Services

APPENDIX A

PHOTOS



Radiated Emissions
10M Chamber

Conducted Emissions
GP3

APPENDIX B

TEST DATA

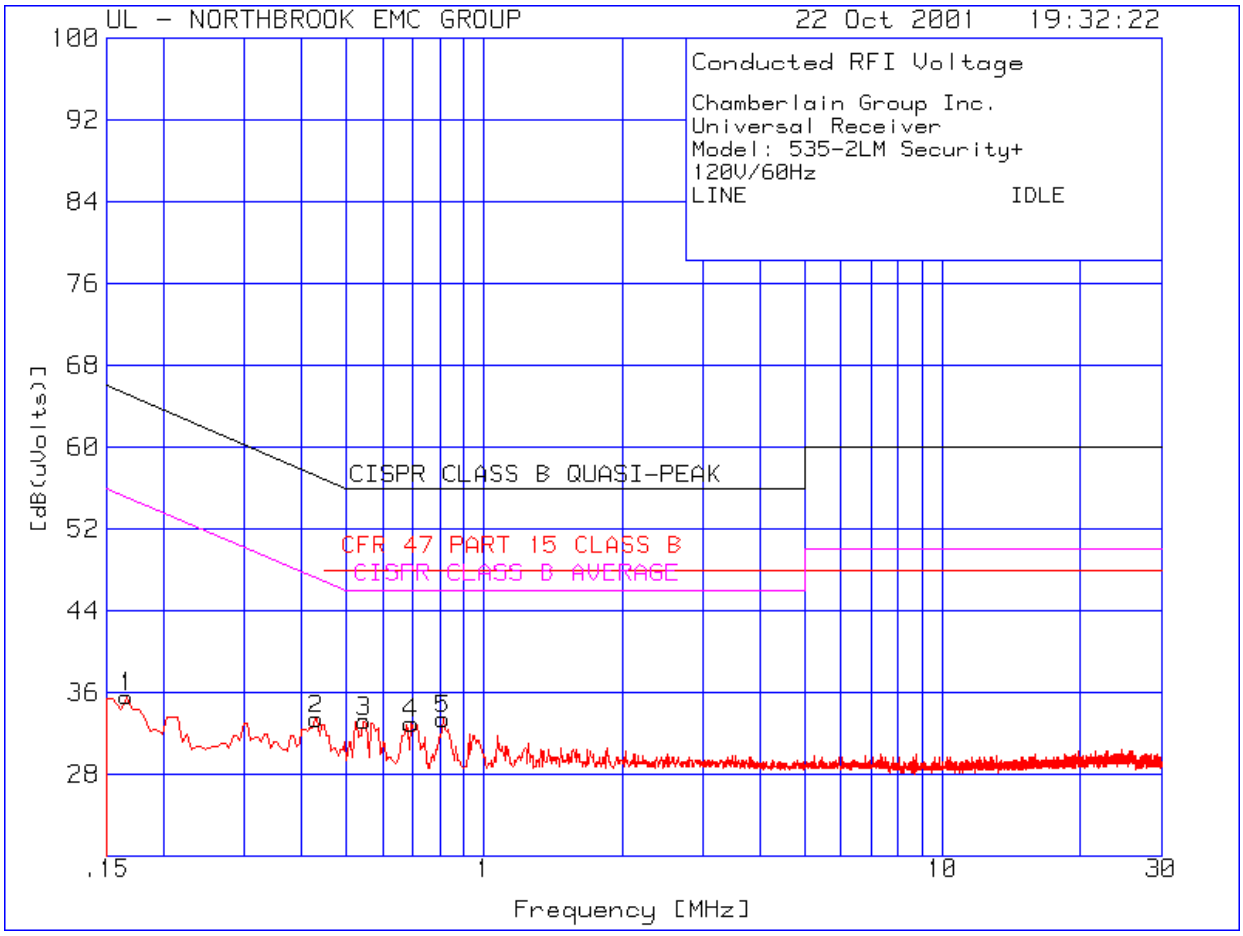
EMISSIONS

Conducted Voltage
Radiated Electric Field Emissions

UNDERWRITERS LABORATORIES INC.
Conducted Emissions

Date Tested: 22 October 2001

Manufacturer	:	**Chamberlain Gropup Inc.**
Equipment Under Test	:	**G535-315LM 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



Chamberlain Group Inc.
Universal Receiver
Model: 535-2LM Security+
120V/60Hz
LINE IDLE

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level	Limit:1	2	3	4
1	.16597	25.6 pk	0	10	35.6	N/A	N/A	65.2	55.2
Azimuth: N/A	Height: N/A				Margin [dB]	N/A	N/A	-29.6	-19.6
2	.42949	23.3 pk	.1	10	33.4	N/A	N/A	57.3	47.3
Azimuth: N/A	Height: N/A				Margin [dB]	N/A	N/A	-23.9	-13.9
3	.54662	23.1 pk	.1	10	33.2	48	N/A	56	46
Azimuth: N/A	Height: N/A				Margin [dB]	-14.8	N/A	-22.8	-12.8
4	.69302	22.9 pk	.1	10	33	48	N/A	56	46
Azimuth: N/A	Height: N/A				Margin [dB]	-15	N/A	-23	-13
5	.81546	23.3 pk	.1	10	33.4	48	N/A	56	46
Azimuth: N/A	Height: N/A				Margin [dB]	-14.6	N/A	-22.6	-12.6

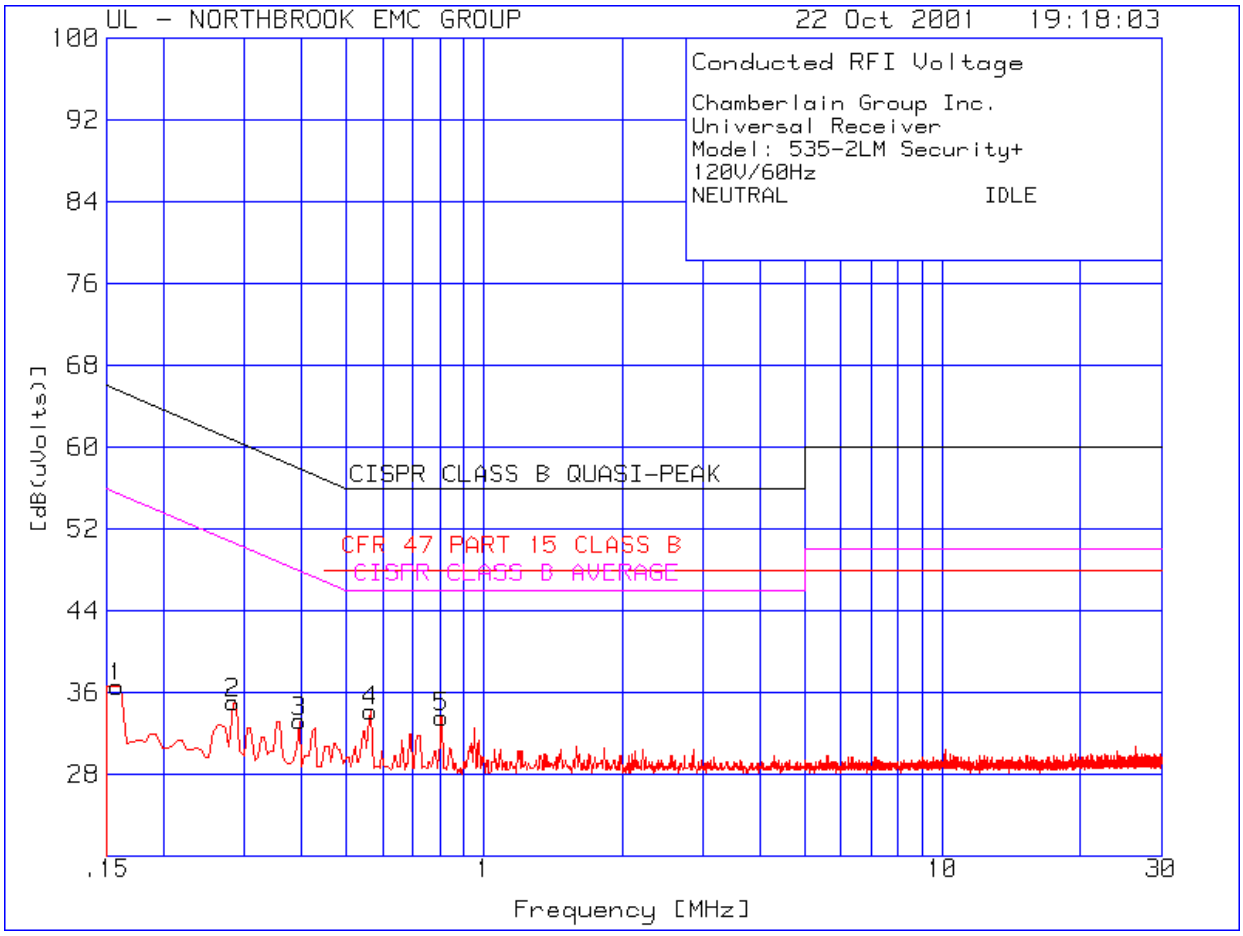
LIMIT 1: CFR 47 PART 15 CLASS B
LIMIT 2: NONE
LIMIT 3: CISPR CLASS B QUASI-PEAK
LIMIT 4: CISPR CLASS B AVERAGE

pk - Peak detector
qp - Quasi-Peak detector
av - Average detector
tm - Trace Math Result

UNDERWRITERS LABORATORIES INC.
Conducted Emissions

Date Tested: 22 October 2001

Manufacturer	:	**Chamberlain Gropup Inc.**
Equipment Under Test	:	**G535-315LM 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



Chamberlain Group Inc.
Universal Receiver
Model: 535-2LM Security+
120V/60Hz
NEUTRAL IDLE

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level Limit:1 [dB(uVolts)]	2	3	4
1	.15799	26.6 pk	0	10	36.6	N/A	N/A	65.6	55.6
Azimuth: N/A	Height: N/A			Margin [dB]		N/A	N/A	-29	-19
2	.28309	24.9 pk	.1	10	35	N/A	N/A	60.7	50.7
Azimuth: N/A	Height: N/A			Margin [dB]		N/A	N/A	-25.7	-15.7
3	.39489	23.2 pk	.1	9.9	33.2	N/A	N/A	58	48
Azimuth: N/A	Height: N/A			Margin [dB]		N/A	N/A	-24.8	-14.8
4	.56525	24.1 pk	.1	10	34.2	48	N/A	56	46
Azimuth: N/A	Height: N/A			Margin [dB]		-13.8	N/A	-21.8	-11.8
5	.80748	23.5 pk	.1	10	33.6	48	N/A	56	46
Azimuth: N/A	Height: N/A			Margin [dB]		-14.4	N/A	-22.4	-12.4

LIMIT 1: CFR 47 PART 15 CLASS B
LIMIT 2: NONE
LIMIT 3: CISPR CLASS B QUASI-PEAK
LIMIT 4: CISPR CLASS B AVERAGE

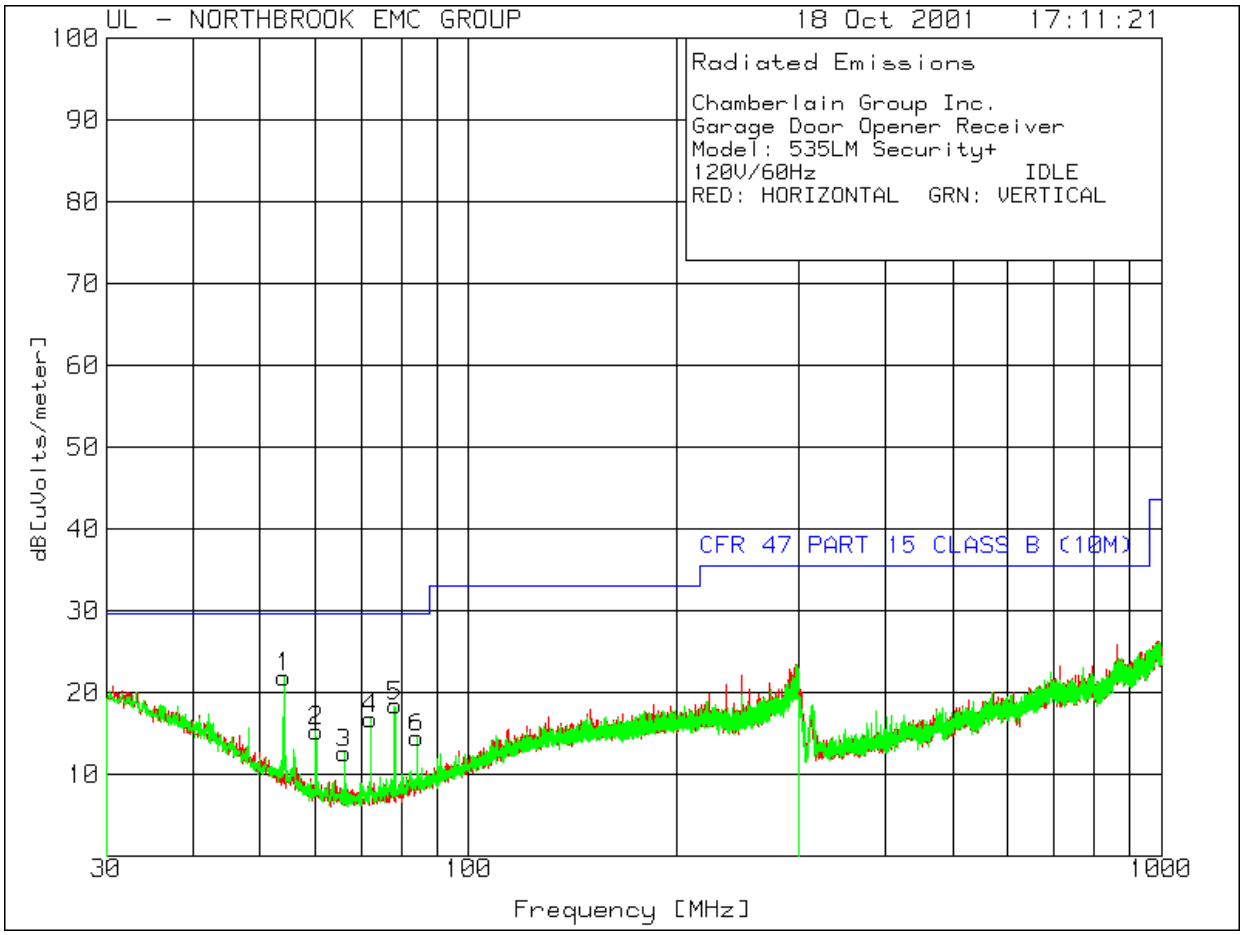
pk - Peak detector
qp - Quasi-Peak detector
av - Average detector
tm - Trace Math Result

UNDERWRITERS LABORATORIES INC.
Radiated Emissions

Date Tested: 19 October 2001

Manufacturer	:	**Chamberlain Gropup Inc.**
Equipment Under Test	:	**G535-315LM 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: 535LM Security+
120V/60Hz IDLE
RED: HORIZONTAL GRN: VERTICAL

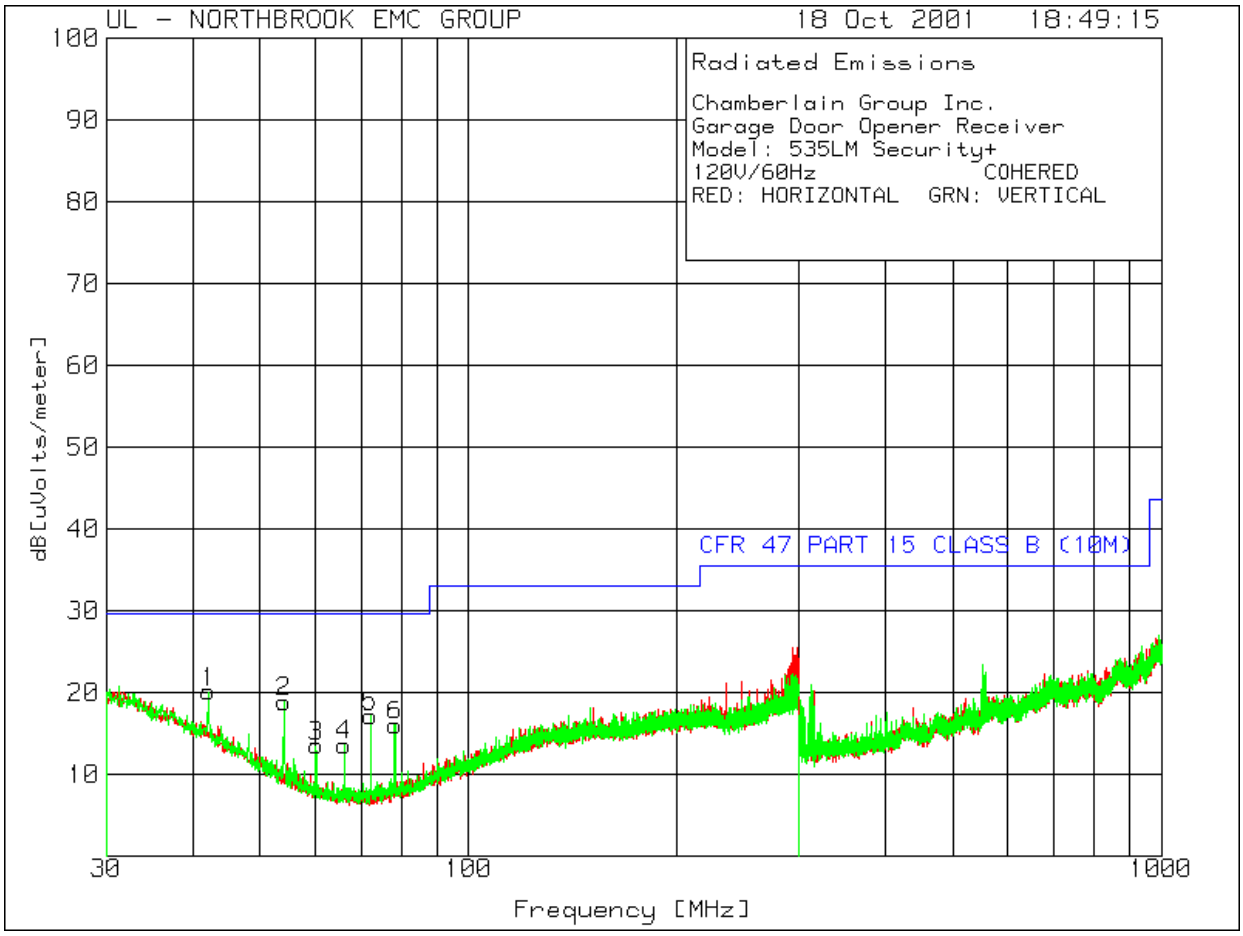
No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3	4
1	54.1469	41.6 pk	-28.4	8.7	21.9	N/A	N/A	N/A	29.5
Azimuth: 14	Height:100 Vert			Margin [dB]		N/A	N/A	N/A	-7.6
2	60.1499	36.8 pk	-28.6	7.1	15.3	N/A	N/A	N/A	29.5
Azimuth: 0	Height:301 Vert			Margin [dB]		N/A	N/A	N/A	-14.2
3	66.1529	34.9 pk	-28.8	6.5	12.6	N/A	N/A	N/A	29.5
Azimuth: 357	Height:100 Vert			Margin [dB]		N/A	N/A	N/A	-16.9
4	72.1559	39.1 pk	-29	6.7	16.8	N/A	N/A	N/A	29.5
Azimuth: 0	Height:301 Vert			Margin [dB]		N/A	N/A	N/A	-12.7
5	78.1589	40.3 pk	-29.2	7.3	18.4	N/A	N/A	N/A	29.5
Azimuth: 0	Height:301 Vert			Margin [dB]		N/A	N/A	N/A	-11.1
6	84.2968	35.5 pk	-29.3	8.3	14.5	N/A	N/A	N/A	29.5
Azimuth: 261	Height:100 Vert			Margin [dB]		N/A	N/A	N/A	-15

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3	4
54.1437	40.22 qp	-28.4	8.7	20.52	N/A	N/A	N/A	29.5
Azimuth: 156	Height:215 Vert		Margin [dB]		N/A	N/A	N/A	-8.98
60.16	34.48 qp	-28.6	7.1	12.98	N/A	N/A	N/A	29.5
Azimuth: 226	Height:199 Vert		Margin [dB]		N/A	N/A	N/A	-16.52
60.16	34.59 qp	-28.6	7.1	13.09	N/A	N/A	N/A	29.5
Azimuth: 226	Height:199 Vert		Margin [dB]		N/A	N/A	N/A	-16.41
66.1606	34.88 qp	-28.8	6.5	12.58	N/A	N/A	N/A	29.5
Azimuth: 97	Height:245 Vert		Margin [dB]		N/A	N/A	N/A	-16.92
72.1763	37.85 qp	-29	6.7	15.55	N/A	N/A	N/A	29.5
Azimuth: 58	Height:215 Vert		Margin [dB]		N/A	N/A	N/A	-13.95
78.198	39.8 qp	-29.2	7.3	17.9	N/A	N/A	N/A	29.5
Azimuth: 129	Height:174 Vert		Margin [dB]		N/A	N/A	N/A	-11.6
84.2138	34.52 qp	-29.3	8.3	13.52	N/A	N/A	N/A	29.5
Azimuth: 4	Height:208 Vert		Margin [dB]		N/A	N/A	N/A	-15.98

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


UL – NORTHBROOK EMC GROUP
18 Oct 2001 18:49:15
Radiated Emissions
Chamberlain Group Inc.
Garage Door Opener Receiver
Model: 535LM Security+
120V/60Hz COHERED
RED: HORIZONTAL GRN: VERTICAL
CFR 47 PART 15 CLASS B (10M)
dB[uVolts/meter]
Frequency [MHz]
100
90
80
70
60
50
40
30
20
10
30
100
1000

Chamberlain Group Inc.
Garage Door Opener Receiver
Model: 535LM Security+
120V/60Hz COHERED
RED: HORIZONTAL GRN: VERTICAL

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3	4
1	42.1409	34 pk	-27.7	13.8	20.1	N/A	N/A	N/A	29.5
Azimuth: 12	Height:101 Vert			Margin [dB]		N/A	N/A	N/A	-9.4
2	54.0794	38.6 pk	-28.4	8.7	18.9	N/A	N/A	N/A	29.5
Azimuth: 0	Height:301 Vert			Margin [dB]		N/A	N/A	N/A	-10.6
3	60.1499	35 pk	-28.6	7.1	13.5	N/A	N/A	N/A	29.5
Azimuth: 358	Height:101 Vert			Margin [dB]		N/A	N/A	N/A	-16
4	66.1529	35.9 pk	-28.8	6.5	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	72.1896	39.4 pk	-29	6.7	17.1	N/A	N/A	N/A	29.5
Azimuth: 0	Height:301 Vert			Margin [dB]		N/A	N/A	N/A	-12.4
6	78.1926	37.9 pk	-29.2	7.3	16	N/A	N/A	N/A	29.5
Azimuth: 0	Height:301 Vert			Margin [dB]		N/A	N/A	N/A	-13.5

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3	4
42.1046	31.55 qp	-27.7	13.8	17.65	N/A	N/A	N/A	29.5
Azimuth: 4	Height:102 Vert		Margin [dB]		N/A	N/A	N/A	-11.85
42.1036	31.78 qp	-27.7	13.8	17.88	N/A	N/A	N/A	29.5
Azimuth: 4	Height:100 Vert		Margin [dB]		N/A	N/A	N/A	-11.62
60.1506	32.34 qp	-28.6	7.1	10.84	N/A	N/A	N/A	29.5
Azimuth: 147	Height:235 Vert		Margin [dB]		N/A	N/A	N/A	-18.66
66.1678	33.47 qp	-28.8	6.5	11.17	N/A	N/A	N/A	29.5
Azimuth: 169	Height:254 Vert		Margin [dB]		N/A	N/A	N/A	-18.33
72.181	38.12 qp	-29	6.7	15.82	N/A	N/A	N/A	29.5
Azimuth: 60	Height:310 Vert		Margin [dB]		N/A	N/A	N/A	-13.68
78.1966	36.93 qp	-29.2	7.3	15.03	N/A	N/A	N/A	29.5
Azimuth: 79	Height:344 Vert		Margin [dB]		N/A	N/A	N/A	-14.47

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