



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

May 24, 2004

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

UL Reference: File MC3181, Project 04NK07835

Subject: EMC Test and Measurement Report for
Model 1A5904 BC 390MHz Billion Code Transmitter

Dear Mr. Sieradzki:

We have provided with this letter your **revised** 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.

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 04NK07835.

Best regards,

Reviewed by:

A handwritten signature in black ink, appearing to read 'Bart Mucha'.

Bart Mucha (Ext 41216)
Project Engineer
International EMC Services

A handwritten signature in black ink, appearing to read 'Jack Steiner'.

Jack Steiner
Section Manager
International EMC Services

EMC – TEST REPORT

Issue Date: March 24, 2004

Ö EMISSIONS IMMUNITY

Test Report File No. : MC3181
 Project No. : 04NK07835

Model / Type : 1A5904 BC
 Kind of Product : 390MHz Billion Code Transmitter

Applicant : Chamberlain Group Inc
 License Holder : Chamberlain Group Inc
 Address : 845 Larch Avenue
 : Elmhurst, IL 60126
 :
 Manufacturer : Same as Applicant
 :
 :
 :
 :

Test Result : COMPLIANT

This report without appendices consists of 8 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.

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

REPORT DIRECTORY

<u>SECTION</u>	<u>TITLE</u>
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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
	Radiated Electric Field Emissions

IMMUNITY

3.0	Immunity Test Regulations
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CONCLUSION

4.0	General Remarks
4.1	Summary

APPENDICIES

A	Test Setups (Photos, Diagrams and Drawings)
B	Test Data
C	Annex C (RSS-210 Form)

1.0 GENERAL PRODUCT DESCRIPTION

The Equipment Under Test (EUT) was a billion code 390MHz Transmitter

1.0.1 Equipment Mobility:

Portable

1.0.2 Test Voltage and Frequency:

<u>Voltage (V)</u>	<u>Frequency (Hz)</u>
3	DC

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
EUT	Chamberlain	1A5904BC	Sample G	HBW1899

Cable	Manufacturer	Length	Type	Shield Type	Shield Termination
None					

1.5 EUT OPERATING MODE(s)

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

Transmitting continuously.

1.6 DEVICE MODIFICATIONS

The following modifications were necessary for compliance:

None.

1.7 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 C: 2003 + ANSI C63.4 - 2000

Evaluated to: 15.231

RADIATED ELECTRIC FIELD EMISSIONSTest Location

10 Meter Semi-Anechoic Chamber

UL Procedure

3014ANBK-LPG-002

Test InstrumentsSpectrum Analyzer / Quasi-peak Adapter / Preamplifier / Preselector

Hewlett Packard Model 8566B Spectrum Analyzer

Model 85650A Quasi-peak Adapter

Model 85685A RF Preselector No. EMC4015

Last Cal. 1-8-04, Next Cal 1-8-05

Rhode & Schwartz Model FSEK20 Spectrum Analyzer

Last Cal. 1-8-04, Next Cal 1-8-05

Antennas

Chase EMC Ltd., Biconical Antenna Model VBA6106A

S/N 1246

Last Cal. 6-23-04, Next Cal 6-23-05

Chase EMC Ltd., Log Periodic Antenna Model UPA6108

S/N 1120

Last Cal. 6-23-04, Next Cal 6-23-05

EMCO, Horn Model 3115

S/N 8812-3032

Last Cal. 6-10-04, Next Cal 6-10-05

Frequency Range of Measurement

30MHz-4000MHz

Measurement Distance

3 meters and 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.

4.0 GENERAL REMARKS

Sample Receipt Date : March 4, 2004

Test Dates

Start : May 21, 2004

End : May 24, 2004

4.1 SUMMARY

The requirements according to the technical regulations are:

MET

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

Test Engineer:

A handwritten signature in black ink, appearing to read "Bart Mucha", written over a light blue rectangular background.

Bart Mucha (Ext 41216)
Project Engineer
International EMC Services

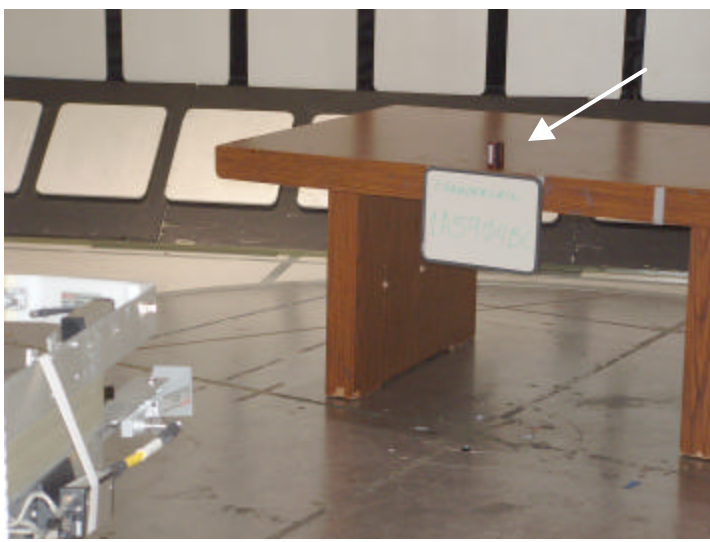
Reviewed by:

A handwritten signature in black ink, appearing to read "Jack Steiner", written over a light blue rectangular background.

Jack Steiner
Section Manager
International EMC Services

APPENDIX A

PHOTOS



**Radiated Emissions Setup
Photo**

APPENDIX B

TEST DATA

EMISSIONS

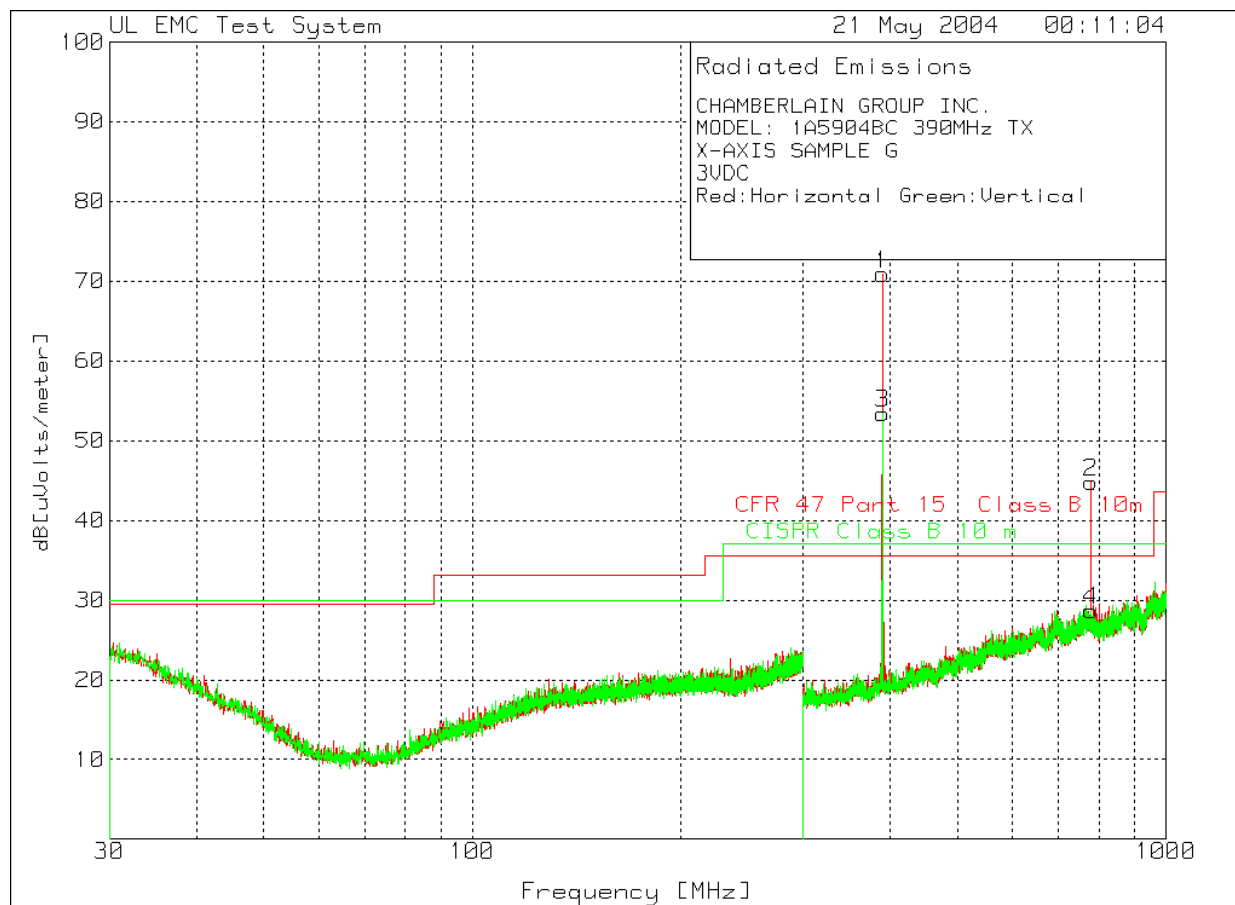
Radiated Electric Field Emissions and Occupied Bandwidth Measurements

UNDERWRITERS LABORATORIES INC.
Radiated Emissions and Occupied Bandwidth Measurement

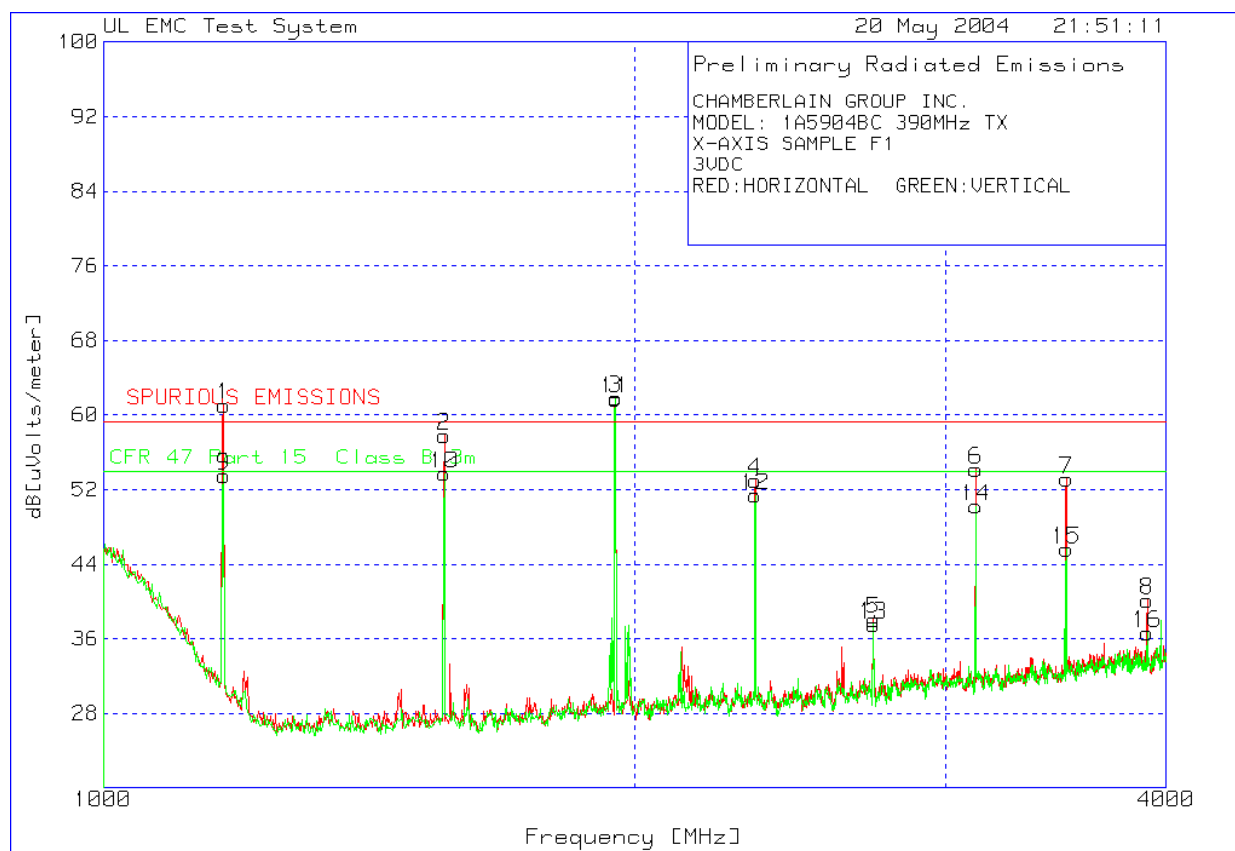
Date Tested: 21 May 2004

Manufacturer : Chamberlain Group Inc
Equipment Under Test : 1A5904 BC 390MHz Billion Code Transmitter
Requirement : 47 CFR 15.231
Detection Mode : Peak
Bandwidth : 120 kHz and 1MHz
Measurement Distance : 10 meter (below 1GHz) 3 meter (above 1GHz)
Antenna Type : 30 - 300 MHz, Biconical
 300 - 1000 MHz, Log-Periodic
 1000 - 4000 MHz, Horn

30MHz – 100MHz



1GHz – 4GHz



Measurements Below 1GHz at 10-meter distance

EUT Orientation	RX Antenna Polarity	Frequency MHz	Meater Reading dBuV	Detector	Cable Loss dB	Antenna Factor dB	Level with 6.7dB duty cycle factor dBuV/m	Limit dBuV/m	Margin	Turntable Azimuth Degrees	Antenna Height cm
X-AXIS	Horizontal	389.9431	91.78	pk	-32.5	15.8	68.38	68.75	-0.37	132	206
Y-AXIS	Vertical	389.9431	87.7	pk	-32.5	15.8	64.3	68.75	-4.45	115	100
X-AXIS	Horizontal	779.9569	56.2	pk	-31.6	22.1	40	48.75	-8.75	161	127
Y-AXIS	Vertical	779.9569	53.32	pk	-31.6	22.1	37.12	48.75	-11.63	123	226

Per the manufacturer the duty cycle factor (average value of the pulsed emission per 15.35(c)) is 6.70dB.

Per 15.231 (and RSS-210, Table 1) the 3-meter limit for intentional radiators with fundamental frequencies between 260 and 470MHz was calculated as follows:

Fundamental Limit = $((41.67 \times F) - 7083) = ((41.67 \times 390) - 7083) = 9168.3\text{uV/m} = (20\log(9168.3)) - 10.45 = \mathbf{68.75\text{dBuV/m}}$

Spurious Limit (non restricted bands) = $916.83\text{uV/m} = (20\log(916.83)) - 10.45 = \mathbf{48.75\text{dBuV/m}}$

Note – Measurements were made at 10-meters, 10.45dB correction was applied ($20\log(10\text{m}/3\text{m}) = 20\log(3.333) = 10.45\text{dB}$)

Measurements Above 1GHz at 3-meter distance

EUT Orientation	RX Antenna Polarity	Frequency MHz	Meater Reading dBuV	Detector	Cable Loss dB	Antenna Factor dB	Level with 6.7dB duty cycle factor dBuV/m	Limit dBuV/m	Margin	Turntable Azimuth Degrees	Antenna Height cm
X-AXIS	Horizontal	1170.0643	85.54	pk	-52.2	25.6	52.24	54	-1.76	225	187
X-AXIS	Vertical	1170.0643	82.72	pk	-52.2	25.6	49.42	54	-4.58	146	126
X-AXIS	Horizontal	1560.0601	88.90	pk	-55.2	26.9	53.90	54	-0.1	327	100
X-AXIS	Vertical	1560.0601	86.66	pk	-55.2	26.9	51.66	54	-2.34	80	137
X-AXIS	Horizontal	1950.0651	84.61	pk	-53.3	28.1	52.71	59.2	-6.49	97	131
X-AXIS	Vertical	1950.0651	86.43	pk	-53.3	28.1	54.53	59.2	-4.67	143	100
X-AXIS	Horizontal	2340.0762	78.62	pk	-51.7	28.7	48.92	54	-5.08	182	102
X-AXIS	Vertical	2340.0762	75.19	pk	-51.7	28.7	45.49	54	-8.51	69	120
X-AXIS	Horizontal	3120.0461	76.82	pk	-50.1	30.5	50.52	59.2	-8.68	303	172
X-AXIS	Vertical	3120.0461	70.43	pk	-50.1	30.5	44.13	59.2	-15.07	222	125
X-AXIS	Horizontal	3510.1182	71	pk	-50.5	31.3	45.1	59.2	-14.1	96	100
X-AXIS	Vertical	3510.1182	70.01	pk	-50.5	31.3	44.11	59.2	-15.09	197	219

Per the manufacturer the duty cycle factor (average value of the pulsed emission per 15.35(c)) is 6.70dB.

Per 15.231 (and RSS-210, Table 1) the 3-meter limit for intentional radiators with fundamental frequencies between 260 and 470MHz was calculated as follows:

$$\text{Fundamental Limit} = (41.67 \times F) - 7083 = (41.67 \times 390) - 7083 = 9168.3\text{uV/m} = 20\log(9168.3) = \mathbf{79.2\text{dBuV/m}}$$

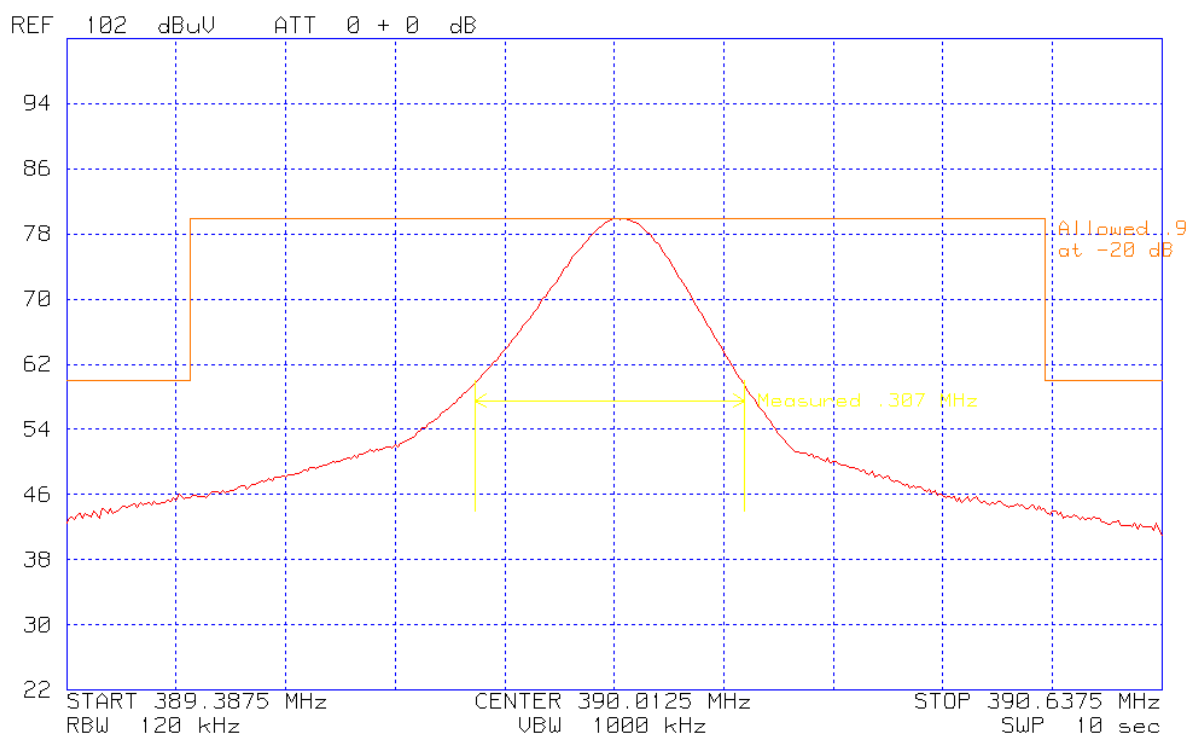
$$\text{Spurious Limit (non restricted bands)} = 916.83\text{uV/m} = 20\log(916.83) = \mathbf{59.2\text{dBuV/m}}$$

$$\text{Spurious Limit (in restricted bands)} = \mathbf{54\text{dBuV/m}}$$

UNDERWRITERS LABORATORIES INC.
Occupied (20dB) Bandwidth

Date Tested: 24 May 2004

Manufacturer : Chamberlain Group Inc
Equipment Under Test : 1A5904 BC 390MHz Billion Code Transmitter
Requirement : CFR 47 Part 15 Subpart C



Per CFR 47, Part 15 clause 15.231(c), the 20dB bandwidth shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz.

Center Frequency	Measured 20dB Bandwidth	Limit (0.25% Center)
390.000 MHz	0.307MHz	0.97495 MHz

APPENDIX C

Form RSS-210

Annex A**Summary of Test Results**

Equipment model : 1A5904 Billion Code 390MHz	Test report page or reference
Transmitter tested to RSS-210 section: 6	
Field strength 68.38 dBuV/m at a distance of 10 metres or RF power N/A watts	B4
Peak-to-average ratio 6.7 dB.	B4
Test conditions: Radiated (sections 11 & 13)	
Transmitter frequency: 390MHz	
Designation of Emission (see section 5.9.2) L1D	Specified by the manufacturer
Occupied Bandwidth (measured): 0.307MHz	B5
Frequency tuning range: Min. 390MHz Max. 390MHz	N/A
Frequency stability: N/A	
Transmitter spurious (worst case)	
Field strength 54.53dBuV/m at a distance of 3 meters	B4
Frequency: 1950.0651MHz	
Momentary operation? Yes	
Holdover time after manual release: 0.6 seconds or Duration of transmission after automatic activation: N/A seconds	Specified by the manufacturer

Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands)RSS-210

Transmitter/receiver AC wireline conducted emissions (worst case)

Transmitter: RF level N/A microvolts, frequency N/A

N/A

Receiver: RF level N/A microvolts, frequency N/A

Receiver spurious (worst case)

Field strength N/A • V/m at a distance of N/A metres

or

RF power N/A nanowatts

Frequency N/A

Attestation:

The radio device identified in this application has been subject to all the applicable test conditions specified in RSS-210 and all of the requirements of the Standard have been met.

except as noted, _____ pages attached.

Project Engineer

Title

Bart Mucha

Name(print)



Signature

24 March 2004

Date