



UL International EMC Services  
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<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 that reads 'Bart Mucha'.

Bart Mucha (Ext 41216)  
Project Engineer  
International EMC Services

A handwritten signature in black ink that reads '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 Pffingsten Rd. Northbrook, IL 60062  
 Fax: (847) 272-8864**

# 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  
                  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
- 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 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

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:



Bart Mucha (Ext 41216)  
Project Engineer  
International EMC Services

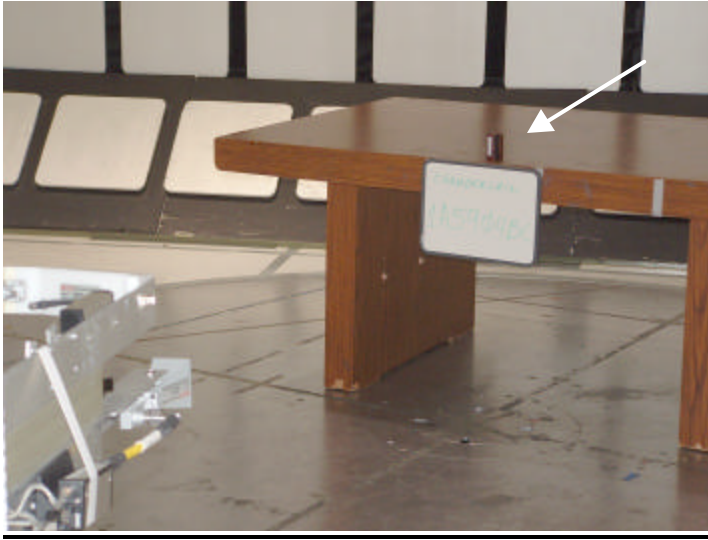
Reviewed by:



Jack Steiner  
Section Manager  
International EMC Services

**APPENDIX A**

**PHOTOS**



**Radiated Emissions Setup  
Photo**

**APPENDIX B**

**TEST DATA**

**EMISSIONS**

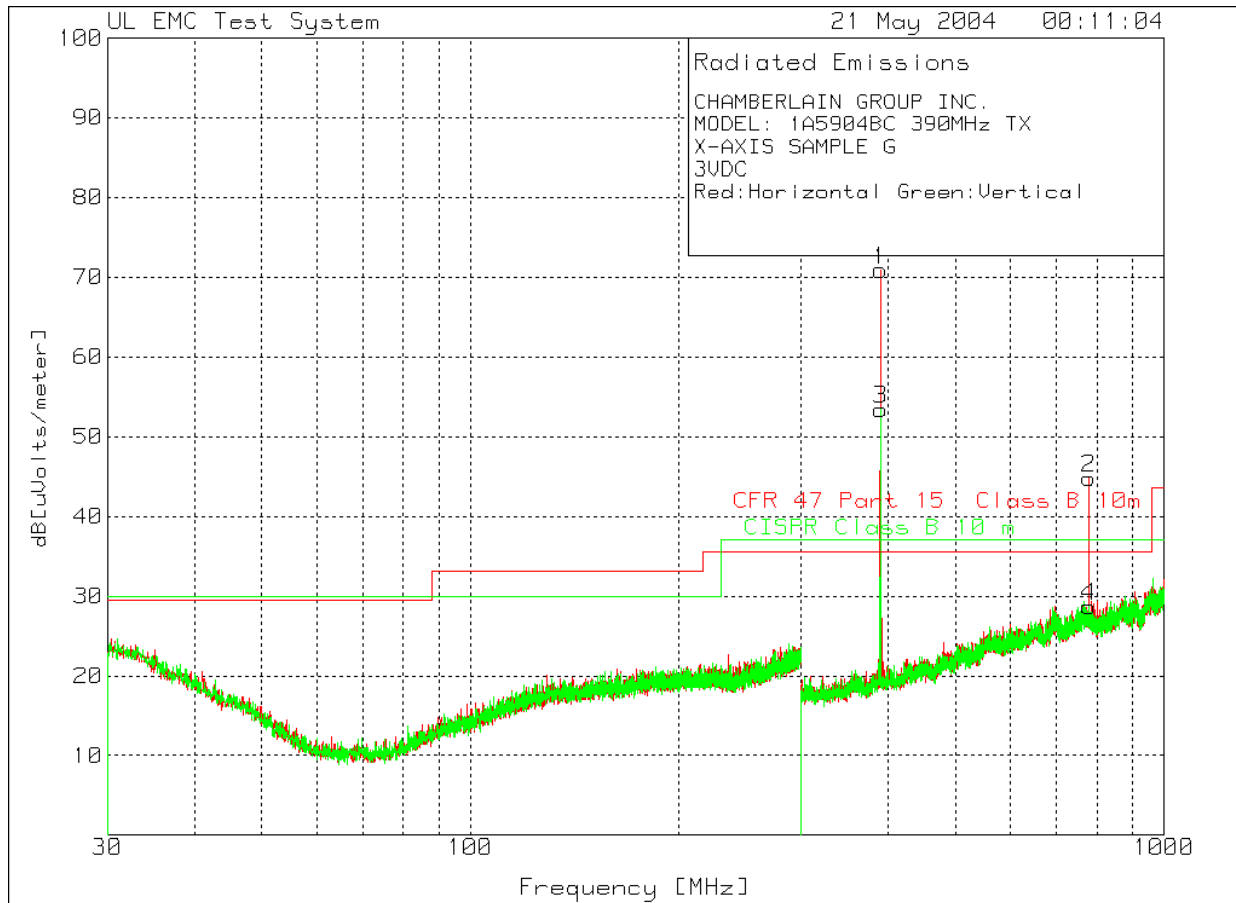
Radiated Electric Field Emissions and Occupied Bandwidth Measurements

**UNDERWRITERS LABORATORIES INC.**  
**Radiated Emissions and Occupied Bandwidth Measurement**

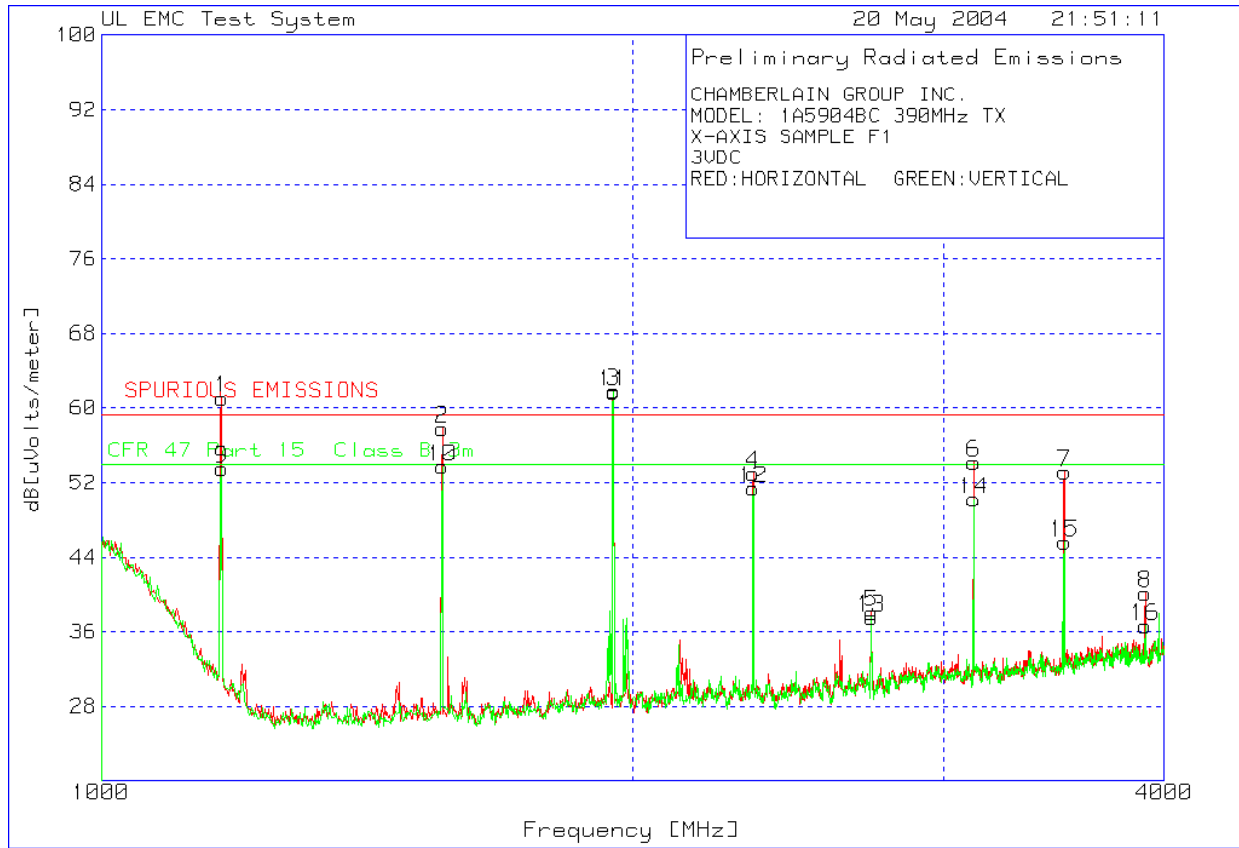
Date Tested: 21 May 2004

**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:

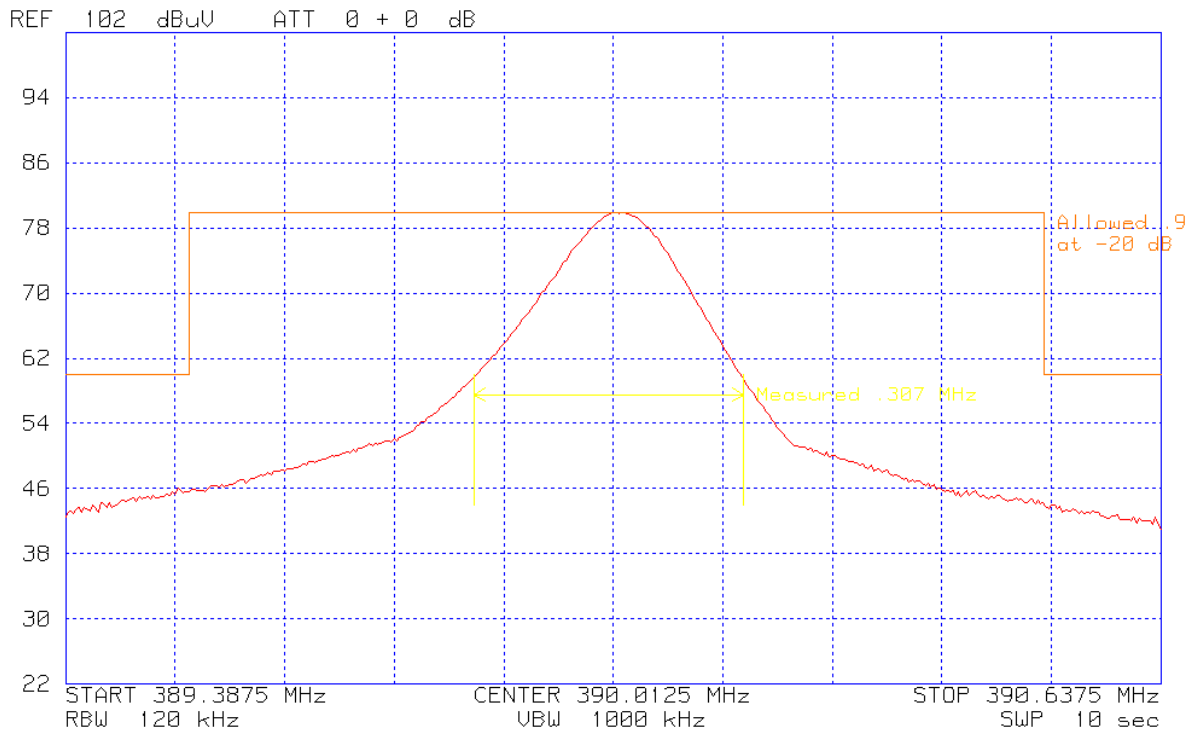
Fundamental Limit =  $(41.67 \times F) - 7083 = (41.67 \times 390) - 7083 = 9168.3\text{uV/m} = 20\log(9168.3) = \mathbf{79.2\text{dBuV/m}}$   
 Spurious Limit (non restricted bands) =  $916.83\text{uV/m} = 20\log(916.83) = \mathbf{59.2\text{dBuV/m}}$   
 Spurious Limit (in restricted bands) =  $\mathbf{54\text{dBuV/m}}$



**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
<hr/>	
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)	
<hr/>	
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	
<hr/>	
Transmitter spurious (worst case)	
Field strength 54.53dBuV/m at a distance of 3 meters	B4
Frequency: 1950.0651MHz	
<hr/>	
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
<hr/>	

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

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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

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**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