Test Report Prepared By:

Electronics Test Centre
MPB Technologies Inc.
Unit 100
302 Legget Drive
Kanata Ontario K2K 1Y5

TEST REPORT
ON

ST800 Guardian

IN ACCORDANCE WITH
FCC Pt 2, Pt. 15 Subpart B and Pt 22 (current as of April 2002),
and IC RSS-102 (1999).

MPBT Report No.: O23R2727 **Customer P.O. No.: 8971 Revised**

Test Personnel: Luc Blais
Janusz Lokaj

Prepared for:

Orion Electronics Ltd.
90 Sanford Drive
P.O. Box 2728
Windsor, NS B0N 2T0

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Client Acceptance
Authorized Signatory

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Dan Zanette
Lab Manager
Electronic Test Centre
Kanata, Ontario
Authorized Signatory

Apr. 9, 2002
Report Composition Pages 1 to 30

_____
Reviewed By

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1.0 INTRODUCTION

1.1 SCOPE

The purpose of this report is to present the findings and results of compliance testing performed, in accordance with FCC Part 2, Part 15 Subpart B and Part 22 and IC RSS-102.

1.2 APPLICANT

This test report has been prepared for Orion Electronics Ltd.

1.3 APPLICABILITY

All test procedures, limits, and results defined in this document apply to the Orion Electronics Ltd. ST800 Guardian, which shall be referred to herein as the Equipment Under Test (**EUT**).

The results contained in this report relate only to the item tested.

This report does not imply product endorsement by NVLAP or the Canadian or US governments.

1.4 TEST SAMPLE DESCRIPTION

The test sample, provided for testing was a ST800 Guardian

Production Unit

Product Type:	GPS Vehicle Locator
Serial Number:	RND Beta 6-6333 ESN 20600440322
Model Number:	ST800
Cables:	10ft Power Cable, 6ft RS-232 cable
Power Requirements:	12VDC, 0.5A
Peripheral Equipment:	None

1.5 GENERAL TEST CONDITIONS AND ASSUMPTIONS

The EUT was setup and exercised using the configurations, modes of operation and arrangements as defined in this report only. All inputs and outputs to and from other equipment associated with the EUT were adequately simulated.

Where relevant, the EUT was only tested using the monitoring methods and test criteria defined in this report.

All testing, unless otherwise noted, was performed under the following environmental conditions:

Temperature: 17 to 23 °C

Humidity: 45 to 75 %

Barometric Pressure: 68 to 106 kPa

1.6 SCOPE OF TESTING

Tests and evaluations were performed in accordance with ANSI 63.4 1992, CISPR 16, IC RSS102 and Health Canada Safety Code 6 (1999).

1.6.1 VARIATIONS IN TEST METHODS

There were no variations from the test procedures outlined above.

1.6.2 TEST SAMPLE MODIFICATIONS

No modifications were made to the sample.

2.0 TEST CONCLUSION

The EUT was subjected to the following tests. Compliance is designated by a **PASS;** non-compliance by a **FAIL**.

The following table summarizes the test results and details the tests performed in terms of the specification and class or level applied, the unique test sample identification, and the EUT modification state, the mode of operation, configuration and cable arrangement (if applicable).

Test Case	Test Type	Specification	Class/ Criteria	Mod State	ENG. / QUAL.	**Result**
2.1	Radiated Emissions	FCC Part 15 Subpart B	B	Typ.	Qual.	**PASS**
2.2	Emission Mask	FCC Part 22.359	N/A	Typ.	Qual.	**PASS**
2.3	Effective radiated power limits	FCC Part 22.913	Mobile	Typ.	Qual.	**PASS**
2.4	Modulation Requirements	FCC Part 22.915	Analog CDMA	Typ.	Qual.	**PASS**
2.5	Emission limitations	FCC Part 22.917	Analog CDMA	Typ.	Qual.	**PASS**
2.6	MPE	IC RSS-102 HC Safety Code 6 FCC Part 2	Non RF personnel	Typ.	Qual.	**EXEMPT**

STATEMENT OF COMPLIANCE

The client equipment referred to in this report was found to comply with the requirements as stated above

ABBREVIATIONS

CE - Conducted Emissions
CS-Conducted Susceptibility(Immunity)
ESD - Electrostatic Discharge
EFT - Electrical Fast Transient Burst
E-Field - Electric Field
H-Field - Magnetic Field
N/T - Not Tested
N/A - Not Applicable
RE - Radiated Emissions
RS- Radiated Susceptibility(Immunity)

MEASUREMENT UNCERTAINTY

The following measurement uncertainty with 95% confidence level was calculated using the methods defined in NAMAS document NIS81: May 1994.

For Radiated E-Field Emissions

Frequency = $\pm$ $1x10^{-3}$ MHz

Amplitude = $\pm$ 4.01 dB

For FM deviation measurements

= $\pm$ 1%

For RF power measurements - Spectrum Analyzer measurements are referenced to the Signal Generator

= $\pm$ 0.3dB

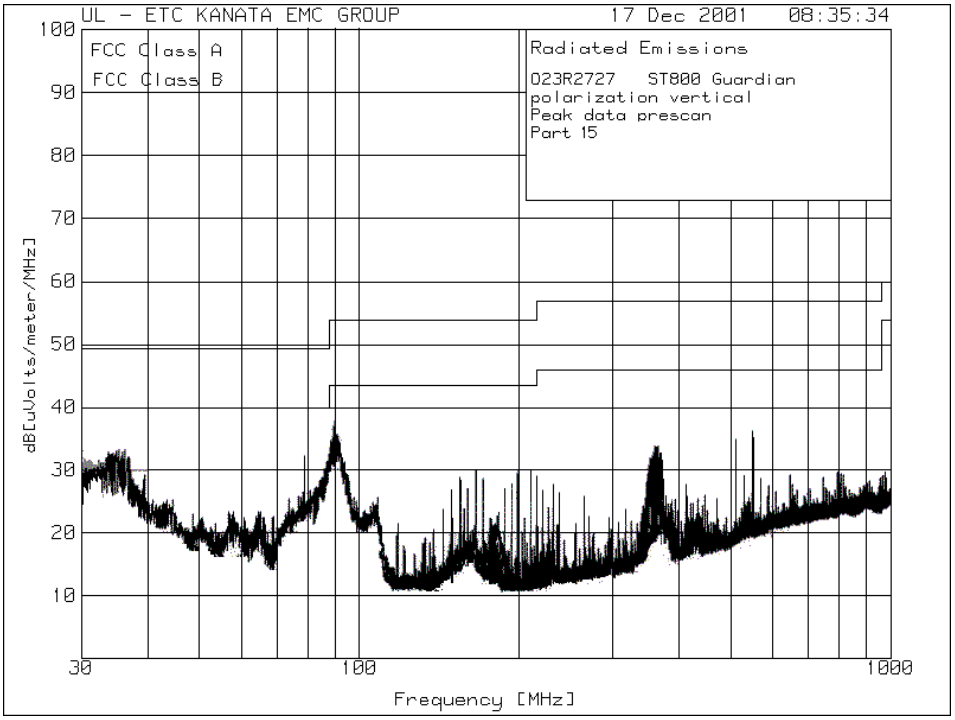
2.1 RADIATED EMISSIONS

Test Summary	
Test Personnel: Luc Blais	Test Date: Dec. 17, 2001

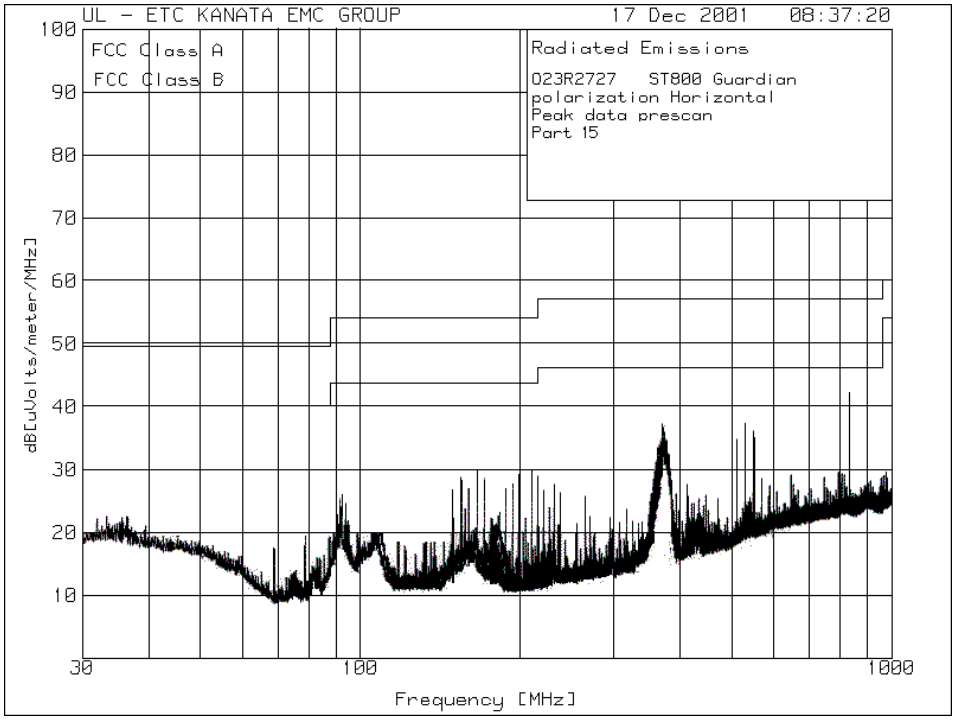
Test Description	
Objectives/Criteria	Specifications
The electric fields radiated by a system or sub-system, shall not exceed the limits for the specifications as stated. **It is recommended that a margin of 6dB be allowed for manufacturing tolerances.** **Worst case Emission** was 39.2dBµV/m @ 530.8224MHz. This is 6.8dB dB below the limit	**FCC Part 15 Subpart B** **Frequency** **Class B** @3m 30-88 MHz 40.0 88-216 MHz 43.5 216-960 MHz 46.0 > 960 MHz 54.0
Test Result Class B @ 3meters PASS	

Top Six Emissions							
Vertical				Horizontal			
Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]
78.6644	30.8	40.0	-9.2	530.8224	39.2	46.0	-6.8
90.5664	32.3	43.5	-11.2	835.558	26.7	46.0	-19.3
210.066	29.6	43.5	-13.9	358.2615	24.5	46.0	-21.5
530.8253	30.6	46.0	-15.4	91.7682	19.2	43.5	-24.3
36.4882	23.6	40.0	-16.4	369.3774	13.3	46.0	-32.7
362.047	23.7	46.0	-22.3	171.8476	7.2	43.5	-36.3

2.1.1 RADIATED EMISSIONS DATA

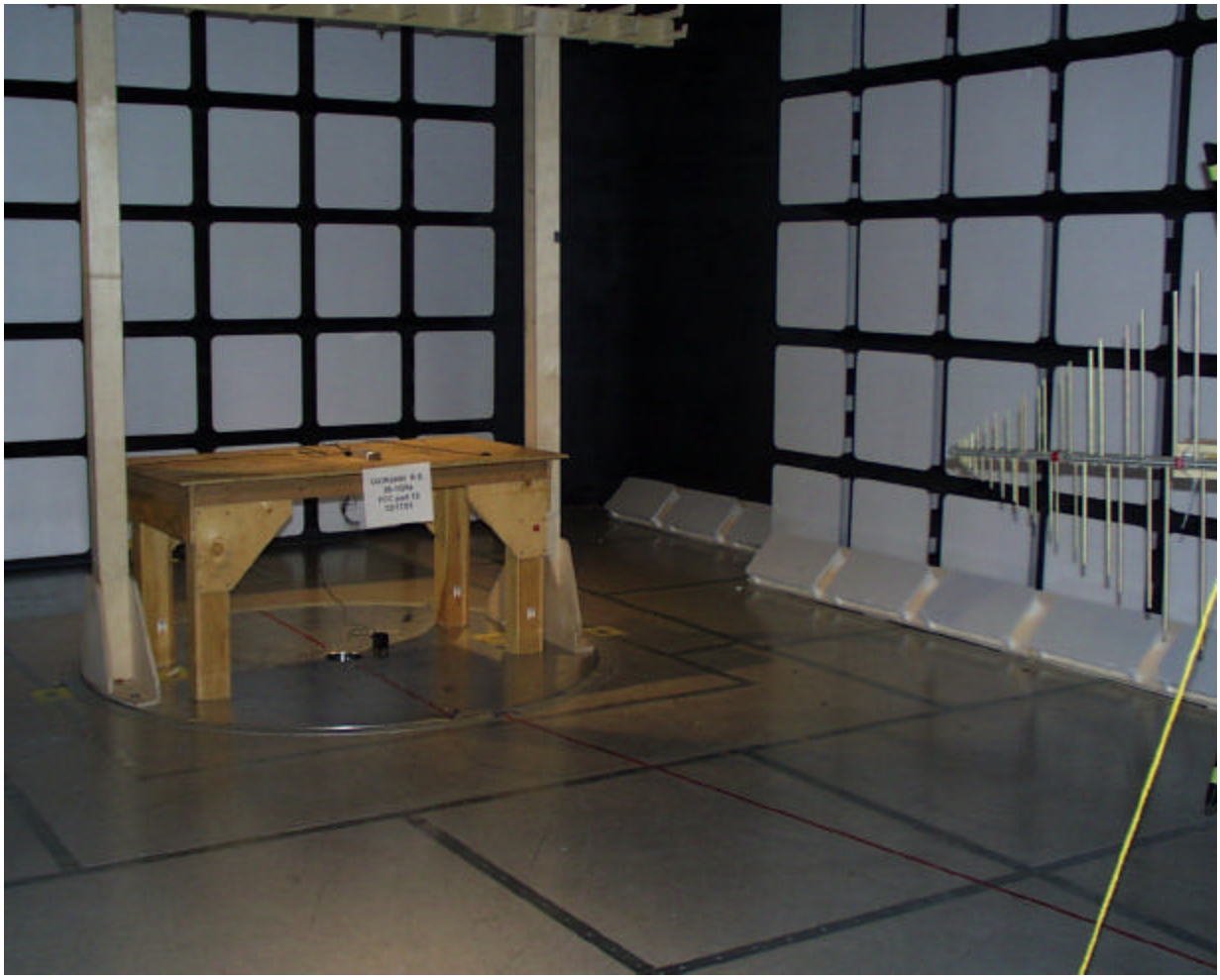


FCC Part 15 radiated emissions, vertical peak prescan



FCC Part 15 radiated emissions, horizontal peak prescan

2.1.2 RADIATED EMISSIONS SETUP



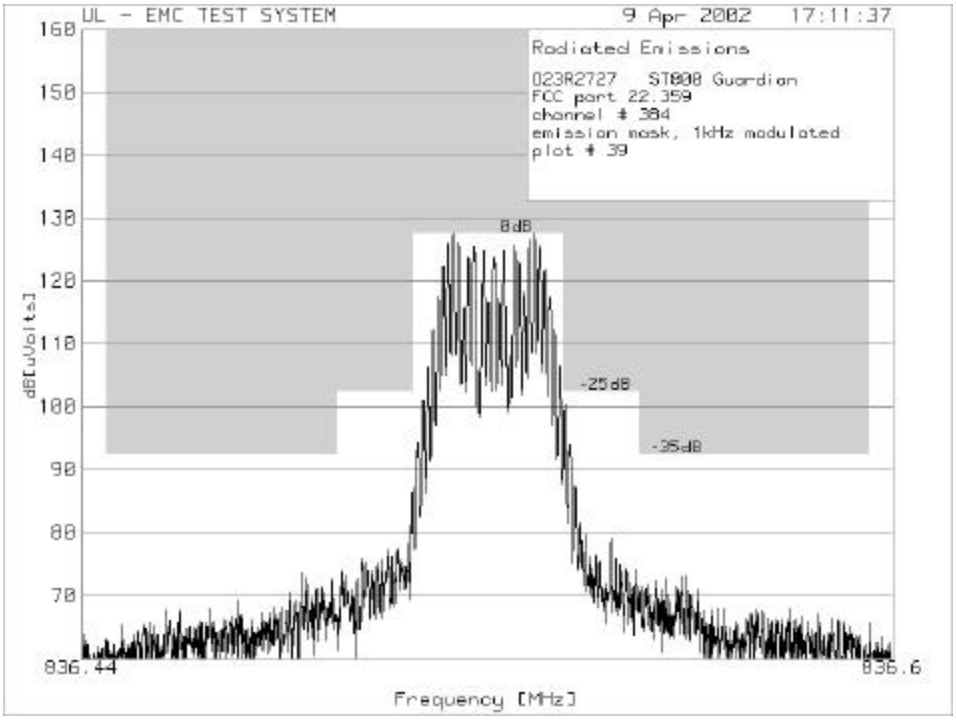
FCC Part 15 Emission setup

2.2 EMISSION MASK

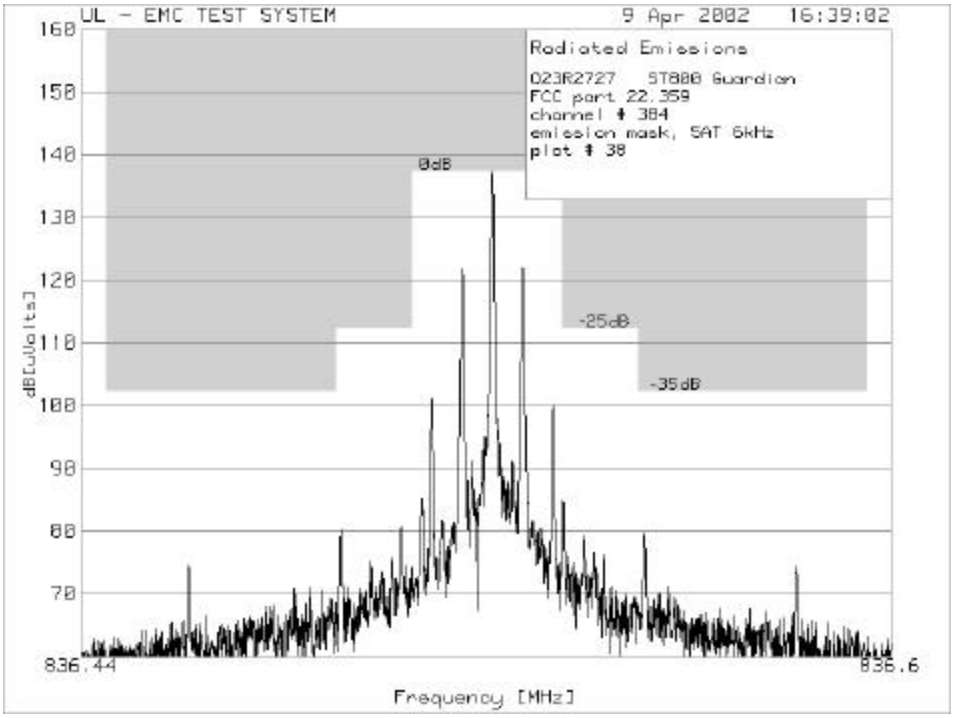
Test Summary	
Test Personnel: JANUSZ LOKAJ	Test Date: Apr. 9, 2002

Test Description	
Objectives/Criteria	Specifications
All transmitters intended for use in the Public Mobile Services must comply with the emission mask in order not to interfere with adjacent channels.	**FCC Part 22.359** Limits: 1. <-25dBc at frequencies removed by 50 to 100% of the authorized bandwidth from assigned channel frequency 2. <-35dBc at frequencies removed by 100 to 250% of the authorized bandwidth from assigned channel frequency
Test Result PASS	

2.2.1 EMISSION MASK DATA



Emission mask, channel AMPS # 384, 1kHz FM modulated, ±12kHz deviation



Emission mask, channel AMPS # 384, SAT (6kHz)

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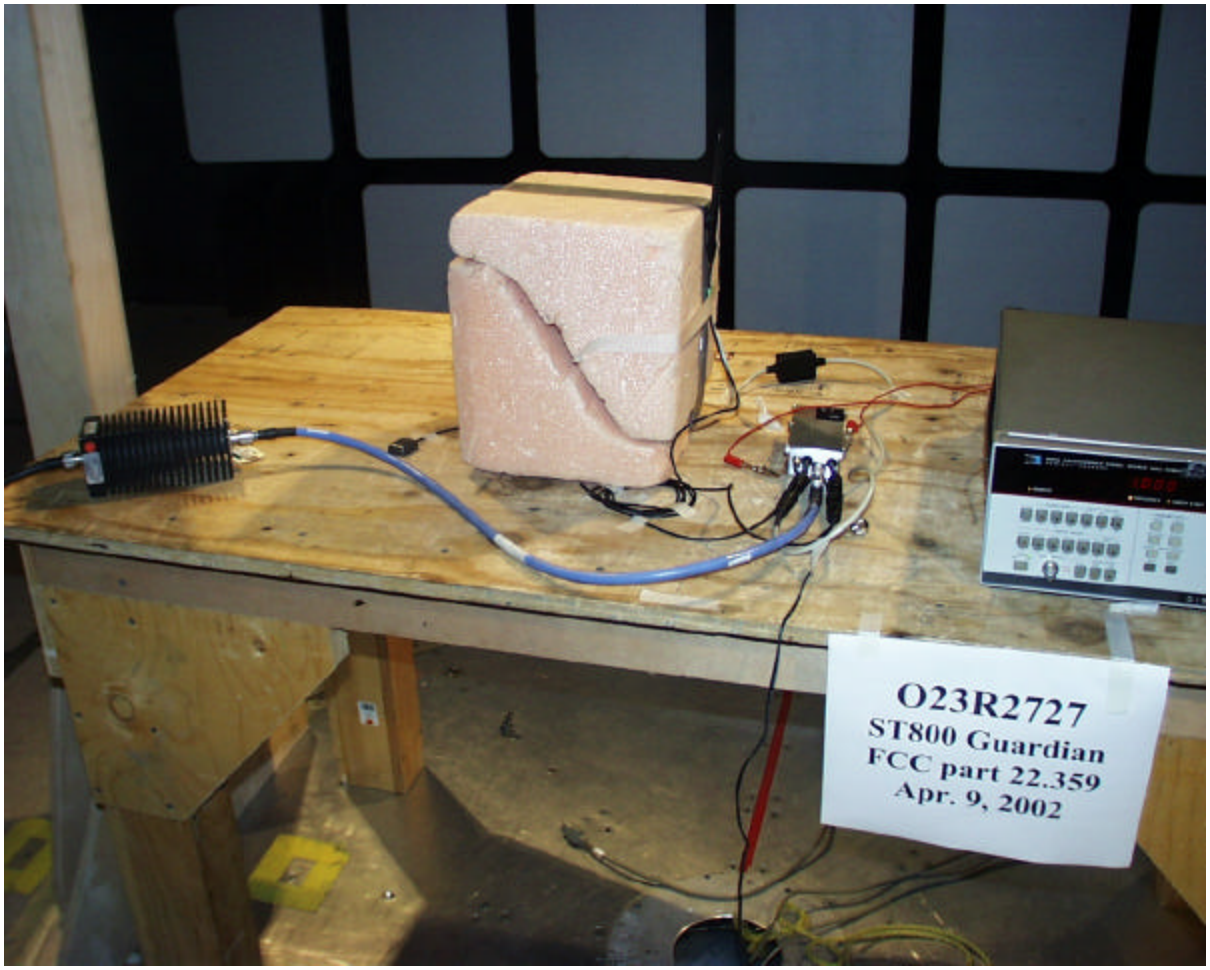
2.2.2 EMISSION MASK SETUP



FCC Part 22.359 Emission mask setup

2.3 EFFECTIVE RADIATED POWER LIMITS

Test Summary	
Test Personnel: JANUSZ LOKAJ	Test Date: Apr. 8, 2002

Test Description	
Objectives/Criteria	Specifications
The Effective Radiated Power (ERP) of transmitters in Cellular Radiotelephone Service must not exceed limits.	**FCC Part 22.913** The power limit for mobile transmitters is 7W ERP (38.45dBm).
Test Result PASS	

MODE and channel #	Frequency [MHz]	Measured Output ERP [dBm]	Limit [dBm]
AMPS #000	825.00MHz	27.6	38.4
AMPS #384	836.52MHz	30.0	38.4
AMPS #799	848.97MHz	23.9	38.4
CDMA #000	825.00MHz	30.6	38.4
CDMA #384	836.52MHz	30.8	38.4
CDMA #799	848.97MHz	24.4	38.4

Notes:
1. CDMA channels output power measured using bandwidth of 3MHz.

2.3.2 EFFECTIVE RADIATED POWER LIMITS SETUP

FCC Part 22.913 ERP measurement setup

2.4 MODULATION REQUIREMENTS

2.4.1 FM DEVIATION LIMITS

Test Summary	
Test Personnel: JANUSZ LOKAJ	Test Date: Apr. 9, 2002

Test Description	
Objectives/Criteria	Specifications
The levels of the FM deviation of all the signals must comply with the requirements to assure compatibility with network and avoid splatter into adjacent channels.	**FCC Part 22.915** FM deviation levels: Main: ± 12kHz SAT: ± 2kHz ST: ± 8kHz WBD: ± 8kHz All maintained within 10% Applies only in AMPS mode.
Test Result PASS	

Signal	Measured FM deviation [kHz]	Deviation limits [kHz]
Main	± 11.4	10.8 – 13.2
SAT	± 2.0	1.8 – 2.2
ST	± 7.5	7.2 – 8.8
Wideband data	± 8.6	7.2 – 8.8

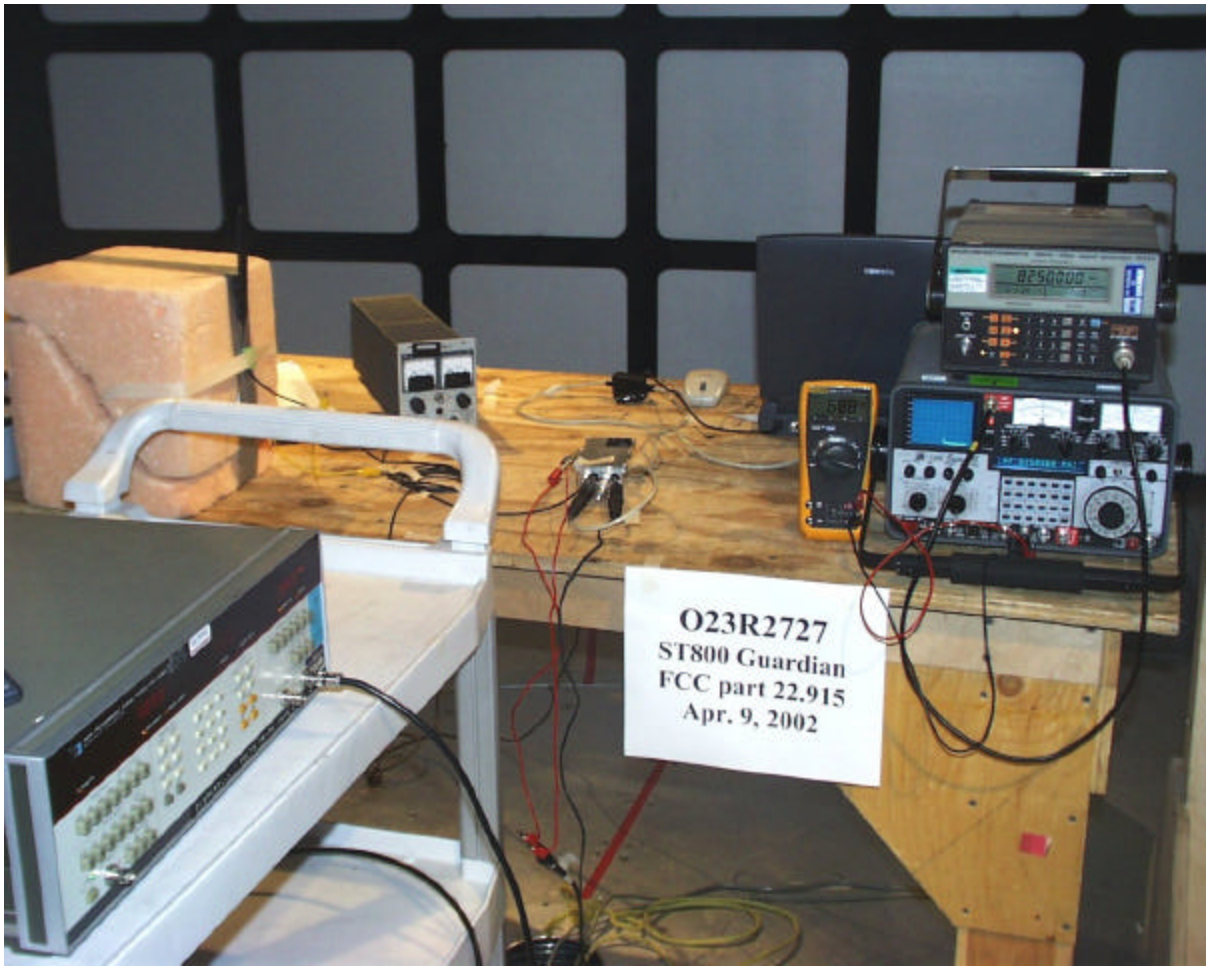
2.4.2 AUDIO FILTER CHARACTERISTICS

Test Summary	
Test Personnel: JANUSZ LOKAJ	Test Date: Apr. 9, 2002

Test Description	
Objectives/Criteria	Specifications
Radiotelephony signals applied to the modulator from the modulator limiter must be attenuated as a function of frequency.	**FCC Part 22.915** Minimum attenuation levels: 1.0kHz = 0dB (reference) 3.0kHz > 0dB 5.9kHz > 11.8dB 6.0kHz > 35dB 6.1kHz > 12.3dB 15kHz and up > 28dB
Test Result PASS	

Frequency	Measured Attenuation [dB]	Limit [dB]
1.0kHz	0 (reference)	N/A
3.0kHz	2.6	> 0
5.1kHz	> 40	>11.8
6.0kHz	> 40	>35.0
6.1kHz	> 40	> 12.3
15kHz	> 40	> 28.0
20kHz	> 40	> 28.0

2.4.3 MODULATION REQUIREMENTS SETUP



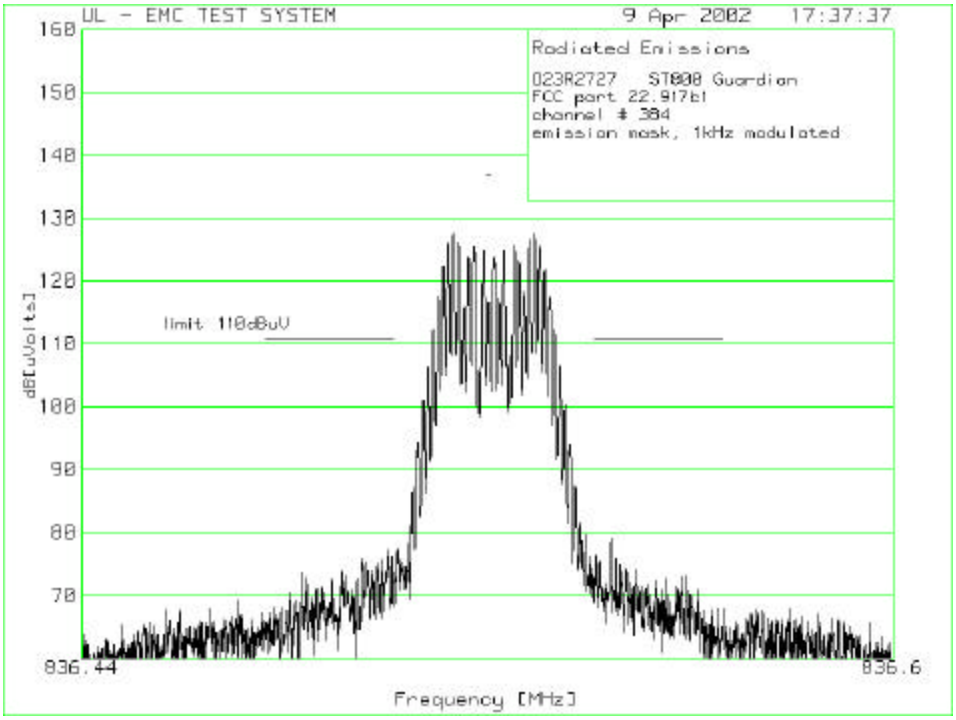
FCC Part 22.913 ERP measurement setup

2.5 EMISSION LIMITATIONS

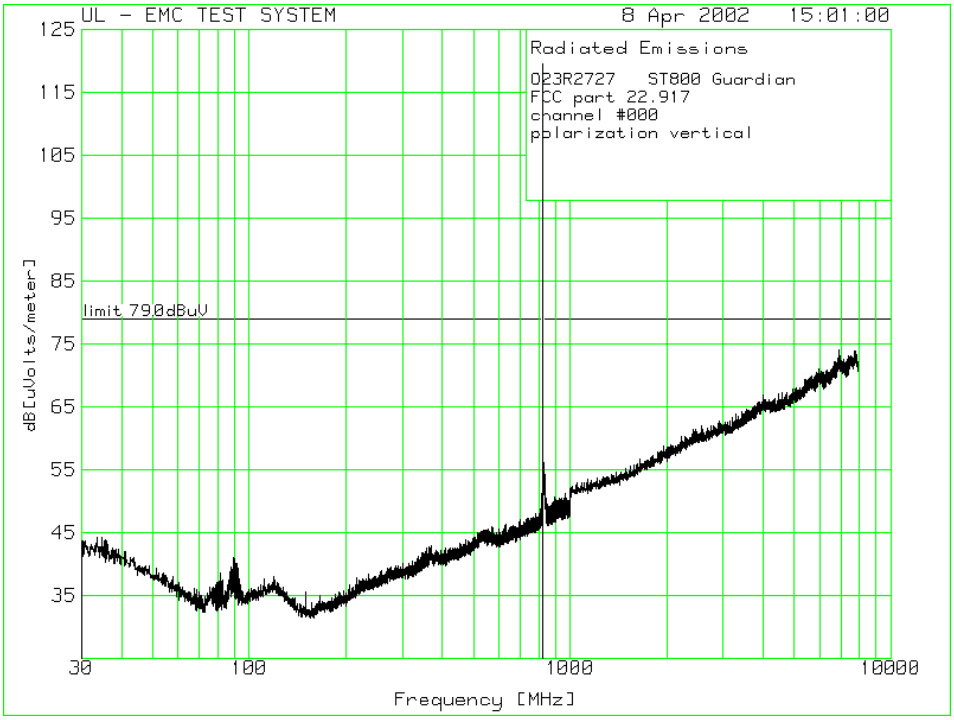
Test Summary	
Test Personnel: JANUSZ LOKAJ	Test Date: Apr. 8, 2002

Test Description	
Objectives/Criteria	Specifications
The electric fields radiated by a system or sub-system shall not exceed the limits for the specifications as stated. **It is recommended that a margin of 6dB be allowed for manufacturing tolerances.** **No emissions within 20dB of the limit were found**	**FCC Part 22.917** **1. On frequencies removed from carrier frequency by 20 to 45kHz,** **limit = 26dBc** **AMPS mode only** **2. On frequencies removed from carrier frequency by more than 45kHz,** **Limit calculated from:** **limit [dBc] = 43+P** **where P = output power in [dBW] as measured in 2.3**
Test Result PASS	

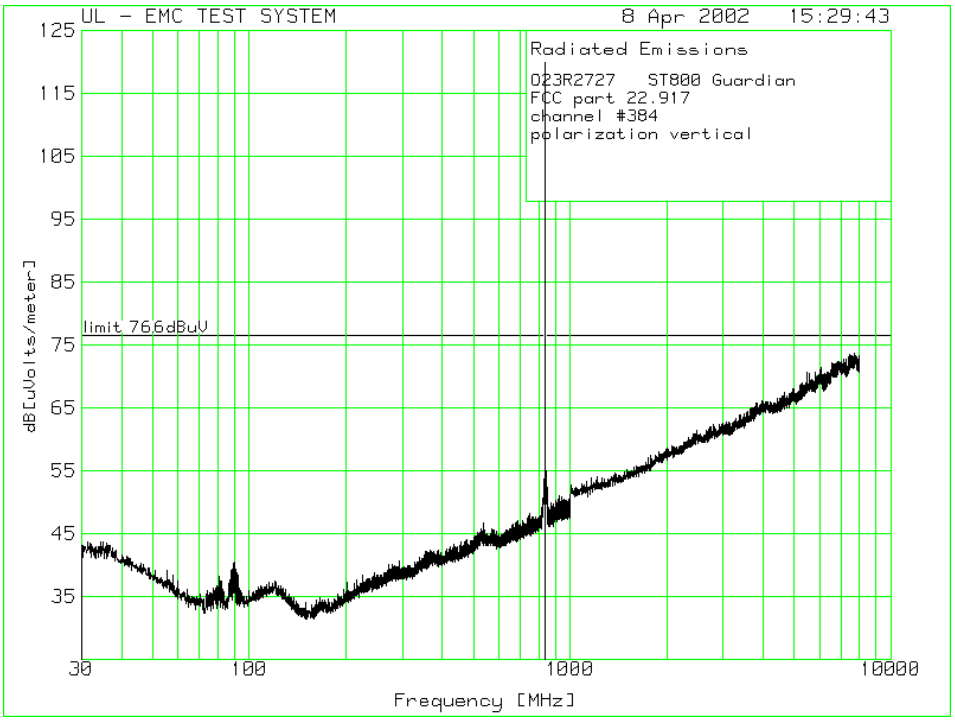
2.5.1 EMISSION LIMITATIONS DATA



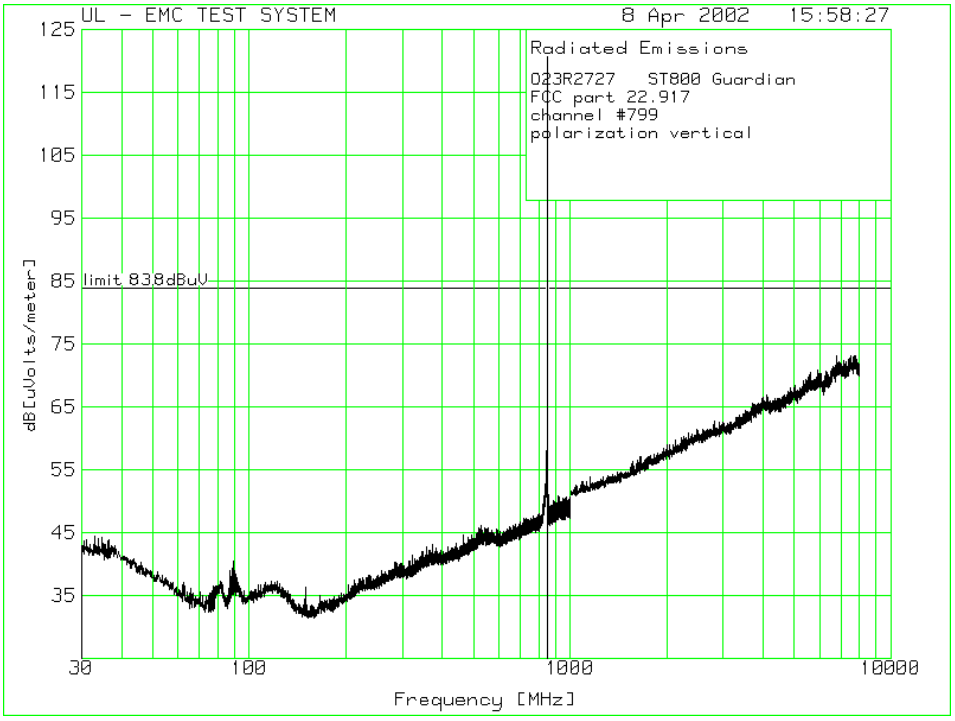
Emission mask at 20 to 45kHz offset. Channel AMPS # 384, 1kHz modulation.



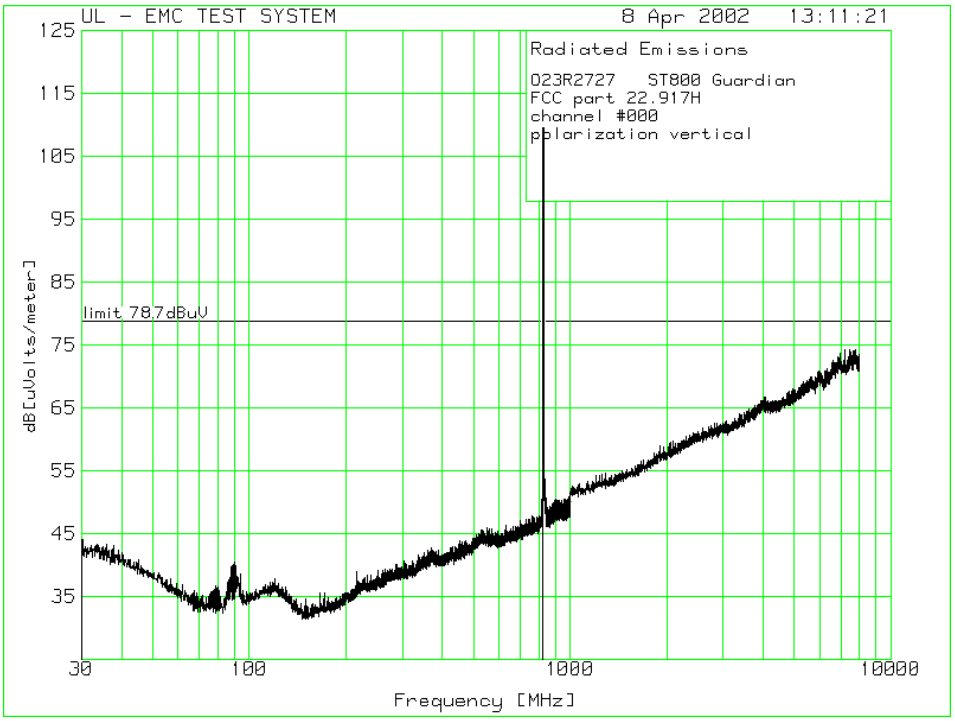
Part 22.917, Spurious emissions, channel AMPS # 000.



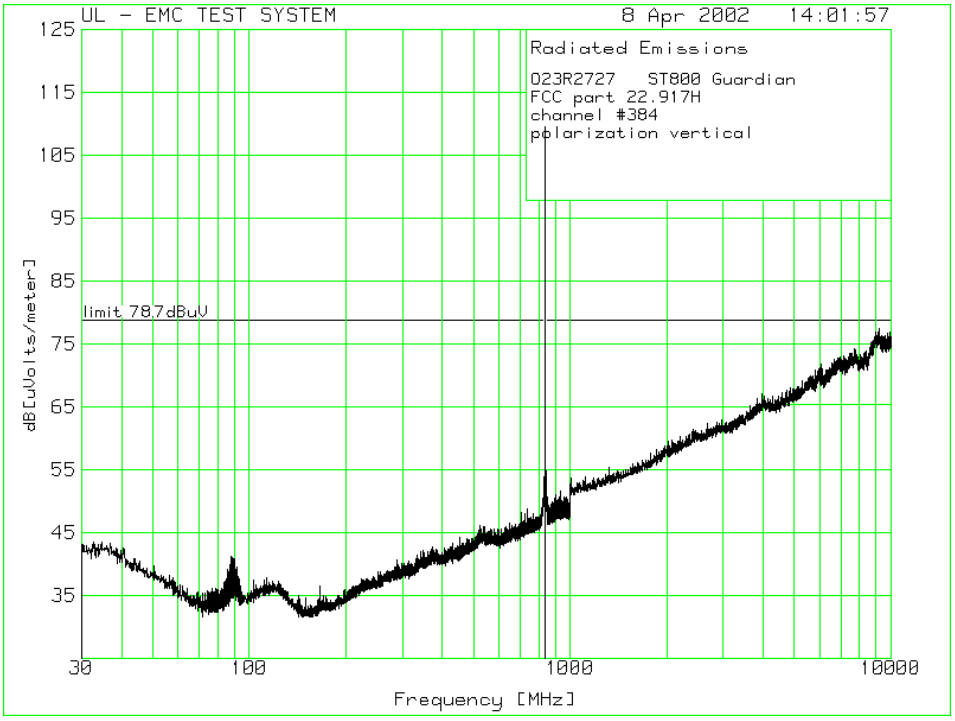
Part 22.917, Spurious emissions, channel APMS # 384.



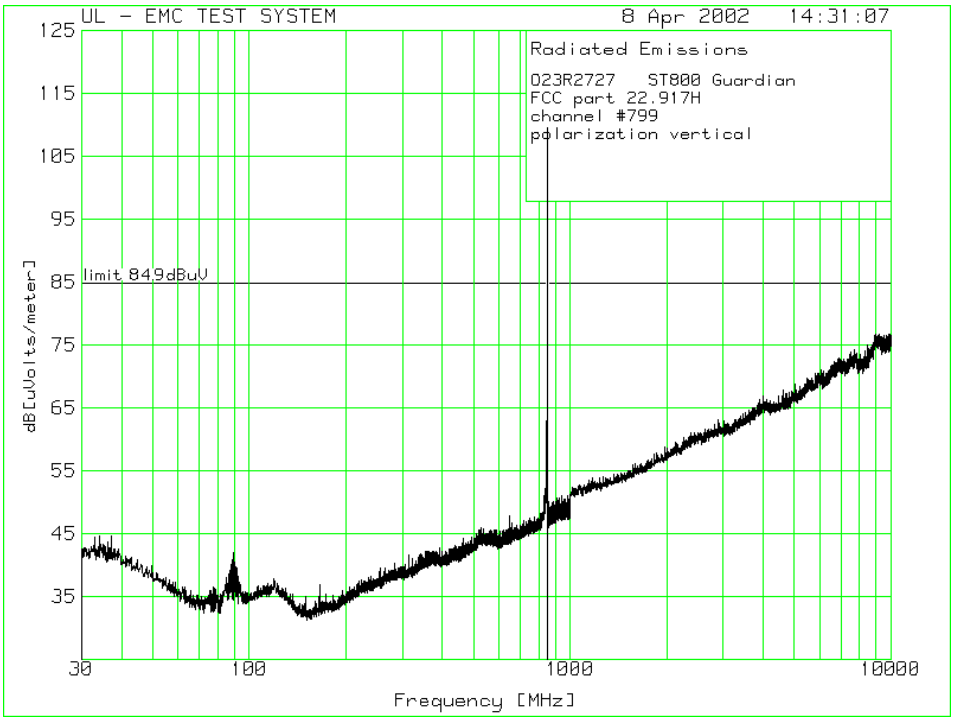
Part 22.917, Spurious emissions, channel AMPS # 799.



Part 22.917, Spurious emissions, channel CDMA # 000.



Part 22.917, Spurious emissions, channel CDMA # 384



Part 22.917, Spurious emissions, channel CDMA # 799.

2.5.2 EMISSION LIMITATIONS SETUP

FCC Part 22.917 Emission limitations setup

2.6 MAXIMUM PERMISSIBLE EXPOSURE EVALUATION

Test Summary	
Test Personnel: JANUSZ LOKAJ	Test Date: Apr. 9, 2002

Test Description	
Objectives/Criteria	Specifications
The electric field due to the transmitter operation must not exceed the safety limits in areas where presence of persons not classified as RF and microwave workers is expected.	**Industry Canada RSS-102** **Health Canada Safety Code 6 (1999)** **FCC CFR 47 Part 2.1091** General Public Safety Limits: Channel #000 (825,00MHz) = 45.5V/m Channel #384 (836.52MHz) = 45.8V/m Channel #799 (848.97MHz) = 46.2V/m
The exposure evaluation is not required as the ERP does not exceed 1.5W	

3.0 TEST FACILITY

3.1 LOCATION

The EUT was tested for Electromagnetic Compatibility at the Electronics Test Centre, located in Kanata, Ontario, Canada.

3.2 GROUNDING PLAN

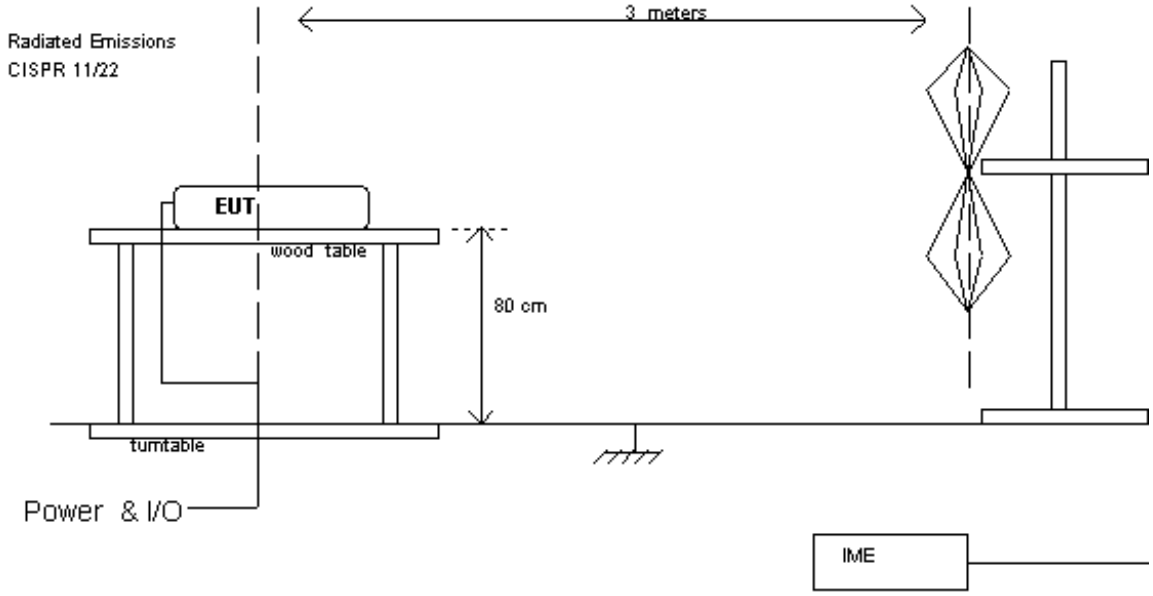
The EUT was located on a wooden table 80 cm above the ground plane. The EUT was not grounded.

3.3 POWER

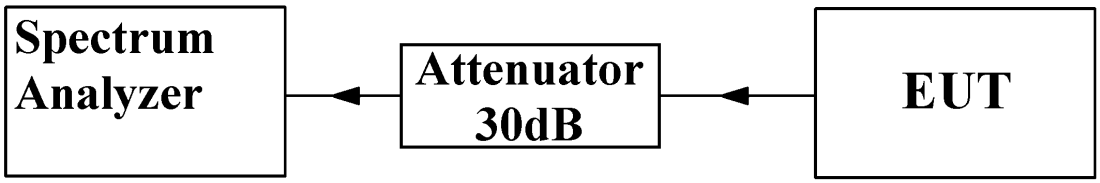
The EUT was powered using external DC power supply simulating a car battery.

3.5 TEST CONFIGURATION

Setup for CISPR Radiated Emissions testing.



Setup for Conducted Output Power Measurement



APPENDIX A

ST800 Guardian

Description provided by

ORION Electronics Ltd

CLIENT SAMPLE DESCRIPTION

	New	Repeat

MPBT Personnel	Date	Project/Work Order	
	Apr. 8, 2002	***2727***	

Contact	***David Roddis***	Address	
Company		***P.O. Box 2728***	
	Orion	***90 Sanford Drive***	
		Windsor, NS B0N 2T0	
Client Code	***O23***		
		Phone: ***(902) 798-8999***	Fax: ***(902) 798-8188***

Product Application		**Product Category**		**Product Type**	
Military	☐	Telecom ☐	Avionics ☐	Production Unit	☑
Commercial	☑	Info Tech. ☐	Other ☑	Pre-production Unit	☐
		Space ☐		Prototype	☐

Product Name/Part No.	***ST800 Guardian***
Serial Number	***RND Beta 6 –6333 ESN 20600440322***
Power Requirements: AC/DC, Current	***12VDC, 0.5A (Car battery)***
Operational Frequency	***800MHz cellular band***
Typical Installation Instructions or Configuration	***Vehicle mount***
Ground EUT	Yes ☐ No ☑
# Interconnecting Leads	***1. DC Power, 2. Serial Port***
Internal Clock Frequency	***22MHz phone and 12.4MHz GPS Receiver***
Peripheral Equipment	
Cables	***12V Power Cable (10ft), RS-232 Cable (6ft)***
Functional or Self-Test Duration	
Brief Functional Description	***GPS Vehicle Location unit & cell CDMA800 data link***
Other Remarks	

Prepared By:		Title:	Date:

APPENDIX B

TEST EQUIPMENT REPORT

Asset	Device	Characteristics	Manufacturer	Model	Serial	Cal Date	Cal Due Date
4297	Spectrum Analyzer	20Hz - 2.5GHz	Hewlett Packard	8566B/462	2747A05484	Jul 26, 2001	Jul 26, 2002
4997	Anechoic chamber	Studio 1	Chamber 1			monitored	monitored
2319	DRG Horn Antenna	1-18GHz	Electrometrics	RGA60	2966	Dec 29, 2000	Dec 29, 2002
3736	Signal Generator	10kHz – 1GHz	Marconi Instruments	2022A	119062/115	Jul 21, 2001	Jul 21, 2002
3759	Sweep Generator	5kHz-1360MHz	Rhode & Schwarz	SMPC	893033/014	Jul 13, 2001	Jul 13, 2002
2322	Communications Service Monitor	10kHz – 1GHz	IFR	1200 Super S	34533	Jul 21, 2001	Jul 21, 2002
4281	Biconilog Antenna	30 – 2000MHz	Antenna Research	LPB2520A	1048	Jan 2, 2002	Jan 2, 2003
3662	Arbitrary Waveform Generator		Wavetek	95	J92021498	Jul 21, 2001	Jul 21, 2002