



Nemko

Test Report: 5W47050 Issue2

Applicant: LOTEK WIRELESS
115 Pony Drive
Newmarket, ON
L3Y 7B5

Apparatus: Portable VHF Telemetry Receiver SRX400A

FCC ID: FW9SRX400158-170

In Accordance With: FCC Part 15 Subpart B, 15.107 and 15.109
Unintentional Radiators

Tested By: Nemko Canada Inc.
303 River Road
Ottawa, Ontario
K1V 1H2

Authorized By:

Sim Jagpal, Resource Manager

Date: 7 September 2005

Total Number of Pages: 21

Report Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart B. Radiated tests were conducted in accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

The assessment summary is as follows:

Apparatus Assessed:	Portable VHF Telemetry Receiver SRX400A
Specification:	FCC Part 15 Subpart B, 15.107 and 15.109
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None
Report Release History:	Issue 2, added test results per clause 15.121.

Author: Roman Kuleba

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025.

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Section 1 : Equipment Under Test

1.1 Product Identification

The Equipment Under Test was identified as follows: SRX400A Portable VHF Telemetry Receiver

1.2 Samples Submitted for Assessment

The following samples of the apparatus have been submitted for type assessment:

Sample No.	Description	Serial No.
Item #1	SRX400A Telemetry Receiver, $f_{RX} = 160.180$ MHz, 158 – 162 MHz Range	10238A
Item #3	SRX400A Telemetry Receiver, $f_{RX} = 168.000$ MHz, 166 – 170 MHz Range	10032A

The first samples were received on: June 16, 2005

1.3 Theory of Operation

SRX400A is a super heterodyne VHF receiver operating in 158 – 170 MHz band. Local Oscillator Frequencies: 116 MHz and 135.99 MHz; IF: 10.7 MHz; other frequencies: 32.68 kHz.

The SRX400 receiver has three variants: SRX400A, SRX400, and STR-1000, which can be considered as a family, the SRX400A being the most advanced.

For this family, two SRX400A devices were configured for the test, to cover the whole range of 158 to 170 MHz:

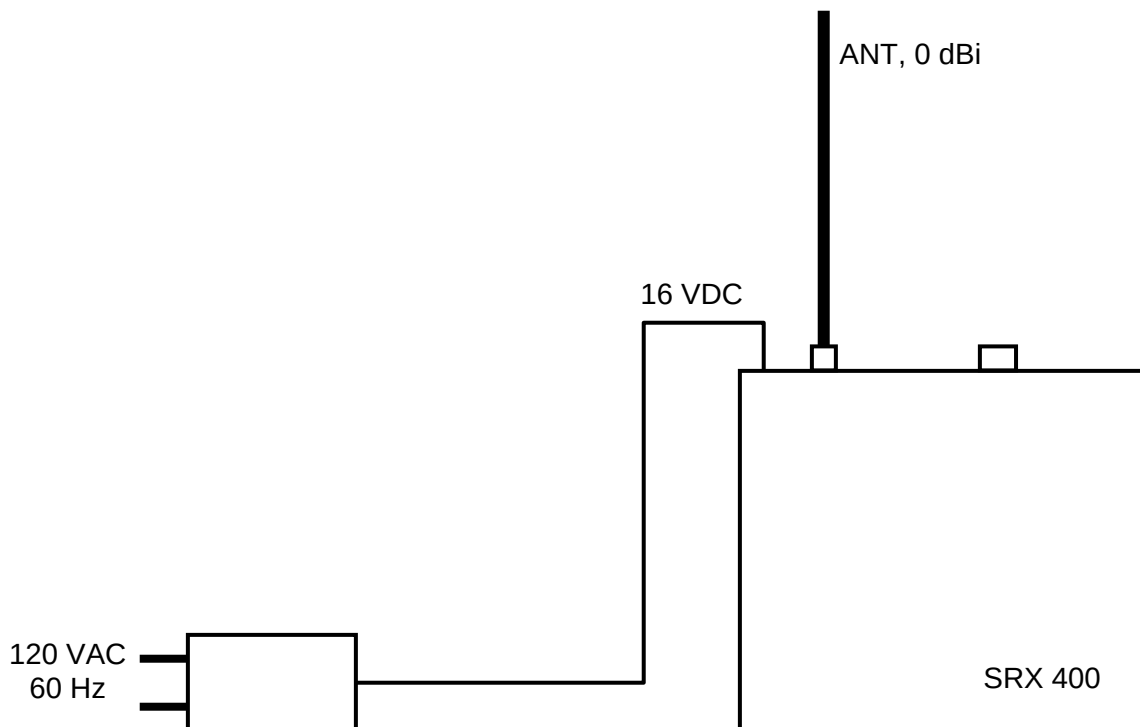
S/N: 10238A, Range: 158 – 162 MHz

S/N: 10238A, Range: 166 – 170 MHz

1.4 Technical Specifications of the EUT

Manufacturer:	LOTEK WIRELESS
Receive Frequency:	158 – 170 MHz
Receiver Type:	Super Heterodyne
Antenna Data:	Detachable, Whip, 0 dBi
Power Source:	120 VAC / 60 Hz to 16 VDC Adapter/Charger Internal Rechargeable Battery 12 VDC

1.5 Block Diagram of the EUT



Section 2 : Test Conditions

2.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart B, 15.107 and 15.109
Unintentional Radiators

2.2 Deviations From Laboratory Test Procedures

No deviations were made from laboratory test procedures.

2.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	15 – 30 °C
Humidity range	:	20 - 75 %
Pressure range	:	86 - 106 kPa
Power supply range	:	+/- 5% of rated voltages

2.4 Test Equipment

Equipment	Manufacturer	Model No.	Asset/Serial No	Last Cal.	Next Cal.
Receiver	Rohde & Schwarz	ESVS-30	FA001437	July 26/04	July 26/05
Spectrum Analyzer	Rohde & Schwarz	FSU	FA001877	May 17/05	May 17/06
Biconical (1) Antenna	EMCO	3109	FA000805	April 22/05	April 22/06
Horn Antenna #2	EMCO	3115	FA000825	Dec. 14/04	Dec. 14/05
Log Periodic Antenna #1	EMCO	LPA-25	FA000477	Aug. 26/04	Aug. 26/05
1.0 – 2.0 GHz Amplifier	JCA	12-400	FA001498	COU	COU
LISN	EMCO	4825/2	FA001545	Jan. 13/05	Jan. 13/06
Receiver	Rohde & Schwarz	ESHS 10	FA001918	Feb. 28/05	Feb. 28/06
Spectrum Analyzer	Hewlett-Packard	8566B	FA001309	May 18/05	May 18/06
Spectrum Analyzer Display	Hewlett-Packard	85662A	FA001309	May 18/05	May 18/06
Transient Limiter	Hewlett-Packard	1194 7A	FA000975	May 25/05	May 25/06
Radiocommunication Analyzer	Rohde & Schwarz	CMTA 54	FA001317	Jan 25/05	Jan 25/06
Signal Generator	Rohde & Schwarz	SMIQ 03E	FA001269	Feb 02/05	Feb 02/06

* COU – Calibrate on Use

Section 3 : Observations

3.1 Modifications Performed During Assessment

No modifications were performed during assessment.

3.2 Record Of Technical Judgements

No technical judgements were made during the assessment.

3.3 EUT Parameters Affecting Compliance

The user of the apparatus could not alter parameters that would affect compliance.

3.4 Test Deleted

No Tests were deleted from this assessment.

Section 4 : Results Summary

This section contains the following:

FCC Part 15 Subpart B : Test Results

The column headed 'Required' indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

- N No : not applicable / not relevant.
- Y Yes : Mandatory i.e. the apparatus shall conform to these tests.
- N/T Not Tested, mandatory but not assessed. (See section 3.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.

4.1 FCC Part 15 Subpart C : Test Results

Part 15	Test Description	Required	Result
15.107(a)	Conducted Emissions for Class B	Y	PASS
15.109(a)	Radiated Emissions for Class B	Y	PASS
15.121	Scanning receivers and frequency converters used with scanning receivers	Y	PASS

Notes: None

Appendix A : Test Results

Criteria: Clause 15.107(a) Conducted Emissions

Frequency of Conducted limit (dBmV)		
Emission (MHz)	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

Test Conditions:

Sample Number:	1 and 3	Temperature:	23 °C
Date:	June 23, 2005	Humidity:	45 %
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa

Test Results: See Attached Table and Plots.

Conducted Emissions, continued

Test Date: June 23, 2005

Engineer's Name: Roman Kuleba

Tested as per: Table Top**Mains Input Voltage: 120 VAC****Mains Input Frequency: 60 Hz**

Port Investigation Data

Port under test: AC Mains

Results: Refer to Plots of this section and or tables.

Conductor	Frequency (MHz)	Detector	Emission Level (dBuV)	LISN Loss (dB)	Cable Loss (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)
Phase	0.1500	Quasi Peak	52.9	0.00	0.00	52.90	66.0	13.1
		Average	27.8	0.00	0.00	27.80	56.0	28.2
	0.2200	Quasi Peak	52.7	0.00	0.20	52.90	62.8	9.9
		Average	24.8	0.00	0.20	25.00	52.8	27.8
	0.2900	Quasi Peak	48.9	0.00	0.20	49.10	60.5	11.4
		Average	22.7	0.00	0.20	22.90	50.5	27.6
	0.3600	Quasi Peak	45.2	0.00	0.20	45.40	58.7	13.3
		Average	20.6	0.00	0.20	20.80	48.7	27.9
	0.4300	Quasi Peak	41.2	0.00	0.20	41.40	57.3	15.9
		Average	19.0	0.00	0.20	19.20	47.3	28.1
	0.5000	Quasi Peak	40.0	0.00	0.20	40.20	56.0	15.8
		Average	18.2	0.00	0.20	18.40	46.0	27.6
Neutral	0.1500	Quasi Peak	52.9	0.00	0.00	52.90	66.0	13.1
		Average	27.2	0.00	0.00	27.20	56.0	28.8
	0.2200	Quasi Peak	52.9	0.00	0.20	53.10	62.8	9.7
		Average	24.8	0.00	0.20	25.00	52.8	27.8
	0.2900	Quasi Peak	58.0	0.00	0.20	58.20	60.5	2.3
		Average	23.3	0.00	0.20	23.50	50.5	27.0
	0.3600	Quasi Peak	46.9	0.00	0.20	47.10	58.7	11.6
		Average	21.3	0.00	0.20	21.50	48.7	27.2
	0.4300	Quasi Peak	43.0	0.00	0.20	43.20	57.3	14.1
		Average	19.5	0.00	0.20	19.70	47.3	27.6
	0.8500	Quasi Peak	46.0	0.00	0.05	46.05	56.0	10.0
		Average	21.0	0.00	0.05	21.05	46.0	25.0

Notes

None

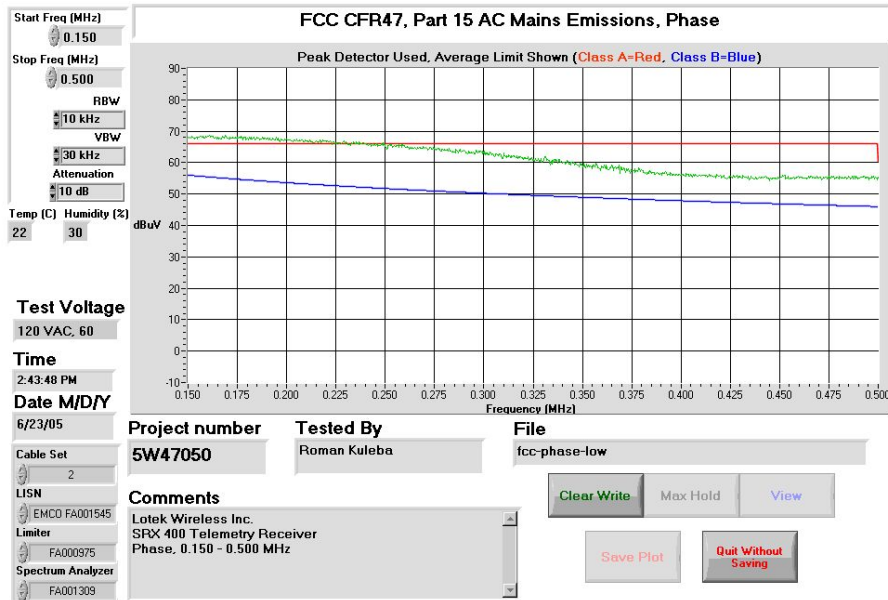
Test Result

Final Test Result: Pass

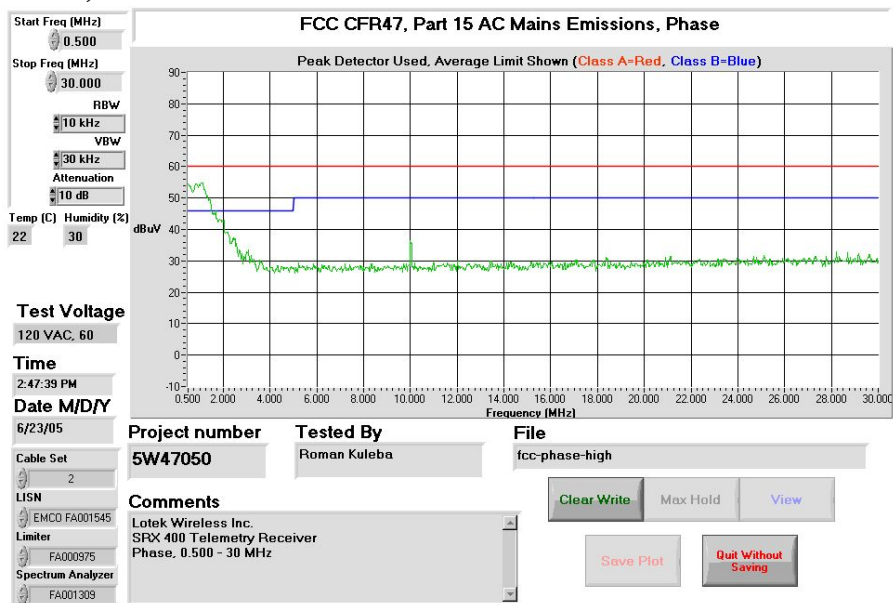
Conducted Emissions, continued

Conducted Emissions Plots

Phase, 0.150 – 0.500 MHz



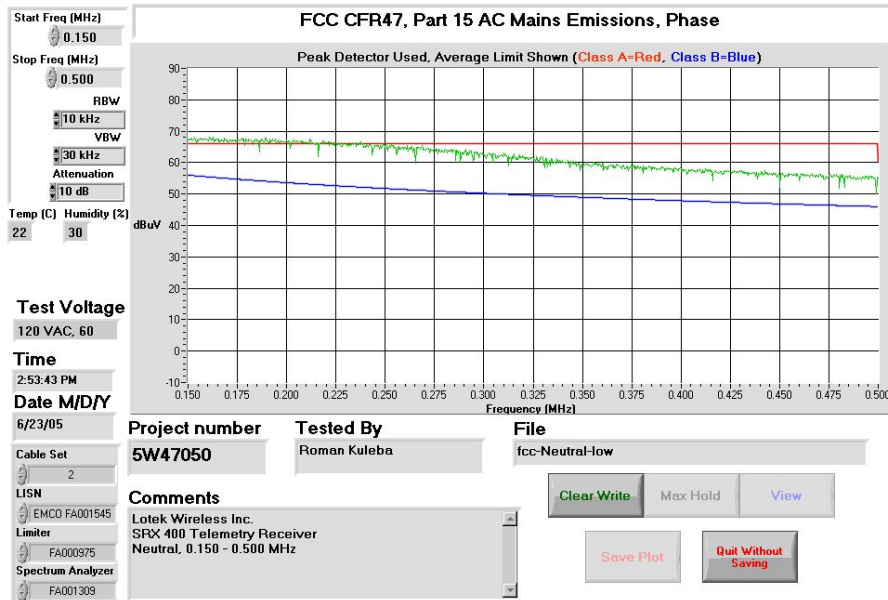
Phase, 0.500 – 30 MHz



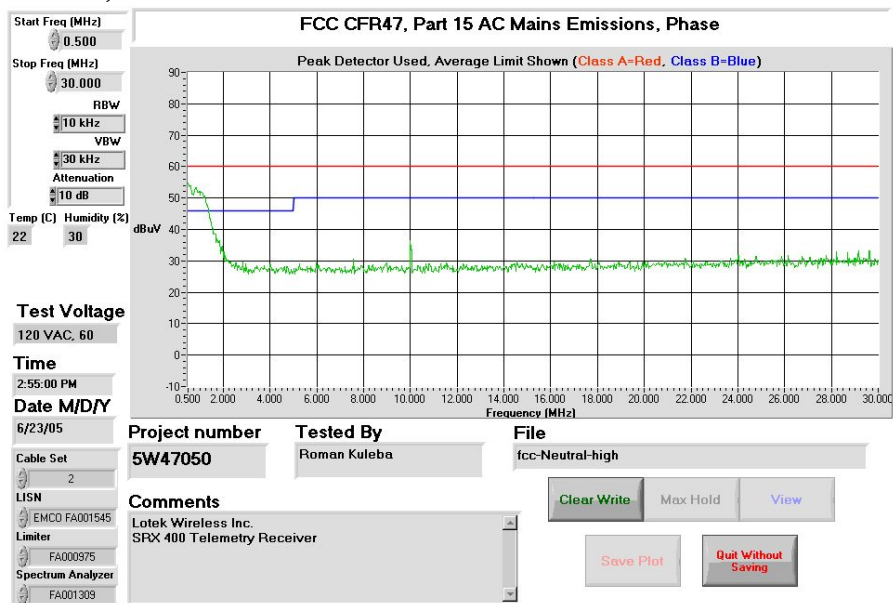
Conducted Emissions, continued

Conducted Emissions Plots

Neutral, 0.150 – 0.500 MHz



Neutral, 0.500 – 30 MHz



Criteria: Clause 15.109(a) Radiated Emissions

Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of Emission (MHz)	Field Strength (microvoltsmeter)
30 - 88	100
88 - 216	150
216 - 960	200
Above 960	500

Test Conditions:

Sample Number:	1 and 3	Temperature:	23 °C
Date:	June 23, 2005	Humidity:	45 %
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa

Test Results:

See Attached Table(s) for Results

Additional Observations:

The Spectrum was searched from 30 MHz to 2 GHz.

The EUT was measured on three orthogonal axes.

Measurement equipment setup was 120 kHz RBW Quasi-peak Detector for measurements below 1GHz and 1MHz RBW/VBW Peak/Average Detector above 1GHz.

All Measurements were performed at 3 meters distance.

Radiated Emissions, continued

Receiver tuned to: 160.180 MHz (Lower Range 158 – 162 MHz)

Freq. (MHz)	Ant.	Pol. V/H	RCVD Signal (dBμV)	Ant. Factor (dB)	Amp. Gain (dB)	Cable Loss (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
149.4793	BC1	V	13.5	12.9	0.0	1.5	27.9	43.5	15.6	Q-Peak
448.4355	LP1	V	13.0	16.5	0.0	2.7	32.2	46.4	14.2	Q-Peak
579.9976	LP1	V	19.0	18.8	0.0	3.1	40.9	46.4	5.5	Q-Peak
597.9143	LP1	V	13.8	18.8	0.0	3.2	35.8	46.4	10.7	Q-Peak
149.4778	BC1	H	8.5	12.6	0.0	1.5	22.6	43.5	20.9	Q-Peak
1046.4600	Horn2	V	60.1	25.2	46.1	3.4	42.6	74.0	31.4	Peak
1046.4600	Horn2	V	57.0	25.2	46.1	3.4	39.5	54.0	14.5	Average
1159.9500	Horn2	V	62.6	25.3	46.5	3.2	44.6	74.0	29.4	Peak
1159.9500	Horn2	V	56.0	25.3	46.5	3.2	38.0	54.0	16.0	Average
1345.3200	Horn2	V	56.0	25.4	46.5	3.3	38.2	74.0	35.8	Peak
1345.3200	Horn2	V	51.6	25.4	46.5	3.3	33.8	54.0	20.2	Average
1623.9400	Horn2	V	61.2	27.3	46.5	3.9	45.9	74.0	28.1	Peak
1623.9400	Horn2	V	56.0	27.3	46.5	3.9	40.7	54.0	13.3	Average
1046.4600	Horn2	H	55.6	25.1	46.1	3.4	38.0	74.0	36.0	Peak
1046.4600	Horn2	H	48.4	25.1	46.1	3.4	30.8	54.0	23.2	Average
1159.9500	Horn2	H	58.5	25.2	46.5	3.2	40.4	74.0	33.6	Peak
1159.9500	Horn2	H	52.0	25.2	46.5	3.2	33.9	54.0	20.1	Average
1345.3200	Horn2	H	58.5	25.3	46.5	3.3	40.6	74.0	33.4	Peak
1345.3200	Horn2	H	53.0	25.3	46.5	3.3	35.1	54.0	18.9	Average
1623.9400	Horn2	H	54.7	27.5	46.5	3.9	39.5	74.0	34.5	Peak
1623.9400	Horn2	H	48.7	27.5	46.5	3.9	33.5	54.0	20.5	Average

Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole

Radiated Emissions, continued

Receiver tuned to: 168.000 MHz (Higher Range 166 – 170 MHz)

Freq. (MHz)	Ant.	Pol. V/H	RCVD Signal (dBμV)	Ant. Factor (dB)	Amp. Gain (dB)	Cable Loss (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
157.2978	BC1	V	11.0	13.2	0.0	1.5	25.7	43.5	17.8	Q-Peak
471.8965	LP1	V	11.0	17.2	0.0	2.9	31.1	46.4	15.4	Q-Peak
579.9976	LP1	V	17.1	18.8	0.0	3.1	39.0	46.4	7.4	Q-Peak
695.9979	LP1	V	13.3	21.0	0.0	3.5	37.8	46.4	8.7	Q-Peak
157.2978	BC1	H	9.5	12.3	0.0	1.5	23.3	43.5	20.2	Q-Peak
695.9962	LP1	H	10.3	21.2	0.0	3.5	35.0	46.4	11.5	Q-Peak
1101.1280	Horn2	V	53.3	25.3	46.5	3.1	35.2	74.0	38.8	Peak
1101.1280	Horn2	V	48.8	25.3	46.5	3.1	30.7	54.0	23.3	Average
1275.9400	Horn2	V	54.0	25.3	46.5	3.5	36.3	74.0	37.7	Peak
1275.9400	Horn2	V	47.7	25.3	46.5	3.5	30.0	54.0	24.0	Average
1623.9400	Horn2	V	59.8	27.3	46.5	3.9	44.5	74.0	29.5	Peak
1623.9400	Horn2	V	54.8	27.3	46.5	3.9	39.5	54.0	14.5	Average
1101.1280	Horn2	H	55.1	25.2	46.5	3.1	36.9	74.0	37.1	Peak
1101.1280	Horn2	H	49.8	25.2	46.5	3.1	31.6	54.0	22.4	Average
1159.9500	Horn2	H	57.2	25.2	46.5	3.2	39.1	74.0	34.9	Peak
1159.9500	Horn2	H	50.7	25.2	46.5	3.2	32.6	54.0	21.4	Average
1623.9400	Horn2	H	53.4	27.5	46.5	3.9	38.2	74.0	35.8	Peak
1623.9400	Horn2	H	47.3	27.5	46.5	3.9	32.1	54.0	21.9	Average
Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole										

Criteria: Clause §15.121 Scanning receivers and frequency converters used with scanning receivers - Rejection of Cellular Telephony Signals

§15.121 (a)(1) Except as provided in paragraph (c) of this section, scanning receivers and frequency converters designed or marketed for use with scanning receivers, shall be incapable of operating (tuning), or readily being altered by the user to operate, within the frequency bands allocated to the Cellular Radiotelephone Service in Part 22 of this chapter (cellular telephone bands).

§15.121 (2)(b) Except as provided in paragraph (c) of this section, scanning receivers shall reject any signals from the Cellular Radiotelephone Service frequency bands that are **38 dB** or lower based upon a 12 dB SINAD measurement, which is considered the threshold where a signal can be clearly discerned from any interference that may be present.

§22.905 Channels for cellular service - The following frequency bands are allocated for assignment to service providers in the Cellular Radiotelephone Service:

- (a) Channel Block A: 869-880 MHz paired with 824-835 MHz, and 890-891.5 MHz paired with 845-846.5 MHz.
(b) Channel Block B: 880-890 MHz paired with 835-845 MHz, and 891.5-894 MHz paired with 846.5-849 MHz.

Test Conditions:

Sample Number:	1 and 3	Temperature:	23 °C
Date:	June 23, 2005	Humidity:	45 %
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa

Test Method Used:

- The EUT was connected as illustrated on page 21.
- Reference sensitivity of the EUT was measured according to the following procedure. In the absence of any other signals the standard input signal (50% AM/1 kHz at nominal frequency) from Radio-communication Analyzer was applied to RF Antenna port through a calibrated combining network. The level of the signal was reduced to obtain 12 dB SINAD value at the AF output of the receiver. The highest sensitivity value obtained in this way in all frequency bands was recorded as reference sensitivity (-90 dBm).
- The reference input signal was then increased by 3 dB.
- An unwanted input signal was added through the second input terminal of the combining network. The level of the unwanted signal was adjusted according to the following:

$$P_{\text{Unwanted}} = P_{\text{Reference}} + \text{Required Rejection} + 6 \text{ dB}$$

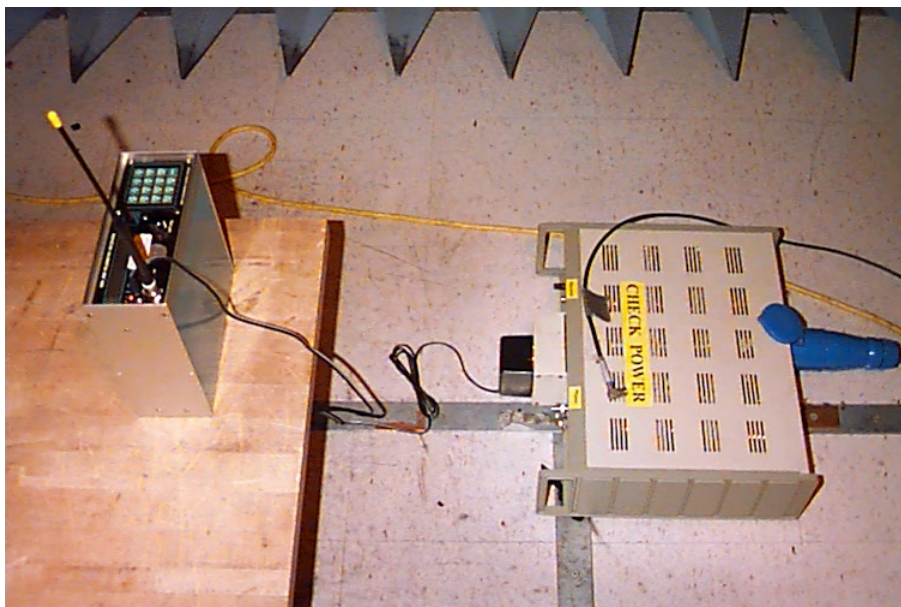
$$P_{\text{Unwanted}} = (-96 \text{ dBm} + 3 \text{ dB}) + 38 \text{ dB} + 6 \text{ dB} = -49 \text{ dBm}$$

- The frequency of the unwanted signal was swept through the frequency bands allocated to the Cellular Radiotelephone Service.
- The test was performed with two different types of modulation applied to the unwanted signal:
 - 80% Amplitude Modulation, 1kHz tone
 - Frequency Modulation, 8 kHz deviation, 400 Hz tone
 No change in SINAD value was measured at the output of the receiver(s).

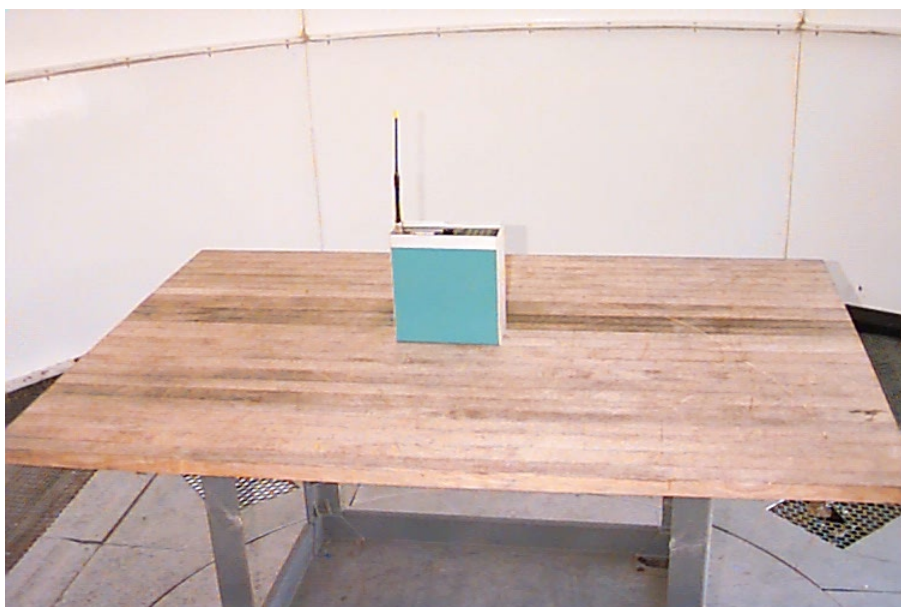
Test Results: Pass

Appendix B : Setup Photographs

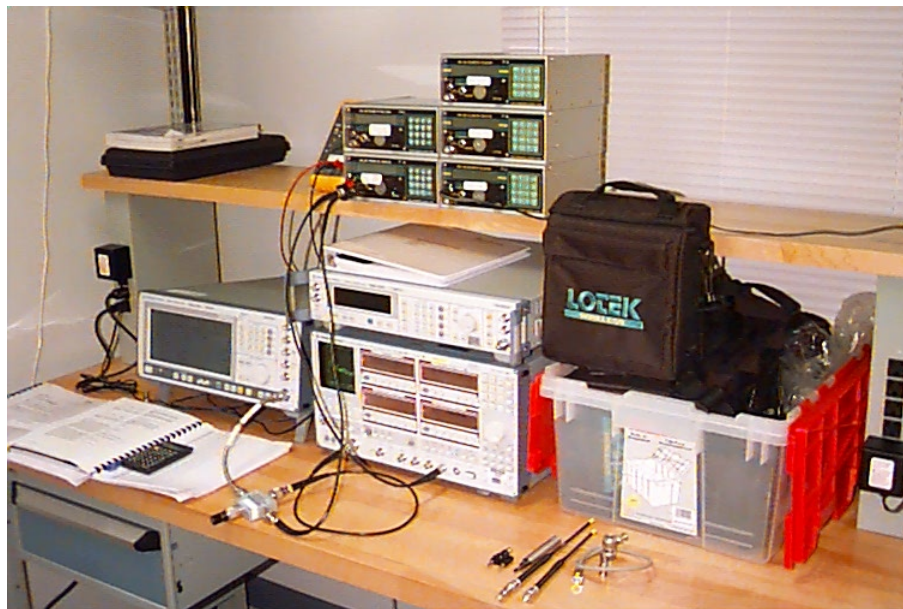
Conducted Emissions Setup:



Spurious Emissions Setup:

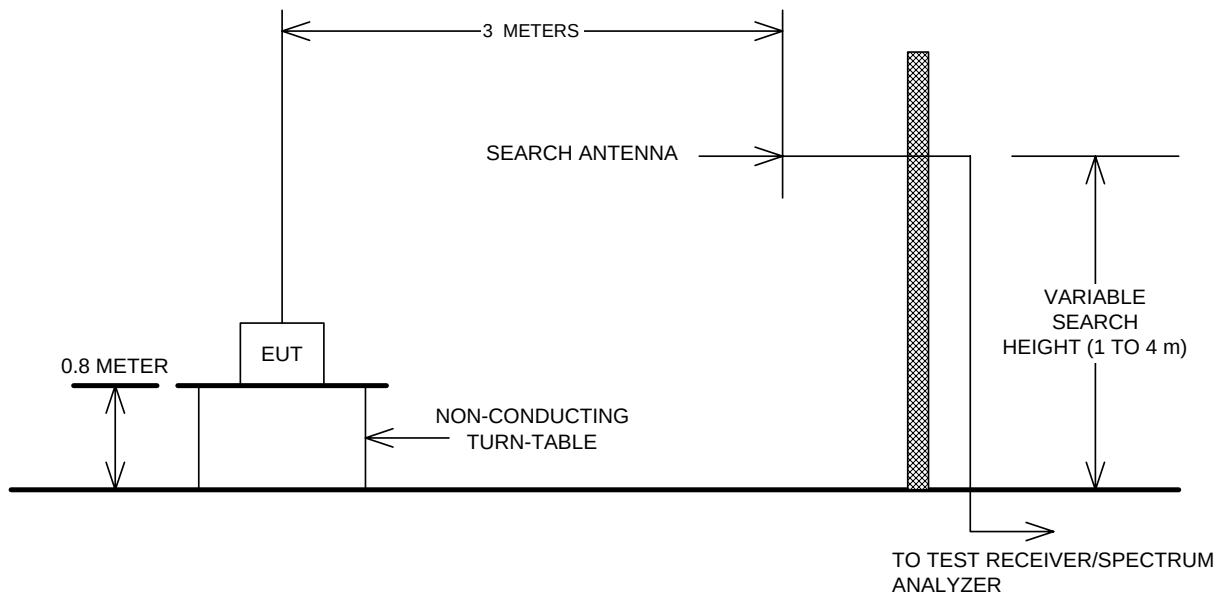


Rejection of Cellular Telephony Signals Test Setup:

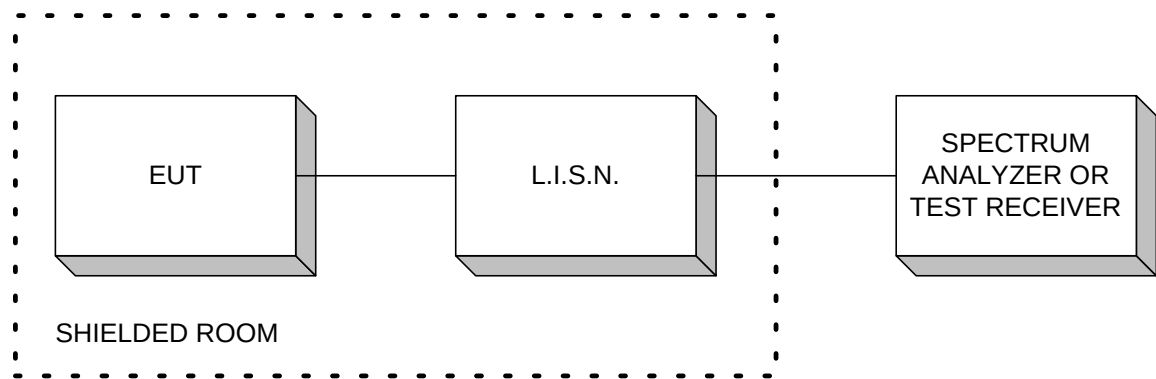


Appendix C : Block Diagram of Test Setups

Test Site For Radiated Emissions



Conducted Emissions



Rejection of Cellular Telephony Signals

