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Test report

274946-1TRFEMC

Date of issue: January 7, 2015

Applicant:

Lotek Wireless Inc.

Product:

SRX800

Model

SRX800-D

Specifications:

- FCC 47 CFR Part 15, Subpart B – Certification
- ICES-003 Issue 5 August 2012

Lab and test locations

Company name	Nemko Canada Inc.		
Designation number	CA2040		
Facility Name	Ottawa	Montreal	Almonte
Address	303 River Road	292 Labrosse Ave	1500 Peter Robinson Rd.
City	Ottawa	Pointe-Claire	West Carleton
Province	ON	QC	ON
Postal code	K1V 1H2	H9R 5M3	K0A 1L0
Country	Canada	Canada	Canada
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Toll free	+1 800 563 6336		
Website	www.nemko.com		

Tested by	Kevin Rose, Wireless/EMC Specialist
Reviewed by	Andrey Adelberg, Senior Wireless/EMC Specialist
Review date	January 7, 2015
Reviewer signature	

Limits of responsibility

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. All results contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

Copyright notification

Table of Contents

Section 1 Report summary

1.1 Test specifications

FCC 47 CFR Part 15, Subpart B – Certification	Title 47: Telecommunication; Part 15—Radio frequency devices
ICES-003 Issue 5 August 2012	Information Technology Equipment (ITE) – Limits and methods of measurement

1.2 Exclusions

None

1.3 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was completed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See "Summary of test results" for full details.

1.4 Test report revision history

Table 1.4-1: *Test report revision history*

Revision #	Details of changes made to test report
TRF	Original report issued

Section 2 Summary of test results

2.1 North America test results

Table 2.1-1: *FCC 47 CFR Part 15, Subpart B and ICES-003 Issue 5 results*

Test description	Verdict
Radiated disturbance	Pass
Conducted disturbance at mains port	Not applicable
FCC 15.241(b) Scanning receivers and frequency converters used with scanning receivers	Pass

Notes: [1] Product classification B
[2] EUT is a DC only device

Section 3 Equipment under test (EUT) details

3.1 Applicant/ Manufacturer

Company name	Lotek Wireless Inc.
Address	115 Pony Drive
City	Newmarket
Province/State	Ontario
Postal/Zip code	L3Y 7B5
Country	Canada

3.2 Sample information

Receipt date	December 3, 2014
Nemko sample ID number	1

3.3 EUT information

Product name	SRX800
Model	SRX800-D
Serial number	000101
Frequency Band	138–176 MHz
Frequencies tested	138.3, 149.8, and 173.845 MHz
Part number	SRX800-D
Power requirements	12 V_{DC}
Description/theory of operation	Telemetry Receiver. The telemetry receiver is a VHF receiver receiving OOK (ON-Off keyed) VHF signals, with a burst interval in the range of seconds. The system consists of: CPU board, RF receiver board (including audio amplifier, power management and interconnect board, and GPS receiver). The CPU controls the system and is collecting information from the RF board. It is also signaled via an attachable 3.5 mm headphone
Software details	Master firmware: V 9.7.10/ Slave firmware V20/ Windows software V1.1.385.3

3.4 EUT exercise and monitoring details

The EUT was receiving RF ID tags.
All testing was performed with the EUT scanning at each frequency of operation.

3.5 EUT setup details

Table 3.5-1: *EUT sub assemblies*

Description	Brand name	Model/Part number	Serial number	Rev.
CPU Board		200-2495	–	2.4
RF board		200-2490	–	2.0
Power management and interconnect board	Lotek	200-2602	–	3
Chassis	Lotek	200-1249	–	N/A

Table 3.5-2: *EUT interface ports*

Description	Qty.
USB	1
RS-232 (9 pin DB, male)	1
VHF input (BNC)	4
GPS antenna connector (SMA female)	1

Table 3.5-3: *Support equipment*

Description	Brand name	Model/Part number	Serial number	Rev.
VHF antenna	Larsen	KD4-150-HQ	–	N/A
Wall Mount Power Supply 9 V/1.3 A DC	Microchip	PS1000	–	N/A

Table 3.5-4: *Inter-connection cables*

Cable description	From	To	Length (m)
USB cable	Receiver	PC	1.8 m
RS-232 cable	Receiver	PC	1.8 m
GPS antenna with cable	Receiver	GPS antenna	2.5 m

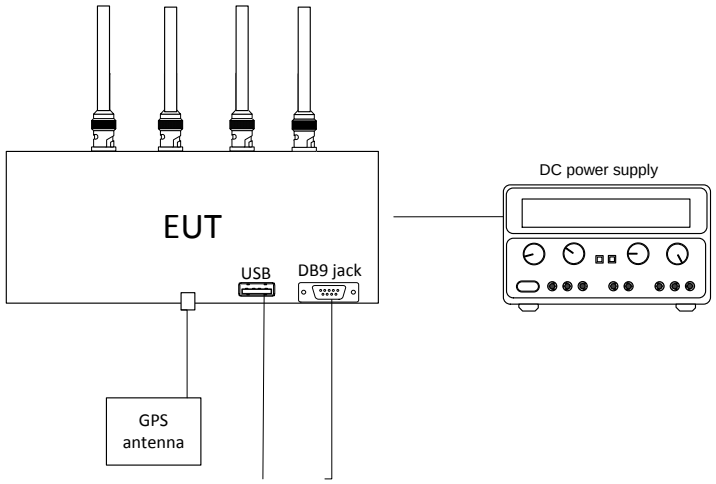


Figure 3.5-1: *Setup diagram*

Section 4 Engineering considerations

4.1 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

4.2 Technical judgment

None

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5 Test conditions

5.1 Atmospheric conditions

Temperature	15–30 °C
Relative humidity	20–75 %
Air pressure	86–106 kPa

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

5.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages ±5 %, for which the equipment was designed.

Section 6 Measurement uncertainty

6.1 Uncertainty of measurement

Nemko Canada Inc. has calculated measurement uncertainty and is documented in EMC/MUC/001 “Uncertainty in EMC measurements.” Measurement uncertainty was calculated using the methods described in CISPR 16-4 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC measurements; as well as described in UKAS LAB34: The expression of Uncertainty in EMC Testing. Measurement uncertainty calculations assume a coverage factor of K=2 with 95% certainty.

Section 7 Terms and definitions

7.1 Product classifications definitions

7.1.1 Title 47: Telecommunication – Part 15-Radio Frequency devices, Subpart A – General

Class A digital device	A digital device that is marketed for use in a commercial, industrial or business environment, exclusive of a device which is marketed for use by the general public or is intended to be used in the home.
Class B digital device	A digital device that is marketed for use in a residential environment notwithstanding use in commercial, business and industrial environments. Examples of such devices include, but are not limited to, personal computers, calculators, and similar electronic devices that are marketed for use by the general public. Note: The responsible party may also qualify a device intended to be marketed in a commercial, business or industrial environment as a Class B device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B digital device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B digital device, regardless of its intended use.

7.1.2 EN 55022, AS/NZS CISPR 22, and CISPR 22

Class B ITE	ITE (Information technology equipment) is intended primarily for use in the domestic environment and may include: – Equipment with no fixed place of use; for example, portable equipment powered by built-in batteries; – Telecommunication terminal equipment powered by a telecommunication network; – Personal computers and auxiliary connected equipment.
Class A ITE	is a category of all other ITE, which satisfies the class A ITE limits but not the class B ITE limits. Such equipment should not be restricted in its sale but the following warning shall be included in the instructions for use: WARNING This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

7.1.3 ICES-003

Class B ITE	limits of radio noise for ITE for residential operation
Class A ITE	limits of radio noise for ITE for non-residential operation
Conditions	Only ITE intended strictly for non-residential use in commercial, industrial or business environments, and whose design or other characteristics strongly preclude the possibility of its use in a residential environment, shall be permitted to comply with the less stringent Class A limits. All ITE that cannot meet the conditions for Class A operation shall comply with the Class B limits. The ITE shall comply with both the power line – conducted and the radiated emissions limits within the same Class, with no intermixing.

7.2 General definitions

7.2.1 Title 47: Telecommunication – Part 15-Radio Frequency devices, Subpart A – General

Digital device (Previously defined as a computing device)	An unintentional radiator (device or system) that generates and uses timing signals or pulses at a rate in excess of 9,000 pulses (cycles) per second and uses digital techniques; inclusive of telephone equipment that uses digital techniques or any device or system that generates and uses radio frequency energy for the purpose of performing data processing functions, such as electronic computations, operations, transformations, recording, filing, sorting, storage, retrieval, or transfer. A radio frequency device that is specifically subject to an emanation requirement in any other FCC Rule part or an intentional radiator subject to subpart C of this part that contains a digital device is not subject to the standards for digital devices, provided the digital device is used only to enable operation of the radio frequency device and the digital device does not control additional functions or capabilities. Note: Computer terminals and peripherals that are intended to be connected to a computer are digital devices.

7.2.2 EN 55022, AS/NZS CISPR 22, and CISPR 22

Information technology equipment (ITE)	Any equipment: a) Which has a primary function of either (or a combination of) entry, storage, display, retrieval, transmission, processing, switching, or control, of data and of telecommunication messages and which may be equipped with one or more terminal ports typically operated for information transfer; b) With a rated supply voltage not exceeding 600 V. It includes, for example, data processing equipment, office machines, electronic business equipment and telecommunication equipment.
Telecommunications/network port	Point of connection for voice, data and signaling transfers intended to interconnect widely dispersed systems via such means as direct connection to multi-user telecommunications networks (e.g. public switched telecommunications networks (PSTN) integrated services digital networks (ISDN), x-type digital subscriber lines (xDSL), etc.), local area networks (e.g. Ethernet, Token Ring, etc.) and similar networks NOTE A port generally intended for interconnection of components of an ITE system under test (e.g. RS-232, IEEE Standard 1284 (parallel printer), Universal Serial Bus (USB), IEEE Standard 1394 (“Fire Wire”), etc.) and used in accordance with its functional specifications (e.g. for the maximum length of cable connected to it), is not considered to be a telecommunications/network port under this definition.

7.2.1 ICES-003

Information technology equipment (ITE)	Information Technology Equipment (ITE) is defined as devices or systems that use digital techniques for purposes such as data processing and computation. ITE is any unintentional radiator (device or system) that generates and/or uses timing signals or pulses having a rate of at least 9 kHz and employs digital techniques for purposes such as computation, display, data processing and storage, and control.

Section 8 Testing data

8.1 Radiated disturbance

8.1.1 References

CISPR 22 and ANSI C63.4-2003

8.1.2 Test summary

Verdict	Pass		
Test date	December 5, 2014	Temperature	23 °C
Test engineer	Kevin Rose	Air pressure	1002 mbar
Test location	Ottawa	Relative humidity	34 %

8.1.3 Notes

The test was performed on each frequency of operation and then in scan mode. Worst case data is presented

8.1.4 Setup details

EUT setup configuration	Table top
Test facility	3 m Semi anechoic chamber
Measuring distance	3 m
Antenna height variation	1–4 m
Turn table position	0–360°
Measurement details	A preview measurement was generated with receiver in continuous scan or sweep mode while the EUT was rotated and antenna adjusted to maximize radiated emission. Emissions detected within 6 dB or above limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

Receiver/spectrum analyzer settings for frequencies below 1 GHz:

Resolution bandwidth	120 kHz
Video bandwidth	300 kHz
Detector mode	Peak (preview measurement); Quasi-peak (final measurement)
Trace mode	Max Hold
Measurement time	100 ms (preview measurement); 1000 ms (final measurement)

Receiver/spectrum analyzer settings for frequencies above 1 GHz:

Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Detector mode	Peak (preview); Peak and Average (final)
Trace mode	Max Hold
Measurement time	100 ms (preview); 1000 ms (final)

8.1.4 Setup details, continued

Table 8.1-1: *Radiated disturbance equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
3 m EMI test chamber	TDK	SAC-3	FA002047	1 year	Mar. 18/15
Flush mount turntable	Sunol	FM2022	FA002082	—	NCR
Controller	Sunol	SC104V	FA002060	—	NCR
Antenna mast	Sunol	TLT2	FA002061	—	NCR
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	Dec. 23/14
Bilog antenna (20–3000 MHz)	Sunol	JB3	FA002108	1 year	Mar. 12/15
Horn antenna (1–18 GHz)	EMCO	3115	FA000825	1 year	Mar. 10/15
Pre-amplifier (1–18 GHz)	JCA	JCA118-503	FA002091	1 year	June 23/15
50 Ω coax cable	C.C.A.	None	FA002555	1 year	June 23/15
50 Ω coax cable	Huber + Suhner	None	FA002074	1 year	June 23/15

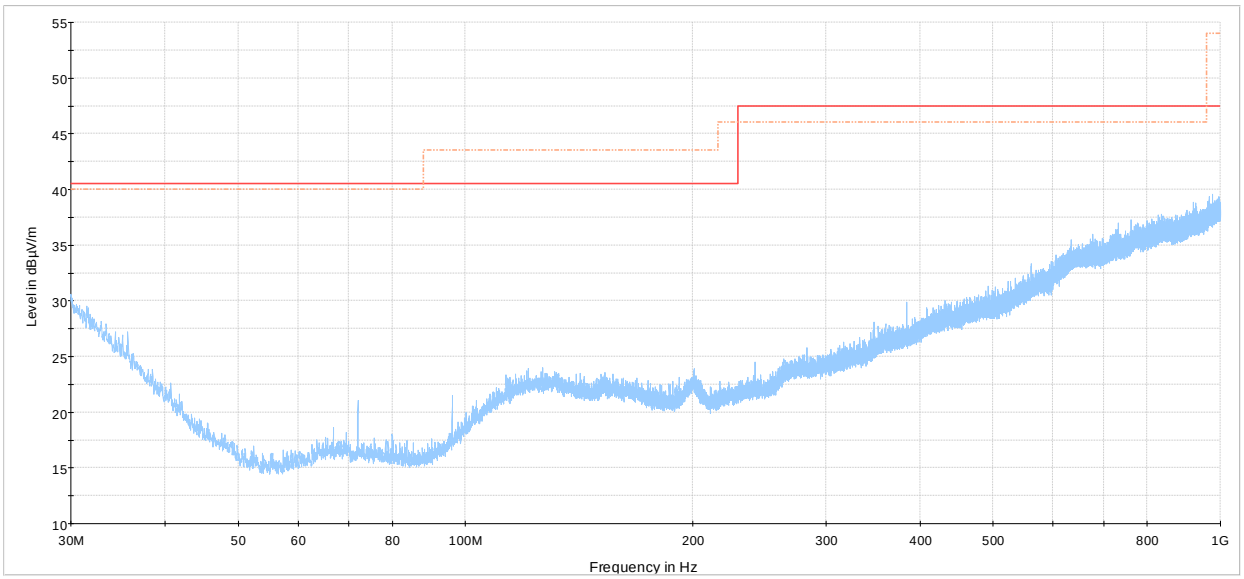
Notes: NCR - no calibration required

Table 8.1-2: *Radiated disturbance test software details*

Manufacturer of Software	Details
Rhode & Schwarz	EMC32, Software for EMC Measurements, Version 8.53.0

Notes: None

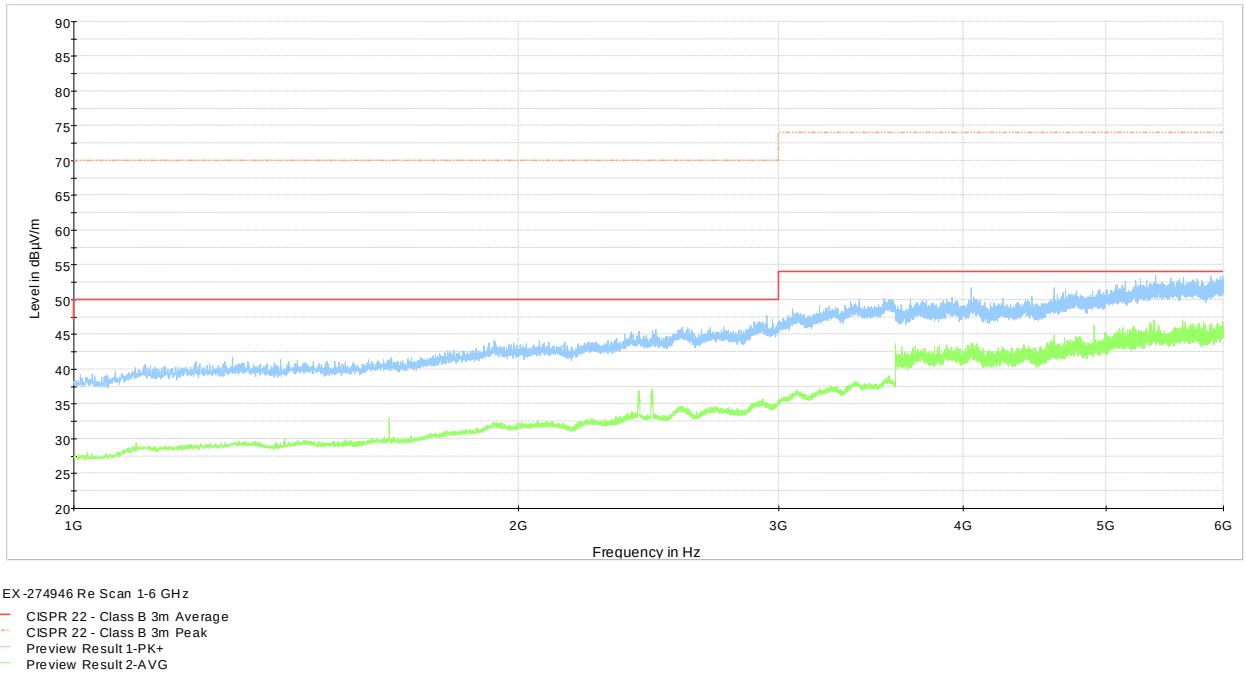
8.1.5 Test data



The spectral plot is a summation of a vertical and horizontal scan. The spectral scan has been corrected with the associated transducer factors (i.e. antenna factors, cable loss, amplifier gains, and attenuators.

Figure 8.1-1: *Radiated disturbance spectral plot (30 to 1000 MHz)*

8.1.5 Test data, continued



The spectral plot is a summation of a vertical and horizontal scan. The spectral scan has been corrected with the associated transducer factors (i.e. antenna factors, cable loss, amplifier gains, and attenuators.

Figure 8.1-2: *Radiated disturbance spectral plot (1 to 6 GHz)*

8.1.6 Setup photos

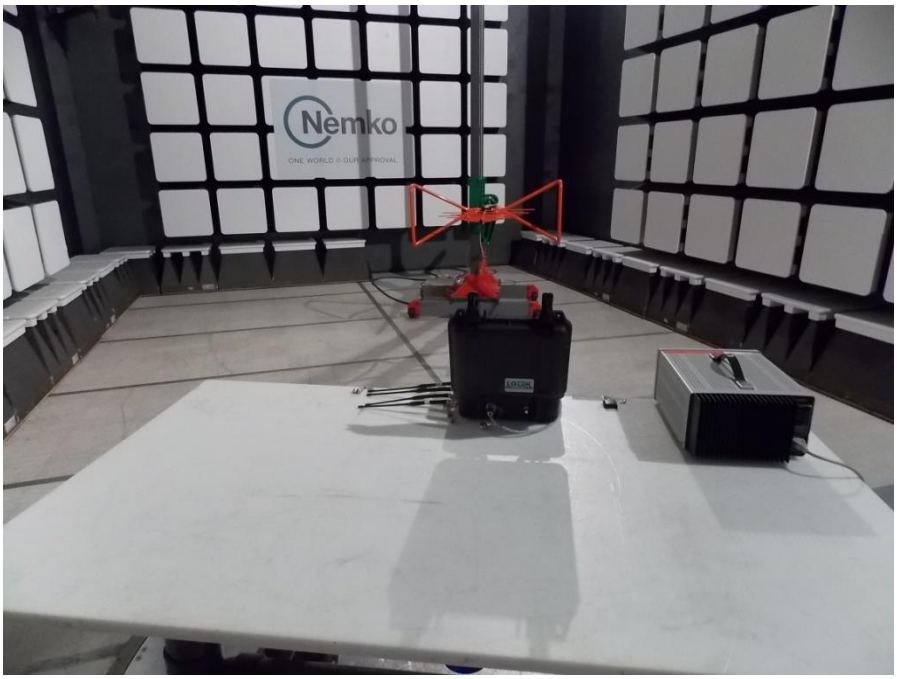


Figure 8.1-3: *Radiated disturbance setup photo*

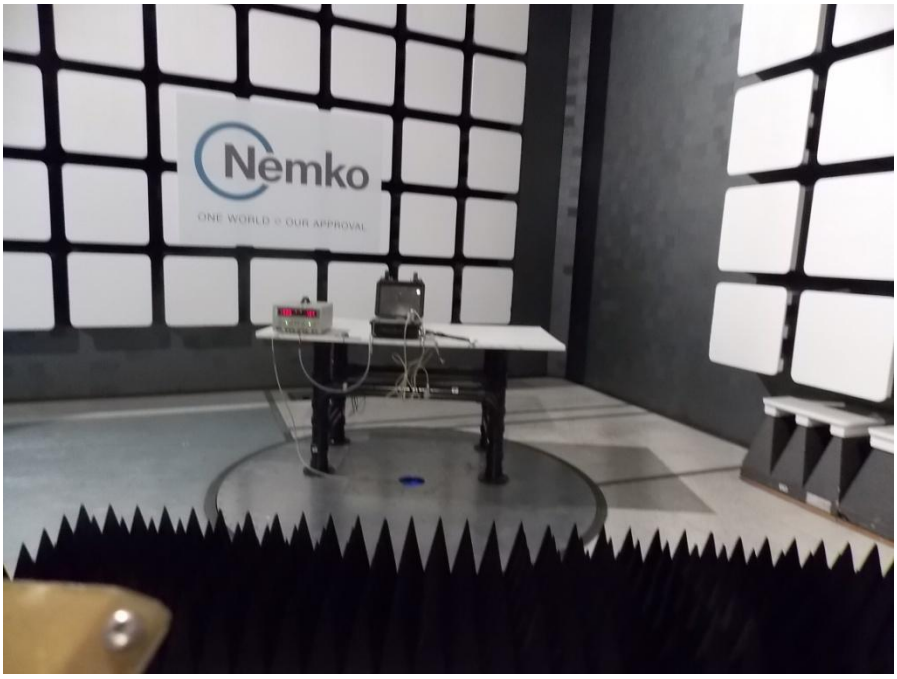


Figure 8.1-4: *Radiated disturbance setup photo*

8.2 Scanning receivers and frequency converters used with scanning receivers

8.2.1 Clause 15.121(b) Scanning receivers and frequency converters used with scanning receivers

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.

8.2.2 Test summary

Verdict	Pass		
Test date	December 5, 2014	Temperature	23 °C
Test engineer	Kevin Rose	Air pressure	1002 mbar
Test location	Ottawa	Relative humidity	34 %

Table 8.2-1: *Conducted disturbance at mains port equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Signal generator	Rohde & Schwarz	SMIQ03E	FA001269	1 year	Jan 27/15
Signal generator	Rohde & Schwarz	SMIQ06B	FA001878	1 year	Jan. 24/15
ARB	HP	33120A	FA001082	-	VOU
Vector analyzer	HP	89410A	-	1 year	Jan 08/15

Notes: VOU - verify on use

8.2.3 Notes

No change in SINAD value was measured at the output of the receiver.

8.2.4 Setup details

1) The EUT was connected as illustrated in appendix C.
2) Reference sensitivity of the EUT was measured according to the following procedure. In the absence of any other signals an input signal of pulse modulated CW carrier at 1 kHz was applied to the RF Antenna port through a calibrated combining network. The level of the signal was reduced until the gain combination gave a 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 (−98 dBm).
3) The reference input signal was then increased by 3 dB.
4) An unwanted input signal added through the second input terminal of the combining network. The level of the unwanted signal was adjusted according to the following:

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

$$P_{Unwanted} = (-98\ \text{dBm} + 3\ \text{dB}) + 38\ \text{dB} + 6\ \text{dB} = -51\ \text{dBm}$$

5) The frequency of the unwanted signal was swept through the frequency bands allocated to the Cellular Radiotelephone Service (824–849 MHz and 880–894 MHz).

Section 9 EUT photos

9.1 External photos

Figure 9.1-1: *Front view photo*

Figure 9.1-2: *Rear view photo*

Figure 9.1-3: *Right Side view photo*

Figure 9.1-4: *Left Side view photo*