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TEST REPORT VERIFICATION to ICES-003

Report Number: M160337-2

Test Sample:	Hand Held Measurement Device
Model Number:	C-Gap
Tested For:	Mintap Services Pty Ltd
Date of Issue:	29 April 2016

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VERIFICATION to ICES-003

EMC Technologies Report No. M160337-2
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Test Sample:	Hand Held Measurement Device
Model Number:	C-Gap
Part Number:	MT_0001
Manufacturer:	Wild Messtechnik UG
Tested for:	Mintap Services Pty Ltd
Address:	PO Box 731, Scarborough, WA 6019 Australia
Contact:	Brant Tapley
Email:	brant@mintap.com.au
Equipment Type:	Unintentional Radiator, Class B Device
Test Standard/s:	**Innovation, Science & Economic Development (ISED) Canada** **ICES-003**, Information Technology Equipment (ITE) – Limits and Methods of Measurement, Issue 6, January 2016 **CAN/CSA-CEI/IEC CISPR 22-10**, Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment
Result of Test:	The Test Samples complied with the applicable ISED Canada requirements of ICES-003 when tested in accordance with CAN/CSA-CEI/IEC CISPR 22-02. Refer to Report M160337-2 for full details.
Test Dates:	17th & 22nd February 2016
Attestation:	*I hereby certify that the device(s) described herein were tested as described in this report and that the data included is that which was obtained during such testing*

Test Officer: **Hamse Mohamed**

Authorised Signatory: **Chris Zombolas**
Technical Director
EMC Technologies Pty Ltd

TEST REPORT FOR VERIFICATION to ICES-003

1.0 INTRODUCTION

This report details the results of EMI tests and measurements performed on the Hand Held Measurement Device, Model Number C-Gap. Testing was performed in accordance with:

- Innovation, Science & Economic Development (ISED) Canada requirements of ICES-003 for a Class B digital apparatus (radiated EMI requirements of CAN/CSA-CEI/IEC CISPR 22).

The results and technical details of the test sample are detailed in this report. The test sample was found to comply with the Class B limits.

The test sample was provided by the Client. The results herein apply only to the test sample.

1.1 Summary of Test Results

Test results and procedures were performed in accordance with the following Innovation, Science & Economic Development (ISED) Canada's standards/regulations:

CAN/CSA CISPR 22-10

Table 2	**Conducted Emissions:**	**0.15-30 MHz**	Not applicable, EUT is battery powered
Table 4	**Radiated Emissions:**	**30-1000 MHz**	Complies Class B, margin of 11.3 dB
Table 4	**Radiated Emissions:**	**> 1 GHz**	Not applicable, highest operating frequency is less than 108 MHz

1.2 EUT – Voltage Power Conditions

Radiated emissions testing was performed at a voltage of 230V AC, 50 Hz.

2.0 GENERAL INFORMATION

(Information supplied by the Client)

The Equipment Under Test (EUT) was identified as follows:

Test Sample:	Hand Held Measurement Device
Model Number:	C-Gap
Part Number:	MT_0001
Power Supply:	4 x AA batteries
Equipment Type:	Unintentional Radiator

2.1 Description supplied by Client

The test sample is a hand held measuring device that measures pressure from an incoming hose and then translates pressure to distance to measure the close side setting of a crusher.

2.2 Operating Conditions

Testing was performed with the test sample powered by battery and set to the measuring option. The EUT was re-started every 20 minutes during testing.

2.3 Modifications

No modifications were required to achieve compliance.

2.4 Test Procedure

Emissions measurements were performed in accordance with EMC Technologies test procedure TP Radiated Emissions. Radiated emissions tests were performed at a distance of 10 metres (30-1000MHz) from the EUT.

2.5 Test Facility

2.5.1 General

Measurements were performed at EMC Technologies' laboratory in Keilor Park, Victoria Australia.

EMC Technologies Pty Ltd is listed by the FCC as a test laboratory able to perform compliance testing for the public. EMC Technologies is listed as an FCC part 47CFR 2.948 test lab and may perform the testing required under Parts 15 and 18 – **FCC Registration Number 90560**

EMC Technologies Pty Ltd has also been accredited as a Conformity Assessment Body (CAB) by Australian Communications and Media Authority (ACMA) under the APECTEL MRA and is designated to perform compliance testing on equipment subject to Declaration of Conformity (DoC) and Certification under Parts 15 and 18 of the FCC Commission's rules – **Registration Number 494713 and Designation number AU0001.**

EMC Technologies' indoor open area test site (iOATS) has been accepted by Innovation, Science & Economic Development Canada (formerly Industry Canada) – ISED Canada, for the performance of radiated measurements in accordance with RSS-Gen, Issue 8 - **ISED Canada iOATS number - IC 3569B.**

2.5.2 NATA Accreditation

NATA is the Australian National laboratory accreditation body and has accredited EMC Technologies to operate to the IEC/ISO17025 requirements. A major requirement for accreditation is the assessment of the Mintap Services Pty Ltd and its personnel as being technically competent in testing to the standards. This requires fully documented test procedures, continued calibration of all equipment to the National Standard at the National Measurements Institute (NMI) and an internal quality system to ISO 17025. NATA is an ILAC member and has mutual recognition agreements with the National Voluntary Laboratory Accreditation Program (NVLAP) and the American Association for Laboratory Accreditation (A^2LA).

All testing in this report has been conducted in accordance with EMC Technologies' scope of NATA accreditation.

The current full scope of accreditation can be found on the NATA website: www.nata.com.au
The scope also includes a large number of emissions, immunity, SAR, EMR and Safety standards.

2.6 Units of Measurements

Conducted Emissions
Measurements are reported in units of dB relative to one microvolt (dBμV).

Radiated Emissions
Measurements are reported in units of dB relative to one microvolt per metre (dBμV/m).

2.6 Test Equipment Calibration

Measurement instrumentation and transducers were calibrated in accordance with the applicable standards by a NATA accredited laboratory such as Keysight Technologies (Australia) Pty Ltd or the National Measurement Institute (NMI). All equipment calibration is traceable to Australia national standards at the National Measurements Institute. The reference antenna calibration was performed by Liberty Labs LLC and the working antennas (biconilog and horn) calibrated by Liberty Labs LLC and EMC Technologies respectively. The complete list of test equipment used for the measurements, including calibration dates and traceability is contained in Appendix A

3.0 TEST CONFIGURATION

Refer to Appendix B for photographs of the tested system.

4.0 CONDUCTED EMISSION MEASUREMENTS

Conducted emissions testing was not applicable as the EUT is battery powered.

5.0 RADIATED EMISSION MEASUREMENTS

5.1 Test Procedure

The EUT was set up on the table top (placed on turntable) of total height 80 cm above the ground plane, and operated as described in section 2 of this report. The EMI Receiver was operated under software control via the PC Controller through the IEEE.488 Interface Bus Card Adaptor. The test frequency range was sub-divided into smaller bands with sufficient frequency resolution to permit reliable display and identification of possible EMI peaks while also permitting fast frequency scan times. A calibrated Biconilog antenna was used for measurements between 30 MHz and 1000 MHz.

Testing was performed at a distance of 10 metres for the frequency range 30 to 1000 MHz.

The measurement of emissions between 30 - 1000 MHz was measured with the resolution bandwidth of 120 kHz and the video bandwidth of 300 kHz. The receiver bandwidth was set to 6 dB.

The EUT was slowly rotated with the Peak Detector set to Max-Hold. This was performed for two antenna heights. Each significant peak was then investigated and maximised with the Quasi-Peak detector. The measurement data for each frequency range was automatically corrected by the software for cable losses, antenna factors and preamplifier gain and all data was then stored on disk in sequential data files. This process was performed for both horizontal and vertical antenna polarisations.

5.2 Plotting of Measurement Data for Radiated Emissions

The stored measurement data was combined to form a single graph which comprised of all the frequency sub-ranges. The accumulated EMI (EUT ON) was plotted as the Red trace.

The highest recorded EMI signals are shown on the Peaks List on the bottom right side of the graph. For radiated EMI, each numbered peak is listed as a frequency, peak field strength, quasi-peak field strength and the margin relative to the limit in dB. A negative margin is the deviation of the recorded value below the limit.

5.3 Calculation of Field Strength

The field strength was calculated automatically by the software using all the pre-stored calibration data. The method of calculation is shown below:

E = V + AF - G + L

Where:

E = Radiated Field Strength in dBµV/m.
V = EMI Receiver Voltage in dBµV. (measured value)
AF = Antenna Factor in dB(m^{-1}). (stored as a data array of factor versus frequency)
G = Preamplifier Gain in dB. (stored as a data array of gain versus frequency)
L = Cable insertion loss in dB. (stored as a data array of insertion loss versus frequency)

- **Example Field Strength Calculation**

Assuming a receiver reading of 34.0 dBµV is obtained at 90 MHz, the Antenna Factor at that frequency is 9.2 dB. The cable loss is 1.9 dB while the preamplifier gain is 20.0 dB. The resulting Field Strength is therefore as follows:

34.0 + 9.2 + 1.9 - 20.0 = 25.1 dBµV/m

5.4 Radiated EMI Results

5.4.1 30-1000 MHz

Frequency MHz	Polarisation	QP Measured dBμV/m	QP Limit dBμV/m	ΔQP ± dB
947.50	Vertical	25.7	37.0	-11.3
953.03	Horizontal	25.7	37.0	-11.3
665.25	Vertical	21.9	37.0	-15.1
663.87	Horizontal	21.8	37.0	-15.2
160.54	Vertical	11.2	30.0	-18.8
95.30	Vertical	9.3	30.0	-20.7
354.10	Vertical	13.9	37.0	-23.1

The worst case radiated EMI occurred at 947.50 MHz and 953.03 MHz and complied with the Class B, quasi peak limit by a margin of 11.3 dB. Refer to Appendix C, Graphs 1 and 2.

5.4.2 Above 1 GHz

Radiated emissions testing above 1 GHz was not applicable as the highest operating frequency of the test sample was less than 108 MHz.

6.0 COMPLIANCE STATEMENT

The Hand Held Measurement Device, Model Number C-Gap complied with the applicable radiated EMI requirements of ICES-003 for a Class B digital apparatus when tested in accordance with CAN/CSA-CEI/IEC CISPR 22-10.

The compliance margins were as follows:

CAN/CSA CISPR 22-10

Table 2	**Conducted Emissions:**	**0.15-30 MHz**	Not applicable, EUT is battery powered
Table 4	**Radiated Emissions:**	**30-1000 MHz**	Complies Class B, margin of 11.3 dB
Table 4	**Radiated Emissions:**	**> 1 GHz**	Not applicable, highest operating frequency is less than 108 MHz

7.0 MEASUREMENT UNCERTAINTY

EMC Technologies has evaluated the equipment and the methods used to perform the emissions testing. The estimated measurement uncertainties for emissions tests shown within this report are as follows:

Conducted Emissions

Mains Port	
9 kHz to 30 MHz	±3.2 dB

Radiated Emissions

9 kHz to 30 MHz	±4.1 dB
30 MHz to 300 MHz	±5.1 dB
300 MHz to 1000 MHz	±4.7 dB

The above expanded uncertainties are based on standard uncertainties multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

Application of measurement uncertainty for this report:
The referenced uncertainty standard specifies that determination of compliance shall be based on measurements without taking into account measurement uncertainty. However, the measurement uncertainty shall appear in the test report.

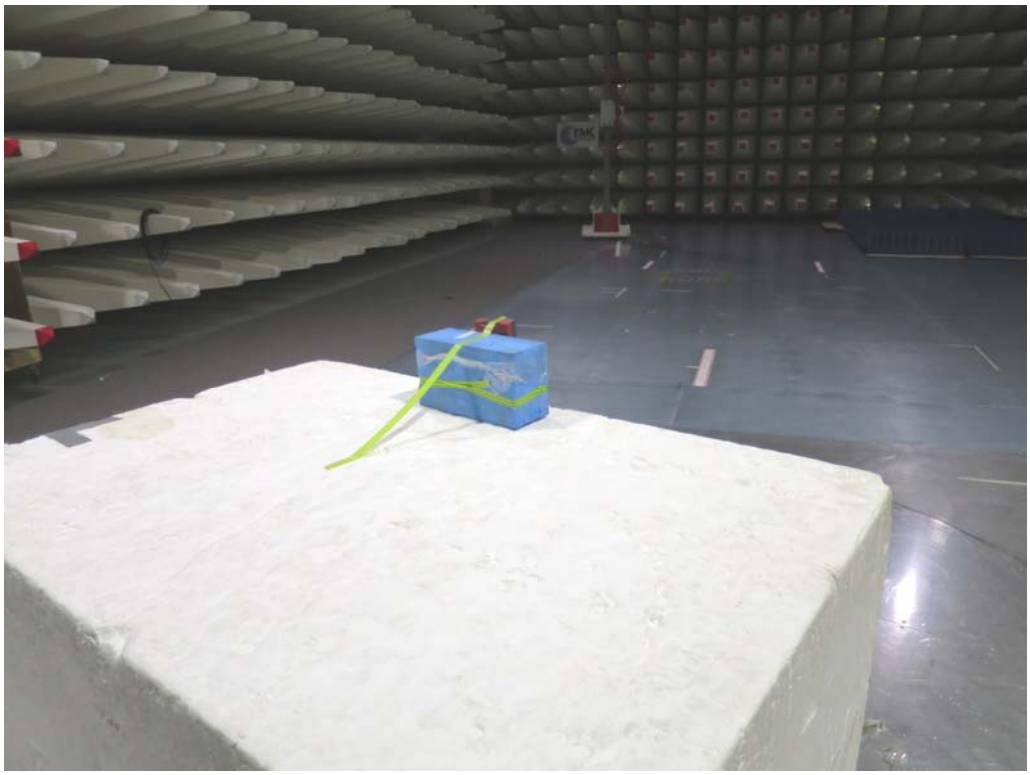
APPENDIX A
MEASUREMENT INSTRUMENTATION DETAILS

EQUIPMENT TYPE	MAKE/MODEL SERIAL NUMBER	LAST CAL. DD/MM/YY	DUE DATE DD/MM/YY	CAL. INTERVAL
EMI RECEIVERS	R&S ESU40 Sn: 100182 (R-037)	18/02/16	18/02/17	1 YEAR *1
ANTENNAS	SUNOL JB6 BICONILOG (A-363) 30 - 6000 MHz Sn. A012312	16/05/14	16/05/16	2 YEAR *2

Note *1. NATA calibration by Rohde & Schwarz (Australia) Pty Ltd
Note *2. A2LA Accredited calibration by Liberty Labs, Inc.

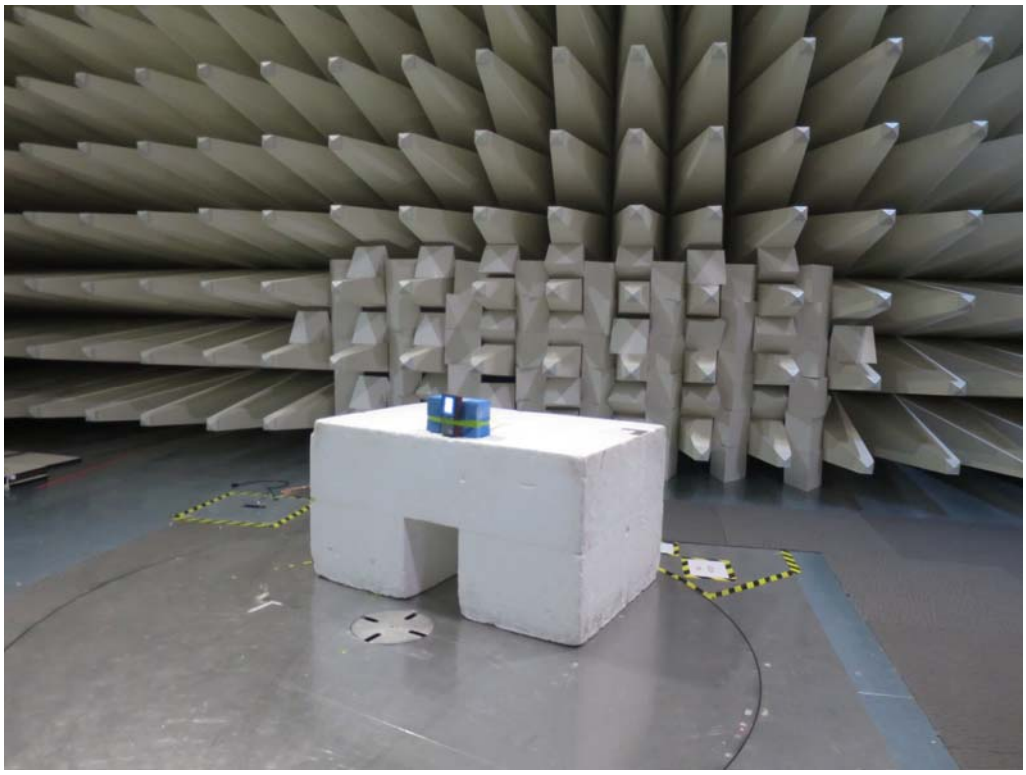
APPENDIX B1
TEST SETUP PHOTOGRAPHS

Radiated Emissions



APPENDIX B2
TEST SETUP PHOTOGRAPHS

Radiated Emissions



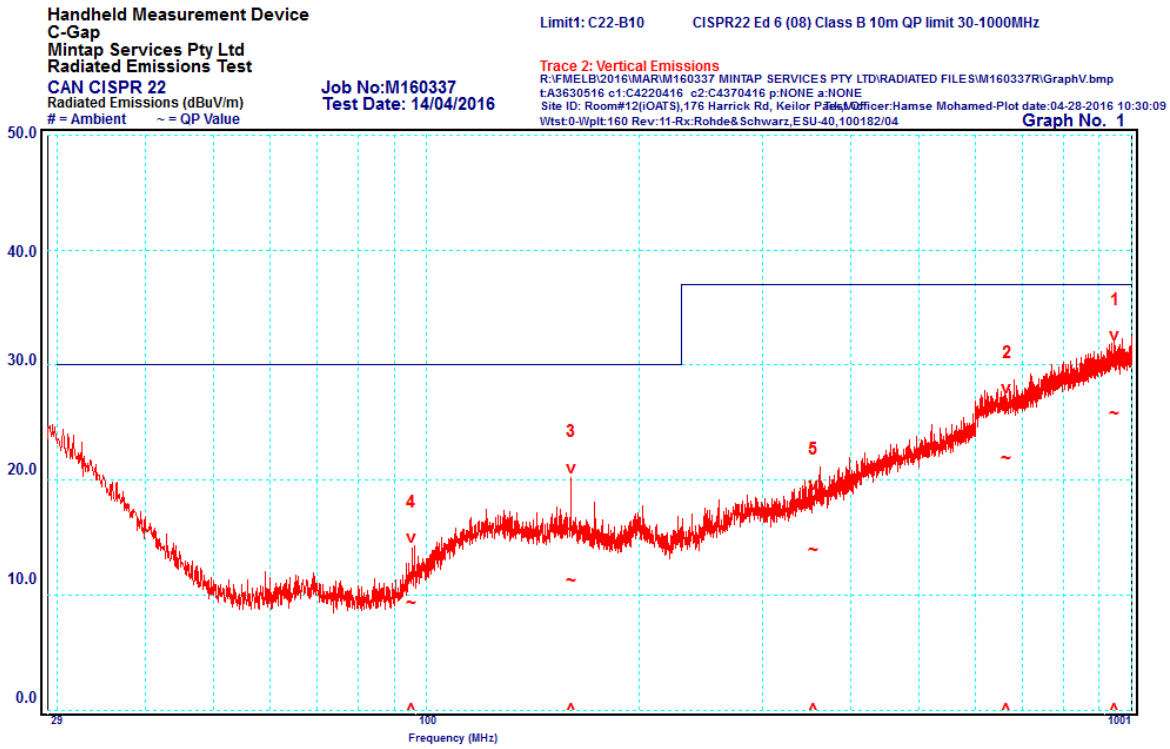
APPENDIX C
GRAPHS OF EMI MEASUREMENT

RADIATED EMI

Graph 1:	**Model AM888**	Vertical Polarity	30 - 1000 MHz
Graph 2:	**Model AM888**	Horizontal Polarity	30 - 1000 MHz

RADIATED EMI

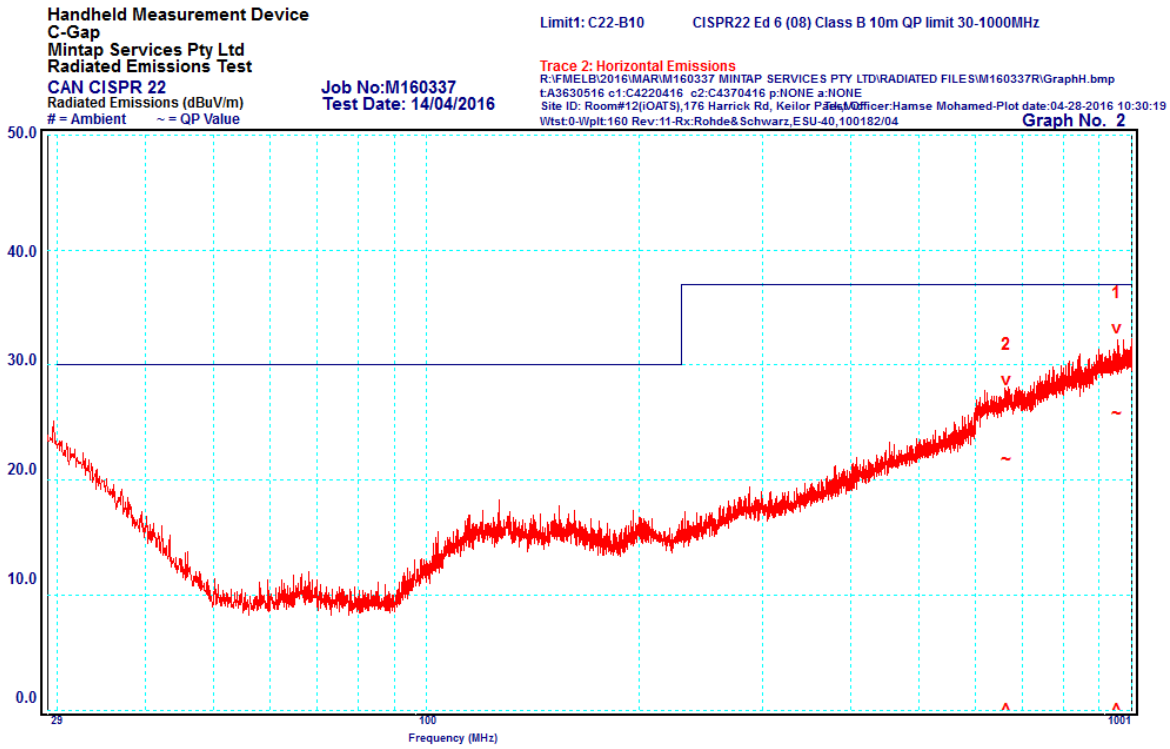
Graph 1: Vertical Polarity, 30 - 1000 MHz



Peak	Frequency MHz	Polarisation	QP Measured dBµV/m	QP Limit dBµV/m	ΔQP ± dB
1	947.50	Vertical	25.7	37.0	-11.3
2	665.25	Vertical	21.9	37.0	-15.1
3	160.54	Vertical	11.2	30.0	-18.8
4	95.30	Vertical	9.3	30.0	-20.7
5	354.10	Vertical	13.9	37.0	-23.1

RADIATED EMI

Graph 2: Horizontal Polarity, 30 - 1000 MHz



Peak	Frequency MHz	Polarisation	QP Measured dBµV/m	QP Limit dBµV/m	ΔQP ± dB
1	953.03	Horizontal	25.7	37.0	-11.3
2	663.87	Horizontal	21.8	37.0	-15.2

APPENDIX D

INNOVATION, SCIENCE & ECONOMIC DEVELOPMENT CANADA (ISED Canada) REQUIREMENTS

The following information is believed to be true and accurate, however we advise that the current ISED Canada (formerly Industry Canada) rules/regulations be consulted. EMC Technologies accepts no responsibility for any consequences arising from the use of the following information. It is the manufacturer's/suppliers responsibility to ensure that all applicable ISEDC Rules are identified and adhered to. If other parts of the ISEDC Rules apply, there may be requirements for additional of different forms of labelling and user information.

1. ISED CANADA REQUIREMENTS (Refer to ICES-003, RSS-Gen, RSP-100)

Procedural Requirements

A record of the measurements and results, showing the date that the measurements were completed, shall be retained by the manufacturer or importer for **a period of at least five years** from the date shown in the record and made available for examination on the request of the Minister.

The manufacturer, importer or supplier shall meet the labelling requirements for every ITE unit.

1. Prior to marketing in Canada, for ITE manufactured in Canada, and;

2. Prior to importation into Canada, for imported ITE.

The presence of the label on the ITE represents the manufacturer's or importer's Self-Declaration of Compliance (SDoC) to Industry Canada ICES-003. Each unit of an ITE model shall bear a label indicating the model's compliance with ICES-003.

The label shall be permanently affixed to the ITE or displayed electronically and its text must be clearly legible. When the dimension of the device is too small or it is otherwise not practical to place the label on the ITE, the label shall be placed in a prominent location in the user manual supplied with the ITE. The user manual may be in an electronic format and must be readily available.

2. ICES-003 LABELLING REQUIREMENTS

Labelling requirements (Refer to ICES-003 Section 8)
ICES-003 Compliance Label statement:

CAN ICES-3 (*)/NMB-3(*)

***Insert either "A" or "B" but not both to identify the applicable Class of ITE.**

Compliance statement for ICES-003:
(RSS-Gen Section 8.4 & RSP-100 Section 3.2: Required notices to the user)

Radio apparatus shall comply with the requirements to include required notices or statements to the user of equipment with each unit of equipment model offered for sale.

The required notices are specified in the RSS documents (including RSS-Gen) applicable to the equipment model. These notices are required to be shown in a conspicuous location in the user manual for the equipment, or to be displayed on the equipment model. If more than one notice is required, the equipment model(s) to which each notice pertains should be

identified. Suppliers of radio apparatus shall provide notices and user information in both English and French.

"*This device complies with Industry Canada's licence-exempt RSS standards. Operation is subject to the following two conditions:*
(1) This device may not cause interference; and
(2) This device must accept any interference, including interference that may cause undesired operation of the device."
Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Please note: If the device contains pre-approved modular transmitter the following label requirements apply:

If using a permanently affixed label, the modular transmitter must be labelled with its own IC identification numbers, and, if the identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module IC: XYZMODEL1":

Any similar wording that expresses the same meaning may be used. The Grantee may either provide such a label, an example of which must be included in the application for equipment authorization, or, must provide adequate instructions along with the module which explains this requirement. In the latter case, a copy of these instructions must be included in the application for equipment authorization.