



Global Product Certification
EMC-EMF Safety Approvals

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**EMI TEST REPORT FOR CERTIFICATION
to
FCC PART 2.1053**

FCC ID: XZ4-1000-0710

Test Sample: Agile Mini Control RTU

Part Number: 1000-0715

Manufacturer: Square One Laboratories Pty Ltd

Report Number: M150714-2_FCC_1000-0715

Issue Date: 24 August 2015

EMC Technologies Pty Ltd reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. EMC Technologies Pty Ltd shall have no liability for any deductions, inferences or generalisations drawn by the client or others from EMC Technologies Pty Ltd issued reports. This report shall not be used to claim, constitute or imply product endorsement by EMC Technologies Pty Ltd.

**EMI TEST REPORT FOR CERTIFICATION
to
FCC PART 2.1053**

EMC Technologies Report No. M50714-2_FCC_1000-0715

Issue Date: 24 August 2015

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EMI TEST REPORT FOR CERTIFICATION
to
FCC PART 2.1053

Report No. M150714-2_FCC_1000-0715

Test Sample: Agile Mini Control RTU
Part Number: 1000-0715
Manufacturer: Square One Laboratories Pty Ltd

FCC ID: XZ4-1000-0710
Equipment Type: Intentional Radiator (Transceiver)

Tested for: Square One Laboratories Pty Ltd
Address: 2/25 Manton Road,
Oakleigh South, VIC 3167 Australia
(PO Box 303, Oakleigh MDC VIC 3166 Australia)

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Fax: +61 3 9545 6777

Responsible Party: Motti Grinberg

Instruction: Measurement of radiated emissions from 1000-0715 sample to show differences to the sample tested previously (refer to EMC Technologies report M091201R_FCC_1000-0710) has not degraded the results.

Test Standards: **FCC Part 2.1053**
Measurements required: Field strength of spurious radiation.

ANSI C63.4-2009
American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

ANSI/TIA-603-C-2004
Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

Test Dates: 15 and 16 July 2015



Test Officer: **Kevin Hansen**

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.*



Authorised Signatory: **Rob Weir**
Facility Manager
EMC Technologies Pty Ltd

EMI TEST REPORT FOR CERTIFICATION to FCC PART 2.1053

1.0 INTRODUCTION

EMI testing was performed on the Agile Mini Control RTU, Part number: 1000-0715. The test results and procedures were performed in accordance with the following Federal Communications Commission (FCC) standards/regulations. The test sample **complied** with the radiated emission requirements of FCC: 47 CFR, Part 2.1053.

Test results and procedures were performed in accordance with the following Federal Communications Commission (FCC) standards/regulations:

FCC Part 2	Test Description	Results
FCC 2.1053	Radiated Emissions	Complied

The measurement procedure used was in accordance with ANSI/TIA-603-C-2004. The instrumentation conformed to the requirements of ANSI C63.2-2009.

1.1 EUT – Voltage Power Conditions

The Control RTU was DC powered by 6VDC (4 x AA batteries).

1.2 Modifications

No modifications were required.

2.0 GENERAL INFORMATION (Information supplied by the Client)

2.1 EUT Details

Test Sample:	Agile Mini Control RTU (also sold under the name RadioNET Mini Control RTU)
Part Number:	1000-0715
Power Rating:	6V DC, 1.8W max
Antenna Type:	¼ Wave Whip
Gain:	Unity
Microprocessor:	MSP430
Crystal Frequency:	14.7456 MHz
Real Time Clock Freq:	32768 Hz
Manufacturer:	Square One Laboratories Pty Ltd

2.2 Description supplied by Client

Control RTUs were powered by 6V DC provided by 4 x AA batteries, or by optional solar power, designed to control and directly drive up to 9 valves as part of the Agile Radio System.

2.3 Test Configuration

The Control RTU was configured in transmitting mode, transmitting at 450 MHz 50 mW communicating via RS232 with a laptop placed outside the chamber.

2.4 Test Procedure

Emissions measurements were performed in accordance with the procedures of ANSI C63.4-2009. Radiated emissions tests were performed at a distance of 10 metres (9 kHz-1000 MHz) and 3 metres (> 1 GHz) 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 Industry Canada for the performance of radiated measurements in accordance with RSS-Gen, Issue 4 - **Industry 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 company 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 (A²LA).

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 Test Equipment Calibration

Measurement instrumentation and transducers were calibrated in accordance with the applicable standards by an independent NATA registered 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 NMI and the working antennas (loop, biconilog and horn) calibrated by the NATA approved procedures. The complete list of test equipment used for the measurements, including calibration due dates are contained in this report

FCC Part 2.1053

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 Loop antenna was used for measurements between 9 kHz to 30 MHz, a calibrated Biconilog antenna was used for measurements between 30 MHz to 1 GHz and a horn antenna used for measurements between 1 GHz and 4.7 GHz.

The resolution bandwidth and video bandwidth settings for final measurements were:

9 kHz – 150 kHz:	Quasi-peak: 1 kHz RBW, 3 kHz VBW
150 kHz – 30 MHz:	Quasi-peak: 10 kHz RBW, 30 kHz VBW
30 MHz – 1000 MHz:	Quasi-peak: 120 kHz RBW, 300 kHz VBW
1 GHz – 4.7 GHz:	Peak: 1 MHz RBW, 1MHz VBW

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. When an emission was located, it was positively identified and its maximum level found by rotating the automated turntable, and by varying the antenna height. Each significant peak was investigated. This process was performed for both horizontal and vertical antenna polarisations.

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

$$E = V + AF - G + L \quad \text{Where:}$$

E	=	Radiated Peak Field Strength in dB μ V/m.
V	=	EMI Receiver Voltage in dB μ V. (measured value)
AF	=	Antenna Factor in dB(m ⁻¹). (stored as a data array)
G	=	Preamplifier Gain in dB. (stored as a data array)
L	=	Cable loss in dB. (stored as a data array of Insertion Loss versus frequency)

- **Example Peak Field Strength Calculation**

Assuming a receiver reading of 34.0 dB μ V 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 dB. The resulting Field Strength is therefore as follows:

$$34.0 + 9.2 + 1.9 - 20 = 25.1 \text{ dB}\mu\text{V/m}$$

3.0 RADIATED EMISSIONS

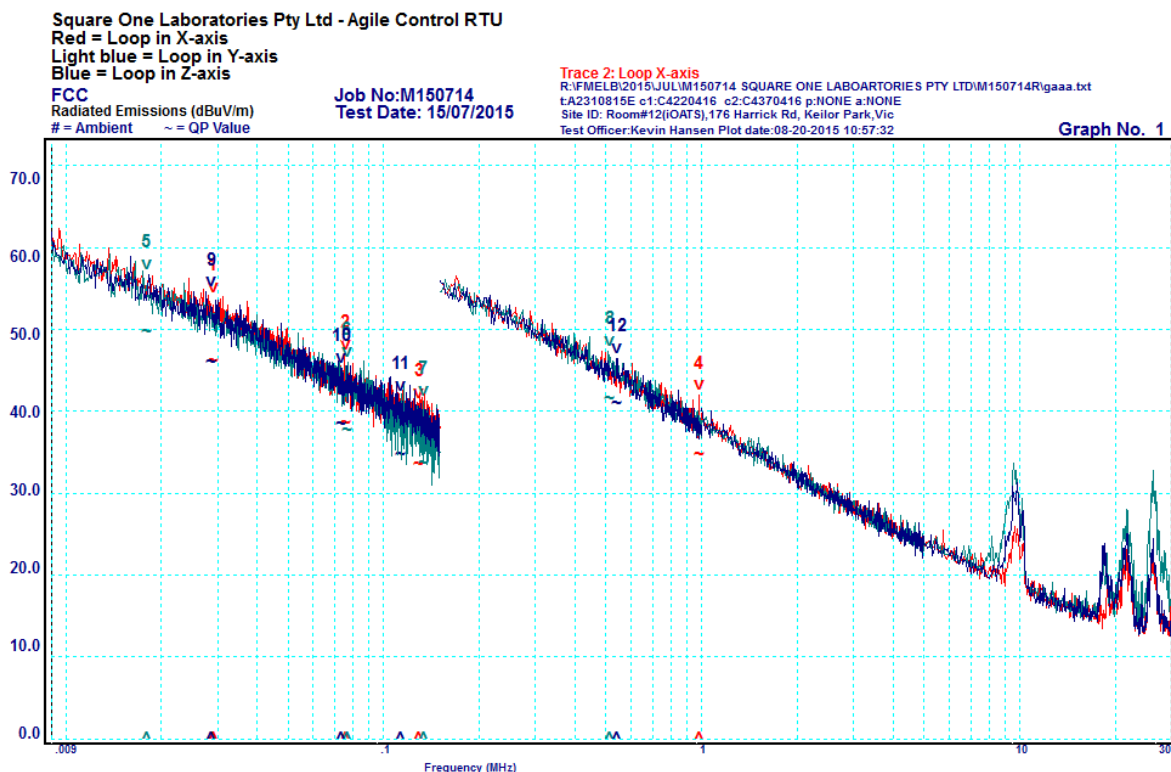
Measurements were performed at a distance of 3 and 10 metres from the EUT.

The limits of any emissions outside the frequency band shall be attenuated by at least 30dBc. The limit for this sample was 72.6 dB μ V/m at 10 metres and 83.1 dB μ V/m at 3 metres. Refer to the following graphs for the transmitter emission measurements.

3.1 Frequency Band: 0.009 - 30 MHz

Result: Complied by a margin of greater than 10 dB. Limit set to top of graph.

10 metre measurement distance.



3.2 Frequency Band: 30 - 300 MHz

Result: Complied by a margin of greater than 10 dB (no emissions were recorded within 40 dB below the carrier). Top of graph = limit.

10 metre measurement distance.

Square One Laboratories Pty Ltd - Agile Control RTU

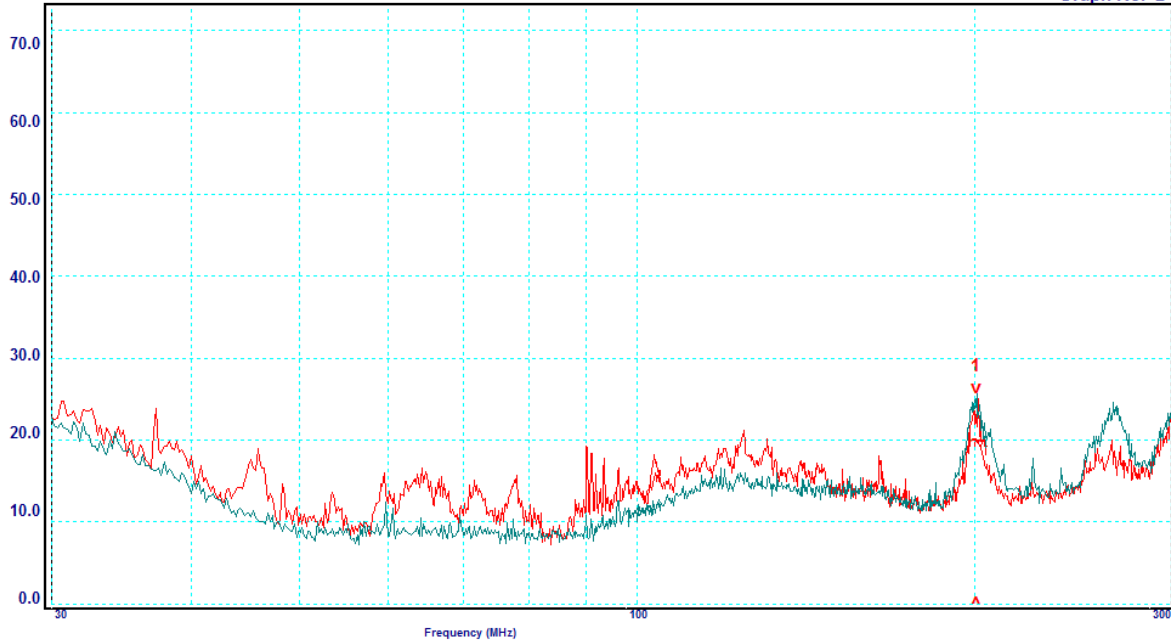
Red = Vertical emissions
Blue = Horizontal emissions

FCC Radiated Emissions (dBuV/m)
= Ambient ~ = QP Value

Job No: M150714
Test Date: 16/07/2015

Trace 2: Vertical Emissions
R:\FME\B\2015\JUL\150714 SQUARE ONE LABOARTORIES PTY LTD\M150714R\GraphV.bmp
t:A3630516 c1:C4220416 c2:C4370416 p:NONE s:NONE
Site ID: Room#12(IQATS),176 Harrick Rd, Keilor Park, Vic
Test Officer: Kevin Hansen Plot date: 08-20-2015 10:54:36

Graph No. 2



3.3 Frequency Band: 300 MHz – 4.7 GHz

Result: Complied by a margin of 10.9 dB.

10 metre measurement distance for the range 300 MHz to 1 GHz and 3 metres for the range 1 GHz to 4.7 GHz.

Peak	Frequency MHz	Polarity	Level Measured dBuV/m	Limit dBμV/m	Δ ± dB
1	337.56	Vertical	44.6	72.6	-28.0
2	364.67	Vertical	33.2	72.6	-39.4
3	449.98	Vertical	102.6	-	Reference
4	562.45	Vertical	32.7	72.6	-39.9
5	418.97	Vertical	32.1	72.6	-40.5
6	900.00	Vertical	55.6	72.6	-17.0
7	1349.96	Vertical	60.4	83.1	-12.2
8	1799.96	Vertical	61.2	83.1	-11.4
1	450.00	Horizontal	98.8	-	-
2	900.00	Horizontal	60.4	72.6	-12.2
3	1799.98	Horizontal	58.4	83.1	-14.2
4	1349.97	Horizontal	61.7	83.1	-10.9

Vertical emissions:

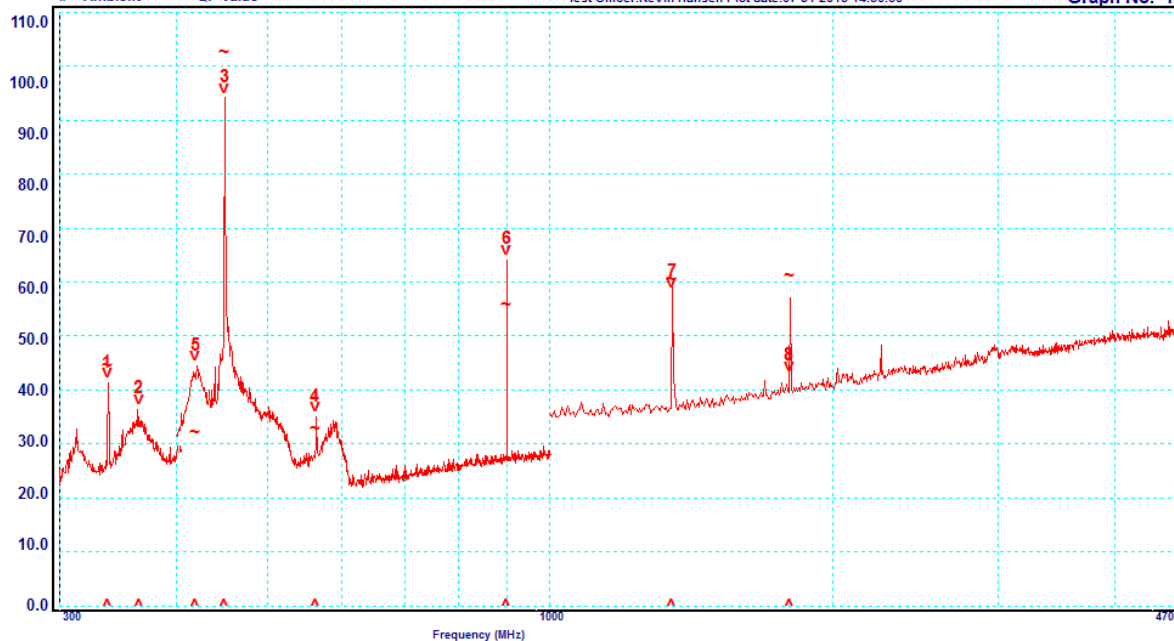
Square One Laboratories Pty Ltd
Agile Control RTU
450 MHz 50mW

FCC
Radiated Emissions (dBuV/m)
= Ambient ~ = QP Value

Job No: M150714
Test Date: 16/07/2015

Trace 2: Vertical Emissions
R:\FME\B\2015\JUL\M150714 SQUARE ONE LABOARTORIES PTY LTD\M150714R\GraphV.bmp
t:A0040516 c1:C4210416 c2:C4370416 p:NONE a:NONE
Site ID: Room#12(iOATS),176 Harrick Rd, Keilor Park,Vic
Test Officer:Kevin Hansen Plot date:07-31-2015 14:50:50

Graph No. 1

Horizontal emissions:

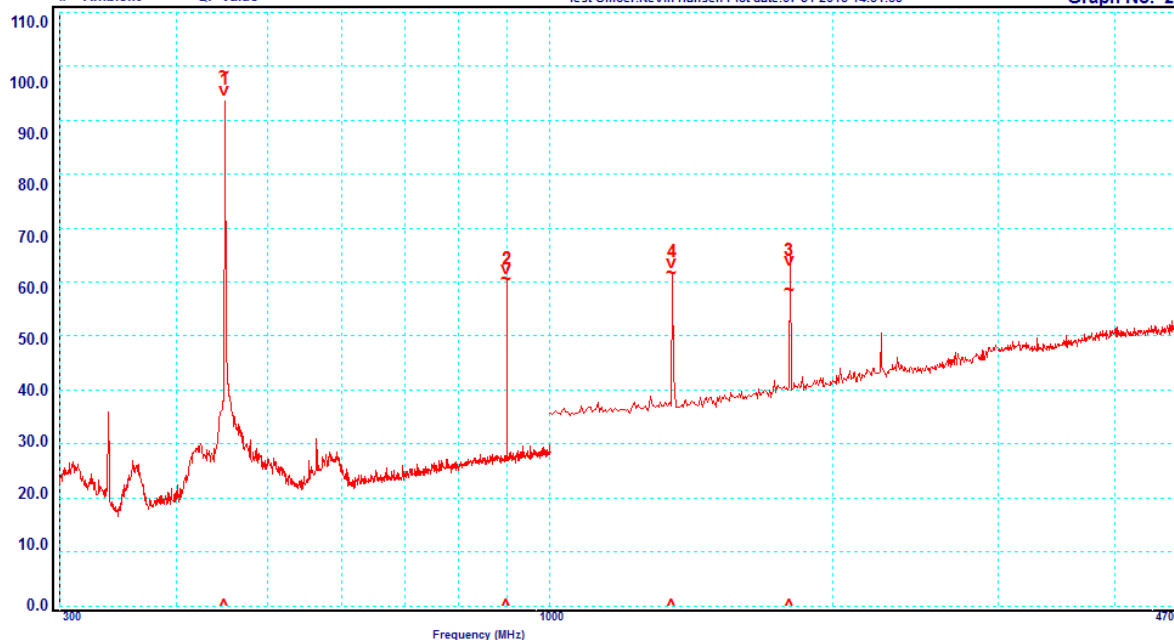
Square One Laboratories Pty Ltd
Agile Control RTU
450 MHz 50mW

FCC
Radiated Emissions (dBuV/m)
= Ambient ~ = QP Value

Job No: M150714
Test Date: 16/07/2015

Trace 2: Horizontal Emissions
R:\FME\B\2015\JUL\M150714 SQUARE ONE LABOARTORIES PTY LTD\M150714R\GraphH.bmp
t:A0040516 c1:C4210416 c2:C4370416 p:NONE a:NONE
Site ID: Room#12(iOATS),176 Harrick Rd, Keilor Park,Vic
Test Officer:Kevin Hansen Plot date:07-31-2015 14:51:59

Graph No. 2



4.0 COMPLIANCE STATEMENT

The Agile Mini Control RTU, Part number: 1000-0715, tested on behalf of Square One Laboratories Pty Ltd **complied** with the radiated emission requirements of 47 CFR, Part 2.1053.

FCC Part 2	Test Description	Results
FCC 2.1053	Radiated Emissions	Complied

5.0 MEASUREMENT UNCERTAINTY

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

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
	1 GHz to 18 GHz	±4.6 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 instrumentation uncertainty. However, the measurement uncertainty shall appear in the test report.

6.0 INSTRUMENT CALIBRATION DETAILS

EQUIPMENT TYPE	MAKE/MODEL SERIAL NUMBER	LAST CAL. DD/MM/YY	DUE DATE DD/MM/YY	CAL. INTERVAL
EMI RECEIVER	HP 8546A Sn: 3549A00290 (R-009)	09/10/2014	02/10/2015	1 YEAR *1
ANTENNAS	SUNOL JB6 BICONILOG (A-363) 30 - 6000 MHz Sn. A012312	16/05/2015	16/05/2016	2 YEAR *2
	EMCO 3115 Broadband Horn (A-004) 1 – 18 GHz	09/05/2013	09/05/2016	3 YEAR *3
	EMCO 6502 Loop Antenna (A-231) (10 kHz – 30 MHz) Sn. 9311-2801	20/08/2012	20/08/2015	3 YEAR *3

Note *1. NATA calibration by Rhode & Schwarz (Australia) Pty Ltd

Note *2. A2LA Accredited calibration by Liberty Labs, Inc.

Note *3. In-house calibration. Refer to Quality Manual.