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Global Product Certification
EMC-EMF Safety Approvals

ELECTROMAGNETIC COMPATIBILITY CERTIFICATION to 47 CFR PART 15, SUBPART B

Report Number: S180319-2

Tested For: Tait Limited
Test Sample: TBCHHX Base Station
Model Number: TB9400
Serial Number: 18274956

Date of Issue: 04 May 2018

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.

ELECTROMAGNETIC COMPATIBILITY CERTIFICATION

47 CFR PART 15, SUBPART B

CONTENTS

ELECTROMAGNETIC COMPATIBILITY CERTIFICATE OF COMPLIANCE

Device under Test:	TBCHHX Base Station
Model Number:	TB9400
Serial Number:	18274956
Manufacturer:	Tait Limited 245 Wooldridge Road, Christchurch, 8051, New Zealand
Tested for: **Address:**	Tait Limited 245 Wooldridge Road, Christchurch, 8051, New Zealand
Phone:	+64 3 358 0309
Contact:	Mr Marcos Louzada
Standards:	**47 CFR Part 15 –** Radio Frequency Devices **Subpart B –** Unintentional Radiators **ANSI C63.4: 2014** *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*
Result:	The Test Sample complied with the applicable requirements of the above standards. Refer to Report S180319-2 for full details
Test Dates:	13th April 2018 to 16th April 2018
Issued by:	EMC Technologies Pty. Ltd., **Unit 3, 87 Station Road, Seven Hills, NSW, 2147, Australia.** Phone: +61 2 9624 2777, Web: www.emctech.com.au
Issue Date:	4 May 2018
Test Engineers:	**James Guo** **Dong Feng**
Authorised Signatory:	**Robert Middleton** **Sydney Manager** **EMC TECHNOLOGIES PTY. LTD.**

ELECTROMAGNETIC COMPATIBILITY CERTIFICATION REPORT

47 CFR PART 15, SUBPART B

1.0 INTRODUCTION

This report details the results of Electromagnetic Interference (EMI) tests performed on the TBCHHX Base Station with Model: TB9400. The measurements were made in accordance with:

- Federal Communications Commission (FCC) regulations as detailed in Title 47 CFR, Part 15 Subpart B for a Class B device, unintentional radiator.

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 Test Procedure

Emission measurements were performed in accordance with the procedures of ANSI C63.4: 2014. Radiated emissions tests were performed at a distance of 3 metres (30-1000MHz) and 3 metres (above 1 GHz) from the EUT.

1.2 Summary of Test Results

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

FCC 15B			
15.107	**Conducted Emissions:**	**0.15-30 MHz**	Not Tested at customer's request
15.109	**Radiated Emissions:**	**30-1000 MHz**	Complied Class B, margin of greater than 10dB.
15.109	**Radiated Emissions:**	**Above 1 GHz**	Complied Class B, margin of greater than 10dB.

The measurement procedure applied was in accordance with ANSI C63.4: 2014. The instrumentation conformed to the requirements of ANSI C63.2: 2016.

2.0 GENERAL INFORMATION

(Information supplied by the Client)

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

Manufacturer:	Tait Limited
Test Sample:	TBCHHX Base Station
Model Number:	TB9400
Serial Number:	18274956
Equipment Type:	Unintentional Radiator

2.1 Description supplied by Client

The EUT is a Base Station with receive only.

2.2 Operating Conditions

The EUT was operated in accordance with the standard and the customer's testing requirements.

2.3 Support Equipment

No support equipment was required.

2.4 Modifications

No modifications were performed on the EUT in order to comply with the standard.

2.5 Test Facility

2.5.1 General

Measurements were performed at EMC Technologies' laboratory in Seven Hills, New South Wales, Australia.

EMC Technologies Pty Ltd has 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 Certification under Parts 15 and 18 of the FCC Commission's rules – **Registration Number 494713 and Designation number AU0002.**

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 (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).

2.7 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 not performed at customer's request.

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 Bilog antenna was used for measurements between 30 MHz and 1000 MHz. A calibrated double-ridged horn antenna was used for measurements over 1000 MHz.

Testing was performed at a distance of 3 metres for the frequency range 30 to 1000 MHz and 3 metres for above 1 GHz.

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 measurement of emissions above 1000 MHz was measured with the resolution bandwidth of 1000 kHz and the video bandwidth of 10 Hz for average measurements. The video bandwidth of 3000 kHz was used for peak measurements.

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 Test Climatic Conditions

Shielded Room Temperature:	23°C
Relative Humidity:	56%

5.5 Radiated EMI Results

5.5.1 30-1000 MHz

All measured frequencies complied with the Class B, quasi peak limit by a margin of greater than 10dB.
Refer to Appendix C1, Graphs 1 and 2.

5.5.2 Above 1 GHz

Testing was performed to 6GHz as the highest operating frequency is greater than 108MHz.

All recorded emissions complied with both the Class B Peak and Average limits by margins of greater than 10 dB.
Refer to Appendix C2 and C3, Graphs 3, 4, 5 and 6.

6.0 COMPLIANCE STATEMENT

The TBCHHX Base Station with model Number: TB9400 tested on behalf of Tait Limited, complied with the radiated EMI requirements of the 47 CFR Part 15 Subpart B Rules for a Class B device (unintentional radiator).

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:

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
EMI Receivers	ESCI EMI Test Receiver (Asset No: R029) SN: 100012 9kHz – 3GHz	04/05/17	04/05/18 *1
	Model: ESU40 (Asset No: R038) S/N: 100183 20Hz – 40GHz	06/04/18	06/04/19 *1
Antennas	Sunar RF Motion JB1 BiLog Antenna (Asset No: A430) S/N: A021318	08/03/18	08/03/21 *3
	Double Ridged Horn Antenna (Asset No: A324) Model: EMCO 3115 S/N: 3823 1-18GHz	29/01/18	29/01/21 *2
Preamplifier	HP 8449B (Asset No: A138) S/N: 3008A01113	14/08/17	14/08/18 *2
Cables	Sucoflex 3m Cable (Asset No: SC028)	10/08/17	10/08/18 *2
	Sucoflex 4m Cable Model: SF104A/2x11N-47/4m (Asset No: SC041)	10/08/17	10/08/18 *2
	Huber Suhner Cable Model: Sucoflex 104A S/N: MY709/4A (Asset No: SC042)	10/08/17	10/08/18 *2
Test Software	Wintst RS	Build: B032R5	Revision 2.0

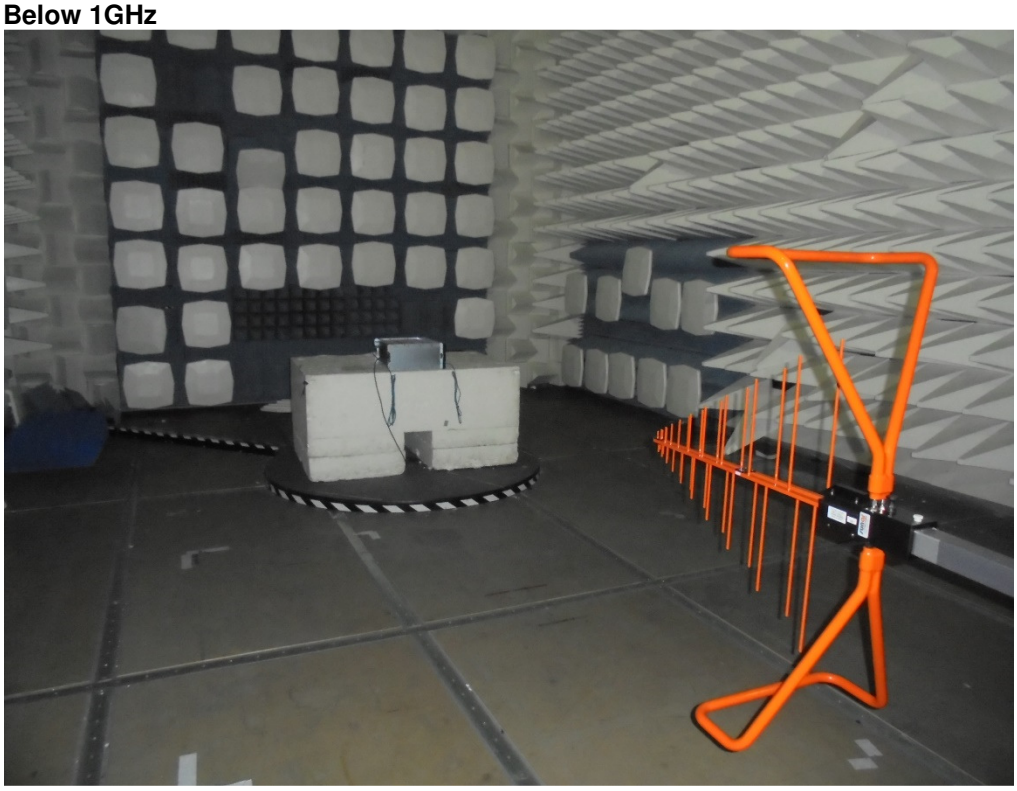
Note *1: NATA Calibration by Rohde & Schwarz.
Note *2 : In-house calibration. Traceable to Australian National Standards.
Note *3: NATA Calibration by Keysight Technologies Pty Ltd.

TEST SITES

Equipment Type	Make/Model Serial Number	Last Cal. DD/MM/YY	Due Date DD/MM/YY
Shielded Room/ Test Laboratory	7.23m × 4.83m × 2.45m	N/A	N/A
Indoor Open Area Test Site (iOATS)	RFI Industries S800 Serial Number: 876, 3 metre site iOATS situated at Seven Hills, NSW	20/04/17	20/04/19

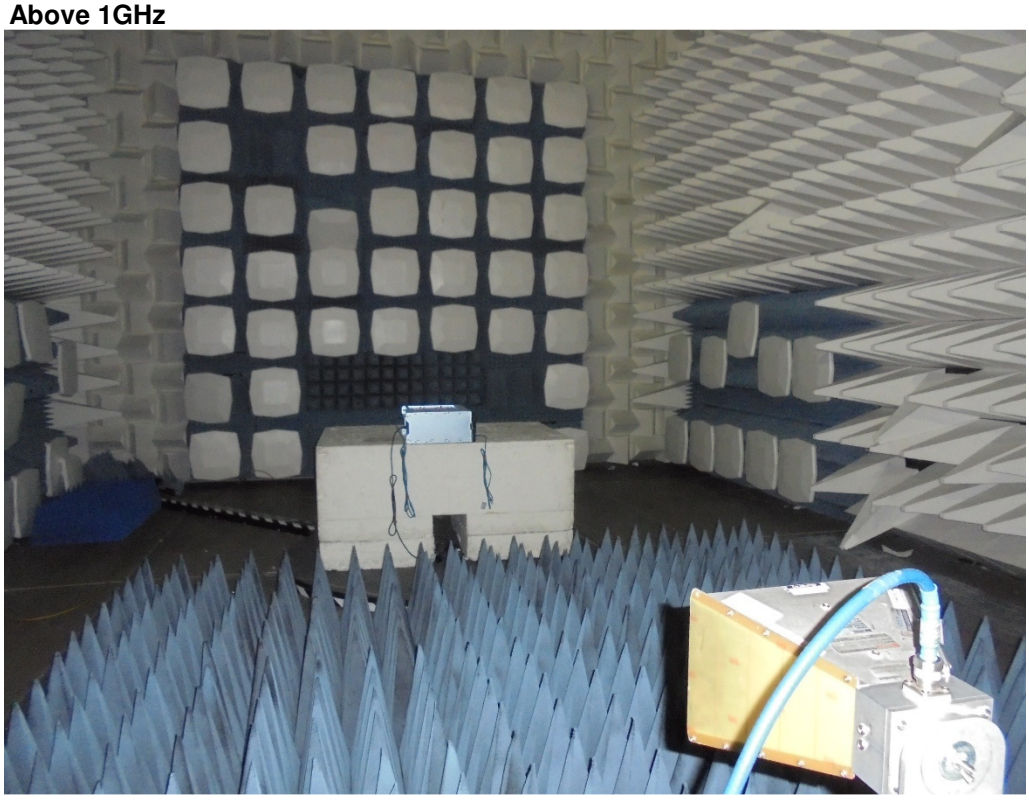
APPENDIX B1
TEST SETUP PHOTOGRAPHS

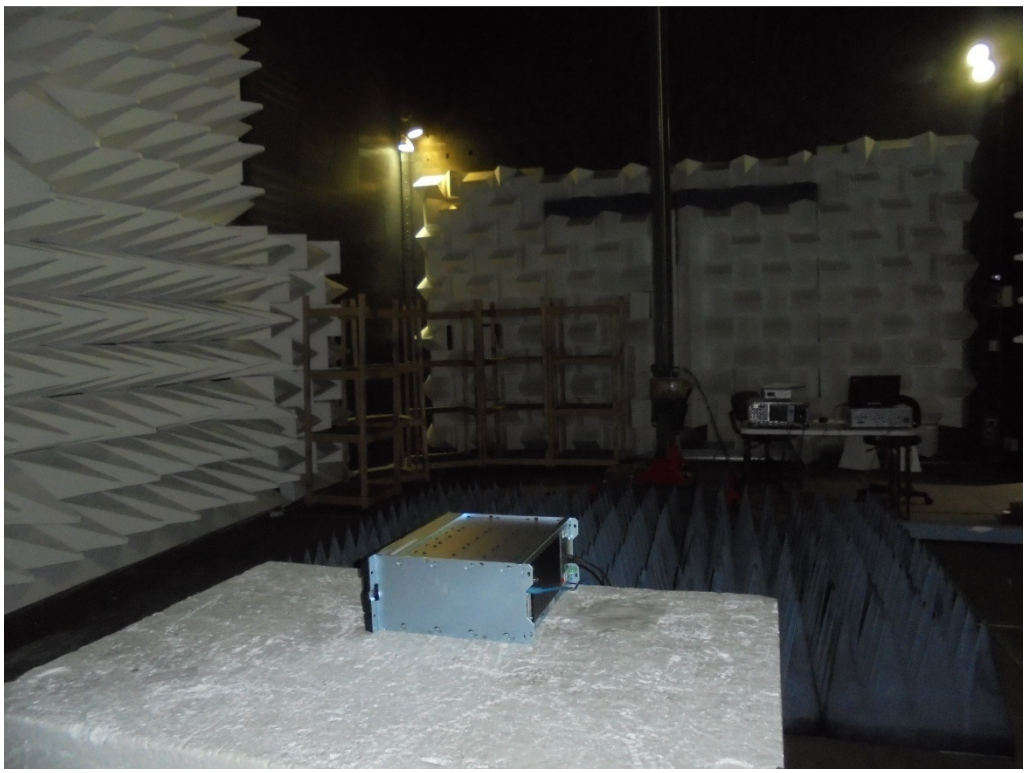
Radiated Emissions Test Setup
Below 1GHz



APPENDIX B2
TEST SETUP PHOTOGRAPHS

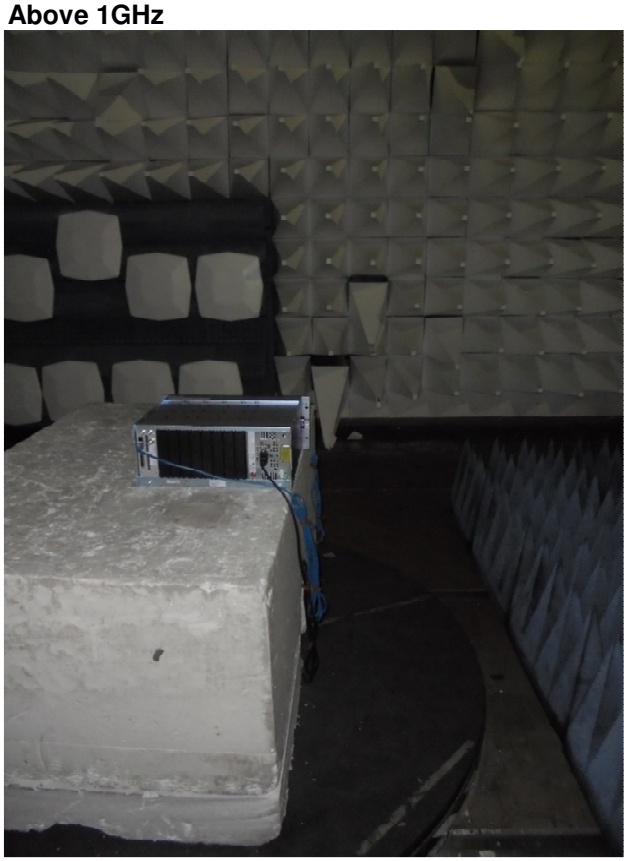
Radiated Emissions Test Setup
Above 1GHz





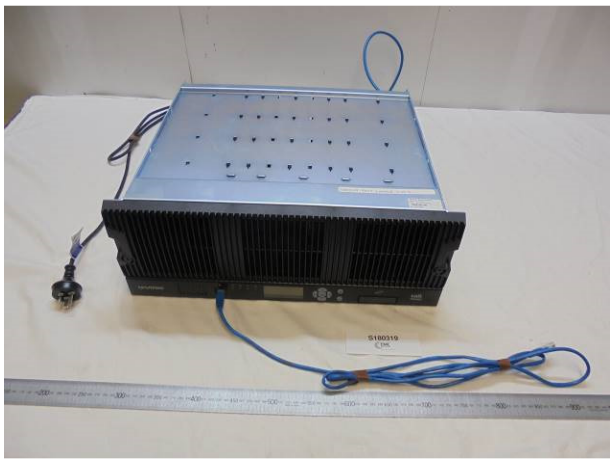
APPENDIX B3
TEST SETUP PHOTOGRAPHS

Radiated Emissions Test Setup
Above 1GHz



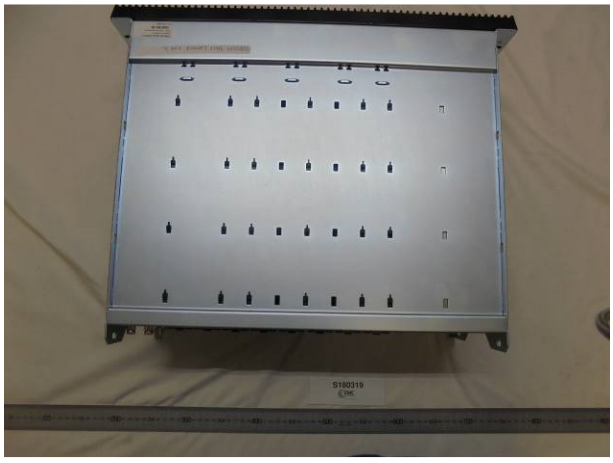
APPENDIX B4
IDENTIFICATION PHOTOGRAPHS

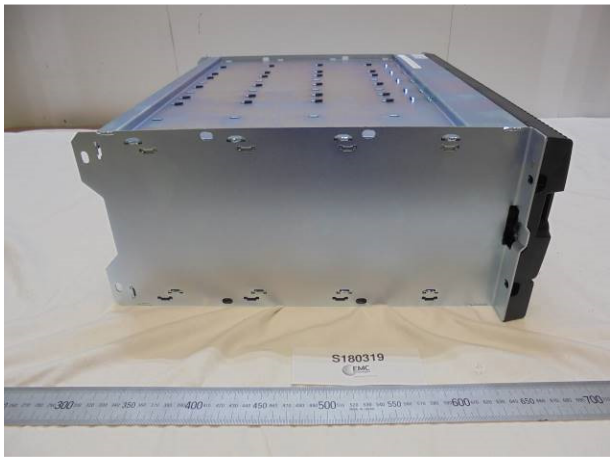
EUT Setup



APPENDIX B5
IDENTIFICATION PHOTOGRAPHS

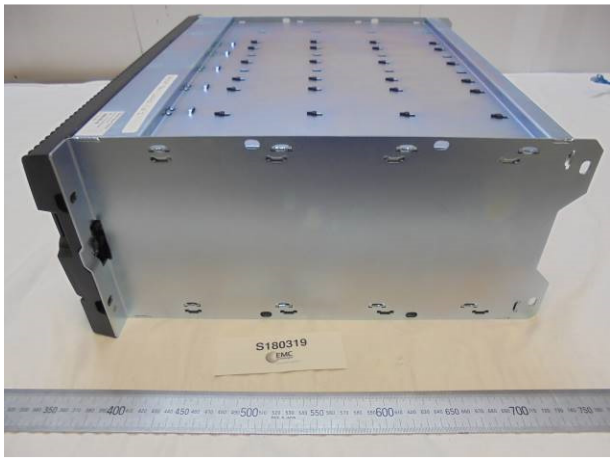
EUT Base Station

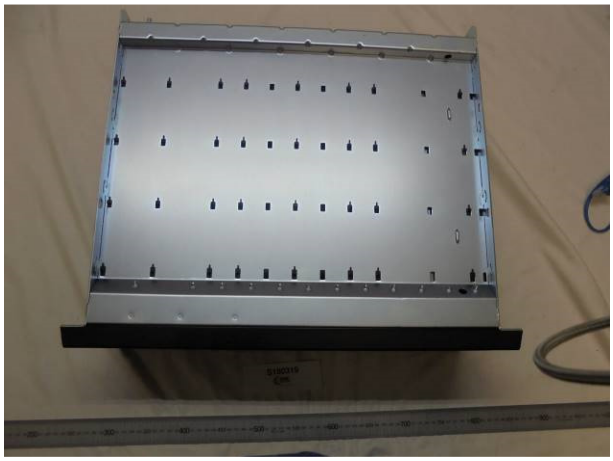




APPENDIX B6
IDENTIFICATION PHOTOGRAPHS

EUT Base Station



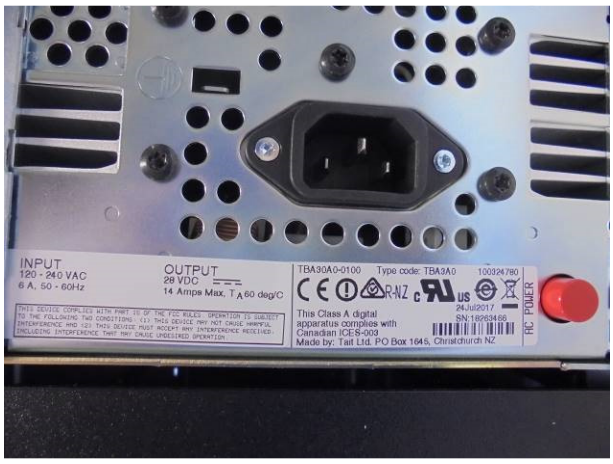


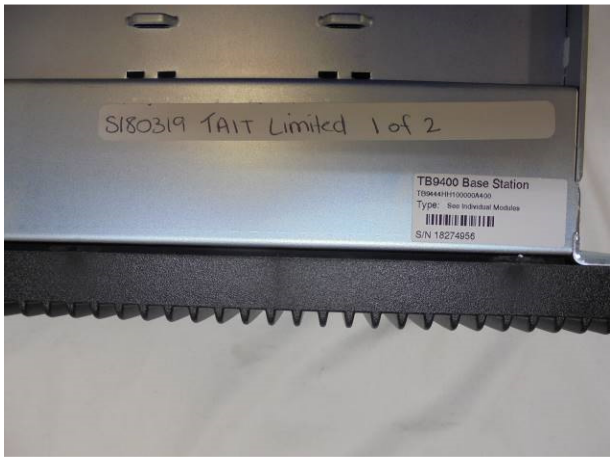
APPENDIX B7
IDENTIFICATION PHOTOGRAPHS

EUT Surface Labels

APPENDIX B8
IDENTIFICATION PHOTOGRAPHS

EUT Surface Labels



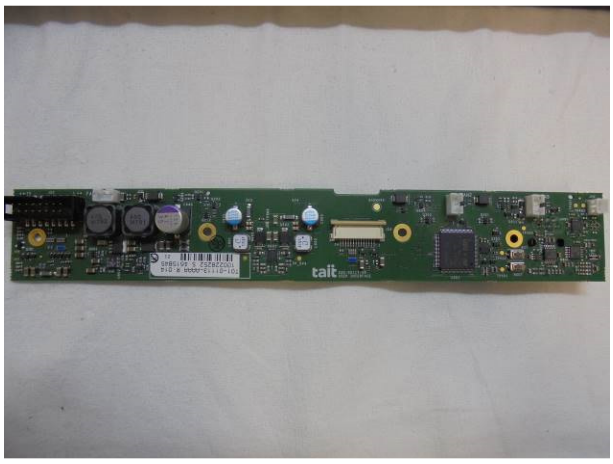


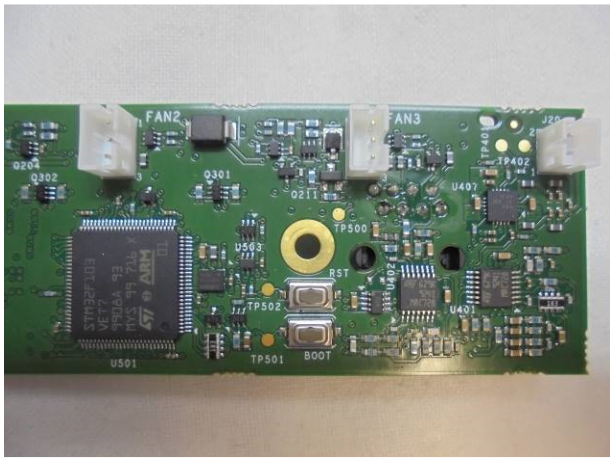
APPENDIX B9
IDENTIFICATION PHOTOGRAPHS

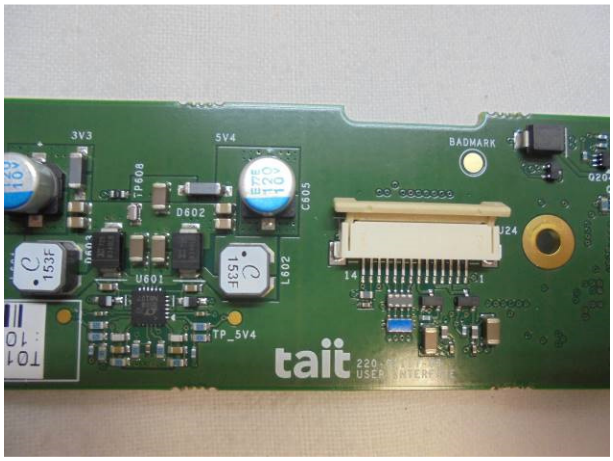
Fan Unit

APPENDIX B10
IDENTIFICATION PHOTOGRAPHS

Fan Control PCB

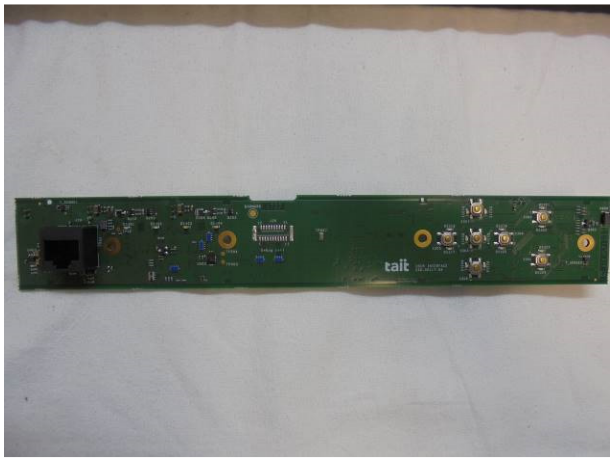






APPENDIX B11
IDENTIFICATION PHOTOGRAPHS

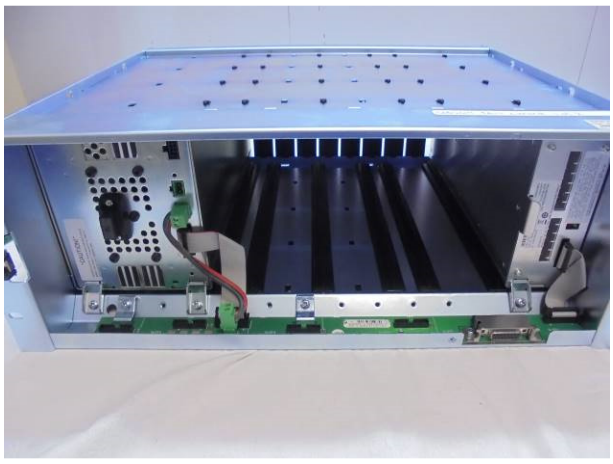
Fan Control PCB

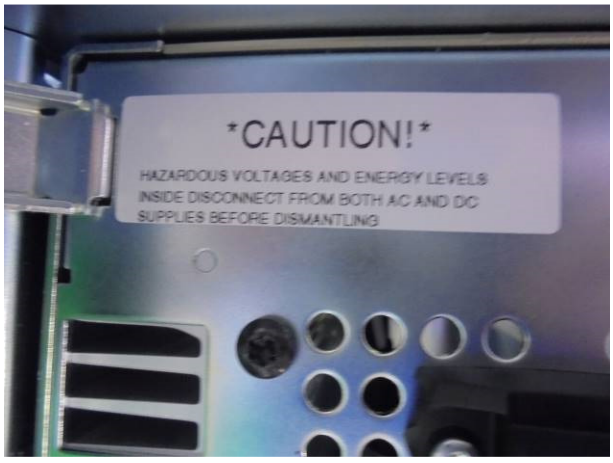


LED Screen Unit

APPENDIX B12
IDENTIFICATION PHOTOGRAPHS

EUT Internal Labels





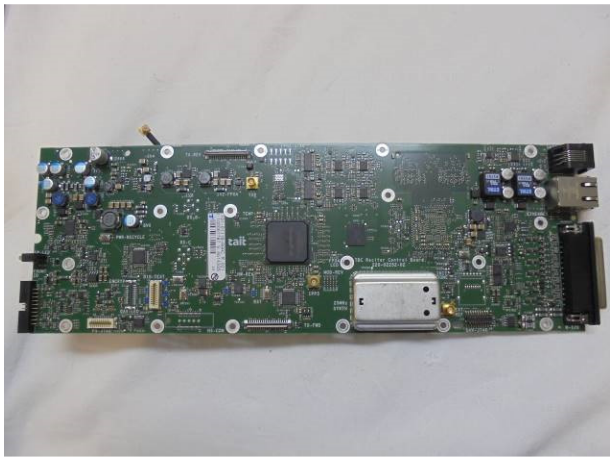
APPENDIX B13
IDENTIFICATION PHOTOGRAPHS

EUT PCB

APPENDIX B14
IDENTIFICATION PHOTOGRAPHS

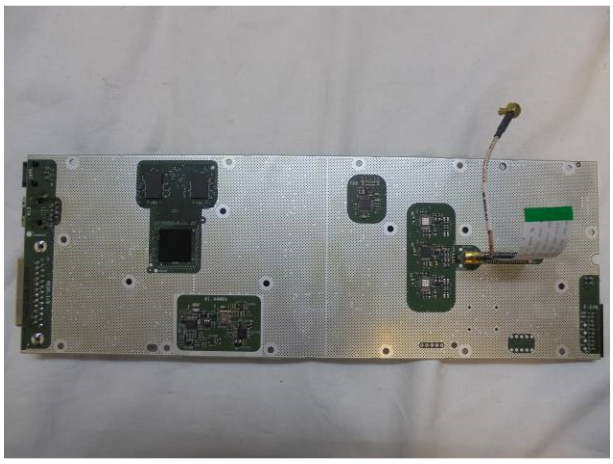
EUT Main Unit

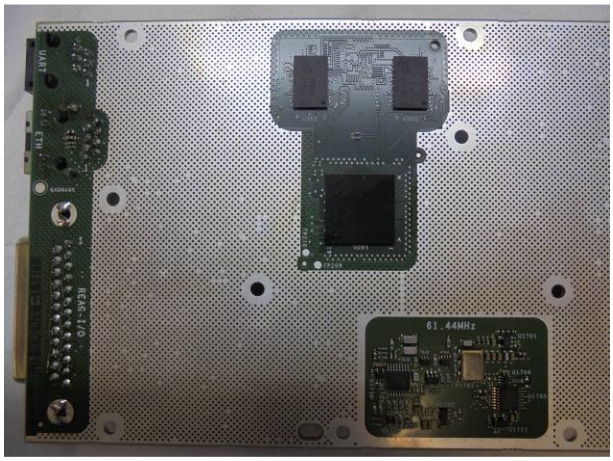
EUT Main Unit PCB



APPENDIX B15
IDENTIFICATION PHOTOGRAPHS

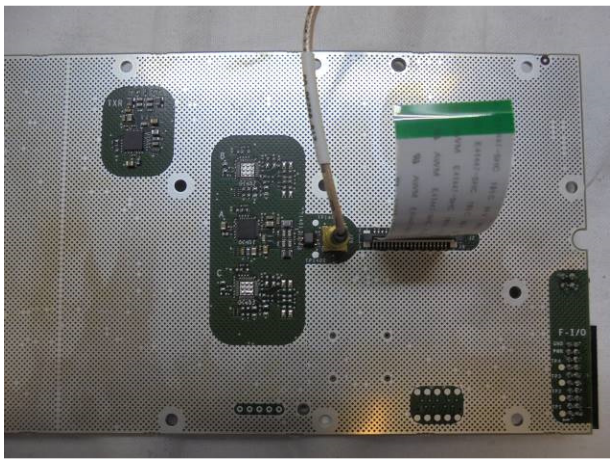
EUT Main Unit PCB





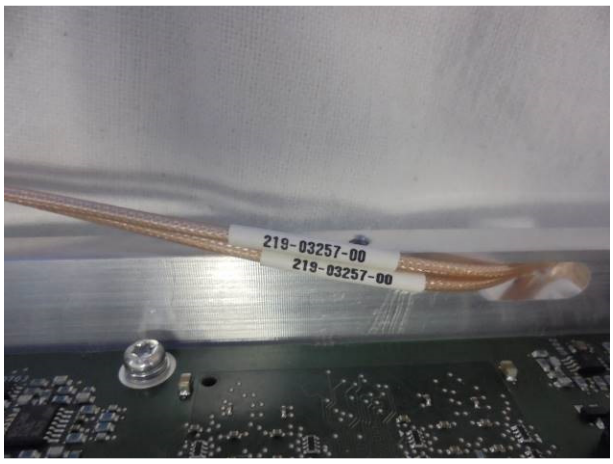
APPENDIX B16
IDENTIFICATION PHOTOGRAPHS

EUT Main Unit PCB



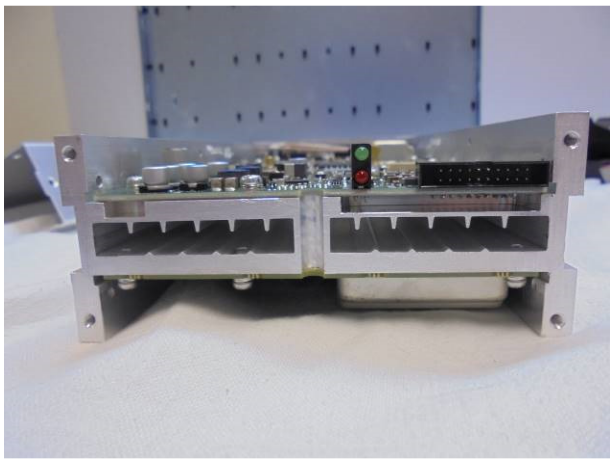
APPENDIX B17
IDENTIFICATION PHOTOGRAPHS

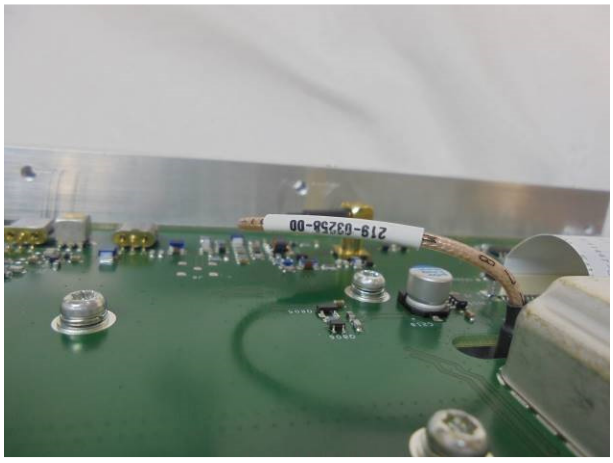
EUT Main Unit PCB

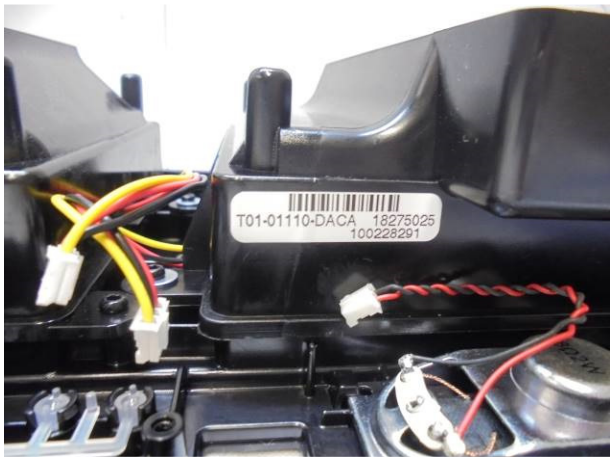


APPENDIX B18
IDENTIFICATION PHOTOGRAPHS

EUT Power Supply & Power Supply PCB

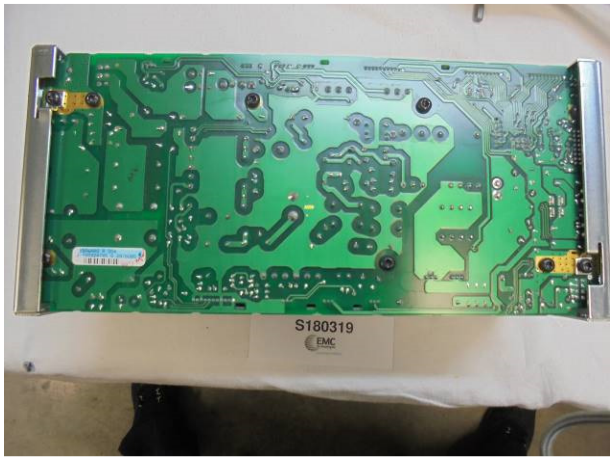


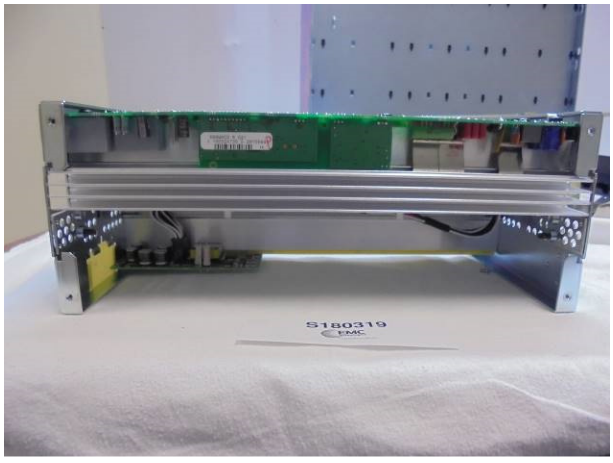




APPENDIX B19
IDENTIFICATION PHOTOGRAPHS

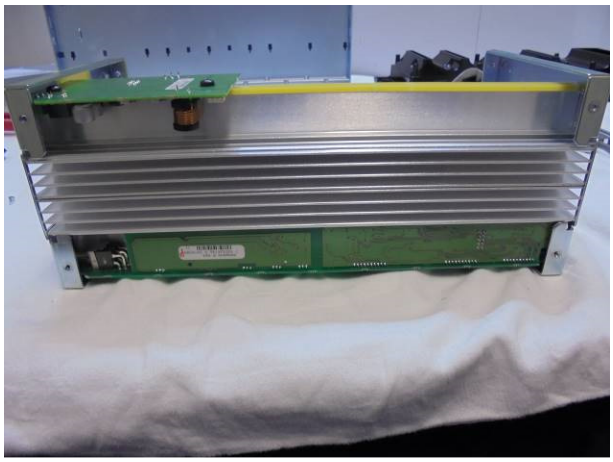
EUT Power Supply & Power Supply PCB





APPENDIX B20
IDENTIFICATION PHOTOGRAPHS

EUT Power Supply & Power Supply PCB

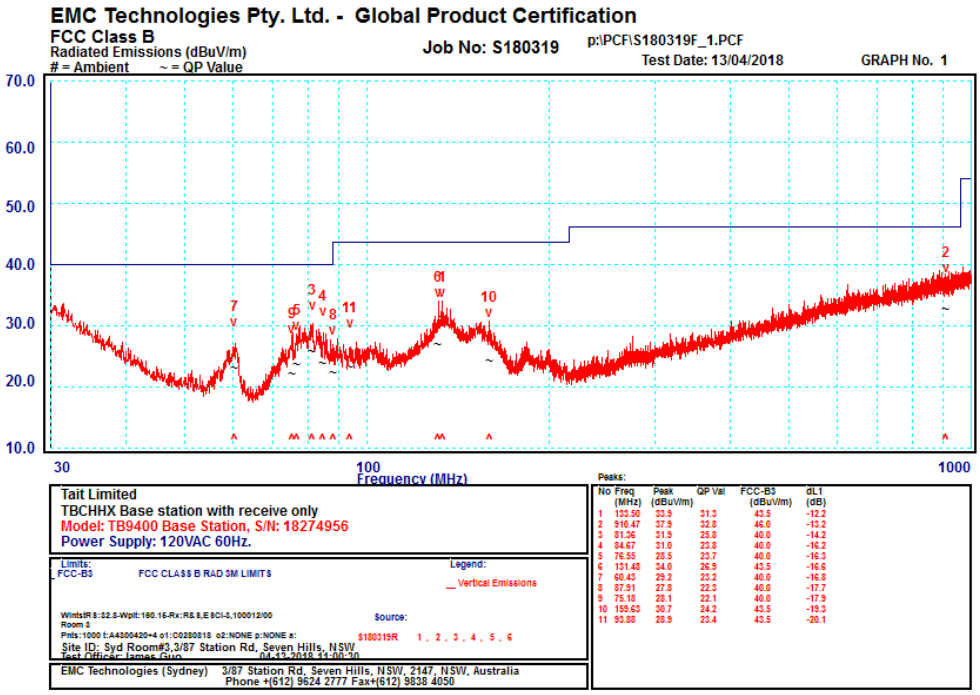


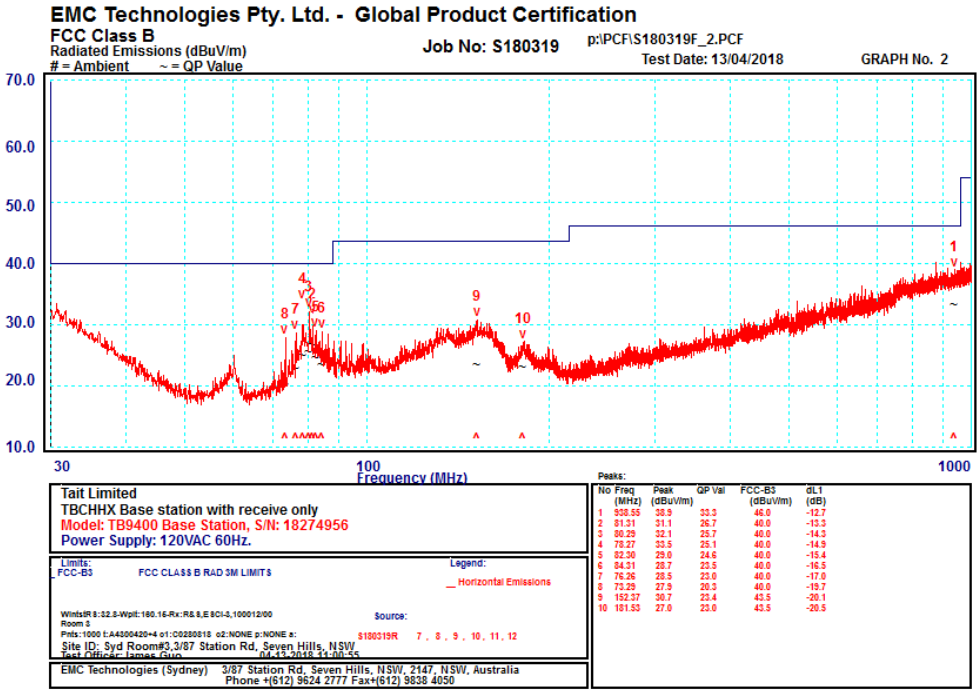
APPENDIX C
GRAPHS OF EMI MEASUREMENTS

RADIATED EMI

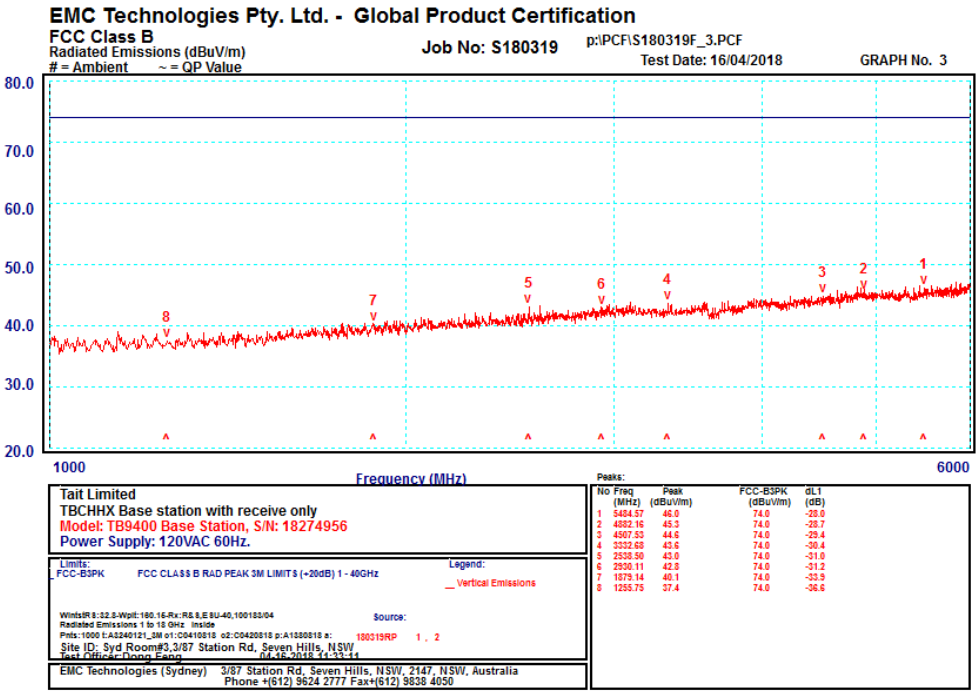
Graph 1:		Vertical Polarisation	30 MHz to 1000 MHz
Graph 2:		Horizontal Polarisation	30 MHz to 1000 MHz
Graph 3:	Peak Measurements	Vertical Polarisation	1 GHz to 6 GHz
Graph 4:	Peak Measurements	Horizontal Polarisation	1 GHz to 6 GHz
Graph 5:	Average Measurements	Vertical Polarisation	1 GHz to 6 GHz
Graph 6:	Average Measurements	Horizontal Polarisation	1 GHz to 6 GHz

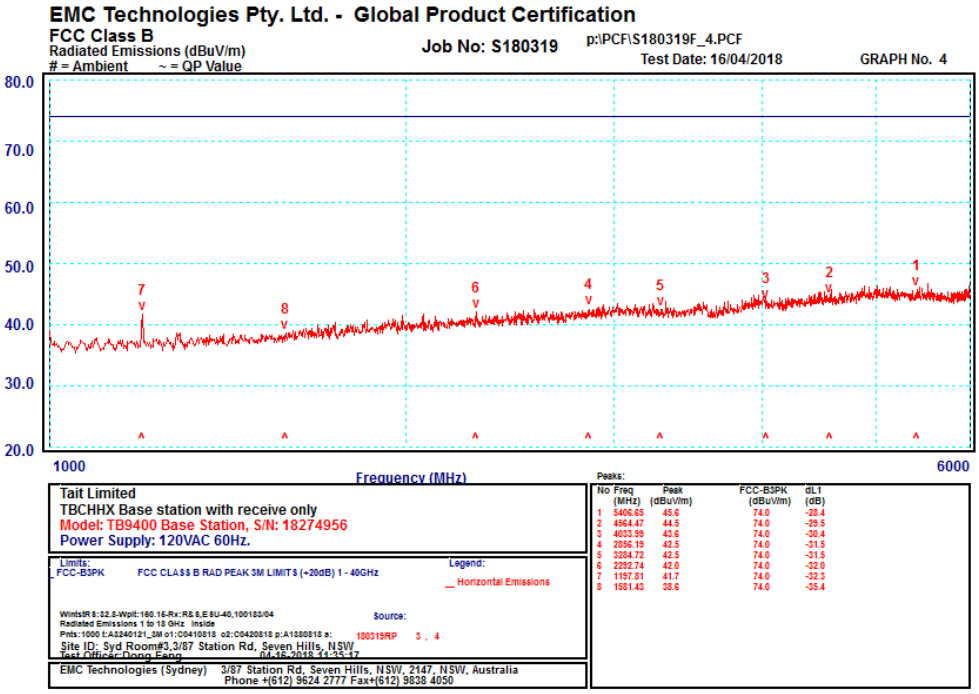
APPENDIX C1
GRAPHS OF EMI MEASUREMENTS
RADIATED EMI



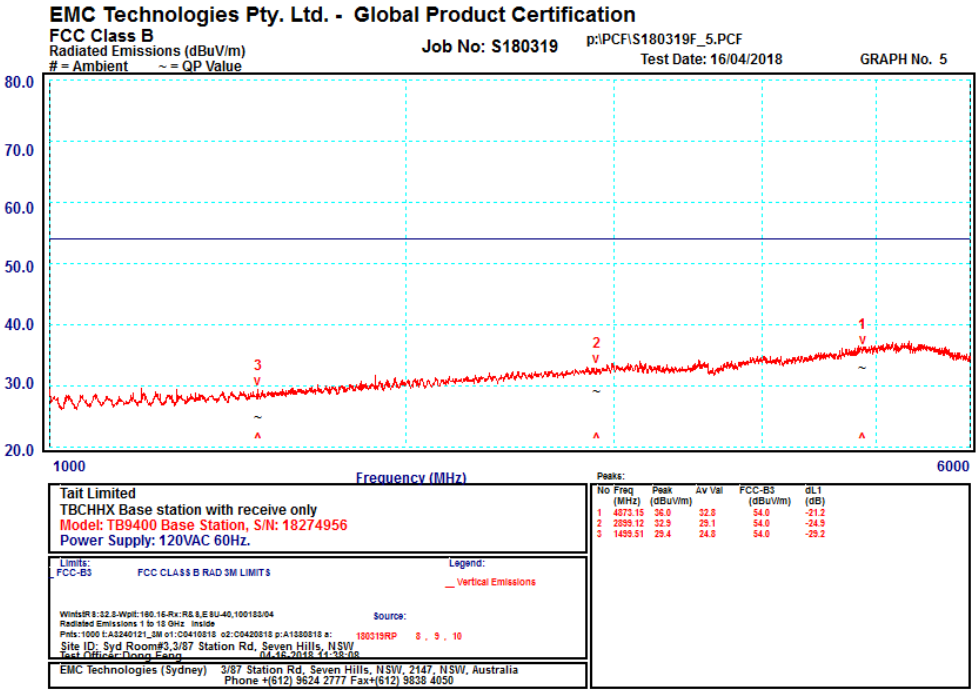


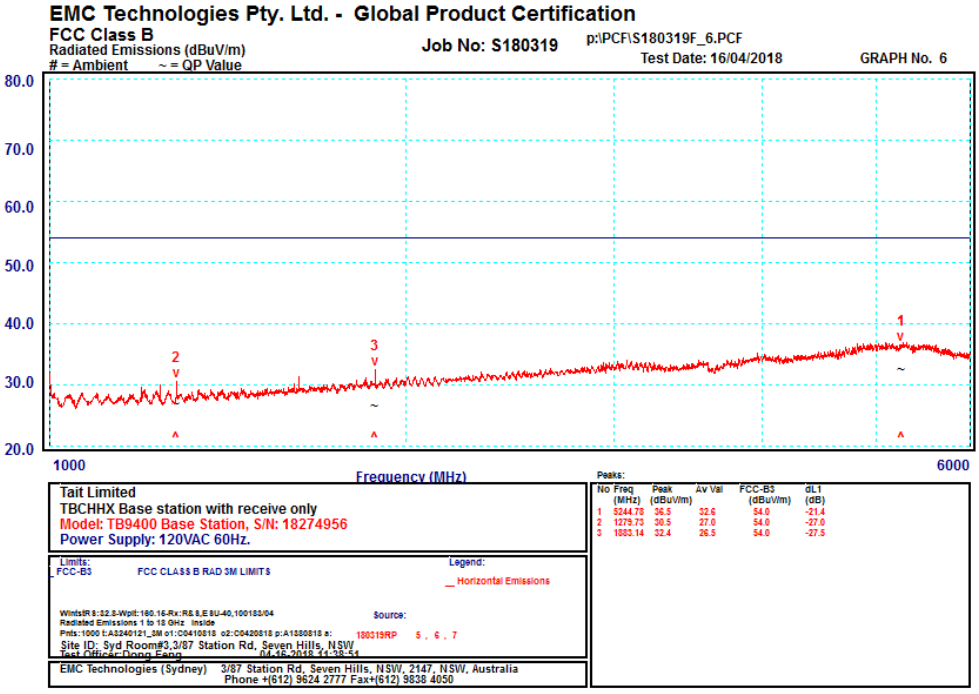
APPENDIX C2
GRAPHS OF EMI MEASUREMENTS
RADIATED EMI





APPENDIX C3
GRAPHS OF EMI MEASUREMENTS
RADIATED EMI





APPENDIX D
LABELLING AND USER INFORMATION REQUIREMENTS

The following information is believed to be true and accurate, however we advise that the current FCC 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 FCC and ISEDC Rules are identified and adhered to.

If other parts of the FCC and ISEDC Rules apply, there may be requirements for additional or different forms of labelling and user information.

1. FCC REQUIREMENTS (Summarised)

FCC 2.955 Retention of records

A copy of the measurement report showing compliance with FCC standards must be retained and, if requested, submitted to the commission.

The following documentation pertaining to the equipment tested must be kept with the test report for up to 2 years after manufacturing has discontinued:

- A record of the original design drawings and specifications and all changes that have been made that may affect compliance
- A record of the procedures used for production inspection and testing (if tests were performed) to insure the conformance

FCC 15.19 Labelling requirements

The following statement shall be placed in a conspicuous location:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

When the device is so small or for such use that it is not practicable to place the statement on it, the information required shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed.

FCC 15.21 and 15.105 Information to user

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

For a Class A digital device or peripheral, the instructions shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

For a Class B digital device or peripheral, the instructions shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
—Reorient or relocate the receiving antenna.
—Increase the separation between the equipment and receiver.
—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
—Consult the dealer or an experienced radio/TV technician for help.