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Global Product Certification
EMC-EMF Safety Approvals

EMI TEST REPORT
for
CERTIFICATION to
FCC PART 15.231

FCC ID: **X4K-PAPTX5V101**

Test Sample: Remote Control Transmitter
Model: PTX-5V1
WTX-4 (extended compliance)
Tested for: Automatic Technology Australia Pty Ltd

Report Number: M120247_Certification

Issue Date: 12th June 2012

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Report Number:	**M120247_Certification**
Test Sample:	Remote Control Transmitter
Model:	PTX-5V1 WTX-4 (extended compliance)
Manufacturer:	Automatic Technology Australia Pty Ltd
FCC ID:	X4K-PAPTX5V101
Equipment Type:	Intentional Radiator
Tested for:	Automatic Technology Australia Pty Ltd
Address:	6-8 Fiveways Boulevard, Keysborough, Vic 3173 Australia
Phone:	+61 3 9791 0200
Fax:	+61 3 9791 0250
Contact:	Nikolai Klepikov
Email:	Nikolai.Klepikov@ata-aust.com.au
Test Standards:	FCC Part 15, Subpart C – Intentional Radiators FCC Part 15.231: Periodic operation in the band 40.66-40.70 MHz and above 70 MHz ANSI C63.4 – 2009
Test Dates:	8th to 23rd March 2012
Test Engineer:	**Chieu Huynh** **B.Eng (Hons) Electronics**
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:	**Chieu Huynh** **Senior EMC Engineer** **EMC Technologies Pty Ltd**

EMI TEST REPORT FOR CERTIFICATION
to
FCC PART 15.231

1.0 INTRODUCTION

This report details the results of EMI tests and measurements performed on the Remote Control Transmitter, Model: PTX-5V1.

Based on information supplied by the client, compliance is extended to wall mounted wireless transmitter, Model number WTX-4. The remote handheld transmitter PTX-5V1 and wall mounted transmitter WTX-4 have the same board PTX5V1.01. The difference is that they have different enclosures only.

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

47 CFR, Part 15, Subpart C:	Rules for intentional radiators (particularly section 15.231)
Section 15.203:	Antenna requirements
Section 15.205:	Restricted bands of operation
Section 15.207:	Conducted Emission Limits
Section 15.209:	Radiated Emission Limits (General requirements)
Section 15.231:	Periodic operation in the band 40.66-40.70 MHz and above 70 MHz

The test sample **complied** with the requirements of 47 CFR, Part 15 Subpart C - Section 15.231.

1.1 Summary of Results

FCC Part 15, Subpart C Clauses	Test Performed	Result
15.203	Antenna Requirement	**Not Applicable**
15.205	Operation in Restricted Band	**Complied**
15.207	Conducted Emissions	**Not Applicable**
15.209	Radiated Emissions	**Complied**
15.231 (a)	Field Strength Emissions	**Complied**
15.231 (c)	Bandwidth	**Complied**

The measurement procedure used was in accordance with ANSI C63.4-2009. The instrumentation conformed to the requirements of ANSI C63.2-1996.

1.2 EUT – Voltage Power Conditions

The test sample is battery powered.

1.3 Modifications by EMC Technologies

No modifications were required.

2.0 GENERAL INFORMATION

(Information supplied by the Client)

2.1 Product Details

Test Sample:	Remote Control Transmitter
Model:	PTX-5V1
	WTX-4 (extended compliance)
Microprocessor:	PIC18F4520T-I/PT
Transmitting Frequencies:	433.47 MHz, 433.92MHz and 434.37MHz
Crystal Frequency:	10 MHz±20ppm
Lowest frequency generated:	2.5MHz
Input Supply:	3V Battery (CR2032)
Equipment Type:	Intentional Radiator

2.2 Test Sample Description

Remote Control is used to control (open and close) Garage Door Openers, Gate Openers, and other equipment, which require remote operations.

2.3 Test Sample Configuration

The Remote Control Transmitter was configured to transmit continuously.

Testing was performed with new battery fitted and rotated around 3 orthogonal planes. Worst-case results are reported.

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 3 metres from the EUT.

2.5 Test Facility

2.5.1 General

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 47CFR2.948 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 & 18 of the FCC Commission's rules – **Registration Number 494713 & Designation number AU0001.**

EMC Technologies has also been accepted by Industry Canada for the performance of radiated measurements in accordance with RSS 212, Issue 1 (Provisional) - **Industry Canada number 3569B.**

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

2.5.2 NATA Accreditation

EMC Technologies is accredited in Australia to test to the following standards by the National Association of Testing Authorities (NATA).

"FCC Part 15 unintentional and intentional emitters in the frequency range 9kHz to 18 GHz excluding TV receivers (15.117 and 15.119), TV interface devices (15.115), cable ready consumer electronic equipment (15.118), cable locating equipment (15.213) and unlicensed national information infrastructure devices (Sub part E)."

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

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 9002. NATA has mutual recognition agreements with the National Voluntary Laboratory Accreditation Program (NVLAP) and the American Association for Laboratory Accreditation (A^2LA).

2.6 Units of Measurements

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 an independent NATA registered laboratory such as Agilent 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 (biconical, log-periodic and horns) calibrated by the EMC Technologies. The complete list of test equipment used for the measurements, including calibration dates and traceability is contained in the Measurement Instrument Details.

3.0 CONDUCTED EMISSION MEASUREMENTS

Not applicable, as EUT is battery powered.

4.0 RADIATED EMISSION MEASUREMENTS

4.1 Test Procedure

Testing was performed in accordance with the requirements of FCC Part 15.231(a), 15.205(a) and 15.209(a).

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 2.5 MHz to 30 MHz. A calibrated Biconilog antenna was used for measurements between 30 MHz to 4350 MHz.

The Receiver bandwidth was set to 6.0 dB.

The following bandwidth settings were used:
Frequency band 2.5 MHz – 30 MHz: RBW = 9 kHz and VBW = 30 kHz
Frequency band 30 MHz – 1000 MHz: RBW = 120 kHz and VBW = 300 kHz
Above 1 GHz: RBW = 1 MHz and VBW = 1 MHz (peak measurements)
Above 1 GHz: RBW = 1 MHz and VBW = 3 kHz (average measurements)

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.

4.2 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 over the range 2.5-30 MHz, 30-1000 MHz and 1000-4350 MHz.

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, calculated average field strength and the margin relative to the limit in dB. A negative margin is the deviation of the recorded value below the limit.

4.3 Calculation of Peak and Average Field Strength

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 Where:

E	=	Radiated Peak 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)
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 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 dB. The resulting Field Strength is therefore as follows:

34.0 + 9.2 + 1.9 - 20 = 25.1 dBµV/m

The EUT was configured to transmit continuously and peak field strength emissions were measured. Peak limits were calculated by using average factor (duty cycle) calculation method.

There are five pulses over 100mS. Four pulses of 4.875mS each and one 11.875mS. So the duty cycle over 100mS is 31.375%. Refer to Appendix B for duty cycle plots. Therefore, a correction factor of 10.1dB can be applied to peak level.

4.4 Results - Fundamental and Spurious (2.5 MHz to 4350 MHz)

A 10.1dB correction factor applied to calculate an average level. Refer to Appendix B for duty cycle plots.

Frequency MHz	Polarity	Peak Level Measured dBµV/m	Calculated Average Level dBuV/m	Peak Limit dBµV/m	Average Limit dBµV/m	Δ ± dB
433.88	Vertical	90.7	80.6	100.8	80.8	-0.2*
434.36	Horizontal	89.1	79.0	100.8	80.8	-1.8*
414.40	Vertical	61.5	51.4	80.8	60.8	-9.4
413.50	Horizontal	58.7	48.6	80.8	60.8	-12.2

*This result falls within the laboratory's measurement uncertainty. Refer to Section 8.0.

The highest radiated fundamental field strength emission complied with FCC limit by a margin of 0.2 dB. Refer to Appendix C1 and C2.

The highest radiated spurious field strength emission complied with FCC limit by a margin of 9.4 dB at 414.4 MHz. Refer to Appendix C1 to C5.

5.0 BANDWIDTH MEASUREMENTS

Testing was performed in accordance with the requirements of FCC Part 15.231(c).

The bandwidth of the emission shall be no wider than 0.25% of the centre frequency.

The resolution bandwidth of 10 kHz and the video bandwidth of 10 kHz were utilised

20dB Bandwidth kHz	Limit kHz	Result	Bandwidth Plot
137.5	< 1085	Complied	Appendix D

6. 0 ANTENNA REQUIREMENT

Testing to the requirements of FCC Part 15.203 was not applicable as this intentional radiator was designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

7.0 COMPLIANCE STATEMENT

The Remote Control Transmitter, Model: PTX-5V1, tested on behalf of Automatic Technology Australia Pty Ltd**, complied** with the requirements of 47 CFR, Part 15 Subpart C - Rules for Radio Frequency Devices (intentional radiators), Section 15.231 – Periodic operation in the band 40.66 – 40.70 MHz and above 70 MHz.

Compliance is extended to wall mounted wireless transmitter, Model number WTX-4. The remote handheld transmitter PTX-5V1 and wall mounted transmitter WTX-4 have the same board PTX5V1.01. The difference is that they have different enclosures only.

Results were as follows:

FCC Part 15, Subpart C Clauses	Test Performed	Result
15.203	Antenna Requirement	**Not Applicable**
15.205	Operation in Restricted Band	**Complied**
15.207	Conducted Emissions	**Not Applicable**
15.209	Radiated Emissions	**Complied**
15.231 (a)	Field Strength Emissions	**Complied**
15.231 (c)	Bandwidth	**Complied**

8.0 UNCERTAINTIES

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
	1 GHz to 18 GHz	±4.6 dB

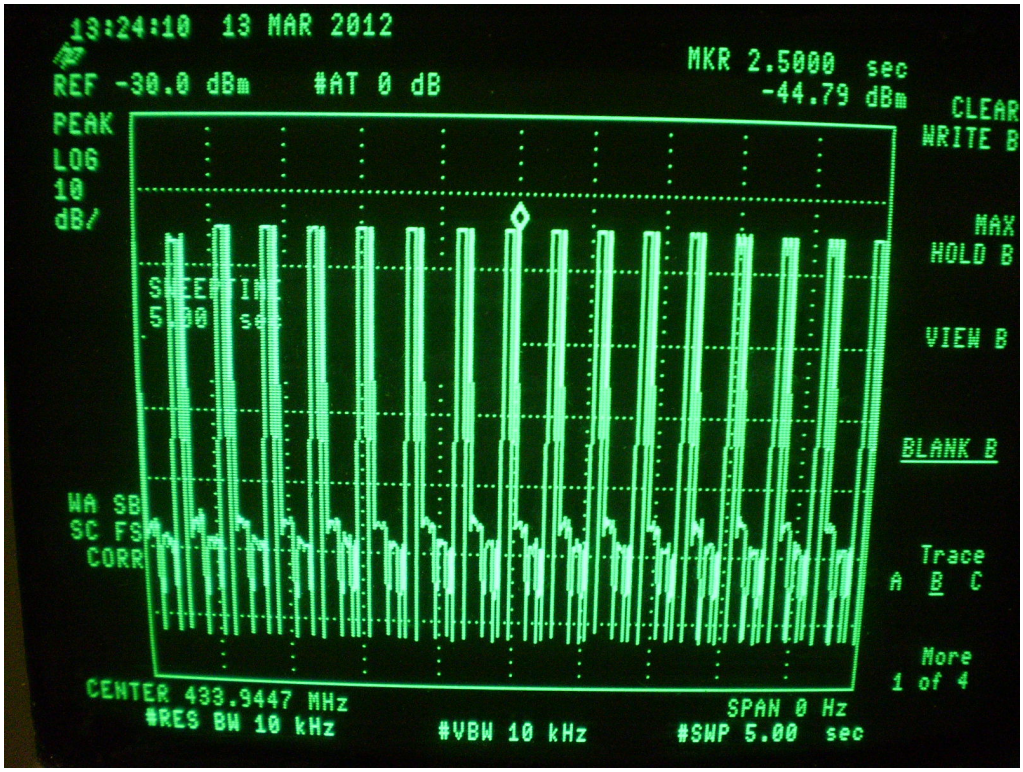
The above expanded uncertainties are based on standard uncertainties multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

APPENDIX A
MEASUREMENT INSTRUMENT

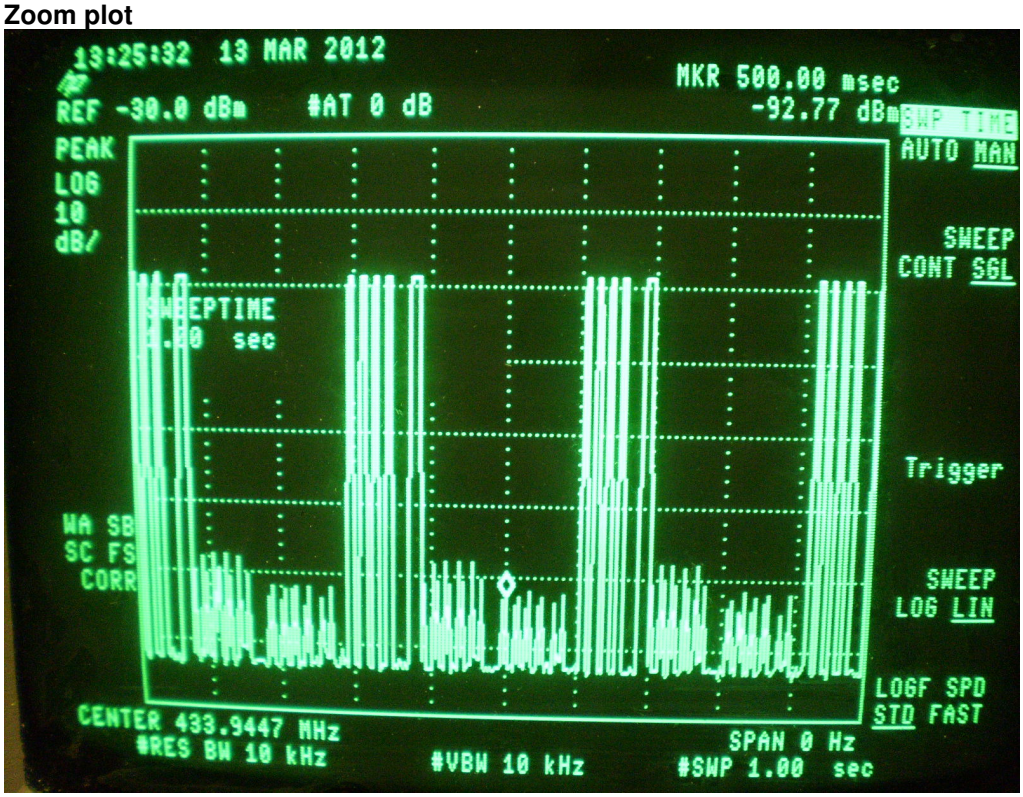
EQUIPMENT TYPE	MANUFACTURER, MODEL NUMBER and SERIAL NUMBER	CALIBRATION DUE DD/MM/YYYY
EMI RECEIVER	HP 8546A Sn: 3549A00290 (R-009)	11/08/2012
ANTENNAS	EMCO 6502 LOOP ANTENNA 9 kHz – 30 MHz Sn: 2021	19/11/2012
	Sunol Sciences Corp (USA) JB6 Biconilog 30 MHz - 6 GHz Sn: A012312	02/02/2013

APPENDIX B1
DUTY CYCLE PLOTS

Pulse train



Zoom plot



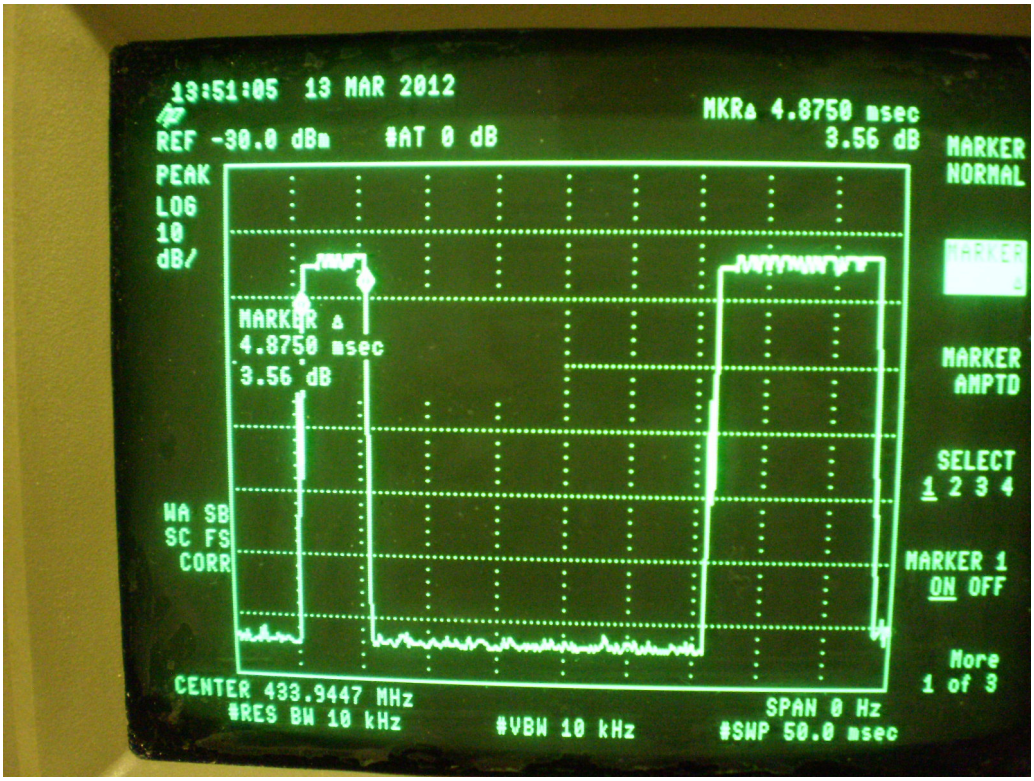
APPENDIX B2
DUTY CYCLE PLOTS

Zoom plot

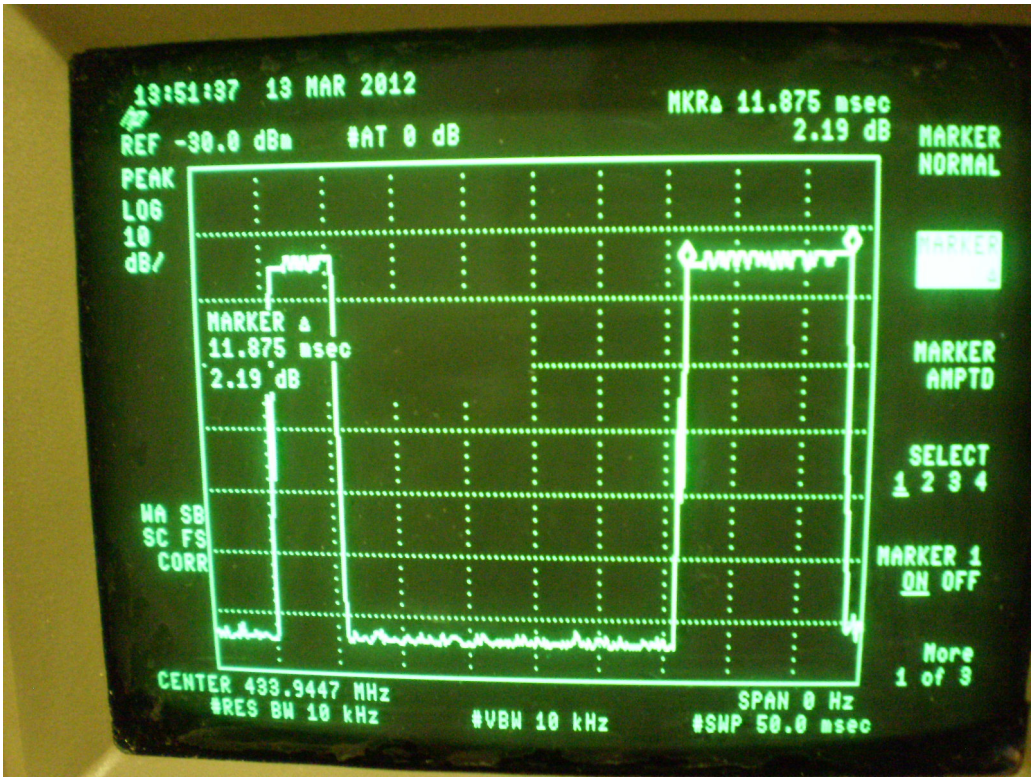
Five pulses over 100mS

APPENDIX B3
DUTY CYCLE PLOTS

Pulse width

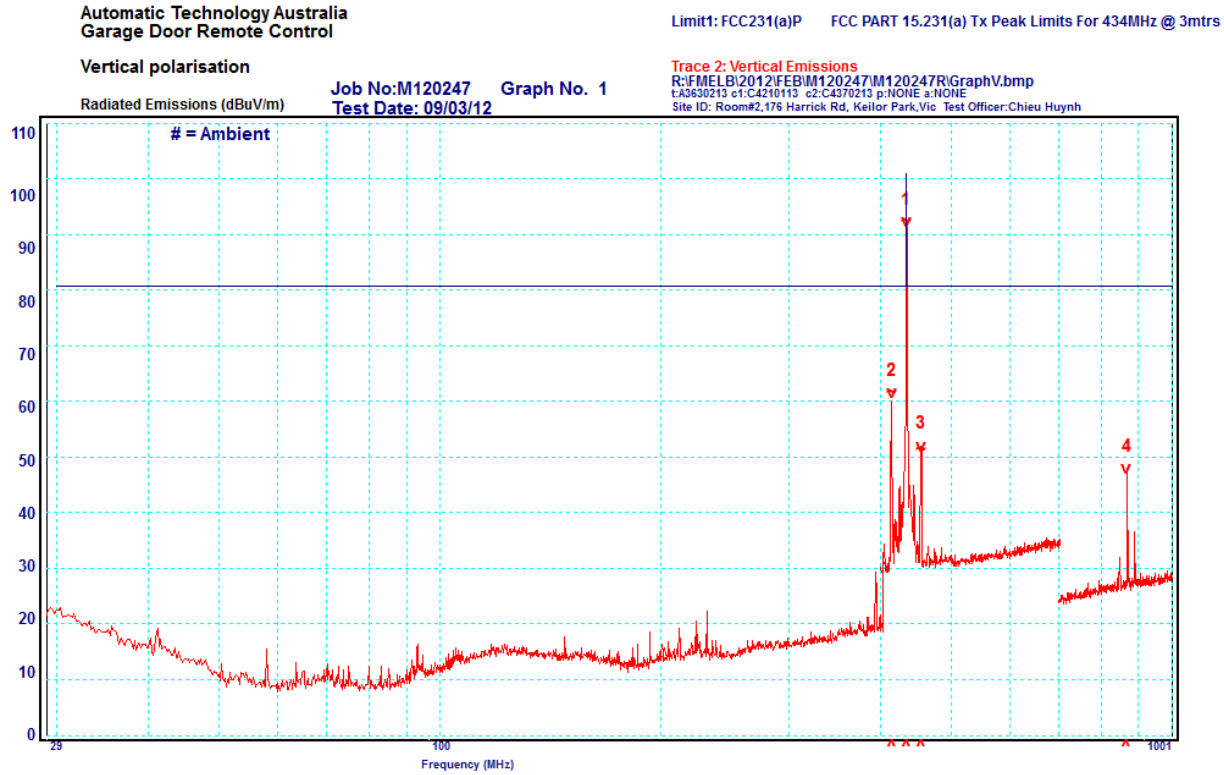


Pulse width



APPENDIX C1
GRAPHS of EMI MEASUREMENTS

Vertical Polarity - 30MHz to 1000 MHz

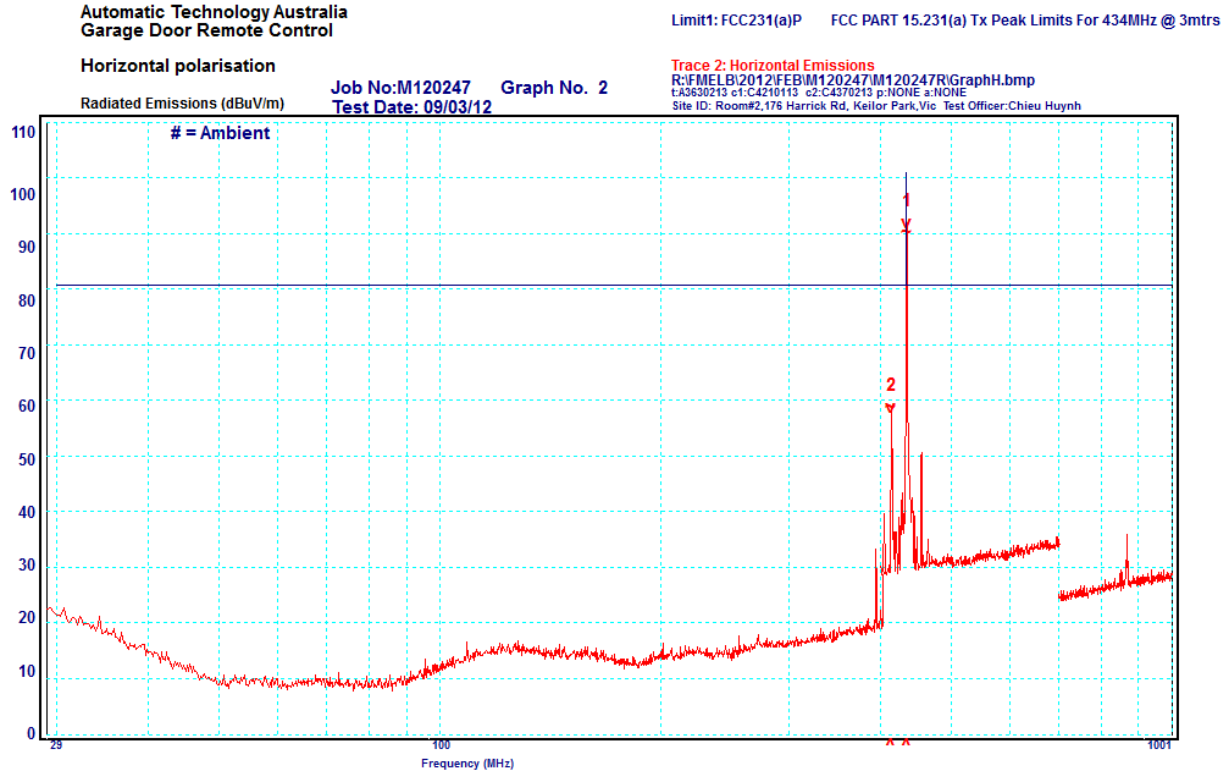


Peak	Frequency MHz	Peak Level Measured dBµV/m	Calculated Average Level dBuV/m	Peak Limit dBµV/m	Average Limit dBµV/m	Δ ± dB
1	433.88	90.7	80.6	100.8	80.8	-0.2
2	414.40	61.5	51.4	80.8	60.8	-9.4
3	453.96	51.3	41.2	80.8	60.8	-19.6
4	866.99	45.6	35.5	80.8	60.8	-25.3

A 10.1dB correction factor applied to calculate an average level. Refer to Appendix B for duty cycle plots.

APPENDIX C2
GRAPHS of EMI MEASUREMENTS

Horizontal Polarity - 30MHz to 1000 MHz

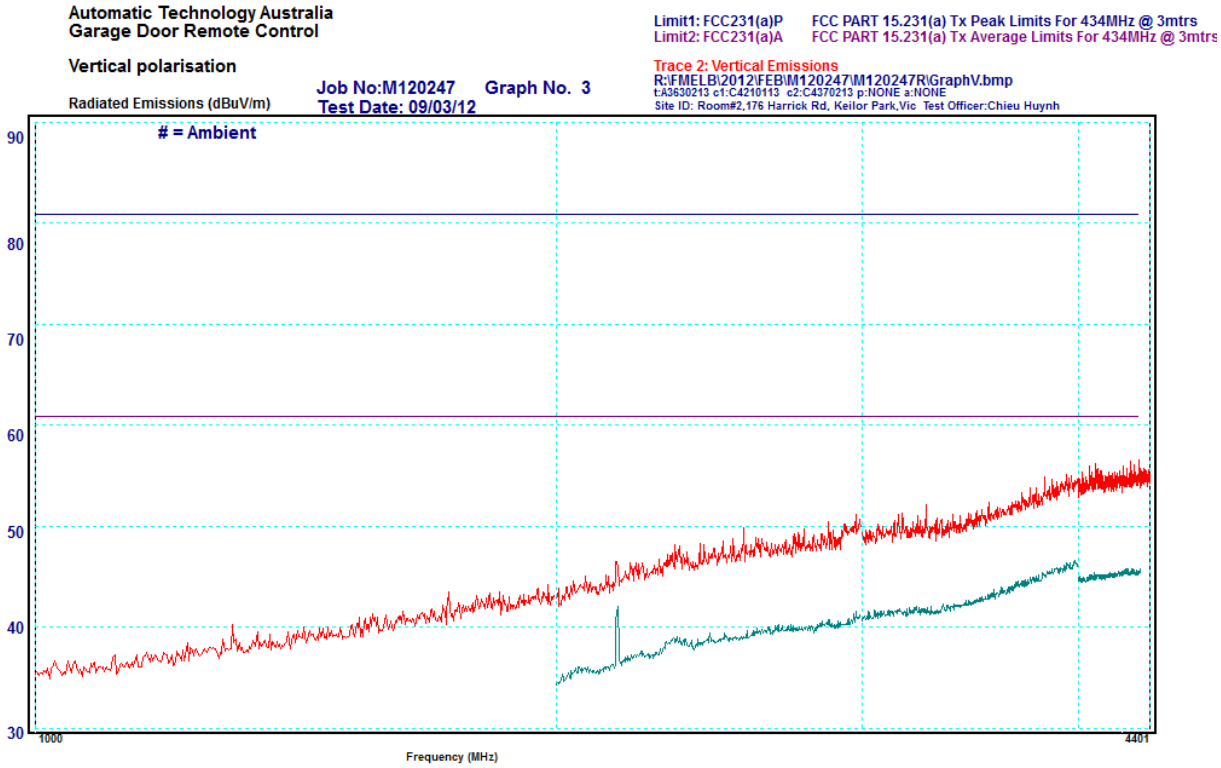


Peak	Frequency MHz	Peak Level Measured dBµV/m	Calculated Average Level dBuV/m	Peak Limit dBµV/m	Average Limit dBµV/m	Δ ± dB
1	434.36	89.1	79.0	100.8	80.8	-1.8
2	413.50	58.7	48.6	80.8	60.8	-12.2

A 10.1dB correction factor applied to calculate an average level. Refer to Appendix B for duty cycle plots.

APPENDIX C3
GRAPHS of EMI MEASUREMENTS

Vertical Polarity - 1000 MHz to 4350 MHz

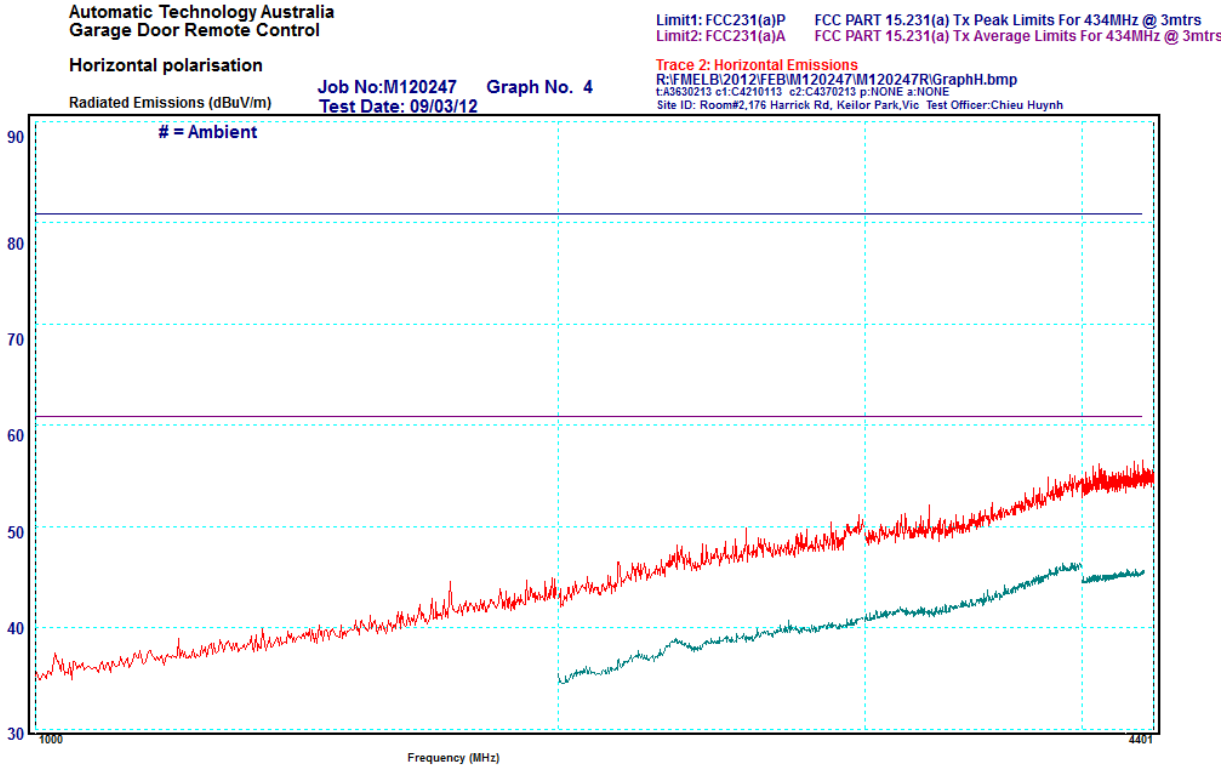


Red Trace – Peak
Blue Trace – Average (bandwidth reduced)

No emissions were recorded within 15 dB below the limits.

APPENDIX C4
GRAPHS of EMI MEASUREMENTS

Horizontal Polarity - 1000 MHz to 4350 MHz

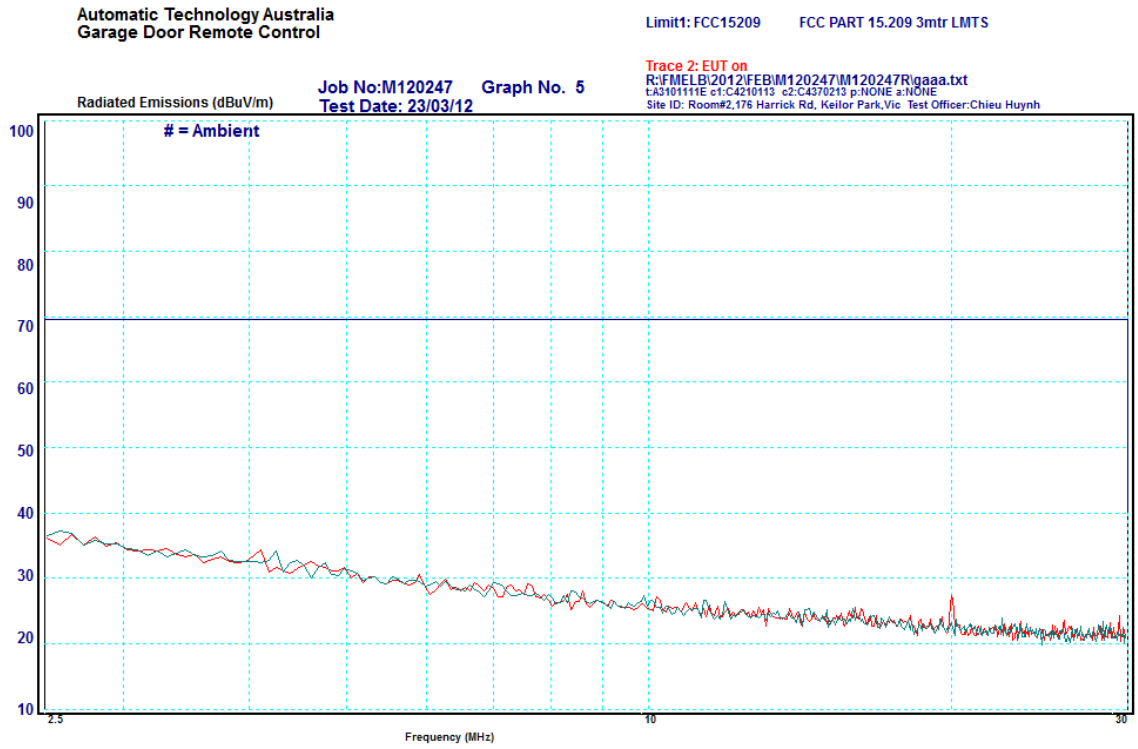


Red Trace – Peak
Blue Trace – Average (bandwidth reduced)

No emissions were recorded within 15 dB below the limits.

APPENDIX C5
GRAPHS of EMI MEASUREMENTS

2.5 MHz to 30 MHz



No emissions were recorded within 15 dB below the limits.

APPENDIX D
BANDWIDTH PLOT