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RADIO CERTIFICATION REPORT
In accordance with:
CFR47 FCC Part 15, Subpart C – Section 15.231

Automatic Technology Australia Pty. Ltd.

WTX-4V2AM

Wall Mounted Remote Control

FCC ID: X4K-WPTX5V102B

REPORT: E2102-1390-1
DATE: February, 2021

Accreditation Number: 18553
Accredited for compliance with ISO/IEC 17025

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Certificate of Compliance

EMC Bayswater Test Report: E2102-1390-1
Issue Date: February, 2021

Product(s):	Wall Mounted Remote Control
Model No:	WTX-4V2AM
Serial No:	Not stated
Product Marketing Name (PMN):	WALL CONTROL
Variant:	None
FCC ID:	X4K-WPTX5V102B
Client Details:	Mr. Nikolai Klepikov Automatic Technology Australia Pty. Ltd. 6 – 8 Fiveways Boulevard Keysborough Victoria 3173 Australia Phone No: +61 3 9791 0275 Fax No: +61 3 9791 0250 e-mail: Nikolai.Klepikov@ata-aust.com.au
Test Specification:	CFR47 FCC Part 15, Subpart C – Section 15.231
Results Summary:	FCC 15.203 - Antenna Requirement ***Complied*** FCC 15.231(a) - Transmitter Deactivation ***Complied*** FCC 15.231(b) - Field strength of fundamental ***Complied*** FCC 15.231(b), 15.209 - Field strength of spurious emissions ***Complied*** FCC 15.231(c) - Emission Bandwidth ***Complied***
Test Date(s):	12th and 15th of February, 2021
Test House (Issued By):	EMC Bayswater Pty Ltd 18/88 Merrindale Drive Croydon South Victoria 3136 Australia FCC Accredited Test Firm Registration number: 527798 FCC Accredited Test Firm Designation number: AU0004 Phone No: +61 3 9761 5888 e-mail: sales@emcbayswater.com.au Fax No: +61 3 8761 6547 Web: www.emcbayswater.com.au

This is to certify that the necessary measurements were made by EMC Bayswater Pty Ltd, and that the Automatic Technology Australia Pty. Ltd., WTX-4V2AM, Wall Mounted Remote Control, has been tested in accordance with requirements contained in the appropriate commission regulations.

Prepared & tested by:	Approved by:	
		26/02/2021 16:21
Adnan Zaman (EMC Test Engineer)	Neville Liyanapatabendige (Manager)	Date

Radio Certification Report
for
Automatic Technology Australia Pty. Ltd.

Contents

1. Introduction

Radio tests were performed on an Automatic Technology Australia Pty. Ltd., WTX-4V2AM, Wall Mounted Remote Control, in accordance with the requirements of CFR47 FCC Part 15, Subpart C – Section 15.231.

2. Test Report Revision History

None

3. Report Information

EMC Bayswater Pty Ltd reports apply only to the specific samples tested under the stated test conditions. All samples tested were in good operating condition throughout the entire test program unless otherwise stated. EMC Bayswater Pty Ltd does not in any way guarantee the later performance of the product/equipment. It is the manufacturer's responsibility to ensure that additional production units of the tested model are manufactured with identical electrical and mechanical components. EMC Bayswater Pty Ltd shall have no liability for any deductions, inference or generalisations drawn by the clients or others from EMC Bayswater Pty Ltd issued reports. This report shall not be used to claim, constitute or imply product endorsement by EMC Bayswater Pty Ltd. This report shall not be reproduced except in full (with the exception of the certificate on page 2) without the written approval of EMC Bayswater Pty Ltd. This document may be altered or revised by EMC Bayswater Pty Ltd personnel only, and shall be noted in the revision section of the document. Any alteration of this document not carried out by EMC Bayswater Pty Ltd will nullify the document.

4. Summary of Results

The EUT complied with applicable requirements of CFR47 FCC Part 15, Subpart C – Section 15.231. Worst-case results are tabled as follows:

FCC sections	Test	Result
15.203	Antenna Requirement	Complied[#]
15.231(a)	Transmitter Deactivation	Complied
15.231(b)	Field strength of fundamental	Complied by 0.6dB[+]
15.231(b) 15.209	Field strength of spurious emissions	Complied Peak limit by 28.3dB
		Complied Average limit by 19.8dB
15.231(c)	Emission Bandwidth	Complied

[+]*Refer to appropriate section for measurement uncertainty statement.*

[#]*The Antenna is permanently attached, internal to the device.*

Table 1: Summary of test results

5. Product Sample, Configuration & Modifications

5.1. Product Sample Details

The EUT (Equipment Under Test), as supplied by the client, is described as follows:

Product:	Wall Mounted Remote Control
Model No:	WTX-4V2AM
Variant:	None
Serial No:	Not stated
Part No:	81318
Firmware:	50A
Software:	Not stated
Hardware Version:	PTX-5 V-1.01
Power Specification:	CR2032 3V Battery powered
EUT Type:	Remote Control (Wall Mounted)
Orientation:	Single typical orientation
Dimensions:	80mm x 112mm x 22mm (Length x Width x Height)
Weight:	65 g

Transmitter details:

Description:	Wall Remote Control
Type:	Wall Mounted Transmitter
Channels:	3 channels
Modulation:	FSK/OOK
Antenna:	Loop Antenna
Antenna Gain:	-3.5 dBi
Max power:	0 dBm (conducted)
FCC ID:	X4K-WPTX5V102B
CE mark:	No
RCM Logo:	Yes

(Customer supplied product information)

(Refer to Photographs in Appendix B for views of the EUT)

5.2. Product description

The EUT (Equipment Under Test) has been described as follows:

“The WTX-4V2AM is a wall mounted wireless transmitter. The WTX-4V2AM used to control (open and close) Garage Door Openers, Gate Openers, and other equipment, which require remote operations.”

The highest fundamental frequency generated or used within the EUT, or the highest frequency at which it operates as specified by the customer is 434.37MHz.

5.3. Support Equipment

None

5.4. Product operating modes

The customer described the products normal operation modes as the following:

The WTX-4V2AM consecutively operates at 3 channels 433.47MHz, 433.92MHz and 434.37MHz. At each channel, the signal is frequency (30 kHz deviation) and amplitude (100%) modulated and is radiated by a common PCB loop antenna. The device is stabilized by a 10MHz crystal ±15ppm. A light emitting diode is used as an indicator.

The WTX-4V2AM is powered by a coin 3V battery CR2032.

5.5. Product operating mode for testing

Normal operation with button pressed and hold for continuous transmission. Normal operation with button pressed once for the transmitter deactivation test.

5.6. Configuration

The EUT was either configured by the customer or configured using the customer's instructions:

Standalone product, powered via internal 3VDC button battery (CR 2032). A new battery was used for all testing. The transmitter was tested in its enclosure and orientated when required to find the worst case orientation.

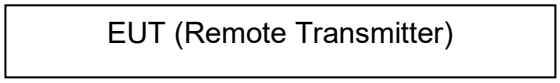


Figure 1: EUT configuration diagram for Transmitter Testing

5.7. Modifications

EMC Bayswater Pty Ltd did not modify the EUT.

5.8. Test Facility

Field strength of fundamental, Duty Cycle Correction Factor, Field strength of spurious emissions, Transmitter Deactivation and 20dB Emission Bandwidth Measurements were taken in the indoor Open Area Test Site (iOATS) facility at EMC Bayswater Pty Ltd, located at 18/88 Merrindale Drive, Croydon South, Victoria, 3136, Australia.

EMC Bayswater Pty Ltd's FCC Accredited Test Firm Registration number: 527798.

EMC Bayswater Pty Ltd's FCC Test Firm Designation number is AU0004.

5.9. Test Equipment

Refer to Appendix A for the measurement instrument list.

6. Referenced Standards

CFR47 FCC Part 15, Subpart C

CFR47 FCC Part 15, Subpart B

ANSI C63.10 - 2013
American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

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.

7. Referenced Documents

Test-Plan
Not supplied

8. Antenna Requirement – FCC Part 15.203

8.1. Requirements

As per section 15.203 of CFR47 FCC Part 15, Subpart C:

- An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

8.2. Result

The EUT uses permanent, internally attached antenna which is etched in to the PCB. Therefore the EUT complied with the antenna requirements of CFR47 FCC Part 15, Subpart C – Section 15.203.

9. Duty cycle correction factor

As per section 7.5 of ANSI C63.10 - 2013 & FCC Part 15.35(c):

Unless otherwise specified, when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 s (100 ms). In cases where the pulse train exceeds 0.1 s, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The following procedure is an example of how the average value may be determined. The average field strength may be found by measuring the peak pulse amplitude (in log equivalent units) and determining the duty cycle correction factor (in dB) associated with the pulse modulation as shown in following equation:

$\delta(dB) = 20\log(\Delta)$

where

δ = The duty cycle correction factor (dB)
Δ = The duty cycle (dimension less)

Duty Cycle = Total on time (ms)/Period (ms)

9.1. Test Procedure

The Duty cycle correction factor determination was performed in accordance with the section 7.5 of ANSI C63.10 - 2013.

9.2. Test Results

(Refer to graphs 12 & 13 in Appendix C)

Duty Cycle calculation:

Type of Pulse	Pulse time	Number of Pulses in a period	Time
Short Pulse	5.05ms	4	20.2ms
Long Pulse	6.5ms	1	6.5ms
		Total ON time	26.7ms
		Pulse Period	100ms

Duty Cycle = (26.7/100) = 0.267
Duty Cycle Correction Factor = 20*Log(0.267) = -11.5dB

Measured Duty Cycle	Correction Factor (dB)
0.267	-11.5

Table 2: Measured Duty Cycle

The measurement uncertainty was calculated as follows:

Measurement Parameter	Calculated measurement uncertainty
Time	±0.2%

The reported uncertainty is an expanded uncertainty calculated using a coverage factor of *k=2* which gives a level of confidence of approximately 95%.

Notes: The measured duty cycle for customer supplied sample is 0.267 (26.7%).

The duty cycle correction factor for 0.267 duty cycle is -11.5dB.

Assessment: All Peak measurements of the transmission fundamental and associated harmonics can be reduced by 11.5dB.

10. Field strength of fundamental – FCC Part 15.231(b)

10.1. Test Procedure

The EUT was tested for Field strength of fundamental in accordance with FCC 47 CFR Part 15 Subpart C Radio frequency devices (Intentional Radiators).

Field strength of fundamental were measured 3 metres away from the EUT in the iOATS (indoor Open Area Test Site) facility, which is an ANSI C63.4 compliant semi-anechoic chamber with ground plane. The EUT was placed on a non-conductive support at a height of 0.8m above the ground plane.

For both horizontal and vertical antenna polarizations, the peak detector was set to MAX-HOLD and the range selected continuously scanned with 120kHz RBW and 300kHz VBW. The antenna height was varied from 1 to 4 metres and the turntable slowly rotated. The EUT was orientated in each of the X, Y and Z-axis, in-turn, to find the worst case emissions. The maximum emissions were recorded.

Plots of the accumulated measurement data for both horizontal and vertical antenna polarizations, including all transducer and other measuring system correction factors were produced using commercially available compliant software (as listed in the test equipment list of this report)

(Refer to photographs in Annex C for views of the test configuration)

10.2. Limits

The EUT shall meet the limits in the following table:

Fundamental frequency (MHz)	Field strength of fundamental (µV/m)
40.66 to 40.70	2,250 *(67 dBµV/m)*
70 to 130	1,250 *(61.9 dBµV/m)*
130 to 174	[1]1,250 to 3,750 *(61.9 to 71.5 dBµV/m)*
174 to 260	3,750 *(71.5 dBµV/m)*
260 to 470	[1]3,750 to 12,500 *(71.5 to 81.9 dBµV/m)*
Above 470	12,500 *(81.9 dBµV/m)*

[1]Linear interpolations.

Table 3: Limits for Field strength of fundamental at 3m distance

10.3.Test Results

Field strength of fundamental measurements are tabulated below:

(Refer to graphs 1 & 2 in Appendix C)

Measurement Antenna Polarisation	EUT Orientation	Frequency (MHz)	Peak Electric Field Strength (3m) (dBµV/m)	Duty Cycle Factor (dB)	Average Electric Field Strength (3m) (dBµV/m)	Limit Electric Field Strength (3m) (dBµV/m)	Delta Limit (dB)
Horizontal	Z	433.506	88.8	-11.5	77.3	80.8	-3.5+
		433.896	88.7	-11.5	77.2	80.8	-3.6+
		434.416	88.6	-11.5	77.1	80.8	-3.7+
Vertical	X	433.506	91.7	-11.5	80.2	80.8	**-0.6+***
		433.896	91.7	-11.5	80.2	80.8	**-0.6+***
		434.338	91.6	-11.5	80.1	80.8	-0.7+

**Worst-case emissions, +refer to measurement uncertainty statement*

Table 4: Field strength of fundamental measurements

The measurement uncertainty was calculated as follows:

Measurement frequency range	Calculated measurement uncertainty
30MHz to 1000MHz	±4.65dB

The reported uncertainty is an expanded uncertainty calculated using a coverage factor of *k=2* which gives a level of confidence of approximately 95%. 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.

Climatic Conditions	
Temperature:	19 to 24°C
Humidity:	48 to 52%
Atmospheric pressure:	1005.2 to 1020.5hPa

Table 5: Climatic conditions

Calculation: The above results are based upon the following calculation:

E (Peak) = V_{pk} + AF + L_C
E(Average) = E(Peak) – Duty Cycle Correction Factor
Where:
E = E-field in dBμV/m
$V_{QP/PK/AV}$ = Measured Voltage (Peak) in dBμV
AF = Antenna Factor in dB(/m)
L_C = Cable and attenuator Loss in dB

Example calculation:
E (Peak) = V_{PK} + AF + L_C
E (Peak) = 30dBμV + 12dB/m + 2.3dB
E (Peak) = 44.3 dBμV/m
E (Average) = E(Peak) – Duty Cycle Correction Factor
E (Average) = 44.3 – 6 = 38.3 dBμV/m

Notes: The Field strength of fundamental measurements were below the specified limit.

Assessment: The EUT complied with the Field strength of fundamental requirements of CFR47 FCC Part 15, Subpart C – Section 15.231.

11. Field strength of spurious emissions – FCC Part 15.231(b)

11.1. Test Procedure

The Radiated Emissions were performed in accordance with the ANSI C63.10 - 2013.

Radiated Emissions were measured 3 metres (from 9kHz to 1GHz) away from the EUT in the iOATS (indoor Open Area Test Site) facility, which is an ANSI C63.4 compliant semi-anechoic chamber with ground plane. The EUT was placed on a non-conductive support at a height of 0.8m above the ground plane.

In the frequency range of 9kHz to 30MHz, an Active loop antenna was used. For X (parallel), Y (perpendicular) and Z (ground-parallel) antenna polarizations, the peak detector was set to MAX-HOLD and the range selected continuously scanned. The measuring antenna was positioned at 1m fixed height and the turntable slowly rotated. The peak preview measurements were performed with a resolution bandwidth of 200 Hz (9kHz to 150kHz), 9kHz (150kHz to 30MHz) and a video bandwidth of 30 kHz. Peak emissions that exceeded the limit or were close to the applicable limit were investigated further. The frequency of each emissions was then accurately determined. Each emission of interest was then in-turn maximised by using the turntable to rotate the EUT through 360 degrees to find the worst-case emission arrangement. Quasi peak measurements were then performed using a measuring time of no less than 15 seconds. The final quasi-peak measurements were performed using a receiver bandwidth of 6dB and a resolution bandwidth of 200 Hz (9kHz to 150kHz) and 9kHz (150kHz to 30MHz).

In the frequency range of 30MHz to 1GHz, a Biconilog antenna was used. For both horizontal and vertical antenna polarizations, the peak detector was set to MAX-HOLD and the range selected continuously scanned. The measuring antenna was positioned at 4 different fixed height positions and the turntable slowly rotated. The peak preview measurements were performed with a resolution bandwidth of 120 kHz and a video bandwidth of 300 kHz. Peak emissions that exceeded the limit or were close to the applicable limit were investigated further. The frequency of each emissions was then accurately determined. Each emission of interest was then in-turn maximised by using the turntable to rotate the EUT through 360 degrees and varying the height of the antenna between 1 and 4 metres to find the worst-case emission arrangement. Quasi peak measurements were then performed using a measuring time of no less than 15 seconds. The final quasi-peak measurements were performed using a receiver bandwidth of 6dB and a resolution bandwidth of 120 kHz.

In the frequency range 1.0GHz to 4.5GHz a Horn antenna was used and an area of 3m x 3m was covered between the antenna and the EUT using RF absorbing material with a rated attenuation more than 20dB over the frequency range. The height of the horn antenna was varied using the antenna bore-sighting technique and the turntable slowly rotated to maximise the emissions. For both horizontal and vertical antenna polarizations, the Peak and Average preview measurements were performed with a resolution bandwidth of 1 MHz and a video bandwidth of 3MHz. Peak and average emissions that exceeded the applicable limit or were close to the applicable limit were investigated further. Each emission of interest was then in-turn maximised by using the turntable to rotate the EUT through 360 degrees and the antenna height varied (if applicable, using the antenna bore-sighting technique) to find the worst-case emission arrangement. Peak and CISPR Average measurements were then performed using a

measuring time of no less than 15 seconds, the maximum emission level in the observed duration was recorded as the final result. The final peak and CISPR Average measurements were performed using a receiver bandwidth of 6dB and a resolution bandwidth of 1 MHz. Peak and Average measurements were performed at spot frequencies where the peak or average emission was close to, or exceeded the applicable limit line with the EUT rotation and antenna height varied (if applicable, using the antenna bore-sighting technique) to produce the highest emission.

Plots of the accumulated measurement data for both horizontal and vertical antenna polarizations, including all transducer and other measuring system correction factors were produced using commercially available compliant software (as listed in the test equipment list of this report).

(Refer to photographs in Annex C for views of the test configuration)

11.2. Limits

CFR47 FCC Part 15, Subpart C – Section 15.231 (b) is applicable as the EUT periodic operation rate does not exceed the rate specified in paragraph (a) of 15.231.

As per section 15.231 (b), in addition to the provisions of 15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following.

Fundamental frequency (MHz)	Field strength of fundamental (µV/m)	Field strength of spurious emissions (µV/m)
40.66 to 40.70	2,250 *(67 dBµV/m)*	225 *(47 dBµV/m)*
70 to 130	1,250 *(61.9 dBµV/m)*	125 *(41.9 dBµV/m)*
130 to 174	[1]1,250 to 3,750 *(61.9 to 71.5 dBµV/m)*	[1]125 to 375 *(41.9 to 51.5 dBµV/m)*
174 to 260	3,750 *(71.5 dBµV/m)*	375 *(51.5 dBµV/m)*
260 to 470	[1]3,750 to 12,500 *(71.5 to 81.9 dBµV/m)*	[1]375 to 1,250 *(51.5 to 61.9 dBµV/m)*
Above 470	12,500 *(81.9 dBµV/m)*	1,250 *(61.9 dBµV/m)*

[1]Linear interpolations.

Table 6: Limits for Radiated Spurious Emissions at distance of 3m – 15.231(b)

As per section 15.231(b)(3), the limits on the field strength of the spurious emissions in the below table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in above table 6 or to the general limits shown in 15.209, whichever limit permits a higher field strength.

Frequency Range (MHz)	Limits at 3m (dBμV/m)
0.009 to 0.490	128.5 to 93.8
0.490 to 1.705	73.8 to 62.9
1.705 to 30.0	69.5
30.0 to 88.0	40.0
88.0 to 216.0	43.5
216.0 to 960.0	46.0
Above 960	54.0
NOTE: The lower limit shall apply at the transition frequency.	

Table 7: Limits for Radiated Spurious Emissions at distance of 3m – 15.209

Frequency Range (MHz)	Limits at 3m (dBμV/m)
30.0 to 4500.0	60.8
NOTE: The lower limit shall apply at the transition frequency.	

Table 8: Limits for Radiated Spurious Emissions at distance of 3m – 15.231(b) -20dB Field strength of Fundamental

11.3. Test Results

Radiated Emissions measurements are tabulated below. For below 1GHz measurements, Quasi-peak or Average measurements were performed at spot frequencies where the peak emission was close to, or exceeded the applicable limit line. For above 1GHz measurements, Peak or Average measurements were performed at spot frequencies where the peak or average emission was close to, or exceeded the applicable limit line.

(Refer to graphs 3 to 11 in Appendix C)

Measurement Antenna Polarisation	Frequency (MHz)	Result peak (dBμV/m)	Limit Quasi-peak/ Average (dBμV/m)	Delta limit (dB)
X	Peak preview emissions >20dB below limit or no significant emissions above the noise floor observed			
Y	Peak preview emissions >20dB below limit or no significant emissions above the noise floor observed			
Z	Peak preview emissions >20dB below limit or no significant emissions above the noise floor observed			

Table 9: Field strength of spurious emissions – 9kHz to 30MHz

Measurement Antenna Polarisation	EUT Orientation	Frequency (MHz)	Peak Electric Field Strength (3m) (dBµV/m)	Duty Cycle Factor (dB)	Average Electric Field Strength (3m) (dBµV/m)	Limit Electric Field Strength (3m) (dBµV/m)	Delta Limit (dB)
Horizontal	Z	413.499	51.4	-11.5	39.9	60.8	-20.9
		413.884	51.5	-11.5	40.0	60.8	-20.8
		414.346	52.2	-11.5	40.7	60.8	**-20.1***
		867.010	49.2	-11.5	37.7	60.8	-23.1
		867.780	47.8	-11.5	36.3	60.8	-24.5
		868.790	47.9	-11.5	36.4	60.8	-24.4
Vertical	X	413.499	51.9	-11.5	40.4	60.8	-20.4
		413.884	51.4	-11.5	39.9	60.8	-20.9
		414.384	51.3	-11.5	39.8	60.8	-21.0
		866.880	51.8	-11.5	40.3	60.8	-20.5
		867.780	50.9	-11.5	39.4	60.8	-21.4
		868.800	50.3	-11.5	38.8	60.8	-22.0

**Worst-case emissions*

Table 10: Field strength of spurious emissions – 30MHz to 1GHz

EUT Orientation	Frequency (MHz)	Peak Result (dBµV/m)	Duty Cycle Factor (dB)	Average Result (dBµV/m)	Peak Limit (dBµV/m)	Average Limit (dBµV/m)	Peak Delta Limit (dB)	Average Delta Limit (dB)
Z	1300.300	38.5	-11.5	27.0	74.0	54.0	-35.5	-27.0
	1301.350	38.0	-11.5	26.5	74.0	54.0	-36.0	-27.5
	1303.100	37.3	-11.5	25.8	74.0	54.0	-36.7	-28.2
	1733.600	49.9	-11.5	38.4	80.8	60.8	-30.9	-22.4
	1735.350	50.2	-11.5	38.7	80.8	60.8	-30.6	-22.1
	1737.100	50.3	-11.5	38.8	80.8	60.8	**-30.5***	**-22.0***
	2167.250	41.6	-11.5	30.1	80.8	60.8	-39.2	-30.7
	2169.700	40.2	-11.5	28.7	80.8	60.8	-40.6	-32.1
	2171.800	39.7	-11.5	28.2	80.8	60.8	-41.1	-32.6
	2600.550	42.2	-11.5	30.7	80.8	60.8	-38.6	-30.1
	2603.350	41.4	-11.5	29.9	80.8	60.8	-39.4	-30.9
	2606.150	42.2	-11.5	30.7	80.8	60.8	-38.6	-30.1

**Worst-case emissions*

Table 11: Field strength of spurious emissions – Horizontal Antenna Polarization – 1GHz to 4.5GHz

EUT Orientation	Frequency (MHz)	Peak Result (dBµV/m)	Duty Cycle Factor (dB)	Average Result (dBµV/m)	Peak Limit (dBµV/m)	Average Limit (dBµV/m)	Peak Delta Limit (dB)	Average Delta Limit (dB)
X	1300.300	40.1	-11.5	28.6	74.0	54.0	-33.9	-25.4
	1301.700	38.7	-11.5	27.2	74.0	54.0	-35.3	-26.8
	1303.100	36.9	-11.5	25.4	74.0	54.0	-37.1	-28.6
	1733.600	52.1	-11.5	40.6	80.8	60.8	-28.7	-20.2
	1735.350	52.0	-11.5	40.5	80.8	60.8	-28.8	-20.3
	1737.450	52.5	-11.5	41.0	80.8	60.8	**-28.3***	**-19.8***

**Worst-case emissions*

Table 12: Field strength of spurious emissions – Vertical Antenna Polarization – 1GHz to 4.5GHz

The measurement uncertainty was calculated as follows:

Measurement frequency range	Calculated measurement uncertainty
0.009MHz to 30MHz	±4.33dB
30MHz to 1GHz	±4.65dB
1GHz to 6GHz	±4.83dB

The reported uncertainty is an expanded uncertainty calculated using a coverage factor of *k=2* which gives a level of confidence of approximately 95%. 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.

Climatic Conditions	
Temperature:	19 to 23°C
Humidity:	48 to 52%
Atmospheric pressure:	1019.7 to 1020.5hPa

Table 13: Climatic conditions

Calculation: The above results are based upon the following calculation:

E (Peak) = V_{pk} + AF + L_C
E(Average) = E(Peak) – Duty Cycle Correction Factor
Where:
E = E-field in dBµV/m
$V_{QP/PK/AV}$ = Measured Voltage (Peak) in dBµV
AF = Antenna Factor in dB(/m)
L_C = Cable and attenuator Loss in dB

Example calculation:
E (Peak) = V_{pk} + AF + L_C
E (Peak) = 30dBµV + 12dB/m + 2.3dB
E (Peak) = 44.3 dBµV/m
E (Average) = E(Peak) – Duty Cycle Correction Factor
E (Average) = 44.3 – 6 = 38.3 dBµV/m

Notes: All Spurious Emissions measurements were below the permissible Spurious and general intentional radiator limits for the Average/Quasi peak detector and the peak detector emissions were below the peak limit.

The average measurements were determined from Peak detector measurements by applying the duty cycle correction factor.

Assessment: The EUT complied with the Radiated Spurious Emissions requirements of CFR47 FCC Part 15, Subpart C – Section 15.231.

12. Emission Bandwidth – FCC Part 15.231(c)

12.1. Test Procedure

The 20dB Emission Bandwidth was performed in accordance with the section 6.9 of ANSI C63.10 - 2013.

The EUT was placed on a polystyrene support at a height of 0.8m above the ground reference plane. The measuring antenna was located at a distance of 3m from the EUT, using the spectrum analyser. The worst-case transmitter orientation, measurement antenna polarization were used for each measurement. The spectrum analyzer centre frequency was tuned to the fundamental (transmit frequency) of the transmitter with span range between two times and five times the OBW (-20dB bandwidth). The nominal IF filter bandwidth (RBW) was set to 1% to 5% of the OBW and video bandwidth (VBW) was set to three times the RBW. The peak detector was used with trace mode to max hold. The resultant bandwidth measurement was recorded.

(Refer to photographs in Annex C for views of the test configuration)

12.2. Requirements

As per CFR47 FCC Part 15, Subpart C – Section 15.231:

- The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Center Frequency: 433.925MHz

12.3. Test Results

Emission Bandwidth measurements are tabulated below:

(Refer to graph 14 in Appendix C)

Transmit center frequency (MHz)	Measured 20dB Bandwidth	Percentage of Measured Bandwidth with respect to Centre Frequency	Limit	Comment
433.925	1.0244MHz	0.236%	0.25%	Complied

Table 14: Results for 20dB Bandwidth

The measurement uncertainty was calculated as follows:

Measurement Parameter	Calculated measurement uncertainty
Operating Frequency	±10.5kHz
Bandwidth	±14.96kHz

The reported uncertainty is an expanded uncertainty calculated using a coverage factor of *k=2* which gives a level of confidence of approximately 95%. 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.

Climatic Conditions	
Temperature:	24°C
Humidity:	52%
Atmospheric pressure:	1005.2hPa

Table 15: Climatic conditions

Notes: The 20dB bandwidth of the emission was contained within 0.25% of 433.925MHz center frequency.

Assessment: The EUT complied with the Emission Bandwidth requirements of CFR47 FCC Part 15, Subpart C – Section 15.231(c).

13. Transmitter Deactivation – FCC Part 15.231(a)

13.1. Test Procedure

The transmitter signal was coupled to the spectrum analyser via a coaxial cable and a near-field probe. The centre frequency of the spectrum analyser was adjusted to the centre of the transmitter frequency. The attenuation and reference levels were adjusted to achieve maximum dynamic range without overloading the spectrum analyser input. The span of the spectrum analyser was set to zero (0Hz), and the sweep time adjusted to 5s. The trigger level was adjusted to allow the greatest amount of "on time" for a pulse train.

13.2. Test Results

(Refer to graph 15 in Appendix C)

Measured Transmitter deactivation time (s)	Required Transmitter deactivation time (s)	Comment
0.290	≤ 5	Complied

Table 16: Results for transmitter deactivation test

The measurement uncertainty was calculated as follows:

Measurement Parameter	Calculated measurement uncertainty
Time	±0.2%

The reported uncertainty is an expanded uncertainty calculated using a coverage factor of *k=2* which gives a level of confidence of approximately 95%.

Notes: The measured transmitter deactivation time was less than 5s.

The device only transmitted when a button was pressed manually. The device transmitted packets repeatedly for some time when the button was held. When the button was released all transmission stopped within 290ms.

Assessment: The EUT complied with the Transmitter Deactivation requirements of CFR47 FCC Part 15, Subpart C – Section 15.231(a).

14. Conclusion

The Automatic Technology Australia Pty. Ltd., WTX-4V2AM, Wall Mounted Remote Control complied with the requirements of CFR47 FCC Part 15, Subpart C – Section 15.231.

Appendix A – Test Equipment

Inv.	Equipment	Make	Model No.	Serial No.	Calibration		
					Interval	Due	Type
	Field strength of fundamental, Duty Cycle & Emissions Bandwidth						
1217	ANALYSER, EMI Receiver	Rohde & Schwarz	ESU40	100182	1 year	May-21	E
0932	CONTROLLER, Position	Sunol Sciences	SC104V-3	081006-1	N/A	N/A	V
0933	TURNTABLE	Sunol Sciences	SM46C	081006-2	N/A	N/A	V
0934	MAST, Antenna	Sunol Sciences	TLT2	081006-5	N/A	N/A	V
A-434	ANTENNA, Biconilog	Sunol Sciences	JB1	A052518	2 years	Nov-22	E
0710	ATTENUATOR, 10dB	JFW	50HF-010N	-	3 years	Nov-21	I
1143	CABLE, Coax, Sucoflex 104PA	Huber + Suhner	84287041	SN MY058/4PA	1 year	Jan-22	I
1145	CABLE, Coax, Sucoflex 104PA	Huber + Suhner	84279564	SN MY056/4PA	1 year	Jan-22	I
1248	HYGROMETER, Temp, Humidity	Thomas Scientific	6066N53	181037404	2 years	Feb-22	I
0666	Enclosure, Semi-Anechoic, No 1	RFI Industries	S800 iOATS	1229	2 years	Jan-22	I
SW007	EMC Measurement Software	Rohde & Schwarz	EMC 32	Version 8.53.0	N/A	N/A	N/A
	Field strength of spurious emissions 9kHz to 4500MHz						
1217	ANALYSER, EMI Receiver	Rohde & Schwarz	ESU40	100182	1 year	May-21	E
0932	CONTROLLER, Position	Sunol Sciences	SC104V-3	081006-1	N/A	N/A	V
0933	TURNTABLE	Sunol Sciences	SM46C	081006-2	N/A	N/A	V
0934	MAST, Antenna	Sunol Sciences	TLT2	081006-5	N/A	N/A	V
0024	ANTENNA, Active Loop	EMCO	6502	2620	2 years	Jun-21	I
A-434	ANTENNA, Biconilog	Sunol Sciences	JB1	A052518	2 years	Nov-22	E
1143	CABLE, Coax, Sucoflex 104PA	Huber + Suhner	84287041	SN MY058/4PA	1 year	Jan-22	I
1145	CABLE, Coax, Sucoflex 104PA	Huber + Suhner	84279564	SN MY056/4PA	1 year	Jan-22	I
1238	CABLE, Coax, Sucoflex 126 E	Huber + Suhner	10422876	SN 8000495/126E	1 year	Jan-22	I
0745	FILTER, Hi-Pass, 800MHz	MiniCircuits	NHP-800	10447	2 years	Jun-22	I
0559	PRE-AMP, Microwave, 18GHz	Miteq	AFS8	605305	1 year	Nov-21	I
0633	ANTENNA, Double Ridge Horn	EMCO	3115	9712-5369	3 years	Aug-21	I
1248	HYGROMETER, Temp, Humidity	Thomas Scientific	6066N53	181037404	2 years	Feb-22	I
0666	Enclosure, Semi-Anechoic, No 1	RFI Industries	S800 iOATS	1229	2 years	Jan-22	I
SW007	EMC Measurement Software	Rohde & Schwarz	EMC 32	Version 8.53.0	N/A	N/A	N/A
	Transmitter Deactivation						
1217	ANALYSER, EMI Receiver	Rohde & Schwarz	ESU40	100182	1 year	May-21	E
1205	CABLE, Coax, Sucoflex 126 E	Huber+ Suhner	84383918	SN MY1006/26EA	1 year	Jan-22	I
1248	HYGROMETER, Temp, Humidity	Thomas Scientific	6066N53	181037404	2 years	Feb-22	I
0697	PROBE, Near-field, E&H, set	ETS Lindgren	7405	4747	N/A	N/A	V
0666	Enclosure, Semi-Anechoic, No 1	RFI Industries	S800 iOATS	1229	2 years	Jan-22	I

V: Verification of operation against an internal reference
I: Internal calibration against a traceable standard
E: External calibration by a NATA or MRA equivalent endorsed facility
N/A: Not Applicable

Appendix B – Photographs

Annex	Number	Photograph Description
A	1	EUT – External Views
A	2	
A	3	
A	4	
A	5	
A	6	
B	1	EUT – Internal Views
B	2	
B	3	
B	4	
B	5	
B	6	
B	7	
B	8	
B	9	
B	10	
B	11	
B	12	
B	13	Transmitter battery
C	1	Field strength of fundamental, Duty cycle and Emission Bandwidth – Test configuration Field strength of spurious emissions – Test configuration – 30MHz to 1GHz
C	2	
C	3	
C	4	
C	5	Field strength of spurious emissions – Test configuration – 9kHz to 30MHz
C	6	
C	7	
C	8	Field strength of spurious emissions – Test configuration – 1GHz to 4.5GHz
C	9	

EUT External Photographs	-	EMC Bayswater Test Report E2102-1390-1 Annex A
EUT Internal Photographs	-	EMC Bayswater Test Report E2102-1390-1 Annex B
EUT Test Configurations Photographs	-	EMC Bayswater Test Report E2102-1390-1 Annex C

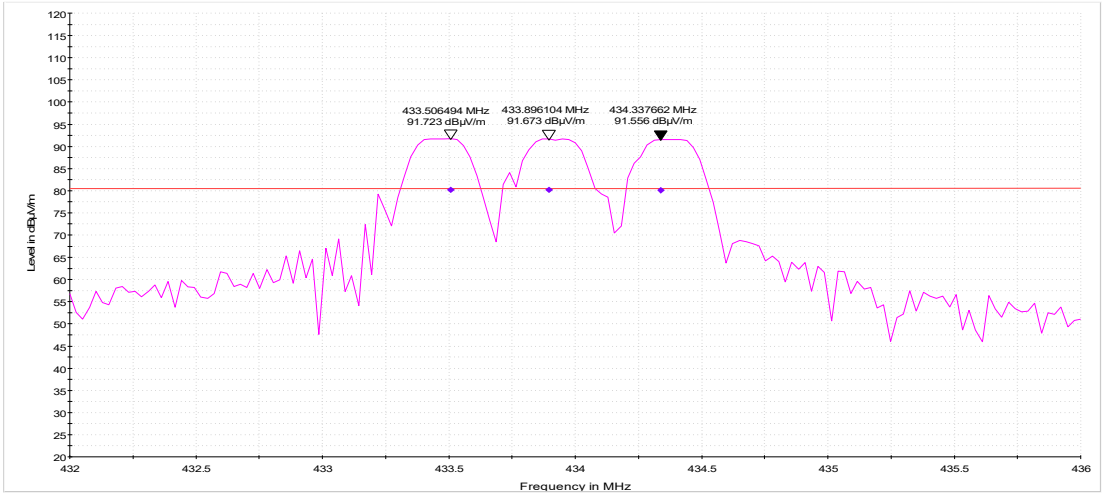
Appendix C – Measurement Graphs

No.	Test	Graph Description
1	Field strength of fundamental	Antenna Vertical – EUT X orientation
2		Antenna Horizontal – EUT Z orientation
3	Field strength of spurious emissions	Antenna X – EUT X orientation – 9kHz to 30MHz
4		Antenna Y – EUT X orientation – 9kHz to 30MHz
5		Antenna Z – EUT X orientation – 9kHz to 30MHz
6		Vertical Antenna Polarisation – EUT X orientation – 30MHz to 800MHz
7		Vertical Antenna Polarisation – EUT X orientation – 800MHz to 1GHz
8		Vertical Antenna Polarisation – EUT X orientation – 1GHz to 4.5GHz
9		Horizontal Antenna Polarisation – EUT Z orientation – 30MHz to 800MHz
10		Horizontal Antenna Polarisation – EUT Z orientation – 800MHz to 1GHz
11		Horizontal Antenna Polarisation – EUT Z orientation – 1GHz to 4.5GHz
12	Duty Cycle Correction Factor	Duration of Long pulse
13		Duration of Short pulse
14	Emissions Bandwidth	
15	Transmitter Deactivation	

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C – Section 15.231 – Field strength of fundamental
Automatic Technology Australia Pty. Ltd. - WTX-4V2AM - Wall Mounted Remote Control
Antenna Vertical – EUT X orientation

Job Number: E2102-1390-1
Test Engineer: AZ

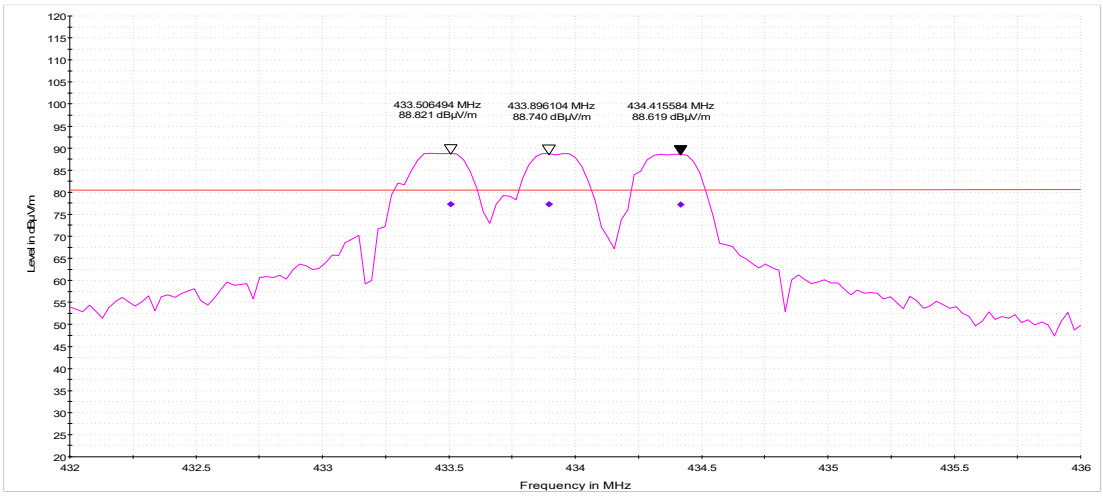


Graph 1

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C – Section 15.231 – Field strength of fundamental
Automatic Technology Australia Pty. Ltd. - WTX-4V2AM - Wall Mounted Remote Control
Antenna Horizontal – EUT Z orientation

Job Number: E2102-1390-1
Test Engineer: AZ

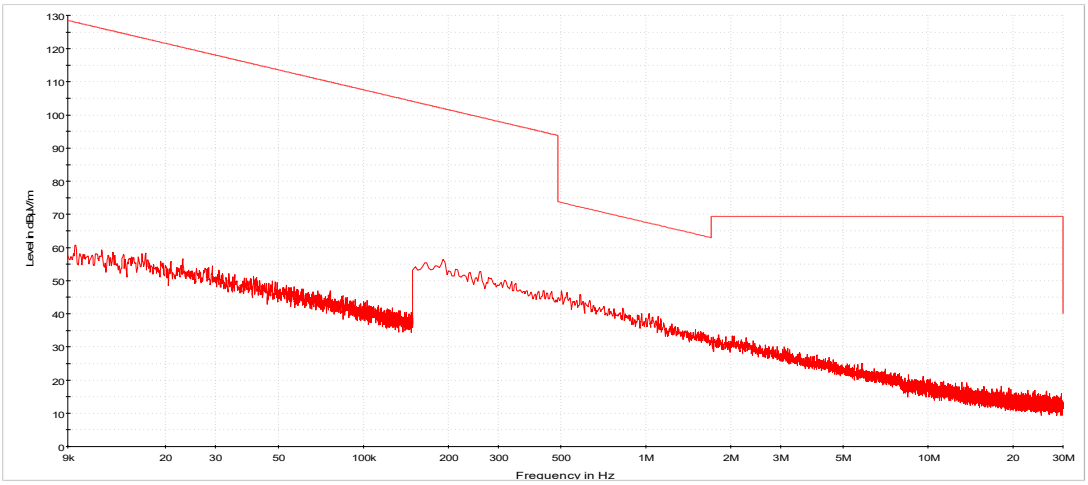


Graph 2

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart B – Section 15.209 - Field strength of spurious emissions
Automatic Technology Australia Pty. Ltd. - WTX-4V2AM - Wall Mounted Remote Control
Antenna X – EUT X orientation – 9kHz to 30MHz

Job Number: E2102-1390-1
Test Engineer: AZ

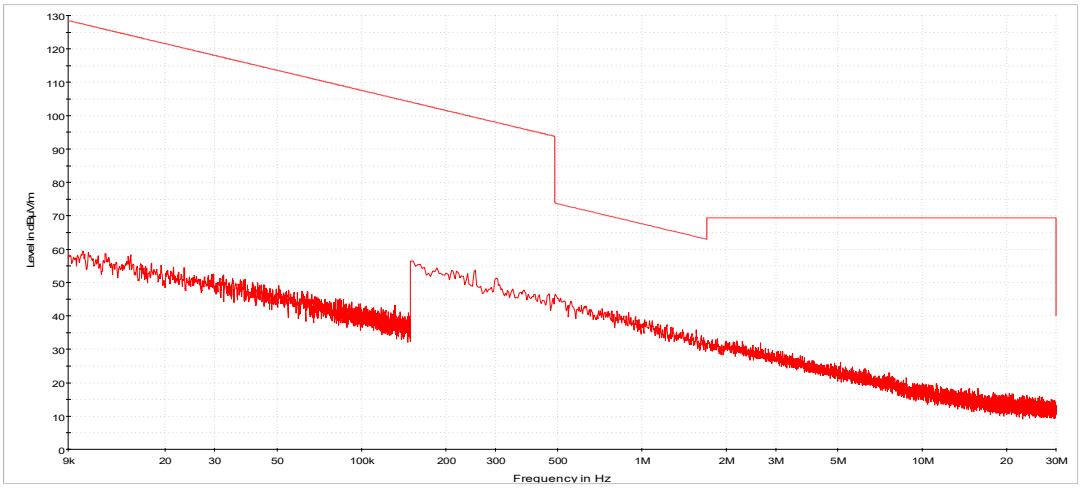


Graph 3

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart B – Section 15.209 - Field strength of spurious emissions
Automatic Technology Australia Pty. Ltd. - WTX-4V2AM - Wall Mounted Remote Control
Antenna Y – EUT X orientation – 9kHz to 30MHz

Job Number: E2102-1390-1
Test Engineer: AZ

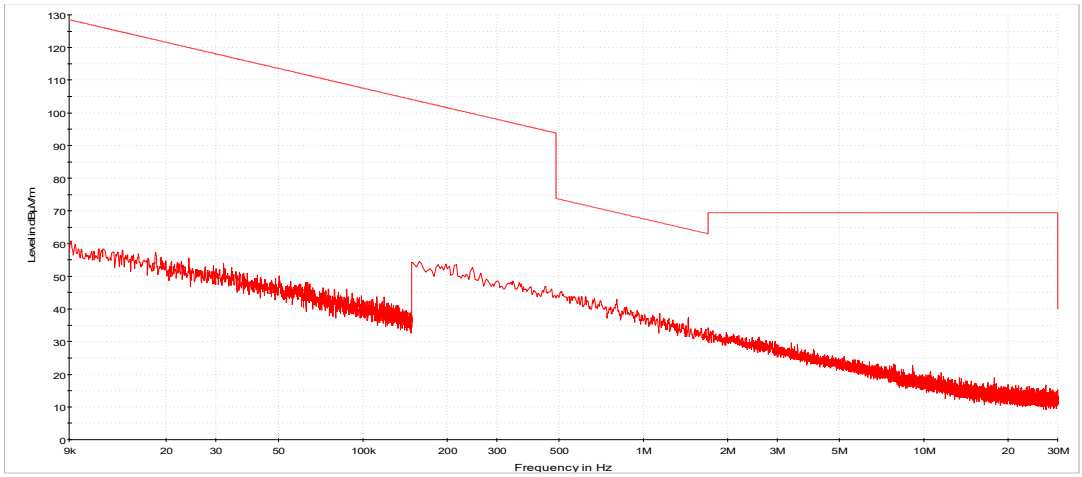


Graph 4

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart B – Section 15.209 - Field strength of spurious emissions
Automatic Technology Australia Pty. Ltd. - WTX-4V2AM - Wall Mounted Remote Control
Antenna Z – EUT X orientation – 9kHz to 30MHz

Job Number: E2102-1390-1
Test Engineer: AZ

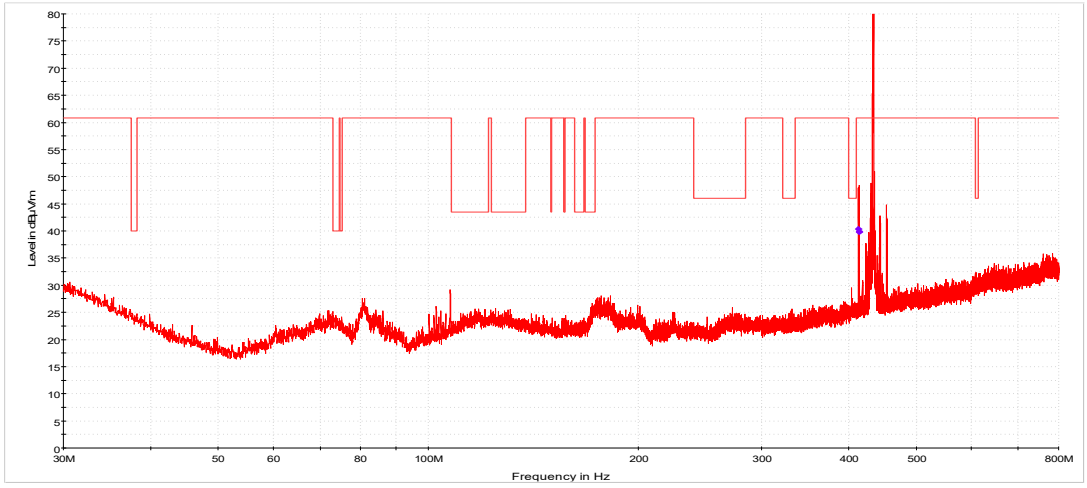


Graph 5

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart B – Section 15.231 - Field strength of spurious emissions
Automatic Technology Australia Pty. Ltd. - WTX-4V2AM - Wall Mounted Remote Control
Antenna Vertical – EUT X orientation – 30MHz to 800MHz

Job Number: E2102-1390-1
Test Engineer: AZ

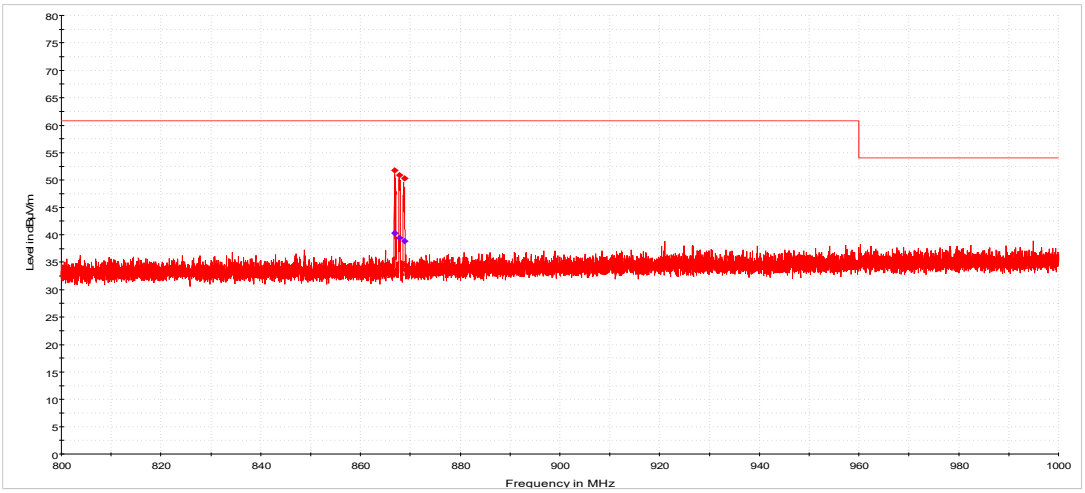


Graph 6

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart B – Section 15.231 - Field strength of spurious emissions
Automatic Technology Australia Pty. Ltd. - WTX-4V2AM - Wall Mounted Remote Control
Antenna Vertical – EUT X orientation – 800MHz to 1GHz

Job Number: E2102-1390-1
Test Engineer: AZ

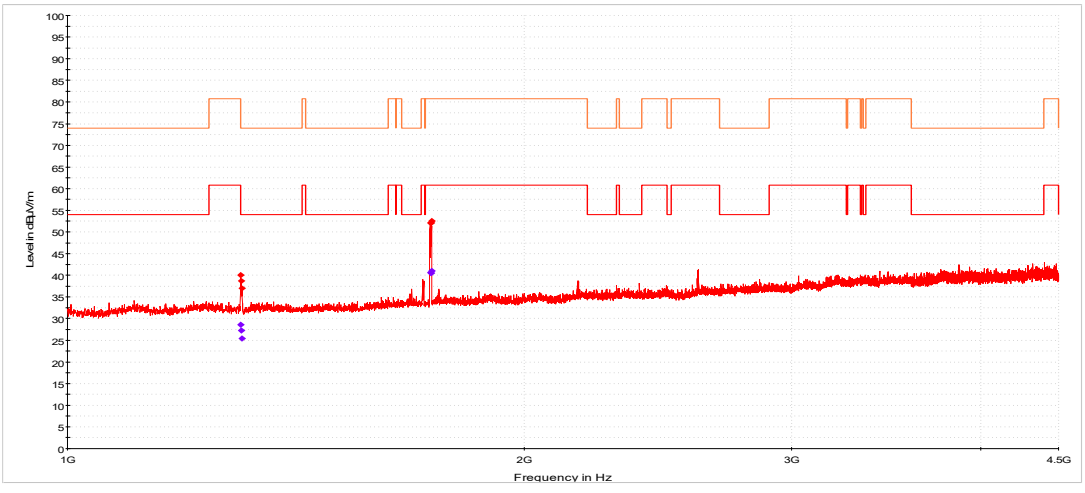


Graph 7

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart B – Section 15.231 - Field strength of spurious emissions
Automatic Technology Australia Pty. Ltd. - WTX-4V2AM - Wall Mounted Remote Control
Antenna Vertical – EUT X orientation – 1GHz to 4.5GHz

Job Number: E2102-1390-1
Test Engineer: AZ

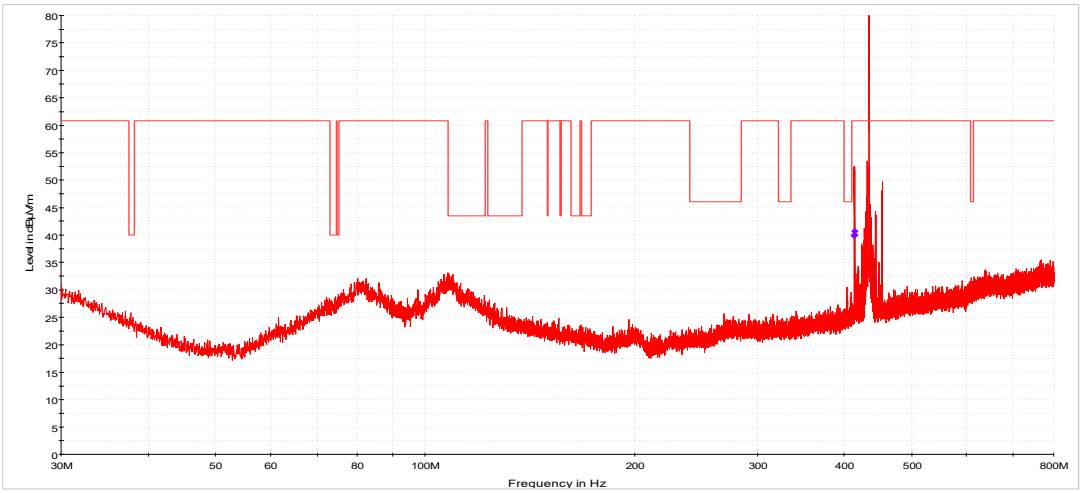


Graph 8

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart B – Section 15.231 - Field strength of spurious emissions
Automatic Technology Australia Pty. Ltd. - WTX-4V2AM - Wall Mounted Remote Control
Antenna Horizontal – EUT Z orientation – 30MHz to 800MHz

Job Number: E2102-1390-1
Test Engineer: AZ



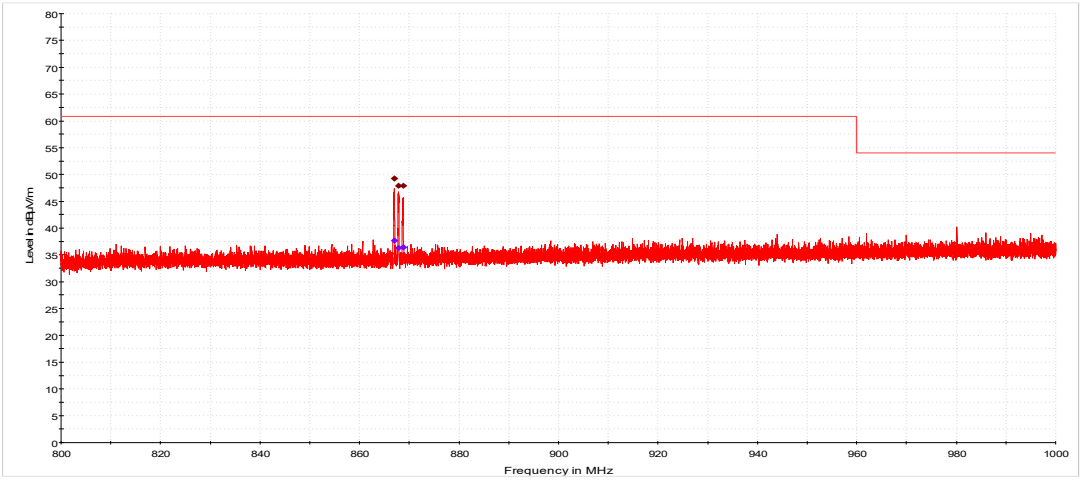
Preview Result 1-PK+ AV FCC Part 15.231(b) and 15.209 3m - Tx spurious Limit

Graph 9

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart B – Section 15.231 - Field strength of spurious emissions
Automatic Technology Australia Pty. Ltd. - WTX-4V2AM - Wall Mounted Remote Control
Antenna Horizontal – EUT Z orientation – 800MHz to 1GHz

Job Number: E2102-1390-1
Test Engineer: AZ



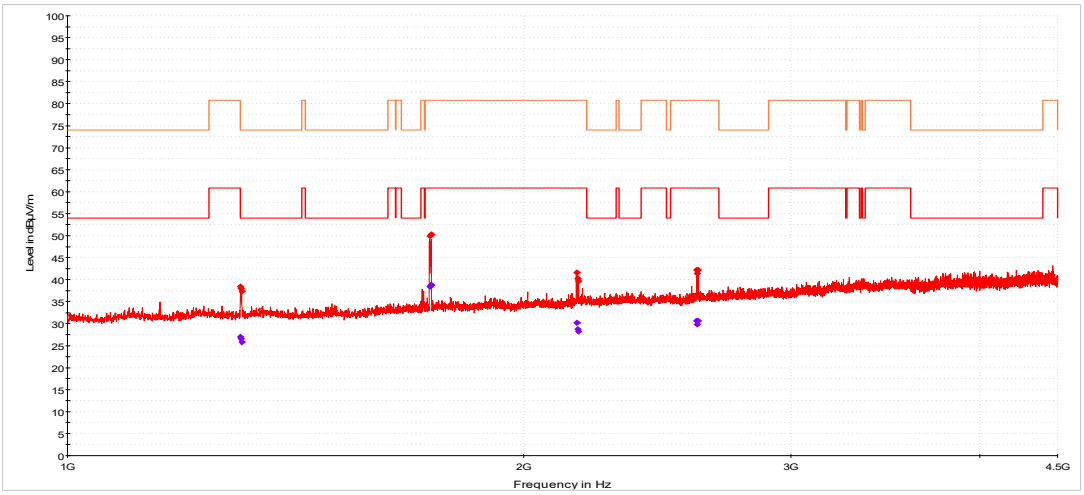
Preview Result 1-PK+ AV Peak FCC Part 15.231(b) and 15.209 3m - Tx spurious Limit

Graph 10

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart B – Section 15.231 - Field strength of spurious emissions
Automatic Technology Australia Pty. Ltd. - WTX-4V2AM - Wall Mounted Remote Control
Antenna Horizontal – EUT Z orientation – 1GHz to 4.5GHz

Job Number: E2102-1390-1
Test Engineer: AZ

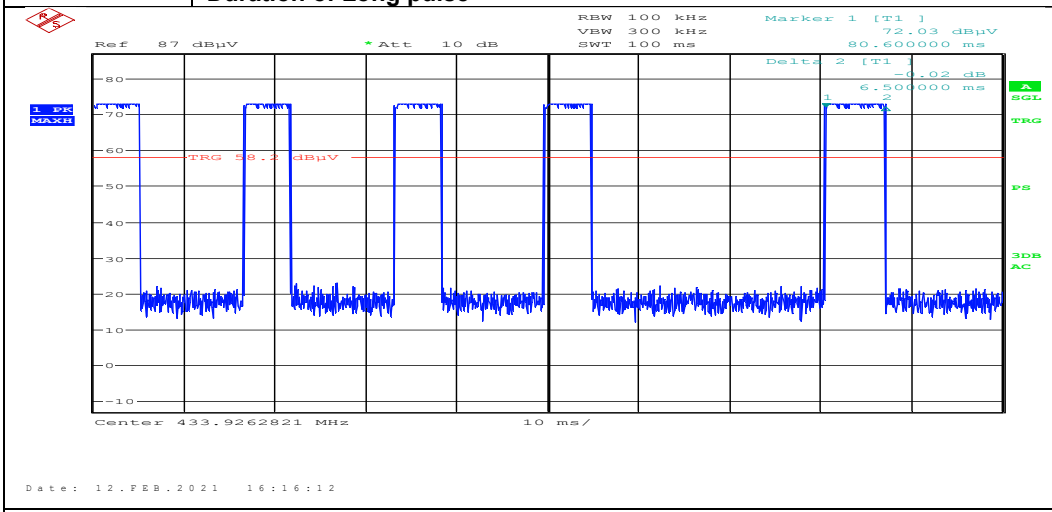


Graph 11

EMC Bayswater Pty. Ltd.

Duty cycle correction
Automatic Technology Australia Pty. Ltd. - WTX-4V2AM - Wall Mounted Remote Control
Duration of Long pulse

Job Number: E2102-1390-1
Test Engineer: NL



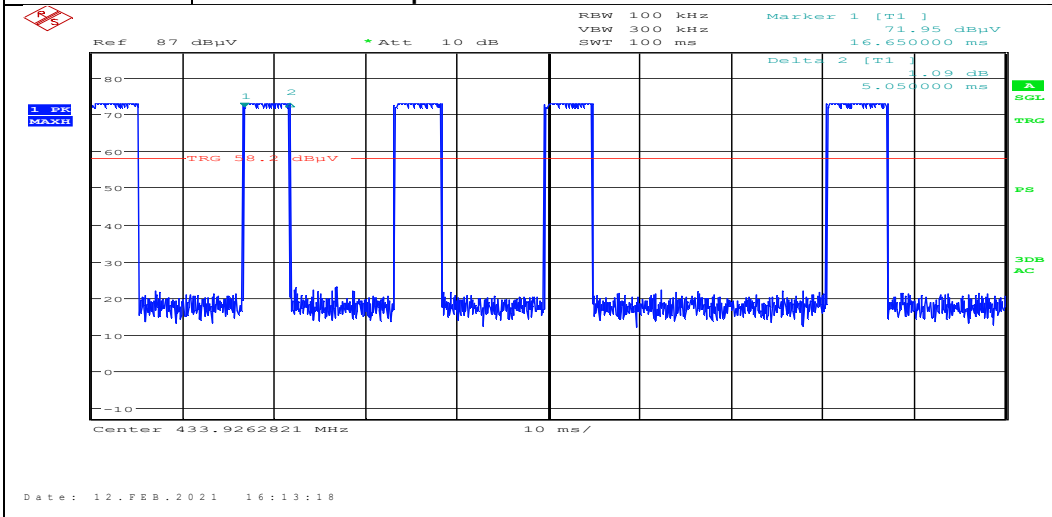
Graph 12

EMC Bayswater Pty. Ltd.

Duty cycle correction

Automatic Technology Australia Pty. Ltd. - WTX-4V2AM - Wall Mounted Remote Control
Duration of Short pulse

Job Number: E2102-1390-1
Test Engineer: NL

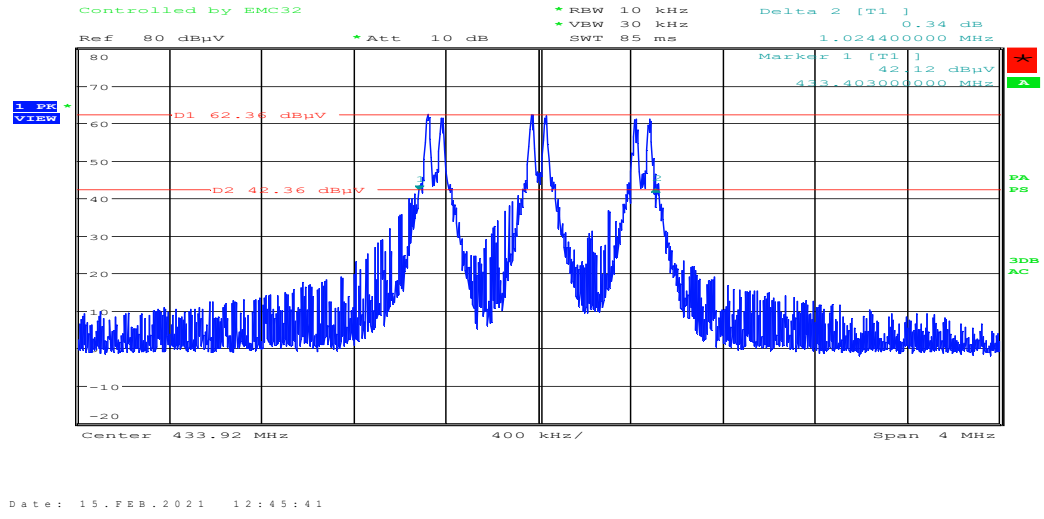


Graph 13

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C – Section 15.231 - Emission Bandwidth
Automatic Technology Australia Pty. Ltd. - WTX-4V2AM - Wall Mounted Remote Control

Job Number: E2102-1390-1
Test Engineer: NL

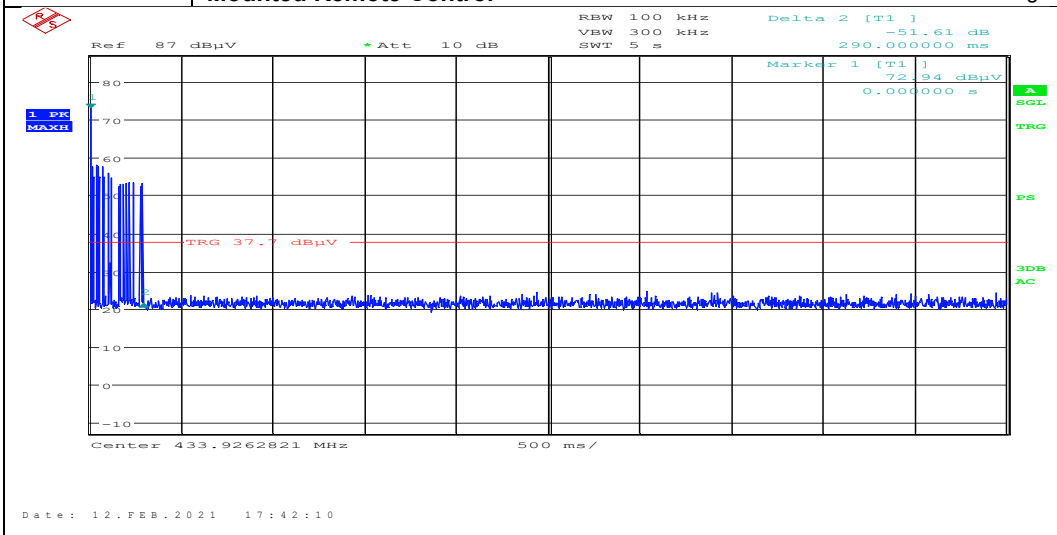


Graph 14

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C – Section 15.231 – Transmitter Deactivation
Automatic Technology Australia Pty. Ltd. - WTX-4V2AM - Wall Mounted Remote Control

Job Number: E2102-1390-1
Test Engineer: NL



Graph 15

Appendix D – Exposure of Humans to RF fields (Radio Frequency Hazard) information

SAR and RF Exposure exception evaluation

SAR exception evaluation

As per Appendix A of KDB 447498 D01 General RF Exposure Guidance v06

***SAR Test Exclusion Thresholds* for 100 MHz – 6 GHz and ≤ 50 mm**

Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table. The equation and threshold in 4.3.1 must be applied to determine SAR test exclusion.

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	*SAR Test Exclusion Threshold* (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	

SAR test exclusion threshold for 433MHz transmitter is 22.5mW for 5mm distance.

The Measured EIRP is 0.444mW (Worst-case, Without Duty Cycle correction factor).

Calculation Example

Measured maximum ,Electric field at 3m distance = 91.7 dBµV/m

Therefore Maximum e.i.r.p calculated from following equation

*Maximum e.i.r.p = (Field Strength(V/m) * Distance(m))^2/30*

Therefore Maximum e.i.r.p = 0.444mW

RF Exposure Evaluation

As per section 1.1310 of CFR 47 following Maximum Permissible Exposure (MPE) limits are applicable.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	$*900/f^2$	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	$*180/f^2$	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

Limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields for 433MHz as per Table 1 of Section 15.1310 is 0.28 mW/cm^2 (General Population/Un-controlled).

Using equation

$$S = PG / 4\pi R^2$$

where: S = Power density
P = Power input to the antenna
G = Antenna gain
R = Distance to the center of radiation of the antenna

Prediction Worst case:

Maximum EIRP: 0.444mW (Worst-case, Without Duty Cycle correction factor)
Distance: 20cm
Calculated Power Density= 0.0000883 mW/cm^2
MPE limit for General Population/Un-controlled exposure: 0.28 mW/cm^2

Result: The measured EIRP is below the SAR exception threshold and the calculated power density level at a distance of 20cm are below the maximum levels allowed by regulations.