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RADIO REPORT FOR CERTIFICATION
to
FCC Part 15 Subpart C (Section 15.231) and
RSS-210 Issue 9, August 2016

FCC ID:	X4K-KPX7201
IC:	8880A-KPX7201
Device under Test / PMN:	Wireless Keypad
Model Number / HVIN:	KPX-7V2
Tested For:	Automatic Technology Australia Pty. Ltd.
Report Number:	M170308-2R1 (This report supersedes M170308-2)
Issue Date:	22 August 2017

RADIO REPORT FOR CERTIFICATION
to
FCC Part 15 Subpart C (Section 15.231) and
RSS-210 Issue 9, August 2016

CONTENTS

RADIO REPORT FOR CERTIFICATION

Issued by: EMC TECHNOLOGIES PTY. LTD.
176 Harrick Road, Keilor Park, Victoria 3042, AUSTRALIA.
Phone: +61 3 9365 1000, **E-mail:** sales@emctech.com.au, **Web:** www.emctech.com.au
FCC registration number: 494713 and ISED Canada Company number: IC 3569B

Product / PMN:	Wireless Keypad
Model / HVIN:	KPX-7V2
Manufacturer:	Automatic Technology Australia Pty. Ltd.
FCC ID:	X4K-KPX7201
IC:	8880A-KPX7201

Tested for:	Automatic Technology Australia Pty. Ltd.
Address:	6-8 Fiveways Boulevard, Keysborough Victoria 3173, AUSTRALIA
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Standards:

47 CFR Part 15 – Radio Frequency Devices
Subpart C – Intentional Radiators
Section 15.231 – Section 15.231 – Periodic operation in the band 40.66 – 40.70 MHz and above 70 MHz.

RSS-210 Issue 9, August 2016 – *License-Exempt Radio Apparatus: Category I Equipment*
RSS-Gen Issue 4, November 2014 - *General Requirements for Compliance of Radio Apparatus*
RSS-102 Issue 5, March 2015 - *Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)*

Test Dates:	24 May to 29 June 2017
Issue Date:	22 August 2017

Attestation: I hereby certify that the device(s) described herein were tested as described in this report and that the data included is that which was obtained during such testing.

Test Engineer:

Rob Weir
Wireless Certification Manager

Authorised Signatory:

Chris Zombolas
Technical Director

RADIO REPORT FOR CERTIFICATION
to
FCC Part 15 Subpart C (Section 15.231) and
RSS-210 Issue 9, August 2016

1.0 INTRODUCTION

Radio tests were performed on the KPX-7V2 wireless keypad in accordance with the applicable requirements of 47 CFR, Part 15 Subpart C – Section 15.231 and RSS-210 Issue 9 for a periodically operated 433 MHz transmitter.

1.1 Test Procedure

Radio measurements were performed in accordance with the appropriate procedures of ANSI C63.10: 2013.

The measurement instrumentation conformed to the requirements of ANSI C63.2: 2009.

1.2 Summary of 47 CFR Part 15 Subpart C Results

FCC Part 15 Subpart C	Test Performed	Results
15.203	Antenna Requirement	**Complied**
15.205	Restricted bands of operation	**Complied**
15.207	Conducted limits	**Not applicable** Battery powered, no AC mains
15.209	Radiated Emissions Limits; General Requirements	**Complied**
15.231(a)	Periodic Operation	**Complied**
15.231(b)(2)	Fundamental Field Strength	**Complied**
15.231(b)(3)	Spurious Emissions	**Complied**
15.231(c)	Emission Bandwidth	**Complied**
2.1093	Radiofrequency radiation exposure evaluation: portable devices.	**Complied**

1.3 Summary of Results

IC Part	Test Performed	Results
RSS-Gen (8.3)	Antenna requirement	**Complied**
RSS-Gen (8.8)	Conducted emissions limits	**Complied**
RSS-Gen (8.9)	Radiated Emission Limits (General requirements)	**Not applicable** Battery powered, no AC mains
RSS-Gen (8.10)	Operation in restricted Band	**Complied**
RSS-210 Annex A.1.1	Types of Momentarily Operated Devices	**Complied**
RSS-210 Annex A.1.2	Fundamental Field Strength	**Complied**
RSS-210 Annex A.1.2	Spurious Emissions	**Complied**
RSS-210 Annex A.1.3	Emission Bandwidth	**Complied**
RSS-Gen (3.2) RSS-102	Radio Frequency Hazard	**Complied**

2.0 GENERAL INFORMATION

2.1 EUT (Transmitter) Details

Radio:	Digital
Number of Channels:	3
Frequency:	433.47, 433.92 and 434.37 MHz
Modulation:	FM + AM
Security Level:	128 bit
Emission Designator:	D7D
Antenna type:	PCB track

2.2 EUT (Host) Details

Product / PMN:	Wireless Keypad
Model / HVIN:	KPX-7V2
Manufacturer:	Automatic Technology Australia Pty. Ltd.
Supply Rating:	3× AAA Batteries, 4.5V
Highest operating Frequency:	434.37 MHz

The KPX-7V2 is a weatherproof keypad operated remote control transmitter that can be used to operate up to 10 remote control functions, commonly used to operate garage doors, gates, etc.

2.3 Test Configuration

The sample was configured to transmit continuously when one of the buttons were pressed.

2.4 Modifications by EMC Technologies

No modifications were performed.

2.5 Test Facility

2.5.1 General

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 & Designation number AU0001.**

EMC Technologies indoor open are test site (iOATS) have been accepted by Industry Canada for the performance of radiated measurements in accordance with RSS-Gen, Issue 8 - **Industry Canada iOATS number - IC 3569B**

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

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

EMC Technologies is accredited in Australia by the National Association of Testing Authorities (NATA). 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.asn.au

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 Agilent Technologies (Australia) Pty Ltd or the National Measurement Institute (NMI) or in-house. All equipment calibration is traceable to Australian national standards at the National Measurements Institute.

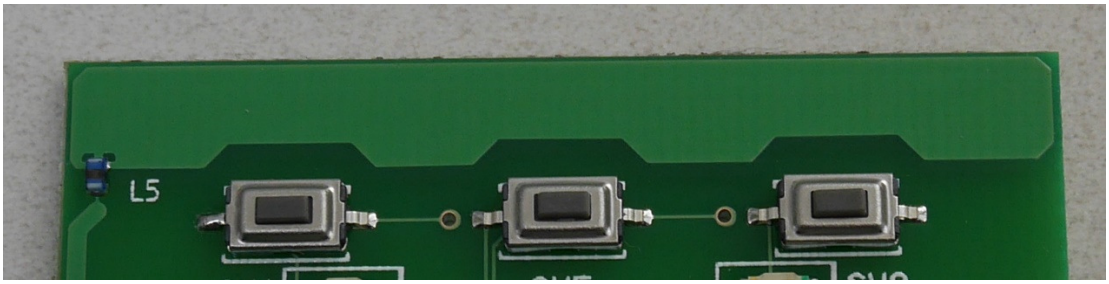
Equipment Type	Make/Model/Serial Number	Last Cal. dd/mm/yyyy	Due Date dd/mm/yyyy	Cal. Interval
Chamber	Frankonia SAC-10-2 (R-139)	22/03/2017	22/03/2018	1 Year, *1
EMI Receiver	R&S ESW26 2 Hz – 26.5 GHz Sn: 101306 (R-143)	31/03/2017	31/03/2018	1 Year, *2
	R&S ESU40 20 Hz – 40 GHz Sn: 100392 (R-140)	23/02/2017	23/02/2018	1 Year, *2
Antennas	EMCO 6502 Active Loop 9 kHz – 30 MHz Sn. 9311-2801 (A-231)	20/07/2015	20/07/2018	3 Year, *2
	SUNOL JB6 Biconilog 30 – 6000 MHz Sn: A012312 (A-363)	26/05/2016	26/05/2018	2 Year, *2
	EMCO 3115 Double Ridge Horn 1 – 18 GHz Sn: 8908-3282 (A-004)	15/07/2016	15/07/2019	3 Year, *1
	ETS-Lindgren 3160-09 Std Gain Horn 18 – 26.5 GHz Sn: 66032 (A-307)	31/05/2016	31/05/2019	3 Year, *1
Cables	Room 12 inbuilt cable Panel 1 to 10 m (C-422)	31/05/2017	31/05/2018	1 Year, *1
	Room 12 inbuilt cable Panel 1 to 3 m (C-421)	31/05/2017	31/05/2018	1 Year, *1
	Room 12 Antenna cable (C-437)	31/05/2017	31/05/2018	1 Year, *1
	Sucoflex 104 Huber & Suhner 18 GHz, 5 m cable (C-337)	03/01/2017	03/01/2018	1 Year, *1
	Sucoflex 102 Huber & Suhner 40 GHz, 3 m cable (C-273)	04/01/2017	04/01/2018	1 Year, *1

Note *1. Internal NATA calibration.
Note *2. External NATA / A2LA calibration

3.0 TEST RESULTS

3.1 §15.203/RSS-Gen 8.3 Antenna Requirement

The antenna was integral to the device ensuring that it could not be replaced. A printed wiring track antenna was used and was part of the circuit board.



3.2 §15.207/RSS-Gen 8.8 Conducted Limits

The device was not connected directly or indirectly to the AC mains network.

3.3 §15.231(a)/RSS-210 Annex A.1.1 Periodic Operation

The device only transmitted when a button were pressed. The device transmitted packets repeatedly when the buttons were held. When the button was released all transmissions stop within a maximum of 300 ms.

3.4 §15.231(b)(2)/RSS-210 Annex A.1.2 Fundamental Field Strength

The field strength of the fundamental transmitted frequency was measured inside a compliant ANSI C63.4: 2014 semi-anechoic chamber. The EUT was positioned on a test turn-table and rotated through 360° to determine the highest emissions. The measurement antenna was also varied between 1 and 4 metres height. A calibrated Biconilog antenna was used for measurement.

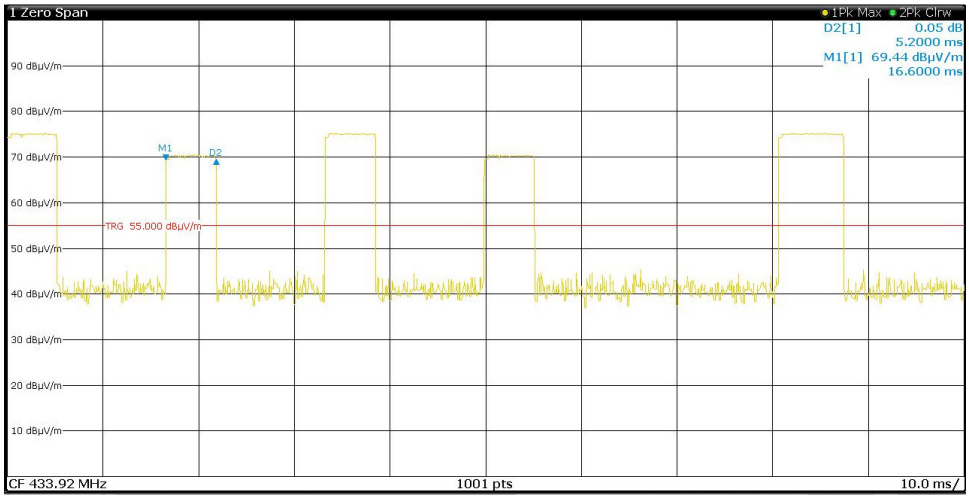
All measurements were made at a distance of 10 metres. The fundamental emissions were measured using a peak detector, as compliance is demonstrated based on the average value a correction factor taking the maximum duty cycle into account was applied. The method of calculation was outlined in section 7.5 of ANSI C63.10:

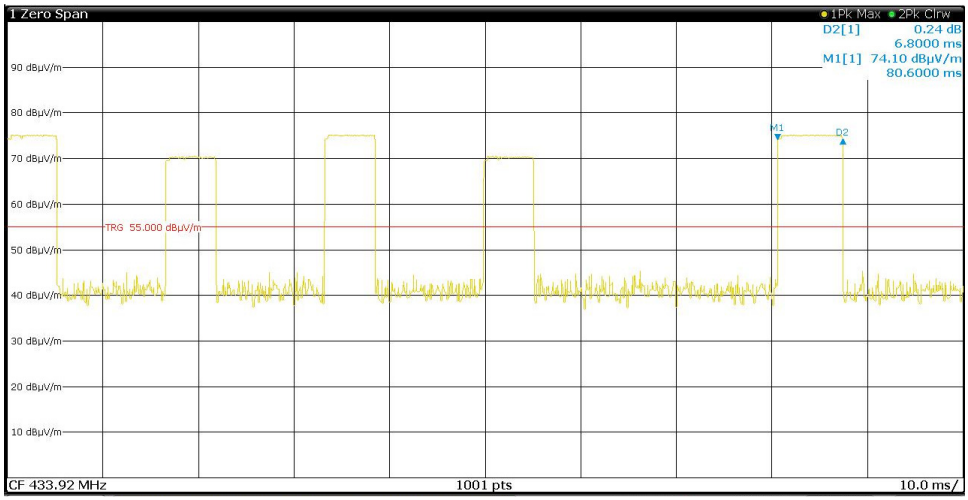
$$E_{ave} = E - \delta\,(dB)$$
$$\delta = 20\log(\Delta)$$

Where: E_{ave} = Average electric field (dBµV/m)
E = Peak electric field (dBµV/m)
δ = duty cycle correction factor(dB)
Δ = Duty cycle

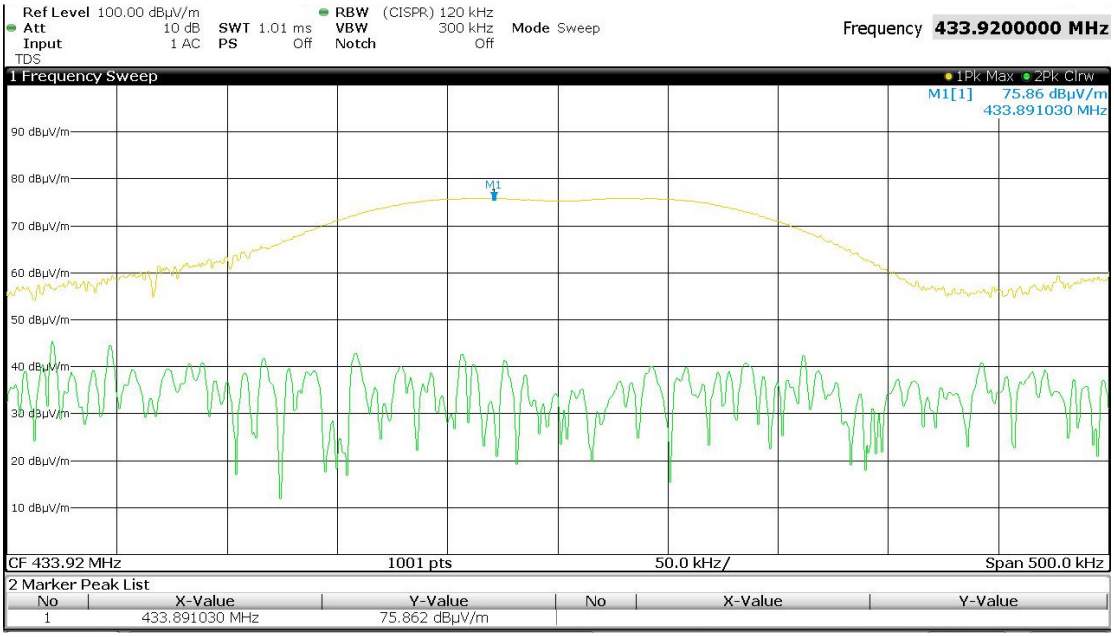
$$\boldsymbol{\delta = 20\log\left(\frac{(4\times 5.2 + 6.8)ms}{100ms}\right)}$$

$$\boldsymbol{\delta = -11.2\ dB}$$





3.4.1 Result



E(peak) dBµV/m	E(average)		10 m Limit		Result
	dBµV/m	µV/m	dBµV/m	µV/m	
75.9	64.7	1718	70.3	3273	Complied

Conversion to 3 metre levels:

Detector	Field at 10 m		Calculated 3 m field		Limit
	dBµV/m	µV/m	dBµV/m	µV/m	µV/m
Average	64.7	1718	75.2	5726	10911
Peak	75.9	6237	86.4	20791	-

Calculation:

$$E_{3m} = 20 \times \log\left(\frac{d_{10m} \times 10^{E_{10m}/20}}{d_{3m}}\right)$$

Where E_{3m} = Electric field at 3 metres (dBµV/m)
E_{10m} = Electric field at 10 metres (dBµV/m)
d_{3m} = 3 metres
d_{10m} = 10 metres

3.4.2 Conclusion

The field strength of the fundamental transmitted signal complied with the limit of §15.231(b) and RSS-210 Annex A.1.2.

3.5 §15.205/RSS-Gen 8.10 Restricted Bands of Operation

The restricted band limits were applied as applicable, refer to section 3.7.

3.6 §15.209/RSS-Gen 8.9 Radiated emission limits; general requirements

The limits given in §15.231 and RSS-210 applied.

3.7 §15.247(d)/RSS-247 5.5 Out of Band Emissions

3.7.1 Radiated Spurious Measurements

Radiated spurious emission measurements were performed in a semi-anechoic chamber compliant with ANSI C63.4: 2014.

The test frequency range was sub-divided into smaller bands with sufficient frequency resolution to permit reliable display and identification of emissions.

Frequency range [MHz]	Measurement Bandwidth [kHz]	Measurement Distance [m]	Antenna
0.009 to 0.150	0.2	10	0.6 metre loop antenna
0.150 to 30	9	10	
30 to 1000	120	10	Biconilog hybrid
1000 to 18 000	1000	3	Standard gain or broad band horns
18 000 to 40 000	1000	1	

The sample was slowly rotated with the spectrum analyser set to Max-Hold. This was performed for at least 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. Devices design for a fixed position were tested in that position, portable devices were tested in three orthogonal orientations.

The measurement data for each frequency range was corrected for cable losses, antenna factors and preamplifier gain. This process was performed for both horizontal and vertical antenna polarisations.

Calculation of field strength

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

$$E = V + AF - G + L$$

Where:

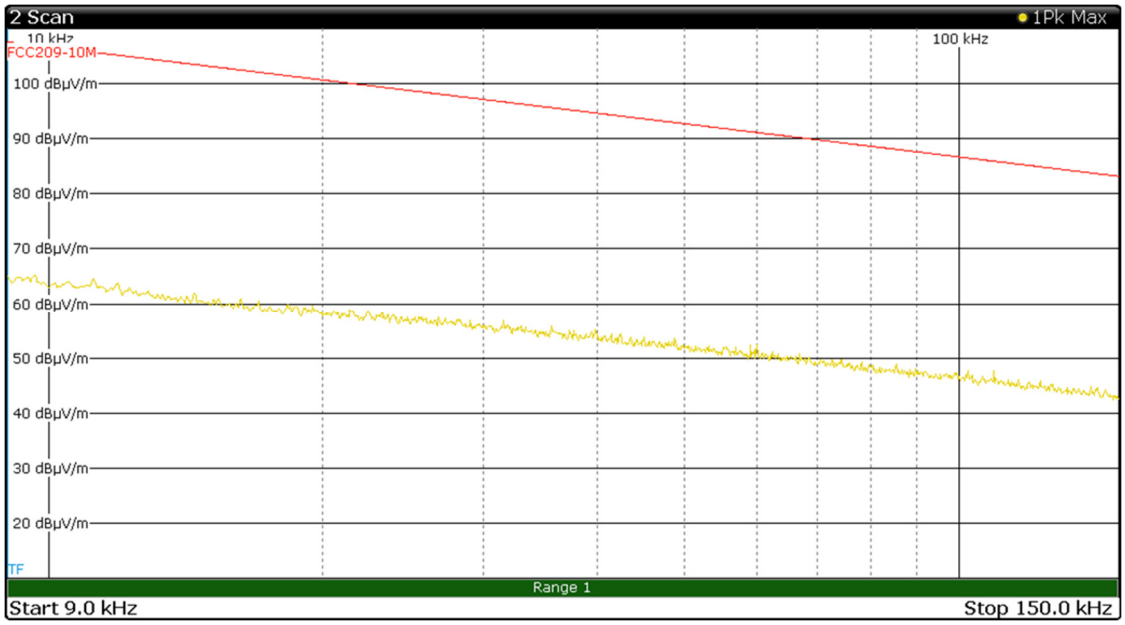
E = Radiated Field Strength in dBµV/m.
V = EMI Receiver Voltage in dBµV/m.
AF = Antenna Factor in dB. (stored as a data array)
G = Preamplifier Gain in dB. (stored as a data array)
L = Cable loss in dB. (stored as a data array of Insertion Loss versus frequency)

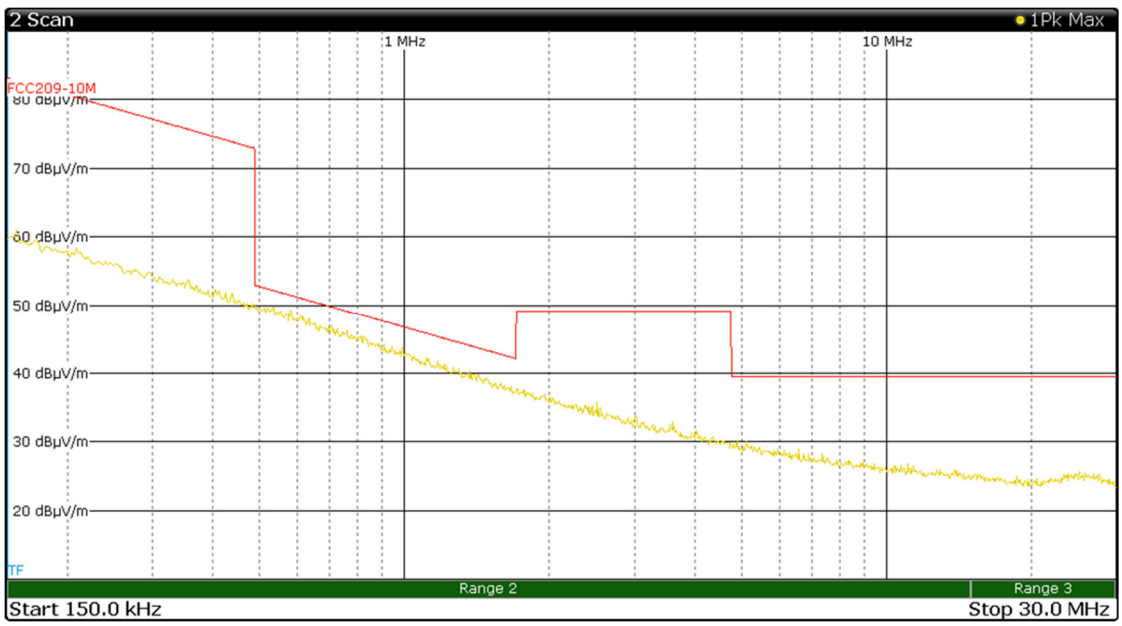
3.7.2 Frequency Band: 9 kHz - 30 MHz

Measurements were made at a distance of 10 metres with the following receiver settings:

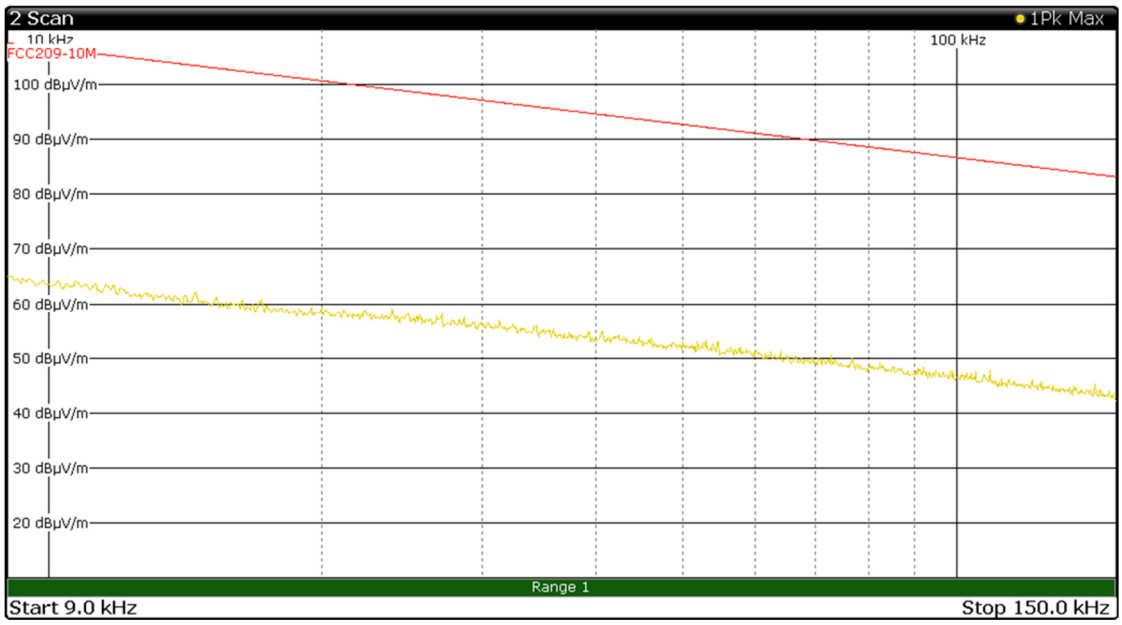
	Range 1	Range 2
Start	9 kHz	150 kHz
Stop	150 kHz	30 MHz
Step	50 Hz	2.25 kHz
RBW	200 Hz	9 kHz
Meas Time	100 ms	100 ms
RF Att	10 dB	10 dB
Preamp	OFF	OFF

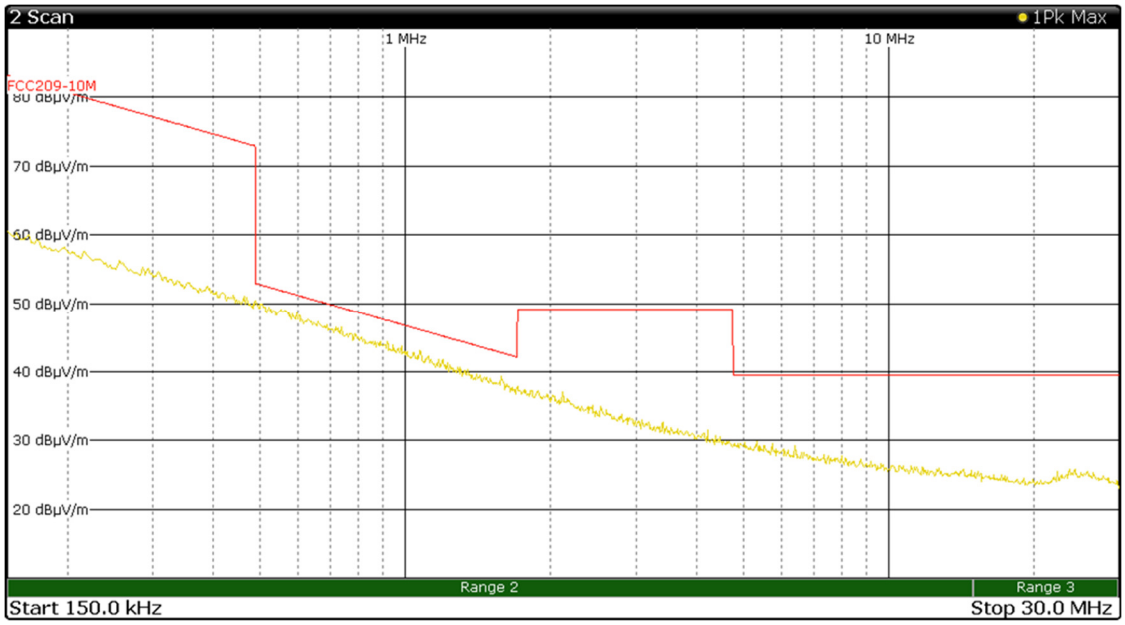
3.7.2.1 Results



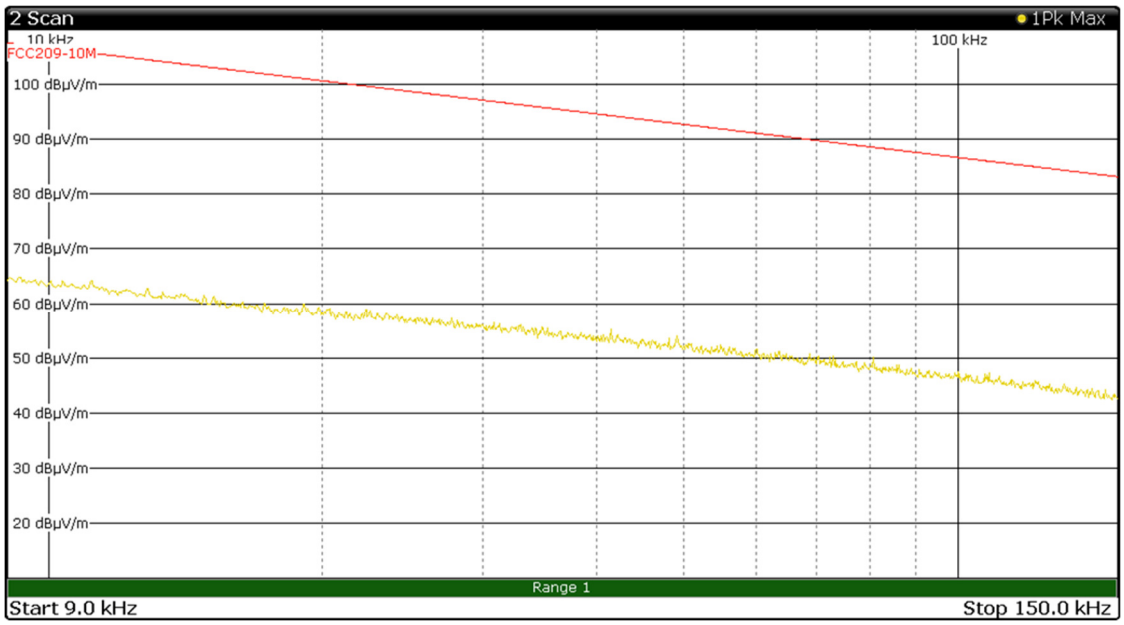


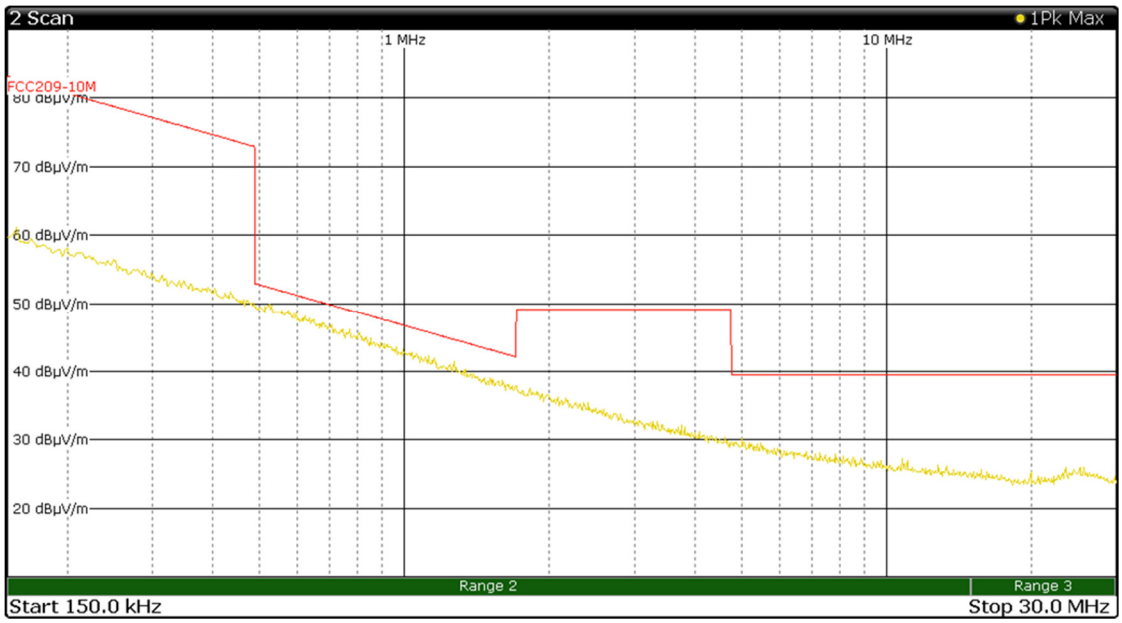
Antenna Perpendicular





Antenna Parallel





Antenna Ground Parallel

Result:

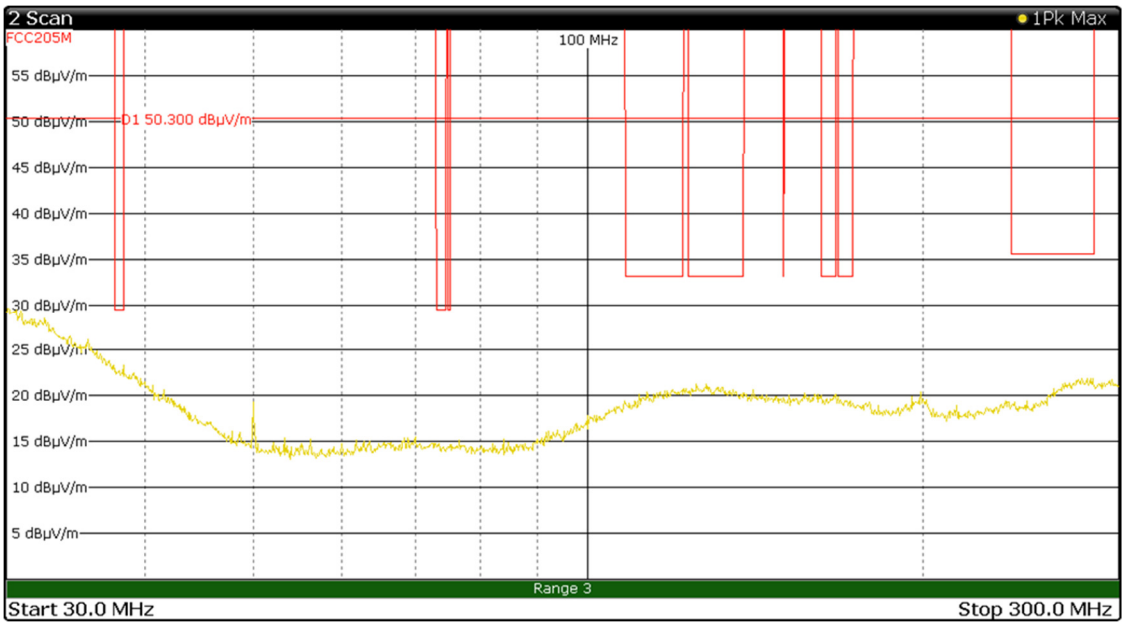
No emissions were detected above the measurement system noise floor.

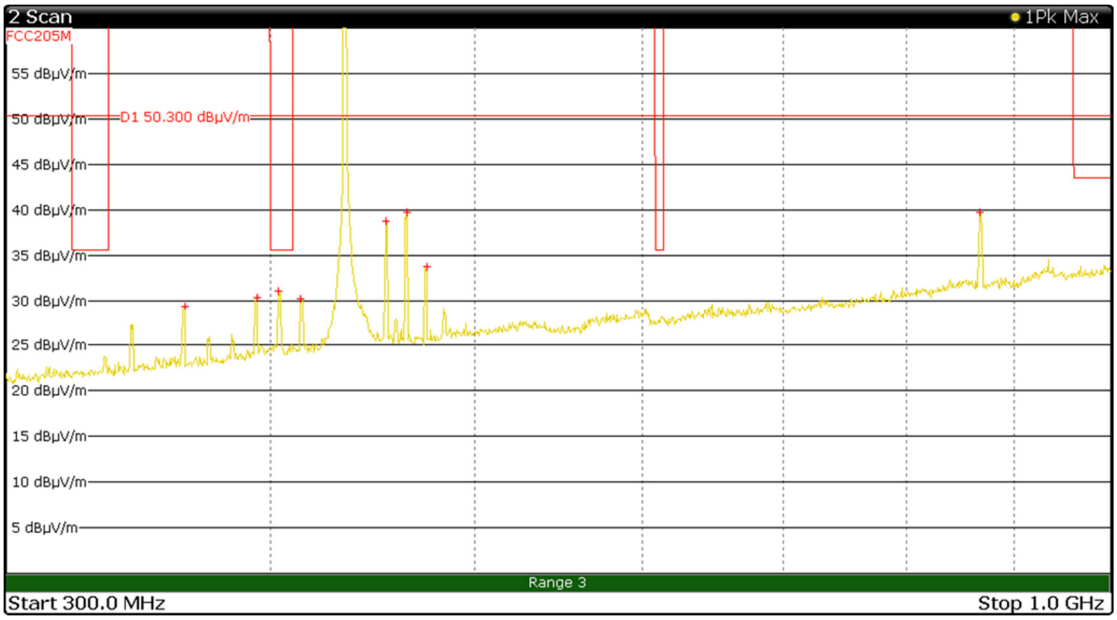
3.7.3 Frequency Band: 30 - 1000 MHz

Measurements were made at a distance of 10 metres with the following receiver settings:

Start	30 MHz
Stop	1 GHz
Step	30 kHz
RBW	120 kHz
Meas Time	100 ms
RF Att	0 dB
Preamp	ON

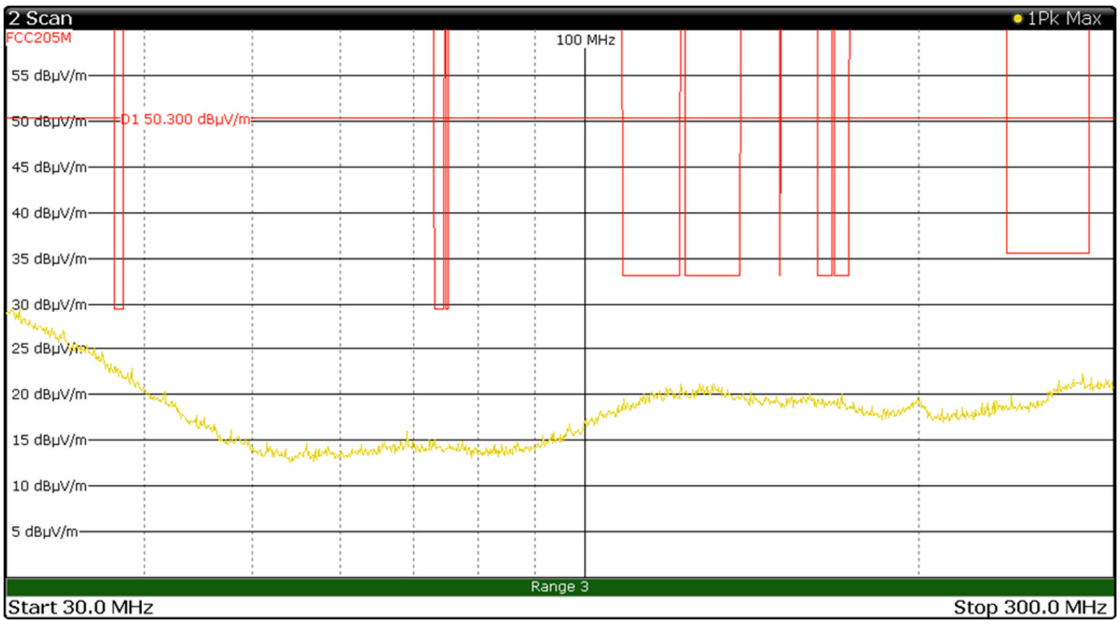
3.7.3.1 Vertical Polarisation

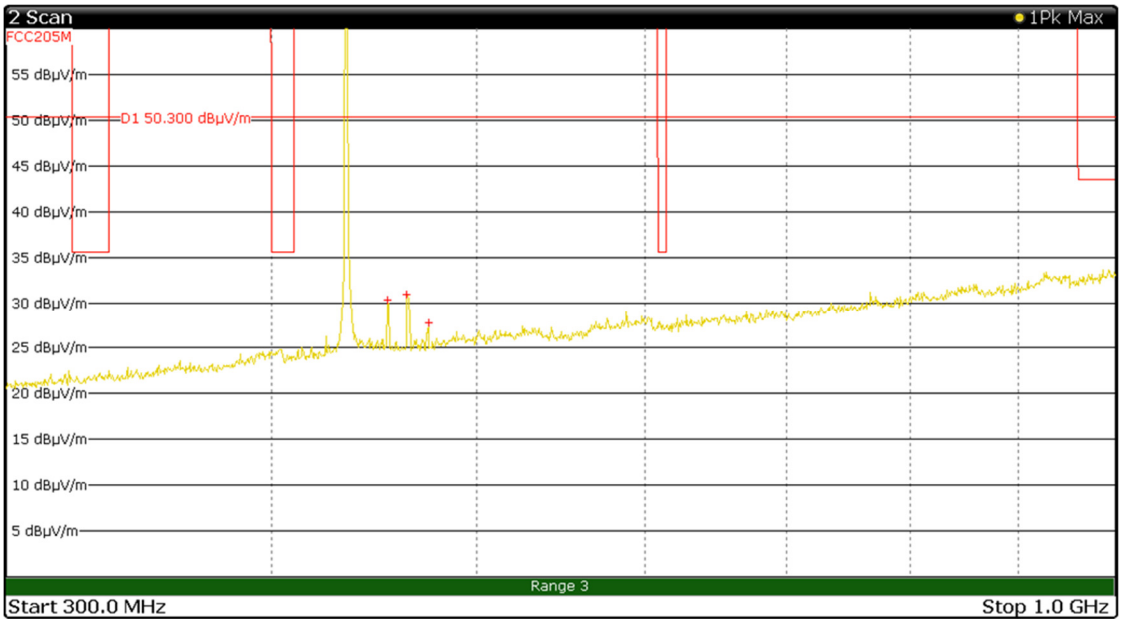




Transmission at the fundamental frequency (peak above limit) was not subjected to the spurious emission limit.

3.7.3.2 Horizontal Polarisation





Transmission at the fundamental frequency (peak above limit) was not subjected to the spurious emission limit.

Result:

Frequency (MHz)	Polarity	Quasi-Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)
403.912	Vertical	24.8	35.5	-10.7

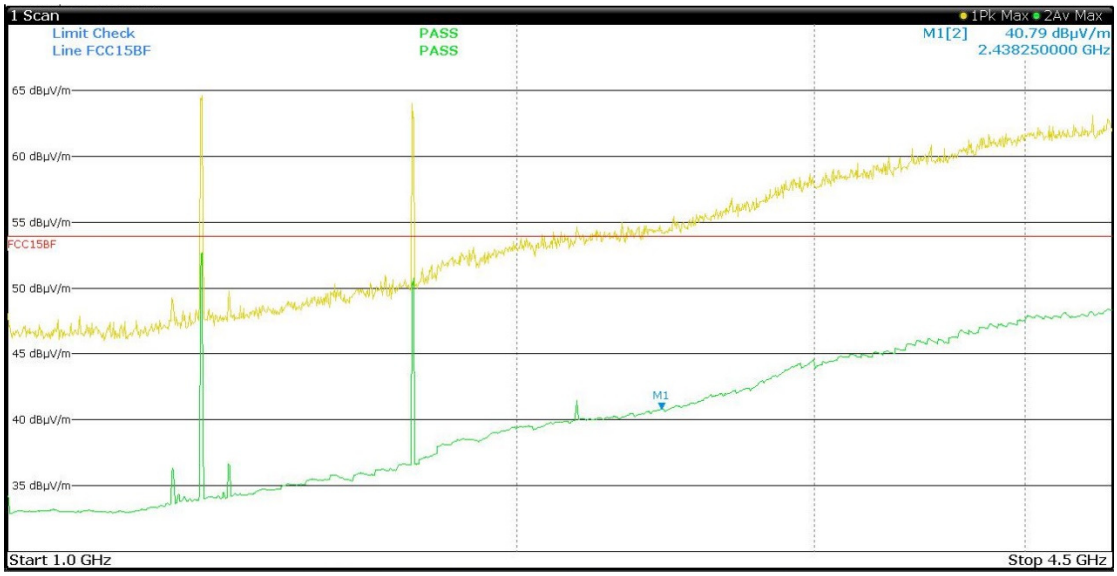
All other emissions recorded fell outside the restricted bands and were greater than 10 dB below the average limit of 50.3 dBµV/m.

3.7.4 Frequency Band: 1 – 4.5 GHz

For simplicity the 15.209 and RSS-Gen general limits applied across this band. Measurements were made at a distance of 3 metres with the following receiver settings:

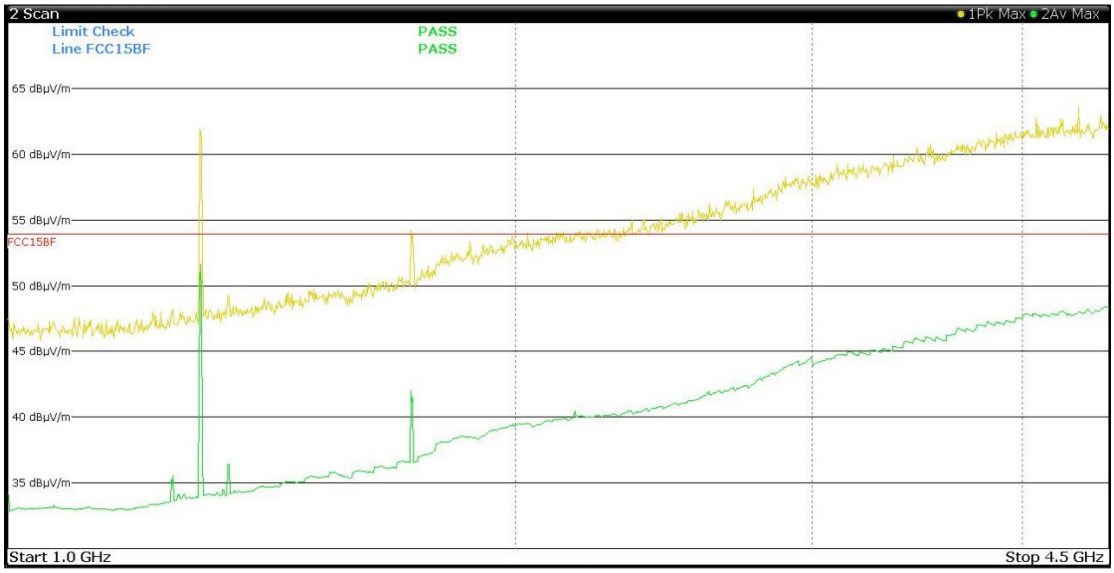
Start	1 GHz
Stop	4.5 GHz
Step	250 kHz
RBW	1 MHz
Meas Time	50 ms
RF Att	10 dB
Preamp	ON

3.7.4.1 Vertical Polarisation



Frequency (MHz)	Average			Peak		
	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1301.75	46.4	54.0	-7.6	65.0	74.0	-9.0
1303.00	46.2	54.0	-7.8	65.5	74.0	-8.5
1300.50	45.8	54.0	-8.2	64.9	74.0	-9.1
1737.50	46.9	54.0	-7.1	64.8	74.0	-9.2
1735.75	46.6	54.0	-7.4	64.8	74.0	-9.2
1733.75	45.9	54.0	-8.1	64.7	74.0	-9.3

3.7.4.2 Horizontal Polarisation



Frequency (MHz)	Average			Peak		
	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1301.75	46.4	54.0	-7.6	66.4	74.0	-7.6
1303.00	47.3	54.0	-6.7	66.3	74.0	-7.7
1300.50	47.5	54.0	-6.5	66.6	74.0	-7.4
1733.75	40.3	54.0	-13.7	56.8	74.0	-17.2

3.7.5 Conclusion

The spurious emissions complied with the general limits of §15.205, §15.231(b) and RSS-Gen 8.10, RSS-210 Annex A.1.2 by a margin of 7.6 dB.

Frequency (MHz)	Polarity	10 m Fields (dBµV/m)		3 m Fields (dBµV/m)		Margin (dB)
		Quasi-Peak		Quasi-Peak		
		Measured	Limit	Calculated	Limit	
403.912	Vertical	24.8	35.5	35.3	46.0	-10.7
				Average		
				Measured	Limit	
1301.75	Vertical			46.4	54.0	-7.6
1303.00	Vertical			46.2	54.0	-7.8
1300.50	Vertical			45.8	54.0	-8.2
1737.50	Vertical			46.9	54.0	-7.1
1735.75	Vertical			46.6	54.0	-7.4
1733.75	Vertical			45.9	54.0	-8.1
1301.75	Horizontal			46.4	54.0	-7.6
1303.00	Horizontal			47.3	54.0	-6.7
1300.50	Horizontal			47.5	54.0	-6.5
1733.75	Horizontal			40.3	54.0	-13.7
				Peak		
				Measured	Limit	
1301.75	Vertical			66.4	74.0	-7.6
1303.00	Vertical			66.3	74.0	-7.7
1300.50	Vertical			66.6	74.0	-7.4
1737.50	Vertical			56.8	74.0	-17.2
1735.75	Vertical			65.0	74.0	-9.0
1733.75	Vertical			65.5	74.0	-8.5
1301.75	Horizontal			64.9	74.0	-9.1
1303.00	Horizontal			64.8	74.0	-9.2
1300.50	Horizontal			64.8	74.0	-9.2
1733.75	Horizontal			64.7	74.0	-9.3

Calculation:

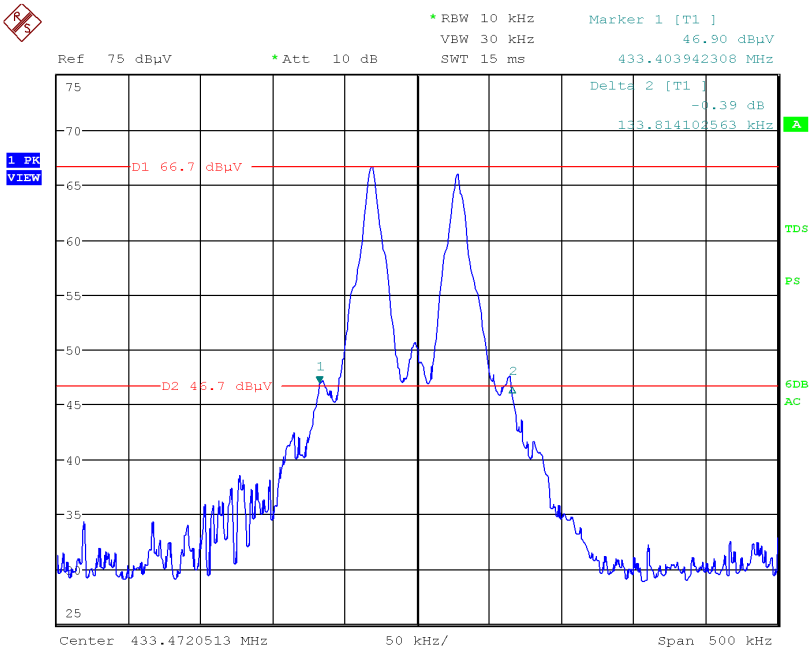
$$E_{3m} = 20 \times \log\left(\frac{d_{10m} \times 10^{E_{10m}/20}}{d_{3m}}\right)$$

Where E_{3m} = Electric field at 3 metres (dBµV/m)
E_{10m} = Electric field at 10 metres (dBµV/m)
d_{3m} = 3 metres
d_{10m} = 10 metres

3.8 §15.231(c)/RSS-210 Annex A.1.3 Emission Bandwidth

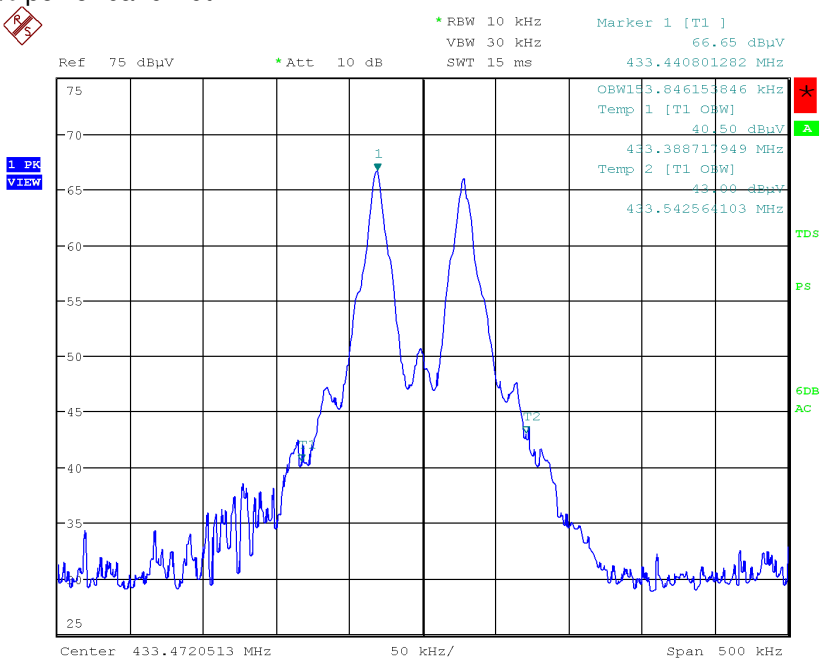
The emission bandwidth shall be less than 0.25% of the centre frequency.

The 20 dB below from the carrier bandwidth:



Frequency	20 dB BW	Limit	Results
433.5 MHz	134 kHz	1084 kHz	Complied

This 99% power bandwidth:



Frequency	99% Pwr BW	Limit	Results
433.5 MHz	154 kHz	1084 kHz	Complied

3.9 §2.1091 Radiofrequency radiation exposure evaluation: mobile devices.

The Maximum Permissible Exposure (MPE) limit defined in §1.1310 for a transmitter operating at 433 MHz is:

MPE limit = [freq., MHz] ÷ 1500 = 1 mW/cm^2
= **0.3 mW/cm^2 = 33.6 V/m** (V/m) = √(1200×π×mW/cm^2)

Field strength = [√(30× transmitter EIRP, W)] ÷ [minimum separation distance, metres] V/m
= [√(30×0.00001)] ÷ 0.2 V/m
= **0.1 V/m = 0.000002 mW/cm^2** (mW/cm^2) = (V/m)^2 ÷ (1200×π)

As the calculated field strength generated by the transmitter is less than the limit the KPX-7V2 wireless keypad is deemed to comply with the radio frequency exposure requirements.

3.10 RSS-Gen 3.2/RSS-102 Maximum Permissible Exposure

The KPX-7V2 wireless keypad was considered a mobile device and not intended to be operated within 20 cm of user or nearby person.

RF exposure evaluation is exempt if the following criteria is met:

Time averaged e.i.r.p. ≤ $1.31\times10^{-2} \times [f_{(MHz)}]^{0.6834}$ W

$1.31\times10^{-2} \times [f_{(MHz)}]^{0.6834}$ = **0.8 W**

The measured e.i.r.p. was **0.00001 W**

As the radiated power generated by the transmitter was less than the limit the KPX-7V2 wireless keypad is deemed to comply with the radio frequency exposure requirements.

4.0 COMPLIANCE STATEMENT

The KPX-7V2 wireless keypad, 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 and RSS-210 Issue 9.

5.0 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
	1 GHz to 18 GHz	±4.6 dB
Peak Output Power:		±1.5 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%.