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RADIO REPORT FOR CERTIFICATION

47 CFR PART 15 SUBPART C (SECTION 15.247)

CLIENT: AUTOMATIC TECHNOLOGY (AUSTRALIA) PTY LTD **DEVICE UNDER TEST / PMN: WIRELESS SMART HUB** MODEL NUMBER / HVIN: HUB200

REPORT NUMBER: M180310-1R2 DATE OF ISSUE: 12 June 2019



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Report Number: M180310-1R2 FCC ID: X4K-HUB1F89BSM02



RADIO REPORT CERTIFICATE OF COMPLIANCE

Device under Test / PMN: Model Number / HVIN: Manufacturer: FCC ID:	Wireless Smart Hub HUB200 Automatic Technology (Australia) Pty Ltd X4K-HUB1F89BSM02
Tested for: Address: Phone: Contact: Email:	Automatic Technology (Australia) Pty Ltd 6-8 Fiveways Boulevard, Keysborough, VIC 3173, Australia +61 3 9791 0200 Nikolai Klepikov Nikolai.Klepikov@ata-aust.com.au
Standards:	47 CFR Part 15 – Radio Frequency Devices Subpart C – Intentional Radiators Section 15.247 – Operation within the bands 902-928 MHz, 2400- 2483.5 MHz, and 5725-5850 MHz
Test Dates:	21 March to 25 June 2018
Issued by:	EMC TECHNOLOGIES PTY. LTD., 176 Harrick Road, Keilor Park, VIC 3042, Australia. FCC Accredited: Designation AU0001 Phone: +61 3 9365 1000, Web: www.emctech.com.au
Issue Date:	12 June 2019
Test Officer(s):	William Alam
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Authorised Signatory:

Chris Zombolas Technical Director EMC Technologies Pty Ltd



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RADIO REPORT FOR CERTIFICATION to 47 CFR Part 15 Subpart C (section 15.247)

1.0 INTRODUCTION

Radio tests were performed on the HUB200 Wireless Smart Hub in accordance with the applicable requirements of 47 CFR, Part 15 Subpart C – Section 15.247 for a Frequency Hopping System operating within the band: 902 MHz to 928 MHz.

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	Test Performed	Results
15.203	Antenna requirement	Complied
15.205	Restricted bands of operation	Complied
15.207	Conducted limits	Complied
15.209	Radiated emissions limits; general requirements	Complied
15.247 (a)	Channel Separation	Complied
	Number of channels and time of occupancy	
15.247 (b)	Peak Output Power	Complied
15.247 (c)	Antenna Gain > 6 dBi	Not Applicable
15.247 (d)	Out of Band Emissions	Complied
15.247 (e)	Peak Power Spectral Density	Not Applicable
15.247 (f)	Hybrid Systems	Not Applicable
15.247 (g)	Frequency hopping channel selection	Complied
15.247 (h)	Adaptivity	Not Applicable
15.247 (i)	Radio Frequency Hazard	Complied
15.215	Occupied Bandwidth	Complied



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2.0 GENERAL INFORMATION

(Information supplied by the Client)

2.1 Equipment Under Test (EUT) - Transmitter Details

Radio: Frequency Band: Frequency Range:

Emission Designator:

Antenna type and gain:

Minimum separation distance:

902-928 MHz 910 to 928 MHz Ch. Low: 912.5 MHz Ch. Mid: 919.7 MHz Ch. High: 926.9 MHz 2GFSK 314KGXW monopole antenna, 0 dBi 20 cm (7.87in)

Frequency Hopping device

2.2 EUT - Host Details

Modulation:

Device under Test / PMN:	Wireless Smart Hub
Model Number / HVIN:	HUB200
Manufacturer:	Automatic Technology (Australia) Pty Ltd
Power Supply:	Model: FJ-SW1260502000DS
	Input: 100-240 VAC, 50/60Hz
	Output: 5 VDC, 0.4 A

Wireless Smart Hub with the Automatic Technology Smart Hub, allow customer to control his garage door and gate on his smart phone while they are at home or away from home. According to HUB200 user manual, the device is not intended to be operated within 20cm of user or nearby person.

2.3 Test Configuration

Testing was performed with the EUT set to continuously transmit (with modulation applied).

2.4 Modifications by EMC Technologies

No modifications were performed.



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2.5 Test Facility

2.5.1 General

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 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) has also been accepted by Industry Canada for the performance of radiated measurements in accordance with RSS-Gen, Issue 8 - Industry Canada number - IC 3569B

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

2.5.2 NATA Accreditation

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.

NATA is the Australian National laboratory accreditation body and has accredited EMC Technologies to IEC/ISO17025. 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 documented test procedures, continued calibration of measurement equipment, traceable to the National Standard at the National Measurements Institute (NMI). NATA has mutual recognition agreements with the National Voluntary Laboratory Accreditation Program (NVLAP) and the American Association for Laboratory Accreditation (A²LA).

The current full scope of accreditation can be found on the NATA website: www.nata.com.au



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2.6 Test Equipment

Measurement instrumentation and transducers were calibrated in accordance with the applicable standards by an independent NATA registered laboratory. 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-3-2 (R-144)	17/06/2017	17/06/2018	1 Year ^{*1}
Chamber	Frankonia SAC-10-2 (R-139)	22/03/2017	22/03/2018	1 Year ^{*1,3}
	T	1	1	
ЕМІ	R&S ESW26 Sn: 101306 (R-143)	31/03/2017 22/05/2018	31/03/2018 22/05/2019	1 Year* ^{2,3}
Receiver	R&S ESU40 Sn: 100392 (R-140)	19/3/2018	19/3/2019	1 Year*2
		r		
LISN	EMCO 3810/2NM Sn: 9607-1505	1/05/2017	1/05/2019	2 Year*1
Antonnoo	EMCO 6502 Active Loop 9 kHz – 30 MHz Sn. 9311-2801 (A-231)	20/07/2015	20/07/2018	3 Year ^{*2}
Antennas	SUNOL JB1 Sn. A061917 (A-425)	21/07/2017	21/07/2019	2 Year*2
	EMCO 3115 Double Ridge Horn Sn: 9501-4398 (A-406)	15/07/2016	15/07/2019	3 Year ^{*1}
				-
	Room 12 inbuilt cable Panel 1 to 10 m (C-422)	31/05/2017	31/05/2018	1 Year*1,3
	Rojone CA-02013A13A700-08R Sn: Lot 64602 (C-437)	31/05/2017	31/05/2018	1 Year*1,3
Cables	Huber & Suhner Sucoflex 104A Sn: 503055 (C-457)	02/01/2018	02/01/2019	1 Year ^{*1}
	Huber & Suhner Sucoflex 104A Sn: 503056 (C-458)	03/01/2018	03/01/2019	1 Year ^{*1}
	Huber & Suhner Sucoflex 104A Sn: 503061 (C-463)	03/01/2018	03/01/2019	1 Year ^{*1}
		r		
Attenuator	Weinschel 2 Sn: ASS-2353 (A-291)	27/04/2018	27/04/2019	1 Year ^{*1}
		1	ſ	1
Preamp	Electronic Development Sales SG18- B3015 Sn: 1 (A-288)	04/08/2017	04/08/2018	1 Year ^{, *1}
		I	1	1

Note *1. Internal NATA calibration.

Note *2. External NATA / A2LA calibration

Note *3. Calibration date was valid during the time of testing.



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3.0 TEST RESULTS

3.1 §15.203 Antenna Requirement

The antenna was fixed to the device ensuring that it could not be replaced.



3.2 §15.207 Conducted Limits

The arrangement specified in ANSI C63.10: 2013 was adhered to for the conducted EMI measurements. The EUT was placed in the RF screened enclosure and a CISPR EMI Receiver as defined in ANSI C63.2: 2009 was used to perform the measurements.

The voltage levels were automatically measured in software and compared to the test limit. The method of calculation was as follows:

$V_{\text{EMI}} = V_{\text{Rx}} + L$

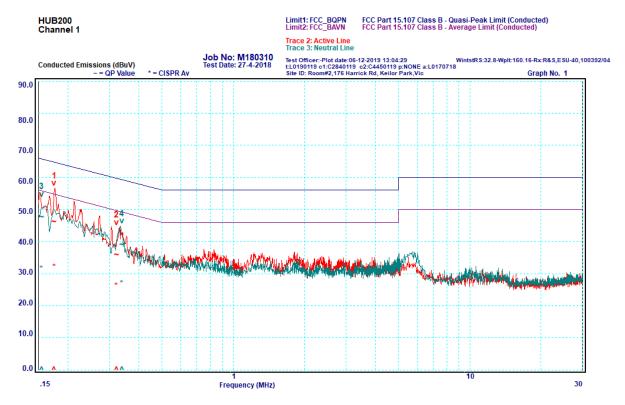
Where:

 $V_{EM I}$ = The Measured EMI voltage in dBµV to be compared to the limit. V_{Rx} = The Voltage in dBµV read directly at the EMI receiver. L = The insertion loss in dB of the LISN, cables and transient Limiter.



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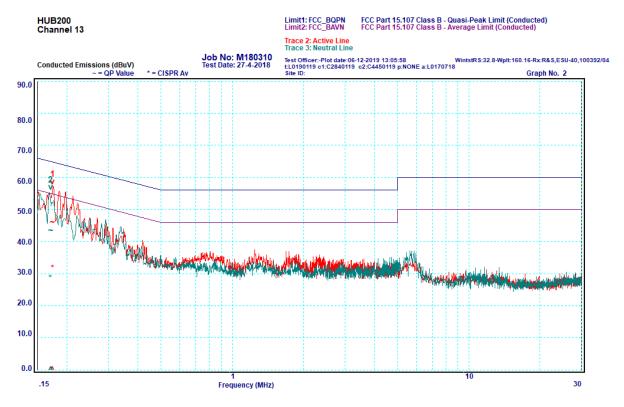
Active and Neutral Line, Lowest Channel, 0.15-30MHz

Frequency			Quasi-Peak		Average		
Frequency [MHz]	Line	Level [dBµV]	Limit [dBµV]	Margin [±dB]	Level [dBµV]	Limit [dBµV]	Margin [±dB]
0.338	Neutral	39.0	59.2	-20.2	26.8	49.2	-22.4
0.175	Active	46.1	64.7	-18.6	32	54.7	-22.7
0.322	Active	35.8	59.7	-23.9	26.1	49.7	-23.6
0.155	Neutral	47.6	65.7	-18.1	31.4	55.7	-24.3



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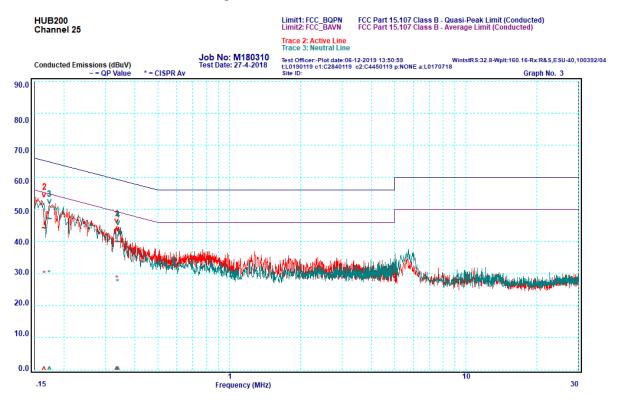
Active and Neutral Line, Middle Channel, 0.15-30MHz

Fraguanay			Quasi-Peak		Average		
Frequency [MHz]	Line	Level [dBµV]	Limit [dBµV]	Margin [±dB]	Level [dBµV]	Limit [dBµV]	Margin [±dB]
0.174	Active	45.9	64.7	-18.8	31.6	54.7	-23.1
0.171	Neutral	43.4	64.9	-21.5	28.4	54.9	-26.5



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Active and Neutral Line, Highest Channel, 0.15-30MHz

Erecuency		Quasi-Peak			Average		
Frequency [MHz]	Line	Level [dBµV]	Limit [dBµV]	Margin [±dB]	Level [dBµV]	Limit [dBµV]	Margin [±dB]
0.335	Active	39.9	59.3	-19.4	28.3	49.3	-21.0
0.339	Neutral	39.9	59.2	-19.3	27.1	49.2	-22.1
0.174	Neutral	47.1	64.8	-17.7	30	54.8	-24.8
0.166	Active	44.1	65.2	-21.1	29.7	55.2	-25.5



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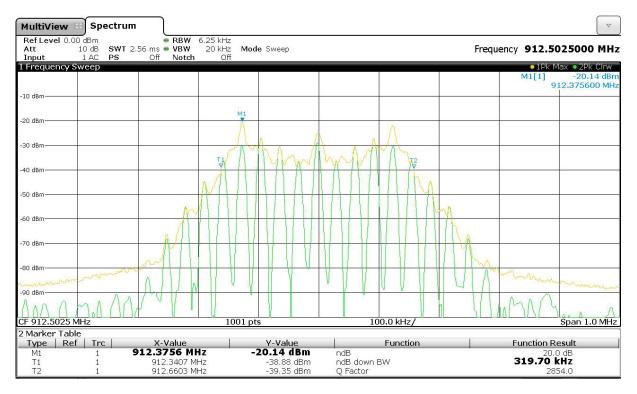


3.3 §15.247(a1)(g) Hopping parameters

3.3.1 Channel Separation and Number of Hopping Channel

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. The 20 dB bandwidth was measured while the device was transmitting with typical modulation applied. The resolution bandwidth of 6.25 kHz and the video bandwidth of 20 kHz were utilised when measuring the bandwidth.

Results:



Centre Frequency [MHz]	20 dB Bandwidth [kHz]
912.5	319.7
919.7	319.7
926.9	319.7



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MultiView 8	Spectrum								▽
Ref Level 10.0 Att Input		■ RBW 1.01 ms ■ VBW Off Notch		de Sweep			Frequ	ency 922.3	000000 MHz
1 Frequency S								D2[1]	•1Pk Max 0.01 dB 597.90 kHz
0 dBm				1			2	M1[1]	-4.27 dBm 922.10170 MHz
-10 dBm									
-30 dBm					$\langle \rangle$			X.	
-40 dBm					$\Delta /$			λ	
-50 dBm								1	-
-60 dBm	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	- M						M	· min
-70 dBm			<i>«</i>						
-80 dBm									
CF 922.3 MHz 2 Marker Table			1001 pt	is	20	0.0 kHz/			Span 2.0 MHz
Type Ref M1 D2 M1	Trc	X-Value 22.1017 MH 597.9 kH	z ·	Y-Value -4.27 dBm 0.01 dB		Function		Function R	esult

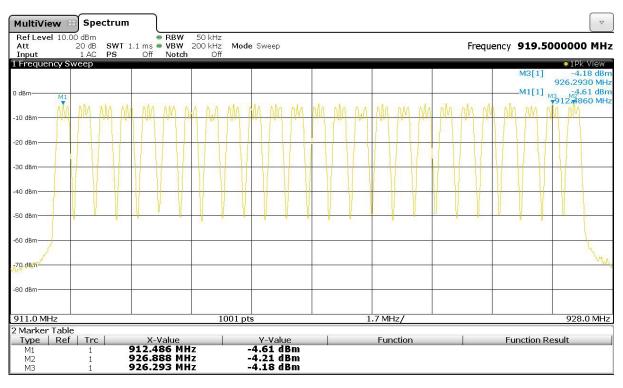
Channel Separation [kHz]	Limit [kHz]	Result
597.9	> 319.7	Complied



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As the measured 20 dB bandwidth was greater than 250 kHz, the EUT shall have at least 25 hopping frequencies.



Number of hopping channels	Result
25	Complied



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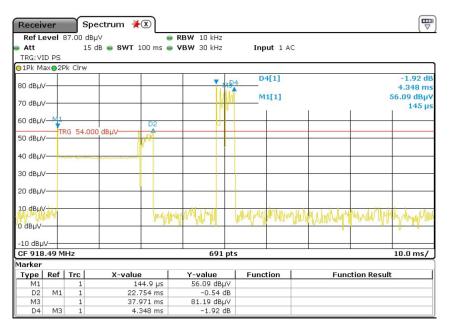


3.3.2 Time of Occupancy

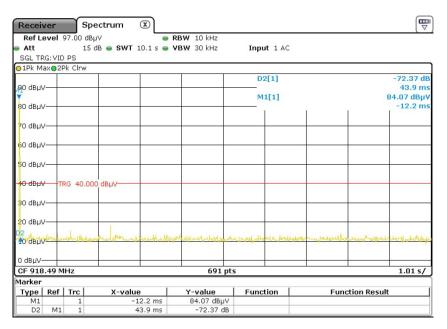
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a 10 second period.

Time of occupancy in $0.4 \times 79 = 31.6$ seconds ≤ 0.4 seconds.

On time of one pulse = 22.754 ms + 4.348 ms = 27.102 msNumber of pulses in 10 seconds = 1Total on time in 10 seconds $= 1 \times 27.102 \text{ ms} = 27.102 \text{ ms}$ (limit = 400 ms)



Duration of one pulse



Pulses in 10 seconds



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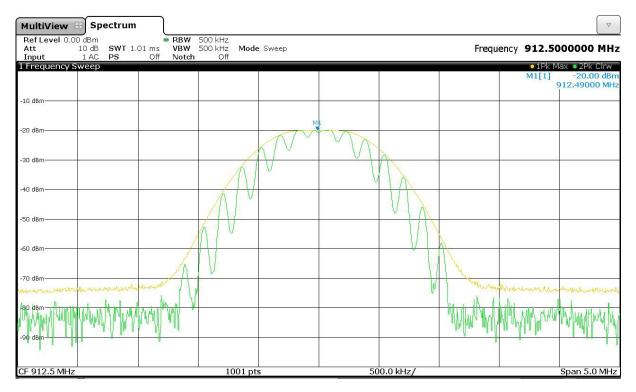
3.4 §15.247(b3) Peak Output power

Testing was performed conductively. Different configurations of EUT and antenna polarization were investigated to produce highest emission EIRP and the EUT was set to transmit in continuous transmission mode.

Results:

Antenna Gain = 0 dBi								
Channel	Peak (dBm)	Condu	icted power	Limit (W)	Margin (W)			
Channel	(ubiii)	(dBm)	(W)	(**)	(**)			
Low	-20.00 ^{*1}	20.00	0.100	0.250	0.150			
Middle	-20.08 ^{*1}	19.92	0.098	0.250	0.152			
High	-20.18 ^{*1}	19.82	0.095	0.250	0.155			

^{*1} Value does not include transducer factor



Maximum peak conducted output power - Lowest Channel

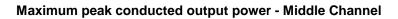


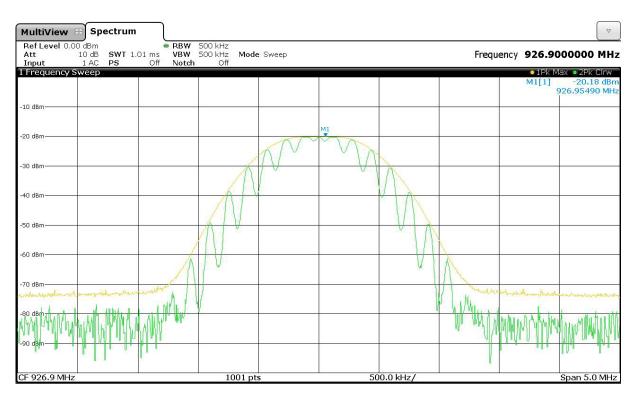
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MultiView 🖽 Spectrum			
Att 10 dB SWT 1.01 ms	 RBW 500 kHz VBW 500 kHz Mode Sweep Notch Off 	Frequ	ency 919.7000000 MHz
I Frequency Sweep			●1Pk Max ●2Pk Clrw M1[1] -20.08 dBm 919.70000 MHz
-10 dBm			
-20 dBm	M M		
-30 dBm		VIA	
-40 dBm			
-60 dBm			
	A	VIA	
-70 dBm	N/V		manument
	r y	1/ what	MANY MANY MANY MANY
CF 919.7 MHz	1001 pts	500.0 kHz/	Span 5.0 MHz





Maximum peak conducted output power - Highest Channel



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3.5 §15.205 Restricted Bands of Operation

The restricted band limits were applied across the applicable spectrum and it was found to comply with the restricted band requirements.

3.6 §15.209 Radiated emission limits; general requirements

The limits given in §15.247 applied, however attenuation below the general levels was not required.

3.7 §15.247(d) 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	0.0 metre loop antenna
30 to 1000	120	10	Biconilog hybrid
1000 to 18 000	1000	3	Standard gain or broad
18 000 to 40 000	1000	1	band horns

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 $dB\mu V/m$.

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)



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Field strength conversion over distance

To convert a limit given at a certain distance to a limit at the measurement distance or vice-versa the following equation was applied:

$$E_x = 20 \times \log\left(\frac{d_y \times 10^{\frac{L_y}{20}}}{d_x}\right)$$

Where: $E_x = Electric field at x metres (dB\mu V/m)$

 E_y = Electric field at y metres (dB μ V/m)

 d_x = Measurement distance of x metres

dy = Measurement distance of y metres

Duty cycle correction factor

Based on the results obtained in section 3.3, the duty cycle correction factor is calculated as follows:

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

Where: δ = duty cycle correction factor in dB Δ = duty cycle

Duty cycle correction factor = $20 \log (27.102/100)$

Average value was calculated according to ANSI C63.10 clause 4.1.4.2.4.

3.7.2 Spurious Emission Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

Channel	Peak	EIRP	Limit [dBµV/m]				
	[dBm]	[dBm]	10 m	3 m	1 m		
Low	-24.37	15.63	80.4	90.9	100.4		
Middle	-24.23	15.77	80.5	91.0	100.5		
High	-24.11	15.89	80.4	90.9	100.4		



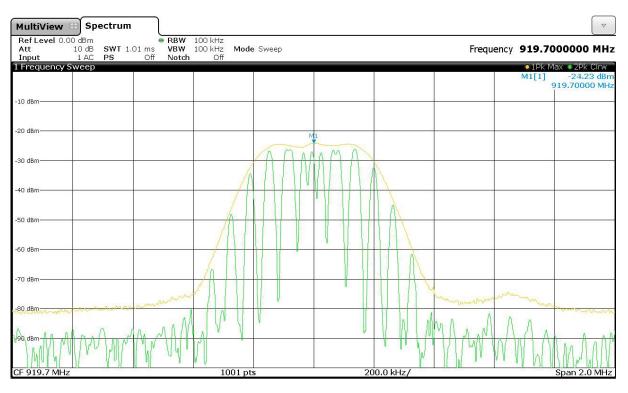
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MultiView 88	Spectru	n									
Input	0 dB SWT 1 AC PS	1.01 ms	RBW VBW Notch	100 kHz 100 kHz Off	Mode	Sweep			Frequency	y 912.50	00000 MHz
1 Frequency Sw	/eep									●1Pk M	ax 💿 2Pk Clrw
										M1[1] 9	-24.37 dBm 912.50200 MHz
-10 dBm				1							
-20 dBm							1				
-30 dBm						0 0 00	AMA				
-50 0611					A	$\Pi \Pi \Pi$		\mathbf{X}			
-40 dBm				10	11						
-50 dBm				1							
-60 dBm											
-00 0811				1							
-70 dBm			90	At							
-80 dBm	m	مەسىرىمە	mark						Mul asuper	matin	termenter
MA AA AA	. 1	1.00	Aal	~	V			YAD	An m	. 1 1	A
	4 martal		YMY	1V	-8	i -			MARIN	MM	1 MM
CF 912.5 MHz				10	01 pts	5	20	0.0 kHz/			Span 2.0 MHz

100 kHz bandwidth- lowest channel



100 kHz bandwidth- middle channel



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MultiView 😁 Spectrum			
Att 10 dB SWT 1.01 ms Input 1 AC PS Off	RBW 100 kHz VBW 100 kHz Mode Sweep Notch Off		Frequency 926.9000000 MHz
1 Frequency Sweep			●1Pk Max ●2Pk Clrw
			M1[1] -24.11 dBm 926.90000 MHz
-10 dBm			
-20 dBm		M1	
00 dB	1	MATAAAA	
-30 dBm	MA		
-40 dBm			
-50 dBm			
-60 dBm			
-70 dBm			
-80 dBm	man		munimer and the second
	La MANULLI		have and and a
			B. MUMERAN MALAN MAR
CF 926.9 MHz	1001 pts	200.0 kHz/	Span 2.0 MHz

100 kHz bandwidth- highest channel



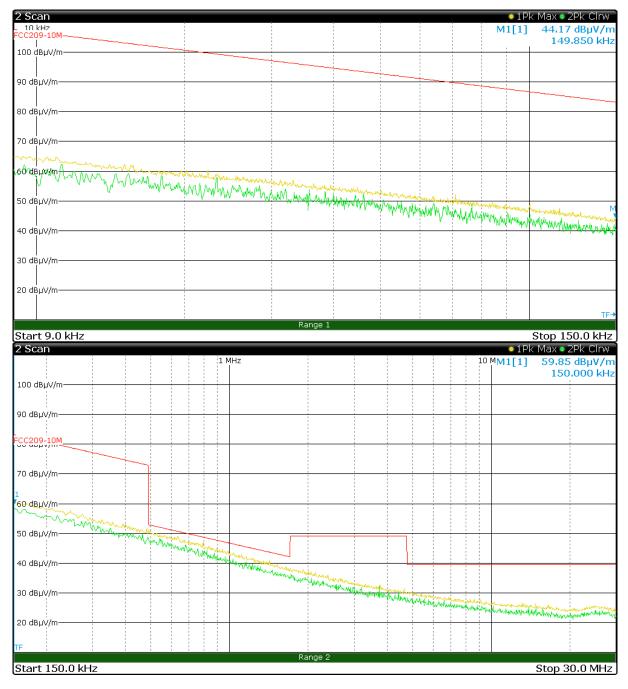
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3.7.3 Radiated Spurious Emission Tabulated Results

Radiated Emission Frequency Band: 9 kHz - 30 MHz

Measurements were made at a distance of 10 metres. The measurement of emissions between 9 kHz - 150 kHz were made with a resolution bandwidth (RBW) of 200 Hz and the video bandwidth (VBW) of 3 kHz, 150 kHz - 30 MHz were measured with the resolution bandwidth (RBW) of 9 kHz and the video bandwidth (VBW) of 30 kHz. Measurements were made with the loop antenna oriented perpendicular, parallel and ground-parallel with respect to the sample. Only the maximum graphs have been reported. No emissions detected above the measurement system noise floor.



9 kHz to 30 MHz - Lowest Channel



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_ 10 kHz						IP	k Max 🖲 2Pk Clrw
FCC209-10M						M1[1]	42.88 dBµV/m
							150.000 kHz
100 dBµV/m			1				
					_		
90 dBµV/m				1			
80 dBµV/m							
70 dBµV/m							
montering							
BO BRYNN WWW. SAN WYNN SAN AND SAN	Marken marken and	man					
- Warney Warney	KWWWWWW	Mulimur.	and the sound was	Martine and an an			Martin Martin Martin
50 dBµV/m		· · · · · ·	KMMMMMM	MMMMM	Add the Balance of	Manunhannen	Wheels . M
					white white	and a subserved and	Any manufacture & and he
40 dBµV/m							
30 dBµV/m							
20 dBµV/m							
TE							
		Range 1					
Start 9.0 kHz 2 Scan						<u>~ 10</u>	Stop 150.0 kHz k Max • 2Pk Clrw
	1 MHz					10 MM1[1]	
							150.000 kHz
100 dBµV/m							
				1 1	1 1 1		
90 dBµV/m							
90 dBµV/m							
FCC209-10M							
FCC209-10М 70 dBµV/m1							
FCC209-10M							
FCC209-10М 70 dBµV/m 1 60-dBµV/m							
FCC209-10М 70 dBµV/m 1 60-dBµV/m							
FCC209-10М 70 dBµV/m 1 60-dBµV/m							
FCC209-10М 70 dBµV/m 1 60-dBµV/m							
FCC209-10M 70 dBµV/m 1 60 dBµV/m 50 dBµV/m 40 dBµV/m							
FCC209-10М 70 dBµV/m 1 60-dBµV/m							
FCC 209-10М 70 dBµV/m 1 60 dBµV/m 50 dBµV/m 40 dBµV/m 30 dBµV/m							
FCC209-10M 70 dBµV/m 1 60 dBµV/m 50 dBµV/m 40 dBµV/m							
FCC 209-10М 70 dBµV/m 1 60 dBµV/m 50 dBµV/m 40 dBµV/m 30 dBµV/m		HUMAL AL MANY					where where we wanted and
FCC 209-10М 70 dBµV/m 1 60 dBµV/m 50 dBµV/m 40 dBµV/m 30 dBµV/m		Human Munanya					Stop 30.0 MHz

Page 23 of 37

9 kHz to 30 MHz - Middle Channel



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2 Scan				• 1P	k Max 🖲 2Pk Clrw
_ 10 kH7 FCC209-10M				M1[1]	
100 dBµV/m					
90 dBµV/m					
 80 dBµV/m					
 70 dBµV/m					
mannen					
abadena/man	mannenserse				
	MMM NAMANA ALIAN	Wind Wind Wind			
50 dBμV/m	X A ANALANA ANA	MANG MANA MANA	March 1	monteres	
		and the state of t	an Making Maring Ann	When Marthe well of	underhannen M
 40 dBµV/m				and a source the Marthal	WWWWWWWWWWWWWWWWWWWWWWWW
 30 dBµV/m					
20 dBµV/m					
TE					
	1	Range 1	<u> </u>	<u>, , , ,</u>	
Start 9.0 kHz					Stop 150.0 kHz
2 Scan				• 1P	'k Max 🖲 2Pk Clrw 🗋
		· · ·			
	1 MHz			10 MM1[1]	
	1 MHz			10 MM1[1]	60.67 dBµV/m 150.000 kHz
100 dBµV/m	1 MHz			10 MM1[1]	
100 dBµV/m	1 MHz			^{10 MM1[1]}	
	1 MHz			10 MM1[1]	
100 dBµV/m	1 MHz			10 MM1[1]	
100 dBµV/m	1 MHz			10 MM1[1]	
100 dBµV/m 90 dBµV/m F <u>CC209-10M</u>	1 MHz			10 MM1[1]	
100 dBµV/m	1 MHz			10 MM1[1]	
100 dBµV/m 90 dBµV/m F <u>CC209-10M</u>	1 MHz			10 MM1[1]	
100 dBµV/m 90 dBµV/m F <u>CC209-10M</u>				10 MM1[1]	
100 dBµV/m 90 dBµV/m FCC209-10M 70 dBµV/m 1 60-dBµV/m				10 MM1[1]	
100 dBµV/m 90 dBµV/m FCC209-10M 70 dBµV/m 1 60-dBµV/m				10 MM1[1]	
100 dBµV/m 90 dBµV/m FCC209-10M 70 dBµV/m 1 60-dBµV/m				10 MM1[1]	
100 dBµV/m 90 dBµV/m FCC209-10M 70 dBµV/m 1 60-dBµV/m				10 MM1[1]	150.000 kHz
100 dBµV/m 90 dBµV/m FCC209-10M 70 dBµV/m 1 60-dBµV/m				10 MM1[1]	150.000 kHz
100 dBµV/m 90 dBµV/m FCC209-10M 70 dBµV/m 50 dBµV/m 40 dBµV/m				10 MM1[1]	150.000 kHz
100 dBµV/m 90 dBµV/m FCC209-10M 70 dBµV/m 1 60-dBµV/m				10 MM1[1]	150.000 kHz
100 dBµV/m 90 dBµV/m FCC2209-10M 70 dBµV/m 50 dBµV/m 40 dBµV/m 30 dBµV/m				10 MM1[1]	150.000 kHz
100 dBµV/m 90 dBµV/m FCC209-10M 70 dBµV/m 50 dBµV/m 40 dBµV/m				10 MM1[1]	150.000 kHz
100 dBµV/m 90 dBµV/m FCC2209-10M 70 dBµV/m 50 dBµV/m 40 dBµV/m 30 dBµV/m				10 MM1[1]	150.000 kHz
100 dBµV/m 90 dBµV/m FCC2209-10M 70 dBµV/m 50 dBµV/m 40 dBµV/m 30 dBµV/m		Range 2		10 MM1[1]	150.000 kHz

9 kHz to 30 MHz - Highest Channel



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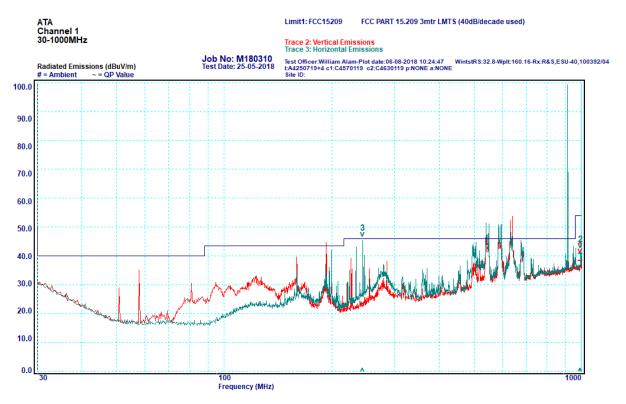


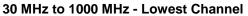
Radiated Cabinet Emission Frequency Band: 30 - 1000 MHz

Measurements were made at a distance of 10 metres. The measurement of emissions between 30 - 1000 MHz was made with a resolution bandwidth (RBW) of 120 kHz and the video bandwidth (VBW) of 300 kHz. EUT transmit antenna was replaced with termination matching the impedance of the antenna.

The §15.209 limits were applied.

Channel	Frequency [GHz]	Polarity	QP [dBµV/m]	Limit [dBµV/m]	Margin [dB]
Low	991.830	Horizontal	41.0	54.0	-13.0
Middle	991.840	Horizontal	40.6	54.0	-13.4
High	996.110	Horizontal	40.2	54.0	-13.8
Low	121.420	Vertical	28.9	43.5	-14.6
Middle	991.840	Vertical	38.2	54.0	-15.8
High	991.840	Vertical	38.2	54.0	-15.8
Low	282.600	Vertical	25.9	46.0	-20.1
Middle	243.900	Horizontal	23.4	46.0	-22.6

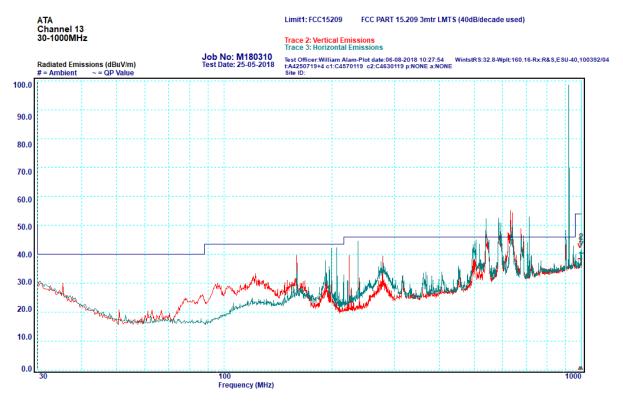




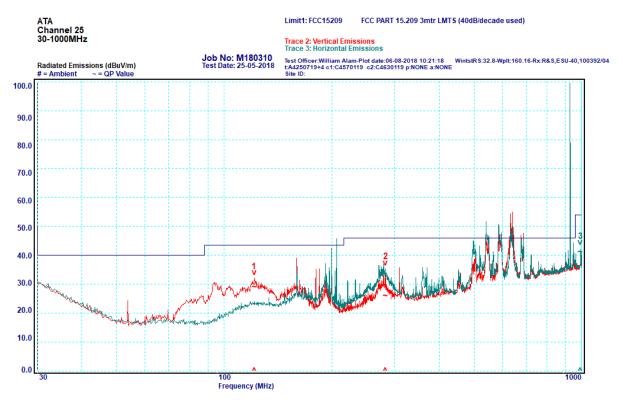


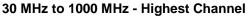
Accredited for compliance with ISO/IEC 17025 - Testing. The results of tests, calibration and/or measurements included in this document are traceable to Australian/national standards. NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.













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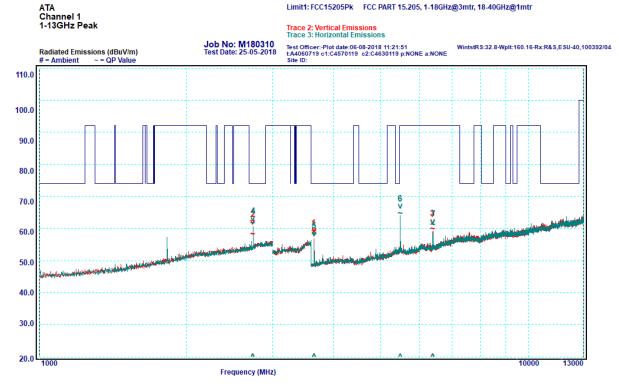


Radiated Cabinet Emission Frequency Band: 1 000 – 13 000 MHz

Measurements to 13 GHz were made at a distance of 3 metres. The measurements were made with a resolution bandwidth (RBW) of 1000 kHz and the video bandwidth (VBW) of 1000 kHz. EUT transmit antenna was replaced with termination matching the impedance of the antenna.

	Eroguopov			Peak			Average	
Channel	Frequency [MHz]	V/H	Peak [dBµV/m]	Limit [dBµV/m]	_∆ [dB]	AV [dBµV/m]	Limit [dBµV/m]	∆ [dB
Low	2737.72	Н	61.7	74	-12.3	50.4	54	-3.6
Middle	2758.63	Н	61.6	74	-12.4	50.3	54	-3.7
High	2780.5	V	61.6	74	-12.4	50.3	54	-3.7
High	2780.44	Н	60.6	74	-13.4	49.3	54	-4.7
Middle	2759.14	V	60.3	74	-13.7	49.0	54	-5.0
High	3707.19	V	60.1	74	-13.9	48.8	54	-5.2
Low	3649.64	V	59.4	74	-14.6	48.1	54	-5.9
Middle	3678.34	V	59.1	74	-14.9	47.8	54	-6.2
High	3707.22	Н	58.3	74	-15.7	47.0	54	-7.0
Low	2737.88	V	58.2	74	-15.8	46.9	54	-7.1
Low	3649.78	Н	58.2	74	-15.8	46.9	54	-7.1
Middle	3678.52	Н	58.2	74	-15.8	46.9	54	-7.1

The §15.209 limits were applied.



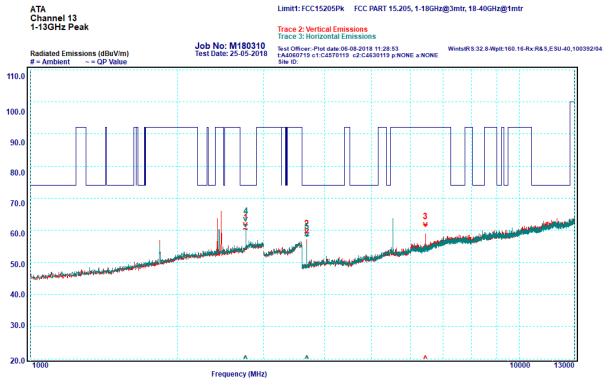




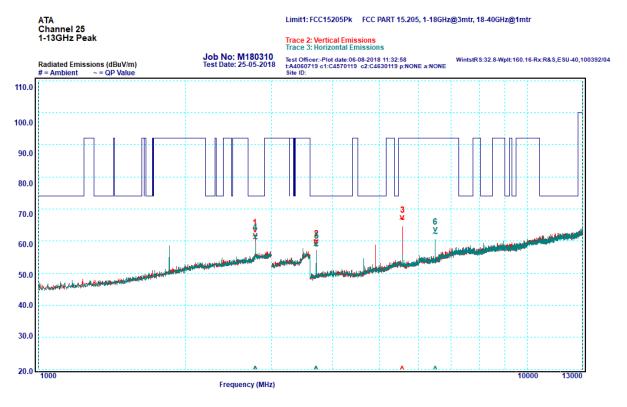
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1 to 13 GHz – Middle Channel



1 to 13 GHz – Highest Channel



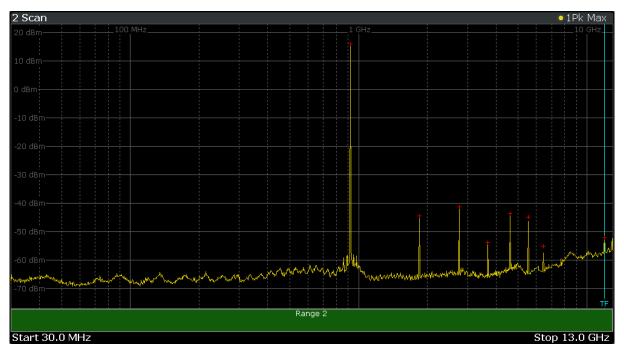
Accredited for compliance with ISO/IEC 17025 - Testing. The results of tests, calibration and/or measurements included in this document are traceable to Australian/national standards. NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.



Conducted Spurious Emission Frequency Band: 30 – 13 000 MHz

Additional measurements from 30 MHz to 13 GHz were made conductively. The measurements were made with the same RBW and VBW with radiated measurement. EUT transmit antenna was connected to dummy load and Spectrum Analyser.

The §15.209 limits were applied.



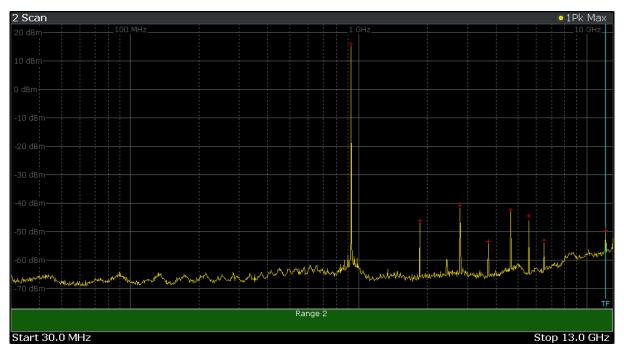
30 MHz – 13 GHz Lowest Channel

Frequency	Peak		Peak		Average			
[GHz]	[dBm]	EIRP [dBµV/m]	Limit [dBµV/m]	Margin [dB]	EIRP [dBµV/m]	Limit [dBµV/m]	Margin [dB]	
2.761	-41.28	53.95	74	-20.05	42.61	54	-11.39	
4.602	-43.61	51.62	74	-22.38	40.28	54	-13.72	
1.841	-44.44	50.79	74	-23.21	39.45	54	-14.55	
5.522	-44.81	50.42	74	-23.58	39.08	54	-14.92	
11.96	-52.19	43.04	74	-30.96	31.70	54	-22.30	
3.681	-53.74	41.49	74	-32.51	30.15	54	-23.85	
6.441	-55.07	40.16	74	-33.84	28.82	54	-25.18	



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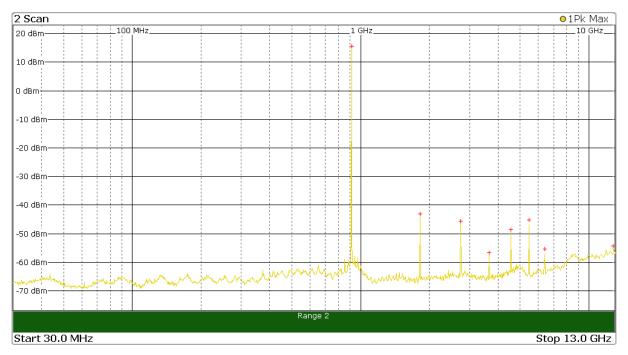
30 MHz – 13 GHz Middle Channel

Frequency	Peak		Peak		Average			
[GHz]	[dBm]	EIRP [dBµV/m]	Limit [dBµV/m]	Margin [dB]	EIRP [dBµV/m]	Limit [dBµV/m]	Margin [dB]	
2.781	-40.89	54.34	74	-19.66	43.00	54	-11.00	
4.635	-42.24	52.99	74	-21.01	41.65	54	-12.35	
5.561	-44.41	50.82	74	-23.18	39.48	54	-14.52	
1.854	-46.2	49.03	74	-24.97	37.69	54	-16.31	
12.05	-49.62	45.61	74	-28.39	34.27	54	-19.73	
6.487	-53.01	42.22	74	-31.78	30.88	54	-23.12	
3.707	-53.47	41.76	74	-32.24	30.42	54	-23.58	



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30 MHz – 13 GHz Highest Channel

Frequency	Peak	Peak			Average		
[GHz]	[dBm]	EIRP [dBµV/m]	Limit [dBµV/m]	Margin [dB]	EIRP [dBµV/m]	Limit [dBµV/m]	Margin [dB]
1.825	-43.01	52.22	74	-21.78	40.88	54	-13.12
5.474	-45.26	49.97	74	-24.03	38.63	54	-15.37
2.738	-45.66	49.57	74	-24.43	38.23	54	-15.77
4.563	-48.63	46.60	74	-27.40	35.26	54	-18.74
12.78	-54.42	40.81	74	-33.19	29.47	54	-24.53
6.387	-55.29	39.94	74	-34.06	28.60	54	-25.40
3.650	-56.67	38.56	74	-35.44	27.22	54	-26.78



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Band-Edge Emission Measurements

Measurements were made at a distance of 3 metres. The measurement of emissions between 30 - 1000 MHz was made with a resolution bandwidth (RBW) of 120 kHz and the video bandwidth (VBW) of 300 kHz. Emissions within 10 MHz of an authorised band edge were measured. Highest emission was found on vertical polarisation. Only emissions in this orientation are reported.

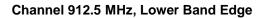
Channel	Frequency [GHz]	QP [dBµV/m]	Limit [dBµV/m]	Margin [dB]	
High	928.564	61.55	91	-29.45	
Low	909.565	56.99	91	-34.01	
High	934.989	55.44	91	-35.56	
Low	901.381	53.97	91	-37.03	
High	928.000	53.83	91	-37.17	
Low	902.000	48.51	91	-42.49	
Hopping ON					
Low	910.325	60.88	91	-30.12	
High	928.000	57.50	91	-33.50	
Low	901.381	56.14	91	-34.86	
High	929.996	56.02	91	-34.98	
High	934.786	55.29	91	-35.71	
Low	902.000	48.51	91	-42.49	

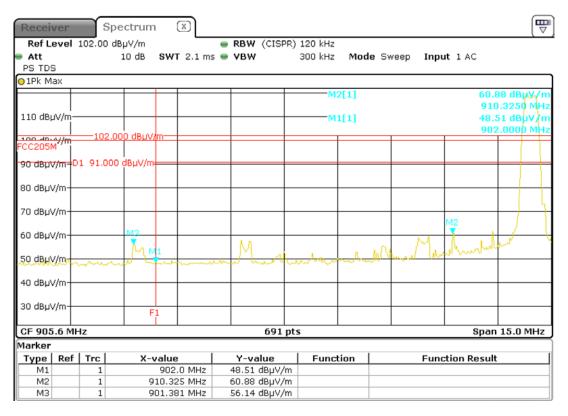


Accredited for compliance with ISO/IEC 17025 - Testing. The results of tests, calibration and/or measurements included in this document are traceable to Australian/national standards. NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.



Ref Level 102.00 dBµV/m RBW (CISPR) 120 kHz Att 10 dB SWT 2.1 ms VBW 300 kHz Mode Sweep Input 1 AC PS TDS 91Pk Max M3[1] \$3.97 dB 901.3810 110 dBµV/m M1[1] 48.51 dB 902.000 100 dBµV/m 102.000 dBµV/m 902.000 902.000 100 dBµV/m 102.000 dBµV/m 902.000 902.000 100 dBµV/m 101 91.000 dBµV/m 102.000 dBµV/m 102.000 dBµV/m 90 dBµV/m 01 91.000 dBµV/m 100 dBµV/m 100 dBµV/m 10 dBµV/m 100 dBµV/m 100 dBµV/m 100 dBµV/m 10 dBµV/m 10 dBµV/m 100 dBµV/m 100 dBµV/m	IV/m
M3[1] 53.97 dB 901.3810 901.3810 110 dBµV/m M1[1] 102.000 dBµV/m 902.000 90 dBµV/m 90.000 90 dBµV/m 90.000	ıV/m
901.3810 110 dBµV/m 102.000 dBµV/m 902.000 100 dBµV/m 01 91.000 dBµV/m 902.000 90 dBµV/m 01 91.000 dBµV/m 902.000 80 dBµV/m 01 91.000 dBµV/m 902.000 100 dBµV/m 90 90.000 dBµV/m 900 900 900 900 900 100 dBµV/m 90 90.000 dBµV/m 900 900 900 900 900 900 900 900 900 90	ıV/m
зопа-влании 102.000 dBµV/m FCC205M/m D1 91.000 dBµV/m 90 dBµV/m 0 80 dBµV/m 0 70 dBµV/m 0 60 dBµV/m 0 50 dBµV/m 0	rMHz JV∤m
90 dBµV/m D1 91.000 dBµV/m 80 dBµV/m 70 dBµV/m 60 dBµV/m 50 dBµV/m 50 dBµV/m	-
70 dBμV/m M3 60 dBμV/m M2 50 dBμV/m M3	\rightarrow
60 dBµV/m M3 50 dBµV/m M1 50 dBµV/m M1	+
50 dBpv/m M3 M1	-4
50 dBuvin man the second have been been been been been been been be	-
40 dBuV/m	
30 dBµV/m F1	
CF 905.6 MHz 691 pts Span 15.0	МНz
Marker	
Type Ref Trc X-value Y-value Function Function Result	
M1 1 902.0 MHz 48.51 dBµV/m	
M2 1 909.565 MHz 56.99 dBμV/m M3 1 901.381 MHz 53.97 dBμV/m	



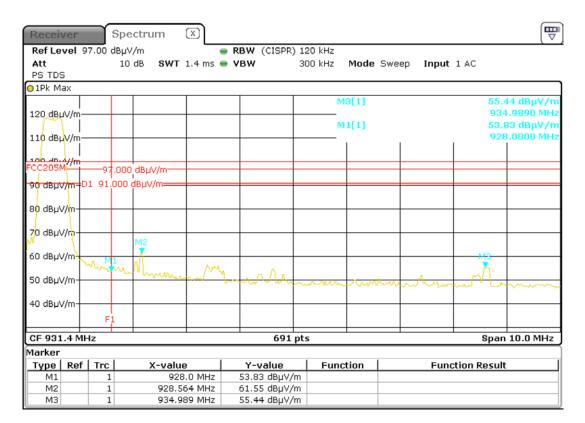


Channel 912.5 MHz, Lower Band Edge Hopping ON

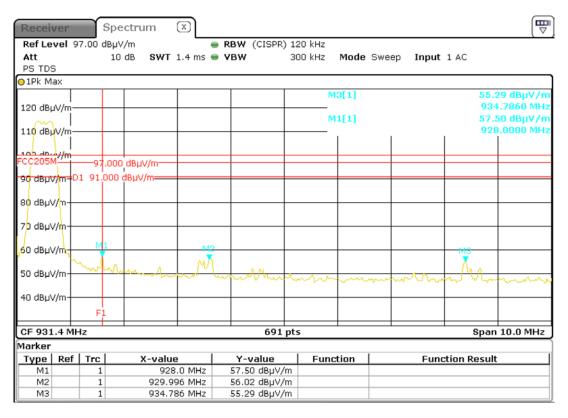


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Channel 926.9 MHz, Upper Band Edge



Channel 926.9 MHz, Upper Band Edge Hopping ON



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3.8 §15.247(i) Maximum Permissible Exposure

The EUT complied with the applicable maximum permissible exposure levels. Refer to EMC Technologies report M180310-3.



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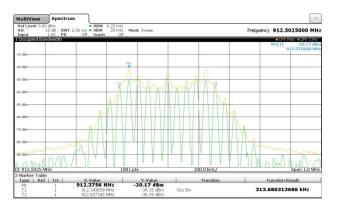


3.9 §15.215 Occupied bandwidth – 99% power

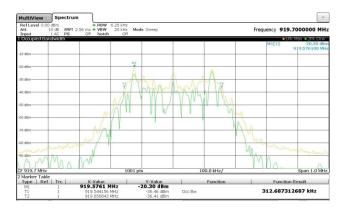
The bandwidth containing 99% power of the transmitted signal was measured using the procedure from ANSI C63.10 section 6.9.

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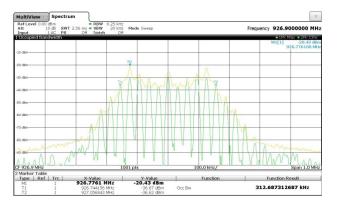
Channel	99% Bandwidth [MHz]	Low Frequency [MHz]	High Frequency [MHz]
Low	0.31368	912.343659	912.657345
Middle	0.31268	919.544156	919.856843
High	0.31268	926.744156	927.056843



Occupied Bandwidth – lowest channel



Occupied Bandwidth – middle channel



Occupied Bandwidth – highest channel



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4.0 COMPLIANCE STATEMENT

The HUB200 Wireless Smart Hub 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) for a Frequency Hopping System operating within the band: 902 MHz to 908 MHz.

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:

Conducted Emissions:	9 kHz to 30 MHz	±3.2 dB
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
Peak Power Spectral Density:		±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%.



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