

**RADIO REPORT FOR CERTIFICATION
to
47 CFR Part 15 Subpart C (Section 15.247) and
RSS-247 Issue 2, February 2017**

Test Report Number: S210610-1 v2

FCC ID: S7R-CK2T1
IC: 25706-CK2T1

Tested For: Taggle Systems Pty Ltd
Device under Test: Cockatoo
Model Number: CK2-T1-I-EX-S12-0-WXT530-AU
Serial Number: 113188

Issue Date: 22 December 2021

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RADIO REPORT FOR CERTIFICATION

47 CFR Part 15 Subpart C (Section 15.247) and RSS-247 Issue 2, February 2017

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REVISION TABLE

Version	Change Made	Date
1	Initial issue of document	10 December 2021
2	Model Number amended on Data	22 December 2021



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RADIO REPORT

Device under Test: Cockatoo
Model Number: CK2-T1-I-EX-S12-0-WXT530-AU
Serial Number: 113188

Variant Model: CK2-T1-C-1B-0-0-FL2-AU
Serial Number: 113195

FCC ID: S7R-CK2T1
IC: 25706-CK2T1

Manufacturer: Taggle Systems Pty Ltd

Tested for: Taggle Systems Pty Ltd
Address: Level 1, 101 Sussex Street, Sydney NSW 2000

Phone: +61 2 8999 1919

Contact: Richard Keaney
Email: rkeaney@taggle.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
RSS-247 Issue 2, February 2017 - Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
RSS-102 Issue 5, March 2015 - Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

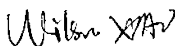
Result: The Cockatoo complied with the applicable requirements of the above standards. Refer to Report S210610-1 v2 for full details.

Test Date(s): 13 September 2021 to 5 November 2021

Issue Date: 22 December 2021

Attestation: I hereby certify that the Test Sample described herein was tested as described in this report and that the data included is that which was obtained during such testing.

Test Engineer: 
Dong Feng

Authorised Signatory: 
Wilson Xiao
Lead Engineer- Radio
EMC Technologies Pty Ltd

Issued by: EMC Technologies Pty. Ltd.,
Unit 3, 87 Station Road, Seven Hills, NSW, 2147, Australia.
Phone: +61 2 9624 2777

E-mail: emc-general@emctech.com.au **Web:** www.emctech.com.au



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RADIO REPORT FOR CERTIFICATION to 47 CFR Part 15 Subpart C (section 15.247) and RSS-247 Issue 2, February 2017

1.0 Introduction

Radio tests were performed on Cockatoo with Model Number: CK2-T1-I-EX-S12-0-WXT530-AU and CK2-T1-C-1B-0-0-FL2-AU, in accordance with the applicable requirements of 47 CFR, Part 15 Subpart C – Section 15.247 and RSS-247 Issue 2 for a Digital Transmission System (DTS) 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 and KDB 558074 v05r02 - Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.

The measurement instrumentation conformed to the requirements of ANSI C63.2: 2016.

1.2 Summary of 47 CFR Part 15 Subpart C Results

EUT: Cockatoo, Model: CK2-T1-I-EX-S12-0-WXT530-AU			
Section	FCC Part 15 Subpart C	Test Performed	Results
3.1	15.203	Antenna requirement	Complied
3.2	15.205	Restricted bands of operation	Complied
3.3	15.209	Radiated emissions limits; general requirements	Complied
3.4	15.207	Conducted limits	Complied
3.5	15.247 (a)	Channel Bandwidth	Complied
3.6	15.247 (b)	Peak Output Power	Complied
3.7	15.247 (d)	Out of Band Emissions	Complied
3.8	15.247 (e)	Peak Power Spectral Density	Complied
3.9	2.1049	Occupied Bandwidth	7.47 MHz
3.10	15.247 (i)	Radio Frequency Hazard	Complied

1.3 Summary of RSS-247 Results

EUT: Cockatoo, Model: CK2-T1-I-EX-S12-0-WXT530-AU			
Section	RSS	Test Performed	Results
3.1	RSS-Gen (6.8)	Antenna requirement	Complied
3.2	RSS-Gen (8.10)	Restricted bands of operation	Complied
3.3	RSS-Gen (8.9)	Radiated emissions limits; general requirements	Complied
3.4	RSS-Gen (8.8)	Conducted limits	Complied
3.5	RSS-247 (5.2(a))	Channel Bandwidth	Complied
3.6	RSS-247 (5.4(d))	Peak Output Power	Complied
3.7	RSS-247 (5.5)	Out of Band Emissions	Complied
3.8	RSS-247 (5.2(b))	Peak Power Spectral Density	Complied
3.9	RSS-Gen (6.7)	Occupied Bandwidth	7.47 MHz
3.11	RSS-Gen (3.2) RSS-102	Radio Frequency Hazard	Complied



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1.4 Spot Check Testing for Variant Model

EUT: Cockatoo, Model: CK2-T1-C-1B-0-0-FL2-AU				
Section	FCC Part 15 Subpart C	RSS	Test Performed	Results
3.12	15.203	RSS-Gen (6.8)	Antenna requirement	Complied
	15.247 (d)	RSS-247 (5.5)	Out of Band Emissions	Complied

1.5 Modifications

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

2.0 GENERAL INFORMATION

(Information supplied by the Client)

2.1 EUT (Transmitter) Details

Frequency Band:	902-928MHz
Modulation:	BPSK
Number of Channels:	1
Operating Frequency:	922 MHz
Nominal Bandwidth:	9.6MHz
Antenna type and gain:	2 dBi monopole

2.2 EUT (Host) Details

Manufacturer:	Taggle Systems Pty Ltd
Device under Test:	Cockatoo
Model Number:	CK2-T1-I-EX-S12-0-WXT530-AU
Serial Number:	113188
Antenna type and gain:	2 dBi monopole
Highest Internal Frequency:	1844MHz
Power Supply unit:	Switching Power Adapter FSP Group Inc. Model No.: FSP060-DIBAN2 AC Input: 100-240V~, 1.5A, 50-60Hz DC Output: 12.0Vdc, 5.0A Max (60W Max)
Variant Device	
Model Number:	CK2-T1-C-1B-0-0-FL2-AU
Serial Number:	113195
Antenna type and gain:	1 dBi Patch
Power Supply unit:	3.6V 14Ah 50.4Wh DC Non-rechargeable battery

2.3 EUT Description

The Cockatoo is Taggle's most versatile telemetry device with the flexibility to accommodate a range of sensors, protocols and radio technologies to address uncommon or specific requirements and challenges.

Use cases include water metering, bore hole monitoring, flood plain and water catchment monitoring, pipeline management, wastewater network management or other activities where monitoring level, pressure, flow, water and air quality, weather, odour and gas.

2.4 Test Sample Operation Mode

The device transmits only. In normal mode of operation the device transmits 1 message per hour. Messages are ~0.45s in duration. The device will be shipped in test mode, which sets the device to transmit modulated output continuously. The device is a direct sequence spread spectrum (DSSS) transmitter with a data rate of 1172 bit/s, spread with a 4095 bit spreading code to yield a baud rate of 4.8Mbit/s. The modulation is BPSK, and the nominal occupied bandwidth is 9.6MHz. The centre frequency is fixed at 922.0MHz



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2.5 Facility

2.5.1 General

EMC Technologies Pty Ltd is listed by the FCC as a test laboratory able to perform compliance testing for the public. EMC Technologies is listed as an FCC part 47CFR2.948 test lab and may perform the testing required under Parts 15 and 18 – **FCC Registration Number 90560**

EMC Technologies Pty Ltd has also been accredited as a Conformity Assessment Body (CAB) by Australian Communications and Media Authority (ACMA) under the APECTEL MRA and is designated to perform compliance testing on equipment subject to Declaration of Conformity (DoC) and Certification under Parts 15 and 18 of the FCC Commission's rules – **Designation number AU0002.**

EMC Technologies indoor open area test site (iOATS) located at Unit 3, 87 Station Road, Seven Hills, NSW, Australia, 2147 has been accepted by Industry Canada for the performance of radiated measurements in accordance with RSS-Gen, Issue 5 - **Industry Canada iOATS number - IC 4207A.**

Measurements in this report were performed at EMC Technologies' laboratory located at Unit 3, 87 Station Road, Seven Hills, New South Wales, 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 (A²LA).

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



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2.6 Test Equipment Calibration

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	Asset No:	Make/Model/Serial Number	Due Date dd/mm/yyyy
EMI Receivers	R-038	Rohde & Schwarz EMI Receiver Model: ESU40 S/N: 100183 20Hz – 40GHz	01/04/2022
	R-029	Rohde & Schwarz EMI Test Receiver Model: ESCI S/N: 100012 9kHz – 3GHz	29/04/2022
Antenna	A-324	Double Ridged Horn Antenna 1-18GHz Model: EMCO 3115 S/N: 3823	04/02/2024
	A-430	Sunar RF Motion Model: JB1 S/N: A021318	14/04/2024
	A-008	EMCO Model: 6502 SN: 9108-2660	12/12/2021
	A-305	Horn Antenna 18-26.5GHz, MN: 3160-09, SN: 00066033	30/04/2024
Pre-amplifier	A-138	1-26.5 GHz, 30 dB Gain MN: HP 8449B, SN: 3008A1113	18/01/2022
LISN	L-076	TESEQ AG Model: NNB 51 SN: 47448	05/11/2021
USB Power Meter	P-198	D.A.R.E!! Development Model: RPR3006W SN: 17100015SNO82	27/07/2022
RF Cables	C-413	Microwave Cable 36 inch – 18-40GHz MN: PE319-36, SN: 0063308	24/06/2022
	C-414	Microwave Cable 36 inch – 18-40GHz MN: PE319-36, SN: 0083308	24/06/2022
	SC-043	Sucoflex 3m, 10MHz - 18GHz	05/01/2022
	SC-028	13m RG214 N-Type, 0.1- 6000MHz	11/01/2022
	SC-041	Sucoflex 4m 10MHz - 18GHz Cable Model: SF104A/2x11N-47/4m	21/05/2022

3.0 TEST RESULTS

3.1 §15.203/ RSS-Gen 8.3/ RSS-Gen 6.8 Antenna Requirement

Parameters	
Antenna Gain	2 dBi
Antenna Type	Monopole
Antenna Connector	SMA Male
Device Antenna Connector	SMA Female

The above antennas will be installed by professional installer only.

3.2 §15.205/RSS-Gen 8.10 Restricted Bands of Operation

The limits of §15.209 were applied across the applicable spectrum and therefore complied with the restricted band requirements.

3.3 §15.209/RSS-Gen 8.9 Radiated emission limits; general requirements

The limits given in §15.205, §15.209 and §15.247 were applied.

3.4 §15.207/RSS-Gen 8.8 Conducted limits

3.4.1 Test Procedure

The arrangement specified in ANSI C63.4: 2014 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: 2016 was used to perform the measurements.

The EMI Receiver was operated under program control using the Max-Hold function and automatic frequency scanning, measurement and data logging techniques. The specified 0.15 MHz to 30 MHz frequency range was sub-divided into sub-ranges to ensure that all short duration peaks were captured.

The various operating modes of the system were investigated. For each of the sub-ranges, the EMI receiver was set to continuous scan with the Peak detector set to Max-Hold mode. The Quasi-Peak detector and the Average detector were then invoked to measure the actual Quasi-Peak and Average level of the most significant peaks, which were detected. EUT power 120V 60Hz.

The limit applied was in accordance to the conducted limits defined in §15.207 / RSS-Gen 8.8.



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3.4.2 Results

Active Line

0.15 to 30MHz

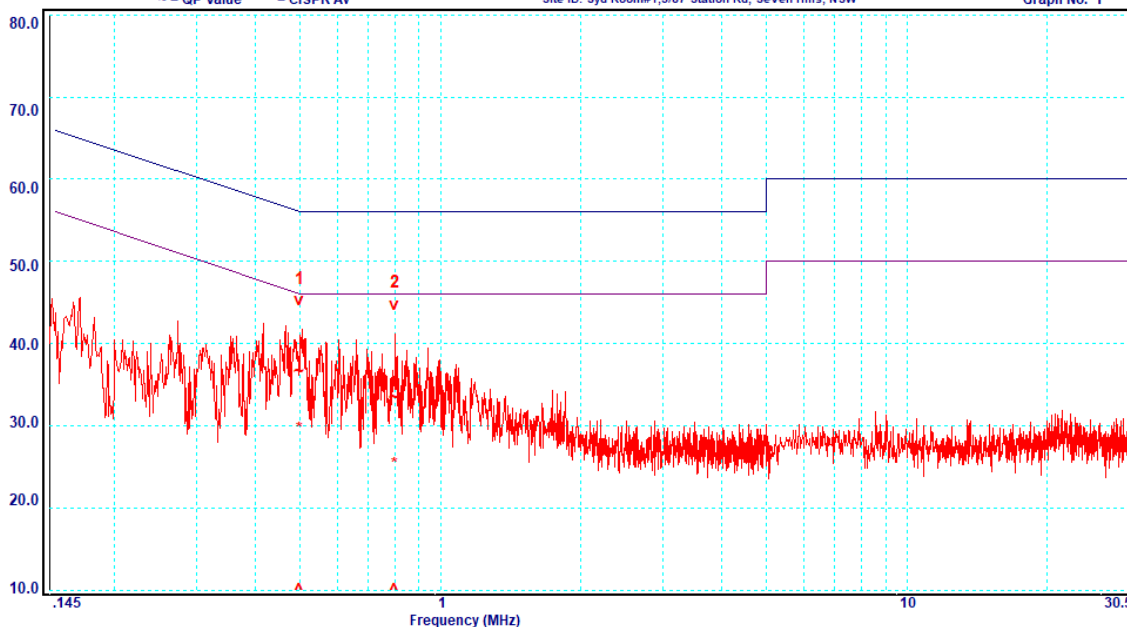
Taggle Systems Pty Ltd
Cockatoo
Model: CK2-T1-I-EX-S12-0-WXT530-AU
Internal Antenna 120V 60Hz
FCC 15.209
Conducted Emissions (dBuV)
~ = QP Value * = CISPR Av

Job No: S210610
Test Date: 11/10/2021

Limit1: FCC15207QP FCC15207 QP CONDUCTED LIMITS
Limit2: FCC15207AV FCC 15207 AV CONDUCTED LIMITS (CISPR)
Trace 2: Active Line

Test Officer: Dong Feng-Plot date: 12-22-2021 10:38:48 WintstRS: 32.8-Wpl: 160.16-Rx: R&S, ESCI-3, 100012/00
t: L0761121 c: 1: C0030122 c2: NONE p: NONE a: L0030122
Site ID: Syd Room#1, 3/87 Station Rd, Seven Hills, NSW

Graph No. 1



Peak	Frequency [MHz]	Line	Quasi-Peak			Average		
			Level [dBμV]	Limit [dBμV]	Margin [dB]	Level [dBμV]	Limit [dBμV]	Margin [dB]
1	0.499	Active	36.6	56.0	-19.4	29.6	46.0	-16.4
2	0.798	Active	33.5	56.0	-22.5	25.2	46.0	-20.8

Complied with the limit by a margin greater than 10dB.

Neutral Line

0.15 to 30MHz

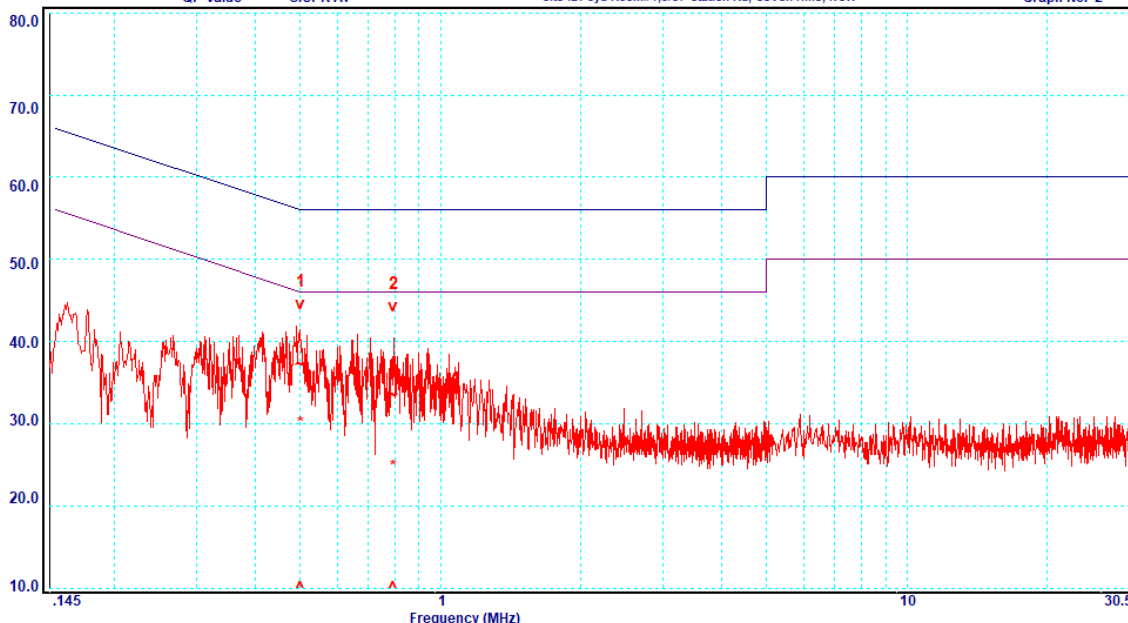
Taggle Systems Pty Ltd
Cockatoo
Model: CK2-T1-I-EX-S12-0-WXT530-AU
internal Antenna 120V 60Hz
FCC 15.209
Conducted Emissions (dBuV)
~ = QP Value * = CISPR Av

Job No: S210610
Test Date: 11/10/2021

Limit1: FCC15207QP
Limit2: FCC15207AV
Trace 2: Neutral Line

Test Officer: Dong Feng-Plot date: 12-22-2021 10:38:59
t: L0761121 c1: C0030122 c2: NONE p: NONE a: L0030122
Site ID: Syd Room#1,3/87 Station Rd, Seven Hills, NSW
WintstRS: 32.8-Wpl: 160.16-Rx: R&S, ESCI-3, 100012/00

Graph No. 2



Peak	Frequency [MHz]	Line	Quasi-Peak			Average		
			Level [dBμV]	Limit [dBμV]	Margin [dB]	Level [dBμV]	Limit [dBμV]	Margin [dB]
1	0.502	Neutral	37.2	56.0	-18.8	30.0	46.0	-16.0
2	0.793	Neutral	33.5	56.0	-22.5	24.7	46.0	-21.3

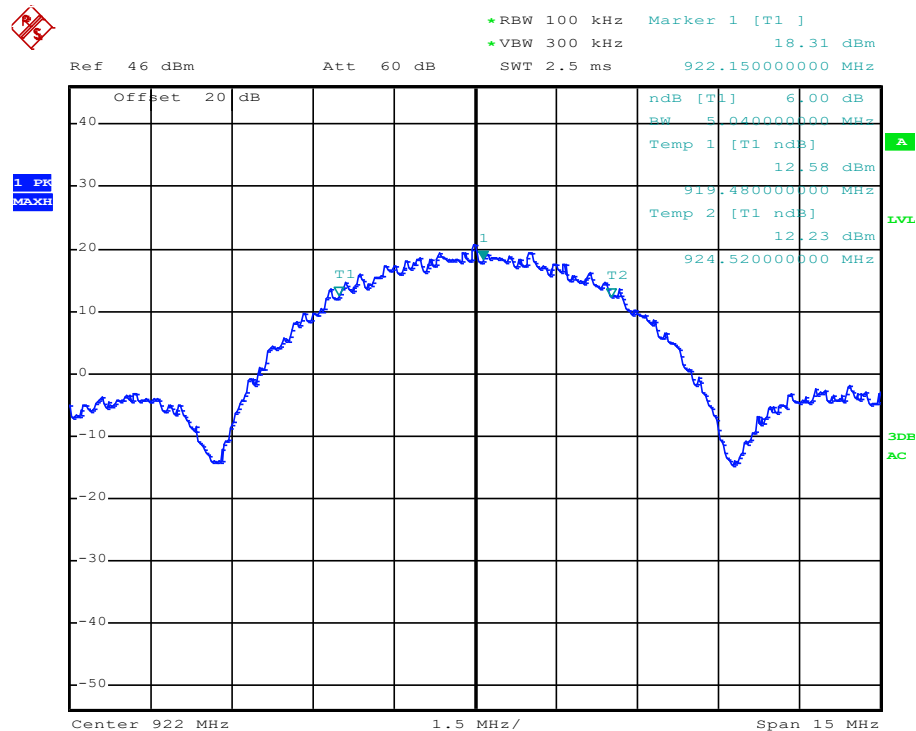
Complied with the limit by a margin greater than 10dB.

3.5 §15.247(a)/RSS-247 5.2(a) DTS Bandwidth

In the band 902 - 928 MHz, the minimum 6 dB bandwidth is to be at least 500 kHz. The 6 dB bandwidth was measured while the device was transmitting with typical modulation applied.

The tests were performed in accordance with ANSI C63.10: 2013 Clause 11.8 DTS bandwidth. Testing was performed via conducted method, the resolution bandwidth of 100 kHz and the video bandwidth of 300 kHz were utilised when measuring the bandwidth.

Centre Frequency [MHz]	Measured 6 dB Bandwidth [kHz]	Limit [kHz]	Result
922	5040	≥500	Complied



Date: 11.OCT.2021 12:40:24

3.6 §15.247(b)/RSS-247 5.4(d) Peak Output power

The tests were performed in accordance with ANSI C63.10: 2013 Clause 11.9.1.3. The peak output power was performed using a power meter via conducted method. The limit for digital transmission systems operating in the 902-928MHz is 1 Watt (30 dBm)

Centre Frequency [MHz]	Measured Conducted Peak Output Power [dBm]	Limit	Result
922MHz	26.6	30dBm	Complied

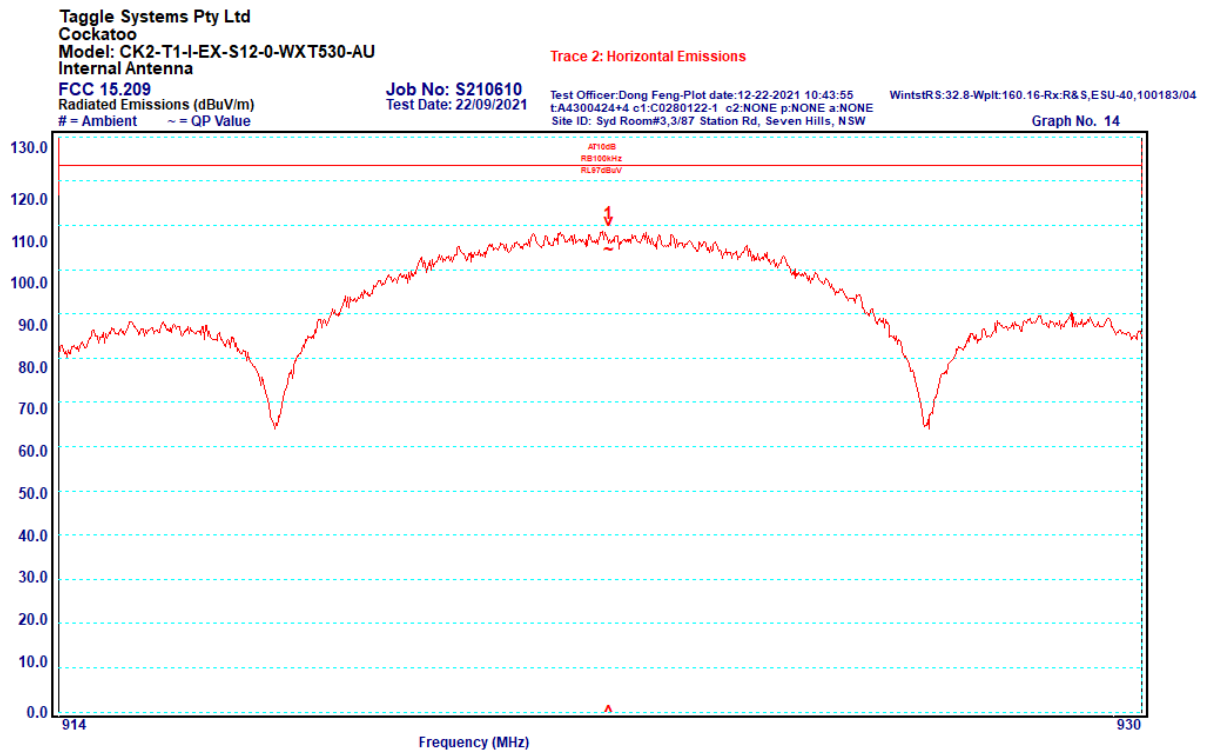
3.7 §15.247(d)/RSS-247 5.5 Out of Band Emissions

3.7.1 Band-Edge Emission Measurements

Band-edge measurements were done using radiated in accordance to ANSI C63.10 clause 6.10. All emissions measured near the lower and higher band edge complied with the requirements of §15.247/ RSS-247 5.0.

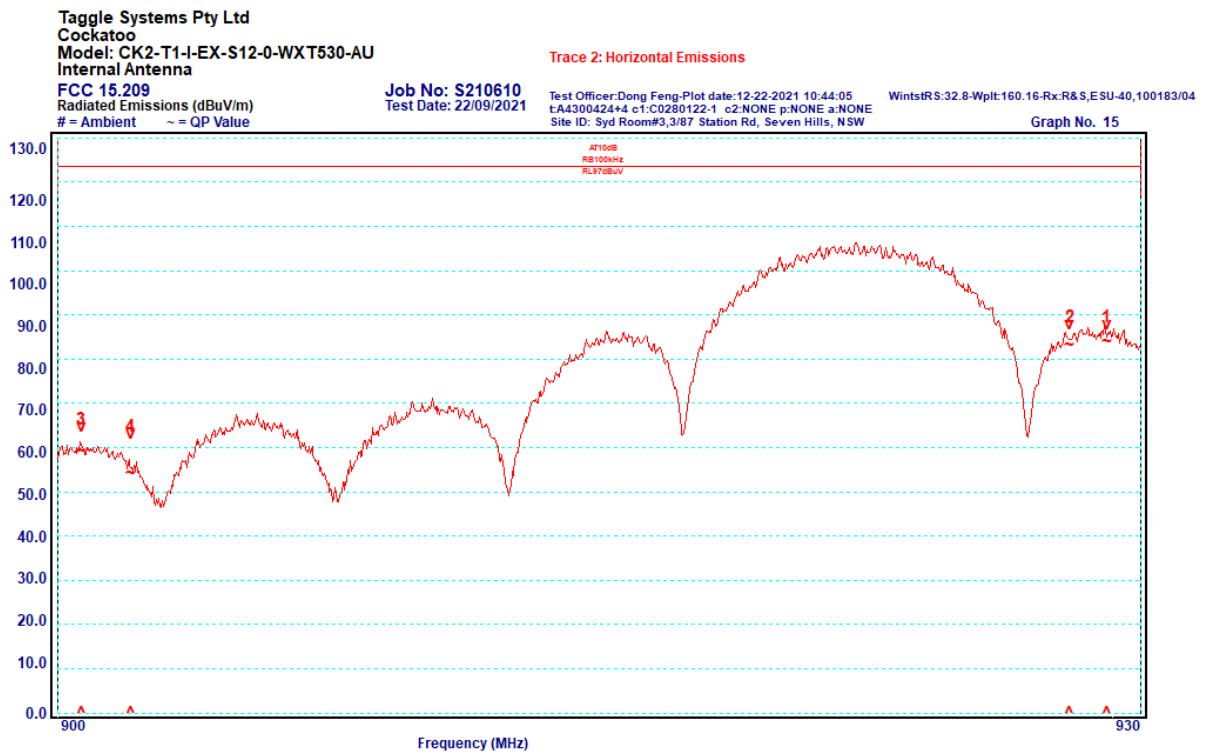
3.7.1.1 Results

100kHz reference measurement



Peak	Frequency (MHz)	100 kHz Bandwidth level (dBuV/m) @3m	20 dB below the 100 kHz Bandwidth level (dBuV/m) @3m
1	922.09	104.5	84.5

The worst Emission 900 to 930MHz



Peak	Frequency (MHz)	Peak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Result
1	929.05	84.0	84.5	-0.5	Complied
2	928.00	83.2	84.5	-1.3	
3	900.66	59.2	84.5	-25.3	
4	902.00	54.1	84.5	-30.4	

3.7.2 Radiated Spurious Measurements

Radiated EMI tests 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 possible EMI peaks. Measurements between 9 kHz and 30 MHz were made at 3 metres using a 0.6 metre loop antenna and calibrated Biconilog antenna for measurements between 30 MHz and 1000 MHz. Calibrated Sunar RF Motion JB1 Biconilog antenna and EMCO 3115, ETS standard gain horn antennas were used for measurements between 1 to 40 GHz as applicable.

The test frequency range was sub-divided into smaller bands with the defined resolution bandwidths 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	3	0.6 metre loop antenna
0.150 to 30	9	3	
30 to 1000	120	3	Biconilog hybrid
1000 to 18 000	1000	3	Standard gain or broadband horn
18 000 to 40 000	1000	1	

The EUT was slowly rotated with the spectrum analyser was set to Max-Hold. This was performed for 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. The procedure was repeated with the device orientated in three orthogonal axis to further maximise the emission.

Each significant peak was investigated with the Peak/Average Detectors. 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 all the pre-stored calibration data. The method of calculation is shown below:

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

Where:

- E** = Radiated Field Strength in dBμV/m.
- V** = EMI Receiver Voltage in dBμV. (measured value)
- AF** = Antenna Factor in dB. (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)

3.7.2.1 Results

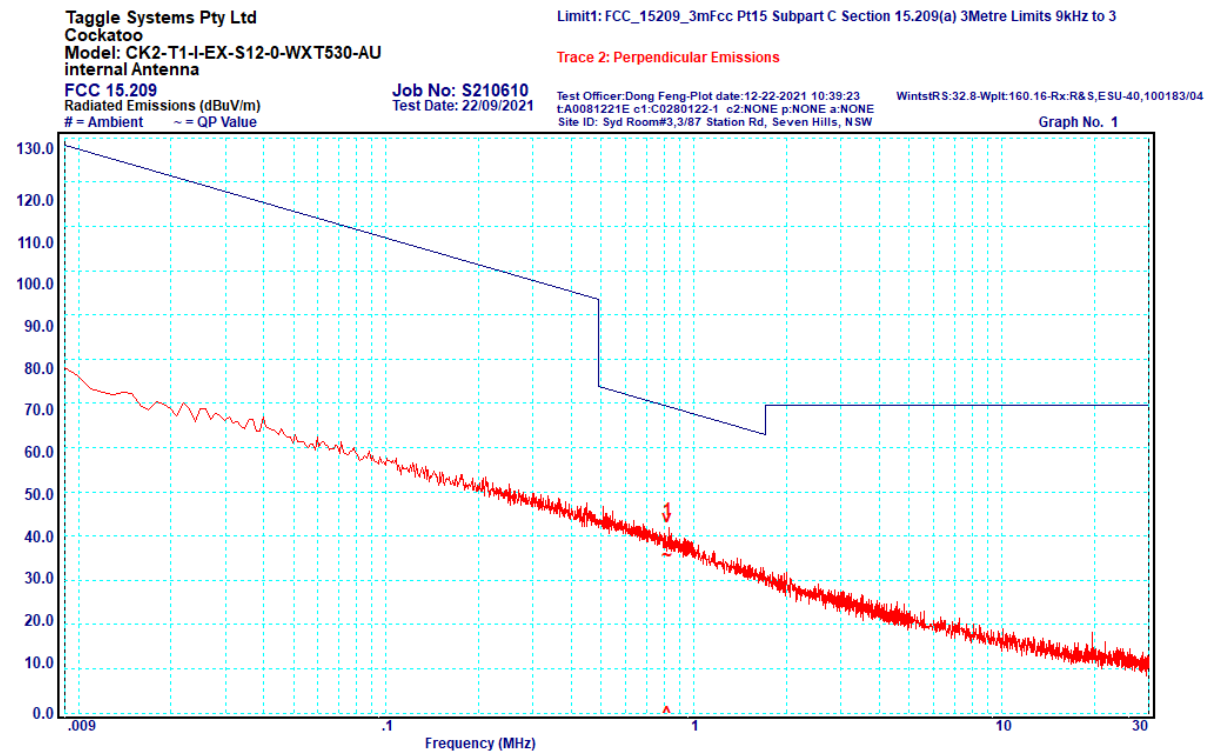
The limit applied is in accordance with the out-of-band/spurious emissions limit defined in §15.247(d).

All emissions measured complied with the §15.209(a), §15.205&§15.247(d) requirements of spurious emission of the standard.

3.7.2.1.1 Frequency Band: 9kHz – 30MHz

Perpendicular Emissions

9kHz to 30MHz



Peak	Frequency (MHz)	Antenna Polarisation	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	0.822	Perpendicular	35.5	69.3	-33.8

Parallel Emissions

9kHz to 30MHz

Taggle Systems Pty Ltd
Cockatoo
Model: CK2-T1-I-EX-S12-0-WXT530-AU
internal Antenna
FCC 15.209
Radiated Emissions (dBuV/m)
= Ambient ~ = QP Value

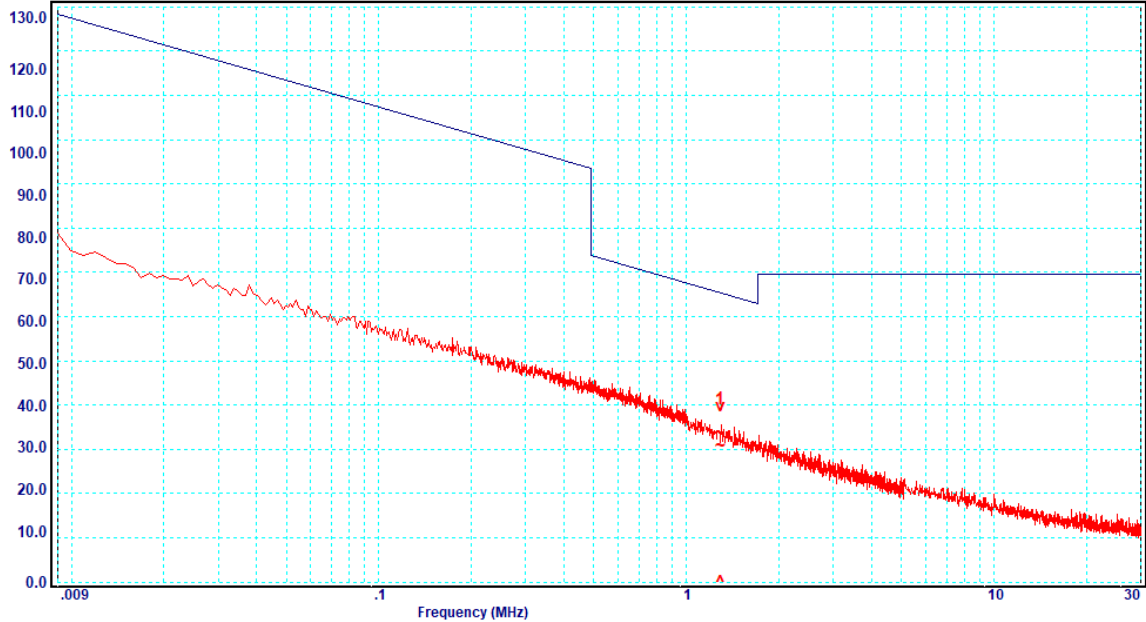
Job No: S210610
Test Date: 22/09/2021

Limit1: FCC_15209_3mFcc Pt15 Subpart C Section 15.209(a) 3Metre Limits 9kHz to 3

Trace 2: Parallel Emissions

Test Officer: Dong Feng-Plot date: 12-22-2021 10:39:41 WinstRS: 32.8-Wplit: 160.16-Rx: R&S, ESU-40, 100183/04
t: A0081221E c1: C0280122-1 c2: NONE p: NONE a: NONE
Site ID: Syd Room#3, 3/87 Station Rd, Seven Hills, NSW

Graph No. 2



Peak	Frequency (MHz)	Antenna Polarisation	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	1.289	Parallel	30.8	65.4	-34.6

Ground Parallel Emissions

9kHz to 30MHz

Taggle Systems Pty Ltd
Cockatoo
Model: CK2-T1-I-EX-S12-0-WXT530-AU
internal Antenna
FCC 15.209
Radiated Emissions (dBuV/m)
= Ambient ~ = QP Value

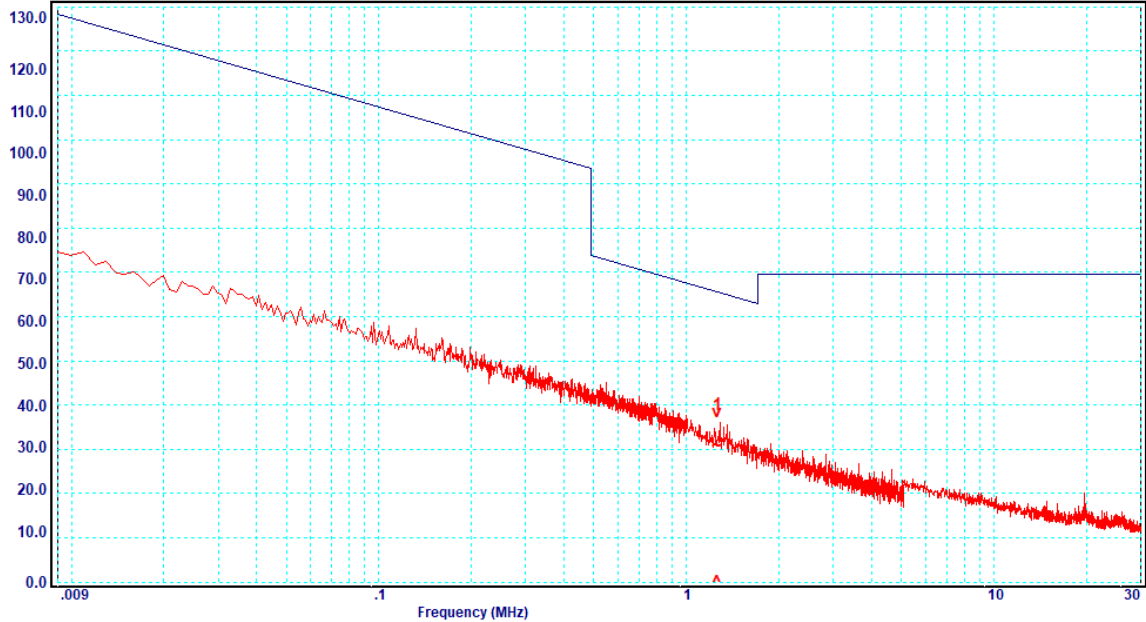
Job No: S210610
Test Date: 22/09/2021

Limit1: FCC_15209_3mFcc Pt15 Subpart C Section 15.209(a) 3Metre Limits 9kHz to 3

Trace 2: Ground Parallel Emissions

Test Officer: Dong Feng-Plot date: 12-22-2021 10:39:56 WinstRS: 32.8-Wplit: 160.16-Rx: R&S, ESU-40, 100183/04
t: A0081221E c1: C0280122-1 c2: NONE p: NONE a: NONE
Site ID: Syd Room#3, 3/87 Station Rd, Seven Hills, NSW

Graph No. 3

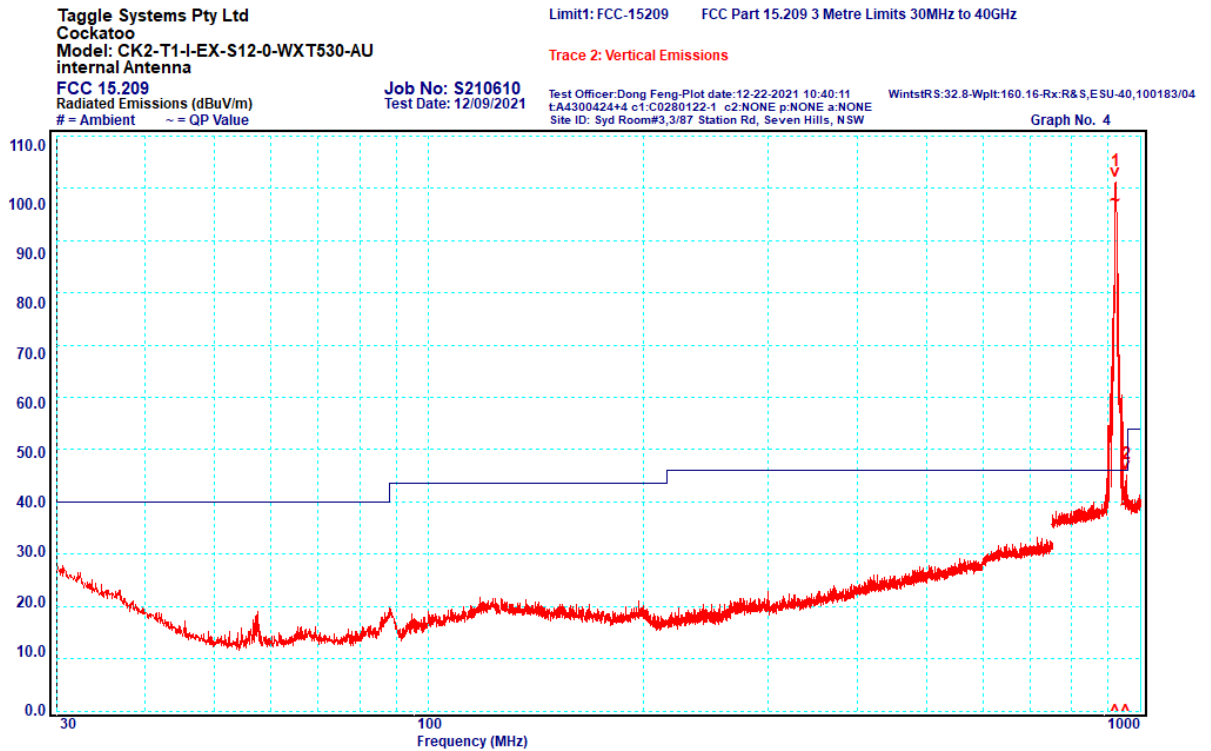


Peak	Frequency (MHz)	Antenna Polarisation	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	1.263	Ground Parallel	30.7	65.6	-34.9

3.7.2.1.2 Frequency Band: 30 – 1000 MHz

Vertical Emissions

30MHz to 1000MHz

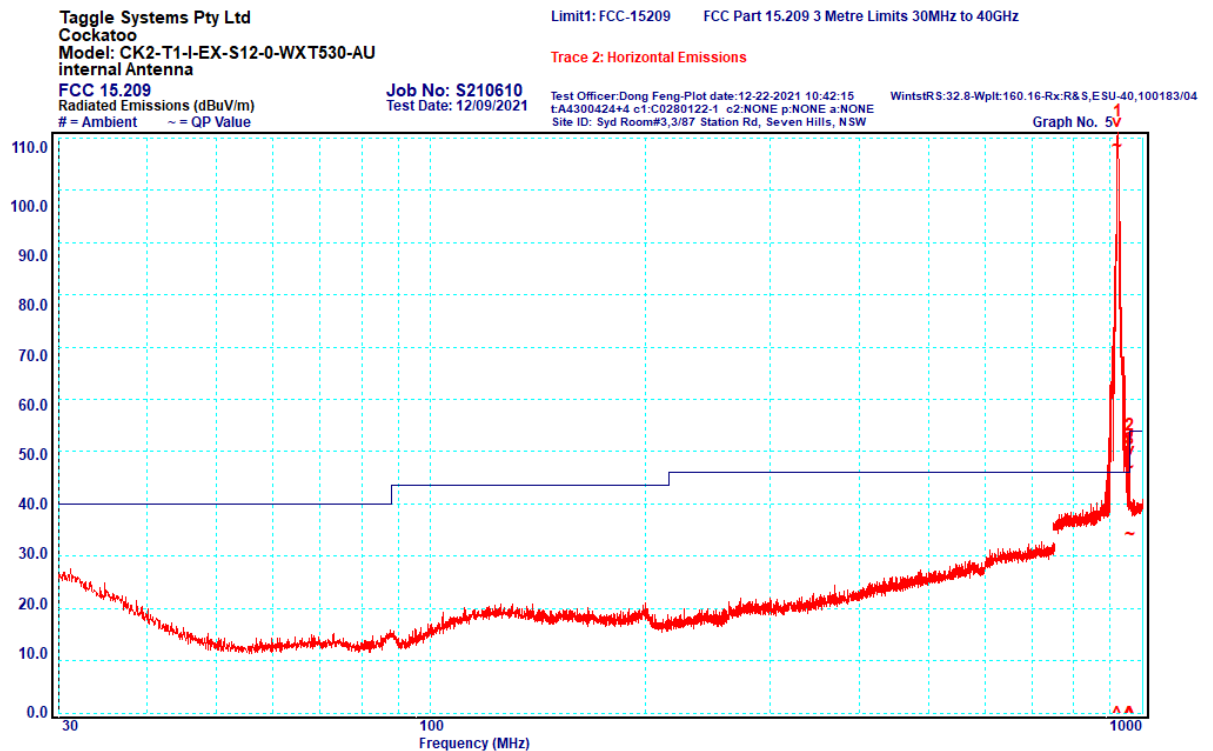


Peak	Frequency (MHz)	Antenna Polarisation	Quasi Peak (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	921.91	Vertical	N/A	N/A	N/A *
2	953.48	Vertical	39.4	46.0	-6.6

* The peak above the limit is the fundamental transmission and not subject to the spurious emissions limit of the standard

Horizontal Emissions

30MHz to 1000MHz



Peak	Frequency (MHz)	Antenna Polarisation	Quasi Peak (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	922.09	Horizontal	N/A	N/A	N/A *
2	957.74	Horizontal	47.0	84.5	-37.5**
3	960	Horizontal	34.1	54.0	-19.9

*The peak above the limit is the fundamental transmission and not subject to the spurious emissions limit of the standard

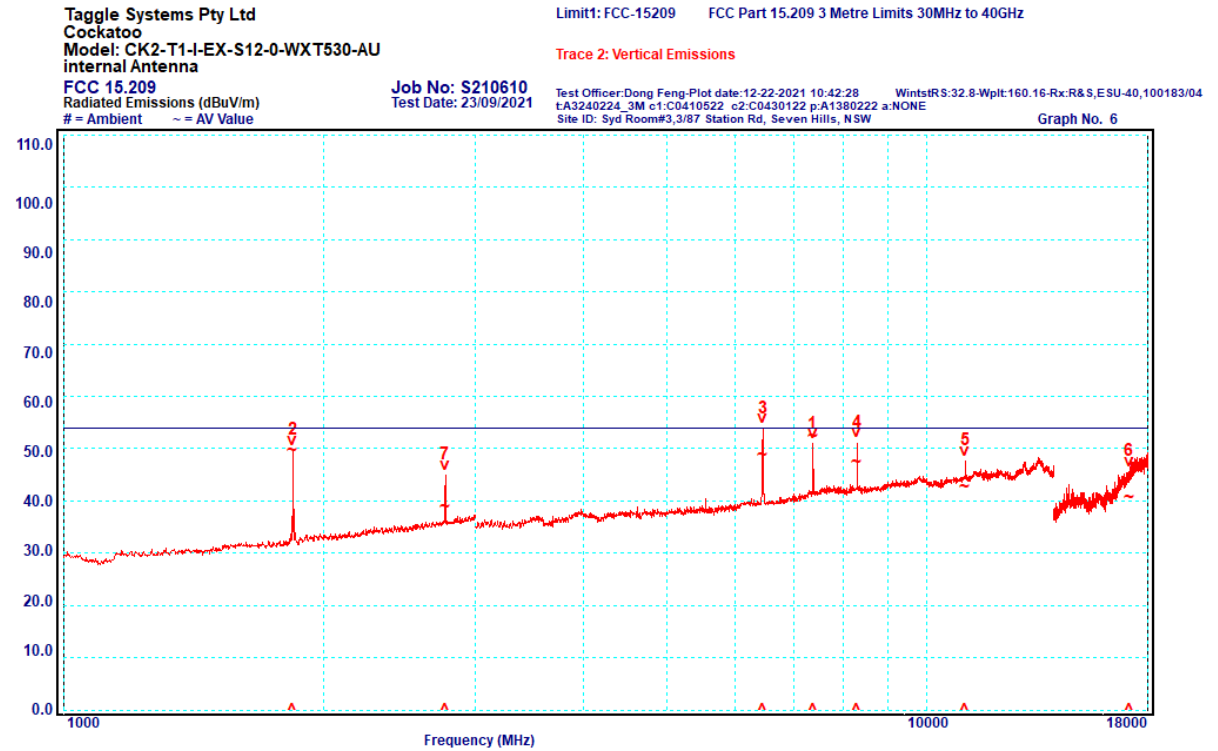
**This reading is not within the restricted band in §15.205(a), according to §15.247(d), this reading complied with the requirement of at least 20dB lower than the highest level of desired power.

3.7.2.1.3 Frequency Band: 1000 – 18000 MHz

3.7.2.1.3.1 Average Measurements

Vertical Emissions

1000MHz to 18000MHz



Peak	Frequency (MHz)	Antenna Polarisation	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	7375.97	Vertical	52.4	54.0	-1.6
2	1844.00	Vertical	49.6	54.0	-4.4
3	6453.99	Vertical	48.8	54.0	-5.2
4	8297.29	Vertical	47.4	54.0	-6.6
5	11064.0	Vertical	42.6	54.0	-11.4
6	17126.2	Vertical	40.6	54.0	-13.4
7	2764.18	Vertical	38.9	54.0	-15.1

Horizontal Emissions

1000MHz to 18000MHz

Taggle Systems Pty Ltd
Cockatoo
Model: CK2-T1-I-EX-S12-0-WXT530-AU
internal Antenna
FCC 15.209
Radiated Emissions (dBuV/m)
= Ambient ~ = AV Value

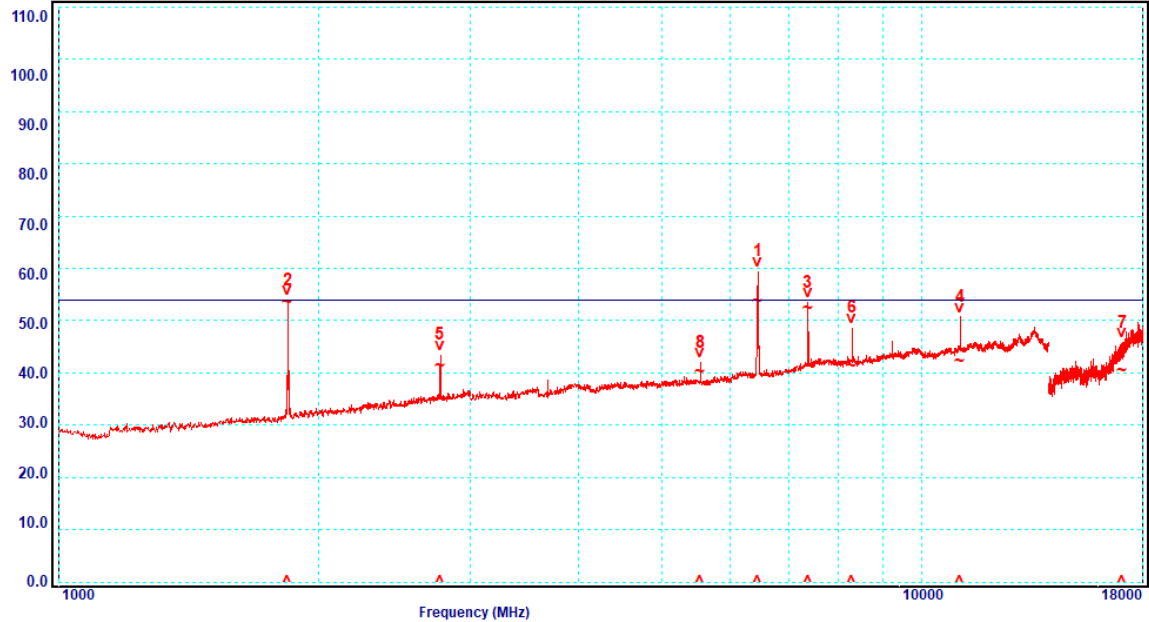
Limit1: FCC-15209 FCC Part 15.209 3 Metre Limits 30MHz to 40GHz

Trace 2: Horizontal Emissions

Job No: S210610
Test Date: 23/09/2021

Test Officer: Dong Feng-Plot date: 12-22-2021 10:42:38 WintSR: 32.8-Wpl: 160.16-Rx: R&S, ESU-40, 100183/04
t: A3240224_3M c1: C0410522 c2: C0430122 p: A1380222 a: NONE
Site ID: Syd Room#3, 3/87 Station Rd, Seven Hills, NSW

Graph No. 7

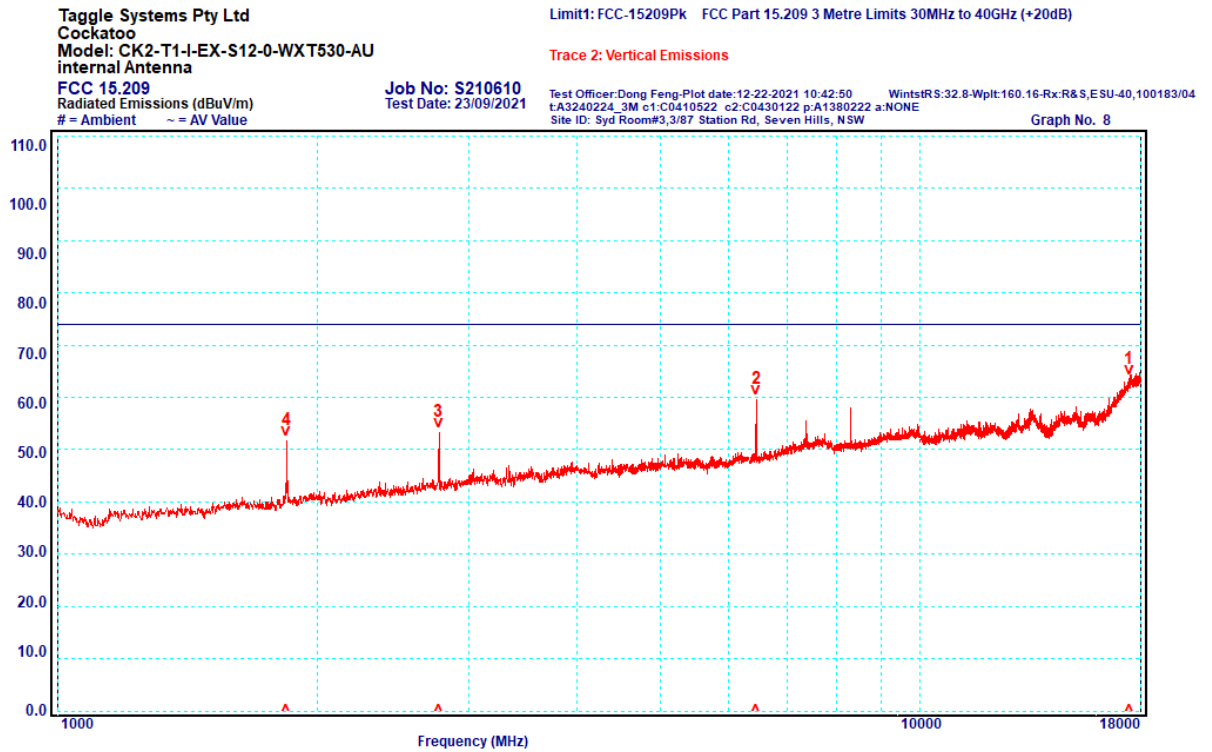


Peak	Frequency (MHz)	Antenna Polarisation	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1	6453.86	Horizontal	53.7	54.0	-0.3
2	1844.01	Horizontal	53.4	54.0	-0.6
3	7375.99	Horizontal	52.3	54.0	-1.7
4	11062.2	Horizontal	42.2	54.0	-11.8
5	2766.07	Horizontal	41.4	54.0	-12.6
6	8297.27	Horizontal	41.3	54.0	-12.7
7	17055.2	Horizontal	40.5	54.0	-13.5
8	5532.00	Horizontal	40.2	54.0	-13.8

3.7.2.1.3.2 Peak Measurements

Vertical Emissions

1000MHz to 18000MHz



Peak	Frequency (MHz)	Antenna Polarisation	Peak (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	17456.6	Vertical	63.5	74.0	-10.5
2	6451.56	Vertical	59.6	74.0	-14.4
3	2766.27	Vertical	53.2	74.0	-20.8
4	1843.18	Vertical	51.6	74.0	-22.4

Horizontal Emissions

1000MHz to 18000MHz

Taggle Systems Pty Ltd
Cockatoo
Model: CK2-T1-I-EX-S12-0-WXT530-AU
internal Antenna
FCC 15.209
Radiated Emissions (dBuV/m)
= Ambient ~ = AV Value

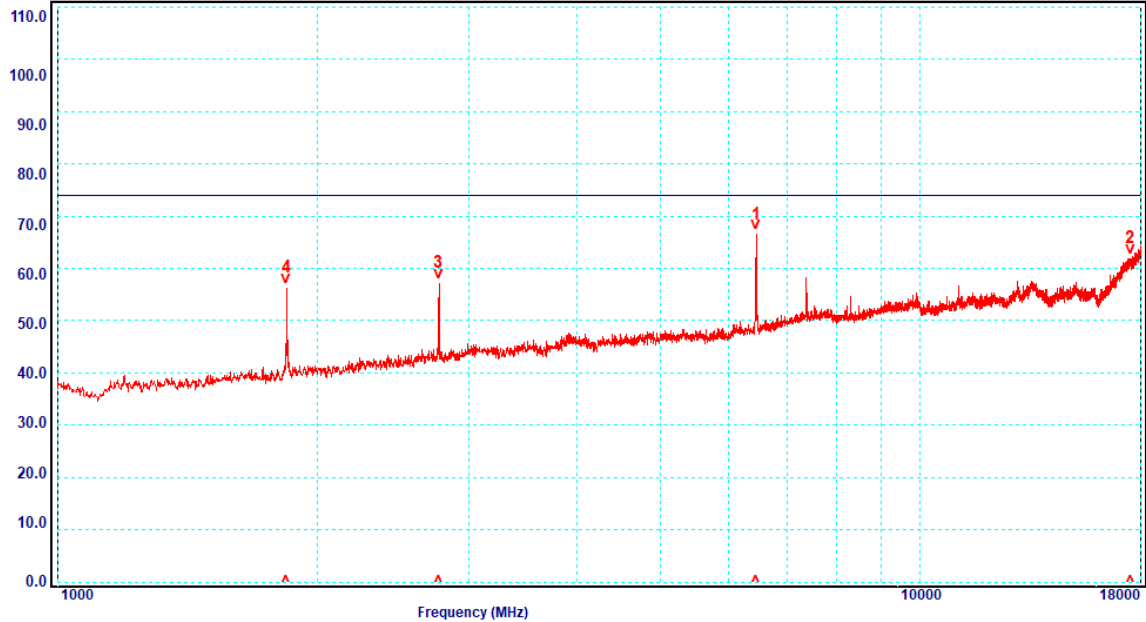
Job No: S210610
Test Date: 23/09/2021

Limit1: FCC-15209Pk FCC Part 15.209 3 Metre Limits 30MHz to 40GHz (+20dB)

Trace 2: Horizontal Emissions

Test Officer: Dong Feng-Plot date: 12-22-2021 10:43:02 WinstRS: 32.8-Wplit: 160.16-Rx: R&S, ESU-40, 100183/04
t: A3240224_3M c1: C0410522 c2: C0430122 p: A1380222 a: NONE
Site ID: Syd Room#3, 3/87 Station Rd, Seven Hills, NSW

Graph No. 9



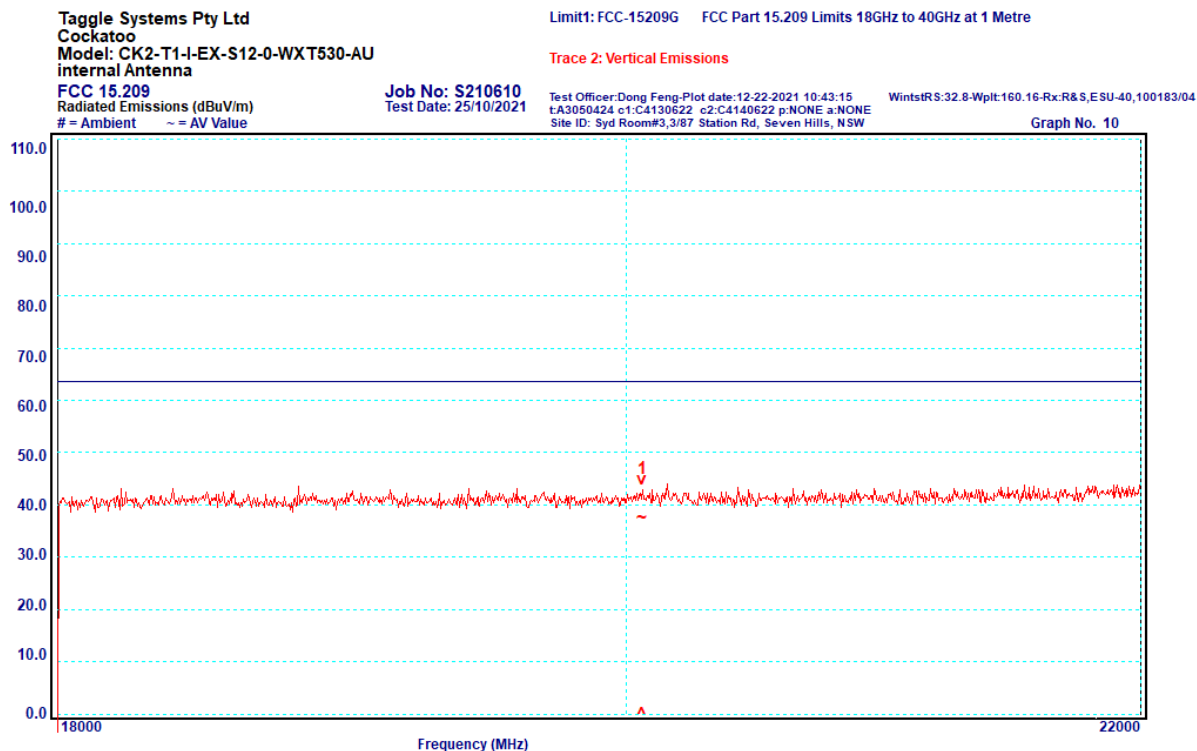
Peak	Frequency (MHz)	Antenna Polarisation	Peak (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	6451.56	Horizontal	66.4	74.0	-7.6
2	17516.6	Horizontal	61.7	74.0	-12.3
3	2764.28	Horizontal	57.0	74.0	-17.0
4	1843.18	Horizontal	56.1	74.0	-17.9

3.7.2.1.4 Frequency Band: 18000 - 22000 MHz

3.7.2.1.4.1 Average Measurements

Vertical Emissions

18000 to 22000MHz



Peak	Frequency (MHz)	Antenna Polarisation	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	20060.19	Vertical	37.5	63.5	-26

Horizontal Emissions

18000 to 22000MHz

Taggle Systems Pty Ltd
Cockatoo
Model: CK2-T1-I-EX-S12-0-WXT530-AU
internal Antenna
FCC 15.209
Radiated Emissions (dBuV/m)
= Ambient ~ = AV Value

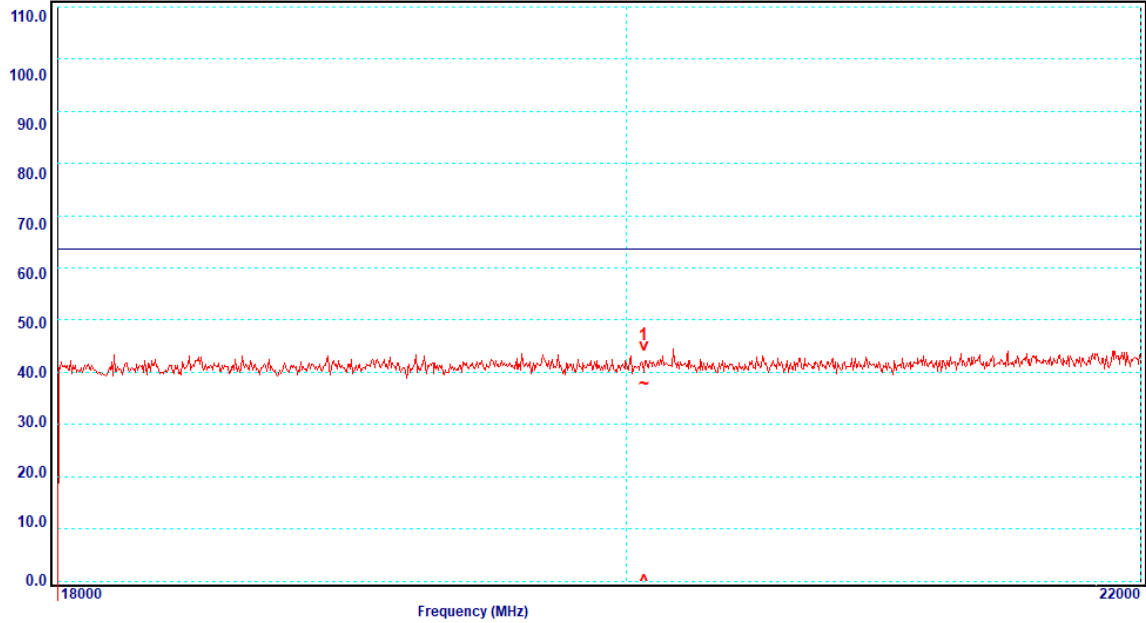
Job No: S210610
Test Date: 25/10/2021

Limit1: FCC-15209G FCC Part 15.209 Limits 18GHz to 40GHz at 1 Metre

Trace 2: Horizontal Emissions

Test Officer: Dong Feng-Plot date: 12-22-2021 10:43:25 WinstRS: 32.8-Wplit: 160.16-Rx: R&S, ESU-40, 100183/04
tA3050424 c1: C4130622 c2: C4140622 p: NONE a: NONE
Site ID: Syd Room#3, 3/67 Station Rd, Seven Hills, NSW

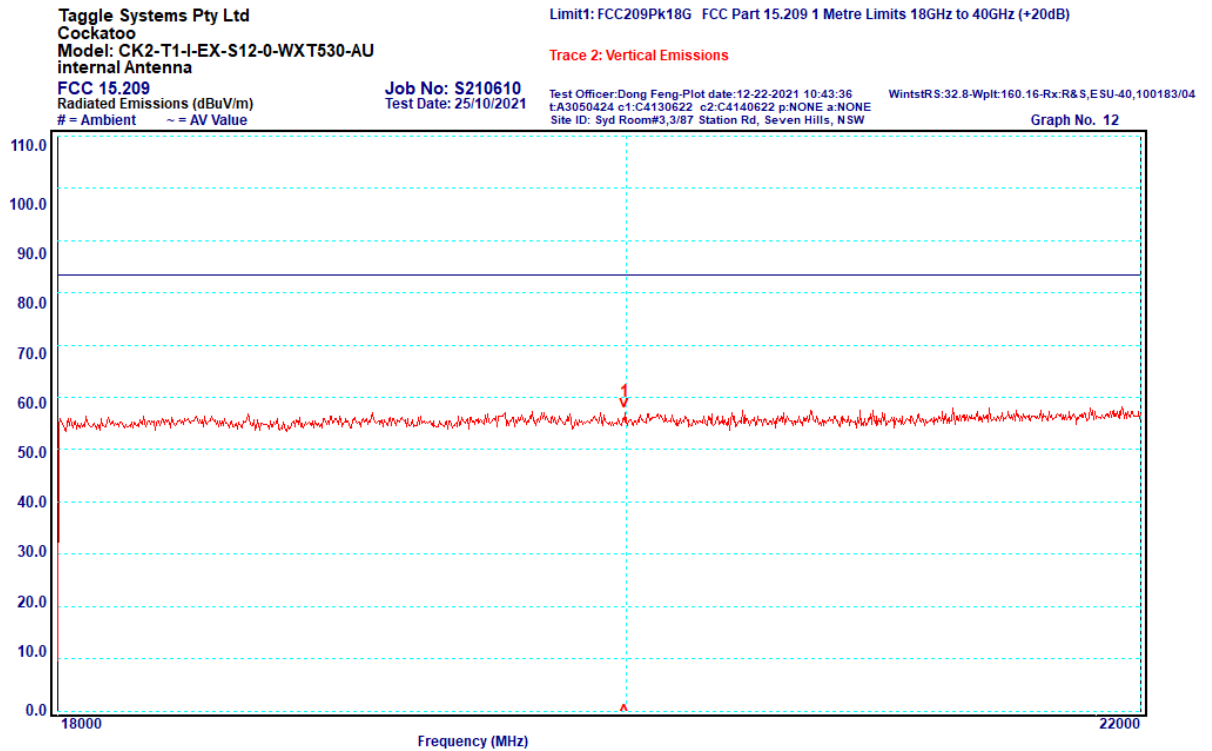
Graph No. 11



Peak	Frequency (MHz)	Antenna Polarisation	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	20066.78	Horizontal	37.6	63.5	-25.9

3.7.2.1.4.2 Peak Measurements

Vertical Emissions 18000 to 22000MHz



Peak	Frequency (MHz)	Antenna Polarisation	Peak (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	19994.05	Vertical	57.1	83.5	-26.4

Horizontal Emissions

18000 to 22000MHz

Taggle Systems Pty Ltd
Cockatoo
Model: CK2-T1-I-EX-S12-0-WXT530-AU
internal Antenna
FCC 15.209
Radiated Emissions (dBuV/m)
= Ambient ~ = AV Value

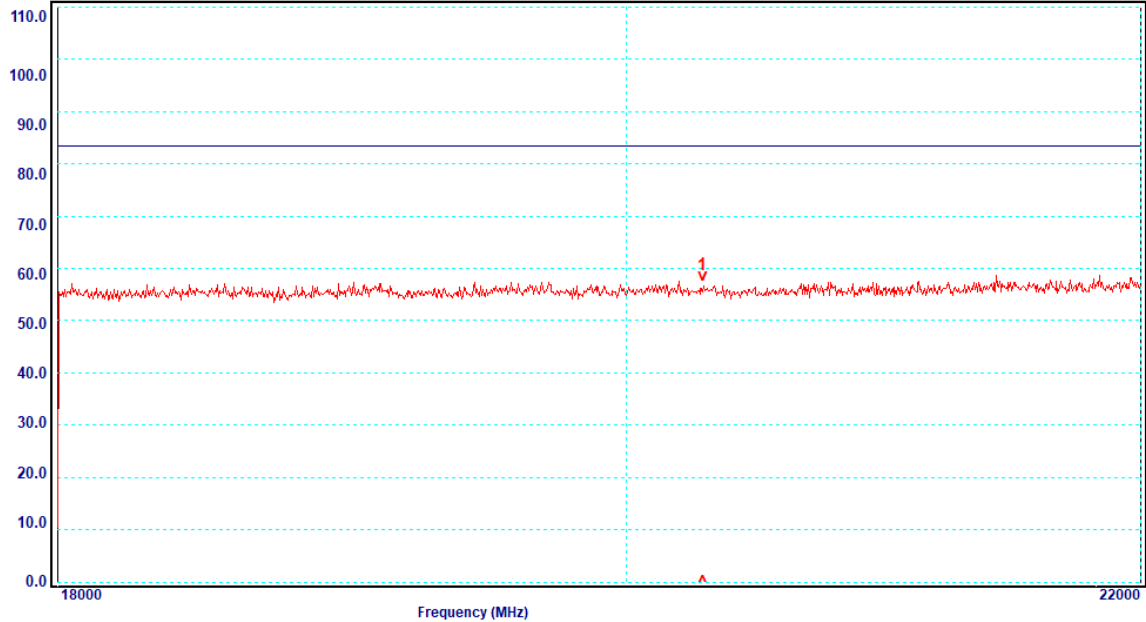
Job No: S210610
Test Date: 25/10/2021

Limit1: FCC209Pk18G FCC Part 15.209 1 Metre Limits 18GHz to 40GHz (+20dB)

Trace 2: Horizontal Emissions

Test Officer: Dong Feng-Plot date: 12-22-2021 10:43:45 WinstRS: 32.8-Wpit: 160.16-Rx: R&S, ESU-40, 100183/04
t: A3060424 e1: C4130622 c2: C4140622 p: NONE a: NONE
Site ID: Syd Room#3, 3/87 Station Rd, Seven Hills, NSW

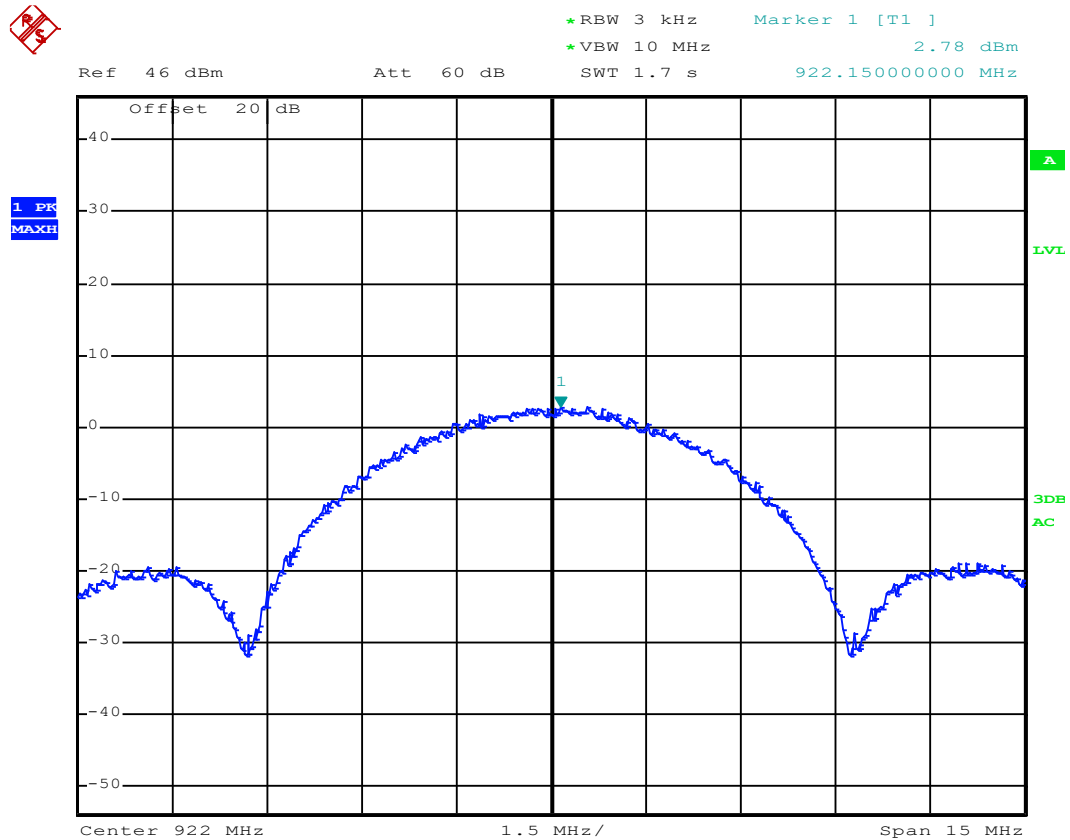
Graph No. 13



Peak	Frequency (MHz)	Antenna Polarisation	Peak (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	20285.76	Horizontal	56.6	83.5	-26.9

3.8 §15.247(e)/RSS-247 5.2(b) Power Spectral Density

The tests were performed in accordance with ANSI C63.10: 2013 Clause 11.10 Maximum power spectral density level in the fundamental emissions.
Power Spectral Density measurements were made at conducted method. The measurement resolution bandwidth was 3 kHz.



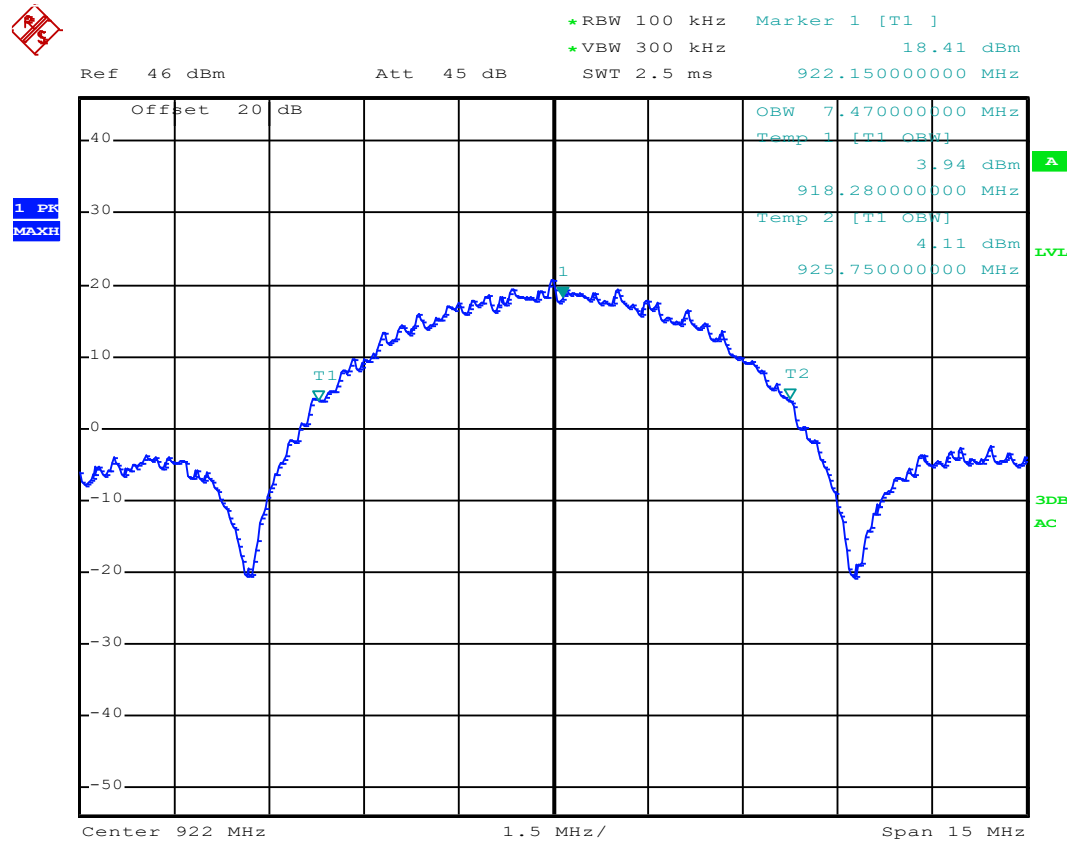
Date: 11.OCT.2021 12:38:42

Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)	Result
922.15	2.78	8.0	-5.22	Complied

3.9 §2.1049/RSS-Gen 6.6 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.

The 99% power bandwidth was **7.47MHz**.



Date: 11.OCT.2021 12:41:41

3.10 §15.247(i) Maximum Permissible Exposure

Table 1—Limits for Maximum Permissible Exposure (MPE)

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

The MPE was evaluated at 20 cm to show compliance with the power density listed in table, The following formula was used to calculate the power density at 20 cm

$$S = \frac{P * G}{4\pi R^2}$$

$$S = \frac{EIRP}{4\pi R^2}$$

Where

(S): Power density (mW/cm^2)

(P): Output power at antenna terminal (mW)

(G): Gain (ratio)

(R): Minimum test separation distance (20 cm)

Frequency (MHz)	Power	Gain	Duty Cycle	EIRP	EIRP	Flux Density at 20 cm	Flux Density limit	Percentage of the limit
	<i>dBm</i>	<i>dBi</i>	%	<i>dBm</i>	<i>mW</i>	<i>mW/cm²</i>	<i>mW/cm²</i>	%
922	26.6	2	100%	28.6	725.0	0.14	0.61	23.00%

Based on an assessment of the documentation provided the device complies with the 47 CFR Part 2.1091. An exclusion zone of 20 cm in front of the radiating elements applies, elsewhere the exposure level was below the applicable limits.

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

RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10	83	90	-	Instantaneous
0.1-10	-	0.73/ f	-	6"
1.1-10	87/ $f^{0.5}$	-	-	6"
10-20	27.46	0.0728	-2	6
20-48	58.07/ $f^{0.25}$	0.1540/ $f^{0.25}$	8.944/ $f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 $f^{0.3417}$	0.008335 $f^{0.3417}$	0.02619 $f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ $f^{1.2}$
150000-300000	0.158 $f^{0.5}$	4.21 x 10 ⁻⁴ $f^{0.5}$	6.67 x 10 ⁻⁵ f	616000/ $f^{1.2}$

The MPE was evaluated at 20 cm to show compliance with the power density listed in table, The following formula was used to calculate the power density at 20 cm.

$$S = \frac{P * G}{4\pi R^2}$$

$$S = \frac{EIRP}{4\pi R^2}$$

Where

(S): Power density (W/m²)

(P): Output power at antenna terminal (W)

(G): Gain (ratio)

(R): Minimum test separation distance (0.2 m)

Frequency (MHz)	Power	Gain	Duty Cycle	EIRP	EIRP	Flux Density at 20 cm	Flux Density limit	Percentage of the limit
	<i>dBm</i>	<i>dBi</i>	%	<i>dBm</i>	<i>W</i>	<i>W/m²</i>	<i>W/m²</i>	%
922	26.6	2	100%	28.6	0.725	1.44	2.78	51.8%

Based on an assessment of the documentation provided the device complies with the RF exposure requirements of RSS-102. An exclusion zone of 20 cm in front of the radiating elements applies, elsewhere the exposure level was below the applicable limits.

3.12 Spot Check Testing Results

EUT: Cockatoo, Model: CK2-T1-C-1B-0-0-FL2-AU

3.12.1 §15.203/ RSS-Gen 8.3/ RSS-Gen 6.8 Antenna Requirement

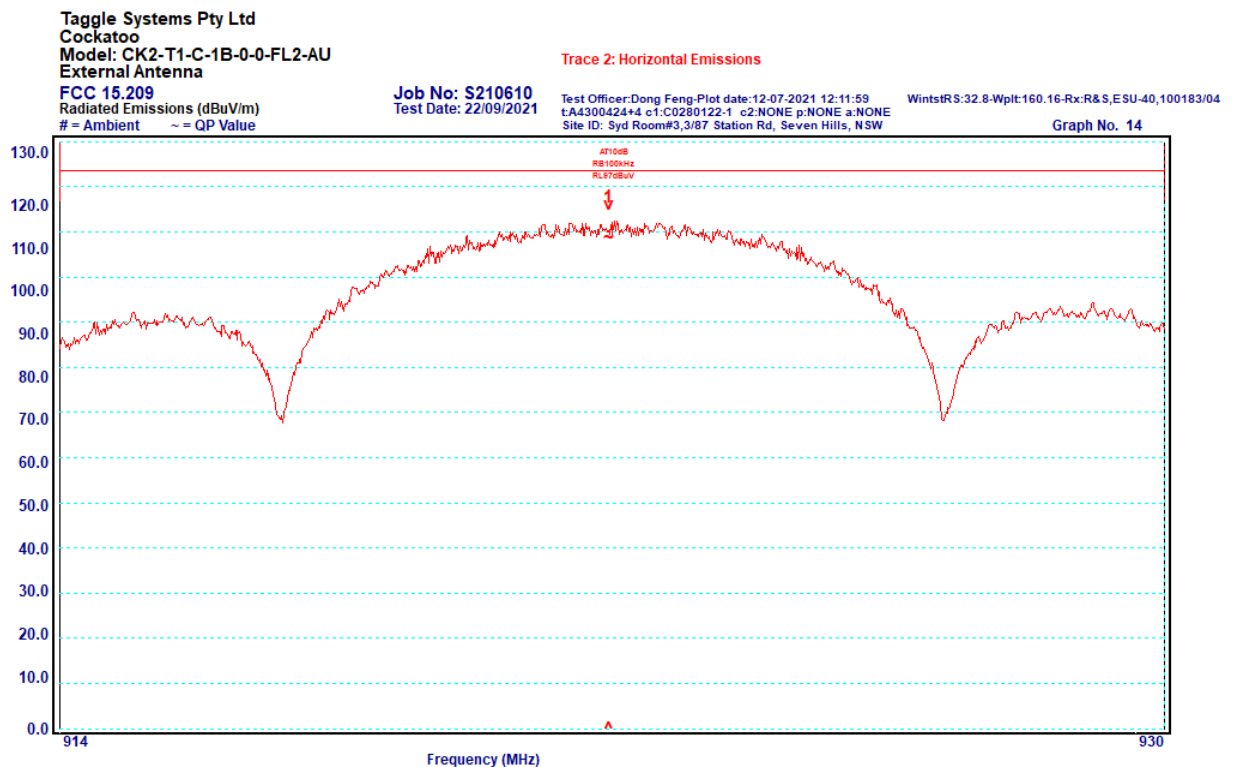
Parameters	
Antenna Gain	1 dBi
Antenna Type	Patch
Antenna Connector	Cable with SMA Male
Device Antenna Connector	SMA Female

The above antennas will be installed by professional installer only.

3.12.2 Band-Edge Emission Measurements

Band-edge measurements were done using radiated in accordance to ANSI C63.10 clause 6.10. All emissions measured near the lower and higher band edge complied with the requirements of §15.247/ RSS-247 5.0.

100kHz reference measurement

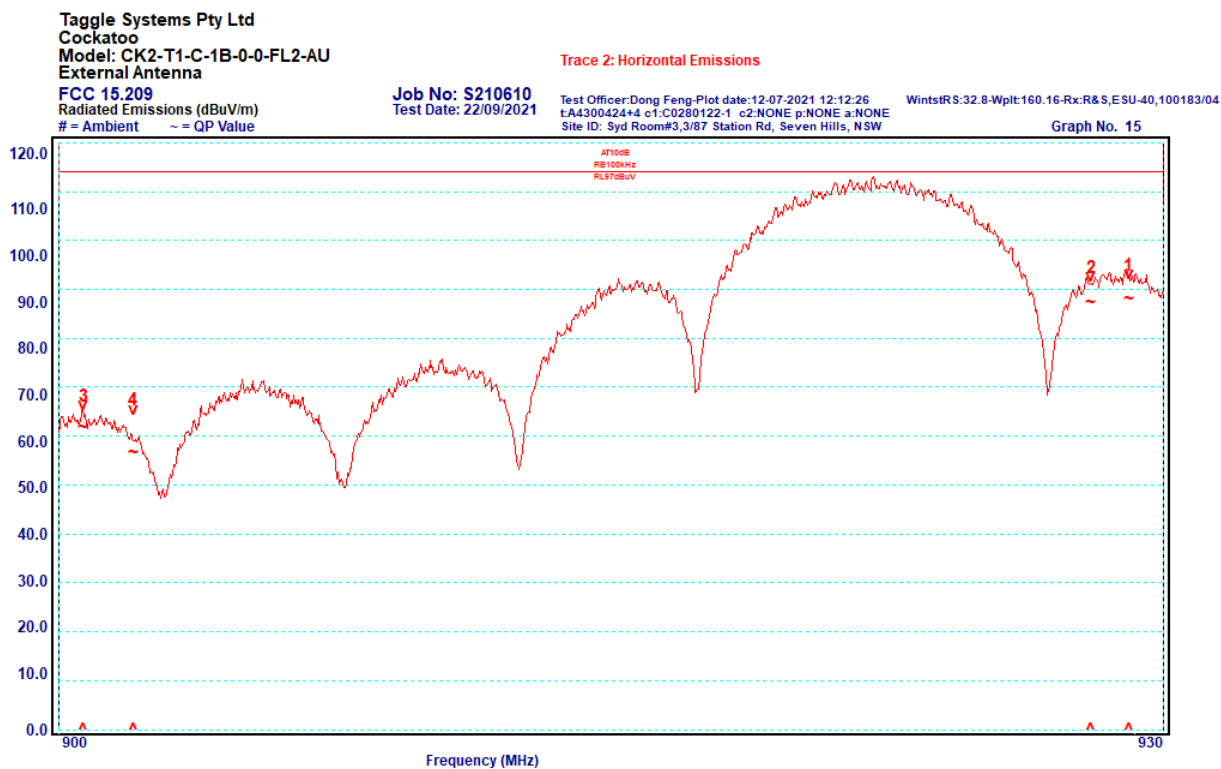


Peak	Frequency (MHz)	100 kHz Bandwidth level (dBuV/m) @3m	20 dB below the 100 kHz Bandwidth level (dBuV/m) @3m
1	921.92	108.6	88.6



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The worst Emission 900 to 930MHz



Peak	Frequency (MHz)	Peak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Result
1	929.05	88.0	88.6	-0.6	Complied
2	928.00	87.4	88.6	-1.2	
3	900.68	61.6	88.6	-27.0	
4	902.00	56.7	88.6	-31.9	

3.12.3 Radiated Spurious Measurements

Test Procedure refer to section 3.7.2

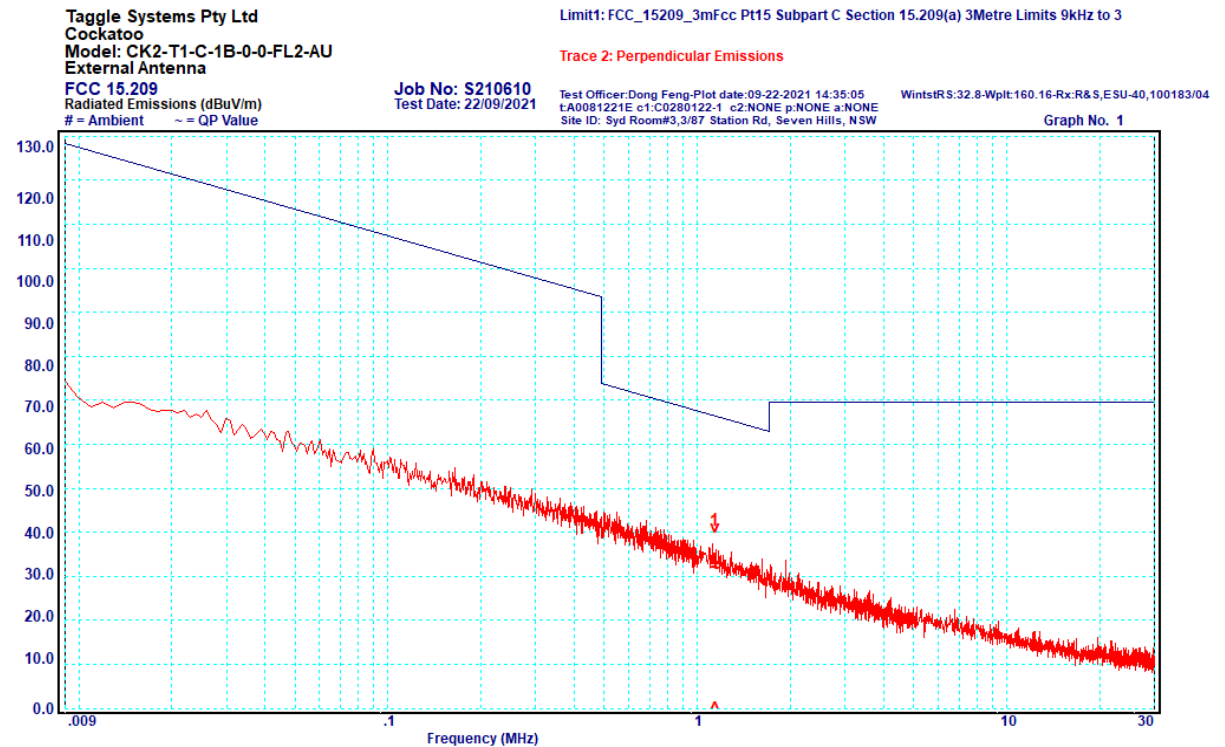
All emissions measured complied with the §15.209(a), §15.205&§15.247(d) requirements of spurious emission of the standard.

Frequency Band: 9 kHz – 30MHz

Perpendicular Emissions

External Antenna Unit

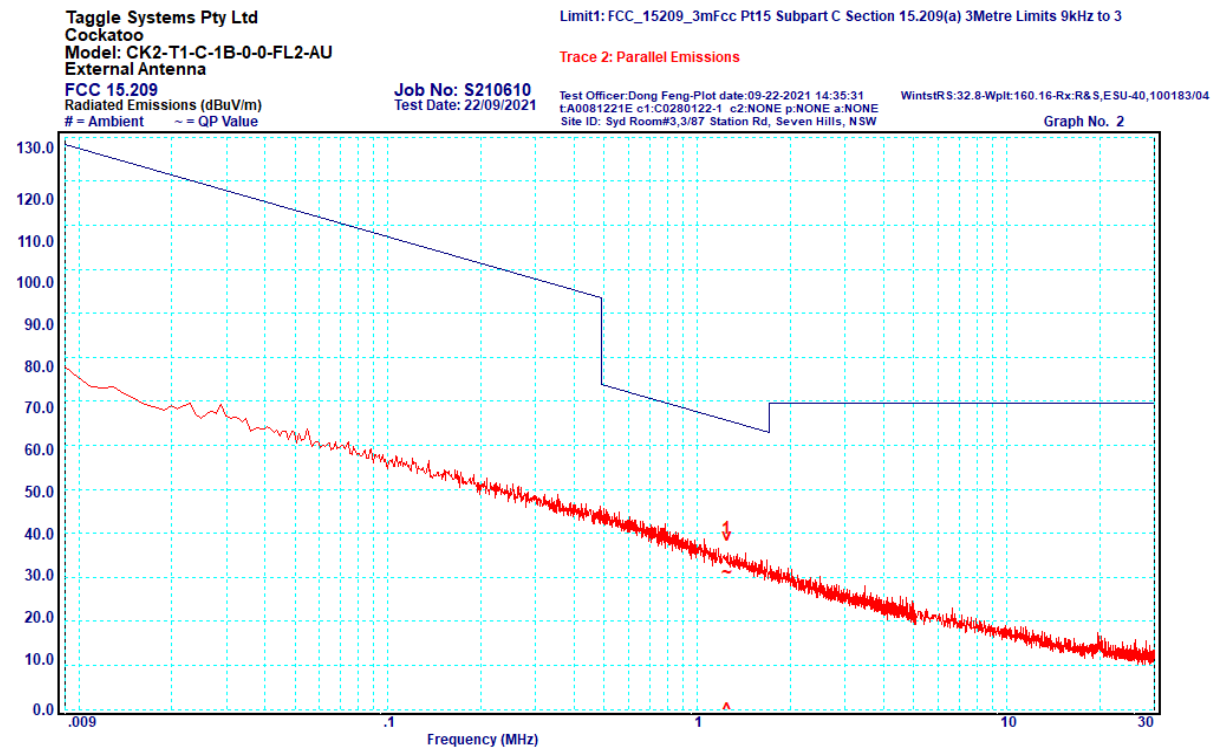
9kHz to 30MHz



Peak	Frequency (MHz)	Antenna Polarisation	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	1.142	Perpendicular	31.8	66.5	-34.7

Parallel Emissions

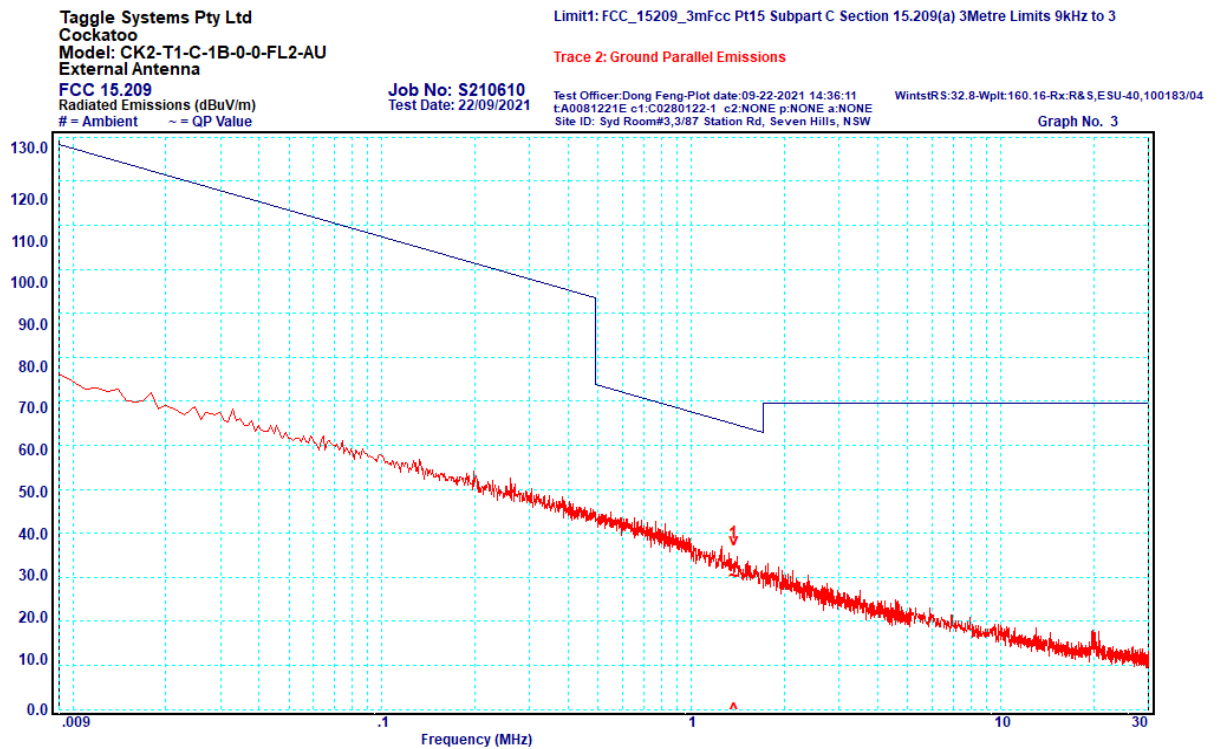
9kHz to 30MHz



Peak	Frequency (MHz)	Antenna Polarisation	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	1.243	Parallel	30.9	65.8	-34.9

Ground Parallel Emissions

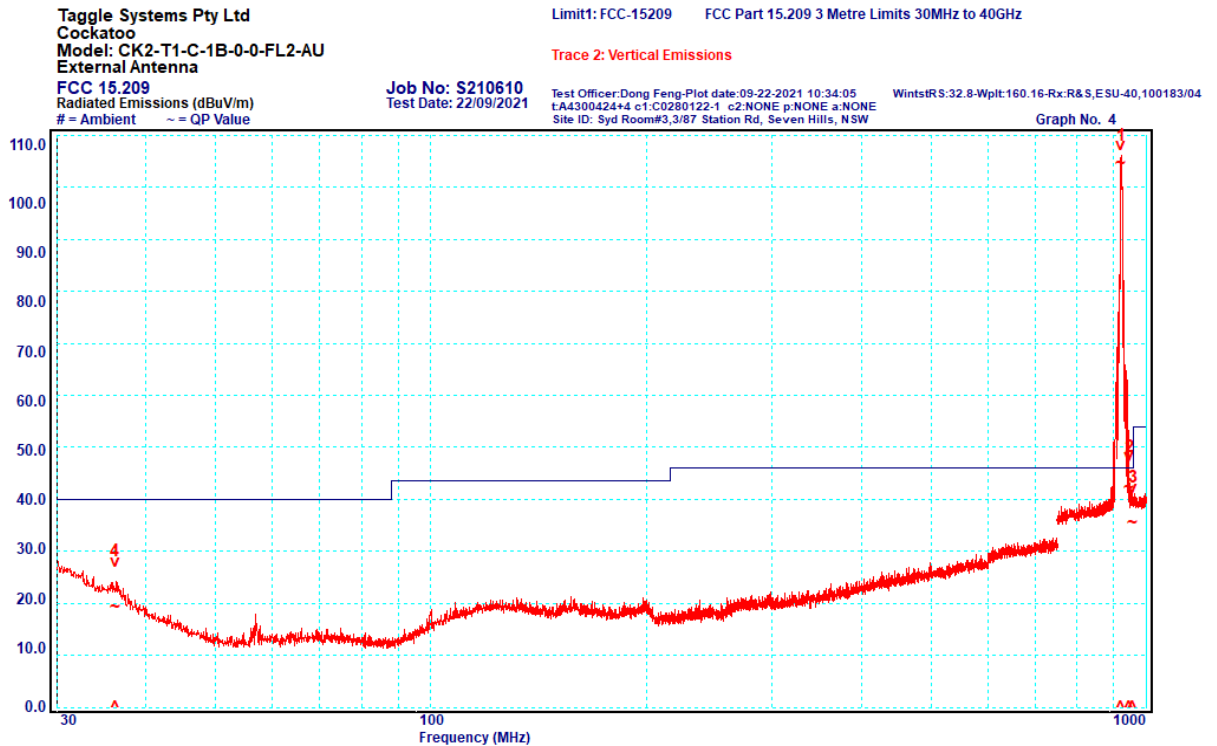
9kHz to 30MHz



Peak	Frequency (MHz)	Antenna Polarisation	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	1.374	Ground Parallel	30.1	64.9	-34.8

Frequency Band: 30 – 1000MHz

Vertical Emissions External Antenna Unit 30MHz to 1000MHz

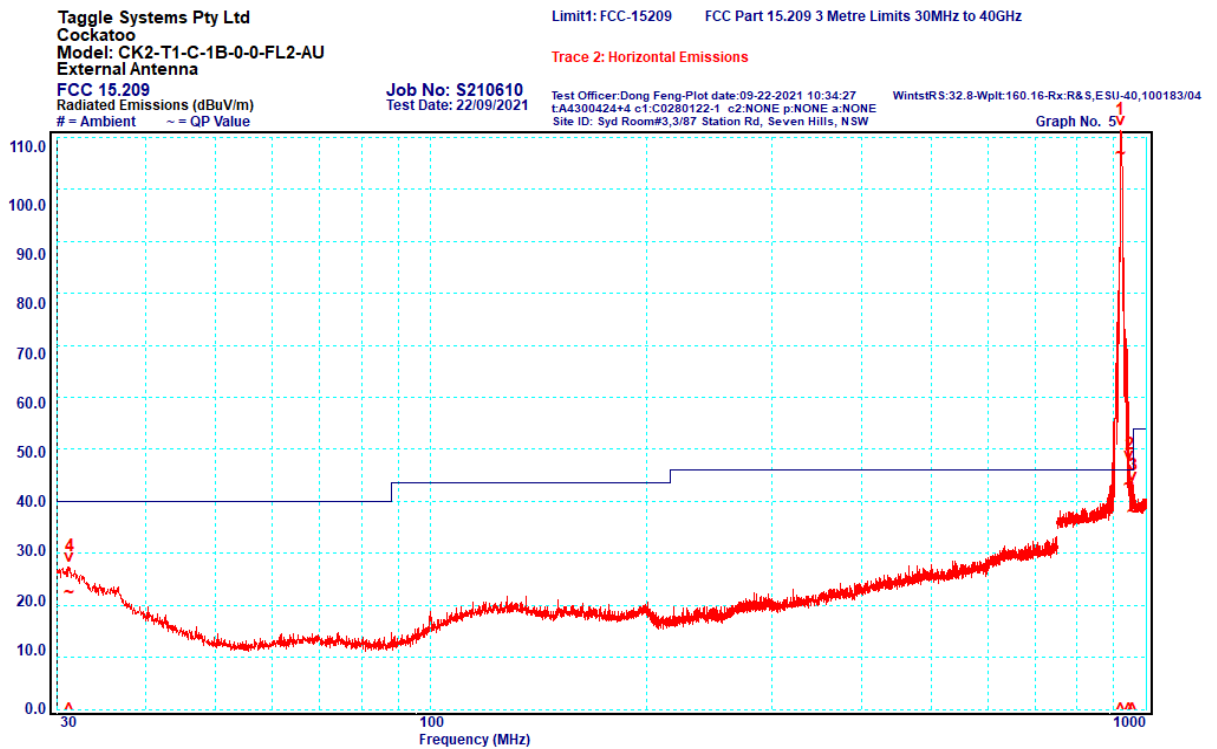


Peak	Frequency (MHz)	Antenna Polarisation	Quasi Peak (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	922.00	Vertical	N/A	N/A	N/A *
2	947.62	Vertical	42.2	46.0	-3.8
3	957.68	Vertical	35.4	46.0	-10.6
4	36.230	Vertical	19.2	40.0	-20.8

*The peak above the limit is the fundamental transmission and not subject to the spurious emissions limit of the standard

Horizontal Emissions

30MHz to 1000MHz



Peak	Frequency (MHz)	Antenna Polarisation	Quasi Peak (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	920.85	Horizontal	N/A	N/A	N/A *
2	947.04	Horizontal	43.2	46.0	-2.8
3	958.03	Horizontal	38.0	46.0	-8.0
4	31.320	Horizontal	22.4	40.0	-17.6

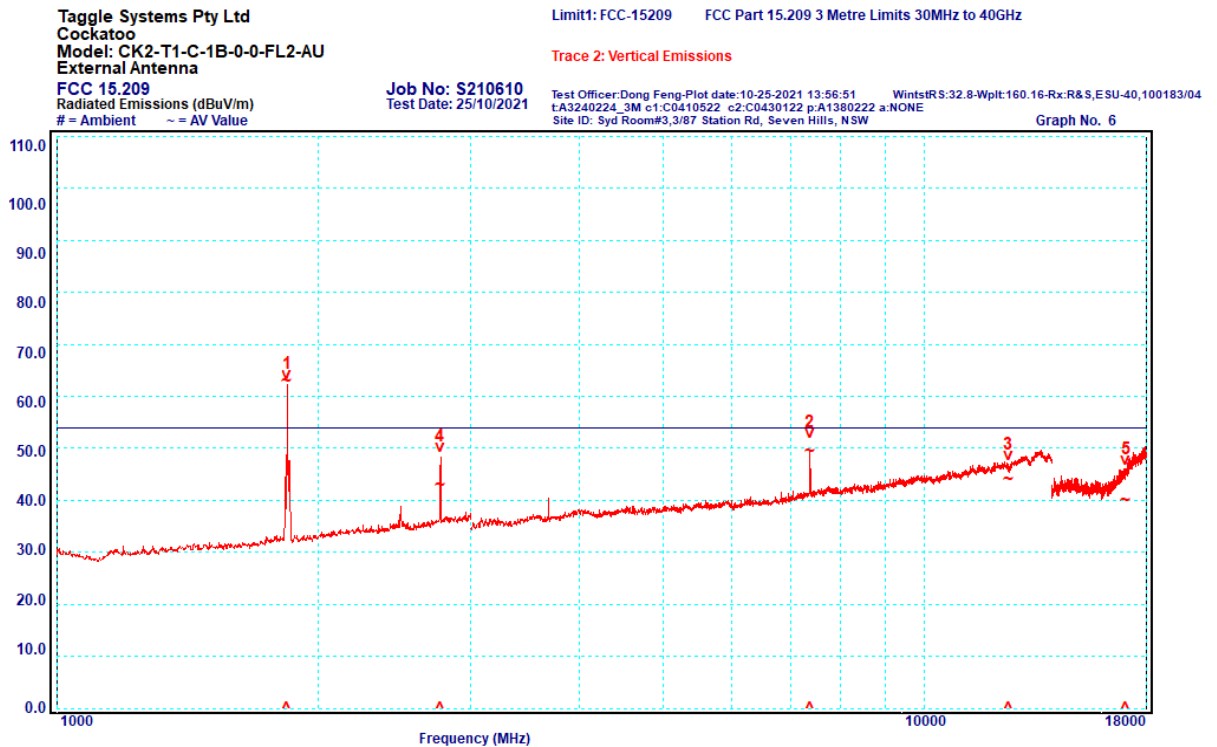
*The peak above the limit is the fundamental transmission and not subject to the spurious emissions limit of the standard

Frequency Band: 1000 – 18000 MHz

Average Measurements

Vertical Emissions

1000MHz to 18000MHz

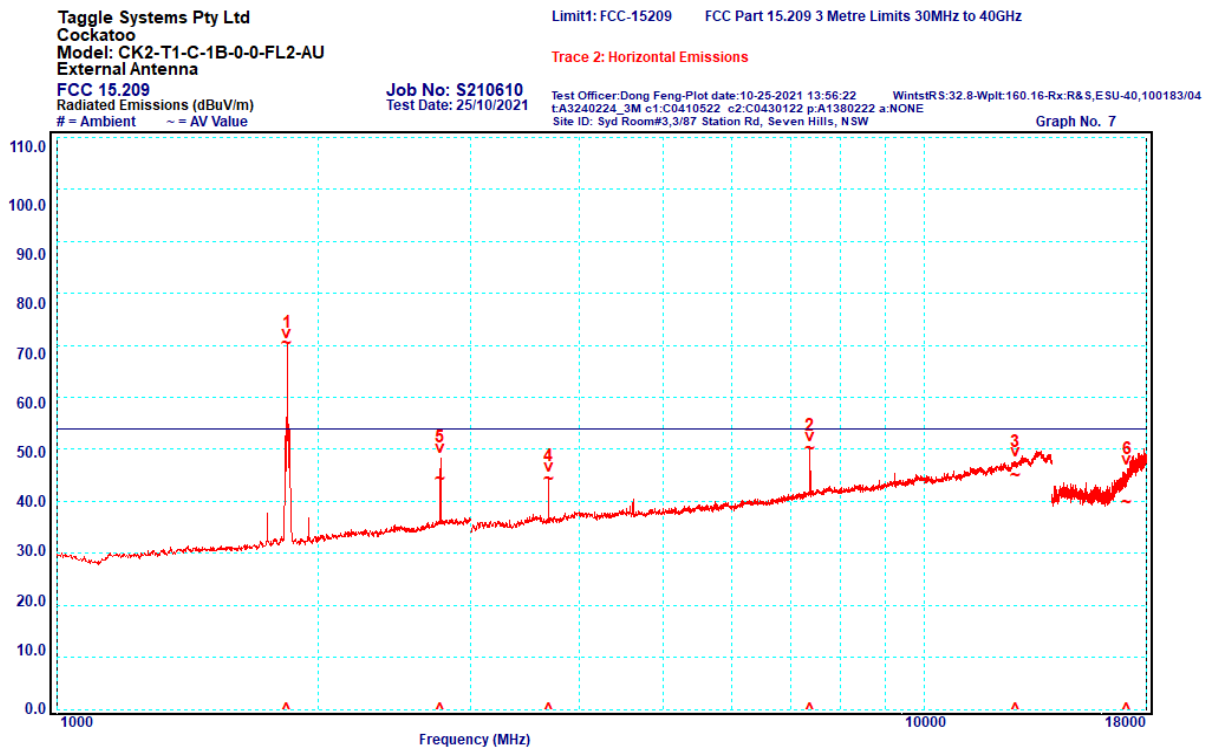


Peak	Frequency (MHz)	Antenna Polarisation	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	1844.01	Vertical	N/A	N/A	N/A*
2	7375.98	Vertical	49.5	54.0	-4.5
3	12484.1	Vertical	44.1	54.0	-9.9
4	2765.89	Vertical	42.8	54.0	-11.2
5	17042.5	Vertical	39.9	54.0	-14.1

*The Non-Restricted Band Frequency is not subject the average limit of the spurious emission of the standard.

Horizontal Emissions

1000MHz to 18000MHz



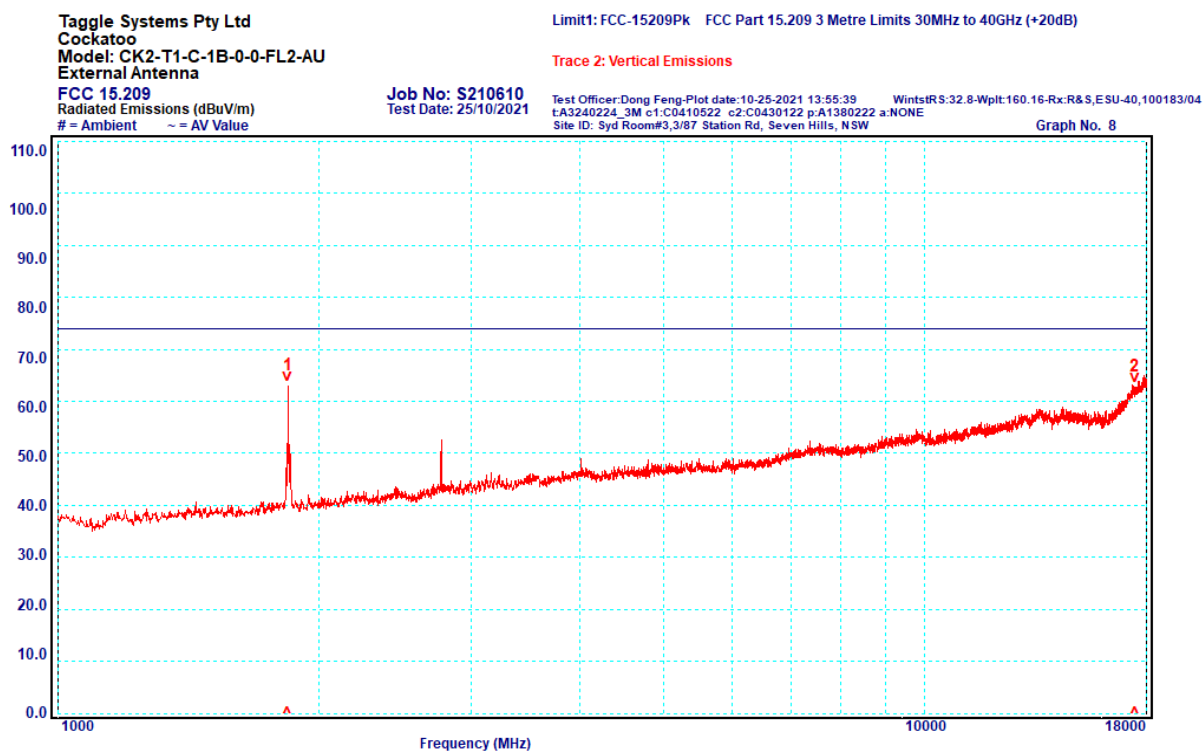
Peak	Frequency (MHz)	Antenna Polarisation	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	1843.98	Horizontal	N/A	N/A	N/A *
2	7375.95	Horizontal	50.0	54.0	-4.0
3	12711.1	Horizontal	44.8	54.0	-9.2
4	3687.92	Horizontal	44.2	54.0	-9.8
5	2765.84	Horizontal	44.1	54.0	-9.9
6	17092.1	Horizontal	39.7	54.0	-14.3

*The Non-Restricted Band Frequency is not subject the average limit of the spurious emission of the standard.

Peak Measurements

Vertical Emissions

1000MHz to 18000MHz



Peak	Frequency (MHz)	Antenna Polarisation	Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1	1843.18	Vertical	63.0	74.0	-11.0
2	17444.6	Vertical	62.7	74.0	-11.3

Horizontal Emissions

1000MHz to 18000MHz

Taggle Systems Pty Ltd
Cockatoo
Model: CK2-T1-C-1B-0-0-FL2-AU
External Antenna
FCC 15.209
Radiated Emissions (dBuV/m)
= Ambient ~ = AV Value

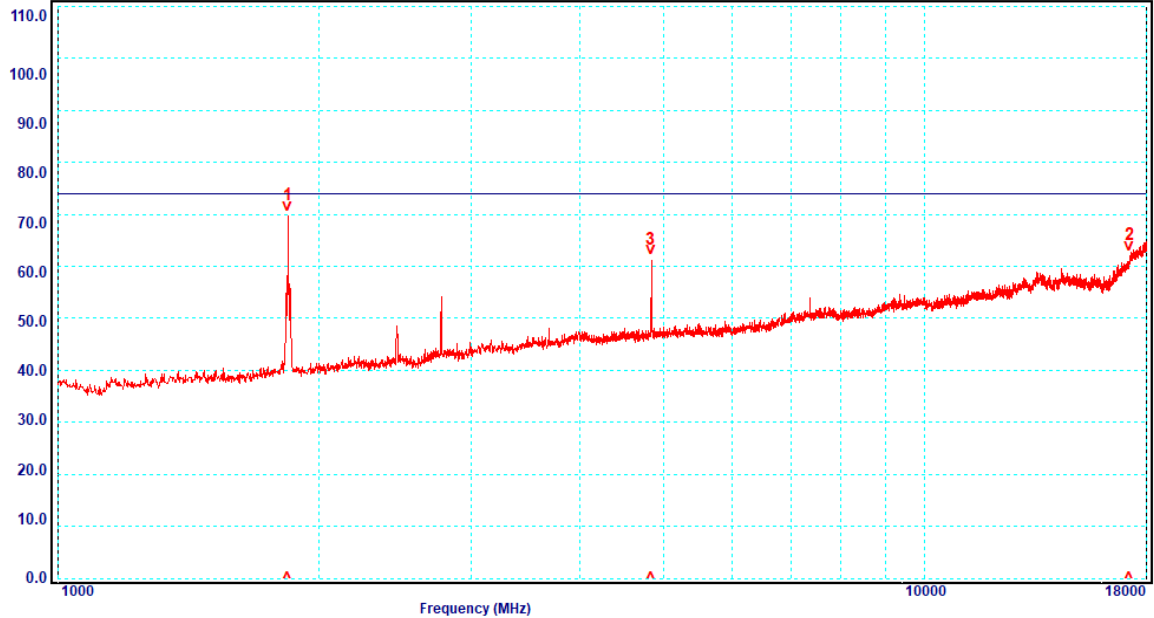
Job No: S210610
Test Date: 25/10/2021

Limit1: FCC-15209Pk FCC Part 15.209 3 Metre Limits 30MHz to 40GHz (+20dB)

Trace 2: Horizontal Emissions

Test Officer: Dong Feng-Plot date: 10-25-2021 13:56:14 WinstRS: 32.8-Wplt: 160.16-Rx: R&S, ESU-40, 100183/04
t: A3240224_3M c1: C0410522 c2: C0430122 p: A1380222 a: NONE
Site ID: Syd Room#3, 3/87 Station Rd, Seven Hills, NSW

Graph No. 9



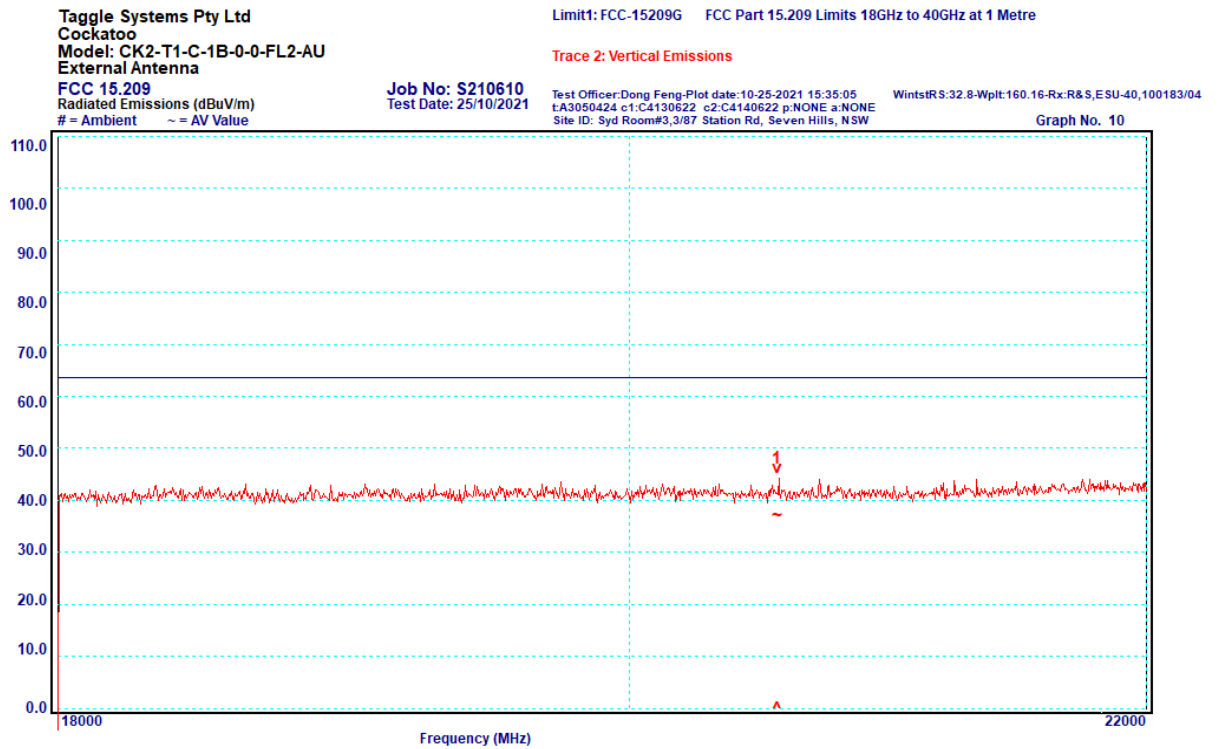
Peak	Frequency (MHz)	Antenna Polarisation	Peak (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	1843.18	Horizontal	69.6	74.0	-4.4
2	17212.9	Horizontal	62.1	74.0	-11.9
3	4831.21	Horizontal	61.2	74.0	-12.8

Frequency Band: 18000 – 22000MHz

Average Measurements

Vertical Emissions

18000 to 22000MHz



Peak	Frequency (MHz)	Antenna Polarisation	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	20553.64	Vertical	37.1	63.5	-26.4

Horizontal Emissions

18000 to 22000MHz

Taggle Systems Pty Ltd
Cockatoo
Model: CK2-T1-C-1B-0-0-FL2-AU
External Antenna
FCC 15.209
Radiated Emissions (dBuV/m)
= Ambient ~ = AV Value

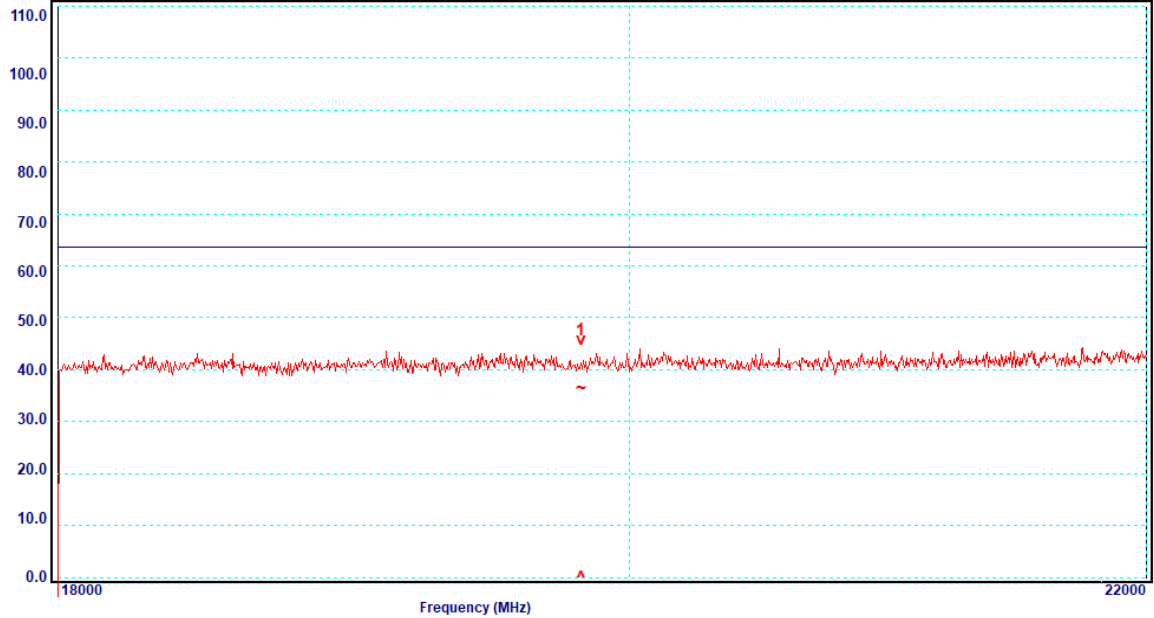
Job No: S210610
Test Date: 25/10/2021

Limit1: FCC-15209G FCC Part 15.209 Limits 18GHz to 40GHz at 1 Metre

Trace 2: Horizontal Emissions

Test Officer: Dong Feng-Plot date: 10-25-2021 15:32:46 Wints: RS:32.8-Wplt:160.16-Rx:R&S,ESU-40,100183/04
LA3050424 c1:C4130622 c2:C4140622 p:NONE a:NONE
Site ID: Syd Room#3,3/87 Station Rd, Seven Hills, NSW

Graph No. 11

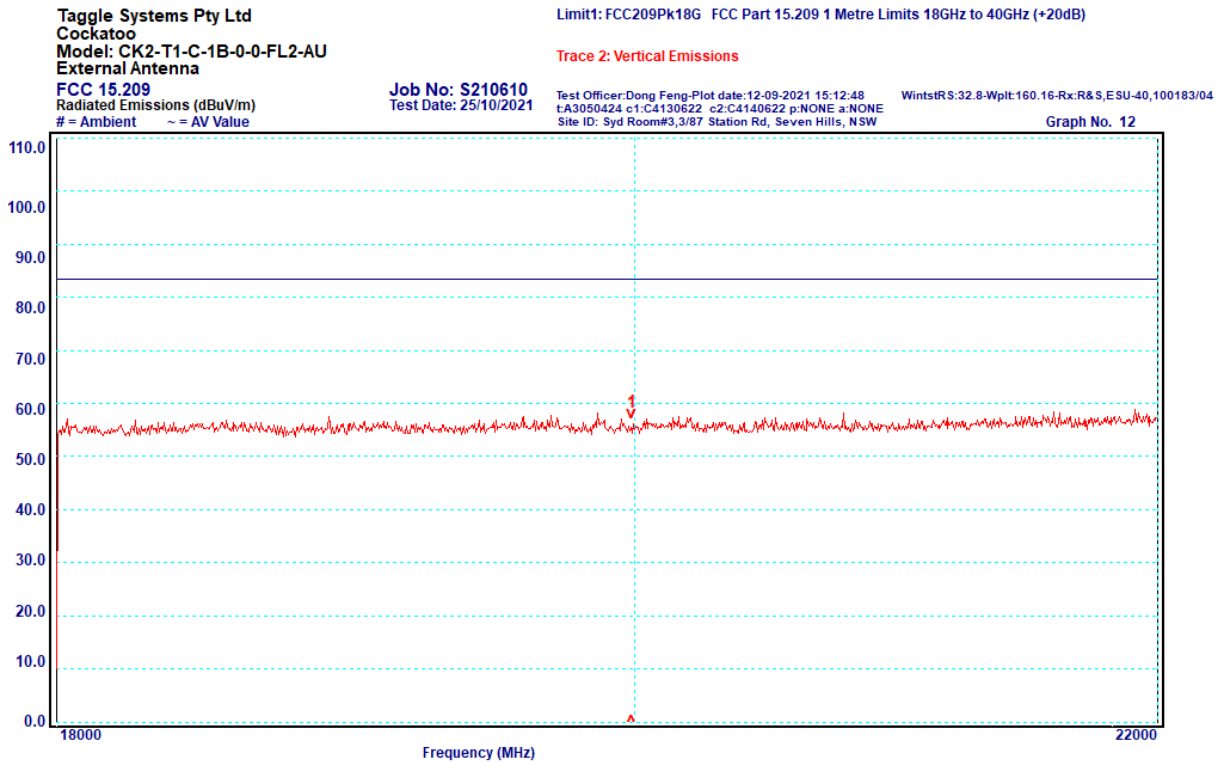


Peak	Frequency (MHz)	Antenna Polarisation	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	19824.62	Horizontal	36.4	63.5	-27.1

Peak Measurements

Vertical Emissions

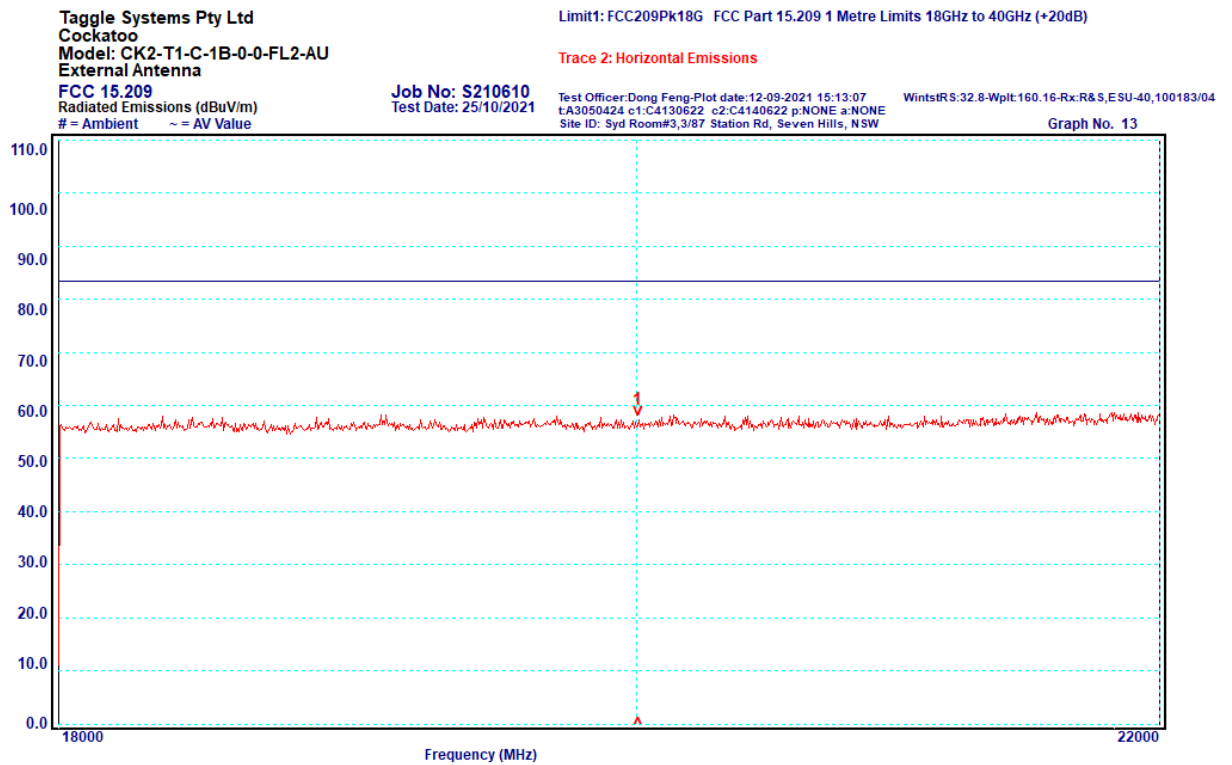
18000 to 22000MHz



Peak	Frequency (MHz)	Antenna Polarisation	Peak (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	19990.05	Vertical	56.1	83.5	-27.4

Horizontal Emissions

18000 to 22000MHz



Peak	Frequency (MHz)	Antenna Polarisation	Peak (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	20006.04	Horizontal	57.2	83.5	-26.3

4.0 COMPLIANCE STATEMENT

The Cockatoo with Model Number: CK2-T1-I-EX-S12-0-WXT530-AU and CK2-T1-C-1B-0-0-FL2-AU on behalf of Taggle Systems Pty Ltd complied with all the applicable requirements of 47 CFR, Part 15 Subpart C - Rules for Radio Frequency Devices (intentional radiators) and RSS-247 Issue 2 for a Digital Transmission System (DTS) operating within the band: 902 MHz to 928 MHz.



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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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