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RADIO TEST REPORT

REPORT NUMBER: M181212-6

TEST STANDARD: FCC PART 15 SUBPART C

(SECTION §15.207 & § 15.209)

CLIENT: BLUECHIIP LIMITED

DEVICE: MULTIVIAL READER

**MODEL: BLU-667 (MATCH BOX) & BLU-1200
(MULTIVIAL READER ATTACHMENT)**

FCC ID: 2ATNO-BRMV001

DATE OF ISSUE: 12 AUGUST 2022

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TEST CERTIFICATE

Device: Multivial Reader
Model Number: BLU-667 (Match Box) & BLU-1200 (Multivial Reader Attachment)
Serial Number: MB00003679(Match Box) & SAMB0014(Multivial Reader Attachment)
Equivalent Variant Model: BLU-1300 (Multivial Reader Attachment)

FCC ID: 2ATNO-BRMV001

Manufacturer: Bluechiip Limited

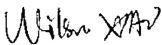
Tested for: Bluechiip Limited
Address: 1 Dalmore Drive, Scoresby, Vic, 3179
Phone Number: +61 (0) 3 97639763
Contact: Scott Turner
Email: Scott.turner@bluechiip.com

Standard: FCC Part 15 – Radio Frequency Devices
Subpart C – Intentional Radiators
Section §15.207 Conducted Limits
Section §15.209 Radiated emission limits; general requirements

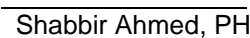
Result: The Test Sample complied with applicable requirements of FCC 47 CFR Part 15 Part C.
Refer to Report M181212-6 for full details

Test Date(s): 17 and 21 October, 07 and 12 November, 2019

Issue Date: 12 August 2022

Test Engineer(s): 
Wilson Xiao

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

Authorised Signatory: 
Shabbir Ahmed, PHD
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RADIO TEST REPORT

1 TEST SUMMARY

Section	Clause	Result(s)
6.1	§15.203 Antenna Requirement	Complied
6.2	§15.205 Restricted Bands of Operation	Complied*
6.3	§15.207 Conducted Limits	Complied
6.4	§15.215 Operating Frequency Range	Complied
6.5	§15.209 (a) Radiated emission limits; general requirements	Complied
*FCC Waiver ID: DA 11-461 (Allows Bluechiip tracking system to transmit in the three restricted bands within the 1.5-4.2 MHz band: 2.1735-2.1095 MHz, 4.125-4.128 MHz and 4.17725-4.17775 MHz)		

2 TEST FACILITY

2.1 General

EMC Technologies Pty Ltd is accredited by the FCC as a test laboratory able to perform compliance testing for the public. EMC Technologies Pty Ltd has also been designated 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 Pty Ltd is also an ISED Canada recognized testing laboratory – **ISED company number: 9626A and CAB identifier number: AU0001.**

2.2 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 similar to ISO 9002. NATA has mutual recognition agreements with the National Voluntary Laboratory Accreditation Program (NVLAP) and the American Association for Laboratory Accreditation (A²LA).

All testing in this report has been conducted in accordance with EMC Technologies' scope of NATA accreditation to ISO 17025 for both testing and calibration and ISO 17020 for Inspection – **Accreditation Number 5292.**

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

3 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-3-2 (R-144)	17/07/2017	17/07/2020	3 Year* ¹
EMI Receiver	R&S ESW26 Sn: 101306 (R-143)	27/05/2019	27/05/2020	1 Year* ²
Antennas	SUNOL JB1 Sn. A061917 (A-425)	09/04/2019	09/04/2020	1 Year* ²
	EMCO 6502 Active Loop Antenna Sn. 9311-2801 (A-231)	16/11/2018	16/11/2020	2 Year* ¹
Cables* ³	Huber & Suhner Sucoflex 104A Sn: 503055 (C-457)	21/01/2019	21/01/2020	1 Year* ¹
	Huber & Suhner Sucoflex 104A Sn: 507099 (C-479)	21/01/2019	21/01/2020	1 Year* ¹
	Huber & Suhner Sucoflex 104A Sn: 503061 (C-463)	21/01/2019	21/01/2020	1 Year* ¹

Note *1. Internal NATA calibration.

Note *2. External NATA / A2LA calibration.

Note *3. Cables are verified before measurements are taken.

4 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

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%.

5 DEVICE DETAILS

(Information supplied by the Client)

The Multivial Reader contains a Match Box and Multivial Reader attachment.

The Multivial Reader (MVR) is designed to scan the ID and temperature of 100 (10 X 10) vials in a Bluechiip CryoBox.

The Multivail Reader can sense the ID of the CryoBox and the vials in it via the CryoBox Tag.

5.1 EUT (Transmitter) Details

Radio:	RFID Transmitter
Operating Band:	1.3 – 4.5 MHz
No. of Channels:	80
Channel Bandwidth:	Approx. 30 kHz
Antenna:	Air coil Antenna 15 uH (MVR Read Coils) Air coil Antenna 15 uH (Box Read Coils)
FCC Waiver ID:	DA 11-461 (Allows Bluechiip tracking system to transmit in the three restricted bands within the 1.5-4.2 MHz band: 2.1735-2.1095 MHz, 4.125-4.128 MHz and 4.17725-4.17775 MHz)

5.2 EUT (Host) Details

Device under Test:	Multivial Reader
Model Number:	BLU-667 (Match Box) & BLU-1200 (Multivial Reader Attachment)
Serial Number:	MB00003679(Match Box) & SAMB0014(Multivial Reader attachment)
Equivalent Variant Model:	BLU-1300 (Multivial Reader Attachment) Refer to Customer Declaration for Equivalent Variant Model detail
Power requirements:	Input: 100-240V AC, 50/60 Hz, 1.5A Output: 12V DC, 5A

5.3 Test Configuration

Testing was performed with the EUT set to transmit continuously at 10 times per second.

Note: The EUT transmitter could not be configured to transmit separately on the Low, Mid and High channels. The interrogator steps through 80 sub-bands of approximately 30 kHz each over the 1.3-4.5 MHz band.

5.4 Modifications

No modification was required to achieve compliance.

6 RESULTS

6.1 §15.203 Antenna Requirement

RFID antenna is placed internally within the Bluechiip Multivial Reader. The below antennas will only be installed by the manufacturer. Said installation will preclude any unauthorised switching of antennas.

The RFID module incorporates the following antennas:

Antenna Type: Air coil antenna 15 uH (MVR Read Coils)

Antenna port to antenna connection: N/A. Soldered on PCB

Antenna Type: Air coil antenna 15 uH (Box Read Coils)

Antenna port to antenna connection: U. FL connector

6.2 §15.205 Restricted Bands of Operation

Provisions of the §15.205 restricted bands of operation have been met.

Bluechiip has an FCC Waiver (ID: DA 11-461) that allows Bluechiip tracking system to transmit in the three restricted bands within the 1.5-4.2 MHz band: 2.1735-2.1095 MHz, 4.125-4.128 MHz and 4.17725-4.17775 MHz)

6.3 §15.207 Conducted Limits

The Bluechiip Multivial Reader System is powered by a plug pack as detailed below.

Plug pack:	IDEAL POWER
Model:	JYH32-1205000
Input supply:	100-240V AC, 50/60 Hz, 1.5A
Output supply:	12V DC, 5A

6.3.1 Test Procedure

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 specified 0.15 MHz to 30 MHz frequency range was sub-divided into sub-ranges to ensure that all short duration peaks were captured. 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.

6.3.2 Limits

The limit applied was in accordance to the conducted limits defined in §15.207.

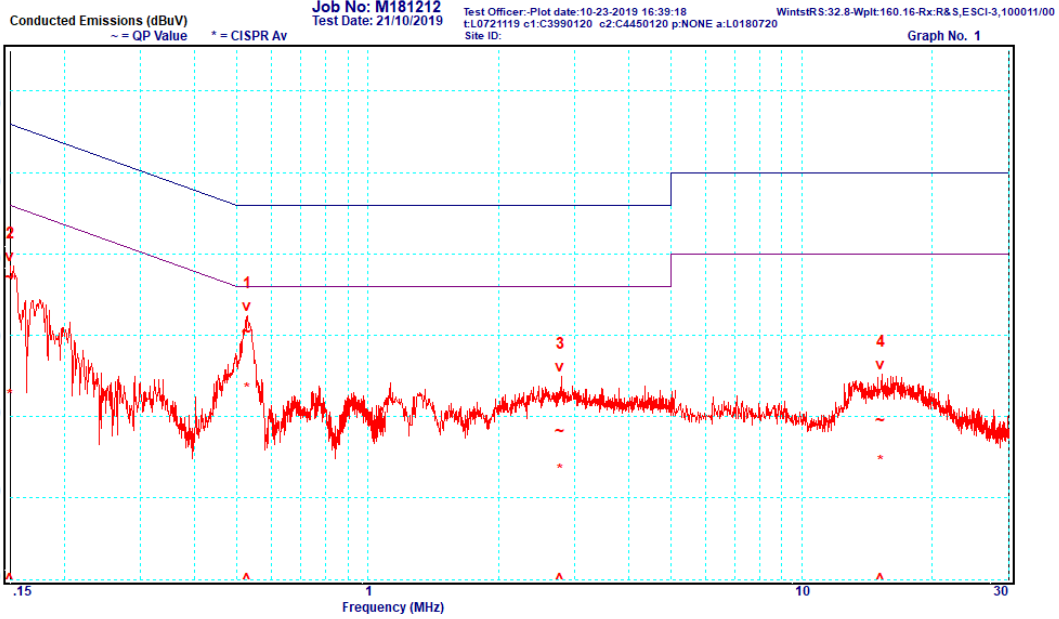
6.3.3 Results

The sample complied with the conducted emission limits of §15.207.

Testing was performed over the frequency range of 150 kHz to 30 MHz at a voltage of 110V AC, 60 Hz.

M181212
MVR
FCC 15.207

Limit1: FCC207_QP FCC Part 15.207 Conducted Quasi-Peak Limit
Limit2: FCC207_AV FCC Part 15.207 Conducted Average Limit
Trace 2: Active Line



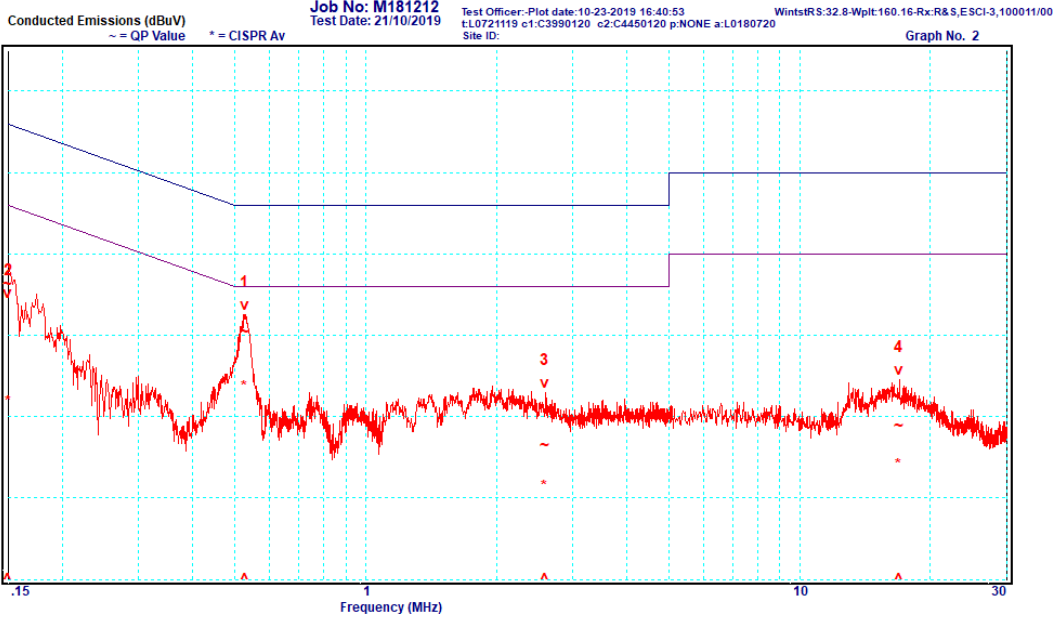
Graph 6-1: Active Line (0.15 MHz to 30 MHz)

Table 6-1: Active Line (0.15 MHz to 30 MHz)

Peak	Frequency [MHz]	Line	Quasi-Peak			Average		
			Level [dB μ V]	Limit [dB μ V]	Margin [dB]	Level [dB μ V]	Limit [dB μ V]	Margin [dB]
1	0.529	Active	40.4	56	-15.6	33.4	46	-12.6
2	0.15	Active	47	66	-19	32.5	56	-23.5
3	2.776	Active	28.1	56	-27.9	23.4	46	-22.6
4	15.22	Active	29.5	60	-30.5	24.4	50	-25.6

M181212
MVR
FCC 15.207

Limit1: FCC207_QP FCC Part 15.207 Conducted Quasi-Peak Limit
Limit2: FCC207_AV FCC Part 15.207 Conducted Average Limit
Trace 2: Neutral Line



Graph 6-2: Neutral Line (0.15 MHz to 30 MHz)

Table 6-2: Neutral Line (0.15 MHz to 30 MHz)

Peak	Frequency [MHz]	Line	Quasi-Peak			Average		
			Level [dBμV]	Limit [dBμV]	Margin [dB]	Level [dBμV]	Limit [dBμV]	Margin [dB]
1	0.527	Neutral	40.5	56	-15.5	33.6	46	-12.4
2	0.15	Neutral	46.2	66	-19.8	31.8	56	-24.2
3	2.582	Neutral	26.4	56	-29.6	21.4	46	-24.6
4	16.89	Neutral	28.8	60	-31.2	24.1	50	-25.9

6.4 §15.215 Operating Frequency Range

6.4.1 Test procedure

A near-field passive probe was used to measure the operating frequency range. The RFID reader was allowed to sweep across its band of operation with the EMI receiver set at Max-Hold until the trace stabilised. The frequencies of the upper and lower edges that were 20 dB below the peak were recorded.

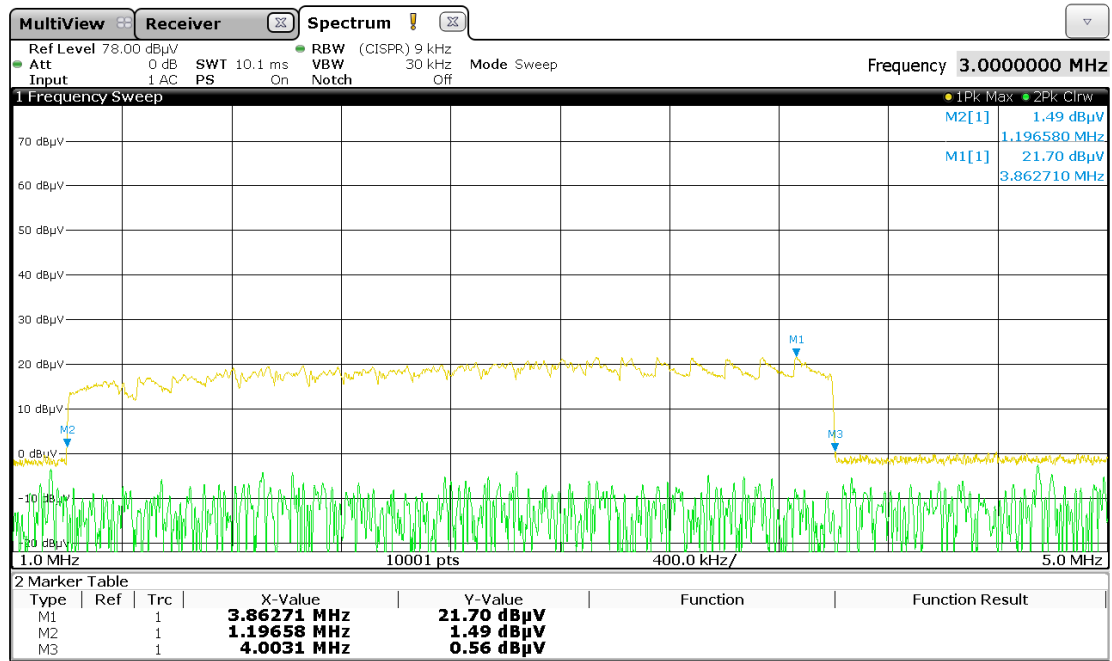
6.4.2 Limits

No set limits.

6.4.3 Results

Table 6-3: Operating Frequency Range

	Low Frequency [MHz]	High Frequency [MHz]
20 dB below the peak	1.19658	4.0031



Graph 6-3: Operating Frequency Range

6.5 §15.209 Radiated emission limits; general requirements

6.5.1 Test procedure

Radiated emissions 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 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	

EUT was set at 0.8 m for measurements below 1000 MHz and set at 1.5 m at measurements above 1000 MHz.

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. For below 1000 MHz the emissions were measured with a Quasi-Peak detector, and for above 1000 MHz the emissions were measured with Peak and 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 polarisations of the measurement antenna.

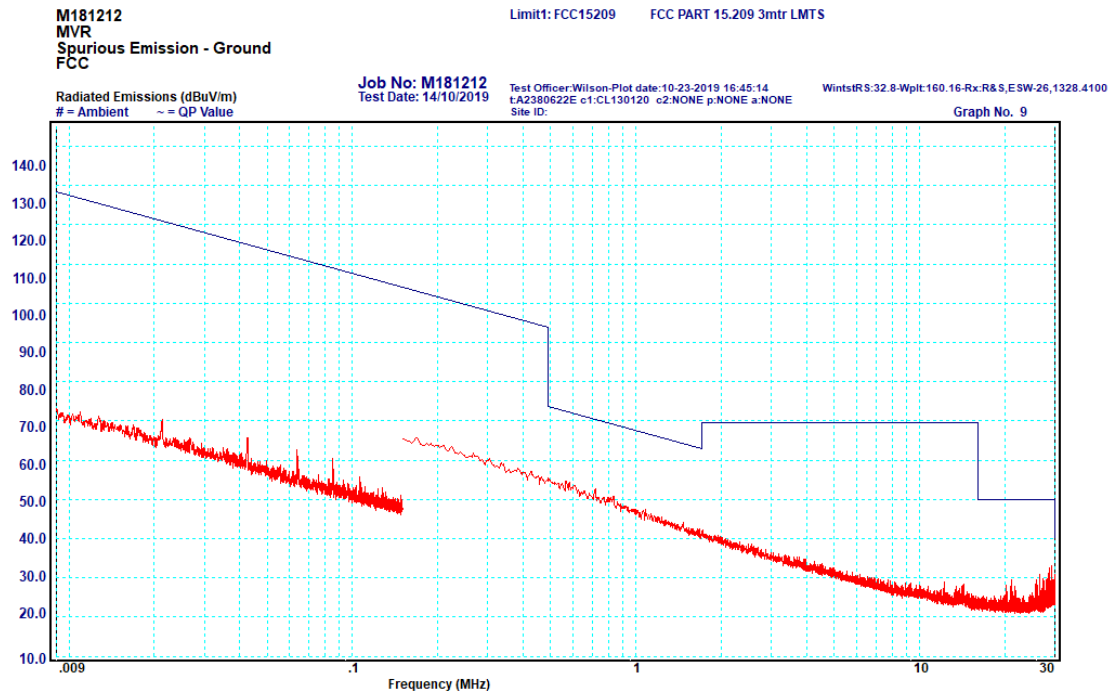
6.5.2 Limits

The limit applied is in accordance to the radiated emission limits defined in §15.209.

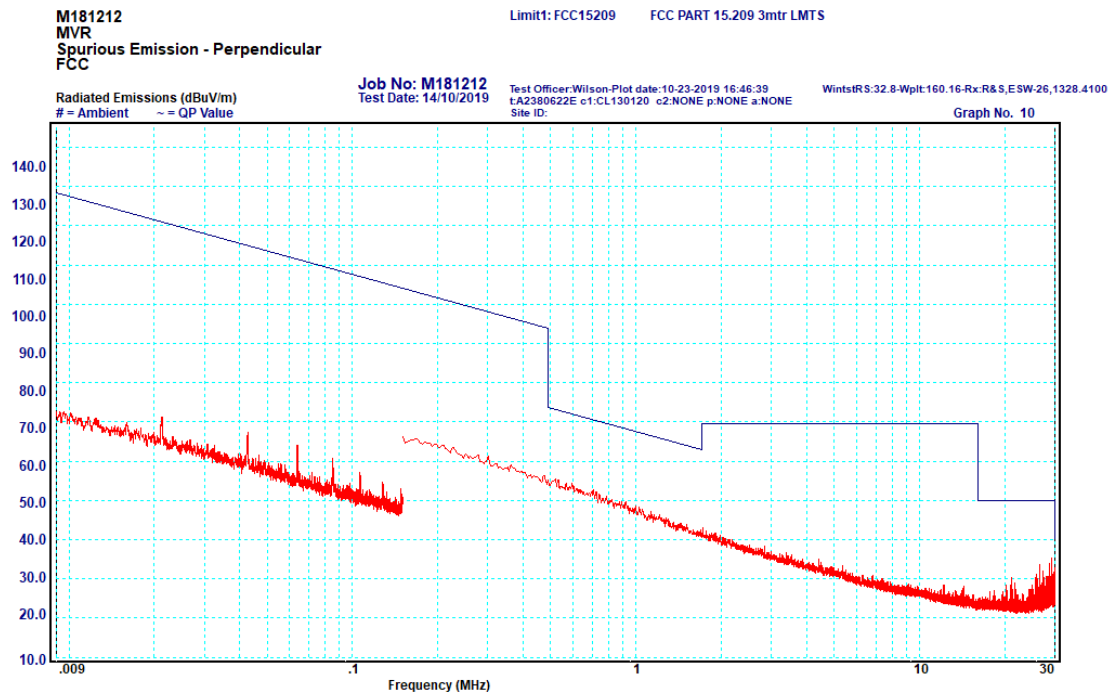
6.5.3 Results: Frequency Band: 9 kHz – 30 MHz

All spurious emissions measured in the frequency band 9 kHz - 30MHz complied with the requirements of §15.209. The emissions were more than 10 dB below the limit.

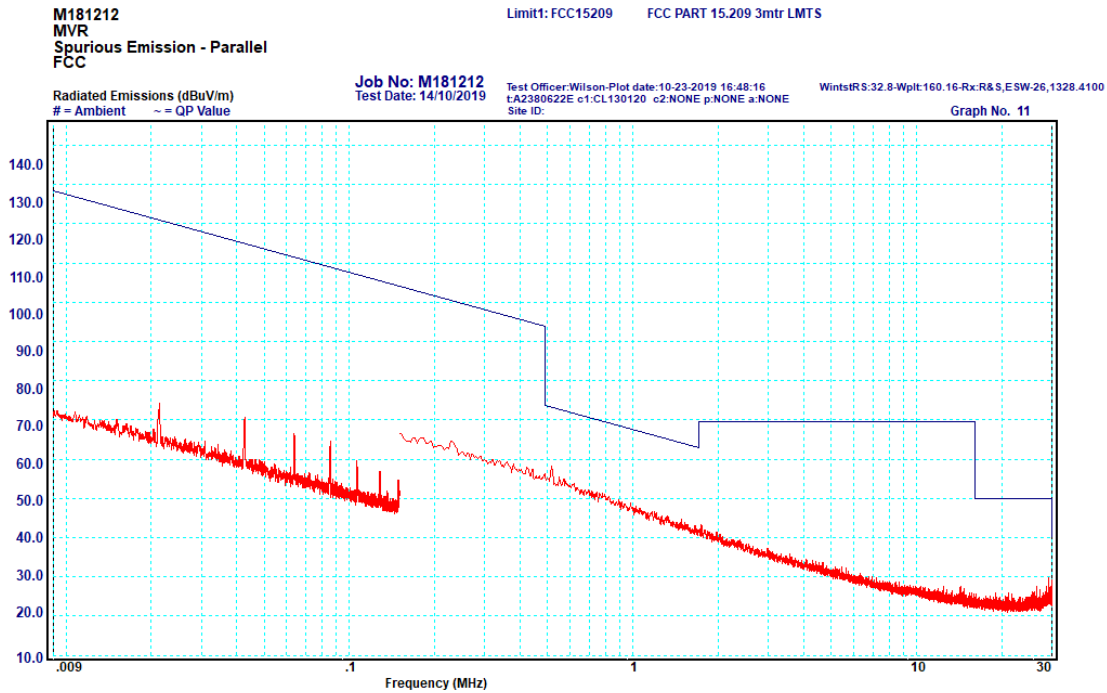
Note: At a measurement distance of 3 metres, all Bluechiip fundamental transmissions were below the noise floor of the EMI receiver.



Graph 6-4: Spurious Emissions, 9 kHz – 30 MHz, Ground



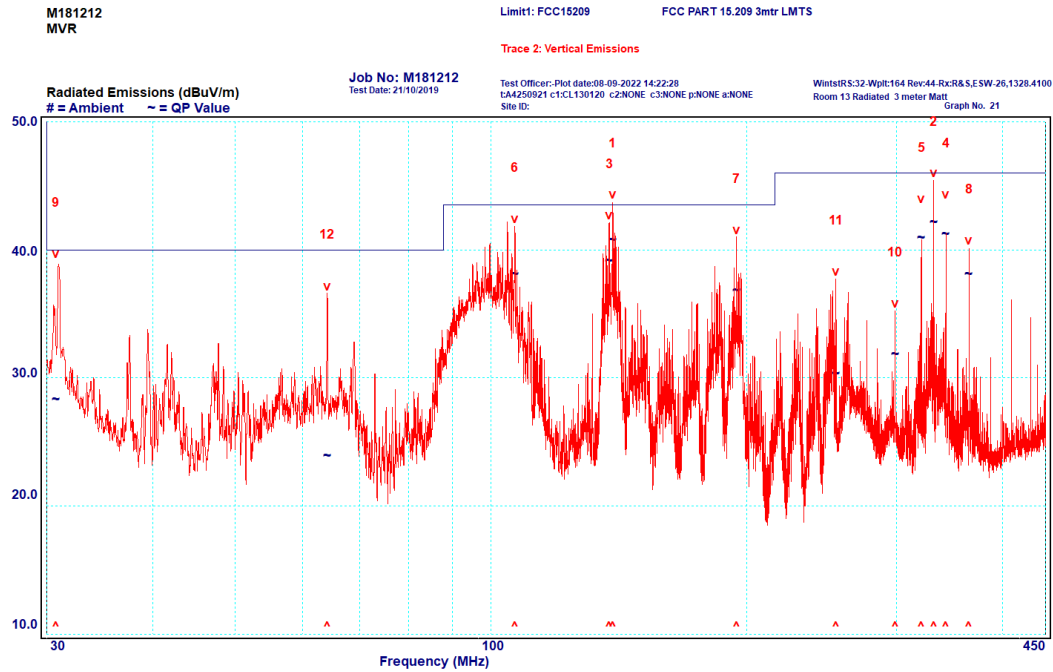
Graph 6-5: Spurious Emissions, 9 kHz – 30 MHz, Perpendicular



Graph 6-6: Spurious Emissions, 9 kHz – 30 MHz, Parallel

6.5.4 Results: Frequency Band: 30 – 450 MHz

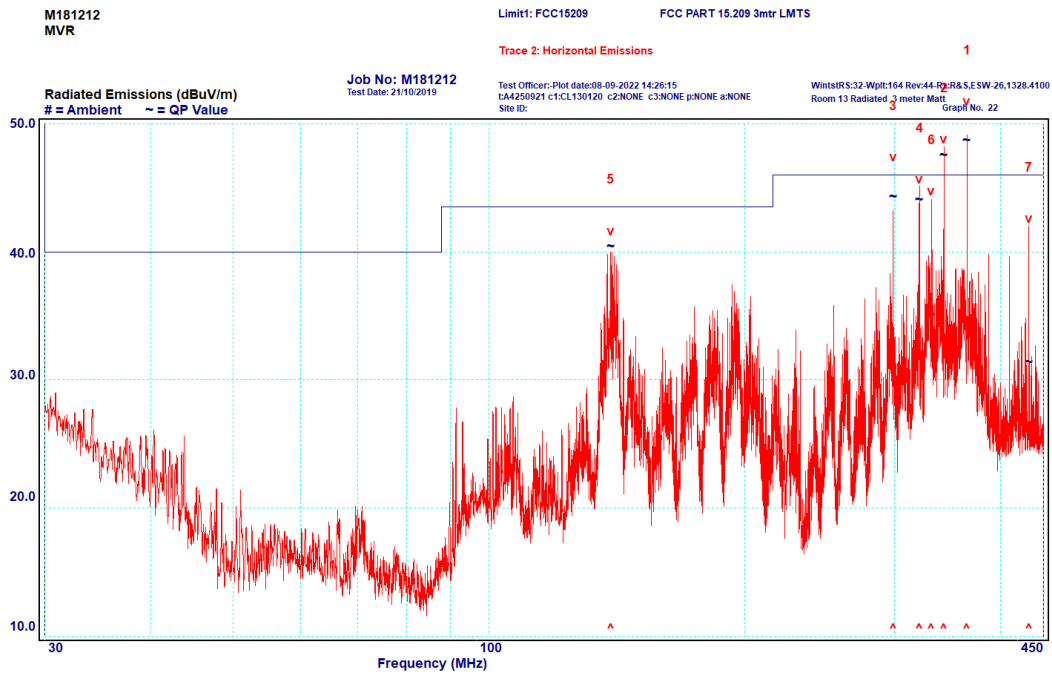
All spurious emissions measured in the frequency band 30 MHz to 300 MHz complied with the requirements of §15.209 (a).



Graph 6-7: Spurious Emissions, 30 – 450 MHz, Vertical

Table 6-4: Spurious Emissions, 30 – 450 MHz, Vertical

Peak	Polarisation	Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Delta Limit (dB)
1	139.12	Vertical	41.2	43.5	-2.3
2	331.99	Vertical	42.6	46	-3.4
3	137.8	Vertical	39.7	43.5	-3.8
4	343.4	Vertical	41.7	46	-4.3
5	321.24	Vertical	41.4	46	-4.6
6	106.73	Vertical	38.6	43.5	-4.9
7	194.51	Vertical	37.3	43.5	-6.2
8	365.54	Vertical	38.6	46	-7.4
9	30.74	Vertical	28.8	40	-11.2
10	299.08	Vertical	32.4	46	-13.6
11	254.67	Vertical	30.8	46	-15.2
12	64.17	Vertical	24.4	40	-15.6



Graph 6-8: Spurious Emissions, 30 – 450 MHz, Horizontal

Table 6-5: Spurious Emissions, 30 – 450 MHz, Horizontal

Peak	Polarisation	Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Delta Limit (dB)
1*	365.55	Horizontal	49.2	46	N/A
2*	343.39	Horizontal	48	46	N/A
3	299.07	Horizontal	44.8	46	-1.2
4	321.24	Horizontal	44.5	46	-1.5
5	139.11	Horizontal	40.9	43.5	-2.6
6	331.96	Horizontal	35.6	46	-10.4
7	432	Horizontal	31.9	46	-14.1

*Note, these emissions were identified from unintentional emission and not subject to the limit of the standard.

END OF REPORT