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# TEST REPORT

ICT Protégé RME-DFBT Rear Mount Electronic Reader

tested to

47 Code of Federal Regulations

**Part 15 - Radio Frequency Devices Subpart C – Intentional Radiators** 

**Section 15.209** 

Section 15.225 OPCS Operation within the band 13.110 -14.010 MHz

Section 15.249 Operation in the band 2400 – 2483.5 MHz

for

## **Integrated Control Technology**

Andrew Cuttor

Andrew Cutler- General Manager



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

This Test Report is issued with the authority of:

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Test Report No 241102.1 This report may not be reproduced except in full. 15th December 2024

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# **Global Product Certification**

# **1. STATEMENT OF COMPLIANCE**

The **ICT Protégé RME-DFBT Rear Mount Electronic Reader** <u>complies with</u> FCC Part 15 Subpart C Sections 15.209, 15.225 and 15.249 as an Intentional Radiator when the methods as described in ANSI C63.10 - 2020 are applied.

## 2. RESULTS SUMMARY

The results from testing carried out on between Friday November 15<sup>th</sup> 2024 and Friday December 13<sup>th</sup> 2024 are summarised in the following table:

Clause	Parameter	Result
15.201	Equipment authorisation	Certification required.
	requirement	
15.203	Antenna requirement	Complies. Antennas internal to the device.
15.004		NT / 11 11 NT / 1 1 1
15.204	External PA and antenna	Not applicable. No external devices.
	modifications	
15.205	Restricted bands of operation	Complies.
	1	
15.207	Conducted limit	Not applicable. Internal battery powered
		device.
15.209	Radiated emission limits -	Complies.
	Emissions < 30 MHz	10105105
15.000		
15.209	Radiated emission limits –	Complies.
	Emissions > 30 MHZ	
15 225	Radiated emission limits -	Complies
13.225	Fundamental	complies.
15.225	Frequency stability	Complies.
15.249 (a)	Field strength of fundamental	Complies.
15.249 (a)	Field strength of harmonics	Complies.
15.249 (b)	Fixed, point to point operations	Not applicable.
15.249 (c)	3 metre measurement distance	Noted
15.249 (d)	Spurious emission levels except	Complies.
	harmonics	
15.249 (e)	Detectors above 1000 MHz	Noted.
15.249 (f)	Reference to section 15.37(d)	Noted.

## 3. INTRODUCTION

This report describes the tests and measurements performed for the purpose of determining compliance with the specification with the following conditions:

The client selected the test sample.

The report relates only to the sample tested.

#### The corrections or erasures in the test report are indicated in the report revision table.

Measurement uncertainties with statistical confidence intervals of 95% are shown below test results. Both Class A and Class B uncertainties have been accounted for, as well as influence uncertainties where appropriate.

All compliance statements have been made with respect of the specification limit with no reference to the measurement uncertainty.

All testing was carried out as per the standard in the worst-case configuration with no deviations being applied.

In addition this equipment has been tested in accordance with the requirements contained in the appropriate Commission regulations.

To the best of my knowledge, these tests were performed using measurement procedures that are consistent with industry or Commission standards and demonstrate that the equipment complies with the appropriate standards.

I further certify that the necessary measurements were made by EMC Technologies NZ Ltd, 47 MacKelvie Street, Grey Lynn, Auckland, New Zealand.

#### **Report Revision Table**

Version	Change Made	Date
241102.1	Initial Issue.	15 Dec 2024

Andrew Cutler General Manager EMC Technologies NZ Ltd

## 4. CLIENT INFORMATION

Company Name	Integrated Control Technology Limited
Address	4 John Glenn Avenue, Rosedale
City	Auckland 0632
Country	New Zealand
Contact	Steven Whitaker

## 5. DESCRIPTION OF TEST SAMPLE

Brand Name	ICT Protege
Model Number	RME-DFBT
Product	Rear Mount Electronic Reader
Manufacturer	Integrated Control Technology Ltd. (ICT)
<b>Country of Origin</b>	New Zealand
Serial Number	Sample not serialised 02285
FCC ID	UAURMEDFBT

#### **Product Description:**

# **Global Product Certification**

This device tested is a Rear Mount Mortise Wireless Lock

The Wireless Lock is triggered using an access card that operates on 13.560 MHz

The device also contains a Bluetooth device which allows remote access to the Wireless Lock

The product is powered using a 4.5 Vdc internal battery supply (3 x 1.5 Vdc dry cell batteries) this is replaced every two or three years.

# 6. SETUPS AND PROCEDURES

#### Standard

The sample was tested in accordance with 47 CFR Part 15 Subpart C.

#### **Methods and Procedures**

The measurement methods and procedures as described in ANSI C63.10 - 2020 were used.

#### Section 15.201: Equipment authorisation requirement

Certification as detailed in Subpart J of Part 2 is required for this device.

#### Section 15.203: Antenna requirement

This device has an internal antenna for the 13.560 MHz transmitter.

This device has internal antennas for the 2.4 GHz Bluetooth transmitter.

Result: Complies.

# Technologies

#### Section 15.204: External radio frequency power amplifiers and antenna modifications

It is not possible to attach an external power amplifier to this transmitter.

Result: Complies.

#### Section 15.205: Restricted bands of operation

The transmitter transmits on 13.560 MHz in two modes being

- standby while awaiting a card to open the door
- operating when a card is placed next to the reader and the lock locks or unlocks

When operating in standby mode approximately 50 us pulse is transmitted ever 440 ms which is shown below.



When a card is presented the pulse transmission becomes continuous for approximately 5 to 6 seconds where the level steps up approximately 4 dB after about 1 second on initial transmission.

The plot below shows this.

After the lock as unlocked and then locked the pulse transmission every 440 ms is once again evident.



Date:

In Standby mode this device would therefore fall into the band of 13.110 - 14.010 MHz that is covered by Section 15.225.

Measurements were made at the test site using a spectrum analyser.

The plot below shows a 99% occupied bandwidth of 125.050 kHz.



In Operating mode this device would therefore fall into the band of 13.110 – 14.010 MHz that is covered by Section 15.225.

Measurements were made at the test site using a spectrum analyser.

The plot below shows a 99% occupied bandwidth of 442.886 kHz.



Date:

22.NOV.2024 07:41:36

The Bluetooth transmitter was observed transmitting on 2402, 2426 and 2480 MHz.

This device would therefore fall into the band of 2400.0 - 2483.5 MHz band that is covered by Section 15.249.





13.DEC.2024 13:25:03

#### **Bluetooth transmission on 2426 MHz**

#### 99% Occupied Bandwidth - 1062.124 kHz



**Result:** Complies

#### Section 15.207: Conducted emissions testing

Testing not applicable as this device is powered using an internal battery supply at 4.5 Vdc (3 x 1.5 Vdc dry cell batteries) that is removed when voltage decreases.

No provisions have been made for the attachment of a charger.

Device cannot be directly or in-directly connected to the public AC mains supply.

**Result:** Not applicable

# **ERAC** Technologies

# **Global Product Certification**

#### Section 15.209: Radiated Emission Limits, General Requirements

Radiated emissions testing was carried out over the frequency range of 100 kHz to 25,000 MHz as the device contains a Bluetooth Transmitter.

Testing was carried out at the laboratory's open area test site - located at Driving Creek, Orere Point, Auckland, New Zealand.

An enclosure containing absorber material, Panashield HYB-NF-12, has been placed between the turntable and the measurement antenna for when measurements are made above 1 GHz.

This material has no absorbing affect below 1 GHz with site verification measurements confirming this.

Testing carried out when the device was placed in the centre of the table standing upright.

Below 1000 MHz the top of the test table was 80 cm above the test site ground plane.

Above 1000 MHz the top of the test table was 150 cm above the test site ground plane

Device tested has a 13.560 MHz card reader that was operated in standby and continuous operating modes.

The device also supports Bluetooth functionality in the 2.4 GHz band which was active during the test.

Device was tested when powered using an internal 4.5 Vdc battery supply.

The lock was periodically activated using a supplied swipe card which caused the lock to open and close which confirmed continuing correct operations.

When an emission is located, it is positively identified and its maximum level is found by rotating the automated turntable, and by varying the antenna height, where appropriate, with an automated antenna tower.

Below 30 MHz a magnetic loop is used with the centre of the loop being 1 metre above the ground with a test distance of 10 metres being used.

Between 100 – 490 kHz a Peak and Average detector with a bandwidth of 9 kHz was used

Between 490 kHz – 30 MHz a Quasi Peak detector with a bandwidth of 9 kHz was used.

Above 30 MHz the emission is measured in both vertical and horizontal antenna polarisations, where appropriate at a test distance of 3 metres.

A quasi peak detector with a 120 kHz bandwidth was used between 30 - 1000 MHz

Above 1000 MHz an Average and a Peak detector were used which used a bandwidth of 1 MHz

#### Section 15.209: Radiated Emission Limits, General Requirements cont.

The emission level was determined in field strength by taking the following into consideration:

Level  $(dB\mu V/m) =$  Receiver Reading  $(dB\mu V)$  + Antenna Factor (dB/m) + Coax Loss (dB)

For example, if an emission of 30 dBµV was observed at 30 MHz.

 $45.5 \text{ dB}\mu\text{V/m} = 30.0 \text{ dB}\mu\text{V} + 14 \text{ dB/m} + 1.5 \text{ dB}$ 

**Result:** Complies

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests  $(30 25000 \text{ MHz}) \pm 4.1 \text{ dB}$ 
  - Free radiation tests  $(100 \text{ kHz} 30 \text{ MHz}) \pm 4.8 \text{ dB}$



# **Global Product Certification**

# Section 15.209: 13.560 MHz Transmitter below 30 MHz Spurious Emissions Measurements

Standby operating mode

Frequency	Level	Limit	Margin
(MHz)	(dBµV/m)	(dBµV/m)	( <b>dB</b> )
27.120	15.3	48.6	33.3

Operating mode

Frequency	Level	Limit	Margin
(MHz)	(dBµV/m)	(dBµV/m)	(dB)
27.120	10.1	48.6	38.5

Magnetic loop measurements were attempted at a distance of 10 metres.

A receiver using a Quasi Peak detector with a 9 kHz bandwidth was used between 490 kHz – 30.0 MHz.

The 30 metre limit between 1.705 MHz - 30 MHz has been scaled by a factor of 40 dB per decade, as per section 15.31 (f) (2).

The limit at 27.120 MHz when measured at 30 metres is 30 uV/m or 29.54 dBuV/m.

Therefore when scaled the limit at 10 metres will be 48.6 dBuV/m as detailed below.

= 29.54 dBuV/m + -40 dB/decade \* (log (10) - log (30)) = 29.54 dBuV/m + -40 dB/decade \* (1.000 - 1.477) = 29.54 dBuV/m + -40 dB/decade \* - 0.477 = 29.54 dBuV/m + 19.08 = 48.6 dBuV/m

The spurious emission observed does not exceed the level of the fundament emission

Result: Complies.

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests  $(100 \text{ kHz} - 30 \text{ MHz}) \pm 4.8 \text{ dB}$ 

#### Section 15.209: Spurious Emissions (above 30 MHz) – Standby mode

Measurements between 30 - 25000 MHz have been made at a distance of 3 metres.

A receiver using a detector with a 120 kHz bandwidth was used between 30 - 1000 MHz as the emission consisted of a 50 us pulse every 440 ms.

No Quasi Peak emissions were detected.

The emissions were measured using a peak detector and recorded gain the Quasi Peak limits.

The limits as described in Section 15.209 have been applied.

Frequency (MHz)	Vertical (dBµV/m)	Horizontal (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Antenna Pol	Detector
40.680	30.7	23.7	40.0	9.3	Vertical	Peak
54.240	25.1	18.2	40.0	14.9	Vertical	Peak
67.800	22.3	17.1	40.0	17.7	Vertical	Peak
81.360	19.8	16.4	40.0	20.2	Vertical	Peak
108.480	21.5	23.6	43.5	19.9	Vertical	Peak
122.040	32.8	24.8	43.5	10.7	Vertical	Peak
135.600	32.9	26.2	43.5	10.6	Vertical	Peak
149.160	33.5	28.5	43.5	10.0	Vertical	Peak
162.720	31.7	26.2	43.5	11.8	Vertical	Peak
176.280	32.7	26.5	43.5	10.8	Vertical	Peak
189.840	28.1	26.6	43.5	15.4	Vertical	Peak
203.400	30.4	25.9	43.5	13.1	Vertical	Peak
216.960	26.8	26.2	46.0	19.2	Vertical	Peak
230.520	27.5	25.9	46.0	18.5	Vertical	Peak
244.080	28.2	27.8	46.0	17.8	Vertical	Peak
257.640	27.8	29.1	46.0	16.9	Vertical	Peak
271.200	29.3	28.9	46.0	16.7	Vertical	Peak
284.760	29.5	28.6	46.0	16.5	Vertical	Peak
298.320	30.4	30.1	46.0	15.6	Vertical	Peak
352.560	32.1	27.7	46.0	13.9	Vertical	Peak
379.680	32.7	27.9	46.0	13.3	Vertical	Peak

Above 1000 MHz the only emissions observed were from the Bluetooth transmitter that was observed advertising on 2402, 2426 and 2480 MHz.

All other emissions observed had a margin to the limit that exceeded 15 dB when measurements were made between 30 - 25000 MHz using both vertical and horizontal polarisations.

Result: Complies.

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests  $(30 \text{ MHz} - 25000 \text{ MHz}) \pm 4.1 \text{ dB}$ 

#### Section 15.209: Spurious Emissions (above 30 MHz) – Operating Mode

Measurements between 30 - 25000 MHz have been made at a distance of 3 metres.

Modifications were made by the client to product which enable the 13.560 MHz transmitter to operate for approximately 400 ms every two seconds which simulating the reading of a card.

A Quasi Peak detector was used to make these measurements.

The limits as described in Section 15.209 have been applied.

Frequency	Vertical	Horizontal	Limit	Margin	Antenna	Detector
(MHz)	(dBµV/m)	(dBµV/m)	(dBµV/m)	( <b>dB</b> )	Pol	
40.680	36.0	20.6	40.0	4.0	Vertical	QP
67.800	26.2	17.5	40.0	13.8	Vertical	QP
94.920	32.1	24.1	43.5	11.4	Vertical	QP
122.040	18.5	19.1	43.5	24.4	Horizontal	QP
149.160	31.5	30.1	43.5	12.0	Vertical	QP
176.280 -	24.9	21.5	43.5	18.6	Vertical	QP
203.400	23.2	24.1	43.5	19.4	Horizontal	QP
230.520		24.5	46.0	21.5	Horizontal	QP
271.200	26.5	24.1	46.0	19.5	Vertical	QP
298.320	30.2	27.6	46.0	15.8	Vertical	QP
311.880	26.3		46.0	19.7	Vertical	QP
339.000	30.6	24.5	46.0	15.4	Vertical	QP
352.560	31.1	23.1	46.0	14.9	Vertical	QP
366.120	35.5	27.2	46.0	10.5	Vertical	QP
379.680	28.1	IEC	46.0	17.9	Vertical	QP
393.240	28.3		46.0	17.7	Vertical	QP
474.600	26.4		46.0	19.6	Vertical	QP
583.080	30.4		46.0	15.6	Vertical	QP

Above 1000 MHz the only emissions observed were from the Bluetooth transmitter that was observed advertising on 2402, 2426 and 2480 MHz.

All other emissions observed had a margin to the limit that exceeded 15 dB when measurements were made between 30 - 25000 MHz using both vertical and horizontal polarisations.

Result: Complies.

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests  $(30 \text{ MHz} - 25000 \text{ MHz}) \pm 4.1 \text{ dB}$ 

#### Section 15.225: Fundamental Emission:

Measurements were made using a magnetic loop antenna and a receiver using a Quasi Peak detector using a 9 kHz bandwidth

Measurements were made at a distance of 10 metres with the limit being determined by using the extrapolation factor of 40 dB per decade limit, as detailed in section 15.31 f (2).

The limit at 30 m at 13.560 MHz is 15,848 uV/m or 84.0 dBuV/m.

Applying the extrapolation factor of 40 dB/ per decade, the limit is 103.1 dBuV/m.

= 84.0 dBuV/m + -40 dB/decade \* (log (10) - log (30)) = 84.0 dBuV/m + 19.08 = 103.1 dBuV/m

Testing was carried out in Standby and Operating mode when the 4.5 Vdc supply to the device was varied by - 15% as dry cell batteries are used.

Result: Complies.

Measurement uncertainty with a confidence interval of 95% is: - Free radiation tests  $(100 \text{ kHz} - 30 \text{ MHz}) \pm 4.8 \text{ dB}$ 

Standby mode

Frequency (MHz)	Level (dBuV/m)	Distance (metres)	Limit (dBuV/m)	Voltage (Vdc)	Margin (dB)
13.560	33.8	10.0	103.1	3.8	69.3
13.560	33.8	10.0	103.1	4.5	69.3

#### Operating mode

Frequency (MHz)	Level (dBuV/m)	Distance (metres)	Limit (dBuV/m)	Voltage (Vdc)	Margin (dB)
13.560	42.6	10.0	103.1	3.8	60.5
13.560	42.6	10.0	103.1	4.5	60.5

A spectrum analyser plot showing the carrier and modulation peaks within +/- 100 kHz. Marker 1 [T1] RBW 10 kHz RF Att 0 dB Ref Lvl 35.33 dB**\V**/m VBW 10 kHz 72 dB\* 15 ms dB**⊻**V/m 13.56020040 MHz SWT Unit 72 A FCC13MHZ 60 50 IN1 40 **1MA** 1MAX 3 ( 11 What 1 ANNAMAN Λ P20 2 TDS 1( -10 -20 -2 20 kHz/ Span 200 kHz Center 13.56 MHz Date: 21.NOV.2024 12:38:59

Standby mode:

Marker 1 [T1] RBW 10 kHz RF Att 20 dB Ref Lvl 34.46 dB**\V**/m VBW 10 kHz 100 dB\* 13.56501002 MHz SWT dB**u**V/m 25 ms Unit 100 A FCC13MHZ 90 80 70 IN1 **1VIEW 1MA** 60 Р0 50 TDS 40 30 20 1( Center 13.56 MHz 100 kHz/ Span 1 MHz 21.NOV.2024 11:51:55 Date:

A spectrum analyser plot showing the carrier and modulation peaks within +/- 500 kHz.

Measurement was made at the test site and due to the time of day a number of ambient emissions can be seen which are not from the device under test

Result: Complies.

Standby mode:

Measurement uncertainty with a confidence interval of 95% is: - Free radiation tests  $(100 \text{ kHz} - 30 \text{ MHz}) \pm 4.8 \text{ dB}$ 



A spectrum analyser plot showing the carrier and modulation peaks within +/- 125 kHz.

Date:

Operating mode:

5.DEC.2024 12:04:12

Marker 1 [T1] RBW 10 kHz 20 dB RF Att Ref Lvl 43.09 dB**V**/m VBW 30 kHz 105 dB\* 13.56300601 MHz SWT Unit dB**V**/m 25 ms 105 A 100 90 80 IN1 **IVIEW 1MA** 70 60 РO 50 TDS 4( 30 h 2 1( 100 kHz/ Span 1 MHz Center 13.56 MHz Date: 5.DEC.2024 12:01:08

#### A spectrum analyser plot showing the carrier and modulation peaks within +/- 500 kHz.

#### Result: Complies.

Operating mode:

Measurement uncertainty with a confidence interval of 95% is: - Free radiation tests  $(100 \text{ kHz} - 30 \text{ MHz}) \pm 4.8 \text{ dB}$ 

#### Section 15.225: Frequency Tolerance:

The frequency tolerance of the carrier is required to be  $\pm -0.01\%$  of operating frequency when the temperature is varied between -20 degrees C and  $\pm 50$  degrees C.

Testing was carried out in Standby mode and Continuous operating mode with the same results being observed.

The device operates nominally on 13.560 MHz which gives a frequency tolerance of  $\pm -1,356.0$  Hz.

Temperature (°C)	Frequency (MHz)	Difference (Hz)	
50.0	13.559 800	-600	
40.0	13.559 700	-300	
30.0	13.559 600	-400	
20.0	13.559 600	-400	
10.0	13.559 800	-200	
0.0	13.559 850	-150	
-10.0	13.559 600	-400	
-20.0	13.559 900	-100	

The 4.5 Vdc supply voltage was varied by - 15% at 20 degrees C (ambient).

Voltage (Vdc)	Frequency (MHz)	Difference (Hz)	•
3.8	13.559 600	-400	pies
4.5	13.559 600	-400	

Result: Complies.

Measurement uncertainty with a confidence interval of 95% is: Frequency tolerance  $\pm$  50 Hz

#### Section 15.249 (a) – Field Strength of the Fundamental and Harmonics

Radiated emission measurements were carried out with the limits as per section 15.249 (a) being applied to the Fundamental and Harmonics of each transmitter.

Testing was carried out at EMC Technologies (NZ) Ltd Open Area Test Site, which is located at Driving Creek, Orere Point, Auckland.

An enclosure containing absorber material, Panashield HYB-NF-12, has been placed between the turntable and the measurement antenna for when measurements are made above 1 GHz.

This material has no absorbing affect below 1 GHz with site verification measurements.

Below 1000 MHz the transmitter was placed on the test table top which was a total of 0.8 m above the test site ground plane.

Above 1000 MHz the transmitter was placed on the test table top which was a total of 1.5 m above the test site ground plane.

Measurements of the radiated field were made 3 metres from the transmitting antenna.

Measurements below 1000 MHz were made using a Quasi Peak Detector with a bandwidth of 120 kHz.

Measurements above 1000 MHz were made using an average detector with a bandwidth of 1.0 MHz and also a peak detector with a bandwidth of 1.0 MHz.

When an emission is located, it is positively identified and its maximum level is found by rotating the automated turntable, and by varying the antenna height with an automated antenna tower.

All emissions were measured in both vertical and horizontal antenna polarisations.

The emission is measured in both vertical and horizontal antenna polarisations with no measurements were made above the  $10^{\text{th}}$  harmonic.

Testing was carried out when the device was powered using an 4.5 Vdc battery.

Testing was carried out with the device being placed in the centre of the test table standing vertically upright.

The device was tested when transmitting continuously on 2402, 2426 and 2480 MHz

The emission level is determined in field strength by taking the following into consideration:

Level (dB $\mu$ V/m) = Receiver Reading (dB $\mu$ V) + Antenna Factor (dB/m) + Coax Loss (dB) - Amplifier Gain (dB)

#### **Fundamental Emission**

Frequency	Vertical	Horizontal	Limit	Margin	Antenna	Detector	BW
(MHz)	(dBµV/m)	(dBµV/m)	(dBµV/m)	( <b>dB</b> )	Pol.		
2402.000	74.1	67.4	114.0	39.9	Horizontal	Peak	1 MHz
2402.000	41.5	41.5	94.0	52.5	Vertical	Average	1 MHz
-						-	-
2426.000	74.1	66.2	114.0	39.9	Horizontal	Peak	1 MHz
2426.000	41.5	41.5	94.0	52.5	Vertical	Average	1 MHz
-						-	-
2480.000	71.4	65.4	114.0	42.6	Vertical	Peak	1 MHz
2480.000	41.7	41.7	94.0	52.3	Vertical	Average	1 MHz

Testing was carried out as detailed below

Section 15.249 specifies a limit of 50 mV/m (94 dBuV/m) when an average detector is used for devices operating in the band of 2400 - 2483.5 MHz.

A peak limit of 114 dBuV/m has also been applied.

This limit has been converted to dBuV/m using the formula  $20 * (\log 0.050 / 0.000001)$ 

Result: Complies.

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests

 $(30 - 25,000 \text{ MHz}) \pm 4.1 \text{ dB}$ 

# **Global Product Certification**

## **Spurious Emissions**

#### **Transmitting on 2402 MHz**

Frequency	Vertical	Horizontal	Limit	Margin	Detector	Antenna	BW
(MHz)	(dBuV/m)	(dBuV/m)	(dBuV/m)	( <b>dB</b> )			
4804.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
4804.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz
-	-	-	-	-	-	-	-
7206.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
7206.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz
-	-	-	-	-	-	-	-
9608.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
9608.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz
-	-	-	-	-	-	-	-
12010.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
12010.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz
-	-	-	-	-	-	-	-
14413.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
14413.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz
-	_	-	-	-	-	-	-
16814.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
16814.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz
-	-	_	-	-	-	-	-
19216.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
19216.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz
-	_		-	-	-	-	-
21618.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
21618.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz
_		_	-	-	-	-	-
24020.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
24020.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz

## **Spurious Emissions**

#### **Transmitting on 2426 MHz**

Frequency	Vertical	Horizontal	Limit	Margin	Detector	Antenna	BW
(MHz)	(dBuV/m)	(dBuV/m)	(dBuV/m)	( <b>dB</b> )			
4852.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
4852.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz
-	-	-	-	-	-	-	-
7278.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
7278.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz
-	-	-	-	-	-	-	-
9704.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
9704.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz
-	-	-	-	-	-	-	-
12130.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
12130.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz
-	-	-	-	-	-	-	-
14556.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
14556.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz
-	_	-	-	-	-	-	-
16982.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
16982.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz
-	-	-	-	-	-	-	-
19408.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
19408.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz
-	_		-	-	-	-	-
21834.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
21834.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz
_	-	-	-	-	-	-	-
24260.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
24260.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz

#### **Spurious Emissions**

#### **Transmitting on 2480 MHz**

Frequency	Vertical	Horizontal	Limit	Margin	Detector	Antenna	BW
(MHz)	(dBuV/m)	(dBuV/m)	(dBuV/m)	( <b>dB</b> )			
4960.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
4960.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz
-	-	-	-	-	-	-	-
7440.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
7440.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz
-	-	-	-	-	-	-	-
9920.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
9920.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz
-	-	-	-	-	-	-	-
12400.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
12400.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz
-	-	-	-	-	-	-	-
14880.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
14880.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz
-	_	-	-	-	-	-	-
17360.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
17360.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz
-	-	_	-	-	-	-	-
19840.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
19840.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz
-	-		-	-	-	-	-
22320.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
22320.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz
_			-	-	-	-	-
24800.000	< 59	< 59	74.0	> 15	Peak	Vert/Horiz	1 MHz
24800.000	< 46	< 46	54.0	> 8	Average	Vert/Horiz	1 MHz

Measurements were performed at a distance of 3 metres using vertical and horizontal polarisations with a peak and an average detector with a 1 MHz bandwidth being used.

As per section 15.249 a limit of 500  $\mu$ /m applies to the harmonic emissions when an average detector is used.

This limit has been converted to dBuV/m using the formula 20 \* (log 500) with a factor of + 20 dB being added to determine the peak limit.

Result: Complies.

Measurement uncertainty with a confidence interval of 95% is: - Free radiation tests  $(30 - 25,000 \text{ MHz}) \pm 4.1 \text{ dB}$ 

# Section 15.215 (c) – Additional Provisions to the General Radiated Emissions Limitations

The device operates in the 2400 - 2483.5 MHz band.

Relative spectrum mask measurements have been made when the device was operating on 2402 MHz, 2426 MHz and 2480 MHz

Measurements made at the -20 dB points.

Frequency (MHz)	F low (MHz)	F high (MHz)
2402.000	2401.3567	-
2480.000	-	2480.6513

The device can be seen to stay within the band of 2400 - 2483.5 MHz at the -20 dB points



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# 7. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial No	Asset Ref	Cal Due	Period
Aerial Controller	EMCO	1090	9112-1062	RFS 3710	Not applic	N/a
Aerial Mast	EMCO	1070-1	9203-1661	RFS 3708	Not applic	N/a
VHF Balun	Schwarzbeck	VHA 9103	11042021A	3696	23 Nov 2025	3 years
<b>Biconical</b> Antenna	Schwarzbeck	BBA 9106	11042021A	3697	23 Nov 2025	3 years
Horn Antenna	EMCO	3115	9511-4629	E1526	3 April 2025	3 years
Log Periodic	Schwarzbeck	VUSLP 9111B	112+11042021B	4025	16 Nov 2025	3 years
Loop Antenna	EMCO	6502	9003-2485	3798	7 March 2025	3 years
Receiver	R & S	ESIB 40	100295	4030	6 Oct 2025	1 year
Turntable	EMCO	1080-1-2.1	9109-1578	RFS 3709	Not applic	N/a
Heliax cable	Andrews	L6PNM-RPD	22869	Oats Cable	30 Dec 2024	1 year
Thermal chamber	Contherm	M180F	86025	N/a	N/a	N/a
Thermometer	DSIR	RT200	35	EMC4029	21 April 2027	5 years

At the time of testing all equipment was within calibration.

# 8. ACCREDITATIONS

Testing was carried out in accordance with EMC Technologies NZ Ltd designation as a FCC Accredited Laboratory by International Accreditation New Zealand, designation number: NZ0002 under the APEC TEL MRA.

All testing was carried out in accordance with the terms of EMC Technologies (NZ) Ltd International Accreditation New Zealand (IANZ) Accreditation to NZS/ISO/IEC 17025.

All measurement equipment has been calibrated in accordance with the terms of the EMC Technologies (NZ) Ltd International Accreditation New Zealand (IANZ) Accreditation to NZS/ISO/IEC 17025.

International Accreditation New Zealand has International Laboratory Accreditation Council (ILAC) Mutual Recognition Arrangements for testing and calibration with various accreditation bodies in a number of economies.

This includes NATA (Australia), UKAS (UK), SANAS (South Africa), NVLAP (USA), A2LA (USA), SWEDAC (Sweden).

Further details can be supplied on request.

## 9. PHOTOGRAPHS

Device Under Test External Views

































