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TEST REPORT

Datamars DMO1 SMT Radio Module

tested to the specification

47 Code of Federal Regulations

Part 15 - Radio Frequency Devices

Subpart C – Intentional Radiators

Section 15.247 Operation within the band 2400-2483.5 MHz

for

Datamars SA

This test report is issued with the authority of:

Andrew Cutler - General Manager



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

Table of Contents

1.	STATEMENT OF COMPLIANCE	3
2.	RESULTS SUMMARY	3
3.	INTRODUCTION	4
4.	CLIENT INFORMATION	4
5.	DESCRIPTION OF TEST SAMPLE	5
6.	SETUPS AND PROCEDURES	6
7.	TEST EQUIPMENT USED	28
8.	ACCREDITATIONS	28
9.	PHOTOGRAPHS	29
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Page 2 of 31 Test Report No 210803.20 14th December 2021

1. STATEMENT OF COMPLIANCE

The **Datamars DMO1 SMT Radio Module** <u>complies with</u> FCC Part 15 Subpart C Section 15.247 as Intentional Radiators when the methods as described in ANSI C63.10 - 2020 are applied.

2. RESULTS SUMMARY

The results from testing carried out in between the 13th October and 15th November 2021 are detailed in the following table:

Clause	Parameter	Result
15.201	Equipment authorisation	Certification as a Single Limited
	requirement	Module will be required.
15.203	Antenna requirement	Noted.
15.204	External PA and antenna	Noted.
	modifications	
15.205	Restricted bands of operation	Complies.
15.207	Conducted limits	Not applicable. Internal battery
		powered with a solar panel charger.
15.209	Radiated emission limits	Complies
15.247	TOG	hnologio
(a)(1)	Hopping channel separation	Complies
		0.0
(a)(1)(i)(iii)	Channel occupancy / Bandwidth	Complies
(b)(1)(2)	Peak output power	Complies
(b)(4)	Antenna gain less than 6 dBi	Complies. Typical antenna used is a
		antenna with a 4 dBi gain.
(d)	Out of band emissions	Complies
(e)	Spectral density	Not applicable. Frequency hopping
	77.1.110	device.
(f)	Hybrid Systems	Not applicable. Standard frequency
		hopping device.
(g)	Frequency hopping channel	Complies
	usage	27 . 11 11
(h)	Intelligent frequency hopping	Not applicable
(1)	D 1' C 1 1	G I
(i)	Radio frequency hazards	Complies

3. INTRODUCTION

This report describes the tests and measurements performed for the purpose of determining compliance with the specification.

The client selected the test sample.

This report relates only to the sample tested.

This report contains no erasures or corrections.

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.

CLIENT INFORMATION Chnologies 4.

Company Name Datamars SA

Address Via Industria 16 6814

City Lamone

Switzerland **Country**

Contact Mr Jacky Chou (Auckland, New Zealand)

Mr Damien Pachoud (Head Quarters, SA)

Page 4 of 31 14th December 2021 Test Report No 210803.20

5. DESCRIPTION OF TEST SAMPLE

Brand Name Datamars

Model Number DMO1 SMT Radio Module

Product Radio Module

Manufacturer Datamars Limited

Country of Origin New Zealand

FCC ID: NDXDM01

Host Device Trutest FN1F 4W Fence Monitoring Node

Host Serial Number 400002230001-0080E107500B4022

Host Power Supply Internal 3.7 Vdc battery with a 4 Watt solar panel charger

Host Antenna 2J0902-2.4-C468G 4 dBi half dipole antenna.

Product overview:

Single Limited Modular certification is sought for the DMO1 module with has been tested when it is installed in a Fence Monitoring Node device.

The module to be certified has been contructed from a Semtech SX1280 2.4 GHz transceiver

The node host product is used in the Datamars Internet of Things (IoT) farm netwok that consists of a number of wireless devices called nodes which connect to the cloud through a farm gateway device.

Nodes carryout services like monitoring, control and data collection with the data collected being provided to end users via cloud services.

The DMO1 module provides a 2.4 GHz RF Mesh Network using LoRa principles of operation where GMSK (Gaussian Minimum Shift Keying) is used and a modulation designator of F1B has been applied

The module was programmed to operate on 15 frequencies between 2402 MHz and 2480 MHz.

6. SETUPS AND PROCEDURES

Standard

The sample was tested in accordance with 47 CFR Part 15 Subpart A, B and C.

Methods and Procedures

The measurement methods and procedures as described in ANSI C63.4 – 2014 and ANSI C63.10 - 2020 were used.

Section 15.201: Equipment authorisation requirement

Single Limited Modular Certification as detailed in Subpart J of Part 2 and FCC Part 15 Section 15.212 is required for this device.

Section 15.203: Antenna requirement

Testing was carried out using a 2J0902-2.4-C468G 4 dBi half dipole antenna that was permanently attached to the host device. echnolog

The host has no external antenna port.

Result: Complies.

Section 15.204: External radio frequency power amplifiers and antenna modifications

Noted.

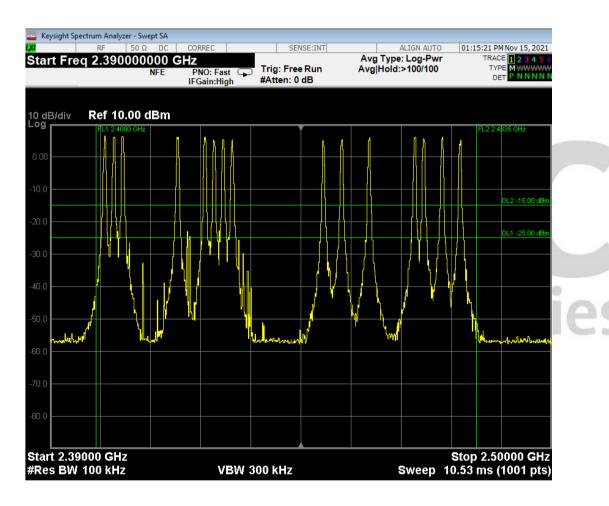
Result: Complies.

Section 15.205: Restricted bands of operation

The device was observed to frequency hop on the following frequencies in the 2400 - 2483.5 MHz band as shown below.

2402 MHz, 2404 MHz, 2406 MHz, 2418 MHz, 2424 MHz, 2426 MHz, 2428 MHz, 2430 MHz, 2450 MHz, 2454 MHz 2460 MHz, 2470 MHz, 2472 MHz, 2476 MHz, 2480 MHz.

These transmissions would fall into the 2400-2483.5 MHz band that is covered by Section 15.247.



Result: Complies.

Section 15.207: Conducted emissions

Test not applicable

Module is powered from the host device.

In this instance the Node host device is powered using an internal battery that is charged using a permanently attached solar panel.

Direct or in-direct connection to the public AC mains supply was not possible.

Result: Not applicable



Section 15.209: Radiated emission limits, general requirements

Radiated emission testing was carried out over the frequency range of 30 MHz to 26,000 MHz as the module operates in the 2400 - 2483.5 MHz band.

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

Testing was carried out when the module in the host was transmitting continuously at maximum power on Channel 22 (2454 MHz) using the commands provided by the client.

Testing was carried out when the host was powered using an internal battery that was being re-charged using an integrated solar panel.

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.

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

Below 1000 MHz a Quasi Peak detector with a 120 kHz bandwidth is used.

Above 1000 MHz an Average detector and a Peak detector with bandwidths of 1 MHz were used.

Below 1000 MHz measurements were made when the product was 80 cm above the test site ground plane.

Above 1000 MHz measurements were made when the product was 1.5 metres above the test site ground plane.

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.

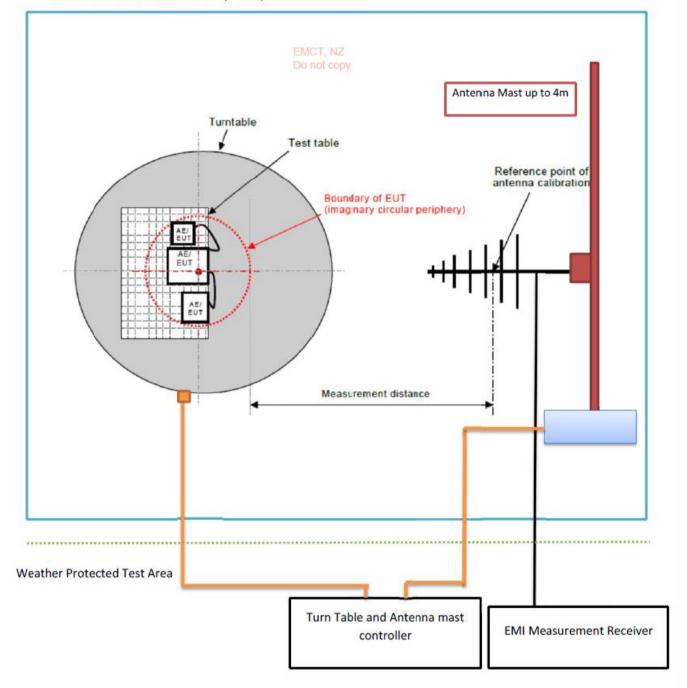
$$45.5 dB\mu V/m = 30.0 dB\mu V + 14 dB/m + 1.5 dB$$

Result: Complies

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests $(30 - 26000 \text{ MHz}) \pm 4.1 \text{ dB}$

Radiated Emissions Test setup at Open area test site



30 MHz-300 MHz: Bi conical Antenna; Measurement distance: 3m

300 MHz-1 GHz: Log Periodic Antenna; Measurement distance: 3m

Above 1 GHz: Horn Antennas; Measurement distance: 3m

EMI Receiver Used: ESIB-40

Section 15.209: Spurious Emissions (above 30 MHz)

Measurements above 30 MHz have been made at a distance of 3 metres.

The limits as described in Section 15.209 have been applied

The following general emissions were observed when the DMO1 module was tested when installed in the host Node device

Frequency	Vertical	Horizontal	Limit	Margin	Result	Antenna
(MHz)	$(dB\mu V/m)$	$(dB\mu V/m)$	$(dB\mu V/m)$	(dB)		Polarisation
35.880	17.5	14.0	40.0	22.5	Pass	Vertical
47.760	16.3	14.0	40.0	23.7	Pass	Vertical
49.200	15.8	14.0	40.0	24.2	Pass	Vertical
53.680	17.8	14.0	40.0	22.2	Pass	Vertical
62.960	19.3	14.0	40.0	20.7	Pass	Vertical
72.000	15.5	14.0	40.0	24.5	Pass	Vertical
75.840	19.2	14.0	40.0	20.8	Pass	Vertical
87.000	17.8	14.0	40.0	22.2	Pass	Vertical
111.900	18.5	-	43.5	25.0	Pass	Vertical
114.360	20.6	-	43.5	22.9	Pass	Vertical
120.360	27.3	-	43.5	16.2	Pass	Vertical
126.000	<u>-</u>	18.7	43.5	24.8	Pass	Horizontal
132.000	19.0	-	43.5	24.5	Pass	Vertical
137.760	-	25.2	43.5	18.3	Pass	Horizontal
281.480	_	39.0	46.0	7.0	Pass	Horizontal
290.160	24.7	-	46.0	21.4	Pass	Vertical
316.400	21.8	18.0	46.0	24.2	Pass	Vertical
326.200	21.4	18.4	46.0	24.6	Pass	Vertical
372.100	21.5	22.4	46.0	23.6	Pass	Horizontal
403.700	21.6	16.0	46.0	24.4	Pass	Vertical
416.600	23.7	20.1	46.0	22.3	Pass	Vertical
459.840	29.2	22.0	46.0	16.8	Pass	Vertical
487.400	24.9	-	46.0	21.1	Pass	Vertical
499.000	26.4	-	46.0	19.6	Pass	Vertical
525.200	24.0	-	46.0	22.0	Pass	Vertical
537.400	27.3	-	46.0	18.7	Pass	Vertical
569.300	25.0	-	46.0	21.0	Pass	Vertical
573.100	-	26.1	46.0	19.9	Pass	Horizontal
584.100	26.3	-	46.0	19.7	Pass	Vertical
599.700	28.5	-	46.0	17.5	Pass	Vertical

No further general emissions were detected within 15 dB of the limit when testing was carried out between 30 MHz and 26 GHz when vertical and horizontal polarisations were used.

Result: Complies.

Section 15.247 tests

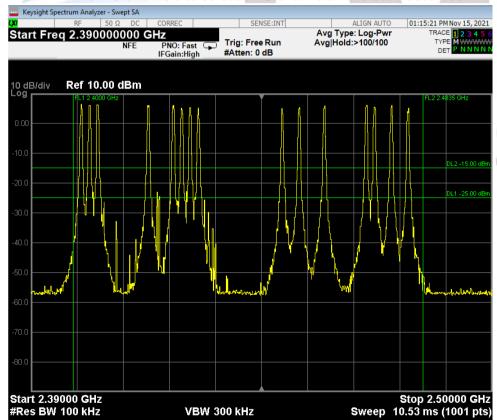
The DMO1 module has been classified as a Frequency Hopping Spread Spectrum device.

Therefore the following Section 15.247(a) frequency hopping spread spectrum tests have been carried out which are summarised below:

Clause	Parameter	Limit	Observation
(a)(1)(iii)	Number of channels	Minimum of 15 channels to be used	15 channels observed in use
(a)(1)	20 dB bandwidth	Less than the channel	566.8 kHz measured.
		spacing	2 MHz channel spacing used
(a)(1)(iii)	Dwell time	Not to exceed 400 ms	A dwell time of 2 ms was
(f)			measured
(a)(1)(iii)	Transmit time	-	Transmitter observed to
			transmit once every 6 seconds

Number of channels

A minimum of 15 channels to be used. 15 channels have been observed.



The following frequencies were observed in use: 2402 MHz, 2404 MHz, 2406 MHz, 2418 MHz, 2424 MHz, 2426 MHz, 2428 MHz, 2430 MHz, 2450 MHz, 2454 MHz 2460 MHz, 2470 MHz, 2472 MHz, 2476 MHz, 2480 MHz.

A worst case channel spacing of 2 MHz has been applied.

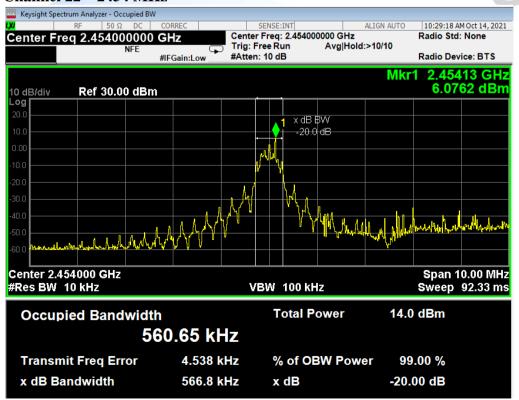
20 dB bandwidth:

The 20 dB bandwidth measurements were performed using a spectrum analyser with an inbuilt occupied bandwidth measurement function where the 99% and 20 dB bandwidths are both shown.

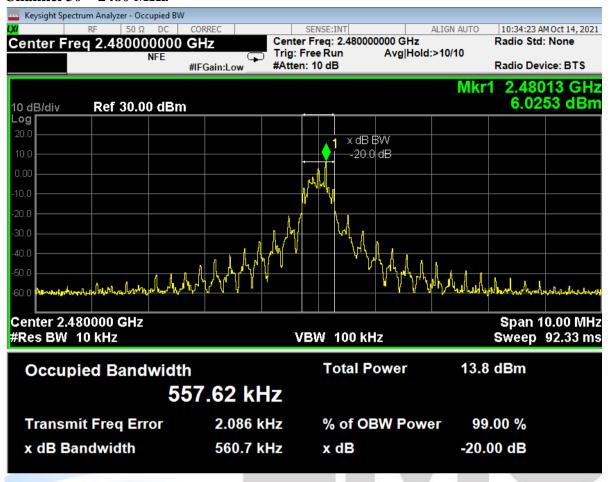
Channel 1 – 2402 MHz



Channel 22 – 2454 MHz



Channel 30 – 2480 MHz



A worst case 20 dB bandwidth of 566.8 kHz was observed at 2454 MHz.

It has been shown that this device operates with a worst case channel spacing of 2 MHz

Therefore the 20 dB bandwidth will be less that the channel spacing

Result: Complies

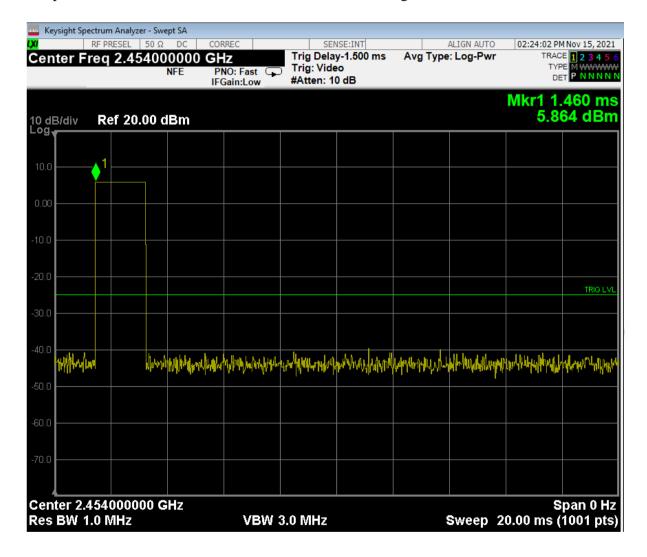
Dwell time

As per section 15.247 (a) (1) (iii) frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

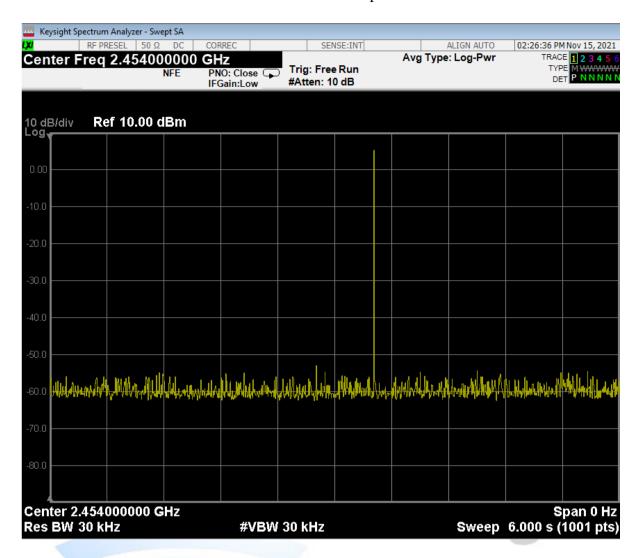
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

15 channels have been observed in operation therefore an observation time of 6 seconds has been applied (15 \times 0.4 seconds).

The plot below shows that each transmission is 2 ms in length.



The transmitter was then observed on 2454 MHz for a period of 6 seconds



As can be seen above during this 6 second observation the transmitter only operated once.

Therefore a dwell time of 2 ms was observed during a period of 6 seconds.

Result: Complies

Section 15.247(b)(1) + (2) - Peak output power

Conducted Power

Testing was carried out at the DMO1 module antenna connector.

Measurements were carried out at lowest, middle and highest available frequencies in the product.

A measuring receiver using a peak detector with a 1 MHz bandwidth was used.

Channel No	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
1	2402.000	7.0	21.0	14.0	Pass
22	2454.000	6.4	21.0	14.6	Pass
30	2480.000	6.3	21.0	14.7	Pass

A conducted power limit of 0.125 watt (+21.0 dBm) has been applied as this device is a hybrid frequency hopping device using less than 75 channels in the 2400 - 2483.5 MHz band.

At the test site the gain of the antenna was confirmed.

The radiated field strength was converted to EIRP power and then comparted against the conducted power to determine the antenna gain.

Channel No	Frequency (MHz)	Field Strength (dBuV/m)	Power	Conducted Power (dBm)	Antenna Gain (dBi)
1	2402.000	104.4	9.2	7.0	2.2
22	2454.000	104.3	9.1	6.4	2.7
30	2480.000	105.0	9.8	6.3	3.5

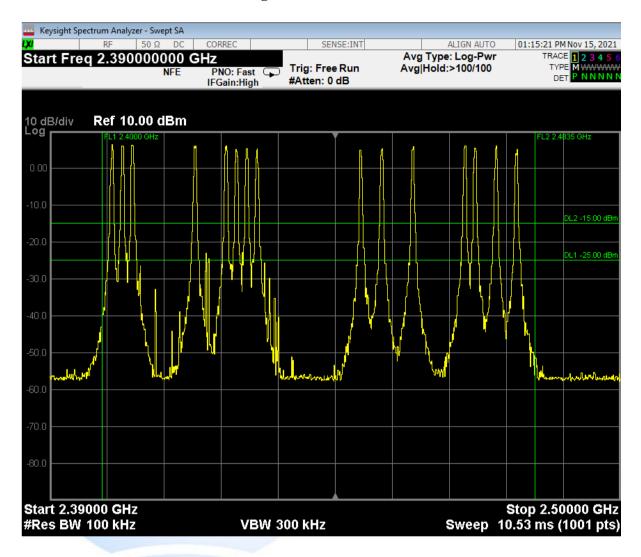
The antenna gain can be seen to not exceed +6 dBi and it does not exceed the 4 dBi specified by the client.

Result: Complies.

Measurement Uncertainty: $\pm 0.5 \text{ dB}$

Section 15.247(d) Out of band emissions

Conducted Antenna Port - Band edge measurements.



The above plots has been carried out between 2390 MHz and 2500 MHz using a peak detector with a 100 kHz resolution bandwidth.

Frequency display lines have been placed at 2400 MHz and 2483.5 MHz which is the band of operating.

A limit of -20 dBc is shown using Amplitude display line no 2 which has an absolute value of -15 dBm.

Amplitude display line no 3 shows a limit of -30 dBc which is provided for additional information.

Result: Complies

Conducted Antenna Port – Transmitter Spurious Emissions

Frequency: 2402.000 MHz

Spurious emission	Emission level	Limit
(MHz)	(dBm)	(dBm)
2402.000	7.0	Not applicable
4804.000	-38.0	-13.0
7206.000	Less than -40.0	-13.0
9608.000	Less than -40.0	-13.0
12010.000	Less than -40.0	-13.0
14412.000	Less than -40.0	-13.0
16814.000	Less than -40.0	-13.0
19216.000	Less than -40.0	-13.0
21618.000	Less than -40.0	-13.0
24020.000	Less than -40.0	-13.0

Frequency: 2454.000 MHz

Spurious emission (MHz)	Emission level (dBm)	Limit (dBm)
2454.000	6.4	Not applicable
4908.000	-38.0	-13.6
7362.000	Less than -40.0	-13.6
9816.000	Less than -40.0	-13.6
12270.000	Less than -40.0	-13.6
14724.000	Less than -40.0	-13.6
17178.000	Less than -40.0	-13.6
19632.000	Less than -40.0	-13.6
22086.000	Less than -40.0	-13.6
24540.000	Less than -40.0	-13.6

Frequency: 2480.000 MHz

Spurious emission	Emission level	Limit
(MHz)	(dBm)	(dBm)
2480.000	6.3	Not applicable
4960.000	-38.0	-13.7
7440.000	Less than -40.0	-13.7
9920.000	Less than -40.0	-13.7
12400.000	Less than -40.0	-13.7
14880.000	Less than -40.0	-13.7
17360.000	Less than -40.0	-13.7
19840.000	Less than -40.0	-13.7
22320.000	Less than -40.0	-13.7
24800.000	Less than -40.0	-13.7

Conducted Antenna Port - Transmitter Spurious Emissions cont.

No other spurious emissions were observed at the antenna port when conducted measurements were made up to the 10^{th} Harmonic of the transmit frequency.

A limit of -20 dBc had been applied with reference to the fundamental emission level when measured with a 100 kHz resolution bandwidth.

All spurious emission measurements were made using a 100 kHz resolution bandwidth.

Result: Complies

Measurement Uncertainty: ±3.3 dB



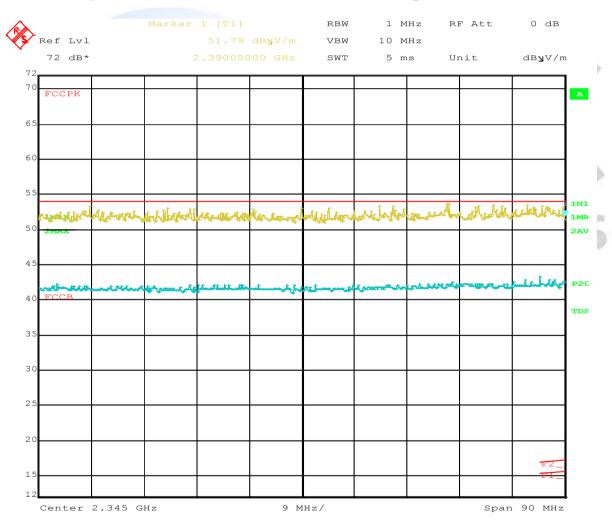
Radiated - Band Edge Measurements - Restricted Bands

When the device was transmitting on 2402 MHz and 2480 MHz radiated emission measurements were made at the open area test site in the 2310 - 2390 MHz restricted band and in the 2483.5 - 2500 MHz restricted band to determine compliance.

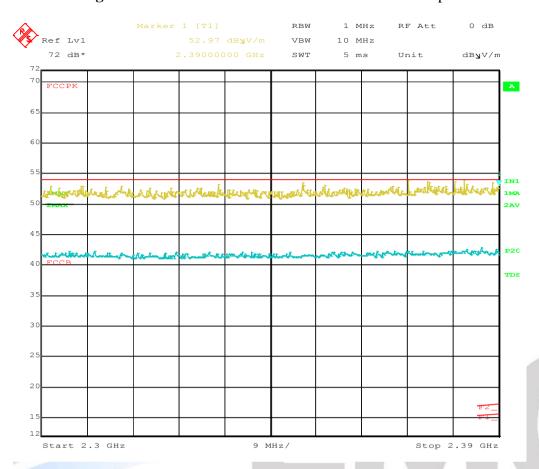
Measurements were made using a scanning measuring receiver that scanned between 2310 - 2390 MHz and between 2483.5 - 2500.0 MHz using both an Average and a Peak detector with a 1 MHz bandwidth in peak hold mode when the device was rotated and height scanned.

The Yellow trace represents measurements taken using a peak detector and the blue trace represents measurements taken using average detector.

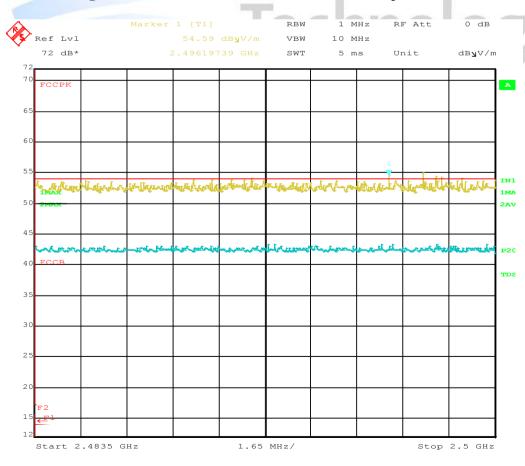
Transmitting on 2402 MHz: 2300 MHz – 2390 MHz Vertical polarization.



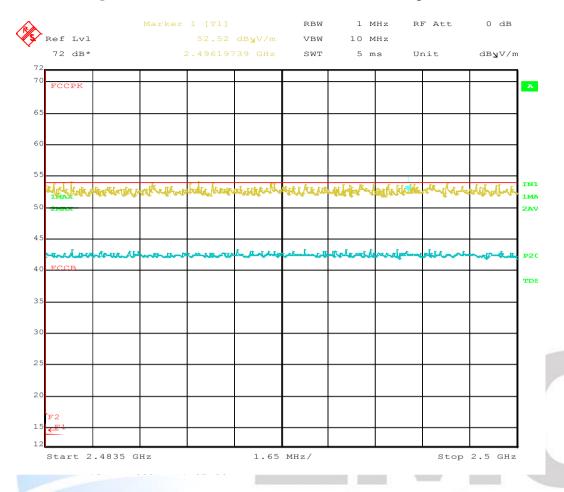
Transmitting on 2402 MHz: 2300 MHz – 2390 MHz Horizontal polarization



Transmitting on 2480 MHz: 2483.5-2500.0 MHz Vertical polarization.



Transmitting on 2480 MHz. 2483.5-2500.0 MHz Horizontal polarization.



The device was placed at a height of 1.5 metres above the ground plane.

All measurements were attempted at a distance of 3 metres using vertical and horizontal polarisations with a peak and an average detector with a 1 MHz bandwidth was used.

As per section 15.209 a limit of 500 uV/m applies to the restricted band 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

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

${\bf Radiated-Transmitter\ Spurious\ Emissions}$

Transmitting on 2402 MHz

Frequency	Vertical	Horizontal	Limit	Margin	Detector	Antenna	\mathbf{BW}
(MHz)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)			
4804.000	54.0	55.0	74.0	19.0	Peak	Vert/Hort	1 MHz
	46.0	49.0	54.0	5.0	Average	Vert/Hort	1 MHz
7206.000	55.0	55.0	74.0	19.0	Peak	Vert/Hort	1 MHz
	47.0	48.0	54.0	6.0	Average	Vert/Hort	1 MHz
9608.000	55.0	55.0	74.0	19.0	Peak	Vert/Hort	1 MHz
	45.0	45.0	54.0	9.0	Average	Vert/Hort	1 MHz
12010.000	< 59	< 59	74.0	> 15	Peak	Vert/Hort	1 MHz
	< 46	< 46	54.0	> 8	Average	Vert/Hort	1 MHz
14413.000	< 59	< 59	74.0	> 15	Peak	Vert/Hort	1 MHz
	< 46	< 46	54.0	> 8	Average	Vert/Hort	1 MHz
16814.000	< 59	< 59	74.0	> 15	Peak	Vert/Hort	1 MHz
	< 46	< 46	54.0	> 8	Average	Vert/Hort	1 MHz
19216.000	< 59	< 59	74.0	> 15	Peak	Vert/Hort	1 MHz
	< 46	< 46	54.0	> 8	Average	Vert/Hort	1 MHz
21618.000	< 59	< 59	74.0	> 15	Peak	Vert/Hort	1 MHz
	< 46	< 46	54.0	> 8	Average	Vert/Hort	1 MHz
24020.000	< 59	< 59	74.0	> 15	Peak	Vert/Hort	1 MHz
	< 46	< 46	54.0	> 8	Average	Vert/Hort	1 MHz

Radiated - Transmitter Harmonic Emissions

Transmitting on 2454 MHz

Frequency	Vertical	Horizontal	Limit	Margin	Detector	Antenna	\mathbf{BW}
(MHz)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)			
4908.000	57.3	54.5	74.0	16.7	Peak	Vert/Hort	1 MHz
	52.3	46.5	54.0	1.7	Average	Vert/Hort	1 MHz
7362.000	57.1	55.2	74.0	16.9	Peak	Vert/Hort	1 MHz
	52.1	47.1	54.0	1.9	Average	Vert/Hort	1 MHz
9816.000	56.9	56.0	74.0	17.1	Peak	Vert/Hort	1 MHz
	50.2	46.0	54.0	3.8	Average	Vert/Hort	1 MHz
12270.000	< 59	< 59	74.0	> 15	Peak	Vert/Hort	1 MHz
	< 46	< 46	54.0	> 8	Average	Vert/Hort	1 MHz
14724.000	< 59	< 59	74.0	> 15	Peak	Vert/Hort	1 MHz
	< 46	< 46	54.0	> 8	Average	Vert/Hort	1 MHz
17178.000	< 59	< 59	74.0	> 15	Peak	Vert/Hort	1 MHz
	< 46	< 46	54.0	> 8	Average	Vert/Hort	1 MHz
12.22.22							
19632.000	< 59	< 59	74.0	> 15	Peak	Vert/Hort	1 MHz
	< 46	< 46	54.0	> 8	Average	Vert/Hort	1 MHz
22086.000	< 59	< 59	74.0	> 15	Peak	Vert/Hort	1 MHz
	< 46	< 46	54.0	> 8	Average	Vert/Hort	1 MHz
21710077							4.3.555
24540.000	< 59	< 59	74.0	> 15	Peak	Vert/Hort	1 MHz
	< 46	< 46	54.0	> 8	Average	Vert/Hort	1 MHz

Radiated - Transmitter Harmonic Emissions

Transmitting on 2480 MHz

Frequency	Vertical	Horizontal	Limit	Margin	Detector	Antenna	\mathbf{BW}
(MHz)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)			
4960.000	54.0	55.0	74.0	19.0	Peak	Vert/Hort	1 MHz
	47.3	48.5	54.0	5.5	Average	Vert/Hort	1 MHz
7440.000	55.0	55.0	74.0	19.0	Peak	Vert/Hort	1 MHz
	49.0	47.0	54.0	5.0	Average	Vert/Hort	1 MHz
9920.000	55.0	55.0	74.0	19.0	Peak	Vert/Hort	1 MHz
	45.0	45.0	54.0	9.0	Average	Vert/Hort	1 MHz
12400.000	< 59	< 59	74.0	> 15	Peak	Vert/Hort	1 MHz
	< 46	< 46	54.0	> 8	Average	Vert/Hort	1 MHz
14880.000	< 59	< 59	74.0	> 15	Peak	Vert/Hort	1 MHz
	< 46	< 46	54.0	> 8	Average	Vert/Hort	1 MHz
17360.000	< 59	< 59	74.0	> 15	Peak	Vert/Hort	1 MHz
	< 46	< 46	54.0	> 8	Average	Vert/Hort	1 MHz
19840.000	< 59	< 59	74.0	> 15	Peak	Vert/Hort	1 MHz
	< 46	< 46	54.0	> 8	Average	Vert/Hort	1 MHz
		11.					
22320.000	< 59	< 59	74.0	> 15	Peak	Vert/Hort	1 MHz
	< 46	< 46	54.0	> 8	Average	Vert/Hort	1 MHz
24800.000	< 59	< 59	74.0	> 15	Peak	Vert/Hort	1 MHz
	< 46	< 46	54.0	> 8	Average	Vert/Hort	1 MHz

The device was placed at a height of 1.5 metres above the ground plane.

All measurements were attempted at a distance of 3 metres using vertical and horizontal polarisations with a peak and an average detector with a 1 MHz bandwidth was used.

As per section 15.209 a limit of 500 uV/m applies to the restricted band 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.

The section 15.209 limit has been applied as a worst case 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 15.247(i) – Radio Frequency Hazard Information

As per Section 15.247 (i) spread spectrum transmitters operating in the 2400.0 – 2483.5 MHz band are required to be operated in a manner that ensures that the public is not exposed to RF Energy levels in accordance with FCC KDB 447498 D01 v07 and CFR 47 Section 2.1091

The DMO1 module has been assessed as a Mobile device as per Appendix B – Exemptions for Single RF Sources.

In accordance with B3 an MPE based exemption has been determined.

When the DMO1 module is used it will possible to maintain a 20 cm separation distance between the product and user and / or bystander.

The device operates in the 2400 - 2483.5 MHz band.

The conducted power of this device has been measured to be +7.0 dBm or 5.0 mW

A half dipole antenna with a maximum gain of +4 dBi (2.51) would typically be attached to this module.

In accordance with Formula (B.1) the threshold power P_{th} (mW) will equal the ERP_{20cm} (mW) which is stated to be 3060 mW for frequencies between 1.5 GHz and 6.0 GHz.

The EIRP of the DMO1 Module has calculated to be +7 dBm + 4 dBi = +11 dBm EIRP.

This gives an EIRP radiated power of 12.6 mW

The device will not exceed the threshold power.

An MPE based exemption can therefore be applied provided a safe distance of 20 cm is specified in the user manual for this device

Result: Complies

7. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial No	Asset Ref	Cal Due	Period
Aerial Controller	EMCO	1090	9112-1062	RFS 3710	Not applic	Not applic
Aerial Mast	EMCO	1070-1	9203-1661	RFS 3708	Not applic	Not applic
Biconical Antenna	Schwarzbeck	BBA 9106	=	3680	1 Jan 2022	3 years
Horn Antenna	EMCO	3115	9511-4629	E1526	1 Jan 2022	3 years
Horn Antenna	EMCO	3116	92035	E1527	20 Feb 2022	3 years
Log Periodic	Schwarzbeck	VUSLP 9111	9111-112	EMC4025	1 Jan 2022	3 years
Loop Antenna	EMCO	6502	9003-2485	3798	1 Jan 2022	3 years
Mains Network	R & S	ESH2-Z5	881362/032	3628	12 Oct 2022	2 years
Receiver	R & S	ESHS 10	828404/005	3728	10 Mar 2022	2 year
Receiver	R & S	ESIB 40	100295	INV0818	3 June 2023	2 year
Spectrum Analyser	Keysight	N9038A	MY57290153	E4033	29 Jan 2022	1 year
Turntable	EMCO	1080-1-2.1	9109-1578	RFS 3709	Not applic	Not applic
VHF Balun	Schwarzbeck	VHA 9103	9594	3696	1 Jan 2022	3 years
Heliax cable	Andrews	L6PNM-RPD	22869	Oats Cable	30 Dec 2022	1 year
Succoflex cable	Huber and Suhner	104 3m n-n	339901/4	13938	10 Nov 2022	1 year
Succoflex cable	Huber and Suhner	104 1m n-n	340521/4	13937	10 Nov 2022	1 year
Power Supply	APT	7008	4170003	·	Not applic	Not applic
Voltage Variac	Powerteck	SRV-5	RFS3800	-	- /	Not applic

At the time of testing all test 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

Host Device







Radiated Emissions Test Setup – Host Device (Below 1000 MHz)



