March 19, 2021

InfiNet Malta LTD
Vsevolod Doronin
Level 1, Britannia House, 9 Old Bakery Street
Valletta VLT 1450 Malta

Dear Vsevolod Doronin,

Enclosed is the Electromagnetic Compatibility for the InfiNet Malta LTD, Q5-E/04701, tested to the requirements of:

- FCC Part 15 Subpart B

Thank you for using the services of Eurofins Electrical and Electronic Testing NA, Inc. Please contact me if you have any questions regarding these results or if Eurofins E&E can be of further service to you.

Sincerely,

Michelle Tawmging

Documentation Department
Eurofins Electrical and Electronic Testing NA, Inc.

Reference: EMC110274-FCC Rev. 1

A2LA ACCREDITED TESTINGCERT #0591.01

Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	March 11, 2021	Initial Issue.
1	March 19, 2021	Implemented Customer-Requested Revisions.

Table of Contents

1.0 Testing Summary

The InfiNet Malta LTD, Q5-E/04701 was found to be compliant to the following specification(s).

- FCC Part 15 Subpart B

Donald Salguero
EMC Laboratory Engineer

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements.

Steve Pitta
Director, Operations Strategy

2.0 Overview

Eurofins Electrical and Electronic Testing NA, Inc. was contracted by InfiNet Malta LTD to perform testing on the Q5-E/04701, under purchase order number IM00-000331.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of InfiNet Malta LTD, Q5-E/04701.

The results obtained relate only to the item(s) tested.

Model(s) Tested:	Q5-E/04701
Equipment Emissions Class:	B

2.1 Test Site

All testing was performed at Eurofins Electrical and Electronic Testing NA, Inc., 914 West Patapsco Avenue, Baltimore, MD 21230. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology. Eurofins Electrical and Electronic Testing NA, Inc. has been accredited by the American Association for Laboratory Accreditation (A2LA) (Certificate #: 0591.01) in accordance with ISO/IEC 17025:2017.

2.2 Measurement Uncertainty

Measurement uncertainty calculated as per NIST Technical Note (TN) 1297 and ANSI / NCSL Z540-2, as equivalent to EN 55016-4-2 / IEC CISPR 16-4-2.

Test Method	Typical Expanded Uncertainty (dB)	K	Confidence Level
Radiated Emissions, (30 MHz – 1 GHz)	±3.20	2	95%
Radiated Emissions, (1 GHz – 6 GHz)	±2.52	2	95%
Conducted Emission Voltage	±2.03	2	95%
Conducted Emission Telecom	±1.58	2	95%

Measurement Uncertainty

2.4 Equipment Overview and Test Configuration

Name of EUT/Model:	Q5-E/04701
Description of EUT and its intended use:	5GHz fixed wireless service point-to-point RF-transceiver for various purposes, with wired Ethernet network connection, PoE powered, intended to be mounted on towers/masts.
Selected Operation Mode(s):	For the purpose of testing, there are several operational modes offered: 1) Master mode - for the purpose of testing of transmitter qualities (i.e. spurious emissions, power and power density, etc.) it is enough to manage device to work in a Master mode on a desired channel. In that mode, radio of device periodically transmits beacon packets, representative of actual traffic; 2) Slave mode - for the purpose of testing of receiver qualities (i.e. spurious emissions) it is enough to manage device to work in a Slave mode on a desired channel. In that mode and in the absence of master, radio of device is in constant receiving state; 3) Radio switched off - for the purpose of testing qualities of unintentional radiator it is enough to switch off the radio off. CPU, RAM, Ethernet and other on-board devices that may be incidental radiators continue to operate as usual.
Rationale for the selection of the Operation Mode(s):	Spectrum of a device's RF output was observed by conductively (via coaxial cable) connecting it to a spectrum analyzer and number of frequencies with disturbances of highest levels was then noted. It was found, that disturbances' levels of radio are not affected by origin of traffic (self-generated packets or data from external source), neither do they depend on center frequency of selected channel, bandwidth, modulation or duty cycle. Regarding conductive emissions of Ethernet port, level of those emission was observed by connecting Ethernet cable to measuring receiver via coupling network (AAN). It was found, that disturbances of highest levels are not affected by data activity on port but significantly depend on cable length: levels increase with increase of cable length. Thus, cabling and modes of operation were identified so to demonstrate worst case EMC condition.
Monitoring Method(s):	LEDs on the rear side of the enclosure are indicating powering and Received Signal Strength (RSSI). Not glowing LEDs indicate that EUT is not powered. LED on the bottom of the scale, the closest one to 'PWR' designator, when glowing, indicates that the board is powered. Next on top LED signalizes Ethernet connectivity: red means the EUT is not connected to another networking device, green means the EUT's Ethernet is operating at speed 1000Mbps, amber means the EUT's Ethernet is operating at speed 100Mbps. Monitoring transmitter/receiver parameters may be done via HTTP (user web-interface) or Telnet protocol. State of the radio of a normally operating device in Master mode (i.e. transceiver) is "started". In that state, device already transmits beacon packets. State of the radio of a normally operating Slave device is "connecting" or "base_detection". In that state, device is already constantly receiving.
Emissions Class Declaration:	Class B
Configuration(s):	Single device, either Master or Slave mode (radiating setup) – Antenna (provided separately) is connected to EUT and mounted on the same pole, EUT itself and the antenna are oriented in needed direction. Ethernet port of EUT should be connected to 'PWR OUT' port of PoE injector. 'DATA IN' port of PoE injector should be connected to a PC or networking device (switch, router). AC input port of the PoE injector should be connected to AC mains outlet (100 to 240 V AC). For quick software configuration, refer to "Test prescriptions.pdf" (uploaded to METrak). Single device, either Master or Slave mode (conductive setup) – Coaxial cables are connected to RF-ports of the EUT, other ends of cables are terminated on 50 Ohm loads or inputs of measuring equipment. Ethernet port of EUT should be connected to 'PWR OUT' port of PoE injector. 'DATA IN' port of PoE injector should be connected to a PC or networking device (switch, router). AC input port of the PoE injector should be connected to AC mains outlet (100 to 240 V AC). For quick software configuration, refer to "Test prescriptions.pdf" (uploaded to METrak).
EUT Power Requirement	
Voltage:	100...240
AC or DC:	AC
Voltage Frequency:	50
Number of Phases:	1
Current:	0.4
Physical Description	
EUT Arrangement:	Table Top
System with Multiple Chassis?	False

Size (HxWxD - inches):	7.1x7.5x3.4
Weight (lbs.):	2.64
Highest Internal Frequency (MHz):	1333 (digital device), 5845 (RF)
Other Info	
EUT Software (internal to EUT):	unit's firmware
Support Software (used by support PC to exercise EUT):	telnet client, web browser
Firmware:	preinstalled, H18S14-OCTOPUS_PTPv1.3.0, revision 018O0012
Transmitter Parameters	
Description of your unit:	MIMO SC-FDE
Modulation Type:	QPSK, QAM16, QAM64, QAM256
Number of Channels:	12
Frequency range (MHz):	5735-5845
Antenna Type:	external
Antenna Gain (db):	up to 23dBi
Data Rates:	flexible, 2.3Mbps to 461Mbps
Expected Power Level:	15mW (11dBm) total
Number of Antenna:	2
Number of Intentional Transmitters:	1
Number of Certified Intentional Transmitter Modules:	0

Equipment Details

Ref. ID	Slot #	Name/Description	Model Number	Part Number	Serial Number	Rev. #
A		RF-transceiver	Q5-E/04701		700113, 700115, 700119, 700567	
		Bracket for mounting on a pipe rack	MOUNT-KIT-85			

Equipment Configuration

Ref. ID	Port Name on EUT	Cable Description or reason for no cable	Qty	Length as tested (m)	Max Length (m)	Shielded? (Y/N)	Termination Box ID & Port Name
1	A. Ethernet port	Cat5e UTP, 4 pairs	1	3	90	No	B. PWR OUT
2	B. DATA IN	Cat5e UTP, 4 pairs	1	2	-	No	(to PC or to networking device)
3	B. AC Input	3 conductor cord	1	2	-	No	(100...240V/50...60Hz)
4	A. (grounding screw hole)	Grounding wire crimped with grounding ring, wire gauge not less than 10awg	1	2	-	No	(to ground plane)
5	N-type(f) ports	50 Ohm coaxial cables, SMA(m)/3.5(m) to N-type(m) connectors o	2	0.5	2.5	Yes	C. SMA(f) ports
5	N-type(f) ports	50 Ohm coaxial cables with N-type(m) connectors on one end	2	0.5	2.5	Yes	(to 50Ω loads/measuring equipment/distribution)

Ports and Cabling

Ref. ID	Name/Description	Manufacturer	Model Number	Customer Supplied Calibration Data
B	PoE Injector, AC/DC converter	Microsemi	PD-ACDC48GR/AC (PD-6641G300)	
C	External antenna	MARS antennas	MA-WA56-DP23	
	Enclosure for mounting			
	Bracket for mounting on a pipe rack	Infinet LLC	MOUNT-KIT-85	

Support Equipment

2.5 Modifications to the EUT

No modifications were made to the EUT.

2.6 Modifications to the Standard

No modifications were made to the Test Standard.

2.7 Disposition of EUT

The test sample including all support equipment (if any), submitted to the Electromagnetic Compatibility Lab for testing was returned to InfiNet Malta LTD upon completion of testing.

3.0 Electromagnetic Compatibility Emission Criteria

3.1 Limits for Conducted Disturbance at Mains Terminals

Test Method: ANSI C63.4-2014

Sample Calculation:

$$R_f - S = M$$

where:

R_f = Receiver Reading in dBuV
S = Specification Limit in dBuV
M = Margin to Specification in +/- dB

Sample formula for calculating the Corrected Data for the Conducted Emissions Measurements:

Line	Freq (MHz)	Uncorrected QP** Amplitude (dBµV)	LISN IL (dB)	CBL (dB)	Corrected QP** Amplitude (dBµV)	QP** Limit (dBµV)	Delta (dB)	Results
XYZ	0.18	42.65	10	0.58	53.23	79	-25.77	Pass

*Corrected QP** Amplitude (dBµV) = Uncorrected Amplitude (dBµV) +LISN IL (dB) + CBL (dB) =42.65+10+0.58=53.23*
*** Same Calculation applies to Corrected Avg. amplitude as well.*

Test Requirement(s): The following standards specified below are covered in the scope of this section of the test report:

- FCC Part 15 Subpart B

The EUT shall meet the Class B limits shown in the table below.

Frequency Range (MHz)	Class A Limits(dBµV)		Class B Limits (dBµV)	
	Quasi-Peak	Average	Quasi- Peak	Average
0.15 - 0.5	79	66	66 to 56	56 to 46
0.5 - 5	73	60	56	46
5 - 30	73	60	60	50
Note 1 – The lower limit shall apply at the transition frequencies. Note 2 – The limit decreases linearly with the logarithm if the frequency in the range 0.15 MHz to 0.5 MHz.				

Conducted Emissions - Limits

Test Procedure: The EUT was placed on a non-metallic table, 80 cm above the ground plane and 40 cm away from the vertical reference ground plane. The method of testing, test conditions, and test procedures of ANSI C63.4-2014 were used. The EUT was powered through a 50Ω/50µH LISN. An EMI receiver, connected to the measurement port of the LISN, scanned the frequency range from 150 kHz to 30 MHz in order to find the peak conducted emissions. All peak emissions within 6 dB of the limit were re-measured using a quasi-peak and/or average detector as appropriate. Any measured frequency that exhibits a margin of compliance that is less than 3 dB below the specification limit is marked. MET recommends that every emission measured, has at least a 3 dB margin to allow for deviations in the emission characteristics that may occur during the production process. Photographs of test setup are presented below.

Test Software Used: Trace Data Grabber version 11/24/08 was used to perform this test.

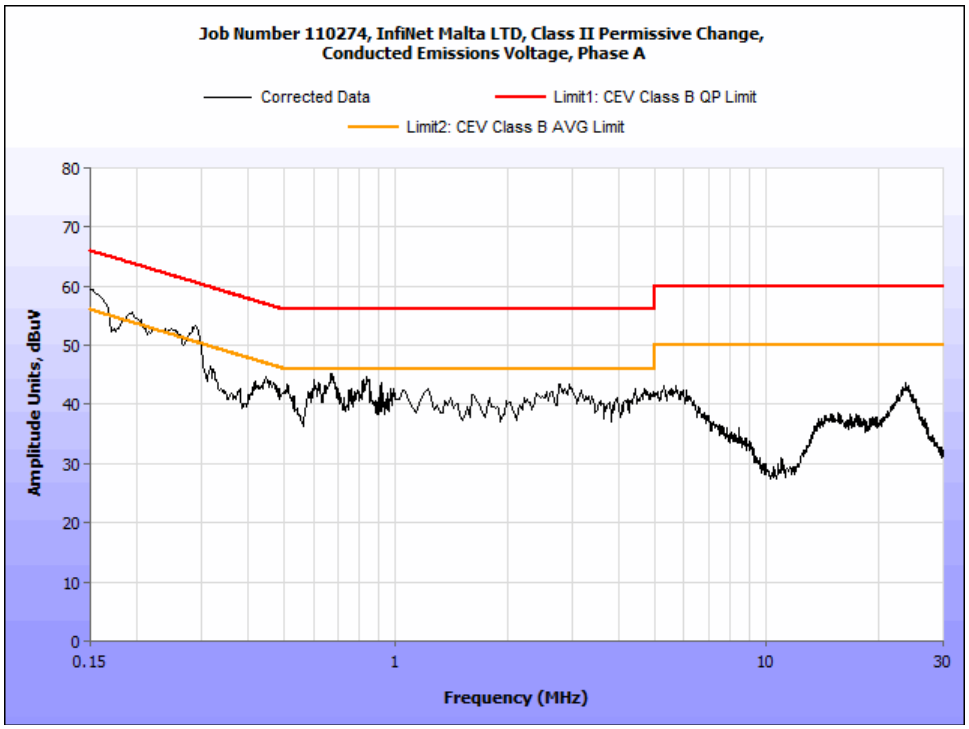
Test Results:

Test Standard:	FCC Part 15 Subpart B Class B
Test Name	Conducted Emissions
Test Dates:	March 3, 2021
Laboratory	Eurofins Electrical and Electronic Testing NA, Inc.
Test Engineer:	Donald Salguero
Test Results:	Compliant
Additional Notes:	Measured emissions were below applicable limits.

Test Data

Freq-uency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measure-ment (dBuV) QP	Limit (dBuV) QP	Pass/ Fail QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measure-ment (dBuV) AVG	Limit (dBuV) AVG	Pass/ Fail AVG	Margin (dB) AVG
0.154	47.26	0	57.26	65.78	PASS	-8.52	35.89	0	45.89	55.78	PASS	-9.89
0.1962	40.53	0	50.53	63.77	PASS	-13.24	29.49	0	39.49	53.77	PASS	-14.28
0.2854	39.45	0	49.45	60.66	PASS	-11.21	34.9	0	44.9	50.66	PASS	-5.76
0.6695	28.51	0	38.51	56	PASS	-17.49	20.46	0	30.46	46	PASS	-15.54
0.8425	28.74	0	38.74	56	PASS	-17.26	18.97	0	28.97	46	PASS	-17.03
2.795	28.79	0	38.79	56	PASS	-17.21	20.61	0	30.61	46	PASS	-15.39

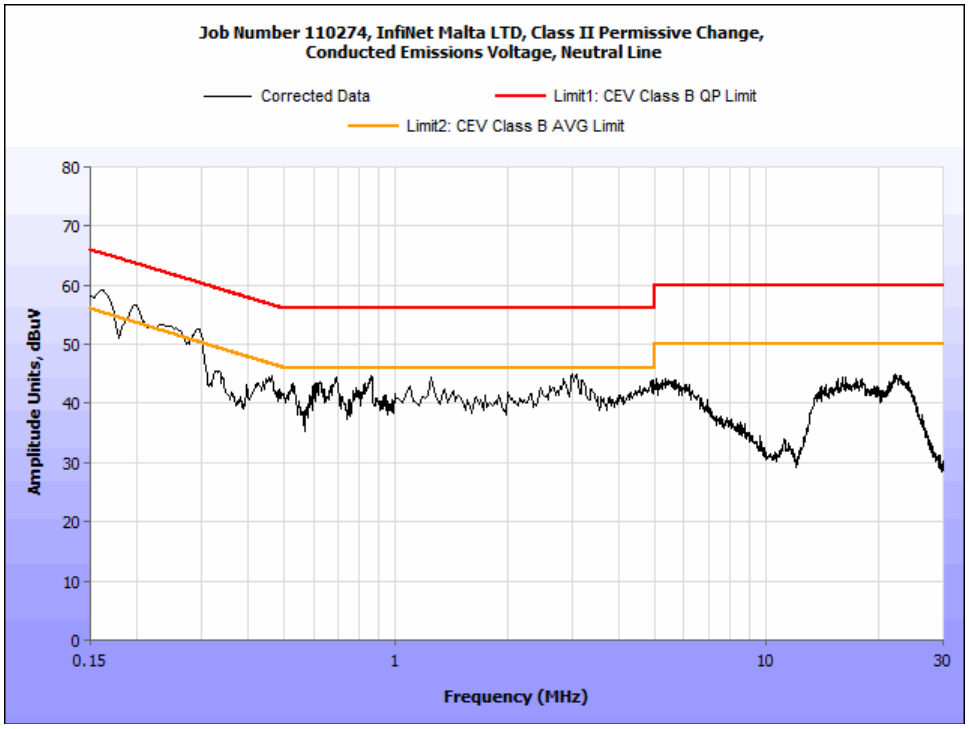
Conducted Emissions at the Mains Port, Phase Line, Test Data



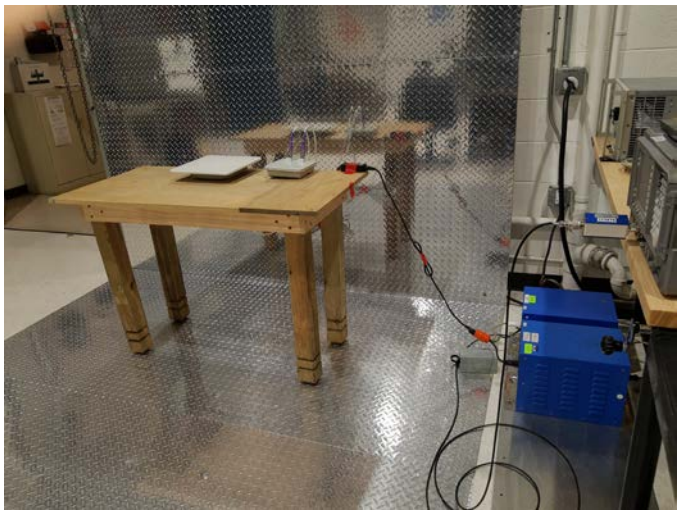
Conducted Emissions at the Mains Port, Phase Line, Prescan

Freq-uency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measure-ment (dBuV) QP	Limit (dBuV) QP	Pass/ Fail QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measure-ment (dBuV) AVG	Limit (dBuV) AVG	Pass/ Fail AVG	Margin (dB) AVG
0.1638	45.93	0	55.93	65.27	PASS	-9.34	36.23	0	46.23	55.27	PASS	-9.04
0.1992	41.51	0	51.51	63.64	PASS	-12.13	29.14	0	39.14	53.64	PASS	-14.5
0.2913	39.56	0	49.56	60.49	PASS	-10.93	34.69	0	44.69	50.49	PASS	-5.8
0.6771	29.4	0	39.4	56	PASS	-16.6	22.26	0	32.26	46	PASS	-13.74
0.839	29.59	0	39.59	56	PASS	-16.41	20.78	0	30.78	46	PASS	-15.22
2.86	27.89	0	37.89	56	PASS	-18.11	19.75	0	29.75	46	PASS	-16.25

Conducted Emissions at the Mains Port, Neutral Line, Test Data



Conducted Emissions at the Mains Port, Neutral Line, Prescan



Conducted Emissions at the Mains Port, Test Setup

MET #	EQUIPMENT	MANUFACTURER	MODEL#	CAL DATE	CAL DUE
1T4797	LISN	COM-POWER	LI-150A	11/12/2019	06/12/2021
1T4612	SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4407B	03/04/2020	09/04/2021
1T4875	LISN	COM-POWER	LI-150A	11/12/2019	05/12/2021
1T9583	THERMO/HYGROMETER	CONTROL COMPANY	9337T07	05/09/2019	05/09/2021
1T8834	CONDUCTED COMB GENERATOR	COM-POWER	CGC-255E	11/13/2019	05/13/2021

Conducted Emissions at the Mains Port, Test Equipment List

3.3 Radiated Emissions: Limits of Electromagnetic Radiation Disturbance

Test Method: ANSI C63.4-2014

Test Requirement(s): The following standards specified below are covered in the scope of this section of the test report:

- FCC Part 15 Subpart B

§15.109 (a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Field Strength (dBµV/m)
30 - 88	40.00
88 - 216	43.50
216 - 960	46.00
Above 960	54.00

Sample Calculation for Distance Correction factor (DCF) measurement:

$F_d = 20*LOG_{10}(D_m/D_s)$

where:

F_d = Distance Factor in dB
D_m = Measurement Distance in meters
D_s = Specification Distance in meters

Sample formula for calculating the Corrected Data for the Radiated Emissions Measurements:

Frequency (MHz)	Antenna Polarity	EUT Azimuth (Degrees)	Antenna Height (cm)	Uncorrected Amplitude (dBµV)	ACF (dB/m) (+)	Pre Amp Gain (dB)(-)	CBL (dB) (+)	DCF (dB) (+)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
249.99	V	359.9	240.7	55.46	11.4	28.335	0	0	***38.505***	47	-8.495

Corrected Amplitude (dBµV/m) = Uncorrected Amplitude (dBµV) +ACF (dB/m) - Preamp Gain (dB) + CBL (dB) +DCF (dB) = 55.46 + 11.4 - 28.355 + 0 + 0 = ***38.505***

Test Procedure: The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber. The method of testing, test conditions, and test procedures of ANSI C63.4-2014 were used. Any measured frequency that exhibits a margin of compliance that is less than 3 dB below the specification limit is marked. MET recommends that every emission measured, has at least a 3 dB margin to allow for deviations in the emission characteristics that may occur during the production process.

For emissions between 30 MHz and 1000 MHz, a biconilog antenna was located 3m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. Unless otherwise specified, measurements were made using a quasi-peak detector with a 120 kHz resolution bandwidth.

Test Software Used: EMC-REG-TDS-11, Radiated Emissions Prescan.xls version 06/29/11 were used to perform this test.

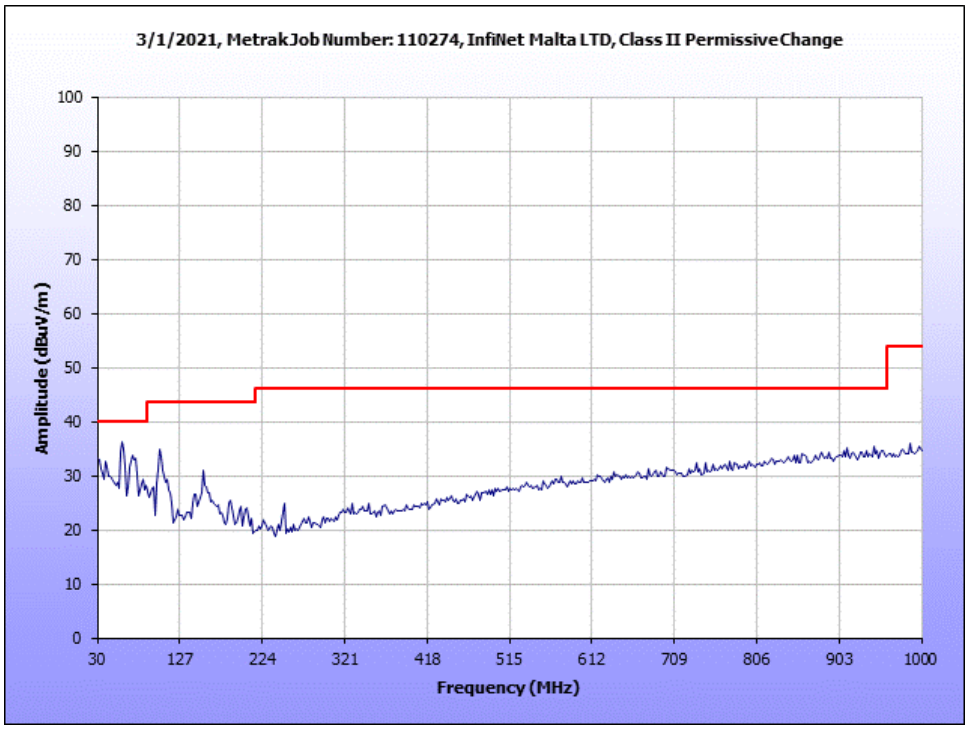
Test Results:

Test Standard:	FCC Part 15 Subpart B Class B
Test Name	Radiated Emissions
Test Dates:	March 1, 2021
Laboratory	Eurofins Electrical and Electronic Testing NA, Inc.
Test Engineer:	Donald Salguero
Test Results:	Compliant
Additional Notes:	Measured emissions were below applicable limits.

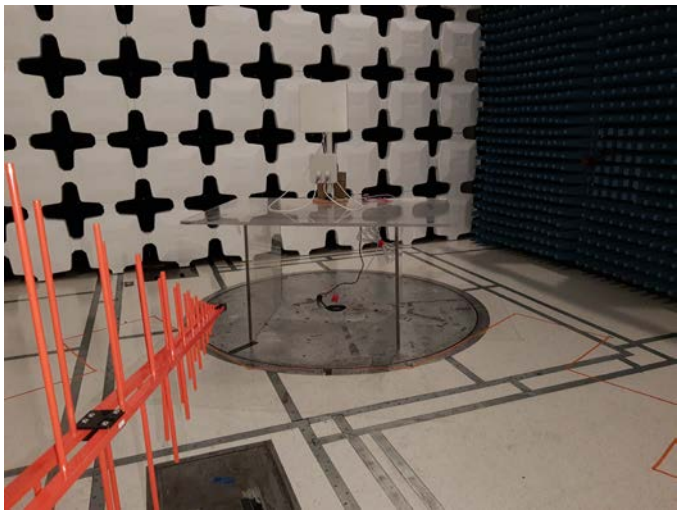
Test Data

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected EMI Meter Reading (dBuV)	Antenna Correction Factor (dB/m) (+)	Cable Loss/Pre-amp (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/ Fail
58.938878	222	H	1.5521	8.78	11.90	1.38	0	22.06	40	-17.94	pass
58.938878	76	V	1.0017	18.4	11.90	1.38	0	31.68	40	-8.32	pass
69.257515	171	H	2.1021	7.72	12.50	1.45	0	21.67	40	-18.33	pass
69.257515	248	V	1.0191	14.23	12.50	1.45	0	28.18	40	-11.82	pass
104.04709	353	H	1.0152	7.11	15.71	1.78	0	24.60	43.5	-18.90	pass
104.04709	156	V	1.0152	14.46	15.71	1.78	0	31.95	43.5	-11.55	pass
154.8487	360	H	1.8808	7.96	17.50	2.17	0	27.63	43.5	-15.87	pass
154.8487	138	V	1.0152	9.34	17.50	2.17	0	29.01	43.5	-14.49	pass
930	14	H	1.0091	6.58	27.30	5.32	0	39.20	46	-6.80	pass
930	345	V	1.0078	6.58	27.30	5.32	0	39.20	46	-6.80	pass
30	166	H	1.1539	5.95	26.50	1.02	0	33.47	40	-6.53	pass
30	12	V	1.0665	6.37	26.50	1.02	0	33.89	40	-6.11	pass

Radiated Emissions, Test Data



Radiated Emissions, 30 MHz – 1 GHz, Prescan



Radiated Emissions, 30 MHz – 1 GHz, Test Setup

MET #	EQUIPMENT	MANUFACTURER	MODEL#	CAL DATE	CAL DUE
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	01/21/2021	01/21/2022
1T4753	ANTENNA - BILOG	SUNOL SCIENCES	JB6	21/12/2020	21/06/2022
1T4300B	SEMI-ANECHOIC 3M CHAMBER SVSWR	EMC TEST SYSTEMS	NONE	08/16/2019	08/16/2021
1T4300	SEMI-ANECHOIC CHAMBER (NSA)	EMC TEST SYSTEMS	NONE	08/16/2019	08/16/2021

Radiated Emissions, Test Equipment List

END OF REPORT

