Report on the FCC and IC Testing of the

SureFlap Ltd
Cat Flap Connect. Model: iDSCF

In accordance with FCC 47 CFR Part 15C, Industry Canada RSS-247 and Industry Canada RSS-GEN

Product Service

Choose certainty.
Add value.

Prepared for: SureFlap Ltd
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FCC ID: XO9-DSCF-1002 IC: 8906A-DSCF1002

COMMERCIAL-IN-CONFIDENCE

Date: June 2018
Document Number: 75941461-06 | Issue: 01

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Project Management	Natalie Bennett	19 June 2018	
Authorised Signatory	Matthew Russell	19 June 2018	

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 15C, Industry Canada RSS-247 and Industry Canada RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Mehadi Choudhury	19 June 2018	
Testing	Graeme Lawler	19 June 2018	

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

Industry Canada Accreditation
IC2932B-1 Octagon House, Fareham Test Laboratory

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15C: 2017, Industry Canada RSS-247: Issue 2 (2017-02) and Industry Canada RSS-GEN: Issue 4 (2014-11).

TÜV SÜD Product Service
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Product Service

Contents

1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	19 June 2018

1.2 Introduction

Applicant	SureFlap Ltd
Manufacturer	SureFlap Ltd
Model Number(s)	iDSCF
Serial Number(s)	Not Serialised (75941461-TSR0018) and N001-0000973
Hardware Version(s)	00500621-DA_02 Internet 00500621-DA_02 Internet DualScan Cat Flap General Assembly (_02: revision 02)
Software Version(s)	Firmware 01127_FF (but special version for TUV SUD testing)
Number of Samples Tested	2
Test Specification/Issue/Date	FCC 47 CFR Part 15C: 2017 Industry Canada RSS-247: Issue 2 (2017-02) Industry Canada RSS-GEN: Issue 4 (2014-11)
Order Number Date	2265 19-January-2018
Date of Receipt of EUT	14-February-2018 and 25-May-2018
Start of Test	19-February-2018
Finish of Test	28-May-2018
Name of Engineer(s)	Mehadi Choudhury and Graeme Lawler
Related Document(s)	ANSI C63.10 (2013)

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1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15C, Industry Canada RSS-247 and Industry Canada RSS-GEN is shown below.

Section	Specification Clause			Test Description	Result	Comments/Base Standard
	Part 15C	RSS-247	RSS-GEN			
Configuration and Mode: 2.4 GHz (Zigbee)						
2.1	15.247 (b)	5.4	6.12	Maximum Conducted Output Power	Pass	ANSI C63.10 (2013)
2.2	15.247 (e)	5.2	-	Power Spectral Density	Pass	ANSI C63.10 (2013)
2.3	15.247 (a)(2)	5.2	6.6	Emission Bandwidth	Pass	ANSI C63.10 (2013)
2.4	15.247 (d)	5.5	-	Authorised Band Edges	Pass	ANSI C63.10 (2013)
2.5	15.205	-	8.10	Restricted Band Edges	Pass	ANSI C63.10 (2013)
2.6	15.247 (d) and 15.205	5.5	6.13	Spurious Radiated Emissions	Pass	ANSI C63.10 (2013)

1.4 Application Form

EQUIPMENT DESCRIPTION	
Model Name/Number	iDSCF
Part Number	N/A
Hardware Version	00500621-DA_02 Internet DualScan Cat Flap General Assembly (_02: revision 02)
Software Version	Firmware 01127_FF (but special version for TUV SUD testing)
FCC ID (if applicable)	XO9-DSCF-1002
Industry Canada ID (if applicable)	8906A-DSCF1002
Technical Description (Please provide a brief description of the intended use of the equipment)	CatFlap connected by 2.4 GHz RF to a hub which is connected to the internet. Allows the conditional entry of animals based on RFID tags. Usually situated in an external door of a house.

Types of Modulations used by the Equipment	
☐	FHSS
☒	Other forms of modulation
In case of FHSS Modulation	
In case of non-Adaptive Frequency Hopping equipment:	
	Number of Hopping Frequencies:
In case of Adaptive Frequency Hopping Equipment:	
	Maximum number of Hopping Frequencies:
	Minimum number of Hopping Frequencies:
Dwell Time:	
Adaptive / non-adaptive equipment:	
☒	non-adaptive Equipment
☐	adaptive Equipment without the possibility to switch to a non-adaptive mode
☐	adaptive Equipment which can also operate in a non-adaptive mode
In case of adaptive equipment:	
The maximum Channel Occupancy Time implemented by the equipment: ms	
☐	The equipment has implemented an LBT based DAA mechanism
In case of equipment using modulation different from FHSS:	
☐	The equipment is Frame Based equipment
☐	The equipment is Load Based equipment
☐	The equipment can switch dynamically between Frame Based and Load Based equipment
The CCA time implemented by the equipment: µs	
☐	The equipment has implemented an non-LBT based DAA mechanism
☐	The equipment can operate in more than one adaptive mode

In case of non-adaptive Equipment:	
The maximum RF Output Power (e.i.r.p.): 4 dBm	
The maximum (corresponding) Duty Cycle: 1 %	
Equipment with dynamic behaviour, that behaviour is described here. (e.g. the different combinations of duty cycle and corresponding power levels to be declared):	
N/A	
The worst case operational mode for each of the following tests:	
RF Output Power: 4 dBm	
Power Spectral Density:	
Duty cycle, Tx-Sequence, Tx-gap: 1%	
Accumulated Transmit Time, Frequency Occupation & Hopping Sequence (only for FHSS equipment):	
Hopping Frequency Separation (only for FHSS equipment):	
Medium Utilisation:	
Adaptivity & Receiver Blocking:	
Nominal Channel Bandwidth:	
Transmitter unwanted emissions in the OOB domain:	
Transmitter unwanted emissions in the spurious domain:	
Receiver spurious emissions:	
The different transmit operating modes (tick all that apply):	
☒	Operating mode 1: Single Antenna Equipment
☒	Equipment with only 1 antenna
☐	Equipment with 2 diversity antennas but only 1 antenna active at any moment in time
☐	Smart Antenna Systems with 2 or more antennas, but operating in a (legacy) mode where only 1 antenna is used. (e.g. IEEE 802.11™ [i.3] legacy mode in smart antenna systems)
☐	Operating mode 2: Smart Antenna Systems - Multiple Antennas without beam forming
☐	Single spatial stream / Standard throughput / (e.g. IEEE 802.11™ [i.3] legacy mode)
☐	High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1
☐	High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2
☐	High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 3
☐	High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 4
☐	High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 5
NOTE: Add more lines if more channel bandwidths are supported.	
☐	Operating mode 3: Smart Antenna Systems - Multiple Antennas with beam forming
☐	Single spatial stream / Standard throughput (e.g. IEEE 802.11™ [i.3] legacy mode)
☐	High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1
☐	High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2
☐	High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 3
☐	High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 4
☐	High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 5
NOTE: Add more lines if more channel bandwidths are supported.	

In case of Smart Antenna Systems:
The number of Receive chains:
The number of Transmit chains:
☐ symmetrical power distribution
☐ asymmetrical power distribution
In case of beam forming, the maximum (additional) beam forming gain: dB
NOTE: The additional beam forming gain does not include the basic gain of a single antenna.
Operating Frequency Range(s) of the equipment:
Operating Frequency Range 1: 2425 MHz to 2480 MHz
Operating Frequency Range 2: MHz to MHz
Operating Frequency Range 3: MHz to MHz
NOTE: Add more lines if more Frequency Ranges are supported.
Nominal Channel Bandwidth(s):
Nominal Channel Bandwidth1: TBC MHz
Nominal Channel Bandwidth2: MHz
Nominal Channel Bandwidth3: MHz
Nominal Channel Bandwidth4: MHz
Nominal Channel Bandwidth5: MHz
NOTE: Add more lines if more channel bandwidths are supported.
Type of Equipment (stand-alone, combined, plug-in radio device, etc.):
☒ Stand-alone
☐ Combined Equipment (Equipment where the radio part is fully integrated within another type of equipment)
☐ Plug-in radio device (Equipment intended for a variety of host systems)
☐ Other
The normal and extreme operating conditions that apply to the equipment:
Normal operating conditions (if applicable):
Operating temperature: 25 °C
Other (please specify if applicable):
Extreme operating conditions:
Operating temperature range: Minimum -20 °C to Maximum 55 °C
Other (please specify if applicable): Minimum °C to Maximum °C
Details provided are for the:
☒ stand-alone equipment
☐ combined (or host) equipment
☐ test jig

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The intended combination(s) of the radio equipment power settings and one or more antenna assemblies and their corresponding e.i.r.p levels:			
Antenna Type:			
☒ Integral Antenna (information to be provided in case of conducted measurements)			
Antenna Gain: 2 dBi			
If applicable, additional beamforming gain (excluding basic antenna gain): dB			
☐ Temporary RF connector provided			
☐ No temporary RF connector provided			
☐ Dedicated Antennas (equipment with antenna connector)			
☐ Single power level with corresponding antenna(s)			
☐ Multiple power settings and corresponding antenna(s)			
Number of different Power Levels:			
Power Level 1: dBm			
Power Level 2: dBm			
Power Level 3: dBm			
NOTE 1: Add more lines in case the equipment has more power levels.			
NOTE 2: These power levels are conducted power levels (at antenna connector).			
For each of the Power Levels, provide the intended antenna assemblies, their corresponding gains (G) and the resulting e.i.r.p. levels also taking into account the beamforming gain (Y) if applicable			
Power Level 1: dBm			
Number of antenna assemblies provided for this power level:			
Assembly #	**Gain (dBi)**	**e.i.r.p (dBm)**	**Part number or model number**
1			
2			
NOTE: Add more rows in case more antenna assemblies are supported for this power level.			
Power Level 2: dBm			
Number of antenna assemblies provided for this power level:			
Assembly #	**Gain (dBi)**	**e.i.r.p (dBm)**	**Part number or model number**
1			
2			
NOTE: Add more rows in case more antenna assemblies are supported for this power level.			
Power Level 3: dBm			
Number of antenna assemblies provided for this power level:			
Assembly #	**Gain (dBi)**	**e.i.r.p (dBm)**	**Part number or model number**
1			
2			
NOTE: Add more rows in case more antenna assemblies are supported for this power level.			

The nominal voltages of the stand-alone radio equipment or the nominal voltages of the combined (host) equipment or test jig in case of plug-in devices:	
Details provided are for the:	
☒ stand-alone equipment	
☐ combined (or host) equipment	
☐ test jig	
Supply Voltage ☐ AC mains State AC voltage V	
☒ DC State DC voltage 6 V	
In case of DC, indicate the type of power source	
☐ Internal Power Supply	
☐ External Power Supply or AC/DC adapter	
☒ Battery	
☐ Other:	
Describe the test modes available which can facilitate testing:	
described in separate document	
The equipment type (e.g. Bluetooth®, IEEE 802.11™ [i.3] IEEE 802.15.4™ [i.4], proprietary, etc.):	
If applicable, the statistical analysis referred in clause 5.4.1 q)	
To be provided as separate attachment	
If applicable, the statistical analysis referred in clause 5.4.1 r)	
To be provided as separate attachment	
Geo-location capability supported by the equipment:	
☐ Yes	
☐ The geographical location determined by the equipment as defined in clause 4.3.1.13.2 or clause 4.3.2.12.2 is not accessible to the user.	
☒ No	
Describe the minimum performance criteria that apply to the equipment (see clause 4.3.1.12.3 or 4.3.2.11.3)	
PER less than or equal to 10 %.	
Combination for testing (see clause 5.3.2.3 of EN 300 328 V21.1)	
From all combinations of conducted power settings and intended antenna assembly(ies) specified in clause 5.4.1 m), specify the combination resulting in the highest e.i.r.p. for the radio equipment. Unless otherwise specified in ETSI EN 300 328, this power setting is to be used for testing against the requirements of ETSI EN 300 328. In case there is more than one such conducted power setting resulting in the same (highest) e.i.r.p. level, the highest power setting is to be used for testing. See also ETS EN 300 328, clause 5.3.2.3	
Highest overall e.i.r.p. value: 6 dBm	
Corresponding Antenna assembly gain: 2 dBi	Antenna Assembly #: n/a
Corresponding conducted power setting: n/a dBm (also the power level to be used for testing)	Listed as Power Setting #: n/a
Additional information provided by the applicant	
Modulation	
ITU Class(es) of emission:	
Can the transmitter operate unmodulated? ☐ Yes ☐ No	

Duty Cycle	
The transmitter is intended for:	
☐	Continuous duty
☒	Intermittent duty
☐	Continuous operation possible for testing purposes

About the UUT	
☐	The equipment submitted are representative production models
☒	If not, the equipment submitted are pre-production models?
☒	If pre-production equipment are submitted, the final production equipment will be identical in all respects with the equipment tested
☐	If not, supply full details
☒	The equipment submitted is CE marked

Additional items and/or supporting equipment provided	
☒	Spare batteries (e.g. for portable equipment)
☐	Battery charging device
☐	External Power Supply or AC/DC adapter
☐	Test Jig or interface box
☐	RF test fixture (for equipment with integrated antennas)
☐	Host System
	Manufacturer
	Model
	Model Name
☐	Combined equipment
	Manufacturer
	Model
	Model Name
☒	User Manual
☒	Technical documentation (Handbook and circuit diagrams)

I hereby declare that the information supplied is correct and complete.

Name: Chris Cowdery Position held: Head of Embedded Systems
Date: 13th Feb 2018

1.5 Product Information

1.5.1 Technical Description

The product is a Cat Flap that permits transit of selected pets based on the unique ID number of their implanted RFID Microchip. It is intended for use in a domestic environment.

1.6 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

1.7 EUT Modification Record

The table below details modifications made to the EUT during the test programme.
The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
Serial Number: Not Serialised (75941461-TSR0018)			
0	As supplied by the customer	Not Applicable	Not Applicable
Serial Number: N001-0000973			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 1

1.8 Test Location

TÜV SÜD Product Service conducted the following tests at our Fareham Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: 2.4 GHz (Zigbee)		
Maximum Conducted Output Power	Mehadi Choudhury	UKAS
Power Spectral Density	Mehadi Choudhury	UKAS
Emission Bandwidth	Mehadi Choudhury	UKAS
Authorised Band Edges	Graeme Lawler	UKAS
Restricted Band Edges	Graeme Lawler	UKAS
Spurious Radiated Emissions	Graeme Lawler	UKAS

Table 2

Office Address:

Octagon House
Concorde Way
Segensworth North
Fareham
Hampshire
PO15 5RL
United Kingdom

2 Test Details

2.1 Maximum Conducted Output Power

2.1.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (b)
Industry Canada RSS-247, Clause 5.4
Industry Canada RSS-GEN, Clause 6.12

2.1.2 Equipment Under Test and Modification State

iDSCF, S/N: Not Serialised (75941461-TSR0018) - Modification State 0

2.1.3 Date of Test

19-February-2018

2.1.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 11.9.1.2.

2.1.5 Environmental Conditions

Ambient Temperature	22.5 °C
Relative Humidity	39.6 %

2.1.6 Test Results

2.4 GHz (Zigbee)

Frequency (MHz)	Maximum Conducted Output Power	
	dBm	mW
2425	2.13	1.63
2450	2.34	1.71
2480	2.34	1.71

Table 3

FCC 47 CFR Part 15, Limit Clause 15.247 (b)(3)

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

Industry Canada RSS-247, Limit Clause 5.4 (d)

For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e) of the specification.

2.1.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Multimeter	Fluke	75 Mk3	455	12	14-Sep-2018
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	11-Apr-2018
Cable(3m, SMA(m) - SMA(m))	Reynolds	262-0248-3000	2402	12	19-Sep-2018
Hygrometer	Rotronic	I-1000	3220	12	30-Aug-2018
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	02-Oct-2018
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	19-Sep-2018
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	12-Mar-2018
Quad Power Supply	Rohde & Schwarz	HMP4040	4954	-	O/P Mon
EXA	Keysight Technologies	N9010B	4969	12	21-Dec-2018

Table 4

O/P Mon – Output Monitored using calibrated equipment

2.2 Power Spectral Density

2.2.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (e)
Industry Canada RSS-247, Clause 5.2

2.2.2 Equipment Under Test and Modification State

iDSCF, S/N: Not Serialised (75941461-TSR0018) - Modification State 0

2.2.3 Date of Test

19-February-2018

2.2.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 11.10.2.

2.2.5 Environmental Conditions

Ambient Temperature	22.5 °C
Relative Humidity	39.6 %

2.2.6 Test Results

2.4 GHz (Zigbee)

Frequency (MHz)	Power Spectral Density (dBm)
2425	-0.68
2450	-0.86
2480	-0.82

Table 5

Table 6 – 2425 MHz

Table 7 – 2450 MHz

Table 8 – 2480 MHz

FCC 47 CFR Part 15, Limit Clause 15.247 (e)

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Industry Canada RSS-247, Limit Clause 5.2(b)

The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

2.2.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Multimeter	Fluke	75 Mk3	455	12	14-Sep-2018
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	11-Apr-2018
Cable(3m, SMA(m) - SMA(m))	Reynolds	262-0248-3000	2402	12	19-Sep-2018
Hygrometer	Rotronic	I-1000	3220	12	30-Aug-2018
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	02-Oct-2018
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	19-Sep-2018
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	11-Apr-2018
Quad Power Supply	Rohde & Schwarz	HMP4040	4954	-	O/P Mon
EXA	Keysight Technologies	N9010B	4969	12	21-Dec-2018

Table 9

O/P Mon – Output Monitored using calibrated equipment

2.3 Emission Bandwidth

2.3.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (a)(2)
Industry Canada RSS-247. Clause 5.2
Industry Canada RSS-GEN, Clause 6.6

2.3.2 Equipment Under Test and Modification State

iDSCF, S/N: Not Serialised (75941461-TSR0018) - Modification State 0

2.3.3 Date of Test

19-February-2018 to 20-February-2018

2.3.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 11.8.2 for 6 dB bandwidth and Industry Canada RSS-GEN clause 6.6 for 99% occupied bandwidth.

2.3.5 Environmental Conditions

Ambient Temperature	22.5 °C
Relative Humidity	39.6 %

2.3.6 Test Results

2.4 GHz (Zigbee)

Frequency (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
2425	1.587	2.423
2450	1.586	2.439
2800	1.612	2.481

Table 10

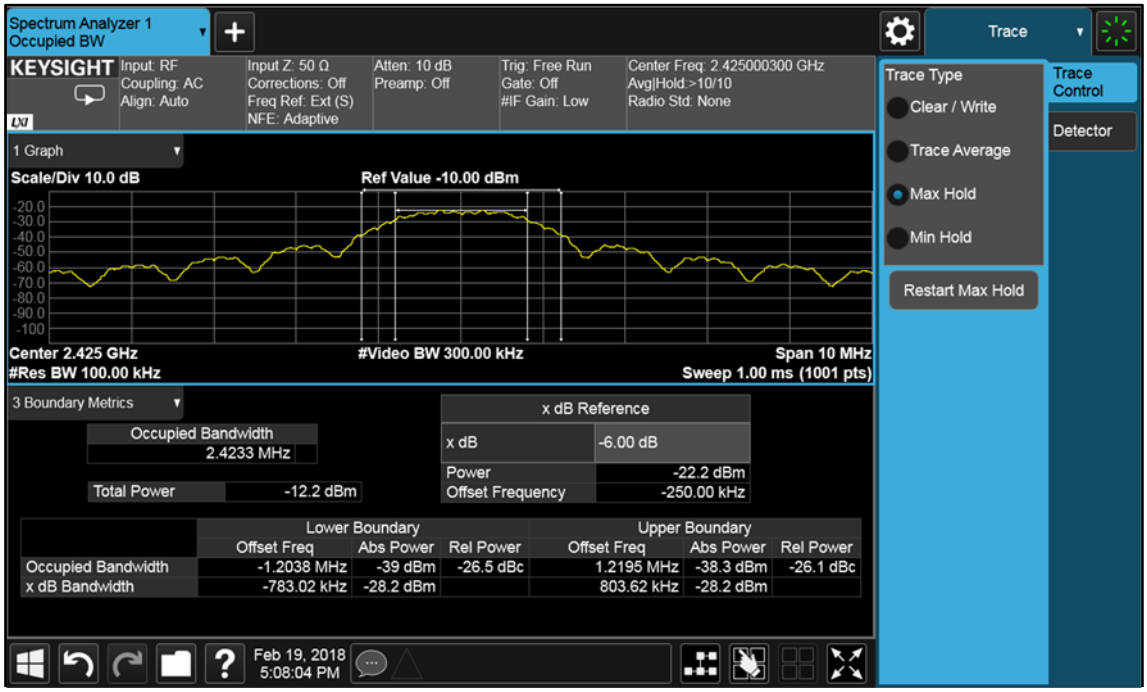

Figure 1 - 2425 MHz – 6 dB Bandwidth and 99% Occupied Bandwidth

Figure 2 - 2450 MHz – 6 dB Bandwidth and 99% Occupied Bandwidth

Figure 3 – 2480 MHz – 6 dB Bandwidth and 99% Occupied Bandwidth

FCC 47 CFR Part 15, Limit Clause 15.247(a)(2)

The minimum 6 dB Bandwidth shall be at least 500 kHz.

Industry Canada RSS-247, Clause 5.2(a)

The minimum 6 dB Bandwidth shall be at least 500 kHz.

2.3.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Multimeter	Fluke	75 Mk3	455	12	14-Sep-2018
Digital Temperature Indicator	Fluke	51	1385	12	02-Jan-2019
Cable(3m, SMA(m) - SMA(m))	Reynolds	262-0248-3000	2402	12	19-Sep-2018
Hygrometer	Rotronic	I-1000	3220	12	30-Aug-2018
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	12-Mar-2018
Quad Power Supply	Rohde & Schwarz	HMP4040	4954	-	O/P Mon
EXA	Keysight Technologies	N9010B	4968	12	21-Dec-2018

Table 11

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment

2.4 Authorised Band Edges

2.4.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (d)
Industry Canada RSS-247, Clause 5.5

2.4.2 Equipment Under Test and Modification State

iDSCF, S/N: N001-0000973 - Modification State 0

2.4.3 Date of Test

27-May-2018

2.4.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 6.10.4.

The following conversion can be applied to convert from dBµV/m to µV/m:
10^(Field Strength in dBµV/m/20).

2.4.5 Environmental Conditions

Ambient Temperature	24.2 °C
Relative Humidity	56.4 %

2.4.6 Test Results

2.4 GHz (Zigbee)

Mode	Frequency (MHz)	Measured Frequency (MHz)	Level (dBc)
Static	2425	2400.0	-52.80
Static	2480	2483.5	-34.40

Table 12

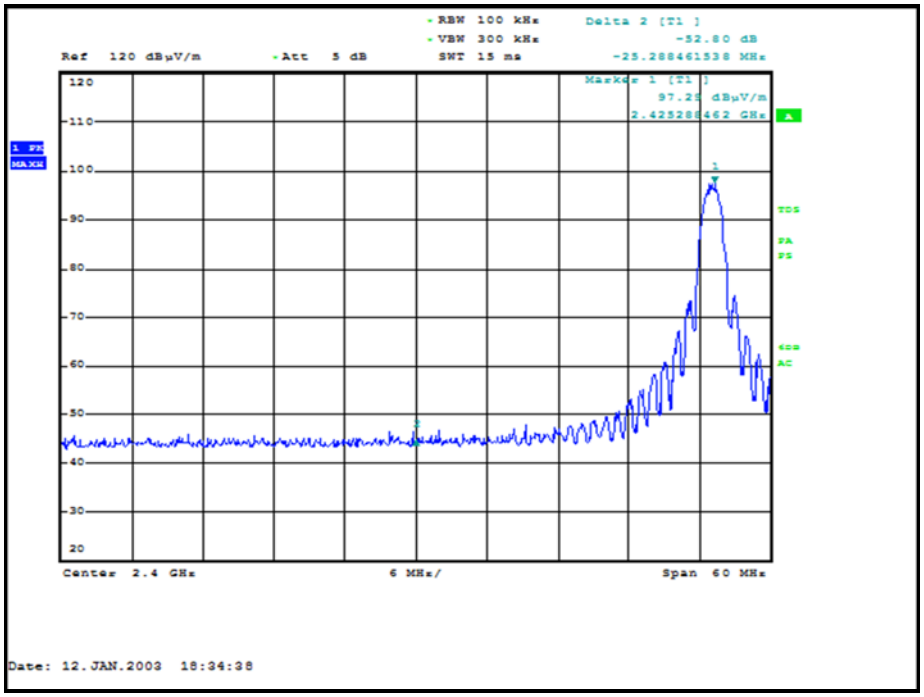

Figure 4 - 2425 MHz - Measured Frequency 2400.0 MHz

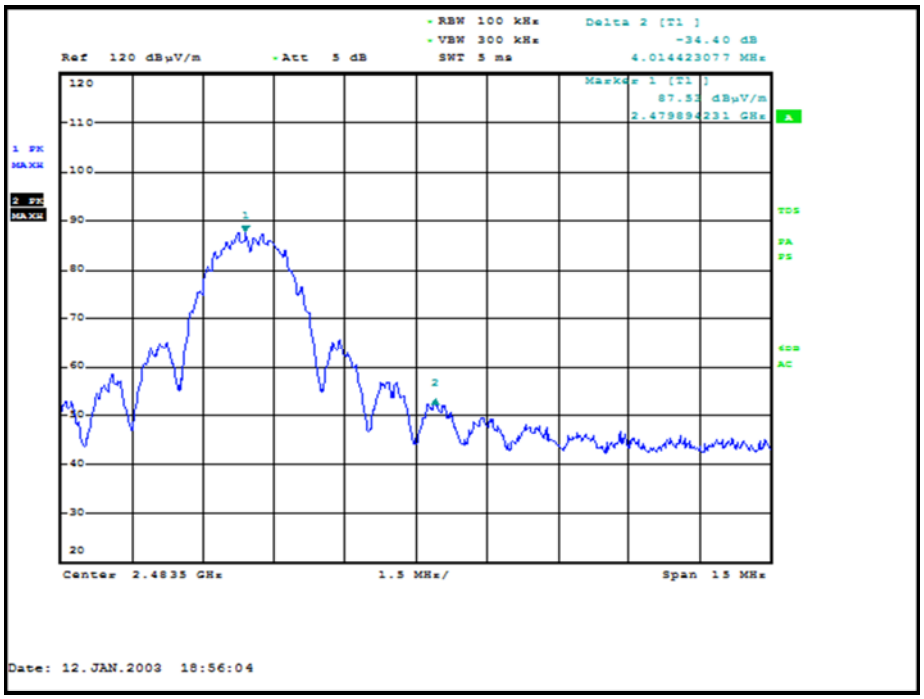

Figure 5 - 2480 MHz - Measured Frequency 2483.5 MHz

FCC 47 CFR Part 15, Limit Clause 15.247 (d)

20 dB below the fundamental measured in a 100 kHz bandwidth using a peak detector. If the transmitter complies with the conducted power limits, based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB below the fundamental instead of 20 dB.

Industry Canada RSS-247, Limit Clause 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

2.4.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Screened Room (5)	Rainford	Rainford	1545	36	09-Jun-2018
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Nov-2018
Cable (Rx, Nm-Nm, 7m)	Scott Cables	SLU18-NMNM-07.00M	4498	6	19-Jun-2018
Cable (Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4526	6	02-Jul-2018
Mast Controller	maturo Gmbh	NCD	4810	-	TU
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	4811	-	TU
Double Ridge Broadband Horn Antenna	Schwarzbeck	BBHA 9120 B	4848	12	12-Feb-2019
Hygrometer	Rotronic	HP21	4989	12	26-Apr-2019

Table 13

TU - Traceability Unscheduled

2.5 Restricted Band Edges

2.5.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.205
Industry Canada RSS-GEN, Clause 8.10

2.5.2 Equipment Under Test and Modification State

iDSCF, S/N: N001-0000973 - Modification State 0

2.5.3 Date of Test

27-May-2018

2.5.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 6.10.5.

Plots for average measurements were taken in accordance with ANSI C63.10 clause 4.1.4.2.3. These are shown for information purposes and were used to determine the worst-case measurement point. Final average measurements were then taken in accordance with ANSI C63.10 clause 4.1.4.2.2. to obtain the measurement result recorded in the test results tables.

The following conversion can be applied to convert from dBµV/m to µV/m:
10^(Field Strength in dBµV/m/20).

2.5.5 Environmental Conditions

Ambient Temperature	24.2 °C
Relative Humidity	56.4 %

2.5.6 Test Results

2.4 GHz (Zigbee)

Mode	Frequency (MHz)	Measured Frequency (MHz)	Peak Level (dBµV/m)	Average Level (dBµV/m)
Static	2425	2390.0	55.07	45.90
Static	2480	2483.5	62.32	51.98

Table 14

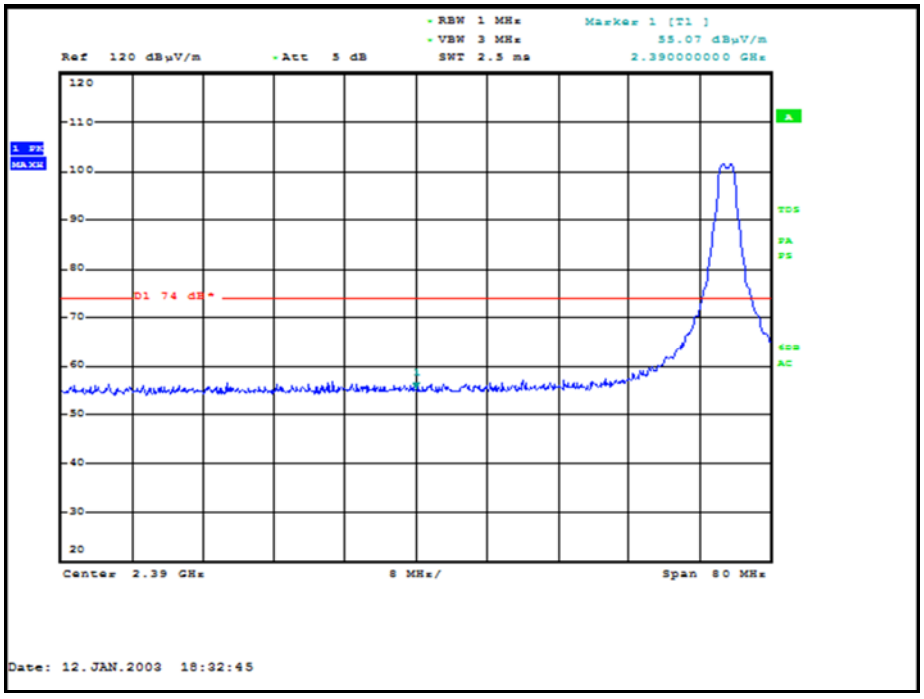

Figure 6 - 2425 MHz - Measured Frequency 2390.0 MHz - Peak

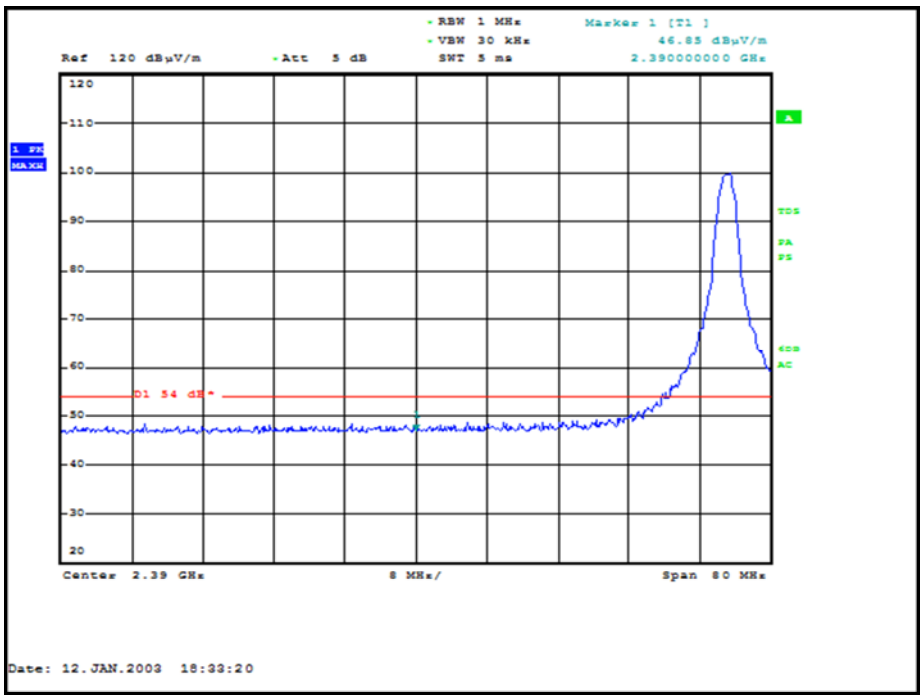

Figure 7 - 2425 MHz - Measured Frequency 2390.0 MHz - Average

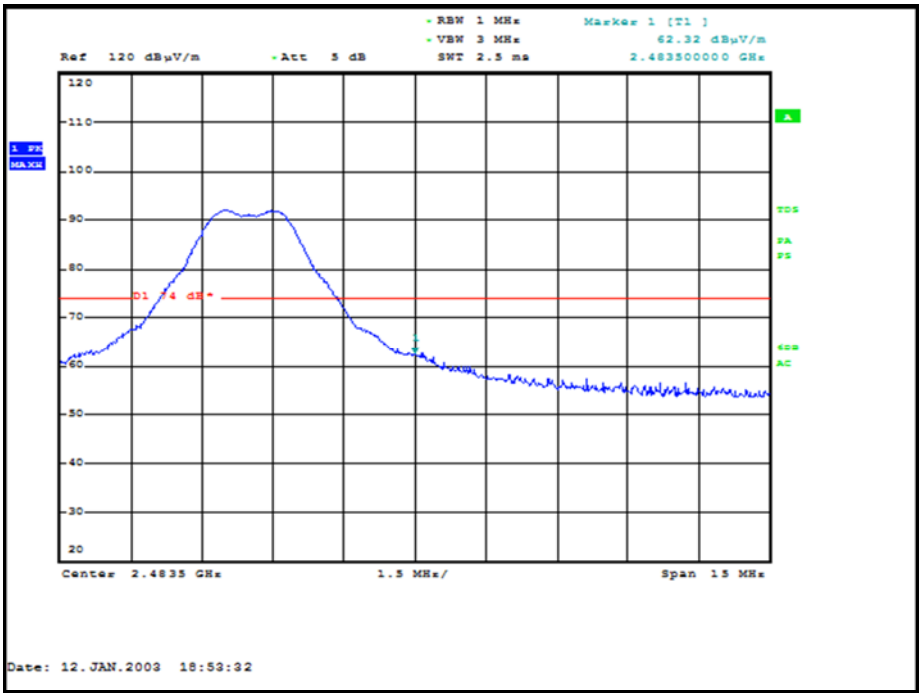

Figure 8 - 2480 MHz - Measured Frequency 2483.5 MHz - Peak

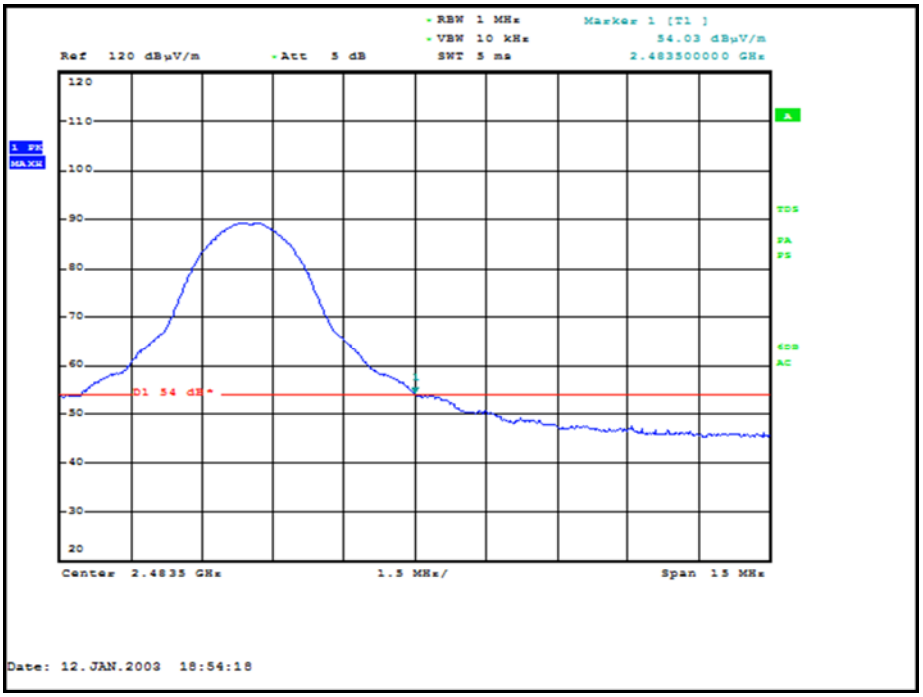

Figure 9 - 2480 MHz - Measured Frequency 2483.5 MHz - Average

FCC 47 CFR Part 15, Limit Clause 15.209

Frequency (MHz)	Field Strength (µV/m at 3 m)
30 to 88	100
88 to 216	150
216 to 960	200
Above 960	500

Table 15

Industry Canada RSS-GEN, Limit Clause 8.9

Frequency (MHz)	Field Strength (µV/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960*	500

Table 16

*Unless otherwise specified, for all frequencies greater than 1 GHz, the radiated emission limits for licence-exempt radio apparatus stated in applicable RSSs (including RSS-Gen) are based on measurements using a linear average detector function having a minimum resolution bandwidth of 1 MHz. If an average limit is specified for the EUT, then the peak emission shall also be measured with instrumentation properly adjusted for such factors as pulse desensitization to ensure the peak emission is less than 20 dB above the average limit.

2.5.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Screened Room (5)	Rainford	Rainford	1545	36	09-Jun-2018
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Nov-2018
Cable (Rx, Nm-Nm, 7m)	Scott Cables	SLU18-NMNM-07.00M	4498	6	19-Jun-2018
Cable (Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4526	6	02-Jul-2018
Mast Controller	maturo Gmbh	NCD	4810	-	TU
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	4811	-	TU
Double Ridge Broadband Horn Antenna	Schwarzbeck	BBHA 9120 B	4848	12	12-Feb-2019
Hygrometer	Rotronic	HP21	4989	12	26-Apr-2019

Table 17

TU - Traceability Unscheduled

2.6 Spurious Radiated Emissions

2.6.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (d) and 15.205
Industry Canada RSS-247, Clause 5.5
Industry Canada RSS-GEN, Clause 8.10

2.6.2 Equipment Under Test and Modification State

iDSCF, S/N: N001-0000973 - Modification State 0

2.6.3 Date of Test

26-May-2018 to 28-May-2018

2.6.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 6.3, 6.5 and 6.6.

For frequencies > 1 GHz, plots for average measurements were taken in accordance with ANSI C63.10 clause 4.1.4.2.3 to characterize the EUT. Where emissions were detected, final average measurements were taken in accordance with ANSI C63.10 clause 4.1.4.2.2.

The plots shown are the characterization of the EUT. The limits on the plots represent the most stringent case for restricted bands, (74/54 dBuV/m) when compared to 20 dBc outside restricted bands. The limits shown have been used as a threshold to determine where further measurements are necessary. Where results are within 10 dB of the limits shown on the plots, further investigation was carried out and reported in results tables.

The following conversion can be applied to convert from dBµV/m to µV/m:
10^(Field Strength in dBµV/m/20).

For frequencies > 18 GHz, the measurement distance was reduced to 1 meter and the limit line was increased by 20*LOG (3/1) = 9.54 dB.

2.6.5 Environmental Conditions

Ambient Temperature	23.5 - 24.2 °C
Relative Humidity	55.1 - 56.4 %

2.6.6 Test Results

2.4 GHz (Zigbee)

Frequency (GHz)	Result (dBµV/m)		Limit (dBµV/m)		Margin (dBµV/m)	
	Peak	Average	Peak	Average	Peak	Average
*						

Table 18 - 2425 MHz - 30 MHz to 1 GHz Emissions Results

*No emissions were detected within 10 dB of the limit.

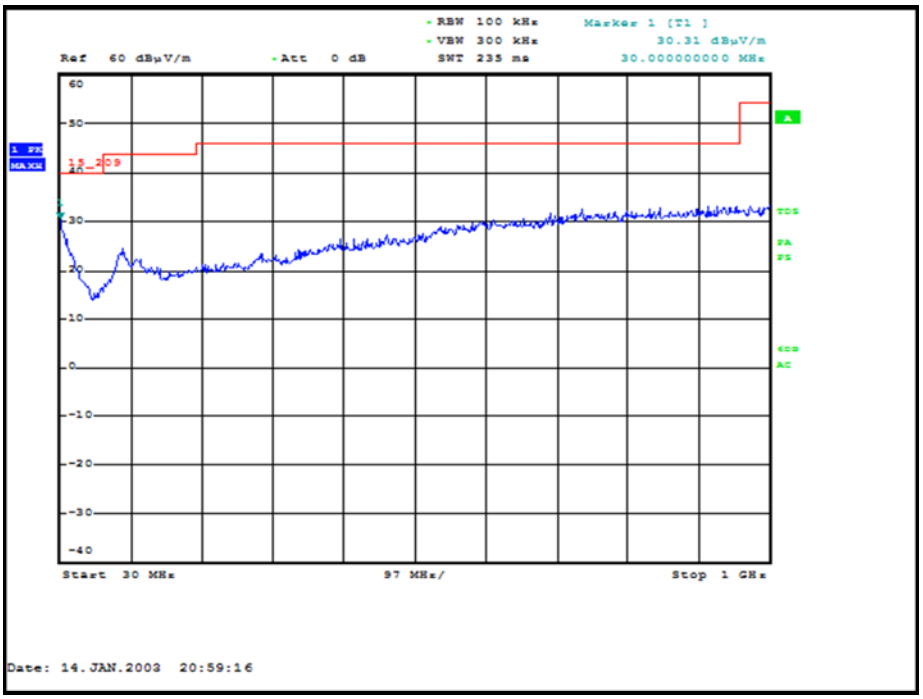

Figure 10 - 2425 MHz - 30 MHz to 1 GHz - Horizontal and Vertical

Frequency (GHz)	Result (dBµV/m)		Limit (dBµV/m)		Margin (dBµV/m)	
	Peak	Average	Peak	Average	Peak	Average
*						

Table 19 - 2425 MHz - 1 GHz to 25 GHz Emissions Results

*No emissions were detected within 10 dB of the limit.

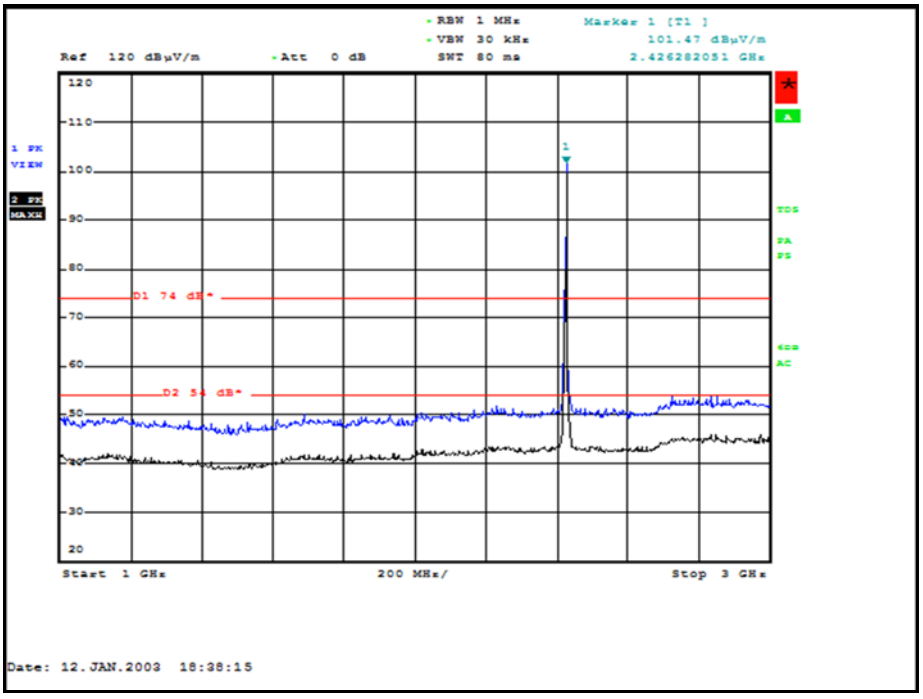

Figure 11 - 2425 MHz – 1 GHz to 3 GHz – Horizontal and Vertical

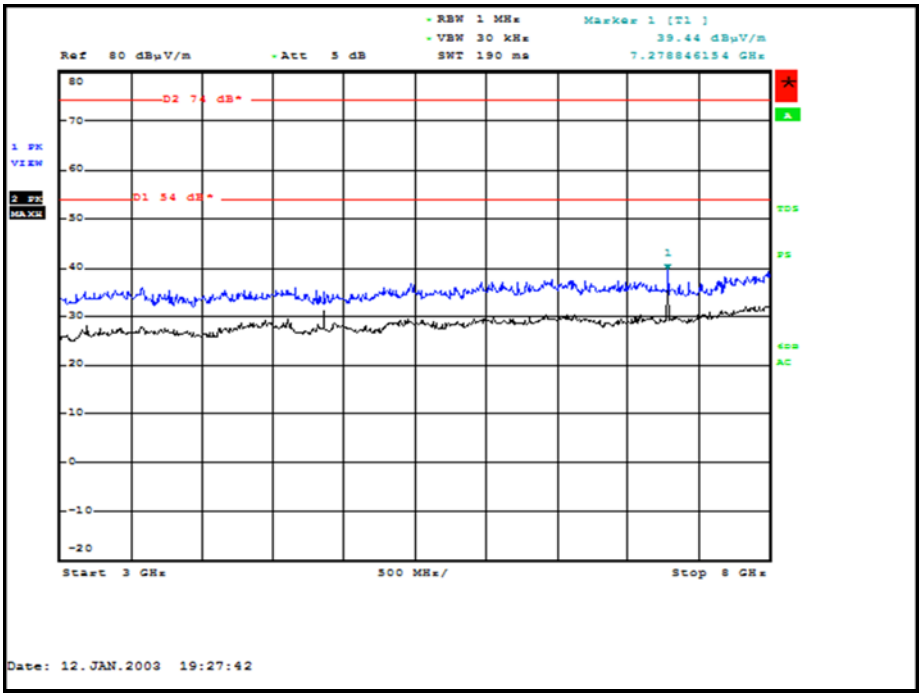

Figure 12 - 2425 MHz – 3 GHz to 8 GHz – Horizontal and Vertical

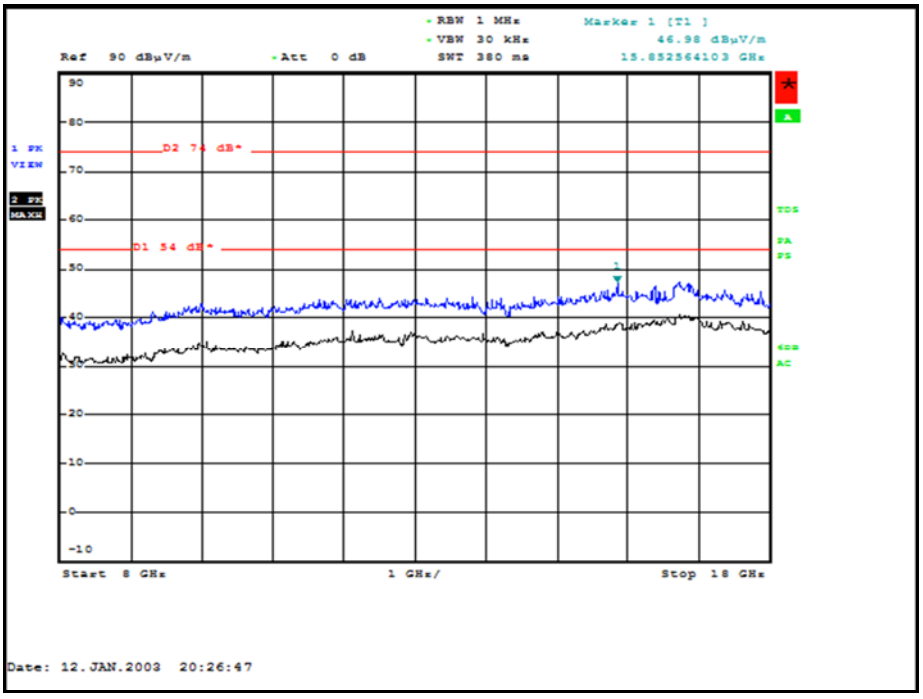

Figure 13 - 2425 MHz – 8 GHz to 18 GHz – Horizontal and Vertical

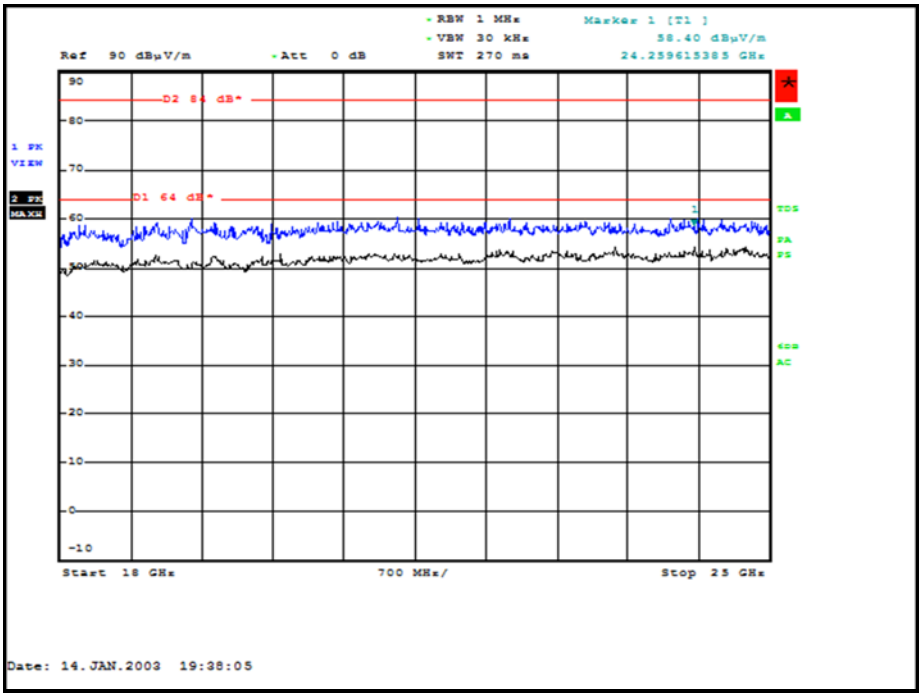

Figure 14 - 2425 MHz – 18 GHz to 25 GHz – Horizontal and Vertical

Frequency (GHz)	Result (dBµV/m)		Limit (dBµV/m)		Margin (dBµV/m)	
	Peak	Average	Peak	Average	Peak	Average
*						

Table 20 - 2450 MHz - 30 MHz to 1 GHz Emissions Results

*No emissions were detected within 10 dB of the limit.

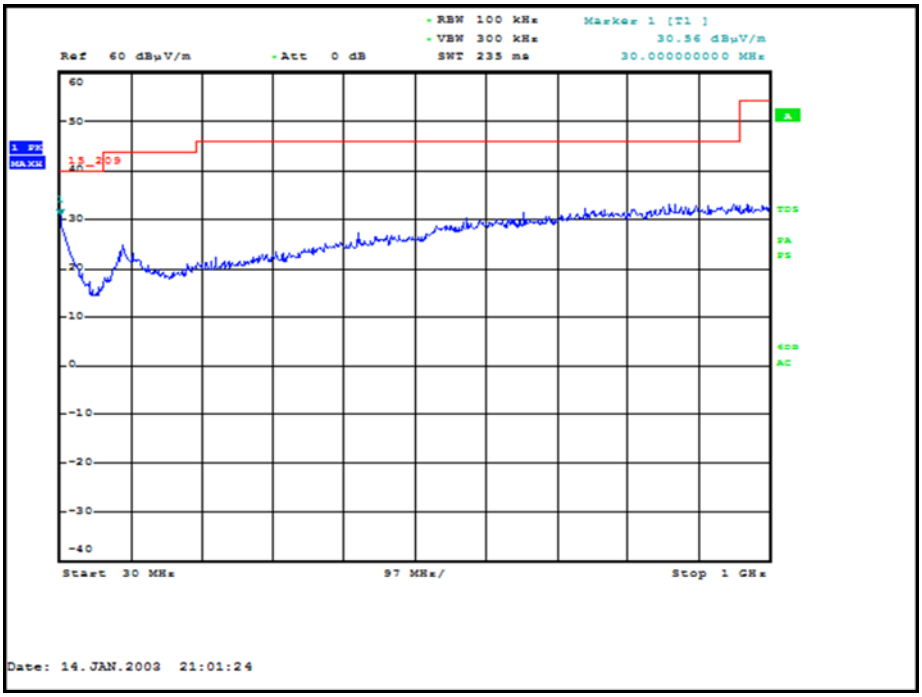

Figure 15 - 2450 MHz - 30 MHz to 1 GHz - Horizontal and Vertical

Frequency (GHz)	Result (dBµV/m)		Limit (dBµV/m)		Margin (dBµV/m)	
	Peak	Average	Peak	Average	Peak	Average
*						

Table 21 - 2450 MHz - 1 GHz to 25 GHz Emissions Results

*No emissions were detected within 10 dB of the limit.

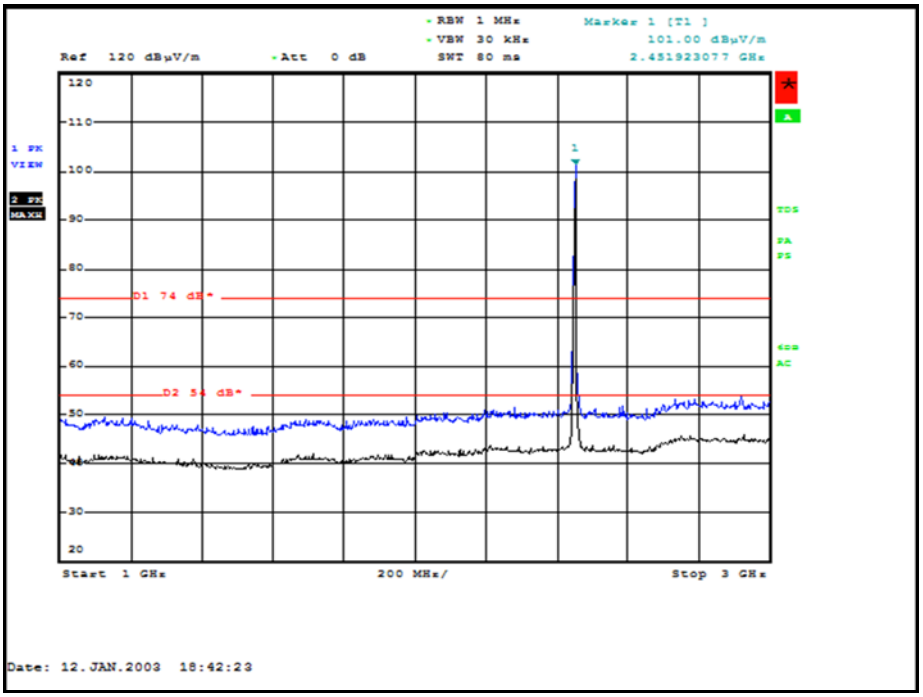

Figure 16 - 2450 MHz – 1 GHz to 3 GHz – Horizontal and Vertical

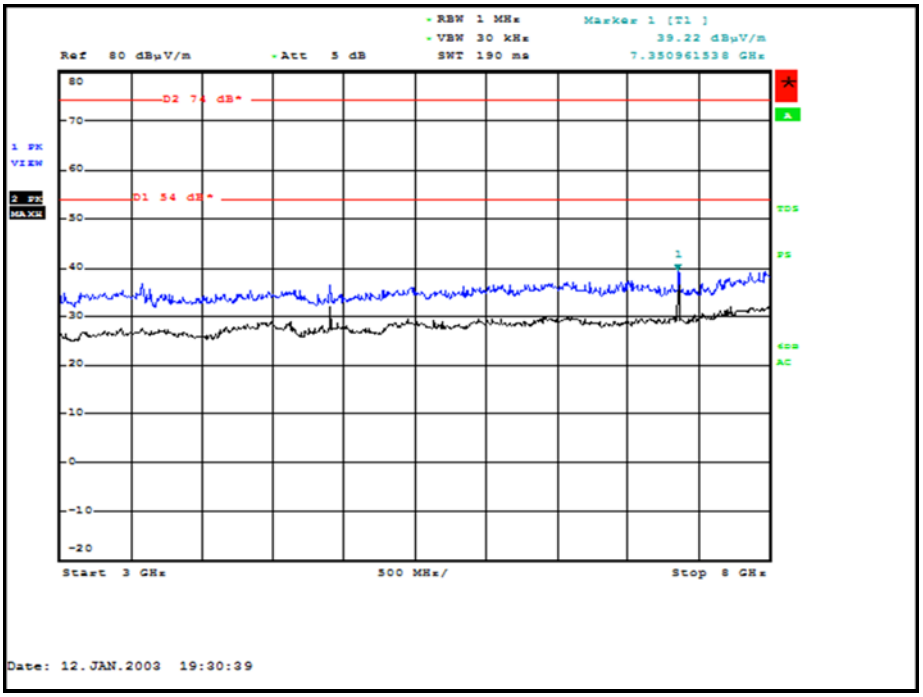

Figure 17 - 2450 MHz – 3 GHz to 8 GHz – Horizontal and Vertical

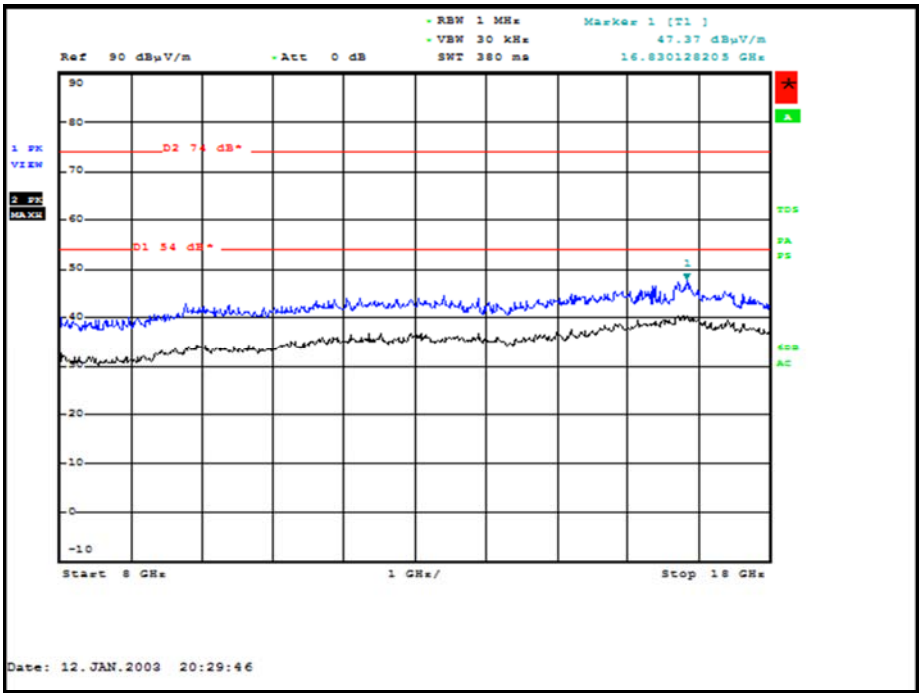

Figure 18 - 2450 MHz – 8 GHz to 18 GHz – Horizontal and Vertical

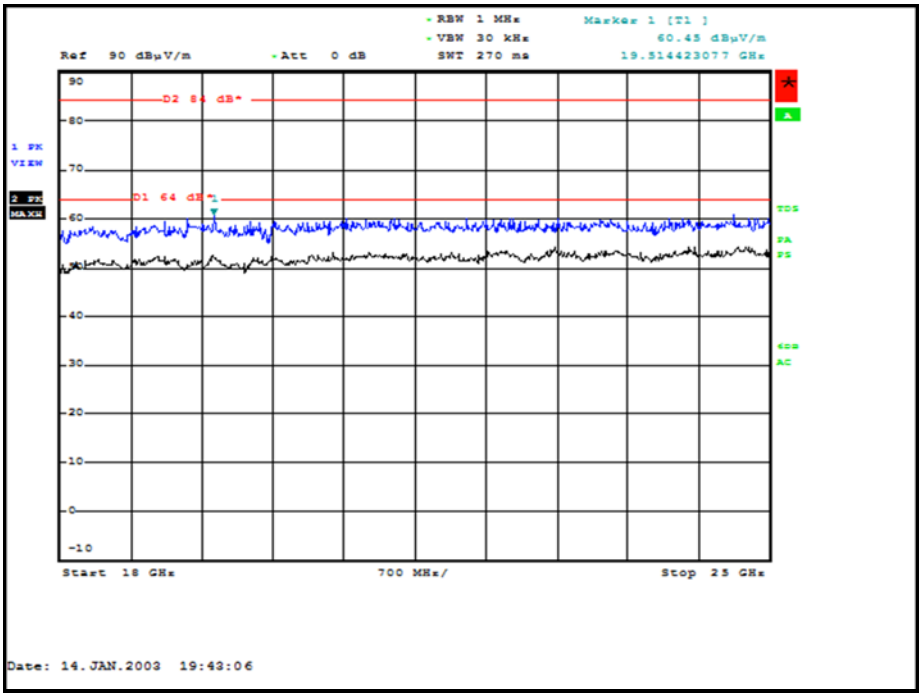

Figure 19 - 2450 MHz – 18 GHz to 25 GHz – Horizontal and Vertical

Frequency (GHz)	Result (dBµV/m)		Limit (dBµV/m)		Margin (dBµV/m)	
	Peak	Average	Peak	Average	Peak	Average
*						

Table 22 - 2480 MHz - 30 MHz to 1 GHz Emissions Results

*No emissions were detected within 10 dB of the limit.

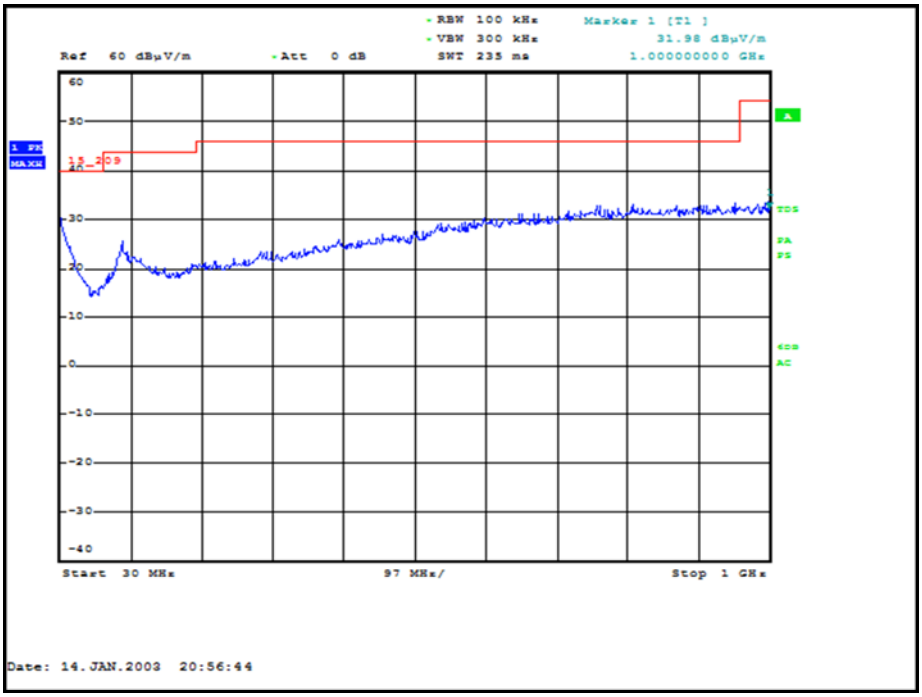

Figure 20 - 2480 MHz - 30 MHz to 1 GHz - Horizontal and Vertical

Frequency (GHz)	Result (dBµV/m)		Limit (dBµV/m)		Margin (dBµV/m)	
	Peak	Average	Peak	Average	Peak	Average
*						

Table 23 - 2480 MHz - 1 GHz to 25 GHz Emissions Results

*No emissions were detected within 10 dB of the limit.

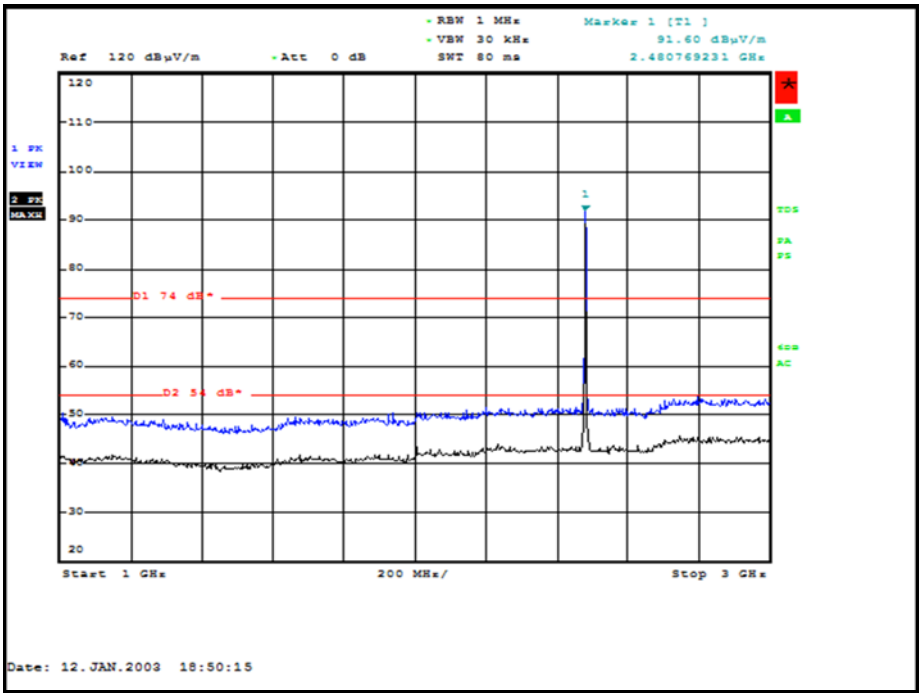

Figure 21 - 2480 MHz – 1 GHz to 3 GHz – Horizontal and Vertical

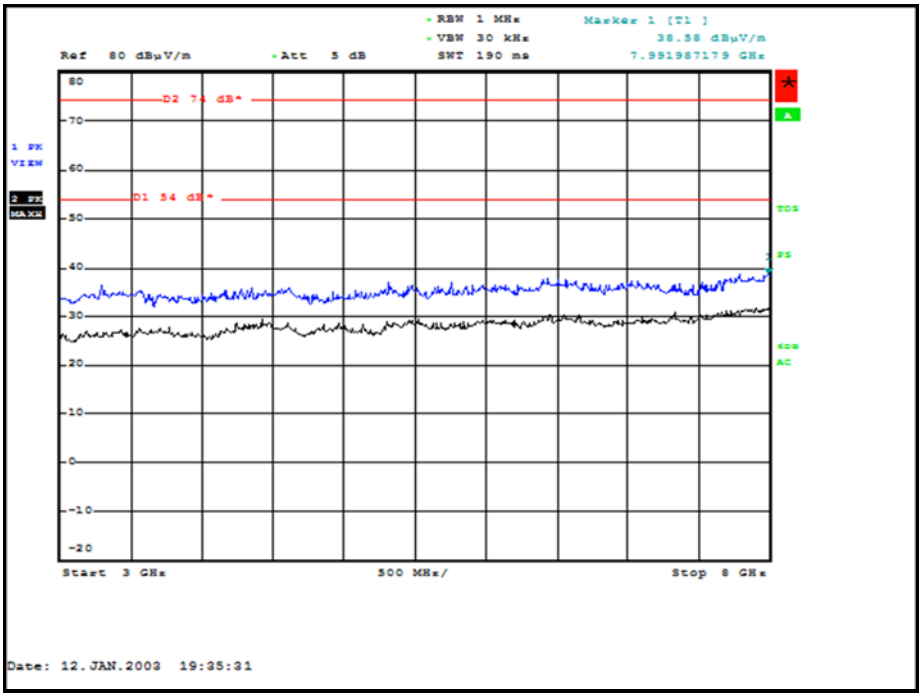

Figure 22 – 2480 MHz – 3 GHz to 8 GHz – Horizontal and Vertical

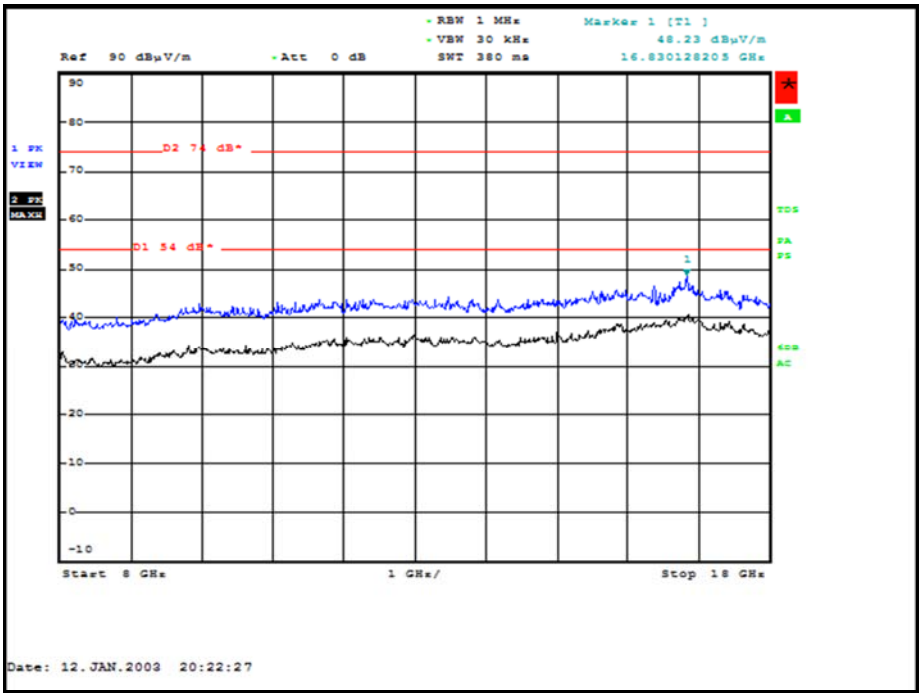

Figure 23 - 2480 MHz – 8 GHz to 18 GHz – Horizontal and Vertical

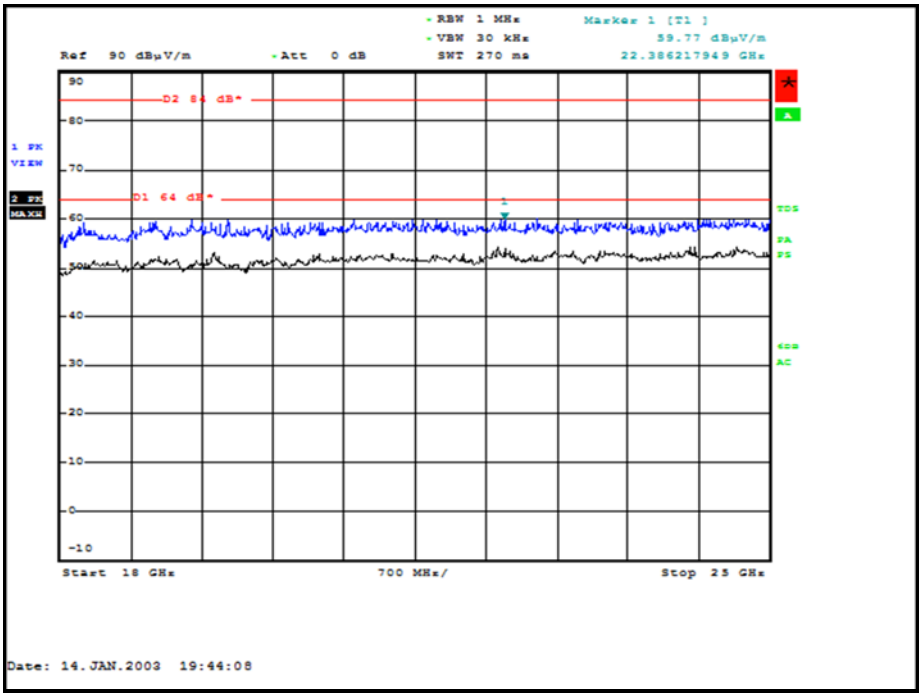

Figure 24 - 2480 MHz – 18 GHz to 25 GHz – Horizontal and Vertical

FCC 47 CFR Part 15, Limit Clause 15.247 (d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in 15.209(a)

Industry Canada RSS-247, Limit Clause 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

2.6.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Antenna 18-40GHz (Double Ridge Guide)	Q-Par Angus Ltd	QSH 180K	1511	24	07-Dec-2018
Pre-Amplifier	Phase One	PS04-0086	1533	12	12-Jan-2019
18GHz - 40GHz Pre-Amplifier	Phase One	PSO4-0087	1534	12	02-Feb-2019
Screened Room (5)	Rainford	Rainford	1545	36	09-Jun-2018
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Antenna (Bilog)	Chase	CBL6143	2904	24	08-Aug-2019
1501A 4.0M Km Km Cable	Rhophase	KPS-1501A-4000-KPS	4301	12	19-Feb-2019
1GHz to 8GHz Low Noise Amplifier	Wright Technologies	APS04-0085	4365	12	18-Oct-2018
Suspended Substrate Highpass Filter	Advance Power Components	11SH10-3000/X18000-O/O	4412	12	14-Jun-2018
Cable (Rx, Nm-Nm, 7m)	Scott Cables	SLU18-NMNM-07.00M	4498	6	19-Jun-2018
Cable (Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4526	6	02-Jul-2018
Cable (Rx, SMAm-SMAm 0.5m)	Scott Cables	SLSLL18-SMSM-00.50M	4528	6	15-Aug-2018
Double Ridged Waveguide Horn Antenna	ETS-Lindgren	3117	4722	12	01-Mar-2019
Mast Controller	maturo Gmbh	NCD	4810	-	TU
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	4811	-	TU
Double Ridge Broadband Horn Antenna	Schwarzbeck	BBHA 9120 B	4848	12	12-Feb-2019
4dB Attenuator	Pasternack	PE7047-4	4935	12	28-Nov-2018
Hygrometer	Rotronic	HP21	4989	12	26-Apr-2019

Table 24

TU - Traceability Unscheduled

3 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

Test Name	Measurement Uncertainty
Maximum Conducted Output Power	± 3.2 dB
Power Spectral Density	± 3.2 dB
Emission Bandwidth	± 85759.091 kHz
Authorised Band Edges	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB
Restricted Band Edges	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB
Spurious Radiated Emissions	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB

Table 25