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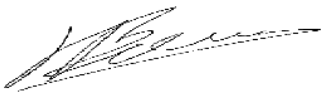
Test Report for the FCC and ISED Testing of a DigiTemp DCT150M-W thermometer for Quantum Cryogenics

Test Report number: 14215TR3
Project number: C6234



Author: ....
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Laboratory Business Manager

Issue	Description						Issue by	Date
3	Copy 1		Copy 2		PDF	✓	CWG	3rd August 2021

Registered Address:
Eurofins York
i54 Business Park, Valiant Way
Wolverhampton, WV9 5GB, UK

Registered in England and Wales
Company Reg. No. 6048589
VAT Reg. No. GB 887 1276 83

CONTENTS

Test Report Change History

Issue	Date	Modification Details
1	20th July 2021	First Issue
2	22nd July 2021	Addition of HVIN
3	3rd August 2021	Update following TCB comments
4		
5		
6		
7		
8		
9		
10		

Section 1 Test Location

All testing was performed at;

Eurofins York	Unit 5
	Speedwell Road
	Castleford
	WF10 5PY
Tel:	01977 731173
Website	http://www.yorkemc.co.uk
UKAS Testing No.	1574

1.1 UKAS Accreditation

Opinions and interpretations expressed herein are outside the scope of UKAS Accreditation.

Eurofins York latest accreditation schedule can be found at:
http://www.ukas.org/testing/lab_detail.asp?lab_id=989&location_id=&vMenuOption=3

For USA:

Eurofins York is a recognised test facility with the Federal Communications Commission (FCC).

Type of testing: Certification and Suppliers Declaration of Conformity.

Designation Number: UK2013

Test Firm Registration Number: 445101

Expiration date 2nd February 2023

For Canada:

Eurofins York is a wireless device testing laboratory recognized by Innovation, Science and Economic Development (ISED) Canada to test to Canadian radio equipment requirements

Company Number: 22959

Recognised until 10th May 2023

Section 2 Customer Information

Company name	Quantum Cryogenics
Address	Unit B Cranmere Court
	Exeter Road Industrial Estate
	Okehampton
	EX20 1UE
	United Kingdom
Tel:	+44 (0) 1844 339993
Contact	Ms Adela Thornton-Wood
Email	atw@quantumcryogenics.com

Section 3 Equipment Details

3.1 Equipment Under Test (EUT)

Date received:	25th May 2021		
Product Marketing Name:	DigiTemp DCT150M-W thermometer		
FCC ID	2A2HPDCT150M-W		
ISED Number	IC:27472-DCT150MW		
Hardware Version Identification Number	DCT1509.2.6/RF1060.2.6		
Firmware Version Identification Number	0.4.0.51782		
EUT description:	The DigiTemp is a wireless digital thermometer for tanks and tank containers. The DigiTemp DCT150M-W thermometer provides temperature monitoring for tanker and tank container operators, with a temperature operating range from -50ºC to +150ºC and a battery life of 7 years with no maintenance.		
Operating frequency band	2400MHz to 2483.5MHz		
No of units tested:	One		
EUT power:	3.6V DC Lithium Thionyl Chloride Battery		
Highest internal frequency:	2.45GHz		
Wireless module	EFR32FG1 Flex Gecko ProprietaryProtocol SoC		
Wireless module part no.	EFR32FG1P132F256GM32-C0		
Manufacturer	Silicon Labs		
Transmission system	DTS		
Modulation scheme(s)	O-QPSK		
Bandwidth	20 MHz		
Size of EUT (mm)	Width: 150 mm	Depth: 40 mm	Height: 150 mm
Mode/s of operation	Continuous fixed frequency transmission transmit at 2.45GHz, single modulation scheme.		
Modifications incorporated during testing:	None		

3.2 EUT Photographs

Photographs are supplied separately.

3.3 Configuration of EUT

The apparatus was supplied in one single possible configuration.

3.4 EUT Monitoring/Auxiliary Equipment

None.

3.5 Monitoring Software

None.

Section 4 Test Specifications

For USA:

Regulation / Test Standard	**Regulation:** Title 47 of the Code of Federal Regulations (CFR) Part 15 (47CFR15) Subpart C – Intentional Radiators §15.249 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz. **Measurement standard:** ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

Requirement	FCC Rule Part	Comments	Result Summary
15.249 (a)Fundamental frequency	FCC § 15.249(a)	Applies	Pass
15.249(a) Harmonics	FCC § 15.249(a)	Applies	Pass
15.249(d) Spurious emissions other than specified in 15.249(a)	FCC § 15.249(d)	Applies	Pass
15.259(e) Emissions > 1GHz	FCC § 15.249(e)	Applies	Pass
15.31(e) Test standard: ANSI C63.10-2013 Clause 5.13	FCC § 15.31(e)	Applies	Pass
15.215(c) 20dB bandwidth	FCC § 15.215(c)	Applies	Pass

For Canada

Regulation / Test Standard	RSS-210 — Licence-Exempt Radio Apparatus: Category I Equipment Issue 10 December 2019 Annex B.10 Bands 902-928MHz, 2400-2483MHz, 5725-5875MHz and 24-24.25GHz And, RSS-Gen — General Requirements for Compliance of Radio Apparatus Issue 5

Requirement	**ISED Regulation**	**Comments**	**Results Summary**
RSS-210 B10 a Fundamental frequency	ISED RSS-210 B10 a	Applies	Pass
RSS-210 B10 a Harmonics	ISED RSS-210 B10 a	Applies	Pass
RSS-210 B10 b Spurious emissions other than specified in RSS-210 B10 a	ISED RSS-210 B10 b	Applies	Pass
99% occupied bandwidth RSS-GEN issue 5 Clause 6.6		Applies	Pass

4.1 Knowledge Database References

The following KDBs were referenced during the testing of the DigiTemp DCT150M-W thermometer
The latest knowledge database references are available via the FCC KDB website at:

https://apps.**fcc**.gov/kdb

4.1.1 Radiated Emissions (30MHz to 1000MHz)

Publication Number	Keyword	Publication Date
913591	Measurement of radiated emissions at the band-edge for a Part 15 RF Device	04/05/2017

4.1.2 Radiated Emissions (1GHz to 40GHz)

Publication Number	Keyword	Publication Date
704992	Test Site Validation Requirements above 1 GHz.	12/06/2015
149045	Comparison Noise Emitter (CNE), reference noise source, .pdf	05/04/2007
913591	Measurement of radiated emissions at the band-edge for a Part 15 RF Device	04/05/2017
934285	Comparison Noise Emitters (CNE), test equipment, Broadband.pdf	05/04/2007

4.2 Compliance Statement

The DigiTemp DCT150M-W thermometer, as tested, was shown to meet requirements of the standards listed in Section 4 of this report.

Section 5 Spurious Emission Results – Radiated

5.1 Test Specification

FCC Rule Part	47CFR 15.249 (d) and 15.249 (e)
ISED Regulation	ISED RSS-210 B10 b
Standard	ANSI C63.10:2013
Measurement Uncertainty Radiated tests	The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95% is +/- 5.85dB for the frequency range 30MHz to 1GHz +/- 4.64dB for the frequency range from 1GHz to 6GHz +/- 4.96dB for the frequency range from 6GHz to 18GHz

5.2 Procedure and Test Software Version

Radiated tests:- 47CFR15.205 Restricted Bands of operation

Eurofins York test procedure (30MHz to 1GHz)	CEP23b Issue 8
Eurofins York test procedure (1GHz to 40GHz)	CEP64b Issue 8
Test software	RadiMation Version 2016.2.8

5.3 Radiated Emissions (30MHz to 1GHz)

Radiated electric field emission measurements are applied to the restricted bands, defined in 47CFR15.205.

5.3.1 Limits at 3m

Frequency (MHz)	Limit (dBµV/m)
	Quasi Peak
30 - 88	40.0
88 -216	43.5
216 - 960	46.0
960- 1000	54.0

Note: FCC 47 CFR Part 15 Section 15.209 specifies test limits at 3m

Receiver Settings

Receiver Parameters	Setting
Detector Function	Quasi Peak
Start Frequency	30MHz
Stop Frequency	1000MHz
Resolution Bandwidth	120kHz
Video Bandwidth	Auto

5.3.2 Date of Test

28th May 2021

5.3.3 Test Area

LAB 1 (SAC)

5.3.4 Tested by

M Render

5.3.5 Test Setup

The EUT was configured in the SAC on an 80cm high polystyrene table.

The measurement was performed with an antenna to EUT separation distance of 3m. The results were maximised in orientation 0-360 degrees and height 1-4m.

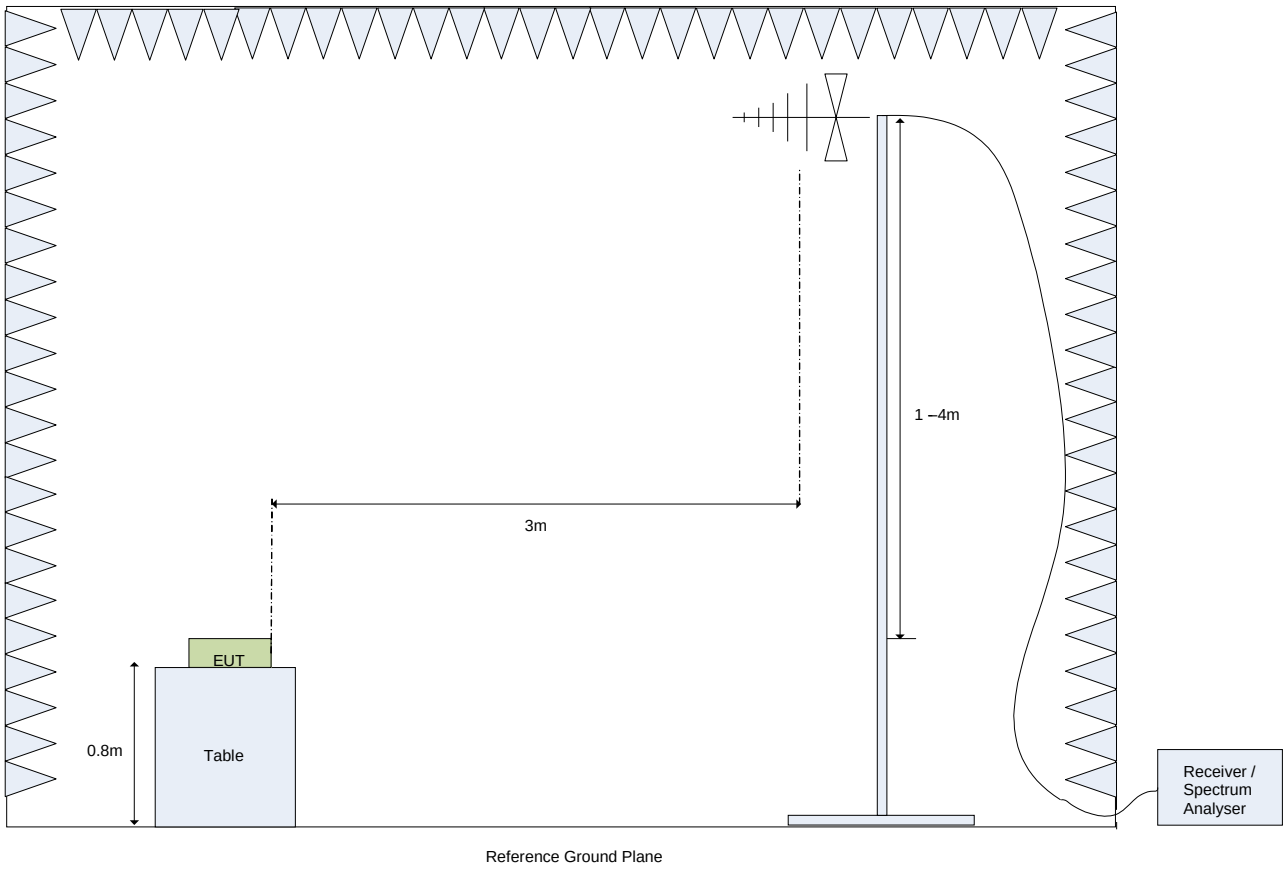


Figure 5.3.5.1: Test Setup for E-Field Measurements from 30MHz to 1GHz

Note 1 : With the EUT de-energized the ambient radio noise and signals met the 6dB peak detection requirement of ANSI C63.10-2013.

Note 2 : There were no significant environmental temperature changes during the test duration and hence it was not considered necessary to consider any variation in cable loss.

5.3.6 Electric field emissions, 30MHz to 1GHz

The equipment under test was pre-scanned using peak detection when operating continuously on the single 2.45GHz operating channel. Final measurements were performed with the equipment under test operating on the same mode.

Investigations showed that the emissions profile was not affected by apparatus under test orientation.

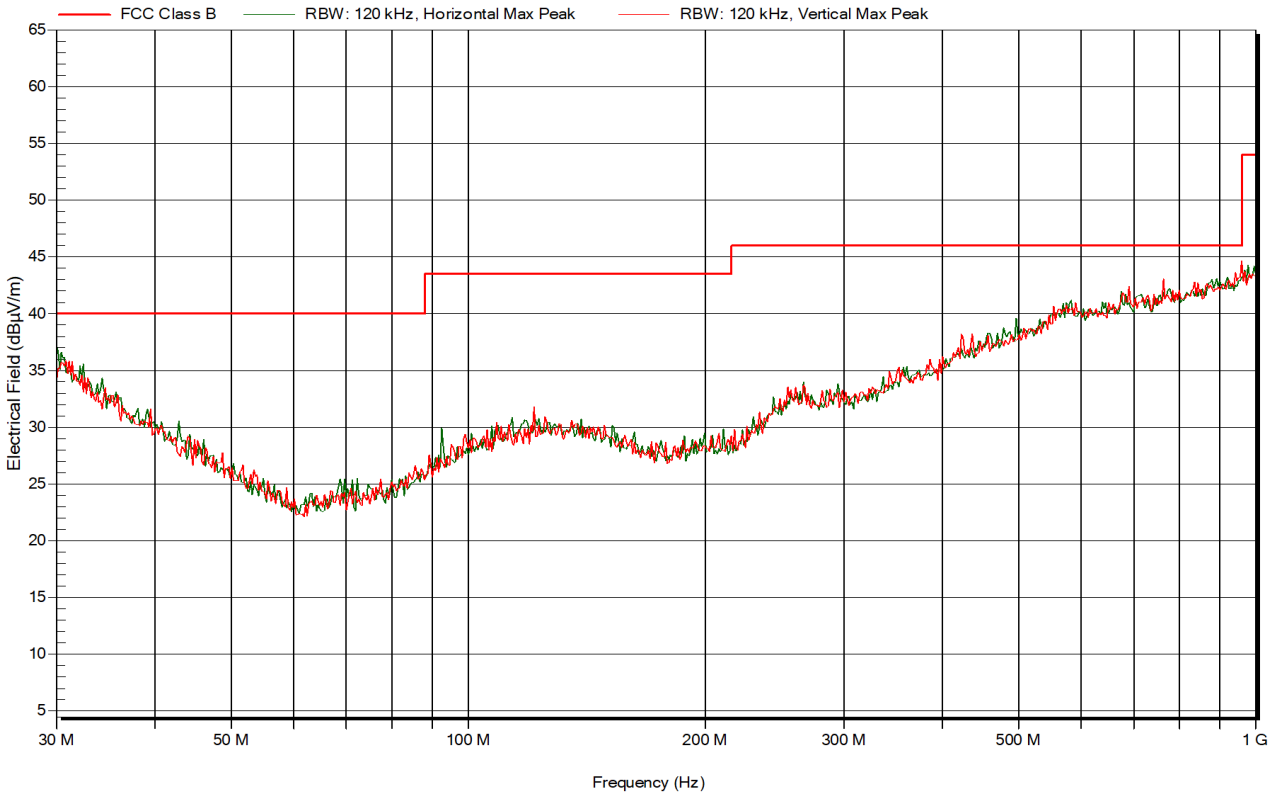


Figure 5.3.6.1: Electric field emissions Plot, 30MHz to 1GHz

Frequency	Quasi-Peak	Quasi Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height	Polarization
MHz	dBµV/m	dBµV/m	dB		degrees	m	
907.98	18.8	46.0	-27.2	Pass	205	1.60	Vertical
706.02	21.1	46.0	-24.9	Pass	350	1.41	Horizontal
261.18	12.7	46.0	-33.3	Pass	140	2.39	Vertical
123.06	10.2	43.5	-33.3	Pass	130	1.29	Horizontal
30.18	16.6	40.0	-23.4	Pass	290	2.90	Horizontal
572.82	15.4	46.0	-30.6	Pass	335	1.41	Horizontal

Table 5.3.6.1: Electric Field Emission Peaks, 30MHz to 1GHz,

5.3.7 Example field strength calculation

Field strength (FS) is calculated as follows:

FS (dBµV/m) = Indicated Signal Level (dBµV) + AF (dB/m) + CL (dB)

5.3.8 Sample Data

From Figure 5.3.6.1, table 5.3.6.1, the Quasi-Peak level at 907.98 MHz is calculated as follows:

FS (dBµV/m) = -10.8 (dBµV) + 26.5 (dB/m) + 3.1 (dB) = 18.8 dBµV/m

5.4 Radiated Emissions (1GHz to 18GHz)

5.4.1 Limits

Frequency (GHz)	Limit (dBµV/m)	Limit (dBµV/m)
	Peak	Average
1-18	74.0	54.0

5.4.2 Receiver Settings

Receiver Parameters	Setting
Detector Function	Average and Peak
Start Frequency	1GHz
Stop Frequency	18GHz
Resolution Bandwidth	1MHz
Video Bandwidth	Auto

5.4.3 Date of Test

2nd June 2021

5.4.4 Test Area

LAB 1 (SAC)

5.4.5 Tested by

M Render

5.4.6 Test Setup

The EUT was configured in the SAC on an 80cm high table Exploratory measurements on the EUT were carried out to identify suspect frequencies and worst case orientations, see Section 5.4.7.

The antenna was kept in the “cone of radiation” from the EUT and pointed at the area both in azimuth and elevation using the tilt mechanism on the antenna mast.

The results were maximised in orientation 0-360 degrees and height 1-4m at a measurement distance of 3m.

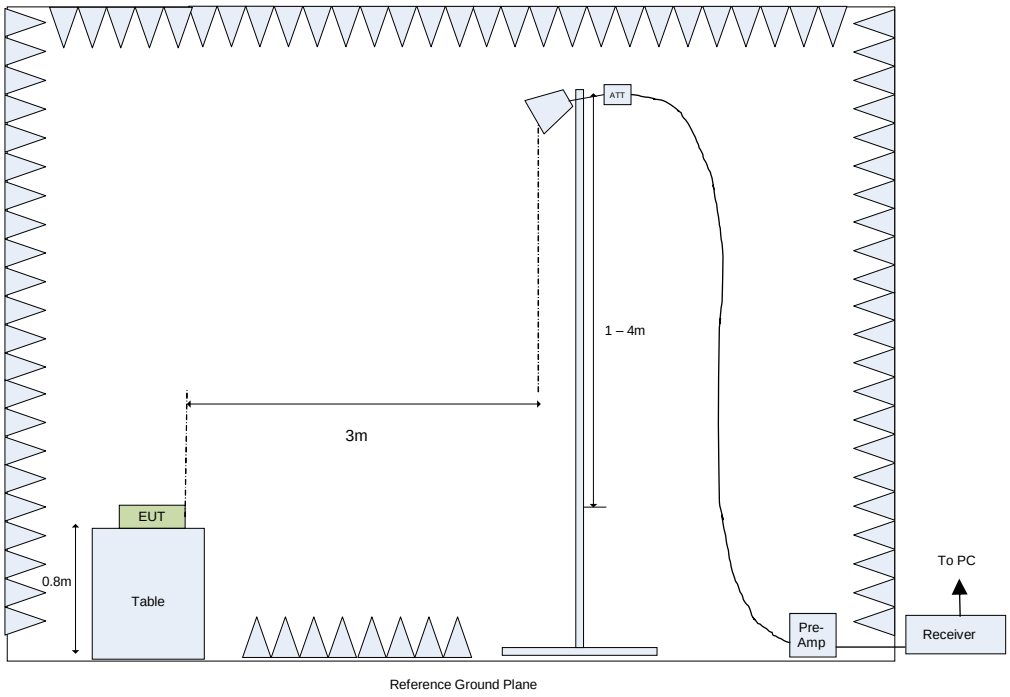


Figure 5.4.6.1: Test Setup for Final E-Field Measurements from 1GHz to 18GHz

Note 1 : With the EUT de-energized the ambient radio noise and signals met the 6dB peak detection requirement of ANSI C63.4-2010.

Note 2 : There were no significant environmental temperature changes during the test duration and hence it was not considered necessary to consider any variation in cable loss.

Note 3: A 2.4GHz band reject filter was fitted to the input of the preamplifier, providing at least 50 dB attenuation of the carrier, in order the prevent the generation of artificial harmonics within the measurement system.

5.4.7 Exploratory Radiated Emission Maximization

During exploratory testing, suspect emissions from the EUT were identified both in terms of the frequency and directionality. This was achieved by manually positioning the antenna close to the EUT and also by scanning it over all sides of the EUT whilst observing a spectral display. The typical distance between the surface of the EUT and the scanning antenna was circa 30cm.

Frequency (GHz)	Mode of operation	EUT face *	Emissions Angle (w.r.t. turntable)	Height	Polarization
None	Transmitting on 2.45Hz	-	-	-	-

Frequencies identified during Exploratory Radiated Emission maximization

Note 1 : The front face of the EUT is deemed to be 0°, which is then turned in a clockwise direction through 360°.

5.4.8 Electric field emissions, 1GHz to 18GHz

The equipment under test was pre-scanned using peak detection when operating continuously on the single 2.45GHz operating channel. Final measurements were performed with the equipment under test operating on the same mode.

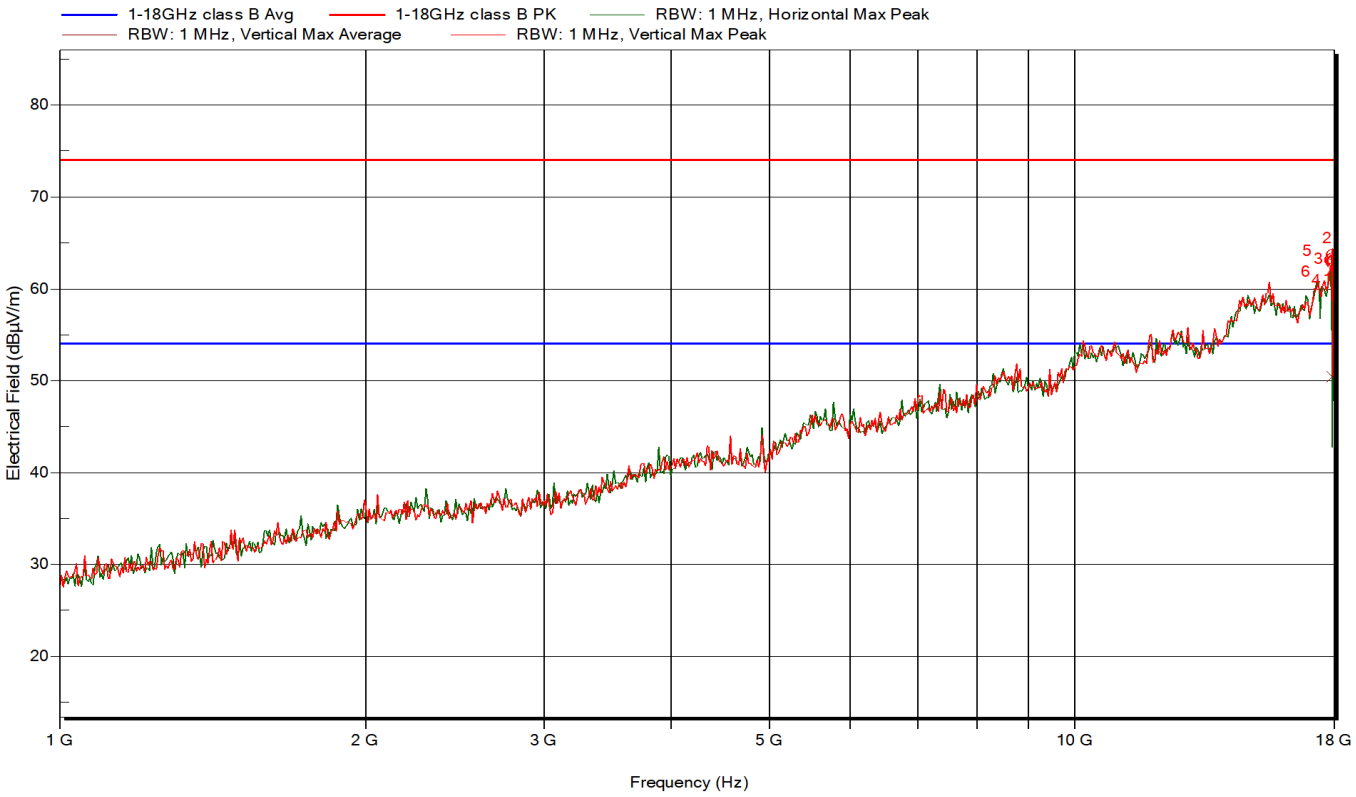


Figure 5.4.8.1: Electric field emissions Plot, 1GHz to 18GHz.

Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height	Polarization
GHz	dBµV/m	dBµV/m	dB		degrees	m	
17.995	49.79	54.0	-4.21	Pass	75	3.1	Horizontal
17.944	50.39	54.0	-3.61	Pass	130	2.9	Vertical
17.923	50.40	54.0	-3.60	Pass	125	3.4	Vertical
17.952	50.39	54.0	-3.61	Pass	180	1.5	Vertical
17.935	49.82	54.0	-4.18	Pass	305	2.6	Horizontal
17.881	50.02	54.0	-3.98	Pass	275	1.8	Horizontal
17.995	49.79	54.0	-4.21	Pass	75	3.1	Horizontal

Table 5.4.8.1: Electric Field Emissions Peaks, 1GHz to 18GHz

5.4.9 Example field strength calculation

The total average corrections are shown in the above table. This correction figure consists of Preamplifier gain (PG), Antenna factor (AF),Cable loss (CL) and distance extrapolation factor

Field strength (FS) is calculated as follows:

FS (dBµV/m) = Indicated Signal Level (dBµV) - PG (dB) + AF (dB) + CL (dB)

5.4.10 Sample Data

From Figure 5.4.8.1 and table 5.4.8.1, The Average level at 17.995GHz is calculated as follows:

FS (dBµV/m) = 39.36(dBµV) -49.66(dB) +47.87(dB/m) +21.76 (dB) = 49.79dBµV/m

5.5 Radiated Emissions (18GHz to 26GHz)

5.5.1 Limits

Frequency (GHz)	Limit (dBµV/m)	Limit (dBµV/m)
	Peak	Average
18-26	74.0	54.0

5.5.2 Receiver Settings

Receiver Parameters	Setting
Detector Function	Average and Peak
Start Frequency	1GHz
Stop Frequency	18GHz
Resolution Bandwidth	1MHz
Video Bandwidth	Auto

5.5.3 Date of Test

2nd June 2021

5.5.4 Test Area

LAB 1 (SAC)

5.5.5 Tested by

M Render

5.5.6 Test Setup

The EUT was configured in the SAC on an 80cm high table Exploratory measurements on the EUT were carried out to identify suspect frequencies and worst case orientations, see Section 5.4.7.

The antenna was kept in the “cone of radiation” from the EUT and pointed at the area both in azimuth and elevation using the tilt mechanism on the antenna mast.

The results were maximised in orientation 0-360 degrees and height 1-4m at a measurement distance of 1m.

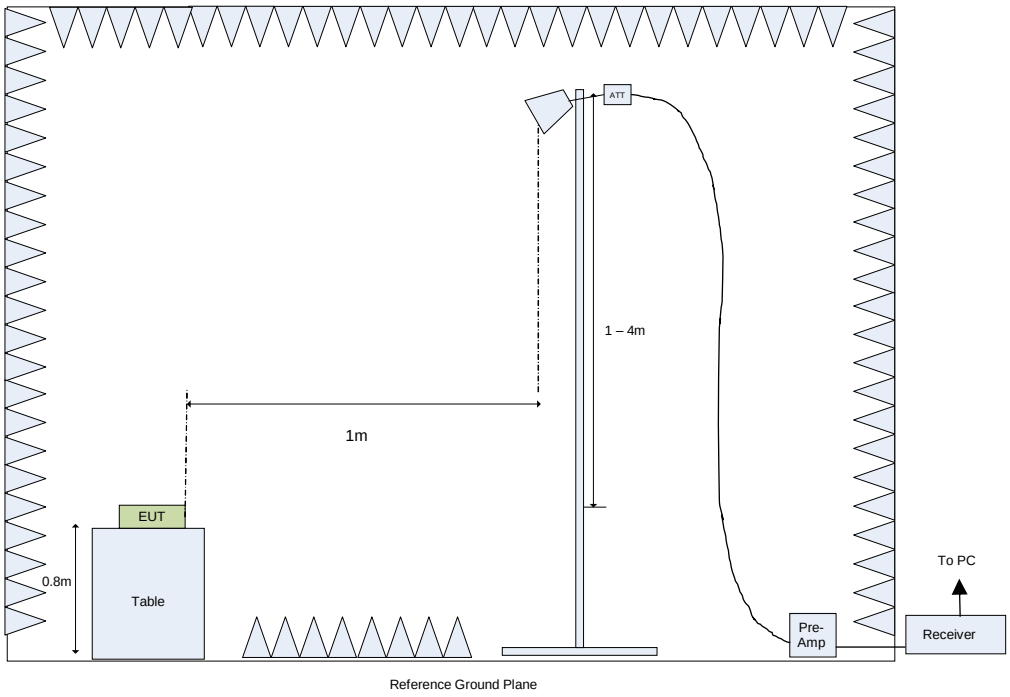


Figure 5.4.6.1: Test Setup for Final E-Field Measurements from 1GHz to 18GHz

Note 2 : With the EUT de-energized the ambient radio noise and signals met the 6dB peak detection requirement of ANSI C63.4-2010.

Note 3 : There were no significant environmental temperature changes during the test duration and hence it was not considered necessary to consider any variation in cable loss.

5.5.7 Exploratory Radiated Emission Maximization

During exploratory testing, suspect emissions from the EUT were identified both in terms of the frequency and directionality. This was achieved by manually positioning the antenna close to the EUT and also by scanning it over all sides of the EUT whilst observing a spectral display. The typical distance between the surface of the EUT and the scanning antenna was circa 30cm.

Frequency (GHz)	Mode of operation	EUT face *	Emissions Angle (w.r.t. turntable)	Height	Polarization
None	Transmitting on 2.45GHz	-	-	-	-

Table 5.5.7.1: Frequencies identified during Exploratory Radiated Emission maximization

Note 4 : The front face of the EUT is deemed to be 0°, which is then turned in a clockwise direction through 360°.

5.5.8 Electric field emissions, 18GHz to 26GHz

The equipment under test was pre-scanned using peak detection when operating continuously on the single 2.45GHz operating channel. Final measurements were performed with the equipment under test operating on the same mode.

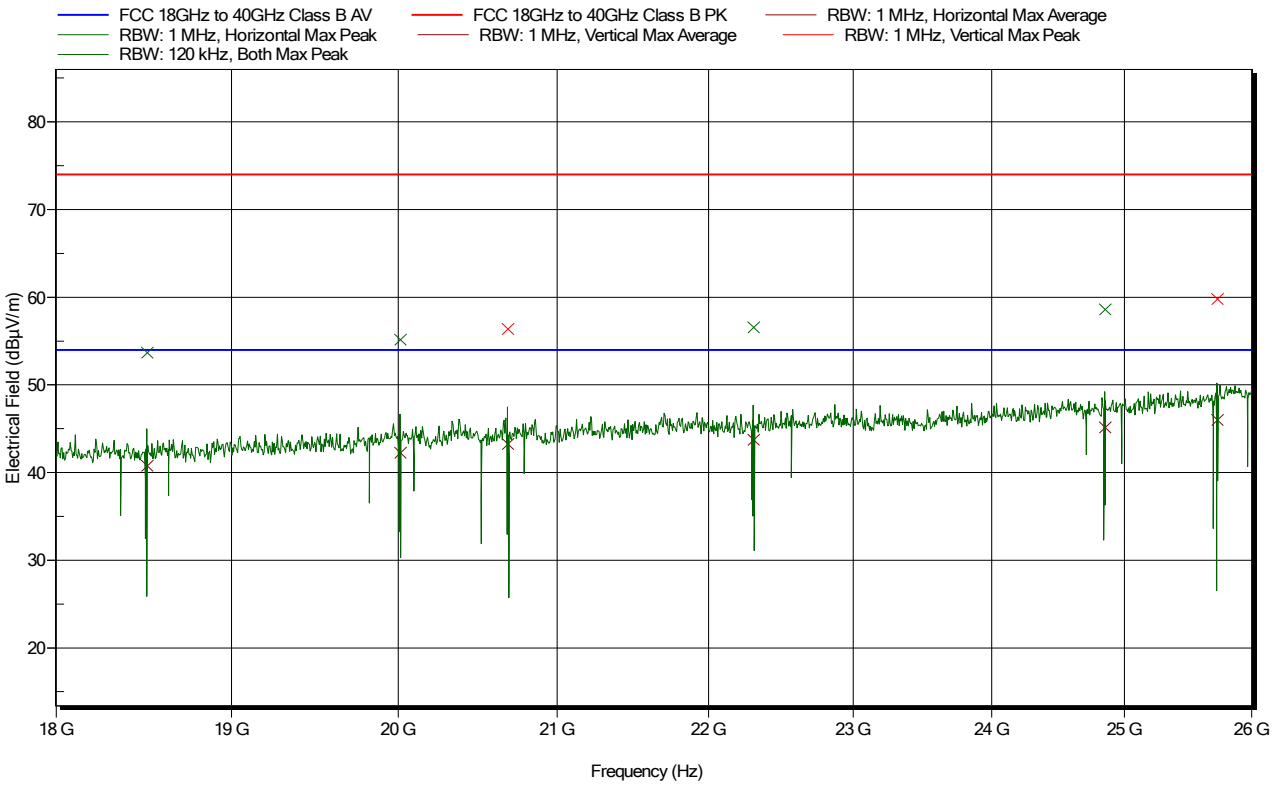


Figure 5.5.8.1: Electric field emissions Plot, 18GHz to 26GHz.

Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height	Polarization
GHz	dBµV/m	dBµV/m	dB		degrees	m	
20.681	43.3	54.0	-10.71	Pass	345	2.3	Vertical
20.010	42.3	54.0	-11.68	Pass	20	2.2	Horizontal
18.513	40.8	54.0	-13.18	Pass	205	2.5	Horizontal
24.848	45.2	54.0	-8.81	Pass	305	2.5	Horizontal
25.721	46.0	54.0	-7.97	Pass	30	4.0	Vertical
22.305	43.8	54.0	-10.22	Pass	70	3.9	Horizontal
20.681	43.3	54.0	-10.71	Pass	345	2.3	Vertical

Table 5.5.8.1: Electric Field Emissions Peaks, 18GHz to 26GHz

5.5.9 Example field strength calculation

The total average corrections are shown in the above table. This correction figure consists of Preamplifier gain (PG), Antenna factor (AF),Cable loss (CL) and distance extrapolation factor

Distance extrapolation factor:

The measurements were made at a 1m measurement distance. The measurements were extrapolated to the field strength expected at 3m by:

Measurements at 3m = measurements at 1m – 9.54dB

Where the extrapolation factor, 9.54dB, is calculated from:

$$\text{extrap.} = 20\log\frac{\text{specification distance}}{\text{measurement distance}} = 20log\frac{3}{1} = 9.54dB$$

Field strength (FS) is calculated as follows:

FS (dBµV/m) = Indicated Signal Level (dBµV) - PG (dB) + AF (dB) + CL (dB) - extrap

5.5.10 Sample Data

From Figure 5.5.8.1 and table 5.5.8.1, The Average level at 20.681GHz is calculated as follows:

FS (dBµV/m) = 39.95(dBµV) +2.45(dB/m) +10.44 (dB) – 9.54 = 43.3 dBµV/m

Section 6 20dB Bandwidth and 99% Occupied Bandwidth

6.1 Test Specification

FCC Rule Part	47CFR 15.215(c)
ISED Regulation	RSS-Gen 6.6
Standard	ANSI C63.10:2013

6.2 Procedure and Test Software Version

Conducted Tests

ANSi C63.10-2013 Clause reference:	6.9.2 and 6.9.3
Test software	Keysight Connection Expert

Frequency (MHz)	Limit, 47CFR 15.215(c)
	Peak
2400MHz to 2483.5MHz 2.45GHz fixed operation	20 dB bandwidth must be contained within the designated frequency band

Spectrum analyser settings as specified by ANSI C63.10-2013 Clause 6.9.2

Receiver Parameters	Setting
Detector Function	Peak
Span	3 x OBW
Resolution Bandwidth	5% of OBW
Video Bandwidth	3 x RBW
Sweep rate	Auto couple
Trace mode	Max hold

6.2.1 Date of Test

22nd July 2021

6.2.2 Test Area

LAB 5

6.2.3 Tested by

M Render

6.2.4 Test Setup

Conducted measurement. Apparatus close coupled to a receive antenna.

20dB bandwidth: ANSI C63.10-2013 Clause 6.9.2
99% occupied bandwidth: ANSI C63.10-2013 Clause 6.9.3

6.3 Test Results

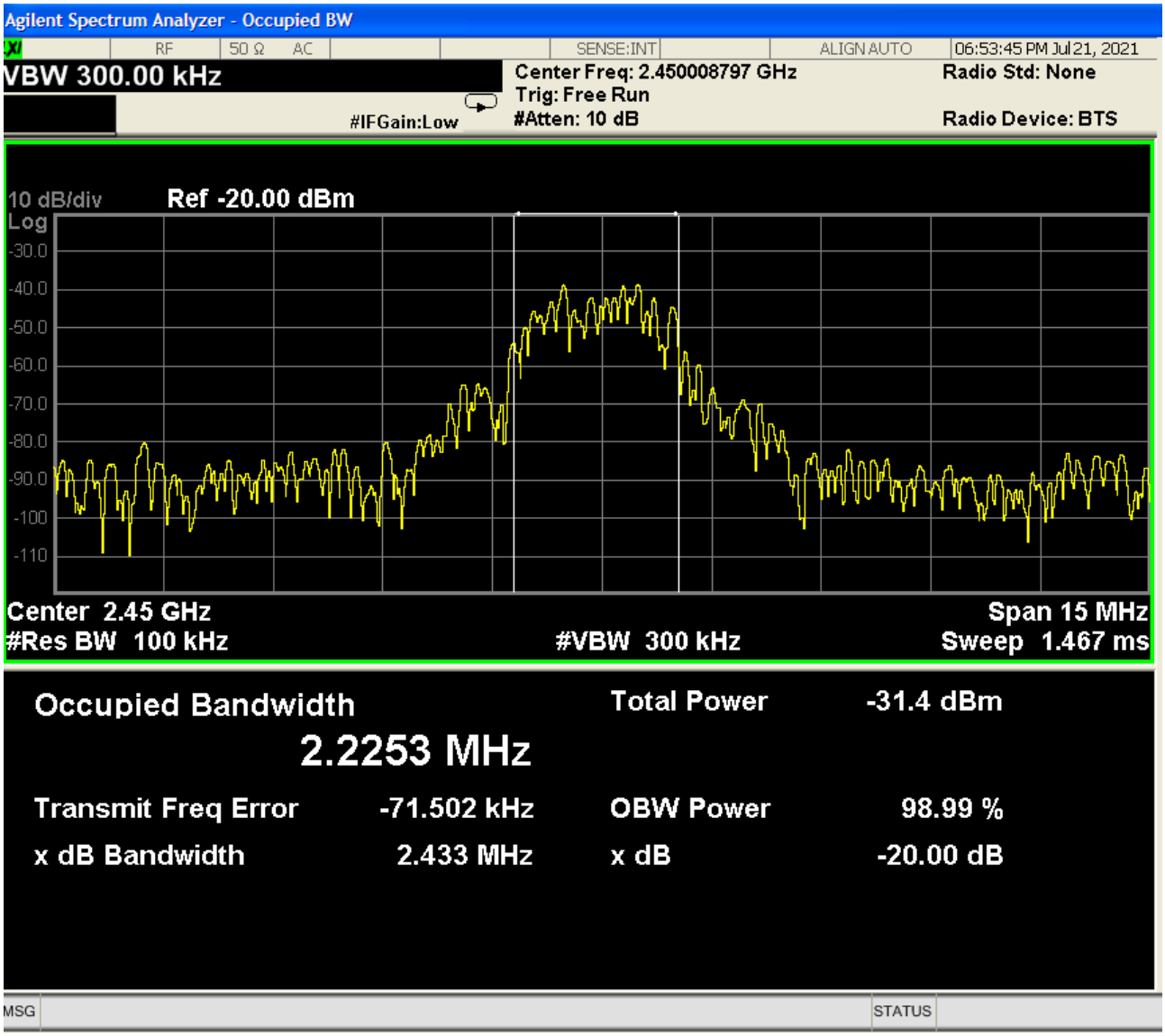
The following measurements were made using the procedures specified by ANSI C63.10-2013

20dB bandwidth: ANSI C63.10-2013 Clause 6.9.2
99% occupied bandwidth: ANSI C63.10-2013 Clause 6.9.3

Centre frequency (GHz)	99% OBW (MHz)	20dB bandwidth (MHz)
2.45	2.2253	2.433

The whole emission was contained with the operating frequency band 2400MHz to 2483.5MHz

6.4 Spectrum Analyser Display



Spectrum analyser display of occupied bandwidth measurements.

Section 7 Fundamental Frequency and Harmonics

7.1 Test Specification

FCC Rule Part	FCC § 15.249(a)
ISED Regulation	ISED RSS-210 B10 a
Standard	ANSI C63.10:2013

7.2 Procedure and Test Software Version

ANSi C63.10-2013 Clause reference:	6.6 (Radiated emissions from unlicensed wireless devices above 1GHz)
Test software	Keysight Connection Expert

Frequency (MHz)	Limit, 47CFR 15.249(a)		
	Detector type	Field Strength of Fundamental	Field Strength of Harmonics
2400MHz to 2483.5MHz	Linear Average	50 mV/m (94.0 dBμV/m)	500 μV/m (54.0 dBμV/m)
2400MHz to 2483.5MHz	Peak	114.0 dBμV/m	74.0 dBμV/m

Spectrum analyser settings as specified by ANSI C63.10-2013 Clause 6.6

Receiver Parameters	Setting
Detector Function	Average and Peak
Start Frequency	1GHz
Stop Frequency	18GHz
Resolution Bandwidth	1MHz
Video Bandwidth	Auto

7.2.1 Date of Test

2nd June 2021

7.2.2 Test Area

LAB 7

7.2.3 Tested by

M Render

7.2.4 Test Setup

The test setup was identical to radiated emissions testing 1-18GHz.

7.3 Test Result

As per FCC rule part 15.31(e) measurements were performed using a new battery.
The results of the Field strength of the Fundamental measurements are stated in the table below.

Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
GHz	dBµV/m	dBµV/m	dB		
2.45	89.2	94.0	-4.8	Pass	Vertical
2.45	84.7	94.0	-9.3	Pass	Horizontal

Average Field Strength Measurement

Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
GHz	dBµV/m	dBµV/m	dB		
2.45	94.7	114.0	-19.3	Pass	Vertical
2.45	89.8	114.0	-24.2	Pass	Horizontal

Peak Field Strength Measurement

note: No harmonics of the fundamental carrier frequency were observed.

Section 8 Band Edge Compliance

8.1 Test Specification

FCC Rule Part	47CFR 15.249(a)
ISED Regulation	ISED RSS-210 B10 a
Standard	ANSI C63.10:2013

8.2 Procedure and Test Software Version

ANSi C63.10-2013 Clause reference:	Clause 6.10
Test software	Keysight Connection Expert

Frequency (MHz)	Limit, 47CFR 15.249(a)(e)
	Peak
2400MHz to 2483.5MHz	Measured signal at the band edge must below the radiated emission limits of 47CFR15.209

Spectrum analyser settings as specified by ANSI C63.10-2013 Clause 6.10.

Receiver Parameters	Setting
Detector Function	Peak
Span	As necessary
Resolution Bandwidth	1MHz
Video Bandwidth	3 x RBW
Sweep rate	Auto couple
Trace mode	Max hold

8.2.1 Date of Test

2nd June 2021

8.2.2 Test Area

LAB 1 (SAC)

8.2.3 Tested by

M Render

8.2.4 Test Setup

The test setup was identical to radiated emissions testing 1-18GHz.

8.3 Test Results

Results are presented in two formats:

Tabular results of measurements at the band edges. Manual measurements were performed to measure the maximum value of signal at the band edge. The tabular data includes the following:

1. Polarity of the measurement antenna
2. Modulation scheme
3. Frequency at the band edge
4. Amplitude of signal at the input of the test receiver
5. Pre-amplifier gain
6. Cable loss
7. Antenna factor
8. Resultant Electric field strength = 3-4+5+6

Spectrum analyser screen displays are also included. Please note that the screen displays do not include losses or antenna factor.

Tabular Data

The following radiated measurements were made at the band edges:

Upper band edge

Polarity	Frequency (MHz)	Amplitude (dBuV)	Preamp (dB)	Cable loss (dB)	AF (dB/m)	E (dBuV/m)	Limit (dBuV/m)	Margin (dB)
H	2483.5	45.6	38.1	4.8	29.9	42.2	74.0	-31.8
V	2483.5	44.6	38.1	4.8	29.9	41.2	74.0	-32.8

Peak detector measurements

Polarity	Frequency (MHz)	Amplitude (dBuV)	Preamp (dB)	Cable loss (dB)	AF (dB/m)	E (dBuV/m)	Limit (dBuV/m)	Margin (dB)
H	2483.5	31.9	38.1	4.8	29.9	28.5	54.0	-25.5
V	2483.5	31.9	38.1	4.8	29.9	28.5	54.0	-25.5

Average detector measurements

Lower band edge

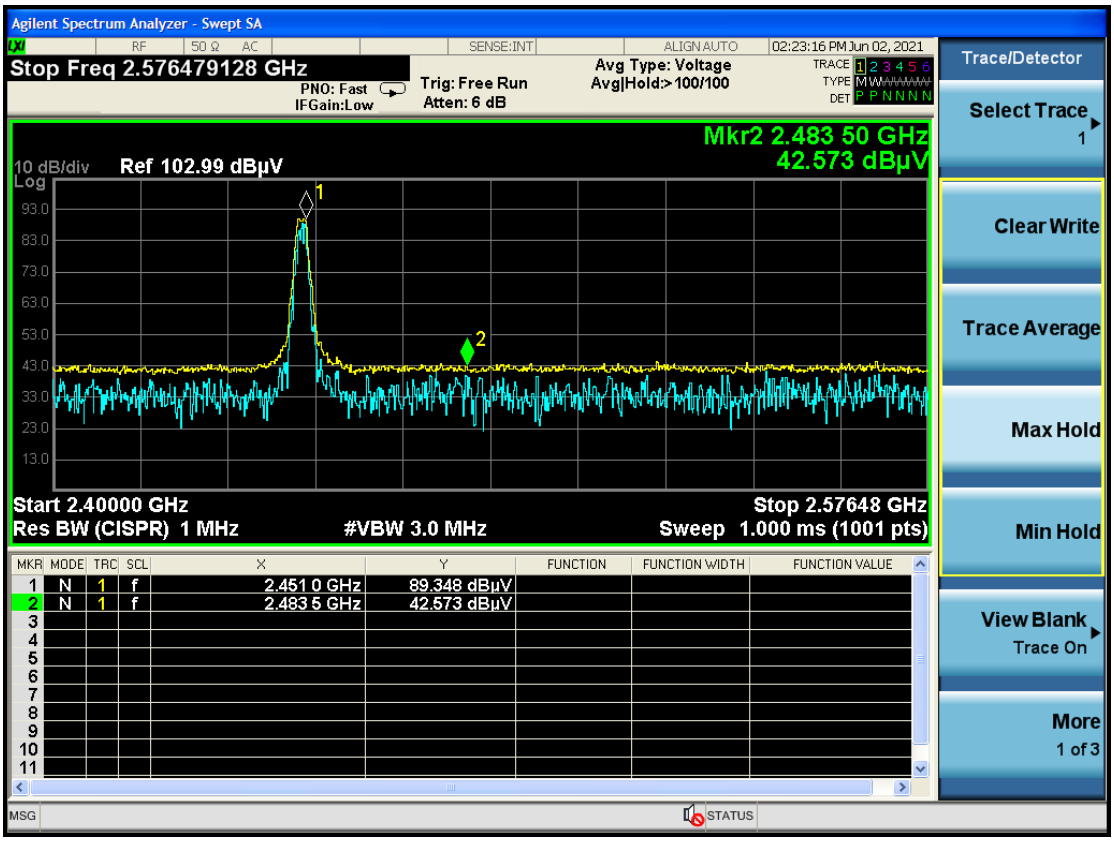
Polarity	Frequency (MHz)	Amplitude (dBuV)	Preamp (dB)	Cable loss (dB)	AF (dB/m)	E (dBuV/m)	Limit (dBuV/m)	Margin (dB)
H	2400.0	44.7	38.1	4.6	29.7	40.9	74.0	-33.1
V	2400.0	45.4	38.1	4.6	29.7	41.6	74.0	-32.4

Peak detector measurements

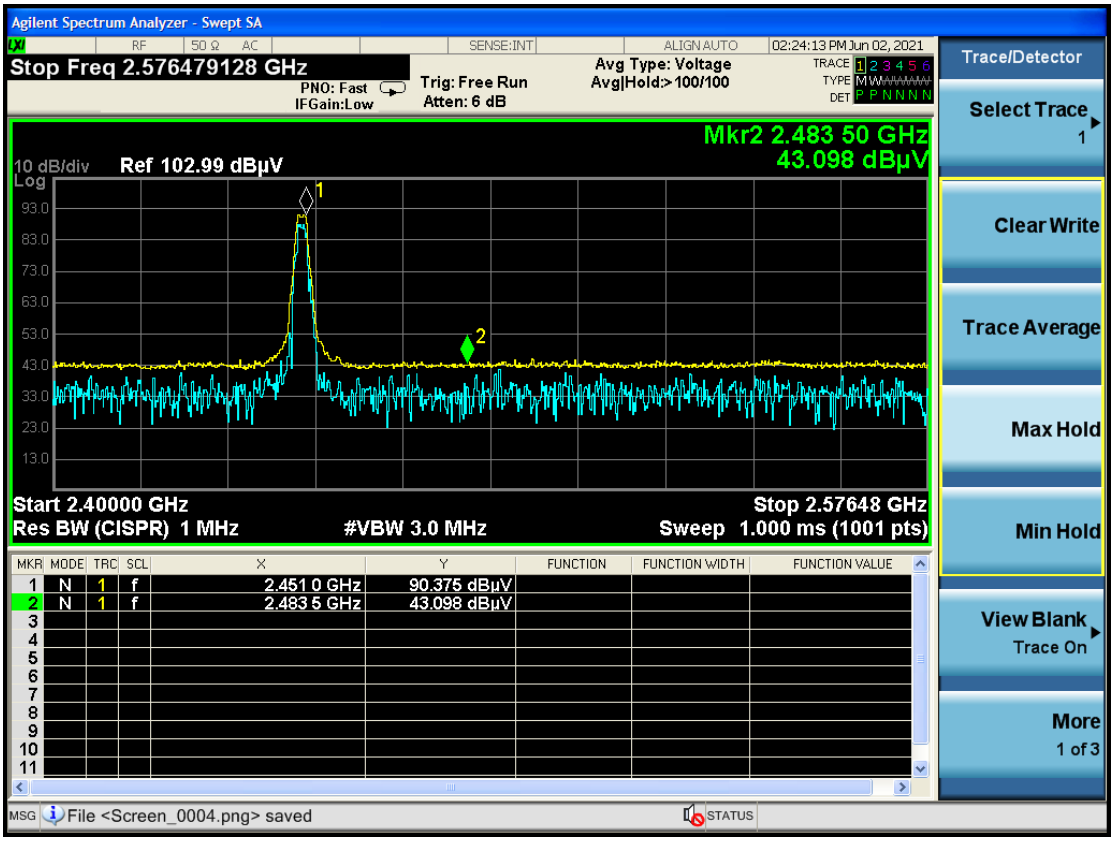
Polarity	Frequency (MHz)	Amplitude (dBuV)	Preamp (dB)	Cable loss (dB)	AF (dB/m)	E (dBuV/m)	Limit (dBuV/m)	Margin (dB)
H	2400.0	32.0	38.1	4.6	29.7	28.2	54.0	-25.8
V	2400.0	31.9	38.1	4.6	29.7	28.1	54.0	-25.9

Average detector measurements

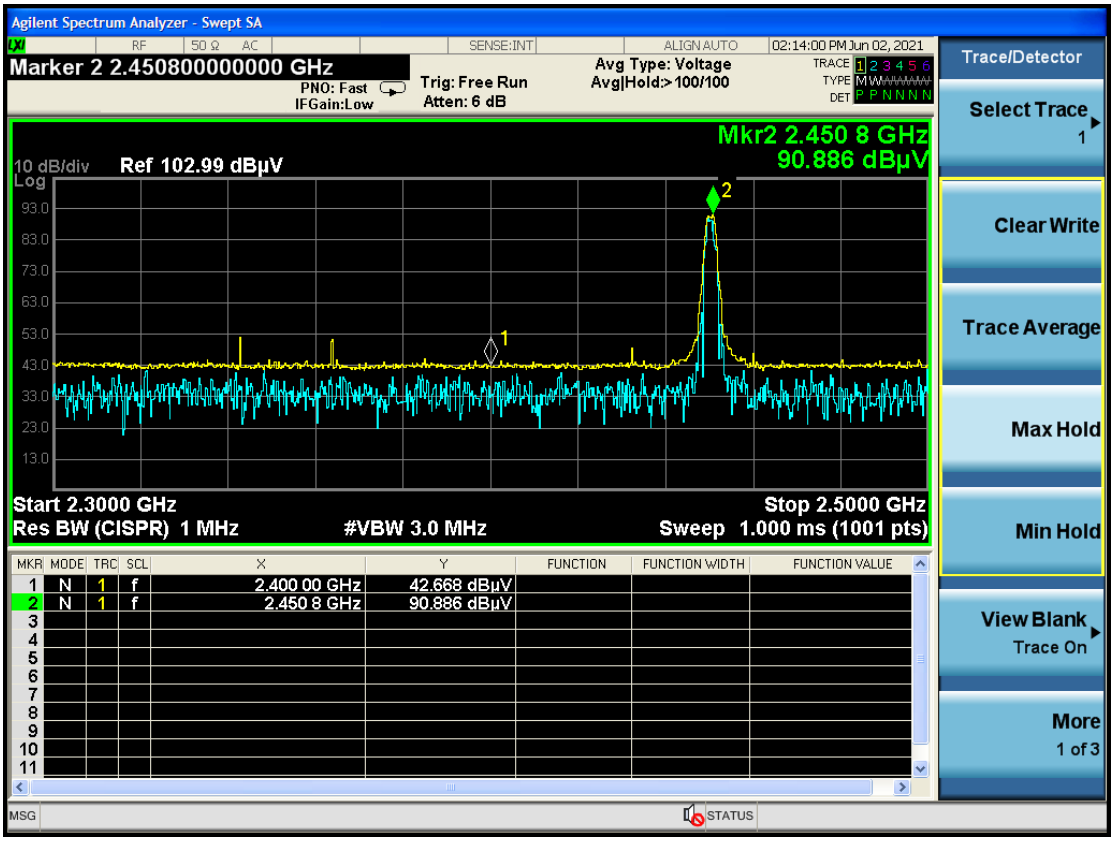
Spectrum analyser displays



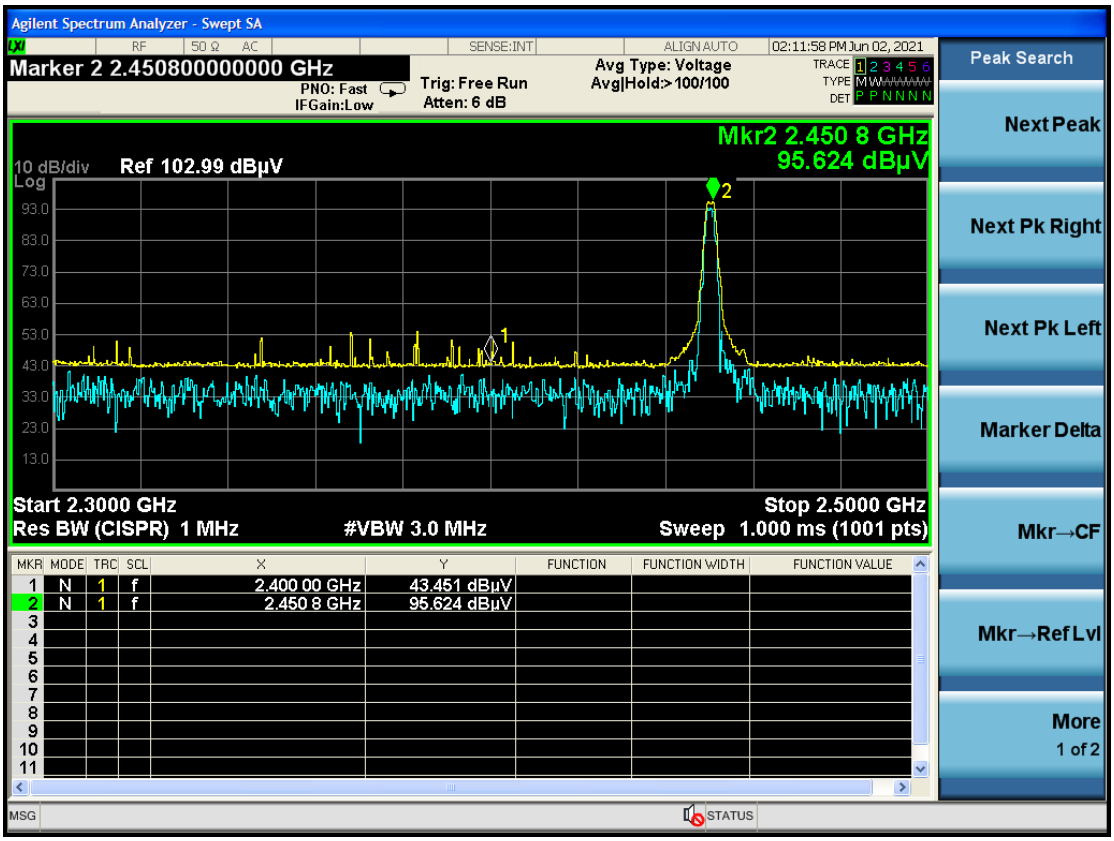
Band Edge Measurement – upper band edge – horizontal polarity



Band Edge Measurement – upper band edge – vertical polarity



Band Edge Measurement – lower band edge – horizontal polarity



Band Edge Measurement – lower band edge – vertical polarity

Appendix A EUT Test Photos

Test set up photographs are supplied separately.

Appendix B Test Equipment List

Radiated Emissions Equipment

Item	Serial No.	Last Calibration Date	Calibration Interval
Laboratory 1 Semi-Anechoic Chamber	Lab 1	28th January 2020	36 Months
ETS Lindgren 2017B Mast (1 – 4m) with tilting mechanism	--	N/A	N/A
R & S ESR	C0499	26th January 2021	12 Months
Chase CBL6112B Bilog Antenna, 78167	1503	13th December 2019	36 Months
6dB Attenuator (For use with Bilog Antenna)	78708B	13th December 2019	36 Months
HF26 Cable	167003-001	5th January 2021	12 Months
HF17 Cable	167002-001	5th January 2021	12 Months
HF27 Cable	-	5th January 2021	12 Months
EMCO 3115 Horn Antenna 78347	9712-5380	25th May 2020	24 Months
BONN BLMA 0118-5A Preamplifier	149759	9th March 2021	12 Months
ETS Lindgren 3116C Horn Antenna	C0433	17th October 2019	36 Months
Microtronics BRM50702 2.4GHz Notch filter	C0473	5th January 2021	12 Months