



# Test Report for the FCC Radio Testing of a HAVwear Module To 47CFR 15.247 (Limited Testing for Class 2 Permissive Change) For Reactec Ltd

Test Report number: 14173TR2  
Project number: C5667

Author:   
M Render BSc, PhD, MIET  
Senior Test Engineer

Checked:   
J Beevers MPhys, PhD  
Test Engineer

Approved:   
C Greenfield BEng (Hons)  
Laboratory Business Manager

Issue	Description						Issue by	Date
2	Copy 1		Copy 2		PDF	X	CWG	21 <sup>st</sup> June 2021

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**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

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## Test Report Change History

Issue	Date	Modification Details
1	27 <sup>th</sup> May 2021	Original issue of test report
2	21 <sup>st</sup> June 2021	Reference to certified BLE module included.
3		
4		
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## Section 1 Test Location

All testing was performed at;

<b>Eurofins York Ltd</b>	Unit 5
	Speedwell Road
	Castleford
	WF10 5PY
<b>Tel:</b>	01977 731173
<b>Website</b>	<a href="https://www.yorkemc.com">https://www.yorkemc.com</a>
<b>UKAS Testing No.</b>	1574

### 1.1 UKAS Accreditation

Tests marked "Not UKAS Accredited" in this report are not included in the UKAS Accreditation Schedule for our laboratory.

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

Eurofins York, Castleford latest accreditation schedule can be found at:

[http://www.ukas.org/testing/lab\\_detail.asp?lab\\_id=989&location\\_id=&vMenuOption=3](http://www.ukas.org/testing/lab_detail.asp?lab_id=989&location_id=&vMenuOption=3)

Eurofins York, is a recognised test facility with the Federal Communications Commission (FCC). The appropriate FCC recognition number is UK2013, recognition date 1<sup>st</sup> March 2021.

**Section 2 Customer Information**

<b>Company name</b>	Reactec Ltd
<b>Address</b>	Vantage Point
	3 Cultins Road
	Edinburgh
	EH11 4DF
<b>Tel:</b>	44 (0)131 221 0930
<b>Contact</b>	Mr P Gillespie
<b>Email</b>	PeterGillespie@reactec.com
<b>Customer Representative(s) present during testing</b>	Testing was not witnessed

**2.1 Purpose of Testing**

This testing was in support of a Class II Permissive change procedure, to allow a certified BLE module to be integrated into the HAVwear Module.

FCC ID of BLE module: QOQBGM12LMA

## Section 3 Equipment Details

### 3.1 Equipment Under Test (EUT)

<b>Date received:</b>	7 <sup>th</sup> December 2020					
<b>EUT name:</b>	HAVwear Module with BLE					
<b>Type/Part no:</b>	HVW-002, HVW-004					
<b>FCC ID</b>	2AYGFHVW001					
<b>EUT description:</b>	Device which monitors Hand Arm Vibration (HAV) exposure of the user or Social Distance between users. The operating mode used is configured by the end user within the Reactec Analytics system.					
<b>No of units tested:</b>	One					
<b>EUT power:</b>	4.1V $\pm$ 0.1V DC					
<b>Cables:</b>	None, enclosure only					
<b>Size of EUT (mm)</b>	L: -	40	W: -	37	H: -	14
<b>Tested as</b>	Body worn					
<b>Mode/s of operation</b>	BLE transmitting: 2402MHz 2440MHz and 2480MHz					
<b>Client modification statement:</b>	Not applicable					
<b>Modifications incorporated during testing:</b>	None.					

### **3.2 EUT Photos**

Photographs are supplied separately.



### 3.3 Configuration of EUT

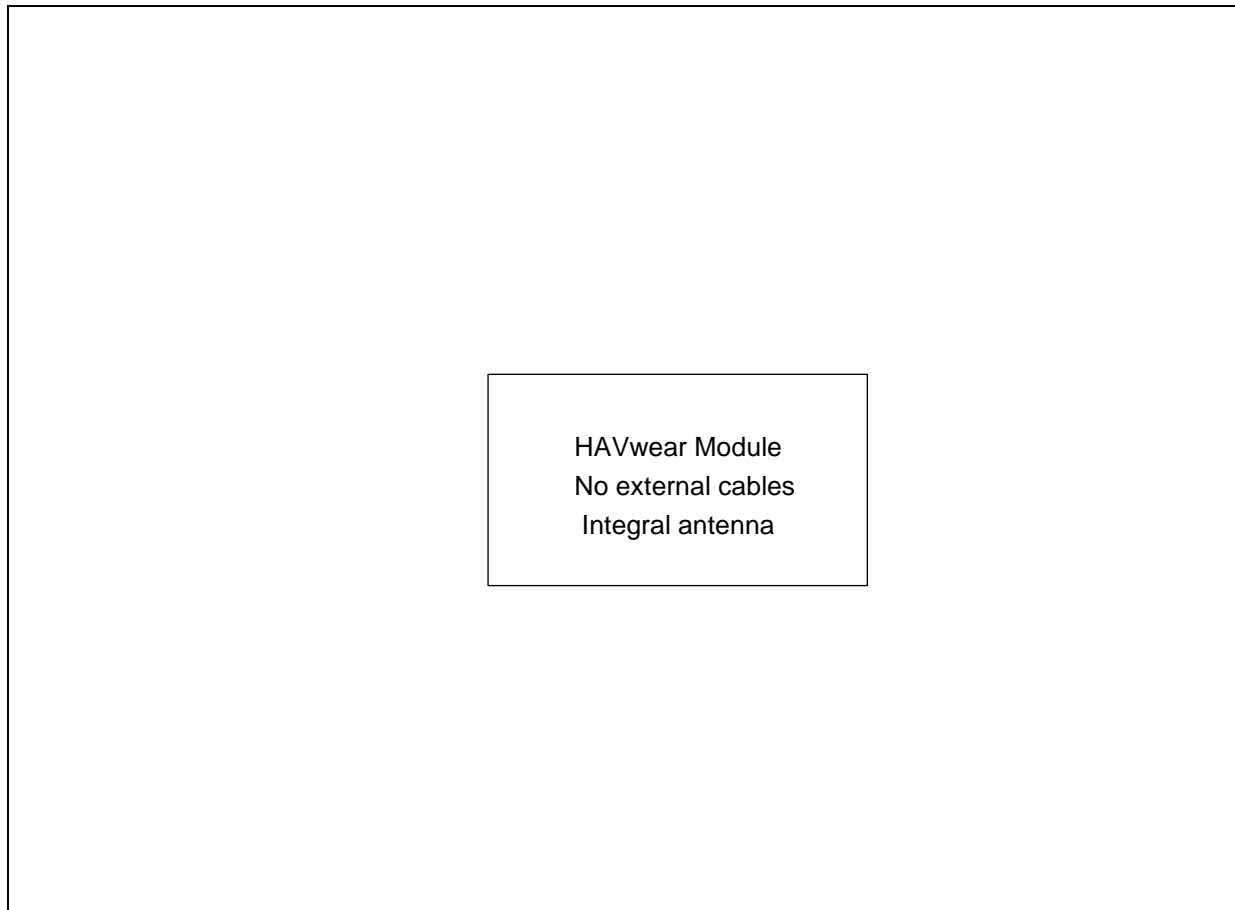


Figure 1: Diagram of EUT

### 3.4 EUT Monitoring/Auxiliary Equipment

None.

### **3.5 Monitoring Software**

Monitoring software was not used.

## Section 4 Test Specifications

The tests were performed in accordance with Eurofins York Ltd Quotation QuC5667.

<b>47CFR Part 15, Sub Part C Intentional Radiators</b>
<b>§15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.</b>
<b>Which references the following test standard 47CFR 15.38 (G) (3): -</b>
<b>ANSI C63-10: 2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.</b>

Requirement	FCC Rule Part	Comments
6 dB Bandwidth	FCC § 15.247(a)(2)	Applies only if module is not certified
Maximum peak conducted power	FCC § 15.247(b)(3)	Applies only if module is not certified
Power spectral density	FCC § 15.247(e)	Applies only if module is not certified
AC power line conducted emissions	FCC § 15.207	For mains powered apparatus only
Band edge compliance	FCC § 15.247(d)	Applies for Class 2 Permissive Change Procedure
Conducted spurious emissions	FCC § 15.247(d)	Applies only if module is not certified
Transmitter radiated spurious emissions	FCC § 15.247(d) FCC § 15.209	Applies for Class 2 Permissive Change Procedure

### Notes:

1. Where the module has limited modular certification, only the tests required for a Class 2 Permissive change are required.
2. Where the module has no certification, then all the tests apply followed by TCB certification.
3. Where the module has full singular certification, then radiated emission testing is required for co-located radios

#### 4.1 Knowledge Database References

The following KDBs were referenced during the testing of the HAVwear Module

The latest knowledge database references are available via the FCC KDB website at:

<https://apps.fcc.gov/kdb>

##### 4.1.1 Conducted Emissions

Publication Number	Keyword	Publication Date
174176	Section 15.107, 15.207, 18.307, C63.4, C63.10, Suitable Dummy Load, AC Power Line Conducted Measurement	03/06/2015
640677	Radio Frequency LED Lighting	17/06/2016
892282	Exclusions, Transportation, Electric Vehicle Battery Charge	21/01/2012
657217	Test procedures for Notebook Computers	01/10/2008

##### 4.1.2 Radiated Emissions (9kHz to 30MHz)

Publication Number	Keyword	Publication Date
937606	Test Site Requirements for Part 15 and 18 Devices Operating Below 30 MHz	10/10/2014
460108	Radiated emission measurements below 30 MHz	06/15/2015

##### 4.1.3 Radiated Emissions (30MHz to 1000MHz)

Publication Number	Keyword	Publication Date
746324	CE Mark and use of CISPR 22 limits	06/12/2015
640677	Radio Frequency LED Lighting	17/06/2016
657217	Test procedures for Notebook Computers	01/10/2008
913591	Measurement of radiated emissions at the band-edge for a Part 15 RF Device	04/05/2017

##### 4.1.4 Radiated Emissions (1GHz to 40GHz)

Publication Number	Keyword	Publication Date
746324	CE Mark and use of CISPR 22 limits	12/06/2015
714737	15B, Average Detector for Unintentional Radiator	30/11/2010
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

**4.1.5 Radiated Emissions - Apparatus Containing a Modular Transmitter**

Publication Number	Keyword	Publication Date
996369	Modular Transmitter Integration Guide – Guidance for Host Product Manufacturers, Frequency Spectrum to be Investigated	01/02/2019

#### **4.2 Compliance Statement**

The HAVwear Module as tested, was shown to meet requirements of the standards listed in Section 4 of this report.

## **Section 5 Conducted Emission Results**

This test was not applicable.

## Section 6 Radiated Emission Results

### 6.1 Test Specification

Standard	ANSI C63.10-2013
Measurement Uncertainty	<p>The reported uncertainty of measurement <math>y \pm U</math>, where expended uncertainty <math>U</math> is based on a standard uncertainty multiplied by a coverage factor of <math>k=2</math>, providing a level of confidence of approximately 95% is</p> <p>+/- 5.01dB for the frequency range from 9kHz to 30MHz</p> <p>+/- 6.23dB for the frequency range 30MHz to 1GHz</p> <p>+/- 5.04dB for the frequency range from 1GHz to 6GHz</p> <p>+/- 5.35dB for the frequency range from 6GHz to 18GHz</p> <p>+/- 4.81dB for the frequency range from 18GHz to 40GHz</p>

### 6.2 Procedure and Test Software Version

Eurofins York test procedure (30MHz to 1GHz)	CEP23 Issue 5
Eurofins York test procedure (1GHz to 40GHz)	CEP64 Issue 6
Test software	Radimation Version 2018-2-8



**6.3 Radiated Emissions (30MHz to 1GHz)****6.3.1 Limits at 3m**

Frequency (MHz)	47CFR15.209 (a) (dBµV/m)
	Quasi Peak
30 - 88	40.0
88 -216	43.5
216 - 960	46.0
960- 1000	54.0

47CFR 15.209 specifies limits at a 3m measurement distance.

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

**6.3.2 Emissions measurements****6.3.3 Date of Test**

19<sup>th</sup> January 2021

**6.3.4 Test Area**

LAB 1 (SAC)

**6.3.5 Tested by**

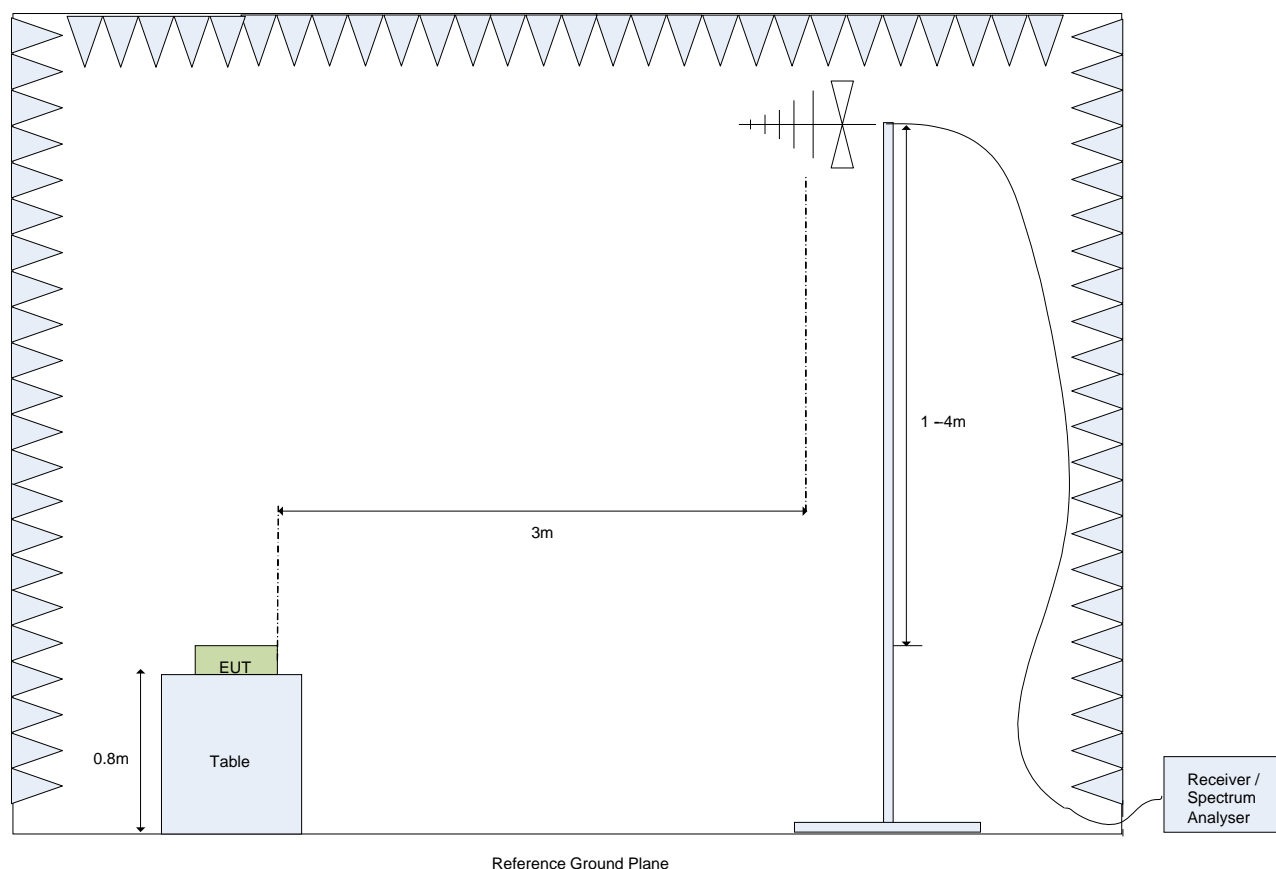
M Render

### 6.3.6 Test Setup

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

The measurement was performed with an antenna to EUT separation distance of 3m. The Quasi peak limits are therefore increased by 10dB (from the 10m values), to allow for the reduction in the measurement distance.

The results were maximised in orientation 0-360 degrees and height 1-4m.



**Figure 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.

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.

## 6.3.7 Electric field emissions, 30MHz to 1GHz

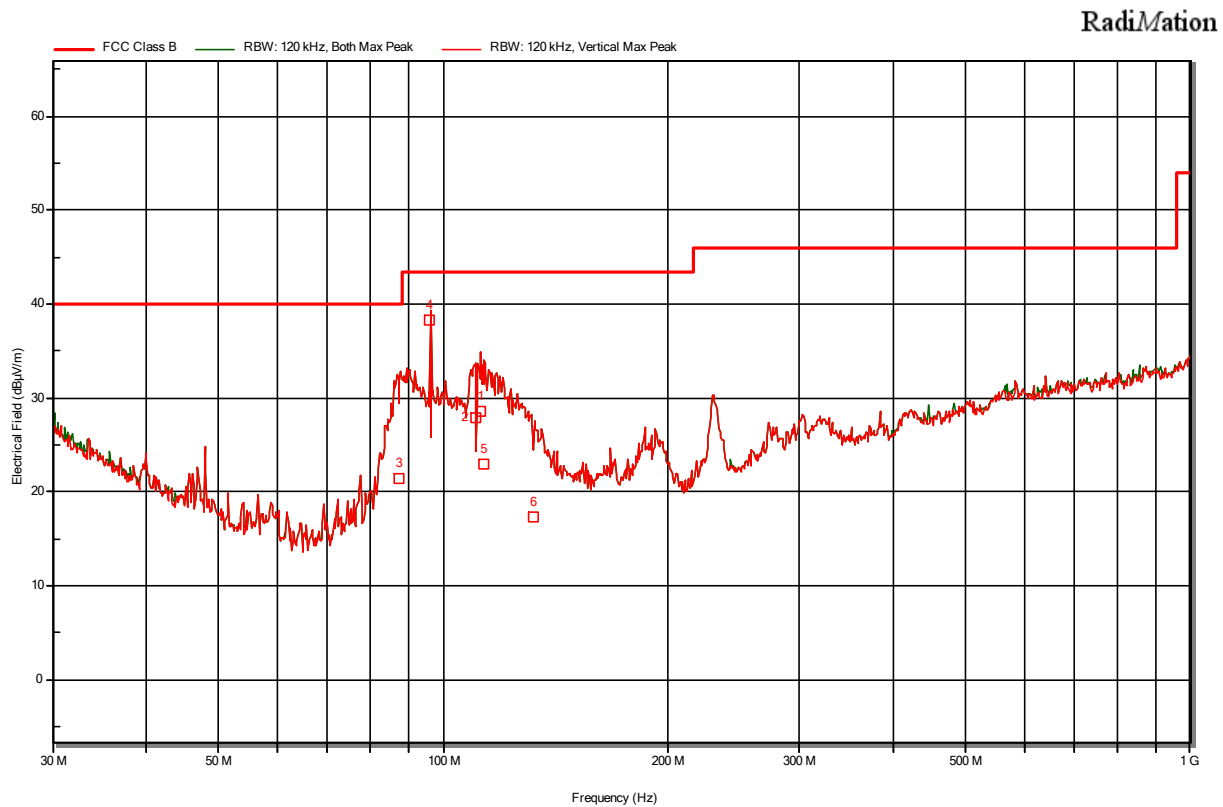


Figure 2: Electric field emissions Plot, 30MHz to 1GHz. 2402MHz operation

Frequency MHz	Measured QP dBμV/m	Limit dBμV/m	Margin dB	Polarity	Height m	Comment
87.240	21.4	40.0	-18.6	Vertical	1.4	Pass
96.006	38.4	43.5	-5.1	Vertical	1.2	Pass
110.646	27.9	43.5	-15.6	Vertical	1.0	Pass
112.200	28.6	43.5	-14.9	Vertical	1.0	Pass
113.100	23.0	43.5	-20.5	Vertical	1.0	Pass
132.120	17.3	43.5	-26.2	Vertical	1.0	Pass

Table 1 Final quasi-peak measurements. 2402MHz operation

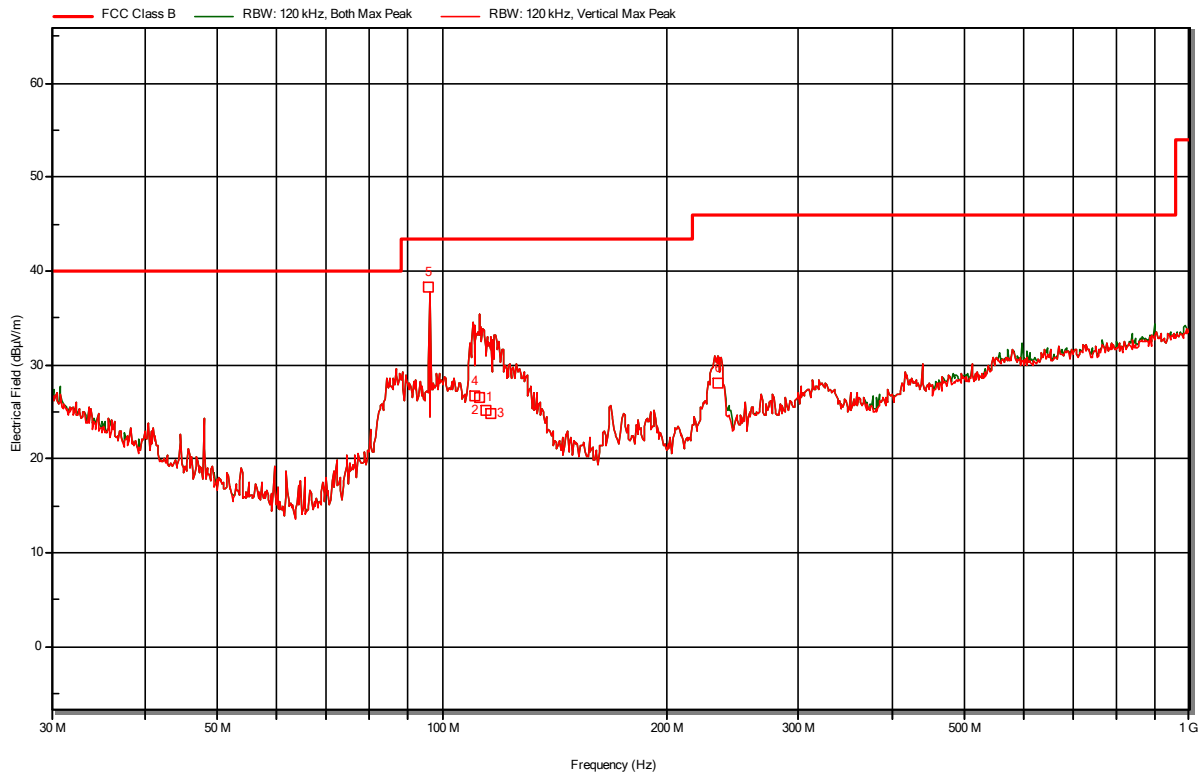


Figure 2: Electric field emissions Plot, 30MHz to 1GHz. 2440MHz operation

Frequency MHz	Measured QP dBμV/m	Limit dBμV/m	Margin dB	Polarity	Height m	Comment
96.006	38.3	43.5	-5.2	Vertical	1.1	Pass
110.640	26.7	43.5	-16.8	Vertical	1.1	Pass
112.200	26.6	43.5	-16.9	Vertical	1.0	Pass
114.720	25.2	43.5	-18.3	Vertical	1.0	Pass
116.280	24.9	43.5	-18.6	Vertical	1.0	Pass
234.540	28.1	46.0	-17.9	Vertical	1.0	Pass

Table 2: Final quasi-peak measurements. 2440MHz operation

RadiMation

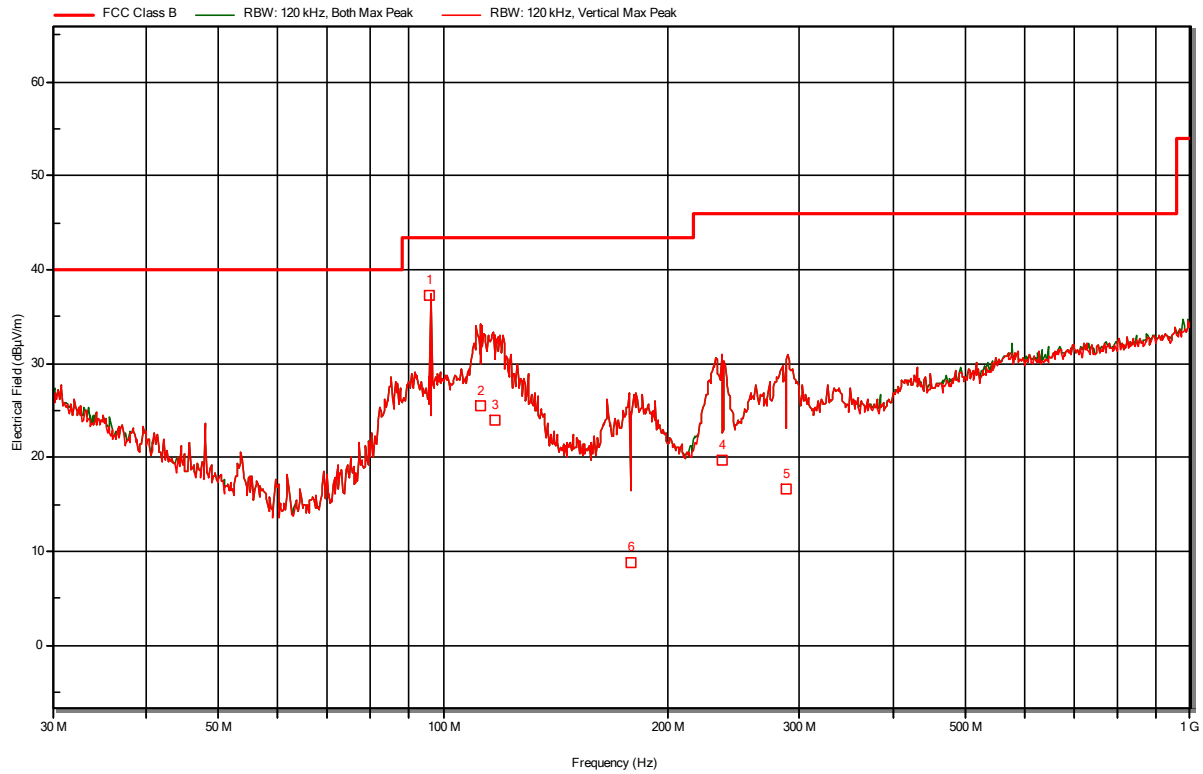


Figure 3: Electric field emissions Plot, 30MHz to 1GHz. 2480MHz operation

Frequency MHz	Measured QP dBμV/m	Limit dBμV/m	Margin dB	Polarity	Height m	Comment
96.006	37.4	43.5	-6.1	Vertical	1.2	Pass
112.200	25.6	43.5	-17.9	Vertical	1	Pass
117.360	24.1	43.5	-19.4	Vertical	1	Pass
178.140	8.8	43.5	-34.7	Vertical	1	Pass
236.820	19.7	46.0	-26.3	Vertical	1	Pass
287.820	16.7	46.0	-29.3	Vertical	1.2	Pass

Table 3: Final quasi-peak measurements. 2480MHz operation

### 6.3.8 Quasi Peak correction factors

The quasi peak correction is shown in the above table. This correction figure consists of Antenna factor (AF); and Cable loss (CL).

Field strength (FS) is calculated as follows:

$$\text{FS (dB}\mu\text{V/m)} = \text{Indicated Signal Level (dB}\mu\text{V)} + \text{AF (dB/m)} + \text{CL (dB)}$$

### 6.3.9 Sample Data

The Quasi-Peak level at 96.006MHz (2402MHz operation)

$$\text{FS (dB}\mu\text{V/m)} = 38.3\text{dB}\mu\text{V/m} = 21.5\text{dB}\mu\text{V} + 15.96\text{dB/m} + 0.96\text{dB}$$

**6.4 Radiated Emissions (1GHz to 18GHz)****6.4.1 Limits**

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

**6.4.2 Receiver Settings**

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

**6.4.3 Emissions measurements****6.4.4 Date of Test**13<sup>th</sup> January 2001**6.4.5 Test Area**

LAB 1 (SAC)

**6.4.6 Tested by**

M Render

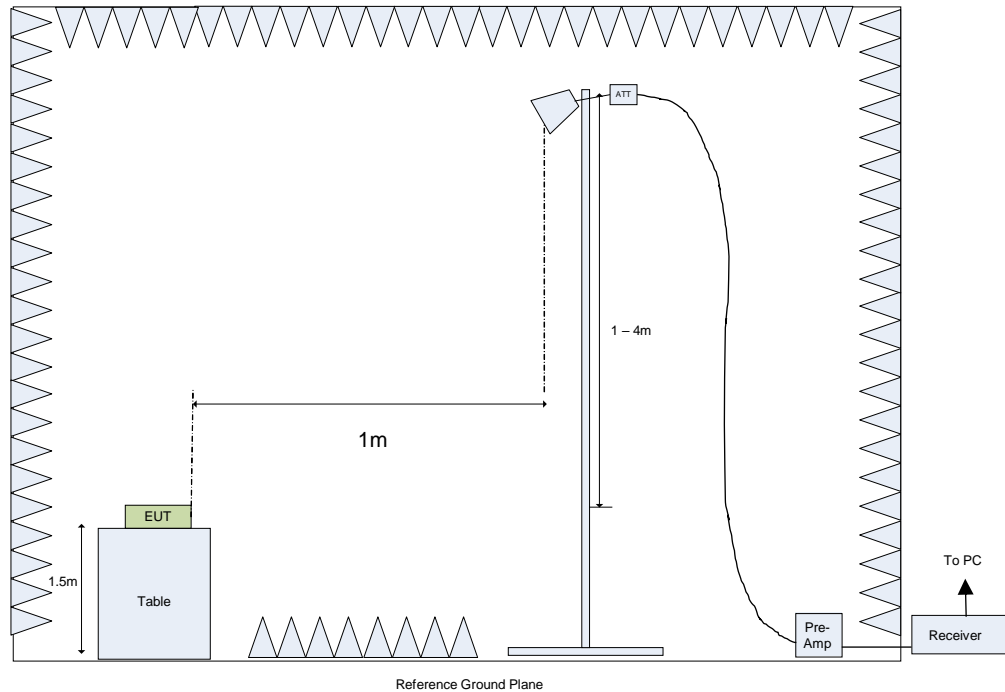
#### 6.4.7 Test Setup

The EUT was configured in the SAC on a 1.5m high table. Exploratory measurements on the EUT were carried out to identify suspect frequencies and worst case orientations, see Section 6.4.8.

The measurement was then performed with an antenna to EUT separation distance of 3m.

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.



**Figure 4: 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 C63.10-2013

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.



#### 6.4.8 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 channel 2402MHz	-	-	-	-
None	Transmitting on channel 2440MHz	-	-	-	-
None	Transmitting on channel 2480MHz	-	-	-	-

**Table 4: Frequencies identified during Exploratory Radiated Emission maximization**

Note 3 : The front face of the EUT is deemed to be 0°, which is then turned in a clockwise direction through 360°.

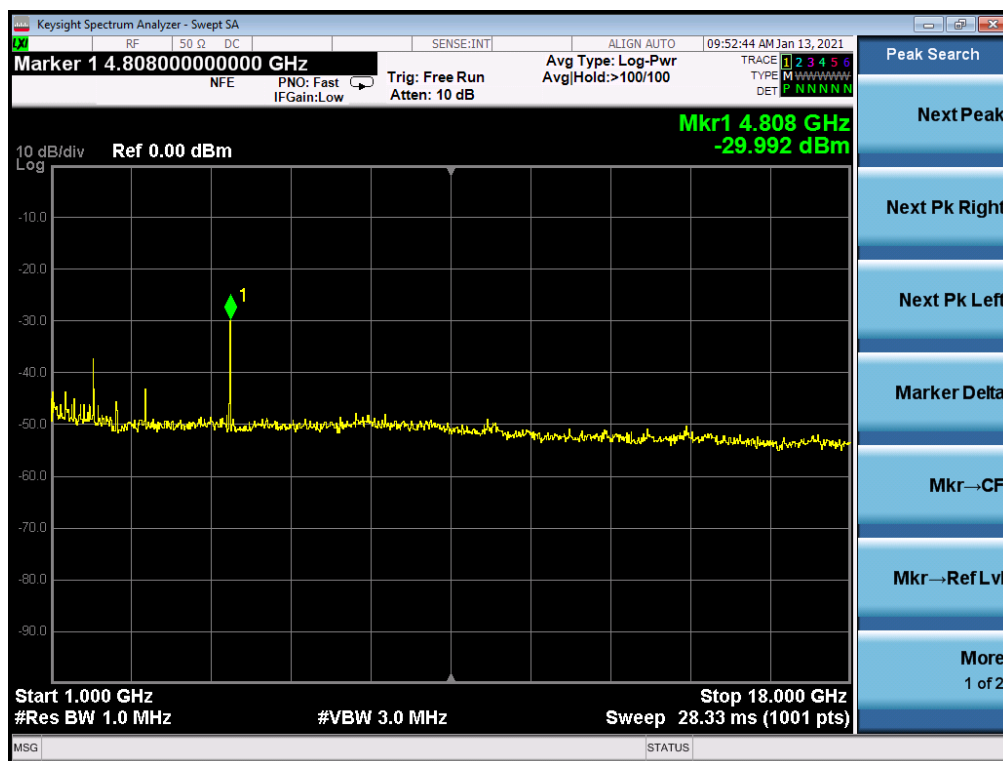


Figure 5: Exploratory measurements. Transmitting on channel 2402MHz

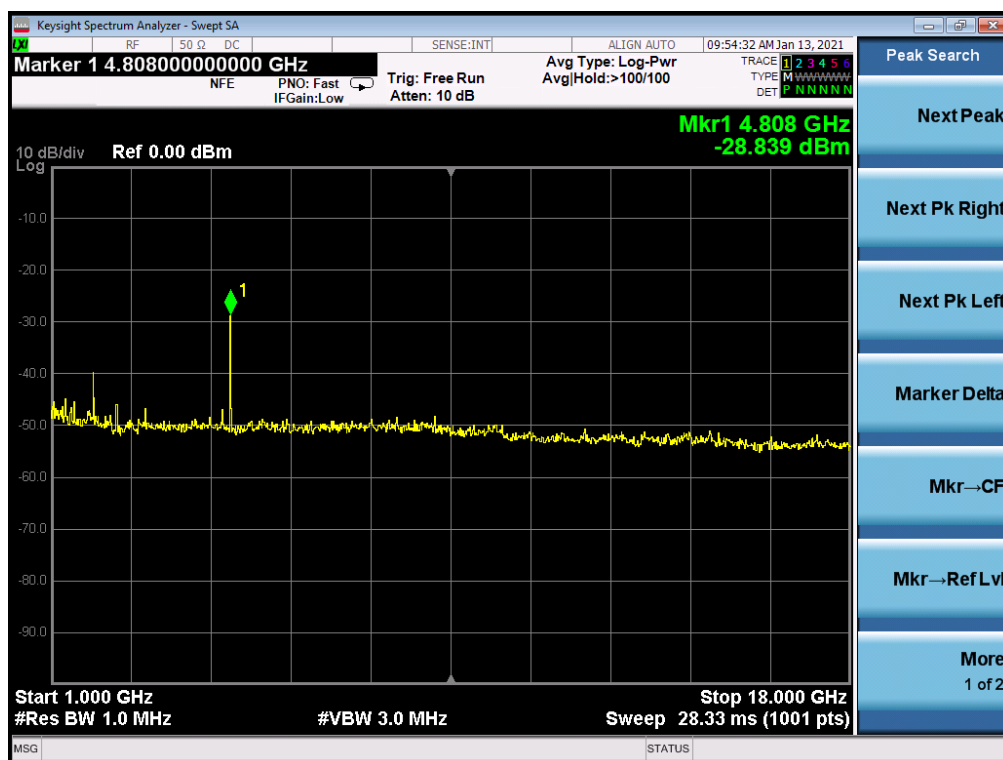


Figure 6: Exploratory measurements. Transmitting on channel 2440MHz

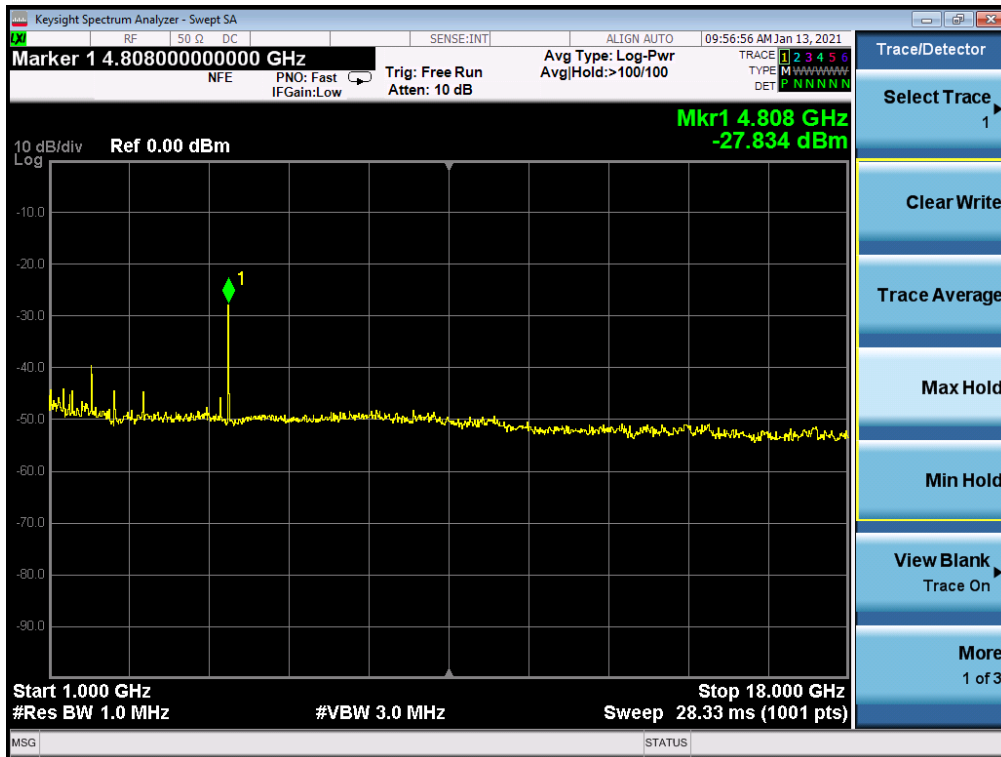


Figure 7: Exploratory measurements. Transmitting on channel 2440MHz

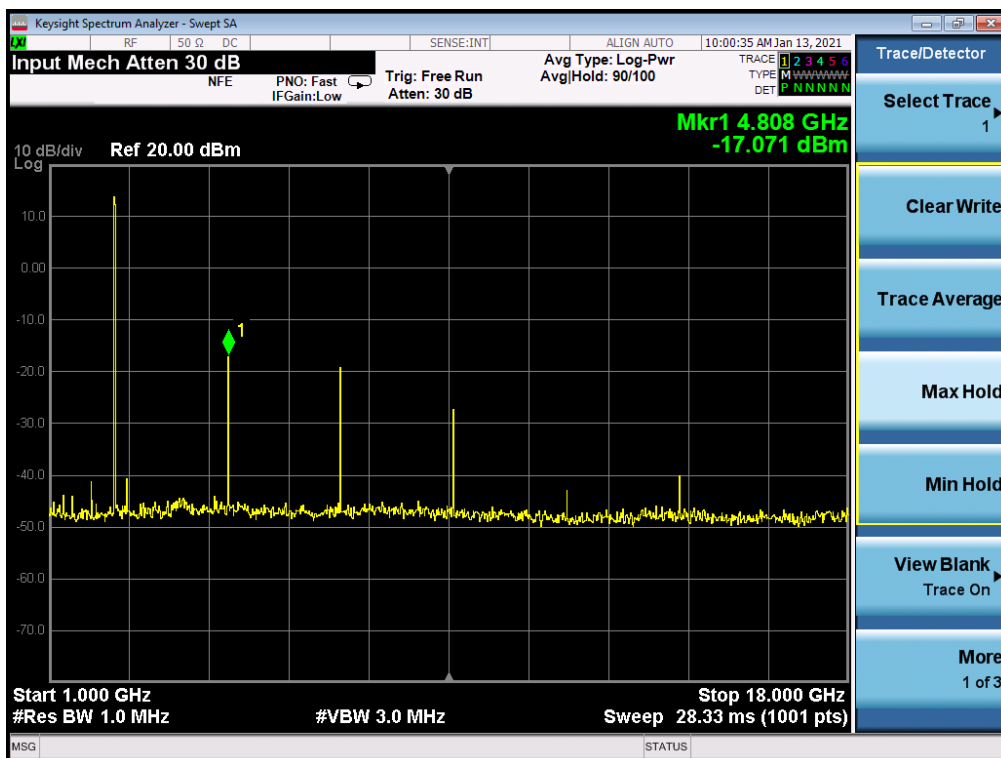


Figure 8: Exploratory measurements – band reject filter not used

#### 6.4.9 Electric field emissions, 1GHz to 18GHz

The equipment under test was pre-scanned using peak detection when operating on all three channels. Final measurements were performed on each channel.

**Note: A band reject filter was used to attenuate the carrier signal during these tests.**

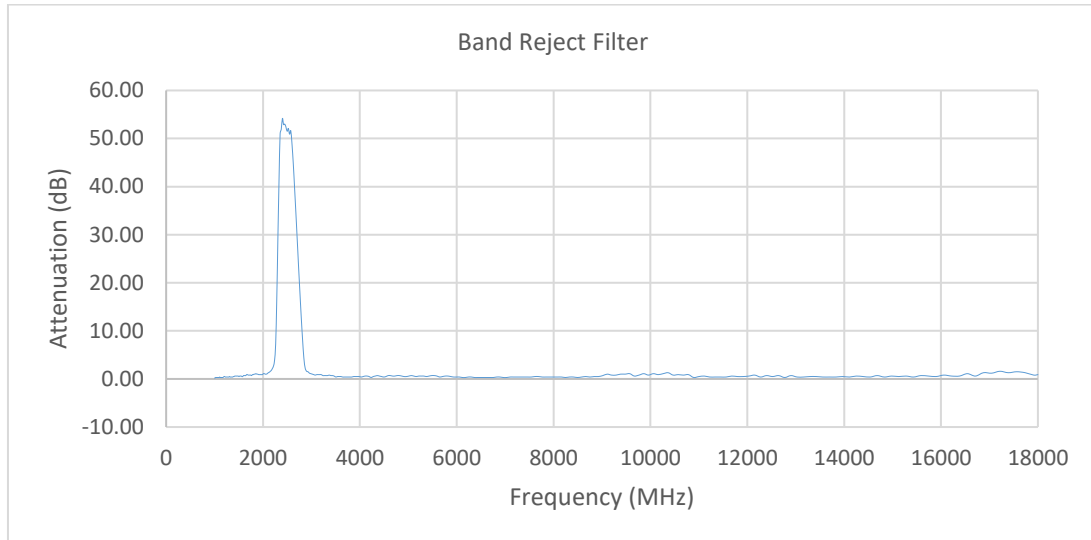


Figure 9: Band reject filter characteristics

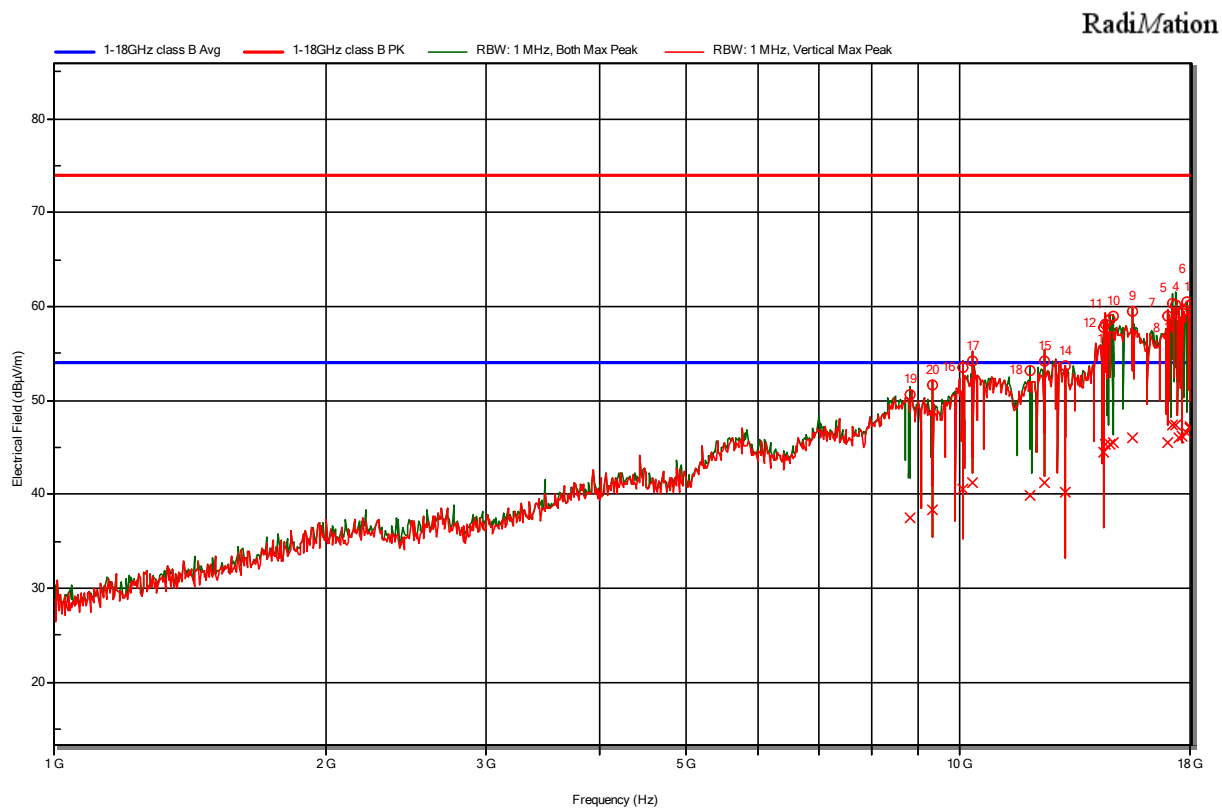
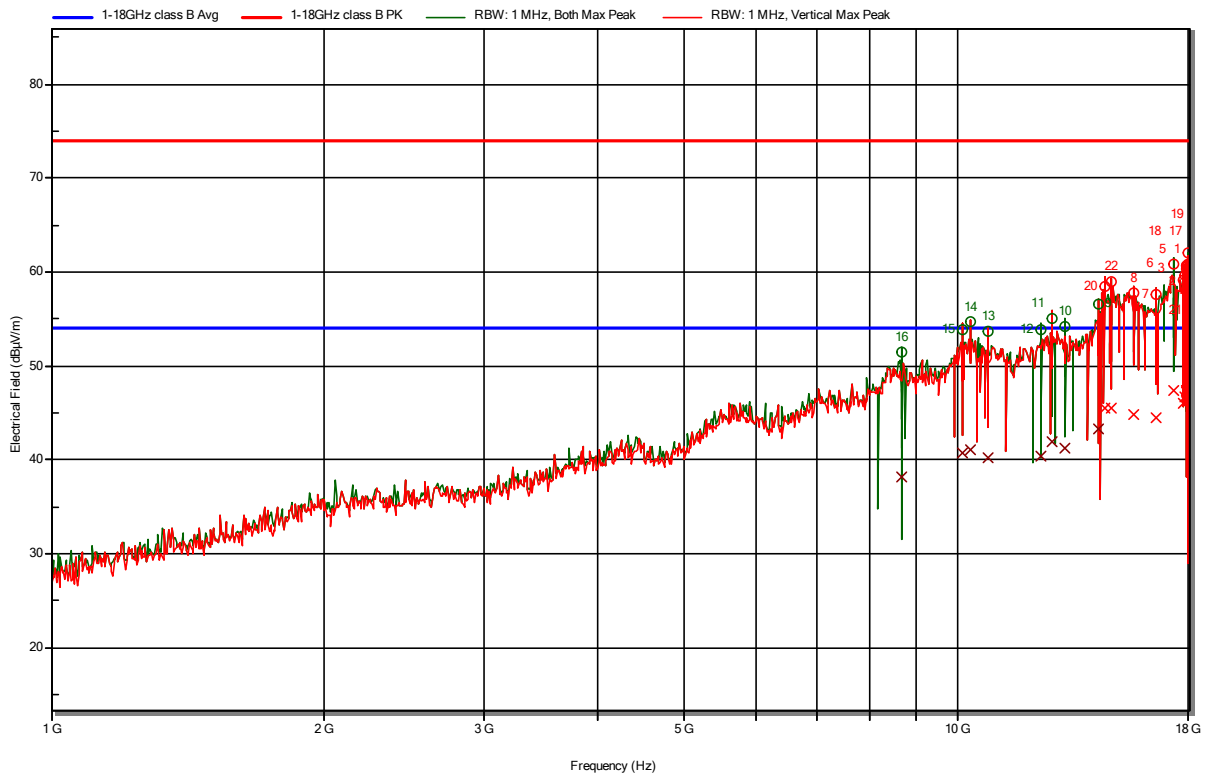


Figure 10: Electric field emissions Plot, 1GHz to 18GHz. 2402MHz operation

Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height	Polarization
GHz	dBμV/m	dBμV/m	dB		degrees	m	
8.815	37.57	54	-16.43	Pass	75	2.2	Horizontal
9.334	38.34	54	-15.66	Pass	65	3.2	Vertical
10.104	40.52	54	-13.48	Pass	220	3.3	Vertical
10.334	41.22	54	-12.78	Pass	155	2.3	Vertical
11.987	39.95	54	-14.05	Pass	120	3.1	Horizontal
12.404	41.27	54	-12.73	Pass	165	1	Vertical
13.088	40.28	54	-13.72	Pass	325	1.6	Vertical
14.413	44.43	54	-9.57	Pass	55	1.8	Vertical
14.503	45.32	54	-8.68	Pass	225	3.4	Vertical
14.665	45.44	54	-8.56	Pass	80	2	Horizontal
14.782	45.51	54	-8.49	Pass	270	2.1	Horizontal
15.542	46.05	54	-7.95	Pass	225	3.2	Vertical
16.935	45.5	54	-8.50	Pass	200	3.9	Vertical
17.203	47.45	54	-6.55	Pass	140	4	Horizontal
17.293	47.4	54	-6.6	Pass	235	1.8	Horizontal
17.453	45.96	54	-8.04	Pass	225	2.3	Vertical
17.635	46.25	54	-7.75	Pass	265	1.6	Vertical
17.789	46.48	54	-7.52	Pass	90	1.5	Horizontal
17.968	47.19	54	-6.81	Pass	300	1.5	Horizontal
17.974	47.02	54	-6.98	Pass	245	1.3	Vertical

Table 5: Final average detector measurements. 2402MHz operation

RadiMation



Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height	Polarization
GHz	dBμV/m	dBμV/m	dB		degrees	m	
8.669	38.14	54	-15.86	Pass	250	2.4	Horizontal
10.126	40.67	54	-13.33	Pass	285	2.6	Vertical
10.333	41.14	54	-12.86	Pass	275	2.6	Vertical
10.809	40.3	54	-13.7	Pass	185	1.9	Vertical
12.366	40.44	54	-13.56	Pass	285	4.0	Horizontal
12.366	40.44	54	-13.56	Pass	285	4.0	Horizontal
12.702	42.01	54	-11.99	Pass	45	3.3	Vertical
12.702	42.01	54	-11.99	Pass	45	3.3	Vertical
14.539	45.55	54	-8.45	Pass	85	2.5	Vertical
14.775	45.44	54	-8.56	Pass	195	1.0	Vertical
15.633	44.92	54	-9.08	Pass	335	3.8	Vertical
16.572	44.52	54	-9.48	Pass	235	1.3	Vertical
17.292	47.34	54	-6.66	Pass	140	4.0	Horizontal
17.738	46.05	54	-7.95	Pass	235	3.5	Vertical
17.802	46.77	54	-7.23	Pass	255	4.0	Vertical
17.864	47.40	54	-6.6	Pass	55	1.3	Vertical
17.865	47.38	54	-6.62	Pass	185	1.5	Vertical
17.908	47.28	54	-6.72	Pass	200	2.0	Horizontal
17.931	47.43	54	-6.57	Pass	200	1.9	Vertical
17.948	48.01	54	-5.99	Pass	175	2.5	Vertical
17.956	47.73	54	-6.27	Pass	155	3.9	Horizontal
17.963	47.87	54	-6.13	Pass	60	3.7	Vertical

Table 6: Final average detector measurements. 2440MHz operation

RadiMation

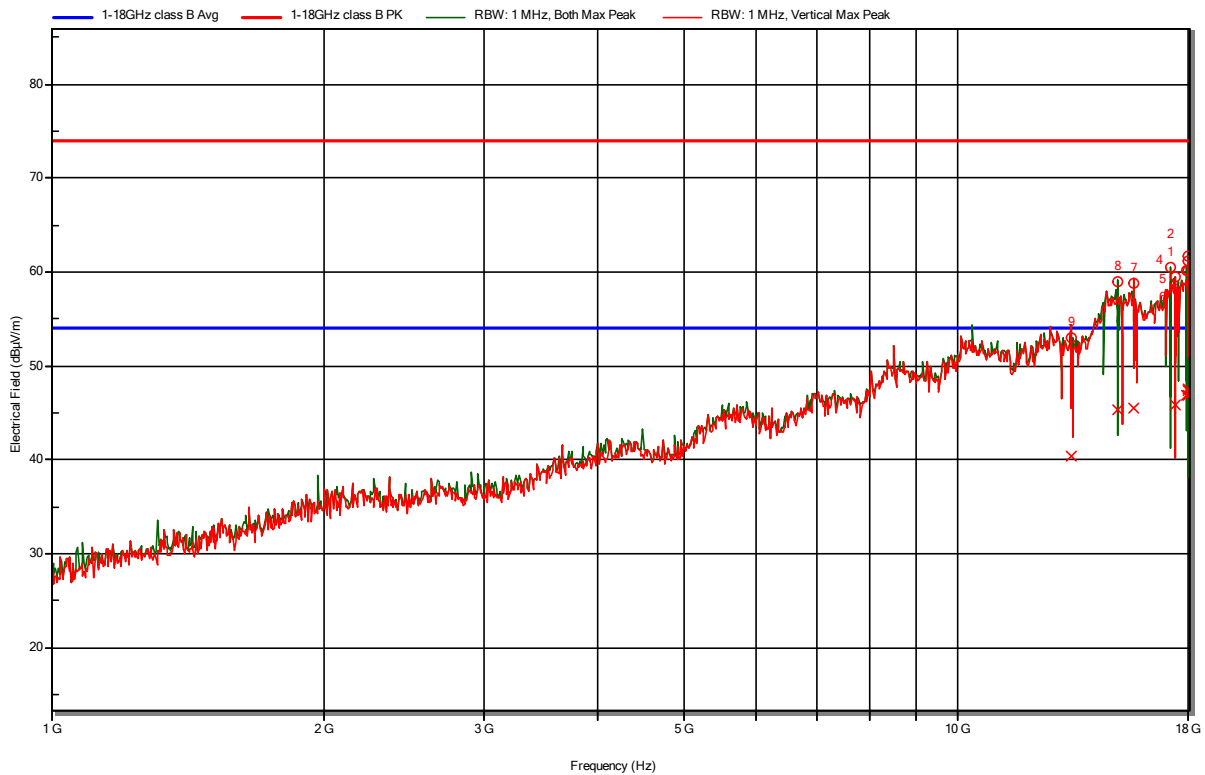


Figure 12: Electric field emissions Plot, 1GHz to 18GHz. 2480MHz operation

Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height	Polarization
GHz	dBμV/m	dBμV/m	dB		degrees	m	
13.374	40.35	54	-13.65	Pass	275	3.9	Vertical
14.998	45.34	54	-8.66	Pass	180	2.7	Horizontal
15.673	45.46	54	-8.54	Pass	200	1.5	Vertical
17.379	45.8	54	-8.20	Pass	155	3.8	Vertical
17.904	46.93	54	-7.07	Pass	175	2.2	Horizontal
17.931	47.38	54	-6.62	Pass	280	1.3	Vertical
17.972	46.89	54	-7.11	Pass	20	1.4	Horizontal
17.986	47.57	54	-6.43	Pass	95	3.2	Horizontal

Table 7: Final average detector measurements. 2480MHz opera



#### 6.4.10 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); and Cable loss (CL).

Field strength (FS) is calculated as follows:

$$\text{FS (dB}\mu\text{V/m)} = \text{Indicated Signal Level (dB}\mu\text{V)} - \text{PG (dB)} + \text{AF (dB/m)} + \text{CL (dB)}$$

#### 6.4.11 Sample Data

From Figure 5 and table 5, The Average level at is calculated as follows:

$$\text{FS (dB}\mu\text{V/m)} = 45.8(\text{dB}\mu\text{V/m)} = 31.2(\text{dB}\mu\text{V)} - 49.76(\text{dB}) + 46.76(\text{dB/m}) + 17.62(\text{dB})$$

**6.5 Radiated Emissions (18GHz to 26GHz)****6.5.1 Limits**

Frequency (GHz)	Limit (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)
	Peak	Average
18-26	74.0	54.0

**6.5.2 Receiver Settings**

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

**6.5.3 Emissions measurements****6.5.4 Date of Test**13<sup>th</sup> January 2021**6.5.5 Test Area**

LAB 1 (SAC)

**6.5.6 Tested by**

M Render

**6.5.7 Test Setup**

This is the same as for the 1-18GHz range for final measurements, except with a measurement distance of 1m.

#### 6.5.8 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
-	Tx on channels 2402MHz, 2440MHz and 2480MHz.	-	-	-	-

**Table 4: Frequencies identified during Exploratory Radiated Emission maximization**

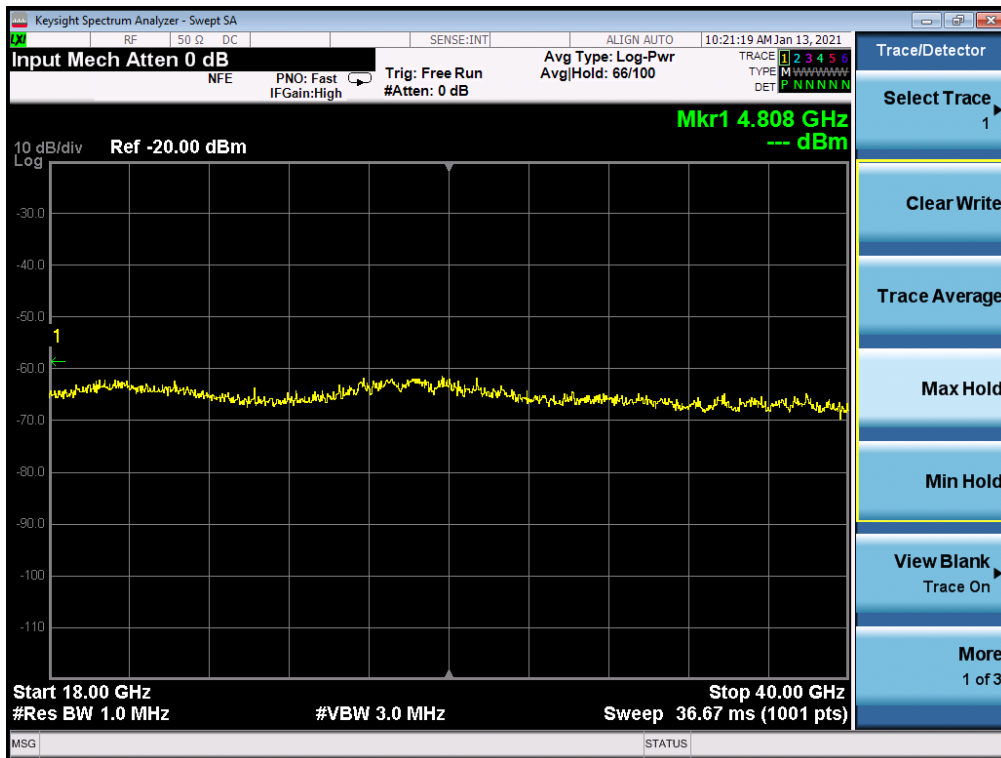


Figure 13: Exploratory measurements. Transmitting on channel 2402MHz

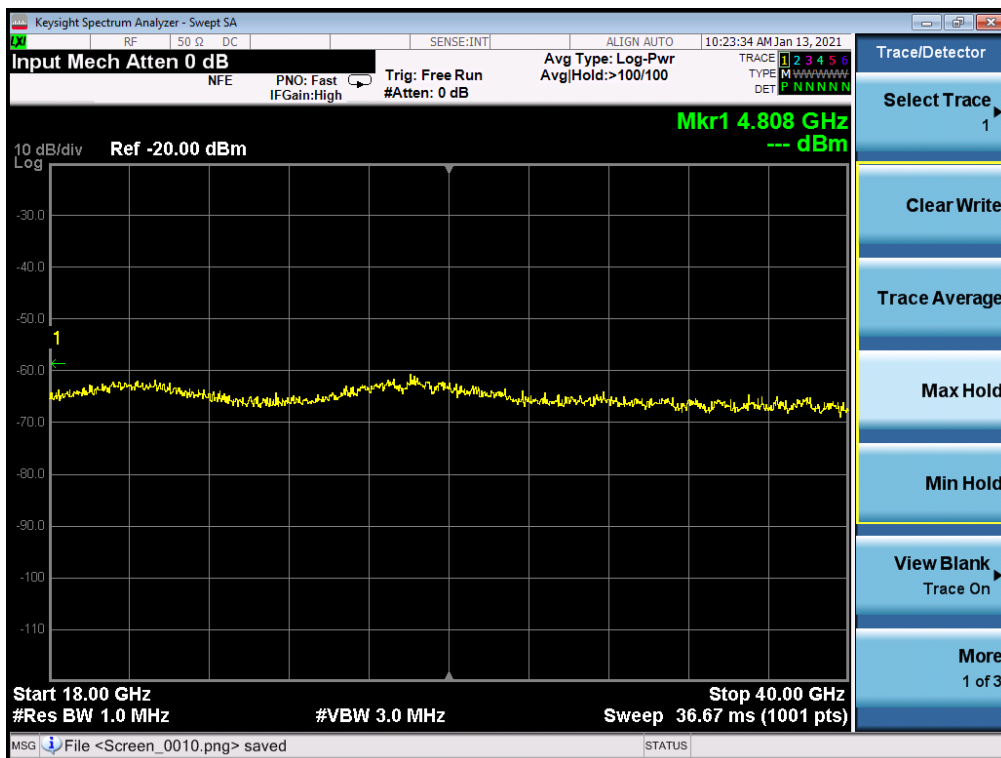


Figure 14: Exploratory measurements. Transmitting on channel 2440MHz

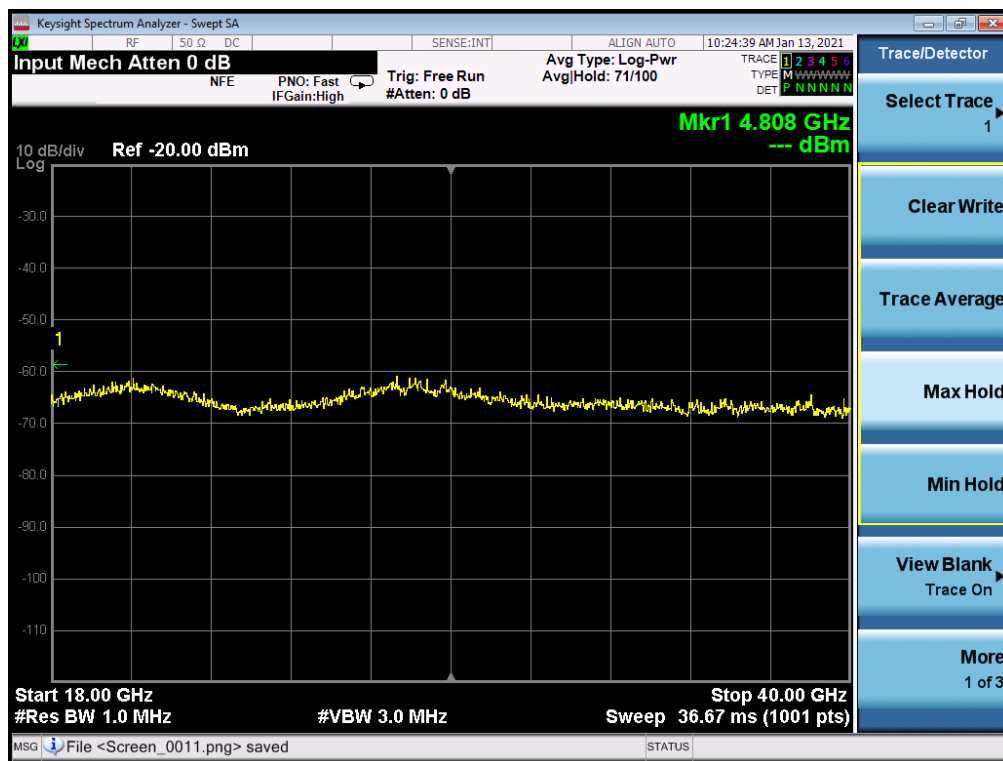


Figure 15: Exploratory measurements. Transmitting on channel 2480MHz

## Section 7 Band Edge

### 7.1 Test Specification

FCC Rule Part	46CFR 15.205 and 47CFR15.209
Standard	ANSI C63.10:2013

### 7.2 Procedure and Test Software Version

#### Conducted Tests

ANSi C63.10-2013 Clause reference:	Clause 6.10.4 Authorised band-edge measurements
Test software	Keysight Connection Expert

Frequency (MHz)	Limit, 47CFR 15.247(e)
	Peak
2400MHz to 2483.5MHz	Measured signal at the band edge must be below the radiated emission limits of 47CFR15.209

Spectrum analyser settings as specified by ANSI C63.10-2013 Clause 6.10.5 "Restricted band-edge measurements"

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

#### 7.2.1 Emissions measurements

#### 7.2.2 Date of Test

22<sup>nd</sup> January 2021

#### 7.2.3 Test Area

LAB 1

#### 7.2.4 Tested by

M Render

#### 7.2.5 Test Setup

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

#### 7.2.6 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. Frequency at the band edge
3. Amplitude of signal at the input of the test receiver
4. Pre-amplifier gain
5. Cable loss
6. Antenna factor
7. 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 (dBμV)	Preamplifier (dB)	Cable loss (dB)	AF(dB/m)	E dBμV/m	Limit (dBμV/m)	Margin (dB)
H	2483.5	57.1	51.0	4.8	28.4	39.3	54.0	-14.7
V	2483.5	55.7	51.0	4.8	28.4	37.9	54.0	-16.1

**Table 9: Operation on 2480MHz Channel. Peak detector measurements compared to average detector limit**

**Lower band edge**

Polarity	frequency (MHz)	Amplitude (dBμV)	Preamplifier (dB)	Cable loss (dB)	AF(dB/m)	E dBμV/m	Limit (dBμV/m)	Margin (dB)
H	2400.0	62.3	51.0	4.6	28.2	44.1	54.0	-9.9
V	2400.0	66.0	51.0	4.6	28.2	47.8	54.0	-6.2

**Table 10: Operation on 2402MHz. Peak detector measurements compared to average detector limit**



## Spectrum Analyser displays

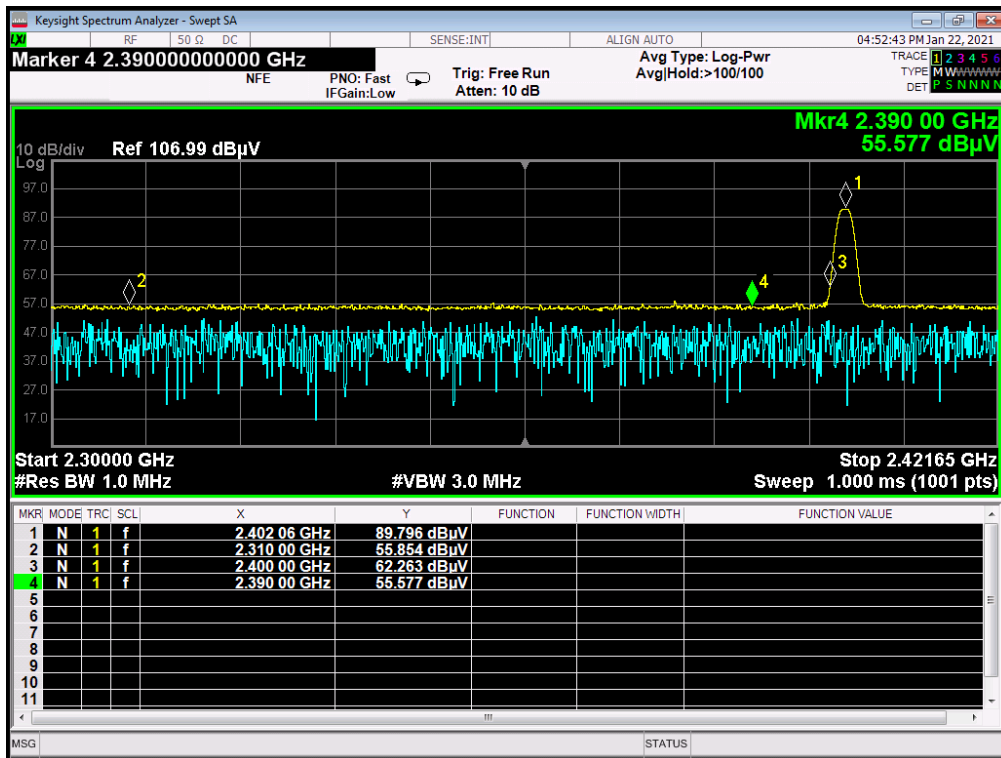


Figure 16: Lower Band Edge - Horizontal

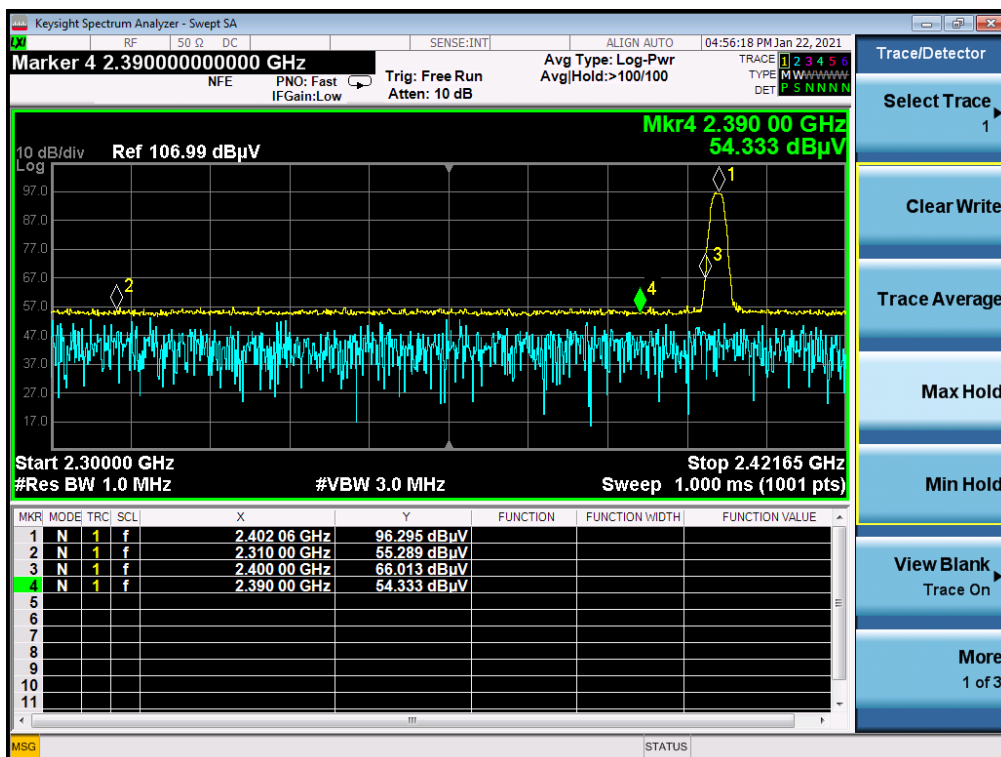


Figure 17: Lower Band Edge - Vertical

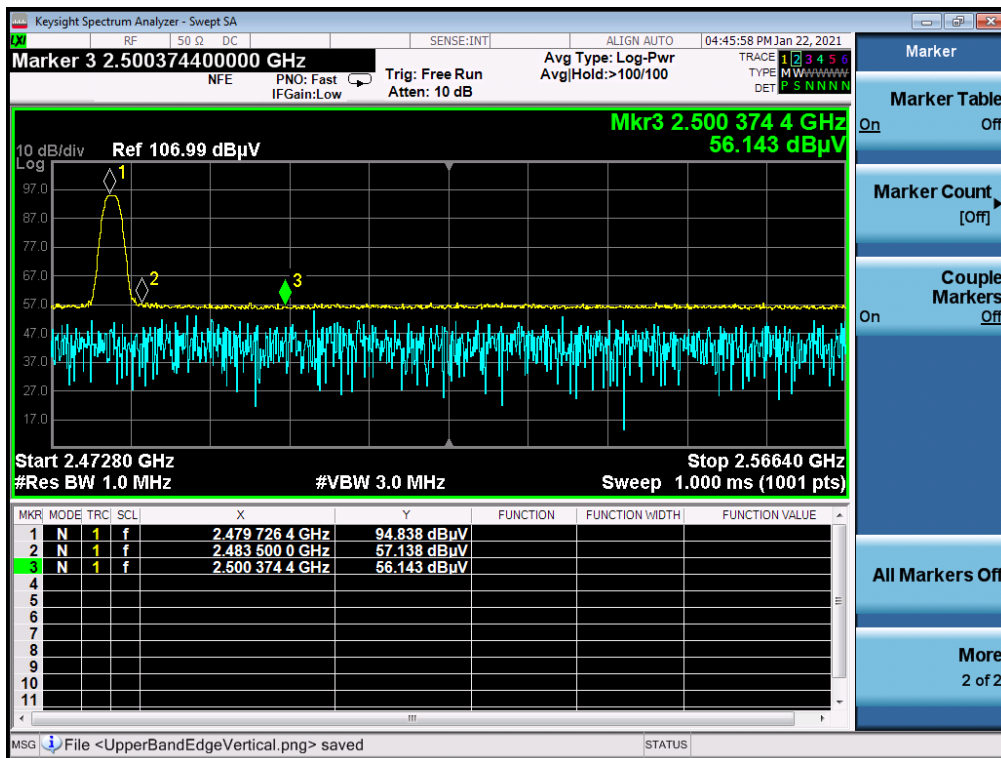


Figure 18: Upper Band Edge - Horizontal

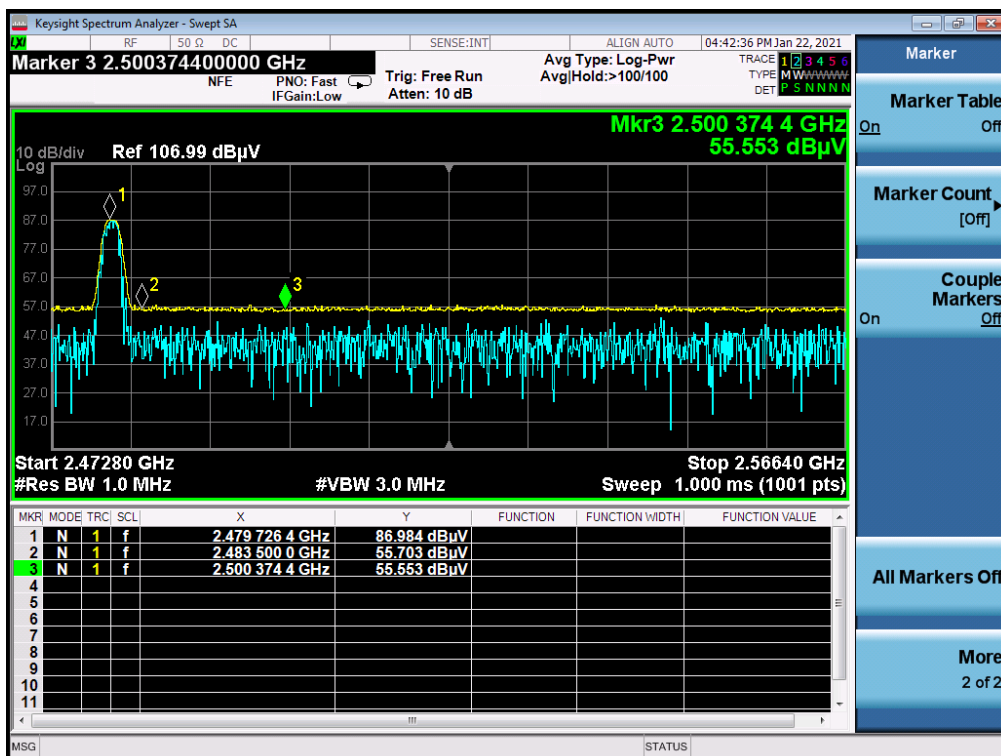


Figure 19: Upper Band Edge - Vertical

## Appendix A EUT Test Photos

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	04/11/2019 (NSA) 28/01/2020 (Svswr)	36 Months
ETS Lindgren 2017B Mast (1 – 4m) with tilting mechanism	--	N/A	N/A
EMCO Loop antenna 6512	00148043	2/06/2020	24 Months
Rohde & Schwarz ESR 26	101464	10/11/2020	12 Months
Rohde & Schwarz ESR 7	101930	26/01/2021	12 Months
Teseq CBL6112D Bilog Antenna	49040	15/08/2018	36 Months
6dB Attenuator (For use with Bilog Antenna)	C0506B	15/08/2018	36 Months
HF 26 Cable	19148_06_13_001	5/01/2021	12 Months
HF 27 Cable	19149.03.13.004	5/01/2021	12 Months
HF17 Cable	167002-001	5/01/2021	12 Months
HF29 Cable		5/01/2121	12 Months
Cable 3		5/01/2021	12 Months
Keysight PXA EMI Receiver	MY54170531	3/04/20	20 Months
3116C-PA ETS Lindgren Horn antenna with preamplifier	00209121	17/10/2019	36 months
Microtronics 2.4GHz band reject filter	BRM 50702	5/1/2021	12 months