Eurofins E&E UK Castleford Laboratory
Unit 5, Speedwell Road
Castleford, WF10 5PY
United Kingdom
+44 (0) 1977 731173
enquiryyork@eurofins.com
eurofins.co.uk/york

Test Report for the FCC and ISED Testing of a Wireless Gateway to FCC Rule 47CFR 15.247 and ISED RSS-247 for Building Automated Products, Inc

Report number: C15292TR4
Project number: C8034

Author: .....
L Trickett
Radio Test Engineer

Checked: .....
J Beevers MPhys(Hons), PhD
Radio Testing Team Lead

Approved: .....
J Beevers MPhys(Hons), PhD
Radio Testing Team Lead

Issue	Description						Issue by	Date
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Test Report Change History

Issue	Date	Modification Details
1	3rd November 2023	First Issue
2	4th December 2023	Company address amended
3	4th December 2023	FCC ID updated
4	22nd February 2024	Statement added regarding EUT orientation
5		
6		
7		
8		
9		
10		

Section 1 Test Location

All testing was performed at;

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

Eurofins E&E UK Castleford Laboratory, is an Accredited facility recognised by the Federal Communications Commission (FCC) for certification testing. The appropriate FCC Designation Number is UK2013, dated 1st March 2021.

Eurofins E&E UK Castleford Laboratory is recognised by ISED for certification testing.
ISED Assigned Code: 22959

Section 2 Customer Information

Company name	Building Automated Products, Inc
Address	750 North Royal Avenue
	Gays Mills
	Wisconsin
	54631
	US
Contact	Mr Gavin Moizer-Peace
Email	Gavin@bapihvac.co.uk

Section 3 Equipment Details

3.1 Equipment Under Test (EUT)

Date received:	9th October 2023		
EUT name:	Wireless Gateway		
PMN:	Wireless Gateway		
HVIN:	REV B		
FVIN:	V02.23.00		
FCC ID:	T4FSM211221		
ISED number:	9067A-SM211221		
Serial no:	8c4995840d04		
EUT description:	The Wireless Gateway receives data from one or more sensors via Bluetooth Low Energy (BLE) and provides data to the cloud using the 2.4GHz Wi-Fi connection. The Wireless Gateway contains a pre-approved Wi-Fi module, FCC ID QOQWFM200		
Antenna	External Whip antenna ANT-2.4-LCW-RPS (2.8dBi gain)		
Transmission	Bluetooth Low Energy (BLE)		
Modulation schemes	PRBS9 (GFSK)		
Operating frequency band	2400MHz to 2483.5MHz		
Channel width	1MHz		
No of units tested:	One		
EUT power:	5VDC via USB port		
	48VDC via PoE port		
Highest internal frequency:	2.480GHz		
Size of EUT (mm)	Width: 123.1mm	Depth: 67.9 mm	Height: 50.4 mm
Mode/s of operation:	Continuous transmit of packetised data at top, middle and bottom channels. Channels used: Ch0 2402MHz Ch17 2436MHz Ch39 2480MHz		
Test software:	Test Firmware installed to allow selection of BLE channels via button on EUT for the radiated measurements. Conducted measurements were performed with the use of Silabs NCP Commander test hardware & software prior to the start of the tests. The test modes for all transmissions were limited in output power to a setting of 9 in the software, as instructed by the customer.		
Modifications incorporated during testing:	None		

Ports and Cables	Cable Length	Screened/ unscreened	Connected to
USB cable	1m	unscreened	5V USB adaptor
CAT5 cable	1m	unscreened	48V PoE adaptor

EUT Monitoring/Auxiliary Equipment

Equipment name	Type no.	Serial no
HP Laptop	14-ce1507sa	5CD9115SNKV
Silicon Labs NCP commander interface	-	202601865
Sony 5VDC adaptor	AC-UUD12	22021HR3012628
Ubiquiti PoE adaptor	U-POE-at	1902-0709169

EUT Photographs

Photographs are supplied separately.

3.2 Configuration of EUT

The apparatus was supplied in one single possible configuration.

3.3 EUT Monitoring/Auxiliary Equipment

None.

3.4 Monitoring Software

None. The channel required was selected via a button press prior to the testing.

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 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
6 dB Bandwidth	FCC § 15.247(a)(2)	Applies	Pass
Maximum peak conducted power	FCC § 15.247(b)(3)	Applies	Pass
Power spectral density	FCC § 15.247(e)	Applies	Pass
AC power line conducted emissions	FCC § 15.207	Applies	Pass
Band edge compliance	FCC § 15.247(d)	Applies	Pass
Conducted spurious emissions	FCC § 15.247(d)	Applies	Pass
Transmitter radiated spurious emissions – restricted bands	FCC § 15.247(d) FCC § 15.209	Applies	Pass

For Canada:

Regulation / Test Standard	RSS-247 Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices Issue 3 August 2023 And, RSS-Gen — General Requirements for Compliance of Radio Apparatus Issue 5 April 2018 +A1 March 2019 +A2 February 2021

Requirement	ISED Ragulation	Comments	Results Summary
99% Occupied Bandwidth	ISED RSS-Gen 6.6	Applies	Pass
6 dB Bandwidth	ISED RSS-247 § 5.2	Applies	Pass
Maximum peak conducted power	ISED RSS-247 § 5.4	Applies	Pass
Power spectral density	ISED RSS-247 § 5.2	Applies	Pass
AC power line conducted emissions	ISED RSS-247 § 3.1	Applies	Pass
Band edge compliance	ISED RSS-247 § 3.3 and 5.5 RSS-GEN Issue 5 Section 8.10	Applies	Pass
Conducted spurious emissions	ISED RSS-247 § 5.5	Applies	Pass
Transmitter radiated spurious emissions	ISED RSS-GEN § 8.9	Applies	Pass

4.1 Knowledge Database References

The following KDBs were referenced during the testing.
The latest knowledge database references are available via the FCC KDB website at:

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

3.1.1 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

3.1.2 Radiated Emissions (1GHz to 40GHz)

Publication Number	Keyword	Publication Date
414788	Test Site Validation Requirements above 1 GHz.	07/12/2018
414788	Comparison Noise Emitter (CNE), reference noise source, .pdf	07/12/2018
913591	Measurement of radiated emissions at the band-edge for a Part 15 RF Device	04/05/2017
414788	Comparison Noise Emitters (CNE), test equipment, Broadband.pdf	07/12/2018

4.2 Compliance Statement

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

Section 5 Spurious Emission Results – Radiated and Conducted

5.1 Test Specification

FCC Rule Part	47CFR 15.247 (d)
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 +/- 5.01dB for the frequency range from 9kHz to 30MHz +/- 6.26dB for the frequency range 30MHz to 1GHz +/- 5.14dB for the frequency range from 1GHz to 6GHz +/- 5.45dB for the frequency range from 6GHz to 18GHz
Measurement Uncertainty Conducted tests	±1.4dB

Note: during exploratory measurements the worst case EUT orientation was investigated and determined to be with the EUT positioned horizontally in the desktop position.

5.2 Procedure and Test Software Version

Radiated tests:- 47CFR15.205 and 47CFR15.209

Eurofins E&E UK test procedure (30MHz to 1GHz)	CEP23 Issue 9
Eurofins E&E UK test procedure (1GHz to 40GHz)	CEP64 Issue 10
Test software	RadiMation Version 2016.2.8

Conducted Tests 47CFR 15.247(d)

ANSi C63.10-2013 Clause reference:	11.11.2 and 11.11.3
Test software	N/A

5.3 Radiated Emissions (30MHz to 1GHz)

Radiated electric field emission measurements are applied as defined in 47CFR15.205 and 47CFR15.209.

5.3.1 Limits at 3m

Frequency (MHz)	Electric Field Strength Limit (dBµV/m) at 3m measurement distance
	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 and 15.205 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 Emissions measurements

5.3.3 Date of Test

17th October 2023

5.3.4 Test Area

LAB 1 (SAC)

5.3.5 Tested by

L Trickett

5.3.6 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.

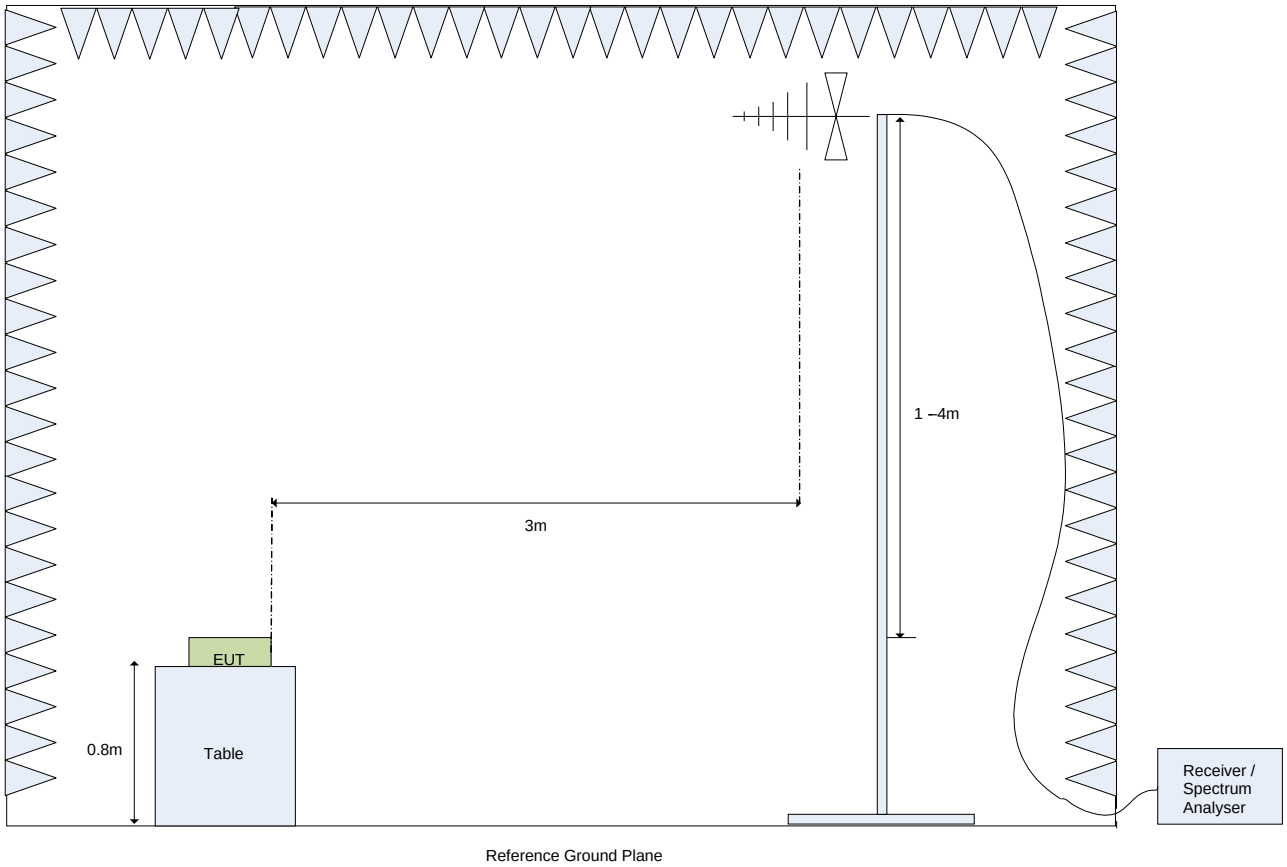


Figure 1 Test Setup for E-Field Measurements from 30MHz to 1GHz

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.

Operating Mode During testing

During spurious emission testing the equipment under test was set to transmit at the same frequency on the following channels: 2402MHz, 2436MHz and 2480MHz for both USB and PoE power.

Note: USB and PoE power was provided using representative plug top / inline power supplies

The equipment under test was pre-scanned using peak detection when operating on all three channels for USB and POE power. Final measurements were performed at 2436MHz USB powered & 2402MHz PoE powered.

5.3.7 Electric field emissions, 30MHz to 1GHz

5.3.7.1 USB powered operation

The equipment under test was pre-scanned using peak detection when operating on all three channels. Final measurements were performed with the equipment under test operating on 2436MHz

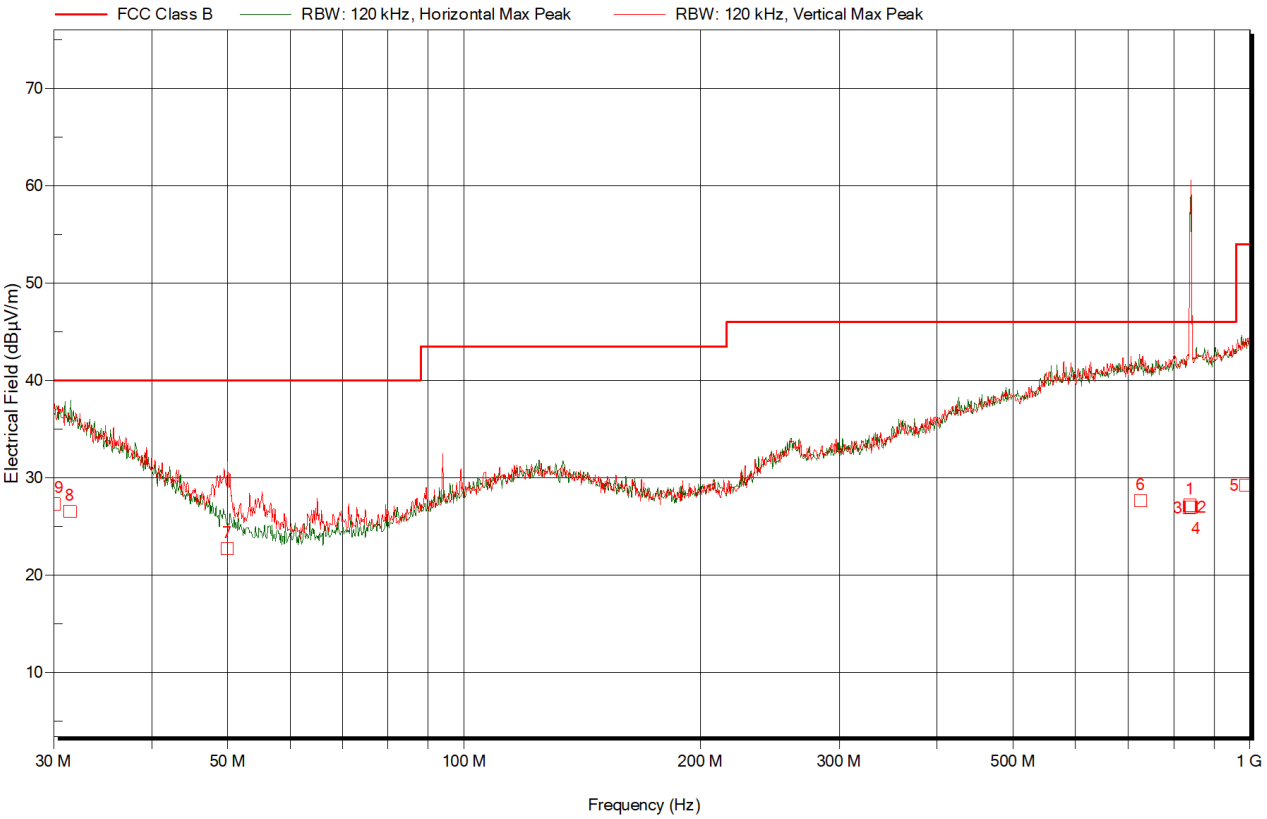


Figure 2 Electric field emissions Plot, 30MHz to 1GHz, 2436MHz Operation

Frequency	Quasi-Peak	Quasi Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height	Polarization
MHz	dBµV/m	dBµV/m	dB		degrees	m	
838.44	27.2	46	-18.8	Pass	205	1.5	Vertical
840.66	27.0	46	-19.0	Pass	345	2.3	Vertical
837.30	27.0	46	-19.0	Pass	295	3.8	Horizontal
841.69	27.0	46	-19.0	Pass	205	2.4	Horizontal
987.18	29.2	54	-24.8	Pass	280	1.3	Vertical
725.46	27.6	46	-18.4	Pass	360	1.9	Vertical
49.92	22.7	40	-17.3	Pass	45	1.0	Vertical
31.50	26.5	40	-13.5	Pass	265	1.0	Horizontal
30.06	27.3	40	-12.7	Pass	69	2.8	Vertical

Table 1 Electric Field Emissions Peaks, 30MHz to 1GHz. 2436MHz Operation

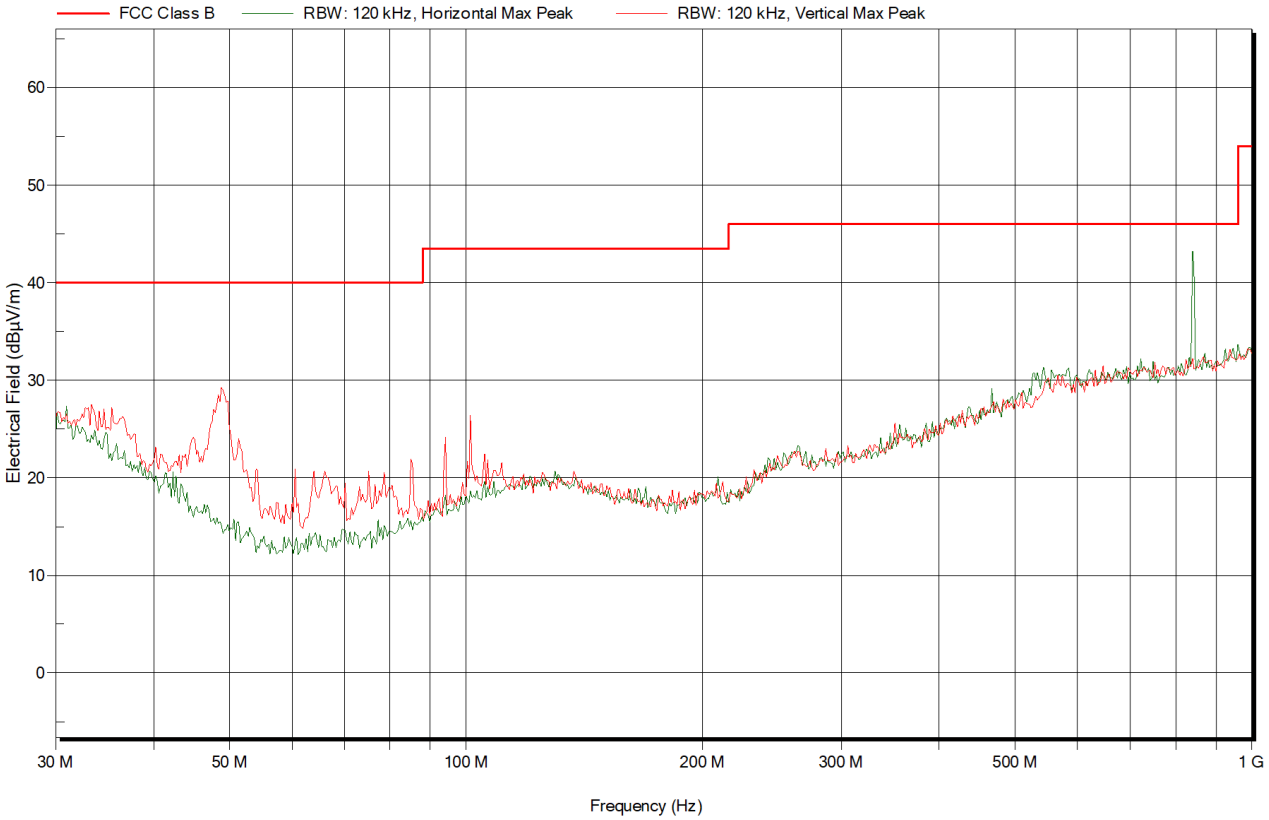


Figure 3 Electric field emissions Plot, 30MHz to 1GHz, Operation on 2402MHz - Peak detector pre-scan

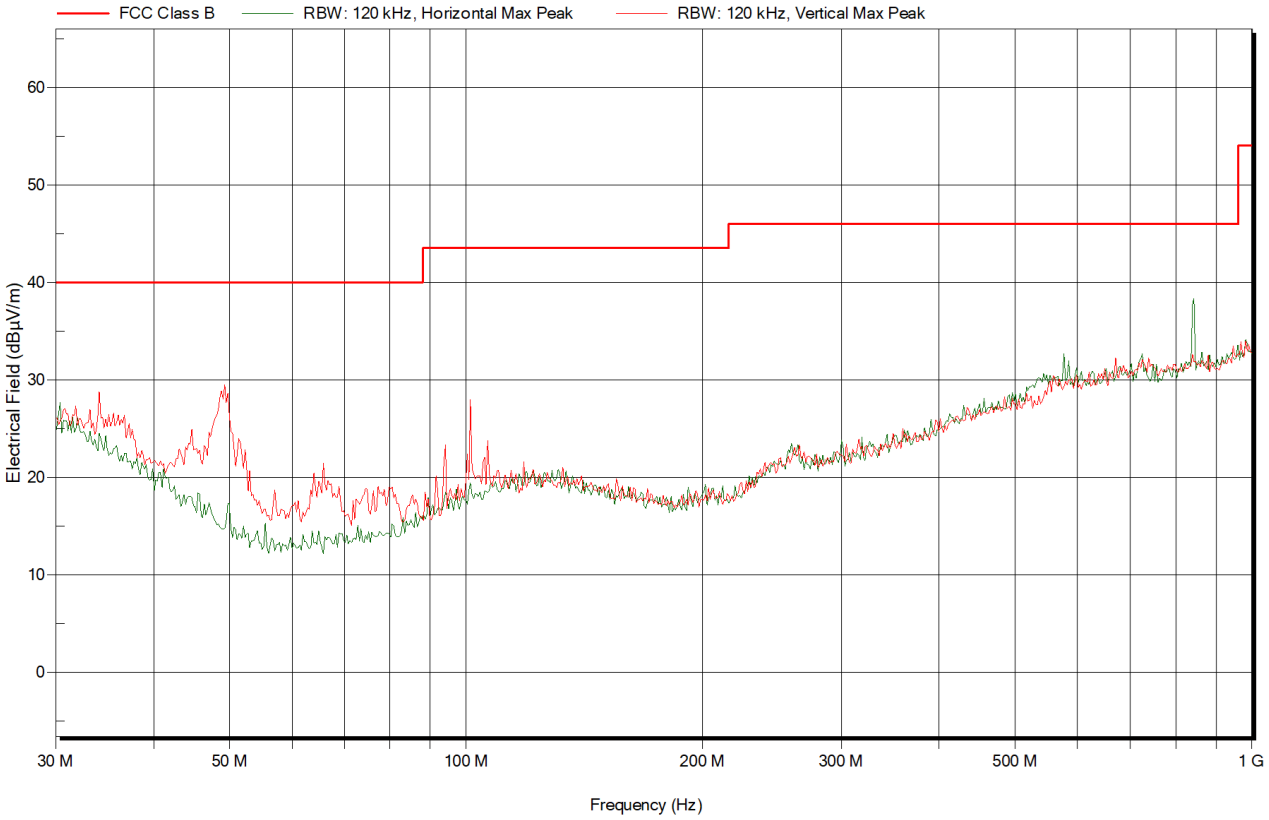


Figure 4 Electric field emissions Plot, 30MHz to 1GHz, Operation on 2480MHz - Peak detector pre-scan

5.3.7.2 PoE powered operation

The equipment under test was pre-scanned using peak detection when operating on all three channels. Final measurements were performed with the equipment under test operating on 2402MHz

Figure 5 Electric field emissions Plot, 30MHz to 1GHz, 2402MHz Operation

Frequency	Quasi-Peak	Quasi Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height	Polarization
MHz	dBµV/m	dBµV/m	dB		degrees	m	
44.40	37.3	40	-2.7	Pass	245	1.0	Vertical
45.36	36.9	40	-3.1	Pass	245	1.0	Vertical
46.62	32.2	40	-7.8	Pass	250	1.0	Vertical
30.72	27.4	40	-12.6	Pass	124	1.0	Vertical
31.51	28.0	40	-12.0	Pass	240	1.0	Vertical
82.02	26.7	40	-13.3	Pass	104	1.3	Vertical
551.16	25.2	46	-20.8	Pass	345	1.6	Horizontal
650.58	26.9	46	-19.1	Pass	340	1.2	Horizontal
716.88	26.9	46	-19.1	Pass	245	1.1	Horizontal
788.16	26.7	46	-19.3	Pass	310	1.0	Horizontal
862.14	27.0	46	-19.0	Pass	89	1.3	Vertical
990.12	29.2	54	-24.8	Pass	240	1.5	Vertical

Table 2 Electric Field Emissions Peaks, 30MHz to 1GHz. 2402MHz Operation

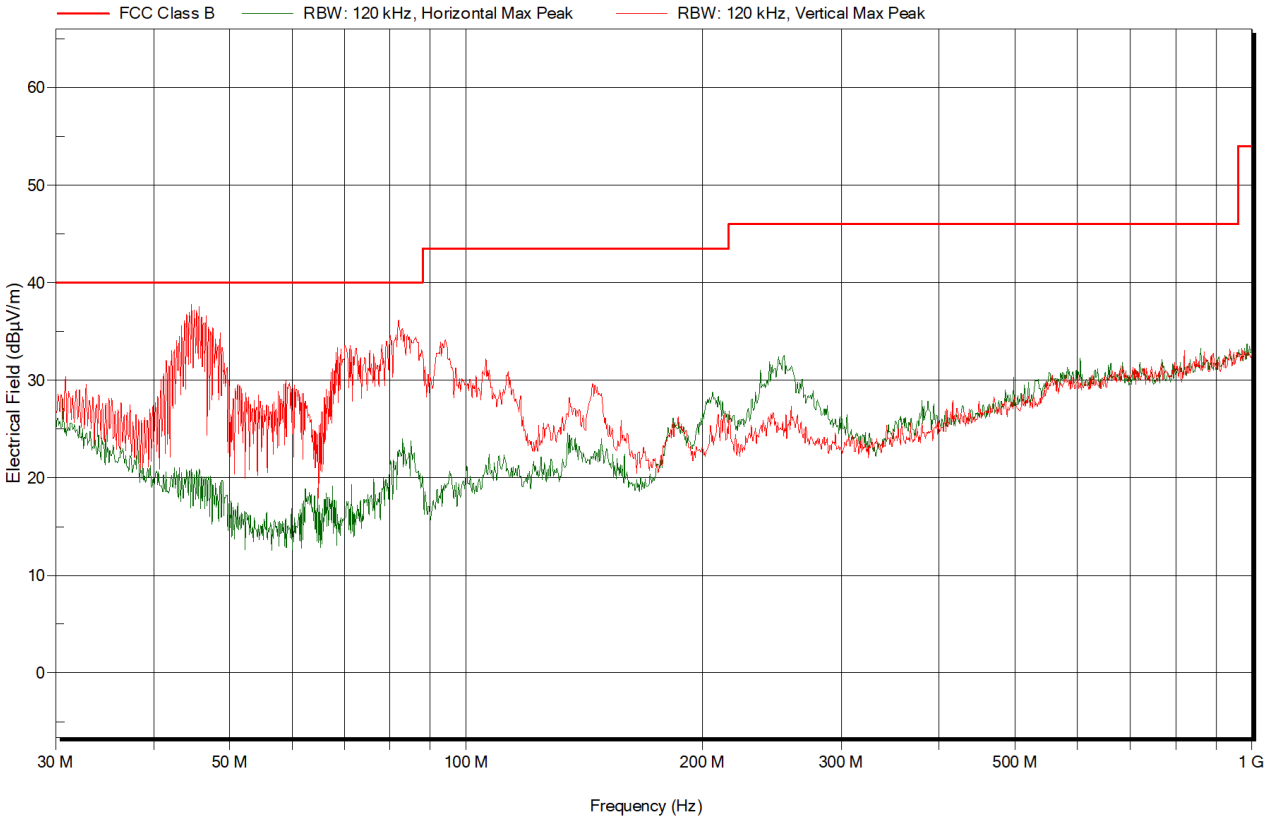


Figure 6 Electric field emissions Plot, 30MHz to 1GHz, Operation on 2436MHz - Peak detector pre-scan

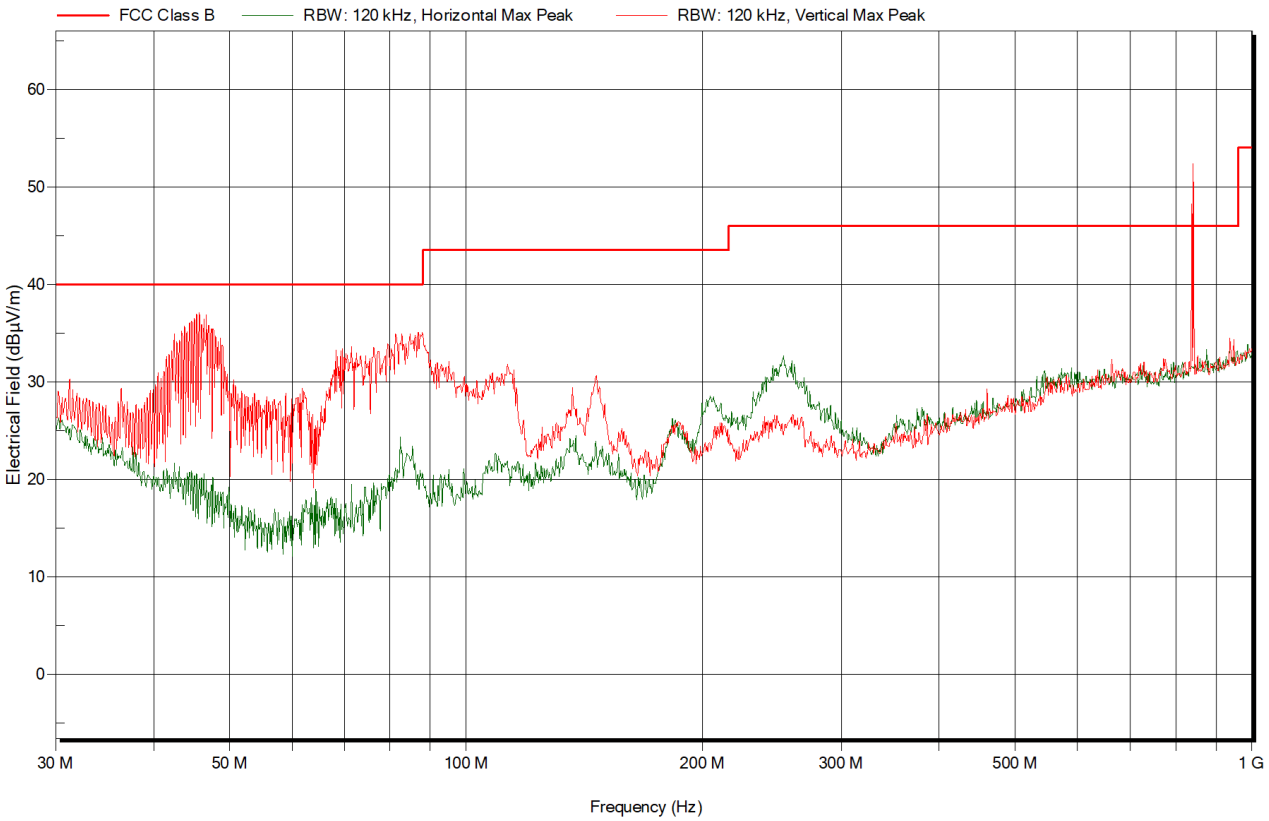


Figure 7 Electric field emissions Plot, 30MHz to 1GHz, Operation on 2480MHz - Peak detector pre-scan

5.4 Radiated Emissions (1GHz to 18GHz)

5.4.1 Limits

Frequency (GHz)	Limit (dBµV/m)	Limit (dBµV/m)
	Peak	Average
1-10	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 Emissions measurements

5.4.4 Date of Test

17th October 2023

5.4.5 Test Area

LAB 1 (SAC)

5.4.6 Tested by

L Trickett

5.4.7 Test Setup

The EUT was configured in the SAC on an 1.5m high table Exploratory measurements on the EUT were carried out to identify suspect frequencies and worst case orientations, see Section 5.4.8.

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.

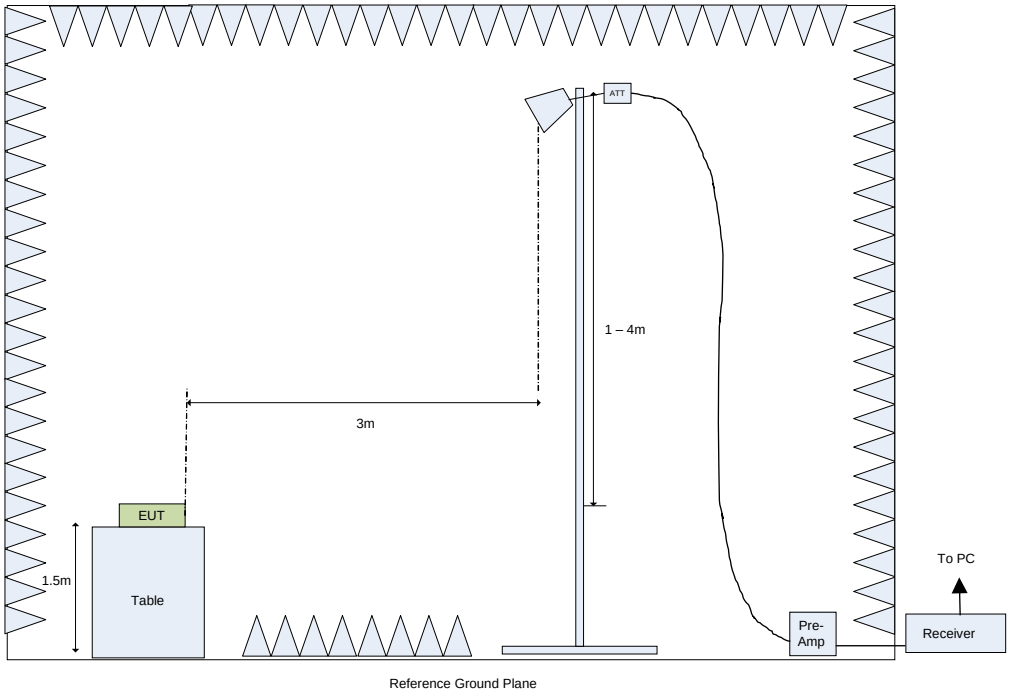


Figure 5.4.7.1: Test Setup for Final E-Field Measurements from 1GHz to 18GHz

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: On all swept and final measurements made between 1GHz and 10GHz a 2.4GHz Microtronics BRM50702 notch filter was placed in the measurement chain between the antenna and pre-amplifier to prevent the artificial generation of harmonics within the pre-amplifier.

5.4.8 Exploratory Radiated Emission Maximization

5.4.8.1 USB powered operation

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
1.012	Transmitting on channel 2402MHz & 2436MHz	USB face	270	1.5	V
1.037	Transmitting on channel 2480MHz	USB face	270	1.5	V
2.169	Transmitting on channel 2436MHz & 2480MHz	USB face	270	1.5	V
2.242	Transmitting on channel 2402MHz	USB face	270	1.5	V
2.907	Transmitting on channel 2402MHz	USB face	270	1.5	V
3.030	Transmitting on channel 2436MHz	USB face	270	1.5	V
3.079	Transmitting on channel 2480MHz	USB face	270	1.5	V
4.801	Transmitting on channel 2402MHz	USB face	270	1.5	V
4.875	Transmitting on channel 2436MHz	USB face	270	1.5	V
4.949	Transmitting on channel 2480MHz	USB face	270	1.5	V
7.212	Transmitting on channel 2402MHz	USB face	270	1.5	V
7.310	Transmitting on channel 2436MHz	USB face	270	1.5	V
7.433	Transmitting on channel 2436MHz	USB face	270	1.5	V

Table 3 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°.

Note 2 : 10GHz-18GHz no emissions found in USB powered mode.

5.4.8.2 PoE powered operation

Frequency (GHz)	Mode of operation	EUT face *	Emissions Angle (w.r.t. turntable)	Height	Polarization
1.012	Transmitting on channel 2436MHz	PoE face	270	1.5	V
1.062	Transmitting on channel 2402MHz & 2480MHz	PoE face	270	1.5	V
1.873	Transmitting on channel 2436MHz	PoE face	270	1.5	V
2.169	Transmitting on channel 2480MHz	PoE face	270	1.5	V
2.242	Transmitting on channel 2402MHz	PoE face	270	1.5	V
2.931	Transmitting on channel 2436MHz	PoE face	270	1.5	V
2.907	Transmitting on channel 2480MHz	PoE face	270	1.5	V
2.980	Transmitting on channel 2436MHz	PoE face	270	1.5	V
4.801	Transmitting on channel 2402MHz	PoE face	270	1.5	V
4.949	Transmitting on channel 2480MHz	PoE face	270	1.5	V
7.212	Transmitting on channel 2402MHz	PoE face	270	1.5	V
7.310	Transmitting on channel 2436MHz	PoE face	270	1.5	V
7.433	Transmitting on channel 2480MHz	PoE face	270	1.5	V

Table 4 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°.

Note 2 : 10GHz-18GHz no emissions found in PoE powered mode.

5.4.9 Electric field emissions, 1GHz to 10GHz

5.4.9.1 USB powered operation

The equipment under test was pre-scanned using peak detection when operating on all three channels. Final measurements were performed with the equipment under test operating on 2436MHz

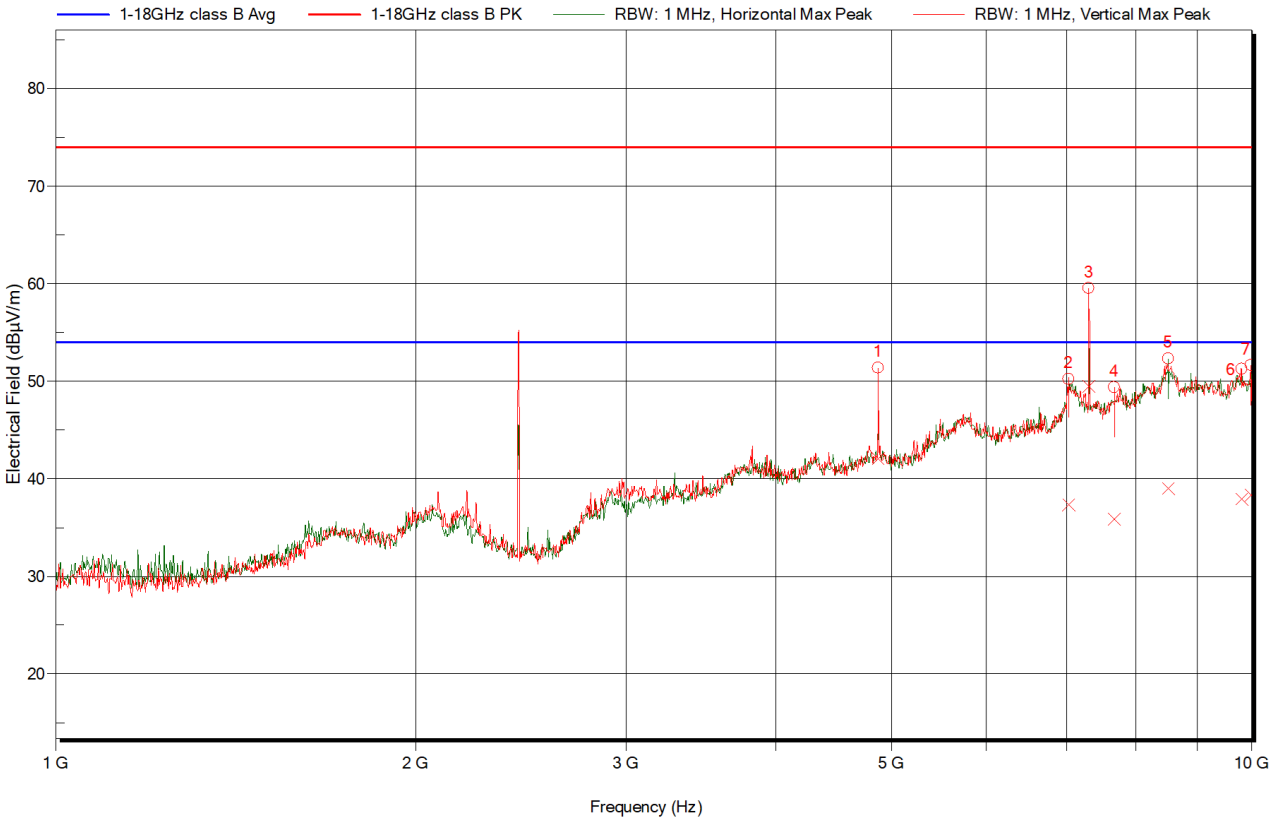


Figure 8 Electric field emissions Plot, 1GHz to 10GHz. Operation on 2436MHz

Note: The emission visible at 2436MHz is the intentional transmit frequency of the EUT

Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height	Polarization
GHz	dBµV/m	dBµV/m	dB		degrees	m	
4.872	42.09	54	-11.91	Pass	130	1.6	Vertical
7.030	37.33	54	-16.67	Pass	55	1.4	Vertical
7.307	49.46	54	-4.54	Pass	125	1.6	Vertical
7.675	35.86	54	-18.14	Pass	210	2.1	Vertical
8.513	38.99	54	-15.01	Pass	220	2.4	Horizontal
9.812	37.91	54	-16.09	Pass	110	3.3	Vertical
9.984	38.84	54	-15.66	Pass	135	2.7	Vertical

Table 5 Electric Field Emissions Peaks, 1GHz to 10GHz – Operation on 2436MHz

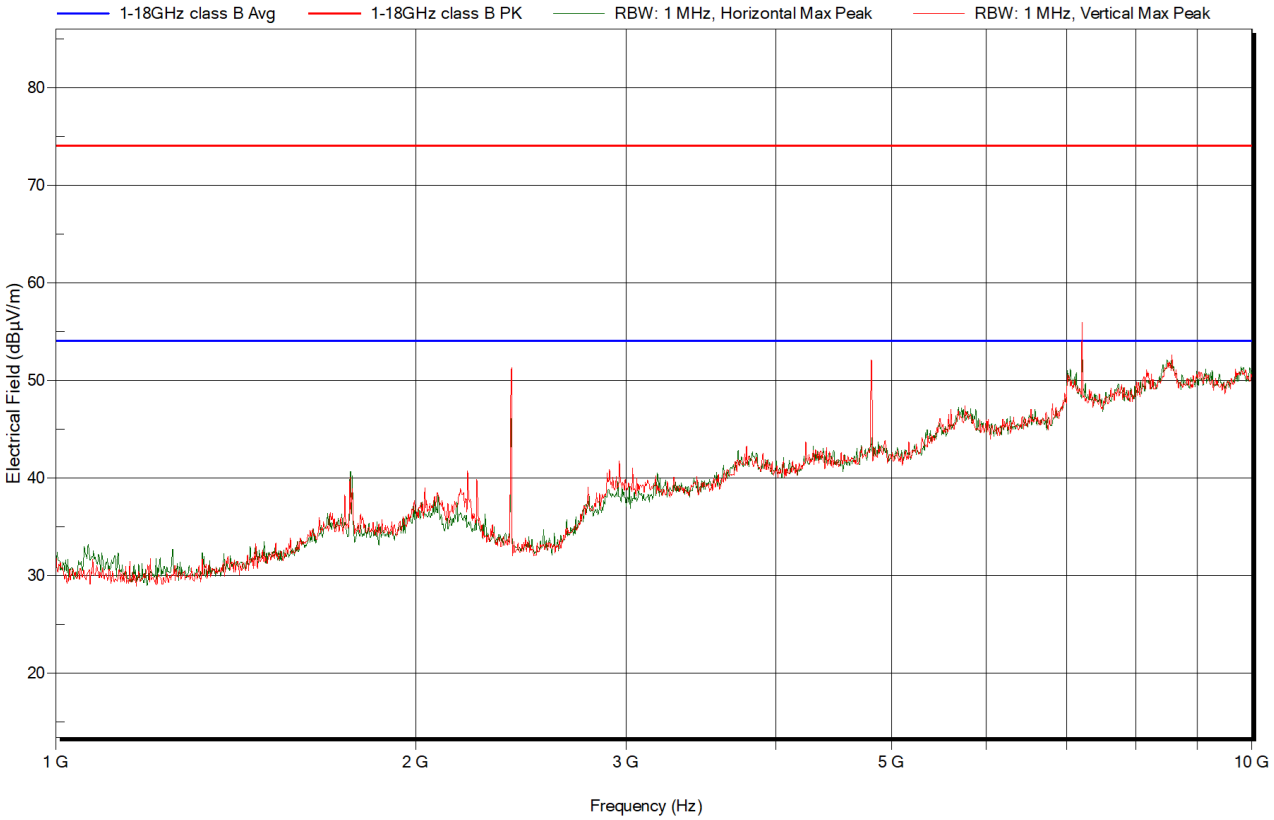


Figure 9 Electric field emissions Plot, 1GHz to 10GHz, Operation on 2402MHz - Peak detector pre-scan

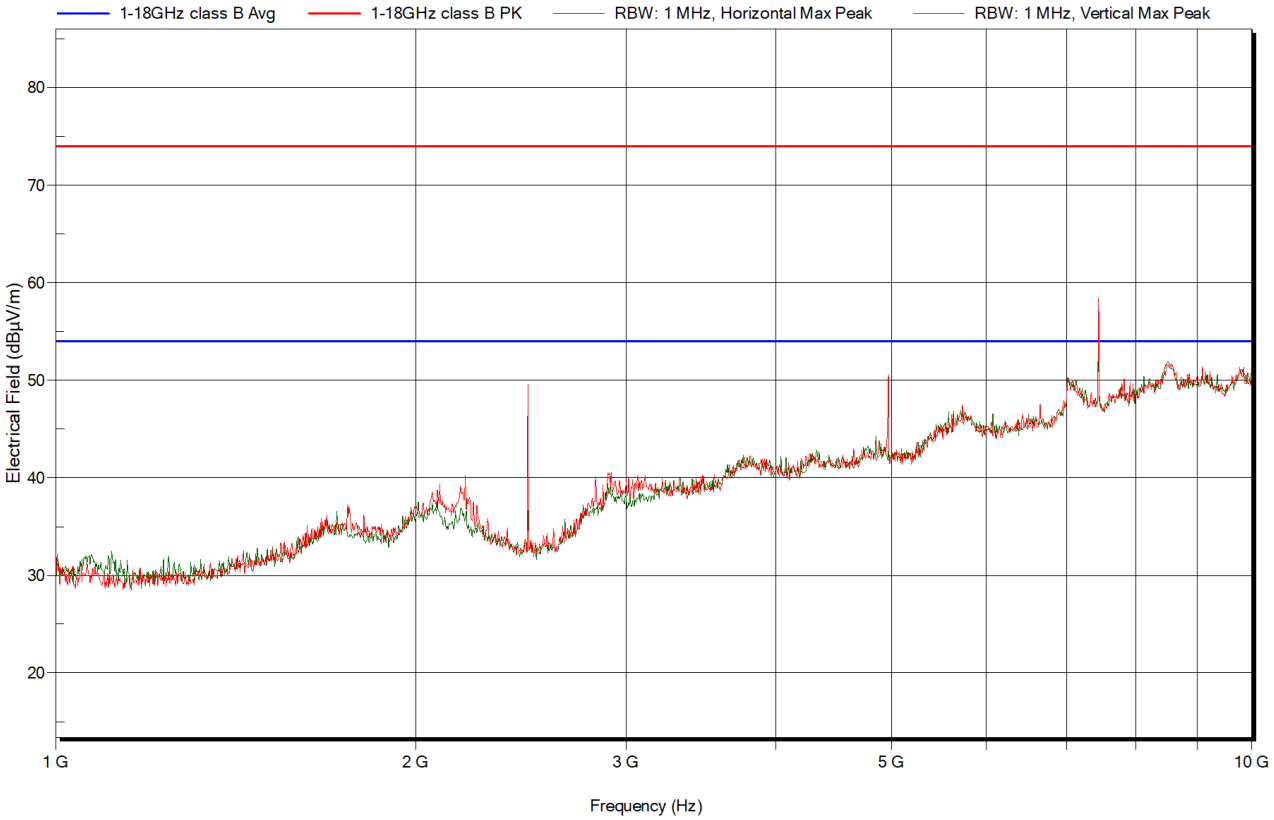


Figure 10 Electric field emissions Plot, 1GHz to 10GHz, Operation on 2480MHz - Peak detector pre-scan

5.4.9.2 PoE powered operation

The equipment under test was pre-scanned using peak detection when operating on all three channels. Final measurements were performed with the equipment under test operating on 2436MHz

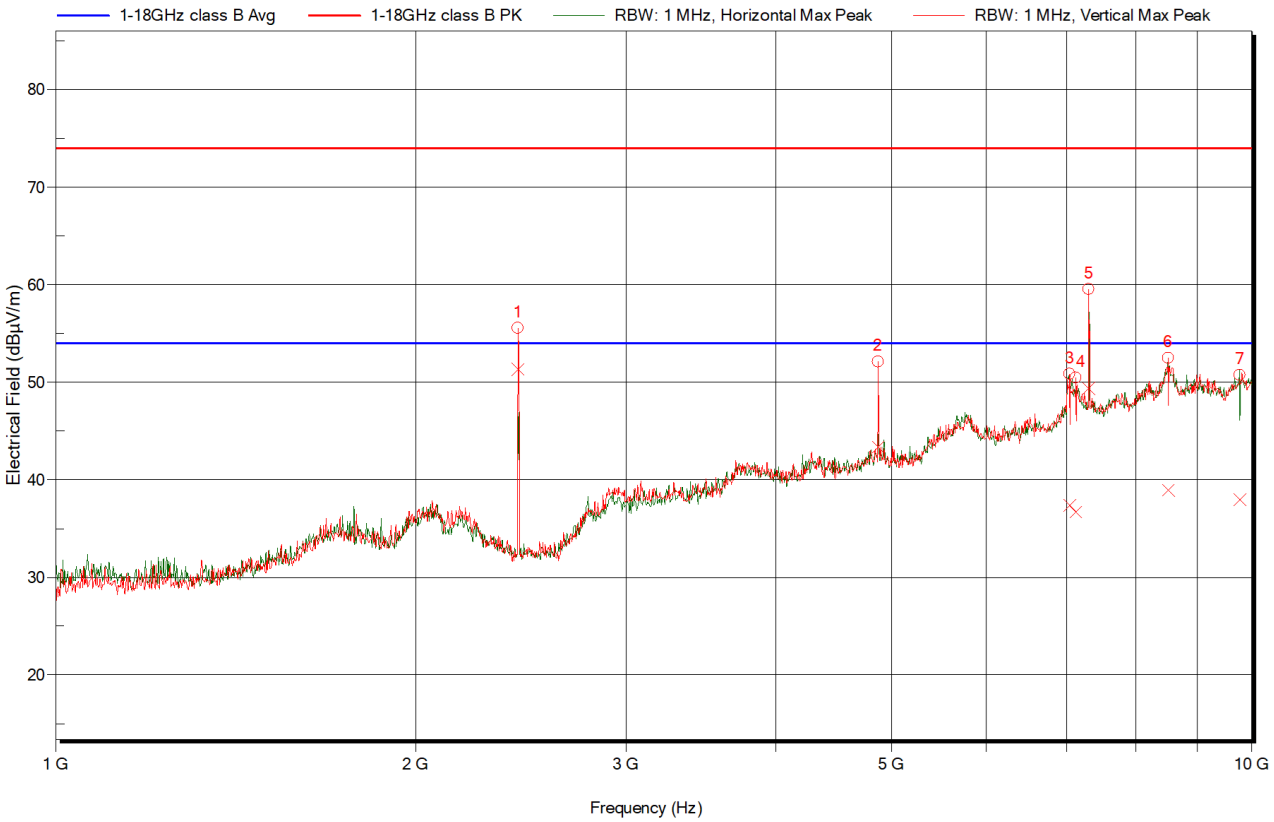


Figure 11 Electric field emissions Plot, 1GHz to 10GHz. Operation on 2436MHz

Note: The emission visible at 2436MHz is the intentional transmit frequency of the EUT

Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height	Polarization
GHz	dBµV/m	dBµV/m	dB		degrees	m	
4.872	43.37	54	-10.63	Pass	140	1.2	Vertical
7.045	37.36	54	-16.64	Pass	65	2.9	Vertical
7.128	36.69	54	-17.31	Pass	260	2.3	Vertical
7.307	49.38	54	-4.62	Pass	40	2.1	Vertical
8.517	38.92	54	-15.08	Pass	35	2.1	Vertical
9.769	37.95	54	-16.05	Pass	195	2.7	Horizontal

Table 6 Electric Field Emissions Peaks, 1GHz to 10GHz – Operation on 2436MHz

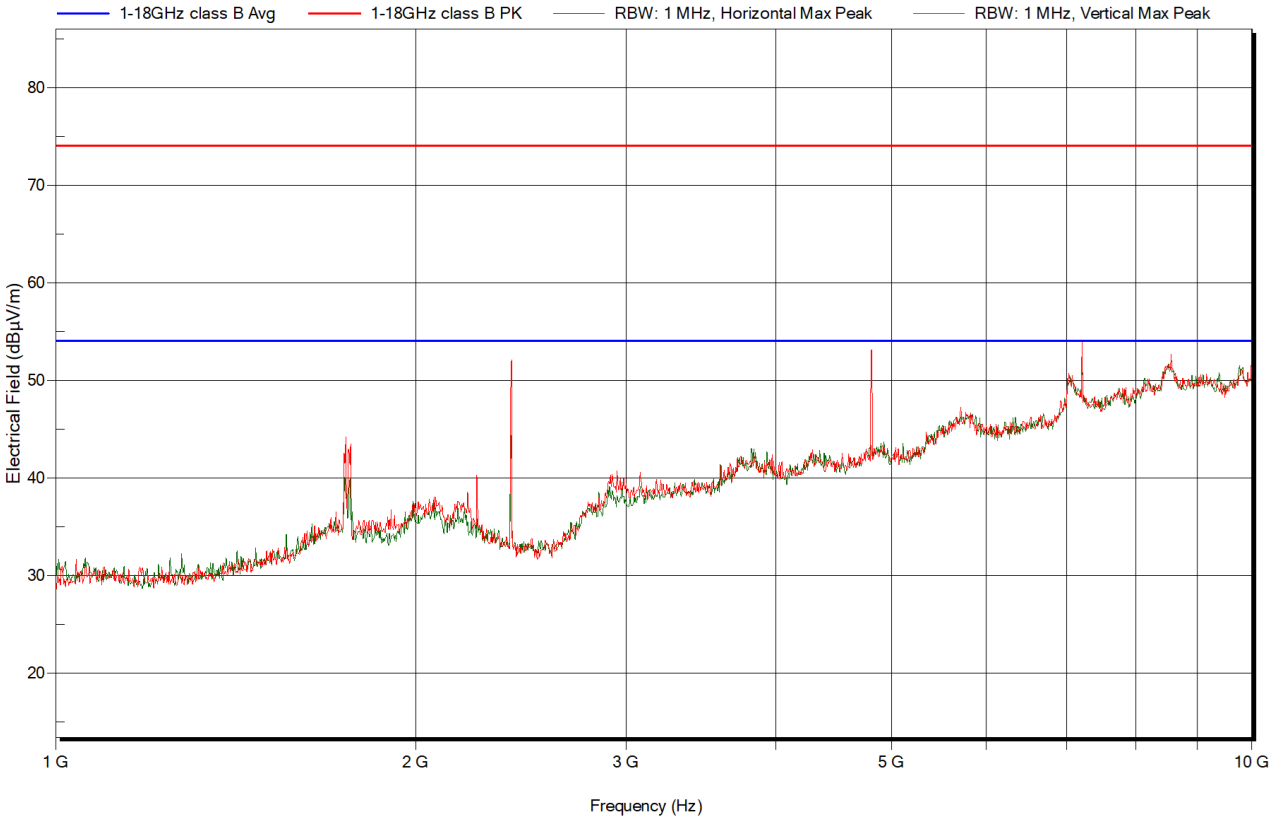


Figure 12 Electric field emissions Plot, 1GHz to 10GHz, Operation on 2402MHz – Peak detector pre-scan

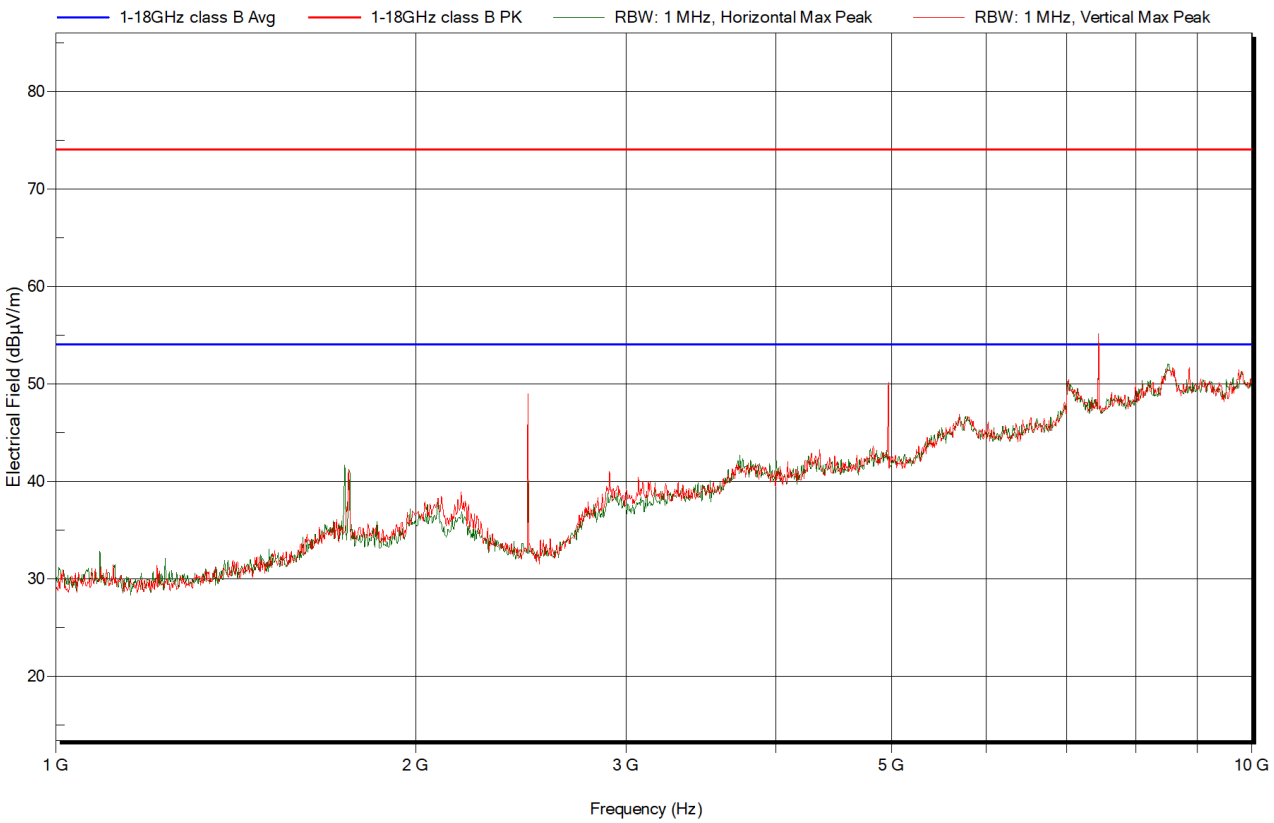


Figure 13 Electric field emissions Plot, 1GHz to 10GHz, Operation on 2480MHz – Peak detector pre-scan

5.4.10 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), and where necessary distance extrapolation factor (dB).

Field strength (FS) is calculated as follows:

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

5.4.11 Sample Data

From Figure 11 and table 6, The Average level at 9.769GHz is calculated as follows:

FS (dBµV/m) = 41.81(dBµV) – 53.14(dB) + 41.28(dB/m) +8.00(dB) = 37.95dBµV/m

5.5 Radiated Emissions (18GHz to 25GHz)

5.5.1 Limits

Frequency (GHz)	Limit (dBµV/m)	Limit (dBµV/m)
	Peak	Average
18-25	74.0	54.0

5.5.2 Receiver Settings

Receiver Parameters	Setting
Detector Function	Average and Peak
Start Frequency	18GHz
Stop Frequency	25GHz
Resolution Bandwidth	1MHz
Video Bandwidth	Auto

5.5.3 Date of Test

17th October 2023

5.5.4 Test Area

LAB 1 (SAC)

5.5.5 Tested by

L Trickett

5.5.6 Test Setup

This is the same as for the 1-18GHz range for final measurements

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
-	Tx on channels 2402MHz, 2436MHz and 2480MHz.	-	-	-	-

Table 7: 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°.

No emissions were identified for further investigation above 18GHz.

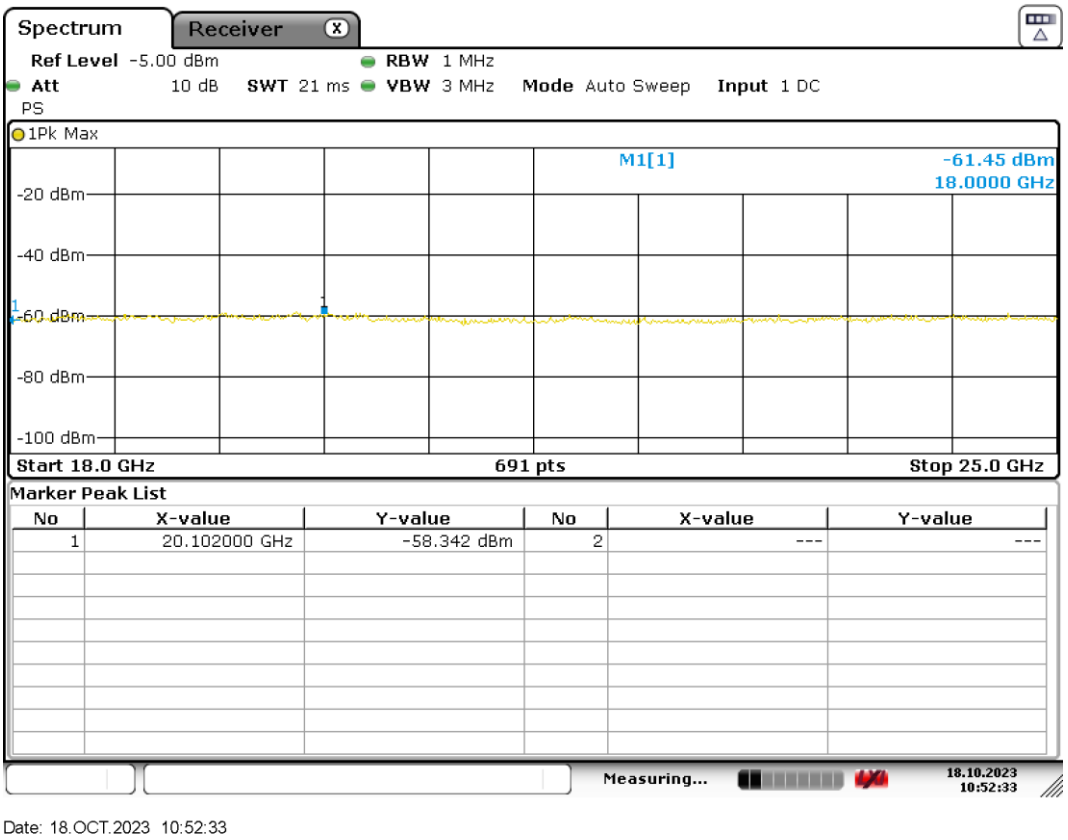
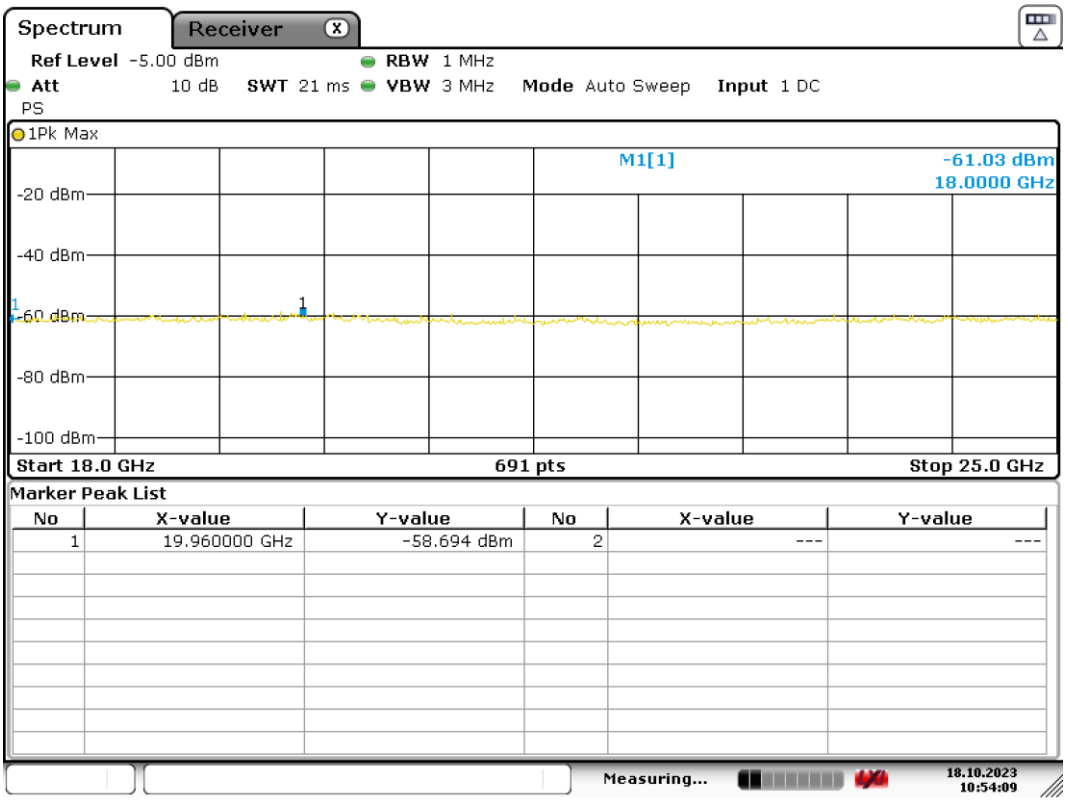
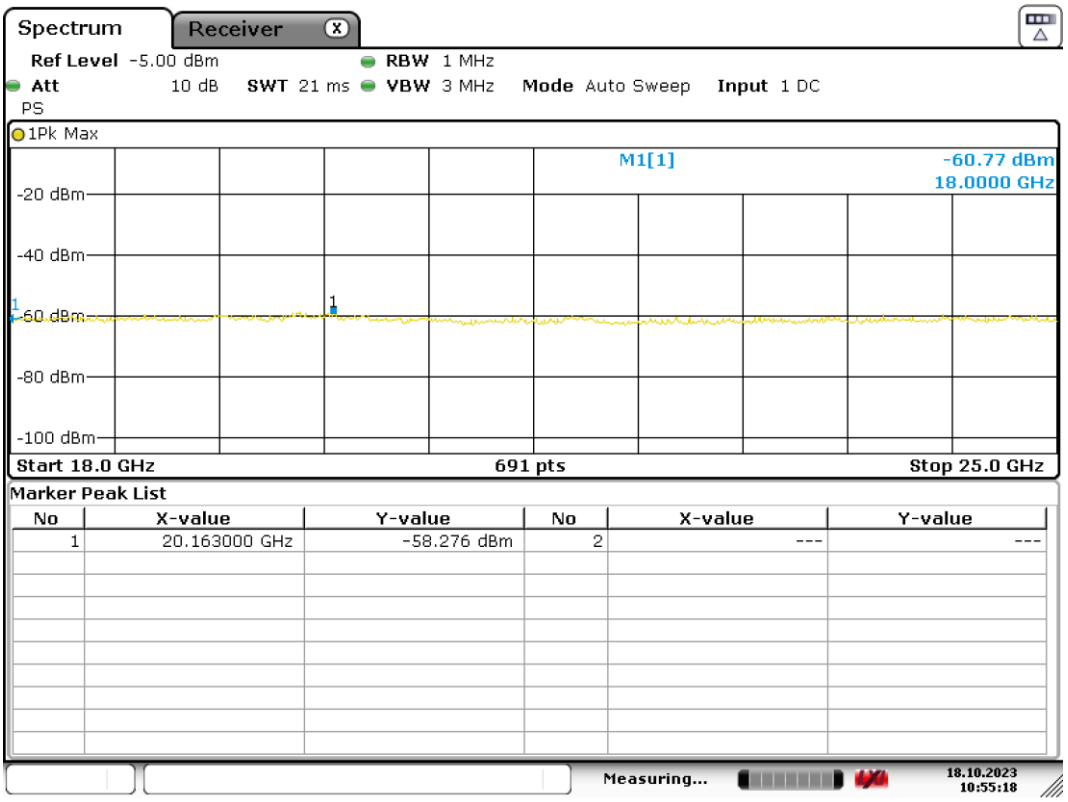


Figure 5.5.7.1 – Manual investigation – Operating on channel 2402MHz



Date: 18.OCT.2023 10:54:10

Figure 5.5.7.2 – Manual investigation – Operating on channel 2436MHz



Date: 18.OCT.2023 10:55:18

Figure 5.5.7.3 – Manual investigation – Operating on channel 2480MHz

5.6 Conducted Spurious Emissions 30MHz to 25GHz

5.6.1 Limits

Frequency (MHz)	Limit, 47CFR 15.247(d)
	Peak
30 – 25000	-20dBc

Spectrum analyser settings as specified by ANSI C63.10-2013 Clause 11.11.2

Receiver Parameters	Setting
Detector Function	Peak
Start Frequency	30MHz
Stop Frequency	25000MHz
Resolution Bandwidth	100kHz
Video Bandwidth	300kHz
Sweep rate	Auto couple
Trace mode	Max hold

5.6.2 Emissions measurements

5.6.3 Date of Test

16th October 2023

5.6.4 Test Area

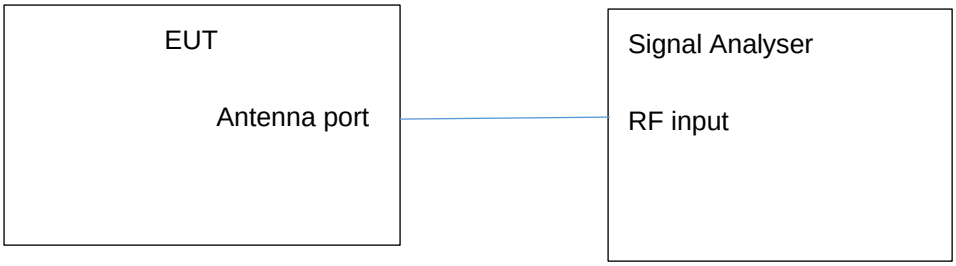
LAB 1

5.6.5 Tested by

J Beevers

5.6.6 Test Setup

The antenna port was connected directly to the signal analyser.



5.6.7 Test Results

The results of the conducted spurious emissions are stated below and by the signal analyser images.

All disturbances detected were > 20dB below the carrier.

5.6.8 Antenna port conducted emissions, 30MHz to 25GHz

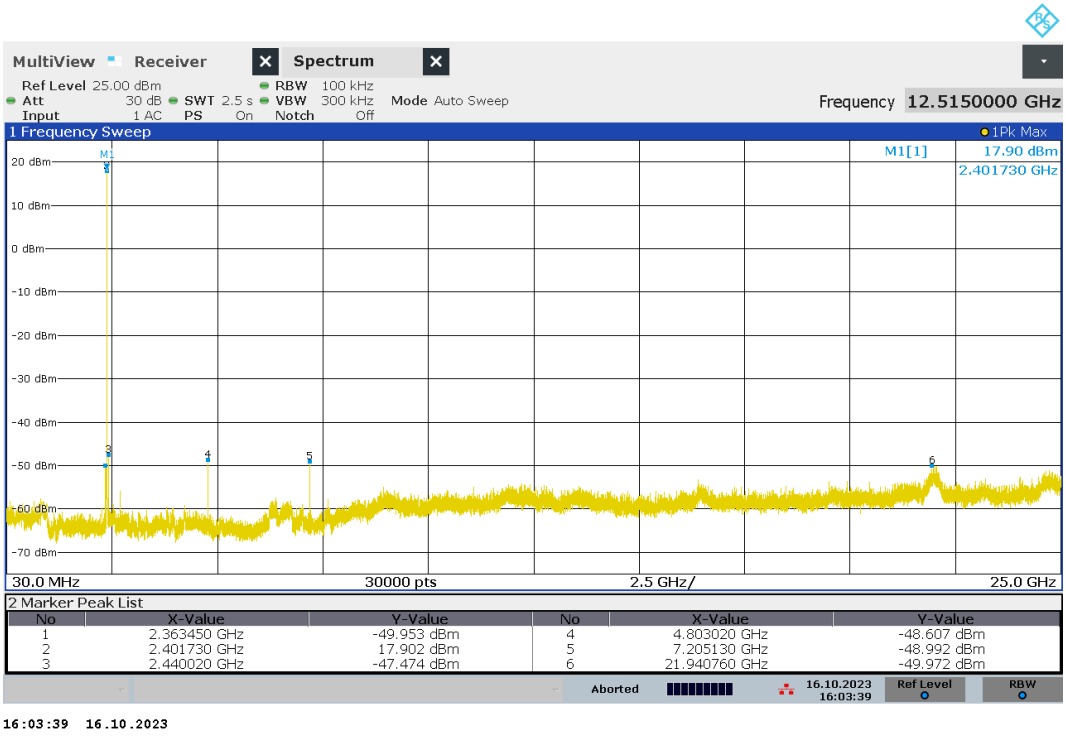


Figure 14 Conducted emissions 30MHz to 25GHz. Operation on channel 2402MHz.

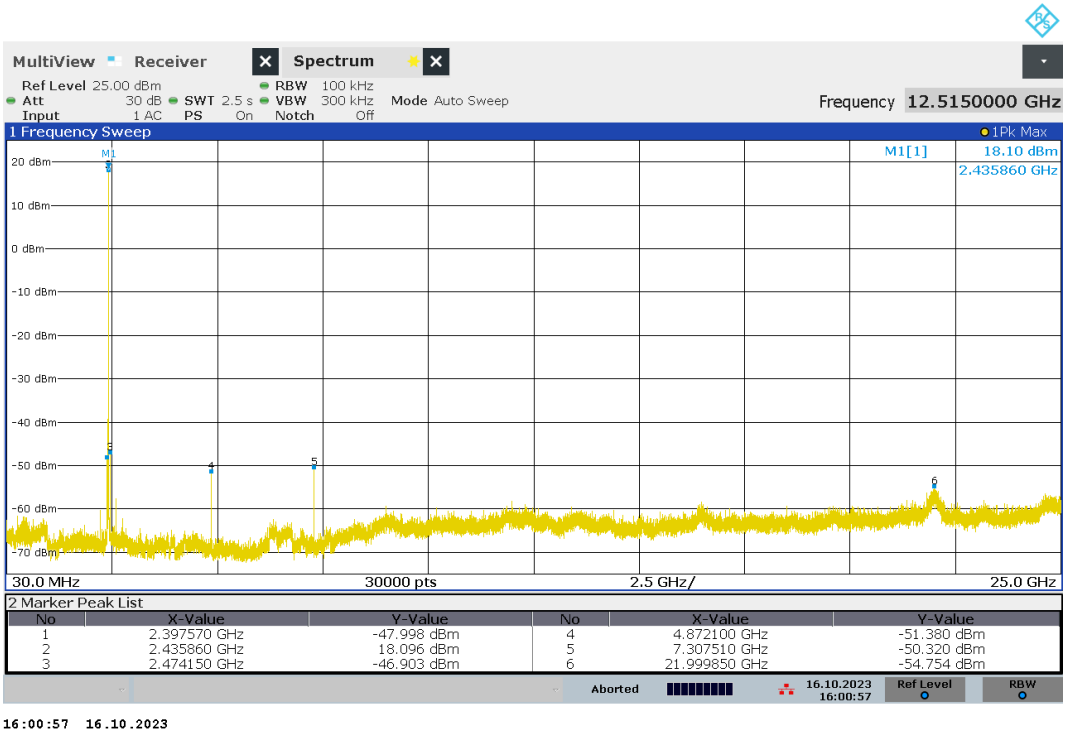


Figure 15 Conducted emissions 30MHz to 25GHz. Operation on channel 2436MHz.

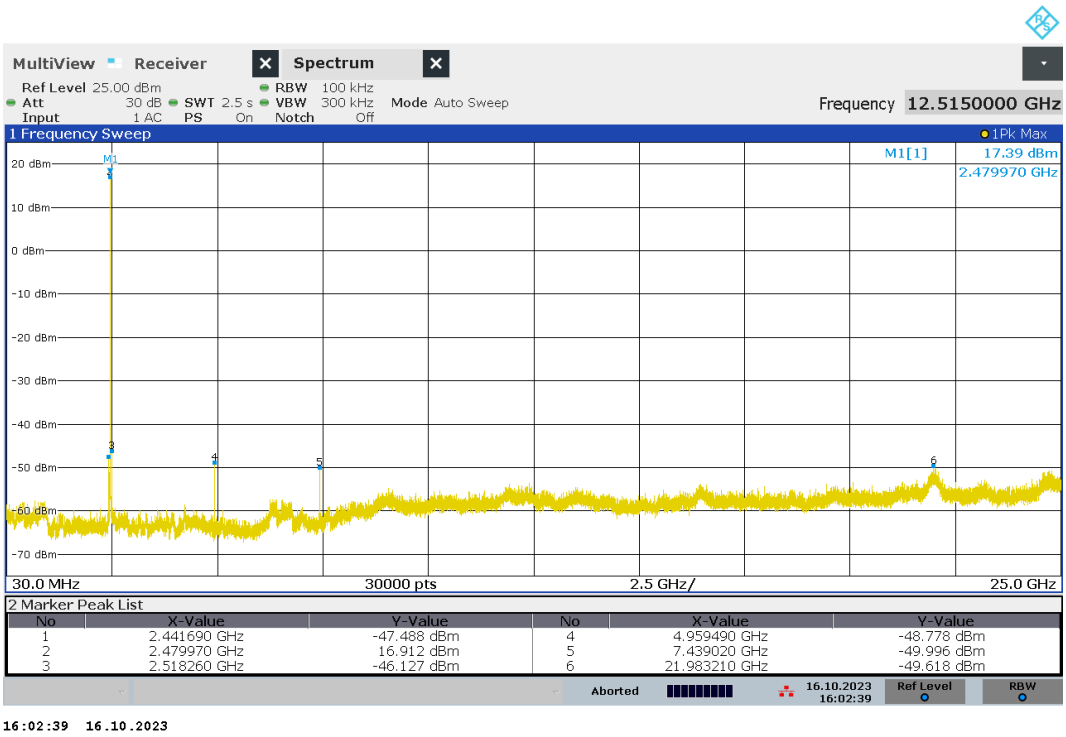


Figure 16 Conducted emissions 30MHz to 25GHz. Operation on channel 2480MHz.

Section 6 6dB Bandwidth and 99% Occupied Bandwidth

6.1 Test Specification

FCC Rule Part	46CFR 15.247 (b)(2)
Standard	ANSI C63.10:2013

6.2 Procedure and Test Software Version

Conducted Tests

ANSi C63.10-2013 Clause reference:	11.9.1.1 (RBW>DTS bandwidth)
Test software	N/A

Frequency (MHz)	**Limit, 47CFR 15.247(a)(2) 6dB bandwidth**
	Peak
2400MHz to 2483.5MHz	At least 500kHz

Spectrum analyser settings as specified by ANSI C63.10-2013 Clause 11.8.1

Receiver Parameters	**Setting**
Detector Function	Peak
Span	3MHz
Resolution Bandwidth	50kHz
Video Bandwidth	150kHz
Sweep rate	Auto couple
Trace mode	Max hold

6.2.1 Emissions measurements

6.2.2 Date of Test

16th October 2023

6.2.3 Test Area

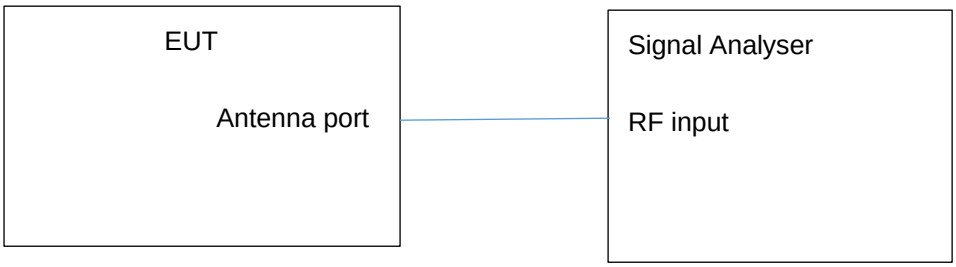
LAB 1

6.2.4 Tested by

J Beevers

6.2.5 Test Setup

The antenna port was connected directly to the signal analyser.



6.2.6 Test Results

The results of the 6dB bandwidth measurements are stated in the table below and by the signal analyser images.

Channel (MHz)	99% Occupied Bandwidth (MHz)	Measured 6dB bandwidth (kHz)	Minimum requirement (kHz)	Figure	Result
2402.0	1.0136	753.50	500.0	17 & 18	Pass
2436.0	1.0145	750.50	500.0	19 & 20	Pass
2480.0	1.0165	748.50	500.0	21 & 22	Pass

Table 8 Bandwidth Measurements

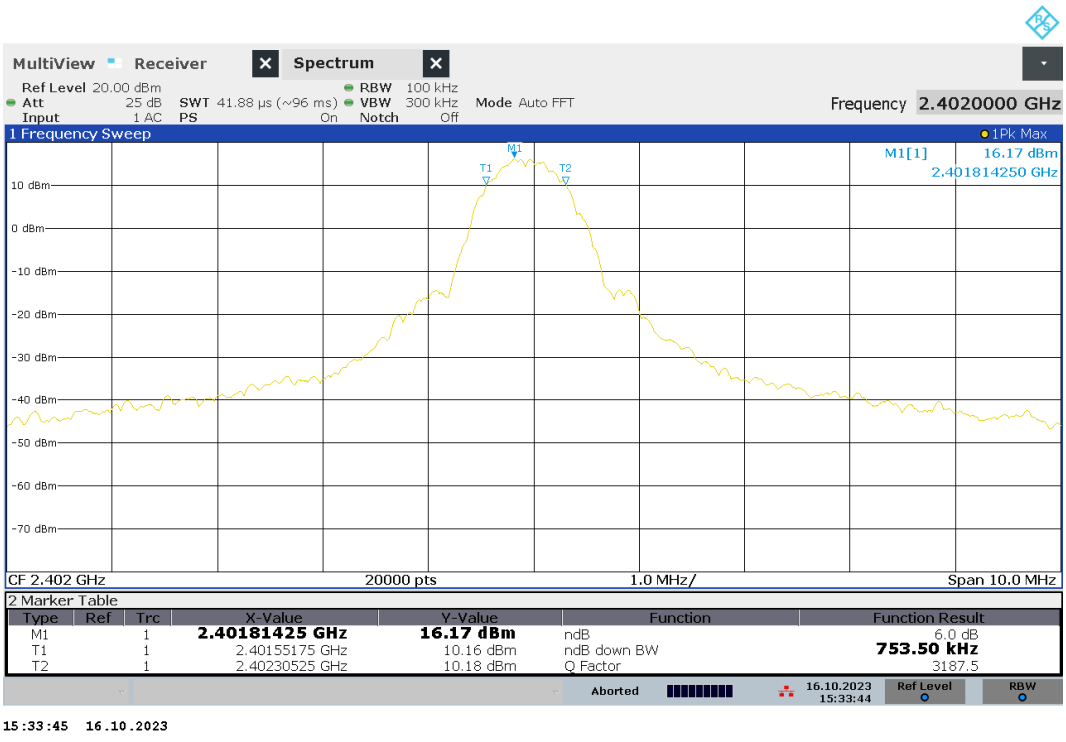


Figure 17 Bandwidth at 6dB Point. Operation on channel 2402MHz

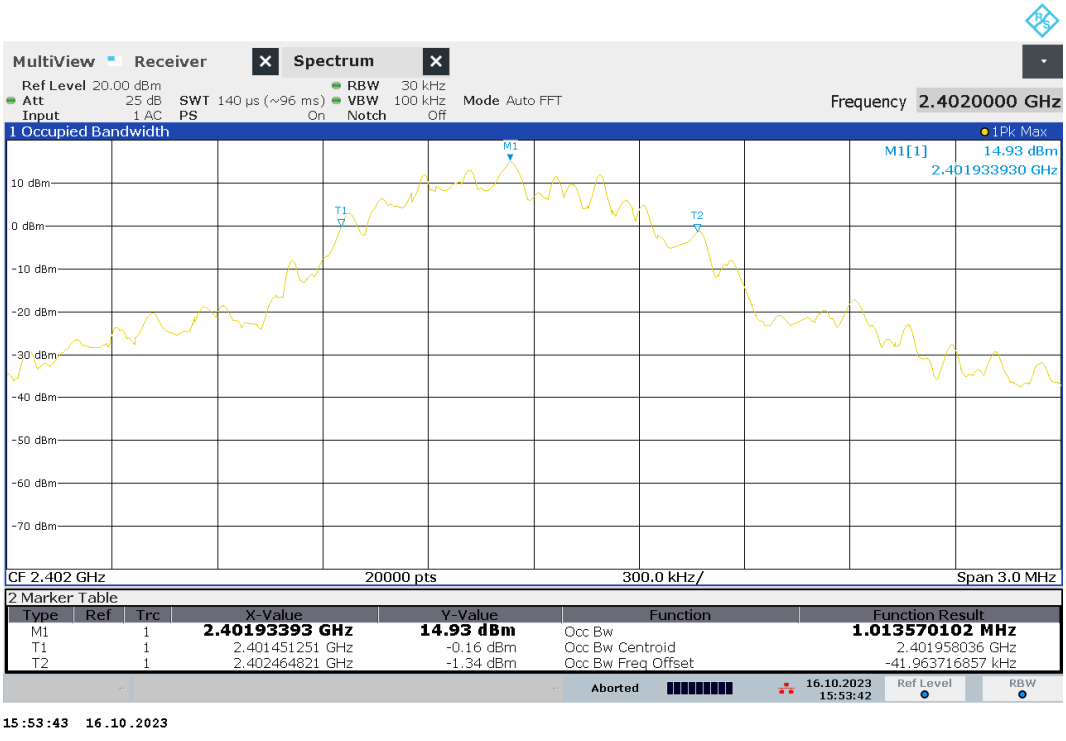


Figure 18 99% Occupied Bandwidth. Operation on channel 2402MHz

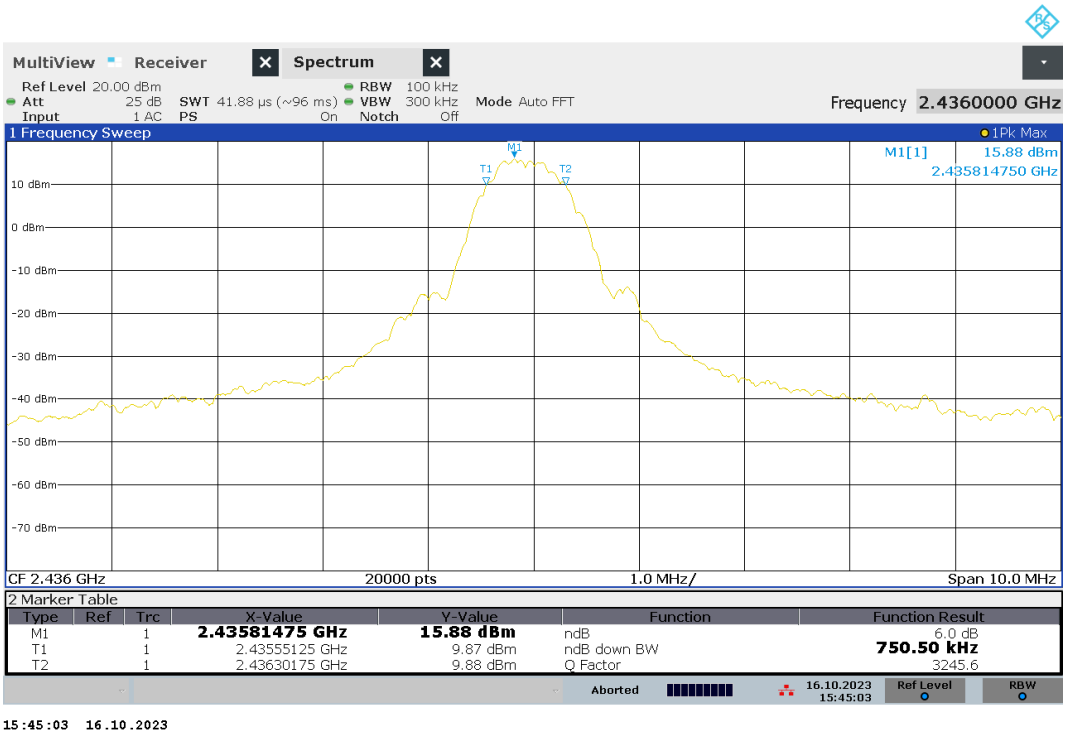


Figure 19 Bandwidth at 6dB Point. Operation on channel 2436MHz

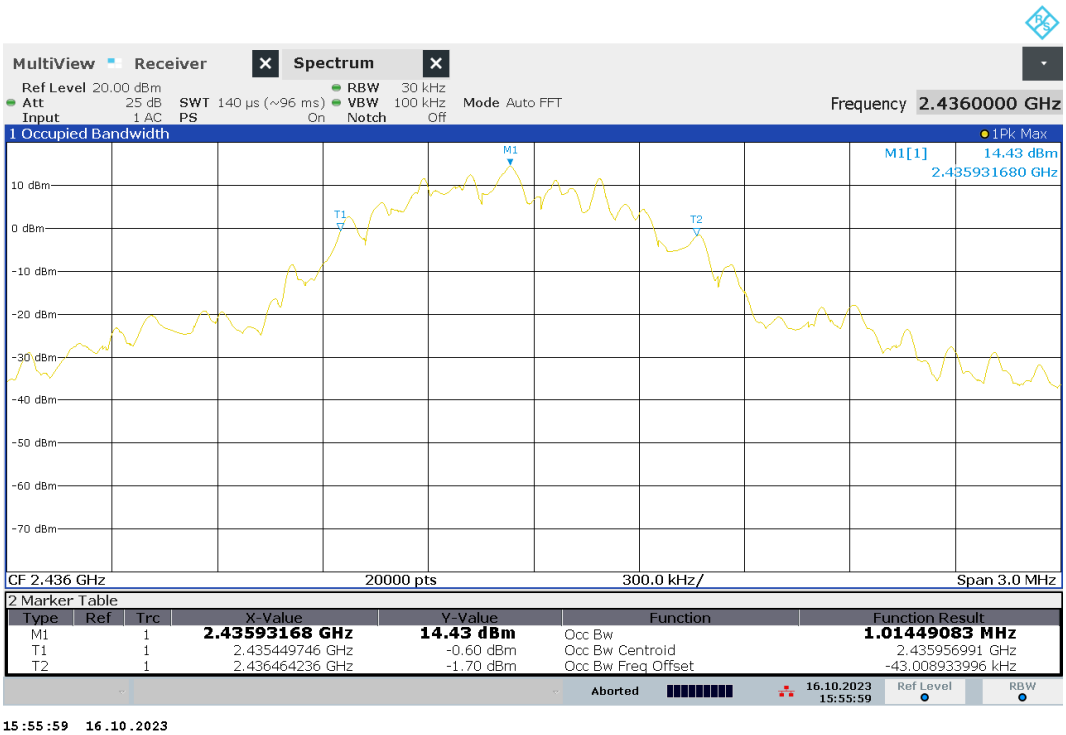


Figure 20 99% Occupied Bandwidth. Operation on channel 2436MHz

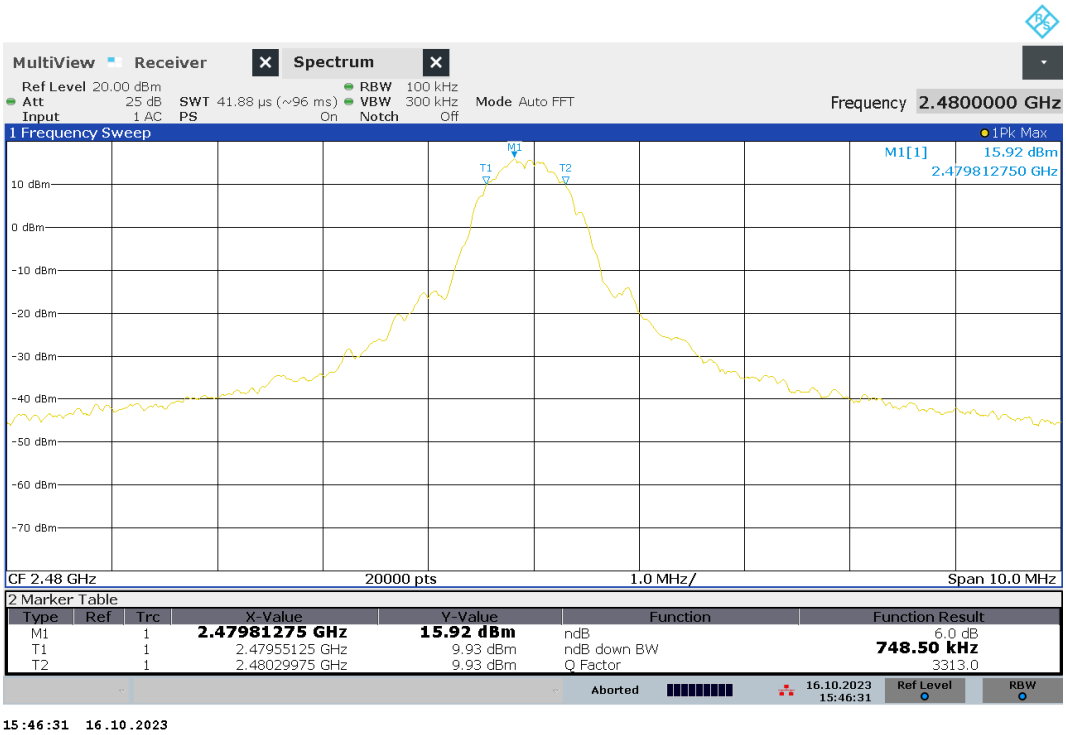


Figure 21 Bandwidth at 6dB Point. Operation on channel 2480MHz

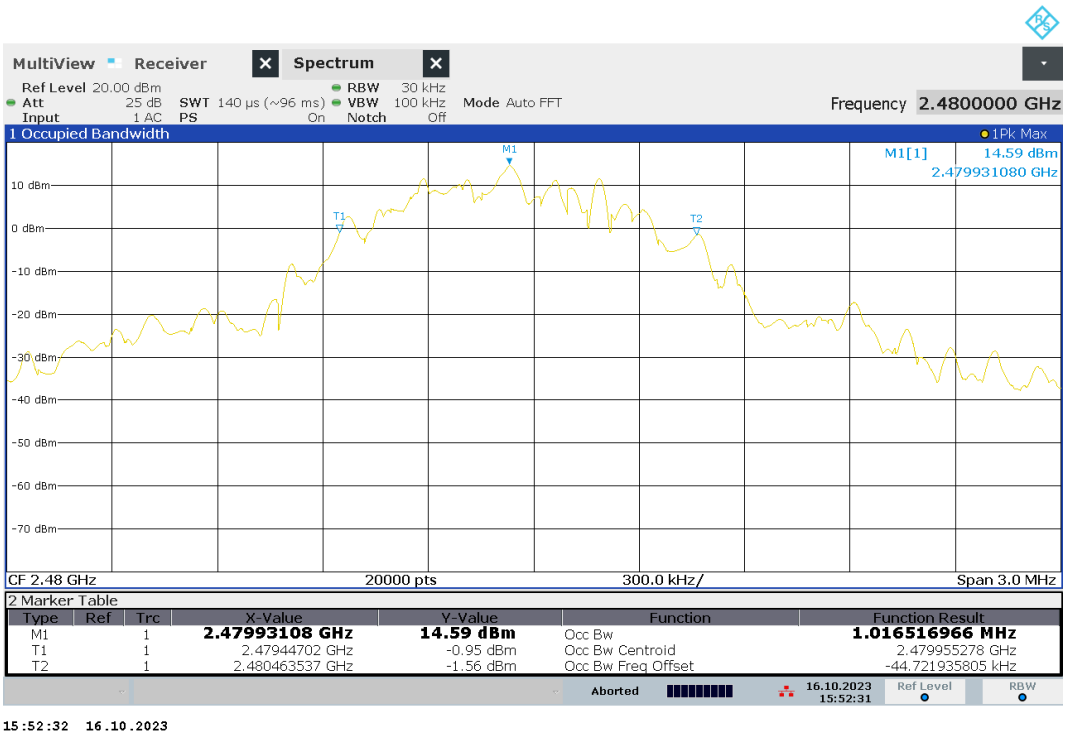


Figure 22 99% Occupied Bandwidth. Operation on channel 2480MHz

Section 7 Peak Output Power

7.1 Test Specification

FCC Rule Part	46CFR 15.247 (b)(3)
Standard	ANSI C63.10:2013

7.2 Procedure and Test Software Version

Conducted Tests

ANSi C63.10-2013 Clause reference:	11.9.1.1 (RBS>DTS bandwidth)
Test software	N/A

Frequency (MHz)	**Limit, 47CFR 15.247(b)(2)**
	Peak
2400MHz to 2483.5MHz	1 Watt

Spectrum analyser settings as specified by ANSI C63.10-2013 Clause 11.11.2

Receiver Parameters	**Setting**
Detector Function	Peak
Span	6MHz
Resolution Bandwidth	2MHz (>DTS Bandwidth)
Video Bandwidth	10MHz
Sweep rate	Auto couple
Trace mode	Max hold

7.2.1 Emissions measurements

7.2.2 Date of Test

27th October 2023

7.2.3 Test Area

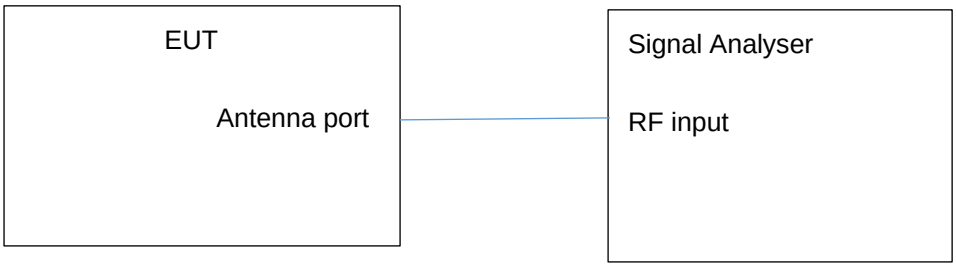
LAB 1

7.2.4 Tested by

J Beevers

7.2.5 Test Setup

The antenna port was connected directly to the signal analyser.



7.2.6 Test Result

The results of the peak output power measurements are stated in the table below and by the signal analyser images.
The cable loss was taken to be 0.6dB.

Channel (MHz)	Peak Power (dBm)	Peak Power (Watts)	Limit (Watts)	Figure
2402	7.32	0.00540	1	23
2436	7.06	0.00508	1	24
2480	6.68	0.00466	1	25

Table 9 Peak Output Power Measurements

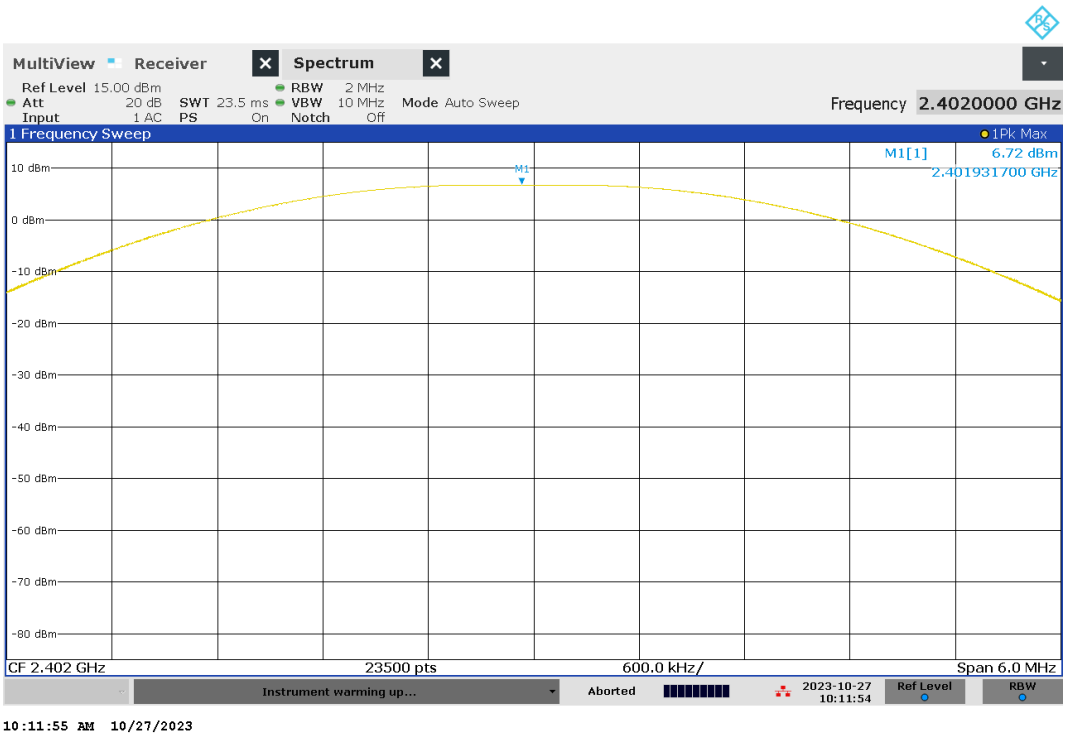


Figure 23 Peak output power, Operation on channel 2402MHz

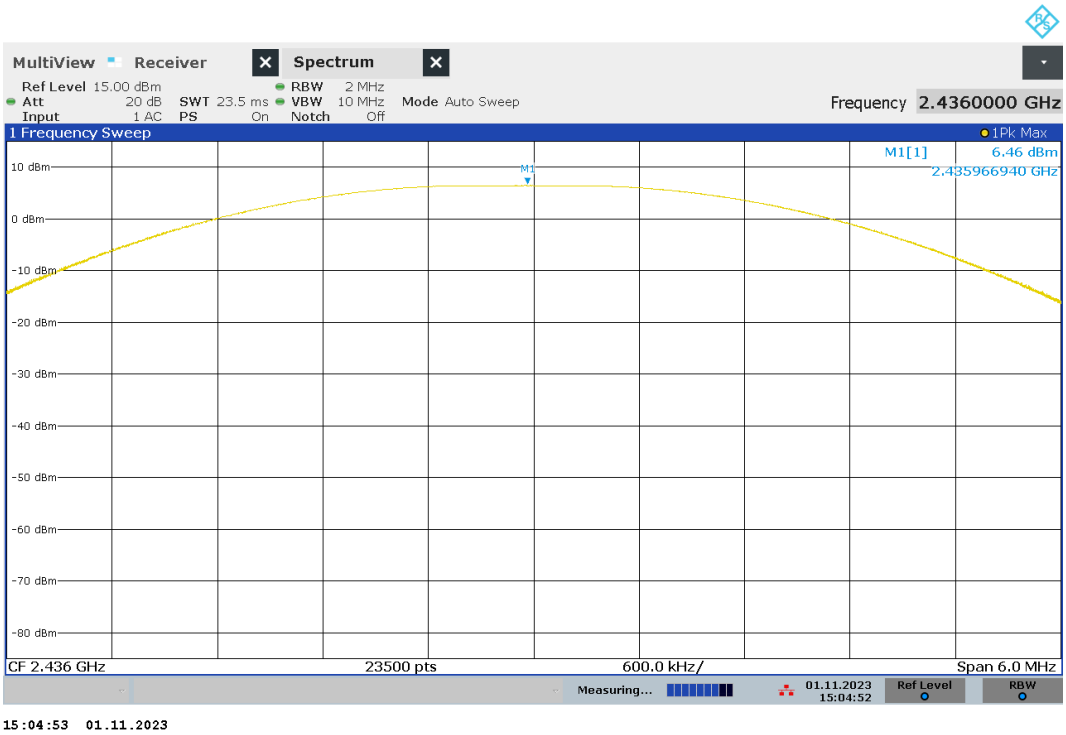


Figure 24 Peak output power, Operation on channel 2436MHz

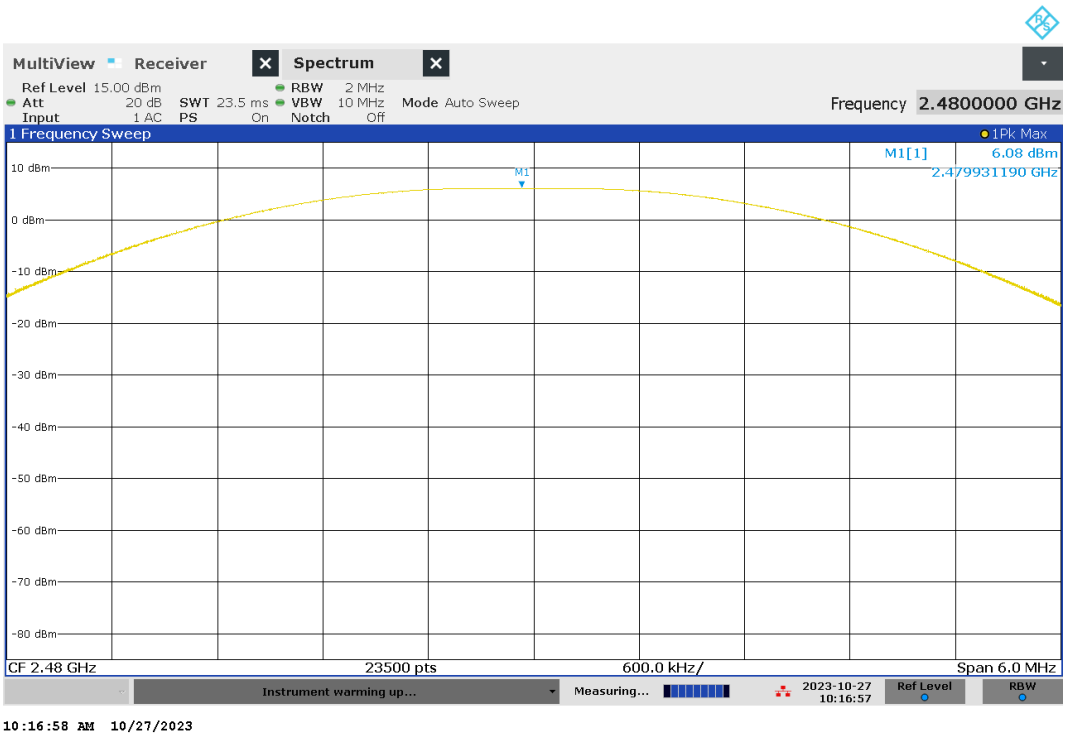


Figure 25 Peak output power, Operation on channel 2480MHz

Section 8 Power Spectral Density

8.1 Test Specification

FCC Rule Part	46CFR 15.247 (e)
Standard	ANSI C63.10:2013

8.2 Procedure and Test Software Version

Conducted Tests

ANSi C63.10-2013 Clause reference:	Clause 11.10.2
Test software	N/A

Frequency (MHz)	**Limit, 47CFR 15.247(e)**
	Peak
2400MHz to 2483.5MHz	<8dBm in any 3kHz band during any time interval of complete transmission

Spectrum analyser settings as specified by ANSI C63.10-2013 Clause 11.10.2

Receiver Parameters	**Setting**
Detector Function	Peak
Span	1.5xDTS bandwidth
Resolution Bandwidth	3kHz ≤RBW ≤100kHz
Video Bandwidth	3 x RBW
Sweep rate	Auto couple
Trace mode	Max hold

8.2.1 Emissions measurements

8.2.2 Date of Test

27th October 2023

8.2.3 Test Area

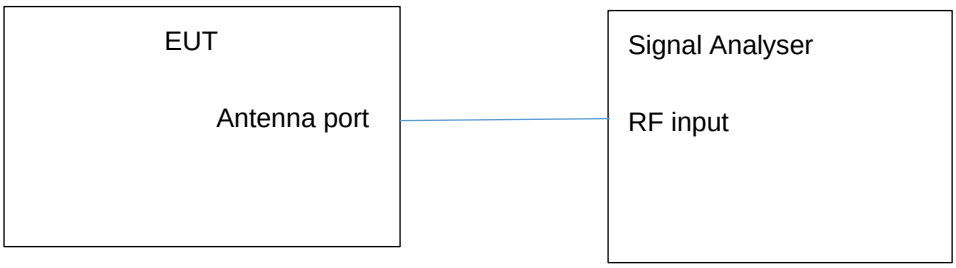
LAB 1

8.2.4 Tested by

J Beevers

8.2.5 Test Setup

The antenna port was connected directly to the signal analyser.



8.2.6 Test Results

The cable loss was taken to be 0.6dB.

Channel (MHz)	Power in 3kHz RBW (dBm)	Limit (dBm)	Figure	Result
2402	-9.27	8.0	26	Pass
2436	-9.18	8.0	27	Pass
2480	-9.77	8.0	28	Pass

Table 10 Peak Spectral Density Measurements

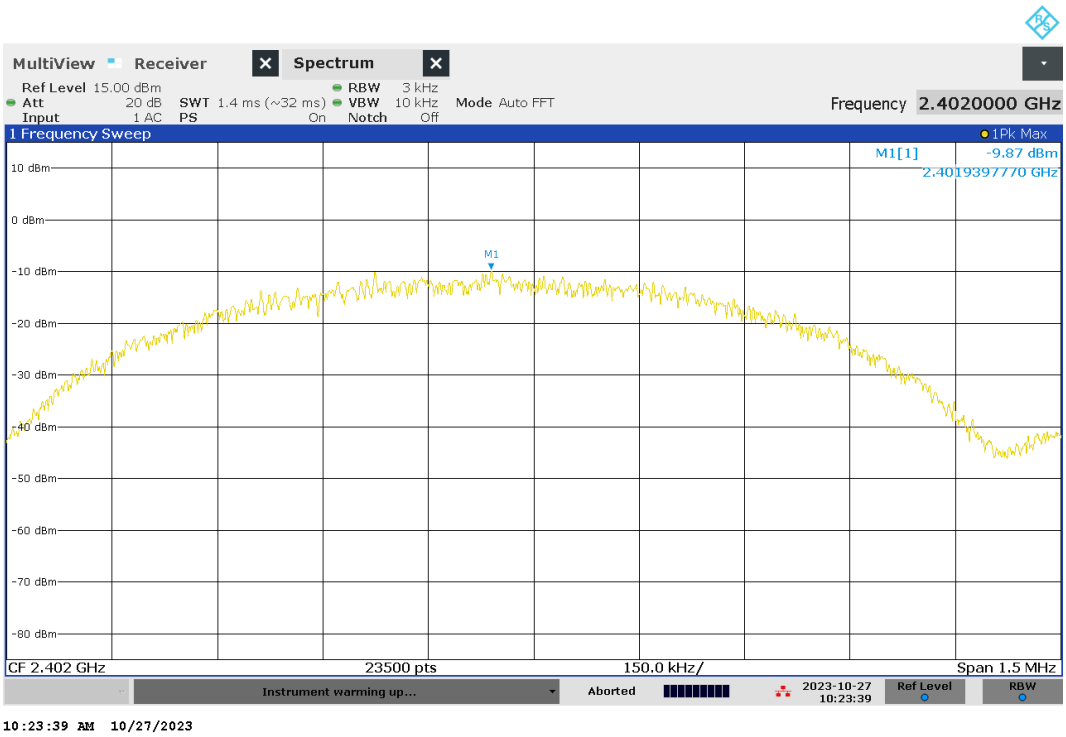


Figure 26 Power spectral density, Operation on channel 2402MHz

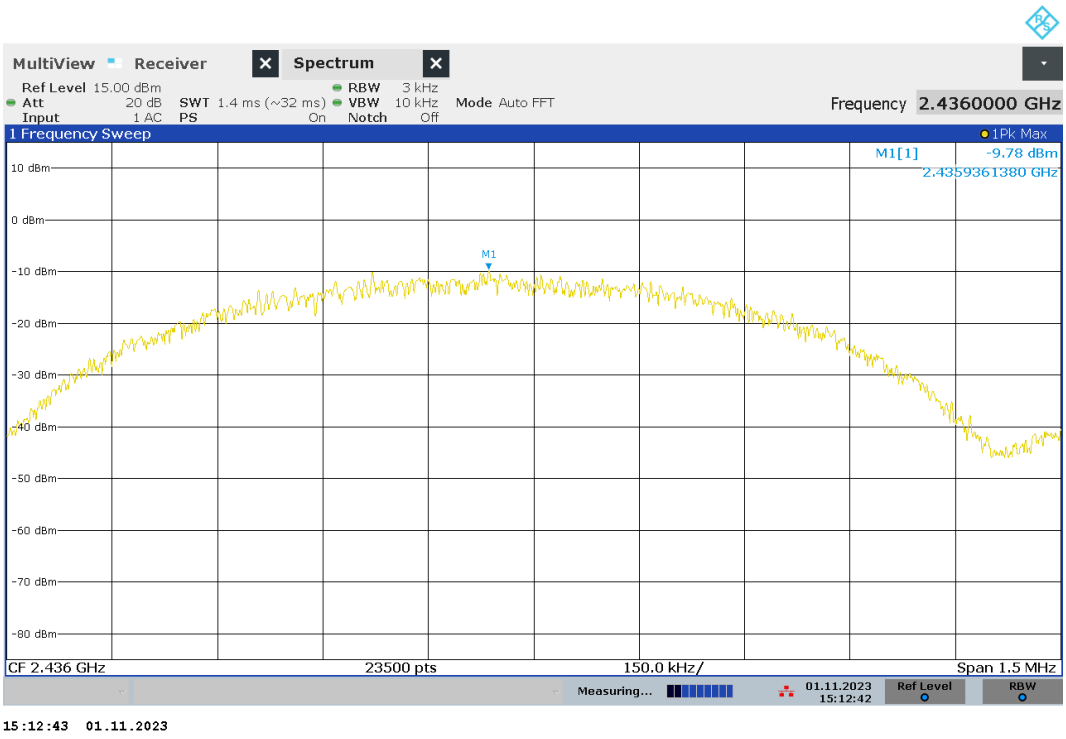


Figure 27 Power spectral density, Operation on channel 2436MHz

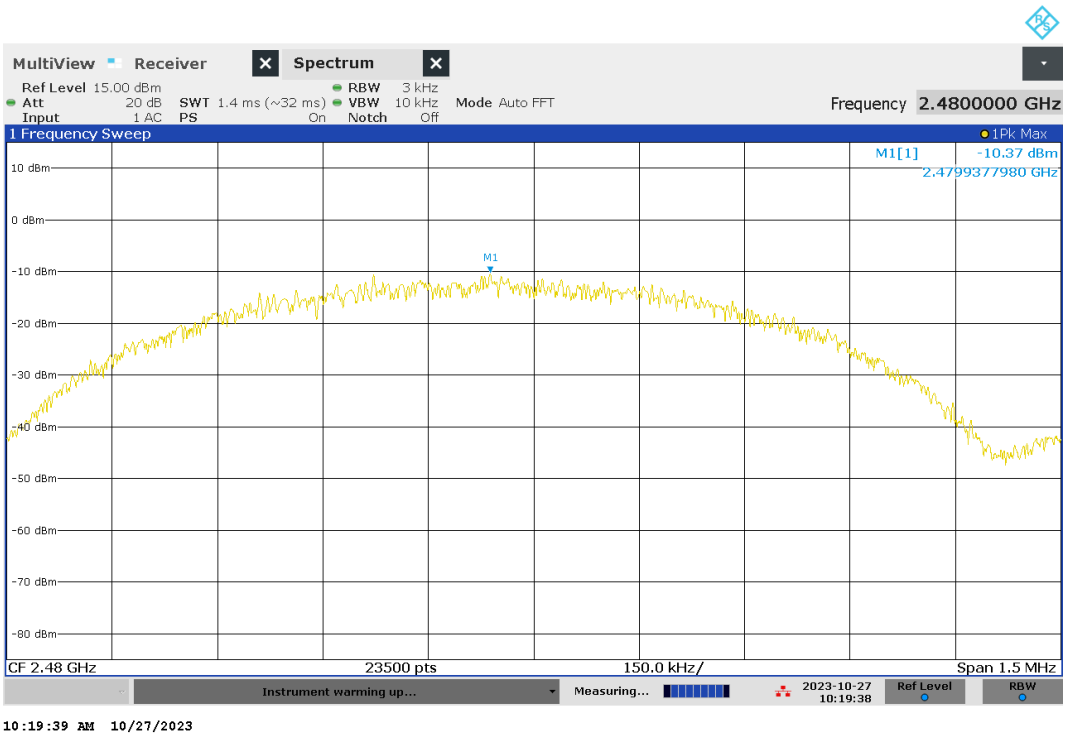


Figure 28 Power spectral density, Operation on channel 2480MHz

Section 9 Band Edge Compliance

9.1 Test Specification

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

9.2 Procedure and Test Software Version

Conducted Tests

ANSi C63.10-2013 Clause reference:	Clause 6.10.4 Authorised band-edge measurements
Test software	N/A

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

9.2.1 Emissions measurements

9.2.2 Date of Test

19th October 2023

9.2.3 Test Area

LAB 1

9.2.4 Tested by

J Beevers

9.2.5 Test Setup

The test setup was identical to radiated emissions testing 1-10GHz.

9.2.6 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.

9.2.6.1 USB powered operation results

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	78.0	54.0	3.2	29.9	57.0	74	17.0
V	2483.5	79.2	54.0	3.2	29.9	58.2	74	15.8

Table 11 Operation on 2480MHz Channel, 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	61.8	54.0	3.2	29.9	40.8	54	13.2
V	2483.5	62.5	54.0	3.2	29.9	41.5	54	12.5

Table 12 Operation on Channel 2480MHz, average detector measurements

Lower band edge

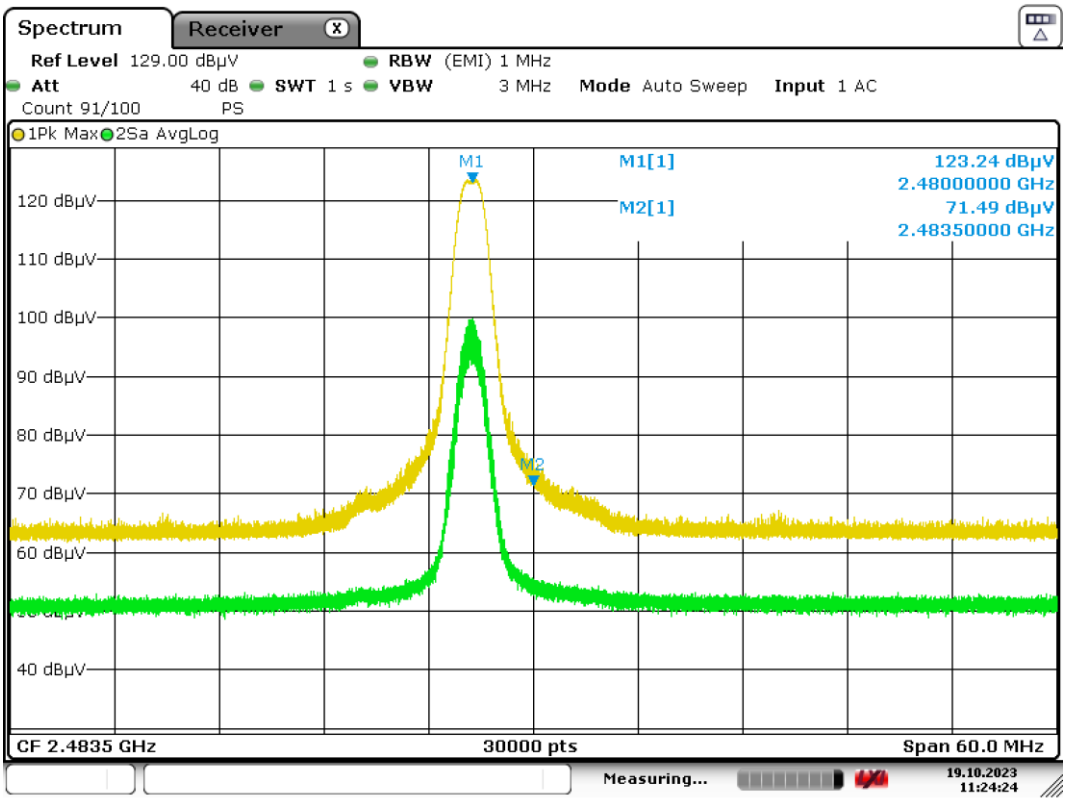
Polarity	frequency (MHz)	Amplitude (dBuV)	Preamp (dB)	Cable loss (dB)	AF(dB/m)	E (dBuV/m)	Limit (dBuV/m)	Margin (dB)
H	2400	93.3	54.0	3.1	29.7	72.1	74	1.9
V	2400	87.0	54.0	3.1	29.7	65.8	74	8.2

Table 13 Operation on channel 2402MHz 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	70.0	54.0	3.1	29.7	48.8	54	5.2
V	2400	71.0	54.0	3.1	29.7	49.8	54	4.2

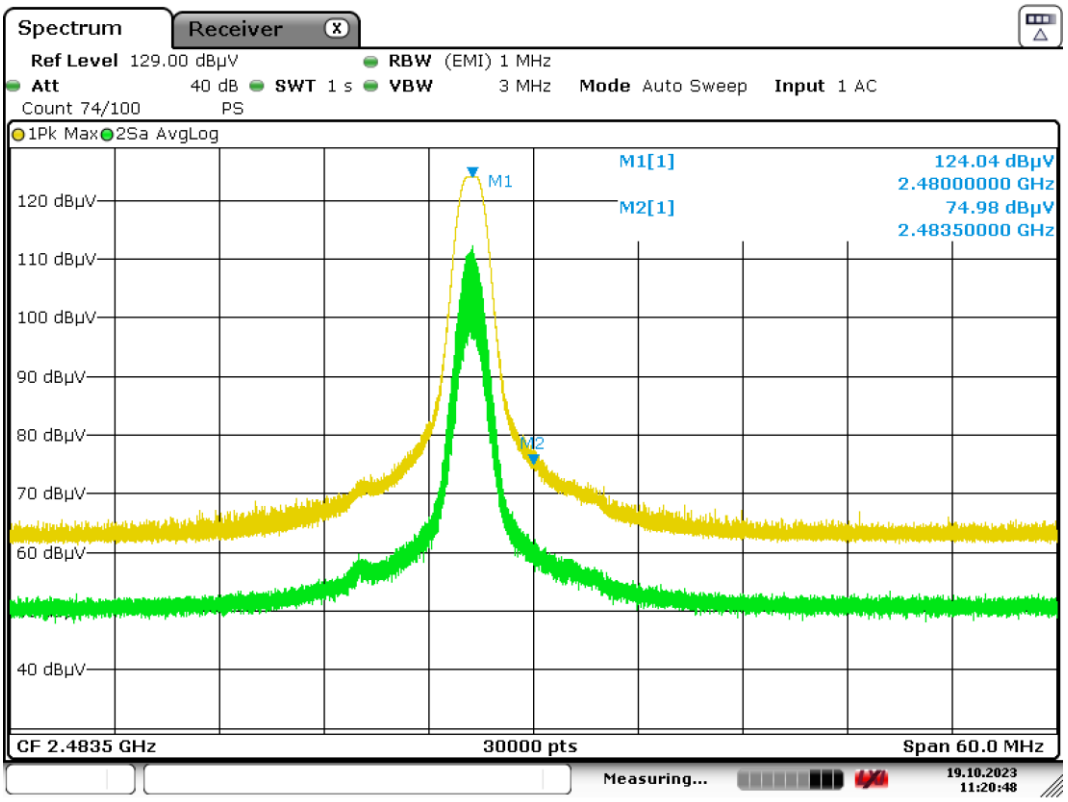
Table 14 Operation on channel 2402MHz average detector measurements

Spectrum analyser displays



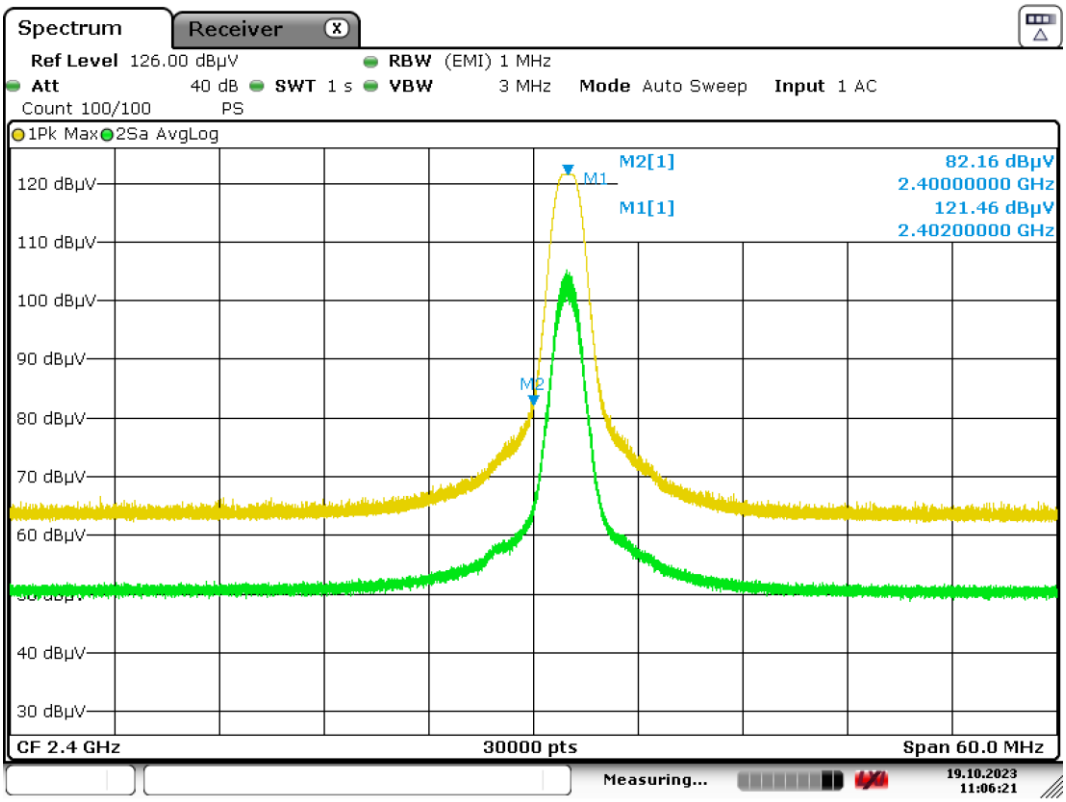
Date: 19.OCT.2023 11:24:25

Figure 29 Band Edge Measurement – Upper band edge - Horizontal polarity



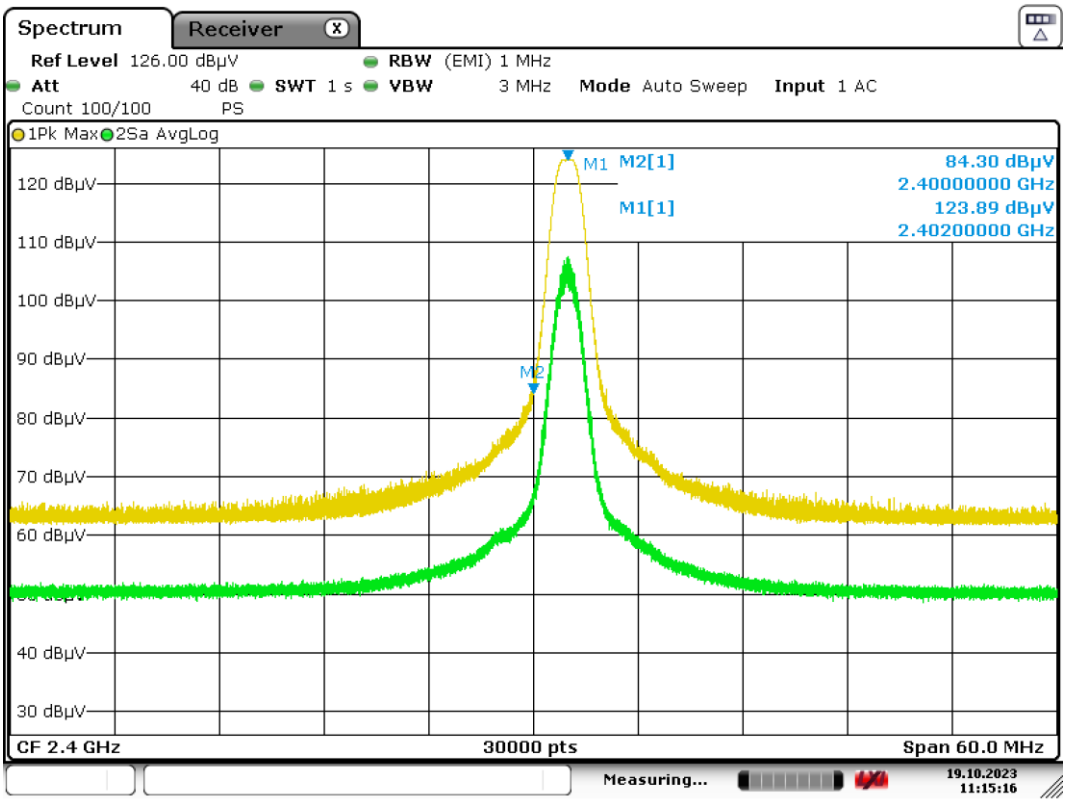
Date: 19.OCT.2023 11:20:48

Figure 30 Band Edge Measurement – Upper band edge - Vertical polarity



Date: 19.OCT.2023 11:06:22

Figure 31 Band Edge Measurement – Lower band edge - Horizontal polarity



Date: 19.OCT.2023 11:15:16

Figure 32 Band Edge Measurement – Lower band edge - Vertical polarity

9.2.6.2 PoE powered operation results

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	78.0	54.0	3.2	29.9	57.1	74	17.9
V	2483.5	79.1	54.0	3.2	29.9	58.2	74	15.8

Table 15 Operation on 2480MHz Channel, 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	62.0	54.0	3.2	29.9	41.1	54	12.9
V	2483.5	62.4	54.0	3.2	29.9	41.5	54	12.5

Table 16 Operation on Channel 2480MHz, average detector measurements

Lower band edge

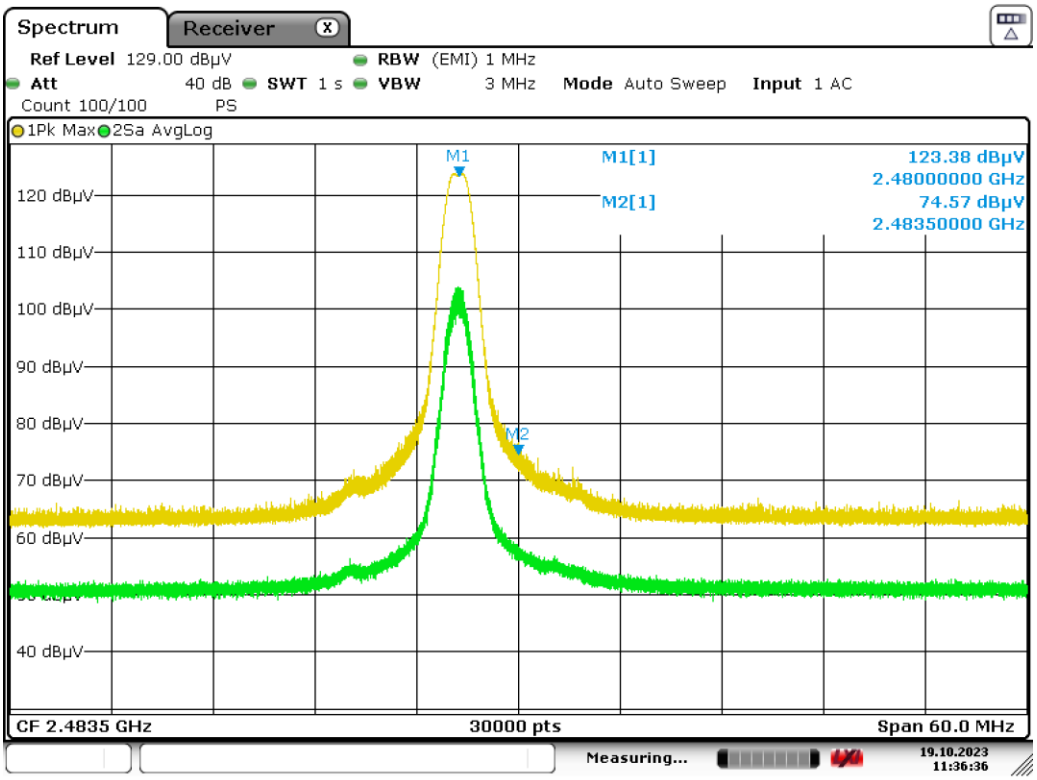
Polarity	frequency (MHz)	Amplitude (dBuV)	Preamp (dB)	Cable loss (dB)	AF(dB/m)	E (dBuV/m)	Limit (dBuV/m)	Margin (dB)
H	2400.0	92.9	54.0	3.1	29.7	71.7	74	2.3
V	2400.0	87.8	54.0	3.1	29.7	66.6	74	7.4

Table 17 Operation on channel 2402MHz 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	69.5	54.0	3.1	29.7	48.3	54	5.7
V	2400.0	70.9	54.0	3.1	29.7	49.7	54	4.3

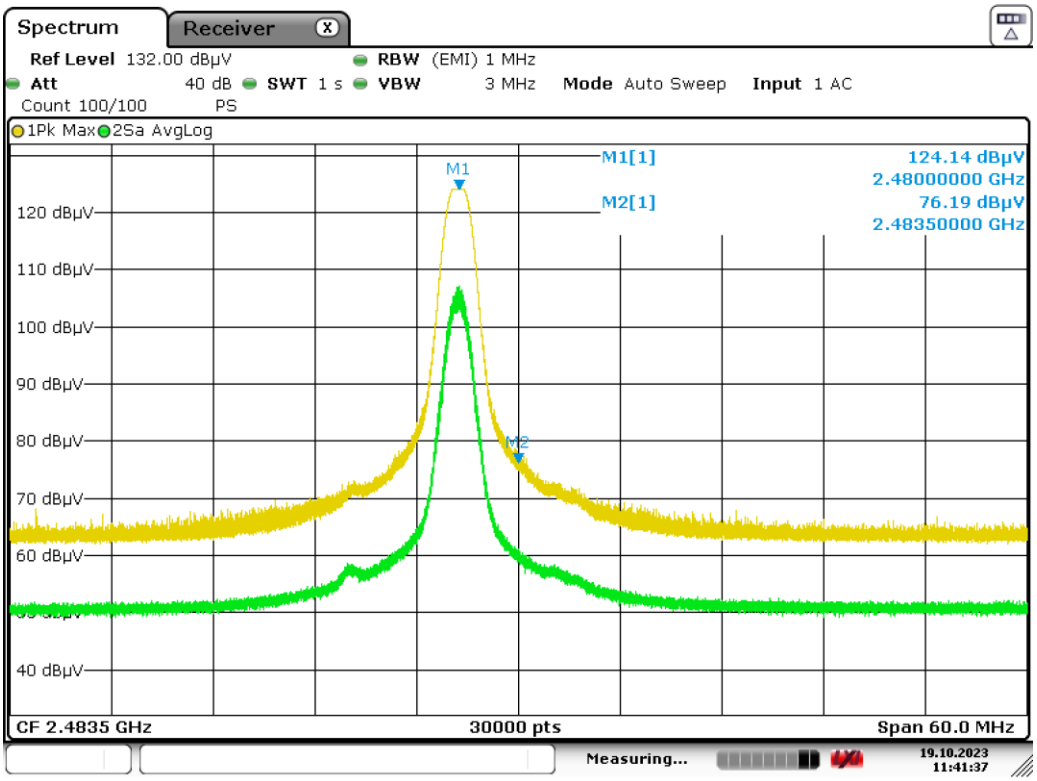
Table 18 Operation on channel 2402MHz average detector measurements

Spectrum analyser displays



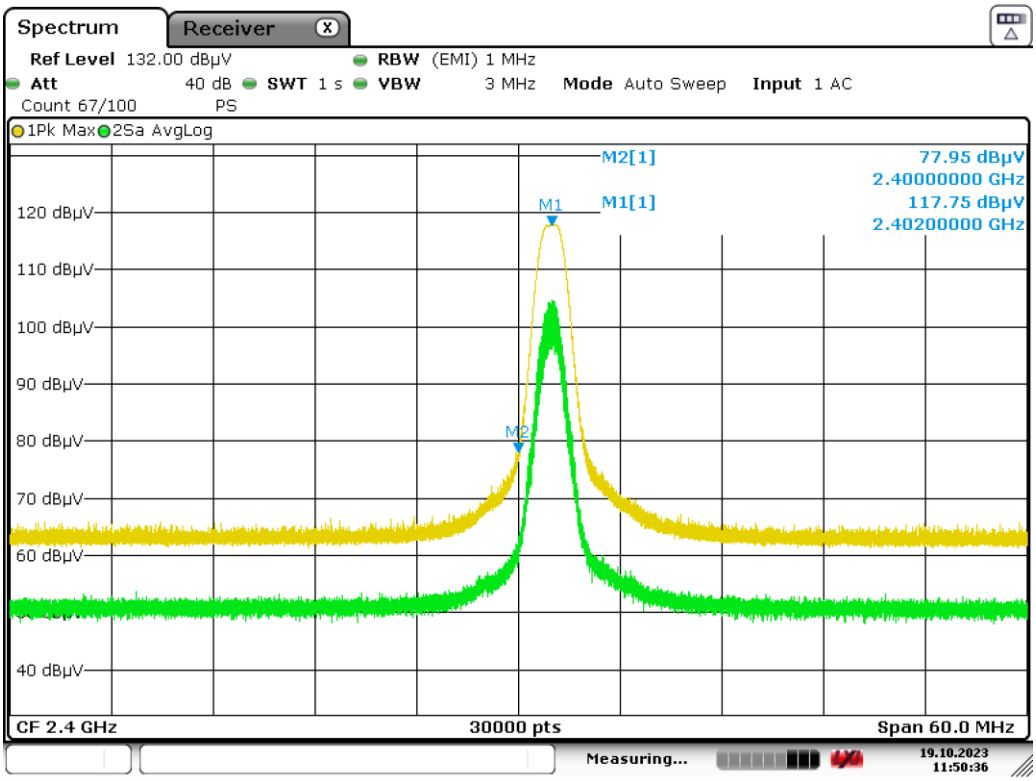
Date: 19.OCT.2023 11:36:37

Figure 33 Band Edge Measurement – upper band edge - horizontal polarity



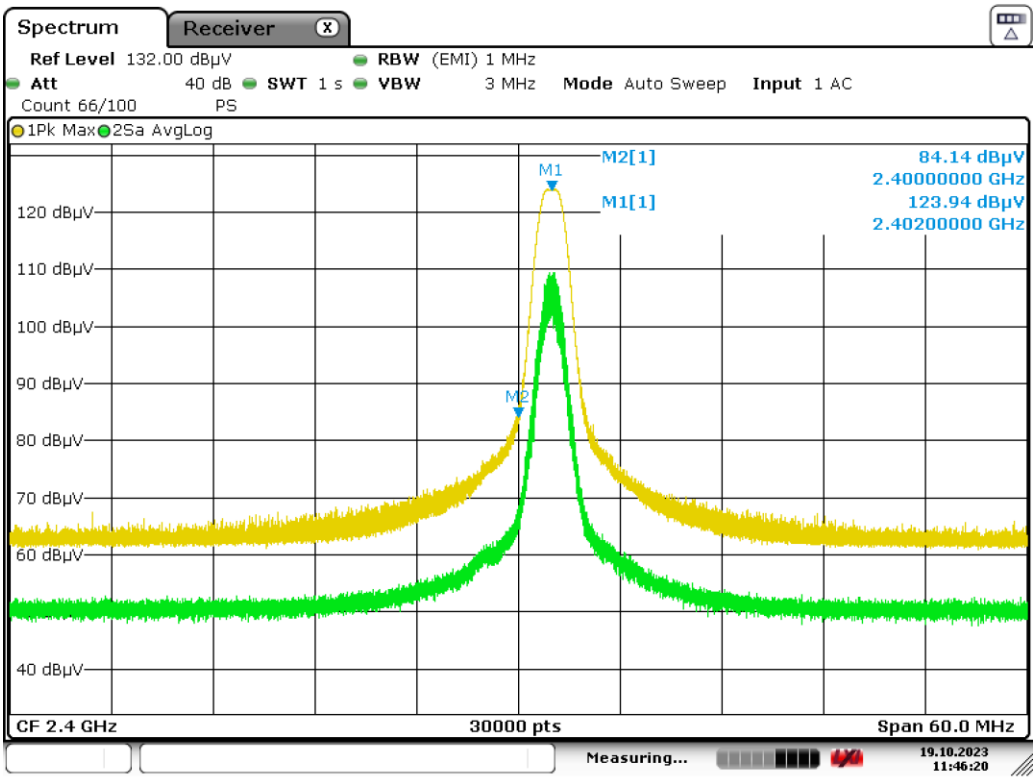
Date: 19.OCT.2023 11:41:37

Figure 34 Band Edge Measurement – upper band edge - vertical polarity



Date: 19.OCT.2023 11:50:36

Figure 35 Band Edge Measurement – lower band edge - horizontal polarity



Date: 19.OCT.2023 11:46:21

Figure 36 Band Edge Measurement – lower band edge - vertical polarity

Section 10 AC Mains Conducted Emissions

10.1 Test Specification

Standard	ANSI C63.10:2013
Measurement Uncertainty	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 +/- 3.45dB

10.2 Power Line Emission Limits

Frequency (MHz)	Class B (dBµV)	
	Quasi Peak	Average
0.15 – 0.5	66 – 56*	56 – 46*
0.5 – 5.0	56.0	46.0
5.0 - 30	60.0	50.0

Note: * The limit decreases linearly with the logarithm of the frequency in the range

10.3 Receiver Settings

Receiver Parameters	Setting
Detector Function	Quasi Peak and Average
Start Frequency	150kHz
Stop Frequency	30MHz
Resolution Bandwidth	10kHz
Video Bandwidth	Auto

10.4 Procedure and Test Software Version

Eurofins York test procedure	CEP19 Issue 9
Test software	RadiMation Version 2016.1.6

10.4.1 Date of Test

16th October 2023

10.4.2 Test Area

LAB 2

10.4.3 Tested by

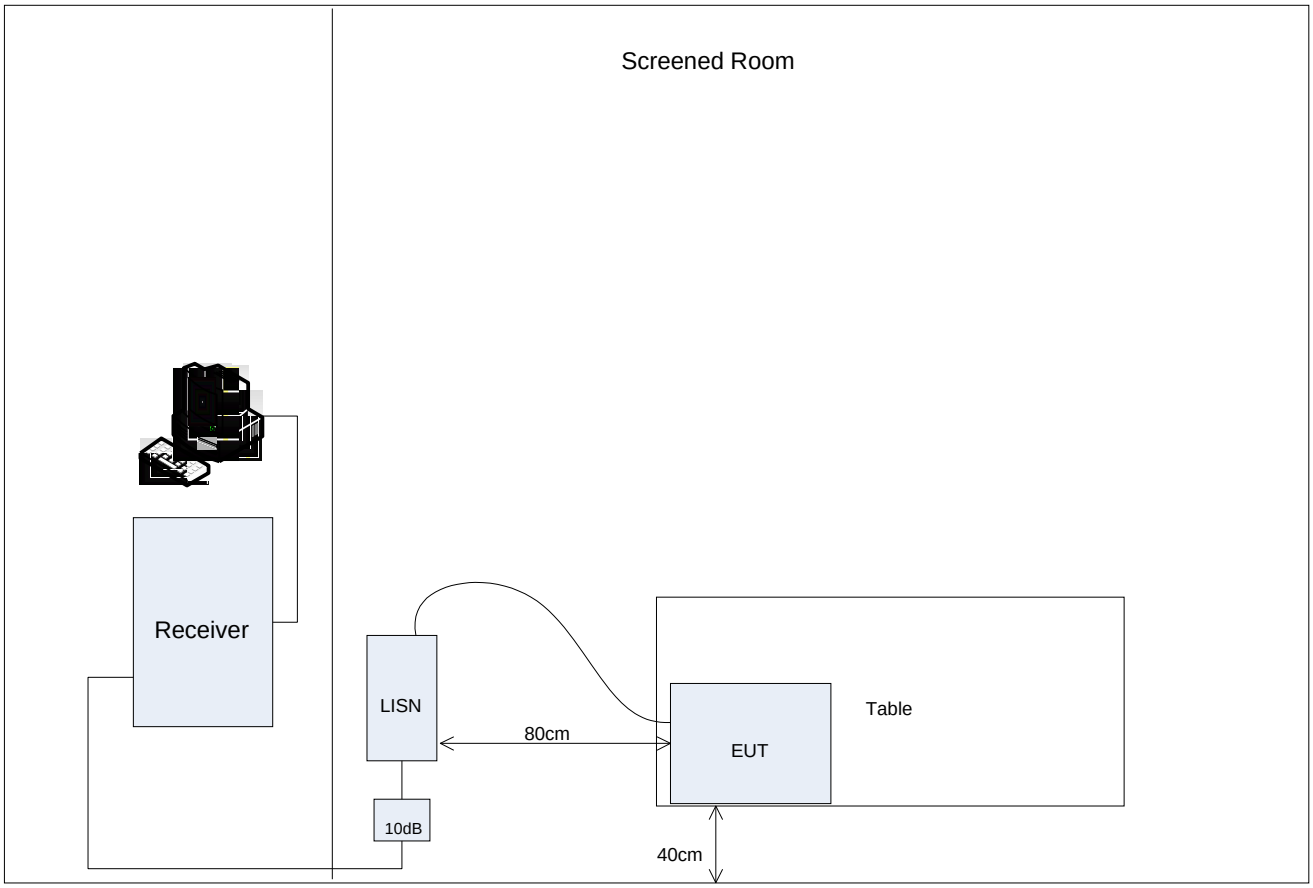
L Trickett

10.4.4 Test Setup

This test was applied to the EUT's Live and Neutral lines. The EUT was configured in the screened room on an 80cm high table was positioned 40cm from the room wall.

A calibrated mains extension lead was used to ensure a known impedance was presented to the EUT

The EUT was then powered from the mains supply via a Line Impedance Stabilisation Network (LISN).



10.5 Test Results

This section contains graphical and tabulated data. The following data is presented

Mode of Operation	Conductor	Result summary
2402 MHz transmission	Live	Pass
2402 MHz transmission	Neutral	Pass
2436 MHz transmission	Live	Pass
2436 MHz transmission	Neutral	Pass
2480 MHz transmission	Live	Pass
2480 MHz transmission	Neutral	Pass

Note: measurements were performed with the USB input connected to a representative plug top power supply.

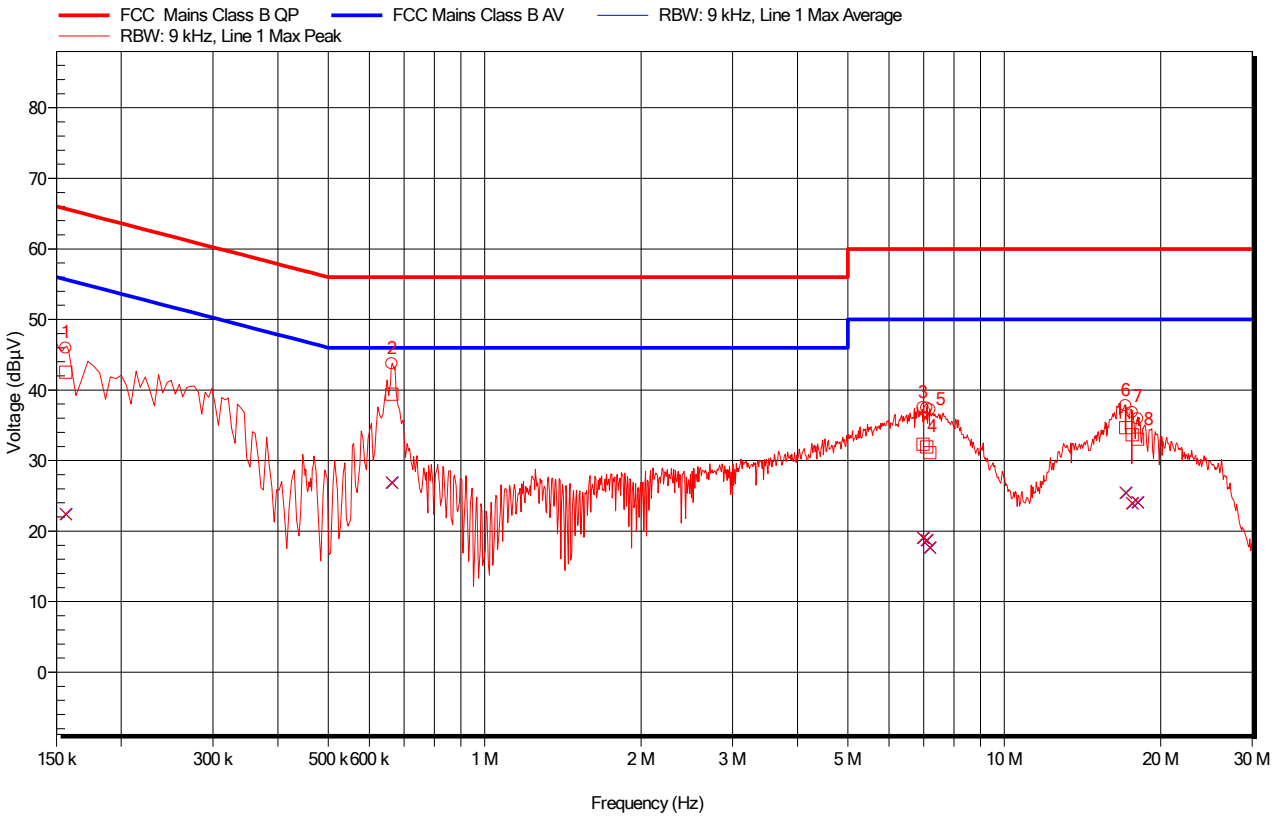


Figure 37: AC mains conducted emissions. Operation on channel 2402MHz – Live

Frequency (MHz)	Average (dBuV)	Average Limit (dBu)V	Average Difference (dB)	Average Status	Quasi-Peak (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Difference (dB)	Quasi-Peak Status
0.156	22.5	55.7	-33.2	Pass	42.5	65.7	-23.2	Pass
0.663	26.9	46.0	-19.1	Pass	39.4	56.0	-16.6	Pass
6.972	19.1	50.0	-30.9	Pass	32.3	60.0	-27.7	Pass
7.094	18.7	50.0	-31.3	Pass	31.9	60.0	-28.1	Pass
7.188	17.7	50.0	-32.3	Pass	31.1	60.0	-28.9	Pass
17.112	25.5	50.0	-24.5	Pass	34.6	60.0	-25.4	Pass
17.605	24.0	50.0	-26.01	Pass	33.6	60.0	-26.4	Pass
18.051	24.1	50.0	-25.9	Pass	33.0	60.0	-27.0	Pass

Table 19: Conducted emissions Peaks, 150kHz to 30MHz – Operation on channel 2402MHz - Live

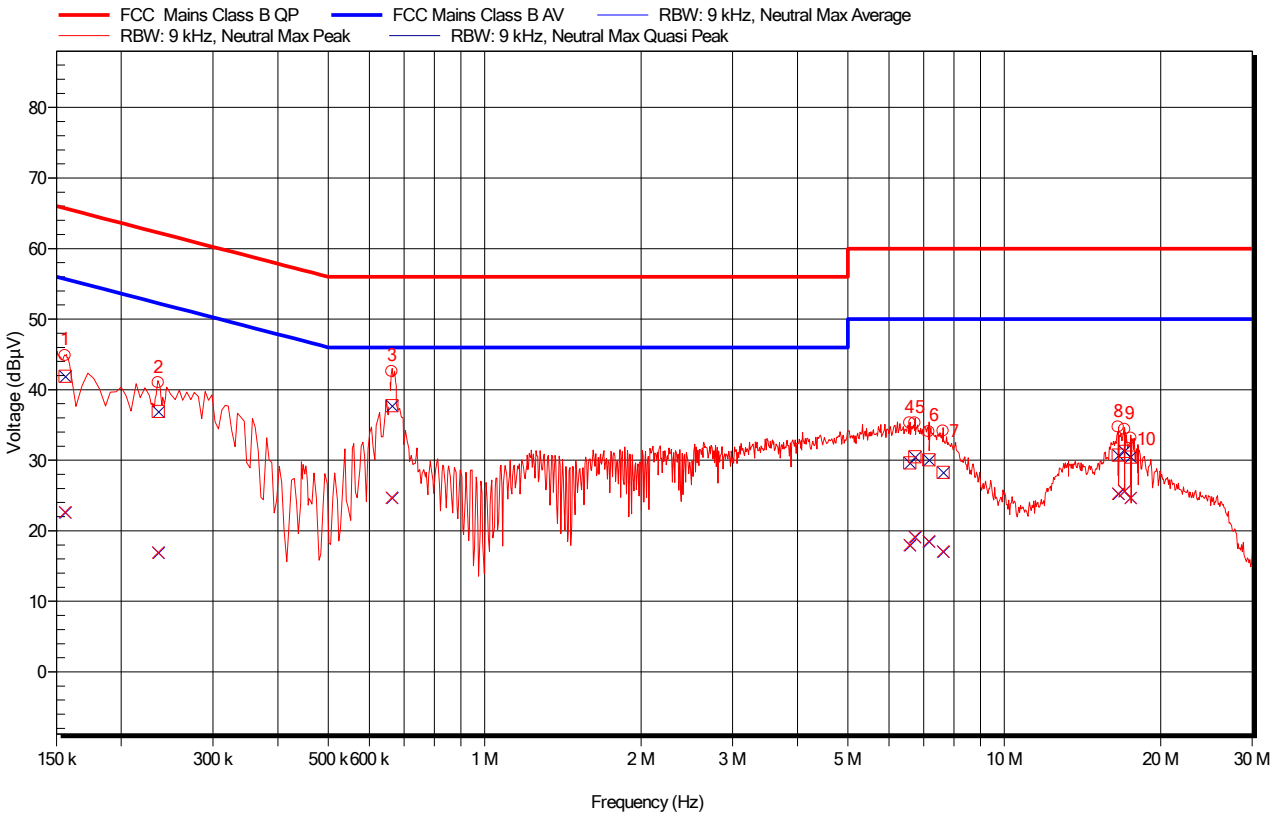


Figure 38: AC mains conducted emissions. Operation on channel 2402MHz – Neutral

Frequency (MHz)	Average (dBuV)	Average Limit (dBuV)	Average Difference (dB)	Average Status	Quasi-Peak (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Difference (dB)	Quasi-Peak Status
0.156	22.6	55.7	-33.1	Pass	41.9	65.7	-23.8	Pass
0.236	16.9	52.3	-35.3	Pass	36.9	62.3	-25.3	Pass
0.663	24.7	46.0	-21.3	Pass	37.7	56.0	-18.3	Pass
6.576	18.0	50.0	-32.0	Pass	29.6	60.0	-30.4	Pass
6.729	19.1	50.0	-30.9	Pass	30.5	60.0	-29.5	Pass
7.157	18.5	50.0	-31.5	Pass	30.1	60.0	-29.9	Pass
7.620	17.1	50.0	-32.9	Pass	28.3	60.0	-31.7	Pass
16.569	25.3	50.0	-24.7	Pass	30.7	60.0	-29.3	Pass
17.041	25.6	50.0	-24.4	Pass	31.3	60.0	-28.7	Pass
17.509	24.7	50.0	-25.3	Pass	30.4	60.0	-29.6	Pass

Table 20: Conducted emissions peaks, 150kHz to 30MHz – Operation on channel 2402MHz - Neutral

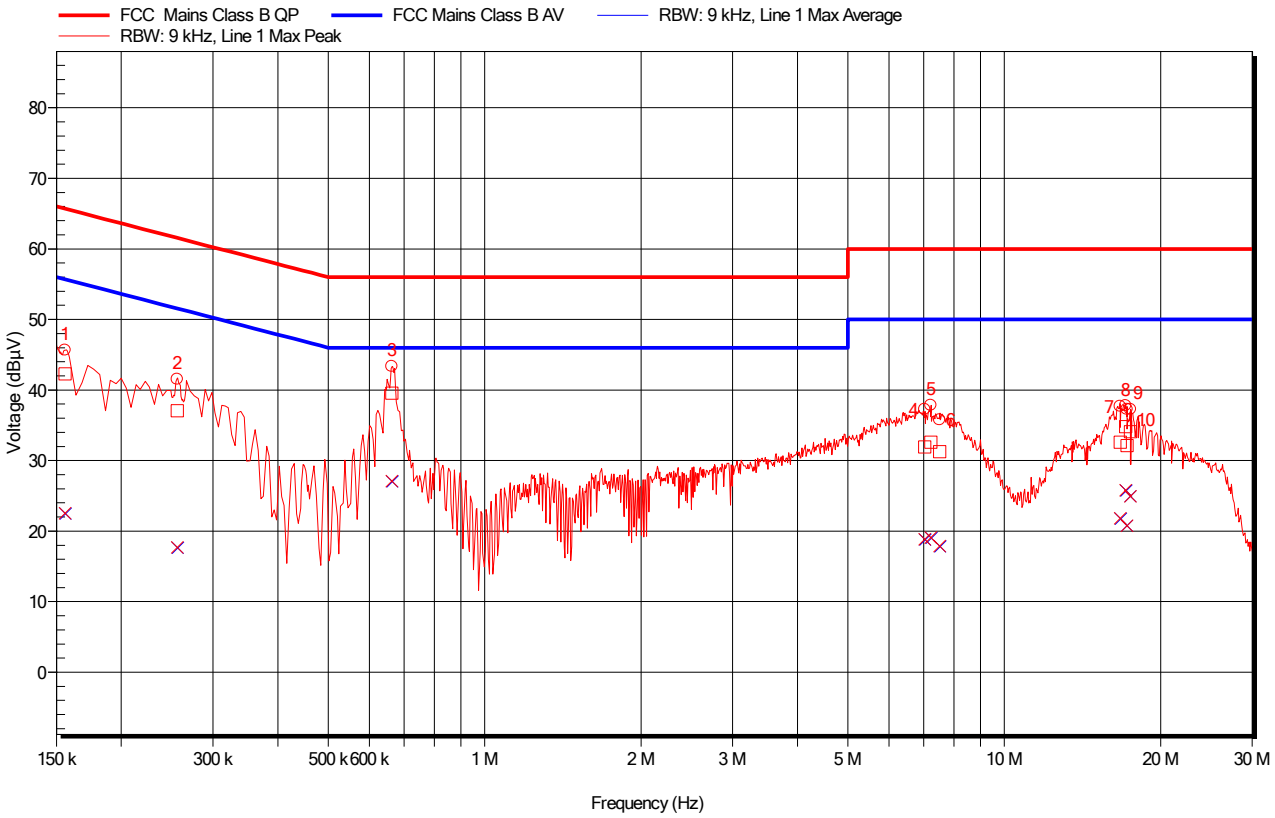


Figure 39: AC mains conducted emissions. Operation on channel 2436MHz – Live

Frequency (MHz)	Average (dBuV)	Average Limit (dBuV)	Average Difference (dB)	Average Status	Quasi-Peak (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Difference (dB)	Quasi-Peak Status
0.156	22.5	55.7	-33.2	Pass	42.3	65.7	-23.4	Pass
0.256	17.7	51.6	-33.9	Pass	37.1	61.6	-24.5	Pass
0.663	27.1	46.0	-18.9	Pass	39.5	56.0	-16.5	Pass
7.031	18.8	50.0	-31.2	Pass	31.9	60.0	-28.1	Pass
7.223	19.1	50.0	-30.9	Pass	32.6	60.0	-27.4	Pass
7.512	17.9	50.0	-32.1	Pass	31.3	60.0	-28.7	Pass
16.706	21.8	50.0	-28.2	Pass	32.6	60.0	-27.4	Pass
17.107	25.8	50.0	-24.2	Pass	34.8	60.0	-25.2	Pass
17.219	20.8	50.0	-29.2	Pass	32.1	60.0	-27.9	Pass
17.490	24.9	50.0	-25.1	Pass	34.1	60.0	-25.9	Pass

Table 21: Conducted emissions peaks, 150kHz to 30MHz – Operation on channel 2436MHz - Live

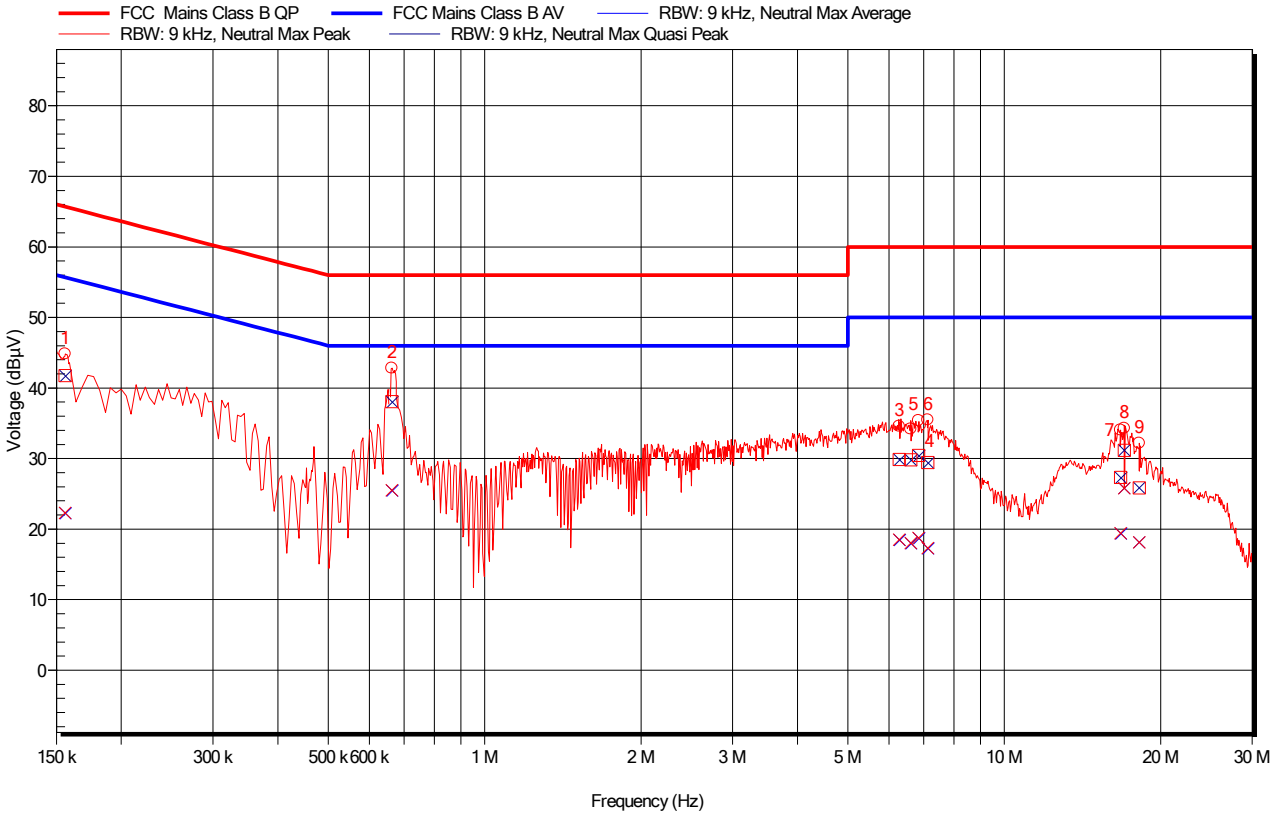


Figure 40: AC mains conducted emissions. Operation on channel 2436MHz – Neutral

Frequency (MHz)	Average (dBuV)	Average Limit (dBuV)	Average Difference (dB)	Average Status	Quasi-Peak (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Difference (dB)	Quasi-Peak Status
0.156	22.3	55.7	-33.4	Pass	41.8	65.7	-23.9	Pass
0.663	25.5	46.0	-20.5	Pass	38.0	56.0	-18.0	Pass
6.279	18.5	50.0	-31.5	Pass	29.9	60.0	-30.2	Pass
6.603	18.0	50.0	-32.0	Pass	29.8	60.0	-30.2	Pass
6.842	18.7	50.0	-31.3	Pass	30.5	60.0	-29.6	Pass
7.121	17.3	50.0	-32.7	Pass	29.5	60.0	-30.6	Pass
16.733	19.4	50.0	-30.6	Pass	27.3	60.0	-32.7	Pass
17.017	25.8	50.0	-24.2	Pass	31.2	60.0	-28.8	Pass
18.182	18.1	50.0	-31.9	Pass	25.8	60.0	-34.2	Pass

Table 22: Conducted emissions peaks, 150kHz to 30MHz – Operation on channel 2436MHz - Neutral

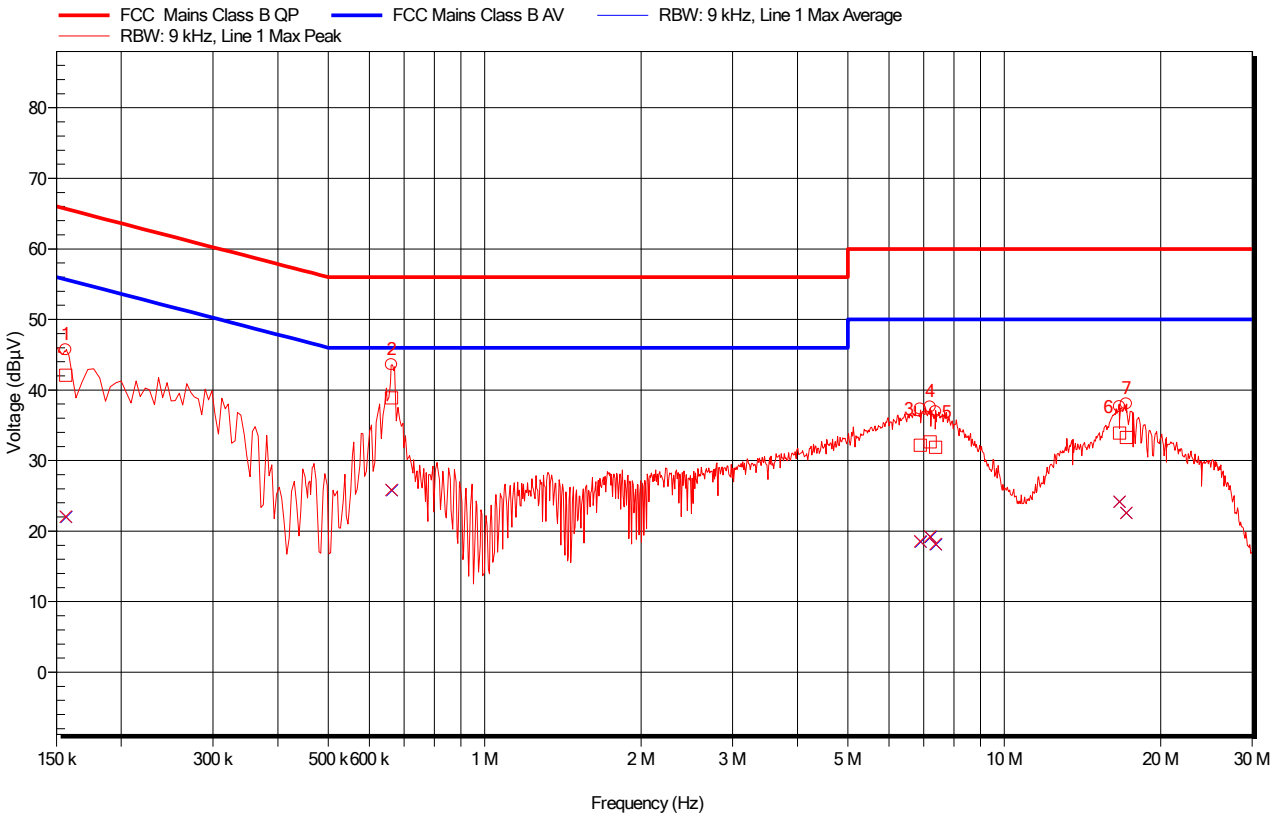


Figure 41: AC mains conducted emissions. Operation on channel 2480MHz – Live

Frequency (MHz)	Average (dBuV)	Average Limit (dBuV)	Average Difference (dB)	Average Status	Quasi-Peak (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Difference (dB)	Quasi-Peak Status
0.156	22.1	55.7	-33.6	Pass	42.1	65.7	-23.6	Pass
0.662	25.8	46.0	-20.2	Pass	38.9	56.0	-17.1	Pass
6.887	18.5	50.0	-31.5	Pass	32.2	60.0	-27.8	Pass
7.202	19.2	50.0	-30.8	Pass	32.7	60.0	-27.3	Pass
7.377	18.2	50.0	-31.9	Pass	31.9	60.0	-28.1	Pass
16.658	24.2	50.0	-25.9	Pass	33.9	60.0	-26.1	Pass
17.167	22.6	50.0	-27.4	Pass	33.3	60.0	-26.7	Pass

Table 23: Electric Field Emissions Peaks, 150kHz to 30MHz – Operation on channel 2480MHz - Live

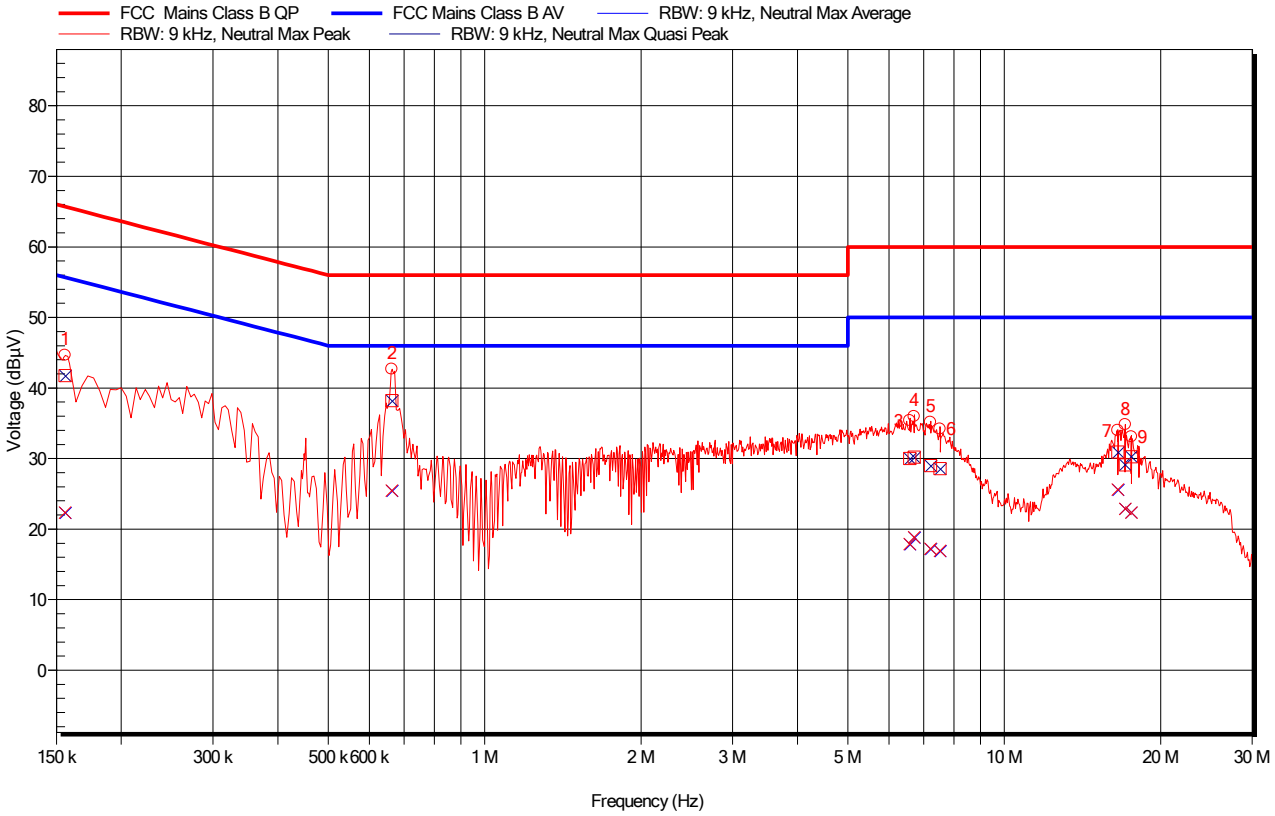


Figure 42: AC mains conducted emissions. Operation on channel 2480MHz – Neutral

Frequency (MHz)	Average (dBuV)	Average Limit (dBuV)	Average Difference (dB)	Average Status	Quasi-Peak (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Difference (dB)	Quasi-Peak Status
0.156	22.3	55.7	-33.3	Pass	41.7	65.7	-23.9	Pass
0.663	25.5	46.0	-20.6	Pass	38.2	56.0	-17.8	Pass
6.576	17.9	50.0	-32.1	Pass	30.0	60.0	-30.0	Pass
6.710	18.8	50.0	-31.2	Pass	30.2	60.0	-29.8	Pass
7.206	17.2	50.0	-32.8	Pass	29.0	60.0	-31.0	Pass
7.517	16.9	50.0	-33.1	Pass	28.6	60.0	-31.4	Pass
16.525	25.6	50.0	-24.4	Pass	30.9	60.0	-29.1	Pass
17.088	22.8	50.0	-27.2	Pass	29.1	60.0	-30.9	Pass
17.556	22.3	50.0	-27.7	Pass	30.3	60.0	-29.7	Pass

Table 24: AC mains conducted emissions, 150kHz to 30MHz – Operation on channel 2480MHz - Neutral

10.5.1 Example calculation

This correction factors required consists of LISN Insertion loss (IL), Cable loss (CL) and Transient Limiter Loss (TL)

The Actual Signal Level (ASL) is calculated as follows:

ASL (dBµV) = Indicated Signal Level (dBµV) + IL (dB) + CL (dB) + TL (dB)

10.5.2 Sample Data

The Quasi-Peak level at 17.556 MHz

ASL (dBµV) = 30.3dBµV = 19.1dBµV + 1.3dB - 0.2dB + 10.1dB

Appendix A EUT Test Photos

Test set up photographs are supplied separately.

Appendix B Test Equipment List

Conducted Emissions from Antenna Port

Item	Serial No.	Last Calibration Date	Calibration Interval
RF Cable	Cable 23	30th November 2022	12 Months
R&S ESW44 EMI Receiver	C0751	10th July 2023	12 Months
Kikusui PCR200M	C0198	-	-

Radiated Emissions Equipment

Item	Serial No.	Last Calibration Date	Calibration Interval
Laboratory 1 Semi-Anechoic Chamber	C0471	6th December 2022	36 Months
ETS Lindgren 2017B Mast (1 – 4m) with tilting mechanism	--	N/A	N/A
R & S ESR26	C0502	8th August 2023	12 Months
Kikusui PCR200M	C0198	-	-
Teseq CBL6112D Bilog Antenna	C0506	12th January 2023	36 Months
HF29 Cable	20147.01.09.001	30th November 2022	12 Months
HF31 Cable	19148.06.13.002	30th November 2022	12 Months
HF35 Cable	19149.02.13.003	30th November 2022	12 Months
HF27 Cable	19149.03.13.004	30th November 2022	12 Months
Schwarzbeck STLP 9148 Antenna 1-18GHz	C0626	12th April 2022	24 Months
2.4GHz Microtronics BRM50702 notch filter	79178	1st December 2022	12 Months
BONN BLMA 0118-M Preamplifier	C0702	7th July 2023	12 Months
ETS Lingren 3116C-PA Horn Antenna 18-40GHz	C0433	28th September 2023	36 Months

----------END OF REPORT----------