

TEST REPORT

Report Number: 101984602MIN-001

Project Number: G101984602

Testing performed on the
BLE module

FCC ID: 2AEA5-ZXB16

Industry Canada ID: 12670A-ZXB16

to

47 CFR Part 15. 249:2010

RSS- 210, Issue 8, 2010

RSS-Gen, Issue 3, 2010

47 CFR, Part 15:2010, §15.107 and §15.109, Class / ICES-003, Issue 5:2012

For

Zivix, LLC

Test Performed by:
Intertek Testing Services NA, Inc.
7250 Hudson Blvd., Suite 100
Oakdale, MN 55128 USA

Test Authorized by:
Zivix, LLC
4150 Olson Memorial Hwy #400
Golden Valley, MN 55422, USA

Prepared by: Richard Blonigen
Richard Blonigen

Reviewed by: Uri Spector
Uri Spector

Date of issue: February 23, 2015

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.



TABLE OF CONTENTS

1.0 GENERAL DESCRIPTION.....3

1.1 Product Description; Test Facility.....4

1.3 Environmental conditions5

1.4 Measurement uncertainty.....6

1.5 Field Strength Calculation6

2.0 TEST SUMMARY.....7

3.0 TEST CONDITIONS AND RESULTS.....8

3.1 Field strength of fundamental.....8

3.2 Field strength of harmonics and spurious emissions12

3.3 Bandwidth of Emissions26

3.4 Transmitter power line conducted emissions31

3.5 Receiver/digital device radiated emissions34

3.6 Digital device conducted emissions44

4.0 TEST EQUIPMENT.....47

5.0 REVISION HISTORY.....48



1.0 GENERAL DESCRIPTION

Model:	BLE module
Type of EUT:	RF Module
FCC ID:	2AEA5-ZXB16
Industry Canada ID:	12670A-ZXB16
Related Submittal(s) Grants:	None
Company:	Zivix, LLC
Customer:	Mr. Dennys Bisogno
Address:	4150 Olson Memorial Hwy #400 Golden Valley, MN 55422
Phone:	(612) 225-0096
Test Standards:	☒ 47 CFR, Part 15:2010, §15.249 ☒ RSS-210, Issue 8, 20010 ☒ RSS-Gen, Issue 3, 2010 ☒ 47 CFR, Part 15:2010, §15.107 and §15.109, Class B ☒ ICES-003, Issue 5:2012 ☐ Other
Type of radio:	☐ Stand -alone ☒ Module ☐ Hybrid
Date Sample Submitted:	January 27, 2015
Test Work Started:	January 27, 2015
Test Work Completed:	January 29, 2015
Test Sample Conditions:	☐ Damaged ☐ Poor (Usable) ☒ Good



1.1 Product Description; Test Facility

Product Description:	RF Module
Band of Operation	2400 – 2483.5 MHz
Operating Frequency	2402 – 2480 MHz
Number of Channels	79
Modulation:	G2D
Emission Designator:	1M89G2D
Antenna(s) Info:	Integral Antenna
Antenna Installation:	☐ User ☐ Professional ☒ Factory
Transmitter Power Configuration:	☐ Internal battery ☒ External power source ☒ Other: Powered via USB through a host device ■ Amp. ☐ 50Hz ☐ 60Hz
Special Test Arrangement:	As a potentially hand-held device the EUT was rotated through three orthogonal axes to determine and tested with the maximum emissions
Test Facility Accreditation:	A2LA (Certificate No. 1427.01)
Test Methodology:	Measurements performed according to the procedures in ANSI C63.10-2009

1.2 EUT Configuration

The equipment under test was operated during the measurement under the following conditions:

- ☐ - Standby
- ☒ - Continuous
- ☒ - Continuous un-modulated
- ☐ - Test program (customer specific)
- ☐ -

Operating modes of the EUT:

No.	Description
1	The EUT was pre-programmed to transmit continuously at a low, middle, and high (2402, 2440, 2480MHz) frequency using either a modulated or unmodulated signal, or set in receive mode

Cables:

No.	Type	Length	Designation	Note
1	Unshielded USB	<3m	USB, powered EUT through laptop computer	

Support equipment/Services:

No.	Item	Description
1	HP Elitebook 6930	Host Laptop computer

1.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

☒ **Normal**

Temperature: 15-35 ° C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

1.4 Measurement uncertainty

The expanded uncertainty ($k = 2$) for radiated emissions from 30 to 1000 MHz has been determined to be: ± 4 dB at 10m and ± 5.4 dB at 3m

The expanded uncertainty ($k = 2$) for conducted emissions from 150 kHz to 30 MHz has been determined to be:
 ± 2.6 dB

1.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured emissions reading on the EMI Receiver.

The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where: FS = Field Strength in dB(μ V/m)

RA = Receiver Amplitude in dB(μ V)

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB(m^{-1})

AG = Amplifier Gain in dB

Assume a receiver reading of 48.1 dB(μ V) is obtained. The antenna factor of 7.4 dB(m^{-1}) and cable factor of 1.6 dB is added and amplifier gain of 16.0 dB is subtracted giving field strength of 41.1 dB(μ V/m).

$$RA = 48.1 \text{ dB}(\mu\text{V})$$

$$AF = 7.4 \text{ dB}(m^{-1})$$

$$CF = 1.6 \text{ dB}$$

$$AG = 16.0 \text{ dB}$$

$$FS = RA + AF + CF - AG$$

$$FS = 48.1 + 7.4 + 1.6 - 16.0$$

$$FS = 41.1 \text{ dB}(\mu\text{V}/\text{m})$$

General notes:

2.0 TEST SUMMARY

Referring to the performance criteria and the operating mode during the tests specified in this report, the equipment complies with the requirements according to the following standards.

TEST SPECIFICATION	TEST PARAMETERS	RESULT
15.249(a) / RSS-210 A2.9(a)	Field strength of fundamental	Pass
15.249(a) / RSS-210 A2.9(a)	Field strength of harmonics	Pass
15.249(d) / RSS-210 A2.9(b)	Field strength of spurious emissions	Pass
15.215(c) / RSS- Gen 4.6.1	Bandwidth of the emission	Pass
15.207/RSS-Gen 7.2.2	Transmitter Power Line conducted emissions	Pass
15.109/ICES-003	Receiver/digital device radiated emissions	Pass
15.107/ ICES-003	Digital device conducted emissions	Pass



3.0 TEST CONDITIONS AND RESULTS

3.1 Field strength of fundamental

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test distance: ☐ 10 meters ☒ 3 meters

Frequency range of measurements: 2400 – 2483.5MHz

Test result: Pass

Max. Emissions margin at fundamental: 26.9 dB below the limits

Notes: None

Date:	January 27, 2015	Result: Pass
Standard:	FCC 15.249(a) / RSS-210 A2.9	
Tested by:	Simon Khazon	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	Low Fundamental Frequency: 2402MHz	

Table 3.1.1

Frequency MHz	Antenna		Ant. CF dB1/m	Cable loss dB	Pre-amp Gain (dB)	Reading dBμV	Total @ 3m dBμV/m	Limit dBμV/m	Margin dB	Comments
	Polarity	Hts(cm)								
			Position X							
2402.00	V	100	28.4	2.9	0.0	38.9	70.2	114.0	-43.8	Peak
2402.00	H	100	28.4	2.9	0.0	41.7	73.0	114.0	-41.0	Peak
2402.00	V	100	28.4	2.9	0.0	24.1	55.4	94.0	-38.6	Average
2402.00	H	100	28.4	2.9	0.0	26.9	58.2	94.0	-35.8	Average
			Position Y							
2402.00	V	100	28.4	2.9	0.0	49.5	80.8	114.0	-33.2	Peak
2402.00	H	202	28.4	2.9	0.0	50.2	81.5	114.0	-32.5	Peak
2402.00	V	100	28.4	2.9	0.0	32.7	64.0	94.0	-30.0	Average
2402.00	H	202	28.4	2.9	0.0	33.4	64.7	94.0	-29.3	Average
			Position Z							
2402.00	V	100	28.4	2.9	0.0	48.7	80.0	114.0	-34.0	Peak
2402.00	H	163	28.4	2.9	0.0	50.3	81.6	114.0	-32.4	Peak
2402.00	V	100	28.4	2.9	0.0	31.7	63.0	94.0	-31.0	Average
2402.00	H	163	28.4	2.9	0.0	32.7	64.0	94.0	-30.0	Average

Date:	January 27, 2015	Result: Pass
Standard:	FCC 15.249(a) / RSS-210 A2.9	
Tested by:	Simon Khazon	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	Low Fundamental Frequency: 2440MHz	

Table 3.1.2

Frequency MHz	Antenna		Ant. CF dB1/m	Cable loss dB	Pre-amp Gain (dB)	Reading dBμV	Total @ 3m dBμV/m	Limit dBμV/m	Margin dB	Comments
	Polarity	Hts(cm)								
			Position X							
2440.00	V	100	28.5	2.9	0.0	53.4	84.8	114.0	-29.2	Peak
2440.00	H	168	28.5	2.9	0.0	50.3	81.7	114.0	-32.3	Peak
2440.00	V	100	28.5	2.9	0.0	33.4	64.8	94.0	-29.2	Average
2440.00	H	168	28.5	2.9	0.0	31.4	62.8	94.0	-31.2	Average
			Position Y							
2440.00	V	100	28.5	2.9	0.0	52.1	83.5	114.0	-30.5	Peak
2440.00	H	181	28.5	2.9	0.0	59.3	90.7	114.0	-23.3	Peak
2440.00	V	100	28.5	2.9	0.0	32.5	63.9	94.0	-30.1	Average
2440.00	H	181	28.5	2.9	0.0	35.4	66.8	94.0	-27.2	Average
			Position Z							
2440.00	V	100	28.5	2.9	0.0	55.3	86.7	114.0	-27.3	Peak
2440.00	H	148	28.5	2.9	0.0	54.3	85.7	114.0	-28.3	Peak
2440.00	V	100	28.5	2.9	0.0	32.4	63.8	94.0	-30.2	Average
2440.00	H	148	28.5	2.9	0.0	32.6	64.0	94.0	-30.0	Average

Date:	January 27, 2015	Result: Pass
Standard:	FCC 15.249(a) / RSS-210 A2.9	
Tested by:	Simon Khazon	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	Low Fundamental Frequency: 2480MHz	

Table 3.1.3

Frequency MHz	Antenna		Ant. CF dB1/m	Cable loss dB	Pre-amp Gain (dB)	Reading dBμV	Total @ 3m dBμV/m	Limit dBμV/m	Margin dB	Comments
	Polarity	Hts(cm)								
			Position X							
2480.00	V	100	28.6	2.9	0.0	53.6	85.1	114.0	-28.9	Peak
2480.00	H	122	28.6	2.9	0.0	54.1	85.6	114.0	-28.4	Peak
2480.00	V	100	28.6	2.9	0.0	33.1	64.6	94.0	-29.4	Average
2480.00	H	122	28.6	2.9	0.0	31.4	62.9	94.0	-31.1	Average
			Position Y							
2480.00	V	100	28.6	2.9	0.0	50.9	82.4	114.0	-31.6	Peak
2480.00	H	199	28.6	2.9	0.0	54.8	86.3	114.0	-27.7	Peak
2480.00	V	100	28.6	2.9	0.0	27.4	58.9	94.0	-35.1	Average
2480.00	H	199	28.6	2.9	0.0	32.3	63.8	94.0	-30.2	Average
			Position Z							
2480.00	V	100	28.6	2.9	0.0	55.6	87.1	114.0	-26.9	Peak
2480.00	H	143	28.6	2.9	0.0	52.3	83.8	114.0	-30.2	Peak
2480.00	V	100	28.6	2.9	0.0	34.3	65.8	94.0	-28.2	Average
2480.00	H	143	28.6	2.9	0.0	29.2	60.7	94.0	-33.3	Average



3.2 Field strength of harmonics and spurious emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test distance: ☐ 10 meters ☒ 3 meters

Frequency range of measurements: 30MHz-26000MHz

Test result: Pass

Max. margin of harmonics and spurious emissions: 13.4 dB below the limits

Max. Emissions margin at Bandedge: 4.2 dB below the limits

- Notes:**
1. It was determined from the Fundamental Emissions readings that the orientation of the EUT during testing has minimal effect on the output readings. Therefore, the orientation of the EUT during testing was considered to be irrelevant.
 2. No emissions above the 3rd harmonic were detected.
 3. Table 3.2.1 shows harmonics and spurious emissions
 4. Table 3.2.2 shows bandedge emissions.
-

Date:	January 28, 2015	Result: Pass
Standard:	FCC 15.249(a) and (d) / RSS-210 A2.9	
Tested by:	Richard Blonigen	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	none	

Table 3.2.1

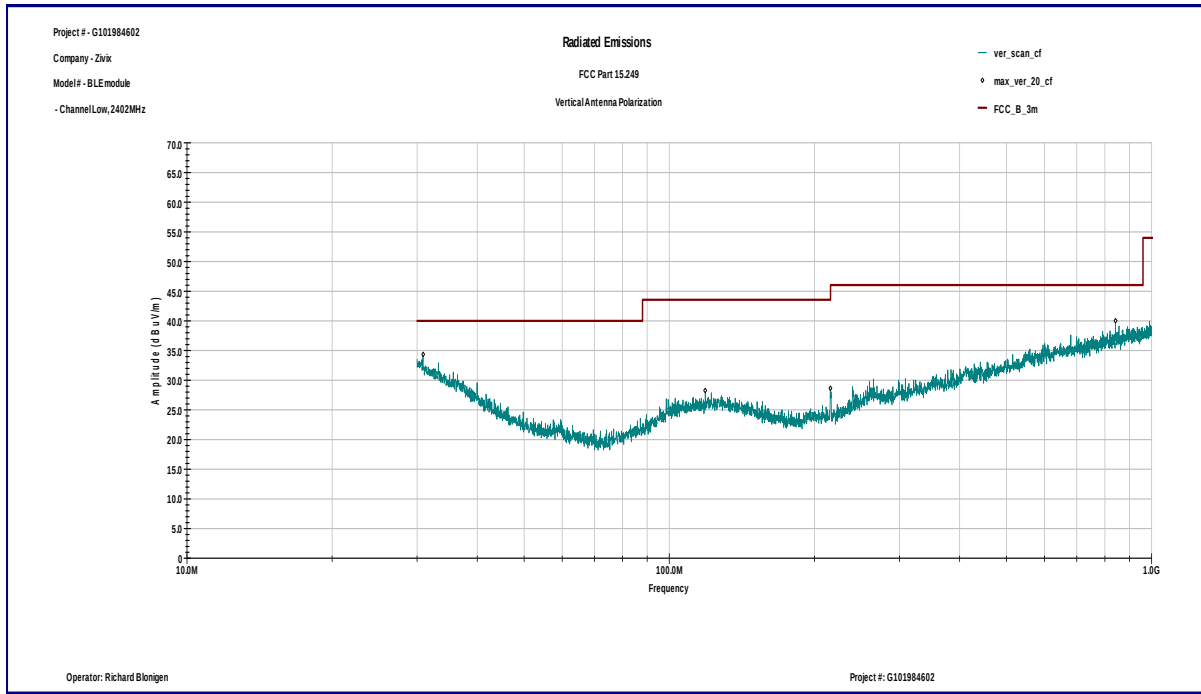
Frequency MHz	Antenna		Ant. CF dB1/m	Cable loss dB	Pre-amp Gain (dB)	AVG Reading dBμV	Total @ 3m dBμV/m	Limit dBμV/m	Margin dB	Comments
	Polarity	Hts(cm)								
Channel 2402MHz										
4804.00	V	134	33.1	4.1	42.1	39.9	35.0	54.0	-19.0	
7206.00	V	136	35.8	5.3	41.4	35.5	35.2	54.0	-18.8	
4804.00	H	183	33.1	4.1	42.1	38.2	33.2	54.0	-20.8	
7206.00	H	150	35.8	5.3	41.4	34.2	33.9	54.0	-20.1	
Channel 2440MHz										
4880.00	V	130	33.1	4.1	42.1	39.4	34.6	54.0	-19.4	
7320.00	V	160	36.1	5.3	41.2	35.2	35.3	54.0	-18.6	
4880.00	H	165	33.1	4.1	42.1	38.3	33.5	54.0	-20.5	
7320.00	H	129	36.1	5.3	41.2	33.9	34.0	54.0	-19.9	
Channel 2480MHz										
4960.00	V	184	33.2	4.1	42.0	38.9	34.2	54.0	-19.7	
7440.00	V	163	36.4	5.4	41.1	39.9	40.6	54.0	-13.4	
4960.00	H	162	33.2	4.1	42.0	35.0	30.3	54.0	-23.7	
7440.00	H	167	36.4	5.4	41.1	35.9	36.5	54.0	-17.5	

Table 3.2.2

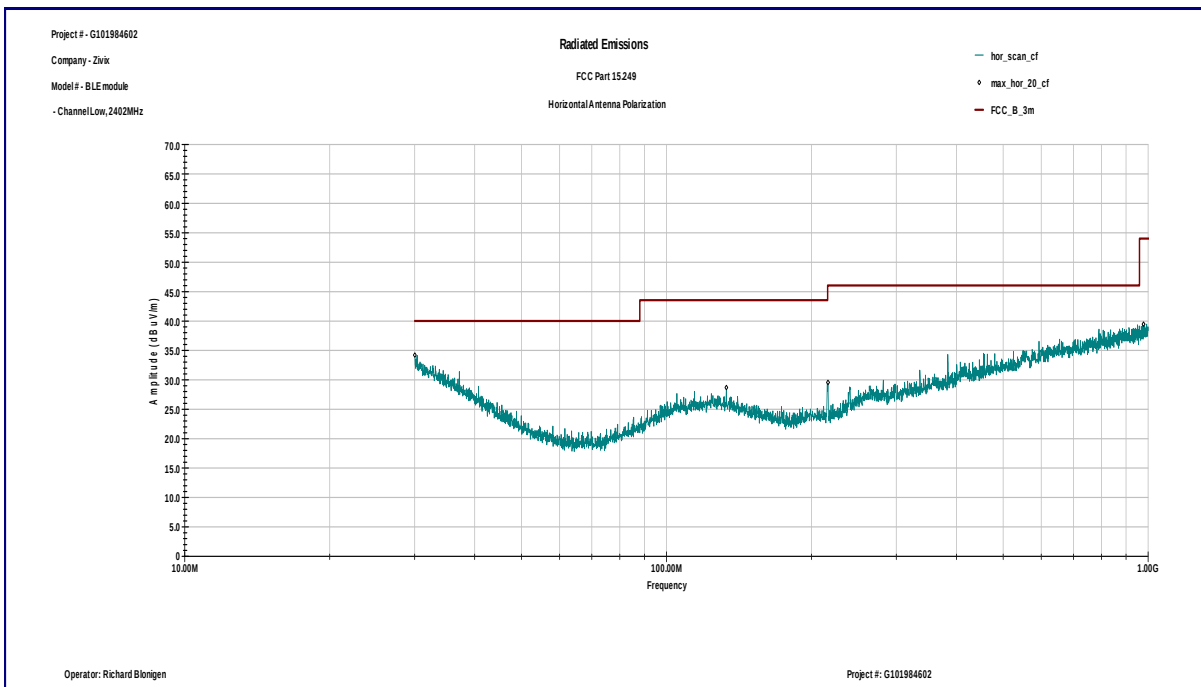
Frequency MHz	Antenna		Ant. CF dB1/m	Cable loss dB	Pre-amp Gain (dB)	Reading dBμV	Total @ 3m dBμV/m	Limit dBμV/m	Margin dB	Comments
	Polarity	Hts(cm)								
2400.00	H	100	28.4	2.9	0.0	24.5	55.8	60.0	-4.2	
2483.50	H	122	28.6	2.9	0.0	14.0	45.5	60.0	-14.5	

Graph 3.2.1

Vertical antenna polarization

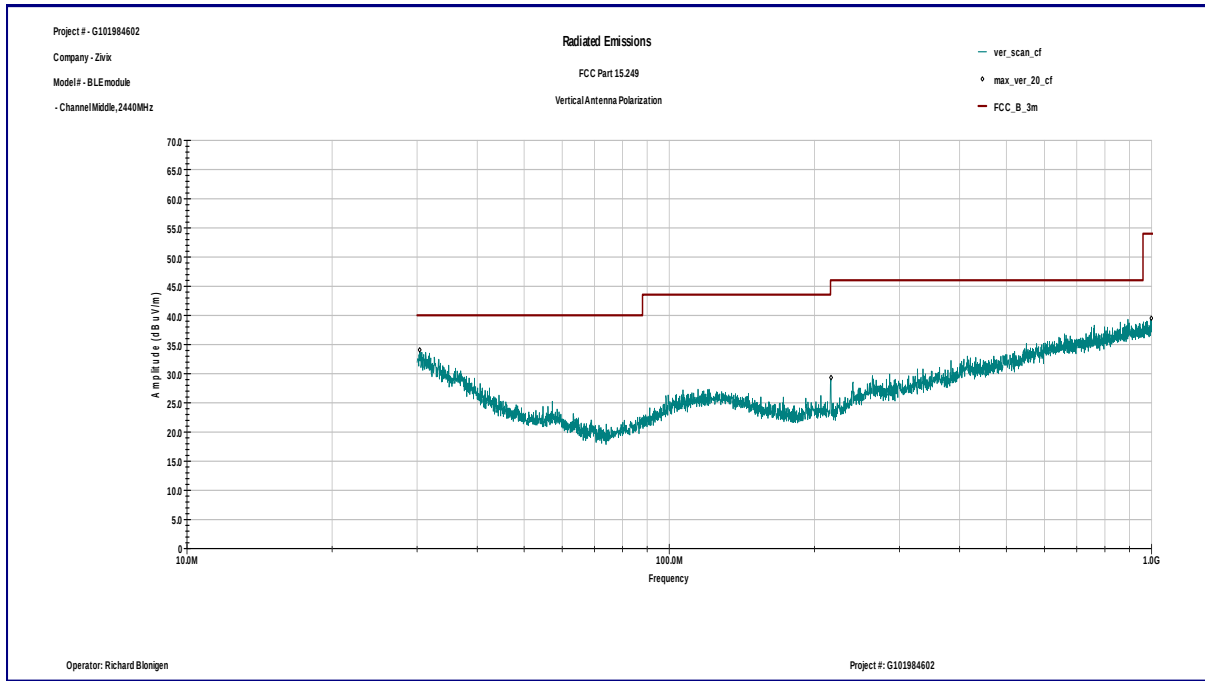


Horizontal antenna polarization

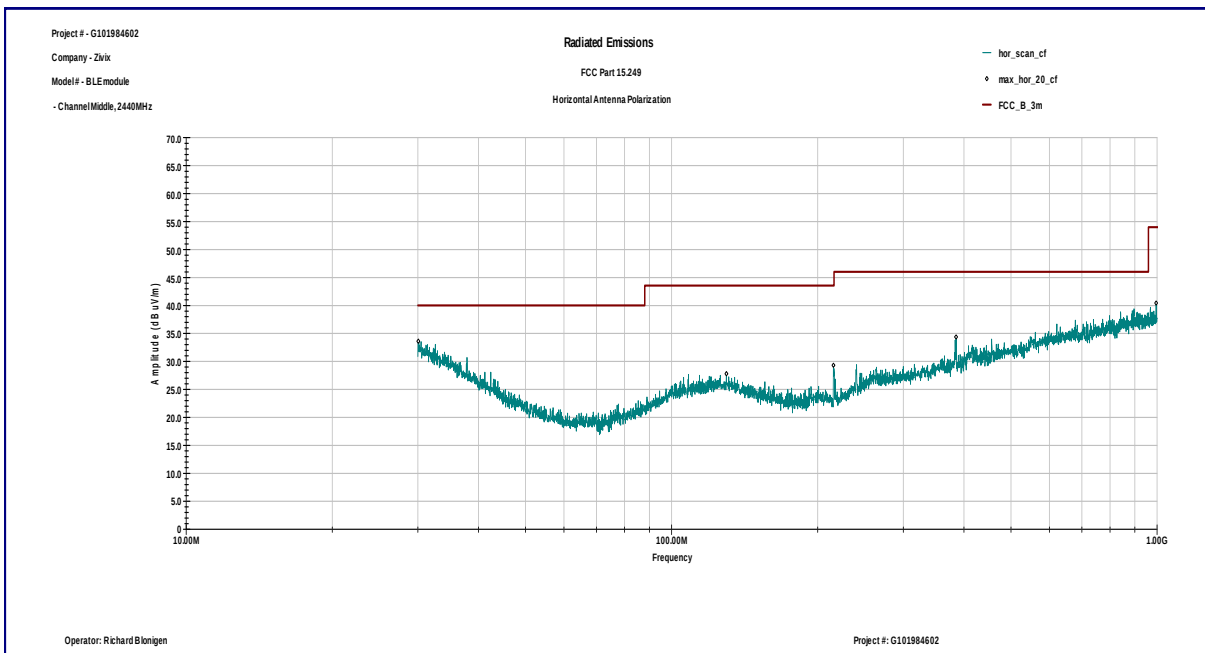


Graph 3.2.2

Vertical antenna polarization

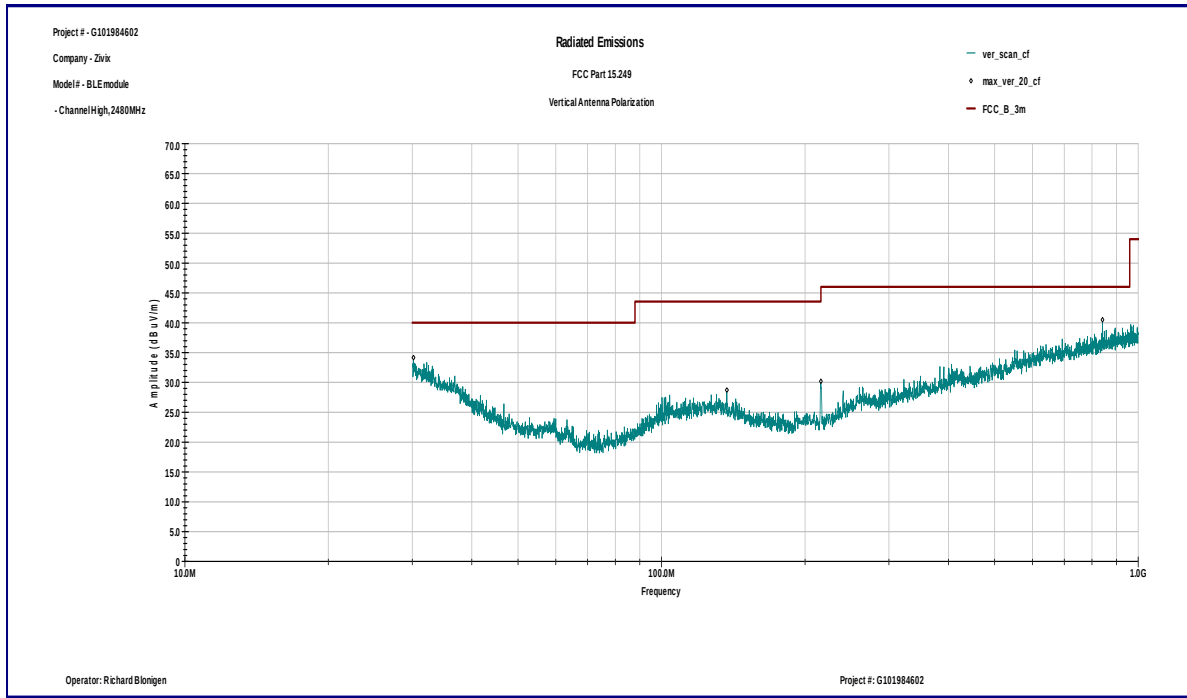


Horizontal antenna polarization

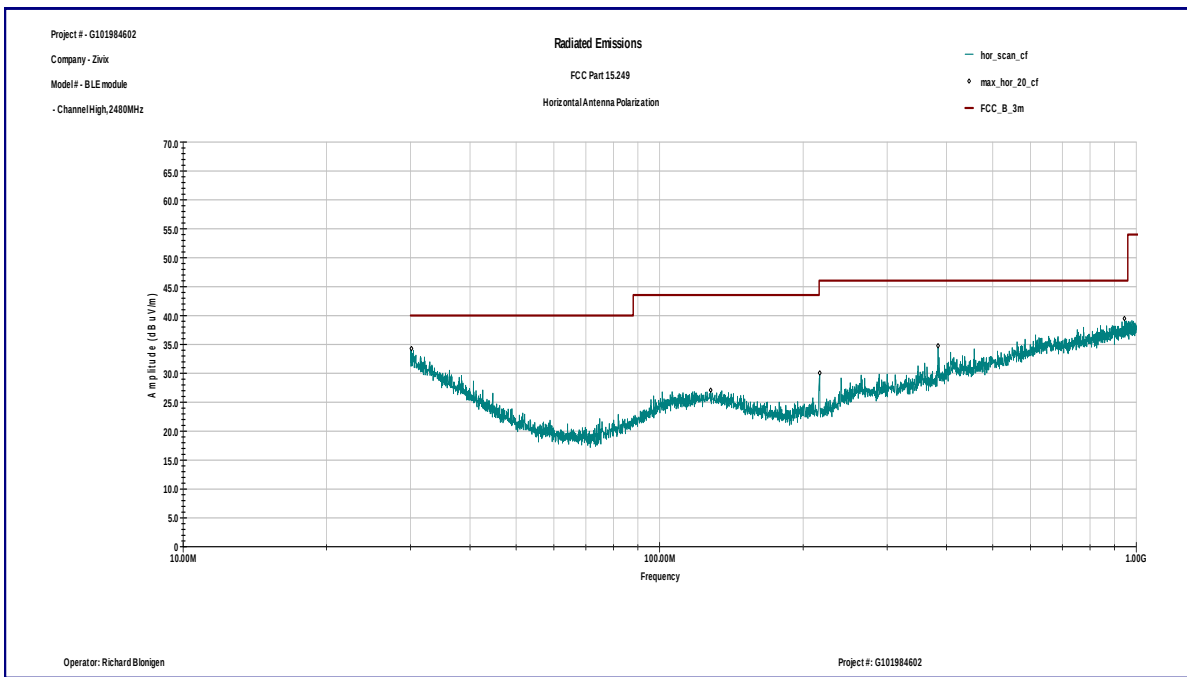


Graph 3.2.3

Vertical antenna polarization

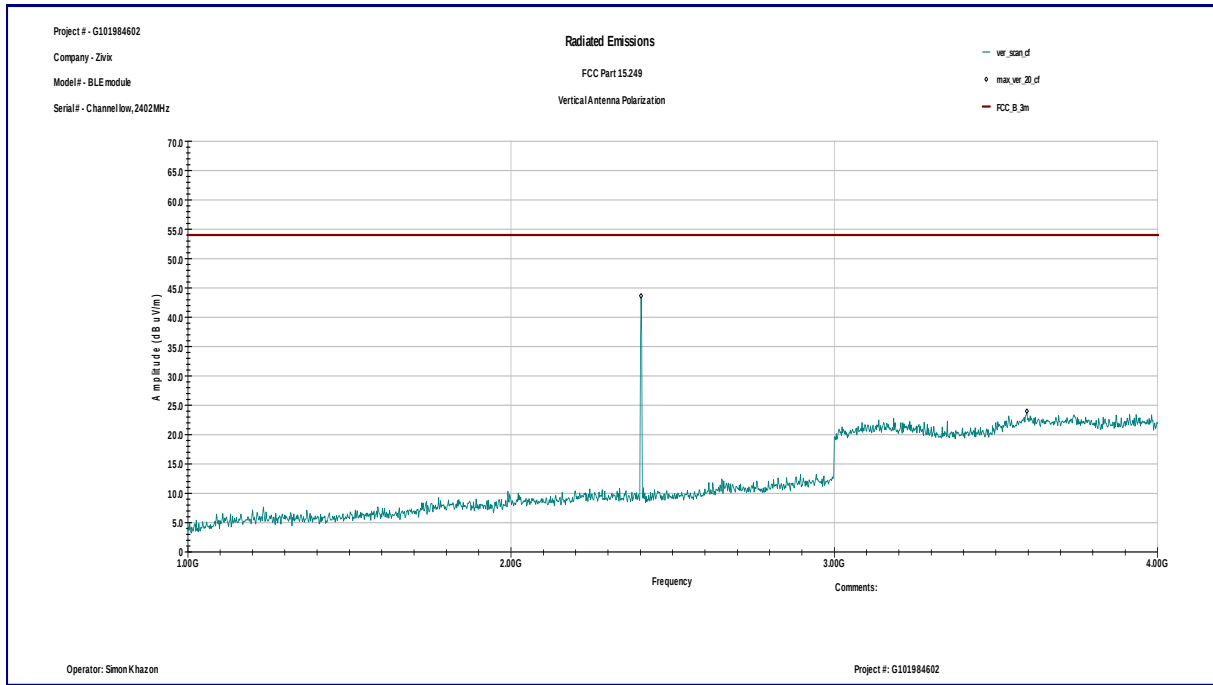


Horizontal antenna polarization

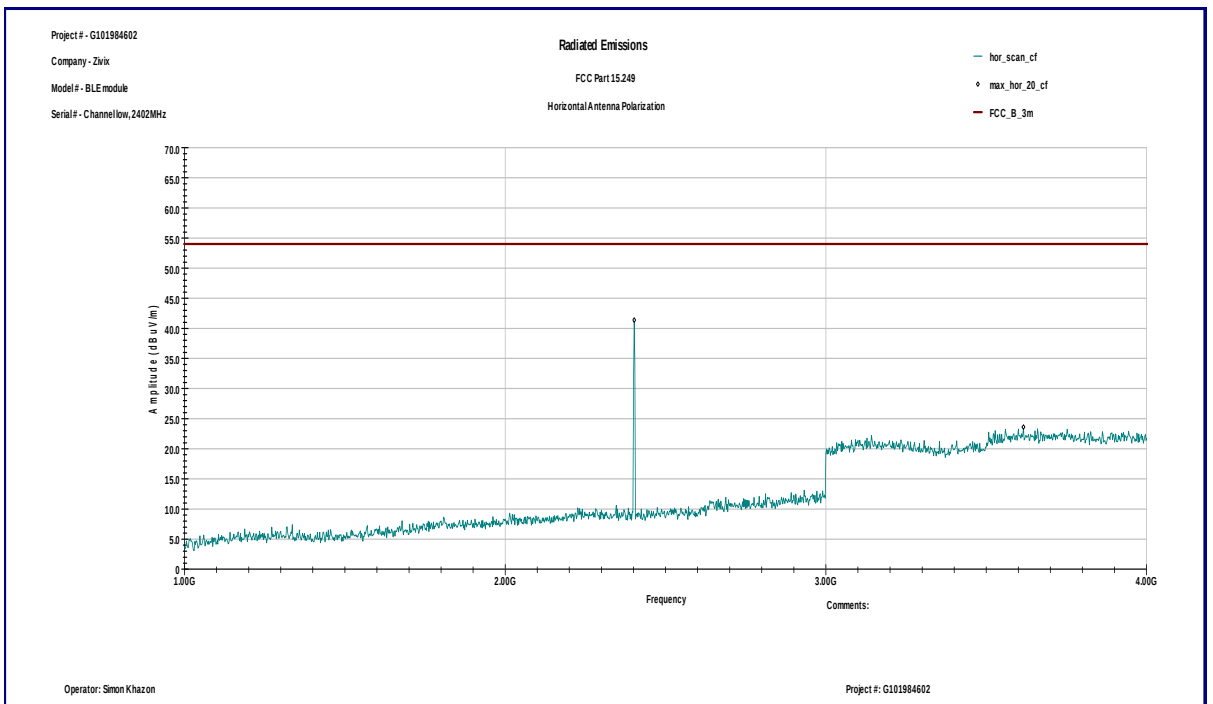


Graph 3.2.4

Vertical antenna polarization

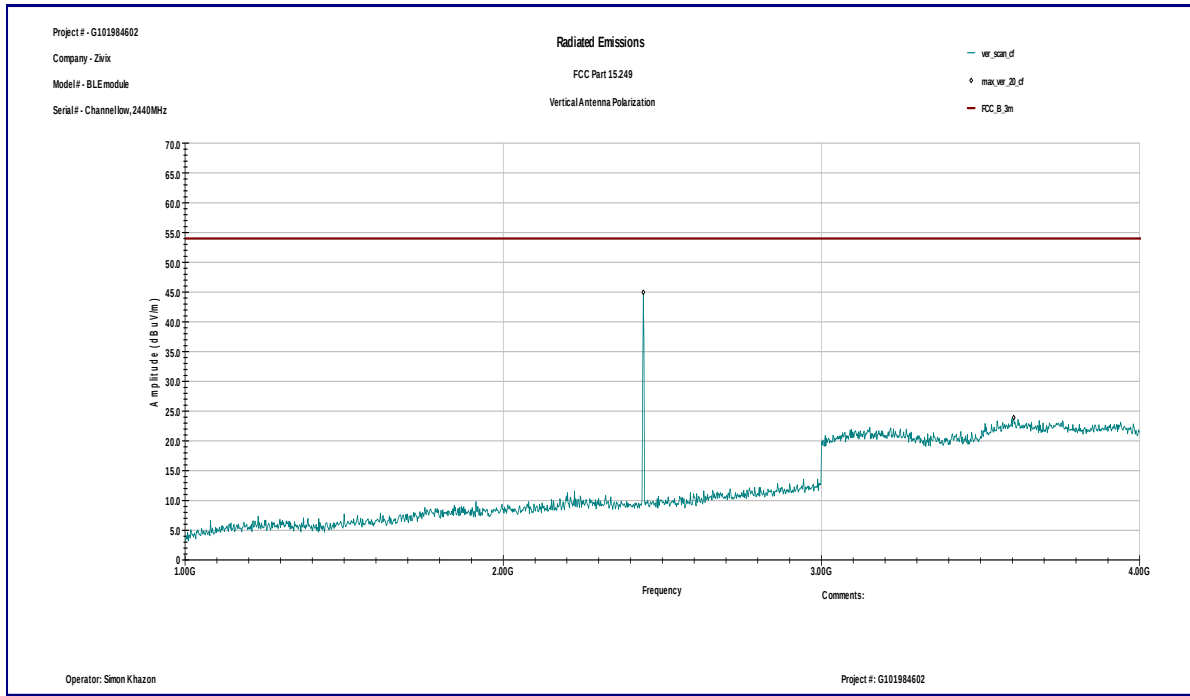


Horizontal antenna polarization

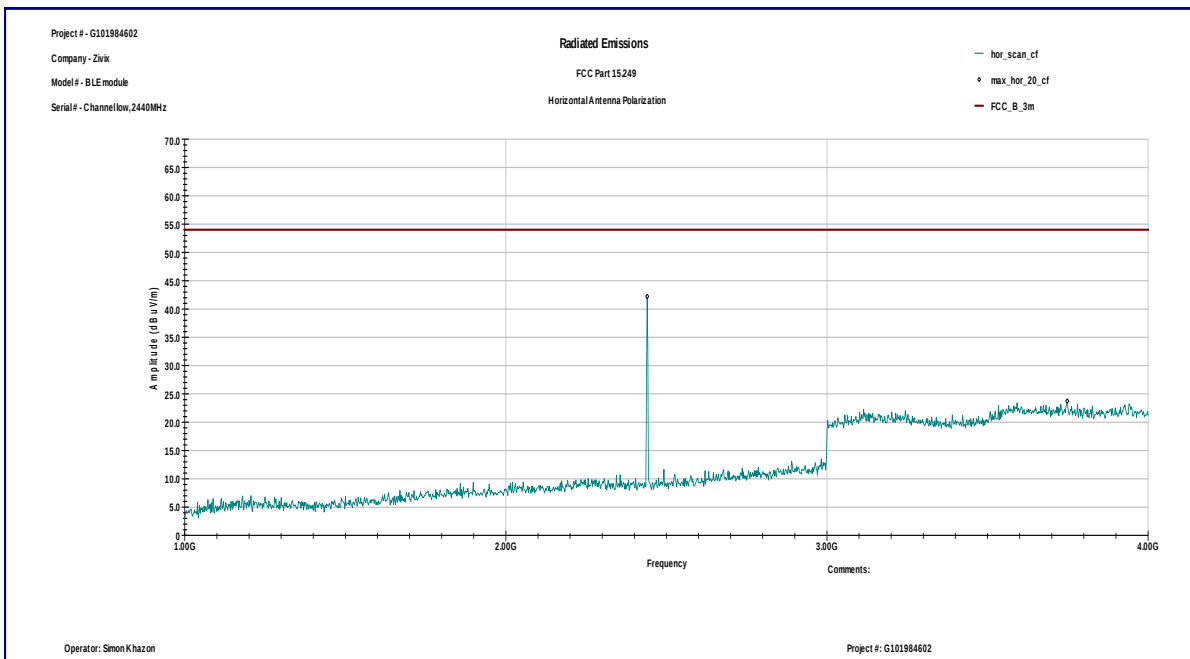


Graph 3.2.5

Vertical antenna polarization

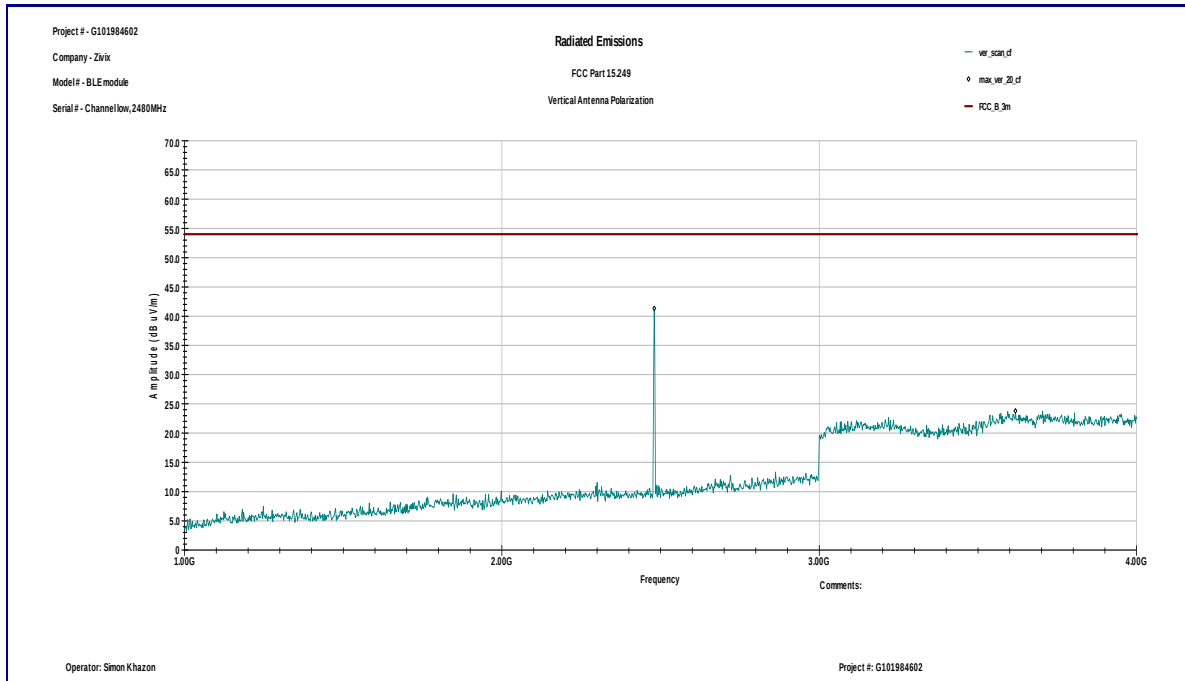


Horizontal antenna polarization

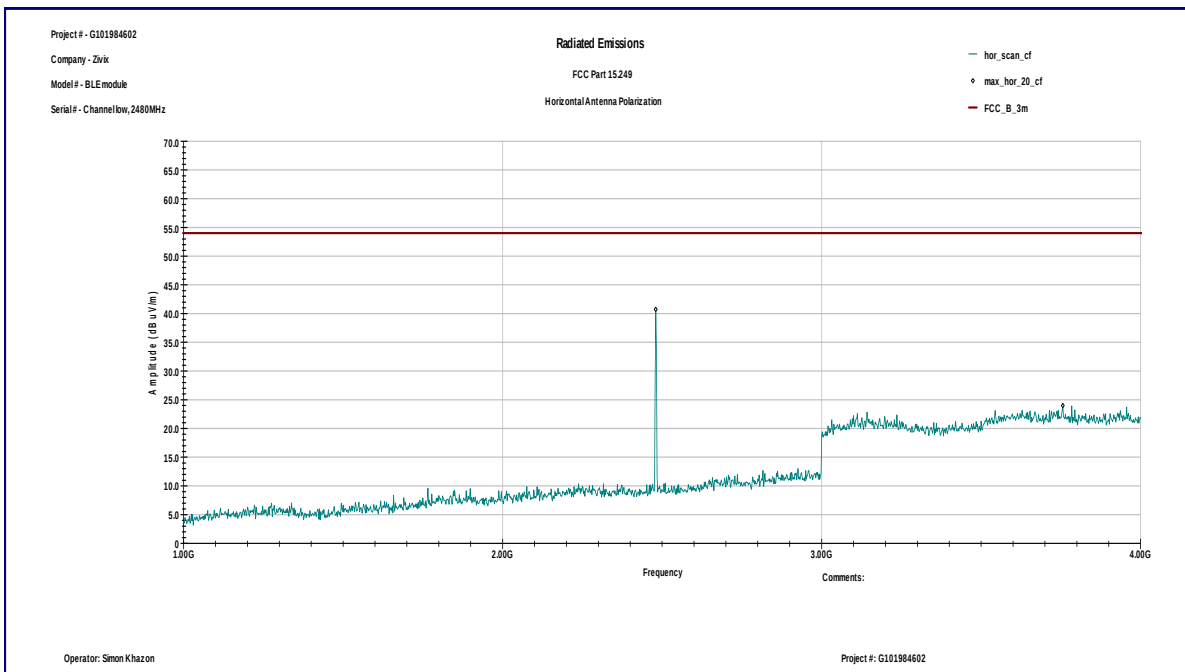


Graph 3.2.6

Vertical antenna polarization

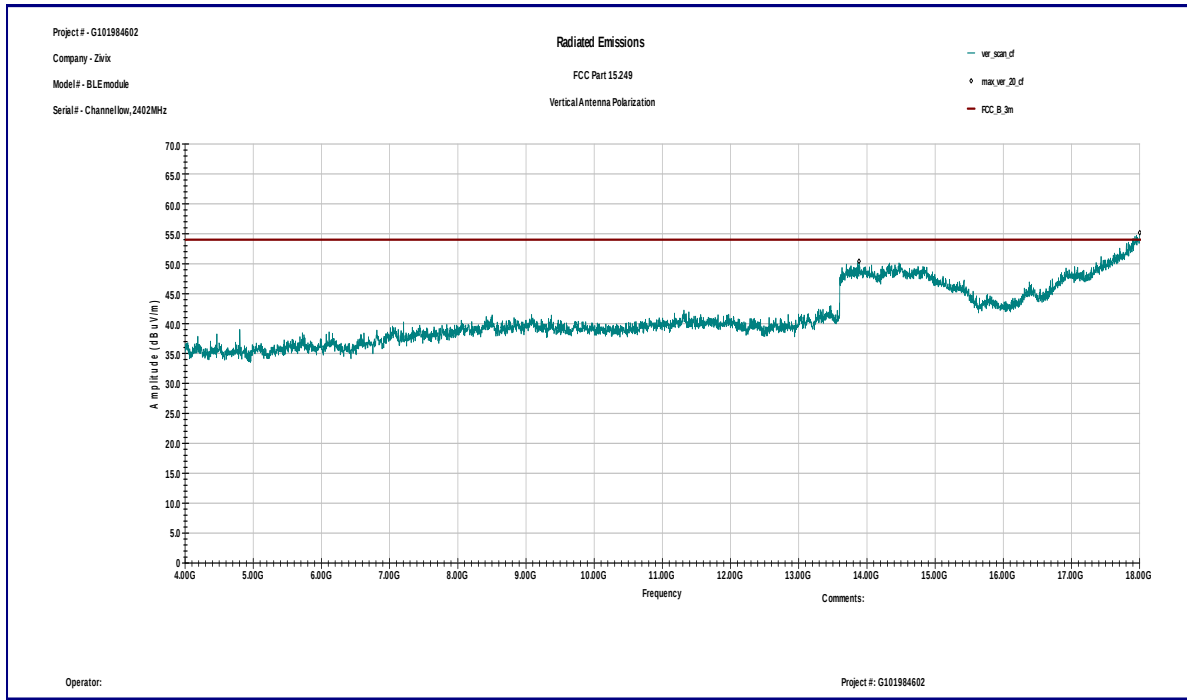


Horizontal antenna polarization

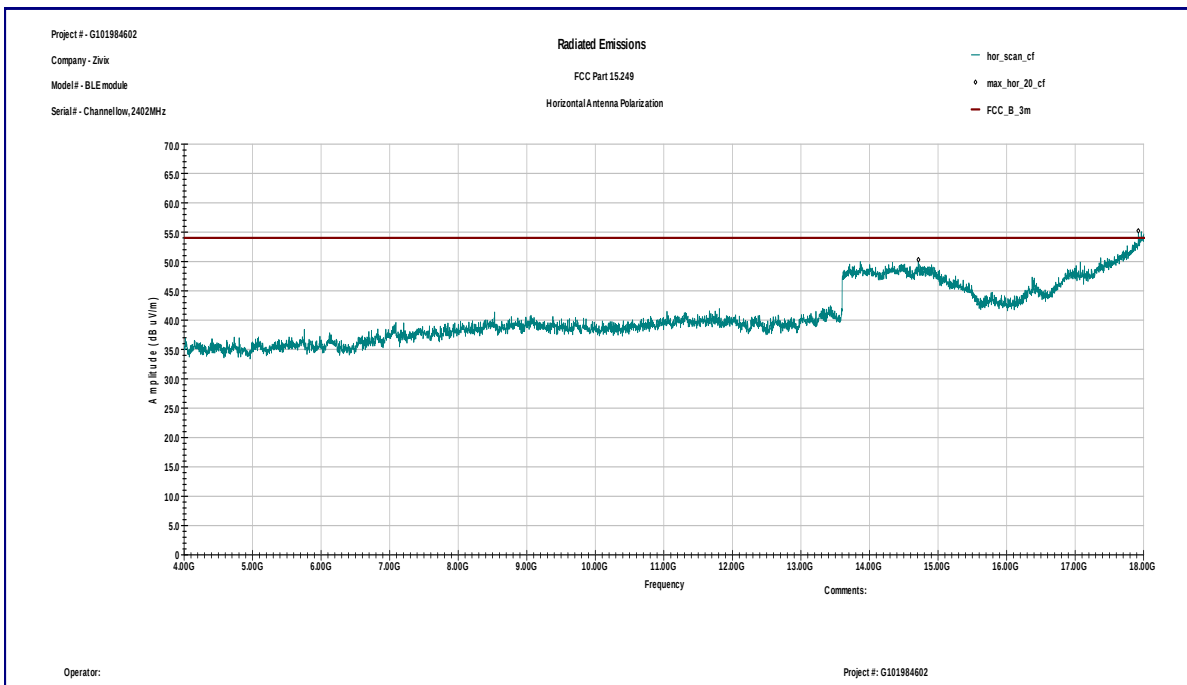


Graph 3.2.7

Vertical antenna polarization

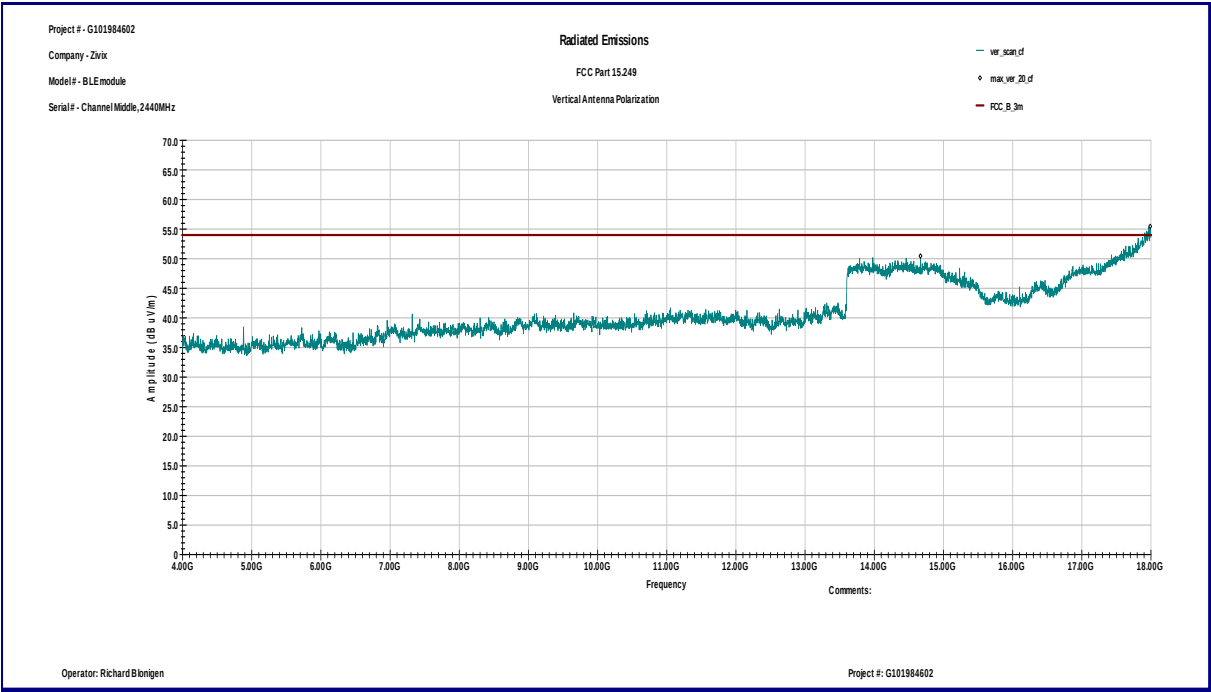


Horizontal antenna polarization

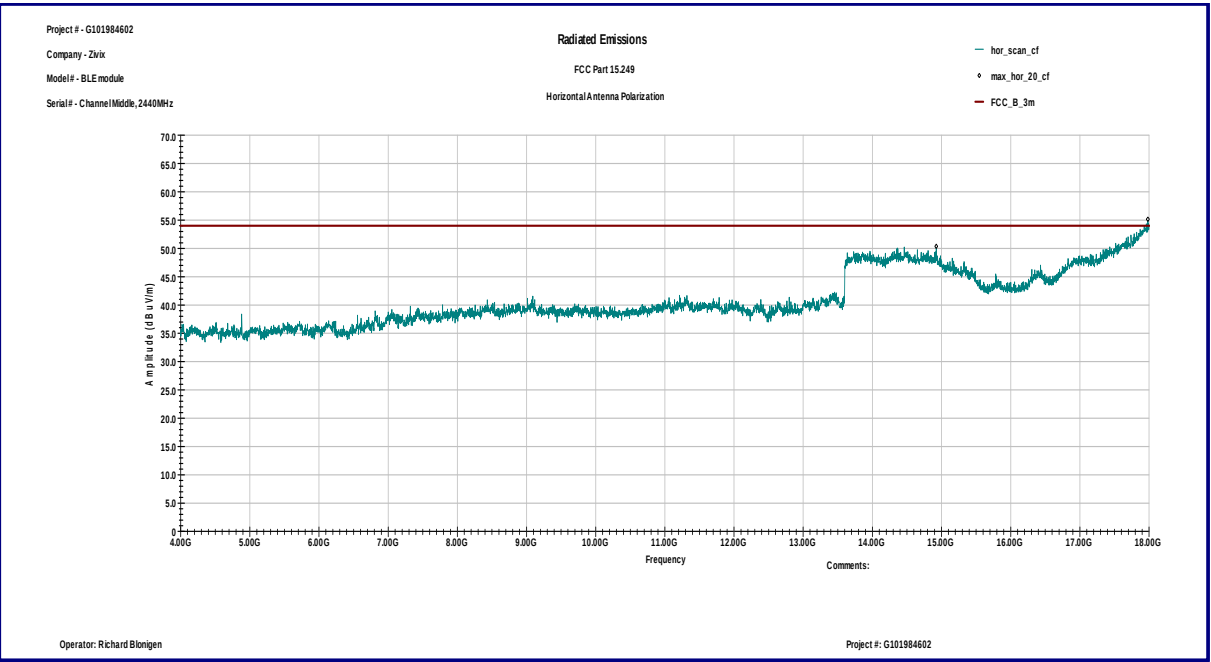


Graph 3.2.8

Vertical antenna polarization

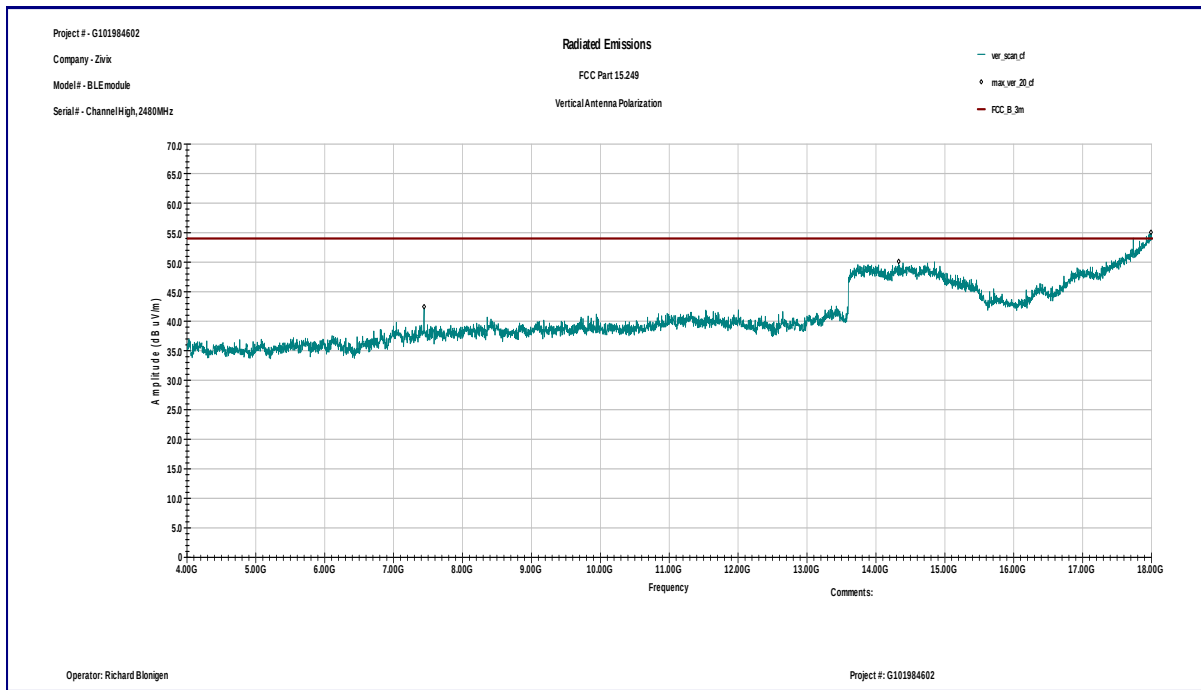


Horizontal antenna polarization

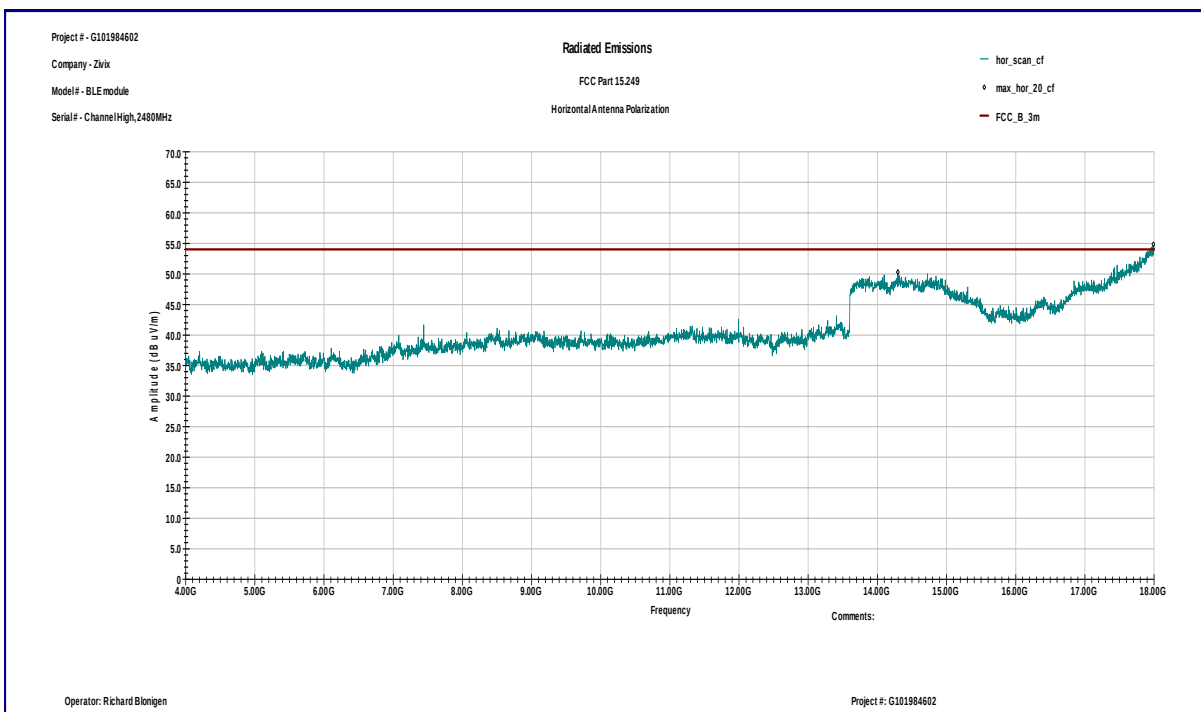


Graph 3.2.9

Vertical antenna polarization

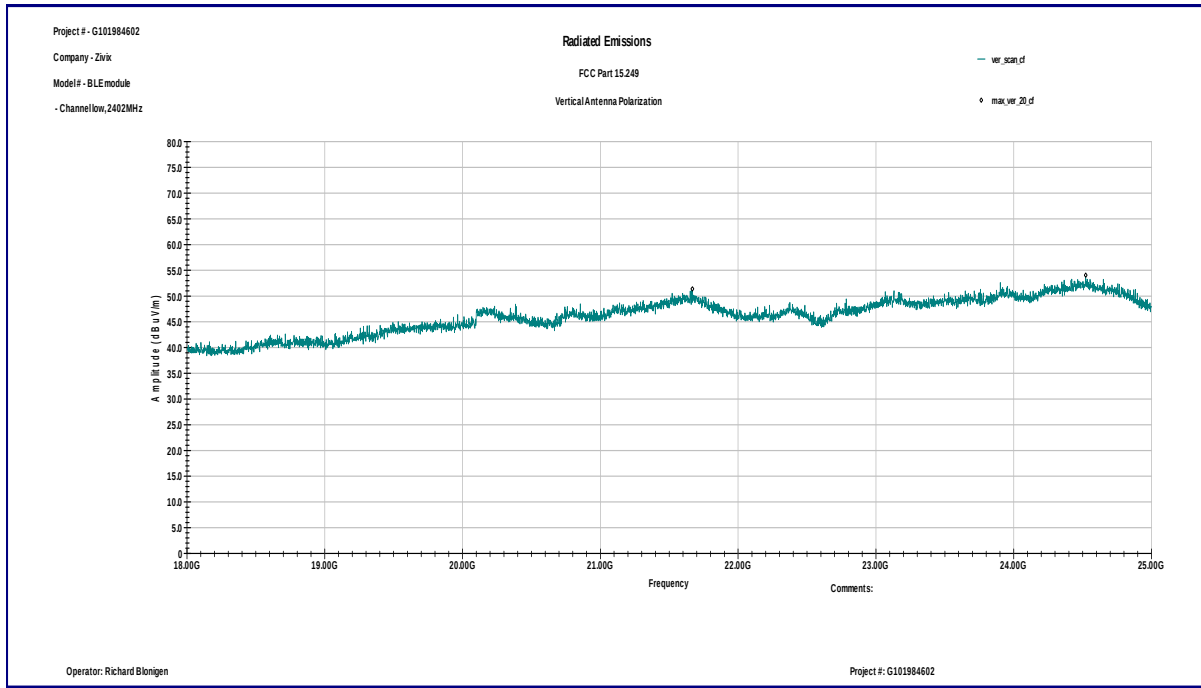


Horizontal antenna polarization

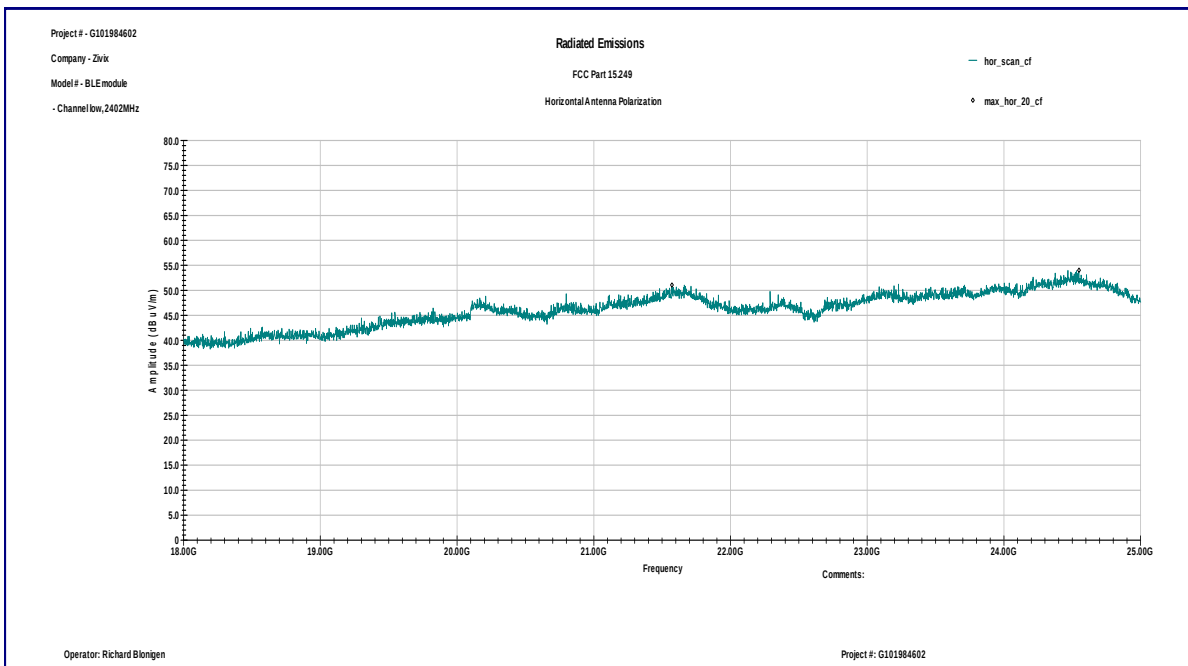


Graph 3.2.10

Vertical antenna polarization

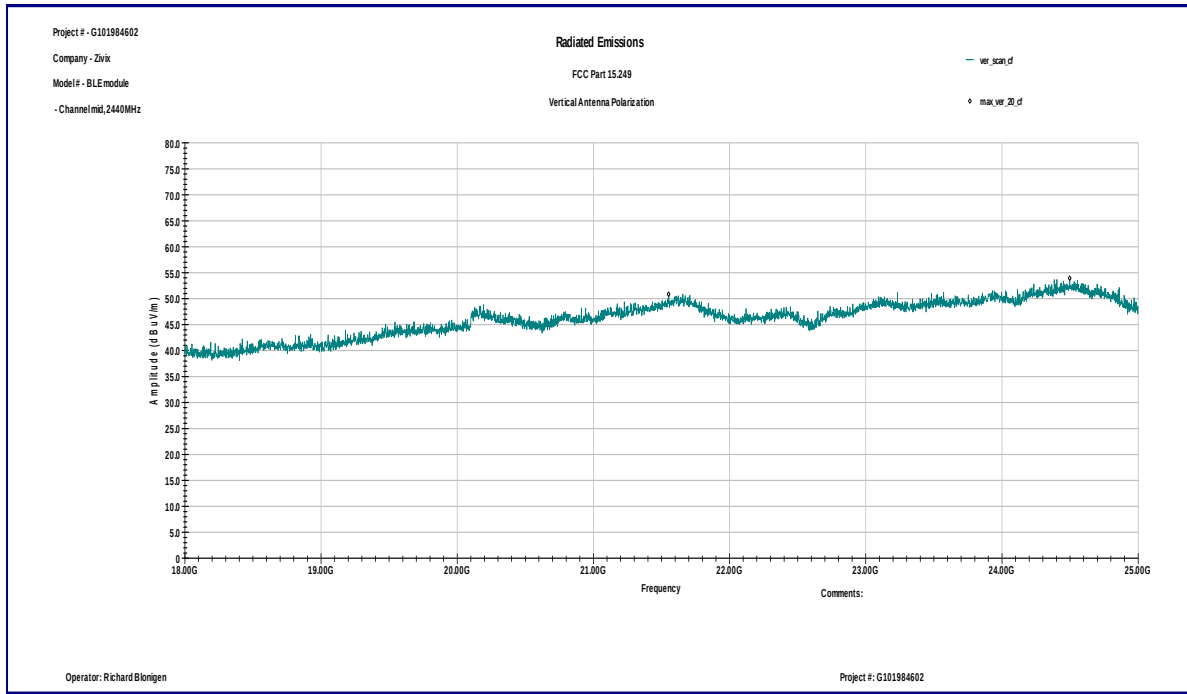


Horizontal antenna polarization

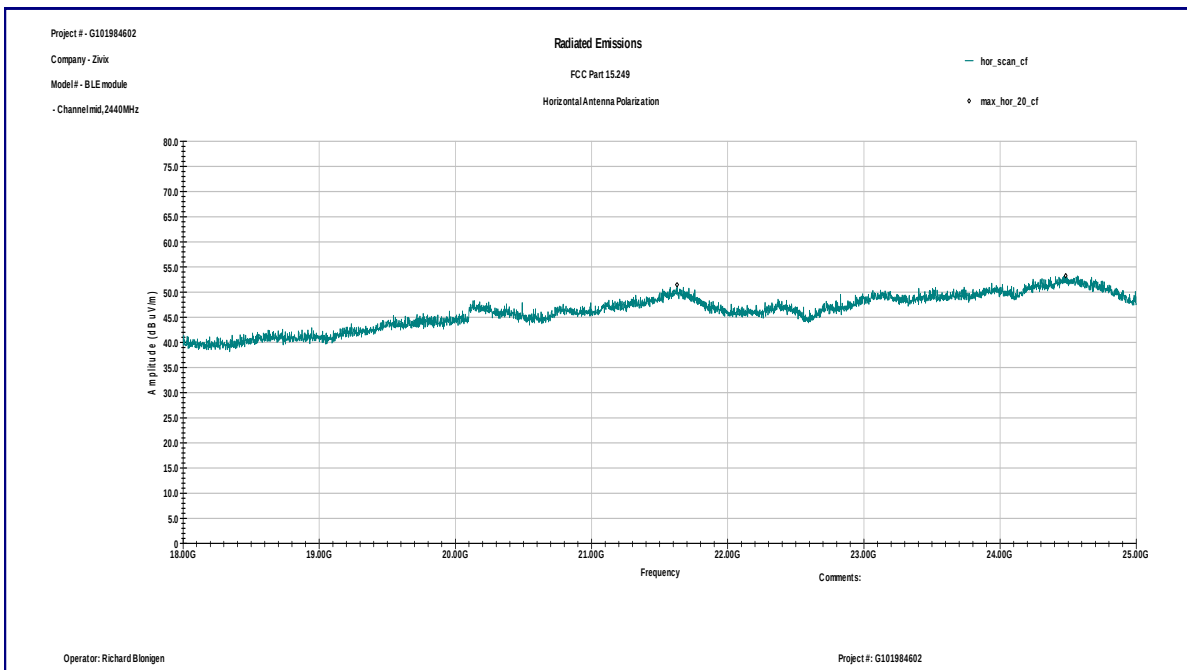


Graph 3.2.11

Vertical antenna polarization

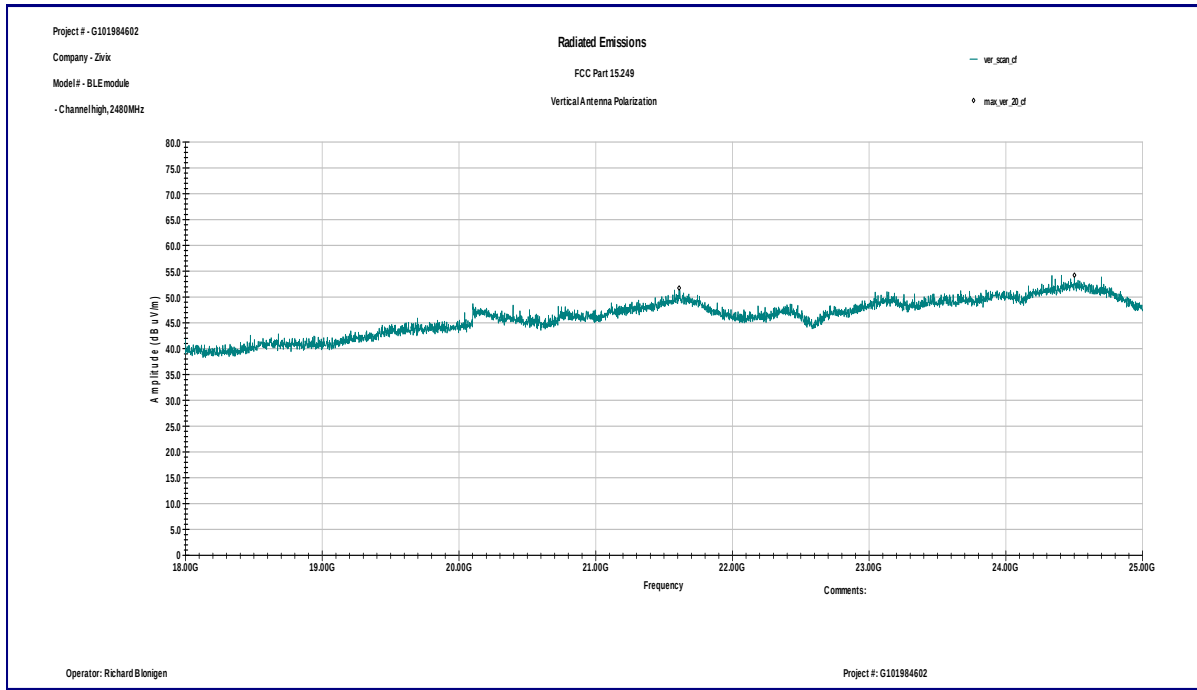


Horizontal antenna polarization

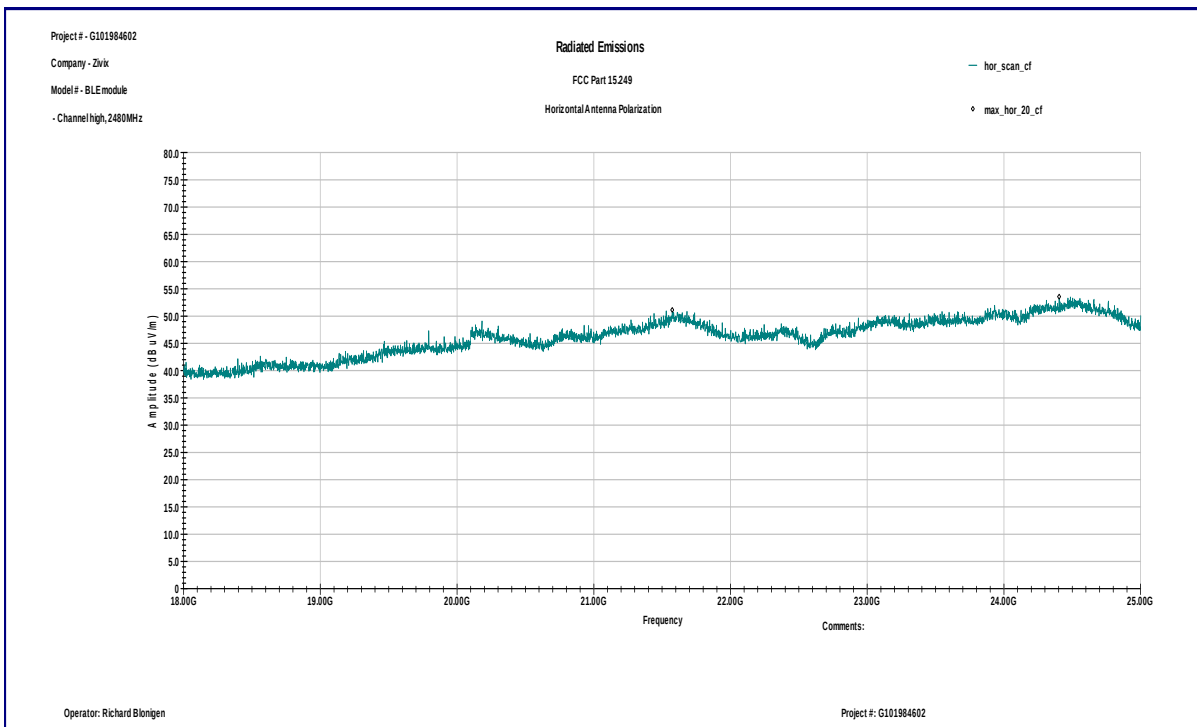


Graph 3.2.12

Vertical antenna polarization



Horizontal antenna polarization



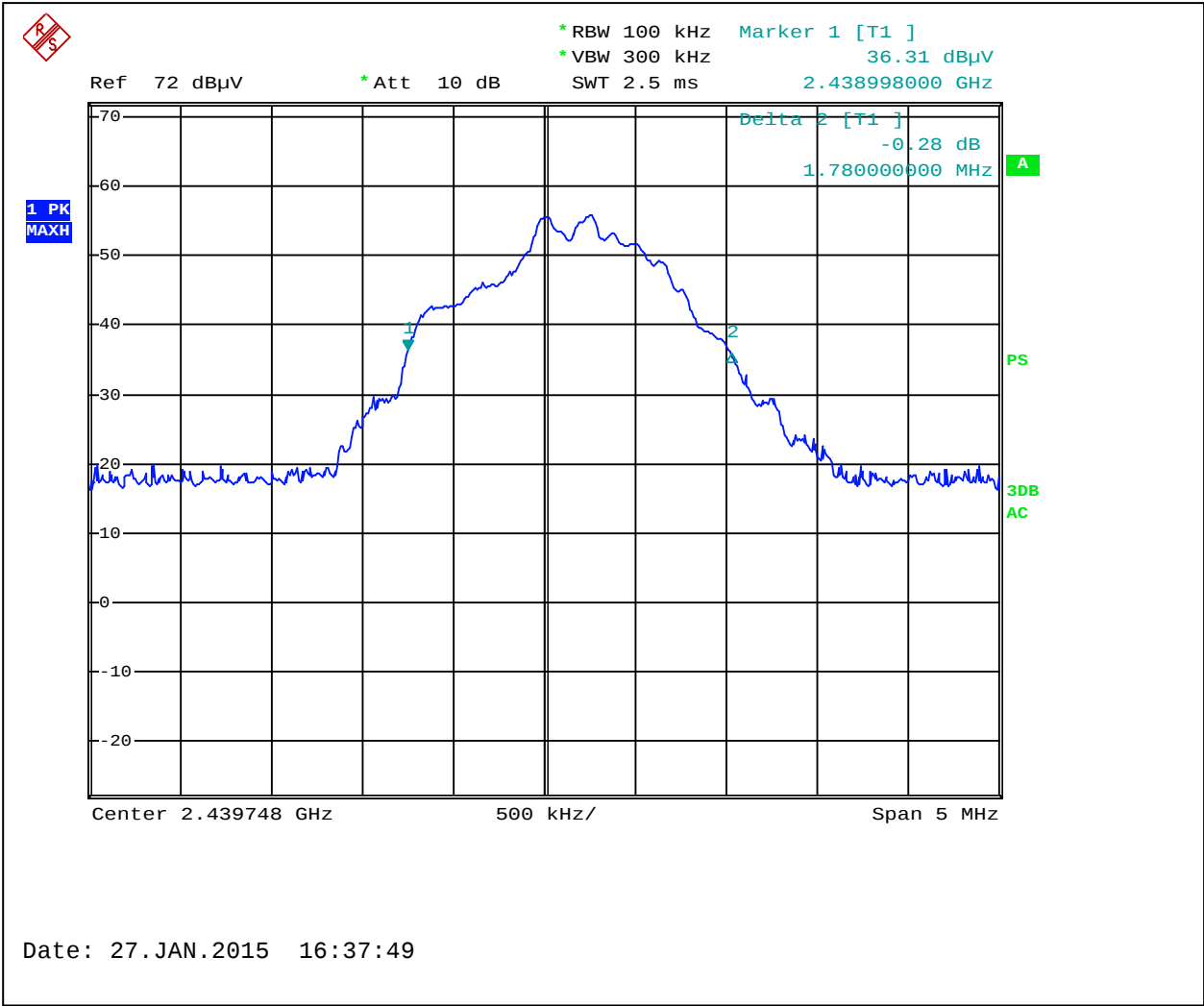
3.3 Bandwidth of Emissions

Center Frequency of operation MHz	Measured 20dB bandwidth kHz	Measured 99% bandwidth kHz
2402	1990	1880
2440	1780	1620
2480	2000	1890

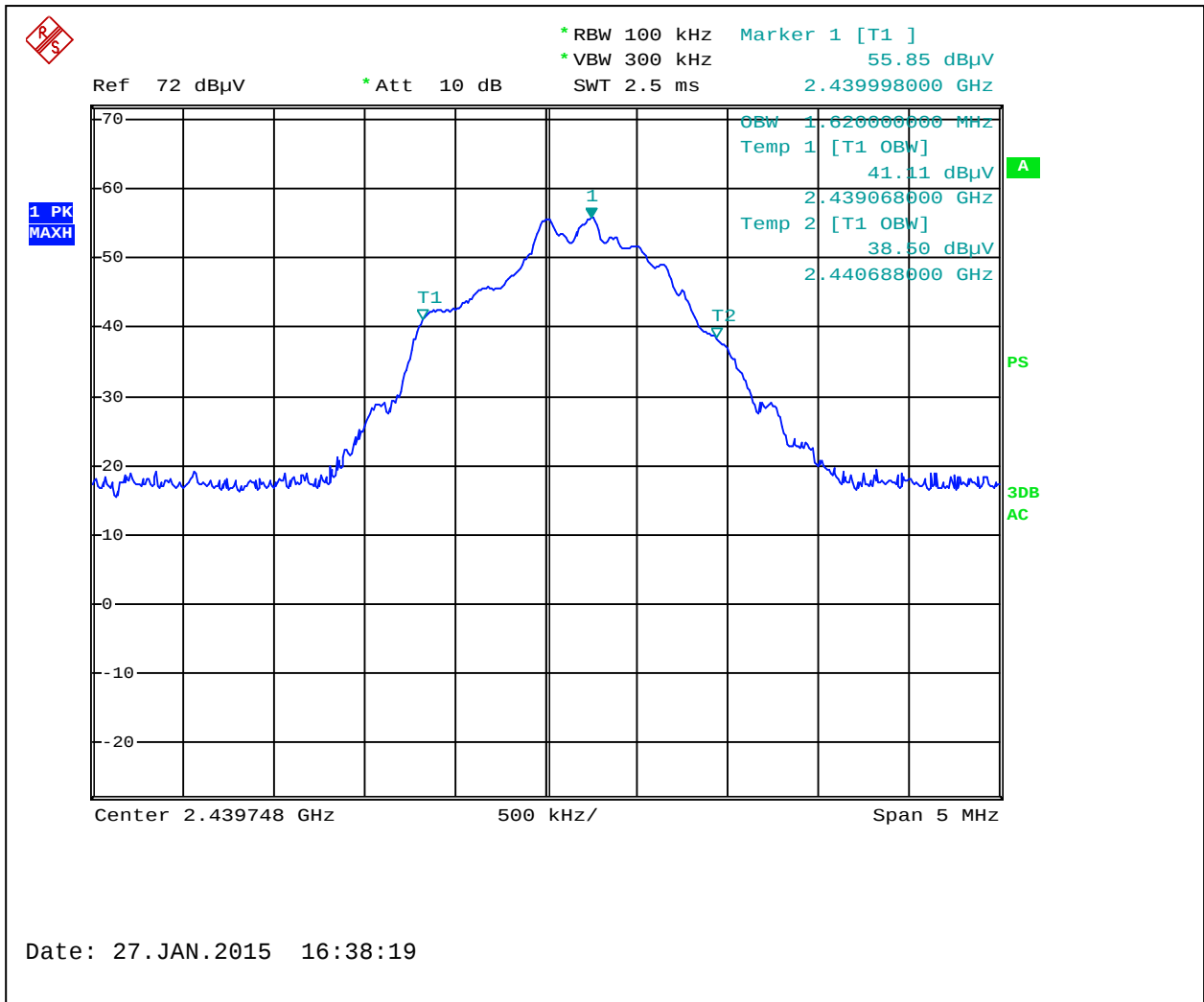
Graphs 3-3-1 through 3-3-6 show bandwidth of emissions

Notes: The bandwidth of emissions is contained within the frequency band of operation

Graph 3.3.3

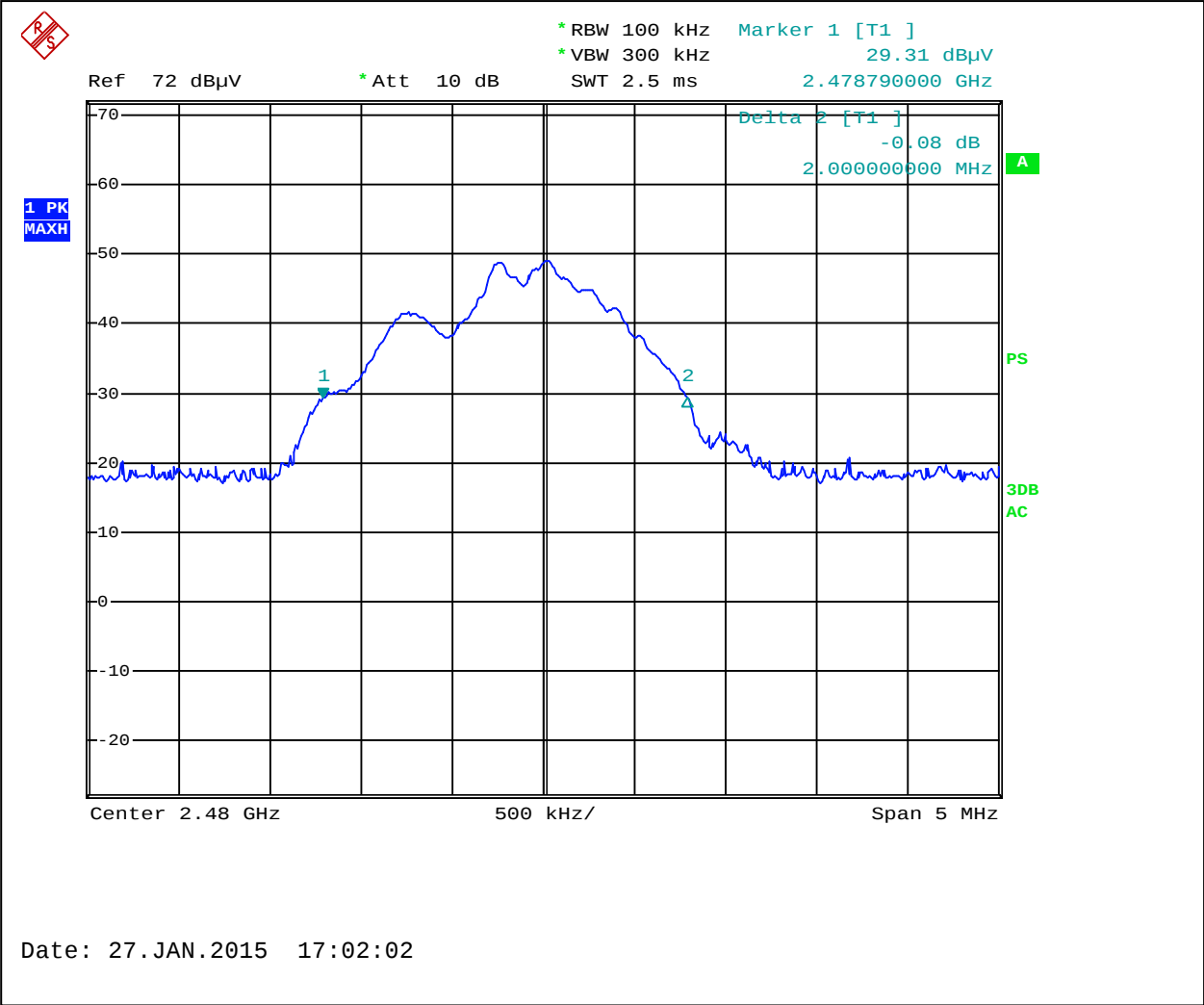


Graph 3.3.4

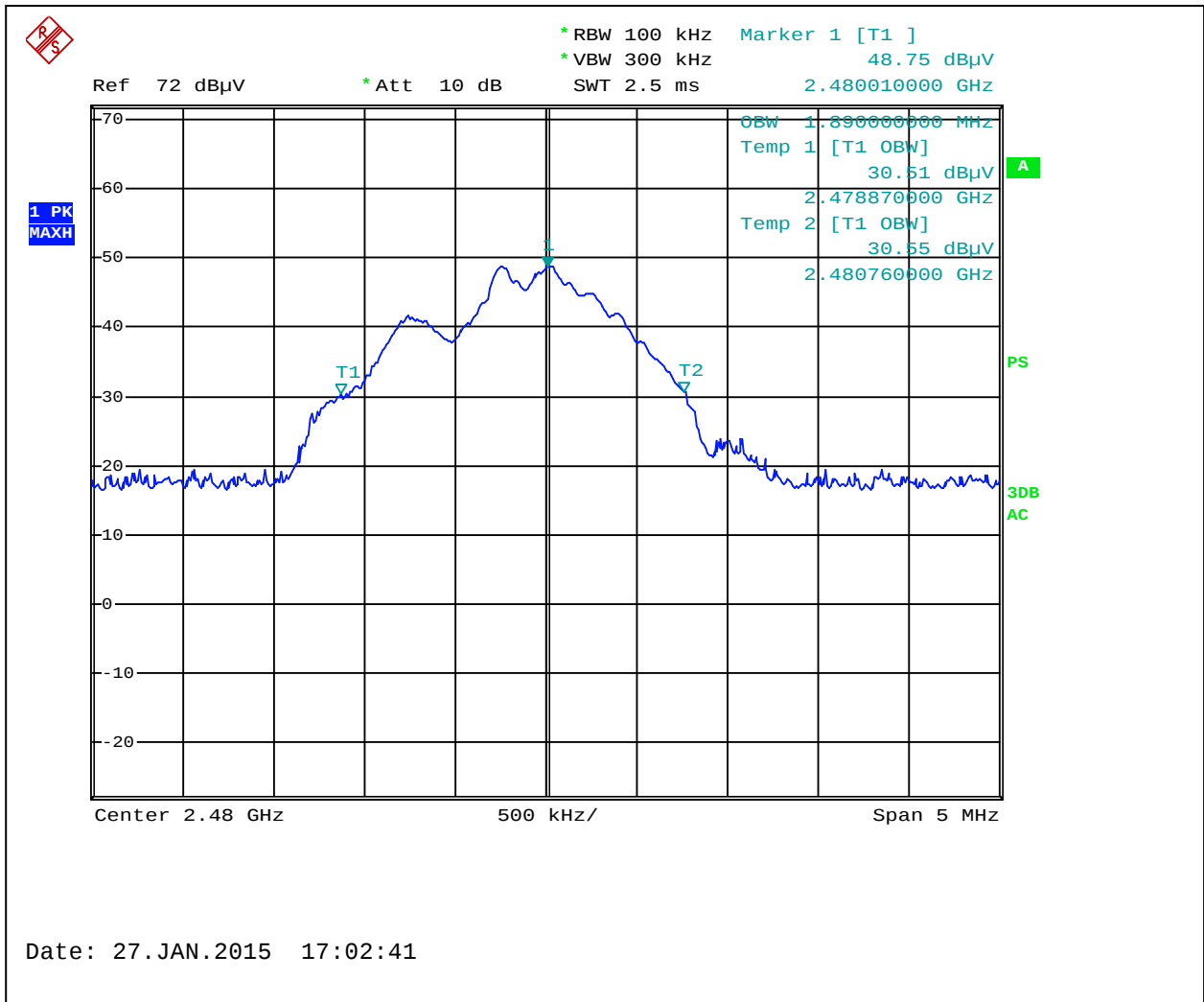




Graph 3.3.5



Graph 3.3.6





3.4 Transmitter power line conducted emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test result: **Pass**

Frequency range: 0.15MHz-30MHz

Max. Emissions margin: 9.1 dB below the limits

Notes: The test was performed through the host laptop computer power supply because the EUT is powered through the host laptop computer.

Date:	January 29, 2015	Result: Pass
Standard:	FCC 15.207	
Tested by:	Richard Blonigen	
Test Point:	Power Line	
Operation mode:	See Page 5	
Note:	None	

Table 3.4.1

Line 1

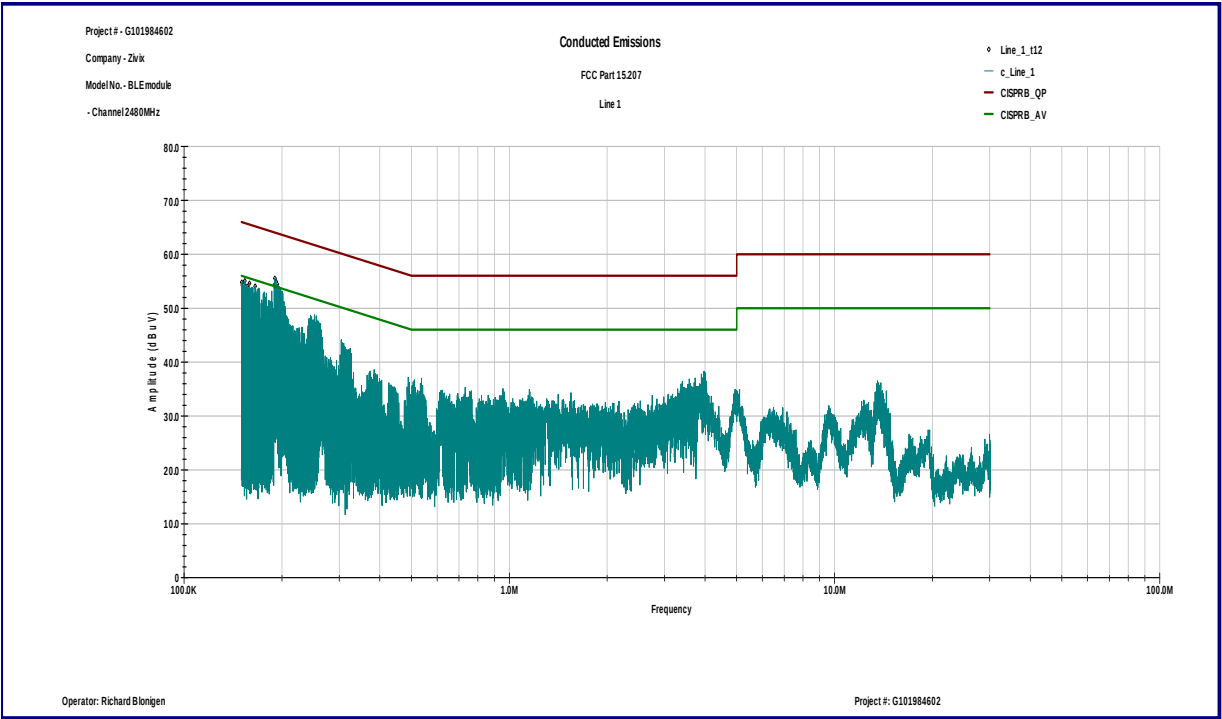
Frequency	QP dB μ V	AVG dB μ V	QP Limit dB μ V	AVG Limit dB μ V	QP Margin dB	AVG Margin dB
152.03 KHz	46.8	29.0	65.9	55.9	-19.1	-26.9
158.38 KHz	56.0	41.7	65.6	55.6	-9.6	-13.9
161.04 KHz	56.3	43.2	65.4	55.4	-9.1	-12.2
163.64 KHz	55.6	43.0	65.3	55.3	-9.7	-12.3
191.41 KHz	40.6	17.5	64.0	54.0	-23.4	-36.4
194.27 KHz	40.5	19.4	63.9	53.9	-23.3	-34.4

Line 2

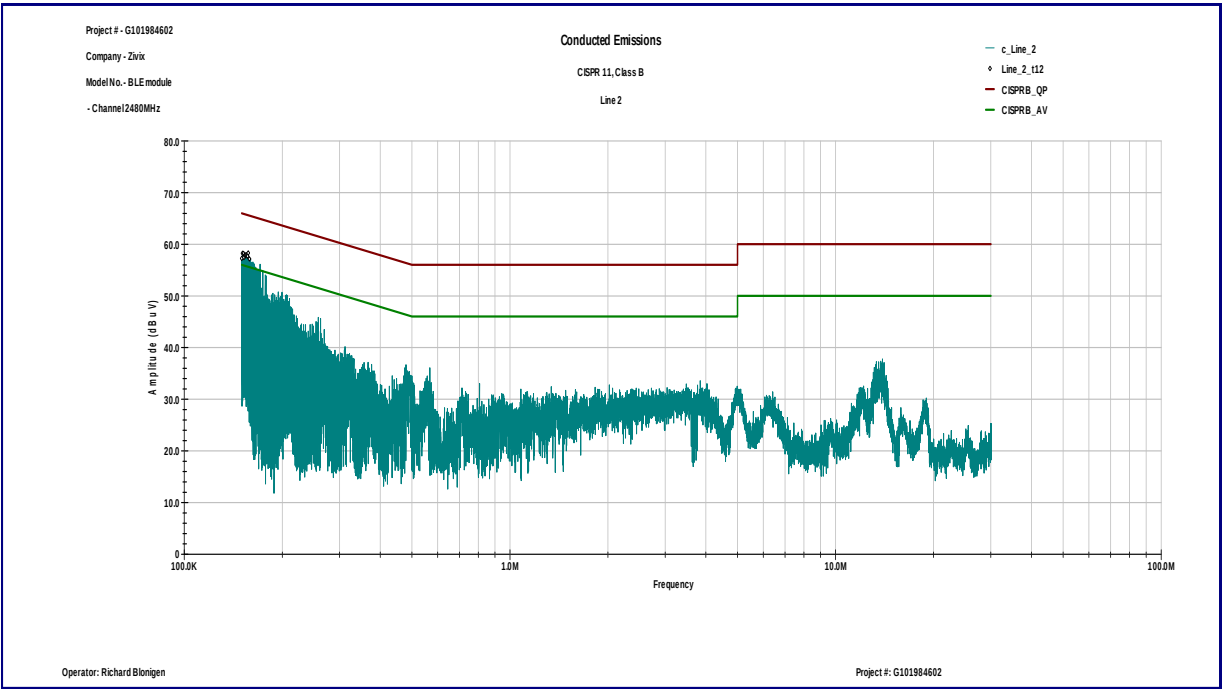
Frequency	QP dB μ V	AVG dB μ V	QP Limit dB μ V	AVG Limit dB μ V	QP Margin dB	AVG Margin dB
150.59 KHz	56.4	43.1	66.0	56.0	-9.6	-12.9
151.79 KHz	55.7	38.4	65.9	55.9	-10.2	-17.6
152.13 KHz	55.5	42.4	65.9	55.9	-10.4	-13.5
153.55 KHz	55.8	42.2	65.8	55.8	-10.0	-13.6
153.77 KHz	50.2	35.7	65.8	55.8	-15.6	-20.1
158.54 KHz	47.5	27.2	65.5	55.5	-18.0	-28.4

Graph 3.4.1

Line 1



Line 2





3.5 Receiver/digital device radiated emissions

Test location: ☐ OATS ☒ Anechoic Chamber

Test distance: ☐ 10 meters ☒ 3 meters

Test result: **Pass**

Frequency range: 30MHz-13000MHz

Max. Emissions margin: 0.3 dB below the limits

- Notes:**
1. The Radiated Emissions test was performed in the Anechoic chamber at 3m measurement distance (see Table 3.11.1 and Graphs 3.11.1 and 3.11.2)
 2. The EUT was measured at the low, middle, and high (2402, 2440, 2480MHz) receiver channel.
-

Date:	January 27 – 29, 2015	Result: Pass
Standard:	FCC Part 15.109, Class B	
Tested by:	Simon Khazon	
Test Point:	Enclosure	
Operation mode:	See Page 5	
Note:	Receiver channel low 2402MHz	

Table 3.5.1

Frequency	Ant. Polarity	Peak Reading dBμV	Total C.F. dB1/m	Total at 3m dBμV/m	Limit dBμV/m	Margin dB
36.527 MHz	V	22.6	16.5	39.1	40.0	-1.0
39.651 MHz	V	21.2	14.7	35.9	40.0	-4.1
55.945 MHz	V	23.2	7.8	30.9	40.0	-9.1
75.709 MHz	V	19.2	7.7	26.9	40.0	-13.1
83.026 MHz	V	23.4	8.8	32.2	40.0	-7.8
88.315 MHz	V	21.7	9.7	31.4	43.5	-12.1
89.284 MHz	V	21.8	9.9	31.7	43.5	-11.9
91.047 MHz	V	20.8	10.3	31.1	43.5	-12.5
93.692 MHz	V	20.6	10.9	31.5	43.5	-12.0
94.485 MHz	V	22.0	11.1	33.1	43.5	-10.4
98.54 MHz	V	22.0	11.9	34.0	43.5	-9.5
99.686 MHz	V	23.5	12.2	35.7	43.5	-7.8
100.3 MHz	V	20.3	12.3	32.6	43.5	-10.9
102.15 MHz	V	19.0	12.6	31.6	43.5	-11.9
102.86 MHz	V	18.5	12.7	31.2	43.5	-12.3
977.82 MHz	V	14.9	25.1	40.1	54.0	-13.9
33.194 MHz	H	19.2	18.4	37.6	40.0	-2.4
36.352 MHz	H	20.5	16.6	37.1	40.0	-2.9
82.938 MHz	H	28.3	8.8	37.1	40.0	-2.9
86.287 MHz	H	21.0	9.3	30.3	40.0	-9.7
88.315 MHz	H	22.3	9.7	31.9	43.5	-11.6
91.047 MHz	H	22.0	10.3	32.3	43.5	-11.3
94.485 MHz	H	18.4	11.1	29.5	43.5	-14.0
98.452 MHz	H	17.9	11.9	29.8	43.5	-13.7
99.686 MHz	H	18.9	12.2	31.1	43.5	-12.5
928.53 MHz	H	15.8	24.6	40.3	46.0	-5.7

Frequency MHz	Antenna Polarity	Peak Reading dBμV	Total C.F. dB1/m	Pre-Amp. Gain (dB)	Total at 3m dBμV/m	Limit dBμV/m	Margin dB
1.9216 GHz	V	50.0	30.0	43.7	36.3	54.0	-17.7
2.4016 GHz	V	50.0	31.5	43.9	37.6	54.0	-16.4
11.363 GHz	V	36.4	46.4	41.1	41.7	54.0	-12.3
2.4016 GHz	H	50.7	31.3	43.9	38.0	54.0	-16.0
11.368 GHz	H	36.0	46.2	41.1	41.2	54.0	-12.8

Date:	January 27 – 29, 2015	Result: Pass
Standard:	FCC Part 15.109, Class B	
Tested by:	Simon Khazon	
Test Point:	Enclosure	
Operation mode:	See Page 5	
Note:	Receiver channel low 2440MHz	

Table 3.5.2

Frequency	Ant. Polarity	Peak Reading dBμV	Total C.F. dB1/m	Total at 3m dBμV/m	Limit dBμV/m	Margin dB
36.095 MHz	V	23.0	16.7	39.7	40.0	-0.3
61.308 MHz	V	24.7	6.9	31.6	40.0	-8.4
82.988 MHz	V	21.1	8.8	29.9	40.0	-10.1
88.36 MHz	V	20.3	9.7	30.0	43.5	-13.5
91.047 MHz	V	18.3	10.3	28.6	43.5	-14.9
93.584 MHz	V	21.8	10.9	32.7	43.5	-10.9
94.479 MHz	V	23.6	11.1	34.7	43.5	-8.8
98.508 MHz	V	23.5	11.9	35.4	43.5	-8.1
99.702 MHz	V	23.9	12.2	36.1	43.5	-7.4
102.84 MHz	V	17.9	12.7	30.7	43.5	-12.9
216.09 MHz	V	18.0	11.4	29.4	46.0	-16.6
801.95 MHz	V	16.6	23.5	40.0	46.0	-6.0
33.186 MHz	H	17.4	18.4	35.8	40.0	-4.2
82.988 MHz	H	18.4	8.8	27.1	40.0	-12.9
91.047 MHz	H	18.0	10.3	28.2	43.5	-15.3
94.479 MHz	H	17.6	11.1	28.7	43.5	-14.8
99.702 MHz	H	17.0	12.2	29.2	43.5	-14.3
216.41 MHz	H	16.9	11.4	28.3	46.0	-17.7
937.75 MHz	H	15.0	24.7	39.7	46.0	-6.3

Frequency MHz	Antenna Polarity	Peak Reading dBμV	Total C.F. dB1/m	Pre-Amp. Gain (dB)	Total at 3m dBμV/m	Limit dBμV/m	Margin dB
2.44 GHz	V	47.4	31.6	43.9	35.2	54.0	-18.8
11.834 GHz	V	36.3	46.4	40.9	41.7	54.0	-12.3
2.44 GHz	H	48.5	31.4	43.9	36.0	54.0	-18.0
11.646 GHz	H	36.3	46.2	40.9	41.6	54.0	-12.4

Date:	January 27 – 29, 2015	Result: Pass
Standard:	FCC Part 15.109, Class B	
Tested by:	Simon Khazon	
Test Point:	Enclosure	
Operation mode:	See Page 5	
Note:	Receiver channel low 2480MHz	

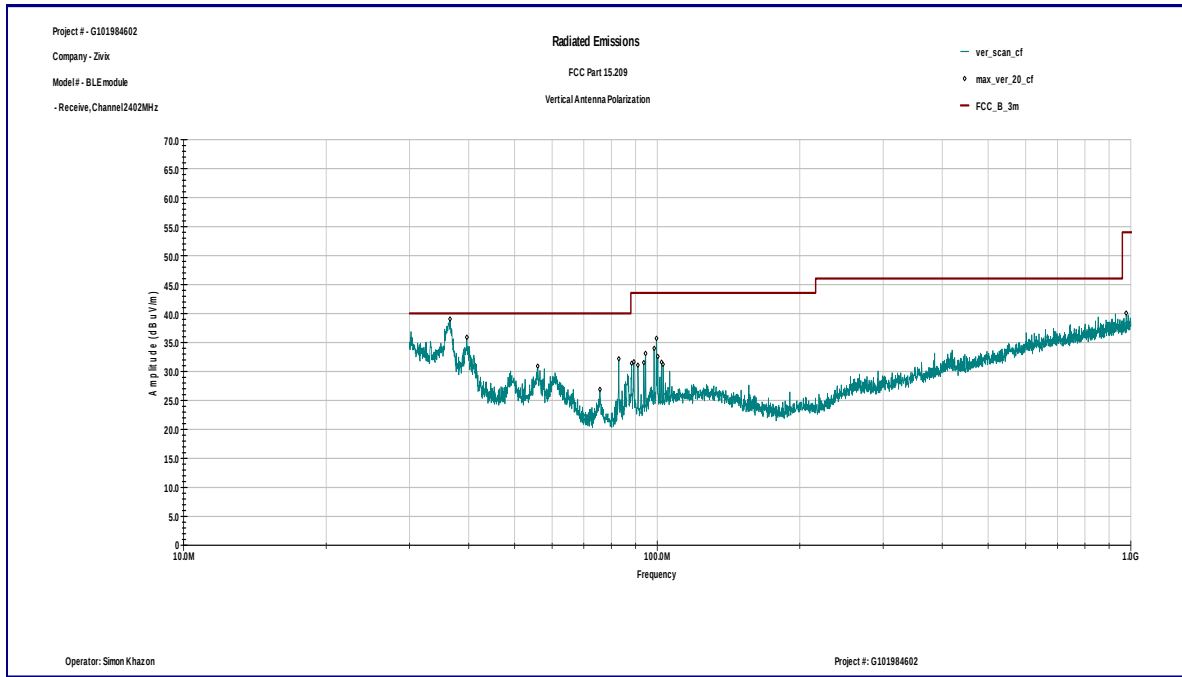
Table 3.5.3

Frequency	Ant. Polarity	Peak Reading dBμV	Total C.F. dB1/m	Total at 3m dBμV/m	Limit dBμV/m	Margin dB
33.186 MHz	V	17.3	18.4	35.7	40.0	-4.3
62.555 MHz	V	24.3	6.9	31.2	40.0	-8.8
82.988 MHz	V	20.5	8.8	29.3	40.0	-10.7
88.36 MHz	V	20.9	9.7	30.6	43.5	-12.9
93.733 MHz	V	18.9	10.9	29.8	43.5	-13.7
94.479 MHz	V	21.6	11.1	32.7	43.5	-10.8
98.508 MHz	V	21.5	11.9	33.5	43.5	-10.1
99.702 MHz	V	22.9	12.2	35.1	43.5	-8.5
216.41 MHz	V	19.6	11.4	31.0	46.0	-15.0
948.36 MHz	V	15.0	24.8	39.8	46.0	-6.3
31.801 MHz	H	15.8	19.2	35.1	40.0	-5.0
82.988 MHz	H	18.5	8.8	27.2	40.0	-12.8
94.479 MHz	H	19.3	11.1	30.4	43.5	-13.1
98.508 MHz	H	17.5	11.9	29.4	43.5	-14.1
99.702 MHz	H	17.3	12.2	29.4	43.5	-14.1
990.1 MHz	H	14.3	25.2	39.5	54.0	-14.5

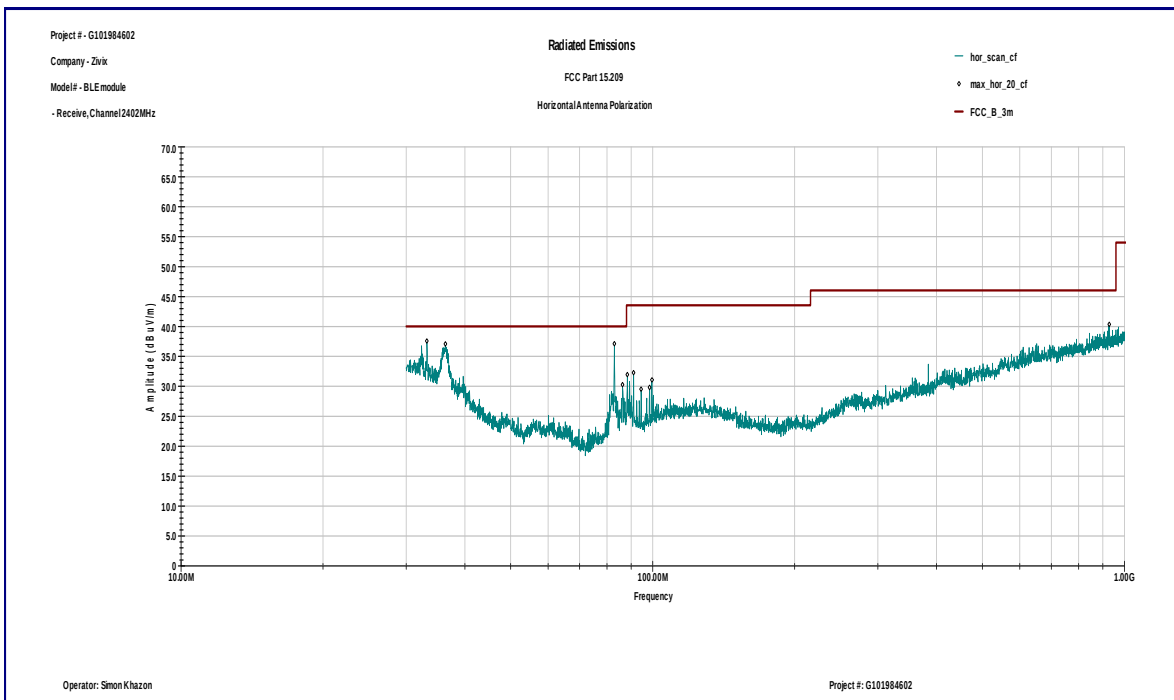
Frequency MHz	Antenna Polarity	Peak Reading dBμV	Total C.F. dB1/m	Pre-Amp. Gain (dB)	Total at 3m dBμV/m	Limit dBμV/m	Margin dB
1.1056 GHz	V	49.9	26.0	43.1	32.8	54.0	-21.1
1.9216 GHz	V	48.0	30.0	43.7	34.3	54.0	-19.7
1.996 GHz	V	51.4	30.3	43.7	38.0	54.0	-16.0
2.4808 GHz	V	47.4	31.8	43.9	35.2	54.0	-18.8
11.308 GHz	V	36.8	46.4	41.1	42.1	54.0	-11.9
11.31 GHz	H	36.6	46.3	41.1	41.7	54.0	-12.2

Graph 3.5.1

Vertical antenna polarization

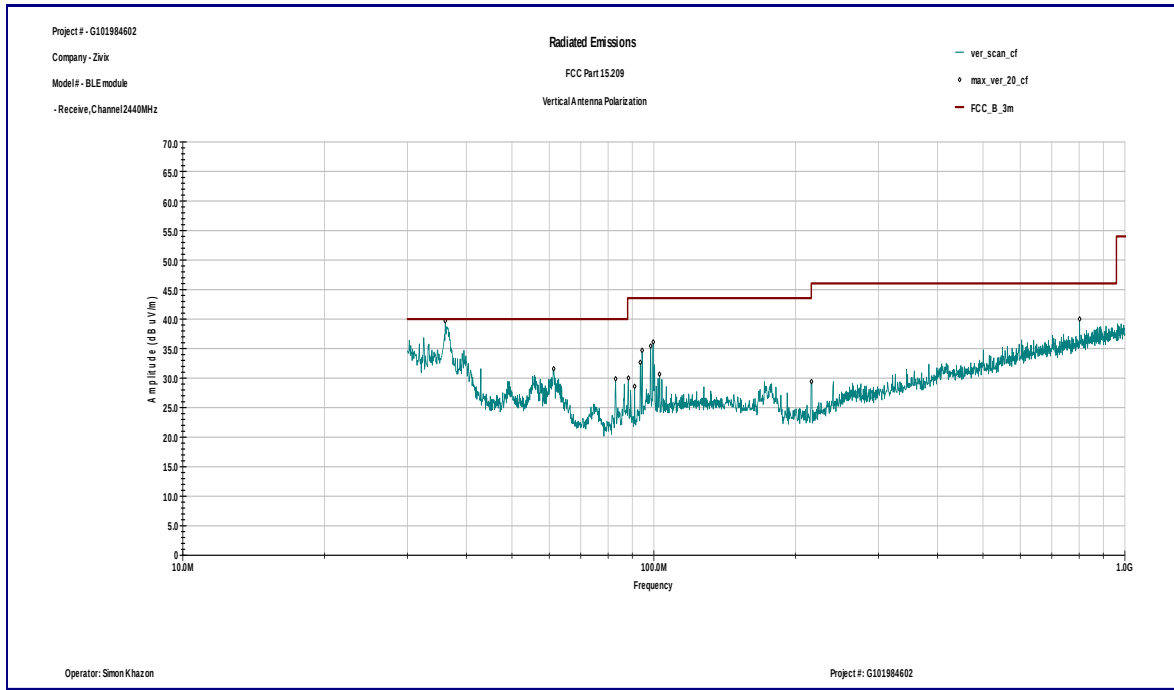


Horizontal antenna polarization

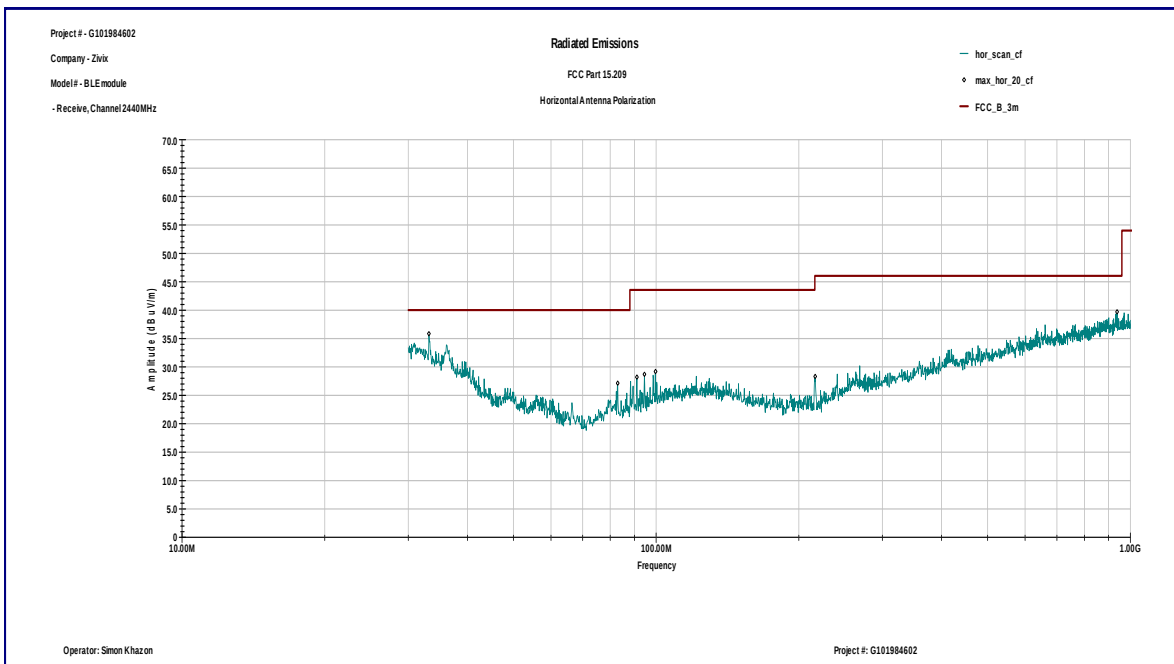


Graph 3.5.2

Vertical antenna polarization

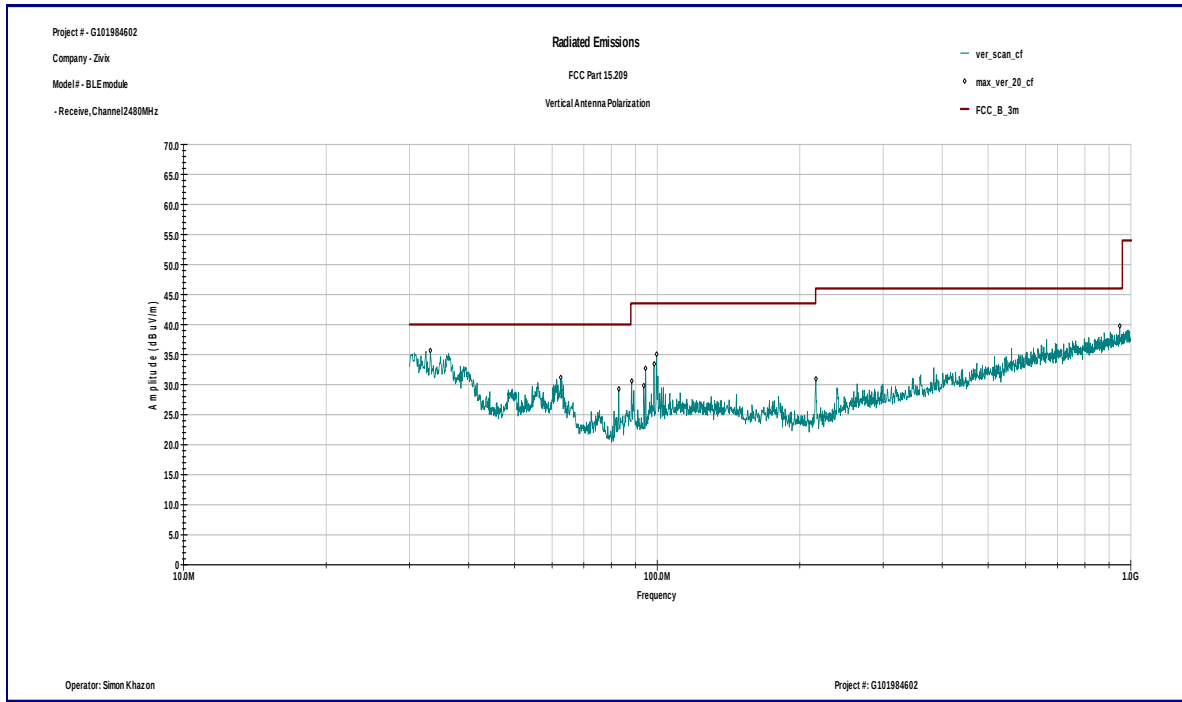


Horizontal antenna polarization

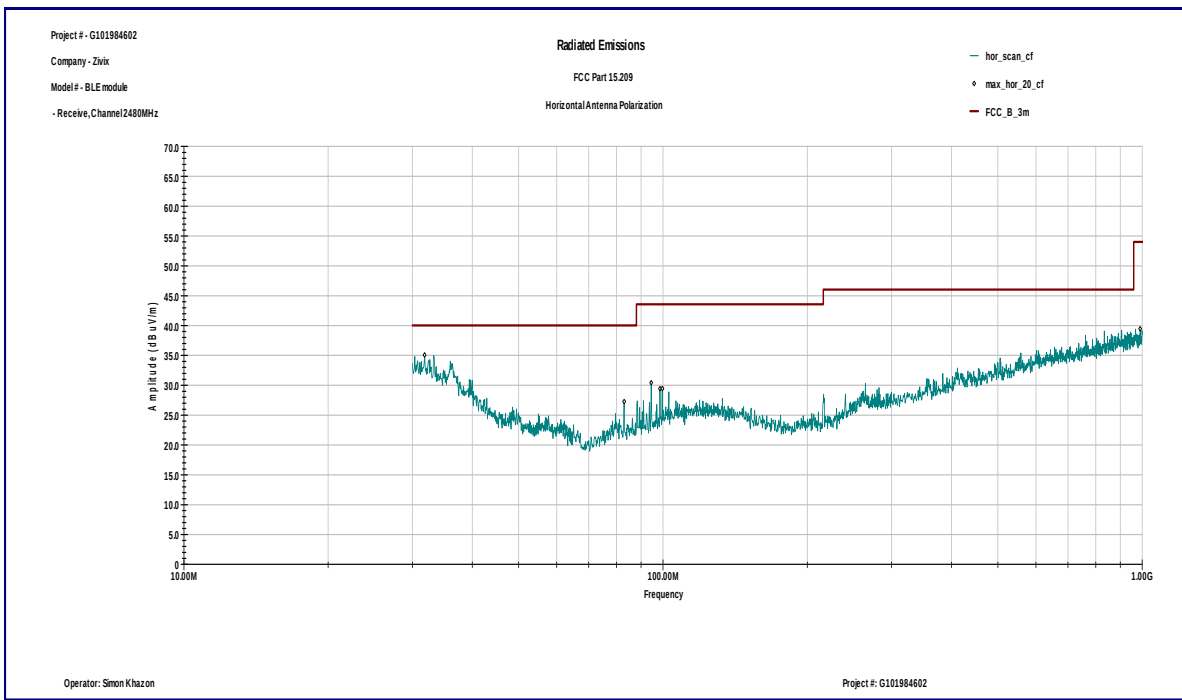


Graph 3.5.3

Vertical antenna polarization

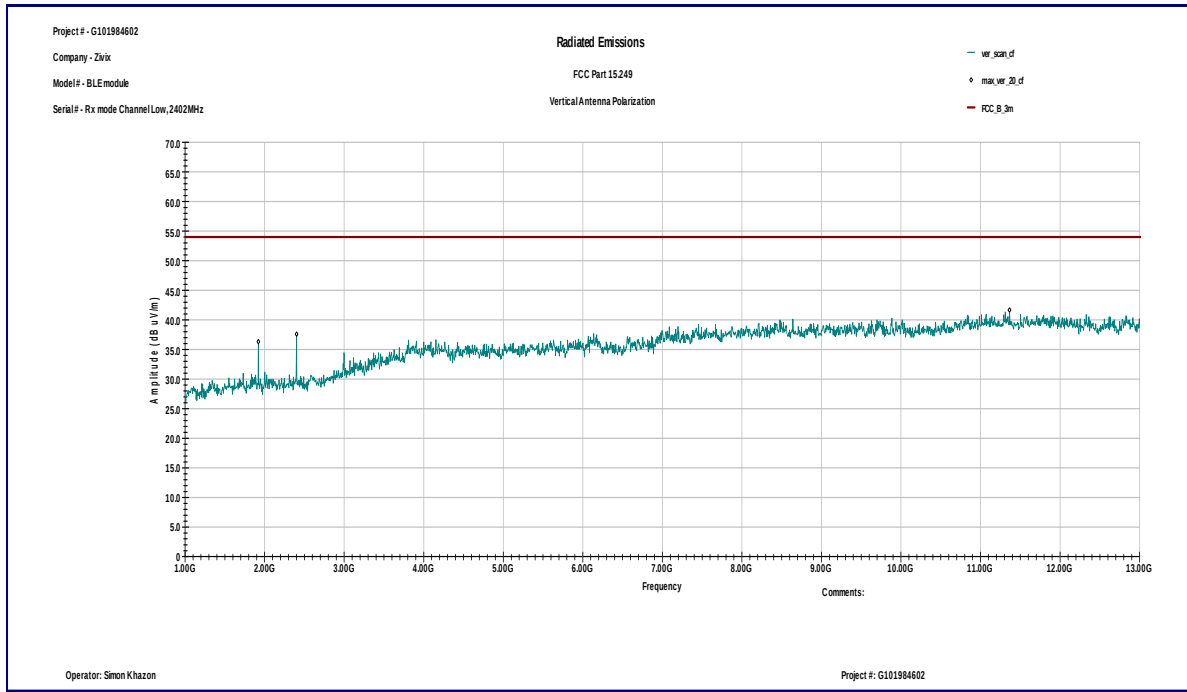


Horizontal antenna polarization

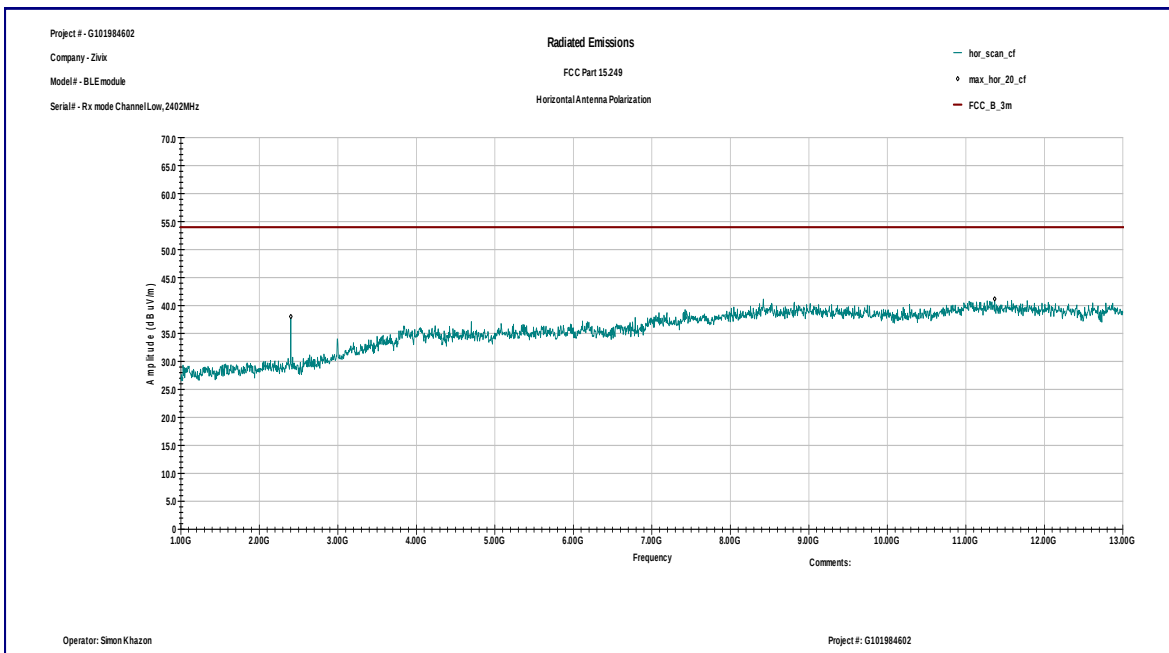


Graph 3.5.4

Vertical antenna polarization

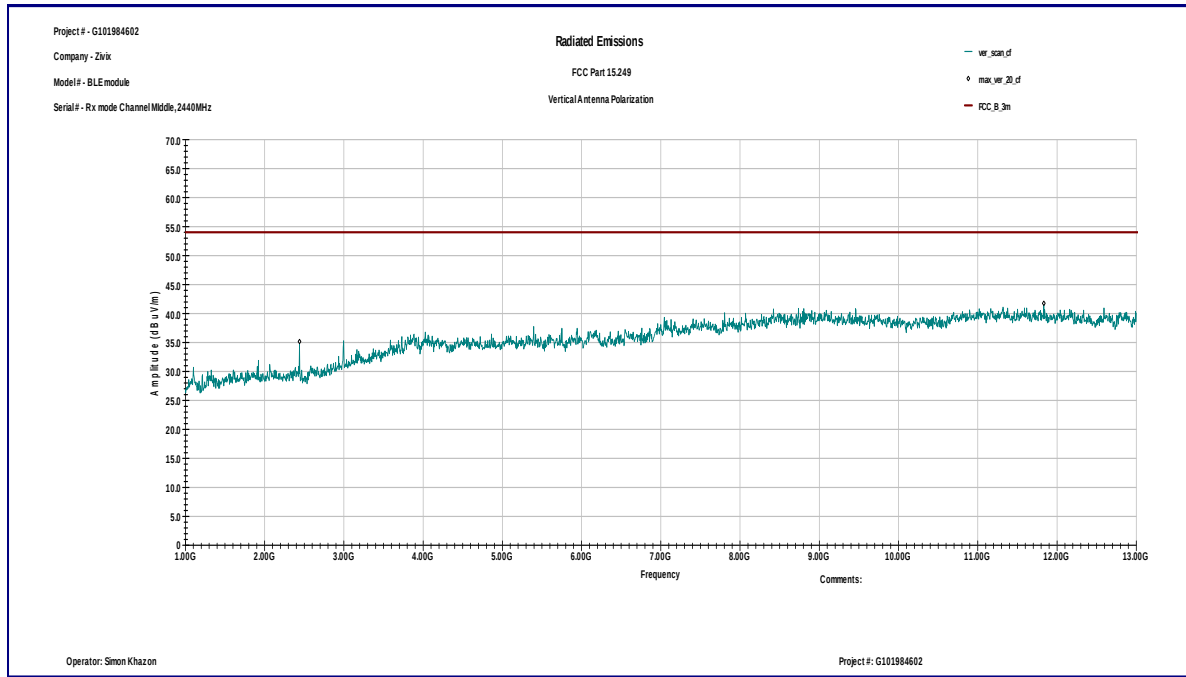


Horizontal antenna polarization

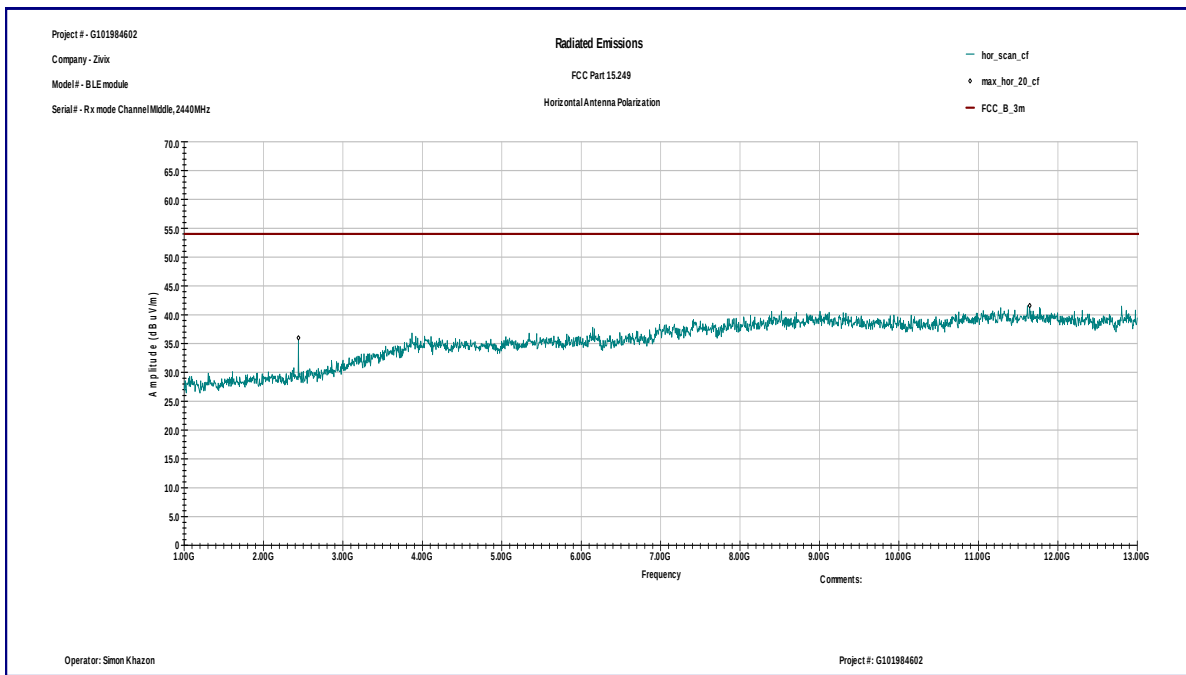


Graph 3.5.5

Vertical antenna polarization

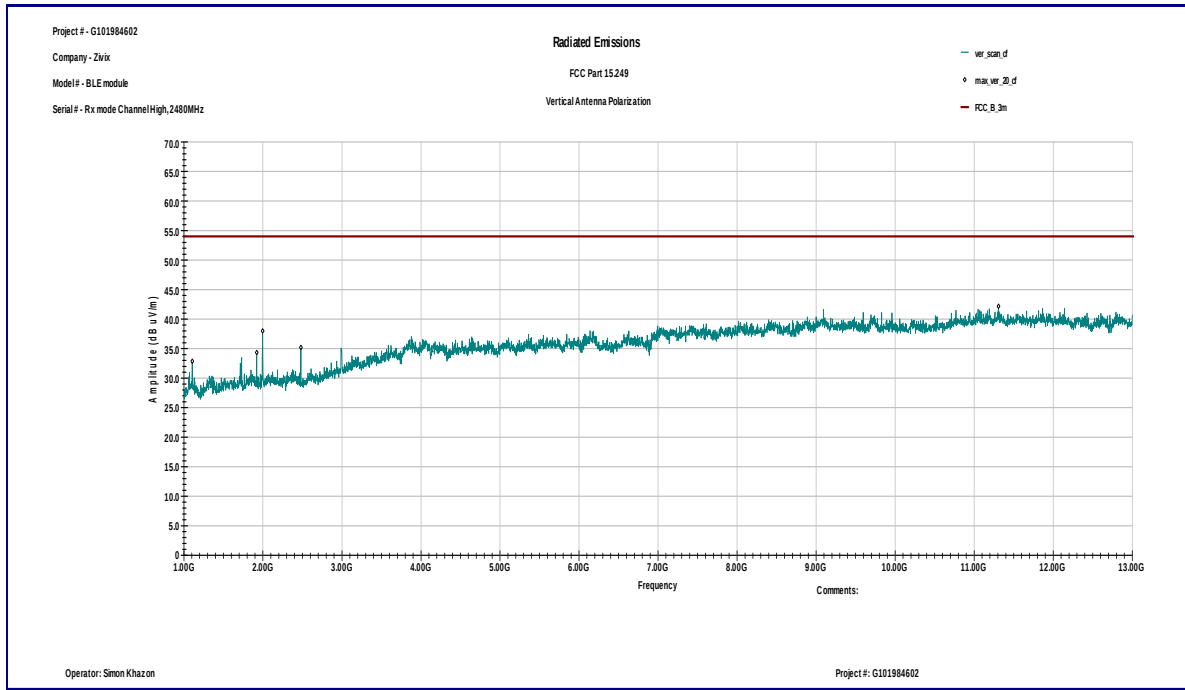


Horizontal antenna polarization

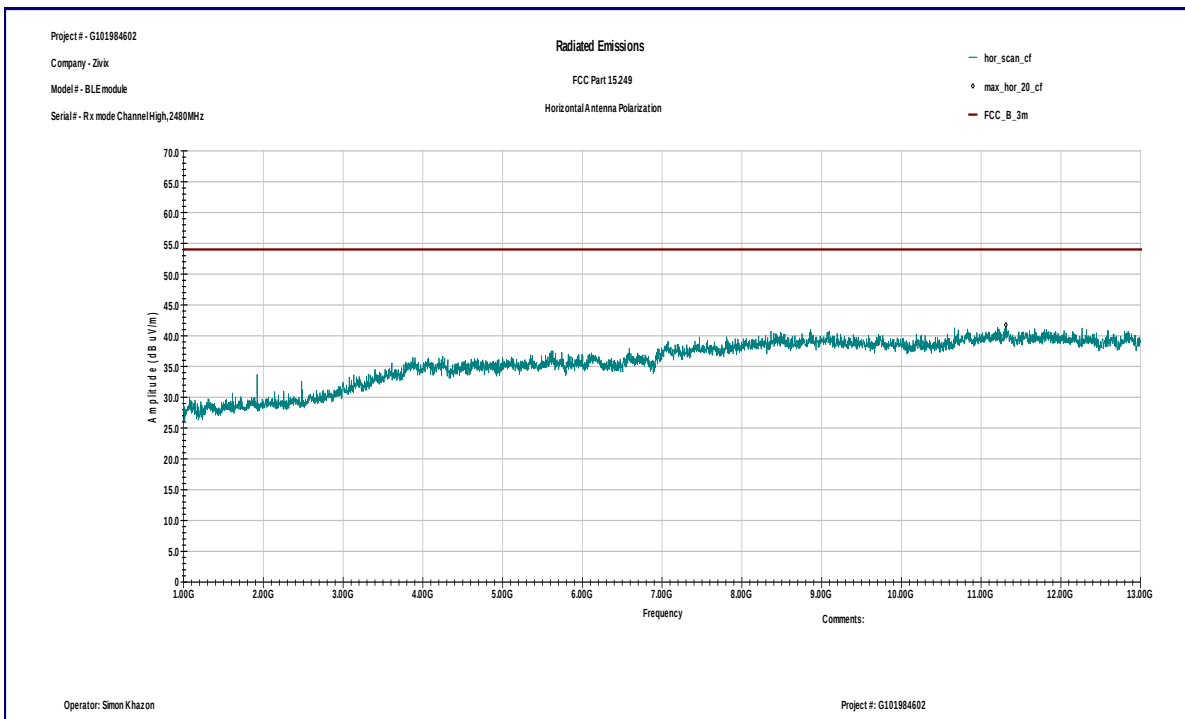


Graph 3.5.6

Vertical antenna polarization



Horizontal antenna polarization





3.6 Digital device conducted emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test result: **Pass**

Frequency range: 0.15MHz-30MHz

Max. Emissions margin: 14.8 dB below the limits

Notes: The test was performed through the host laptop computer power supply because the EUT is powered through the host laptop computer.

Date:	January 29, 2015	Result: Pass
Standard:	FCC 15.107, Class B	
Tested by:	Richard Blonigen	
Test Point:	Power Line	
Operation mode:	See Page 5	
Note:	None	

Table 3.6.1

Line 1

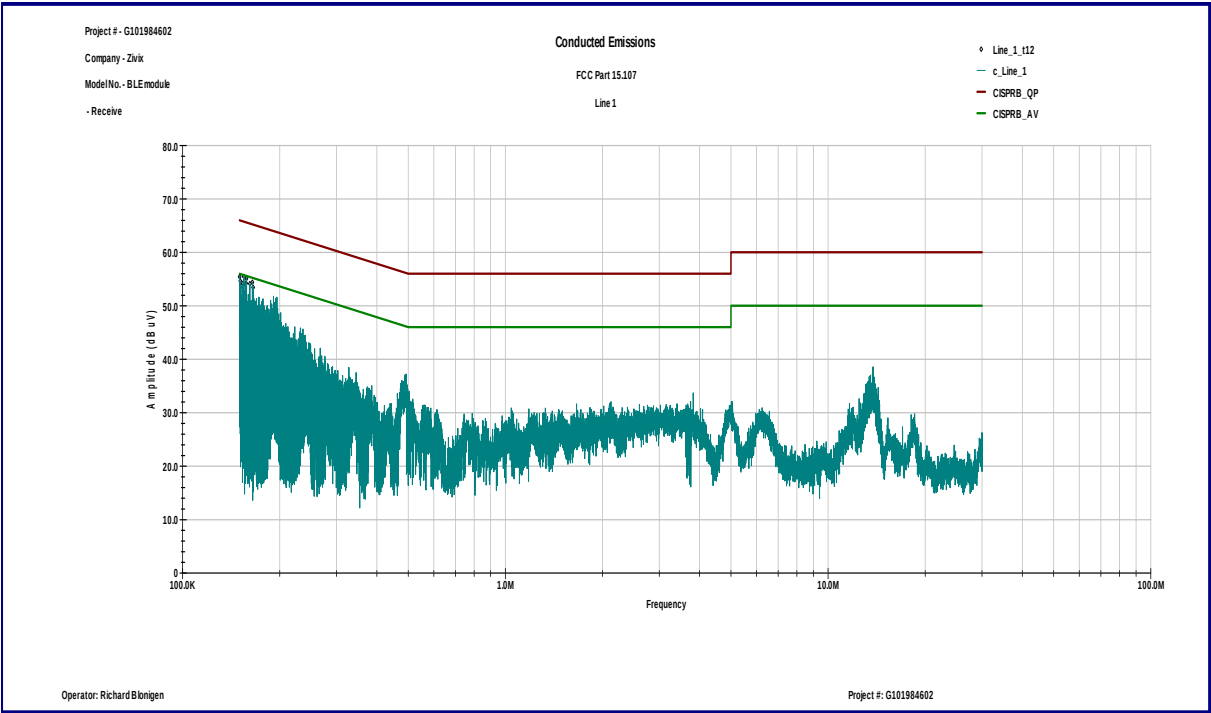
Frequency	QP dB μ V	AVG dB μ V	QP Limit dB μ V	AVG Limit dB μ V	QP Margin dB	AVG Margin dB
151.16 KHz	50.8	28.5	65.9	55.9	-15.1	-27.4
152.08 KHz	47.8	25.8	65.9	55.9	-18.1	-30.1
155.16 KHz	45.8	21.1	65.7	55.7	-19.9	-34.6
155.73 KHz	46.3	24.8	65.7	55.7	-19.4	-30.9
159.7 KHz	44.8	19.1	65.5	55.5	-20.7	-36.4
165.66 KHz	44.0	23.0	65.2	55.2	-21.2	-32.2

Line 2

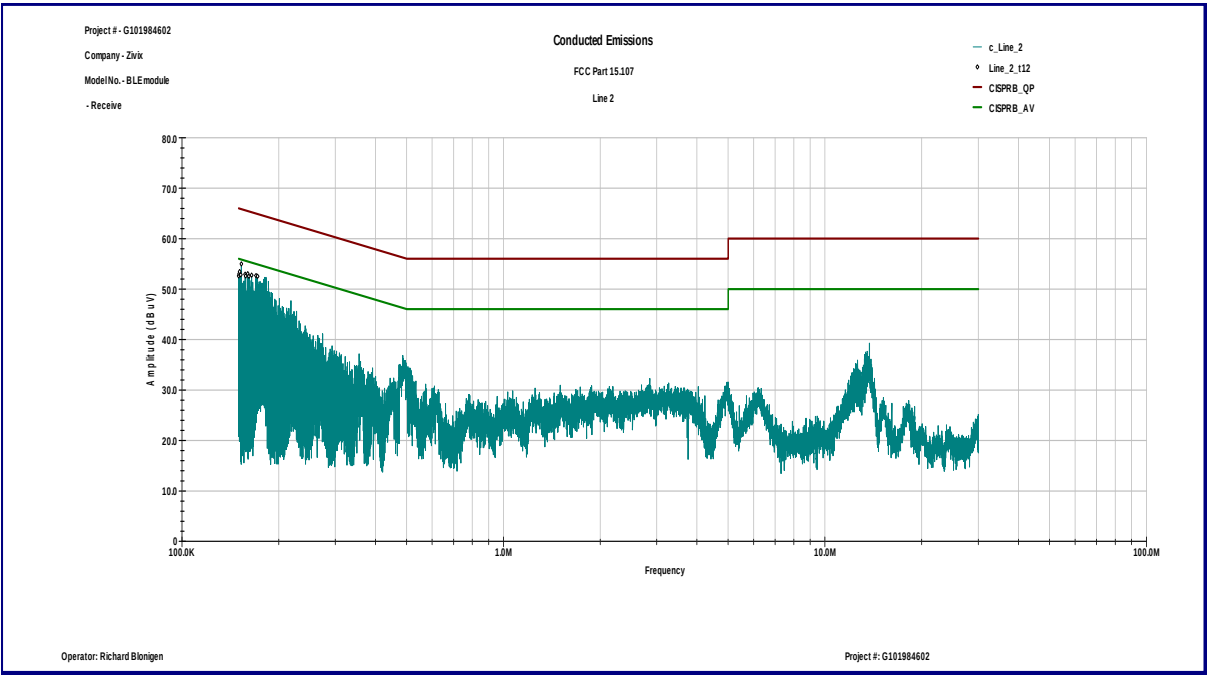
Frequency	QP dB μ V	AVG dB μ V	QP Limit dB μ V	AVG Limit dB μ V	QP Margin dB	AVG Margin dB
151.47 KHz	45.4	24.0	65.9	55.9	-20.5	-32.0
156.81 KHz	45.4	23.0	65.6	55.6	-20.2	-32.6
162.24 KHz	46.8	30.6	65.4	55.4	-18.6	-24.7
167.37 KHz	49.6	36.8	65.1	55.1	-15.5	-18.3
168.68 KHz	50.3	36.8	65.0	55.0	-14.8	-18.3
171.05 KHz	49.9	36.7	64.9	54.9	-15.0	-18.3

Graph 3.6.1

Line 1



Line 2





4.0 TEST EQUIPMENT

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NO.	INTERTEK ID	CAL DUE	USED
Spectrum Analyzer	R & S	FSP 40	100024	12559	01/07/2016	☒
Spectrum Analyzer	R & S	ESCI	100358	12909	10/15/2015	☒
Bicono-Log Antenna	Teseq	CBL6112D	32859	25289	09/10/2015	☒
Horn Antenna	EMCO	3115	9507-4513	9936	06/27/2015	☒
Waveguide Horn Antenna	EMCO	3116	9904-2423	9705	11/24/2015	☒
LISN	COM-Power	Li-215A	191970	172315	04/08/2015	☒
Pre-Amplifier	MITEQ	AMF-5D-00501800-28-13P	1122951	13475	11/19/2015	☒
Pre-Amplifier	MITEQ	AMF-6F-16002600-25-10P	1222383	MIN-0065	11/19/2015	☒
System	Quantum Change	TILE! Instrument Control	Ver. 3.4.K.29	15259	VBU	☒



5.0 Revision History

REVISION LEVEL	DATE	REPORT NUMBER	PREPARED	REVIEWED	NOTES
0	2-23-2015	101984602MIN-001	RB	RB	Original Issue