TEST REPORT

Report Number: 101277992MIN-011B
Project Number: G101277992

Testing performed on the
Model 4100, Pocket Programmer

FCC ID:
Industry Canada ID:

to
47 CFR Part 15. 249:2013
RSS- 210, Issue 8, 2010
RSS-Gen, Issue 3, 2010
47 CFR, Part 15:2013, §15.107 and §15.109, Class B / ICES-003, Issue 5:2012

For
Minnetronix

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

Test Authorized by:
Minnetronix
1635 Energy Park Drive
St. Paul, MN 55108 USA

Prepared by: U. Spector — Date: October 30, 2013
Uri Spector

Reviewed by: S.Khazon — Date: October 30, 2013
Simon Khazon

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1.0 GENERAL DESCRIPTION

Model:	4100
Type of EUT:	Pocket Programmer, Wakeup Radio
Serial Number:	DBR 1616
FCC ID:	
Industry Canada ID:	
Related Submittal(s) Grants:	N/A
Company:	Minnetronix
Customer:	Sue Sibilski
Address:	1635 Energy Park Drive St. Paul, MN 55108
Phone:	(651) 917-4060
Fax:	(651) 917-4066
e-mail:	ssibilski@minnetronix.com
Test Standards:	☒ 47 CFR, Part 15:2013, §15.249 ☒ RSS–210, Issue 8, 20010 ☒ RSS-Gen, Issue 3, 2010 ☒ 47 CFR, Part 15:2013, §15.107 and §15.109, Class B ☒ ICES-003, Issue 5:2012 ☐ Other
Type of radio:	☒ Stand -alone ☐ Module ☐ Hybrid
Date Sample Submitted:	August 16, 2013
Test Work Started:	August 19, 2013
Test Work Completed:	September 26, 2013
Test Sample Conditions:	☐ Damaged ☐Poor (Usable) ☒ Good

1.1 Product Description; Test Facility

Product Description:	Pocket Programmer
Operating Frequency	2.45GHz
Power Level Setting	10
Modulation:	OOK
Emission Designator:	3MX1D
Antenna(s) Info:	-3dBi wire loop antenna
Antenna Installation:	☐ User ☐ Professional ☒ Factory
Transmitter Power Configuration:	☐ Internal battery ☒ External power source ☒ 100-240VAC ☐ 400VAC ☐ DC ☐ Other: ☒ 50-60Hz
Special Test Arrangement:	As a 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
☒ - Continuous modulated
☐ - Test program (customer specific)
☒ - Below

Operating modes of the EUT:

No.	Description
1	The EUT was powered 120VAC and was activated to transmit continuously at 2.45GHz.

Cables:

No.	Type	Length	Designation	Note
1	Not shielded USB Power cable	2m	Power Cable	

Support equipment/Services:

No.	Item	Description
1	None	

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(µV/m)
RA = Receiver Amplitude in dB(µV)
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(µV) 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(µV/m).

RA = 48.1 dB(µV)
AF = 7.4 dB(m^{-1})
CF = 1.6 dB
AG = 16.0 dB
FS = RA + AF + CF - AG
FS = 48.1 + 7.4 + 1.6 – 16.0
FS = 41.1 dB(µV/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: 2.45GHz

Test result: **Pass**

Max. Emissions margin at fundamental: 10.3dB below the limits

Notes: None

Date:	September 4, 2013	**Result:** **Pass**
Standard:	FCC 15.249(a) / RSS-210 A2.9	
Tested by:	Uri Spector	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	Emission at fundamental	

Table 3.1.1

Frequency MHz	Antenna Polarity	Antenna Hts(cm)	Ant. CF dB1/m	Cable loss dB	Pre-amp Gain (dB)	Reading dBµV	AVG CF dB	Total @ 3m dBµV/m	Limit dBµV/m	Margin dB	Comments
Peak Limits											
2450.00	V	118	28.4	2.9	0.0	72.4	0.0	103.7	114.0	-10.3	
2450.00	H	210	28.4	2.9	0.0	70.2	0.0	101.5	114.0	-12.5	
Average Limits											
2450.00	V	118	28.4	2.9	0.0	55.9	16.3	70.9	94.0	-23.1	
2450.00	H	210	28.4	2.9	0.0	53.7	16.3	68.7	94.0	-25.3	

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: 0.5dB below the limits

Notes: The radiated harmonics and spurious emissions test was performed in the Anechoic chamber at 3m measurement distance (see Tables 3.2.1, 3.2.2, 3.2.3 and Graphs 3.2.1. 3.2.2, 3.2.3, 3.2.4, 3.2.5).

Date:	August 30-September 26, 2013	**Result:**	**Pass**
Standard:	FCC 15.249(a) / RSS-210 A2.9		
Tested by:	Uri Spector		
Test Point:	Enclosure with antenna		
Operation mode:	See Page 5		
Note:	Harmonics and spurious emissions 30MHz-1GHz		

Table 3.2.1

Frequency	Ant. Polarity	Peak Reading dBµV	Total C.F. dB1/m	Total at 3m dBµV/m	Limit dBµV/m	Margin dB
35.922 MHz	V	14.6	16.8	31.4	40.0	-8.6
46.485 MHz	V	24.1	11.2	35.3	40.0	-4.7
47.905 MHz	V	24.0	10.5	34.5	40.0	-5.5
66.424 MHz	V	23.5	7.0	30.5	40.0	-9.5
75.452 MHz	V	18.9	8.0	26.9	40.0	-13.1
81.496 MHz	V	15.1	8.9	24.0	40.0	-16.0
107.01 MHz	V	15.6	13.3	28.9	43.5	-14.6
120.07 MHz	V	13.1	13.9	27.0	43.5	-16.5
132.53 MHz	V	14.4	13.8	28.1	43.5	-15.4
143.11 MHz	V	21.3	13.1	34.3	43.5	-9.2
33.256 MHz	H	9.8	18.4	28.2	40.0	-11.8
47.732 MHz	H	14.1	10.6	24.7	40.0	-15.3
81.496 MHz	H	14.5	8.9	23.4	40.0	-16.7
143.11 MHz	H	15.1	13.1	28.1	43.5	-15.4

Date:	August 30-September 26, 2013	**Result:** **Pass**
Standard:	FCC 15.249(a) / RSS-210 A2.9	
Tested by:	Uri Spector	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	Harmonics and spurious emissions 1GHz-26GHz. Emission at fundamental frequency was excluded from the table.	

Table 3.2.2

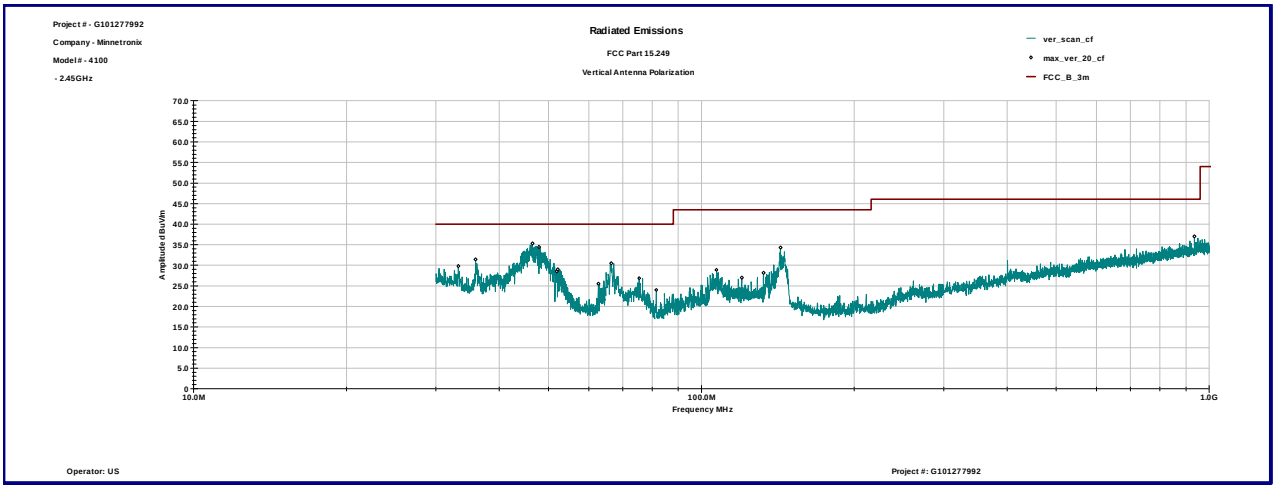
Frequency	Antenna		Ant. CF	Cable loss	Pre-amp	Reading	AVG CF	Total @ 3m	Limit	Margin	Comments
MHz	Polarity	Hts(cm)	dB1/m	dB	Gain (dB)	dBµV	dB	dBµV/m	dBµV/m	dB	
1956.08	V	100	28.3	6.0	0.0	15.7	0.0	50.0	54.0	-4.0	Peak
1956.08	H	100	28.3	6.0	0.0	19.4	0.0	53.7	74.0	-20.3	Peak
1956.08	H	100	28.3	6.0	0.0	7.6	16.5	25.4	54.0	-28.6	AVG Value
1982.08	V	100	28.2	6.0	0.0	20.1	0.0	54.3	74.0	-19.7	Peak
1982.08	V	100	28.2	6.0	0.0	8.8	16.3	26.7	54.0	-27.3	AVG Value
1982.08	H	112	28.2	6.0	0.0	22.3	0.0	56.5	74.0	-17.5	Peak
1982.08	H	112	28.2	6.0	0.0	10.2	16.5	27.9	54.0	-26.1	AVG Value
2138.10	V	137	27.6	2.8	0.0	25.8	0.0	56.1	74.0	-17.9	Peak
2138.10	V	137	27.6	2.8	0.0	25.8	16.5	39.6	54.0	-14.4	AVG Value
2138.10	H	139	27.6	2.8	0.0	27.3	0.0	57.6	74.0	-16.4	Peak
2138.10	H	139	27.6	2.8	0.0	27.3	16.5	41.1	54.0	-12.9	AVG Value
2229.00	V	217	27.8	2.8	0.0	29.8	0.0	60.4	74.0	-13.6	Peak
2229.00	V	217	27.8	2.8	0.0	29.8	16.5	43.9	54.0	-10.1	AVG Value
2229.00	H	208	27.8	2.8	0.0	27.4	0.0	58.0	74.0	-16.0	Peak
2229.00	H	208	27.8	2.8	0.0	27.4	16.5	41.5	54.0	-12.5	AVG Value
2294.10	V	240	28.0	2.9	0.0	32.7	0.0	63.5	74.0	-10.5	Peak
2294.10	V	240	28.0	2.9	0.0	10.4	0.0	41.2	54.0	-12.7	AVG Detector
2294.10	H	147	28.0	2.9	0.0	42.7	0.0	73.5	74.0	-0.5	Peak
2294.10	H	147	28.0	2.9	0.0	19.7	0.0	50.5	54.0	-3.4	AVG Detector
4900.00	V	121	33.1	4.2	42.0	64.2	0.0	59.5	74.0	-14.5	Peak
4900.00	V	121	33.1	4.2	42.0	51.7	16.5	30.5	54.0	-23.5	AVG Value
4900.00	H	141	33.1	4.2	42.0	70.1	0.0	65.4	74.0	-8.6	Peak
4900.00	H	141	33.1	4.2	42.0	57.1	16.5	35.9	54.0	-18.1	AVG Value

Table 3.2.3

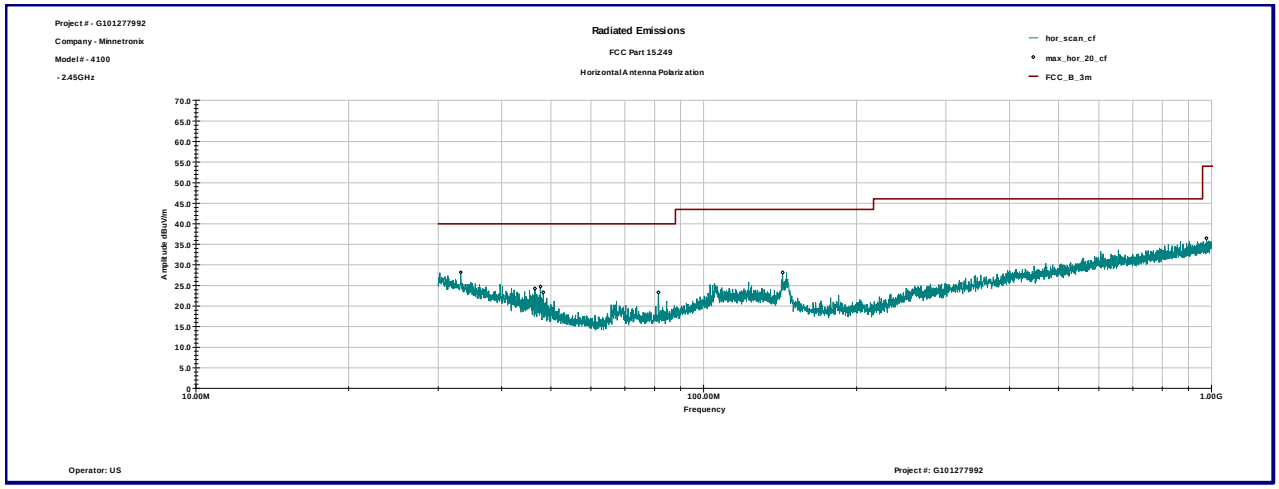
Frequency	Antenna		Ant. CF	Cable loss	Pre-amp	Reading	AVG CF	Total @ 3m	Limit	Margin	Comments
MHz	Polarity	Hts(cm)	dB1/m	dB	Gain (dB)	dBµV	dB	dBµV/m	dBµV/m	dB	
Bandedge Compliance											
2400.00	V	123	28.3	2.9	0.0	36.5	0.0	67.7	74.0	-6.3	Peak
2400.00	V	123	28.3	2.9	0.0	26.2	16.3	41.1	54.0	-12.9	AVG
2400.00	H	137	28.3	2.9	0.0	37.0	0.0	68.2	74.0	-5.8	Peak
2400.00	H	137	28.3	2.9	0.0	25.3	16.3	40.2	54.0	-13.8	AVG
2483.50	V	113	28.5	3.0	0.0	31.0	0.0	62.5	74.0	-11.5	Peak
2483.50	V	113	28.5	3.0	0.0	24.1	16.3	39.3	54.0	-14.7	AVG
2483.50	H	138	28.5	3.0	0.0	32.8	0.0	64.3	74.0	-9.7	Peak
2483.50	H	138	28.5	3.0	0.0	24.9	16.3	40.1	54.0	-13.9	AVG

Graph 3.2.1

Vertical antenna polarization

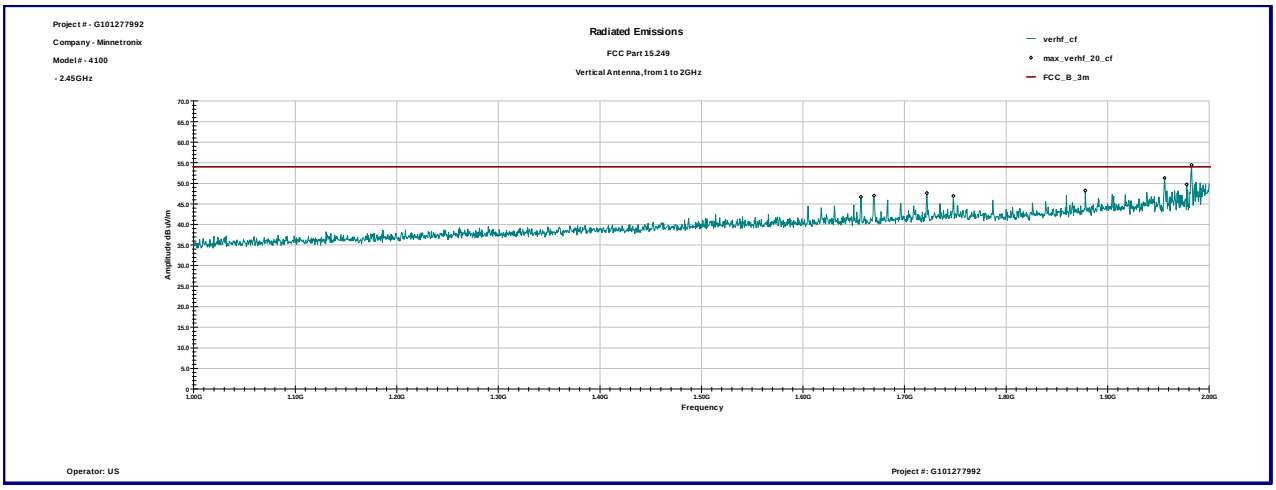


Horizontal antenna polarization

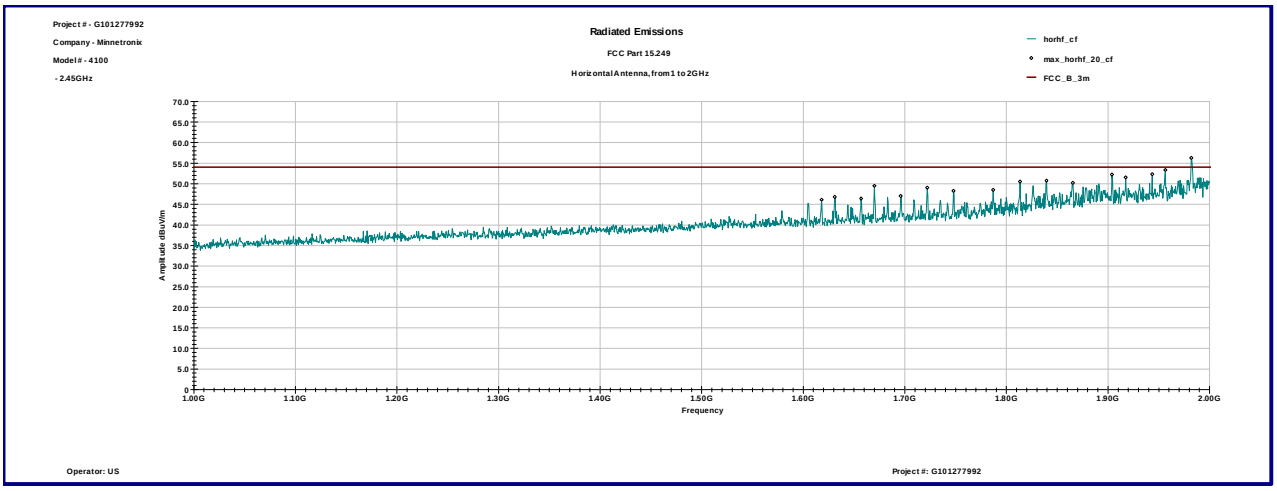


Graph 3.2.2

Vertical antenna polarization

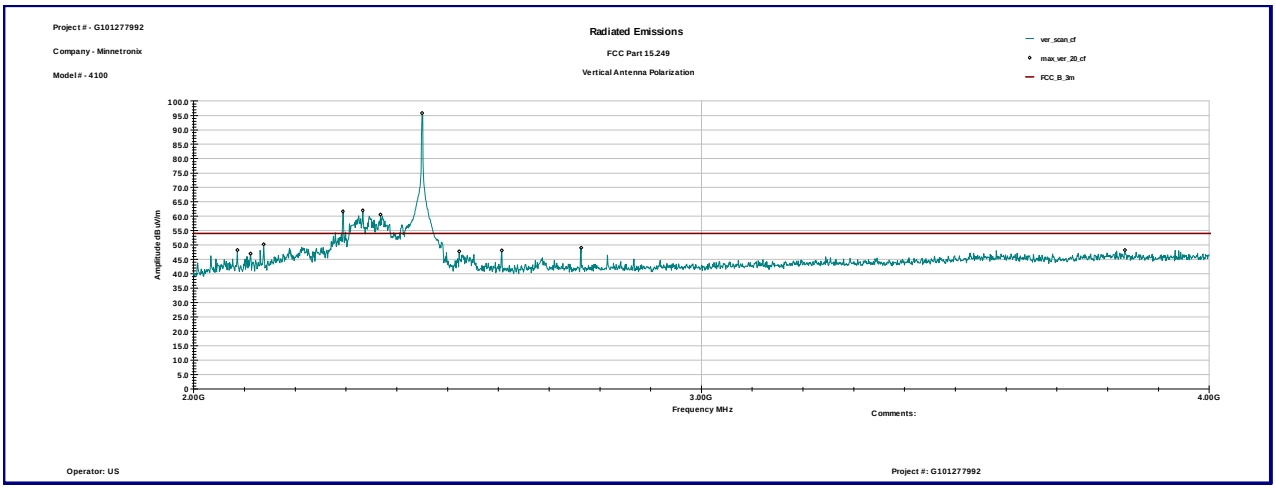


Horizontal antenna polarization

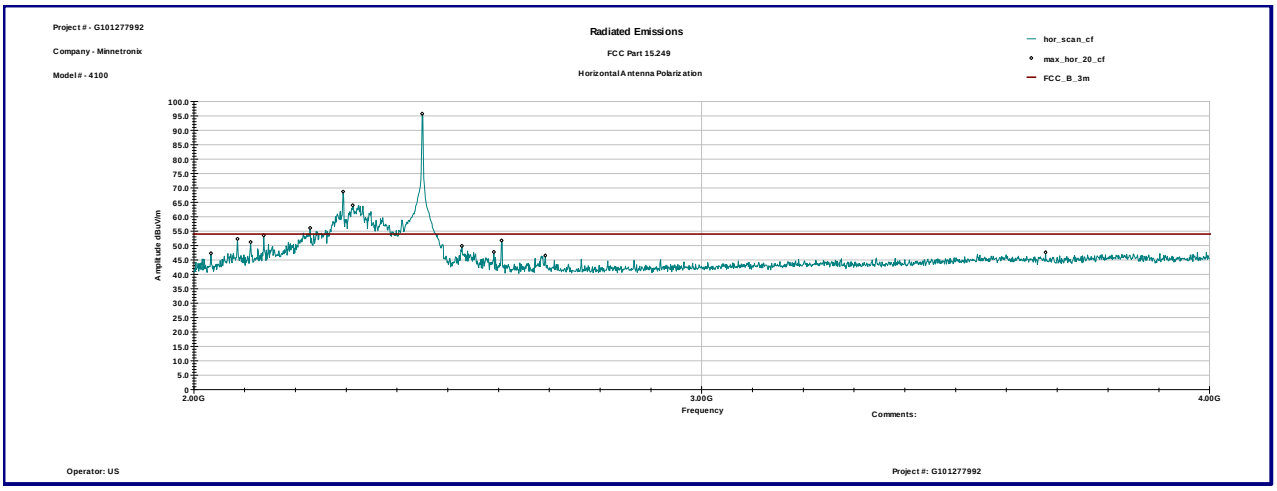


Graph 3.2.3

Vertical antenna polarization

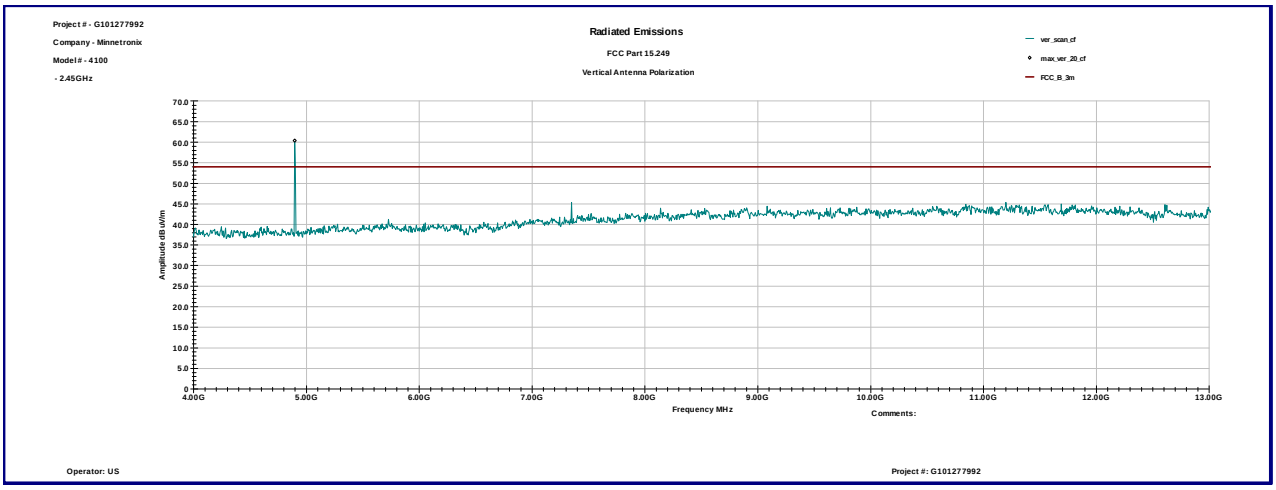


Horizontal antenna polarization

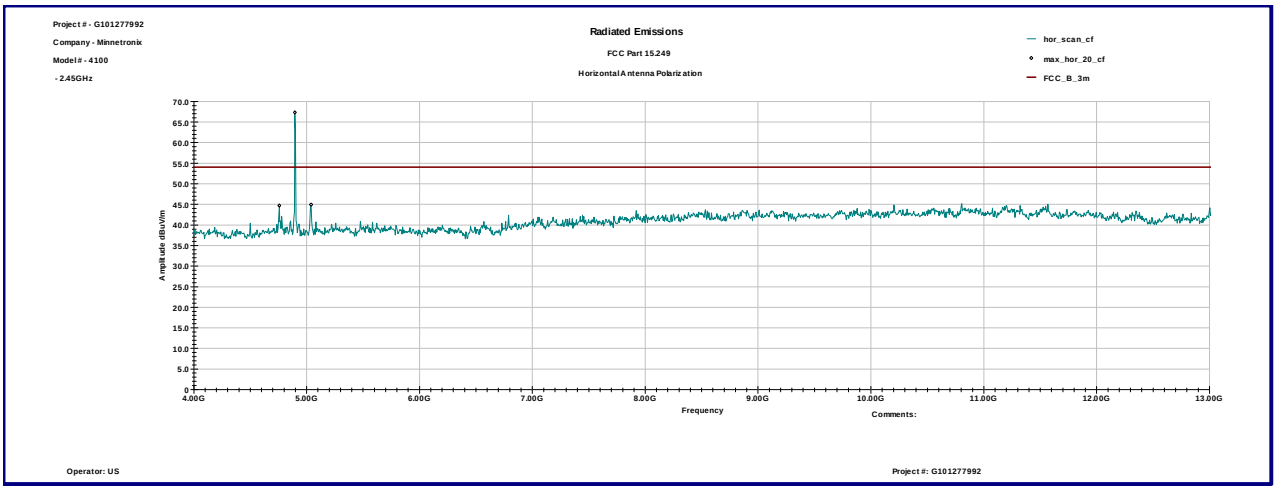


Graph 3.2.4

Vertical antenna polarization

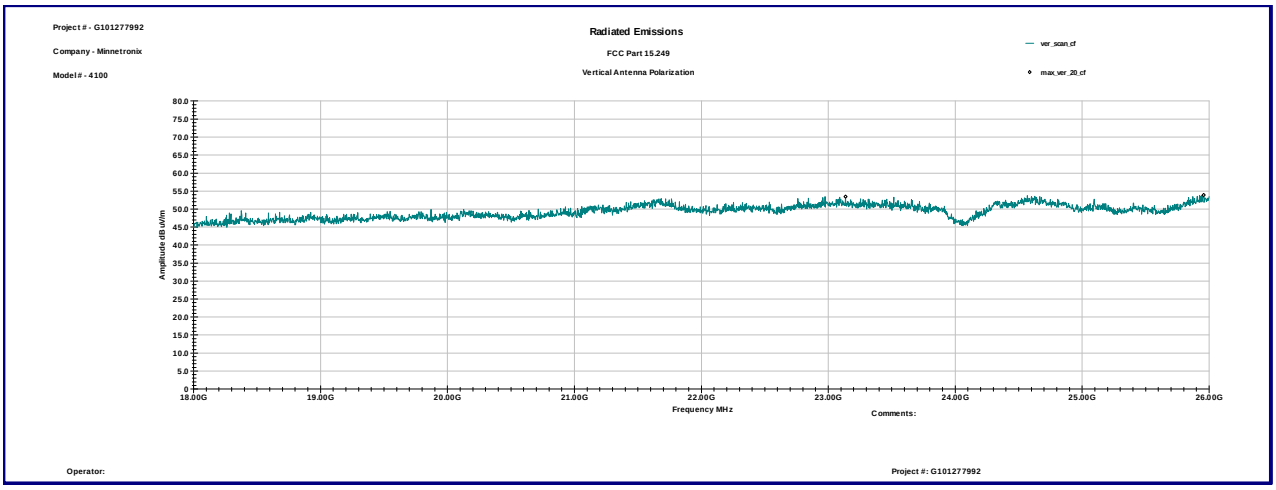


Horizontal antenna polarization

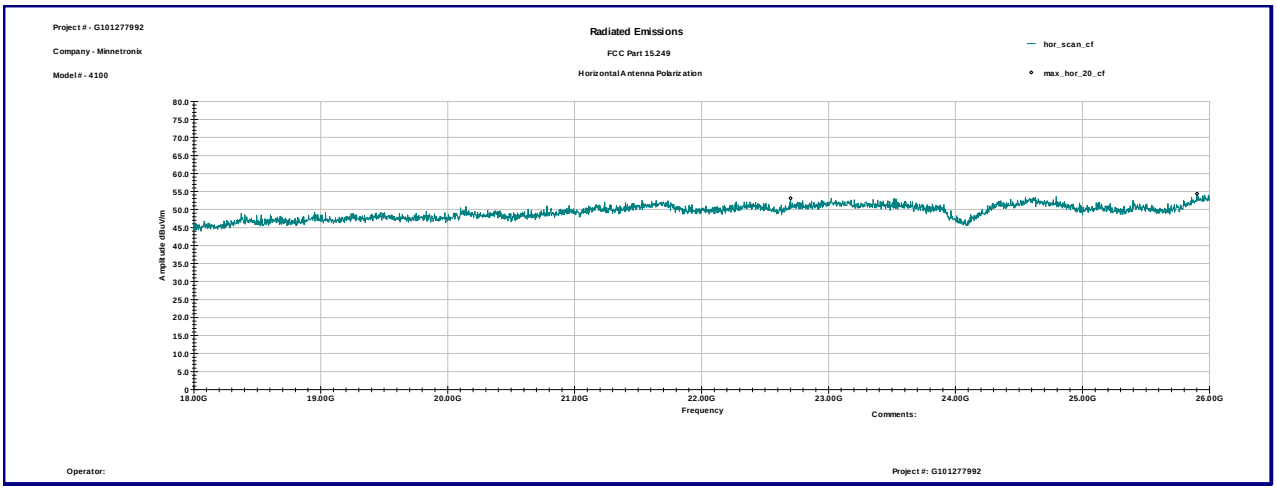


Graph 3.2.5

Vertical antenna polarization



Horizontal antenna polarization



3.2.1 Average correction factor calculation

An Average correction factor is calculated by averaging one complete pulse train.

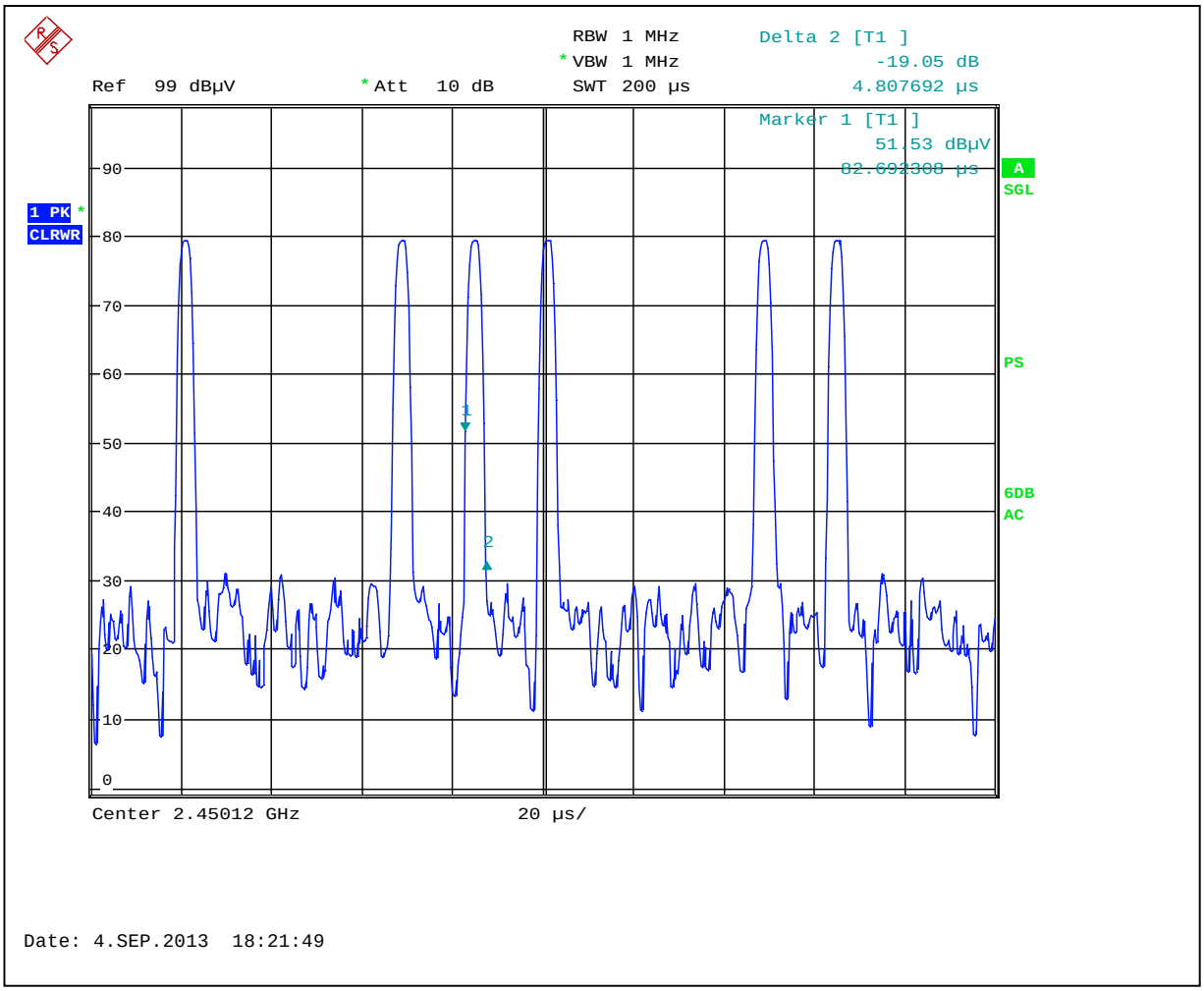
Time of one pulse is 4.8µsec (see Graph 3.2.6). There are 32 pulses over 1msec period (see Graph 3.2.7) or 3200 pulses over 100msec period.

Time with field strength is in its maximum value (length of pulses) = 3200* 4.8µsec = 15.36ms

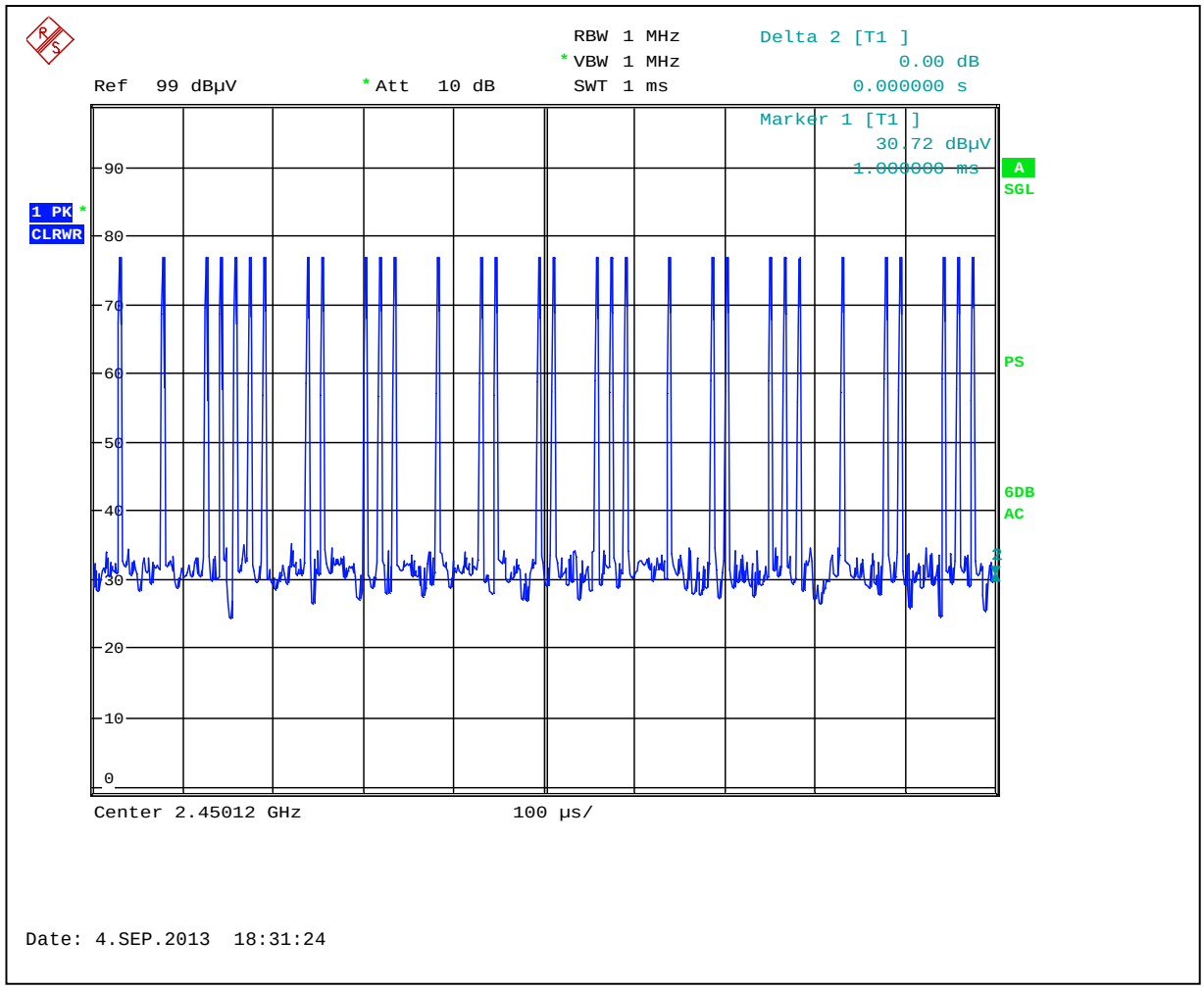
Average Correction Factor = 20Log(15.36ms/100ms) = -16.3dB

Graphs 3-2-6 to 3-2-7 show pulse train timing.

Graph 3.2.6


RBW 1 MHz
*VBW 1 MHz
SWT 200 µs
Delta 2 [T1]
-19.05 dB
4.807692 µs
Marker 1 [T1]
51.53 dBµV
82.692308 µs
Ref 99 dBµV
*Att 10 dB
1 PK *
CLRWR
A
SGL
PS
6DB
AC
90
80
70
60
50
40
30
20
10
0
Center 2.45012 GHz
20 µs/
Date: 4.SEP.2013 18:21:49

Graph 3.2.7


RBW 1 MHz
*VBW 1 MHz
SWT 1 ms
Delta 2 [T1]
0.00 dB
0.000000 s
Marker 1 [T1]
30.72 dBµV
1.000000 ms
Ref 99 dBµV
*Att 10 dB
1 PK
CLRWR
A
SGL
PS
6DB
AC
90
80
70
60
50
40
30
20
10
0
Center 2.45012 GHz
100 µs/
Date: 4.SEP.2013 18:31:24

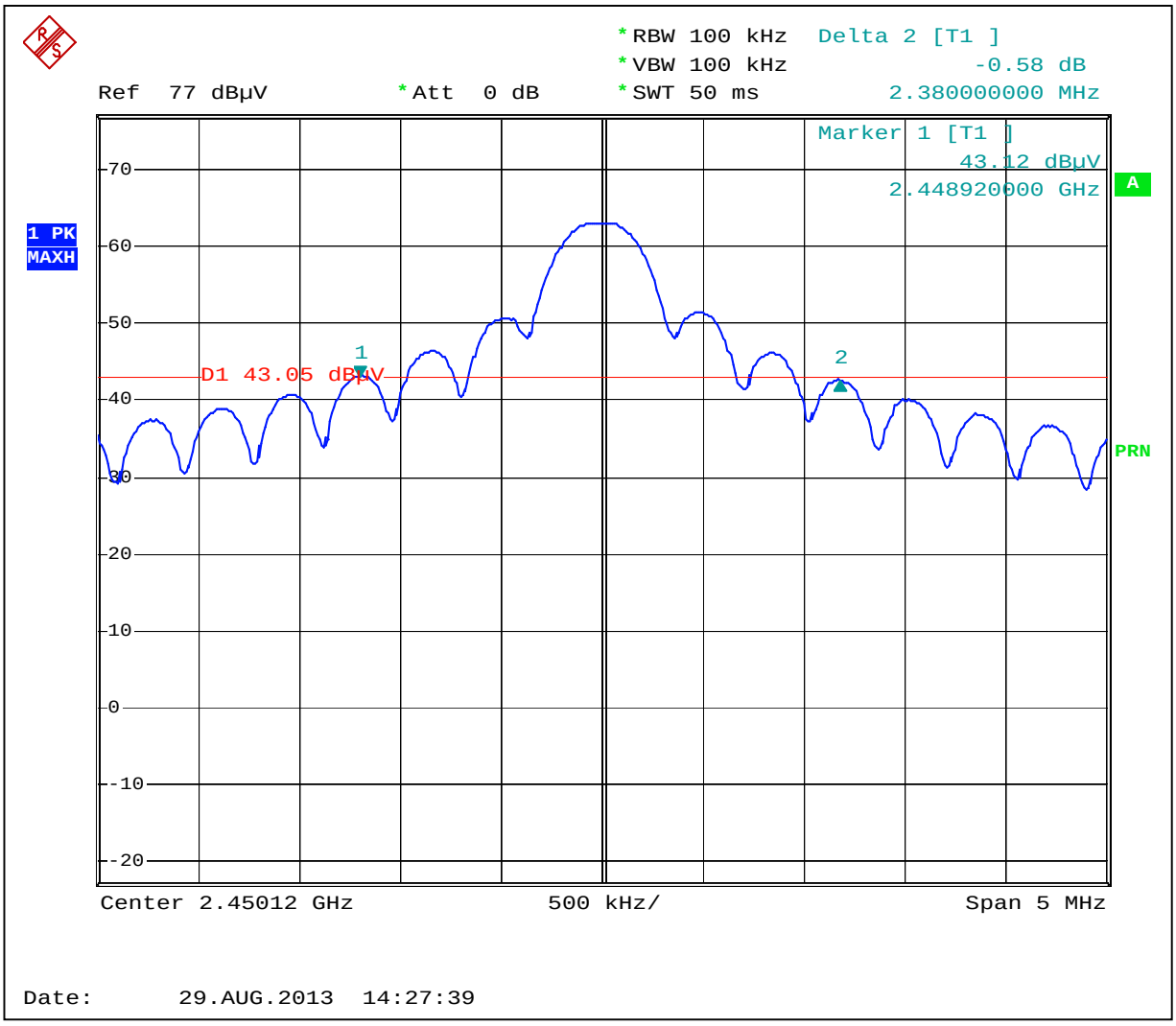
3.3 Bandwidth of Emissions

Center Frequency of operation MHz	Measured 20dB bandwidth MHz	Measured 99% bandwidth MHz
2450	2.38	2.99

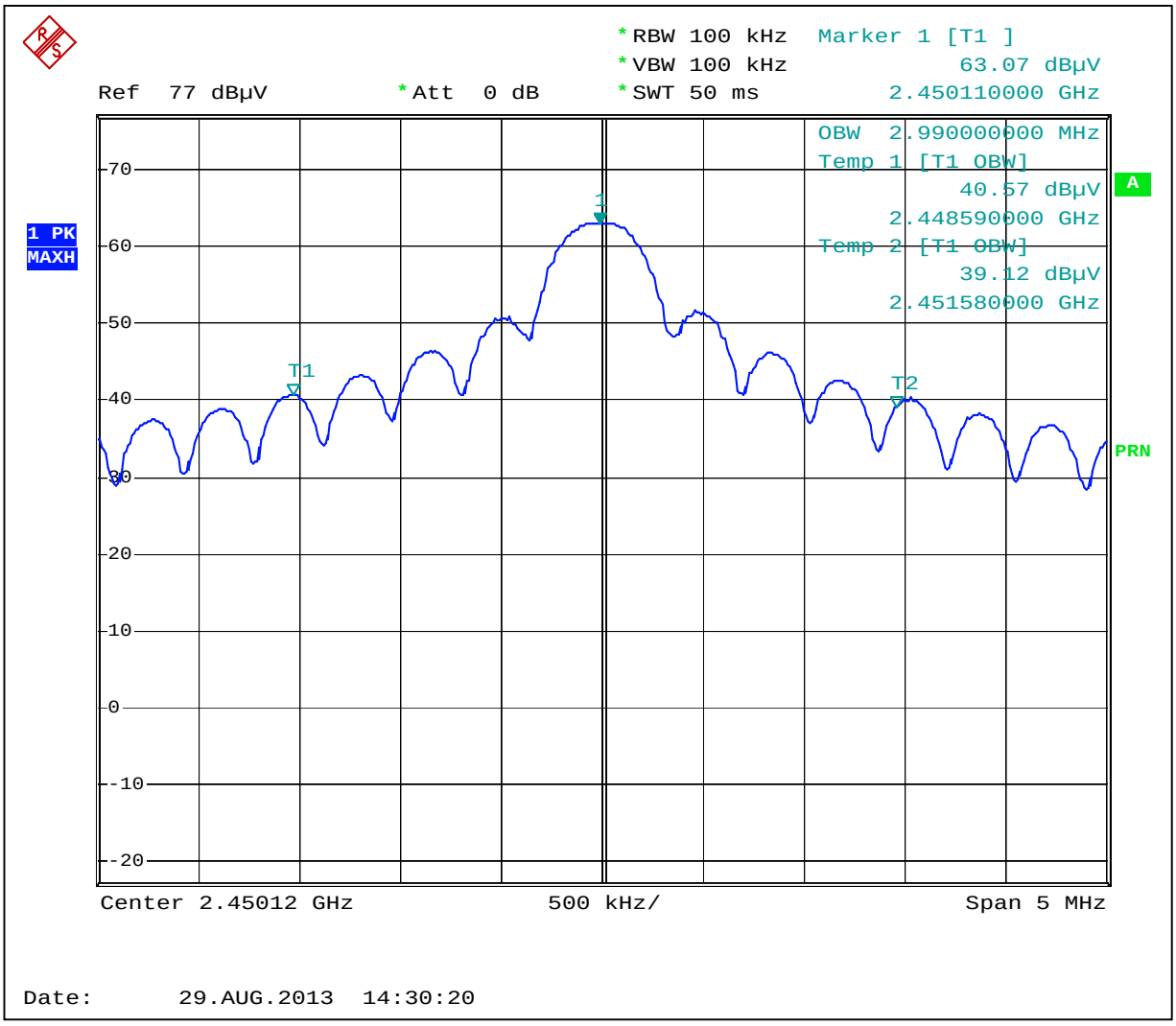
Graphs 3-3-1 and 3-3-2 are show bandwidth of emissions

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

Graph 3.3.1


*RBW 100 kHz
*VBW 100 kHz
*SWT 50 ms
Delta 2 [T1]
-0.58 dB
2.380000000 MHz
Ref 77 dBµV
*Att 0 dB
Marker 1 [T1]
43.12 dBµV
2.448920000 GHz
A
1 PK
MAXH
D1 43.05 dBµV
PRN
70
60
50
40
30
20
10
0
-10
-20
Center 2.45012 GHz
500 kHz/
Span 5 MHz
Date: 29.AUG.2013 14:27:39

Graph 3.3.2


*RBW 100 kHz
*VBW 100 kHz
*SWT 50 ms
Marker 1 [T1]
63.07 dBµV
2.450110000 GHz
Ref 77 dBµV
*Att 0 dB
OBW 2.990000000 MHz
Temp 1 [T1 OBW]
40.57 dBµV
2.448590000 GHz
Temp 2 [T1 OBW]
39.12 dBµV
2.451580000 GHz
1 PK
MAXH
A
PRN
70
60
50
40
30
20
10
0
-10
-20
T1
T2
Center 2.45012 GHz
500 kHz/
Span 5 MHz
Date: 29.AUG.2013 14:30:20

3.4 Transmitter power line conducted emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test result: **Pass**

Frequency range: 0.15MHz-30MHz

Max. Emissions margin: 12.3dB below the limits

Notes: None

Date:	August 28, 2013	**Result:** **Pass**
Standard:	FCC 15.207	
Tested by:	Uri Spector	
Test Point:	Power Line	
Operation mode:	See Page 5	
Note:	None	

Table 3.4.1

Line 1

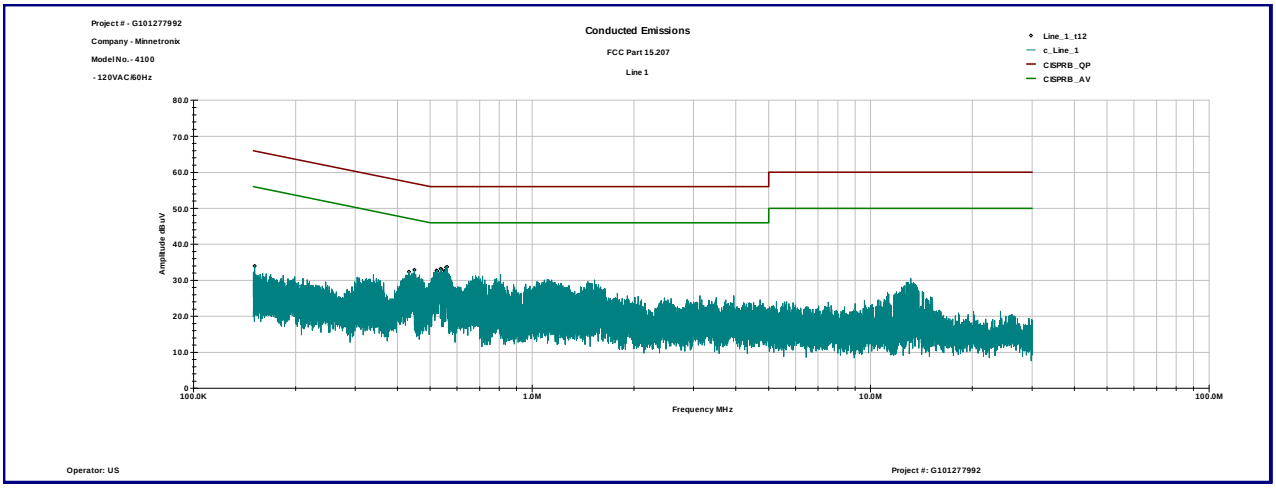
Frequency	Peak dBµV	QP Limit dBµV	AVG Limit dBµV	QP Margin dB	AVG Margin dB
432.59 KHz	32.4	57.2	47.2	-24.8	-14.8
448.88 KHz	32.9	56.9	46.9	-24.0	-14.0
521.14 KHz	32.7	56.0	46.0	-23.3	-13.3
536.61 KHz	33.2	56.0	46.0	-22.8	-12.8
556.38 KHz	33.6	56.0	46.0	-22.4	-12.4
561.05 KHz	33.7	56.0	46.0	-22.3	-12.3

Line 2

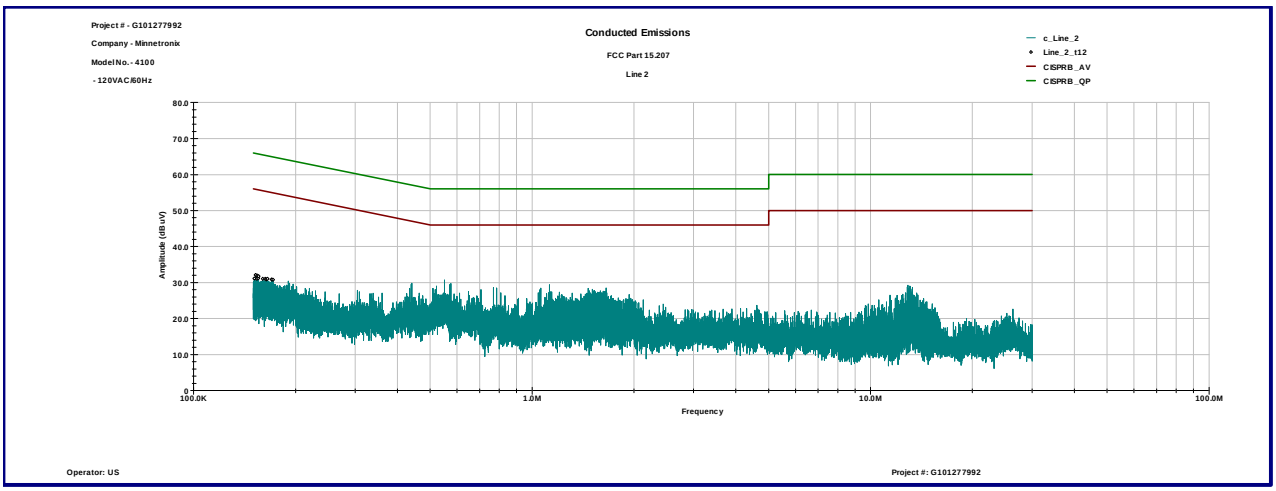
Frequency	Peak dBµV	QP Limit dBmV	AVG Limit dBmV	QP Margin dB	AVG Margin dB
152.45 KHz	32.1	65.9	55.9	-33.7	-23.7
155.55 KHz	31.7	65.7	55.7	-34.0	-24.0
162.82 KHz	31.0	65.3	55.3	-34.3	-24.3
165.42 KHz	31.0	65.2	55.2	-34.2	-24.2
169.81 KHz	30.8	65.0	55.0	-34.1	-24.1
171.63 KHz	30.8	64.9	54.9	-34.1	-24.1

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: 4.0dB below the limits

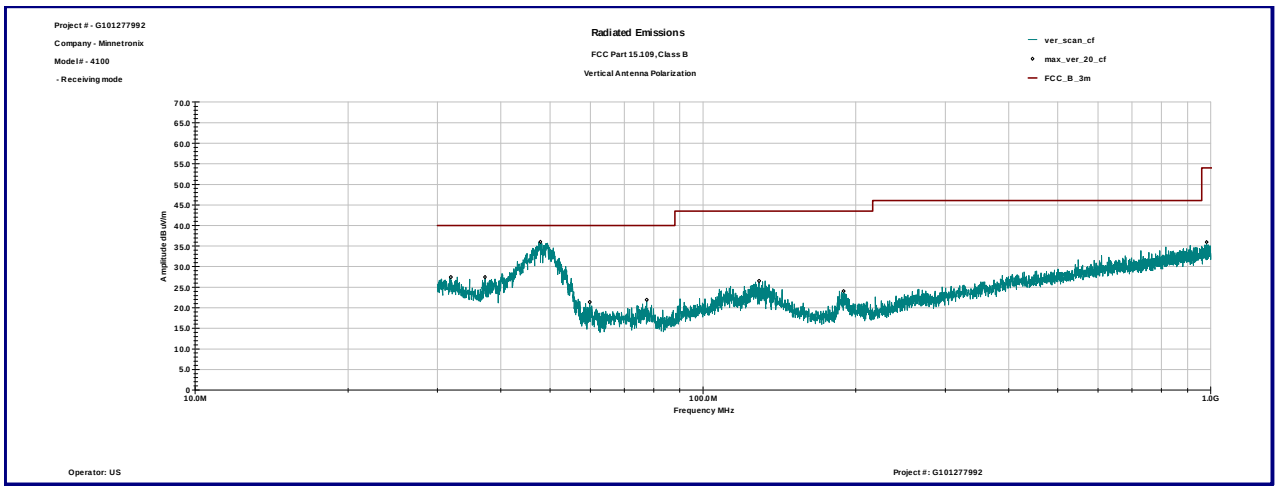
Notes: The Radiated Emissions test was performed in the Anechoic chamber at 3m measurement distance (see Table 3.5.1 and Graphs 3.5.1 to 3.5.2).

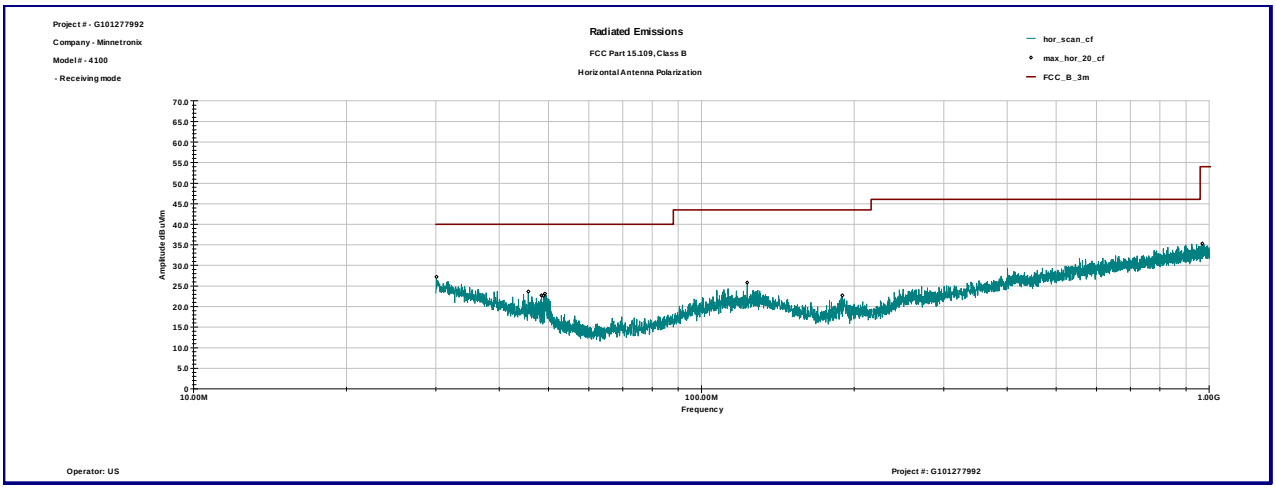
Date:	August 28, 2013	**Result:** **Pass**
Standard:	FCC Part 15.109, Class B	
Tested by:	Uri Spector	
Test Point:	Enclosure	
Operation mode:	Standby/Receiving mode	
Note:	No radiated spurious emissions were detected above 1GHz (see Graph 3.5.2).	

Table 3.5.1

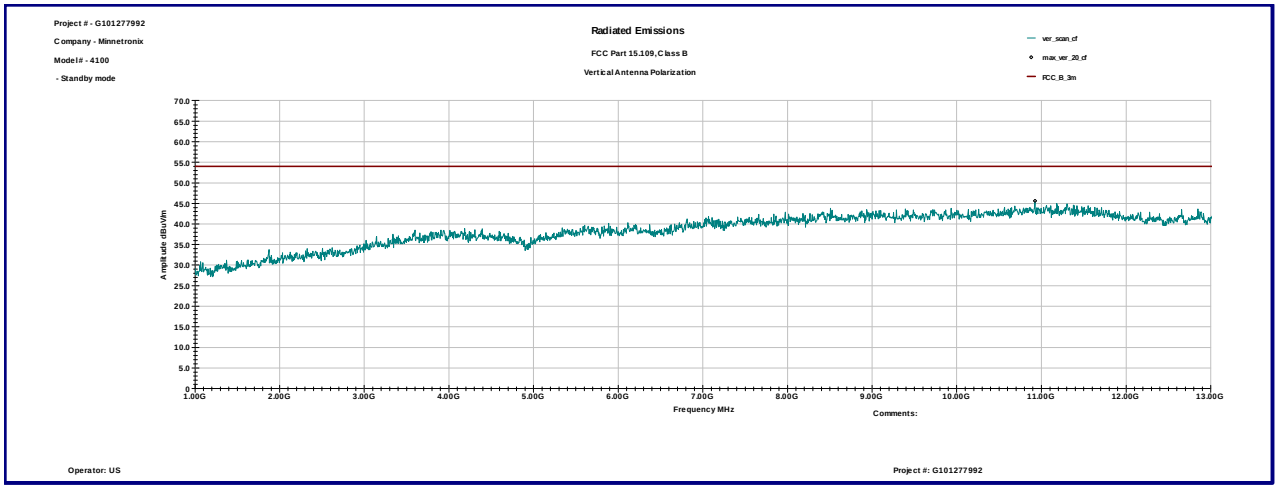
Frequency	Ant. Polarity	Peak Reading dBµV	Total C.F. dB1/m	Total at 3m dBµV/m	Limit dBµV/m	Margin dB
31.87 MHz	V	8.4	19.0	27.5	40.0	-12.5
37.204 MHz	V	11.3	16.1	27.5	40.0	-12.5
47.836 MHz	V	25.5	10.6	36.0	40.0	-4.0
59.819 MHz	V	14.2	7.2	21.4	40.0	-18.7
77.467 MHz	V	13.6	8.3	21.9	40.0	-18.1
128.95 MHz	V	12.5	14.0	26.5	43.5	-17.0
189.24 MHz	V	12.8	11.3	24.1	43.5	-19.5
30.069 MHz	H	7.1	20.2	27.3	40.0	-12.7
45.619 MHz	H	12.0	11.6	23.6	40.0	-16.4
49.187 MHz	H	13.1	10.0	23.1	40.0	-16.9
123.06 MHz	H	11.9	14.0	25.9	43.5	-17.7
189.4 MHz	H	11.4	11.3	22.7	43.5	-20.8

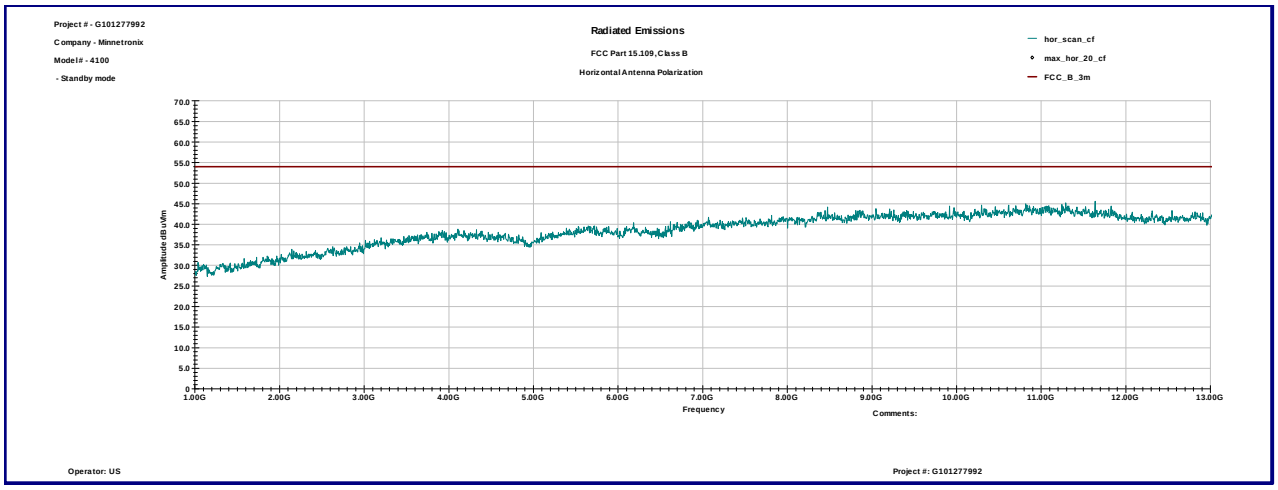
Graph 3.5.1


Project # - G101277992
Company - Minnetronix
Model # - 4100
- Receiving mode
Radiated Emissions
FCC Part 15.109, Class B
Vertical Antenna Polarization
ver_scan_cf
max_ver_20_cf
FCC_B_3m
Amplitude dB uV/m
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0
10.0M
100.0M
1.0G
Frequency MHz
Operator: US
Project #: G101277992


Project # - G101277992
Company - Minnetronix
Model # - 4100
- Receiving mode
Radiated Emissions
FCC Part 15.109, Class B
Horizontal Antenna Polarization
hor_scan_cf
max_hor_20_cf
FCC_B_3m
Amplitude dB uV/m
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0
10.00M
100.00M
1.00G
Frequency
Operator: US
Project #: G101277992

Graph 3.5.2


Project # - G101277992
Company - Minnetronix
Model# - 4100
- Standby mode
Radiated Emissions
FCC Part 15.109,Class B
Vertical Antenna Polarization
ver_scan.cf
max_ver_20.cf
FCC_B_3m
Amplitude dBuV/m
Frequency MHz
Comments:
Operator: US
Project #: G101277992


Project # - G101277992
Company - Minnetronix
Model# - 4100
- Standby mode
Radiated Emissions
FCC Part 15.109,Class B
Horizontal Antenna Polarization
hor_scan_cf
max_hor_20_cf
FCC_B_3m
Amplitude dBuV/m
Frequency
Comments:
Operator: US
Project #: G101277992

3.6 Digital device conducted emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test result: **Pass**

Frequency range: 0.15MHz-30MHz

Max. Emissions margin: 11.7dB below the limits

Notes: None

Date:	August 28, 2013	**Result:**	**Pass**
Standard:	FCC 15.107, Class B		
Tested by:	Uri Spector		
Test Point:	Power Line		
Operation mode:	Receiving mode		
Note:	None		

Table 3.6.1

Line 1

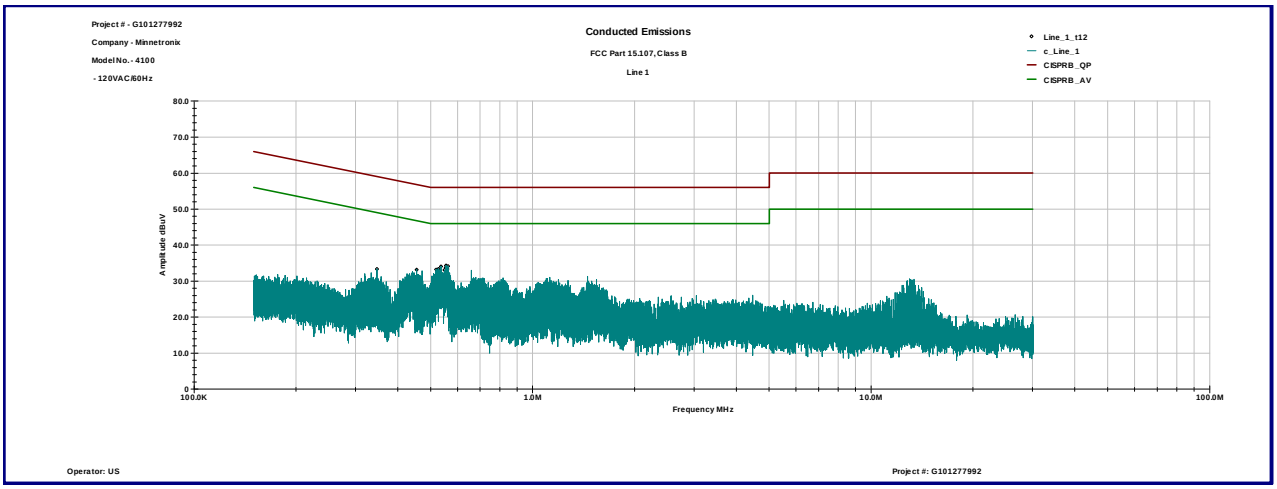
Frequency	Peak dBµV	QP Limit dBµV	AVG Limit dBµV	QP Margin dB	AVG Margin dB
346.87 KHz	33.3	59.0	49.0	-25.7	-15.7
454.34 KHz	33.1	56.8	46.8	-23.7	-13.7
519.05 KHz	33.2	56.0	46.0	-22.8	-12.8
526.05 KHz	33.3	56.0	46.0	-22.7	-12.7
554.79 KHz	34.3	56.0	46.0	-21.7	-11.7
562.03 KHz	34.2	56.0	46.0	-21.9	-11.9

Line 2

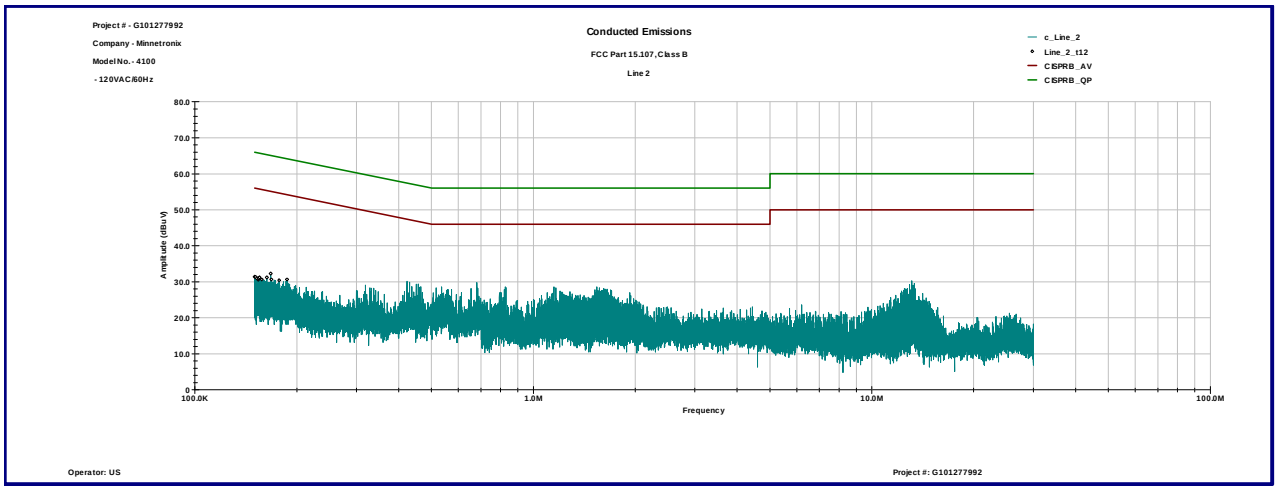
Frequency	Peak dBµV	QP Limit dBmV	AVG Limit dBmV	QP Margin dB	AVG Margin dB
150.08 KHz	31.4	66.0	56.0	-34.6	-24.6
154.51 KHz	31.0	65.8	55.8	-34.7	-24.7
157.69 KHz	30.6	65.6	55.6	-35.0	-25.0
163.09 KHz	31.2	65.3	55.3	-34.1	-24.1
167.4 KHz	32.3	65.1	55.1	-32.8	-22.8
177.38 KHz	30.4	64.6	54.6	-34.2	-24.2
187.09 KHz	30.6	64.2	54.2	-33.5	-23.5

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	ESU	100398	25283	12/19/2013	☒
Spectrum Analyzer	R & S	FSP 40	100024	12559	11/29/2013	☒
Bicono-Log Antenna	Schaffner-Teseq	CBL6112B	2468	9734	11/30/2013	☒
Horn Antenna	EMCO	3115	6579	15580	07/18/2014	☒
LISN	Fischer Custom Communications	FCC-LISN-50-25-2	2014	9665	04/23/2014	☒
System	Quantum Change	TILE! Instrument Control	Ver. 3.4.K.29	15259	VBU	☒
Pre-Amplifier	MITEQ	AMF-5D-00501800-28-13P	1122951	13475	11/01/2013	☒