TEST REPORT

Report Number: 101277992MIN-001A
Project Number: G101277992

Testing performed on the
Model 4300, Trial Stimulator

FCC ID:
Industry Canada ID:

to
47 CFR Part 95 Subpart I: 2013
RSS- 243, Issue 3, November 2010
47 CFR, Part 15:2013, §15.109, Class B

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: _____ Date: October 10, 2013
Uri Spector

Reviewed by: _____ Date: October 10, 2013
Simon Khazon

TABLE OF CONTENTS

1.0 GENERAL DESCRIPTION

Model:	4300
Type of EUT:	Trial Stimulator, MedRadio
Serial Number:	DBR 1427
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 95 Subpart I: 2013 ☒ RSS–243, Issue 3, November 2010 ☐ RSS-Gen, Issue 2, 2007 ☒ 47 CFR, Part 15:2013, §15.109, Class B ☐ Other
Type of radio:	☒ Stand -alone ☐ Module ☐ Hybrid
Date Sample Submitted:	August 16, 2013
Test Work Started:	August 19, 2013
Test Work Completed:	October 10, 2013
Test Sample Conditions:	☐ Damaged ☐Poor (Usable) ☒ Good

1.1 Product Description; Test Facility

Product Description:	Trial Stimulator
Operating Frequency	402-405MHz
Power Level Setting	5
Modulation:	FSK
Emission Designator:	247K8F1D
Antenna(s) Info:	-20dBi PCB loop antenna (trace)
Antenna Installation:	☐ User ☐ Professional ☒ Factory
Transmitter power configuration:	☒ Internal battery ☐ External power source ☐ 120VAC ☐ 230VAC ☐ 400VAC ☒ 3VDC AA Alkaline Batteries ☐ Other: ☐ 50Hz ☐ 60Hz
Special Test Arrangement:	None
Test Facility Accreditation:	A2LA (Certificate No. 1427.01)
Test Methodology:	Measurements performed according to the procedures in ANSI C63.10-2009 / TIA 603-C

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 from a fresh batteries and was activated from laptop using xCT program to transmit continuously modulated carrier except frequency error testing were a CW signal was transmitted. Channel 5 (403.65MHz) was utilized for testing.

Cables:

No.	Type	Length	Designation	Note
1	Ground Path Lead	2m	Not shielded	
2	Stimulation Cable	2m	Not shielded	

Support equipment/Services:

No.	Item	Description
1	Dell Laptop	Laptop computer with xCT software

General notes: 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

☒ **Extreme**

☐ **Temperature:**	+25 to +45 ° C
☒ **Temperature:**	-20 to +55 ° C
☐ **DC power:**	± 10%
☒ **Battery:**	As declared by the manufacturer

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)

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
FCC §2.1046 / FCC §95.639(f) / RSS-243 Section 5.4	Effective Radiated Power at Fundamental	Pass
FCC §2.1049 / FCC §95.633(e) / RSS-243 Section 5.1	Bandwidth of the emission	Pass
FCC §2.1053 / FCC §95.635 / RSS-243 Sections 5.5, 5.6	Radiated Spurious Emissions	Pass
FCC §2.1055 / FCC §95.627(e) / RSS-243 Sections 5.3	Frequency Error	Pass
FCC Part 15.109/ICES-003	Receiver/digital device radiated emissions	Pass
FCC §95.627(a)(1-4) / RSS-243 Sections 5.7	The MedRadio Communication Sessions (Threshold Power Levels, Monitoring System Bandwidth, Scan Cycle Time, Minimum Channel Monitoring Period, Channel Access, Discontinuation of a MedRadio Session, and Use of Pre-Scanned Alternate Channel)	N/A (See note below)

Note: The 4300 Trail Stimulator does not initiate telemetry, therefore the MedRadio Communication sessions evaluation is unnecessary.

3.0 TEST CONDITIONS AND RESULTS

3.1 Effective Radiated Power at Fundamental

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test distance: ☐ 10 meters ☒ 3 meters

Frequency range of measurements: 403.59MHz

Test result: **Pass**

Max. Emissions margin at fundamental: 0.2dB below the limits

Notes: Per FCC 95.627 (g)(3), the maximum effective radiated power measurement was determined by measuring radiated field from the equipment under test at 3m distance. The equivalent radiated field strength at 3 meters for 200mW or 1.7mW/meter at 3m test distance (64.6dBµV/m at 3m).

Date:	August 19, 2013	**Result:** **Pass**
Standard:	FCC 95 Subpart I / RSS-243	
Tested by:	Uri Spector	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	None	

Table 3.1

Frequency	Antenna		Ant. CF	Cable loss	Pre-amp	Reading	Total @ 3m	Limit	Margin	Comments
MHz	Polarity	Hts(cm)	dB1/m	dB	Gain (dB)	dBµV	dBµV/m	dBµV/m	dB	
403.59	V	131	16.6	2.3	0.0	45.5	64.4	64.6	-0.2	
403.59	H	268	16.6	2.3	0.0	39.0	57.9	64.6	-6.7	

Comments: Measurements were taken using an Peak detector at RBW 300kHz, VBW 1MHz

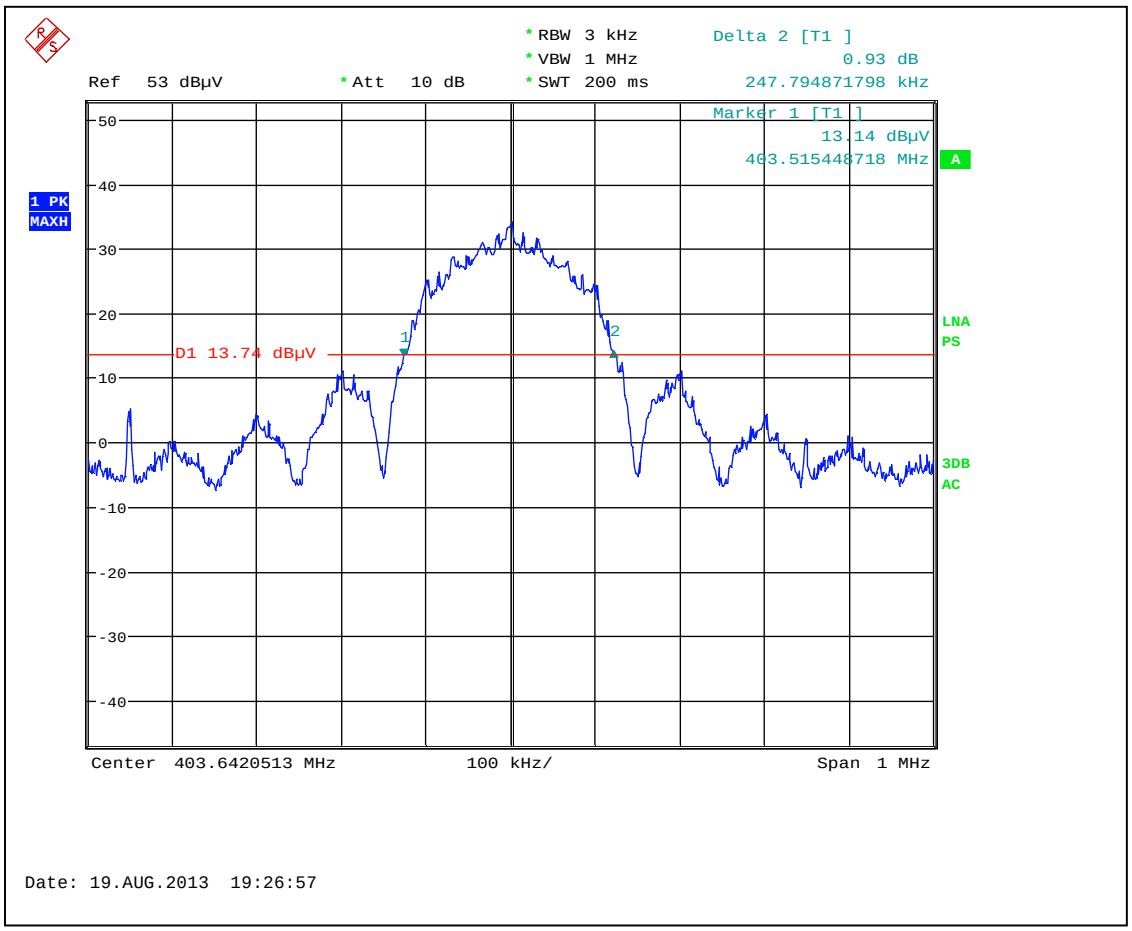
3.2 Bandwidth of Emissions

Center Frequency of operation MHz	Measured 20dB bandwidth kHz	Maximum bandwidth allowed kHz
403.65	247.8	300

Graph 3.2.1 shows bandwidth of emissions

Notes: None

Graph 3.2.1


RBW 3 kHz
VBW 1 MHz
SWT 200 ms
Delta 2 [T1]
0.93 dB
247.794871798 kHz
Ref 53 dBµV
Att 10 dB
Marker 1 [T1]
13.14 dBµV
463.515448718 MHz
A
1 PK
MAXH
50
40
30
20
10
0
-10
-20
-30
-40
D1 13.74 dBµV
1
2
LNA
PS
3DB
AC
Center 403.6420513 MHz
100 kHz/
Span 1 MHz
Date: 19.AUG.2013 19:26:57

3.3 Radiated Spurious Emissions

Test location:	☐ OATS	☒ Anechoic Chamber
Test distance:	☐ 10 meters	☒ 3 meters
Test result:	**Pass**	
Frequency range:	30MHz-5000MHz	
Max. Emissions margin:	9.9dB below the limits	

Notes: The Radiated Spurious Emissions test was performed in the Anechoic chamber at 3m measurement distance (see Table 3.3.1 and Graphs 3.3.1. 3.3.2).

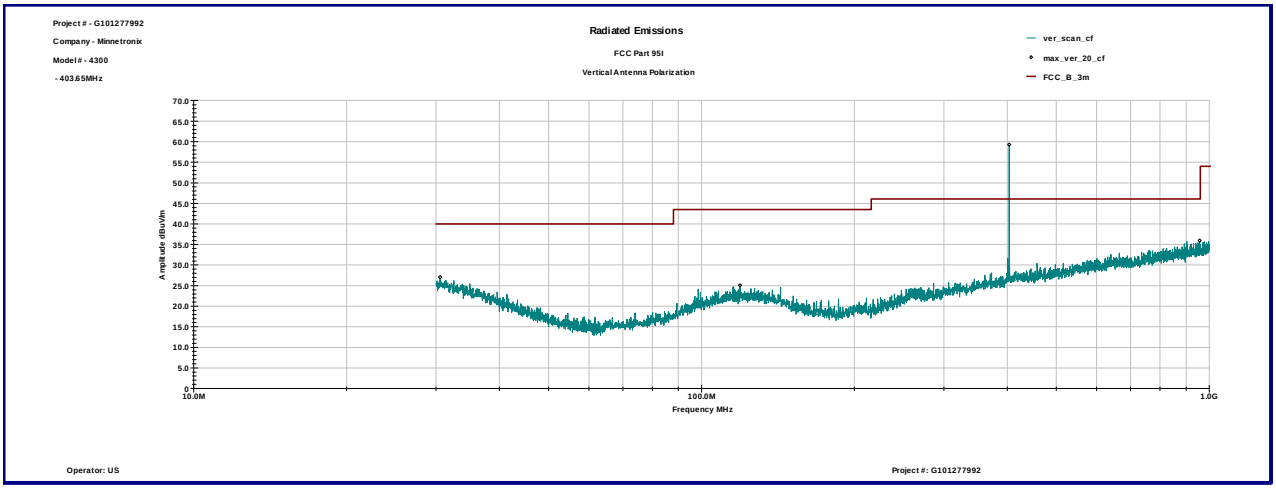
Date:	August 19, 2013	**Result:** **Pass**
Standard:	FCC Part 95 Subpart I / RSS-243	
Tested by:	Uri Spector	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	The fundamental frequency was removed from the table. No radiated spurious emissions were detected above 1GHz (see Graph 3.3.2).	

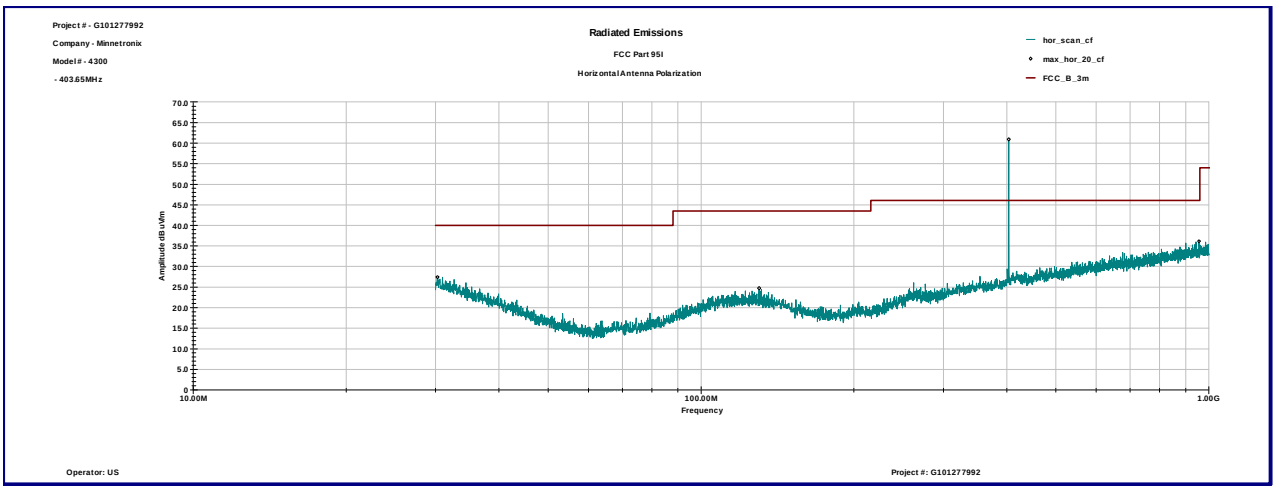
Spurious emissions more than 250 kHz removed from the MedRadio band (402-405MHz) at 3 meters test distance must not exceed 40dBµV/m in the range from 30-88 MHz, 43.5 from 88-216 MHz, 46dBµV/m from 216-960 MHz and 54dBµV/m above 960 MHz.
Emissions within 250kHz of the MedRadio band must be attenuated by at least 20dB below the maximum permitted output power, using an instrument resolution bandwidth approximately equal to 1% of the emissions bandwidth.
Emissions within the MedRAdio band more than 150kHz away from the center frequency of the spectrum the transmission is intended to occupy, will be attenuated below the transmitter output power by at least 20dB, using an instrument resolution bandwidth approximately equal to 1% of the emissions bandwidth.

Table 3.3.1

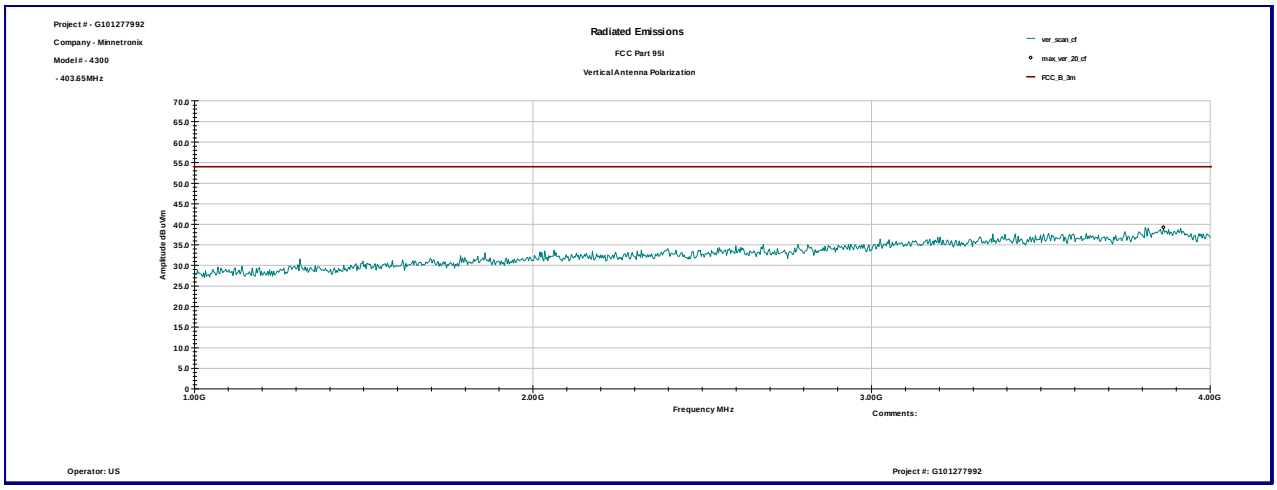
Frequency	Ant. Polarity	Peak Reading dBµV	Total C.F. dB1/m	Total at 3m dBµV/m	Limit dBµV/m	Margin dB
30.554 MHz	V	7.2	19.9	27.1	40.0	-12.9
119.03 MHz	V	11.2	13.9	25.1	43.5	-18.4
956.85 MHz	V	10.1	25.8	36.0	46.0	-10.1
30.242 MHz	H	7.4	20.1	27.4	40.0	-12.6
130.07 MHz	H	10.9	13.8	24.7	43.5	-18.8
956.5 MHz	H	10.3	25.8	36.1	46.0	-9.9

Graph 3.3.1


Project # - G101277992
Company - Minnetronix
Model # - 4300
- 403.65MHz
Radiated Emissions
FCC Part 95I
Vertical Antenna Polarization
ver_scan_cf
max_ver_20_cf
FCC_B_3m
Amplitude dBuV/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 # - 4300
- 403.65MHz
Radiated Emissions
FCC Part 95I
Horizontal Antenna Polarization
hor_scan_cf
max_hor_20_cf
FCC_B_3m
Amplitude dBuV/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 3.3.2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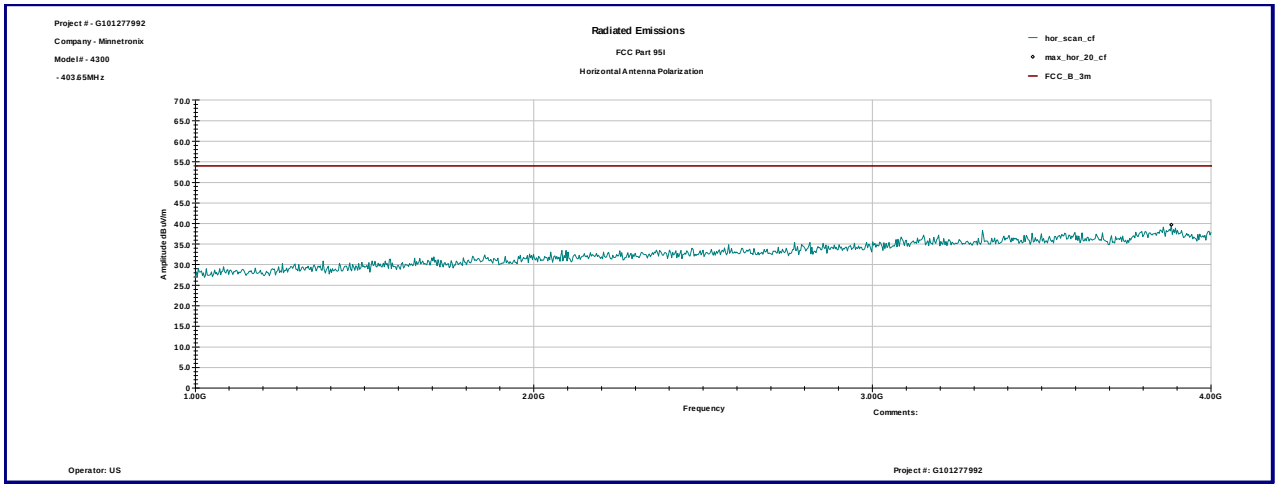
Company - Minnetronix
Model # - 4300
- 403.65MHz
Radiated Emissions
FCC Part 95I
Vertical Antenna Polarization
ver_scan.cf
max_ver_20.cf
FCC_B_3m
Amplitude dBuV/m
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0
1.00G
2.00G
3.00G
4.00G
Frequency MHz
Comments:
Operator: US
Project #: G101277992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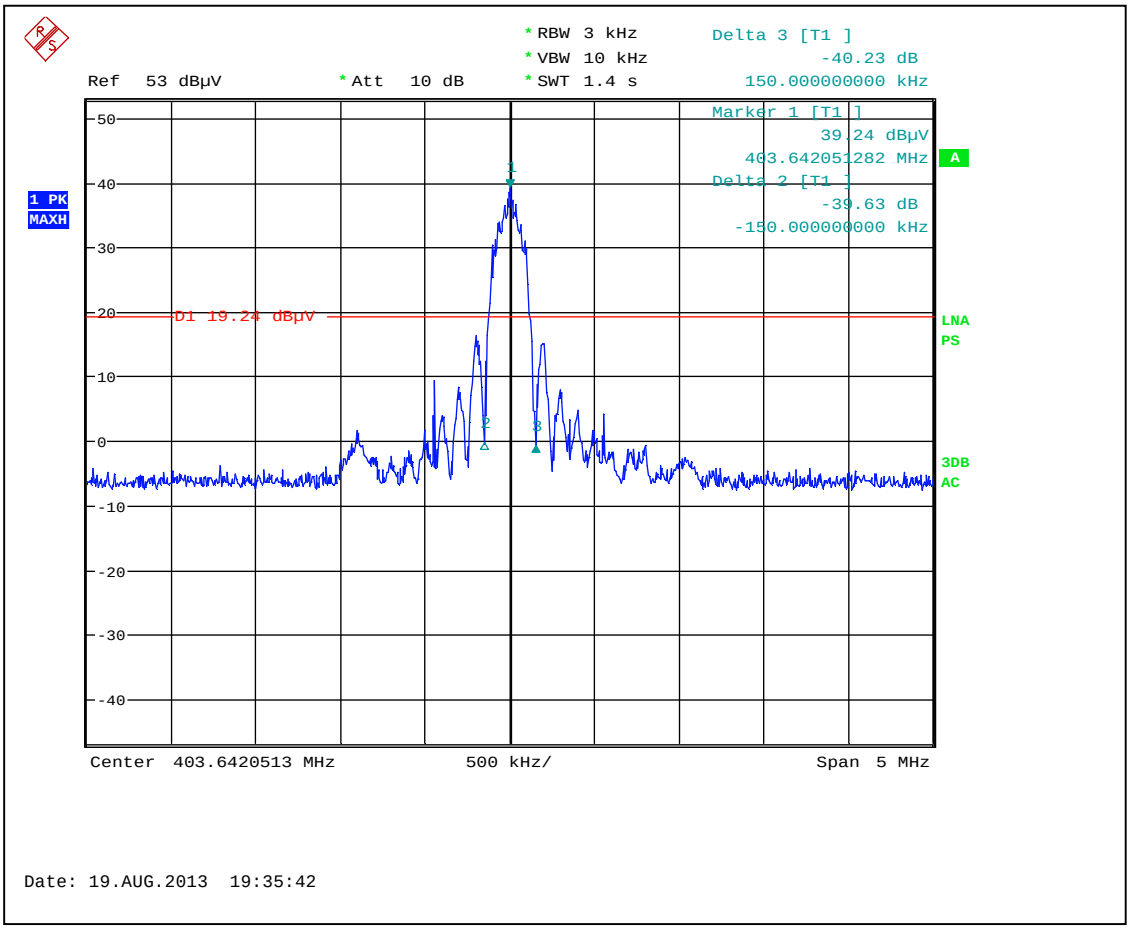
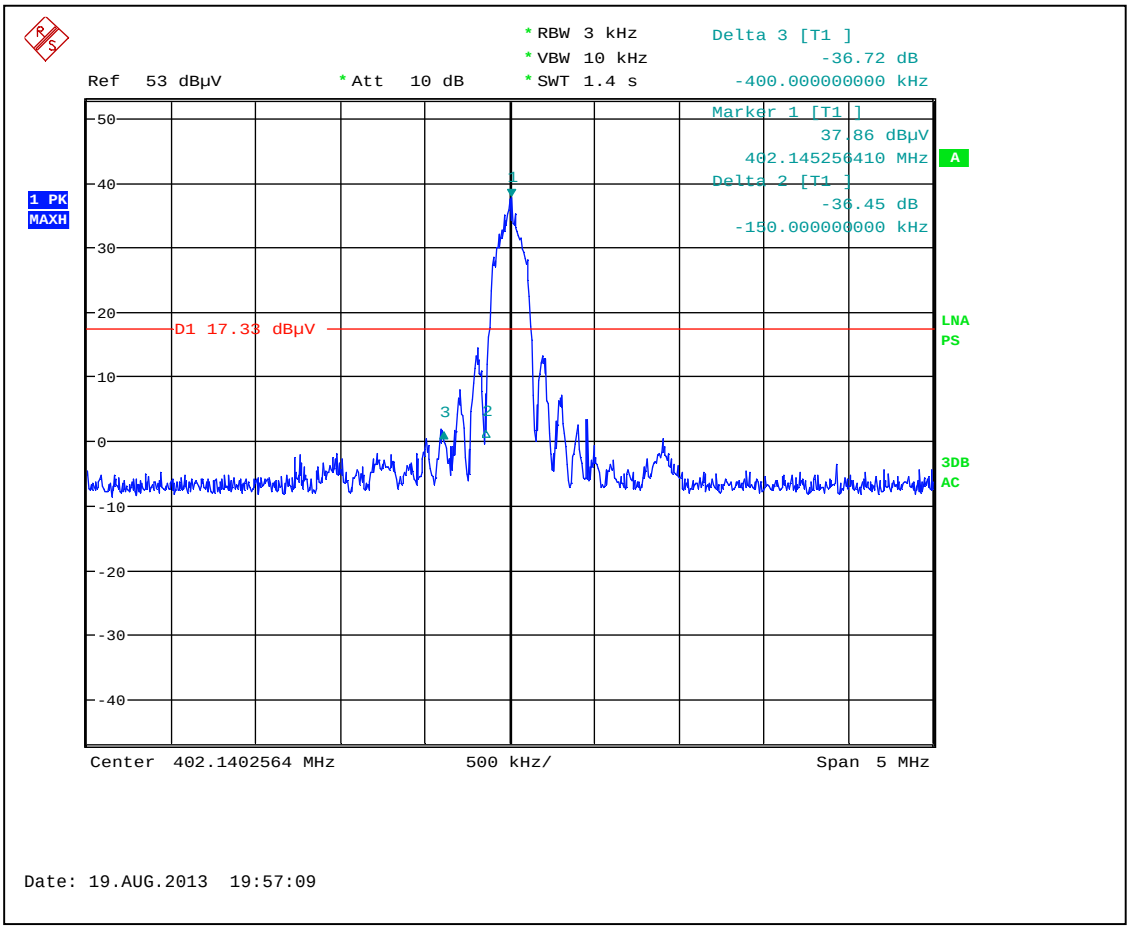
Company - Minnetronix
Model # - 4300
- 403.65MHz
Radiated Emissions
FCC Part 95I
Horizontal Antenna Polarization
hor_scan_cf
max_hor_20_cf
FCC_B_3m
Amplitude dBuV/m
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0
1.00G
2.00G
3.00G
4.00G
Frequency
Comments:
Operator: US
Project #: G101277992

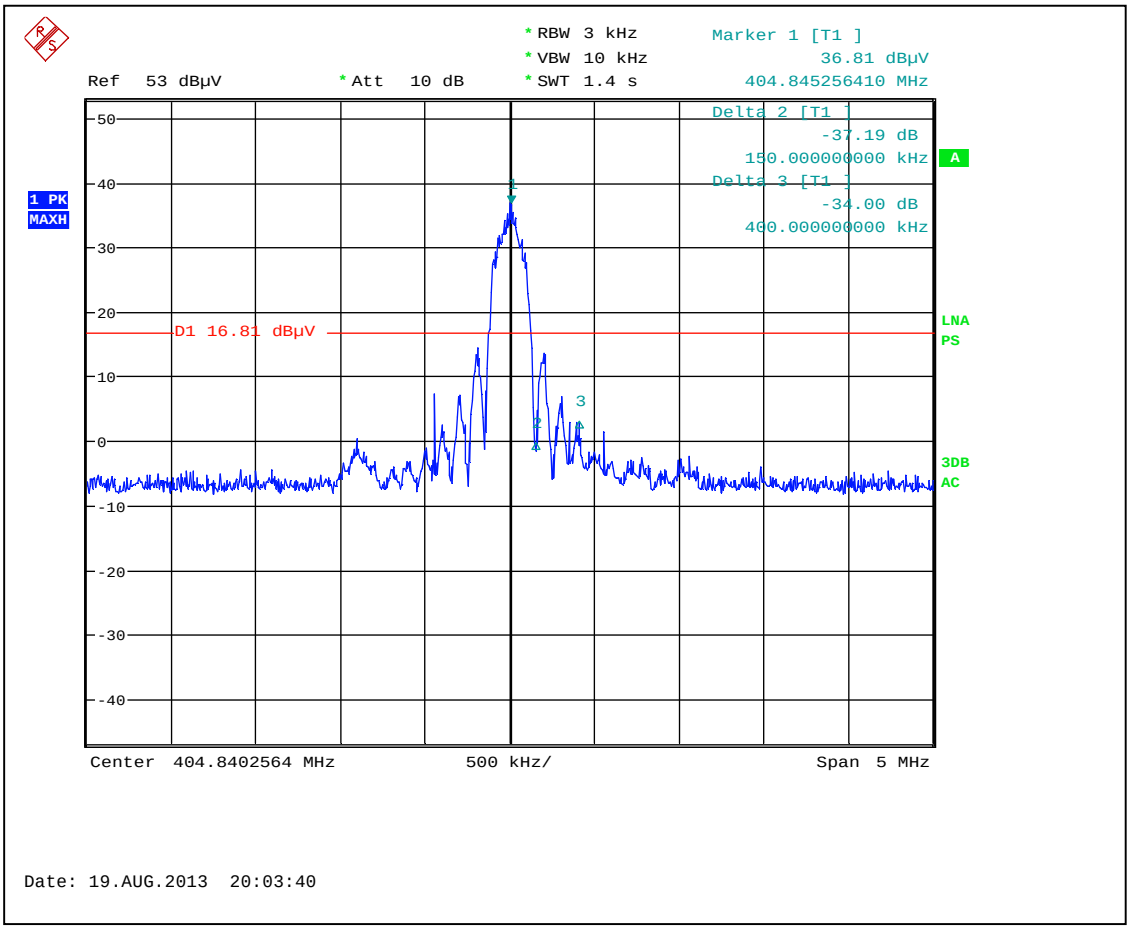
Graph 3.3.3
Emissions outside 150kHz offset from the intended frequency



Graph 3.3.4
Lower 250kHz band edge



Graph 3.3.5
Upper 250kHz band edge



3.4 Frequency Error

Table 3.4.1

Temperature Degree C	Output Frequency MHz	Frequency Deviation kHz	Frequency Stability ppm	Frequency error limit ppm	Test Result
-20	403.6491	3.0	7.4	±100	Pass
0	403.6496	2.5	6.2	±100	Pass
15	403.6511	1.0	2.5	±100	Pass
25	403.6521	0.0	0.0	±100	Pass
35	403.6525	0.4	1.0	±100	Pass
55	403.6536	1.5	3.7	±100	Pass

Table 3.4.2

Input Voltage V	Input Voltage Description	Output Frequency MHz	Frequency Band MHz	Test Result
3.00	Upper Extreme	403.6521	402-405	Pass
2.40	Lower Extreme	403.6521	402-405	Pass

3.5 MedRadio Operation

N/A

3.6 Receiver/digital device radiated emissions

Test location: ☐ OATS ☒ Anechoic Chamber

Test distance: ☐ 10 meters ☒ 3 meters

Test result: **Pass**

Frequency range: 30MHz-5000MHz

Max. Emissions margin: 13.4dB below the limits

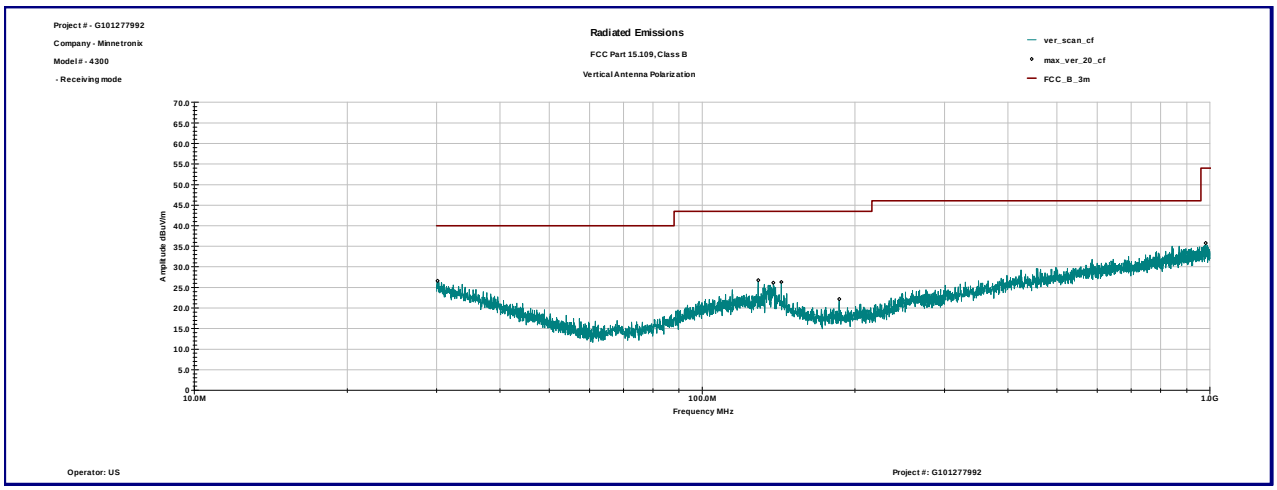
Notes: The Radiated Emissions test was performed in the Anechoic chamber at 3m measurement distance (see Tables 3.6.1 and Graphs 3.6.1 to 3.6.2).

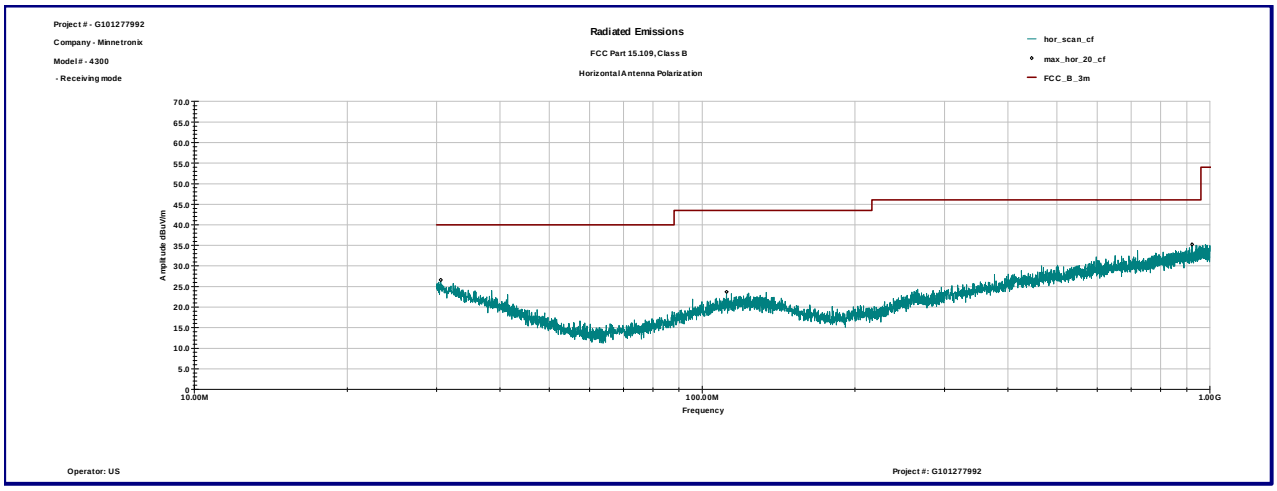
Date:	August 19, 2013	**Result:** **Pass**
Standard:	FCC Part 15.109, Class B	
Tested by:	Uri Spector	
Test Point:	Enclosure	
Operation mode:	Standby/Receiving mode	
Note:	No radiated spurious emissions were detected above 1GHz (see Graph 3.6.2).	

Table 3.6.1

Frequency	Ant. Polarity	Peak Reading dBµV	Total C.F. dB1/m	Total at 3m dBµV/m	Limit dBµV/m	Margin dB
30.139 MHz	V	6.5	20.1	26.6	40.0	-13.4
128.95 MHz	V	12.8	14.0	26.8	43.5	-16.8
138.13 MHz	V	12.7	13.4	26.1	43.5	-17.4
143.11 MHz	V	13.3	13.1	26.3	43.5	-17.2
186.19 MHz	V	10.8	11.3	22.1	43.5	-21.4
30.554 MHz	H	6.7	19.9	26.6	40.0	-13.4
111.71 MHz	H	10.0	13.7	23.7	43.5	-19.8

Graph 3.6.1


Project # - G101277992
Company - Minnetronix
Model # - 4300
- Receiving 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
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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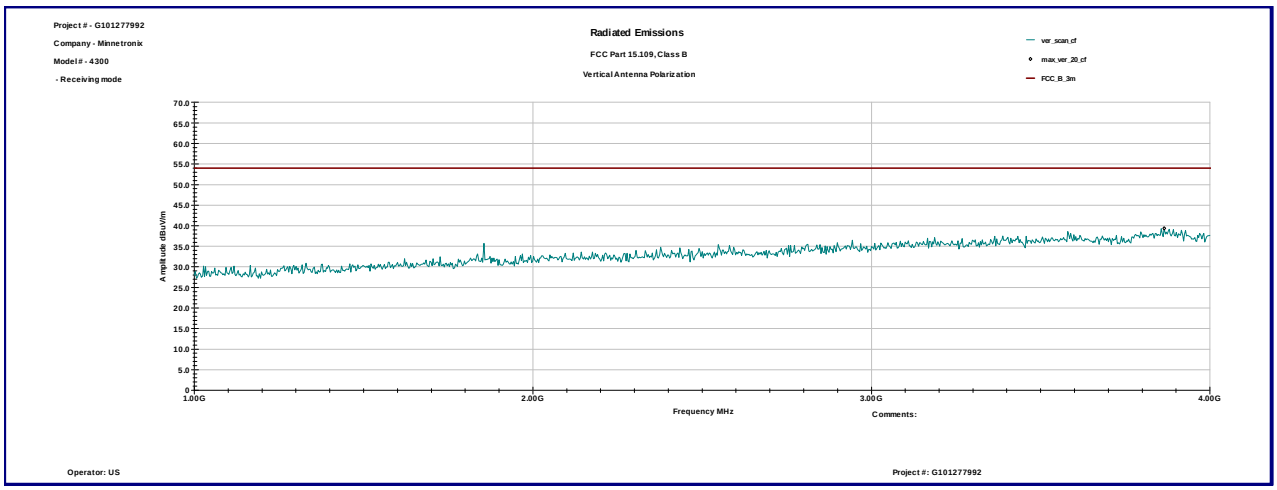
Radiated Emissions
FCC Part 15.109, Class B
Horizontal Antenna Polarization
hor_scan_cf
max_hor_20_cf
FCC_B_3m
Amplitude dBuV/m
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0
10.00M
100.00M
1.00G
Frequency
Operator: US
Project #: G101277992

Graph 3.6.2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Company - Minnetronix
Model # - 4300
- Receiving mode
Radiated Emissions
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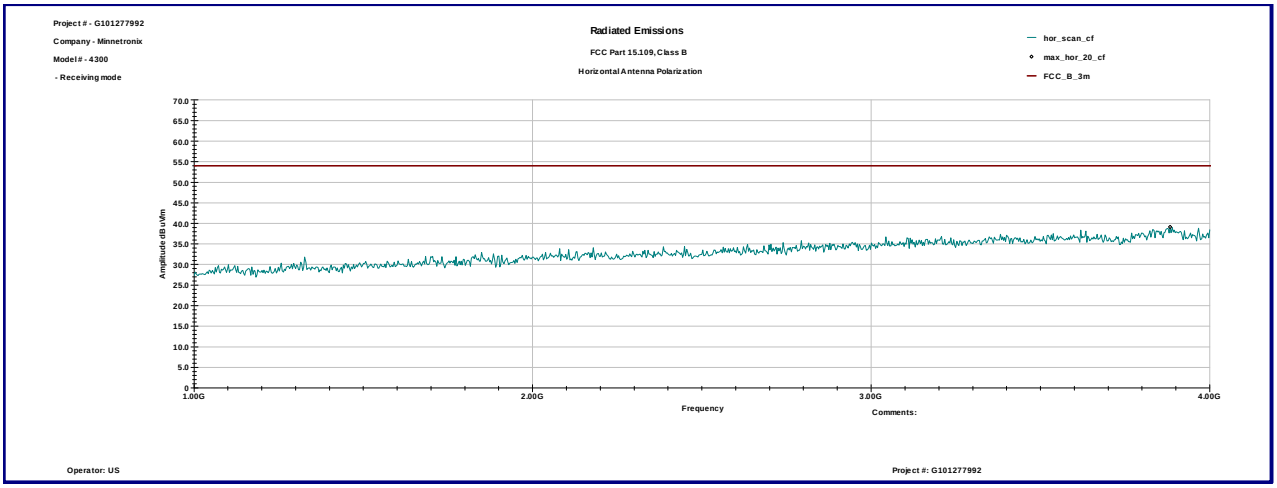
Vertical Antenna Polarization
ver_scan.cf
max_ver_20.cf
FCC_B_3m
Amplitude dBuV/m
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0
1.00G
2.00G
3.00G
4.00G
Frequency MHz
Comments:
Operator: US
Project #: G101277992


Project # - G101277992
Company - Minnetronix
Model # - 4300
- Receiving 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
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
1.00G
2.00G
3.00G
4.00G
Frequency
Comments:
Operator: US
Project #: G101277992

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	☒
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	☒
Environmental Chamber	ESPEC	ESX-4CA	0111386	24300	04/11/2014	☒