



TEST REPORT

Report Number: 100372109MIN-001

Project Number: G100372109

Testing performed on the
PROLINK.z

FCC ID: MMURTI1800

Industry Canada ID: 3166A-RTI1800

to

47 CFR Part 15. 249:2009

RSS- 210, Issue 8, 2010

47 CFR, Part 15:2009, §15.107 and §15.109, Class B

RSS-Gen, Issue 3, 2010

ICES-003, Issue 4:2004

For

Remote Technologies Inc

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

Test Authorized by:
Remote Technologies
5775 12th Avenue East
Suite 180
Shakopee, MN 55379, USA

Prepared by: Richard Blonigen
Richard Blonigen

Date: April 22, 2011

Reviewed by: Norman Shpilsher
Norman Shpilsher

Date: April 22, 2011

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1.0 GENERAL DESCRIPTION

Model:	PROLINK.z
Type of EUT:	Control Processor
FCC ID:	MMURTI1800
Industry Canada ID:	3166A-RTI1800
Related Submittal(s) Grants:	N/A
Company:	Remote Technologies Inc.
Customer:	Mr. Mark Melville
Address:	5775 12 th Avenue East Suite 180 Shakopee MN 55379, USA
Phone:	(952) 253-3116
Fax:	(952) 253-3131
e-mail:	markm@rticorp.com
Test Standards:	☒ 47 CFR, Part 15:2009, §15.249 ☒ RSS-210, Issue 8, 20010 ☒ RSS-Gen, Issue 3, 2010 ☒ 47 CFR, Part 15:2009, §15.107 and §15.109, Class B ☒ ICES-003, Issue 4:2004 ☐ Other
Type of radio:	☒ Stand -alone ☐ Module ☐ Hybrid
Date Sample Submitted:	March 30, 2011
Test Work Started:	March 30, 2011
Test Work Completed:	March 31, 2011
Test Sample Conditions:	☐ Damaged ☐ Poor (Usable) ☒ Good



1.1 Product Description; Test Facility

Product Description:	Control Processor
Operating Frequency	2400-2483.5 MHz
Modulation:	Offset Quadrature Phase Shift Keying
Emission Designator:	2M7G1D
Antenna(s) Info:	Integral
Antenna Installation:	☒ User ☐ Professional ☐ Factory
Transmitter Power Configuration:	☐ Internal battery ☐ External power source ☒ 100-240VAC ☐ 400VAC ☐ [REDACTED] VDC ☐ Other: USB 5VDC from the Host PC 0.4 Amp. ☒ 50/60Hz ☐ 60Hz
Special Test Arrangement:	None
Test Facility Accreditation:	A2LA (Certificate No. 1427.01)
Test Methodology:	Measurements performed according to the procedures in ANSI C63.4-2003

1.2 EUT Configuration

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

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

Operating modes of the EUT:

No.	Description
1	The device was pre-programmed to transmit continuously in three separate frequency channels, low, middle, and upper frequency channel, one channel being transmitted at a given time.
2	Standby/Receiving mode

Cables:

No.	Type	Length	Designation	Note
1	Shielded, USB	6ft.	Software loading	
2	8 wires, unshielded	6 ft	Power/Sense/Relays	
3	Unshielded, RJ45	15 ft	Ethernet	
4	Unshielded, RJ45	6 ft	RS-232	
5	(2) Unshielded, Audio	6 ft	Port 1 and 2	

Support equipment/Services:

No.	Item	Description
1	Dell Notebook, Latitude D610	Host PC

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).

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

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

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

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

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

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

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

General notes: None

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 and of harmonics and spurious emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test distance: ☐ 10 meters ☒ 3 meters

Frequency range of measurements: 30MHz-25GHz

Test result: Pass

Max. Emissions margin at fundamental: 4.0 dB below the limits

Max. margin of harmonics and spurious emissions: 1.4 dB below the limits

Notes: None

Date:	March 30, 2011	Result: Pass
Standard:	FCC 15.249(a) / RSS-210 A2.9	
Tested by:	Richard Blonigen	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	Measurements at Fundamental Frequency and Bandedge Compliance	

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)								
Channel 11										
2404.45	V	104	28.2	3.5	0.0	63.3	95.0	114.0	-19.0	Peak
2404.45	H	281	28.2	3.5	0.0	58.9	90.6	114.0	-23.4	Peak
2404.45	V	104	28.2	3.5	0.0	58.3	90.0	94.0	-4.0	AVG
2404.45	H	281	28.2	3.5	0.0	54.2	85.9	94.0	-8.1	AVG
Channel 18										
2439.45	V	100	28.3	3.6	0.0	62.3	94.1	114.0	-19.9	Peak
2439.45	H	189	28.3	3.6	0.0	60.7	92.5	114.0	-21.5	Peak
2439.45	V	100	28.3	3.6	0.0	57.5	89.3	94.0	-4.7	AVG
2439.45	H	189	28.3	3.6	0.0	55.8	87.6	94.0	-6.4	AVG
Channel 26										
2479.47	V	112	28.3	3.6	0.0	59.9	91.8	114.0	-22.2	Peak
2479.47	H	100	28.3	3.6	0.0	56.2	88.1	114.0	-25.9	Peak
2479.47	V	112	28.3	3.6	0.0	55.2	87.2	94.0	-6.8	AVG
2479.47	H	100	28.3	3.6	0.0	51.4	83.3	94.0	-10.7	AVG
Bandedge Compliance										
2400.00	V	111	28.2	3.5	0.0	16.8	48.5	54.0	-5.5	
2400.00	H	100	28.2	3.5	0.0	14.2	45.9	54.0	-8.1	
2483.50	V	100	28.4	3.6	0.0	21.1	53.1	54.0	-0.9	
2483.50	H	100	28.4	3.6	0.0	18.0	50.0	54.0	-4.0	

Date:	March 30-31, 2011	Result: Pass
Standard:	FCC 15.249(a) / RSS-210 A2.9	
Tested by:	Richard Blonigen	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	Spurious emissions below 1 GHz	

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)								
Channel 11										
31.44	V	100	19.0	0.5	0.0	15.1	34.6	40.0	-5.4	
43.80	V	100	12.3	0.6	0.0	24.3	37.2	40.0	-2.8	
69.13	V	142	6.4	0.8	0.0	27.4	34.7	40.0	-5.3	
81.20	V	100	8.2	0.9	0.0	26.6	35.7	40.0	-4.3	
110.79	V	100	12.5	1.1	0.0	22.2	35.8	43.5	-7.7	
79.74	H	400	8.0	0.9	0.0	16.3	25.2	40.0	-14.8	
111.60	H	400	12.6	1.1	0.0	18.5	32.2	43.5	-11.4	
250.03	H	121	13.1	1.7	0.0	18.5	33.3	46.0	-12.7	
Channel 18										
31.44	V	100	19.0	0.5	0.0	14.6	34.1	40.0	-5.9	
43.81	V	100	12.3	0.6	0.0	25.7	38.6	40.0	-1.4	
56.54	V	100	7.0	0.7	0.0	27.1	34.8	40.0	-5.2	
66.29	V	100	6.2	0.8	0.0	31.5	38.5	40.0	-1.5	
81.21	V	100	8.2	0.9	0.0	28.9	38.0	40.0	-2.0	
Channel 26										
31.43	V	100	19.0	0.5	0.0	16.7	36.2	40.0	-3.8	
43.80	V	100	12.3	0.6	0.0	23.2	36.1	40.0	-3.9	
66.29	V	131	6.2	0.8	0.0	30.5	37.5	40.0	-2.5	
86.06	V	100	8.8	0.9	0.0	25.7	35.5	40.0	-4.5	

Date:	March 30-31, 2011	Result: Pass
Standard:	FCC 15.249(a) / RSS-210 A2.9	
Tested by:	Richard Blonigen	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	Spurious and Harmonics emissions above 1 GHz	

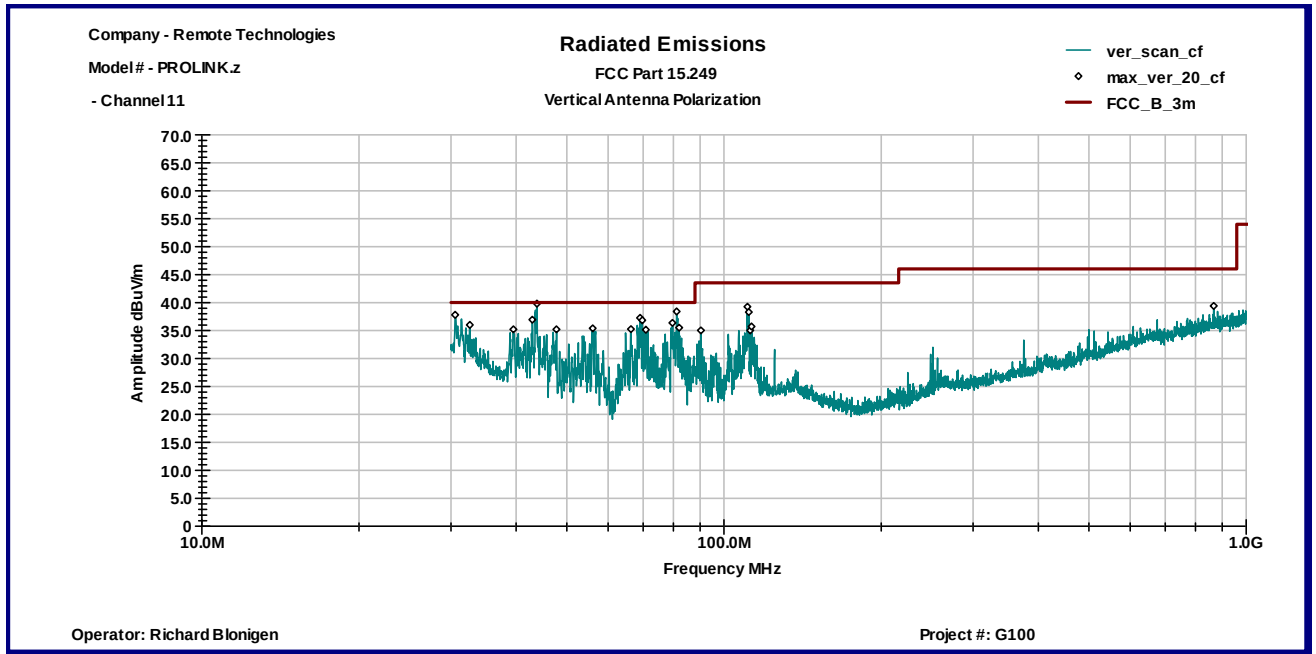
Table 3.1.3

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)								
Channel 11										
4808.91	V	141	32.7	4.9	36.7	42.3	43.3	54.0	-10.7	
4808.91	H	203	32.7	4.9	36.7	41.5	42.5	54.0	-11.5	
Channel 18										
4878.91	V	234	32.9	4.9	36.6	40.5	41.7	54.0	-12.3	
4878.91	H	175	32.9	4.9	36.6	42.3	43.5	54.0	-10.5	
Channel 26										
4958.90	V	189	33.0	5.0	36.6	40.3	41.7	54.0	-12.3	
4958.90	H	194	33.0	5.0	36.6	40.1	41.5	54.0	-12.5	

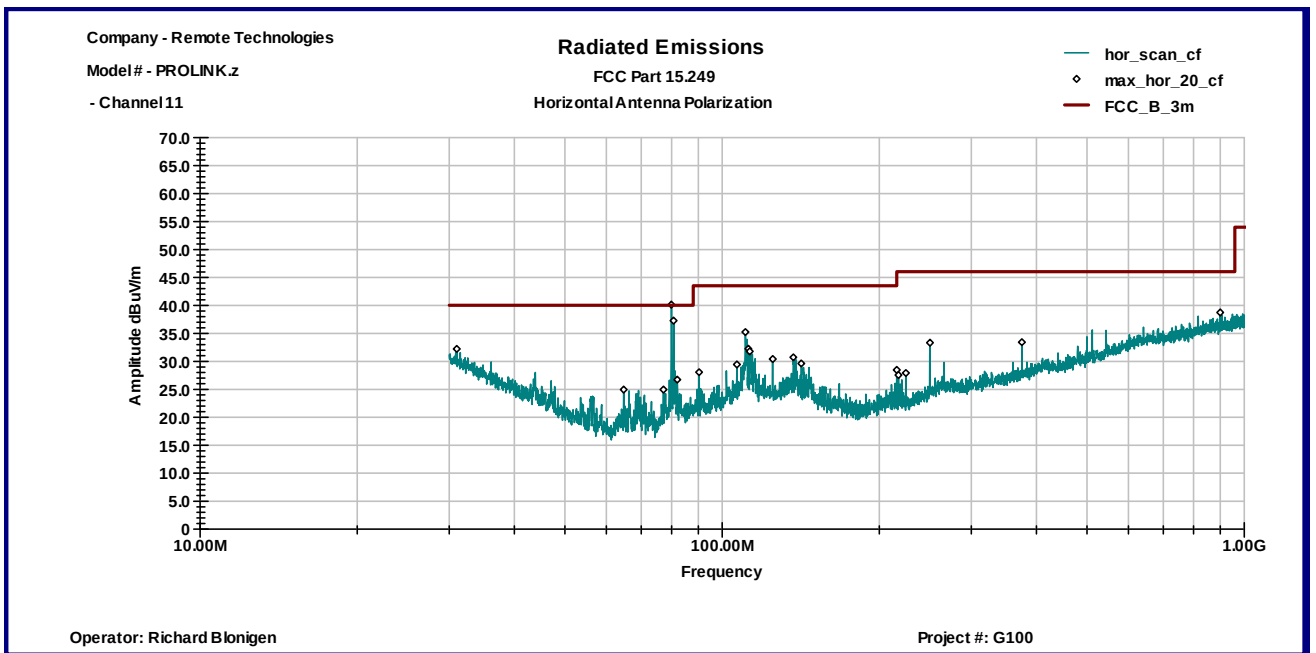
Note: No Spurious / Harmonics emissions above ambient in the Frequency range above 1 GHz other than 2nd Harmonics were detected.

Graph 3.1.1

Vertical antenna polarization

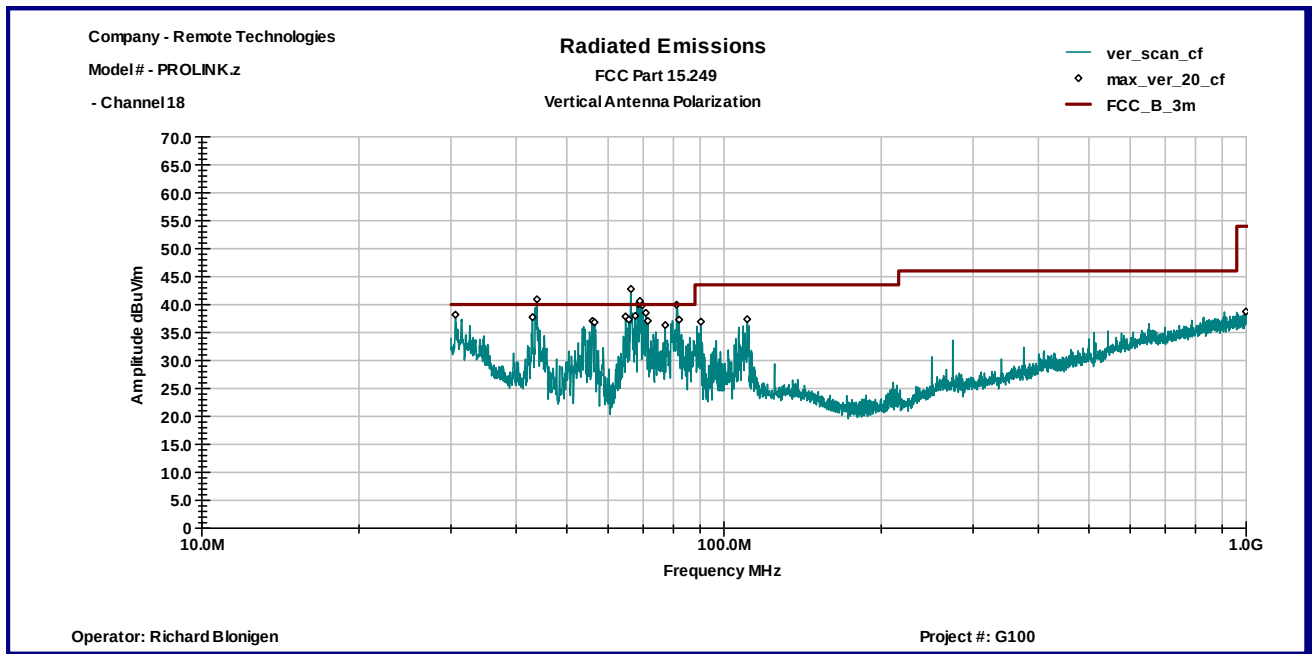


Horizontal antenna polarization

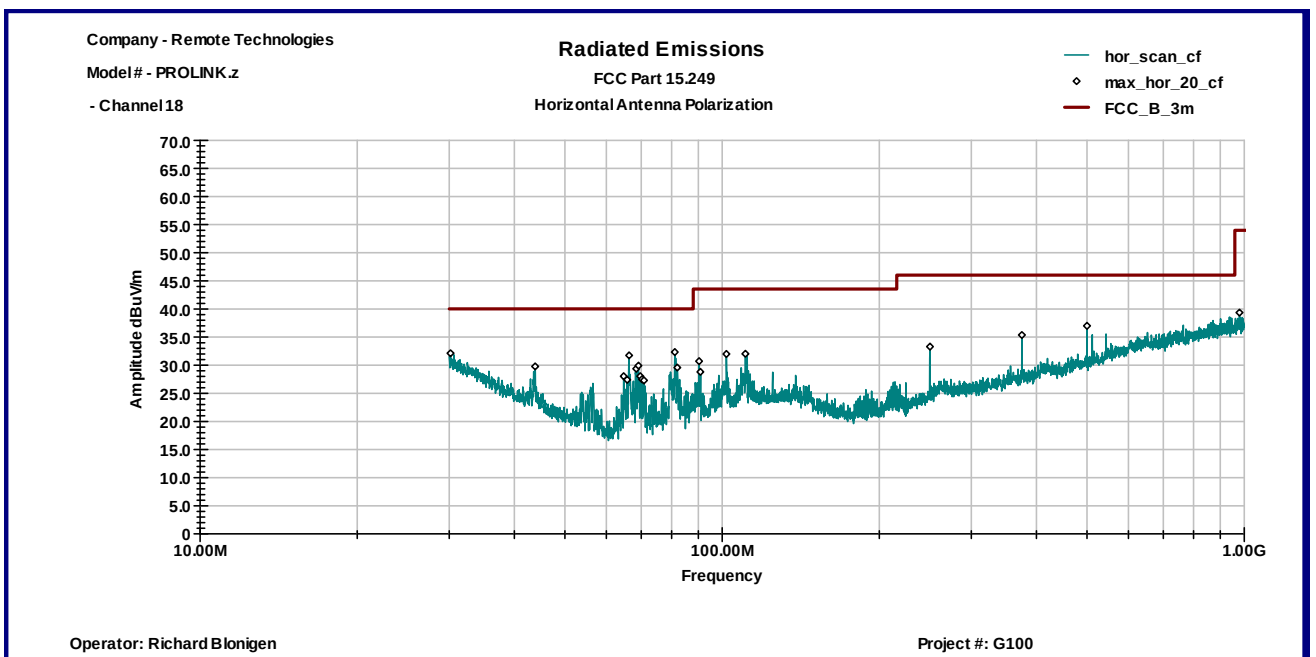


Graph 3.1.2

Vertical antenna polarization

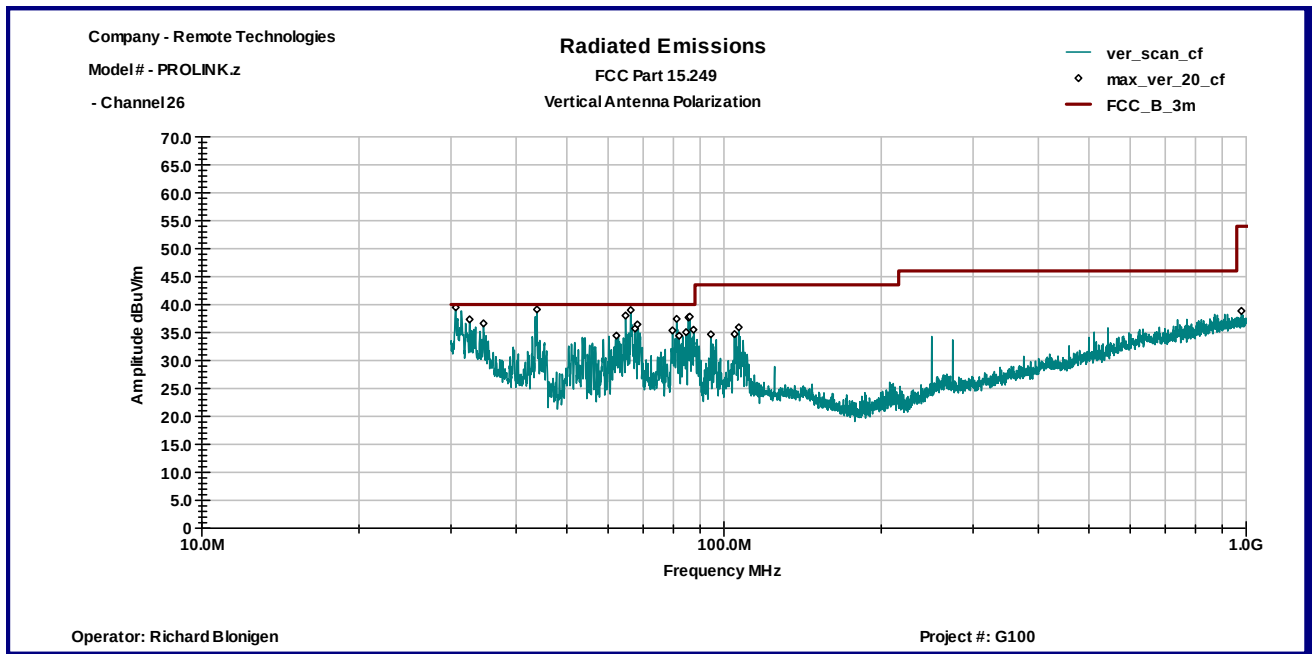


Horizontal antenna polarization

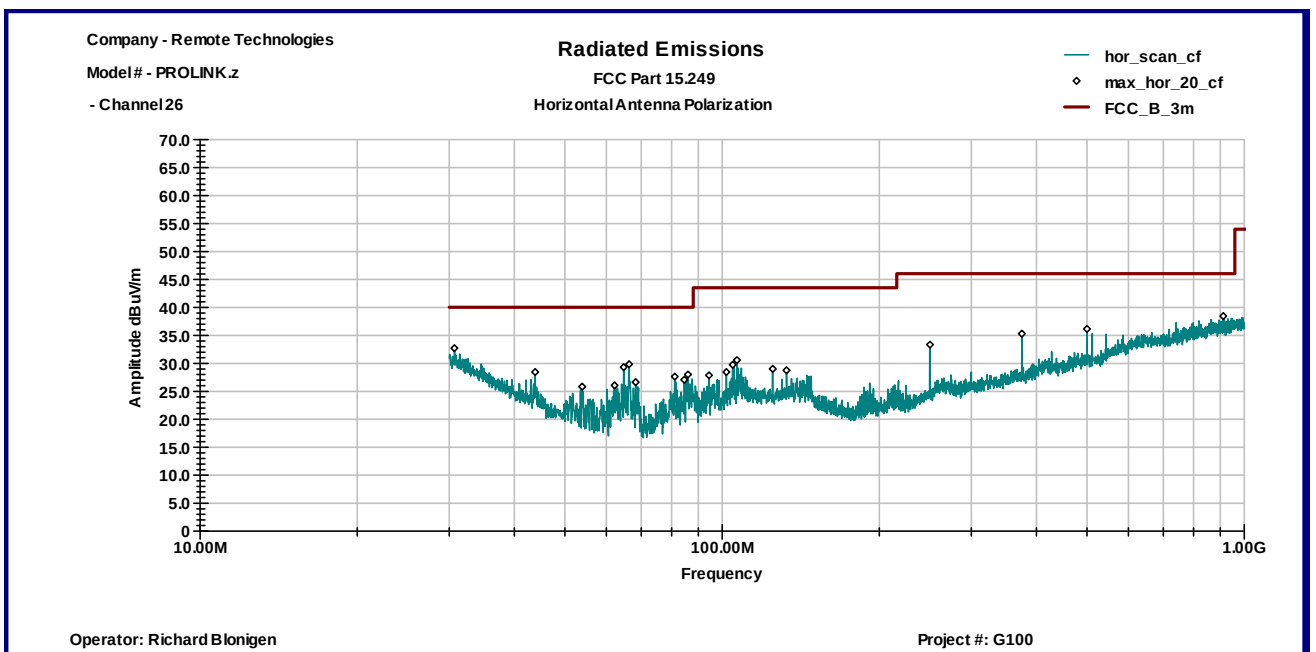


Graph 3.1.3

Vertical antenna polarization

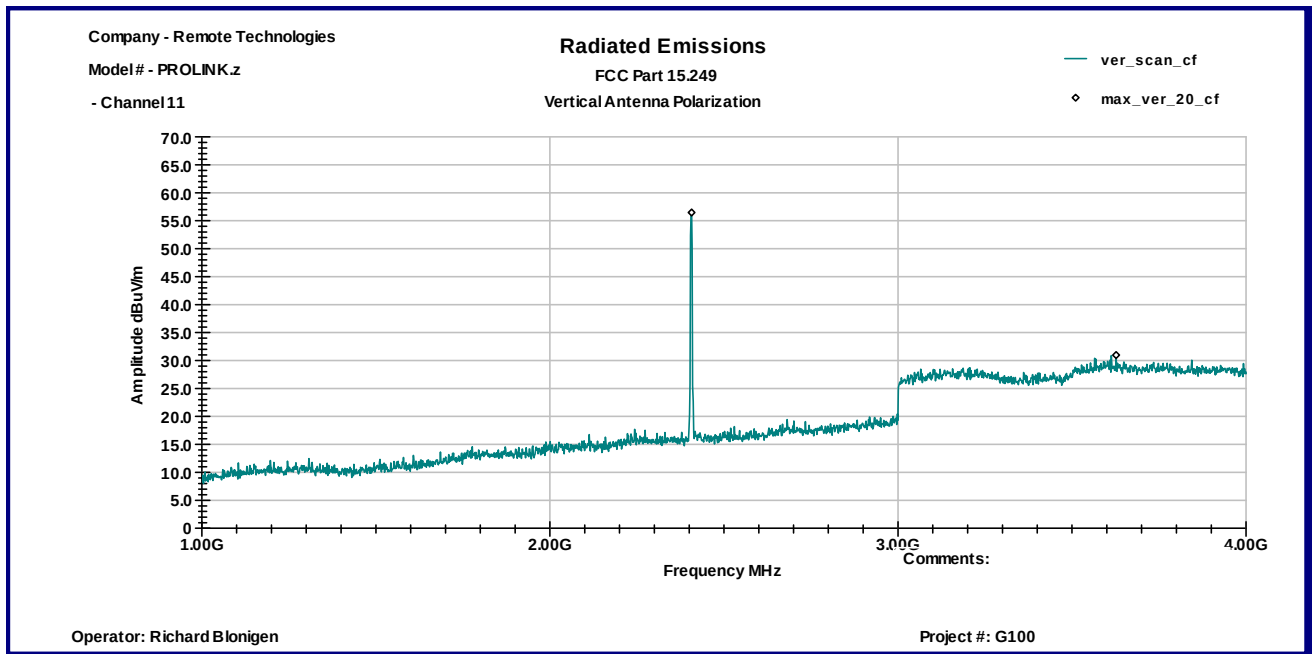


Horizontal antenna polarization

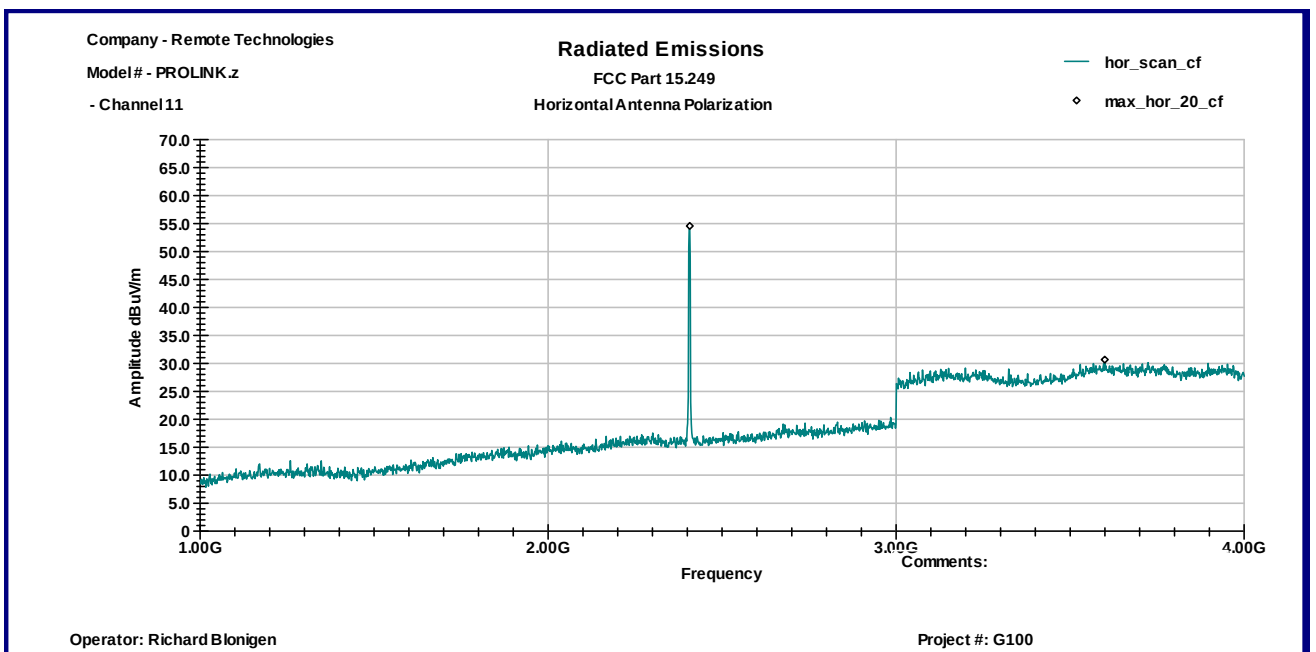


Graph 3.1.4

Vertical antenna polarization

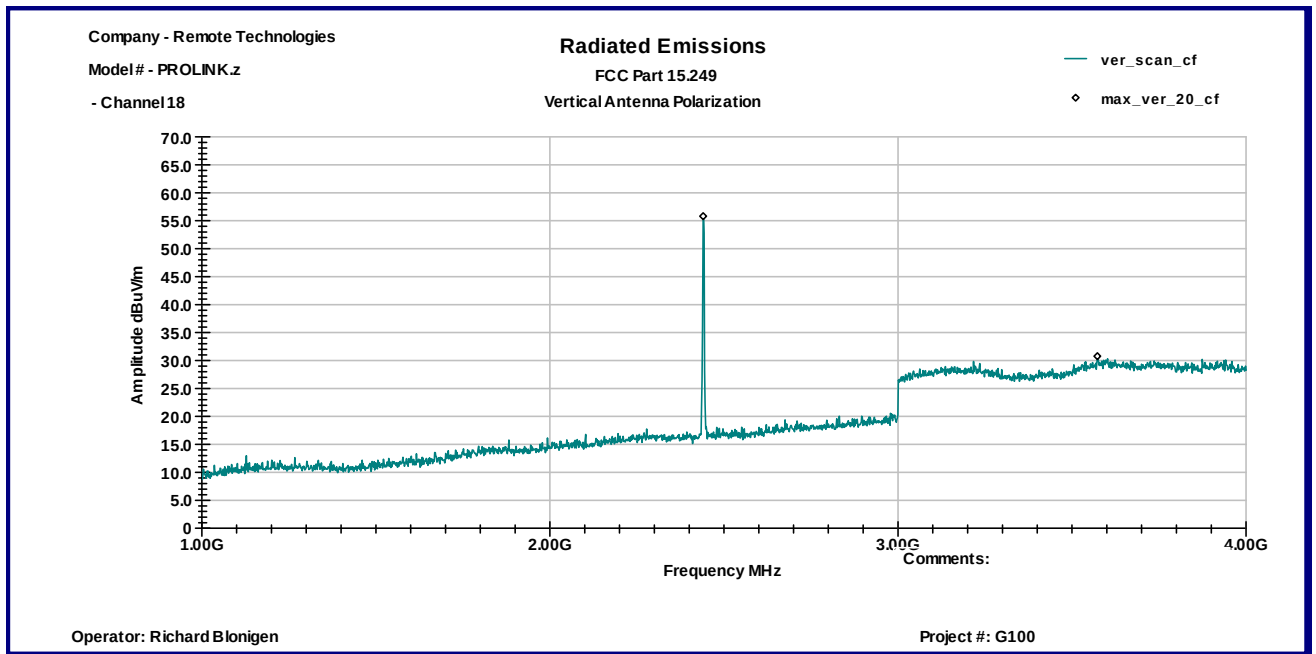


Horizontal antenna polarization

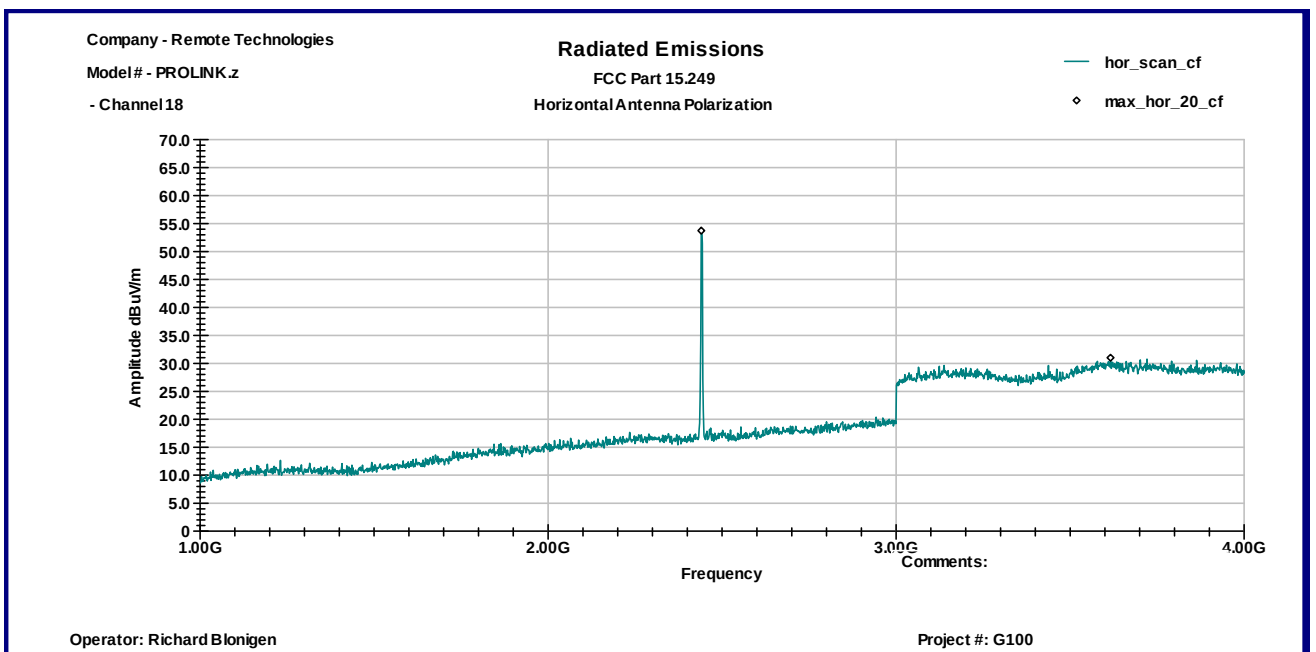


Graph 3.1.5

Vertical antenna polarization



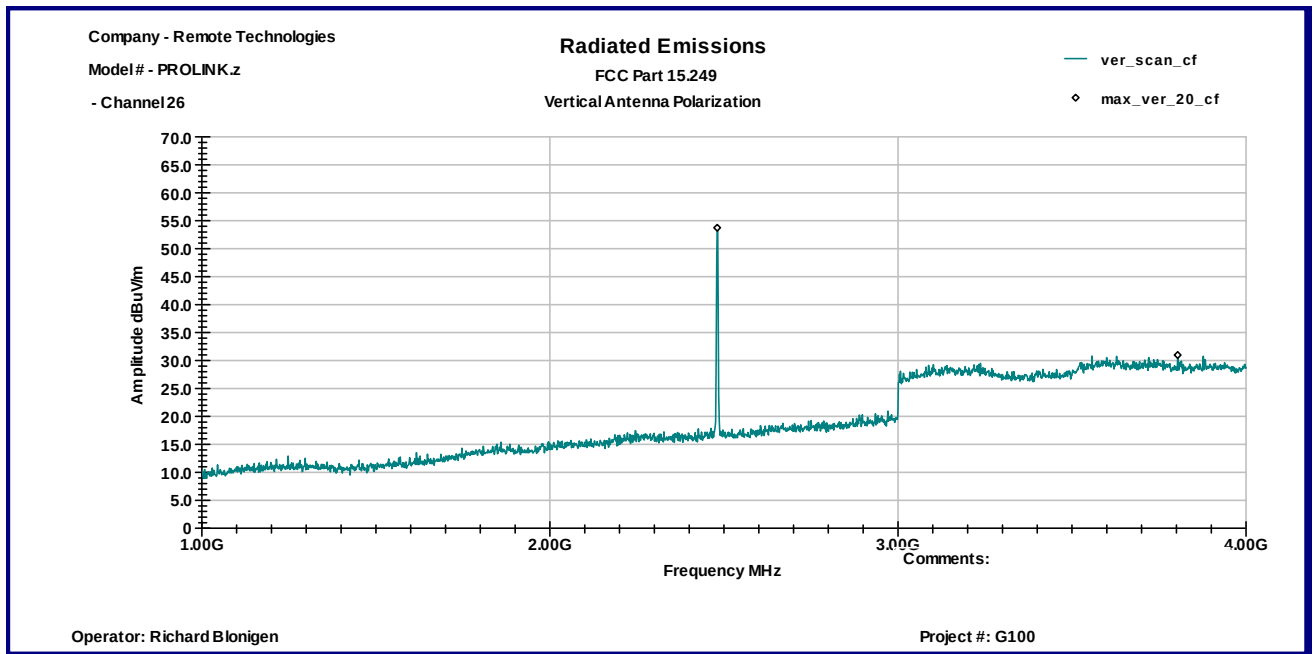
Horizontal antenna polarization



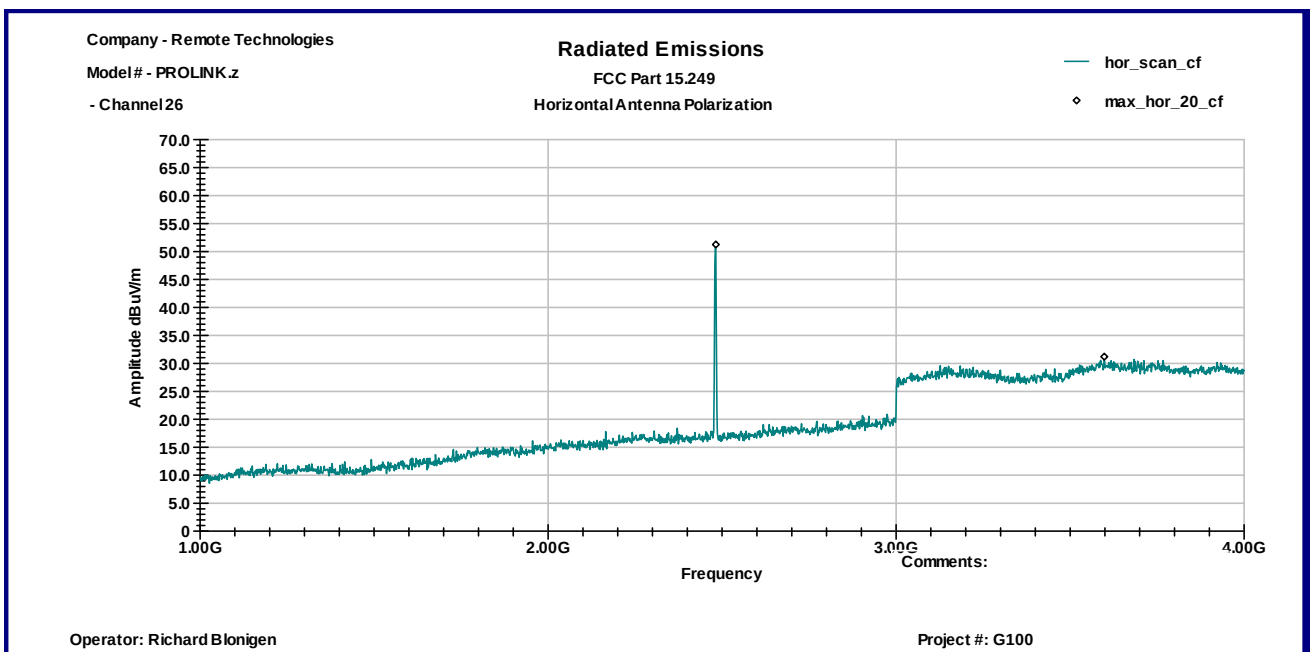


Graph 3.1.6

Vertical antenna polarization

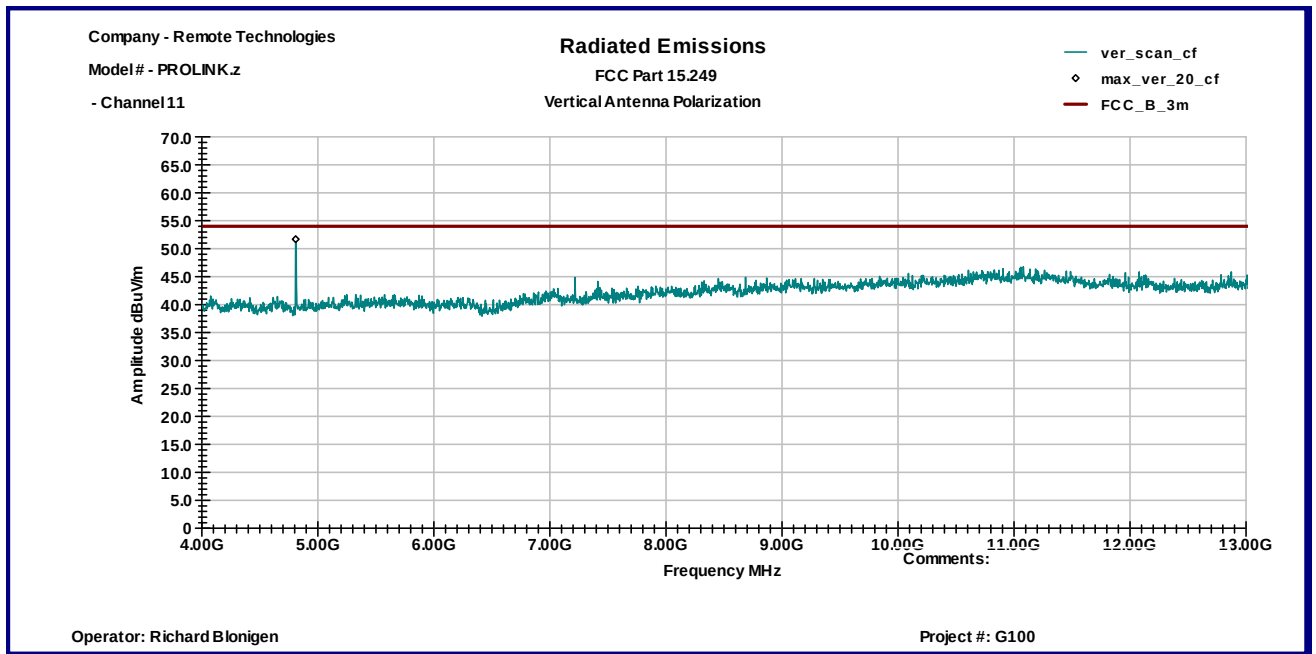


Horizontal antenna polarization

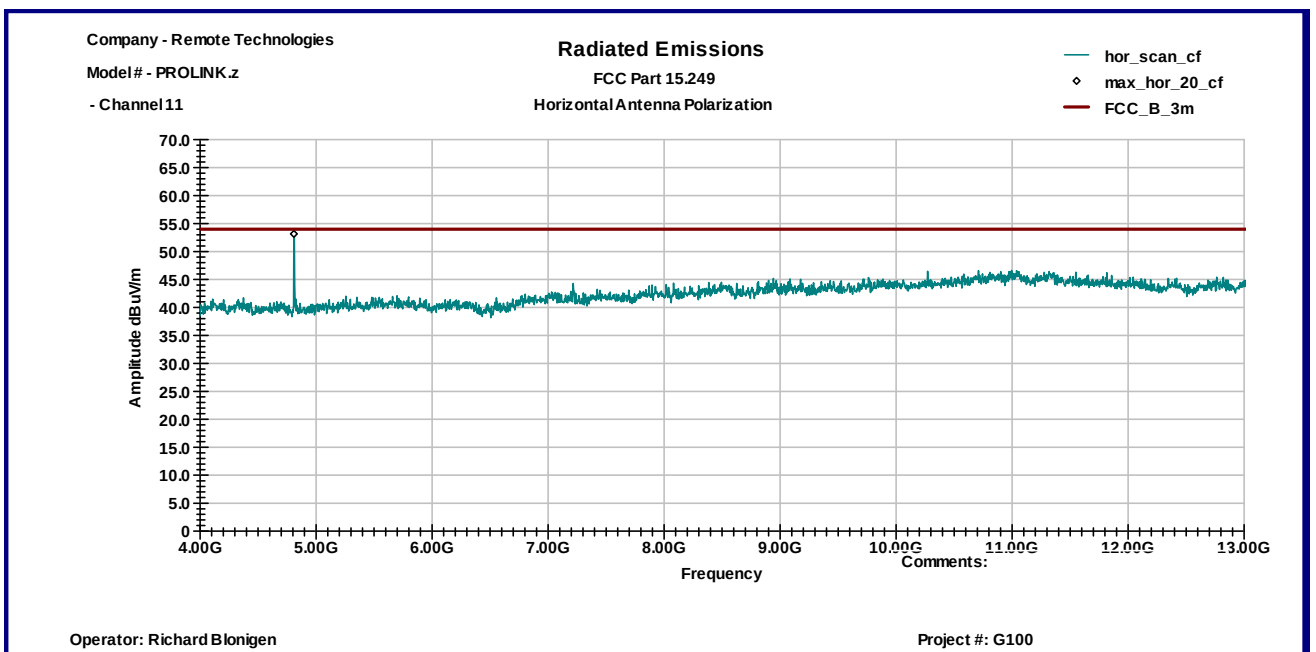


Graph 3.1.7

Vertical antenna polarization

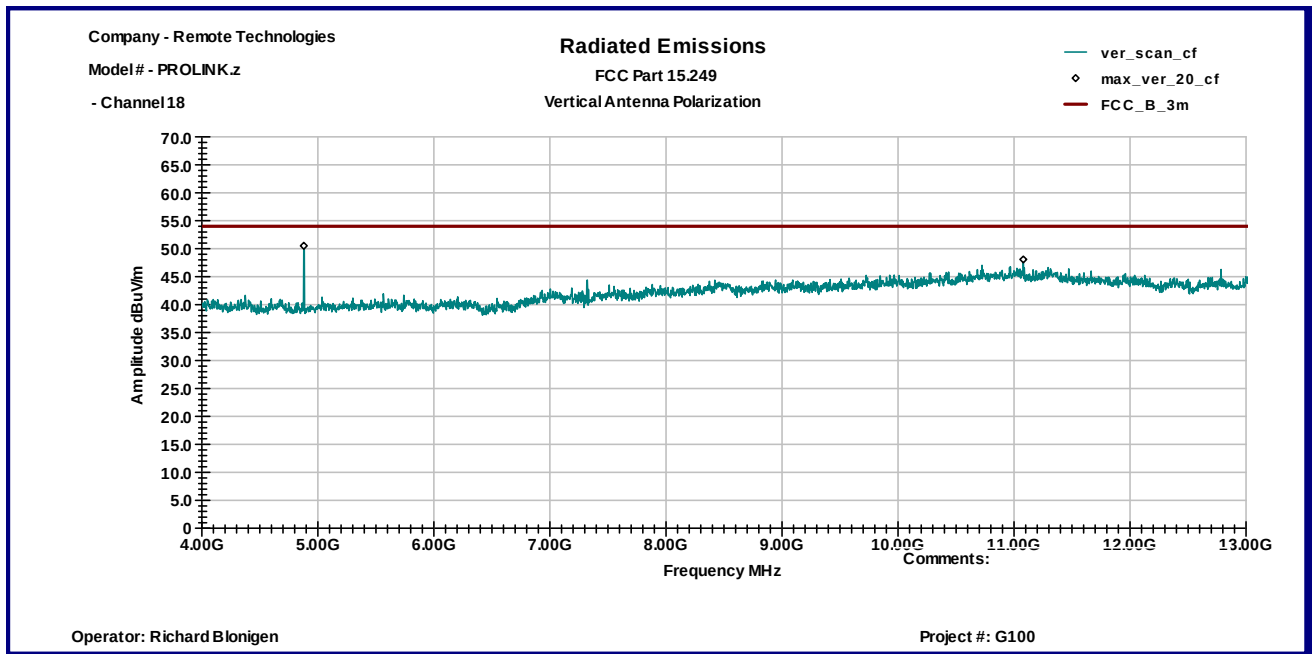


Horizontal antenna polarization

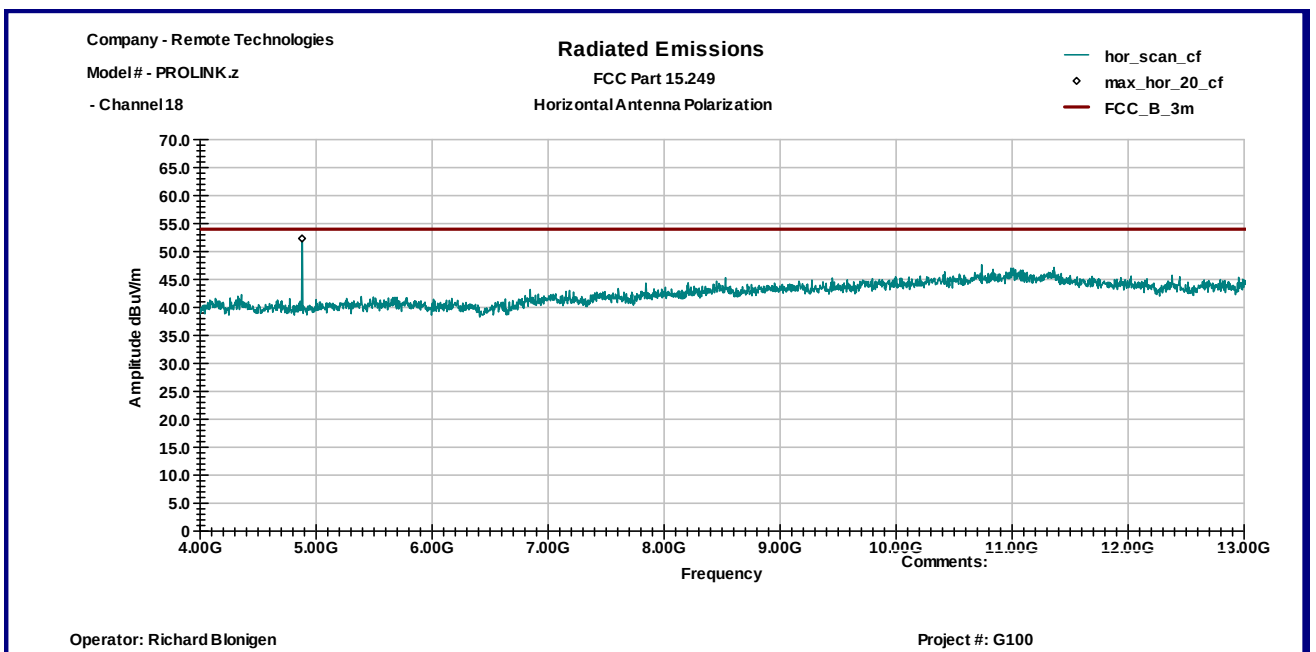


Graph 3.1.8

Vertical antenna polarization

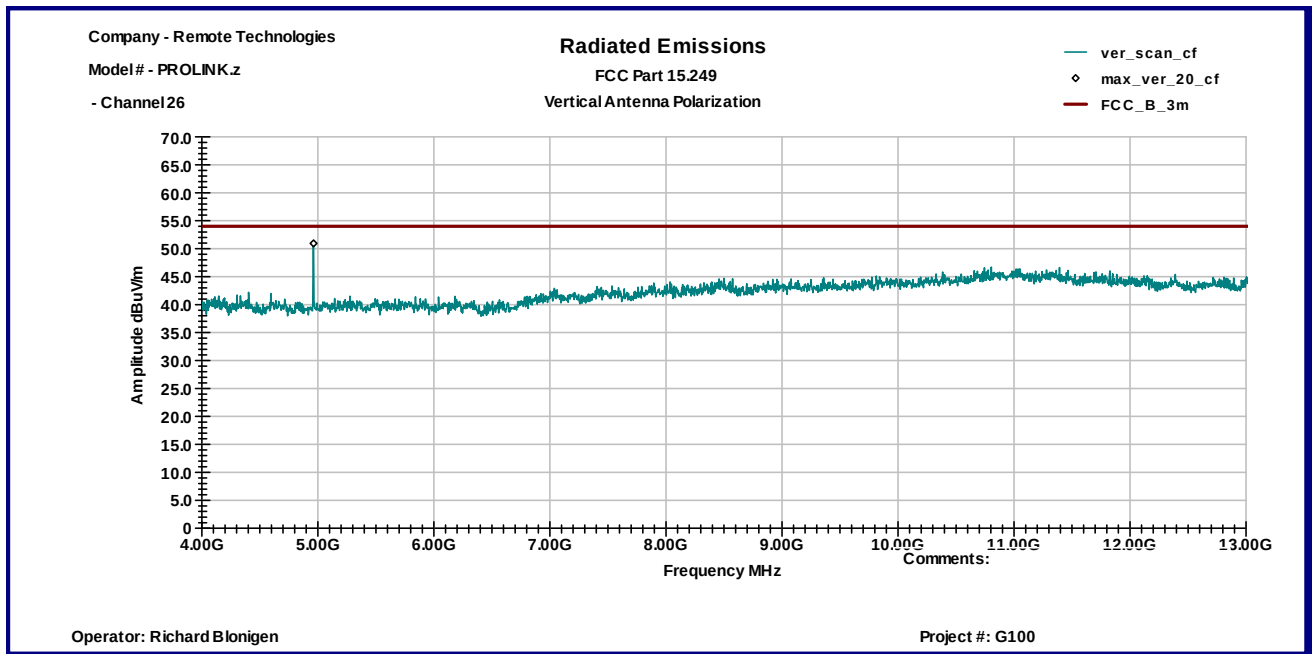


Horizontal antenna polarization

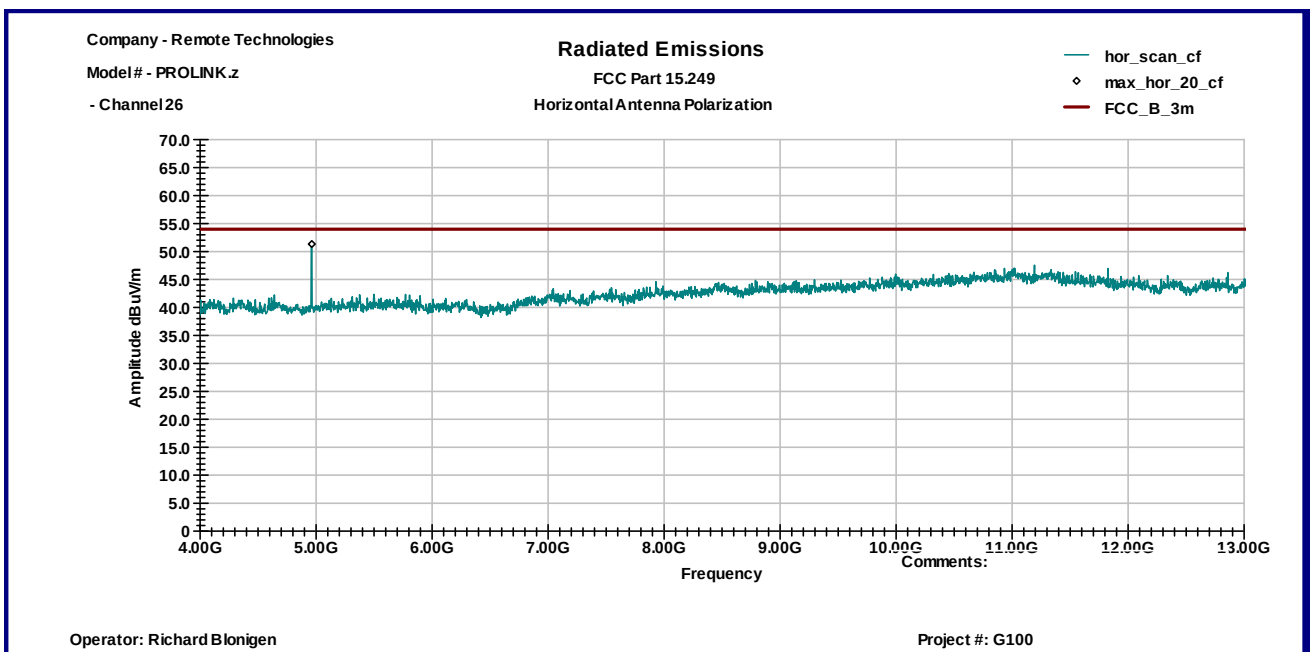


Graph 3.1.9

Vertical antenna polarization

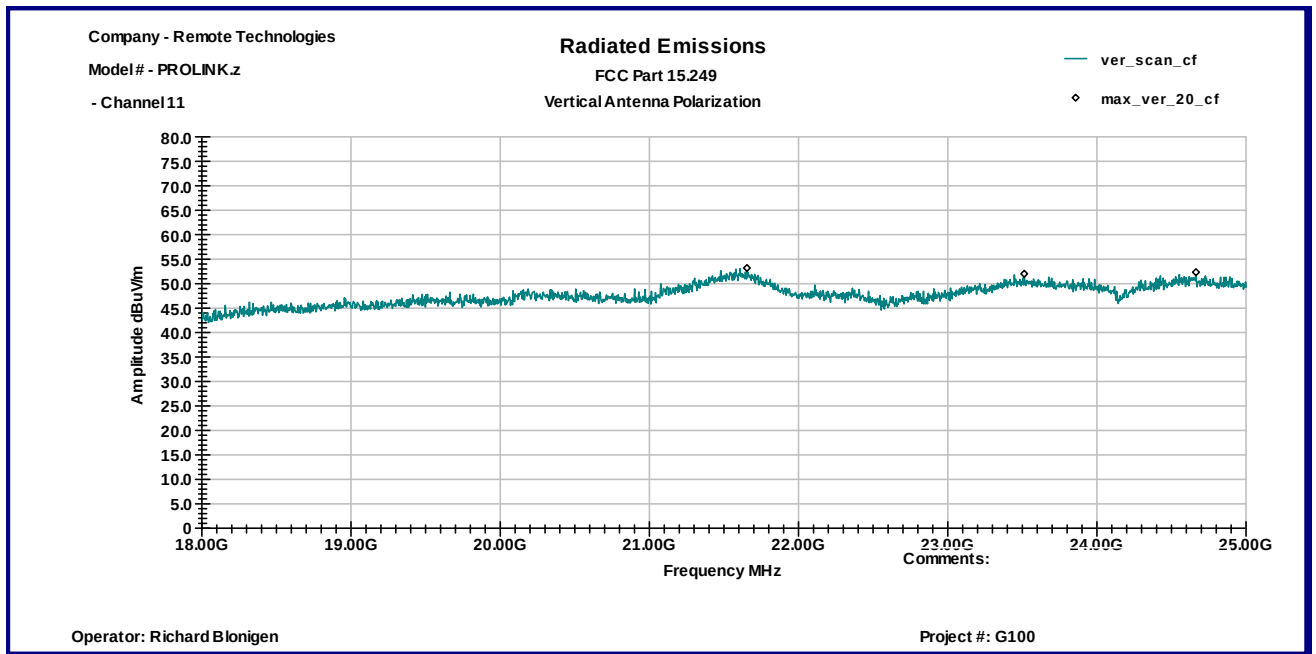


Horizontal antenna polarization

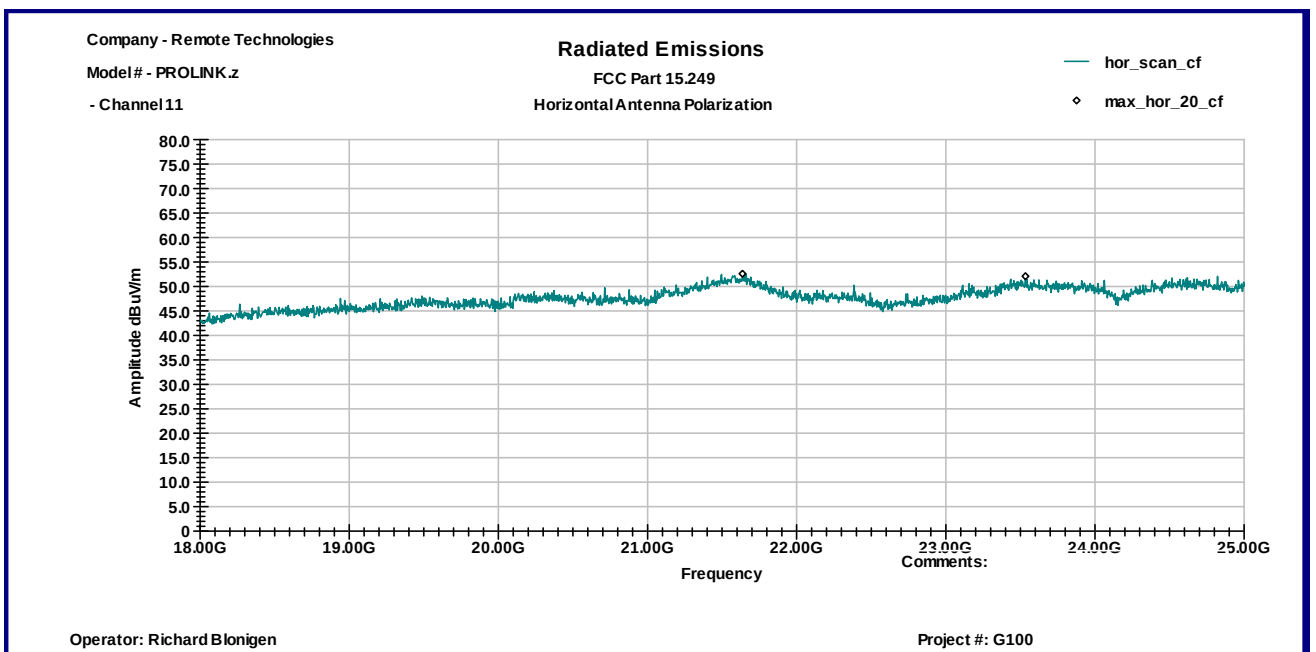


Graph 3.1.10

Vertical antenna polarization

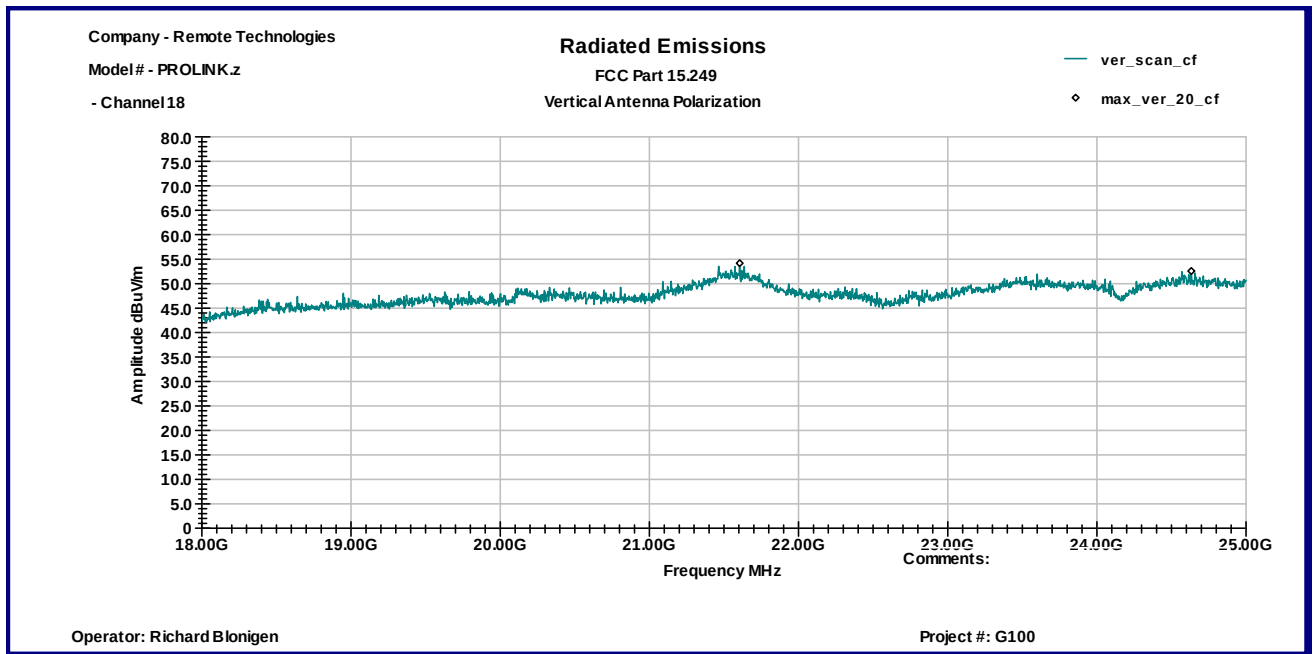


Horizontal antenna polarization

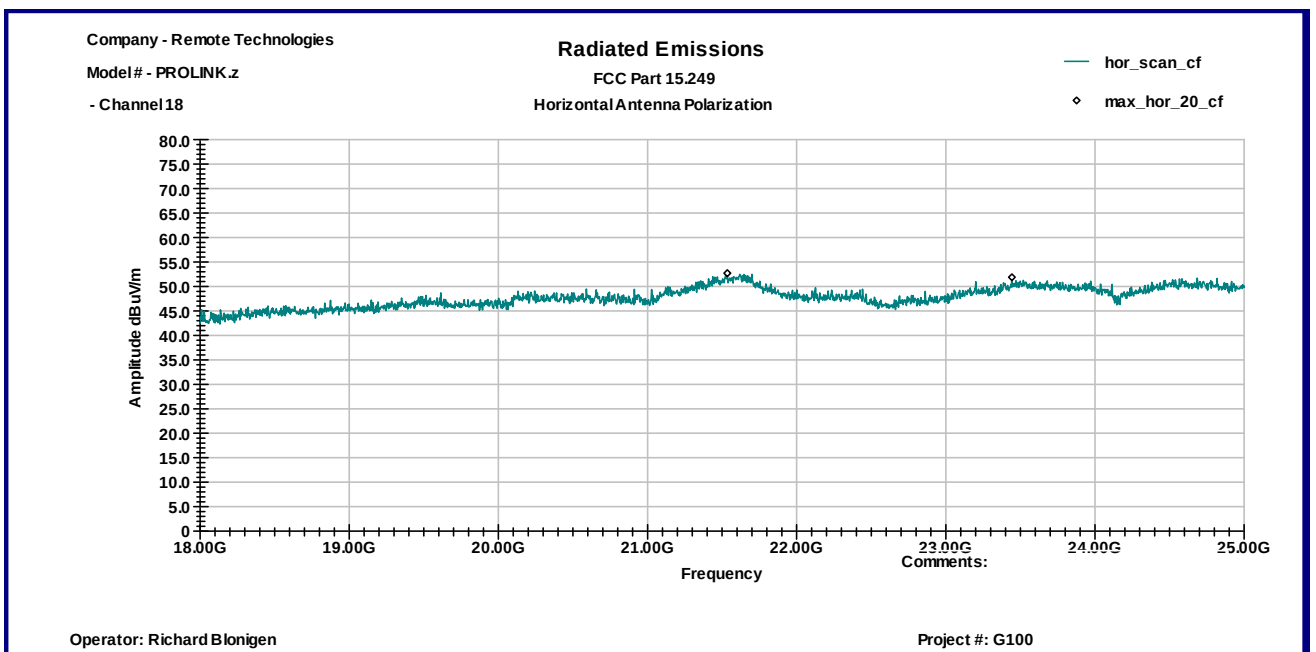


Graph 3.1.11

Vertical antenna polarization

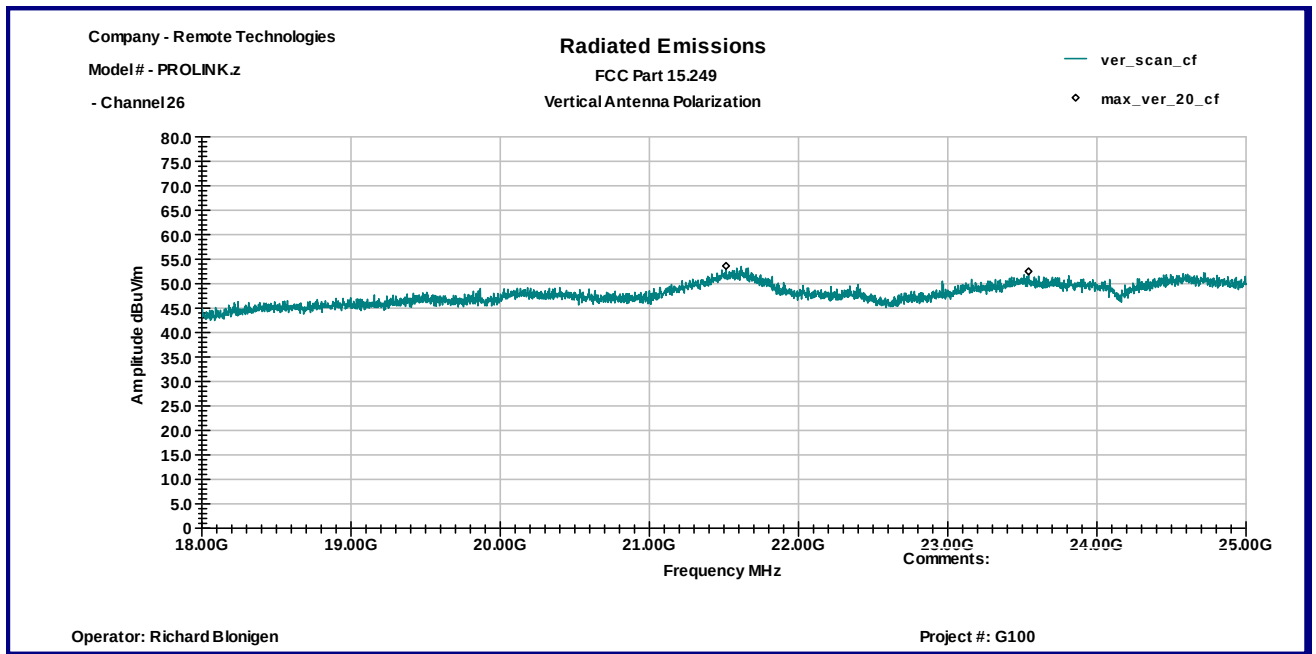


Horizontal antenna polarization

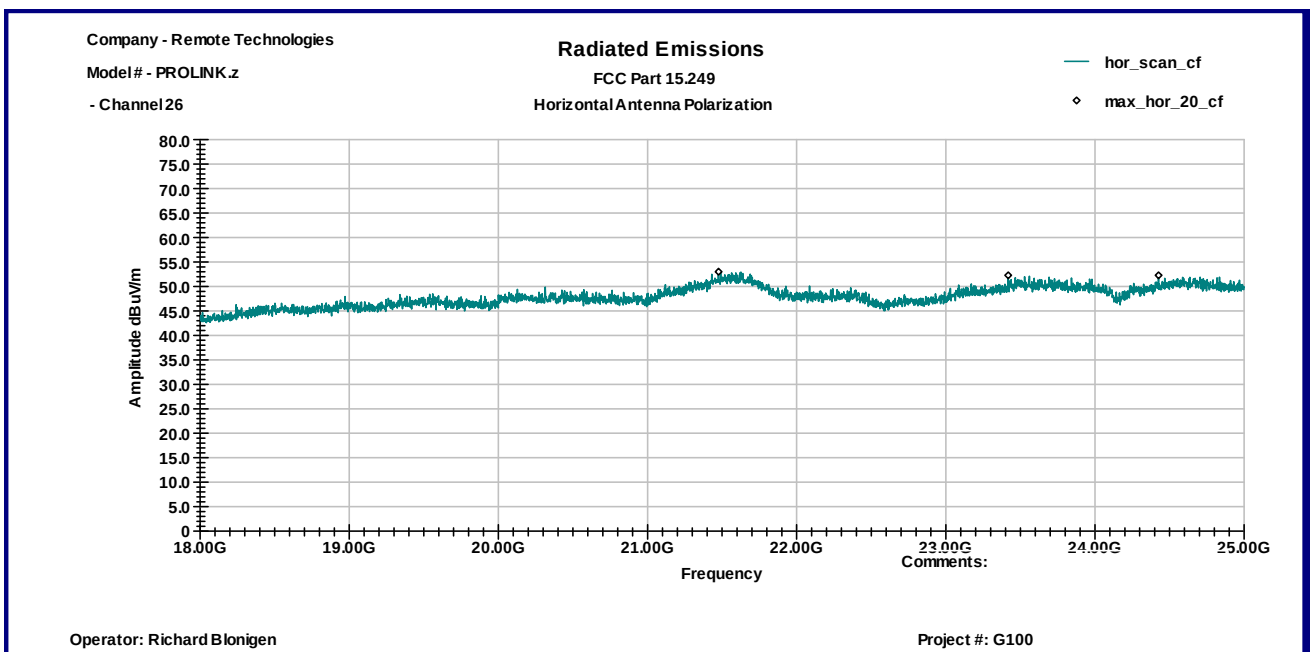


Graph 3.1.12

Vertical antenna polarization



Horizontal antenna polarization



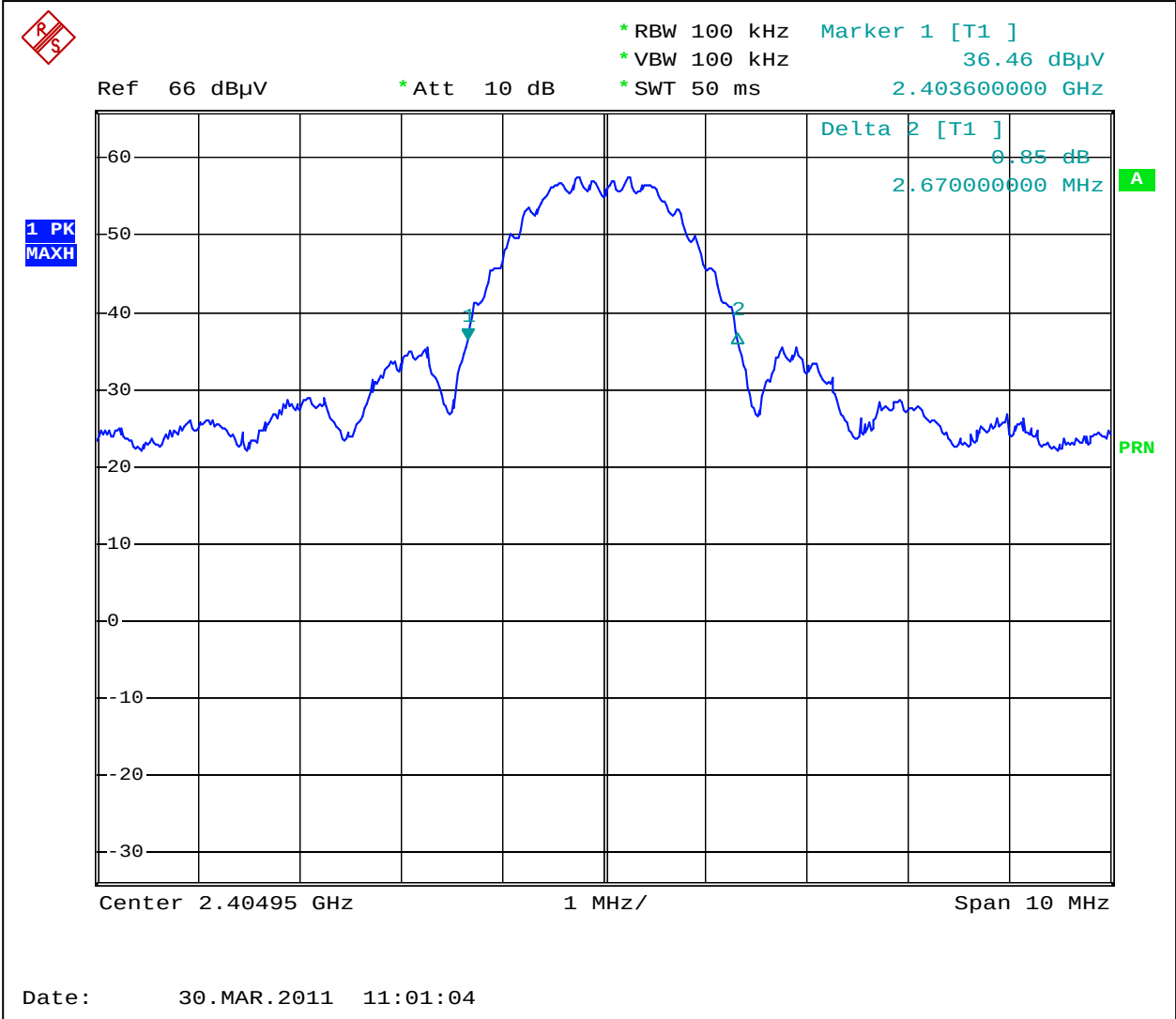
3.2 Bandwidth of Emissions

Center Frequency of operation MHz	Measured 20dB bandwidth MHz	Measured 99% bandwidth MHz
2405	2.67	2.52
2440	2.68	2.54
2480	2.65	2.66

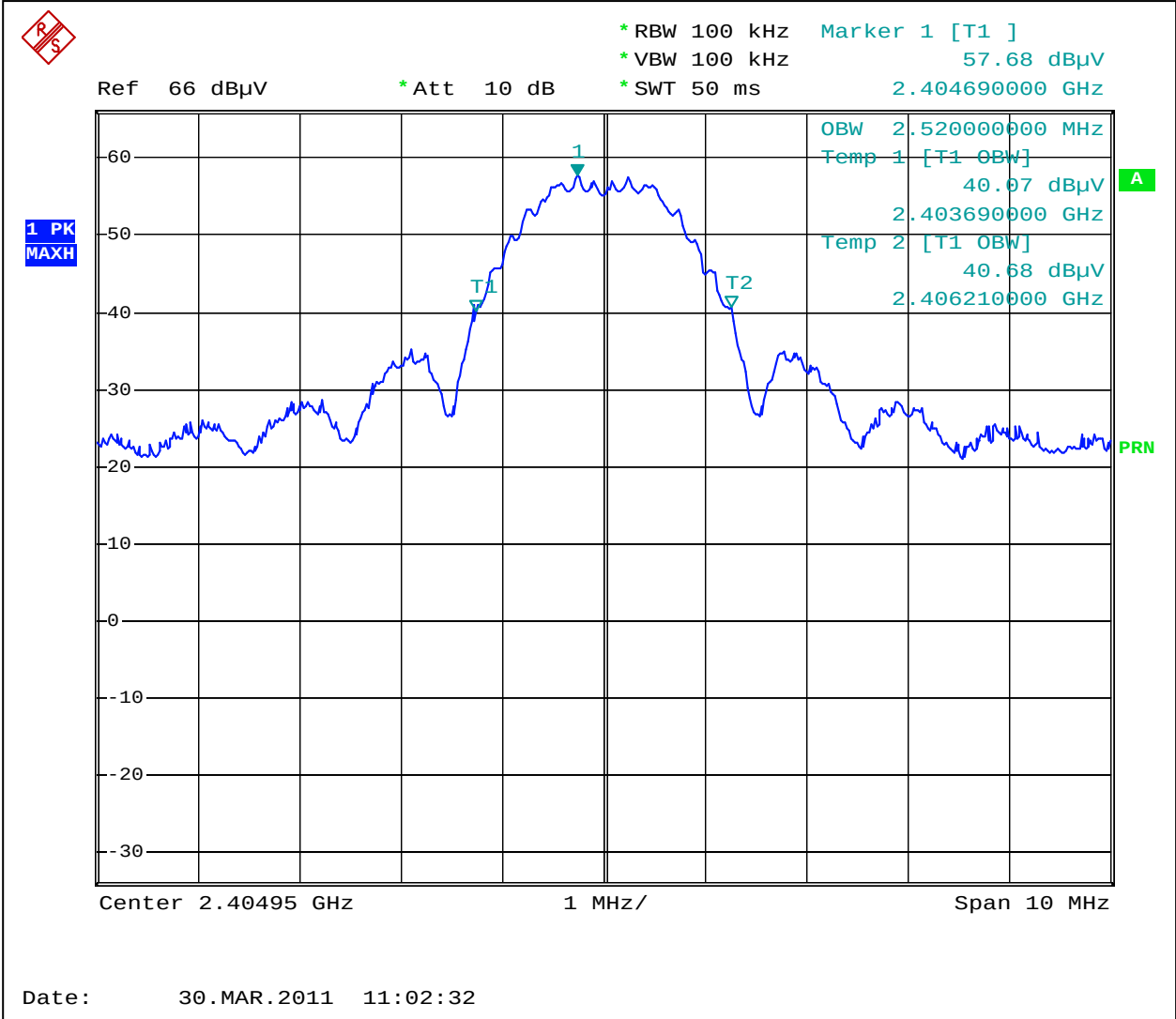
Graphs from 3-2-1 to 3-2-6 show bandwidth of emissions

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

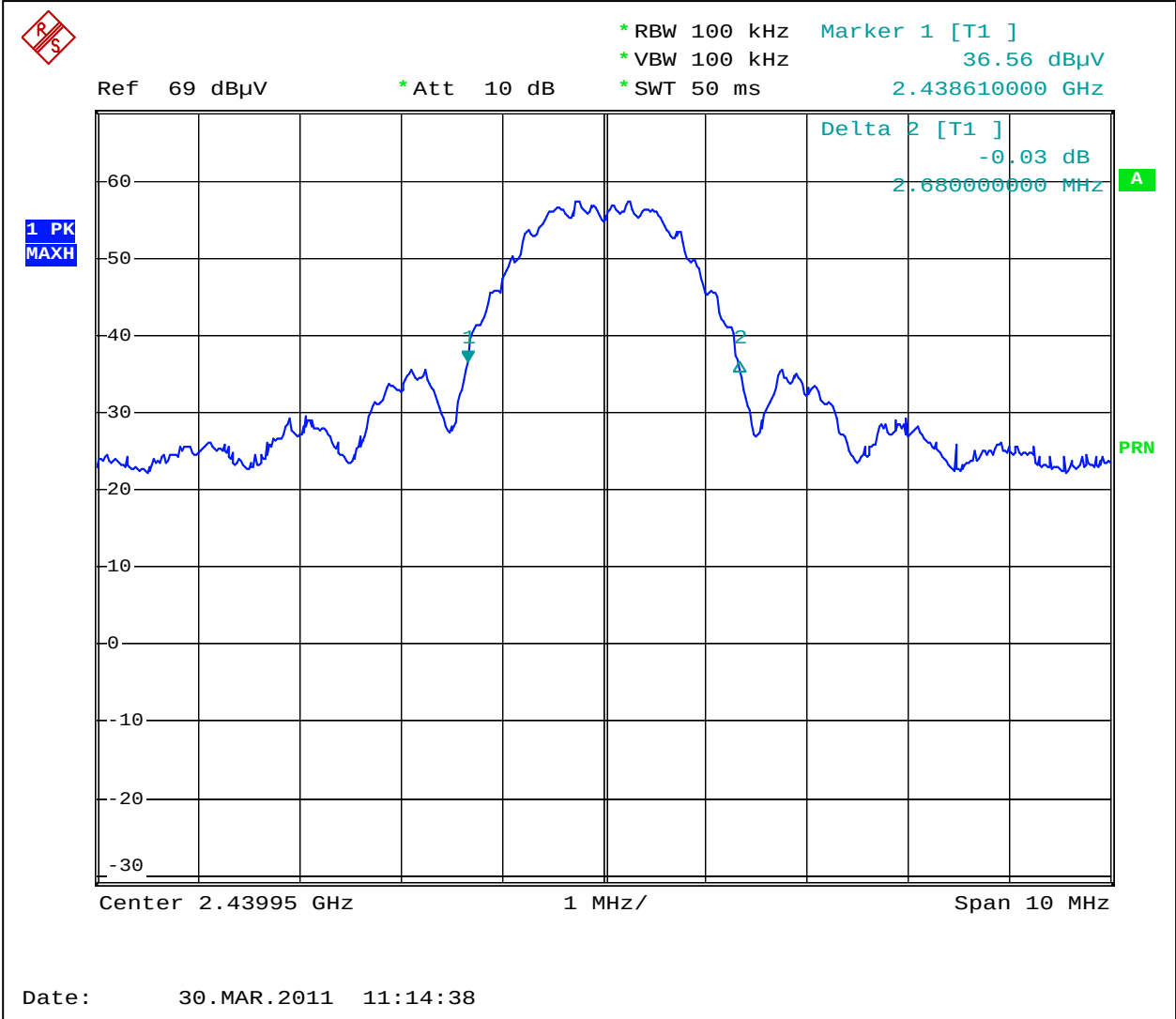
Graph 3.3.1



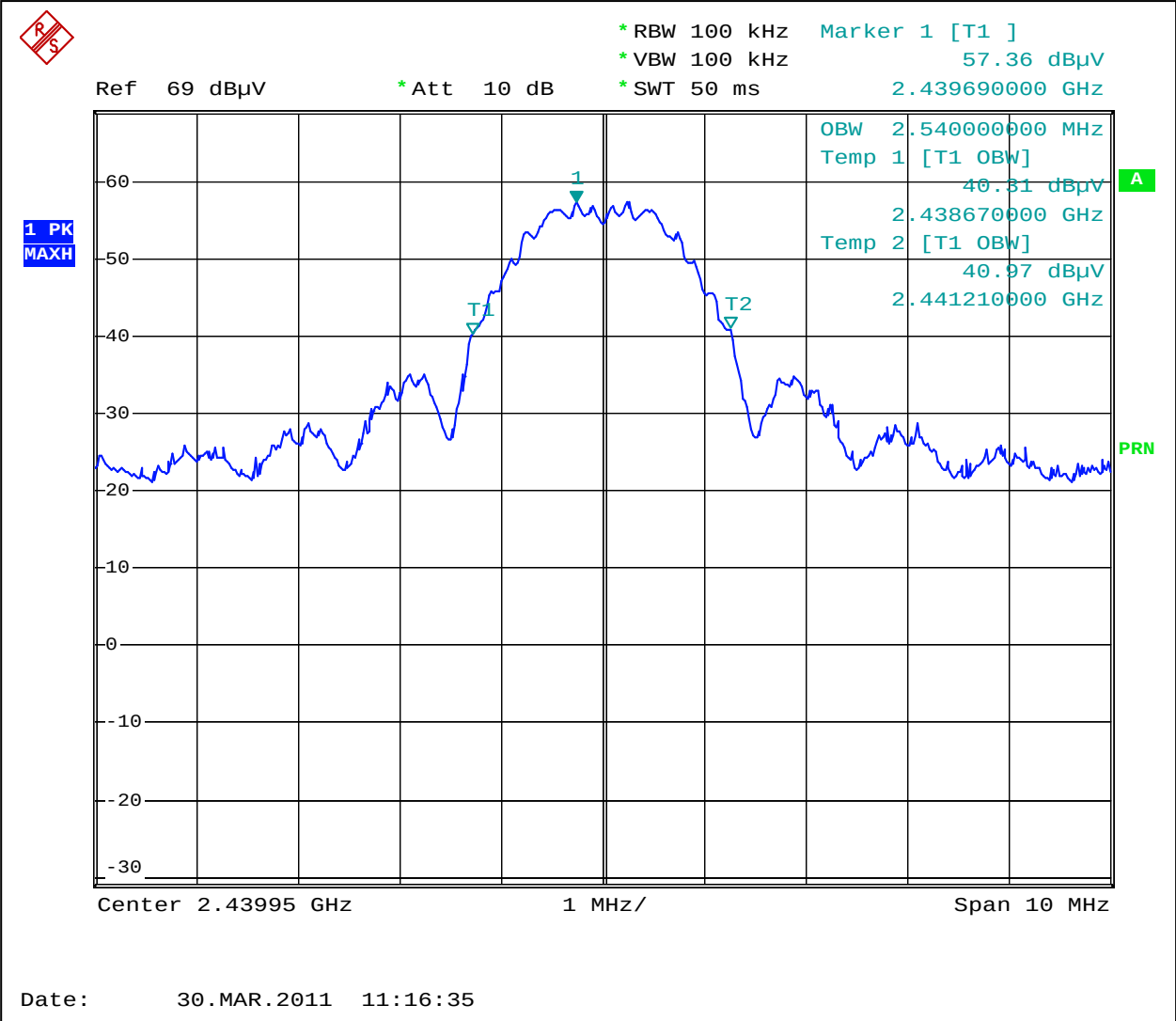
Graph 3.3.2



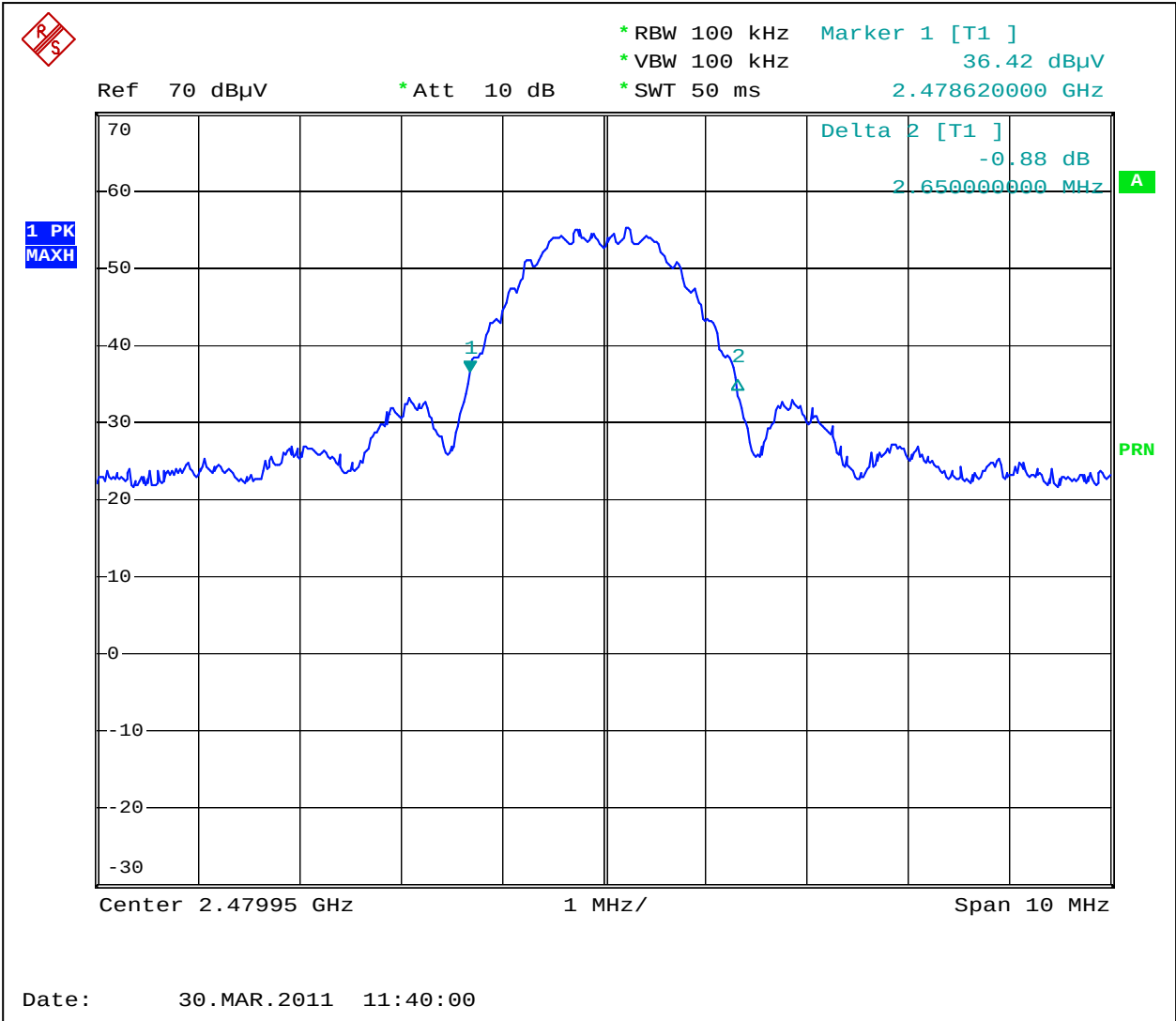
Graph 3.3.3



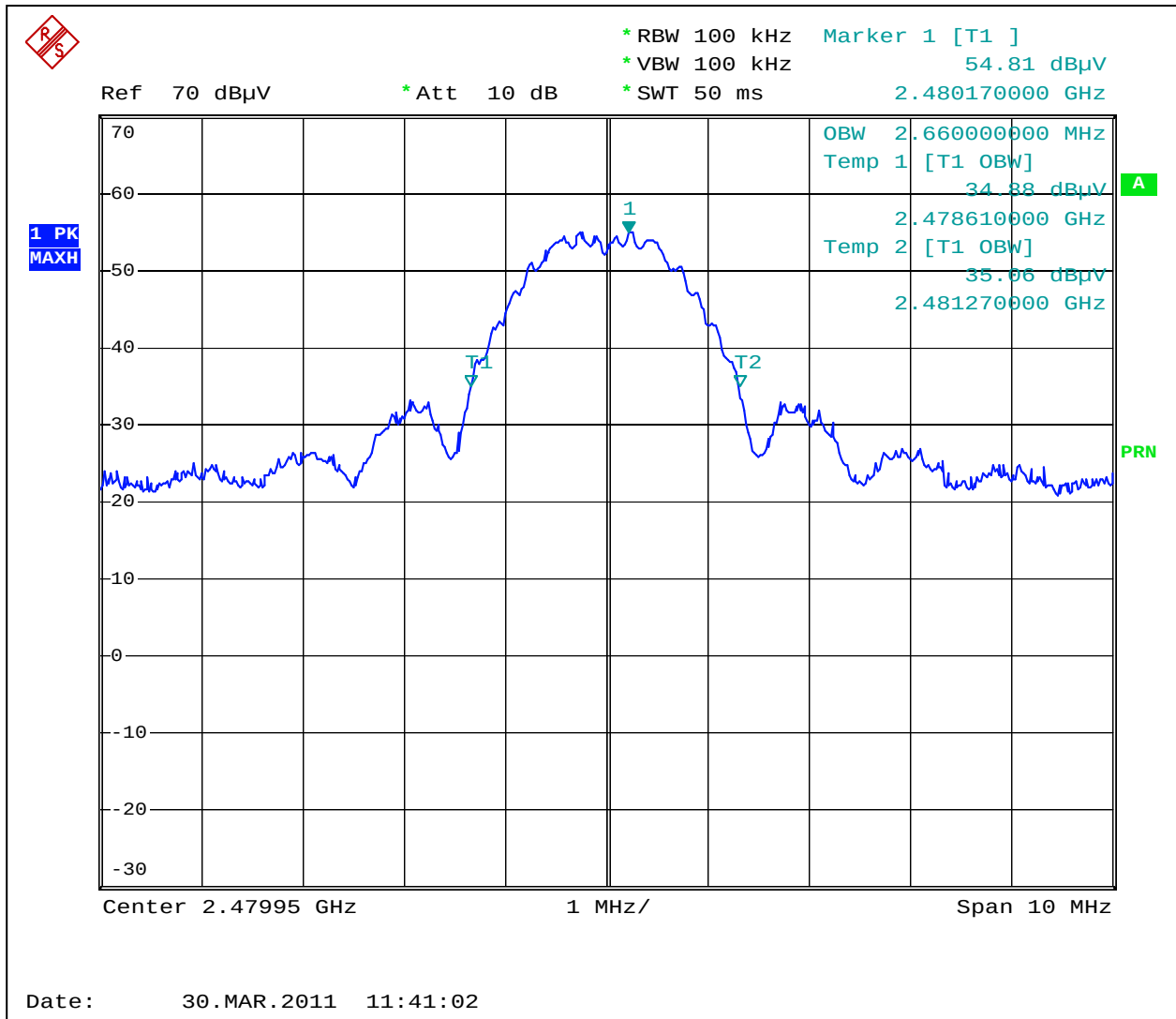
Graph 3.3.4



Graph 3.3.5



Graph 3.3.6





3.3 Transmitter power line conducted emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test result: **Pass**

Frequency range: 0.15MHz-30MHz

Max. Emissions margin: 3.6 dB below the limits

Notes: None

Date:	March 30, 2011	Result: Pass
Standard:	FCC 15.207	
Tested by:	Richard Blonigen	
Test Point:	Power Line	
Operation mode:	See Page 5	
Note:	None	

Table 3.3.1

Line 1

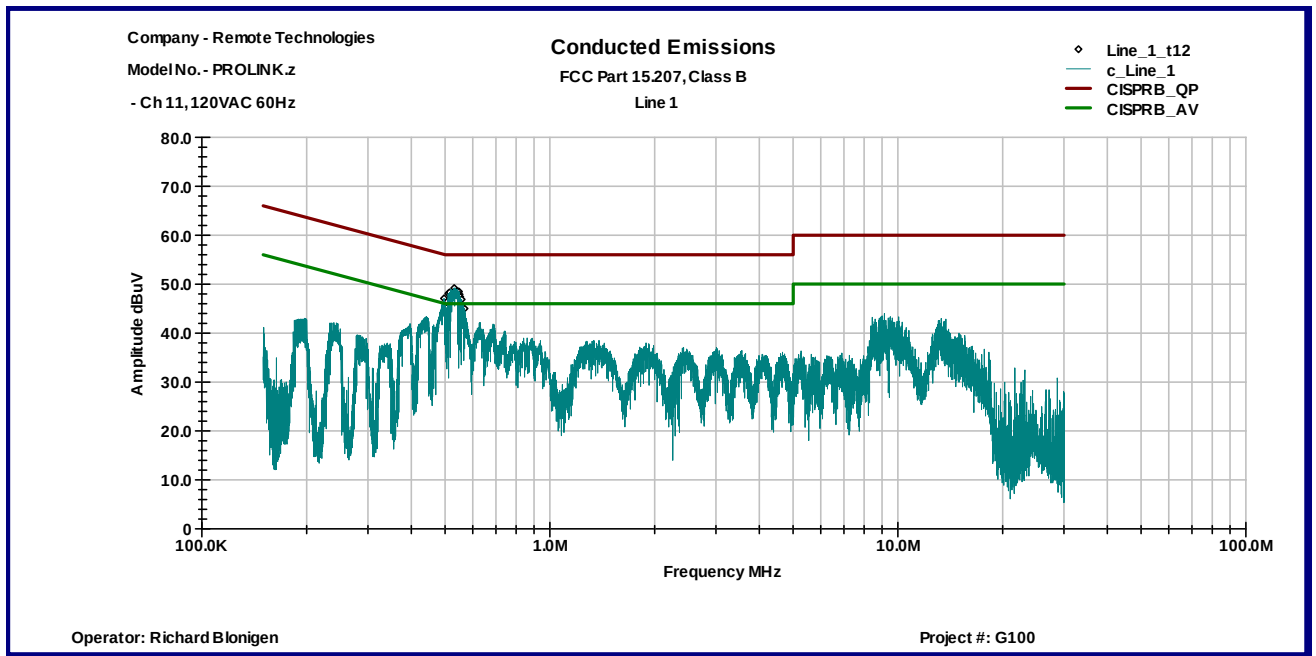
Frequency	Peak dBμV	QP dBμV	AVG dBμV	QP Limit dBμV	AVG Limit dBμV	QP Margin dB	AVG Margin dB
440.976 KHz	43.5	N/A	N/A	57.1	47.1	-13.6	-3.6
529.49 KHz	N/A	47.2	38.4	56.0	46.0	-8.8	-7.6
531.69 KHz	N/A	47.4	38.6	56.0	46.0	-8.6	-7.4
536.91 KHz	N/A	47.4	38.7	56.0	46.0	-8.6	-7.3
626.848 KHz	42.3	N/A	N/A	56.0	46.0	-13.7	-3.7
688.170 KHz	41.8	N/A	N/A	56.0	46.0	-14.2	-4.2

Line 2

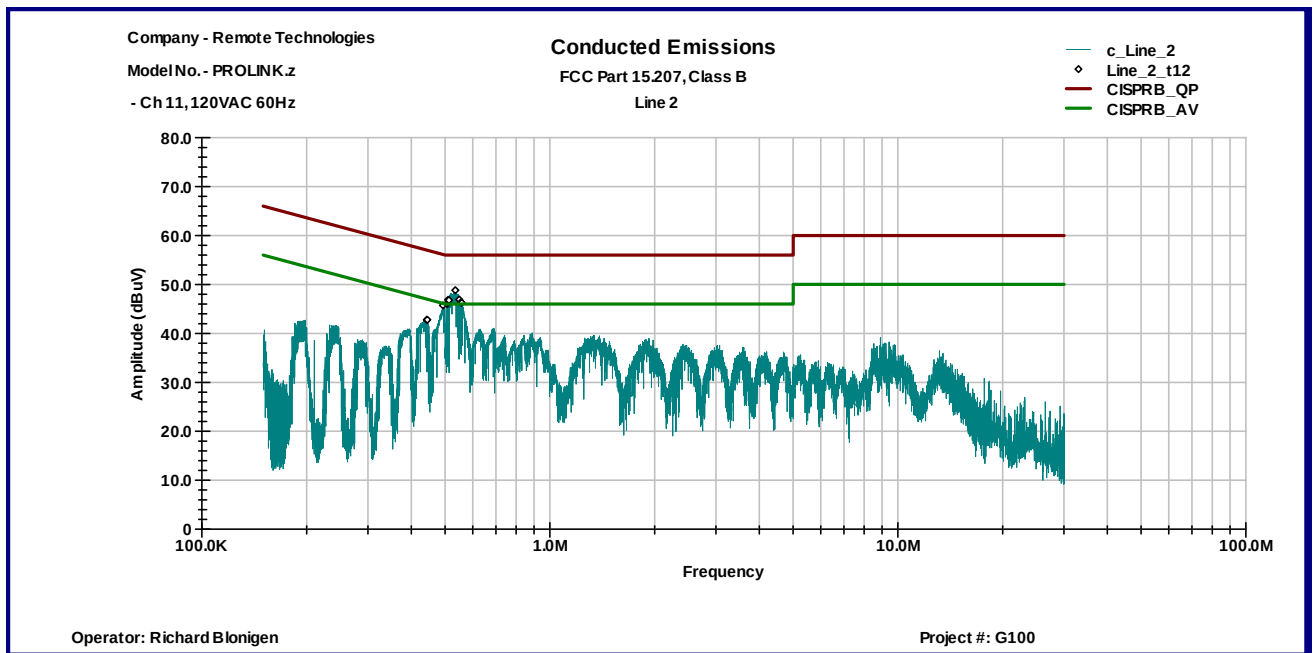
Frequency	Peak dBμV	QP dBμV	AVG dBμV	QP Limit dBμV	AVG Limit dBμV	QP Margin dB	AVG Margin dB
442.342 KHz	42.7	N/A	N/A	57.0	47.0	-17.3	-7.3
522.02 KHz	N/A	46.1	36.6	56.0	46.0	-9.9	-9.4
531.08 KHz	N/A	46.7	38.0	56.0	46.0	-9.3	-8.0
533.71 KHz	N/A	46.7	38.0	56.0	46.0	-9.3	-8.0
629.940 KHz	41.0	N/A	N/A	56.0	46.0	-15.0	-5.0
690.242 KHz	41.2	N/A	N/A	56.0	46.0	-14.8	-4.8

Graph 3.3.1

Line 1



Line 2





3.4 Receiver/digital device radiated emissions

Test location: ☐ OATS ☒ Anechoic Chamber

Test distance: ☐ 10 meters ☒ 3 meters

Test result: **Pass**

Frequency range: 30MHz-13GHz

Max. Emissions margin: 3.0 dB below the limits

Notes: The Radiated Emissions test was performed in the Anechoic chamber at 3m measurement distance (see Tables 3.4.1 and Graphs 3.4.1 to 3.4.2)



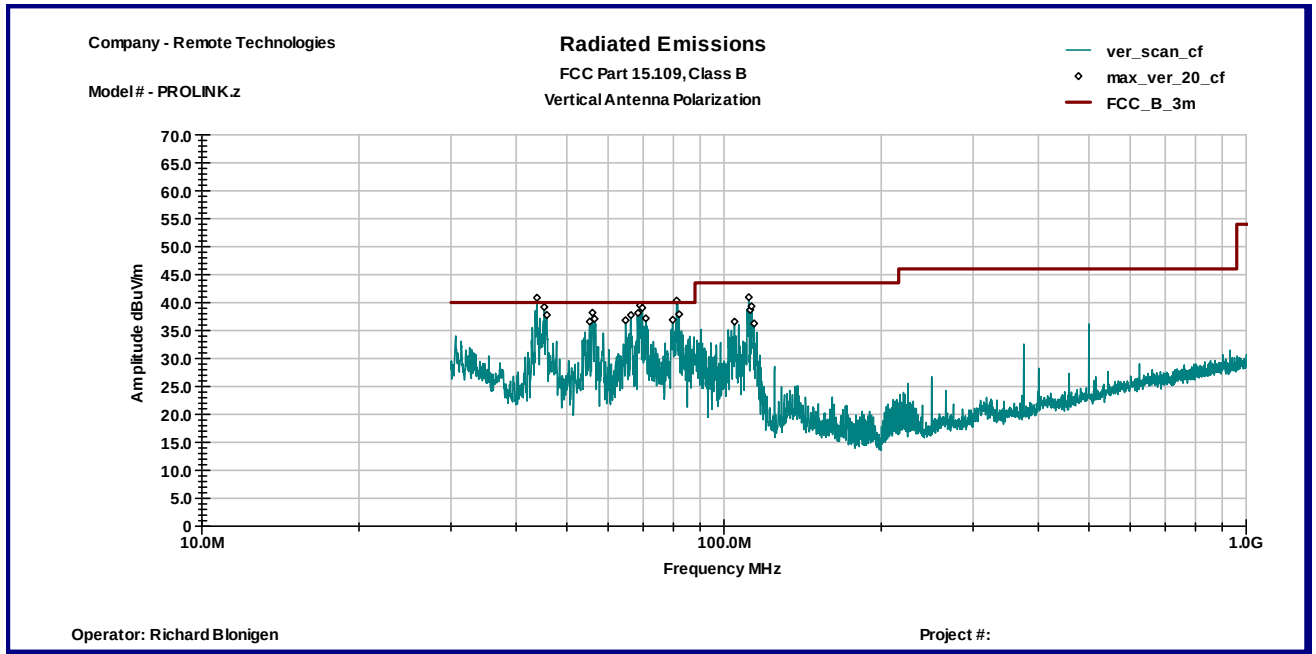
Date:	March 30-31, 2011	Result: Pass
Standard:	FCC Part 15.109, Class B	
Tested by:	Richard Blonigen	
Test Point:	Enclosure	
Operation mode:	Standby mode/Receiver mode	
Note:	None	

Table 3.4.1

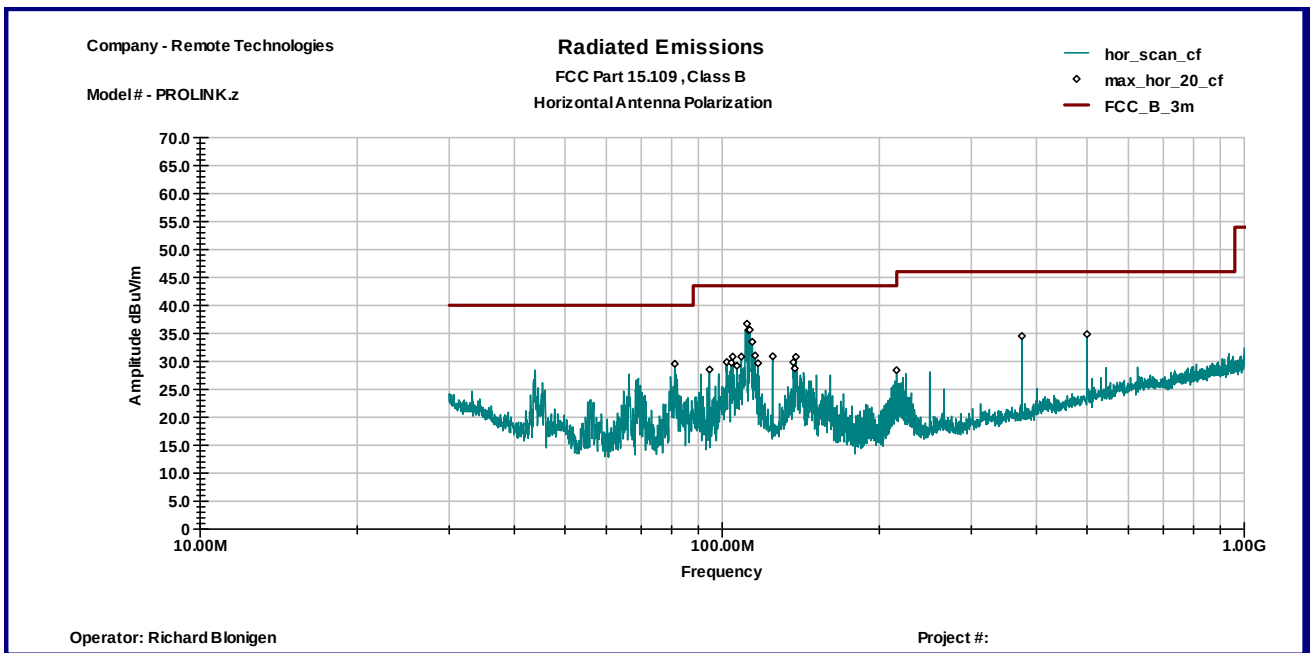
Frequency MHz	Antenna		Ant. CF dB1/m	Cable loss dB	Pre-amp Gain (dB)	Reading dB μ V	Total @ 3m dB μ V/m	Limit dB μ V/m	Margin dB	Comments
	Polarity	Hts(cm)								
31.42	V	100	19.0	0.5	0.0	13.6	33.1	40.0	-6.9	
43.81	V	100	12.3	0.6	0.0	24.1	37.0	40.0	-3.0	
56.02	V	100	7.1	0.7	0.0	26.6	34.4	40.0	-5.6	
69.00	V	100	6.4	0.8	0.0	29.6	36.8	40.0	-3.2	
81.21	V	100	8.2	0.9	0.0	27.2	36.3	40.0	-3.7	
110.80	V	100	12.5	1.1	0.0	25.9	39.5	43.5	-4.0	
110.80	H	400	12.5	1.1	0.0	21.3	34.9	43.5	-8.6	
375.03	H	100	16.1	2.2	0.0	17.0	35.2	46.0	-10.8	
500.03	H	100	18.2	2.6	0.0	14.5	35.3	46.0	-10.7	

Graph 3.4.1

Vertical antenna polarization

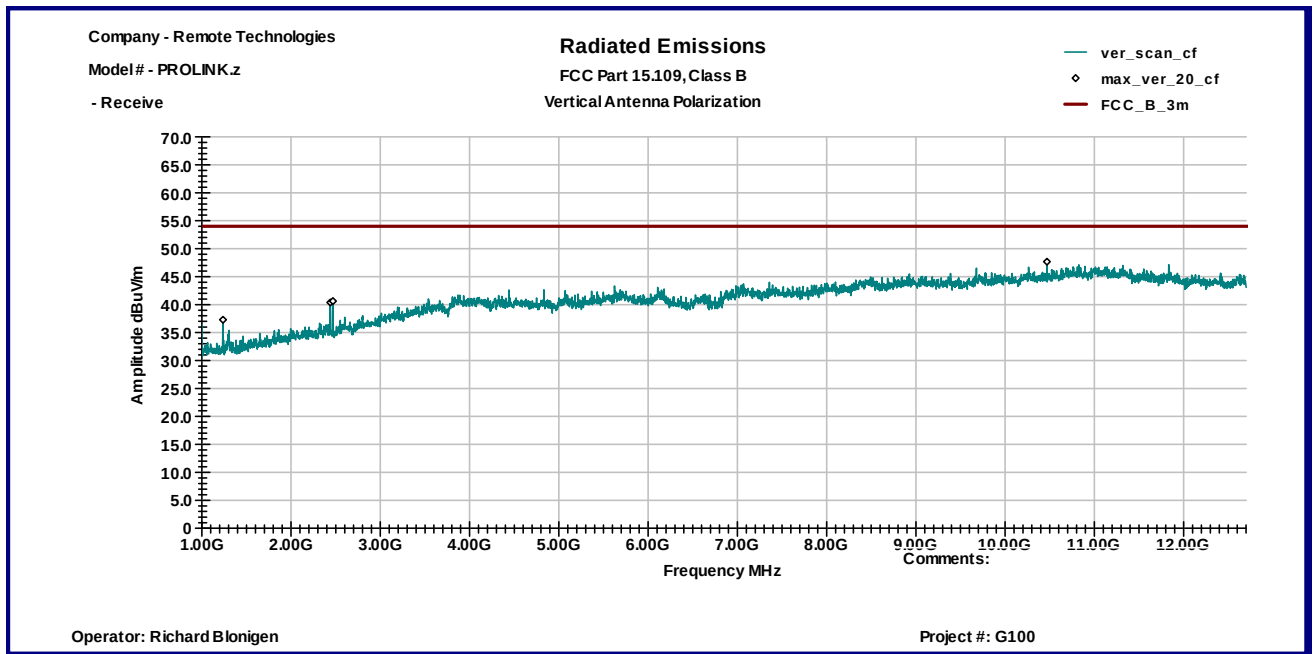


Horizontal antenna polarization

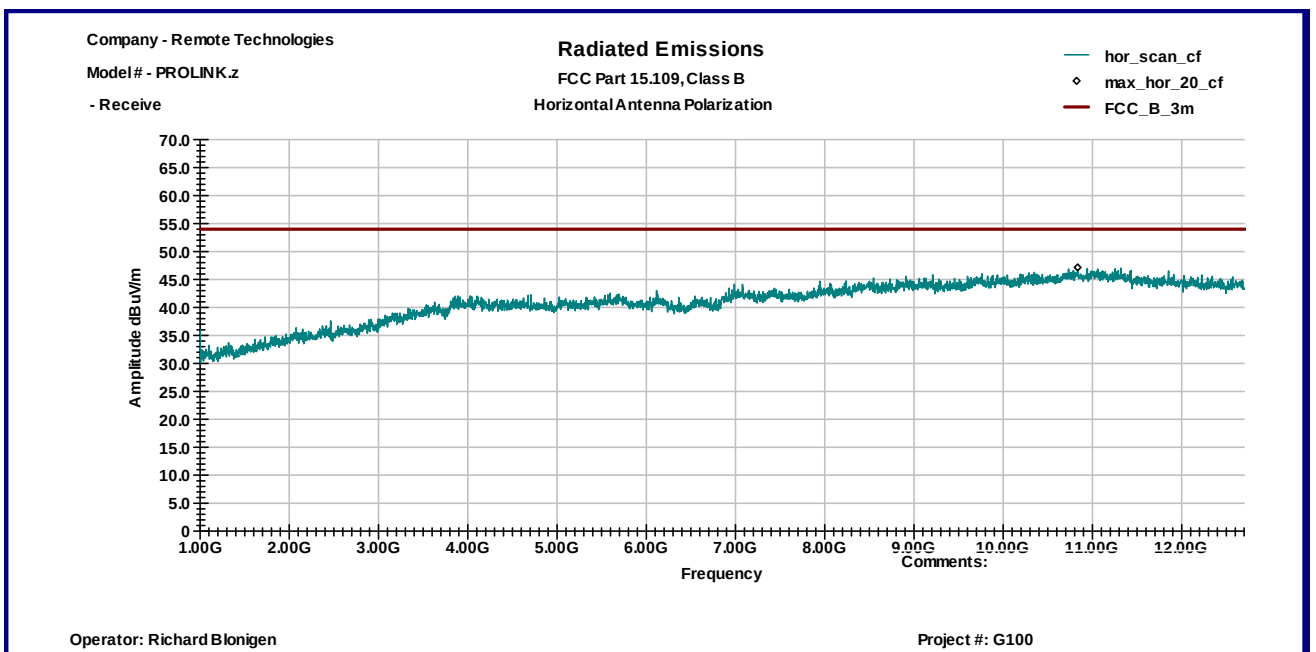


Graph 3.4.2

Vertical antenna polarization



Horizontal antenna polarization





3.5 Digital device conducted emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test result: **Pass**

Frequency range: 0.15MHz-30MHz

Max. Emissions margin: 3.4 dB below the limits

Notes: None

Date:	March 31, 2011	Result: Pass
Standard:	FCC 15.107, Class B	
Tested by:	Richard Blonigen	
Test Point:	Power Line	
Operation mode:	Standby mode	
Note:	None	

Table 3.5.1

Line 1

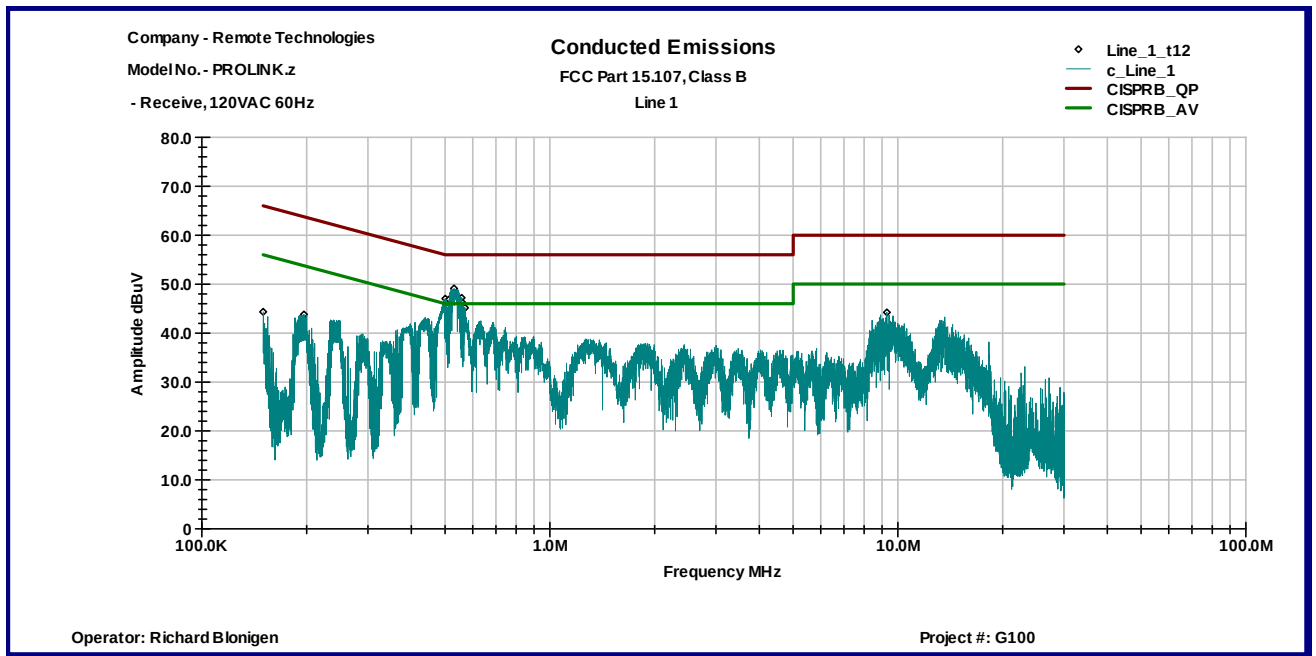
Frequency	Peak dBμV	QP dBμV	AVG dBμV	QP Limit dBμV	AVG Limit dBμV	QP Margin dB	AVG Margin dB
446.05 KHz	43.0	N/A	N/A	56.9	46.9	-13.9	-3.9
500.8 KHz	N/A	44.9	31.4	56.0	46.0	-11.2	-14.6
536.15 KHz	N/A	47.4	39.4	56.0	46.0	-8.6	-6.6
541.38 KHz	N/A	47.2	39.2	56.0	46.0	-8.8	-6.8
633.033 KHz	42.6	N/A	N/A	56.0	46.0	-13.4	-3.4
689.624 KHz	41.9	N/A	N/A	56.0	46.0	-14.1	-4.1

Line 2

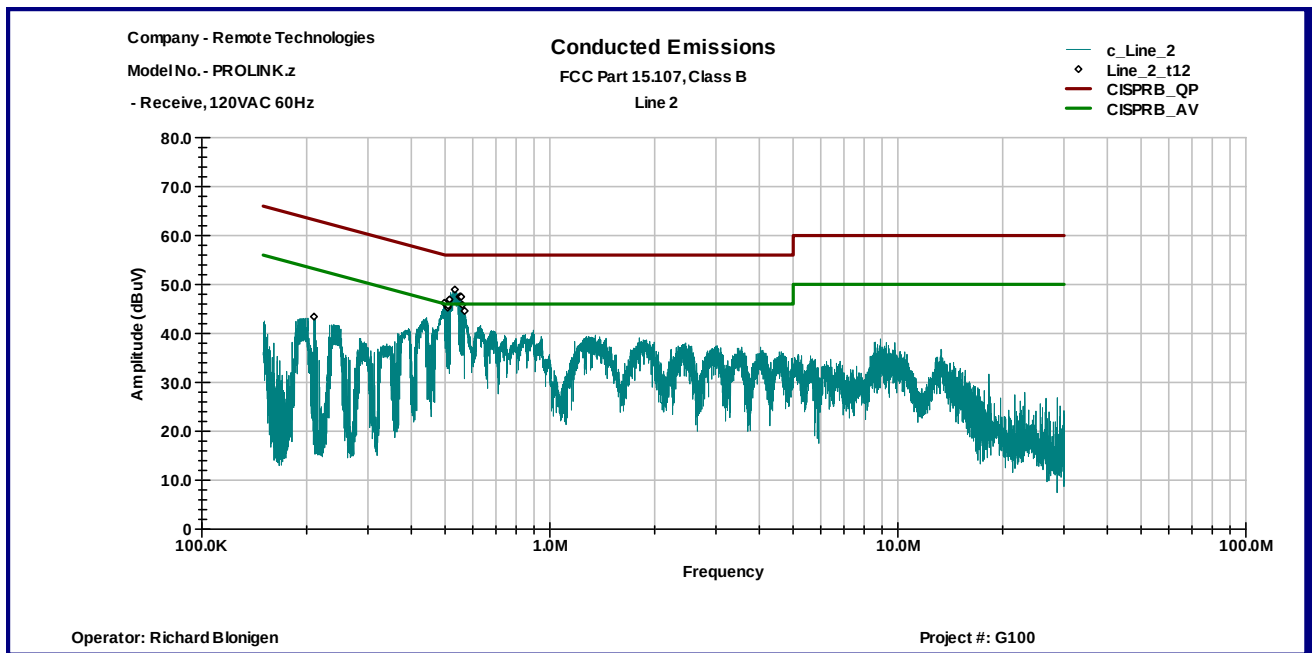
Frequency	Peak dBμV	QP dBμV	AVG dBμV	QP Limit dBμV	AVG Limit dBμV	QP Margin dB	AVG Margin dB
442.34 KHz	43.3	N/A	N/A	57.0	47.0	-13.7	-3.7
504.73 KHz	N/A	42.0	28.2	56.0	46.0	-14.0	-17.8
528.33 KHz	N/A	46.6	37.7	56.0	46.0	-9.4	-8.3
541.18 KHz	N/A	46.6	38.7	56.0	46.0	-9.4	-7.3
634.58 KHz	41.1	N/A	N/A	56.0	46.0	-14.9	-4.9
698.28 KHz	40.3	N/A	N/A	56.0	46.0	-15.7	-5.7

Graph 3.5.1

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	12/07/2011	☒
Spectrum Analyzer	R & S	ESCI	100358	12909	07/12/2011	☒
Bicono-Log Antenna	Schaffner-Chase	CBL 6112 B	2468	14459	10/18/2011	☒
Horn Antenna	EMCO	3115	9507-4513	9936	04/13/2011	☒
Waveguide Horn Antenna	EMCO	3116	9904-2423	9705	10/04/2011	☒
LISN	Fischer Custom Communications	FCC-LISN-50-25-2	2014	9665	03/23/2012	☒
High Pass Filter	Reactel	7HS-4G-S12	0223	015274	VBV	☒
Pre-Amplifier	MITEQ	AMF-5D-00501800-28-13P	1122951	13475	10/06/2011	☒
Pre-Amplifier	MITEQ	AMF-6F-26004000-40-8P	13224444	MIN-0064	10/06/2011	☒
System	TILE! Instrument Control		Ver. 3.4.K.29	15259	VBV	☒