TEST REPORT

Report Number: 100305264MIN-002
Project Number: G100305264

Testing performed on the
PRO-24.r

FCC ID: MMURTI1700
Industry Canada ID: 3166A-RTI1700

to
47 CFR Part 15. 231:2009
RSS- 210, Issue 8, 2010

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 Inc.
5775 12th Avenue East, Suite 180
Shakopee, MN 55379, USA

Prepared by: _____ Date: January 19, 2011
Simon Khazon

Reviewed by: _____ Date: January 19, 2011
Norman Shpilsher

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1.0 GENERAL DESCRIPTION

Model:	PRO-24.r
Type of EUT:	Remote Control
FCC ID:	MMURTI1700
Industry Canada ID:	3166A-RTI1700
Related Submittal(s) Grants:	None
Company:	Remote Technologies Inc.
Customer:	Mr. Mark Melville
Address:	5775-12th Avenue East Suite 180 Shakopee MN 55379
Phone:	(952) 253-3116
Fax:	(952) 253-3131
e-mail:	markm@rticorp.com
Test Standards:	☒ 47 CFR, Part 15:2009, §15.231 ☒ RSS–210, Issue 8, 2010 ☒ RSS-Gen, Issue 3, 2010 ☒ 47 CFR, Part 15:2009, §15.107 and §15.109, Class B ☐ Other
Type of radio:	☒ Stand -alone ☐ Module ☐ Hybrid
Date Sample Submitted:	January 6, 2011
Test Work Started:	January 6, 2011
Test Work Completed:	January 12, 2011
Test Sample Conditions:	☐ Damaged ☐Poor (Usable) ☒ Good

1.1 Product Description; Test Facility

Product Description:	Transmitter
Operating Frequency	433.91 MHz
Modulation:	2FSK
Emission Designator:	81K7F2D
Antenna(s) Info:	Integral
Antenna Installation:	☐ User ☐ Professional ☒ Factory
Transmitter power configuration:	☒ Internal battery ☐ External power source ☐ 120VAC ☐ 230VAC ☐ 400VAC ☒ 3.3 VDC ☐ Other: Amp. ☐ 50Hz ☐ 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 C63.4-2003

1.2 EUT Configuration

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

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

Operating modes of the EUT:

No.	Description
1	The transmitter was programmed to transmit continuously, or in regular mode

Cables:

No.	Type	Length	Designation	Note
	N/A			

Support equipment/Services:

No.	Item	Description
	N/A	

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

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
15.231(a) / RSS-210 A1.1.1(a)	Transmitter deactivation time	Pass
15.231(b) / RSS-210 A1.1.2	Transmitter field strength of emissions	Pass
15.231(c) / RSS-210 A1.1.3	Bandwidth of the emission	Pass
15.207/RSS-Gen 7.2.2	Transmitter Power Line conducted emissions	Pass
15.109/ICES-003/ RSS-Gen 4.10	Receiver/digital device radiated emissions	Pass
15.107/ ICES-003	Digital device conducted emissions	Pass

3.0 TEST CONDITIONS AND RESULTS

3.1 Transmitter deactivation time

Maximum allowed deactivation time: 5 sec

Measured deactivation time: within about 1 sec

Test result: **Pass**

Notes: None.

3.2 Transmitter field strength of emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test distance: ☐ 10 meters ☒ 3 meters

Frequency range of measurements: 30MHz-5000MHz

Test result: **Pass**

Max. Emissions margin at fundamental: 0.3 dB below the limits

Max. margin of harmonics and spurious emissions: 6.2 dB below the limits

Notes: Field Strength of Fundamental and Spurious Emissions measurements were made at Fundamental frequency of 433.91MHz; Spurious Emissions were tested up to 5GHz

The Table 3.2.1 shows the Field Strength of Fundamental Radiation. The Tables 3.2.2 and 3.2.3 and Graphs 3.2.1 and 3.2.2 show the Field Strength of Spurious Emissions.

Date:	January 6-12, 2011	**Result: Pass**
Standard:	FCC 15.231(b) / RSS-210 A1.1.2	
Tested by:	Simon Khazon	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	Measurements at Fundamental Frequency	

Table 3.2.1

Frequency MHz	Pol	Antenna Hts(cm)	Ant. CF dB1/m	Cable loss dB	Pre-amp Gain (dB)	Reading dBµV	Total @ 3m dBµV/m	AVG C.F. dB	Limit dBµV/m	Margin dB	Comments
		Emissions at Fundamental Frequency (Peak Readings)									
433.91	V	100	17.0	2.4	0.0	63.5	82.9	0.0	100.8	-17.9	
433.91	H	100	17.0	2.4	0.0	59.3	78.7	0.0	100.8	-22.1	
		Emissions at Fundamental Frequency (Average Value)									
433.91	V	100	17.0	2.4	0.0	63.5	82.9	2.4	80.8	-0.3	
433.91	H	100	17.0	2.4	0.0	59.3	78.7	2.4	80.8	-4.5	

Date:	January 6-12, 2011	**Result:** **Pass**
Standard:	FCC 15.231(b) / RSS-210 A1.1.2	
Tested by:	Simon Khazon	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	Spurious Radiated Emissions 30MHz-5000MHz	

Table 3.2.2

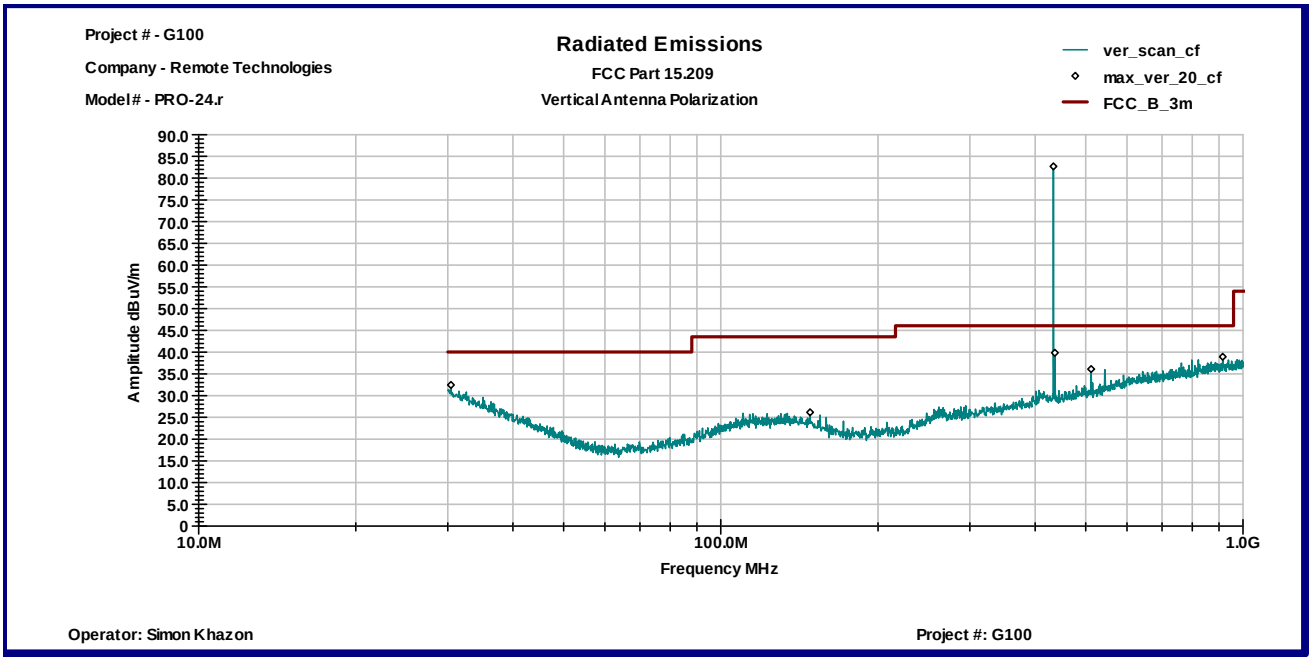
Frequency	Ant. Polarity	Peak Reading dBµV	Ant.Factor dB1/m	Total at 3m dBµV/m	Average Limit dBµV/m	Margin dB
30.416 MHz	V	12.4	20.1	32.4	40.0	-7.6
148.25 MHz	V	13.3	12.8	26.1	43.5	-17.4
436.45 MHz	V	20.3	19.5	39.8	46.0	-6.2
511.95 MHz	V	15.4	20.7	36.1	46.0	-9.9
915.12 MHz	V	13.5	25.5	38.9	46.0	-7.1
30.069 MHz	H	12.3	20.3	32.6	40.0	-7.4
962.51 MHz	H	13.1	26.0	39.1	54.0	-14.9

Table 3.2.3

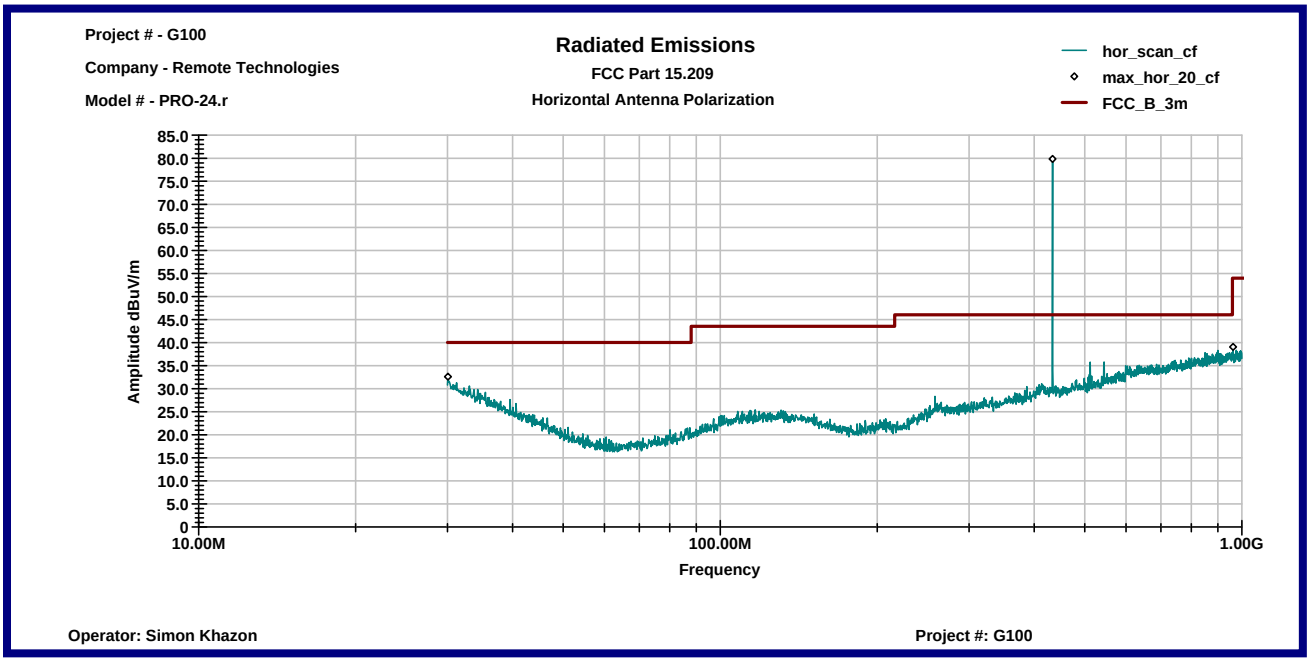
Frequency MHz	Antenna Polarity	Peak Reading dBµV	Total C.F. dB1/m	Pre-Amp. Gain (dB)	Total at 3m dBµV/m	Average Limit dBµV/m	Margin dB
2.4608 GHz	V	47.4	31.9	37.8	41.5	54.0	-12.5
4.048 GHz	V	43.1	37.1	37.1	43.0	54.0	-11.0
2.1696 GHz	H	50.9	31.4	38.1	44.1	54.0	-9.9
2.6048 GHz	H	46.3	32.6	37.7	41.2	54.0	-12.8
4.6256 GHz	H	42.9	37.7	36.8	43.8	54.0	-10.2

Graph 3.2.1

Vertical antenna polarization

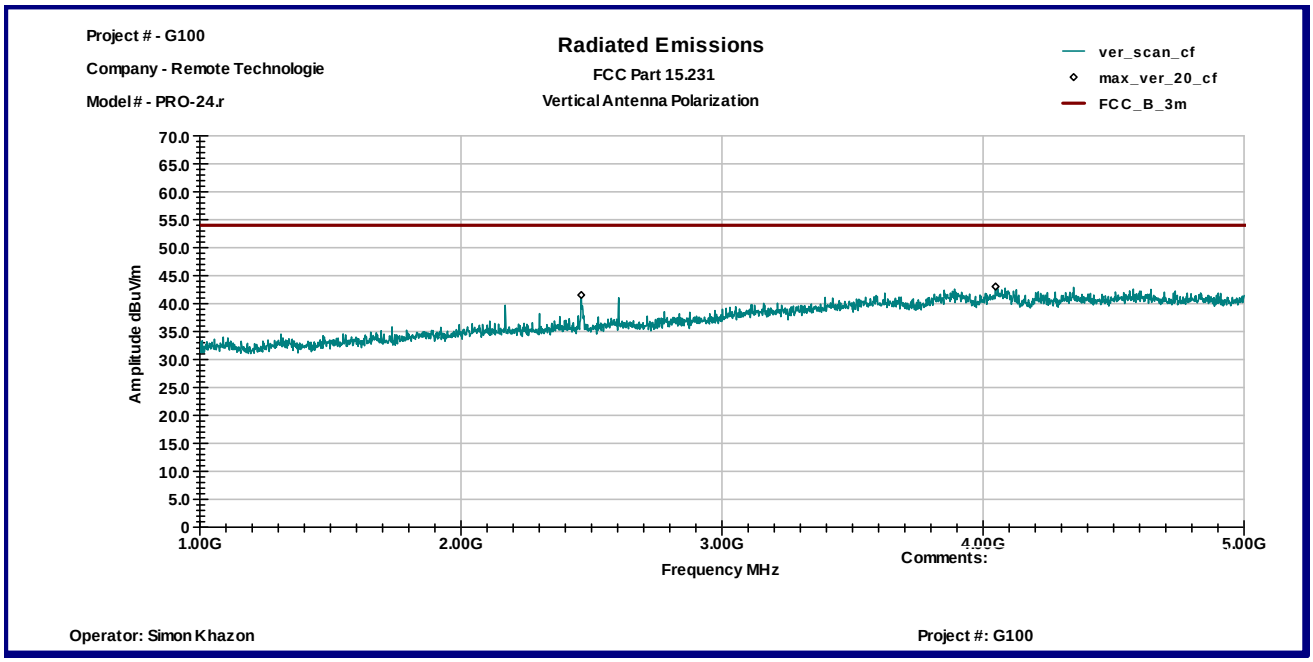


Horizontal antenna polarization

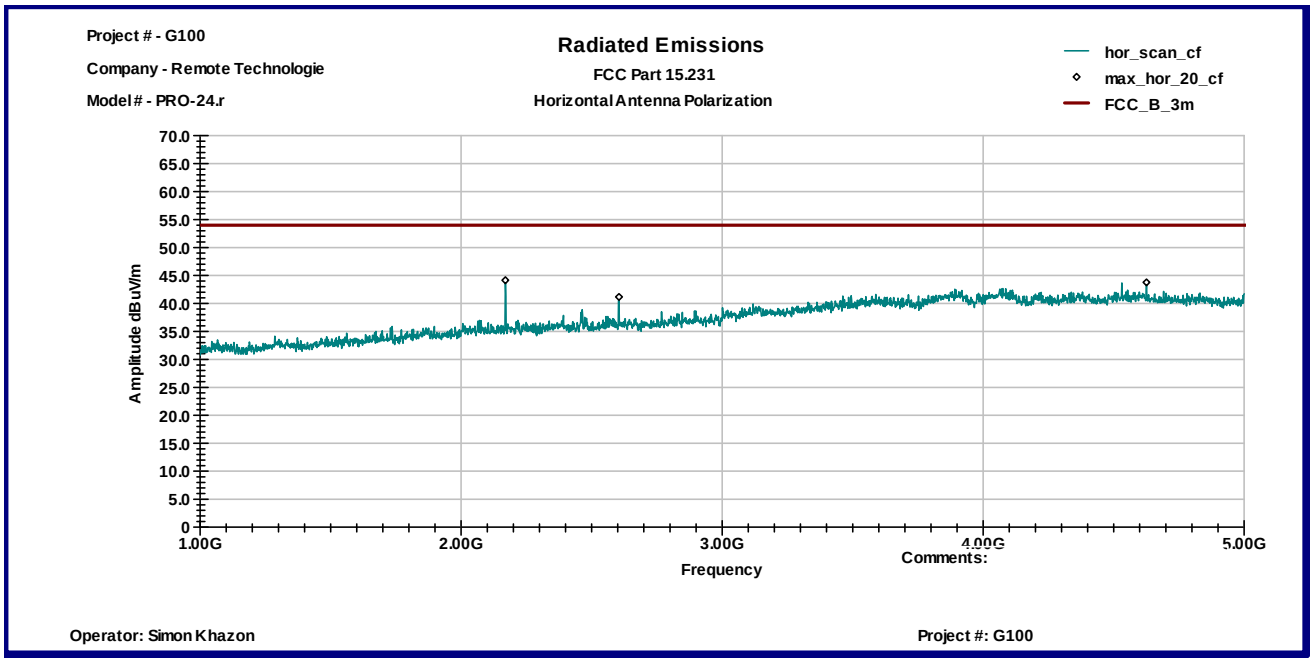


Graph 3.2.2

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 over complete cycle.

Average Factor= 20Log (On air/Cycle) =20Log (64/84)= -2.4dB

Cycle = 84msec (According to the Modulation Scheme)
On air Time = 64msec (According to the Modulation Scheme)

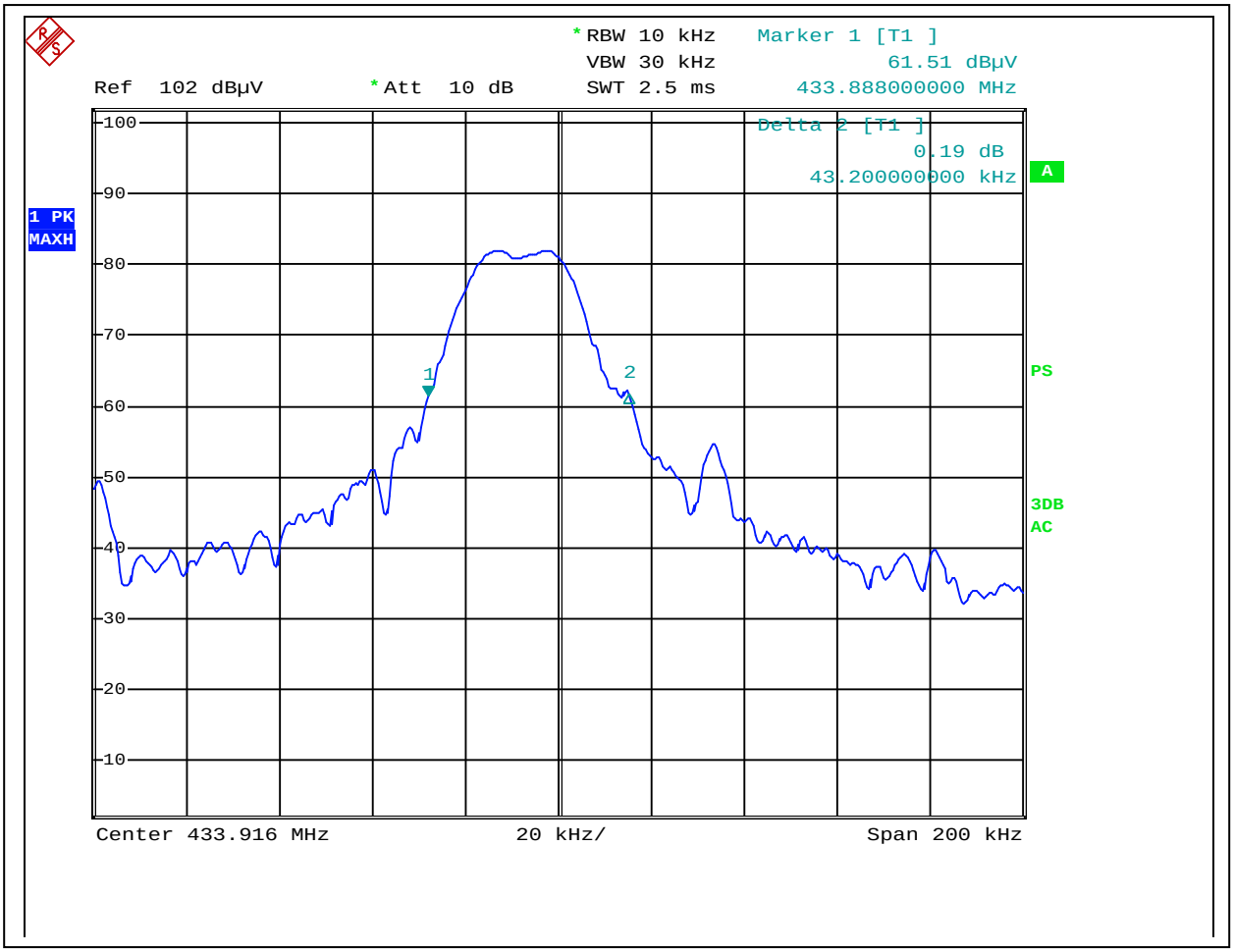
3.3 Bandwidth of Emissions

Center Frequency of operation MHz	Maximum allowed bandwidth kHz	Measured 20dB bandwidth kHz	Measured 99% bandwidth kHz	Result
433.91	1084.775	61.5	81.7	**Pass**
Maximum allowed bandwidth:	☒ 0.25% of the centre operating frequency ☐ 0.5% of the centre operating frequency			
RBW: **VBW:**	☒ 10kHz ☐ 100kHz ☐ other kHz ☒ 30kHz ☐ 300kHz ☐ other kHz			

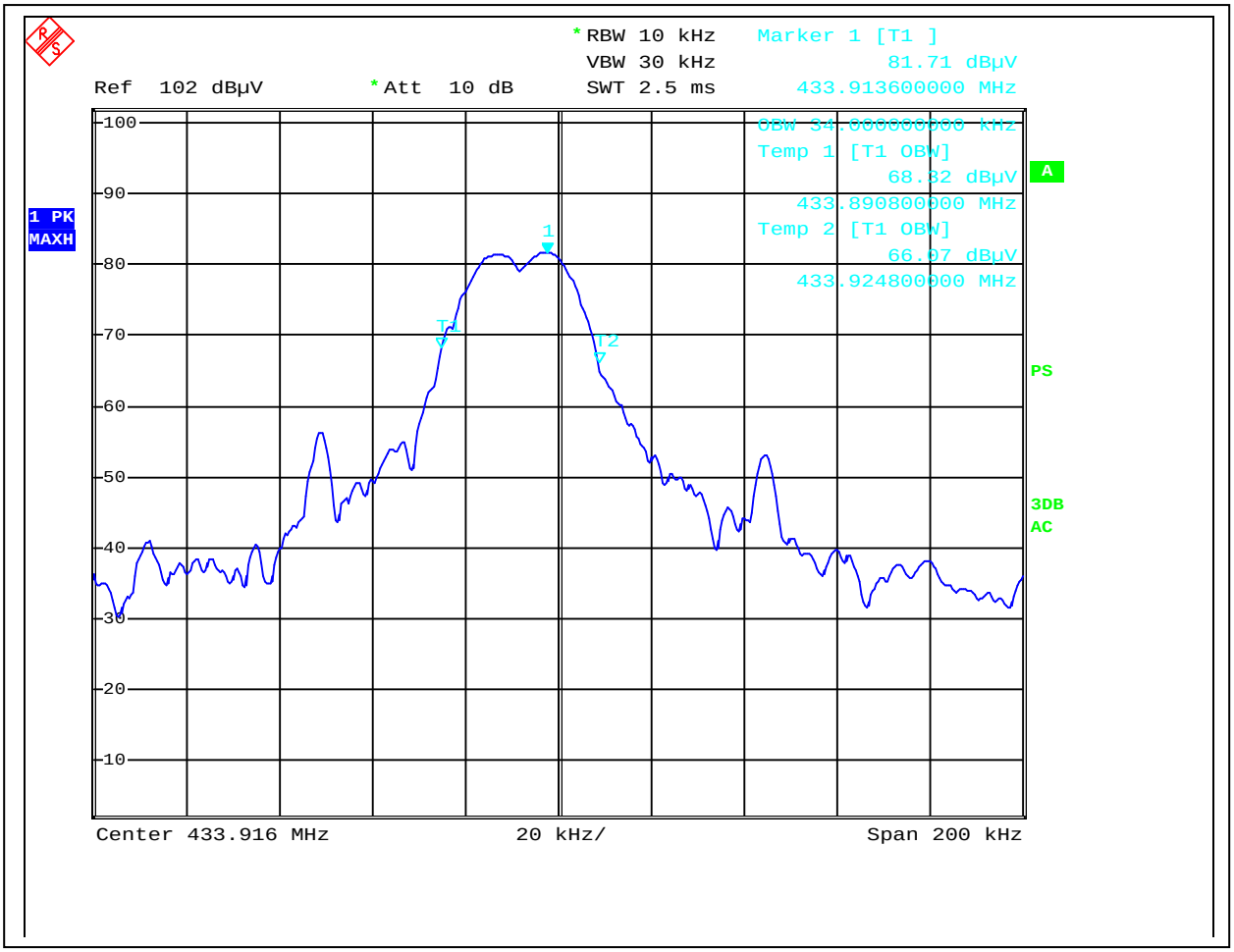
Graphs 3-3-1 and 3-3-2 are show bandwidth of emissions

Notes:

Graph 3.3.1


*RBW 10 kHz
VBW 30 kHz
SWT 2.5 ms
Marker 1 [T1]
61.51 dBµV
433.888000000 MHz
Delta 2 [T1]
0.19 dB
43.200000000 kHz
Ref 102 dBµV
*Att 10 dB
1 PK
MAXH
A
PS
3DB
AC
100
90
80
70
60
50
40
30
20
10
Center 433.916 MHz
20 kHz/
Span 200 kHz

Graph 3.3.2


*RBW 10 kHz
VBW 30 kHz
Ref 102 dBµV
*Att 10 dB
SWT 2.5 ms
Marker 1 [T1]
81.71 dBµV
433.913600000 MHz
OBW 34.000000000 kHz
Temp 1 [T1 OBW]
68.32 dBµV
433.890800000 MHz
Temp 2 [T1 OBW]
66.07 dBµV
433.924800000 MHz
1 PK
MAXH
A
PS
3DB
AC
100
90
80
70
60
50
40
30
20
10
Center 433.916 MHz
20 kHz/
Span 200 kHz

3.4 Transmitter power line conducted emissions

Test location: ☐ OATS ☐ Anechoic Chamber ☐ Other

Test result: **N/A**

Frequency range: 0.15MHz-30MHz

Max. Emissions margin: dB below the limits

Note: It was determined from consideration of the electrical characteristics and usage of particular apparatus that Conducted Emissions testing is inappropriate and therefore unnecessary (as battery operated equipment).

3.5 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: 1.4 dB below the limits

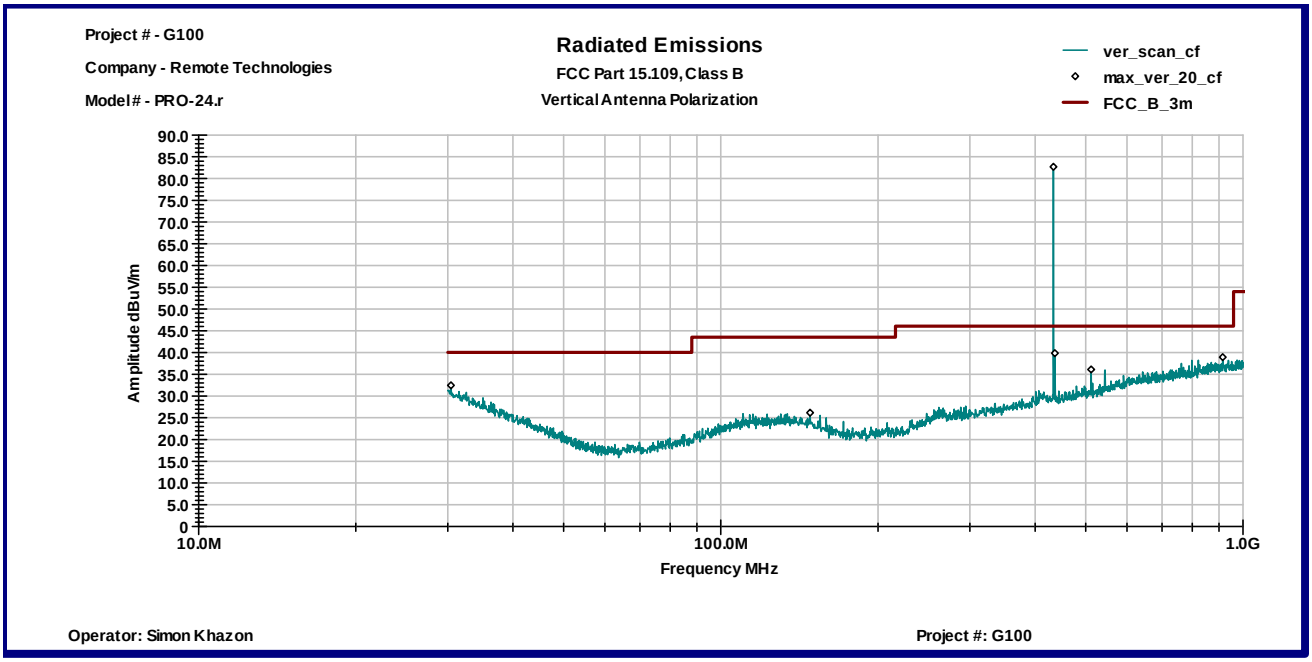
Note: The Radiated Emissions test was performed in the Anechoic chamber at 3m measurement distance (see Table 3.5.1 and Graphs 3.5.1 and 3.5.2).

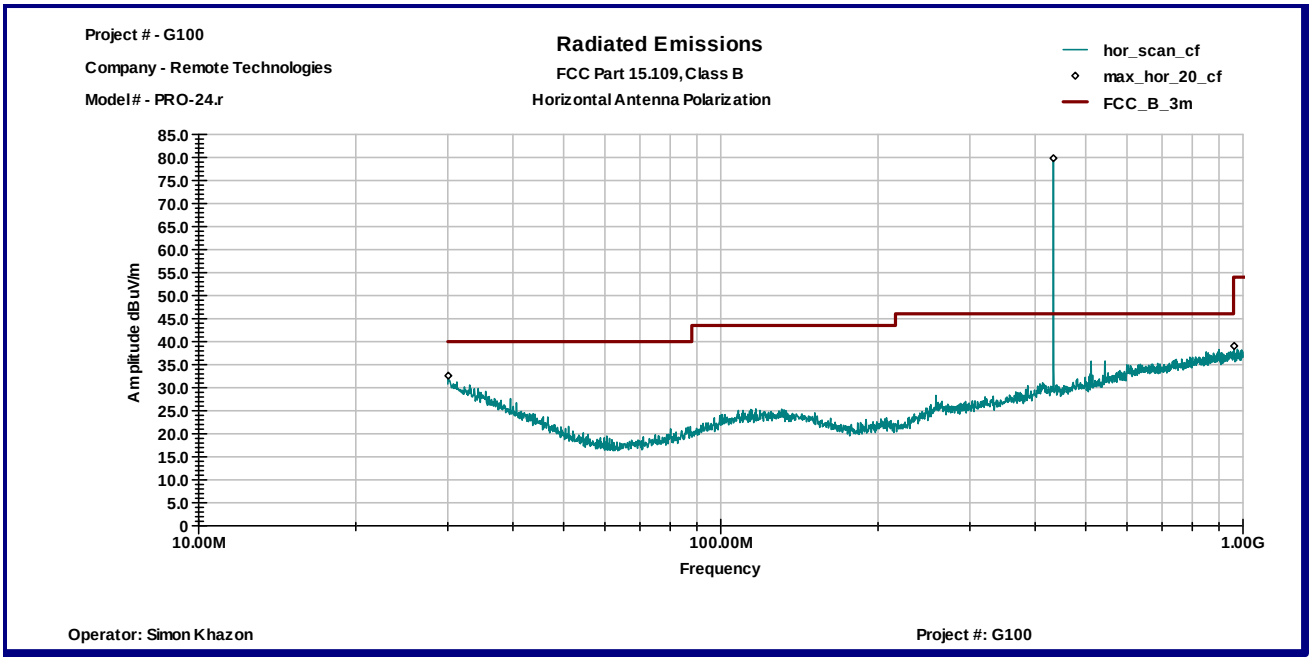
Date:	January 10, 2011	**Result:** **Pass**
Standard:	FCC Part 15.109, Class B	
Tested by:	Simon Khazon	
Test Point:	Enclosure	
Operation mode:	See page 5	
Note:	Standby Mode	

Table 3.5.1

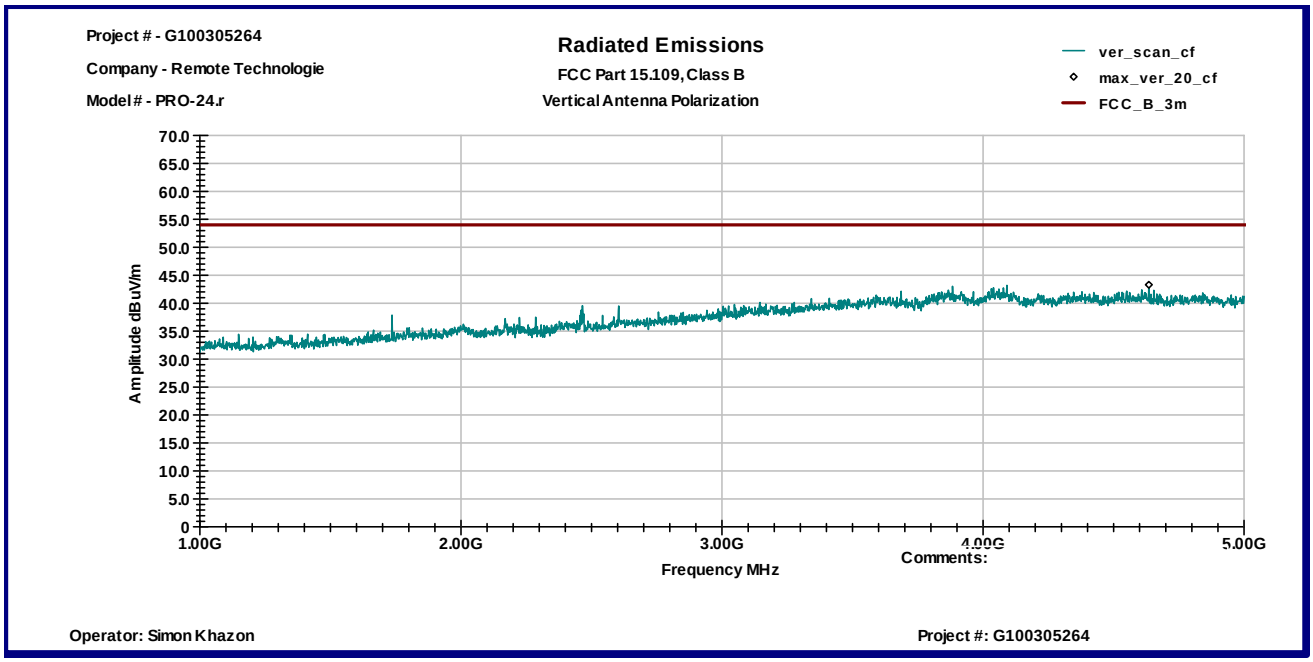
Frequency MHz	Antenna Polarity	Reading dBµV	Total C.F. dB1/m	Pre-Amp. Gain (dB)	Total at 3m dBµV/m	QP Limit dBµV/m	Margin dB
2.4608 GHz	V	47.4	31.9	37.8	41.5	54.0	-12.5
4.048 GHz	V	43.1	37.1	37.1	43.0	54.0	-11.0
2.1696 GHz	H	50.9	31.4	38.1	44.1	54.0	-9.9
2.6048 GHz	H	46.3	32.6	37.7	41.2	54.0	-12.8
4.6256 GHz	H	42.9	37.7	36.8	43.8	54.0	-10.2

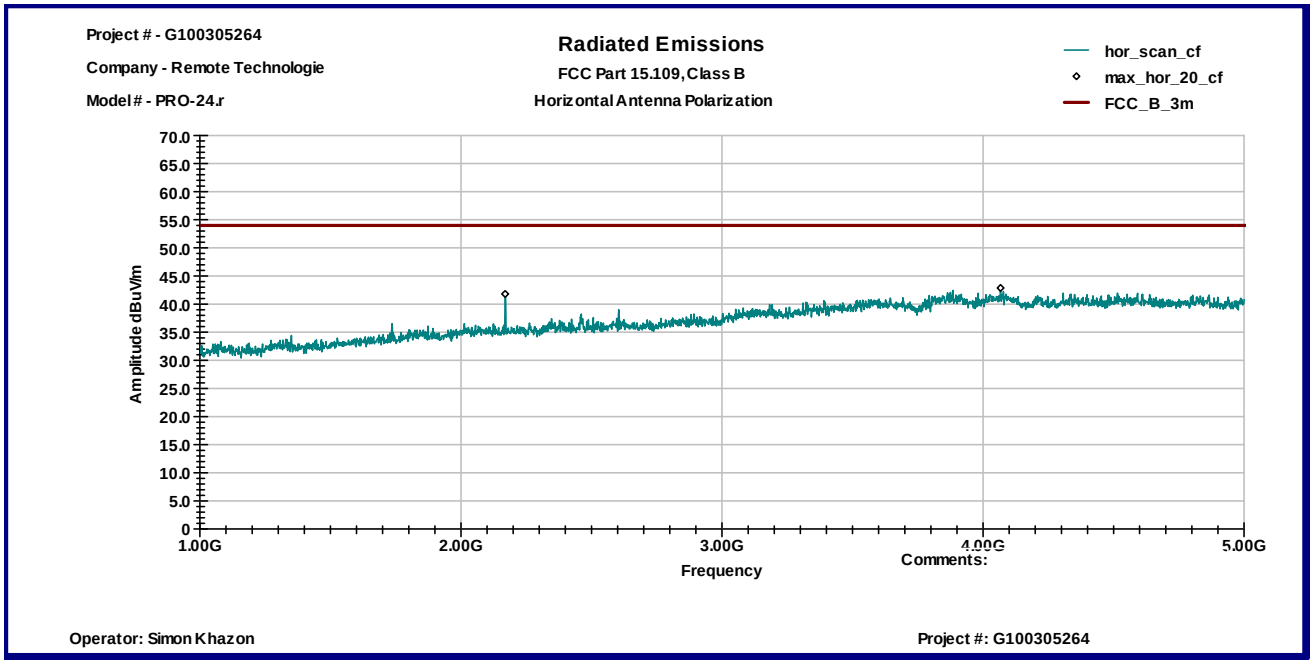
Graph 3.4.1


Project # - G100
Company - Remote Technologies
Model # - PRO-24.r
Radiated Emissions
FCC Part 15.109, Class B
Vertical Antenna Polarization
ver_scan_cf
max_ver_20_cf
FCC_B_3m
Amplitude dBuV/m
90.0
85.0
80.0
75.0
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: Simon Khazon
Project #: G100


Project # - G100
Company - Remote Technologies
Model # - PRO-24.r
Radiated Emissions
FCC Part 15.109, Class B
Horizontal Antenna Polarization
hor_scan_cf
max_hor_20_cf
FCC_B_3m
Amplitude dBuV/m
85.0
80.0
75.0
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: Simon Khazon
Project #: G100

Graph 3.5.1


Project # - G100305264
Company - Remote Technologie
Model # - PRO-24.r
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
1.00G
2.00G
3.00G
4.00G
5.00G
Frequency MHz
Comments:
Operator: Simon Khazon
Project #: G100305264


Project # - G100305264
Company - Remote Technologie
Model # - PRO-24.r
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
5.00G
Frequency
Comments:
Operator: Simon Khazon
Project #: G100305264

3.6 Digital device conducted emissions

Test location: ☐ OATS ☐ Anechoic Chamber ☐ Other

Test result: **N/A**

Frequency range: 0.15MHz-30MHz

Max. Emissions margin: dB below the limits

Note: It was determined from consideration of the electrical characteristics and usage of particular apparatus that Conducted Emissions testing is inappropriate and therefore unnecessary (as battery operated equipment).

4.0 TEST EQUIPMENT

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NO.	INTERTEK ID	CAL DUE	USED
Receiver RF Section	HP	85462A	3549A00306	9995	03/31/2011	☐
RF Filter Section	HP	85460A	3448A00276	9937	03/31/2011	☐
Spectrum Analyzer	R & S	FSP 40	100024	12559	07/12/2011	☒
Spectrum Analyzer	R & S	ESCI	100358	12909	07/12/2011	☒
Bicono-Log Antenna	Schaffner-Chase	CBL 6112 B	2468	14459	10/18/2011	☐
Bicono-Log Antenna	Schaffner-Chase	CBL 6112 B	2630	14459	11/22/2011	☒
Horn Antenna	EMCO	3115	9507-4513	9936	04/13/2011	☒
Horn Antenna	EMCO	3115	6579	15580	04/29/2011	☒
Pre-Amplifier	MITEQ	AMF-5D-00501800-28-13P	1122951	13475	10/06/2011	☒
System	TILE! Instrument Control		Ver. 3.4.K.29	15259	VBU	☒