TEST REPORT

Report Number: 100105670MIN-001
Project Number: G100105670

Testing performed on the
433.9MHz TXB-DB Dual Transmitter Module

FCC ID: MMURTI1500
Industry Canada ID: 3166A-RTI1500

to
47 CFR Part 15. 231:2009
RSS- 210, Issue 7, 2007

Remote Technologies Inc.

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

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

Prepared by: _____ Date: July 1, 2010
Norman Shpilsher

Reviewed by: _____ Date: July 1, 2010
Simon Khazon

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1.0 GENERAL DESCRIPTION

Model:	433.9MHz TXB-DB
Type of EUT:	Dual Transmitter Module
FCC ID:	MMURTI1500
Industry Canada ID:	3166A-RTI1500
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
Company:	Remote Technologies Inc.
Test Standards:	☒ 47 CFR, Part 15:2009, §15.231 ☒ RSS–210, Issue 7, 2007 ☒ RSS-Gen, Issue 2, 2007 ☒ 47 CFR, Part 15:2009, §15.107 and §15.109, Class B ☐ Other
Type of radio:	☐ Stand -alone ☒ Module ☐ Hybrid
Date Sample Submitted:	May 18, 2010
Test Work Started:	May 18, 2010
Test Work Completed:	June 1, 2010
Test Sample Conditions:	☐ Damaged ☐Poor (Usable) ☒ Good

1.1 Product Description; Test Facility

Product Description:	Dual Transmitter Module
Operating Frequency	433.91 MHz
Modulation:	On-Off Keying
Emission Designator:	95K6X1D
Antenna(s) Info:	Integral antenna
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
☒ - Continuous un-modulated
☐ - Test program (customer specific)
☐ -

Operating modes of the EUT:

No.	Description
1	The transmitter was wired to transmit continuously.

Cables:

No.	Type	Length	Designation	Note
1	N/A			

Support equipment/Services:

No.	Item	Description
1	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	N/A
15.109/ICES-003/ RSS-Gen 4.10	Receiver/digital device radiated emissions	Pass
15.107/ ICES-003	Digital device conducted emissions	N/A

3.0 TEST CONDITIONS AND RESULTS

3.1 Transmitter deactivation time

Maximum allowed deactivation time: 5 sec

Measured deactivation time: within 5 sec

Test result: **Pass**

Notes: The transmitter transmitted continuously while the activation button was pressed. According to FCC Part 15.231(a)(1) a manually operated transmitter should stop transmitting within 5 sec after release the activation button. Measured deactivation time was within then 5 sec. after releasing the activation button.

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: 4.9dB below the limits

Max. margin of harmonics and spurious emissions: 7.1dB 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 4.5GHz (10^{th} harmonic).

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:	May 18-26, 2010	**Result:** **Pass**
Standard:	FCC 15.231(b) / RSS-210 A1.1.2	
Tested by:	Norman Shpilsher	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	Measurements at Fundamental Frequency	

Table 3.2.1

Frequency	Antenna		Ant. CF	Cable loss	Pre-amp	Reading	Total @ 3m	AVG C.F.	Limit	Margin	Comments
MHz	Polarity	Hts(cm)	dB1/m	dB	Gain (dB)	dBµV	dBµV/m	dB	dBµV/m	dB	
433.92	V	121	16.9	2.4	0.0	56.7	76.0	0.0	80.8	-4.9	
433.92	H	100	16.9	2.4	0.0	55.0	74.3	0.0	80.8	-6.6	

Date:	May 18-26, 2010	**Result:** **Pass**
Standard:	FCC 15.231(b) / RSS-210 A1.1.2	
Tested by:	Norman Shpilsher	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	Spurious Radiated Emissions 30MHz-5000MHz	

Table 3.2.2

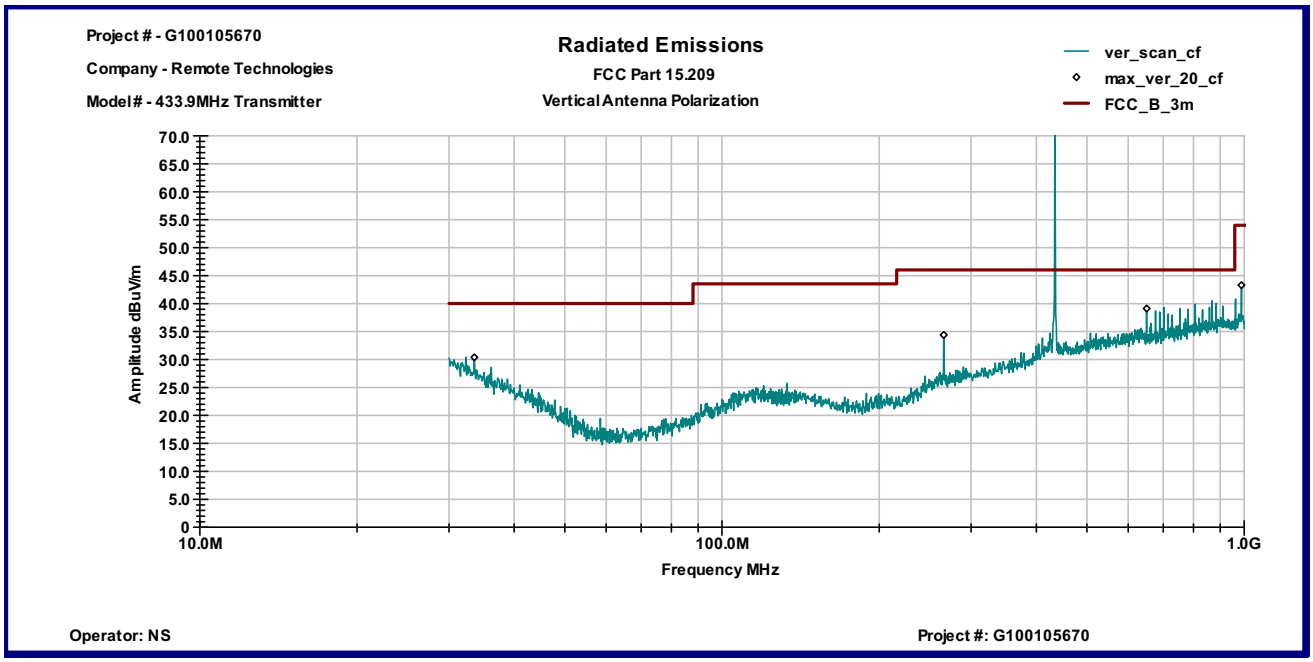
Frequency	Ant. Polarity	Peak Reading dBµV	Ant.Factor dB1/m	Total at 3m dBµV/m	QP Limit dBµV/m	Margin dB
33.55 MHz	V	11.5	18.9	30.4	40.0	-9.6
265.84 MHz	V	18.7	15.7	34.4	46.0	-11.6
650.75 MHz	V	16.4	22.7	39.1	46.0	-6.9
988.51 MHz	V	16.6	26.7	43.3	54.0	-10.7
31.558 MHz	H	11.4	19.9	31.4	40.0	-8.6
265.84 MHz	H	19.5	15.7	35.2	46.0	-10.8
676.39 MHz	H	17.7	23.0	40.7	46.0	-5.4
728.56 MHz	H	16.2	23.5	39.7	46.0	-6.3
806.37 MHz	H	16.4	24.4	40.9	46.0	-5.2
868.26 MHz	H	15.5	25.1	40.6	46.0	-5.4

Table 3.2.3

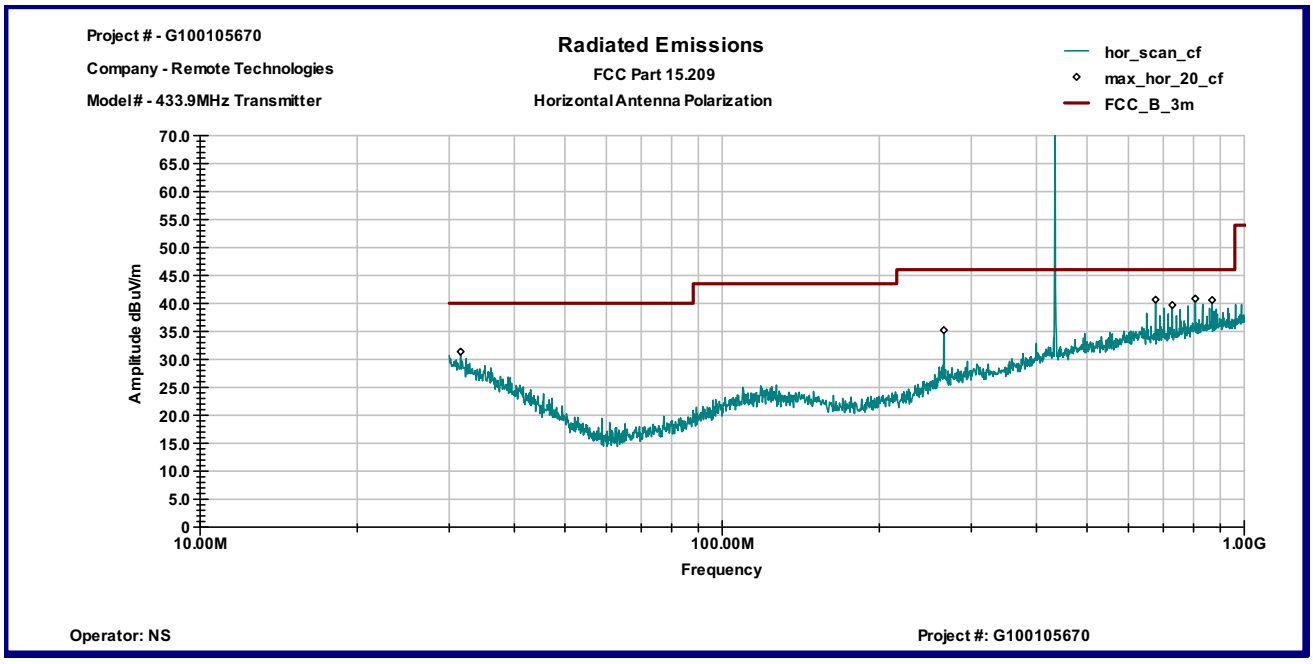
Frequency MHz	Antenna Polarity	Peak Reading dBµV	Total C.F. dB1/m	Pre-Amp. Gain (dB)	Total at 3m dBµV/m	Avg Value dB	Limit dBµV/m	Margin dB
1.04 GHz	V	61.9	26.5	42.5	45.9	0.0	60.8	-14.9
1.066 GHz	V	61.9	26.5	42.5	46.0	0.0	60.8	-14.9
1.302 GHz	V	62.3	27.4	42.6	47.1	0.0	60.8	-13.7
1.996 GHz	V	58.2	30.5	43.3	45.4	0.0	60.8	-15.4
2.472 GHz	V	55.0	32.0	43.1	43.9	0.0	60.8	-16.9
3.036 GHz	V	72.1	33.9	43.4	62.5	8.8	60.8	-7.1
3.472 GHz	V	53.9	35.5	43.3	46.0	0.0	60.8	-14.8
3.906 GHz	V	58.3	36.8	43.0	52.0	0.0	60.8	-8.8
1.014 GHz	H	57.3	26.1	42.5	41.0	0.0	60.8	-19.8
1.302 GHz	H	54.6	27.3	42.6	39.3	0.0	60.8	-21.5
1.996 GHz	H	56.4	30.9	43.3	44.0	0.0	60.8	-16.8
2.17 GHz	H	60.6	31.4	43.2	48.7	0.0	60.8	-12.1
2.604 GHz	H	50.4	32.6	43.2	39.9	0.0	60.8	-21.0
3.036 GHz	H	72.0	33.9	43.4	62.5	8.8	60.8	-7.1
3.472 GHz	H	52.0	35.6	43.3	44.2	0.0	60.8	-16.6
3.906 GHz	H	61.1	36.9	43.0	55.0	0.0	60.8	-5.8
4.774 GHz	H	46.9	37.9	41.9	42.8	0.0	60.8	-18.0

Graph 3.2.1

Vertical antenna polarization

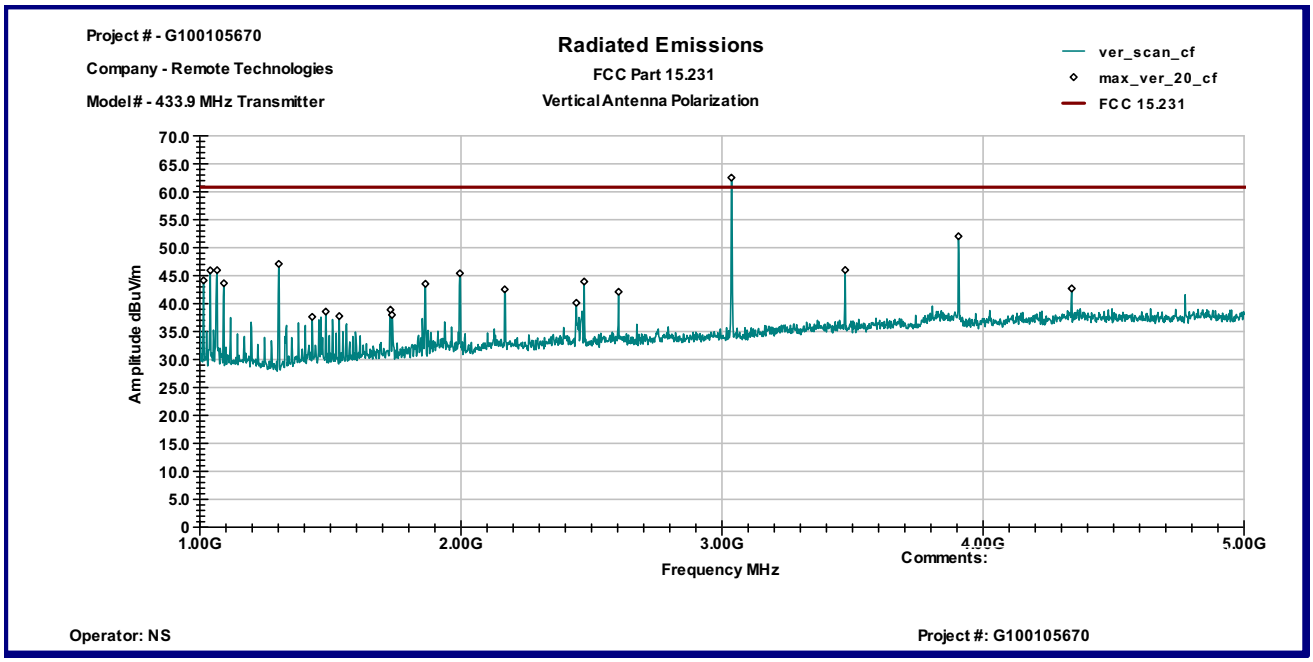


Horizontal antenna polarization

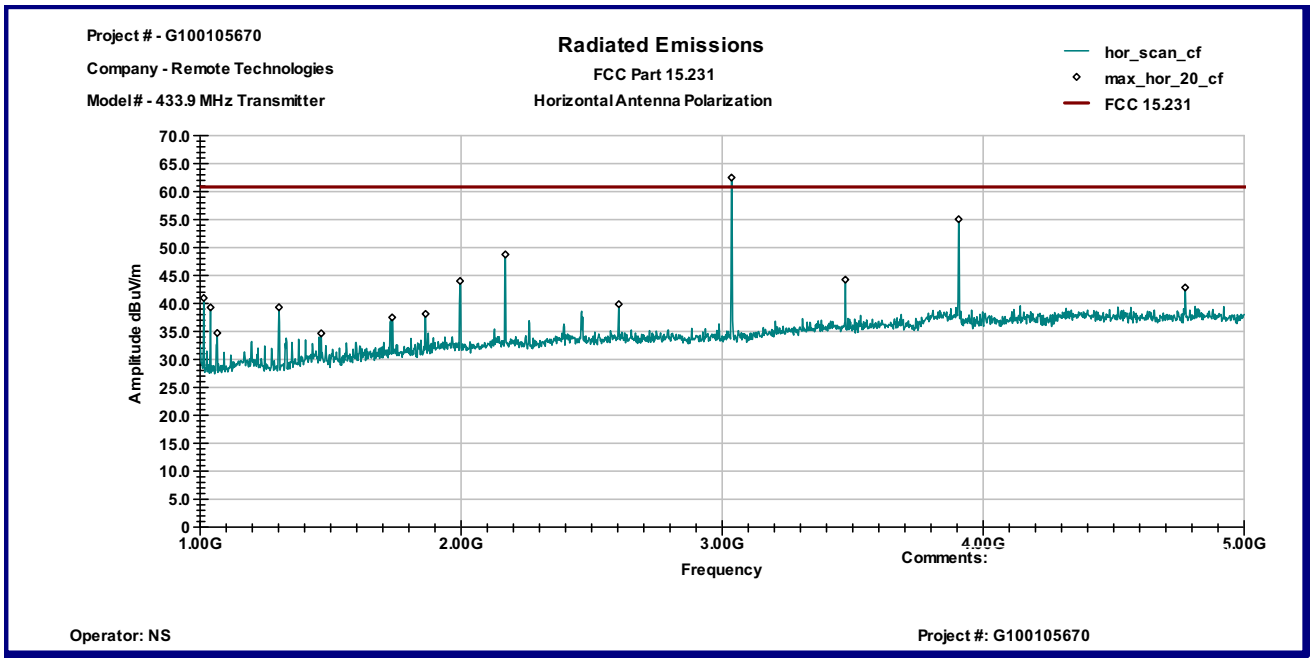


Graph 3.2.2

Vertical antenna polarization



Horizontal antenna polarization



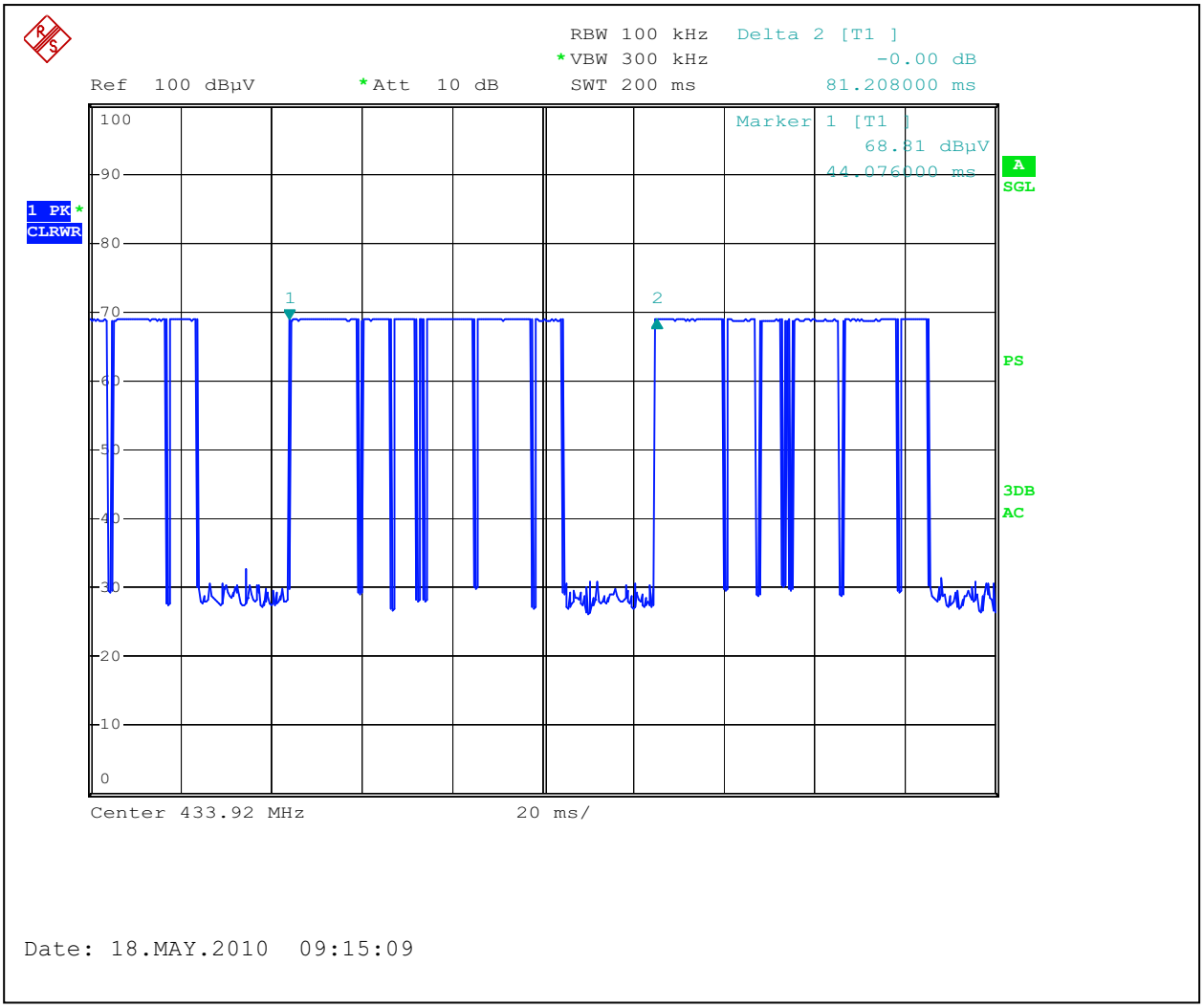
3.2.1 Average correction factor calculation

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

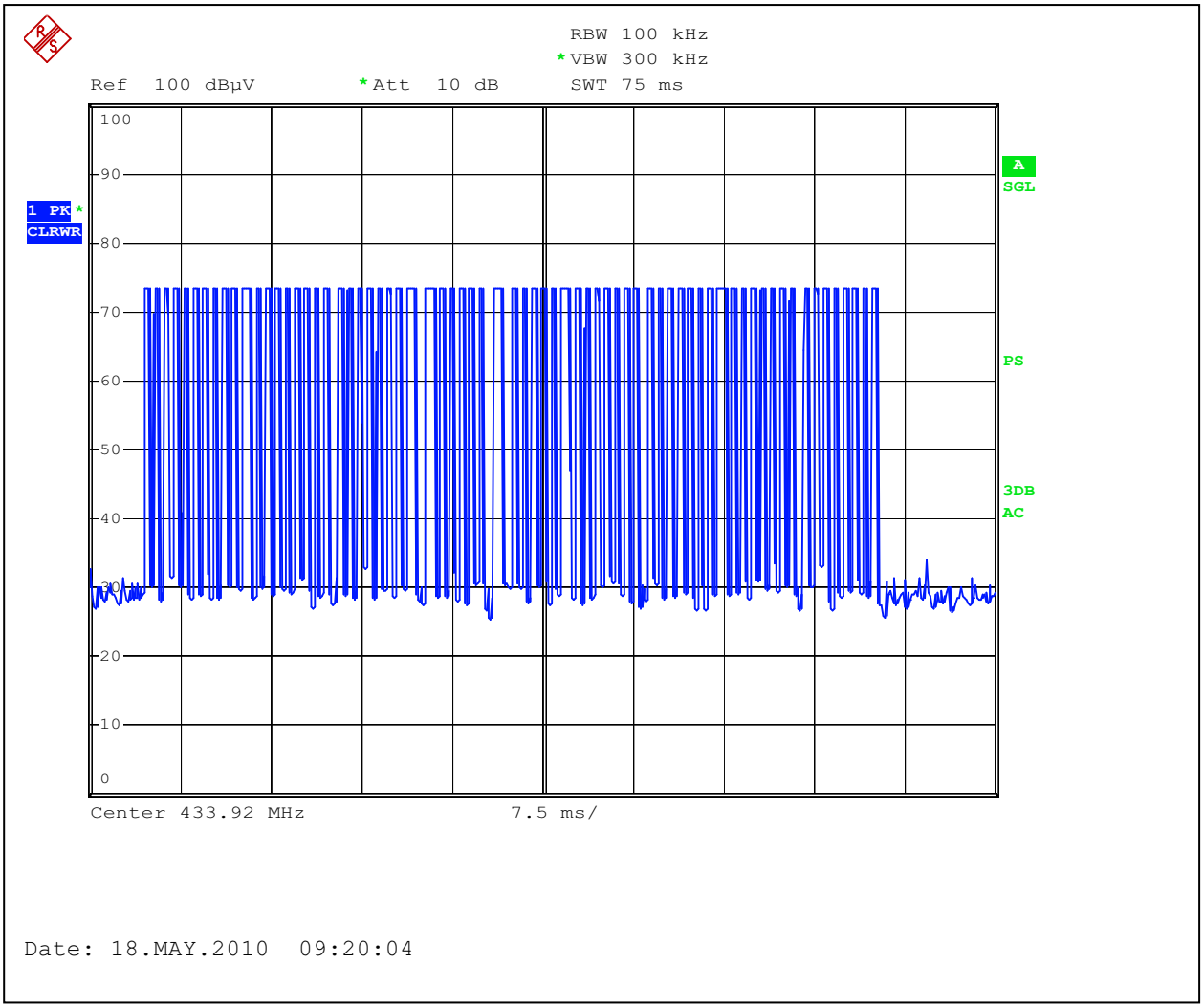
Average Factor= 20Log(On air/Pulse Train)=20Log(6*0.804)+(61*0.404)/81.2=20Log0.363= -8.8dB

Pulse train=81.2msec (see Graph 3.2.3)
“Wide pulses”: 6 each of 0.804msec (see Graphs 3.2.4 and 3.2.6)
“Regular pulses”: 61 each of 0.404msec (see Graphs 3.2.4 and 3.2.5)

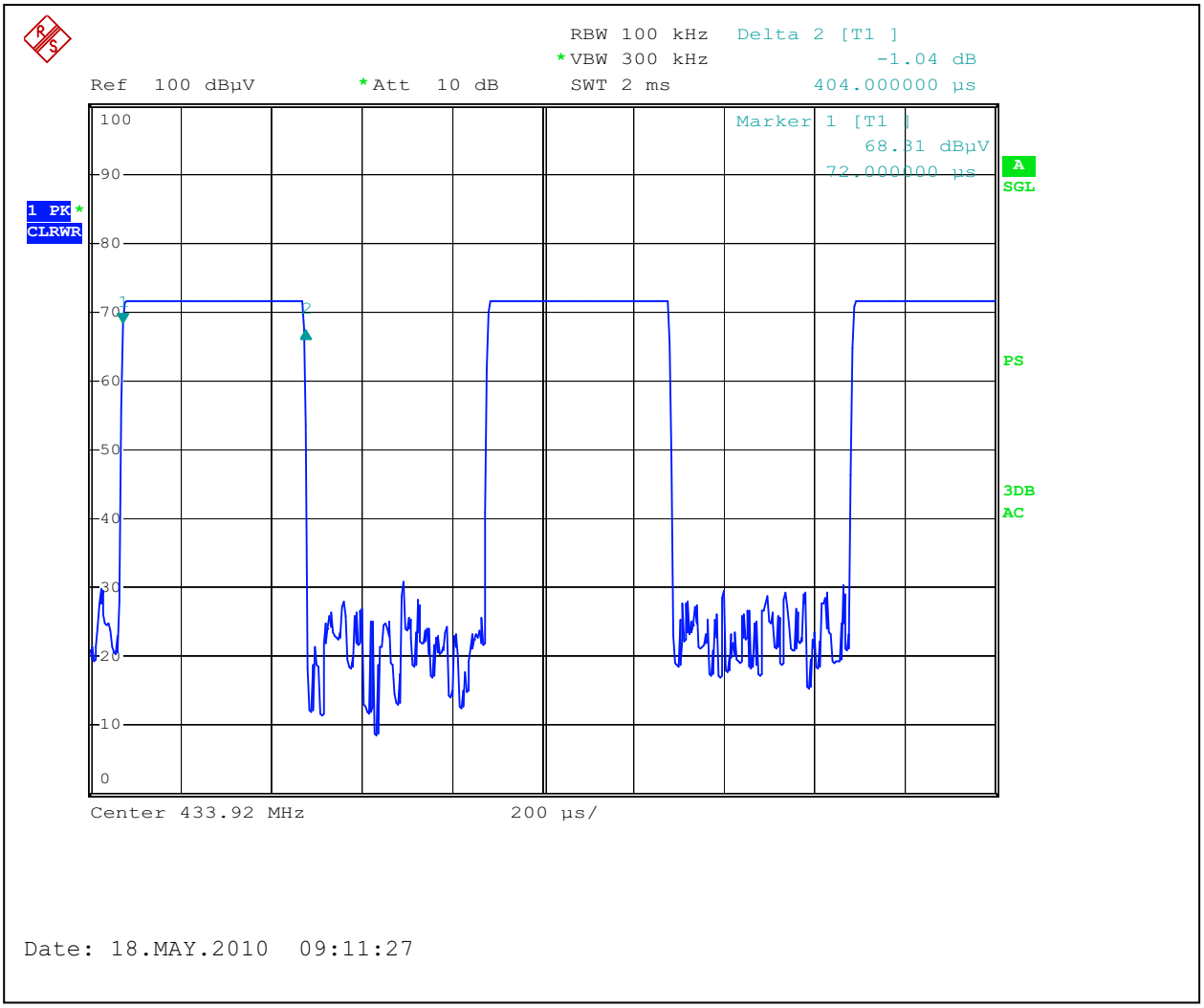
Graph 3.2.3


RBW 100 kHz
*VBW 300 kHz
SWT 200 ms
Delta 2 [T1]
-0.00 dB
81.208000 ms
Ref 100 dBµV
*Att 10 dB
Marker 1 [T1]
68.81 dBµV
44.076000 ms
1 PK *
CLRWR
A
SGL
PS
3DB
AC
100
90
80
70
60
50
40
30
20
10
0
1
2
Center 433.92 MHz
20 ms/
Date: 18.MAY.2010 09:15:09

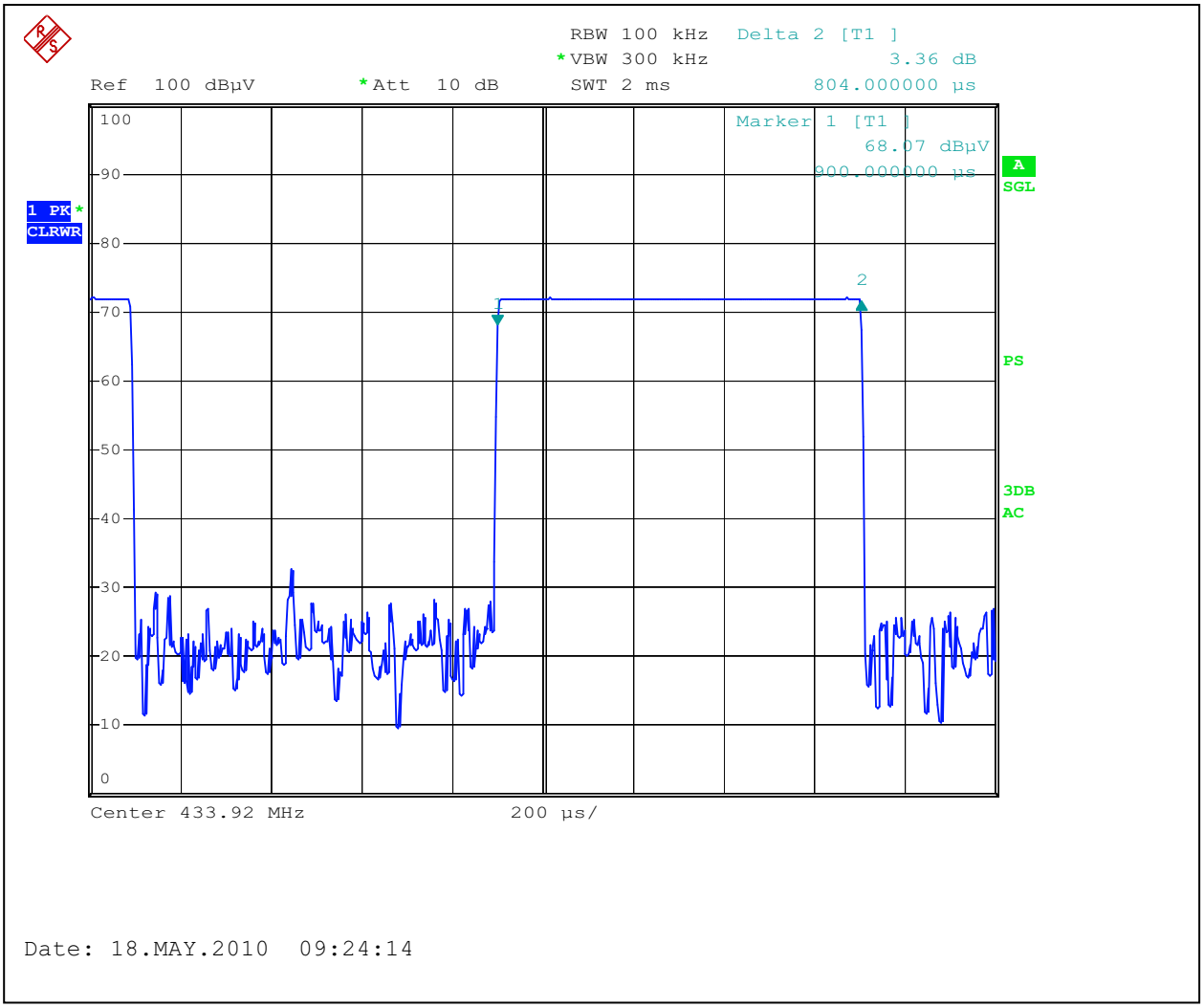
Graph 3.2.4


RBW 100 kHz
*VBW 300 kHz
Ref 100 dBµV
*Att 10 dB
SWT 75 ms
100
90
80
70
60
50
40
30
20
10
0
1 PK*
CLRWR
A
SGL
PS
3DB
AC
Center 433.92 MHz
7.5 ms/
Date: 18.MAY.2010 09:20:04

Graph 3.2.5


RBW 100 kHz
Delta 2 [T1]
*VBW 300 kHz
-1.04 dB
Ref 100 dBµV
*Att 10 dB
SWT 2 ms
404.000000 µs
Marker 1 [T1]
68.81 dBµV
72.000000 µs
1 PK *
CLRWR
A
SGL
PS
3DB
AC
100
90
80
70
60
50
40
30
20
10
0
Center 433.92 MHz
200 µs/
Date: 18.MAY.2010 09:11:27

Graph 3.2.6


RBW 100 kHz
*VBW 300 kHz
SWT 2 ms
Delta 2 [T1]
3.36 dB
804.000000 µs
Ref 100 dBµV
*Att 10 dB
Marker 1 [T1]
68.07 dBµV
900.000000 µs
1 PK *
CLRWR
A
SGL
PS
3DB
AC
100
90
80
70
60
50
40
30
20
10
0
Center 433.92 MHz
200 µs/
Date: 18.MAY.2010 09:24:14

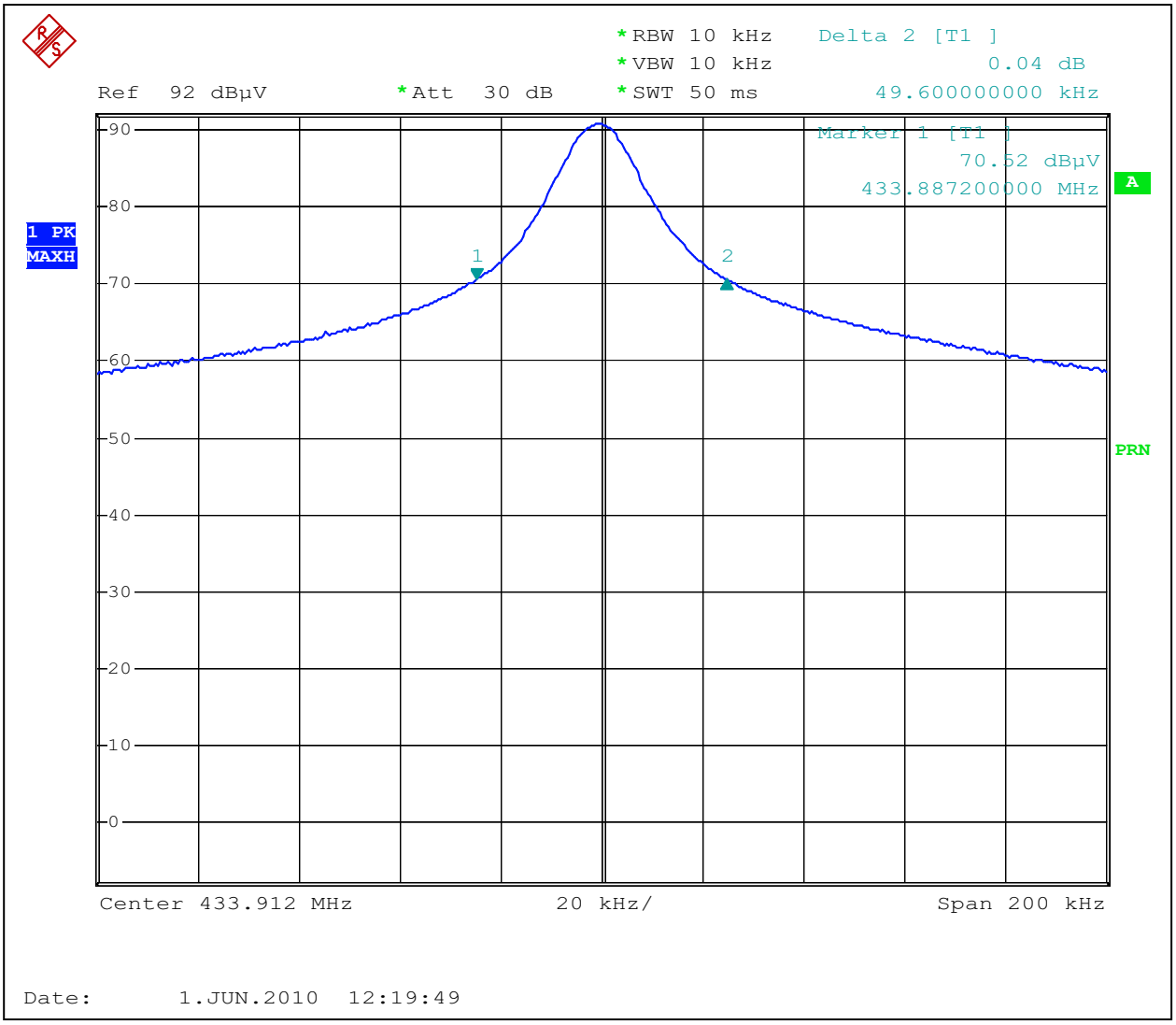
3.3 Bandwidth of Emissions

Center Frequency of operation MHz	Maximum allowed bandwidth kHz	Measured 20dB bandwidth kHz	Measured 99% bandwidth kHz	Result
	1084.775	49.6	95.6	**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			

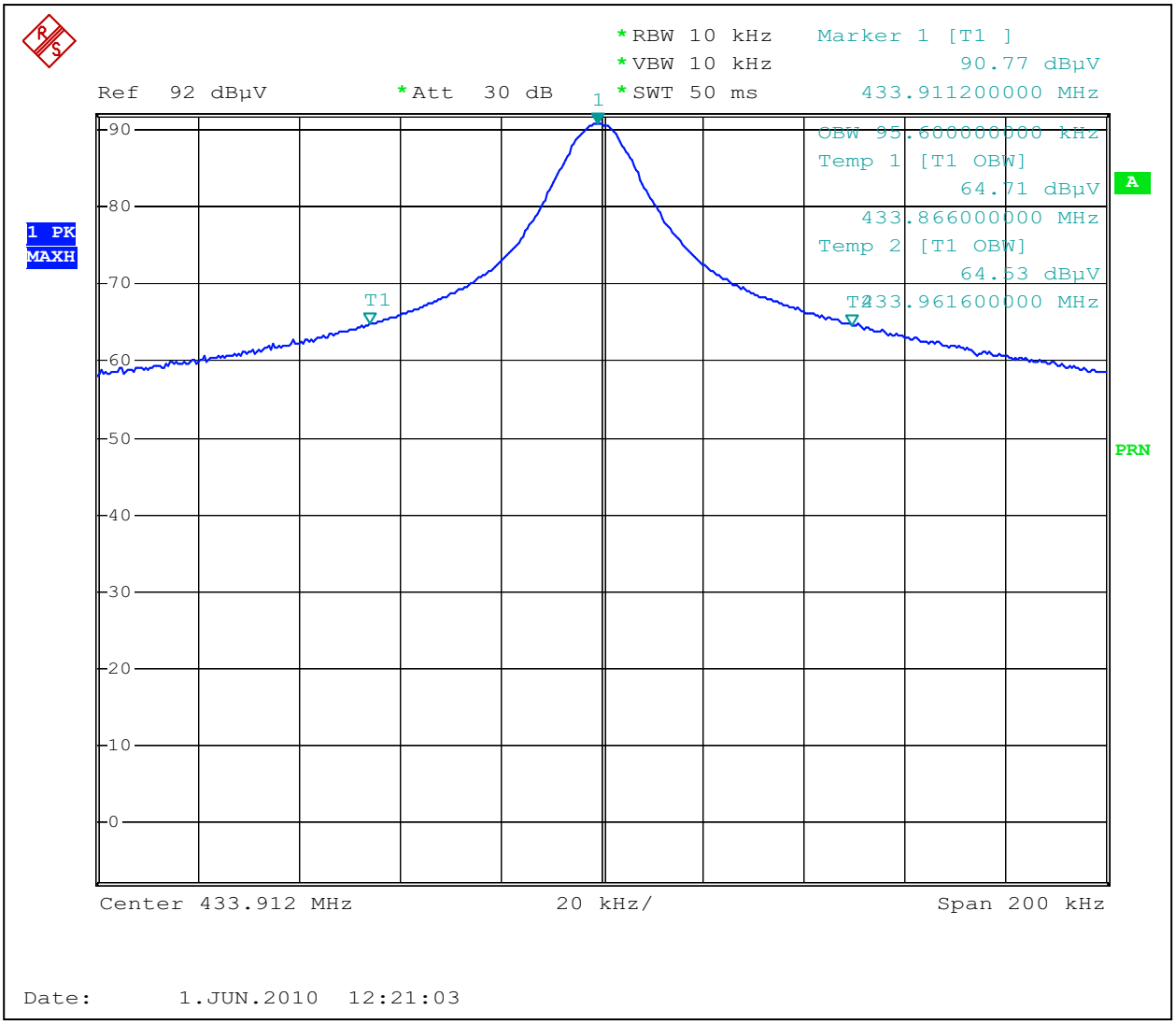
Graphs 3-3-1 and 3-3-2 are show bandwidth of emissions

Notes:

Graph 3.3.1


*RBW 10 kHz
*VBW 10 kHz
*SWT 50 ms
Delta 2 [T1]
0.04 dB
49.600000000 kHz
Ref 92 dBµV
*Att 30 dB
Marker 1 [T1]
70.52 dBµV
433.887200000 MHz
A
1 PK
MAXH
PRN
90
80
70
60
50
40
30
20
10
0
1
2
Center 433.912 MHz
20 kHz/
Span 200 kHz
Date: 1.JUN.2010 12:19:49

Graph 3.3.2


*RBW 10 kHz
*VBW 10 kHz
*SWT 50 ms
Marker 1 [T1]
90.77 dBµV
433.911200000 MHz
OBW 95.600000000 kHz
Temp 1 [T1 OBW]
64.71 dBµV
433.866000000 MHz
Temp 2 [T1 OBW]
64.53 dBµV
433.961600000 MHz
Ref 92 dBµV
*Att 30 dB
1 PK
MAXH
A
PRN
T1
T2
90
80
70
60
50
40
30
20
10
0
Center 433.912 MHz
20 kHz/
Span 200 kHz
Date: 1.JUN.2010 12:21:03

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-2000MHz

Max. Emissions margin: 0.6dB 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:	May 27, 2010	**Result:** **Pass**
Standard:	FCC Part 15.109, Class B	
Tested by:	Norman Shpilsher/Uri Spector	
Test Point:	Enclosure	
Operation mode:	See page 5	
Note:		

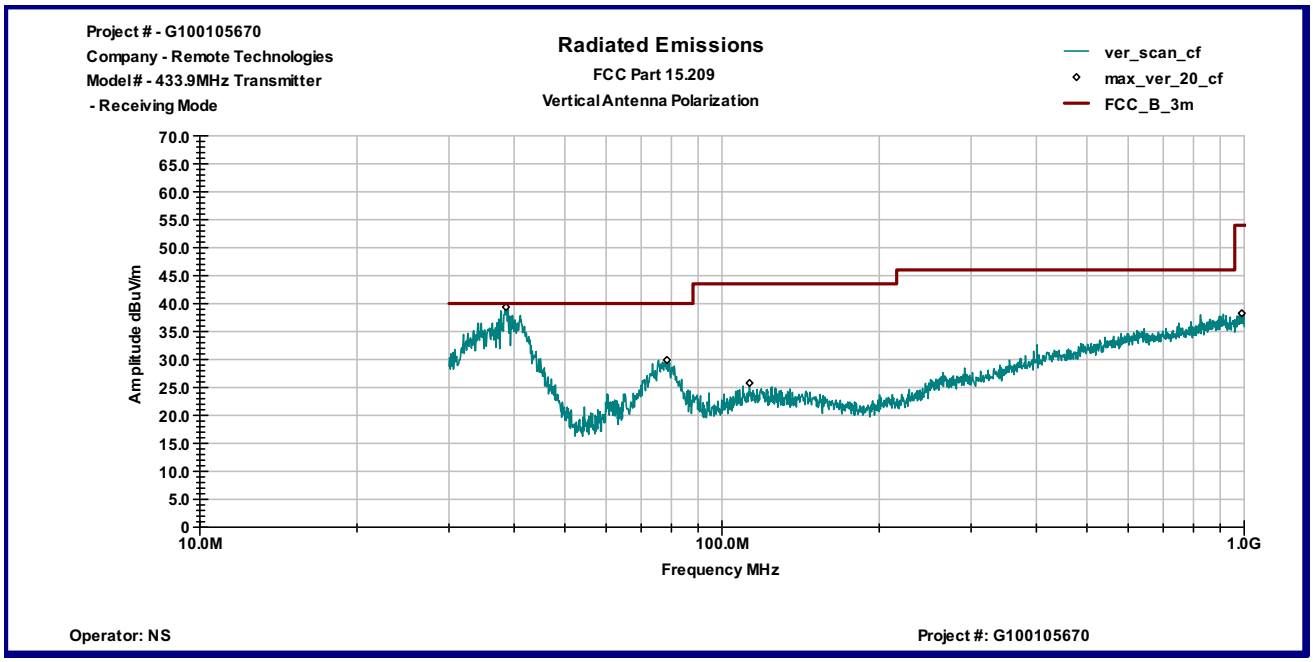
Table 3.5.1

Frequency	Ant. Polarity	Peak Reading dBµV	Ant.Factor dB1/m	Total at 3m dBµV/m	QP Limit dBµV/m	Margin dB
38.572 MHz	V	23.1	16.3	39.4	40.0	-0.6
78.437 MHz	V	21.5	8.4	29.9	40.0	-10.1
112.95 MHz	V	12.2	13.6	25.8	43.5	-17.8
990.27 MHz	V	11.7	26.6	38.3	54.0	-15.7
30.087 MHz	H	9.9	20.7	30.6	40.0	-9.4
71.908 MHz	H	15.9	7.4	23.3	40.0	-16.7
127.68 MHz	H	12.1	13.7	25.8	43.5	-17.7
984.08 MHz	H	12.5	26.6	39.0	54.0	-15.0

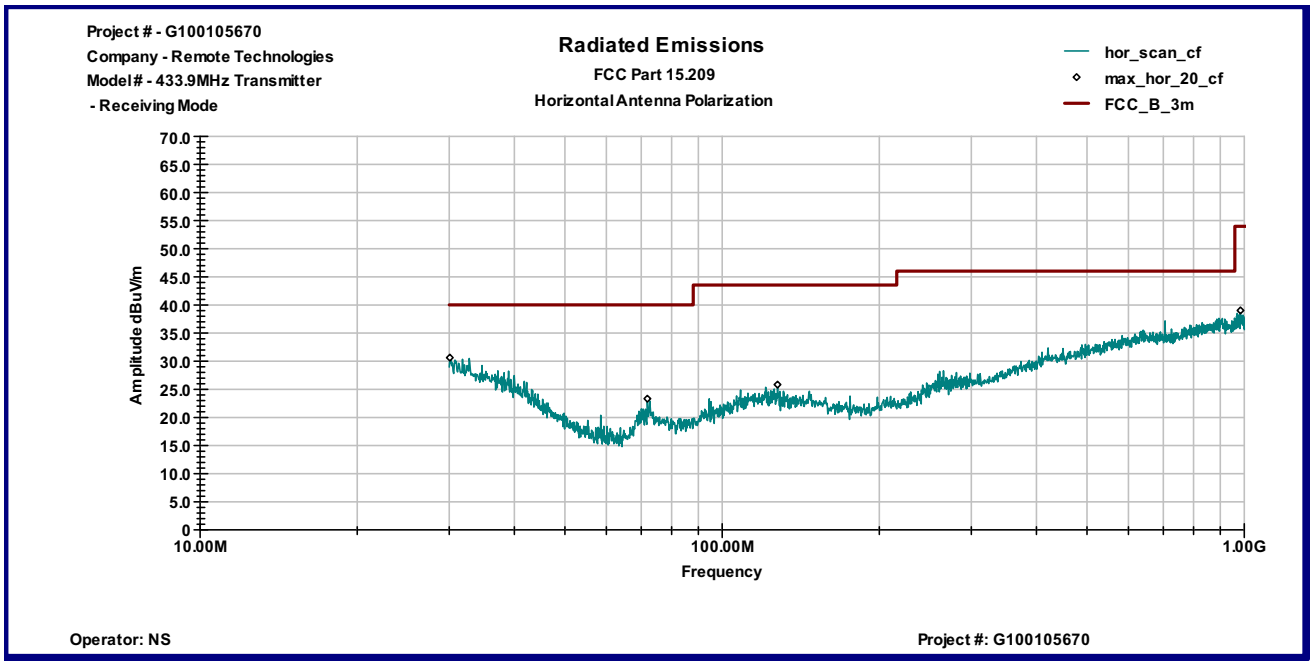
Frequency MHz	Antenna Polarity	Peak Reading dBµV	Total C.F. dB1/m	Pre-Amp. Gain (dB)	Total at 3m dBµV/m	Avg Limit dBµV/m	Margin dB
1.014 GHz	V	57.6	26.4	42.5	41.5	54.0	-12.4
1.04 GHz	V	57.1	26.5	42.5	41.1	54.0	-12.9
1.066 GHz	V	56.5	26.5	42.5	40.6	54.0	-13.4
1.092 GHz	V	55.1	26.6	42.5	39.2	54.0	-14.7
1.196 GHz	V	55.7	27.0	42.6	40.1	54.0	-13.9
1.236 GHz	V	55.6	27.1	42.6	40.2	54.0	-13.8
1.456 GHz	V	52.0	27.9	42.7	37.1	54.0	-16.8
1.864 GHz	V	55.0	29.8	43.1	41.8	54.0	-12.2
1.996 GHz	V	51.3	30.5	43.3	38.5	54.0	-15.5
1.014 GHz	H	52.8	26.1	42.5	36.5	54.0	-17.5
1.04 GHz	H	53.1	26.2	42.5	36.9	54.0	-17.1
1.066 GHz	H	53.3	26.4	42.5	37.2	54.0	-16.8
1.092 GHz	H	53.5	26.5	42.5	37.5	54.0	-16.5
1.236 GHz	H	50.3	27.0	42.6	34.7	54.0	-19.3

Graph 3.5.1

Vertical antenna polarization

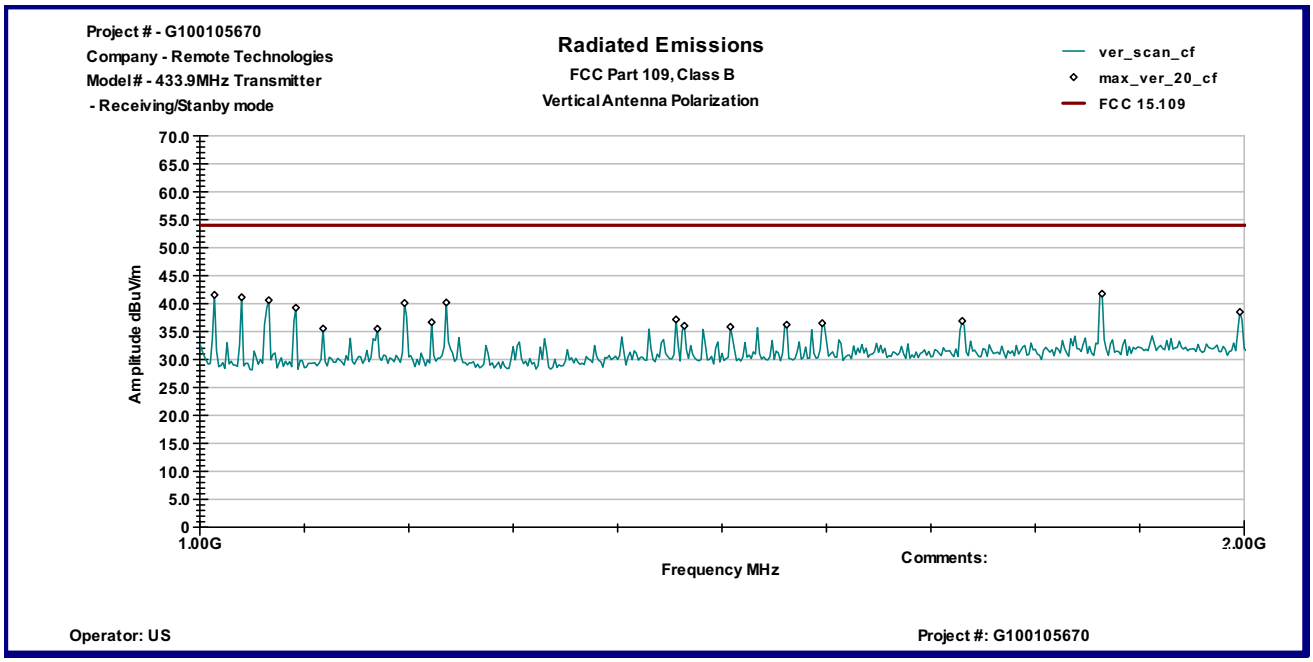


Horizontal antenna polarization

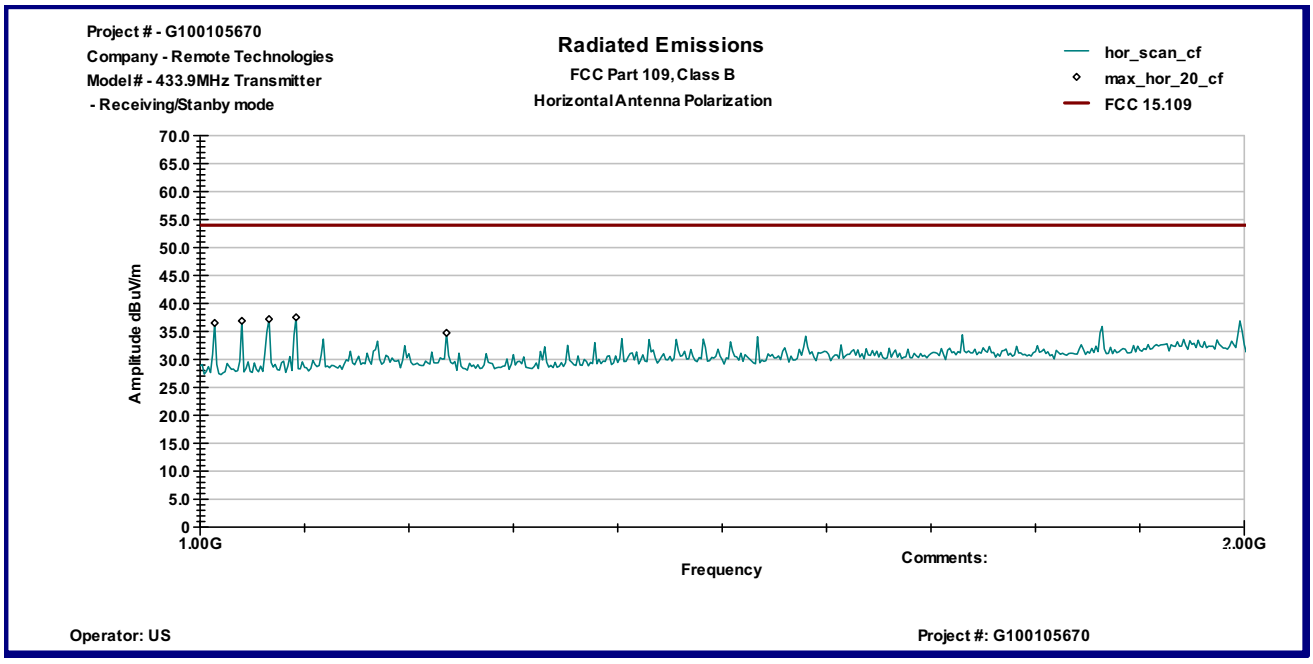


Graph 3.5.2

Vertical antenna polarization



Horizontal antenna polarization



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
Spectrum Analyzer	R & S	FSP 40	100024	12559	09/10/2010	☒
Spectrum Analyzer	Agilent	E7402A	MY44212200	12660	11/20/2010	☒
Bicono-Log Antenna	Schaffner-Chase	CBL 6112 B	2468	14459	09/22/2010	☒
Bicono-Log Antenna	Schaffner-Chase	CBL 6112 B	2630	14459	10/02/2010	☒
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	1402232	172081	08/07/2010	☒
System	TILE! Instrument Control		Ver. 3.4.K.29	15259	VBU	☒