TEST REPORT

Report Number: 100856230MIN-001
Project Number: G100856230

Testing performed on the
TXB-DB

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

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

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

Prepared by: Richard Blonigen — Date: November 2, 2012

Reviewed by: Norman Shpilsher — Date: November 2, 2012

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1.0 GENERAL DESCRIPTION

Model:	TXB-DB
Type of EUT:	Dual Transmitter Module
FCC ID:	MMURTI1500
Industry Canada ID:	3166A-RTI1500
Related Submittal(s) Grants:	Class II Permissive Changes
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 15:2010, §15.231 ☒ RSS–210, Issue 8, 2010 ☐ RSS-Gen, Issue 3, 2010 ☐ 47 CFR, Part 15:2010, §15.107 and §15.109, Class ☐ ICES-003, Issue 4:2004 ☐ Other
Type of radio:	☐ Stand -alone ☒ Module ☐ Hybrid
Date Sample Submitted:	September 24, 2012
Test Work Started:	September 24, 2012
Test Work Completed:	October 16, 2012
Test Sample Conditions:	☐ Damaged ☐Poor (Usable) ☒ Good

1.1 Product Description; Test Facility

Product Description:	Dual Transmitter Module
Operating Frequency	433.05 – 434.73 MHz
Modulation:	GFSK
Emission Designator:	95K6F1D
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 C63.10-2009

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 EUT was programmed to transmit continuously.
2	Two channels were tested; 433.05MHz and 434.73MHz

Cables:

No.	Type	Length	Designation	Note
1	NA			

Support equipment/Services:

No.	Item	Description
1	NA	

General notes: Evaluation is related with Class II Permissive Changes.
Additional channels were implemented in the Radio, therefore limited testing related with new channels were performed only and no evaluation of digital / receiving portion of the Radio were performed

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	N/A
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: 0.7 dB below the limits

Max. margin of harmonics and spurious emissions: 26.2 dB below the limits

Notes: Field Strength of Fundamental and Spurious Emissions measurements were made at Fundamental frequency of 433.05MHz and 434.73MHz; Spurious Emissions were tested up to 5GHz (10^{th} harmonic).

The Table 3.2.1 shows the Field Strength of Fundamental Radiation. Table 3.2.2 and Graphs 3.2.1 - 3.2.4 show the Field Strength of Spurious Emissions.

Date:	September 25-27, 2012	**Result:** **Pass**
Standard:	FCC 15.231(b) / RSS-210 A1.1.2	
Tested by:	Richard Blonigen	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	Measurements at Fundamental Frequencies	

Table 3.2.1

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	
Channel 1										
Average Fundamental Frequency										
433.06	V	140	16.9	2.4	0.0	59.0	78.3	80.8	-2.5	
433.06	H	100	16.9	2.4	0.0	60.8	80.1	80.8	-0.7	
Peak Fundamental Frequency										
433.06	V	140	16.9	2.4	0.0	67.9	87.2	100.8	-13.6	
433.06	H	100	16.9	2.4	0.0	69.8	89.1	100.8	-11.7	
Channel 13										
Average Fundamental Frequency										
434.70	V	136	16.9	2.4	0.0	58.4	77.7	80.9	-3.1	
434.70	H	100	16.9	2.4	0.0	60.0	79.3	80.9	-1.5	
Peak Fundamental Frequency										
434.70	V	136	16.9	2.4	0.0	67.3	86.6	100.9	-14.3	
434.70	H	100	16.9	2.4	0.0	69.0	88.3	100.9	-12.6	

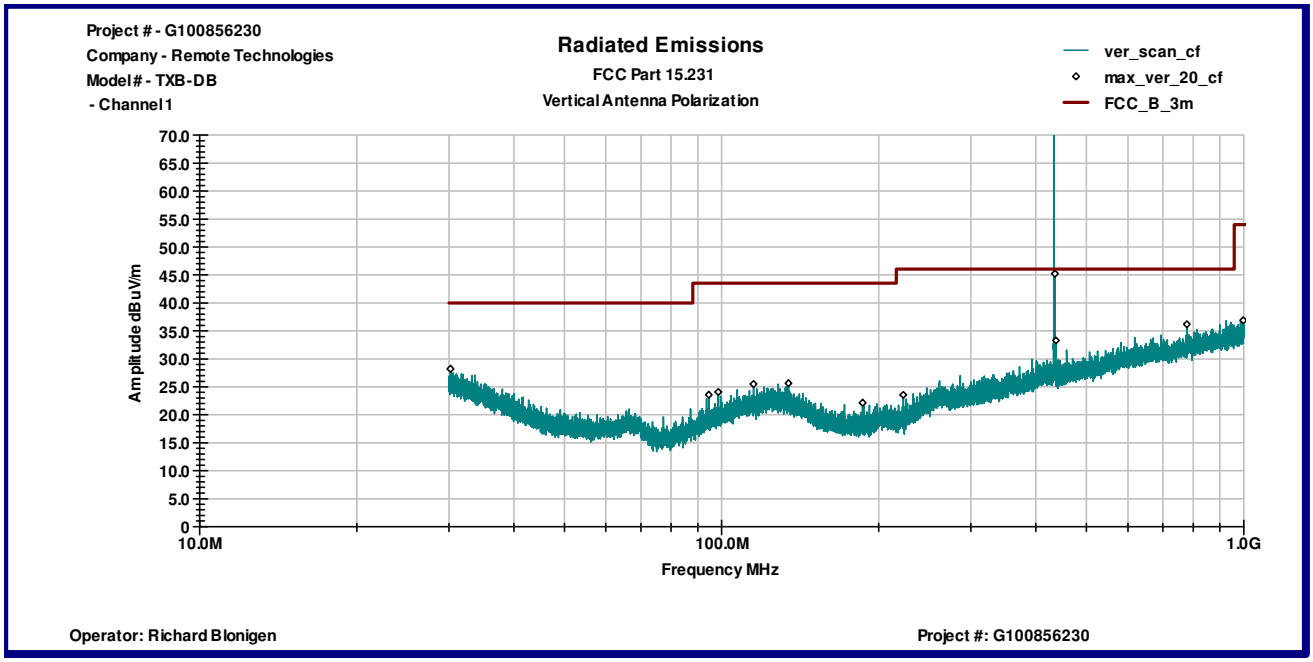
Date:	September 25-27, 2012	**Result:** **Pass**
Standard:	FCC 15.231(b) / RSS-210 A1.1.2	
Tested by:	Richard Blonigen	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	Spurious Radiated Emissions 30MHz-5000MHz	

Table 3.2.2

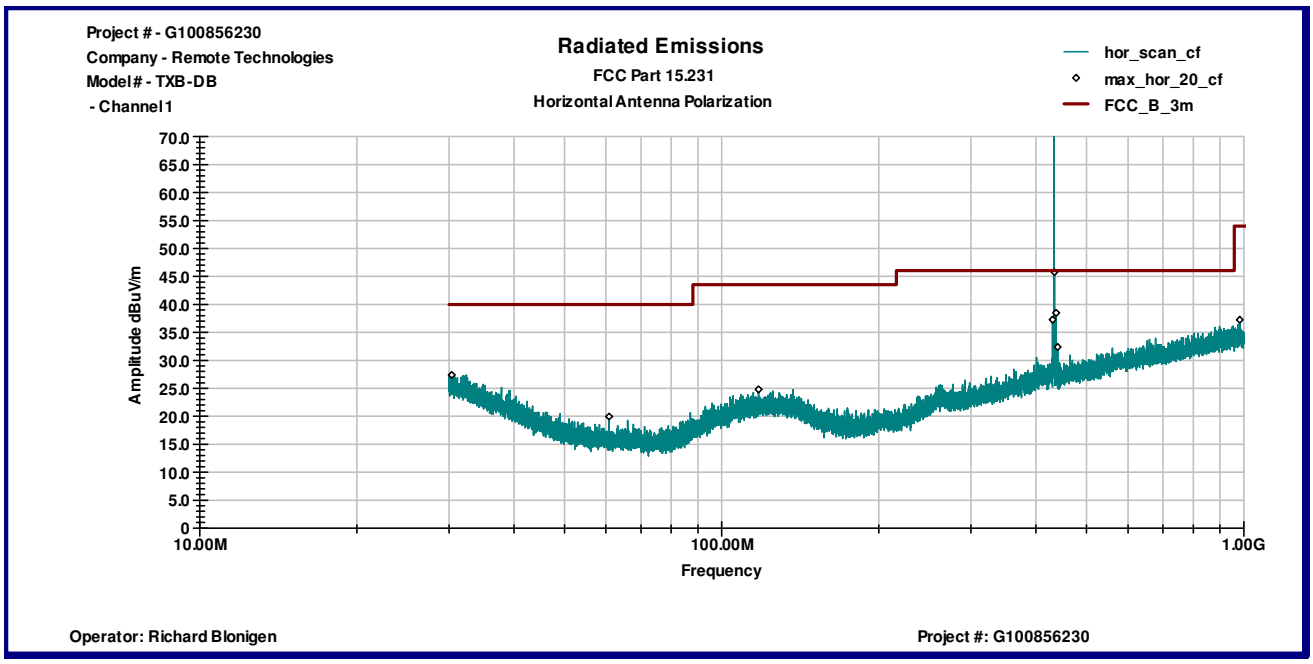
Frequency MHz	Antenna Polarity	Antenna Hts(cm)	Ant. CF dB1/m	Cable loss dB	Pre-amp Gain (dB)	Average Reading dBµV	Total @ 3m dBµV/m	Limit dBµV/m	Margin dB	Comments
Channel 1 (433.049805MHz)										
1235.00	V	100	24.4	2.1	42.9	35.2	18.8	60.8	-41.9	
2415.30	V	104	28.3	2.9	43.5	38.9	26.7	60.8	-34.1	
3464.55	V	100	31.2	3.5	43.6	43.5	34.6	60.8	-26.2	
4330.60	V	100	32.6	3.9	42.5	41.2	35.2	60.8	-25.6	
1853.60	H	251	26.6	2.6	43.4	40.1	25.9	60.8	-34.9	
2463.30	H	230	28.4	2.9	43.5	34.7	22.6	60.8	-38.2	
3464.60	H	275	31.2	3.5	43.6	39.9	30.9	60.8	-29.9	
Channel 13 (434.725586MHz)										
1232.00	V	113	24.4	2.1	42.9	33.9	17.6	60.9	-43.3	
2460.00	V	100	28.4	2.9	43.5	35.0	22.9	60.9	-37.9	
3477.80	V	124	31.2	3.5	43.6	41.6	32.7	60.9	-28.1	
4347.20	V	100	32.6	3.9	42.5	38.7	32.8	60.9	-28.1	
2462.00	H	100	28.4	2.9	43.5	33.7	21.6	60.9	-39.3	
3477.70	H	201	31.2	3.5	43.6	38.9	30.0	60.9	-30.9	
4347.10	H	223	32.6	3.9	42.5	35.6	29.6	60.9	-31.2	

Graph 3.2.1

Vertical antenna polarization

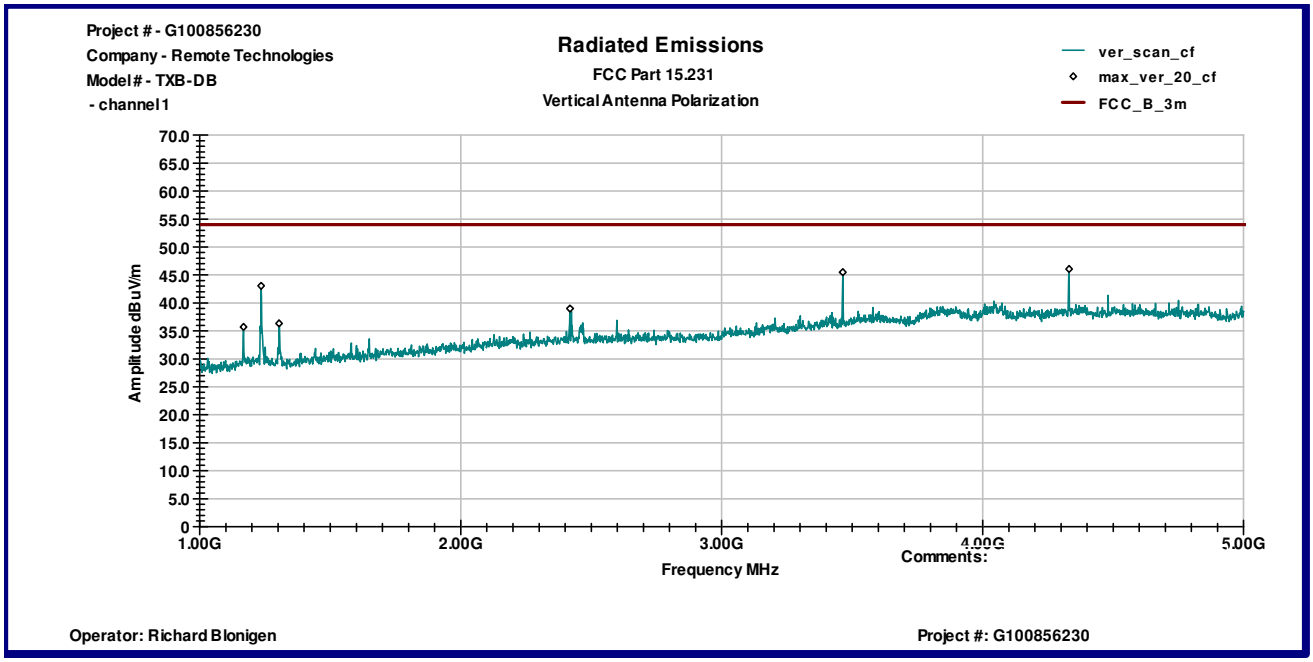


Horizontal antenna polarization

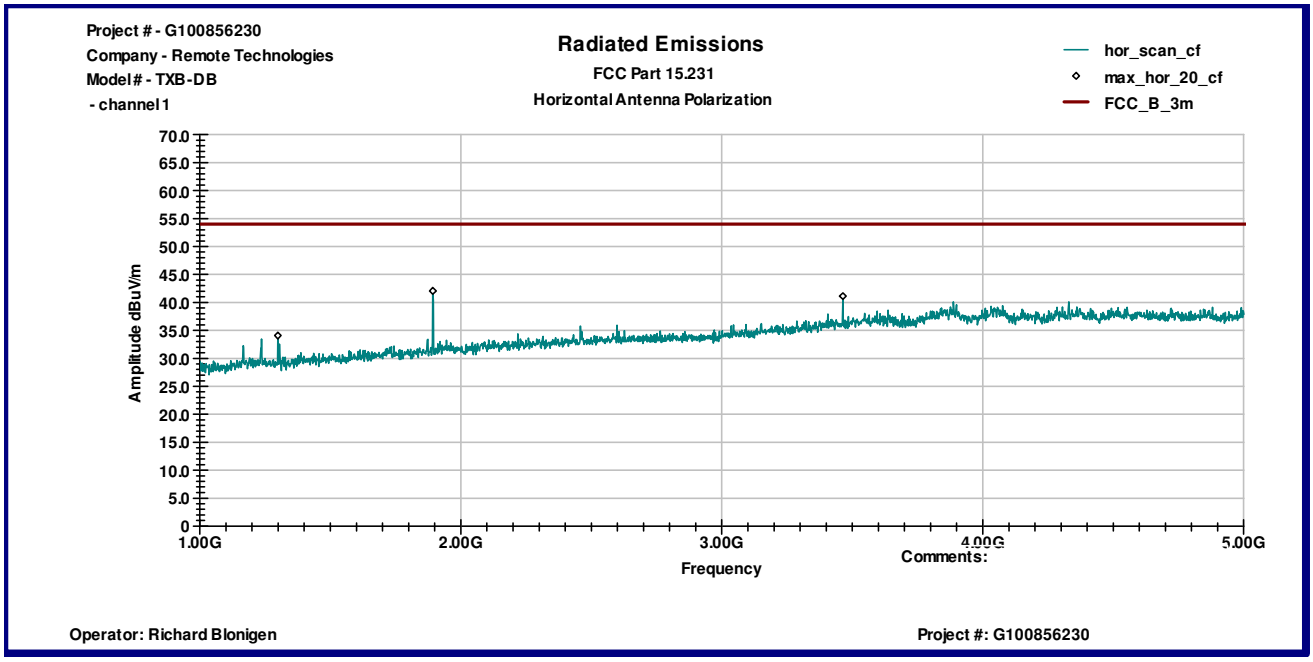


Graph 3.2.2

Vertical antenna polarization

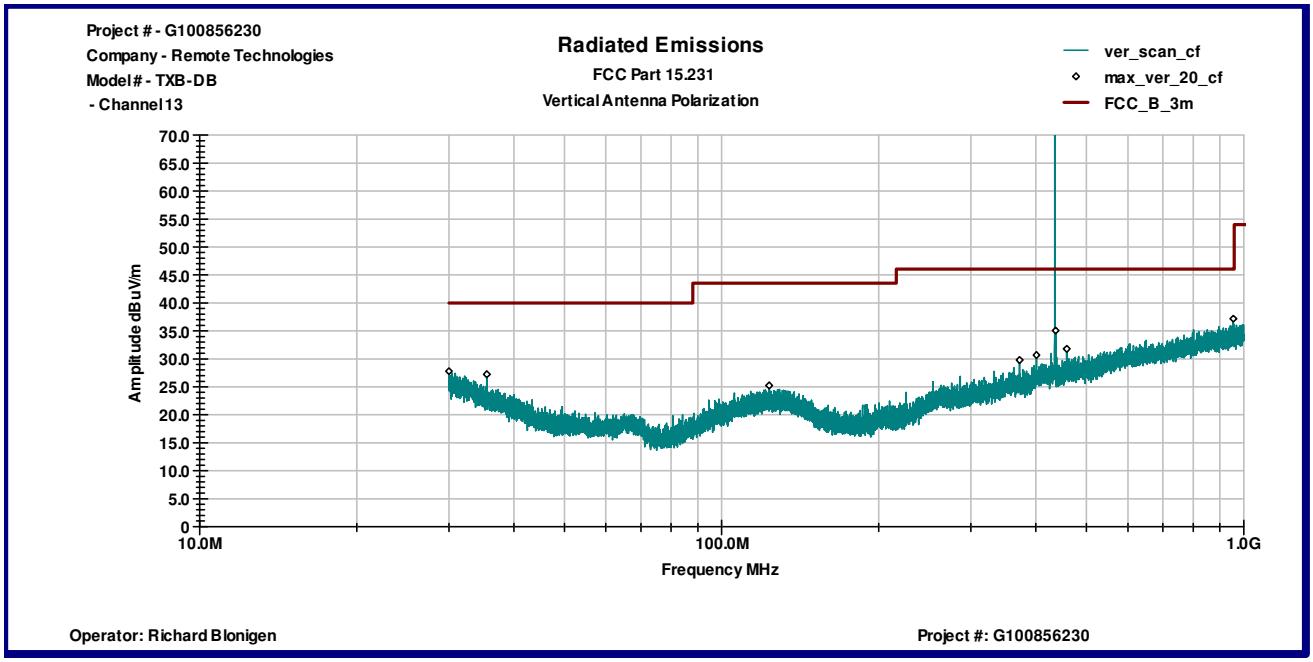


Horizontal antenna polarization

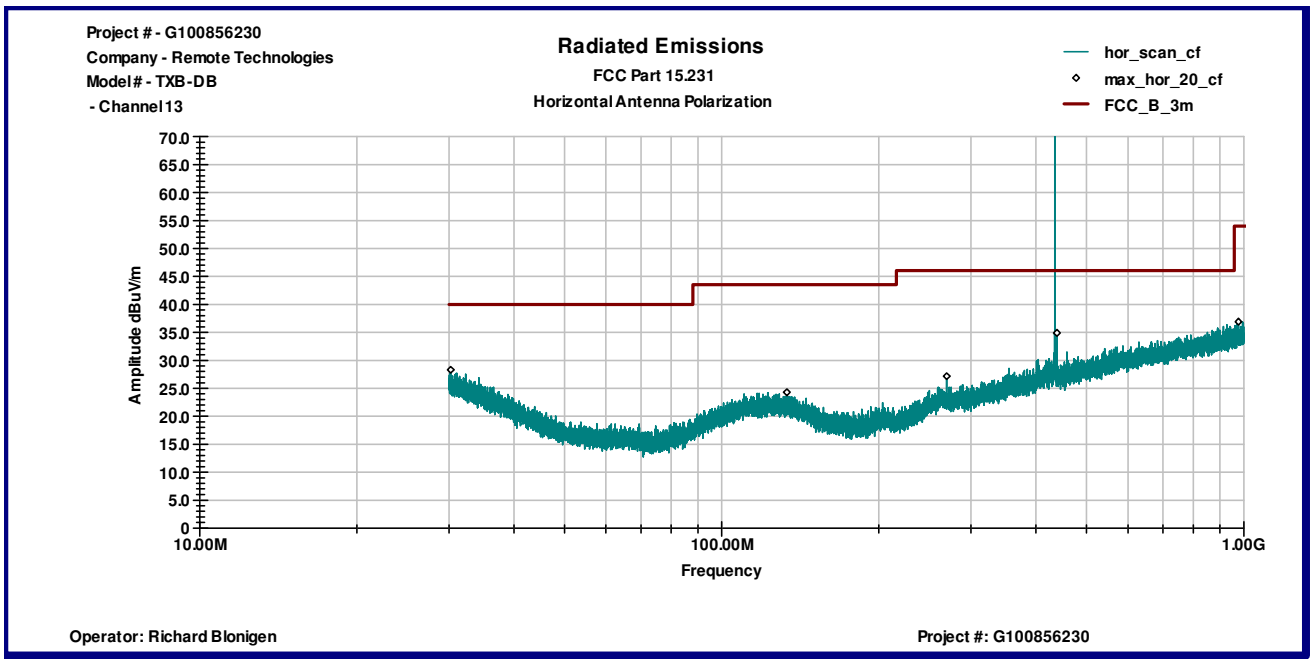


Graph 3.2.3

Vertical antenna polarization

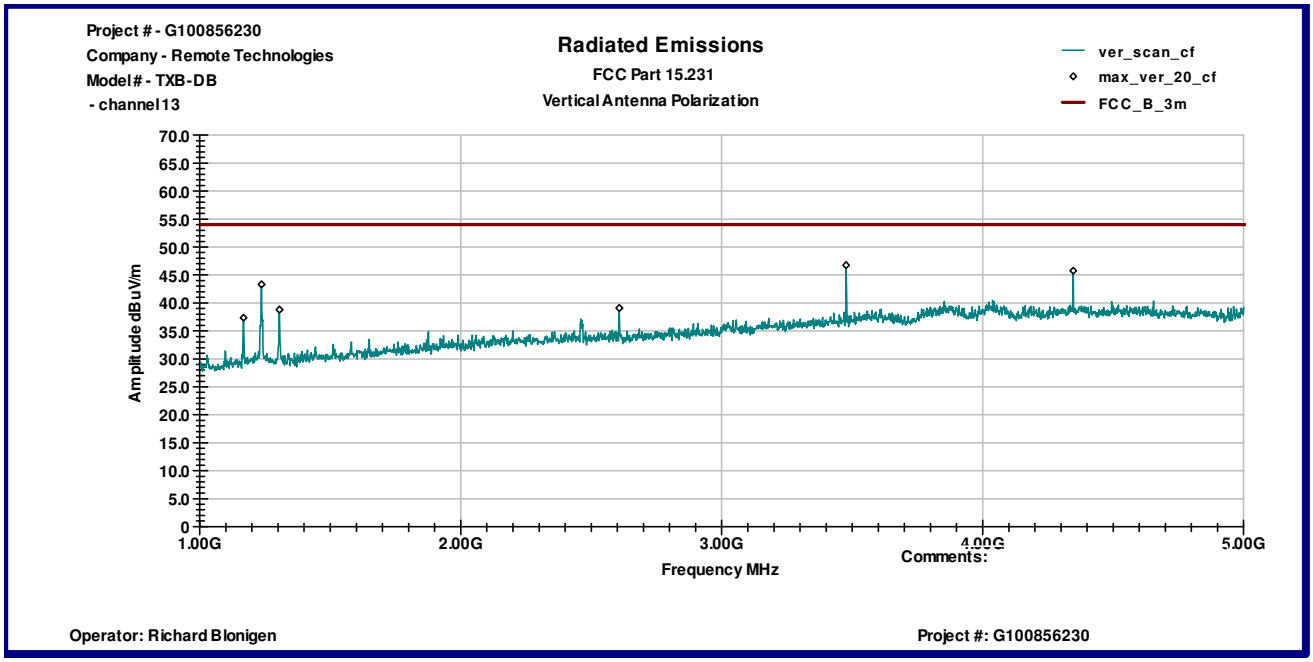


Horizontal antenna polarization

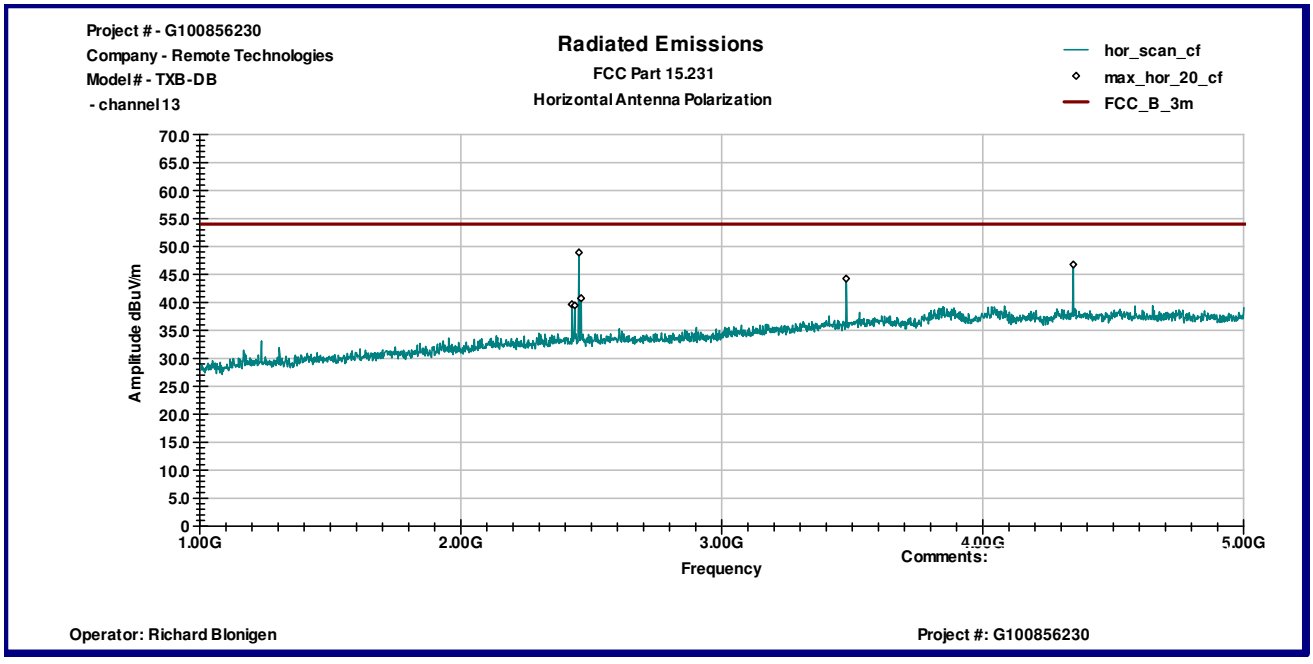


Graph 3.2.4

Vertical antenna polarization



Horizontal antenna polarization



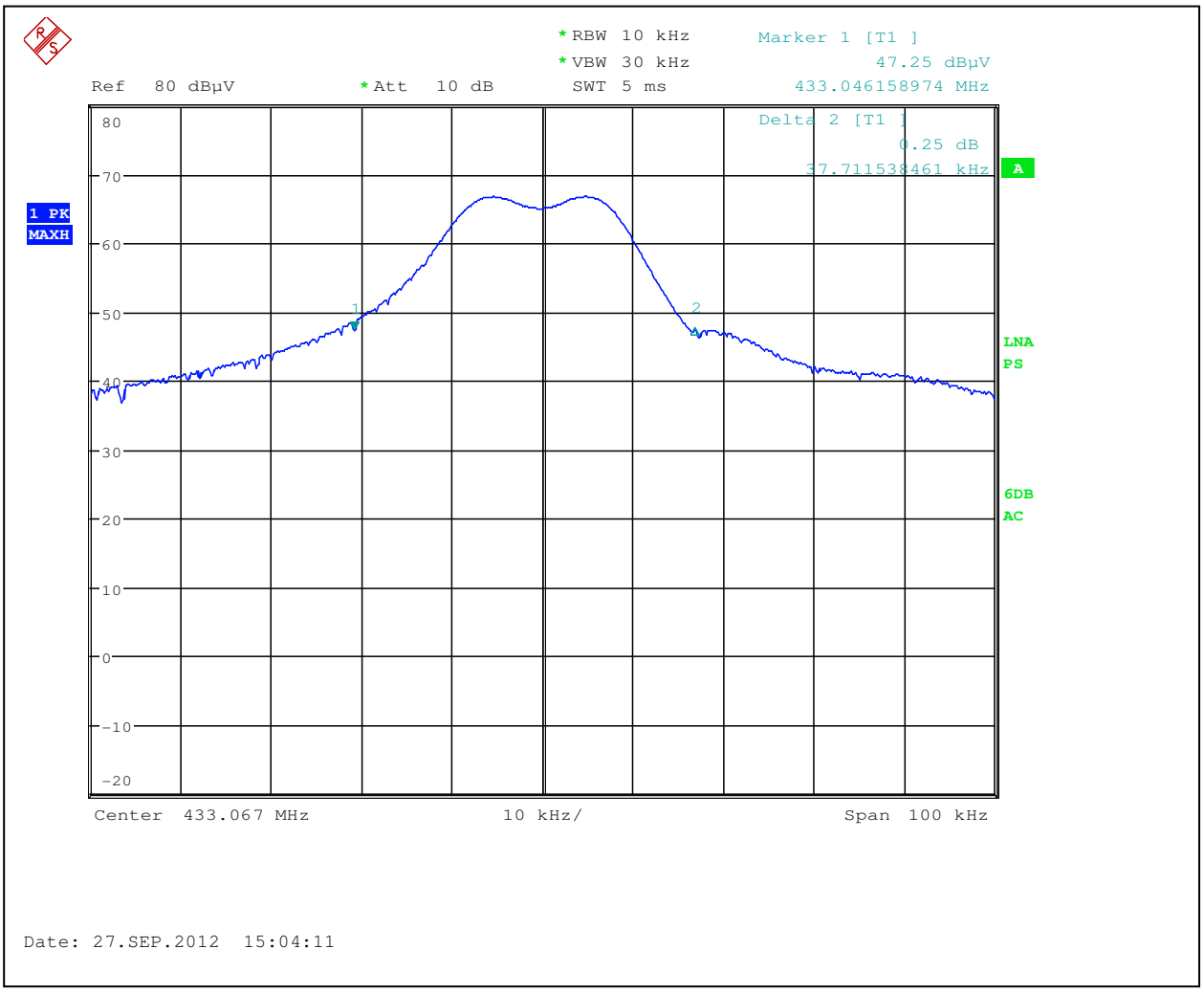
3.3 Bandwidth of Emissions

Center Frequency of operation MHz	Maximum allowed bandwidth kHz	Measured 20dB bandwidth kHz	Measured 99% bandwidth kHz	Result
433.05	1082.625	37.7	32.5	**Pass**
434.73	1086.825	34.3	32.2	**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			

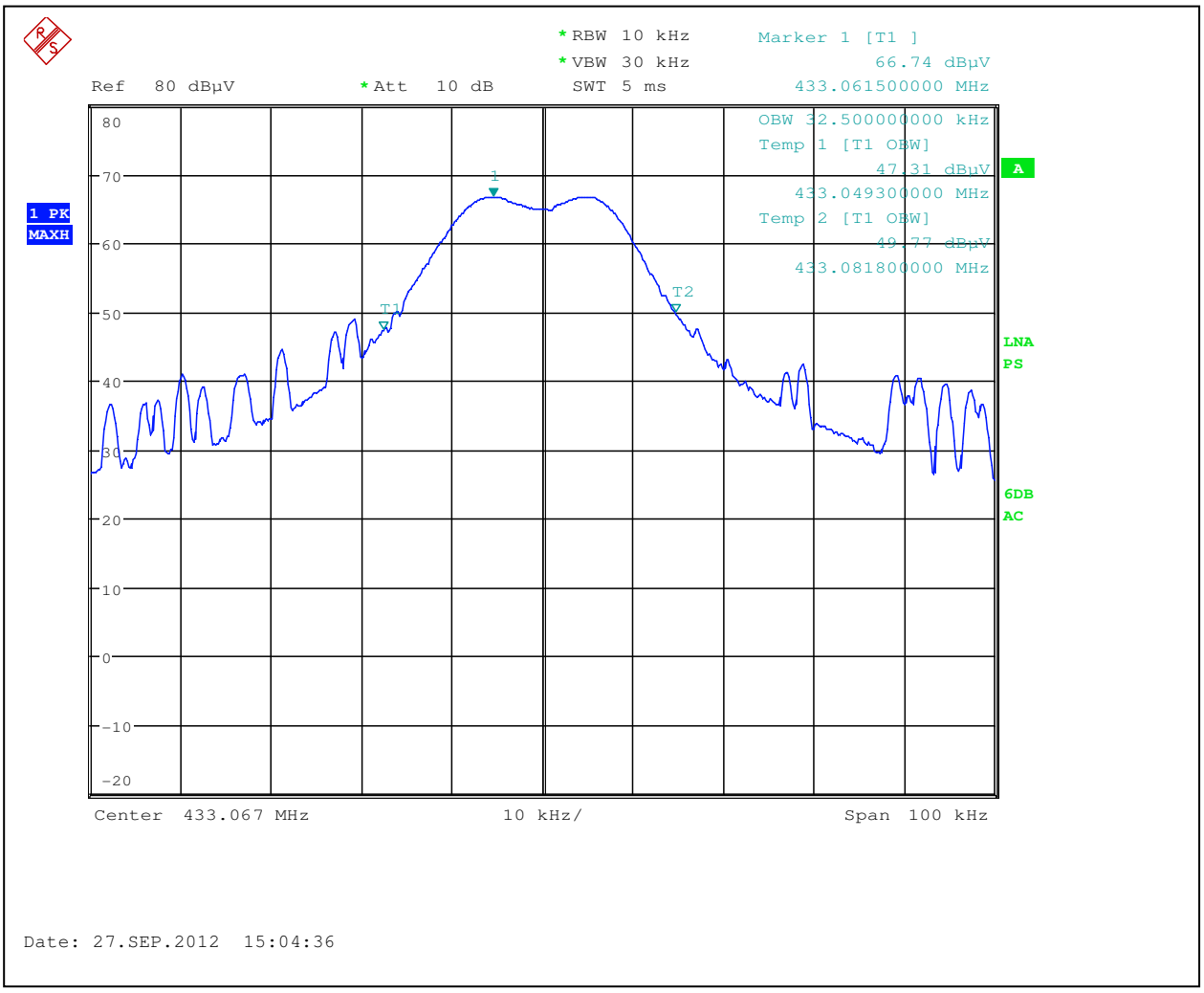
Graphs 3-3-1 - 3-3-4 show bandwidth of emissions

Notes:

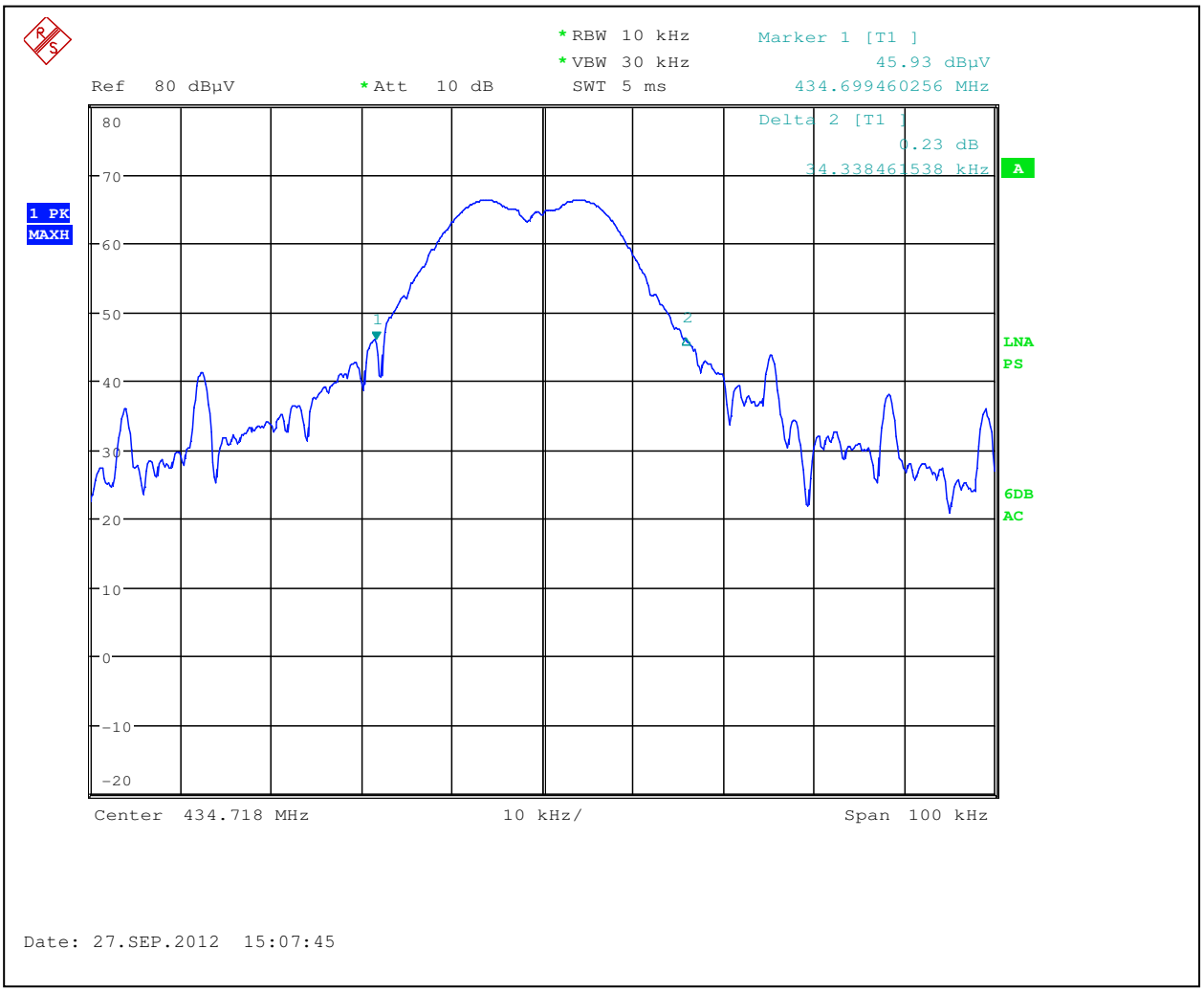
Graph 3.3.1


*RBW 10 kHz
*VBW 30 kHz
Ref 80 dBµV
*Att 10 dB
SWT 5 ms
Marker 1 [T1]
47.25 dBµV
433.046158974 MHz
Delta 2 [T1]
0.25 dB
37.711538461 kHz
A
1 PK
MAXH
LNA
PS
6DB
AC
80
70
60
50
40
30
20
10
0
-10
-20
Center 433.067 MHz
10 kHz/
Span 100 kHz
Date: 27.SEP.2012 15:04:11

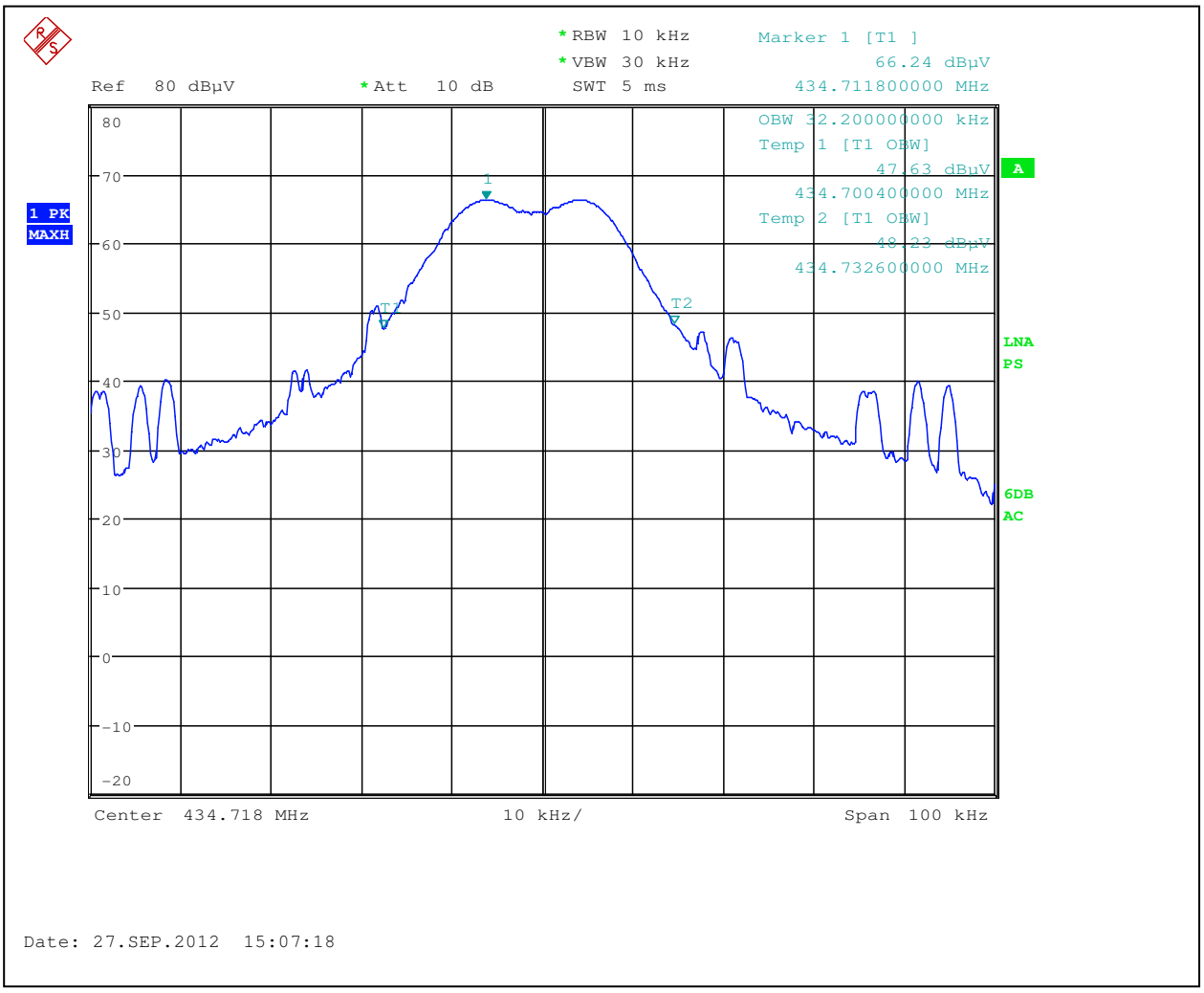
Graph 3.3.2


*RBW 10 kHz
*VBW 30 kHz
Ref 80 dBµV
*Att 10 dB
SWT 5 ms
Marker 1 [T1]
66.74 dBµV
433.061500000 MHz
OBW 32.500000000 kHz
Temp 1 [T1 OBW]
47.31 dBµV
433.049300000 MHz
Temp 2 [T1 OBW]
49.77 dBµV
433.081800000 MHz
1 PK
MAXH
A
LNA
PS
6DB
AC
80
70
60
50
40
30
20
10
0
-10
-20
T1
T2
Center 433.067 MHz
10 kHz/
Span 100 kHz
Date: 27.SEP.2012 15:04:36

Graph 3.3.3


*RBW 10 kHz
*VBW 30 kHz
Ref 80 dBµV
*Att 10 dB
SWT 5 ms
Marker 1 [T1]
45.93 dBµV
434.699460256 MHz
Delta 2 [T1]
0.23 dB
34.338461538 kHz
A
1 PK
MAXH
LNA
PS
6DB
AC
80
70
60
50
40
30
20
10
0
-10
-20
Center 434.718 MHz
10 kHz/
Span 100 kHz
Date: 27.SEP.2012 15:07:45

Graph 3.3.4


RBW 10 kHz
VBW 30 kHz
Ref 80 dBµV
Att 10 dB
SWT 5 ms
Marker 1 [T1]
66.24 dBµV
434.711800000 MHz
OBW 32.200000000 kHz
Temp 1 [T1 OBW]
47.63 dBµV
434.700400000 MHz
Temp 2 [T1 OBW]
48.23 dBµV
434.732600000 MHz
1 PK
MAXH
A
LNA
PS
6DB
AC
80
70
60
50
40
30
20
10
0
-10
-20
T1
T2
Center 434.718 MHz
10 kHz/
Span 100 kHz
Date: 27.SEP.2012 15:07:18

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

Notes: 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: **N/A**

Frequency range: 30MHz-1000MHz

Max. Emissions margin: dB below the limits

Notes: Evaluation is related with Class II Permissive Changes.
Additional channels were implemented in the Radio, therefore limited testing related with new channels were performed only and no evaluation of digital / receiving portion of the Radio were performed

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

Notes: 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	11/17/2012	☒
Spectrum Analyzer	R & S	ESU	100398	25283	12/09/2012	☒
Bicono-Log Antenna	Teseq	CBL6112D	32859	25289	08/09/2013	☒
Horn Antenna	EMCO	3115	9507-4513	9936	05/16/2013	☒
Pre-Amplifier	MITEQ	AMF-5D-00501800-28-13P	1402232	172081	10/31/2012	☒
System	Quantum Change	TILE! Instrument Control	Ver. 3.4.K.29	15259	VBU	☒

Test Setup Photos