TEST REPORT

Report Number: 100934544MIN-001
Project Number: G100934544

Testing performed on the
SALLISRPOE
FCC ID: UKCRPOE
Industry Canada ID: 10088A-RPOE

to
47 CFR Part 15. 247:2010
RSS- 210, Issue 8, 2010

For
Salto Systems SL

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

Test Authorized by:
Salto Systems SL
Pol. Lanbarren, c/Arkotz 9
20180-OIARTZUN
SPAIN

Prepared by: _____ Date: March 15, 2013
Uri Spector

Reviewed by: _____ Date: March 15, 2013
Simon Khazon

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1.0 GENERAL DESCRIPTION

Model:	SALLISRPOE
Type of EUT:	RF Router
Intertek Sample ID:	MIN1212210942-001
FCC ID:	UKCRPOE
Industry Canada ID:	10088A-RPOE
Related Submittal(s) Grants:	None
Company:	Salto Systems SL
Customer:	Mr. Julen Gutierrez
Address:	Pol. Lanbarren, c/Arkotz 9 20180-OIARTZUN SPAIN
Phone:	+34 943 344 731
Fax:	+34 943 341 621
e-mail:	j.gutierrez@saltosystems.com
Test Standards:	☒ 47 CFR, Part 15:2010, §15.247 ☒ RSS–210, Issue 8, 2010 ☒ RSS-Gen, Issue 3, 2010 ☒ 47 CFR, Part 15:2010, §15.107 and §15.109, Class B ☒ ICES-003, Issue 5:2012 ☐ Other
Type of radio:	☒ Stand -alone ☐ Module ☐ Hybrid
Date Sample Submitted:	January 7, 2013
Test Work Started:	January 7, 2013
Test Work Completed:	January 24, 2013
Test Sample Conditions:	☐ Damaged ☐Poor (Usable) ☒ Good

1.1 Product Description; Test Facility

Product Description:	2.4GHz Sallis Router PoE
Transmitter Type:	☐ FHSS ☒ Digital Modulation ☐ WiFi ☐ Blue Tooth
Operating Frequency Range(s):	From 2400 to 2483.5 MHz
Number of Channels:	16
Modulation:	O-QPSK with DSSS
Emission Designator:	1M83GXD
Antenna(s) Info:	Antenna Type: Chip antenna Gain: 1.7dBi
Antenna Installation:	☐ User ☐ Professional ☒ Factory
Transmitter power configuration:	☐ Internal battery ☒ External power source ☒ 100-240VAC from AC/DC Power Adapter ADPV500 ☐ 230VAC ☐ 400VAC ☐ 12VDC from ☐ Other: 0.3Amp. ☒ 50Hz ☒ 60Hz
Test Facility Accreditation:	A2LA (Certificate No. 1427.01)
Test Methodology:	Measurements performed according to the procedures in ANSI C63.10-2009 and FCC DTS Measurement Guide

1.2 EUT Configuration

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

☐ - Standby
☒ - Continuous transmissions (modulated signal)
☐ - Continuous transmissions (un-modulated signal)
☒ - Continuous receiving
☐ - Test program (customer specific)
☒ - See below

Operating modes of the EUT:

No.	Description
1	Test was performed at low channel, middle channel, and upper channel

Cables:

No.	Type	Length	Designation	Note
1	Ethernet CAT45	6ft.	not shielded, communication cable	
2	AUX Power wires	6ft.	2-wires not shielded	
3	Node Connection Wires	6ft.	4-wires not shielded	

Support equipment/Services:

No.	Item	Description
1	None	

1.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

☒ **Normal**

Temperature:	+15 to +35 ° C
Humidity:	20-75 %
Atmospheric pressure:	86-106 kPa

☐ **Extreme**

☐ **Temperature:**	-20 to +50 ° C
☐ **Supply voltage:**	85% to +115%

1.4 Measurement uncertainty

The expanded uncertainty (k = 2) for radiated measurements has been determined to be:
±4 dB at 10m and ±5.4 dB at 3m
The expanded uncertainty (k = 2) for conducted measurements at antenna terminal has been determined to be:
±1.0 dB
The expanded uncertainty (k = 2) for line conducted measurements 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)

General notes:

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
15.247(b), (c) / RSS-210 A8.4	Maximum peak output power	Pass
15.247(a) / RSS-210 A8.2	6dB bandwidth of the digital modulation system and Emissions Bandwidth	Pass
15.247/(e) / RSS-210 A8.2	Power spectral density	Pass
15.247(d) / RSS-210 A8.5	Antenna conducted spurious emissions	Pass
15.247(d) / RSS-210 A8.5	Radiated spurious emissions	Pass
15.247(i) / RSS- Gen 5.5	RF Exposure Compliance	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

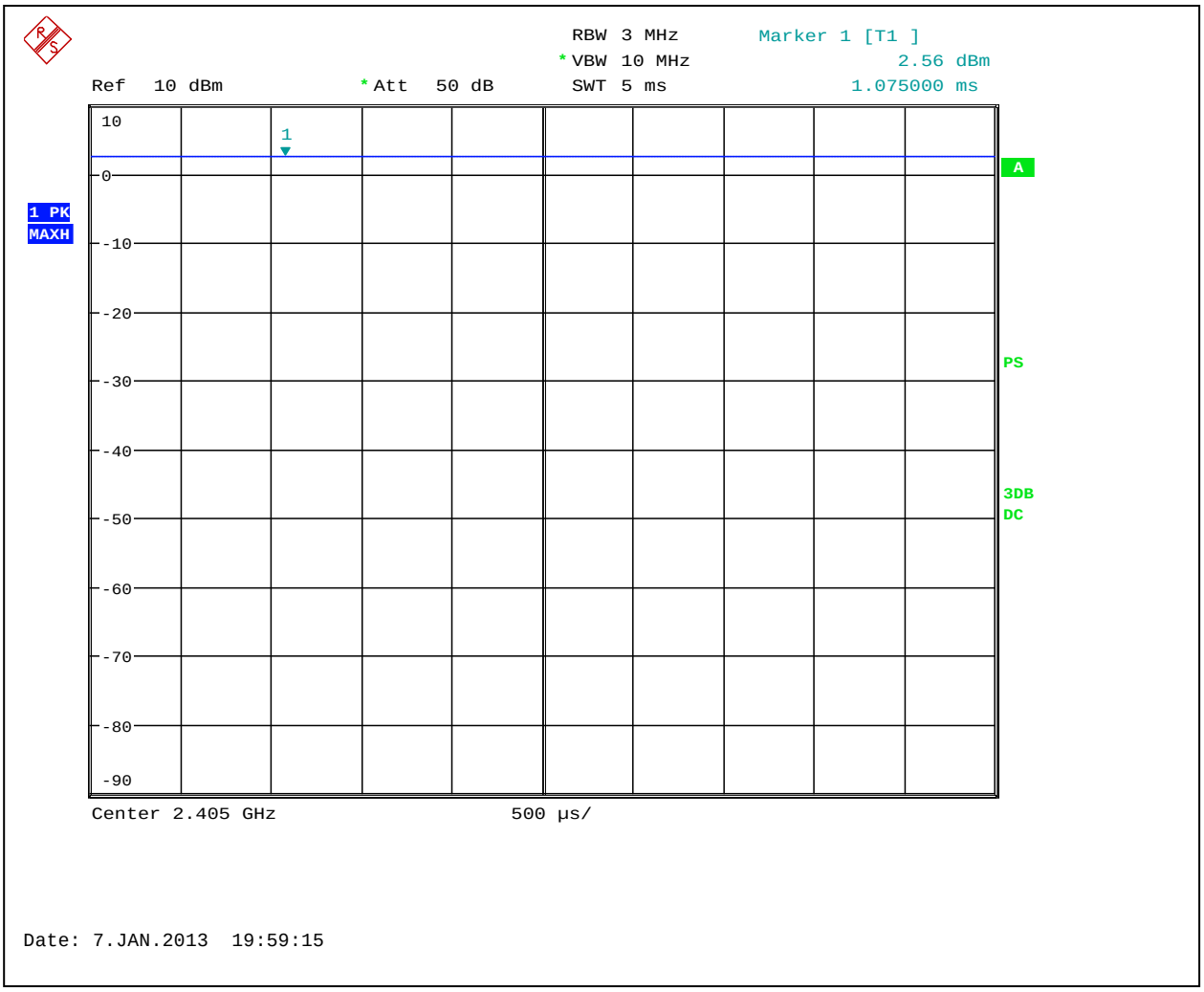
3.1 Maximum peak output power

Test result: **Pass**

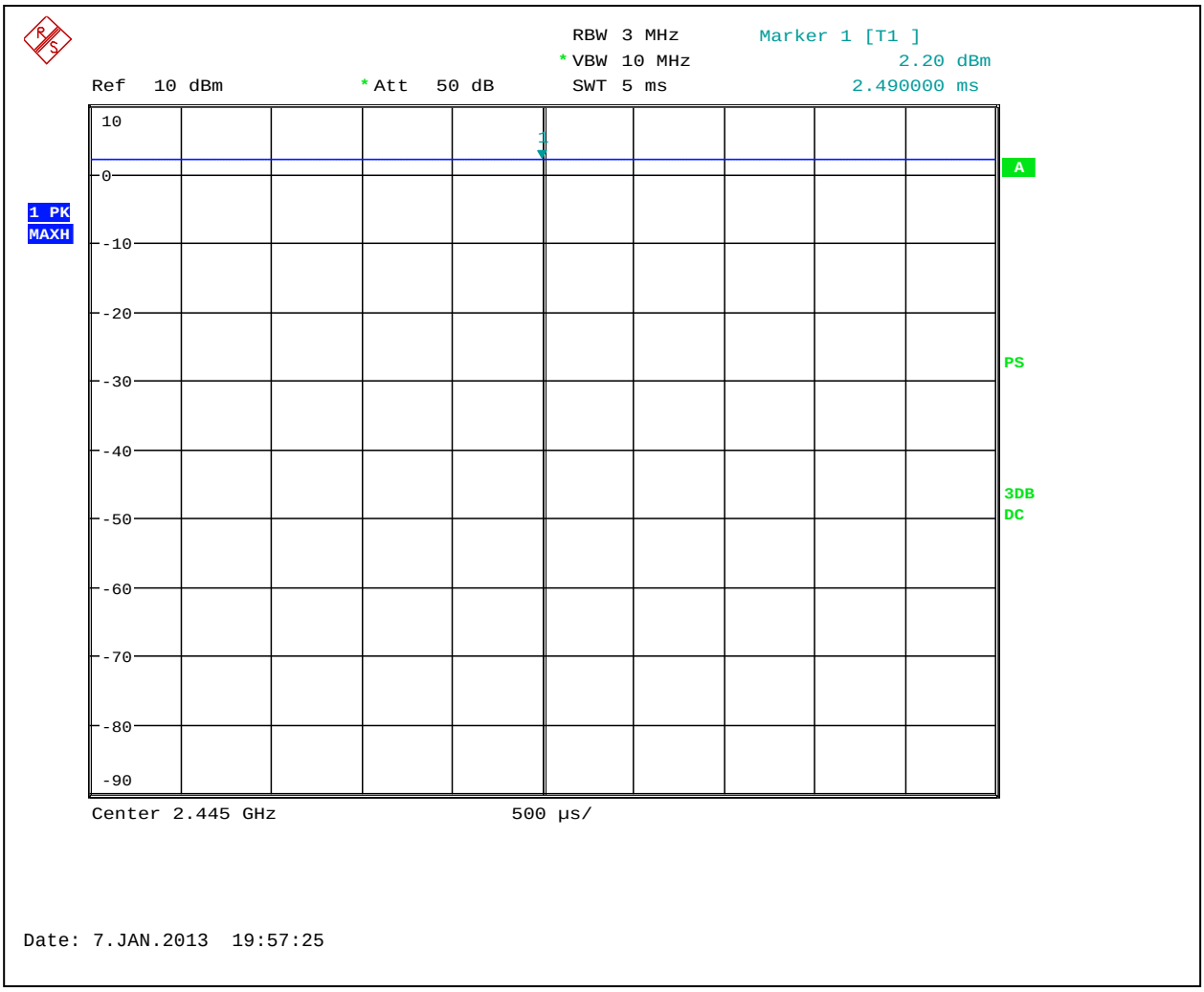
Max. Margin: 26.1dB below the limits

Power Output:	**Conducted**					
Frequency Range:	☐ 902-928MHz		☒ 2400-2483.5MHz		☐ 5725-5850MHz	
Low Frequency MHz	**Measured power dBm**	**Attenuaton dB**	**Power at Antenna dBm**	**Limit dBm**	**Limit Reduction dB**	**Margin dB**
2405.00	2.6	1.3	3.9	30	0	-26.1
Middle Frequency MHz						
2445.00	2.2	1.3	3.5	30	0	-26.5
Upper Frequency MHz						
2479.95	2.1	1.3	3.4	30	0	-26.6
RBW:	☐ 1MHz	☒ 3MHz	☐ 10MHz			
VBW:	☐ 1MHz	☒ 10MHz	☐ 10MHz			
Antenna Gain:	☒ < 6dBi	☐ >6dBi and = dBi, Output power reduction = dB				

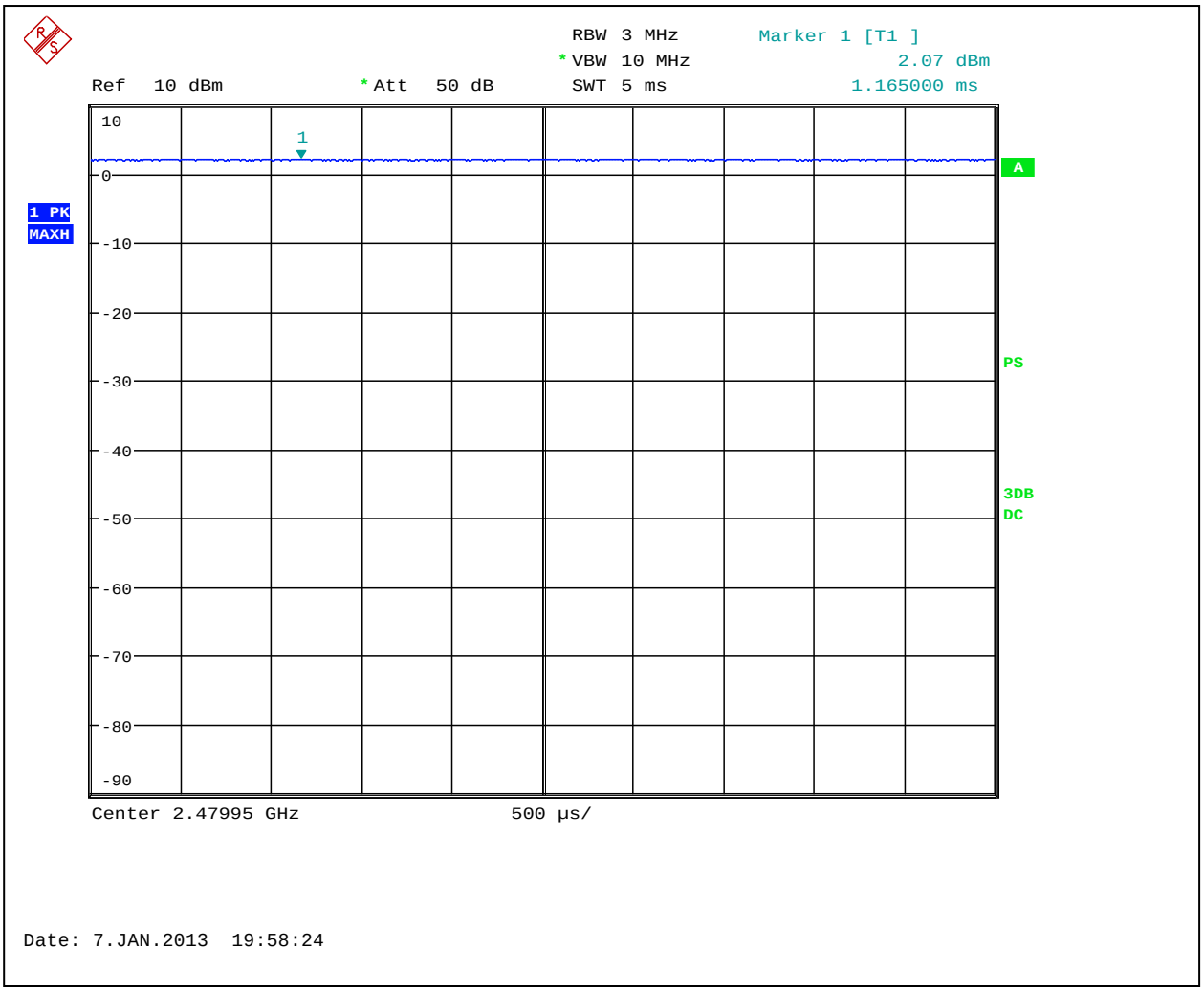
Notes: None


RBW 3 MHz
*VBW 10 MHz
SWT 5 ms
Marker 1 [T1]
2.56 dBm
1.075000 ms
Ref 10 dBm
*Att 50 dB
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
1 PK
MAXH
A
PS
3DB
DC
Center 2.405 GHz
500 µs/
Date: 7.JAN.2013 19:59:15

Graph 3.1.1


RBW 3 MHz
*VBW 10 MHz
SWT 5 ms
Marker 1 [T1]
2.20 dBm
2.490000 ms
Ref 10 dBm
*Att 50 dB
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
1 PK
MAXH
A
PS
3DB
DC
Center 2.445 GHz
500 µs/
Date: 7.JAN.2013 19:57:25

Graph 3.1.2

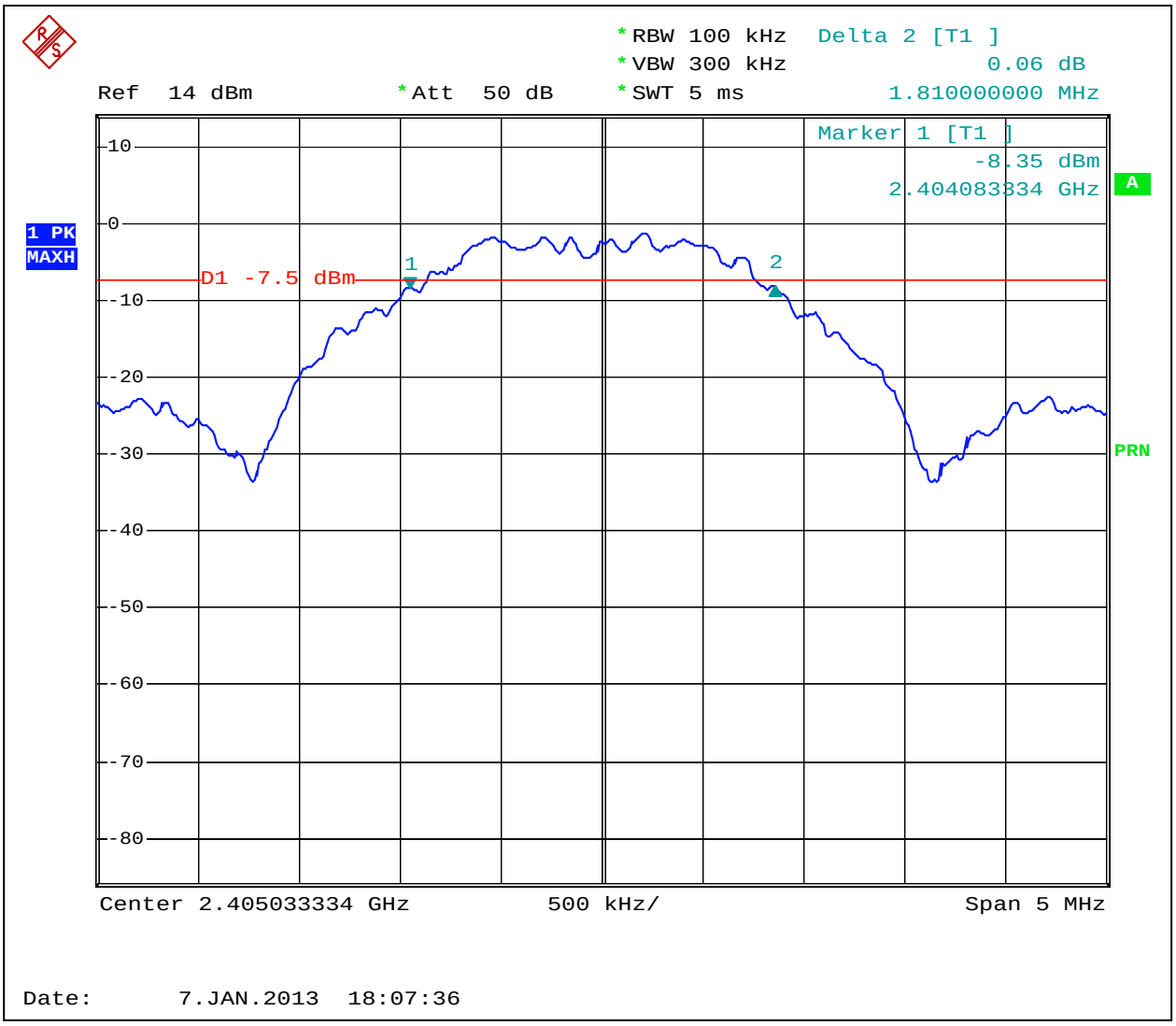

RBW 3 MHz
*VBW 10 MHz
SWT 5 ms
Marker 1 [T1]
2.07 dBm
1.165000 ms
Ref 10 dBm
*Att 50 dB
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
1 PK
MAXH
A
PS
3DB
DC
Center 2.47995 GHz
500 µs/
Date: 7.JAN.2013 19:58:24

Graph 3.1.3

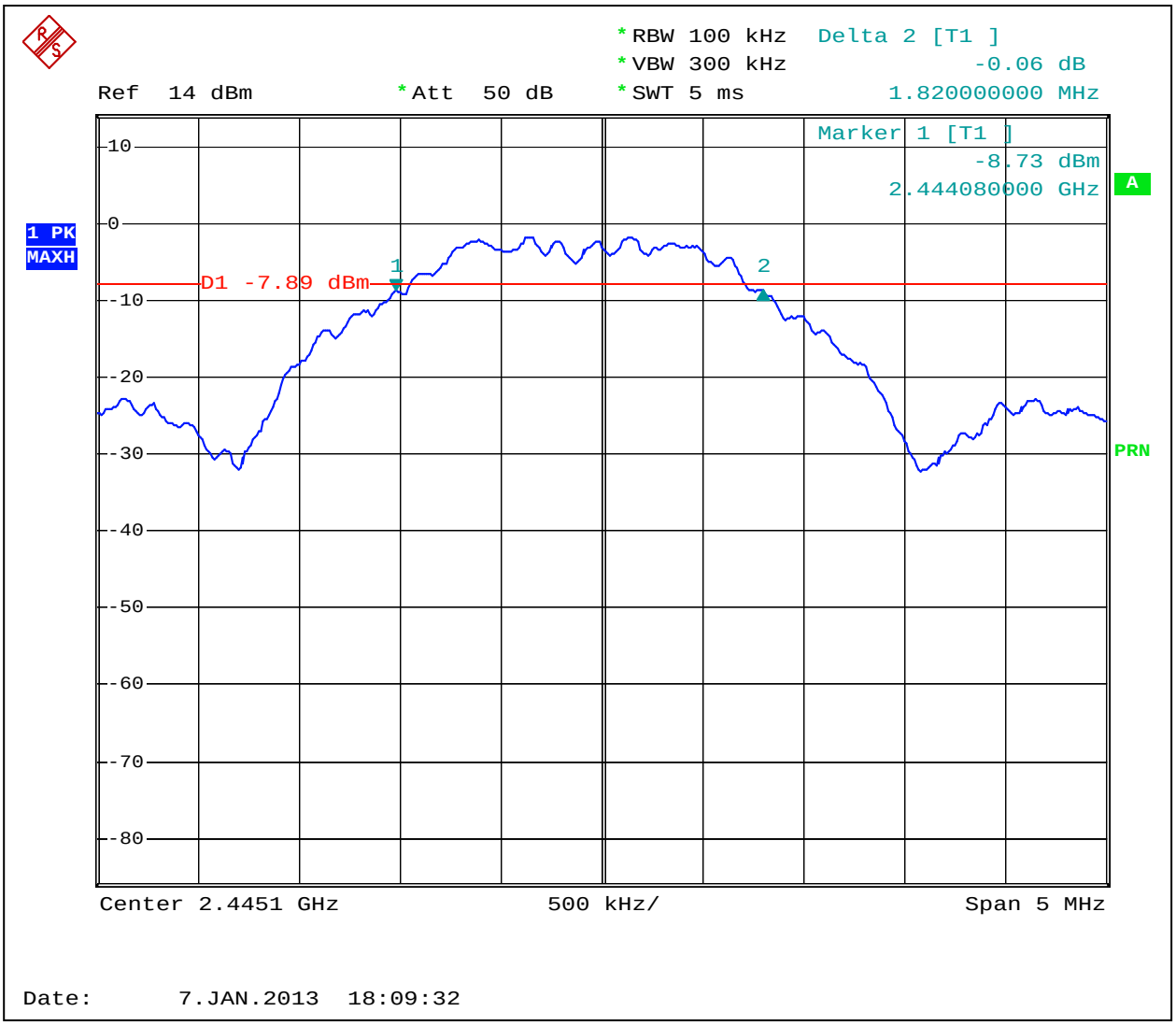
3.2 6dB bandwidth of the digital modulation

Low Frequency Channel kHz	Middle Frequency Channel kHz	Upper Frequency Channel kHz	Minimum Bandwidth kHz	Result
1810	1820	1820	500	**Pass**
RBW: **VBW:**	☒ 100kHz ☐ other kHz ☒ 300kHz ☐ 300kHz ☐ other kHz			

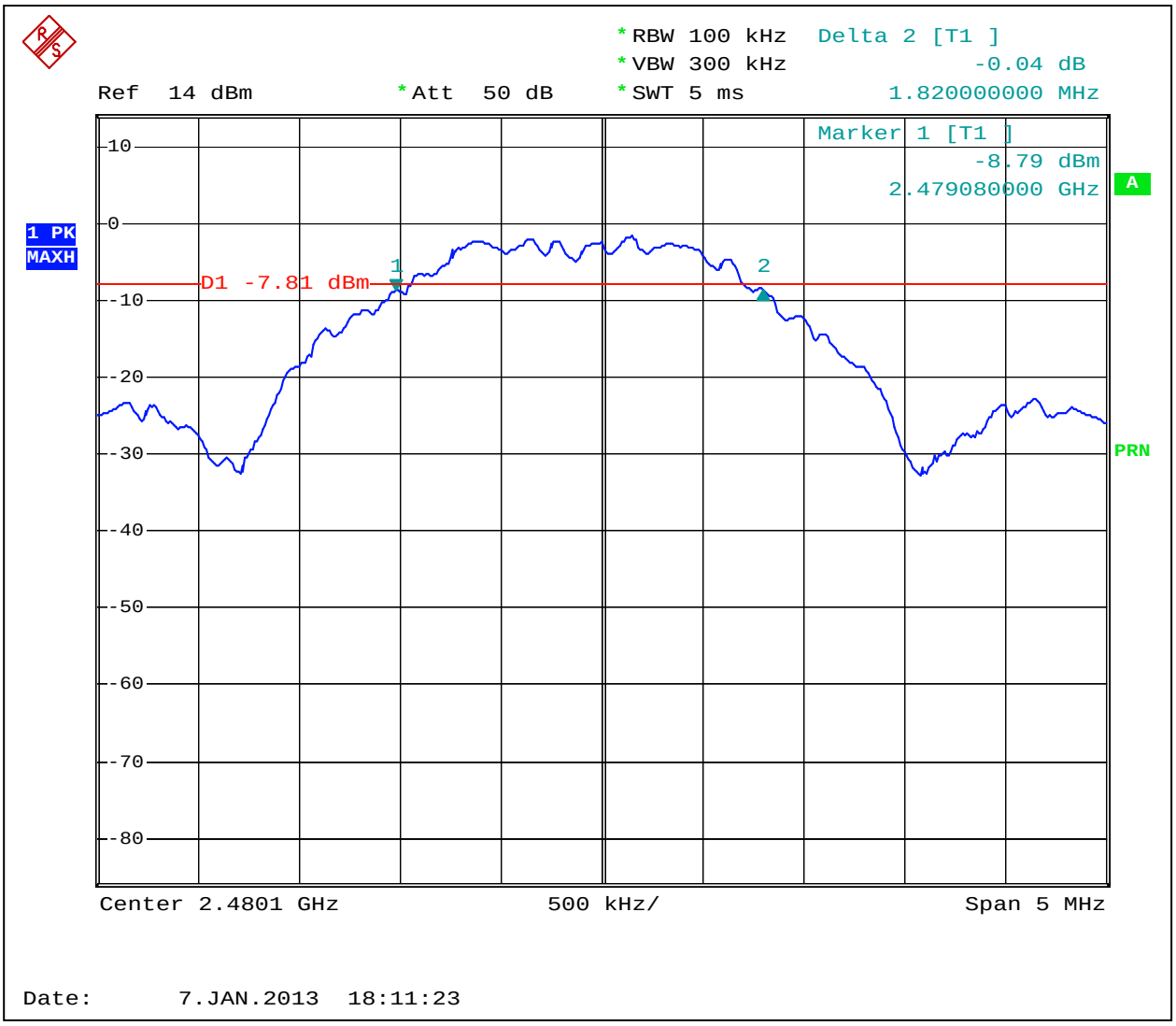
Notes: None


*RBW 100 kHz
*VBW 300 kHz
Ref 14 dBm
*Att 50 dB
*SWT 5 ms
Delta 2 [T1]
0.06 dB
1.810000000 MHz
Marker 1 [T1]
-8.35 dBm
2.404083334 GHz
1 PK
MAXH
A
PRN
D1 -7.5 dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.405033334 GHz
500 kHz/
Span 5 MHz
Date: 7.JAN.2013 18:07:36

Graph 3.2.1


*RBW 100 kHz
*VBW 300 kHz
*SWT 5 ms
Delta 2 [T1]
-0.06 dB
1.820000000 MHz
Ref 14 dBm
*Att 50 dB
Marker 1 [T1]
-8.73 dBm
2.444080000 GHz
1 PK
MAXH
A
PRN
D1 -7.89 dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.4451 GHz
500 kHz/
Span 5 MHz
Date: 7.JAN.2013 18:09:32

Graph 3.2.2

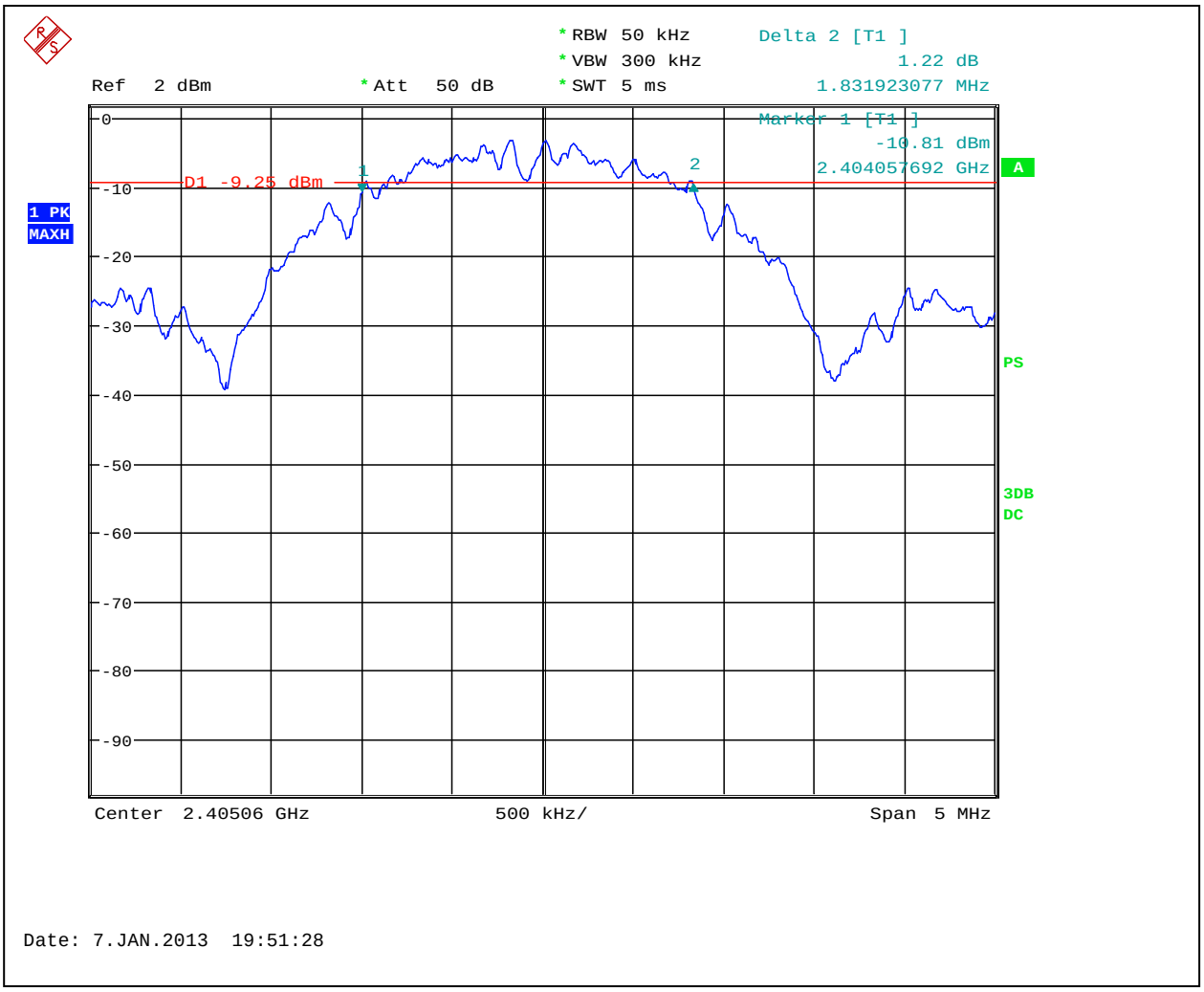

*RBW 100 kHz
*VBW 300 kHz
Ref 14 dBm
*Att 50 dB
*SWT 5 ms
Delta 2 [T1]
-0.04 dB
1.820000000 MHz
Marker 1 [T1]
-8.79 dBm
2.479080000 GHz
1 PK
MAXH
A
PRN
D1 -7.81 dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.4801 GHz
500 kHz/
Span 5 MHz
Date: 7.JAN.2013 18:11:23

Graph 3.2.3

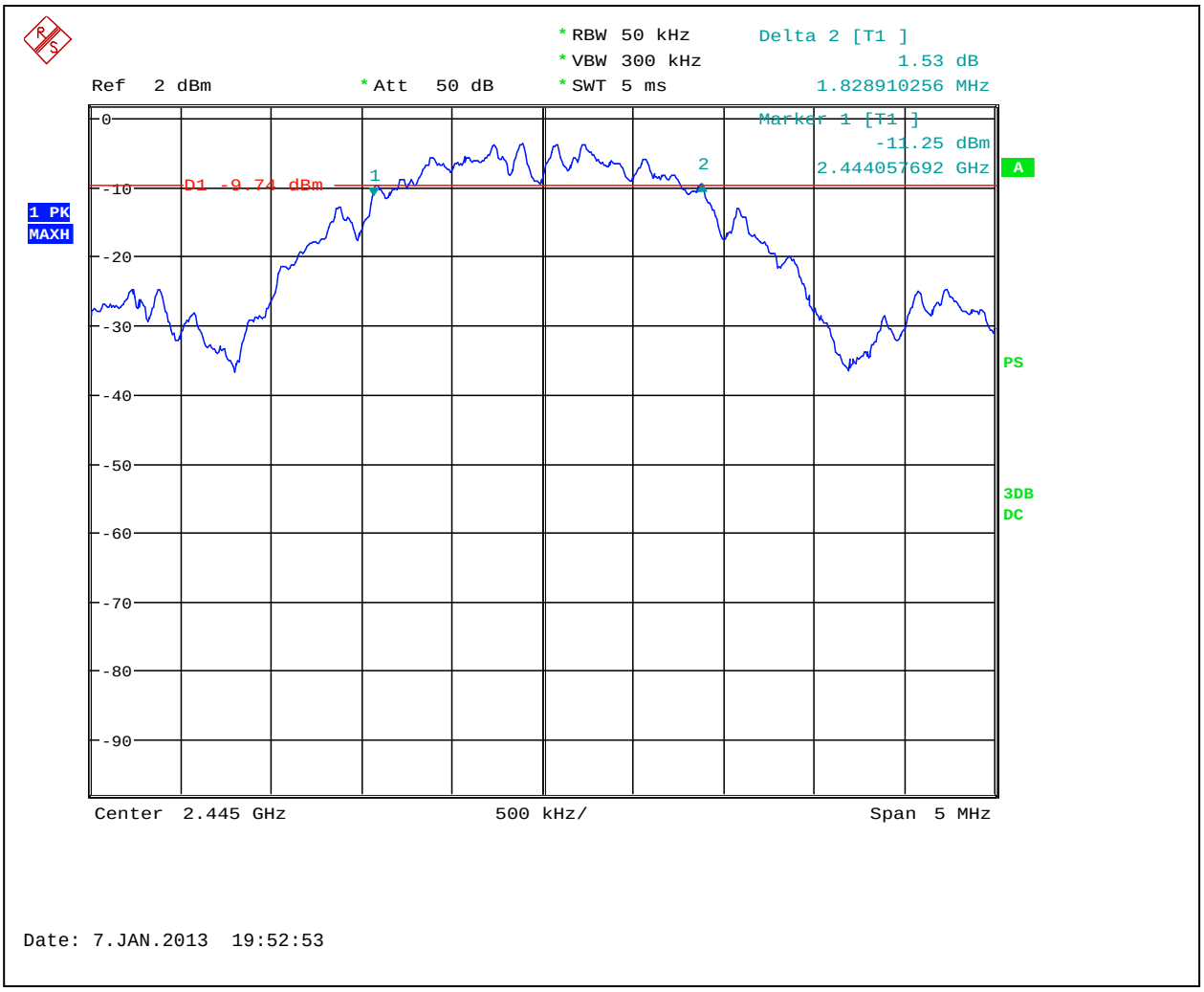
3.2.1 Emission bandwidth (EBW) of the digital modulation

Low Frequency Channel kHz	Middle Frequency Channel kHz	Upper Frequency Channel kHz	Minimum Bandwidth kHz	Result
1831.92	1828.91	1828.91	500	**Pass**
RBW: **VBW:**	☒ 50kHz ☐ other kHz ☒ 300kHz ☐ 300kHz ☐ other kHz			

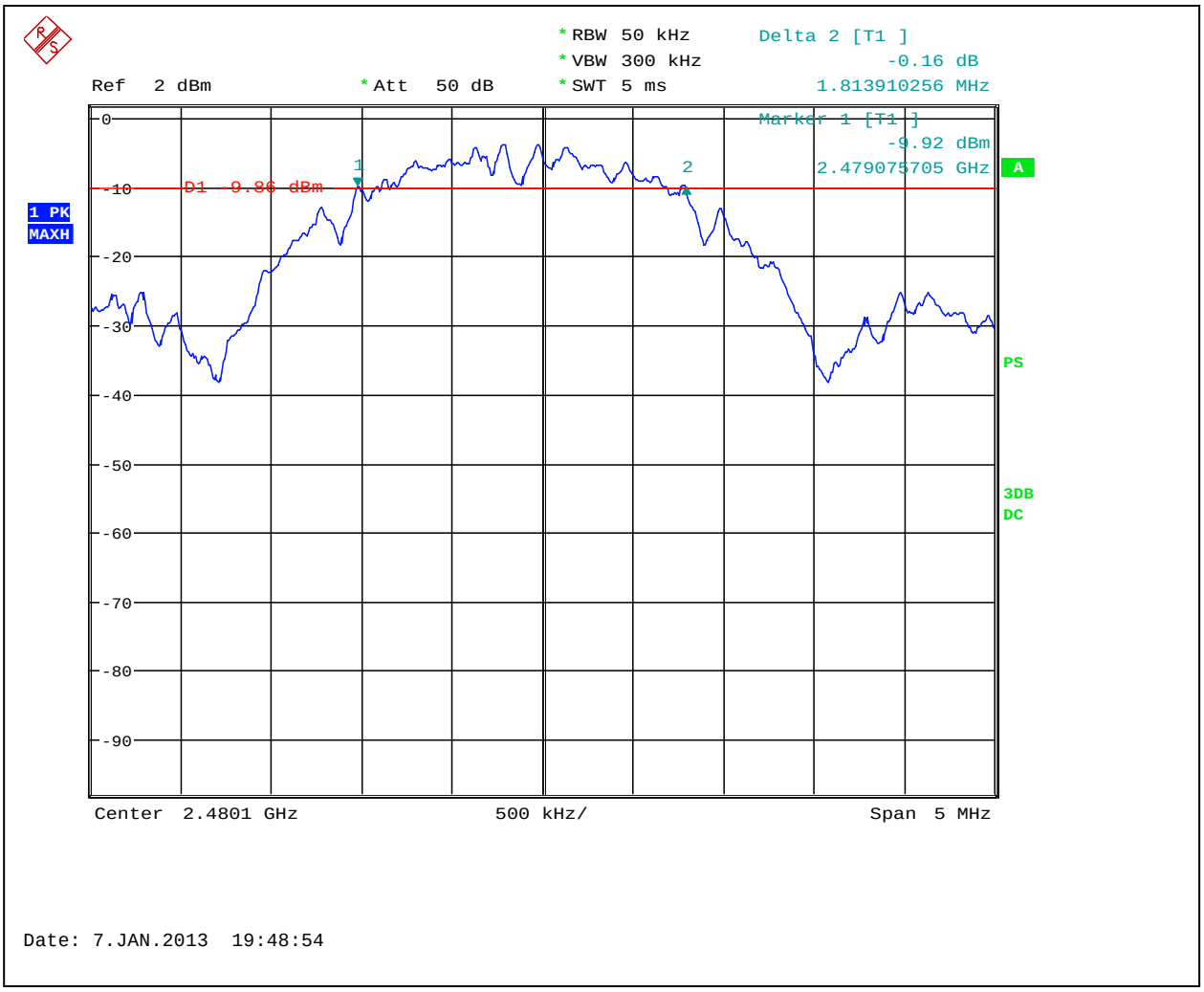
Notes: None


RBW 50 kHz
VBW 300 kHz
SWT 5 ms
Delta 2 [T1]
1.22 dB
1.831923077 MHz
Ref 2 dBm
Att 50 dB
Marker 1 [T1]
-10.81 dBm
2.404057692 GHz
D1 -9.25 dBm
1 PK
MAXH
A
PS
3DB
DC
Center 2.40506 GHz
500 kHz/
Span 5 MHz
Date: 7.JAN.2013 19:51:28

Graph 3.2.1.1


RBW 50 kHz
VBW 300 kHz
SWT 5 ms
Delta 2 [T1]
1.53 dB
1.828910256 MHz
Ref 2 dBm
Att 50 dB
Marker 1 [T1]
-11.25 dBm
2.444057692 GHz
D1 -9.74 dBm
1 PK
MAXH
A
PS
3DB
DC
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.445 GHz
500 kHz/
Span 5 MHz
Date: 7.JAN.2013 19:52:53

Graph 3.2.1.2

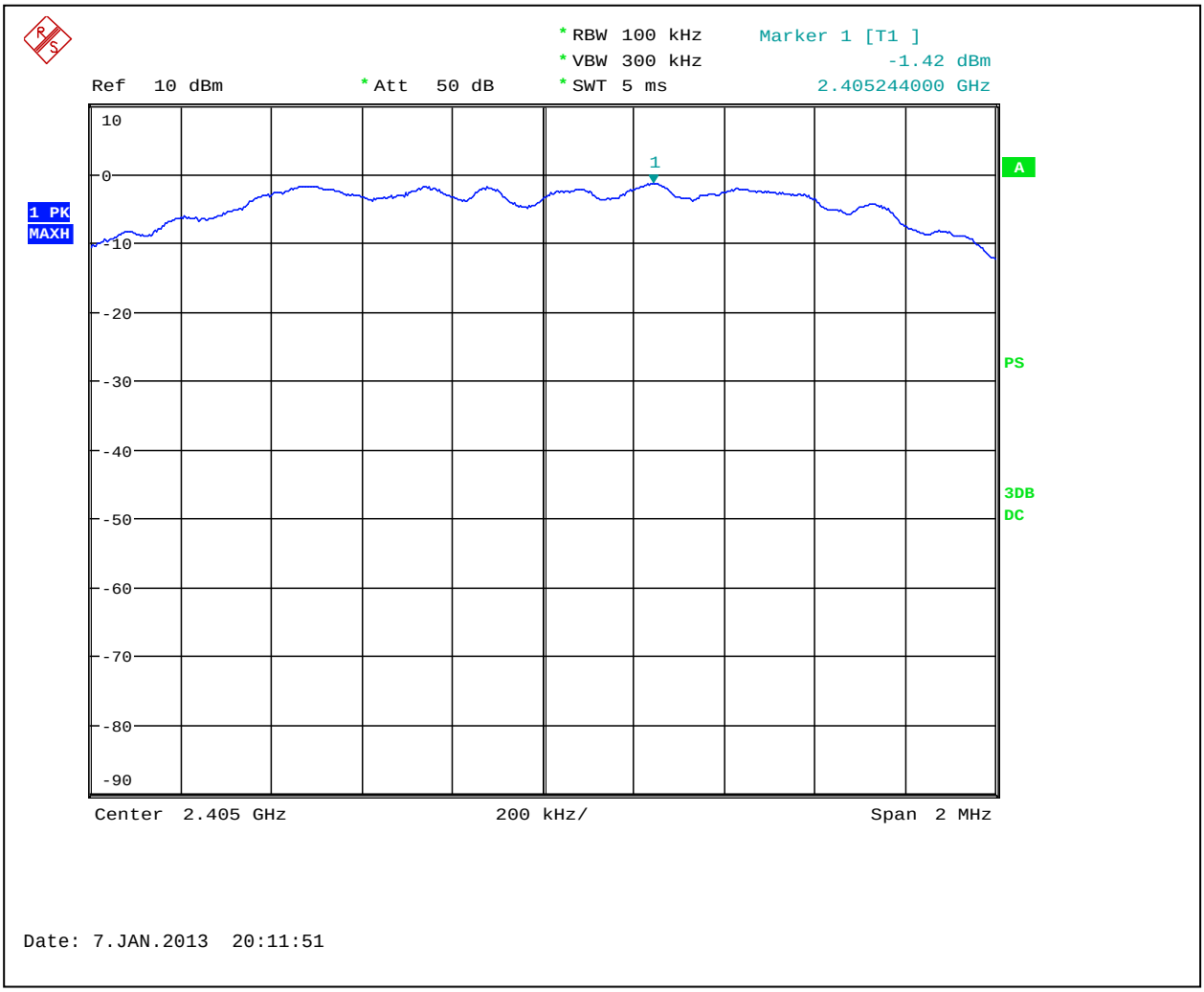

RBW 50 kHz
VBW 300 kHz
SWT 5 ms
Delta 2 [T1]
-0.16 dB
1.813910256 MHz
Ref 2 dBm
Att 50 dB
Marker 1 [T1]
-9.92 dBm
2.479075705 GHz
D1 -9.86 dBm
1 PK
MAXH
A
PS
3DB
DC
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.4801 GHz
500 kHz/
Span 5 MHz
Date: 7.JAN.2013 19:48:54

Graph 3.2.1.3

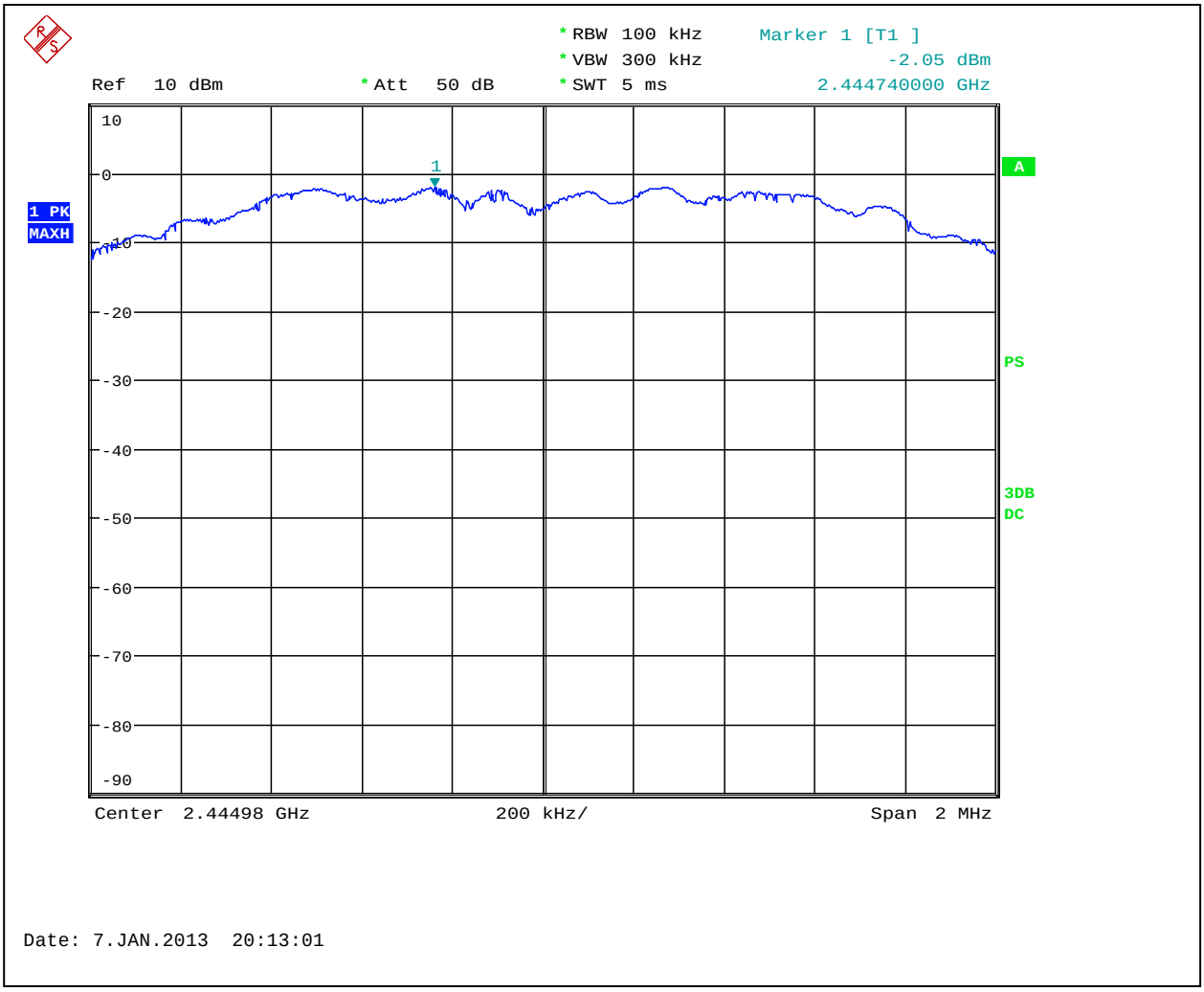
3.3 Power spectral density

Power Output:	☒ Conducted ☐ Radiated				
	Measured Density dBm	**Power Spectral Density (dBm) @ RBW 100kHz**	**Power Spectral Density (dBm) @ RBW 3kHz**	**Limit dBm**	**Margin dB**
Low Frequency Channel	-1.4	-0.1	-15.3	8	-23.3
Middle Frequency Channel	-2.1	-0.8	-16.0	8	-24.0
Upper Frequency Channel	-1.9	-0.6	-15.8	8	-23.8
Analyzer Settings:	☒ RBW=100KHz ☒ VBW=300KHz ☒ Span=2MHz ☒ Sweep=Auto				
Antenna Gain:	☒ < 6dBi and = dBi ☐ >6dBi and = dBi, limit reduction = dB				

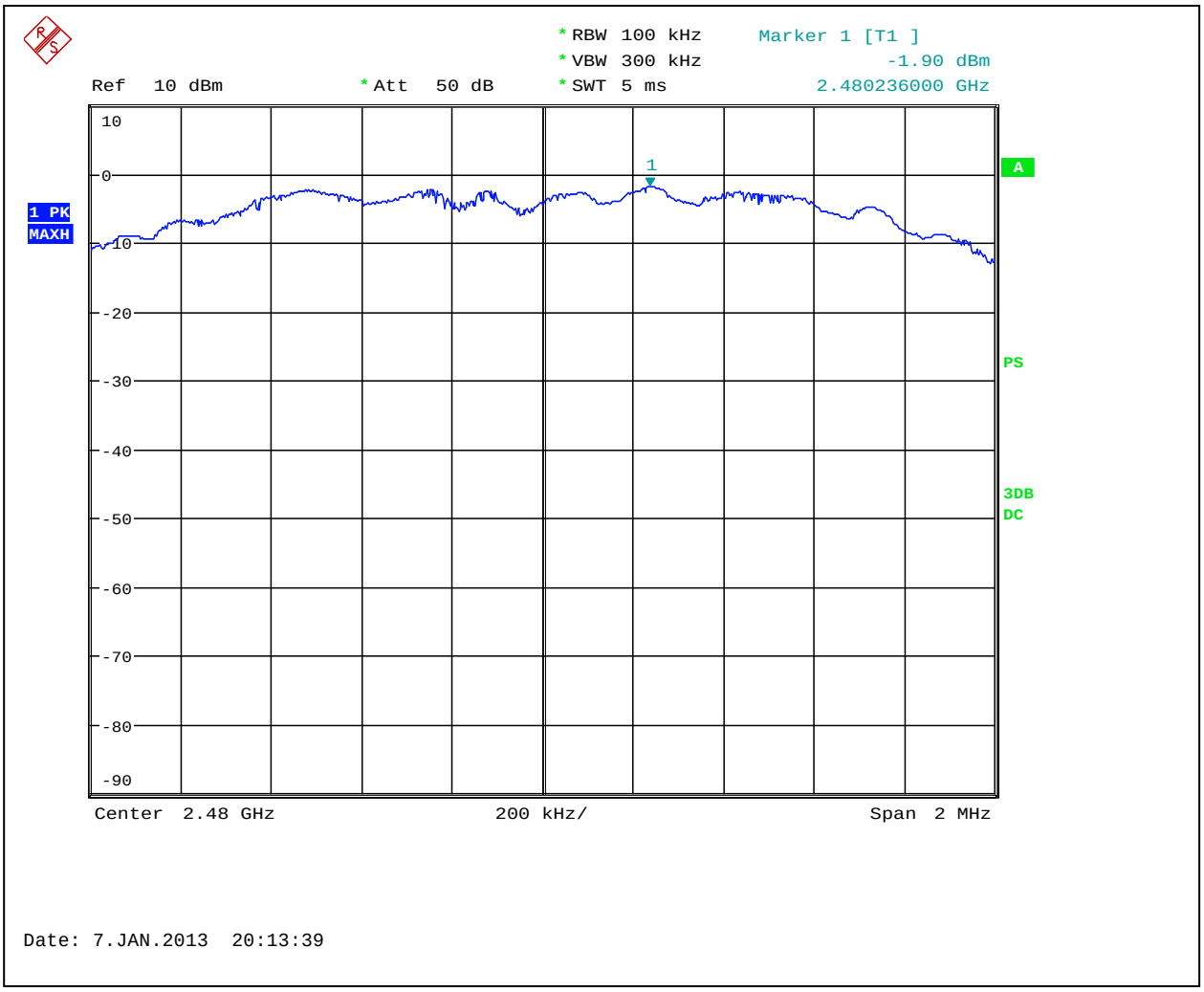
Notes: The Power Spectral Density was calculated adding the cable/attenuator loss of 1.3dB from the measured density value.
The observed power level at RBW=100kHz was adjusted by reducing the measured power by a bandwidth correction factor (BWCF)=15.2dB


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
Marker 1 [T1]
-1.42 dBm
2.405244000 GHz
Ref 10 dBm
Att 50 dB
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
1 PK
MAXH
A
PS
3DB
DC
Center 2.405 GHz
200 kHz/
Span 2 MHz
Date: 7.JAN.2013 20:11:51

Graph 3.3.1


*RBW 100 kHz
*VBW 300 kHz
*SWT 5 ms
Marker 1 [T1]
-2.05 dBm
2.444740000 GHz
Ref 10 dBm
*Att 50 dB
1 PK
MAXH
A
PS
3DB
DC
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.44498 GHz
200 kHz/
Span 2 MHz
Date: 7.JAN.2013 20:13:01

Graph 3.3.2

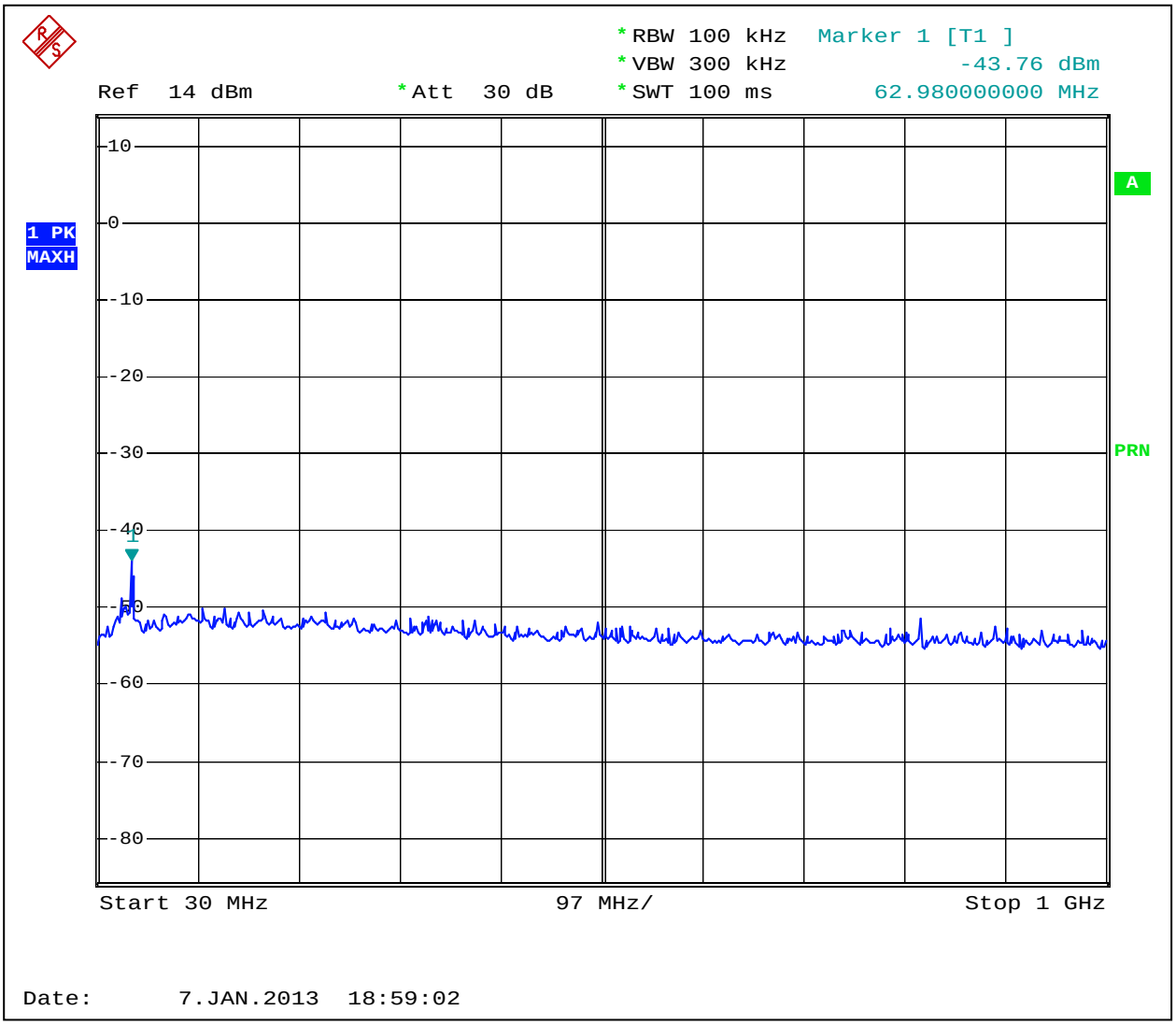

*RBW 100 kHz
*VBW 300 kHz
*SWT 5 ms
Marker 1 [T1]
-1.90 dBm
2.480236000 GHz
Ref 10 dBm
*Att 50 dB
1 PK
MAXH
A
PS
3DB
DC
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.48 GHz
200 kHz/
Span 2 MHz
Date: 7.JAN.2013 20:13:39

Graph 3.3.3

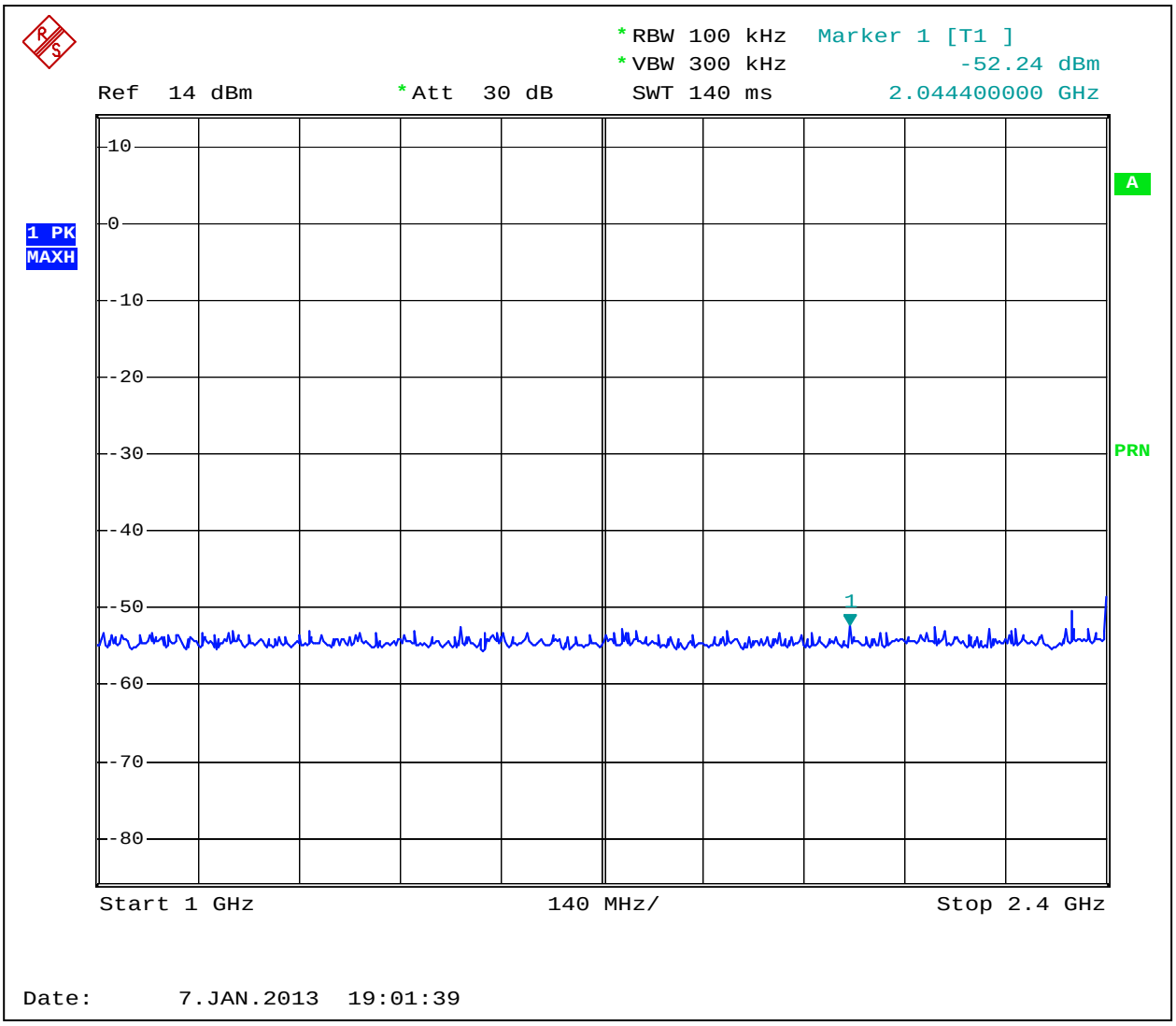
3.4 Antenna conducted spurious emissions

	Minimum Measured Attenuation dB	Minimum Allowed Attenuation dB	Margin dB
Low Frequency Channel	-43.8	20	-63.8
Middle Frequency Channel	-44.0	20	-64.0
Upper Frequency Channel	-44.2	20	-64.2
Analyzer Settings:	☒ RBW=100KHz		
Minimum Allowed Attenuation:	☒ 20dB ☐ 30dB (for digital systems with conducted power measured using RMS averaging over a time interval)		

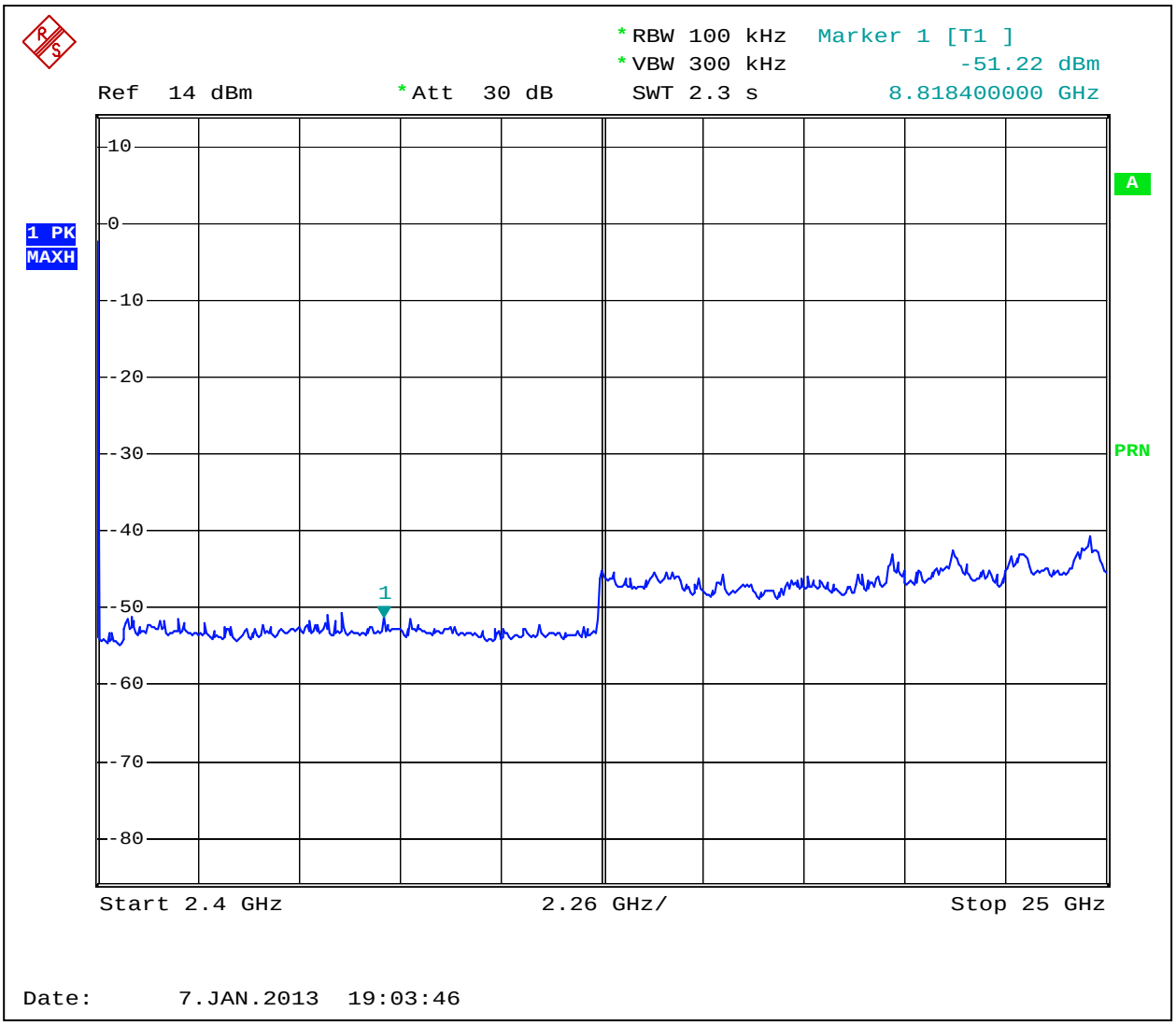
Notes: None


*RBW 100 kHz
*VBW 300 kHz
*SWT 100 ms
Marker 1 [T1]
-43.76 dBm
62.980000000 MHz
Ref 14 dBm
*Att 30 dB
1 PK
MAXH
A
PRN
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Start 30 MHz
97 MHz/
Stop 1 GHz
Date: 7.JAN.2013 18:59:02

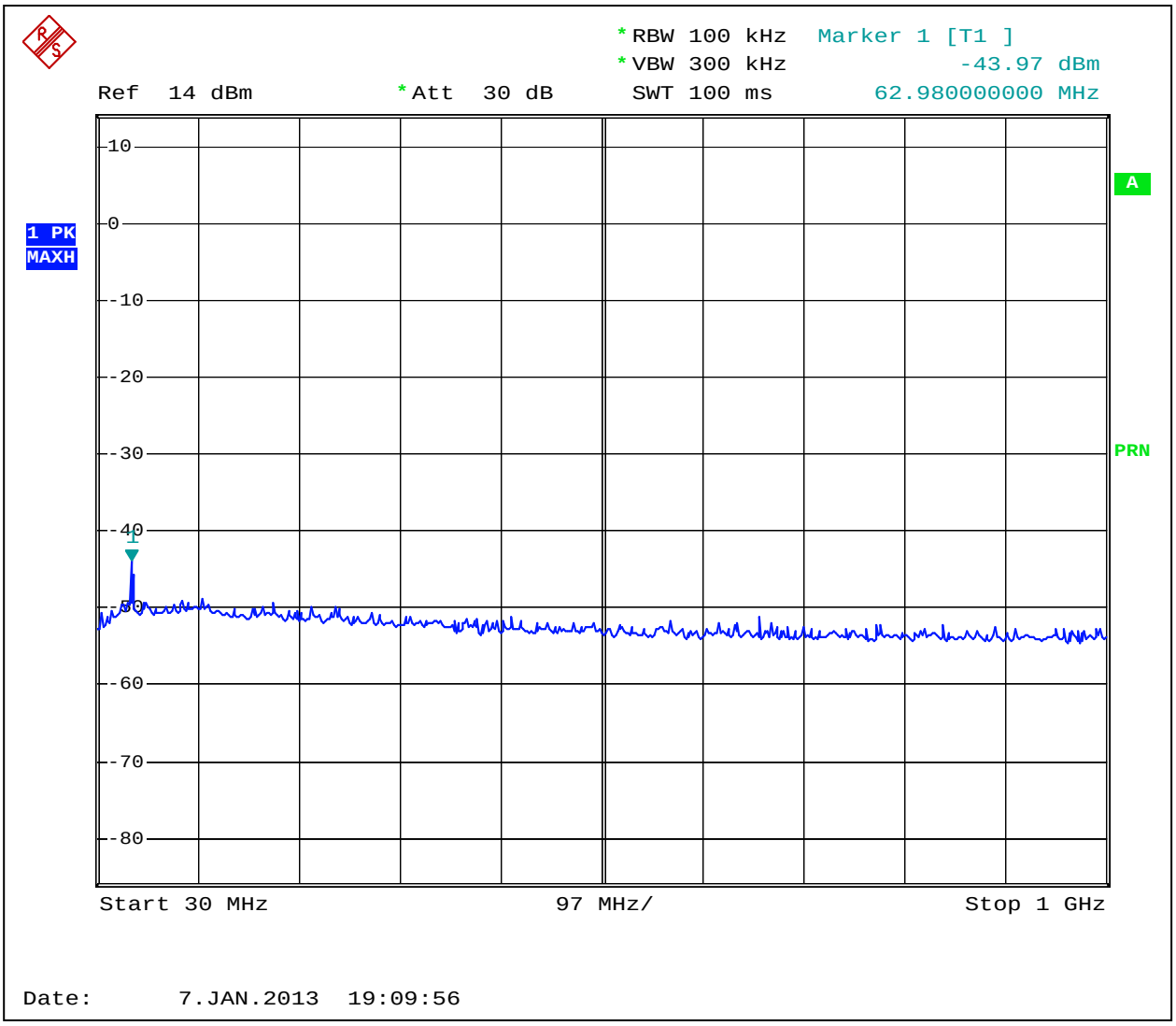
Graph 3.4.1


*RBW 100 kHz
*VBW 300 kHz
Ref 14 dBm
*Att 30 dB
SWT 140 ms
Marker 1 [T1]
-52.24 dBm
2.044400000 GHz
1 PK
MAXH
A
PRN
10
0
-10
-20
-30
-40
-50
-60
-70
-80
1
Start 1 GHz
140 MHz/
Stop 2.4 GHz
Date: 7.JAN.2013 19:01:39

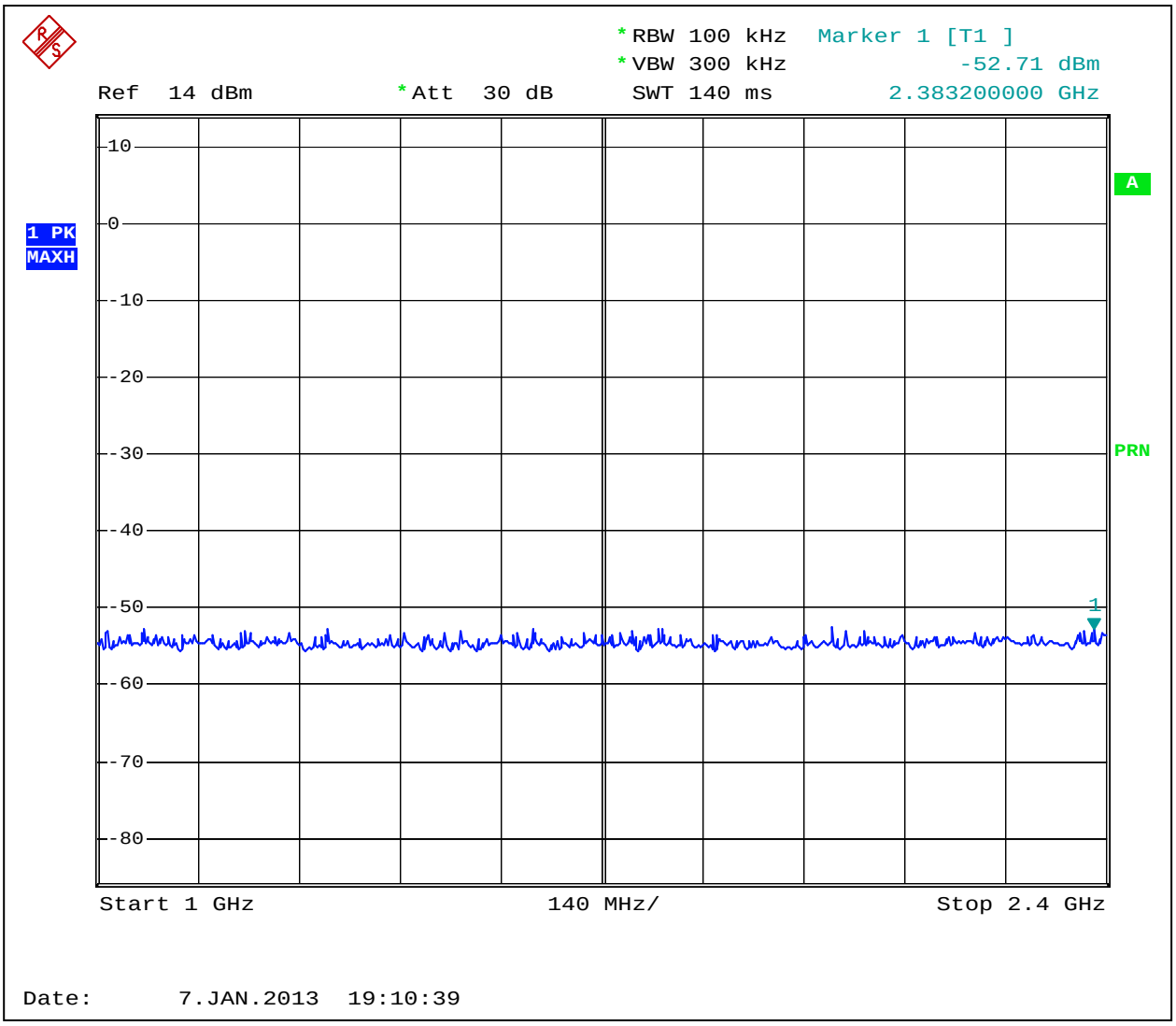
Graph 3.4.2


*RBW 100 kHz
*VBW 300 kHz
Ref 14 dBm
*Att 30 dB
SWT 2.3 s
Marker 1 [T1]
-51.22 dBm
8.818400000 GHz
1 PK
MAXH
A
PRN
10
0
-10
-20
-30
-40
-50
-60
-70
-80
1
Start 2.4 GHz
2.26 GHz/
Stop 25 GHz
Date: 7.JAN.2013 19:03:46

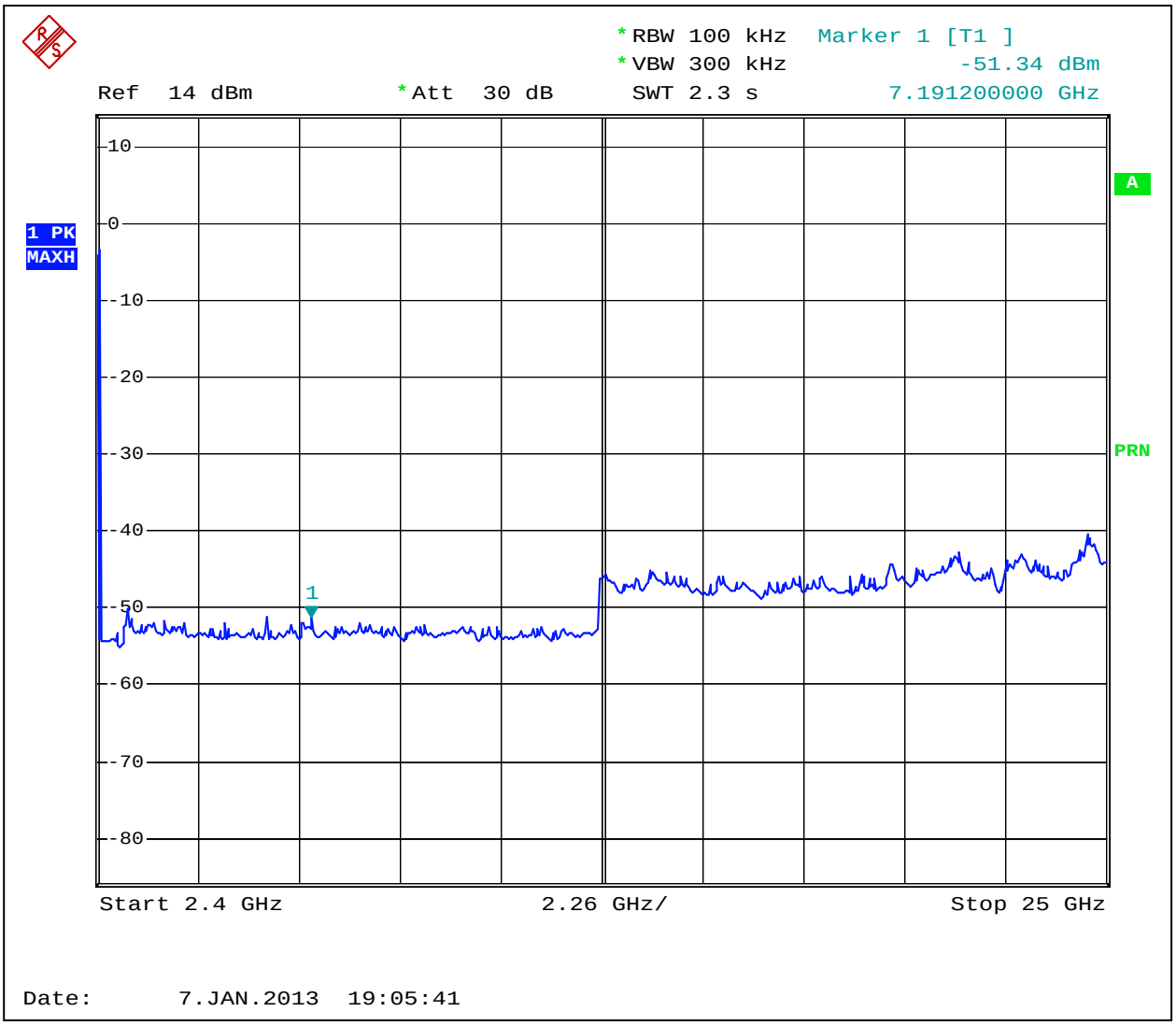
Graph 3.4.3


*RBW 100 kHz
*VBW 300 kHz
Ref 14 dBm
*Att 30 dB
SWT 100 ms
Marker 1 [T1]
-43.97 dBm
62.980000000 MHz
1 PK
MAXH
A
PRN
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Start 30 MHz
97 MHz/
Stop 1 GHz
Date: 7.JAN.2013 19:09:56

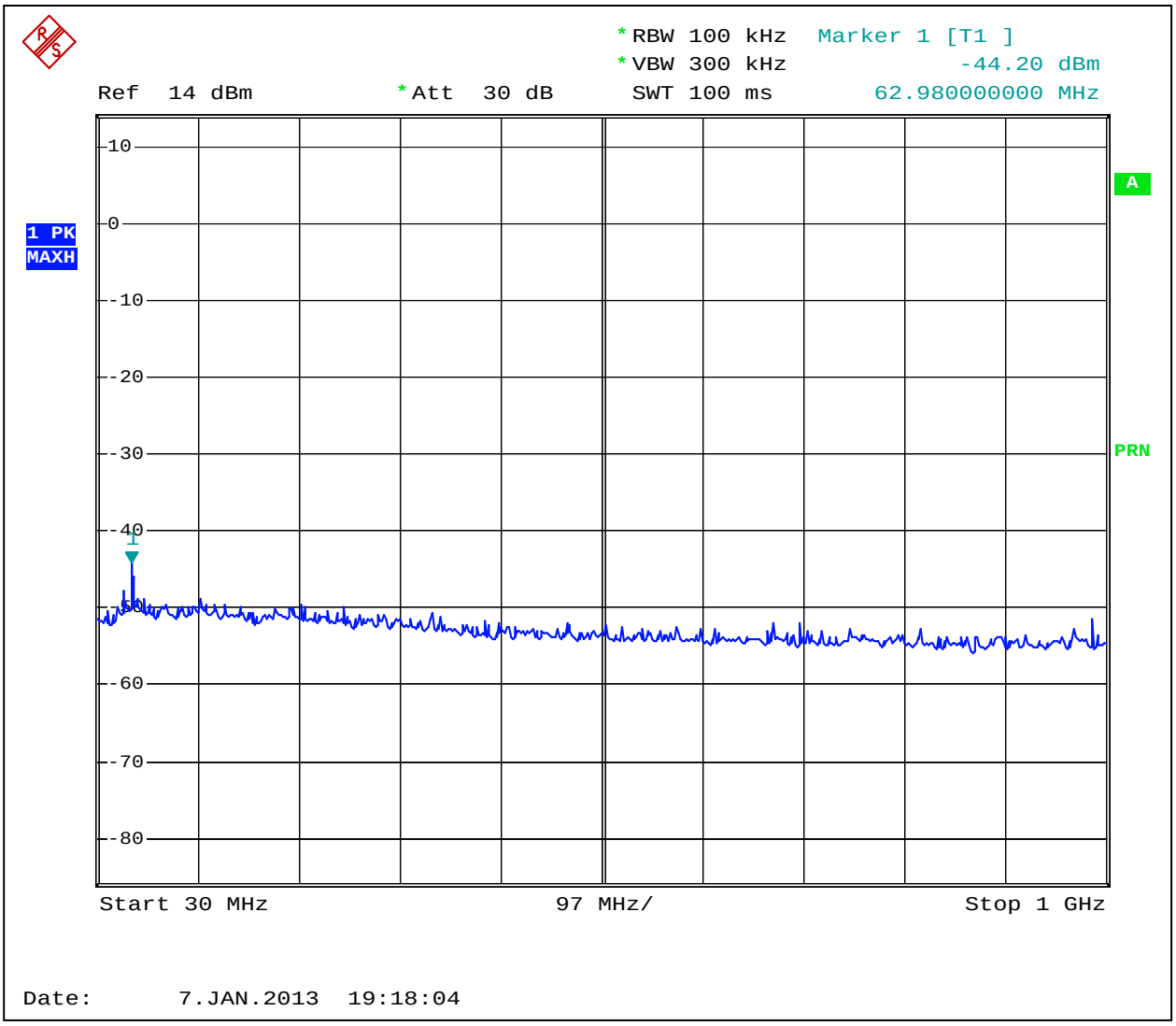
Graph 3.4.4


*RBW 100 kHz
*VBW 300 kHz
Ref 14 dBm
*Att 30 dB
SWT 140 ms
Marker 1 [T1]
-52.71 dBm
2.383200000 GHz
1 PK
MAXH
A
PRN
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Start 1 GHz
140 MHz/
Stop 2.4 GHz
Date: 7.JAN.2013 19:10:39

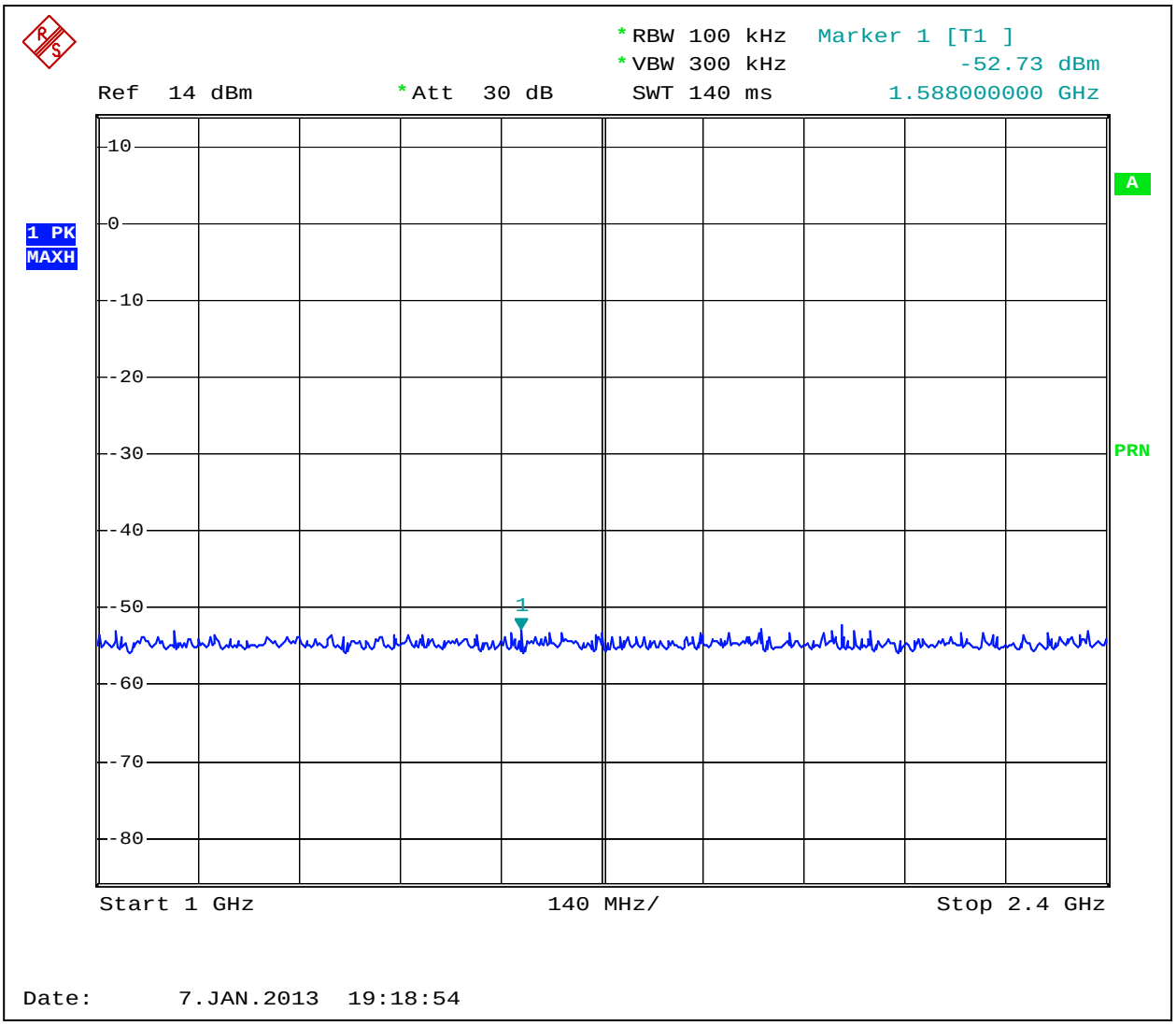
Graph 3.4.5


*RBW 100 kHz
*VBW 300 kHz
Marker 1 [T1]
-51.34 dBm
Ref 14 dBm
*Att 30 dB
SWT 2.3 s
7.191200000 GHz
1 PK
MAXH
A
PRN
10
0
-10
-20
-30
-40
-50
-60
-70
-80
1
Start 2.4 GHz
2.26 GHz/
Stop 25 GHz
Date: 7.JAN.2013 19:05:41

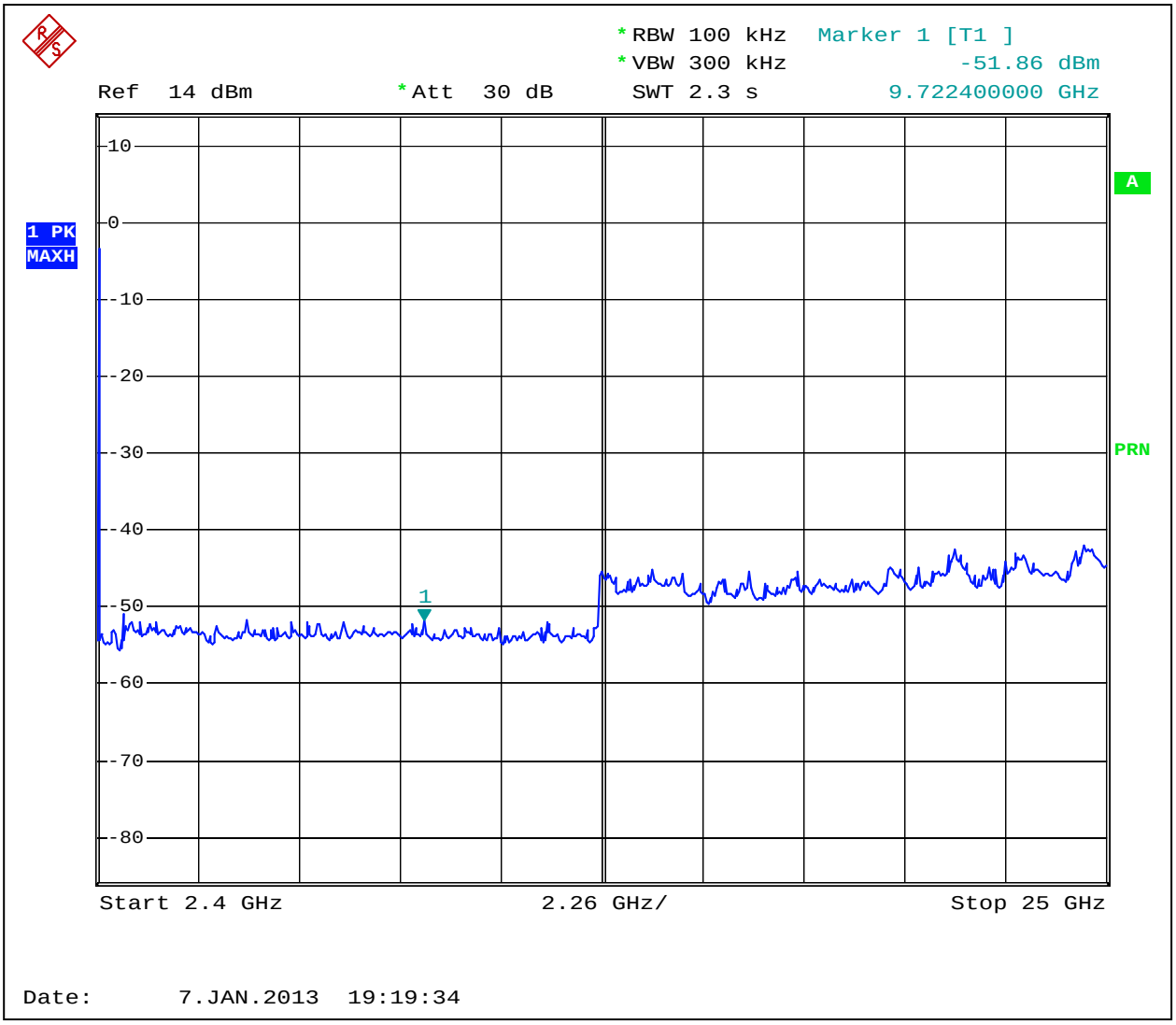
Graph 3.4.6


*RBW 100 kHz
*VBW 300 kHz
Ref 14 dBm
*Att 30 dB
SWT 100 ms
Marker 1 [T1]
-44.20 dBm
62.980000000 MHz
1 PK
MAXH
A
PRN
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Start 30 MHz
97 MHz/
Stop 1 GHz
Date: 7.JAN.2013 19:18:04

Graph 3.4.7


*RBW 100 kHz
*VBW 300 kHz
Ref 14 dBm
*Att 30 dB
SWT 140 ms
Marker 1 [T1]
-52.73 dBm
1.588000000 GHz
1 PK
MAXH
A
PRN
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Start 1 GHz
140 MHz/
Stop 2.4 GHz
Date: 7.JAN.2013 19:18:54

Graph 3.4.8

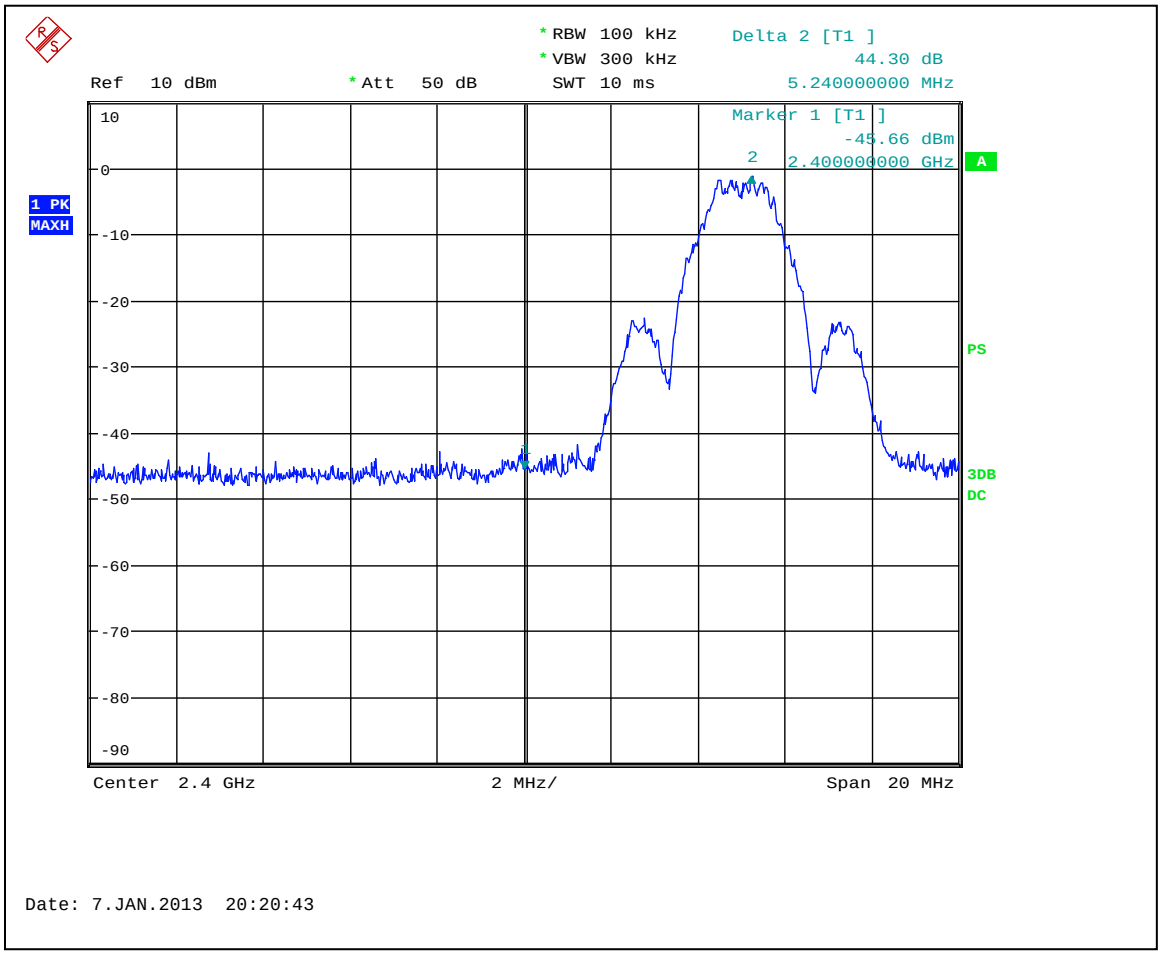

*RBW 100 kHz
*VBW 300 kHz
Marker 1 [T1]
-51.86 dBm
9.722400000 GHz
Ref 14 dBm
*Att 30 dB
SWT 2.3 s
1 PK
MAXH
A
PRN
10
0
-10
-20
-30
-40
-50
-60
-70
-80
1
Start 2.4 GHz
2.26 GHz/
Stop 25 GHz
Date: 7.JAN.2013 19:19:34

Graph 3.4.9

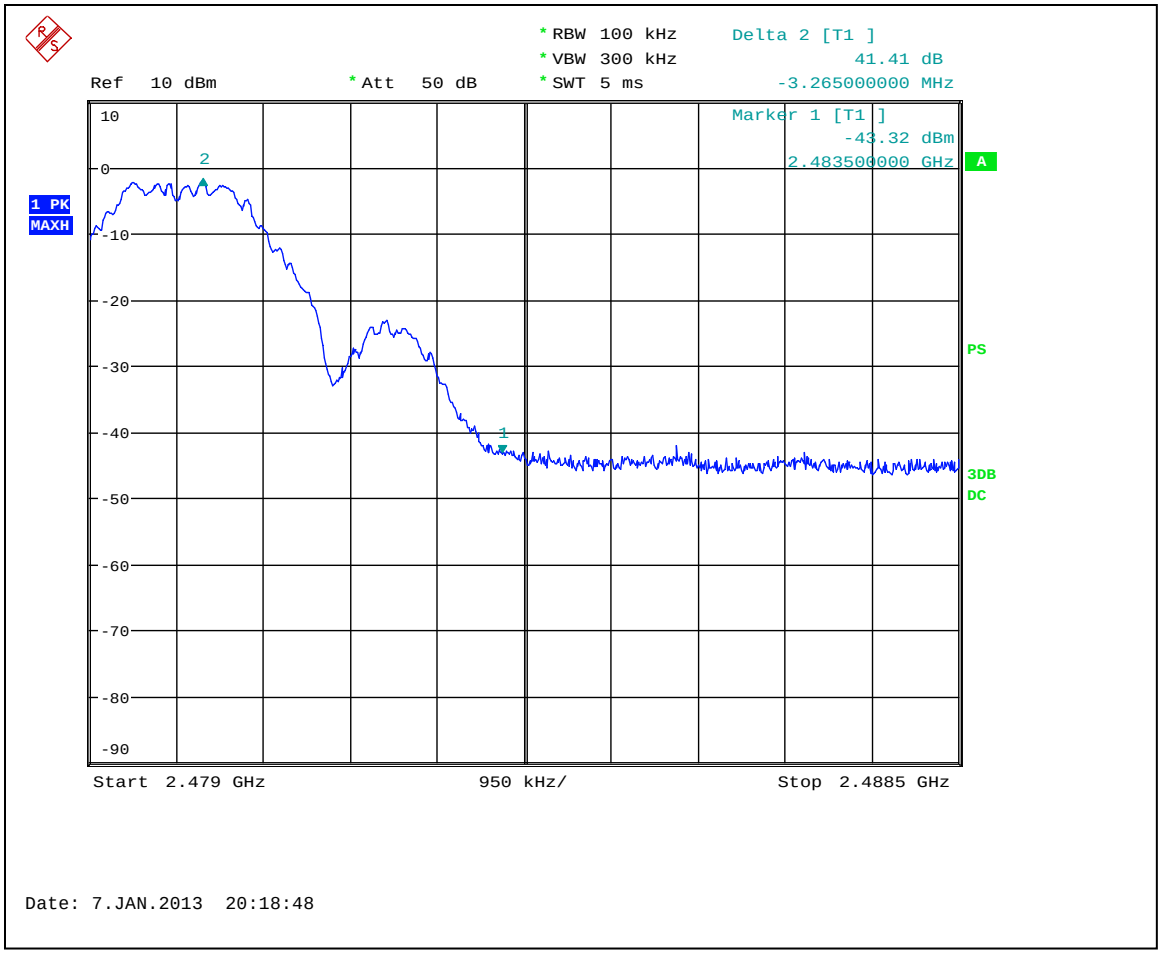
3.4.1 Antenna conducted band edge compliance

Frequency Range:	☐ 902-928MHz ☒ 2400-2483.5MHz ☐ 5725-5850MHz		
	Minimum Measured Attenuation dB	**Minimum Allowed Attenuation dB**	**Margin dB**
Low Frequency Channel	44.3	20	-24.3
Upper Frequency Channel	41.4	20	-21.4
Analyzer Settings:	☒ RBW=100KHz		
Minimum Allowed Attenuation:	☒ 20dB ☐ 30dB (for digital systems with conducted power measured using RMS averaging over a time interval)		

Notes: None


*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 50 dB
SWT 10 ms
Delta 2 [T1]
44.30 dB
5.240000000 MHz
Marker 1 [T1]
-45.66 dBm
2.400000000 GHz
1 PK
MAXH
A
PS
3DB
DC
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.4 GHz
2 MHz/
Span 20 MHz
Date: 7.JAN.2013 20:20:43

Graph 3.4.10


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
Delta 2 [T1]
41.41 dB
-3.265000000 MHz
Ref 10 dBm
Att 50 dB
Marker 1 [T1]
-43.32 dBm
2.483500000 GHz
1 PK
MAXH
A
PS
3DB
DC
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Start 2.479 GHz
950 kHz/
Stop 2.4885 GHz
Date: 7.JAN.2013 20:18:48

Graph 3.4.11

3.5 Radiated spurious emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test result: **Pass**

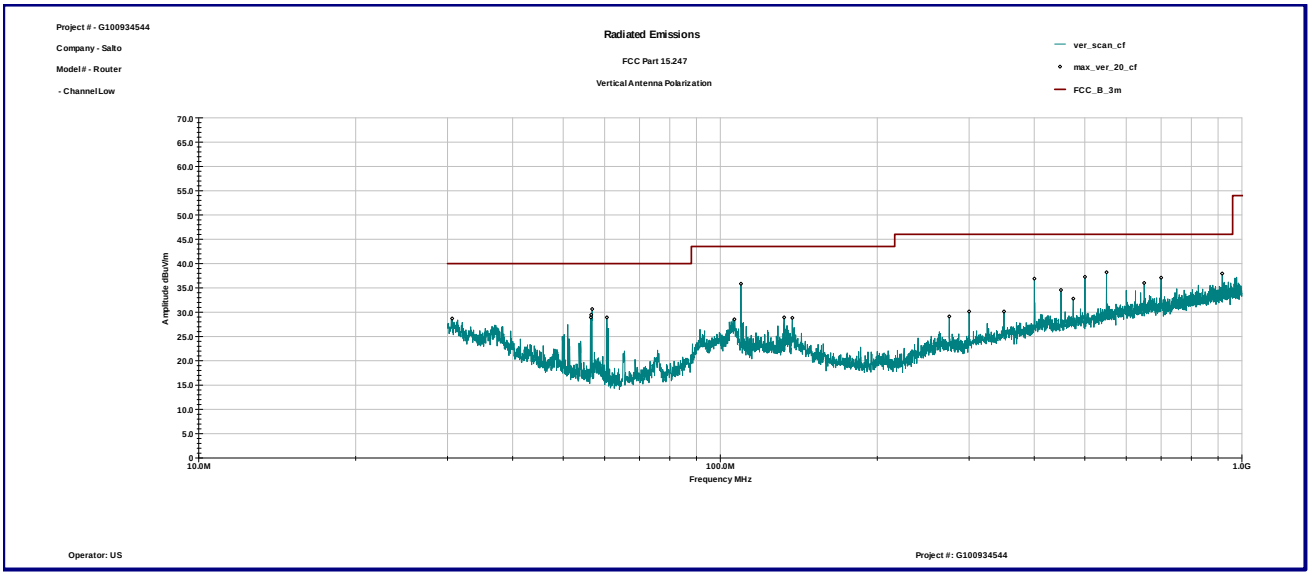
Max. Margin: 6.4dB below the limits

Date:	January 8-9, 2013, January 24, 2013	**Result:** **Pass**
Standard:	FCC part 15.247(d)	
Tested by:	Richard Blonigen/Uri Spector	
Test Point:	Enclosure	
Operation mode:	See Page 5	
Note:	Emissions at fundamental frequency, spurious emissions and harmonics outside restricted band of operation per FCC 15.205, and spurious emissions not related with transmitter operations were excluded from the Table. Testing was performed at Low, Middle and Upper channels.	

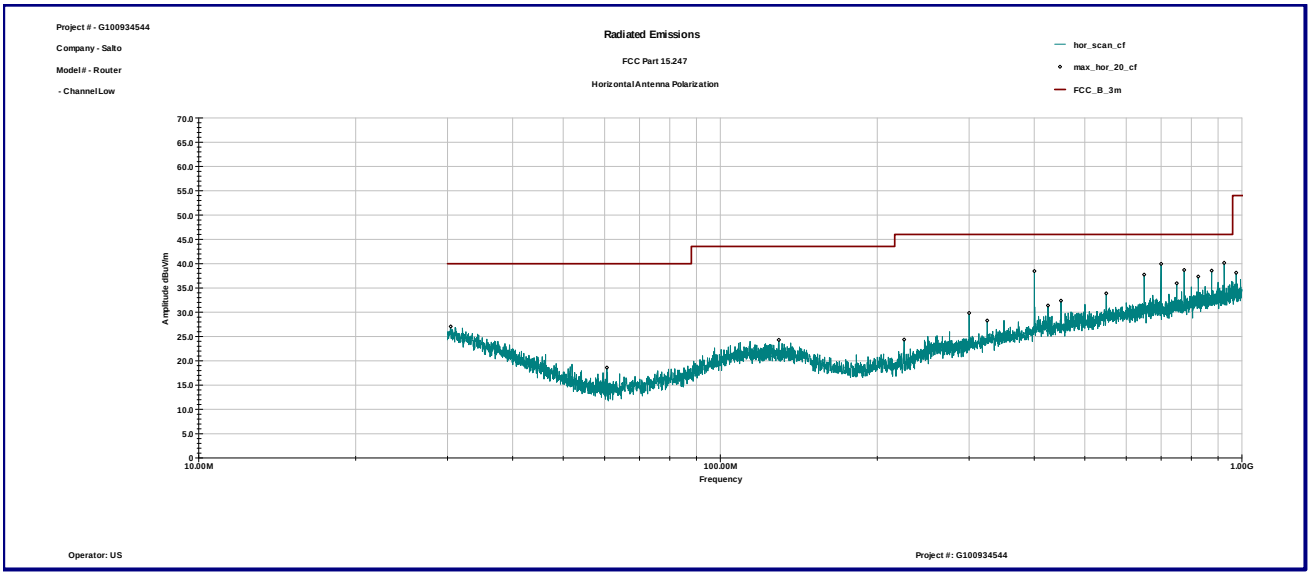
Table 3.5.1

Frequency MHz	Antenna Polarity	Peak Reading dBµV	Total C.F. dB1/m	Pre-Amp. Gain (dB)	Total at 3m dBµV/m	Limit dBµV/m	Margin dB
Channel Low							
4.8073 GHz	V	47.6	37.2	39.2	45.7	54.0	-8.3
4.812 GHz	H	49.7	37.1	39.2	47.6	54.0	-6.4
Channel Middle							
4.8913 GHz	V	44.5	37.4	39.1	42.8	54.0	-11.2
4.8913 GHz	H	49.0	37.2	39.1	47.2	54.0	-6.8
Channel High							
4.9613 GHz	V	44.2	37.5	39.0	42.7	54.0	-11.3
4.9613 GHz	H	46.6	37.3	39.0	44.9	54.0	-9.1

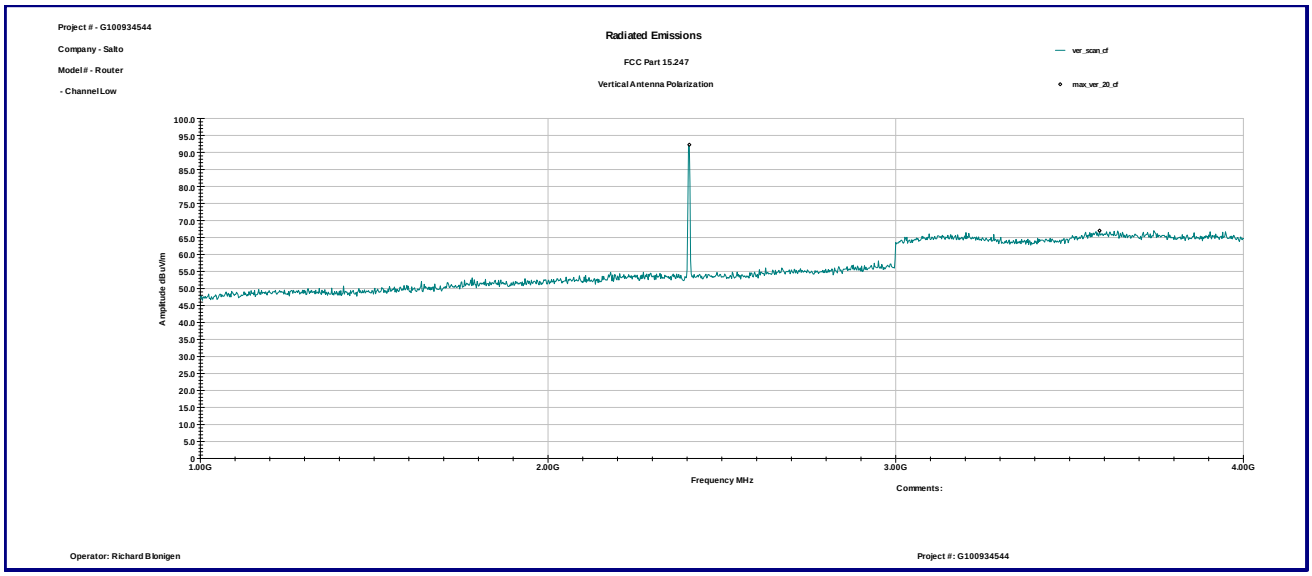
Comment:



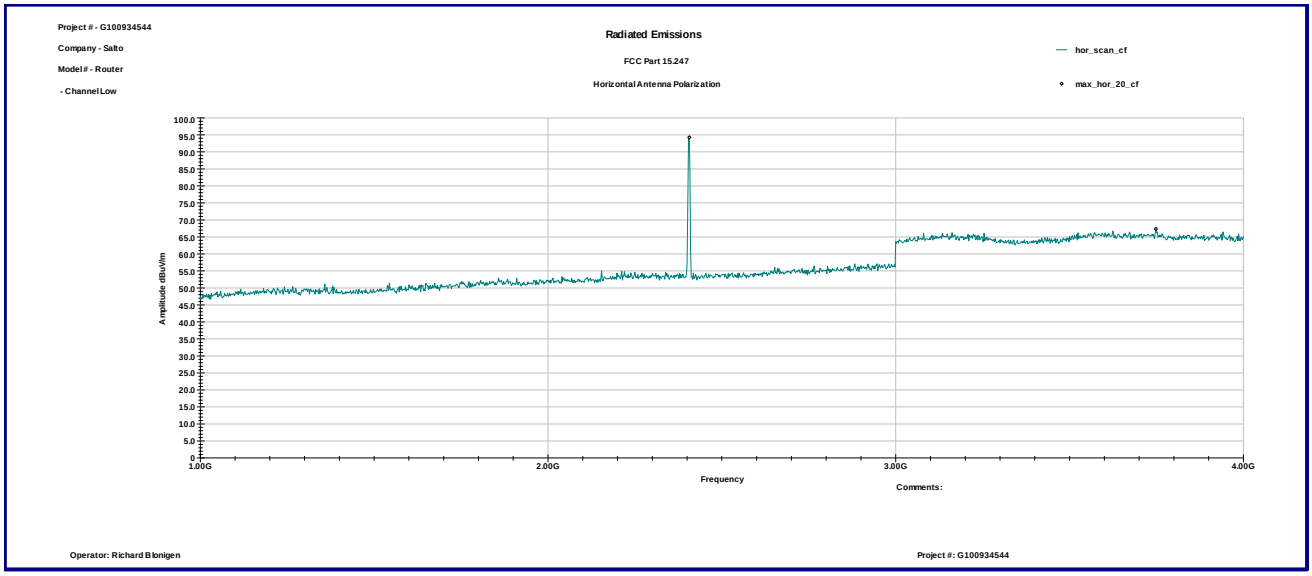
Graph 3.5.1



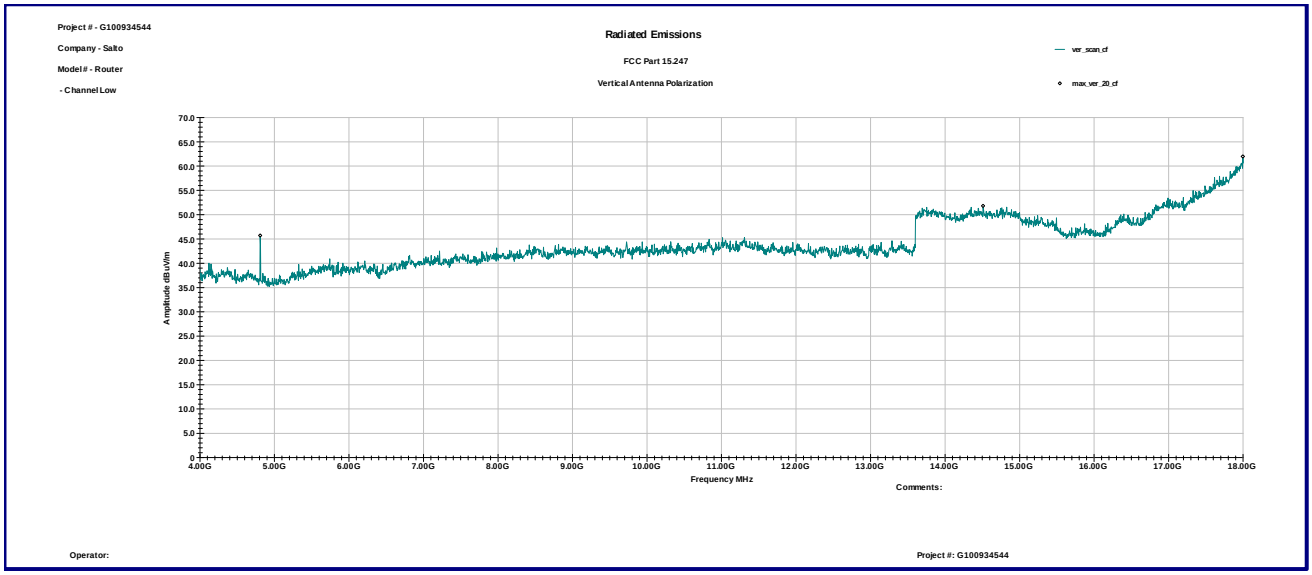
Graph 3.5.2



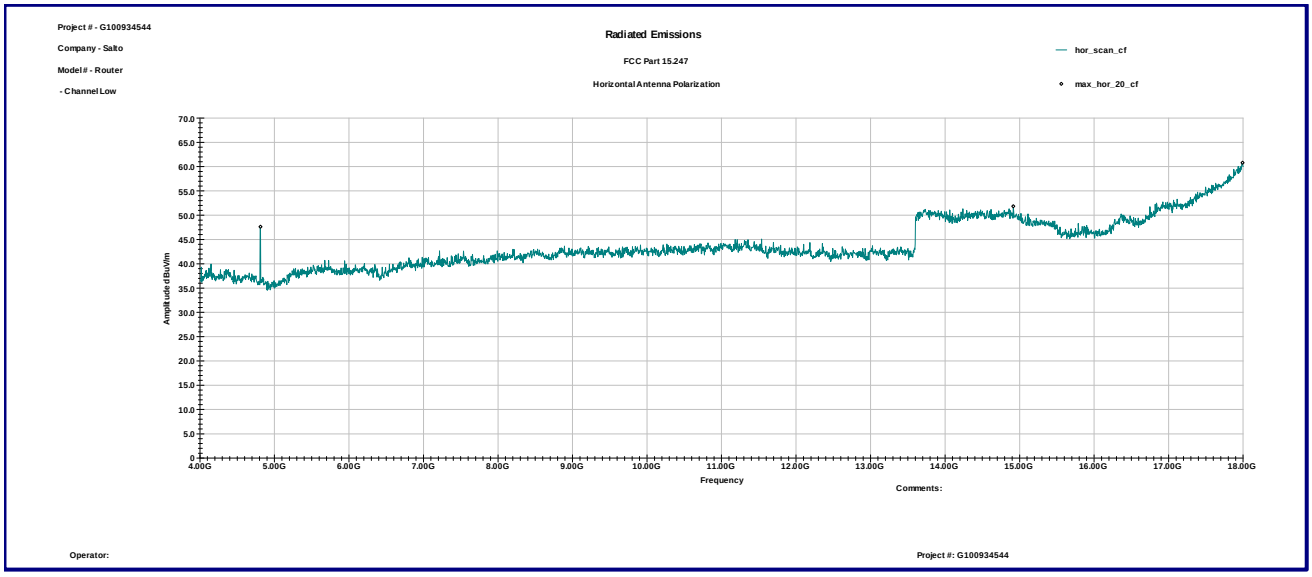
Graph 3.5.3



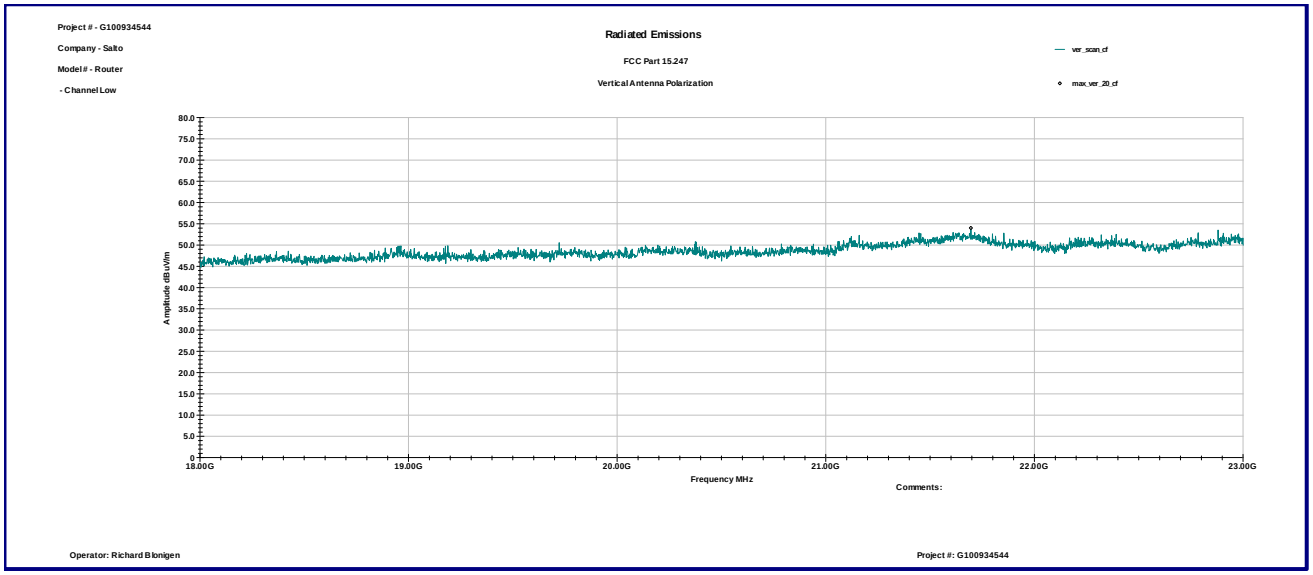
Graph 3.5.4



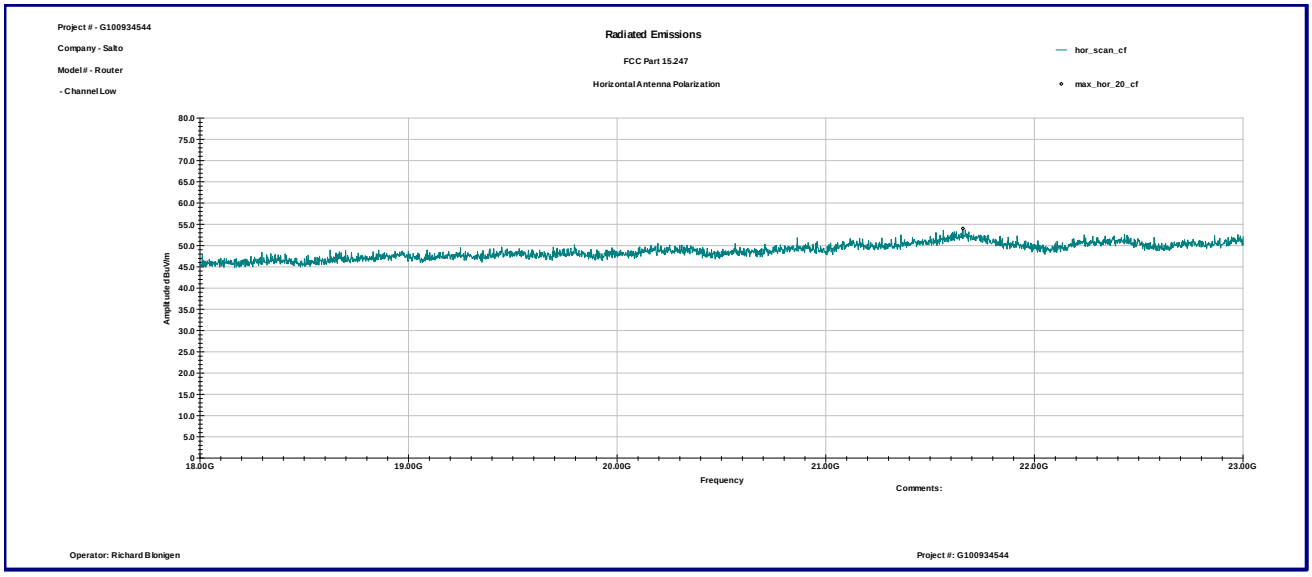
Graph 3.5.5



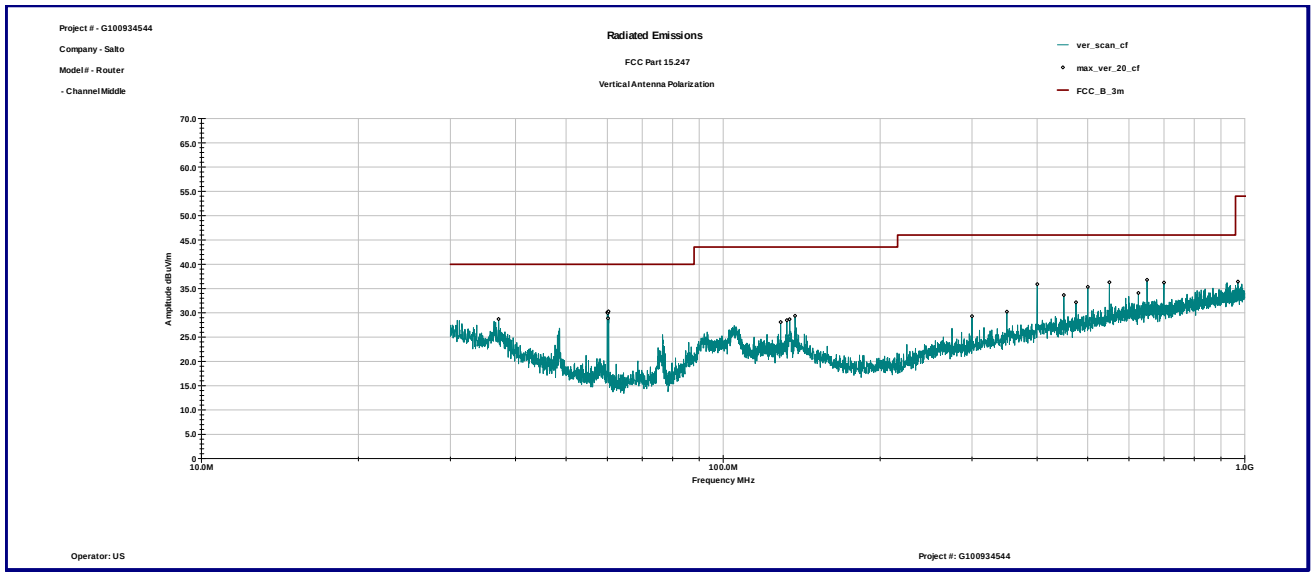
Graph 3.5.6



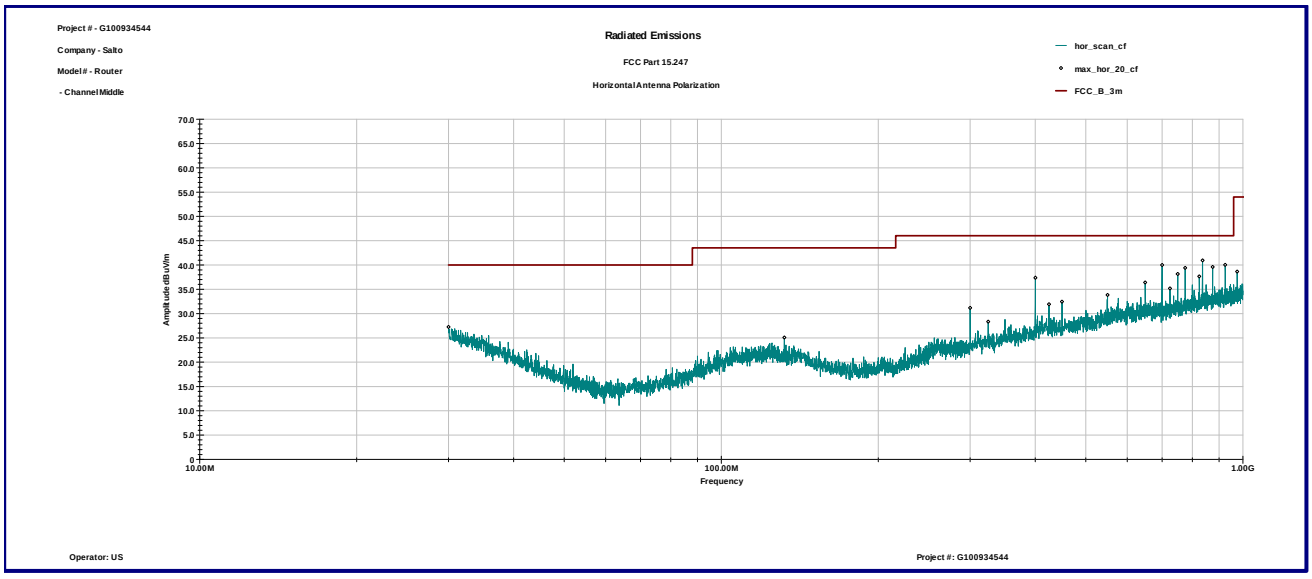
Graph 3.5.7



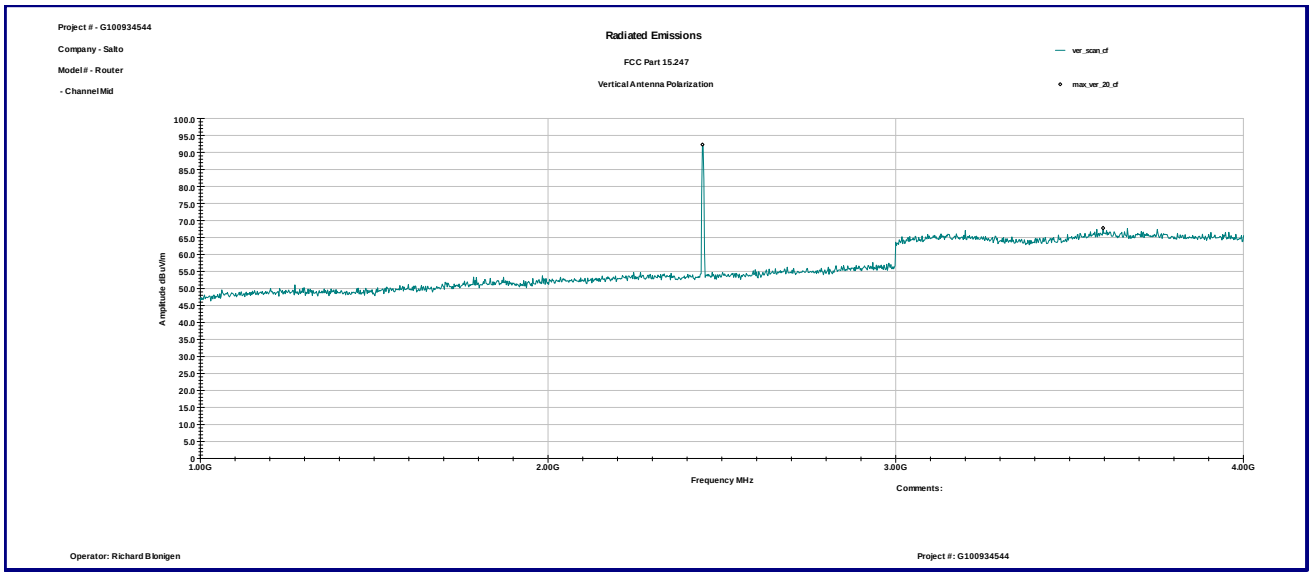
Graph 3.5.8



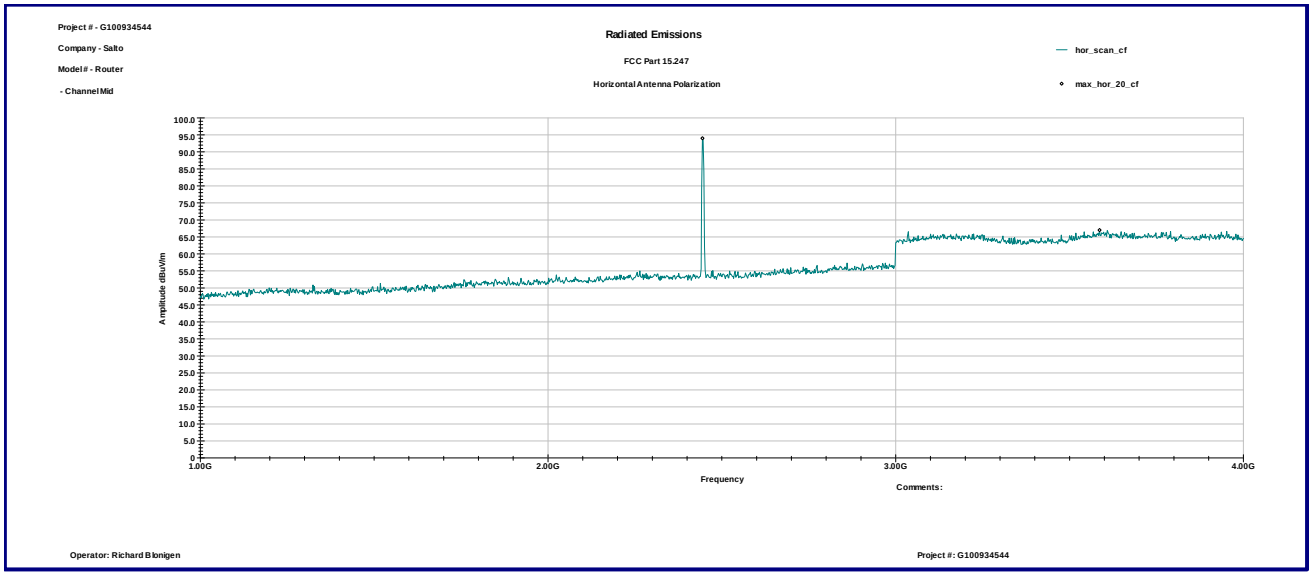
Graph 3.5.9



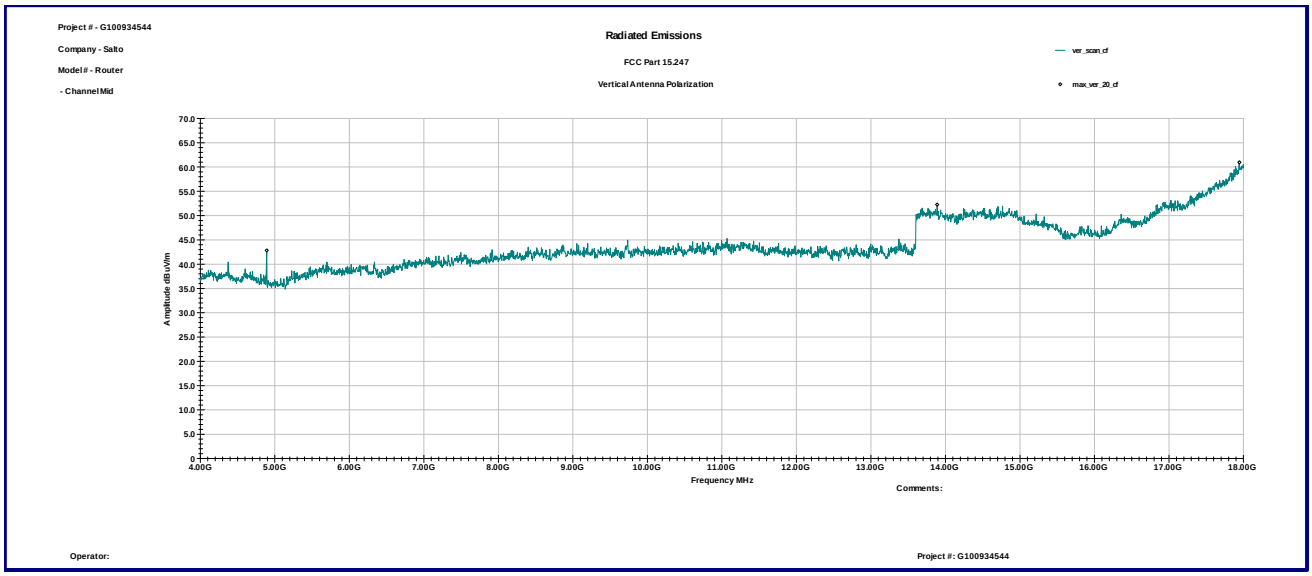
Graph 3.5.10



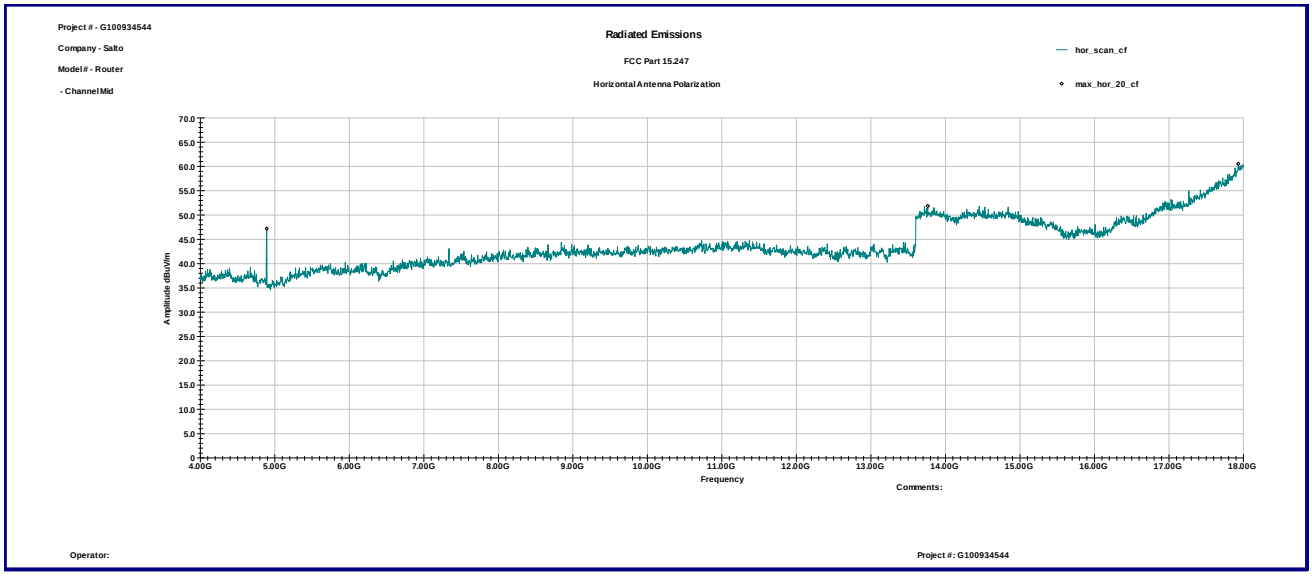
Graph 3.5.11



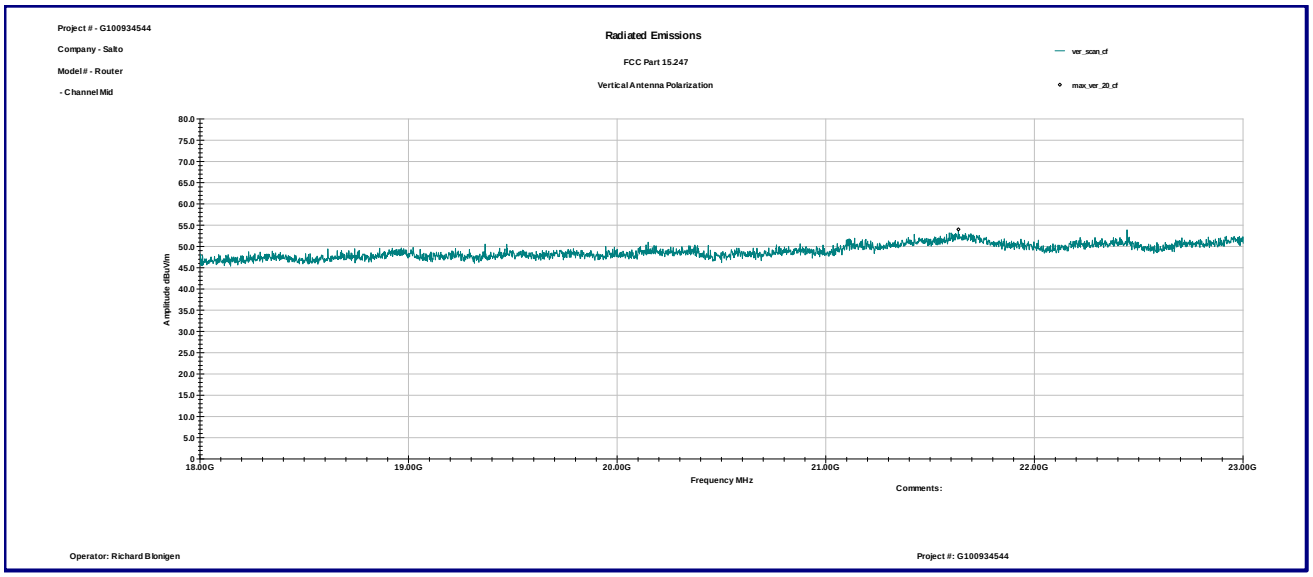
Graph 3.5.12



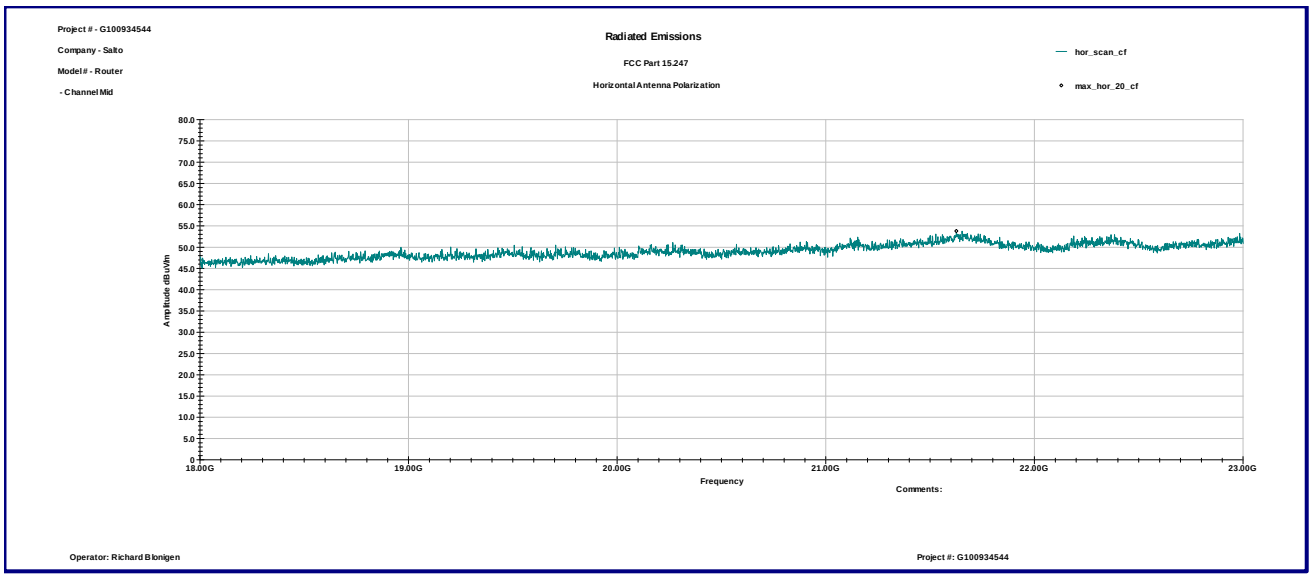
Graph 3.5.13



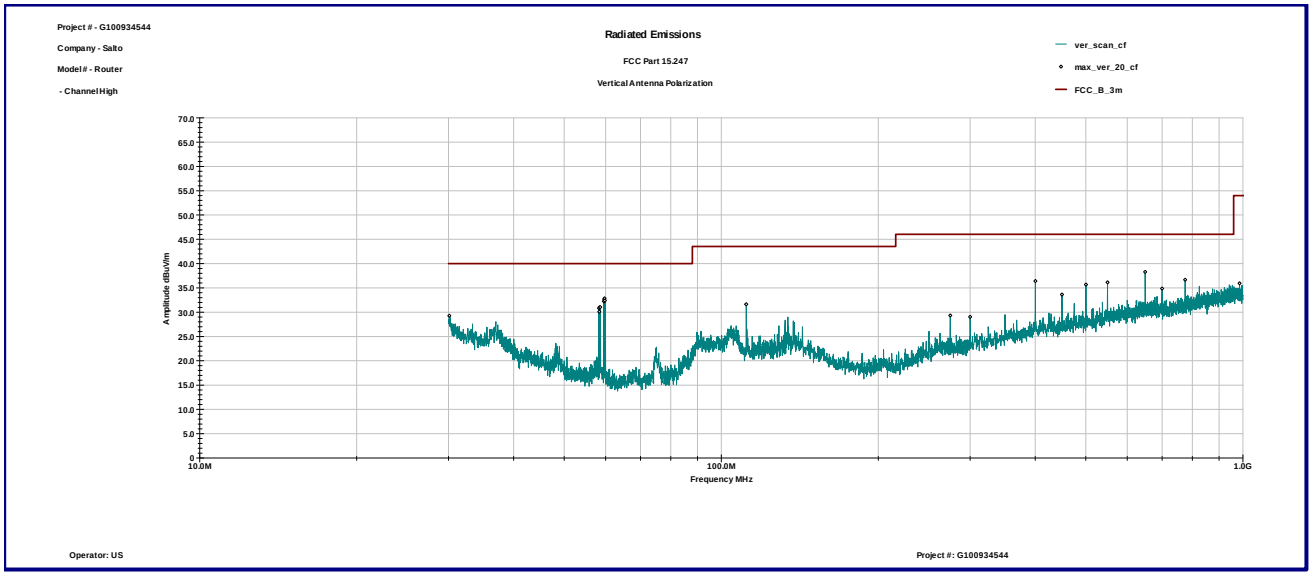
Graph 3.5.14



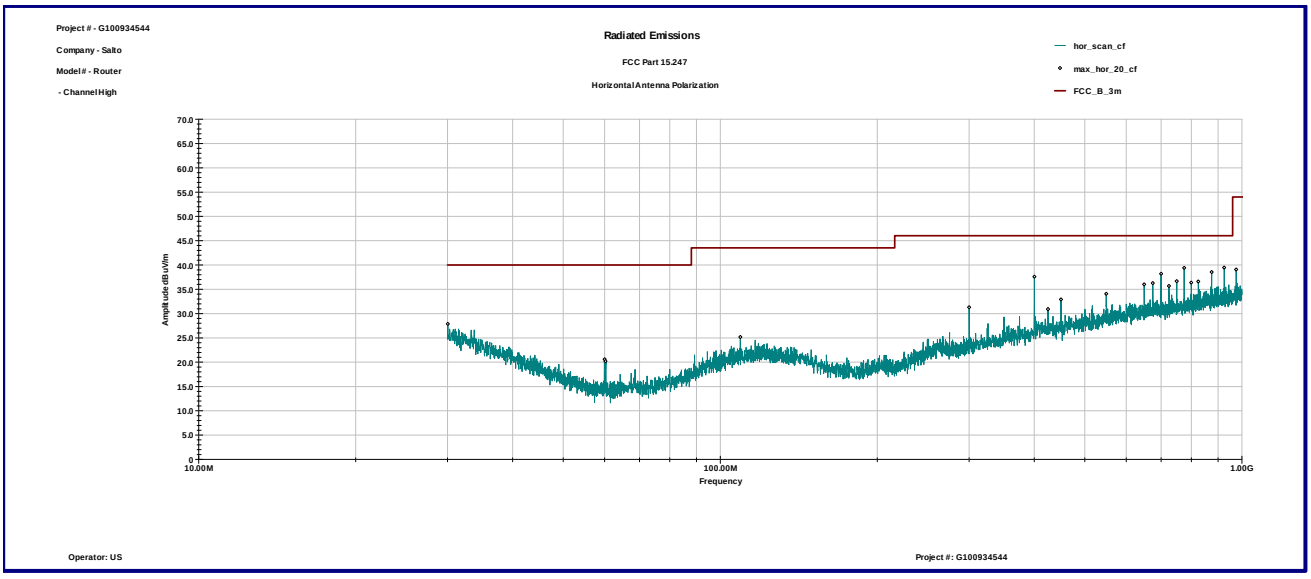
Graph 3.5.15



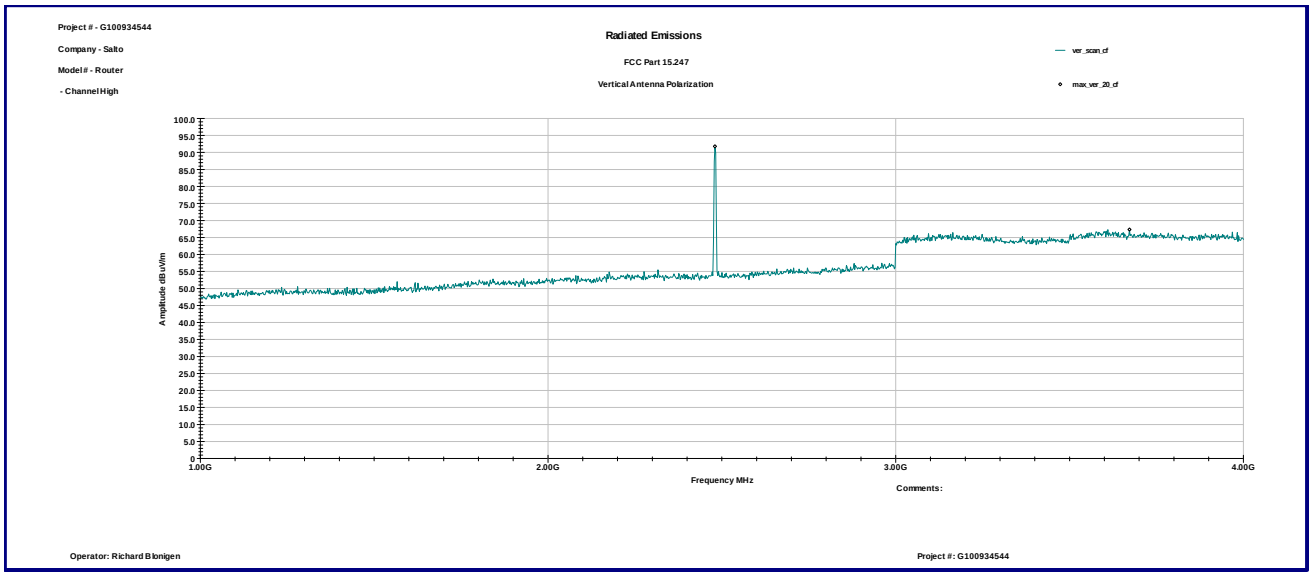
Graph 3.5.16



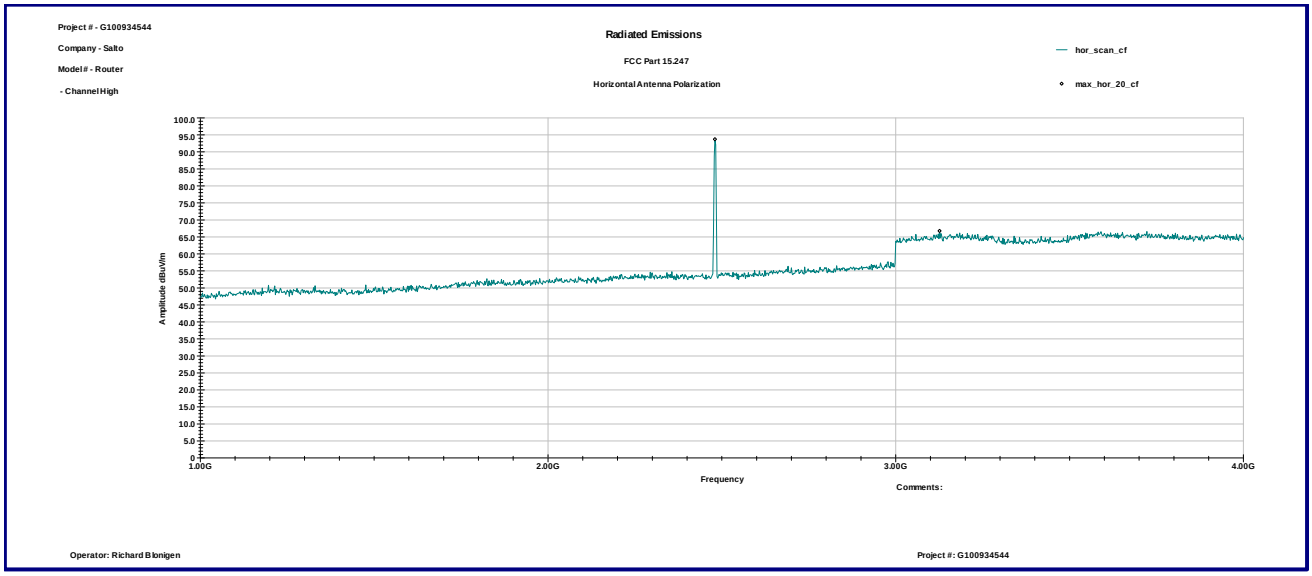
Graph 3.5.17



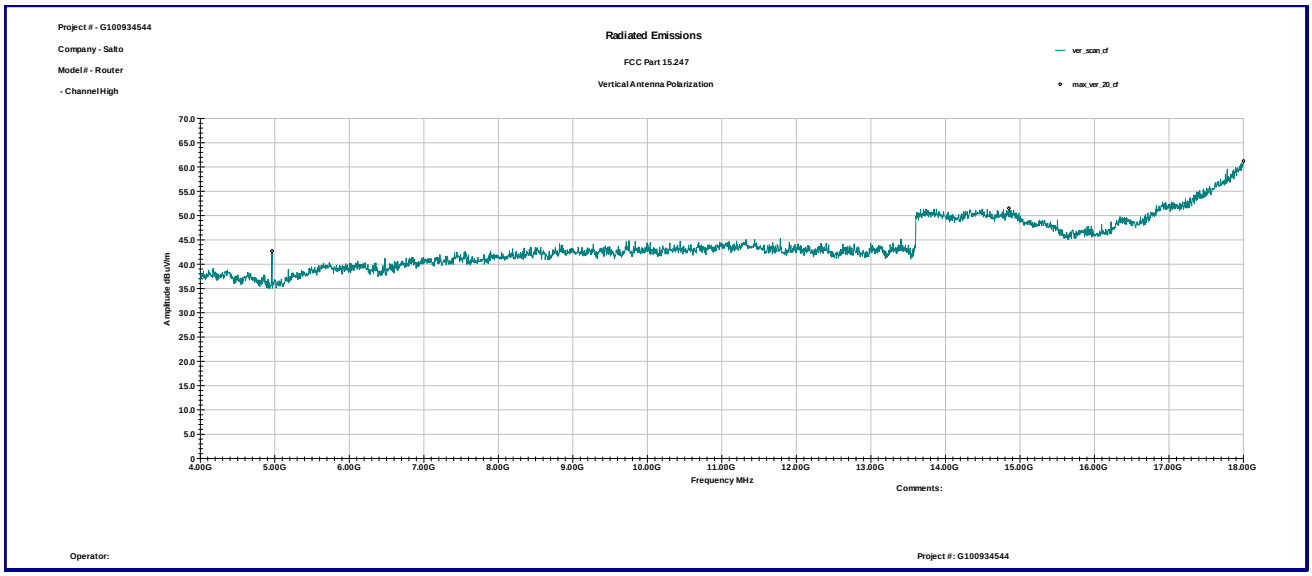
Graph 3.5.18



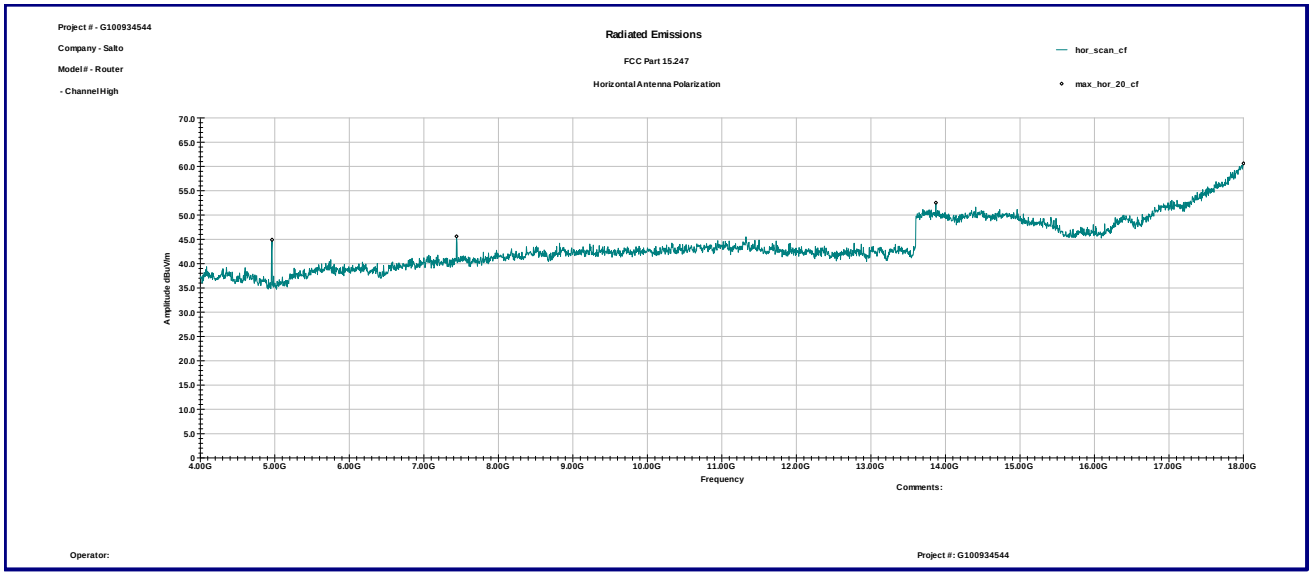
Graph 3.5.19



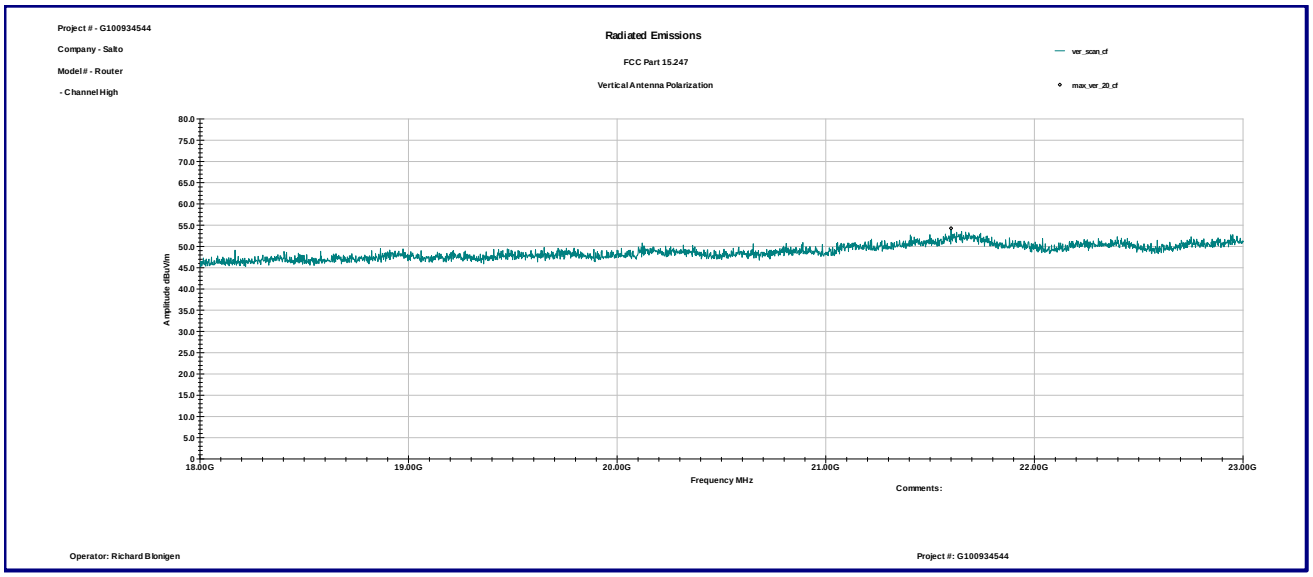
Graph 3.5.20



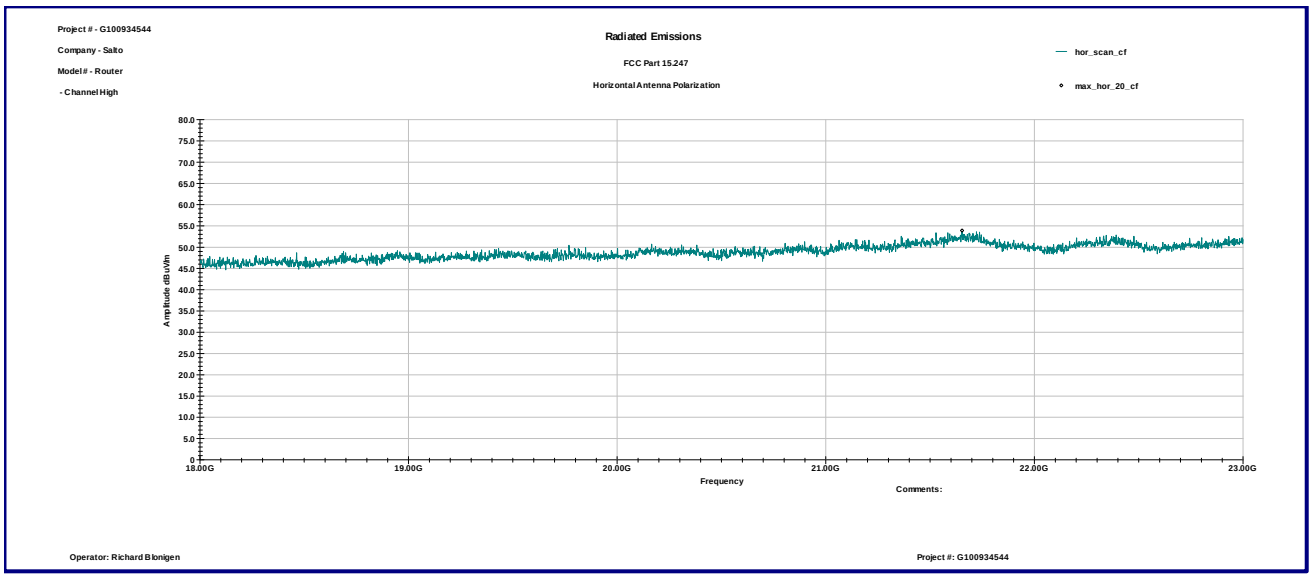
Graph 3.5.21



Graph 3.5.22



Graph 3.5.23



Graph 3.5.24

3.6 RF Exposure Compliance

The maximum measured antenna conducted power, P is 3.9dBm

The antenna gain, G is 1.7dBi

The maximum EIRP power = P + G
ERP = 3.9+1.7= 5.6dBm, or 0.0036W=3.6mW

The limits for Maximum Permissible Exposure (MPE) for transmitter operating at 2.4Hz, MPE is 1mW/cm^2, or 10W/m^2
0.053

S = 10W/m^2

The Power Density is related to EIRP with the equation:
S = EIRP / 4πD^2, or 10 = 0.0036 / 4πD^2, where D is a separation distance

The minimum safe separation distance, D = 0.5cm, which is below 20cm

3.7 Transmitter power line conducted emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test result: **Pass**

Frequency range: 0.15MHz-30MHz

Max. Emissions margin: 9.8dB below the limits

Notes: None

Date:	January 9, 2013	**Result:** **Pass**
Standard:	FCC 15.207	
Tested by:	Richard Blonigen	
Test Point:	Power Line	
Operation mode:	See Page 5	
Note:	None	

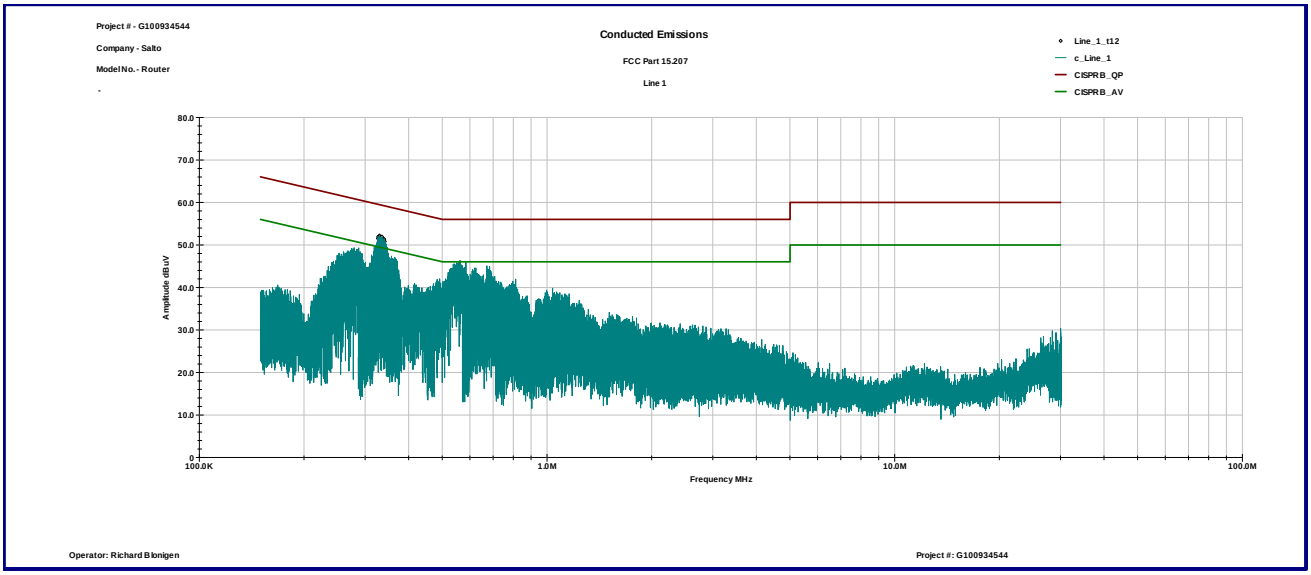
Table 3.7.1

Line 1

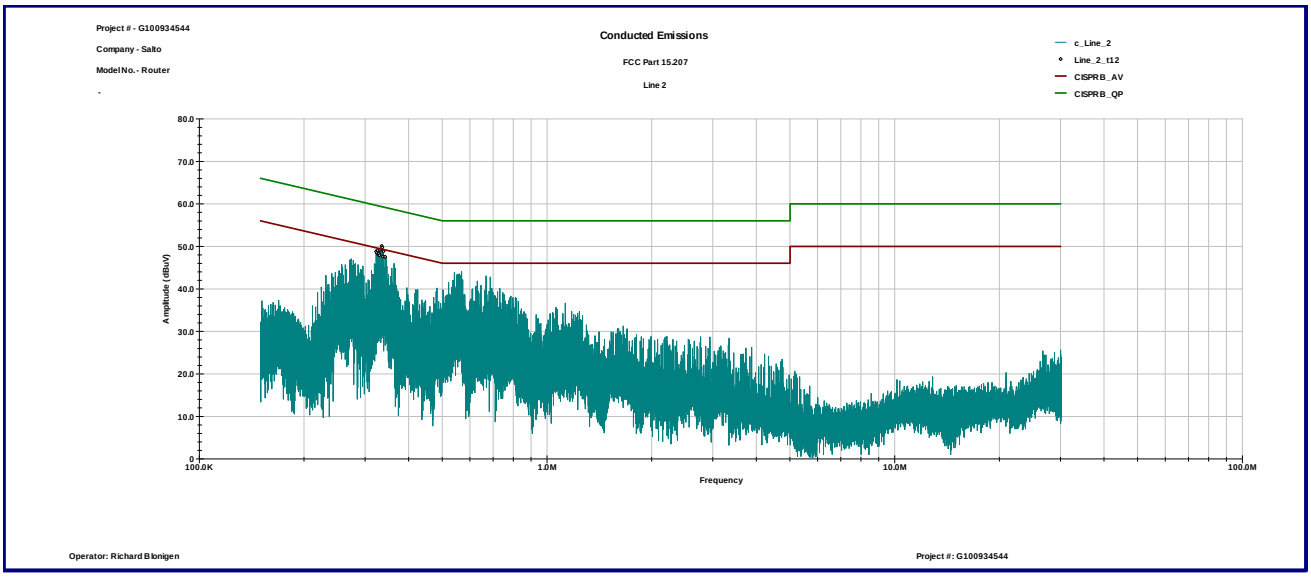
Frequency	QP dBµV	AVG dBµV	QP Limit dBµV	AVG Limit dBµV	QP Margin dB	AVG Margin dB
285.99 KHz	46.5	33.1	60.6	50.6	-14.1	-17.6
332.02 KHz	49.4	36.1	59.4	49.4	-10.0	-13.3
338.55 KHz	49.4	36.6	59.2	49.2	-9.8	-12.6
533.58 KHz	41.5	28.2	56.0	46.0	-14.6	-17.8
625.69 KHz	40.7	27.8	56.0	46.0	-15.3	-18.2
671.7 KHz	40.4	27.0	56.0	46.0	-15.6	-19.0

Line 2

Frequency	QP dBµV	AVG dBµV	QP Limit dBµV	AVG Limit dBµV	QP Margin dB	AVG Margin dB
269.7 KHz	39.7	26.7	61.1	51.1	-21.4	-24.5
328.67 KHz	42.4	27.8	59.5	49.5	-17.1	-21.7
330.65 KHz	42.6	28.5	59.4	49.4	-16.8	-20.9
532.74 KHz	35.8	20.9	56.0	46.0	-20.2	-25.1
556.22 KHz	37.0	22.6	56.0	46.0	-19.0	-23.5
671.73 KHz	33.4	19.5	56.0	46.0	-22.6	-26.5



Graph 3.7.1



Graph 3.7.2

3.8 Receiver/digital device radiated emissions

Test location: ☐ OATS ☒ Anechoic Chamber

Test distance: ☐ 10 meters ☒ 3 meters

Test result: **Pass**

Frequency range: 30MHz-13000MHz

Max. Emissions margin: 5.5dB below the limits

Notes: None

Date:	January 24, 2013	**Result:** **Pass**
Standard:	FCC Part 15.109, Class B	
Tested by:	Uri Spector	
Test Point:	Enclosure	
Operation mode:	See page 5	
Note:	Frequency range 30MHz-1GHz	

Table 3.8.1

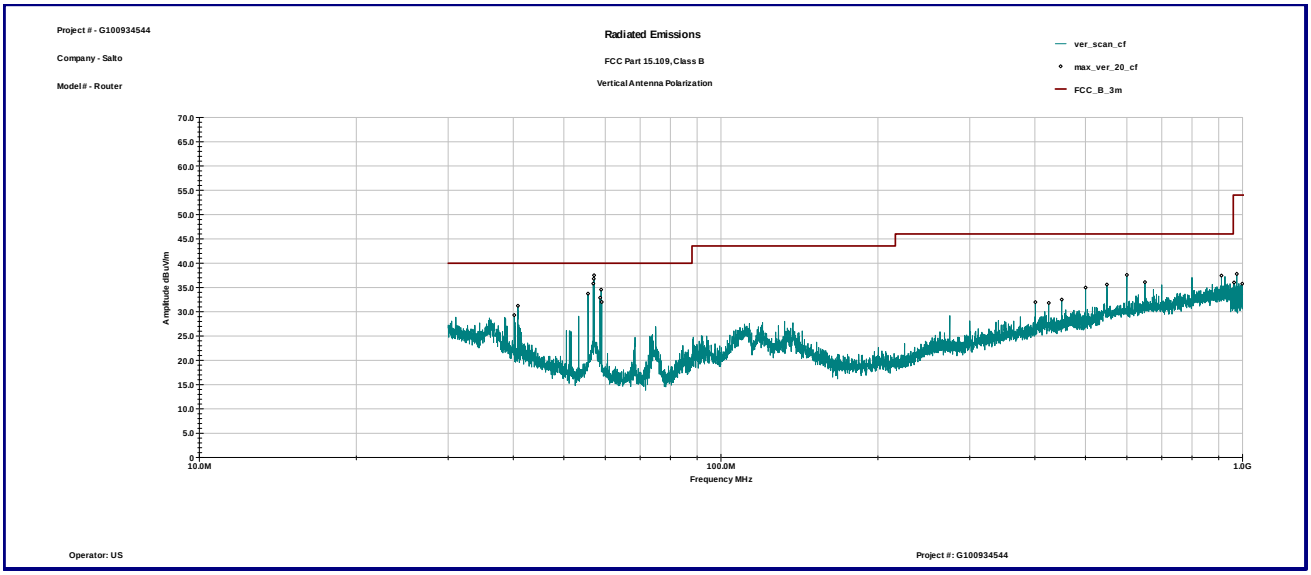
Frequency	Ant. Polarity	Reading dBµV	Total C.F. dB1/m	Total at 3m dBµV/m	Limit dBµV/m	Margin dB
40.157 MHz	V	14.9	14.5	29.3	40.0	-10.7
40.81 MHz	V	17.0	14.2	31.2	40.0	-8.8
55.632 MHz	V	25.8	7.9	33.7	40.0	-6.3
*57.127 MHz	V	17.3	7.5	24.8	40.0	-15.2
58.912 MHz	V	27.3	7.3	34.5	40.0	-5.5
400.86 MHz	V	13.0	18.9	32.0	46.0	-14.1
425.15 MHz	V	12.3	19.6	31.8	46.0	-14.2
450.13 MHz	V	13.0	19.5	32.5	46.0	-13.5
500.1 MHz	V	14.5	20.5	35.0	46.0	-11.0
549.68 MHz	V	14.0	21.6	35.6	46.0	-10.4
599.92 MHz	V	15.4	22.2	37.6	46.0	-8.5
650.15 MHz	V	13.4	22.7	36.1	46.0	-9.9
911.32 MHz	V	12.1	25.3	37.5	46.0	-8.6
963.46 MHz	V	10.2	25.9	36.0	54.0	-18.0
975.06 MHz	V	11.7	26.1	37.8	54.0	-16.2
998.97 MHz	V	9.5	26.2	35.8	54.0	-18.2
30.023 MHz	H	9.3	20.2	29.5	40.0	-10.5
57.127 MHz	H	12.9	7.5	20.4	40.0	-19.6
114.58 MHz	H	12.4	13.7	26.2	43.5	-17.4
225.03 MHz	H	12.6	12.4	25.1	46.0	-21.0
300.0 MHz	H	13.1	15.9	29.1	46.0	-17.0
349.97 MHz	H	13.5	17.5	30.9	46.0	-15.1
425.15 MHz	H	12.7	19.6	32.3	46.0	-13.7
450.13 MHz	H	15.4	19.5	34.9	46.0	-11.1
500.1 MHz	H	15.9	20.5	36.3	46.0	-9.7
599.92 MHz	H	17.1	22.2	39.3	46.0	-6.7
650.15 MHz	H	13.8	22.7	36.5	46.0	-9.5
800.04 MHz	H	16.3	24.1	40.4	46.0	-5.6
850.28 MHz	H	13.0	24.7	37.7	46.0	-8.4
925.43 MHz	H	14.1	25.5	39.6	46.0	-6.5
975.01 MHz	H	13.9	26.1	39.9	54.0	-14.0

Measurements were taken using a Peak detector or CISPR Quasi-peak detector (marked *)

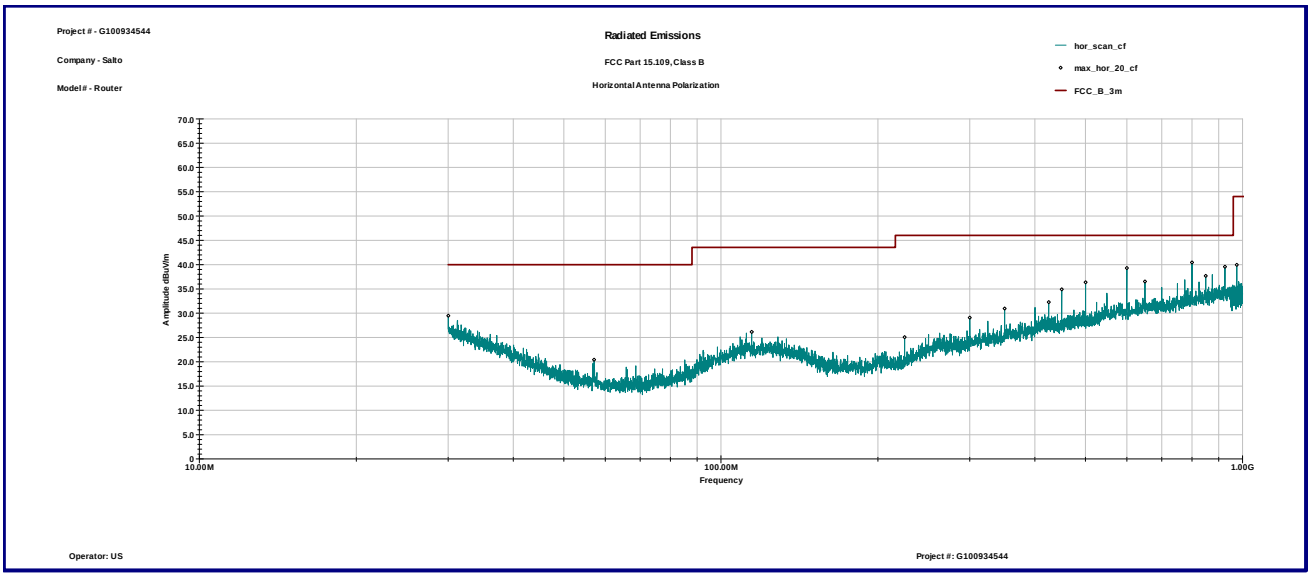
Date:	January 9, 2013	**Result:** **Pass**
Standard:	FCC Part 15.109, Class B	
Tested by:	Richard Blonigen	
Test Point:	Enclosure	
Operation mode:	See page 5	
Note:	Frequency range 1GHz-13GHz	

Table 3.8.2

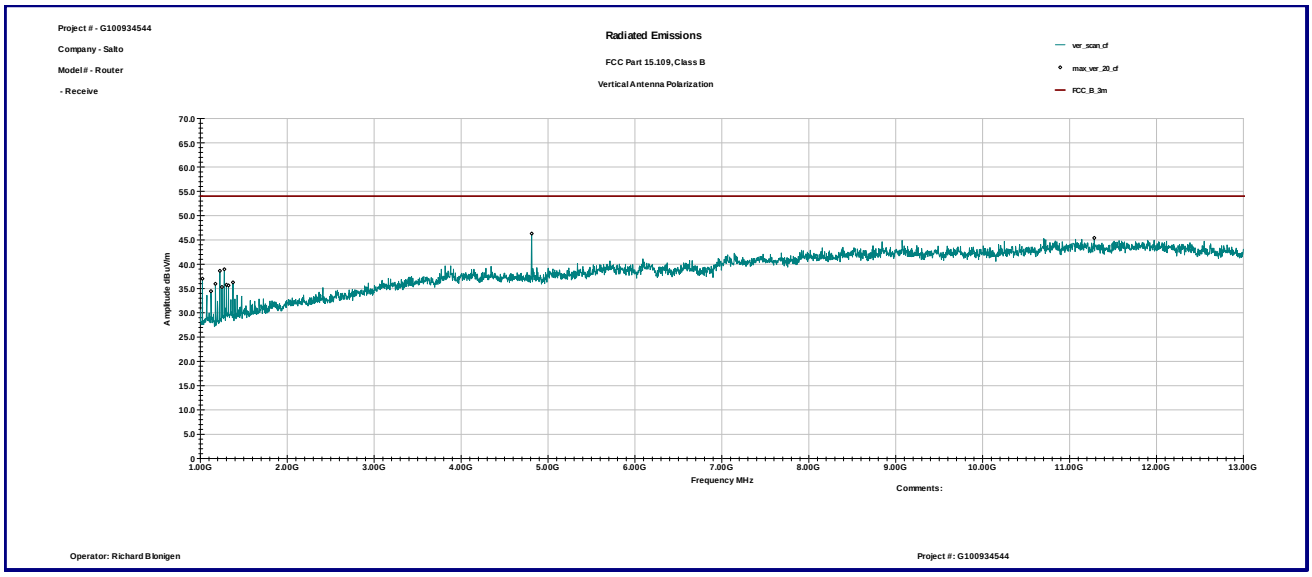
Frequency MHz	Antenna Polarity	Peak Reading dBµV	Total C.F. dB1/m	Pre-Amp. Gain (dB)	Total at 3m dBµV/m	Limit dBµV/m	Margin dB
1.024 GHz	V	53.5	25.6	42.1	37.0	54.0	-17.0
1.225 GHz	V	54.1	26.5	42.0	38.6	54.0	-15.4
1.276 GHz	V	54.2	26.7	41.9	38.9	54.0	-15.1
1.375 GHz	V	51.0	27.1	41.9	36.2	54.0	-17.7
4.813 GHz	V	48.2	37.2	39.2	46.3	54.0	-7.7
1.024 GHz	H	53.7	25.7	42.1	37.3	54.0	-16.7
1.225 GHz	H	53.3	26.5	42.0	37.8	54.0	-16.1
1.276 GHz	H	54.6	26.7	41.9	39.3	54.0	-14.7
1.324 GHz	H	50.7	26.9	41.9	35.7	54.0	-18.3
1.375 GHz	H	50.7	27.1	41.9	36.0	54.0	-18.0
4.813 GHz	H	48.2	37.1	39.2	46.2	54.0	-7.8



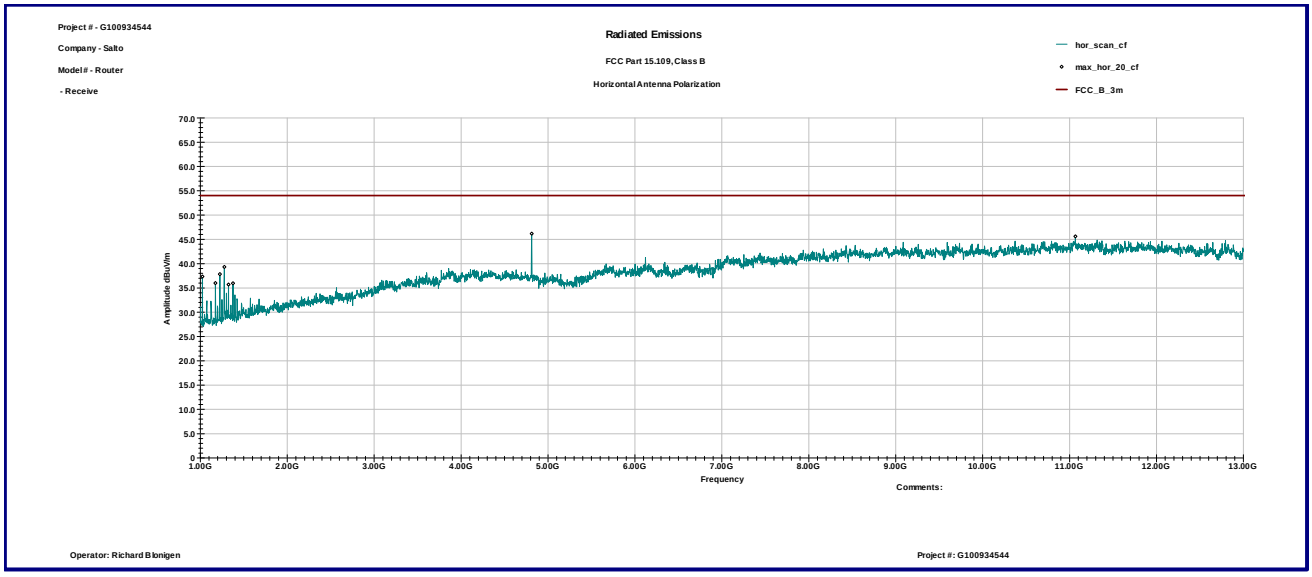
Graph 3.8.1



Graph 3.8.2



Graph 3.8.3



Graph 3.8.4

3.9 Digital device conducted emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test result: **Pass**

Frequency range: 0.15MHz-30MHz

Max. Emissions margin: 10.4dB below the limits

Notes:

Date:	January 9, 2013	**Result:** **Pass**
Standard:	FCC 15.107, Class B	
Tested by:	Richard Blonigen	
Test Point:	Power Line	
Operation mode:	See page 5	
Note:	None	

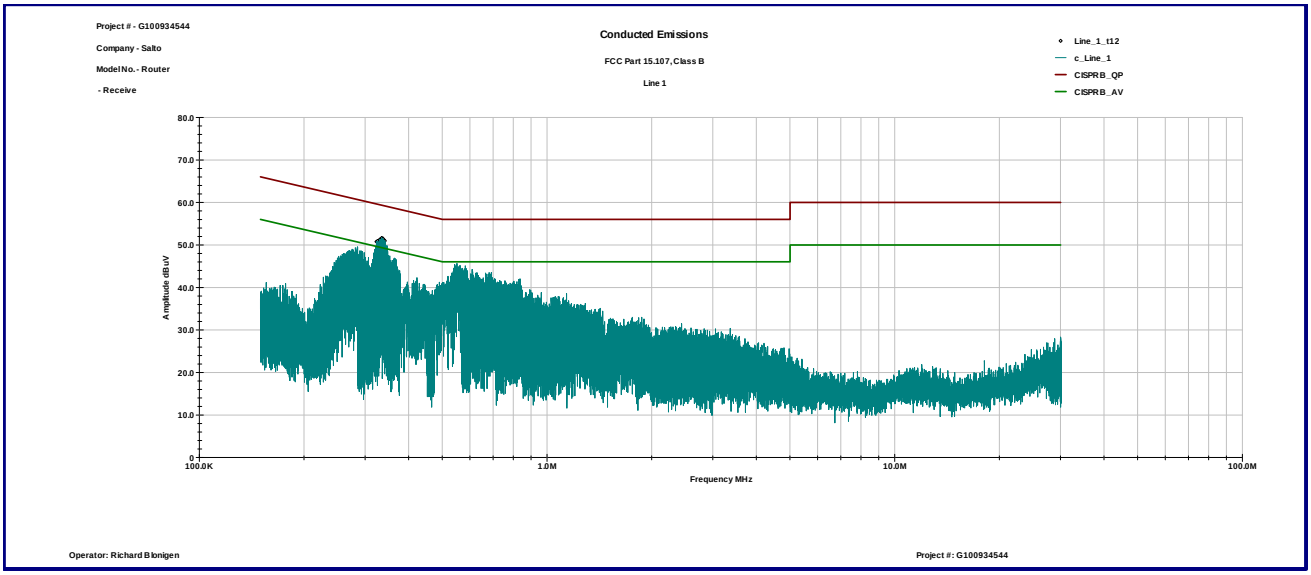
Table 3.9.1

Line 1

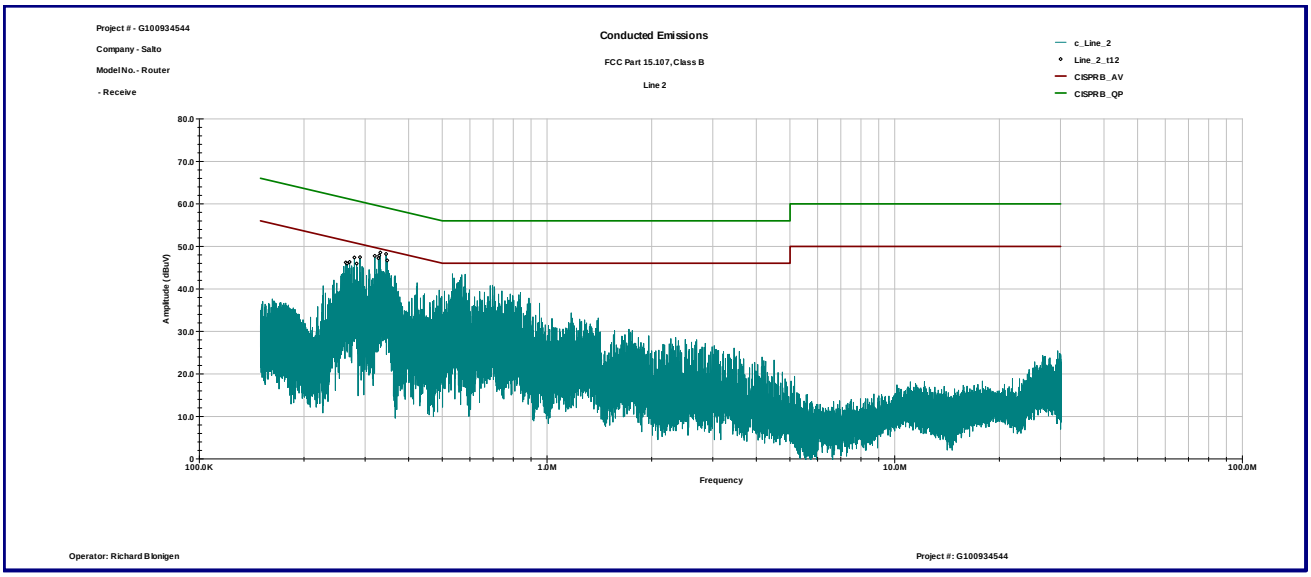
Frequency	QP dBµV	AVG dBµV	QP Limit dBµV	AVG Limit dBµV	QP Margin dB	AVG Margin dB
285.57 KHz	46.9	34.0	60.7	50.7	-13.7	-16.7
327.75 KHz	48.4	35.2	59.5	49.5	-11.1	-14.4
331.08 KHz	49.0	35.8	59.4	49.4	-10.4	-13.6
547.99 KHz	41.6	28.5	56.0	46.0	-14.4	-17.5
579.75 KHz	41.7	28.3	56.0	46.0	-14.3	-17.7
668.72 KHz	38.6	25.5	56.0	46.0	-17.5	-20.5

Line 2

Frequency	QP dBµV	AVG dBµV	QP Limit dBµV	AVG Limit dBµV	QP Margin dB	AVG Margin dB
278.97 KHz	39.8	26.2	60.9	50.9	-21.1	-24.6
328.49 KHz	41.2	27.5	59.5	49.5	-18.3	-22.0
331.34 KHz	41.7	28.0	59.4	49.4	-17.7	-21.4
418.09 KHz	32.8	18.9	57.5	47.5	-24.7	-28.6
544.7 KHz	35.3	20.9	56.0	46.0	-20.7	-25.1
580.5 KHz	35.3	20.5	56.0	46.0	-20.7	-25.5



Graph 3.9.1



Graph 3.9.2

4.0 TEST EQUIPMENT

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NO.	INTERTEK ID	CAL DUE	USED
Spectrum Analyzer	R & S	FSP 40	100024	12559	11/29/2013	☒
Spectrum Analyzer	R & S	ESCI	100358	12909	07/02/2013	☒
Bicono-Log Antenna	Teseq	CBL6112D	32859	25289	08/09/2013	☒
LISN	Fischer Custom Communications	FCC-LISN-2 MOD.SD	316	9945	07/17/2013	☒
Horn Antenna	EMCO	3115	9507-4513	9936	05/16/2013	☒
Pre-Amplifier	MITEQ	AMF-5D-00501800-28-13P	1122951	13475	11/01/2013	☒
Pre-Amplifier	MITEQ	AMF-6F-16002600-25-10P	1222383	MIN-0065	11/01/2013	☒
High Pass Filter	Reactel	7HS-4G-S12	0223	015274	VBU	☒
System	Quantum Change	TILE! Instrument Control	Ver. 3.4.K.29	15259	VBU	☒