



TEST REPORT

Report Number: 100657224MIN-001

Project Number: G100657224

Testing performed on the
BTE Hearing Aid

FCC ID: EOA- 3Sermini
Industry Canada ID: 6903A- 3Sermini

to
47 CFR Part 15. 249:2010
RSS- 210, Issue 8, 2010
RSS-Gen, Issue 3, 2010
ICES-003, Issue 4:2004
47 CFR, Part 15:2009, §15.107 and §15.109, Class B

For
Starkey Laboratories, Inc.

Test Performed by:
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Test Authorized by:
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Date: March 19, 2012

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Date: March 19, 2012

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TABLE OF CONTENTS

- 1.0 GENERAL DESCRIPTION..... 3**
 - 1.1 Product Description; Test Facility 4
 - 1.3 Environmental conditions..... 5
 - 1.4 Measurement uncertainty 6
 - 1.5 Field Strength Calculation..... 6
- 2.0 TEST SUMMARY..... 7**
- 3.0 TEST CONDITIONS AND RESULTS..... 8**
 - 3.1 Field strength of fundamental 8
 - 3.2 Field strength of harmonics and spurious emissions 10
 - 3.3 Bandwidth of Emissions..... 19
 - 3.4 Transmitter power line conducted emissions 26
 - 3.5 Receiver/digital device radiated emissions..... 27
 - 3.6 Digital device conducted emissions..... 35
- 4.0 TEST EQUIPMENT..... 36**



1.0 GENERAL DESCRIPTION

Model:	BTE
Type of EUT:	Hearing Aid
Serial Number:	12089115
FCC ID:	EOA- 3Sermini
Industry Canada ID:	6903A- 3Sermini
Related Submittal(s) Grants:	None
Company:	Starkey Laboratories Inc.
Customer:	Mr. Ken Meyer
Address:	6700 Washington Avenue South Eden Prairie, MN 55344 USA
Phone:	(952) 947-4734
Fax:	(952) 828-9262
E-mail:	ken_meyer@starkey.com
Test Standards:	<input checked="" type="checkbox"/> 47 CFR, Part 15:2010, §15.249 <input checked="" type="checkbox"/> RSS-210, Issue 8, 20010 <input checked="" type="checkbox"/> RSS-Gen, Issue 3, 2010 <input checked="" type="checkbox"/> 47 CFR, Part 15:2010, §15.107 and §15.109, Class B <input checked="" type="checkbox"/> ICES-003, Issue 4:2004 <input type="checkbox"/> Other [REDACTED]
Type of radio:	<input checked="" type="checkbox"/> Stand -alone <input type="checkbox"/> Module <input type="checkbox"/> Hybrid
Date Sample Submitted:	March 5, 2012
Test Work Started:	March 5, 2012
Test Work Completed:	March 9, 2012
Test Sample Conditions:	<input type="checkbox"/> Damaged <input type="checkbox"/> Poor (Usable) <input checked="" type="checkbox"/> Good



1.1 Product Description; Test Facility

Product Description:	Hearing Aid
Operating Frequency	902-928 MHz
Number of Channels	81
Modulation:	FSK
Emission Designator:	388K2FXD
Antenna(s) Info:	Integral
Antenna Installation:	<input type="checkbox"/> User <input type="checkbox"/> Professional <input checked="" type="checkbox"/> Factory
Transmitter Power Configuration:	<input checked="" type="checkbox"/> Internal battery <input type="checkbox"/> External power source <input type="checkbox"/> 120VAC <input type="checkbox"/> 230VAC <input type="checkbox"/> 400VAC <input checked="" type="checkbox"/> 1.4 VDC <input type="checkbox"/> Other: <input type="text"/> <input type="text"/> Amp. <input type="checkbox"/> 50Hz <input type="checkbox"/> 60Hz
Special Test Arrangement:	None
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)
- [REDACTED]

Operating modes of the EUT:

No.	Description
1	The device was pre-programmed to operate continuously in three separate frequency channels, low, middle, and upper frequency channel, one channel being transmitted at a given time.
2	Standby / Receiving mode were used for FCC Part 15.109 Class B, ICES-003 testing and RSS-Gen.

Cables:

No.	Type	Length	Designation	Note
1	None			

Support equipment/Services:

No.	Item	Description
1	R&S SMR20	Signal Generator, used to activated Hearing Aid in receiving mode

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).

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

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

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

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

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

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

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

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
15.249(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	N/A
15.109/ICES-003	Receiver/digital device radiated emissions	Pass
15.107/ ICES-003	Digital device conducted emissions	N/A



3.0 TEST CONDITIONS AND RESULTS

3.1 Field strength of fundamental

Test location: OATS Anechoic Chamber Other

Test distance: 10 meters 3 meters

Test result: **Pass**

Max. Emissions margin at fundamental: 18.1dB below the limits

Notes: None



Date:	March 7, 2012	Result: Pass
Standard:	FCC 15.249(a) / RSS-210 A2.9	
Tested by:	Uri Spector	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	None	

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 353										
902.69	V	124	21.8	3.6	0.0	49.9	75.3	94.0	-18.7	Pk
902.69	H	208	21.8	3.6	0.0	44.5	69.9	94.0	-24.1	Pk
Channel 393										
914.83	V	122	21.9	3.6	0.0	49.6	75.1	94.0	-18.9	Pk
914.83	H	191	21.9	3.6	0.0	45.7	71.2	94.0	-22.8	Pk
Channel 433										
926.96	V	119	22.0	3.7	0.0	50.3	75.9	94.0	-18.1	Pk
926.96	H	191	22.0	3.7	0.0	46.3	71.9	94.0	-22.1	Pk
Band Edge Compliance										
902.00	V	100	21.8	3.6	0.0	7.7	33.1	46.0	-12.9	QP
902.00	H	211	21.8	3.6	0.0	6.2	31.6	46.0	-14.4	QP
928.00	V	100	22.0	3.7	0.0	6.1	31.7	46.0	-14.3	QP
928.00	H	200	22.0	3.7	0.0	5.2	30.8	46.0	-15.2	QP



3.2 Field strength of harmonics and spurious emissions

Test location: OATS Anechoic Chamber Other

Test distance: 10 meters 3 meters

Frequency range of measurements: 30MHz-10000MHz

Test result: **Pass**

Max. margin of harmonics and spurious emissions: 1.8dB below the limits

Notes: Transmitting fundamental frequencies were excluded from the table.



Date:	March 8-9, 2012	Result: Pass
Standard:	FCC 15.249(a) and (d) / RSS-210 A2.9	
Tested by:	Uri Spector	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	30MHz-1000MHz	

Table 3.2.1

Frequency	Ant. Polarity	Peak Reading dB μ V	Ant.Factor dB1/m	Total at 3m dB μ V/m	Limit dB μ V/m	Margin dB
Ch. 353						
30.808 MHz	V	8.9	19.9	28.7	40.0	-11.3
37.651 MHz	V	10.1	16.1	26.2	40.0	-13.8
102.88 MHz	V	14.1	12.8	26.9	43.5	-16.6
275.57 MHz	V	11.5	15.5	27.1	46.0	-19.0
31.212 MHz	H	9.1	19.7	28.7	40.0	-11.3
126.36 MHz	H	10.6	13.9	24.5	43.5	-19.0
422.56 MHz	H	11.0	19.7	30.8	46.0	-15.2
Ch. 393						
30.416 MHz	V	7.6	20.1	27.7	40.0	-12.4
65.901 MHz	V	13.8	7.0	20.8	40.0	-19.2
102.91 MHz	V	12.5	12.8	25.3	43.5	-18.2
132.53 MHz	V	10.8	13.8	24.5	43.5	-19.0
30.727 MHz	H	8.2	19.9	28.1	40.0	-11.9
127.01 MHz	H	10.0	13.9	23.9	43.5	-19.6
Ch. 433						
30.104 MHz	V	7.4	20.3	27.6	40.0	-12.4
60.927 MHz	V	13.9	7.1	21.0	40.0	-19.0
99.702 MHz	V	14.0	12.4	26.3	43.5	-17.2
102.91 MHz	V	13.2	12.8	26.0	43.5	-17.5
372.38 MHz	V	11.3	18.0	29.2	46.0	-16.8
30.485 MHz	H	7.7	20.1	27.7	40.0	-12.3
116.64 MHz	H	10.5	13.8	24.3	43.5	-19.2



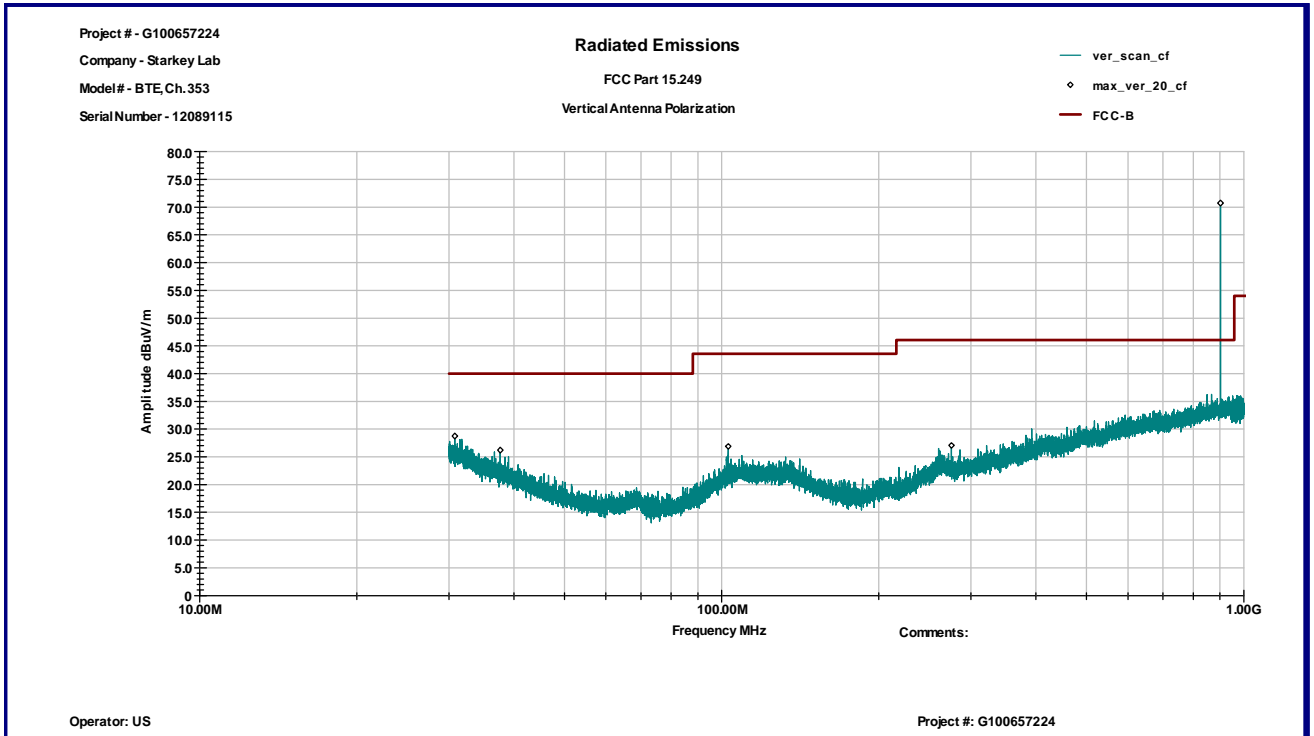
Date:	March 8-9, 2012	Result: Pass
Standard:	FCC 15.249(a) and (d) / RSS-210 A2.9	
Tested by:	Uri Spector	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	1000MHz-10000MHz	

Table 3.2.2

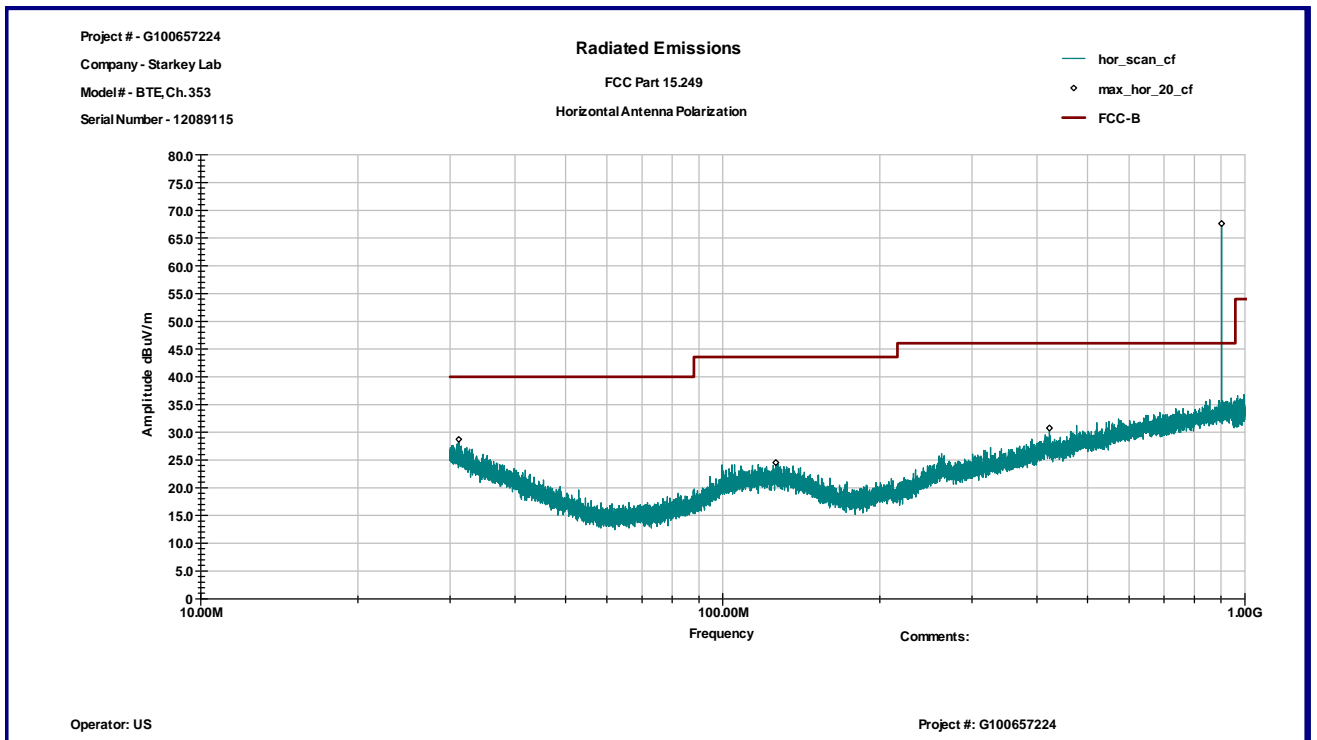
Frequency MHz	Antenna Polarity	Peak Reading dB μ V	Total C.F. dB1/m	Pre-Amp. Gain (dB)	Total at 3m dB μ V/m	Limit dB μ V/m	Margin dB
Ch. 353							
1.8055 GHz	V	62.6	29.2	43.3	48.5	54.0	-5.5
2.71 GHz	V	50.0	32.5	43.6	38.8	54.0	-15.1
1.8055 GHz	H	59.7	29.2	43.3	45.5	54.0	-8.5
Ch. 393							
1.8316 GHz	V	65.7	29.4	43.4	51.7	54.0	-2.3
2.746 GHz	V	53.8	32.6	43.6	42.8	54.0	-11.2
1.8316 GHz	H	58.6	29.3	43.4	44.5	54.0	-9.5
Ch. 433							
1.8568 GHz	V	66.1	29.5	43.4	52.2	54.0	-1.8
2.782 GHz	V	54.7	32.8	43.7	43.8	54.0	-10.2
4.6324 GHz	V	49.7	37.0	42.2	44.6	54.0	-9.4
1.8568 GHz	H	58.7	29.4	43.4	44.7	54.0	-9.3

Graph 3.2.1

Vertical antenna polarization

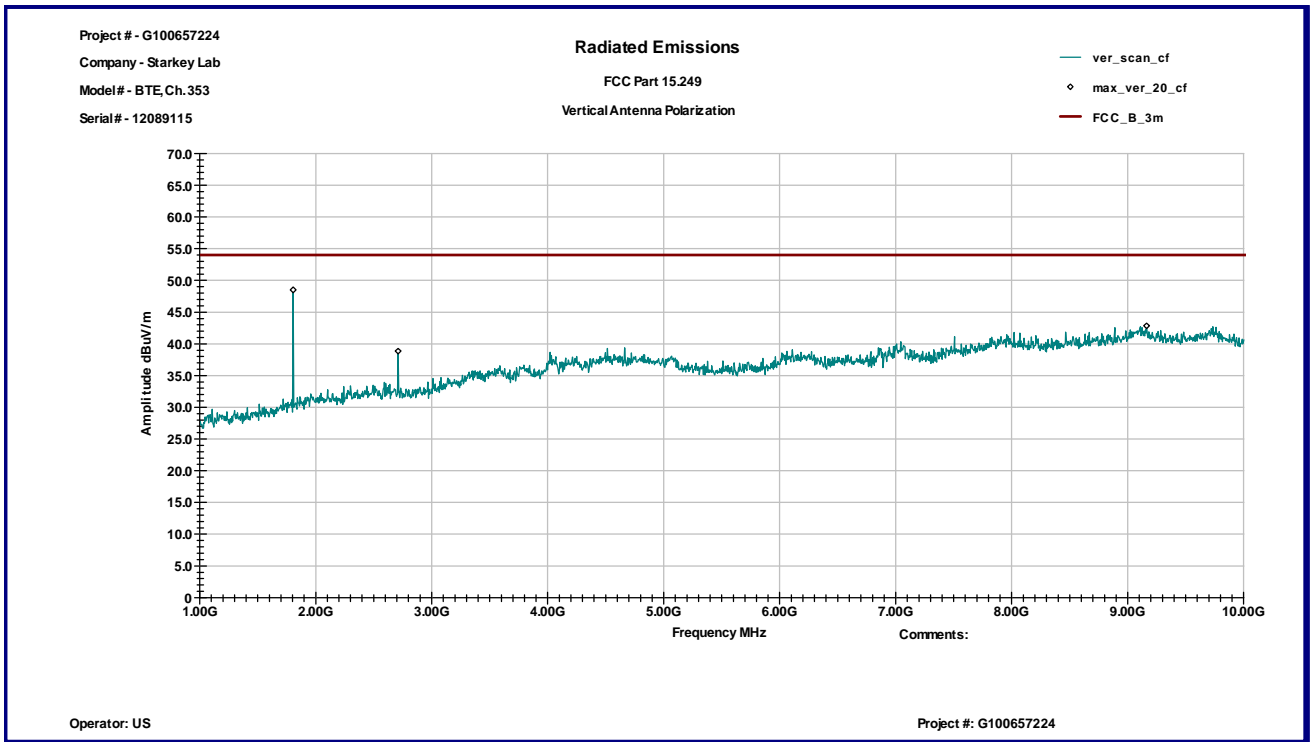


Horizontal antenna polarization

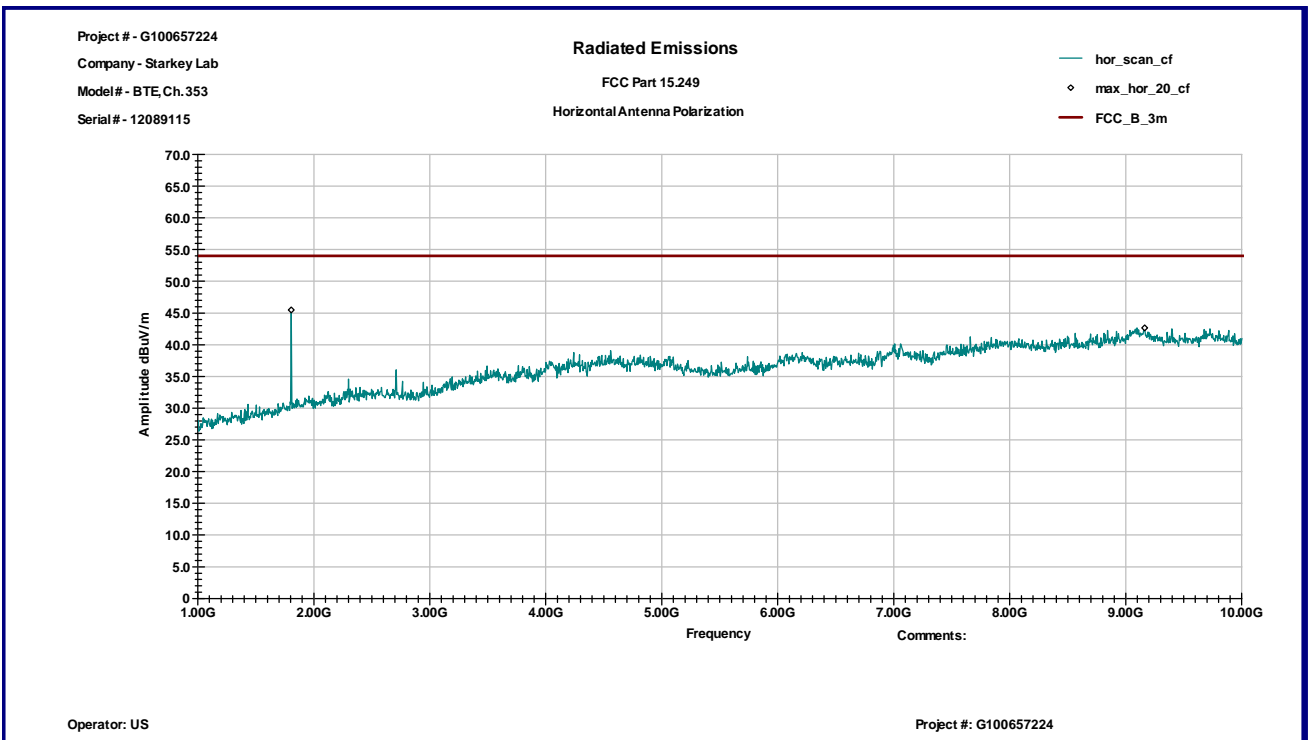


Graph 3.2.2

Vertical antenna polarization

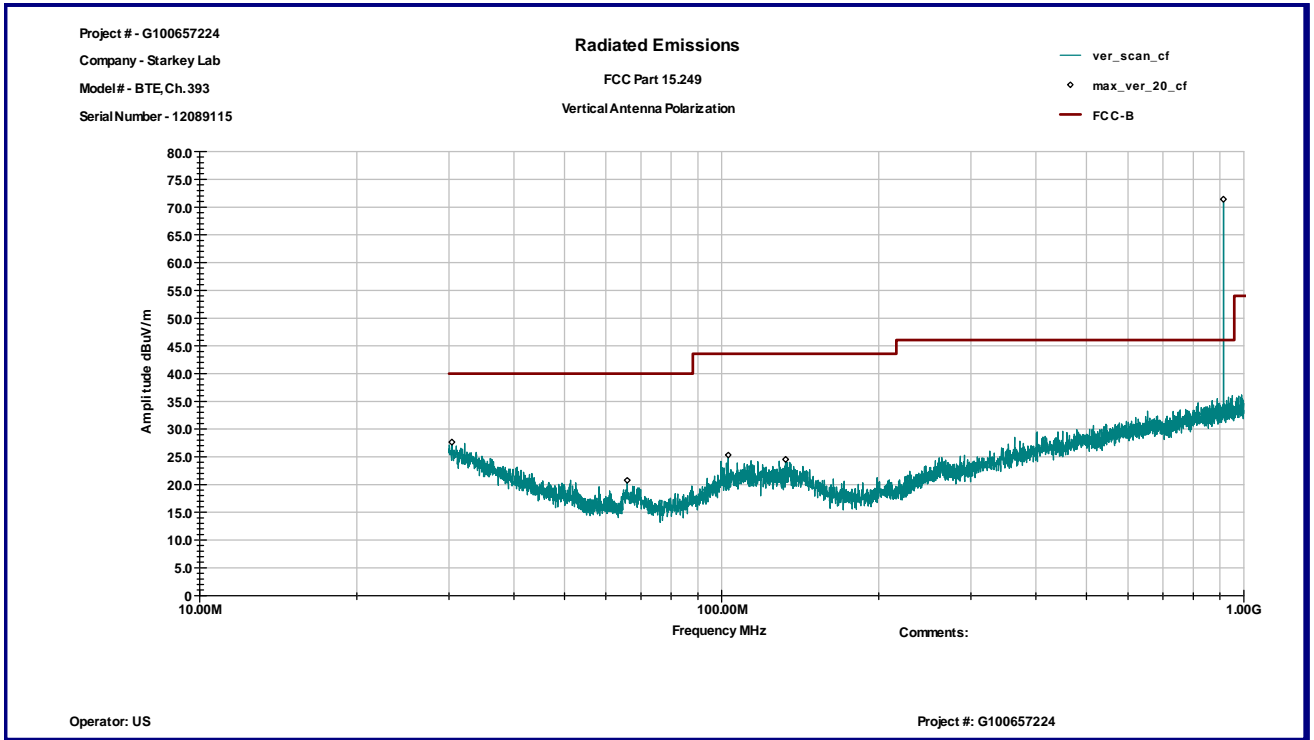


Horizontal antenna polarization

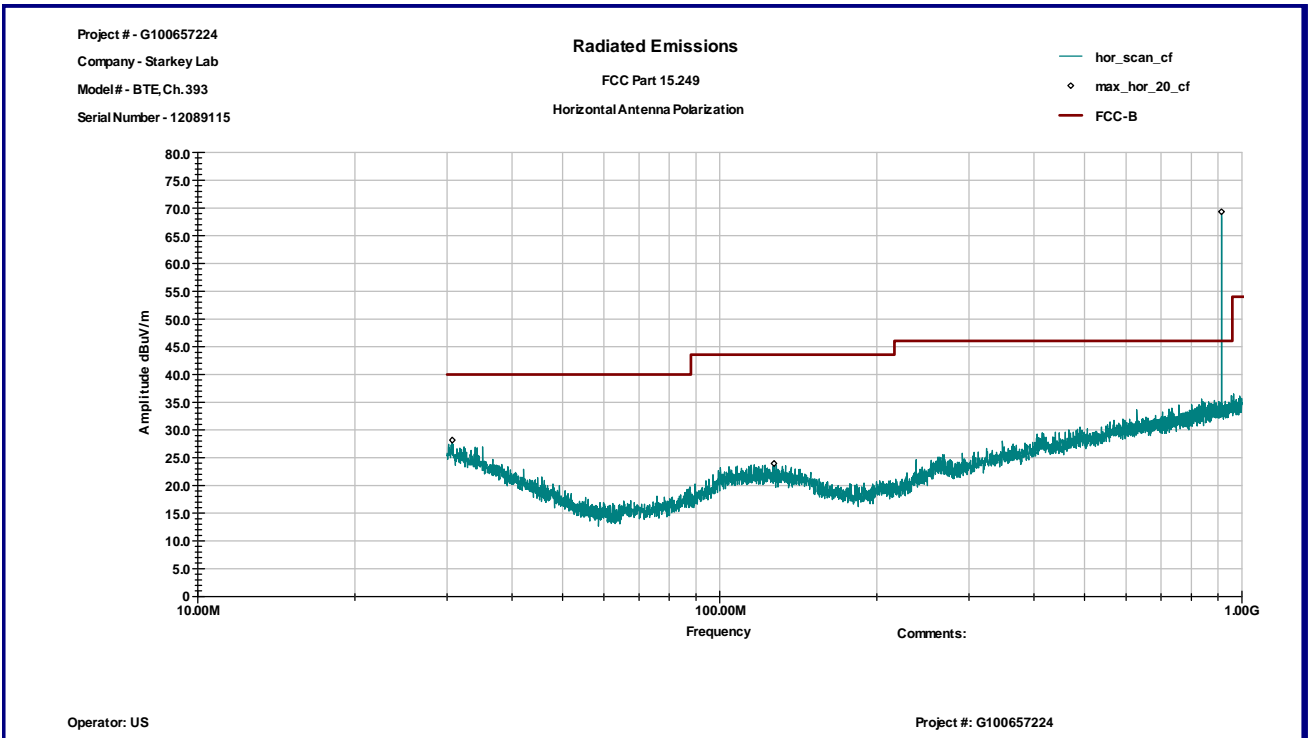


Graph 3.2.3

Vertical antenna polarization

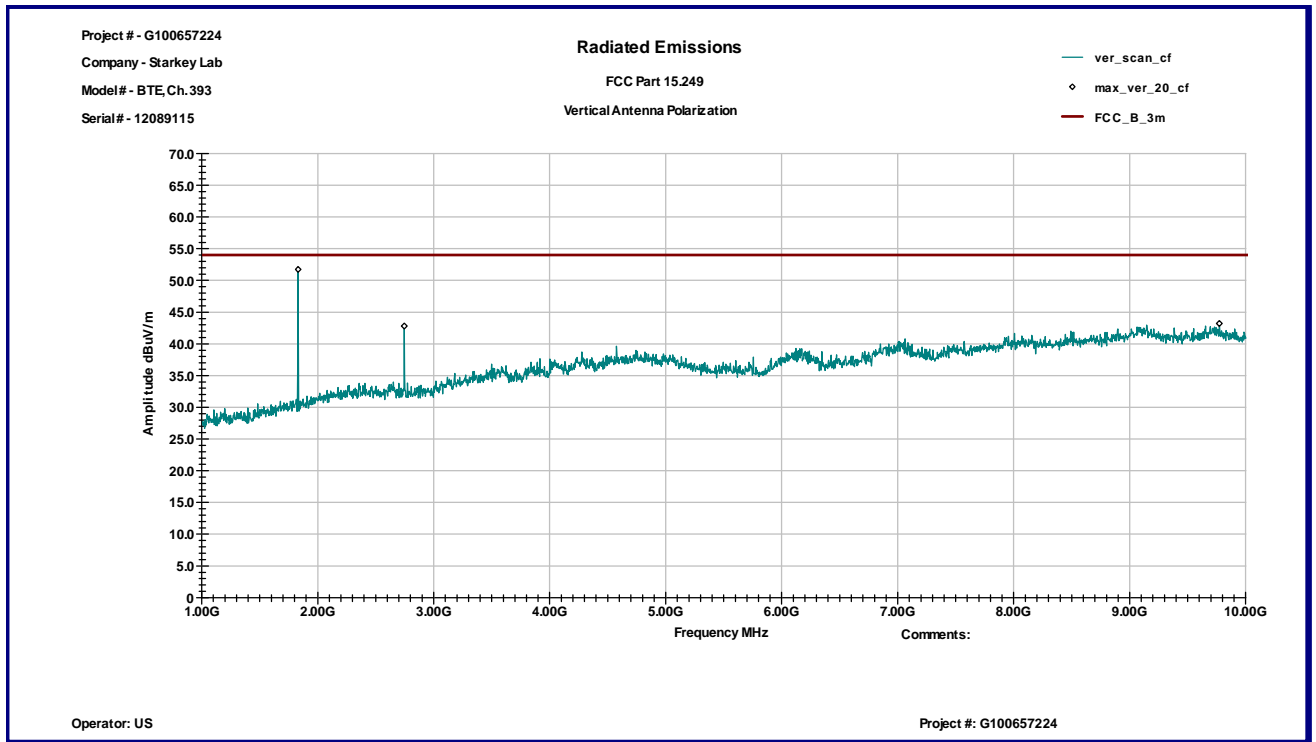


Horizontal antenna polarization

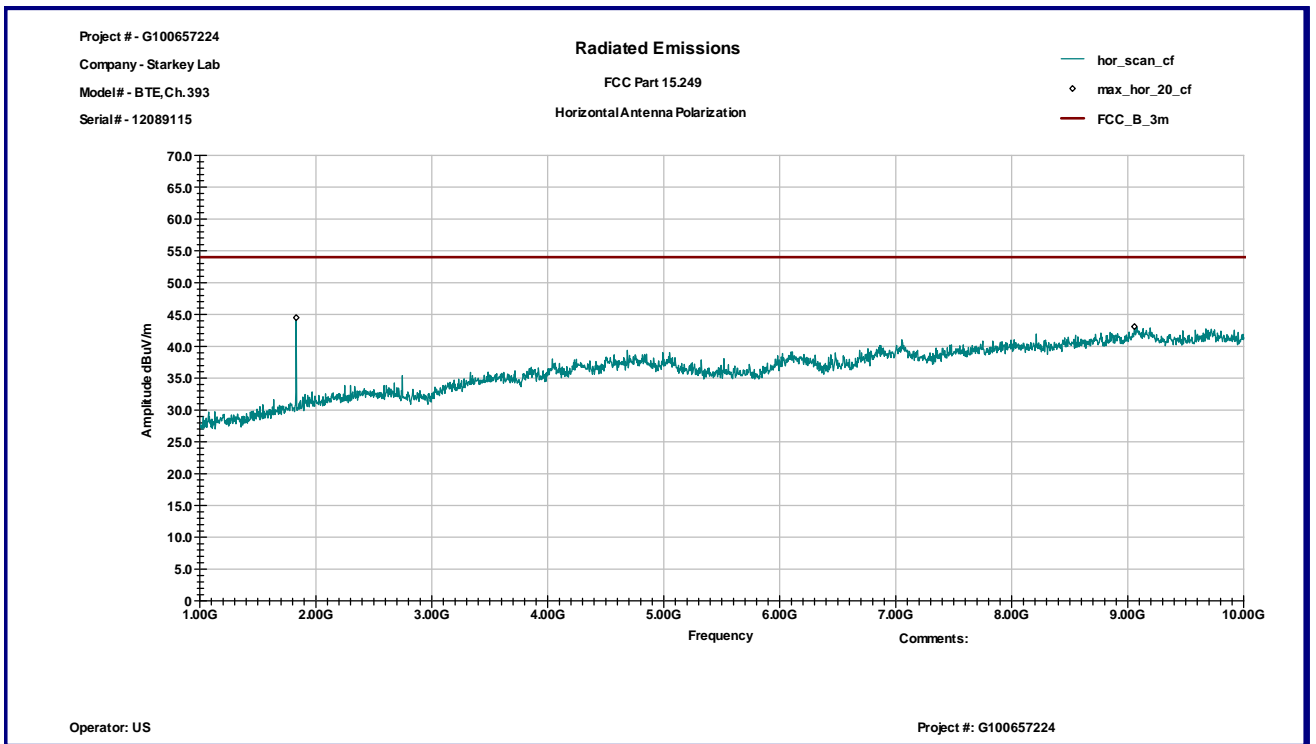


Graph 3.2.4

Vertical antenna polarization



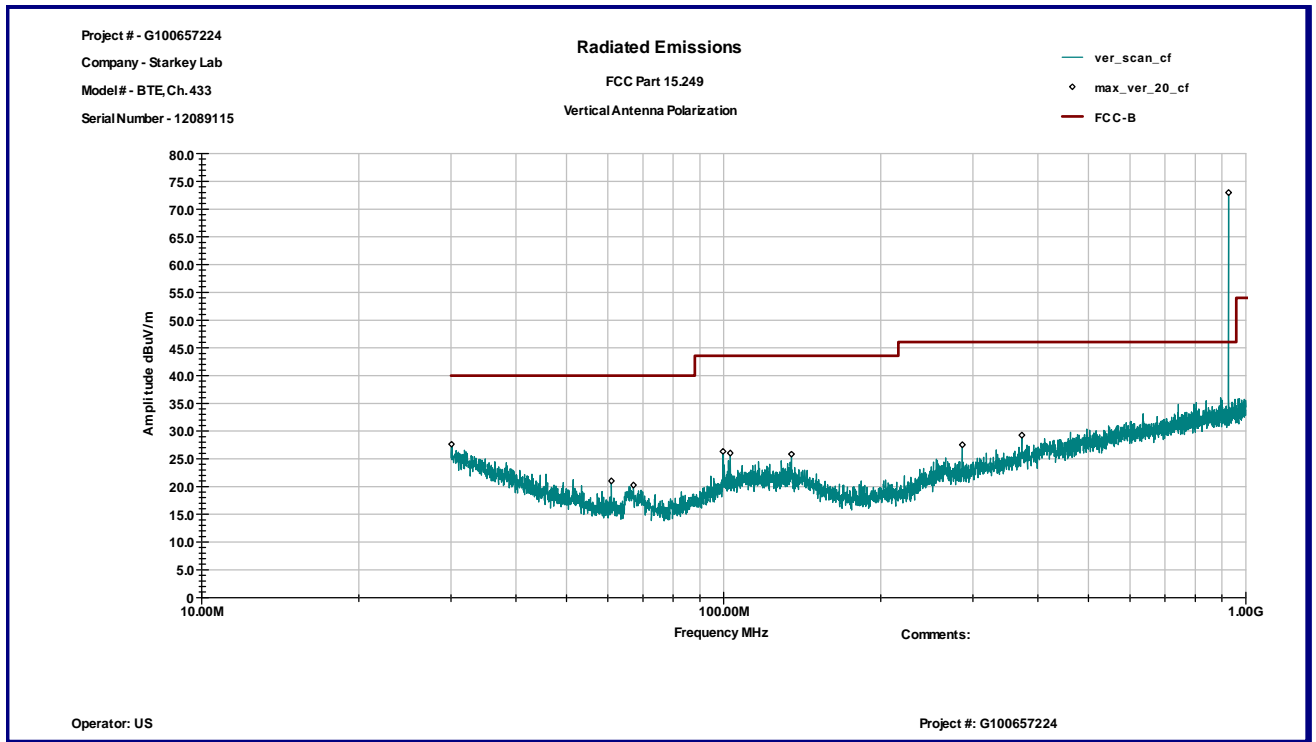
Horizontal antenna polarization



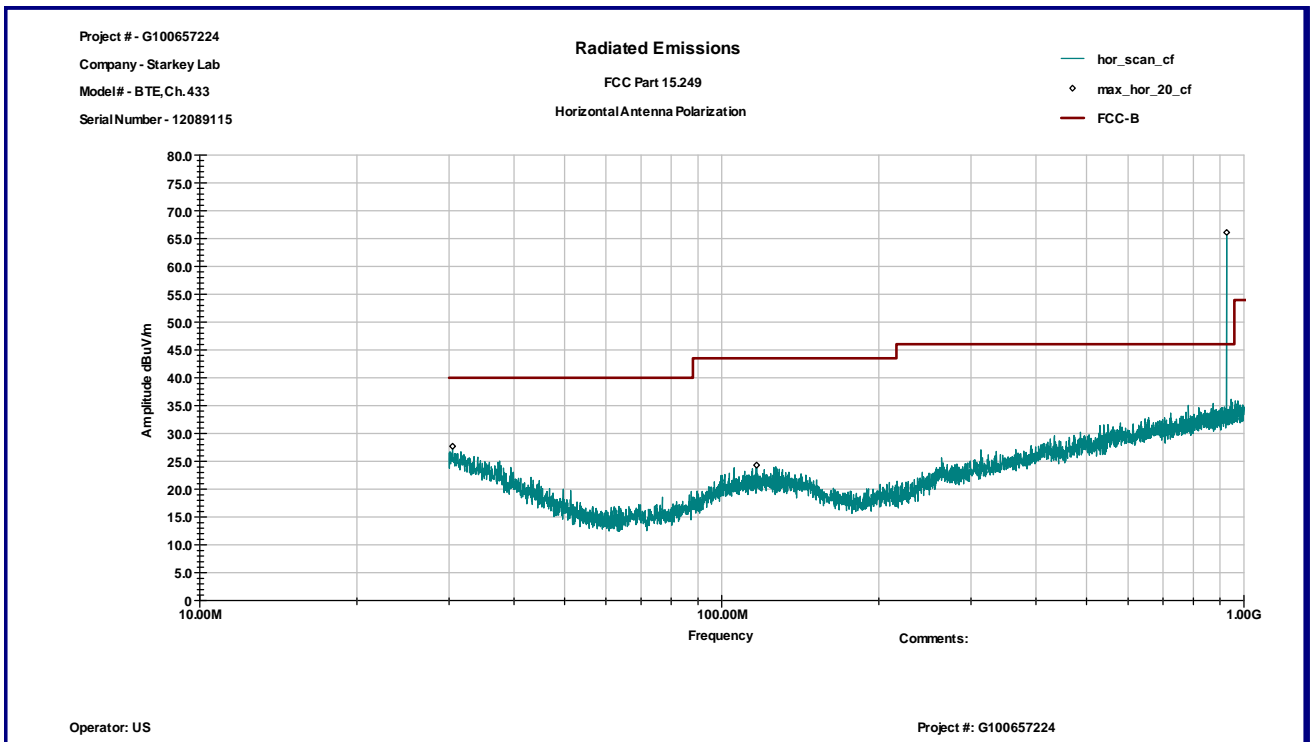


Graph 3.2.5

Vertical antenna polarization

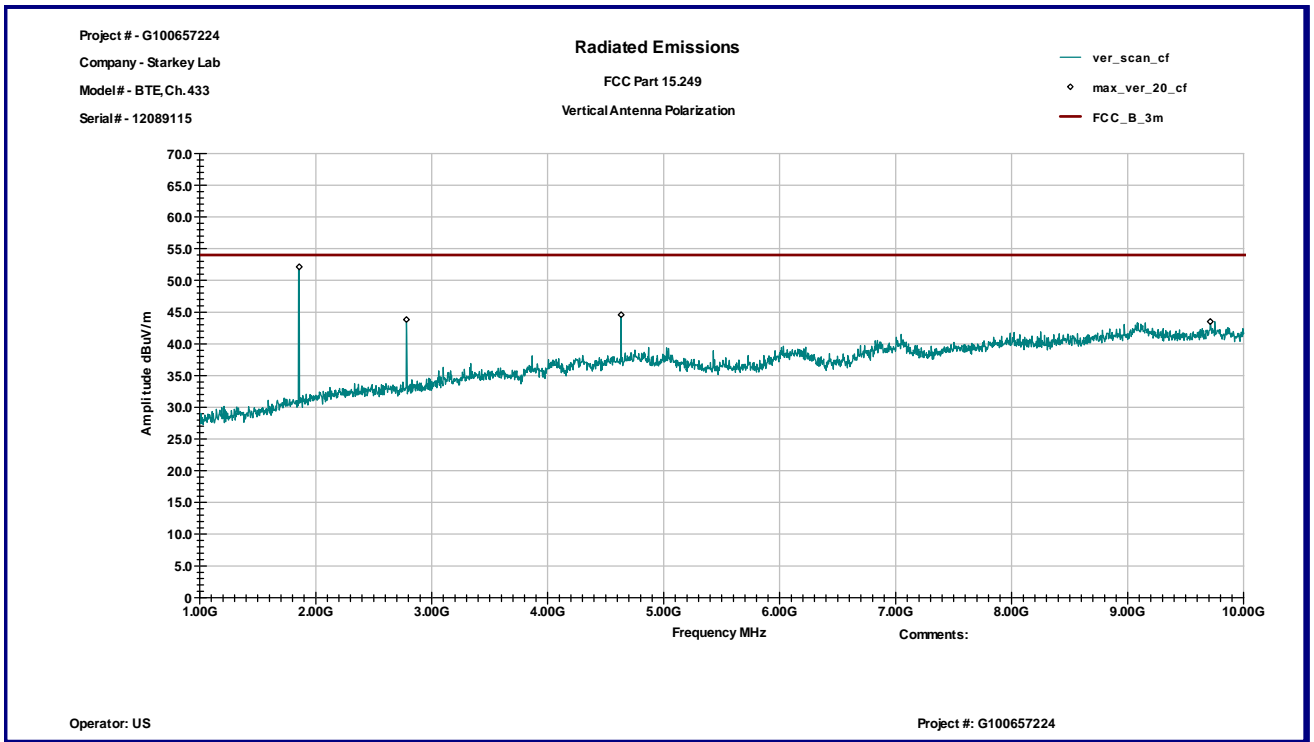


Horizontal antenna polarization

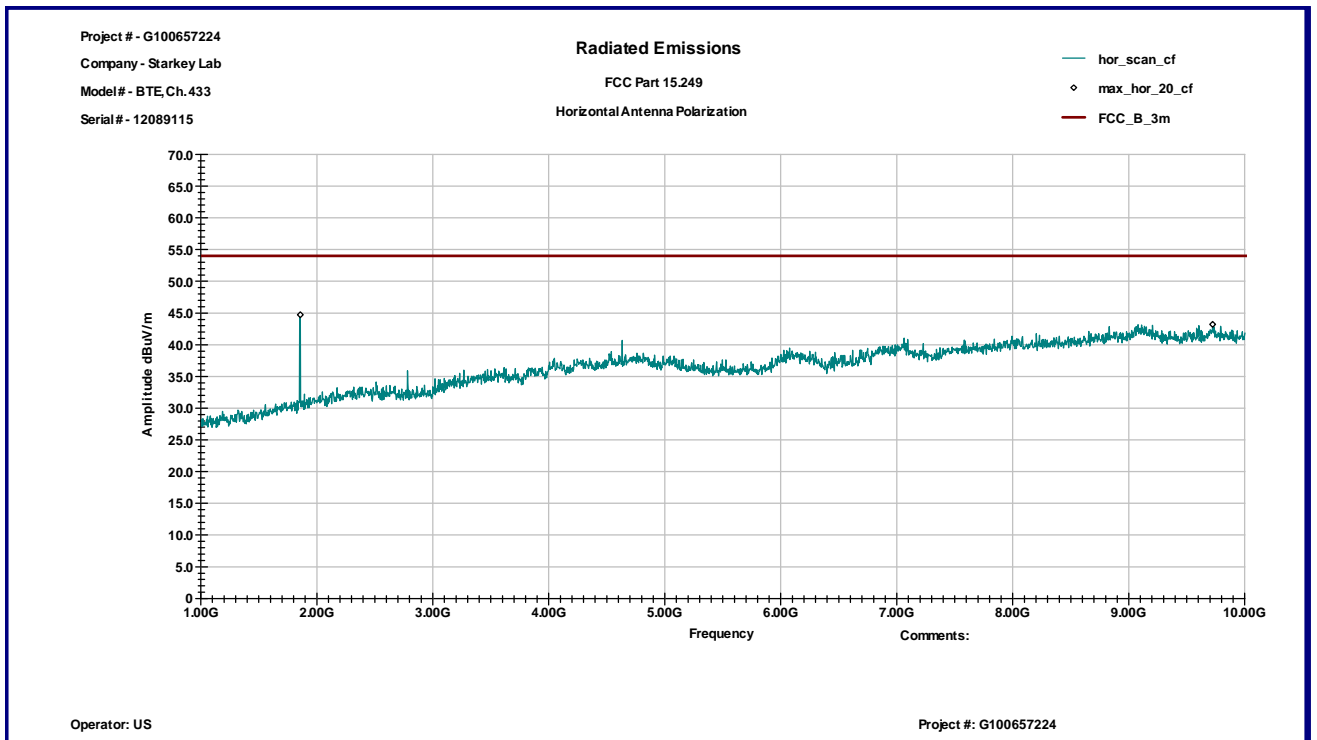


Graph 3.2.6

Vertical antenna polarization



Horizontal antenna polarization





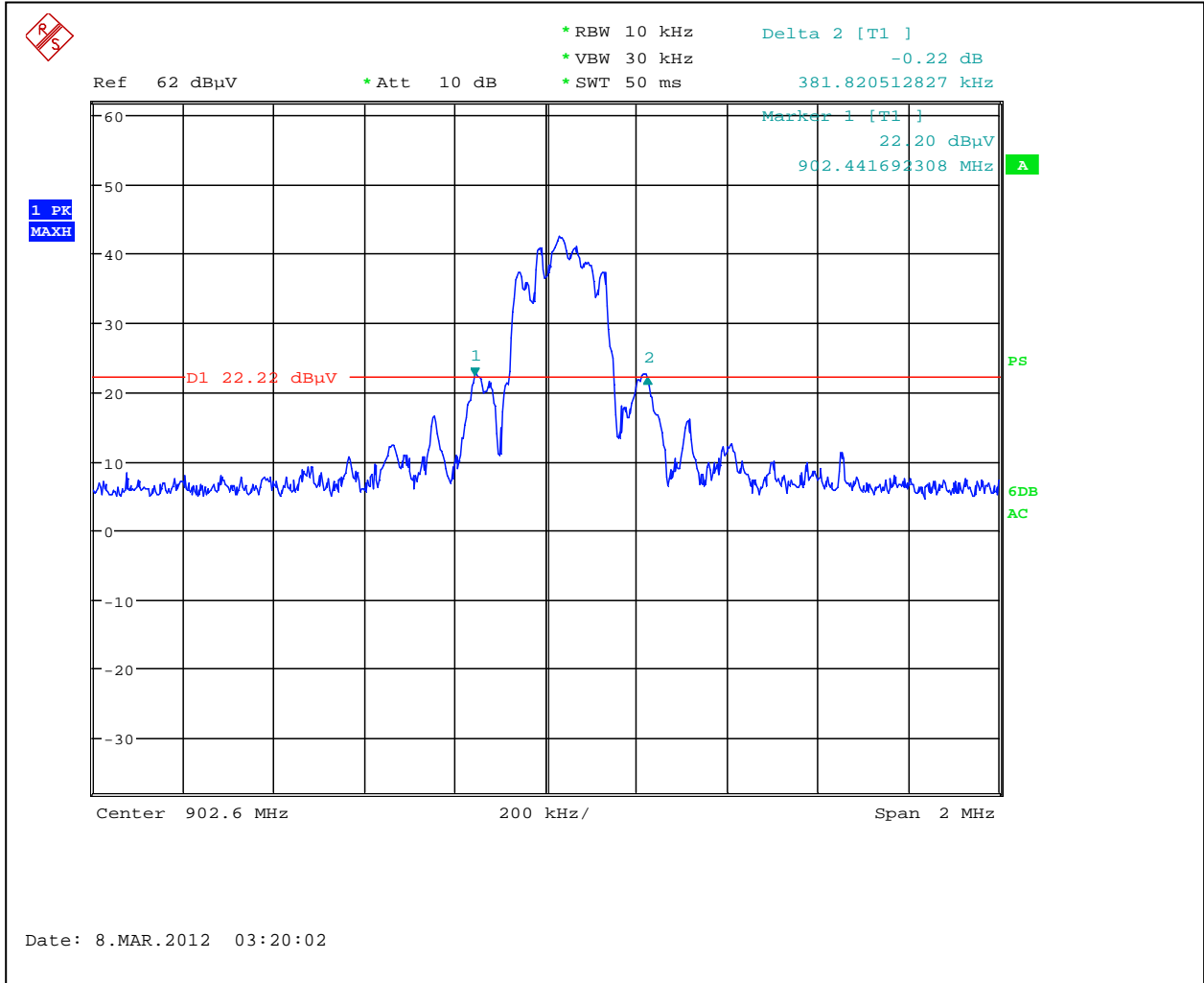
3.3 Bandwidth of Emissions

Center Frequency of operation MHz	Measured 20dB bandwidth kHz	Measured 99% bandwidth kHz
902.60	383.8	360
914.71	388.2	340
926.96	387.4	366

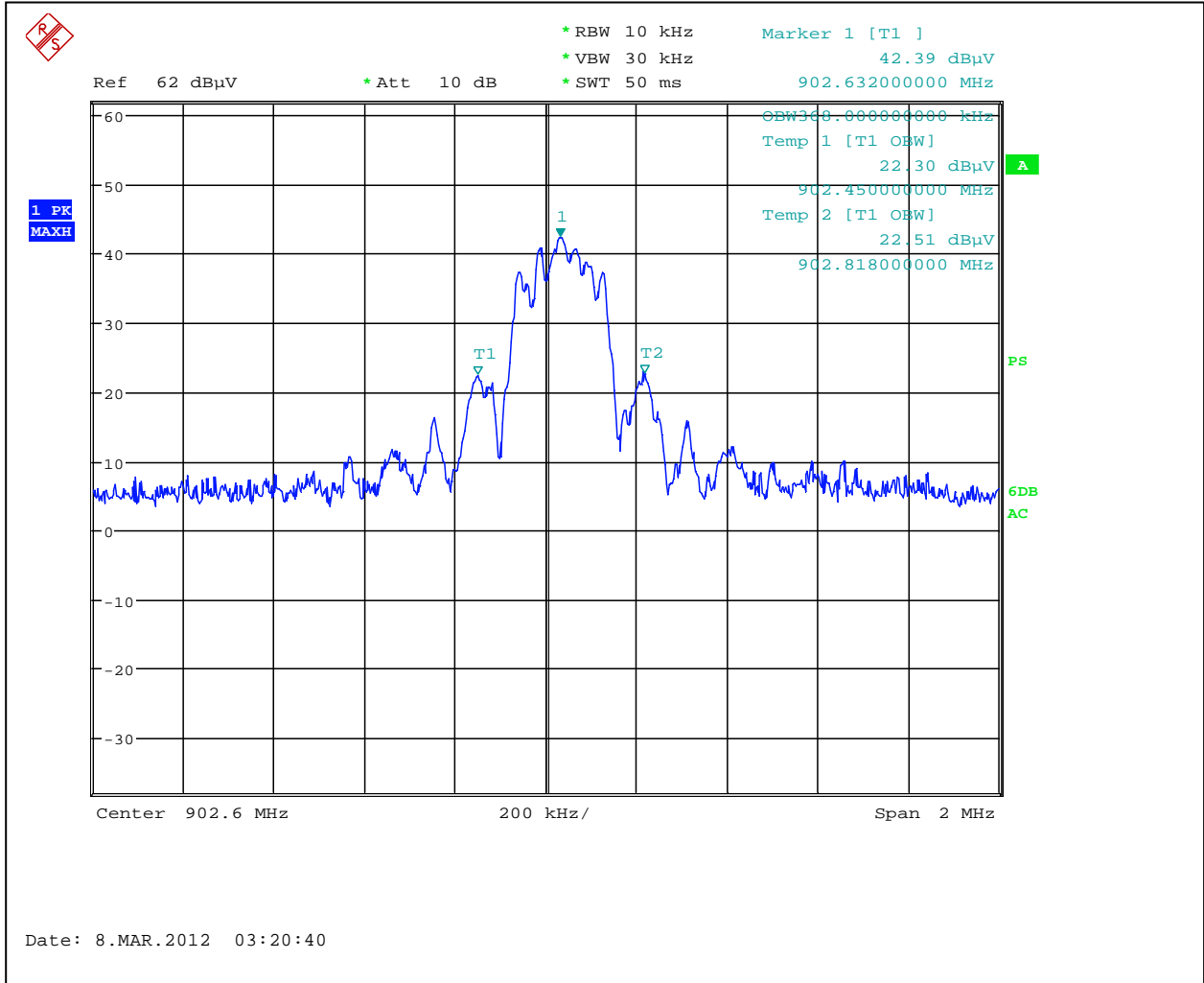
Graphs 3-3-1 to 3-3-6 show bandwidth of emissions

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

Graph 3.3.1

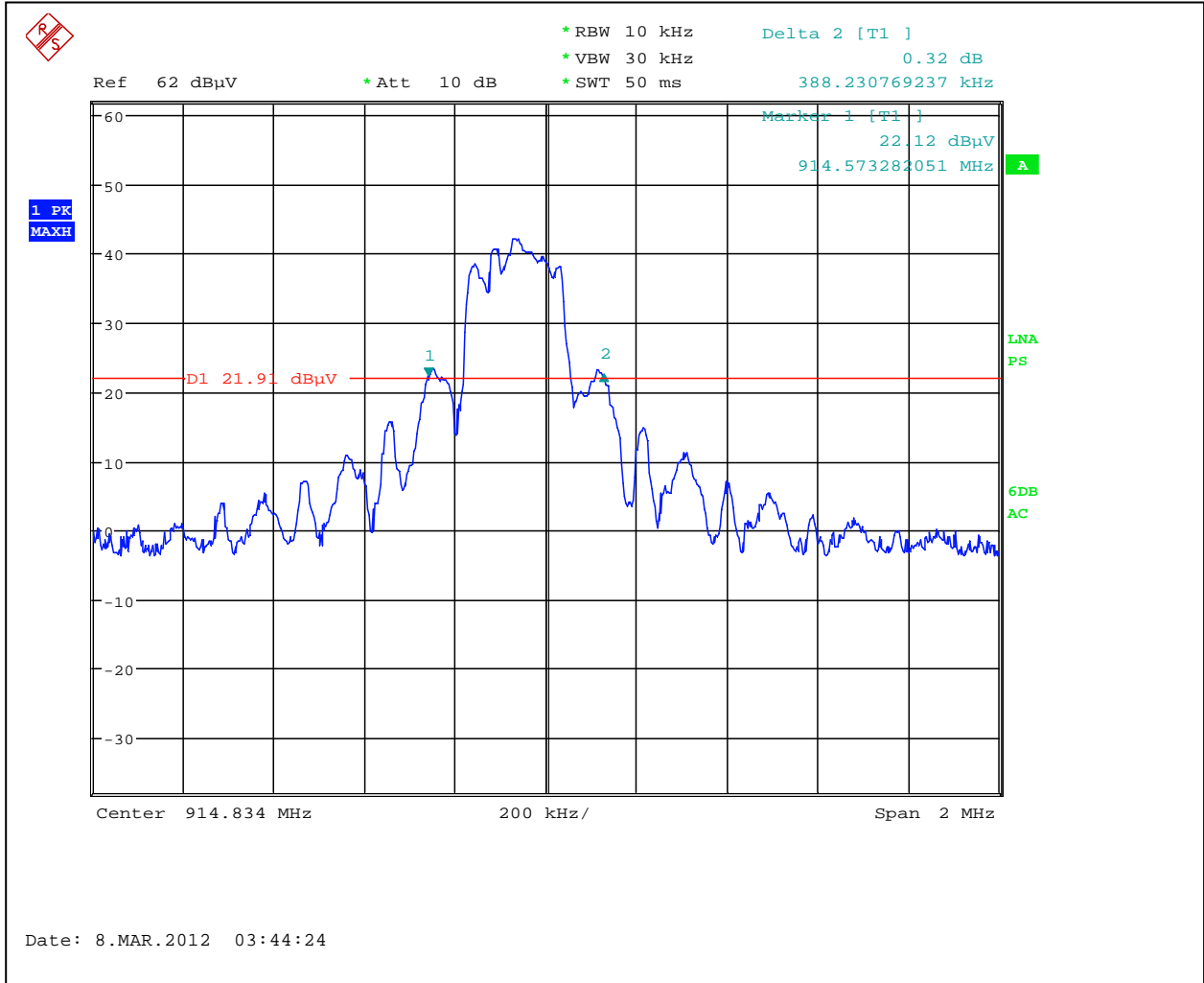


Graph 3.3.2

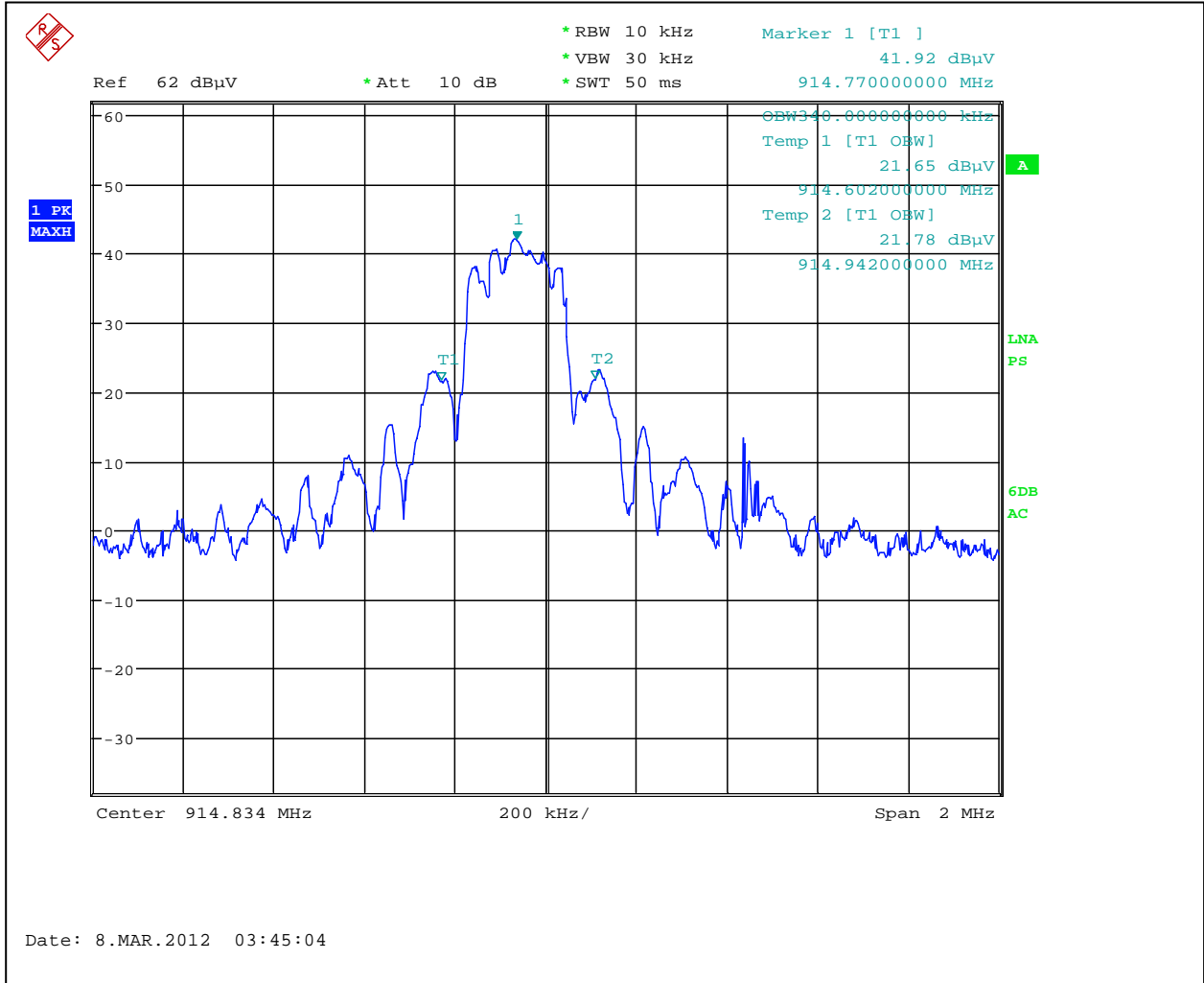




Graph 3.3.3

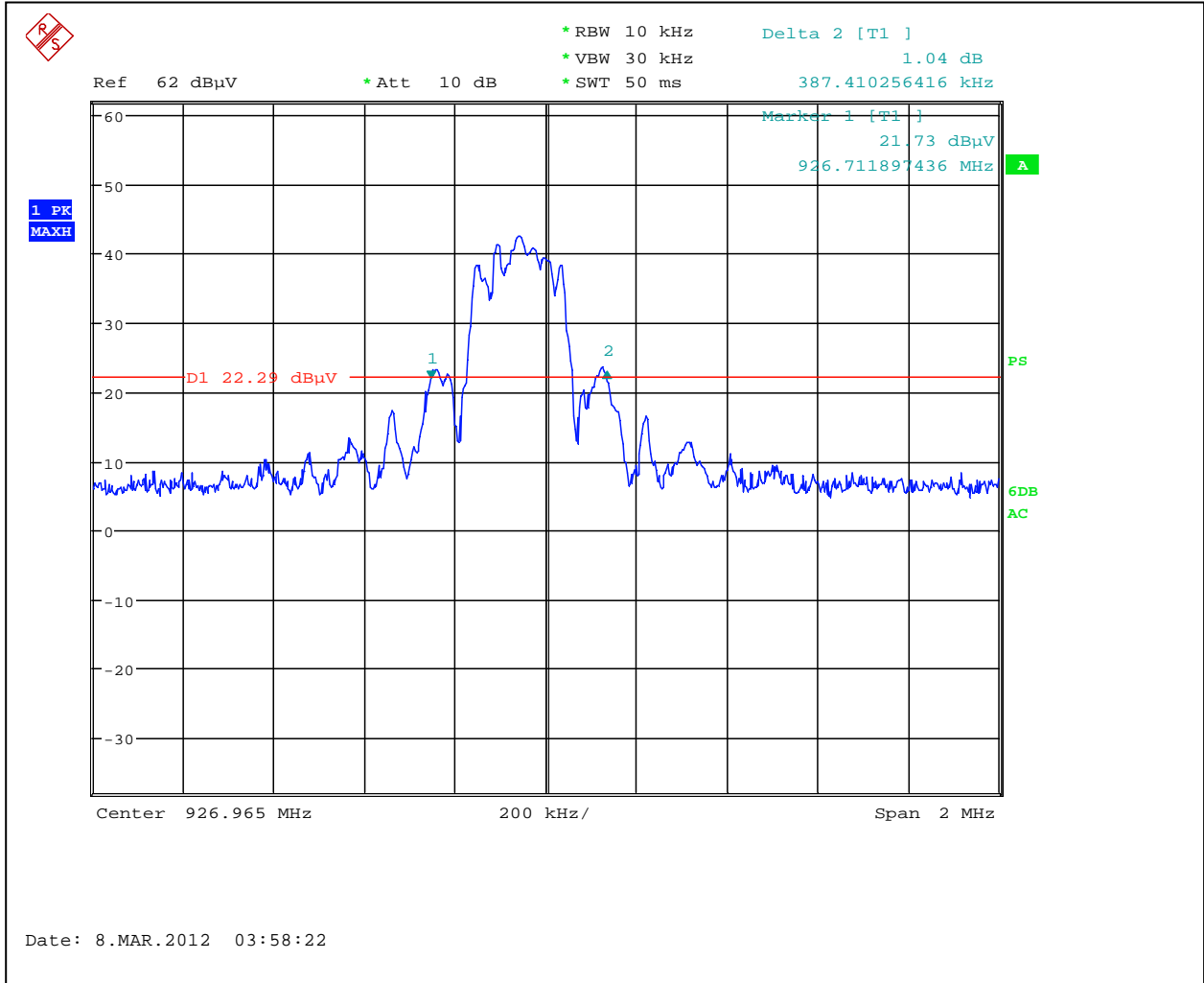


Graph 3.3.4

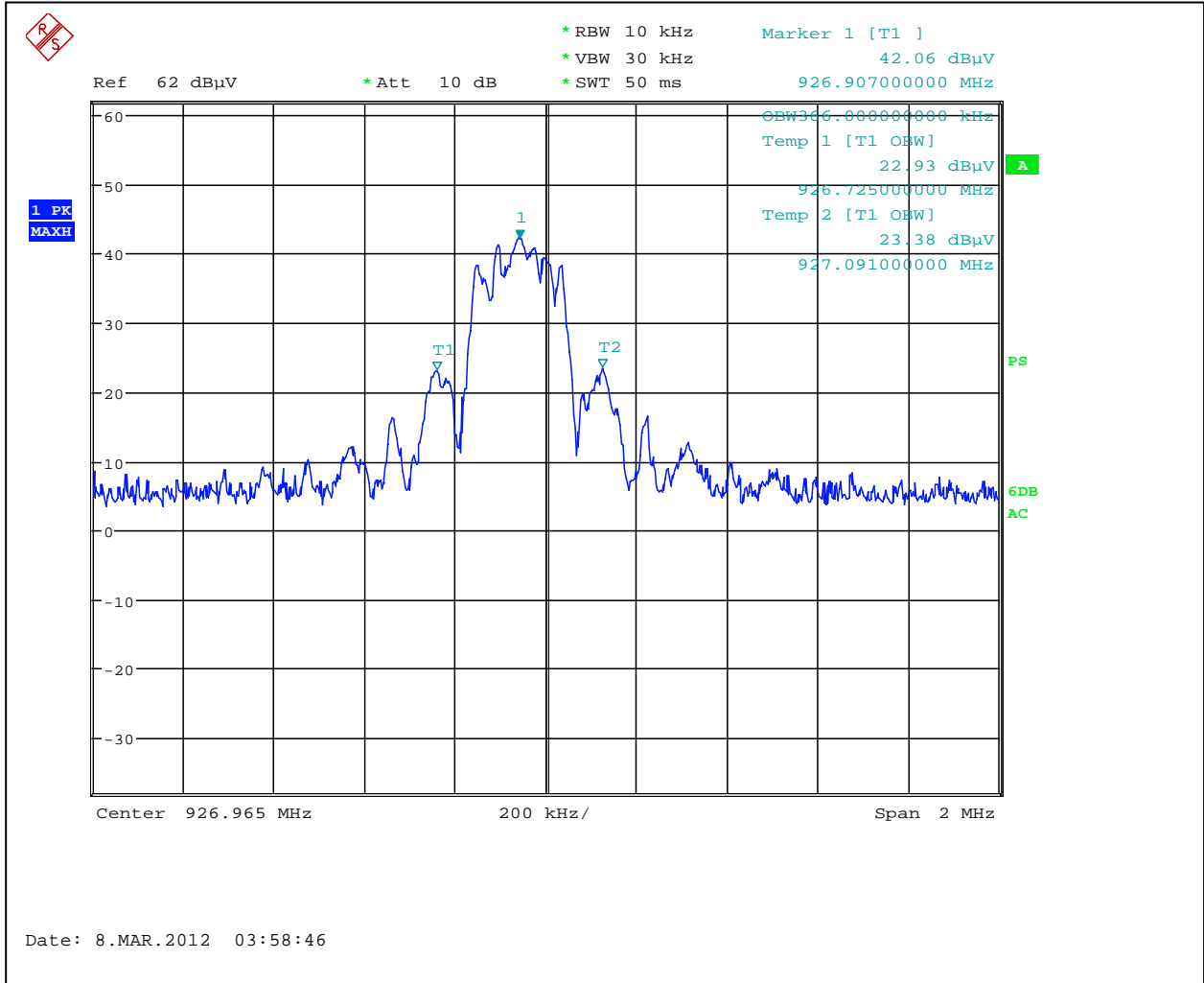




Graph 3.3.5



Graph 3.3.6





3.4 Transmitter power line conducted emissions

Test result: N/A

Frequency range: 0.15MHz-30MHz

Max. Emissions margin: [redacted] 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: **Pass**

Frequency range: 30MHz-5000MHz

Max. Emissions margin: 11.5dB below the limits

Notes: The Radiated Emissions test was performed in the Anechoic chamber at 3m measurement distance (see Table 3.5.1 and Graphs 3.5.1 to 3.5.6). No Radiated Emissions above ambient were detected in the frequency range above 1GHz.
Transmitting frequencies used by the signal generator were excluded from the tables.



Date:	March 8, 2012	Result: Pass
Standard:	FCC Part 15.109, Class B	
Tested by:	Uri Spector	
Test Point:	Enclosure	
Operation mode:	Receiving/Standby mode	
Note:	30MHz-1000MHz	

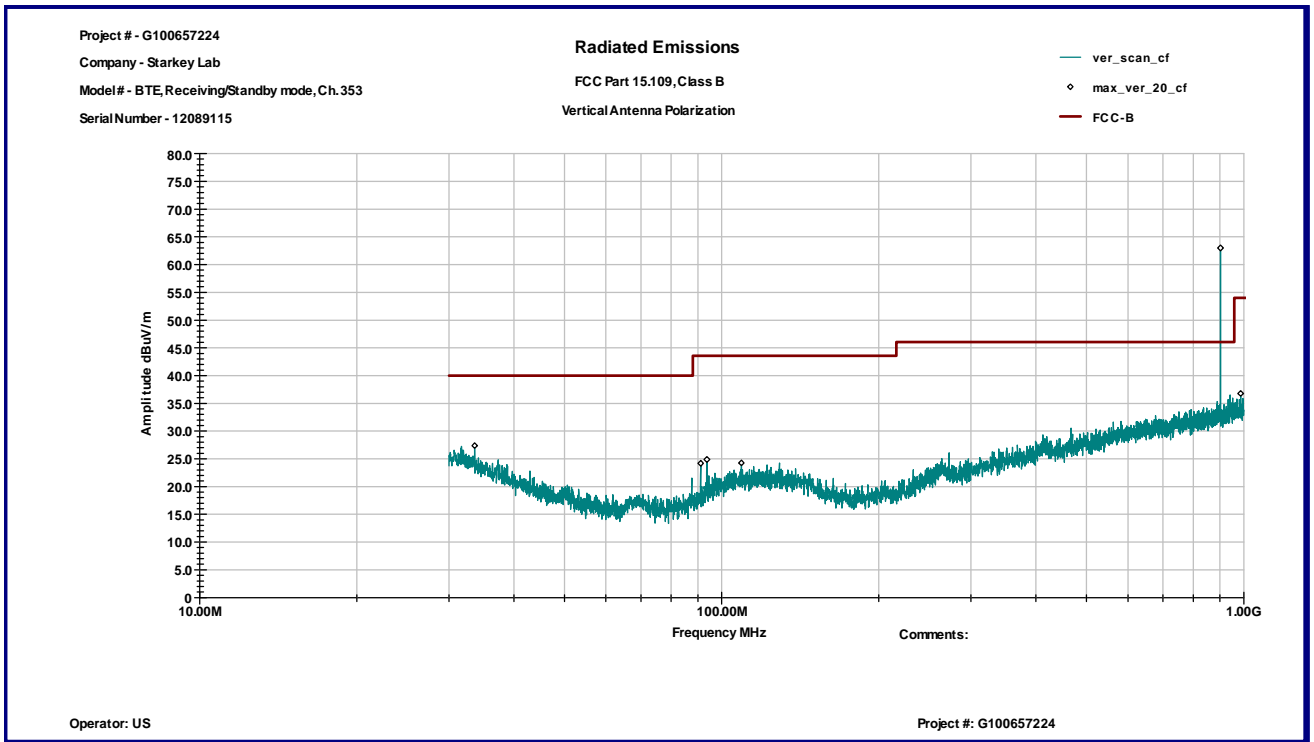
Table 3.5.1

Frequency	Ant. Polarity	Peak Reading dB μ V	Ant.Factor dB1/m	Total at 3m dB μ V/m	Limit dB μ V/m	Margin dB
Ch. 353						
33.636 MHz	V	9.0	18.3	27.4	40.0	-12.6
93.658 MHz	V	13.8	11.1	24.9	43.5	-18.6
109.03 MHz	V	10.8	13.5	24.3	43.5	-19.2
30.623 MHz	H	7.5	20.0	27.5	40.0	-12.6
134.92 MHz	H	10.4	13.7	24.1	43.5	-19.4
Ch. 393						
30.173 MHz	V	7.0	20.2	27.3	40.0	-12.8
93.733 MHz	V	14.0	11.1	25.1	43.5	-18.4
119.1 MHz	V	10.0	13.9	23.9	43.5	-19.6
400.78 MHz	V	11.4	18.7	30.1	46.0	-15.9
32.632 MHz	H	8.5	18.9	27.4	43.5	-16.1
121.12 MHz	H	10.8	14.0	24.8	43.5	-18.7
420.87 MHz	H	10.8	19.9	30.7	46.0	-15.3
Ch. 433						
30.069 MHz	V	8.2	20.3	28.5	40.0	-11.5
93.733 MHz	V	14.0	11.1	25.1	43.5	-18.4
105.07 MHz	V	11.7	13.1	24.8	43.5	-18.7
278.46 MHz	V	10.8	15.5	26.3	46.0	-19.7
31.87 MHz	H	8.7	19.3	28.0	40.0	-12.0
127.83 MHz	H	10.3	13.9	24.1	43.5	-19.4

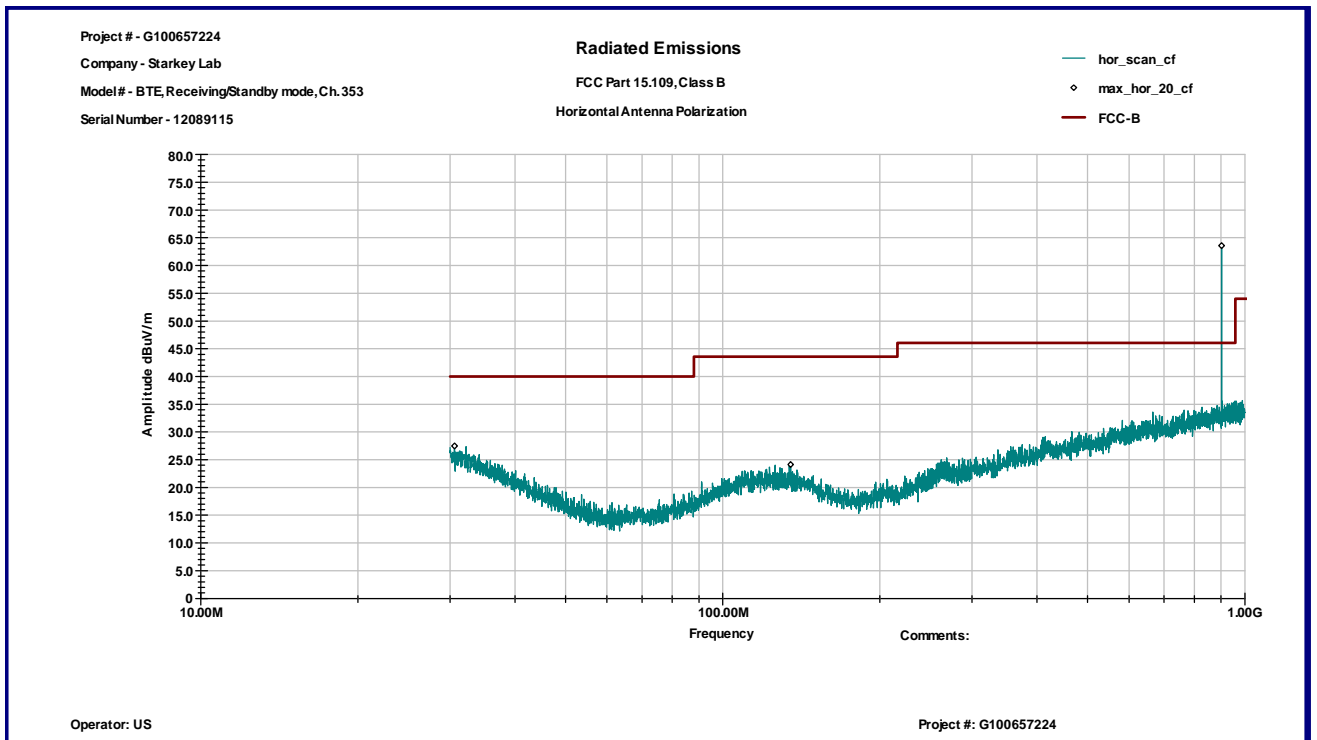


Graph 3.5.1

Vertical antenna polarization



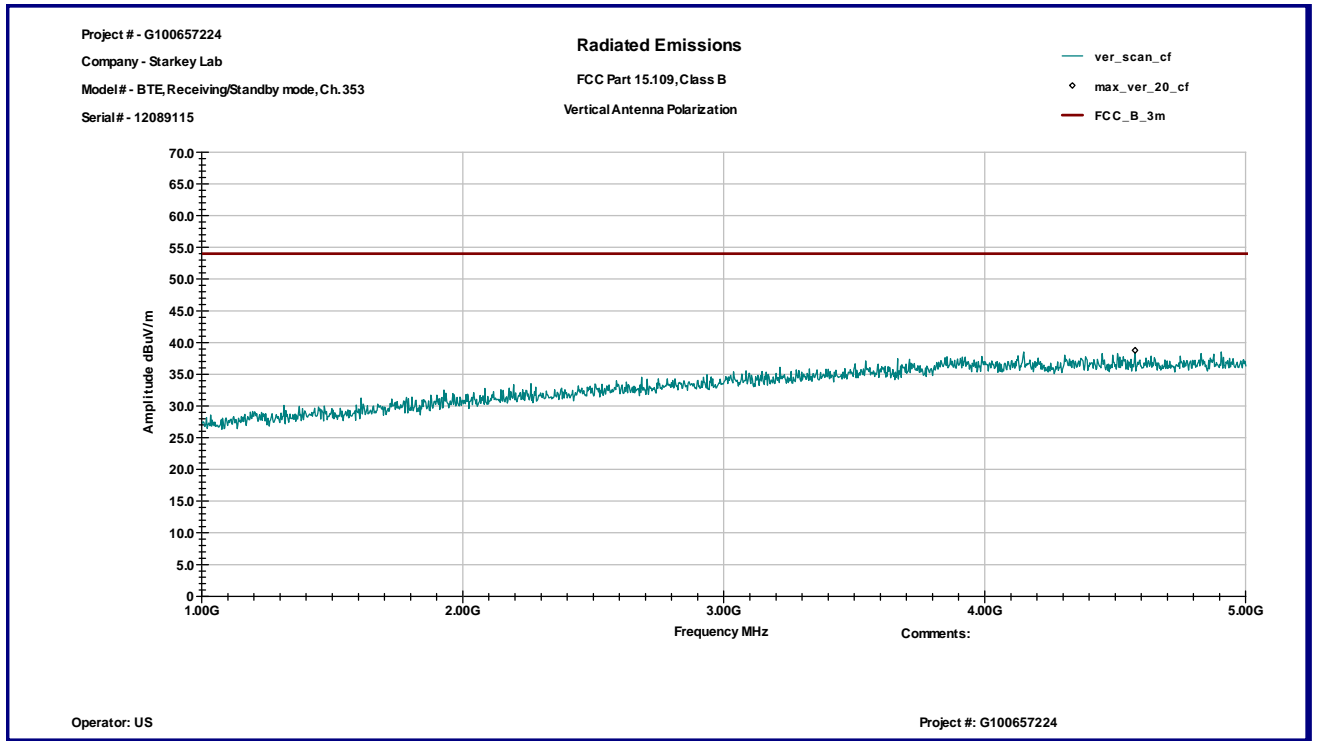
Horizontal antenna polarization



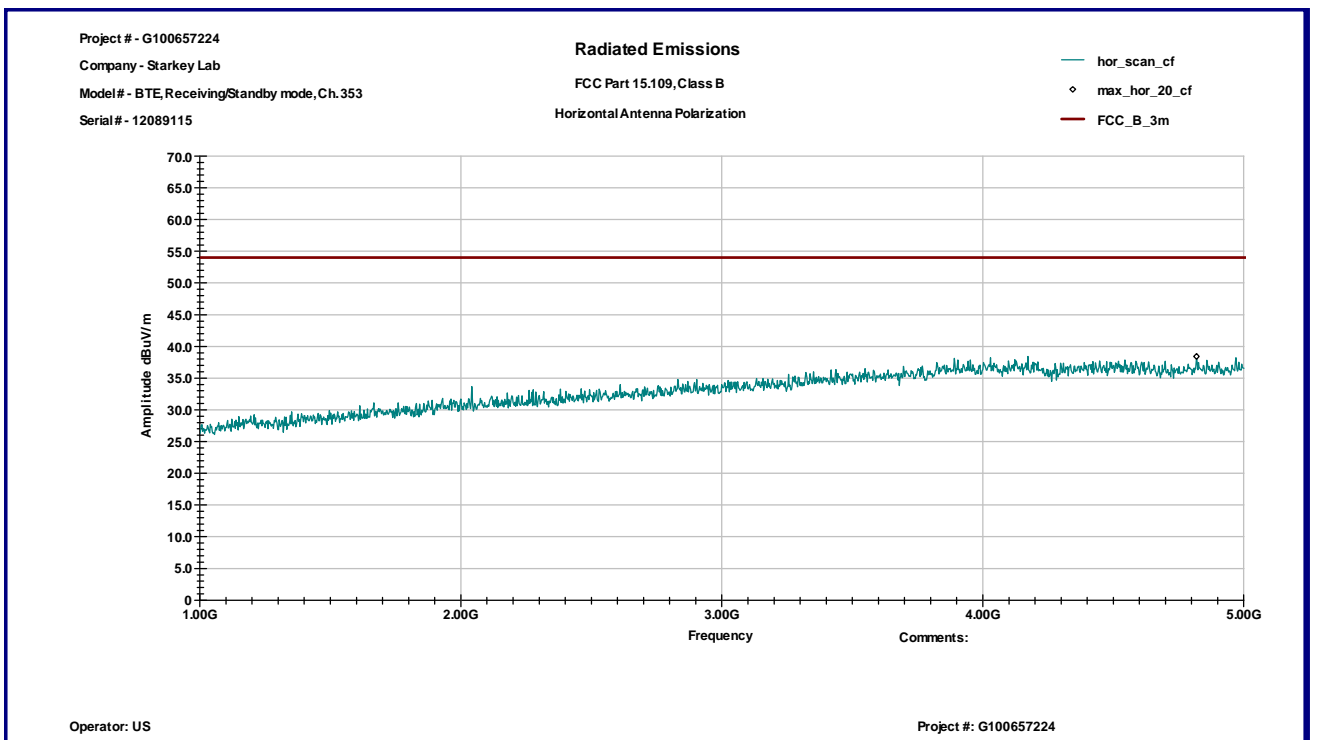


Graph 3.5.2

Vertical antenna polarization



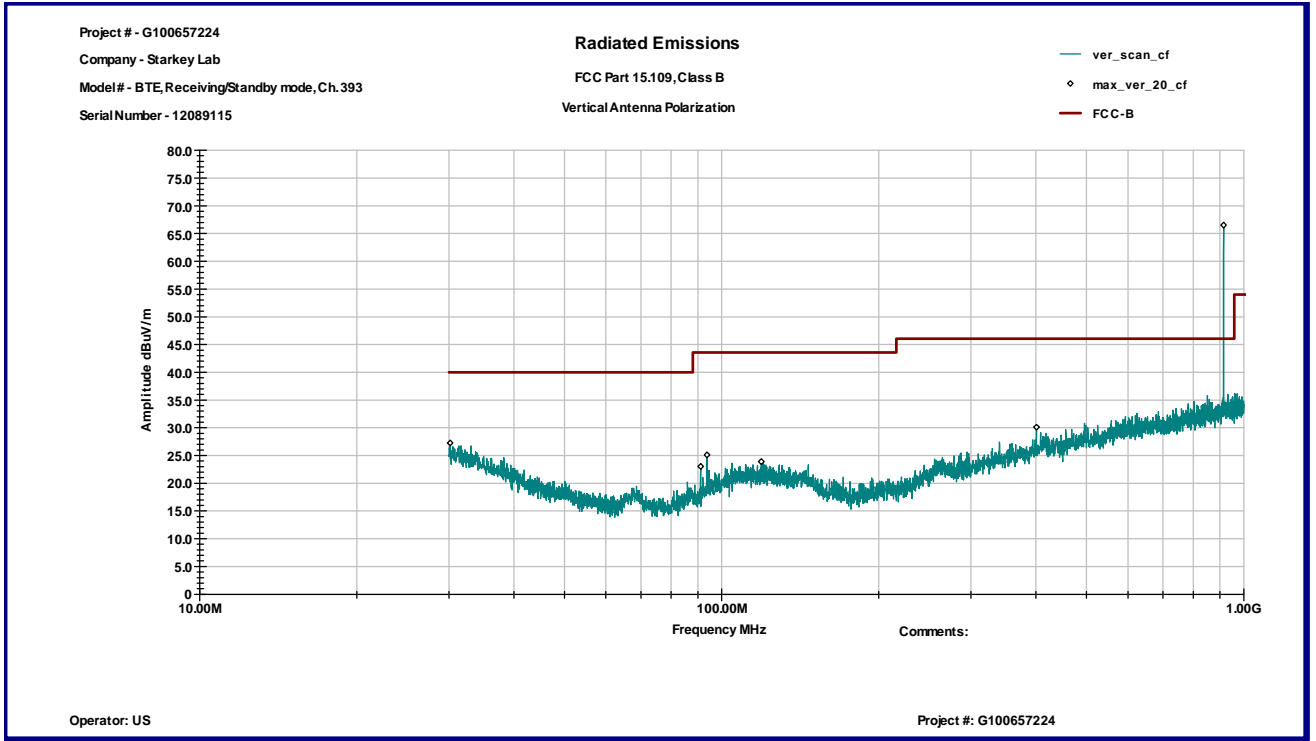
Horizontal antenna polarization



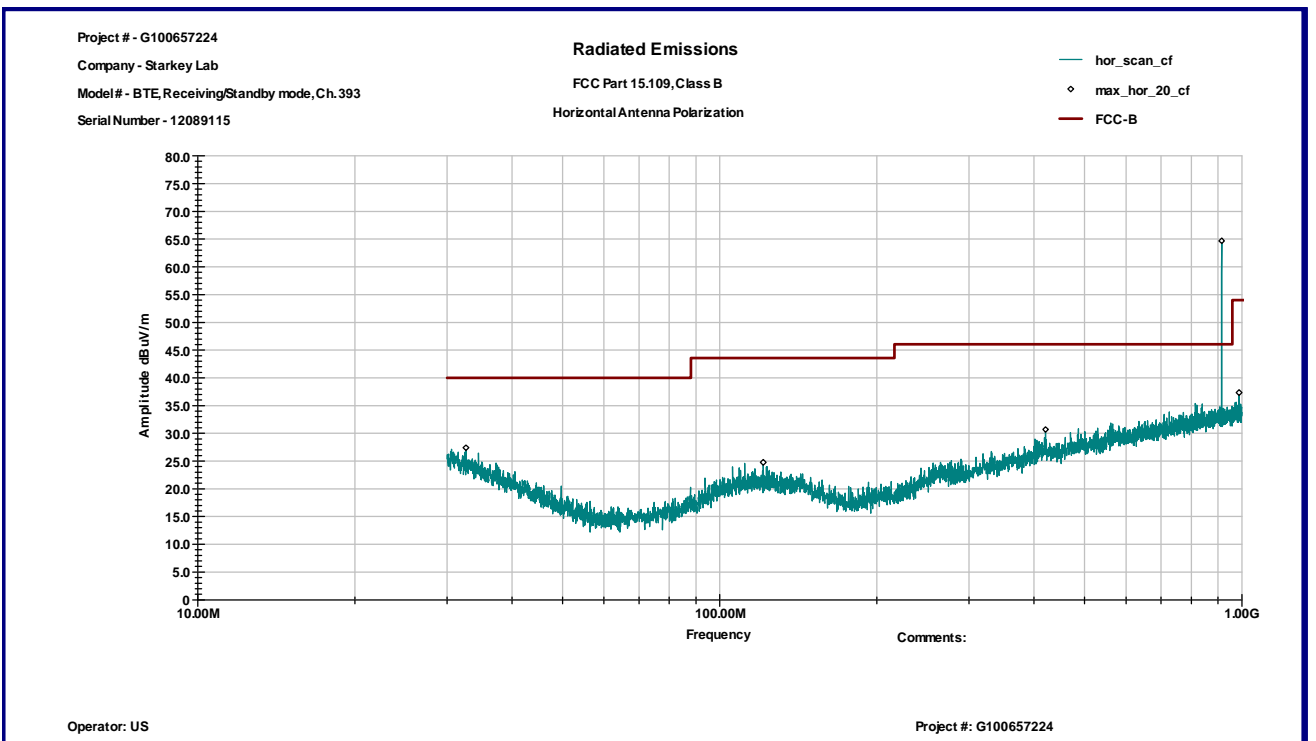


Graph 3.5.3

Vertical antenna polarization



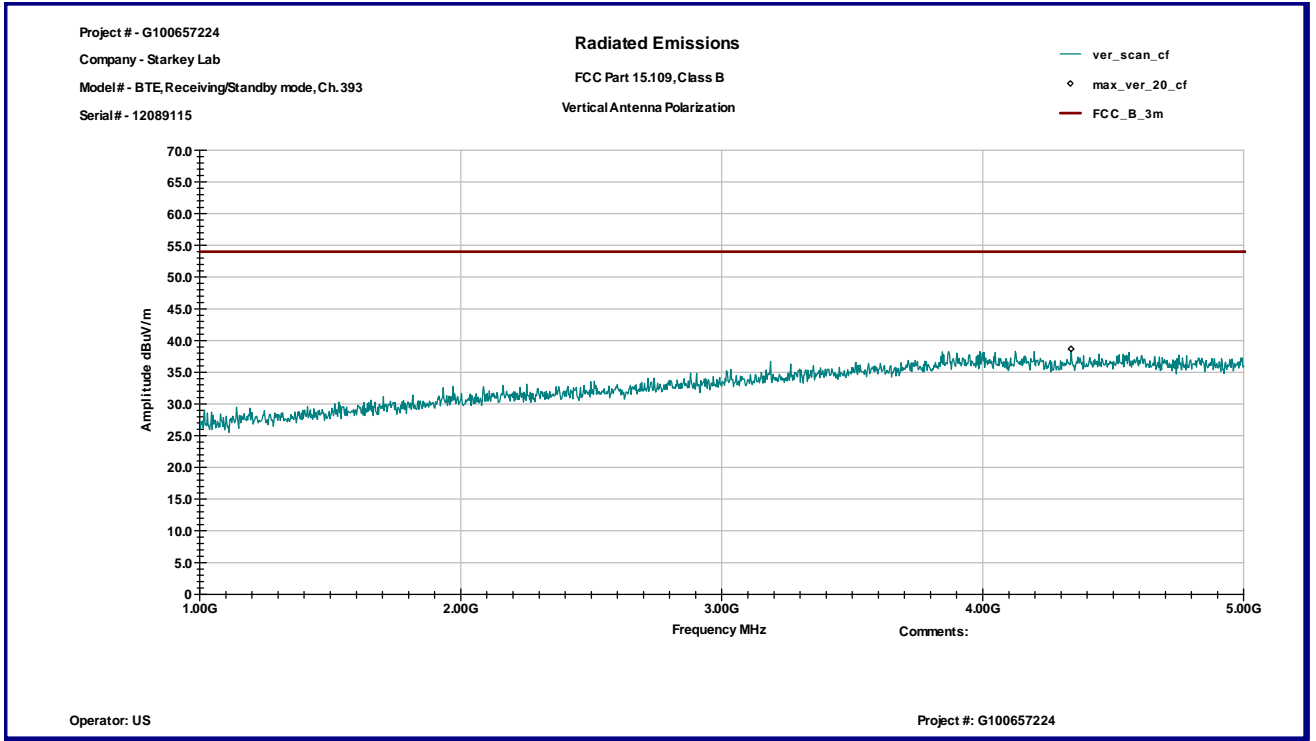
Horizontal antenna polarization



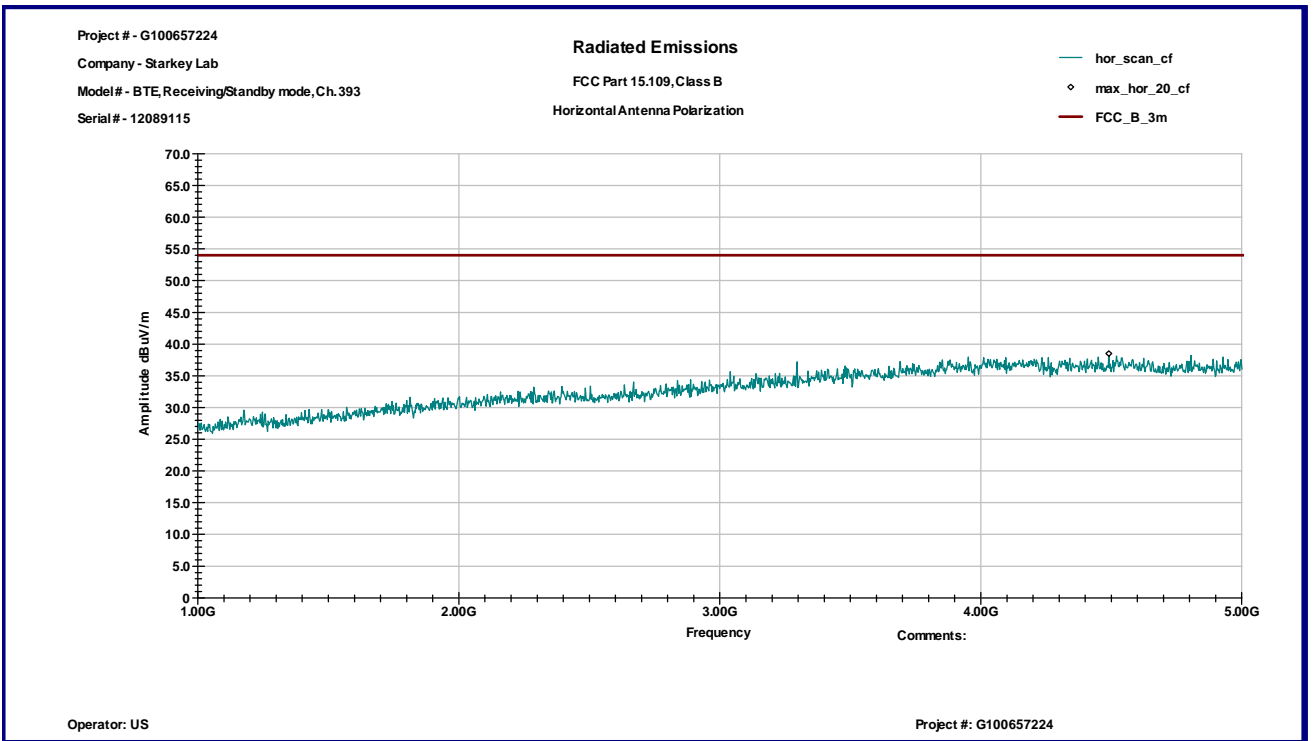


Graph 3.5.4

Vertical antenna polarization



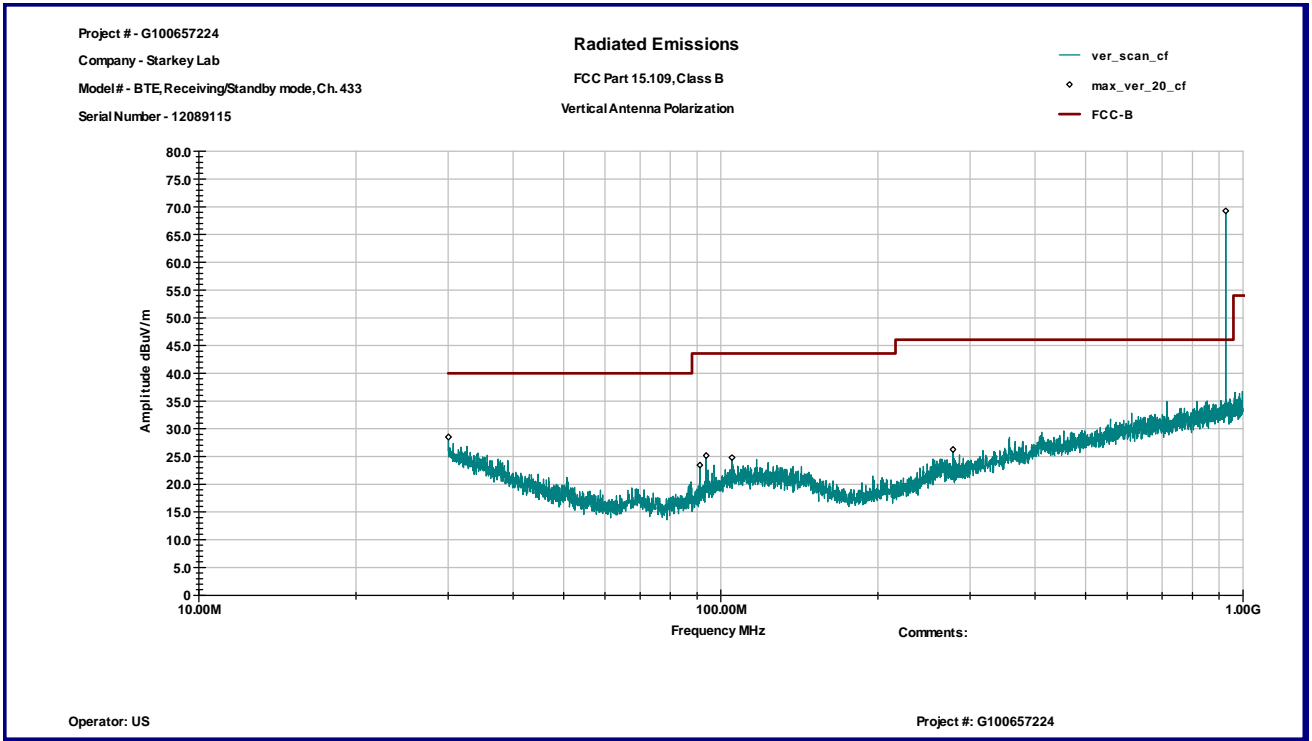
Horizontal antenna polarization



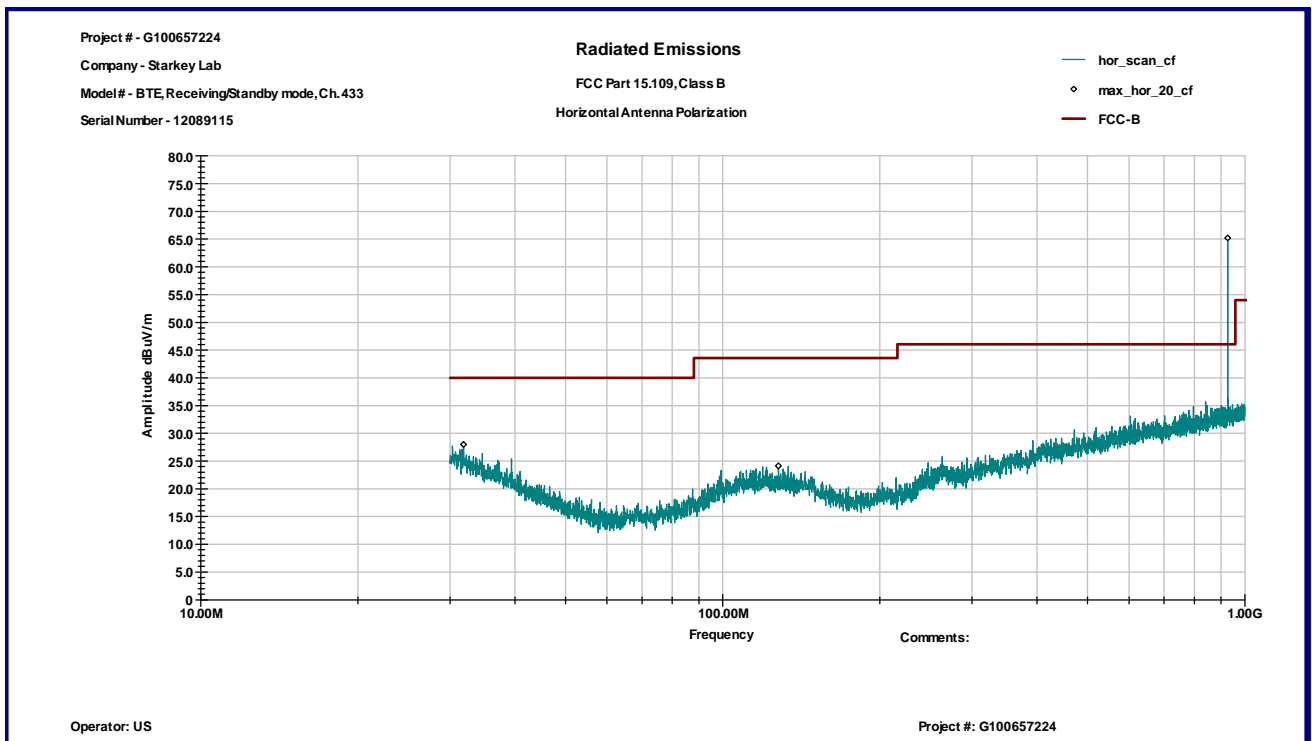


Graph 3.5.5

Vertical antenna polarization



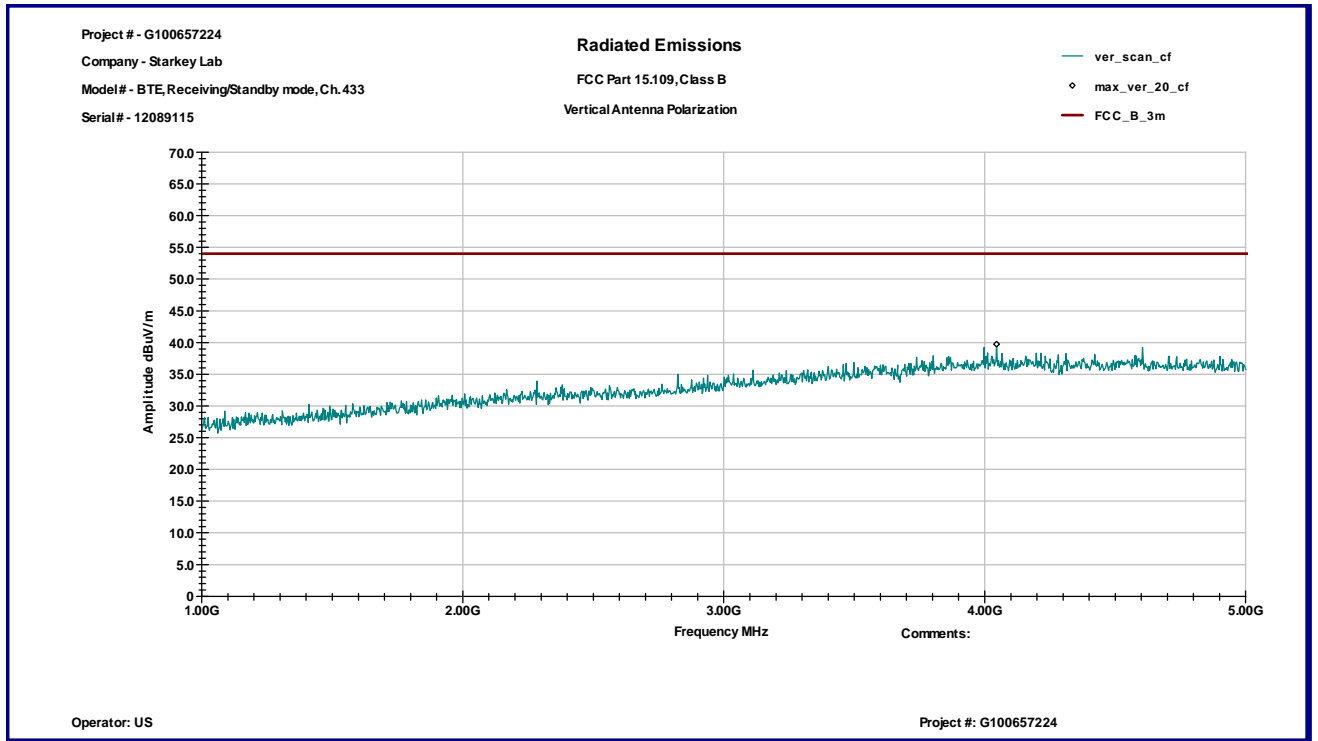
Horizontal antenna polarization



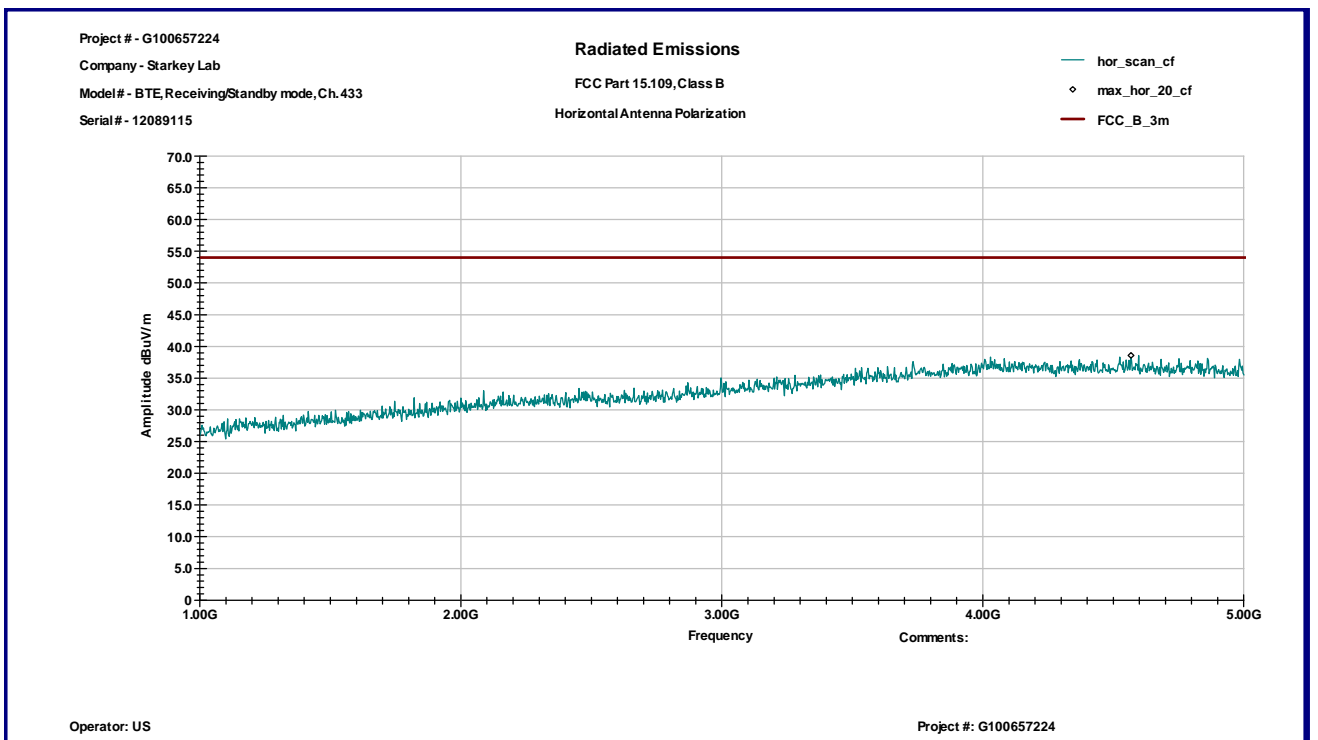


Graph 3.5.6

Vertical antenna polarization



Horizontal antenna polarization





3.6 Digital device conducted emissions

Test result: N/A

Frequency range: 0.15MHz-30MHz

Max. Emissions margin: [redacted] 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	ESU	100398	25283	12/09/2012	<input checked="" type="checkbox"/>
Spectrum Analyzer	R & S	FSP 40	100024	12559	11/17/2012	<input checked="" type="checkbox"/>
Bicono-Log Antenna	Schaffner-Chase	CBL 6112 B	2468	9734	11/08/2012	<input checked="" type="checkbox"/>
Horn Antenna	EMCO	3115	9507-4513	9936	04/29/2012	<input checked="" type="checkbox"/>
LISN	Fischer Custom Communications	FCC-LISN-2 MOD.SD	316	9945	05/26/2012	<input type="checkbox"/>
Pre-Amplifier	MITEQ	AMF-5D-00501800-28-13P	1402232	172081	10/31/2012	<input checked="" type="checkbox"/>
System	TILE! Instrument Control		Ver. 3.4.K.29	15259	VBU	<input checked="" type="checkbox"/>