TEST REPORT

Report Number: 101628693MIN-001
Project Number: G101628693

Testing performed on the
Zseries ITE / A3 ITE / Start ITE
FCC ID: EOA-ZSERIES-HA
Industry Canada ID: 6903A-ZSERIESHA

to
47 CFR Part 15. 249:2013
RSS- 210, Issue 8, 2010
RSS-Gen, Issue 3, 2010
47 CFR, Part 15:2013, §15.107 and §15.109, Class / ICES-003, Issue 5:2012

For
Starkey Laboratories, Inc.

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

Test Authorized by:
Starkey Laboratories, Inc.
6700 Washington Avenue South
Eden Prairie, MN 55344, USA

Prepared by: Richard Blonigen — Date: May 7, 2014

Reviewed by: Uri Spector — Date: May 7, 2014

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1.0 GENERAL DESCRIPTION

Model:	ZSeries ITE
Type of EUT:	Hearing Aid, Istanbul ITE
Serial Number:	2911320533
FCC ID:	EOA-ZSERIES-HA
Industry Canada ID:	6903A-ZSERIESHA
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) 828-6972
Email:	Ken_meyer@starkey.com
Test Standards:	☒ 47 CFR, Part 15:2013, §15.249 ☒ RSS–210, Issue 8, 2010 ☒ RSS-Gen, Issue 3, 2010 ☒ 47 CFR, Part 15:2013, §15.107 and §15.109, Class B ☒ ICES-003, Issue 5:2012 ☐ Other
Type of radio:	☒ Stand -alone ☐ Module ☐ Hybrid
Date Sample Submitted:	May 5, 2014
Test Work Started:	May 5, 2014
Test Work Completed:	May 7, 2014
Test Sample Conditions:	☐ Damaged ☐Poor (Usable) ☒ Good

1.1 Product Description; Test Facility

Product Description:	Hearing Aid Transceiver
Band of Operation	902-928 MHz
Operating Frequencies	902.58-926.85 MHz
Number of Channels	81 (channels 353 to 433)
Modulation:	FSK
Emission Designator:	313KFXD
Antenna(s) Info:	Integral
Antenna Installation:	☐ User ☐ Professional ☒ Factory
Transmitter Power Configuration:	☒ Internal battery ☐ External power source ☐ 120VAC ☐ 230VAC ☐ 400VAC ☒ 1.4 VDC ☐ Other: Amp. ☐ 50Hz ☐ 60Hz
Special Test Arrangement:	N/A
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 modulated mode
☐ - Continuous un-modulated
☒ - Continuous receiving mode
☐ -

Operating modes of the EUT:

No.	Description
1	The device was pre-programmed to operate continuously at low, middle, and upper frequency channels, one channel being transmitted at a given time.

Cables:

No.	Type	Length	Designation	Note
	None			

Support equipment/Services:

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

Notes: Per Client information the Devices ZSeries ITE; A3 ITE; and Start ITE are identical. The model ZSeries ITE was tested only

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)

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 and Bandedge Compliance

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test distance: ☐ 10 meters ☒ 3 meters

Frequency range of measurements: 902-928MHz

Test result: **Pass**

Max. Emissions margin at fundamental: 14.4dB below the limits

Max. Emissions margin at bandedge: 7.9dB below the limits

Notes: None

Date:	May 5, 2014	**Result: Pass**
Standard:	FCC 15.249(a) / RSS-210 A2.9	
Tested by:	Richard Blonigen	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	None	

Table 3.1.1

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 353										
902.580	V	134	21.8	3.6	0.0	53.0	78.5	94.0	-15.5	Pk
902.580	H	160	21.8	3.6	0.0	53.6	79.1	94.0	-14.9	Pk
Channel 393										
914.750	V	128	21.8	3.6	0.0	53.6	79.0	94.0	-15.0	Pk
914.750	H	100	21.8	3.6	0.0	53.9	79.3	94.0	-14.7	Pk
Channel 433										
926.850	V	128	21.7	3.7	0.0	54.1	79.5	94.0	-14.5	Pk
926.850	H	100	21.7	3.7	0.0	54.2	79.6	94.0	-14.4	Pk
Bandedge Compliance										
902.000	V	134	21.8	3.6	0.0	12.3	37.8	46.0	-8.3	QP
902.000	H	157	21.8	3.6	0.0	12.7	38.2	46.0	-7.9	QP
928.000	V	100	21.7	3.7	0.0	7.2	32.6	46.0	-13.5	QP
928.000	H	100	21.7	3.7	0.0	7.3	32.7	46.0	-13.4	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-10GHz

Test result: **Pass**

Max. margin of harmonics and spurious emissions: 7.7dB below the limits

Notes: Fundamental frequencies were omitted from Table

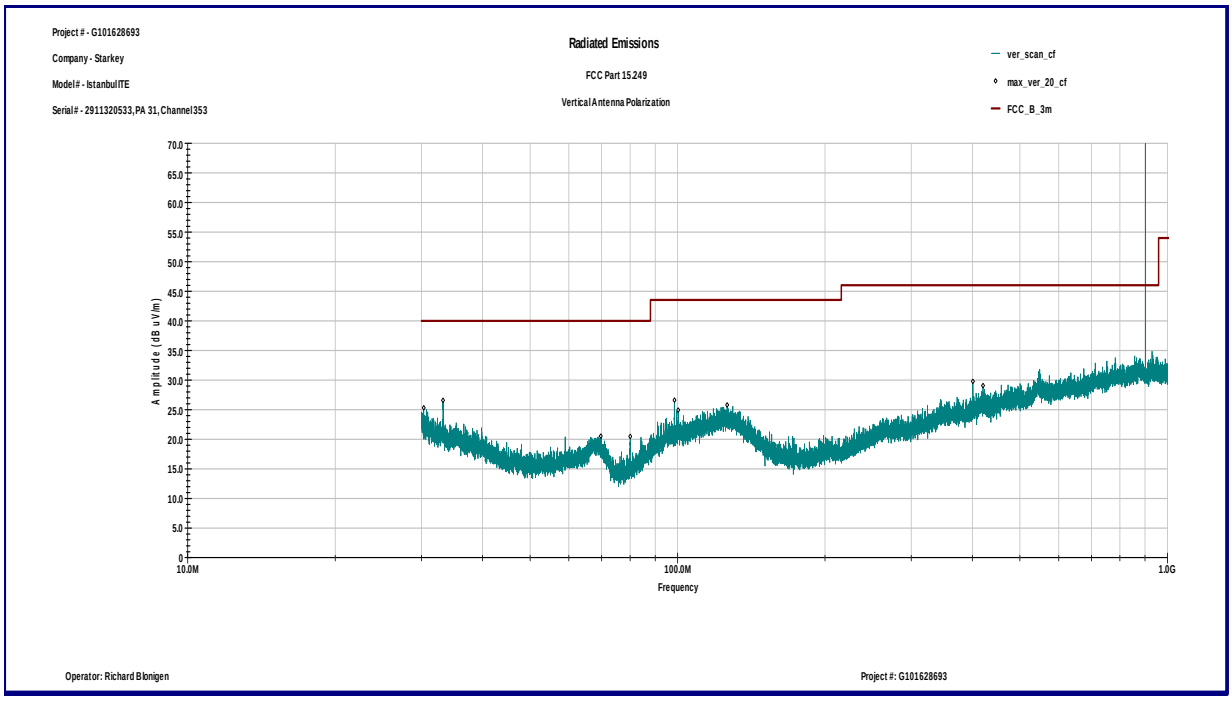
Date:	May 5 – 7, 2014	**Result:** **Pass**
Standard:	FCC 15.249(a) and (d) / RSS-210 A2.9	
Tested by:	Richard Blonigen	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	None	

Table 3.2.1

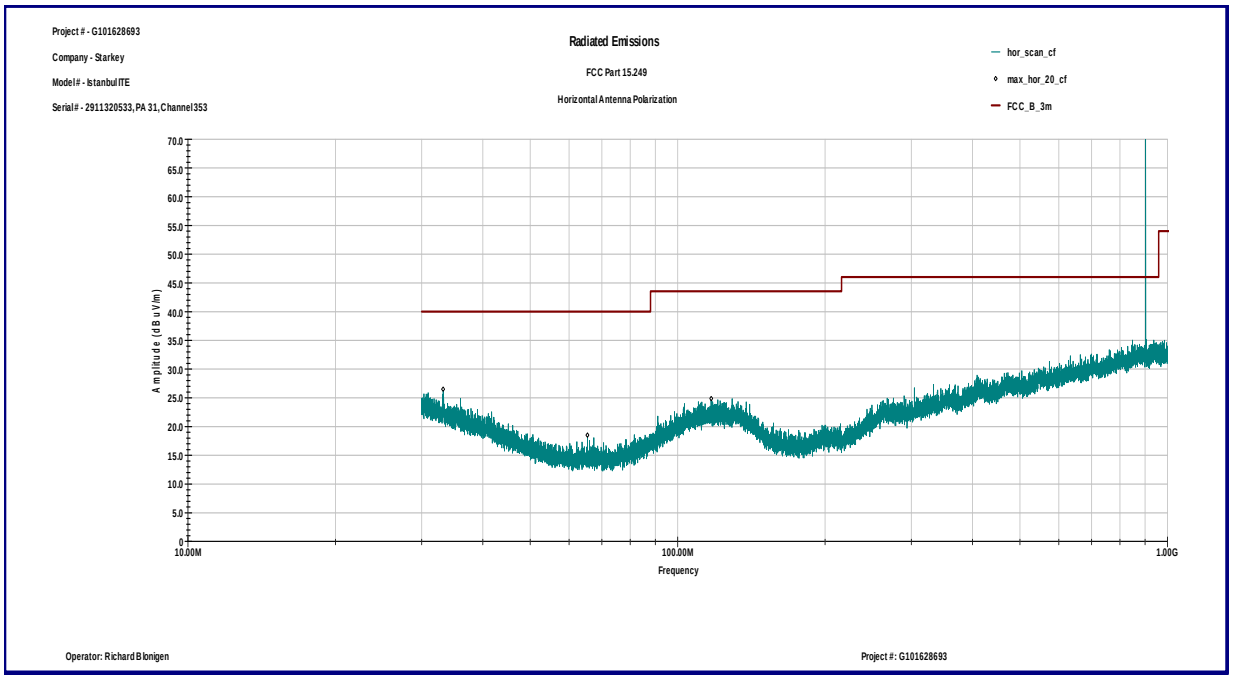
Frequency	Antenna		Ant. CF	Cable loss	Pre-amp	Peak Reading	Total @ 3m	Limit	Margin
MHz	Polarity	Hts(cm)	dB1/m	dB	Gain (dB)	dBµV	dBµV/m	dBµV/m	dB
				Channel 353					
1805.20	V	100	26.4	2.6	43.3	54.9	40.6	54.0	-13.4
1805.20	H	100	26.4	2.6	43.3	54.0	39.6	54.0	-14.3
2707.75	V	100	29.2	3.1	43.6	56.0	44.7	54.0	-9.3
2707.75	H	214	29.2	3.1	43.6	56.7	45.4	54.0	-8.6
3610.35	V	186	31.5	3.6	43.4	47.8	39.5	54.0	-14.5
3610.35	H	234	31.5	3.6	43.4	48.3	39.9	54.0	-14.1
4513.00	V	153	32.7	4.0	42.2	49.0	43.4	54.0	-10.6
4513.00	H	189	32.7	4.0	42.2	51.1	45.5	54.0	-8.5
				Channel 393					
1829.45	V	100	26.5	2.6	43.4	56.1	41.8	54.0	-12.1
1829.45	H	100	26.5	2.6	43.4	52.0	37.7	54.0	-16.2
2744.20	V	100	29.3	3.1	43.6	57.5	46.3	54.0	-7.7
2744.20	H	204	29.3	3.1	43.6	57.1	45.9	54.0	-8.1
3659.00	V	178	31.6	3.6	43.4	48.7	40.6	54.0	-13.4
3659.00	H	230	31.6	3.6	43.4	48.1	40.0	54.0	-14.0
4573.65	V	151	32.7	4.0	42.2	47.3	41.9	54.0	-12.1
4573.65	H	191	32.7	4.0	42.2	47.7	42.3	54.0	-11.7
				Channel 433					
1853.75	V	100	26.6	2.6	43.4	53.8	39.6	54.0	-14.4
1853.75	H	100	26.6	2.6	43.4	53.9	39.7	54.0	-14.3
2780.60	V	100	29.4	3.1	43.7	56.1	45.0	54.0	-9.0
2780.60	H	208	29.4	3.1	43.7	55.6	44.5	54.0	-9.5
3707.45	V	171	31.8	3.6	43.3	47.7	39.8	54.0	-14.2
3707.45	H	230	31.8	3.6	43.3	48.9	41.0	54.0	-13.0
4634.30	V	143	32.8	4.1	42.2	38.9	33.6	54.0	-20.4
4634.30	H	180	32.8	4.1	42.2	39.8	34.5	54.0	-19.5

Graph 3.2.1

Vertical antenna polarization

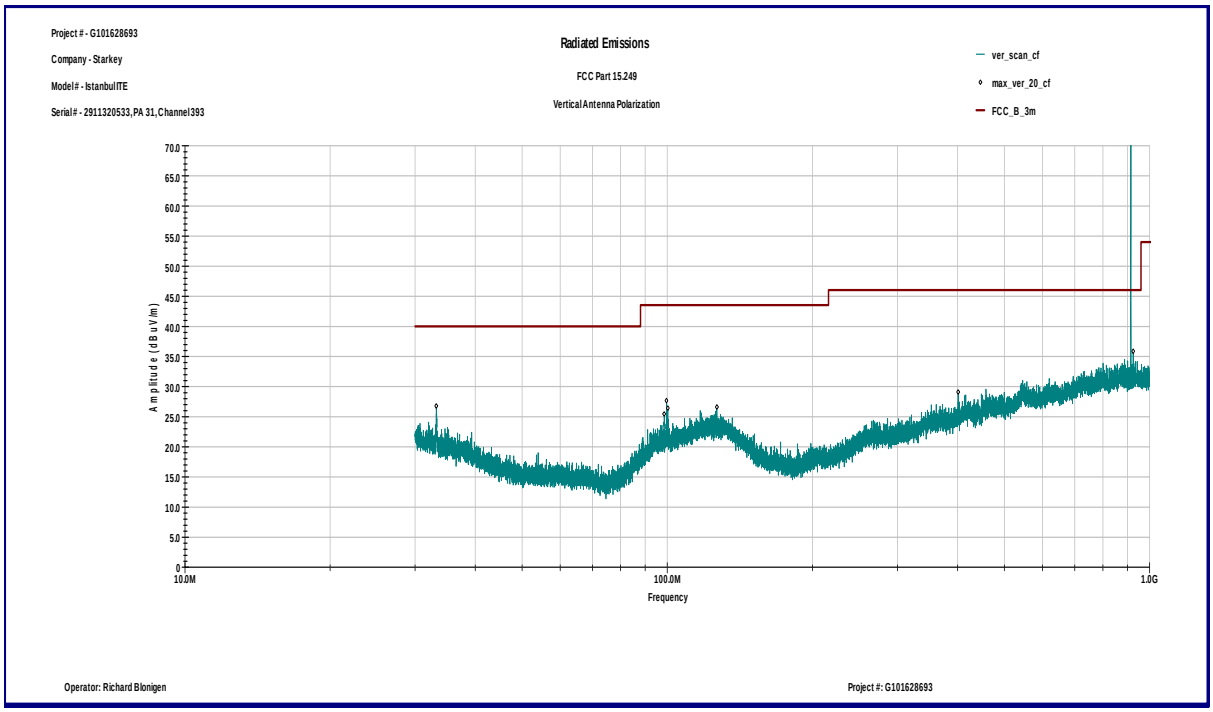


Horizontal antenna polarization

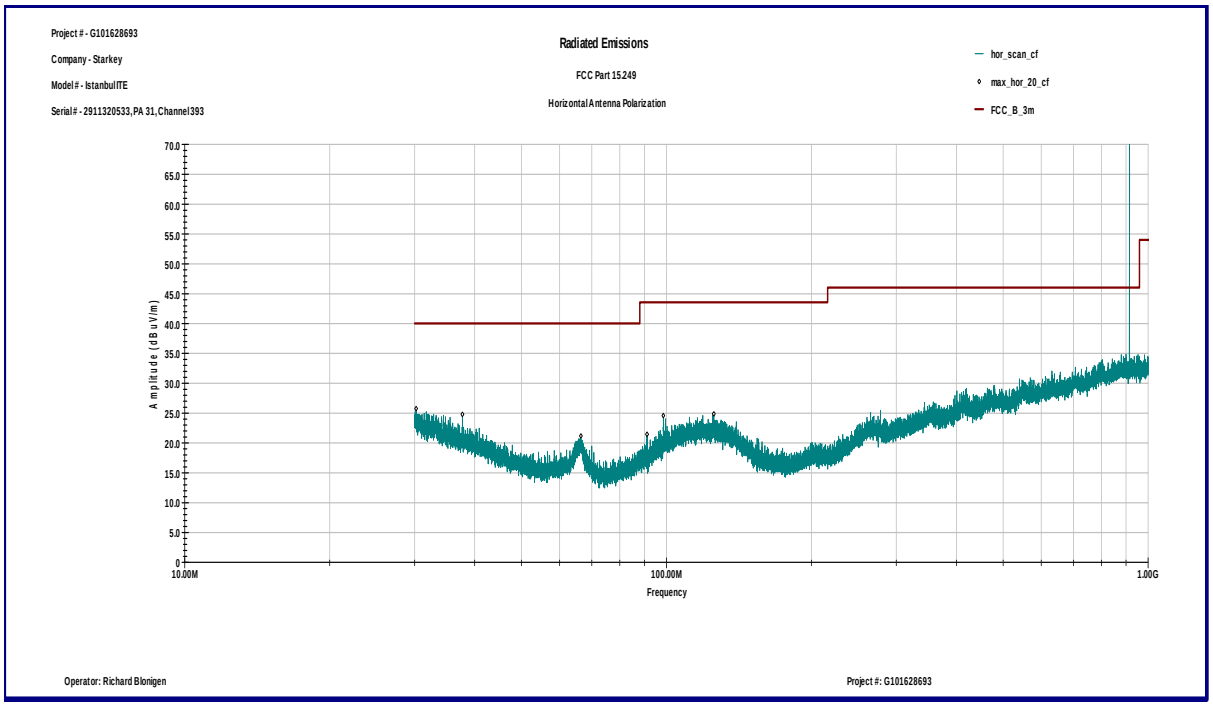


Graph 3.2.2

Vertical antenna polarization

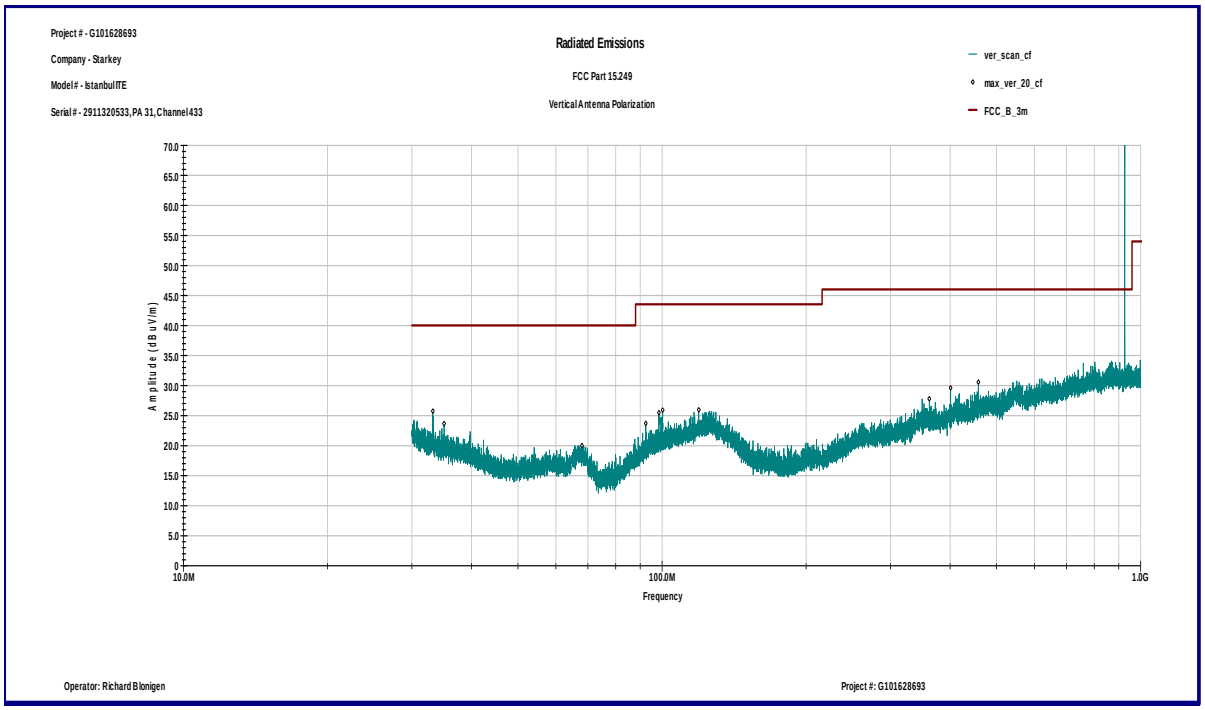


Horizontal antenna polarization

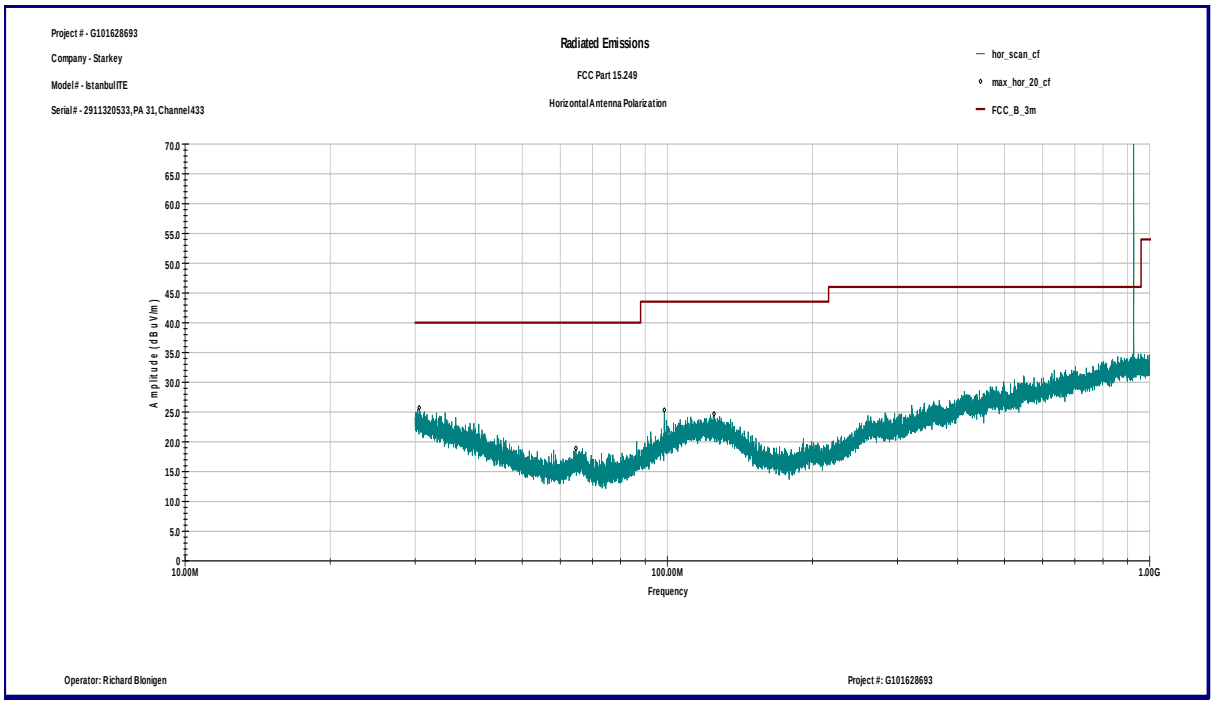


Graph 3.2.3

Vertical antenna polarization

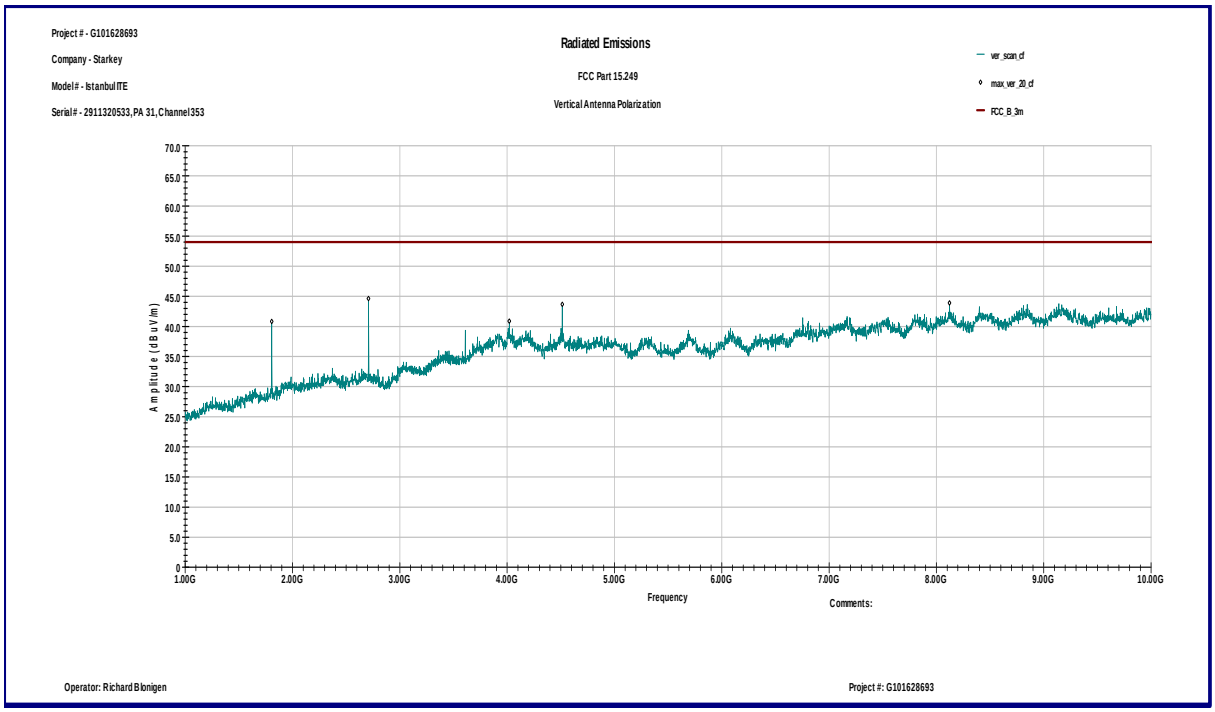


Horizontal antenna polarization

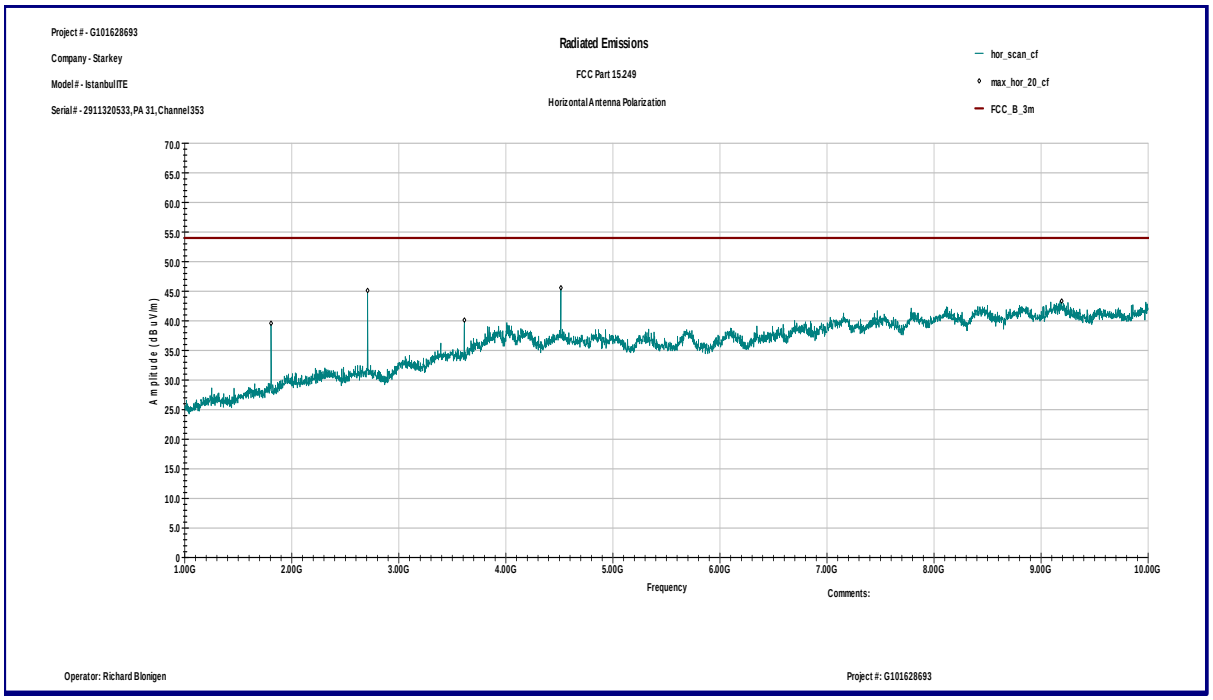


Graph 3.2.4

Vertical antenna polarization

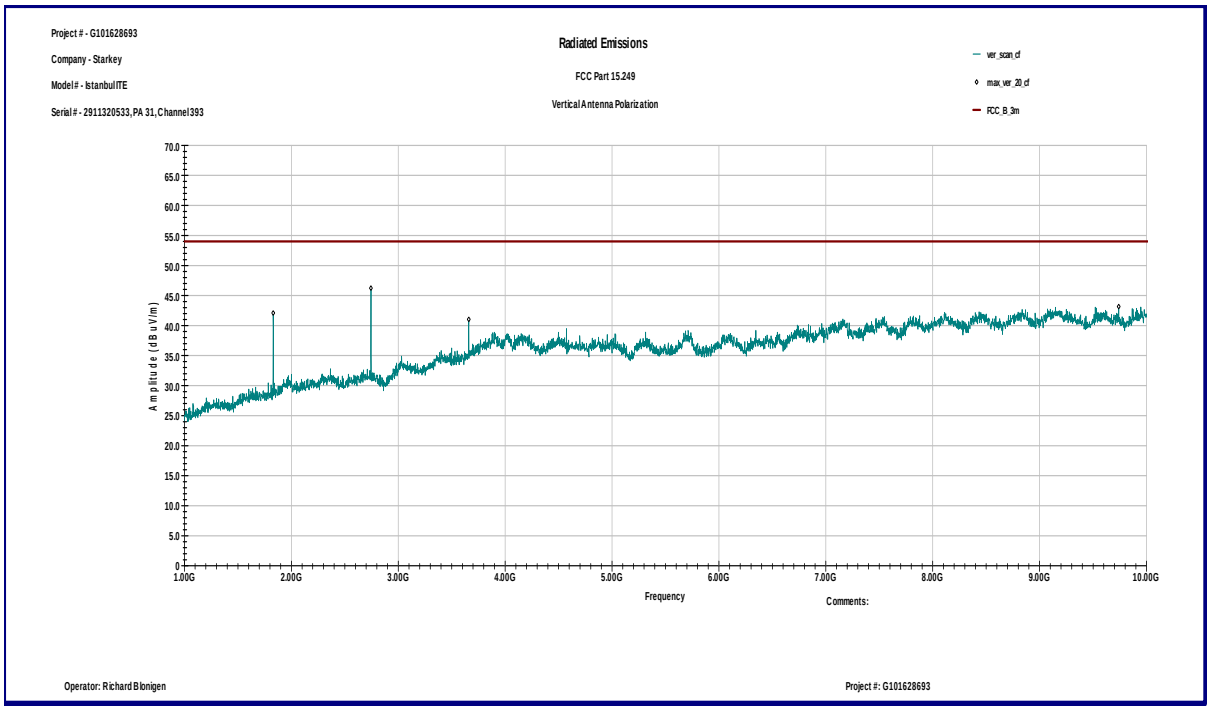


Horizontal antenna polarization

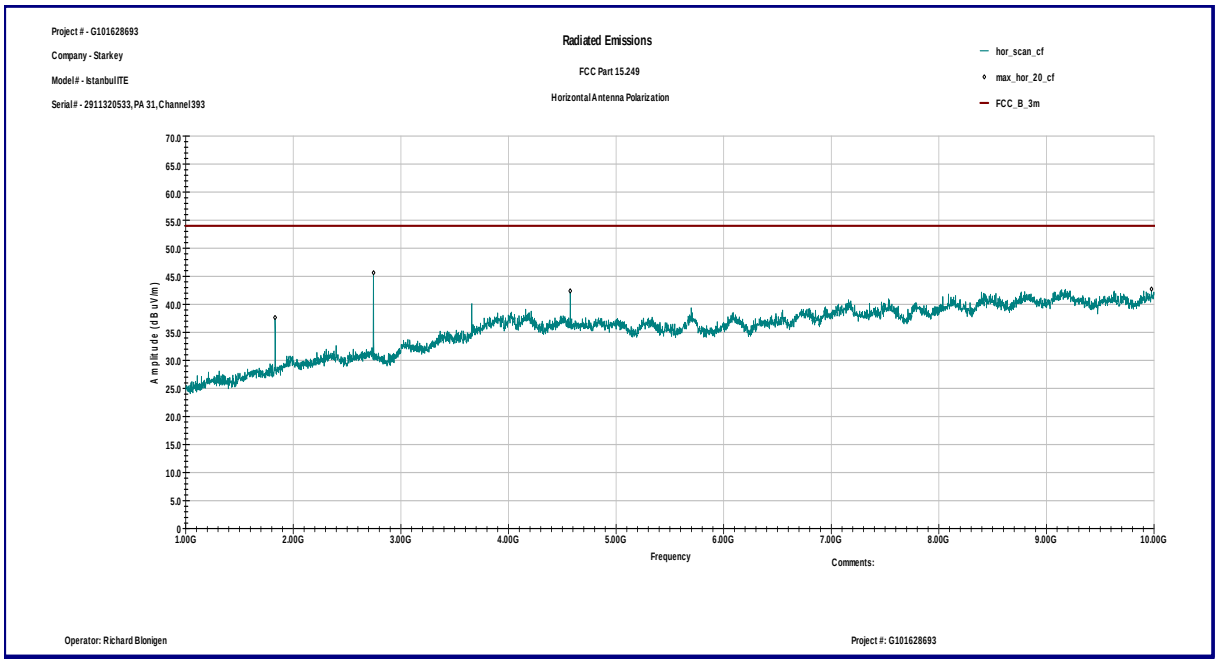


Graph 3.2.5

Vertical antenna polarization

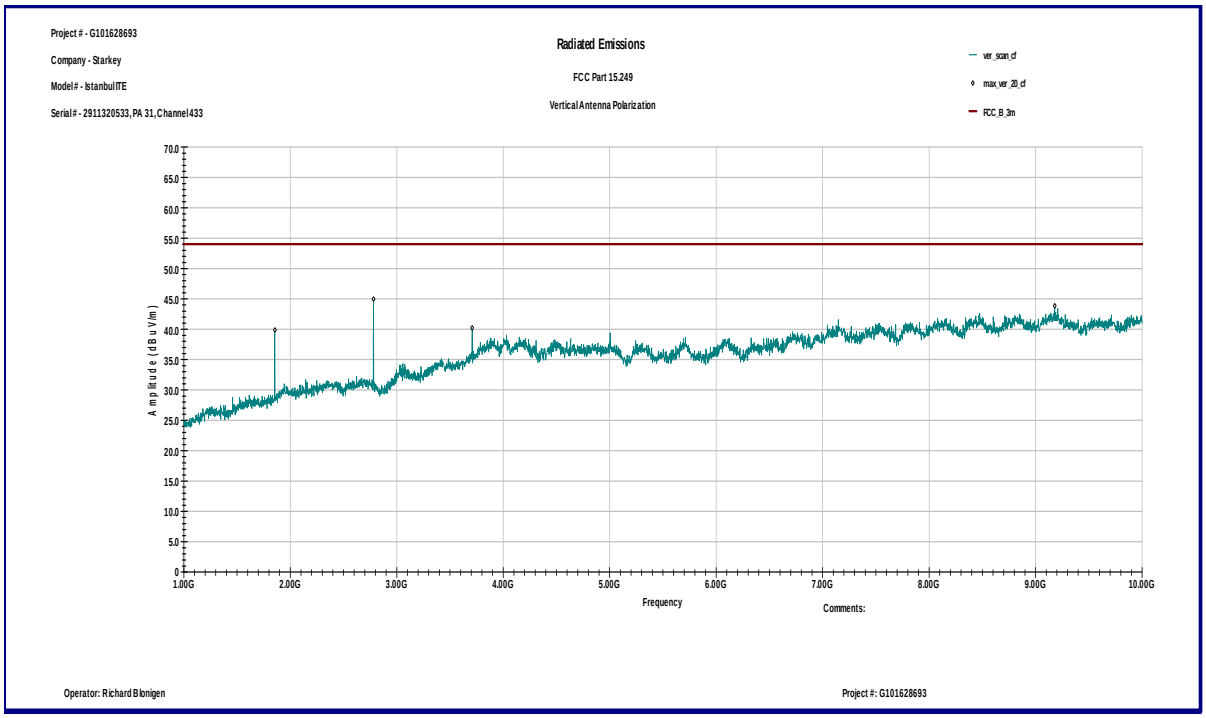


Horizontal antenna polarization

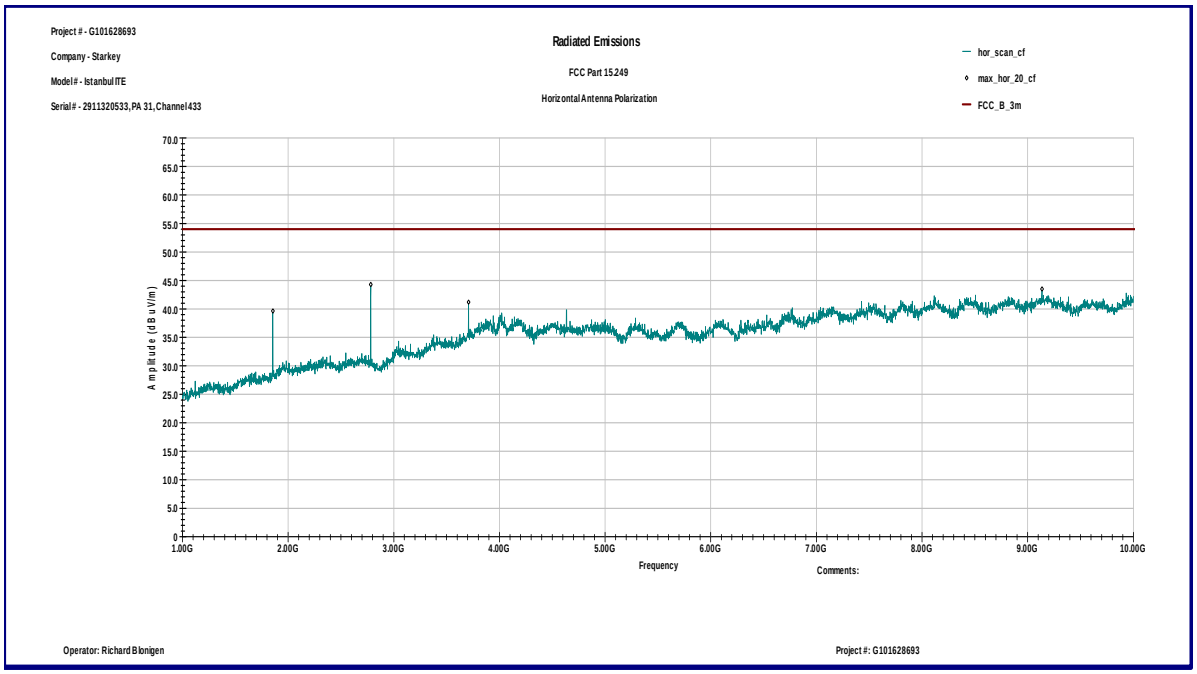


Graph 3.2.6

Vertical antenna polarization



Horizontal antenna polarization



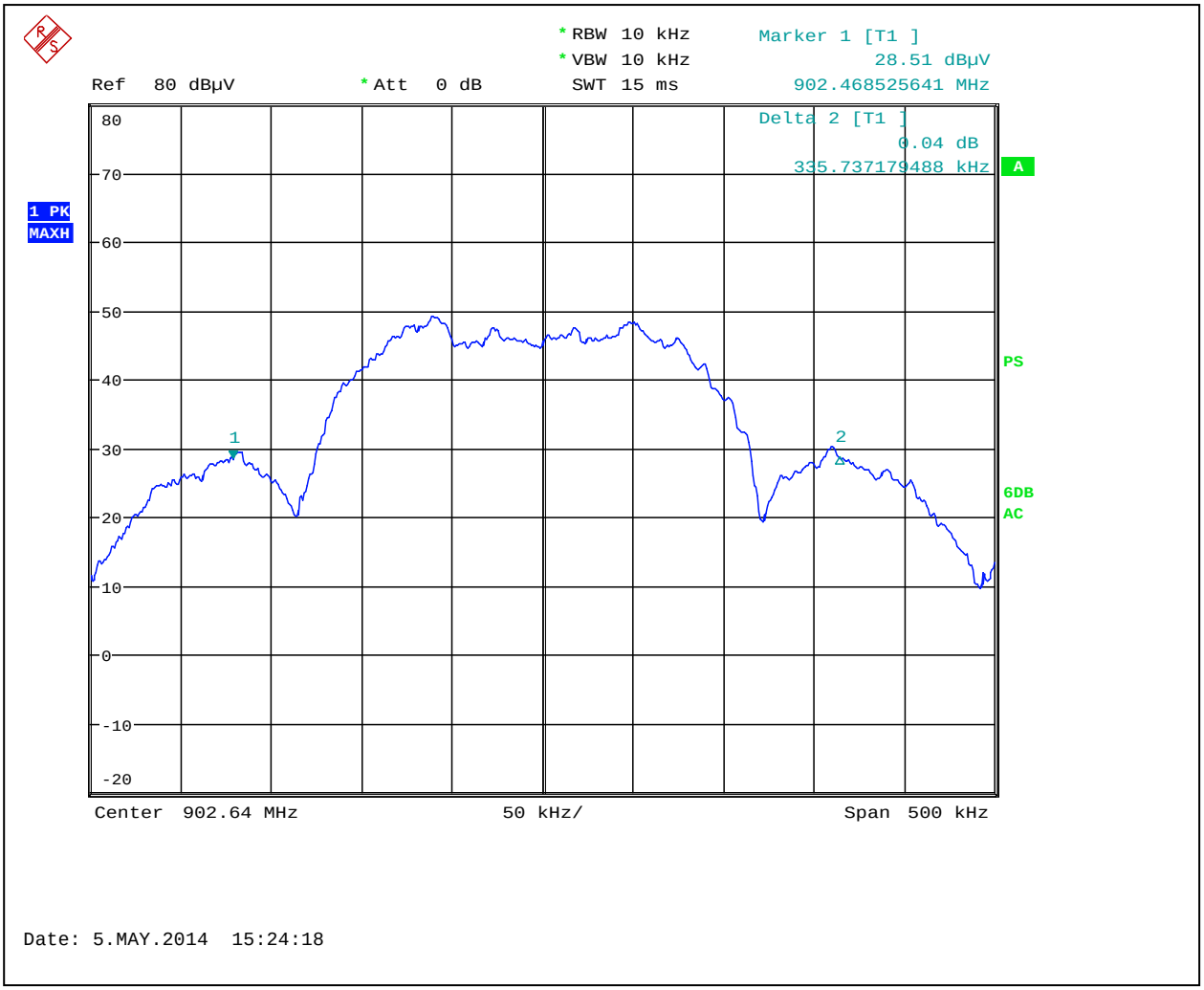
3.3 Bandwidth of Emissions

Center Frequency of operation MHz	Measured 20dB bandwidth kHz	Measured 99% bandwidth kHz
902.69	335.7	260.4
914.71	362.2	294.1
926.85	360.6	313.3

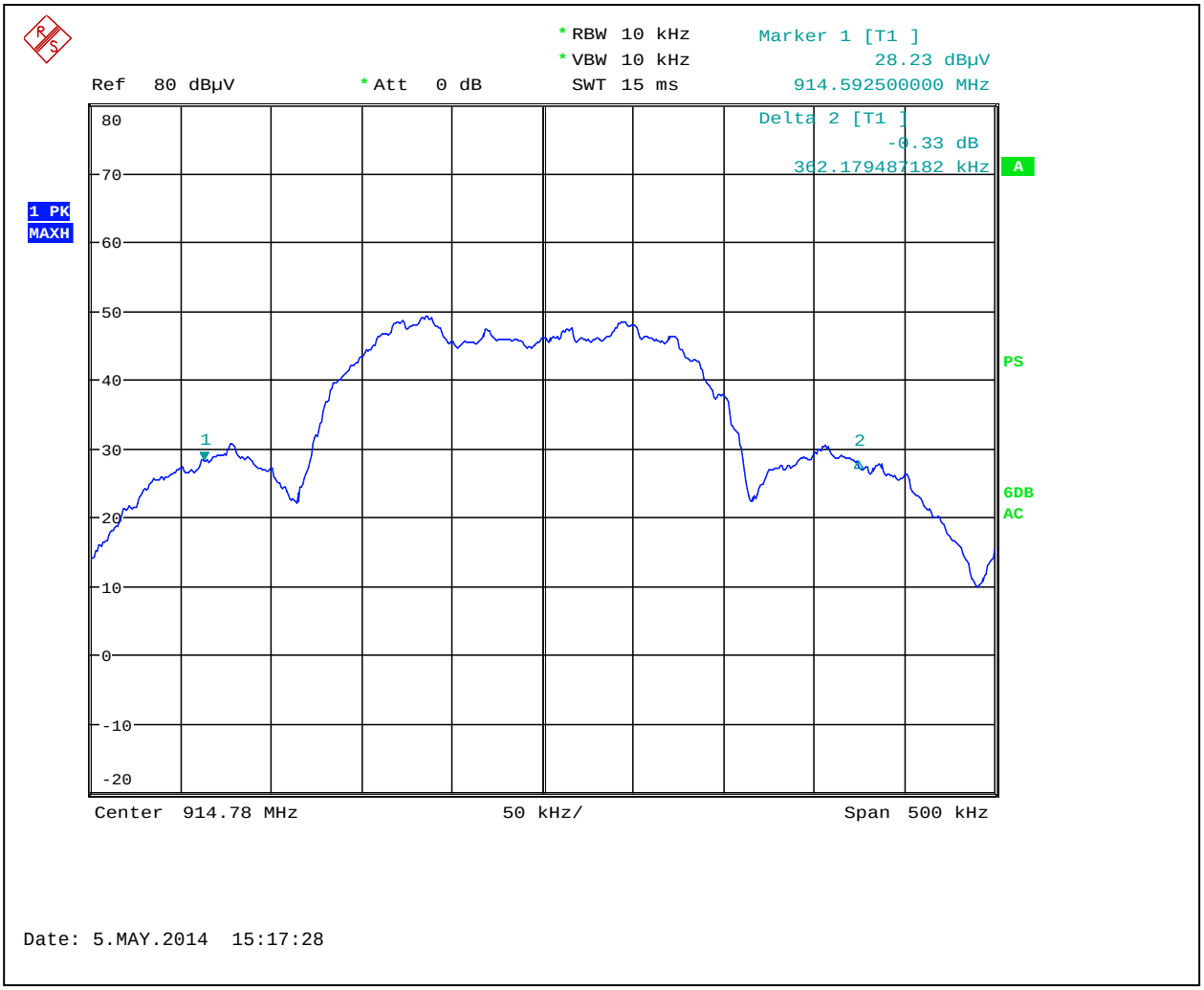
Graphs 3-3-1 through 3-3-6 show bandwidth of emissions

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

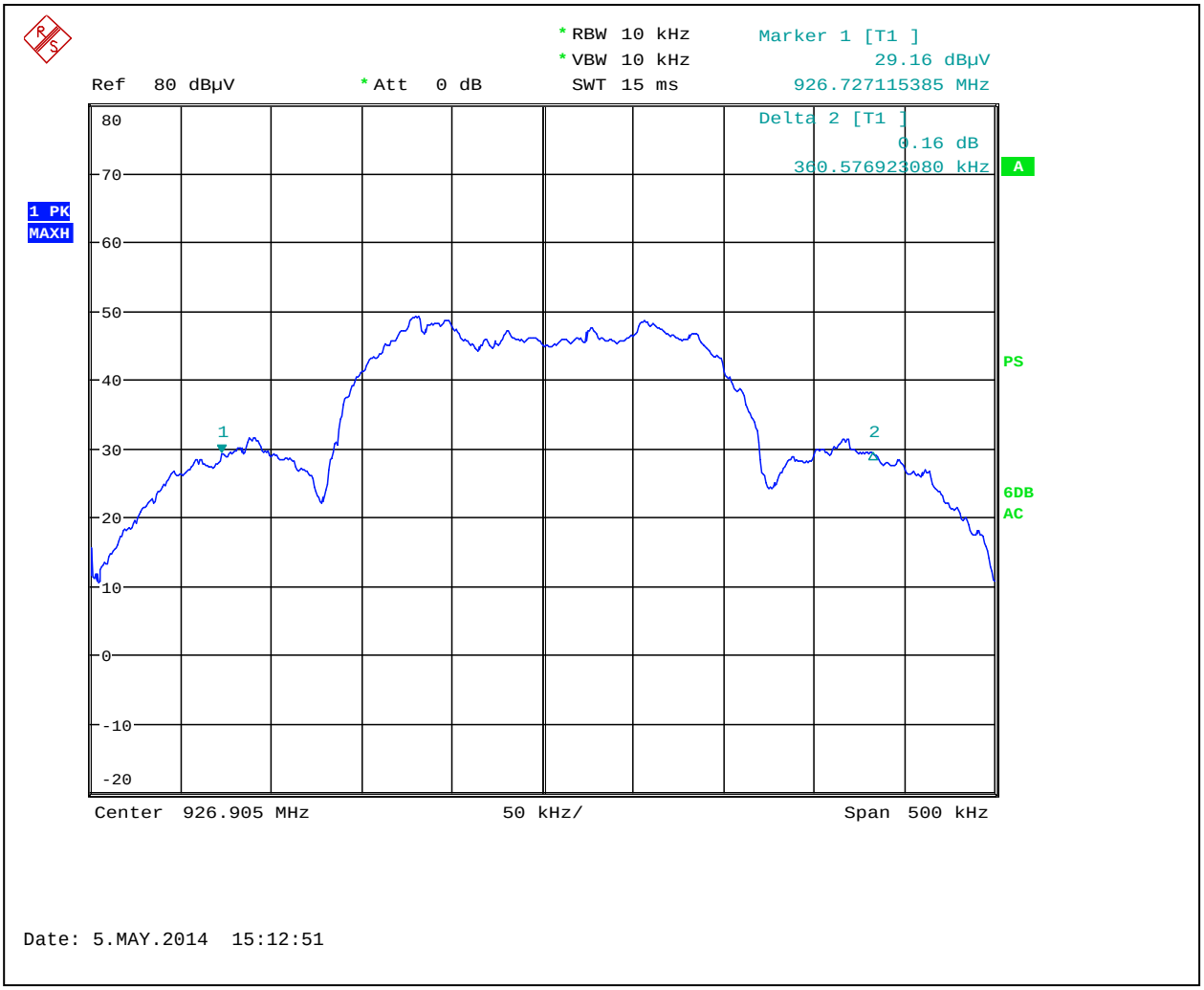
Graph 3.3.1


*RBW 10 kHz
*VBW 10 kHz
Ref 80 dBµV
*Att 0 dB
SWT 15 ms
Marker 1 [T1]
28.51 dBµV
902.468525641 MHz
Delta 2 [T1]
0.04 dB
335.737179488 kHz
A
1 PK
MAXH
PS
6DB
AC
80
70
60
50
40
30
20
10
0
-10
-20
Center 902.64 MHz
50 kHz/
Span 500 kHz
Date: 5.MAY.2014 15:24:18

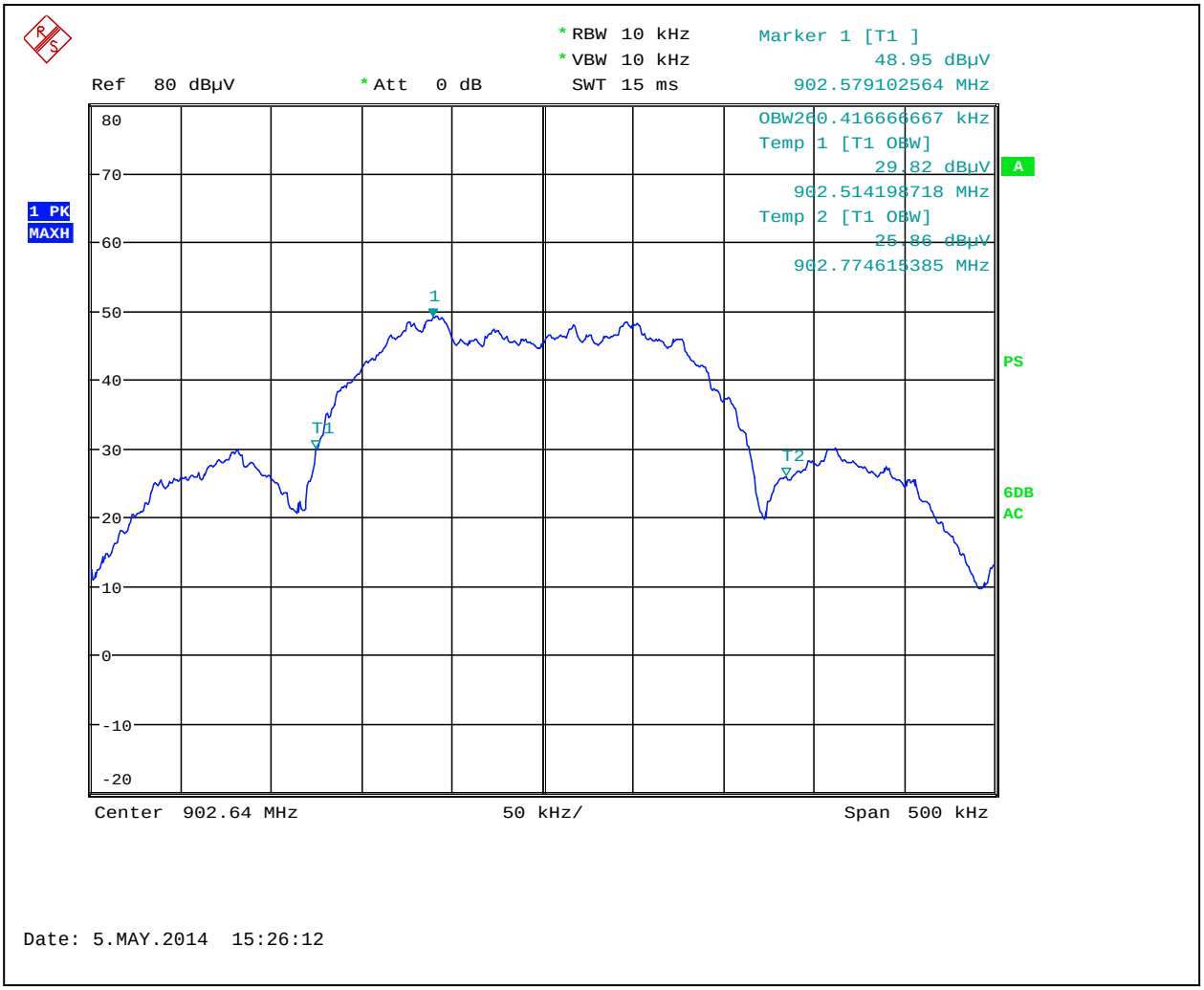
Graph 3.3.2


*RBW 10 kHz
*VBW 10 kHz
Ref 80 dBµV
*Att 0 dB
SWT 15 ms
Marker 1 [T1]
28.23 dBµV
914.592500000 MHz
Delta 2 [T1]
-0.33 dB
362.179487182 kHz
1 PK
MAXH
A
PS
6DB
AC
80
70
60
50
40
30
20
10
0
-10
-20
Center 914.78 MHz
50 kHz/
Span 500 kHz
Date: 5.MAY.2014 15:17:28

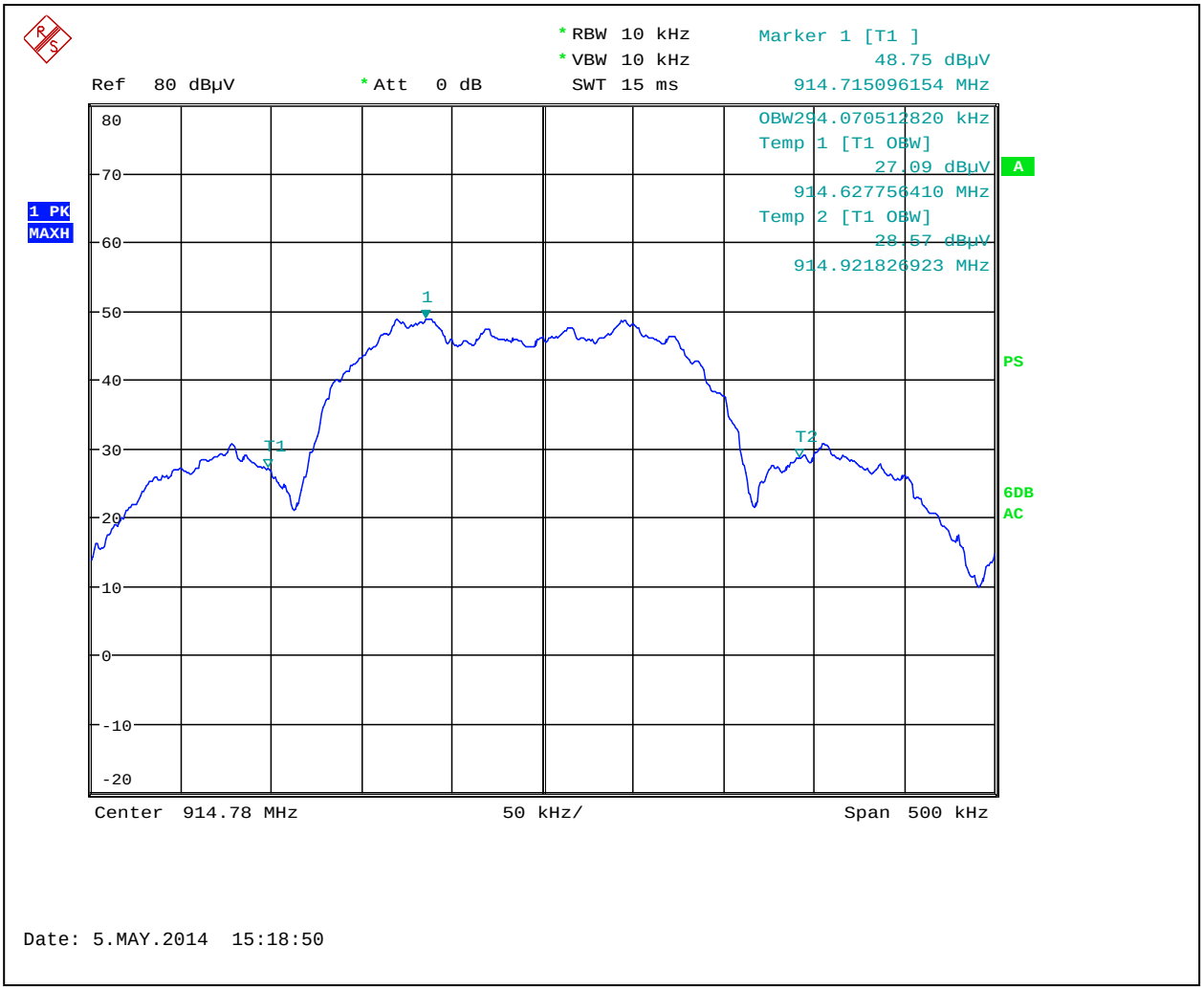
Graph 3.3.3


*RBW 10 kHz
*VBW 10 kHz
Ref 80 dBµV
*Att 0 dB
SWT 15 ms
Marker 1 [T1]
29.16 dBµV
926.727115385 MHz
Delta 2 [T1]
0.16 dB
360.576923080 kHz
1 PK
MAXH
A
PS
6DB
AC
80
70
60
50
40
30
20
10
0
-10
-20
Center 926.905 MHz
50 kHz/
Span 500 kHz
Date: 5.MAY.2014 15:12:51

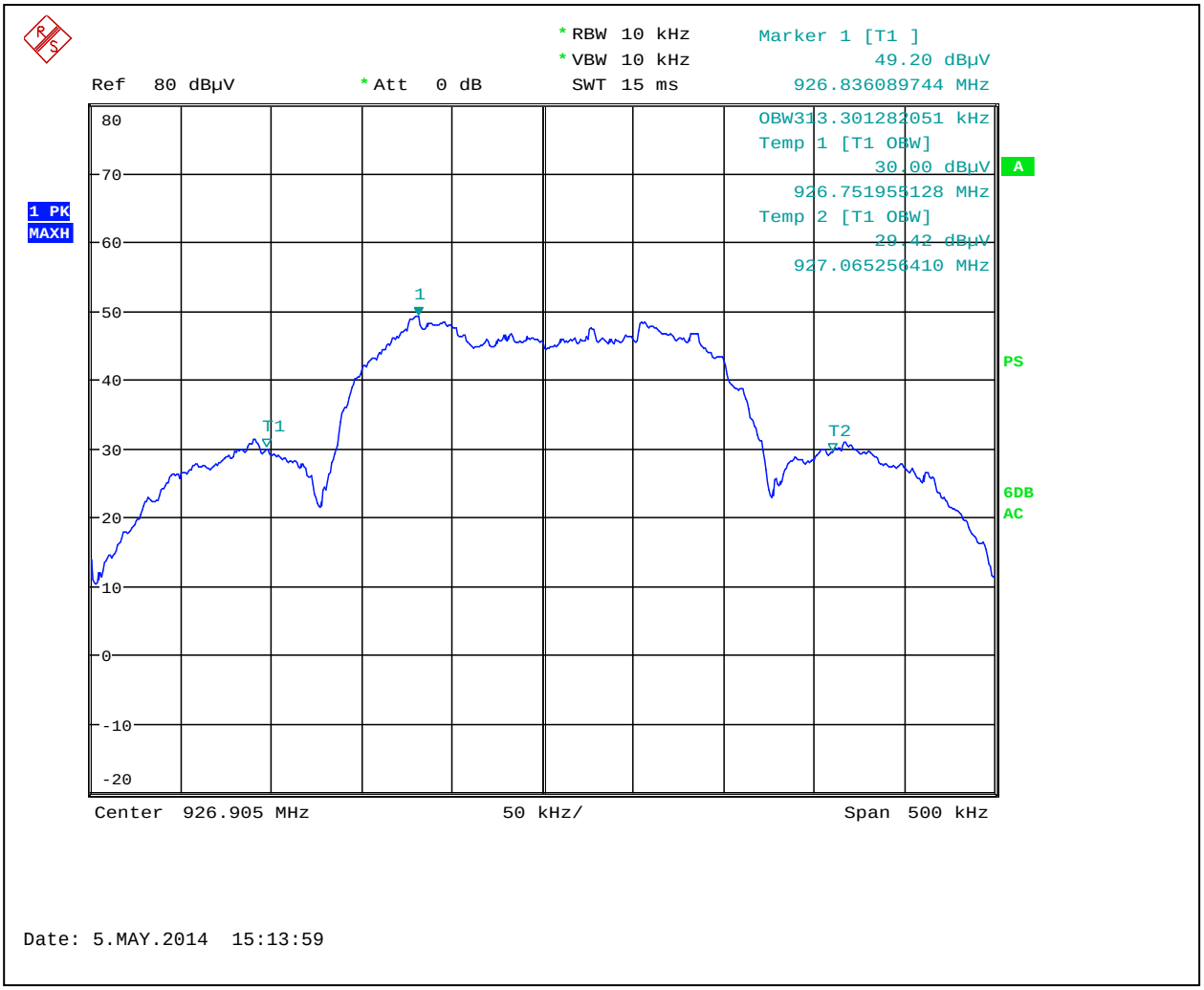
Graph 3.3.4


*RBW 10 kHz
*VBW 10 kHz
Ref 80 dBµV
*Att 0 dB
SWT 15 ms
Marker 1 [T1]
48.95 dBµV
902.579102564 MHz
OBW260.416666667 kHz
Temp 1 [T1 OBW]
29.82 dBµV
902.514198718 MHz
Temp 2 [T1 OBW]
25.86 dBµV
902.774615385 MHz
1 PK
MAXH
A
PS
6DB
AC
80
70
60
50
40
30
20
10
0
-10
-20
T1
T2
Center 902.64 MHz
50 kHz/
Span 500 kHz
Date: 5.MAY.2014 15:26:12

Graph 3.3.5


*RBW 10 kHz
*VBW 10 kHz
Ref 80 dBµV
*Att 0 dB
SWT 15 ms
Marker 1 [T1]
48.75 dBµV
914.715096154 MHz
OBW294.070512820 kHz
Temp 1 [T1 OBW]
27.09 dBµV
914.627756410 MHz
Temp 2 [T1 OBW]
28.57 dBµV
914.921826923 MHz
1 PK
MAXH
A
PS
6DB
AC
80
70
60
50
40
30
20
10
0
-10
-20
T1
1
T2
Center 914.78 MHz
50 kHz/
Span 500 kHz
Date: 5.MAY.2014 15:18:50

Graph 3.3.6


*RBW 10 kHz
*VBW 10 kHz
Ref 80 dBµV
*Att 0 dB
SWT 15 ms
Marker 1 [T1]
49.20 dBµV
926.836089744 MHz
OBW313.301282051 kHz
Temp 1 [T1 OBW]
30.00 dBµV
926.751955128 MHz
Temp 2 [T1 OBW]
29.42 dBµV
927.065256410 MHz
1 PK
MAXH
A
PS
6DB
AC
80
70
60
50
40
30
20
10
0
-10
-20
T1
1
T2
Center 926.905 MHz
50 kHz/
Span 500 kHz
Date: 5.MAY.2014 15:13:59

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: Test not applicable as EUT battery powered device.

3.5 Receiver/digital device radiated emissions

Test location: ☐ OATS ☒ Anechoic Chamber

Test distance: ☐ 10 meters ☒ 3 meters

Test result: **Pass**

Frequency range: 30MHz-5GHz

Max. Emissions margin: 6.8dB 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).
Fundamental frequencies at Low, Middle and Upper channels from the Signal Generator were excluded from the tables.

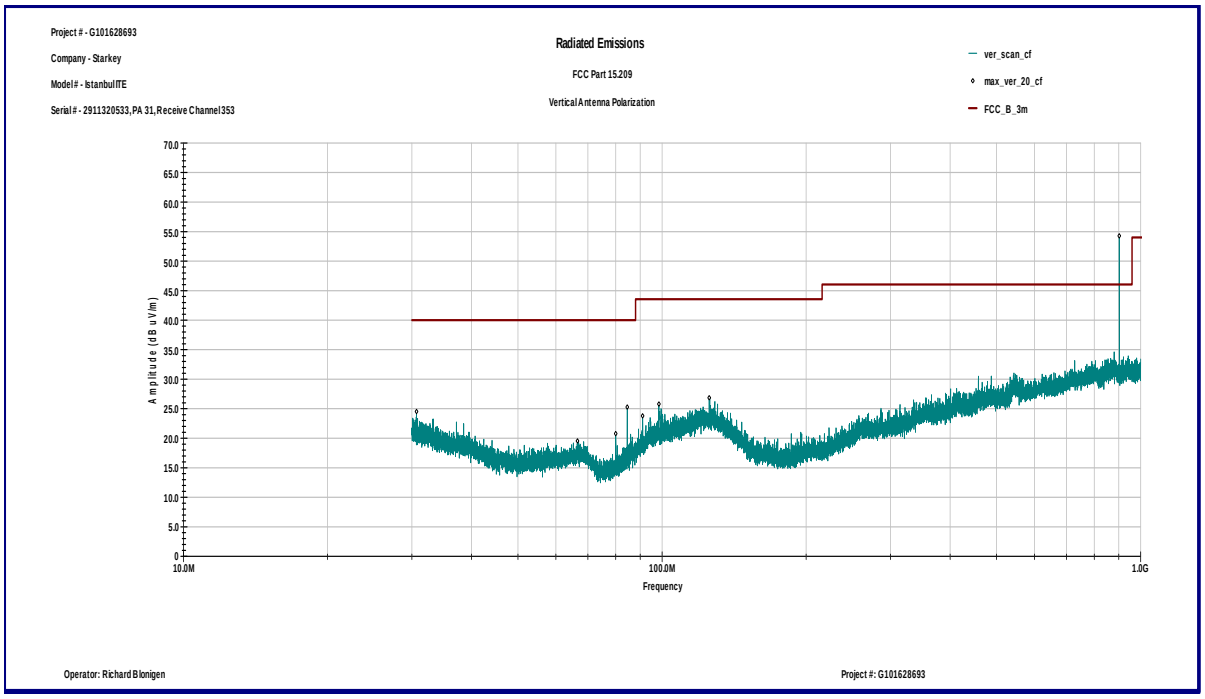
Date:	May 5-7, 2014	**Result:** **Pass**
Standard:	FCC Part 15.109, Class B	
Tested by:	Richard Blonigen	
Test Point:	Enclosure	
Operation mode:	Receive	
Note:	None	

Table 3.5.1

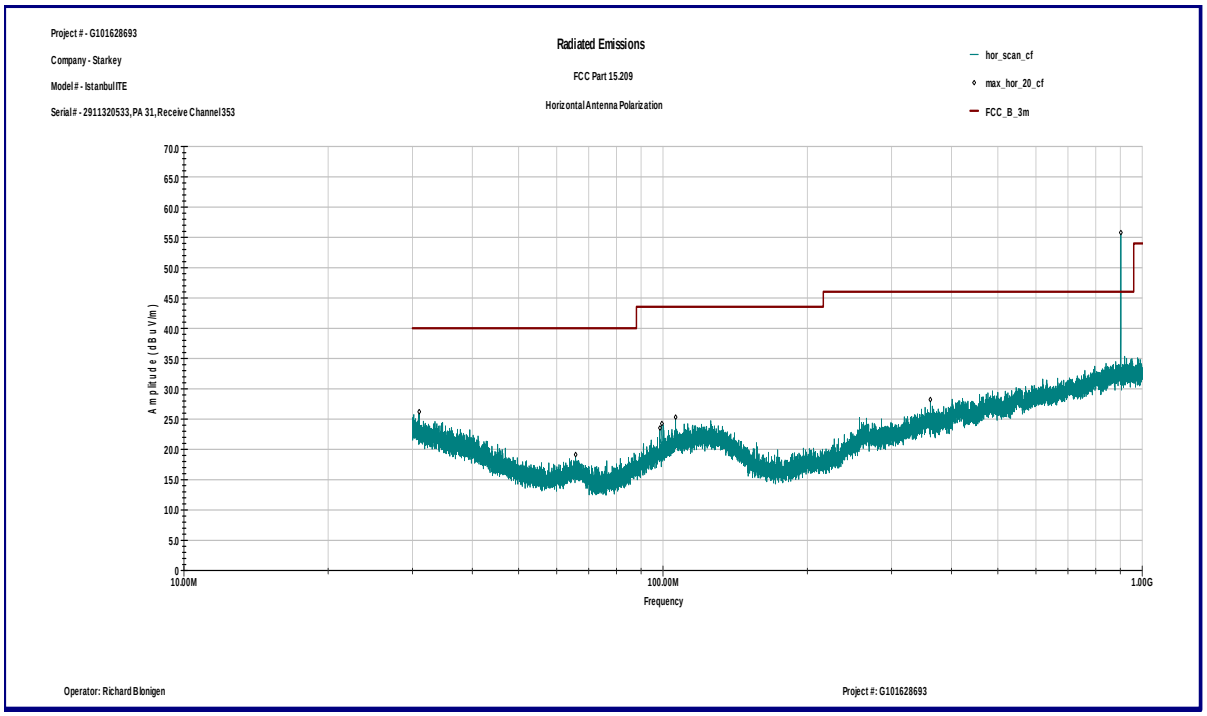
Frequency	Ant. Polarity	Peak Reading dBµV	Total C.F. dB1/m	Total at 3m dBµV/m	Limit dBµV/m	Margin dB
Channel 353						
30.685 MHz	V	6.8	19.9	24.5	40.0	-15.5
84.57 MHz	V	15.8	9.0	25.3	40.0	-14.7
91.071 MHz	V	12.2	10.3	23.8	43.5	-19.7
98.472 MHz	V	12.6	11.9	25.8	43.5	-17.7
125.47 MHz	V	12.4	13.7	26.9	43.5	-16.7
30.992 MHz	H	6.5	19.7	26.2	40.0	-13.8
98.512 MHz	H	11.6	11.9	23.5	43.5	-20.0
99.507 MHz	H	12.1	12.1	24.3	43.5	-19.3
106.27 MHz	H	12.2	13.1	25.3	43.5	-18.2
361.33 MHz	H	11.0	17.3	28.2	46.0	-17.8
Channel 393						
33.248 MHz	V	8.7	18.4	24.8	40.0	-15.2
80.007 MHz	V	14.6	8.4	22.6	40.0	-17.4
98.568 MHz	V	13.7	12.0	26.9	43.5	-16.6
99.54 MHz	V	12.7	12.2	26.0	43.5	-17.5
121.63 MHz	V	12.1	13.7	26.4	43.5	-17.1
31.11 MHz	H	6.8	19.6	26.5	40.0	-13.5
98.474 MHz	H	12.3	11.9	24.2	43.5	-19.3
100.32 MHz	H	12.3	12.3	24.6	43.5	-18.9
114.09 MHz	H	12.5	13.6	26.0	43.5	-17.5
Channel 433						
30.14 MHz	V	7.0	20.2	25.1	40.0	-14.9
93.678 MHz	V	12.5	10.9	24.9	43.5	-18.6
99.477 MHz	V	11.7	12.1	25.0	43.5	-18.5
129.42 MHz	V	11.6	13.7	26.0	43.5	-17.6
400.96 MHz	V	11.7	18.3	29.5	46.0	-16.5
30.444 MHz	H	13.1	20.0	33.2	40.0	-6.8
98.537 MHz	H	12.4	11.9	24.4	43.5	-19.1
99.508 MHz	H	12.7	12.1	24.8	43.5	-18.7
117.14 MHz	H	10.9	13.7	24.6	43.5	-18.9
138.66 MHz	H	11.2	13.1	24.3	43.5	-19.2

Graph 3.5.1

Vertical antenna polarization

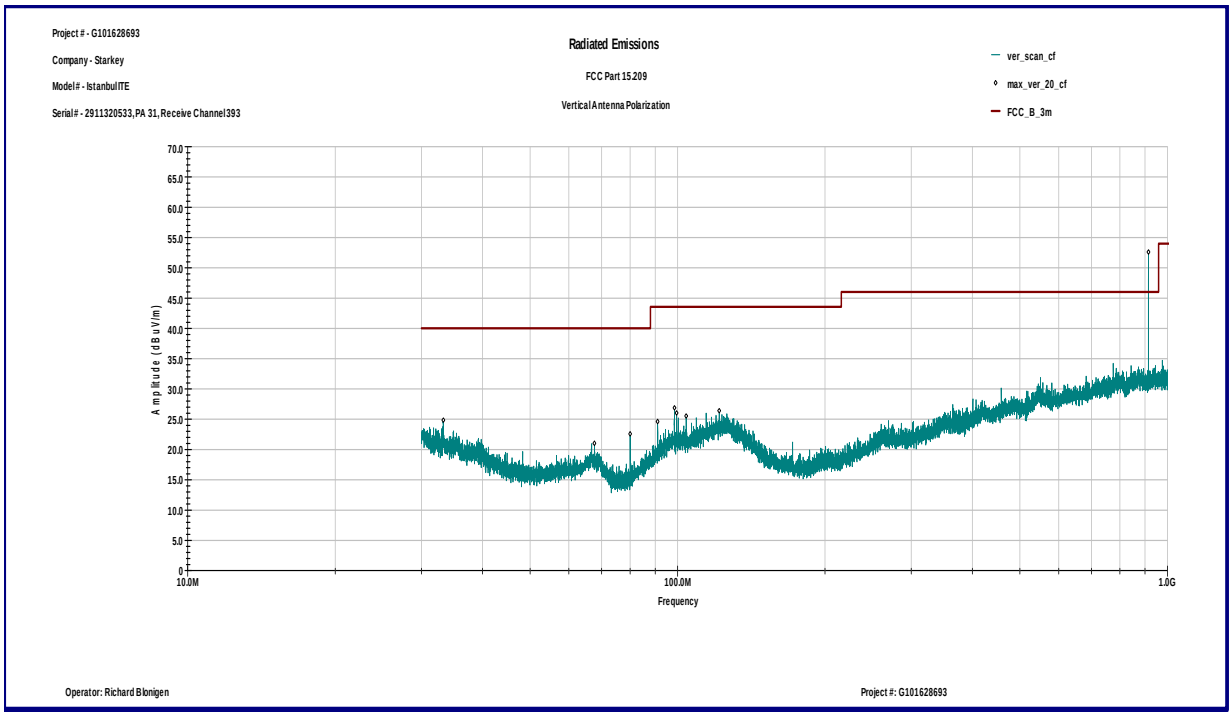


Horizontal antenna polarization

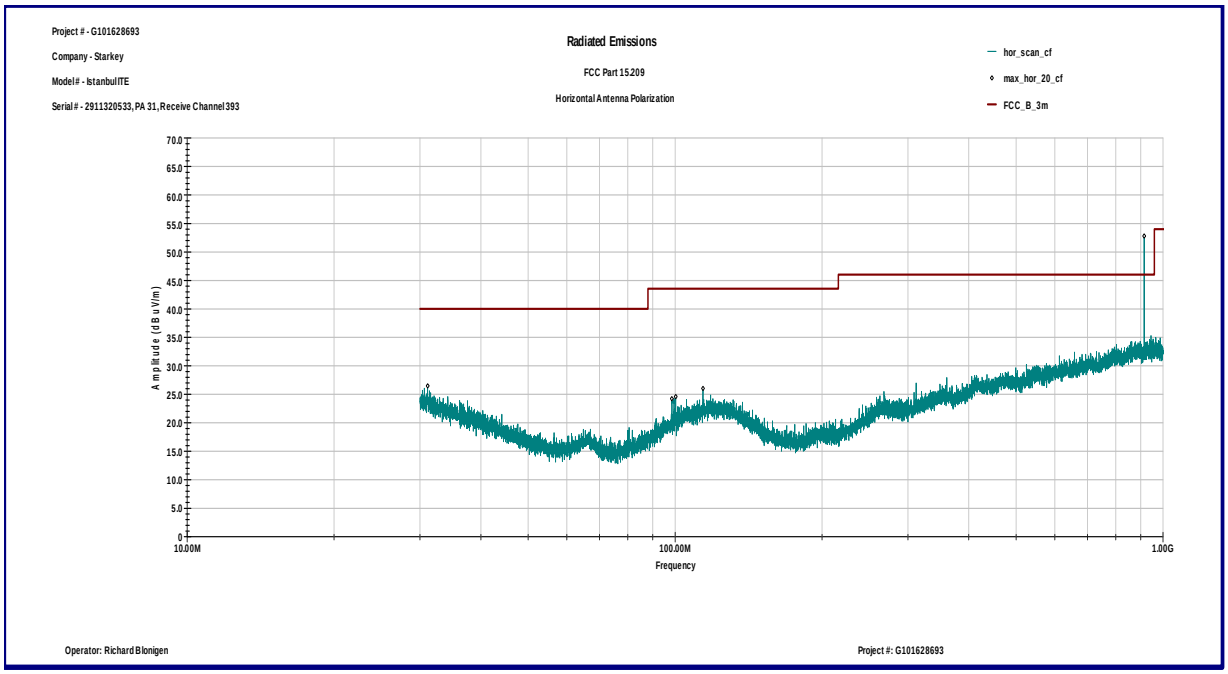


Graph 3.5.2

Vertical antenna polarization

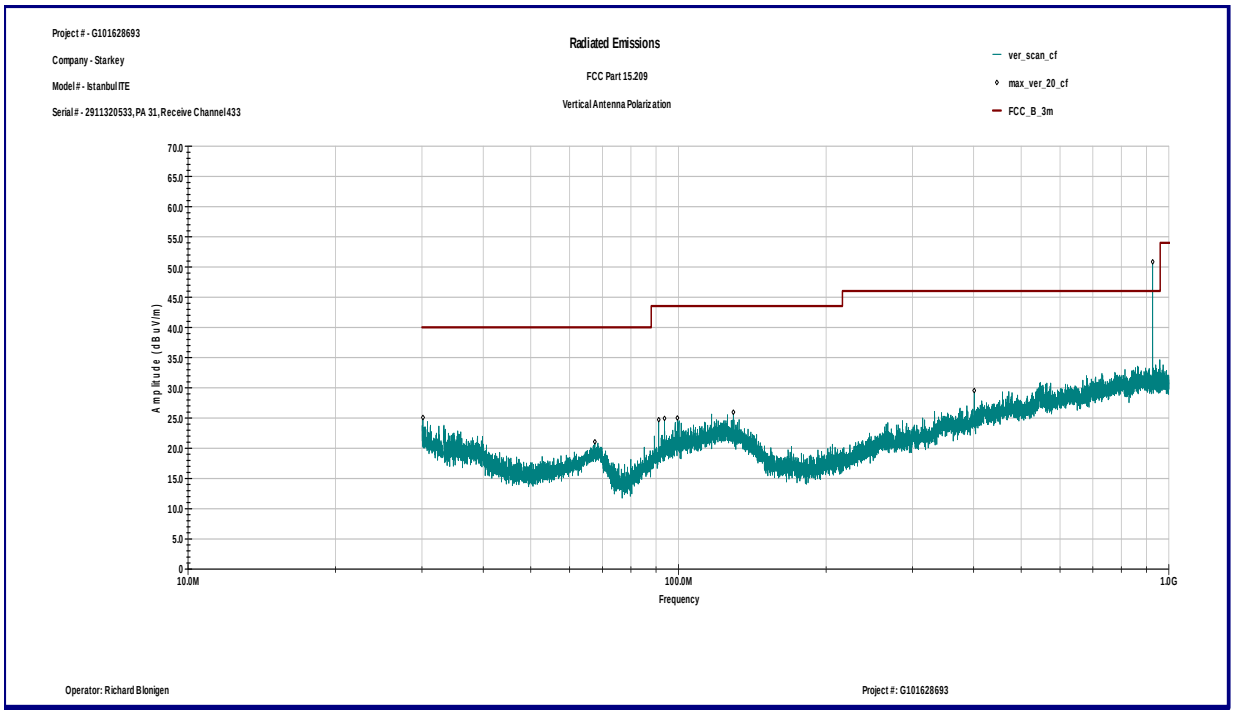


Horizontal antenna polarization

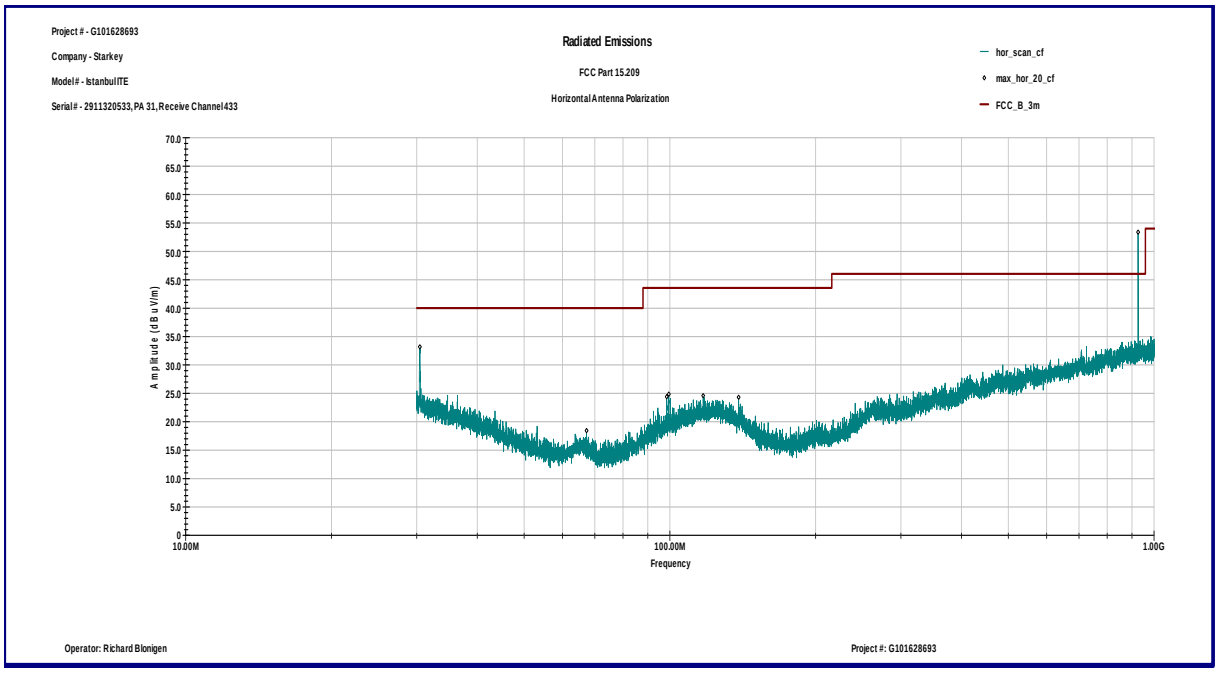


Graph 3.5.3

Vertical antenna polarization

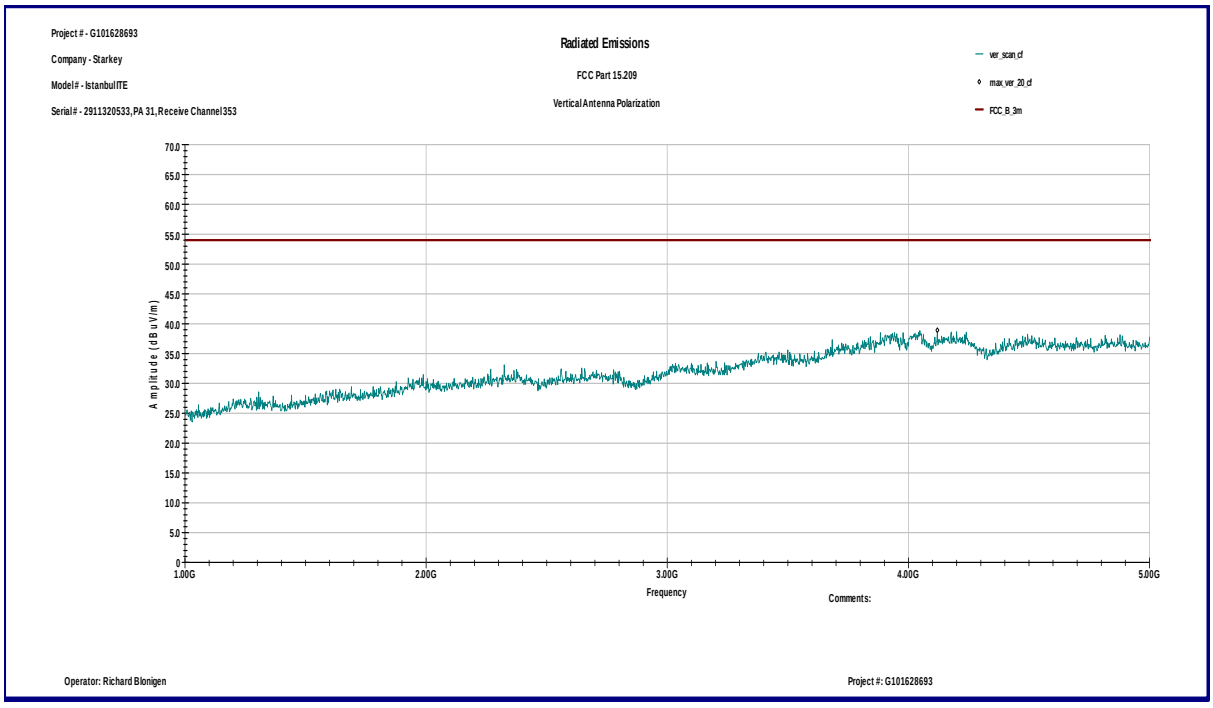


Horizontal antenna polarization

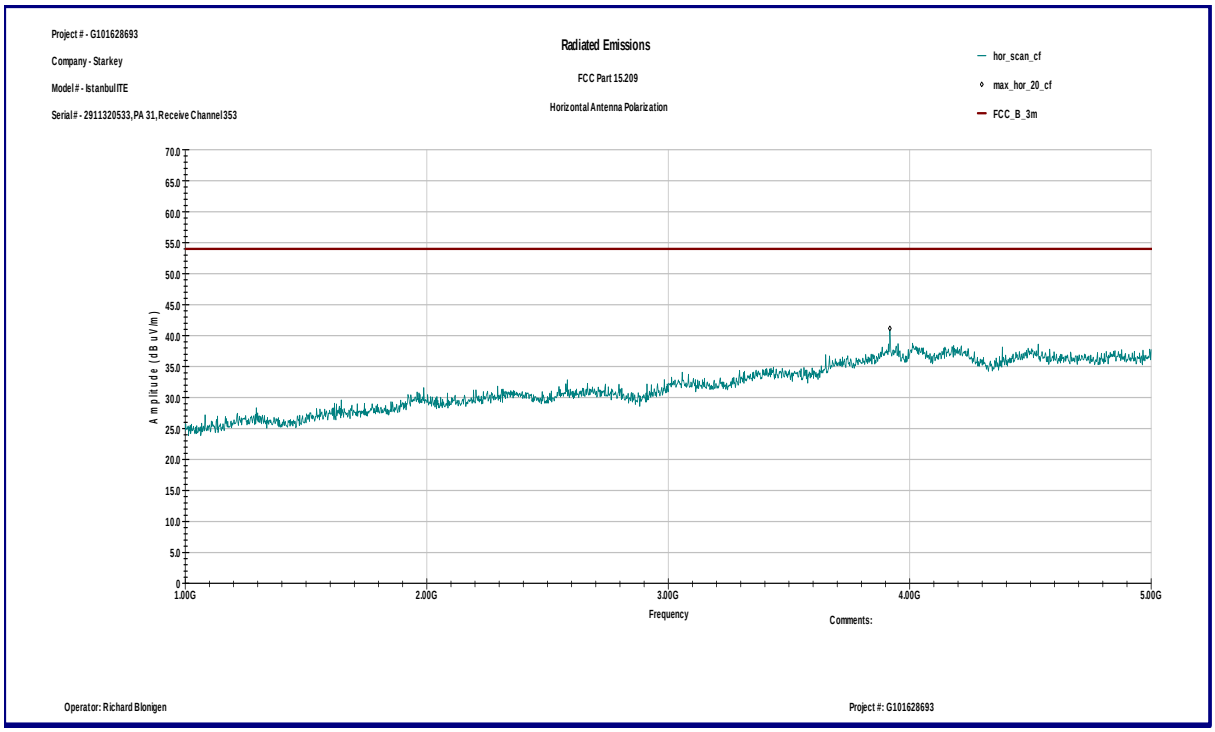


Graph 3.5.4

Vertical antenna polarization

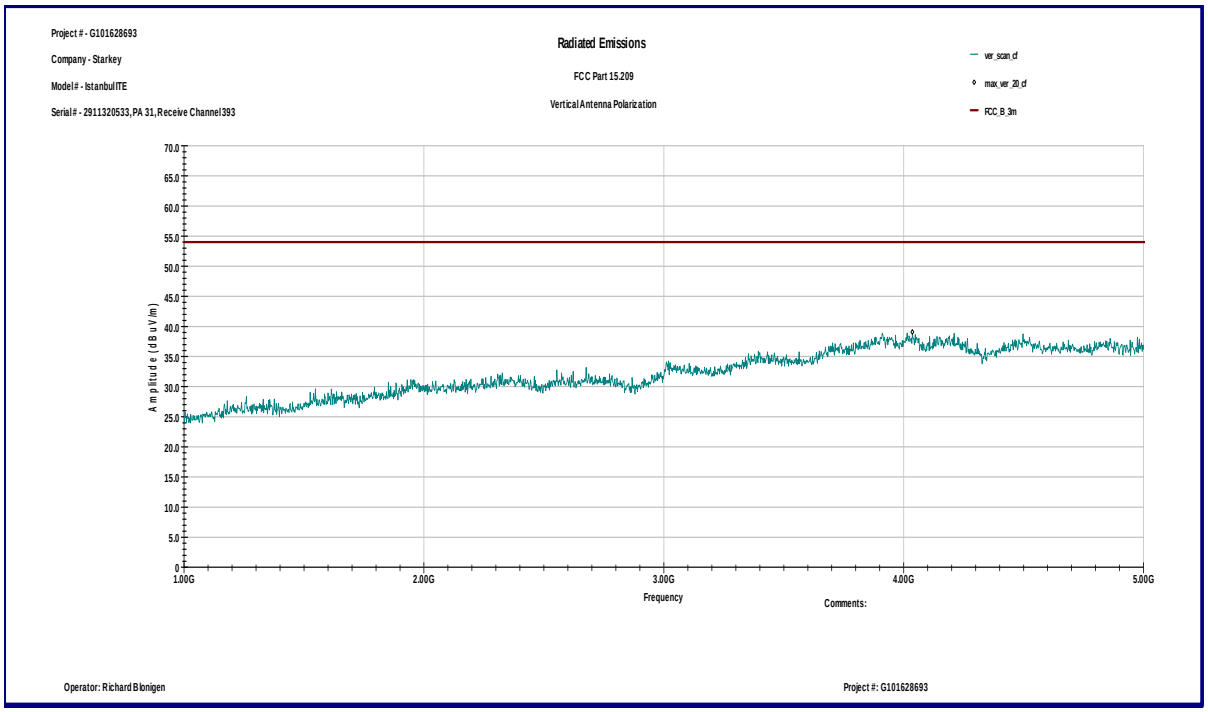


Horizontal antenna polarization

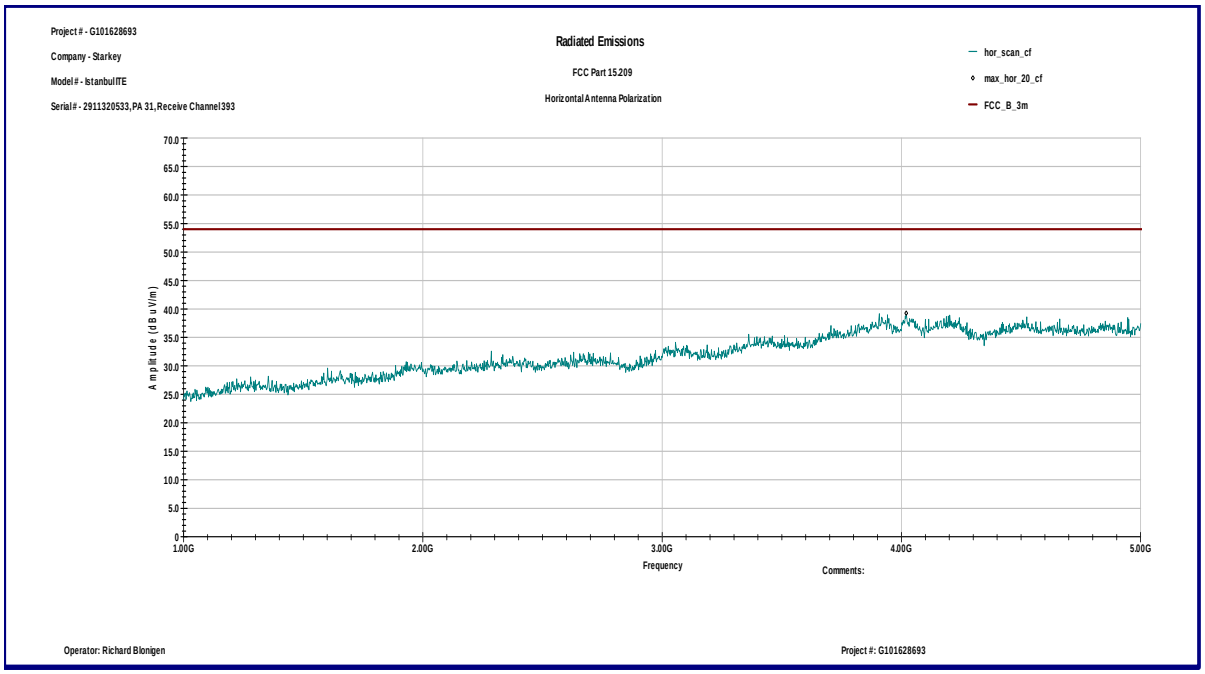


Graph 3.5.5

Vertical antenna polarization

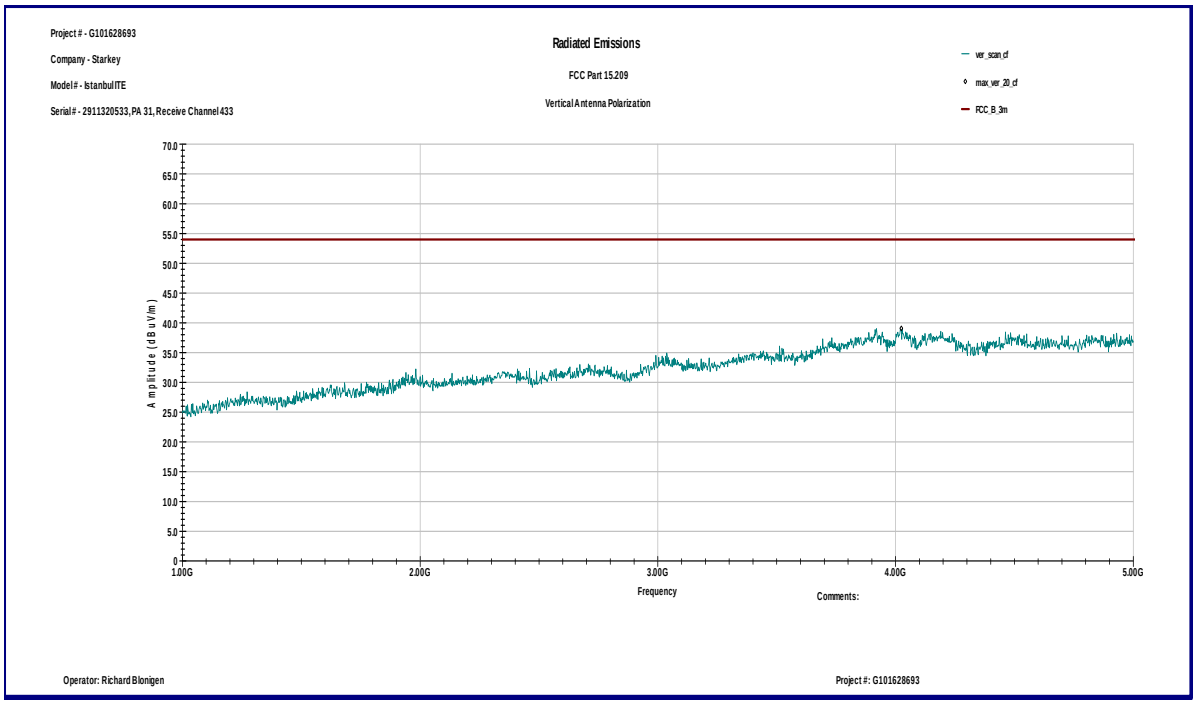


Horizontal antenna polarization

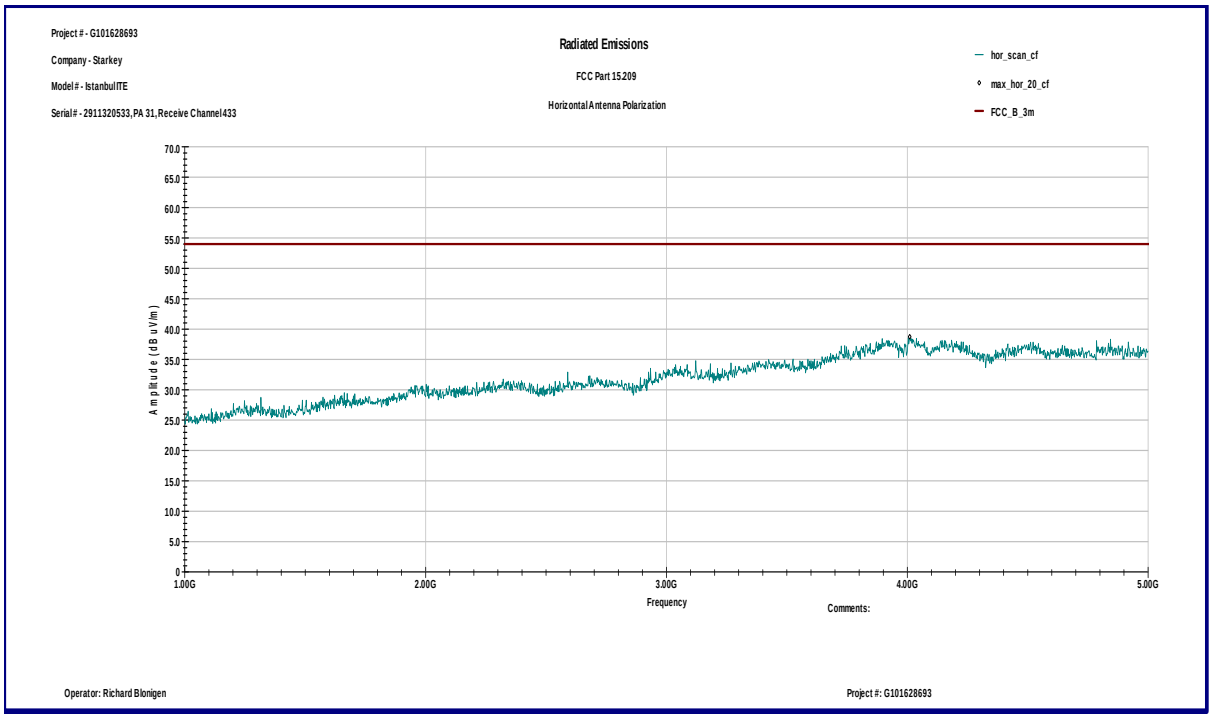


Graph 3.5.6

Vertical antenna polarization



Horizontal antenna polarization



3.6 Digital device conducted emissions

Test location: ☐ OATS ☐ Anechoic Chamber ☐ Other

Test result: **N/A**

Frequency range: 0.15MHz-30MHz

Max. Emissions margin: dB below the limits

Notes: Test not applicable as EUT battery powered device.

4.0 TEST EQUIPMENT

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NO.	INTERTEK ID	CAL DUE	USED
Spectrum Analyzer	R & S	FSP 40	100024	12559	12/12/2014	☒
Spectrum Analyzer	R & S	ESU	100398	25283	01/07/2015	☒
Bicono-Log Antenna	Teseq	CBL6112D	32859	25289	08/30/2014	☒
Horn Antenna	EMCO	3115	9507-4513	9936	05/28/2014	☒
Pre-Amplifier	MITEQ	AMF-5D-00501800-28-13P	1402232	172081	11/12/2014	☒
System	Quantum Change	TILE! Instrument Control	Ver. 3.4.K.29	15259	VBU	☒