



TEST REPORT

Report Number: 101157672MIN-001

Project Number: G101157672

Testing performed on the
ZCombo
ZSmoke

FCC ID: M7U-FAALR
Industry Canada ID: 10190A-FAALR

to
47 CFR Part 15.249:2010
RSS- 210, Issue 8, 2010
RSS-Gen, Issue 3, 2010
47 CFR, Part 15:2010, §15.107 and §15.109, Class / ICES-003, Issue 5:2012

For
BRK Brands Inc.

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

Test Authorized by:
BRK Brands Inc.
3901 Liberty Street
Aurora, IL 60504-8122 USA

Prepared by: U. Spector
Uri Spector

Date: April 26, 2013

Reviewed by: S. Khazon
Simon Khazon

Date: April 26, 2013

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.



TABLE OF CONTENTS

1.0 GENERAL DESCRIPTION.....3

1.1 Product Description; Test Facility.....4

1.3 Environmental conditions5

1.4 Measurement uncertainty.....6

1.5 Field Strength Calculation6

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 emissions10

3.3 Bandwidth of Emissions16

3.4 Transmitter power line conducted emissions21

3.5 Receiver/digital device radiated emissions22

3.6 Digital device conducted emissions28

4.0 TEST EQUIPMENT.....29

1.0 GENERAL DESCRIPTION

Models:	ZCombo ZSmoke
Type of EUT:	Smoke and Carbon Monoxide Alarm Smoke Alarm
Intertek Sample ID:	MN1303271306-006 MN1303271306-004
FCC ID:	M7U-FAALR
Industry Canada ID:	10190A-FAALR
Related Submittal(s) Grants:	None
Company:	BRK Brands Inc.
Customer:	Mr. Mark Dippner
Address:	BRK Brands Inc. 3901 Liberty Street Aurora, IL 60504-8122 USA
Phone:	(630) 499-3422
Fax:	(630) 851-9309
email:	MDippner@jardensafety.com
Test Standards:	☒ 47 CFR, Part 15:2010, §15.249 ☒ RSS-210, Issue 8, 2010 ☒ RSS-Gen, Issue 3, 2010 ☒ 47 CFR, Part 15:2010, §15.107 and §15.109, Class ☒ ICES-003, Issue 5:2012 ☐ Other
Type of radio:	☒ Stand -alone ☐ Module ☐ Hybrid
Date Sample Submitted:	March 27, 2013
Test Work Started:	April 5, 2013
Test Work Completed:	April 12, 2013
Test Sample Conditions:	☐ Damaged ☐ Poor (Usable) ☒ Good



1.1 Product Description; Test Facility

Product Description:	Transmitter
Operating Frequency	908.4MHz
Modulation:	FSK
Emission Designator:	117KFXD-(40kbps rate) 101KFXD- (9.6kbps rate)
Antenna(s) Info:	Antenna Type: Integral
Antenna Installation:	☐ User ☒ Professional ☐ Factory
Transmitter Power Configuration:	☒ Internal battery ☐ External power source ☐ 120VAC ☐ 230VAC ☐ 400VAC ☒ 3.0VDC ☐ Other: Amp. ☐ 50Hz ☐ 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)
- ☐ -

Operating modes of the EUT:

No.	Description
1	Samples wired to provide continuous transmitting mode or receiving/standby mode were tested

Cables:

No.	Type	Length	Designation	Note
1	None			

Support equipment/Services:

No.	Item	Description
1	None	

General notes: ZCombo and ZSmoke alarms are identical RF Transmitters operating on the same frequency and the same modulation scheme with 40kbps and 9.9kbps transfer rate; the both devices use the same digital PCB with ZSmoke downscaled from ZCombo unit removing CO detector. Based on the above the ZCombo unit was tested for intentional radiator tests, and the both units were tested separately for unintentional radiator tests.

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).

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

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

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

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

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

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

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

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: 1.4dB below the limits

Notes: None



Date:	April 8, 2013	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)	Peak Reading dBμV	Total @ 3m dBμV/m	Limit dBμV/m	Margin dB	Comments
	Polarity	Hts(cm)								
		40kbps rate Emissions at Fundamental Frequency								
908.4	V	118	21.8	3.6	0.0	64.0	89.5	94.0	-4.5	
908.4	H	163	21.8	3.6	0.0	63.7	89.2	94.0	-4.8	
		9.6kbps rated Emissions at Fundamental Frequency								
908.4	V	133	21.8	3.6	0.0	62.1	87.6	94.0	-6.4	
908.4	H	158	21.8	3.6	0.0	67.1	92.6	94.0	-1.4	



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: 15.6dB below the limits

Max. margin of spurious emissions-bandedge compliance: 13.2dB below the limits

Notes: Fundamental frequencies were excluded from the Table.

Date:	April 8-9, 2013	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:	None	

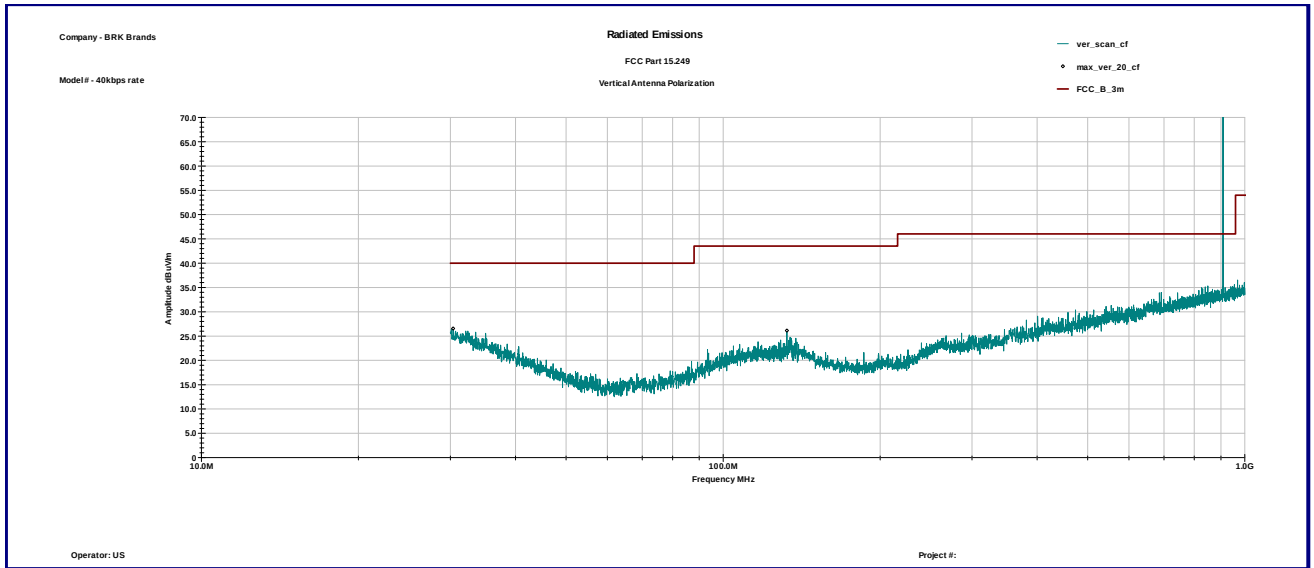
Table 3.2.1

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
40kbps rate Spurious Emissions							
1.8145 GHz	V	47.2	29.2	41.3	35.2	54.0	-18.8
1.8145 GHz	H	48.6	29.0	41.3	36.3	54.0	-17.7
2.728 GHz	H	46.3	32.4	40.4	38.3	54.0	-15.7
9.6kbps rate Spurious Emissions							
2.728 GHz	H	46.4	32.4	40.4	38.4	54.0	-15.6

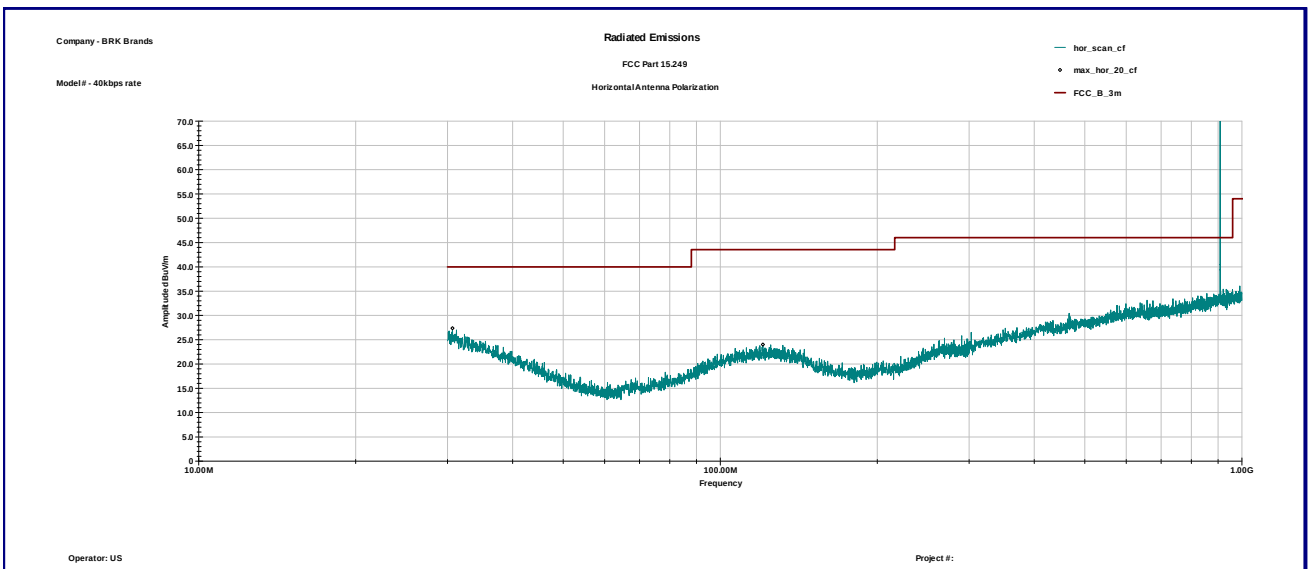
Frequency MHz	Antenna		Ant. CF dB1/m	Cable loss dB	Pre-amp Gain (dB)	Reading dBμV	Total @ 3m dBμV/m	Limit dBμV/m	Margin dB	Comments
	Polarity	Hts(cm)								
	40kbps rate Spurious Emissions-Bandedge Compliance, QP Reading									
902.00	V	100	21.8	3.6	0.0	6.9	32.3	46.0	-13.7	
902.00	H	100	21.8	3.6	0.0	6.8	32.2	46.0	-13.8	
928.00	V	100	21.9	3.7	0.0	7.0	32.6	46.0	-13.4	
928.00	H	100	21.9	3.7	0.0	7.2	32.8	46.0	-13.2	
	9.6kbps rate Spurious Emissions-Bandedge Compliance, QP Reading									
902.00	V	100	21.8	3.6	0.0	6.9	32.3	46.0	-13.7	
902.00	H	100	21.8	3.6	0.0	6.7	32.1	46.0	-13.9	
928.00	V	100	21.9	3.7	0.0	7.0	32.6	46.0	-13.4	
928.00	H	100	21.9	3.7	0.0	6.8	32.4	46.0	-13.6	

Graph 3.2.1

Vertical antenna polarization

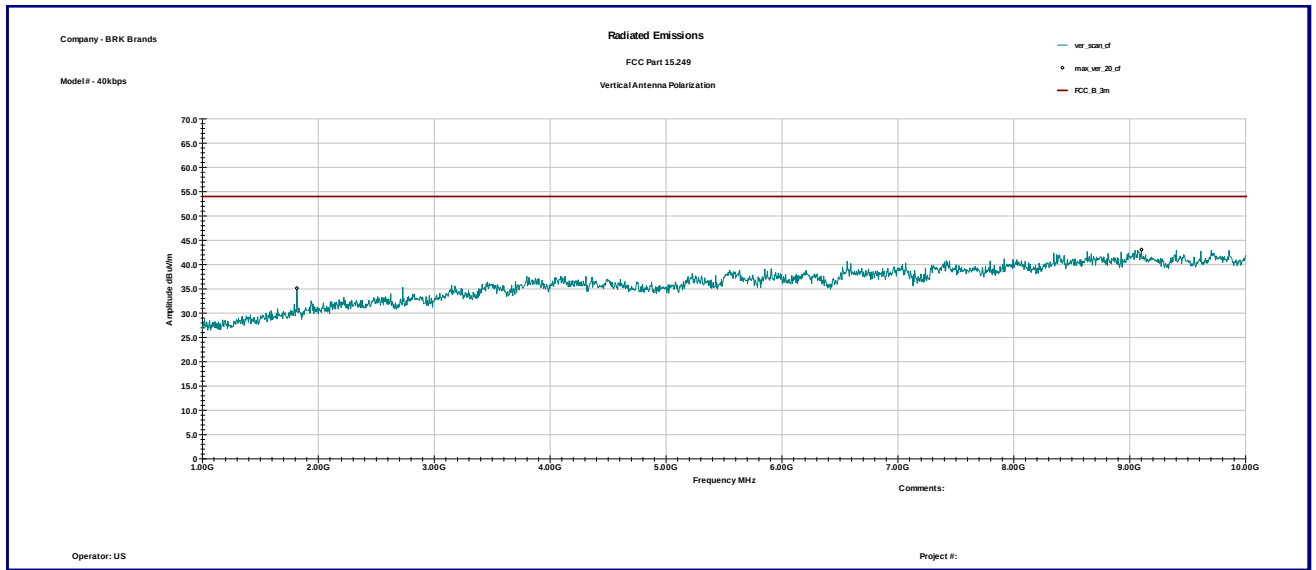


Horizontal antenna polarization

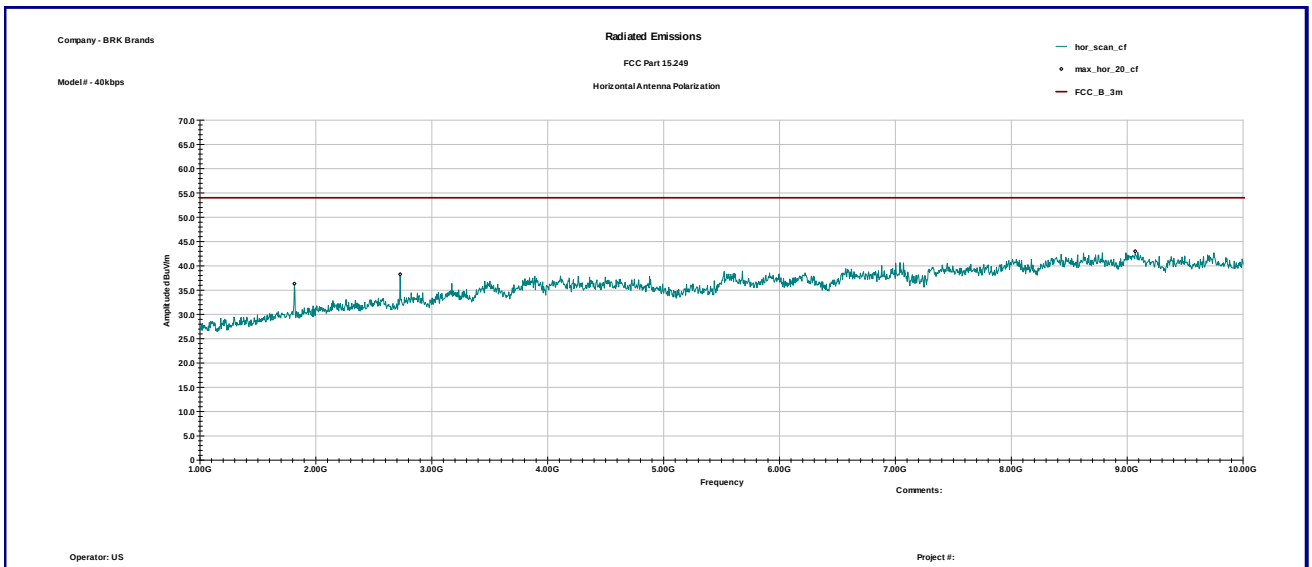


Graph 3.2.2

Vertical antenna polarization

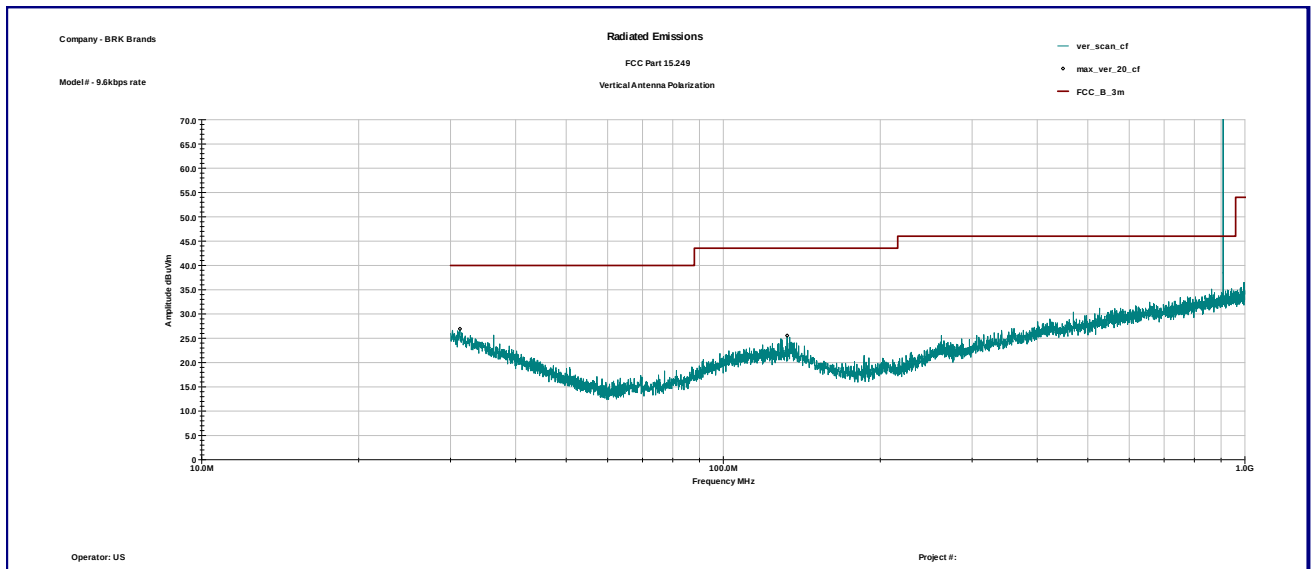


Horizontal antenna polarization

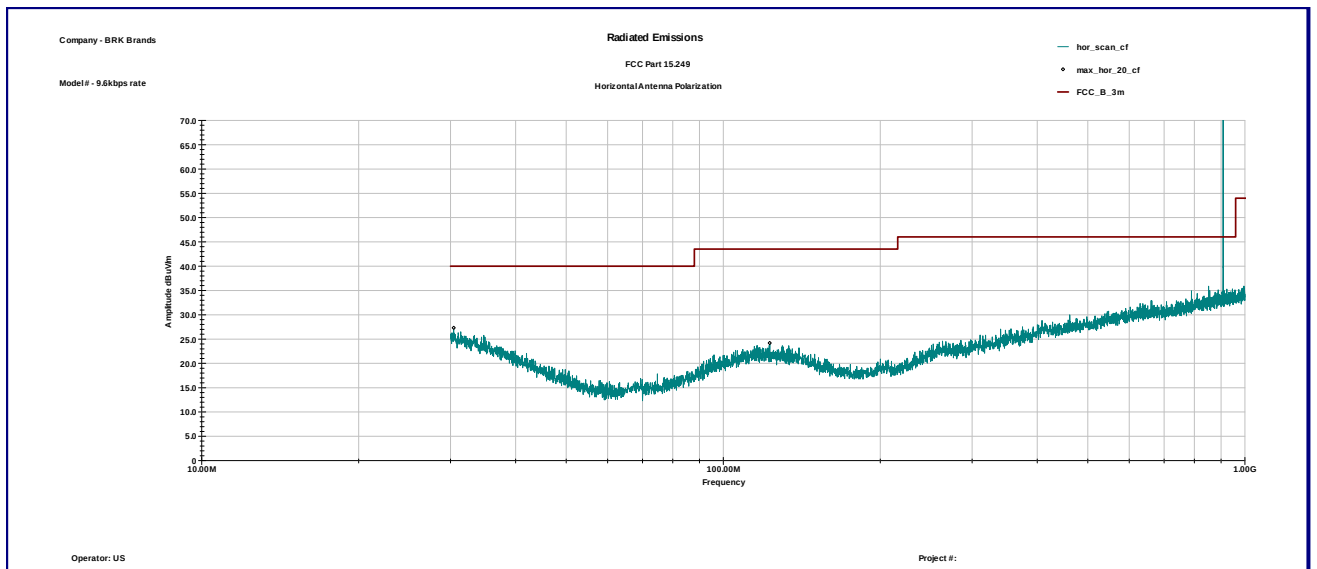


Graph 3.2.3

Vertical antenna polarization

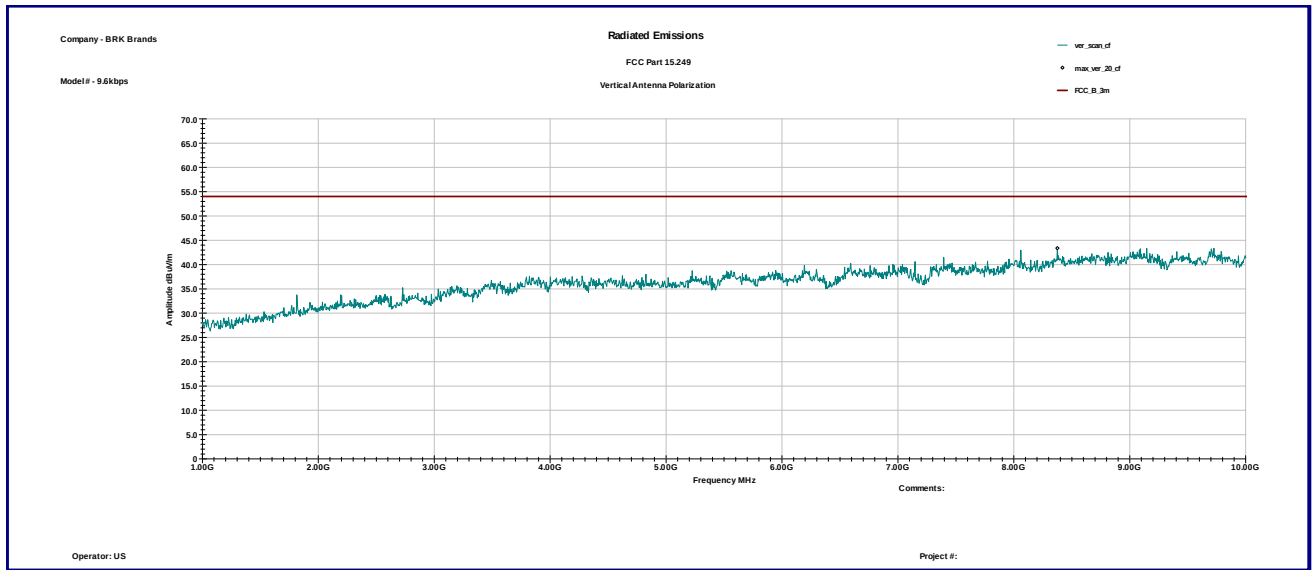


Horizontal antenna polarization

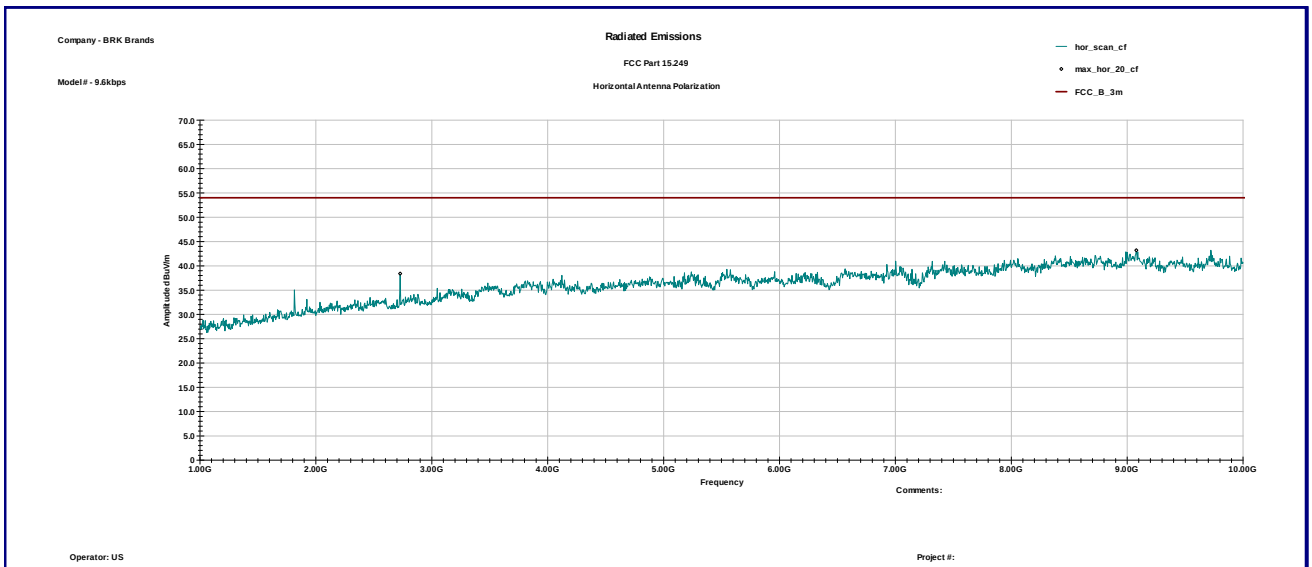


Graph 3.2.4

Vertical antenna polarization



Horizontal antenna polarization



3.3 Bandwidth of Emissions

(40kbps rate)

Center Frequency of operation MHz	Measured 20dB bandwidth kHz	Measured 99% bandwidth kHz
908.4	116.98	108.17

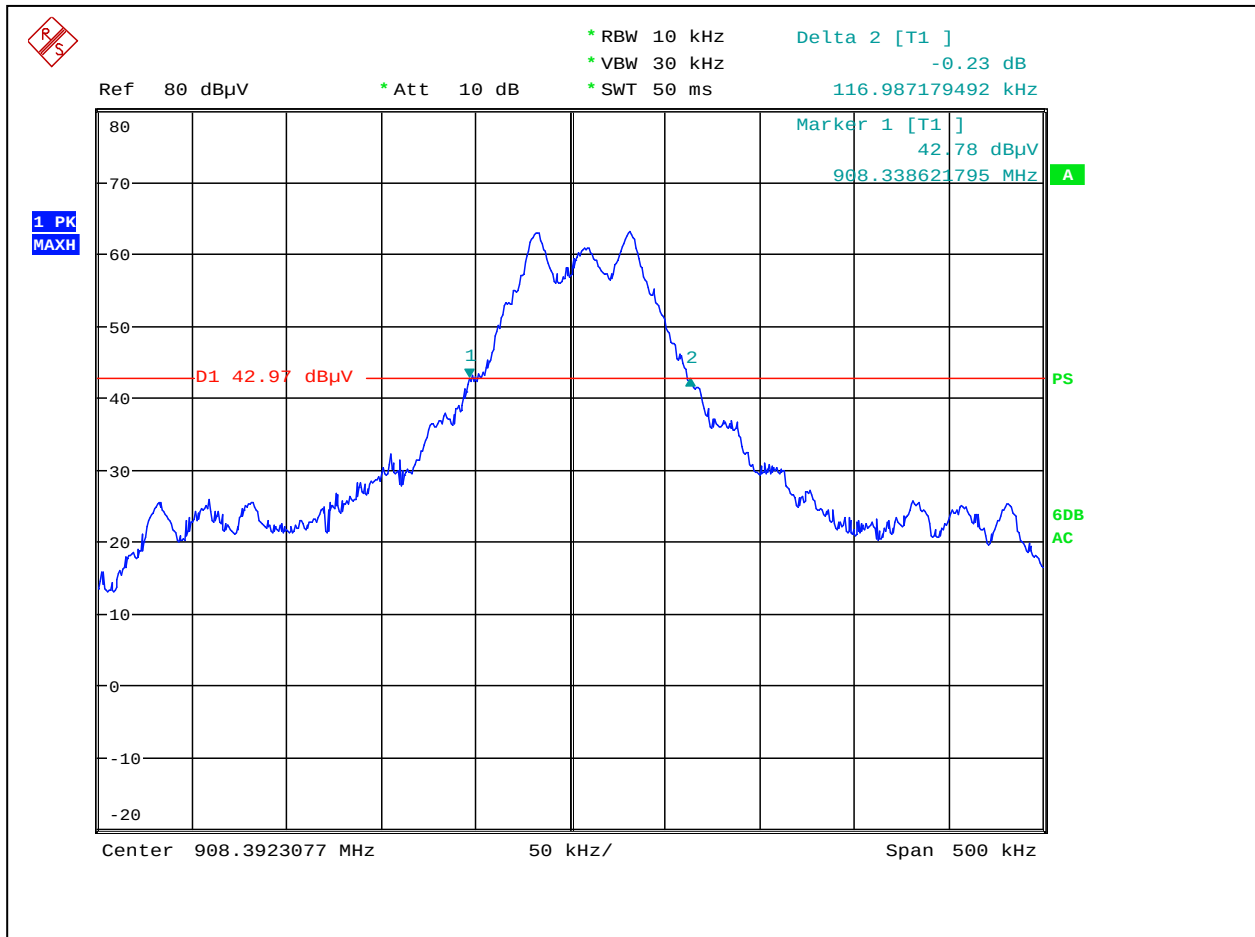
(9.6kbps rate)

Center Frequency of operation MHz	Measured 20dB bandwidth kHz	Measured 99% bandwidth kHz
908.4	100.96	93.75

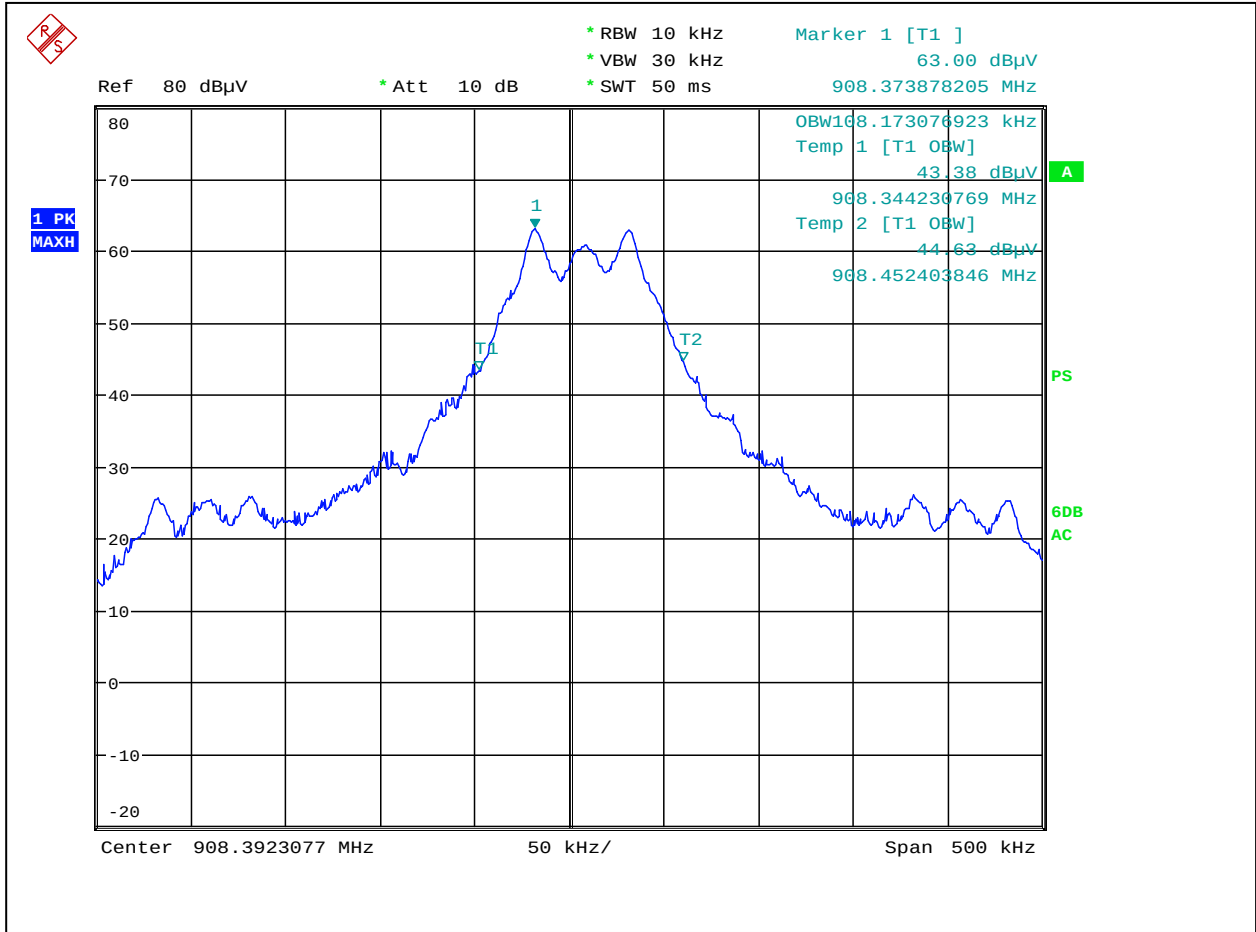
Graphs 3-3-1, 3-3-2, 3-3-3 and 3-3-4 show bandwidth of emissions

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

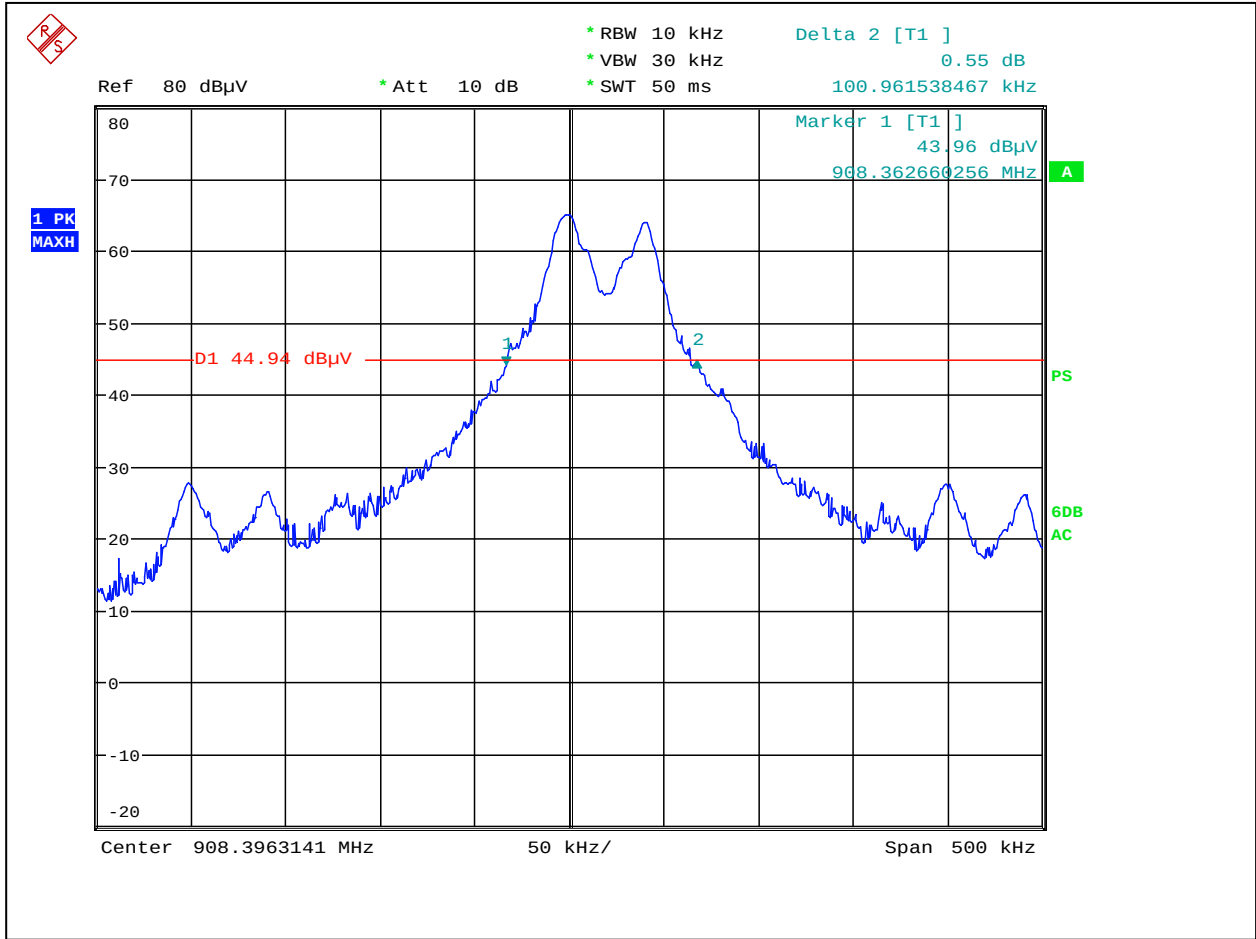
Graph 3.3.1



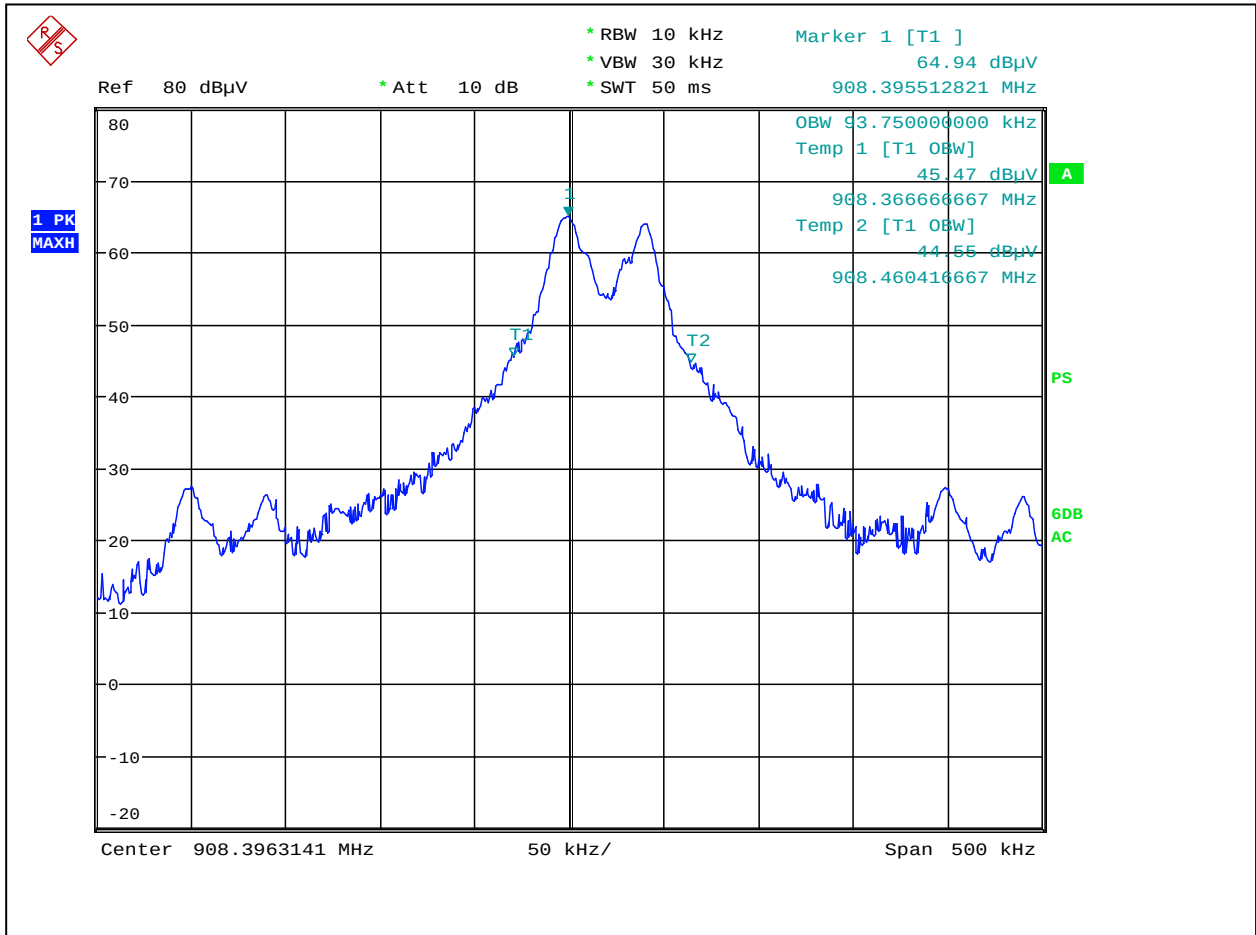
Graph 3.3.2



Graph 3.3.3



Graph 3.3.4





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: **Pass**

Frequency range: 30MHz-5000MHz

Max. Emissions margin: 12.6dB 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, 3.5.2, 3.5.3 and 3.5.4)



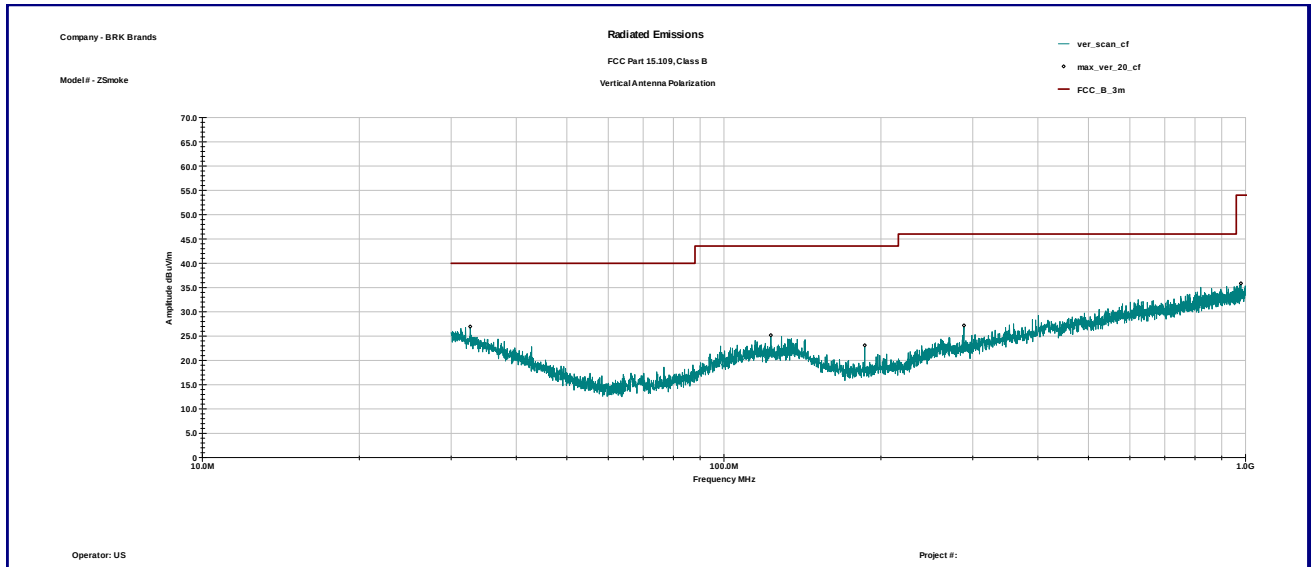
Date:	April 9-10, 2013	Result: Pass
Standard:	FCC Part 15.109, Class B	
Tested by:	Uri Spector	
Test Point:	Enclosure	
Operation mode:	See page 5	
Note:	30MHz-5000MHz	

Table 3.5.1

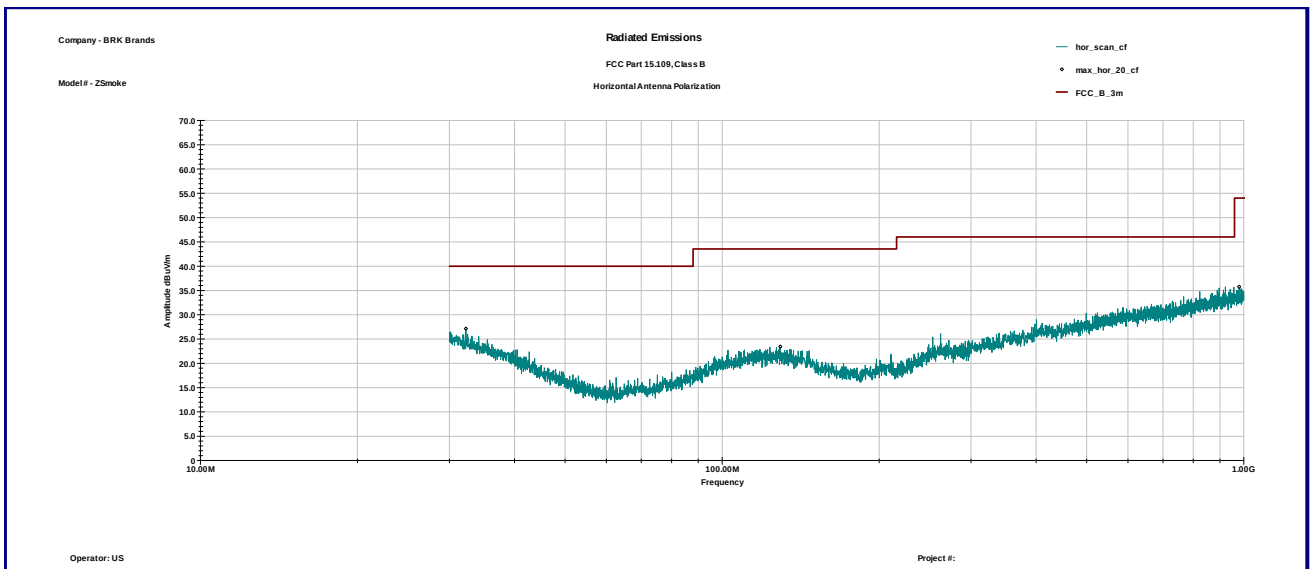
Frequency	Ant. Polarity	Peak Reading dB μ V	Total C.F. dB1/m	Total at 3m dB μ V/m	Limit dB μ V/m	Margin dB
ZSmoke						
32.632 MHz	V	8.3	18.7	27.0	40.0	-13.0
123.06 MHz	V	11.2	14.0	25.2	43.5	-18.3
186.19 MHz	V	11.8	11.3	23.1	43.5	-20.4
288.43 MHz	V	11.7	15.5	27.2	46.0	-18.8
32.286 MHz	H	8.3	18.8	27.1	40.0	-12.9
129.32 MHz	H	9.5	13.9	23.5	43.5	-20.1
ZCombo						
31.108 MHz	V	7.9	19.6	27.4	40.0	-12.6
132.53 MHz	V	11.1	13.8	24.8	43.5	-18.7
30.519 MHz	H	7.3	19.9	27.2	40.0	-12.8
121.79 MHz	H	10.4	14.0	24.3	43.5	-19.2

Graph 3.5.1

Vertical antenna polarization

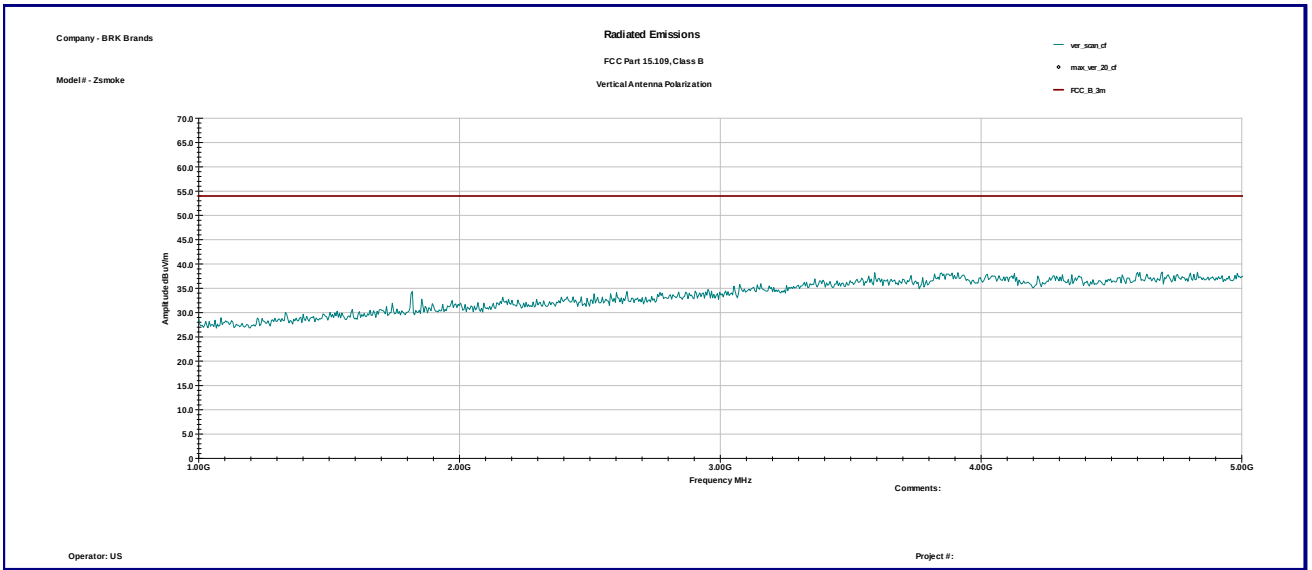


Horizontal antenna polarization

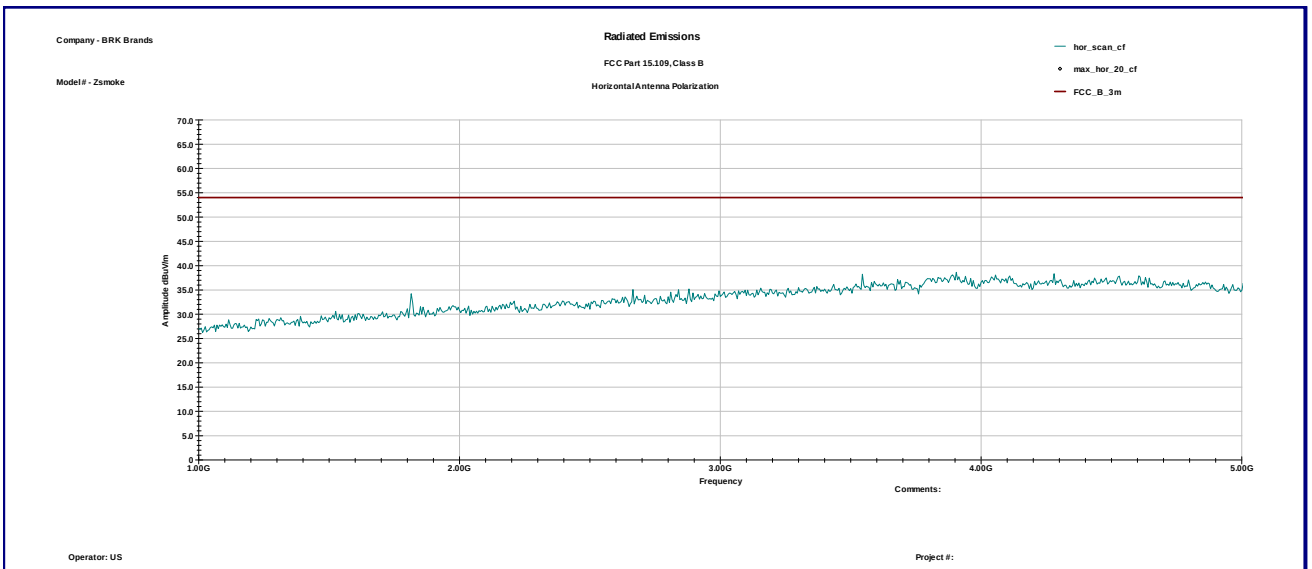


Graph 3.5.2

Vertical antenna polarization

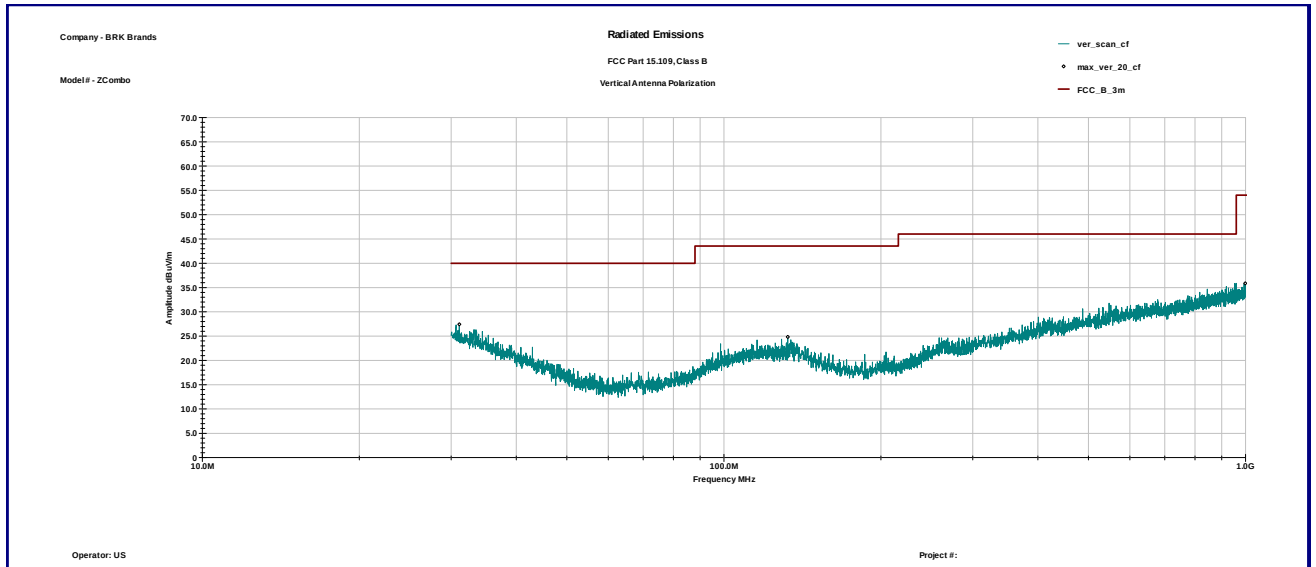


Horizontal antenna polarization

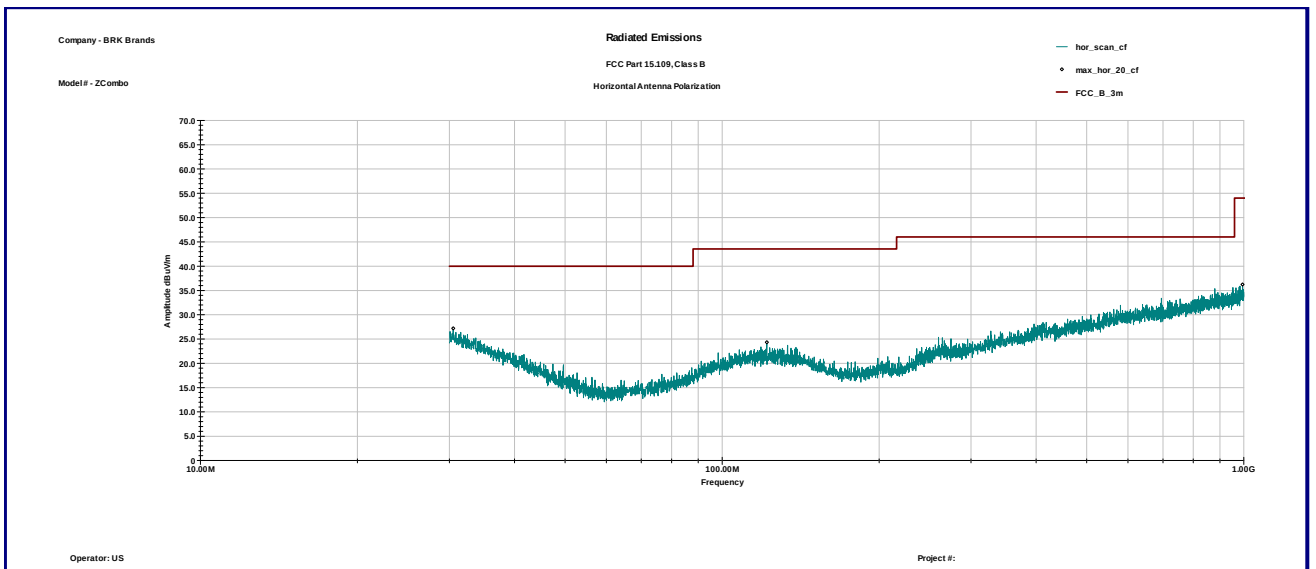


Graph 3.5.3

Vertical antenna polarization



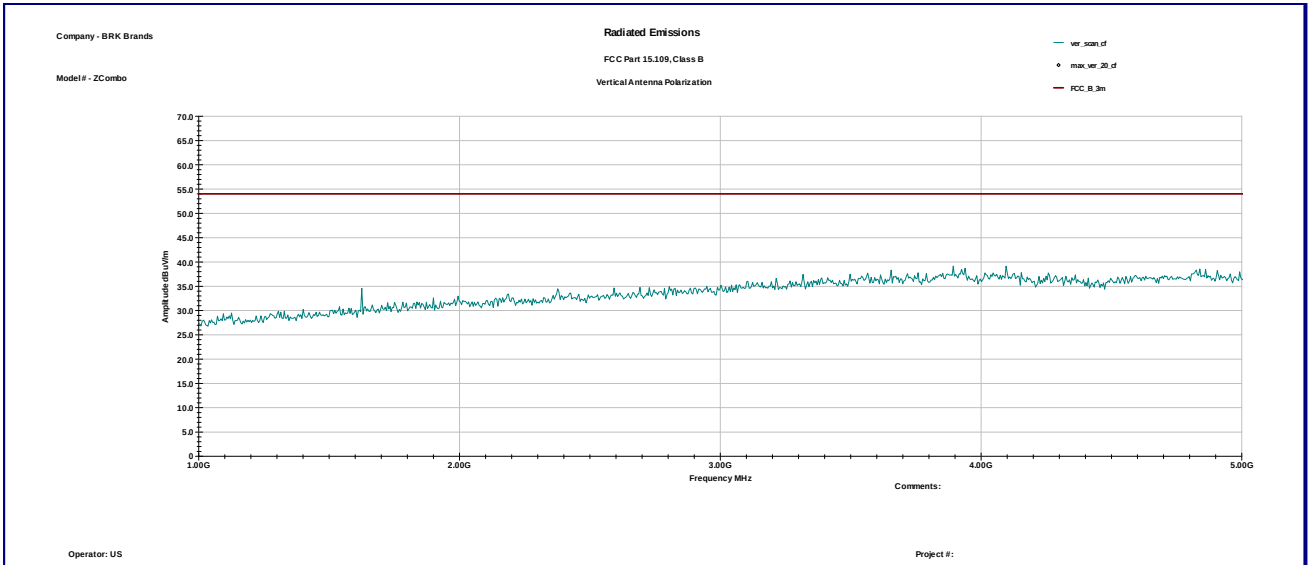
Horizontal antenna polarization



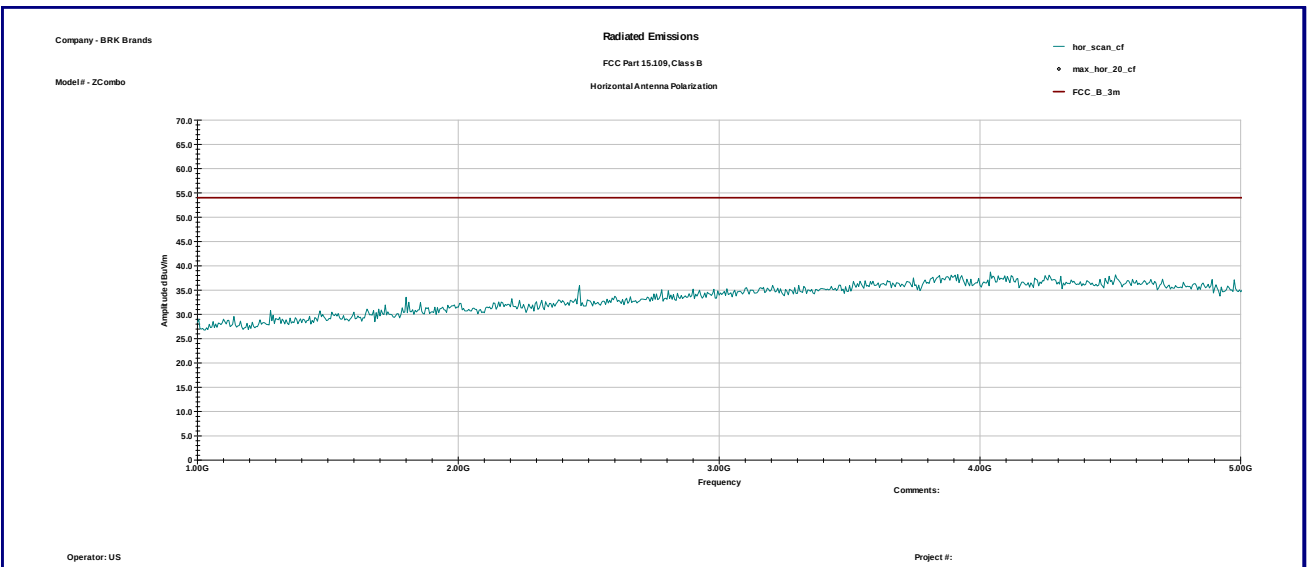


Graph 3.5.4

Vertical antenna polarization



Horizontal antenna polarization





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	ESU	100398	25283	12/19/2013	☒
Spectrum Analyzer	R & S	FSP 40	100024	12559	11/29/2013	☒
Bicono-Log Antenna	Teseq	CBL6112D	32859	25289	08/09/2013	☒
Horn Antenna	EMCO	3115	9507-4513	9936	05/16/2013	☒
High Pass Filter	Reactel Inc.	7HS-1G-S1	0223	15275	VBV	☒
Pre-Amplifier	MITEQ	AMF-5D-00501800-28-13P	1122951	13475	11/01/2013	☒
System	Quantum Change	TILE! Instrument Control	Ver. 3.4.K.29	15259	VBV	☒