TEST REPORT

Report Number: 104257746MIN-001
Project Number: G104257746

Equipment Designator:
ZCOMBO, ZCOMBOA, SMCO400

to
47 CFR, Part 15. 249:2020
RSS- 210, Issue 10, 2019
RSS-Gen, Issue 5, 2019, Amendment 1
47 CFR, Part 15:2020, §15.107 and §15.109, Class B/ ICES-003, Issue 6 Update 2017

For
BRK Brands, Inc

Test Performed by:
Intertek Testing Services NA, Inc.
40 51st Way NE, Suite 100
Fridley, MN 55421 USA

Test Authorized by:
BRK Brands, Inc.
3901 Liberty St
Aurora, IL 60504, USA

Prepared by: Richard Blonigen

Reviewed by: Uri Spector

Date of issue: March 4, 2020

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1.0 GENERAL DESCRIPTION

Model Tested:	ZCOMBO
Type of EUT:	Smoke and Carbon Monoxide Alarm with Wireless
Serial Number:	Transmitter 16 Receive 38
Related Submittal(s) Grants:	None
Company:	BRK Brands, Inc.
Customer:	Kevin Sein
Address:	3901 Liberty St Aurora, IL 60504, USA
Phone:	(630) 499-3330
Email:	Kevin.sein@newellco.com
Test Standards:	☒ 47 CFR, Part 15:2020, §15.249 ☒ RSS- 210, Issue 10, 2019 ☒ RSS-Gen, Issue 5, 2019, Amendment 1 ☒ 47 CFR, Part 15:2020, §15.107 and §15.109, Class B, test method: ANSI C63.4-2014 ☒ ICES-003, Issue 6 Update 2017 ☐ Other
Type of radio:	☒ Stand -alone ☐ Module ☐ Hybrid
Date Sample Submitted:	February 28, 2020
Test Work Started:	March 2, 2020
Test Work Completed:	March 4, 2020
Test Sample Conditions:	☐ Damaged ☐Poor (Usable) ☒ Good

1.1 Product Description; Test Facility

Product Description:	Transmitter 9.6 kbps rate
Operating Frequency	908.4 MHz
Modulation:	FSK
Antenna(s) Info:	Antenna Type: Integral
Antenna Installation:	☐ User ☒ Professional ☐ Factory
Transmitter Power Configuration:	☒ Internal battery ☐ External power source ☒ 3.0 VDC 2 AA batteries 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 C63.10-2013

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	EUT was pre-programmed to transmit a modulated signal continuously at 9.6kbps rate.
2	EUT was pre-programmed for receive/standby mode.

Cables:

No.	Type	Length	Designation	Note
1	None			

Support equipment/Services:

No.	Item	Description
1	None	

General notes:

1. Per the client, the ZCOMBO and ZCOMBOA radios are identical radios. The only difference are the model numbers for marketing purposes.
2. Per client declaration, the new Model SMCO400 is electrically identical to previous Models ZCOMBO/ZCOMBOA with the ZWAVE ZM5202 chipset. Model SMCO400 has updated smoke sensing firmware to meet new smoke alarm performance requirements.
3. Intertek does not make any claims of compliance for samples or variants which were not tested.

EUT was tested in 3-axis (X; Y and Z)

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 ±4.8 dB at 3m

The expanded uncertainty (k = 2) for radiated emissions above 1GHz has been determined to be: ±5.9 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

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test distance: ☐ 10 meters ☒ 3 meters

Test result: **Pass**

Max. Emissions margin at fundamental: 0.2 dB below the limits

Notes: None

Date:	March 2, 2020 May 18,2020	**Result: Pass**
Tested by:	Richard Blonigen Simon Khazon	
Standard:	FCC 15.249(a) / RSS-210 A2.9	
Test Point:	Enclosure with antenna	
Operation mode:	See page 5	
Environmental Conditions:	22°C; 40%(RH); 98kPa	
Equipment Verification:	☒	
Note:	None	

Table 3.1.1

Frequency	Antenna		Ant. CF	Cable loss	Pre-amp	QP Reading	Total @ 3m	Limit	Margin	Axis
MHz	Polarity	Hts(cm)	dB1/m	dB	Gain (dB)	dBµV	dBµV/m	dBµV/m	dB	
Fundamental Frequency										
908.40	H	176	26.0	2.6	0.0	65.1	93.7	94.0	-0.3	X
908.40	V	121	26.0	2.6	0.0	60.0	88.6	94.0	-5.4	X
908.40	H	123	26.0	2.6	0.0	64.7	93.3	94.0	-0.7	Y
908.40	V	100	26.0	2.6	0.0	59.9	88.5	94.0	-5.5	Y
908.40	H	127	26.0	2.6	0.0	65.2	93.8	94.0	-0.2	Z
908.40	V	100	26.0	2.6	0.0	60.1	88.7	94.0	-5.3	Z

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: 20.4 dB below the limits

Max. margin of spurious emissions-bandedge compliance: 10.3 dB below the limits

Notes: Fundamental frequencies were excluded from Table.

Date:	March 2-4, 2020 May 18, 2020	**Result: Pass**
Tested by:	Richard Blonigen Simon Khazon	
Standard:	FCC 15.249(a) and (d) / RSS-210 A2.9	
Test Point:	Enclosure with antenna	
Operation mode:	See page 5	
Environmental Conditions:	22°C; 41%(RH); 98kPa	
Equipment Verification:	☒	
Note:	The table 3.2.1 shows the worst case of the Radiated Emissions noise.	

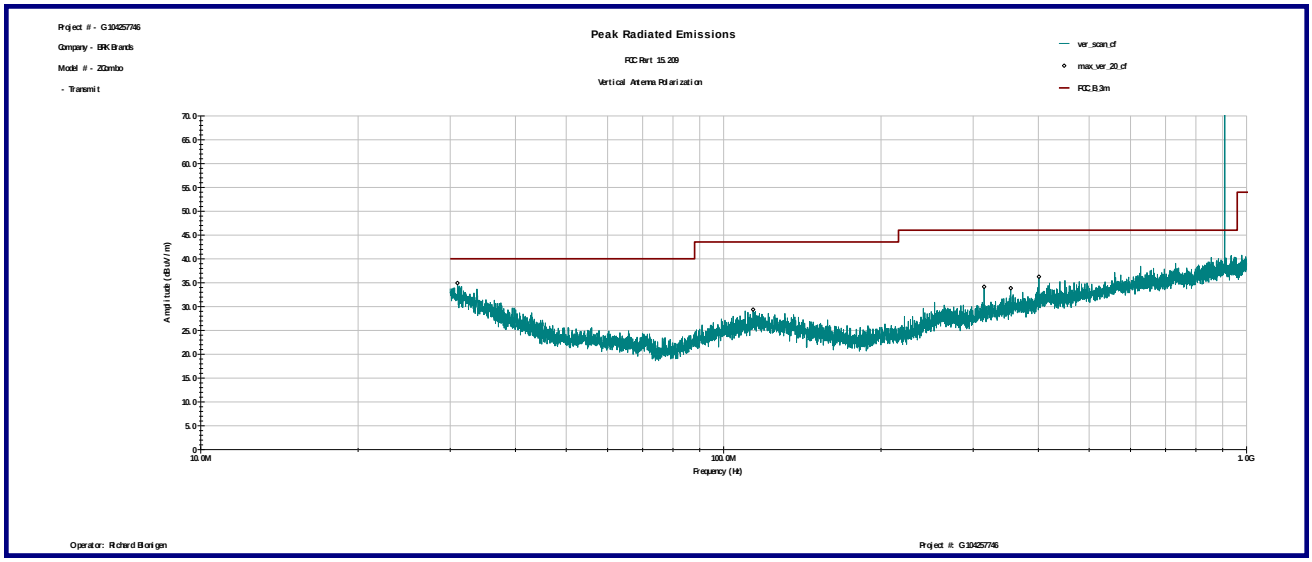
Table 3.2.1

Frequency	Antenna		Ant. CF	Cable loss	Pre-amp	AVG Reading	Total @ 3m	Limit	Margin	Comments
MHz	Polarity	Hts(cm)	dB1/m	dB	Gain (dB)	dBµV	dBµV/m	dBµV/m	dB	
Spurious Emissions										
1817.00	V	127	26.5	2.5	42.3	37.9	24.6	54.0	-29.4	
2725.00	V	100	29.1	3.1	42.4	42.3	32.1	54.0	-21.9	
4542.00	V	100	32.5	4.1	43.0	35.3	28.8	54.0	-25.1	
1817.00	H	100	26.5	2.5	42.3	39.6	26.3	54.0	-27.7	
2725.00	H	100	29.1	3.1	42.4	43.1	32.9	54.0	-21.1	
4542.00	H	193	32.5	4.1	43.0	40.0	33.5	54.0	-20.4	

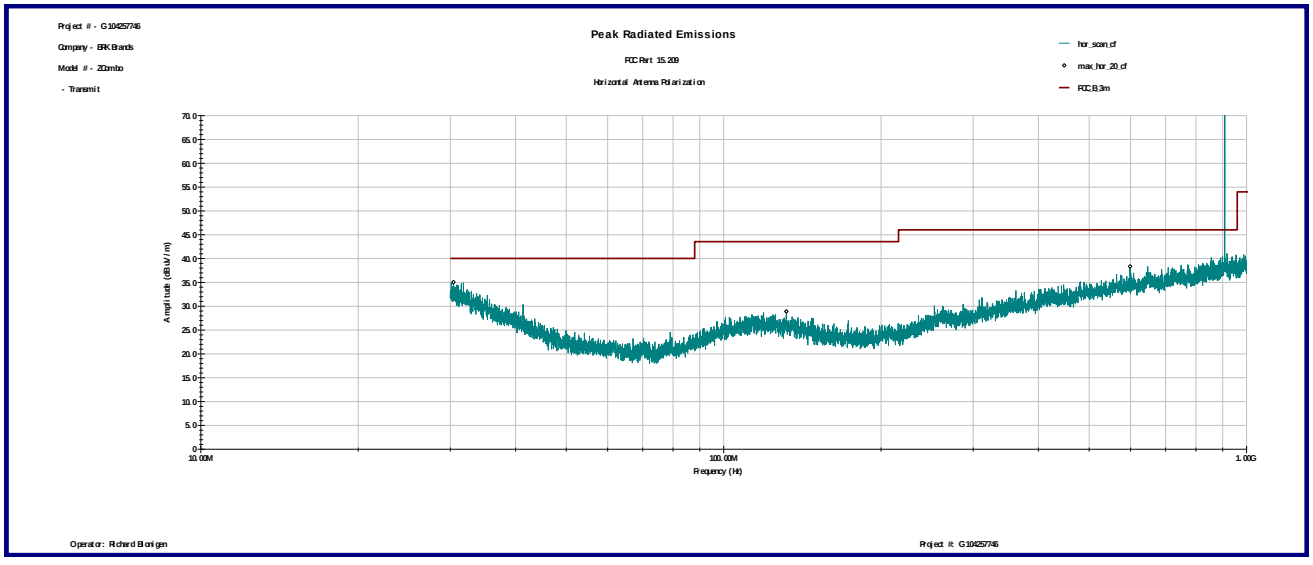
Frequency	Antenna		Ant. CF	Cable loss	Pre-amp	QP Reading	Total @ 3m	Limit	Margin	Comments
MHz	Polarity	Hts(cm)	dB1/m	dB	Gain (dB)	dBµV	dBµV/m	dBµV/m	dB	
Spurious Emissions-Bandegde Compliance										
902.00	V	100	26.0	2.6	0.0	6.8	35.4	46.0	-10.6	
902.00	H	100	26.0	2.6	0.0	6.6	35.2	46.0	-10.8	
928.00	V	100	26.0	2.6	0.0	7.1	35.7	46.0	-10.3	
928.00	H	100	26.0	2.6	0.0	6.9	35.5	46.0	-10.5	

Graph 3.2.1
X-axis of the EUT

Vertical antenna polarization

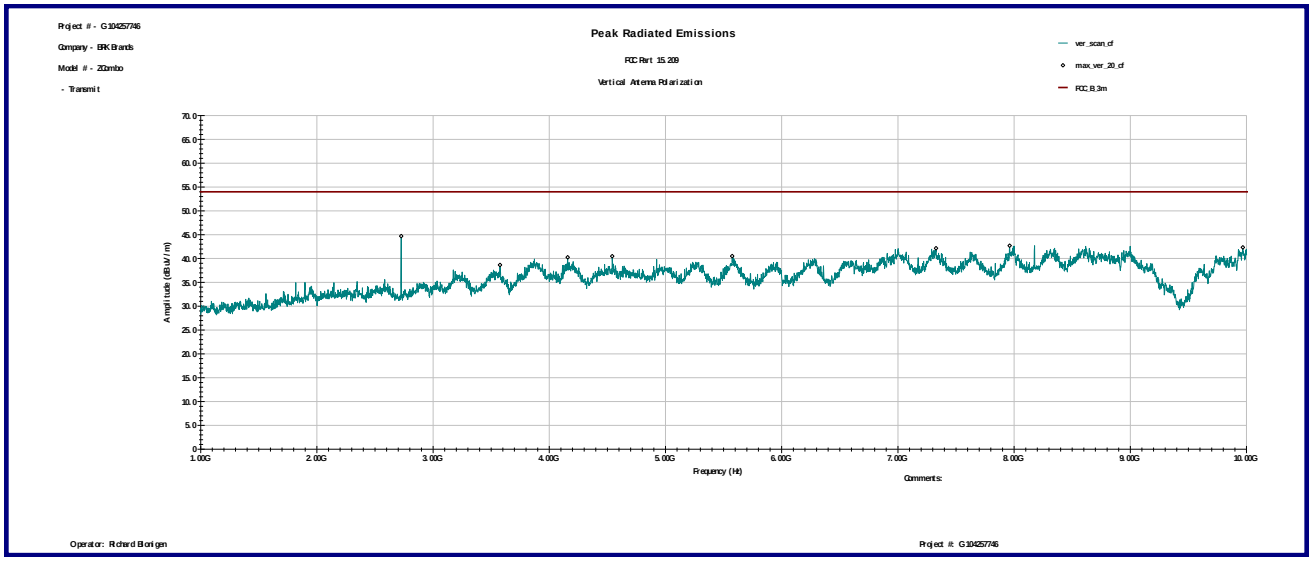


Horizontal antenna polarization

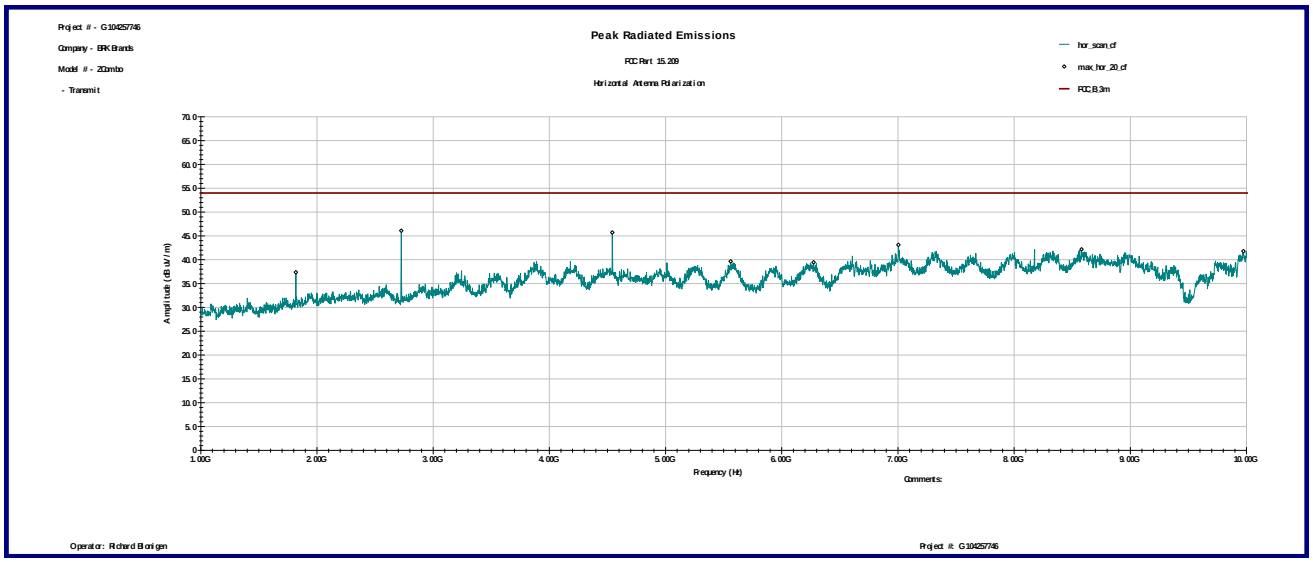


Graph 3.2.2
X-axis of the EUT

Vertical antenna polarization

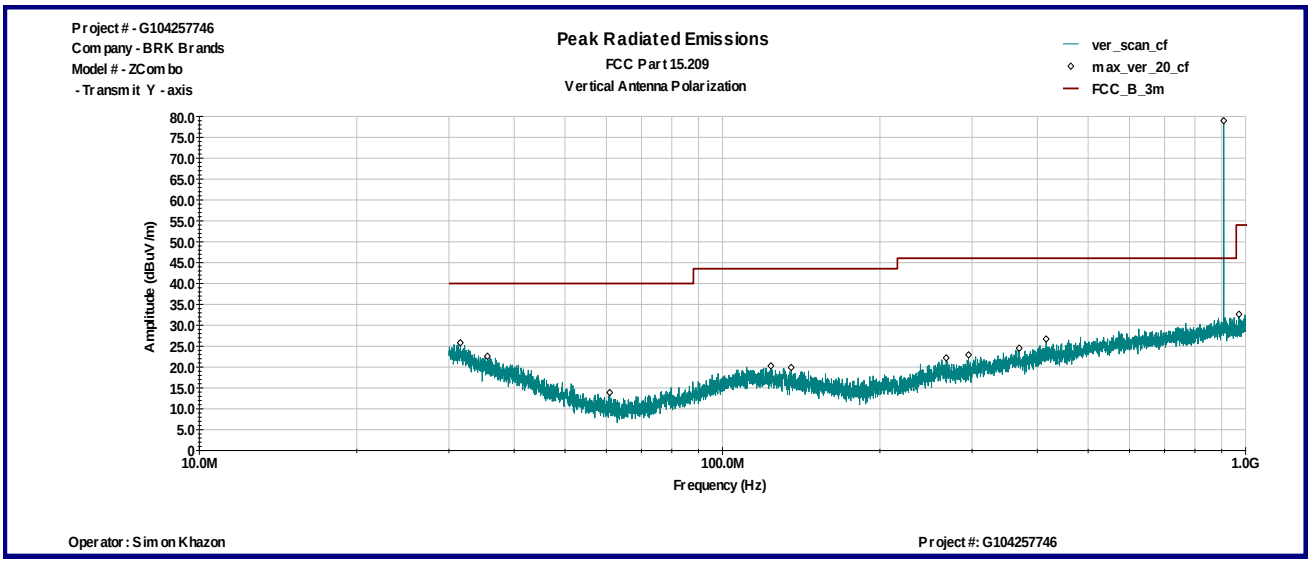


Horizontal antenna polarization

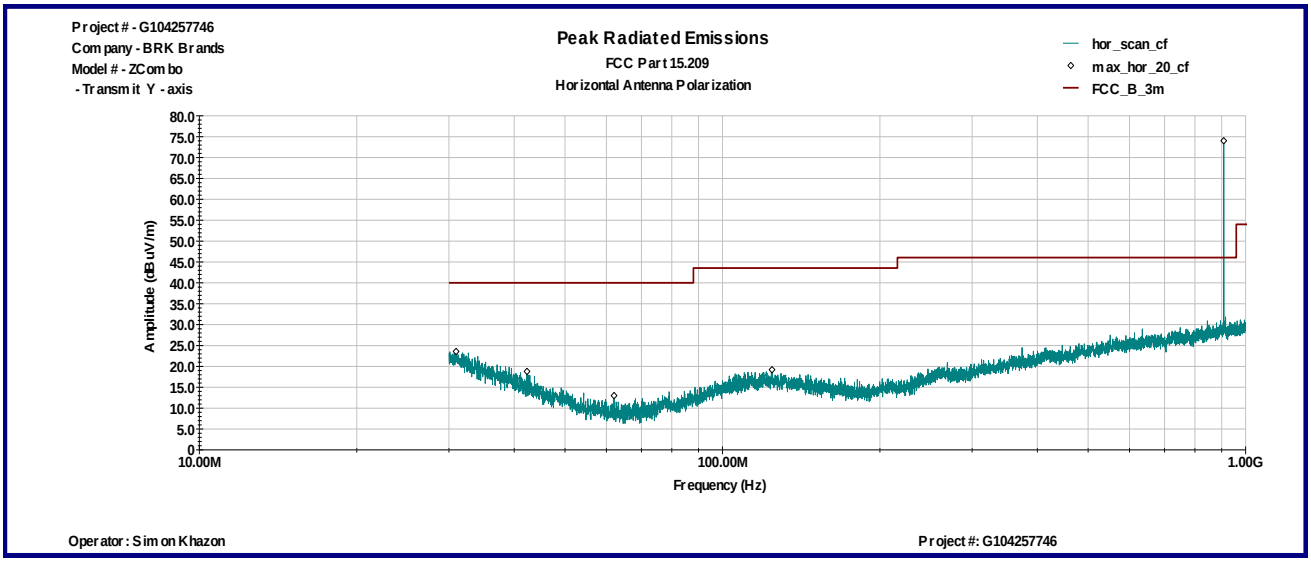


Graph 3.2.3
Y-axis of the EUT

Vertical antenna polarization

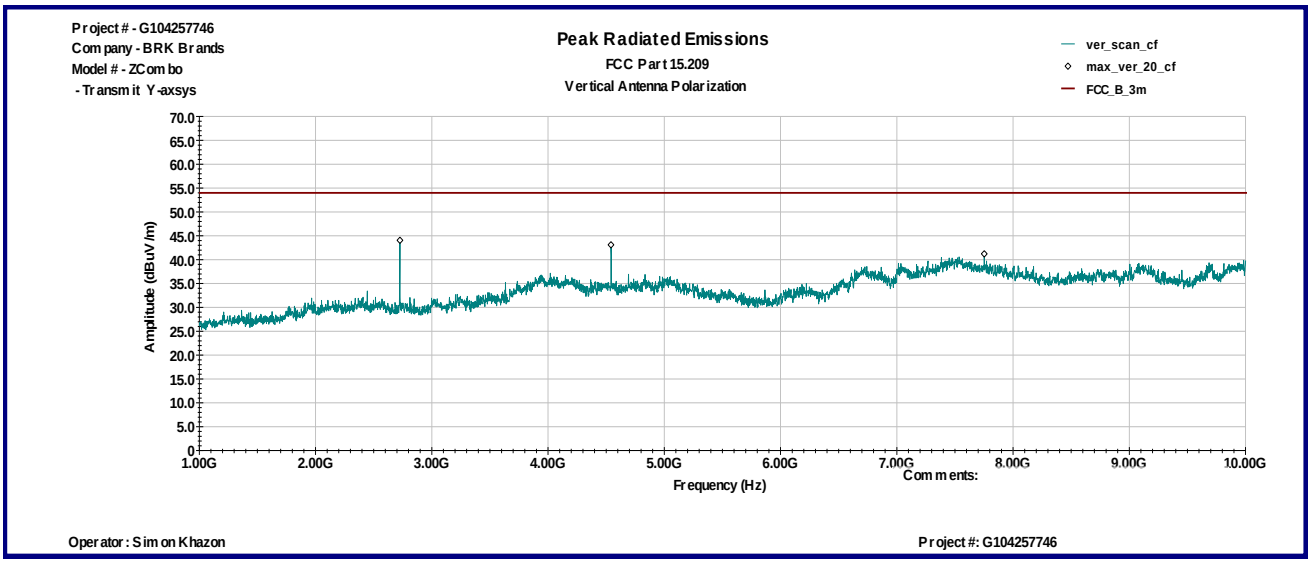


Horizontal antenna polarization

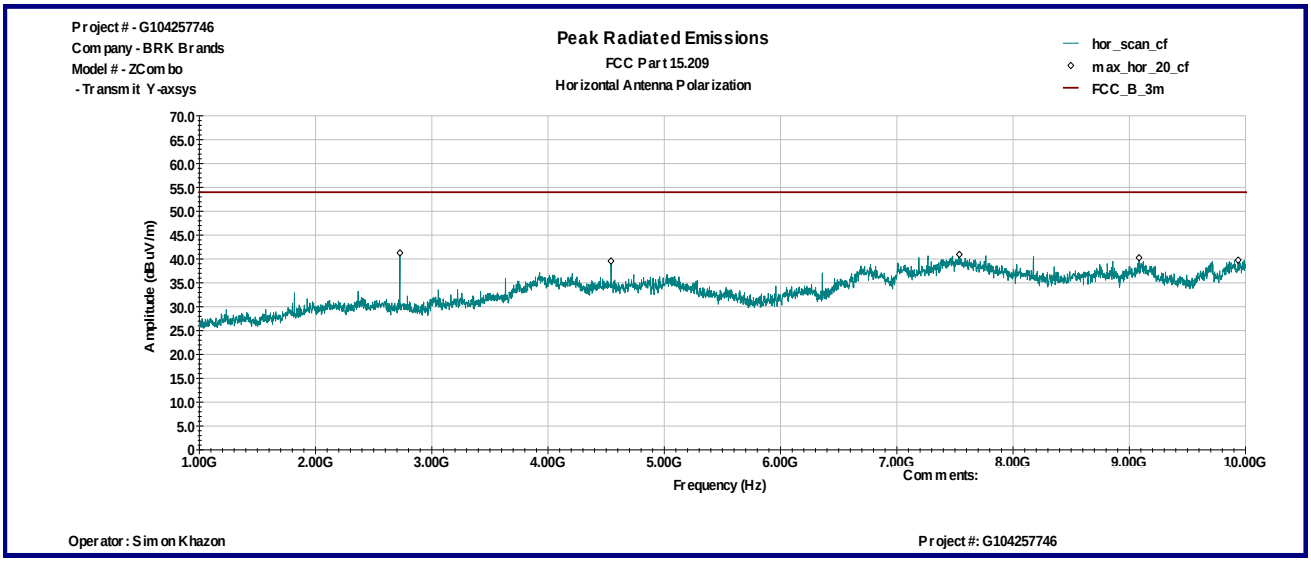


Graph 3.2.4
Y-axis of the EUT

Vertical antenna polarization

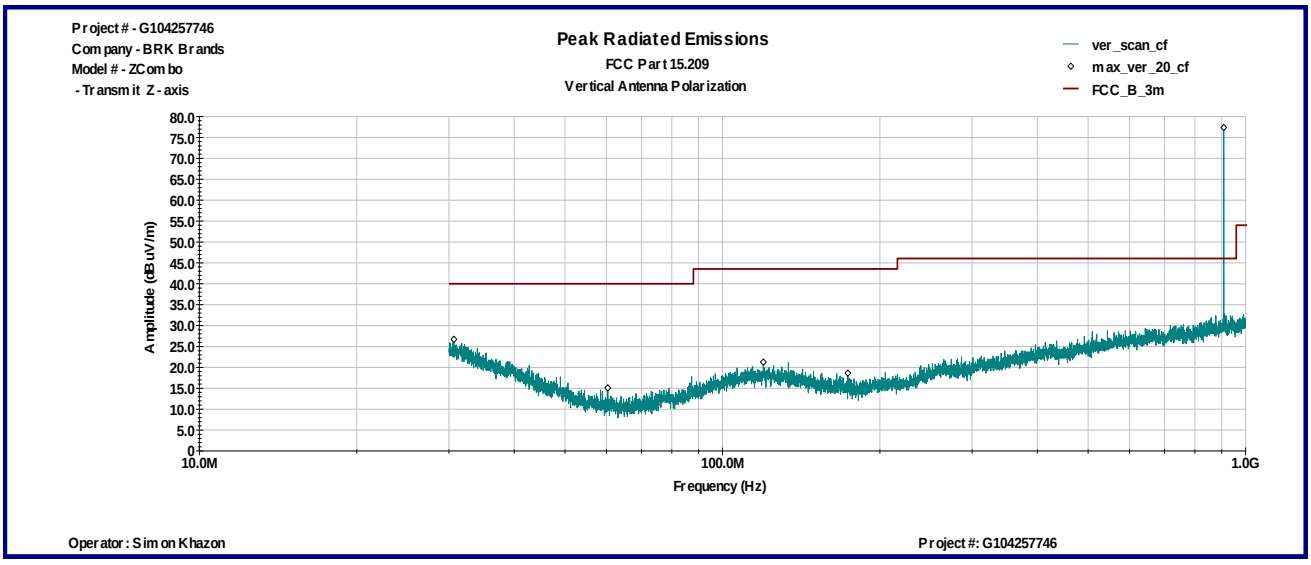


Horizontal antenna polarization

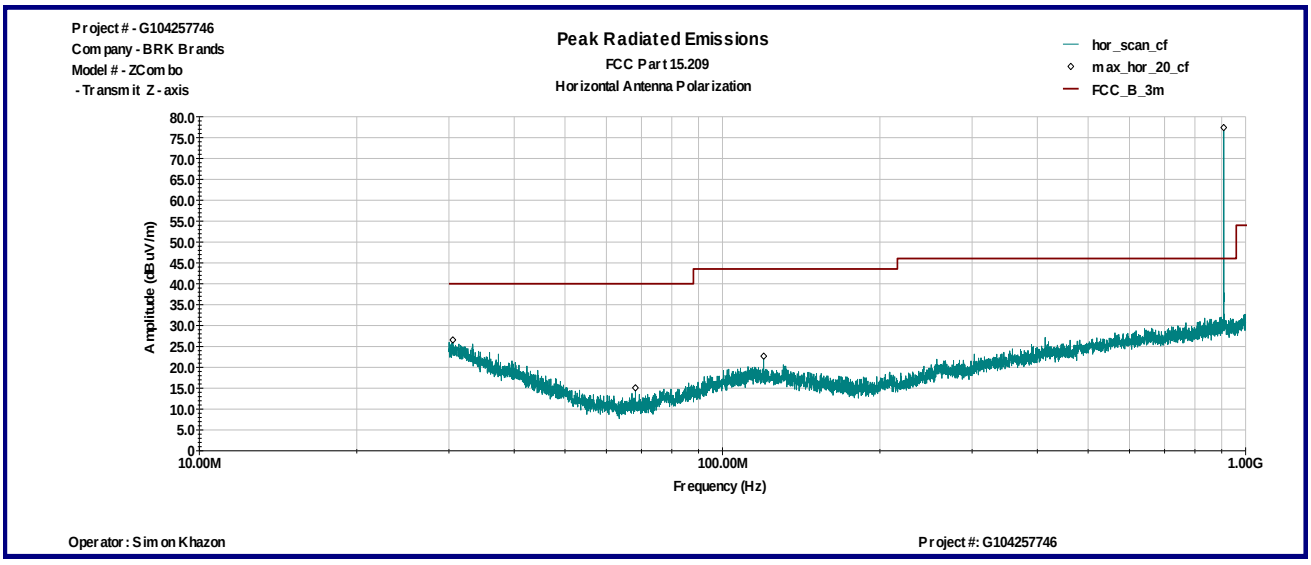


Graph 3.2.5
Z-axis of the EUT

Vertical antenna polarization

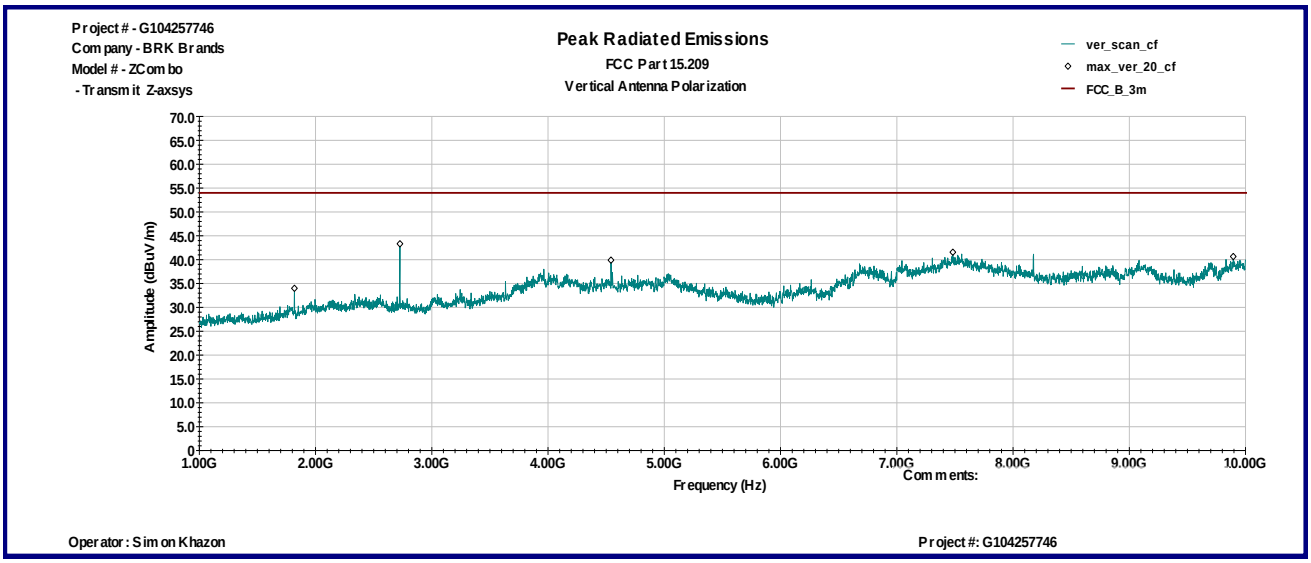


Horizontal antenna polarization

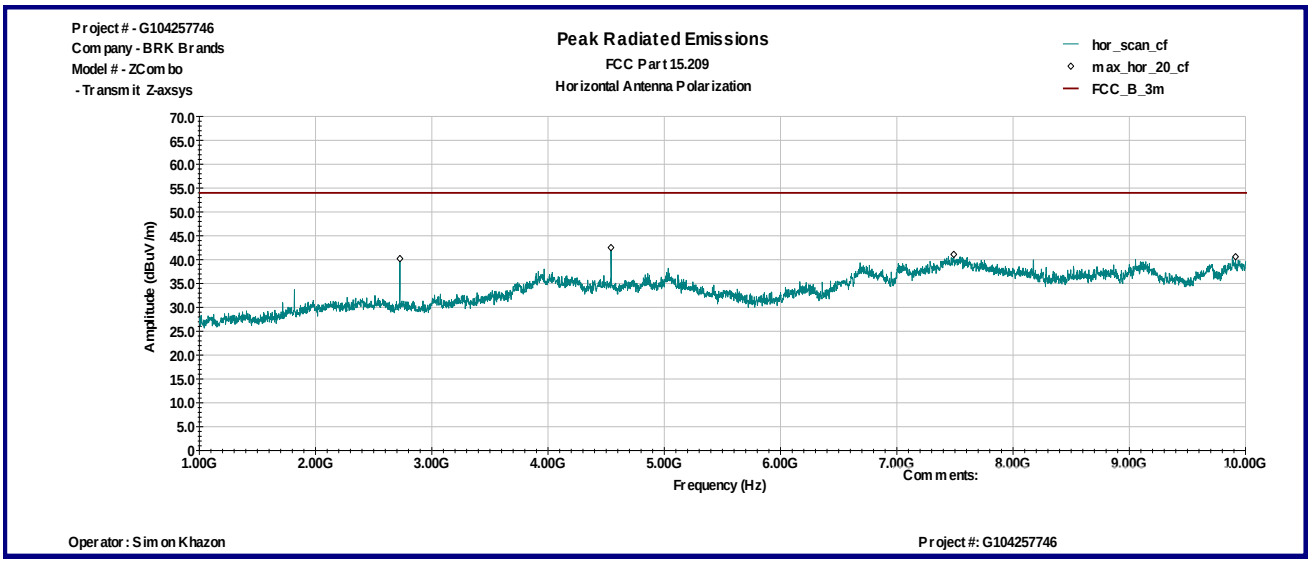


Graph 3.2.6
Z-axis of the EUT

Vertical antenna polarization



Horizontal antenna polarization



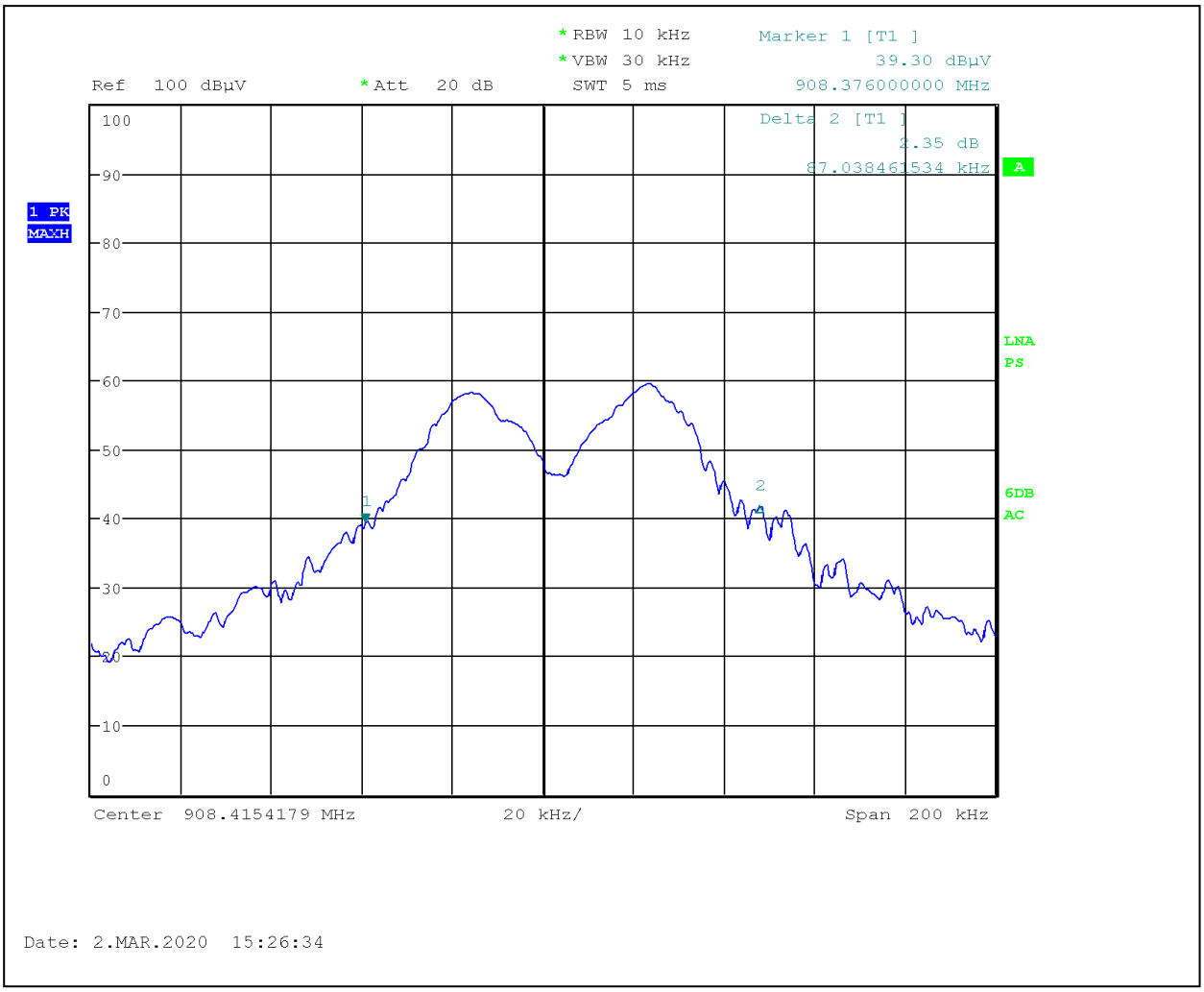
3.3 Bandwidth of Emissions

Center Frequency of operation MHz	Measured 20dB bandwidth kHz	Measured 99% bandwidth kHz
908.4	87.0	79.4

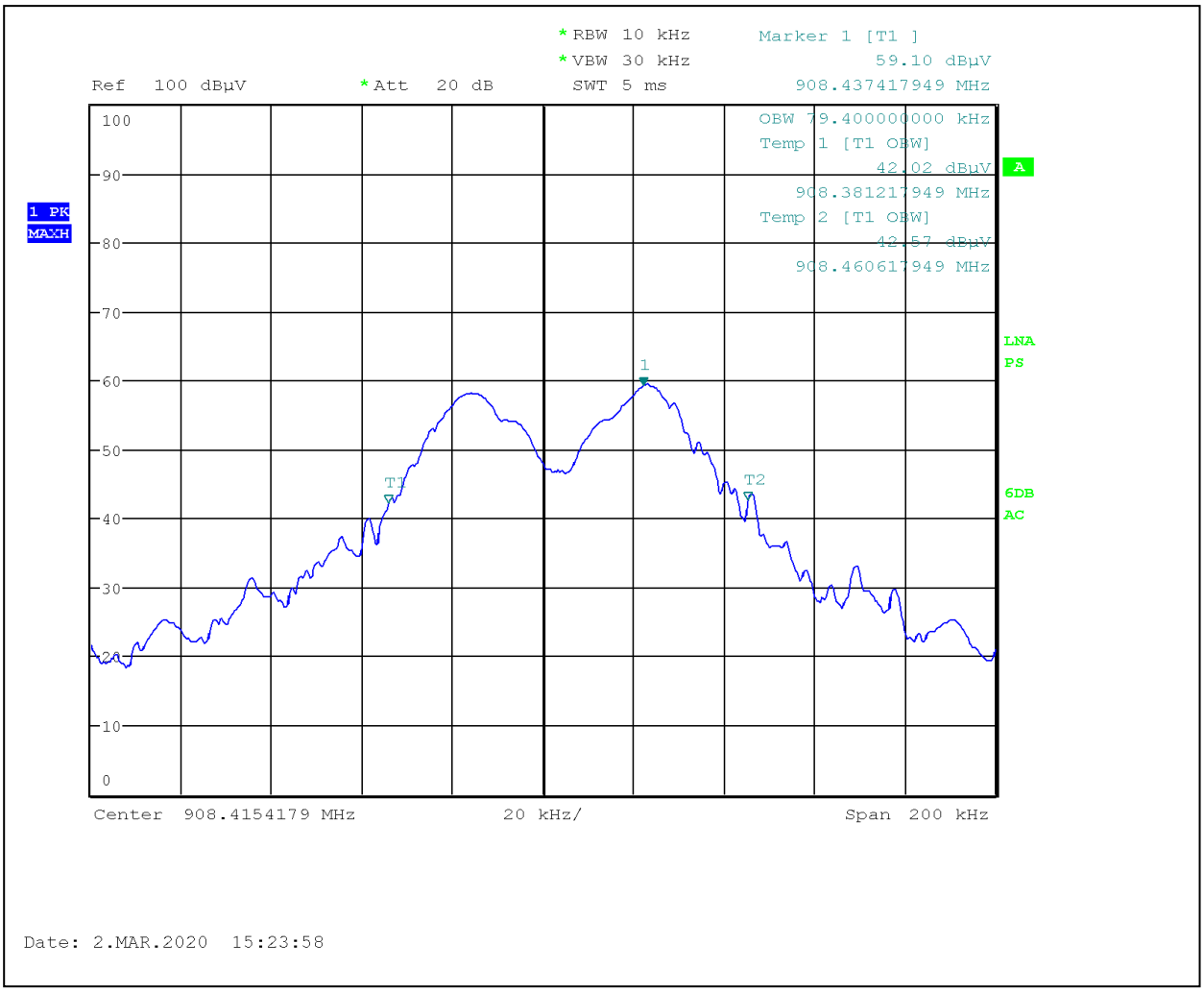
Graphs 3-3-1 and 3-3-2 show bandwidth of emissions

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

Graph 3.3.1


*RBW 10 kHz
*VBW 30 kHz
Ref 100 dBµV
*Att 20 dB
SWT 5 ms
Marker 1 [T1]
39.30 dBµV
908.376000000 MHz
Delta 2 [T1]
2.35 dB
87.038461534 kHz
1 PK
MAXH
A
LNA
PS
6DB
AC
100
90
80
70
60
50
40
30
20
10
0
Center 908.4154179 MHz
20 kHz/
Span 200 kHz
Date: 2.MAR.2020 15:26:34

Graph 3.3.2


*RBW 10 kHz
*VBW 30 kHz
Ref 100 dBµV
*Att 20 dB
SWT 5 ms
Marker 1 [T1]
59.10 dBµV
908.437417949 MHz
OBW 79.400000000 kHz
Temp 1 [T1 OBW]
42.02 dBµV
908.381217949 MHz
Temp 2 [T1 OBW]
42.57 dBµV
908.460617949 MHz
1 PK
MAXH
A
LNA
PS
6DB
AC
100
90
80
70
60
50
40
30
20
10
0
T1
T2
1
Center 908.4154179 MHz
20 kHz/
Span 200 kHz
Date: 2.MAR.2020 15:23:58

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-5000MHz

Max. Emissions margin: 5.1 dB 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 and 3.5.2)

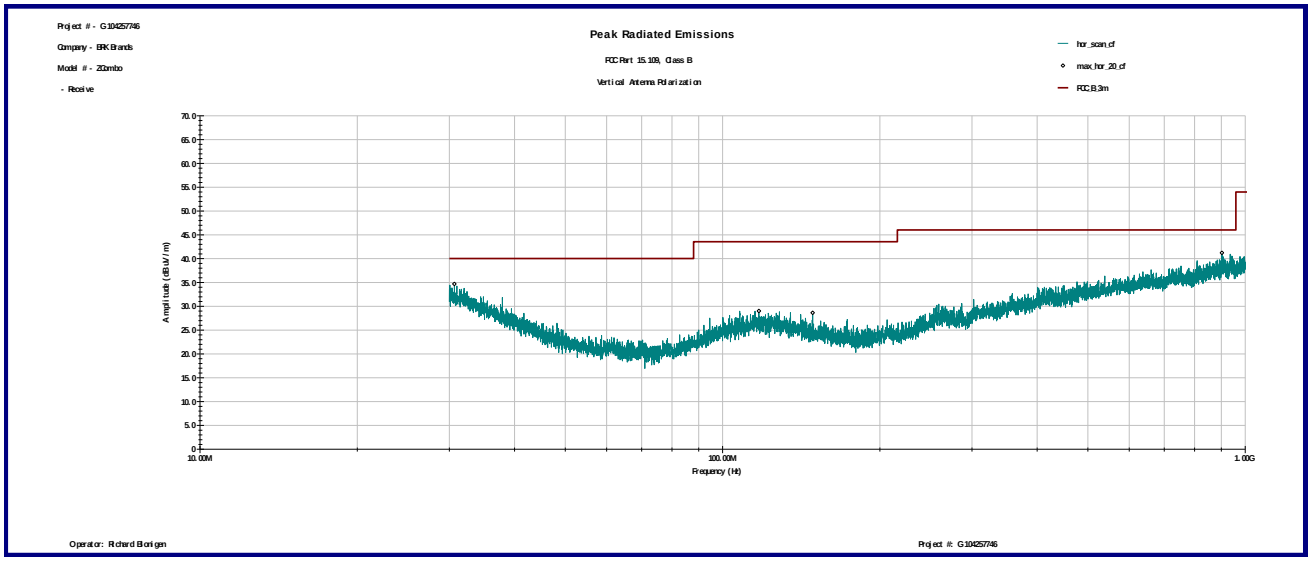
Date:	March 3, 2020	**Result: Pass**
Tested by:	Richard Blonigen	
Standard:	FCC Part 15.109, Class B	
Test Point:	Enclosure	
Operation mode:	See page 5	
Environmental Conditions:	21°C; 43%(RH); 98kPa	
Equipment Verification:	☒	
Note:	None	

Table 3.5.1

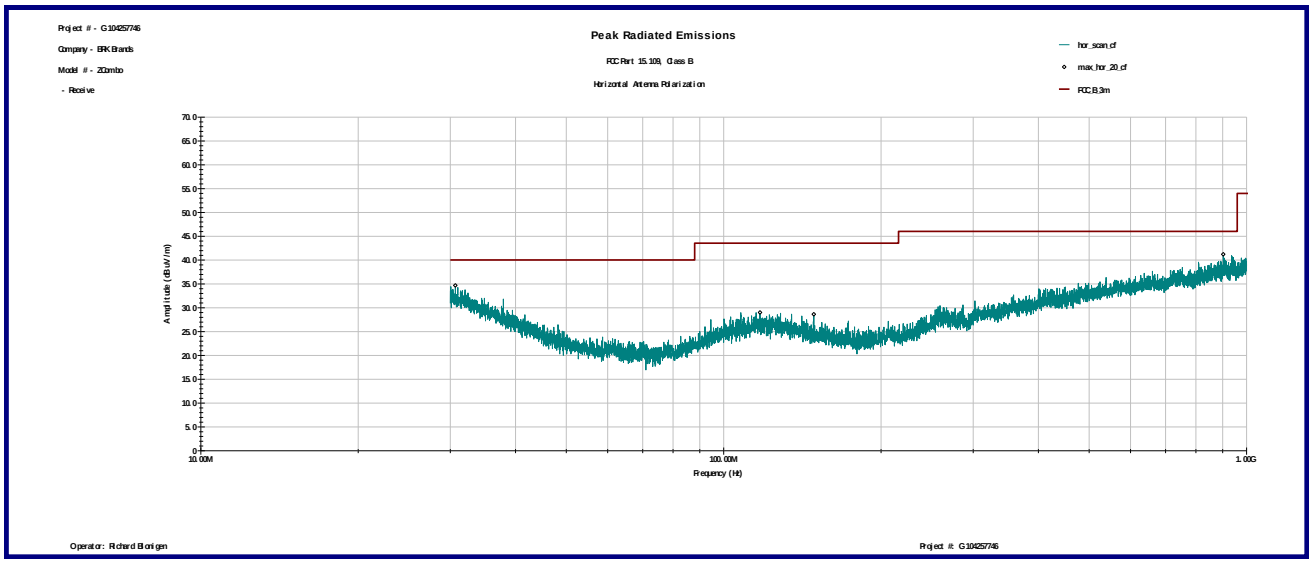
Frequency MHz	Antenna Polarity	Peak Reading dBµV	Total C.F. dB1/m	Pre-Amp. Gain (dB)	Total at 3m dBµV/m	Limit dBµV/m	Margin dB
30.948 MHz	V	11.0	23.8	0.0	34.9	40.0	-5.1
115.95 MHz	V	11.4	18.0	0.0	29.3	43.5	-14.2
314.91 MHz	V	14.3	20.0	0.0	34.3	46.0	-11.7
2.912 GHz	V	47.0	32.7	42.4	37.3	54.0	-16.7
3.85 GHz	V	46.8	36.7	42.8	40.7	54.0	-13.3
4.518 GHz	V	45.7	36.7	43.0	39.4	54.0	-14.6
30.684 MHz	H	10.7	24.0	0.0	34.7	40.0	-5.3
117.36 MHz	H	11.1	17.9	0.0	29.0	43.5	-14.5
148.7 MHz	H	12.2	16.4	0.0	28.6	43.5	-14.9
3.9 GHz	H	45.5	36.7	42.8	39.4	54.0	-14.6
4.548 GHz	H	45.2	36.7	43.0	38.9	54.0	-15.1

Graph 3.5.1

Vertical antenna polarization

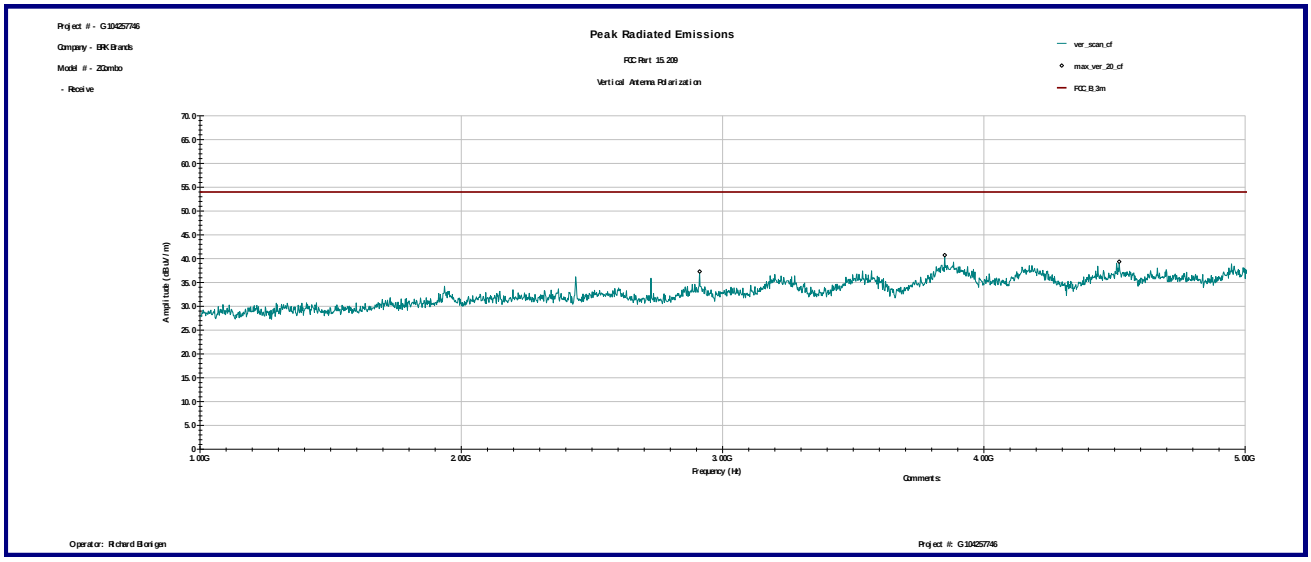


Horizontal antenna polarization

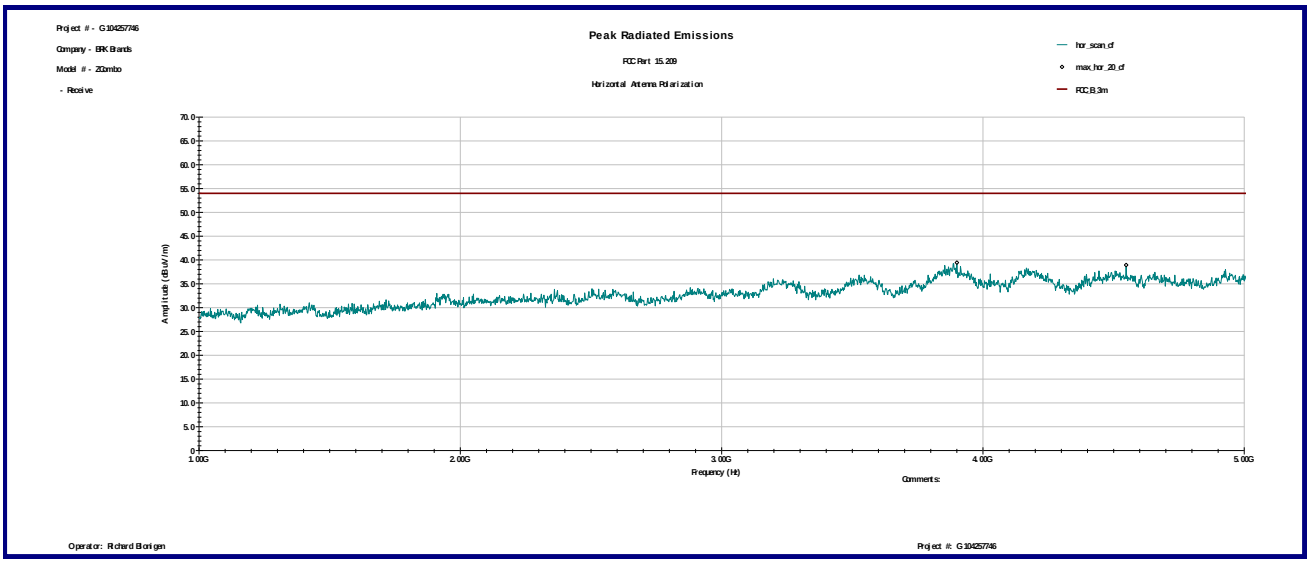


Graph 3.5.2

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	LAST CAL DATE	CAL DUE
Spectrum Analyzer	R & S	FSP 40	100024	12559	02/12/2020	02/12/2021
Spectrum Analyzer	R & S	ESU	100398	25283	07/17/2019	07/17/2020
Bicono-Log Antenna	Teseq	CBL6112D	32859	25289	05/23/2019	05/23/2020
Horn Antenna	EMCO	3115	9507-4513	9936	08/13/2019	08/13/2020
Pre-Amplifier	MITEQ	LNA-40-00101800-35-15P	2108525	172474	05/09/2019	05/09/2020
Hi-pass Filter	Reactel	7HS-1G-S12	02-1		VBU	VBU
System	Quantum Change	TILE! Instrument Control	Ver. 3.4.K.29	15259	VBU	VBU

5.0 Revision History

REVISION LEVEL	DATE	REPORT NUMBER	PREPARED	REVIEWED	NOTES
0	3-4-2020	104257746MIN-001	RB	US	Original Issue
1	3-13-2020	104257746MIN-001	RB	US	Added ZCOMBOA equipment designation and note declaring that it is identical to ZCOMBO
2	05-18-2020	104257746MIN-001	SK	US	Added two additional testing axis (Y and Z)
3	06-28-2021	104257746MIN-001	SK	US	Added additional model SMCO400