

TEST REPORT

Report Number: 100413755MIN-001

Project Number: G100413755

Testing performed on the
Keyfob

FCC ID: B4Z-931-KEYFOB

Industry Canada ID: 1175C-931KEYFOB

to

47 CFR Part 15. 231:2009

RSS- 210, Issue 8, 2010

FCC Part 15.109, Class B/RSS-Gen, Issue 3, 2010/ICES-003, Issue 4:2004

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1.0 GENERAL DESCRIPTION

Model:	Keyfob
Type of EUT:	Transmitter
FCC ID:	B4Z-931-KEYFOB
Industry Canada ID:	1175C-931KEYFOB
Related Submittal(s) Grants:	None
Company:	UTC Fire & Security Americas Corporation Inc.
Customer:	Mr. Rick Connor
Address:	1275 Red Fox Road Arden Hills, MN 55112, USA
Phone:	(651) 779-4824
Fax:	(651) 779-4884
e-mail:	Rick.Conner@ge.com
Test Standards:	☒ 47 CFR, Part 15:2009, §15.231 ☒ RSS-210, Issue 8, 20010 ☒ RSS-Gen, Issue 3, 2010 ☒ 47 CFR, Part 15:2009, §15.107 and §15.109, Class B ☒ ICES-003, Issue 4:2004 ☐ Other
Type of radio:	☒ Stand -alone ☐ Module ☐ Hybrid
Date Sample Submitted:	May 5, 2011
Test Work Started:	May 10, 2011
Test Work Completed:	May 24, 2011
Test Sample Conditions:	☐ Damaged ☐ Poor (Usable) ☒ Good



1.1 Product Description; Test Facility

Product Description:	Transmitter
Operating Frequency	319.5 MHz
Modulation:	FSK
Emission Designator:	K1D
Antenna(s) Info:	Integral Antenna
Antenna Installation:	☐ User ☐ Professional ☒ Factory
Transmitter power configuration:	☒ Internal battery ☐ External power source ☐ 120VAC ☐ 230VAC ☐ 400VAC ☒ 4.5 VDC ☐ Other: Amp. ☐ 50Hz ☐ 60Hz
Special Test Arrangement:	As a hand-held device the EUT was rotated through three orthogonal axes to determine and tested with the maximum emissions
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 modulated transmissions
- ☒ - Continuous Standby Mode
- ☐ -

Operating modes of the EUT:

No.	Description

Cables:

No.	Type	Length	Designation	Note
	N/A			

Support equipment/Services:

No.	Item	Description
	N/A	

General notes: None

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).

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

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

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

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

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

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

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

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
15.231(a) / RSS-210 A1.1.1(a)	Transmitter deactivation time	Pass
15.231(b) / RSS-210 A1.1.2	Transmitter field strength of emissions	Pass
15.231(c) / RSS-210 A1.1.3	Bandwidth of the emission	Pass
15.207/RSS-Gen 7.2.2	Transmitter Power Line conducted emissions	N/A
15.109/ICES-003/ RSS-Gen 4.10	Receiver/digital device radiated emissions	Pass
15.107/ ICES-003	Digital device conducted emissions	N/A

3.0 TEST CONDITIONS AND RESULTS

3.1 Transmitter deactivation time

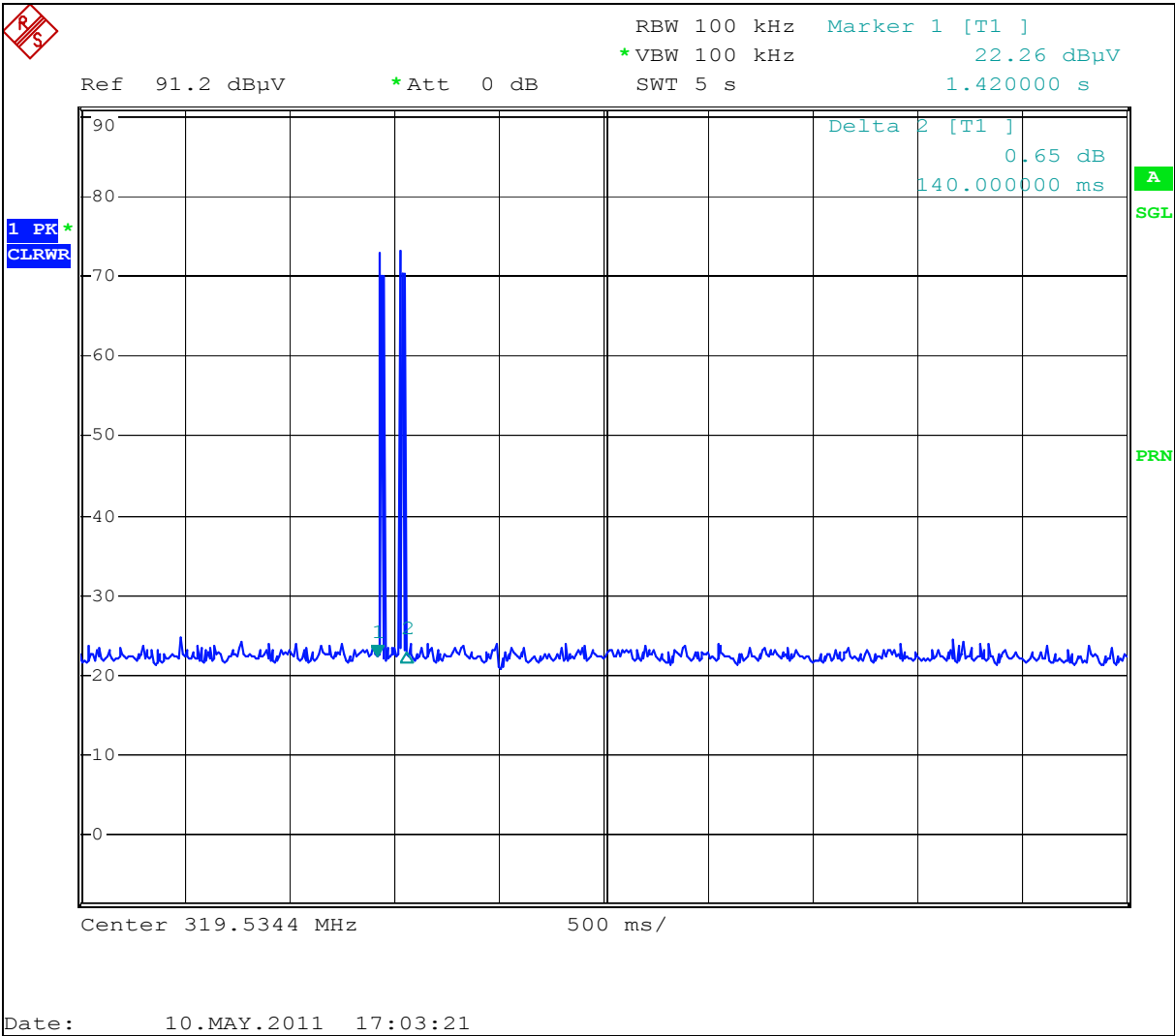
Maximum allowed deactivation time: 5 sec

Measured deactivation time: 1.4 sec

Test result: Pass

Notes: None

Graph 3.1.1





3.2 Transmitter field strength of emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test distance: ☐ 10 meters ☒ 3 meters

Frequency range of measurements: 30MHz-7000MHz

Test result: **Pass**

Max. Emissions margin at fundamental: 8.0 dB below the limits

Max. margin of harmonics and spurious emissions: 12.0 dB below the limits

Notes: None

Date:	May 10-11, 2011	Result: Pass
Standard:	FCC 15.231(b) / RSS-210 A1.1.2	
Tested by:	Simon Khazon	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	Fundamental Frequency	

Table 3.2.1

Frequency MHz	Antenna		Ant. CF dB1/m	Cable loss dB	Pre-amp Gain (dB)	Reading dΒμV	Total @ 3m dΒμV/m	Average C.F. dB	Limit dΒμV/m	Margin dB	Comments
	Polarity	Hts(cm)									
					Peak Readings						
319.57	V	160	14.5	2.0	0.0	63.8	80.3	0.0	95.9	-15.5	
319.53	H	100	14.5	2.0	0.0	65.6	82.1	0.0	95.9	-13.7	
					Average value						
319.57	V	160	14.5	2.0	0.0	63.8	80.3	14.3	75.9	-9.8	
319.53	H	100	14.5	2.0	0.0	65.6	82.1	14.3	75.9	-8.0	

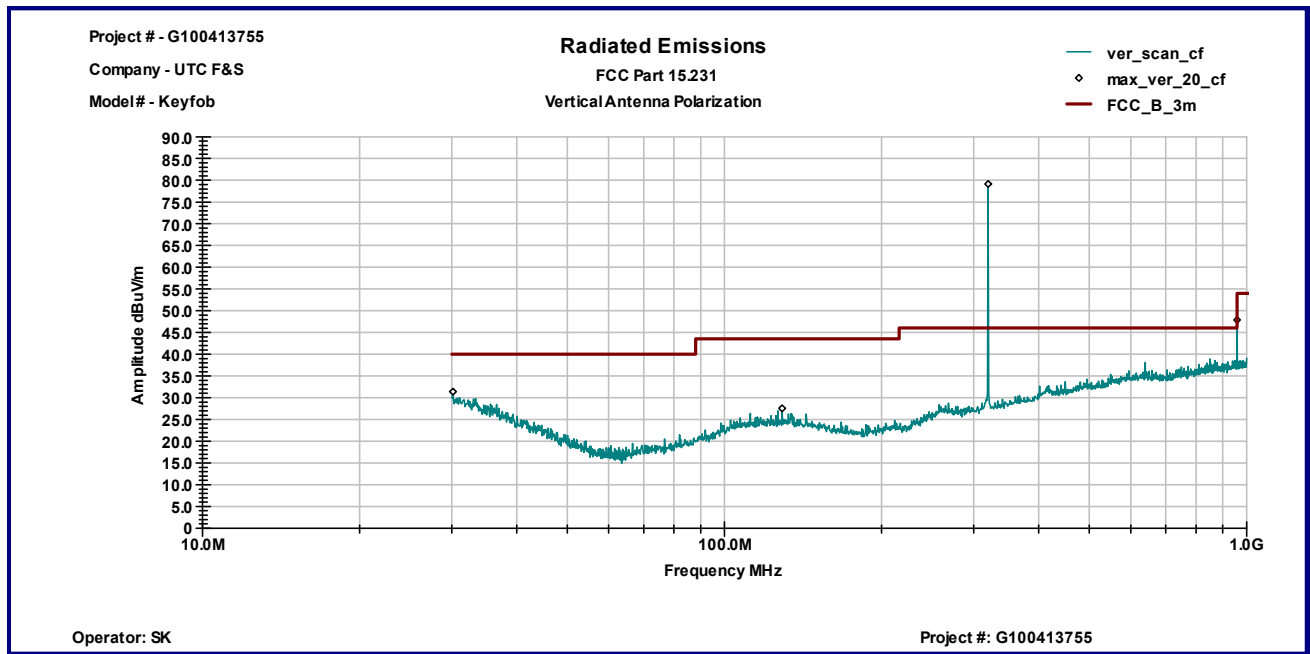
Date:	May 10-11, 2011	Result: Pass
Standard:	FCC 15.231(b) / RSS-210 A1.1.2	
Tested by:	Simon Khazon	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	Spurious Emissions	

Table 3.2.2

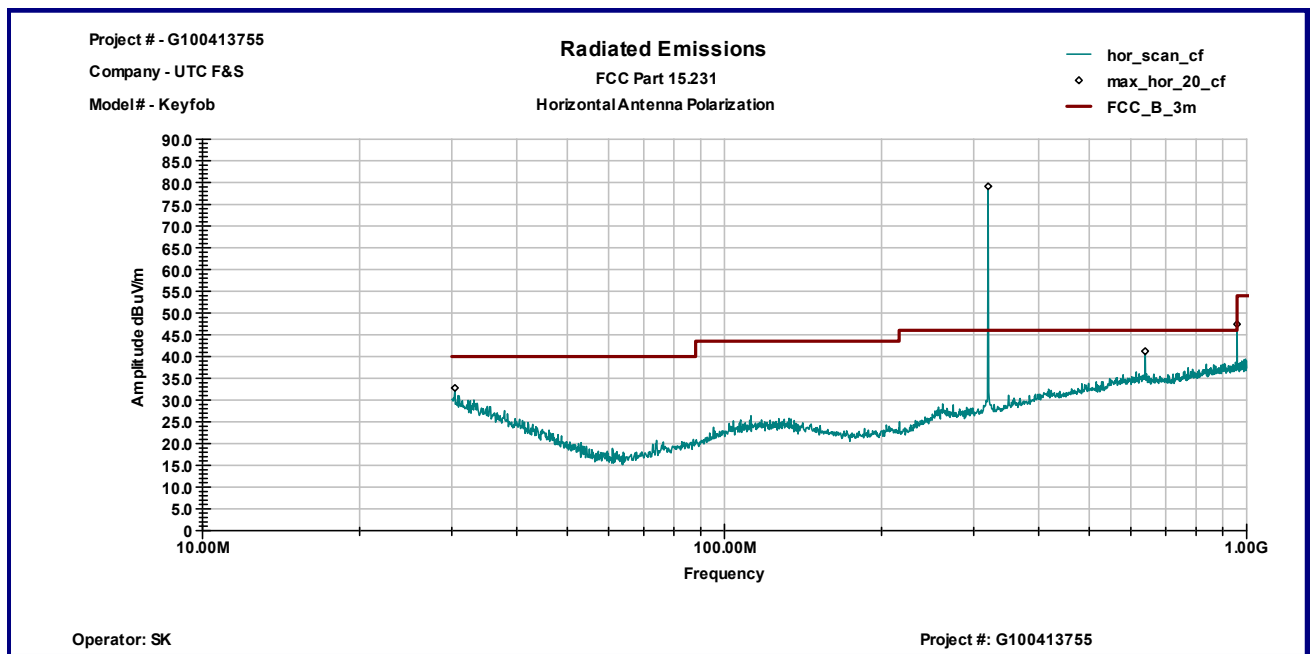
Frequency MHz	Antenna		Ant. CF dB1/m	Cable loss dB	Pre-amp Gain (dB)	Reading dBμV	Total @ 3m dBμV/m	Average C.F. dB	Limit dBμV/m	Margin dB	Comments
	Polarity	Hts(cm)									
					Peak Readings						
958.61	V	130	22.3	3.7	0.0	23.7	49.7	0.0	75.9	-26.2	
958.61	H	100	22.3	3.7	0.0	20.3	46.3	0.0	75.9	-29.6	
1597.72	V	168	26.4	5.2	38.8	58.9	51.7	0.0	75.9	-24.2	
1917.26	V	117	28.3	5.9	38.4	59.2	55.0	0.0	75.9	-20.9	
1917.24	H	188	28.3	5.9	38.4	62.4	58.2	0.0	75.9	-17.7	
3994.24	H	143	32.8	4.5	37.1	52.6	52.8	0.0	75.9	-23.1	
					Average value						
958.61	V	130	22.3	3.7	0.0	23.7	49.7	14.3	55.9	-20.5	
958.61	H	100	22.3	3.7	0.0	20.3	46.3	14.3	55.9	-23.9	
1597.72	V	168	26.4	5.2	38.8	58.9	51.7	14.3	55.9	-18.5	
1917.26	V	117	28.3	5.9	38.4	59.2	55.0	14.3	55.9	-15.2	
1917.24	H	188	28.3	5.9	38.4	62.4	58.2	14.3	55.9	-12.0	
3994.24	H	143	32.8	4.5	37.1	52.6	52.8	14.3	55.9	-17.4	

Graph 3.2.1

Vertical antenna polarization

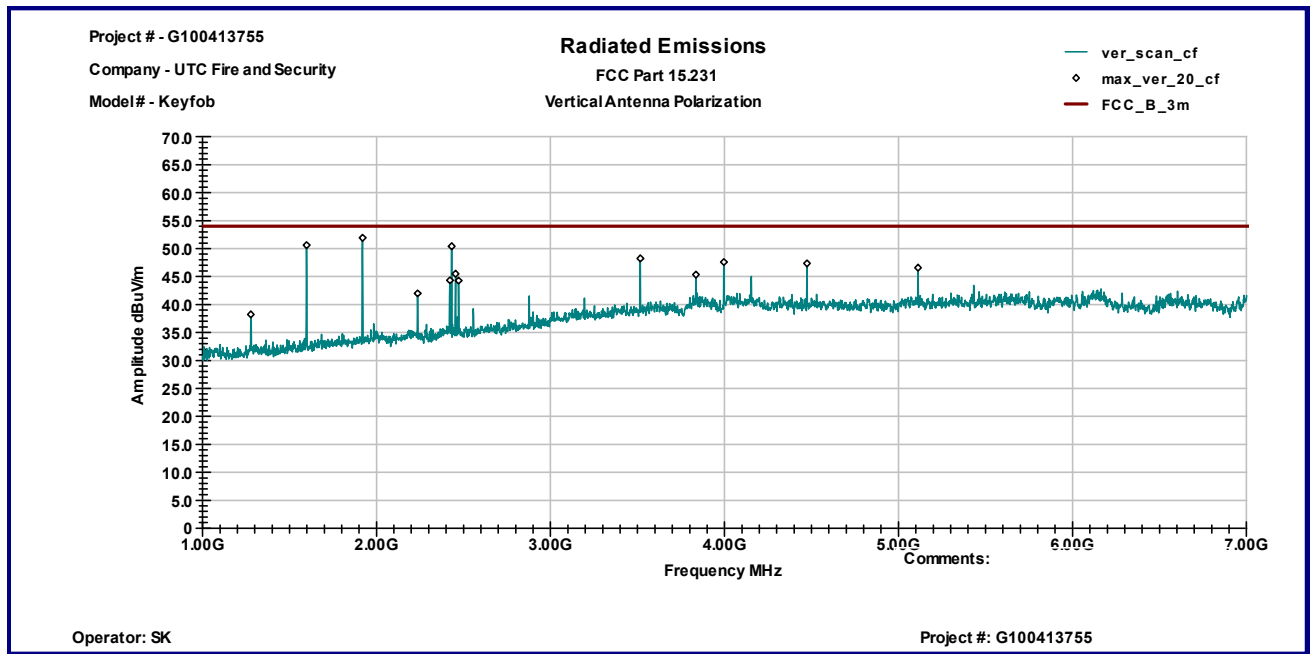


Horizontal antenna polarization

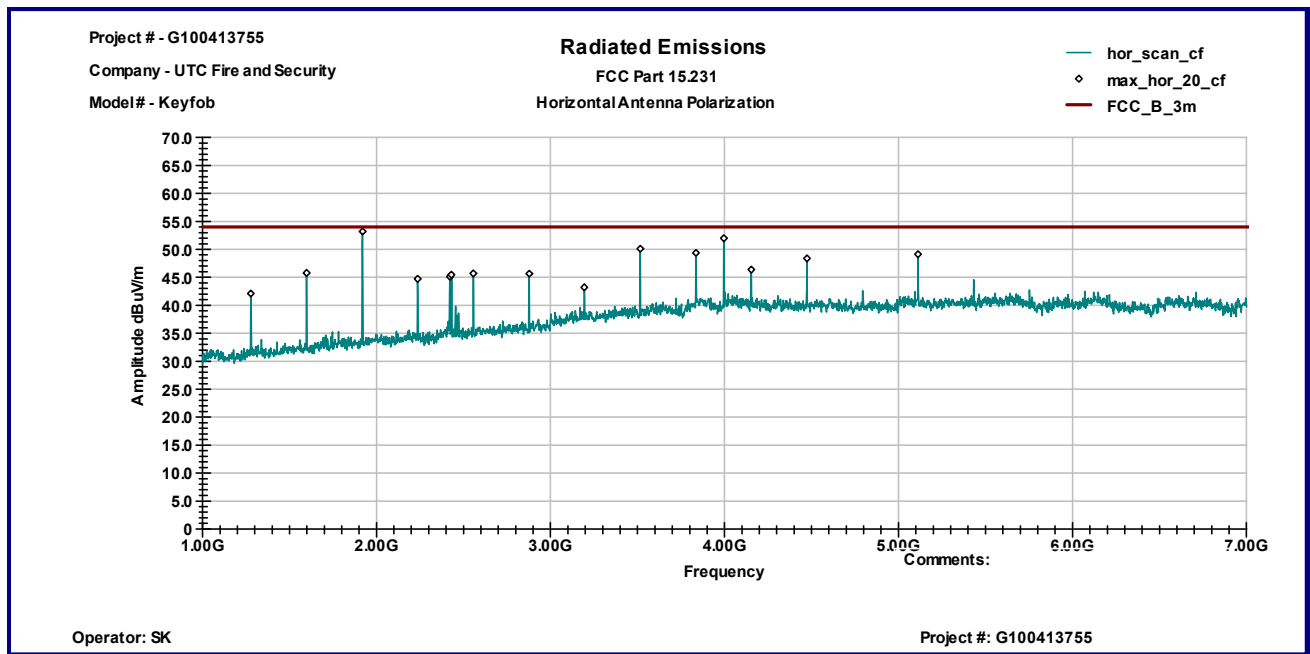


Graph 3.2.2

Vertical antenna polarization



Horizontal antenna polarization



3.2.1 Average correction factor calculation

An Average correction factor is calculated by averaging one complete pulse train.

Cycle is 102.4 ms (See Graph 3.2.3); therefore the Averaging calculated over 100 ms

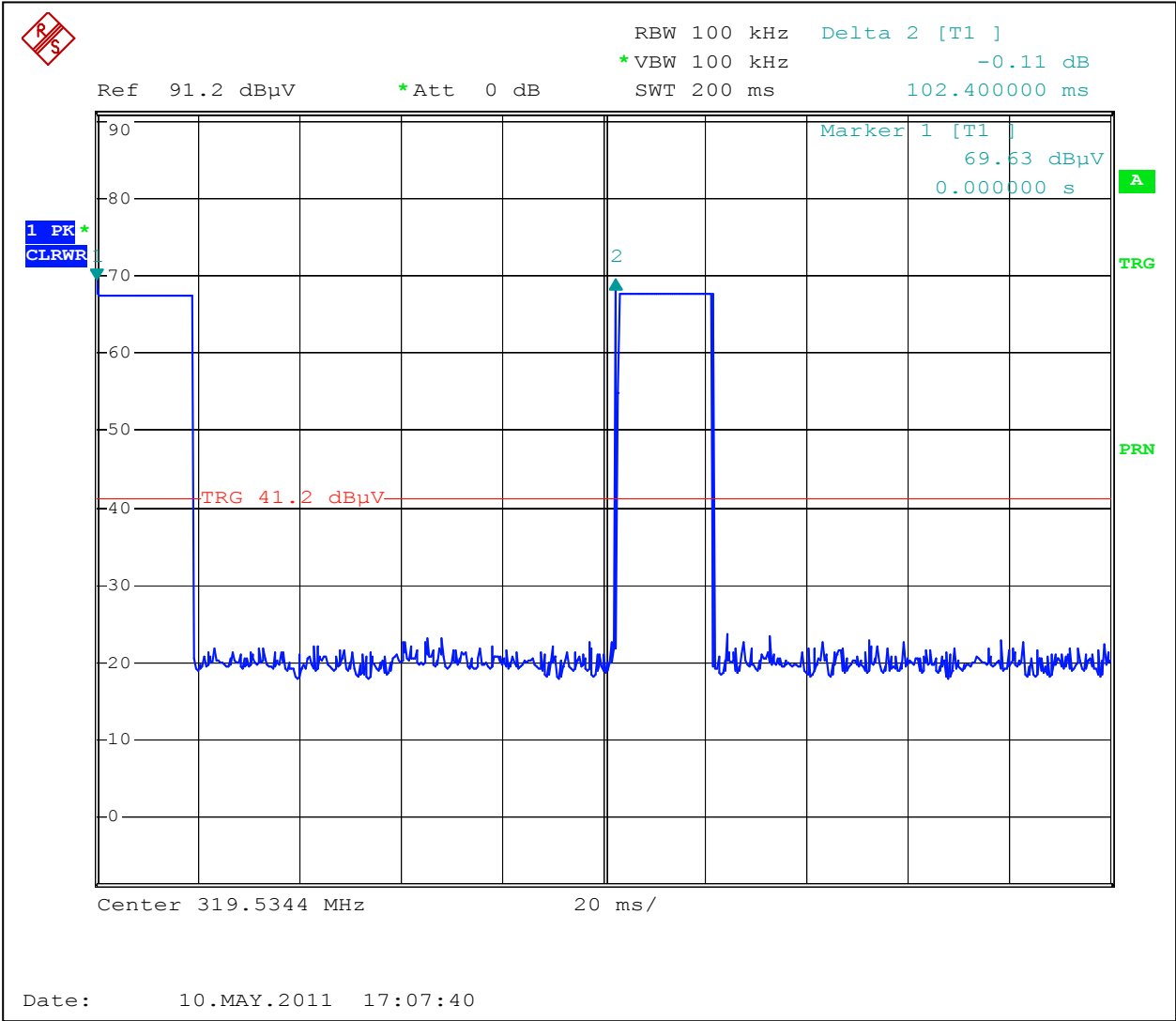
Time of the Pulse Trane is 19.2 ms (See Graph 3.2.4

Average Correction Factor = $20\text{Log}(19.2\text{ms}/100\text{ms}) = -14.3\text{dB}$

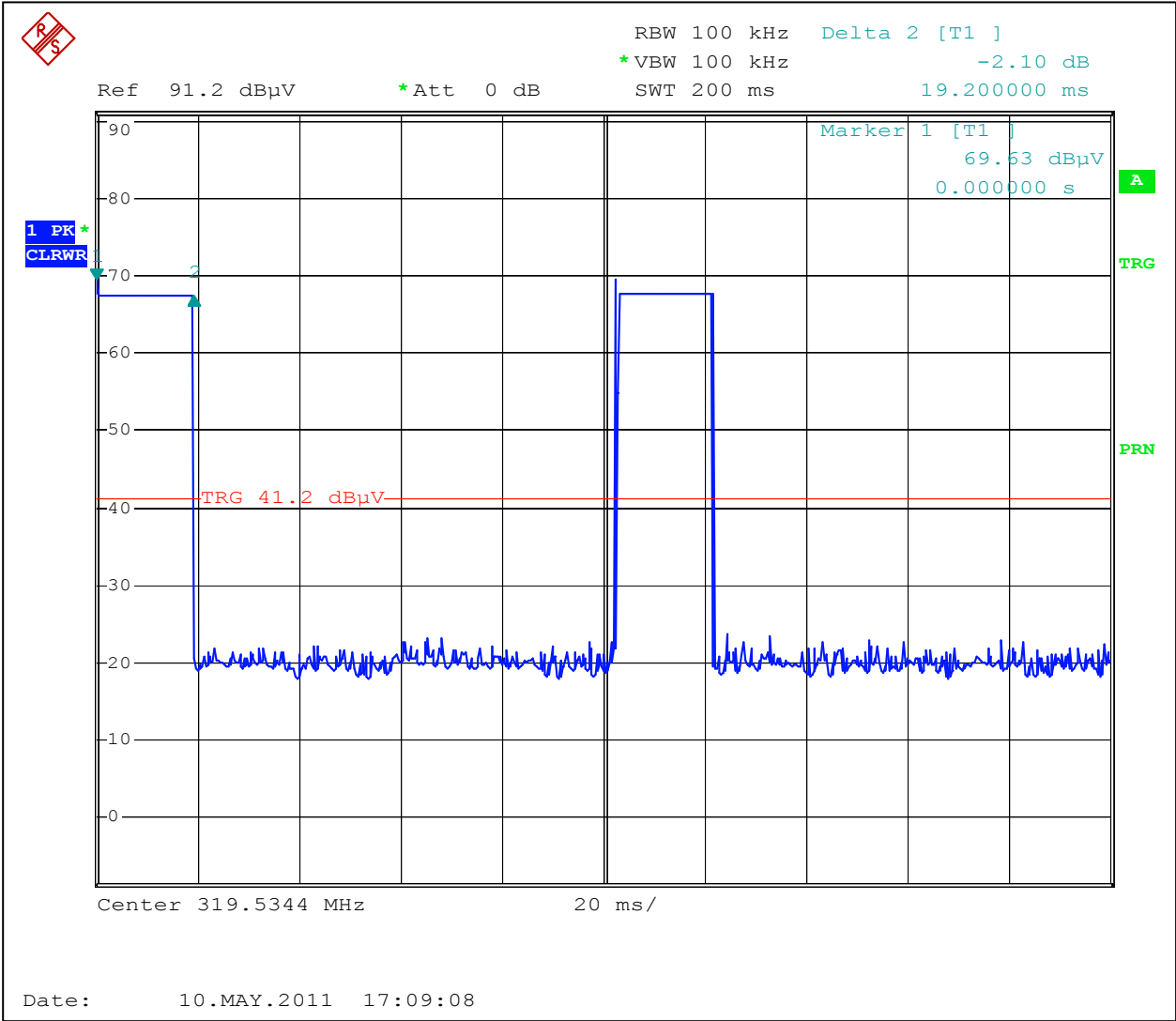
.



Graph 3.2.3



Graph 3.2.4



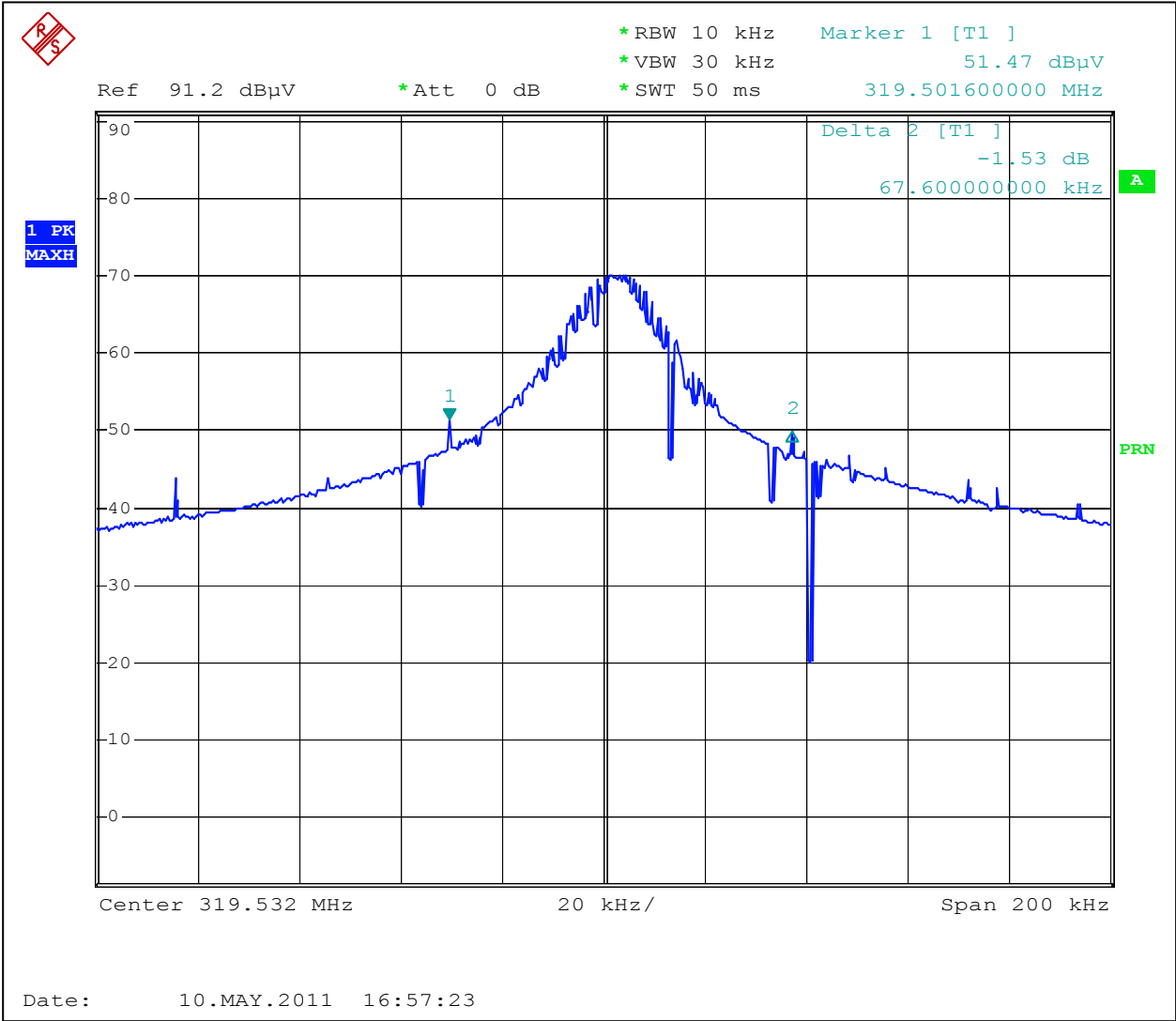
3.3 Bandwidth of Emissions

Center Frequency of operation MHz	Maximum allowed bandwidth kHz	Measured 20dB bandwidth kHz	Measured 99% bandwidth kHz	Result
319.5	798.8	67.6	94.0	Pass
Maximum allowed bandwidth:	☒ 0.25% of the centre operating frequency ☐ 0.5% of the centre operating frequency			
RBW:	☒ 10kHz	☐ 100kHz	☐ other	kHz
VBW:	☒ 30kHz	☐ 300kHz	☐ other	kHz

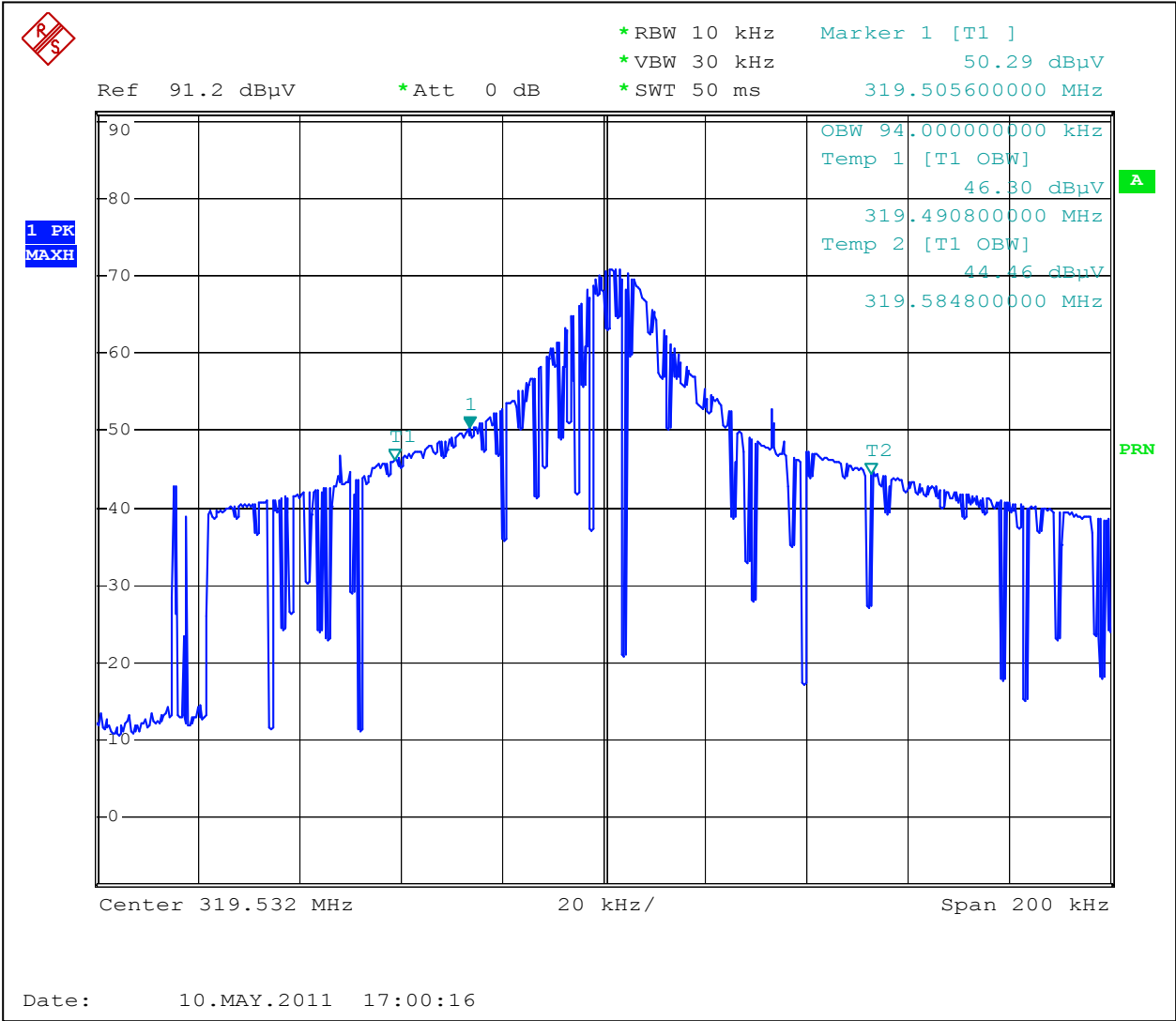
Graphs 3-3-1 and 3-3-2 are show bandwidth of emissions

Notes:

Graph 3.3.1



Graph 3.3.2





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-2000MHz

Max. Emissions margin: 7.7dB below the limits

Notes: The Radiated Emissions test was performed in the Anechoic chamber at 3m measurement distance, no emissions above the ambient noise were detected (see Table 3.5.1 and Graphs 3.5.1 and 3.5.2). Also no emissions above the ambient noise were detected above 1GHz.

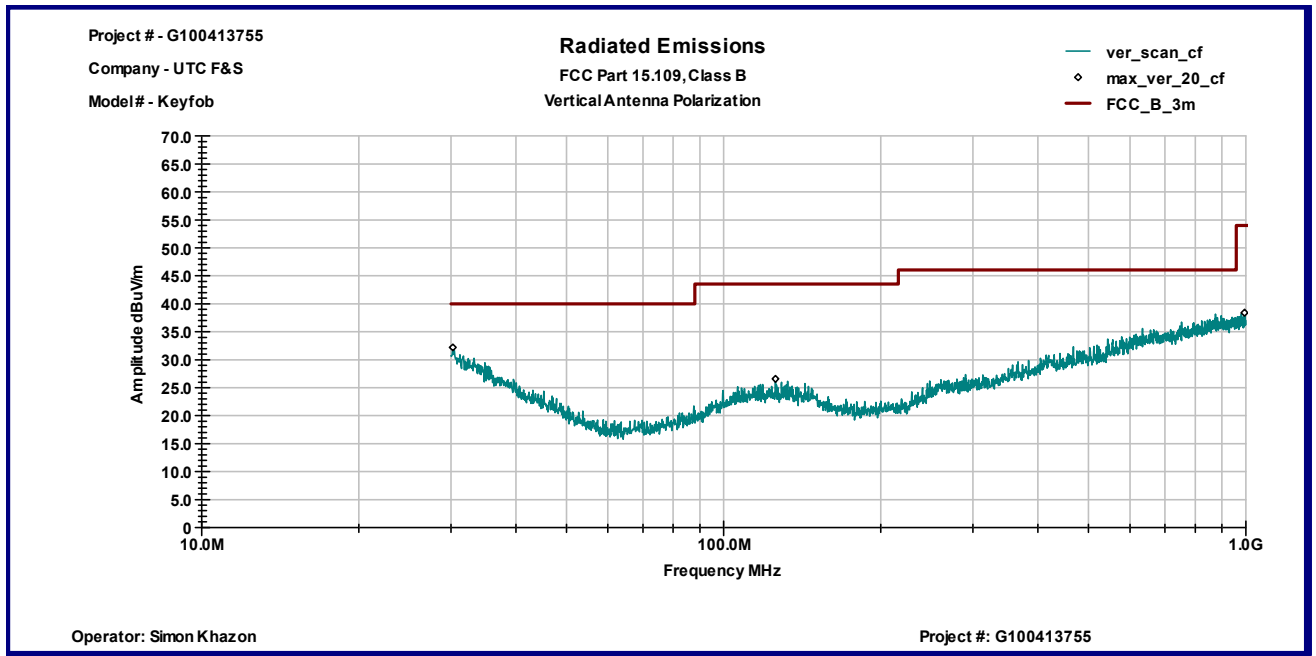
Date:	May 23, 2011	Result: Pass
Standard:	FCC Part 15.109, Class B	
Tested by:	Simon Khazon	
Test Point:	Enclosure	
Operation mode:	See page 5	
Note:	Standby	

Table 3.5.1

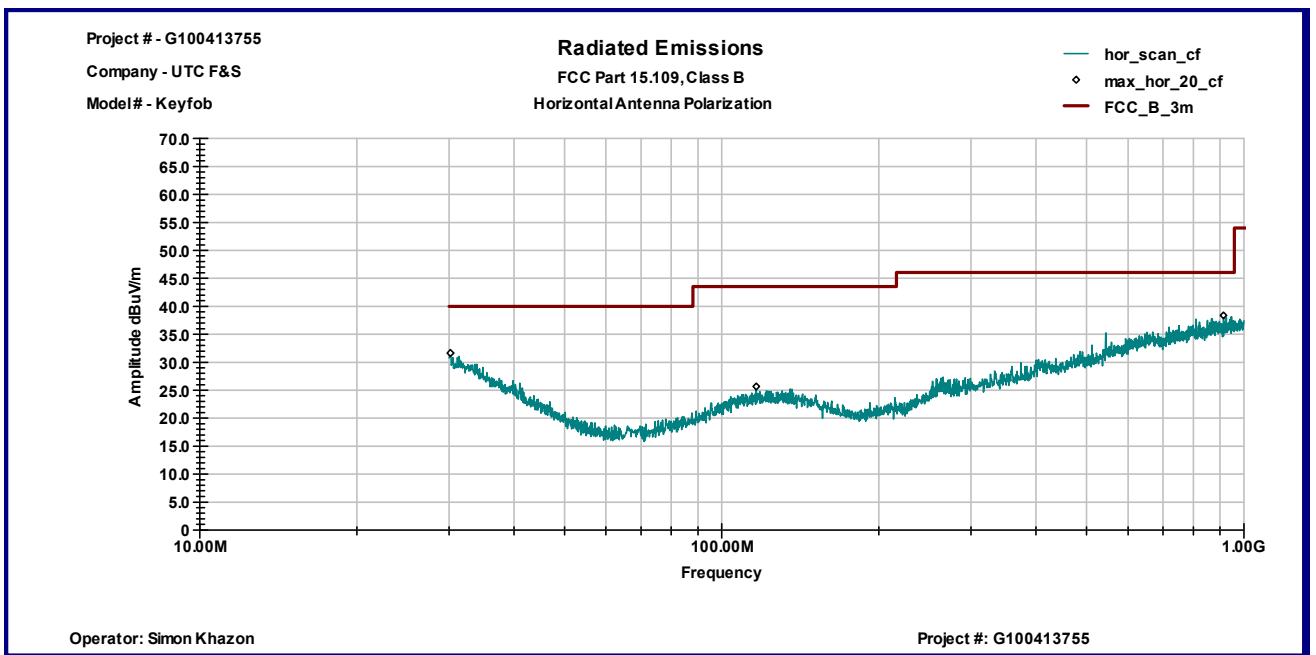
Frequency	Ant. Polarity	Peak Reading dBμV	Ant.Factor dB1/m	Total at 3m dBμV/m	QP Limit dBμV/m	Margin dB
30.277 MHz	V	12.0	20.2	32.2	40.0	-7.8
125.67 MHz	V	12.6	14.0	26.6	43.5	-17.0
994.34 MHz	V	12.1	26.3	38.4	54.0	-15.6
30.208 MHz	H	11.4	20.2	31.6	40.0	-8.4
116.42 MHz	H	11.7	13.9	25.7	43.5	-17.9
914.41 MHz	H	12.9	25.5	38.4	46.0	-7.7

Graph 3.5.1

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	FSP 40	100024	12559	12/07/2011	☒
Spectrum Analyzer	R & S	ESCI	100358	12909	05/12/2012	☒
Bicono-Log Antenna	Schaffner-Chase	CBL 6112 B	2468	9734	10/18/2011	☒
Horn Antenna	EMCO	3115	9507-4513	9936	04/29/2012	☒
Pre-Amplifier	MITEQ	AMF-5D-00501800-28-13P	1122951	13475	10/06/2011	☒
System	TILE! Instrument Control		Ver. 3.4.K.29	15259	VBU	☒



Test Setup Photos

