



**FCC 47 CFR PART 15 SUBPART C  
INDUSTRY CANADA RSS-210 ISSUE 8**

**CERTIFICATION TEST REPORT**

**FOR**

**Sonicaid Freedom SF1-TOCO**

**MODEL NUMBER: SF1-TOCO**

**FCC ID: 2ABOQ-SF1TOCO  
IC: 11744A- SF1TOCO**

**REPORT NUMBER: 7554936C**

**ISSUE DATE: April 17, 2014**

*Prepared for*  
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Revision History

Rev.	Issue Date	Revisions	Revised By
--	April 17, 2014	Initial Issue	BM

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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** Huntleigh Diagnostics  
35 Portmanmoor Road  
Cardiff  
CF24 5HN, United Kingdom

**EUT DESCRIPTION:** Wireless Fetal Monitoring Solution (TOCO Transducer)

**MODEL:** SF1-TOCO

**SERIAL NUMBER:** Prototype

**DATE TESTED:** October 2013 to February 2014

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

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Michael Ferrer  
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UL Verification Services Inc.

Tested By:



Bartlomiej Mucha  
EMC ENGINEER  
UL Verification Services Inc.

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 333 Pfingsten Road, Northbrook, IL, USA.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 100414-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/1004140.htm>.

Unless specified otherwise in the individual Methods, the tests shall be conducted under the following ambient conditions. Confirmation of these conditions shall be verified at the time the test is conducted.

Ambient Temperature, °C	22.5 ± 2.5	Relative Humidity, %	45 ± 15	Barometric Pressure, mBar	950 150
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## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamplifier Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

### 4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test	Range	Equipment	Uncertainty k=2
Radiated Emissions	30-200MHz	Bicon 10m Horz	4.27dB
Radiated Emissions	30-200MHz	Bicon 10m Vert	4.28dB
Radiated Emissions	200-1000MHz	LogP 10m Horz	3.33dB
Radiated Emissions	200-1000MHz	LogP 10m Vert	3.39dB
Radiated Emissions	1-6GHz	Horn	5.02dB
Radiated Emissions	6-18GHz	Horn	5.34dB
Radiated Emissions	18-26GHz	Horn	6.60dB
Radiated Emissions	26-40GHz	Horn	7.02dB
Conducted Emissions	150k-30MHz	LISN	2.29dB

Uncertainty figures are valid to a confidence level of 95%.

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is an Wireless Fetal Monitoring Solution. It consists of multiple parts of which each is covered by separate test report. This report applies to the TOCO unit containing a 2.4GHz Short Range Communication Transceiver.

### 5.2. MAXIMUM OUTPUT E-FIELD STRENGTH

The transmitter has a maximum output peak E-field as follows:

Frequency Range (MHz)	Mode	Output PK E-field Strength (dBuV/m)
2415	TX	63.60

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an trace antenna

### 5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was T880T\_C4\_u1 – test v8

Switchable transmission frequencies between 2.415GHz and 2.446GHz

### 5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power.

## 5.6. DESCRIPTION OF TEST SETUP

### EUT and SUPPORT EQUIPMENT

Support Equipment List			
Description	Manufacturer	Model	Serial Number
EUT - TOCO Transducer	Huntleigh	SF1-TOCO	Prototype
AE - Receiver Base	Huntleigh	SF1-SL	Prototype

EUT – Equipment Under Test

AE – Auxiliary Equipment

### I/O CABLES

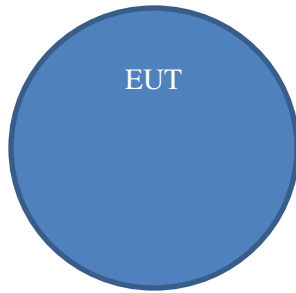
I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
0	Enclosure	1	-	-	-	none
1	AC Input	1	AC	2 wire AC	1.5	none

### TEST SETUP

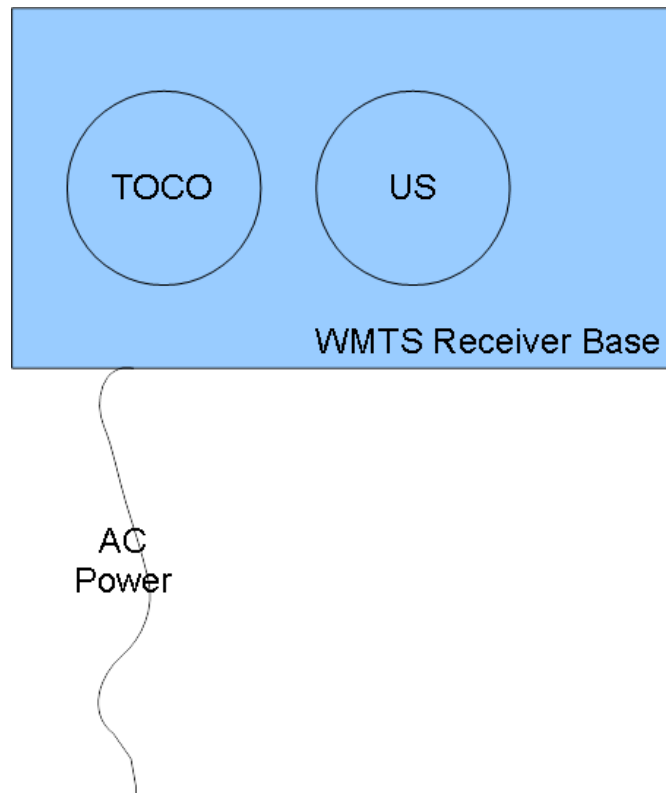
EUT is tested as stand-alone battery operated and while charging on the base. For all applicable stand alone testing (fundamental measurements and harmonic measurements) EUT was tested in three planes, X, Y, and Z.



**SETUP DIAGRAM FOR Stand-alone TESTS**



**SETUP DIAGRAM FOR on the Base TESTS**



## 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

### Radiated Emissions – 10-Meter Chamber

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due Date
EMI Test Receiver	Rohde & Schwarz	ESU	EMC4323	20131227	20141231
Bicon Antenna	Chase	VBA6106A	EMC4078	20130213	20140228
Log-P Antenna	Chase	UPA6109	EMC4258	20131015	20141030
Log-P Antenna	Chase	UPA6109	EMC4313	20131003	20141003
Spectrum Analyzer	Rhode & Schwarz	FSEK	EMC4182	20131226	20141231
Spectrum Analyzer	Agilent	N9030A (PXA)	EMC4360	20131221	20141221

### Line Conducted Emissions

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due Date
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC4328	20121228	20131231
Transient Limiter	Electro-Metrics	EM7600-2	EMC4224	N/A	N/A
HighPass Filter	Solar Electronics	2803-150	885551	N/A	N/A
Attenuator	HP	8494B	2831A00838	N/A	N/A
LISN - L1	Solar	8602-50-TS-50-N	EMC4052	20130115	20140115
LISN - L2	Solar	8602-50-TS-50-N	EMC4064	20130115	20140115

## 7. TEST RESULTS

### 7.1.1. 99% BANDWIDTH and 20dB Bandwidth

#### LIMITS

None; for reporting purposes only.

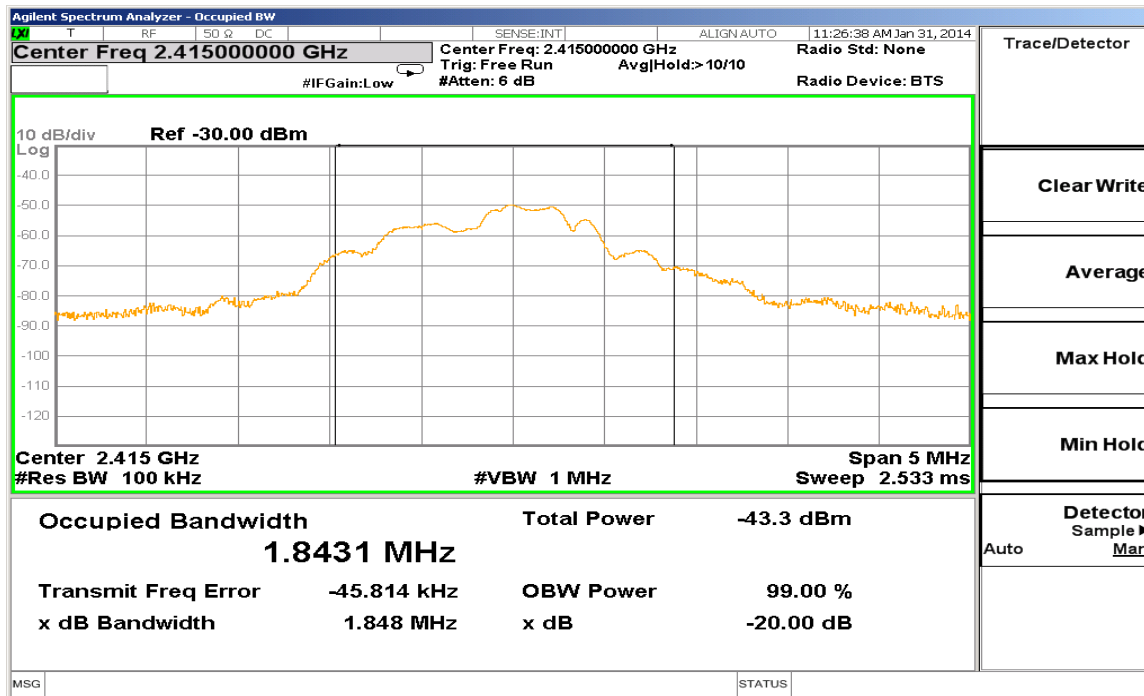
#### TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to minimum of 100kHz. The VBW is set to 3 times or more of the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function and 20dB bandwidth function is utilized.

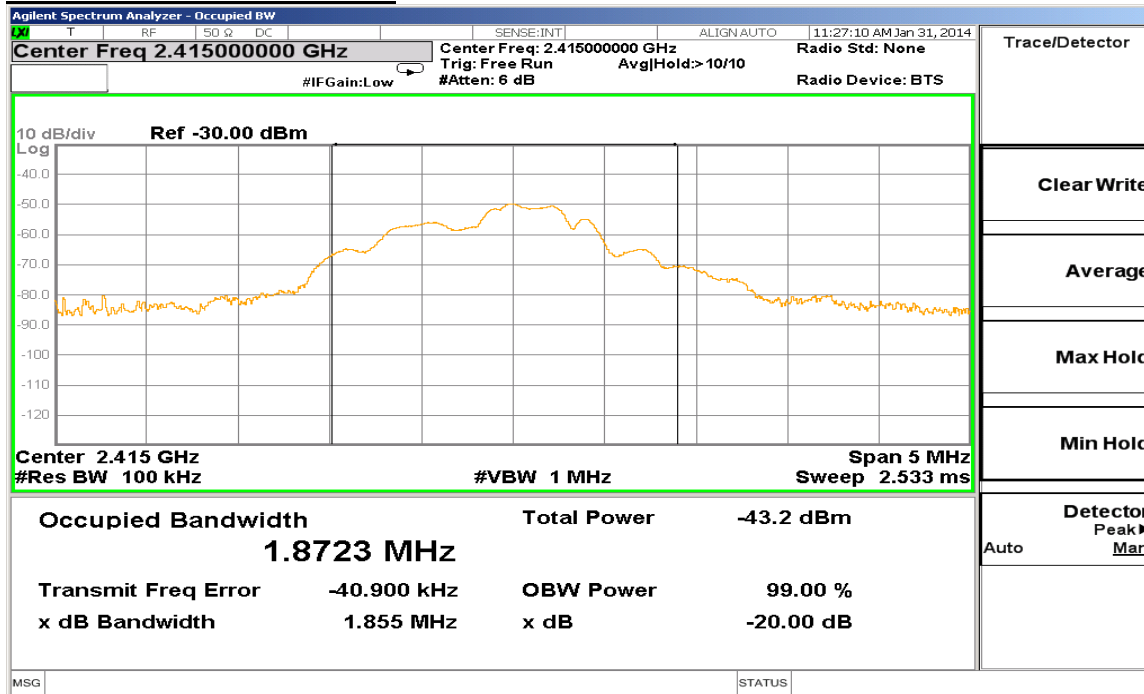
#### RESULTS

Frequency (MHz)	99% Bandwidth (MHz)	20dB Bandwidth (MHz)
2415	1.8431	1.855
2446	1.9697	1.873

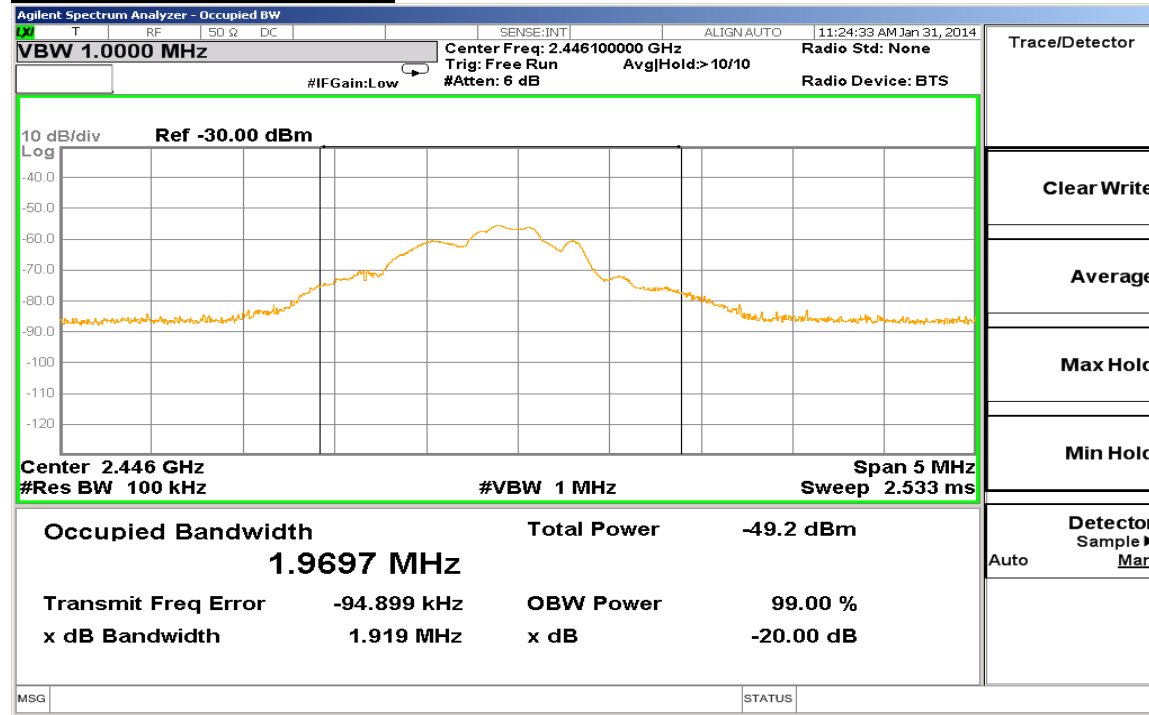
### 99% BANDWIDTH 2415MHz



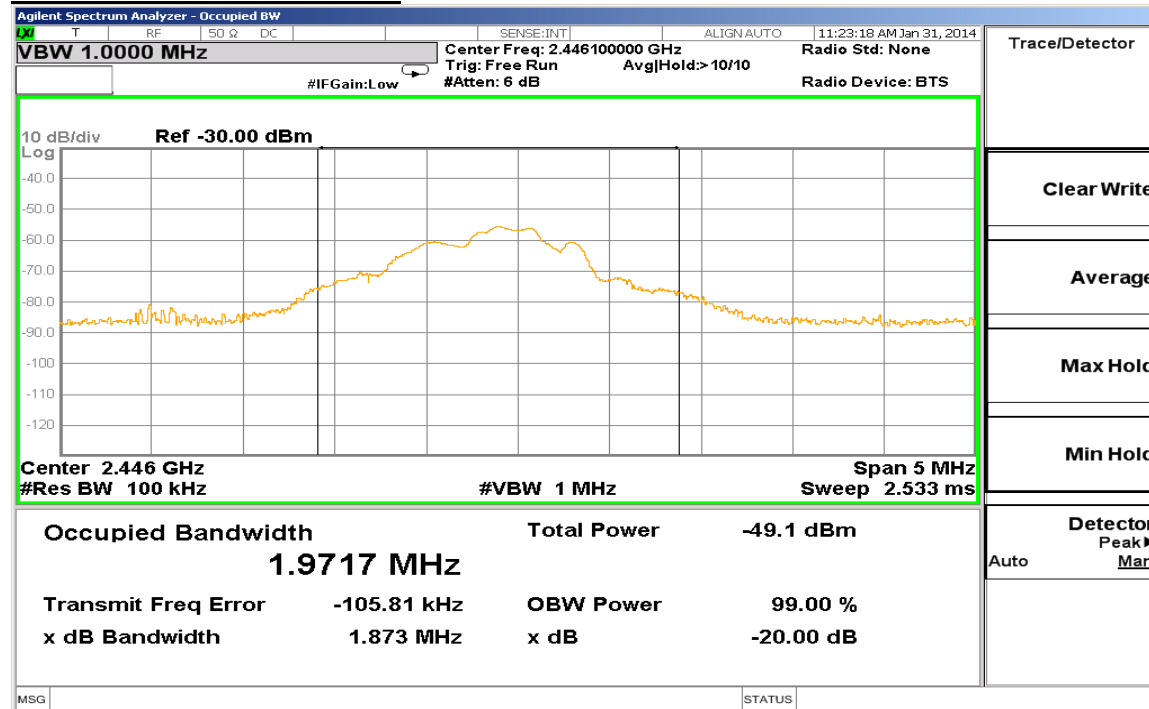
### 20dB BANDWIDTH 2415MHz



### 99% BANDWIDTH 2446MHz



### 20dB BANDWIDTH 2446MHz



## 7.1.2. Duty Cycle

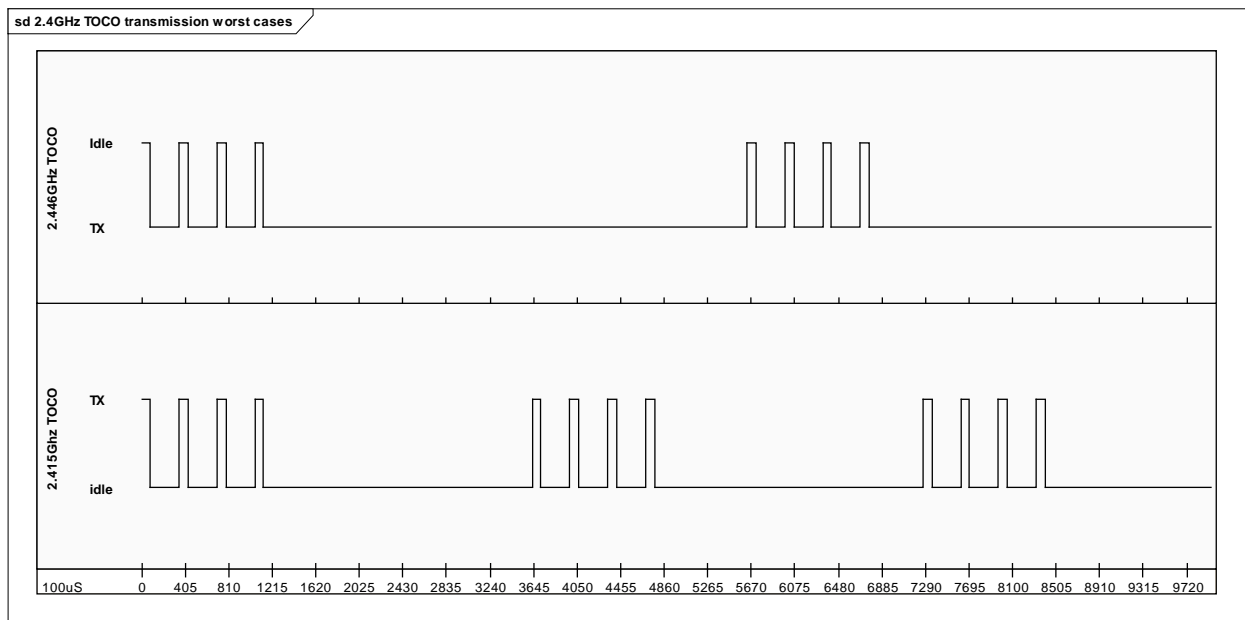
### LIMITS

None; for reporting purposes only.

### TEST PROCEDURE

Duty cycle normally should be measured and reported. In this case the duty cycle was calculated based on information provided from the manufacturer since it was not possible to capture the worst case by doing measurements. Attempts to capture the duty cycle would show results from both the TOCO device and the WMTS Receiver base device and it would not represent the true number.

### RESULTS



1. TOCO transmit at 2.415GHz. 4 pulses of about 81uS in a 3.63mS window. See attached file TOCOworstcase. (Error mode, TOCO not receiving ACK message for id request)
  - a. Duty cycle approx. 9%  
 $20 \times \log(\text{OnTime}/\text{Period}) = 20 \times \log((4 \times 0.081)/3.63) = -20.99\text{dB}$
2. TOCO transmit at 2.446GHz. 4 pulses of about 81uS in a 5.63mS window. See attached file TOCOworstcase. (Error mode, TOCO not receiving ACK message for battery level)
  - a. Duty cycle approx. 6%  
 $20 \times \log(\text{OnTime}/\text{Period}) = 20 \times \log((4 \times 0.081)/5.63) = -24.8\text{dB}$

## 7.2. RADIATED EMISSIONS

### TEST PROCEDURE

ANSI C63.4

### LIMIT

IC RSS-210, A2.9  
FCC 15.249

Operation within the bands 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHz, and 24.0–24.25 GHz.

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz .....	50	500
2400–2483.5 MHz .....	50	500
5725–5875 MHz .....	50	500
24.0–24.25 GHz .....	250	2500

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490 .....	2400/F(kHz)	300
0.490–1.705 .....	24000/F(kHz)	30
1.705–30.0 .....	30	30
30–88 .....	100 **	3
88–216 .....	150 **	3
216–960 .....	200 **	3
Above 960 .....	500	3

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

## RESULTS

### 7.2.1. FUNDAMENTAL FREQUENCY RADIATED EMISSION

#### Fundamental Measurements for 2.415GHz, TOCO Alone

Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	BOMS Factor (dB)	Peak Level dBuV/m	Peak Limit dbuV/m	Margin dB	Duty Cycle Factor dB	Average Level dBuV/m	46 CFR 15.249 Limit dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity	Notes
2.415	56.78	PK	21.8	4.51	83.09	104	-20.91	-20.99	62.1	94	-31.9	347	100	H	1
2.4148	46.8	PK	21.8	4.51	73.11	104	-30.89	-20.99	52.12	94	-41.88	119	100	V	1
2.4146	55.69	PK	21.8	4.52	82.01	104	-21.99	-20.99	61.02	94	-32.98	248	100	H	2
2.4151	57.8	PK	21.8	4.51	84.11	104	-19.89	-20.99	63.12	94	-30.88	320	120	V	2
2.4148	55.83	PK	21.8	4.51	82.14	104	-21.86	-20.99	61.15	94	-32.85	279	100	H	3
2.4153	56.9	PK	21.8	4.51	83.21	104	-20.79	-20.99	62.22	94	-31.78	200	121	V	3
Notes: 1 - X-Axis 2 - Y-Axis 3 - Z-Axis PK - Peak detector															

#### Fundamental Measurements for 2.415GHz, TOCO on WMTS Receiver Base

Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	BOMS Factor (dB)	Peak Level dBuV/m	47 CFR 15.249 Peak Limit dbuV/m	Margin dB	Duty Cycle Factor dB	Average Level dBuV/m	CFR 47 15.249 Limit dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
2.4151	56.42	PK	21.8	4.51	82.73	104	-21.27	-20.99	61.74	94	-32.26	215	100	H
2.4147	58.27	PK	21.8	4.52	84.59	104	-19.41	-20.99	63.6	94	-30.4	77	119	V
Notes: PK - Peak detector														



### Fundamental Measurements for 2.446GHz, TOCO Alone

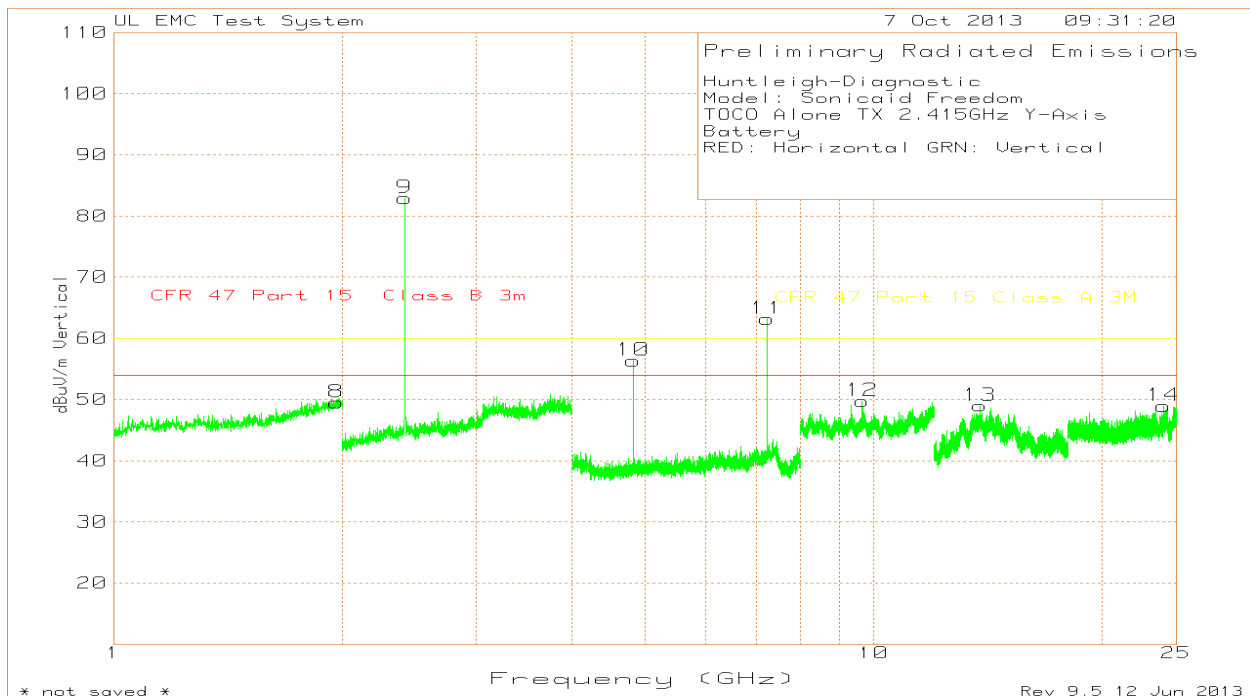
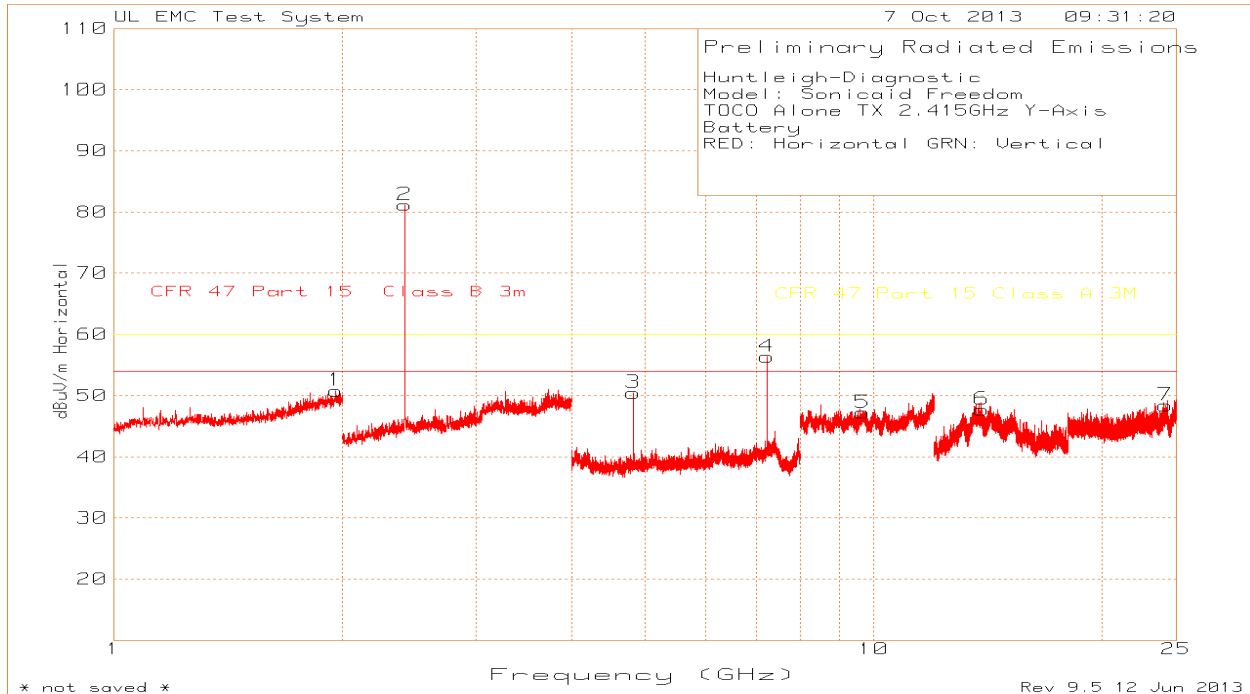
Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	BOMS Factor (dB)	Peak Level dBuV/m	47 CFR 15.249 Peak Limit dbuV/m	Margin dB	Duty Cycle Factor dB	Average Level dBuV/m	CFR 47 15.249 Limit dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity	Notes
2.4456	54.7	PK	21.9	4.52	81.12	104	-22.88	-24.8	56.32	94	-37.68	91	100	H	1
2.4461	44.27	PK	21.9	4.51	70.68	104	-33.32	-24.8	45.88	94	-48.12	217	131	V	1
2.4457	53.38	PK	21.9	4.52	79.8	104	-24.2	-24.8	55	94	-39	360	114	H	2
2.4459	56.09	PK	21.9	4.52	82.51	104	-21.49	-24.8	57.71	94	-36.29	64	120	V	2
2.4459	54.06	PK	21.9	4.52	80.48	104	-23.52	-24.8	55.68	94	-38.32	24	100	H	3
2.4457	55.01	PK	21.9	4.52	81.43	104	-22.57	-24.8	56.63	94	-37.37	329	120	V	3
Notes: 1 - X-Axis 2 - Y-Axis 3 - Z-Axis PK - Peak detector															

### Fundamental Measurements for 2.446GHz, TOCO on WMTS Receiver Base

Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	BOMS Factor (dB)	Peak Level dBuV/m	47 CFR 15.249 Peak Limit dbuV/m	Margin dB	Duty Cycle Factor dB	Average Level dBuV/m	CFR 47 15.249 Limit dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
2.4462	51.25	PK	21.9	4.51	77.66	104	-26.34	-24.8	52.86	94	-41.14	33	100	H
2.4459	52.67	PK	21.9	4.52	79.09	104	-24.91	-24.8	54.29	94	-39.71	86	119	V

## 7.2.2. HARMONICS AND SPURIOUS EMISSIONS ABOVE 1GHz

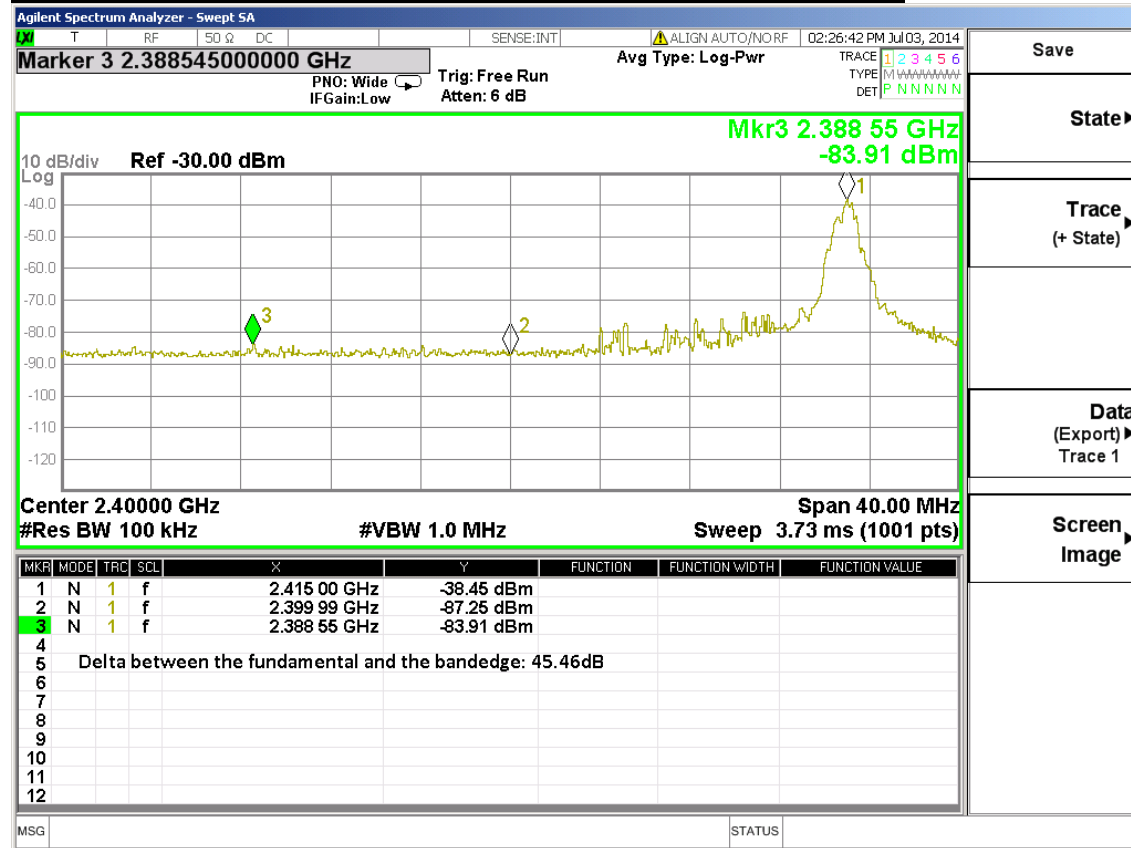
### 2415MHz 1GHz-25GHz Prescan, TOCO Alone, Y-Axis Worst Case



## 2415MHz 1GHz-25GHz Measurement Data, TOCO Alone, Y-Axis Worst Case

Huntleigh-Diagnostic Model: Sonicaid Freedom TOCO Alone TX 2.415GHz Y-Axis Battery RED: Horizontal GRN: Vertical															
Marker No.	Test Frequency (GHz)	Meter Reading dBuV	Detector	Antenna Factor dB/m	Path Factor	Peak Level dBuV/m	Peak Limit dBuV/m	Margin dB	Duty Cycle Factor dB	Average Level dBuV/m	Average Limit dBuV/m	Margin dB	Azimuth Degr	Height [cm]	Polarity
Trace Markers															
1	1.96	19.42	PK	27.3	4.1	50.82	74	-23.18	-20.99	29.83	54	-24.17	0-360	149	H
2	2.415	54.86	PK	21.8	4.51	81.17	n/a	n/a	n/a	n/a	n/a	n/a	0-360	100	H
3	4.831	73.03	PK	27.7	-50.3	50.48	74	-23.52	-20.99	29.49	54	-24.51	0-360	100	H
4	7.246	72.52	PK	30	-46.2	56.34	74	-17.66	-20.99	35.35	54	-18.65	0-360	100	H
5	9.667	58.76	PK	36.4	-48	47.2	74	-26.8	-20.99	26.21	54	-27.79	0-360	100	H
6	13.891	46.27	PK	39.9	-38.4	47.73	74	-26.27	-20.99	26.74	54	-27.26	0-360	100	H
7	24.232	51.71	PK	40.3	-43.6	48.42	74	-25.58	-20.99	27.43	54	-26.57	0-360	100	H
8	1.962	18.12	PK	27.3	4.1	49.52	74	-24.48	-20.99	28.53	54	-25.47	0-360	149	V
9	2.415	56.66	PK	21.8	4.51	82.97	n/a	n/a	n/a	n/a	n/a	n/a	0-360	100	V
10	4.83	78.91	PK	27.7	-50.3	56.35	74	-17.65	-20.99	35.36	54	-18.64	0-360	100	V
11	7.245	79.36	PK	30	-46.2	63.17	74	-10.83	-20.99	42.18	54	-11.82	0-360	100	V
12	9.66	61.43	PK	36.4	-48	49.79	74	-24.21	-20.99	28.8	54	-25.2	0-360	100	V
13	13.789	47.45	PK	39.9	-38.3	49.02	74	-24.98	-20.99	28.03	54	-25.97	0-360	100	V
14	24.078	51.51	PK	40.3	-42.8	48.98	74	-25.02	-20.99	27.99	54	-26.01	0-360	100	V
Radiated Emission Data															
	Test Frequency (GHz)	Meter Reading dBuV	Detector	Antenna Factor dB/m	Path Factor	Peak Level dBuV/m	Peak Limit dBuV/m	Margin dB	Duty Cycle Factor dB	Average Level dBuV/m	Average Limit dBuV/m	Margin dB	Azimuth [Degr]	Height [cm]	Polarity
	4.8304	76.24	PK	27.7	-50.3	53.68	74	-20.32	-20.99	32.69	54	-21.31	182	100	H
	4.8284	81.46	PK	27.7	-50.3	58.87	74	-15.13	-20.99	37.88	54	-16.12	251	100	V
	7.2447	76.33	PK	30	-46.2	60.14	74	-13.86	-20.99	39.15	54	-14.85	112	100	H
	7.2443	82.29	PK	30	-46.2	66.1	74	-7.9	-20.99	45.11	54	-8.89	156	100	V
PK - Peak detector															

## 2415MHz Low Band Edge Data, TOCO Alone, Y-Axis Worst Case



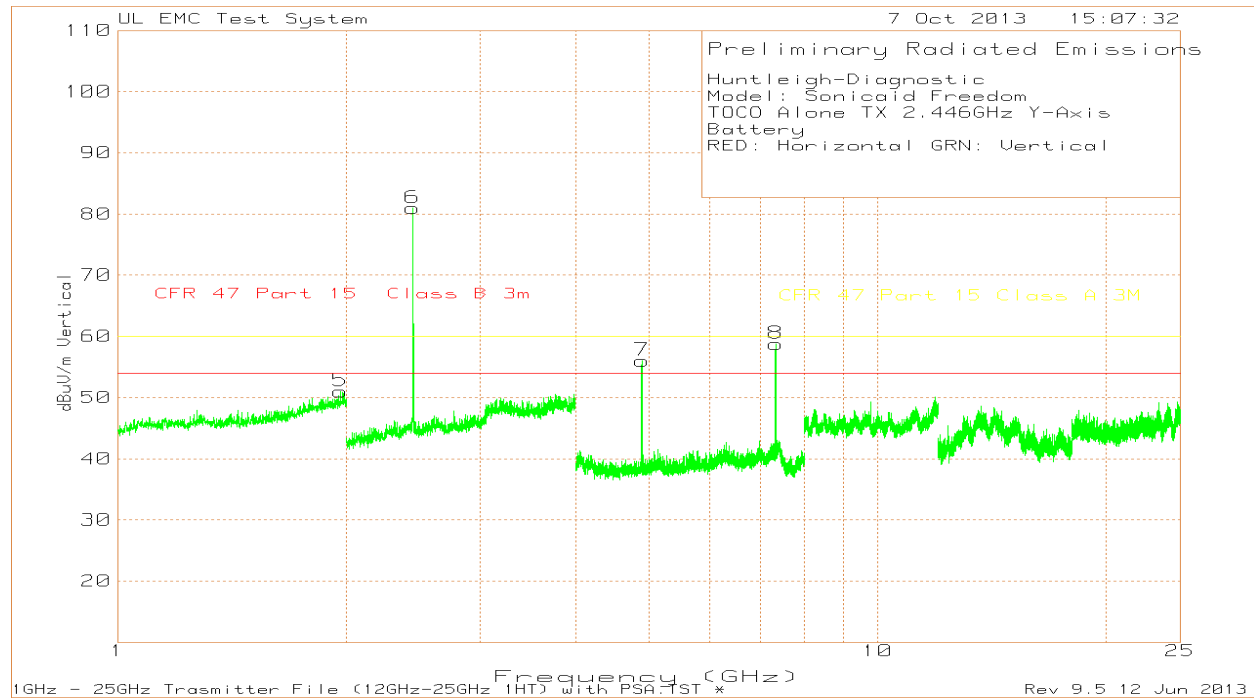
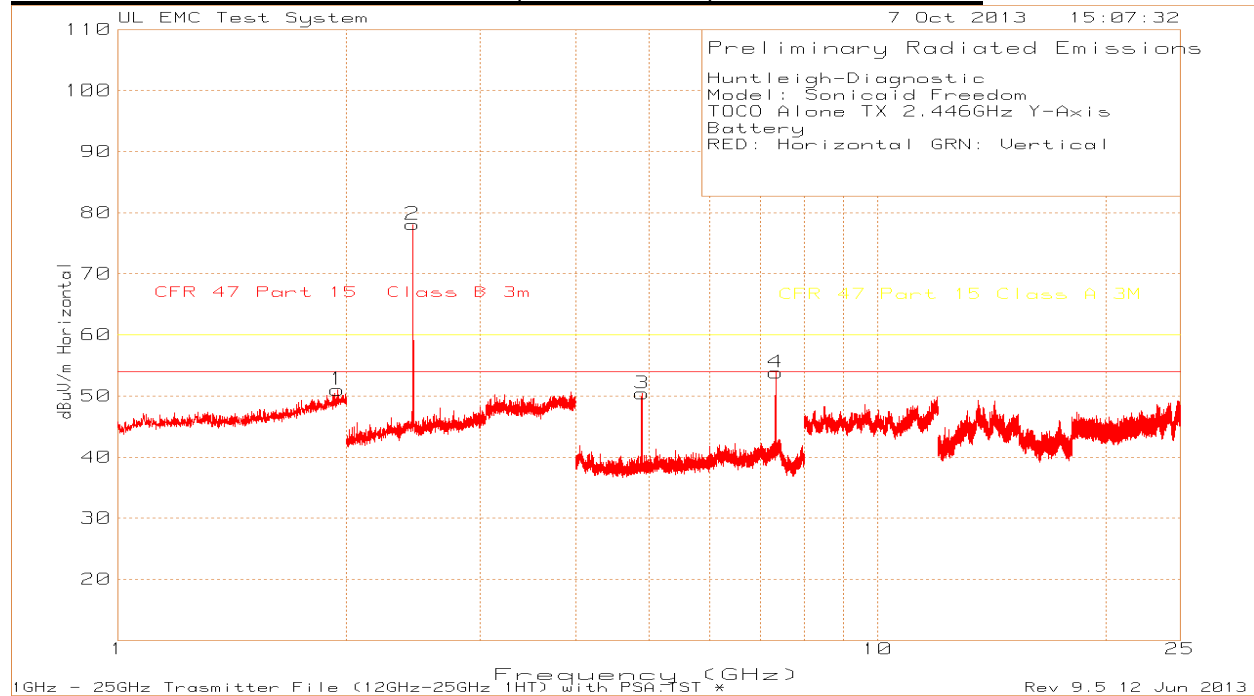
Calculated Worst Case Peak Level at Lower Band Edge based on above relative measurement and Maximum Peak Field Strength:

Peak Level:  $(84.11 \text{ dBuV/m} - 45.46 \text{ dB}) = 38.65 \text{ dBuV/m}$ , Limit: 74dBuV/m, Margin: -35.35dB

Calculated Worst Case Average Level at Lower Band Edge based on above relative measurement and Maximum Average Filed Strength:

Average Level:  $(38.65 \text{ dBuV/m peak} - 20.99 \text{ dB DC Factor}) = 17.66 \text{ dBuV/m}$ , Limit: 54dBuV/m, Margin: -36.34

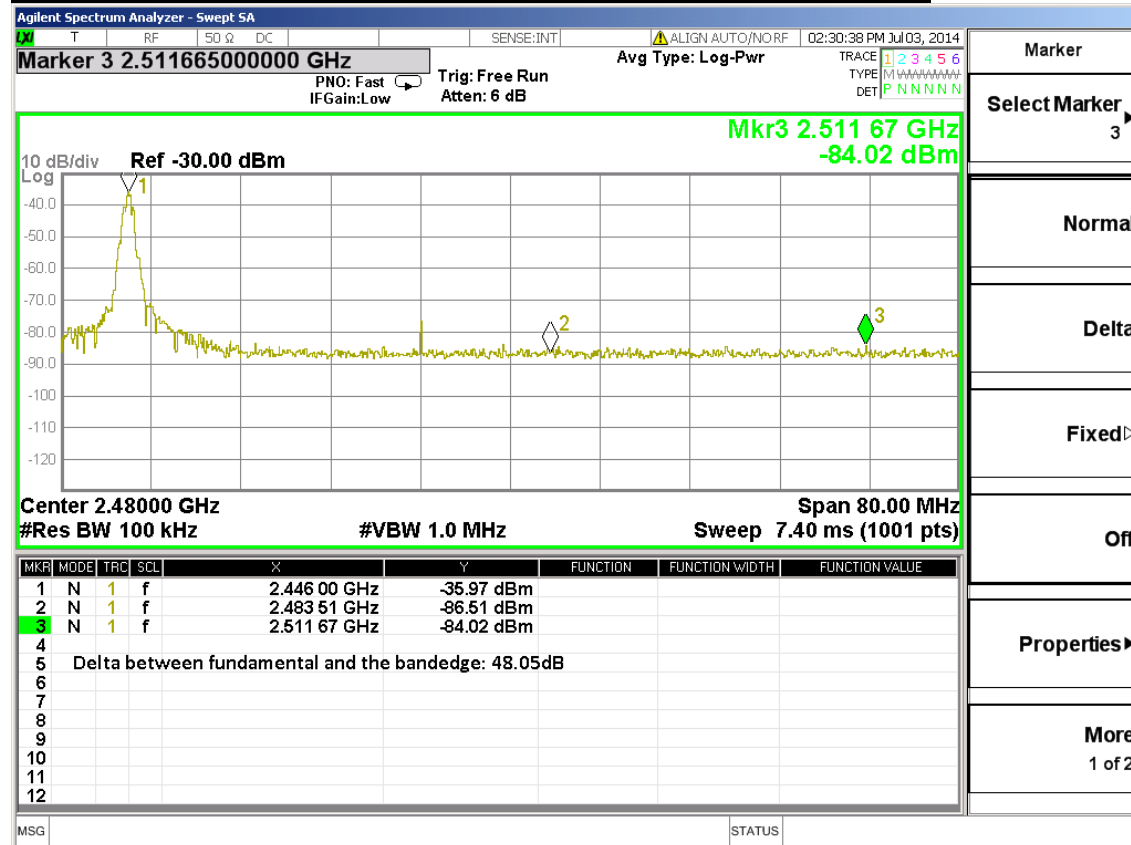
### 2446MHz 1GHz-25GHz Prescan Data, TOCO Alone, Y-Axis Worst Case



**2446MHz 1GHz-25GHz Measurement Data, TOCO Alone, Y-Axis Worst Case**

Huntleigh-Diagnostic Model: Sonicaid Freedom TOCO Alone TX 2.446GHz Y-Axis Battery RED: Horizontal GRN: Vertical															
Marker No.	Test Frequency (GHz)	Meter Reading dBuV	Detector	Antenna Factor dB/m	Path Factor	Peak Level dBuV/m	Peak Limit dBuV/m	Margin dB	Duty Cycle Factor dB	Average Level dBuV/m	Average Limit dBuV/m	Margin dB	Azimuth [Degs]	Height [cm]	Polarity
Trace Markers															
1	1.948	19.64	PK	27.3	4.11	51.05	74	-22.95	0	51.05	54	-2.95	0-360	149	H
2	2.446	51.68	PK	21.9	4.51	78.09	n/a	n/a	n/a	n/a	n/a	n/a	0-360	100	H
3	4.893	72.86	PK	27.7	-50.16	50.4	74	-23.6	-24.8	25.6	54	-28.4	0-360	100	H
4	7.339	68.89	PK	30.7	-45.76	53.83	74	-20.17	-24.8	29.03	54	-24.97	0-360	100	H
5	1.965	19.66	PK	27.3	4.1	51.06	74	-22.94	0	51.06	54	-2.94	0-360	149	V
6	2.446	54.56	PK	21.9	4.51	80.97	n/a	n/a	n/a	n/a	n/a	n/a	0-360	100	V
7	4.892	78.47	PK	27.7	-50.15	56.02	74	-17.98	-24.8	31.22	54	-22.78	0-360	100	V
8	7.338	73.8	PK	30.7	-45.75	58.75	74	-15.25	-24.8	33.95	54	-20.05	0-360	100	V
Radiated Emission Data															
Marker No.	Test Frequency (GHz)	Meter Reading dBuV	Detector	Antenna Factor dB/m	Path Factor	Peak Level dBuV/m	Peak Limit dBuV/m	Margin dB	Duty Cycle Factor dB	Average Level dBuV/m	Average Limit dBuV/m	Margin dB	Azimuth [Degs]	Height [cm]	Polarity
	4.8914	76.67	PK	27.7	-50.15	54.22	74	-19.78	-24.8	29.42	54	-24.58	267	104	H
	4.8909	81.04	PK	27.7	-50.15	58.59	74	-15.41	-24.8	33.79	54	-20.21	0	101	V
	7.3382	73.05	PK	30.7	-45.75	58	74	-16	-24.8	33.2	54	-20.8	215	100	H
	7.3376	78.93	PK	30.7	-45.75	63.88	74	-10.12	-24.8	39.08	54	-14.92	260	100	V
PK - Peak detector															

## 2446MHz Upper Band Edge Data, TOCO Alone, Y-Axis Worst Case



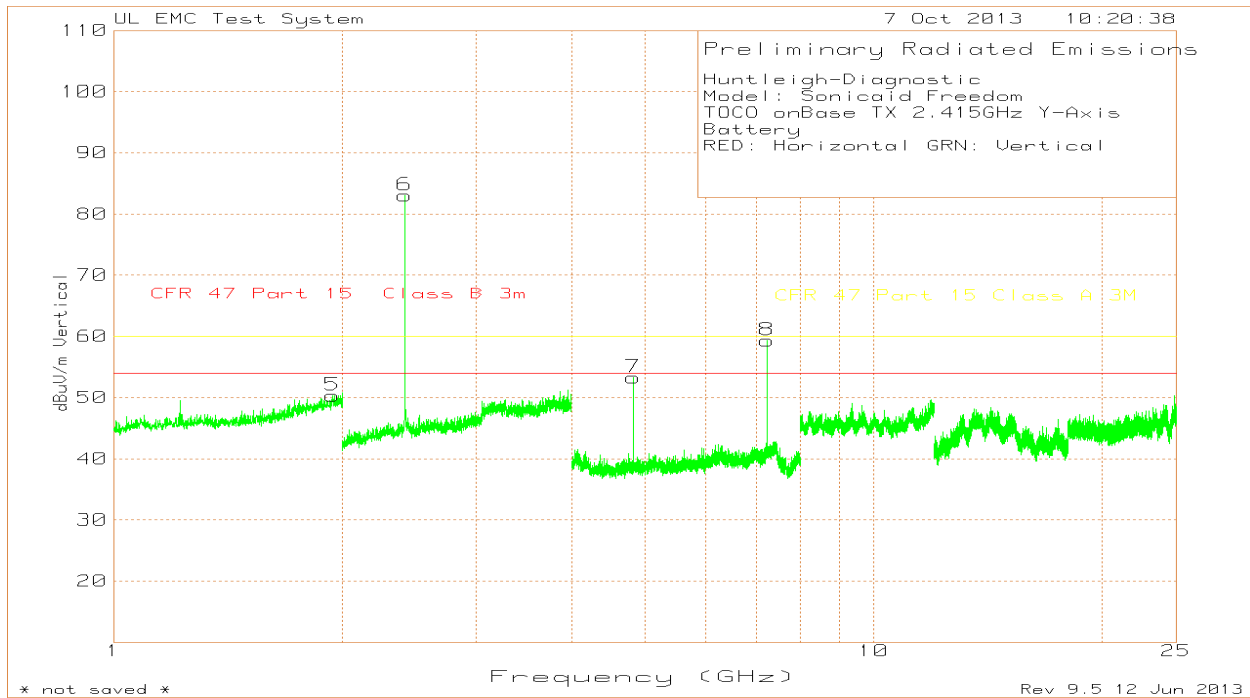
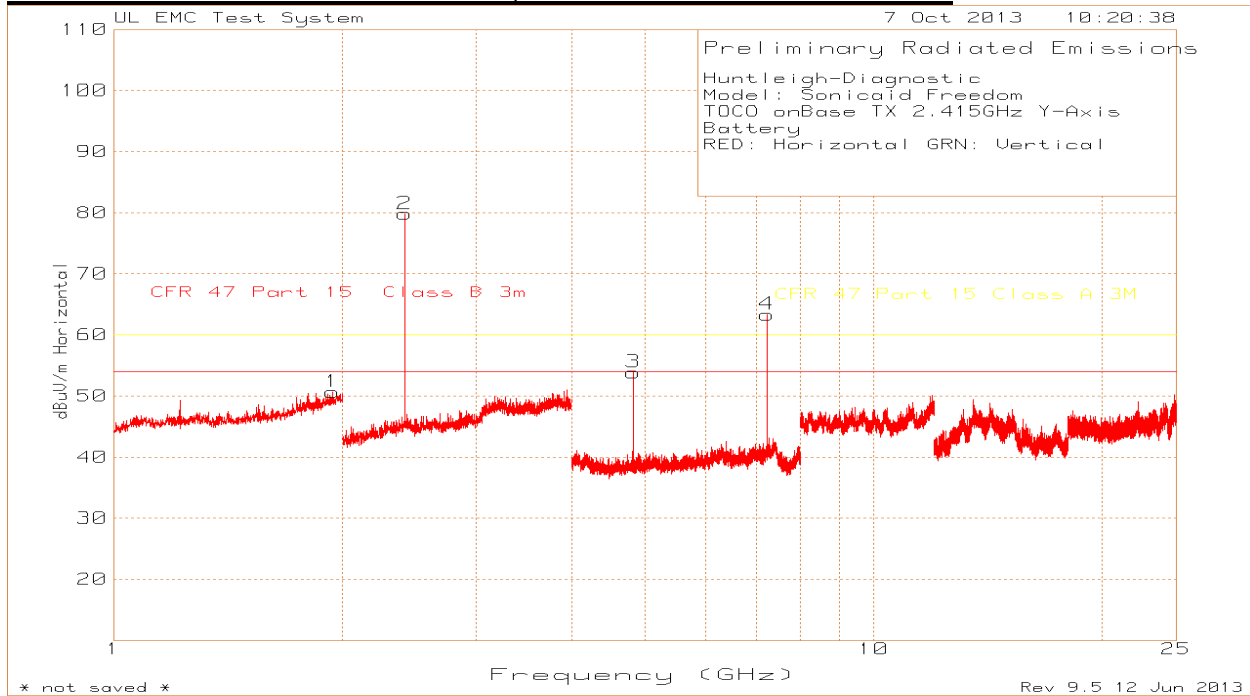
Calculated Worst Case Peak Level at Lower Band Edge based on above relative measurement and Maximum Peak Field Strength:

Peak Level:  $(82.51 \text{ dBuV/m} - 48.05 \text{ dB}) = 34.46 \text{ dBuV/m}$ , Limit: 74 dBuV/m, Margin: -39.54 dB

Calculated Worst Case Average Level at Lower Band Edge based on above relative measurement and Maximum Average Filed Strength:

Average Level:  $(34.46 \text{ dBuV/m peak} - 24.80 \text{ dB DC Factor}) = 9.66 \text{ dBuV/m}$ , Limit: 54 dBuV/m, Margin: -44.34

**2415MHz 1GHz-25GHz Prescan Data, TOCO on WMTS receiver Base**

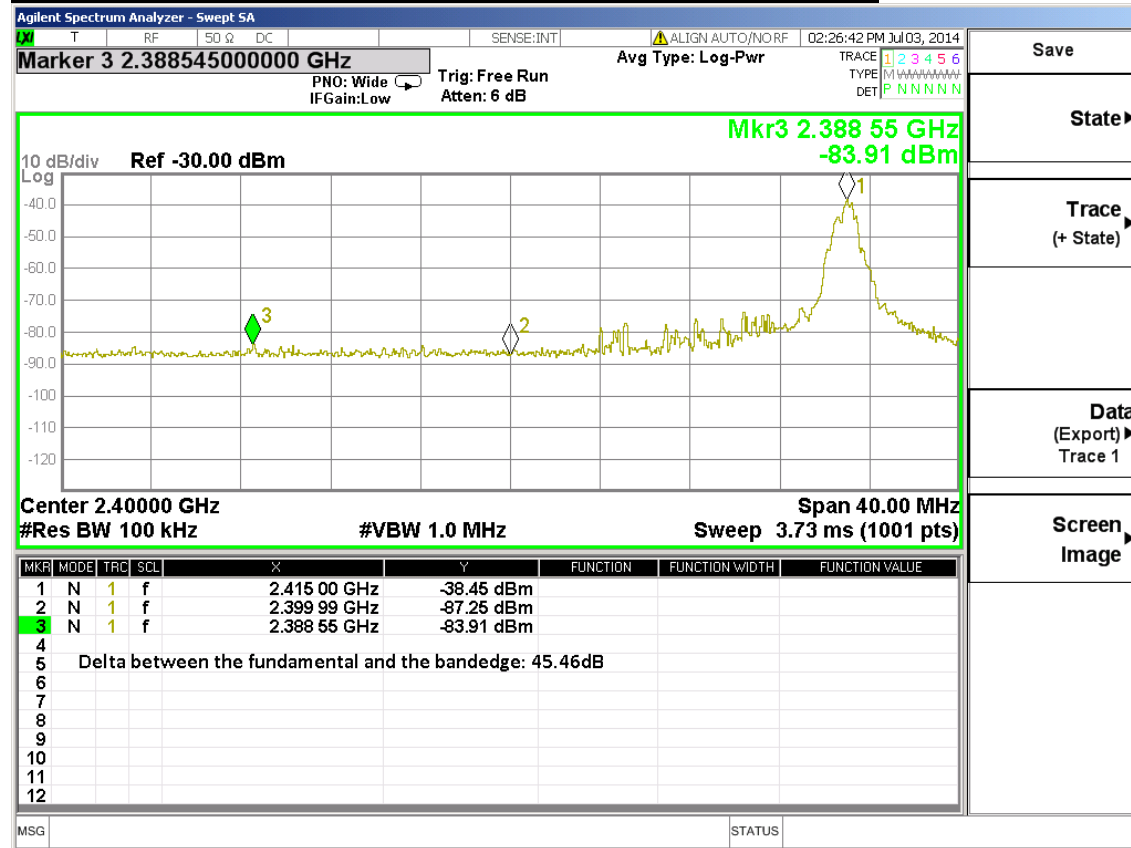




## 2415MHz 1GHz-25GHz Measurement Data, TOCO on WMTS receiver Base

Huntleigh-Diagnostic Model: Sonicaid Freedom TOCO onBase TX 2.415GHz Battery RED: Horizontal GRN: Vertical Trace Markers															
Marker No.	Test Frequency (GHz)	Meter Reading dBuV	Detector	Antenna Factor dB/m	Path Factor dB	Peak Level dBuV/m	Peak Limit dBuV/m	Margin dB	Duty Cycle Factor dB	Average Level dBuV/m	Average Limit dBuV/m	Margin dB	Azimuth [Degs]	Height [cm]	Polariz y
1	1.941	19.25	PK	27.3	4.08	50.63	74	-23.37	-20.99	29.64	54	-24.36	0-360	99	H
2	2.415	53.5	PK	21.8	4.51	79.81	n/a	n/a	n/a	n/a	n/a	n/a	0-360	100	H
3	4.83	76.42	PK	27.7	-50.26	53.86	74	-20.14	-20.99	32.87	54	-21.13	0-360	100	H
4	7.246	79.5	PK	30	-46.18	63.32	74	-10.68	-20.99	42.33	54	-11.67	0-360	100	H
5	1.941	18.95	PK	27.3	4.08	50.33	74	-23.67	-20.99	29.34	54	-24.66	0-360	100	V
6	2.415	56.74	PK	21.8	4.51	83.05	n/a	n/a	n/a	n/a	n/a	n/a	0-360	149	V
7	4.831	75.87	PK	27.7	-50.25	53.32	74	-20.68	-20.99	32.33	54	-21.67	0-360	100	V
8	7.245	75.54	PK	30	-46.19	59.35	74	-14.65	-20.99	38.36	54	-15.64	0-360	100	V
Radiated Emission Data															
	Test Frequency (GHz)	Meter Reading dBuV	Detector	Antenna Factor dB/m	Path Factor	Peak Level dBuV/m	Peak Limit dBuV/m	Margin dB	Duty Cycle Factor dB	Average Level dBuV/m	Average Limit dBuV/m	Margin dB	Azimuth [Degs]	Height [cm]	Polariz y
	4.8293	78.68	PK	27.7	-50.28	56.1	74	-17.9	-20.99	35.11	54	-18.89	210	100	H
	4.8288	79.04	PK	27.7	-50.29	56.45	74	-17.55	-20.99	35.46	54	-18.54	63	111	V
	7.2439	82.7	PK	30	-46.19	66.51	74	-7.49	-20.99	45.52	54	-8.48	248	100	H
	7.2445	83.51	PK	30	-46.19	67.32	74	-6.68	-20.99	46.33	54	-7.67	112	111	V
PK - Peak detector															

## 2415MHz Low Band Edge Data, TOCO on WMTS receiver Base



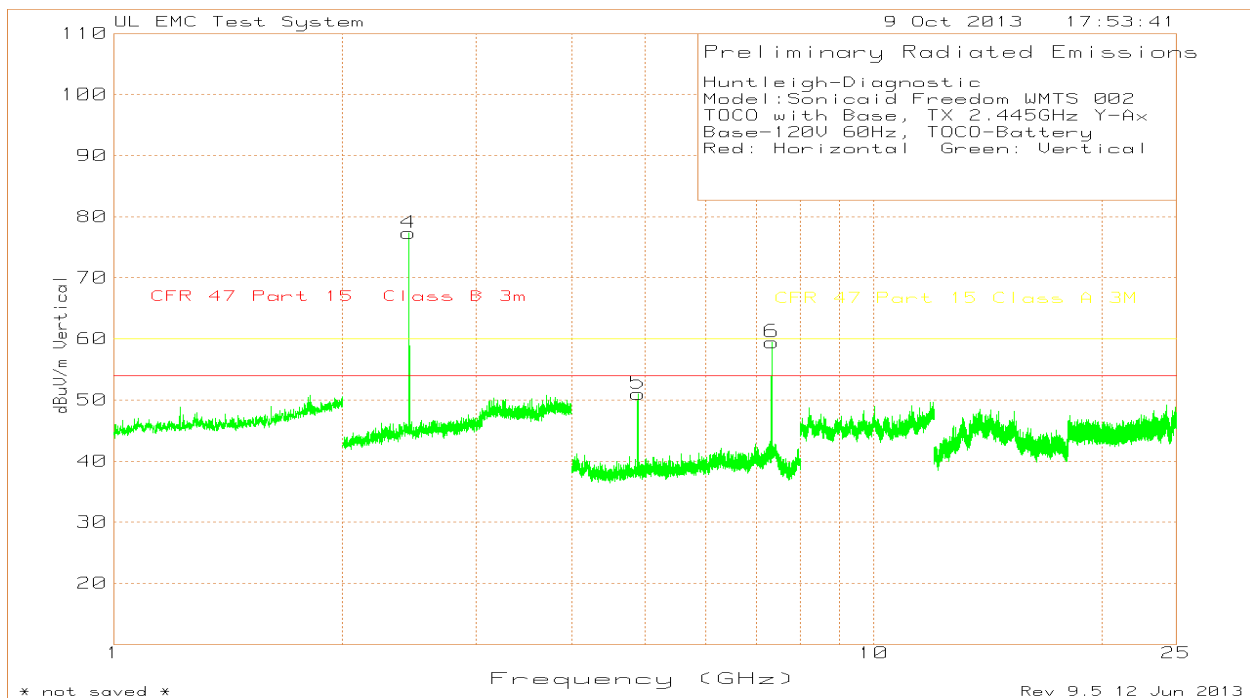
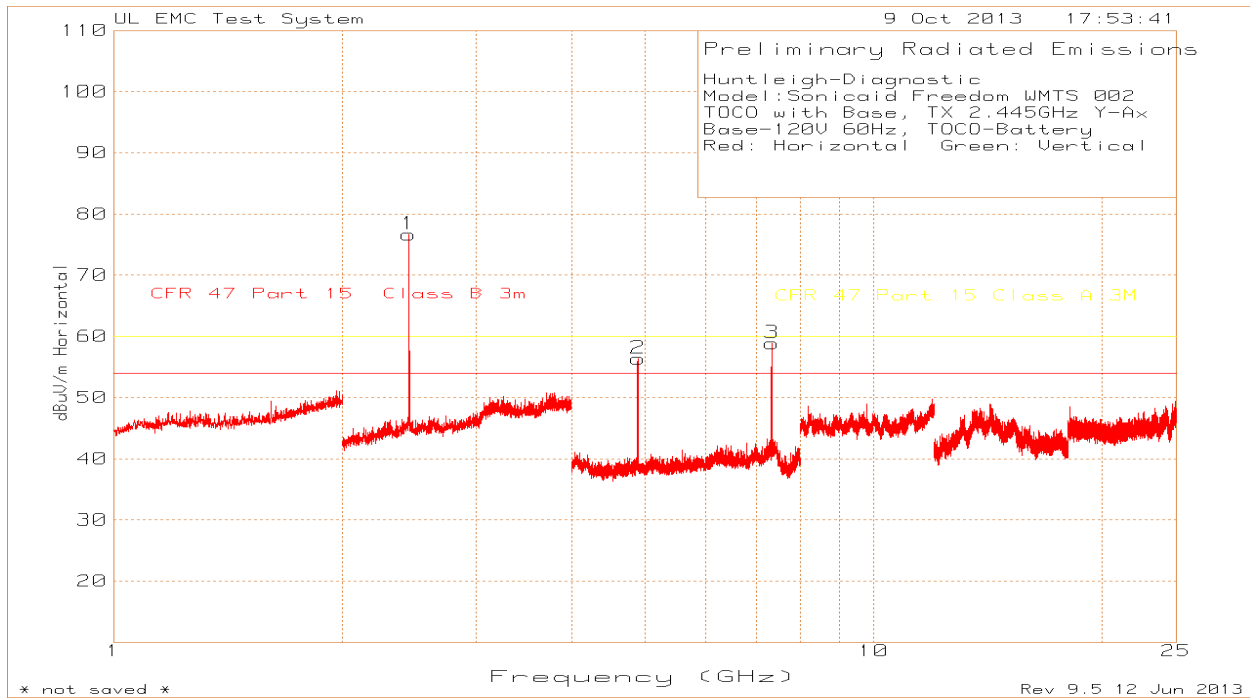
Calculated Worst Case Peak Level at Lower Band Edge based on above relative measurement and Maximum Peak Field Strength:

Peak Level:  $(84.59\text{dBuV/m} - 45.46\text{dB}) = 39.13\text{dBuV/m}$ , Limit:  $74\text{dBuV/m}$ , Margin:  $-34.87\text{dB}$

Calculated Worst Case Average Level at Lower Band Edge based on above relative measurement and Maximum Average Filed Strength:

Average Level:  $(39.13\text{dBuV/m peak} - 20.99\text{dB DC Factor}) = 18.14\text{dBuV/m}$ , Limit:  $54\text{dBuV/m}$ , Margin:  $-35.86$

**2446MHz 1GHz-25GHz Prescan Data, TOCO on WMTS receiver Base**



## 2446MHz 1GHz-25GHz Measurement Data, TOCO on WMTS receiver Base

Huntleigh-Diagnostic Model: Sonicaid Freedom WMTS 002 TOCO with Base, TX 2.445GHz Y-Ax Base-120V 60Hz, TOCO-Battery Red: Horizontal Green: Vertical Trace Markers															
Marker No.	Test Frequency (GHz)	Meter Reading dBuV	Detector	Antenna Factor dB/m	Path Factor	Peak Level dBuV/m	Peak Limit dBuV/m	Margin dB	Duty Cycle Factor dB	Average Level dBuV/m	Average Limit dBuV/m	Margin dB	Azimuth [Degs]	Height [cm]	Polarity
1	2.446	50.23	PK	21.9	4.51	76.64	n/a	n/a	n/a	n/a	n/a	n/a	0-360	100	H
2	4.893	78.84	PK	27.7	-50.16	56.38	74	-17.62	-24.8	31.58	54	-22.42	0-360	100	H
3	7.338	73.92	PK	30.7	-45.75	58.87	74	-15.13	-24.8	34.07	54	-19.93	0-360	100	H
4	2.446	50.91	PK	21.9	4.51	77.32	n/a	n/a	n/a	n/a	n/a	n/a	0-360	100	V
5	4.893	73.45	PK	27.7	-50.16	50.99	74	-23.01	-24.8	26.19	54	-27.81	0-360	149	V
6	7.339	74.54	PK	30.7	-45.76	59.48	74	-14.52	-24.8	34.68	54	-19.32	0-360	100	V
Radiated Emission Data															
	Test Frequency (GHz)	Meter Reading dBuV	Detector	Antenna Factor dB/m	Path Factor	Peak Level dBuV/m	Peak Limit dBuV/m	Margin dB	Duty Cycle Factor dB	Average Level dBuV/m	Average Limit dBuV/m	Margin dB	Azimuth [Degs]	Height [cm]	Polarity
	4.8912	81.45	PK	27.7	-50.15	59	74	-15	-24.8	34.2	54	-19.8	352	100	H
	4.8904	77.9	PK	27.7	-50.14	55.46	74	-18.54	-24.8	30.66	54	-23.34	107	110	V
	7.3378	80.57	PK	30.7	-45.75	65.52	74	-8.48	-24.8	40.72	54	-13.28	26	100	H
	7.338	81.11	PK	30.7	-45.75	66.06	74	-7.94	-24.8	41.26	54	-12.74	256	108	V
PK - Peak detector															

**Agilent Spectrum Analyzer - Sweep 5A**

Marker 3 2.511665000000 GHz  
PNO: Fast IFGain:Low Trig: Free Run Atten: 6 dB

Avg Type: Log-Pwr

TRACE 1 2 3 4 5 6  
TYPE M W W W W W W  
DET P N N N N N

Mkr3 2.511 67 GHz  
-84.02 dBm

Center 2.48000 GHz Span 80.00 MHz  
#Res BW 100 kHz #VBW 1.0 MHz Sweep 7.40 ms (1001 pts)

MKR	MODE	TAC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.446 00 GHz	-35.97 dBm			
2	N	1	f	2.483 51 GHz	-86.51 dBm			
3	N	1	f	2.511 67 GHz	-84.02 dBm			

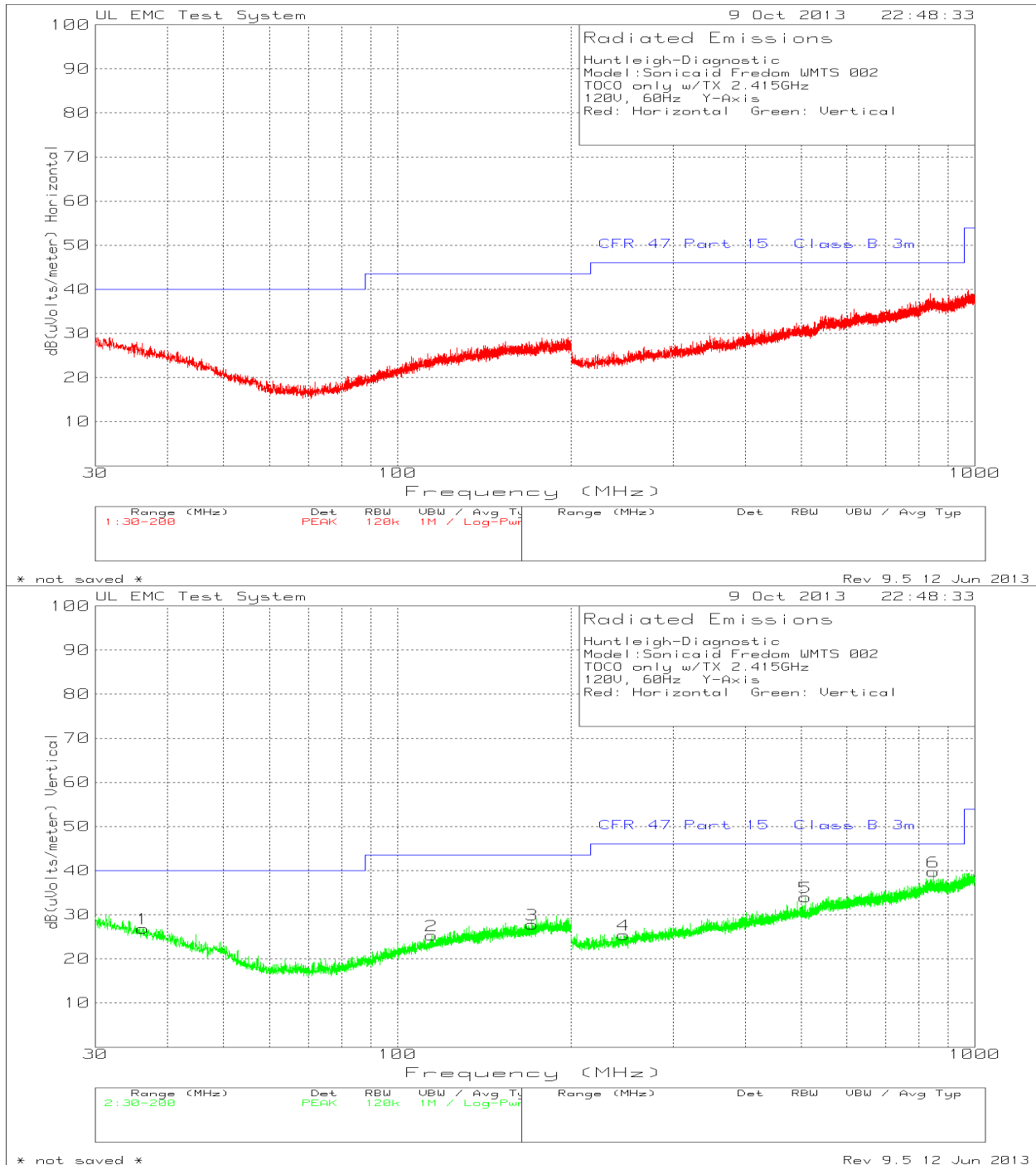
Delta between fundamental and the bandedge: 48.05dB

Peak Level:  $(79.09\text{dBuV/m} - 48.05\text{dB}) = 31.04\text{dBuV/m}$ , Limit:  $74\text{dBuV/m}$ , Margin:  $-42.96\text{dB}$

Average Level: (31.04dBuV/m peak – 24.80dB DC Factor) = 6.24dBuV/m, Limit: 54dBuV/m, Margin: -47.76

### 7.2.3. WORST-CASE BELOW 1 GHz

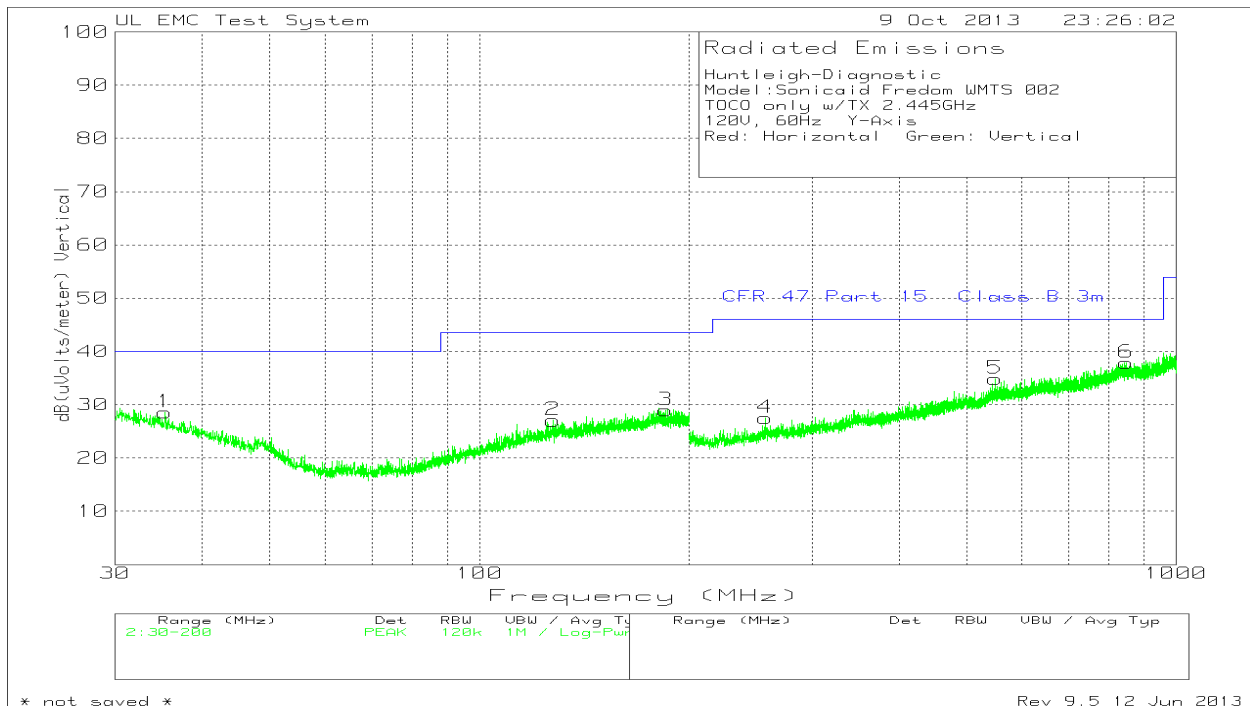
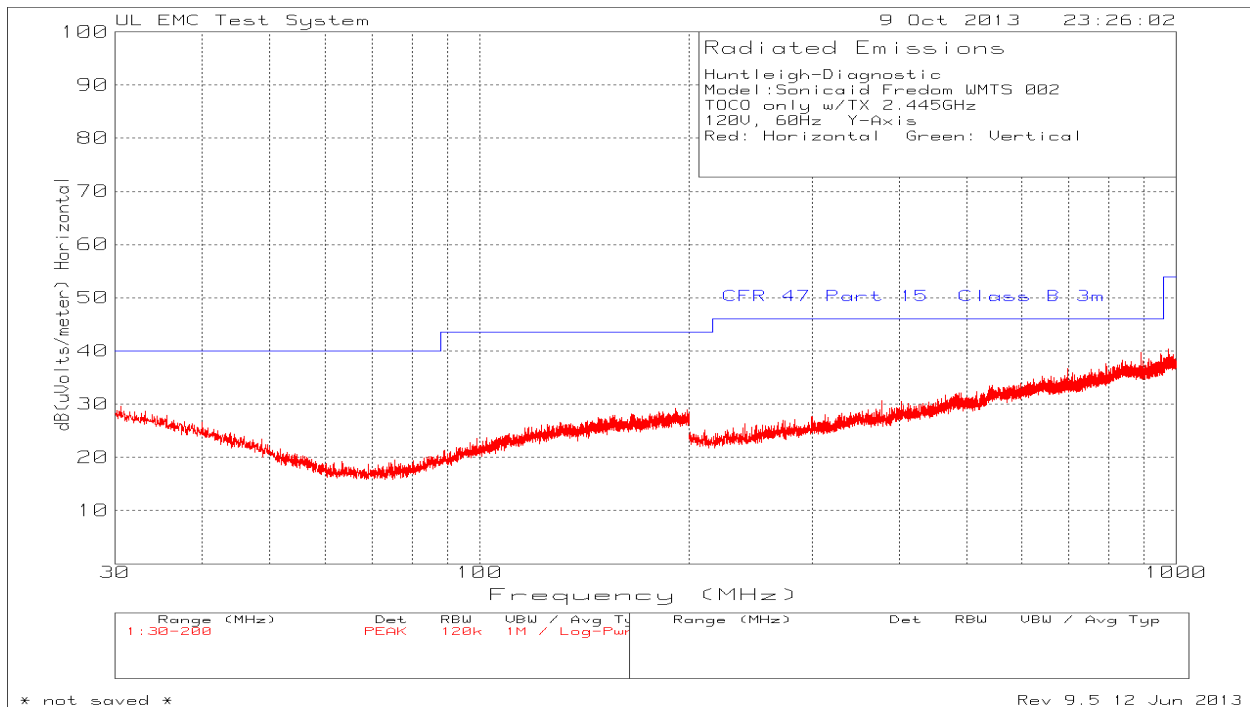
#### 2415MHz Prescan Data, TOCO Alone



#### 2415MHz Tabular Data, TOCO Alone

No Emissions Recorded

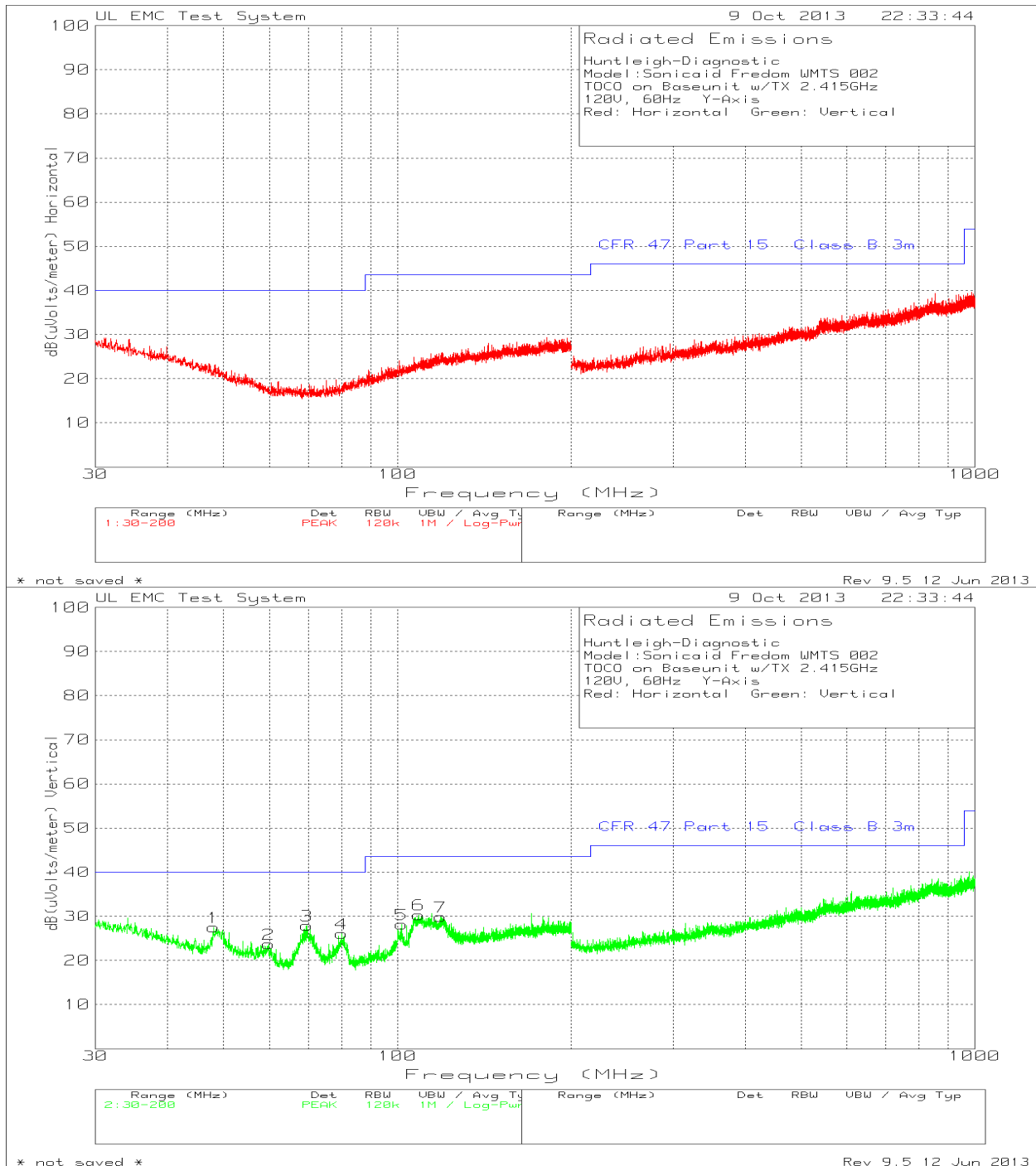
## 2446MHz Prescan Data, TOCO Alone



## 2446MHz Tabular Data, TOCO Alone

No Emissions Recorded

## 2415MHz Prescan Data, TOCO on WMTS Receiver Base

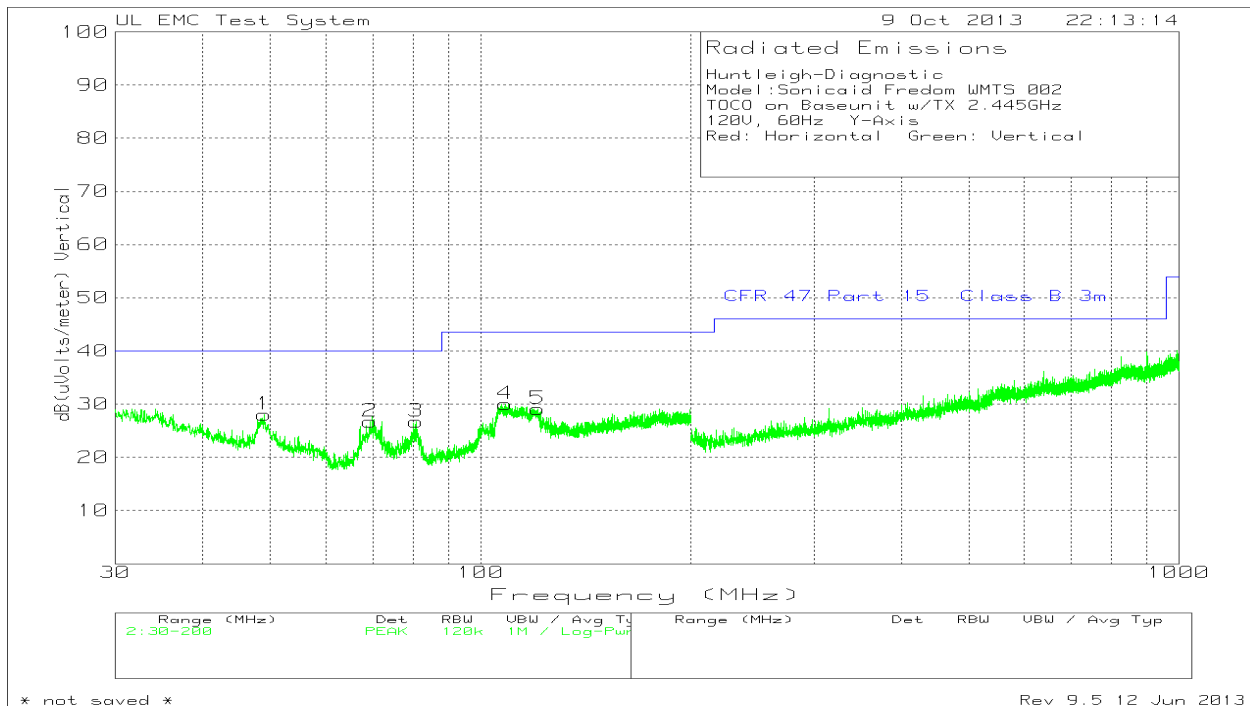
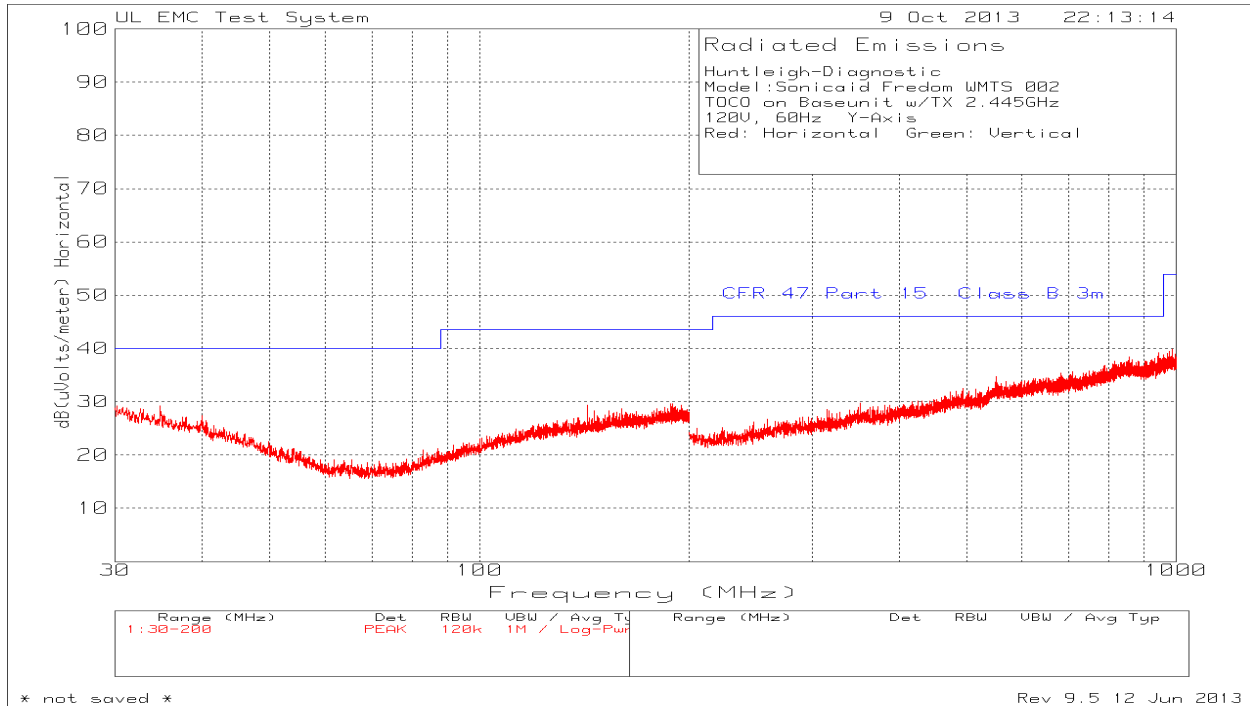


## 2415MHz Tabular Data, TOCO on WMTS Receiver Base

No Emissions Recorded



## 2446MHz Prescan Data, TOCO on WMTS Receiver Base



## 2446MHz Tabular Data, TOCO on WMTS Receiver Base

No Emissions Recorded

## 8. AC MAINS LINE CONDUCTED EMISSIONS

### LIMITS

§15.207 (a)  
IC RSS-GEN, Section 7.2.2

Frequency of emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50
* Decreases with the logarithm of the frequency.		

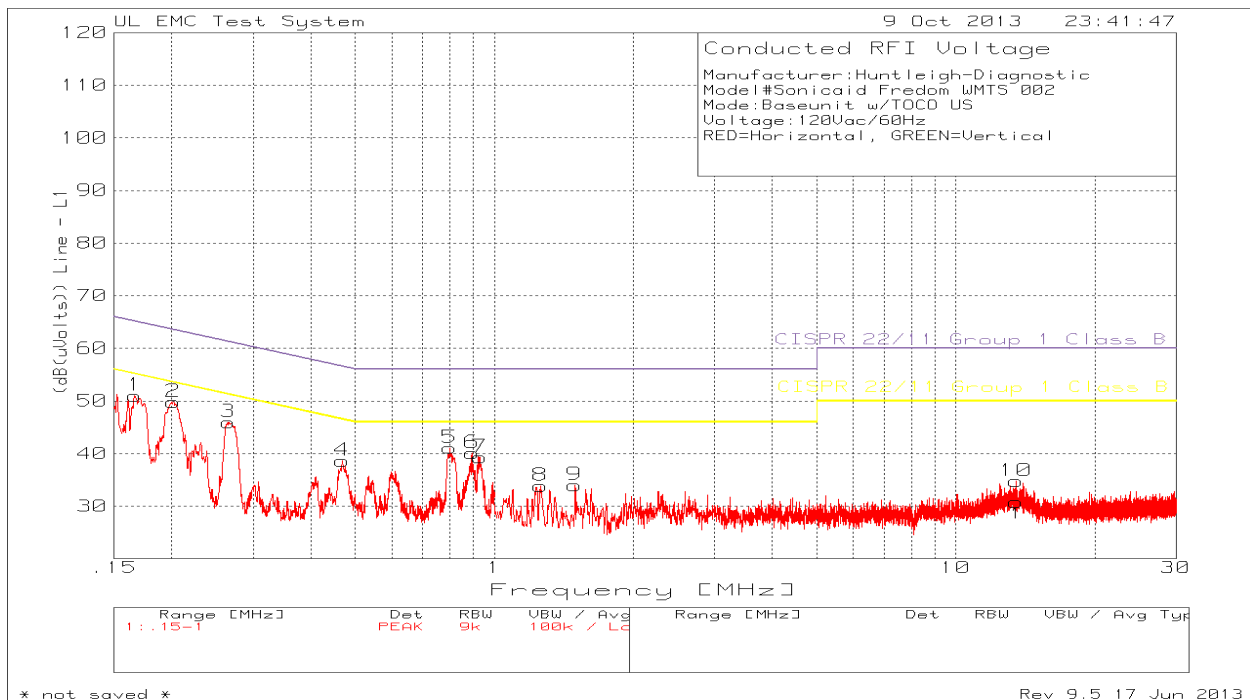
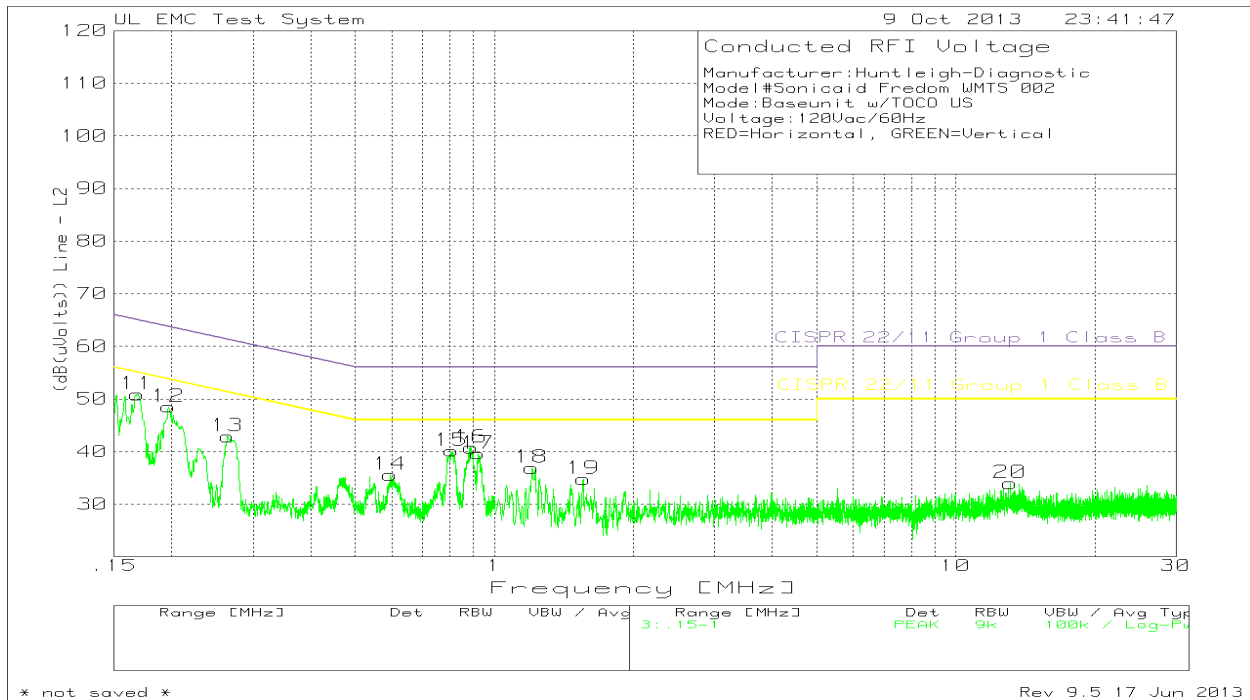
### TEST PROCEDURE

ANSI C63.4

### RESULTS

No non-compliance noted:

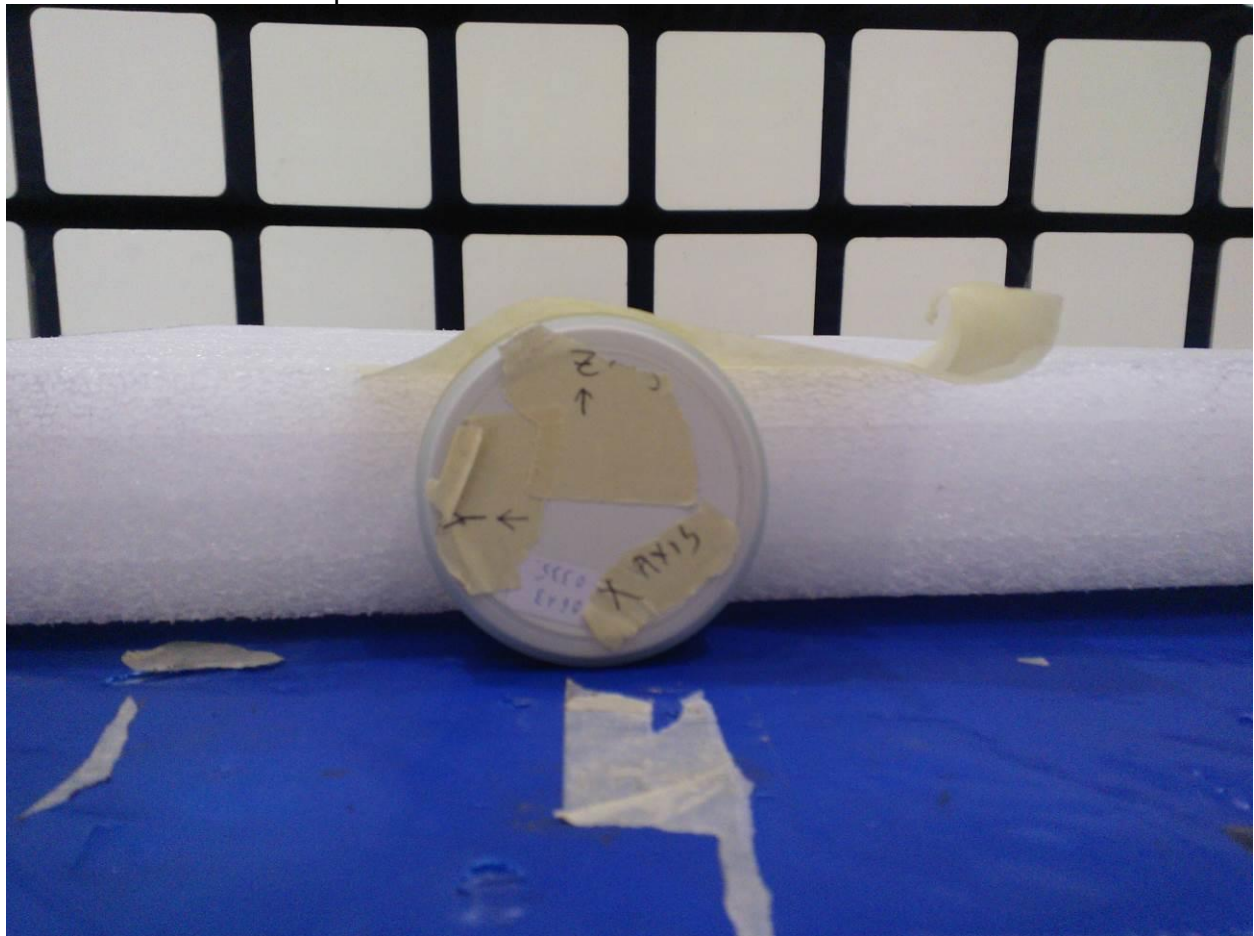
## TX 2415MHz



\* All peak levels are below the limit. Quasi Peak measurements or Average measurements are not needed.

## 9. SETUP PHOTOS

### Radiated Emissions Setup – Z-Axis



Radiated Emissions Setup – X-Axis



TOCO Unit on Base





Line Conducted Emissions (TOCO and US) TOCO communicating.



## END OF REPORT