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EMC testing of the Orpyx Medical Technologies Inc. LogR Shoe Pod in accordance with FCC Part 15.247, ANSI C63.4: 2009 and ANSI C63.10: 2009 as referenced by FCC OET 558074 D01 DTS Measurement Guidance v03r02 FCC ID: 2AAH8SSV2

Test Personnel: David Raynes, Imran Akram, Vassan Kohli

Prepared for: Orpyx Medical Technologies Inc.

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REVISION RECORD

ISSUE	DATE	AUTHOR	REVISIONS
DRAFT 1	2015-05-19	D. Raynes	Initial draft submitted for review.
DRAFT 2	2015-05-21	D. Raynes	AC conducted emissions added.
Release 1	2015-05-21	M. Rousseau	Sign off
Release 2	2015-06-07	M. Rousseau	Add FCC ID & ANSI standards on cover page ANSI references added to Test Methodology Peak RF power calculation added in section 2.7 USB port usage is define in section 1.3 EUT positioning procedure is in section 2.12 Measurement below 30Mhz in section 2.13
Release 3	2015-06-08	D. Raynes	Remove channel separation Remove number of hoping channels Remove average time of occupancy Add PSD measurement and calculation (p.23) Corrected RF Exposure statement (p.30)

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1.0 INTRODUCTION

1.1 Scope

The purpose of this report is to present the results of compliance testing performed in accordance with FCC Part 15.247 as specified in Orpyx Medical Technologies Inc. Test Plan. All test procedures, limits, criteria, and results described in this report apply only to the Orpyx Medical Technologies Inc. LogR Shoe Pod test sample, referred to herein as the EUT (Equipment Under Test).

This report does not imply product endorsement by the Electronics Test Centre, SCC, NAVLP, A2LA, nor any Canadian Government agency.

1.2.1 Applicant

This test report has been prepared for Orpyx Medical Technologies Inc., located in Calgary, Alberta, Canada.

1.3 Test Sample Description

As provided to ETC (Airdrie) by Orpyx Medical Technologies Inc.:

Product Name:	LogR Shoe Pod
Model #	SSV2
Serial #	N/A
Power:	Internal rechargeable battery

The device is a wireless (Bluetooth Low Energy) foot pressure sensor. It incorporates an internal antenna, which the characteristics can be found in Texas Instrument design note DN0007 (document number: SWRU120B).

The device has an internal rechargeable battery. The device USB port is strictly used for charging the internal battery by end users. End users can only exchange data via the Bluetooth wireless interface and manufacturer application software.

1.4 General Test Conditions and Assumptions

The EUT was set up and exercised using the configurations, modes of operation and arrangements defined in this report only. All inputs and outputs to and from other equipment associated with the EUT were adequately simulated.

Where relevant, the EUT was only tested using the monitoring methods and test criteria defined in this report.

The environmental conditions are recorded during each test, and are reported in the relevant sections of this document.

1.5 Scope of Testing

Tests were performed in accordance with FCC Part 15.247, ANSI C63.4-2009, and ANSI C63.10-2009 as referenced in FCC OET 558074 v03r02.

1.5.1 Test Methodology

Test methods are documented in the part of Section 2 of this report associated with each particular Test Case.

1.5.2 Variations in Test Methodology

Any variance in methodology or deviation from the reference Standard is documented in the part of Section 2 of this report associated with each particular Test Case.

1.5.3 Test Sample Verification, Configuration & Modifications

EUT setup, configuration, protocols for operation and monitoring of EUT functions, and any modifications performed in order to meet the requirements, are detailed in each Test Case of Section 2 of this report.

2.0 TEST CONCLUSION

STATEMENT OF COMPLIANCE

The customer equipment referred to in this report was found to comply with the requirements, as summarized below.

The EUT was subjected to the following tests. Compliance status is reported as **Compliant** or **Non-compliant**. If testing was not performed at this time, the appropriate field is marked **n/t**. **N/A** indicates the test was Not Applicable to the EUT.

> **Note:** Maintenance of compliance is the responsibility of the Manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the EUT with respect to the standards detailed in this test report.

The following table summarizes the tests performed in terms of the specification, class or performance criterion applied, and the EUT modification state.

Test Case	Test Type	Specification	Test Sample	Modifications	Config.	Result
2.1	AC Conducted Emissions (Rx)	15.107	LogR Shoe Pod	none	see § 2.1	**Compliant**
2.2	AC Conducted Emissions (Tx)	15.207	LogR Shoe Pod	none	see § 2.2	**Compliant**
2.3	Occupied Bandwidth	15.247(a)	LogR Shoe Pod	none	see § 2.3	**Compliant**
2.4	Peak Output	15.247(d)	LogR Shoe Pod	none	see § 2.4	**Compliant**
2.5	PSD	15.247(e)	LogR Shoe Pod	none	see § 2.5	**Compliant**
2.6	Band Edge	15.247(d)	LogR Shoe Pod	none	see § 2.6	**Compliant**
2.7	Conducted Spurious	15.247(d)	LogR Shoe Pod	none	see § 2.7	**N/A**
2.8	RF Exposure	15.247(i)	LogR Shoe Pod	none	see § 2.8	**Compliant**
2.9	EUT Position	ANSI C63.4	LogR Shoe Pod	none	see § 2.9	see § 2.9
2.10	Radiated Spurious	15.205, 15.209 15.247(d)	LogR Shoe Pod	none	see § 2.10	**Compliant**

Refer to the test data for applicable test conditions.

2.1 AC Power Line Conducted Emissions: Receive Mode

Test Lab: Electronics Test Centre, Airdrie	**EUT: LogR Shoe Pod**
Test Personnel: Imran Akram	**Standard: FCC Part 15.107**
Test Method: TM-EMC 11	**Basic Standard: ANSI C63.4: 2009**
Date: 2015-05-20 (20° C, 24.6% RH)	
EUT status: Compliant	

Specification:

Frequency (MHz)	Quasi-Peak Limit (dBµV)	Average Limit (dBµV)
0.15 – 0.5	66 – 56	56 – 46
0.5 – 5	56	46
5 – 30	60	50
Criteria: The conducted emissions produced by a device shall not exceed the limits as specified.		

2.1.1 Test Methodology:

Before any testing is performed, the Ambient (measurement noise floor) is recorded, and a QC check is performed to show that the system is functioning correctly.

Testing starts with a scan, performed under software control. After this is complete, the list of frequencies of interest is generated. These frequencies are then investigated for quasi-peak amplitude. Emissions measured with a peak detector that fall below the quasi-peak limit are deemed to meet the requirements.

2.1.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

2.1.3 Uncertainty of Measurement:

The factors contributing to uncertainty of measurement are identified and calculated in accordance with UKAS (United Kingdom Accreditation Service) document “Lab 34, The Expression of Uncertainty in EMC Testing, Aug 2002.” As based on the “ISO Guide to the Expression of Uncertainty in Measurement, 1995.”

This uncertainty estimate represents an expended uncertainty expressed at approximately 95% confidence using a coverage factor of k = 2.

Test Method	Frequency	Uncertainty
Conducted Emissions Level	150 KHz – 30 MHz	±2.7 dB

2.1.4 Test Equipment

Testing was performed with this equipment:

Equipment	Manufacturer	Model #	Asset #	Calibration Due-Date
EMC Software	UL	Ver. 9.5	ETC-SW-EMC 2.1	N/A
EMI receiver	Agilent	N9038A	6130	2015-06-17
LISN	Com-Power	LI-150A	6121	2015-06-11
LISN	Com-Power	LI-150A	6122	2015-06-11

2.1.5 Test Sample Verification, Configuration & Modifications

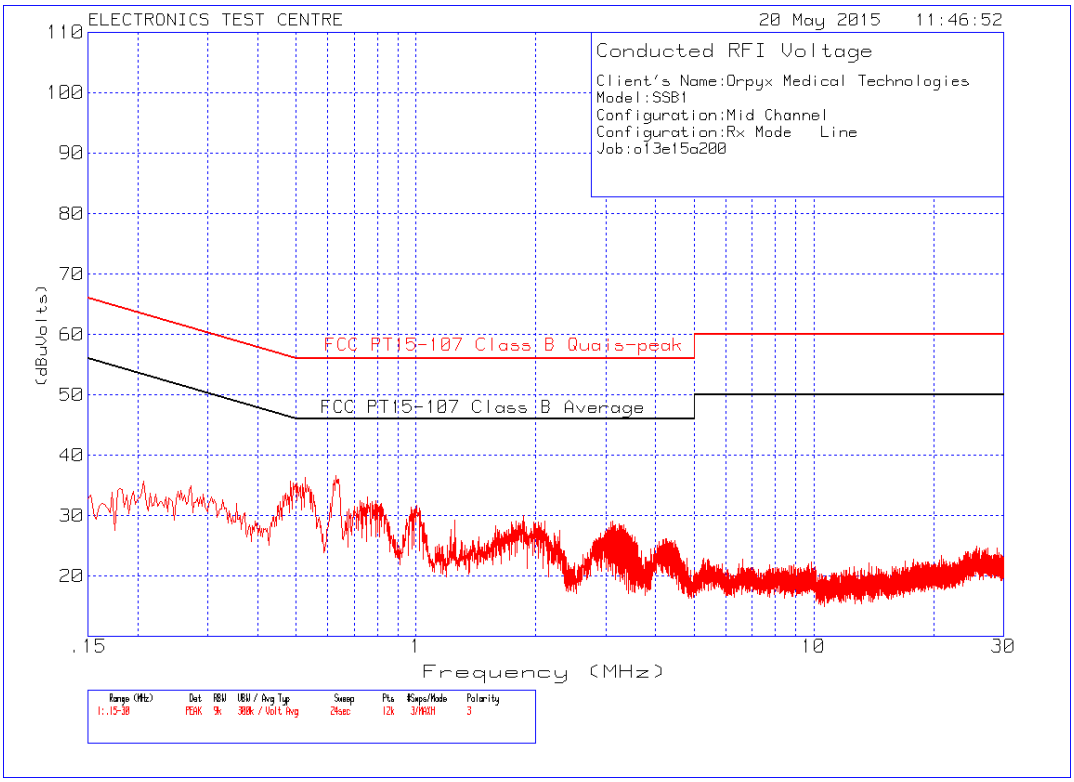
The USB cable was plugged into the EUT, which was then plugged into the AC adaptor. Line voltage was 120 VAC, at 60 Hz. The EUT met the requirements without modification.

2.1.6 Conducted Emissions Data:

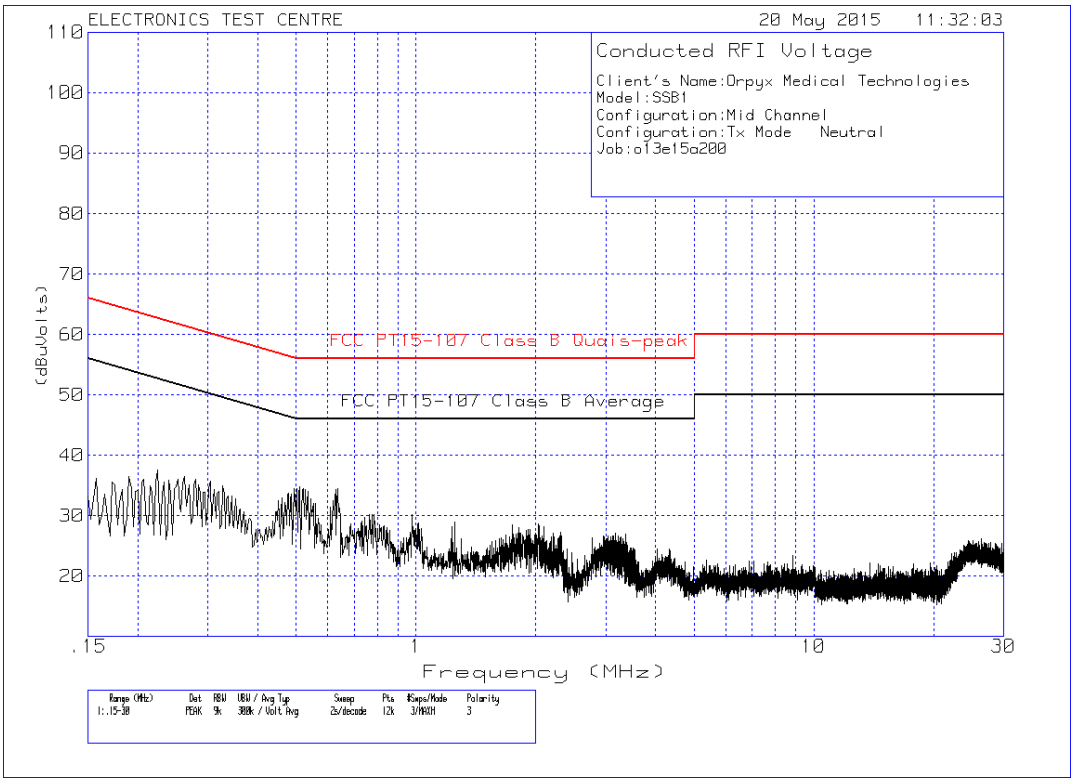
The low, mid, and high frequencies were pre-scanned with the EUT set to Receive on selected channels with test-specific software. The mid channel was selected as the worst-case condition, and is presented here.

There were no emissions within 10 dB of the applicable limit.

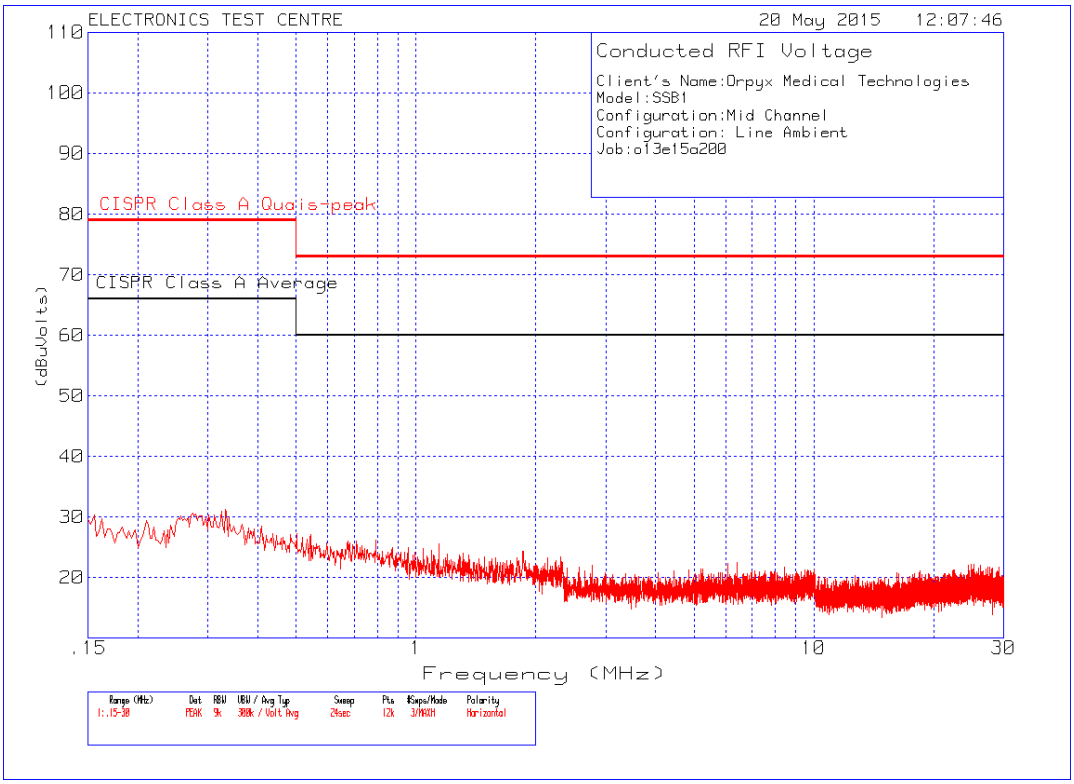
Plot of Conducted Emissions: Line



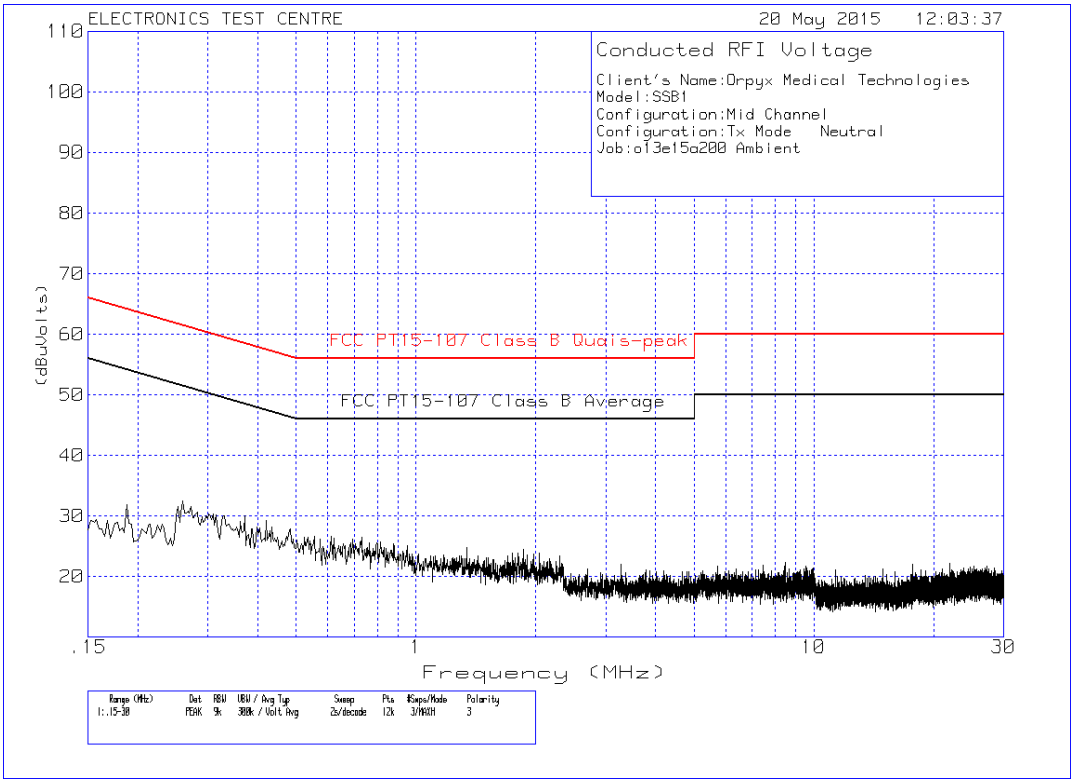
Plot of Conducted Emissions: Neutral



Plot of Test Chamber Ambient: (measurement noise floor): Line



Plot of Test Chamber Ambient: (measurement noise floor): Neutral



2.2 AC Power Line Conducted Emissions: Transmit Mode

Test Lab: Electronics Test Centre, Airdrie	**EUT: LogR Shoe Pod**
Test Personnel: Imran Akram	**Standard: FCC Part 15.207**
Test Method: TM-EMC 11	**Basic Standard: ANSI C63.4: 2009**
Date: 2015-05-20 (20° C, 24.6% RH)	

EUT status: Compliant

Specification:

Frequency (MHz)	Quasi-Peak Limit (dBµV)	Average Limit (dBµV)
0.15 – 0.5	66 – 56	56 – 46
0.5 – 5	56	46
5 – 30	60	50
Criteria: The conducted emissions produced by a device shall not exceed the limits as specified.		

2.2.1 Test Methodology:

Before any testing is performed, the Ambient (measurement noise floor) is recorded, and a QC check is performed to show that the system is functioning correctly.

Testing starts with a scan, performed under software control. After this is complete, the list of frequencies of interest is generated. These frequencies are then investigated for quasi-peak and average amplitude, as applicable. Emissions measured with a QP detector that fall below the Average limit are deemed to meet both requirements.

2.2.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

2.2.3 Uncertainty of Measurement:

The factors contributing to uncertainty of measurement are identified and calculated in accordance with UKAS (United Kingdom Accreditation Service) document “Lab 34, The Expression of Uncertainty in EMC Testing, Aug 2002.” As based on the “ISO Guide to the Expression of Uncertainty in Measurement, 1995.”

This uncertainty estimate represents an expended uncertainty expressed at approximately 95% confidence using a coverage factor of k = 2.

Test Method	Frequency	Uncertainty
Conducted Emissions Level	150 KHz – 30 MHz	±2.7 dB

2.2.4 Test Equipment

Testing was performed with this equipment:

Equipment	Manufacturer	Model #	Asset #	Calibration Due-Date
EMC Software	UL	Ver. 9.5	ETC-SW-EMC 2.1	N/A
EMI receiver	Agilent	N9038A	6130	2015-06-17
LISN	Com-Power	LI-150A	6121	2015-06-11
LISN	Com-Power	LI-150A	6122	2015-06-11

2.2.5 Test Sample Verification, Configuration & Modifications

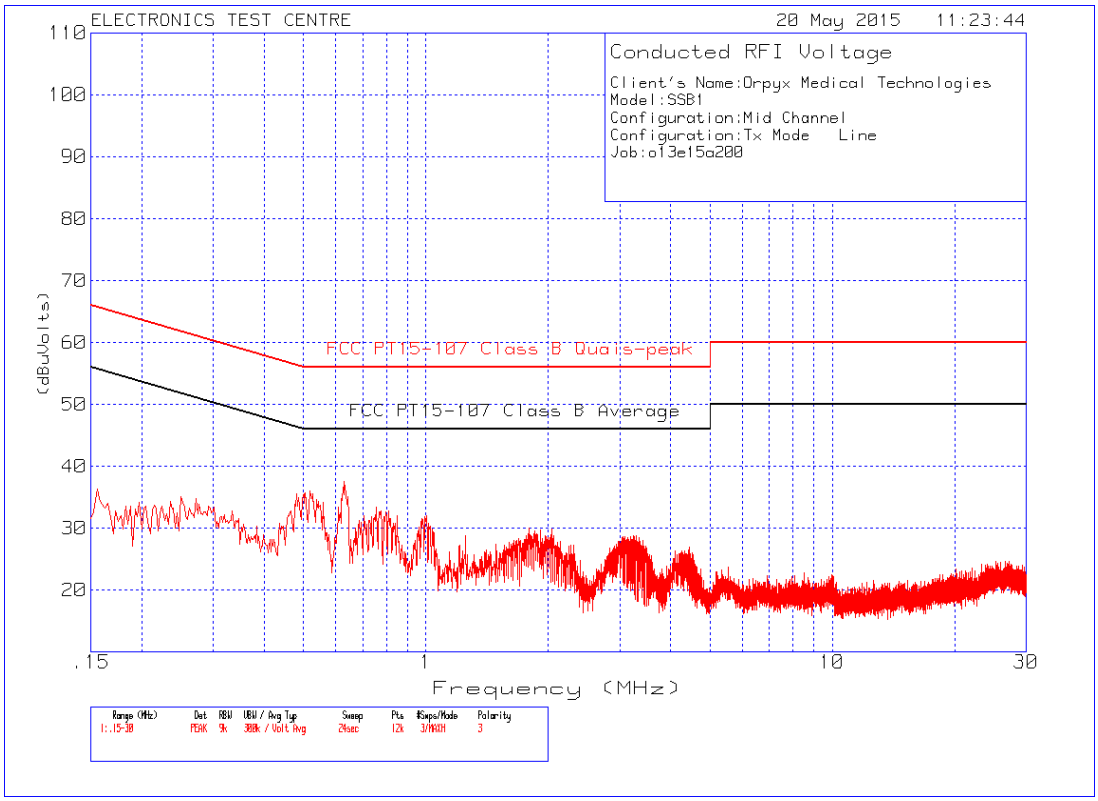
The USB cable was plugged into the EUT, which was then plugged into the AC adaptor. Line voltage was 120 VAC, at 60 Hz. The EUT met the requirements without modification.

2.2.6 Conducted Emissions Data:

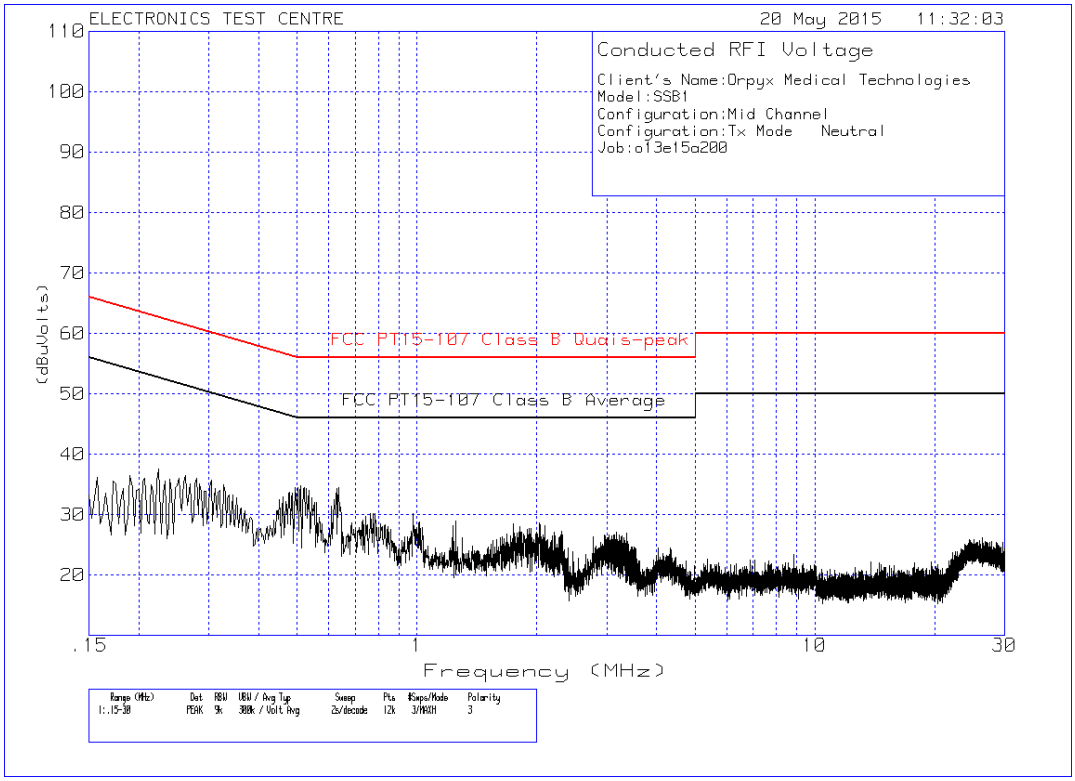
The low, mid, and high frequencies were pre-scanned with the EUT set to Transmit on selected channels with test-specific software. The mid channel was selected as the worst-case condition, and is presented here.

There were no emissions within 10 dB of the applicable limit.

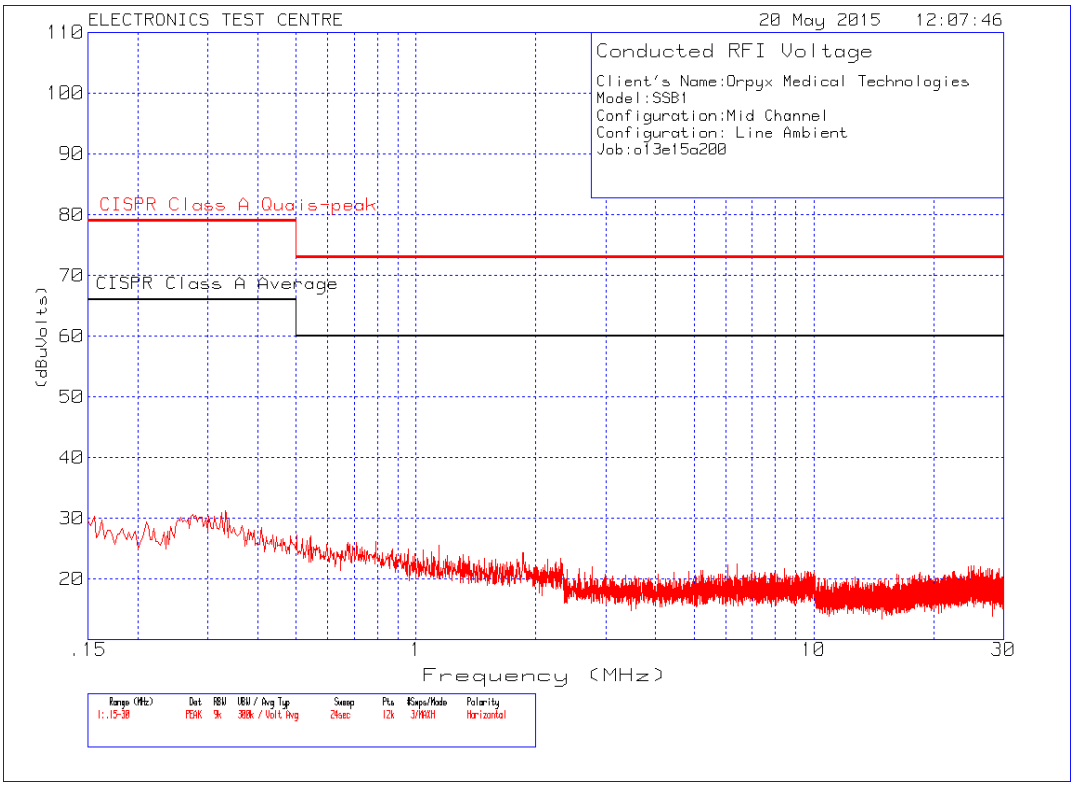
Plot of Conducted Emissions: Line



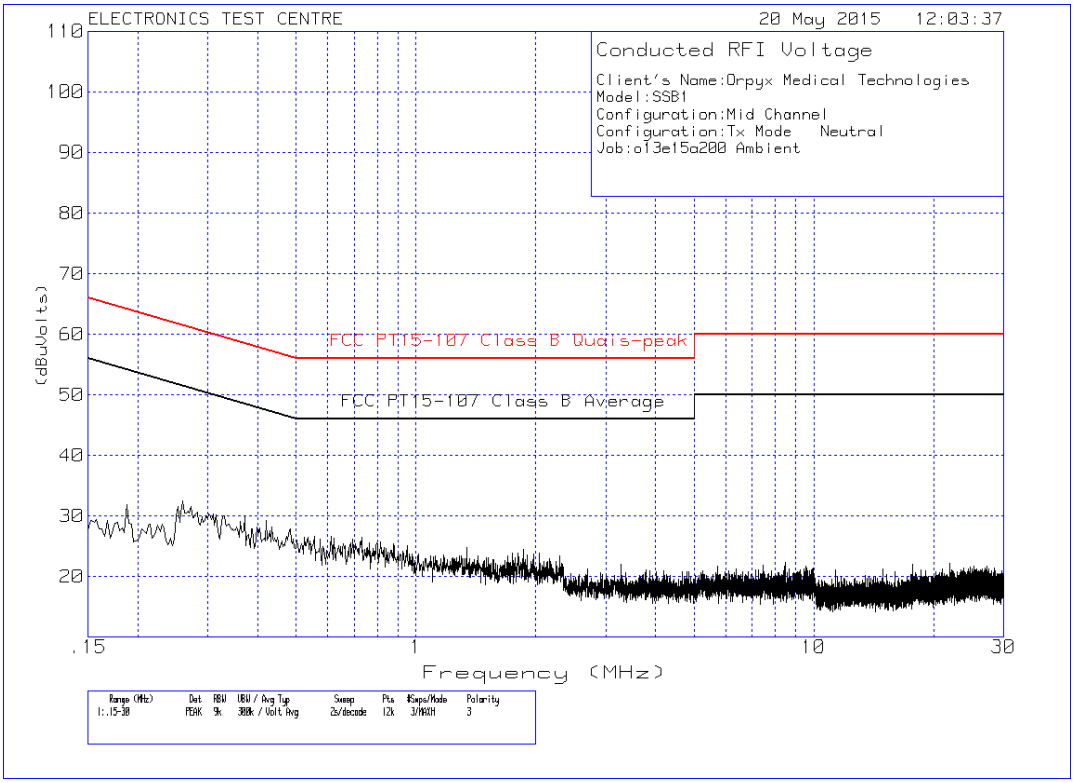
Plot of Conducted Emissions: Neutral



Plot of Test Chamber Ambient: (measurement noise floor): Line



Plot of Test Chamber Ambient: (measurement noise floor): Neutral



2.3 Channel Occupied Bandwidth

Test Lab: Electronics Test Centre, Airdrie	**EUT: LogR Shoe Pod**
Test Personnel: David Raynes	**Standard: FCC PART 15.247**
Test Method: TM-EMC 05	**Basic Standard: ANSI C63.10: 2009**
Date: 2015-05-12	

EUT status: Compliant

Specification: FCC Part 15.247(2)

Criteria: Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

2.3.1 Test Methodology: ANSI C63.10, Clause 6.9.1

This measurement is performed at low, mid and high frequencies, with modulation.

The RF output of EUT with an antenna connector is fed to the input of the spectrum analyzer through appropriate attenuation. If the EUT antenna is integral to the device, an antenna is placed to capture the transmitted signals.

The spectrum analyzer is set for a frequency span selected to clearly display the channel. The RBW is set ≥ 1% of the 20 dB BW. The Peak detector is used, with the trace set to Max Hold.

The automated 99% BW function of the spectrum analyzer is engaged, and the 6 dB OBW and/or the 20 dB OBW is measured with the x dB function.

2.3.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

2.3.3 Test Equipment

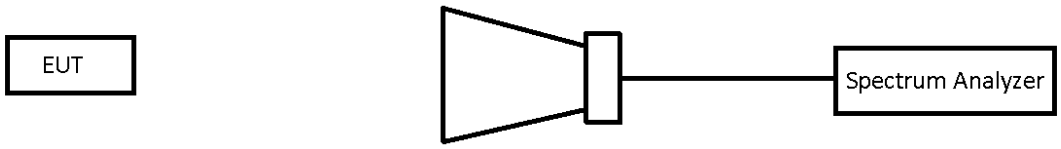
Testing was performed with this equipment:

Equipment	Manufacturer	Model #	Asset #	Calibration Due-Date
EMI receiver	Agilent	N9038A	6130	2015-06-17

2.3.4 Test Sample Verification, Configuration & Modifications

The EUT was set to transmit continuously on a selected channel with test-specific software. The output was modulated as in normal operation. The EUT met the requirements without modification.

EUT configuration for Occupied Bandwidth testing:

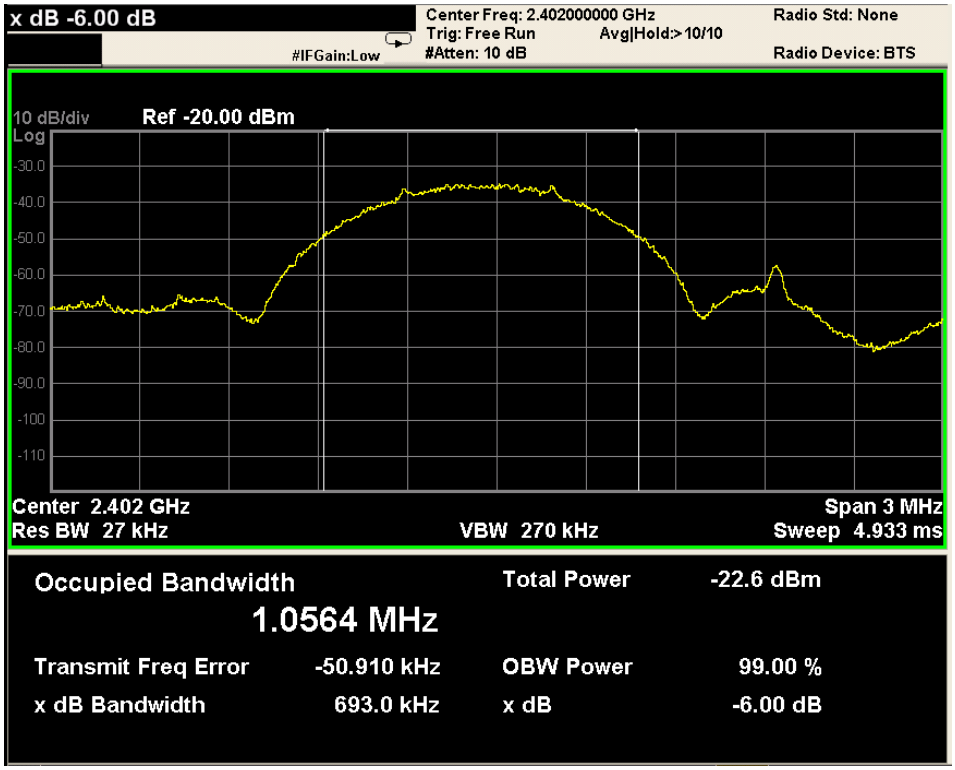


2.3.5 Channel Occupied Bandwidth Data:

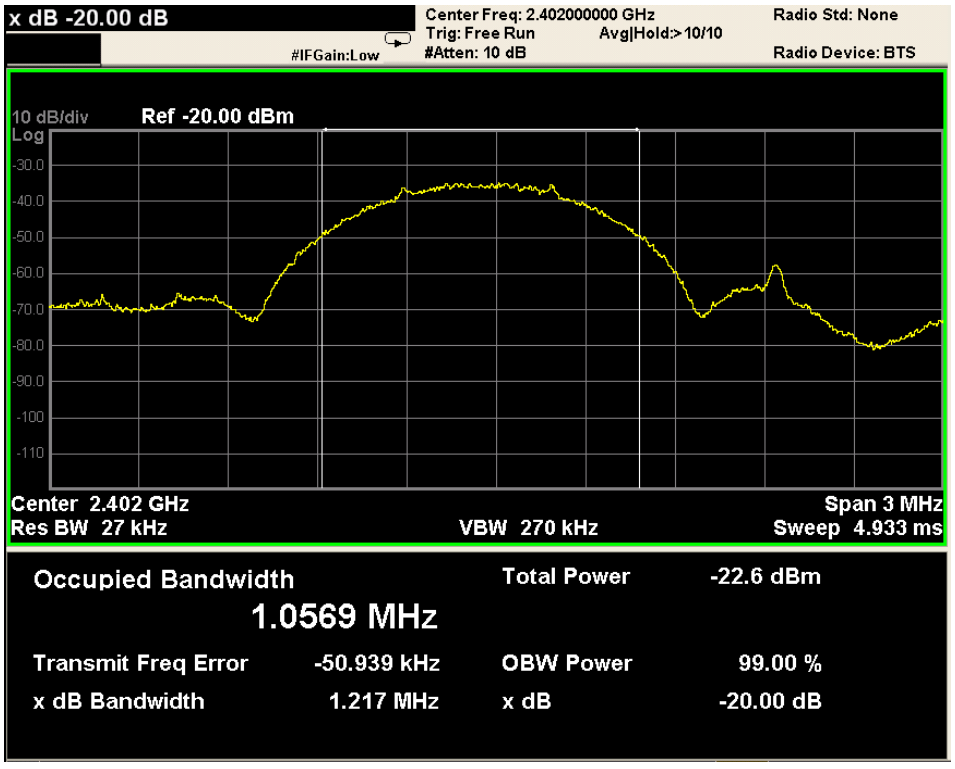
Freq. [MHz]	6 dB OBW [kHz]	20 dB OBW [MHz]	99% OBW [MHz]
2402	693	1.217	1.0569
2440	702	1.217	1.0890
2480	682	1.202	1.0379

Screen Captures from the spectrum analyzer:

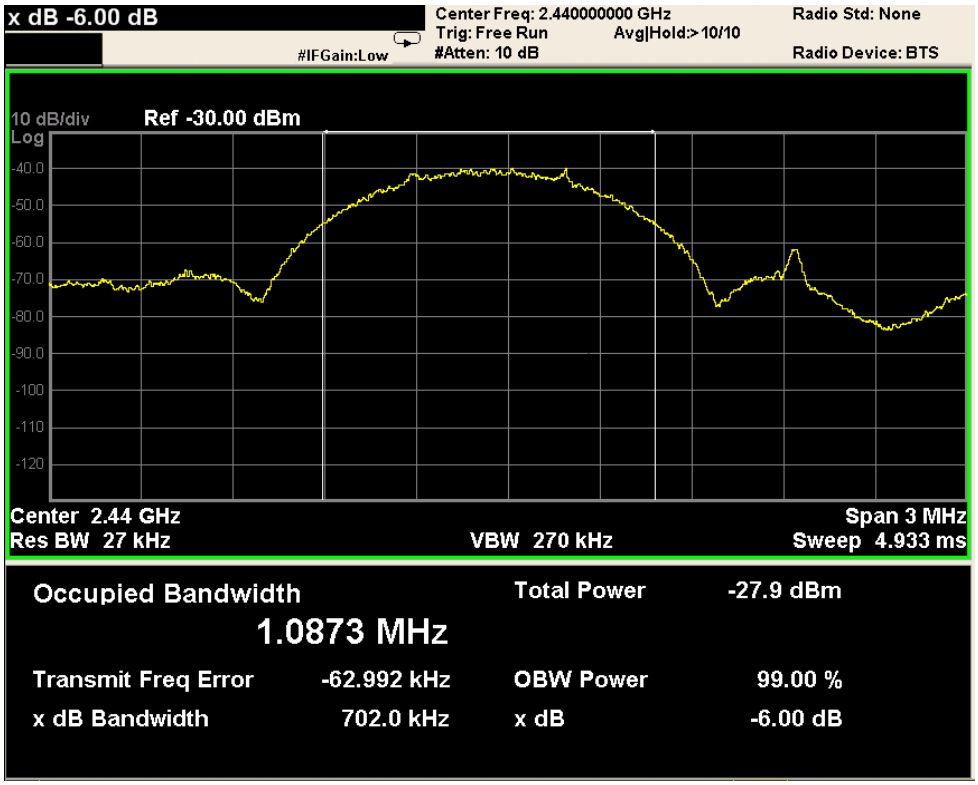
6 dB OBW, 2402 MHz:



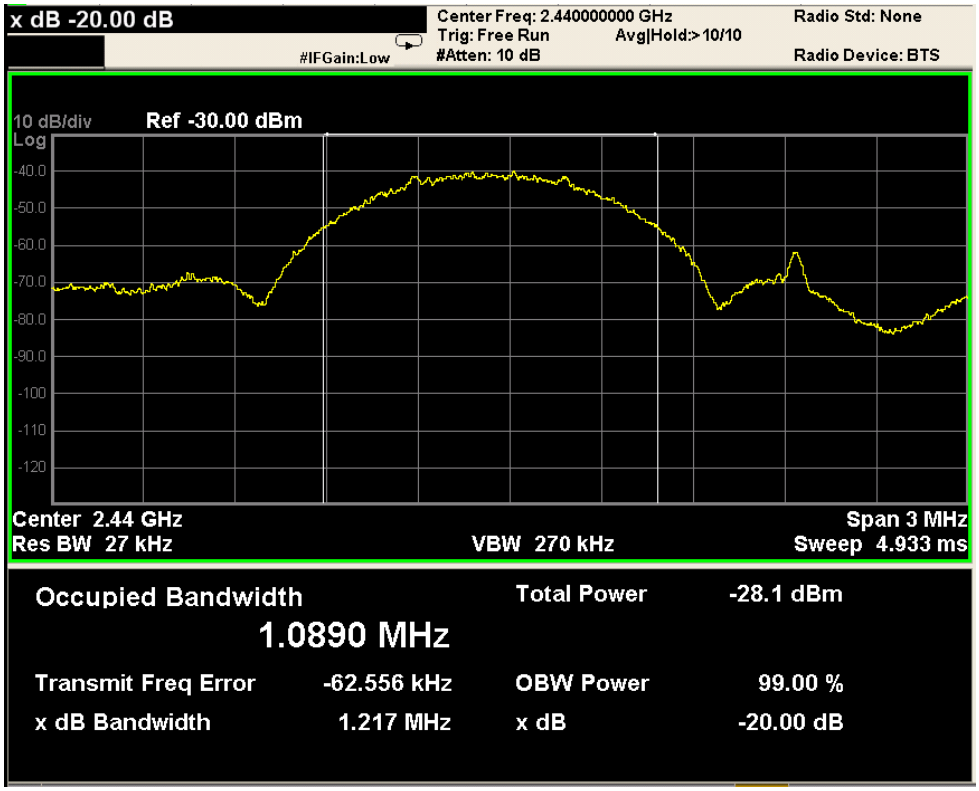
20 dB OBW, 2402 MHz:



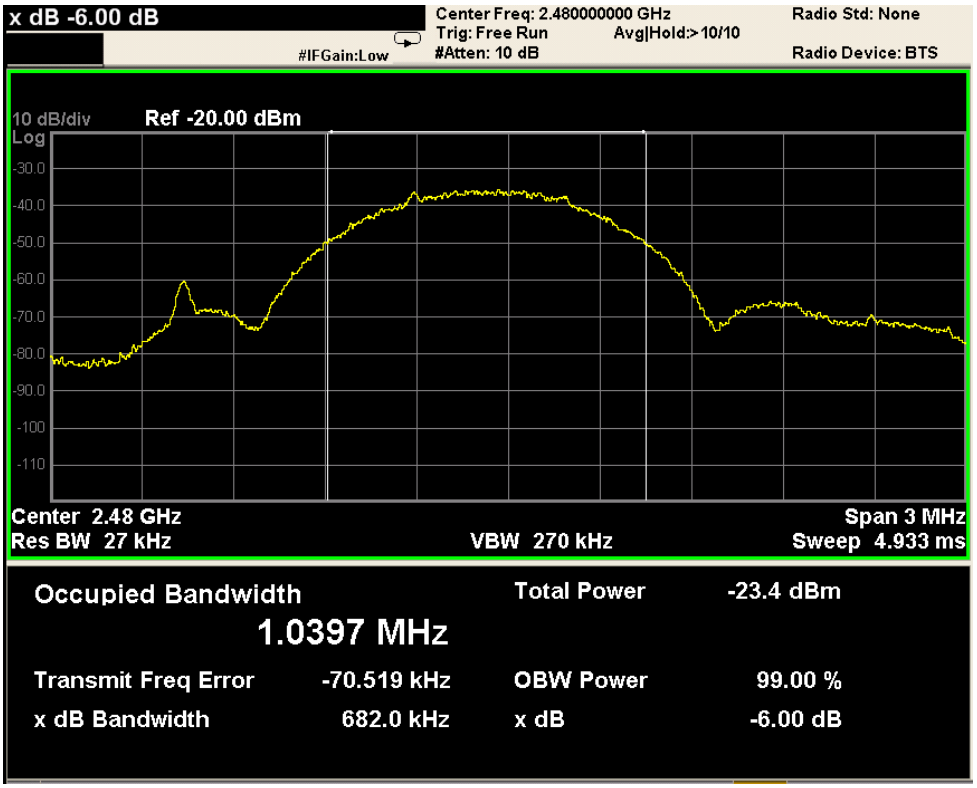
6 dB OBW, 2440 MHz:



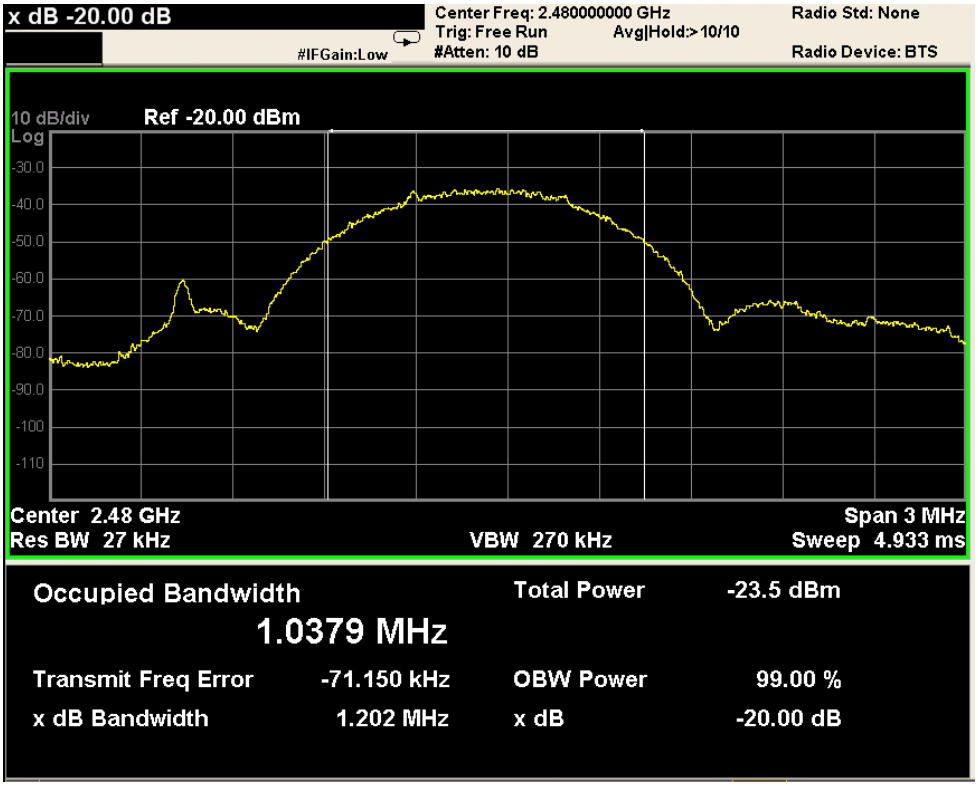
20 dB OBW, 2440 MHz:



6 dB OBW, 2480 MHz:



20 dB OBW, 2480 MHz:



2.4 Peak Output Power

Test Lab: Electronics Test Centre, Airdrie	**EUT: LogR Shoe Pod**
Test Personnel: David Raynes	**Standard: FCC PART 15.247**
Date: 2015-05-14 (20.9 °C, 28.3% RH)	**Basic Standard: ANSI C63.10: 2009**

EUT status: Compliant

Specification: FCC Part 15.247(b)(1)

Criteria	The maximum peak conducted output power of the intentional radiator shall not exceed the following: (1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

2.4.1 Test Methodology: ANSI C63.10-2009, Clause 7.10.3.8

This measurement is performed at low, mid and high frequencies, with modulation.

The RF output of EUT with an antenna connector is fed to the input of the spectrum analyzer through appropriate attenuation.

If the EUT antenna is integral to the device, the radiated output is measured. The output power is then calculated from the result.

The spectrum analyzer is set for a 5 MHz frequency span centered on a channel. The RBW and VBW are set to 3 MHz. The Peak detector is used, with the trace set to Max Hold.

2.4.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

2.4.3 Test Equipment

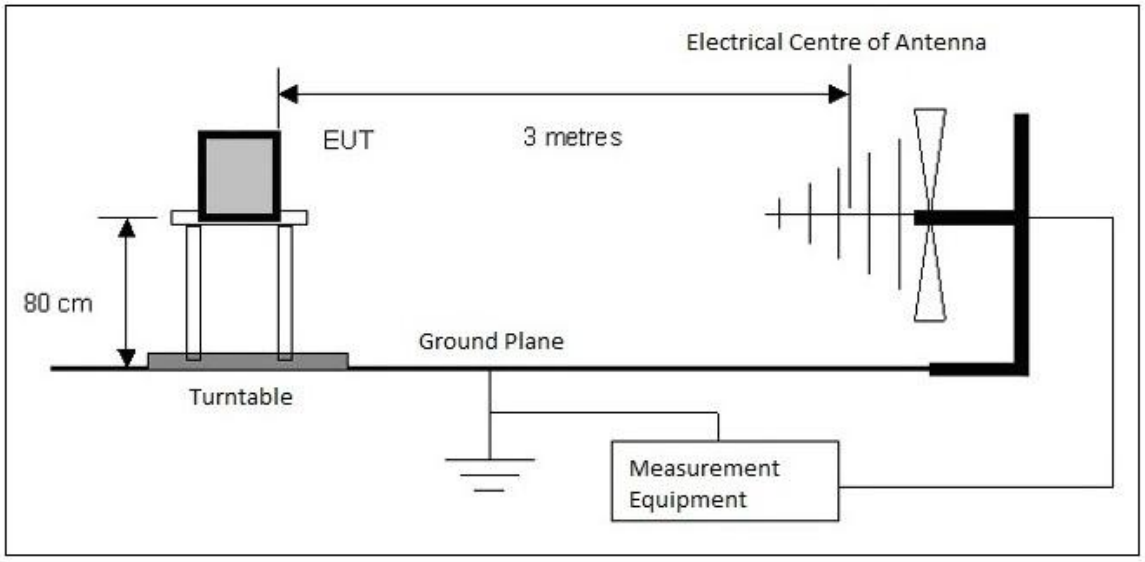
Testing was performed with this equipment:

Equipment	Manufacturer	Model #	Asset #	Calibration Due-Date
EMC Software	UL	Ver. 9.5	ETC-SW-EMC 2.1	N/A
EMI receiver	Agilent	N9038A	6130	2015-06-17
DRG Horn	EMCO (Tensor)	4105	9588	2017-02-19

2.4.4 Test Sample Verification, Configuration & Modifications

The EUT was set to a selected channel with test-specific software. The output was modulated as in normal operation. The EUT met the requirements without modification.

EUT configuration for Peak Power testing:



2.4.5 Peak Output Power Data

The EUT antenna is integral to the device. The EIRP was calculated from the radiated measurement.

Frequency (MHz)	EUT Peak Reading (dBµV/m)	EIRP (dBm)	Integral antenna Gain (dB)	Peak RF Output (dBm)	Peak RF Output (mW)
2402	98.53	3.23	3.3	-0.07	1.0
2440	98.24	2.94	3.3	-0.36	0.9
2480	97.12	1.82	3.3	-1.48	0.7

From ANSI C63.10, Clause 7.10.3.8, Determination of EIRP:

Equation (17): EIRP(dBm) = E(dBµV/m) - 95.3

Peak Output Power (dBm) = (EIRP - G)

98.53 - 95.3 - 3.3 = -0.07 dBm ⇒ **1.0 mW**

98.24 - 95.3 - 3.3 = -0.36 dBm ⇒ **0.9 mW**

97.12 - 95.3 - 3.3 = -1.48 dBm ⇒ **0.7 mW**

2.5 Power Spectral Density

Test Lab: Electronics Test Centre, Airdrie	**EUT: LogR Shoe Pod**
Test Personnel: David Raynes	**Standard: FCC PART 15.247**
Date: 2015-06-08 (24.9 °C, 35.0% RH)	**Basic Standard: ANSI C63.10: 2009**

EUT status: Compliant

Specification: FCC Part 15.247(e)

Criteria	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

2.5.1 Test Methodology: FCC KDB 558074 D01 DTS Meas Guidance v03r02

This measurement is performed at low, mid and high frequencies, in continuous transmission, with modulation.

The RF output of EUT with an antenna connector is fed to the input of the spectrum analyzer through appropriate attenuation.

If the EUT antenna is integral to the device, the radiated output is measured. The output power spectral density is then calculated from the result.

The spectrum analyzer is set for a 1.5 MHz frequency span centered on a channel. The RBW is set to 3 kHz and VBW is set to 10 kHz. The Peak detector is used, with the trace set to Max Hold. The marker is placed on the highest peak of the resulting trace.

2.5.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

2.5.3 Test Equipment

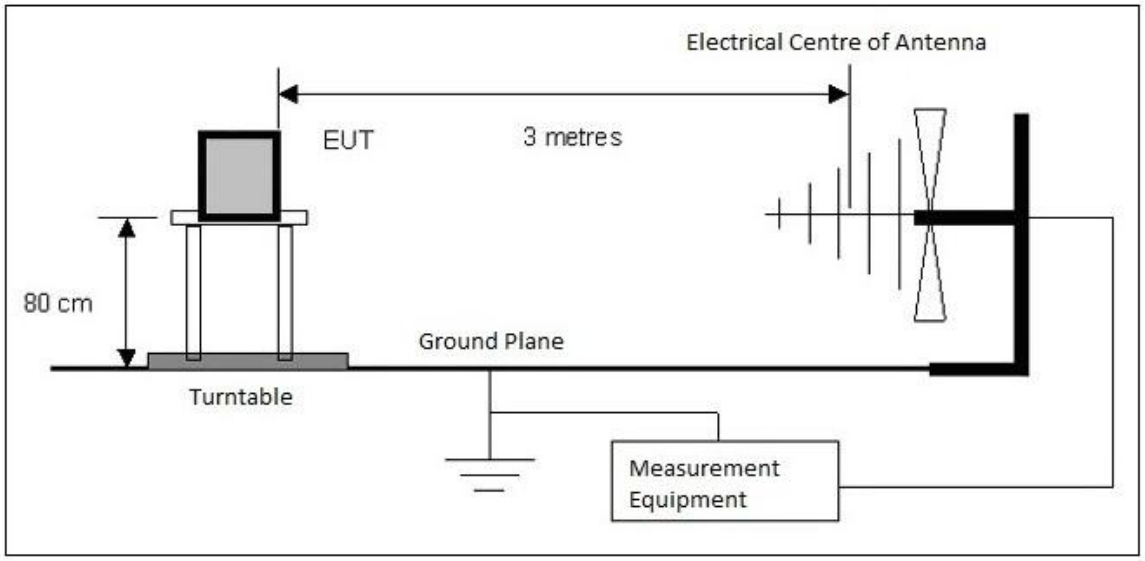
Testing was performed with this equipment:

Equipment	Manufacturer	Model #	Asset #	Calibration Due-Date
EMC Software	UL	Ver. 9.5	ETC-SW-EMC 2.1	N/A
EMI receiver	Agilent	N9038A	6130	2015-06-17
DRG Horn	EMCO (Tensor)	4105	9588	2017-02-19

2.5.4 Test Sample Verification, Configuration & Modifications

The EUT was set to transmit continuously on a selected channel with test-specific software. The output was modulated as in normal operation. The EUT met the requirements without modification.

EUT configuration for Power Spectral Density testing:



2.5.5 Peak PSD Data

The EUT antenna is integral to the device. The EIRP was calculated from the radiated measurement.

Frequency (MHz)	SA Peak (dBµV)	AF (dB/m)	Cable Loss (dB)	Peak Field Strength (dBµV/m)	EIRP (dBm)	Integral antenna Gain (dB)	Peak PSD (dBm)	Limit (dBm)	**Margin (dB)** [PSD – Limit]
2402	43.18	29.5	12.57	85.25	-10.05	3.3	-13.35	8	**-21.35**
2440	42.09	29.5	12.97	84.56	-10.74	3.3	-14.04	8	**-22.04**
2480	41.24	29.5	12.51	83.25	-12.05	3.3	-15.35	8	**-23.35**

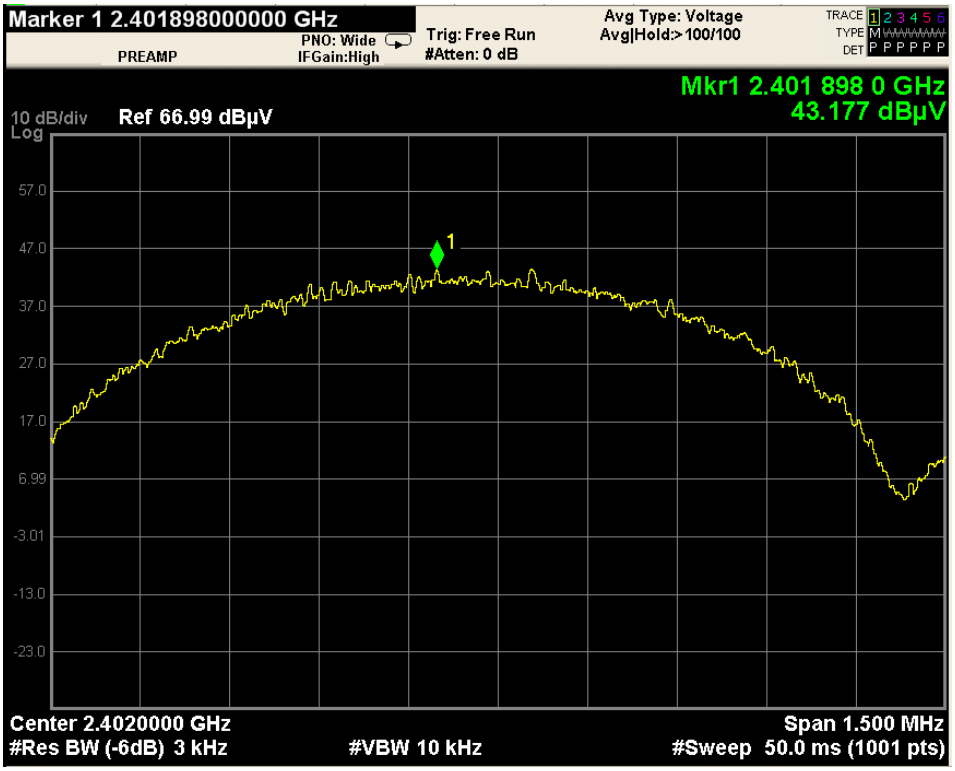
From ANSI C63.10, Clause 7.10.3.8, Determination of EIRP:

Equation (17): EIRP(dBm) = E(dBµV/m) - 95.3

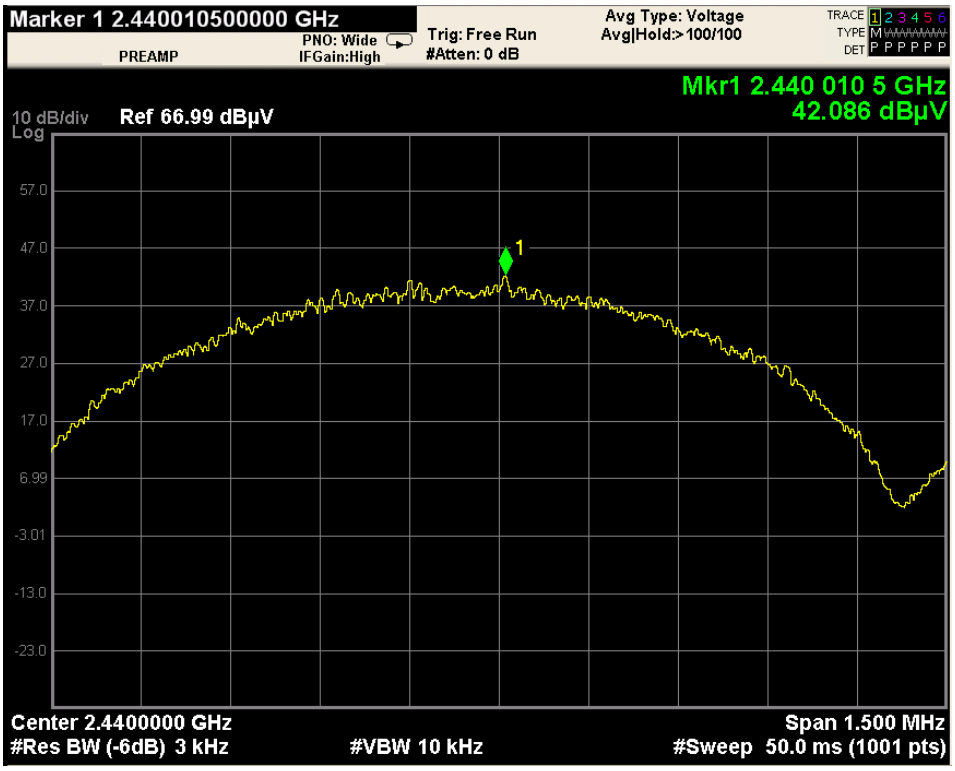
Peak Output Power (dBm) = (EIRP - G)

Screen Captures from the spectrum analyzer:

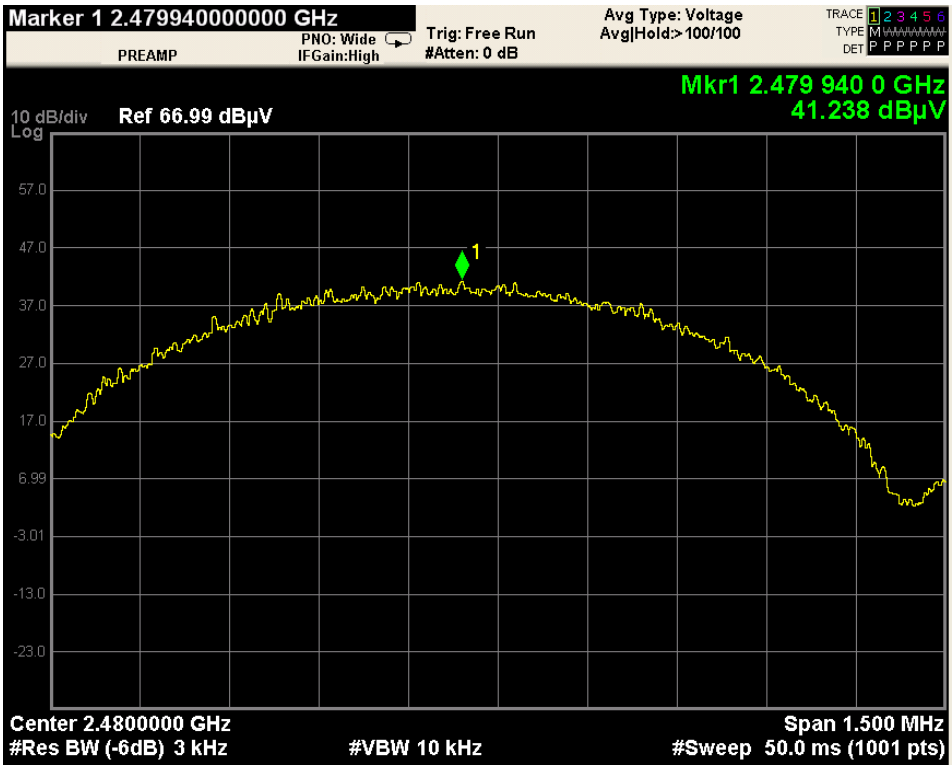
2402 MHz:



2440 MHz:



2480 MHz:


Marker 1 2.479940000000 GHz
PREAMP
PNO: Wide
IFGain:High
Trig: Free Run
#Atten: 0 dB
Avg Type: Voltage
Avg|Hold:>100/100
TRACE 1 2 3 4 5 6
TYPE M
DET P P P P P P
Mkr1 2.479 940 0 GHz
41.238 dBµV
10 dB/div
Log
Ref 66.99 dBµV
57.0
47.0
37.0
27.0
17.0
6.99
-3.01
-13.0
-23.0
1
Center 2.4800000 GHz
#Res BW (-6dB) 3 kHz
#VBW 10 kHz
Span 1.500 MHz
#Sweep 50.0 ms (1001 pts)

2.6 Band Edge

Test Lab: Electronics Test Centre, Airdrie	**EUT: LogR Shoe Pod**
Test Personnel: David Raynes	**Standard: FCC PART 15.247**
Test Method: TM-EMC 08	**Basic Standard: ANSI C63.10: 2009**
Date: 2015-05-12	

EUT status: Compliant

Specification: FCC Part 15.247(d)

Criteria: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

2.6.1 Test Methodology: ANSI C63.10, Clause 7.7.9

This measurement is performed at the low and high frequencies, with modulation.

The RF output of EUT with an antenna connector is fed to the input of the spectrum analyzer through appropriate attenuation. If the EUT antenna is integral to the device, the radiated output is measured.

The spectrum analyzer is set for a frequency span to show the band edge and the nearest channel. The RBW is set to ≥ 100 kHz. The VBW is set to ≥ RBW * 3. The Peak detector is used, with the trace set to Max Hold.

2.6.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

2.6.3 Test Equipment

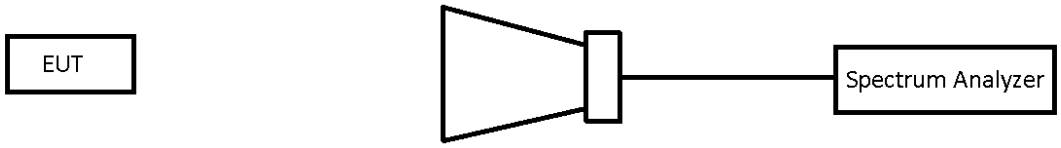
Testing was performed with this equipment:

Equipment	Manufacturer	Model #	Asset #	Calibration Due-Date
EMI receiver	Agilent	N9038A	6130	2015-06-17

2.6.4 Test Sample Verification, Configuration & Modifications

The EUT was operating normally, in communication with an iPod. The EUT met the requirements without modification.

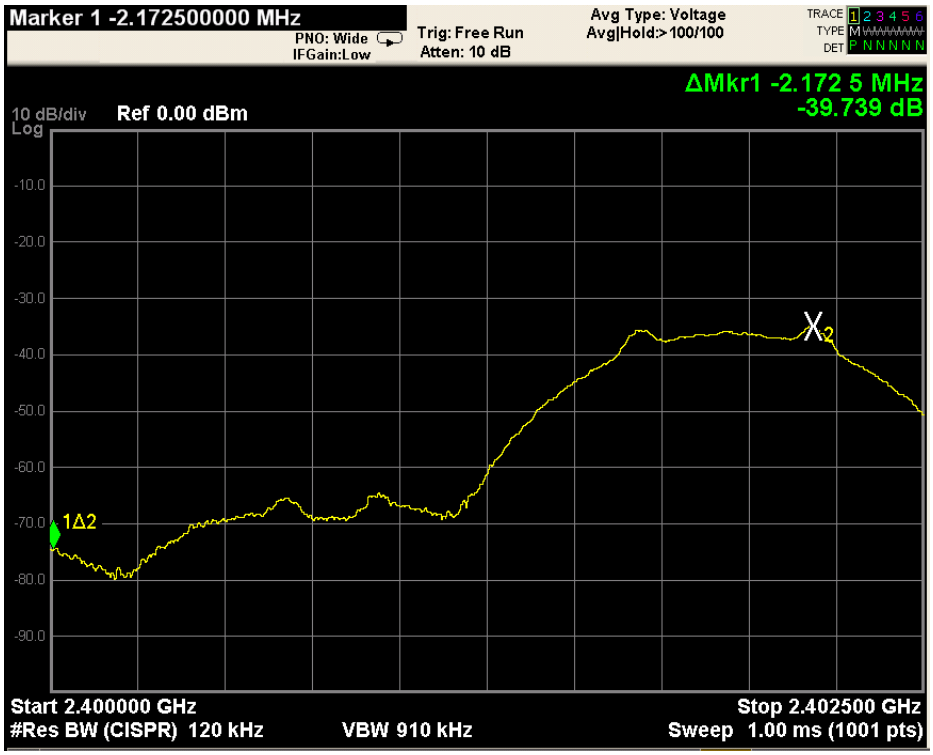
EUT configuration for Band Edge testing:



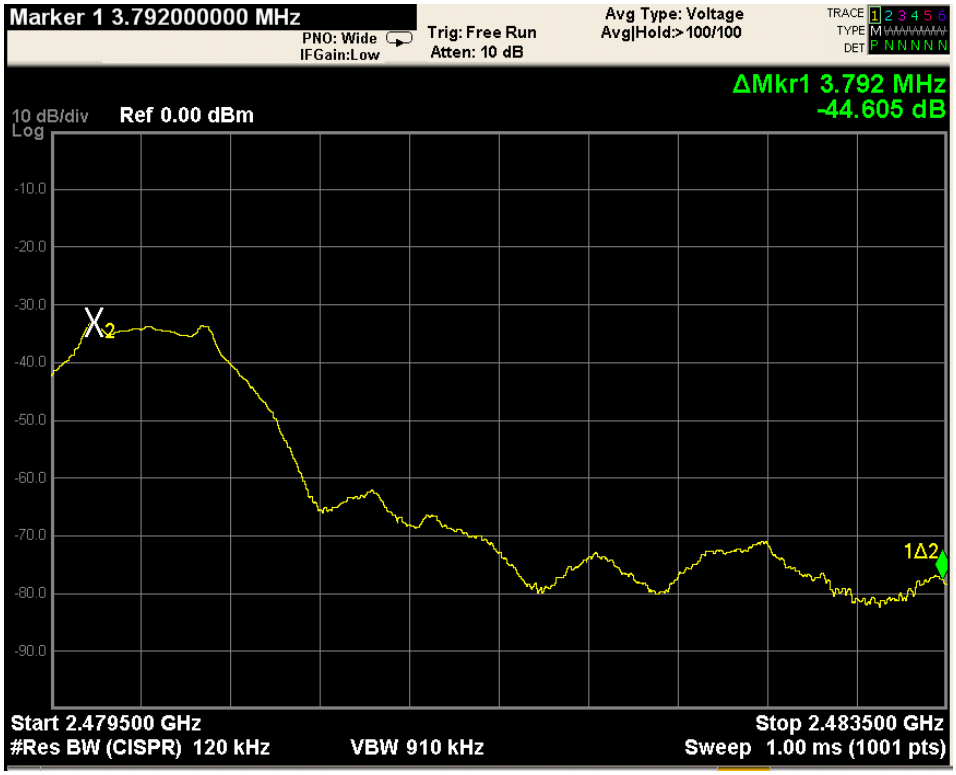
2.6.5 Band Edge Data

Channel	Attenuation at Band Edge
2402 MHz	39.8 dB
2480 MHz	44.6 dB

Screen Capture from the spectrum analyzer: Lower Band Edge



Screen Capture from the spectrum analyzer: Upper Band Edge



2.7 Conducted Spurious Emissions

Test Lab: Electronics Test Centre, Airdrie	**EUT: LogR Shoe Pod**
Test Personnel:	**Standard: FCC PART 15.247**
Test Method:	**Basic Standard: ANSI C63.10: 2009**
Date:	

EUT status: Not Applicable

Not Applicable: The EUT antenna is integral to the device, with no means of direct connection to the RF output. See Radiated Spurious Emissions.

2.8 RF Exposure

Test Lab: Electronics Test Centre, Airdrie	**EUT: LogR Shoe Pod**
Test Personnel:	**Standard: FCC PART 15.247**
Test Method:	
Date:	

EUT status: Compliant

Compliant: Environmental Assessment provided in a separate Exhibit.

2.9 EUT Positioning Assessment

Test Lab: Electronics Test Centre, Airdrie	**EUT: LogR Shoe Pod**
Test Personnel: David Raynes	**Standard: FCC PART 15.247**
Date: 2015-04-27 (19.8° C, 25.6% RH)	**Basic Standard: ANSI C63.4-2009**

EUT status: Upright position selected

Specification: ANSI C63.4-2009, Clause 6.3.1

Portable, small, lightweight, or modular devices that may be handheld, worn on the body, or placed on a table during operation shall be positioned on a nonconducting platform, the top of which is 80 cm above the reference ground plane. The preferred area occupied by the EUT arrangement is 1 m by 1.5 m, but it may be larger or smaller to accommodate various sized EUTs (see Figure 6, Figure 7, and Figure 9). For testing purposes, ceiling- and wall-mounted devices also shall be positioned on a tabletop (see also 6.3.4 and 6.3.5). In making any tests involving handheld, body-worn, or ceiling-mounted equipment, it is essential to recognize that the measured levels may be dependent on the orientation (attitude) of the three orthogonal axes of the EUT. Thus, exploratory tests as specified in 8.3.1 shall be carried out for various axes orientations to determine the attitude having maximum or near-maximum emission level.

2.9.1 Test Methodology:

The EUT is set to a selected channel with test-specific software. The output is modulated as in normal operation.

The EUT is rotated in azimuth over 360 degrees to find the direction of maximum emission. Antenna height is varied from 1 – 4 meters at this azimuth to obtain the maximum emission. Then the maximum level is measured with the Peak detector and recorded.

This process is repeated for all three orthogonal axes of the EUT, in both polarizations.

2.9.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

2.9.3 Uncertainty of Measurement:

The factors contributing to uncertainty of measurement are identified and calculated in accordance with UKAS (United Kingdom Accreditation Service) document “Lab 34, The Expression of Uncertainty in EMC Testing, Aug 2002.” as based on the “ISO Guide to the Expression of Uncertainty in Measurement, 1995.”

This uncertainty estimate represents an expended uncertainty expressed at approximately 95% confidence using a coverage factor of k = 2.

Test Method	Frequency	Uncertainty
Radiated Emissions Level	1 GHz – 26.5 GHz	±5.31 dB

2.9.4 Test Equipment

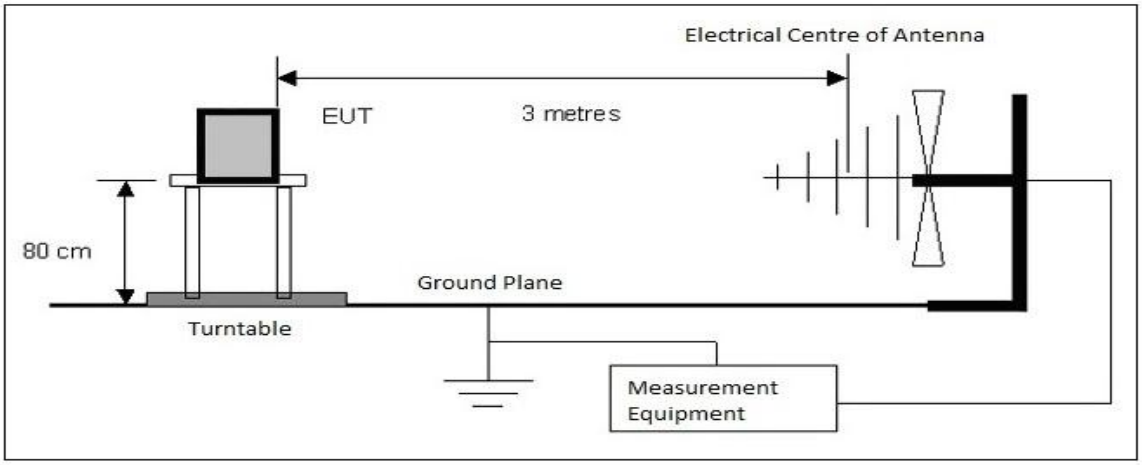
Testing was performed with this equipment:

Equipment	Manufacturer	Model #	Asset #	Calibration Due-Date
EMC Software	UL	Ver. 9.5	ETC-SW-EMC 2.1	N/A
EMI receiver	Agilent	N9038A	6130	2015-06-17
DRG Horn	EMCO (Tensor)	4105	9588	2017-02-19

2.9.5 Test Sample Verification, Configuration & Modifications

The EUT was set to a selected channel with test-specific software. The output was modulated as in normal operation. The EUT was not modified.

EUT configuration for EUT Positioning:



2.9.6 Peak Radiated Emissions Data:

The emissions data are presented in tabular form, showing turntable azimuth, antenna height and polarization, and the uncorrected spectrum analyzer reading.

EUT Position	f [MHz]	SA Reading [dBuV]	Azimuth [deg]	Antenna Height [cm]	Polarization
Upright	2440	55.612	62	140	Horizontal
Upright	2440	56.842	64	122	Vertical
Flat	2440	49.598	238	198	Horizontal
Flat	2440	50.149	76	178	Vertical
On Edge	2440	50.571	350	141	Horizontal
On Edge	2440	51.884	132	107	Vertical

2.10 Radiated Spurious Emissions

Test Lab: Electronics Test Centre, Airdrie	**EUT: LogR Shoe Pod**
Test Personnel: David Raynes	**Standard: FCC PART 15.247**
Test Method: TM-EMC 10	**Basic Standard: ANSI C63.10: 2009**
Date: 2015-04-27 (19.8° C, 25.6% RH) **2015-04-28 (21.0° C, 24.6% RH)** **2015-04-29 (21.2° C, 21.6% RH)** **2015-06-05 (25.3° C, 35.9% RH)**	

EUT status: Compliant

Specification: FCC PART 15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Restricted Bands of Operation:

MHz	MHz	MHz	MHz	MHz	GHz	GHz
0.0900000 – 0.1100000	8.2910000 - 8.2940000	16.804250 - 16.804750	162.01250 - 167.17000 *	1660.0000 – 1710.0000	3.6000000 – 4.4000000	14.470000 – 14.500000
0.4950000 - 0.5050000 *	8.3620000 - 8.3660000	25.500000 - 25.670000	167.72000 - 173.20000 *	1718.8000 – 1722.2000	4.5000000 – 5.1500000	15.350000 – 16.200000
2.1735000 - 2.1905000	8.3762500 - 8.3867500	37.500000 - 38.250000	240.00000 – 285.00000	2200.0000 – 2300.0000	5.3500000 – 5.4600000	17.700000 – 21.400000
4.1250000 - 4.1280000	8.4142500 - 8.4147500	73.000000 - 74.600000	322.00000 - 335.40000	2310.0000 – 2390.0000	7.2500000 – 7.7500000	22.010000 – 23.120000
4.1772500 - 4.1777500	12.290000 - 12.293000	74.800000 - 75.200000	399.90000 – 410.00000	2483.5000 – 2500.0000 *	8.0250000 – 8.5000000	23.600000 – 24.000000
4.2072500 - 4.2077500	12.519750 - 12.520250	108.00000 - 121.94000 **	608.00000 – 614.00000	2655.0000 – 2900.0000	9.0000000 – 9.2000000	31.200000 – 31.800000
5.6770000 - 5.6830000	12.576750 - 12.577250	123.00000 - 138.00000 **	960.00000 – 1240.0000 ***	3260..0000 – 3267.0000	9.3000000 – 9.5000000	36.430000 – 36.500000
6.2150000 - 6.2180000	13.360000 - 13.410000	149.90000 - 150.05000 *	1300.0000 – 1427.0000 ***	3332.0000 – 3339.0000	10.600000 – 12.700000	Above 38.600000
6.2677500 - 6.2682500	16.420000 - 16.423000	156.52475- 156.52525	1435.0000 – 1626.5000	3345.8000 – 3358.0000	13.250000 – 13.400000	
6.3117500 - 6.3122500	16.694750 - 16.695250	156.70000 - 156.90000	1645.5000 – 1646.5000	3500.0000 – 3600.0000 ****		

* US only ** Canada 108 – 138 MHz *** Canada 960 – 1427 MHz **** Canada only

2.10.1 Test Methodology: ANSI C63.10, Clause 6.6.4

From 9kHz to 150 kHz (resolution bandwidth of 200 Hz) and from 150 kHz to 30 Mhz (resolution bandwidth 9 kHz) measurements are performed with a loop antenna (as per KDB 460108).

From 30 MHz to 1000 MHz, measurements are performed with a broadband biconilog antenna and a resolution bandwidth of 120 kHz.

Above 1000 MHz, measurements are performed with a DRG Horn antenna or a Standard Gain horn, and a resolution bandwidth of 1 MHz.

The scan is performed at discreet increments of turntable azimuth and antenna height, which are selected in accordance with the applicable standard in order to assure capture of frequencies of interest. Optimization is performed based on the scan data.

All frequencies having peak emissions within 10dB of the limits are optimized. The EUT is rotated in azimuth over 360 degrees and the direction of maximum emission is noted.

Antenna height is varied from 1 – 4 meters at this azimuth to obtain the maximum emission. Then the maximum level is measured with the appropriate detector and recorded. Up to 1 GHz, measurements are performed with a Quasi-Peak detector. Above 1 GHz, measurements are recorded with Peak and/or Average detectors, as applicable.

Note: The EUT was assessed for worst-case orientation. All radiated testing was performed with this orientation, as shown in the test setup photos.

2.10.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

2.10.3 Uncertainty of Measurement:

The factors contributing to uncertainty of measurement are identified and calculated in accordance with UKAS (United Kingdom Accreditation Service) document “Lab 34, The Expression of Uncertainty in EMC Testing, Aug 2002.” as based on the “ISO Guide to the Expression of Uncertainty in Measurement, 1995.”

This uncertainty estimate represents an expended uncertainty expressed at approximately 95% confidence using a coverage factor of k = 2.

Test Method	Frequency	Uncertainty
Radiated Emissions Level	30 MHz – 1 GHz	±4.6 dB
Radiated Emissions Level	1 GHz – 26.5 GHz	±5.31 dB

2.10.4 Test Equipment

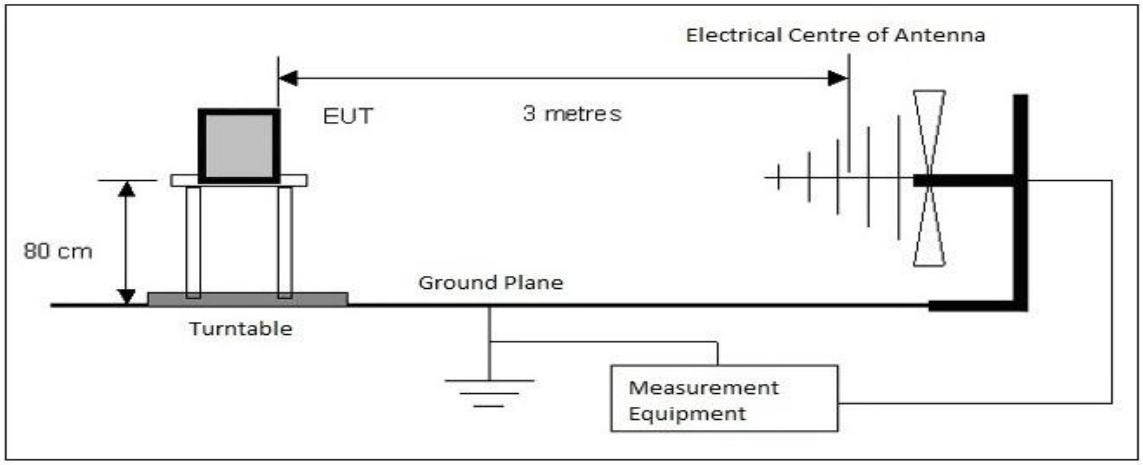
Testing was performed with this equipment:

Equipment	Manufacturer	Model #	Asset #	Calibration Due-Date
EMC Software	UL	Ver. 9.5	ETC-SW-EMC 2.1	N/A
EMI receiver	Agilent	N9038A	6130	2015-06-17
Loop Antenna	EMCO	6502	10868	2017-04-10
Biconilog Antenna	ARA	LPB-2520/A	4318	2017-02-20
DRG Horn	EMCO (Tensor)	4105	9588	2017-02-19
Low Noise Amplifier (1 – 18 GHz)	MITEQ	JS43-01001800-21-5P	4354	Monitored
Standard Gain Horn 18 – 26.5 GHz	QuinStar	QWH-KPRS-00	6163	2016-08-27

2.10.5 Test Sample Verification, Configuration & Modifications

The EUT was set to a selected channel with test-specific software. The output was modulated as in normal operation. The EUT met the requirements without modification.

EUT configuration for Radiated Spurious Emissions testing:



2.10.6 Radiated Emissions Data:

The emissions data are presented in tabular form, showing turntable azimuth, antenna height and polarization, the uncorrected spectrum analyzer reading, the correction factors applied, the net result, the value of the limit at the frequency investigated, and the Delta between the result and the limit.

Meter Reading in dBμV + Antenna Factor in dB/m + Gain/Loss Factor in dB = Corrected Field Strength in dbμV/m.

Delta = Field Strength - Limit

Notes:

- When a preamp is used, the resulting gain is compensated, producing a negative value for the Cable Loss.
- Measurements reported are the result of adjusting the turntable azimuth and antenna height to obtain the maximum EUT emission. This may produce a different reading than the plot trace. The plot is a Peak Hold function obtained at discreet increments of height and azimuth, while the reported measurement is obtained with the appropriate Quasi Peak or Average detector after the height and azimuth have been adjusted for maximum emission.
- Preliminary scans were performed for all channels in both Receive and Transmit modes. The midband channel (2440 MHz) was selected as the worst-case condition for detailed examination.
- In Receive mode, the EUT was assessed up to 12.5 GHz.
- In Transmit mode, the EUT was assessed up to 26.5 GHz. To prevent LNA saturation, a band-reject filter was used to block frequencies between 2.4 GHz and 2.5 GHz. Above 10 GHz, in Transmit mode, preliminary scanning of the EUT was performed at a distance of 50 cm with the RBW set at 300 kHz. There were no emissions.
- The USB cable was not included in the setup, because this is only used for recharging the internal battery. No data is carried on this cable except during initial setup at the factory.
- Pursuant to Part 15.31(o), emissions that are more than 20 dB below the applicable limit are not reported.

Negative values for Delta indicate compliance.

Receive Mode, 2440 MHz:

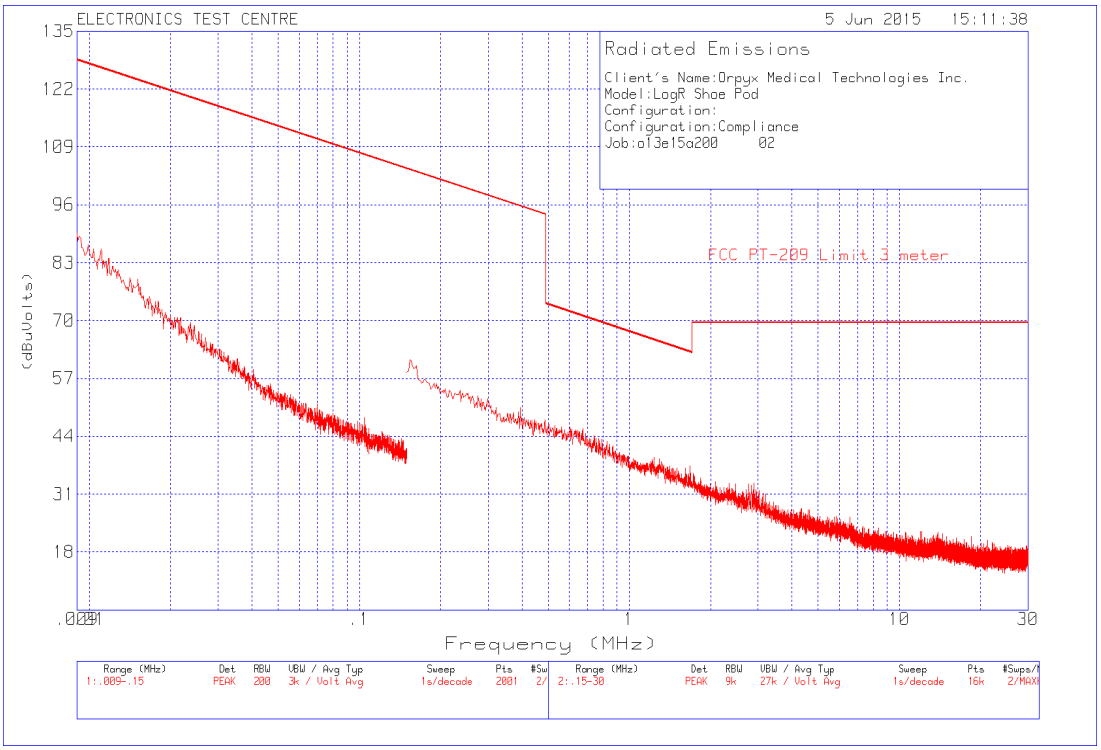
Freq. Marker	Freq. [MHz]	Raw reading [dBμv]	Det	Antenna Factor [dB/m]	Cable Loss [dB]	Corrected Reading [dBμv/m]	FCC 15.109 Limit [dBμv/m]	Delta [dB]	Azimuth [Deg]	Height [cm]	Polarization
1	2434.1	40.32	Av	29.5	-47.7	22.12	53.98	**-31.86**	224	315	Vertical
2	2434.1	46.27	Pk	29.5	-47.7	28.07	73.98	**-45.91**	224	315	Vertical

Transmit Mode, 2440 MHz:

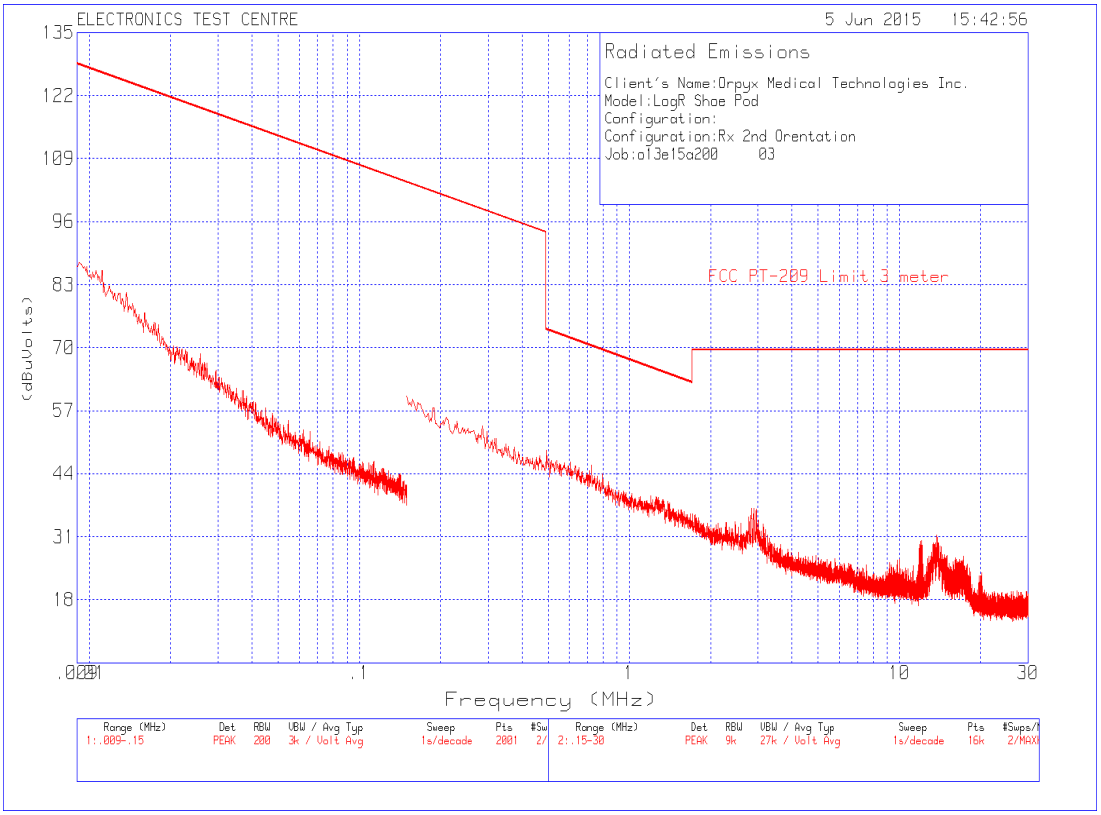
Freq. Marker	Freq. [MHz]	Raw reading [dBµv]	Det	Antenna Factor [dB/m]	Cable Loss [dB]	Corrected Reading [dBµv/m]	FCC 15.209 Limit [dBµv/m]	Delta [dB]	Azimuth [Deg]	Height [cm]	Polarization
1	351.68	3.33	QP	15	4.2	22.53	43.52	**-20.99**	56	388	Horizontal
1	4879.4*	43.74	Av	34	-40.8	36.94	53.98	**-17.04**	296	100	Horizontal
1	4879.4*	52.72	Pk	34	-40.8	45.92	73.98	**-28.06**	296	100	Horizontal
2	7224.0	29.14	Av	37.9	-35.3	31.74	53.98	**-22.24**	346	388	Horizontal
2	7224.0	32.27	Pk	37.9	-35.3	34.87	73.98	**-39.11**	346	388	Horizontal

*** Restricted Band**

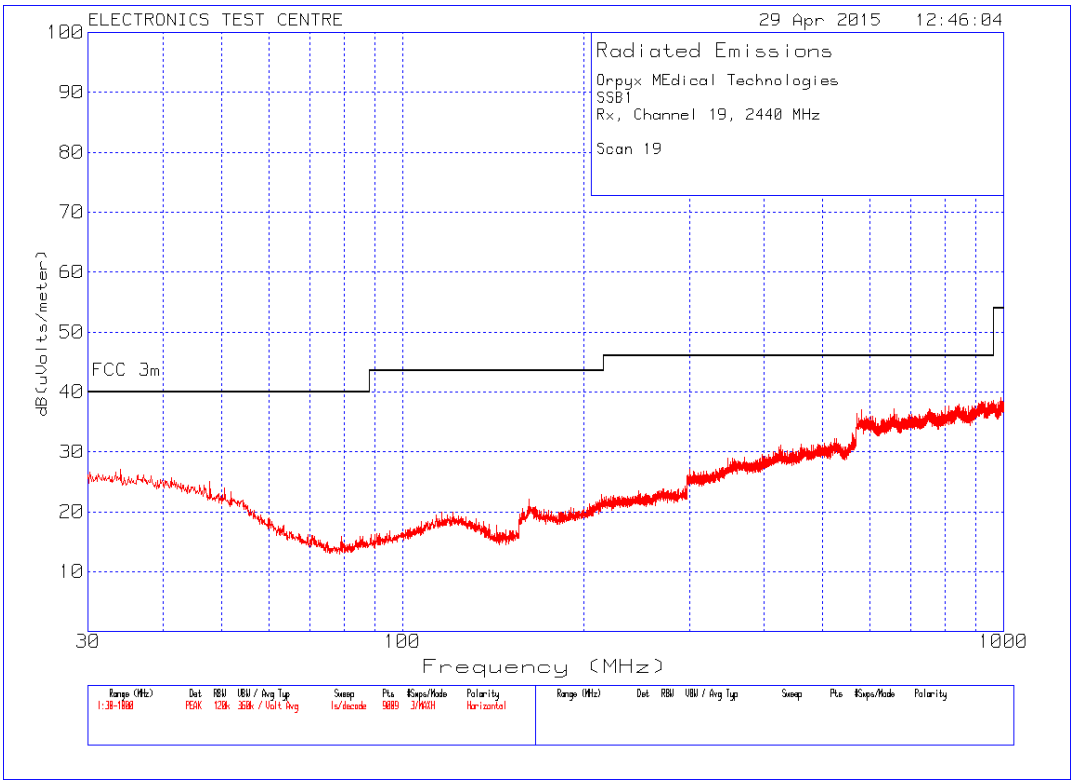
Plot of Radiated Emissions: Measuring Antenna 1st Orientation



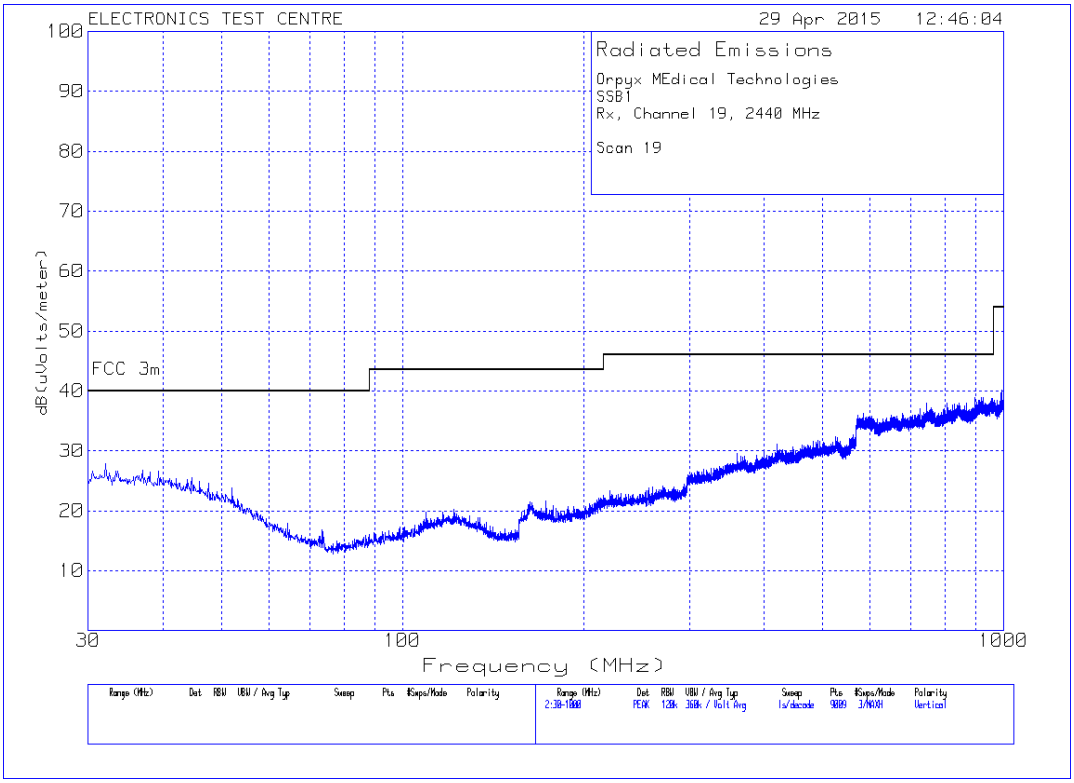
Plot of Radiated Emissions: Measuring Antenna 2nd Orientation



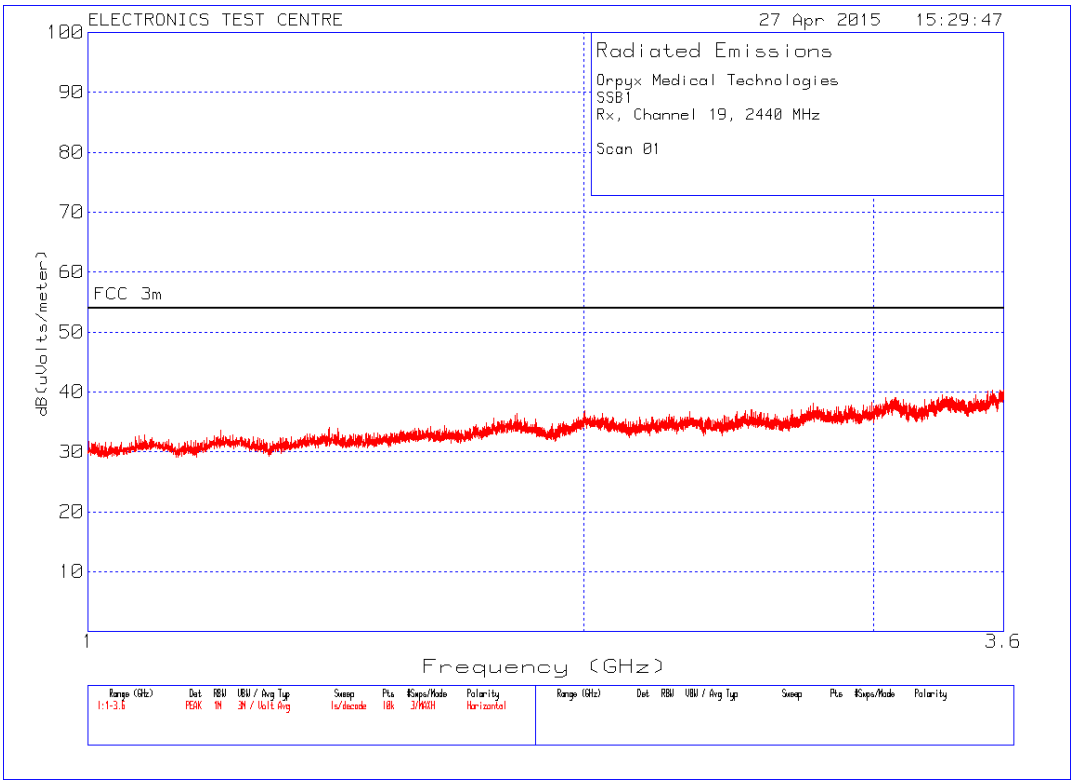
Plot of Radiated Emissions: Horizontal polarization



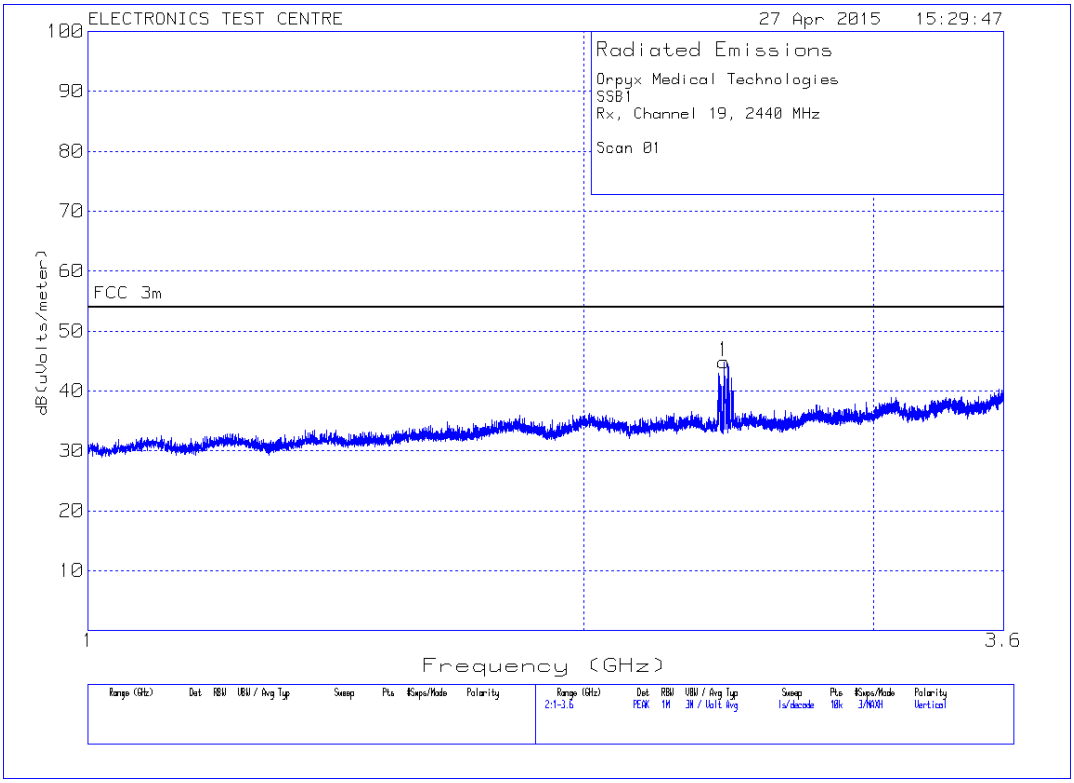
Plot of Radiated Emissions: Vertical polarization



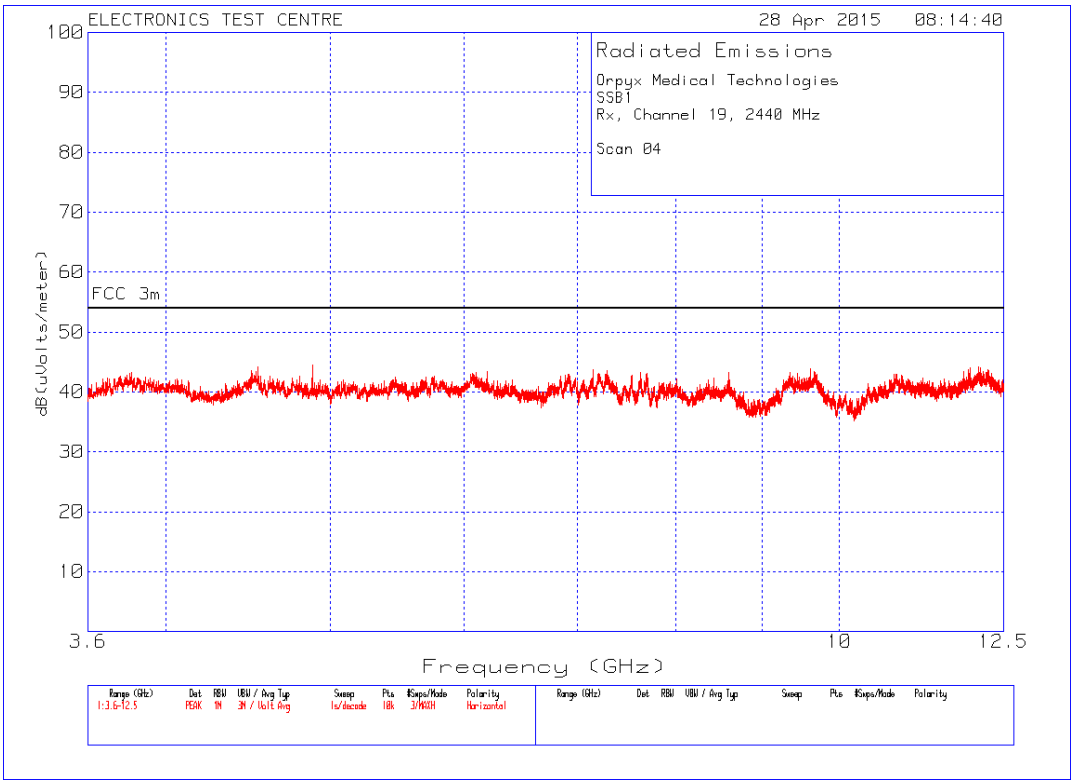
Plot of Radiated Emissions: Horizontal polarization



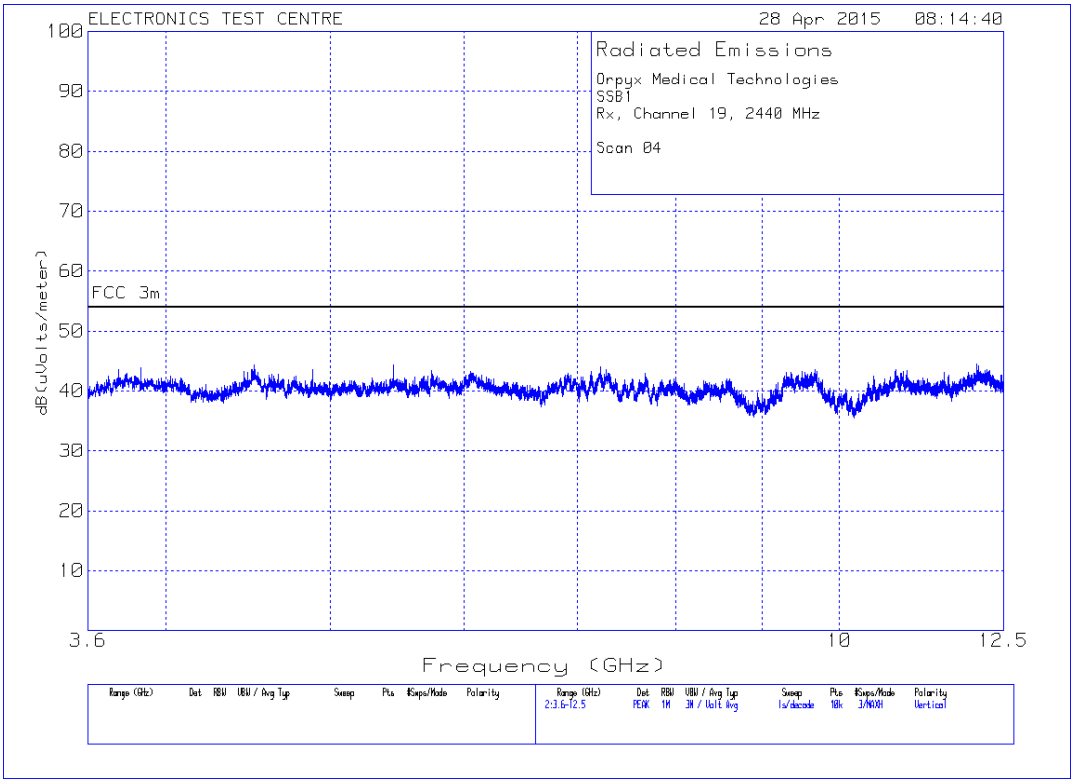
Plot of Radiated Emissions: Vertical polarization



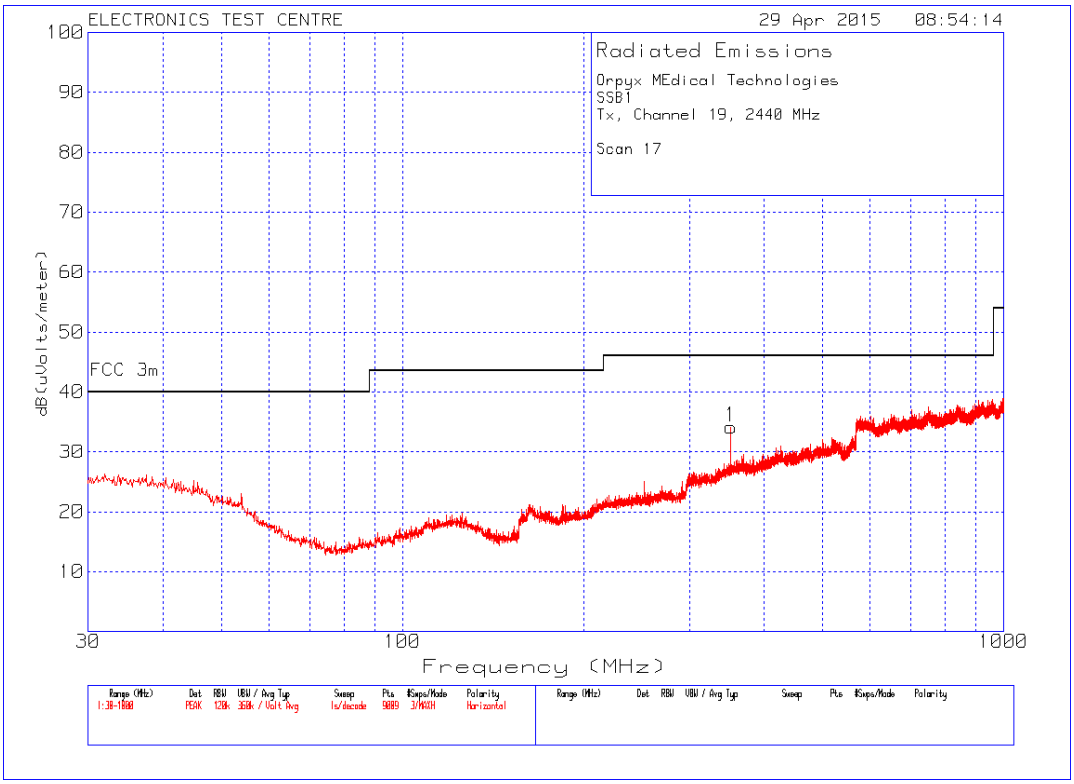
Plot of Radiated Emissions: Horizontal polarization



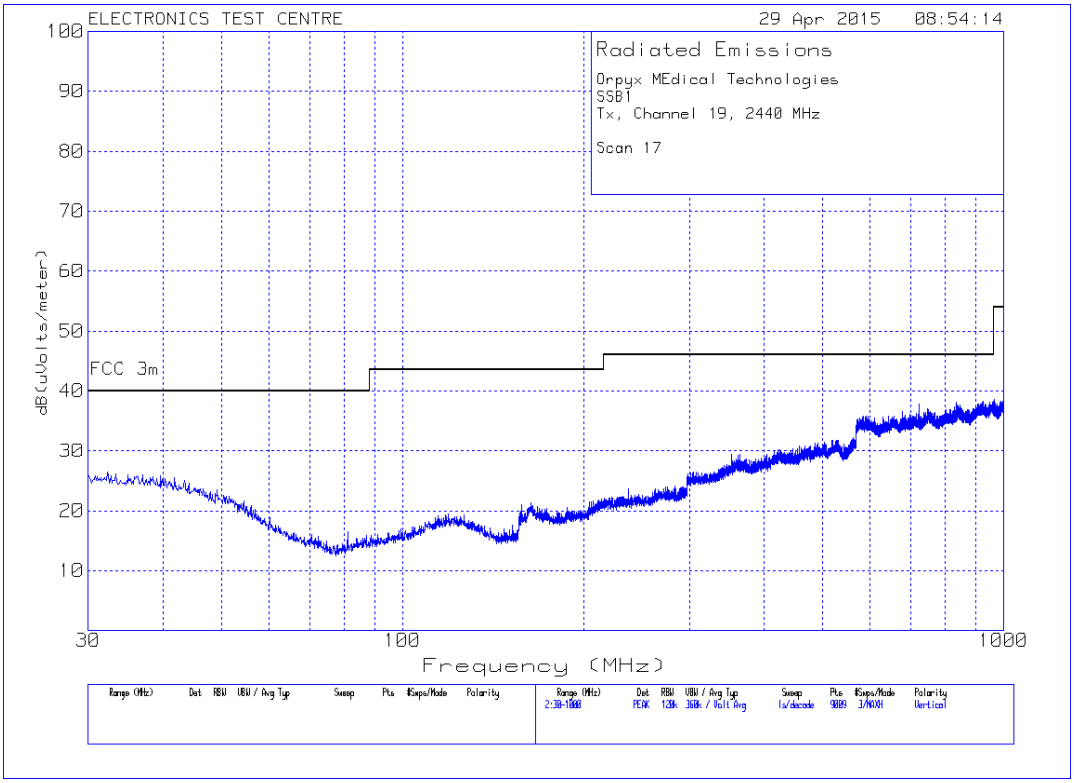
Plot of Radiated Emissions: Vertical polarization



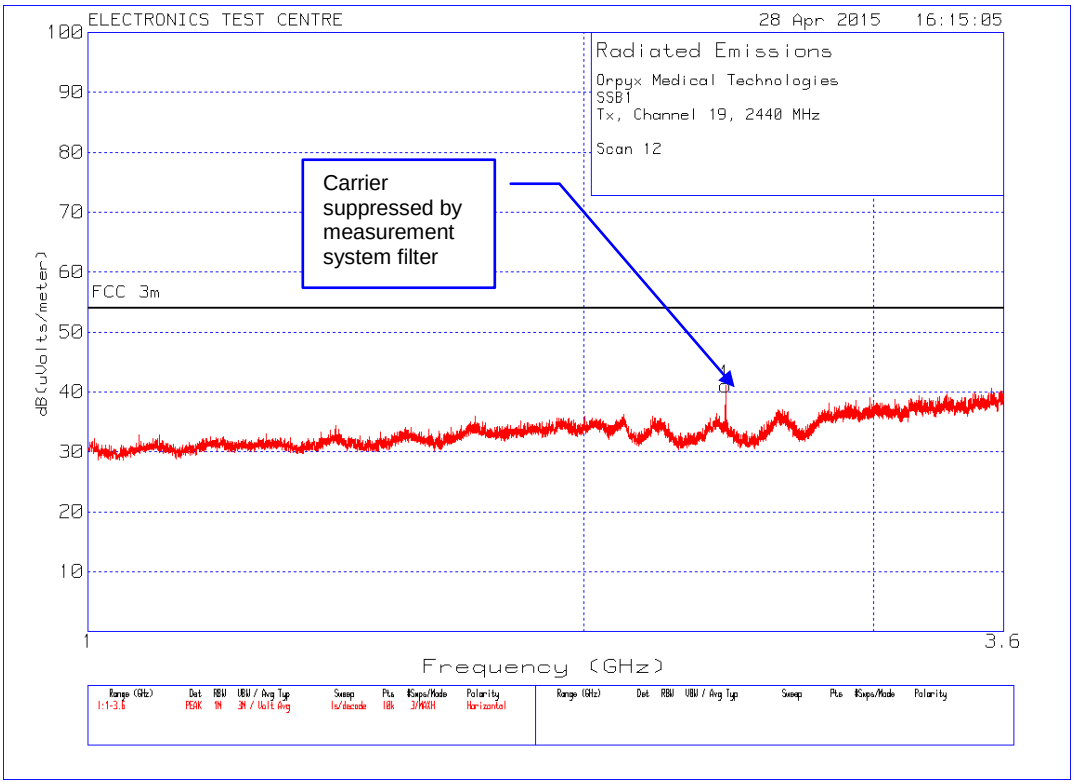
Plot of Radiated Emissions: Horizontal polarization



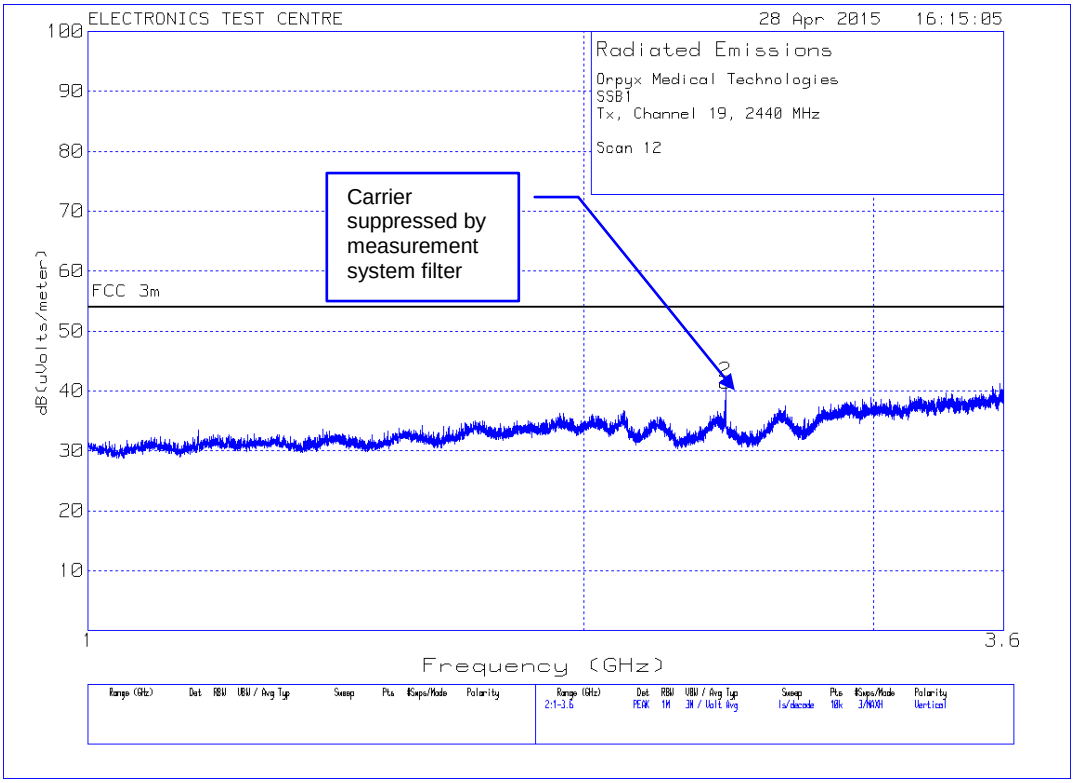
Plot of Radiated Emissions: Vertical polarization



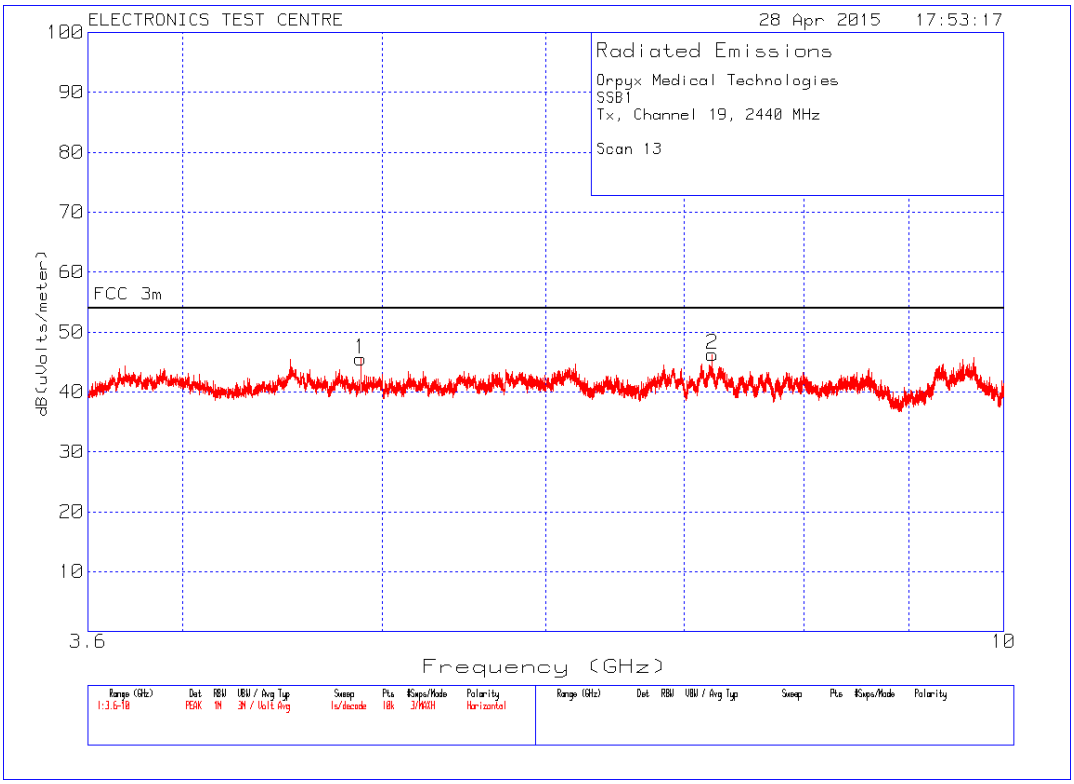
Plot of Radiated Emissions: Horizontal polarization



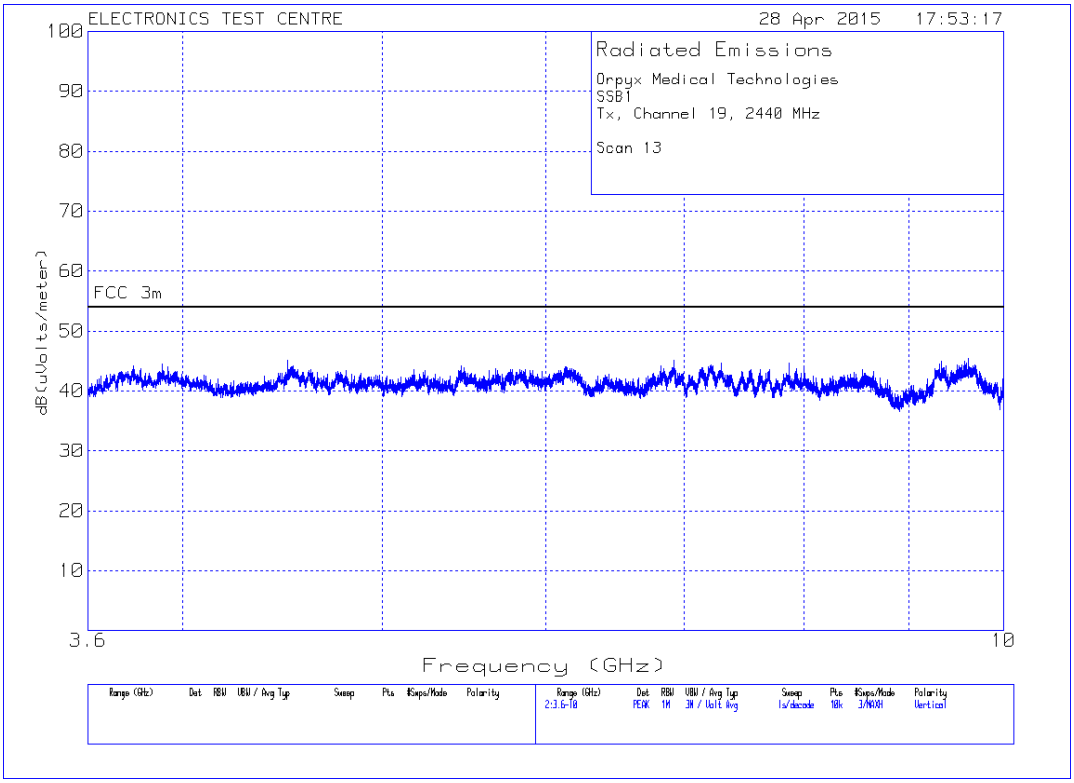
Plot of Radiated Emissions: Vertical polarization



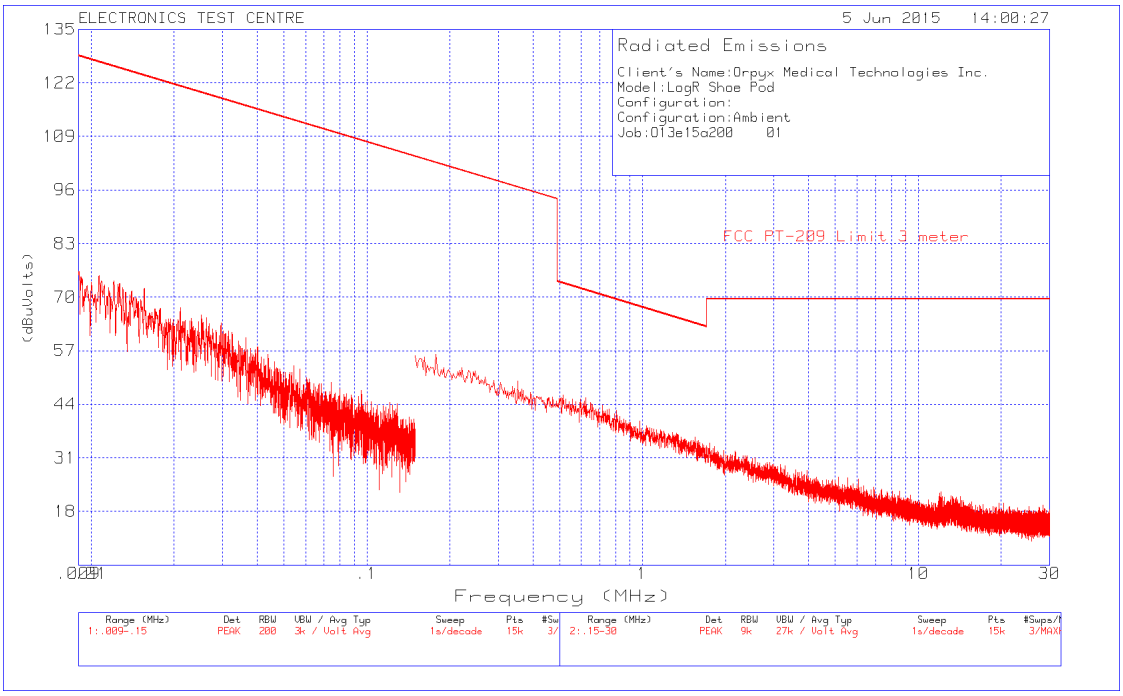
Plot of Radiated Emissions: Horizontal polarization



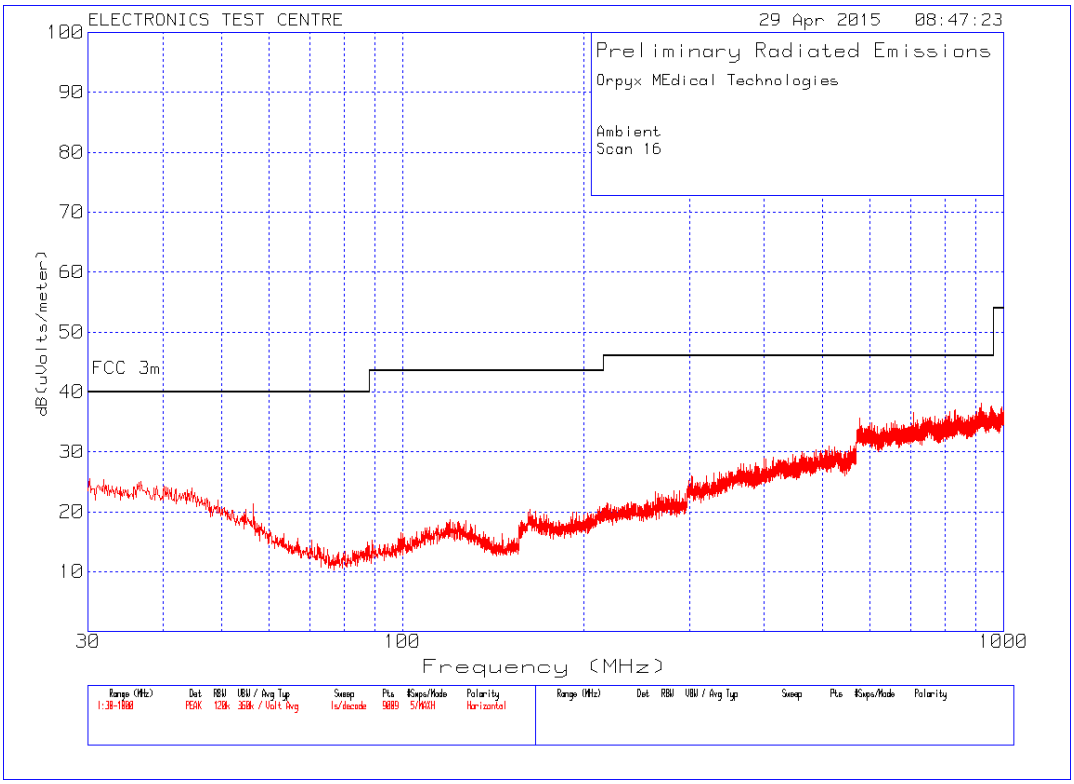
Plot of Radiated Emissions: Vertical polarization



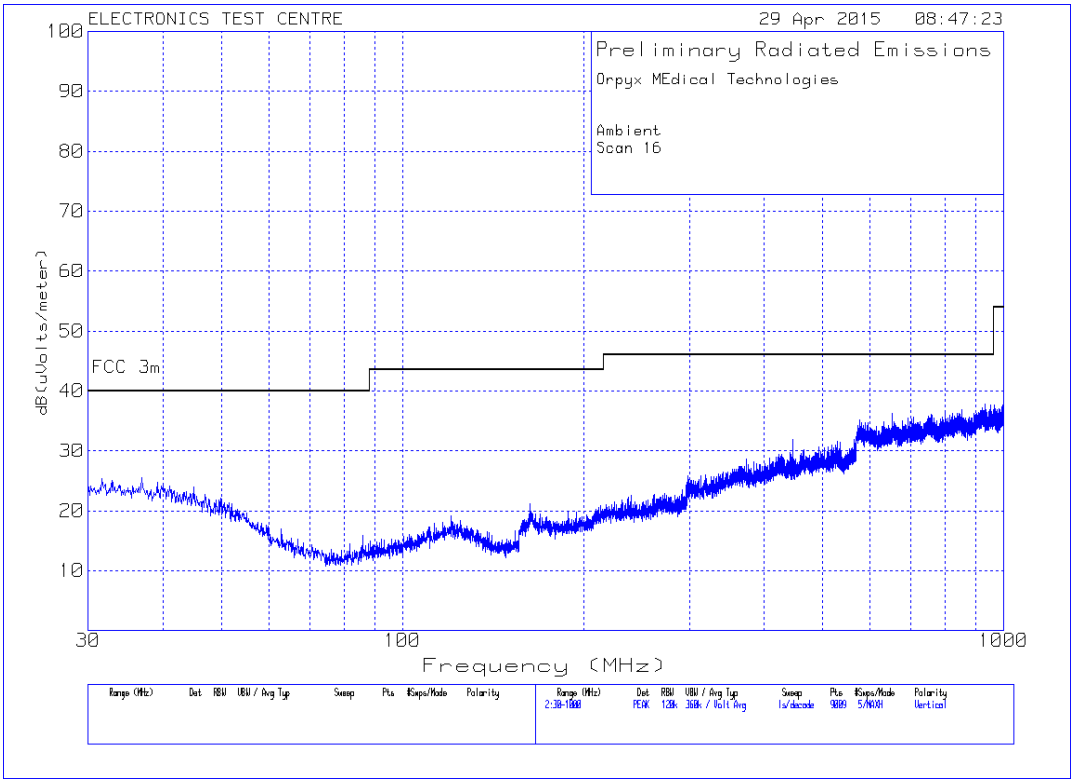
Plot of Test Chamber Ambient: (measurement noise floor):



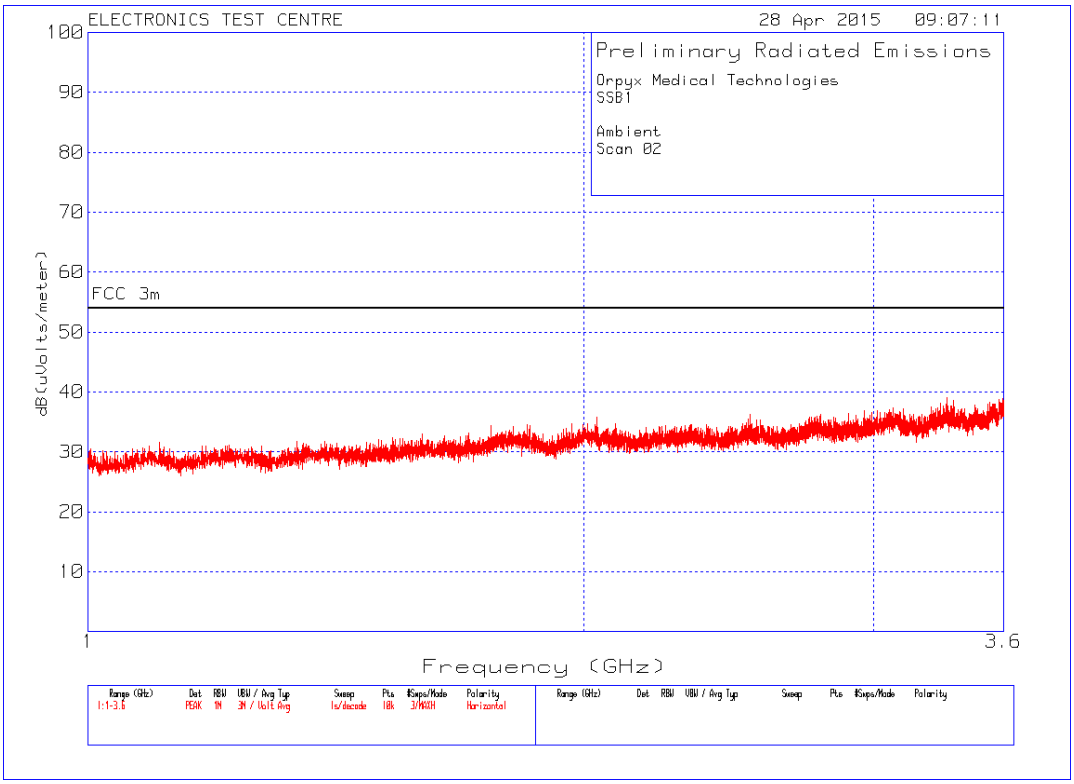
aPlot of Test Chamber Ambient: (measurement noise floor):



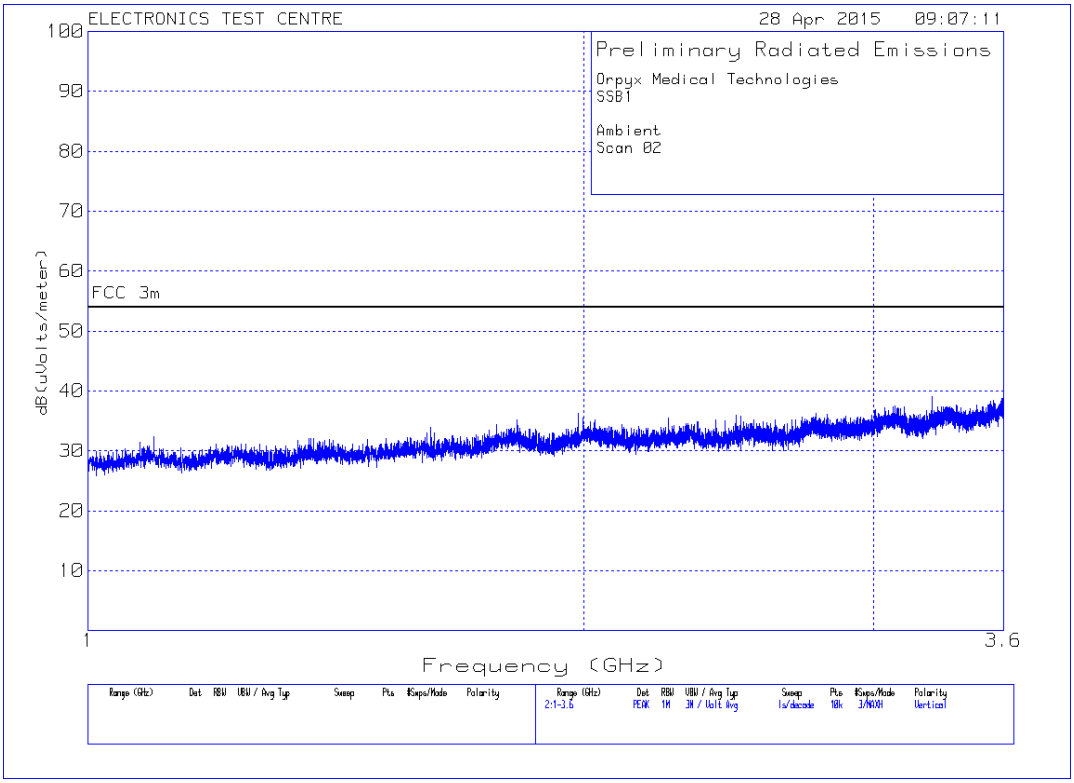
Plot of Test Chamber Ambient: (measurement noise floor):



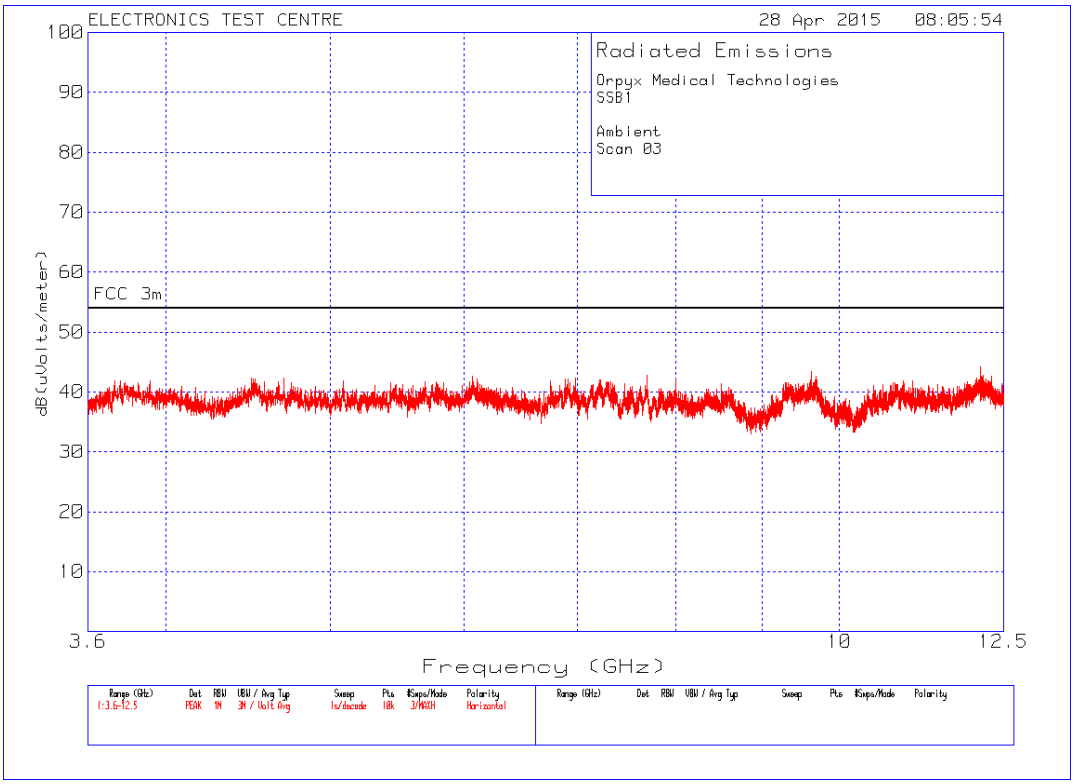
Plot of Test Chamber Ambient: (measurement noise floor):



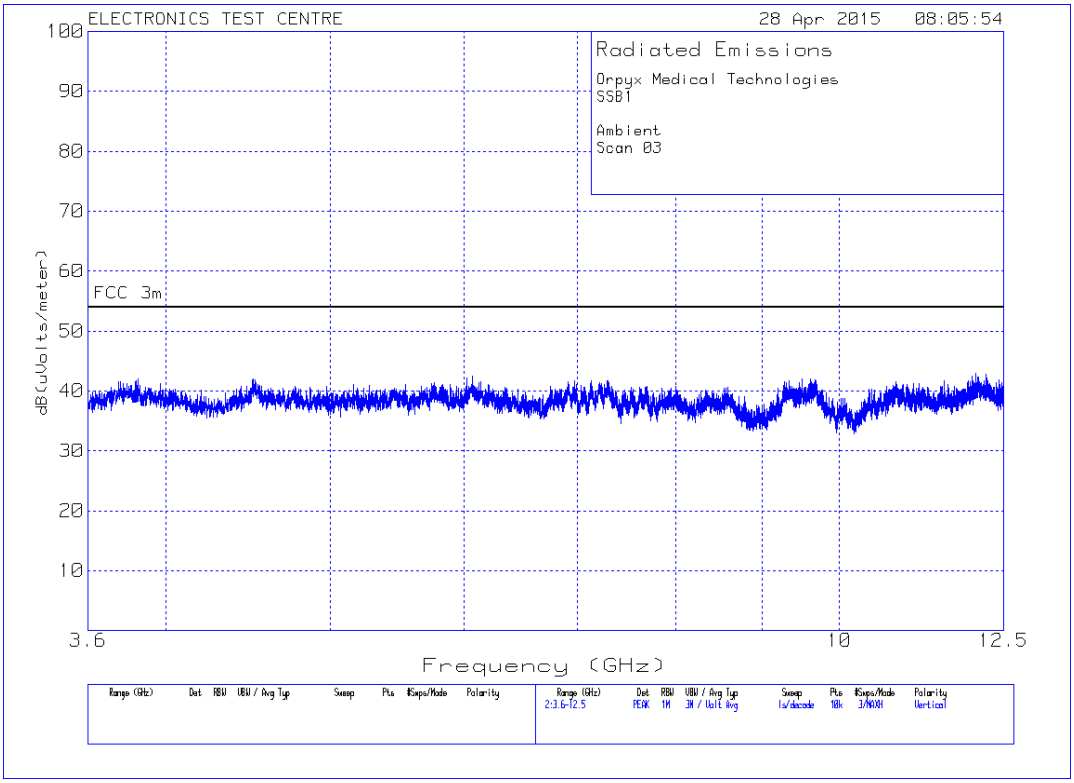
Plot of Test Chamber Ambient: (measurement noise floor):



Plot of Test Chamber Ambient: (measurement noise floor):



Plot of Test Chamber Ambient: (measurement noise floor):



3.0 TEST FACILITY

3.1 Location

The LogR Shoe Pod was tested for emissions at the Electronics Test Centre laboratory located in Airdrie, Alberta, Canada. The Radio Frequency Anechoic Chamber (RFAC), identified as Chamber 1, has a usable working space measuring 10.6 m long x 7.3 m wide x 6.5 m high.

Measurements taken at this site are accepted by Industry Canada as evidence of conformity per registration file # IC 2046A – 1. This site is also listed with the FCC under Registration Number 90587.

The floor, walls and ceiling consist of annealed steel panels. The walls and ceiling are covered with ferrite tile, augmented by RF absorbant foam material on the end wall nearest the turntable, and on the adjacent walls and the ceiling. The chamber floor supports a 15 cm high internal floor, constructed of annealed steel panels, that forms the ground plane, and is bonded to the chamber walls.

The 3-m diameter turntable is flush-mounted with the floor. A sub-floor cable-way is provided to route cables between the turntable pit and EUT support equipment located in the Control Room. Cables reach the EUT through an opening in the centre of the turntable.

Test instrumentation and EUT support equipment is located in the Control Room, consisting of two shielded vestibules joined together at the side of the main room. Cables are routed through bulkhead panels between the rooms and the test chamber as required. Power feeds are routed into the main room and vestibules through line filters providing at least 100 dB of attenuation between 10 kHz and 10 GHz.

Either floor mounted or table-top equipment can be tested at this facility.

3.2 Grounding Plan

The LogR Shoe Pod was placed at the centre of the test chamber turntable on top of an 80-cm high polystyrene foam table. The EUT was grounded according to Orpyx Medical Technologies Inc. specifications.

3.3 Power Supply

All EUT power was supplied by an internal rechargeable battery. There is no EUT function while the battery is charging.

3.4 Emissions Profile

Ambient emission profiles were generated throughout the tests and are included in the test data.

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