



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

CERTIFICATION TEST REPORT

FOR

**WIRELESS SpO2 FOR PATIENT MONITORING IN MRI ENVIRONMENTS**

**MODEL NUMBER: wSpO2 (REF 989803192771 and REF 989803194331)**

**FCC ID: S6W3GSPO2  
IC: 6331A-3GSPO2**

**REPORT NUMBER: R10608232-RF6**

**ISSUE DATE: 2015-04-06**

*Prepared for*  
**INVIVO CORP.**  
**12501 RESEARCH PARKWAY**  
**ORLANDO**  
**FL, 32826, USA**

*Prepared by*  
**UL LLC**  
**12 LABORATORY DR.**  
**RESEARCH TRIANGLE PARK, NC 27709 USA**  
**TEL: (919) 549-1400**

**NVLAP**<sup>®</sup>

NVLAP LAB CODE 200246-0

Revision History

Rev.	Date	Issue Revisions	Revised By
--	2015-03-12	Initial Issue	Jeff Moser
1	2015-03-30	Revised Spurious emissions data to include calculated average data per FCC 15.35c. Revised 'P/N' to 'REF' for the wSpO2 model designations.	Jeff Moser
2	2015-04-02	Revised to add 20 dB bandwidth plots and additional Duty Cycle information.	Jeff Moser
3	2015-04-06	Added Average Output E-field strength on page 8.	Jeff Moser

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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** INVIVO CORP.  
12501 RESEARCH PARKWAY  
ORLANDO, FL, 32826, USA

**EUT DESCRIPTION:** WIRELESS SpO2 FOR PATIENT MONITORING IN MRI ENVIRONMENTS

**MODEL:** wSpO2 (P/N 989803192771 and 989803194331)

**SERIAL NUMBER:** Refer to Section 5.6 for details

**DATE TESTED:** 2015-01-14 to 2015-03-08, 2015-04-02

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 2	Pass
INDUSTRY CANADA RSS-GEN Issue 4	Pass

UL LLC 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 LLC 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 LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC 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.

Approved & Released  
For UL LLC By:



Bart Mucha  
EMC Staff Engineer  
UL – Consumer Technology Division

Prepared By:



Jeff Moser  
EMC Program Manager  
UL – Consumer Technology Division

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 4, and RSS-210 Issue 8.

Test Deviations – Test Site validation for radiated measurements above 1GHz used ANSI C63.4:2003. The EUT height for measurements above 1GHz was 0.8m.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 12 Laboratory Dr., Research Triangle Park, NC 27709, USA.

12 Laboratory Dr., RTP, NC 27709	
<input type="checkbox"/>	Chamber A
<input checked="" type="checkbox"/>	Chamber C

The onsite chambers (A & C) are covered under Industry Canada company address code 2180C with site numbers 2180C -1 through 2180C-2, respectively.

UL LLC (RTP) is accredited by NVLAP, Laboratory Code 200246-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2002460.htm>.

## 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:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) +  
Cable Loss (dB) – Preamp Gain (dB)  
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

### 4.3. MEASUREMENT UNCERTAINTY

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

Test	Uncertainty
Conducted Emissions (0.150-30MHz)	+/- 2.37 dB
Radiated Emissions (30-1000 MHz)	+/- 6.04 dB (3m)
Radiated Emissions (1-6 GHz)	+/- 5.96 dB
Radiated Emissions (6-18 GHz)	+/- 6.10 dB
Radiated Emissions (18-26 GHz)	+/- 6.81 dB

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

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT, wSpO2 REF 989803192771 and 989803194331 are wireless SpO2 modules that are part of the MR400 Patient Monitoring Device for MRI Environments. The wSpO2 contains a custom designed radio that is DSSS, operating under a GFSK modulation.

The custom radio contains a radio chip for the SpO2 communication (2425-2479 MHz). The radio module contains a chip antenna with a 1.5 dBi gain.

The only difference between the REF 989803192771 and 989803194331 are the operating frequencies:

Color codes	Low Frequency
	Mid Frequency
	High Frequency

#### 2nd generation SpO2 module

\*\*Frequency list below is forward channel (i.e. SpO2 transmit, MR400 receive)

Network	Primary	Secondary	Part Number: 989803192771
1	2457	2465	
2	2459	2467	
3	2456	2464	
4	2460	2468	
5	2470	2478	Description: Wireless SpO2 Patient Module (Gen 3) 1-5
6	2439	2447	Part Number: 989803194331
7	2434	2442	
8	2425	2433	
9	2438	2446	Description: Wireless SpO2 Patient Module (Gen 3) 6-10
10	2471	2479	

No other differences exist between the two modules. The devices use the same schematic design, PCB layout and software.

Note – The module was originally intended to accommodate all 10 network channels. However, the module has 5 Network Channel ID LEDs for the user. Due to this, Invivo created two part numbers to maintain the 5 Network Channel ID LEDs. P/N 989803192771 will host Networks 1-5 and P/N 989803194331 will host Networks 6-10. The tested unit accommodates all 10 networks.

## 5.2. MAXIMUM OUTPUT E-FIELD STRENGTH

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

Frequency Range (MHz)	Mode	PEAK Output E-field Strength (dBuV/m)	AVERAGE Output E-field Strength (dBuV/m)
2425-2479	GFSK	100.38	71.31

## 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

This radio utilizes a chip antenna, manufactured by Mitsubishi (model AHD1403) and has an antenna gain of 1.5 dBi.

## 5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was SW021, rev. 25.

## 5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case data rate is determined to be as follows, based on input from the manufacturer of the radio.

All final tests in the GFSK mode were made at 1 Mb/s.

For radiated emissions below 1 GHz and 18-26 GHz, the worst-case configuration is determined to be the mode and channel with the highest field strength.

The fundamental of the EUT was investigated in three orthogonal orientations X, Y, Z and it was determined that Z orientation (EUT upright) was worst-case orientation; therefore, all final radiated testing was performed with the EUT in the Z orientation.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Use*	Product Type	Manufacturer	Model	Comments
EUT	Wireless SpO2 Patient Module (Gen 3)	Invivo, a division of Philips Medical Systems	989803192771	Conducted – S/N: 0000000011, SGS000002, Radiated – S/N: SGS000007, LP70000001, Non-serialized.

Note: \* Use one of the following:  
EUT - Equipment Under Test  
AE - Auxiliary/Associated Equipment  
SIM - Simulator (Not Subjected to Test) \*Note: Use abbreviations:

### I/O CABLES

Port No.	Name	Type*	Cable Max. >3m	Cable Shielded	Comments
0	Enclosure	N/E	—	—	None
1	SPO2	I/O	N	N	(989803161991) QUICK CONNECT SPO2 PROBE, MRI

\*Note: AC = AC Power Port DC = DC Power Port N/E = Non-Electrical  
I/O = Signal Input or Output Port (Not Involved in Process Control)  
TP = Telecommunication Ports

### TEST SETUP

The EUT has test software loaded during the test that allows it to operate in a modulated carrier mode at the low, mid and high frequencies in the band.

**SETUP DIAGRAM FOR TESTS**



## 6. TEST AND MEASUREMENT EQUIPMENT

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

### Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	<b>Common Equipment</b>				
SA0020	Spectrum Analyzer	Agilent Technologies	E4446A	2015-02-26	2016-02-29
MM0150	Digital Multimeter, 4½ Digit (True RMS AC, AC+DC measurement)	Agilent	U1252A	2014-09-04	2016-09-30
MM0151	Digital Multimeter, 4½ Digit (True RMS AC, AC+DC measurement)	Agilent	U1252A	2014-09-04	2016-09-30
HI0041	Temp/Humid/Pressure Meter	Cole-Parmer	99760-00	2014-02-19	2015-02-28
HI0069	Temp/Humid/Pressure Meter	Cole-Parmer	99760-00	2014-06-27	2015-06-30

Radiated Disturbance Emissions (E-field) – Chamber C

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	<b>30-1000 MHz Range</b>				
AT0066	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB1	2014-07-10	2015-07-31
	<b>1-18 GHz</b>				
AT0067	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2014-02-19	2015-02-28
	<b>18-40 GHz (calibrated as set)</b>				
AT0063	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2014-07-23	2015-07-31
	<b>Gain-Loss Chains</b>				
SAC_G (Hybrid) 30-1000MHz	Gain-Loss string for Hybird antenna at 3m	Various	Various	2015-01-26	2016-01-31
SAC_G (BOM) 1-18GHz	Gain-Loss string for Hybird antenna at 3m	Various	Various	2015-01-26	2016-01-31
SAC_G (BOM) 18-40GHz	Gain-Loss string for Hybird antenna at 3m	Various	Various	2015-01-26	2016-01-31
	<b>Receiver &amp; Software</b>				
SA0018	Spectrum Analyzer	Agilent	N9030A	2014-06-24	2015-06-30
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
	<b>Additional Equipment used</b>				
HI0034	Temp/Humid/Pressure Meter	Cole-Parmer	99760-00	2014-02-19	2015-02-28

## 7. TEST RESULTS

### 7.1. 99% BANDWIDTH and 20 dB BANDWIDTH

#### LIMITS

None; for reporting purposes only.

#### TEST PROCEDURE

99% BW: The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 5% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

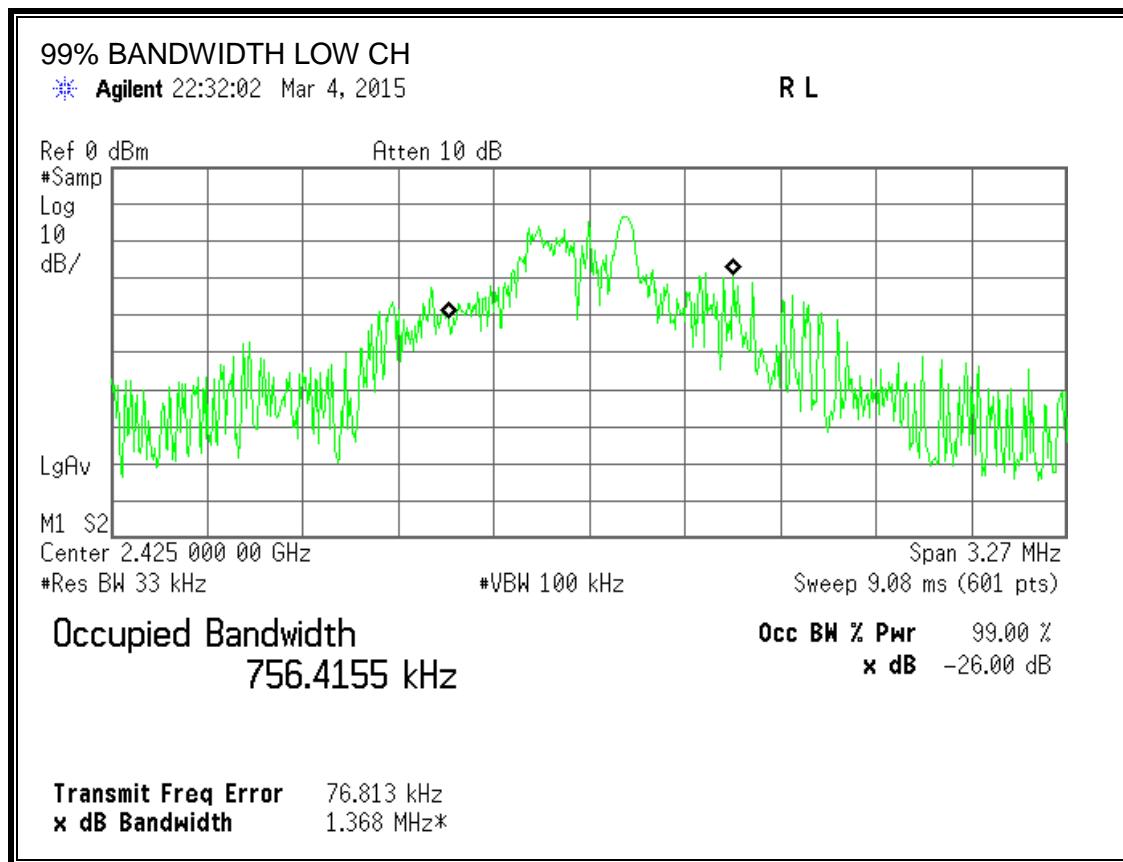
20 dB BW: The transmitter output is connected to the spectrum analyzer. The RBW is set to > 1% of the 20 dB BW. The VBW is set to 3 times the RBW. The sweep time is coupled. The detector is set to peak and a peak marker search is performed. Both sides of the signal are marked at the 20 dB points below the peak.

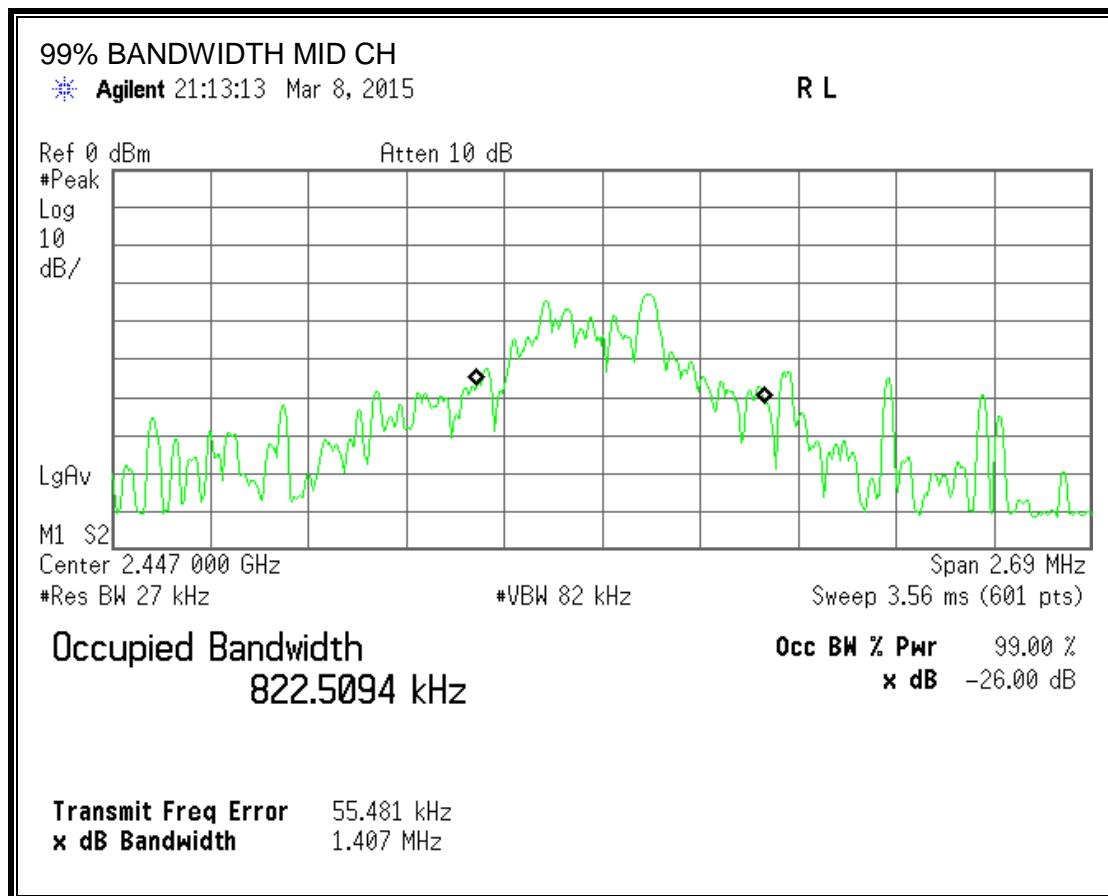
#### RESULTS

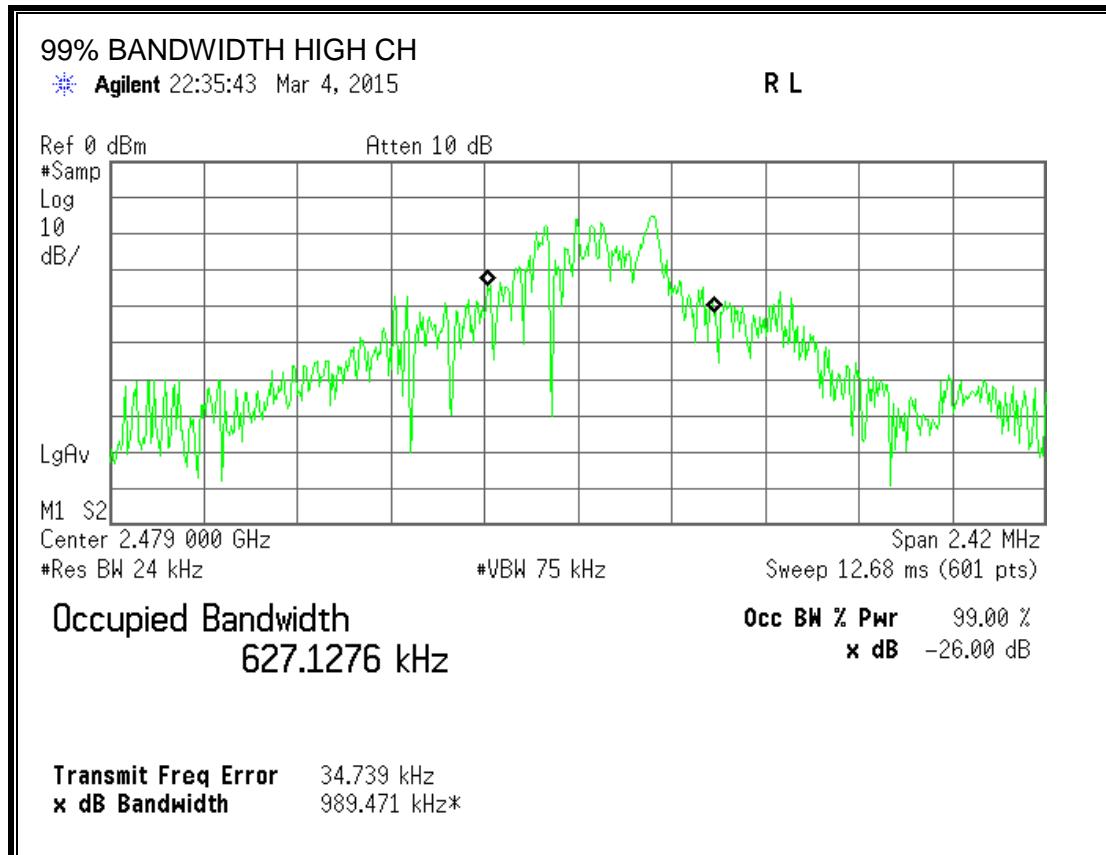
wSpO2

Frequency (MHz)	99% Bandwidth (MHz)	20 dB Bandwidth (MHz)
2425	0.756416	0.605
2447	0.822509	0.450
2479	0.627128	0.700

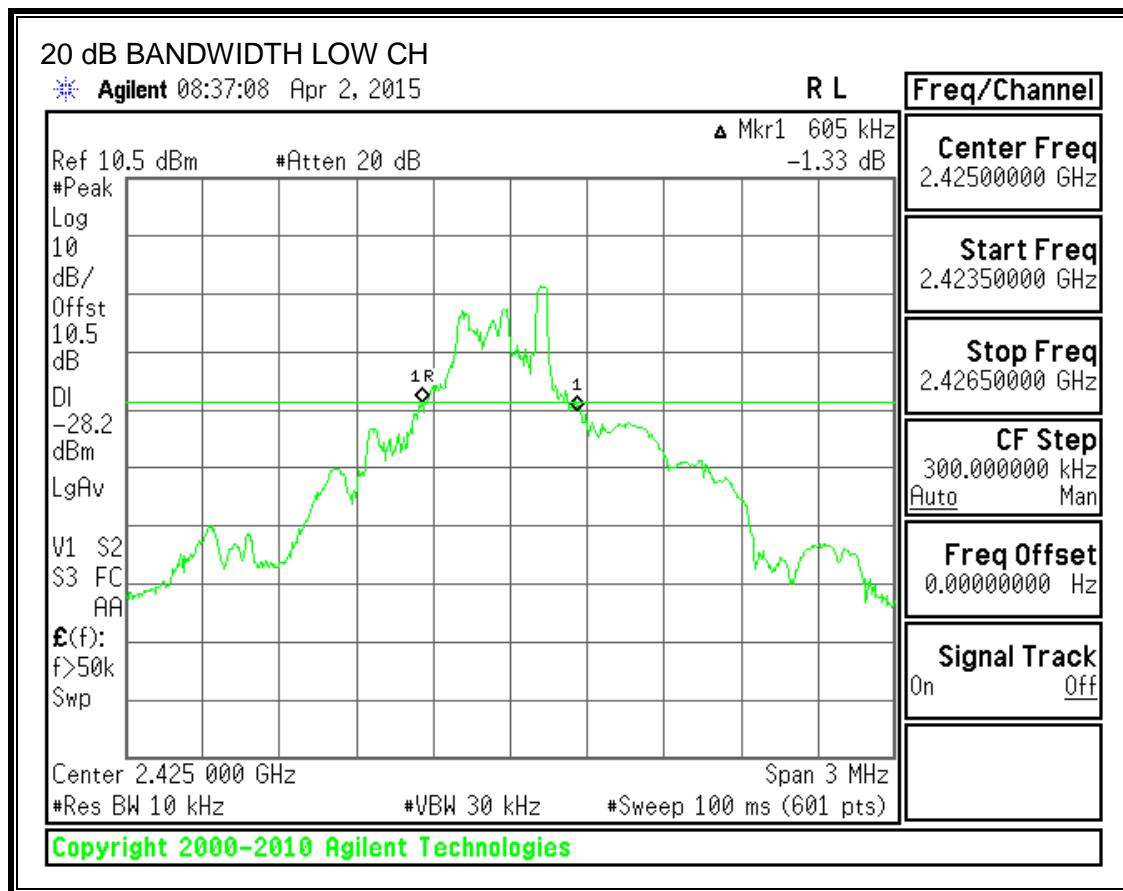
**99% BANDWIDTH**

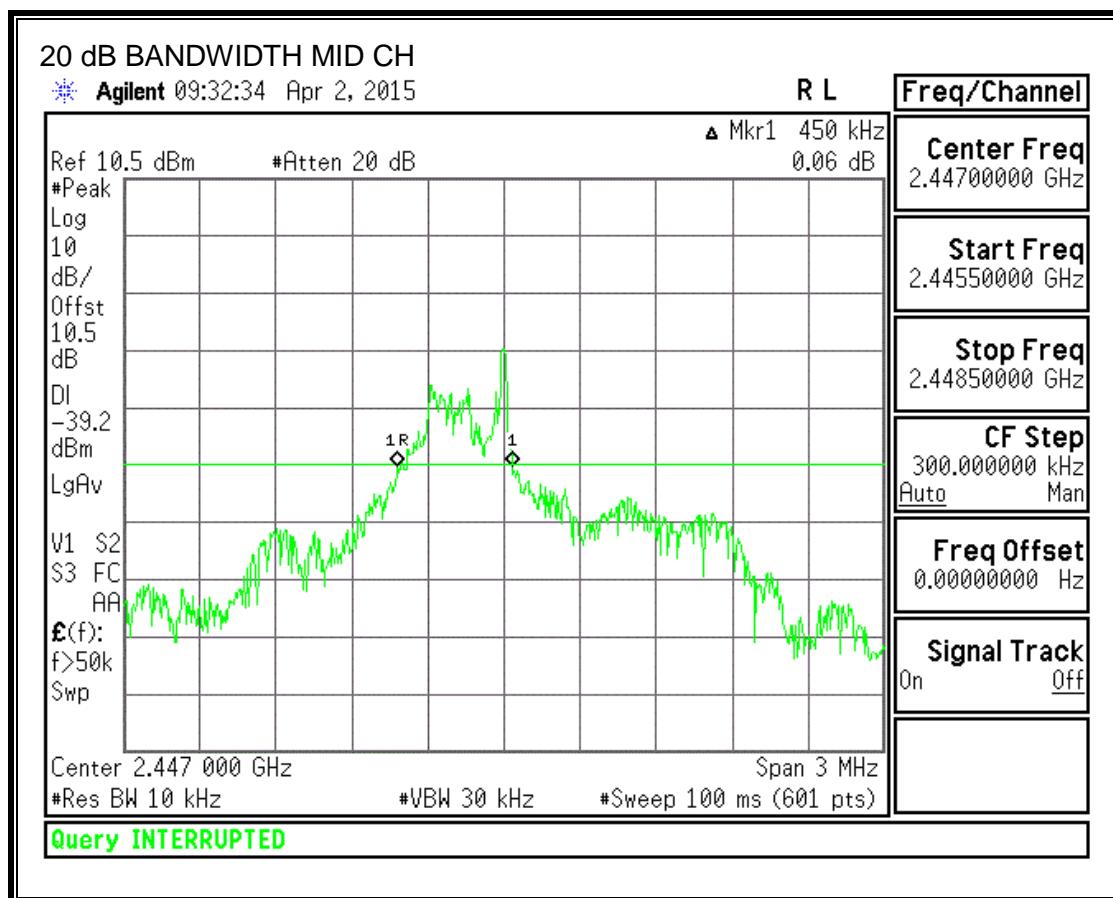


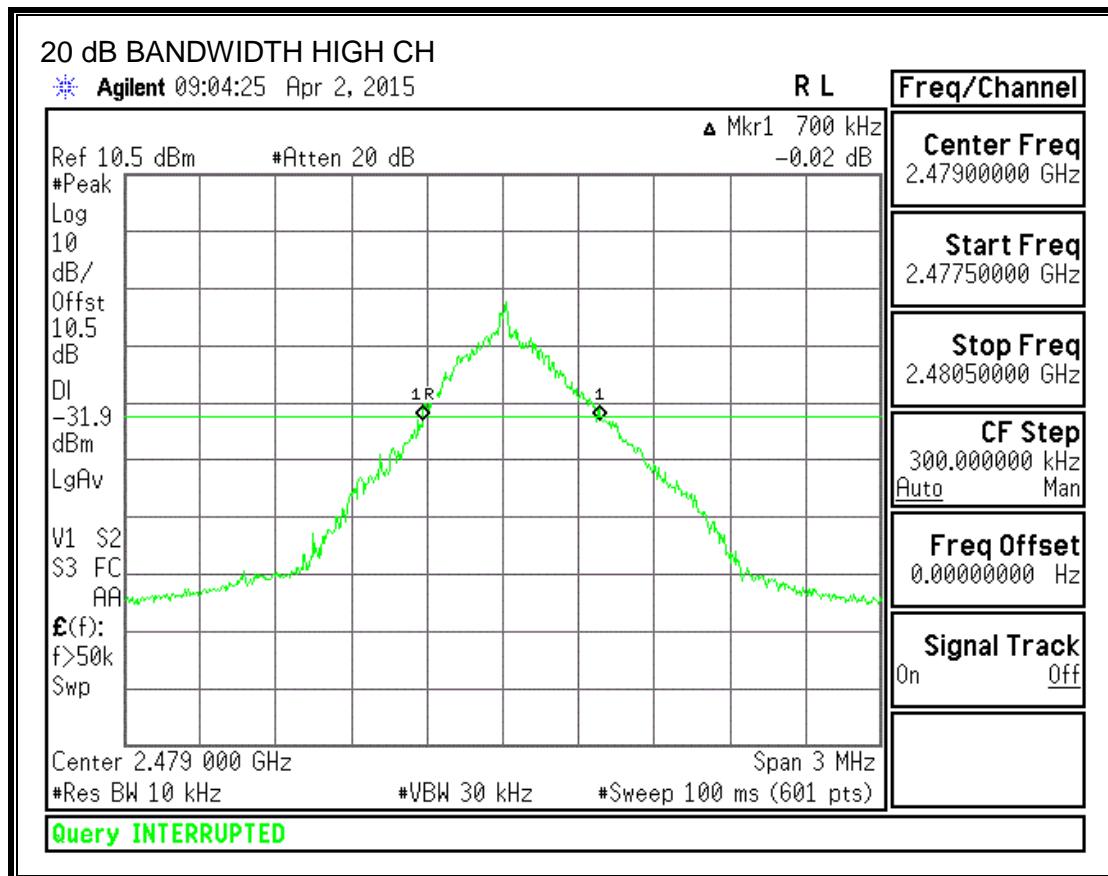




20 dB BANDWIDTH







## 7.2. ON TIME AND DUTY CYCLE

### LIMITS

None; for reporting purposes only.

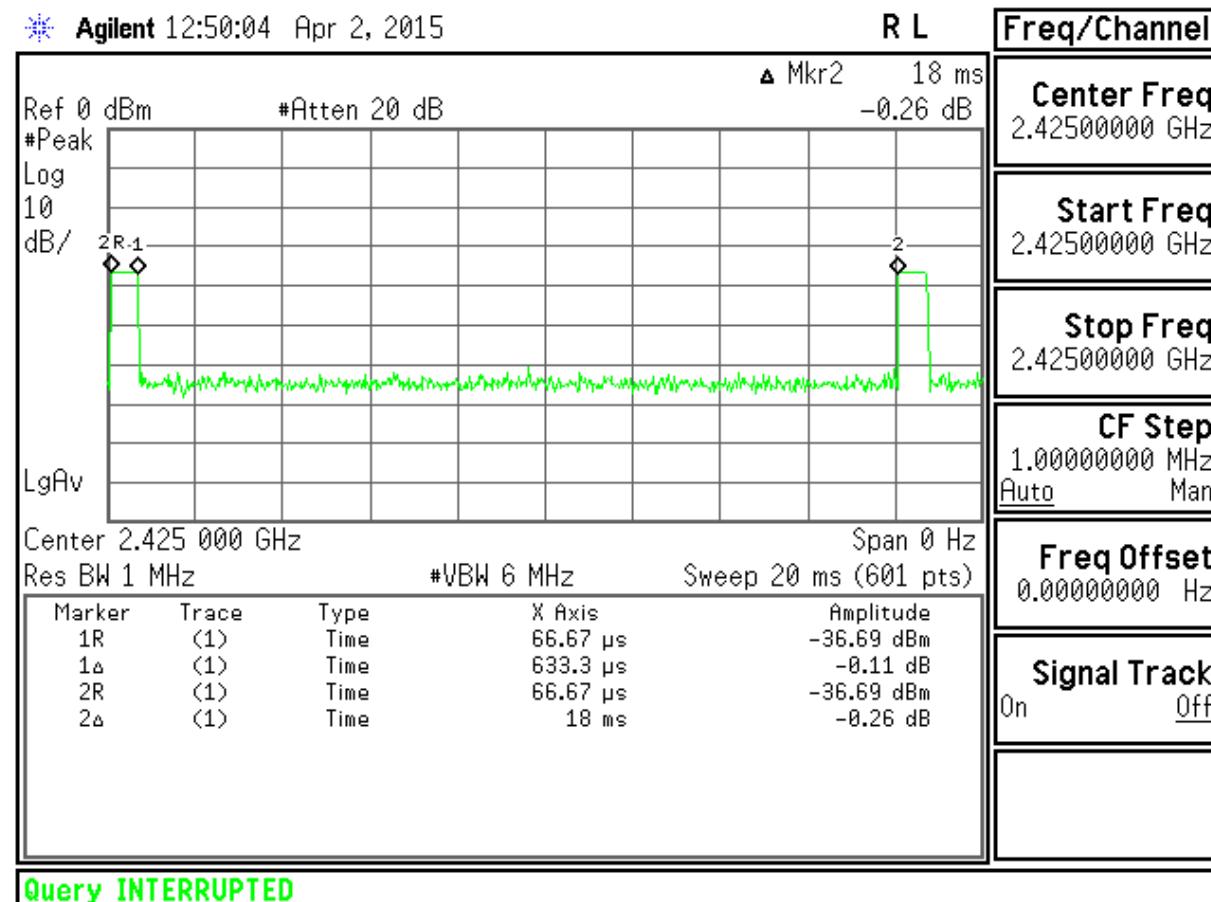
### PROCEDURE

Zero-Span Spectrum Analyzer Method.

### ON TIME AND DUTY CYCLE

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor For Average Measurements (FCC 15.35) (dB)
<b>2.4GHz Band</b>					
SpO2	0.633	18.000	0.035	3.52%	-29.07

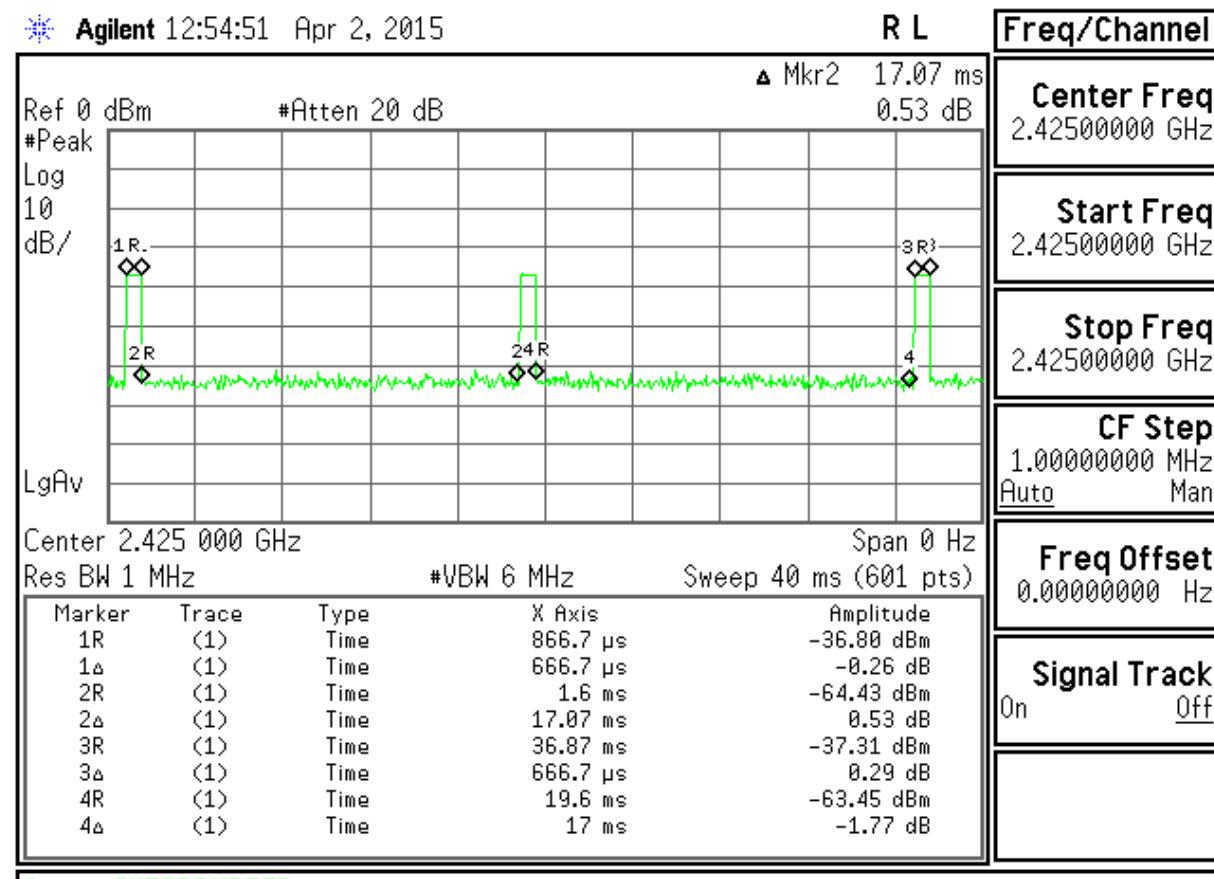
DUTY CYCLE PLOT – wSpO2



20 log (633.3us/18ms) = -29.07 dB

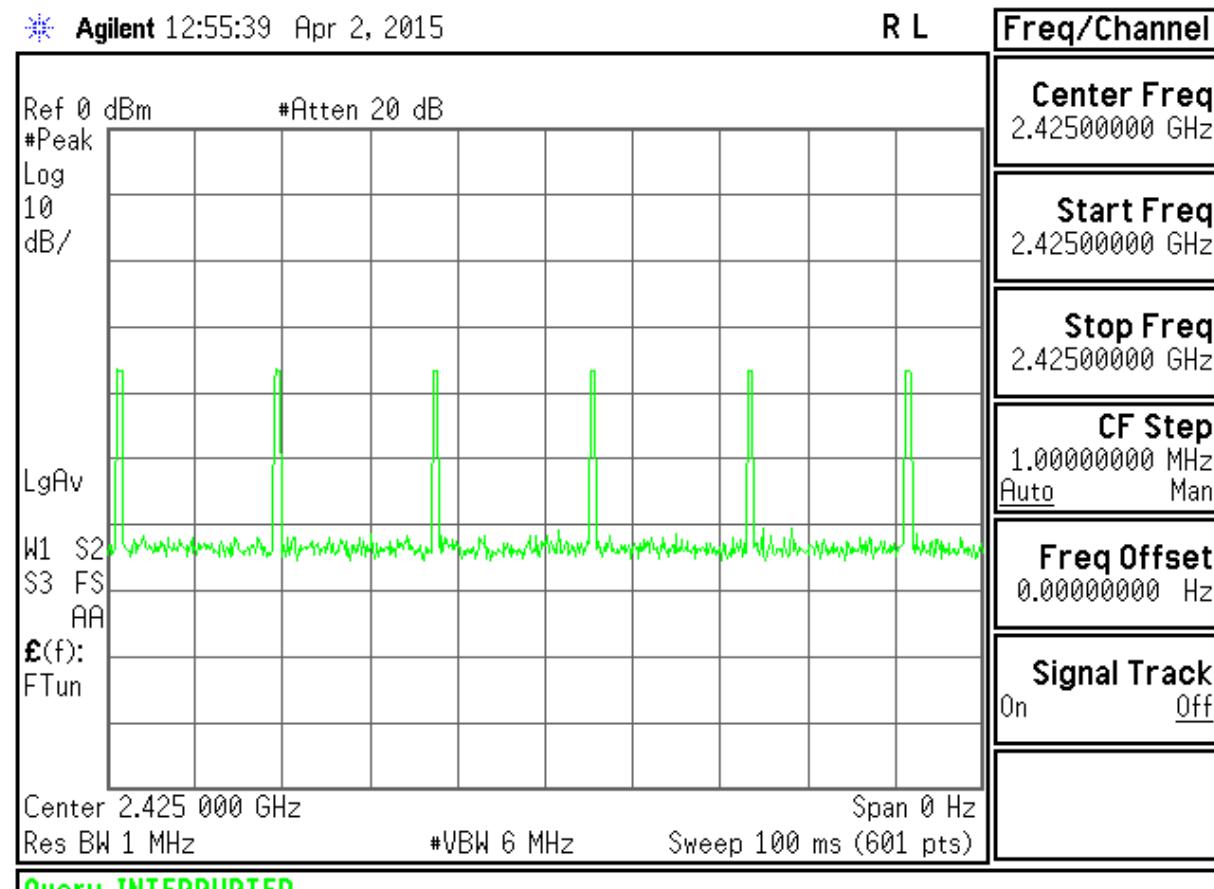
DUTY CYCLE PLOT – wSpO2 (Over 40 ms)

This plot shows a uniform pulse train over 40 ms



DUTY CYCLE PLOT – wSpO2 (Over 100 ms)

This plot shows a uniform pulse train over 100 ms



### 7.3. RADIATED EMISSIONS

#### 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

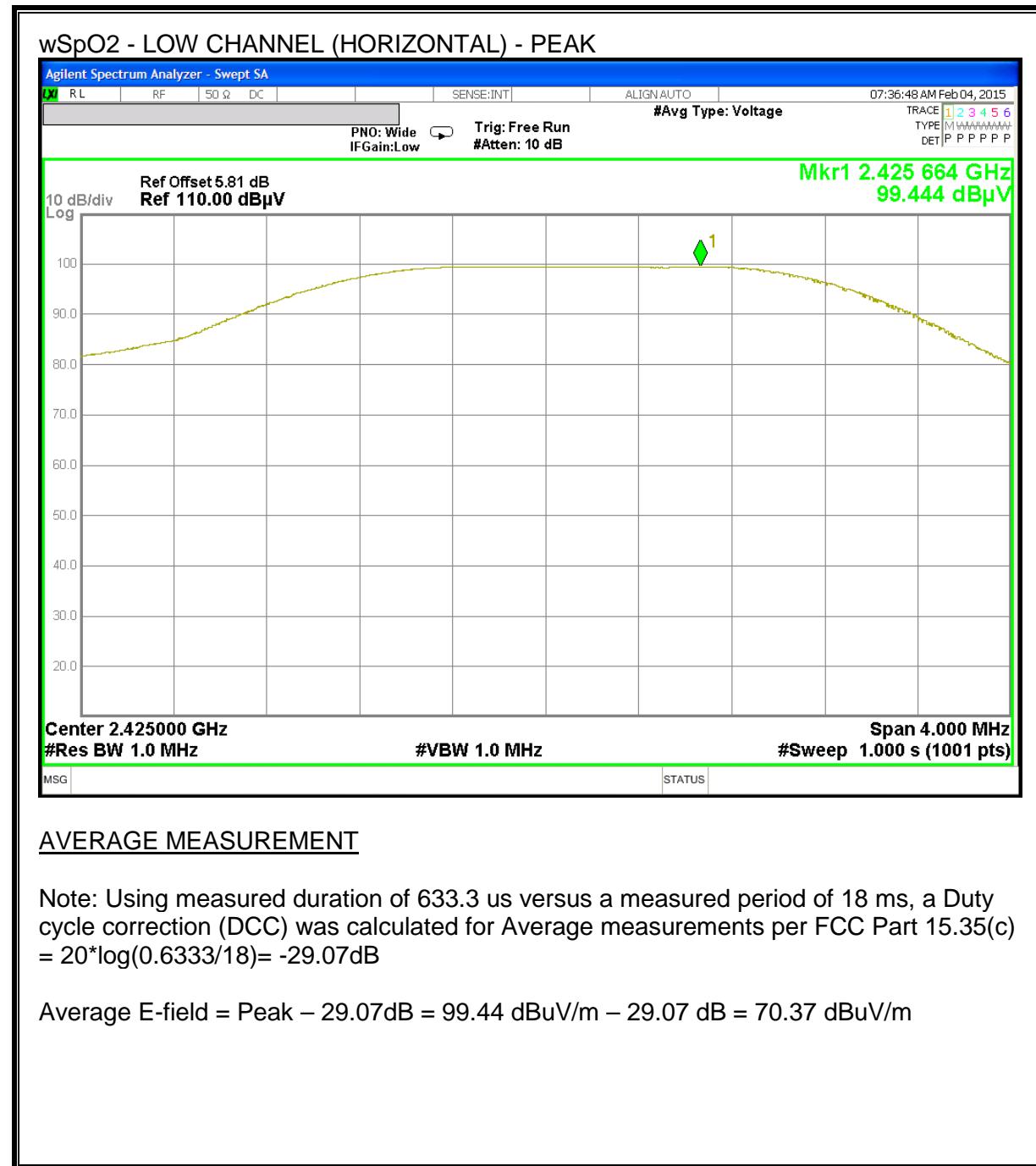
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

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

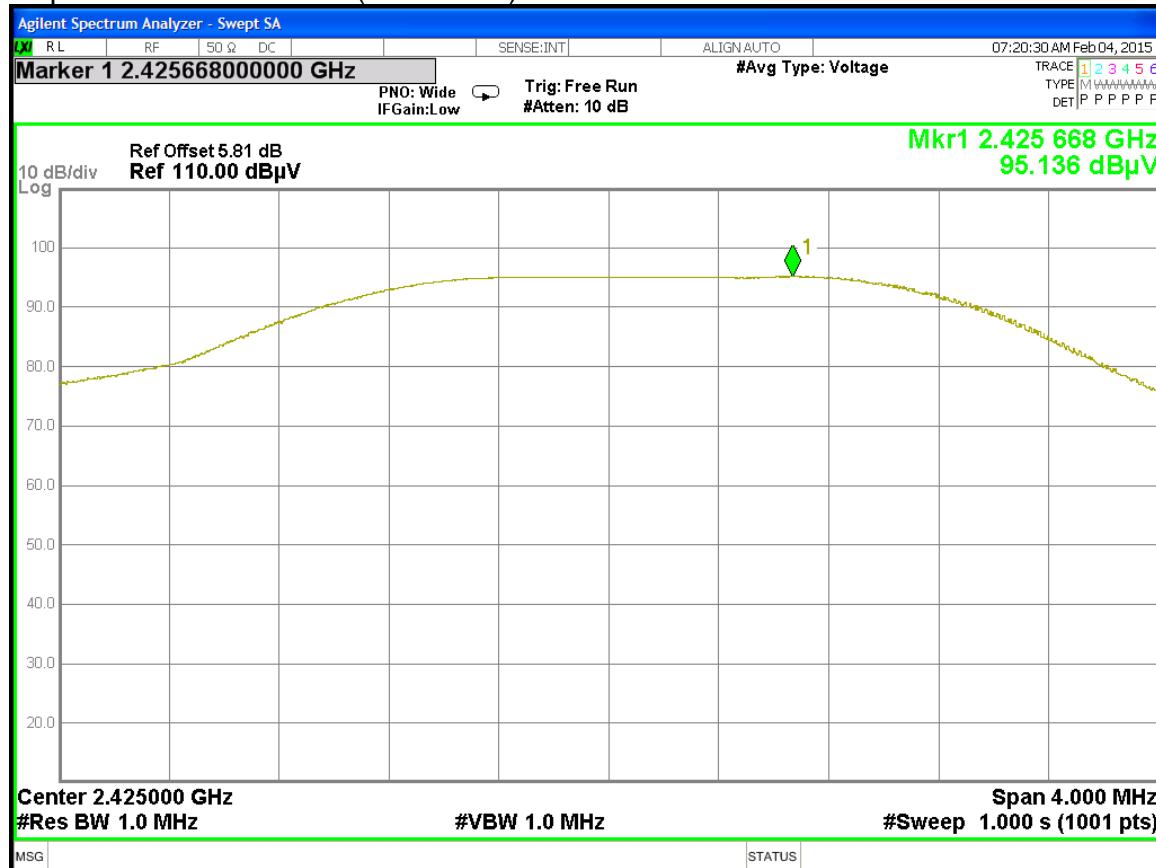
\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permitted under other sections of this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

## RESULTS

### 7.3.1. FUNDAMENTAL FREQUENCY RADIATED EMISSION



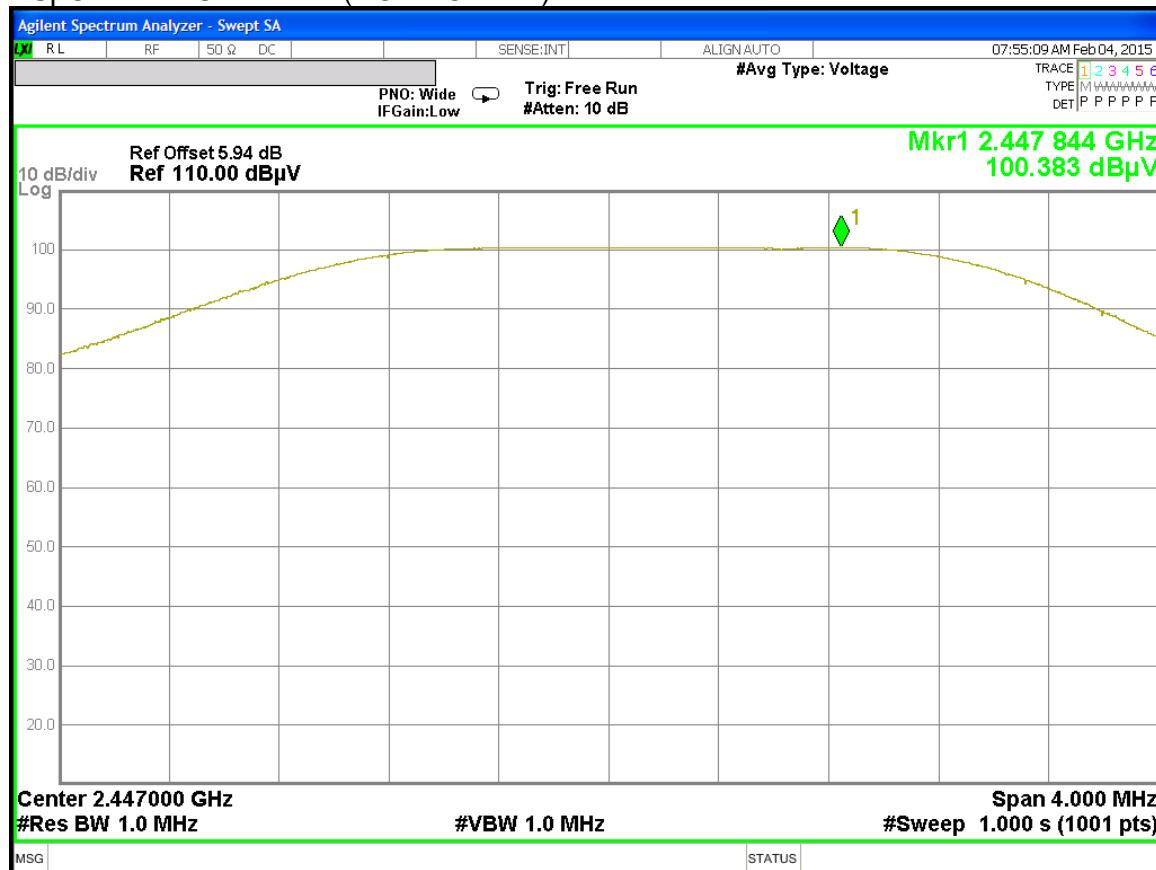
## wSpO2 - LOW CHANNEL (VERTICAL) - PEAK

AVERAGE MEASUREMENT

Note: Using measured duration of 633.3 us versus a measured period of 18 ms, a Duty cycle correction (DCC) was calculated for Average measurements per FCC Part 15.35(c)  
 $= 20 \cdot \log(0.6333/18) = -29.07 \text{ dB}$

Average E-field = Peak - 29.07 dB = 95.14 dB $\mu$ V/m - 29.07 dB = 66.07 dB $\mu$ V/m

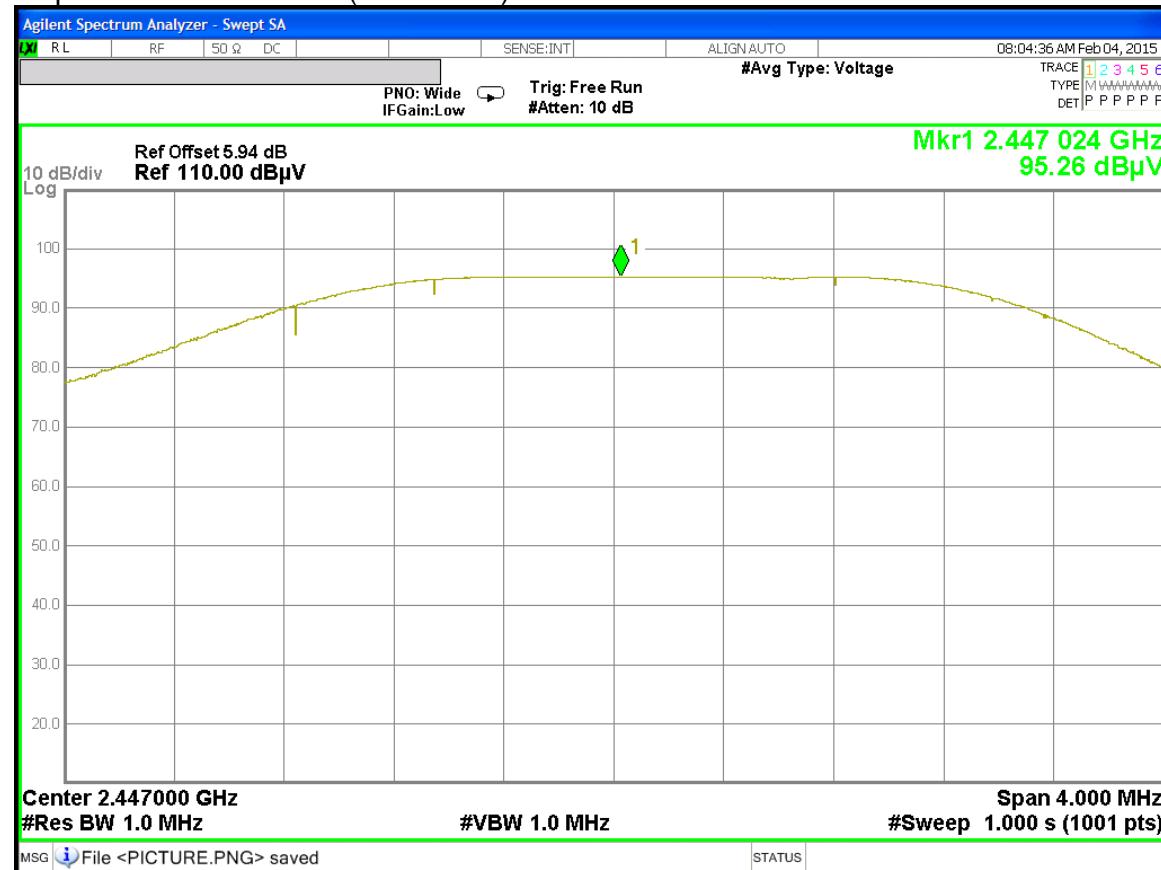
## wSpO2 - MID CHANNEL (HORIZONTAL) - PEAK

AVERAGE MEASUREMENT

Note: Using measured duration of 633.3 us versus a measured period of 18 ms, a Duty cycle correction (DCC) was calculated for Average measurements per FCC Part 15.35(c)  
 $= 20 \cdot \log(0.6333/18) = -29.07\text{dB}$

Average E-field = Peak - 29.07dB = 100.38 dB $\mu$ V/m - 29.07 dB = 71.31 dB $\mu$ V/m

### wSpO2 - MID CHANNEL (VERTICAL) - PEAK

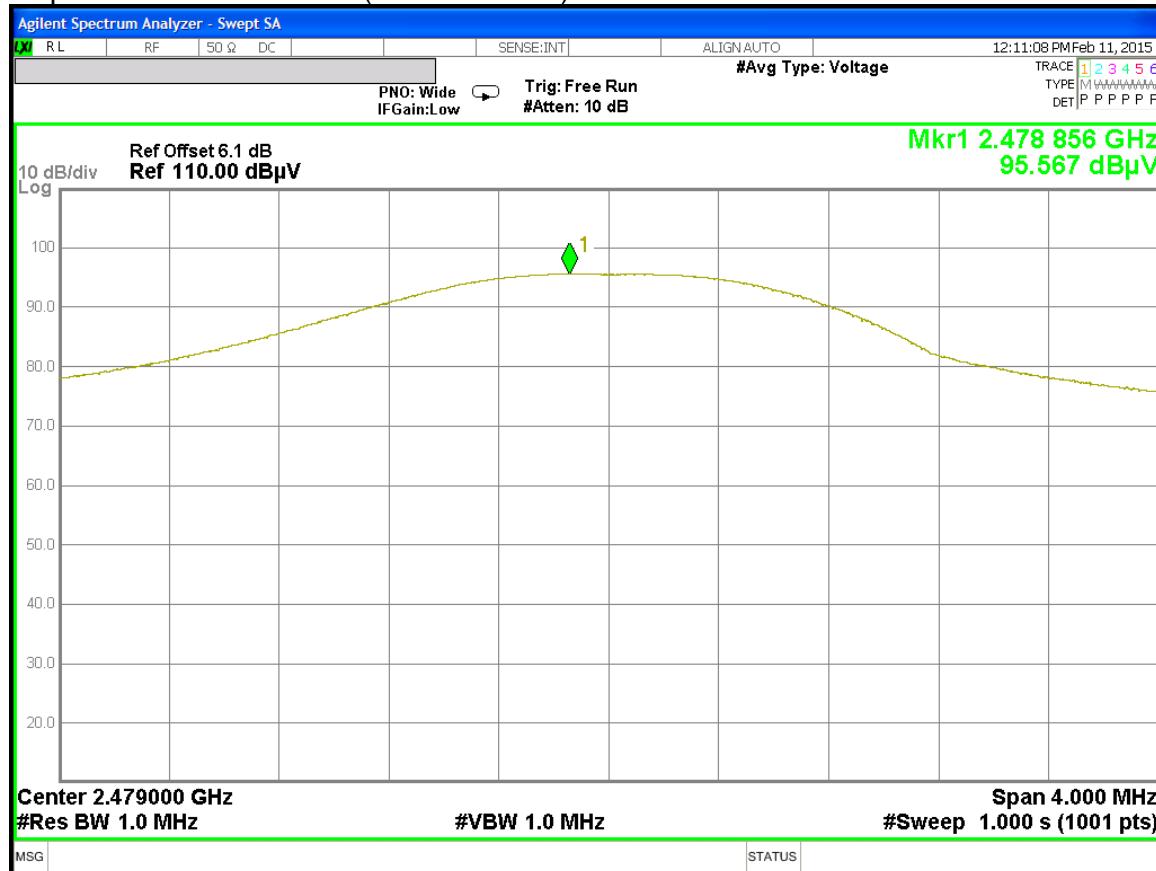


### AVERAGE MEASUREMENT

Note: Using measured duration of 633.3 us versus a measured period of 18 ms, a Duty cycle correction (DCC) was calculated for Average measurements per FCC Part 15.35(c) =  $20 \times \log(0.6333/18) = -29.07\text{dB}$

Average E-field = Peak – 29.07dB = 95.26 dB $\mu$ V/m – 29.07 dB = 66.19 dB $\mu$ V/m

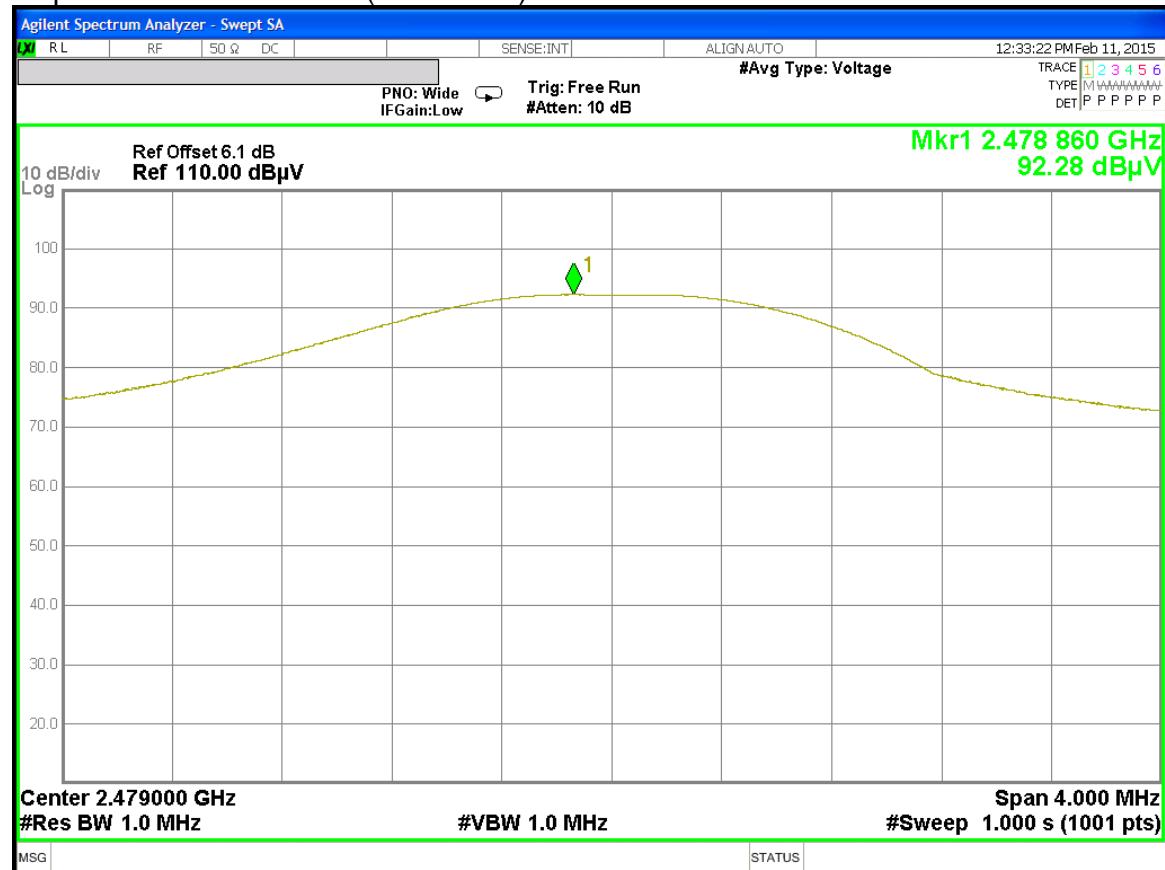
## wSpO2 - HIGH CHANNEL (HORIZONTAL) - PEAK

AVERAGE MEASUREMENT

Note: Using measured duration of 633.3 us versus a measured period of 18 ms, a Duty cycle correction (DCC) was calculated for Average measurements per FCC Part 15.35(c) =  $20 \cdot \log(0.6333/18) = -29.07 \text{ dB}$

Average E-field = Peak - 29.07dB = 95.57 dB $\mu$ V/m - 29.07 dB = 66.50 dB $\mu$ V/m

## wSpO2 - HIGH CHANNEL (VERTICAL) - PEAK

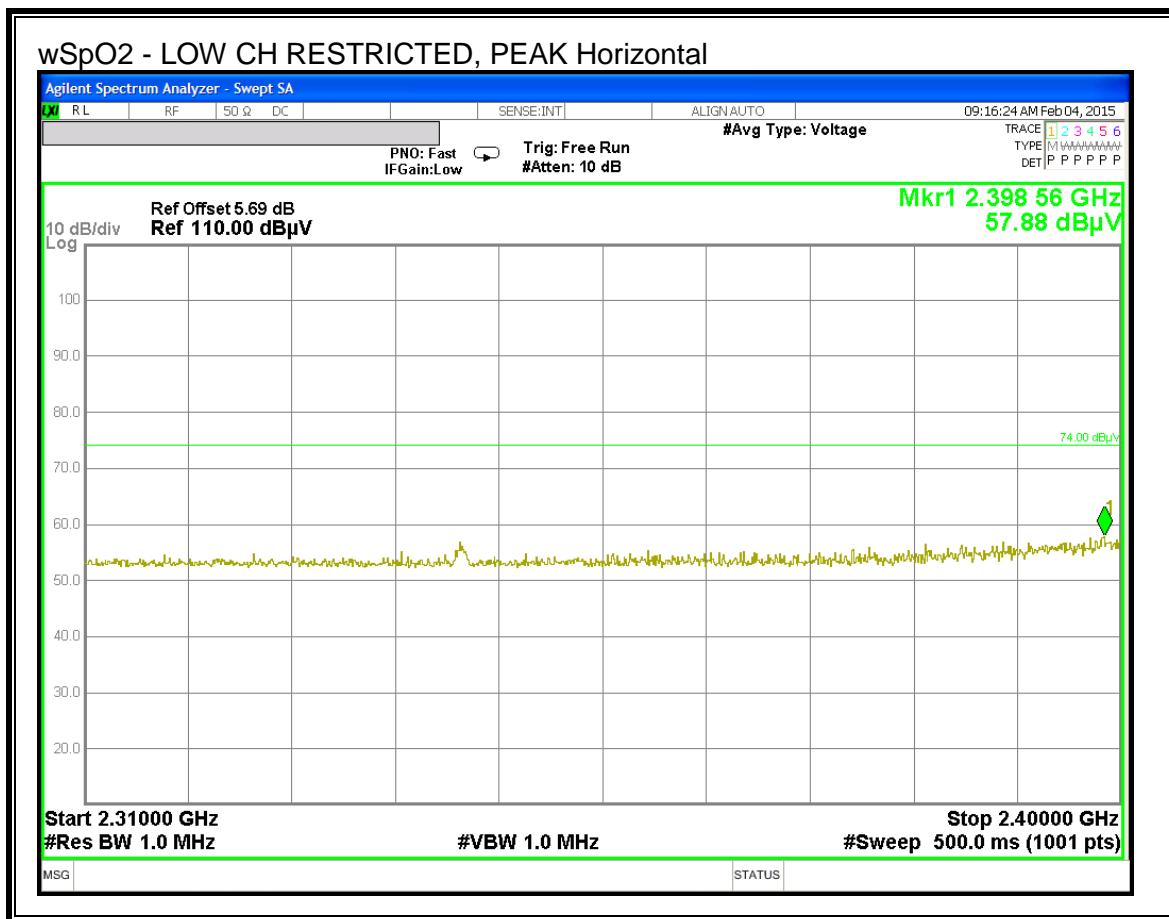
AVERAGE MEASUREMENT

Note: Using measured duration of 633.3 us versus a measured period of 18 ms, a Duty cycle correction (DCC) was calculated for Average measurements per FCC Part 15.35(c) =  $20 \cdot \log(0.6333/18) = -29.07\text{dB}$

Average E-field = Peak – 29.07dB = 92.28 dB $\mu$ V/m – 29.07 dB = 63.21 dB $\mu$ V/m

### 7.3.2. TRANSMITTER RESTRICTED BAND EDGES

#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

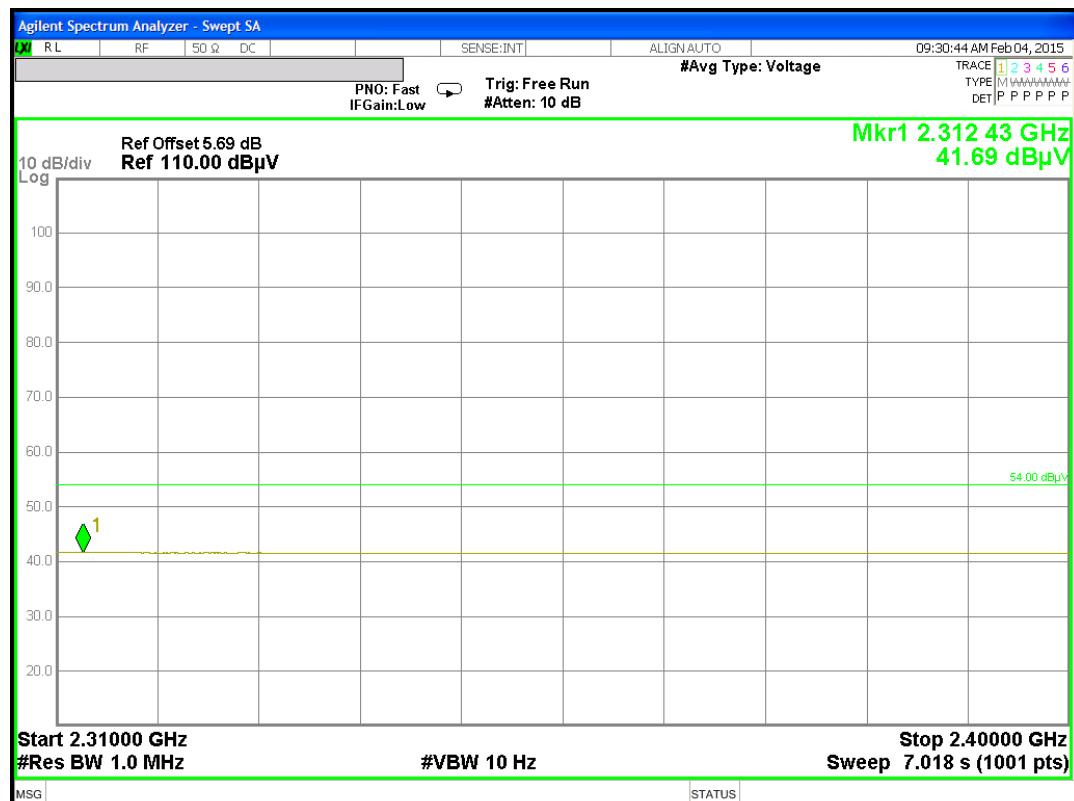


wSpO2 - LOW CH RESTRICTED, AVG, Horizontal

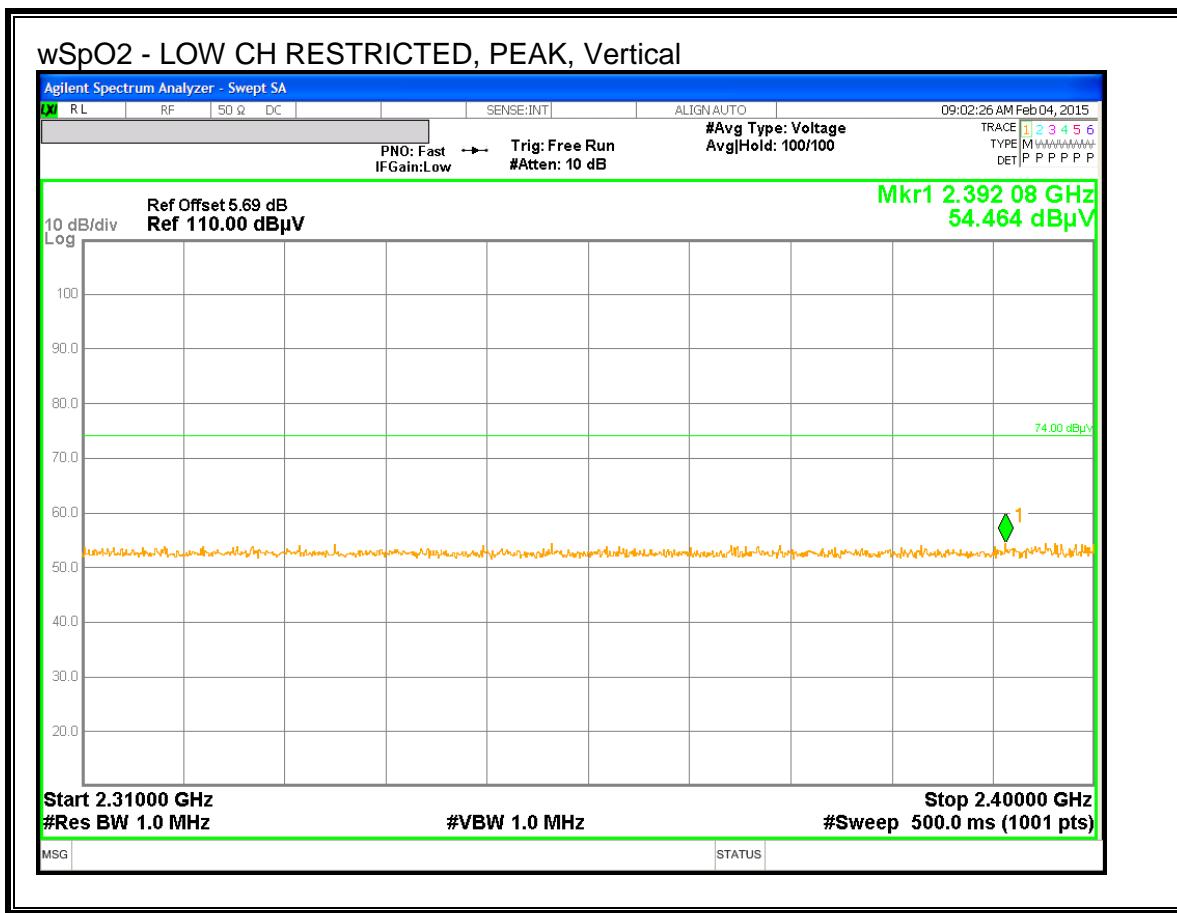
Note: Using measured duration of 633.3 us versus a measured period of 18 ms, a Duty cycle correction (DCC) was calculated for Average measurements per FCC Part 15.35(c) =  $20 \times \log(0.6333/18) = -29.07\text{dB}$

Average E-field = Peak – 29.07dB = 57.88 dB $\mu$ V/m – 29.07 dB = 28.81 dB $\mu$ V/m

Additionally, a reduced video bandwidth scan was performed to show no emissions were below the noise floor that is not related to the fundamental.



**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**

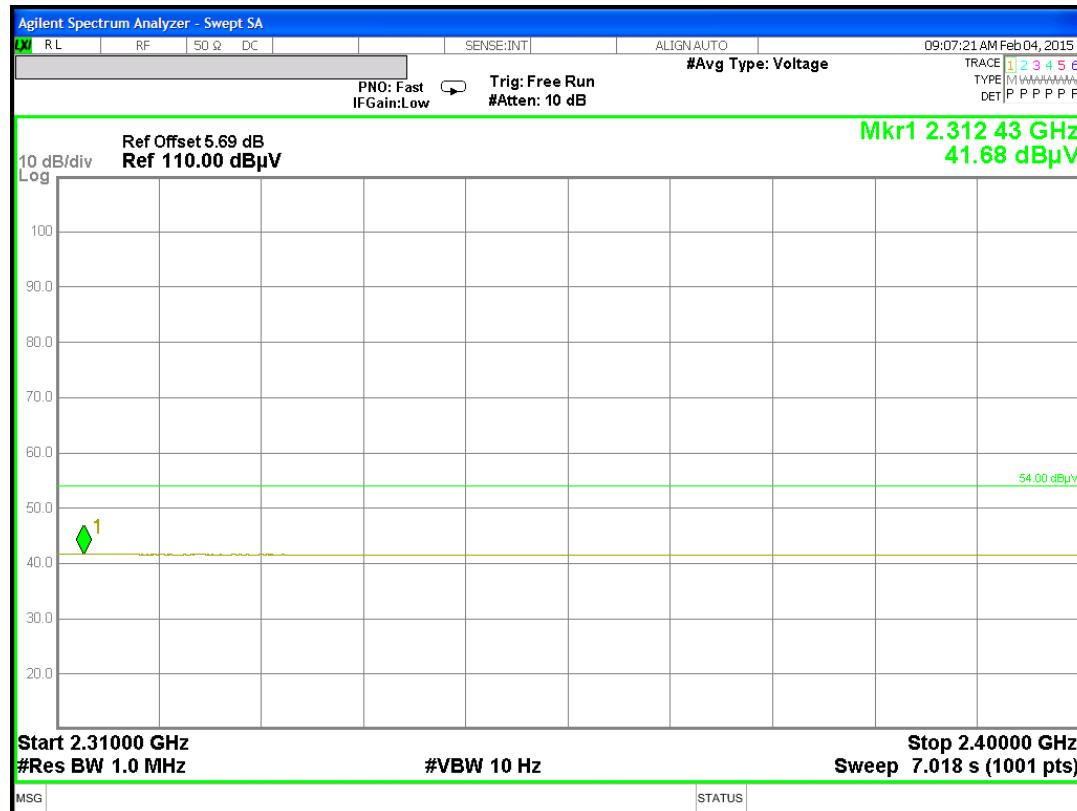


wSpO2 - LOW CH RESTRICTED, AVG, Vertical

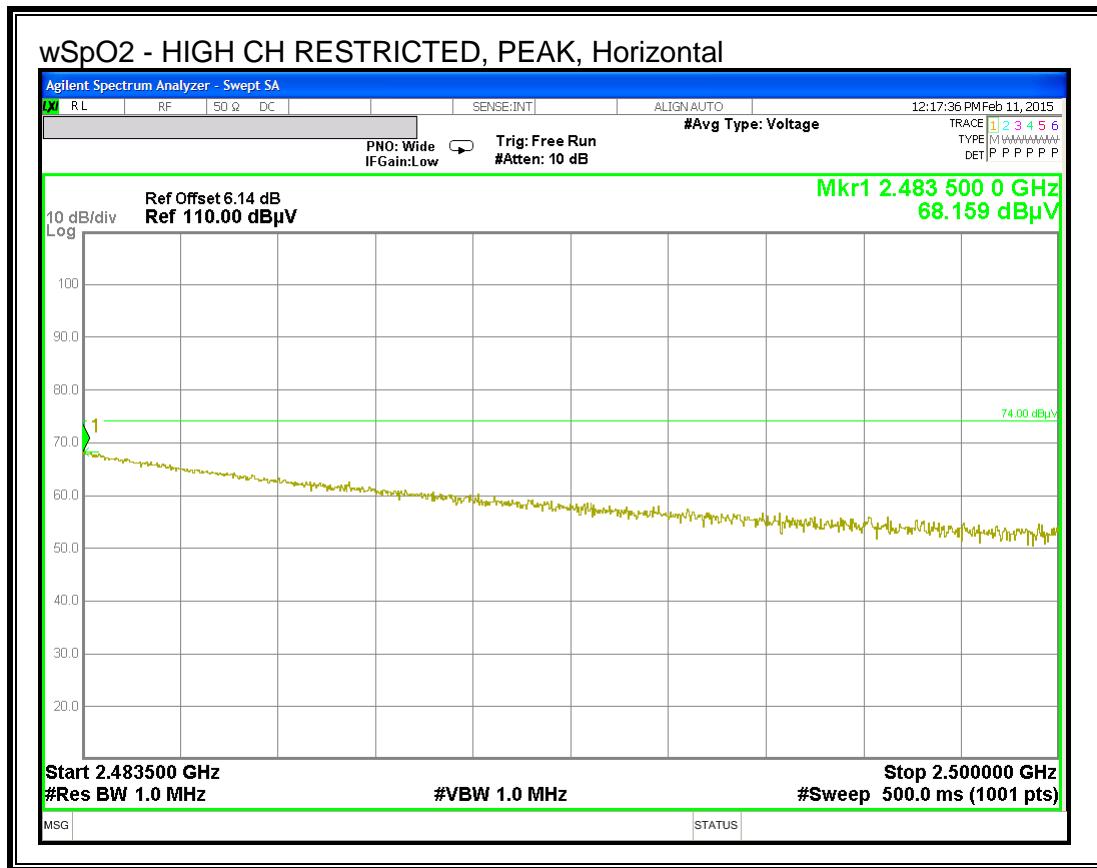
Note: Using measured duration of 633.3 us versus a measured period of 18 ms, a Duty cycle correction (DCC) was calculated for Average measurements per FCC Part 15.35(c) =  $20 \times \log(0.6333/18) = -29.07\text{dB}$

Average E-field = Peak – 29.07dB = 54.46 dB<sub>uV</sub>/m – 29.07 dB = 25.39 dB<sub>uV</sub>/m

Additionally, a reduced video bandwidth scan was performed to show no emissions were below the noise floor that is not related to the fundamental.



## RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

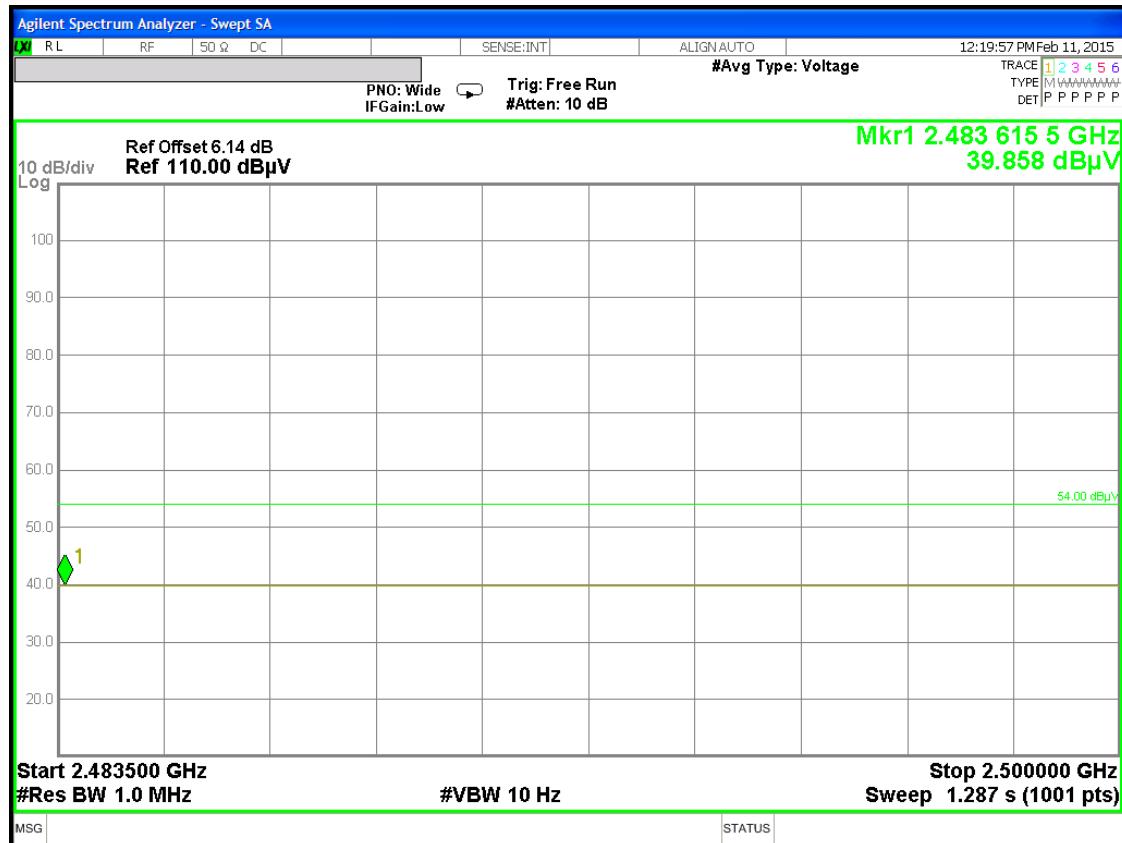


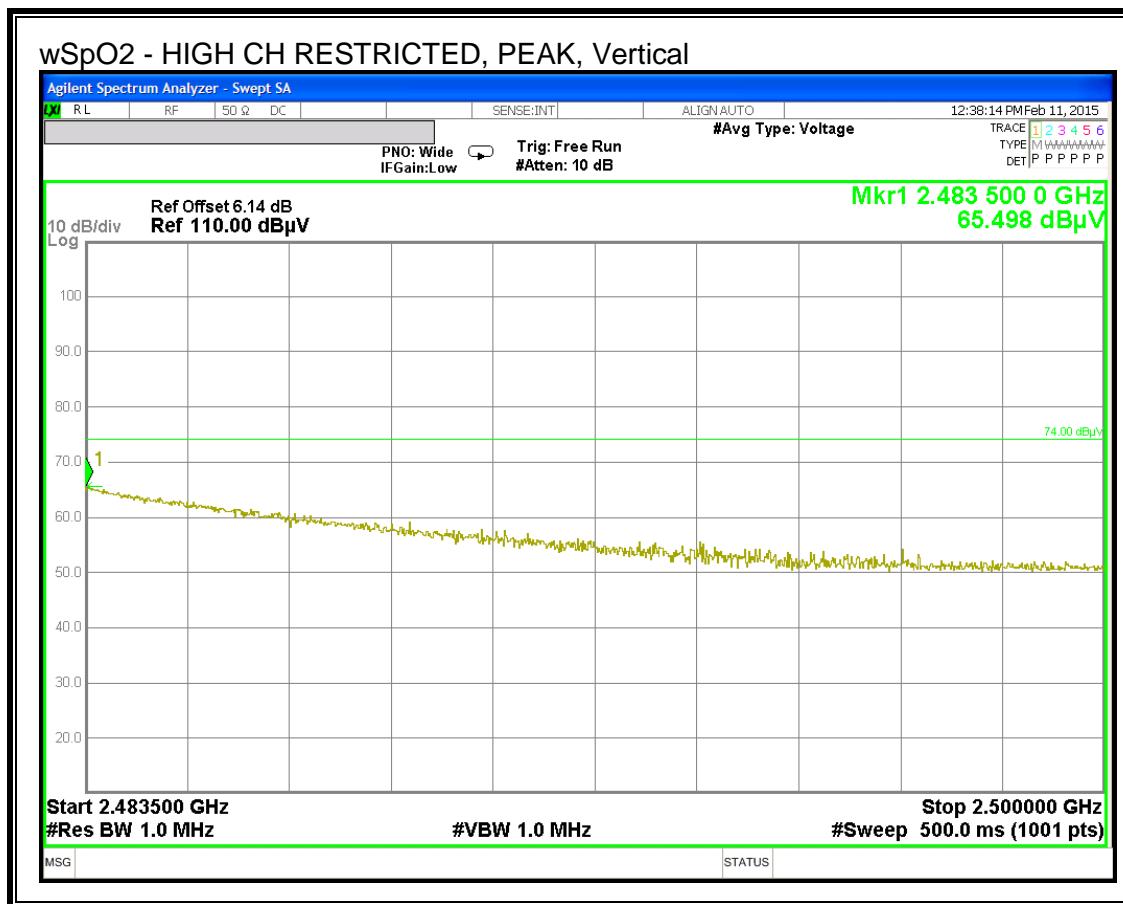
## wSpO2 - HIGH CH RESTRICTED, AVG, Horizontal

Note: Using measured duration of 633.3 us versus a measured period of 18 ms, a Duty cycle correction (DCC) was calculated for Average measurements per FCC Part 15.35(c) =  $20 \times \log(0.6333/18) = -29.07\text{dB}$

Average E-field = Peak – 29.07dB = 68.16 dB $\mu$ V/m – 29.07 dB = 39.09 dB $\mu$ V/m

Additionally, a reduced video bandwidth scan was performed to show no emissions were below the noise floor that is not related to the fundamental.



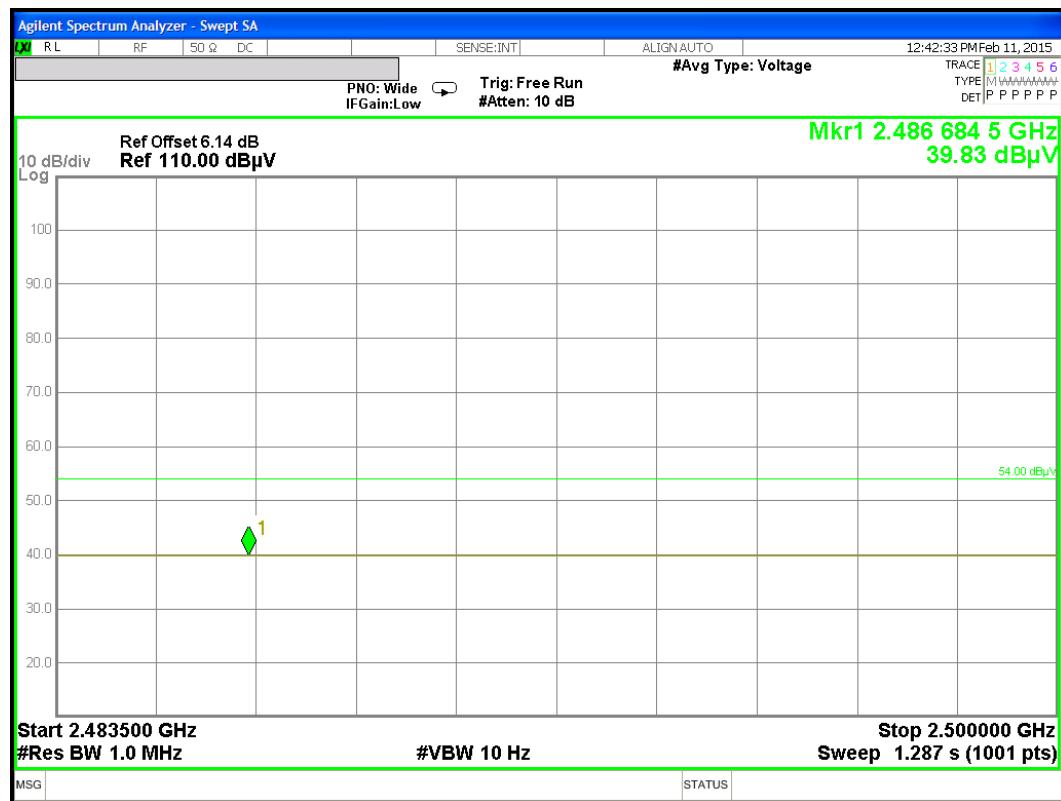
**RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**

## wSpO2 - HIGH CH RESTRICTED, AVG, Vertical

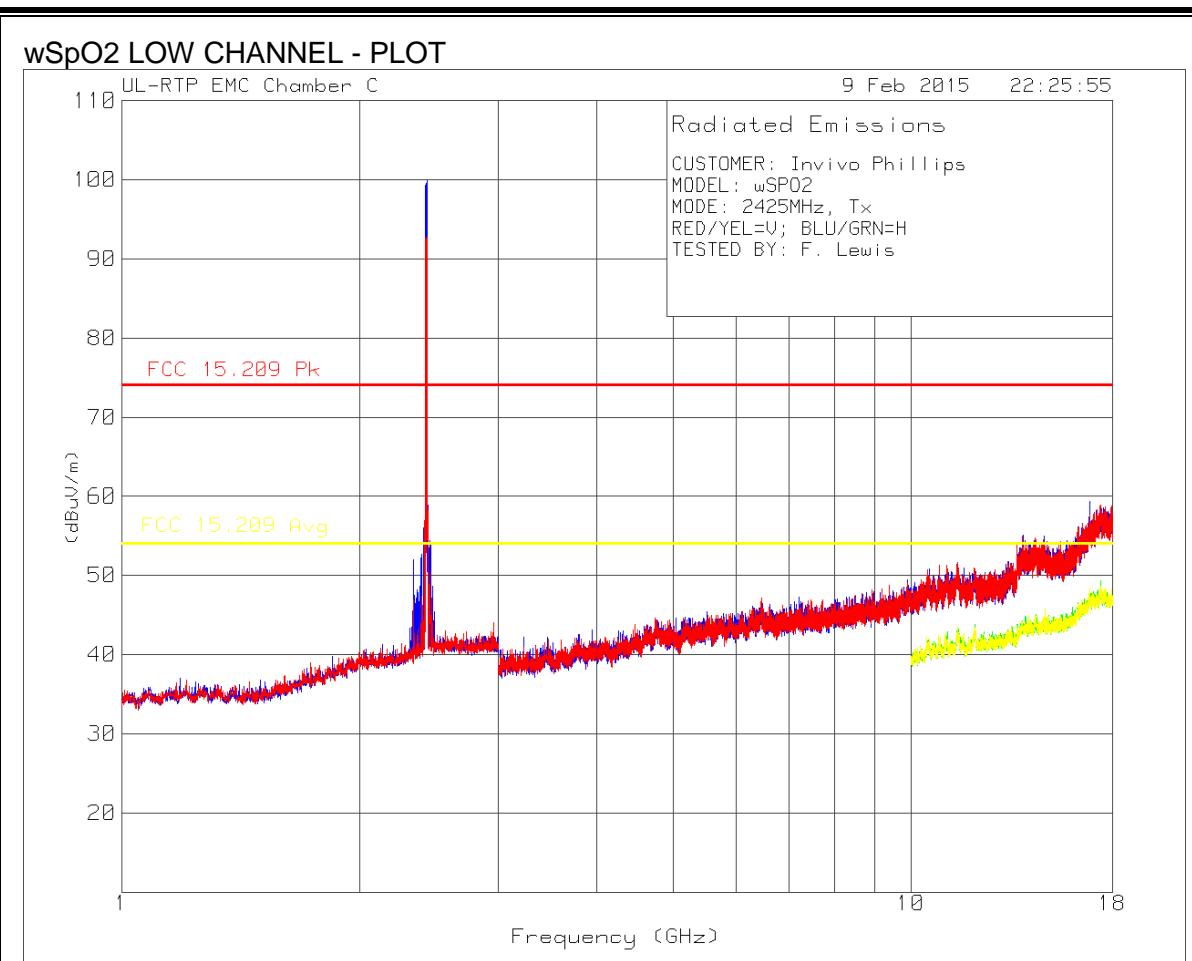
Note: Using measured duration of 633.3 us versus a measured period of 18 ms, a Duty cycle correction (DCC) was calculated for Average measurements per FCC Part 15.35(c) =  $20 * \log(0.6333/18) = -29.07\text{dB}$

Average E-field = Peak – 29.07dB = 65.50 dB $\mu$ V/m – 29.07 dB = 36.43 dB $\mu$ V/m

Additionally, a reduced video bandwidth scan was performed to show no emissions were below the noise floor that is not related to the fundamental.



### 7.3.3. HARMONICS AND SPURIOUS EMISSIONS ABOVE 1GHz



The yellow/green trace represents a reduced video bandwidth trace (10Hz) to show no emissions present in this range.

### wSpO2 LOW CHANNEL - DATA

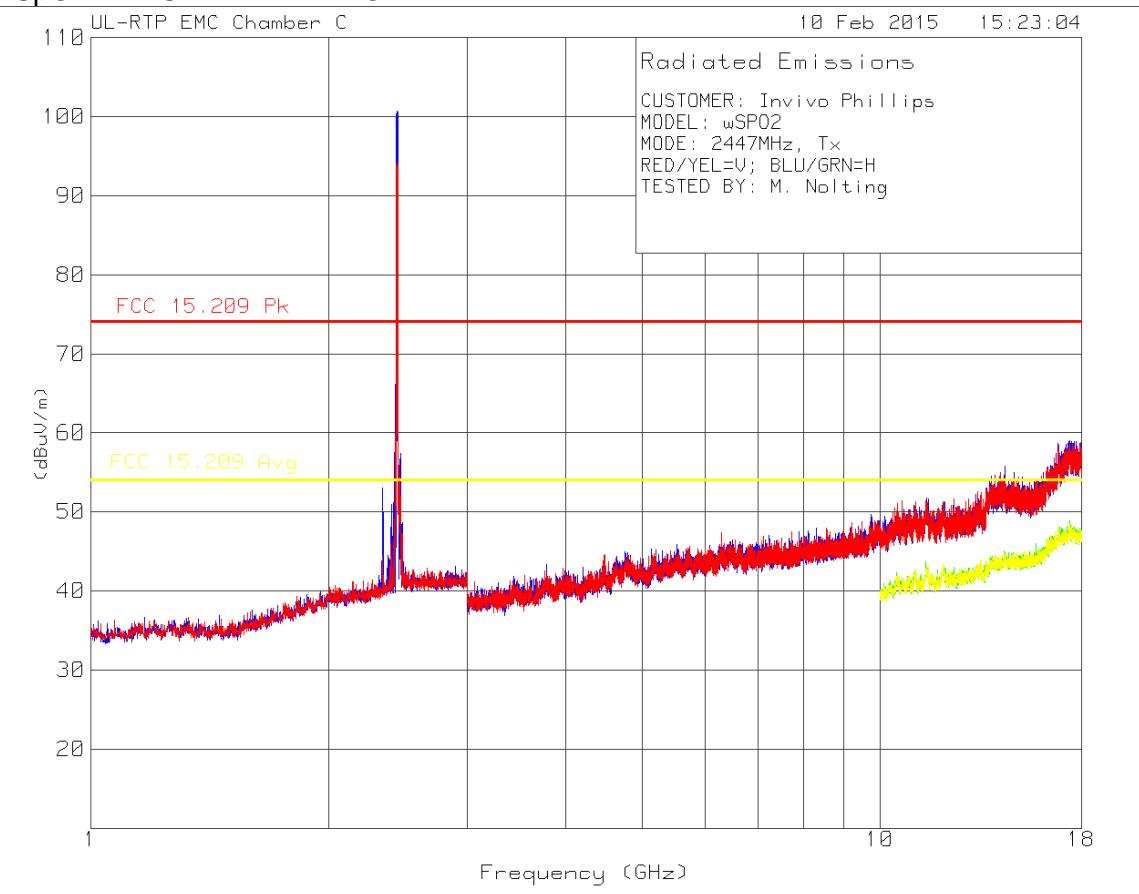
CUSTOMER: Invivo Phillips  
MODEL: wSPO2  
MODE: 2425MHz, Tx  
RED/YEL=V; BLU/GRN=H  
TESTED BY: F. Lewis

Freq (GHz)	Meter Reading [dBuV]	Detector	Antenna Factor [dB/m]	Gain/Loss [dB]	DCCF (dB)	Field Strength [dBuV/m]	Peak Limit [dBuV/m]	Margin [dB]	Average Limit [dBuV/m]	Margin [dB]	Antenna Polarity
4.852	41.3	Pk	35.1	-32.8	0.0	43.6	74.0	-30.4	54.0	-10.4	H
7.209	39.8	Pk	36.3	-28.8	0.0	47.3	74.0	-26.7	54.0	-6.7	H
9.788	38.6	Pk	37.6	-27.0	0.0	49.2	74.0	-24.8	-	-	H
9.788	38.6	AvCalc	37.6	-27.0	-29.1	20.2	-	-	54.0	-33.8	H
4.852	40.3	Pk	35.1	-32.8	0.0	42.6	74.0	-31.4	54.0	-11.4	V
6.459	39.4	Pk	36.3	-28.5	0.0	47.2	74.0	-26.8	54.0	-6.8	V
9.908	38.1	Pk	37.8	-26.3	0.0	49.6	74.0	-24.4	-	-	V
9.908	38.1	AvCalc	37.8	-26.3	-29.1	20.5	-	-	54.0	-33.5	V

\*Pk = Peak

[AvCalc: Average Field Strength computed as follows for the above harmonics: PK + DCCF, where DCCF = 20\*log(T\_on/Period)]

wSpO2 MID CHANNEL - PLOT



The yellow/green trace represents a reduced video bandwidth trace (10Hz) to show no emissions present in this range.

## wSpO2 MID CHANNEL - DATA

CUSTOMER: Invivo Phillips

MODEL: wSpO2

MODE: 2447MHz, Tx

RED/YEL=V; BLU/GRN=H

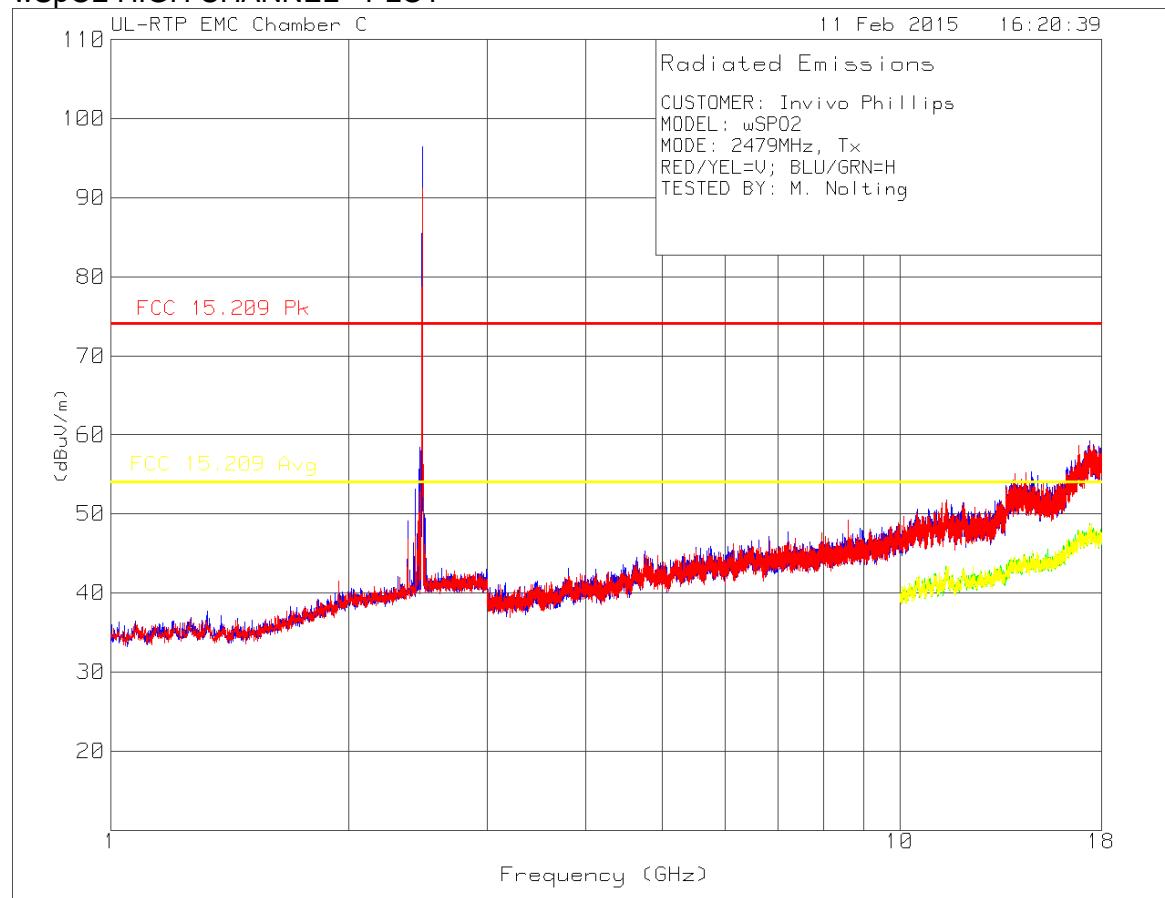
TESTED BY: M. Nolting

Freq (GHz)	Meter Reading [dBuV]		Antenna Factor [dB/m]	Gain/Loss [dB]	DCCF (dB)	Field Strength [dBuV/m]	Peak Limit [dBuV/m]		Average Limit [dBuV/m]	Margin [dB]	Margin [dB]	Antenna Polarity	Comment #
2.342	60.1	Pk	32.1	-36.6	0.0	55.6	74.0	-18.4	-	-	-	H	1
2.342	60.1	AvCalc	32.1	-36.6	-29.1	26.5	-	-	54.0	-27.5	-	H	1
5.539	39.9	Pk	35.9	-30.5	0.0	45.3	74.0	-28.7	54.0	-8.7	-	H	
9.745	38.2	Pk	37.5	-26.5	0.0	49.2	74.0	-24.8	-	-	-	H	
9.745	38.2	AvCalc	37.5	-26.5	-29.1	20.1	-	-	54.0	-33.9	-	H	
4.480	43.0	Pk	34.7	-33.1	0.0	44.6	74.0	-29.4	54.0	-9.4	-	V	
6.293	40.3	Pk	36.1	-29.0	0.0	47.4	74.0	-26.6	54.0	-6.6	-	V	
14.207	38.0	Pk	39.7	-22.9	0.0	54.8	74.0	-19.2	-	-	-	V	
14.207	38.0	AvCalc	39.7	-22.9	-29.1	25.7	-	-	54.0	-28.3	-	V	

\*Pk = Peak

AvCalc: Average Field Strength computed as follows for the above harmonics: PK + DCCF, where DCCF =  $20 \cdot \log(T_{on}/\text{Period})$

wSpO2 HIGH CHANNEL - PLOT



The yellow/green trace represents a reduced video bandwidth trace (10Hz) to show no emissions present in this range.

## wSpO2 HIGH CHANNEL - DATA

CUSTOMER: Invivo Phillips

MODEL: wSPO2

MODE: 2479MHz, Tx

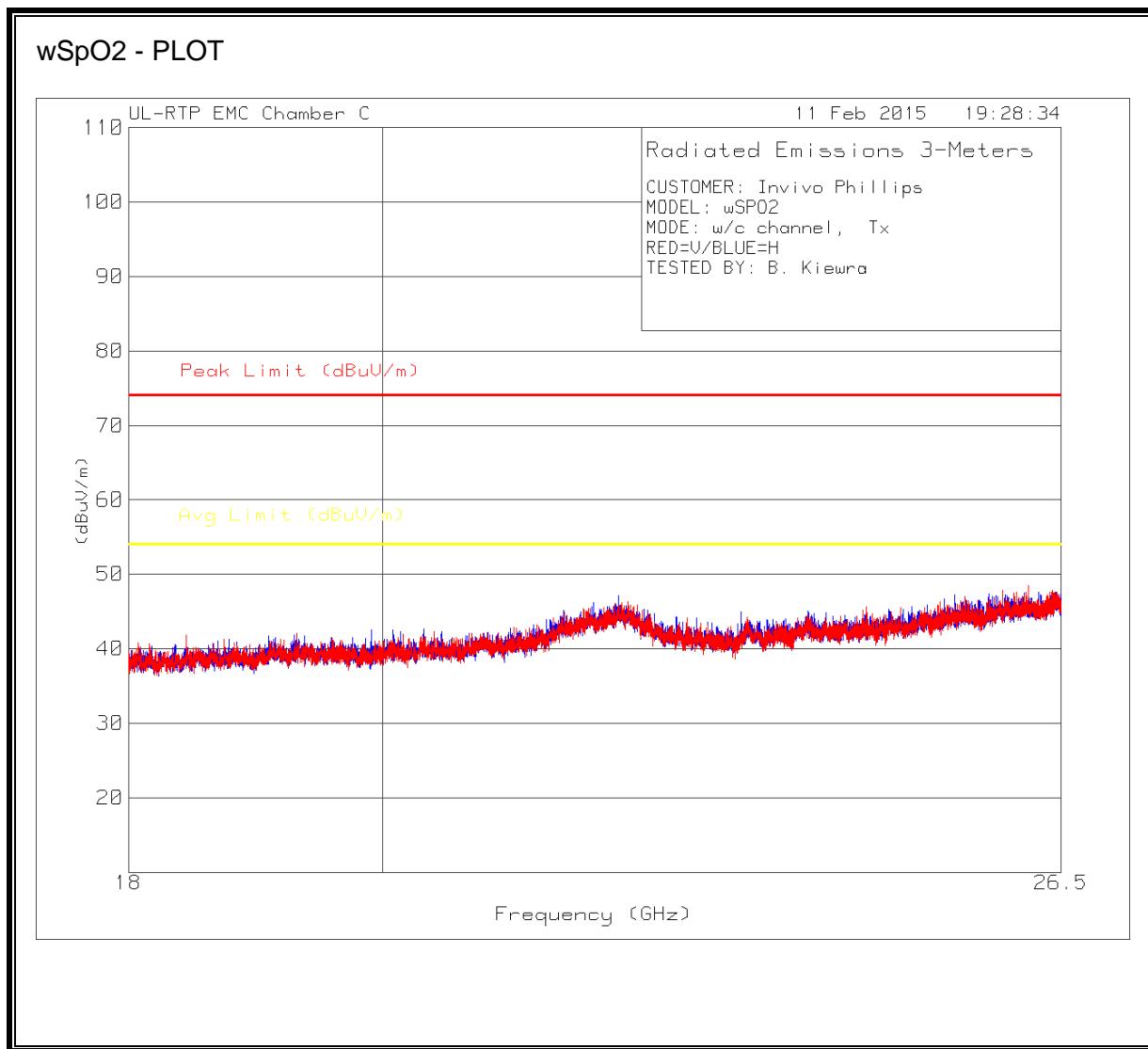
RED/YEL=V: BLU/GRN=H

TESTED BY: M. Nolting

Freq (GHz)	Meter Reading [dBuV]	Detector	Antenna Factor [dB/m]	Gain/Loss [dB]	DCCF (dB)	Field Strength [dBuV/m]	Peak Limit [dBuV/m]	Margin [dB]	Average Limit [dBuV/m]	Margin [dB]	Antenna Polarity	Comment #
2.376	57.3	Pk	32.3	-36.7	0.0	52.9	74.0	-21.1	-	-	H	1
2.376	57.3	AvCalc	32.3	-36.7	-29.1	23.8	-	-	54.0	-30.2	H	1
7.220	39.5	Pk	36.3	-28.8	0.0	47.0	74.0	-27.1	-	-	H	
7.220	39.5	AvCalc	36.3	-28.8	-29.1	17.9	-	-	54.0	-36.1	H	
14.661	37.3	Pk	39.9	-23.0	0.0	54.2	74.0	-19.8	-	-	H	
14.661	37.3	AvCalc	39.9	-23.0	-29.1	25.1	-	-	54.0	-28.9	H	
2.376	53.8	Pk	32.3	-36.7	0.0	49.4	74.0	-24.6	-	-	V	1
2.376	53.8	AvCalc	32.3	-36.7	-29.1	20.3	-	-	54.0	-33.7	V	1
8.589	38.4	Pk	36.5	-27.2	0.0	47.7	74.0	-26.3	-	-	V	
8.589	38.4	AvCalc	36.5	-27.2	-29.1	18.6	-	-	54.0	-35.4	V	
16.838	36.7	Pk	42.2	-20.8	0.0	58.1	74.0	-15.9	-	-	V	
16.838	36.7	AvCalc	42.2	-20.8	-29.1	29.1	-	-	54.0	-24.9	V	

\*Pk = Peak

AvCalc: Average Field Strength computed as follows for the above harmonics: PK + DCCF, where DCCF =  $20 \log(T_{on}/\text{Period})$

**7.3.4. WORST-CASE ABOVE 1 GHz (18-26 GHz)****SPURIOUS EMISSIONS 18 to 26 GHz (HORIZONTAL)**

### wSpO2 - DATA

CUSTOMER: Invivo Phillips

MODEL: wSPO2

MODE: w/c channel, Tx

RED=V/BLUE=H

TESTED BY: B. Kiewra

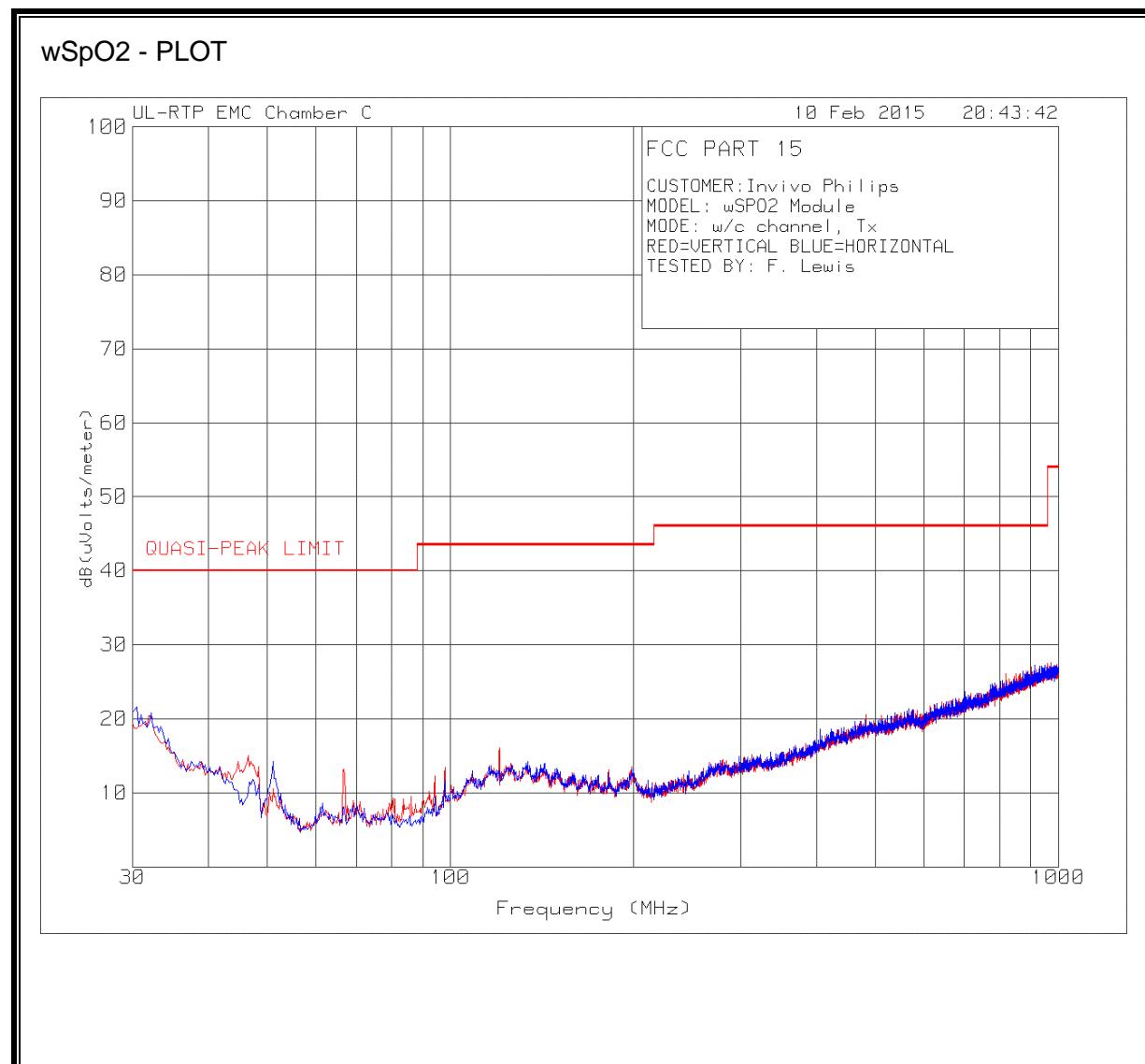
Freq (GHz)	Meter Reading [dBuV]	Detector	Antenna Factor [dB/m]	Gain/Loss [dB]	DCCF (dB)	Field Strength [dBuV/m]	Peak Limit [dBuV/m]	Margin [dB]	Average Limit [dBuV/m]	Margin [dB]	Antenna Polarity
19.904	43.1	Pk	32.6	-33.2	0.0	42.5	74.0	-31.4	54.0	-11.4	H
22.055	42.0	Pk	36.9	-31.7	0.0	47.2	74.0	-26.8	54.0	-6.8	H
25.718	41.7	Pk	33.9	-28.2	0.0	47.4	74.0	-26.6	54.0	-6.6	H
22.145	41.8	Pk	36.5	-31.9	0.0	46.4	74.0	-27.6	54.0	-7.6	V
24.443	42.4	Pk	33.6	-30.3	0.0	45.7	74.0	-28.3	54.0	-8.3	V
26.144	42.0	Pk	34.1	-28.4	0.0	47.7	74.0	-26.3	-	-	V
26.144	42.0	AvCalc	34.1	-28.4	-29.1	18.6	-	-	54.0	-35.4	V

\*Pk = Peak

AvCalc: Average Field Strength computed as follows for the above harmonics: PK + DCCF, where DCCF =  $20 \log(T_{on}/\text{Period})$

### 7.3.5. WORST-CASE BELOW 1 GHz

#### SPURIOUS EMISSIONS 30 TO 1000 MHz (HORIZONTAL)



wSpO2 - DATA

CUSTOMER: Invivo Philips  
MODEL: wSPO2 Module  
MODE: w/c channel, Tx  
RED=VERTICAL BLUE=HORIZONTAL  
TESTED BY: F. Lewis

Test Frequency [MHz]	Meter Reading [dBuV]	Detector *	Antenna [dB/m]	Gain/Loss [dB]	Field Strength [dBuV/m]	QP Limit [dBuV/m]	Margin [dB]	Polarity
31.940	31.7	Pk	20.3	-31.6	20.4	40.0	-19.6	V
46.486	36.7	Pk	9.7	-31.4	15.0	40.0	-25.0	V
66.851	36.1	Pk	8.3	-31.2	13.2	40.0	-26.8	V
97.883	34.7	Pk	9.7	-31.0	13.4	43.5	-30.1	V
120.430	33.4	Pk	13.6	-30.9	16.1	43.5	-27.5	V
51.092	38.1	Pk	7.5	-31.4	14.2	40.0	-25.8	H

\*Pk = Peak, Qp = Quasi-Peak, AV = Average.

**END OF REPORT**