TEST REPORT

Report Number: 100618766MPK-009
Project Number: G100618766
Report Date: April 30, 2012

Testing performed on the
Dental Soft Tissue Laser
Model Number: EPIC 10
FCC ID: G2OEPIC
IC: 10338A-EPIC

to

FCC Part 15 Subpart C (15.247)
RSS-210 Issue 8
FCC Part 15, Subpart B
Industry Canada ICES-003

for

Biolase Technology, Inc.

Test Performed by:	Test Authorized by:
Intertek	Biolase Technology, Inc.
1365 Adams Court	4 Cromwell
Menlo Park, CA 94025 USA	Irvine, CA 92618 USA

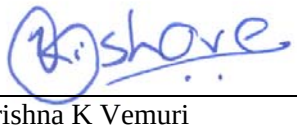
Prepared by: _____ **Date:** April 30, 2012
Krishna K Vemuri, Senior Staff Engineer

Reviewed by: _____ **Date:** April 30, 2012
Yuriy Litvinov, EMC Business Manager

Report No. 100618766MPK-009

Equipment Under Test:	Dental Soft Tissue Laser
Trade Name:	Biolase Technology, Inc.
Model No.:	EPIC 10
FCC ID:	G2OEPIC
IC:	10338A-EPIC
Applicant:	Biolase Technology, Inc.
Contact:	Mr. Peter Pham
Address:	4 Cromwell Irvine, CA 92618
Country	USA
Tel. Number:	(949) 361-1200
email	ppham@biolase.com
Applicable Regulation:	FCC Part 15 Subpart C (15.247) RSS-210 Issue 8 FCC Part 15, Subpart B Industry Canada ICES-003
Test Site Location:	ITS – Site 1 1365 Adams Drive Menlo Park, CA 94025
Date of Test:	April 18 to April 30, 2012

We attest to the accuracy of this report:



Krishna K Vemuri	Yuriy Litvinov
EMC Senior Staff Engineer	EMC Business Manager

TABLE OF CONTENTS

1.0 Introduction

The Equipment Under Test (EUT) is a surgical and therapeutic device at the cutting edge of technology, designed for a wide variety of oral soft tissue procedures and dental whitening, as well as for use in providing temporary relief of minor pain.

The EPIC 10 utilizes a solid state diode as a semiconductor source for invisible infrared radiation. The energy is delivered to the treatment site via flexible fiber, connected at one end to the laser source and the other end to the handpiece. Various types of the single use tips were designed and optimized for different applications. The device is activated by means of a wireless footswitch.

The Equipment Under Test (EUT) is a device with a DTS (Digital Transmission System) transceiver operating in the 2.4GHz frequency band.

This report is designed to show compliance of the 2.4 GHz transceiver with FCC Part 15.247 and RSS-210 requirements.

1.1 Summary of Tests

TEST	REFERENCE FCC 15.247	REFERENCE RSS-210	RESULTS
Output Power	15.247(b)(3)	A8.4(4)	Complies
6-dB Bandwidth	15.247(a)(2)	A8.2(a)	Complies
Power Spectral Density	15.247(e)	A8.2(b)	Complies
Out-of-Band Antenna Conducted Emission	15.247(d)	A8.5	The EUT has a permanently attached internal antenna. It does not contain an antenna port connector. Instead of Antenna Conducted measurements, Radiated measurements were performed.
Out-of-Band Radiated Emission (except emissions in Restricted Bands)	15.247(d)	A8.5	Complies
Radiated Emission in Restricted Bands	15.247(d), 15.205	2.2	Complies
Radiated Emission from Digital Part and Receiver	15.109	ICES-003	Complies
RF Exposure	15.247(i)	RSS-102	Complies
AC Conducted Emission	15.207	RSS-GEN	Complies

2.0 General Description

2.1 Product Description

Overview of the EUT

Applicant	Biolase Technology, Inc. 4 Cromwell Irvine, CA 92618
Manufacturer Name & Address	Biolase Technology, Inc. 4 Cromwell Irvine, CA 92618
Model Number	EPIC 10
FCC Identifier	G2OEPIC
IC Number	10338A-EPIC
Rated RF Output (EIRP)	-6.7 dBm, 0.214 mW
Frequency Range	2425 - 2475 MHz
Number of Channel(s)	11
Modulation Type	ZigBee (IEEE 802.15.4)
Antenna Type and Gain	Internal PCB Antenna, Gain = 4.5dBi

EUT receive date: April 18, 2012
EUT receive condition: The prototype version of the EUT was received in good condition with no apparent damage. As declared by the Applicant it is identical to the production units.
Test start date: April 18, 2012
Test completion date: April 30, 2012
The test results in this report pertain only to the item tested.

2.2 Related Submittal(s) Grants

None.

2.3 Test Methodology

Radiated and AC Line conducted emissions measurements were performed according to the procedures in ANSI C63.4. Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the **"Data Sheet"** of this Application. All other measurements were made in accordance with the procedures described in the FCC guidance document, *Measurement of Digital Transmission Systems Operating under Section 15.247*.

2.4 Test Facility

The radiated emission test site and conducted measurement facility used to collect the data is 10m semi-anechoic chamber located in Menlo Park, California. This test facility and site measurement data have been fully placed on file with the FCC and Industry Canada (Site # 2042L-1).

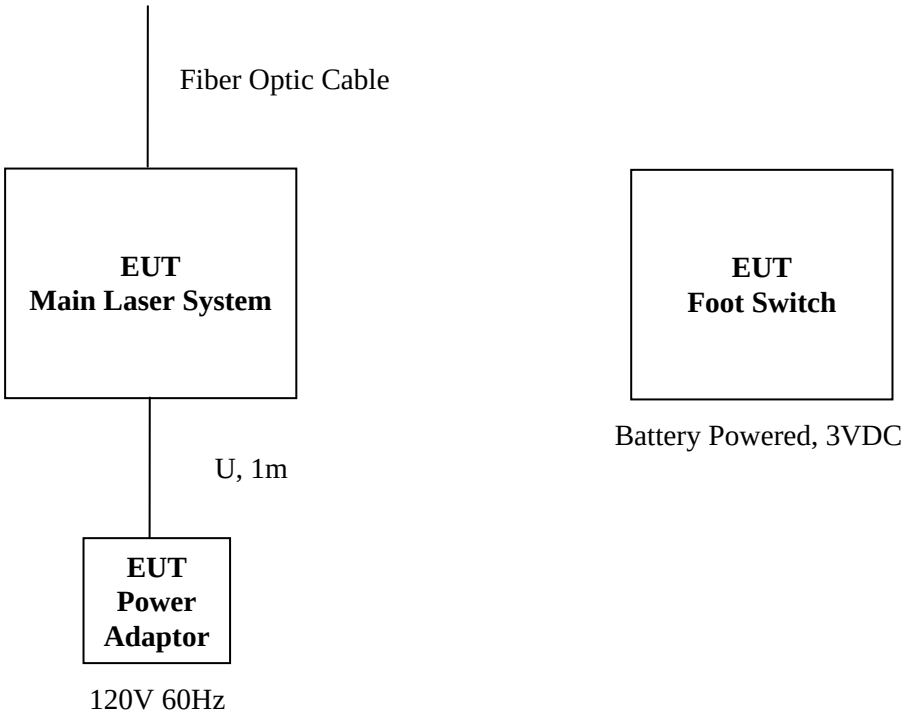
3.0 System Test Configuration

3.1 Support Equipment

None.

3.2 Block Diagram of Test Setup

The diagram shown below details the interconnection of the EUT and support equipment. For specific layout, refer to the test configuration photograph in the relevant section of this report.



Power Adaptor - Make: SL Power, Model: MW174KB1203F01

S = Shielded **U** = Unshielded	**F** = With Ferrite **m** = Length in Meters

3.3 Justification

For radiated emission measurements the EUT was placed on a non-conductive table. The EUT was configured to transmit full power.

3.4 Software Exercise Program

Biolase Technology, Inc. proprietary test software.

3.5 Mode of Operation During Test

The EUT was setup in the software controlled test mode to continuously transmit a modulated signal at the lowest (2425 MHz), middle (2450 MHz) and highest (2475 MHz) channels.

3.6 Modifications Required for Compliance

No modifications were installed by Intertek Testing Services during compliance testing in order to bring the product into compliance.

4.0 Measurement Results

4.1 Conducted Output Power at Antenna Terminals
FCC 15.247(b)(3)

Requirements

For systems operating in the 2400-2483.5 MHz band using digital modulation, the maximum peak output power is 1 watt (30 dBm), the conducted power limit is based on the use of antenna with directional gain that do not exceed 6dBi. If the transmitting antenna of directional gain greater than 6dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated value as in FCC 15.247(b)(4)(i).

Procedure

The EUT has a permanently attached internal antenna. It does not contain an antenna port connector. Instead of Antenna Conducted measurements, Radiated measurements were performed.

The maximum field strength of the fundamental was measured.

The transmitter's peak power was calculated using the following equation:

Where: E = the measured maximum field strength in V/m.

Set the RBW > 6dB bandwidth of the emission or use a peak power meter.

P = (E x d) squared / (30 x G).

G = the numeric gain of the transmitting antenna over an isotropic radiator.

d = the distance in meters from which the field strength was measured.

P = the power in watts for which you are solving.

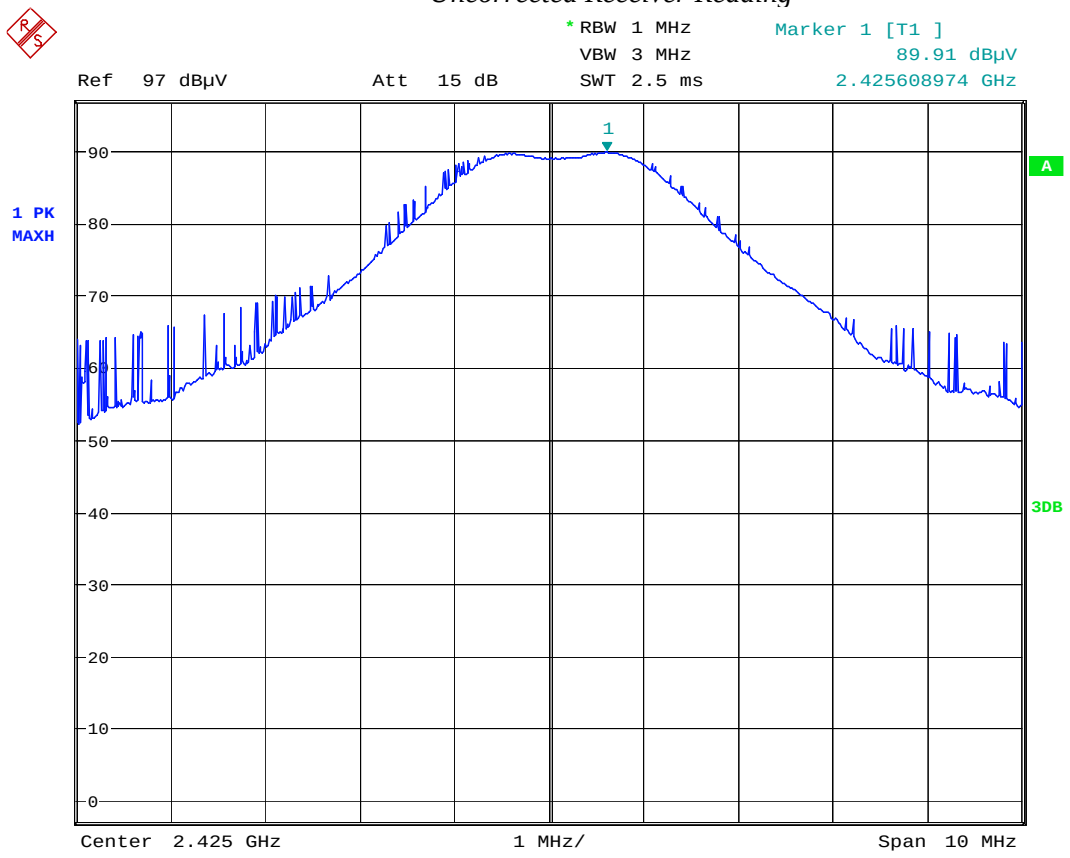
Test Results

Frequency (MHz)	Output in dBm	Output in mW	Plot number
2425	-8.8	0.131	1.1
2450	-8.2	0.151	1.2
2475	-6.7	0.214	1.3

Note: The EUT's antenna has less than 6 dBi gain.

Plot 1.1

Uncorrected Receiver Reading



Output Power
Date: 24.APR.2012 18:53:56

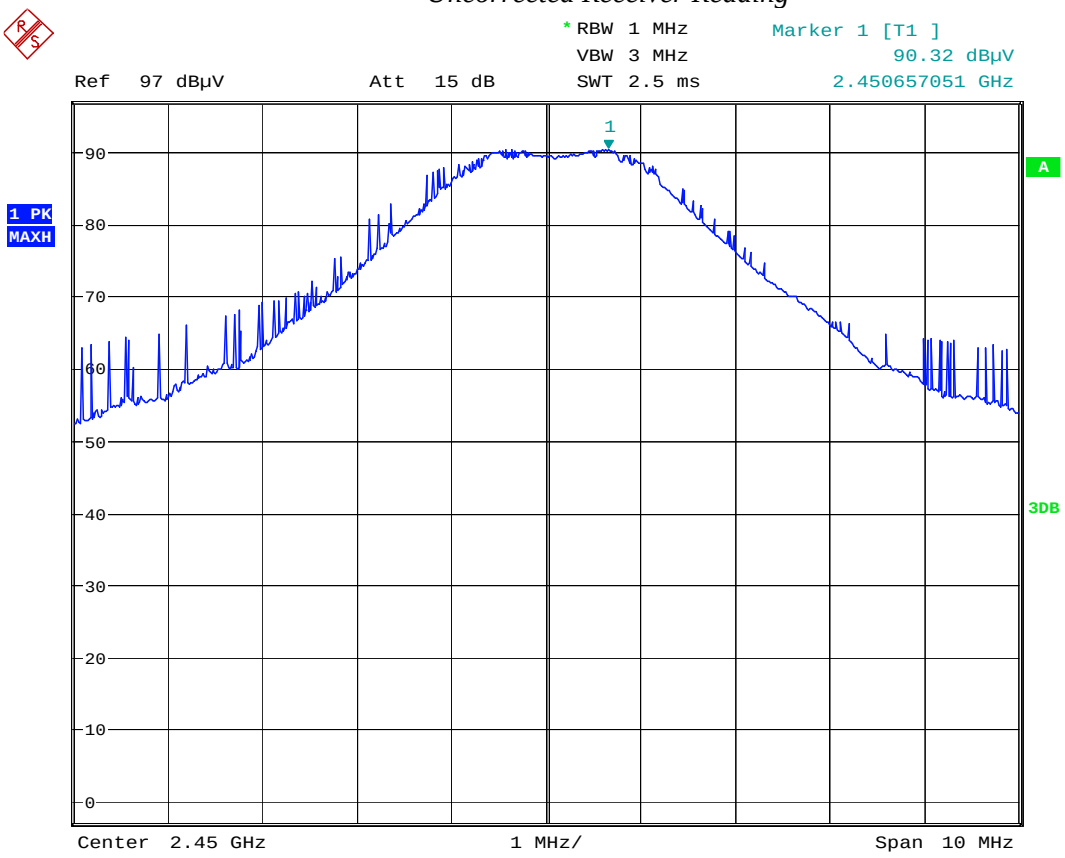
Final Corrected Reading

Frequency	RA	AG	CF	AF	Final Field Strength	EIRP	EIRP
MHz	dB(uV)	dB	dB	dB(1/m)	dB(uV/m)	dBm	mW
2425.0	89.9	35.6	4.4	27.8	86.5	-8.8	0.131

RA = Receiver Amplitude
AG = Amplifier Gain
CF = Cable Factor
AF = Antenna Factor

Plot 1.2

Uncorrected Receiver Reading



Output Power
Date: 24.APR.2012 18:06:04

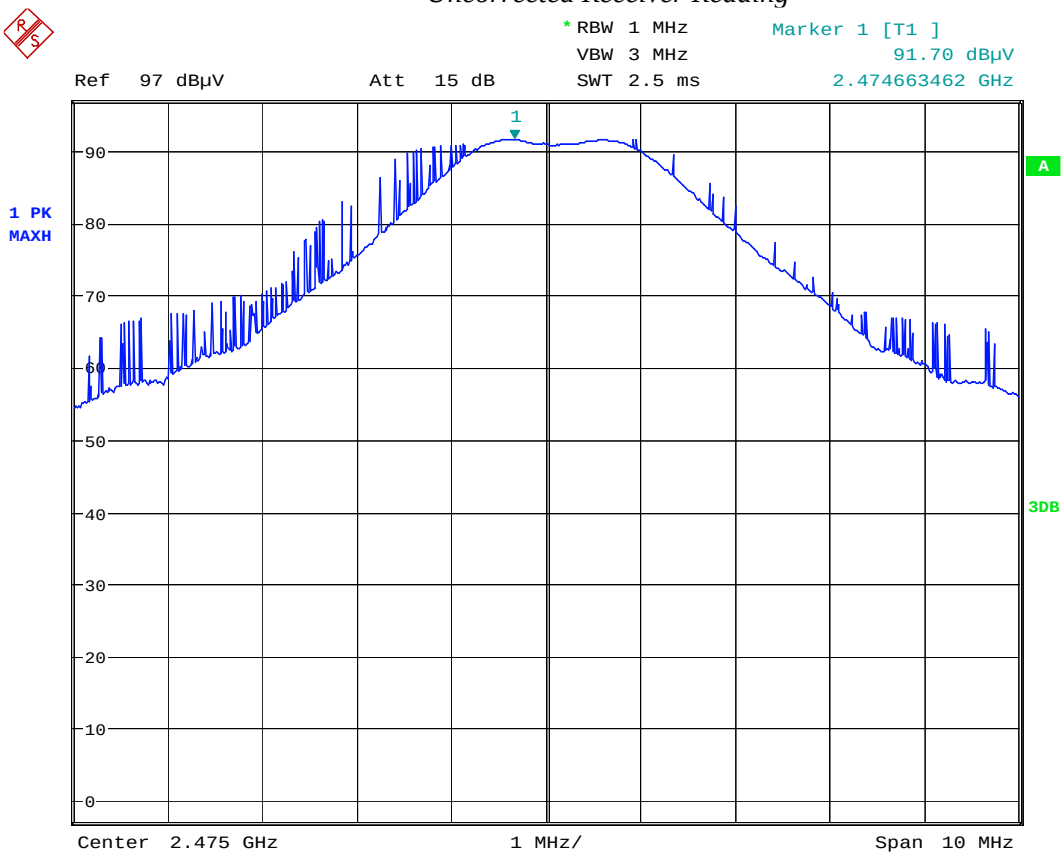
Final Corrected Reading

Frequency	RA	AG	CF	AF	Final Field Strength	EIRP	EIRP
MHz	dB(uV)	dB	dB	dB(1/m)	dB(uV/m)	dBm	mW
2450.0	90.3	35.6	4.5	27.9	87.1	-8.2	0.151

RA = Receiver Amplitude
AG = Amplifier Gain
CF = Cable Factor
AF = Antenna Factor

Plot 1.3

Uncorrected Receiver Reading



Output Power

Date: 24.APR.2012 18:29:58

Final Corrected Reading

Frequency	RA	AG	CF	AF	Final Field Strength	EIRP	EIRP
MHz	dB(uV)	dB	dB	dB(1/m)	dB(uV/m)	dBm	mW
2475.0	91.7	35.7	4.5	28.1	88.6	-6.7	0.214

RA = Receiver Amplitude
AG = Amplifier Gain
CF = Cable Factor
AF = Antenna Factor

4.2 6-dB Bandwidth
FCC 15.247(a)(2)

Requirements

For systems operating in the 2400-2483.5 MHz band using digital modulation, the minimum 6-dB Bandwidth shall be at least 500kHz.

Procedure

A measuring antenna was placed in close proximity to the EUT. The spectrum analyzer resolution bandwidth was set to approximately 1% of the total emission bandwidth, VBW>RBW. The 6-dB Bandwidth was measured by using the DELTA MARKER function of the analyzer.

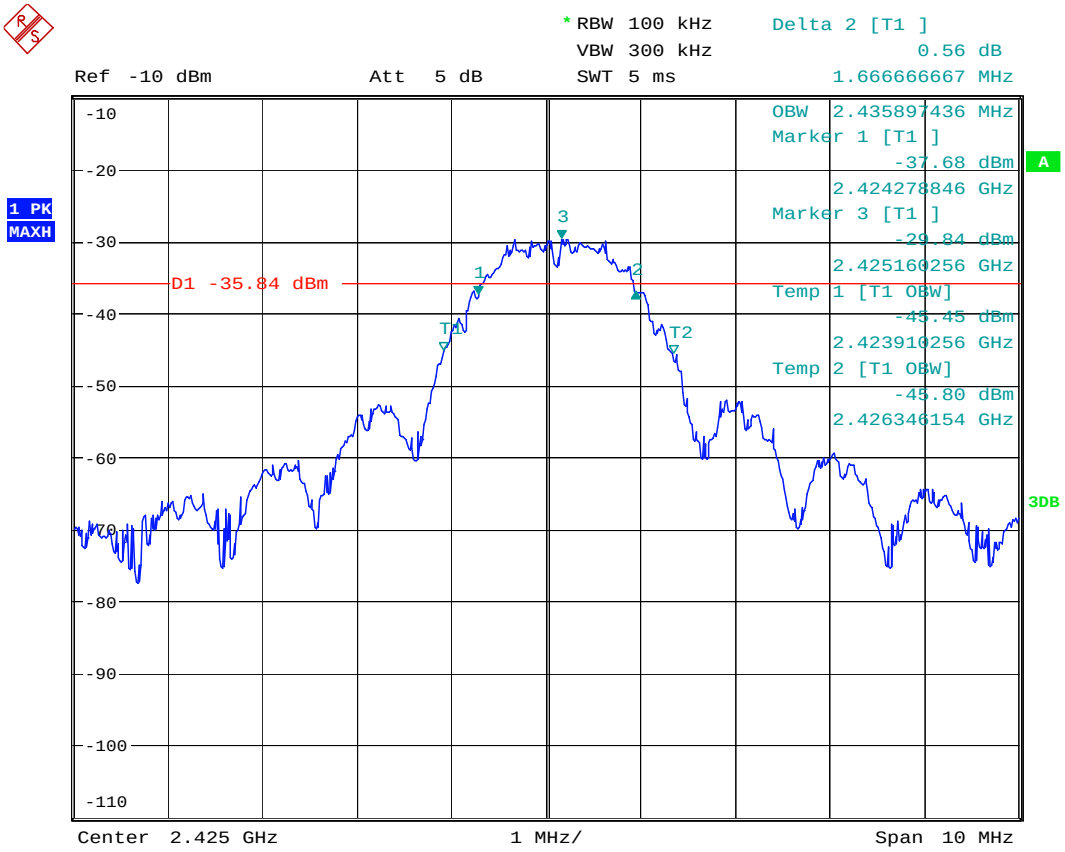
In addition, the Occupied Bandwidth (99%) was measured.

Test Results

Frequency (MHz)	6-dB Channel Bandwidth (MHz)	Plot
2425	1.6667	2.1
2450	1.6667	2.2
2475	1.6186	2.3

Frequency (MHz)	99% Occupied Bandwidth (MHz)	Plot
2425	2.4359	2.1
2450	2.4679	2.2
2475	2.7724	2.3

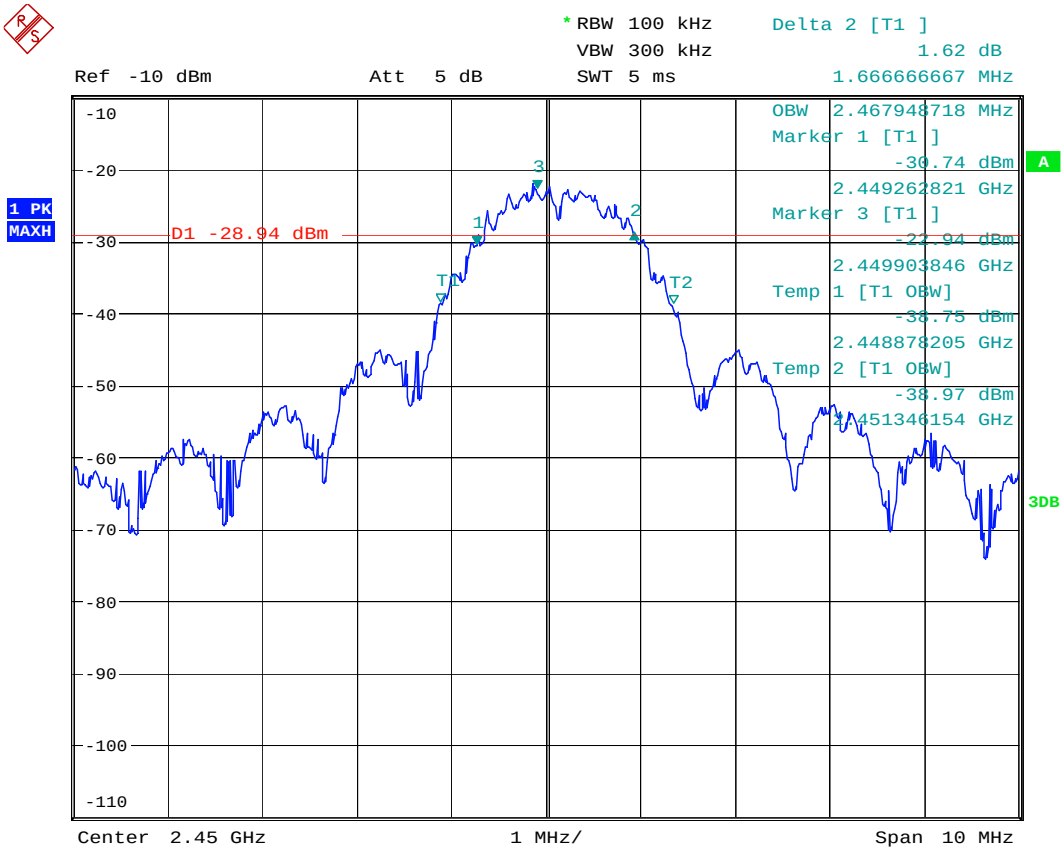
Plot 2.1



Bandwidth

Date: 24.APR.2012 17:44:38

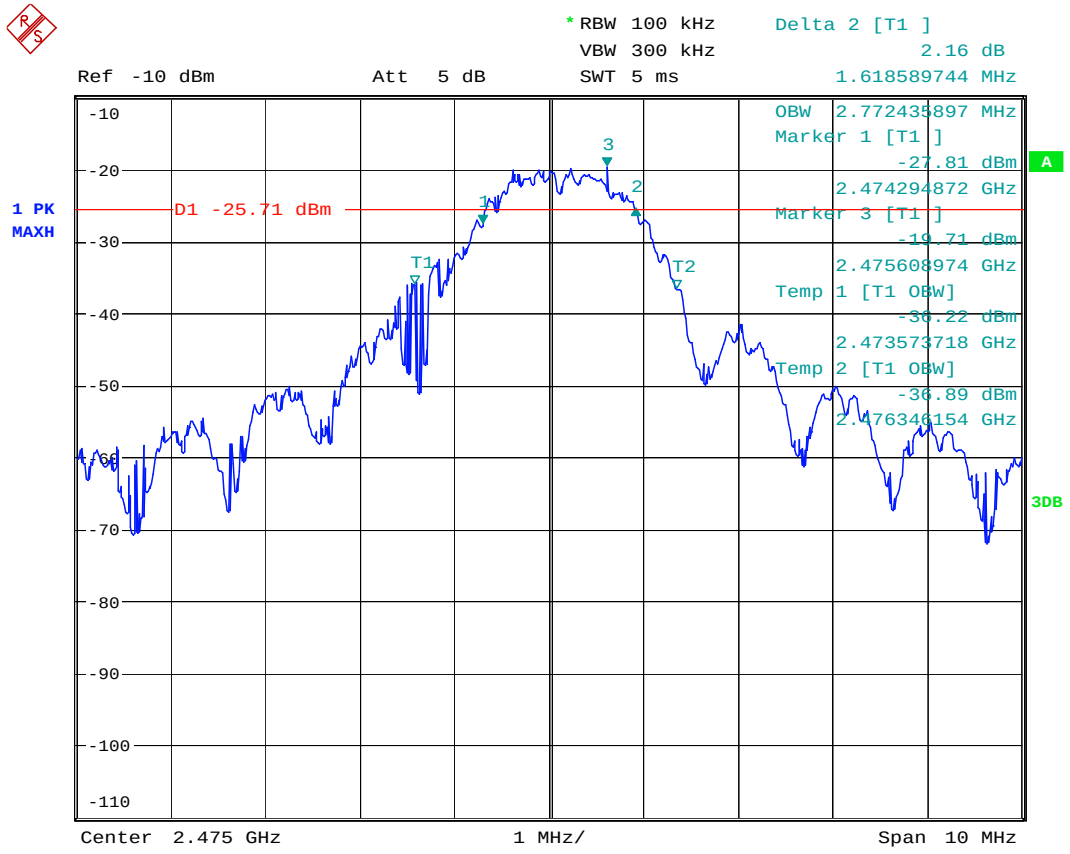
Plot 2.2



Bandwidth

Date: 24.APR.2012 18:10:07

Plot 2.3



Bandwidth

Date: 24.APR.2012 18:33:21

4.3 Out-of-Band Conducted Emissions
FCC 15.247(d)

Requirement

In any 100 kHz bandwidth outside the EUT pass-band, the RF power shall be at least 20 dB below that of the maximum in-band 100 kHz emission.

Procedure

The EUT has a permanently attached internal antenna. It does not contain an antenna port connector. Instead of Antenna Conducted measurements, Radiated measurements were performed. The out-of-band emissions were measured from 30 MHz to 25 GHz.

Test Result

Refer to the radiated emissions test data located in report section 4.5.

The attenuation of emissions outside the EUT pass-band is more than 20 dB.

4.4 Power Spectral Density
FCC 15.247 (e)

Requirement

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

Procedure

The EUT has a permanently attached internal antenna. It does not contain an antenna port connector. Instead of Antenna Conducted measurements, Radiated measurements were performed.

(A) Tune the analyzer to the highest point of the maximized fundamental emission.
Reset the analyzer to a RBW = 3 kHz, VBW > RBW, span = 300 kHz, sweep = 100 sec.

(B) From the peak level obtained in (A), derive the field strength, E, by applying the appropriate antenna factor, cable loss, pre-amp gain, etc.

The transmitter's peak power was calculated using the following equation:

Where: E = the measured maximum field strength in V/m.

Set the RBW > 6dB bandwidth of the emission or use a peak power meter.

P = (E x d) squared / (30 x G)

G = the numeric gain of the transmitting antenna over an isotropic radiator.

d = the distance in meters from which the field strength was measured.

P = the power in watts for which you are solving.

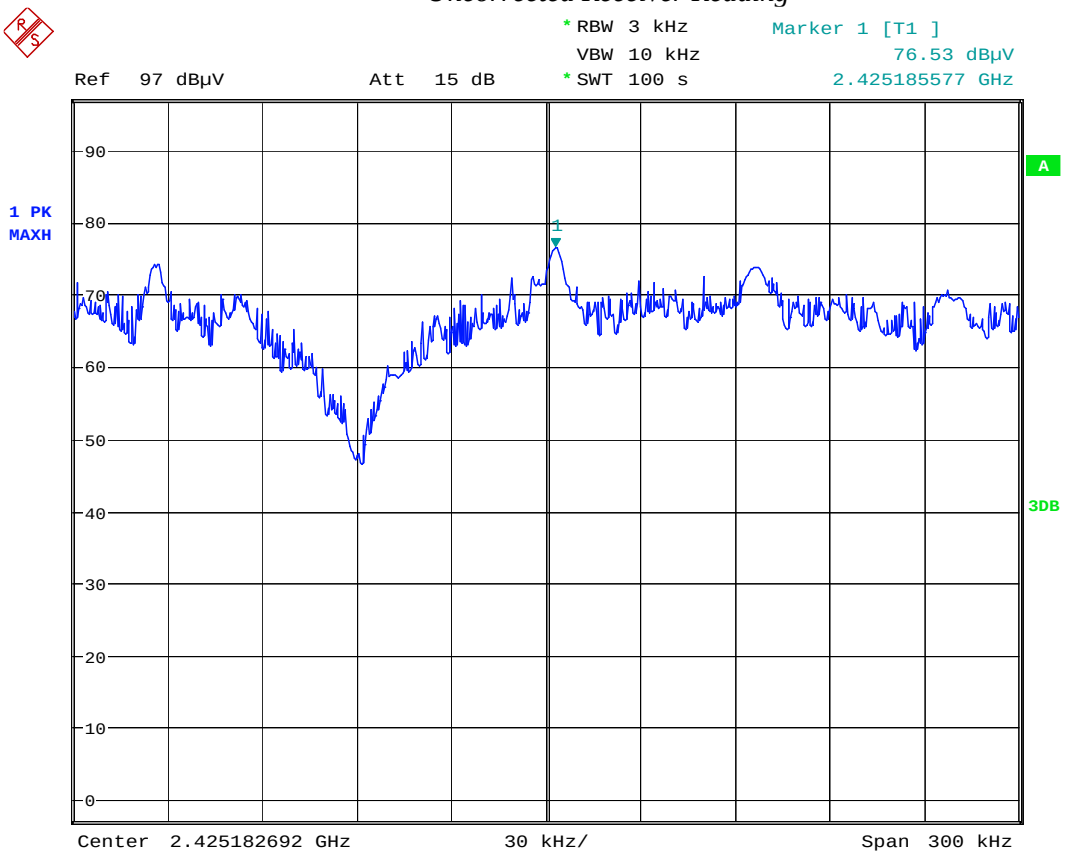
Test Result

Refer to the following plots for the test result:

Frequency (MHz)	Power Spectral Density (dBm)	Plot
2425	-22.2	4.1
2450	-22.6	4.2
2475	-20.2	4.3

Plot 4.1

Uncorrected Receiver Reading



Power Spectral Density

Date: 24.APR.2012 18:59:16

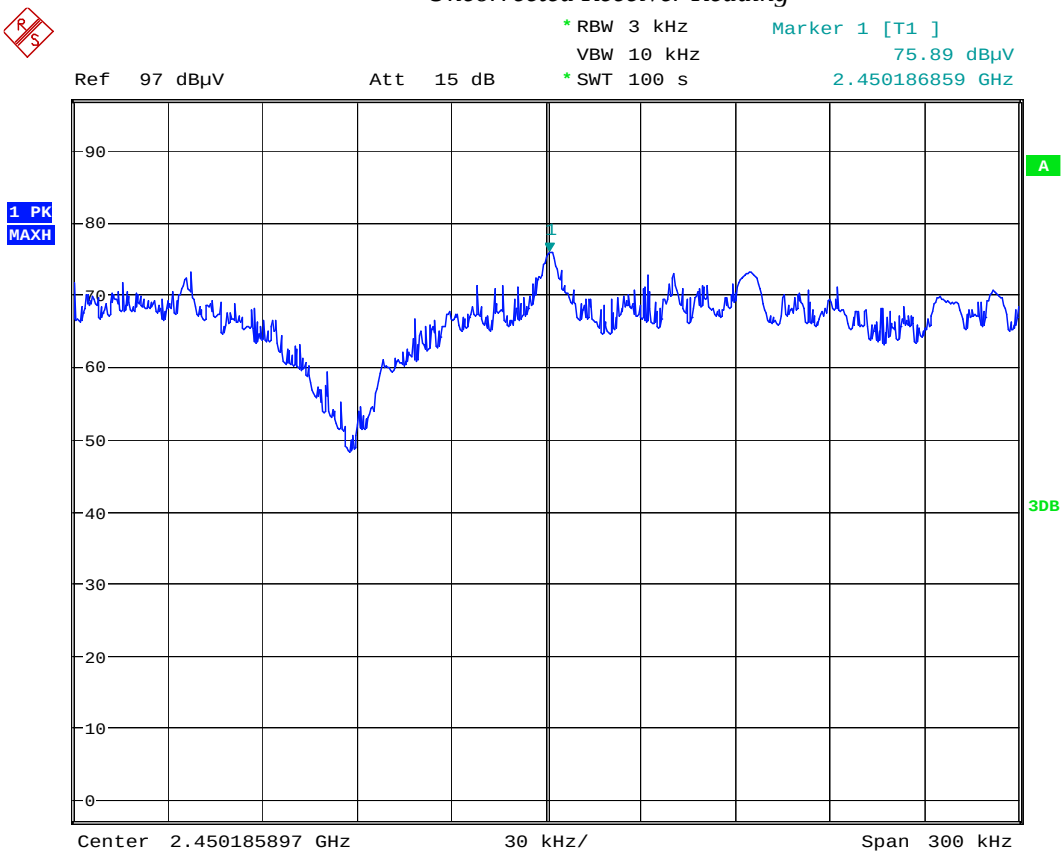
Final Corrected Reading

Frequency	RA	AG	CF	AF	Final Field Strength	EIRP	EIRP
MHz	dB(uV)	dB	dB	dB(1/m)	dB(uV/m)	dBm	mW
2425.0	76.5	35.6	4.4	27.8	73.1	-22.2	0.006

RA = Receiver Amplitude
AG = Amplifier Gain
CF = Cable Factor
AF = Antenna Factor

Plot 4.2

Uncorrected Receiver Reading



Power Spectral Density

Date: 24.APR.2012 18:18:17

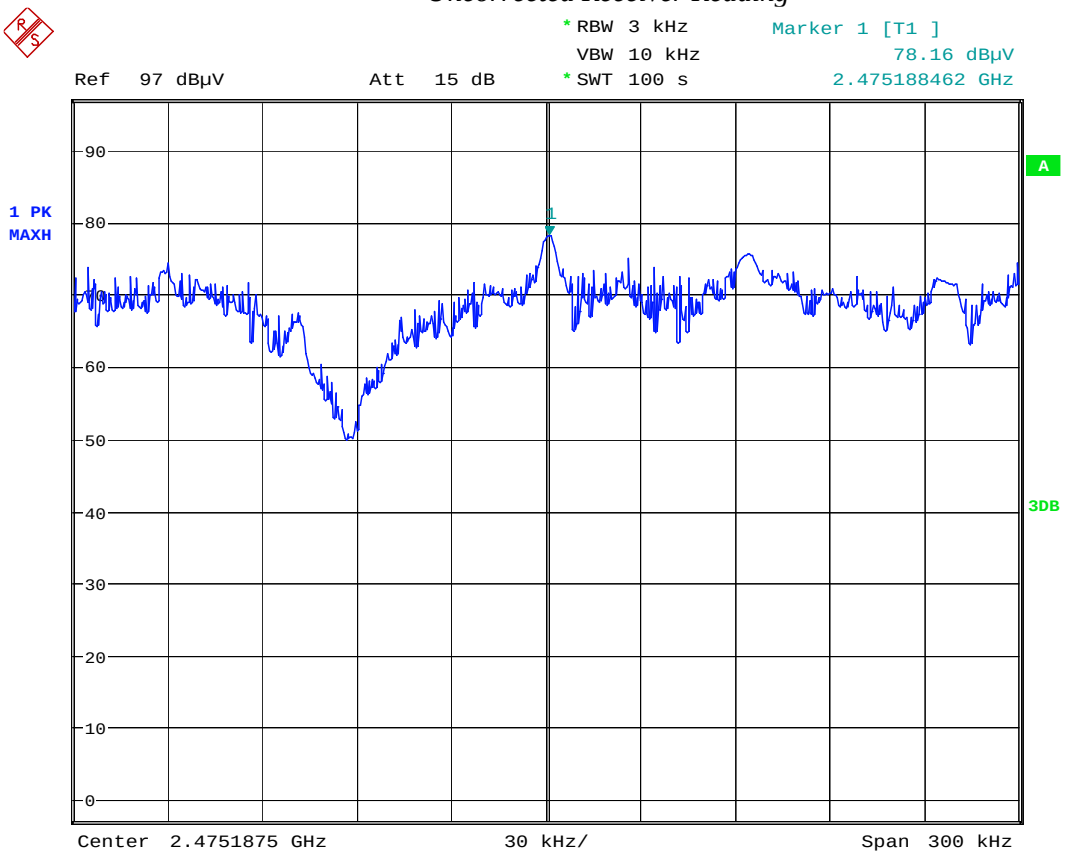
Final Corrected Reading

Frequency	RA	AG	CF	AF	Final Field Strength	EIRP	EIRP
MHz	dB(uV)	dB	dB	dB(1/m)	dB(uV/m)	dBm	mW
2450.0	75.9	35.6	4.5	27.9	72.7	-22.6	0.0055

RA = Receiver Amplitude
AG = Amplifier Gain
CF = Cable Factor
AF = Antenna Factor

Plot 4.3

Uncorrected Receiver Reading



Power Spectral Density

Date: 24.APR.2012 18:38:14

Final Corrected Reading

Frequency	RA	AG	CF	AF	Final Field Strength	EIRP	EIRP
MHz	dB(uV)	dB	dB	dB(1/m)	dB(uV/m)	dBm	mW
2475.0	78.2	35.7	4.5	28.1	75.1	-20.2	0.0095

RA = Receiver Amplitude
AG = Amplifier Gain
CF = Cable Factor
AF = Antenna Factor

4.5 Transmitter Radiated Emissions
FCC 15.247 (d), 15.205, 15.209

Procedure

Radiated emission measurements were performed from 30 MHz to 25,000 MHz. Spectrum Analyzer Resolution Bandwidth is 100 kHz or greater for frequencies 30 MHz to 1000 MHz, 1 MHz - for frequencies above 1000 MHz.

The EUT is placed on a non-conductive table. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). During testing, all cables were manipulated to produce worst case emissions. The signal is maximized through rotation. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent three-meter reading using inverse scaling with distance.

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

Field Strength Calculation

For measurements made at 10 meters distance
The field strength is calculated by adding the Antenna Factor and Cable Factor to from the measured reading, followed by subtracting the Amplifier Gain (if any) and Distance Correction Factor (if any). The basic equation with a sample calculation is as follows:

The field strength is calculated by adding the Antenna Factor, Cable Factor and the Distance Correction Factor; and subtracting the Amplifier Gain from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF – AG + DCF

Where FS = Field Strength in dB(μV/m)
RA = Receiver Amplitude (including preamplifier) in dB(μV)
AF = Antenna Factor in dB(1/m)
CF = Cable Attenuation Factor in dB
AG = Amplifier Gain in dB
DCF = Distance Correction Factor in dB for measurements made at 10 meters distance

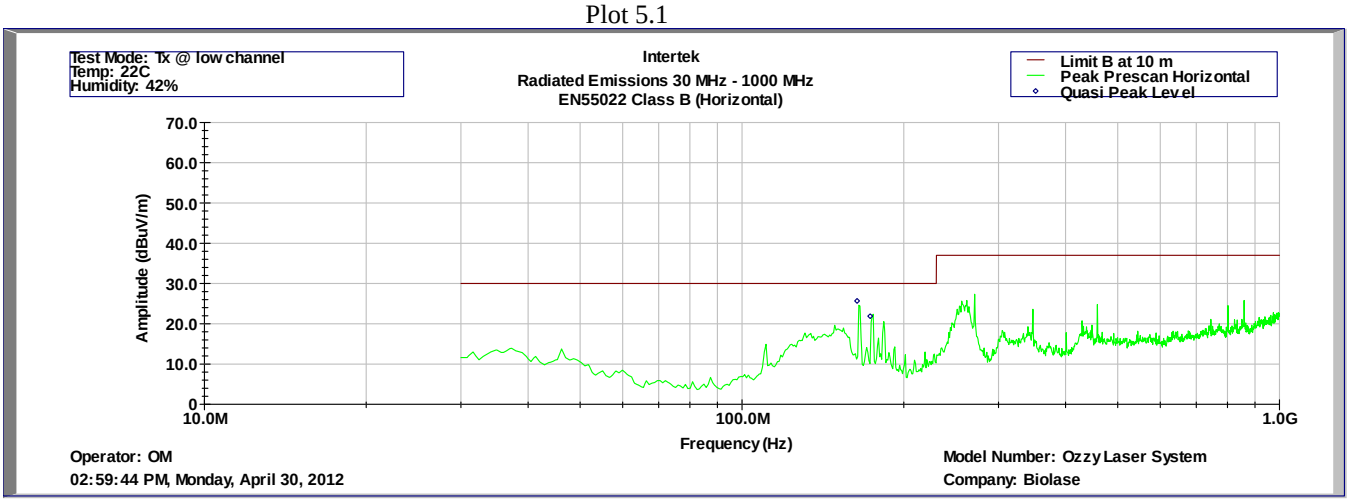
Assume a receiver reading of 52.5 dB(μV) is obtained. The antennas factor of 7.4 dB(1/m) and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted and Distance Correction Factor (for measurements made at 10 meters distance) of 10.5 dB is added, giving field strength of 43 dB(μV/m). This value in dB(μV/m) was converted to its corresponding level in μV/m.
RA = 52.5 dB(μV)
AF = 7.4 dB(1/m)
CF = 1.6 dB
AG = 29.0 dB
DCF = 10.5 dB
FS = 52.5+7.4+1.6-29.0+10.5 = 43 dB(μV/m).
Level in μV/m = Common Antilogarithm [(43 dBμV/m)/20] = 141.3 μV/m.

For measurements made at 3 meters distance
The field strength is calculated by following the example above *for measurements made at 10 meters distance* except the Distance Correction Factor in dB is not applied.

Result

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance. The radiated emissions in the restricted bands are presented on the following Plots 5.1 – 5.30. The EUT passed by 1.8dB.

Plot 5.1



Intertek
Radiated Emissions 30 MHz - 1000 MHz
EN55022 Class B (QP-Horizontal)

Operator: KK
02:59:44 PM, Monday, April 30, 2012

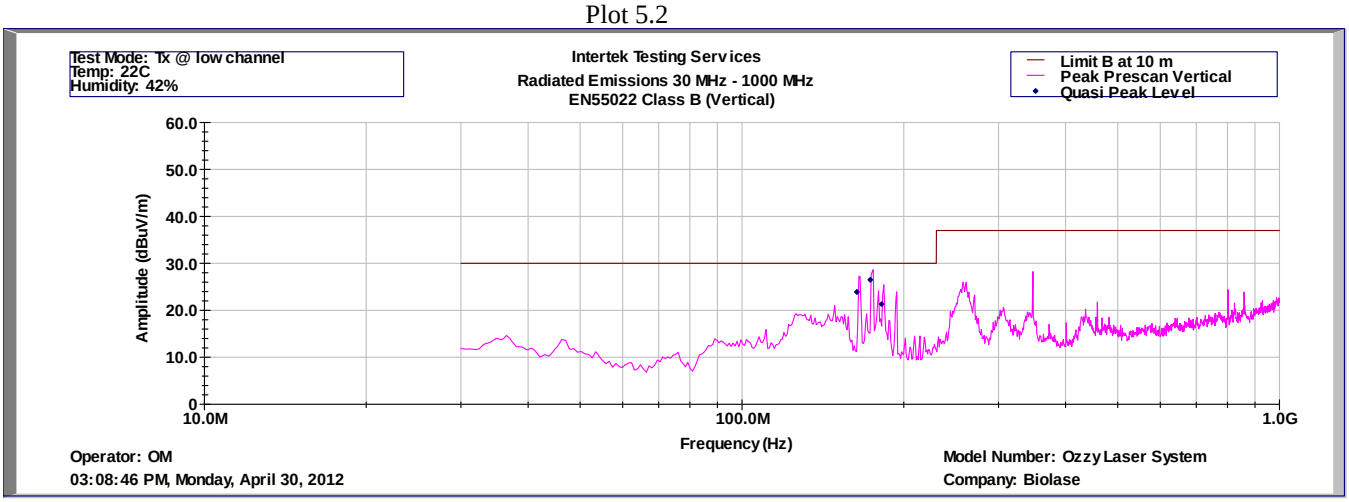
Model Number: EPIC 10
Company: Biolase

Frequency	Quasi Pk FS	Limit@10m	Margin	RA	AG	AF	CF
Hz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB(1/m)	dB
1.637E+08	25.7	30.0	-4.3	47.6	32.0	8.6	1.5
1.732E+08	21.9	30.0	-8.1	42.3	32.0	10.1	1.5

Test Mode: Tx @ low channel
Temp: 22C
Humidity: 42%

Notes: Measurements made at 10 meters distance.

Plot 5.2



Intertek Testing Services
Radiated Emissions 30 MHz - 1000 MHz
EN55022 Class B (QP-Vertical)

Operator: KK
03:08:46 PM, Monday, April 30, 2012

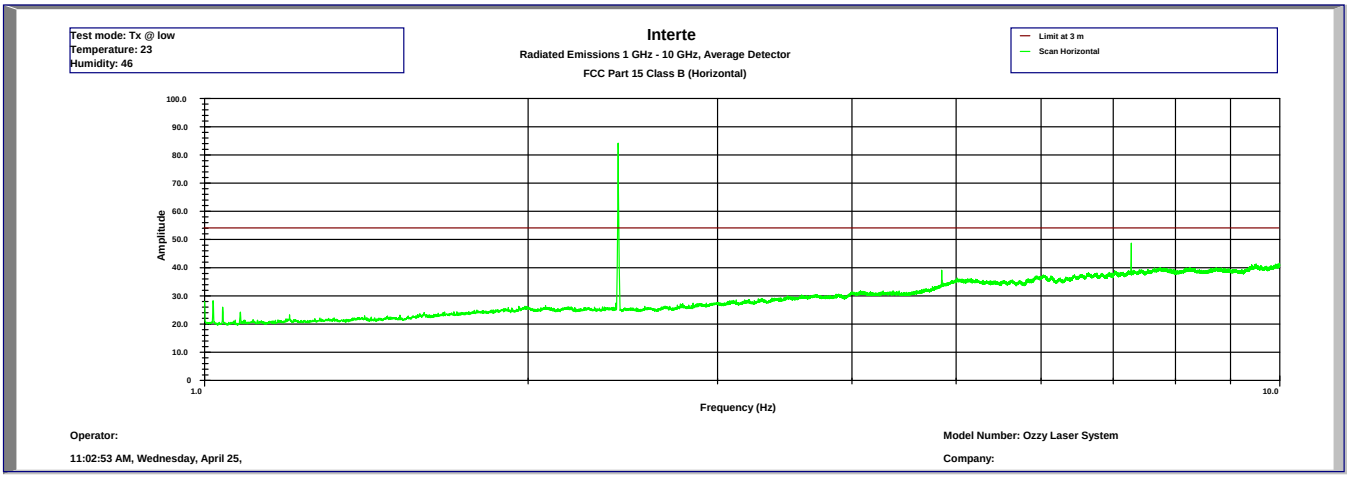
Model Number: EPIC 10
Company: Biolase

Frequency	Quasi Pk FS	Limit@10m	Margin	RA	AG	AF	CF
Hz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB(1/m)	dB
1.637E+08	23.9	30.0	-6.1	45.9	32.0	8.6	1.5
1.733E+08	26.5	30.0	-3.5	46.9	32.0	10.1	1.5
1.819E+08	21.3	30.0	-8.7	42.3	32.0	9.5	1.6

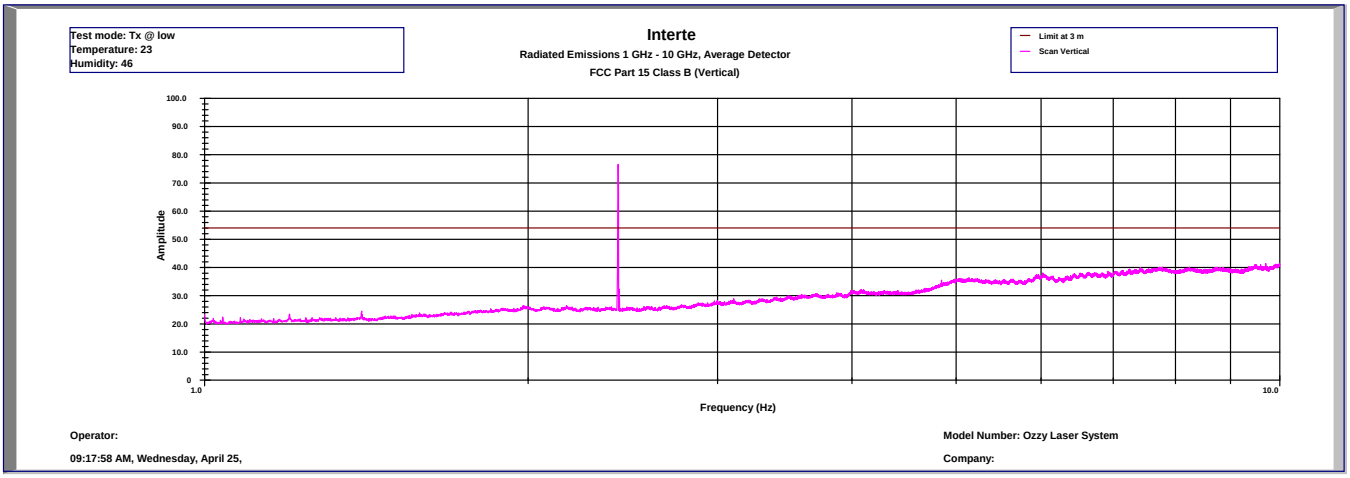
Test Mode: Tx @ low channel
Temp: 22C
Humidity: 42%

Notes: Measurements made at 10 meters distance.

Plot 5.3



Plot 5.4

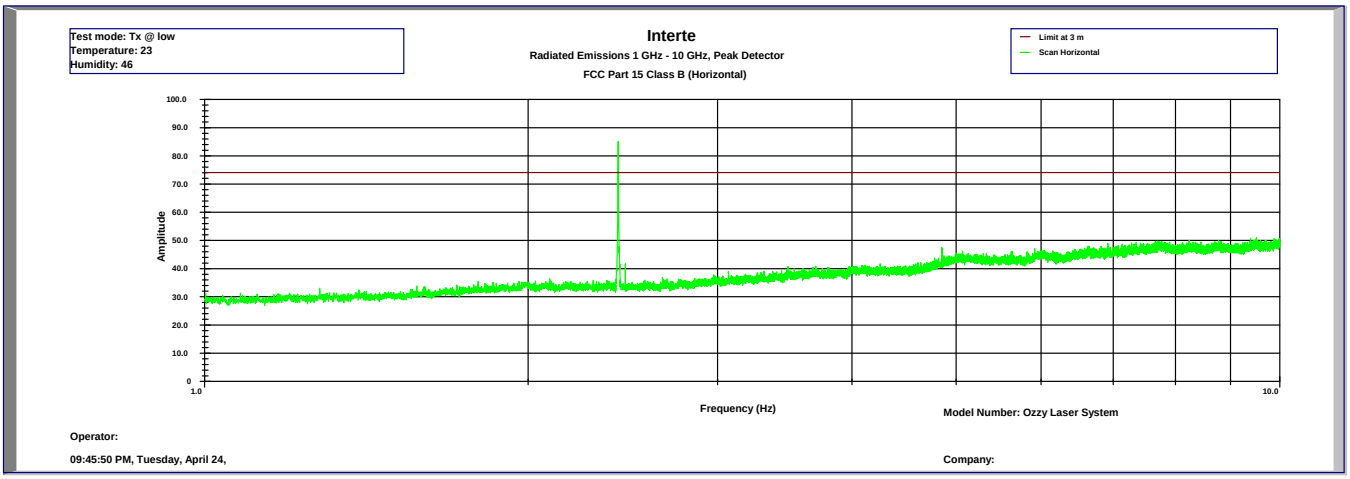


Measurement at the Bandedge

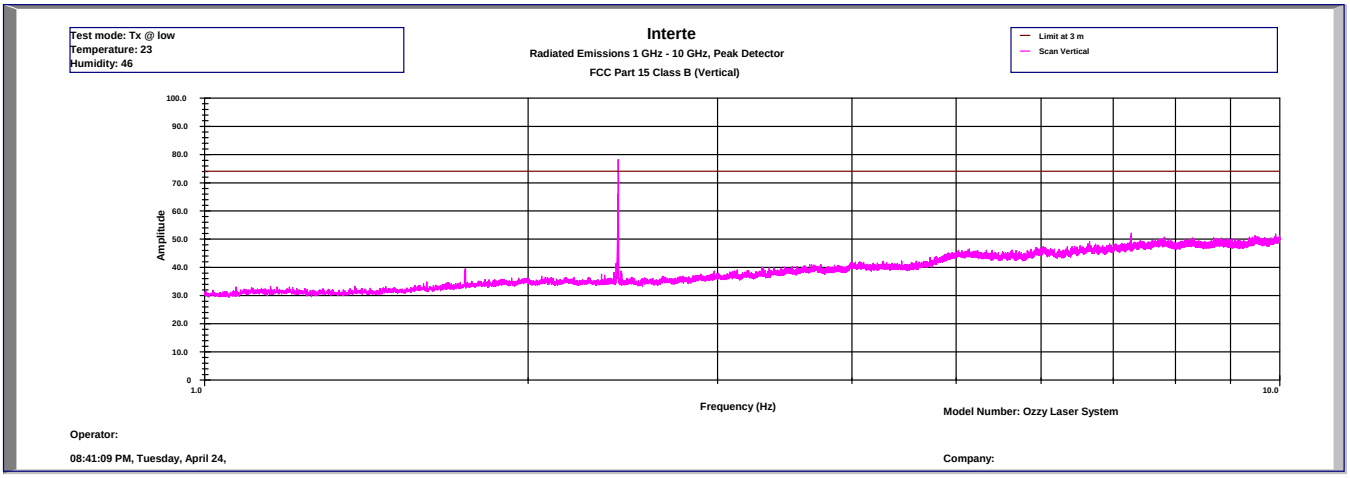
Frequency (Hz)	Av Level (dBuV/m)	Limit@3m (dBuV/m)	Margin (dB)	Raw (dBuV)	Cable (dB)	Preamp (dB)	AF dB(1/m)
2.3900+09	25.2	54.0	-28.8	28.6	4.4	35.6	27.8

Notes: Measurements made at 3 meters distance.

Plot 5.5



Plot 5.6

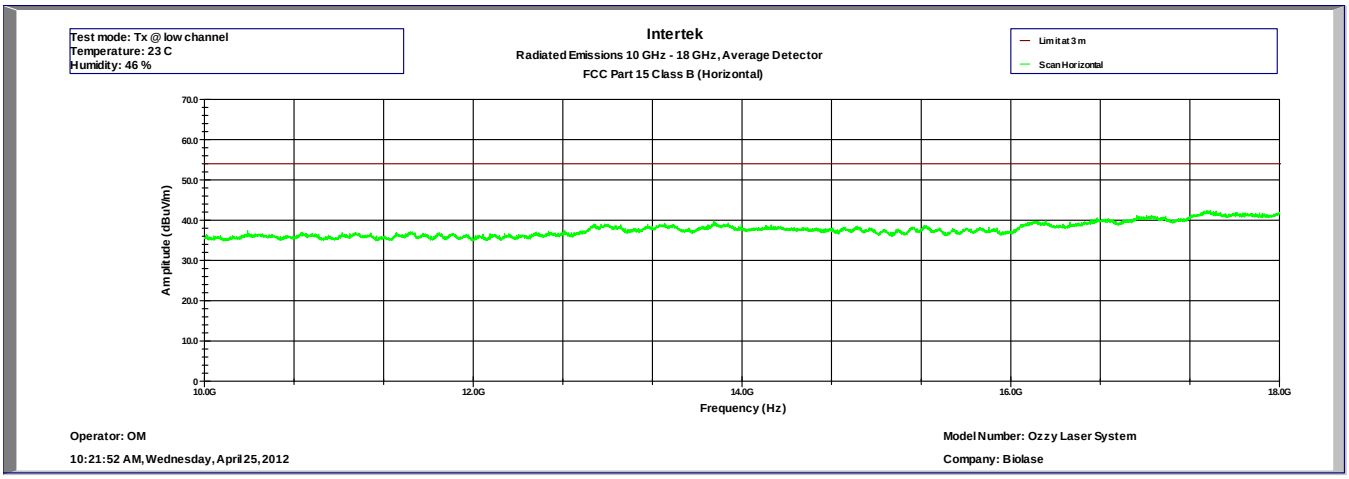


Measurement at the Bandedge

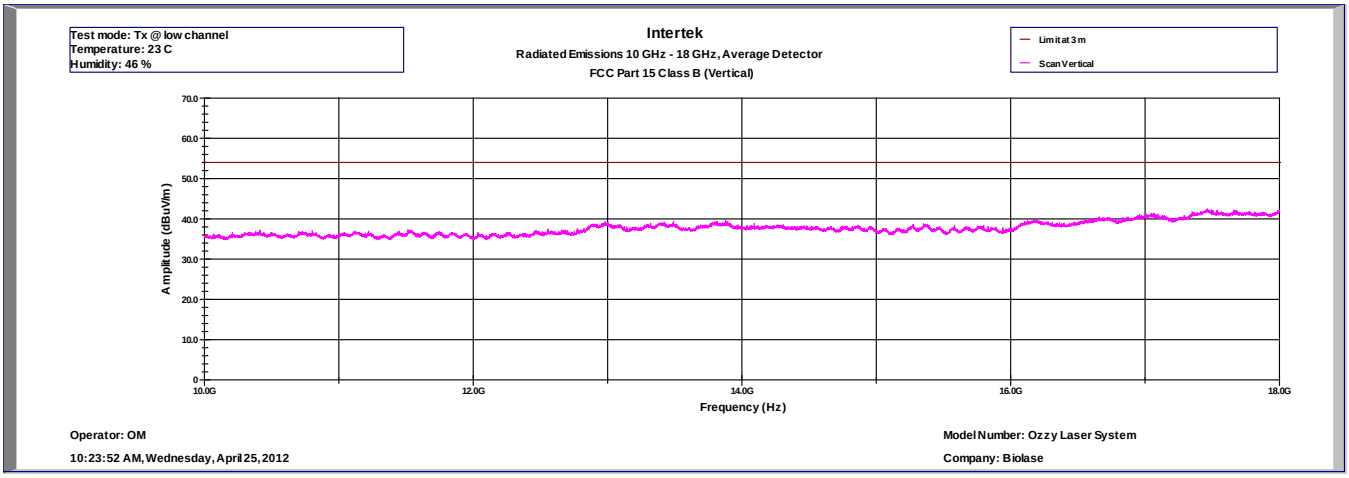
Frequency (Hz)	Pk Level (dBuV/m)	Limit@3m (dBuV/m)	Margin (dB)	Raw (dBuV)	Cable (dB)	Preamp (dB)	AF dB(1/m)
2.3900+09	34.9	74.0	-39.1	38.3	4.4	35.6	27.8

Notes: Measurements made at 3 meters distance.

Plot 5.7



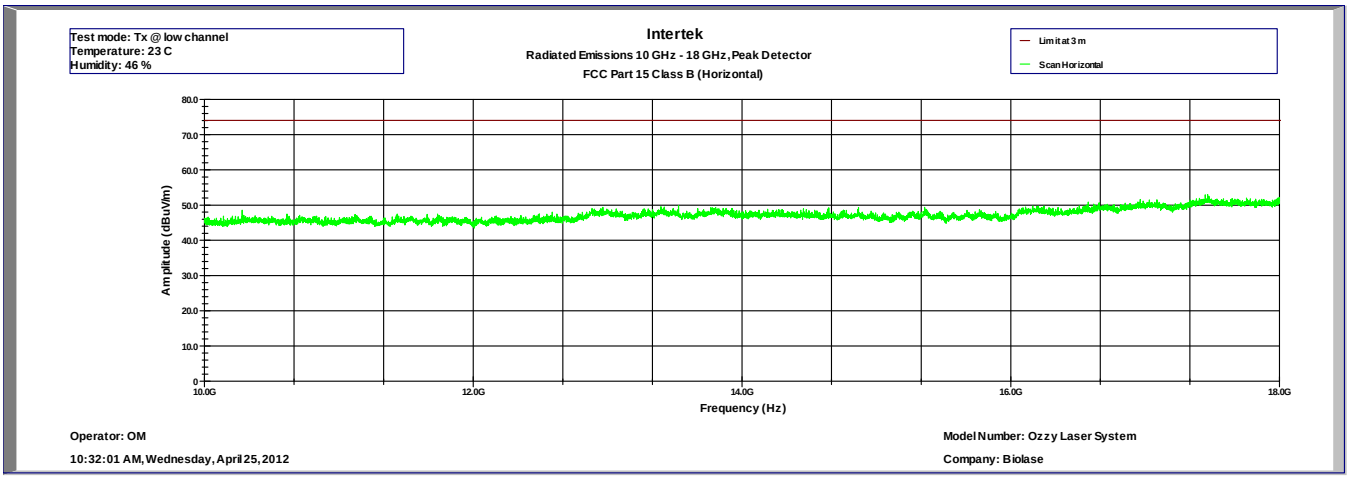
Plot 5.8



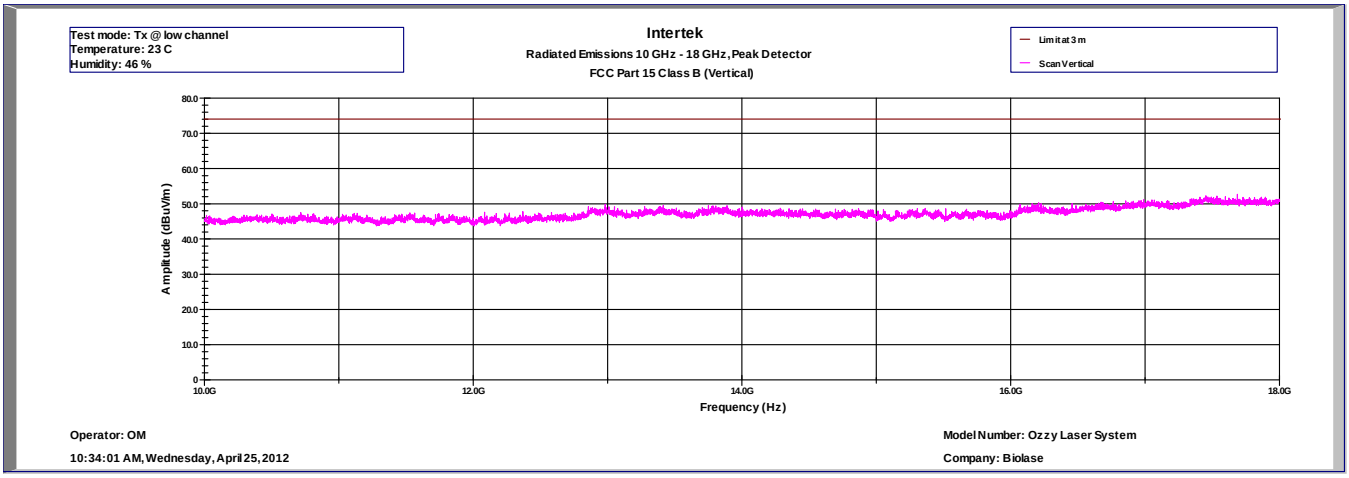
Notes: Measurements made at 3 meters distance.

No emissions were detected above the noise floor which was at least 10 dB below the limit in the range of 18GHz – 25GHz.

Plot 5.9



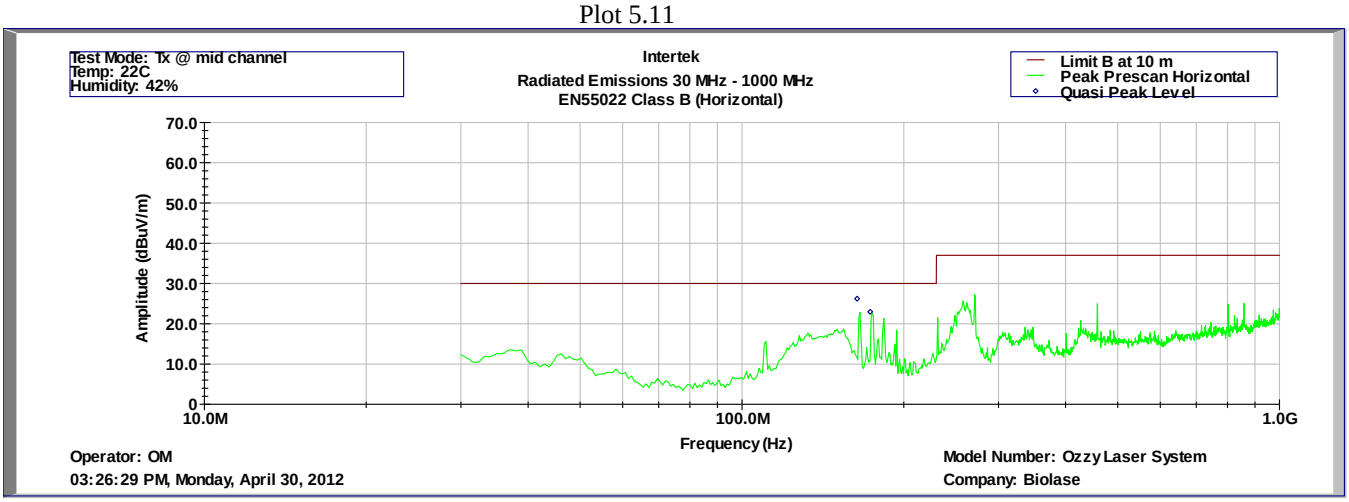
Plot 5.10



Notes: Measurements made at 3 meters distance.

No emissions were detected above the noise floor which was at least 10 dB below the limit in the range of 18GHz – 25GHz.

Plot 5.11



Intertek
Radiated Emissions 30 MHz - 1000 MHz
EN55022 Class B (QP-Horizontal)

Operator: KK
03:26:29 PM, Monday, April 30, 2012

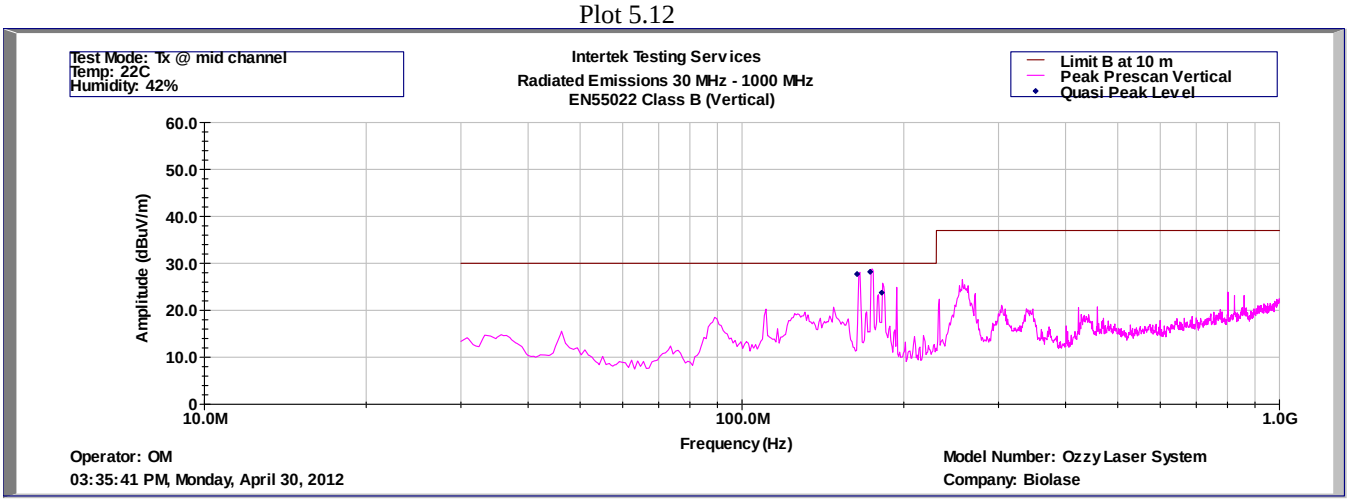
Model Number: EPIC 10
Company: Biolase

Frequency	Quasi Pk FS	Limit@10m	Margin	RA	AG	AF	CF
Hz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB(1/m)	dB
1.637E+08	26.2	30.0	-3.8	48.2	32.0	8.6	1.5
1.732E+08	23.0	30.0	-7.0	43.4	32.0	10.1	1.5

Test Mode: Tx @ mid channel
Temp: 22C
Humidity: 42%

Notes: Measurements made at 10 meters distance.

Plot 5.12



Intertek Testing Services
Radiated Emissions 30 MHz - 1000 MHz
EN55022 Class B (QP-Vertical)

Operator: KK
03:35:41 PM, Monday, April 30, 2012

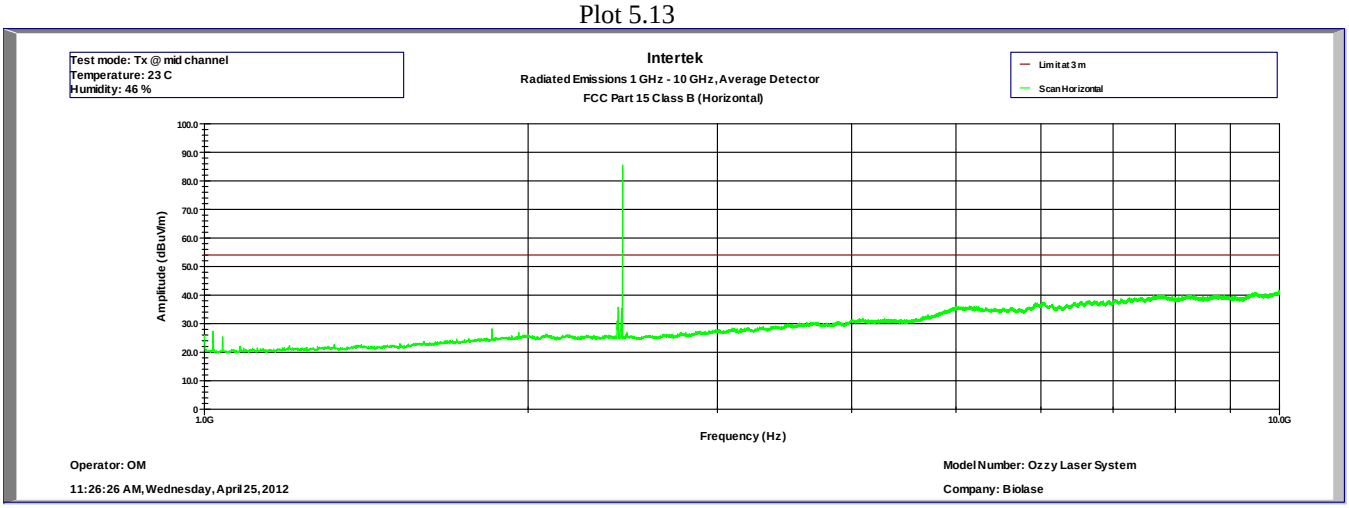
Model Number: EPIC 10
Company: Biolase

Frequency	Quasi Pk FS	Limit@10m	Margin	RA	AG	AF	CF
Hz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB(1/m)	dB
1.637E+08	27.7	30.0	-2.3	49.7	32.0	8.6	1.5
1.732E+08	28.2	30.0	-1.8	48.6	32.0	10.1	1.5
1.819E+08	23.7	30.0	-6.3	44.7	32.0	9.5	1.6

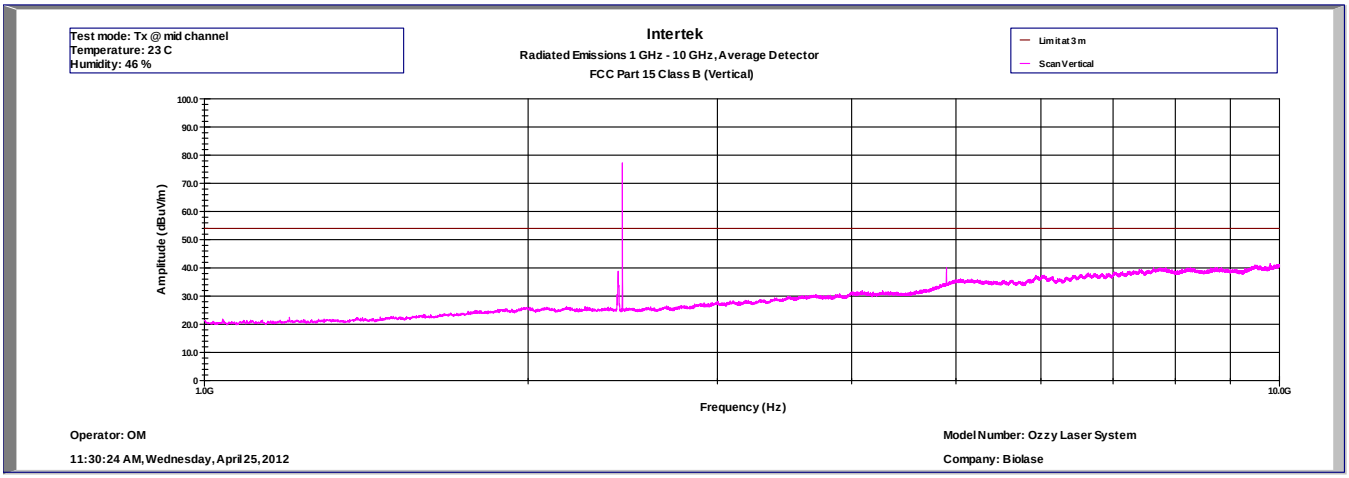
Test Mode: Tx @ mid channel
Temp: 22C
Humidity: 42%

Notes: Measurements made at 10 meters distance.

Plot 5.13

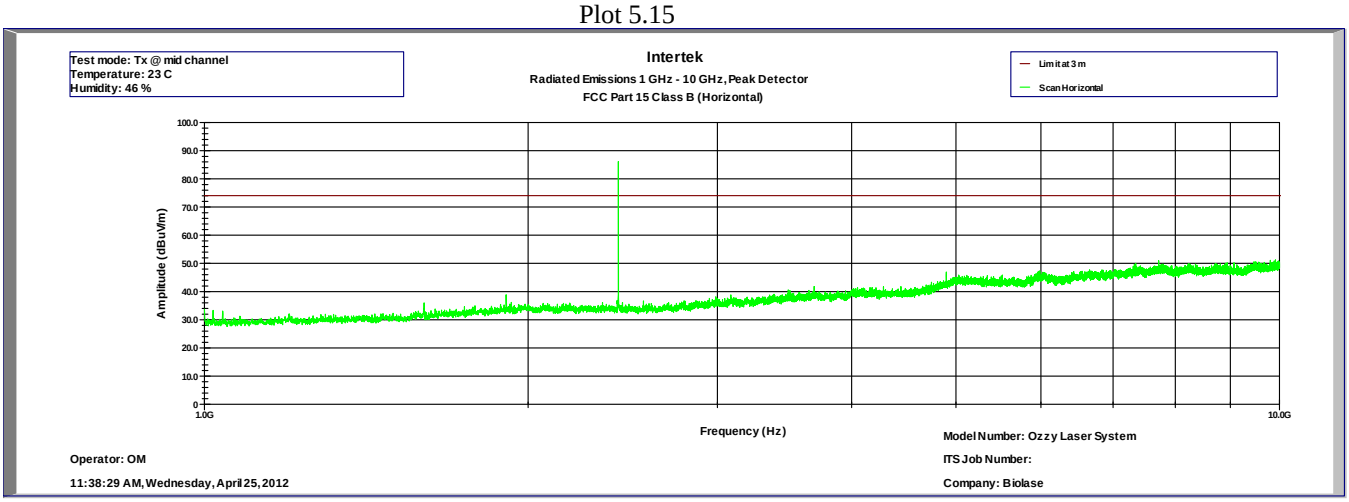


Plot 5.14

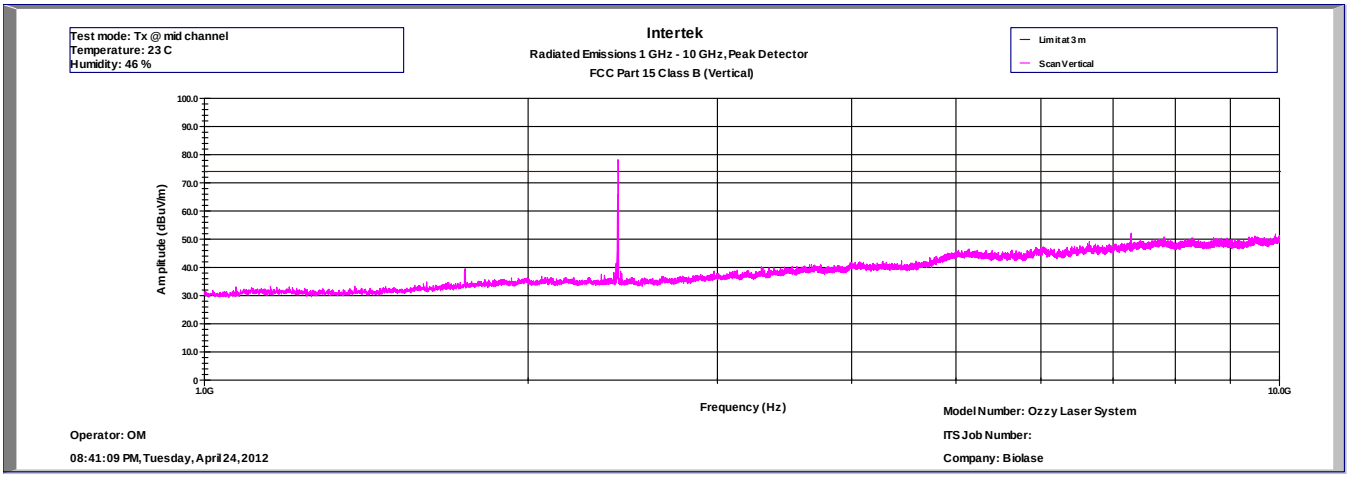


Notes: Measurements made at 3 meters distance.

Plot 5.15

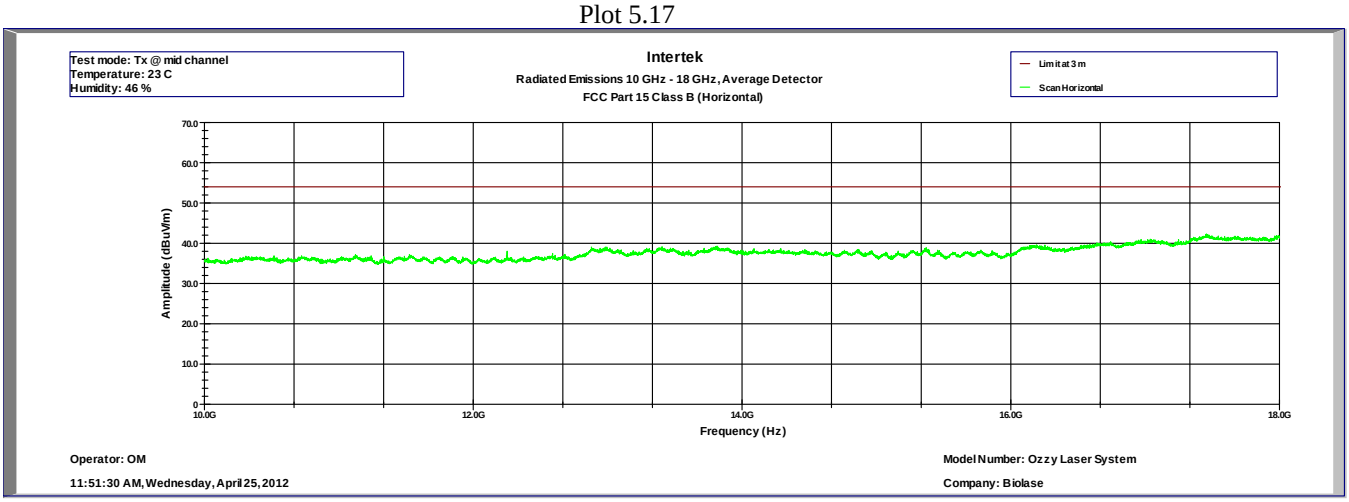


Plot 5.16

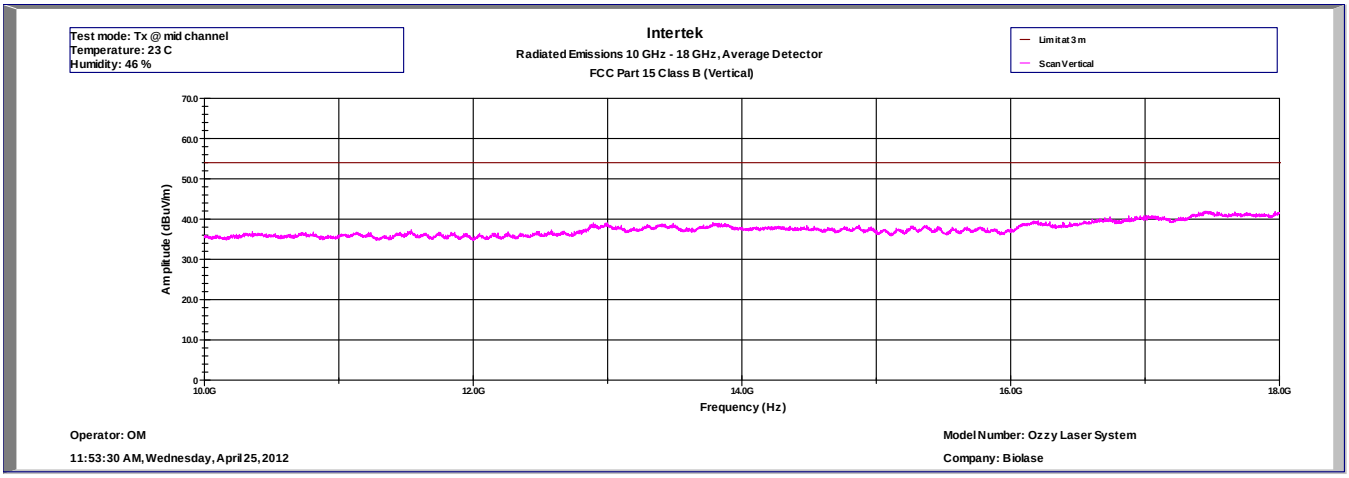


Notes: Measurements made at 3 meters distance.

Plot 5.17



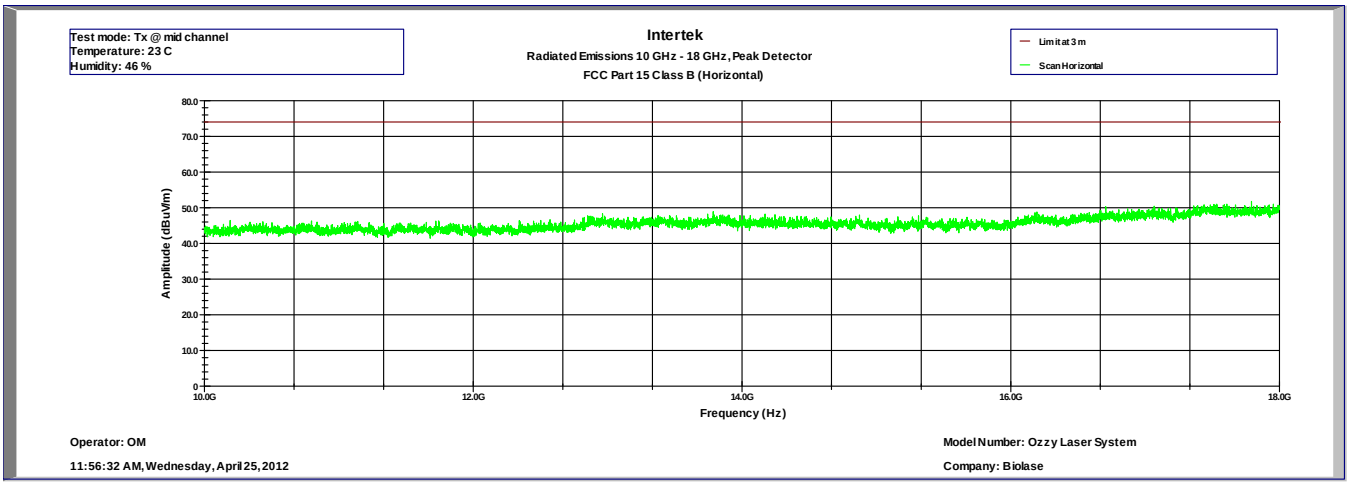
Plot 5.18



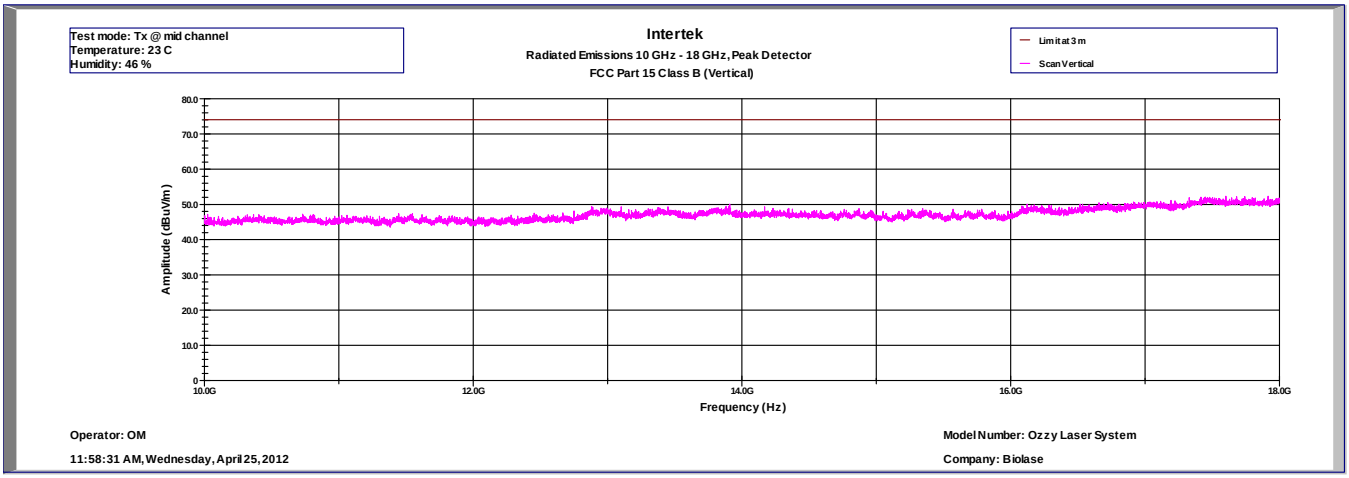
Notes: Measurements made at 3 meters distance.

No emissions were detected above the noise floor which was at least 10 dB below the limit in the range of 18GHz – 25GHz.

Plot 5.19



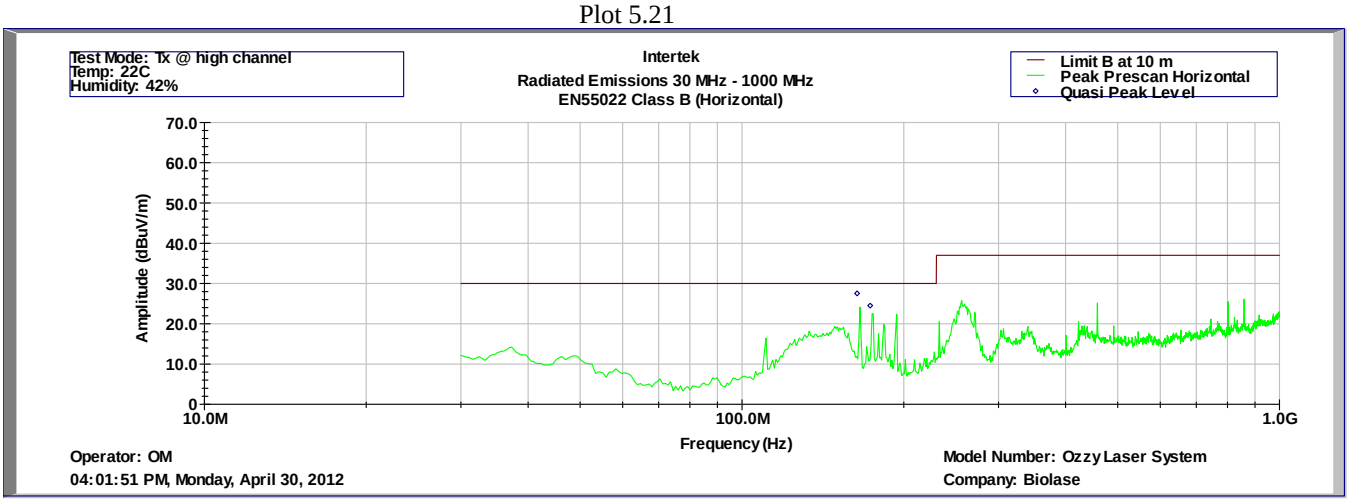
Plot 5.20



Notes: Measurements made at 3 meters distance.

No emissions were detected above the noise floor which was at least 10 dB below the limit in the range of 18GHz – 25GHz.

Plot 5.21



Intertek
Radiated Emissions 30 MHz - 1000 MHz
EN55022 Class B (QP-Horizontal)

Operator: KK
04:01:51 PM, Monday, April 30, 2012

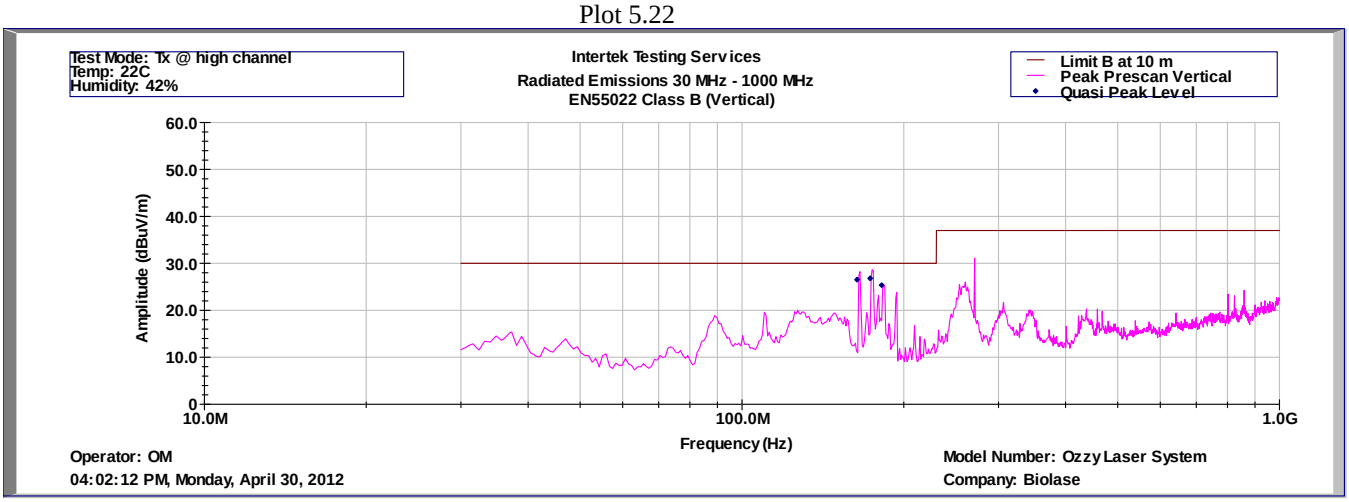
Model Number: EPIC 10
Company: Biolase

Frequency	Quasi Pk FS	Limit@10m	Margin	RA	AG	AF	CF
Hz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB(1/m)	dB
1.637E+08	27.5	30	-2.5	49.5	32	8.6	1.5
1.732E+08	24.5	30	-5.5	44.9	32	10.1	1.5

Test Mode: Tx @ high channel
Temp: 22C
Humidity: 42%

Notes: Measurements made at 10 meters distance.

Plot 5.22



Intertek Testing Services
Radiated Emissions 30 MHz - 1000 MHz
EN55022 Class B (QP-Vertical)

Operator: KK
04:02:12 PM, Monday, April 30, 2012

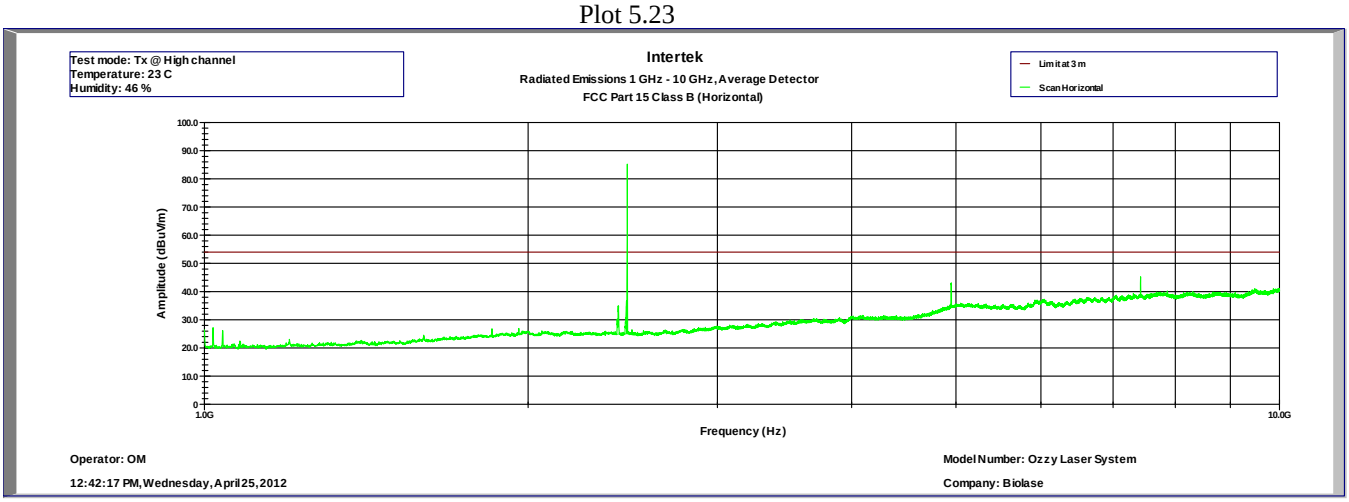
Model Number: EPIC 10
Company: Biolase

Frequency	Quasi Pk FS	Limit@10m	Margin	RA	AG	AF	CF
Hz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB(1/m)	dB
1.637E+08	26.5	30.0	-3.5	48.5	32.0	8.6	1.5
1.732E+08	26.8	30.0	-3.2	47.2	32.0	10.1	1.5
1.819E+08	25.3	30.0	-4.7	46.3	32.0	9.5	1.6

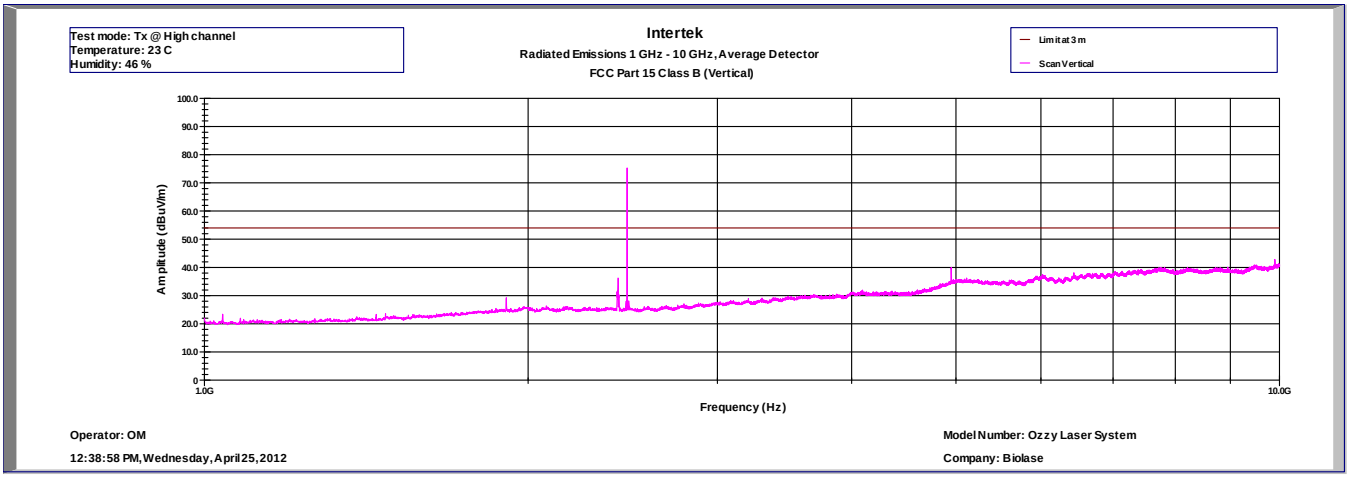
Test Mode: Tx @ high channel
Temp: 22C
Humidity: 42%

Notes: Measurements made at 10 meters distance.

Plot 5.23



Plot 5.24

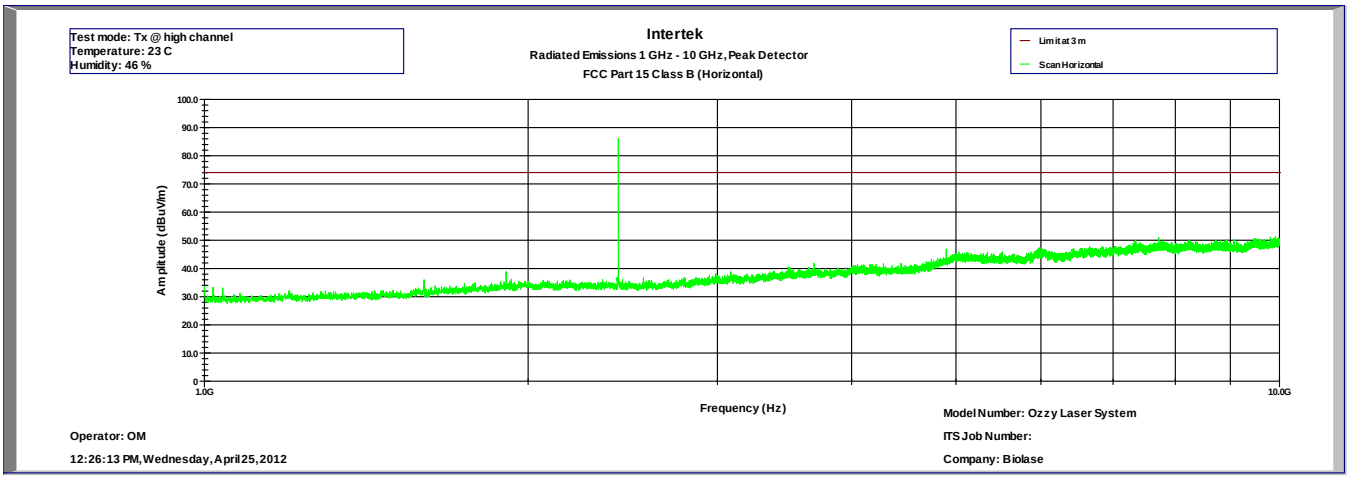


Measurement at the Bandedge

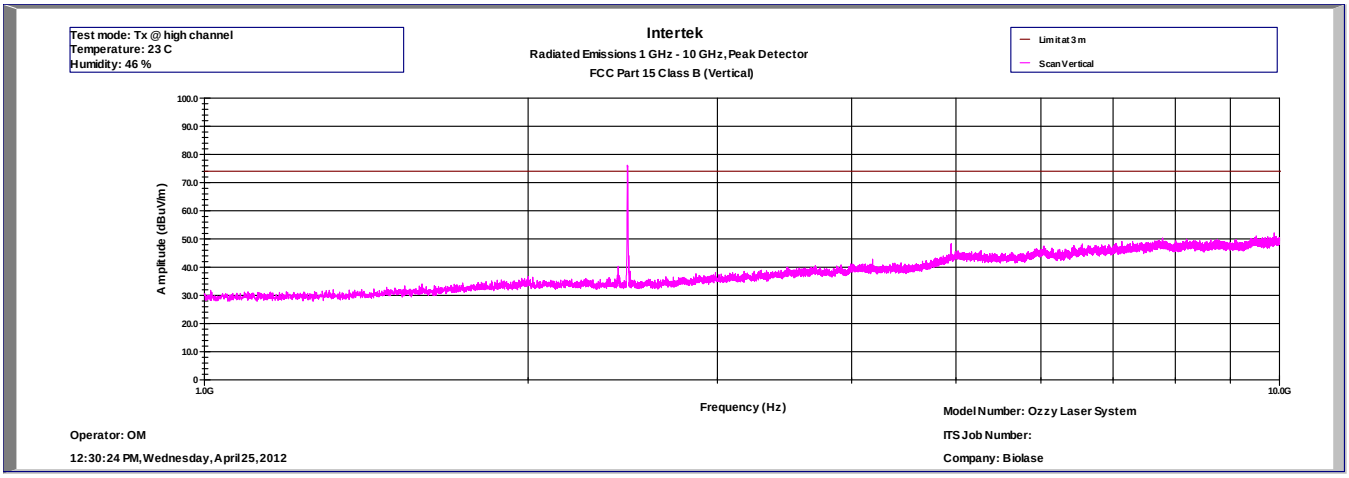
Frequency (Hz)	Av Level (dBuV/m)	Limit@3m (dBuV/m)	Margin (dB)	Raw (dBuV)	Cable (dB)	Preamp (dB)	AF dB(1/m)
2.4835+09	26.1	54.0	-27.9	29.2	4.5	35.7	28.1

Notes: Measurements made at 3 meters distance.

Plot 5.25



Plot 5.26

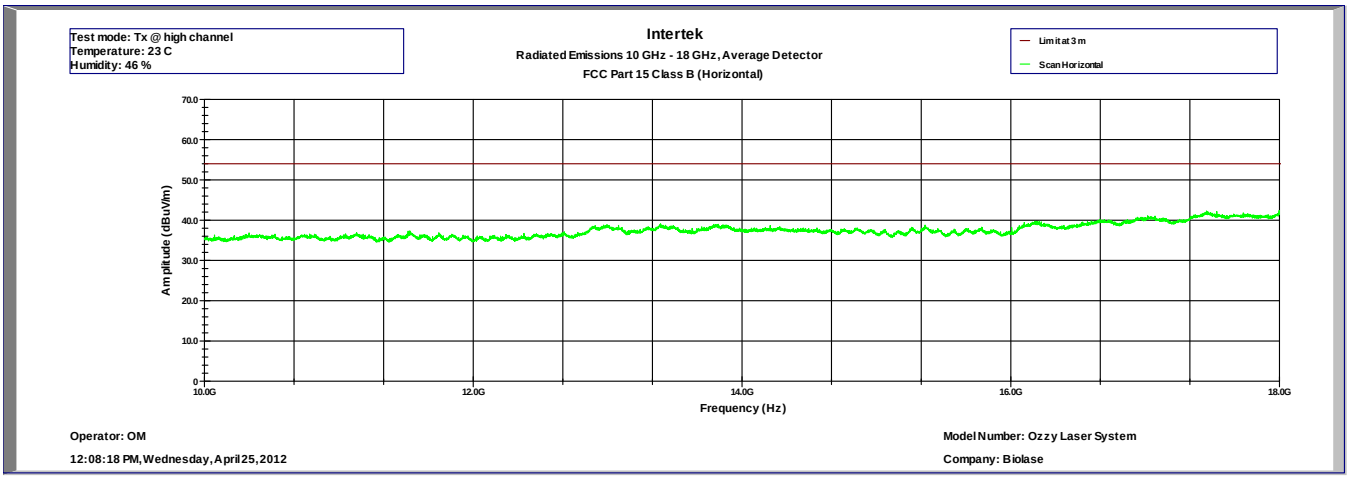


Measurement at the Bandedge

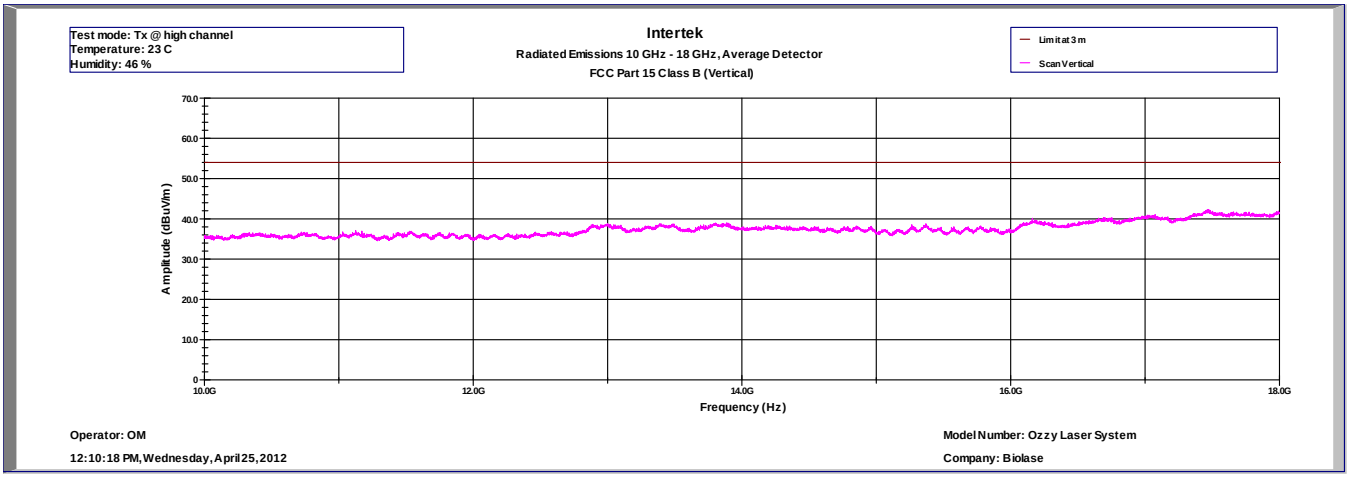
Frequency	Pk Level	Limit@3m	Margin	Raw	Cable	Preamp	AF
(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV)	(dB)	(dB)	dB(1/m)
2.4835+09	35.6	74.0	-38.4	38.7	4.5	35.7	28.1

Notes: Measurements made at 3 meters distance.

Plot 5.27



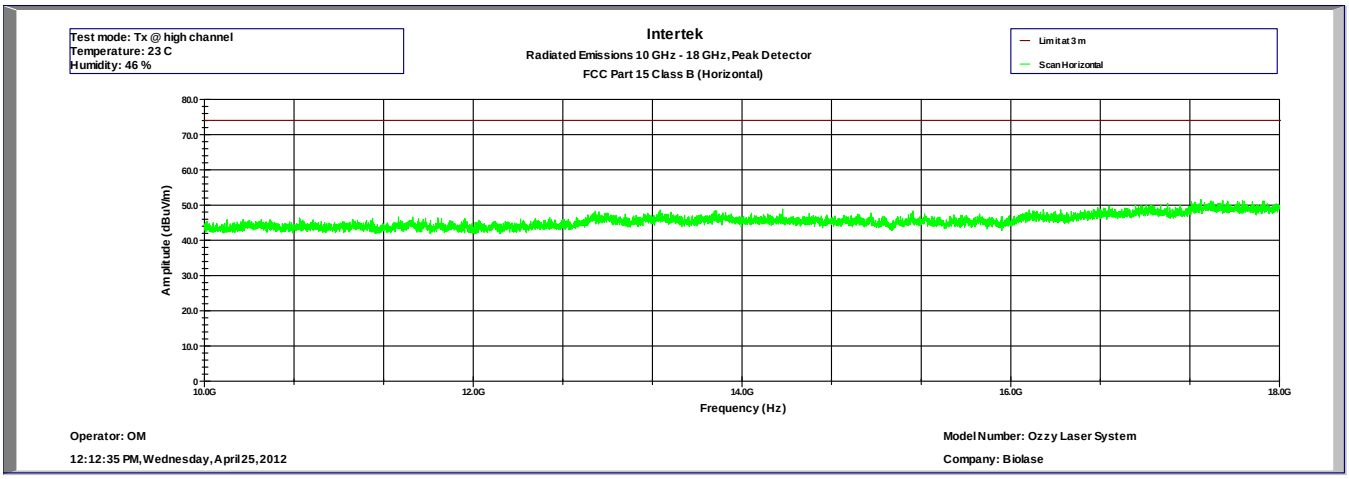
Plot 5.28



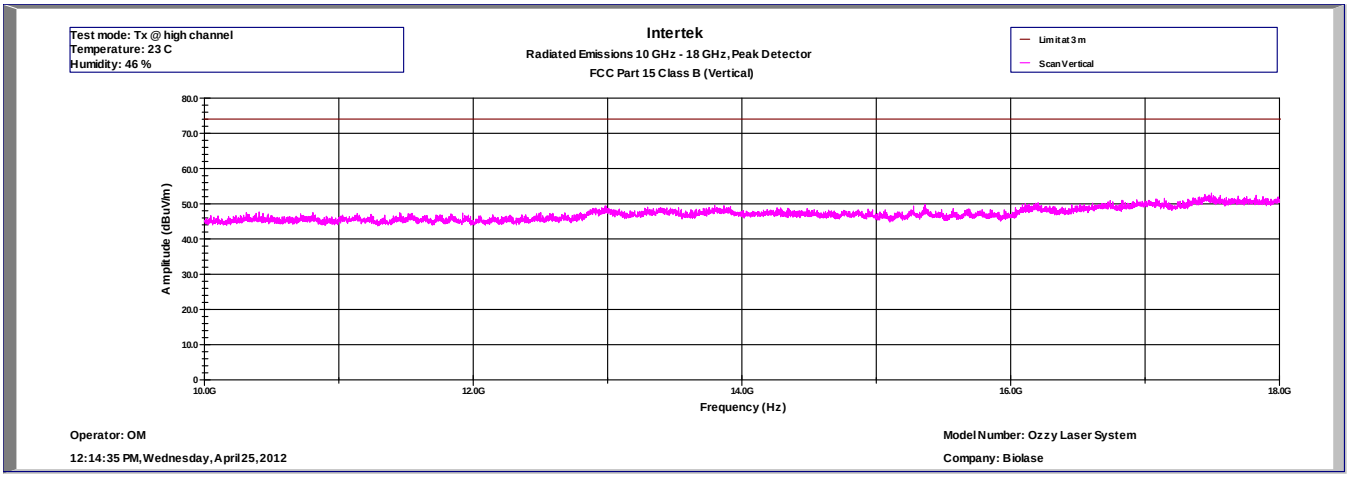
Notes: Measurements made at 3 meters distance.

No emissions were detected above the noise floor which was at least 10 dB below the limit in the range of 18GHz – 25GHz.

Plot 5.29



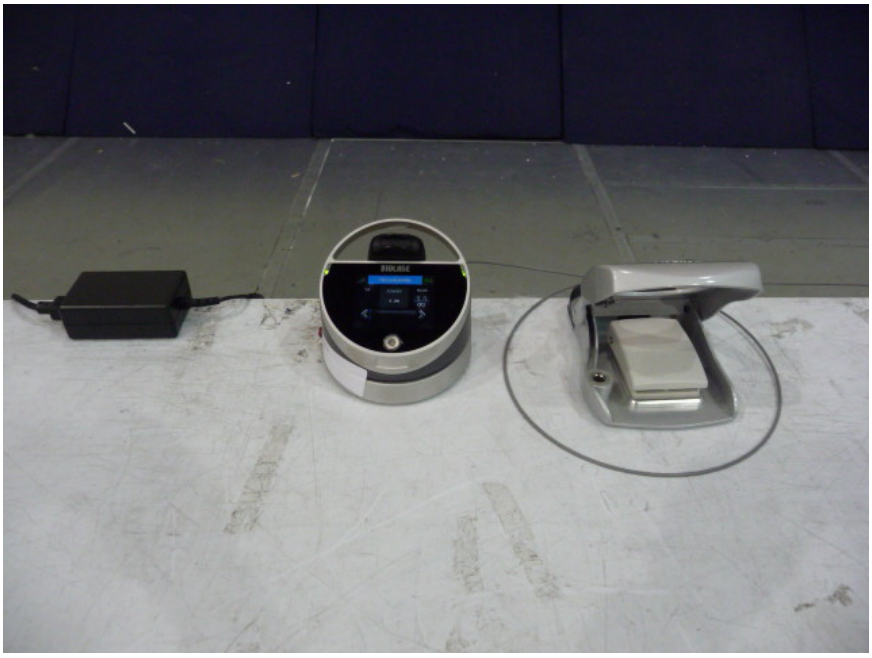
Plot 5.30



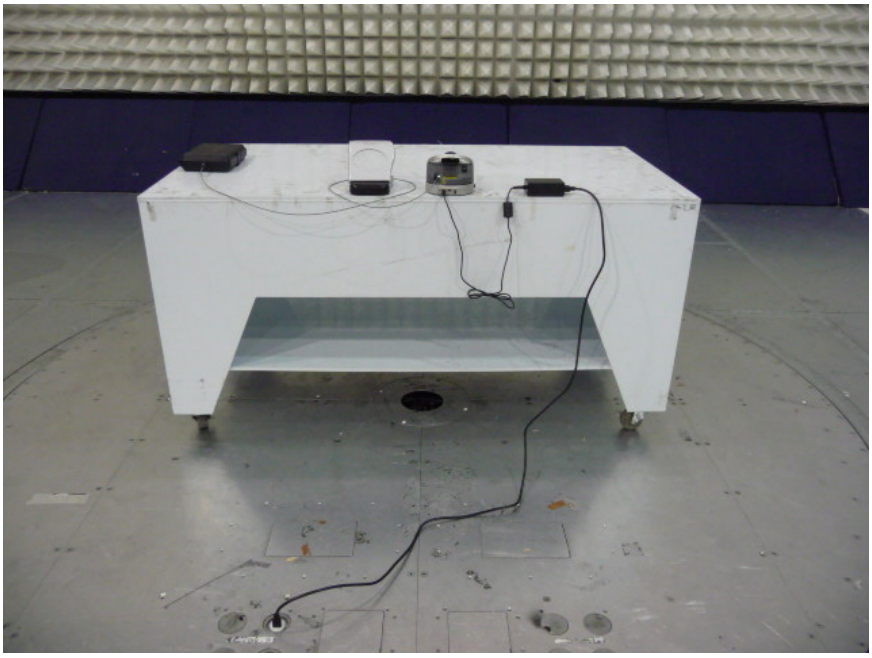
Notes: Measurements made at 3 meters distance.

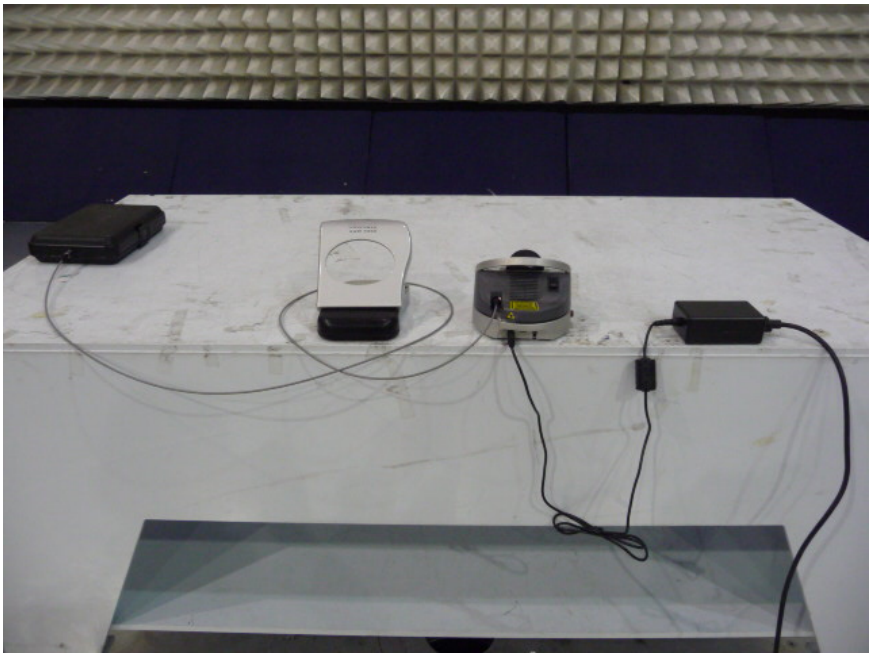
No emissions were detected above the noise floor which was at least 10 dB below the limit in the range of 18GHz – 25GHz.

Test Configuration Photographs



Test Configuration Photographs





4.6 Radiated Emissions from Receiver and Digital Parts
FCC Ref: 15.109

Test Limit

Limits for Electromagnetic Radiated Emissions, FCC Section 15.109(b) and ICES 003*

Frequency (MHz)	**Class B at 3m dB(μV/m)**
30-88	40.0
88-216	43.5
216-960	46.0
Above 960	54.0

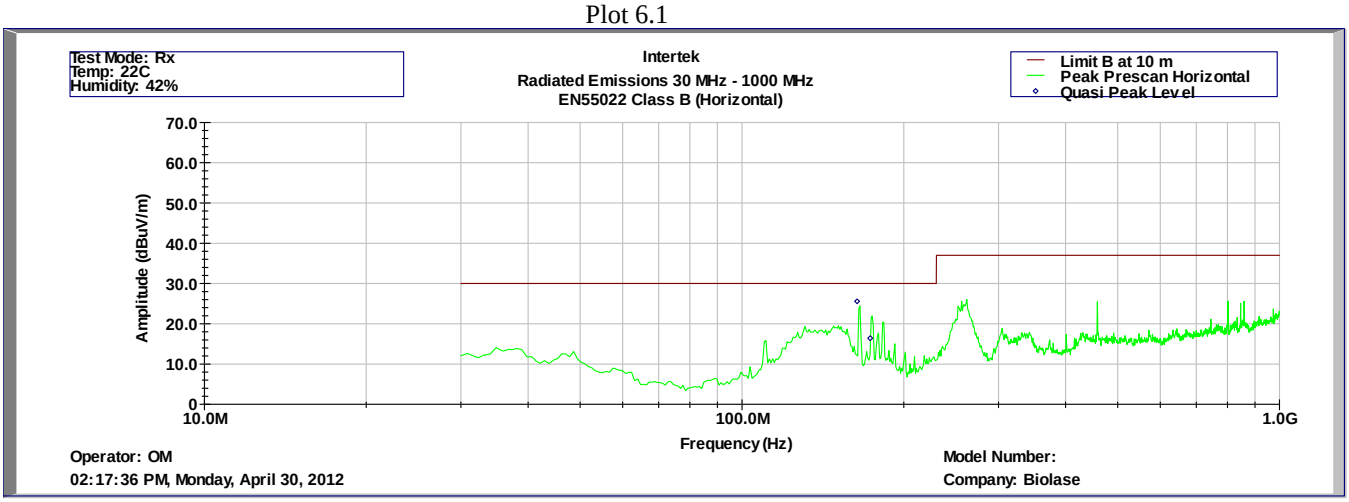
* According to FCC Part 15.109(g) an alternative to the radiated emission limits shown above, digital devices may be shown to comply with the limit of CISPR Pub. 22

Test Results

Radiated emission measurements were performed from 30 MHz to 25 GHz. The data on the following pages list the significant emission frequencies, the limit and the margin of compliance. The results are presented on the following Plots 6.1 – 6.6.

The EUT passed by 3.5 dB.

Plot 6.1



Intertek
Radiated Emissions 30 MHz - 1000 MHz
EN55022 Class B (QP-Horizontal)

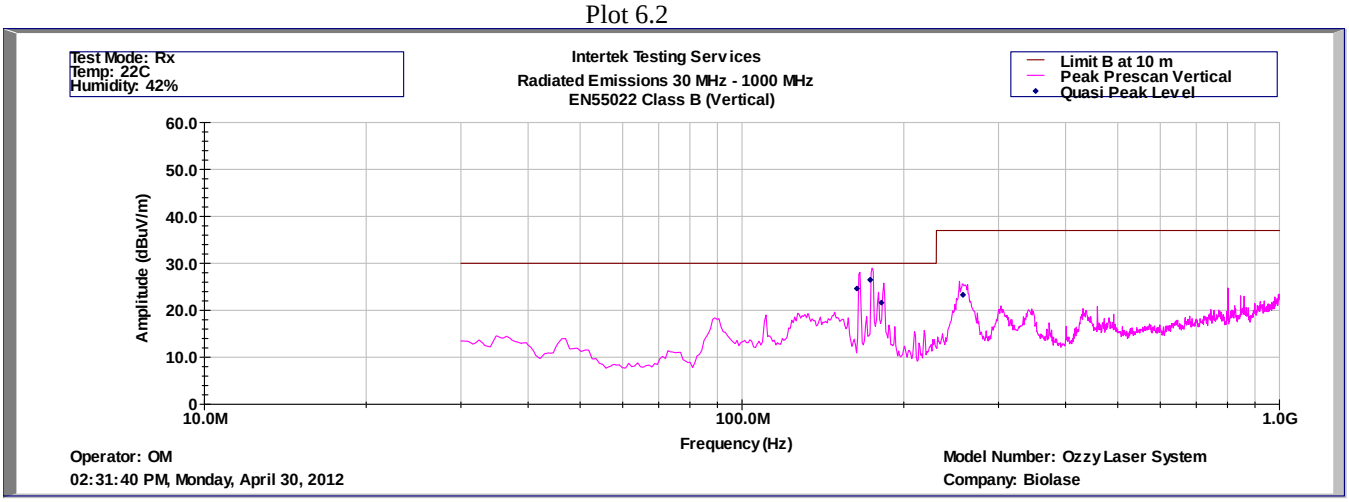
Operator: KK
02:17:36 PM, Monday, April 30, 2012

Model Number: EPIC 10
Company: Biolase

Frequency	Quasi Pk FS	Limit@10m	Margin	RA	AG	AF	CF
Hz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB(1/m)	dB
1.637E+08	25.6	30.0	-4.4	47.5	32.0	8.6	1.5
1.732E+08	16.4	30.0	-13.6	36.8	32.0	10.1	1.5

Test Mode: Rx
Temp: 22C
Humidity: 42%

Plot 6.2



Intertek Testing Services
Radiated Emissions 30 MHz - 1000 MHz
EN55022 Class B (QP-Vertical)

Operator: KK
02:31:40 PM, Monday, April 30, 2012

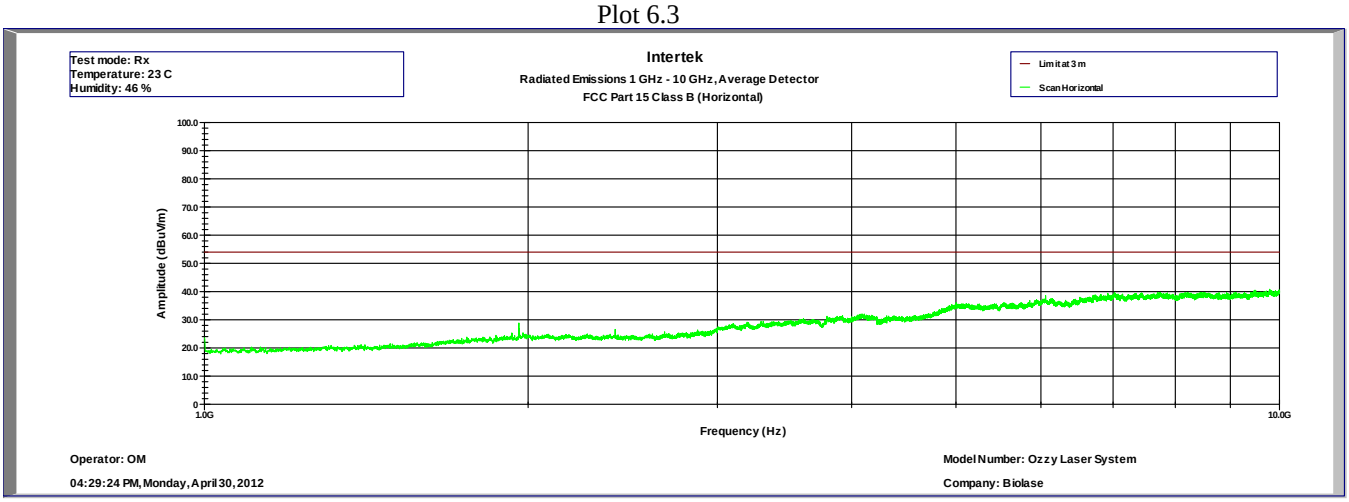
Model Number: EPIC 10
Company: Biolase

Frequency	Quasi Pk FS	Limit@10m	Margin	RA	AG	AF	CF
Hz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB(1/m)	dB
1.637E+08	24.6	30.0	-5.4	46.5	32.0	8.6	1.5
1.732E+08	26.5	30.0	-3.5	46.9	32.0	10.1	1.5
1.818E+08	21.6	30.0	-8.4	42.5	32.0	9.5	1.6
2.578E+08	23.3	37.0	-13.7	40.9	32.0	12.5	1.9

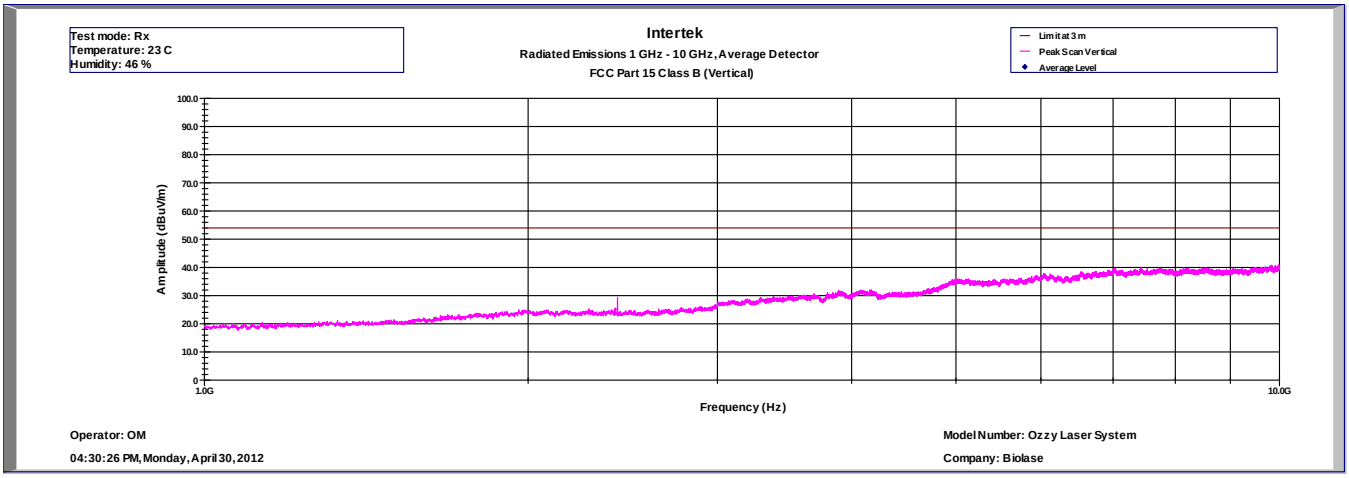
Test Mode: Rx
Temp: 22C
Humidity: 42%

Notes: Measurements made at 10 meters distance.

Plot 6.3

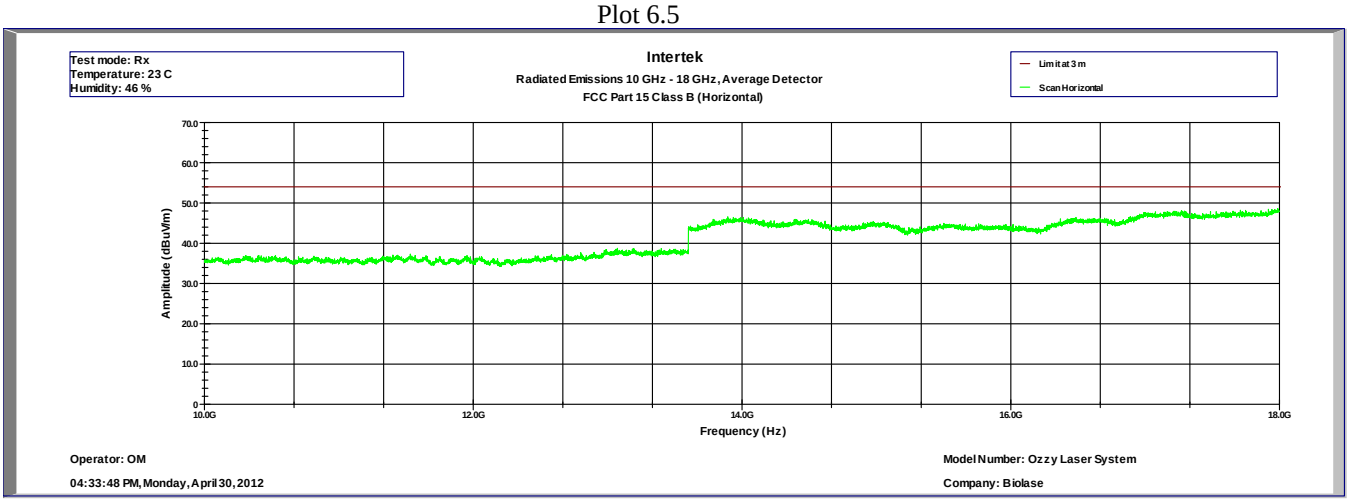


Plot 6.4

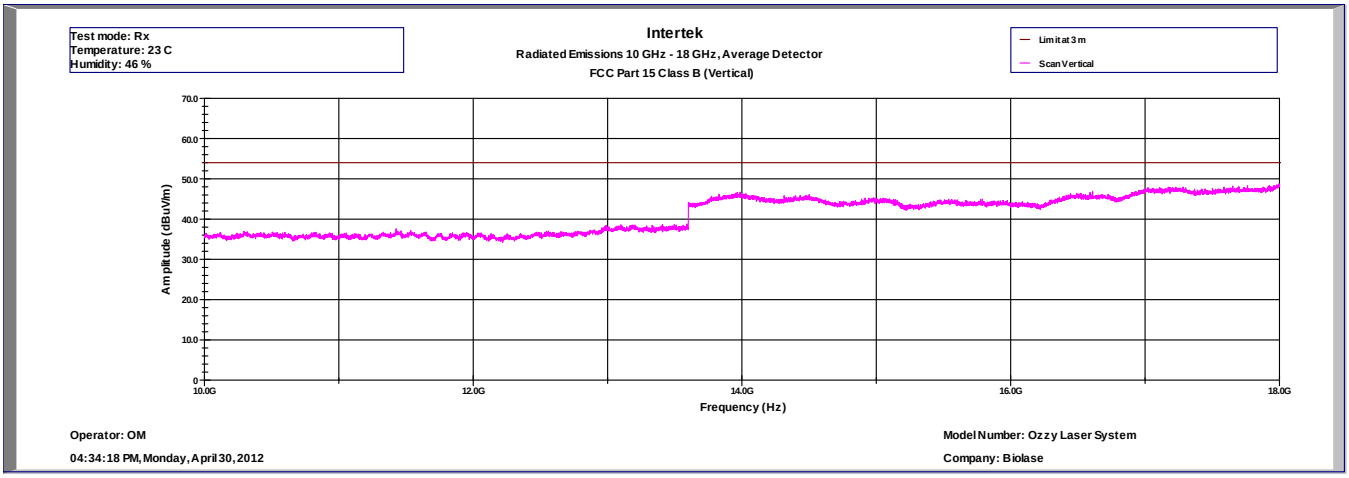


Notes: Measurements made at 3 meters distance.

Plot 6.5



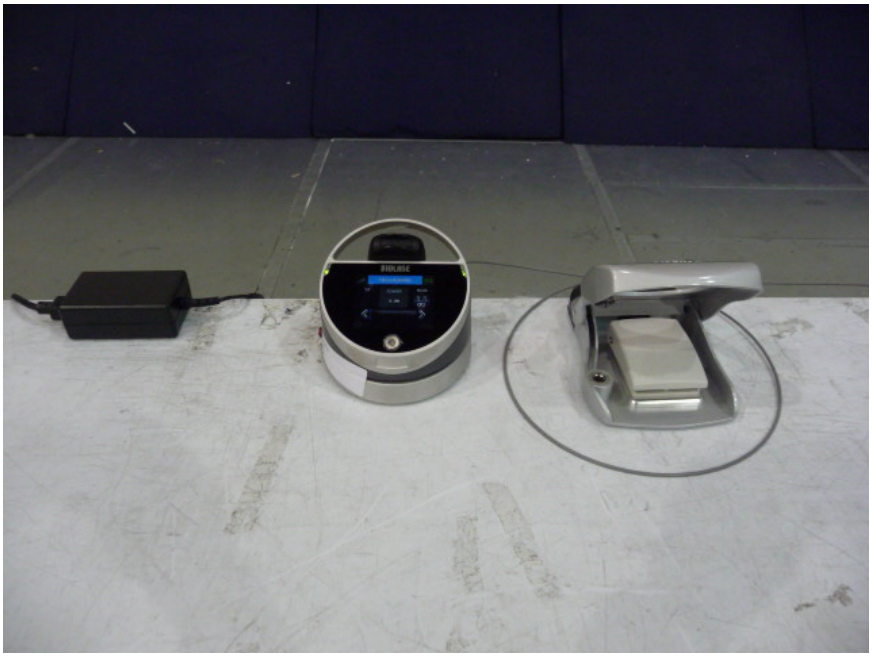
Plot 6.6



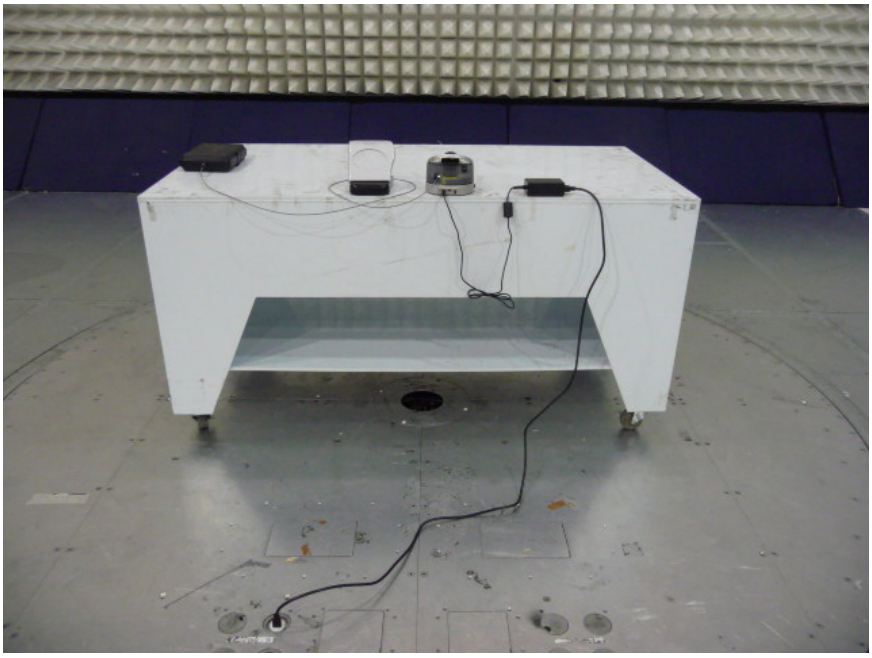
Notes: Measurements made at 3 meters distance.

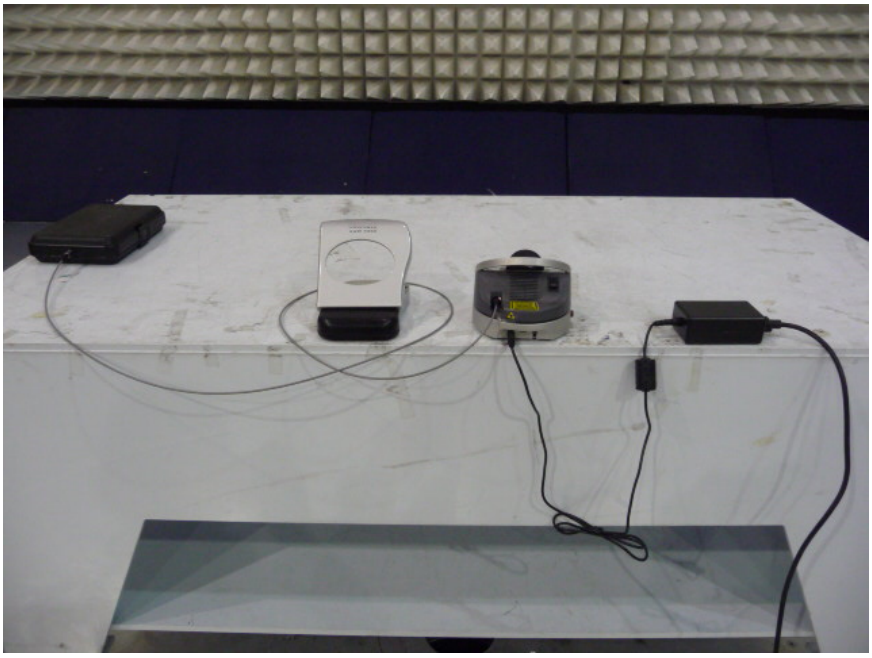
No emissions were detected above the noise floor which was at least 10 dB below the limit in the range of 18GHz – 25GHz.

Test Configuration Photographs



Test Configuration Photographs





4.7 AC Line Conducted Emission
FCC 15.207

Test Limit

Frequency Band MHz	Class B Limit dB (μV)	
	Quasi-Peak	Average
0.15-0.50	66 to 56 Decreases linearly with the logarithm of the frequency	56 to 46 Decreases linearly with the logarithm of the frequency
0.50-5.00	56	46
5.00-30.00	60	50

Note: At the transition frequency the lower limit applies.

Test Procedure

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

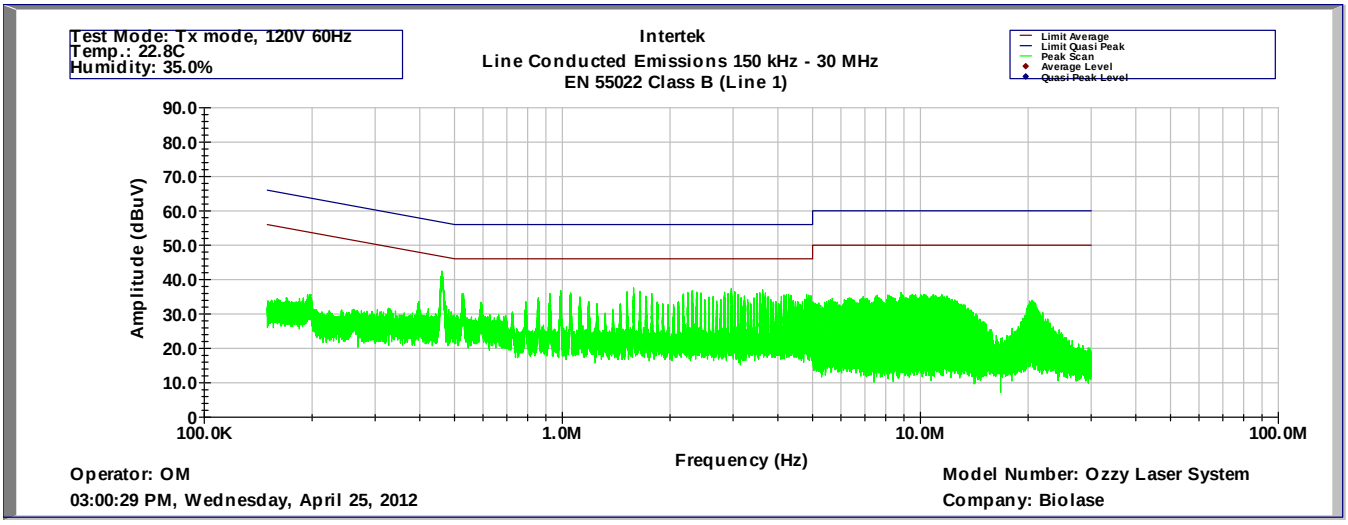
Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Floor standing EUT are placed on a horizontal metal ground plane and isolated from the ground plane by resting on an insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.4.

Test Results



Intertek Testing Services
Line Conducted Emissions 150 kHz - 30 MHz
EN 55022 Class B (Line 1)

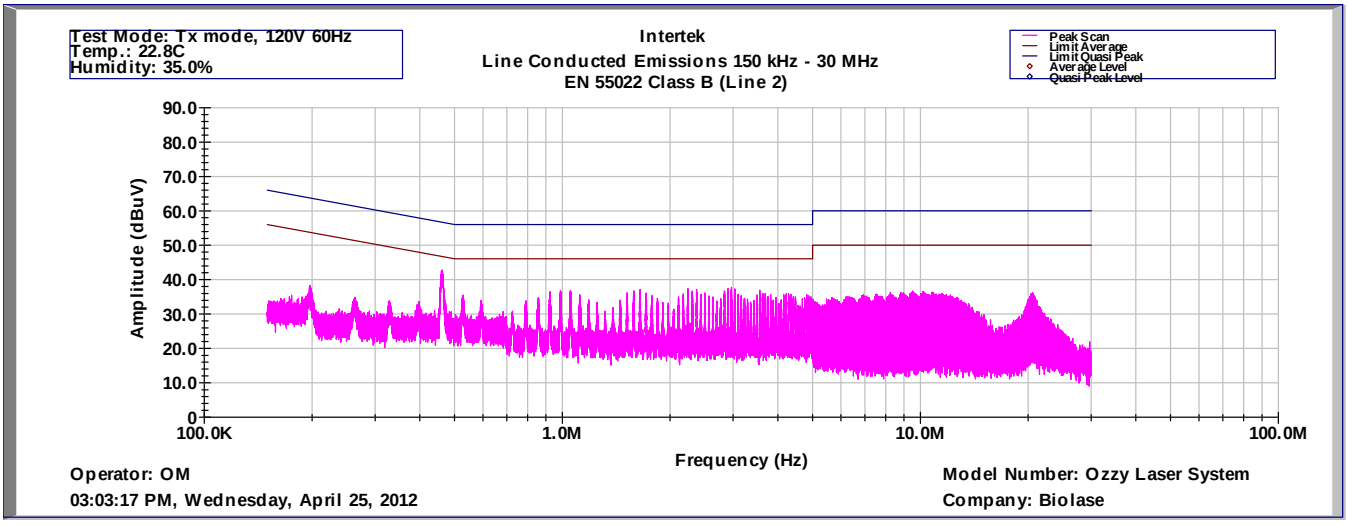
Operator: KK
03:00:29 PM, Wednesday, April 25, 2012

Model Number: EPIC 10
Company: Biolase

Frequency	Pk Level	Av Limit	QP Limit	Margin
Hz	dBuV	dBuV	dBuV	dB
461062	42.5	47.1	57.1	-4.6
989511	36.8	46.0	56.0	-9.2
1.515E+06	36.5	46.0	56.0	-9.5
1.582E+06	37.6	46.0	56.0	-8.4
1.647E+06	36.5	46.0	56.0	-9.5
2.242E+06	36.3	46.0	56.0	-9.7
2.306E+06	36.8	46.0	56.0	-9.2
2.373E+06	36.4	46.0	56.0	-9.6
2.437E+06	36.1	46.0	56.0	-9.9
2.837E+06	36.3	46.0	56.0	-9.7
2.964E+06	37.4	46.0	56.0	-8.6
3.029E+06	36.5	46.0	56.0	-9.5
3.558E+06	36.1	46.0	56.0	-9.9
3.628E+06	37.1	46.0	56.0	-8.9

Test Mode: Tx mode, 120V 60Hz
Temp.: 22.8C
Humidity: 35.0%

Test Results



Intertek
Line Conducted Emissions 150 kHz - 30 MHz
EN 55022 Class B (Line 2)

Operator: KK
03:03:17 PM, Wednesday, April 25, 2012

Model Number: EPIC 10
Company: Biolase

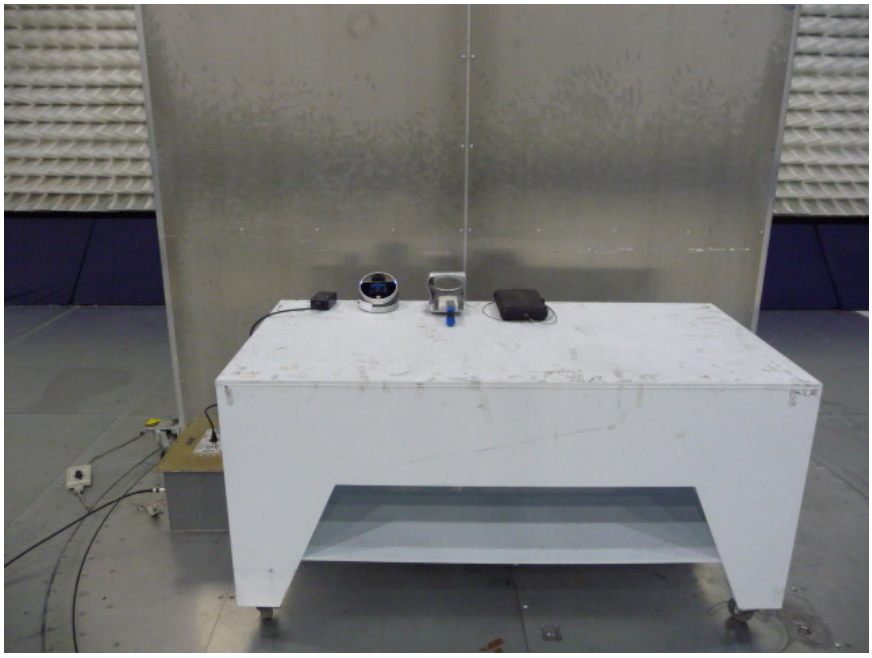
Frequency	Pk Level	Av Limit	QP Limit	Margin
Hz	dBuV	dBuV	dBuV	dB
197209	38.2	54.7	64.7	-16.4
462135	42.8	47.1	57.1	-4.3
988205	36.7	46.0	56.0	-9.3
1.053E+06	36.7	46.0	56.0	-9.3
1.583E+06	36.7	46.0	56.0	-9.3
1.648E+06	37.1	46.0	56.0	-8.9
2.243E+06	37.4	46.0	56.0	-8.6
2.370E+06	37.1	46.0	56.0	-8.9
2.836E+06	36.6	46.0	56.0	-9.4
2.901E+06	37.4	46.0	56.0	-8.6
2.966E+06	37.7	46.0	56.0	-8.3
3.030E+06	37.2	46.0	56.0	-8.8
3.560E+0	36.9	46.0	56.0	-9.1

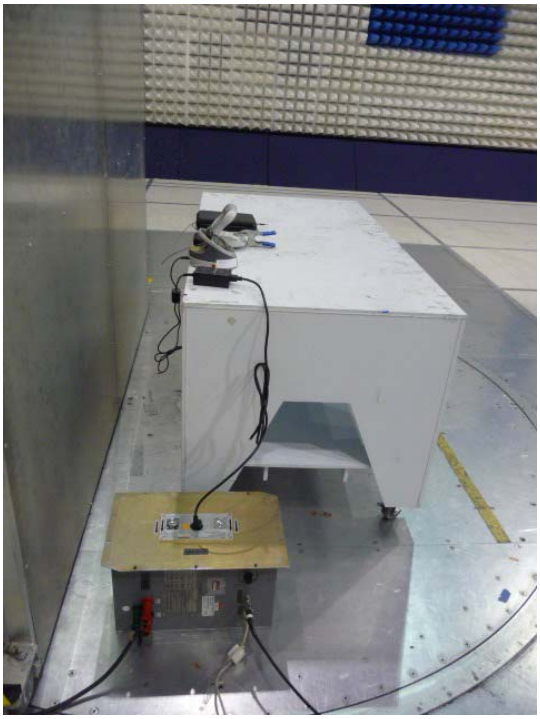
6				

Test Mode: Tx mode, 120V 60Hz
Temp.: 22.8C
Humidity: 35.0%

Results:	**Complies** by 4.3dB

Test Configuration Photographs





5.0 RF Exposure Evaluation

MPE Evaluation

The EUT is a wireless device used in a mobile application, at least 20 cm from any body part of the user or nearby persons.

The maximum EIRP is -6.7 dBm, 0.214 mW; therefore, to comply with the requirements for RF Exposure, the MPE is calculated.

The Power Density can be calculated using the formula

$$S = EIRP/ 4\pi D^2$$

Where: S is Power Density in W/m^2
D is the distance from the antenna.

It is considered that 20 cm is the minimum distance that user can go closest to the EUT.

At 20 cm, $S = 0.0004257\ W/m^2$, which is below the MPE Limit of $10\ W/m^2$

6.0 List of Test Equipment

Measurement equipment used for emission compliance testing utilized the equipment on the following list:

Equipment	Manufacturer	Model/Type	Serial #	Cal Int	Cal Due
Spectrum Analyzer	Rohde&Schwarz	FSP40	036612004	12	11/09/12
Bi-Log Antenna	ARA	LPB-2513/A	1154	12	07/06/12
Pre-Amplifier	Sonoma	310N	293620	12	11/11/12
Pre-Amplifier	Miteq	AMF-4D-001180-24-10P	799159	12	09/01/12
Spectrum Analyzer	Rohde&Schwarz	FSU	200482	12	03/22/13
Horn Antenna	EMCO	3115	00126795	12	11/03/12
Signal Generator	Hewlett Packard	SMR40	100445	12	09/01/12
LISN	FCC	FCC-LISN-50-50-M-H	2012	12	08/28/12

7.0 Document History

Revision/ Job Number	Writer Initials	Date	Change
1.0 / G100618766	KK	April 30, 2012	Original document