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TEST REPORT

Report Number:	**101344818LAX-001a**
Project Number:	**G101344818**
Report Issue Date:	**1/9/2014**
Product Name:	**Footswitch for Epic Family Series Soft Tissue Laser Systems**
Model Number:	**EPIC T-SERIES / EPIC S-SERIES**
FCCID:	**G2OEPIC-1**
ICID:	**IC: 10338A-EPIC**
Standards:	**Title 47 CFR Part 15 Subpart C and RSS-210 Issue 8**

Tested by:
Intertek Testing Services NA, Inc.
25800 Commercentre Drive
Lake Forest, CA 92630 USA

Client:
Biolase Technology, Inc.
4 Cromwell
Irvine, CA 92618 USA

Report prepared by

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1 Introduction and Conclusion

The tests indicated in section 2 were performed on the product constructed as described in section 3. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test method, a list of the actual test equipment used, documentation photos, results and raw data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested complied with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested.

The INTERTEK Lake Forest - is located at 25800.Commercentre Drive, Lake Forest CA, 92630. The radiated emission test site is a 10-meter semi-anechoic chamber. The chamber meets the characteristics of CISPR 16-1 and ANSI C63.4. For measurements, a remotely controlled flush-mount metal-top turntable is used to rotate the EUT a full 360 degrees. A remote controlled non-conductive antenna mast is used to scan the antenna height from one to four meters. The test site is listed with the FCC under registration number 485103. The test site is listed with Industry Canada under site number IC 2042M-1.

2 Test Summary

Test full name	FCC Reference	IC Reference	Result
Output Power	§ 15.247(b)(3)	RSS-210 (A8.4)	Pass
Occupied Bandwidth	§ 15.247(a)(2)	RSS-210 A8.2(a)	Pass
Power Spectral Density	§ 15.247(e)	RSS-210 (A8.2b)	Pass
Conducted Spurious Emissions	§ 15.247(d)	RSS-210 (A8.5)	Pass 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	15.247(d) A8.5	Pass
Radiated Spurious Emissions (Transmitter)	§ 15.247(d), § 15.209, and § 15.205	RSS-210 (2.2) (A8.5)	Pass
Radiated Spurious Emissions (Receiver)	§ 15.109	RSS-Gen (6.1)	Pass
AC Powerline Conducted Emissions	§ 15.107, § 15.207	RSS-Gen (7.2.4)	Excluded (not EUT)
RF Exposure	15.247(i)	RS-102	Pass

3 Description of Equipment Under Test

Equipment Under Test	
Manufacturer	Biolase Technology, Inc.
Model Number	EPIC series family of soft tissue laser systems
Serial Number	6400146 & 6400452
Epic Family Series Soft Tissue Laser Systems Footswitch covered	Footswitch for EPIC 10, EPIC V, EPIC S, EPIC T
FCC Identifier	G2OEPIC-1
IC Identifier	10338A-EPIC
Receive Date	9/9/2013
Test Start Date	9/24/2013
Test End Date	9/29/2013
Device Received Condition	Good
Test Sample Type	Production
Frequency Band	2402MHz – 2480MHz
Mode(s) of Operation	Continuously transmits a signal
Modulation Type	OGFSK
Number of Hopping Channels	No hopping
Transmission Control	Automatic using Biolase software when foot pedal is pressed.
Test Channels	15, 20, 25 (2425, 2450, 2475 MHz)
Antenna Type (15.203)	Internal PCB Antenna, 5.5dB gain
Power Supply	115VAC/60Hz (Via AC / DC Power Adapter)

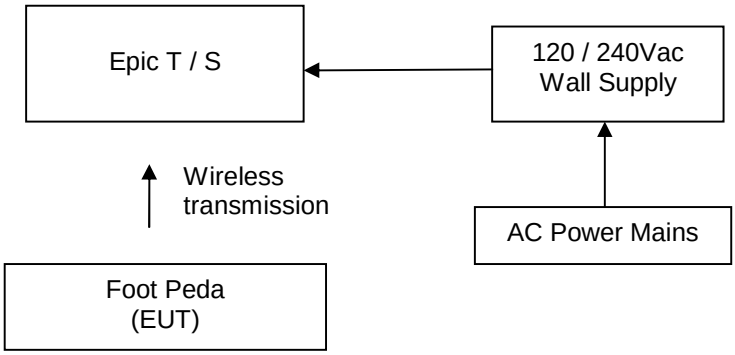
Description of Equipment Under Test
Soft Tissue Laser w/ foot pedal control

Operating modes of the EUT:

No.	**Descriptions of EUT Exercising**
1	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.
2	Receive / idle mode
3	EUT was controlled by Biolase proprietary software.

3.1 System setup including cable interconnection details, support equipment and simplified block diagram

3.2 EUT Block Diagram:



3.3 Cables:

Cables					
Description	Length	Shielding	Ferrites	Connection	
				From	To
120Vac Power Cable	1m	No	No	120V / 240V AC	120 / 240Vac desktop power supply
DC power	2m	Yes	Yes	120 / 240Vac desktop power supply	Epic T / S
Laser cable	2m	Yes	No	Epic T / S	Laser hand piece

3.4 Support Equipment:

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
n/a	n/a	n/a	n/a

4 Peak Conducted Power

4.1 Test Limits

§ 15.247(b)(3): For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

§ 15.247(b)(4): The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.2 Test Procedure

ANSI C63.10: 2009 and KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247). The peak output power was measured using the channel power function of the spectrum analyzer.

4.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	1140	Rohde & Schwarz	ESCI	2/10/2013	2/10/2014

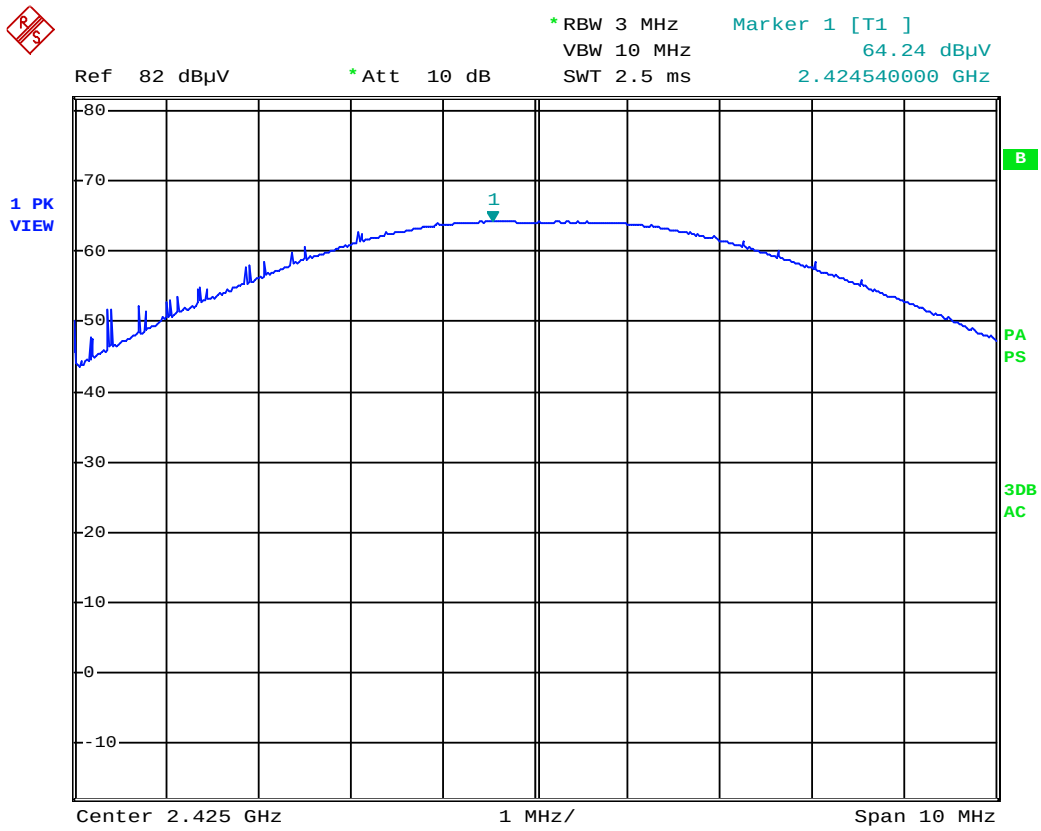
4.4 Results:

The peak output power measurements were all below the 30dBm limit.

Mode	Channel Number	Frequency (MHz)	EIRP Radiated Peak Output Power (dBm)	Transmitter Antenna Gain (dB)	Conducted Peak Output Power (dBm)	Limit (dBm)	Result
OGFSK	15	2425	3.19	5.5	-2.31	30	Pass
OGFSK	20	2450	1.84	5.5	-3.66	30	Pass
OGFSK	25	2475	4.38	5.5	-1.12	30	Pass

EIRP Radiated Peak Output Power in dBm is calculated as E-field + 20 log(d) – 108.4
E-field = dBµV/m
(d) = distance at 3 meters

Conducted Peak Output Power is calculated as EIRP Radiated Peak Power minus the Antenna Gain of the transmitter.



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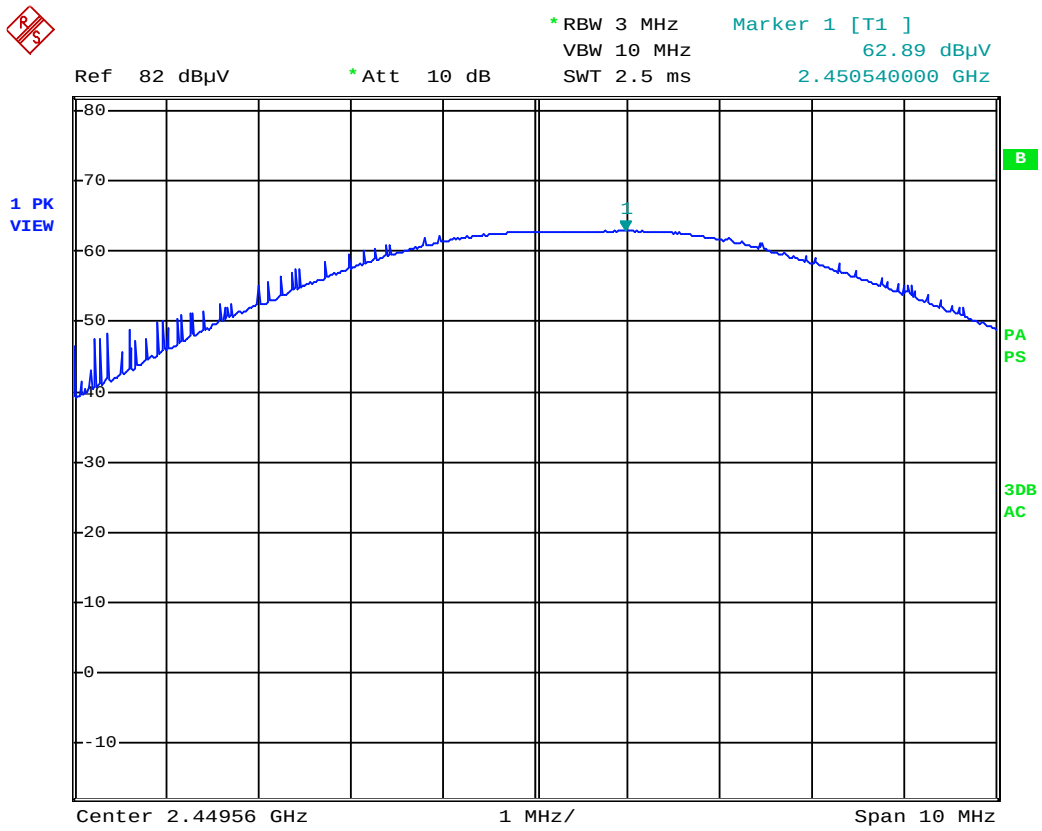
Peak Output Power, Low Channel

Frequency MHz	RA (dBµV)	AG (dB)	CF (dB)	AF (dB1/m)	Final Field Strength (dBµV/m)	EIRP dBm	EIRP mW
2425	64.24	0	6.04	28.17	98.45	3.19	2.08

RA = receiver amplitude
AG = amplifier gain
CF = cable factor
AF = cable factor
Final Field Strength is the same as E-Field

Final Field Strength = RA-AG+CF+AF

EIRP Radiated Peak Output Power in dBm is calculated as E-field + 20 log(d) – 108.4
E-field = dBµV/m
(d) = distance at 3 meters



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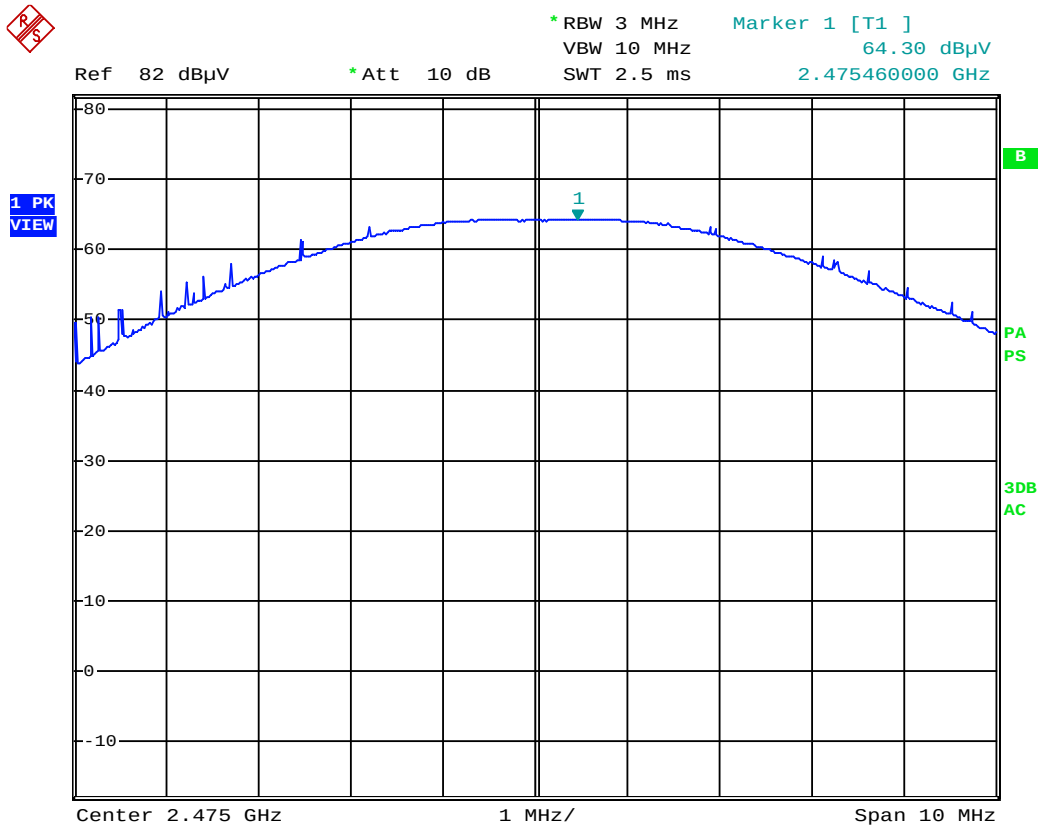
Peak Output Power, Mid Channel

Frequency MHz	RA (dBµV)	AG (dB)	CF (dB)	AF (dB1/m)	Final Field Strength (dBµV/m)	EIRP dBm	EIRP mW
2450	62.89	0	6.04	28.17	97.1	1.84	1.52

RA = receiver amplitude
AG = amplifier gain
CF = cable factor
AF = cable factor
Final Field Strength is the same as E-Field

Final Field Strength = RA-AG+CF+AF

EIRP Radiated Peak Output Power in dBm is calculated as E-field + 20 log(d) – 108.4
E-field = dBµV/m
(d) = distance at 3 meters



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Peak Output Power, High Channel

Frequency MHz	RA (dBµV)	AG (dB)	CF (dB)	AF (dB1/m)	Final Field Strength (dBµV/m)	EIRP dBm	EIRP mW
2475	64.30	0	6.04	29.3	99.64	4.38	2.74

RA = receiver amplitude
AG = amplifier gain
CF = cable factor
AF = cable factor
Final Field Strength is the same as E-Field

Final Field Strength = RA-AG+CF+AF

EIRP Radiated Peak Output Power in dBm is calculated as E-field + 20 log(d) – 108.4
E-field = dBµV/m
(d) = distance at 3 meters

5 Occupied Bandwidth

5.1 Test Limits

§ 15.247(a)(2): For digital modulation systems, the minimum 6dB bandwidth shall be at least 500kHz.

5.2 Test Procedure

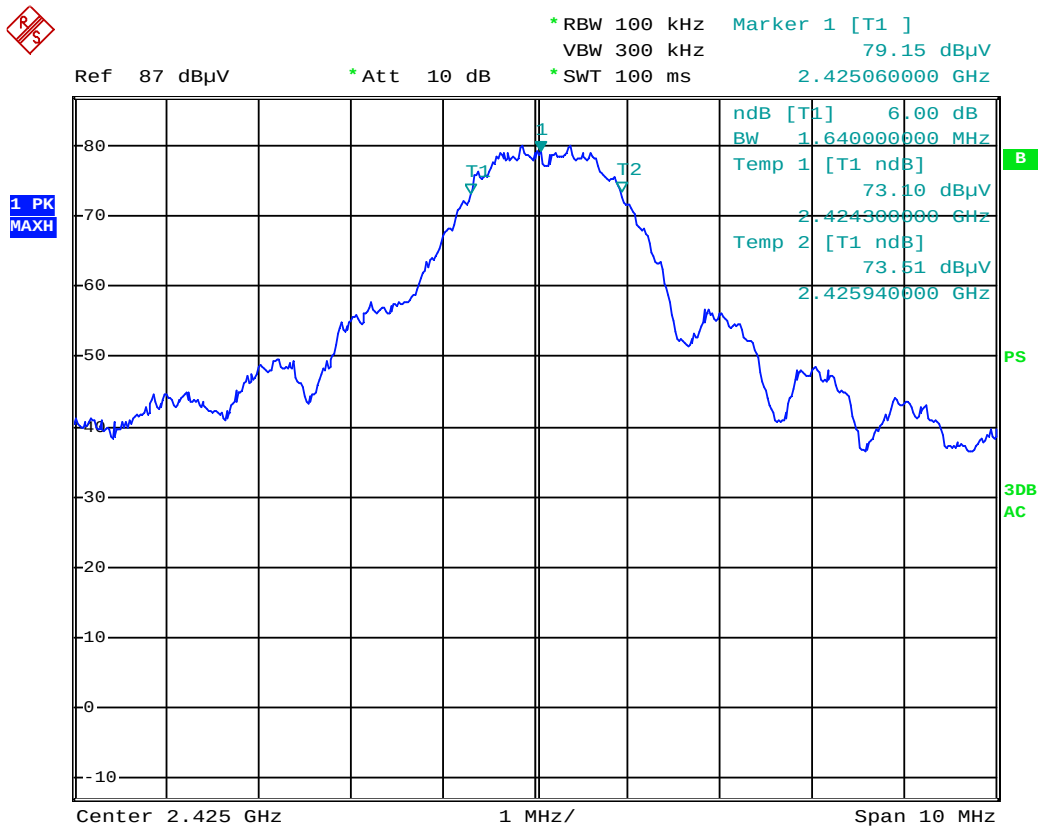
ANSI C63.10: 2009 and KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)

5.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	1140	Rohde & Schwarz	ESCI	2/10/2013	2/10/2014

5.4 Results:

Mode	Channel Number	Frequency (MHz)	6dB Bandwidth	99% Power Bandwidth	Result
OGFSK	15	2425	1.64MHz	2.54MHz	Pass
OGFSK	20	2445	1.72MHz	2.72MHz	Pass
OGFSK	25	2475	1.66MHz	2.84MHz	Pass



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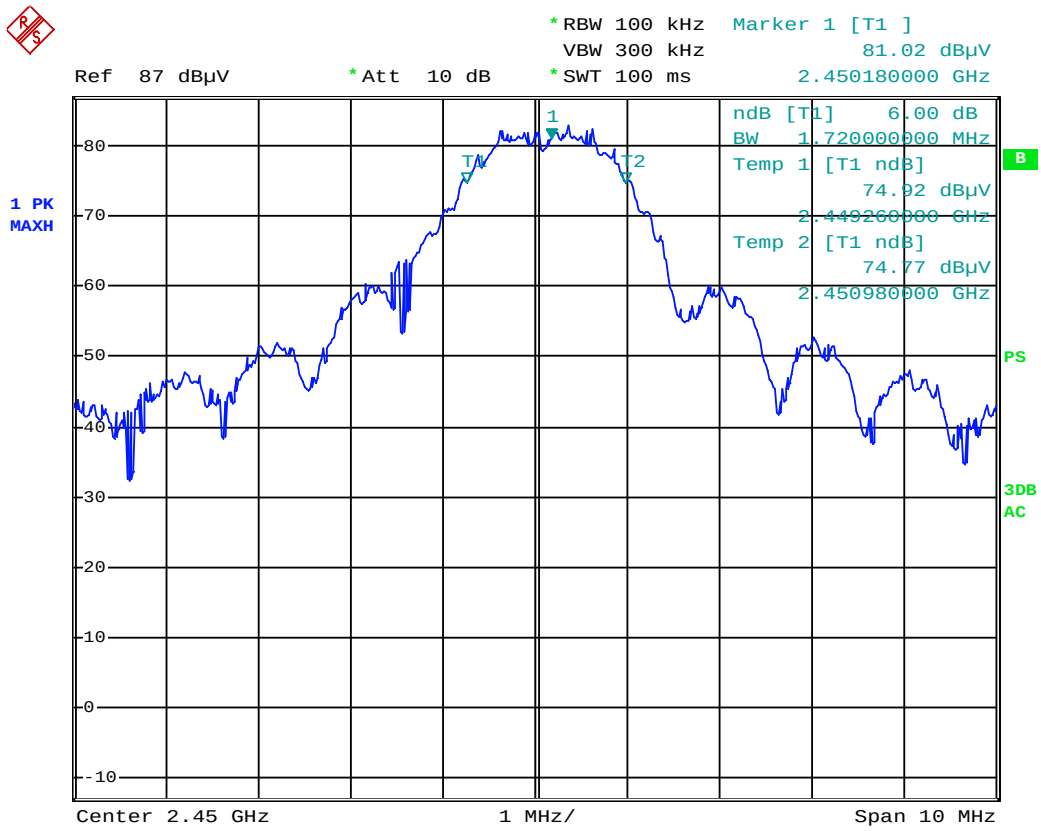
6dB Bandwidth, Low Channel



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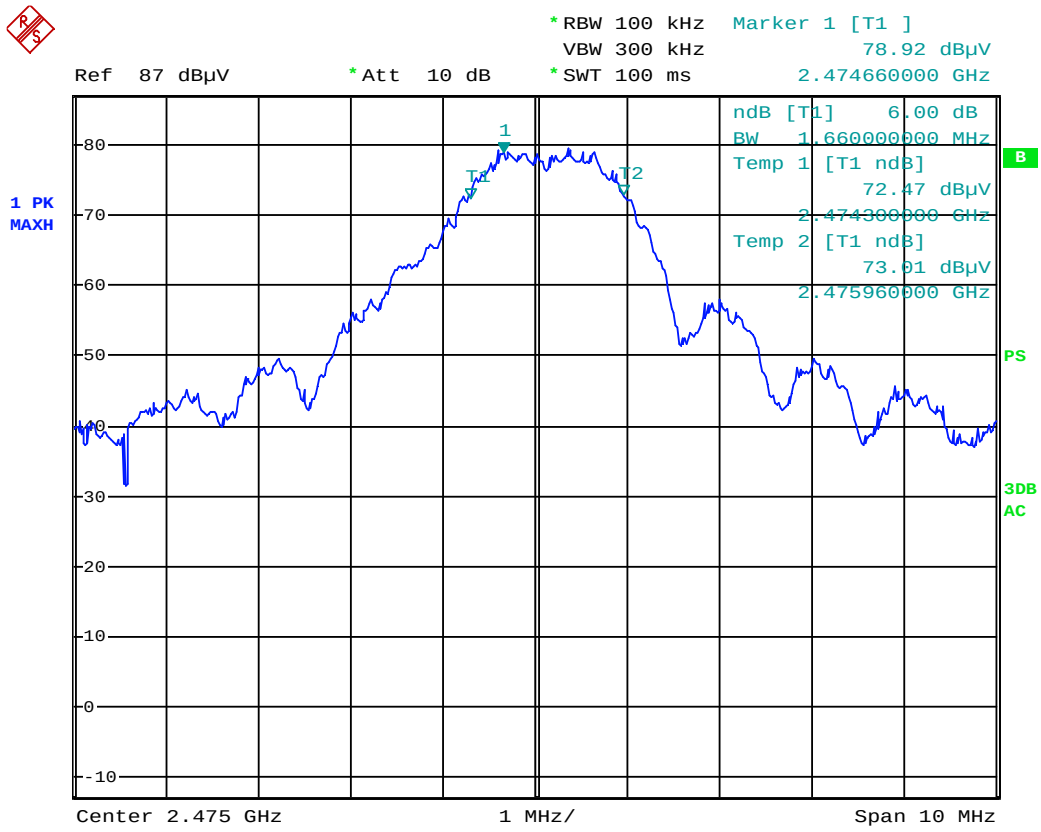
6dB Bandwidth, Middle Channel



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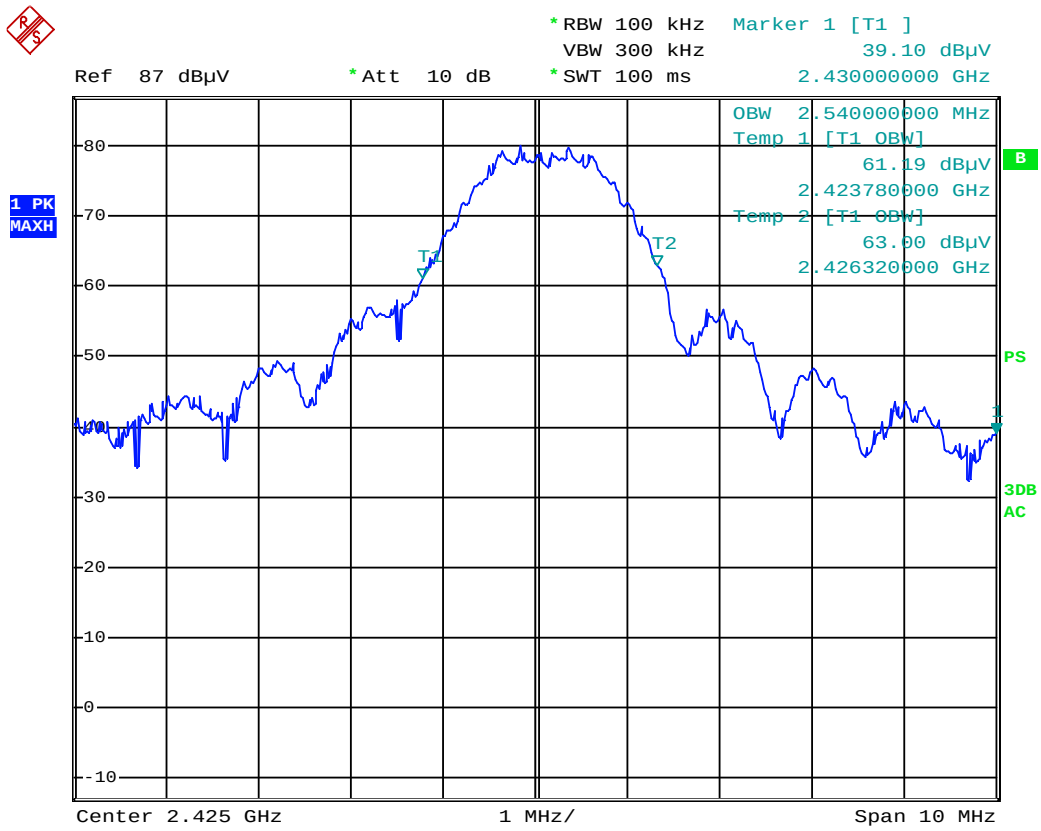
6dB Bandwidth, High Channel



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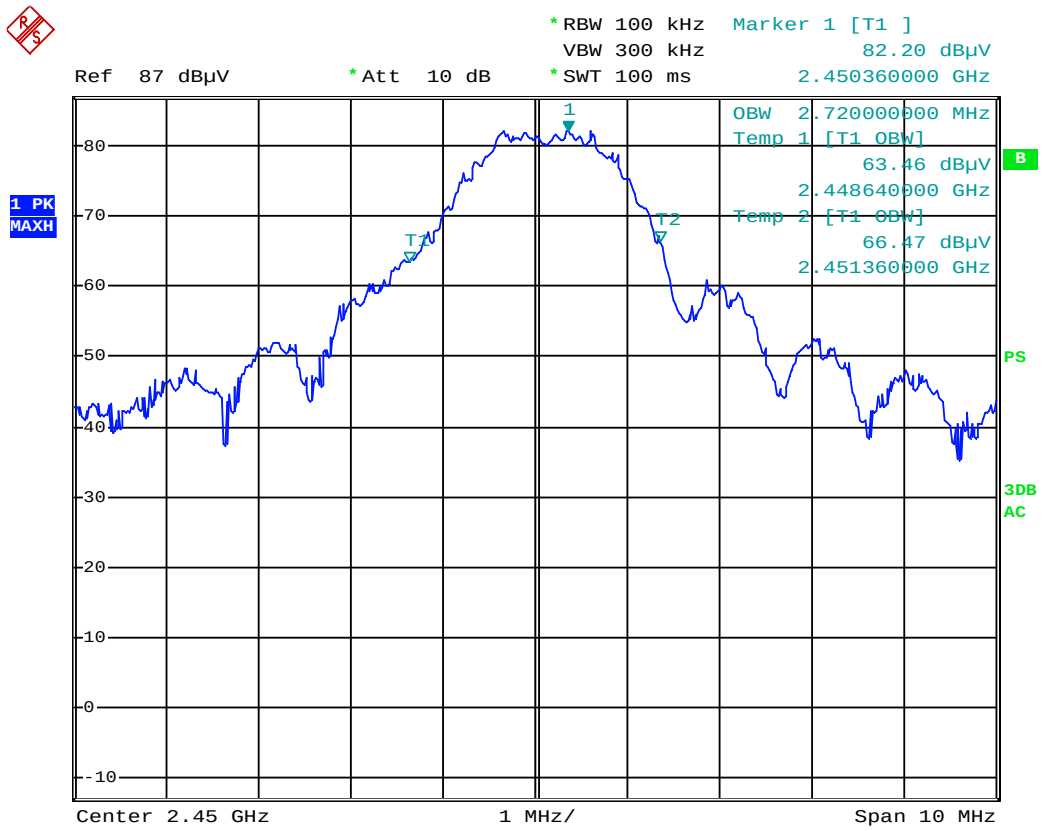
99% Bandwidth, Low Channel



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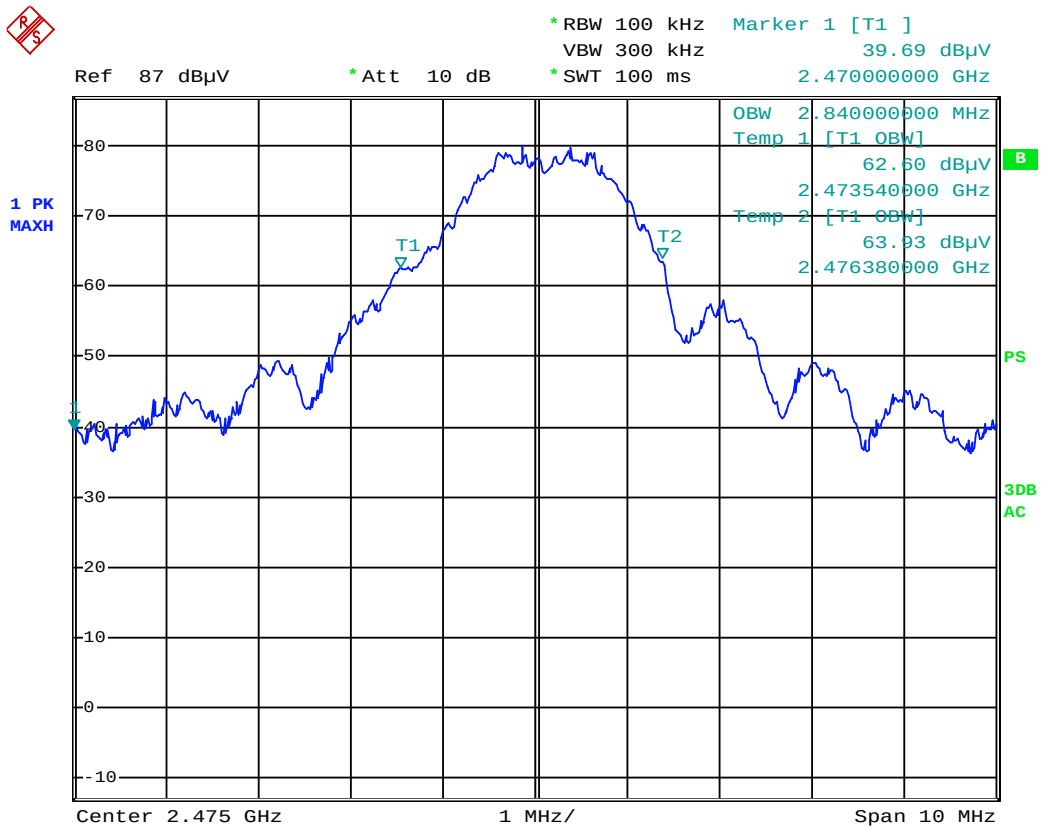
99% Bandwidth, Middle Channel



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99% Bandwidth, High Channel

6 Conducted Spurious Emissions

6.1 Test Limits

§ 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.

6.2 Test Procedure

ANSI C63.10: 2009 and KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)

6.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	1140	Rohde & Schwarz	ESCI	2/10/2013	2/10/2014

6.4 Results:

- The device under test did not have a conducted port, and therefore no conducted plots were taken.

7 Power Spectral Density

7.1 Test Limits

§ 15.247(e): 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. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

7.2 Test Procedure

ANSI C63.10: 2009 and KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)

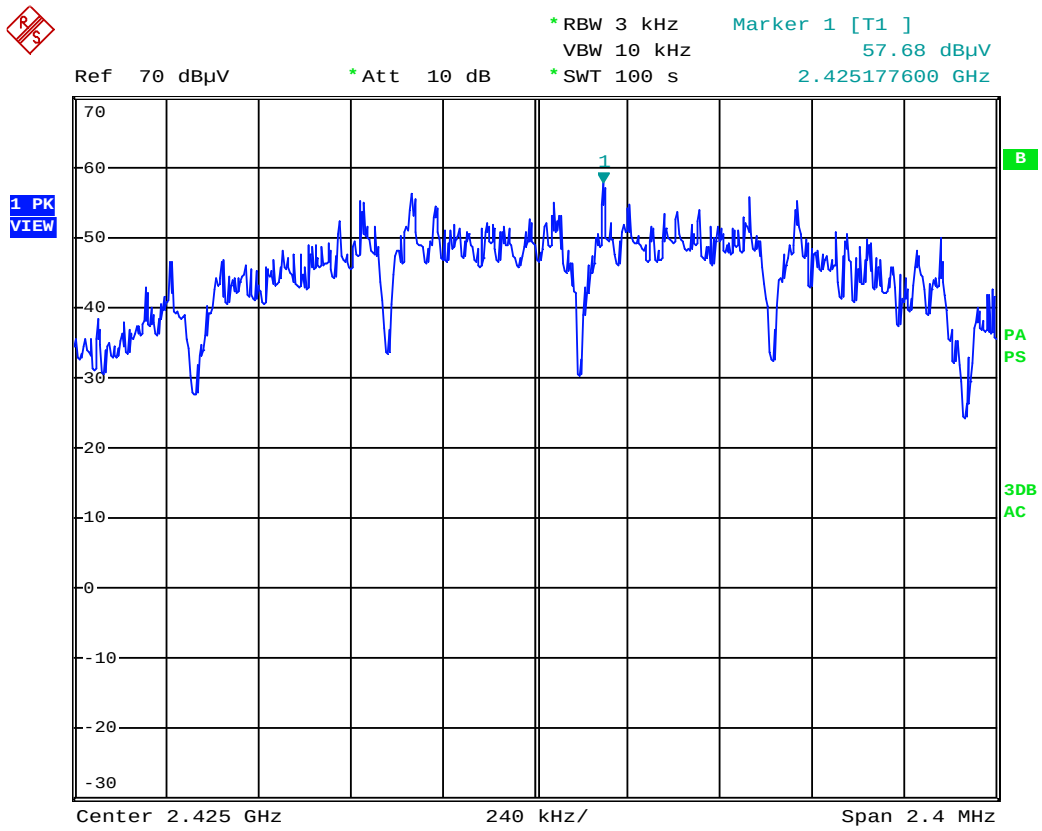
7.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	1140	Rohde & Schwarz	ESCI	2/10/2013	2/10/2014

7.4 Results:

*PSD Option 1 Method

Mode	Channel Number	Frequency (MHz)	PSD in 3kHz BW (dBm)	Limit (dBm)	Result
OGFSK	15	2425	-6.96	8.0	Pass
OGFSK	20	2445	-7.78	8.0	Pass
OGFSK	25	2475	-8.62	8.0	Pass



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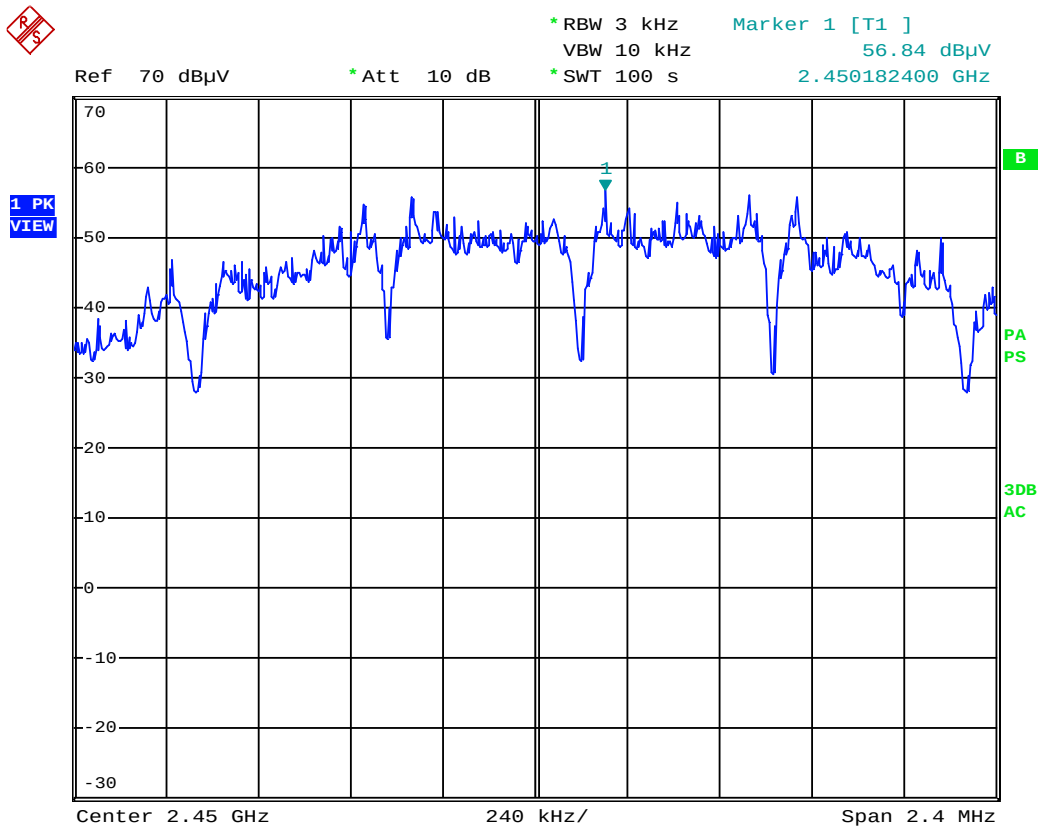
PSD Low Channel

Frequency MHz	RA (dBµV)	AG (dB)	CF (dB)	AF (dB1/m)	Final Field Strength (dBµV/m)	EIRP dBm	EIRP mW
2425	57.68	0	2.44	28.17	88.29	-6.96	0.20

RA = receiver amplitude
AG = amplifier gain
CF = cable factor
AF = cable factor



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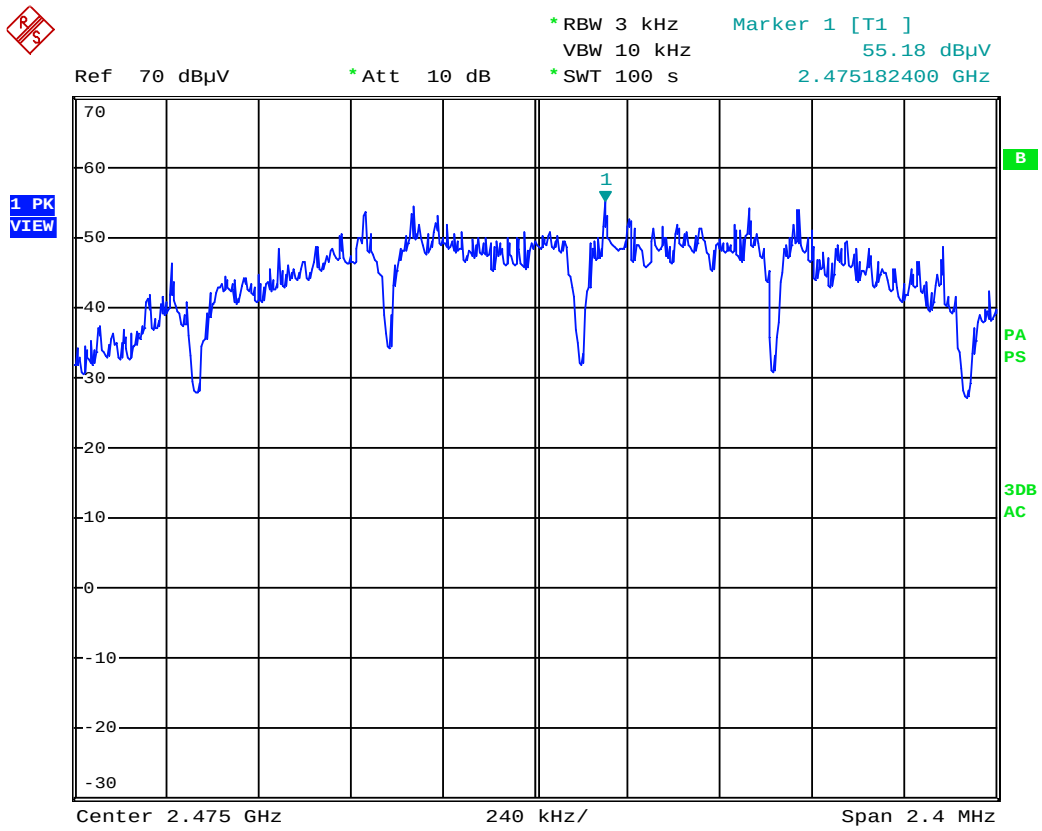
PSD Middle Channel

Frequency MHz	RA (dBµV)	AG (dB)	CF (dB)	AF (dB1/m)	Final Field Strength (dBµV/m)	EIRP dBm	EIRP mW
2450	56.84	0	2.46	28.17	87.47	-7.78	0.166

RA = receiver amplitude
AG = amplifier gain
CF = cable factor
AF = cable factor



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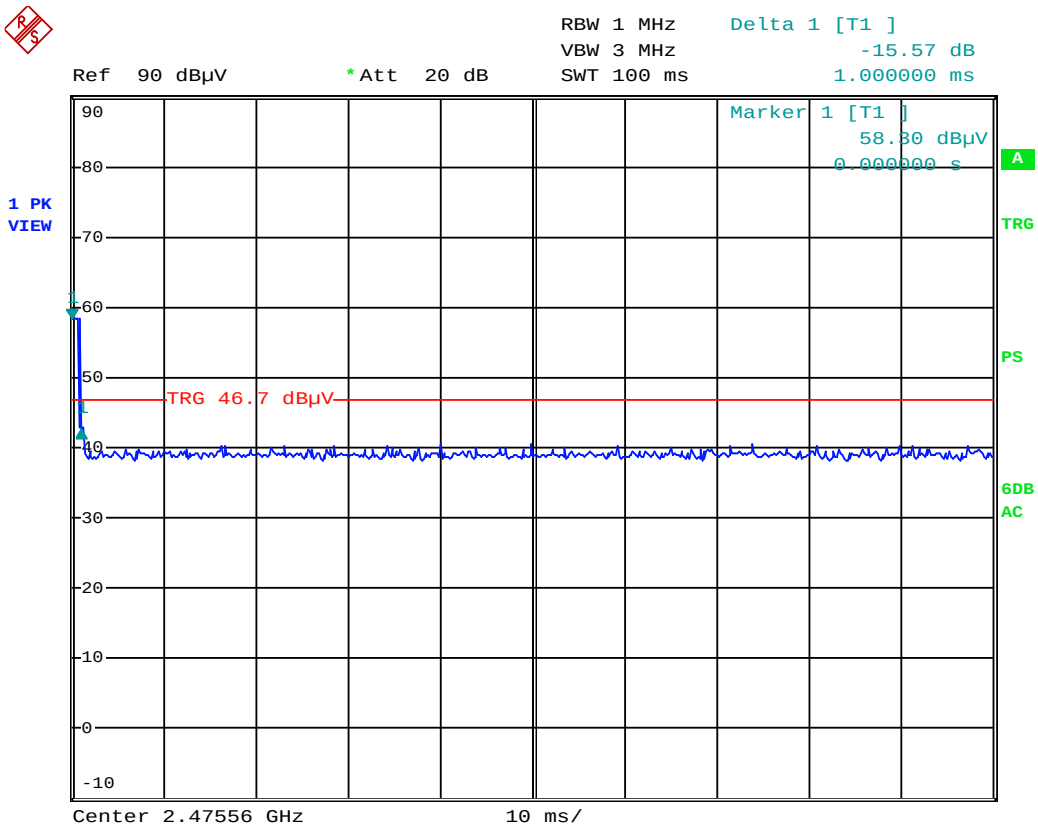
PSD, High Channel

Frequency MHz	RA (dBµV)	AG (dB)	CF (dB)	AF (dB1/m)	Final Field Strength (dBµV/m)	EIRP dBm	EIRP mW
2475	55.18	0	2.46	29.0	86.64	-8.62	0.137

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

8 Duty Cycle Correction Factor



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100mS @ 10ms / div

Time on = 4.6 ms

Duty Cycle Calculation

Sample Calculation:

If $T \leq 0.1$ second, calculate the Duty Cycle correction factor as 20Log(t/T).
If $T > 0.1$ second, calculate the Duty Cycle correction factor as 20Log(t/0.1)

Result:

The duty cycle was calculated by measuring one pulse train in a 100 ms period. The pulse train consists of only “1 Short” 4.6 ms pulse.

Total ON time = 4.6 ms

Duty Cycle calculation: 20Log (4.6/100) = **-26.74dB**

9 Radiated Spurious Emissions (Transmitter)

9.1 Test Limits

§ 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)).

Part 15.205(a): Restricted Bands of Operations

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
[1] 0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2655–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	[2]
13.36–13.41.			

[1] Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz.
[2] Above 38.6

Part 15.209(a): Field Strength Limits for Restricted Bands of Operation

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2,400 / F (kHz)	300
0.490 - 1.705	24,000 / 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

9.2 Test Procedure

ANSI C63.10: 2009 and KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)

9.3 Example of Field Strength Calculation Method:

The measured field strength was calculated by summing the readings taken from the spectrum analyzer with the appropriate correction factors associated with the antenna losses and cable losses. The calculation formula and sample calculations are listed below:

Formula:
FS = RA + AF + CF

FS = Field Strength in dBμV/m
RA = Receiver Amplitude in dBμV
AF = Antenna Factor in dB
CF = Cable Attenuation Factor in dB (Including preamplifier and filter attenuation)

Example Calculation:

RA = 19.48 dBμV
AF = 18.52 dB
CF = 0.78 dB

FS = 19.48 + 18.52 + 0.78 = 38.78 dBμV/m
Level in μV/m = Common Antilogarithm [(38.78 dBμV/m)/20] = 86.89 μV/m

9.4 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	1140	Rohde & Schwarz	ESCI	2/10/13	2/10/14
Spectrum Analyzer	IN960	Rohde & Schwarz	FSP	4/11/13	4/11/14
Preamplifier	1685147	MD	AMF-60	1/4/13	1/4/14
Preamplifier	583	HP	8449B	4/9/13	4/9/14
Biconnilog Antenna	1174	TESEQ	CBL6112D	2/01/2013	02/01/2014
Horn Antenna	1093	EMCO	3160-09	n/a	VBU 9/24/2013
Horn Antenna	571	AH Systems	SAS-571	11/19/2012	11/19/2013
Cable	973	n/a	n/a	10/31/2012	10/31/2013
Cable	1374	AH Systems	n/a	7/18/13	7/18/14

9.5 Results:

All spurious emissions were attenuated by at least 20dB below the level of the fundamental as required by Part 15.247(d). Additionally, all emissions falling within restricted bands of operation and at the band edges were found to be below the limit specified in Part 15.209(a). The spurious emissions listed in the following tables are the worst case emissions. Emissions not reported were at or below the measurement noise floor. The test sample was evaluated on the x any y axis since it is a floor mounted device and is used in only one orientation.

Tx Channel	Spurious Frequency	Polarity	Corrected Peak dBµV/m	Peak Limit	Peak Margin	Corrected Average dBµV/m	Avg Limit	Avg Margin	Results
	4850	H	71.65	74	-2.35	44.91	54	-9.09	Compliant
	7275	H	71.21	74	-2.79	44.47	54	-9.53	Compliant
	9700	H	50.86	74	-23.14	24.12	54	-29.88	Compliant
	12125	H	45.12	74	-28.88	18.38	54	-35.62	Compliant
	4850	V	56.46	74	-17.54	29.72	54	-24.28	Compliant
	7275	V	41.37	74	-32.63	14.63	54	-39.37	Compliant

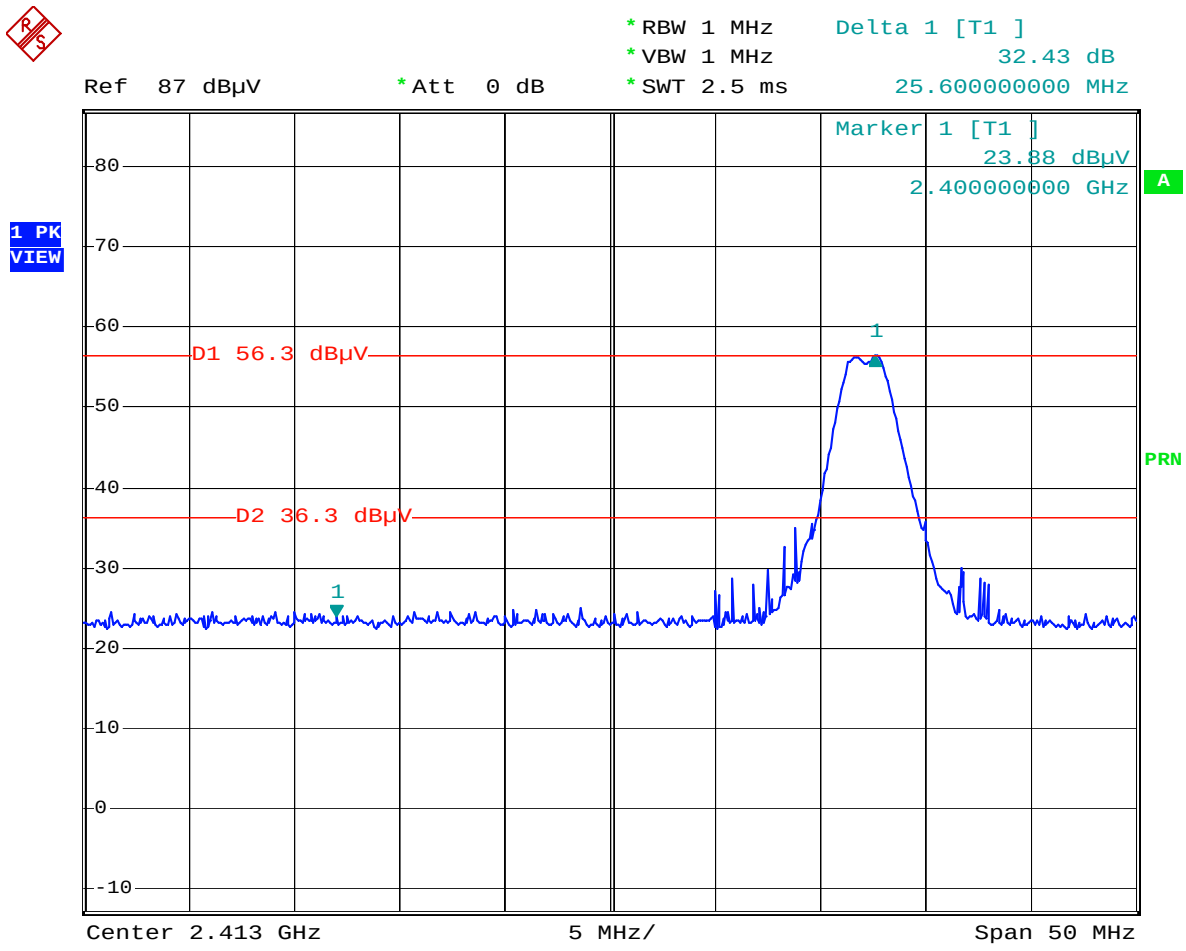
Worst Case Spurious Emissions (OGFSK, Low Channel)

Tx Channel	Spurious Frequency	Polarity	Corrected Peak dBµV/m	Peak Limit	Peak Margin	Corrected Average dBµV/m	Avg Limit	Avg Margin	Results
Mid channel 2450 MHz	4900	V	71.05	74	-2.95	44.31	54	-9.69	Compliant
	7350	V	51.95	74	-22.05	25.21	54	-28.79	Compliant
	9800	V	50.09	74	-23.91	23.35	54	-30.65	Compliant
	12250	V	55.92	74	-18.08	29.18	54	-24.82	Compliant
	14700	V	52.38	74	-21.62	25.64	54	-28.36	Compliant
	17150	V	51.45	74	-22.55	24.71	54	-29.29	Compliant
	4900	H	54.24	74	-19.76	27.5	54	-26.50	Compliant
	7350	H	70.37	74	-3.63	43.63	54	-10.37	Compliant
	9800	H	47.9	74	-26.10	21.16	54	-32.84	Compliant
	12250	H	49.79	74	-24.21	23.05	54	-30.95	Compliant

Worst Case Spurious Emissions (OGFSK, Middle Channel)

Tx Channel	Spurious Frequency	Polarity	Corrected Peak dBµV/m	Peak Limit	Peak Margin	Corrected Average dBµV/m	Avg Limit	Avg Margin	Results
	4950	V	67.99	74	-6.01	41.25	54	-12.75	Compliant
	7425	V	41.35	74	-32.65	14.61	54	-39.39	Compliant
	9900	V	50.52	74	-23.48	23.78	54	-30.22	Compliant
	12375	V	49.67	74	-24.33	22.93	54	-31.07	Compliant
	14850	V	48.36	74	-25.64	21.62	54	-32.38	Compliant
	4950	H	73.02	74	-0.98	46.28	54	-7.72	Compliant
	7425	H	73.32	74	-0.68	46.58	54	-7.42	Compliant
	9900	H	53.78	74	-20.22	27.04	54	-26.96	Compliant
	12375	H	49.4	74	-24.6	22.66	54	-31.34	Compliant

Worst Case Spurious Emissions (OGFSK, High Channel)



Date: 29.SEP.2013 06:05:24

Low Band Edge Plot, Low Channel (Peak)

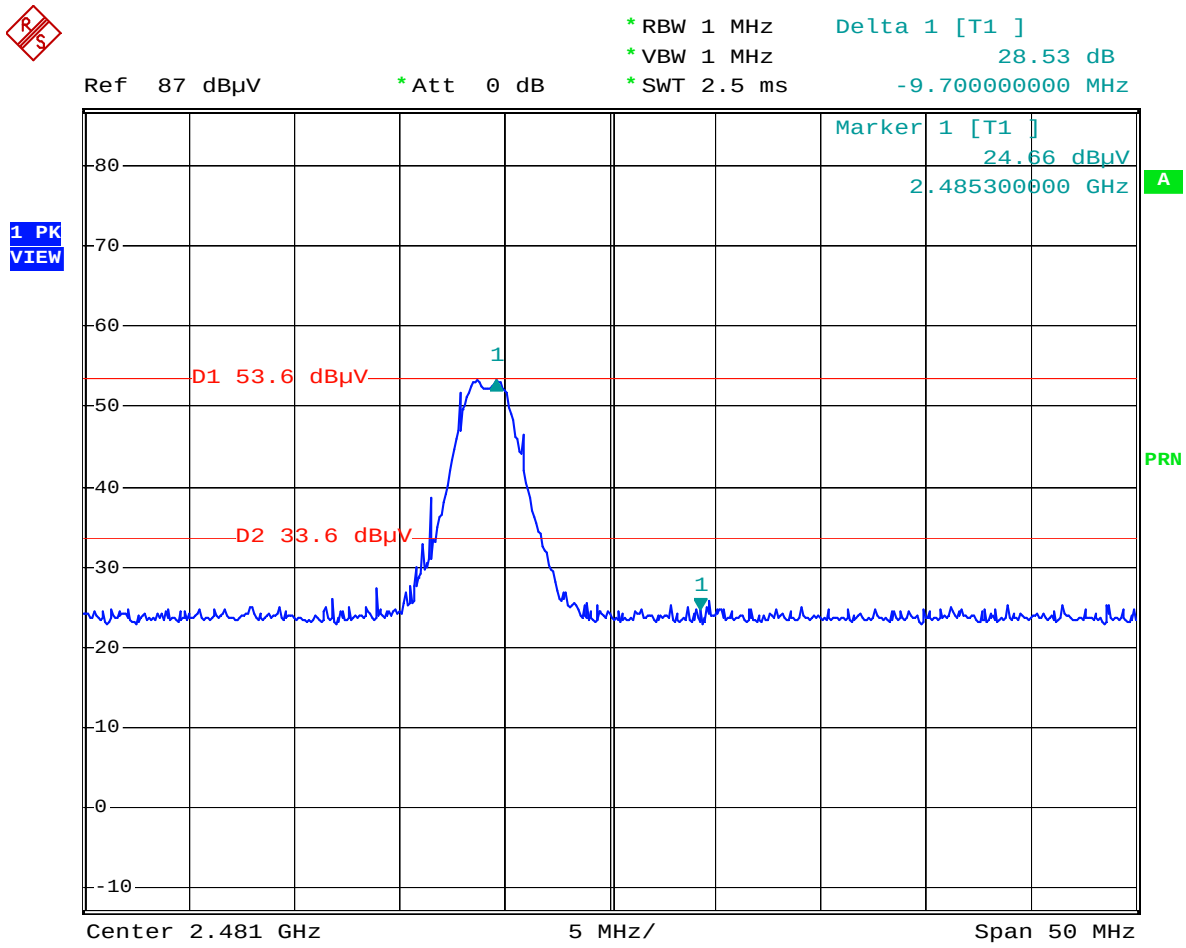
Frequency MHz	RA (dBµV)	DCF (dB)	CF (dB)	AF (dB1/m)	Final Field Strength (dBµV/m)	Average Limit	Margin
2390	23.88	-26.74	2.44	28.217	27.797	53.97	-26.173

Average Field Strength = RA-DCF+CF+AF

Frequency MHz	RA (dBµV)	AG (dB)	CF (dB)	AF (dB1/m)	Final Field Strength (dBµV/m)	Peak Limit	Margin
2390	23.88	0	2.44	28.217	54.53	73.97	-19.43

Peak Field Strength = RA-AG+CF+AF

RA = Receiver Amplitude
AG = Amplifier Gain
CF = Cable Factor
AF = Antenna Factor
DCF = Duty Cycle Correction Factor



High Band Edge Plot, High Channel (Peak)

Frequency MHz	RA (dBµV)	DCF (dB)	CF (dB)	AF (dB1/m)	Final Field Strength (dBµV/m)	Average Limit	Margin
2485.3	24.66	-26.74	2.49	29.008	29.418	53.97	-24.552

Average Field Strength = RA-DCF+CF+AF

Frequency MHz	RA (dBµV)	AG (dB)	CF (dB)	AF (dB1/m)	Final Field Strength (dBµV/m)	Peak Limit	Margin
2485.3	24.66	0	2.49	29.008	56.158	73.97	-17.81

Peak Field Strength = RA-AG+CF+AF

RA = Receiver Amplitude
AG = Amplifier Gain
CF = Cable Factor
AF = Antenna Factor
DCF = Duty Cycle Correction Factor

10 Radiated Spurious Emissions (Receiver)

10.1 Test Limits

§ 15.109: Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of emission (MHz)	Field strength (microvolts/meter)	Field strength (dBuV/m)
30–88	100	40
88–216	150	43.5
216–960	200	46
Above 960	500	54

These limits are identical to those in RSS-GEN

10.2 Test Procedure

ANSI C63.4: 2009

10.3 Example of Field Strength Calculation Method:

The measured field strength was calculated by summing the readings taken from the spectrum analyzer with the appropriate correction factors associated with the antenna losses and cable losses. The calculation formula and sample calculations are listed below:

Formula:
FS = RA + AF + CF

FS = Field Strength in dBμV/m
RA = Receiver Amplitude in dBμV
AF = Antenna Factor in dB
CF = Cable Attenuation Factor in dB (Including preamplifier and filter attenuation)

Example Calculation:

RA = 19.48 dBμV
AF = 18.52 dB
CF = 0.78 dB

FS = 19.48 + 18.52 + 0.78 = 38.78 dBμV/m
Level in μV/m = Common Antilogarithm [(38.78 dBμV/m)/20] = 86.89 μV/m

10.4 Test Equipment Used:

Description	ID Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	1140	Rohde & Schwarz	ESCI7	2/19/13	2/19/14
Spectrum Analyzer	960	Rohde & Schwarz	FSP	4/11/13	4/11/14
Preamplifier	1135	Miteq	AMF-6D	1/4/13	1/4/14
Biconnilog Antenna	1147	TESEQ	CBL6112D	2/1/13	2/1/14
Horn Antenna	1093	AH Systems	SAS571	11/19/12	11/19/13
System Controller	121701-1	Sunol Sciences	SC99V	Time of Use	Time of Use

10.5 Results:

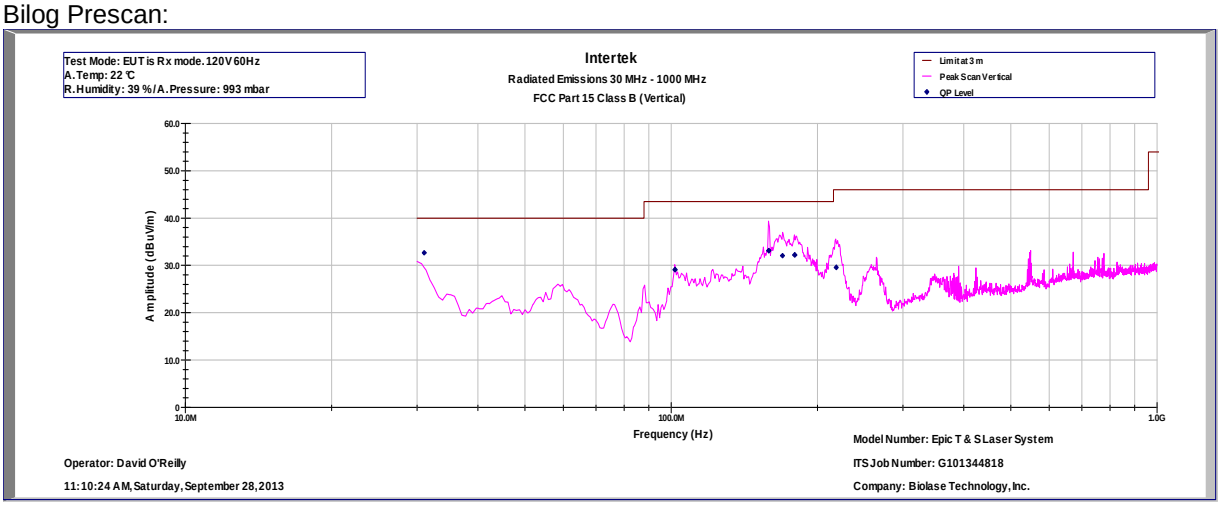
All spurious emissions with the test sample in receive mode were below the limits specified in Part 15.109 for a class B digital device and RSS-GEN Section 6.1.

10.6 Test Data:

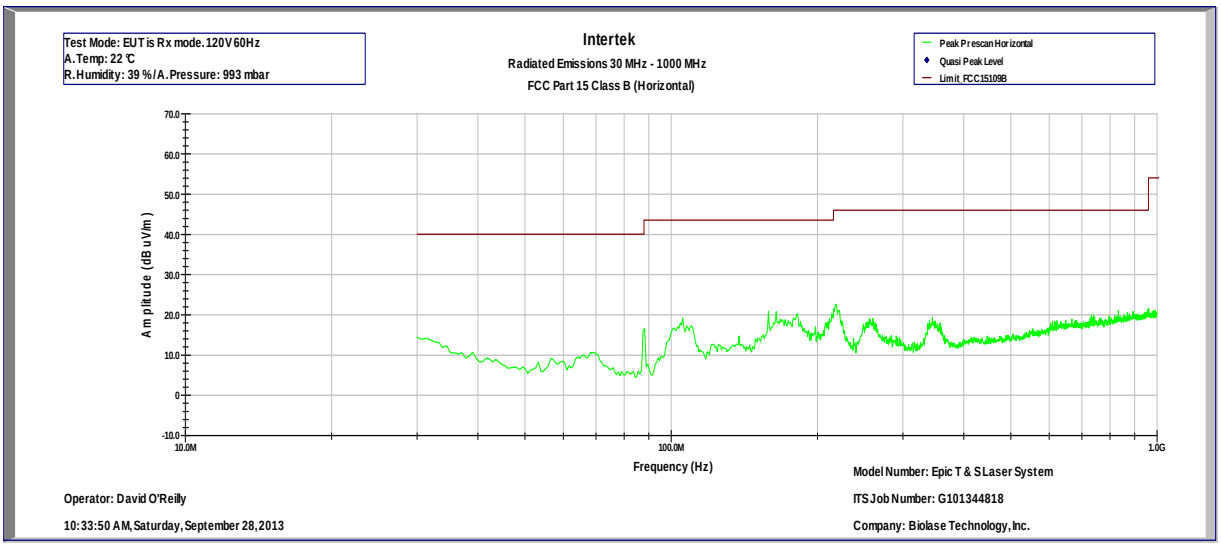
Deviations, Additions, or Exclusions: None

Date:	9/28/2013	**Result: Pass**
Tested by:	David O'Reilly	
Standard:	FCC CFR 47, 15.209, Class B	
Test Point:	Anechoic Chamber 3 meters distance	
Operation mode:	Idle mode (Rx)	
Note:	Performed at battery power	

Bilog Prescan:

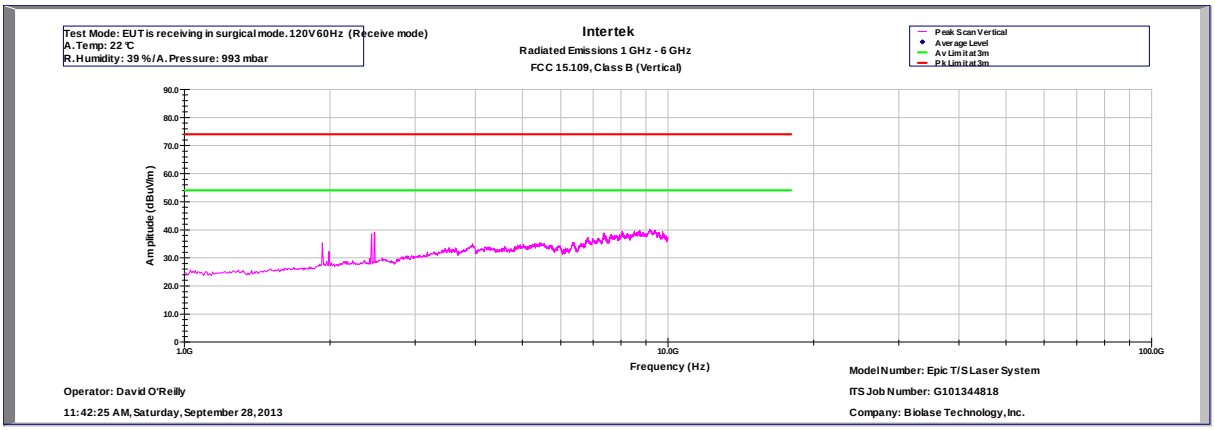


Vertical Polarity (Tx)

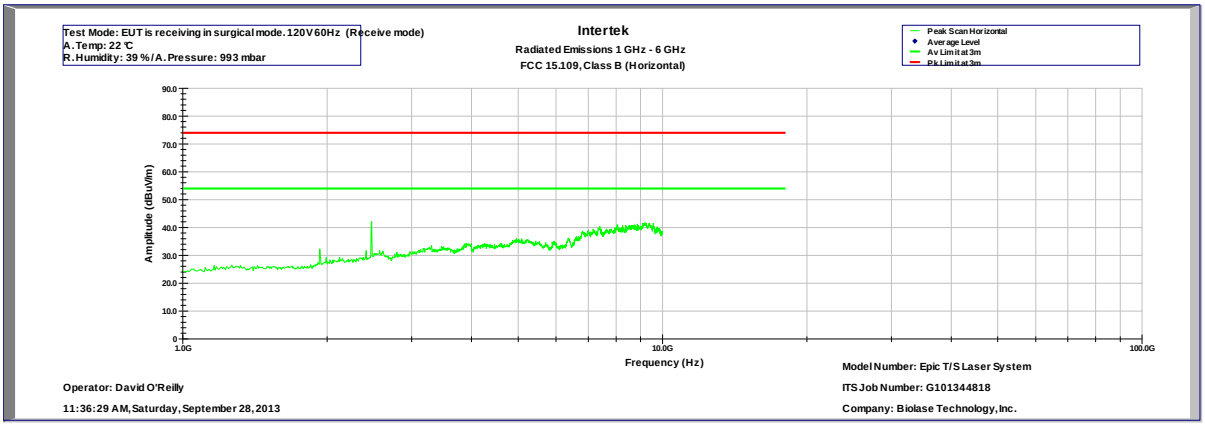


Horizontal Polarity (Tx)

Above 1GHz prescans



Vertical Polarity (Tx)



Horizontal Polarity (Tx)

Note: Emissions from 1GHz – 18 GHz were found to be > than 10dB below the limit.

Six Highest Maximized Emissions from 30MHz to 1000MHz

Frequency MHz	Quasi Pk FS dB(uV/m)	Limit@3m dB(uV/m)	Margin dB(uV)	RA dB(uV)	AG dB(uV)	AF dB(1/m)	CF dB(uV)
31.00	32.7	40	-7.3	15.1	0	17.1	0.5
102.00	29.1	43.5	-14.4	16	0	12.3	0.8
159.00	33.1	43.5	-10.4	20.7	0	11.4	1
178.00	32	43.5	-11.5	20.4	0	10.6	1
180.00	32.2	43.5	-11.3	20.9	0	10.2	1.1
219.00	29.6	46	-16.4	17.7	0	10.7	1.2

Note: Horizontal Antenna polarity emission at least 20 dB below the limit, no final emission data taken.
Horn Pre-scan

11 AC Powerline Conducted Emissions

11.1 Test Limits

§ 15.107(e): Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

11.2 Test Procedure

ANSI C63.4: 2003

11.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	1140	Rohde & Schwarz	ESCI7	2/19/13	2/19/14
LISN	546	EMCO	38162	12/17/2012	12/17/2013

11.4 Results:

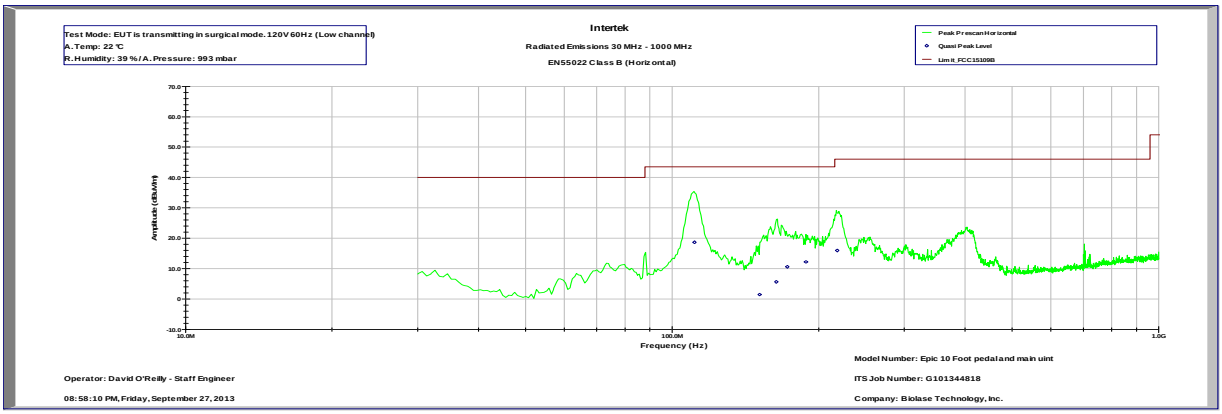
The sample tested was found to Comply.

Conducted Emissions were tested at 120V, 60Hz:

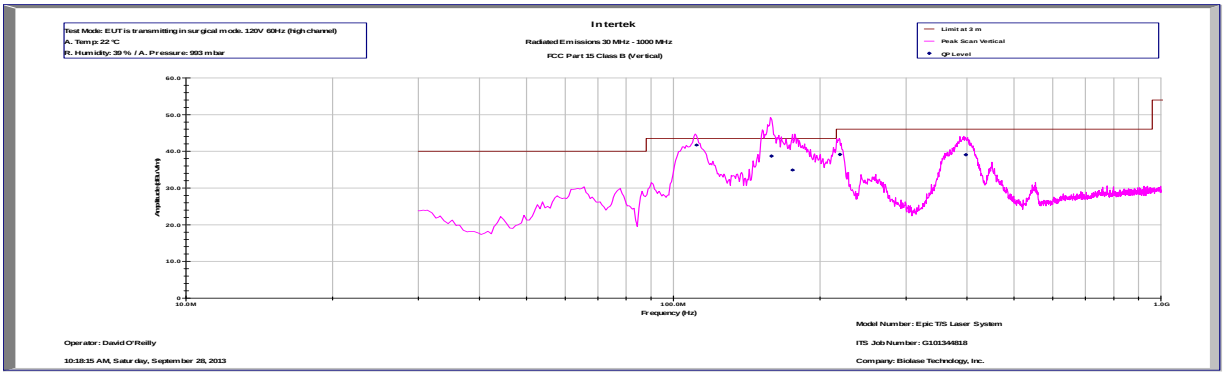
11.5 Data (Transmitting):

Date:	9/28/2013	**Result:** **Pass**
Tested by:	David O'Reilly	
Standard:	FCC CFR 47, 15.209, Class B	
Test Point:	Anechoic Chamber 3 meters distance	
Operation mode:	Transmitting mode (Tx)	
Note:	Performed at power input of 120VAC/60Hz	

Deviations, Additions, or Exclusions: None



Horizontal Tx mode



Vertical Tx mode

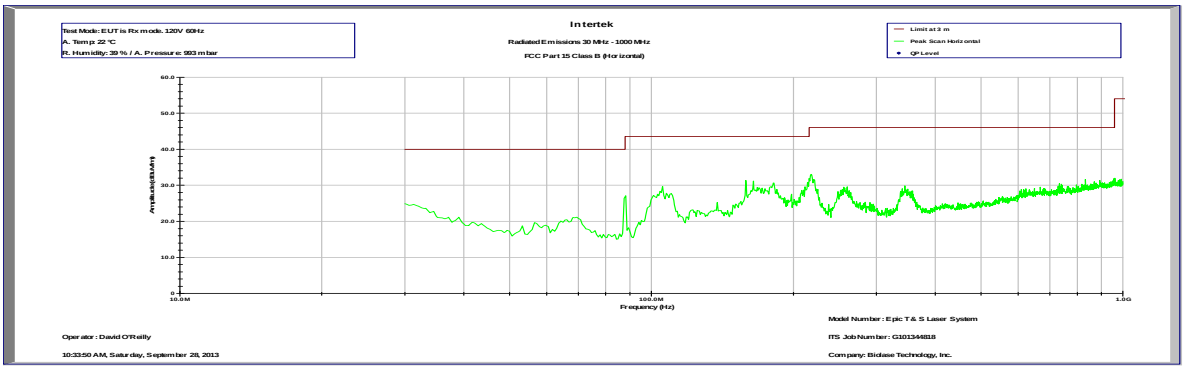
Frequency	Quasi Pk FS	Limit@3m	Margin	RA	AG	AF	CF
MHz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB(1/m)	dB
111.56	41.7	43.5	-1.8	27.8	0	13.1	0.8
158.96	38.7	43.5	-4.8	26.3	0	11.4	1
175.58	34.9	43.5	-8.6	23.5	0	10.4	1.1
219.56	39.1	46	-6.9	27.2	0	10.8	1.2
398.26	39	46	-7	21.6	0	15.8	1.6
155.90	32.8	43.5	-10.7	20.4	0	11.4	1

The above table s vertical data, horizontal was > 10dB below the limit.

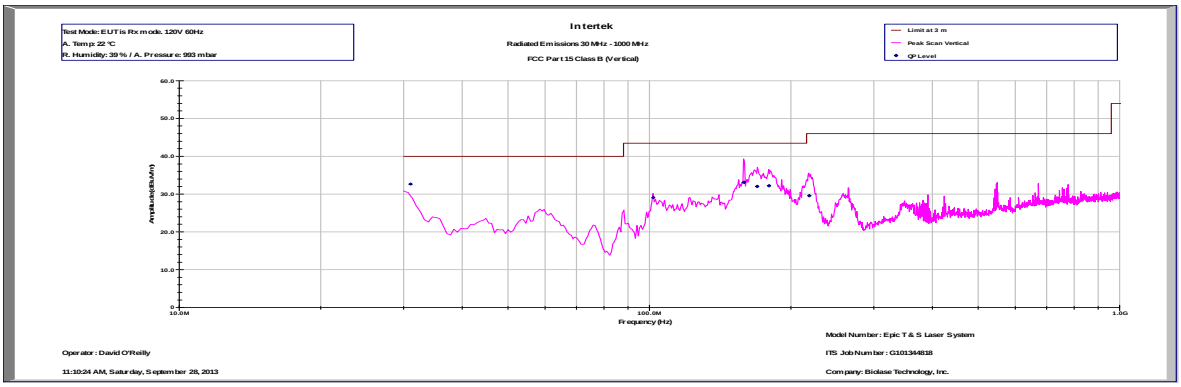
Data (Idle Mode):

Date:	9/28/2013	**Result:** **Pass**
Tested by:	David O'Reilly	
Standard:	FCC CFR 47, 15.209 Class B	
Test Point:	Anechoic Chamber 3 meters distance	
Operation mode:	Idle mode (Rx)	
Note:	Performed under battery power	

Deviations, Additions, or Exclusions: None



Horizontal Rx mode



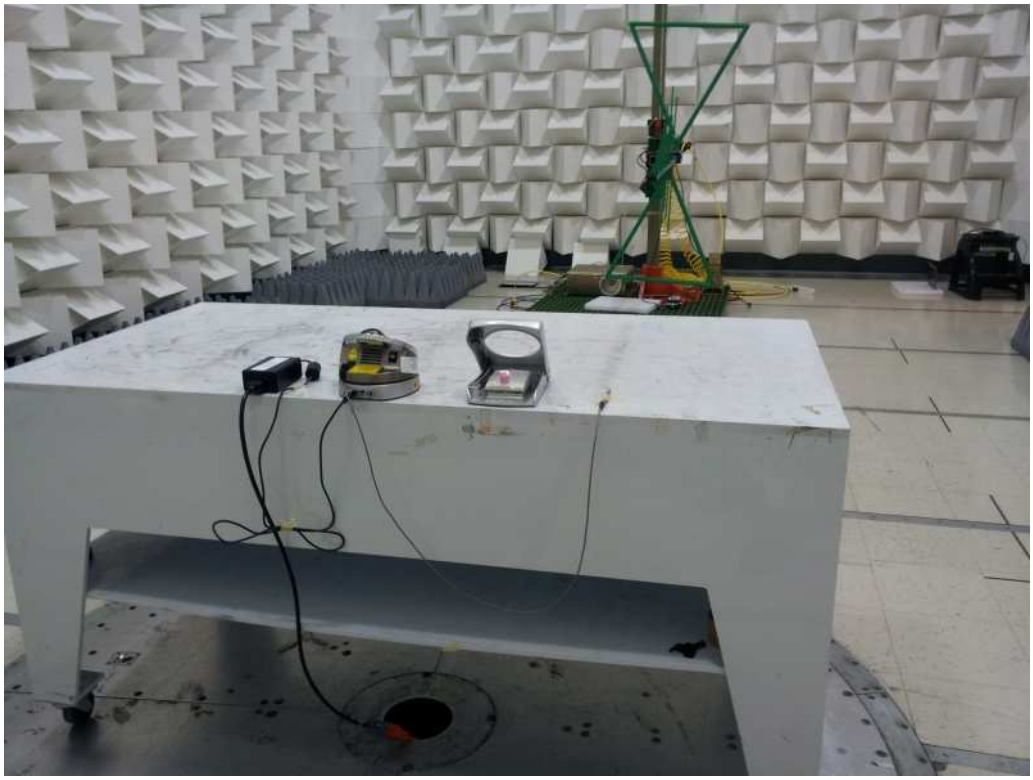
Vertical Rx mode

Frequency	Quasi Pk FS	Limit@3m	Margin	RA	AG	AF	CF
MHz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB(1/m)	dB
31.03	32.7	40	-7.3	15.1	0	17.1	0.5
101.88	29.1	43.5	-14.4	16	0	12.3	0.8
158.94	33.1	43.5	-10.4	20.7	0	11.4	1
169.50	32	43.5	-11.5	20.4	0	10.6	1
179.67	32.2	43.5	-11.3	20.9	0	10.2	1.1
218.70	29.6	46	-16.4	17.7	0	10.7	1.2

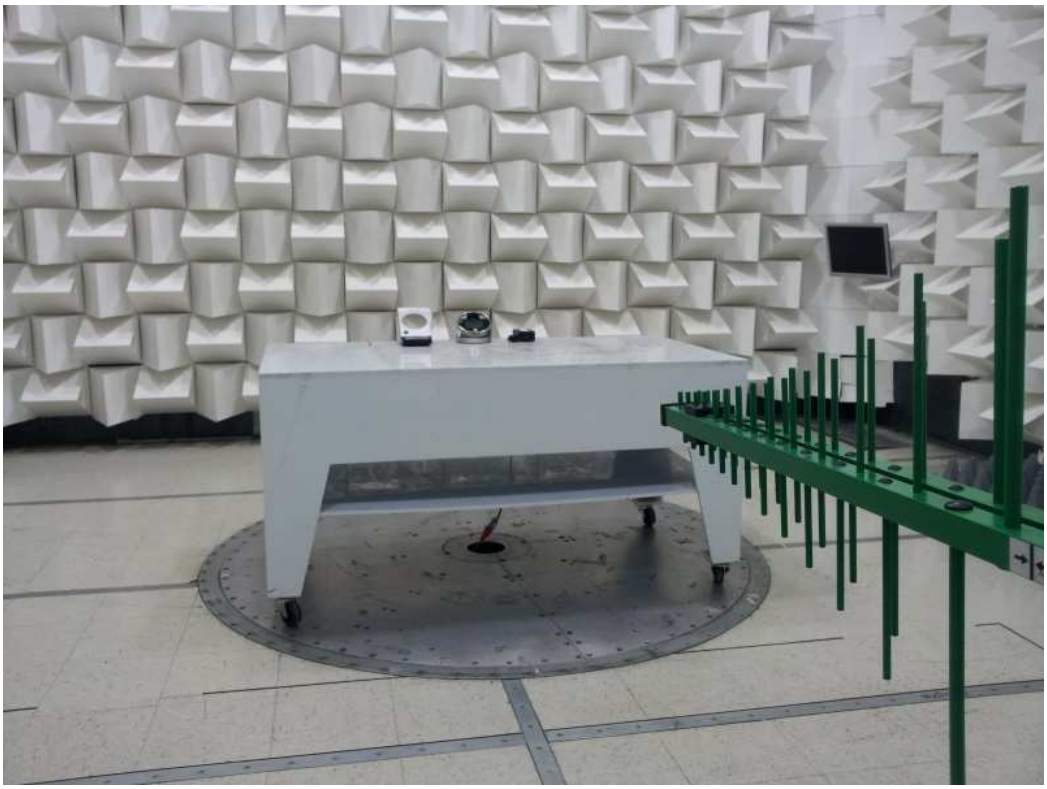
The above table s vertical data, horizontal was > 10dB below the limit.

11.6 Setup photos

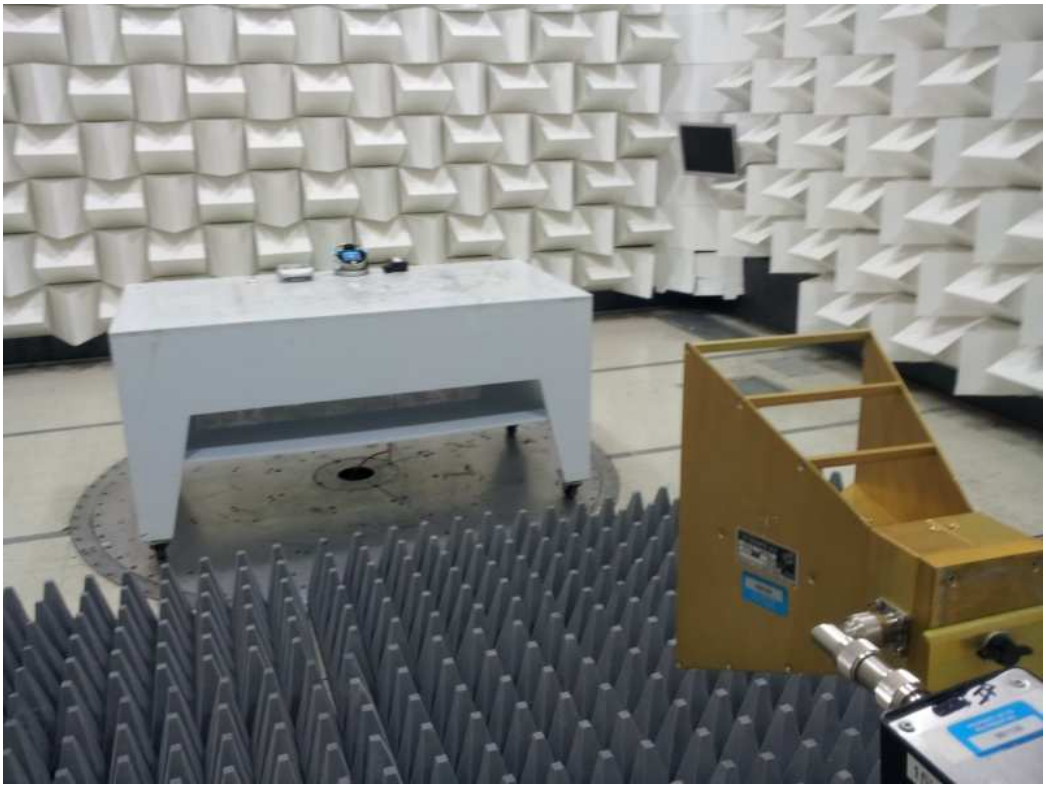
Epic T / Epic S Laser System (front view of product: pictured from left to right, laser hand piece, remote control foot pedal switch (EUT), laser console, and power supply)



Epic T / Epic S Laser System (rear view 30-1000M setup)



Footswitch for the Epic T / Epic S Laser System (front view 30-1000M setup)



Footswitch for the Epic T / Epic S Laser System (front view above 1000M setup)

12 Antenna Requirement per FCC Part 15.203

12.1 Test Limits

§ 15.203: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

12.2 Results:

- The sample tested met the antenna requirement. The antenna utilized is a PCB antenna.

13 Measurement Uncertainty

The measured value related to the corresponding limit will be used to decide whether the equipment meets the requirements.

The measurement uncertainty figures were calculated and correspond to a coverage factor of k = 2, providing a confidence level of respectively 95.45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian).

Measurement uncertainty Table

Parameter	Uncertainty	Notes
Radiated emissions, 30 to 1000 MHz	±3.9dB	
Radiated emissions, 1 to 18 GHz	±4.2dB	
Radiated emissions, 18 to 40 GHz	±4.3dB	
Power Port Conducted emissions, 150kHz to 30 MHz	±2.8dB	

14 Revision History

Revision Level	Date	Report Number	Notes
0	1/9/2014	**101344818LAX-001a**	Initial release for the foot switch.