NVLAP Lab Code 200087-0

Application Submittal Report
For
FCC
Grant Of Certification

FOR

Model: 810-2407
2466 - 2480 MHz Transmitter

FCC ID: ZNQ8102407

FOR

Learn.Net, Inc.
100 Mansell Court East, Suite 115
Roswell, GA 30076

Test Report Number: 120220R

Certification Date: February 20, 2012

Authorized Signatory: Scot D Rogers
Scot D. Rogers

NVLAP Lab Code 200087-0

ROGERS LABS, INC.
4405 West 259th Terrace
Louisburg, KS 66053
Phone / Fax (913) 837-3214

Engineering Test Report For Grant Of Certification Application Submittal

CFR47, Part 15C - Intentional Radiators Paragraphs15.249
Low Power Transmitter

For

Learn.Net, Inc.

100 Mansell Court East, Suite 115
Roswell, GA 30076
Phone: (678) 277-4688
Mr. Kenneth F. Leddick
CEO

Model: 810-2407

Frequency 2466 - 2480 MHz

FCC ID#: ZNQ8102407

Test Date: February 20, 2012

Certifying Engineer: Scot D Rogers

Scot D. Rogers
Rogers Labs, Inc.
4405 West 259th Terrace
Louisburg, KS 66053
Telephone: (913) 837-3214

Table of Contents

Forward

The following information is submitted for consideration in obtaining Grant of Certification for a license exempt low power intentional radiator operating under CFR47 Paragraph 15C, paragraph 15.249.

Name of Applicant: Learn.Net, Inc.
100 Mansell Court East, Suite 115
Roswell, GA 30076

Model: 810-2407

FCC I.D.: ZNQ8102407 Frequency Range: 2466 - 2480 MHz

Operating Power: Peak Transmit emission of 86.3 dBµV/m (3 meter radiated measurement), 969.6 kHz Occupied Bandwidth

Applicable Standards & Procedures

In accordance with the Federal Communications Code of Federal Regulations, dated October 1, 2011, Part 2, Subpart J, Paragraphs 2.907, 2.911, 2.913, 2.925, 2.926, 2.1031 through 2.1057, and applicable parts of paragraph 15, Part 15C Paragraph 15.249 the following information is submitted. Test procedures used are the established Methods of Measurement of Radio-Noise Emissions as described in the ANSI C63.4-2009 and appropriate FCC KDB documents.

Opinion / Interpretation of Results

Test Performed	Minimum Margin (dB)	Results
Antenna requirement per CFR 47 15.203	N/A	Complies
Restricted Bands Emissions as per CFR 47 15.205	-16.6	Complies
AC Line Conducted Emissions as per CFR 47 15.207	-9.4	Complies
Radiated Harmonic Emissions as per CFR 47 15.249	-10.6	Complies

Application for Certification

(1) Manufacturer: Learn.Net, Inc.
100 Mansell Court East, Suite 115
Roswell, GA 30076

(2) Identification: Model: 810-2407
FCC I.D.: ZNQ8102407

(3) Instruction Book: Refer to Exhibit for Instruction Manual.

(4) Description of Circuit Functions: Refer to Operational Description Exhibit

(5) Block Diagram with Frequencies: Refer to Block Diagram Exhibit

(6) Report of Measurements: Report of measurements follows in this Report.

(7) Photographs: Construction, Component Placement, etc.: Refer to Exhibit for photographs of equipment.

(8) Peripheral equipment or accessories for the equipment. The EUT requires connection to powered USB port for operation. Digital communications with the support equipment are available through the USB interface. The equipment operates as receiver portion of wireless system interfacing with compliant equipment. The design offers no provision for direct connection to utility power systems and requires power received form support system. The available configuration options were investigated for this and other reports in compliance with required standards with worst-case data presented.

(9) Transition Provisions of 15.37 are not being requested.

(10) Equipment is not a scanning receiver and this section is not applicable.

(11) The equipment does not operate in the 59 – 64 GHz frequency band and this section is not applicable.

(12) The equipment is not software defined and this section is not applicable.

Statement of Modifications and Deviations

No modifications to the EUT were required for the equipment to demonstrate compliance with CFR47 Part 15C Emission Requirements. There were no deviations or modification to the specifications.

Equipment Tested

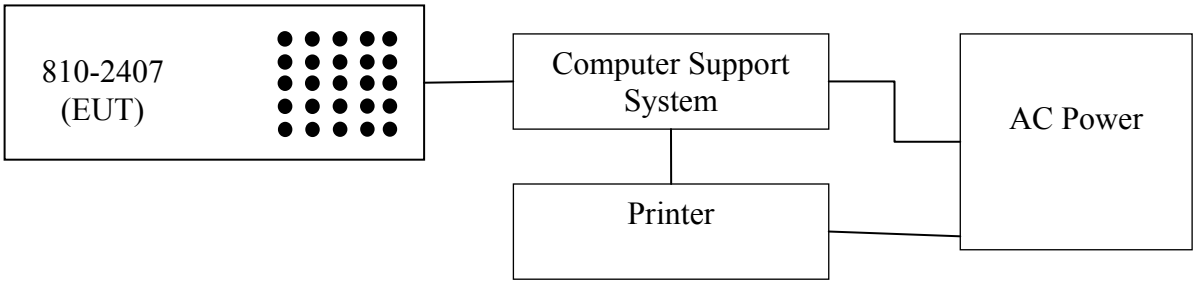
Equipment	Model	Serial Number
(EUT)	810-2407	03111525446
Dell Latitude Laptop	E6520	6CB35Q1
Dell Printer	0N5819	5D1SL61

Test results in this report relate only to the items tested.

Equipment Function and Testing Procedures

The EUT is a 2466 - 2480 MHz low power radio transceiver used to wirelessly interface with compliant equipment. The equipment receives wireless data from compliant remote transmitter equipment typically used in educational environments. The design is marketed for use to incorporate a wireless link aiding in collection of remote data. The EUT operates from direct current power received from supporting USB system and offers no provision for direct connection to utility power systems. The AC power connection point of supporting system was tested for AC line conducted compliance. As requested by the manufacturer and required by regulations, the equipment was tested for emissions compliance using the available configurations with the worst-case data presented. Test results in this report relate only to the products described in this report.

Equipment and Cable Configurations



AC Line Conducted Emission Test Procedure

Testing for the AC line-conducted emissions was performed as defined in sections 7.2.4 and 13 of ANSI C63.4-2009. The test setup, including the EUT, was arranged in the test configurations as shown above and placed on a 1 x 1.5-meter wooden bench, 0.8 meters high located in a screen room. The power lines of the system were isolated from the power source using a standard LISN with a 50-µHy choke. EMI was coupled to the spectrum analyzer through a 0.1 µF capacitor internal to the LISN. The LISN was positioned on the floor beneath the wooden bench supporting the EUT. The power lines and cables were draped over the back edge of the table. Refer to photographs in exhibits for EUT placement used during testing.

Radiated Emission Test Procedure

Testing for the radiated emissions was performed as defined in sections 8.3 and 13.4 of ANSI C63.4-2009. The EUT was arranged in the test configurations as shown above during testing. The test configuration was placed on a rotating 1 x 1.5-meter wooden platform 0.8 meters above the ground plane at a distance of 3 meters from the FSM antenna. EMI energy was maximized by equipment placement, raising and lowering the FSM antenna, changing the antenna polarization, and by rotating the turntable. Each emission was maximized before final data was taken using a spectrum analyzer. Refer to photographs in exhibits for EUT placement used during testing.

Environmental Conditions

Ambient Temperature	21.2° C
Relative Humidity	27%
Atmospheric Pressure	1002.6 mb

Units of Measurements

Conducted EMI	Data is in dBµV; dB referenced to one microvolt.
Radiated EMI	Data is in dBµV/m; dB/m referenced to one microvolt per meter.

Test Site Locations

Conducted EMI — The AC power line conducted emissions testing performed in a shielded screen room located at Rogers Labs, Inc., 4405 W. 259th Terrace, Louisburg, KS.

Radiated EMI — The radiated emissions tests were performed at the 3 meters, Open Area Test Site (OATS) located at Rogers Labs, Inc., 4405 W. 259th Terrace, Louisburg, KS.

Site Registration — Refer to Annex for FCC Site Registration Letter, # 90910, and Industry Canada Site Registration Letter, IC3041A-1.

List of Test Equipment

A Rohde & Schwarz ESU40 and/or Hewlett Packard 8591EM Spectrum Analyzer was used as the measuring device for the emissions testing of frequencies below 1 GHz. A Rohde & Schwarz ESU40 and/or Hewlett Packard 8562A Spectrum Analyzer was used as the measuring device for testing the emissions at frequencies above 1 GHz. The analyzer settings used are described in the following table. Refer to the appendix for a complete list of test equipment.

Analyzer Settings		
AC Line Conducted Emissions:		
RBW	AVG. BW	Detector Function
9 kHz	30 kHz	Peak/Quasi Peak
Radiated Emissions 26-1000 MHz		
RBW	AVG. BW	Detector Function
100 kHz	100 kHz	Peak
120 kHz	300 kHz	Peak/Quasi Peak
Radiated Emissions Above 1000 MHz		
RBW	Video BW	Detector Function
1 MHz	1 MHz	Peak / Average

Equipment	Manufacturer	Model	Calibration Date	Due
LISN	Comp. Design	FCC-LISN-2-MOD.CD	10/11	10/12
Antenna	ARA	BCD-235-B	10/11	10/12
Antenna	EMCO	3147	10/11	10/12
Antenna	Com Power	AH-118	10/11	10/12
Antenna	EMCO	3143	5/11	5/12
Analyzer	HP	8591EM	5/11	5/12
Analyzer	HP	8562A	5/11	5/12
Analyzer	Rohde & Schwarz	ESU40	5/11	5/12

Intentional Radiators Emissions

As per CFR47 Part 15, Subpart C, paragraphs 15.203, 15.205, 15.249 and RSS-210 the following information is submitted.

Antenna Requirements

The unit is produced with a permanently attached transmitter antenna and has no provision for user service, replacement, or antenna modification. The requirements for unique antenna are fulfilled and there are no deviations or exceptions to the specification.

Restricted Bands of Operation

Spurious emissions falling in the restricted frequency bands of operation were measured at a distance of three meters at the OATS. The EUT utilizes frequency, determining circuitry, which generates harmonics falling in the restricted bands. Emissions were checked at the OATS, using appropriate antennas or pyramidal horns, amplification stages, and a spectrum analyzer. No other significant emission was observed which fell into the restricted bands of operation.

Sample Calculation:

RFS (dBµV/m @ 3m)= FSM (dBµV) + Antenna Factor (dB/m) - Amplifier Gain (dB)

Radiated Emissions Data in Restricted Bands

Frequency in MHz	Horizontal Peak (dBμV/m)	Horizontal Quasi-Peak (dBμV/m)	Horizontal Average (dBμV/m)	Vertical Peak (dBμV/m)	Vertical Quasi-Peak (dBμV/m)	Vertical Average (dBμV/m)	Limit @ 3m (dBμV/m)
114.4	31.5	23.7	N/A	30.2	22.5	N/A	43.5
126.6	31.5	23.7	N/A	28.0	20.1	N/A	43.5
137.4	27.9	22.1	N/A	26.8	22.9	N/A	43.5
2390.0	42.3	N/A	30.7	43.2	N/A	30.8	54.0
2483.5	48.1	N/A	32.1	53.0	N/A	32.2	54.0
4932.0	49.8	N/A	37.2	48.6	N/A	36.5	54.0
4948.0	50.9	N/A	37.4	49.1	N/A	37.4	54.0
4960.0	49.7	N/A	36.7	49.3	N/A	37.2	54.0
7398.0	47.6	N/A	34.6	49.3	N/A	34.2	54.0
7422.0	47.2	N/A	34.2	48.0	N/A	34.4	54.0
7440.0	48.2	N/A	35.2	49.0	N/A	35.4	54.0
12330.0	49.8	N/A	34.9	47.2	N/A	35.6	54.0
12370.0	46.7	N/A	34.7	47.3	N/A	35.4	54.0
12400.0	47.7	N/A	35.2	47.2	N/A	34.7	54.0

Other emissions present had amplitudes at least 20 dB below the limit.
Peak and Quasi-Peak amplitude emissions are recorded above for frequency range of 0.5-1000 MHz. Peak and Average amplitude emissions are recorded above for frequency range of 110-490 kHz and above 1000 MHz.

Summary of Results for Radiated Emissions in Restricted Bands

The EUT demonstrated compliance with requirements of CFR47 15C, and Industry Canada RSS-210 requirements. The EUT demonstrated a minimum margin of -16.6 dB below requirements. Peak and Quasi-peak amplitudes of frequencies below 1000 MHz were measured and average and peak amplitudes of frequencies above 1000 MHz were measured for demonstration of compliance with the regulations. No other significant emissions where found in the restricted frequency bands. Other emissions were present with amplitudes at least 20 dB below the FCC Limits.

AC Line Conducted EMI Procedure

The EUT was arranged in the testing configuration, emulating a typical configuration, and placed on a 1 x 1.5-meter wooden bench 80 cm above the conducting ground plane, floor of a screen room. The bench was positioned 40 cm away from the wall of the screen room. The Supporting computer AC power supply was connected to the LISN for AC line conducted emissions testing. A second LISN was positioned on the floor of the screen room 80-cm from the rear of the supporting equipment of the EUT. All power cords except the CPU/EUT were then powered from the second LISN. EMI was coupled to the spectrum analyzer through a 0.1 μF capacitor, internal to the LISN. Power line conducted emissions testing were carried out individually for each current carrying conductor of the EUT. The excess length of lead between the system and the LISN receptacle was folded back and forth to form a bundle not exceeding 40 cm in length. The screen room, conducting ground plane, analyzer, and LISN were bonded together to the protective earth ground. Preliminary testing was performed to identify the frequency of each radio frequency emission displaying the highest amplitude. The cables were repositioned to obtain maximum amplitude of measured EMI level. Once the worst-case configuration was identified, plots were made of the EMI from 0.15 MHz to 30 MHz then the data was recorded with maximum conducted emissions levels. Refer to figures one and two for plots of the CPU AC Power Line conducted emissions while supplying power to the EUT.

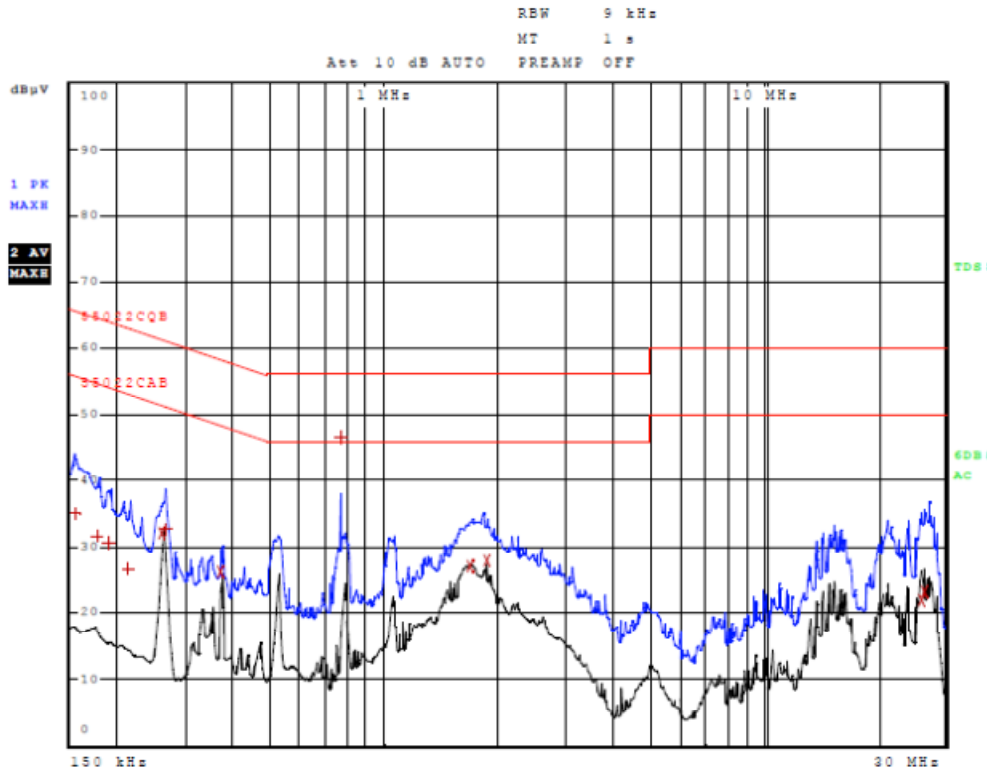


Figure 1 AC Line Conducted Emissions Line 1

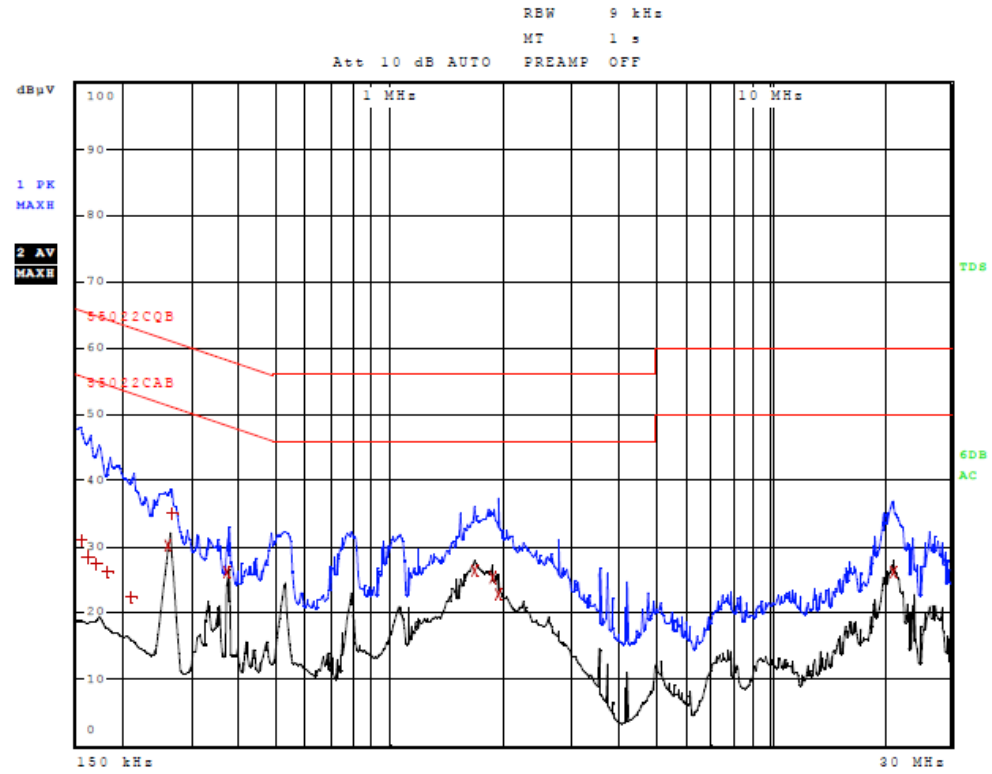


Figure 2 AC Line Conducted Emissions Line 2

AC Line Conducted Emissions Data (Highest Emissions)

Line 1

Trace	Frequency	Level (dBµV)	Detector	Delta Limit/dB
1	154.000000000 kHz	35.04	Quasi Peak	-30.74
1	178.000000000 kHz	31.62	Quasi Peak	-32.95
1	190.000000000 kHz	30.54	Quasi Peak	-33.50
1	214.000000000 kHz	26.62	Quasi Peak	-36.43
2	262.000000000 kHz	32.11	Average	-19.26
1	266.000000000 kHz	32.69	Quasi Peak	-28.55
2	374.000000000 kHz	26.17	Average	-22.25
1	766.000000000 kHz	46.59	Quasi Peak	-9.41
2	1.686000000 MHz	27.07	Average	-18.93
2	1.870000000 MHz	27.75	Average	-18.25
2	25.900000000 MHz	22.05	Average	-27.95
2	26.356000000 MHz	23.23	Average	-26.77

Line 2

Trace	Frequency	Level (dBµV)	Detector	Delta Limit/dB
1	154.000000000 kHz	31.08	Quasi Peak	-34.70
1	162.000000000 kHz	28.43	Quasi Peak	-36.93
1	170.000000000 kHz	27.32	Quasi Peak	-37.64
1	182.000000000 kHz	26.25	Quasi Peak	-38.14
1	210.000000000 kHz	22.39	Quasi Peak	-40.82
2	262.000000000 kHz	30.25	Average	-21.12
1	266.000000000 kHz	34.88	Quasi Peak	-26.36
2	374.000000000 kHz	26.14	Average	-22.27
2	1.666000000 MHz	26.47	Average	-19.53
2	1.870000000 MHz	25.22	Average	-20.78
2	1.930000000 MHz	22.80	Average	-23.20
2	21.104000000 MHz	26.22	Average	-23.78

Other emissions present had amplitudes at least 20 dB below the limit.

Summary of Results for AC Line Conducted Emissions

The EUT demonstrated compliance to the conducted emissions requirements of CFR47 Part 15C and RSS-GEN. The EUT demonstrated minimum margin of -9.4 dB below the limit. Measurements were taken using the peak, quasi peak, and average, measurement function for each emissions amplitude and were below the limits stated in the specification. Other emissions were present with recorded data representing worst-case amplitudes.

Radiated Emissions

The EUT was arranged in the test configuration emulating worst-case equipment configurations and operated through all various modes. Preliminary testing was performed in a screen room with the EUT positioned 1 meter from the FSM. Radiated emission investigations were performed from 9 kHz to 25,000 MHz manipulating interface cable to produce highest emissions per regulations. Plots were made of the worst-case radiated emission frequency spectrum from 30 MHz to 18,000 MHz during the preliminary investigation. Refer to figures three through eight showing plots of the worst-case radiated emissions spectrum taken in the screen room. Radiated emissions measurements were performed to identify the frequencies, which produced the highest emissions. Each radiated emission was then re-maximized at the OATS location before final radiated emissions measurements were performed. Final data was taken with the EUT located at the OATS at a distance of 3 meters between the EUT and the receiving antenna. Measured emission levels were maximized by EUT placement on the table, rotating the turntable through 360 degrees, varying the antenna height between 1 and 4 meters above the ground plane and changing antenna position between horizontal and vertical polarization. Antennas used were Loop, Monopole Spike, Biconical, Broadband Biconilog, Log Periodic, and Double Ridge or Pyramidal Horns, appropriate filters and amplifiers.

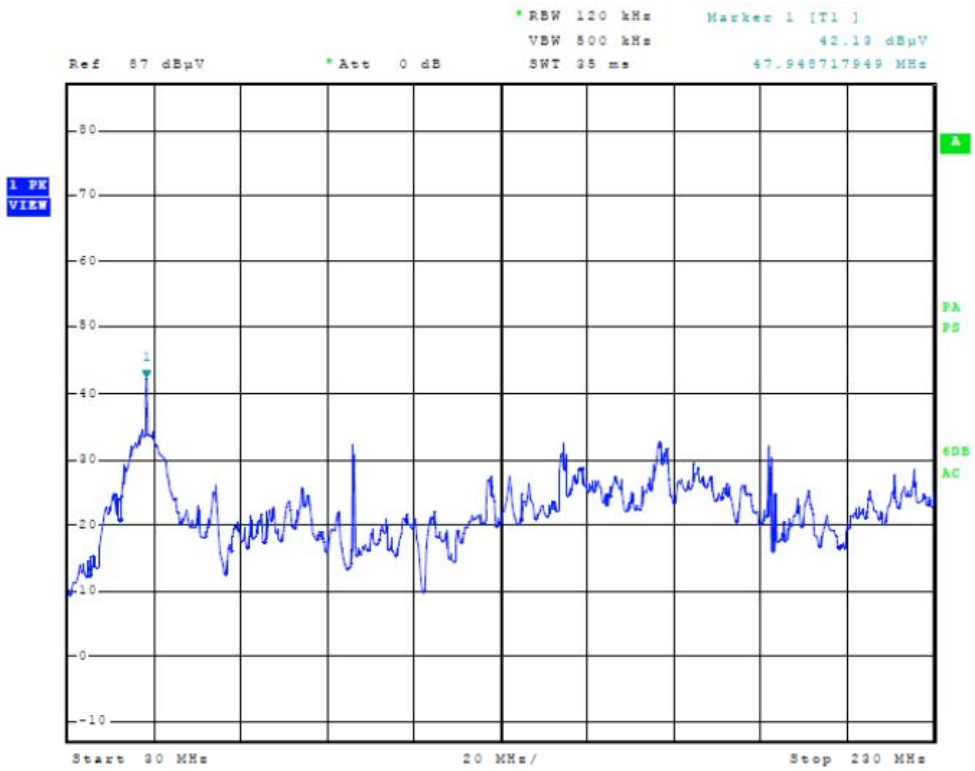


Figure Three Plot of General Radiated Emissions

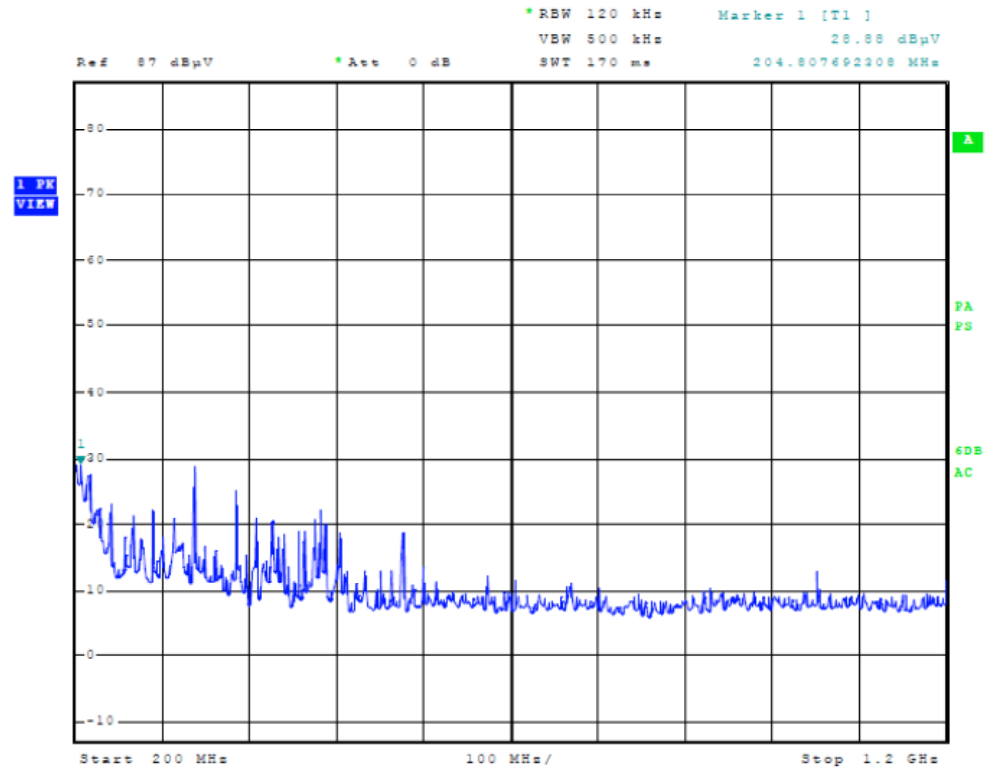


Figure Four Plot of General Radiated Emissions

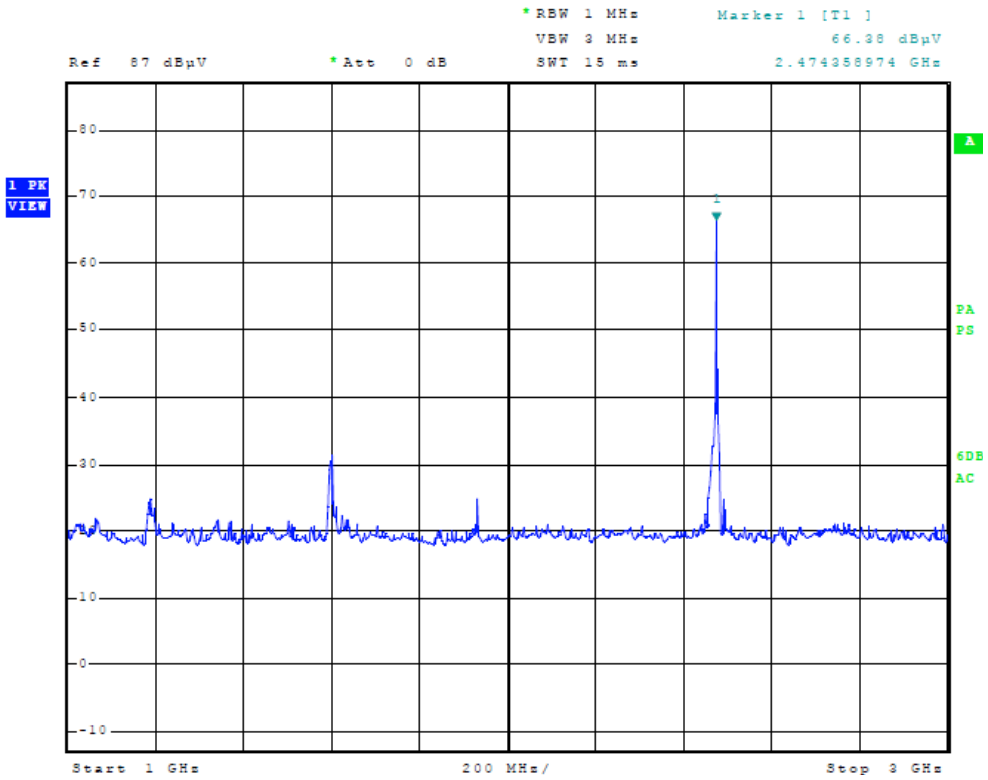


Figure Five Plot of General Radiated Emissions

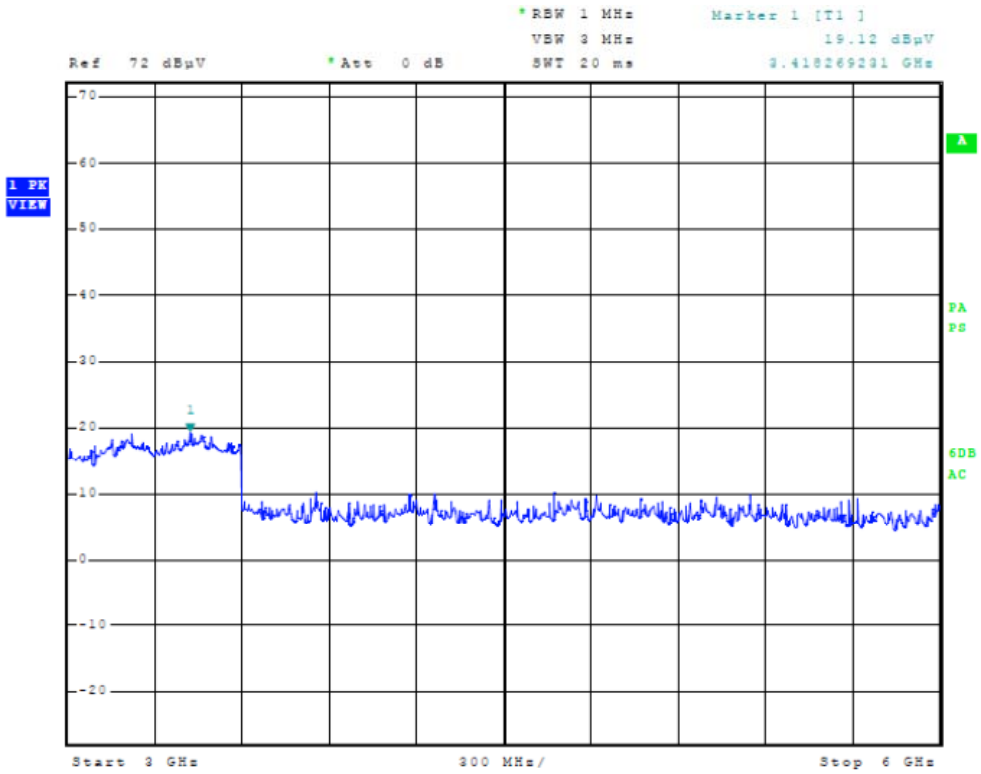


Figure Six Plot of General Radiated Emissions

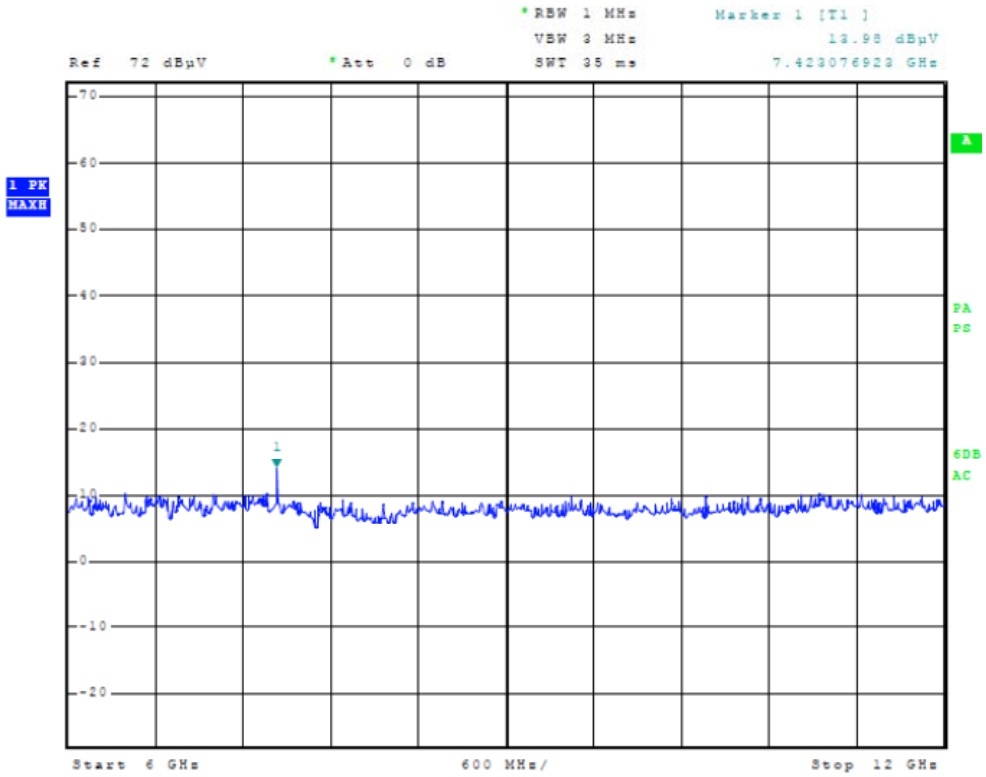


Figure Seven Plot of General Radiated Emissions

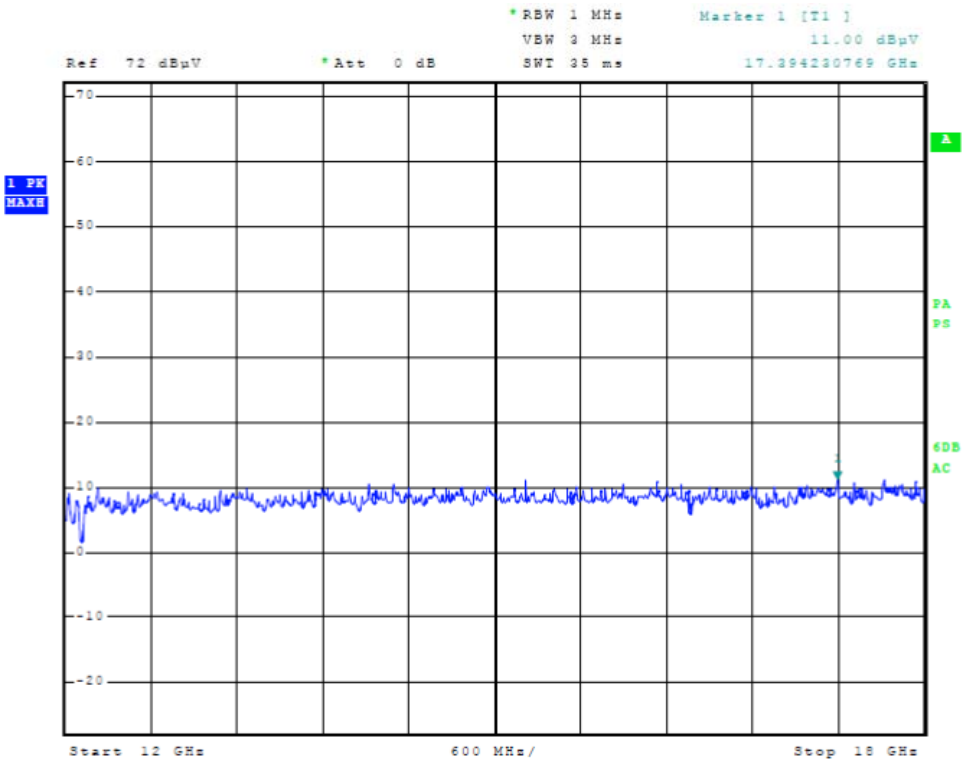


Figure Eight Plot of General Radiated Emissions

Radiated Emissions of Intentional Radiator in the 2400-2483.5 MHz Band

The power output was measured on an open area test site @ 3 meters. Test procedures of ANSI C63.4-2009 paragraphs 13.1 and 8.3.1.2 were used during testing. The EUT was placed on a wooden turntable 0.8 meters above the ground plane and at a distance of 3 meters from the FSM antenna. The peak and quasi-peak amplitude of frequencies below 1000 MHz were measured using a spectrum analyzer. The peak and average amplitude of frequencies above 1000 MHZ were measured using a spectrum analyzer. The amplitude of each emission was then recorded from the analyzer display. Emissions radiated outside of the specified 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. Refer to figures nine through fourteen demonstrating compliance for operation in the 2400-2483.5 MHz band. The amplitude of each radiated emission was measured on the OATS at a distance of 3 meters from the FSM antenna. The amplitude of each radiated emission was maximized by varying the FSM antenna height, polarization, and by rotating the turntable. . Antennas used were Loop, Monopole Spike, Biconical, Broadband Biconilog, Log Periodic, and Double Ridge or Pyramidal Horns, appropriate filters and amplifiers. Emissions were measured in dBµV/m @ 3 meters.

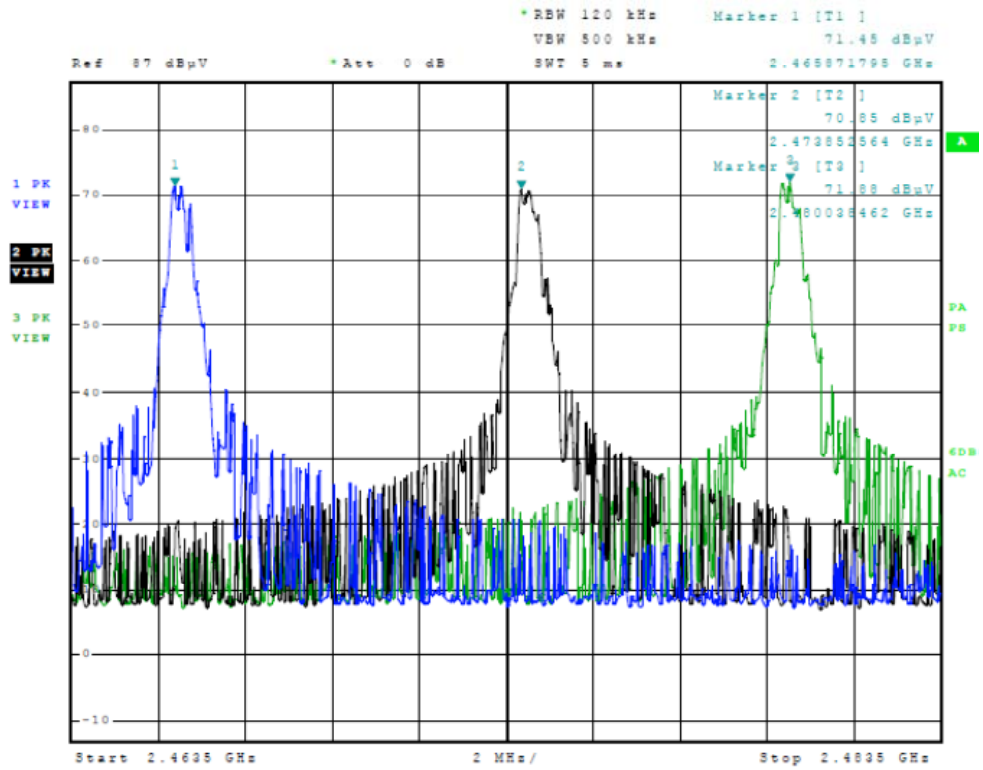


Figure Nine Plot of Operation in 2400-2483.5 MHz Frequency Band

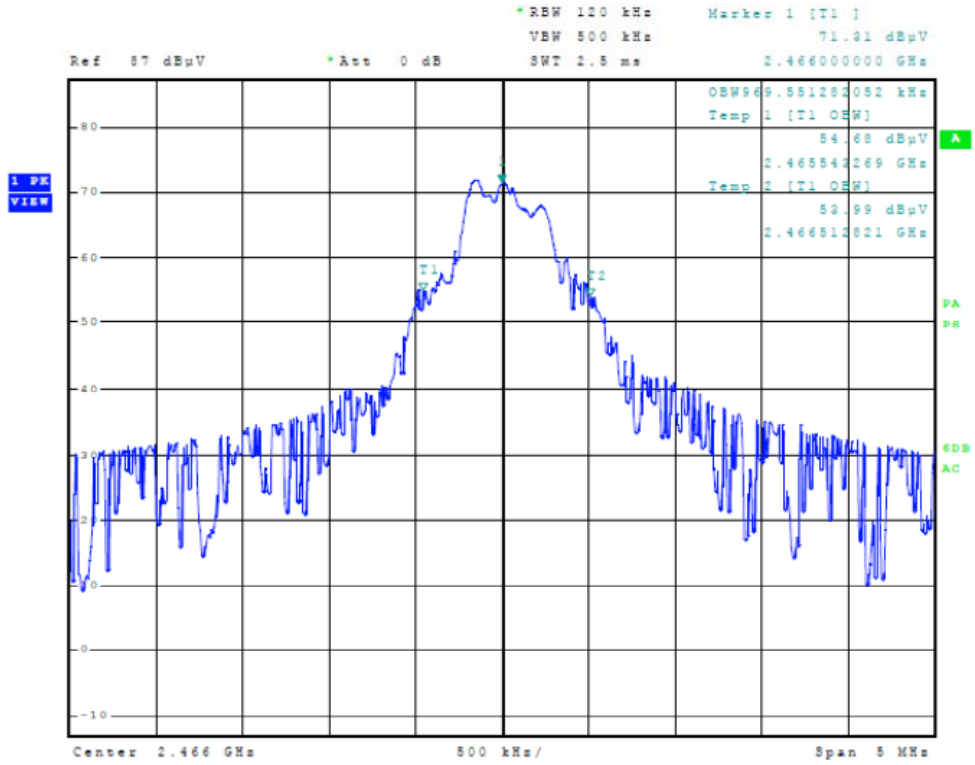


Figure Ten Plot of Occupied Bandwidth

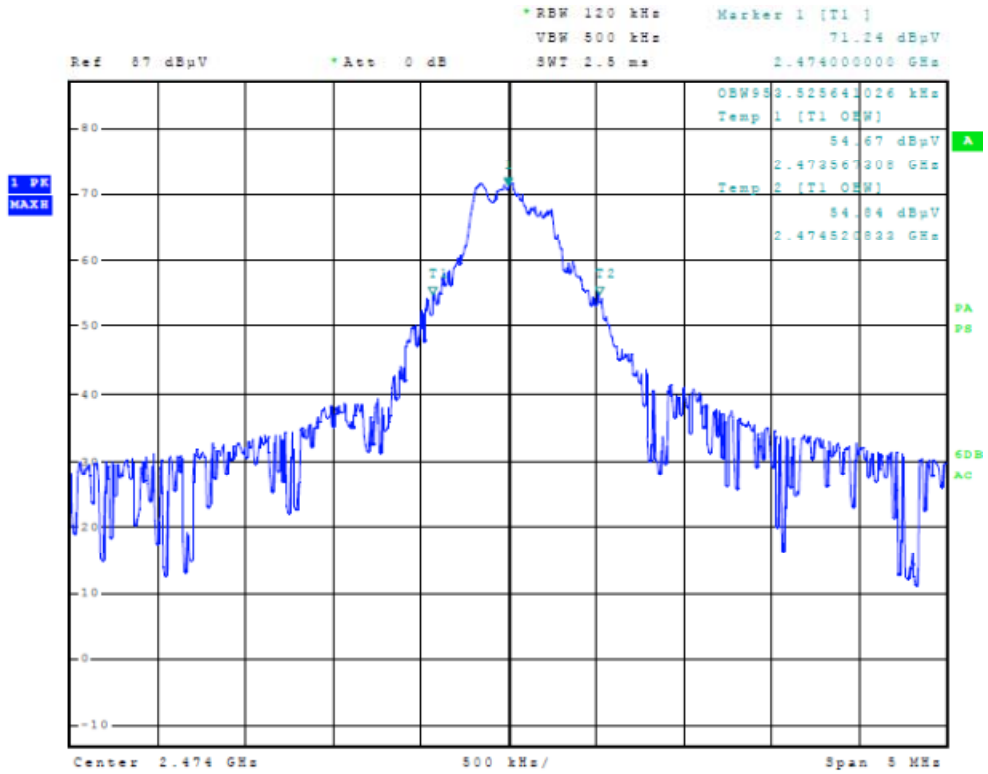


Figure Eleven Plot of Occupied Bandwidth

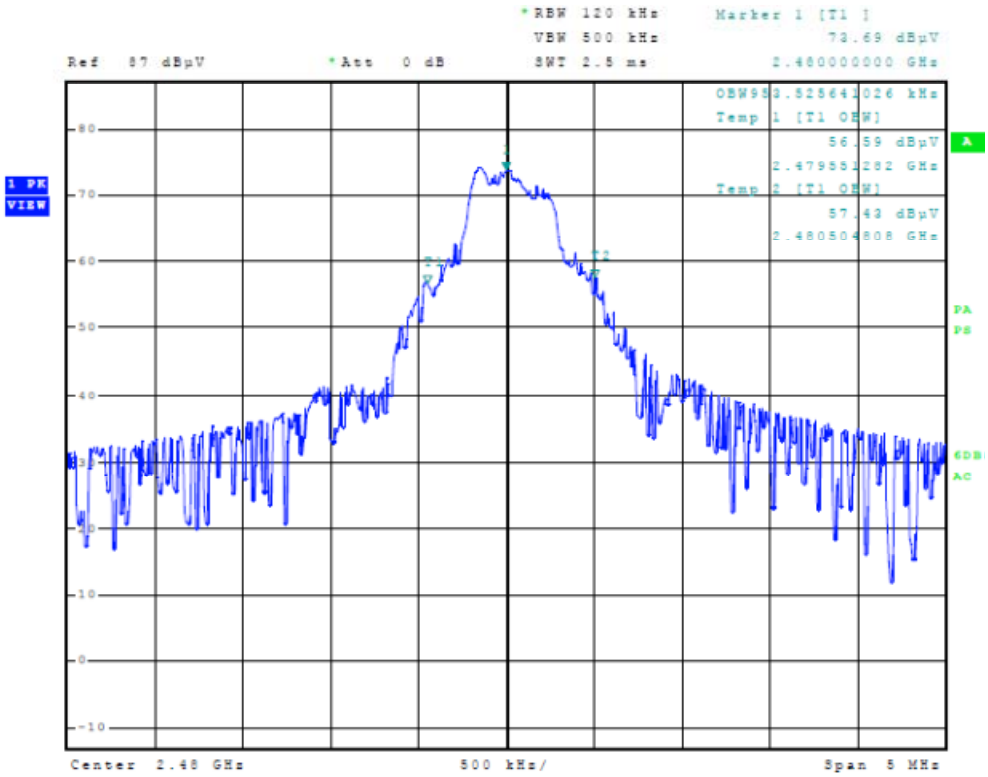


Figure Twelve Plot of Occupied Bandwidth

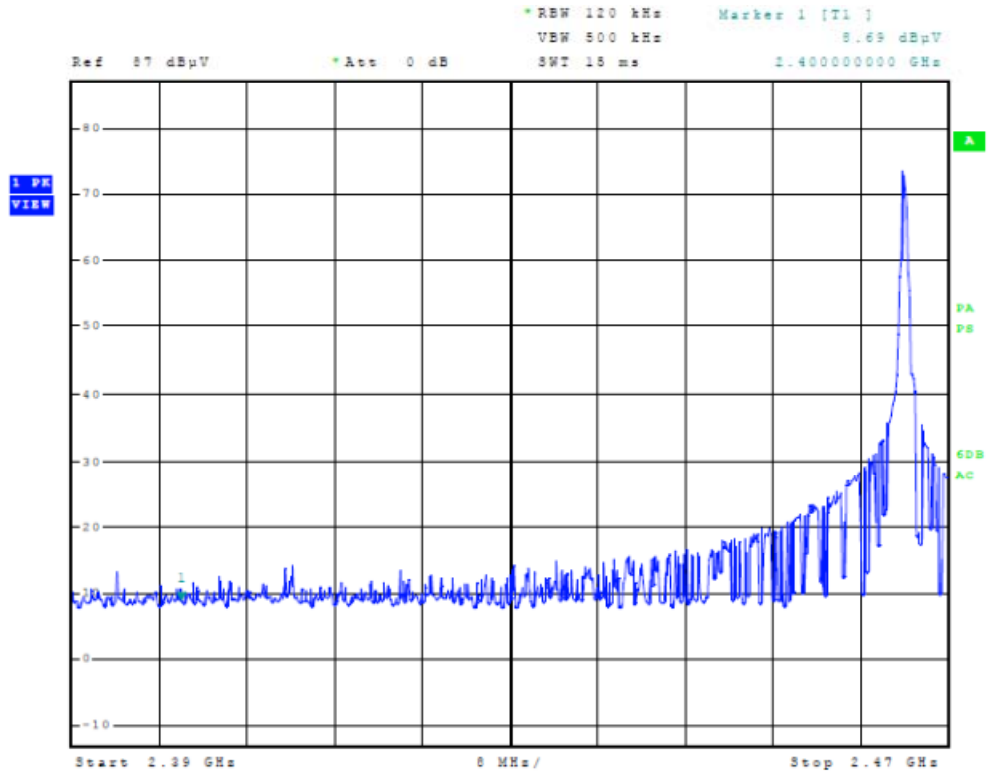


Figure Thirteen Plot of Low Band Edge

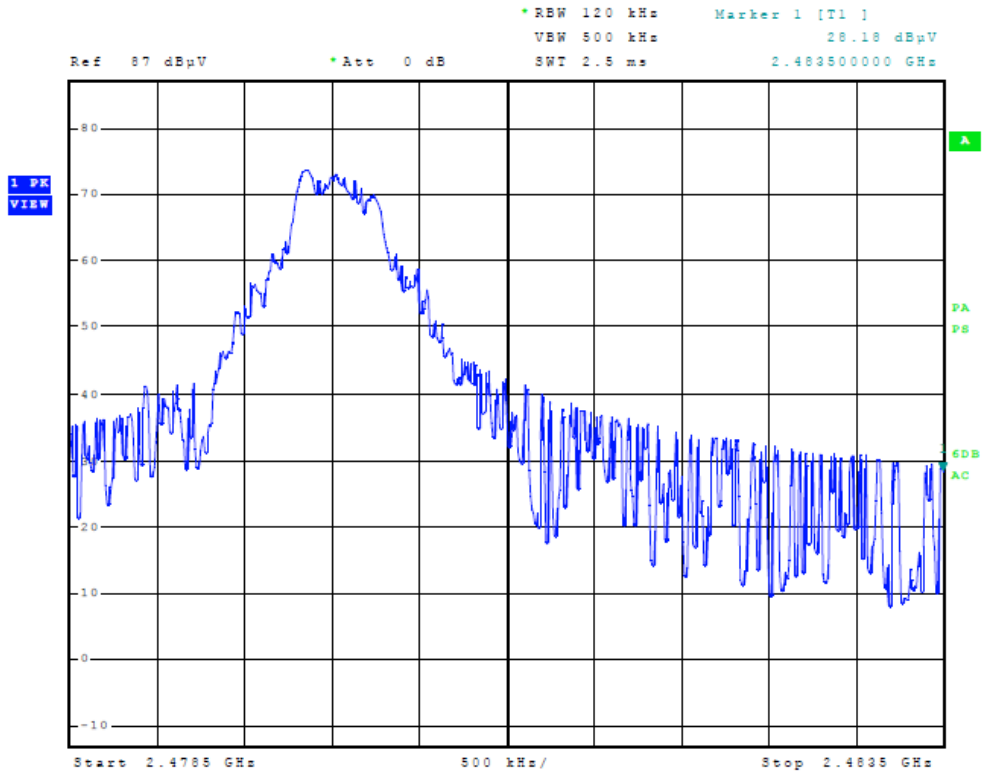


Figure Fourteen Plot of High Band Edge

Transmitter Radiated Emissions Data

Transmitter Radiated Emissions

Frequency in MHz	Horizontal Peak (dBµV/m)	Horizontal Quasi-Peak (dBµV/m)	Horizontal Average (dBµV/m)	Vertical Peak (dBµV/m)	Vertical Quasi-Peak (dBµV/m)	Vertical Average (dBµV/m)	Limit @ 3m (dBµV/m)
2466.0	79.9	N/A	48.8	85.9	N/A	56.8	94.0
4932.0	49.8	N/A	37.2	48.6	N/A	36.5	54.0
7398.0	47.6	N/A	34.6	49.3	N/A	34.2	54.0
9864.0	49.7	N/A	38.0	49.6	N/A	38.1	54.0
12330.0	49.8	N/A	34.9	47.2	N/A	35.6	54.0
14796.0	54.8	N/A	43.3	56.0	N/A	43.4	54.0
17262.0	55.3	N/A	43.3	55.0	N/A	43.4	54.0
2474.0	80.1	N/A	46.9	86.3	N/A	56.4	94.0
4948.0	50.9	N/A	37.4	49.1	N/A	37.4	54.0
7422.0	47.2	N/A	34.2	48.0	N/A	34.4	54.0
9896.0	49.3	N/A	37.5	49.8	N/A	37.6	54.0
12370.0	46.7	N/A	34.7	47.3	N/A	35.4	54.0
14844.0	54.2	N/A	42.6	54.1	N/A	42.7	54.0
17318.0	55.2	N/A	42.8	54.5	N/A	42.9	54.0
2480.0	79.8	N/A	49.1	85.3	N/A	55.6	94.0
4960.0	49.7	N/A	36.7	49.3	N/A	37.2	54.0
7440.0	48.2	N/A	35.2	49.0	N/A	35.4	54.0
9920.0	47.5	N/A	34.8	47.8	N/A	36.5	54.0
12400.0	47.7	N/A	35.2	47.2	N/A	34.7	54.0
14880.0	54.0	N/A	42.7	54.5	N/A	42.6	54.0
17360.0	54.9	N/A	42.7	56.4	N/A	42.8	54.0

Other emissions present had amplitudes at least 20 dB below the limit.

Peak and Quasi-Peak amplitude emissions are recorded above for frequency range of 26-1000 MHz. Peak and Average amplitude emissions are recorded above for frequency range above 1000 MHz.

General Radiated Emissions Data from EUT

Frequency in MHz	Horizontal Peak (dBμV/m)	Horizontal Quasi-Peak (dBμV/m)	Horizontal Average (dBμV/m)	Vertical Peak (dBμV/m)	Vertical Quasi-Peak (dBμV/m)	Vertical Average (dBμV/m)	Limit @ 3m (dBμV/m)
45.1	29.7	23.9	N/A	31.7	23.4	N/A	40.0
47.9	34.5	31.1	N/A	33.5	30.8	N/A	40.0
114.4	31.5	23.7	N/A	30.2	22.5	N/A	43.5
126.6	27.9	22.1	N/A	28.0	20.1	N/A	43.5
137.4	30.8	25.3	N/A	26.8	22.9	N/A	43.5
144.0	37.5	33.2	N/A	30.3	26.0	N/A	43.5
203.6	21.9	15.6	N/A	19.2	14.0	N/A	43.5
287.5	33.1	23.5	N/A	27.5	21.2	N/A	46.0

Other emissions present had amplitudes at least 20 dB below the limit.

Peak and Quasi-Peak amplitude emissions are recorded above for frequency range of 0.5-1000 MHz. Peak and Average amplitude emissions are recorded above for frequency range 60-500 kHz and above 1000 MHz.

Summary of Results for Radiated Emissions

The EUT demonstrated compliance with the radiated emissions requirements of FCC CFR 47 Part 15.249 and other applicable standards for Intentional Radiators. The EUT worst-case configuration demonstrated minimum fundamental frequency margin of -7.7 dB below the average limit for the. The EUT worst-case configuration demonstrated minimum radiated harmonic emission margin of -10.6 dB below the limits. No other radiated emissions were found in the restricted bands less than 20 dB below limits than those recorded in this report. Other emissions were present with amplitudes at least 20 dB below the Limits.

Annex

- Annex A Measurement Uncertainty Calculations
- Annex B Rogers Labs Test Equipment List
- Annex C Rogers Qualifications
- Annex D FCC Test Site Registration Letter
- Annex E Industry Canada Test Site Registration Letter

Annex A Measurement Uncertainty Calculations

Radiated Emissions Measurement Uncertainty Calculation

Measurement of vertically polarized radiated field strength over the frequency range 30 MHz to 1 GHz on an open area test site at 3m and 10m includes following uncertainty:

Contribution	Probability Distribution	Uncertainty (dB)
Antenna factor calibration	normal (k = 2)	±0.58
Cable loss calibration	normal (k = 2)	±0.2
Receiver specification	rectangular	±1.0
Antenna directivity	rectangular	±0.1
Antenna factor variation with height	rectangular	±2.0
Antenna factor frequency interpolation	rectangular	±0.1
Measurement distance variation	rectangular	±0.2
Site Imperfections	rectangular	±1.5

Combined standard uncertainty $u_c(y)$ is

$$U_c(y) = \pm \sqrt{\left[\frac{1.0}{2}\right]^2 + \left[\frac{0.2}{2}\right]^2 + \left[\frac{1.0^2 + 0.1^2 + 2.0^2 + 0.1^2 + 0.2^2 + 1.5^2}{3}\right]}$$

$U_c(y) = \pm 1.6$ dB

It is probable that $u_c(y) / s(q_k) > 3$, where $s(q_k)$ is estimated standard deviation from a sample of n readings unless the repeatability of the EUT is particularly poor, and a coverage factor of k = 2 will ensure that the level of confidence will be approximately 95%, therefore:

$$s(q_k) = \sqrt{\frac{1}{(n-1)} \sum_{k-1}^{n} (q_k - \bar{q})^2}$$

$U = 2\ U_c(y) = 2 \times \pm 1.6$ dB $= \pm 3.2$ dB

Notes:

1.1 Uncertainties for the antenna and cable were estimated, based on a normal probability distribution with k = 2.

1.2 The receiver uncertainty was obtained from the manufacturer's specification for which a rectangular distribution was assumed.

1.3 The antenna factor uncertainty does not take account of antenna directivity.

1.4 The antenna factor varies with height and since the height was not always the same in use as when the antenna was calibrated an additional uncertainty is added.

1.5 The uncertainty in the measurement distance is relatively small but has some effect on the received signal strength. The increase in measurement distance as the antenna height is increased is an inevitable consequence of the test method and is therefore not considered a contribution to uncertainty.

1.6 Site imperfections are difficult to quantify but may include the following contributions:
-Unwanted reflections from adjacent objects.
-Ground plane imperfections: reflection coefficient, flatness, and edge effects.
-Losses or reflections from "transparent" cabins for the EUT or site coverings.
-Earth currents in antenna cable (mainly effect Biconical antennas).

The specified limits for the difference between measured site attenuation and the theoretical value (± 4 dB) were not included in total since the measurement of site attenuation includes uncertainty contributions already allowed for in this budget, such as antenna factor.

Conducted Measurements Uncertainty Calculation

Measurement of conducted emissions over the frequency range 9 kHz to 30 MHz includes following uncertainty:

Contribution	Probability Distribution	Uncertainty (dB)
Receiver specification	rectangular	±1.5
LISN coupling specification	rectangular	±1.5
Cable and input attenuator calibration	normal (k=2)	±0.5

Combined standard uncertainty $u_c(y)$ is

$$U_c(y) = \pm \sqrt{\left[\frac{0.5}{2}\right]^2 + \frac{1.5^2 + 1.5^2}{3}}$$

$U_c(y) = \pm 1.2$ dB

As with radiated field strength uncertainty, it is probable that $u_c(y) / s(q_k) > 3$ and a coverage factor of k = 2 will suffice, therefore:

$U = 2\ U_c(y) = 2 \times \pm 1.2$ dB $= \pm 2.4$ dB

Annex B Rogers Labs Test Equipment List

All test equipment is maintained in calibration and operating condition.

List of Test Equipment	Calibration Date
Spectrum Analyzer: Rohde & Schwarz ESU40	5/11
Spectrum Analyzer: HP 8562A, HP Adapters: 11518, 11519, and 11520 Mixers: 11517A, 11970A, 11970K, 11970U, 11970V, 11970W	5/11
Spectrum Analyzer: HP 8591EM	5/11
Antenna: EMCO Biconilog: 3143	5/11
Signal Generator: Rohde & Schwarz: SMB 100A	5/11
Power Meter and Sensor: Agilent: N1911A and N1921A	5/11
Antenna: Sunol Biconilog: JB6	10/11
Antenna: EMCO Log Periodic Model: 3147	10/11
Antenna: Antenna Research Biconical Model: BCD 235	10/11
Antenna: Com-Power Double ridge Horn: AH-118	10/11
LISN: Compliance Design Model: FCC-LISN-2.Mod.cd, 50 µHy/50 ohm/0.1 µf	10/11
R.F. Preamp CPPA-102	10/11
Attenuator: HP Model: HP11509A	10/11
Attenuator: Mini Circuits Model: CAT-3	10/11
Attenuator: Mini Circuits Model: CAT-3	10/11
Cables: Belden RG-58(L1), Belden RG-58(L2), Belden 8268(L3)	10/11
Cables: Time Microwave: 4M-750HF290-750, 10M-750HF290-750	10/11
Frequency Counter: Leader LDC825	2/11
Oscilloscope Scope: Tektronix 2230	2/11
Wattmeter: Bird 43 with Load Bird 8085	2/11
Power Supplies: Sorensen SRL 20-25, SRL 40-25, DCR 150, DCR 140	2/11
R.F. Generators: HP 606A, HP 8614A, HP 8640B	2/11
R.F. Power Amp 65W Model: 470-A-1010	2/11
R.F. Power Amp 50W M185- 10-501	2/11
R.F. Power Amp A.R. Model: 10W 1010M7	2/11
R.F. Power Amp EIN Model: A301	2/11
LISN: Compliance Eng. Model 240/20	2/11
LISN: Fischer Custom Communications Model: FCC-LISN-50-16-2-08	2/11
Antenna: EMCO Dipole Set 3121C	2/11
Antenna: C.D. B-101	2/11
Antenna: Solar 9229-1 & 9230-1	2/11
Antenna: EMCO 6509	2/11
Audio Oscillator: H.P. 201CD	2/11
Peavey Power Amp Model: IPS 801	2/11
ELGAR Model: 1751	2/11
ELGAR Model: TG 704A-3D	2/11
ESD Test Set 2010i	2/11
Fast Transient Burst Generator Model: EFT/B-101	2/11
Field Intensity Meter: EFM-018	2/11
KEYTEK Ecat Surge Generator	2/11
Shielded Room 5 M x 3 M x 3.0 M	

Annex C Rogers Qualifications

Scot D. Rogers, Engineer

Rogers Labs, Inc.

Mr. Rogers has approximately 17 years' experience in the field of electronics. Work experience includes six years working in the automated controls industry and remaining years working with the design, development and testing of radio communications and electronic equipment.

Positions Held:

Systems Engineer: A/C Controls Mfg. Co., Inc. 6 Years

Electrical Engineer: Rogers Consulting Labs, Inc. 5 Years

Electrical Engineer: Rogers Labs, Inc. Current

Educational Background:

1) Bachelor of Science Degree in Electrical Engineering from Kansas State University

2) Bachelor of Science Degree in Business Administration Kansas State University

3) Several Specialized Training courses and seminars pertaining to Microprocessors and Software programming.

NVLAP Lab Code 200087-0

Annex D FCC Test Site Registration Letter

FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

November 01, 2011

Registration Number: 90910

Rogers Labs, Inc.
4405 West 259th Terrace,
Louisburg, KS 66053

Attention: Scot Rogers,

Re: Measurement facility located at Louisburg
3 & 10 meter site
Date of Renewal: November 01, 2011

Dear Sir or Madam:

Your request for renewal of the registration of the subject measurement facility has been received. The information submitted has been placed in your file and the registration has been renewed. The name of your organization will remain on the list of facilities whose measurement data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Please note that the file must be updated for any changes made to the facility and the registration must be renewed at least every three years.

Measurement facilities that have indicated that they are available to the public to perform measurement services on a fee basis may be found on the FCC website www.fcc.gov under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,

Phyllis Parrish
Industry Analyst

NVLAP Lab Code 200087-0

Annex E Industry Canada Test Site Registration Letter

Industry Canada Industrie Canada

December 28, 2011

OUR FILE: 46405-3041
Submission No: 152685

Rogers Labs Inc.
4405 West 259th Terrance
Louisburg, KS, 66053
USA

Attention: Mr. Scot D. Rogers

Dear Sir/Madame:

The Bureau has received your application for the renewal of 3/10m OATS. Be advised that the information received was satisfactory to Industry Canada. The following number(s) is now associated to the site(s) for which registration / renewal was sought **(Site# 3041A-1).** Please reference the appropriate site number in the body of test reports containing measurements performed on the site. In addition, please keep for your records the following information;

- The company address code associated to the site(s) located at the above address is: **3041A**

Furthermore, to obtain or renew a unique site number, the applicant shall demonstrate that the site has been accredited to ANSI C63.4-2003 or later. A scope of accreditation indicating the accreditation by a recognized accreditation body to ANSI C63.4-2003 or later shall be accepted. Please indicate in a letter the previous assigned site number if applicable and the type of site (example: 3 metre OATS or 3 metre chamber). If the test facility is not accredited to ANSI C63.4-2003 or later, the test facility shall submit test data demonstrating full compliance with the ANSI standard. The Bureau will evaluate the filing to determine if recognition shall be granted.

The frequency for re-validation of the test site and the information that is required to be filed or retained by the testing party shall comply with the requirements established by the accrediting organization. However, in all cases, test site re-validation shall occur on an interval not to **exceed three years**. There is no fee or form associated with an OATS filing. OATS submissions are encouraged to be submitted electronically to the Bureau using the following URL;
http://strategis.ic.gc.ca/epic/internet/inceb-bhst.nsf/en/h_tt00052e.html.

If you have any questions, you may contact the Bureau by e-mail at certification.bureau@ic.gc.ca Please reference our file and submission number above for all correspondence.

Yours sincerely,

Dalwinder Gill

Dalwinder Gill
For: Wireless Laboratory Manager
Certification and Engineering Bureau
3701 Carling Ave., Building 94
P.O. Box 11490, Station "H"
Ottawa, Ontario K2H 8S2
Email: dalwinder.gill@ic.gc.ca
Tel. No. (613) 998-8363
Fax. No. (613) 990-4752