Nemko-CCL, Inc.

1940 West Alexander Street
Salt Lake City, UT 84119
801-972-6146

Test Report

Certification

Test Of:
Stinger

FCC ID:
S4DSTINGER-01

Test Specifications:
FCC PART 15, Subpart B and C

Test Report Serial No: 186981-2.1

Applicant:
Wireless Beehive LLC
2000 Sunset Road
Lake Point, UT 84074

Date of Test: September 7, 2011

Issue Date: September 13, 2011

Accredited Testing Laboratory By:

NVLAP

NVLAP Lab Code 100272-0

CERTIFICATION OF ENGINEERING REPORT

This report has been prepared by Nemko-CCL, Inc. to document compliance of the device described below with the class B requirements of Federal Communications Commission (FCC) Part 15, Subpart B and the requirements of Part 15, Subpart C. This report may be reproduced in full, partial reproduction may only be made with the written consent of the laboratory. The results in this report apply only to the sample tested.

- Applicant: Wireless Beehive LLC
- Manufacturer: Wireless Beehive LLC
- Brand Name: Wireless Beehive
- Model Number: Stinger
- FCC ID Number: S4DSTINGER-01

On this 13th day of September 2011, I, individually, and for Nemko-CCL, Inc., certify that the statements made in this engineering report are true, complete, and correct to the best of my knowledge, and are made in good faith.

Although NVLAP has recognized that the Nemko-CCL, Inc. EMC testing facilities are in good standing, this report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

Nemko-CCL, Inc.

Norman P Hansen

Tested by: Norman P. Hansen
EMC Technician

TABLE OF CONTENTS

PAGE

SECTION 1.0 CLIENT INFORMATION

1.1 Applicant:

Company Name:	Wireless Beehive LLC 2000 Sunset Road Lake Point, UT 84074
Contact Name:	James C. McCown
Title:	General Manager

1.2 Manufacturer:

Company Name:	Wireless Beehive LLC 2000 Sunset Road Lake Point, UT 84074
Contact Name:	James C. McCown
Title:	General Manager

SECTION 2.0 EQUIPMENT UNDER TEST (EUT)

2.1 Identification of EUT:

Brand Name: Wireless Beehive
Model Number: Stinger
Serial Number: None

2.2 Description of EUT:

The Stinger is a professionally installed transceiver operating in the 2400 to 2483.5 MHz frequency band using high index 2 level FSK and 4 level FSK with a signaling rate of 10 Mbps. The Stinger receives power from a 12 – 24 VDC Power-over-Ethernet power supply. The Stinger uses a directional antenna to connect with an access point and is designed to be mounted to a fixed object such as a pole and roof. The Stinger has an integral 8 dBi patch antenna. The Stinger mechanically couples to an external, higher gain antenna to increase the range of the Stinger. The antennas to be authorized for use with the Stinger are shown in the table below.

Antenna	Model Number	Antenna Gain	Used In Testing
Classic Stinger	S-24	14	Yes
Super Stinger	24-SS	18	Yes
Dish	RCL-1	19	No
Dish	RCL-2	20	No
Dish	RCL-3	22	Yes
NOTE: The highest gain of each type antenna was used in testing.			

The Stinger can be set to operate on one of 18 channels. A list of these channels is shown below.

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2415.0	7	2430.0	13	2445.0
2	2417.5	8	2432.5	14	2447.5
3	2420.0	9	2435.0	15	2450.0
4	2422.5	10	2437.5	16	2452.5
5	2425.0	11	2440.0	17	2455.0
6	2427.5	12	2442.5	18	2457.5

Testing was performed at the lowest channel (2415 MHz), the middle channel (2435 MHz), and the upper channel (2457.5 MHz).

2.3 EUT and Support Equipment:

The FCC ID numbers for all the EUT and support equipment used during the test are listed below:

Brand Name Model Number Serial Number	FCC ID Number or Compliance	Description	Name of Interface Ports / Interface Cables
BN: Wireless Beehive MN: Stinger (Note 1) SN: None	S4DSTINGER-01	Transceiver	See Section 2.4
BN: Dell MN: Latitude SN: None	DoC	Computer	Ethernet/Cat 5e cable (Note 2)

Note: (1) EUT
(2) Interface port connected to EUT (See Section 2.4)

The support equipment listed above was not modified in order to achieve compliance with this standard.

2.4 Interface Ports on EUT:

Name of Ports	No. of Ports Fitted to EUT	Cable Descriptions/Length
Ethernet with Power	1	Cat 5e with RJ45 connectors/7 meters
Service/Maintenance	1	Cable with RJ11 connector looped back/20 cm

2.5 Modification Incorporated/Special Accessories on EUT:

The following modifications were made to the EUT by the Client during testing to comply with the specification. This report is not complete without an accompanying signed attestation, included as Appendix 3, that the product will have all of the documented modifications incorporated into the product when manufactured and placed on the market.

1. To comply with the requirements of 15.109, a Steward 28A2025-0A2 ferrite was installed on the Cat 5e cable carrying power and data where it enters the Stinger assembly.

2. To comply with the requirements of 15.247(c), the transmit power was set to the software value shown in the table below for each of the antennas tested.

Antenna	Software Setting
Classic Stinger	CC000000
Super Stinger	B4000000
Dish	A0000000

SECTION 3.0 TEST SPECIFICATION, METHODS & PROCEDURES

3.1 Test Specification:

Title: FCC PART 15, Subpart B

FCC PART 15, Subpart C (47 CFR 15)
(15.203, 15.207, and 15.247)

Limits and methods of measurement of radio interference characteristics of radio frequency devices.

Purpose of Test: The tests were performed to demonstrate initial compliance.

3.2 Methods & Procedures:

3.2.1 §15.107 Conducted Limits

(a) Except for Class A digital devices, for equipment 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 band edges.

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.

(b) For a Class A digital device 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 band edges.

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-peak	Average
0.15 – 0.5	79	66
0.5 – 30	73	60

3.2.2 §15.109 Radiated Limits

(a) 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)
30 - 88	100
88 - 216	150
216 - 960	200
Above 960	500

(b) The field strength of radiated emission from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the following:

Frequency of emission (MHz)	Field Strength (microvolts/meter)
30 - 88	90
88 - 216	150
216 - 960	210
Above 960	300

(c) In the emission tables above, the tighter limit applies at the band edges. §15.33 and §15.35 which specify the frequency range over which radiated emissions are to be measured and the detector functions and other measurement standards apply.

3.2.3 §15.203 Antenna Requirement

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 Sections 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 Section 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.

3.2.4 §15.207 Conducted Limits

(a) Except for Class A digital devices, for equipment 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 band edges.

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.

3.2.5 §15.247 Operation within the bands 902 – 928 MHz, 2400 – 2483.5 MHz, and 5725 – 5850 MHz

(a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400 – 2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudorandomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

(ii) Frequency hopping systems operating in the 5725-5850 MHz band shall use at least 75 hopping frequencies. The maximum 20 dB bandwidth of the hopping channel is 1 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 non-overlapping channels are used.

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

(b) The maximum peak output power of the intentional radiator shall not exceed the following:

(1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

(2) For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

(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 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.

(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 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.

(c) Operation with directional antenna gains greater than 6 dBi.

(1) Fixed point-to-point operation:

(i) Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

(ii) Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

(iii) Fixed, point-to-point operation, as used in paragraphs (b)(4)(i) and (b)(4)(ii) of this section, excludes the use of point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum or digitally modulated intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.

(2) In addition to the provisions in paragraphs (b)(1), (b)(3), (b)(4) and (c)(1)(i) of this section, transmitters operating in the 2400-2483.5 MHz band that emit multiple directional beams, simultaneously or sequentially, for the purpose of directing signals to individual receivers or to groups of receivers provided the emissions comply with the following:

(i) Different information must be transmitted to each receiver.

(ii) If the transmitter employs an antenna system that emits multiple directional beams but does not emit multiple directional beams simultaneously, the total output power conducted to the array or arrays that comprise the device, i.e., the sum of the power supplied to all antennas, antenna elements, staves, etc. and summed across all carriers or frequency channels, shall not exceed the limit specified in paragraph (b)(1) or (b)(3) of this section, as applicable. However, the total conducted output power shall be reduced by 1 dB below the specified limits for each 3 dB that the directional gain of the antenna /antenna array exceeds 6 dBi. The directional antenna gain shall be computed as follows:

(A) The directional gain shall be calculated as the sum of 10 log (number of array elements or staves) plus the directional gain of the element or stave having the highest gain.

(B) A lower value for the directional gain than that calculated in paragraph (c)(2)(ii)(A) of this section will be accepted if sufficient evidence is presented, e.g., due to shading of the array or coherence loss in the beamforming.

(iii) If a transmitter employs an antenna that operates simultaneously on multiple directional beams using the same or different frequency channels, the power supplied to each emission beam is subject to the power limit specified in paragraph (c)(2)(ii) of this section. If transmitted beams overlap, the power shall be reduced to ensure that their aggregate power does not exceed the limit specified in paragraph (c)(2)(ii) of this section. In addition, the aggregate power transmitted simultaneously on all beams shall not exceed the limit specified in paragraph (c)(2)(ii) of this section by more than 8 dB.

(iv) Transmitters that emit a single directional beam shall operate under the provisions of paragraph (c)(1) of this section.

(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 Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

(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.

(f) For the purposes of this section, hybrid systems are those that employ a combination of both frequency hopping and digital modulation techniques. The frequency hopping operation of the hybrid system, with the direct sequence or digital modulation operation turned off, shall have an average time of occupancy on any frequency not to exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4. The digital modulation operation of the hybrid system, with the frequency hopping turned off, shall comply with the power density requirements of paragraph (d) of this section.

(g) Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

(h) The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

(i) Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this Chapter.

Note: Spread spectrum systems are sharing these bands on a noninterference basis with systems supporting critical Government requirements that have been allocated the usage of these bands, secondary only to ISM equipment operated under the provisions of Part 18 of this Chapter. Many of these Government systems are airborne radiolocation systems that emit a high EIRP which can cause interference to other users. Also, investigations of the effect of spread spectrum interference to U. S. Government operations in the 902-928 MHz band may require a future decrease in the power limits allowed for spread spectrum operation.

3.2.6 Test Procedure

The conducted disturbance at mains ports and radiated disturbance testing was performed according to the procedures in ANSI C63.4: 2003. Testing was performed at Nemko-CCL, Inc.'s Wanship open area test site #2, located at 29145 Old Lincoln Highway, Wanship, UT. This site has been fully described in a report submitted to the FCC, and was accepted in a letter dated March 11, 2009 (90504).

Nemko-CCL, Inc. is accredited by National Voluntary Laboratory Accreditation Program (NVLAP); NVLAP Lab Code: 100272-0, which is effective until September 30, 2011.

For radiated emission testing at 30 MHz or above that is performed at distances closer than the specified distance, an inverse proportionality factor of 20 dB per decade was used to normalize the measured data for determining compliance.

SECTION 4.0 OPERATION OF EUT DURING TESTING

4.1 Operating Environment:

Power Supply: 120 VAC at 60 Hz to Power-over Ethernet Supply
+24.0 VDC to Stinger from Power-over Ethernet Supply

4.2 Operating Modes:

The transmitter was tested while in a constant transmit mode using 2 level FSK and 4 level FSK to find worst-case emissions. The AC power to the POE supply was varied in accordance with FCC §15.31(e). The DC output remained constant and no change was seen in transmitter characteristics. Testing was performed using the classic stinger, super stinger, and RCL-3 dish antenna.

4.3 EUT Exercise Software:

Wireless Beehive LLC software was used to exercise the transmitter.

SECTION 5.0 SUMMARY OF TEST RESULTS

5.1 FCC Part 15, Subpart C

5.1.1 Summary of Tests:

Section	Environmental Phenomena	Frequency Range (MHz)	Result
15.107(a)	Conducted Disturbance at Mains Ports	0.15 – 30	Complied
15.109(a)	Radiated Emissions	30 – 2000	Complied
15.203	Antenna Requirements	Structural requirement	Complied
15.207	Conducted Disturbance at Mains Ports	0.15 – 30	Complied
15.247(a)	Bandwidth Requirement	2400 – 2483.5	Complied
15.247(c)	Peak Output Power	2400 – 2483.5	Complied
15.247(d)	Antenna Conducted Spurious Emissions	30 - 25000	Complied
15.247(d)	Radiated Spurious Emissions	30 - 25000	Complied
15.247(e)	Peak Power Spectral Density	2400 – 2483.5	Complied
15.247(f)	Hybrid System Requirements	2400 – 2483.5	Not Applicable
15.247(g)	Frequency Hopping Channel Usage	2400 – 2438.5	Not Applicable
15.247(h)	Frequency Hopping Intelligence	2400 – 2483.5	Not Applicable

5.2 Result

In the configuration tested, the EUT complied with the requirements of the specification.

SECTION 6.0 MEASUREMENTS, EXAMINATIONS AND DERIVED RESULTS

6.1 General Comments:

This section contains the test results only. Details of the test methods used and a list of the test equipment used during the measurements can be found in Appendix 1 of this report.

6.2 Test Results:

6.2.1 §15.107 Conducted Emissions at the AC Mains

The EUT was tested for conducted emissions at the AC mains with the digital circuitry operating and again with the digital circuitry active and the transmitter active. No change in the conducted emissions was seen and the data from testing is shown in 6.2.4.

6.2.2 §15.109 Radiated Emissions

The radiated emissions seen from the EUT that were not associated with the transmitter are shown in the table below.

6.2.2.1 Vertical Polarity

Frequency (MHz)	Detector	Receiver Reading (dBμV)	Correction Factor (dB/m)	Field Strength (dBμV/m)	Class B 3 m Limit (dBμV/m)	Margin (dB)
31.2	Peak (Note 1)	14.6	19.1	33.7	40.0	-6.3
39.7	Peak (Note 1)	19.2	14.3	33.5	40.0	-6.5
43.1	Peak (Note 1)	18.9	13.1	32.0	40.0	-8.0
147.8	Peak (Note 1)	16.0	10.9	26.9	43.5	-16.6
642.2	Peak (Note 1)	4.0	27.2	31.2	46.0	-14.8
755.2	Peak (Note 1)	4.5	28.5	33.0	46.0	-13.0

Note 1: The reference detector used for the measurements was peak or quasi-peak and the data was compared to the quasi-peak limit.

Measurement Uncertainty

The measurement uncertainty (with a 95% confidence level) for this test was ± 4.3 dB from 30 MHz to 200 MHz and ± 6.0 dB from 200 MHz to 1 GHz at a 3 meter measurement distance.

RESULT

The EUT complied with the specification limit by a margin of 6.3 dB.

6.2.2.2 Horizontal Polarity

Frequency (MHz)	Detector	Receiver Reading (dBμV)	Correction Factor (dB/m)	Field Strength (dBμV/m)	Class B 3 m Limit (dBμV/m)	Margin (dB)
30.0	Peak (Note 1)	0.3	19.8	20.1	40.0	-19.9
68.9	Peak (Note 1)	10.1	8.5	18.6	40.0	-21.4
216.0	Peak (Note 1)	6.3	14.2	20.5	43.5	-23.0
224.0	Peak (Note 1)	8.0	14.6	22.6	46.0	-23.4
376.0	Peak (Note 1)	6.9	20.8	27.7	46.0	-18.3
616.0	Peak (Note 1)	3.6	26.8	30.4	46.0	-15.6
Note 1: The reference detector used for the measurements was peak or quasi-peak and the data was compared to the quasi-peak limit.						

<u>Measurement Uncertainty</u>

The measurement uncertainty (with a 95% confidence level) for this test was ± 4.3 dB from 30 MHz to 200 MHz and ± 6.0 dB from 200 MHz to 1 GHz at a 3 meter measurement distance.

RESULT

The EUT complied with the specification limit by a margin of 15.6 dB.

6.2.3 §15.203 Antenna Requirements

The EUT is professionally installed. The Classic Stinger and Super Stinger antennas are designed to mechanically attach only to the Stinger transceiver. The RCL-1, RCL-2, and RCL-3 are designed to only mount the Stinger transceiver.

RESULT

The EUT complied with the specification.

6.2.4 §15.207 Conducted Disturbance at the AC Mains Ports

Frequency (MHz)	AC Mains Lead	Detector	Measured Level (dBμV)	Limit (dBμV)	Margin (dB)
0.17	Hot Lead	Peak (Note 1)	50.3	55.2	-4.9
0.21	Hot Lead	Peak (Note 1)	47.4	53.1	-5.7
0.24	Hot Lead	Peak (Note 1)	44.6	52.2	-7.6
0.28	Hot Lead	Peak (Note 1)	43.7	50.8	-7.1
0.30	Hot Lead	Peak (Note 1)	38.7	50.3	-11.6
7.10	Hot Lead	Peak (Note 1)	36.6	50.0	-13.4
0.17	Neutral Lead	Quasi-Peak (Note 1)	49.6	55.2	-5.6
0.20	Neutral Lead	Peak (Note 1)	47.4	53.5	-6.1
0.26	Neutral Lead	Peak (Note 1)	39.8	51.4	-11.6
0.33	Neutral Lead	Peak (Note 1)	32.8	49.6	-16.8
1.23	Neutral Lead	Peak (Note 1)	30.6	46.0	-15.4
7.25	Neutral Lead	Peak (Note 1)	35.8	50.0	-14.2
Note 1: The reference detector used for the measurements was Quasi-Peak or Peak and the data was compared to the average limit; therefore, the EUT was deemed to meet both the average and quasi-peak limits.					

RESULT

In the configuration tested, the EUT complied with the specification by 4.9 dB.

6.2.3 §15.247(a)(2) Emission 6 dB Bandwidth

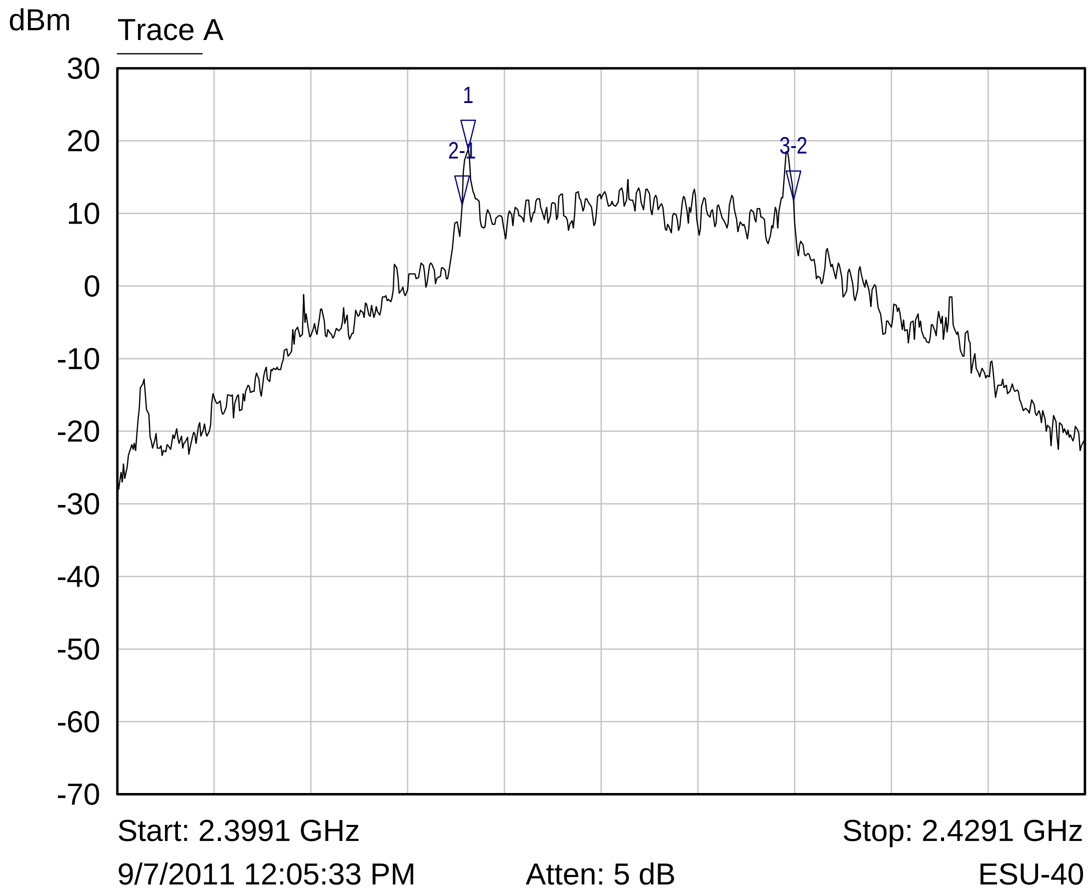
Frequency (MHz)	6 dB Bandwidth (MHz)
2415.0	10.2885
2435.0	10.3365
2457.5	10.2885

RESULT

In the configuration tested, the 6 dB bandwidth was greater than 500 kHz; therefore, the

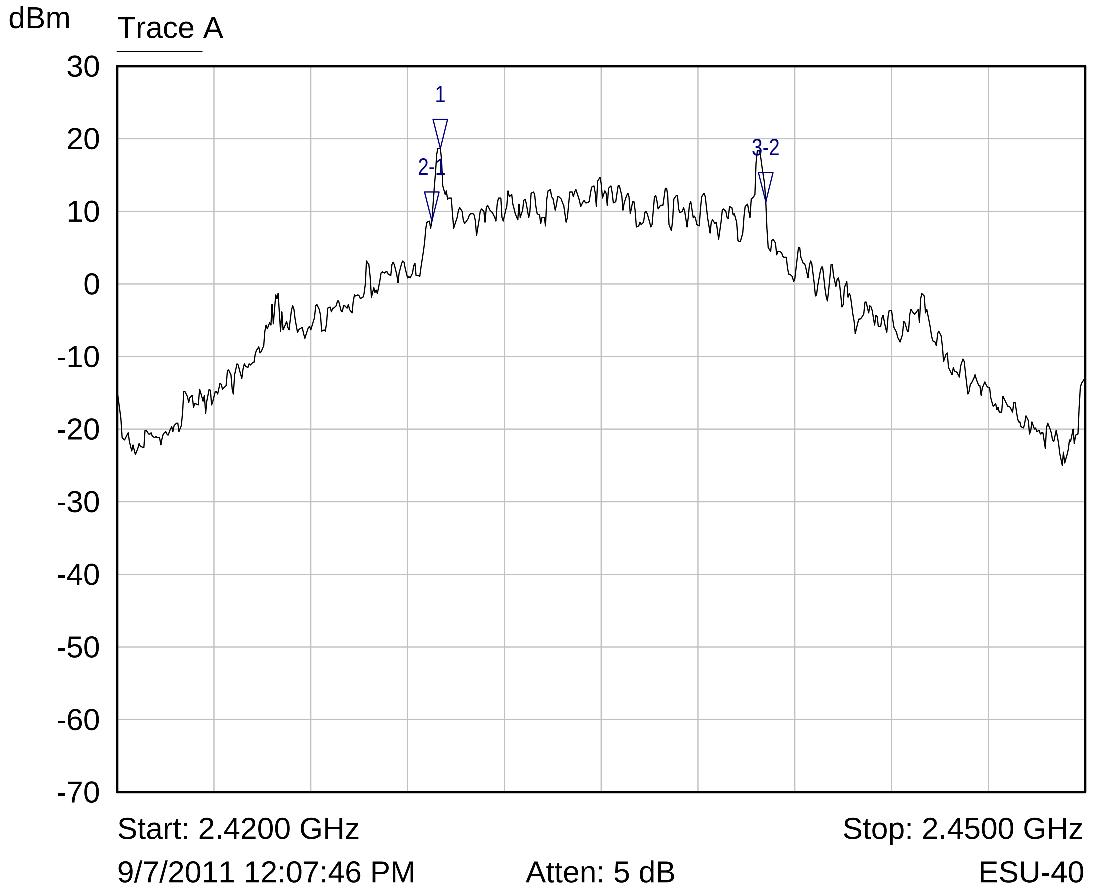
EUT complied with the requirements of the specification (see spectrum analyzer plots below).

2415 MHz Emission 6 dB Bandwidth



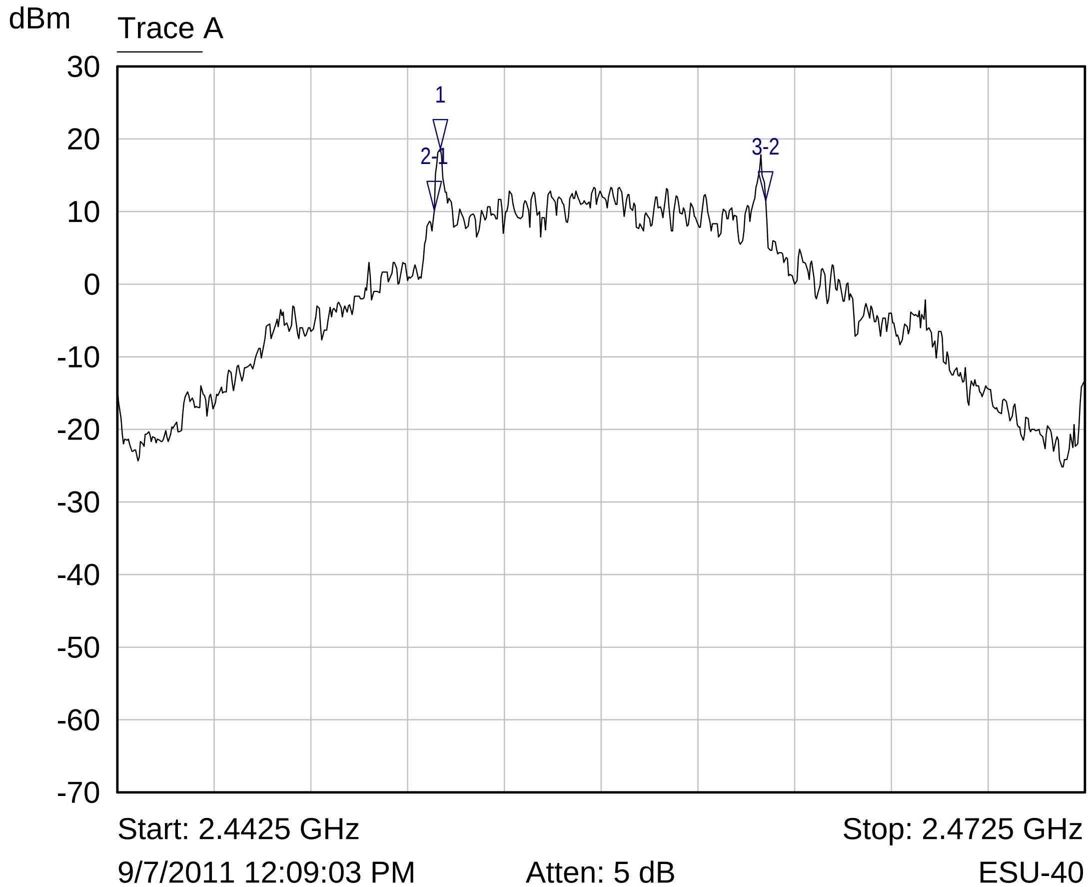
Mkr	Trace	X-Axis	Value	Notes
1 ▽	Trace A	2.4100 GHz	18.81 dBm	
2-1 ▽	Trace A	-192.3077 kHz	-7.59 dB	
3-2 ▽	Trace A	10.2885 MHz	0.63 dB	

2435.0 MHz Emission 6 dB Bandwidth



Mkr	Trace	X-Axis	Value	Notes
1 ∇	Trace A	2.4300 GHz	18.71 dBm	
2-1 ∇	Trace A	-240.3846 kHz	-10.05 dB	
3-2 ∇	Trace A	10.3365 MHz	2.72 dB	

2457.5 MHz Emission 6 dB Bandwidth



Mkr	Trace	X-Axis	Value	Notes
1 ▽	Trace A	2.4525 GHz	18.68 dBm	
2-1 ▽	Trace A	-192.3077 kHz	-8.46 dB	
3-2 ▽	Trace A	10.2885 MHz	1.29 dB	

6.2.4 §15.247(b)(3) Peak Output Power

The maximum peak RF Conducted output power measured for this device was 498.88 mW. The limit is 30 dBm or 1 Watt when using antennas with 6 dBi or less gain. This device operates with antenna gains that exceed 6 dBi and the requirements of §15.247(c)(1) apply. §15.247(c)(1) requires a 1 dB reduction in the conducted output power for every 3 dB that the directional gain of the antenna exceeds 6 dBi. The Classic Stinger antenna has a gain of 14 dBi; therefore, the conducted power must not exceed 27 dBm (14 – 6 = 8, 8/3 = 2 2/3 = 3 dB reduction). The Super Stinger has a gain of 18 dBi; therefore, the conducted power must not exceed 26 dBm (18 – 6 = 12, 12/3 = 4 db reduction). The RCL-3 antenna has a gain of 22 dBi; therefore, the conducted power must not exceed 24 dBm (22 – 6 = 16, 16/3 = 5 1/3 = 6 dB reduction).

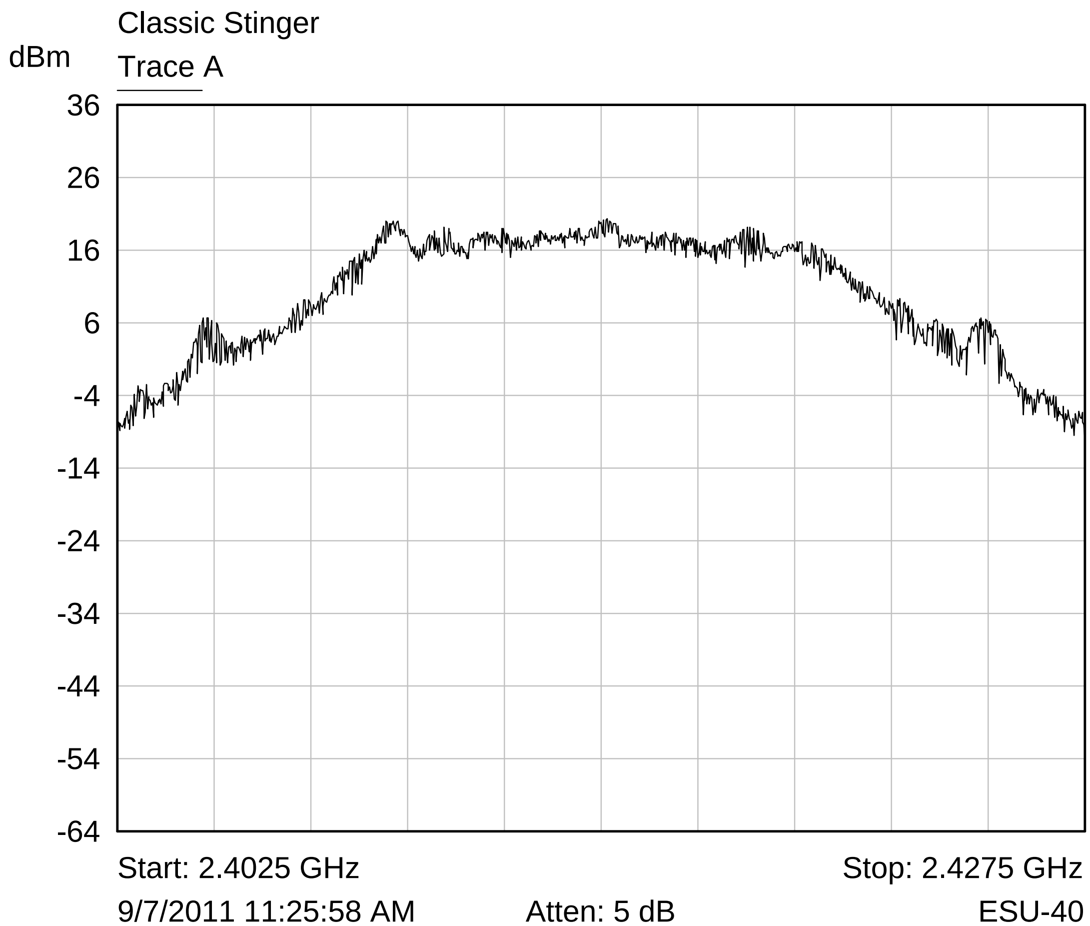
The maximum RBW of the spectrum analyzer was not larger than the bandwidth of the signal to be measured; therefore, the method described in Power Output Option 2, Method #1 of the attachment to FCC Public Notice DA000705 was used to measure and sum the power, as allowed in §15.247(b)(3).

Frequency (MHz)	Classic Stinger		Super Stinger		RCL-3 Dish	
	dBm	mW	dBm	mW	dBm	mW
2415.0	26.97	497.74	25.91	389.94	23.50	223.87
2435.0	26.92	492.04	25.94	392.64	23.55	226.46
2457.5	26.98	498.88	25.98	396.28	23.72	235.50

RESULT

In the configuration tested, the conducted output power meets the requirements of §15.247(c)(1); therefore, the EUT complied with the requirements of the specification (see spectrum analyzer plots below).

2415 MHz Output Power – Power Set for Classic Stinger Antenna

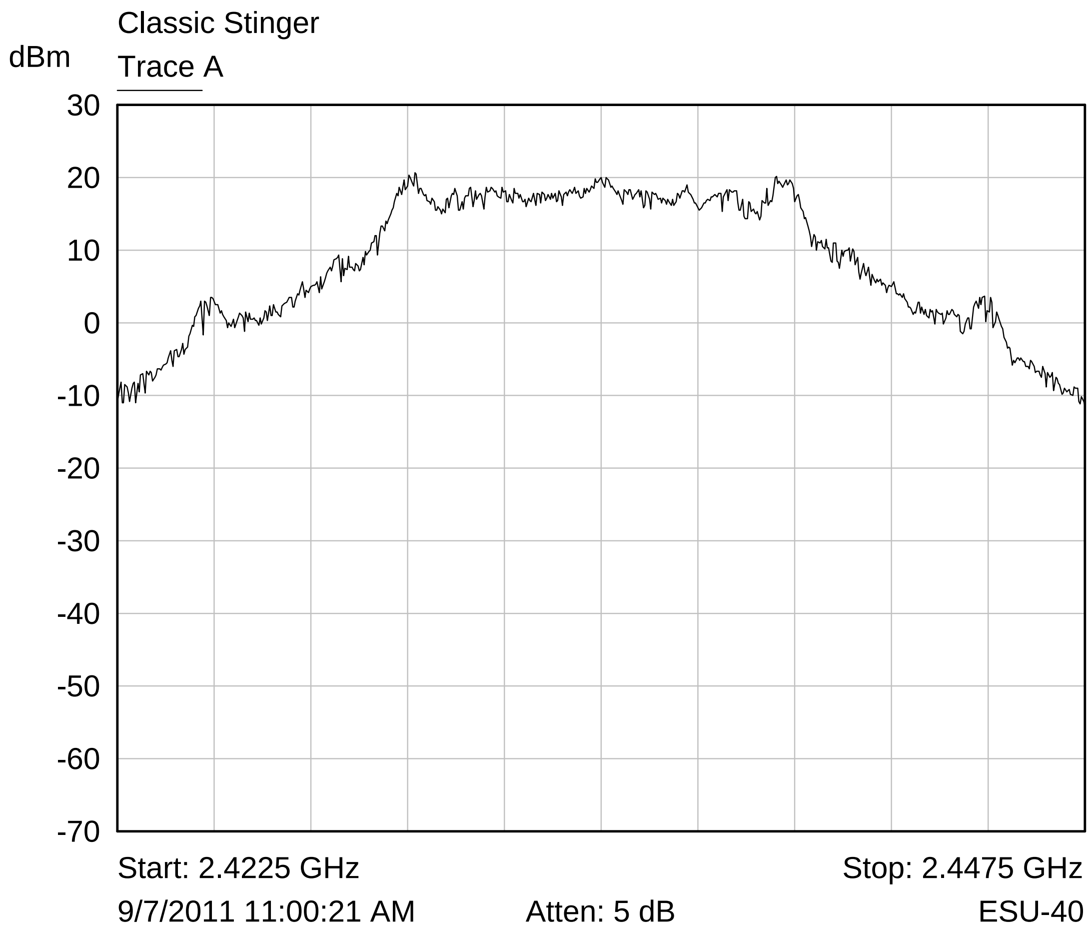


Power at CC000000

Trace A

Measurement Parameter	Value
Channel power	26.97 dBm

2435 MHz Output Power – Power Set for Classic Stinger Antenna

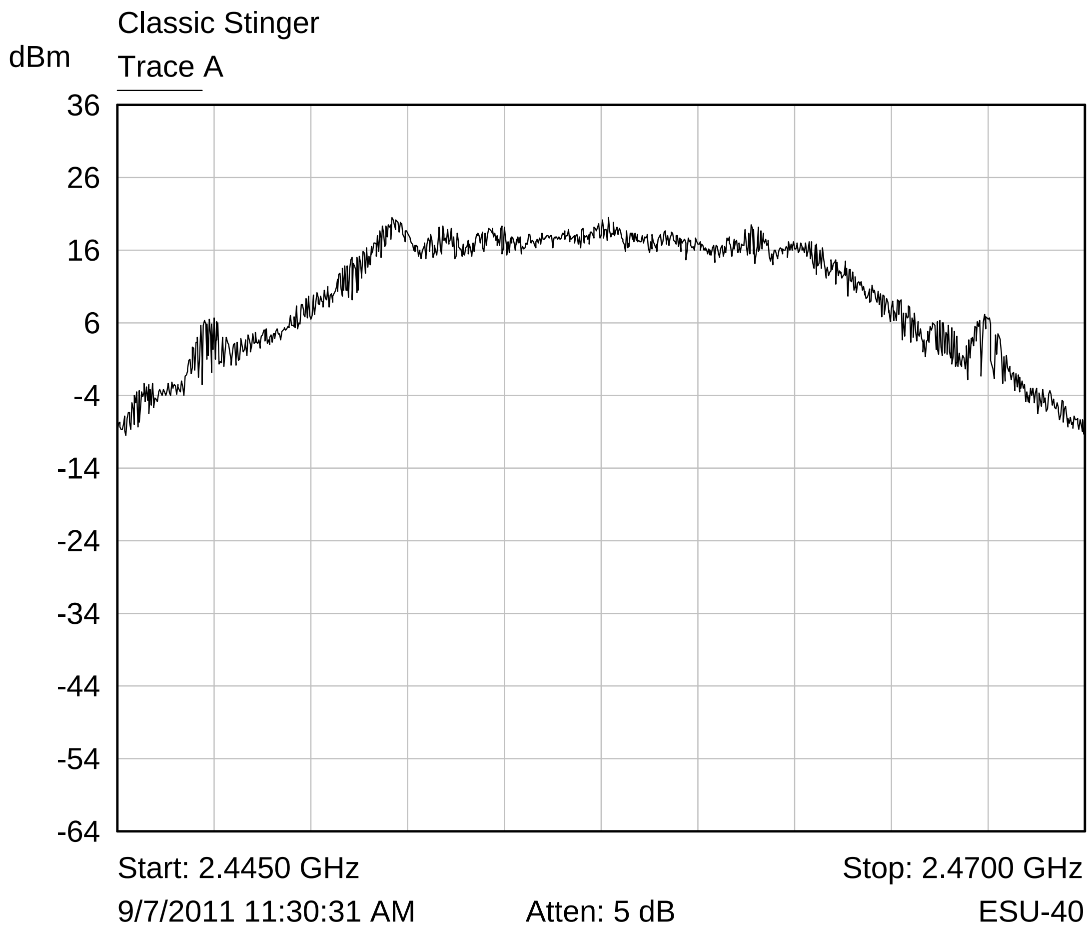


Power at CC000000

Trace A

Measurement Parameter	Value
Channel power	26.92 dBm

2457.5 MHz Output Power – Power Set for Classic Stinger Antenna

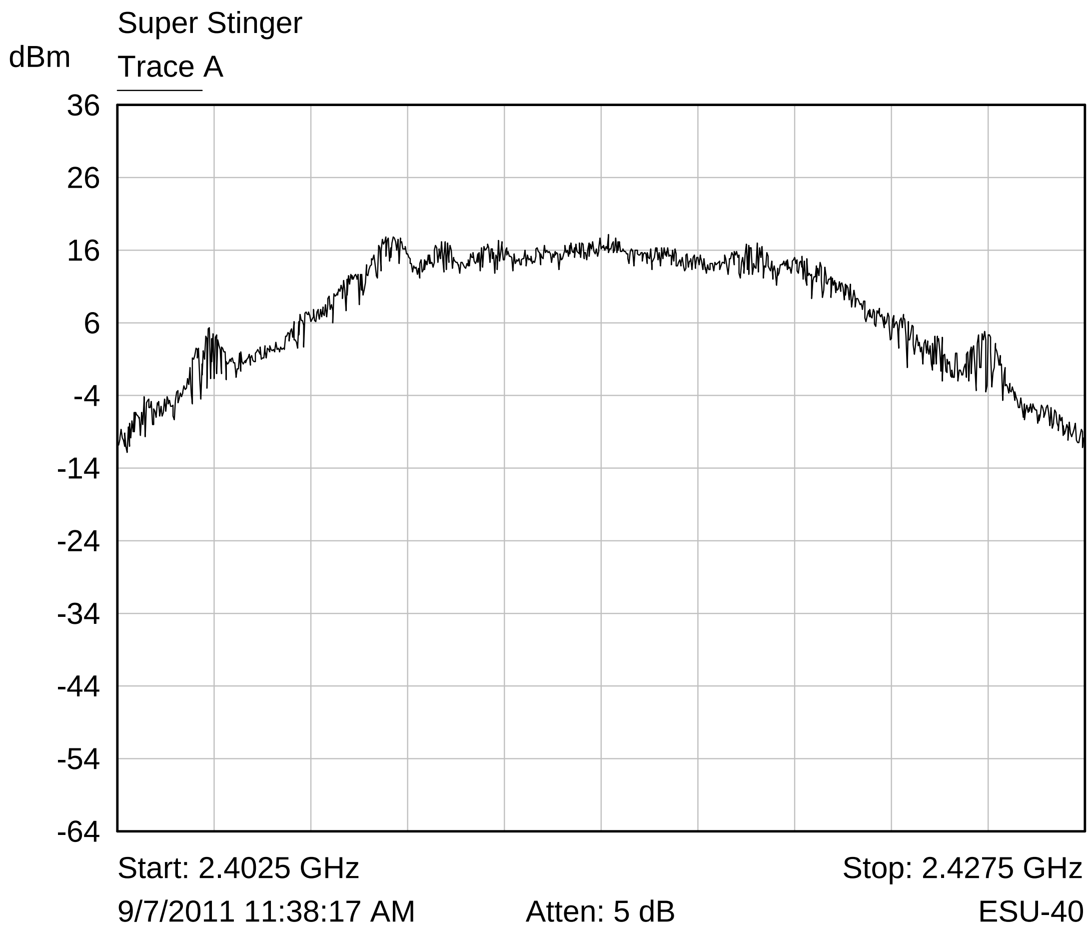


Power at CC000000

Trace A

Measurement Parameter	Value
Channel power	26.98 dBm

2415 MHz Output Power – Power Set for Super Stinger Antenna

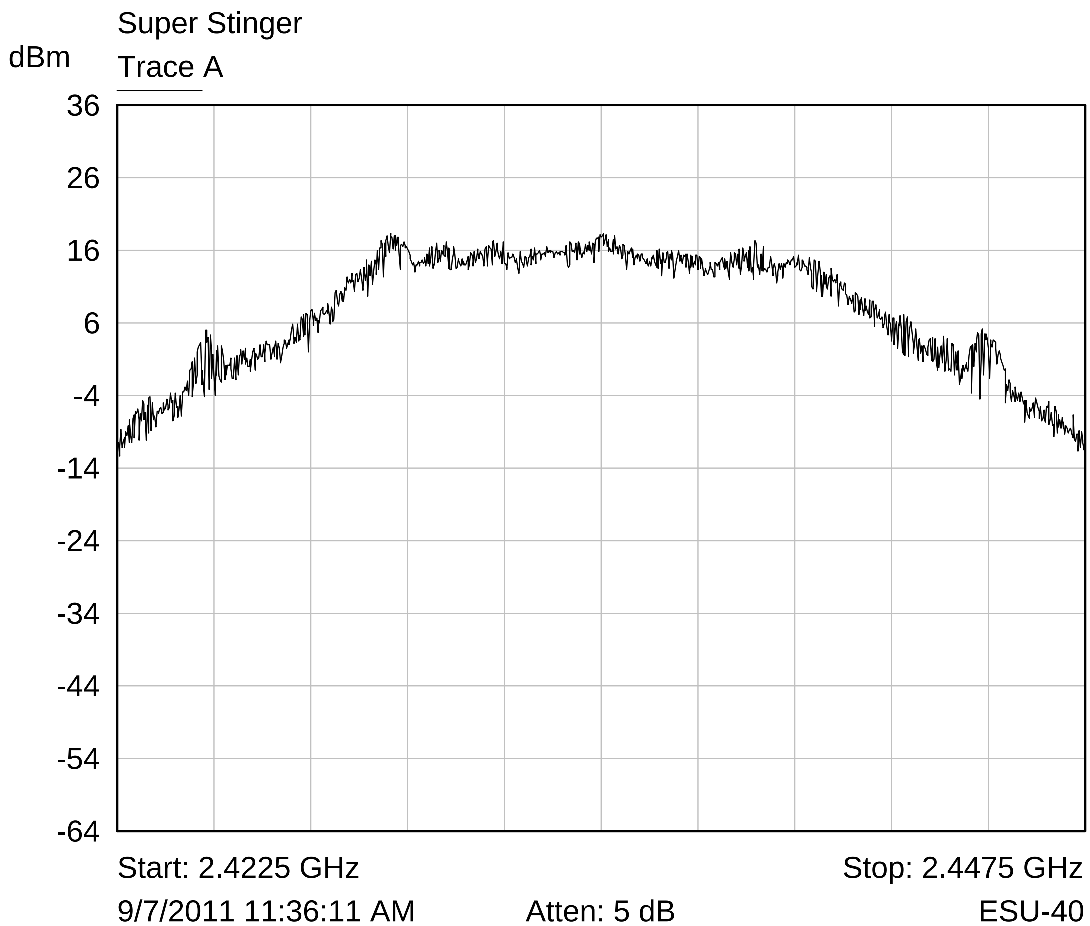


Power at B4000000

Trace A

Measurement Parameter	Value
Channel power	25.91 dBm

2435 MHz Output Power – Power Set for Super Stinger Antenna

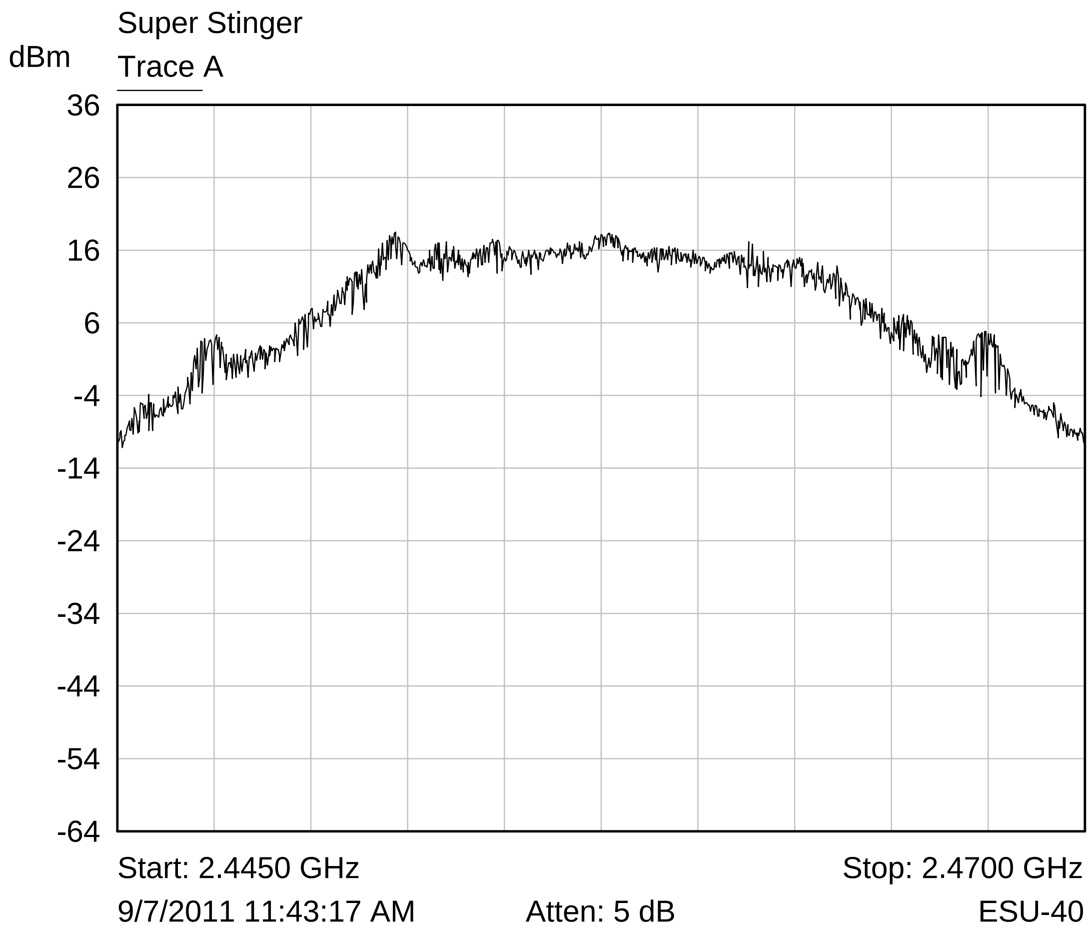


Power at B4000000

Trace A

Measurement Parameter	Value
Channel power	25.94 dBm

2457.5 MHz Output Power – Power Set for Super Stinger Antenna

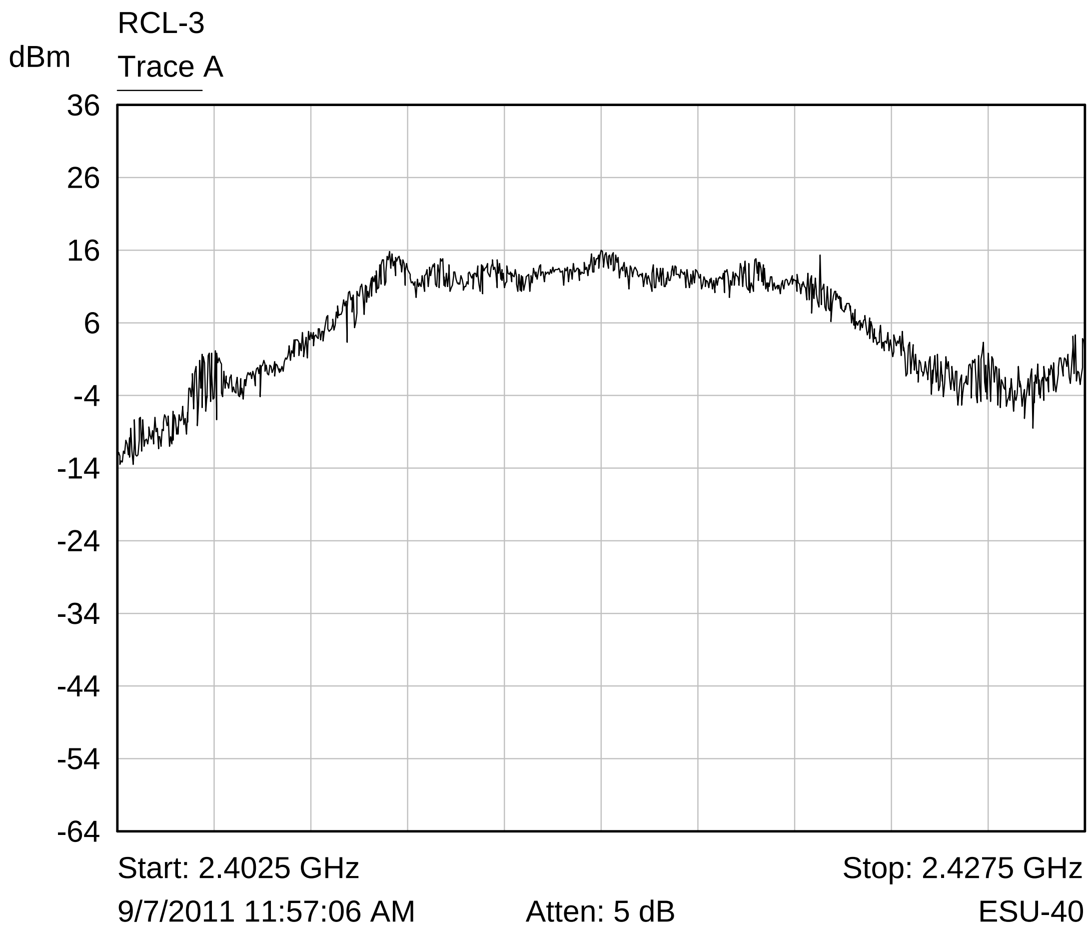


Power at B4000000

Trace A

Measurement Parameter	Value
Channel power	25.98 dBm

2415 MHz Output Power – Power Set for RCL-3 Antenna

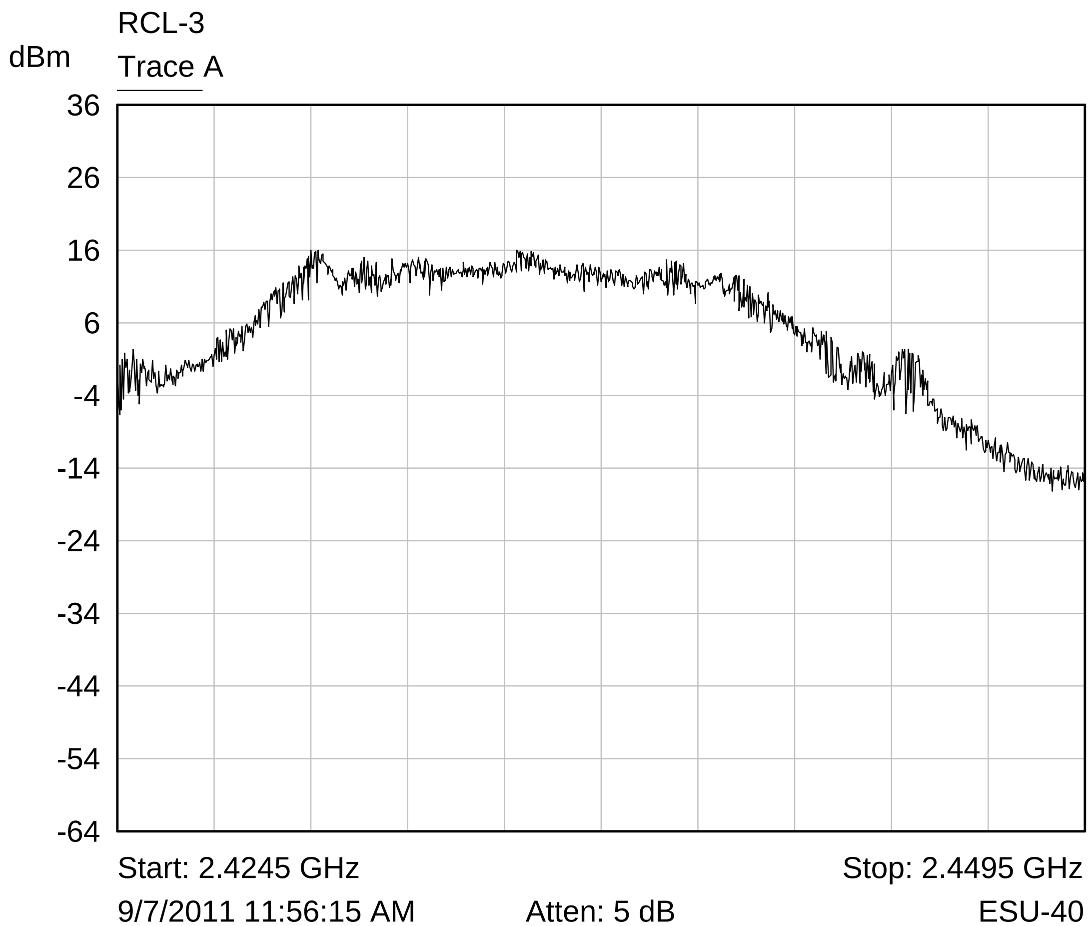


Power at A0000000

Trace A

Measurement Parameter	Value
Channel power	23.50 dBm

2435 MHz Output Power – Power Set for RCL-3 Antenna

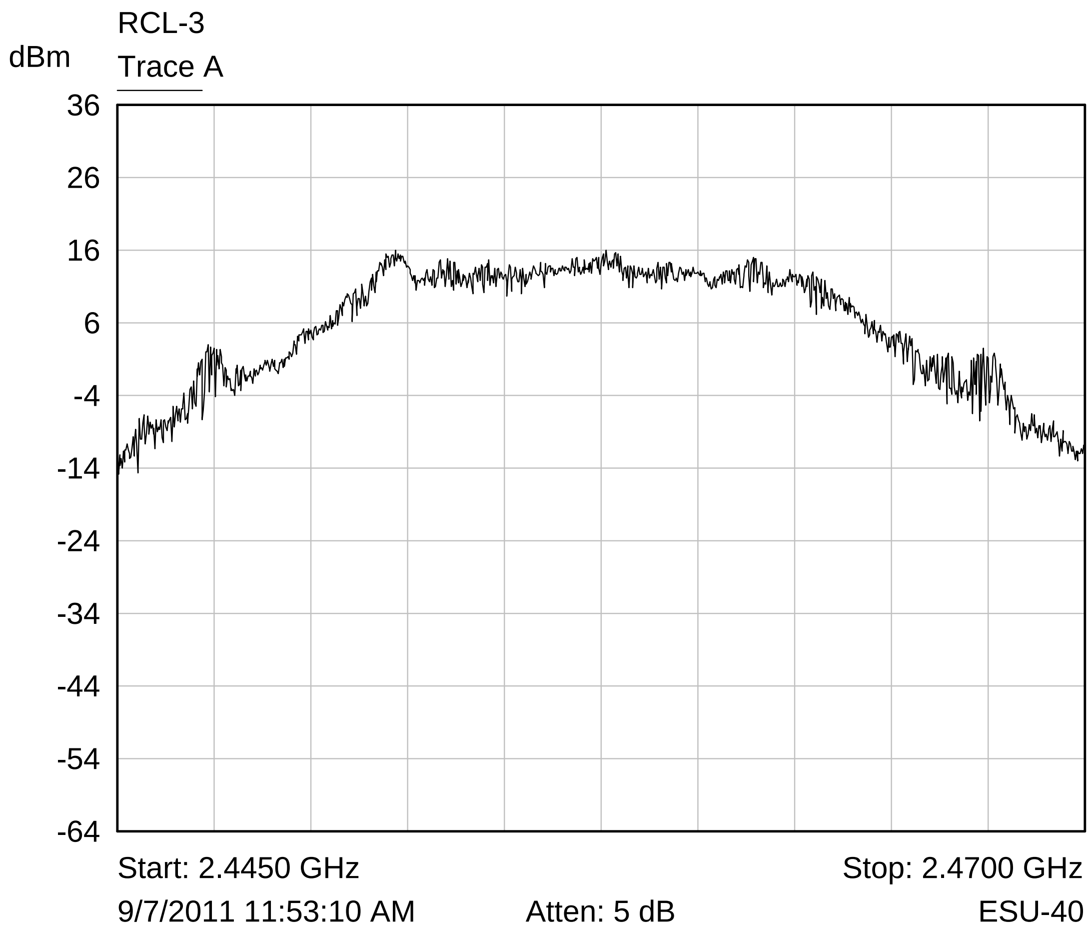


Power at A0000000

Trace A

Measurement Parameter	Value
Channel power	23.55 dBm

2457.5 MHz Output Power – Power Set for RCL-3 Antenna



Power at A0000000

Trace A

Measurement Parameter	Value
Channel power	23.72 dBm

6.2.5 §15.247(d) Spurious Emissions

The frequency range from 30 MHz to 25 GHz was investigated to measure spurious emissions. The emissions must be attenuated by 30 dB from the fundamental emission level. Emissions in the restricted bands of **§**15.205 must meet the limits specified in **§**15.209. The tables show the worst-case emissions measured from the Stinger using the Classic Stinger, Super Stinger, and RCL-3 antenna. Tabular data for each of the spurious emissions is shown below for each of the units. Plots of the band edges are also shown.

For frequencies below 1000 MHz RBW = 100 kHz and VBW = 300 kHz. For frequencies above 1000 MHz RBW = 1 MHz and VBW = 3 MHz.

AVERAGE FACTOR

There was no average factor applied.

RESULT

Although not required, all emissions met the limits specified in **§**15.209; therefore, the EUT complies with the specification.

6.2.5.1 Classic Stinger Antenna

Transmitting at 2415 MHz – Classic Stinger

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)
4830.0	Peak	Vertical	0.3	37.8	38.1	74.0
4830.0	Average	Vertical	-9.6	37.8	28.2	54.0
4830.0	Peak	Horizontal	-0.1	37.8	37.7	74.0
4830.0	Average	Horizontal	-9.7	37.8	28.1	54.0
7245.0	Peak	Vertical	0.8	42.1	42.9	74.0
7245.0	Average	Vertical	-9.9	42.1	32.2	54.0
7245.0	Peak	Horizontal	-0.2	42.1	41.9	74.0
7245.0	Average	Horizontal	-9.7	42.1	32.4	54.0
9660.0	Peak	Vertical	-0.7	44.7	44.0	74.0
9660.0	Average	Vertical	-11.4	44.7	33.3	54.0
9660.0	Peak	Horizontal	-1.4	44.4	43.0	74.0

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBµV)	Correction Factor (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)
9660.0	Average	Horizontal	-11.7	44.7	33.0	54.0
12075.0	Peak	Vertical	-2.2	47.2	45.0	74.0
12075.0	Average	Vertical	-12.3	47.2	34.9	54.0
12075.0	Peak	Horizontal	-2.4	47.2	44.8	74.0
12075.0	Average	Horizontal	-12.4	47.2	34.8	54.0

Transmitting at 2435 MHz – Classic Stinger

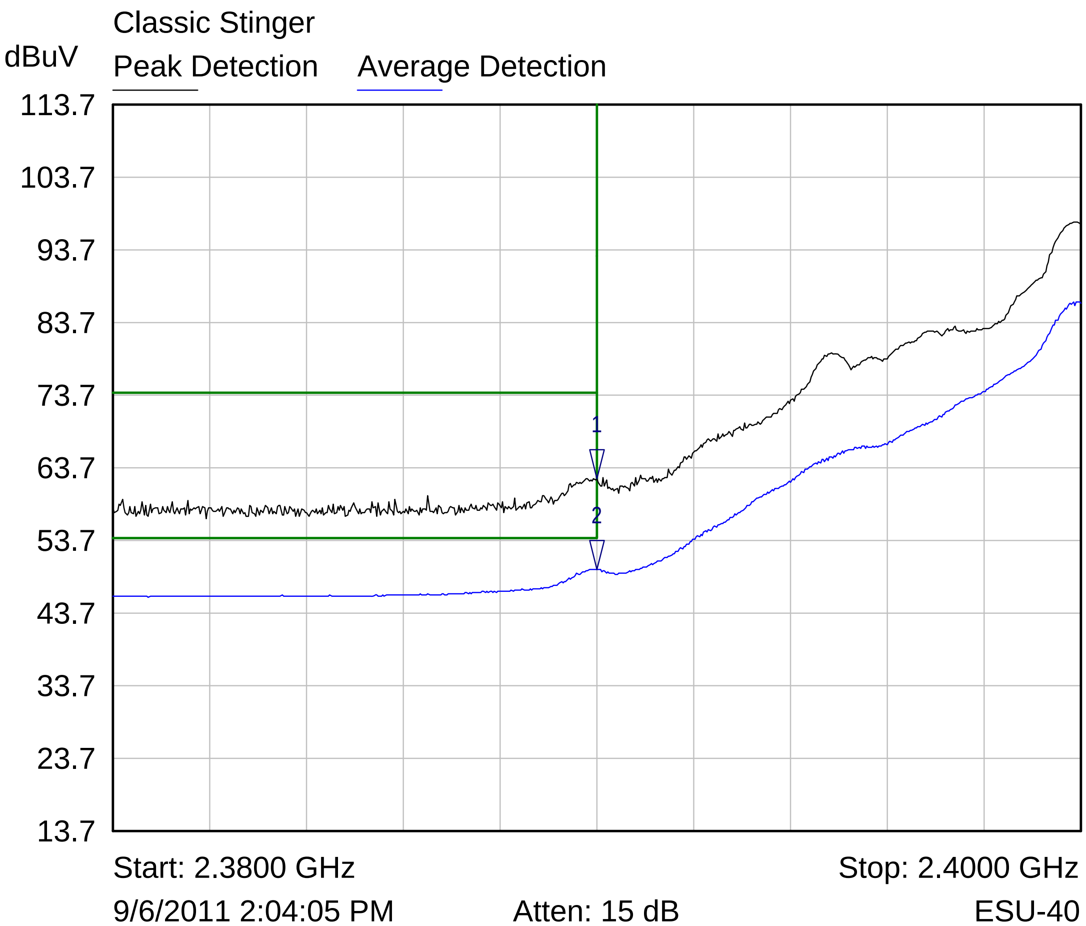
Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBµV)	Correction Factor (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)
4870.0	Peak	Vertical	0.4	37.9	38.3	74.0
4870.0	Average	Vertical	-9.5	37.9	28.4	54.0
4870.0	Peak	Horizontal	1.1	37.9	39.0	74.0
4780.0	Average	Horizontal	-9.9	37.9	28.0	54.0
7305.0	Peak	Vertical	0.2	42.3	42.5	74.0
7305.0	Average	Vertical	-10.0	42.3	32.3	54.0
7305.0	Peak	Horizontal	-1.6	42.3	40.7	74.0
7305.0	Average	Horizontal	-10.0	42.3	32.3	54.0
9740.0	Peak	Vertical	-2.1	44.7	42.6	74.0
9740.0	Average	Vertical	-11.5	44.7	33.2	54.0
9740.0	Peak	Horizontal	-1.7	44.7	43.0	74.0
9740.0	Average	Horizontal	-11.3	44.7	33.4	54.0
12175.0	Peak	Vertical	-2.7	47.1	44.4	74.0
12175.0	Average	Vertical	-12.5	47.1	34.6	54.0
12175.0	Peak	Horizontal	-1.6	47.1	45.5	74.0
12175.0	Average	Horizontal	-12.5	47.1	34.6	54.0

Transmitting at 2457.5 MHz – Classic Stinger

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBµV)	Correction Factor (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)
4915.0	Peak	Vertical	-0.4	37.9	37.5	74.0
4915.0	Average	Vertical	-10.3	37.9	27.6	54.0
4915.0	Peak	Horizontal	0.3	37.9	38.2	74.0
4915.0	Average	Horizontal	-10.0	37.9	27.9	54.0
7372.5	Peak	Vertical	1.0	42.4	43.4	74.0
7372.5	Average	Vertical	-10.1	42.4	32.3	54.0
7372.5	Peak	Horizontal	-0.7	42.4	41.7	74.0
7372.5	Average	Horizontal	-10.2	42.4	32.2	54.0
9830.0	Peak	Vertical	-2.2	44.8	42.6	74.0
9830.0	Average	Vertical	-12.9	44.8	31.9	54.0
9830.0	Peak	Horizontal	-1.5	44.8	43.3	74.0
9830.0	Average	Horizontal	-11.4	44.8	33.4	54.0
12287.5	Peak	Vertical	-2.0	47.0	45.0	74.0
12287.5	Average	Vertical	-11.7	47.0	35.3	54.0
12287.5	Peak	Horizontal	-2.4	47.0	44.6	74.0
12287.5	Average	Horizontal	-12.5	47.0	34.5	54.0

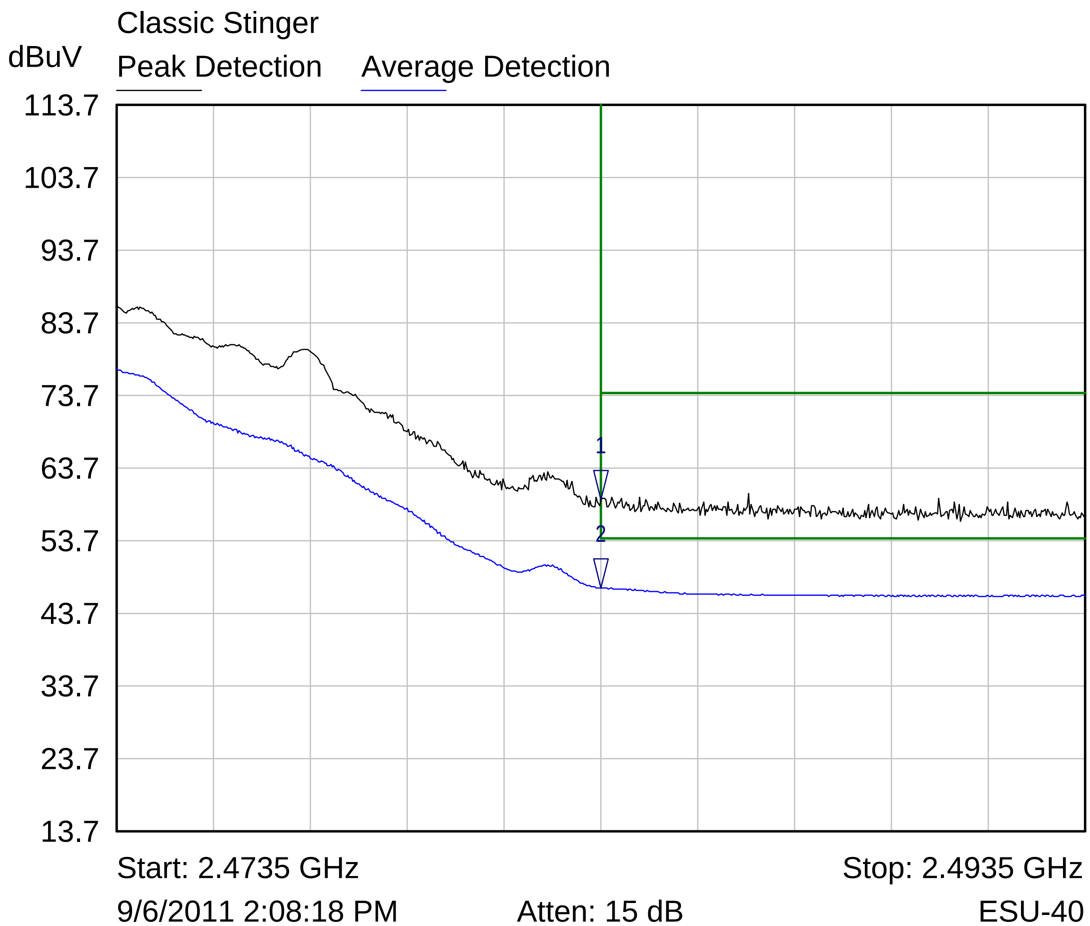
No other emissions were seen. Noise floor was greater than 6 dB below the limit.

Lower Channel Radiated Band Edge – Classic Stinger Antenna



Mkr	Trace	X-Axis	Value	Notes
1 ∇	Peak Detection	2.3900 GHz	62.12 dBuV	
2 ∇	Average Detection	2.3900 GHz	49.67 dBuV	

Upper Channel Radiated Band Edge – Classic Stinger Antenna



Mkr	Trace	X-Axis	Value	Notes
1 ∇	Peak Detection	2.4835 GHz	59.41 dBuV	
2 ∇	Average Detection	2.4835 GHz	47.17 dBuV	

6.2.5.2 Super Stinger Antenna

Transmitting at 2415 MHz – Super Stinger Antenna

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)
4830.0	Peak	Vertical	0.8	37.8	38.6	74.0
4830.0	Average	Vertical	-9.3	37.8	28.5	54.0
4830.0	Peak	Horizontal	1.1	37.8	38.9	74.0
4830.0	Average	Horizontal	-9.0	37.8	28.8	54.0
7245.0	Peak	Vertical	0.9	42.1	43.0	74.0
7245.0	Average	Vertical	-9.2	42.1	32.9	54.0
7245.0	Peak	Horizontal	0.9	42.1	43.0	74.0
7245.0	Average	Horizontal	-9.4	42.1	32.7	54.0
9660.0	Peak	Vertical	-0.9	44.7	43.8	74.0
9660.0	Average	Vertical	-11.6	44.7	33.1	54.0
9660.0	Peak	Horizontal	-1.9	44.4	42.5	74.0
9660.0	Average	Horizontal	-11.5	44.7	33.2	54.0
12075.0	Peak	Vertical	-2.3	47.2	44.9	74.0
12075.0	Average	Vertical	-12.0	47.2	35.2	54.0
12075.0	Peak	Horizontal	-1.8	47.2	45.4	74.0
12075.0	Average	Horizontal	-12.0	47.2	35.2	54.0

Transmitting at 2435 MHz – Super Stinger Antenna

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)
4870.0	Peak	Vertical	-0.5	37.9	37.4	74.0
4870.0	Average	Vertical	-10.1	37.9	27.8	54.0
4870.0	Peak	Horizontal	0.0	37.9	37.9	74.0
4780.0	Average	Horizontal	-10.1	37.9	27.8	54.0
7305.0	Peak	Vertical	-0.4	42.3	41.9	74.0
7305.0	Average	Vertical	-10.5	42.3	31.8	54.0

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBµV)	Correction Factor (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)
7305.0	Peak	Horizontal	-0.5	42.3	41.8	74.0
7305.0	Average	Horizontal	-9.9	42.3	32.4	54.0
9740.0	Peak	Vertical	-2.4	44.7	42.3	74.0
9740.0	Average	Vertical	-11.5	44.7	33.2	54.0
9740.0	Peak	Horizontal	-1.7	44.7	43.0	74.0
9740.0	Average	Horizontal	-11.6	44.7	33.1	54.0
12175.0	Peak	Vertical	-1.8	47.1	45.3	74.0
12175.0	Average	Vertical	-12.3	47.1	34.8	54.0
12175.0	Peak	Horizontal	-3.2	47.1	43.9	74.0
12175.0	Average	Horizontal	-12.6	47.1	34.5	54.0

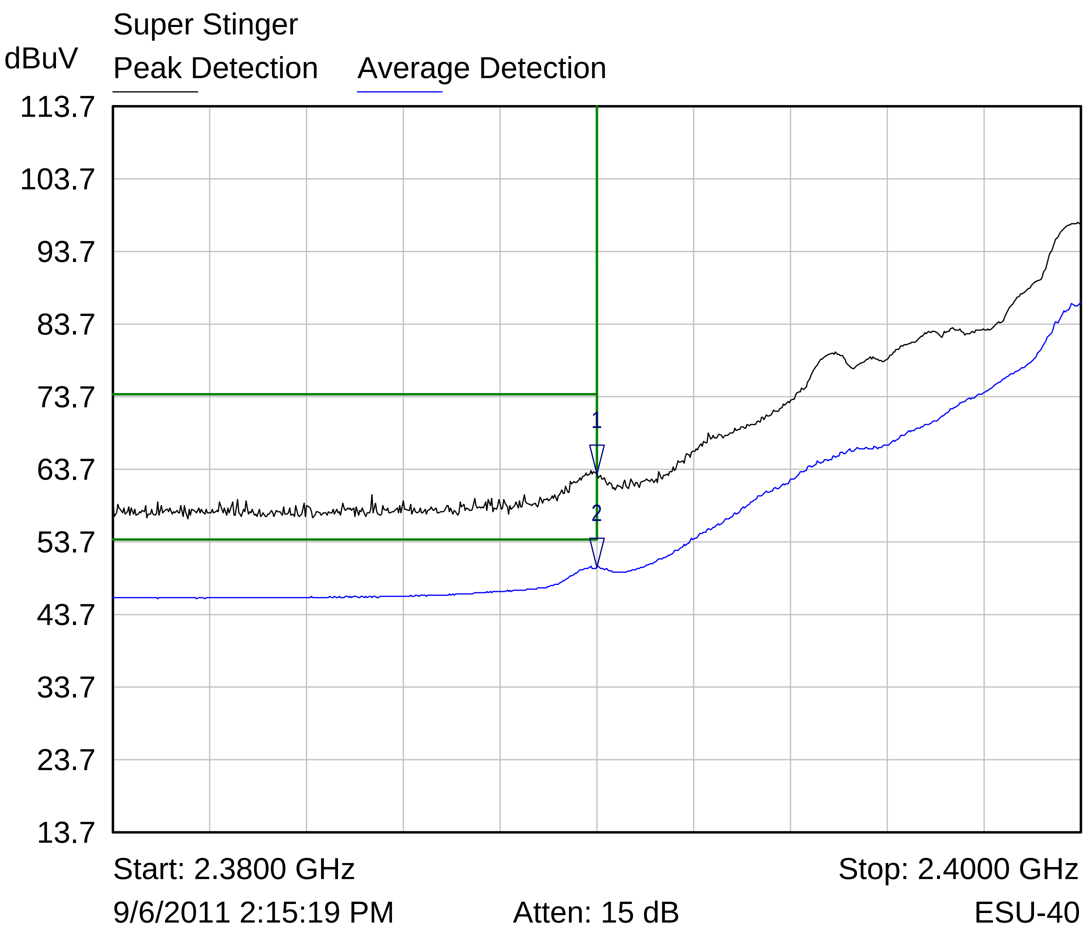
Transmitting at 2457.5 MHz – Super Stinger Antenna

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBµV)	Correction Factor (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)
4915.0	Peak	Vertical	-0.3	37.9	37.6	74.0
4915.0	Average	Vertical	-10.1	37.9	27.8	54.0
4915.0	Peak	Horizontal	-0.1	37.9	37.8	74.0
4915.0	Average	Horizontal	-10.4	37.9	27.5	54.0
7372.5	Peak	Vertical	1.1	42.4	43.5	74.0
7372.5	Average	Vertical	-9.8	42.4	32.6	54.0
7372.5	Peak	Horizontal	0.1	42.4	42.5	74.0
7372.5	Average	Horizontal	-9.1	42.4	33.3	54.0
9830.0	Peak	Vertical	-1.8	44.8	43.0	74.0
9830.0	Average	Vertical	-12.0	44.8	32.8	54.0
9830.0	Peak	Horizontal	-1.8	44.8	43.0	74.0
9830.0	Average	Horizontal	-11.4	44.8	33.4	54.0
12287.5	Peak	Vertical	-1.3	47.0	45.7	74.0
12287.5	Average	Vertical	-12.8	47.0	34.2	54.0
12287.5	Peak	Horizontal	-2.2	47.0	44.8	74.0

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBµV)	Correction Factor (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)
12287.5	Average	Horizontal	-12.2	47.0	34.5	54.0

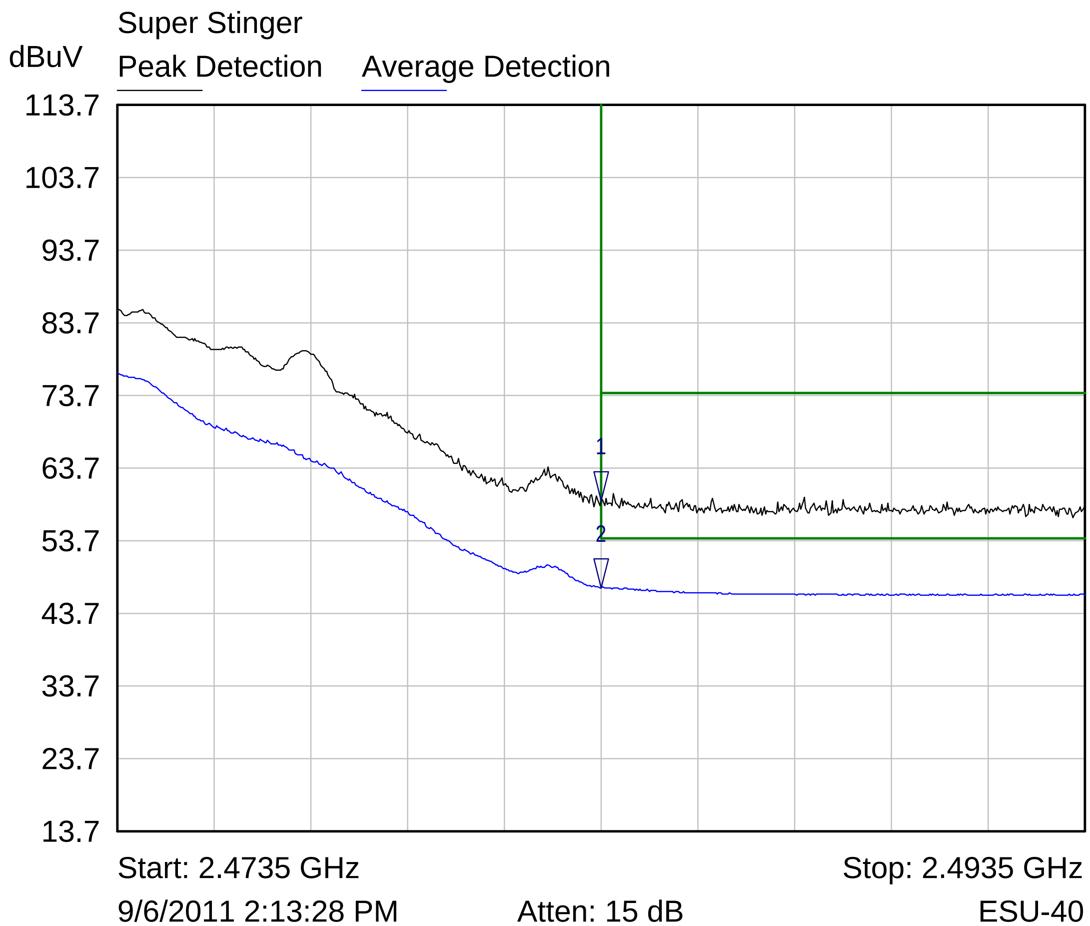
No other emissions were seen. Noise floor was greater than 6 dB below the limit.

Lower Channel Radiated Band Edge – Super Stinger Antenna



Mkr	Trace	X-Axis	Value	Notes
1 ▽	Peak Detection	2.3900 GHz	63.04 dBuV	
2 ▽	Average Detection	2.3900 GHz	50.19 dBuV	

Upper Channel Radiated Band Edge – Super Stinger Antenna



Mkr	Trace	X-Axis	Value	Notes
1 ∇	Peak Detection	2.4835 GHz	59.18 dBuV	
2 ∇	Average Detection	2.4835 GHz	47.21 dBuV	

6.2.5.3 RCL-3 Antenna

Transmitting at 2415 MHz – RCL-3 Antenna

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)
4830.0	Peak	Vertical	0.4	37.8	38.2	74.0
4830.0	Average	Vertical	-11.5	37.8	26.3	54.0
4830.0	Peak	Horizontal	0.1	37.8	37.9	74.0
4830.0	Average	Horizontal	-11.5	37.8	26.3	54.0
7245.0	Peak	Vertical	10.2	42.1	52.3	74.0
7245.0	Average	Vertical	-1.0	42.1	41.1	54.0
7245.0	Peak	Horizontal	0.3	42.1	42.4	74.0
7245.0	Average	Horizontal	-11.1	42.1	31.0	54.0
9660.0	Peak	Vertical	2.5	44.7	47.2	74.0
9660.0	Average	Vertical	-11.7	44.7	33.0	54.0
9660.0	Peak	Horizontal	-0.9	44.4	43.5	74.0
9660.0	Average	Horizontal	-13.6	44.7	31.1	54.0
12075.0	Peak	Vertical	14.1	47.2	61.3	74.0
12075.0	Average	Vertical	-1.4	47.2	45.8	54.0
12075.0	Peak	Horizontal	3.3	47.2	50.5	74.0
12075.0	Average	Horizontal	-10.5	47.2	36.7	54.0

Transmitting at 2435 MHz – RCL-3 Antenna

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)
4870.0	Peak	Vertical	0.7	37.9	38.6	74.0
4870.0	Average	Vertical	-10.4	37.9	27.5	54.0
4870.0	Peak	Horizontal	-0.3	37.9	37.6	74.0
4780.0	Average	Horizontal	-9.6	37.9	28.3	54.0
7305.0	Peak	Vertical	9.0	42.3	51.3	74.0
7305.0	Average	Vertical	-5.8	42.3	36.5	54.0

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBµV)	Correction Factor (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)
7305.0	Peak	Horizontal	0.5	42.3	42.8	74.0
7305.0	Average	Horizontal	-9.6	42.3	32.7	54.0
9740.0	Peak	Vertical	2.5	44.7	47.2	74.0
9740.0	Average	Vertical	-11.5	44.7	33.2	54.0
9740.0	Peak	Horizontal	-2.2	44.7	42.5	74.0
9740.0	Average	Horizontal	-11.5	44.7	33.2	54.0
12175.0	Peak	Vertical	6.7	47.1	53.8	74.0
12175.0	Average	Vertical	-7.9	47.1	39.2	54.0
12175.0	Peak	Horizontal	0.5	47.1	47.6	74.0
12175.0	Average	Horizontal	-13.6	47.1	33.5	54.0

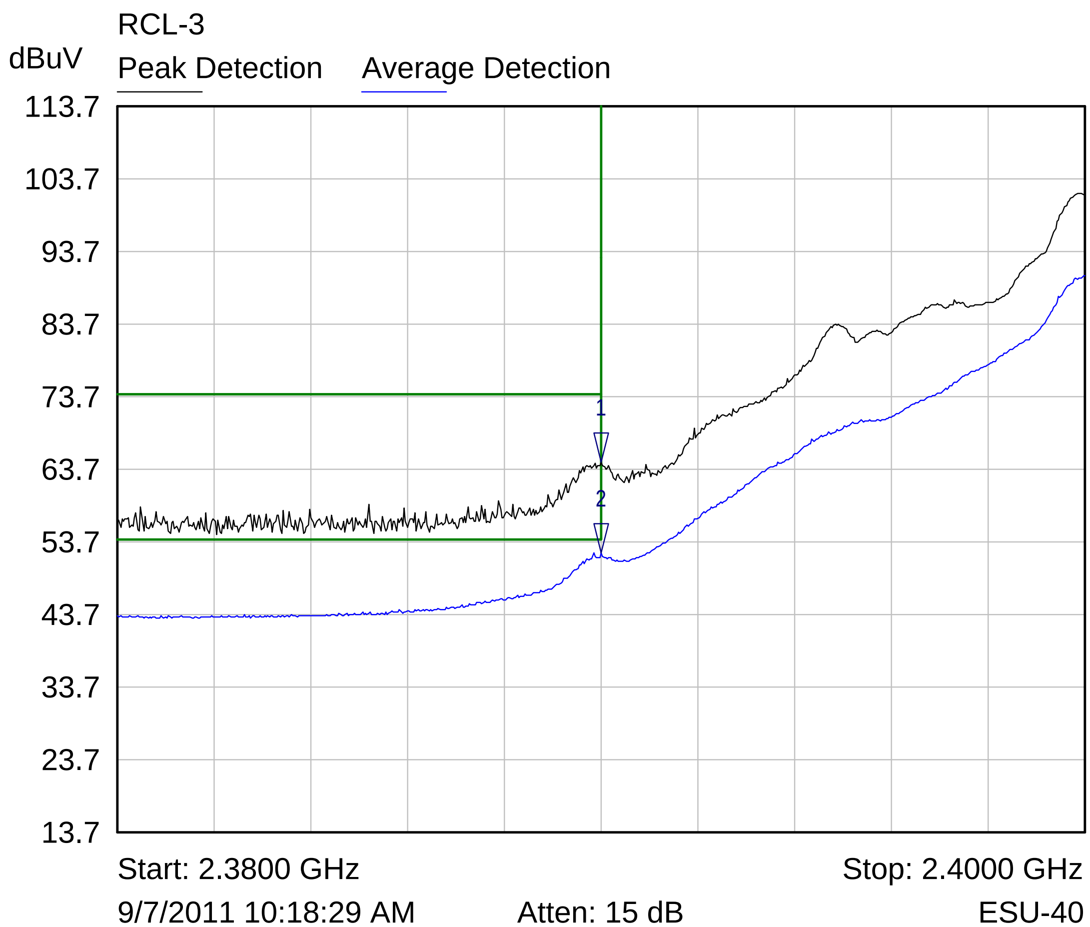
Transmitting at 2457.5 MHz – RCL-3 Antenna

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBµV)	Correction Factor (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)
4915.0	Peak	Vertical	-0.4	37.9	37.5	74.0
4915.0	Average	Vertical	-11.7	37.9	26.2	54.0
4915.0	Peak	Horizontal	0.5	37.9	38.4	74.0
4915.0	Average	Horizontal	-11.3	37.9	26.6	54.0
7372.5	Peak	Vertical	3.9	42.4	46.3	74.0
7372.5	Average	Vertical	-11.4	42.4	31.0	54.0
7372.5	Peak	Horizontal	0.1	42.4	42.5	74.0
7372.5	Average	Horizontal	-11.4	42.4	31.0	54.0
9830.0	Peak	Vertical	-0.3	44.8	44.5	74.0
9830.0	Average	Vertical	-12.2	44.8	32.6	54.0
9830.0	Peak	Horizontal	-1.6	44.8	43.2	74.0
9830.0	Average	Horizontal	-13.9	44.8	30.9	54.0
12287.5	Peak	Vertical	0.1	47.0	47.1	74.0
12287.5	Average	Vertical	-12.4	47.0	34.6	54.0
12287.5	Peak	Horizontal	-1.0	47.0	46.0	74.0

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBµV)	Correction Factor (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)
12287.5	Average	Horizontal	-13.8	47.0	33.2	54.0

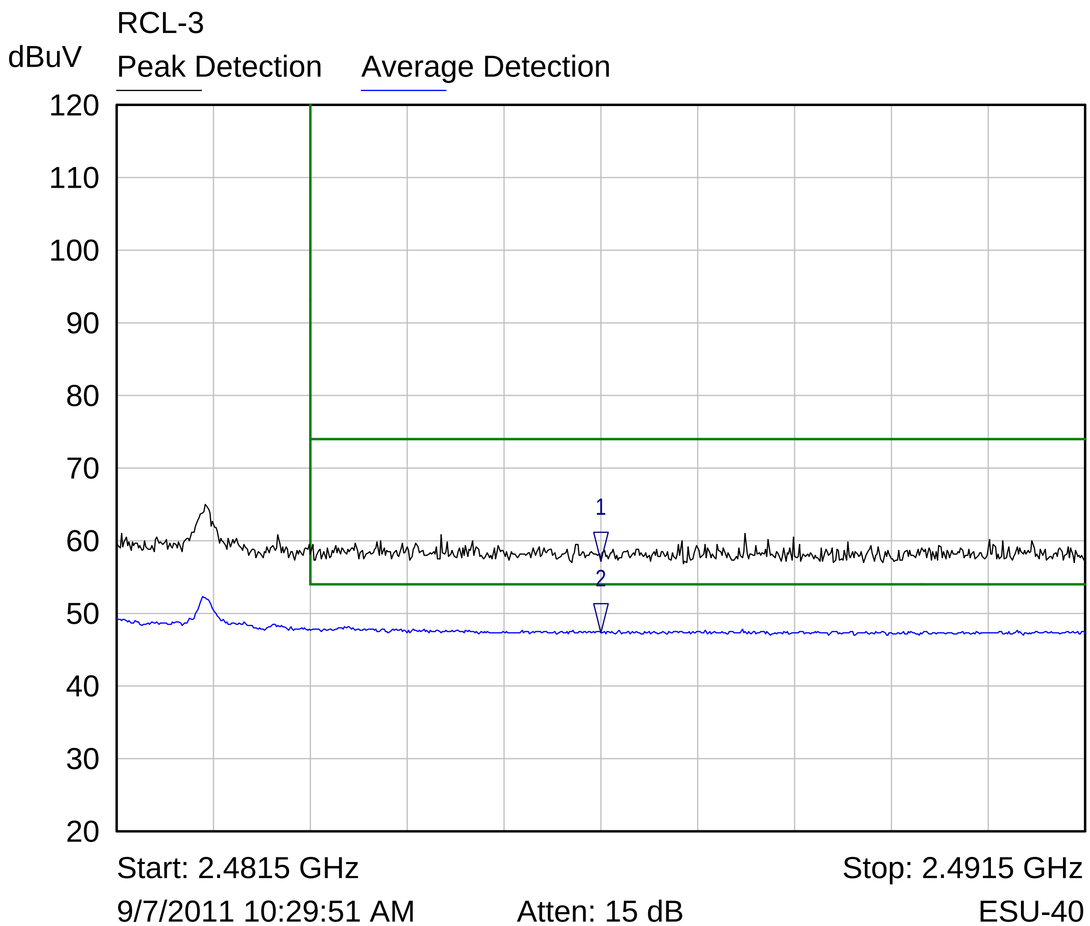
No other emissions were seen. Noise floor was greater than 6 dB below the limit.

Lower Channel Radiated Band Edge – RCL-3 Antenna



Mkr	Trace	X-Axis	Value	Notes
1 ▽	Peak Detection	2.3900 GHz	64.62 dBuV	
2 ▽	Average Detection	2.3900 GHz	52.19 dBuV	

Upper Channel Radiated Band Edge – RCL-3 Antenna



Mkr	Trace	X-Axis	Value	Notes
1 ∇	Peak Detection	2.4865 GHz	57.09 dBuV	
2 ∇	Average Detection	2.4865 GHz	47.35 dBuV	

6.2.6 §15.247(d) Peak Power Spectral Density

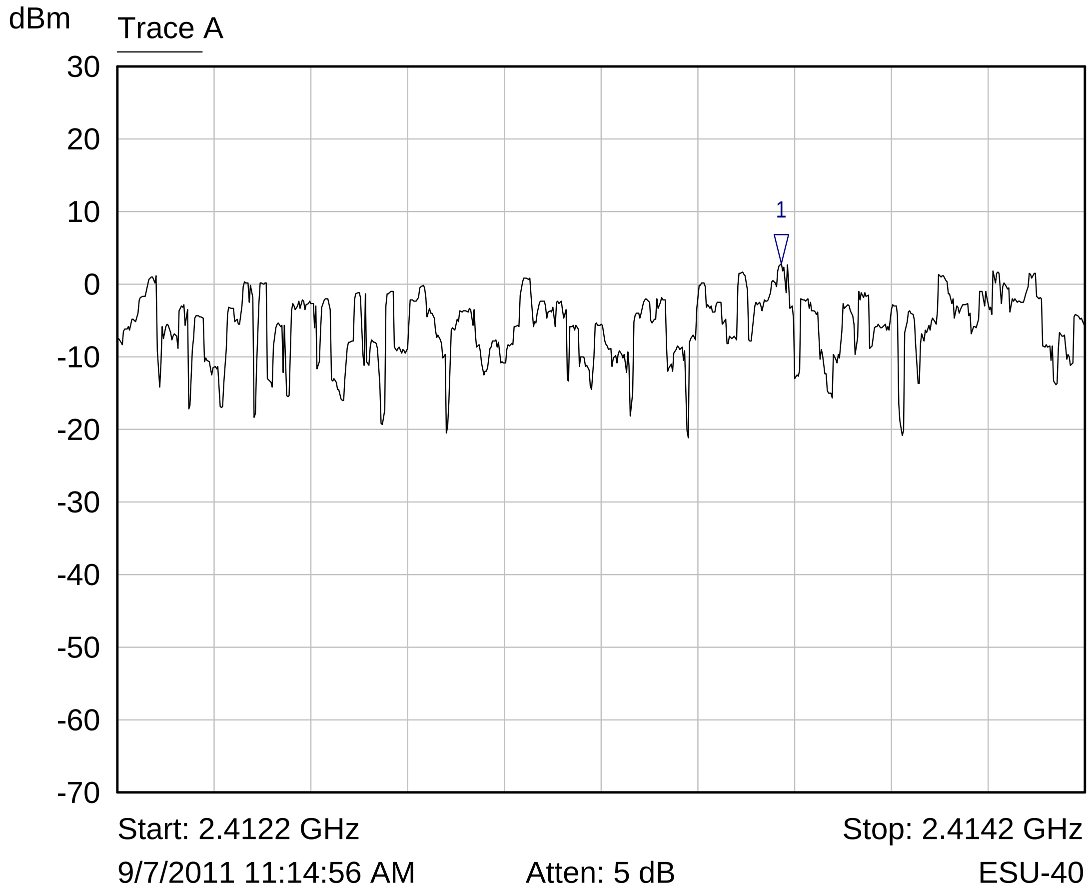
The peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. Since the method described in Power Output Option 2, Method #1 of the attachment to FCC Public Notice DA000705 was used to measure and sum the power, the method in PSD Option 2 of the attachment to FCC Public Notice DA000705 was used to measure the 3 kHz power spectral density of the emission. This testing was performed at the maximum transmitter setting of FC000000. Each of the antenna configurations required the power to be reduced; therefore, if the power spectral density complies at the maximum setting, the reduced power levels should also be deemed to comply. The result of this testing is summarized in the table below.

Frequency (MHz)	3 kHz Power Spectral Density (dBm)
2415.0	2.78
2435.0	3.79
2457.5	3.80

RESULT

The maximum peak power spectral density was 3.80 dBm. The EUT complies with the specification by 4.2 dB.

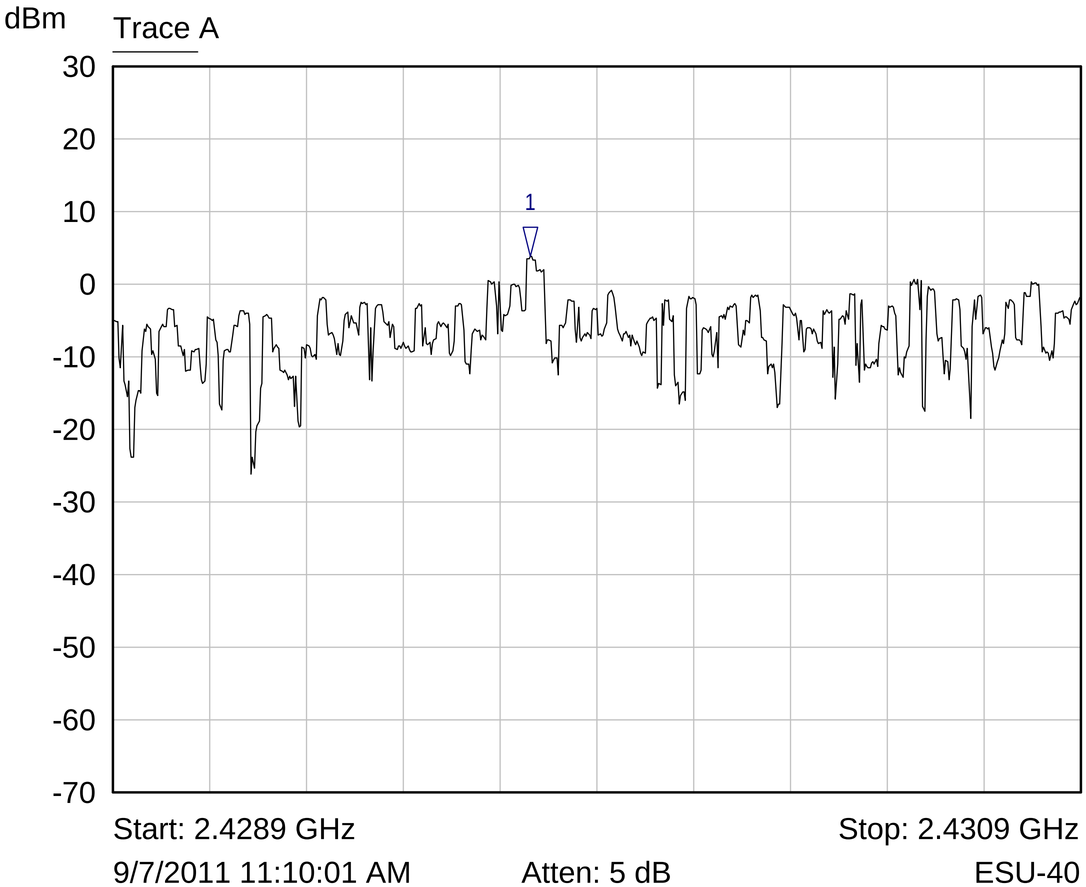
Transmitting at 2415 MHz



Mkr	Trace	X-Axis	Value	Notes
1 ▽	Trace A	2.4136 GHz	2.78 dBm	

Power at FC000000

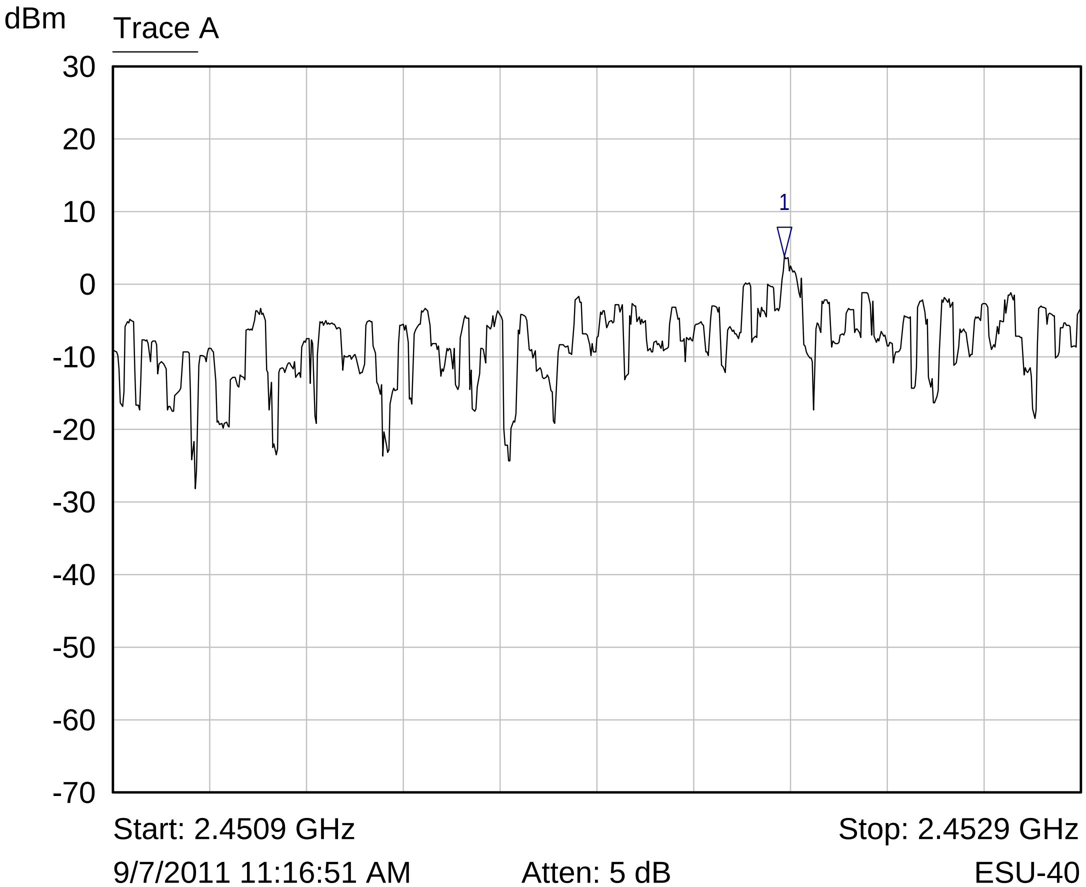
Transmitting at 2435 MHz



Mkr	Trace	X-Axis	Value	Notes
1 ▽	Trace A	2.4298 GHz	3.79 dBm	

Power at FC000000

Transmitting at 2457.5 MHz



Mkr	Trace	X-Axis	Value	Notes
1 ∇	Trace A	2.4523 GHz	3.80 dBm	

Power at FC000000

APPENDIX 1 TEST PROCEDURES AND TEST EQUIPMENT

A1.1 §15.207 Conducted Disturbance at the AC Mains

The conducted disturbance at mains ports from the EUT was measured using a spectrum analyzer with a quasi-peak adapter for peak, quasi-peak and average readings. The quasi-peak adapter uses a bandwidth of 9 kHz, with the spectrum analyzer's resolution bandwidth set at 100 kHz, for readings in the 150 kHz to 30 MHz frequency ranges.

The conducted disturbance at mains ports measurements are performed in a screen room using a (50 Ω/50 μH) Line Impedance Stabilization Network (LISN).

Where mains flexible power cords are longer than 1 m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4 m in length.

Where the EUT is a collection of equipment with each device having its own power cord, the point of connection for the LISN is determined from the following rules:

a) Each power cord, which is terminated in a mains supply plug, shall be tested separately.
b) Power cords, which are not specified by the manufacturer to be connected via a host unit, shall be tested separately.
c) Power cords which are specified by the manufacturer to be connected via a host unit or other power supplying equipment shall be connected to that host unit and the power cords of that host unit connected to the LISN and tested.
d) Where a special connection is specified, the necessary hardware to effect the connection is supplied by the manufacturer for the testing purpose.
e) When testing equipment with multiple mains cords, those cords not under test are connected to an artificial mains network (AMN) different than the AMN used for the mains cord under test.

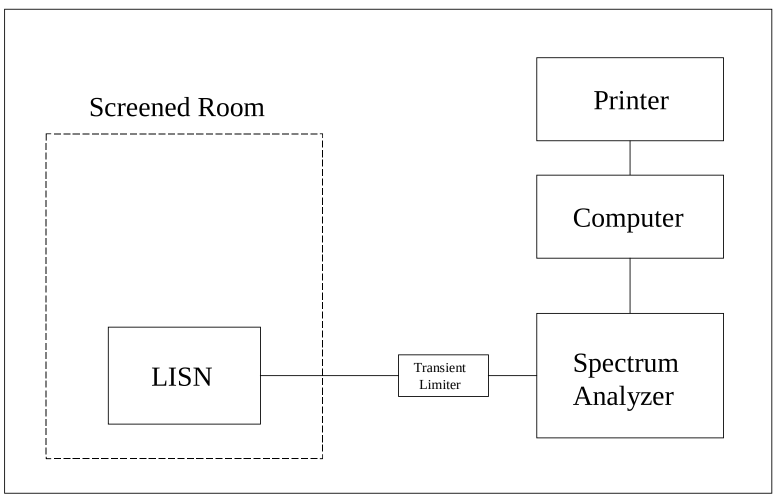
For AC mains port testing the desktop EUT are placed on a non-conducting table at least 0.8 meters from the metallic floor. The equipment is placed a minimum of 40 cm from all walls. Floor standing equipment is placed directly on the earth grounded floor.

Type of Equipment	Manufacturer	Model Number	Serial Number	Date of Last Calibration
Wanship Open Area Test Site #2	Nemko-CCL, Inc.	N/A	N/A	11/15/2010
Test Software	Nemko-CCL, Inc.	Conducted Emissions	Revision 1.2	N/A
Spectrum Analyzer	Hewlett Packard	8566B	2230A01711	01/05/2011
Quasi-Peak Detector	Hewlett Packard	85650A	2043A00137	01/05/2011

Type of Equipment	Manufacturer	Model Number	Serial Number	Date of Last Calibration
LISN	EMCO	3825/2	9305-2099	03/07/2011
Conductance Cable Wanship Site #2	Nemko-CCL, Inc.	Cable J	N/A	12/21/2010
Transient Limiter	Hewlett Packard	11947A	3107A02266	12/21/2010

An independent calibration laboratory or Nemko-CCL, Inc. personnel calibrates all the equipment listed above at intervals defined in ANSI C63.4:2003 Section 4.4 following outlined calibration procedures. All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to tractability is on file and is available for examination upon request.

Conducted Emissions Test Setup



A1.2 §15.247(a)(2) Emission Bandwidth

The EUT was connected to the spectrum analyzer using an attenuator via the antenna output port as shown in the block diagram below.

The measurements were performed on three channels, as per 47 CFR 15.31(m), one near the bottom of the spectrum, one near the middle of the spectrum and one near the top of the spectrum.

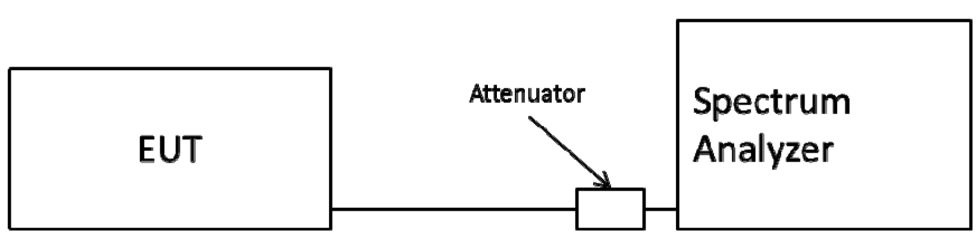
The spectrum analyzer's resolution bandwidth and video bandwidth were set as follows:

RBW = 100 kHz
VBW = 300 kHz

Type of Equipment	Manufacturer	Model Number	Serial Number
Spectrum Analyzer	Hewlett Packard	8566B	2230A01711
Quasi-Peak Detector	Hewlett Packard	85650A	2043A00137
Spectrum Analyzer/Receiver	Rohde & Schwarz	1302.6005.40	100064
Low Loss Cable (1 dB)	N/A	N/A	N/A

An independent calibration laboratory or Nemko-CCL, Inc. personnel calibrates all the equipment listed above at intervals defined in ANSI C63.4:2003 Section 4.4 following outlined calibration procedures. All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to tractability is on file and is available for examination upon request.

Test Configuration Block Diagram



A1.3 §15.247(b)(3) Peak Output Power

The EUT was connected to the spectrum analyzer using an attenuator via the antenna output port as shown in the block diagram below.

The measurements were performed on three channels, as per 47 CFR 15.31(m), one near the bottom of the spectrum, one near the middle of the spectrum and one near the top of the spectrum.

The spectrum analyzer's resolution bandwidth and video bandwidth were set as follows:

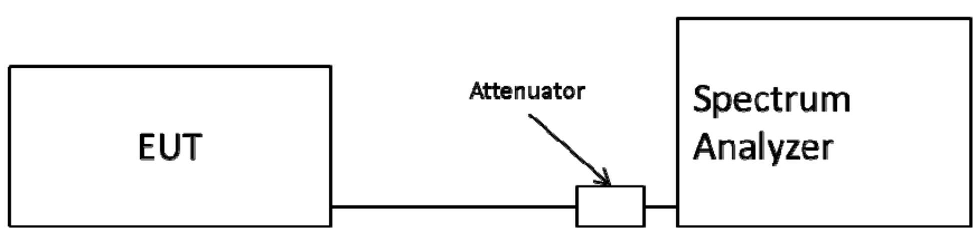
RBW = 1 MHz

VBW = >1 MHz

Type of Equipment	Manufacturer	Model Number	Serial Number
Spectrum Analyzer	Hewlett Packard	8566B	2230A01711
Quasi-Peak Detector	Hewlett Packard	85650A	2043A00137
Spectrum Analyzer/Receiver	Rohde & Schwarz	1302.6005.40	100064
Low Loss Cable (1 dB)	N/A	N/A	N/A

An independent calibration laboratory or Nemko-CCL, Inc. personnel calibrates all the equipment listed above at intervals defined in ANSI C63.4:2003 Section 4.4 following outlined calibration procedures. All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to tractability is on file and is available for examination upon request.

Test Configuration Block Diagram



A1.4 §15.247(c) Conducted Spurious Emissions

The EUT was connected to the spectrum analyzer using an attenuator via the antenna output port as shown in the block diagram below.

The measurements were performed on three channels, as per 47 CFR 15.31(m), one near the bottom of the spectrum, one near the middle of the spectrum and one near the top of the spectrum.

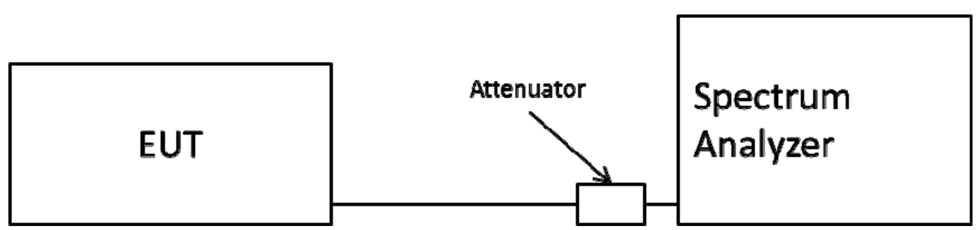
The spectrum analyzer's resolution bandwidth and video bandwidth were set as follows:

RBW = 100 kHz
VBW = 300 kHz

Type of Equipment	Manufacturer	Model Number	Serial Number
Spectrum Analyzer	Hewlett Packard	8566B	2230A01711
Quasi-Peak Detector	Hewlett Packard	85650A	2043A00137
Spectrum Analyzer/Receiver	Rohde & Schwarz	1302.6005.40	100064
Low Loss Cable (1 dB)	N/A	N/A	N/A

An independent calibration laboratory or Nemko-CCL, Inc. personnel calibrates all the equipment listed above at intervals defined in ANSI C63.4:2003 Section 4.4 following outlined calibration procedures. All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to tractability is on file and is available for examination upon request.

Test Configuration Block Diagram



A1.5 §15.109 and §15.247(c) Radiated Spurious Emissions in the Restricted Bands

The radiated emissions from the intentional radiator were measured using a spectrum analyzer with a quasi-peak adapter for peak and quasi-peak readings. An amplifier and preamplifier were used to increase the sensitivity of the measuring instrumentation. The quasi-peak adapter uses a bandwidth of 120 kHz, with the spectrum analyzer's resolution bandwidth set at 1 MHz, for readings in the 30 to 1000 MHz frequency ranges. For peak emissions above 1000 MHz the spectrum analyzer’s resolution bandwidth was set to 1 MHz and the video bandwidth was set to 3 MHz. For average emissions above 1000 MHz the spectrum analyzer’s resolution bandwidth was set to 1 MHz and the average detector of the analyzer was used.

A biconilog antenna was used to measure the frequency range of 30 to 1000 MHz and a Double Ridge Guide Horn antenna was used to measure the frequency range of 1 GHz to 18 GHz, and a Pyramidal Horn antenna was used to measure the frequency range of 18 GHz to 25 GHz, at a distance of 3 meters and 1 meter from the EUT. The readings obtained by the antenna are correlated to the levels obtained with a tuned dipole antenna by adding antenna factors.

The configuration of the intentional radiator was varied to find the maximum radiated emission. The intentional radiator was connected to the peripherals listed in Section 2.4 via the interconnecting cables listed in Section 2.5. These interconnecting cables were manipulated manually by a technician to obtain worst case radiated emissions. The intentional radiator was rotated 360 degrees, and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission. Where there are multiple interface ports all of the same type, cables are either placed on all of the ports or cables added to these ports until the emissions do not increase by more than 2 dB.

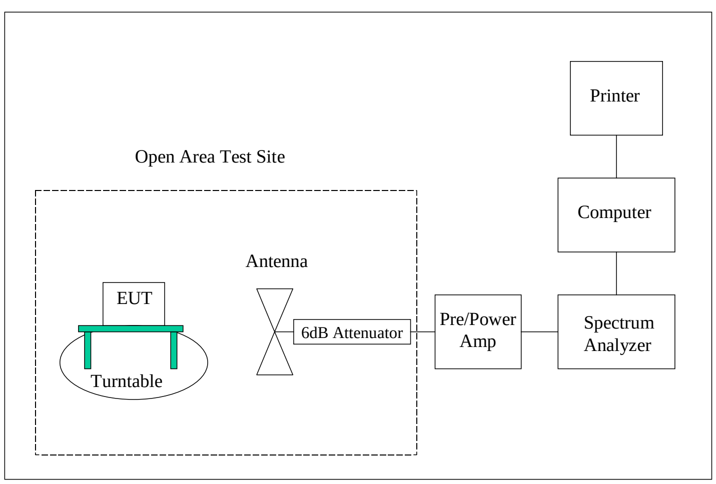
Desktop intentional radiators are measured on a non-conducting table 80 centimeters above the ground plane. The table is placed on a turntable which is level with the ground plane. The turntable has slip rings, which supply AC power to the intentional radiator. For equipment normally placed on floors, the equipment shall be placed directly on the turntable.

Type of Equipment	Manufacturer	Model Number	Serial Number	Date of Last Calibration
Wanship Open Area Test Site #2	Nemko-CCL, Inc.	N/A	N/A	11/15/2010
Test Software	Nemko-CCL, Inc.	Radiated Emissions	Revision 1.3	N/A
Spectrum Analyzer/Receiver	Rohde & Schwarz	1302.6005.40	100064	07/28/2011
Spectrum Analyzer	Hewlett Packard	8566B	2230A01711	01/05/2011
Quasi-Peak Detector	Hewlett Packard	85650A	2043A00137	01/05/2011

Type of Equipment	Manufacturer	Model Number	Serial Number	Date of Last Calibration
Biconilog Antenna	EMCO	3142	9601-1008	10/15/2010
Double Ridged Guide Antenna	EMCO	3115	9604-4779	03/10/2011
High Frequency Amplifier	Miteq	AFS4-01002650-35-10P-4	1637474	05/25/2011
20' High Frequency Cable	Microcoax	UFB197C-1-3120-000000	1297	05/10//2011
3 Meter Radiated Emissions Cable Wanship Site #2	Microcoax	UFB205A-0-4700-000000	1295	05/10/2011
Pre/Power-Amplifier	Hewlett Packard	8447F	3113A05161	08/25/2011
6 dB Attenuator	Hewlett Packard	8491A	32835	12/21/2010

An independent calibration laboratory or Nemko-CCL, Inc. personnel calibrates all the equipment listed above at intervals defined in ANSI C63.4:2003 Section 4.4 following outlined calibration procedures. All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to tractability is on file and is available for examination upon request.

Radiated Emissions Test Setup



A1.6 §15.247(d) Peak Power Spectral Density

The EUT was connected to the spectrum analyzer using an attenuator via the antenna output port as shown in the block diagram below.

The measurements were performed on three channels, as per 47 CFR 15.31(m), one near the bottom of the spectrum, one near the middle of the spectrum and one near the top of the spectrum.

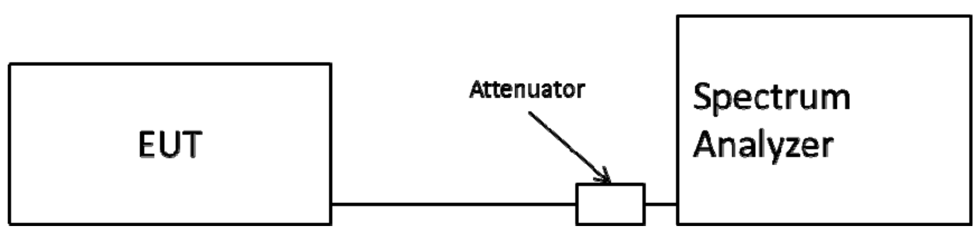
The spectrum analyzer's resolution bandwidth and video bandwidth were set as follows:

RBW = 3 kHz
VBW = 10 kHz

Type of Equipment	Manufacturer	Model Number	Serial Number
Spectrum Analyzer	Hewlett Packard	8566B	2230A01711
Quasi-Peak Detector	Hewlett Packard	85650A	2043A00137
Spectrum Analyzer/Receiver	Rohde & Schwarz	1302.6005.40	100064
Low Loss Cable (1 dB)	N/A	N/A	N/A

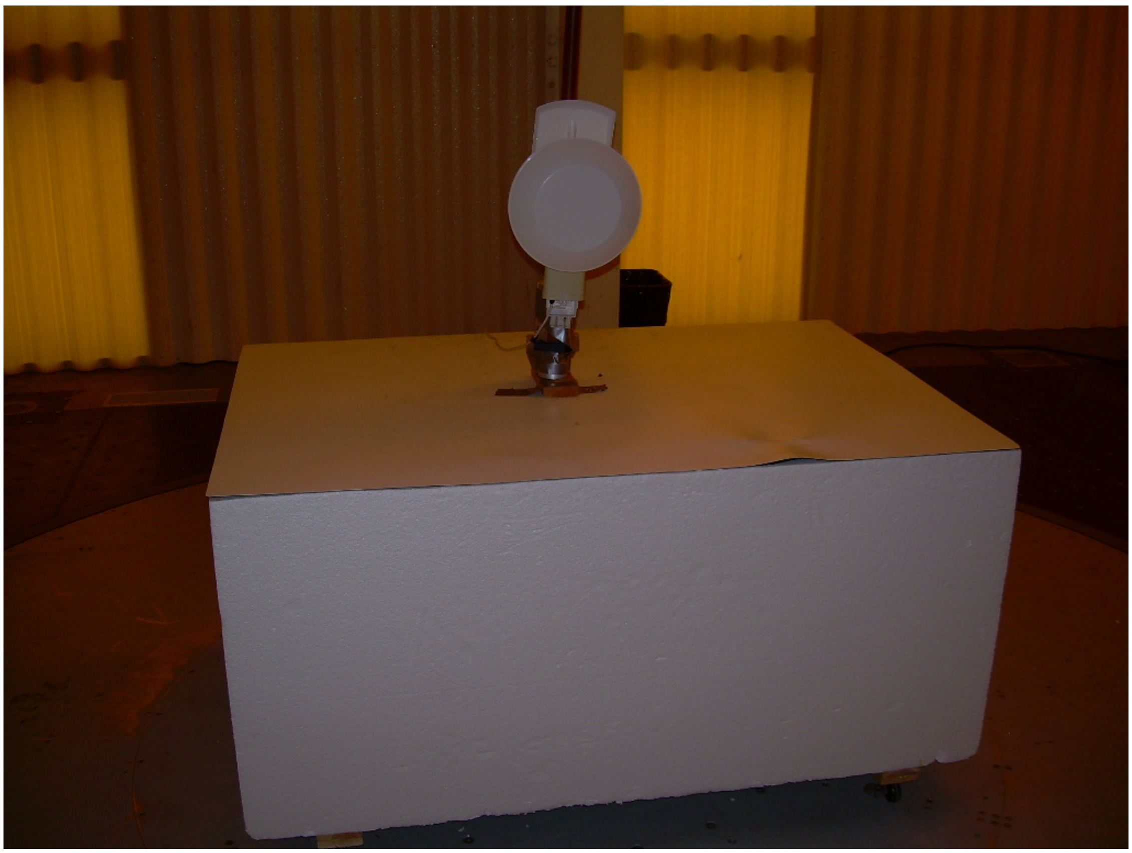
An independent calibration laboratory or Nemko-CCL, Inc. personnel calibrates all the equipment listed above at intervals defined in ANSI C63.4:2003 Section 4.4 following outlined calibration procedures. All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to tractability is on file and is available for examination upon request.

Test Configuration Block Diagram

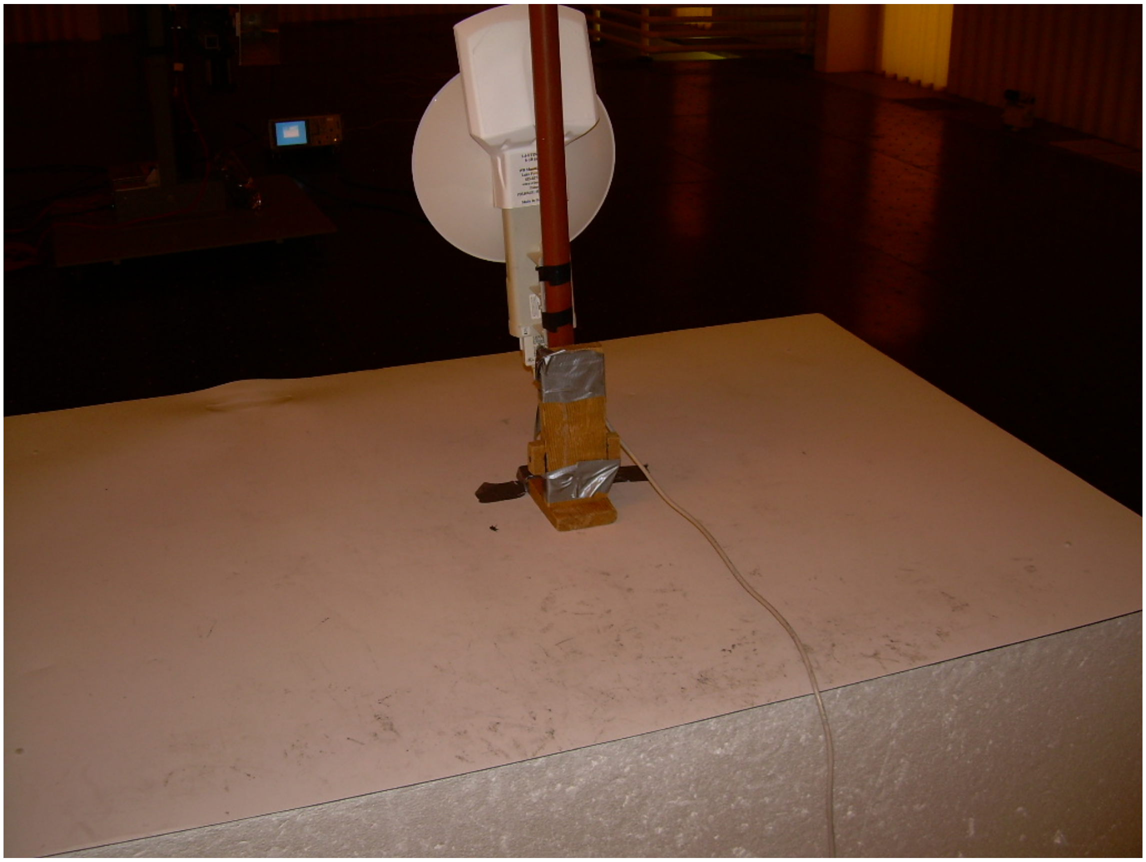


APPENDIX 2 PHOTOGRAPHS

Photograph 1 – Front View Radiated Disturbance – Classic Stinger Antenna

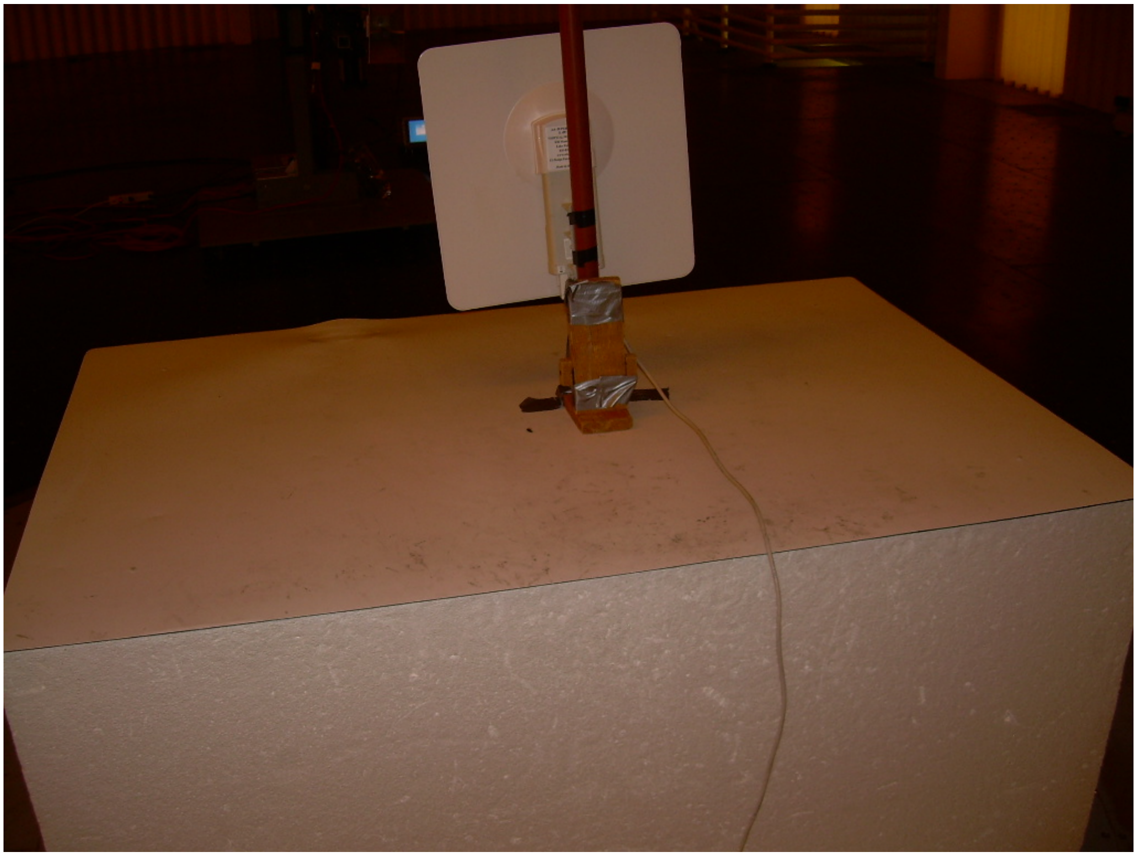


Photograph 2 – Back View Radiated Disturbance – Classic Stinger Antenna



Photograph 3 – Front View Radiated Disturbance – Super Stinger Antenna

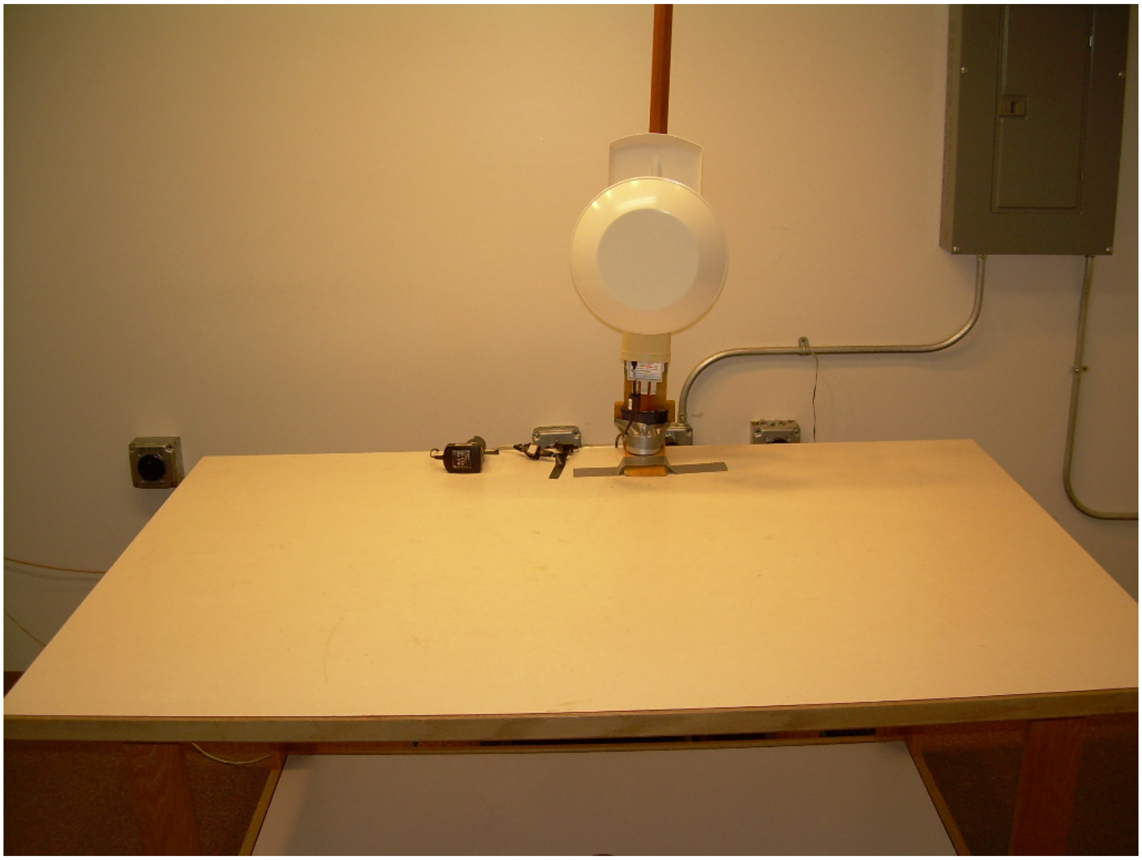
Photograph 4 – Back View Radiated Disturbance – Super Stinger Antenna



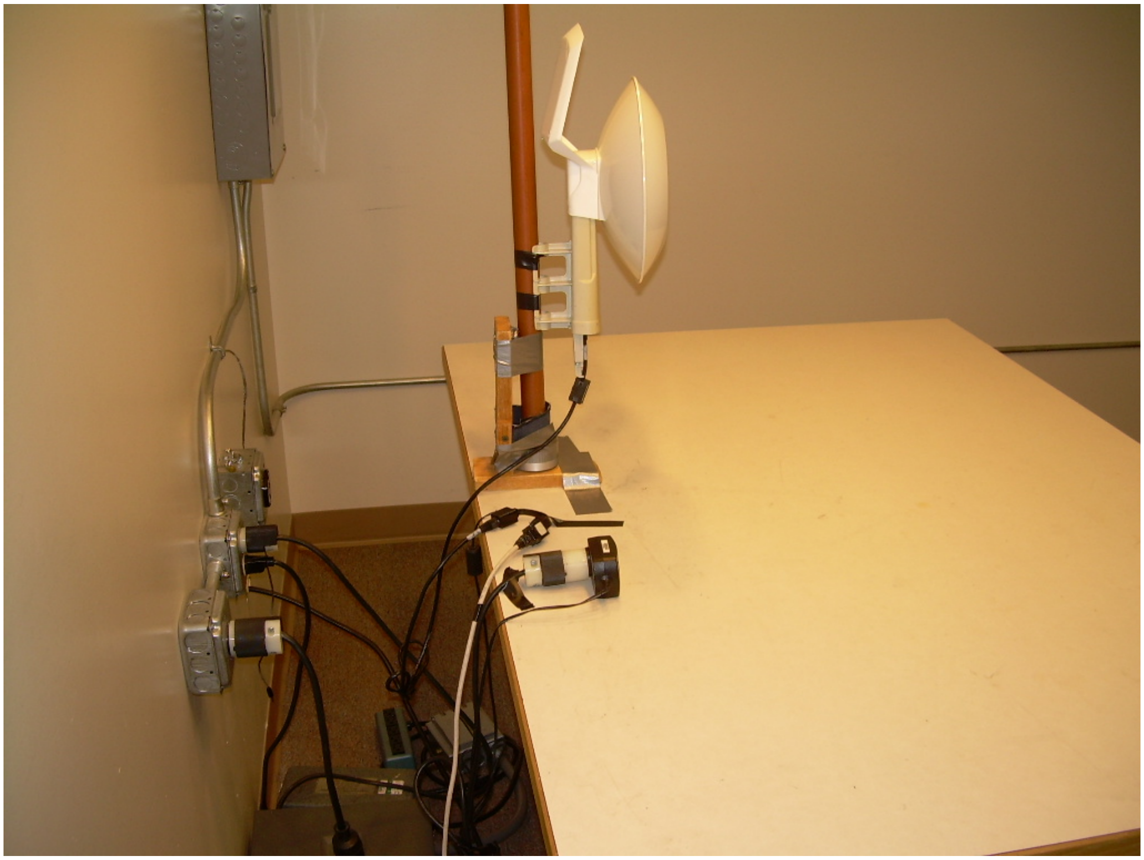
Photograph 5 – Front View Radiated Disturbance – RCL-3 Antenna

Photograph 6 – Back View Radiated Disturbance – RCL-3 Antenna

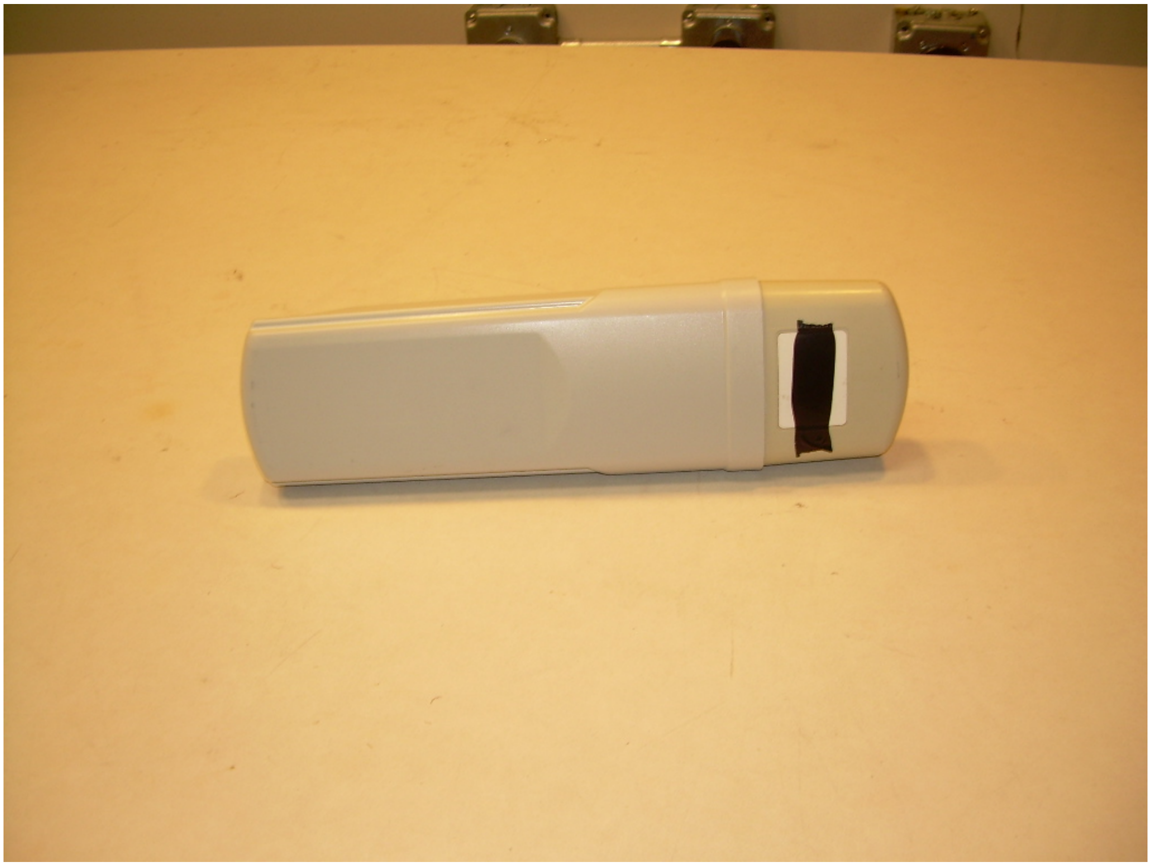
Photograph 7 – Front View Conducted Disturbance Test Setup



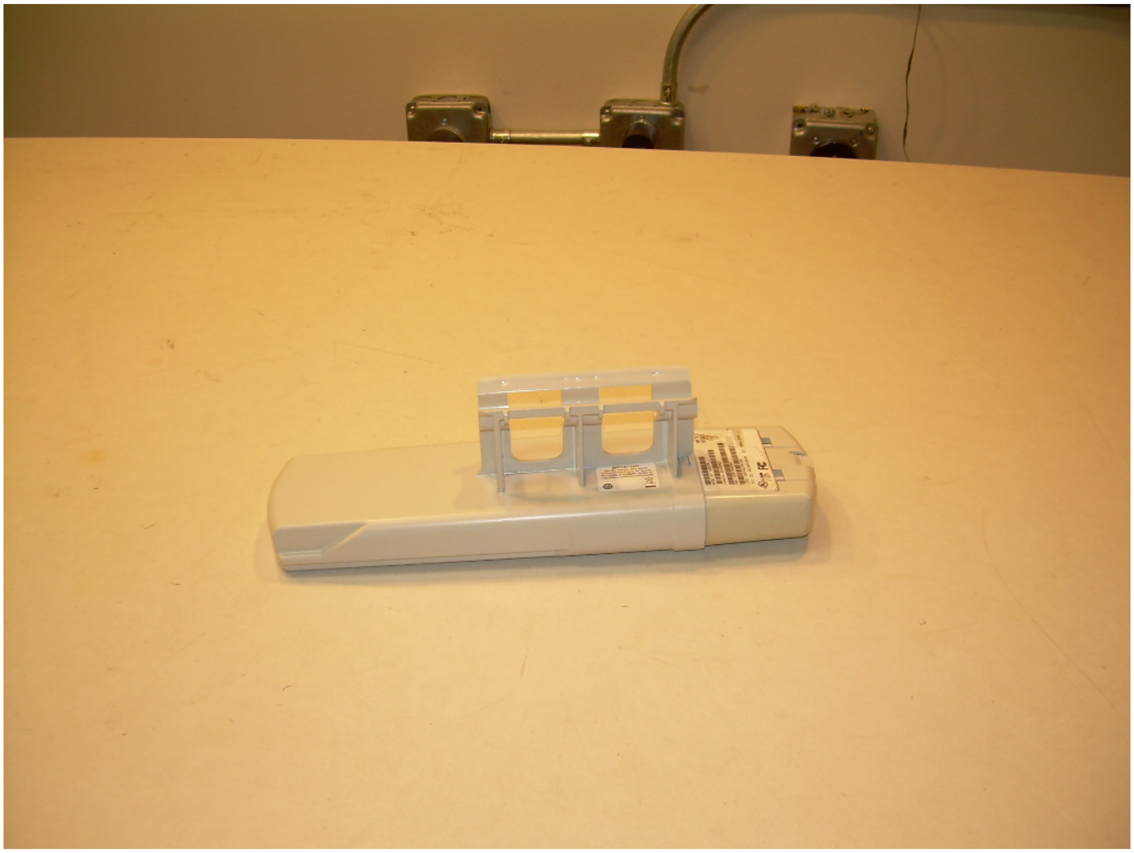
Photograph 8 – Back View Conducted Disturbance Test Setup



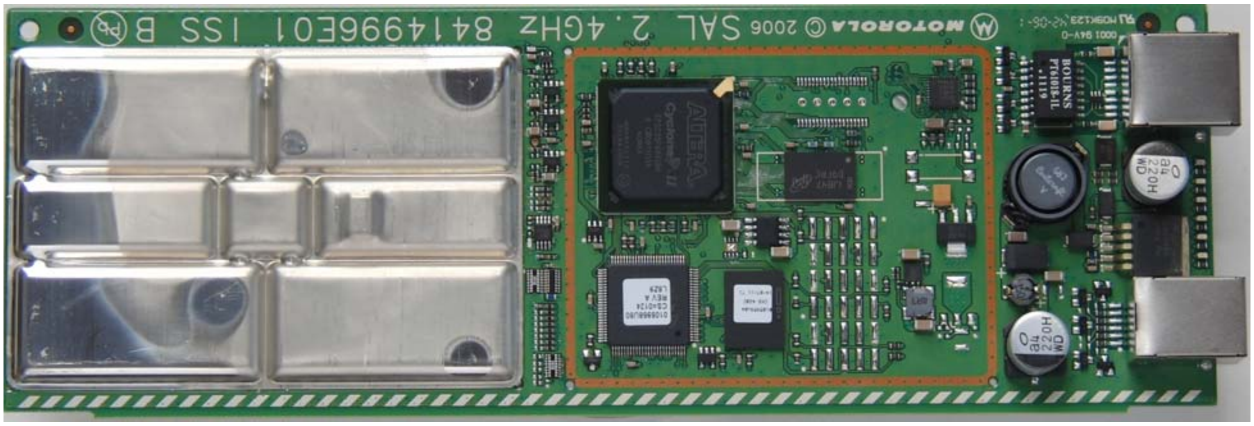
Photograph 9 – Front View of the Stinger



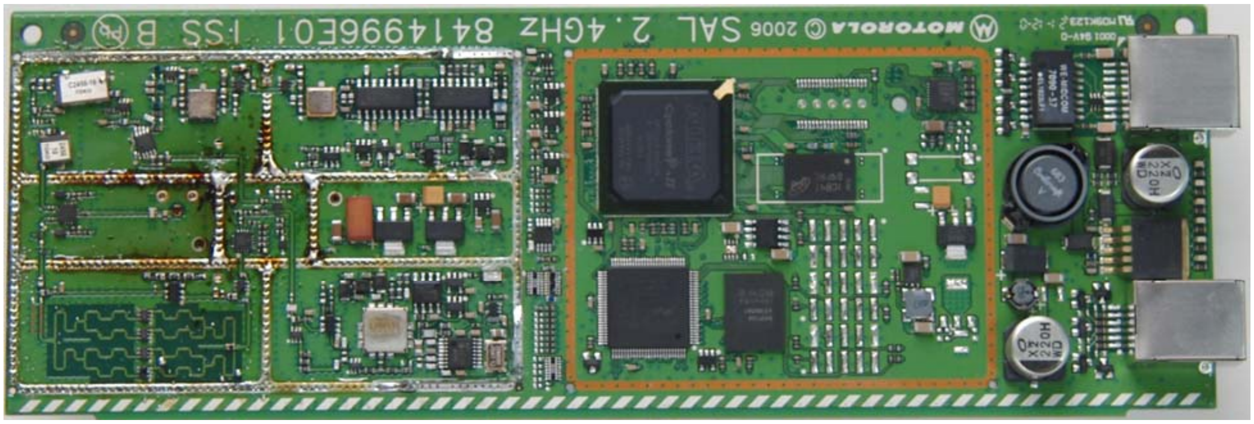
Photograph 10 – Back View of the Stinger



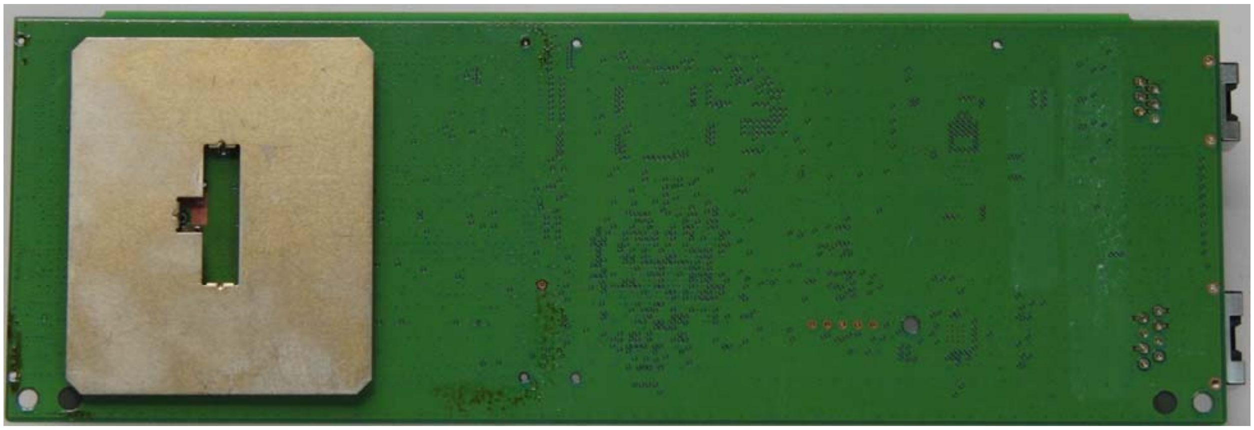
Photograph 11 – View of the Stinger PCB – Component Side



Photograph 12 – View of the Stinger PCB – Component Side with RF Shield Removed



Photograph 13 – View of the Stinger PCB – Antenna Side



Photograph 14 – Front View of the Classic Stinger Antenna

Photograph 15 – Back View of the Classic Stinger Antenna

Photograph 16 – Front View of the Super Stinger Antenna

Photograph 17 – Back View of the Super Stinger Antenna

Photograph 18 – Front View of the RCL-3 Antenna

Photograph 19 –Back View of the RCL-3 Antenna

APPENDIX 3 MANUFACTURER'S STATEMENT/ATTESTATION

The manufacturer or responsible party for the equipment tested hereby affirms:

a) That he/she has reviewed and concurs that the tests shown in this report are reflective of the operational characteristics of the device for which certification is sought;
b) That the device in this test report will be representative of production units;
c) That the product will have all of the documented modifications incorporated into the product when manufactured and placed on the market;
d) That all changes in hardware and software/firmware to the subject device will be reviewed.
e) That any changes impacting the attributes, functionality or operational characteristics documented in this report will be communicated to the body responsible for approving or certifying the subject equipment.

James C. McCown	[signature]	9-14-2011
Printed name of official	Signature of official	Date

NOTE—This affirmation must be signed by the responsible party before it is submitted to a regulatory body for approval.