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EMC Test Report

Application for Grant of Equipment Authorization

Industry Canada RSS-Gen Issue 4 / RSS 247 Issue 1
FCC Part 15 Subpart C

Model: Botvac Connected

IC CERTIFICATION #:	12757A-LEMIQ
FCC ID:	2ABSSLEMIQ
APPLICANT:	Neato Robotics 8100 Jarvis Avenue, Suite 100 Newark, CA 94560
TEST SITE(S):	National Technical Systems - Silicon Valley 41039 Boyce Road. Fremont, CA. 94538-2435
IC SITE REGISTRATION #:	2845B-4
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A2LA ACCREDITED
Testing Cert #0214.26

REVISION HISTORY

Rev#	Date	Comments	Modified By
-	August 13, 2015	First release	
1	August 25, 2015	Removed references to incorrect power settings. Clarified RF conducted emission measurement settings. Corrected standard references in page 18 as RSS-247	Deniz Demirci

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SCOPE

An electromagnetic emissions test has been performed on the Neato Robotics model Botvac Connected, pursuant to the following rules:

Industry Canada RSS-Gen Issue 4
RSS 247 Issue 1 "Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices"
FCC Part 15 Subpart C

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards and as outlined in National Technical Systems - Silicon Valley test procedures:

ANSI C63.10-2013
FCC DTS Measurement Guidance KDB558074

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant Industry Canada performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

OBJECTIVE

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section.

Prior to marketing in the USA, all unlicensed transmitters and transceivers require certification. Receive-only devices operating between 30 MHz and 960 MHz are subject to either certification or a manufacturer's declaration of conformity, with all other receive-only devices exempt from the technical requirements.

Prior to marketing in Canada, Class I transmitters, receivers and transceivers require certification. Class II devices are required to meet the appropriate technical requirements but are exempt from certification requirements.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body's review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

STATEMENT OF COMPLIANCE

The tested sample of Neato Robotics model Botvac Connected complied with the requirements of the following regulations:

Industry Canada RSS-Gen Issue 4
RSS 247 Issue 1 "Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices"
FCC Part 15 Subpart C

Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

The test results recorded herein are based on a single type test of Neato Robotics model Botvac Connected and therefore apply only to the tested sample. The sample was selected and prepared by Matt Tenuta of Neato Robotics.

DEVIATIONS FROM THE STANDARDS

No deviations were made from the published requirements listed in the scope of this report.

TEST RESULTS SUMMARY

DIGITAL TRANSMISSION SYSTEMS (2400 – 2483.5MHz)

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.247(a)	RSS 210 A8.2	Digital Modulation	Systems uses OFDM / DSSS techniques	System must utilize a digital transmission technology	Complies
15.247 (a) (2)	RSS 210 A8.2 (1)	6dB Bandwidth	9.078 MHz	>500 kHz	Complies
15.247 (b) (3)	RSS 210 A8.2 (4)	Output Power (multipoint systems)	20.5 dBm (0.112 Watts) EIRP = 0.0631 W Note 1	1 Watt, EIRP limited to 4 Watts.	Complies
15.247(d)	RSS 210 A8.2 (2)	Power Spectral Density	0.0 dBm/ 10 kHz	8 dBm/ 3 kHz	Complies
15.247(c)	RSS 210 A8.5	Antenna Port Spurious Emissions 30 MHz – 25 GHz	> -20 dBc	< -20 dBc	Complies
15.247(c) / 15.209	RSS 210 A8.5	Radiated Spurious Emissions 30 MHz – 25 GHz	50.3 dBµV/m @ 14471.9 MHz (-3.7 dB)	15.207 in restricted bands, all others < -20 dBc	Complies
Note 1: EIRP calculated using antenna gain of -2.5 dBi for the highest EIRP system.					

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

FCC Rule Part	RSS Rule part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203	-	RF Connector	-	Unique or integral antenna required	Complies
15.207	RSS GEN Table 3	AC Conducted Emissions	46.4 dBµV @ 0.195 MHz	Refer to page 17	Complies (-17.4 dB)
15.109	RSS GEN Table 2	Receiver spurious emissions	N/A	N/A	N/A
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	Refer to MPE calculations in separate exhibit, RSS 102 declaration and User Manual statements.	Refer to OET 65, FCC Part 1 and RSS 102	Complies
-	RSS GEN 8.3	User Manual		Statement for products with detachable antenna	Complies
-	RSP 100 RSS GEN 6.6	Occupied Bandwidth	802.11b: 14.04 MHz 802.11g: 16.80 MHz 802.11n: 17.88 MHz	Information only	N/A

MEASUREMENT UNCERTAINTIES

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level and were calculated in accordance with UKAS document LAB 34.

Measurement Type	Measurement Unit	Frequency Range	Expanded Uncertainty
RF power, conducted (power meter)	dBm	25 to 7000 MHz	± 0.52 dB
RF power, conducted (Spectrum analyzer)	dBm	25 to 7000 MHz	± 0.7 dB
Conducted emission of transmitter	dBm	25 to 26500 MHz	± 0.7 dB
Conducted emission of receiver	dBm	25 to 26500 MHz	± 0.7 dB
Radiated emission (substitution method)	dBm	25 to 26500 MHz	± 2.5 dB
Radiated emission (field strength)	dBµV/m	25 to 1000 MHz	± 3.6 dB
		1000 to 40000 MHz	± 6.0 dB
Conducted Emissions (AC Power)	dBµV	0.15 to 30 MHz	± 2.4 dB

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Neato Robotics model Botvac Connected is a Robotic Vacuum cleaner. The EUT is a floor standing equipment. The EUT is positioned 0.8 m above the ground plane in order to get accurate measurement results and in conformance with ANSI C63.10-2013 requirement. The electrical rating of the EUT is 100-240 Volts, 50/60 Hz, 0.8 Amps.

The sample was received on February 25, 2015 and tested on February 25, 27 and March 2, 2015. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Neato Robotics	Botvac Connected	Robotic Vacuum cleaner	H145000030	2ABSSLEMIQ
Neato Robotics	905-0310	Battery Charger	-	-

ANTENNA SYSTEM

Chip antenna -2.5 dBi at 2.4 GHz

ENCLOSURE

The EUT enclosure is primarily constructed of plastic. It measures approximately 34 cm wide by 32 cm deep by 8 cm high.

MODIFICATIONS

No modifications were made to the EUT during the time the product was at NTS Silicon Valley.

SUPPORT EQUIPMENT

No local support equipment was used during testing.

The following equipment was used as remote support equipment for emissions testing:

Company	Model	Description	Serial Number	FCC ID
DELL	Latitude	Laptop	-	-

Note: The laptop was used to configure the EUT. It was not connected to the EUT during the tests.

EUT INTERFACE PORTS

The I/O cabling configuration during testing was as follows:

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
None	-			

EUT OPERATION

During testing, the EUT was transmitting at maximum rated RF power and the duty cycle with the channels and modulations required for the test cases listed in the test report.
EUT is battery operated. AC Power Conducted Emission test was performed with the battery charger.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken at the test sites listed below. Pursuant to section 2.948 of the FCC's Rules and section 3.3 of RSP-100, construction, calibration, and equipment data has been filed with the Commission and with industry Canada.

Site	Designation / Registration Numbers		Location
	FCC	Canada	
Chamber 4	US0027	2845B-4	41039 Boyce Road Fremont, CA 94538-2435

ANSI C63.4 recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement. The test site(s) contain separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements of ANSI C63.4.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.10. Measurements are made with the EUT connected to the public power network through a nominal, standardized RF impedance, which is provided by a line impedance stabilization network, known as a LISN. A LISN is inserted in series with each current-carrying conductor in the EUT power cord.

RADIATED EMISSIONS CONSIDERATIONS

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in a semi-anechoic chamber. The test sites are maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4 guidelines and meet the Normalized Site Attenuation (NSA) and S_{VSWR} requirements of ANSI C63.4.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1-1 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 7000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the CISPR detector used during measurements. If the repetition frequency of the signal being measured is below 20 Hz, peak measurements are made in lieu of Quasi-Peak measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. Average measurements above 1000 MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz, unless the signal is pulsed in which case the average (or video) bandwidth of the measuring instrument is reduced to onset of pulse desensitization and then increased.

INSTRUMENT CONTROL COMPUTER

The receivers utilize either a Rohde & Schwarz EZM Spectrum Monitor/Controller or contain an internal Spectrum Monitor/Controller to view and convert the receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurements made with the receivers.

The Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer run automated data collection programs which control the receivers. This provides added accuracy since all site correction factors, such as cable loss and antenna factors are added automatically.

LINE IMPEDANCE STABILIZATION NETWORK (LISN)

Line conducted measurements utilize a 50 µH Line Impedance Stabilization Network as the monitoring point. The LISN used also contains a 250 µH CISPR adapter. This network provides for calibrated radio frequency noise measurements by the design of the internal low pass and high pass filters on the EUT and measurement ports, respectively.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the receiving antenna or LISN and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

ANTENNAS

For the measurement range 30 MHz to 1000 MHz either a combination of a biconical antenna and a log periodic or a bi-log antenna is used. Above 1000 MHz, horn antennas are used. The antenna calibration factors to convert the received voltage to electric field strength are included with appropriate cable loss and amplifier gain factors to determine an overall site factor, which is then programmed into the test receivers or incorporated into the test software.

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height. Measurements below 30 MHz are made with the loop antenna at a fixed height of 1m above the ground plane.

ANSI C63.10 specifies the test height for floor-standing equipment as; Where possible, the antenna(s) of the EUT shall be located at a height of 1.5 m above the floor, and the intentional radiator circuitry shall be located within the system at a height of at least 0.8 m above the floor. The EUT has an integral antenna. During radiated measurements, the EUT is positioned on a motorized turntable, 0.8 m above the ground plane in order to get accurate measurement results and in conformance with this requirement.

INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

TEST PROCEDURES

EUT AND CABLE PLACEMENT

The regulations require that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of ANSI C63.10, and the worst-case orientation is used for final measurements.

CONDUCTED EMISSIONS

Conducted emissions are measured at the plug end of the power cord supplied with the EUT. Excess power cord length is wrapped in a bundle between 30 and 40 centimeters in length near the center of the cord. Preliminary measurements are made to determine the highest amplitude emission relative to the specification limit for all the modes of operation. Placement of system components and varying of cable positions are performed in each mode. A final peak mode scan is then performed in the position and mode for which the highest emission was noted on all current carrying conductors of the power cord.

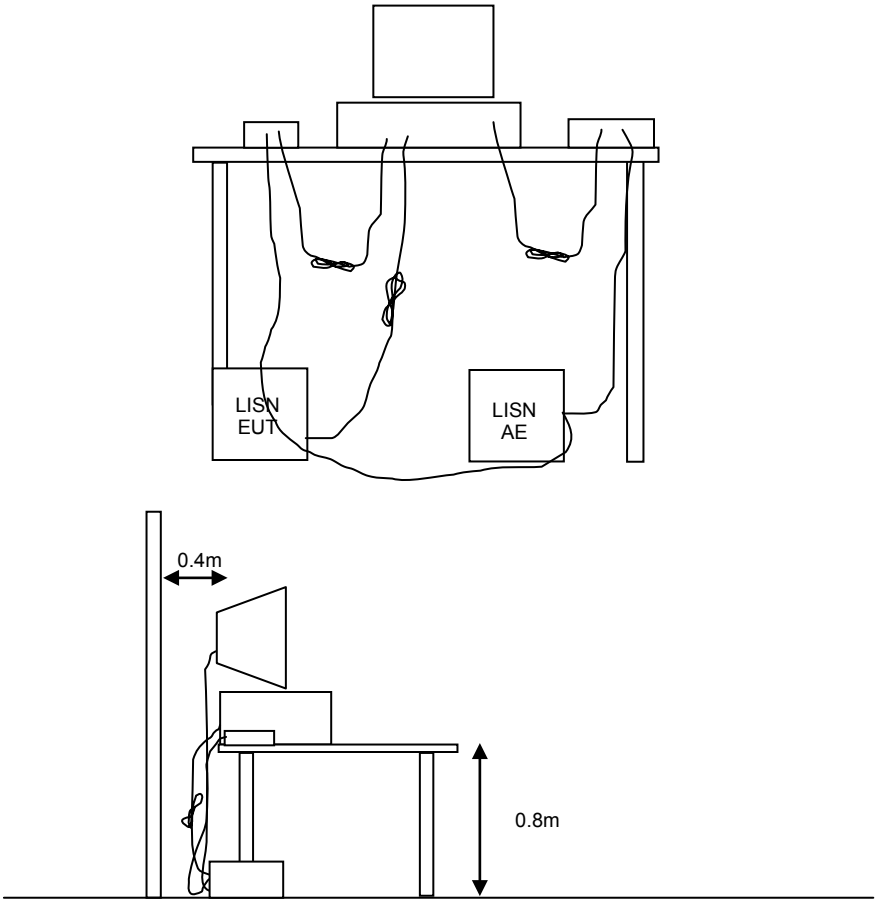


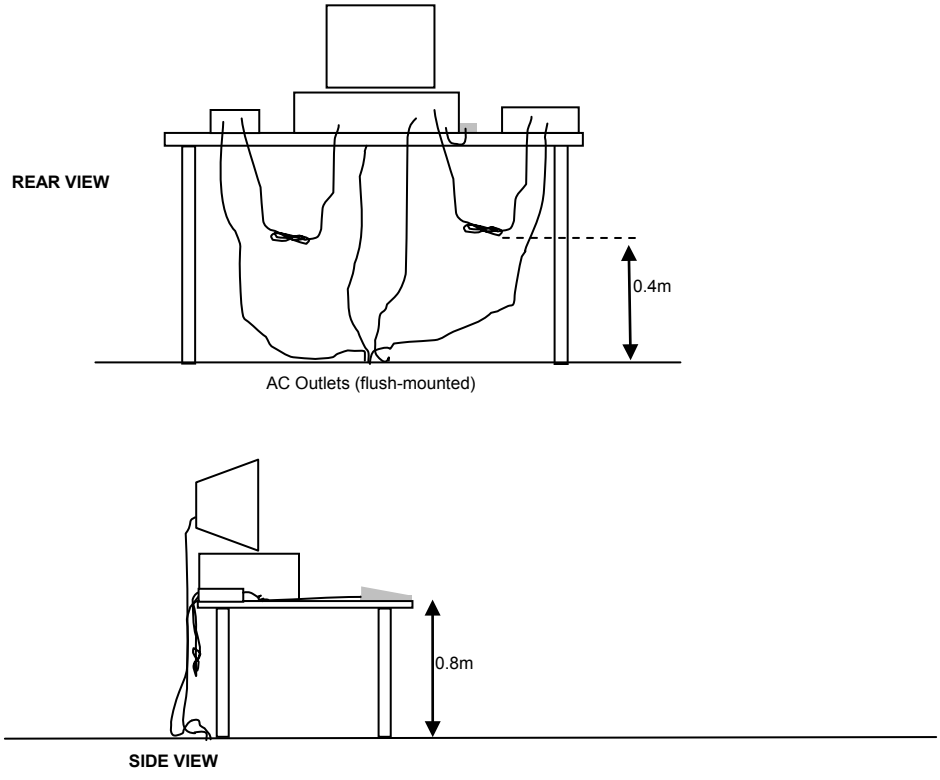
Figure 1 Typical Conducted Emissions Test Configuration

RADIATED EMISSIONS

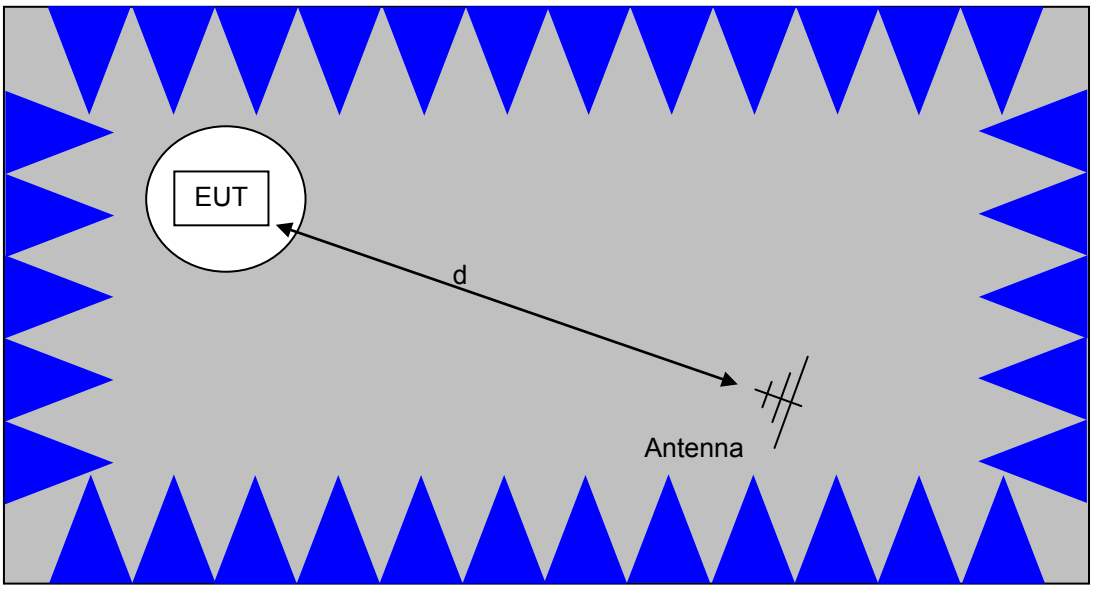
A preliminary scan of the radiated emissions is performed in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed, one scan for each antenna polarization (horizontal and vertical; loop parallel and perpendicular to the EUT). During the preliminary scans, the EUT is rotated through 360˚, the antenna height is varied (for measurements above 30 MHz) and cable positions are varied to determine the highest emission relative to the limit. Preliminary scans may be performed in a semi anechoic chamber for the purposes of identifying the frequencies of the highest emissions from the EUT.

Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth, which results in the highest emission is then maintained while varying the antenna height from one to four meters (for measurements above 30 MHz, measurements below 30 MHz are made with the loop antenna at a fixed height of 1m). The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain.

When testing above 18 GHz, the receive antenna is located at 1 meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.

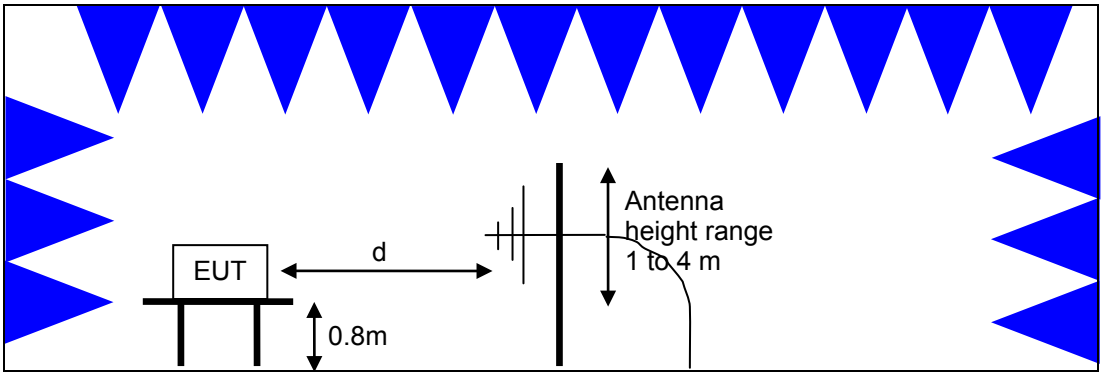


Typical Test Configuration for Radiated Field Strength Measurements



The anechoic materials on the walls and ceiling ensure compliance with the normalized site attenuation requirements of CISPR 16 / CISPR 22 / ANSI C63.4 for an alternate test site at the measurement distances used.

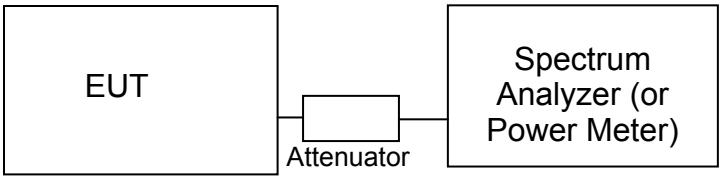
Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.



Test Configuration for Radiated Field Strength Measurements
Semi-Anechoic Chamber, Plan and Side Views

CONDUCTED EMISSIONS FROM ANTENNA PORT

Direct measurements of power, bandwidth and power spectral density are performed, where possible, with the antenna port of the EUT connected to either the power meter or spectrum analyzer via a suitable attenuator and/or filter. These are used to ensure that the front end of the measurement instrument is not overloaded by the fundamental transmission.



Test Configuration for Antenna Port Measurements

Measurement bandwidths (video and resolution) are set in accordance with the relevant standards and NTS Silicon Valley's test procedures for the type of radio being tested. When power measurements are made using a resolution bandwidth less than the signal bandwidth the power is calculated by summing the power across the signal bandwidth using either the analyzer channel power function or by capturing the trace data and calculating the power using software. In both cases the summed power is corrected to account for the equivalent noise bandwidth (ENBW) of the resolution bandwidth used.

If a power meter is used to make output power measurements the sensor head type (peak or average) is stated in the test data table.

BANDWIDTH MEASUREMENTS

The 6 dB, 20 dB, 26 dB and/or 99 % signal bandwidth are measured using the bandwidths recommended by ANSI C63.10 and RSS GEN.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

The limits for conducted emissions are given in units of microvolts, and the limits for radiated emissions are given in units of microvolts per meter at a specified test distance. Data is measured in the logarithmic form of decibels relative to one microvolt, or dB microvolts (dBµV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBµV/m). The results are then converted to the linear forms of µV and µV/m for comparison to published specifications.

For reference, converting the specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. These limits in both linear and logarithmic form are as follows:

CONDUCTED EMISSIONS SPECIFICATION LIMITS: FCC 15.207; FCC 15.107(a), RSS GEN

The table below shows the limits for the emissions on the AC power line from an intentional radiator and a receiver.

Frequency (MHz)	Average Limit (dBµV)	Quasi Peak Limit (dBµV)
0.150 to 0.500	Linear decrease on logarithmic frequency axis between 56.0 and 46.0	Linear decrease on logarithmic frequency axis between 66.0 and 56.0
0.500 to 5.000	46.0	56.0
5.000 to 30.000	50.0	60.0

GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands[1] (with the exception of transmitters operating under FCC Part 15 Subpart D and RSS 247, the limits for all emissions from a low power device operating under the general rules of RSS-Gen, RSS 247 and FCC Part 15 Subpart C section 15.209.

Frequency Range (MHz)	Limit (μV/m)	Limit (dBμV/m @ 3m)
0.009-0.490	$2400/F_{KHz}$ @ 300m	$67.6-20*\log_{10}(F_{KHz})$ @ 300m
0.490-1.705	$24000/F_{KHz}$ @ 30m	$87.6-20*\log_{10}(F_{KHz})$ @ 30m
1.705 to 30	30 @ 30m	29.5 @ 30m
30 to 88	100 @ 3m	40 @ 3m
88 to 216	150 @ 3m	43.5 @ 3m
216 to 960	200 @ 3m	46.0 @ 3m
Above 960	500 @ 3m	54.0 @ 3m

RECEIVER RADIATED SPURIOUS EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from receivers as detailed in FCC Part 15.109, RSS 247, RSS Gen Table 1 and RSS 310 Table 3. Note that receivers operating outside of the frequency range 30 MHz – 960 MHz are exempt from the requirements of 15.109.

Frequency Range (MHz)	Limit (μV/m @ 3m)	Limit (dBμV/m @ 3m)
30 to 88	100	40
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

OUTPUT POWER LIMITS – DIGITAL TRANSMISSION SYSTEMS

The table below shows the limits for output power and output power density. Where the signal bandwidth is less than 20 MHz the maximum output power is reduced to the power spectral density limit plus 10 times the log of the bandwidth (in MHz).

Operating Frequency (MHz)	Output Power	Power Spectral Density
902 – 928	1 Watt (30 dBm)	8 dBm/3kHz
2400 – 2483.5	1 Watt (30 dBm)	8 dBm/3kHz
5725 – 5850	1 Watt (30 dBm)	8 dBm/3kHz

[1] The restricted bands are detailed in FCC 15.203, RSS 210 Table 1 and RSS 310 Table 2

The maximum permitted output power is reduced by 1 dB for every dB the antenna gain exceeds 6 dBi. Fixed point-to-point applications using the 5725 – 5850 MHz band are not subject to this restriction.

TRANSMIT MODE SPURIOUS RADIATED EMISSIONS LIMITS – FHSS and DTS SYSTEMS

The limits for unwanted (spurious) emissions from the transmitter falling in the restricted bands are those specified in the general limits sections of FCC Part 15 and RSS 210. All other unwanted (spurious) emissions shall be at least 20 dB below the level of the highest in-band signal level (30dB if the power is measured using the sample detector/power averaging method).

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

Receiver readings are compared directly to the conducted emissions specification limit (decibel form) as follows:

$$R_r - S = M$$

where:

R_r = Receiver Reading in dBµV

S = Specification Limit in dBµV

M = Margin to Specification in +/- dB

SAMPLE CALCULATIONS - RADIATED EMISSIONS

Receiver readings are compared directly to the specification limit (decibel form). The receiver internally corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

A distance factor, when used for electric field measurements above 30MHz, is calculated by using the following formula:

$$F_d = 20*LOG_{10} (D_m/D_s)$$

where:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_s = Specification Distance in meters

Measurement Distance is the distance at which the measurements were taken and Specification Distance is the distance at which the specification limits are based. The antenna factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

R_r = Receiver Reading in dBµV/m

F_d = Distance Factor in dB

R_c = Corrected Reading in dBµV/m

L_s = Specification Limit in dBµV/m

M = Margin in dB Relative to Spec

SAMPLE CALCULATIONS - FIELD STRENGTH TO EIRP CONVERSION

Where the radiated electric field strength is expressed in terms of the equivalent isotropic radiated power (eirp), or where a field strength measurement of output power is made in lieu of a direct measurement, the following formula is used to convert between eirp and field strength at a distance of d (meters) from the equipment under test:

$$E = \frac{1000000 \sqrt{30 P}}{d} \quad \text{microvolts per meter}$$

where P is the eirp (Watts)

For a measurement at 3m the conversion from a logarithmic value for field strength (dBµV/m) to an eirp power (dBm) is -95.3 dB.

Appendix A Test Equipment Calibration Data

Manufacturer	Description	Model	Asset #	Calibrated	Cal Due
RF Conducted measurements, 25-Feb-15					
Rohde & Schwarz	Power Sensor 100 uW - 2 Watts (w/ 20 dB pad, SN BJ5155)	NRV-Z32	1536	1/15/2015	1/15/2016
Rohde & Schwarz	Power Meter, Dual Channel	NRVD	1539	9/9/2014	9/9/2015
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	4/8/2014	4/8/2015
Agilent Technologies	USB Average Power Sensor	U2001A	2442	12/19/2014	12/19/2015
Radiated Emissions, 1000 - 18,000 MHz, 27-Feb-15					
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	3/25/2014	3/25/2015
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	5/6/2014	5/6/2015
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	6/27/2014	6/27/2016
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1630	6/21/2014	6/21/2015
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	2238	9/16/2014	9/16/2015
Radiated Emissions, 18 - 25 GHz, 02-Mar-15					
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	5/6/2014	5/6/2015
Hewlett Packard	Head (Inc flex cable, (1742,1743) Blue)	84125C	1620	5/6/2014	5/6/2015
A. H. Systems	Spare System Horn, 18-40GHz	SAS-574, p/n: 2581	2162	7/24/2014	7/24/2015
Radiated Emissions, 30 - 1,000 MHz, 02-Mar-15					
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1630	6/21/2014	6/21/2015
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	2237	8/29/2014	8/29/2016
Com-Power	Preamplifier, 1-1000 MHz	PAM-103	2885	10/22/2014	10/22/2015
Conducted Emissions - AC Power Ports, 02-Mar-15					
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	1401	5/15/2014	5/15/2015
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1630	6/21/2014	6/21/2015
Com-Power	9KHz-30MHz, 50uH, 15Aac, 10Adc, max	LI-215A	2671	5/24/2014	5/24/2015
Radio Antenna Port (PSD and Bandwidth), 02-Mar-15					
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1630	6/21/2014	6/21/2015

Appendix B Test Data

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Client:	Neato Robotics	Job Number:	J97654
Product	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	
Emissions Standard(s):	FCC 15.247, RSS 247	Class:	B
Immunity Standard(s):	-	Environment:	

EMC Test Data

For The

Neato Robotics

Product

Botvac Connected

Date of Last Test: 3/2/2015

Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

Power vs. Data Rate

In normal operating modes the card uses power settings stored on EEPROM to set the output power. For a given nominal output power the actual transmit power normally is reduced as the data rate increases, therefore testing was performed at the data rate in the mode with highest power to determine compliance with the requirements.
The following power measurements were made using an average/peak power meter and with the device configured in a continuous transmit mode on Chain 1 at the various data rates in each mode to verify the highest power mode:

Sample Notes

Sample S/N: H145000030
WLAN Driver: MCP-3.3.0.65 Release CCX
WLAN Firmware: PLT 6.3.8.1.119
Date of Test: 2/25/2015
Test Engineer: Deniz Demirci
Test Location: FT Lab #4b

Mode	Data Rate	Peak Power (dBm)	Average Power (dBm)	Power setting
802.11b	1	**20.2**	**19.1**	FCC
	2	20.2	18.8	
	5.5	20.2	19.1	
	11	20.1	18.9	
802.11g	6	**21.1**	**16.9**	FCC
	9	20.5	16.5	
	12	20.5	16.6	
	18	21.0	16.9	
	24	20.4	16.2	
	36	20.7	14.8	
	48	19.9	14.9	
	54	19.9	14.7	
802.11n 20 MHz	6.5	**20.5**	**16.3**	FCC
	13	20.1	15.9	
	19.5	20.0	16.0	
	26	20.4	16.1	
	39	20.5	16.1	
	52	19.3	14.7	
	58.5	18.9	14.6	
	65	18.1	13.8	

Note : Power setting - the software power setting used during testing, included for reference only.

Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

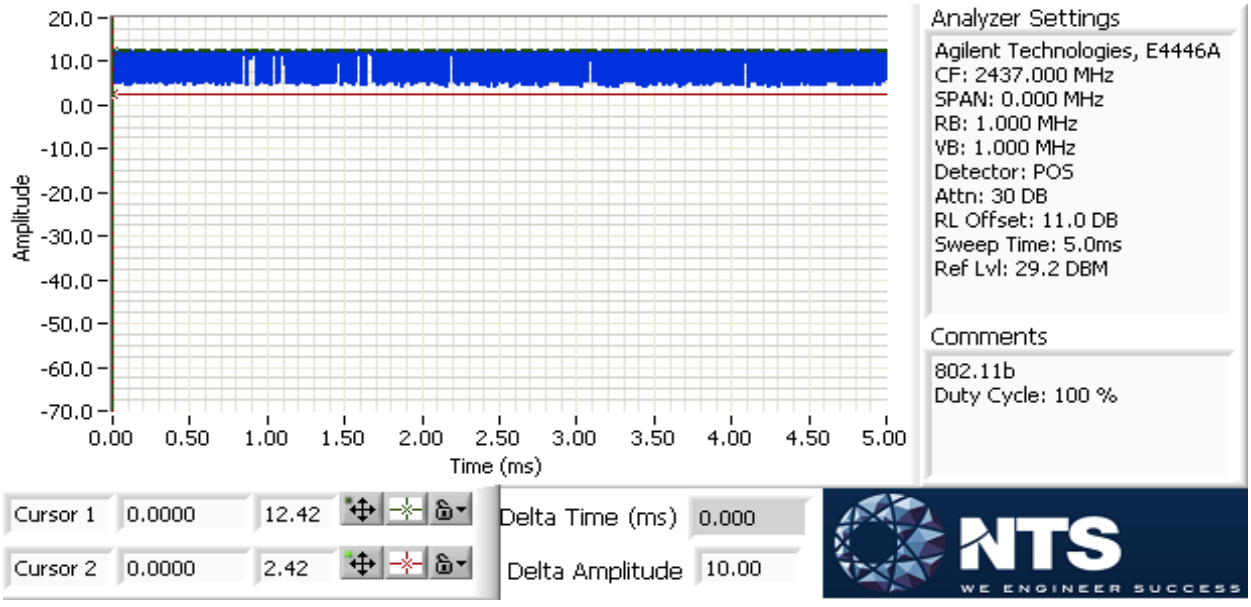
Duty Cycle

Date of Test: 2/25/2015
Test Engineer: Deniz Demirci
Test Location: FT Lab #4b

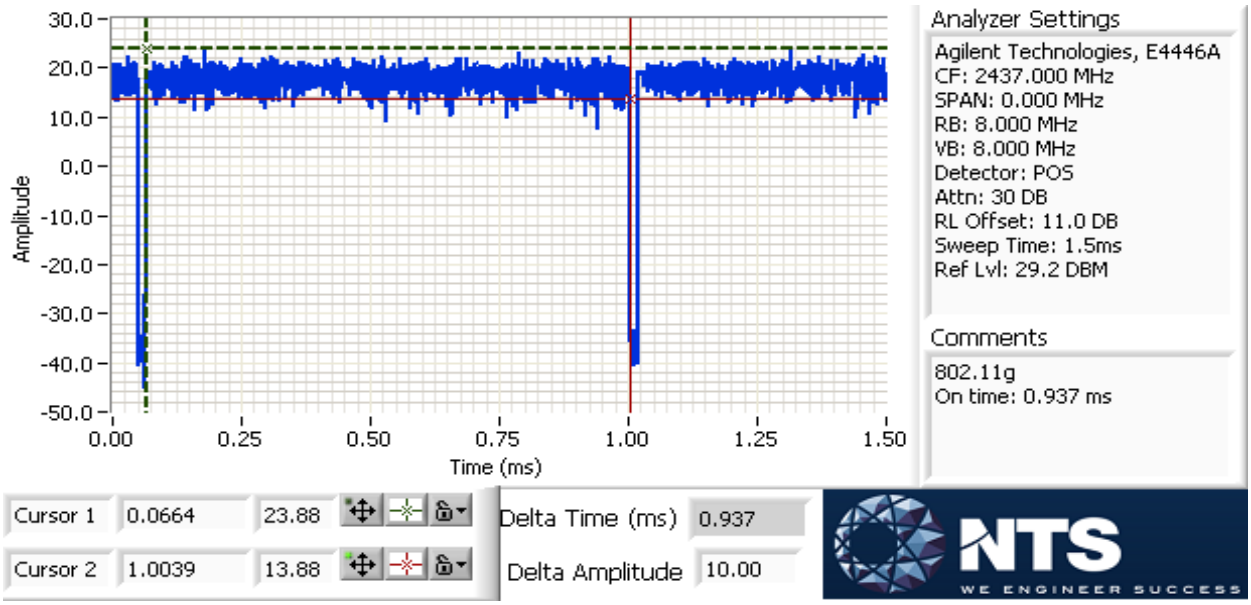
Duty cycle measurements performed on the worse case data rate for power.

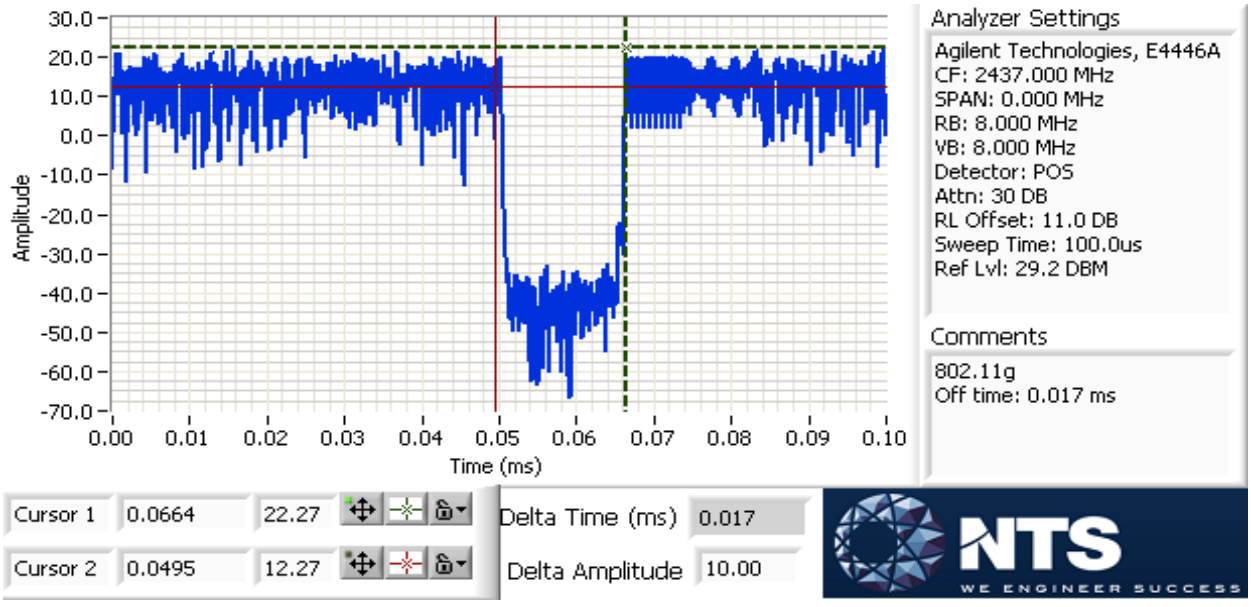
Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11b	1	1.00	Yes	-	0.0	0.0	-
11g	6	0.98	Yes	0.937	0.0	0.0	1067
n20	6.5	0.99	Yes	1.312	0.0	0.0	762

* Correction factor when using RMS/Power averaging - 10*log(1/x)
** Correction factor when using linear voltage average - 20*log(1/x)
T = Minimum transmission duration

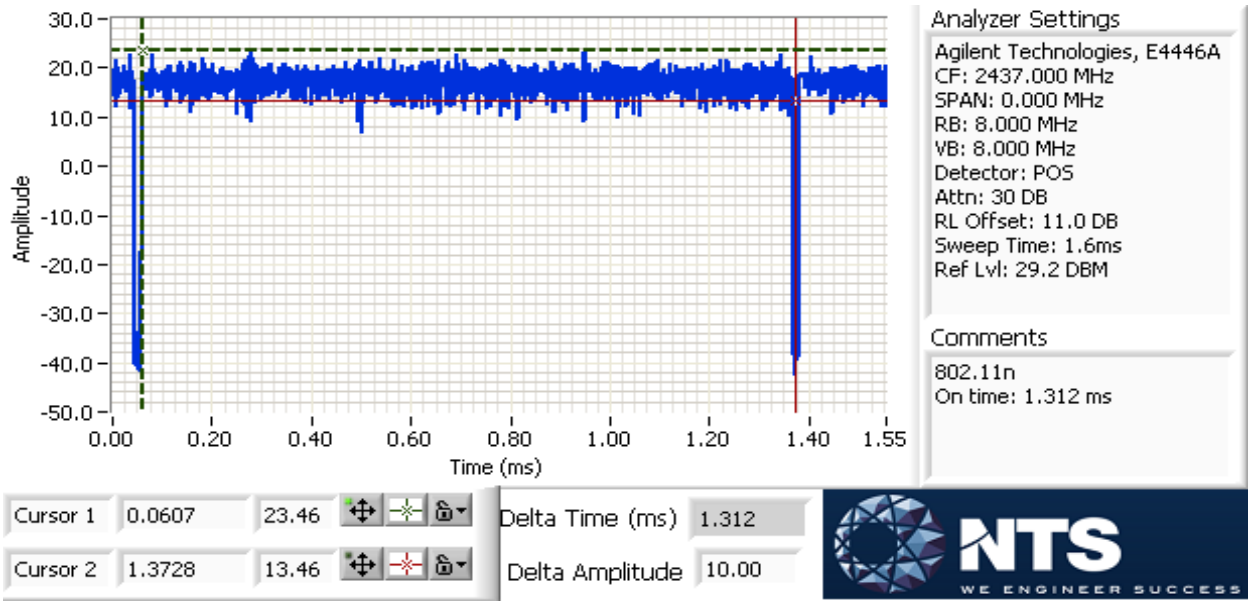


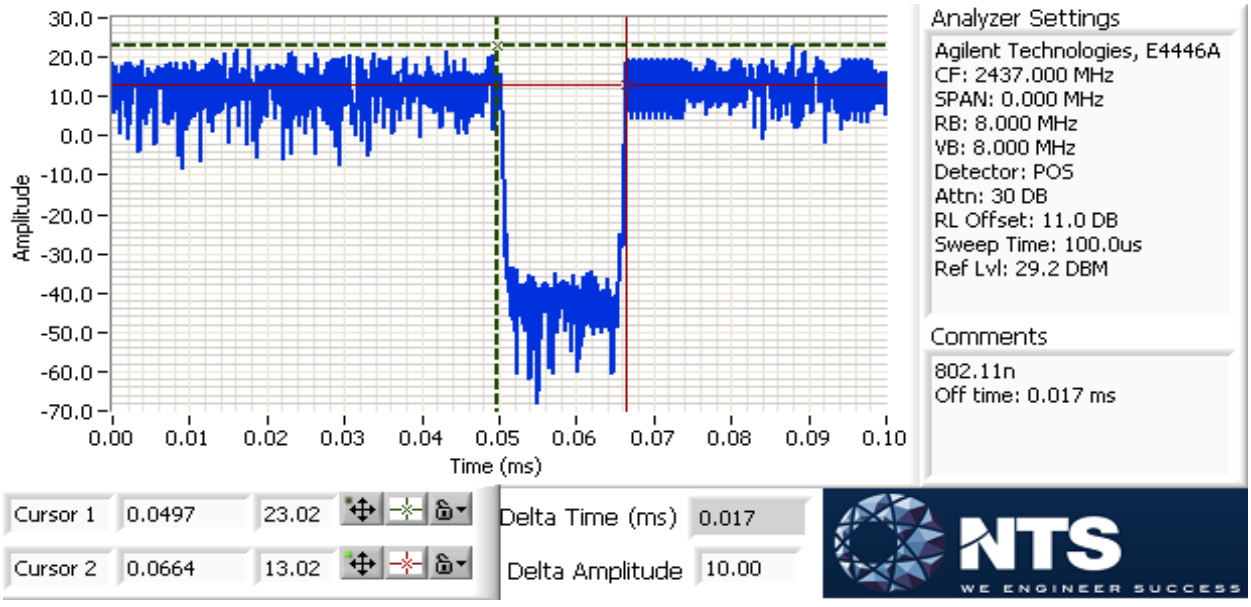
Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A





Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A





Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

RSS 247 and FCC 15.247 (DTS) Antenna Port Measurements

Power, PSD, Bandwidth and Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

General Test Configuration

The EUT was connected to the spectrum analyzer or power meter via a suitable attenuator. All measurements were made on a single chain.

All measurements have been corrected to allow for the external attenuators used.

Ambient Conditions:

Temperature: 20-22 °C
Rel. Humidity: 30-45 %

Summary of Results

Run #	Pwr setting	Avg Pwr	Test Performed	Limit	Pass / Fail	Result / Margin
1	-	-	Output Power	15.247(b)	Pass	20.5 dBm
2	-	-	Power spectral Density (PSD)	15.247(d)	Pass	0.0 dBm/ 10 kHz
3	-	-	Minimum 6 dB Bandwidth	15.247(a)		9.078 MHz
3	-	-	99% Bandwidth	RSS Gen	-	802.11b: 14.04 MHz 802.11g: 16.80 MHz 802.11n: 17.88 MHz
4	-	-	Spurious emissions	15.247(b)	Pass	> -20 dBc

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

Procedure Comments:

Measurements performed in accordance with FCC KDB 558074, ANSI C63.10 and RSS-Gen

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11b	1	1.00	Yes	-	0.0	0.0	-
11g	6	0.98	Yes	0.937	0.0	0.0	1067
n20	6.5	0.99	Yes	1.312	0.0	0.0	762

Sample Notes

Sample S/N: H145000030

WLAN Driver: MCP-3.3.0.65 Release CCX

WLAN Firmware: PLT 6.3.8.1.119

Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

Run #1: Output Power

Date of Test: 2/25/2015, 3/02/2015 — Config. Used: 1

Test Engineer: Deniz Demirci — Config Change: None

Test Location: Fremont EMC Lab #4A, Ch #4 — EUT Voltage: Battery powered

Mode: 11b

Power Setting[2]	Frequency (MHz)	Output Power (dBm)[1]	Output Power mW	Antenna Gain (dBi)	Result	EIRP dBm	EIRP W	Output Power (dBm)[3]	Output Power mW
FCC	2412	19.2	83.2	-2.5	Pass	16.7	0.047		
FCC	2437	20.0	100.0	-2.5	Pass	17.5	0.056		
FCC	2462	20.1	102.3	-2.5	Pass	17.6	0.058		

Mode: 11g

Power Setting[2]	Frequency (MHz)	Output Power (dBm)[1]	Output Power mW	Antenna Gain (dBi)	Result	EIRP dBm	EIRP W	Output Power (dBm)[3]	Output Power mW
FCC	2412	19.3	85.1	-2.5	Pass	16.8	0.048		
FCC	2437	20.5	112.2	-2.5	Pass	18.0	0.063		
FCC	2462	20.0	100.0	-2.5	Pass	17.5	0.056		

Mode: n20

Power Setting[2]	Frequency (MHz)	Output Power (dBm)[1]	Output Power mW	Antenna Gain (dBi)	Result	EIRP dBm	EIRP W	Output Power (dBm)[3]	Output Power mW
FCC	2412	19.1	81.3	-2.5	Pass	16.6	0.046		
FCC	2437	20.1	102.3	-2.5	Pass	17.6	0.058		
FCC	2462	20.0	100.0	-2.5	Pass	17.5	0.056		

Note 1:	Output power measured using a peak power meter, spurious limit is -20 dBc.
Note 2:	Power setting - the software power setting used during testing, included for reference only.
Note 3:	Power measured using average power meter (non-gated) and is included for reference only.

Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

Run #2: Power spectral Density

Mode: 11b

Power Setting	Frequency (MHz)	PSD (dBm/10 kHz) Note 1	Limit dBm/3 kHz	Result
FCC	2411.4890	-0.6	8.0	Pass
FCC	2437.5711	-0.3	8.0	Pass
FCC	2462.6313	0.0	8.0	Pass

Mode: 11g

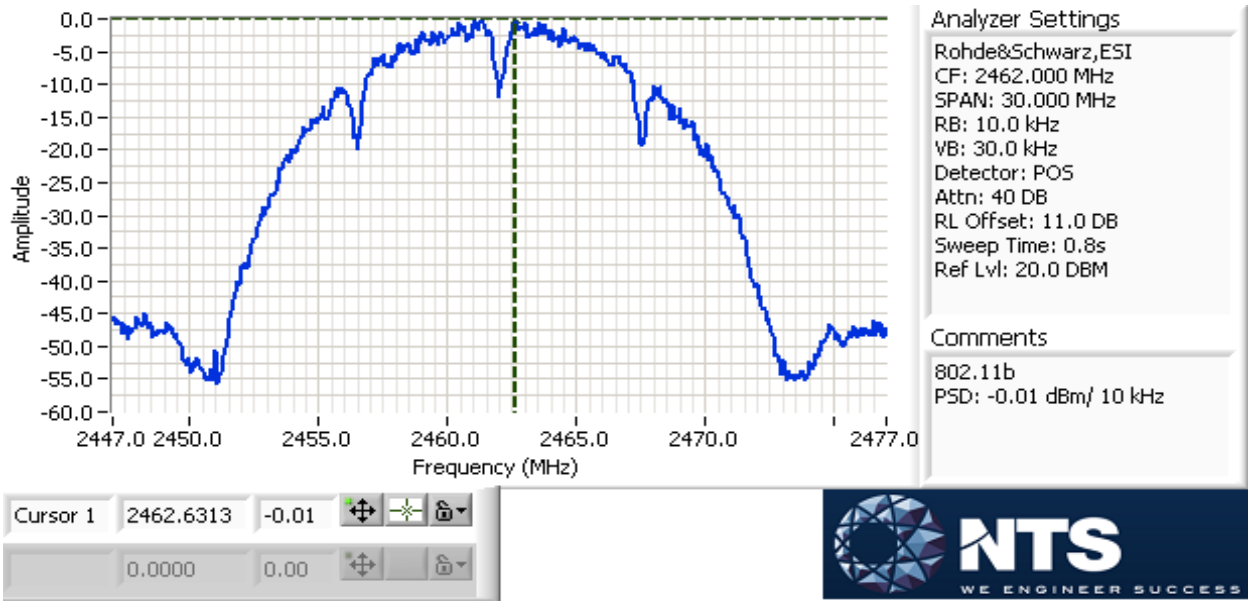
Power Setting	Frequency (MHz)	PSD (dBm/10 kHz) Note 1	Limit dBm/3 kHz	Result
FCC	2415.9980	-5.3	8.0	Pass
FCC	2438.2325	-4.1	8.0	Pass
FCC	2463.2325	-4.3	8.0	Pass

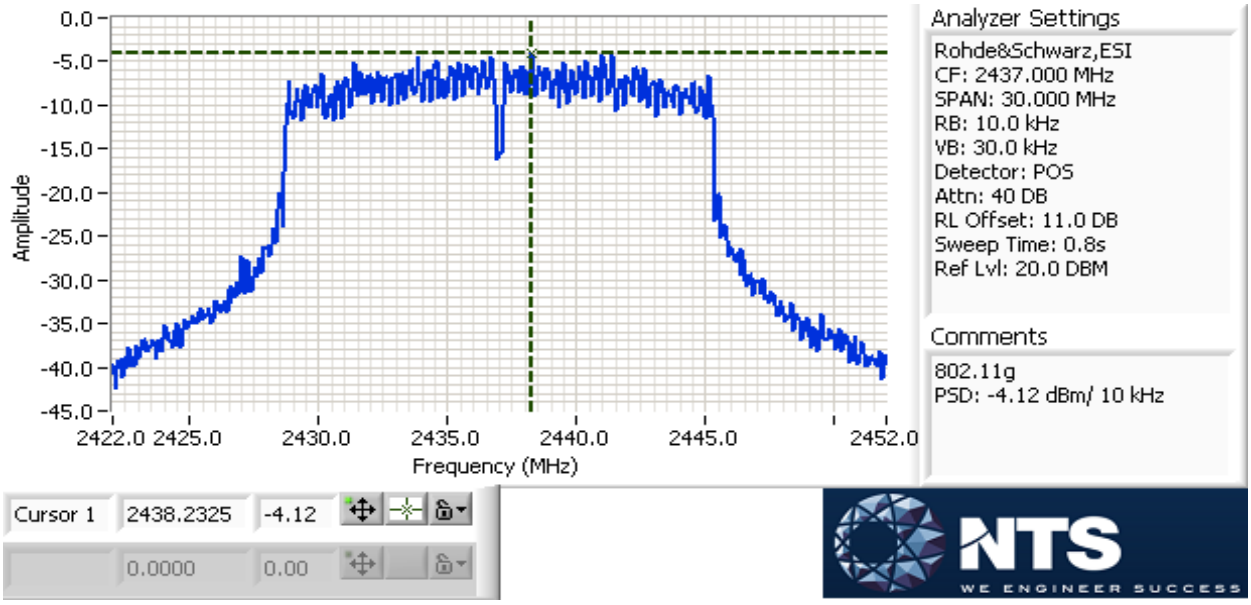
Mode: n20

Power Setting	Frequency (MHz)	PSD (dBm/10 kHz) Note 1	Limit dBm/3 kHz	Result
FCC	2413.2325	-4.2	8.0	Pass
FCC	2438.2545	-3.8	8.0	Pass
FCC	2460.7675	-4.1	8.0	Pass

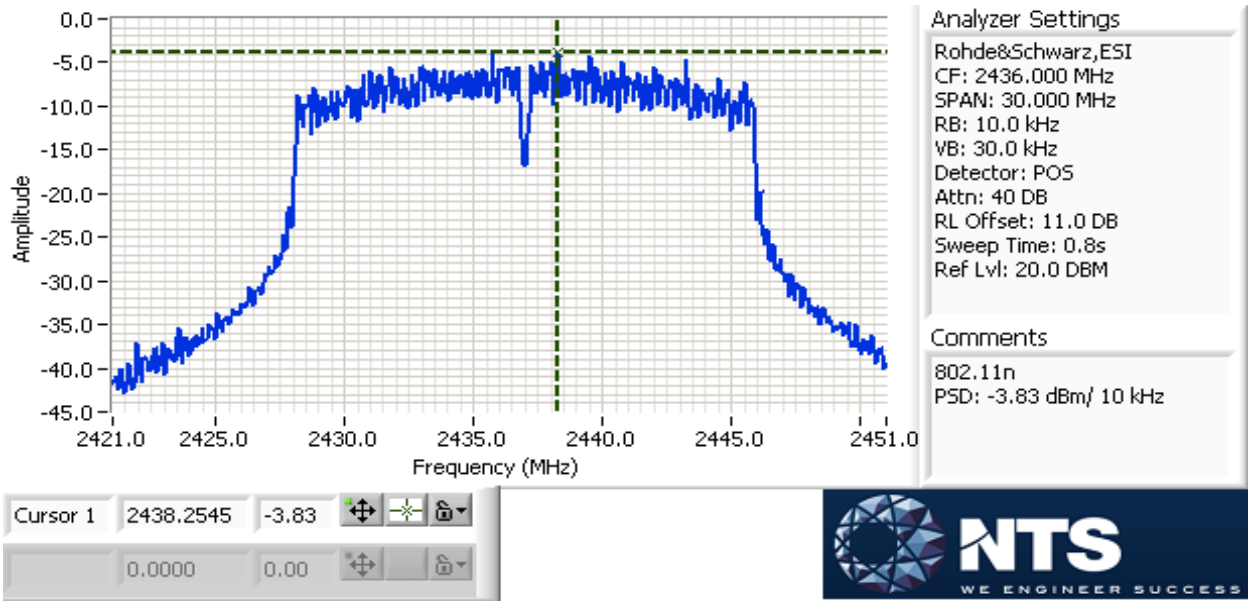
Note 1:	Test performed per method PKSPD, in KDB 558074. Power spectral density measured using: 3 kHz ≤ RBW ≤ 100 kHz, VBW=3*RBW, peak detector, span = 1.5*DTS BW, auto sweep time, max hold.

Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A





Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A



Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

Run #3: Signal Bandwidth

Mode: 11b

Power Setting	Frequency (MHz)	Bandwidth (MHz)		RBW Setting (MHz)	
		6dB	99%	6dB	99%
FCC	2412	9.559	14.04	0.1	0.3
FCC	2437	9.078	14.04	0.1	0.3
FCC	2462	9.559	14.04	0.1	0.3

Mode: 11g

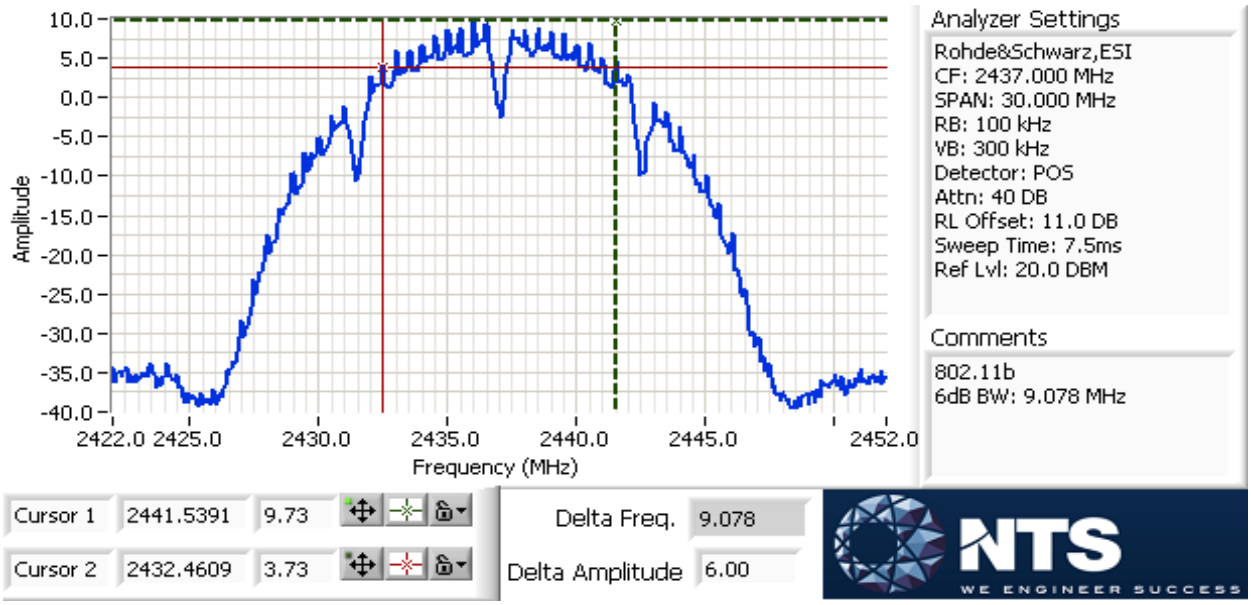
Power Setting	Frequency (MHz)	Bandwidth (MHz)		RBW Setting (MHz)	
		6dB	99%	6dB	99%
FCC	2412	16.293	16.74	0.1	0.3
FCC	2437	16.052	16.80	0.1	0.3
FCC	2462	16.293	16.80	0.1	0.3

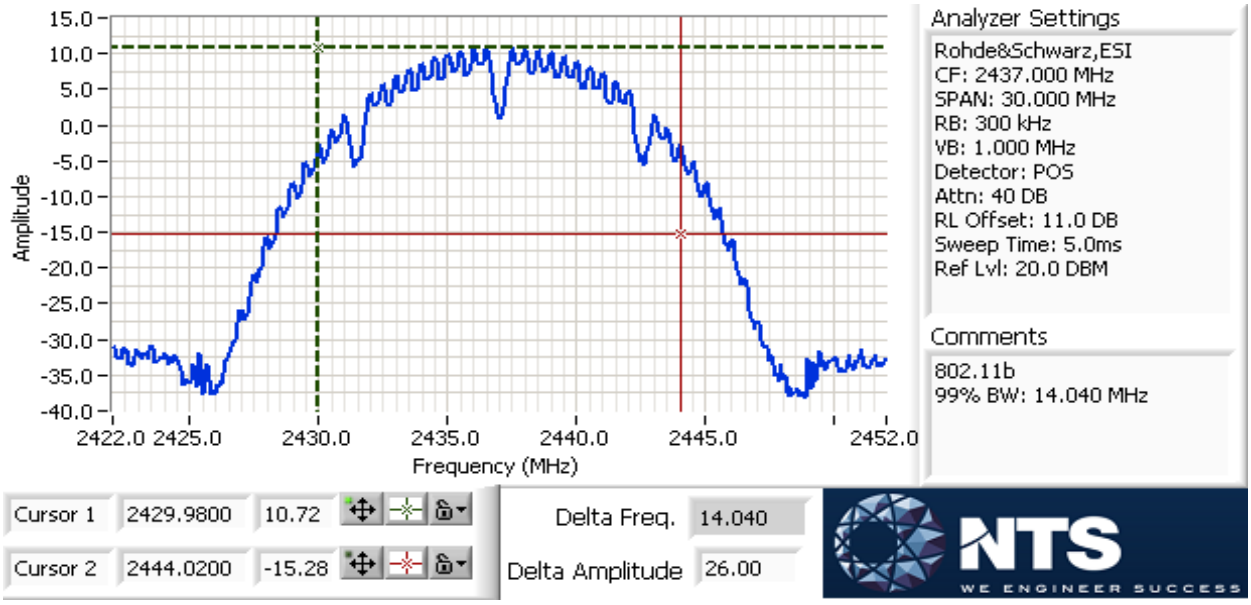
Mode: n20

Power Setting	Frequency (MHz)	Bandwidth (MHz)		RBW Setting (MHz)	
		6dB	99%	6dB	99%
FCC	2412	16.954	17.82	0.1	0.3
FCC	2437	16.894	17.26	0.1	0.3
FCC	2462	16.593	17.88	0.1	0.3

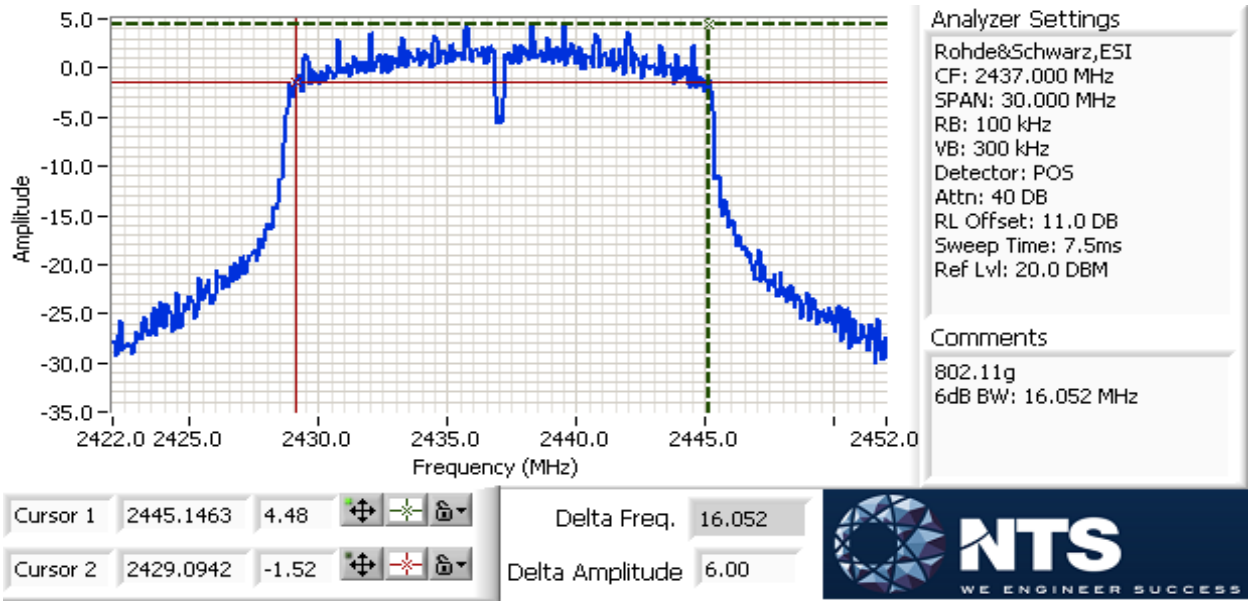
Note 1:	DTS BW: RBW = 100 kHz, VBW ≥ 3*RBW, peak detector, max hold, auto sweep time. 99% BW: RBW = 1-5% of 99% BW, VBW ≥ 3*RBW, peak detector, max hold, auto sweep time.
Note 2:	Graphs indicate worst case results.

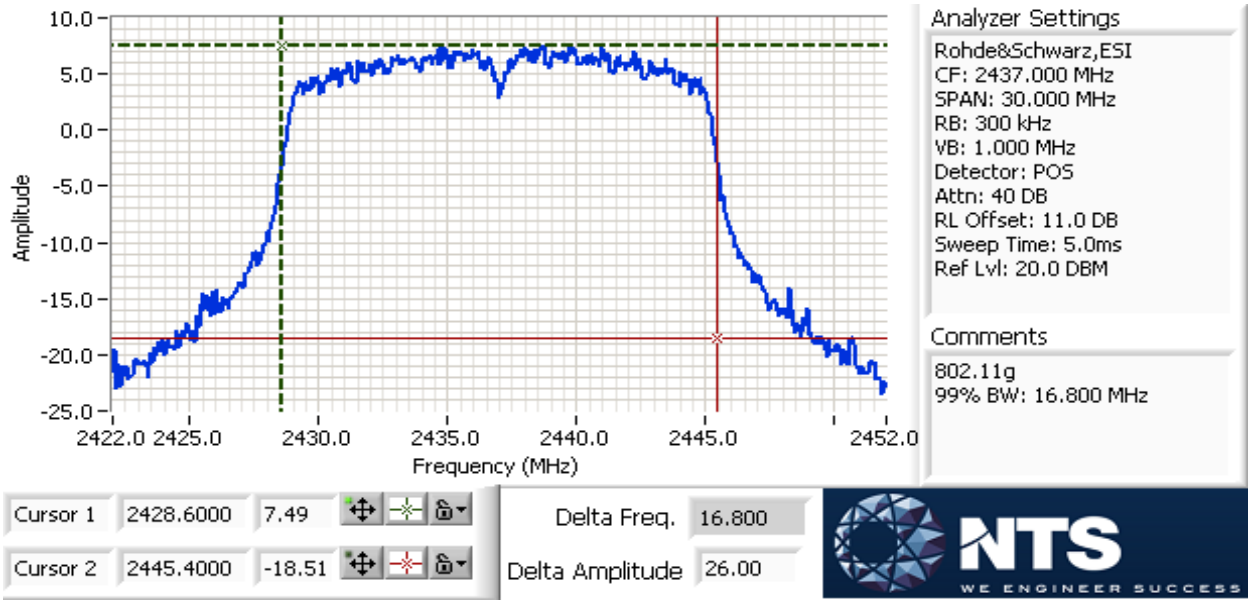
Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A



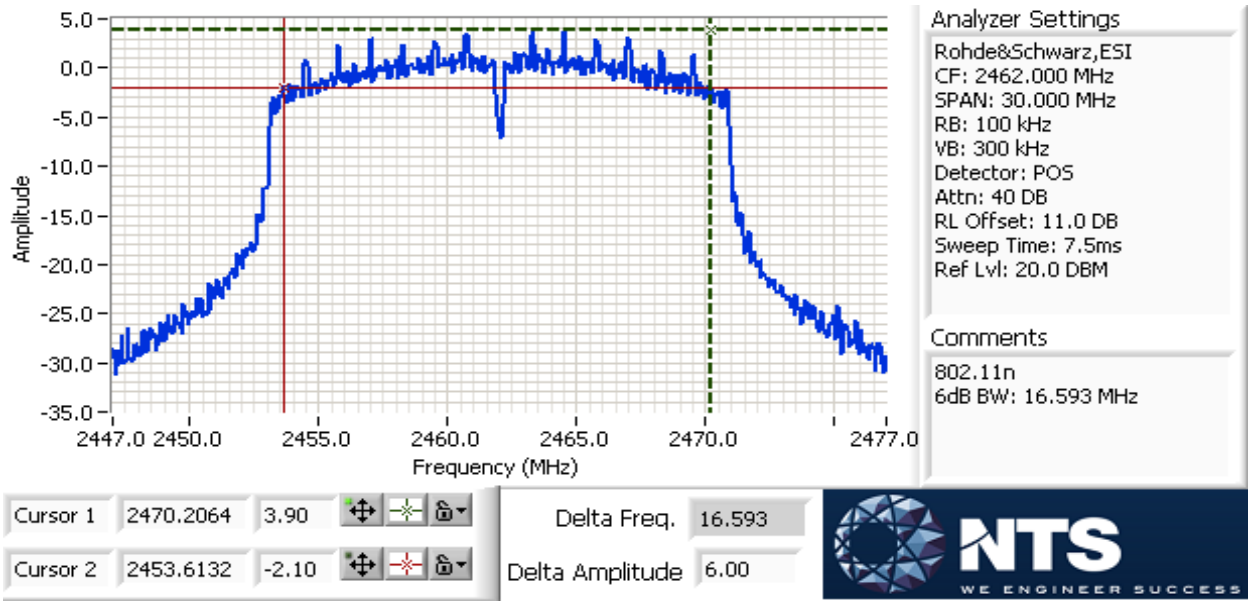


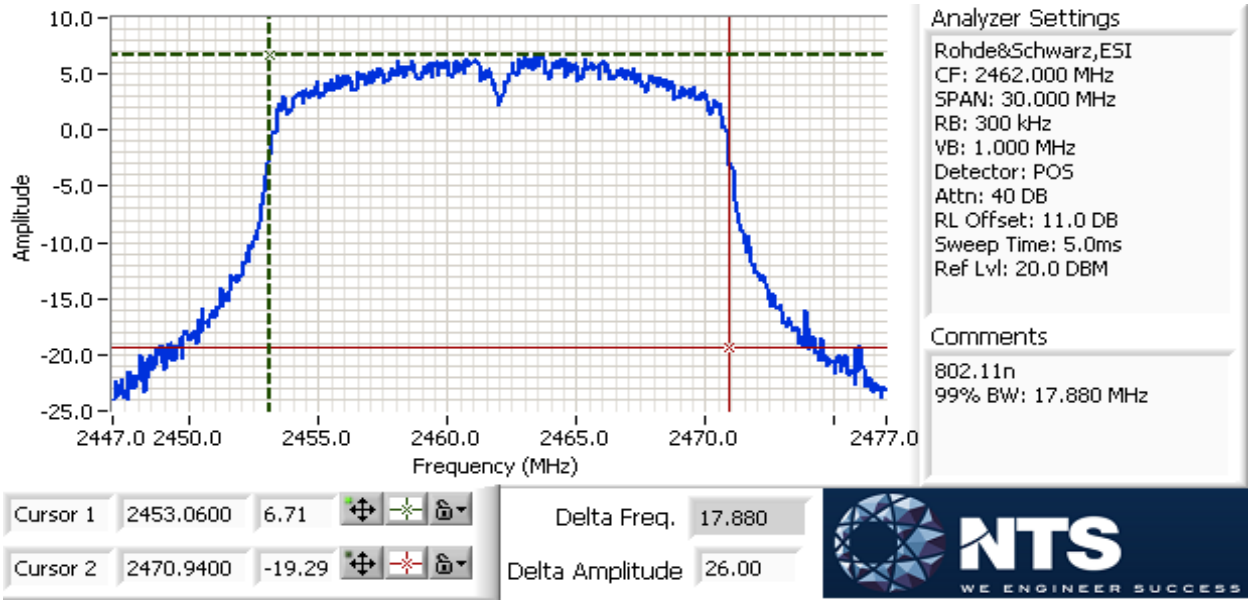
Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A





Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A





Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

Run #4a: Out of Band Spurious Emissions

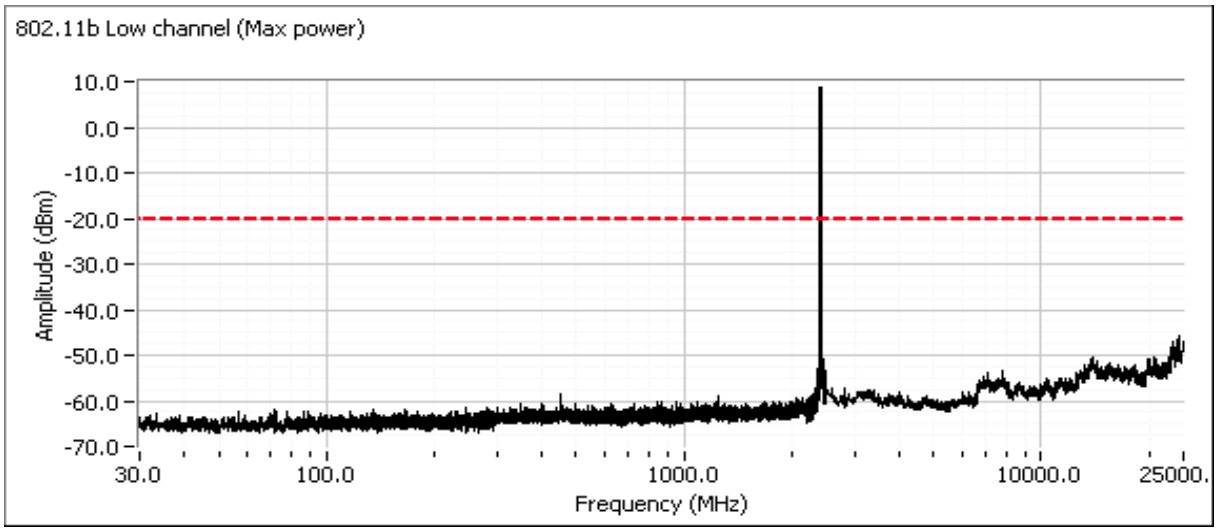
Date of Test: 2/25/2015
Test Engineer: Deniz Demirci
Test Location: Fremont EMC Lab #4A

Config. Used: 1
Config Change: None
EUT Voltage: Battery powered

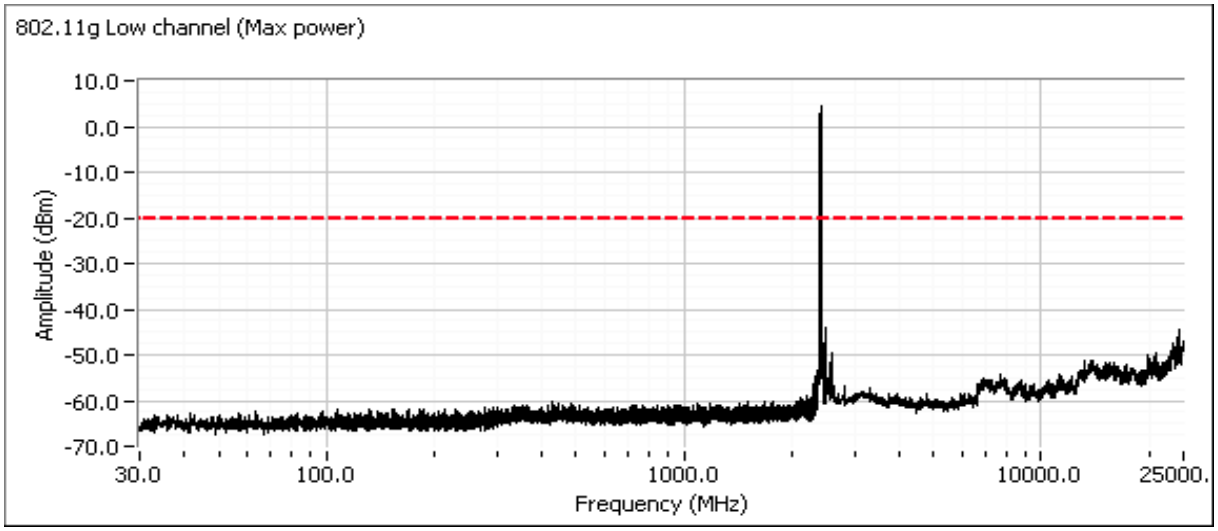
Frequency (MHz)	Power Setting	Mode	Limit	Result
2412	FCC	b/g/n	-20 dBc	Pass
2437	FCC	b/g/n	-20 dBc	Pass
2462	FCC	b/g/n	-20 dBc	Pass

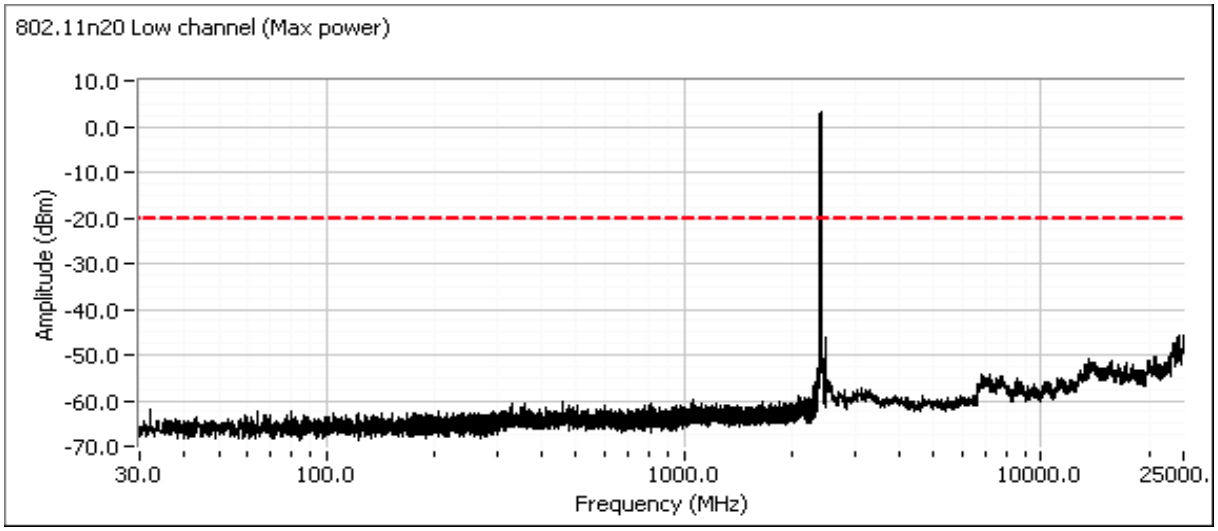
Note 1:	Tests performed per KDB 558074 v03r03 section 11.0. with RBW = 100 kHz, VBW = 3xRBW, peak detector.

Plots for low channel



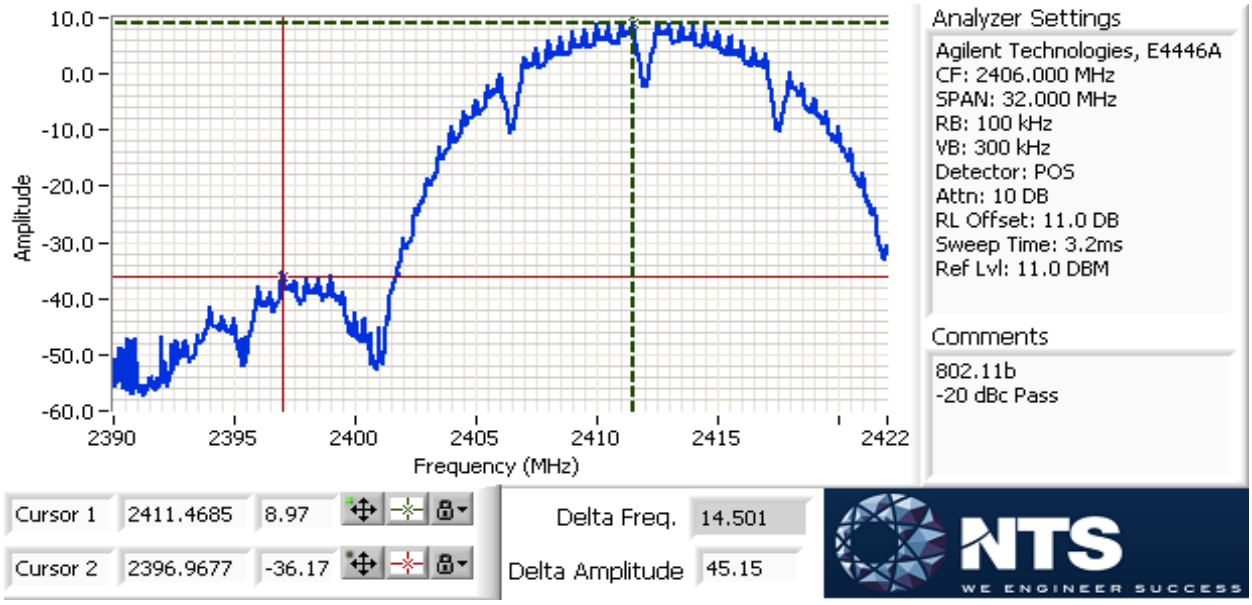
Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

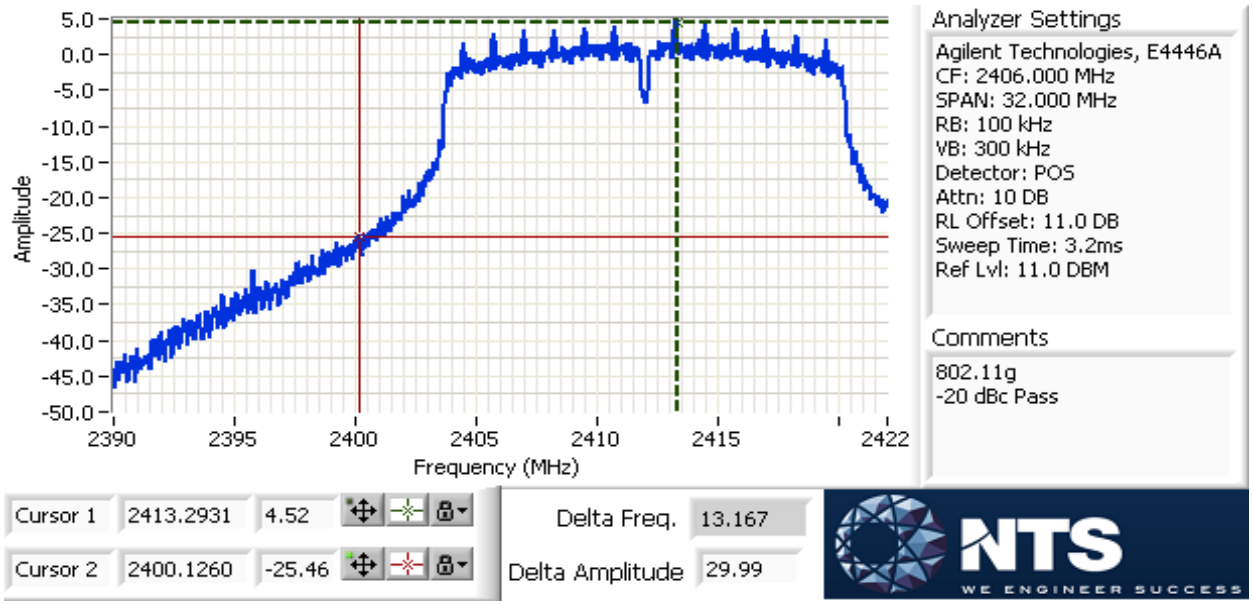




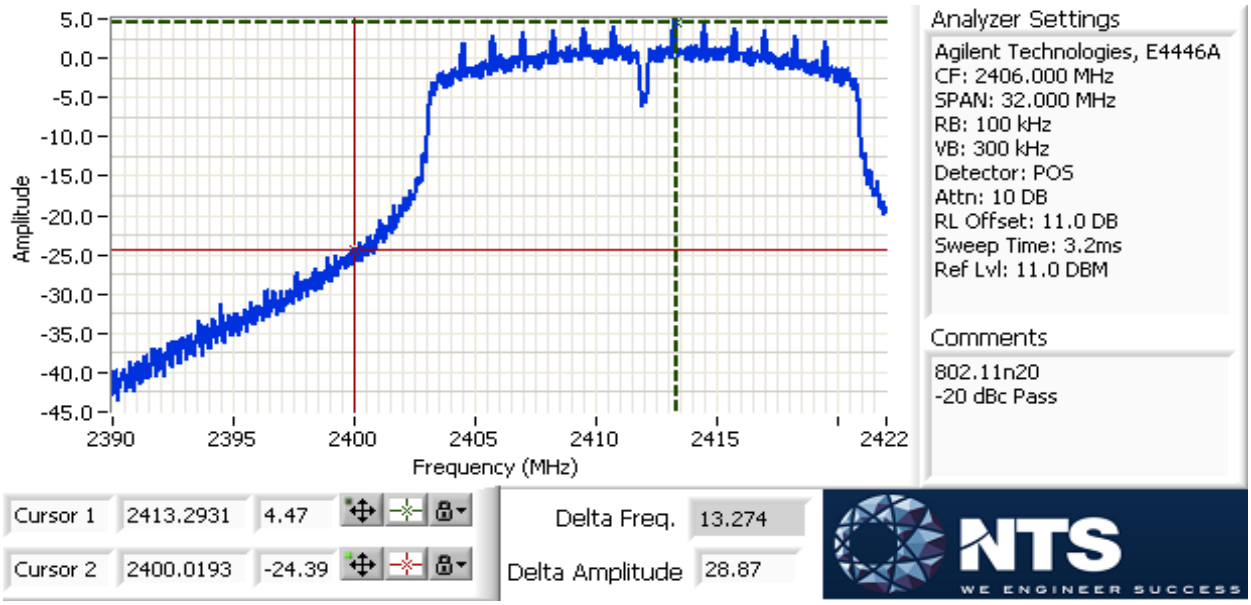
Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

Additional plot showing compliance with -20 dBc limit from 2390 MHz to 2400 MHz. Radiated measurements used to show compliance with the limits in the restricted band below 2390 MHz.

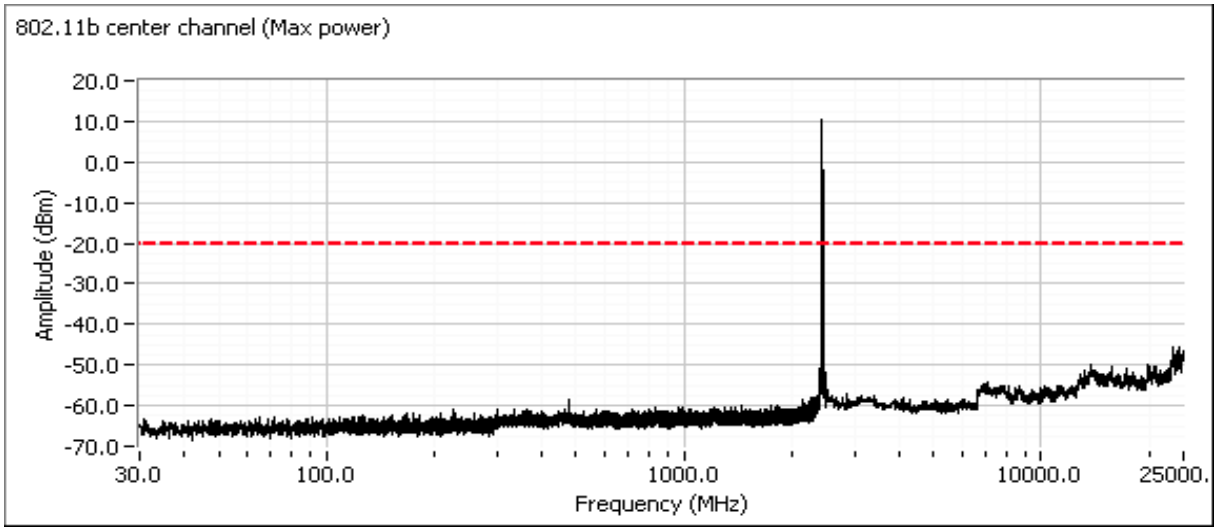




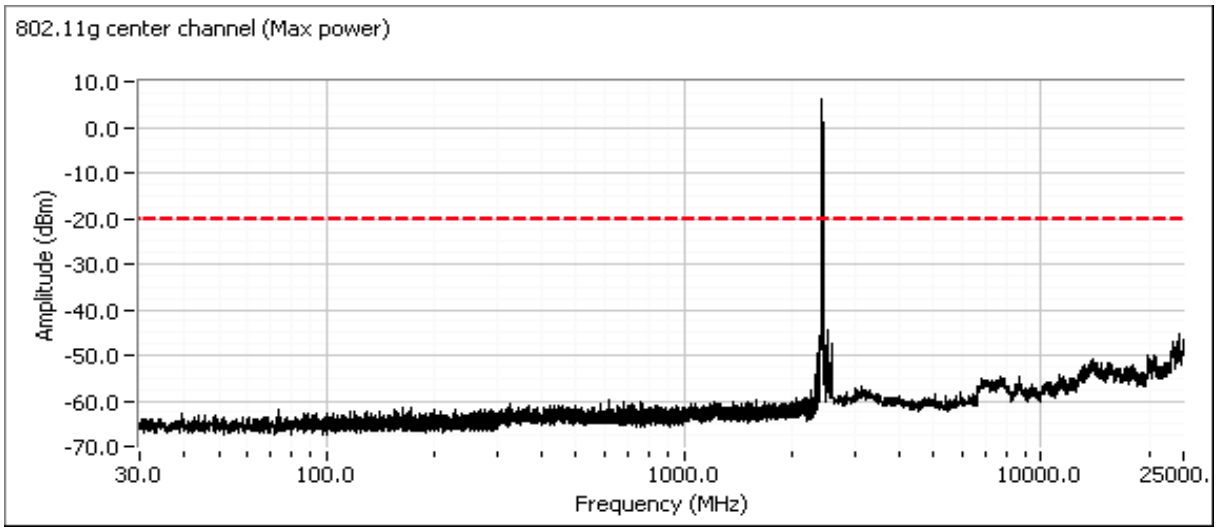
Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

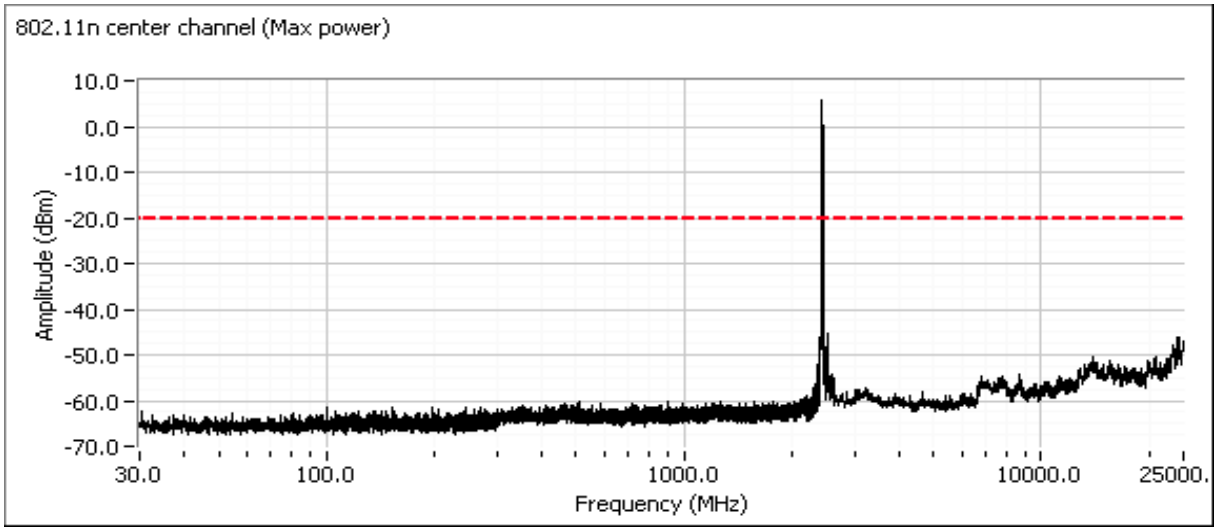


Plots for center channel



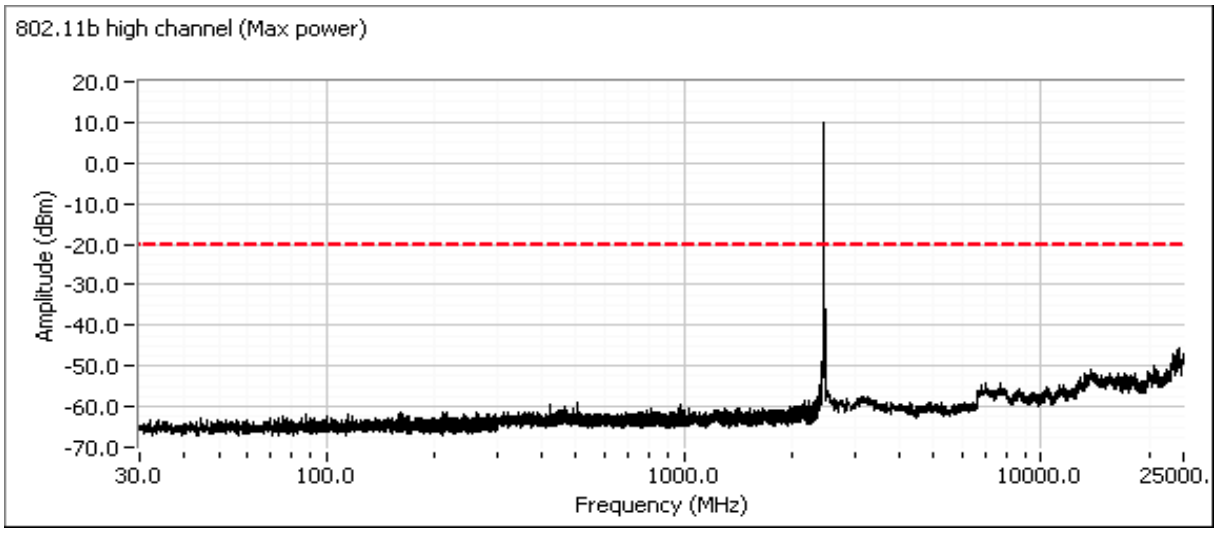
Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

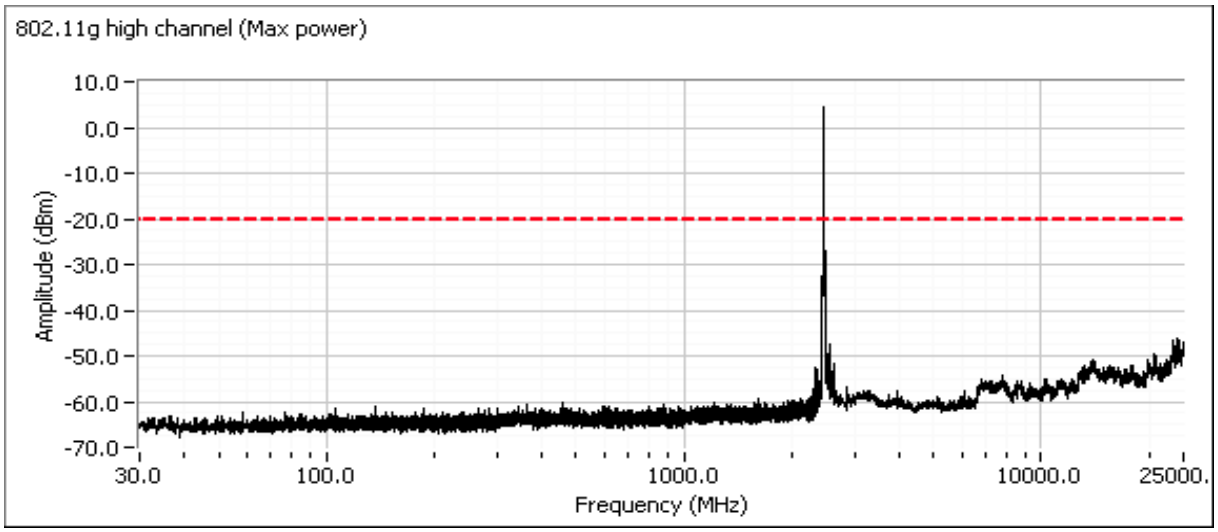




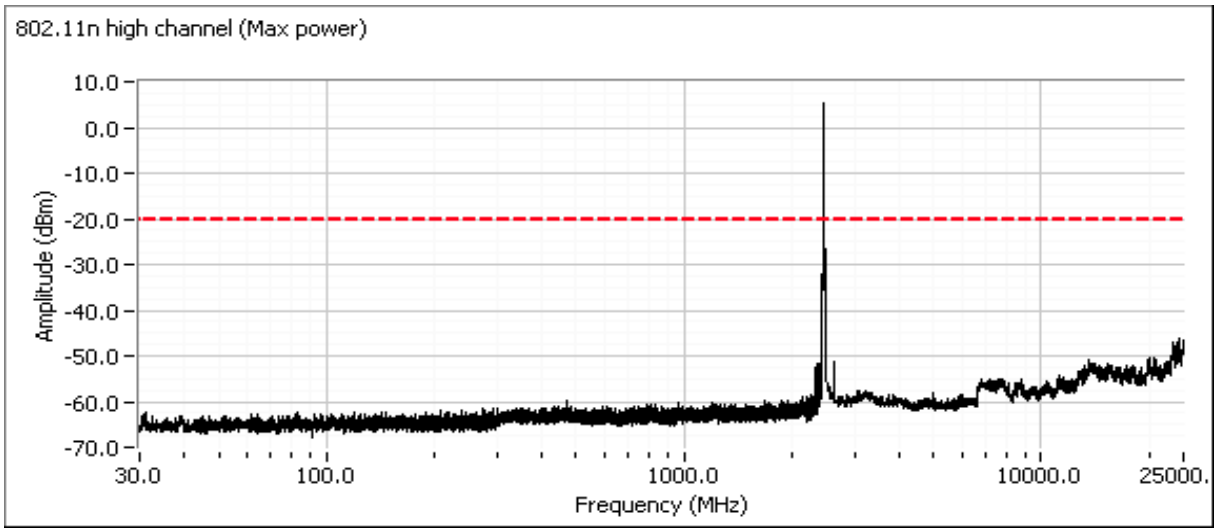
Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

Plots for high channel





Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A



Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

RSS 247 and FCC 15.247 (DTS) Radiated Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT, unless otherwise noted.

Ambient Conditions:

Temperature: 15-18 °C

Rel. Humidity: 30-35 %

Summary of Results - Device Operating in the 2400-2483.5 MHz Band

Run #	Mode	Channel	Target Power	Power Setting	Test Performed	Limit	Result / Margin
1	b	1 - 2412 MHz	-	-	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	58.2 dBµV/m @ 2380.3 MHz (-15.8 dB)
	b	11 - 2462 MHz	-	-	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	44.8 dBµV/m @ 2484.0 MHz (-9.2 dB)
2	g	1 - 2412 MHz	-	-	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	42.0 dBµV/m @ 2390.0 MHz (-12.0 dB)
	g	11 - 2462 MHz	-	-	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	49.5 dBµV/m @ 2483.6 MHz (-4.5 dB)
3	n20	1 - 2412 MHz	-	-	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	45.8 dBµV/m @ 2390.0 MHz (-8.2 dB)
	n20	11 - 2462 MHz	-	-	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	50.2 dBµV/m @ 2483.5 MHz (-3.8 dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Sample Notes

Sample S/N: EVT29

WLAN Driver: MCP-3.3.0.65 Release CCX

WLAN Firmware: PLT 6.3.8.1.119

Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

Procedure Comments:

Measurements performed in accordance with FCC KDB 558074
Peak measurements performed with: RBW = 1 MHz, VBW = 3 MHz, peak detector, max hold, auto sweep time
Unless otherwise stated/noted, emission has duty cycle ≥ 98% and was measured using RBW = 1 MHz, VBW = 10 Hz, peak detector, linear average mode, auto sweep time, max hold.

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11b	1	1.00	Yes	-	0.0	0.0	-
11g	6	0.98	Yes	0.937	0.0	0.0	1067
n20	6.5	0.99	Yes	1.312	0.0	0.0	762

Measurement Specific Notes:

Note 1:	Emission in non-restricted band, but limit of 15.209 used.
Note 2:	Emission in non-restricted band, the limit was set 20 dB below the level of the fundamental and measured in 100 kHz.
Note 3:	Emission has duty cycle ≥ 98%, average measurement performed: RBW = 1 MHz, VBW = 10 Hz, peak detector, linear averaging, auto sweep, trace average 100 traces.

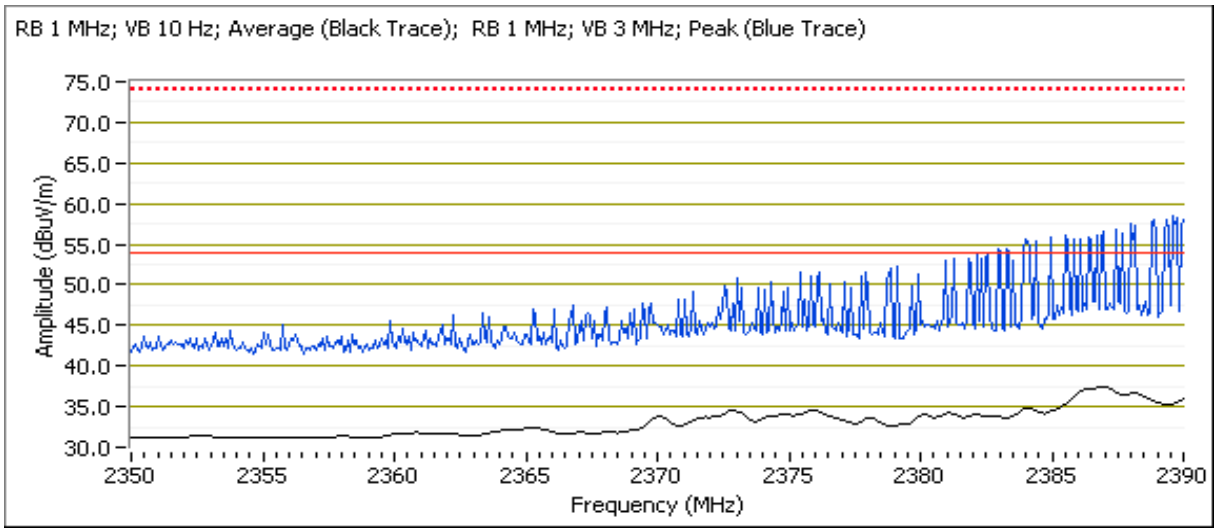
Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

Date of Test: 02/27/15 Config. Used: Radiated
Test Engineer: M. Birgani Test Location: chamber #4

Run #1: Radiated Bandedge Measurements
Channel: 1 Mode: b Power: FCC
Tx Chain: Main Data Rate: 1 Mbps

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2380.300	58.2	H	74.0	-15.8	PK	19	1.8	POS; RB 1 MHz; VB: 3 MHz
2386.870	37.5	H	54.0	-16.5	AVG	19	1.8	POS; RB 1 MHz; VB: 10 Hz
2386.870	35.8	V	54.0	-18.2	AVG	81	1.3	POS; RB 1 MHz; VB: 10 Hz
2361.460	55.6	V	74.0	-18.4	PK	81	1.3	POS; RB 1 MHz; VB: 3 MHz

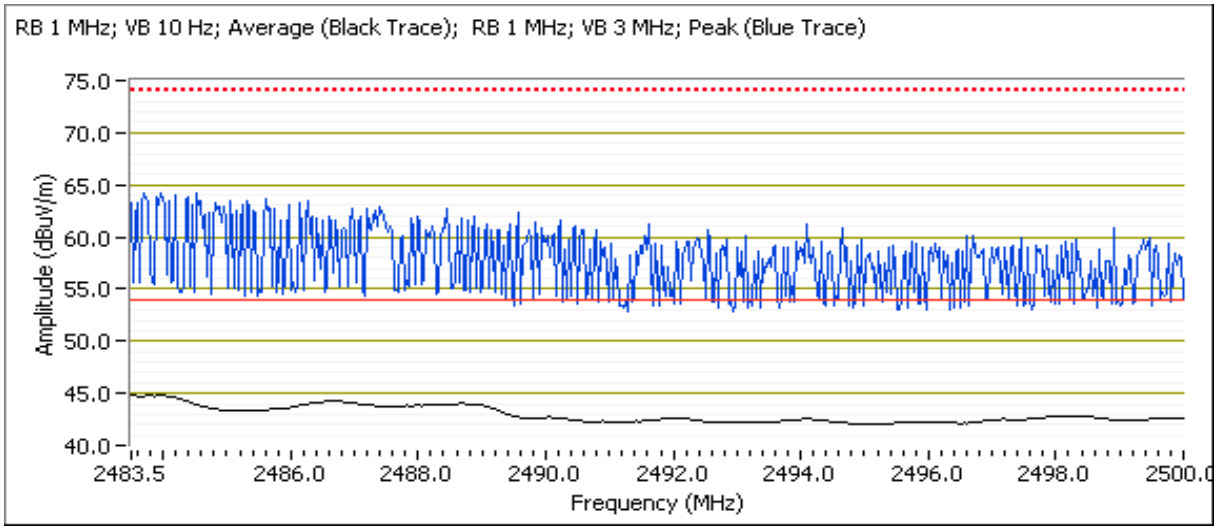


Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

Channel: 11 Mode: b Power: FCC
Tx Chain: Main Data Rate: 1 Mbps

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2484.000	44.8	H	54.0	-9.2	AVG	19	1.1	POS; RB 1 MHz; VB: 10 Hz
2498.810	64.4	H	74.0	-9.6	PK	19	1.1	POS; RB 1 MHz; VB: 3 MHz
2497.550	59.2	V	74.0	-14.8	PK	133	1.0	POS; RB 1 MHz; VB: 3 MHz
2483.530	38.6	V	54.0	-15.4	AVG	133	1.0	POS; RB 1 MHz; VB: 10 Hz



Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

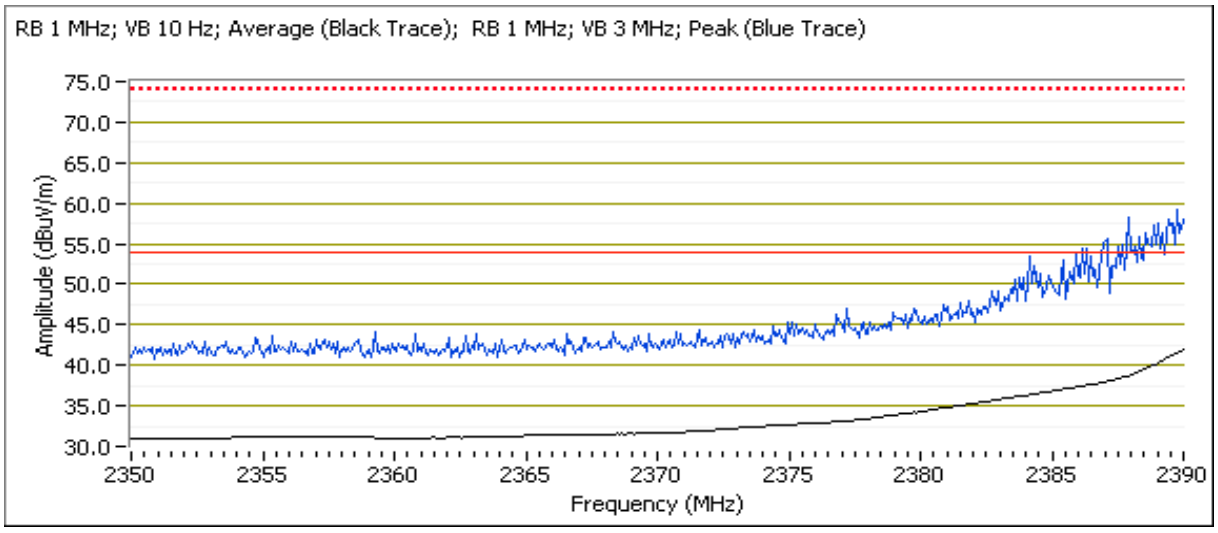
Run #2: Radiated Bandedge Measurements

Channel: 1 Mode: g Power: FCC

Tx Chain: Main Data Rate: 6 Mbps

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2390.000	42.0	H	54.0	-12.0	AVG	2	1.0	POS; RB 1 MHz; VB: 10 Hz
2390.000	40.4	V	54.0	-13.6	AVG	80	1.2	POS; RB 1 MHz; VB: 10 Hz
2389.840	59.4	H	74.0	-14.6	PK	2	1.0	POS; RB 1 MHz; VB: 3 MHz
2389.520	57.3	V	74.0	-16.7	PK	80	1.2	POS; RB 1 MHz; VB: 3 MHz

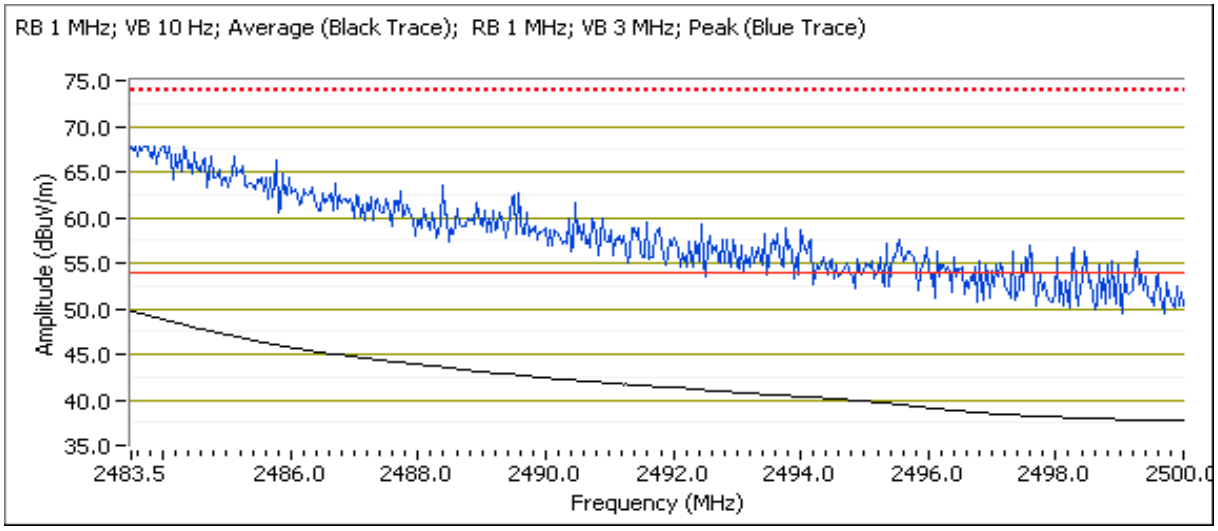


Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

Channel: 11 Mode: g Power: FCC
Tx Chain: Main Data Rate: 6 Mbps

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.570	49.5	H	54.0	-4.5	AVG	22	1.1	POS; RB 1 MHz; VB: 10 Hz
2483.530	67.8	H	74.0	-6.2	PK	22	1.1	POS; RB 1 MHz; VB: 3 MHz
2483.500	46.0	V	54.0	-8.0	AVG	136	1.0	POS; RB 1 MHz; VB: 10 Hz
2484.720	65.9	V	74.0	-8.1	PK	136	1.0	POS; RB 1 MHz; VB: 3 MHz



Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

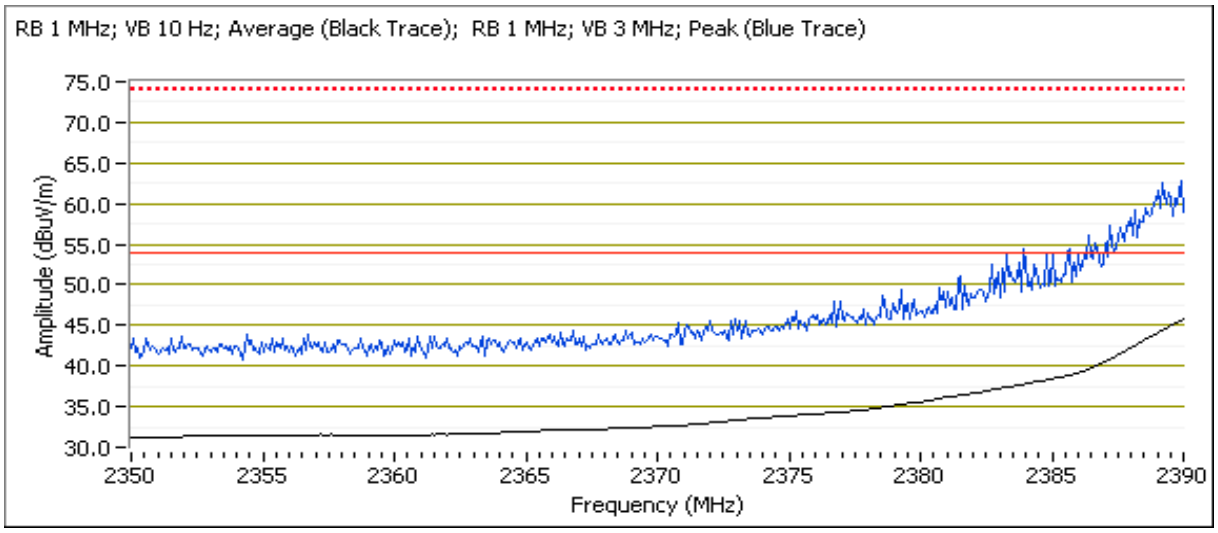
Run #3: Radiated Bandedge Measurements

Channel: 1 Mode: n20 Power: FCC

Tx Chain: Main Data Rate: MCS0

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2390.000	45.8	H	54.0	-8.2	AVG	23	1.2	POS; RB 1 MHz; VB: 10 Hz
2389.680	64.9	H	74.0	-9.1	PK	23	1.2	POS; RB 1 MHz; VB: 3 MHz
2390.000	42.8	V	54.0	-11.2	AVG	77	1.0	POS; RB 1 MHz; VB: 10 Hz
2388.720	60.6	V	74.0	-13.4	PK	77	1.0	POS; RB 1 MHz; VB: 3 MHz

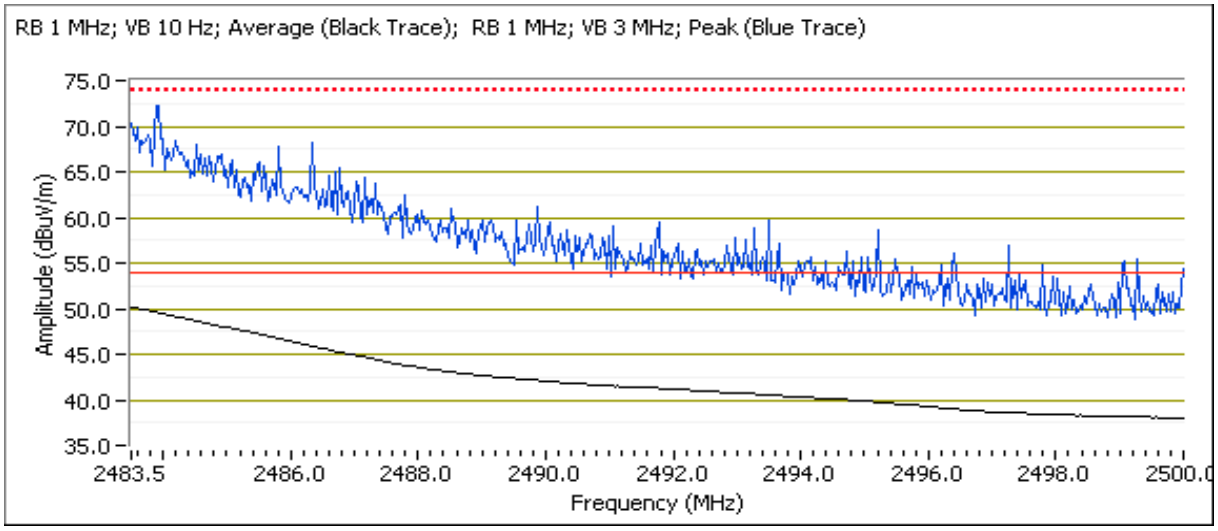


Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

Channel: 11 Mode: n20 Power: FCC
Tx Chain: Main Data Rate: MCS0

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.500	50.2	H	54.0	-3.8	AVG	20	1.1	POS; RB 1 MHz; VB: 10 Hz
2483.700	69.8	V	74.0	-4.2	PK	0	1.6	POS; RB 1 MHz; VB: 3 MHz
2484.690	68.9	H	74.0	-5.1	PK	20	1.1	POS; RB 1 MHz; VB: 3 MHz
2483.500	47.1	V	54.0	-6.9	AVG	0	1.6	POS; RB 1 MHz; VB: 10 Hz



Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

RSS 247 and FCC 15.247 (DTS) Radiated Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT, unless otherwise noted.

Ambient Conditions:

Temperature: 15-18 °C

Rel. Humidity: 30-35 %

Summary of Results - Device Operating in the 2400-2483.5 MHz Band

Run #	Mode	Channel	Target Power	Power Setting	Test Performed	Limit	Result / Margin
1	b	1 - 2412 MHz	-	-	Radiated Emissions, 30 MHz - 25 GHz	FCC Part 15.209 / 15.247(c)	50.3dBµV/m @ 14471.9 MHz (-3.7dB)
	b	6 - 2437 MHz	-	-	Radiated Emissions, 30 MHz - 25 GHz	FCC Part 15.209 / 15.247(c)	47.6dBµV/m @ 14628.3 MHz (-6.4dB)
	b	11 - 2462 MHz	-	-	Radiated Emissions, 30 MHz - 25 GHz	FCC Part 15.209 / 15.247(c)	47.2 dBµV/m @ 19695.9 MHz (-6.8 dB)
Scans on center channel in two OFDM modes to determine the worst case mode.							
2	g	6 - 2437 MHz	-	-	Radiated Emissions, 30 MHz - 25 GHz	FCC Part 15.209 / 15.247(c)	46.7 dBµV/m @ 19495.9 MHz (-7.3 dB)
	n20	6 - 2437 MHz	-	-	Radiated Emissions, 30 MHz - 25 GHz	FCC Part 15.209 / 15.247(c)	47.4 dBµV/m @ 19495.9 MHz (-6.6 dB)
Measurements on low and high channels in worst-case OFDM mode.							
3	n20	1 - 2412 MHz	-	-	Radiated Emissions, 30 MHz - 25 GHz	FCC Part 15.209 / 15.247(c)	46.8 dBµV/m @ 19295.9 MHz (-7.2 dB)
	n20	11 - 2462 MHz	-	-	Radiated Emissions, 30 MHz - 25 GHz	FCC Part 15.209 / 15.247(c)	46.1 dBµV/m @ 19695.9 MHz (-7.9 dB)

Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Sample Notes

Sample S/N: EVT29
WLAN Driver: MCP-3.3.0.65 Release CCX
WLAN Firmware: PLT 6.3.8.1.119

Procedure Comments:

Measurements performed in accordance with FCC KDB 558074
Peak measurements performed with: RBW=1 MHz, VBW=3 MHz, peak detector, max hold, auto sweep time
Unless otherwise stated/noted, emission has duty cycle ≥ 98% and was measured using RBW=1 MHz, VBW=10 Hz, peak detector, linear average mode, auto sweep time, max hold.
2.4GHz band reject filter used

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11b	1	1.00	Yes	-	0.0	0.0	-
11g	6	0.98	Yes	0.937	0.0	0.0	1067
n20	6.5	0.99	Yes	1.312	0.0	0.0	762

Measurement Specific Notes:

Note 1:	Emission in non-restricted band, but limit of 15.209 used.
Note 2:	Emission in non-restricted band, the limit was set 20 dB below the level of the fundamental and measured in 100 kHz.
Note 3:	Emission has duty cycle ≥ 98%, average measurement performed: RBW = 1 MHz, VBW = 10 Hz, peak detector, linear averaging, auto sweep, trace average 100 traces.

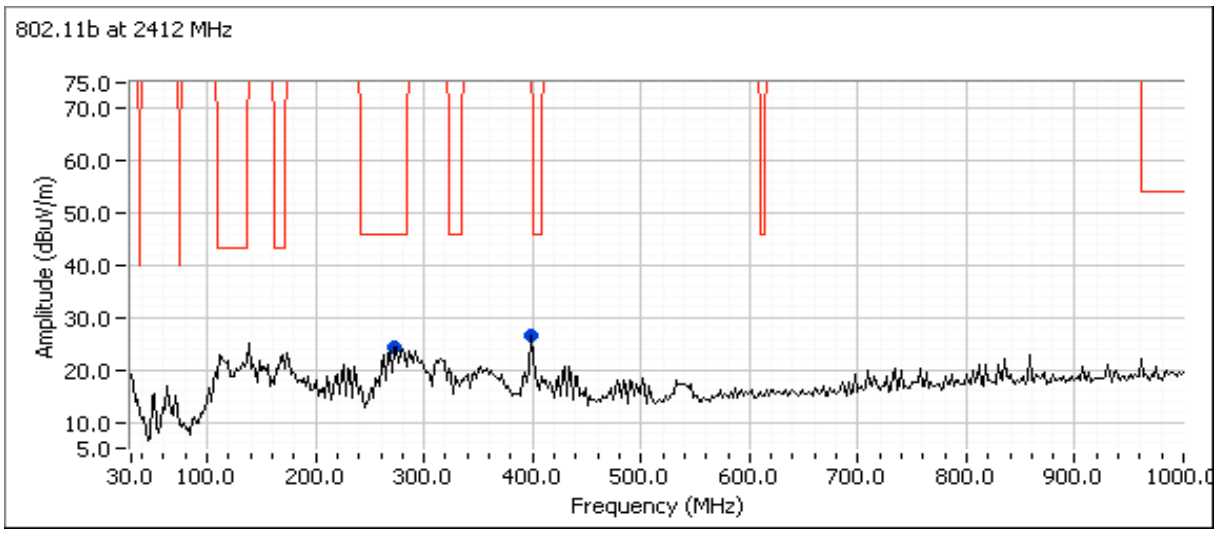
Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

Date of Test: 2/27/2015, 03/02/2015 Config. Used: Radiated
Test Engineer: M. Birgani, D. Demirci Test Location: Chamber #4

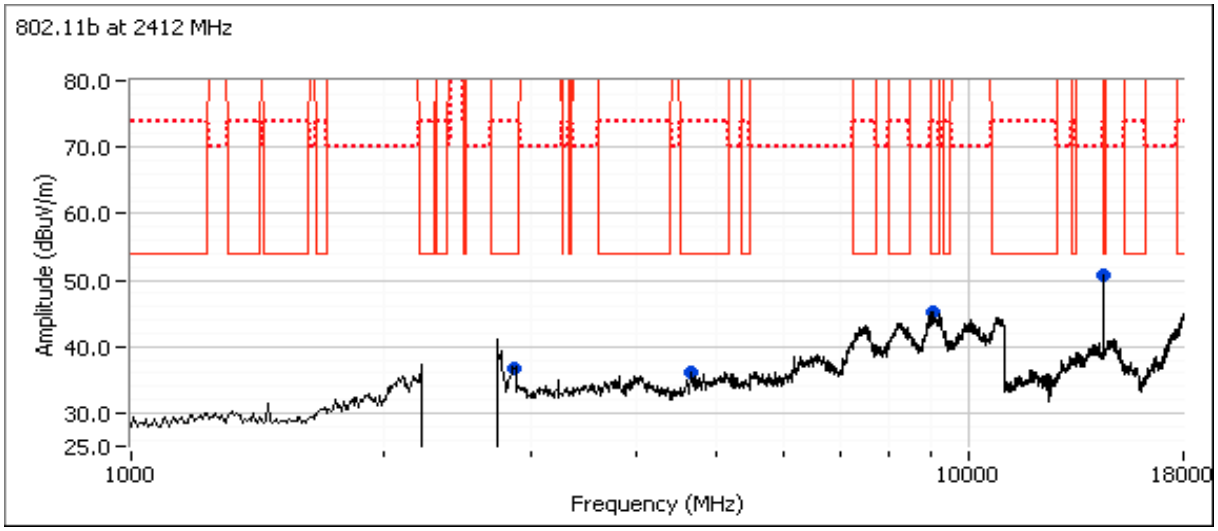
Run #1: Radiated Spurious Emissions, 30 - 25000 MHz. Operating Mode: 802.11b

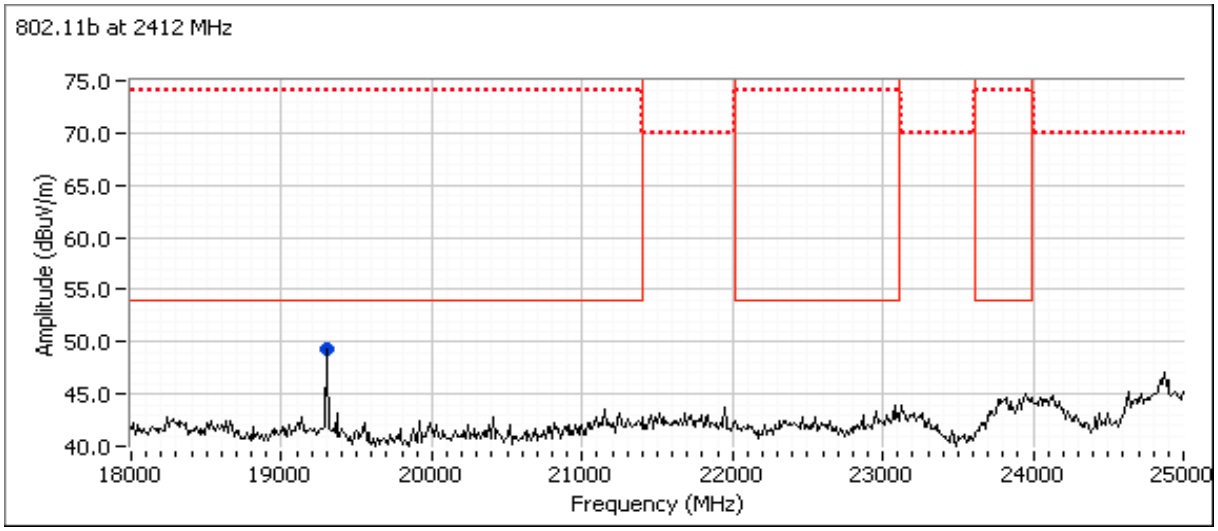
Run #1a: Low Channel
Channel: 1 Mode: b Power: FCC
Tx Chain: Main Data Rate: 1 Mbps

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
19295.910	48.1	H	54.0	-5.9	AVG	349	1.1	RB 1 MHz;VB 10 Hz;Peak
19295.960	53.3	H	74.0	-20.7	PK	349	1.1	RB 1 MHz;VB 3 MHz;Peak
14471.940	50.3	H	54.0	-3.7	AVG	60	1.0	RB 1 MHz;VB 10 Hz;Peak
9057.670	40.7	V	54.0	-13.3	AVG	278	1.3	RB 1 MHz;VB 10 Hz;Peak
399.339	26.6	H	54.0	-27.4	Peak	288	2.5	Peak reading vs QP limit
272.986	24.4	H	46.0	-21.6	Peak	214	1.5	Peak reading vs QP limit
2858.330	36.8	V	54.0	-17.2	Peak	347	1.0	Peak reading vs average limit
4666.670	36.1	V	54.0	-17.9	Peak	20	1.0	Peak reading vs average limit
14471.940	55.1	H	74.0	-18.9	PK	60	1.0	RB 1 MHz;VB 3 MHz;Peak
9058.170	52.0	V	74.0	-22.0	PK	278	1.3	RB 1 MHz;VB 3 MHz;Peak



Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A





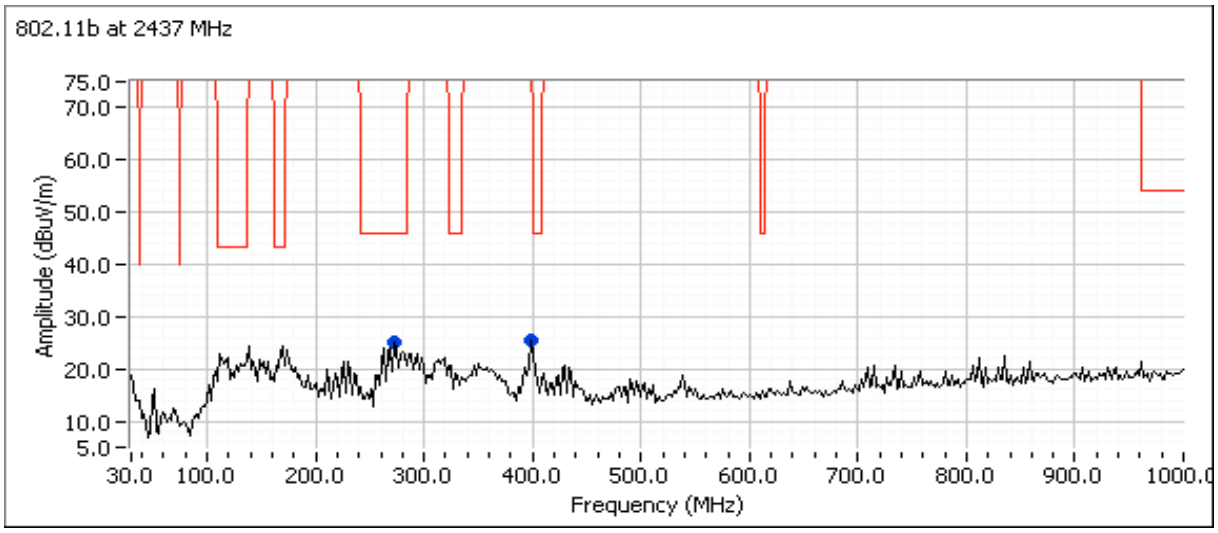
Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

Run #1b: Center Channel

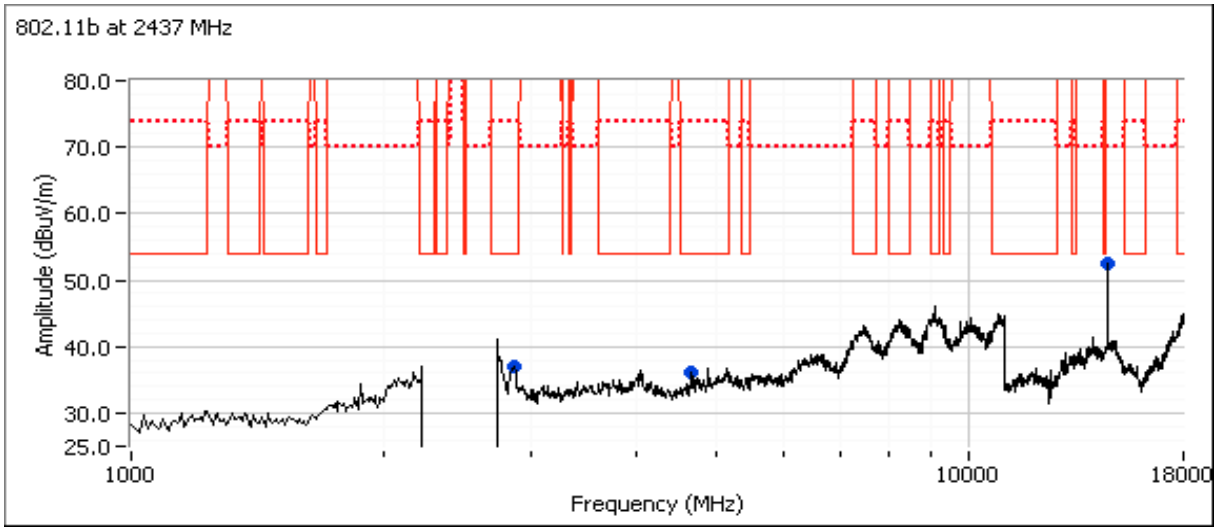
Channel: 6 Mode: b Power: FCC

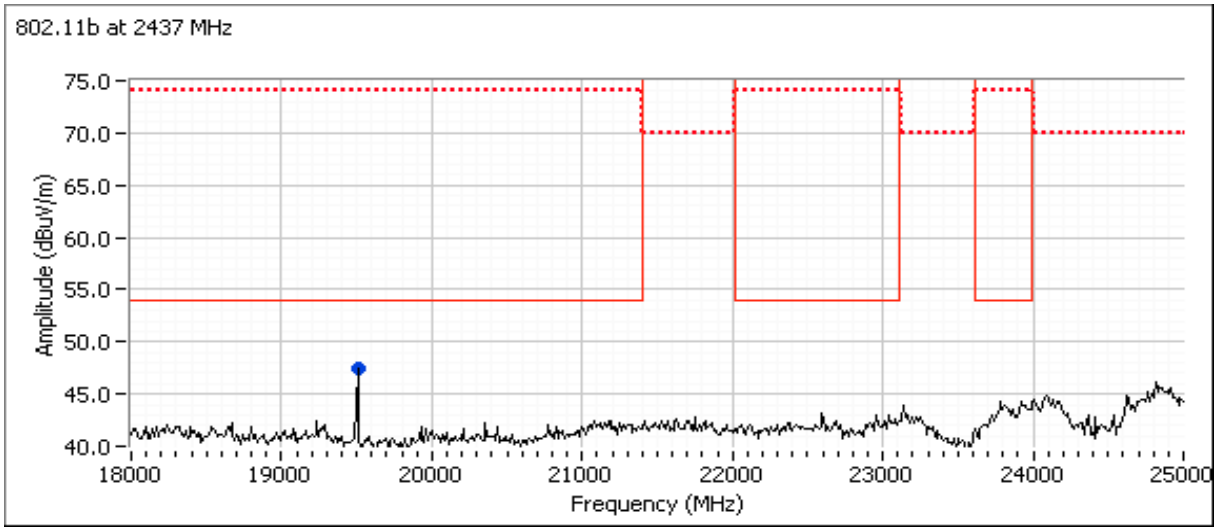
Tx Chain: Main Data Rate: 1 Mbps

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
19495.900	46.3	V	54.0	-7.7	AVG	334	1.0	RB 1 MHz;VB 10 Hz;Peak
19495.820	51.8	V	74.0	-22.2	PK	334	1.0	RB 1 MHz;VB 3 MHz;Peak
14626.330	47.6	H	54.0	-6.4	AVG	59	1.0	Note 1, RB 1 MHz;VB 10 Hz;Peak
399.339	25.6	H	54.0	-28.4	Peak	269	1.0	Peak reading vs QP limit
272.986	25.2	H	46.0	-20.8	Peak	209	1.5	Peak reading vs QP limit
2858.330	37.0	V	54.0	-17.0	Peak	343	2.0	Peak reading vs average limit
4666.670	36.0	V	54.0	-18.0	Peak	321	1.9	Peak reading vs average limit
14626.330	54.6	H	74.0	-19.4	PK	59	1.0	Note 1, RB 1 MHz;VB 3 MHz;Peak



Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A





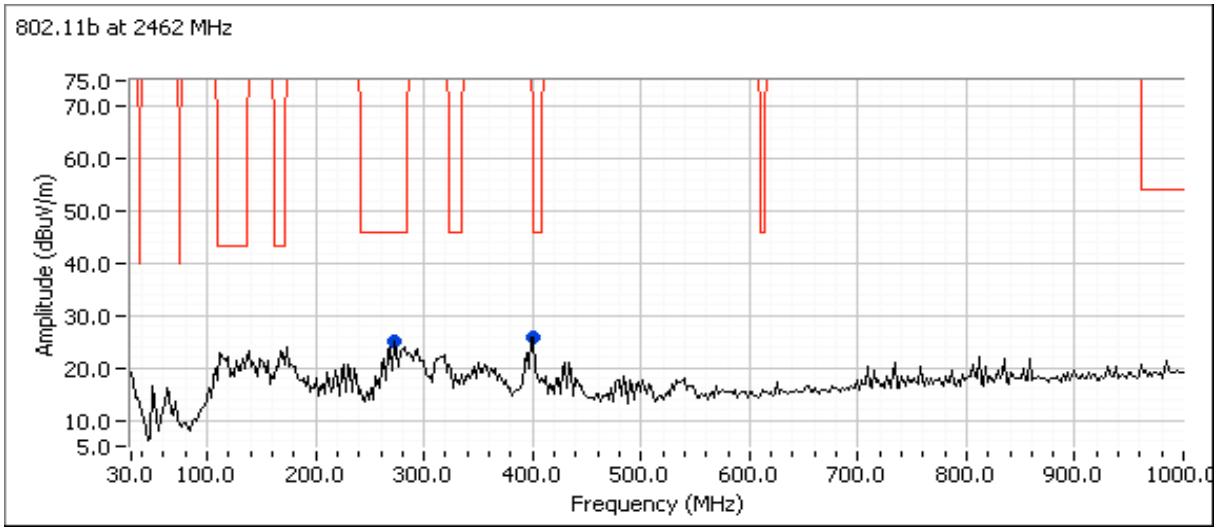
Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

Run #1c: High Channel

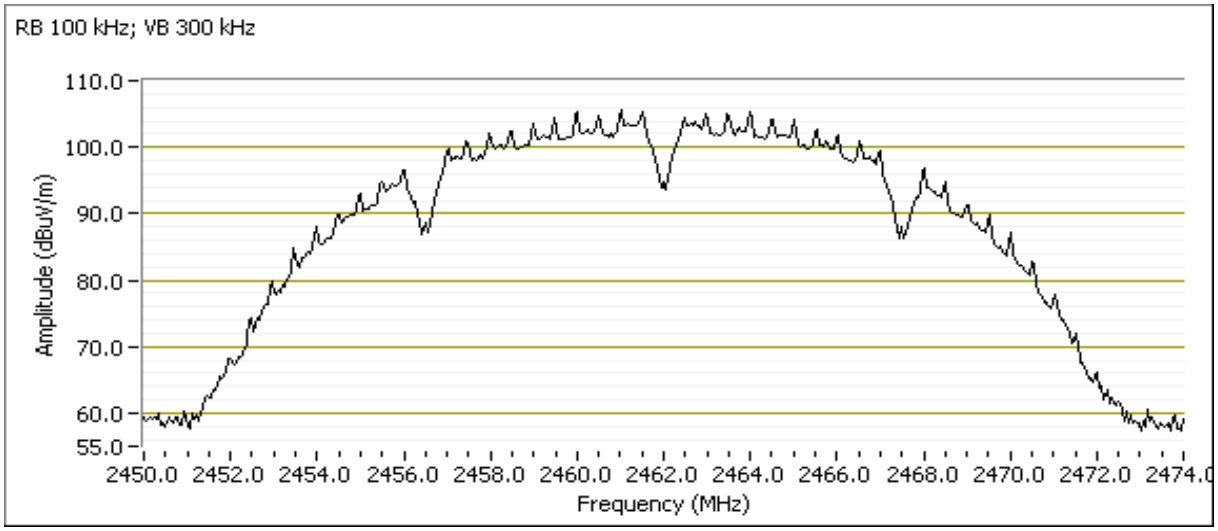
Channel: 11 Mode: b Power: FCC

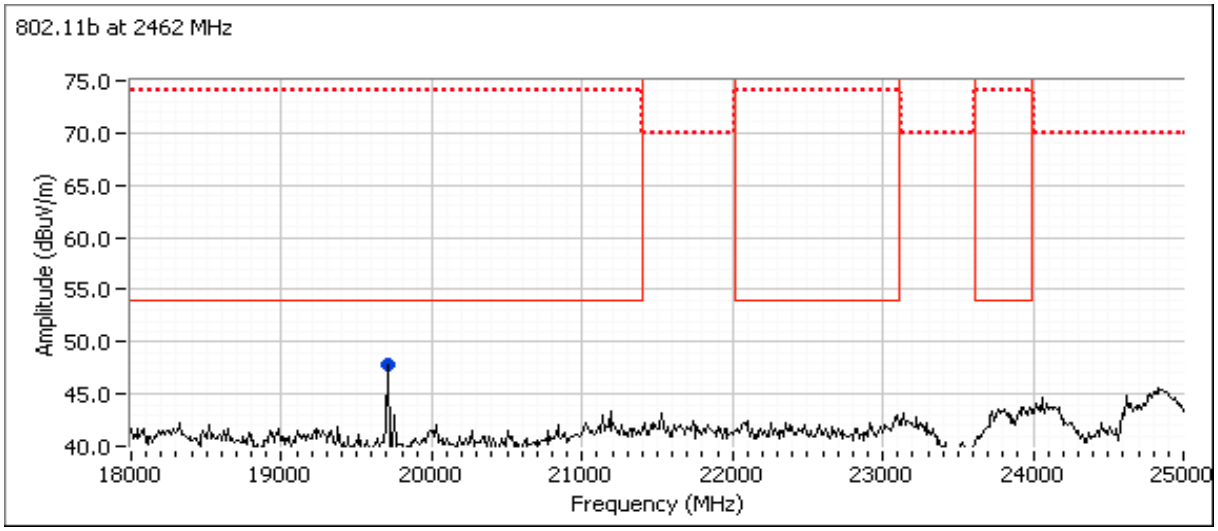
Tx Chain: Main Data Rate: 1 Mbps

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
19695.900	47.2	V	54.0	-6.8	AVG	336	1.0	RB 1 MHz;VB 10 Hz;Peak
14771.940	58.1	V	85.9	-27.8	Peak	60	1.1	Note 2, RB 100 kHz; VB: 300 kHz
4925.000	41.0	V	54.0	-13.0	Peak	329	2.0	Peak reading vs average limit
272.986	25.1	H	46.0	-20.9	Peak	214	1.5	Peak reading vs QP limit
401.283	25.8	H	46.0	-20.2	Peak	288	2.5	Peak reading vs QP limit
2858.330	37.6	V	54.0	-16.4	Peak	115	1.6	Peak reading vs average limit
19695.980	52.1	V	74.0	-21.9	PK	336	1.0	RB 1 MHz;VB 3 MHz;Peak
9850.000	47.5	V	85.9	-38.4	Peak	43	1.9	Note 2, RB 100 kHz; VB: 300 kHz
2462.590	102.5	V	-	-	Peak	42	1.1	POS; RB 100 kHz; VB: 300 kHz
2461.030	105.9	H	-	-	Peak	304	1.1	POS; RB 100 kHz; VB: 300 kHz



Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A





Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

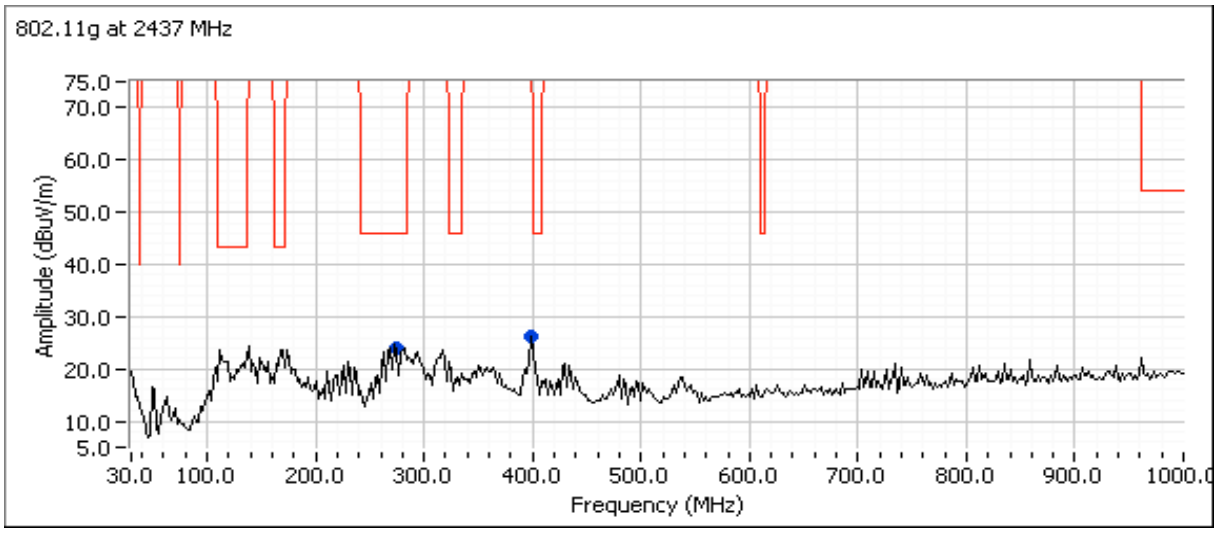
Run #2: Radiated Spurious Emissions, 30 - 25000 MHz. Operating Mode: OFDM

Run #2a: Center Channel

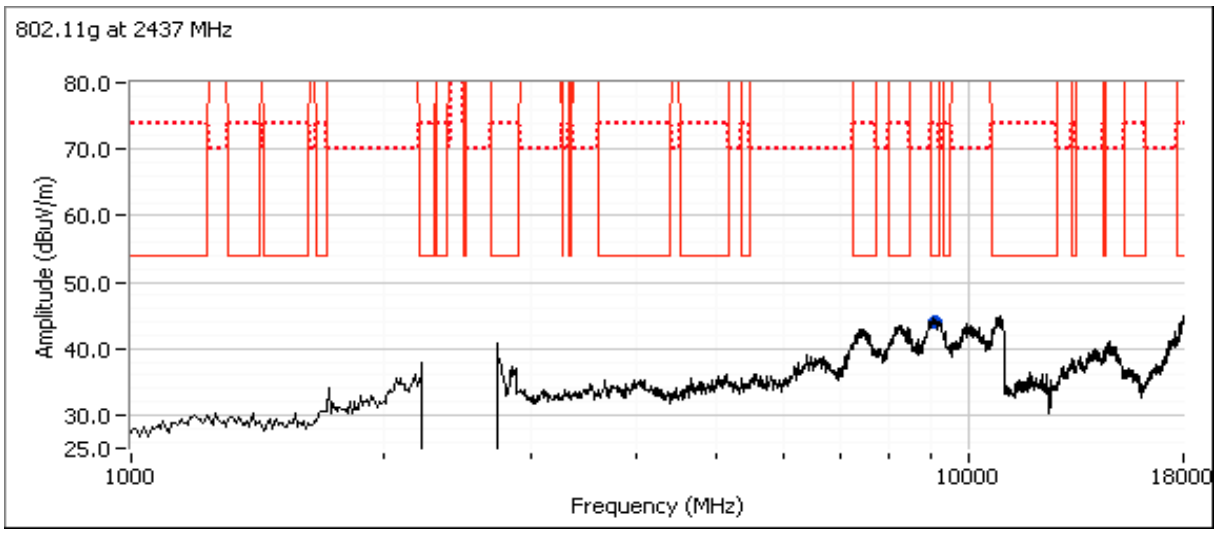
Channel: 6 Mode: g Power: FCC

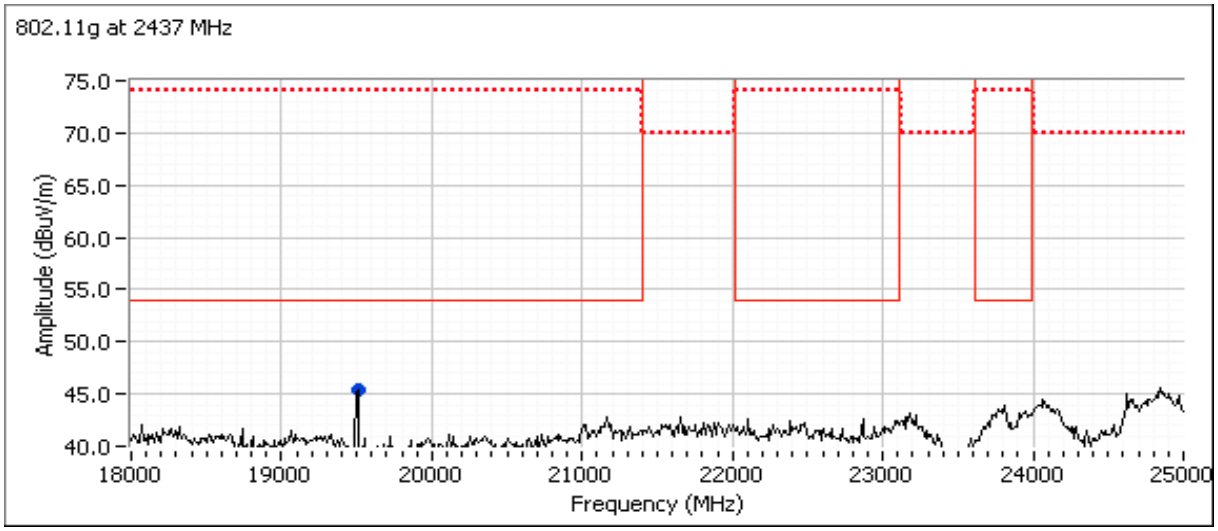
Tx Chain: Main Data Rate: 6 Mbps

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
19495.910	46.7	V	54.0	-7.3	AVG	334	1.0	RB 1 MHz;VB 10 Hz;Peak
399.339	26.2	H	54.0	-27.8	Peak	290	1.0	Peak reading vs QP limit
274.930	24.1	H	46.0	-21.9	Peak	228	1.5	Peak reading vs QP limit
9108.330	38.2	V	54.0	-15.8	AVG	223	1.5	RB 1 MHz;VB 10 Hz;Peak
19496.010	51.9	V	74.0	-22.1	PK	334	1.0	RB 1 MHz;VB 3 MHz;Peak
9108.330	44.0	V	74.0	-30.0	PK	223	1.5	RB 1 MHz;VB 3 MHz;Peak



Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A





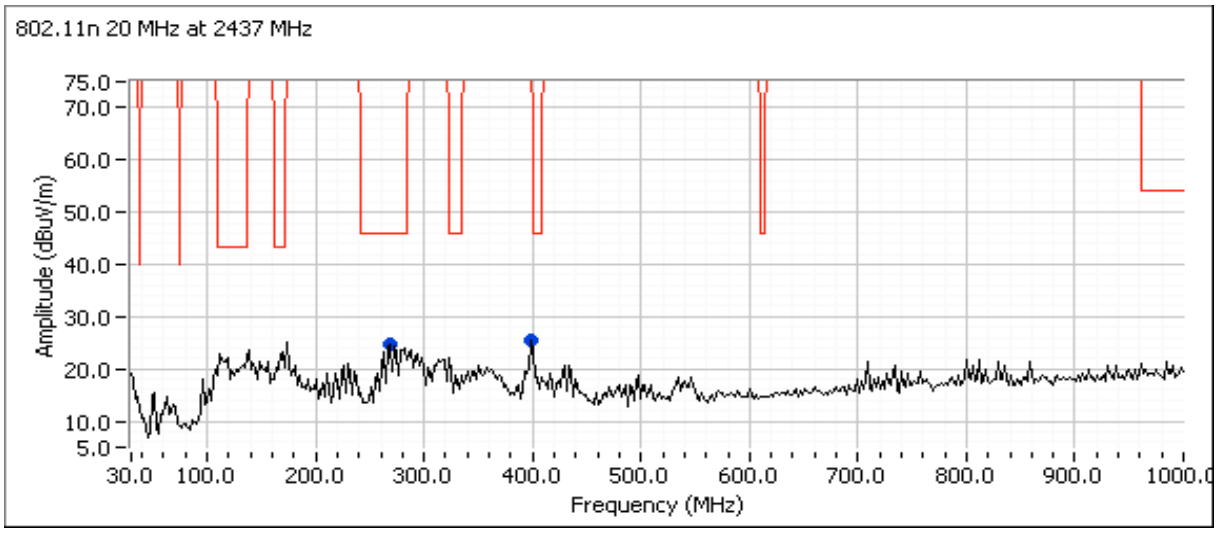
Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

Run #2b: Center Channel

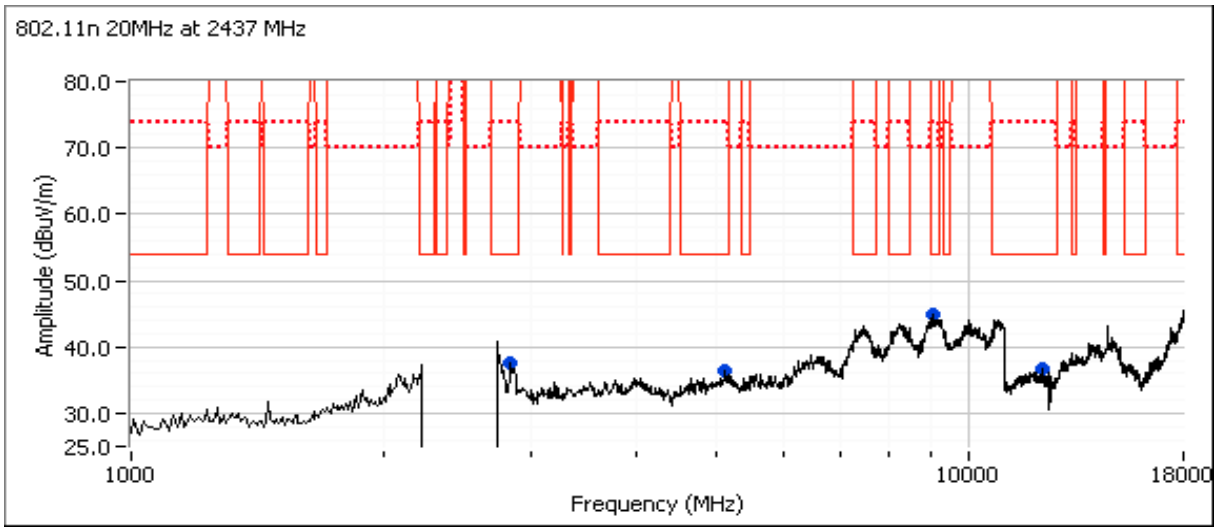
Channel: 6 Mode: n20 Power: FCC

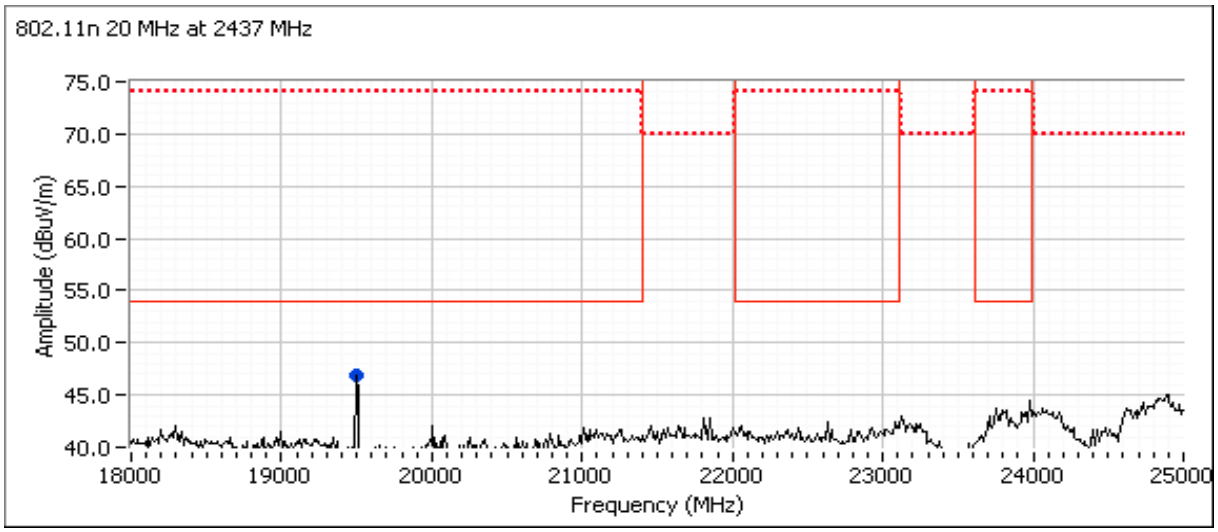
Tx Chain: Main Data Rate: MCS0

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
19495.930	47.4	V	54.0	-6.6	AVG	327	1.1	RB 1 MHz;VB 10 Hz;Peak
9041.160	40.7	H	54.0	-13.3	AVG	257	1.0	RB 1 MHz;VB 10 Hz;Peak
269.098	24.7	H	46.0	-21.3	Peak	205	1.0	Peak reading vs QP limit
399.339	25.4	H	54.0	-28.6	Peak	309	2.5	Peak reading vs QP limit
2833.330	37.6	H	54.0	-16.4	Peak	98	1.0	Peak reading vs average limit
5108.330	36.3	H	54.0	-17.7	Peak	257	1.5	Peak reading vs average limit
19495.810	52.4	V	74.0	-21.6	PK	327	1.1	RB 1 MHz;VB 3 MHz;Peak
9040.780	51.9	H	74.0	-22.1	PK	257	1.0	RB 1 MHz;VB 3 MHz;Peak



Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A





Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

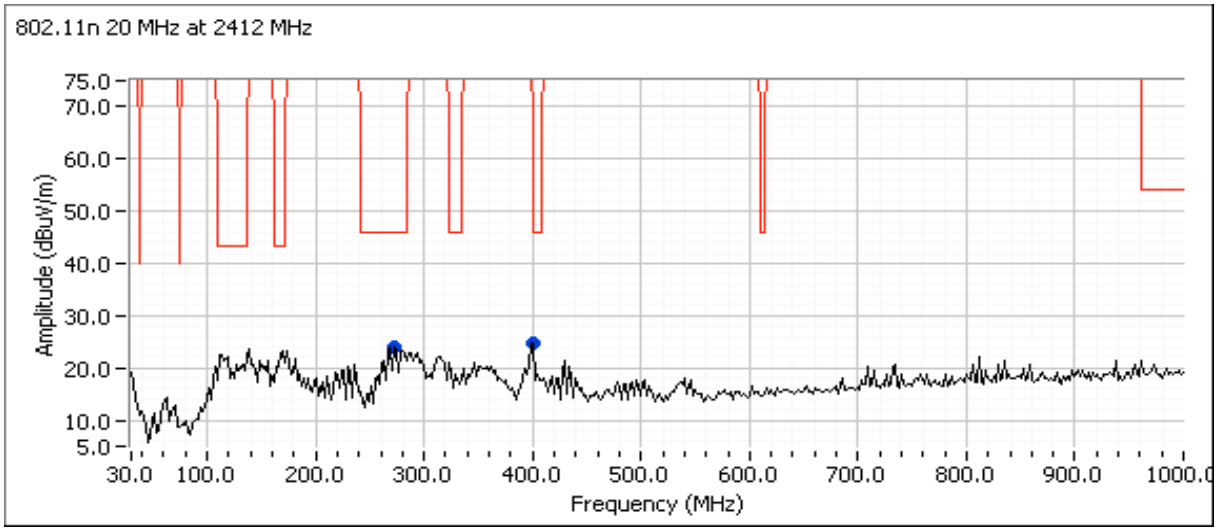
Run #3: Radiated Spurious Emissions, 30 - 25000 MHz. Operating Mode: Worse case from Run #2

Run #3a: Low Channel

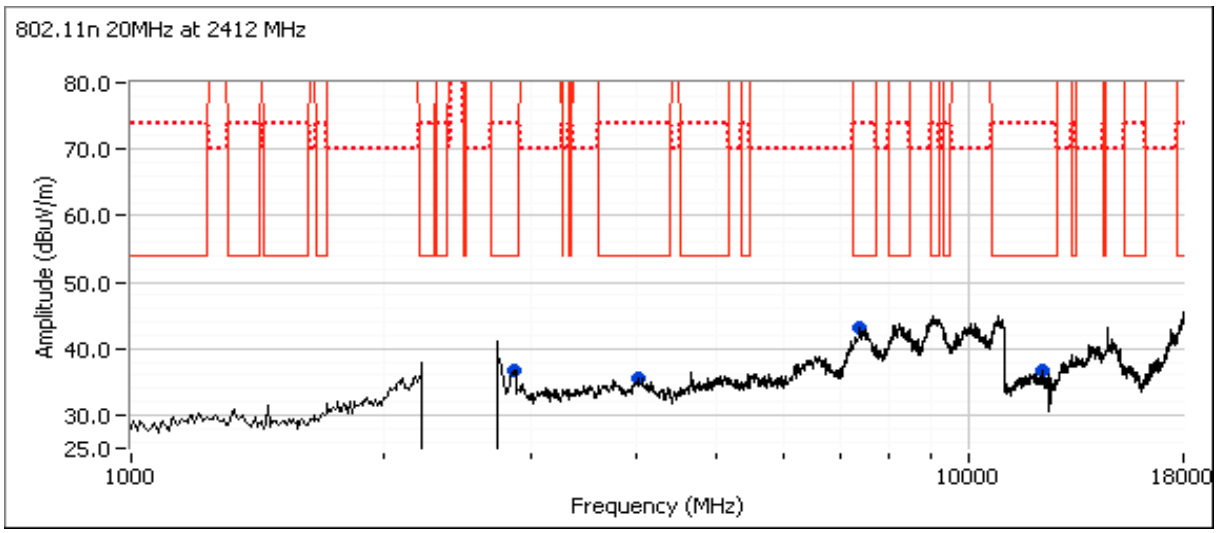
Channel: 1 Mode: n20 Power: FCC

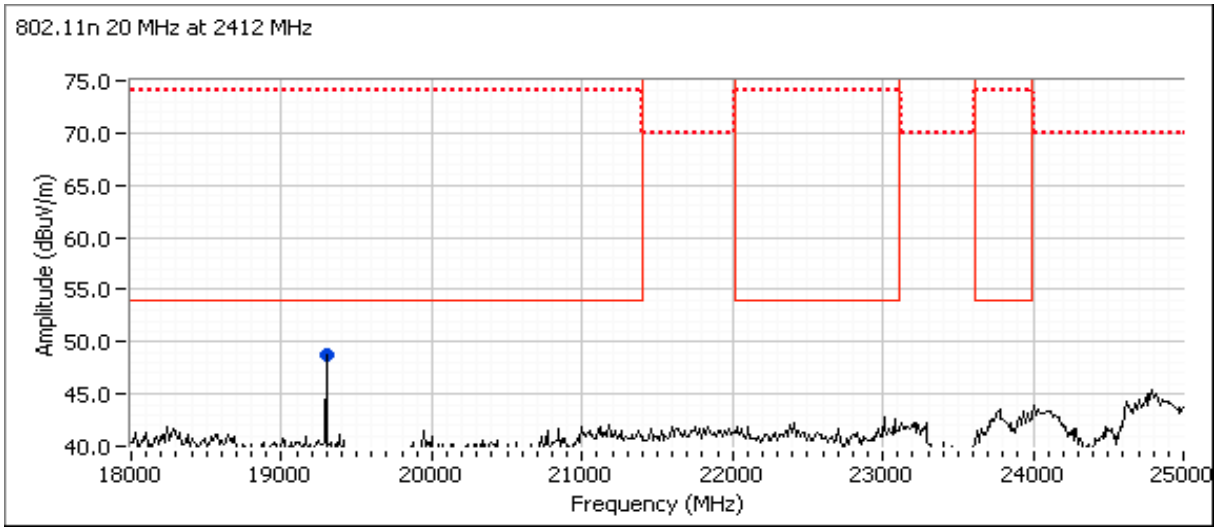
Tx Chain: Main Data Rate: MCS0

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
19295.890	46.8	V	54.0	-7.2	AVG	330	1.0	RB 1 MHz;VB 10 Hz;Peak
7383.330	43.2	H	54.0	-10.8	Peak	256	1.7	Peak reading vs average limit
401.283	24.8	H	46.0	-21.2	Peak	263	2.5	Peak reading vs QP limit
272.986	24.0	H	46.0	-22.0	Peak	244	1.5	Peak reading vs QP limit
2858.330	36.8	H	54.0	-17.2	Peak	313	1.0	Peak reading vs average limit
4016.670	35.5	V	54.0	-18.5	Peak	281	1.6	Peak reading vs average limit
19295.790	53.4	V	74.0	-20.6	PK	330	1.0	RB 1 MHz;VB 3 MHz;Peak



Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A





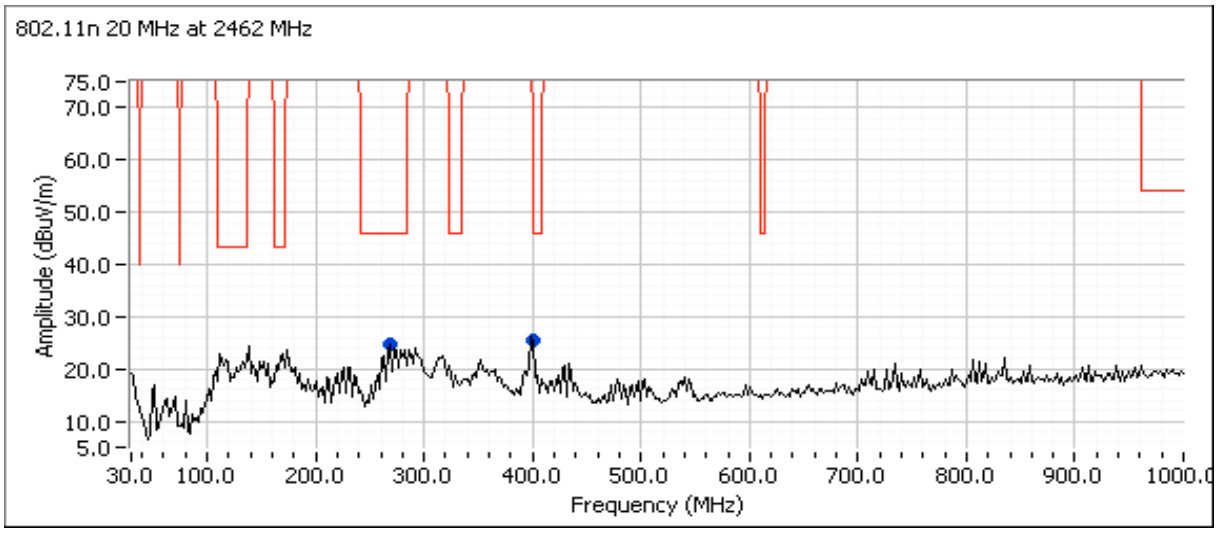
Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A

Run #3b: High Channel

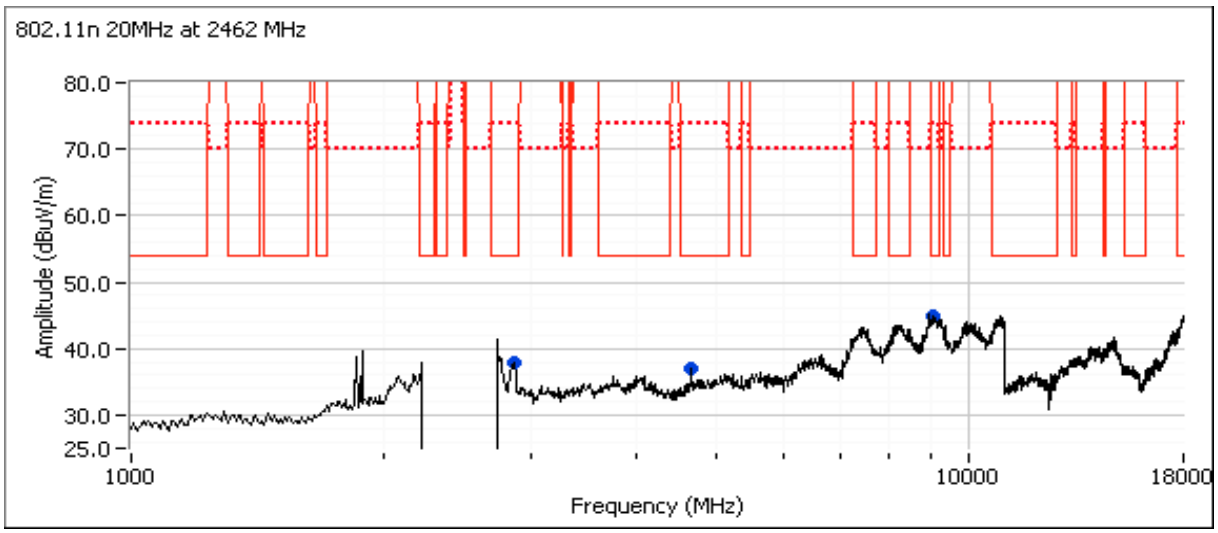
Channel: 11 Mode: n20 Power: FCC

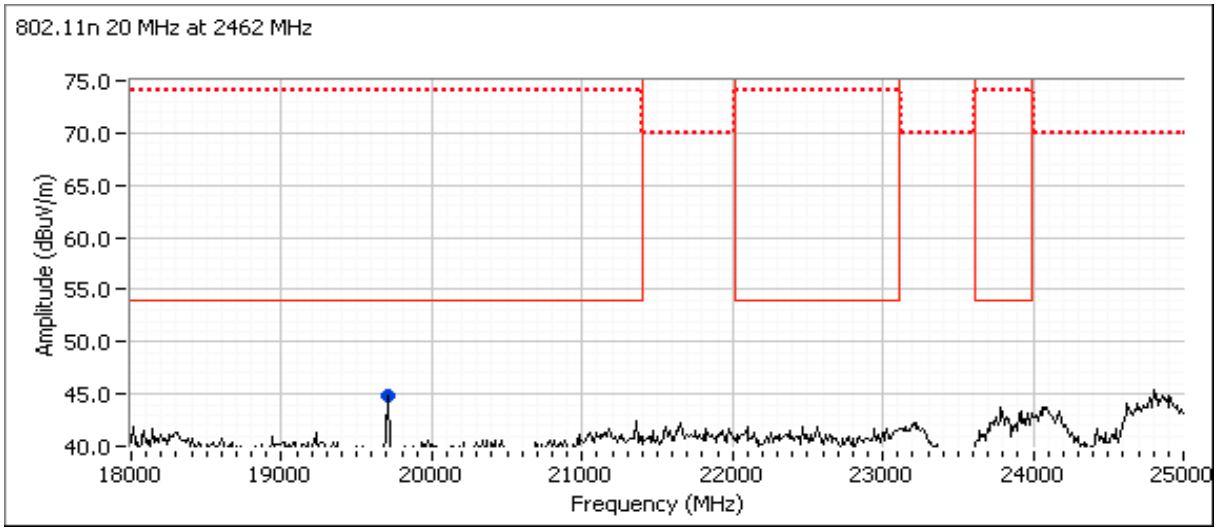
Tx Chain: Main Data Rate: MCS0

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
19695.920	46.1	V	54.0	-7.9	AVG	334	1.0	RB 1 MHz;VB 10 Hz;Peak
9026.160	40.6	H	54.0	-13.4	AVG	227	1.6	RB 1 MHz;VB 10 Hz;Peak
269.098	*24.9*	*H*	*46.0*	*-21.1*	*Peak*	*29*	*1.5*	Peak reading vs QP limit
401.283	*25.6*	*H*	*46.0*	*-20.4*	*Peak*	*273*	*2.5*	Peak reading vs QP limit
2858.330	*37.8*	*V*	*54.0*	-16.2	*Peak*	*295*	*1.6*	Peak reading vs average limit
4658.330	*37.1*	*V*	*54.0*	-16.9	*Peak*	*224*	*2.2*	Peak reading vs average limit
9025.430	52.4	H	74.0	-21.6	PK	227	1.6	RB 1 MHz;VB 3 MHz;Peak
19695.930	51.4	V	74.0	-22.6	PK	334	1.0	RB 1 MHz;VB 3 MHz;Peak



Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	N/A





Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	B

Conducted Emissions

(NTS Silicon Valley, Fremont Facility, Semi-Anechoic Chamber)

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 3/2/2015
Test Engineer: Deniz Demirci
Test Location: Fremont Chamber #4

Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

General Test Configuration

The EUT was located on a table inside the semi-anechoic chamber, 40 cm from a vertical coupling plane and 80 cm from the LISN. No remote support equipment was used.

Ambient Conditions:

Temperature: 15-18 °C
Rel. Humidity: 30-35 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power,120V/60Hz	Class B	Pass	46.4 dBµV @ 0.195 MHz (-17.4 dB)

Modifications Made During Testing

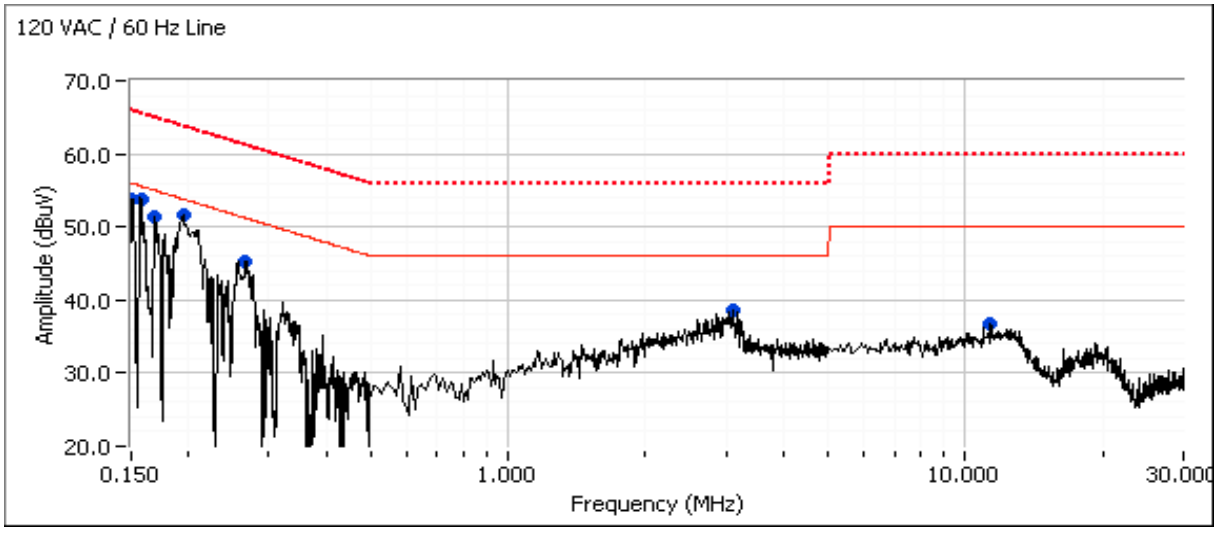
No modifications were made to the EUT during testing

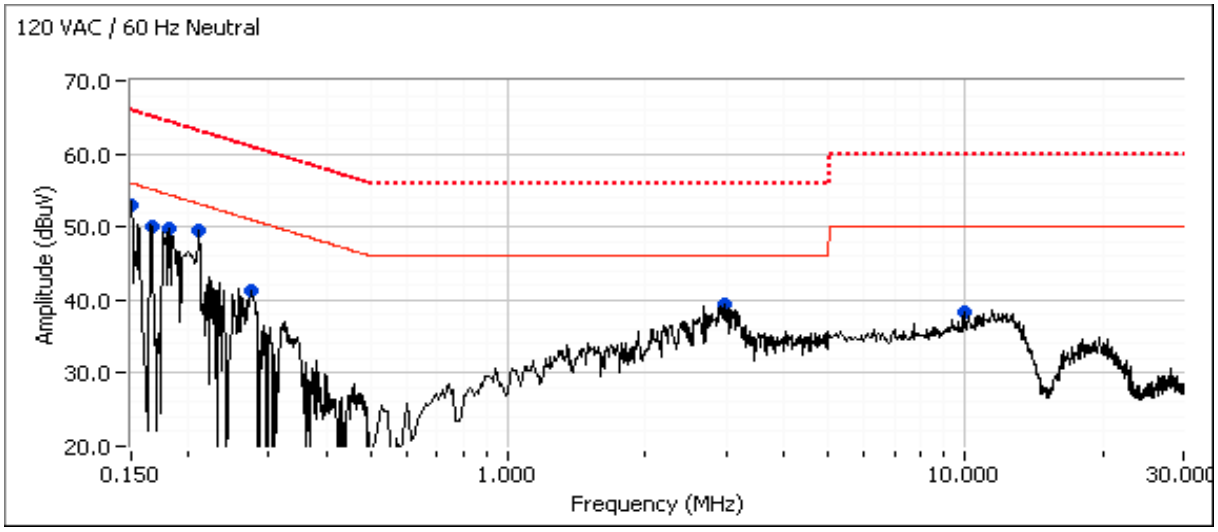
Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	B

Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120 V/60 Hz
Battery Charging (TECH Power charger), WIFI Active, 802.11g, Ch #6, Maximum FCC power setting (Max.)





Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	B

Preliminary peak readings captured during pre-scan (peak readings vs. average limit)

Frequency	Level	AC	Class B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.151	*53.7*	*Line 1*	*56.0*	*-2.3*	*Peak*	
0.158	*53.7*	*Line 1*	*55.6*	*-1.9*	*Peak*	
0.169	*51.4*	*Line 1*	*55.0*	*-3.6*	*Peak*	
0.195	*51.6*	*Line 1*	*53.8*	*-2.2*	*Peak*	
0.267	*45.3*	*Line 1*	*51.2*	*-5.9*	*Peak*	
3.106	*38.5*	*Line 1*	*46.0*	*-7.5*	*Peak*	
11.313	*36.7*	*Line 1*	*50.0*	*-13.3*	*Peak*	
3.043	*39.5*	*Neutral*	*46.0*	*-6.5*	*Peak*	
0.151	*53.1*	*Neutral*	*56.0*	*-2.9*	*Peak*	
0.166	*50.1*	*Neutral*	*55.2*	*-5.1*	*Peak*	
0.181	*49.8*	*Neutral*	*54.4*	*-4.6*	*Peak*	
0.211	*49.4*	*Neutral*	*53.2*	*-3.8*	*Peak*	
0.274	*41.4*	*Neutral*	*51.0*	*-9.6*	*Peak*	
2.989	*39.5*	*Neutral*	*46.0*	*-6.5*	*Peak*	
10.010	*38.4*	*Neutral*	*50.0*	*-11.6*	*Peak*	

Client:	Neato Robotics	Job Number:	J97654
Model:	Botvac Connected	T-Log Number:	T97691
		Project Manager:	Christine Krebill
Contact:	Matt Tenuta	Project Coordinator:	-
Standard:	FCC 15.247, RSS 247	Class:	B

Final quasi-peak and average readings

Frequency	Level	AC	Class B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.195	46.4	Line 1	63.8	-17.4	QP	QP (1.00s)
0.151	45.9	Line 1	65.9	-20.0	QP	QP (1.00s)
0.151	45.6	Neutral	65.9	-20.3	QP	QP (1.00s)
0.158	44.8	Line 1	65.6	-20.8	QP	QP (1.00s)
2.985	34.9	Neutral	56.0	-21.1	QP	QP (1.00s)
0.166	43.8	Neutral	65.2	-21.4	QP	QP (1.00s)
3.048	34.5	Neutral	56.0	-21.5	QP	QP (1.00s)
0.267	39.4	Line 1	61.2	-21.8	QP	QP (1.00s)
0.169	42.9	Line 1	65.0	-22.1	QP	QP (1.00s)
0.195	31.2	Line 1	53.8	-22.6	AVG	AVG (0.10s)
3.115	33.2	Line 1	56.0	-22.8	QP	QP (1.00s)
0.181	41.6	Neutral	64.4	-22.8	QP	QP (1.00s)
10.043	26.7	Neutral	50.0	-23.3	AVG	AVG (0.10s)
11.282	26.0	Line 1	50.0	-24.0	AVG	AVG (0.10s)
0.211	39.2	Neutral	63.2	-24.0	QP	QP (1.00s)
0.274	36.5	Neutral	61.0	-24.5	QP	QP (1.00s)
2.985	21.0	Neutral	46.0	-25.0	AVG	AVG (0.10s)
3.048	20.9	Neutral	46.0	-25.1	AVG	AVG (0.10s)
3.115	20.2	Line 1	46.0	-25.8	AVG	AVG (0.10s)
0.267	23.6	Line 1	51.2	-27.6	AVG	AVG (0.10s)
10.043	32.1	Neutral	60.0	-27.9	QP	QP (1.00s)
11.282	31.7	Line 1	60.0	-28.3	QP	QP (1.00s)
0.274	19.0	Neutral	51.0	-32.0	AVG	AVG (0.10s)
0.211	18.2	Neutral	53.2	-35.0	AVG	AVG (0.10s)
0.151	19.6	Line 1	55.9	-36.3	AVG	AVG (0.10s)
0.151	18.8	Neutral	55.9	-37.1	AVG	AVG (0.10s)
0.181	17.3	Neutral	54.4	-37.1	AVG	AVG (0.10s)
0.158	18.3	Line 1	55.6	-37.3	AVG	AVG (0.10s)
0.169	17.3	Line 1	55.0	-37.7	AVG	AVG (0.10s)
0.166	17.4	Neutral	55.2	-37.8	AVG	AVG (0.10s)

End of Report

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