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EMC Test Report

Application for Grant of Equipment Authorization

FCC Part 15, Subpart E (April 2014 Rules)

Model: SR1420

FCC ID:	2AAAS-CE02
APPLICANT:	Vivint Wireless 3945 Freedom Circle, Suite 150 Santa Clara, CA 95054
TEST SITE(S):	National Technical Systems - Silicon Valley 41039 Boyce Road. Fremont, CA. 94538-2435
REPORT DATE:	November 7, 2014
REISSUE DATE:	November 20, 2014
FINAL TEST DATES:	August 20, September 8, 10, 11, 12 and 15, 2014
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A2LA ACCREDITED
Testing Cert #0214.26

REVISION HISTORY

Rev#	Date	Comments	Modified By
1	November 7, 2014	First release	
2	November 20, 2014	Correct Referenced Power limits, clarification on operating mode	MEH

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SCOPE

An electromagnetic emissions test has been performed on the Vivint Wireless model SR1420, pursuant to the following rules:

FCC Part 15, Subpart E requirements for UNII Devices (April 2014)

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 C63.10-2009
FCC General UNII Test Procedures KDB789033

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.

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 Vivint Wireless model SR1420 complied with the requirements of the following regulations:

FCC Part 15, Subpart E requirements for UNII Devices

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 Vivint Wireless model SR1420 and therefore apply only to the tested sample. The sample was selected and prepared by Venkat Kalkunte of Vivint Wireless.

DEVIATIONS FROM THE STANDARDS

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

TEST RESULTS SUMMARY

UNII / LELAN DEVICES

Operation in the 5.15 – 5.25 GHz Band

FCC Rule Part	Description	Measured Value / Comments	Limit / Requirement[1]	Result
15.407(a)(1)(iv)-	Output Power	n40: 19.7dBm (93.3mW)	24 dBm / 250mW (eirp < 30dBm)	Complies
	Power Spectral Density	n40: 3.6dBm/MHz	11 dBm/MHz	Complies

Operation in the 5.25 – 5.35 GHz Band

FCC Rule Part	Description	Measured Value / Comments	Limit / Requirement[1]	Result (margin)
15.407(a) (2)	26dB Bandwidth	43.3MHz	N/A – limits output power if < 20MHz	N/A
15.407(a) (2)	Output Power	n40: 20.9dBm (123.9mW) max eirp = 29.9dBm	24 dBm / 250mW (eirp < 30dBm)	Complies
	Power Spectral Density	n40: 4.8dBm/MHz	11 dBm/MHz	Complies

Operation in the 5.47 – 5.725 GHz Band

FCC Rule Part	Description	Measured Value / Comments	Limit / Requirement[1]	Result (margin)
15.407(a) (2)	26dB Bandwidth	36.9MHz	N/A – limits output power if < 20MHz	N/A
15.407(a) (2)	Output Power	n40: 20.9dBm (123.4mW) max eirp = 29.9dBm	24 dBm / 250mW (eirp < 30dBm)	Complies
	Power Spectral Density	n40: 5.5dBm/MHz	11 dBm/MHz	Complies

Operation in the 5.725 – 5.850 GHz Band

FCC Rule Part	Description	Measured Value / Comments	Limit / Requirement[1]	Result (margin)
15.407(a) (3) / 15.407(e)	6dB Bandwidth	35.6 MHz	>500kHz	N/A
15.407(a) (3)	Output Power	n40: 23.6dBm (228.7mW) max eirp = 32.6dBm	30 dBm / 1000W (eirp < 36dBm)	Complies
	Power Spectral Density	n40: 7.5 dBm/MHz	30dBm/500kHz (27dBm/MHz)	Complies

[1] Power and PSD limits for devices with effective antenna gain <6dBi. Refer to test data for the final power and PSD limits.

Requirements for all U-NII/LELAN bands

FCC Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.407	Modulation	Digital Modulation is used	Digital modulation is required	Complies
15.407(b) / 15.209	Spurious Emissions	53.7 dBµV/m @ 5149.8 MHz (-0.3 dB)	Refer to page 20	Complies
15.407 (c)	Operation in the absence of information to transmit	Operation is discontinued in the absence of information	Device shall automatically discontinue operation in the absence of information to transmit	Complies
15.407(g)	Frequency Stability	Frequency stability is better than 10ppm	Signal shall remain within the allocated band	Complies
15.407(h)(1)	Transmit Power Control	TCP mechanism is discussed in the Operational Description	The U-NII device shall have the capability to operate with a mean EIRP value lower than 24dBm (250mW)	Complies
15.407(h)(2)	Dynamic frequency Selection (device without radar detection)	Refer to separate test report, reference R96414	Channel move time < 10s Channel closing transmission time < 260ms	Complies

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

FCC Rule Part	RSS Rule part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203		RF Connector	Antenna is integral	Unique or integral antenna required	Complies
15.207		AC Conducted Emissions	60.0 dBµV @ 0.151 MHz (-5.9 dB)	Refer to page 19	Complies
15.109		Receiver spurious emissions	N/A – receiver tunes above 960MHz		
15.407(f)		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

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 Vivint Wireless model SR1420 is a 5GHz 802.11 4x4 client device. The EUT would normally be pole or wall mounted. For testing, it was placed on a tabletop. The EUT is powered via POE connection.

The sample was received on August 5, 2014 and tested on August 20, September 8, 10, 11, 12 and 15, 2014. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Vivint Wireless	1420	5GHz 802.11 4x4 radio	C7105S1140200BT	2AAAS-CE02

OTHER EUT DETAILS

The following EUT details should be noted:
5GHz only, all bands (new rules)
40MHz only, with MCS8 (2 spatial streams) minimum data rates
4x4 operation only
Non-point-to-point
Beamforming (2 pairs) supported
Antenna: 6dBi panel
Outdoor Use
Client Device

ANTENNA SYSTEM

The antenna system consists of 4 element panel antenna integral to the device.

ENCLOSURE

The EUT enclosure is primarily constructed of plastic. It measures approximately 31.5 cm wide by 10 cm deep by 31.5 cm high.

MODIFICATIONS

The following modification was made to the EUT during the time the product was at National Technical Systems - Silicon Valley:

1. For radiated emissions, FerriShield (www.leadertechinc.com) - cable clamp TC28B0617; placed on the etherent cable between external port and internal pcb

Modification made to comply with 15B requirements. Present during all testing.

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
-	PSE802G	POE Injector	-	-
Acer	Aspire 5735	Laptop Computer	LXAU59X265903089 BE2000	-

EUT INTERFACE PORTS

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

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
POE	POE Injector	CAT5	Unshielded	
USB	Not Connected	-	-	-

Additional on Support Equipment

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
POE Injector	Laptop	CAT5	Unshielded	

EUT OPERATION

During emissions testing the EUT was configured to continuously transmit at the noted channel and power level. All transmissions were 4Tx with beamforming active.

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
Chamber 5	US0027	2845B-5	

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 an open field environment or 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) 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 2000 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 20Hz, 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 1000MHz 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 fifty microhenry Line Impedance Stabilization Network as the monitoring point. The LISN used also contains a 250 uH 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

A loop antenna is used below 30 MHz. 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 an 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 that the test height above ground for table mounted devices shall be 80 centimeters. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor as specified in ANSI C63.4. During radiated measurements, the EUT is positioned on a motorized turntable 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.

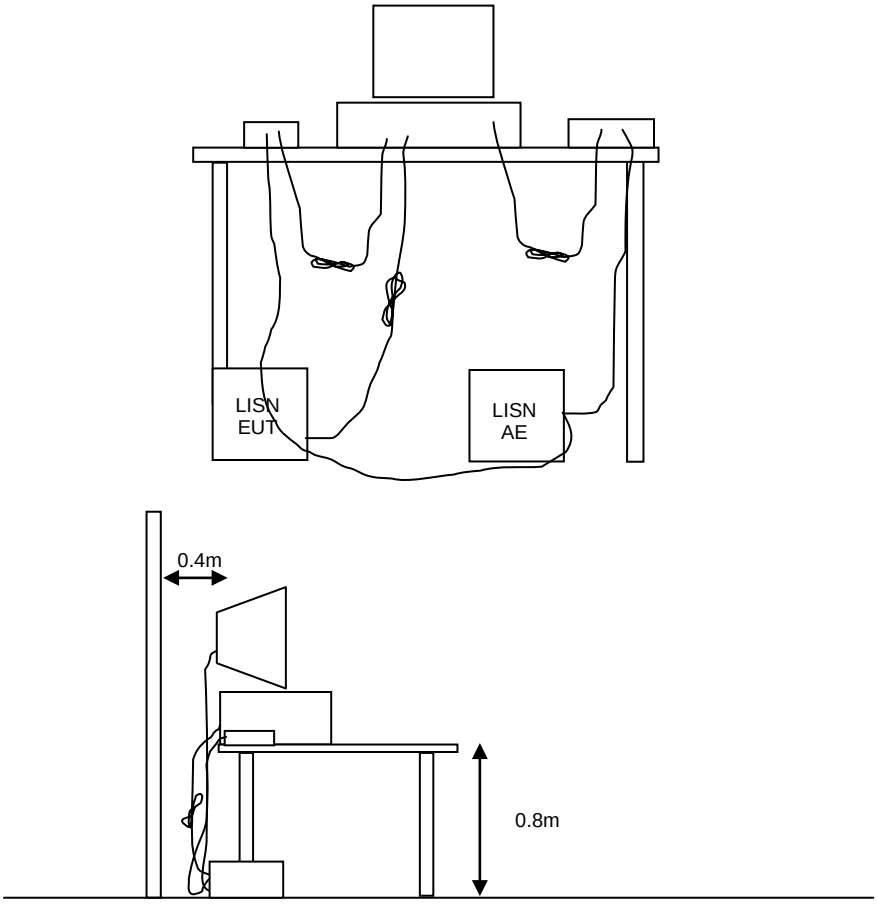


Figure 1 Typical Conducted Emissions Test Configuration

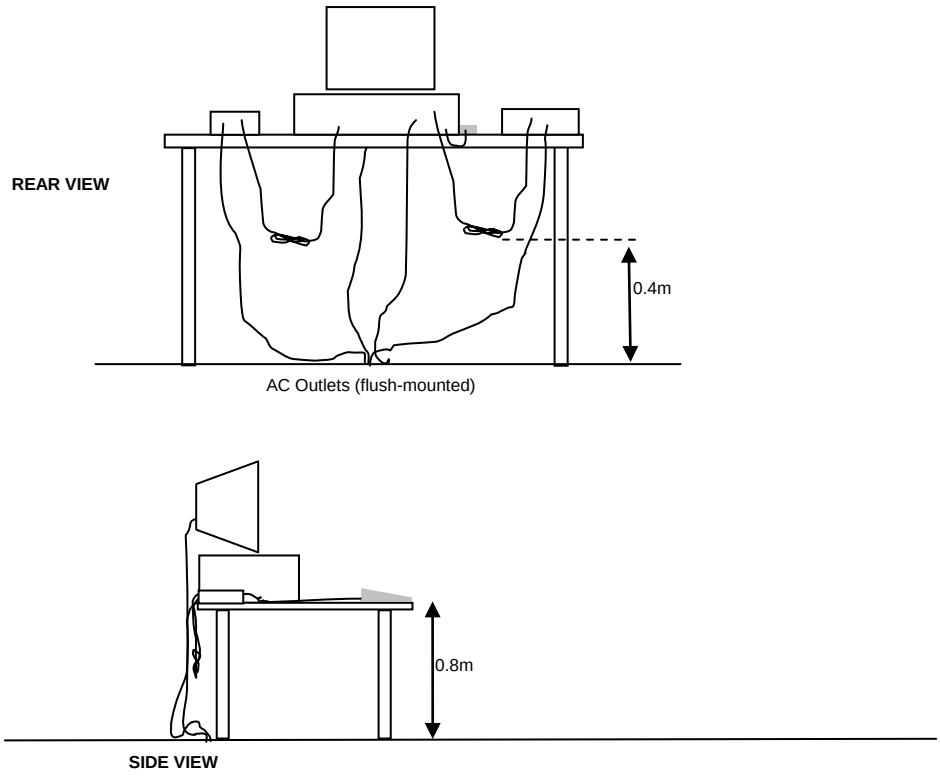
RADIATED EMISSIONS

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 fully anechoic chamber for the purposes of identifying the frequencies of the highest emissions from the EUT.

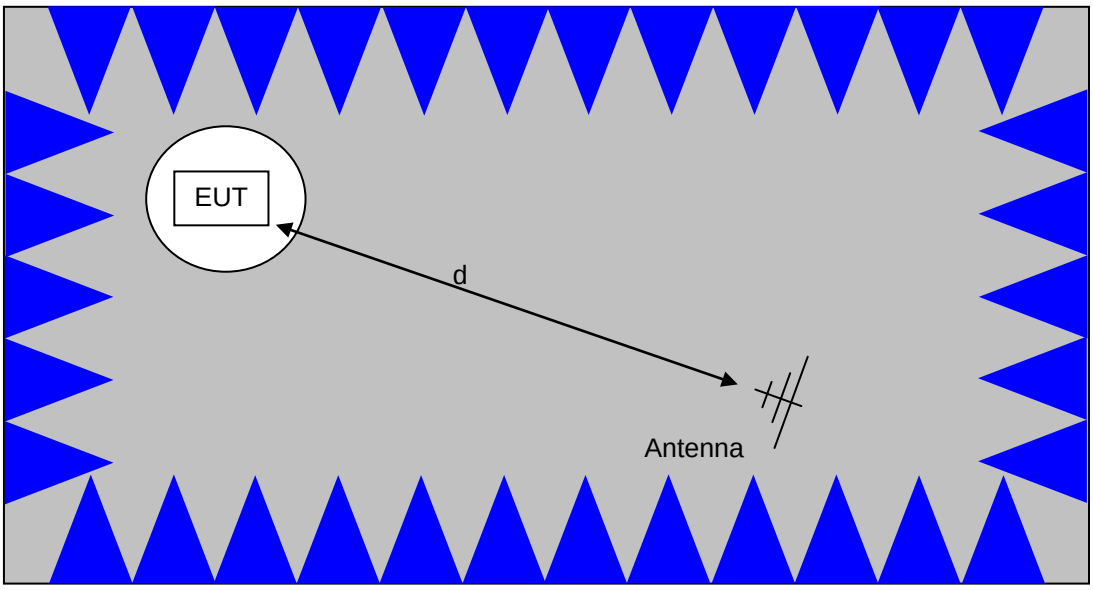
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

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 1meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.

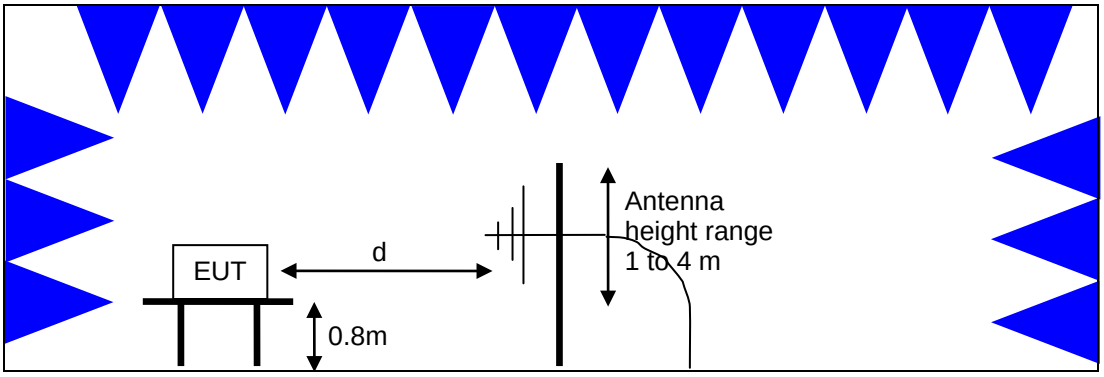


Typical Test Configuration for Radiated Field Strength Measurements



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.

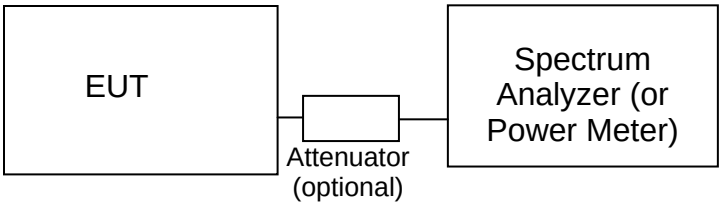
Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.



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 power averaging is used (typically for certain digital modulation techniques), the EUT is configured to transmit continuously. Power averaging is performed using either the built-in function of the analyzer or, if the analyzer does not feature power averaging, using external software. In both cases the average power is calculated over a number of sweeps (typically 100). When the EUT cannot be configured to continuously transmit then either the analyzer is configured to perform a gated sweep to ensure that the power is averaged over periods that the device is transmitting or power averaging is disabled and a max-hold feature is 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 6dB, 20dB, 26dB 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 (dBuV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBuV/m). The results are then converted to the linear forms of uV and uV/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 (dBuV)	Quasi Peak Limit (dBuV)
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[2] (with the exception of transmitters operating under FCC Part 15 Subpart D and RSS 210 Annex 9), the limits for all emissions from a low power device operating under the general rules of RSS 310 (tables 3 and 4), RSS 210 (table 2) and FCC Part 15 Subpart C section 15.209.

Frequency Range (MHz)	Limit (uV/m)	Limit (dBuV/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

FCC 15.407 (a) OUTPUT POWER LIMITS

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
5150 – 5250 (client devices)	250 mW (24 dBm)	11 dBm/MHz
5250 – 5350	250 mW (24 dBm)	11 dBm/MHz
5725 – 5825	1 Watts (30 dBm)	17 dBm/MHz

For system using antennas with gains exceeding 6dBi, the output power and power spectral density limits are reduced by 1dB for every dB the antenna gain exceeds 6dBi. Fixed point-to-point applications using the 5725 – 5825 MHz band may use antennas with gains of up to 23dBi without this limitation. If the gain exceeds 23dBi then the output power limit of 1 Watt is reduced by 1dB for every dB the gain exceeds 23dBi.

The peak excursion envelope is limited to 13dB.

SPURIOUS EMISSIONS LIMITS –UNII and LELAN DEVICES

The spurious emissions limits for signals below 1GHz are the FCC/RSS-GEN general limits. For emissions above 1GHz, signals in restricted bands are subject to the FCC/RSS GEN general limits. All other signals have a limit of –27dBm/MHz, which is a field strength of 68.3dBuV/m/MHz at a distance of 3m. For devices operating in the 5725-5850Mhz bands under the LELAN/UNII rules, the limit within 10MHz of the allocated band is increased to –17dBm/MHz.

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

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 dBuV

S = Specification Limit in dBuV

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

For electric field measurements below 30MHz the extrapolation factor is either determined by making measurements at multiple distances or a theoretical value is calculated using the formula:

$$F_d = 40*LOG_{10} (D_m/D_s)$$

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 dBuV/m

F_d = Distance Factor in dB

R_C = Corrected Reading in dBuV/m

L_S = Specification Limit in dBuV/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:

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

where P is the eirp (Watts)

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

Appendix A Test Equipment Calibration Data

Manufacturer	Description	Model	Asset #	Cal Due
Conducted Emissions - AC Power Ports, 20-Aug-14				
EMCO	LISN, 10 kHz-100 MHz, 25A	3825/2	1292	2/13/2015
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	1594	5/15/2015
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1630	6/21/2015
Radiated Emissions, 1,000 - 12,000 MHz, 8, 10-Sep-14				
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	10/31/2014
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	9/14/2014
Micro-Tronics	Band Reject Filter, 5150-5350 MHz	BRC50703-02	2239	9/18/2014
Micro-Tronics	Band Reject Filter, 5470-5725 MHz	BRC50704-02	2240	9/18/2014
Micro-Tronics	Band Reject Filter, 5725-5875 MHz	BRC50705-02	2241	9/18/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-40 GHz	ESIB40 (1088.7490.40)	2493	1/11/2015
EMCO	Antenna, Horn, 1-18 GHz	3115	2870	8/20/2015
Radiated Emissions, 1,000 - 12,000 MHz, 11-Sep-14				
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	10/31/2014
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	9/14/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1630	6/21/2015
Micro-Tronics	Band Reject Filter, 5150-5350 MHz	BRC50703-02	2239	9/18/2014
Micro-Tronics	Band Reject Filter, 5470-5725 MHz	BRC50704-02	2240	9/18/2014
Micro-Tronics	Band Reject Filter, 5725-5875 MHz	BRC50705-02	2241	9/18/2014
EMCO	Antenna, Horn, 1-18 GHz	3115	2870	8/20/2015
Radio Antenna Port (Power and Spurious Emissions), 12-Sep-14				
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	4/8/2015
Radio Antenna Port (Power and Spurious Emissions), 15-Sep-14				
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	4/8/2015
Radiated Emissions, 30 - 1,000 MHz, 15-Sep-14				
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1549	5/30/2015
Com-Power	Preamplifier, 30-1000 MHz	PA-103	1632	7/6/2015
Rohde & Schwarz	EMI Test Receiver, 20 Hz-40 GHz	ESIB40 (1088.7490.40)	2493	1/11/2015

Appendix B Test Data

T95948 Pages 25 - 70

Client:	Vivint Wireless	Job Number:	J95684
Product	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Emissions Standard(s):	FCC 15.B / 15.407 (New Rules)	Class:	B
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

Vivint Wireless

Product

SR1420 (4x4 5GHz 802.11 Client)

Date of Last Test: 9/29/2014

Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

RSS 210 and FCC 15.407 (UNII) 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: 24 °C
Rel. Humidity: 38 %

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:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

Summary of Results

Run #	Mode	Channel	Target Power Setting	Passing Power Setting	Test Performed	Limit	Result / Margin
1	n40	38 - 5190MHz	21	15	Restricted Band Edge at 5150 MHz	15.209	53.7 dBµV/m @ 5149.8 MHz (-0.3 dB)
	n40	46 - 5230MHz	21	21	Restricted Band Edge at 5150 MHz	15.209	51.3 dBµV/m @ 5150.0 MHz (-2.7 dB)
	n40	54 - 5270MHz	21	21	Restricted Band Edge at 5350 MHz	15.209	47.8 dBµV/m @ 5430.0 MHz (-6.2 dB)
	n40	62 - 5310MHz	21	15	Restricted Band Edge at 5350 MHz	15.209	52.2 dBµV/m @ 5350.0 MHz (-1.8 dB)
2	n40	102 - 5510MHz	21	14	Restricted Band Edge at 5460 MHz	15.209	48.8 dBµV/m @ 5460.0 MHz (-5.2 dB)
	n40				Band Edge 5460 - 5470 MHz	15E	66.7 dBµV/m @ 5467.9 MHz (-1.6 dB)
	n40	110 - 5550MHz	21	21	Restricted Band Edge at 5460 MHz	15.209	47.7 dBµV/m @ 5458.9 MHz (-6.3 dB)
	n40				Band Edge 5460 - 5470 MHz	15E	65.1 dBµV/m @ 5465.5 MHz (-3.2 dB)
	n40	134 - 5670MHz	21	19	Band Edge 5725MHz	15E	66.5 dBµV/m @ 5725.6 MHz (-1.8 dB)
3	n40	151 - 5755MHz	21	15	Band Edge 5725MHz	15E	67.3 dBµV/m @ 5710.1 MHz (-1.0 dB)
	n40	159 - 5795MHz	21	20	Band Edge 5850MHz	15E	65.8 dBµV/m @ 5863.3 MHz (-2.5 dB)

Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
n40	MCS8	0.90	Yes	2	0.4360509	0.8721018	500

Sample Notes

Sample S/N: C7105S1140200BT with ferrite
Driver: 5.1.25
Antenna: 6dBi

Procedure Comments:

Measurements performed in accordance with FCC KDB 789033
Peak measurements performed with: RBW=1MHz, VBW=3MHz, peak detector, max hold, auto sweep time
Unless otherwise stated/noted, emission has duty cycle ≥ 98% and was measured using RBW=1MHz, VBW=10Hz, peak detector, linear average mode, auto sweep time, max hold.

Measurement Specific Notes:

Note 1:	For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m) (or -17dBm/MHz eirp (78.3dBuV/m)). The measurement method required is a peak measurement (RB=1MHz, VB≥3MHz, peak detector). Per KDB 789033 D02 G) 2) (c), compliance can be demonstrated by meeing the average and peak limits of 15.209, as an alternative.
Note 3:	Emission has duty cycle < 98%, but constant, average measurement performed: RBW=1MHz, VBW=10Hz, peak detector, linear averaging, auto sweep, trace average 100 * 1/DC traces, measurement corrected by Linear Voltage correction factor
Note 6:	Plots of the average and peak bandedge do not account for any duty cycle correction. Refer to the tabluar results for final measurements.

Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

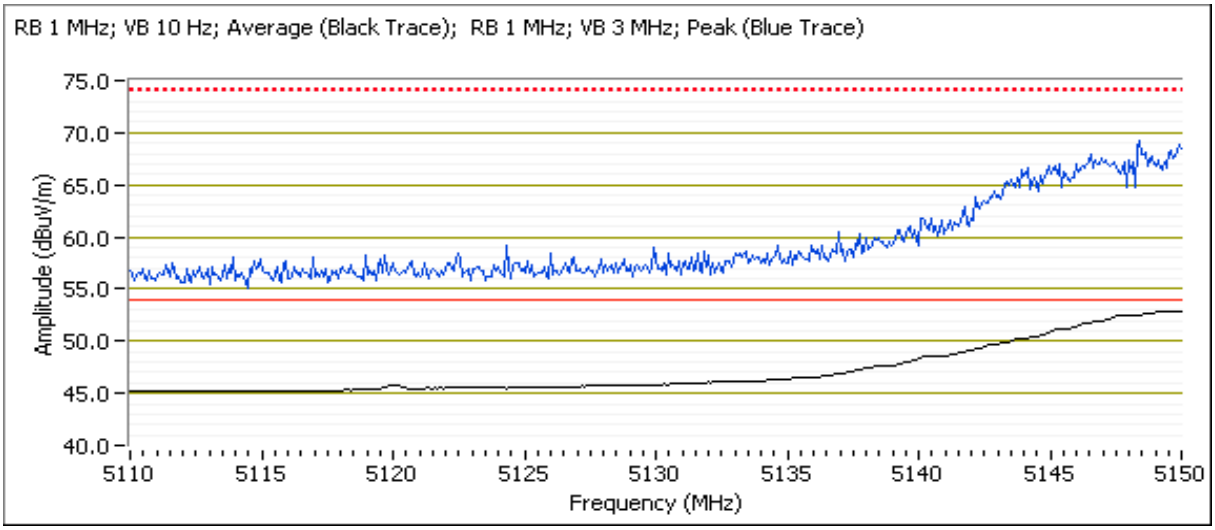
Run #1: Radiated Bandedge Measurements, 5150-5250MHz

Date of Test: 09/08/14 Config. Used: 1
Test Engineer: Mehran Birgani Config Change: Hight 1.6m
Test Location: FT Chamber# 5 EUT Voltage: POE

Channel: 38 - 5190 MHz Mode: n40 Power Setting: 15
Tx Chain: 4Tx Data Rate: 0

5150 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5149.760	53.7	V	54.0	-0.3	AVG	262	2.0	Note 3, POS; RB 1 MHz; VB: 10 Hz
5150.000	52.0	H	54.0	-2.0	AVG	270	1.8	Note 3, POS; RB 1 MHz; VB: 10 Hz
5147.600	68.7	V	74.0	-5.3	PK	262	2.0	POS; RB 1 MHz; VB: 3 MHz
5145.350	66.2	H	74.0	-7.8	PK	270	1.8	POS; RB 1 MHz; VB: 3 MHz

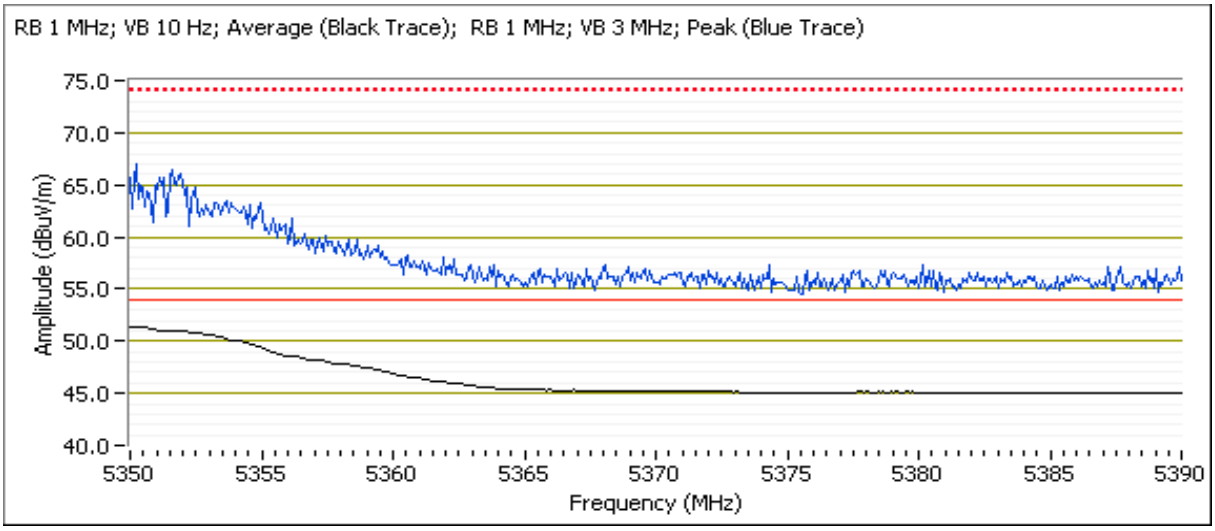


Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

Channel: 62 - 5310MHz Mode: n40 Power Setting: 15
Tx Chain: 4Tx Data Rate: 0

5350 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5350.000	52.2	V	54.0	-1.8	AVG	264	1.9	Note 3, POS; RB 1 MHz; VB: 10 Hz
5350.000	49.6	H	54.0	-4.4	AVG	272	1.7	Note 3, POS; RB 1 MHz; VB: 10 Hz
5350.080	66.3	V	74.0	-7.7	PK	264	1.9	POS; RB 1 MHz; VB: 3 MHz
5352.400	62.5	H	74.0	-11.5	PK	272	1.7	POS; RB 1 MHz; VB: 3 MHz



Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

Date of Test: 09/11/14
Test Engineer: Jack Liu
Test Location: FT Chamber# 4

Config. Used: 1
Config Change: Hight 1.6m
EUT Voltage: POE

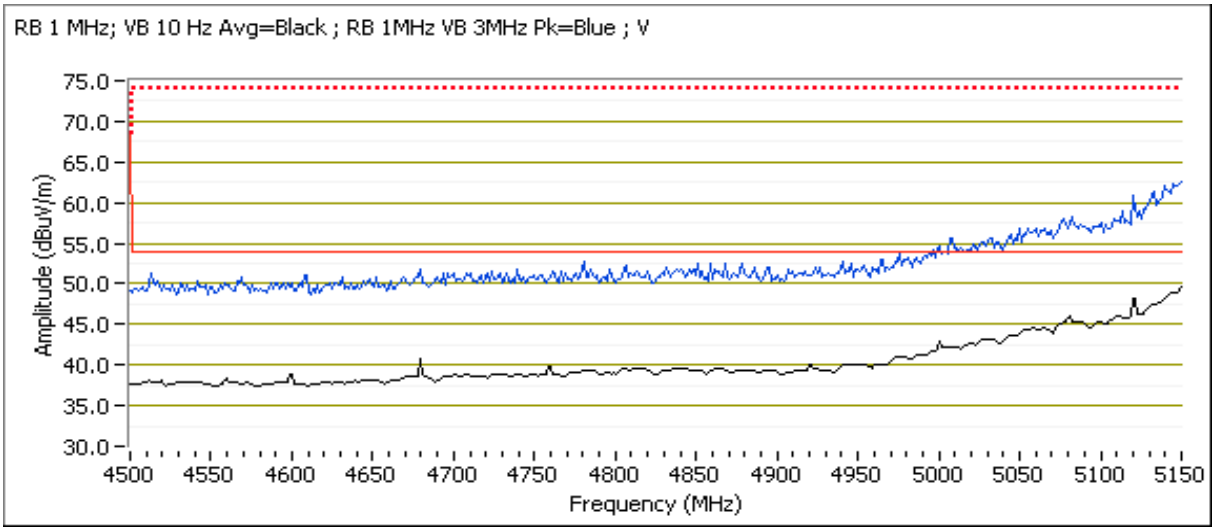
Channel: 46 - 5230 MHz
Tx Chain: 4Tx

Mode: n40
Data Rate: MCS8

Power Setting: 21

5150 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5150.000	51.3	V	54.0	-2.7	AVG	339	1.4	Note3; POS; RB 1 MHz; VB: 10 Hz
5149.840	64.4	V	74.0	-9.6	PK	339	1.4	POS; RB 1 MHz; VB: 3 MHz
5150.000	48.4	H	54.0	-5.6	AVG	346	1.7	Note3; POS; RB 1 MHz; VB: 10 Hz
5147.400	59.8	H	74.0	-14.2	PK	346	1.7	POS; RB 1 MHz; VB: 3 MHz

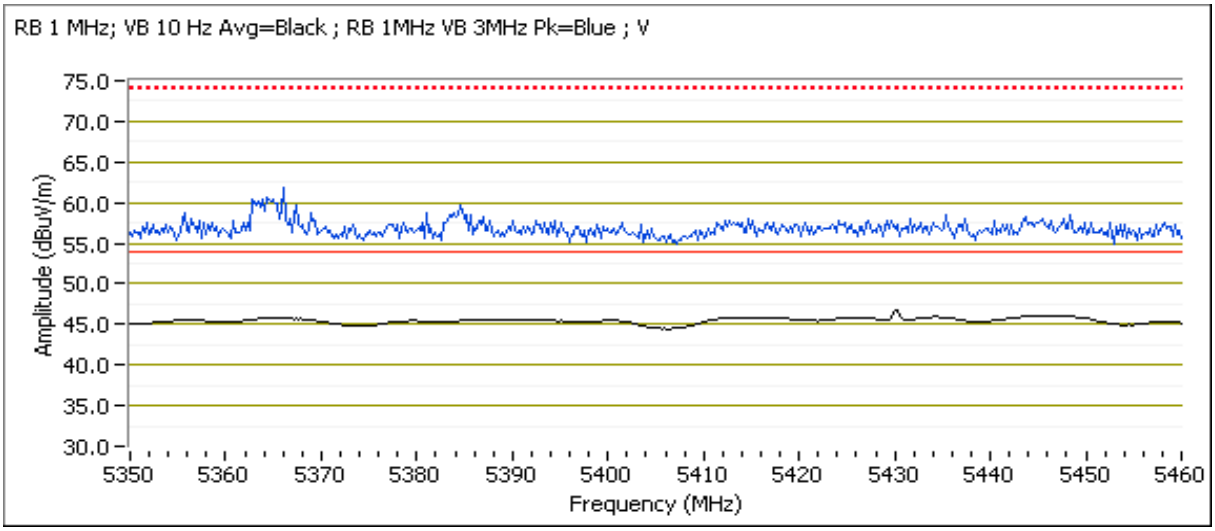


Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

Channel: 54 - 5270MHz Mode: n40 Power Setting: 21
Tx Chain: 4Tx Data Rate: MCS8

5350 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5430.020	47.8	V	54.0	-6.2	AVG	0	1.6	Note3; POS; RB 1 MHz; VB: 10 Hz
5447.210	62.4	V	74.0	-11.6	PK	0	1.6	POS; RB 1 MHz; VB: 3 MHz
5350.000	45.4	H	54.0	-8.6	AVG	350	1.9	Note3; POS; RB 1 MHz; VB: 10 Hz
5414.150	56.9	H	74.0	-17.1	PK	350	1.9	POS; RB 1 MHz; VB: 3 MHz



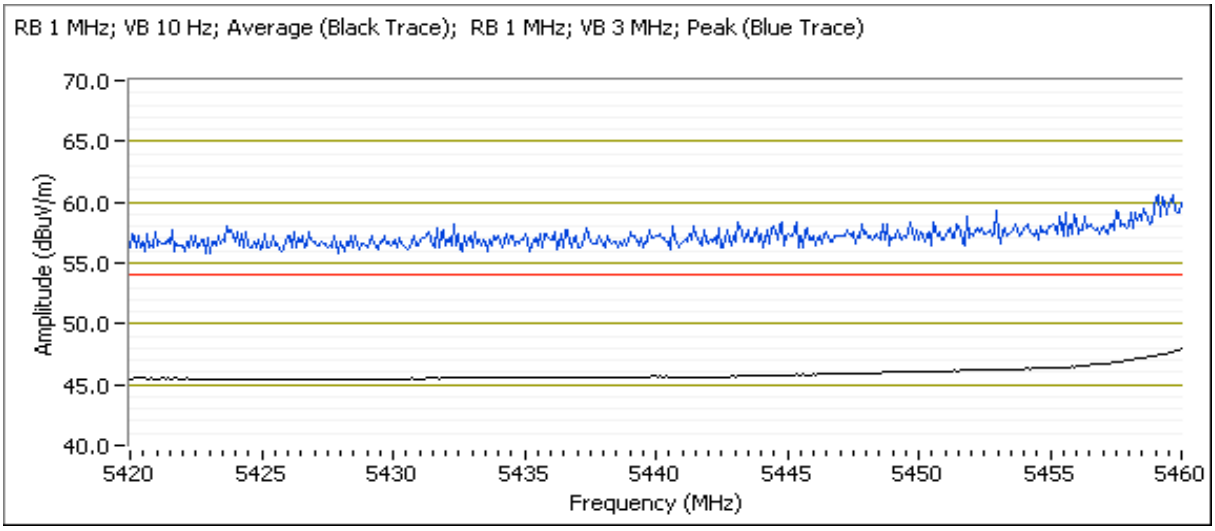
Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

Run #2: Radiated Bandedge Measurements, 5470-5725MHz

Channel: 102 - 5510MHz Mode: n40 Power Setting: 14
Tx Chain: 4Tx Data Rate: MCS8

5460 MHz Band Edge Signal Radiated Field Strength

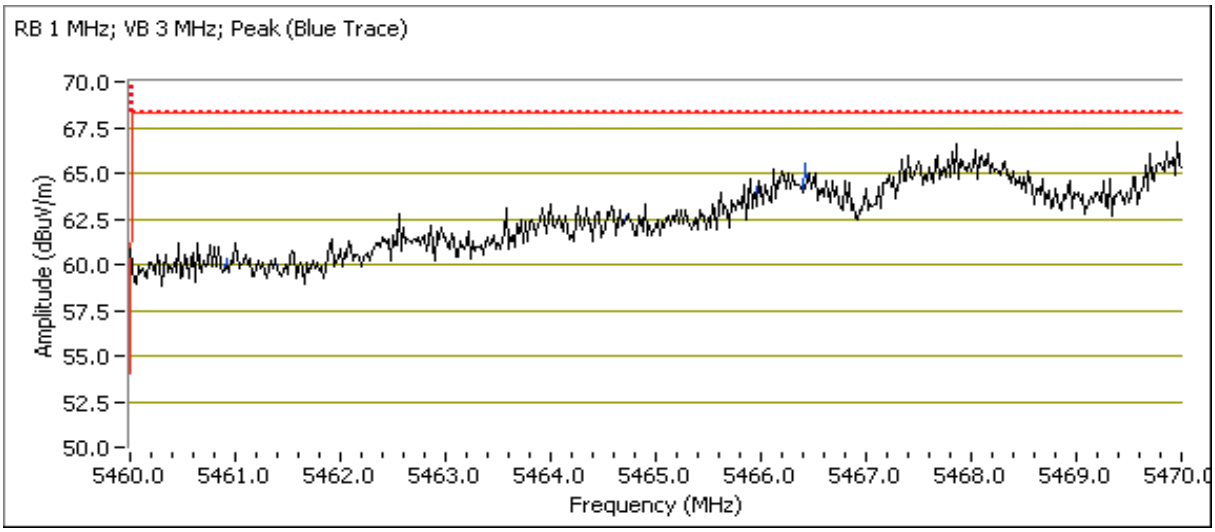
Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5460.000	48.8	V	54.0	-5.2	AVG	264	1.9	Note3, POS; RB 1 MHz; VB: 10 Hz
5460.000	46.8	H	54.0	-7.2	AVG	260	1.8	Note3, POS; RB 1 MHz; VB: 10 Hz
5451.740	60.6	V	74.0	-13.4	PK	264	1.9	POS; RB 1 MHz; VB: 3 MHz
5444.690	58.1	H	74.0	-15.9	PK	260	1.8	POS; RB 1 MHz; VB: 3 MHz



Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

5470 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	15.E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5467.920	66.7	V	68.3	-1.6	PK	264	1.9	
5466.230	63.5	H	68.3	-4.8	PK	260	1.8	

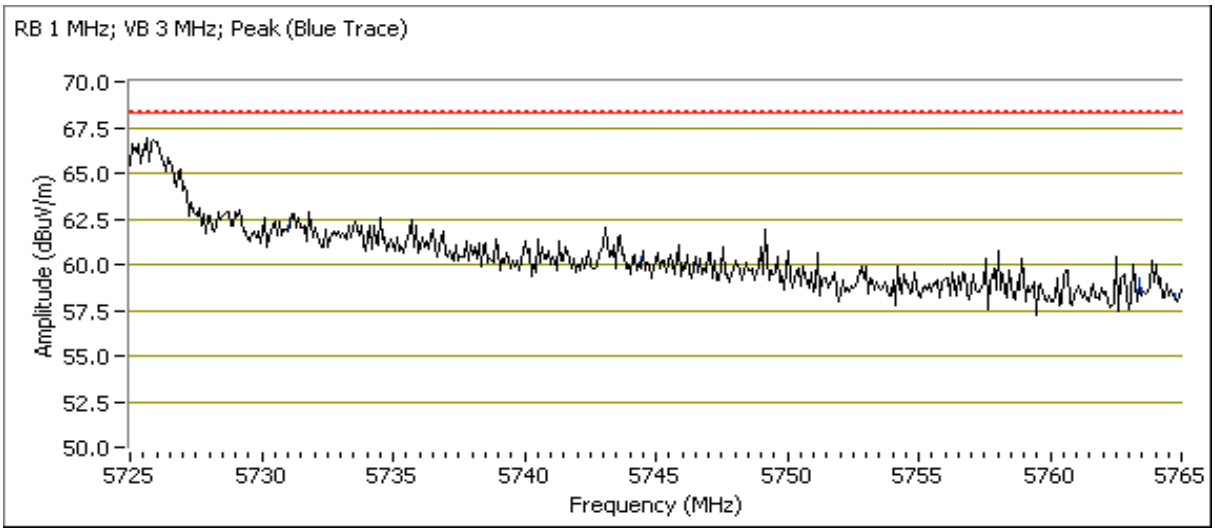


Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

Channel: 134 - 5670MHz Mode: n40 Power Setting: 19
Tx Chain: 4Tx Data Rate: MCS8

5725 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	15.E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5725.560	66.5	V	68.3	-1.8	PK	260	1.8	POS; RB 1 MHz; VB: 3 MHz
5726.680	61.6	H	68.3	-6.7	PK	270	2.0	POS; RB 1 MHz; VB: 3 MHz



Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

Date of Test: 09/11/14
Test Engineer: Jack Liu
Test Location: FT Chamber# 4

Config. Used: 1
Config Change: Hight 1.6m
EUT Voltage: POE

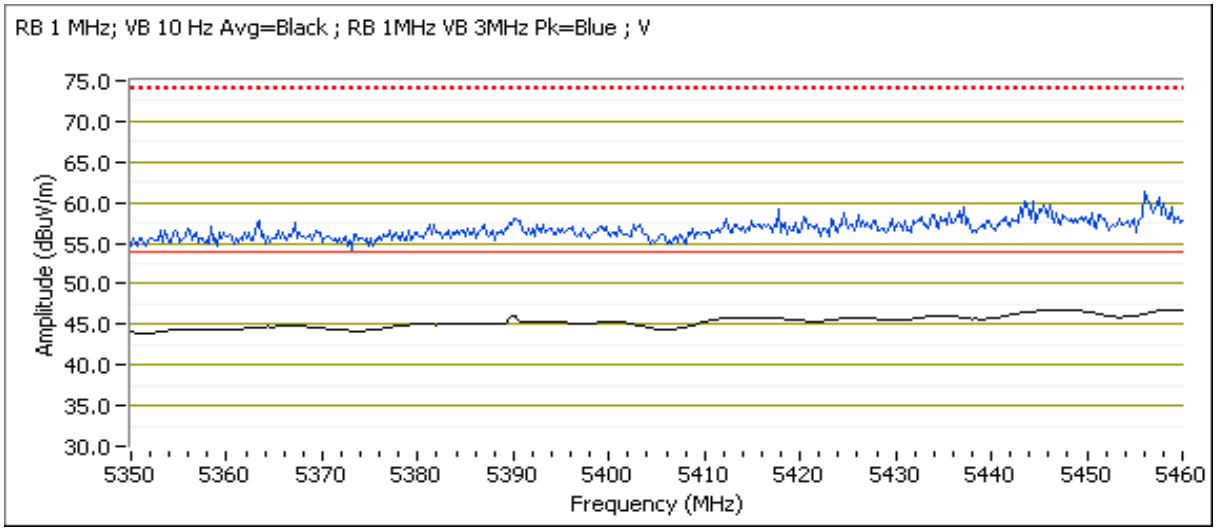
Channel: 110 - 5550MHz
Tx Chain: 4Tx

Mode: n40
Data Rate: MCS8

Power Setting: 21

5460 MHz Band Edge Signal Radiated Field Strength

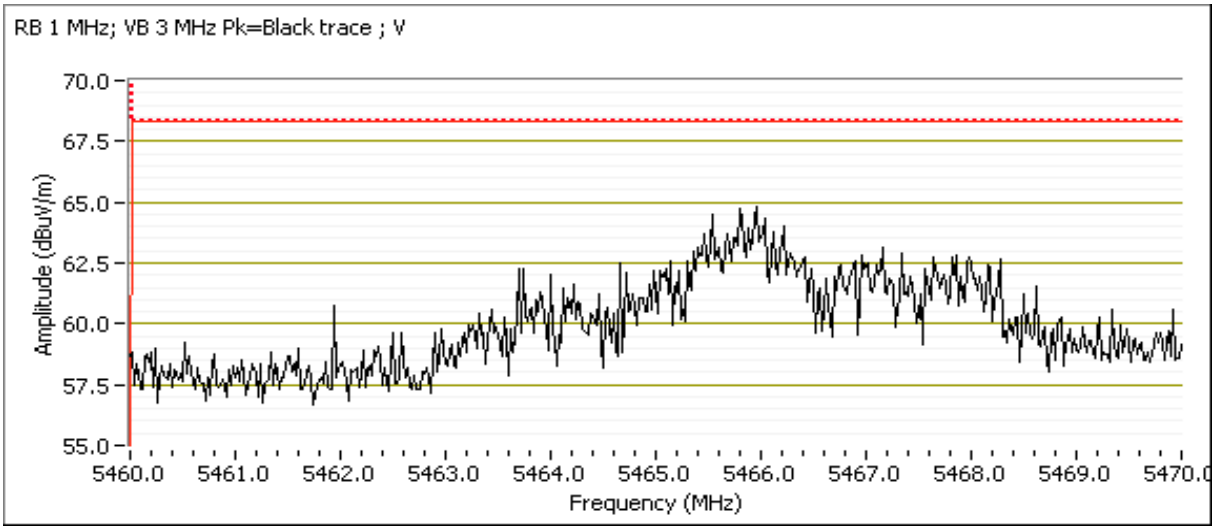
Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5458.900	47.7	V	54.0	-6.3	AVG	354	1.7	Note3; POS; RB 1 MHz; VB: 10 Hz
5442.360	60.1	V	74.0	-13.9	PK	354	1.7	POS; RB 1 MHz; VB: 3 MHz
5460.000	45.2	H	54.0	-8.8	AVG	0	1.7	Note3; POS; RB 1 MHz; VB: 10 Hz
5459.340	59.5	H	74.0	-14.5	PK	0	1.7	POS; RB 1 MHz; VB: 3 MHz



Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

5470 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	15.E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5465.510	65.1	V	68.3	-3.2	PK	0	1.6	POS; RB 1 MHz; VB: 3 MHz
5468.960	60.5	H	68.3	-7.8	PK	352	1.7	POS; RB 1 MHz; VB: 3 MHz



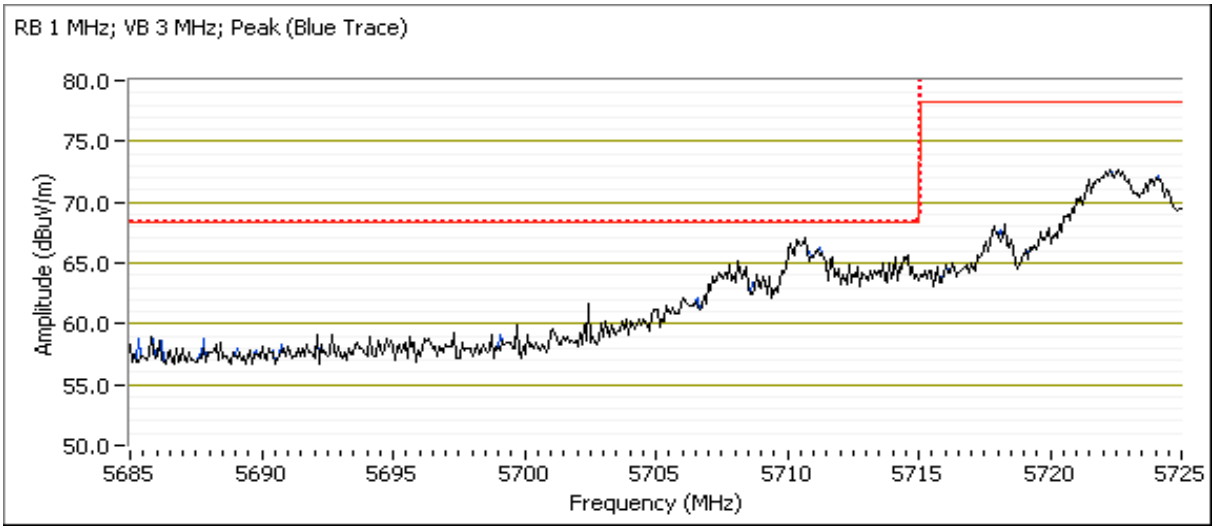
Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

Run #3: Radiated Bandedge Measurements, 5725-5850MHz

Channel: 151 - 5755MHz Mode: n40 Power Setting: 15
Tx Chain: 4Tx Data Rate: MCS8

5725 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	15.E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5710.070	67.3	V	68.3	-1.0	PK	264	1.5	POS; RB 1 MHz; VB: 3 MHz
5722.150	73.2	V	78.3	-5.1	PK	264	1.5	POS; RB 1 MHz; VB: 3 MHz
5711.030	62.3	H	68.3	-6.0	PK	268	1.9	POS; RB 1 MHz; VB: 3 MHz
5719.150	67.6	H	98.3	-30.7	PK	268	1.9	POS; RB 1 MHz; VB: 3 MHz



Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

Date of Test: 09/10/14
Test Engineer: Jack Liu
Test Location: FT Chamber# 5

Config. Used: 1
Config Change: Hight 1.6m
EUT Voltage: POE

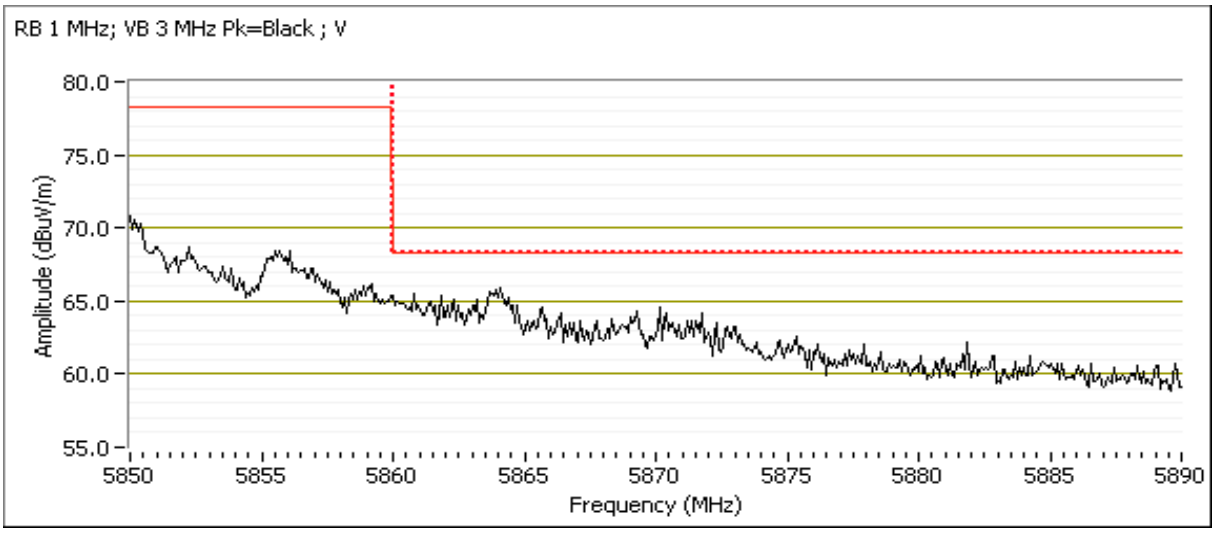
Channel: 159 - 5795MHz
Tx Chain: 4Tx

Mode: n40
Data Rate: MCS8

Power Setting: 20

5850 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	15.E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5863.310	65.8	V	68.3	-2.5	PK	0	1.5	POS; RB 1 MHz; VB: 3 MHz
5850.080	71.4	V	78.3	-6.9	PK	0	1.5	POS; RB 1 MHz; VB: 3 MHz



Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

RSS 210 and FCC 15.407 (UNII) 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: 23 °C
Rel. Humidity: 40 %

Summary of Results

Run #	Mode	Channel	Target Power Setting	Passing Power Setting	Test Performed	Limit	Result / Margin
1	n40	38 - 5190MHz	21	21	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	64.7 dBµV/m @ 10380.7 MHz (-3.6 dB)
	n40	46 - 5230MHz	21	21	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	67.1 dBµV/m @ 10467.1 MHz (-1.2 dB)
2	n40	54 - 5270MHz	21	21	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	53.3 dBµV/m @ 5433.3 MHz (-0.7 dB)
	n40	62 - 5310MHz	21	15	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	43.9 dBµV/m @ 1000.0 MHz (-10.1 dB)
3	n40	102 - 5510MHz	21	14	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	48.2 dBµV/m @ 7346.7 MHz (-5.8 dB)
	n40	110 - 5510MHz	21	21	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	50.6 dBµV/m @ 7400.0 MHz (-3.4 dB)
	n40	142- 5710MHz	21	21	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	51.2 dBµV/m @ 11420.0 MHz (-2.8 dB)
4	n40	151 - 5755MHz	21	15	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	48.3 dBµV/m @ 7673.4 MHz (-5.7 dB)
	n40	159 - 5795MHz	21	21	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	49.8 dBµV/m @ 11588.4 MHz (-4.2 dB)

Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	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.

Procedure Comments:

Measurements performed in accordance with FCC KDB 789033
Peak measurements performed with: RBW=1MHz, VBW=3MHz, peak detector, max hold, auto sweep time
Unless otherwise stated/noted, emission has duty cycle ≥ 98% and was measured using RBW=1MHz, VBW=10Hz, 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)
n40	MCS8	0.90	Yes	2	0.4360509	0.8721018	500

Sample Notes

Sample S/N: C7105S1140200BT with ferrite
Driver: 5.1.25
Antenna: 6dBi

Measurement Specific Notes:

Note 1:	For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is a peak measurement (RB=1MHz, VB≥3MHz, peak detector). Per KDB 789033 2) c) (i), compliance can be demonstrated by meeing the average and peak limits of 15.209, as an alternative.
Note 3:	Emission has duty cycle < 98%, but constant, average measurement performed: RBW=1MHz, VBW=10Hz, peak detector, linear averaging, auto sweep, trace average 100 * 1/DC traces, measurement corrected by Linear Voltage correction factor
Note 6:	Plots of the average and peak bandedge do not account for any duty cycle correction. Refer to the tabluar results for final measurements.

Notes:

Preliminary testing showed no radio related emissions below 1GHz.

Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

Run #1, Radiated Spurious Emissions, 1,000 - 40,000 MHz. Operation in the 5150-5250 MHz Band

Date of Test: 09/10/14 Config. Used: 1

Test Engineer: Jack Liu Config Change: Hight 1.6m

Test Location: FT Chamber# 5 EUT Voltage: POE

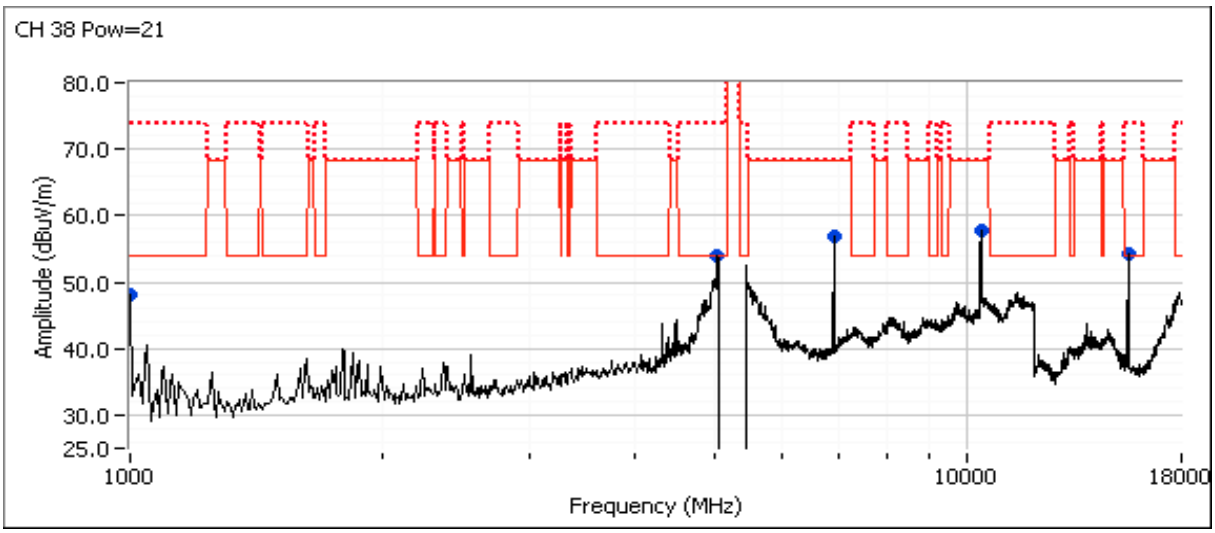
Run #1a:

Channel: 38 Mode: n40 Power Setting: 21

Tx Chain: 4Tx Data Rate: MCS8

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
10380.700	64.7	H	68.3	-3.6	PK	202	1.6	RB 1 MHz;VB 3 MHz;Peak
5005.130	49.7	V	54.0	-4.3	AVG	3	1.9	RB 1 MHz;VB 10 Hz;Peak
15570.200	49.0	H	54.0	-5.0	AVG	223	1.9	Note 3;RB 1 MHz;VB 10 Hz;Peak
1000.040	46.7	H	54.0	-7.3	AVG	217	1.9	RB 1 MHz;VB 10 Hz;Peak
6920.100	59.2	V	68.3	-9.1	PK	360	1.2	RB 1 MHz;VB 3 MHz;Peak
15565.370	63.1	H	74.0	-10.9	PK	223	1.9	RB 1 MHz;VB 3 MHz;Peak
5020.930	63.0	V	74.0	-11.0	PK	3	1.9	RB 1 MHz;VB 3 MHz;Peak
1000.000	50.2	H	74.0	-23.8	PK	217	1.9	RB 1 MHz;VB 3 MHz;Peak

Note:	Scans made between 18 - 40 GHz with the measurement antenna moved around the card and its antennas 20-50cm from the device indicated there were no significant emissions in this frequency range
Note 1:	For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.



Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

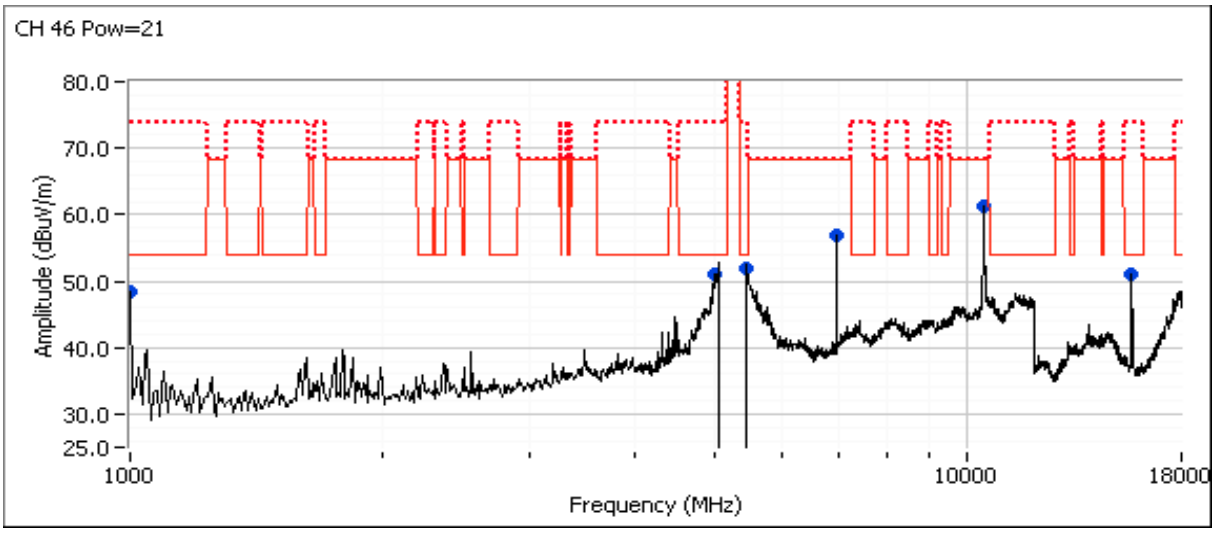
Run #1b:

Channel: 46 Mode: n40 Power Setting: 21

Tx Chain: 4Tx Data Rate: MCS8

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
10467.070	67.1	H	68.3	-1.2	PK	168	2.5	RB 1 MHz;VB 3 MHz;Peak
15695.400	49.2	H	54.0	-4.8	AVG	93	1.8	RB 1 MHz;VB 10 Hz;Peak
5430.020	47.8	V	54.0	-6.2	AVG	0	1.6	Note3; POS; RB 1 MHz; VB: 10 Hz
1000.060	46.3	H	54.0	-7.7	AVG	231	1.9	RB 1 MHz;VB 10 Hz;Peak
6973.320	59.9	V	68.3	-8.4	PK	8	1.1	RB 1 MHz;VB 3 MHz;Peak
5447.210	62.4	V	74.0	-11.6	PK	0	1.6	POS; RB 1 MHz; VB: 3 MHz
15675.470	59.5	H	74.0	-14.5	PK	93	1.8	RB 1 MHz;VB 3 MHz;Peak
1000.030	50.5	H	74.0	-23.5	PK	231	1.9	RB 1 MHz;VB 3 MHz;Peak

Note:	Scans made between 18 - 40 GHz with the measurement antenna moved around the card and its antennas 20-50cm from the device indicated there were no significant emissions in this frequency range
Note 1:	For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.



Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

Run #2, Radiated Spurious Emissions, 1,000 - 40,000 MHz. Operation in the 5250-5350 MHz Band

Date of Test: 09/10/14 Config. Used: 1

Test Engineer: M. Birgani Config Change: Hight 1.6m

Test Location: FT Chamber# 5 EUT Voltage: POE

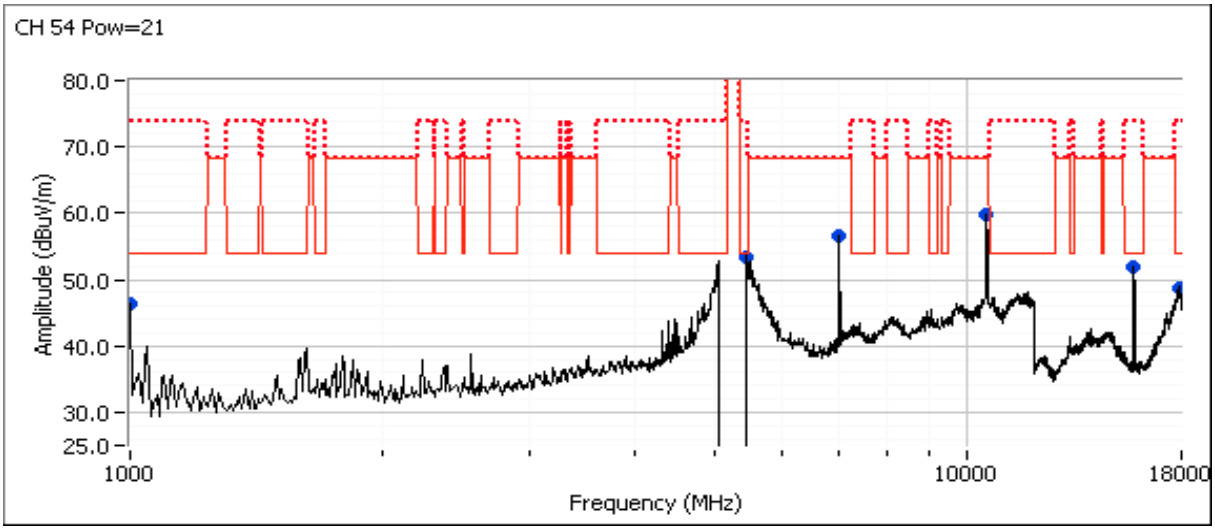
Run #2a:

Channel: 54 Mode: n40 Power Setting: 21

Tx Chain: 4Tx Data Rate: MCS8

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5433.330	53.3	V	54.0	-0.7	Peak	5	1.6	Done with BE measurment
10542.270	66.8	H	68.3	-1.5	PK	199	1.5	RB 1 MHz;VB 3 MHz;Peak
1000.060	46.5	H	54.0	-7.5	AVG	241	2.0	RB 1 MHz;VB 10 Hz;Peak
15797.420	45.5	H	54.0	-8.5	AVG	45	2.0	Note 3;RB 1 MHz;VB 10 Hz;Peak
7026.680	59.3	V	68.3	-9.0	PK	10	1.3	RB 1 MHz;VB 3 MHz;Peak
15803.620	58.4	H	74.0	-15.6	PK	45	2.0	RB 1 MHz;VB 3 MHz;Peak
1000.030	50.7	H	74.0	-23.3	PK	241	2.0	RB 1 MHz;VB 3 MHz;Peak

Note:	Scans made between 18 - 40 GHz with the measurement antenna moved around the card and its antennas 20-50cm from the device indicated there were no significant emissions in this frequency range
Note 1:	For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.



Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

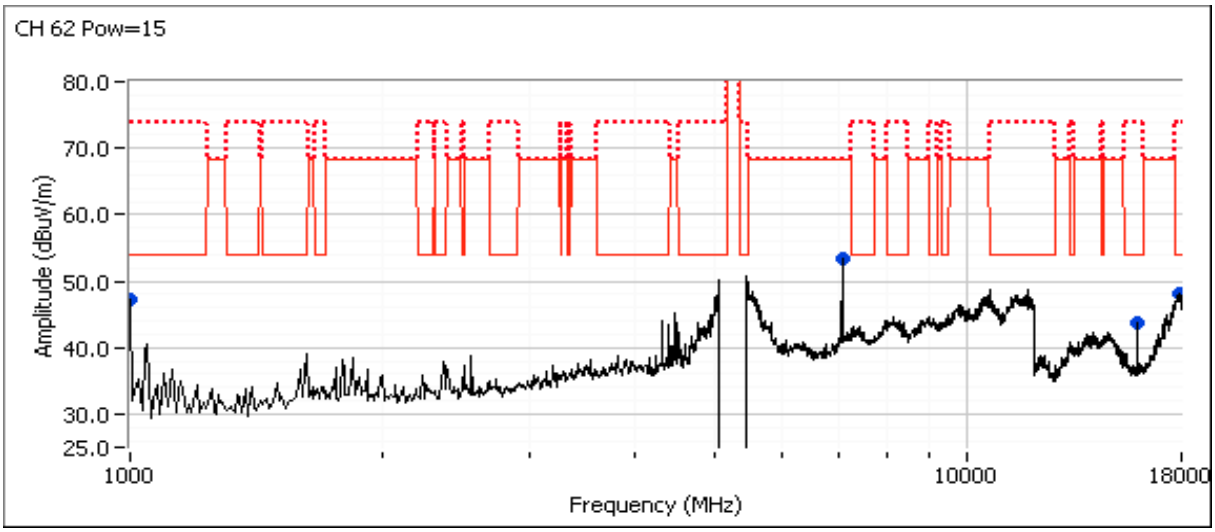
Run #2b:

Channel: 62 Mode: n40 Power Setting: 15

Tx Chain: 4Tx Data Rate: MCS8

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1000.020	43.9	H	54.0	-10.1	AVG	216	2.4	RB 1 MHz;VB 10 Hz;Peak
15930.000	43.7	H	54.0	-10.3	Peak	191	1.9	Peak reading w/ average limit
7079.990	56.9	V	68.3	-11.4	PK	11	1.3	RB 1 MHz;VB 3 MHz;Peak
1000.220	48.3	H	74.0	-25.7	PK	216	2.4	RB 1 MHz;VB 3 MHz;Peak
17870.000	48.2	V	54.0	-5.8	Peak	15	2.5	Noise Floor

Note:	Scans made between 18 - 40 GHz with the measurement antenna moved around the card and its antennas 20-50cm from the device indicated there were no significant emissions in this frequency range
Note 1:	For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.



Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

Run #3, Radiated Spurious Emissions, 1,000 - 40,000 MHz. Operation in the 5470-5725 MHz Band

Date of Test: 09/10/14 Config. Used: 1

Test Engineer: M. Birgani Config Change: Hight 1.6m

Test Location: FT Chamber# 5 EUT Voltage: POE

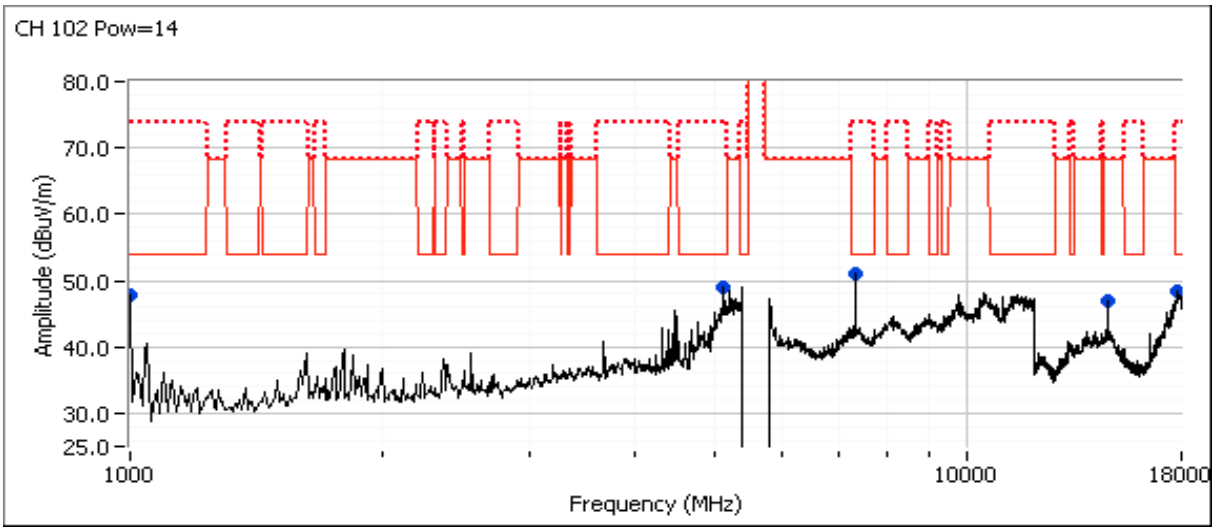
Run #3a:

Channel: 102 Mode: n40 Power Setting: 14

Tx Chain: 4Tx Data Rate: MCS8

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7346.690	48.2	H	54.0	-5.8	AVG	44	1.7	RB 1 MHz;VB 10 Hz;Peak
5120.140	46.9	V	54.0	-7.1	AVG	360	1.7	RB 1 MHz;VB 10 Hz;Peak
1000.020	43.9	H	54.0	-10.1	AVG	216	2.4	RB 1 MHz;VB 10 Hz;Peak
7347.000	55.3	H	74.0	-18.7	PK	44	1.7	RB 1 MHz;VB 3 MHz;Peak
5119.800	55.3	V	74.0	-18.7	PK	360	1.7	RB 1 MHz;VB 3 MHz;Peak
1000.220	48.3	H	74.0	-25.7	PK	216	2.4	RB 1 MHz;VB 3 MHz;Peak
14690.000	46.8	V	68.3	-21.5	Peak	159	1.9	RB 1 MHz;VB 3 MHz;Peak
17790.000	-	V	-	-	Peak	-	-	RB 1 MHz;VB 3 MHz;Peak

Note:	Scans made between 18 - 40 GHz with the measurement antenna moved around the card and its antennas 20-50cm from the device indicated there were no significant emissions in this frequency range
Note 1:	For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.

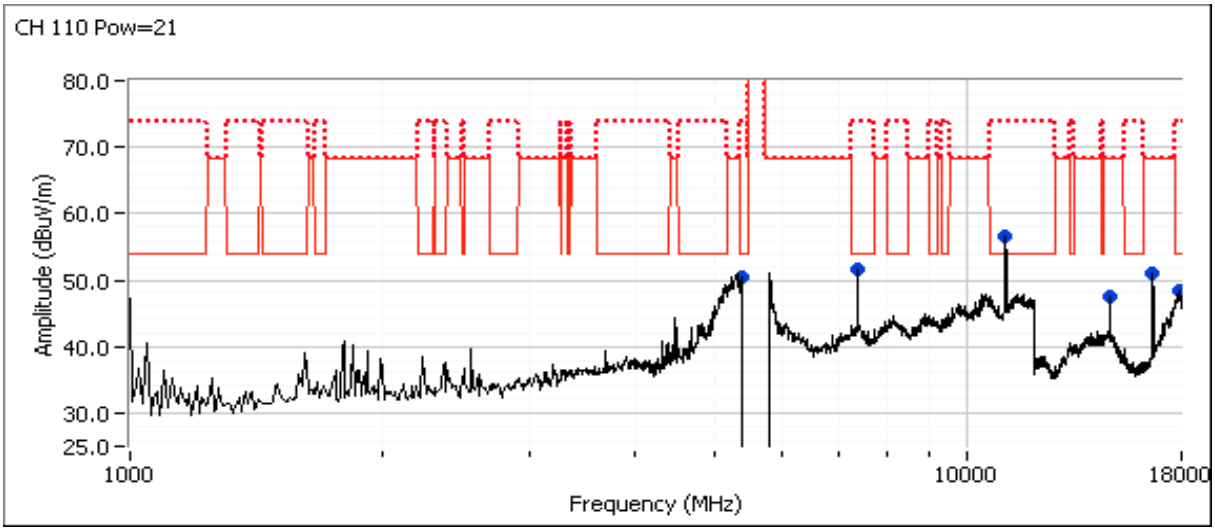


Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

Run #3b:
Channel: 110 Mode: n40 Power Setting: 21
Tx Chain: 4Tx Data Rate: MCS8

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7400.040	50.6	V	54.0	-3.4	AVG	335	1.1	RB 1 MHz;VB 10 Hz;Peak
11099.000	50.2	H	54.0	-3.8	AVG	210	1.2	RB 1 MHz;VB 10 Hz;Peak
11096.670	63.4	H	74.0	-10.6	PK	210	1.2	RB 1 MHz;VB 3 MHz;Peak
7399.870	56.5	V	74.0	-17.5	PK	335	1.1	RB 1 MHz;VB 3 MHz;Peak
16640.000	51.0	H	68.3	-17.3	Peak	145	1.9	RB 1 MHz;VB 3 MHz;Peak
14800.000	47.5	H	68.3	-20.8	Peak	182	1.9	RB 1 MHz;VB 3 MHz;Peak
17850.000	-	V	-	-	Peak	-	-	Noise Floor

Note:	Scans made between 18 - 40 GHz with the measurement antenna moved around the card and its antennas 20-50cm from the device indicated there were no significant emissions in this frequency range
Note 1:	For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.



Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

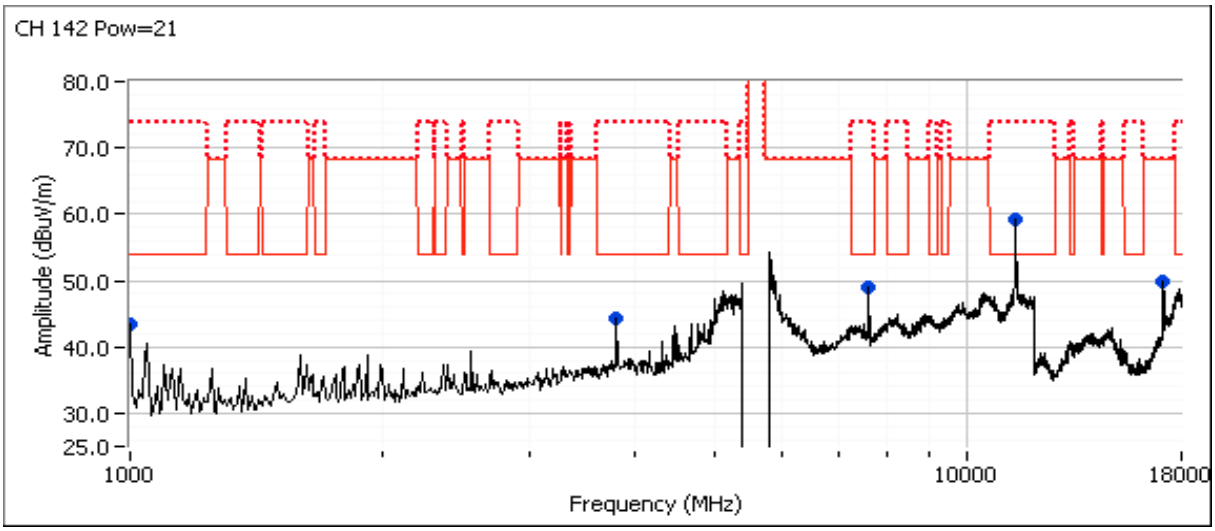
Run #3c:

Date of Test: 09/11/14 Config. Used: 1
Test Engineer: Jack Liu Config Change: Hight 1.6m
Test Location: FT Chamber# 5 EUT Voltage: POE

Channel: 142 Mode: n40 Power Setting: 21
Tx Chain: 4Tx Data Rate: MCS8

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
11420.000	51.2	H	54.0	-2.8	AVG	202	1.6	RB 1 MHz;VB 10 Hz;Peak
7613.380	48.1	V	54.0	-5.9	AVG	123	2.3	RB 1 MHz;VB 10 Hz;Peak
3806.630	44.2	V	54.0	-9.8	AVG	307	2.3	RB 1 MHz;VB 10 Hz;Peak
11410.700	63.9	H	74.0	-10.1	PK	202	1.6	RB 1 MHz;VB 3 MHz;Peak
1000.070	41.5	H	54.0	-12.5	AVG	219	2.2	RB 1 MHz;VB 10 Hz;Peak
17110.000	50.0	H	68.3	-18.3	Peak	206	1.6	RB 1 MHz;VB 3 MHz;Peak
7613.270	54.7	V	74.0	-19.3	PK	123	2.3	RB 1 MHz;VB 3 MHz;Peak
3806.630	50.3	V	74.0	-23.7	PK	307	2.3	RB 1 MHz;VB 3 MHz;Peak
999.930	46.6	H	74.0	-27.4	PK	219	2.2	RB 1 MHz;VB 3 MHz;Peak

Note:	Scans made between 18 - 40 GHz with the measurement antenna moved around the card and its antennas 20-50cm from the device indicated there were no significant emissions in this frequency range
Note 1:	For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.



Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

Run #4, Radiated Spurious Emissions, 1,000 - 40,000 MHz. Operation in the 5725-5850 MHz Band

Date of Test: 09/08/14 Config. Used: 1

Test Engineer: Mehran Birgani Config Change: Hight 1.6m

Test Location: FT Chamber# 5 EUT Voltage: POE

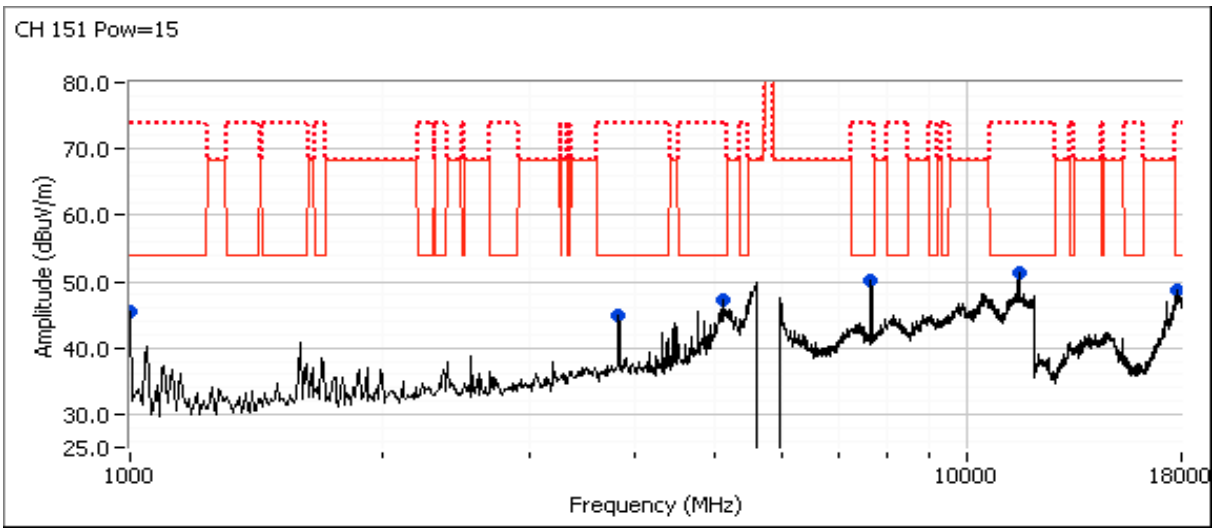
Run #4a:

Channel: 151 Mode: n40 Power Setting: 15

Tx Chain: 4Tx Data Rate: MCS8

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7673.400	48.3	V	54.0	-5.7	AVG	123	2.5	RB 1 MHz;VB 10 Hz;Peak
11509.980	47.2	H	54.0	-6.8	AVG	193	1.8	RB 1 MHz;VB 10 Hz;Peak
1000.010	44.2	H	54.0	-9.8	AVG	135	1.9	RB 1 MHz;VB 10 Hz;Peak
5120.000	43.7	V	54.0	-10.3	AVG	262	1.7	Note 3,RB 1 MHz;VB 10 Hz;Peak
3836.700	40.9	V	54.0	-13.1	AVG	266	1.7	RB 1 MHz;VB 10 Hz;Peak
11509.750	58.2	H	74.0	-15.8	PK	193	1.8	RB 1 MHz;VB 3 MHz;Peak
7673.340	54.0	V	74.0	-20.0	PK	123	2.5	RB 1 MHz;VB 3 MHz;Peak
5119.820	50.6	V	74.0	-23.4	PK	262	1.7	RB 1 MHz;VB 3 MHz;Peak
1000.040	47.6	H	74.0	-26.4	PK	135	1.9	RB 1 MHz;VB 3 MHz;Peak
3836.740	45.6	V	74.0	-28.4	PK	266	1.7	RB 1 MHz;VB 3 MHz;Peak
17810.000	-	V	-	-	Peak	100	1.3	Noise Floor

Note:	Scans made between 18 - 40 GHz with the measurement antenna moved around the card and its antennas 20-50cm from the device indicated there were no significant emissions in this frequency range
Note 1:	For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.

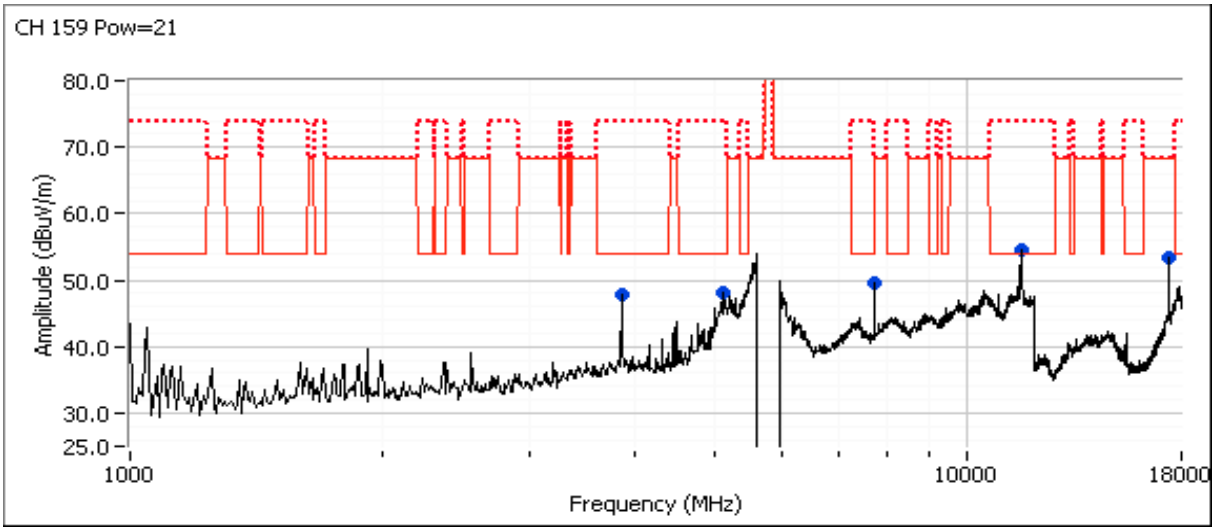


Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

Run #4b:
Channel: 159 Mode: n40 Power Setting: 21
Tx Chain: 4Tx Data Rate: MCS8

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
11588.400	49.8	H	54.0	-4.2	AVG	173	1.7	RB 1 MHz;VB 10 Hz;Peak
7726.690	49.5	H	54.0	-4.5	AVG	130	1.4	RB 1 MHz;VB 10 Hz;Peak
5120.140	45.8	V	54.0	-8.2	AVG	359	1.6	RB 1 MHz;VB 10 Hz;Peak
11590.470	63.4	H	74.0	-10.6	PK	173	1.7	RB 1 MHz;VB 3 MHz;Peak
17390.000	53.3	H	68.3	-15.0	Peak	159	1.9	RB 1 MHz;VB 3 MHz;Peak
5120.140	55.4	V	74.0	-18.6	PK	359	1.6	RB 1 MHz;VB 3 MHz;Peak
7726.900	54.6	H	74.0	-19.4	PK	130	1.4	RB 1 MHz;VB 3 MHz;Peak

Note:	Scans made between 18 - 40 GHz with the measurement antenna moved around the card and its antennas 20-50cm from the device indicated there were no significant emissions in this frequency range
Note 1:	For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.



Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

RSS-210 (LELAN) and FCC 15.407(UNII)
Antenna Port Measurements
Power, PSD, Peak Excursion, 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

When measuring the conducted emissions from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected to allow for the external attenuators and cables used.

Ambient Conditions:

Temperature:	24 °C
Rel. Humidity:	40 %

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:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Power, 5150 - 5250MHz	15.407(a) (1) (iv)	Pass	n40: 19.7dBm (93.3mW)
1	PSD, 5150 - 5250MHz	15.407(a) (1) (iv)	Pass	n40: 3.6dBm/MHz
1	Power, 5250 - 5350MHz	15.407(a) (2)	Pass	n40: 20.9dBm (123.9mW)
1	PSD, 5250 - 5350MHz	15.407(a) (2)	Pass	n40: 4.8dBm/MHz
1	Max EIRP 5250 - 5350MHz	TPC required if EIRP≥ 500mW (27dBm). EIRP ≥ 200mW (23dBm) DFS threshold = -64dBm.	Pass	EIRP = 29.9dBm (987mW)
1	Power, 5470 - 5725MHz	15.407(a) (2)	Pass	n40: 20.9dBm (123.4mW)
1	PSD, 5470 - 5725MHz	15.407(a) (2)	Pass	n40: 5.5dBm/MHz
1	Max EIRP 5470 - 5725MHz	TPC required if EIRP≥ 500mW (27dBm). EIRP ≥ 200mW (23dBm) DFS threshold	Pass	EIRP = 29.9dBm (982mW)
1	Power, 5725 - 5850MHz	15.407(a) (3)	Pass	n40: 23.6dBm (228.7mW)
1	PSD, 5725 - 5850MHz	15.407(a) (3)	Pass	n40: 7.5dBm/MHz
1	26dB Bandwidth	15.407 (Information only)	-	n40: 36.9MHz (min across all bands)
2	Minimum 6dB Bandwidth for UNII3 band	15.407(e)	Pass	n40: 35.6MHz

Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

Note:

1. Antenna port number defined

Port JE09 -Test port 0 ; Port JE10 -Test port 1 ; Port JE11 -Test port 2 ; Port JE12 -Test port 3

2. All the measurements measured at the end of the internal cable

Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

Procedure Comments:

Measurements performed in accordance with FCC KDB 789033 D01 v01r03, dated April 8, 2013

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
n40	MCS8	0.90	Yes	2	0.4360509	0.8721018	500

Sample Notes

Sample S/N: C7105S1140200BT
Driver: 5.1.25

Antenna Gain Information

Freq	Antenna Gain (dBi) / Chain				BF	MultiChain Legacy	CDD	Sectorized / Xpol	Dir G (PWR)	Dir G (PSD)
	1	2	3	4						
5150-5250	6	6	6	6	Yes	No	Yes	No	9.0	9.0
5250-5350	6	6	6	6	Yes	No	Yes	No	9.0	9.0
5470-5725	6	6	6	6	Yes	No	Yes	No	9.0	9.0
5725-5850	6	6	6	6	Yes	No	Yes	No	9.0	9.0

For devices that support CDD modes

Min # of spatial streams: 2 MCS8 is the lowest rate supported
Max # of spatial streams: 4

Notes:	BF = beamforming mode supported, Multichain Legacy = 802.11 legacy data rates supported for multichain transmissions, CDD = Cyclic Delay Diversity (or Cyclic Shift Diversity) modes supported, Sectorized / Xpol = antennas are sectorized or cross polarized.
Notes:	Dir G (PWR) = total gain (Gant + Array Gain) for power calculations; GA (PSD) = total gain for PSD calculations based on FCC KDB 662911. Depending on the modes supported, the Array Gain value for power could be different from the PSD value.
Notes:	Array gain for power/psd calculated per KDB 662911 D01, v02r01. Spatial Multiplexing with Nant=4, Nss=2, for worse case condition. Array gain = 10*log(4/2) = 3dB.

Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

Run #1: Bandwidth, Output Power and Power Spectral Density - MIMO Systems

Note 1:	Output power measured using a spectrum analyzer (see plots below). RBW=1MHz, VB=3 MHz, # of points in sweep ≥ 2*span/RBW, Sample or RMS detector, power averaging on and power integration and adjusted for duty cycle. (method SA-2 of KDB 789033).
Note 2:	Measured using the same analyzer settings used for output power.
Note 4:	99% Bandwidth measured in accordance with RSS GEN - RB > 1% of span and VB >=3xRB
Note 5:	For MIMO systems the total output power and total PSD are calculated form the sum of the powers of the individual chains (in linear terms). The antenna gain used to determine the EIRP and limits for PSD/Output power depends on the operating mode of the MIMO device. If the signals on the non-coherent between the transmit chains then the gain used to determine the limits is the highest gain of the individual chains and the EIRP is the sum of the products of gain and power on each chain. If the signals are coherent then the effective antenna gain is the sum (in linear terms) of the gains for each chain and the EIRP is the product of the effective gain and total power.

Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

Date of Test: 09/12/14
Test Engineer: J. Liu, M. Birgani
Test Location: FT Lab 4A

Config. Used: 1
Config Change: None
EUT Voltage: PoE

MIMO Device - 5150-5250 MHz Band - FCC

Mode: n40

Max EIRP (mW): 743.26

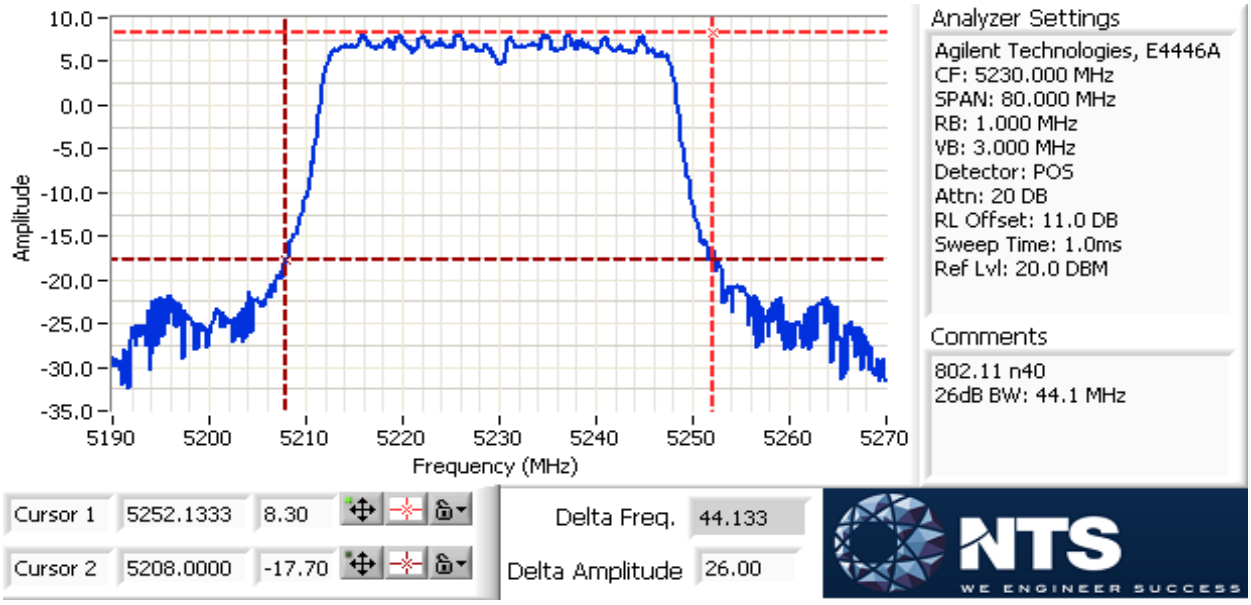
Frequency (MHz)	Chain	Software Setting	26dB BW (MHz)	Duty Cycle %	Power[1] dBm	Total Power mW	Total Power dBm	FCC Limit dBm	Max Power (W)	Result
5190	0	15	43.1	90	13.6	93.3	19.7	21.0	0.093	Pass
	2				13.3					
	3				13.1					
	1				12.8					
5230	0	16	44.1	90	14.1	92.7	19.7	21.0		Pass
	2				13.9					
	3				13.9					
	1				9.1					

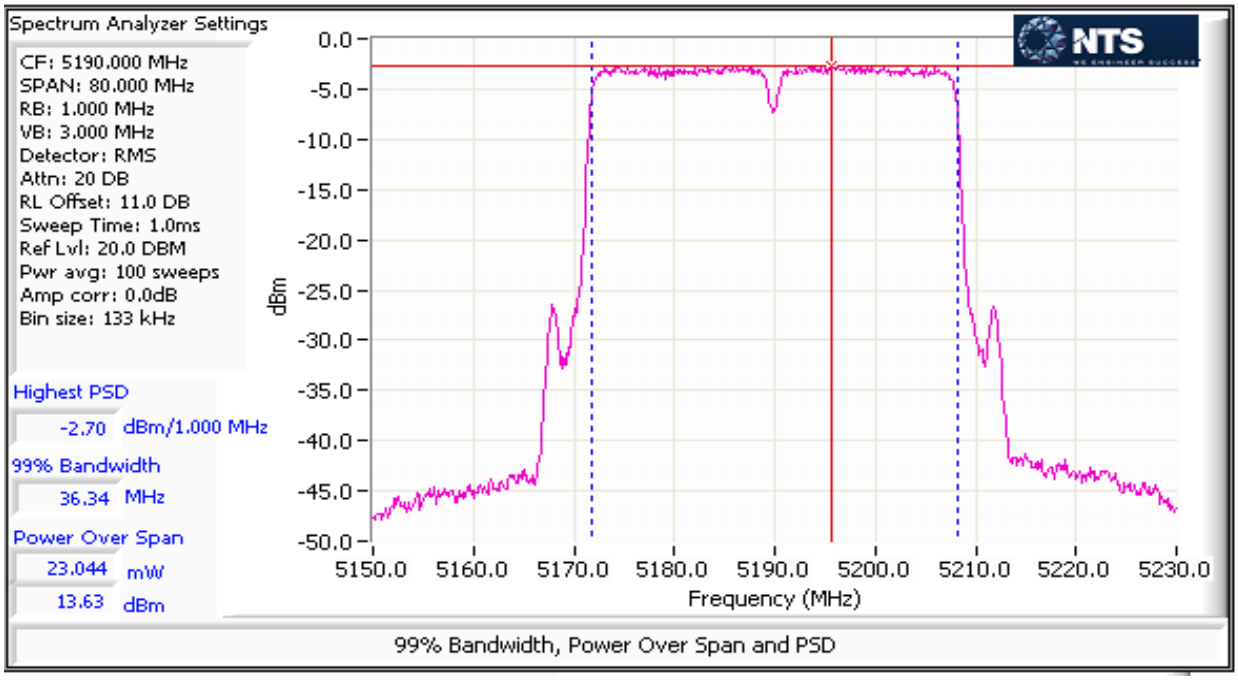
5150-5250 PSD - FCC

Mode: n40

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD[1] mW/MHz	Total PSD[1] dBm/MHz	FCC Limit dBm/MHz	IC Limit dBm/MHz	Result
5190	0	15	36.3	90	-2.7	2.3	3.6	8.0	-	Pass
	2				-2.6					
	3				-3.2					
	1				-3.3					
5230	0	16	36.3	90	-2.0	2.3	3.6	8.0	-	Pass
	2				-2.1					
	3				-2.1					
	1				-6.9					

Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A





Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

Date of Test: 09/12/14 Config. Used: 1
Test Engineer: M. Birgani Config Change: None
Test Location: FT Lab 4A EUT Voltage: PoE

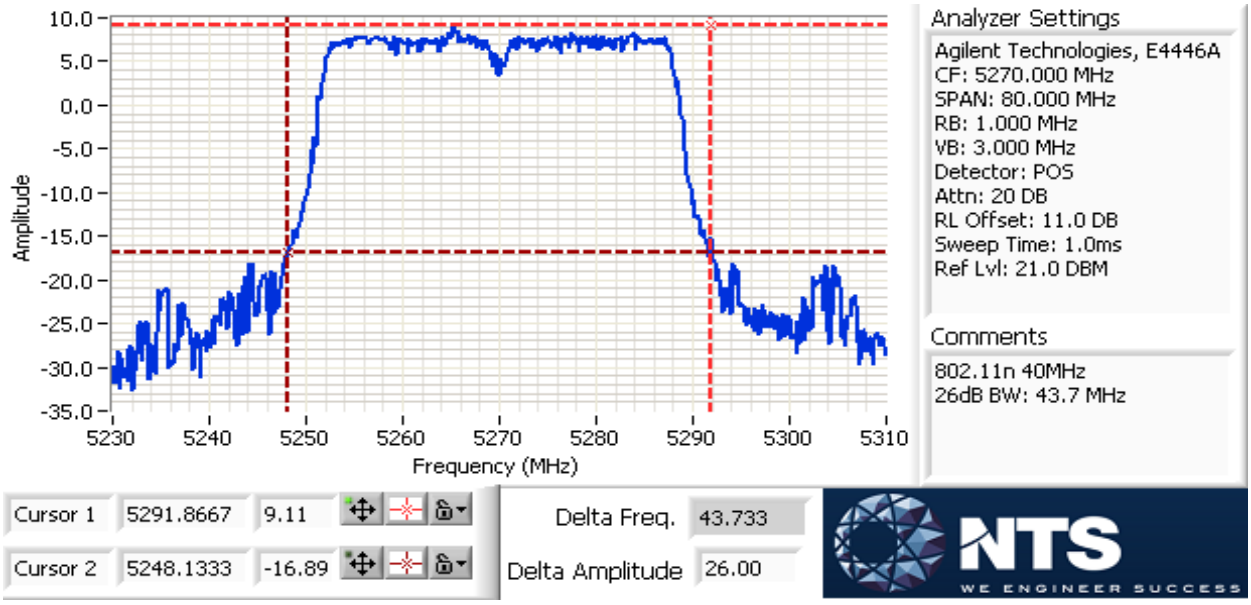
MIMO Device - 5250-5350 MHz Band - FCC
Mode: n40 Max EIRP (mW): 986.9

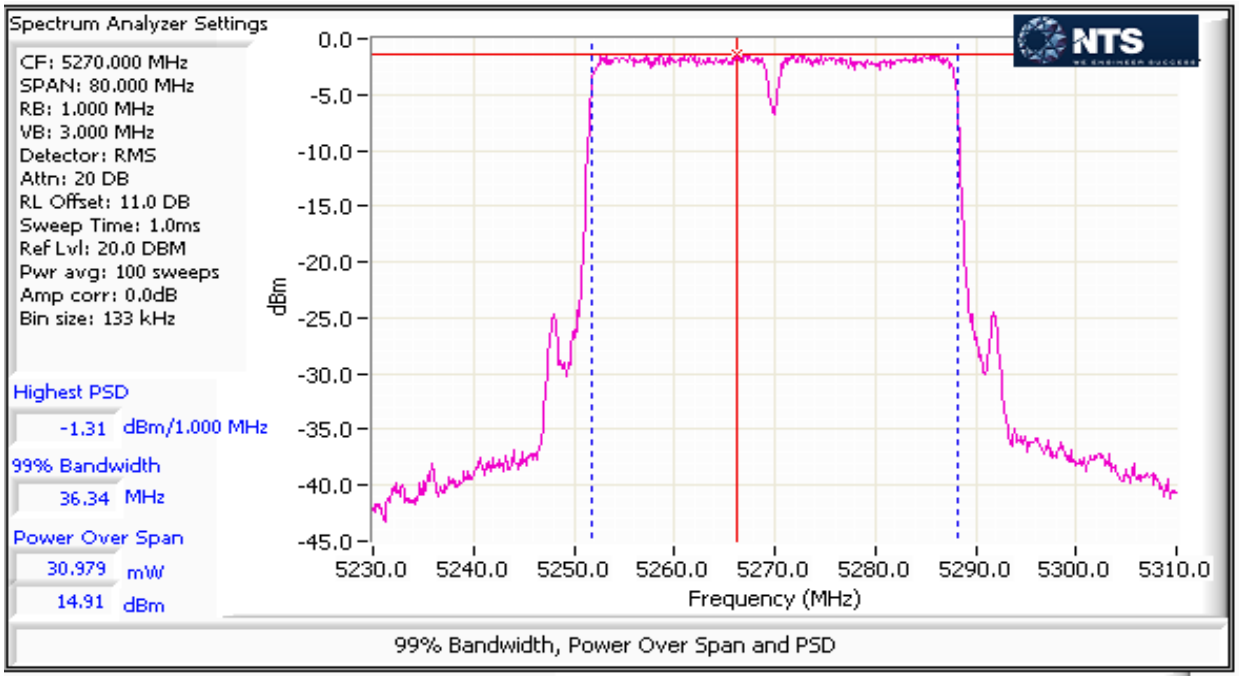
Frequency (MHz)	Chain	Software Setting	26dB BW (MHz)	Duty Cycle %	Power dBm	Total Power[1] mW	Total Power[1] dBm	FCC Limit dBm	Max Power (W)	Result
5270	0	17	43.7	90	14.9	123.9	20.9	21.0	0.124	Pass
	2				14.5					
	3				14.5					
	1				13.8					
5310	0	15	43.3	90	13.9	96.9	19.9	21.0		Pass
	2				13.2					
	3				13.2					
	1				13.2					

MIMO Device 5250-5350 PSD - FCC
Mode: n40

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD[1] mW/MHz	Total PSD[1] dBm/MHz	FCC Limit dBm/MHz	IC Limit dBm/MHz	Result
5270	0	17	36.3	90	-1.3	3.0	4.8	8.0	-	Pass
	2				-1.7					
	3				-1.7					
	1				-2.3					
5310	0	15	36.3	90	-2.2	2.4	3.8	8.0	-	Pass
	2				-2.8					
	3				-3.0					
	1				-3.0					

Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A





Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

Date of Test: 9/12/2014 and 9/15/2014 Config. Used: 1
Test Engineer: M. Birgani Config Change: None
Test Location: FT Lab 4A EUT Voltage: PoE

MIMO Device - 5470-5725 MHz Band - FCC
Mode: n40 Max EIRP (mW): 982.6

Frequency (MHz)	Chain	Software Setting	26dB BW (MHz)	Duty Cycle %	Power dBm	Total Power[1] mW	Total Power[1] dBm	FCC Limit dBm	Max Power (W)	Result
5510	0	14	43.2	90	12.7	74.6	18.7	21.0	0.123	Pass
	2				11.6					
	3				12.0					
	1				12.6					
5550	0	16	43.7	90	15.0	119.9	20.8	21.0		Pass
	2				13.9					
	3				14.2					
	1				14.0					
5670	0	16	43.5	90	14.0	112.1	20.5	21.0		Pass
	2				13.8					
	3				13.9					
	1				14.4					
802.11ac 40MHz UNII-2ext										
5710	0	17	36.9	90	14.5	123.4	20.9	21.0		Pass
	2				14.4					
	3				14.4					
	1				14.5					
UNII-3										
5710	0	17	10.9	90	3.8	10.2	10.1	18.4		Pass
	2				2.7					
	3				4.5					
	1				3.3					

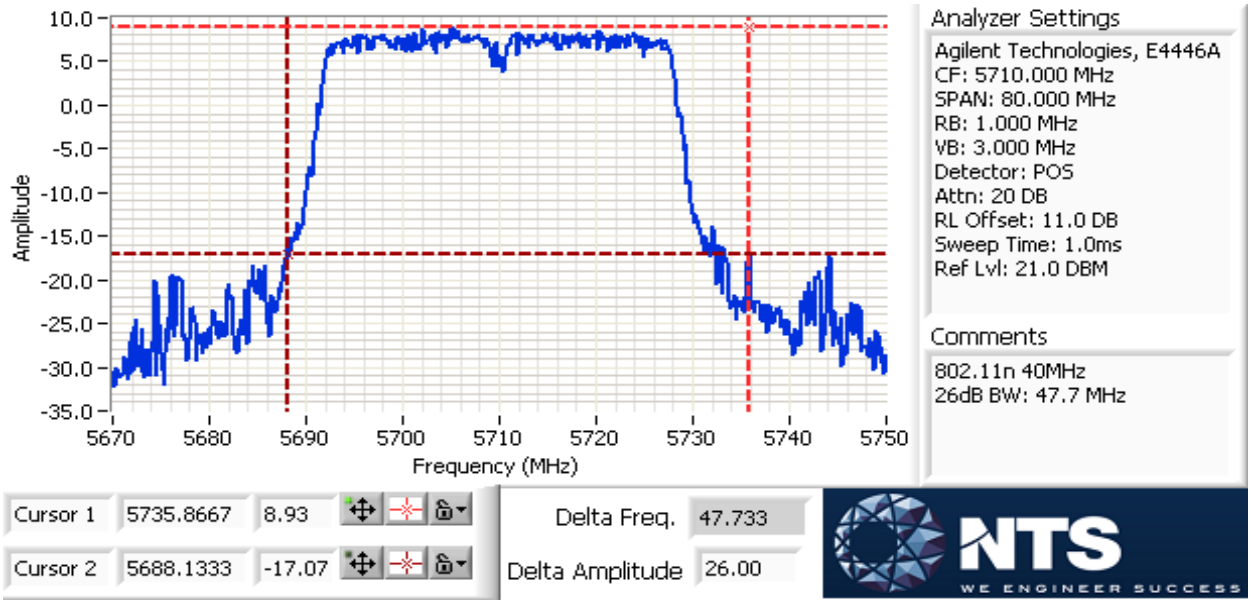
Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

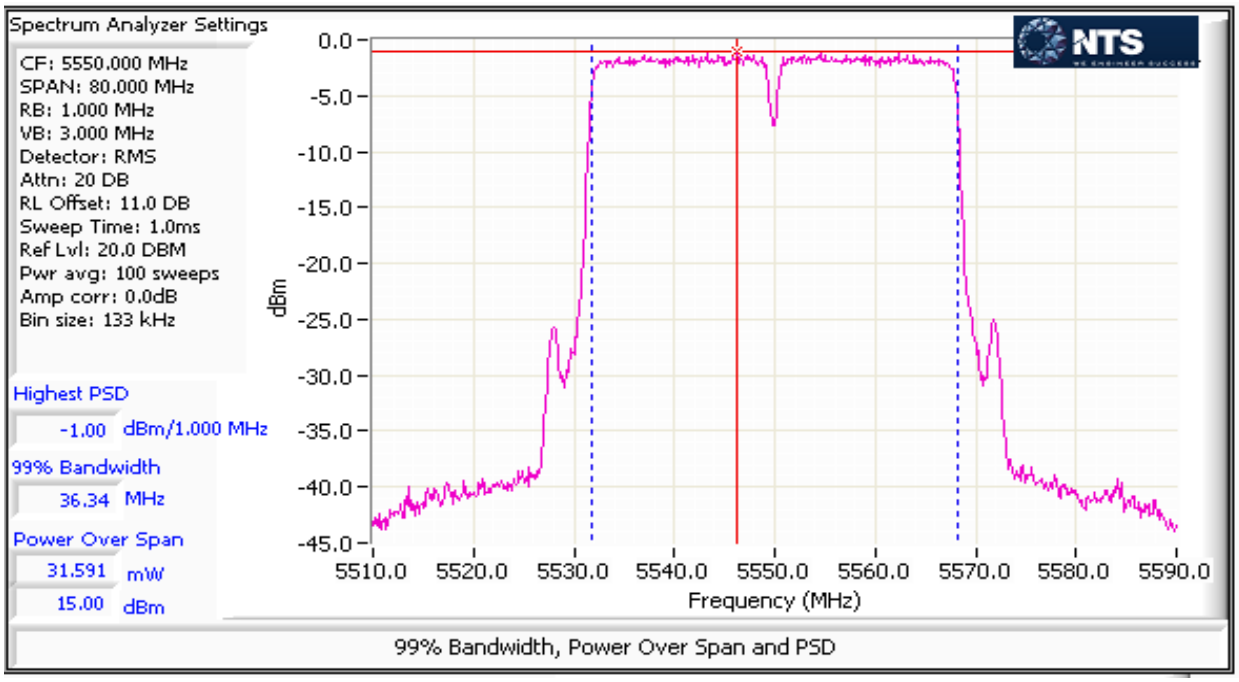
MIMO Device 5470-5725 PSD - FCC

Mode: n40

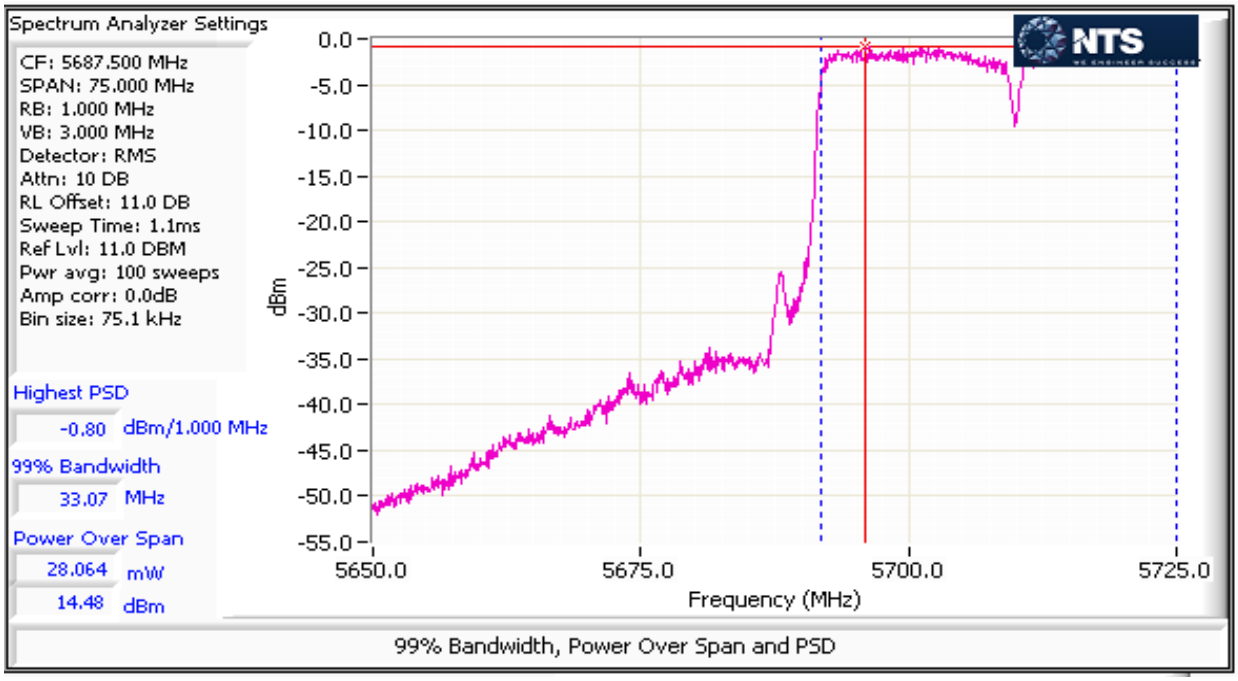
Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD[1] mW/MHz	Total PSD[1] dBm/MHz	FCC Limit dBm/MHz	IC Limit dBm/MHz	Result
5510	0	14	36.3	90	-3.5	1.8	2.5	8.0	-	Pass
	2				-4.6					
	3				-4.2					
	1				-3.6					
5550	0	16	36.3	90	-1.0	2.9	4.7	8.0	-	Pass
	2				-2.3					
	3				-2.0					
	1				-2.0					
5670	0	16	36.3	90	-2.1	2.7	4.3	8.0	-	Pass
	2				-2.4					
	3				-2.4					
	1				-1.9					
802.11ac 40MHz UNII-2ext										
5710	0	17	28.3	90	-0.8	3.6	5.6	8.0	-	Pass
	2				-1.2					
	3				-1.0					
	1				-0.7					
UNII-3										
5710	0	17	8.6	90	-1.7	2.8	4.5	8.0	-	Pass
	2				-3.1					
	3				-1.1					
	1				-2.4					

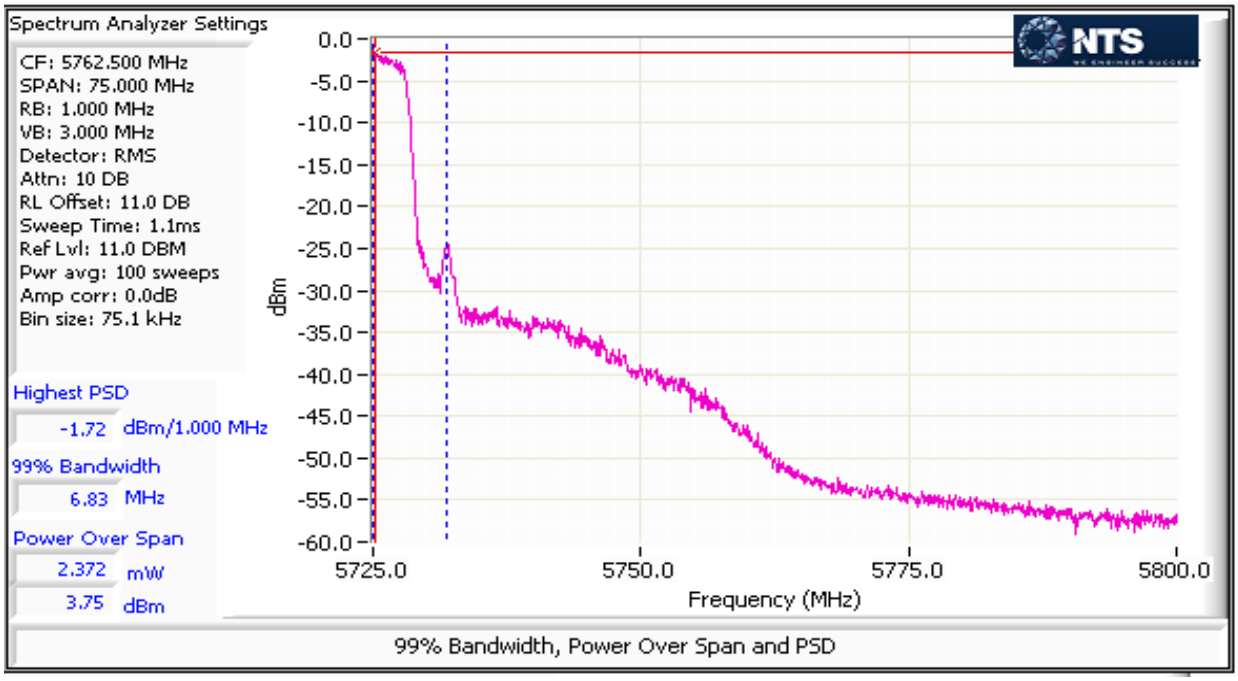
Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A





Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A





Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

Date of Test: 09/12/14
Test Engineer: Jack Liu
Test Location: FT Lab 4A

Config. Used: 1
Config Change: None
EUT Voltage: PoE

MIMO Device - 5725-580 MHz Band - FCC

Mode: n40 Max EIRP (mW): 1820.5777

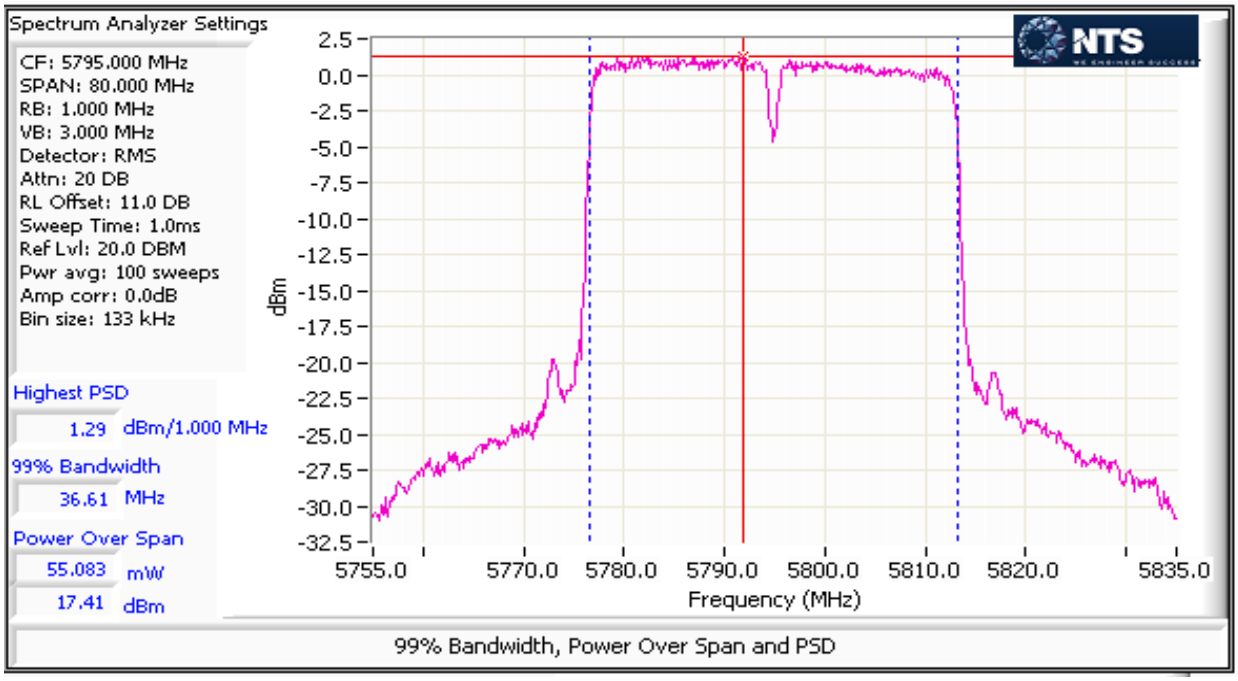
Frequency (MHz)	Chain	Software Setting	6dB BW (MHz)	Duty Cycle %	Power dBm	Total Power[1] mW	Total Power[1] dBm	FCC Limit dBm	Max Power (W)	Result
5755	0	15	35.6	90	13.0	84.6	19.3	27.0	0.229	Pass
	2				12.6					
	3				12.9					
	1				12.7					
5795	0	20	35.6	90	17.4	228.7	23.6	27.0		Pass
	2				17.0					
	3				17.3					
	1				16.7					

MIMO Device 5725-5850 PSD - FCC

Mode: n40

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD[1] mW/MHz	Total PSD[1] dBm/MHz	FCC Limit dBm/MHz	IC Limit dBm/MHz	Result
5755	0	15	36.34	90	-3.0	2.1	3.2	27.0	-	Pass
	2				-3.5					
	3				-3.4					
	1				-3.3					
5795	0	20	36.61	90	1.3	5.7	7.5	27.0	-	Pass
	2				0.9					
	3				1.3					
	1				0.8					

Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A



Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A

Run #2: Bandwidth Measurements

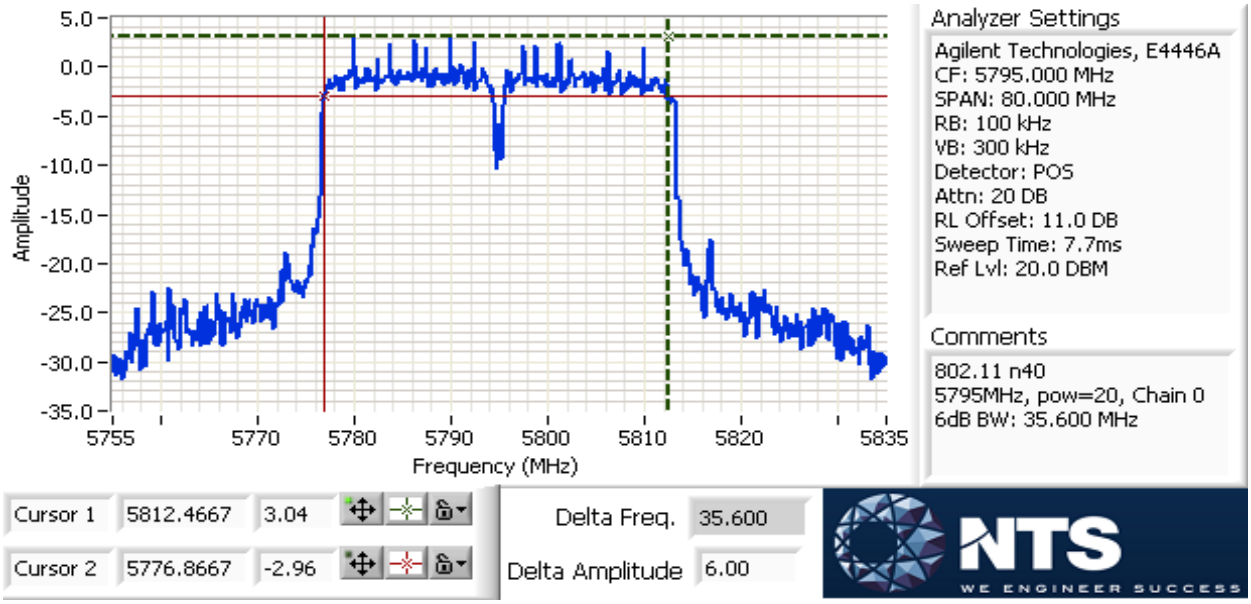
Date of Test: 09/12/14 | Config. Used: 1
Test Engineer: Jack Liu | Config Change: None
Test Location: FT Lab 4A | EUT Voltage: PoE

Mode: HT40

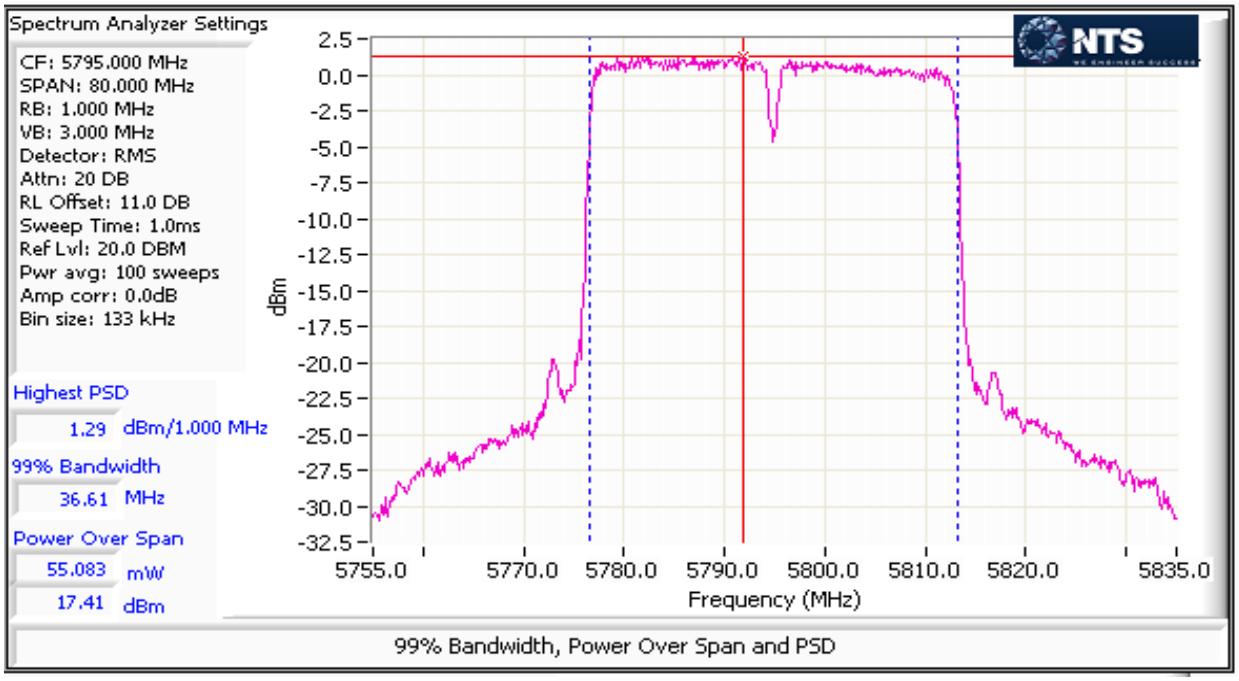
5725-5850MHz band (UNII3)

Power Setting	Frequency (MHz)	Bandwidth (MHz)		RBW Setting (MHz)	
		6dB	99%	6dB	99%
15	5755	35.6	36.3	0.1	1.0
20	5795	35.6	36.6	0.1	1.0

Note 1:	6dB BW: RBW=100kHz, VBW ≥ 3*RBW, peak detector, max hold, auto sweep time. 99% BW: RBW=1-5% of of 99%BW, VBW ≥ 3*RBW, peak detector, max hold, auto sweep time.



Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	N/A



Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	B

Conducted Emissions

(Elliott Laboratories 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: 8/20/2014
Test Engineer: Jack Liu
Test Location: Fremont Chamber #4

Config. Used: 1
Config Change: None
EUT Voltage: PoE

General Test Configuration

For tabletop equipment, the EUT was located on a wooden table inside the semi-anechoic chamber, 40 cm from a vertical coupling plane and 80cm from the LISN. A second LISN was used for all local support equipment. Remote support equipment was located outside of the semi-anechoic chamber. Any cables running to remote support equipment where routed through metal conduit and when possible passed through a ferrite clamp upon exiting the chamber.

Ambient Conditions:

Temperature: 24 °C
Rel. Humidity: 38 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power,120V/60Hz	15.207	Pass	60.0 dBµV @ 0.151 MHz (-5.9 dB)

Modifications Made During Testing

FerriShield (www.leadertechinc.com) - cable clamp TC28B0617; placed on the etherent cable between external port and internal pcb

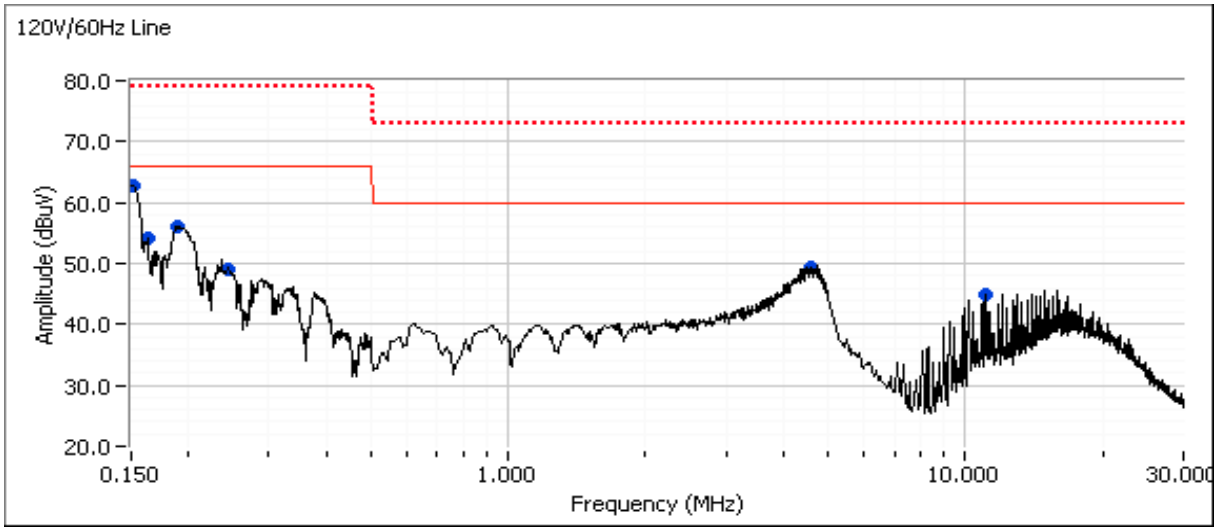
Deviations From The Standard

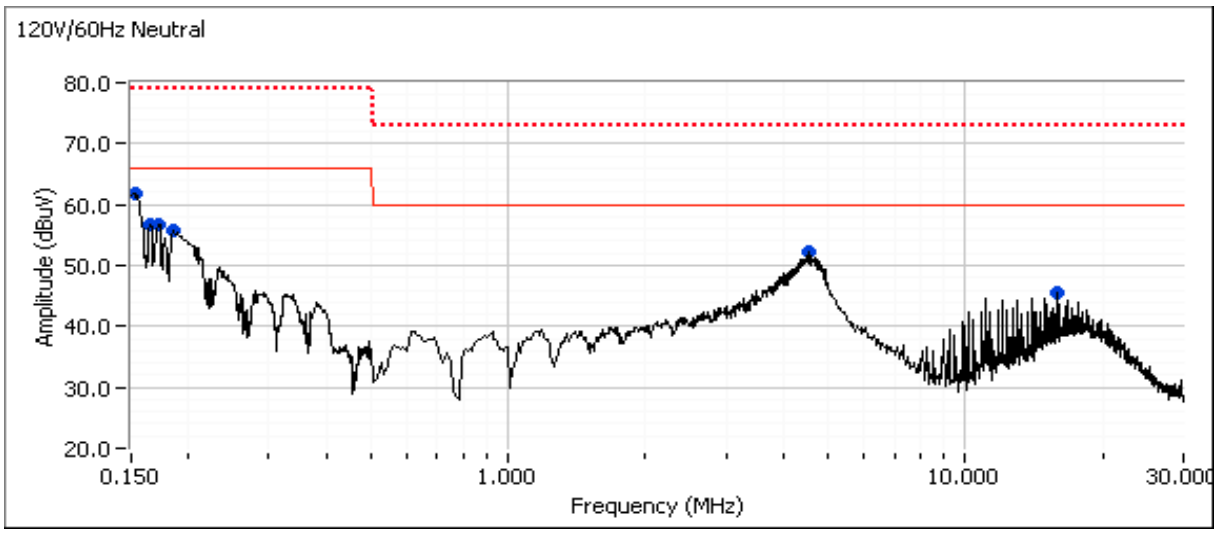
No deviations were made from the requirements of the standard.

Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	B

Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz
EUT transmitting on channel 134 at power setting 18.

Plots show FCC 15.107 Class A limits - Tabular data compared to 15.207 limits





Client:	Vivint Wireless	Job Number:	J95684
Model:	SR1420 (4x4 5GHz 802.11 Client)	T-Log Number:	T95948
		Project Manager:	Christine Krebill
Contact:	Venkat Kalkunte	Project Coordinator:	-
Standard:	FCC 15.B / 15.407 (New Rules)	Class:	B

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

Frequency	Level	AC	15.207		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
11.114	45.0	Line	50.0	-5.0	Average	
4.617	49.3	Line	46.0	3.3	Average	
0.151	62.8	Line	56.0	6.8	Average	
0.190	56.0	Line	54.0	2.0	Average	
0.244	49.2	Line	52.0	-2.8	Average	
0.162	54.1	Line	55.4	-1.3	Average	
0.153	61.8	Neutral	55.9	5.9	Average	
0.167	56.8	Neutral	55.1	1.7	Average	
0.172	56.6	Neutral	54.9	1.7	Average	
0.187	55.6	Neutral	54.2	1.4	Average	
4.551	52.2	Neutral	46.0	6.2	Average	
15.838	45.6	Neutral	50.0	-4.4	Average	

Final quasi-peak and average readings

Frequency	Level	AC	15.207		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.151	60.0	Line	65.9	-5.9	QP	QP (1.00s)
11.114	43.9	Line	50.0	-6.1	Average	AVG (0.10s)
4.551	39.3	Neutral	46.0	-6.7	Average	AVG (0.10s)
4.551	47.8	Neutral	56.0	-8.2	QP	QP (1.00s)
15.838	41.7	Neutral	50.0	-8.3	Average	AVG (0.10s)
0.153	57.3	Neutral	65.8	-8.5	QP	QP (1.00s)
4.617	36.4	Line	46.0	-9.6	Average	AVG (0.10s)
0.190	54.0	Line	64.0	-10.0	QP	QP (1.00s)
4.617	45.7	Line	56.0	-10.3	QP	QP (1.00s)
0.186	52.0	Neutral	64.2	-12.2	QP	QP (1.00s)
0.151	41.6	Line	55.9	-14.3	Average	AVG (0.10s)
0.190	39.3	Line	54.0	-14.7	Average	AVG (0.10s)
11.114	44.9	Line	60.0	-15.1	QP	QP (1.00s)
0.244	45.9	Line	62.0	-16.1	QP	QP (1.00s)
15.838	43.7	Neutral	60.0	-16.3	QP	QP (1.00s)
0.162	48.5	Line	65.4	-16.9	QP	QP (1.00s)
0.153	37.7	Neutral	55.8	-18.1	Average	AVG (0.10s)
0.186	34.5	Neutral	54.2	-19.7	Average	AVG (0.10s)
0.167	45.1	Neutral	65.1	-20.0	QP	QP (1.00s)
0.244	31.8	Line	52.0	-20.2	Average	AVG (0.10s)
0.172	44.4	Neutral	64.9	-20.5	QP	QP (1.00s)
0.162	24.7	Line	55.4	-30.7	Average	AVG (0.10s)
0.167	22.9	Neutral	55.1	-32.2	Average	AVG (0.10s)
0.172	22.5	Neutral	54.9	-32.4	Average	AVG (0.10s)

End of Report

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