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EMC Test Report

Application for Class II Permissive Change/Reassessment

Industry Canada RSS-Gen Issue 3 / RSS 210 Issue 8
FCC Part 15 Subpart C

Model: RS9110-N-11-22

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FCC ID:	ZKSRS9110N1122
APPLICANT:	Safemine Ltd. Lindenstrasse 4 Baar 6340, Switzerland
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SCOPE

An electromagnetic emissions test has been performed on the Safemine Ltd. model RS9110-N-11-22, pursuant to the following rules:

Industry Canada RSS-Gen Issue 3
RSS 210 Issue 8 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
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 C63.10-2009
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 Safemine Ltd. model RS9110-N-11-22 complied with the requirements of the following regulations:

Industry Canada RSS-Gen Issue 3
RSS 210 Issue 8 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
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 Safemine Ltd. model RS9110-N-11-22 and therefore apply only to the tested sample. The sample was selected and prepared by Lukas Herzog of Safemine Ltd.

DEVIATIONS FROM THE STANDARDS

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

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	No change from original filing	System must utilize a digital transmission technology	Complies
15.247 (a) (2)	RSS 210 A8.2 (1)	6dB Bandwidth	No change from original filing	>500kHz	Complies
15.247 (b) (3)	RSS 210 A8.2 (4)	Output Power (multipoint systems)	802.11b: 9.6 dBm 802.11g: 14.0 dBm 802.11n20: 14.3 dBm	1Watt, EIRP limited to 4 Watts.	Complies
15.247(d)	RSS 210 A8.2 (2)	Power Spectral Density	Not performed as power is less than original filing	8dBm/3kHz	Complies
15.247(c)	RSS 210 A8.5	Antenna Port Spurious Emissions 30MHz – 25 GHz	Not performed as power is less than original filing	< -20dBc	Complies
15.247(c) / 15.209	RSS 210 A8.5	Radiated Spurious Emissions 30MHz – 25 GHz	53.9 dBµV/m @ 4924.0 MHz (-0.1 dB)	15.207 in restricted bands, all others < -20dBc	Complies
15.203	-	RF Connector	No change from original filing	Unique or integral antenna required	Complies
15.207	RSS GEN Table 4	AC Conducted Emissions	Not performed as power is less than original filing	Refer to page 16	Complies
-	RSP 100 RSS GEN 4.6.1	99% Bandwidth	Not performed as power is less than original filing	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
Radiated emission (field strength)	dBµV/m	25 to 1000 MHz	± 3.6 dB
		1000 to 40000 MHz	± 6.0 dB

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Safemine Ltd. model RS9110-N-11-22 is an 802.11 compliant 2.4 GHz band Wi-Fi module. Since the EUT could be placed in any position in an end product, it was treated as tabletop equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 3.3Vdc supplied from the host.

The sample was received on March 18, 2014 and tested on March 28 and 31 and April 3 and 15, 2014. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
SafeMine	RS9110-N-11-22	Wi-Fi Module	P07-2812	ZKSRS9110N1122

ANTENNA SYSTEM

The EUT antenna is either a MobileMark MGW-301-3C3J2C-WHT-138-SP-253 or SMW-301-3C3J2C-WHT-8-SP-192. The MGW-301-3C3J2C-WHT-138-SP-253 is a Multi-band Surface Magnet Mt. antenna. The SMW-301-3C3J2C-WHT-8-SP-192 is a surface mount antenna. Both have a 5dBi gain in the 2.4 GHz band. These antennas are also sold as SAFEmine branded models QF037 and QF036.
The antenna connects to the EUT via a non-standard u.FL antenna connector, thereby meeting the requirements of FCC 15.203.

ENCLOSURE

The EUT has no enclosure. It is designed to be installed within the enclosure of a host computer.

MODIFICATIONS

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

SUPPORT EQUIPMENT

The following equipment was used as support equipment for testing:

Company	Model	Description	Serial Number	FCC ID
Redpine Signals	RS9110-N-11-22-02EVB	Test Board	-	-

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

Company	Model	Description	Serial Number	FCC ID
MSI	U100(MS-6837D)	Laptop	-	-
Not on Adapter	0025A2040	AC Adapter	A30836088724	-
Samsung	GB4943-2001	USB AC Adapter	-	-

EUT INTERFACE PORTS

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

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
RF Port	Antenna (Wifi cable)	Coaxial	Shielded	3.5

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Antenna (ISM cable)	50 ohm terminator	Coaxial	Shielded	3.5
Antenna (GPS cable)	50 ohm terminator	Coaxial	Shielded	3.5
Laptop USB	serial port on test board	DB25 to USB	Shielded	1.8
USB AC Adapter	Mini USB port on Test board	regular USB to Mini USB	Unshielded	1.5

EUT OPERATION

During testing, the EUT was set to transmit continuously at the specified power level on the selected channel.

PROPOSED MODIFICATION DETAILS

GENERAL

This section details the modifications to the Safemine Ltd. model RS9110-N-11-22 being proposed. All performance and construction deviations from the characteristics originally reported to the FCC are addressed

The Safemine Ltd. model RS9110-N-11-22 module has not been changed except to add a new antenna type. The output power was lowered in software for use with the new antenna.

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 7	US0027	2845B-7	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 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.

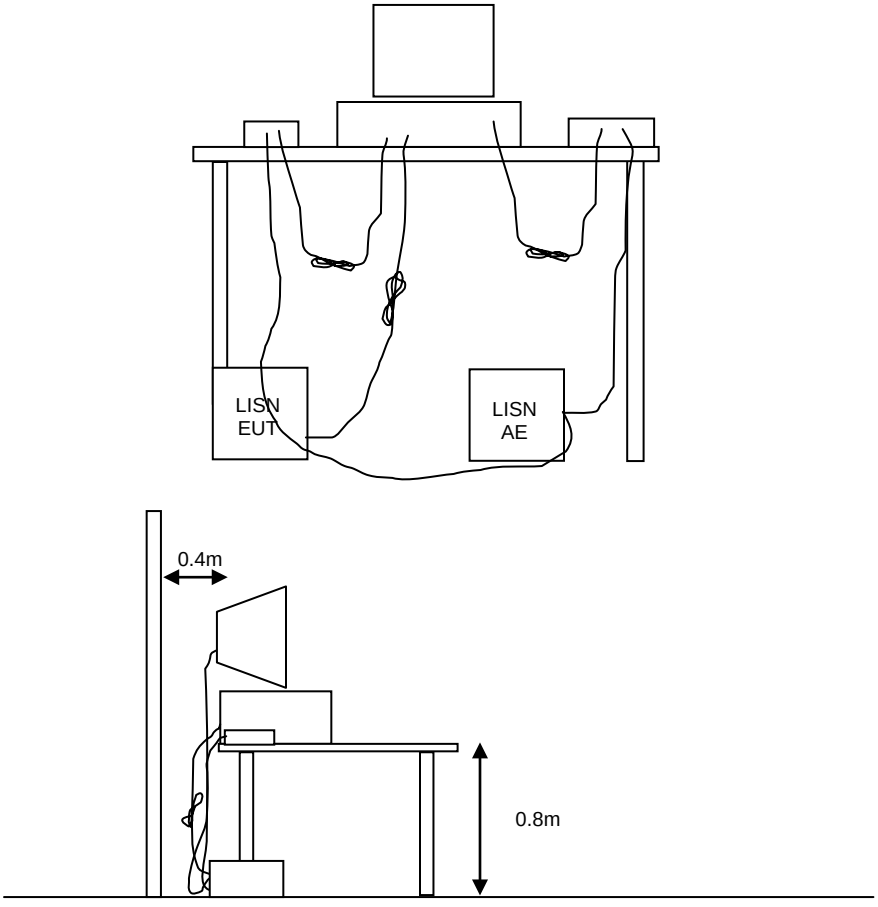


Figure 1 Typical Conducted Emissions Test Configuration

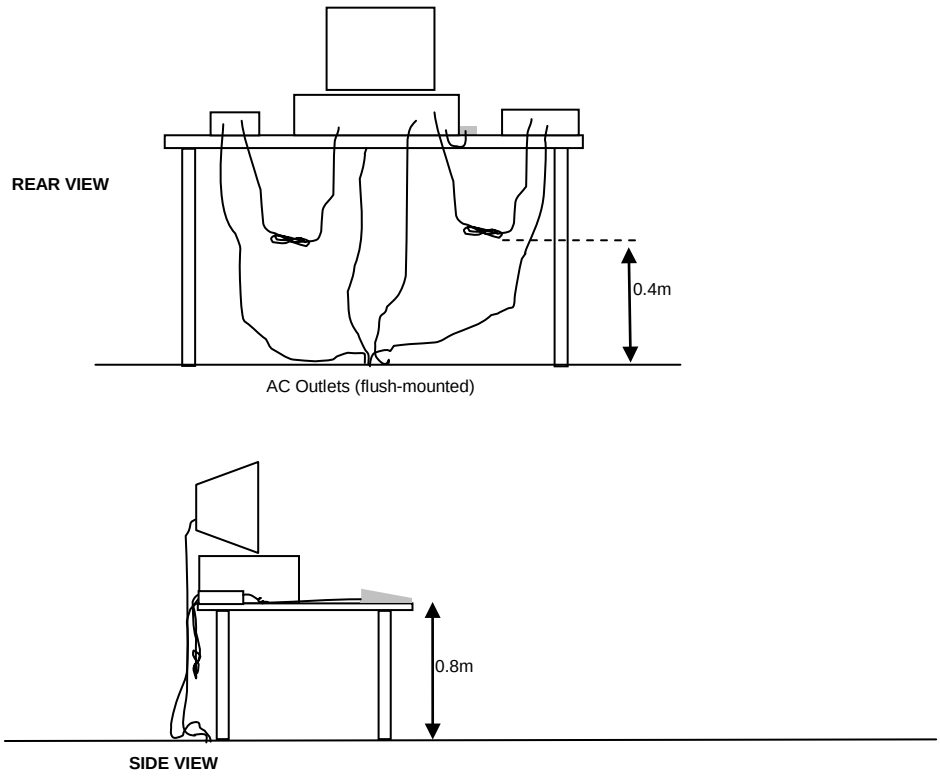
RADIATED EMISSIONS

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.

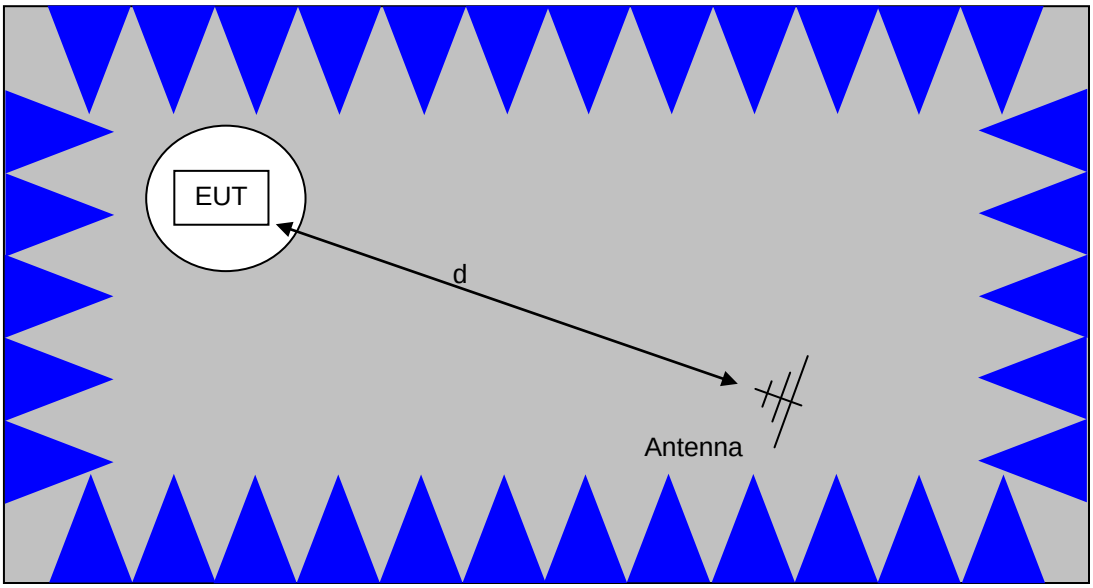
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

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.

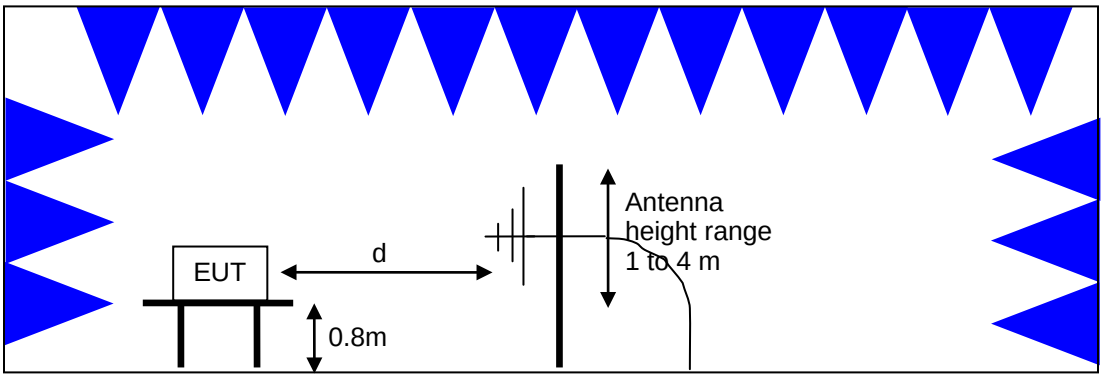


Typical Test Configuration for Radiated Field Strength Measurements



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.

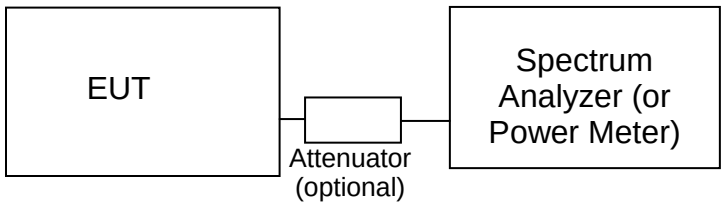
Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.



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[1] (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

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 210 Table 2, 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 (uV/m @ 3m)	Limit (dBuV/m @ 3m)
30 to 88	100	40
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

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

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

The maximum permitted output power is reduced by 1dB for every dB the antenna gain exceeds 6dBi. 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 20dB 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 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:

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

where P is the eirp (Watts)

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

Appendix A Test Equipment Calibration Data

Manufacturer	Description	Model	Asset #	Cal Due
Radiated Emissions, 1,000 - 6,500 MHz, 28-Mar-14				
EMCO	Antenna, Horn, 1-18GHz	3115	868	6/19/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1538	12/14/2014
Power, 28-Mar-14				
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1290	12/10/2014
Rohde & Schwarz	Power Sensor 100 uW - 2 Watts (w/ 20 dB pad, SN BJ5155)	NRV-Z32	1536	12/19/2014
Radiated Emissions, 1000 - 25,000 MHz, 28-Mar-14				
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	10/31/2014
EMCO	Antenna, Horn, 1-18GHz	3115	868	6/19/2014
Hewlett Packard	Head (Inc flex cable, 1143, 2198) Red	84125C	1145	6/26/2014
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	9/14/2014
A. H. Systems	Spare System Horn, 18-40GHz	SAS-574, p/n: 2581	2162	7/24/2014
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	2238	9/18/2014
Radiated Emissions, 1,000 - 12,000 MHz, 31-Mar-14				
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	10/31/2014
EMCO	Antenna, Horn, 1-18GHz	3115	868	6/19/2014
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	9/14/2014
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1290	12/10/2014
Rohde & Schwarz	Power Sensor 100 uW - 2 Watts (w/ 20 dB pad, SN BJ5155)	NRV-Z32	1536	12/19/2014
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	2238	9/18/2014
Radiated Emissions, 1,000 - 18,000 MHz, 03-Apr-14				
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	10/31/2014
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	8/23/2014
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	9/14/2014
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	1683	8/2/2014
Radiated Emissions, 1000 - 25,000 MHz, 03-Apr-14				
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	10/31/2014
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	8/23/2014
Hewlett Packard	Head (Inc flex cable, 1143, 2198) Red	84125C	1145	6/26/2014
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	9/14/2014
Hewlett Packard	High Pass filter, 8.2 GHz	P/N 84300-80039	1156	6/7/2014
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	1683	8/2/2014

Manufacturer	Description	Model	Asset #	Cal Due
A. H. Systems	Spare System Horn, 18-40GHz	SAS-574, p/n: 2581	2162	7/24/2014
Radiated Emissions, 30 - 1,000 MHz, 03-Apr-14				
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1538	12/14/2014
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1657	6/4/2014
Radiated Emissions, 30 - 1,000 MHz, 15-Apr-14				
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1538	12/14/2014
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1657	6/4/2014
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	2238	9/18/2014
Com-Power	Preamplifier, 30-1000 MHz	PA-103	2465	9/13/2014

Appendix B Test Data

T94588 Pages 24 - 65

Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Product	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Emissions Standard(s):	FCC Part 15.247	Class:	-
Immunity Standard(s):	-	Environment:	Radio

EMC Test Data

For The

SAFEmine Technology, Inc.

Product

RS9110-N-11-22

Date of Last Test: 4/15/2014

Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	N/A

RSS 210 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.

Date of Test: 3/28/2014
Test Engineer: Jack Liu
Test Location: FT Chamber 7

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

General Test Configuration

The EUT was connected to the spectrum analyzer or power meter via a suitable attenuator.

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

Ambient Conditions:

Temperature: 22 °C
Rel. Humidity: 40 %

Summary of Results

Run #	Pwr setting		Test Performed	Limit	Pass / Fail	Result / Margin
1	See below		Output Power	15.247(b)	Pass	b: 9.6 dBm g: 14.0 dBm n20: 14.3 dBm

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:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	N/A

Procedure Comments:

Measurements performed in accordance with FCC KDB 558074

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11b	1 Mb/s	100.00	-	-	0	0	-
11g	6 Mb/s	100.00	-	-	0	0	-
n20	MCS 0	100.00	-	-	0	0	-

Sample Notes

Sample S/N: P07-2812 (NTS 2014-4946) MAC: 00:23:A7:25:38:0F

Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	N/A

Run #1: Output Power

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
32	2412	8.0	6.3	5.0	Pass	13.0	0.020		
36	2437	9.4	8.7	5.0	Pass	14.4	0.028		
37	2472	9.6	9.1	5.0	Pass	14.6	0.029		

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
38	2412	14.0	25.1	5.0	Pass	19.0	0.079		
38	2437	14.0	25.1	5.0	Pass	19.0	0.079		
40	2472	14.0	25.1	5.0	Pass	19.0	0.079		

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
36	2412	14.3	26.9	5.0	Pass	19.3	0.085		
36	2437	14.2	26.3	5.0	Pass	19.2	0.083		
37	2472	14.1	25.7	5.0	Pass	19.1	0.081		

Note 1: Output power measured using a peak power meter, spurious limit is -20dBc.

Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	N/A

RSS 210 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: 22 °C
Rel. Humidity: 40 %

Note: Target powers are peak

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 - 2412MHz	16.1	50	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	37.1 dBµV/m @ 2367.6 MHz (-16.9 dB)
	b	11 - 2462MHz	15.9	50	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	35.3 dBµV/m @ 2483.5 MHz (-18.7 dB)
	b	13 - 2472MHz	15.9	51	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	52.5 dBµV/m @ 2483.5 MHz (-1.5 dB)
2	g	1 - 2412MHz	14.0	38	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	36.5 dBµV/m @ 2390.0 MHz (-17.5 dB)
	g	11 - 2462MHz	13.9	38	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	35.0 dBµV/m @ 2483.5 MHz (-19.0 dB)
	g	13 - 2472MHz	14.0	40	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	48.8 dBµV/m @ 2483.8 MHz (-5.2 dB)
3	n20	1 - 2412MHz	14.3	36	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	38.0 dBµV/m @ 2390.0 MHz (-16.0 dB)
	n20	11 - 2462MHz	14.1	37	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	36.7 dBµV/m @ 2483.6 MHz (-17.3 dB)
	n20	12 - 2467MHz	14.1	37	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	43.1 dBµV/m @ 2483.5 MHz (-10.9 dB)
	n20	13 - 2472MHz	14.1	37	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	50.6 dBµV/m @ 2483.5 MHz (-3.4 dB)

Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	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: P07-2812 (NTS 2014-4946) MAC: 00:23:A7:25:38:0F

Driver: -

Antenna: QF-037 (NTS 2014-4945)

Procedure Comments:

Measurements performed in accordance with FCC KDB 558074

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)
11b	1 Mb/s	100.00	-	-	0	0	-
11g	6 Mb/s	100.00	-	-	0	0	-
n20	MCS 0	100.00	-	-	0	0	-

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 30dB below the level of the fundamental and measured in 100kHz.
Note 2:	Emission has duty cycle ≥ 98%, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces
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 traces, measurement corrected by Linear Voltage correction factor
Note 4:	Emission has duty cycle < 98% and is NOT constant, average measurement performed: RBW=1MHz, VBW> 1/T, peak detector, linear average mode, sweep time auto, max hold. Max hold for 50*(1/DC) traces
Note 5:	Emission has duty cycle < 98%, but constant, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces, measurement corrected by Pwr correction factor
Note 6:	Plots of the average and peak bandedge do not account for any duty cycle correction. Refer to the tabular results for final measurements.

Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	N/A

Run #1: Radiated Bandedge Measurements

Date of Test: 3/28/14 , 4/3/14 — Config. Used: 1

Test Engineer: Jack Liu — Config Change: None

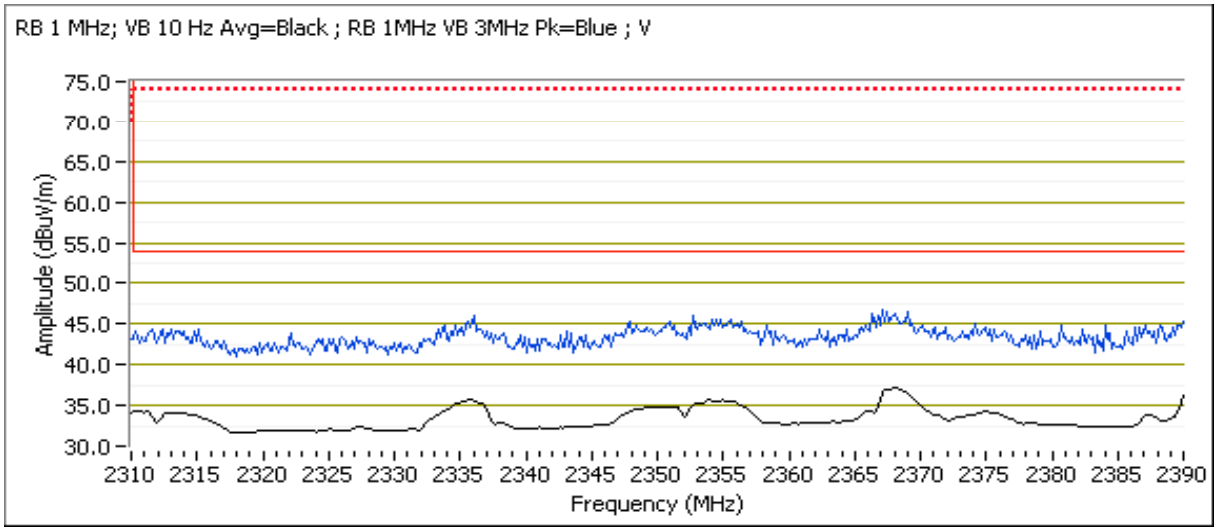
Test Location: FT Chamber7 — EUT Voltage: 120V/60Hz

Channel: 1 — Mode: b

Tx Chain: 1x1 — Data Rate: 1 Mb/s

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	
2367.560	37.1	V	54.0	-16.9	AVG	86	1.0	POS; RB 1 MHz; VB: 10 Hz
2369.320	47.1	V	74.0	-26.9	PK	86	1.0	POS; RB 1 MHz; VB: 3 MHz
2390.000	34.8	H	54.0	-19.2	AVG	149	1.2	POS; RB 1 MHz; VB: 10 Hz
2376.210	45.3	H	74.0	-28.7	PK	149	1.2	POS; RB 1 MHz; VB: 3 MHz

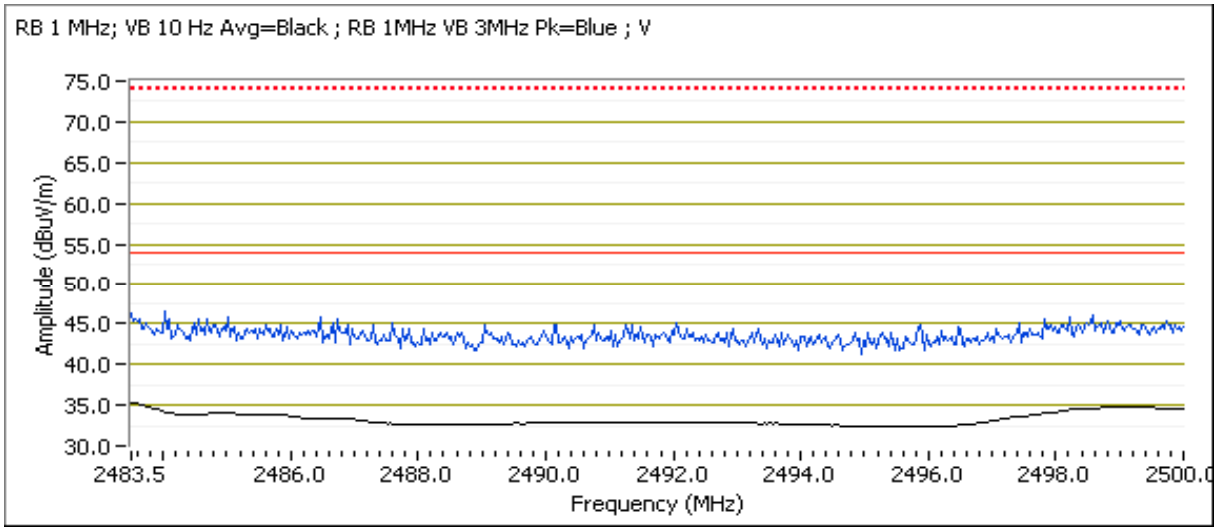


Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	N/A

Channel: 11 Mode: b
Tx Chain: 1x1 Data Rate: 1 Mb/s

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	35.3	V	54.0	-18.7	AVG	100	1.0	POS; RB 1 MHz; VB: 10 Hz
2486.180	46.7	V	74.0	-27.3	PK	100	1.0	POS; RB 1 MHz; VB: 3 MHz
2483.500	33.2	H	54.0	-20.8	AVG	151	1.1	POS; RB 1 MHz; VB: 10 Hz
2492.760	45.2	H	74.0	-28.8	PK	151	1.1	POS; RB 1 MHz; VB: 3 MHz

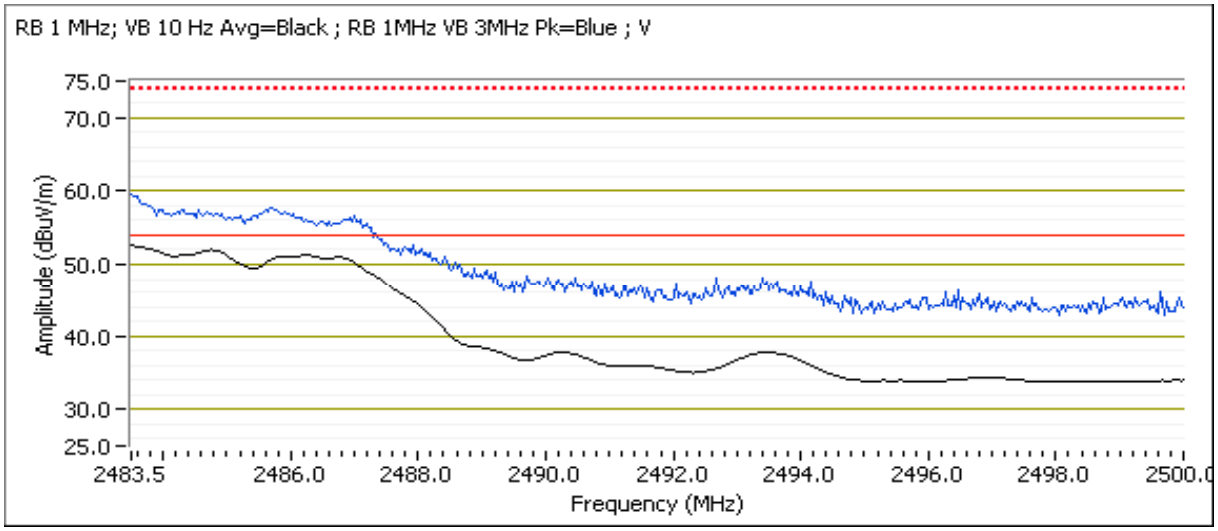


Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	N/A

Channel: 13 Mode: b
Tx Chain: 1x1 Data Rate: 1 Mb/s

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	52.5	H	54.0	-1.5	AVG	106	1.2	POS; RB 1 MHz; VB: 10 Hz
2483.500	59.4	H	74.0	-14.6	PK	106	1.2	POS; RB 1 MHz; VB: 3 MHz
2483.500	47.5	H	54.0	-6.5	AVG	160	1.1	POS; RB 1 MHz; VB: 10 Hz
2483.600	55.0	H	74.0	-19.0	PK	160	1.1	POS; RB 1 MHz; VB: 3 MHz



Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	N/A

Run #2: Radiated Bandedge Measurements

Date of Test: 3/28/14 , 4/3/14
Test Engineer: Rafael Varelas / Jack Liu
Test Location: FT Chamber7

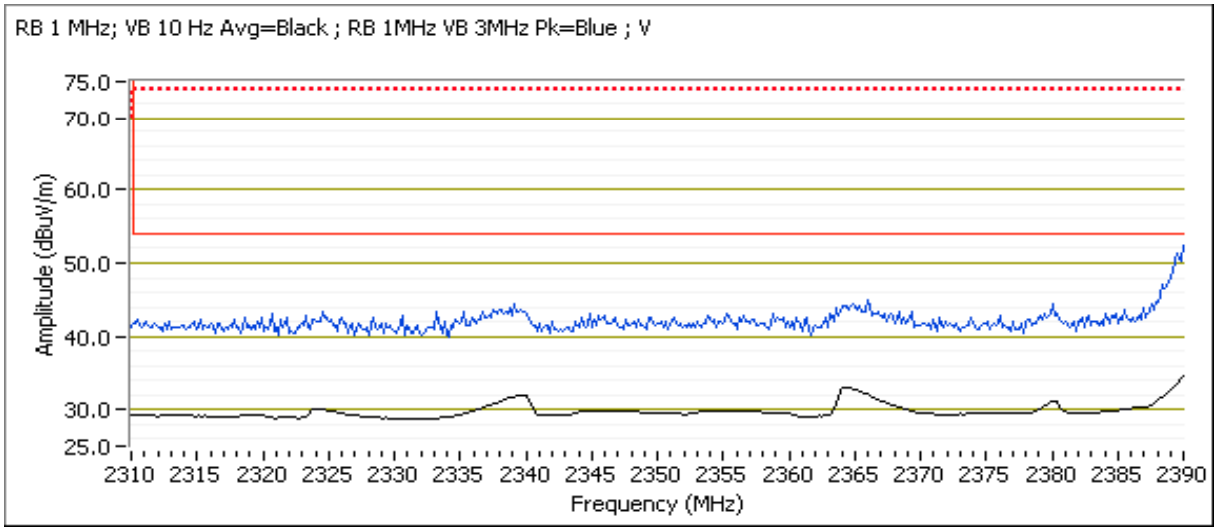
Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

Channel: 1
Tx Chain: 1x1

Mode: g
Data Rate: 6 Mb/s

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	36.5	V	54.0	-17.5	AVG	202	1.0	POS; RB 1 MHz; VB: 10 Hz
2388.960	49.0	V	74.0	-25.0	PK	202	1.0	POS; RB 1 MHz; VB: 3 MHz
2390.000	31.5	H	54.0	-22.5	AVG	140	1.3	POS; RB 1 MHz; VB: 10 Hz
2389.840	44.6	H	74.0	-29.4	PK	140	1.3	POS; RB 1 MHz; VB: 3 MHz

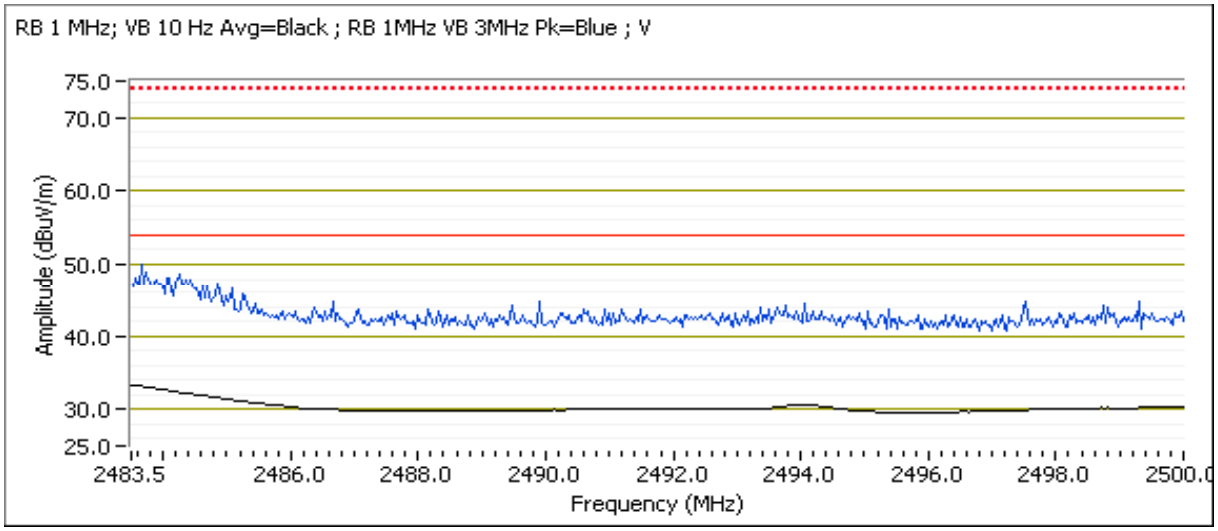


Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	N/A

Channel: 11 Mode: g
Tx Chain: 1x1 Data Rate: 6 Mb/s

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	35.0	V	54.0	-19.0	AVG	100	1.0	POS; RB 1 MHz; VB: 10 Hz
2484.230	46.6	V	74.0	-27.4	PK	100	1.0	POS; RB 1 MHz; VB: 3 MHz
2483.500	31.4	H	54.0	-22.6	AVG	210	1.9	POS; RB 1 MHz; VB: 10 Hz
2487.900	42.1	H	74.0	-31.9	PK	210	1.9	POS; RB 1 MHz; VB: 3 MHz

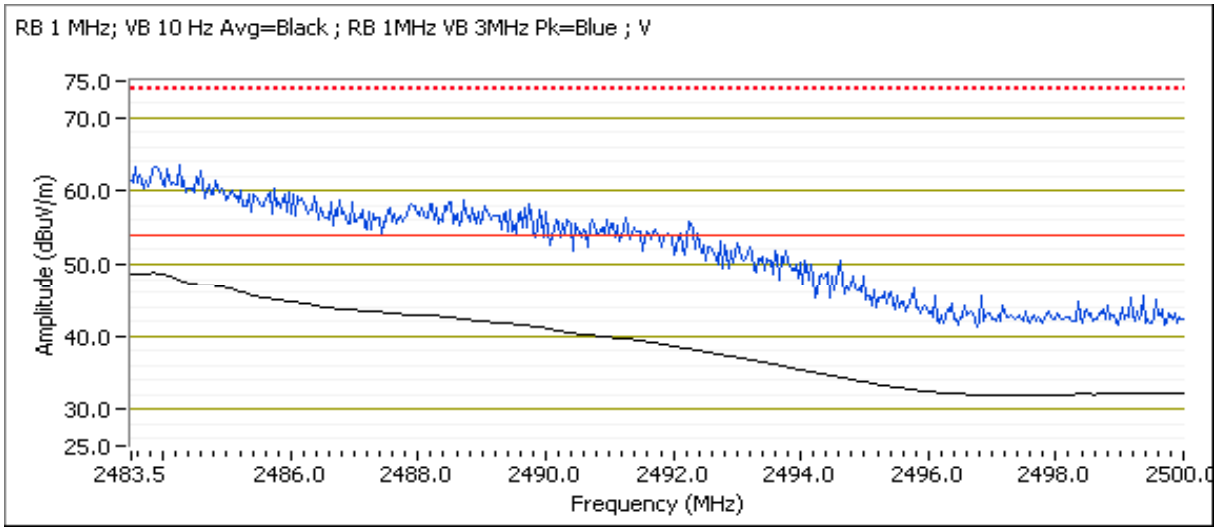


Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	N/A

Channel: 13 Mode: g
Tx Chain: 1x1 Data Rate: 6 Mb/s

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	
2483.830	48.8	V	54.0	-5.2	AVG	107	1.2	POS; RB 1 MHz; VB: 10 Hz
2483.570	63.8	V	74.0	-10.2	PK	107	1.2	POS; RB 1 MHz; VB: 3 MHz
2483.830	44.4	H	54.0	-9.6	AVG	160	1.1	POS; RB 1 MHz; VB: 10 Hz
2484.030	59.4	H	74.0	-14.6	PK	160	1.1	POS; RB 1 MHz; VB: 3 MHz



Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	N/A

Run #3: Radiated Bandedge Measurements

Date of Test: 3/28/14 , 4/3/14
Test Engineer: Rafael Varelas / Jack Liu
Test Location: FT Chamber7

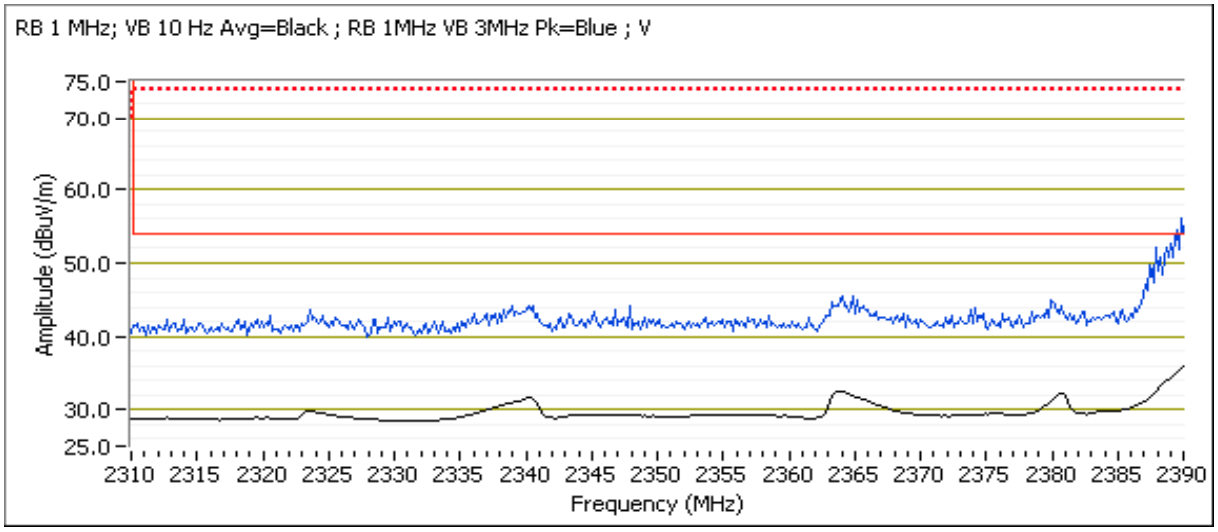
Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

Channel: 1
Tx Chain: 1x1

Mode: n20
Data Rate: MCS 0

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	38.0	V	54.0	-16.0	AVG	198	1.0	POS; RB 1 MHz; VB: 10 Hz
2389.120	51.0	V	74.0	-23.0	PK	198	1.0	POS; RB 1 MHz; VB: 3 MHz
2390.000	35.6	H	54.0	-18.4	AVG	147	1.2	POS; RB 1 MHz; VB: 10 Hz
2389.840	47.4	H	74.0	-26.6	PK	147	1.2	POS; RB 1 MHz; VB: 3 MHz

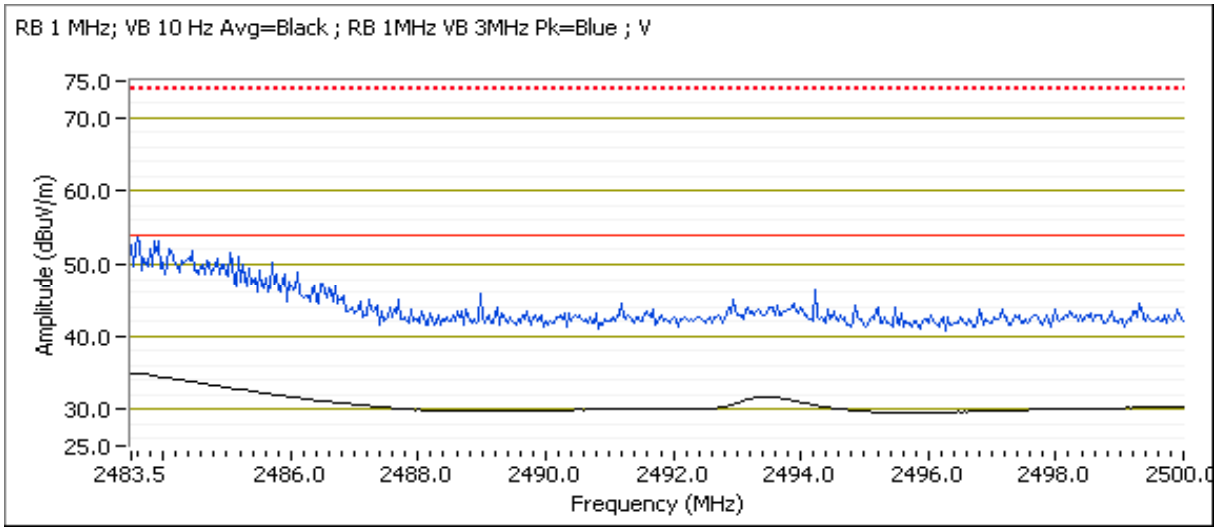


Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	N/A

Channel: 11 Mode: n20
Tx Chain: 1x1 Data Rate: MCS 0

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	36.7	V	54.0	-17.3	AVG	98	1.0	POS; RB 1 MHz; VB: 10 Hz
2483.630	54.3	V	74.0	-19.7	PK	98	1.0	POS; RB 1 MHz; VB: 3 MHz
2483.570	32.6	H	54.0	-21.4	AVG	206	1.1	POS; RB 1 MHz; VB: 10 Hz
2484.490	44.6	H	74.0	-29.4	PK	206	1.1	POS; RB 1 MHz; VB: 3 MHz

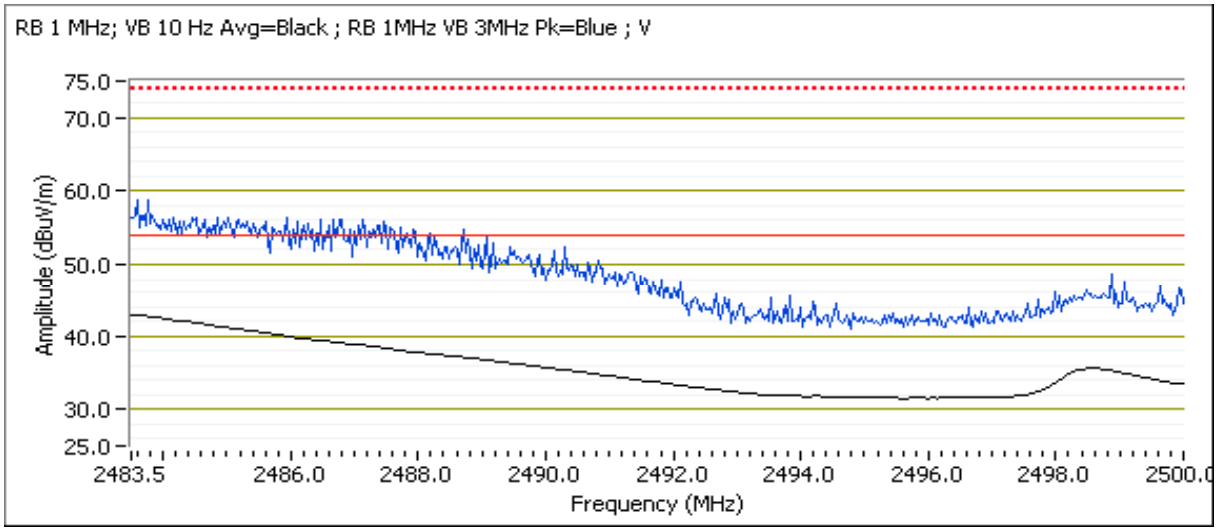


Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	N/A

Channel: 12 Mode: n20
Tx Chain: 1x1 Data Rate: MCS 0

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	
2483.530	43.1	V	54.0	-10.9	AVG	104	1.2	POS; RB 1 MHz; VB: 10 Hz
2484.790	58.8	V	74.0	-15.2	PK	104	1.2	POS; RB 1 MHz; VB: 3 MHz
2483.500	38.6	H	54.0	-15.4	AVG	161	1.1	POS; RB 1 MHz; VB: 10 Hz
2486.150	53.4	H	74.0	-20.6	PK	161	1.1	POS; RB 1 MHz; VB: 3 MHz

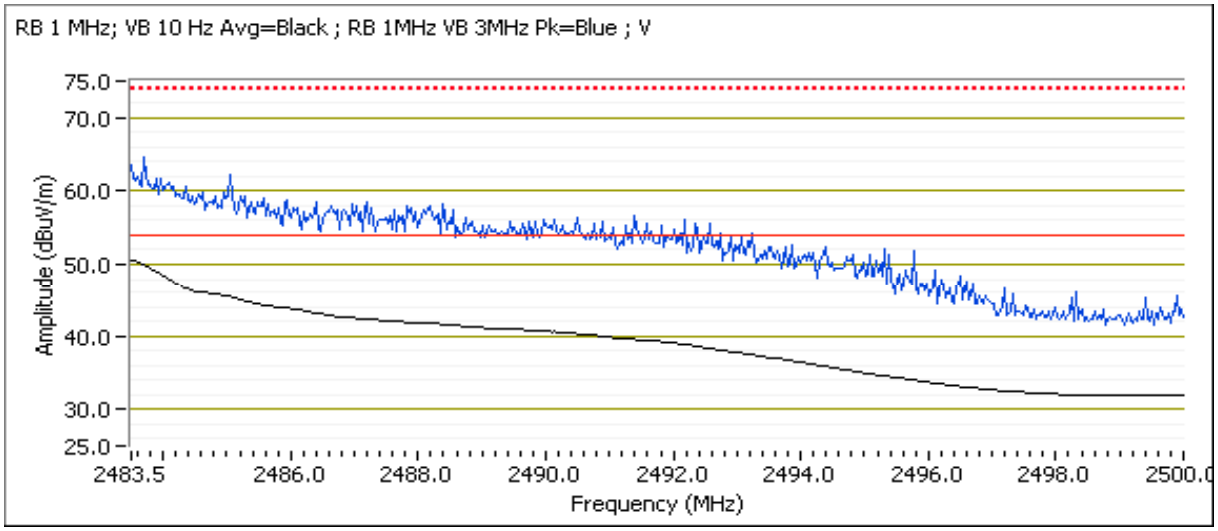


Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	N/A

Channel: 13 Mode: n20
Tx Chain: 1x1 Data Rate: MCS 0

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	50.6	V	54.0	-3.4	AVG	108	1.2	POS; RB 1 MHz; VB: 10 Hz
2483.860	64.0	V	74.0	-10.0	PK	108	1.2	POS; RB 1 MHz; VB: 3 MHz
2483.500	45.9	H	54.0	-8.1	AVG	160	1.1	POS; RB 1 MHz; VB: 10 Hz
2483.800	59.5	H	74.0	-14.5	PK	160	1.1	POS; RB 1 MHz; VB: 3 MHz



Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	N/A

RSS 210 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: 22 °C
Rel. Humidity: 40 %

Note: Target powers are peak

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 - 2412MHz	8.0	32	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	53.5 dBµV/m @ 4824.0 MHz (-0.5 dB)
	b	6 - 2437MHz	9.4	36	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	53.3 dBµV/m @ 4874.1 MHz (-0.7 dB)
	b	11 - 2462MHz	9.5	37	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	53.9 dBµV/m @ 4924.0 MHz (-0.1 dB)
	b	13 - 2472 MHz	9.6	37	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	50.2 dBµV/m @ 4944.1 MHz (-3.8 dB)
Scans on center channel in all OFDM modes to determine the worst case mode.							
2	g	6 - 2437MHz	14	38	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	44.4 dBµV/m @ 4874.1 MHz (-9.6 dB)
	n20	6 - 2437MHz	14.2	36	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	53.6 dBµV/m @ 4874.1 MHz (-0.4 dB)
Measurements on low and high channels in worst-case OFDM mode.							
3	n20	1 - 2412MHz	14.1	36	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	44.5 dBµV/m @ 4824.0 MHz (-9.5 dB)
	n20	13 - 2472MHz	14.2	37	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	45.7 dBµV/m @ 4944.0 MHz (-8.3 dB)

Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	N/A

Modifications Made During Testing

Initial peak scans of 802.11b mode performed at higher power setting than for final measurments.

Deviations From The Standard

No deviations were made from the requirements of the standard.

Sample Notes

Sample S/N: P07-2812 (NTS 2014-4946) MAC: 00:23:A7:25:38:0F

Driver: -

Antenna: QF-037 (NTS 2014-4945)

Procedure Comments:

Measurements performed in accordance with FCC KDB 558074

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.

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 Mb/s	100.00	-	-	0	0	-
11g	6 Mb/s	100.00	-	-	0	0	-
n20	MCS 0	100.00	-	-	0	0	-

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 30dB below the level of the fundamental and measured in 100kHz.
Note 2:	Emission has duty cycle ≥ 98%, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces
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 traces, measurement corrected by Linear Voltage correction factor
Note 4:	Emission has duty cycle < 98% and is NOT constant, average measurement performed: RBW=1MHz, VBW> 1/T, peak detector, linear average mode, sweep time auto, max hold. Max hold for 50*(1/DC) traces
Note 5:	Emission has duty cycle < 98%, but constant, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces, measurement corrected by Pwr correction factor
Note 6:	Plots of the average and peak bandedge do not account for any duty cycle correction. Refer to the tabular results for final measurements.

Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	N/A

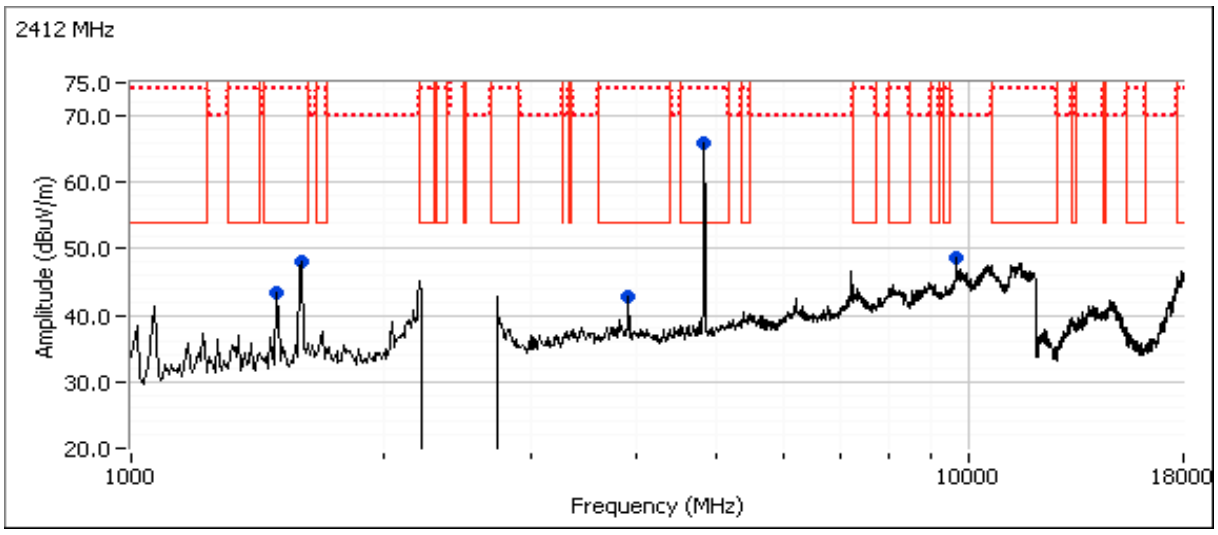
Run #1: Radiated Spurious Emissions, 1,000 - 25000 MHz. Operating Mode: 802.11b

Date of Test: 3/28/2014 0:00 Config. Used: 1
Test Engineer: Rafael Varelas Config Change: None
Test Location: FT Chamber7 EUT Voltage: 120V/60Hz

Run #1a: Low Channel

Channel: 1 Mode: b
Tx Chain: 1x1 Data Rate: 1 Mb/s

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
9648.000	47.2	H	54.0	-6.8	AVG	350	1.4	RB 1 MHz;VB 10 Hz;Peak, Note 1
9647.790	55.0	H	74.0	-19.0	PK	350	1.4	RB 1 MHz;VB 3 MHz;Peak, Note 1
1497.300	43.3	V	54.0	-10.7	AVG	196	1.0	RB 1 MHz;VB 10 Hz;Peak
1497.540	51.2	V	74.0	-22.8	PK	196	1.0	RB 1 MHz;VB 3 MHz;Peak
1602.300	38.4	V	54.0	-15.6	AVG	191	1.0	RB 1 MHz;VB 10 Hz;Peak
1603.750	56.6	V	74.0	-17.4	PK	191	1.0	RB 1 MHz;VB 3 MHz;Peak
3914.610	40.5	V	54.0	-13.5	AVG	149	1.0	RB 1 MHz;VB 10 Hz;Peak
3914.560	47.9	V	74.0	-26.1	PK	149	1.0	RB 1 MHz;VB 3 MHz;Peak
4824.040	53.5	V	54.0	-0.5	AVG	249	1.5	RB 1 MHz;VB 10 Hz;Peak
4824.140	56.0	V	74.0	-18.0	PK	249	1.5	RB 1 MHz;VB 3 MHz;Peak



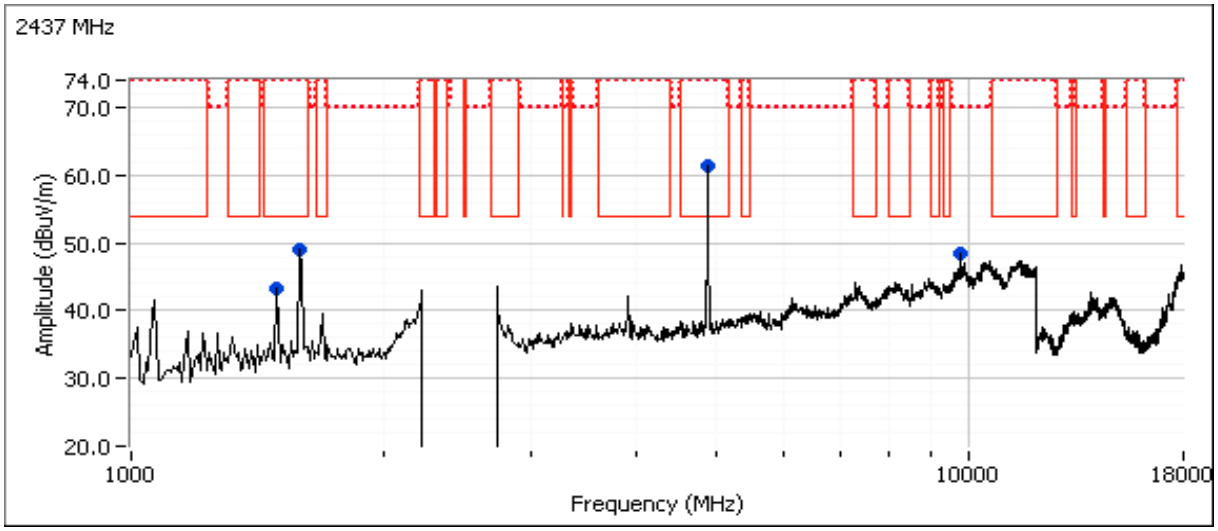
Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	N/A

Run #1b: Center Channel

Channel: 6 Mode: b
Tx Chain: 1x1 Data Rate: 1 Mb/s

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
9747.950	47.5	H	54.0	-6.5	AVG	340	1.6	RB 1 MHz;VB 10 Hz;Peak, Note 1
9748.210	55.5	H	74.0	-18.5	PK	340	1.6	RB 1 MHz;VB 3 MHz;Peak, Note 1
1600.050	40.5	V	54.0	-13.5	AVG	201	1.0	RB 1 MHz;VB 10 Hz;Peak
1600.740	57.7	V	74.0	-16.3	PK	201	1.0	RB 1 MHz;VB 3 MHz;Peak
1497.350	43.0	V	54.0	-11.0	AVG	194	1.1	RB 1 MHz;VB 10 Hz;Peak
1496.980	49.0	V	74.0	-25.0	PK	194	1.1	RB 1 MHz;VB 3 MHz;Peak
4874.050	53.3	V	54.0	-0.7	AVG	236	1.2	RB 1 MHz;VB 10 Hz;Peak
4873.950	55.5	V	74.0	-18.5	PK	236	1.2	RB 1 MHz;VB 3 MHz;Peak

Note:	Scans made between 18 - 25 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

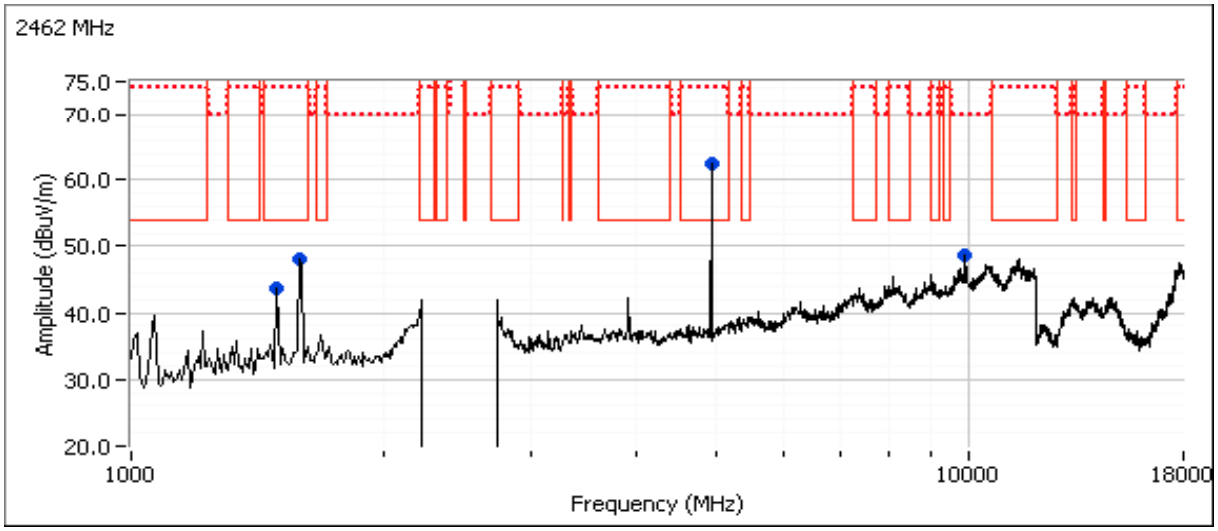


Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	N/A

Run #1c: High Channel

Channel: 11 Mode: b
Tx Chain: 1x1 Data Rate: 1 Mb/s

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
9848.010	47.9	H	54.0	-6.1	AVG	348	1.5	Note 1
9848.040	55.8	H	74.0	-18.2	PK	348	1.5	Note 1
1497.310	43.7	V	54.0	-10.3	AVG	198	1.0	RB 1 MHz;VB 10 Hz;Peak
1497.320	49.1	V	74.0	-24.9	PK	198	1.0	RB 1 MHz;VB 3 MHz;Peak
1598.400	40.8	V	54.0	-13.2	AVG	192	1.0	RB 1 MHz;VB 10 Hz;Peak
1598.570	58.2	V	74.0	-15.8	PK	192	1.0	RB 1 MHz;VB 3 MHz;Peak
4924.030	53.9	V	54.0	-0.1	AVG	231	1.2	RB 1 MHz;VB 10 Hz;Peak
4924.070	56.0	V	74.0	-18.0	PK	231	1.2	RB 1 MHz;VB 3 MHz;Peak

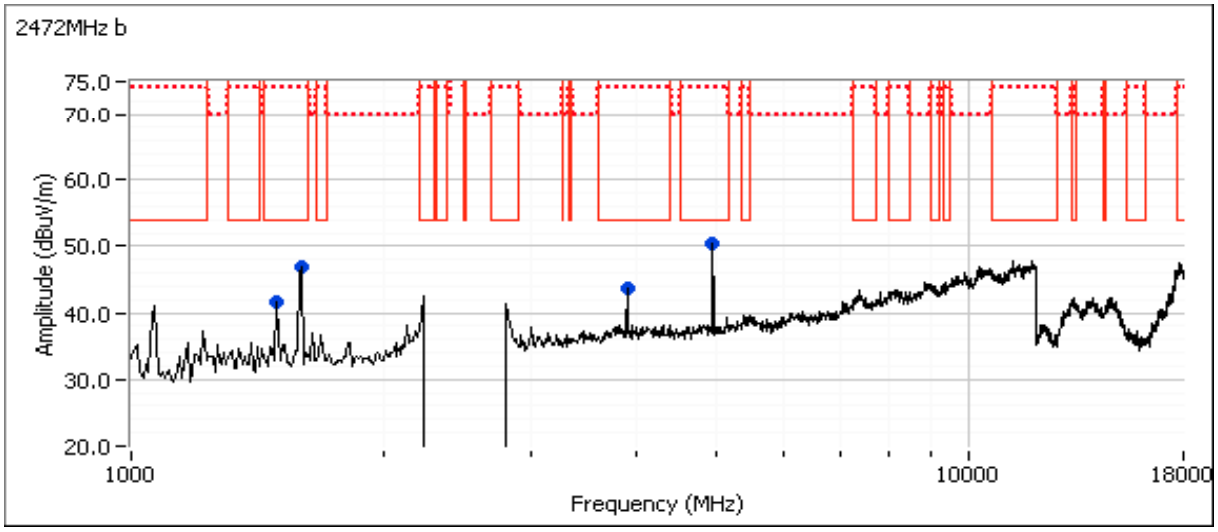


Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	N/A

Run #1d: High Channel

Channel: 13 Mode: b
Tx Chain: 1x1 Data Rate: 1 Mb/s

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4944.050	50.2	V	54.0	-3.8	AVG	97	1.0	RB 1 MHz;VB 10 Hz;Peak
4944.050	53.8	V	74.0	-20.2	PK	97	1.0	RB 1 MHz;VB 3 MHz;Peak
1598.130	38.1	V	54.0	-15.9	AVG	189	1.3	RB 1 MHz;VB 10 Hz;Peak
1596.270	56.7	V	74.0	-17.3	PK	189	1.3	RB 1 MHz;VB 3 MHz;Peak
1497.390	41.9	V	54.0	-12.1	AVG	205	1.0	RB 1 MHz;VB 10 Hz;Peak
1497.570	47.9	V	74.0	-26.1	PK	205	1.0	RB 1 MHz;VB 3 MHz;Peak
3908.600	42.4	V	54.0	-11.6	AVG	192	1.0	RB 1 MHz;VB 10 Hz;Peak
3908.550	49.1	V	74.0	-24.9	PK	192	1.0	RB 1 MHz;VB 3 MHz;Peak



Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	N/A

Run #2: Radiated Spurious Emissions, 1,000 - 25000 MHz. Operating Mode: OFDM

Run #2a: Center Channel

Date of Test: 4/3/2014 0:00
Test Engineer: Jack Liu
Test Location: FT Chamber7

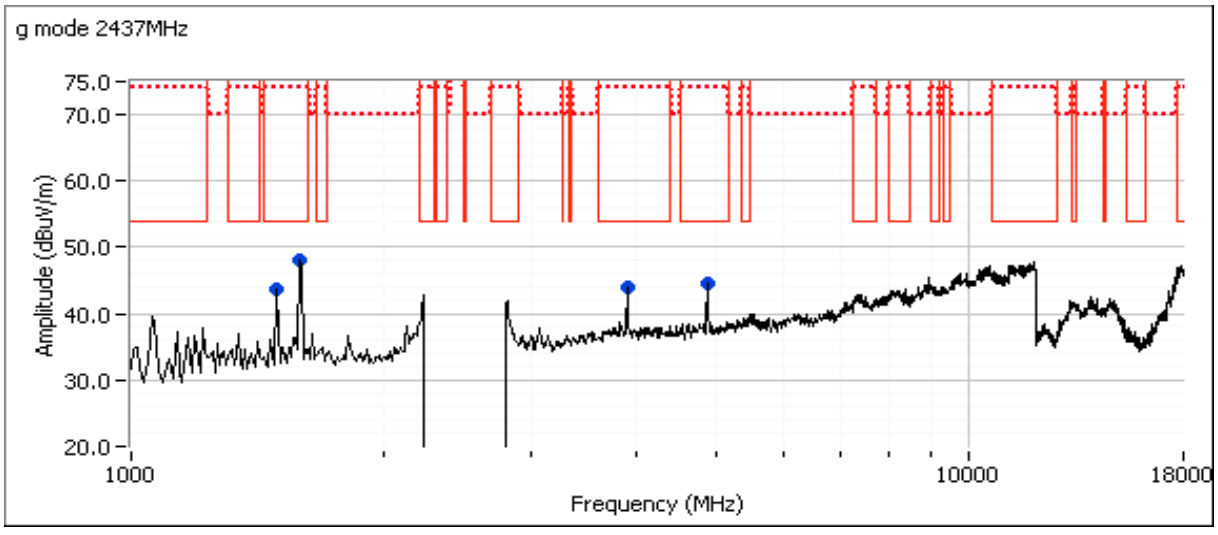
Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

Channel: 6
Tx Chain: 1x1

Mode: g
Data Rate: 6 Mb/s

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4874.050	44.4	V	54.0	-9.6	AVG	158	1.2	RB 1 MHz;VB 10 Hz;Peak
4874.530	51.4	V	74.0	-22.6	PK	158	1.2	RB 1 MHz;VB 3 MHz;Peak
1497.370	41.9	V	54.0	-12.1	AVG	192	1.1	RB 1 MHz;VB 10 Hz;Peak
1497.520	48.6	V	74.0	-25.4	PK	192	1.1	RB 1 MHz;VB 3 MHz;Peak
1599.600	37.0	V	54.0	-17.0	AVG	173	1.0	RB 1 MHz;VB 10 Hz;Peak
1602.140	56.9	V	74.0	-17.1	PK	173	1.0	RB 1 MHz;VB 3 MHz;Peak
3908.810	42.9	V	54.0	-11.1	AVG	140	1.6	RB 1 MHz;VB 10 Hz;Peak
3908.870	49.4	V	74.0	-24.6	PK	140	1.6	RB 1 MHz;VB 3 MHz;Peak

Note: Scans made between 18 - 25 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



Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	N/A

Run #2b: Center Channel

Date of Test: 3/31/2014 0:00
Test Engineer: Jack Liu
Test Location: FT Chamber7

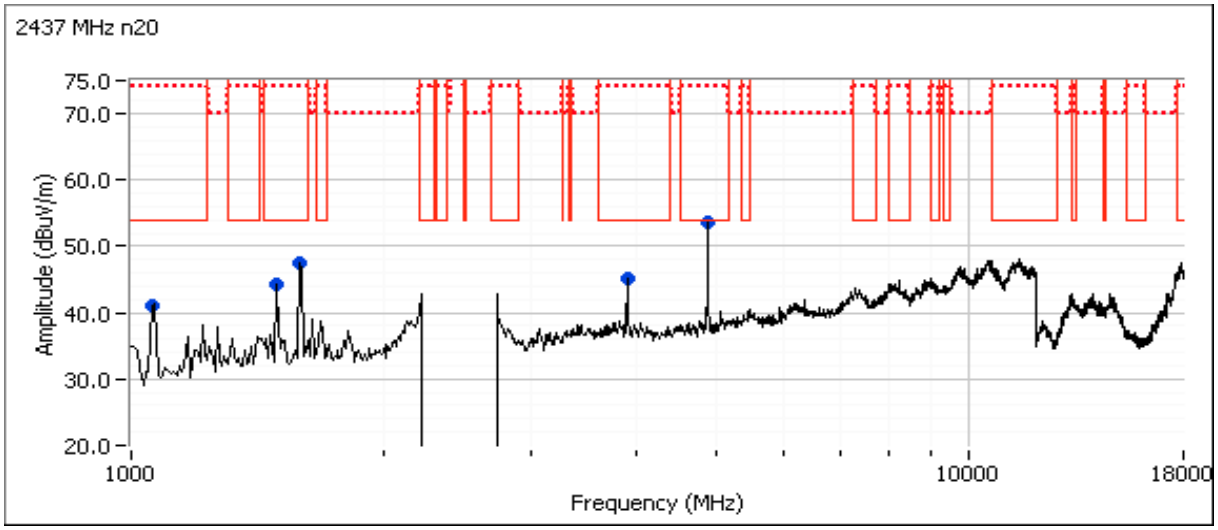
Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

Channel: 6
Tx Chain: 1x1

Mode: n20
Data Rate: MCS 0

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4874.070	53.6	V	54.0	-0.4	AVG	185	1.3	RB 1 MHz;VB 10 Hz;Peak
4874.120	56.7	V	74.0	-17.3	PK	185	1.3	RB 1 MHz;VB 3 MHz;Peak
3908.780	44.2	V	54.0	-9.8	AVG	148	1.3	RB 1 MHz;VB 10 Hz;Peak
3908.880	50.5	V	74.0	-23.5	PK	148	1.3	RB 1 MHz;VB 3 MHz;Peak
1600.090	38.9	V	54.0	-15.1	AVG	207	1.0	RB 1 MHz;VB 10 Hz;Peak
1597.640	58.2	V	74.0	-15.8	PK	207	1.0	RB 1 MHz;VB 3 MHz;Peak
1497.420	44.0	V	54.0	-10.0	AVG	203	1.0	RB 1 MHz;VB 10 Hz;Peak
1497.200	51.5	V	74.0	-22.5	PK	203	1.0	RB 1 MHz;VB 3 MHz;Peak
1066.210	33.1	V	54.0	-20.9	AVG	161	1.3	RB 1 MHz;VB 10 Hz;Peak
1069.360	48.3	V	74.0	-25.7	PK	161	1.3	RB 1 MHz;VB 3 MHz;Peak

Note: Scans made between 18 - 25 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



Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	N/A

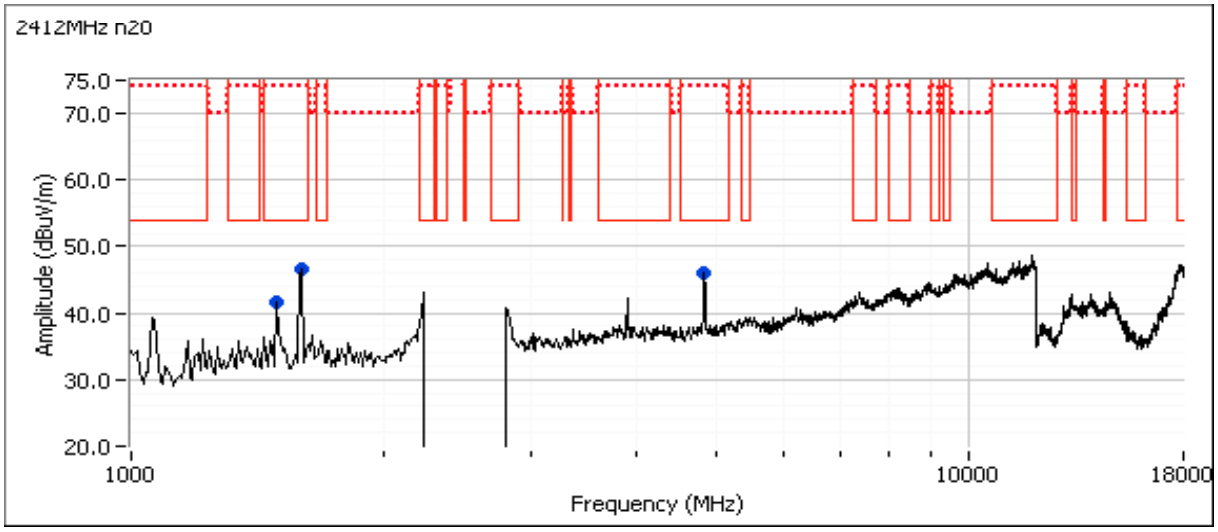
Run #3: Radiated Spurious Emissions, 1,000 - 25000 MHz. Operating Mode: Worse case from Run #2

Date of Test: 4/3/2014 0:00 Config. Used: 1
Test Engineer: Rafael Varelas Config Change: None
Test Location: FT Chamber7 EUT Voltage: 120V/60Hz

Run #3a: Low Channel

Channel: 1 Mode: n20
Tx Chain: 1x1 Data Rate: MCS 0

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4824.020	44.5	V	54.0	-9.5	AVG	152	1.3	RB 1 MHz;VB 10 Hz;Peak
4823.940	50.8	V	74.0	-23.2	PK	152	1.3	RB 1 MHz;VB 3 MHz;Peak
1601.290	38.5	V	54.0	-15.5	AVG	194	1.0	RB 1 MHz;VB 10 Hz;Peak
1600.960	56.4	V	74.0	-17.6	PK	194	1.0	RB 1 MHz;VB 3 MHz;Peak
1497.250	41.3	V	54.0	-12.7	AVG	199	1.0	RB 1 MHz;VB 10 Hz;Peak
1497.590	47.2	V	74.0	-26.8	PK	199	1.0	RB 1 MHz;VB 3 MHz;Peak

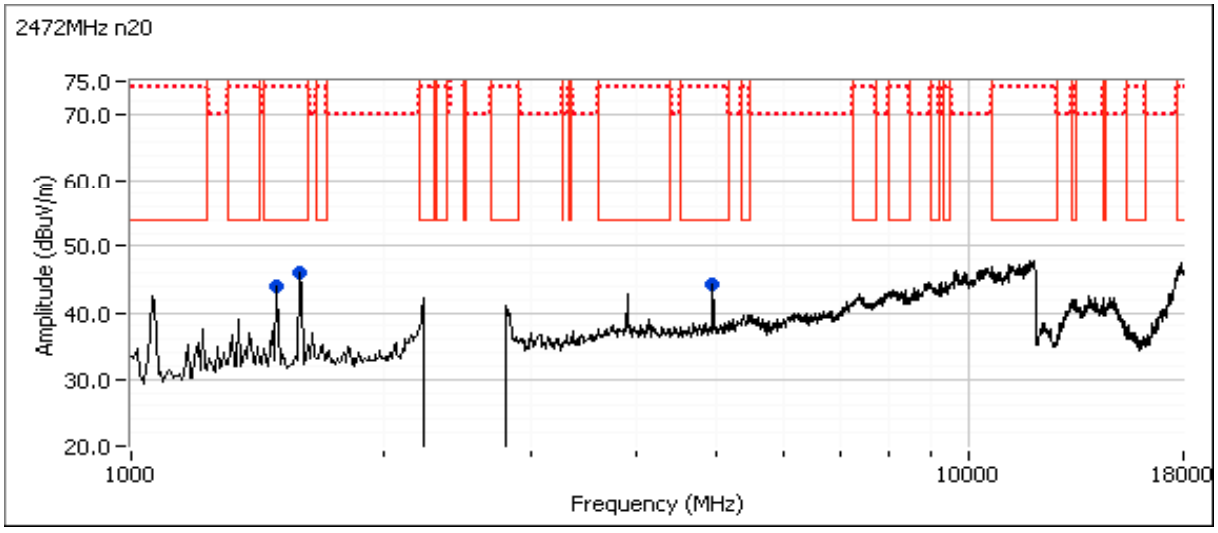


Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	N/A

Run #3b: High Channel

Channel: 13 Mode: n20
Tx Chain: 1x1 Data Rate: MCS 0

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4943.960	45.7	V	54.0	-8.3	AVG	154	1.1	RB 1 MHz;VB 10 Hz;Peak
4944.120	50.5	V	74.0	-23.5	PK	154	1.1	RB 1 MHz;VB 3 MHz;Peak
1602.720	38.0	V	54.0	-16.0	AVG	198	1.0	RB 1 MHz;VB 10 Hz;Peak
1602.280	55.2	V	74.0	-18.8	PK	198	1.0	RB 1 MHz;VB 3 MHz;Peak
1497.280	41.6	V	54.0	-12.4	AVG	195	1.2	RB 1 MHz;VB 10 Hz;Peak
1497.560	48.7	V	74.0	-25.3	PK	195	1.2	RB 1 MHz;VB 3 MHz;Peak



Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	-

Radiated 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: 4/3 & 4/15//2014
Test Engineer: Rafael Varelas
Test Location: FT Chamber #7

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

General Test Configuration

The EUT and any local support equipment were located on the turntable for radiated emissions testing.
The test distance and extrapolation factor (if applicable) are detailed under each run description.

Note, preliminary testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. Maximized testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

Ambient Conditions:

	4/3/2014	4/15/2014
Temperature:	20.8 °C	21.6 °C
Rel. Humidity:	42 %	40 %

Summary of Results (ANSI C63.4:2009)

Run #	Test Performed	Limit	Result	Margin
1	Radiated Emissions 30 - 1000 MHz, Preliminary	Class B	Pass	Refer to individual runs
2	Radiated Emissions 30 - 1000 MHz, Maximized	Class B	Pass	34.9 dBµV/m @ 36.88 MHz (-5.1 dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

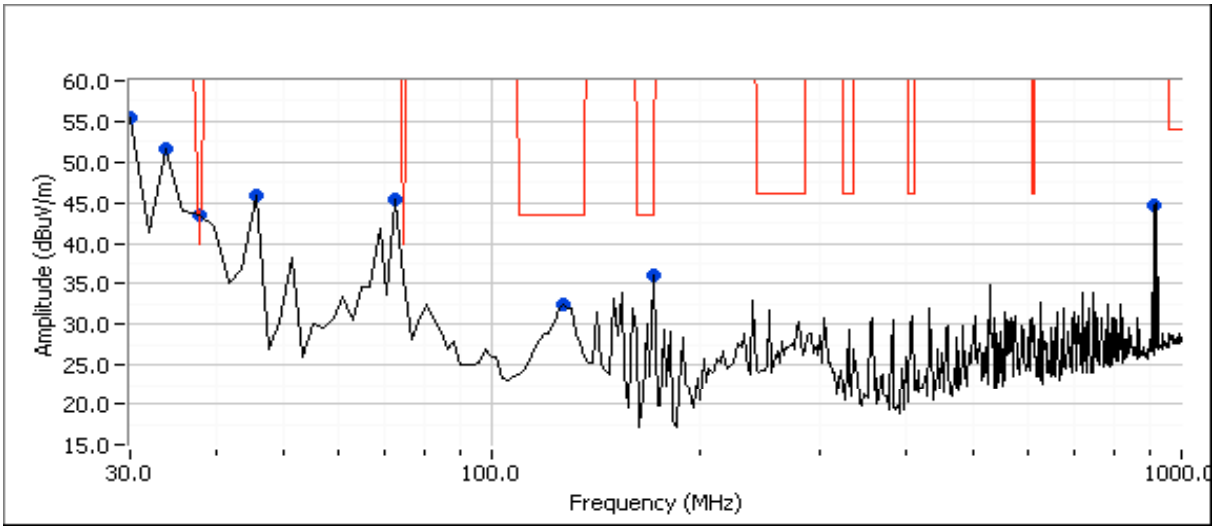
Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	-

Run #1a: Preliminary Radiated Emissions, 30 - 1000 MHz, 802.11b 2412 MHz
Power setting = 32

Test Parameters for Preliminary Scan(s)			
Frequency Range (MHz)	Prescan Distance (meters)	Limit Distance (meters)	Extrapolation Factor (dB, applied to data)
30 - 1000	3	3	0.0



Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	-

Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
30.730	55.4	H	100.0	-44.6	Peak	126	1.5	
33.312	51.7	V	100.0	-48.3	Peak	275	2.0	
37.782	43.5	H	40.0	3.5	Peak	294	1.0	
45.435	45.9	H	100.0	-54.1	Peak	345	1.5	
73.737	45.5	H	40.0	5.5	Peak	136	1.5	
128.365	32.4	H	43.5	-11.1	Peak	209	1.0	
172.026	36.1	V	43.5	-7.4	Peak	131	2.0	
912.029	44.8	V	100.0	-55.2	Peak	353	1.5	

Preliminary quasi-peak readings (no manipulation of EUT interface cables)

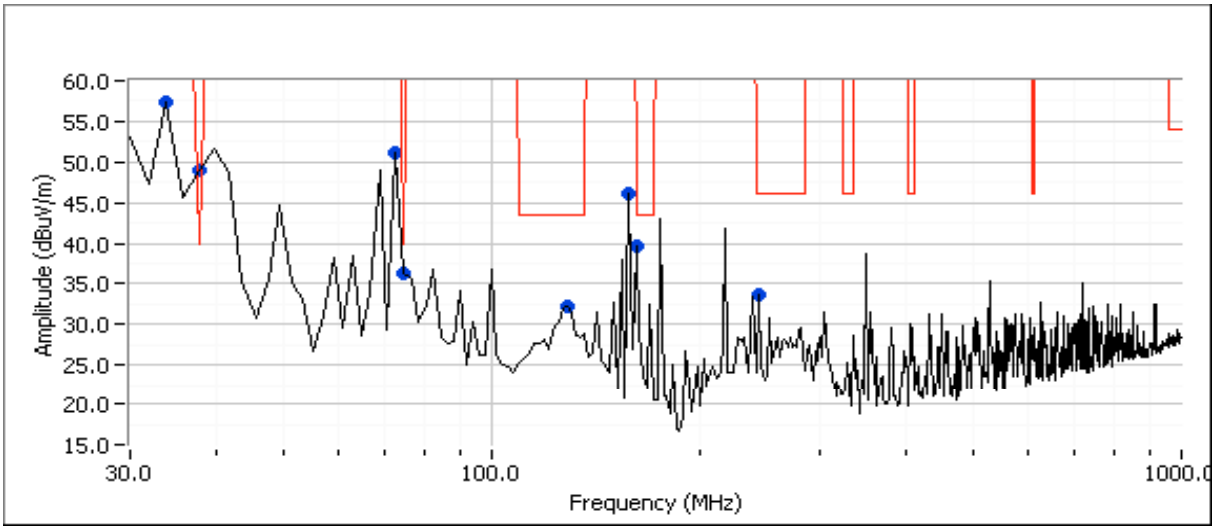
Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
30.730	27.1	H	40.0	-12.9	QP	126	1.0	QP (1.00s), Note 1
172.026	19.4	V	43.5	-24.1	QP	131	2.0	QP (1.00s)
73.737	28.5	H	40.0	-11.5	QP	136	1.4	QP (1.00s)
128.365	29.3	H	43.5	-14.2	QP	209	1.0	QP (1.00s)
33.312	25.1	V	40.0	-14.9	QP	275	1.0	QP (1.00s), Note 1
37.782	23.7	H	40.0	-16.3	QP	294	1.0	QP (1.00s)
45.435	16.7	H	40.0	-23.3	QP	345	1.3	QP (1.00s)
912.029	32.2	V	46.0	-13.8	QP	334	1.0	QP (1.00s), Note 1

Note 1:	Emission in non-restricted band, but restricted limit was used.

Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	-

Run #1b: Preliminary Radiated Emissions, 30 - 1000 MHz, 802.11n20 2472 MHz
Power setting = 37

Test Parameters for Preliminary Scan(s)			
Frequency Range (MHz)	Prescan Distance (meters)	Limit Distance (meters)	Extrapolation Factor (dB, applied to data)
30 - 1000	3	3	0.0



Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	-

Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
33.301	57.3	H	100.0	-42.7	Peak	300	1.0	
36.875	49.1	H	40.0	9.1	Peak	300	1.0	
72.009	51.2	H	100.0	-48.8	Peak	136	1.0	
73.738	36.3	H	40.0	-3.7	Peak	96	3.0	
128.740	32.2	H	43.5	-11.3	Peak	246	1.0	
163.355	39.7	H	43.5	-3.8	Peak	141	1.0	
242.727	33.7	H	46.0	-12.3	Peak	131	1.0	
158.435	46.0	H	100.0	-54.0	Peak	131	1.0	

Preliminary quasi-peak readings (no manipulation of EUT interface cables)

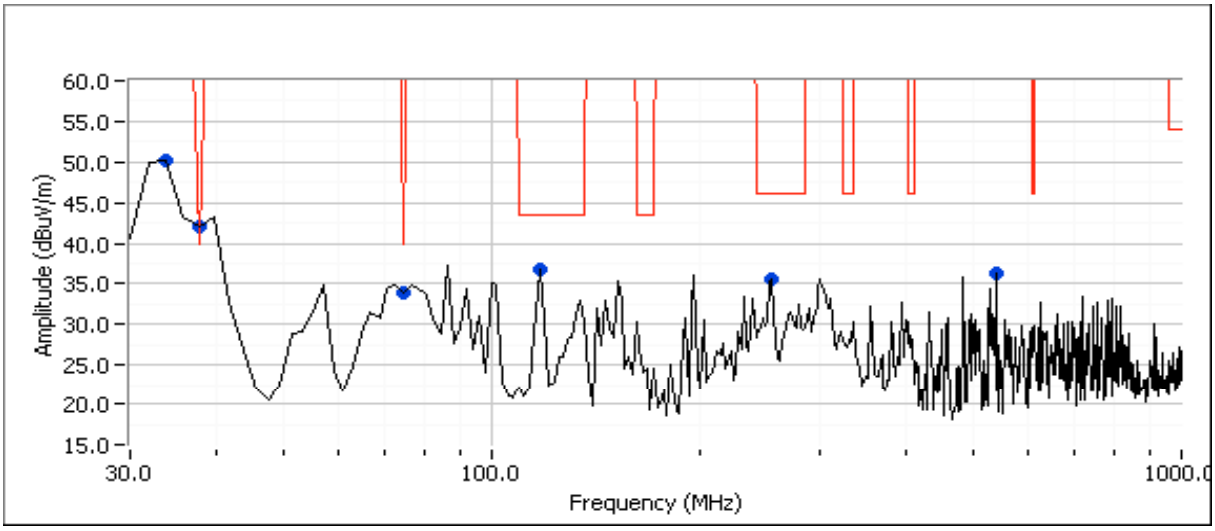
Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
36.875	34.9	H	40.0	-5.1	QP	300	2.0	QP (1.00s), Note 1
33.301	27.0	H	40.0	-13.0	QP	300	1.0	QP (1.00s), Note 1
128.740	29.0	H	43.5	-14.5	QP	246	1.0	QP (1.00s)
163.355	19.4	H	43.5	-24.1	QP	141	1.0	QP (1.00s)
72.009	27.3	H	40.0	-12.7	QP	136	1.3	QP (1.00s), Note 1
158.435	19.6	H	43.5	-23.9	QP	131	1.3	QP (1.00s), Note 1
242.727	21.5	H	46.0	-24.5	QP	131	1.0	QP (1.00s)
73.738	27.3	H	40.0	-12.7	QP	96	1.4	QP (1.00s)

Note 1:	Emission in non-restricted band, but restricted limit was used.

Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	-

Run #1c: Preliminary Radiated Emissions, 30 - 1000 MHz, 802.11b 2437 MHz
Power setting = 36

Test Parameters for Preliminary Scan(s)			
Frequency Range (MHz)	Prescan Distance (meters)	Limit Distance (meters)	Extrapolation Factor (dB, applied to data)
30 - 1000	3	3	0.0



Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	-

Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
34.058	50.2	V	100.0	-49.8	Peak	353	1.0	
37.674	42.1	V	40.0	2.1	Peak	318	1.0	
73.743	33.9	V	40.0	-6.1	Peak	151	1.5	
117.047	36.8	H	43.5	-6.7	Peak	264	4.0	
255.078	35.7	H	46.0	-10.3	Peak	212	1.5	
540.031	36.2	V	100.0	-63.8	Peak	326	2.5	

Preliminary quasi-peak readings (no manipulation of EUT interface cables)

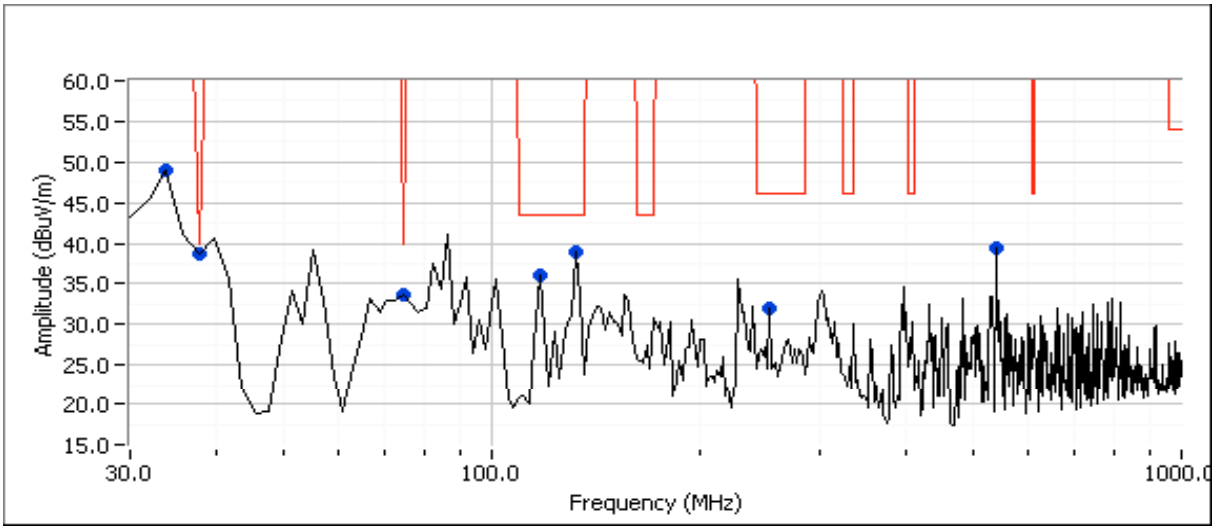
Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
73.743	30.6	V	40.0	-9.4	QP	151	1.0	QP (1.00s)
255.078	22.5	H	46.0	-23.5	QP	227	1.0	QP (1.00s)
117.047	15.5	H	43.5	-28.0	QP	266	2.5	QP (1.00s)
37.674	22.4	V	40.0	-17.6	QP	318	1.0	QP (1.00s)
540.031	22.1	V	46.0	-23.9	QP	313	1.0	QP (1.00s), Note 1
34.058	30.9	V	40.0	-9.1	QP	354	1.0	QP (1.00s), Note 1

Note 1:	Emission in non-restricted band, but restricted limit was used.

Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	-

Run #1d: Preliminary Radiated Emissions, 30 - 1000 MHz, 802.11b 2472 MHz
Power setting = 37

Test Parameters for Preliminary Scan(s)			
Frequency Range (MHz)	Prescan Distance (meters)	Limit Distance (meters)	Extrapolation Factor (dB, applied to data)
30 - 1000	3	3	0.0



Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	-

Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
34.164	48.9	V	100.0	-51.1	Peak	88	1.0	
37.810	38.6	V	40.0	-1.4	Peak	203	1.0	
73.736	33.6	V	40.0	-6.4	Peak	148	1.0	
117.017	36.1	H	43.5	-7.4	Peak	187	4.0	
132.015	38.9	V	43.5	-4.6	Peak	208	1.0	
254.399	31.9	V	46.0	-14.1	Peak	354	1.0	
540.020	39.4	V	100.0	-60.6	Peak	2	2.5	

Preliminary quasi-peak readings (no manipulation of EUT interface cables)

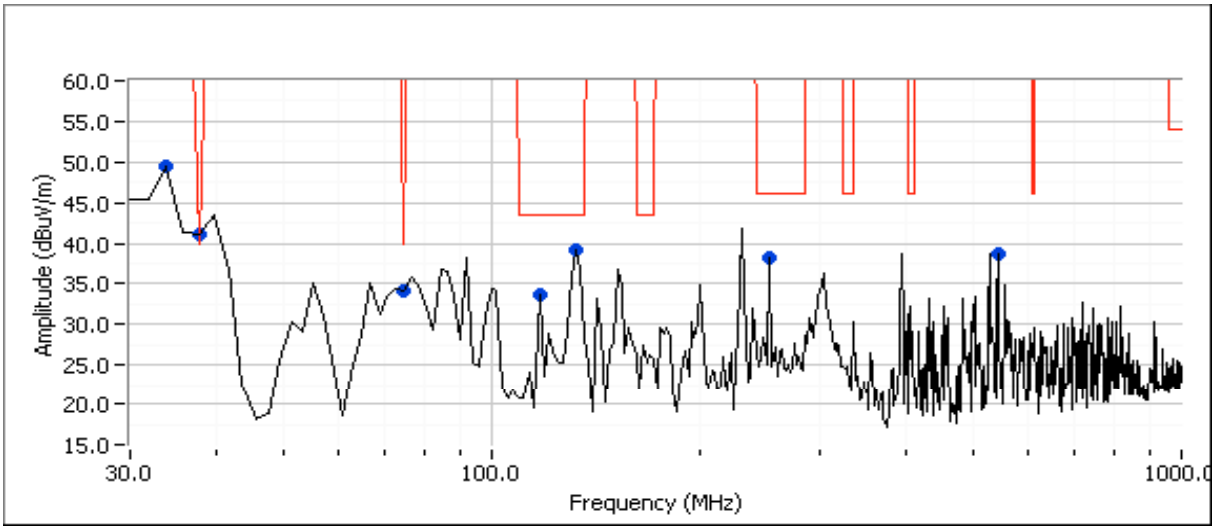
Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
254.399	23.4	V	46.0	-22.6	QP	346	1.2	QP (1.00s)
132.015	25.8	V	43.5	-17.7	QP	222	1.0	QP (1.00s)
37.810	18.1	V	40.0	-21.9	QP	203	1.0	QP (1.00s)
117.017	13.7	H	43.5	-29.8	QP	187	2.5	QP (1.00s)
73.736	32.2	V	40.0	-7.8	QP	158	1.0	QP (1.00s)
34.164	26.5	V	40.0	-13.5	QP	88	1.0	QP (1.00s), Note 1
540.020	22.4	V	46.0	-23.6	QP	0	1.1	QP (1.00s), Note 1

Note 1:	Emission in non-restricted band, but restricted limit was used.

Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	-

Run #1e: Preliminary Radiated Emissions, 30 - 1000 MHz, 802.11g 2472 MHz
Power setting = 37

Test Parameters for Preliminary Scan(s)			
Frequency Range (MHz)	Prescan Distance (meters)	Limit Distance (meters)	Extrapolation Factor (dB, applied to data)
30 - 1000	3	3	0.0



Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	-

Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
33.377	49.4	V	100.0	-50.6	Peak	322	1.0	
37.727	41.1	V	40.0	1.1	Peak	353	1.0	
73.736	34.1	V	40.0	-5.9	Peak	162	1.5	
117.199	33.7	H	43.5	-9.8	Peak	248	1.0	
132.007	39.1	V	43.5	-4.4	Peak	238	1.0	
254.005	38.1	V	46.0	-7.9	Peak	302	1.0	
540.696	38.6	H	100.0	-61.4	Peak	333	1.0	

Preliminary quasi-peak readings (no manipulation of EUT interface cables)

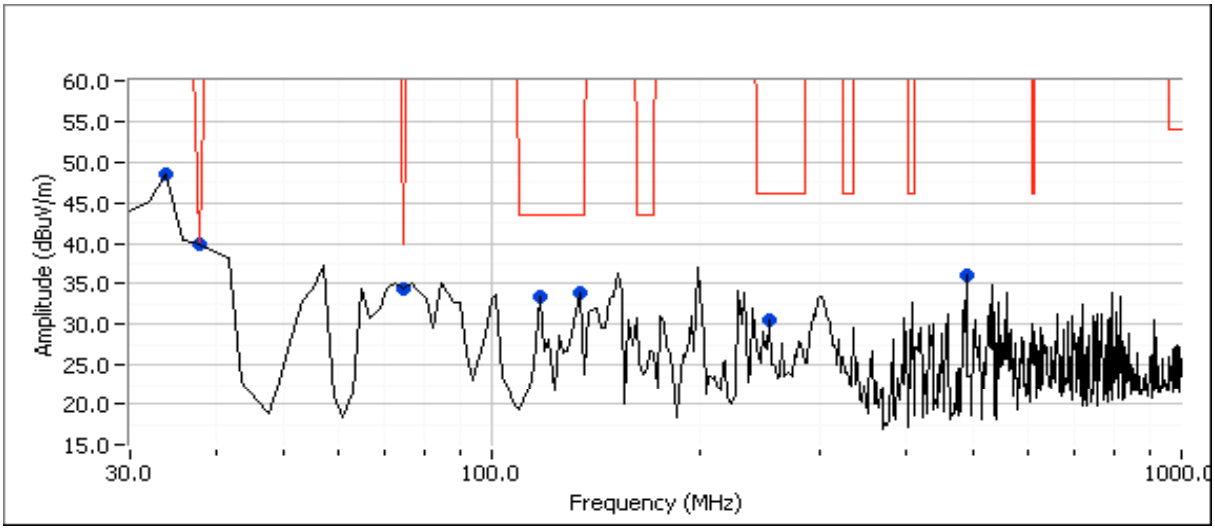
Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
73.736	32.3	V	40.0	-7.7	QP	162	1.0	QP (1.00s)
132.007	27.0	V	43.5	-16.5	QP	247	1.0	QP (1.00s)
117.199	14.9	H	43.5	-28.6	QP	248	2.5	QP (1.00s)
254.005	19.1	V	46.0	-26.9	QP	320	1.5	QP (1.00s)
33.377	25.3	V	40.0	-14.7	QP	322	1.0	QP (1.00s), Note 1
540.696	16.5	H	46.0	-29.5	QP	358	1.0	QP (1.00s), Note 1
37.727	14.1	V	40.0	-25.9	QP	354	1.0	QP (1.00s)

Note 1:	Emission in non-restricted band, but restricted limit was used.

Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	-

Run #1f: Preliminary Radiated Emissions, 30 - 1000 MHz, 802.11n20 2412 MHz
Power setting = 36

Test Parameters for Preliminary Scan(s)			
Frequency Range (MHz)	Prescan Distance (meters)	Limit Distance (meters)	Extrapolation Factor (dB, applied to data)
30 - 1000	3	3	0.0



Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	-

Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
33.309	48.4	V	100.0	-51.6	Peak	97	2.0	
37.803	40.0	V	40.0	0.0	Peak	97	1.0	
73.736	34.3	V	40.0	-5.7	Peak	172	1.0	
117.411	33.4	H	43.5	-10.1	Peak	62	2.5	
135.163	33.9	H	43.5	-9.6	Peak	177	1.5	
253.437	30.6	V	46.0	-15.4	Peak	117	1.0	
492.037	36.1	V	100.0	-63.9	Peak	337	1.0	

Preliminary quasi-peak readings (no manipulation of EUT interface cables)

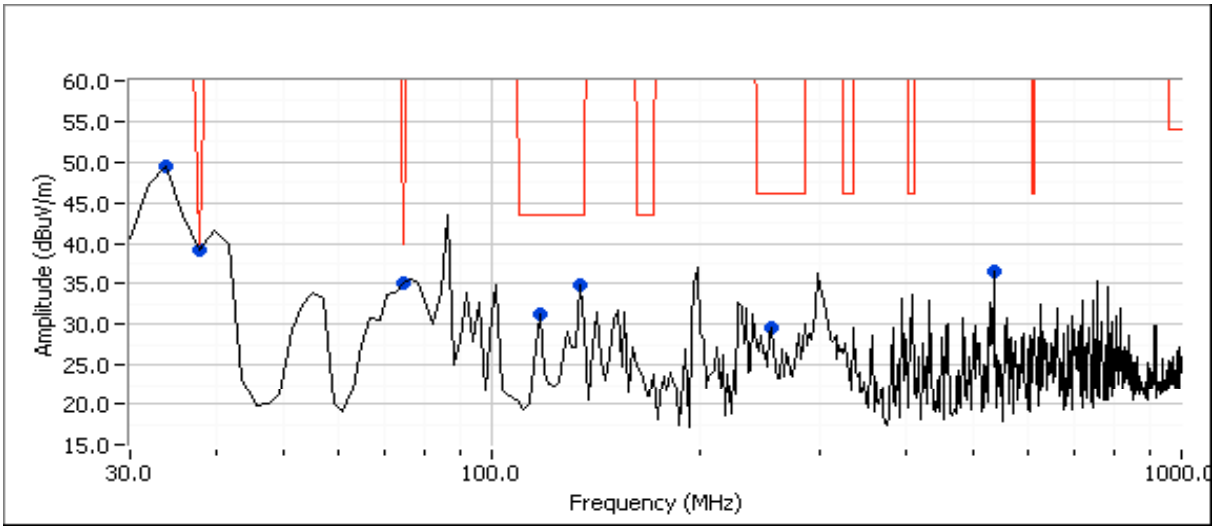
Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
117.411	12.8	H	43.5	-30.7	QP	62	2.4	QP (1.00s)
33.309	24.6	V	40.0	-15.4	QP	97	1.0	QP (1.00s), Note 1
37.803	13.5	V	40.0	-26.5	QP	97	1.0	QP (1.00s)
253.437	27.2	V	46.0	-18.8	QP	135	1.0	QP (1.00s)
73.736	32.3	V	40.0	-7.7	QP	172	1.0	QP (1.00s)
135.163	19.0	H	43.5	-24.5	QP	193	2.2	QP (1.00s)
492.037	22.2	V	46.0	-23.8	QP	316	1.0	QP (1.00s), Note 1

Note 1:	Emission in non-restricted band, but restricted limit was used.

Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	-

Run #1g: Preliminary Radiated Emissions, 30 - 1000 MHz, 802.11n20 2437 MHz
Power setting = 36

Test Parameters for Preliminary Scan(s)			
Frequency Range (MHz)	Prescan Distance (meters)	Limit Distance (meters)	Extrapolation Factor (dB, applied to data)
30 - 1000	3	3	0.0



Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	-

Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
33.377	49.4	V	100.0	-50.6	Peak	318	1.0	
37.696	39.2	V	40.0	-0.8	Peak	32	1.0	
73.743	35.1	V	40.0	-4.9	Peak	192	1.5	
118.115	31.2	H	43.5	-12.3	Peak	267	3.0	
134.103	34.8	H	43.5	-8.7	Peak	193	2.5	
255.230	29.5	H	46.0	-16.5	Peak	323	1.5	
540.051	36.5	V	100.0	-63.5	Peak	22	1.0	

Preliminary quasi-peak readings (no manipulation of EUT interface cables)

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
255.230	21.9	H	46.0	-24.1	QP	315	1.3	QP (1.00s)
33.377	25.2	V	40.0	-14.8	QP	318	1.0	QP (1.00s), Note 1
118.115	13.8	H	43.5	-29.7	QP	267	2.4	QP (1.00s)
134.103	18.5	H	43.5	-25.0	QP	200	2.1	QP (1.00s)
73.743	32.0	V	40.0	-8.0	QP	192	1.0	QP (1.00s)
37.696	13.9	V	40.0	-26.1	QP	32	1.0	QP (1.00s)
540.051	23.5	V	46.0	-22.5	QP	58	1.0	QP (1.00s), Note 1

Note 1:	Emission in non-restricted band, but restricted limit was used.

Client:	SAFEmine Technology, Inc.	Job Number:	J94480
Model:	RS9110-N-11-22	T-Log Number:	T94588
		Project Manager:	Christine Krebill
Contact:	Lukas Herzog	Project Coordinator:	Irene Rademacher
Standard:	FCC Part 15.247	Class:	-

Run #2: Maximized Worst Case Mode Emissons From Run #1
802.11n20, 2472MHz
Power setting = 37

Test Parameters for Maximized Reading(s)			
Frequency Range (MHz)	Test Distance (meters)	Limit Distance (meters)	Extrapolation Factor (dB, applied to data)
30 - 1000	3	3	0.0

Maximized quasi-peak readings (includes manipulation of EUT interface cables)

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
36.875	34.9	H	40.0	-5.1	QP	300	2.0	QP (1.00s), Note 1
33.301	27.0	H	40.0	-13.0	QP	300	1.0	QP (1.00s), Note 1
128.740	29.0	H	43.5	-14.5	QP	246	1.0	QP (1.00s)
163.355	19.4	H	43.5	-24.1	QP	141	1.0	QP (1.00s)
72.009	27.3	H	40.0	-12.7	QP	136	1.3	QP (1.00s), Note 1
158.435	19.6	H	43.5	-23.9	QP	131	1.3	QP (1.00s), Note 1
242.727	21.5	H	46.0	-24.5	QP	131	1.0	QP (1.00s)
73.738	27.3	H	40.0	-12.7	QP	96	1.4	QP (1.00s)

Note 1:	Emission in non-restricted band, but restricted limit was used.

End of Report

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marks the last page of this test report.