Elliott Laboratories
www.elliotlabs.com
684 West Maude Avenue
Sunnyvale, CA 94085-3518
408-245-7800 Phone
408-245-3499 Fax

Electromagnetic Emissions Test Report In Accordance With Industry Canada Radio Standards Specification 119 Issue 6, FCC Part 90 and Part 101 on the GE MDS LLC Transmitter Model: SD9

FCC ID NUMBER:	E5MDS-SD9-1
UPN:	101D-SD9
GRANTEE:	GE MDS LLC 175 Science Parkway Rochester, NY 14620
TEST SITE:	Elliott Laboratories 684 W. Maude Avenue Sunnyvale, CA 94086
REPORT DATE:	July 6, 2009
REISSUE DATE:	November 29, 2010
FINAL TEST DATE:	June 23, June 24, June 25 and June 26, 2009
AUTHORIZED SIGNATORY:	David W Bare David W. Bare Chief Engineer

ACCREDITED

Testing Cert #2016-01

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REVISION HISTORY

Revision #	Date	Comments	Modified By
-	July 10, 2009	Initial Release	-
1	July 20, 2009	Added summary for FCC Part 101/RSS-119	dwb
1.1	November 29, 2010	Corrected typo of FCC ID on Page 5	dwb

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CERTIFICATION INFORMATION

The following information is in accordance with FCC Rules, 47CFR Part 2, Subpart J, Section 2.1033(C) & to Industry Canada RSP-100.

2.1033(c)(1) Applicant:

GE MDS LLC
175 Science Parkway
Rochester, NY 14620

2.1033(c)(2) & RSP-100 (4) FCC ID: E5MDS-SD9-1
UPN: 101D-SD9

2.1033(c)(3) & RSP-100 (7.2(a)) Instructions/Installation Manual

Please refer to Exhibit 7: User Manual

2.1033(c)(4) & RSP-100 (7.2(b)(iii)) Type of emissions

FCC 90, 101 & RSS-119**: F1D, F2D and F3D**
Necessary Bandwidths: (Refer to separate letter regarding derivation of necessary bandwidth)
11.2 kHz and 20.0 kHz

2.1033(c)(5) & RSP-100 (7.2(a)) Frequency Range

FCC 90: **928 –930 MHz**

FCC Part 101 & RSS-119**: 928 – 960 MHz,**
Actual ranges are: **928 - 929, 932 - 935, 941 – 944 and 952 - 960 MHz,**

2.1033(c)(6) & RSP-100 (7.2(a)) Range of Operation Power

FCC 90, 101 & RSS-119**: 0.1 to 5 Watts**

2.1033(c)(7) & RSP-100 (7.2(a)) Maximum FCC & IC Allowed Power Level

FCC 90 & RSS-119**:** 90.205(g)(h)(i): depends on frequency and antenna height authorized in license

2.1033(c)(8) & RSP-100 (7.2(a)) Applied voltage and currents into the final transistor elements

The final RF stage output amplifier operates at 13.8vdc and draws 2.2adc

2.1033(c)(9) & RSP-100 (7.2(a)) Tune-up Procedure

There is no tune up procedure since is a digital radio. All settings and calibration are done in the factory and stored in memory.

2.1033(c)(10) & RSP 100 (7.2(a)) Schematic Diagram of the Transmitter

Refer to Exhibit 9: Schematic diagram

2.1033(c)(10) & RSP-100 (7.2(a)) Means for Frequency Stabilization

Refer to Exhibit 4: Theory of Operation

2.1033(c)(10) & RSP-100 (7.2(a)) Means for Suppression of Spurious radiation

Refer to Exhibits 4, 8 and 9

2.1033(c)(10) & RSP-100 (7.2(a)) Means for Limiting Modulation

Refer to Exhibits 4, 8 and 9

2.1033(c)(10) & RSP-100 (7.2(a)) Means for Limiting Power

Refer to Exhibit 4: Theory of Operation

2.1033(c)(11) & RSP-100 (7.2(g)) Photographs or Drawing of the Equipment Identification Plate or Label

Refer to Exhibit 5

2.1033(c)(12) & RSP-100 (7.2(c)) Photographs of equipment

Refer to Exhibit 6

2.1033(c)(14) & RSP-100 (7.2(b)(ii)) Data taken per Section 2.1046 to 2.1057 and RSS-133 issue 2, Rev. 1.

Refer to Exhibit 2

DECLARATIONS OF COMPLIANCE

Equipment Name and Model:
SD9

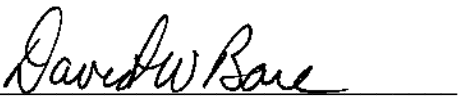
Manufacturer:
GE MDS LLC
175 Science Parkway
Rochester, NY 14620

Tested to applicable standards:
RSS-119, Issue 6 (Land Mobile and Fixed Radio Transmitters and Receivers, 27.41 to 960 MHz).
FCC Part 90 (Private Land Mobile Radio Service)
FCC Part 101 (Fixed Microwave Service)

Measurement Facility Description Filed With Department of Industry:

Departmental Acknowledgement Number: 2845A-1

I declare that the testing was performed or supervised by me; that the test measurements were made in accordance with the above mentioned departmental standards (through the use of TIA/EIA-603 and the specific RSS standards applicable to this device); and that the equipment performed in accordance with the data submitted in this report.

Signature 
Name David W. Bare
Title Chief Engineer
Elliott Laboratories
Address 684 W. Maude Ave
Sunnyvale, CA 94086
USA

Date: July 6, 2009

Maintenance of compliance with the above standards 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.).

SCOPE

FCC Parts 90, 101 & IC RSS-119 testing was performed for the equipment mentioned in this report. The equipment was tested in accordance with the procedures specified in Sections 2.1046 to 2.1057 of the FCC Rules & IC RSS-119. TIA-603 was also used as a test procedure guideline to perform some of the required tests.

The intentional radiator above was tested in a simulated typical installation to demonstrate compliance with the relevant FCC & RSS 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 FCC Parts 90, 101 & IC RSS-119. Certification of these devices is required as a prerequisite to marketing as defined in Section 2.1033 & RSP-100.

Certification is a procedure where the manufacturer or a contracted laboratory makes measurements and submits the test data and technical information to FCC & Industry Canada. FCC & Industry Canada issues a grant of equipment authorization and a certification number upon successful completion of their review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product that 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.).

SUMMARY OF TEST RESULTS

Part 90 and RSS-119 Test Summary

Measurement Required	FCC Part 2 & 90 Sections	RSS-119 Section	Test Performed	Measured Value	Test Procedure Used	Result
Modulation Tested	CPFSK	CPFSK	-	-	-	-
Modulation characteristics	2.1047	5.7	Modulated with appropriated signal	-	H	-
Radiated RF power output (ERP/EIRP)	2.1046 / 90.279 & 90.205(g)	6.2	Radiated Output Power Test	-	-	-
Conducted RF power output	2.1046 / 90.279 & 90.205(g)	6.2	Conducted Output Power Test	37.3dBm (5.4 Watts)	B	Complies
Spurious emissions at antenna Port	2.1051/ 90.210(c) & (d)	6.3 & 6.4(d)	Emission Limits and/or Unwanted Emission 30MHz – 10GHz (**Antenna Conducted**)	-23.0dBm @ 958.3MHz	J	Complies
Occupied Bandwidth	2.1049/ 90.210(c) & (d)	6.4(c) & 6.4(d)	Emission Mask and 99% Bandwidth	Refer to Plots	C & D	Complies
Field strength of spurious radiation	2.1053 / 90.210(d)	6.3 & 6.4(d)	Radiated Spurious Emissions 30MHz – 10GHz	50.3dBµV/m (327.3µV/m) @ 1000.1MHz (-22.1dB)	N	Complies
Frequency stability	2.1055 / 90.213	7	Frequency Vs. Temperature	0.17 ppm	K	Complies
Frequency stability	2.1055 / 90.213	7	Frequency Vs. Voltage	0.005 ppm	L & M	Complies
Exposure to Mobile devices	2.1091	9	Exposure of Humans to RF Fields	See separate MPE Calculation	-	Complies
Receiver	15.109	8	Receiver Spurious Emissions	32.8dBµV/m (43.7µV/m) @ 50.08MHz (-7.2dB)	N/A	Complies

Part 101 and RSS-119 Test Summary

Measurement Required	FCC Part 2 & 101 Sections	RSS-119 Section	Test Performed	Measured Value	Test Procedure Used	Result
Modulation Tested	CPFSK	CPFSK	-	-	-	-
Modulation characteristics	2.1047	5.7	Modulated with appropriated signal	-	H	-
Radiated RF power output (ERP/EIRP)	2.1046 / 101.113(a)	6.2	Radiated Output Power Test	-	-	-
Conducted RF power output	2.1046 / 101.113(a)	6.2	Conducted Output Power Test	37.3dBm (5.4 Watts)	B	Complies
Spurious emissions at antenna Port	2.1051/ 101.111(a)(5)	6.3 & 6.4(d)	Emission Limits and/or Unwanted Emission 30MHz – 10GHz (**Antenna Conducted**)	-23.0dBm @ 958.3MHz	J	Complies
Occupied Bandwidth	2.1049/ 101.111(a)(5), 101.111(a)(6)	6.4(c) & 6.4(d)	Emission Mask and 99% Bandwidth	Refer to Plots	C & D	Complies
Field strength of spurious radiation	2.1053 / 101.111(a)(5)	6.3 & 6.4(d)	Radiated Spurious Emissions 30MHz – 10GHz	50.3dBµV/m (327.3µV/m) @ 1000.1MHz (-22.1dB)	N	Complies
Frequency stability	2.1055 / 101.107(a)	7	Frequency Vs. Temperature	0.17 ppm	K	Complies
Frequency stability	2.1055 / 101.107(a)	7	Frequency Vs. Voltage	0.005 ppm	L & M	Complies
Exposure to Mobile devices	2.1091	9	Exposure of Humans to RF Fields	See separate MPE Calculation	-	Complies
Receiver	15.109	8	Receiver Spurious Emissions	32.8dBµV/m (43.7µV/m) @ 50.08MHz (-7.2dB)	N/A	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 were calculated using the approach described in CISPR 16-4-2:2003 using a coverage factor of k=2, which gives a level of confidence of approximately 95%. The levels were found to be below levels of *U*cispr and therefore no adjustment of the data for measurement uncertainty is required.

Measurement Type	Frequency Range (MHz)	Calculated Uncertainty (dB)
Conducted Emissions	0.15 to 30	± 2.4
Radiated Emissions	30 to 1000	± 3.6

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The GE MDS LLC model SD9 is an industrial radio operating in the 928-960 MHz bands for FCC Part 101 and RSS-119 and operating in the 928-930 MHz bands for FCC Part 90. Since the EUT could be placed anywhere in use, it was placed on a table top during testing to simulate the end-user environment. The electrical rating of the EUT is 10- 30 Volts DC, 2.2 Amps.

The sample was received on June 23, 2009 and tested on June 23, June 24, June 25 and June 26, 2009. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number	FCC ID
GE MDS LLC	SD9	Industrial Radio	1885481	E5MDS-SD9-1

OTHER EUT DETAILS

The radio can operate on 12.5 and 25KHz channels (F1D, F2D and F3D modulations).

ENCLOSURE

The EUT enclosure is primarily constructed of aluminum. It measures approximately 16 cm wide by 12 cm deep by 4 cm high.

MODIFICATIONS

The EUT did not require modifications during testing in order to comply with the emission specifications.

SUPPORT EQUIPMENT

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

Manufacturer	Model	Description	Serial Number	FCC ID
Winbook	Winbook XL	Computer	H1106677	-
Hewlett Packard	6654A	Power Source	US36390821	-

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

Manufacturer	Model	Description	Serial Number	FCC ID
Netgear	EN106	Ethernet Hub	ENT6A90005174	-

EUT INTERFACE PORTS

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

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Ethernet	Hub	Cat 5	Shielded	5.0
COM2	Computer	Serial	Shielded	2.0
DC Power	Power Source	two wire	Unshielded	2.0

Note: The COM1 port was not connected during testing except as needed for configuration of the radio. This port is for diagnostic purposes and therefore would not normally be connected.

EUT OPERATION DURING TESTING

During radio performance emissions testing the EUT was set to transmit at 37dBm with modulation on or off as needed for testing. During receiver and unintentional emissions testing, the radio was set for receive mode.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on June 23, June 24, June 25 and June 26, 2009 at the Elliott Laboratories Open Area Test Site #1 located at 684 West Maude Avenue, Sunnyvale, California. Pursuant to Section 2.948 of the FCC Rules, construction, calibration, and equipment data has been filed with the Commission.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing are performed in conformance with Section 2 of FCC Rules. Measurements are made with the EUT connected to a spectrum analyzer through an attenuator to prevent overloading the analyzer.

RADIATED EMISSIONS CONSIDERATIONS

Radiated measurements are performed in an open field environment or Anechoic Chamber. The test site is maintained free of conductive objects within the CISPR 16-1 defined elliptical area.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1 is used for emissions measurements. The receivers are capable of measuring 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 particular detector used during 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. If average measurements above 1000MHz are performed, the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz is used.

INSTRUMENT CONTROL COMPUTER

A personal computer is utilized to record the receiver measurements of the field strength at the antenna, which is then compared directly with the appropriate specification limit. The receiver is programmed with appropriate factors to convert the received voltage into filed strength at the antenna. Results are printed in a graphic and/or tabular format, as appropriate.

The test receiver also provides a visual display of the signal being measured.

PEAK POWER METER

A peak power meter and thermister mount may be used for output power measurements from transmitters as they provide a broadband indication of the power output.

FILTERS/ATTENUATORS

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

ANTENNAS

A biconical antenna is used to cover the range from 30 MHz to 300 MHz and a log periodic antenna is utilized from 300 MHz to 1000 MHz. Narrowband tuned dipole antennas are used over the 30 to 1000 MHz range for precision measurements of field strength. Above 1000 MHz, a horn antenna is used. The antenna calibration factors are included in site factors programmed into the test receivers

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.

The requirements of ANSI C63.4:2003 were used for configuration of the equipment turntable. It 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. 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 appendix of this report contains the list of test equipment used and calibration information.

TEST PROCEDURES

General: For Transmitters with detachable antenna, direct measurements for output power, modulation characterization, occupied bandwidth, and frequency stability are performed with the antenna port of the EUT connected to either the power meter, modulation analyzer, or spectrum analyzer via a suitable attenuator and/or filter. The attenuators and/or filters are used to ensure that the transmitter fundamental will not overload the front end of the measurement instrument.

Procedure B – Power Measurement (Conducted Method): The following procedure was used for transmitters that do use external antennas.

1) Set the EUT to maximum power and to the lowest channel.
2) Either a power meter or a spectrum analyzer was used to measure the power output.
3) If a spectrum analyzer was used a resolution and video bandwidth 10kHz was used to measure the power output. Corrected for any external attenuation used for the protection of the input of analyzer. In addition, For CDMA or TDMA modulations set spectrum analyzer resolution to 1MHz and video to 30 kHz. Use video averaging with a 100-sample rate.
4) If a power meter was used, corrected for any external attenuation used for the protection of the input of the sensor head. Also set the power sensor correction by setting up the frequency range that will be measured.
5) Repeat this for the high channel and all modulations that will be used and all output ports used for transmission

Procedure C - Occupied Bandwidth (Conducted Method): Either for analog, digital, or data modulations, occupied bandwidth was performed. The EUT was set to transmit the appropriate modulation at maximum power. The bandwidth was measured using following methods:

1) The built-in 99% function of the spectrum analyzer was used.
2) If the built-in 99% is not available then the following method is used:

   26-dB or 20-dB was subtracted to the maximum peak of the emission. Then the display line function was used, in conjunction with the marker delta function, to measure the emissions bandwidth.

3) For the above two methods a resolution and video bandwidth of 100 or 300 Hz was used to measure the emission’s bandwidth.

Procedure D - Occupied Bandwidth (Conducted Emission Mask): Either for analog, digital, or data modulations, emission mask was performed. The EUT was set to transmit the appropriate modulation at maximum power. The following method was used:

1) The EUT was connected directly to the spectrum analyzer and used an attenuator to protect the input of the analyzer. The EUT antenna was removable, so conducted measurements was performed. The EUT was set to transmit continuous packets of data and the Fundamental Frequency set to the middle of the EUT frequency range.

2) Since EUT is designed with a 12.5 kHz channel Section 90.210 (d)(1)(2)(3) was used to show compliance to the emission mask.

3) Any emission must be attenuated below the power (P) as follow:

90.210 (d)(1): 5.625 kHz: 0 dB

90.210(d)(2): 5.625 kHz: 20 dB
12.5 kHz: 70 dB

90.210(d)(3): more than 12.5 kHz: -20 dBm (50+10*log(P))

The following Resolution and Video bandwidth was used to show compliance for the above requirement: 100 Hz.

4) Since EUT is designed with a 25 kHz channel Section 90.210 (c)(1)(2)(3) was used to show compliance to the emission mask.

5) Any emission must be attenuated below the power (P) as follow:

90.210 (c)(1): 5 kHz but no more then 10kHz: 83*log(F_d / 5) dB

90.210(c)(2): 10kHz but no more then 250%: At least 29 log (fd 2/11) dB or 50 dB, whichever is the lesser attenuation

90.210(c)(3): more than 250%: -13 dBm (43+10*log(P))

The following Resolution and Video bandwidth was used to show compliance for the above requirement: 300 Hz.

Procedure H - Other Types of Equipment: Either digital or data modulated signals were simulated, by software or external sources, to performed the required tests. The EUT was set to transmit the appropriate digital modulation.

Procedure J – Antenna Conducted Emissions: For spurious emission measurements at the antenna terminal the following procedure was performed:

1) Set the transmitting signal at the middle of the operating range of the transmitter, as specified in the standard. Power is set to maximum and then to minimum.
2) Set the spectrum analyzer display line function to –20-dBm.
3) Set the spectrum analyzer bandwidth to 10kHz <1GHz and 1 MHz >1GHz.
4) For the spectrum analyzer, the start frequency was set to 30 MHz and the stop frequency set to the 10^{th} harmonic of the fundamental. All spurious or intermodulation emission must not exceed the –20dBm limit.
5) Steps 1 to 4 were repeated for all modulations and output ports that will be used for transmission.

Procedure K - Frequency Stability: The EUT is placed inside a temperature chamber with all support and test equipment located outside of the chamber. The spectrum analyzer is configured to give a 6-digit display for the marker-frequency function. The spectrum analyzer's built-in frequency counter is used to measure the maximum deviation of the fundamental frequency at each temperature. The Temperature chamber was varied from –30 to +50° C (or +60° C for some IC RSS standards, if applicable) in 10 degrees increment. The EUT was allowed enough time to stabilize for each temperature variation.

Procedure L - Frequency Stability: For AC or DC operated devices the nominal voltage is varied to 85% and to 115% at either room temperature or at a controlled +20°C temperature.

Procedure M - Frequency Stability: For battery-powered devices the voltage battery end-point is determined by reducing the dc voltage until the unit ceases to function. This is performed at either room temperature or at a controlled +20°C temperature.

Procedure N - Field Strength Measurement: The EUT was set on the turntable and the search antenna position 3 meters away. The output antenna terminal was terminated with a 50-ohm terminator. The EUT was set at the middle of the frequency band and set at maximum output power.

For the first scan, a pre-liminary measurement is performed. A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. One or more of these is with the antenna polarized vertically while the one or more of these are with the antenna polarized horizontally. During the preliminary scans, the EUT is rotated through 360˚, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit.

For the final measurement, Substitution method is performed on spurious emissions not being 20-dB below the calculated radiated limit. Substitution method is performed by replacing the EUT with a horn antenna and signal generator. The horn antenna factors can be reference to a half-wave dipole in dBi. The signal generator power level was adjusted until a similar level, which was measured on the first scan, is achieved on the spectrum analyzer. The level on the signal generator is than added to the antenna factor, in dBi, which will give the corrected value.

Procedure I – Transient Frequency Behavior: The TIA/EIA 603 procedure was used to determine compliance to radio being keyed on and off.

1) Connected the Test Receiver DOP or Video Output to Channel 1 of the oscilloscope. The output of the RF crystal detector was connected to Auxiliary channel 1, which served as a trigger input. The output of the combiner was connected to the Test Receiver.

2) Set the EUT to maximum power and connected as illustrated above. Set the signal generator to the assigned transmitter frequency and modulate it with a 1 kHz tone at 6.25kHz, 12.5 kHz, or 25 kHz deviation and set its output to –100 dBm, then turn on the EUT.

3) The Combiner output side was connected to the Test Receiver, which was used to measure the Power. Used enough external attenuation so that the output at the combiner was set to 40 dB below the maximum input of the Test Receiver, then turn off the EUT.

4) Set the signal generator output to the same level in step 3. This level was maintained for the remainder of the test.

5) Set the horizontal sweep rate on the storage oscilloscope to 10 milliseconds per division and adjusted the display to continuously view the 1 kHz tone from the DOP or Video Output. Adjusted the vertical amplitude control to display the 1 kHz at +/- 4 divisions vertically centered on the display.

6) Set the oscilloscope to trigger at the AUX channel 1 input port.

7) Removed enough external attenuation so that the input to the RF detector and combiner is increased by 30 dB.

8) Turn on the transmitter and plotted the result for **Ton**, **T1**, and **T2**.

9) Set the oscilloscope to trigger in decreasing magnitude from the RF crystal detector.

10) Turn off the transmitter and plotted the result for **T3**.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

RADIATED EMISSIONS SPECIFICATION LIMITS

The limits for radiated emissions are based on the power of the transmitter at the operating frequency. Data is measured in the logarithmic form of decibels relative to one milliwatt (dBm) or one microvolt/meter (dBuV/m,). The field strength of the emissions from the EUT is measured on a test site with a receiver.

Below is a formula example used to calculate the attenuation requirement, relative to the transmitters power output, in dBuV/m. For this example an operating power range of 3 watts is used. The radiated emissions limit for spurious signals outside of the assigned frequency block is $43+10\text{Log}_{10}$(mean output power in watts) dB below the measured amplitude at the operating power.

CALCULATIONS – EFFECTIVE RADIATED POWER

$$E(V/m) = \frac{\sqrt{30 * P * G}}{d}$$

E= Field Strength in V/m
P= Power in Watts (for this example we use 3 watts)
G= Gain of antenna in numeric gain (Assume 1.64 for ERP)
d= distance in meters

$$E(V/m) = \frac{\sqrt{30 * 3 \text{ watts} * 1.64 \text{ dB}}}{3 \text{ meters}}$$

20 * log (4.049 V/m * 1,000,000) = 132.14 dBuV/m @ 3 meters

FCC Rules request an attenuation of 43 + 10 log (3) or 47.8 dB for all emissions outside the assigned block, the limit for spurious and harmonic emissions is:

132.1 dBuV/m – 47.8 dB = 84.3 dBuV/m @ 3 meter.

Note: Substitution Method is performed for spurious emission not being 20-dB below the calculated field strength.

EXHIBIT 1: Test Equipment Calibration Data

1 Page

Reciever Spurious - Conducted, 23 and 24-Jun-09
Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
Agilent	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	30-Dec-09
Rohde & Schwarz	Power Sensor 100 uW - 2 Watts (w/ 20 dB pad, SN BJ5155)	NRV-Z32	1536	12-Sep-09
Rohde & Schwarz	Power Meter, Dual Channel	NRVD	1786	28-Jan-10

Radiated Emissions, 30 - 10,000 MHz, 24-Jun-09
Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
EMCO	Log Periodic Antenna, 0.3-1 GHz	3146A	364	23-Dec-09
EMCO	Biconical Antenna, 30-300 MHz	3110B	801	19-Sep-09
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	870	09-Oct-09
Hewlett Packard	EMC Spectrum Analyzer, 9 KHz-26.5 GHz	8593EM	1141	29-Dec-09
EMCO	Antenna, Horn, 1-18 GHz	3117	1662	11-Apr-10
Hewlett Packard	Preamplifier, 100 kHz - 1.3 GHz	8447D OPT 010	1826	26-May-10

Radiated Emissions, 30 - 10,000 MHz, 25-Jun-09
Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	870	09-Oct-09
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	15-Jul-10
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	12-Mar-10
EMCO	Log Periodic Antenna, 0.2-1 GHz	3146	1294	17-Sep-10
Rohde & Schwarz	Test Receiver, 9 kHz-2750 MHz	ESCS 30	1337	02-Oct-09
EMCO	Biconical Antenna, 30-300 MHz	3110B	1497	15-Sep-10

Conducted Emissions - AC Power Ports, 25-Jun-09
Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
Elliott Laboratories	LISN, FCC / CISPR	LISN-3, OATS	304	31-Jul-09
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	372	23-Feb-10
Rohde & Schwarz	Test Receiver, 9 kHz-2750 MHz	ESCS 30	1337	02-Oct-09

Environmental Test, 26-Jun-09
Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
Agilent	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	30-Dec-09

EXHIBIT 2: Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T75896 28 Pages

Client:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		David Bare
Emissions Standard(s):	FCC Part 101, RSS-119, FCC Part 15	Class:	A
Immunity Standard(s):	-	Environment:	Radio

EMC Test Data

For The

GE MDS LLC

Model

SD9

Date of Last Test: 6/26/2009

Client:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manger:	Susan Pelzl
Contact:	Dennis McCarthy		
Emissions Standard(s):	FCC Part 101, RSS-119, FCC Part 15	Class:	A
Immunity Standard(s):	-	Environment:	Radio

EUT INFORMATION

The following information was collected during the test session(s).

General Description

The EUT is a industrial radio operating in the 928-960 MHz bands for FCC Part 101 and operating in the 928-930 MHz bands for FCC Part 90. Since the EUT could be placed anywhere in use, it was placed on a table top during testing to simulate the end-user environment. The electrical rating of the EUT is 10 - 30 Volts DC, 2.2 Amps.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
GE MDS LLC	SD9	Industrial Radio	1885481	E5MDS-SD9-1

Other EUT Details

The radio can operate on 12.5 and 25KHz channels (F1D, F2D and F3D modulations).

EUT Antenna (Intentional Radiators Only)

The EUT antenna is a determined at the time of licensing.

EUT Enclosure

The EUT enclosure is primarily constructed of aluminum. It measures approximately 16 cm wide by 12 cm deep by 4 cm high.

Modification History

Mod. #	Test	Date	Modification
1			No modifications were made to the EUT during testing.
2			
3			

Modifications applied are assumed to be used on subsequent tests unless otherwise stated as a further modification.

Client:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manger:	Susan Pelzl
Contact:	Dennis McCarthy		
Emissions Standard(s):	FCC Part 101, RSS-119, FCC Part 15	Class:	A
Immunity Standard(s):	-	Environment:	Radio

Test Configuration #1

The following information was collected during the test session(s).

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Winbook	Winbook XL	Computer	H1106677	-
Hewlett Packard	6654A	Power Source	US36390821	-

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Netgear	EN106	Ethernet Hub	ENT6A90005174	-

Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Ethernet	Hub	Cat 5	Shielded	5.0
COM2	Computer	Serial	Shielded	2.0
DC Power	Power Source	two wire	Unshielded	2.0

Note: The COM1 port was not connected during testing except as needed for configuration of the radio. This port is for diagnostic purposes and therefore would not normally be connected.

EUT Operation During Emissions Tests

During radio performance emissions testing the EUT was set to transmit at 37dBm with modulation on or off as needed for testing. During receiver and unintentional emissions testing, the radio was set for receive mode.

Client:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 101, RSS-119, FCC Part 15	Class:	N/A

RSS 119 and FCC Part 101

Power, Occupied Bandwidth, Frequency Stability 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

With the exception of the radiated spurious emissions tests, all measurements are made with the EUT's rf port connected to the measurement instrument via an attenuator or dc-block if necessary. All amplitude measurements are adjusted to account for the attenuation between EUT and measuring instrument. For frequency stability measurements the EUT was place inside an environmental chamber.

Radiated measurements are made with the EUT located on a non-conductive table, 3m from the measurement antenna.

Ambient Conditions:

Temperature: 23 °C

Rel. Humidity: 42 %

Summary of Results

Run #	Modem	CH Spacing	Test Performed	Limit	Pass / Fail	Result / Margin
1	9600	12.5kHz	Output Power (Low and High)	-	-	24.5dBm/ 37.3dBm
1	19200	25kHz	Output Power (Low and High)	-	-	24.7dBm/ 37.2dBm
2	9600	12.5kHz	Spectral Mask	Mask D, 101.111a5	Pass	-
2	19200	25kHz	Spectral Mask	Mask G, 101.111a6	Pass	-
3	9600	12.5kHz	99% or Occupied Bandwidth	RSS GEN	-	10.6 kHz
3	19200	25kHz	99% or Occupied Bandwidth	RSS GEN	-	16.2 kHz
4	9600	12.5kHz	Spurious Emissions (conducted)	-20 dBm	Pass	-23.0dBm @ 958.3MHz
4	19200	25kHz	Spurious Emissions (conducted)	-13 dBm	Pass	-23.0dBm @ 958.3MHz
5	9600	12.5kHz	Spurious emissions (radiated)	70.3 dBuV/m (FCC Part 90.210)	Pass	50.3dBµV/m (327.3µV/m) @ 1000.1MHz (-22.1dB)
6			Frequency Stability	1.5 ppm	Pass	0.2 ppm

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:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 101, RSS-119, FCC Part 15	Class:	N/A

Run #1: Output Power

Date of Test: 6/23 & 24/2009
Test Engineer: Mehran Birgani
Test Location: Radio Lab

Modem 9600 with 12.5kHz

Power Setting[2]	Frequency (MHz)	Output Power (dBm)[1]	Output Power W	Power Setting[2]	Frequency (MHz)	Output Power (dBm)[1]	Output Power W
37	928.000	37.2	5.2	20	928.000	24.3	0.3
37	944.000	37.3	5.4	20	944.000	24.5	0.3
37	960.000	36.6	4.6	20	960.000	24.5	0.3

Modem 19200 with 25kHz

Power Setting[2]	Frequency (MHz)	Output Power (dBm)[1]	Output Power W	Power Setting[2]	Frequency (MHz)	Output Power (dBm)[1]	Output Power W
37	928.000	37.1	5.1	20	928.000	24.7	0.3
37	944.000	37.2	5.2	20	944.000	24.6	0.3
37	960.000	36.5	4.5	20	960.000	24.6	0.3

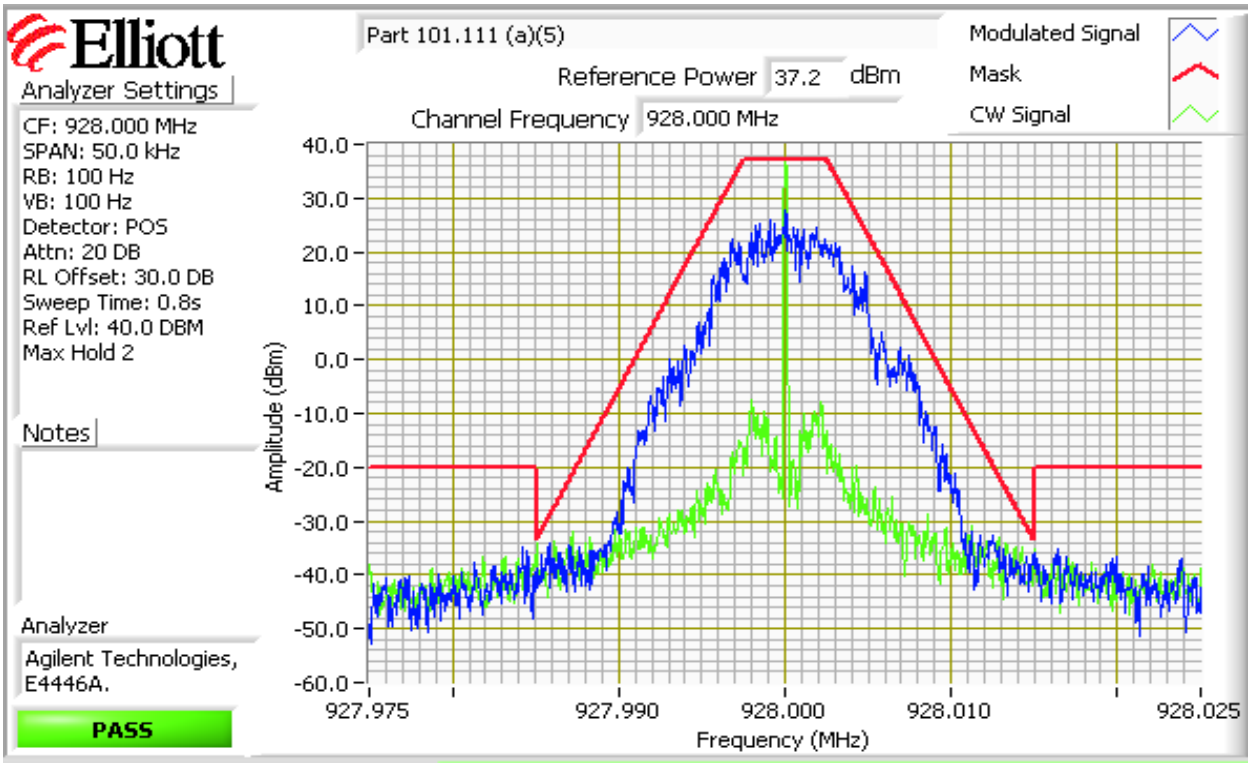
Note 1:	Output power measured using a peak power meter
Note 2:	Power setting - the software power setting used during testing, included for reference only.

Client:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 101, RSS-119, FCC Part 15	Class:	N/A

Run #2: Spectral Mask, FCC Part 101

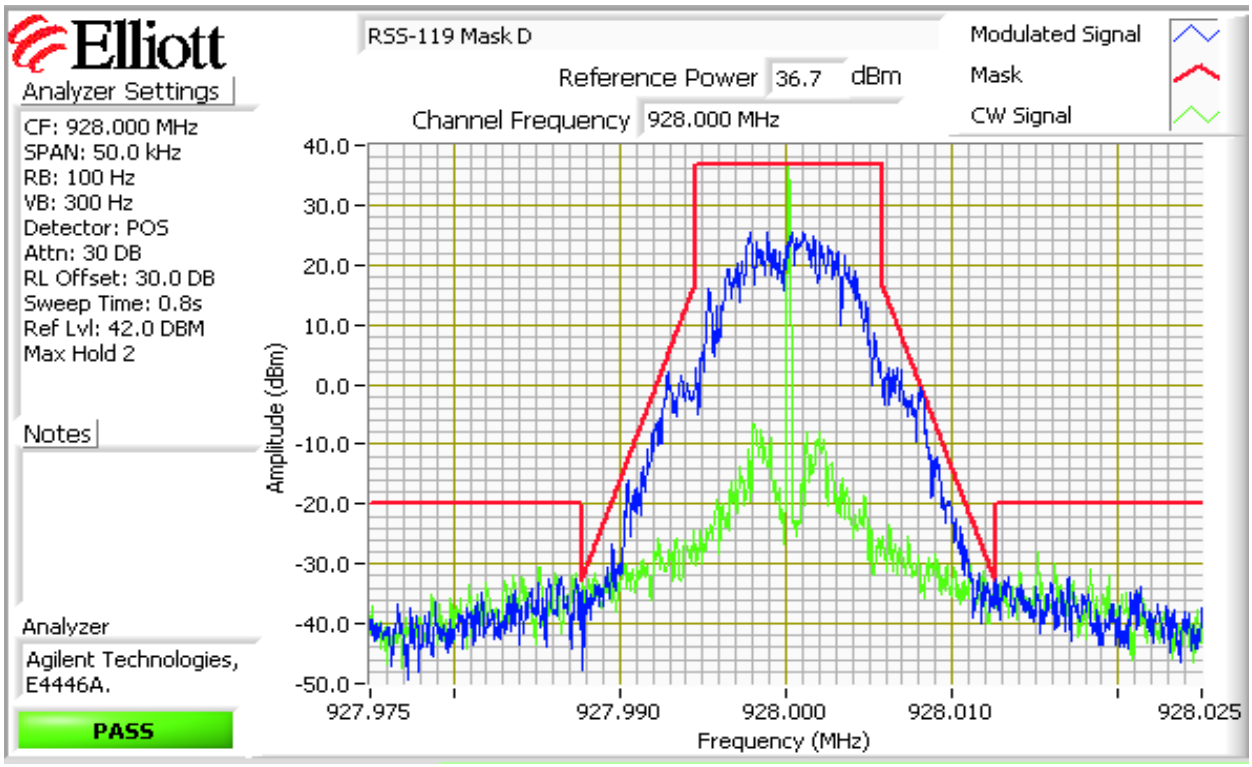
Date of Test: 06/23/09
Test Engineer: Mehran Birgani
Test Location: Radio Lab

Run #2a: Spectral Mask, FCC Part 101.111 Mask (a)(5) (Modem 9600 with 12.5kHz)



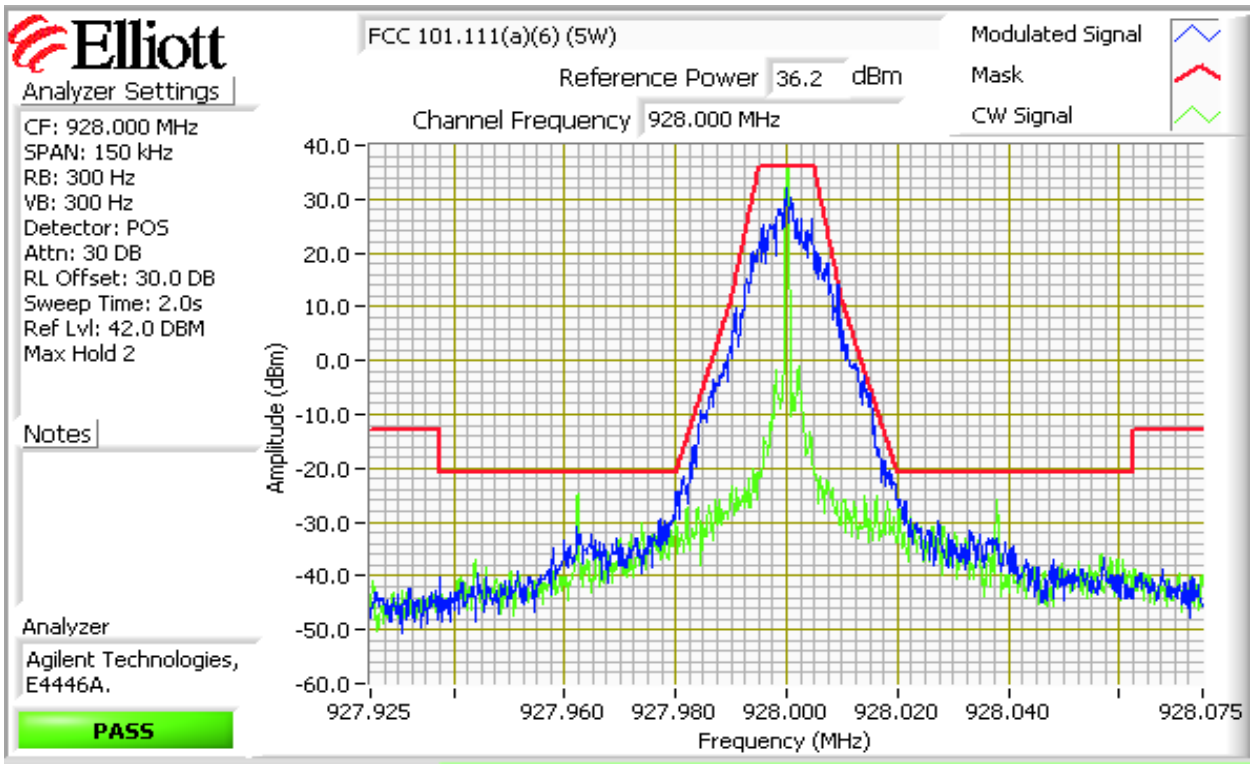
Client:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 101, RSS-119, FCC Part 15	Class:	N/A

Run #2b: Spectral Mask, FCC Part 90, RSS-119 Mask D (Modem 9600 with 12.5kHz)



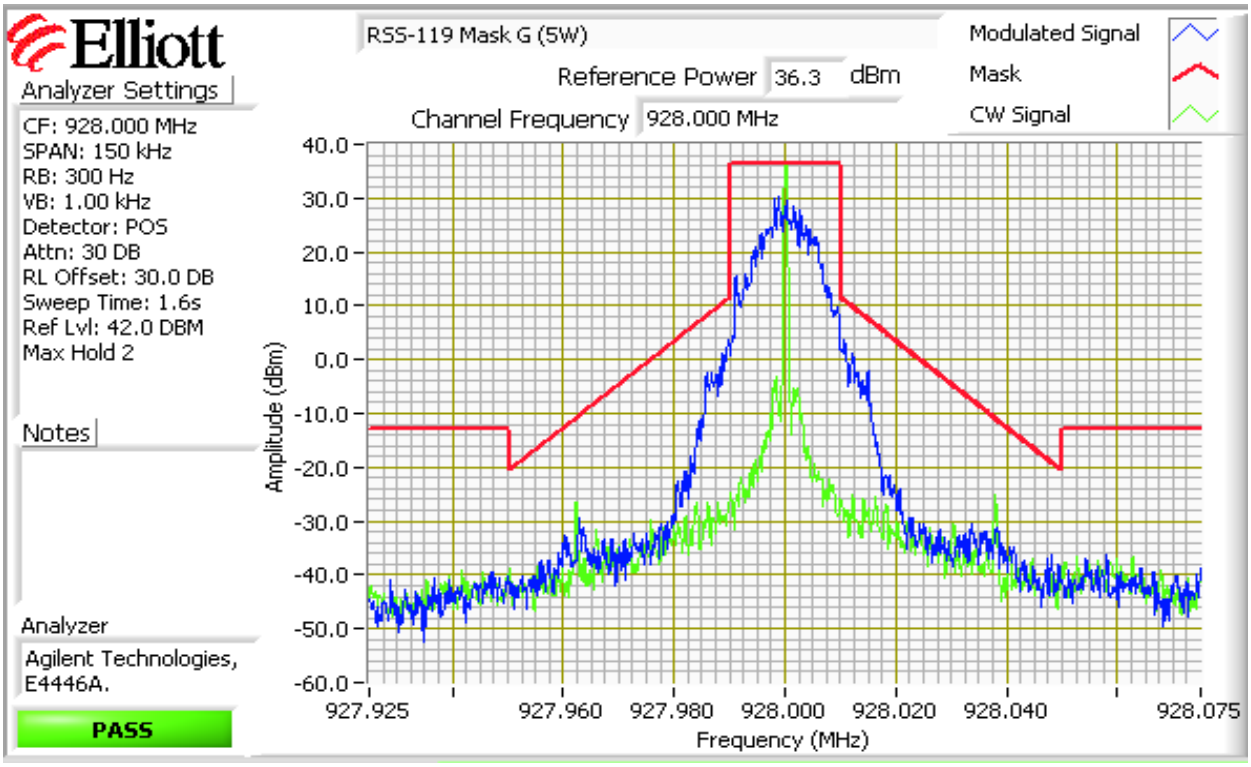
Client:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 101, RSS-119, FCC Part 15	Class:	N/A

Run #2c: Spectral Mask, FCC Part 101.111 Mask (a)(6) (Modem 19200 with 25kHz)



Client:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 101, RSS-119, FCC Part 15	Class:	N/A

Run #2d: Spectral Mask, FCC Part 90, RSS-119 Mask G (Modem 19200 with 25kHz)



Client:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 101, RSS-119, FCC Part 15	Class:	N/A

Run #3: Signal Bandwidth

Date of Test: 06/23/09
Test Engineer: Mehran Birgani
Test Location: Radio Lab

Modem 9600 with 12.5kHz

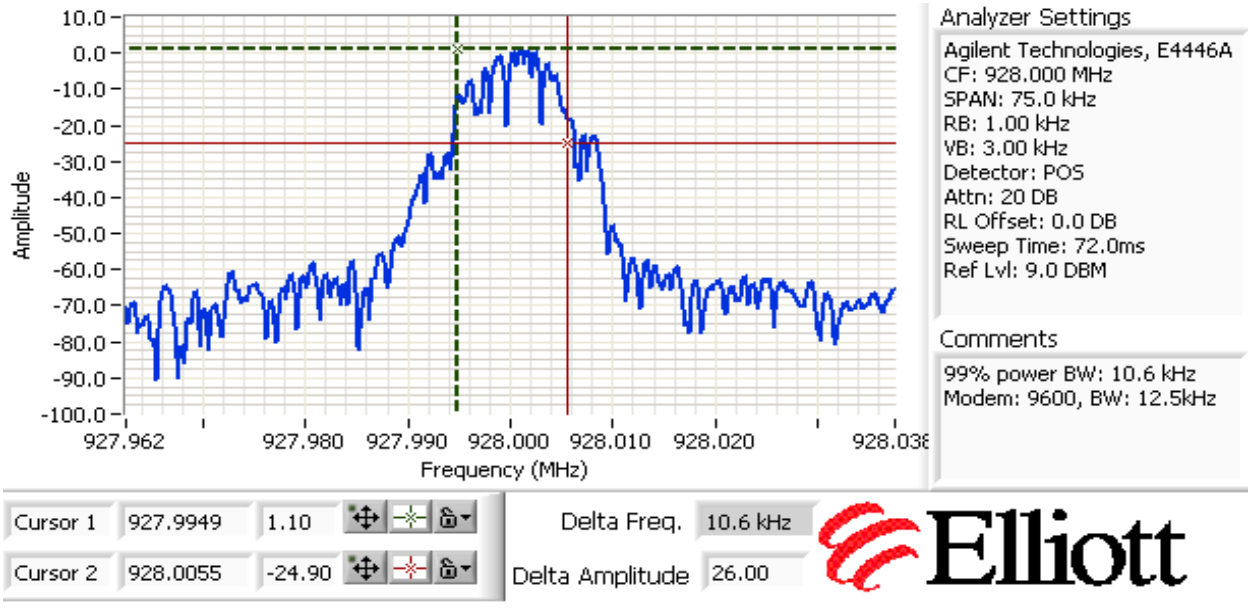
Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (kHz)	
			26dB	99%
37	928.000	1kHz	14.0	10.6
37	944.000	1kHz	14.0	10.1
37	960.000	1kHz	13.2	10.1

Modem 19200 with 25kHz

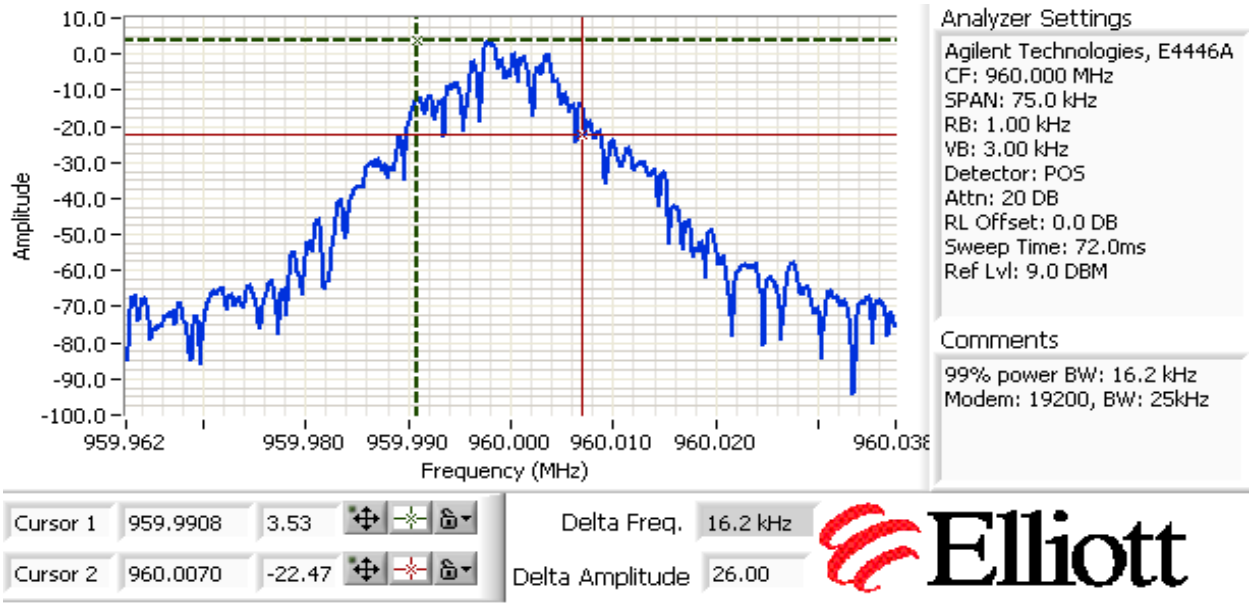
Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (kHz)	
			26dB	99%
37	928.000	1kHz	21.5	15.0
37	944.000	1kHz	21.6	15.7
37	960.000	1kHz	18.8	16.2

Note 1:	99% bandwidth measured in accordance with RSS GEN, with RB > 1% of the span and VB > 3xRB

Note: Necessary BW for 25kHz channel spacing is 20.0kHz and 11.2kHz for 12.5kHz channel spacing. See separate document from GE MDS describing how Necessary BW is determined.



Client:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 101, RSS-119, FCC Part 15	Class:	N/A



Run #4: Out of Band Spurious Emissions, Conducted

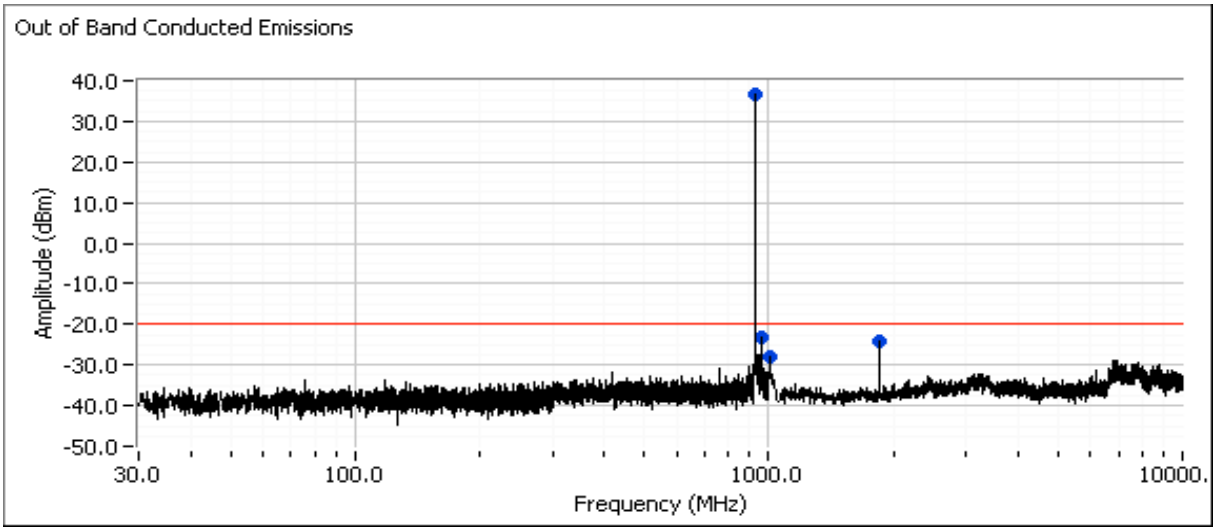
Date of Test: 06/23/09
Test Engineer: Mehran Birgani
Test Location: Radio Lab

The limit is taken from FCC Part 101.111 Mask a5

Frequency (MHz)	Limit	Result
928.000	-20dBm	Pass
944.000	-20dBm	Pass
960.000	-20dBm	Pass

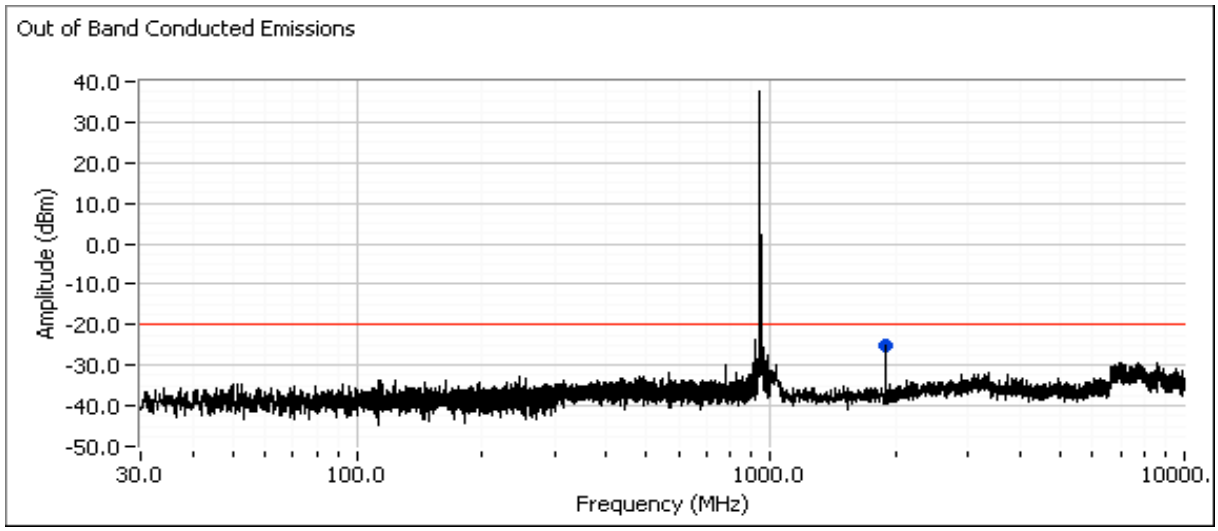
Client:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 101, RSS-119, FCC Part 15	Class:	N/A

Plots for low channel, power setting(s) = 37 dBm



Frequency	Level	Pol	FCC Part 101		Detector			Comments
MHz	dBµV/m	-	Limit	Margin	Pk/QP/Avg			
958.302	-23.0	RF Port	-20.0	-3.0	Peak			
1010.170	-28.0	RF Port	-20.0	-8.0	Peak			
1856.040	-24.3	RF Port	-20.0	-4.3	Peak			

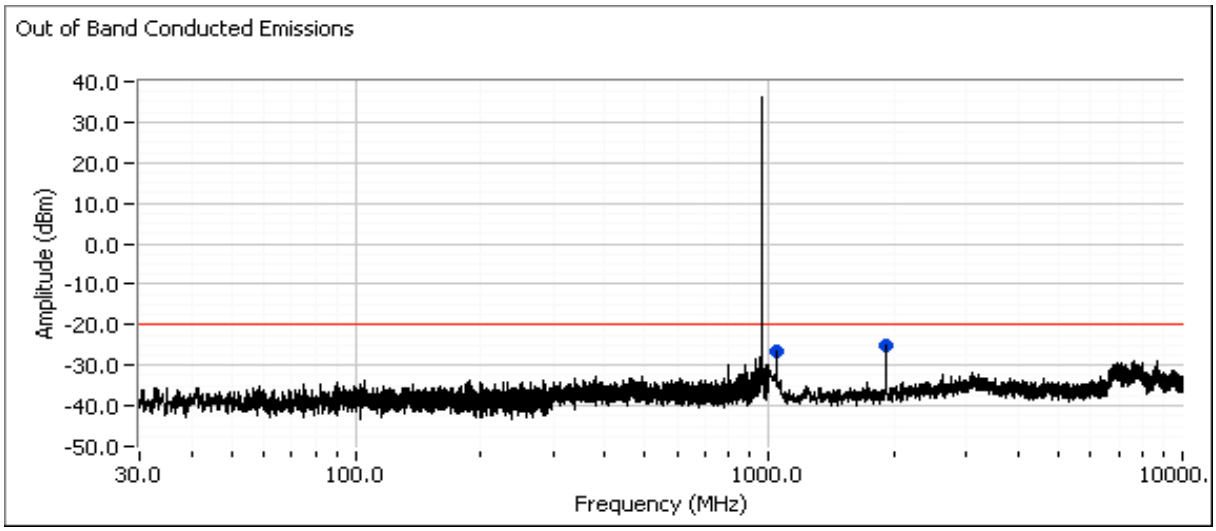
Plots for center channel, power setting(s) = 37 dBm



Frequency	Level	Pol	FCC Part 101		Detector			Comments
MHz	dBµV/m	-	Limit	Margin	Pk/QP/Avg			
1888.300	-24.9	RF Port	-20.0	-4.9	Peak			

Client:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 101, RSS-119, FCC Part 15	Class:	N/A

Plots for high channel, power setting(s) = 37 dBm



Frequency	Level	Pol	FCC Part 101		Detector			Comments
MHz	dBµV/m	-	Limit	Margin	Pk/QP/Avg			
1042.150	-26.5	RF Port	-20.0	-6.5	Peak			
1920.040	-25.2	RF Port	-20.0	-5.2	Peak			

Client:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 101, RSS-119, FCC Part 15	Class:	N/A

Run #5: Out of Band Spurious Emissions, Radiated

Conducted limit (dBm): -25
Approximate field strength limit @ 3m: 70.3

The limit is taken from FCC Part 90 Mask E (The limit is -25dBm and it is more restrictive than FCC Part 101 for Mask 101.111a6 which is -20 dBm)

Run #5a - Preliminary measurements - chamber scans

Date of Test: 6/24/2009
Test Engineer: Mehran Birgani
Test Location: Chamber #2

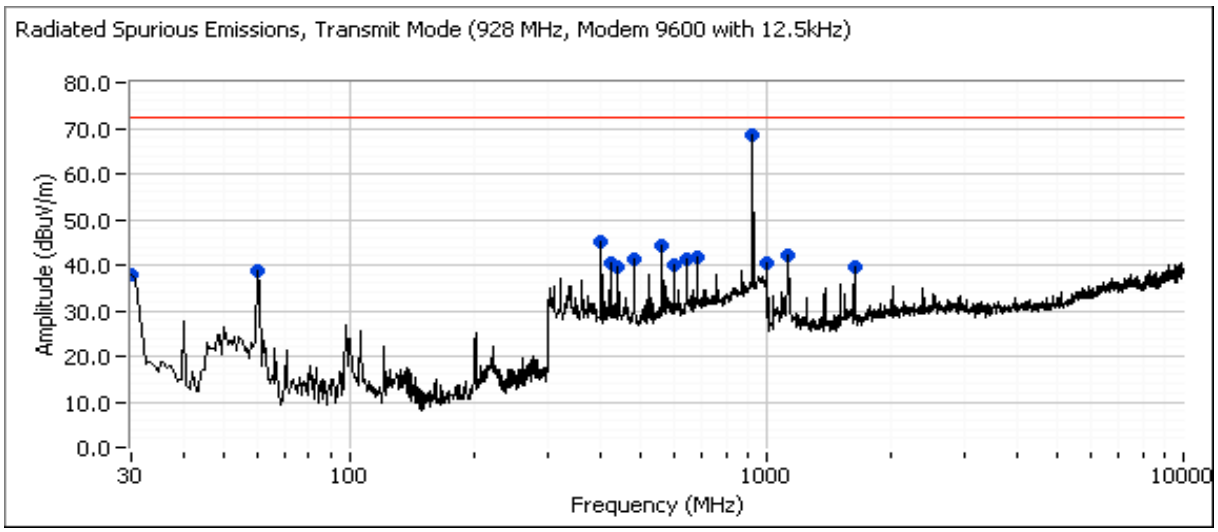
Frequency	Level	Pol	FCC Part 90		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters		
928.250	68.3	H	72.4	-4.1	Peak	101	1.7	Fundamental	928
944.000	64.6	V	72.4	-7.8	Peak	159	1.7	Fundamental	944
959.750	62.8	V	72.4	-9.6	Peak	174	1.7	Fundamental	960
846.000	47.9	V	72.4	-24.5	Peak	223	1.7		960
401.500	45.3	H	72.4	-27.1	Peak	91	1.7		944
401.500	45.1	H	72.4	-27.3	Peak	95	1.7		960
401.500	44.9	H	72.4	-27.5	Peak	89	1.7		928
602.750	44.6	H	72.4	-27.8	Peak	216	1.7		960
562.500	44.4	V	72.4	-28.0	Peak	304	1.7		960
562.500	44.1	V	72.4	-28.3	Peak	304	1.7		928
602.750	43.9	H	72.4	-28.5	Peak	220	1.7		944
830.250	43.9	V	72.4	-28.5	Peak	232	1.7		960
562.500	43.8	V	72.4	-28.6	Peak	298	1.7		944
1000.060	42.7	V	72.4	-29.7	Peak	263	1.7		944
1124.980	42.3	V	72.4	-30.1	Peak	313	1.7		928
441.750	42.0	V	72.4	-30.4	Peak	31	1.7		960
482.000	41.6	V	72.4	-30.8	Peak	43	1.7		944
683.250	41.6	V	72.4	-30.8	Peak	336	1.7		928
643.000	41.4	V	72.4	-31.0	Peak	14	1.7		960
482.000	41.2	V	72.4	-31.2	Peak	46	1.7		928
1000.000	41.2	H	72.4	-31.2	Peak	177	1.7		928
643.000	41.1	V	72.4	-31.3	Peak	293	1.7		928
482.000	40.7	V	72.4	-31.7	Peak	38	1.7		960
643.000	40.7	V	72.4	-31.7	Peak	298	1.7		944
441.750	40.6	V	72.4	-31.8	Peak	47	1.7		944
1000.000	40.6	V	72.4	-31.8	Peak	272	1.7		928
683.250	40.5	H	72.4	-31.9	Peak	258	1.7		960
422.500	40.4	V	72.4	-32.0	Peak	23	1.7		928

Client:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 101, RSS-119, FCC Part 15	Class:	N/A

Frequency	Level	Pol	FCC Part 90		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters		
683.250	40.4	H	72.4	-32.0	Peak	298	1.7		944
1000.000	40.3	V	72.4	-32.1	Peak	125	1.7		960
602.750	40.1	H	72.4	-32.3	Peak	285	1.7		928
1124.980	39.8	V	72.4	-32.6	Peak	269	1.7		960
441.750	39.7	V	72.4	-32.7	Peak	37	1.7		928
1625.050	39.4	V	72.4	-33.0	Peak	261	1.7		928
2375.150	39.3	V	72.4	-33.1	Peak	263	1.7		960
1624.970	39.1	V	72.4	-33.3	Peak	261	1.7		944
1625.010	39.1	V	72.4	-33.3	Peak	257	1.7		960
1537.380	38.9	V	72.4	-33.5	Peak	261	1.7		960
60.375	38.6	V	72.4	-33.8	Peak	329	1.7		928
2000.010	38.5	V	72.4	-33.9	Peak	246	1.7		960
30.000	37.7	V	72.4	-34.7	Peak	360	1.7		928
30.000	36.6	V	72.4	-35.8	Peak	360	1.7		944
30.109	33.4	V	72.4	-39.0	Peak	329	1.7		960
100.875	32.1	V	72.4	-40.3	Peak	329	1.7		944
50.083	30.1	V	72.4	-42.3	Peak	329	1.7		960
97.736	27.0	V	72.4	-45.4	Peak	329	1.7		960

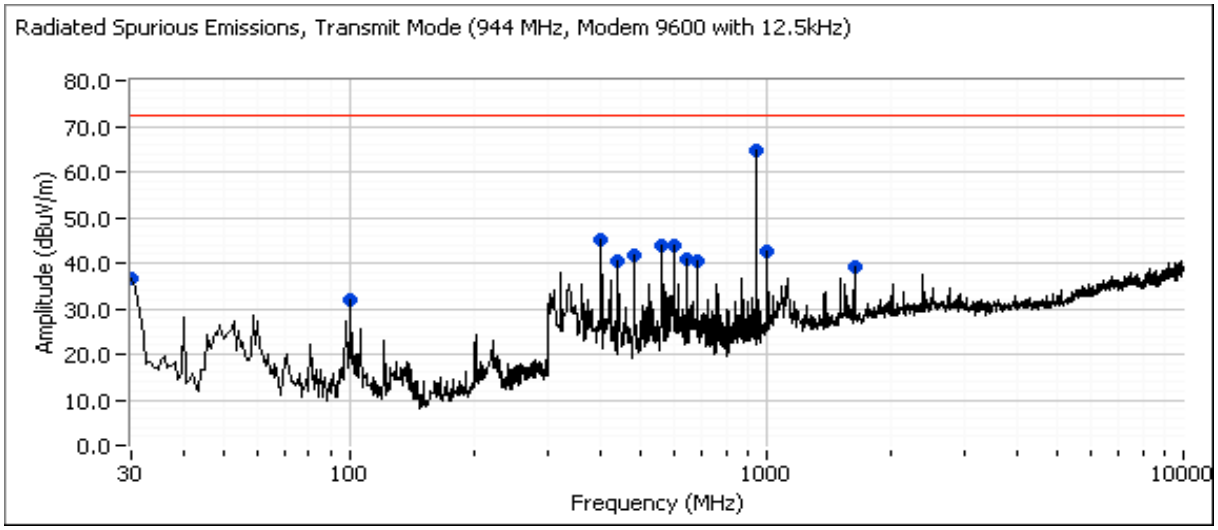
Note 1:	The field strength limit in the tables above was calculated from the erp/eirp limit detailed in the standard using the free space propagation equation: E=√(30PG)/d. This limit is conservative - it does not consider the presence of the ground plane and, for erp limits, the dipole gain (2.2dBi) has not been included. The erp or eirp for all signals with less than 20dB of margin relative to this field strength limit is determined using substitution measurements.
Note 2:	Measurements are made with the antenna port terminated.

Plots for low channel, power setting = 37

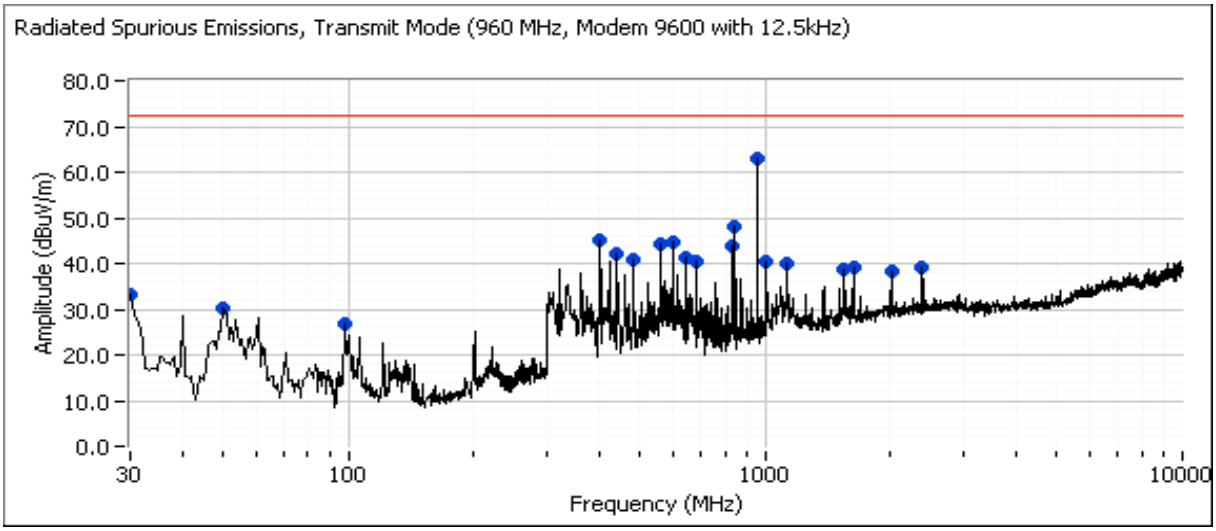


Client:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 101, RSS-119, FCC Part 15	Class:	N/A

Plots for center channel, power setting = 37



Plots for high channel, power setting = 37



Client:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 101, RSS-119, FCC Part 15	Class:	N/A

Run #5b: - OATS EUT Field Strength Measurements and Substitution Measurements

Date of Test: 6/25/2009
Test Engineer: Mehran Birgani
Test Location: SVOATS #1

EUT Field Strength

Frequency	Level	Pol	FCC Part 90		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters		
401.500	36.6	H	72.4	-35.8	PK	99	1.0		944
562.500	32.5	V	72.4	-39.9	PK	160	1.1		960
602.750	40.5	H	72.4	-31.9	PK	15	1.5		960
830.250	30.7	V	72.4	-41.7	PK	0	1.0		960
846.000	41.7	V	72.4	-30.7	PK	216	1.0		960
1000.050	50.3	V	72.4	-22.1	PK	0	1.0		944
1125.010	47.0	V	72.4	-25.4	PK	0	1.0		928

Note 1:	The field strength limit in the tables above was calculated from the erp/eirp limit detailed in the standard using the free space propagation equation: $E=\sqrt{(30PG)}/d$. This limit is conservative - it does not consider the presence of the ground plane and, for erp limits, the dipole gain (2.2dBi) has not been included. The erp or eirp for all signals with less than 20dB of margin relative to this field strength limit is determined using substitution measurements.
Note 2:	Measurements are made with the antenna port terminated.

Client:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 101, RSS-119, FCC Part 15	Class:	N/A

Run #8: Frequency Stability

Date of Test: 6/26/2009
Test Engineer: Mehran Birgani
Test Location: Environmental Lab

Nominal Frequency: 944.000109 MHz

Frequency Stability Over Temperature

The EUT was soaked at each temperature for a minimum of 30 minutes prior to making the measurements to esnure the EUT and chamber had stabilized at that temperature.

Temperature	Frequency Measured	Drift	
(Celsius)	(MHz)	(Hz)	(ppm)
-30	943.999950	159	0.17
-20	944.000018	91	0.10
-10	944.000014	95	0.10
0	943.999945	164	0.17
10	944.000111	2	0.00
20	944.000109	0	
30	944.000060	49	0.05
40	944.000092	17	0.02
50	944.000144	35	0.04
	Worst case:	164	0.17

Frequency Stability Over Input Voltage

Nominal Voltage is 13.8Vdc.

Voltage	Frequency Measured	Drift	
(Dc)	(MHz)	(Hz)	(ppm)
10.0	944.000114	5	0.005
13.8	944.000109	0	
30.0	944.000112	3	0.003
	Worst case:	5	0.005

Note 1:	Maximum drift of fundamental frequency before it shut down at 5.1Vdc was 12Hz.

Client:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 101, RSS-119, FCC Part 15	Class:	N/A

Radiated Spurious Emissions
RSS 119, FCC Part 90 and 101

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. All remote support equipment was located approximately 30 meters from the EUT with all I/O connections running on top of the groundplane or routed in overhead in the GR-1089 test configuration.

The measurement antenna was located 3 meters from the EUT.

Ambient Conditions:

Temperature: 24 °C
Rel. Humidity: 39 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Spurious Emissions Receive/Stand-By Mode 30 - 10000 MHz	FCC 101 RSS 119	Pass	32.8dBµV/m (43.7µV/m) @ 50.08MHz (-7.2dB)

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:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 101, RSS-119, FCC Part 15	Class:	N/A

Run #1: Radiated Spurious Emissions, Receive Mode, 30 - 10000 MHz

Run #1a - Preliminary measurements - chamber scans

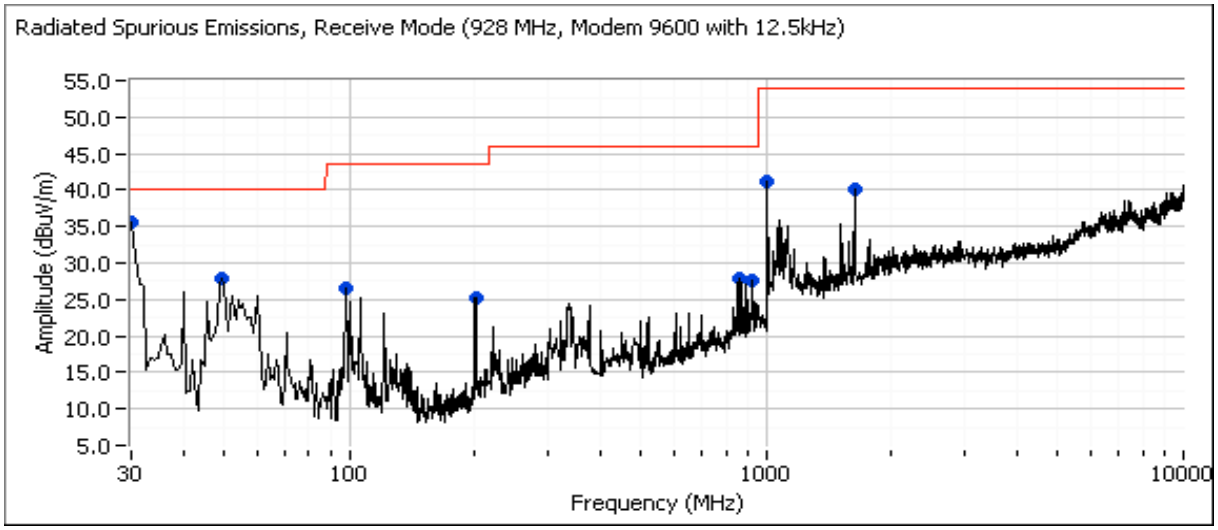
Date of Test: 6/24/2009
Test Engineer: Mehran Birgani
Test Location: Chamber #2

Frequency	Level	Pol	FCC Class B		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters		and mode
30.035	39.8	V	40.0	-0.2	Peak	329	1.7		960
30.013	36.7	V	40.0	-3.3	Peak	329	1.7		944
30.033	35.5	V	40.0	-4.5	Peak	360	1.7		928
1000.060	42.4	V	54.0	-11.6	Peak	272	1.7		960
49.999	28.3	V	40.0	-11.7	Peak	299	1.7		960
60.114	28.2	V	40.0	-11.8	Peak	329	1.7		944
50.080	28.0	V	40.0	-12.0	Peak	329	1.7		928
1000.060	41.1	V	54.0	-12.9	Peak	297	1.7		928
1000.030	40.2	V	54.0	-13.8	Peak	270	1.7		944
1625.050	40.2	V	54.0	-13.8	Peak	253	1.7		960
1625.050	40.1	V	54.0	-13.9	Peak	261	1.7		928
97.715	29.3	V	43.5	-14.2	Peak	329	1.7		944
1625.050	39.8	V	54.0	-14.2	Peak	255	1.7		944
1125.000	39.6	V	54.0	-14.4	Peak	60	1.7		944
97.675	27.4	V	43.5	-16.1	Peak	329	1.7		960
97.721	26.5	V	43.5	-17.0	Peak	329	1.7		928
120.282	25.7	V	43.5	-17.8	Peak	360	1.7		944
861.750	27.8	H	46.0	-18.2	Peak	203	1.7		928
861.750	27.8	V	46.0	-18.2	Peak	203	1.7		944
1500.020	35.8	V	54.0	-18.2	Peak	267	1.7		960
928.250	27.7	V	46.0	-18.3	Peak	238	1.7		928
928.250	27.7	V	46.0	-18.3	Peak	238	1.7		944
200.012	25.1	H	43.5	-18.4	Peak	329	1.7		928
200.007	25.0	V	43.5	-18.5	Peak	360	1.7		960
651.750	26.8	H	46.0	-19.2	Peak	177	1.7		960
200.002	24.2	V	43.5	-19.3	Peak	329	1.7		944

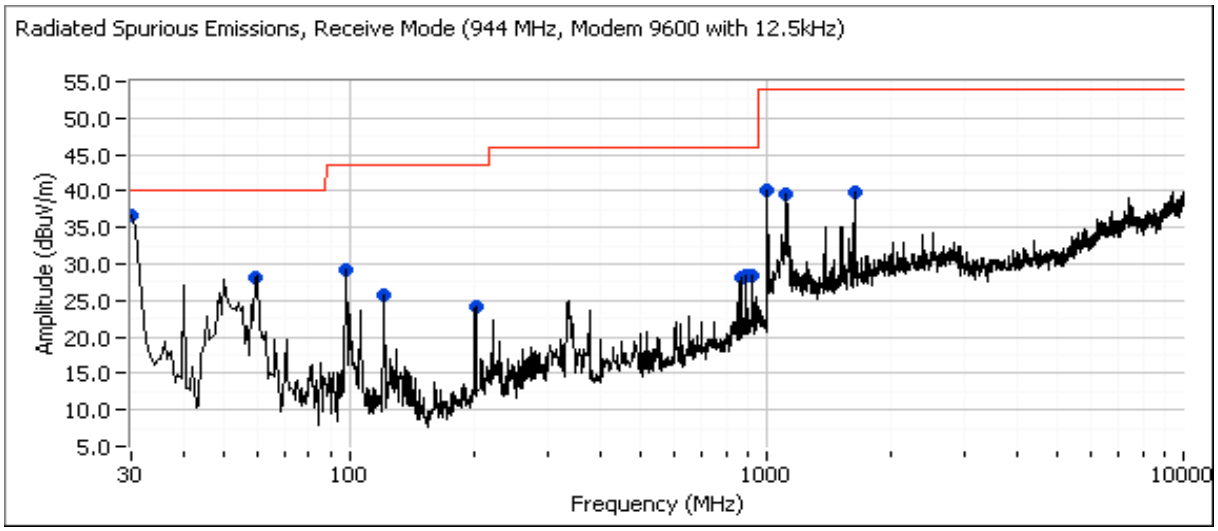
Note 1:	The field strength limit in the tables above was calculated from the erp/eirp limit detailed in the standard using the free space propagation equation: $E=\sqrt{(30PG)}/d$. This limit is conservative - it does not consider the presence of the ground plane and, for erp limits, the dipole gain (2.2dBi) has not been included. The erp or eirp for all signals with less than 10dB of margin relative to this field strength limit is determined using substitution measurements.

Client:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 101, RSS-119, FCC Part 15	Class:	N/A

Graph - Channel: 928 MHz, Mode: Modem 9600

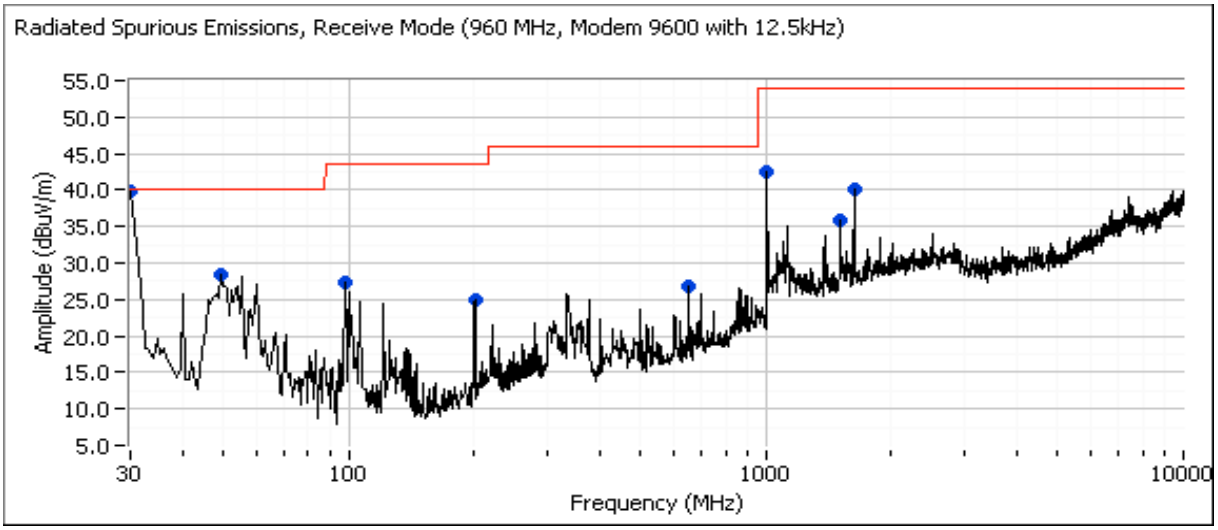


Graph - Channel: 944 MHz, Mode: Modem 9600



Client:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 101, RSS-119, FCC Part 15	Class:	N/A

Graph - Channel: 960 MHz, Mode: Modem 9600



Run #2: Radiated Spurious Emissions, Receive Mode: Final Field Strength

Date of Test: 6/25/2009
Test Engineer: Mehran Birgani
Test Location: SVOATS #1

Frequency MHz	Level dBµV/m	Pol V/H	FCC Part 101 Limit	FCC Part 101 Margin	Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments	Channel and mode
1000.050	47.7	V	72.4	-24.7	AVG	0	1.0		960
1124.980	38.0	V	72.4	-34.4	AVG	0	1.0		960
1625.030	27.8	V	72.4	-44.6	AVG	170	1.0		960
1000.050	50.3	V	72.4	-22.1	PK	0	1.0		960
1125.010	47.0	V	72.4	-25.4	PK	0	1.0		960
1625.220	36.1	V	72.4	-36.3	PK	170	1.0		960
30.035	26.5	V	40.0	-13.5	QP	273	1.0		960
49.999	30.6	V	40.0	-9.4	QP	90	1.0		960
50.080	32.8	V	40.0	-7.2	QP	30	1.0		928
60.114	31.8	V	40.0	-8.2	QP	0	1.0		944
97.715	33.1	V	43.5	-10.4	QP	15	1.1		944

Client:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 101, RSS-119, FCC Part 15	Class:	A

Conducted Emissions - Power Ports

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: 6/25/2009
Test Engineer: Mehran Birgani
Test Location: SVOATS #2

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

General Test Configuration

The EUT was located on a wooden table, 40 cm from a vertical coupling plane and 80cm from the LISN. Remote support equipment was located approximately 30 meters from the test area. All I/O connections were running on top of the groundplane.

Ambient Conditions:

Temperature: 25 °C
Rel. Humidity: 32 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power,120V/60Hz	EN 55022 Class B	Pass	40.9dBµV @ 2.748MHz (-5.1dB)

Modifications Made During Testing

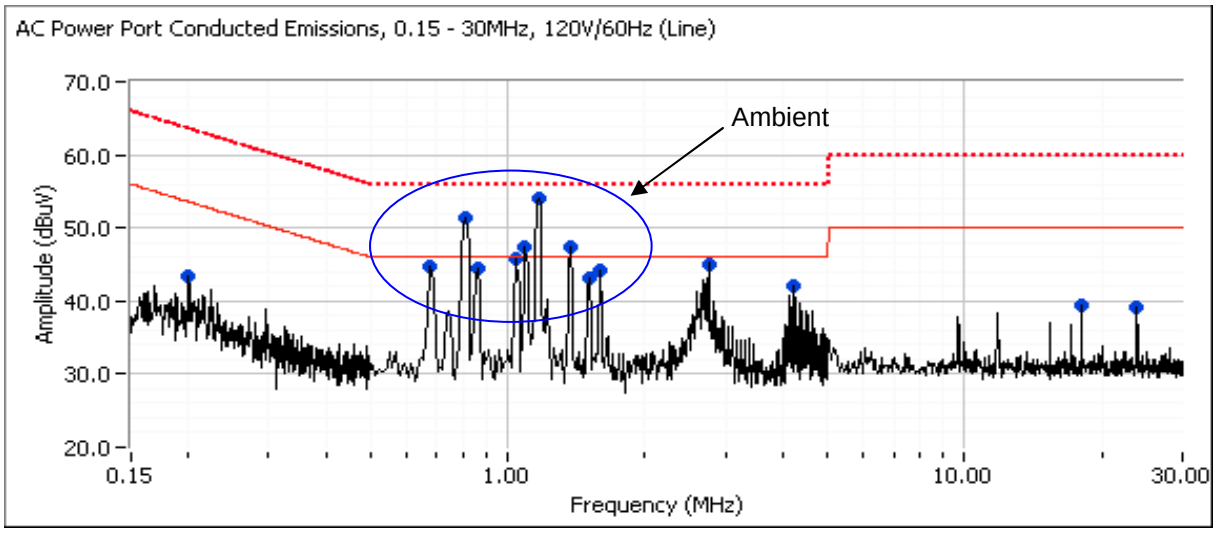
No modifications were made to the EUT during testing

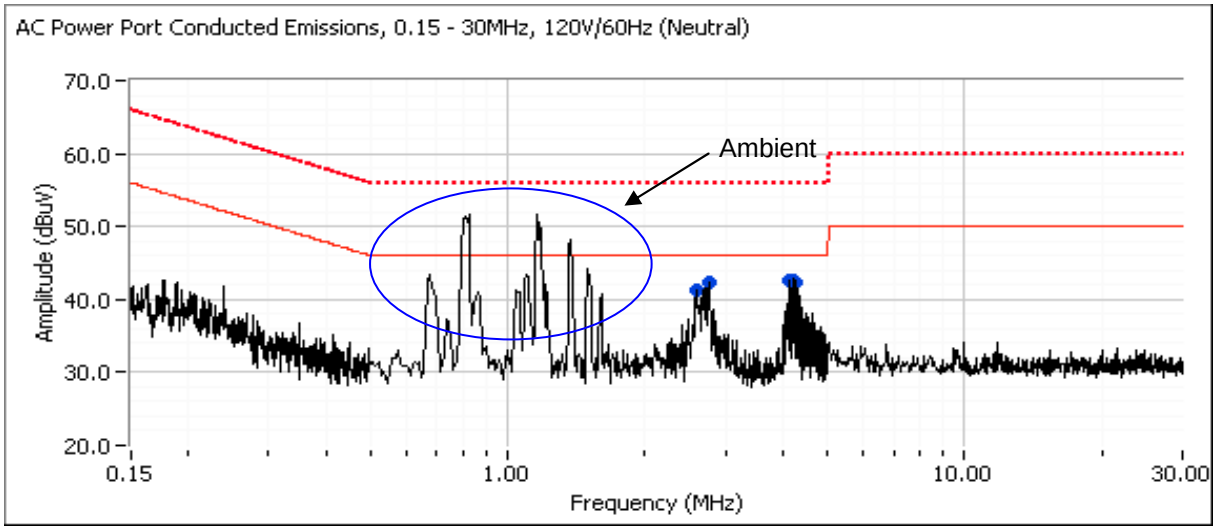
Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 101, RSS-119, FCC Part 15	Class:	A

Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz (EUT was transmiting at 37dBm and 944 MHz)





Client:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 101, RSS-119, FCC Part 15	Class:	A

Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz (EUT was transmiting at 37dBm and 944 MHz)

Frequency	Level	AC	EN55022 B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.200	4.3	Line	53.6	-49.3	AVG	AVG (0.100s)
2.579	36.1	Neutral	46.0	-9.9	AVG	AVG (0.100s)
2.747	36.4	Line	46.0	-9.6	AVG	AVG (0.100s)
2.748	40.9	Neutral	46.0	-5.1	AVG	AVG (0.100s)
4.120	31.9	Neutral	46.0	-14.1	AVG	AVG (0.100s)
4.188	37.7	Line	46.0	-8.3	AVG	AVG (0.100s)
4.188	37.7	Neutral	46.0	-8.3	AVG	AVG (0.100s)
4.261	36.6	Neutral	46.0	-9.4	AVG	AVG (0.100s)
18.227	6.6	Line	50.0	-43.4	AVG	AVG (0.100s)
23.898	32.6	Line	50.0	-17.4	AVG	AVG (0.100s)
0.200	13.6	Line	63.6	-50.0	QP	QP (1.000s)
2.579	37.8	Neutral	56.0	-18.2	QP	QP (1.000s)
2.747	39.2	Line	56.0	-16.8	QP	QP (1.000s)
2.748	42.3	Neutral	56.0	-13.7	QP	QP (1.000s)
4.120	37.5	Neutral	56.0	-18.5	QP	QP (1.000s)
4.188	40.8	Neutral	56.0	-15.2	QP	QP (1.000s)
4.188	40.1	Line	56.0	-15.9	QP	QP (1.000s)
4.261	37.6	Neutral	56.0	-18.4	QP	QP (1.000s)
18.227	12.6	Line	60.0	-47.4	QP	QP (1.000s)
23.898	36.3	Line	60.0	-23.7	QP	QP (1.000s)

Client:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 101, RSS-119, FCC Part 15	Class:	N/A

RSS GEN and FCC Part 15
Receiver 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

With the exception of the radiated spurious emissions tests, all measurements are made with the EUT's rf port connected to the measurement instrument via an attenuator or dc-block if necessary. All amplitude measurements are adjusted to account for the attenuation between EUT and measuring instrument. For frequency stability measurements the EUT was place inside an environmental chamber.

Radiated measurements are made with the EUT located on a non-conductive table, 3m from the measurement antenna.

Ambient Conditions:

Temperature: 21 °C
Rel. Humidity: 39 %

Summary of Results

Run #	Modem	CH Spacing	Test Performed	Limit	Pass / Fail	Result / Margin
1	9600	12.5 kHz	Spurious Emissions (conducted)	-57dBm	Pass	-62.1dBm @ 545.182MHz (-5.1dB)

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:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 101, RSS-119, FCC Part 15	Class:	N/A

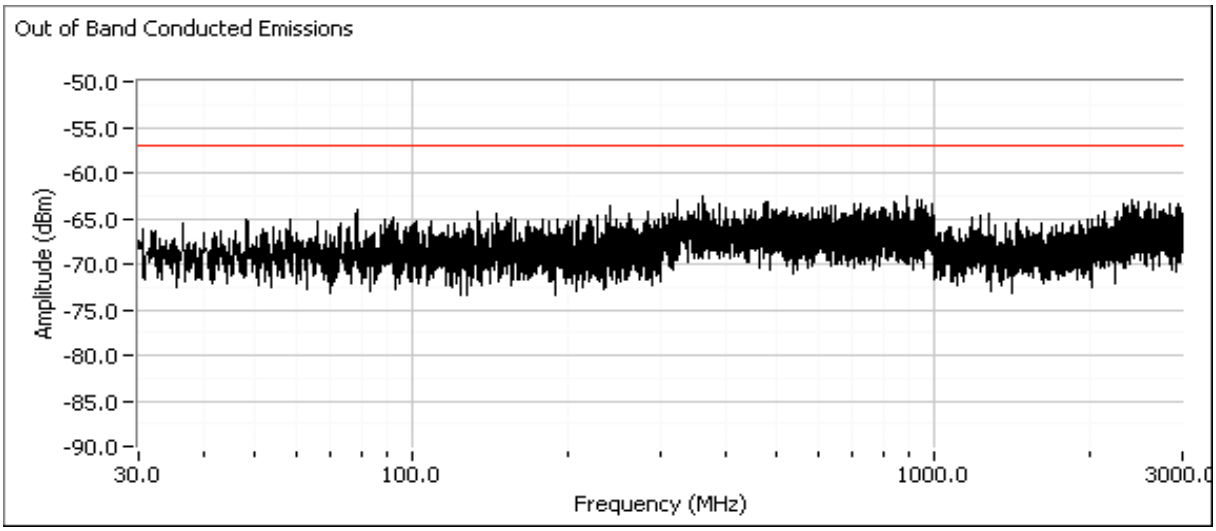
Run #1: Out of Band Spurious Emissions, Conducted

Date of Test: 6/24/2009
Test Engineer: Mehran Birgani
Test Location: Radio Lab

Frequency (MHz)	Limit	Result
928	-57dBm	Pass
944	-57dBm	Pass
960	-57dBm	Pass

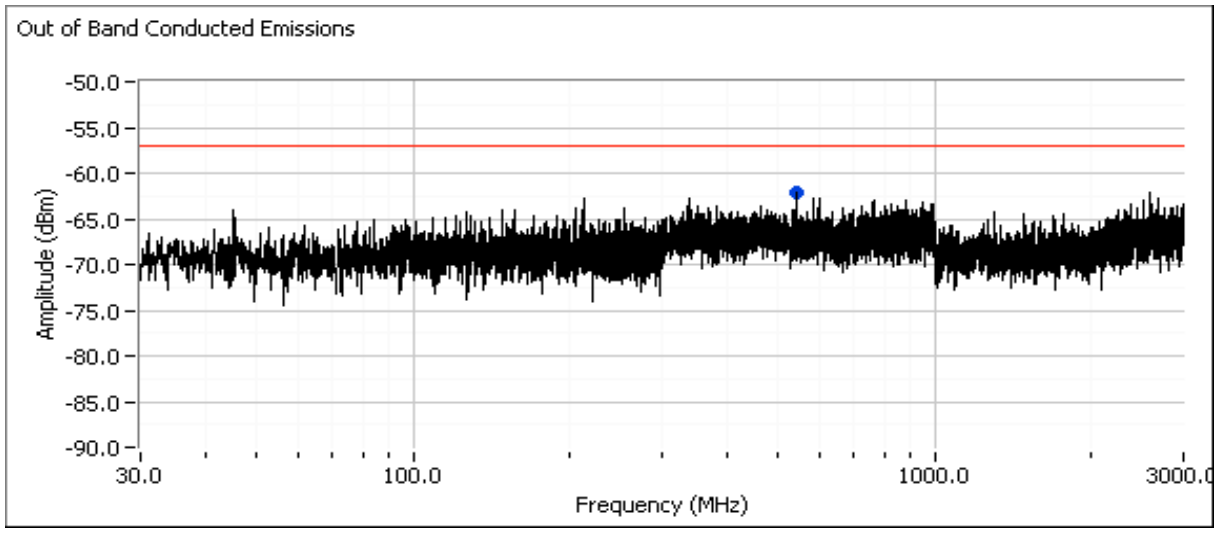
The limit is taken from FCC Part 15.111 and RSS-GEN

Plots for low channel



Client:	GE MDS LLC	Job Number:	J75790
Model:	SD9	T-Log Number:	T75896
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 101, RSS-119, FCC Part 15	Class:	N/A

Plots for center channel



Frequency	Level	Pol	FCC Part 15		Detector			Comments
MHz	dBµV/m	-	Limit	Margin	Pk/QP/Avg			
545.182	-62.1	RF Port	-57.0	-5.1	Peak			

Plots for high channel

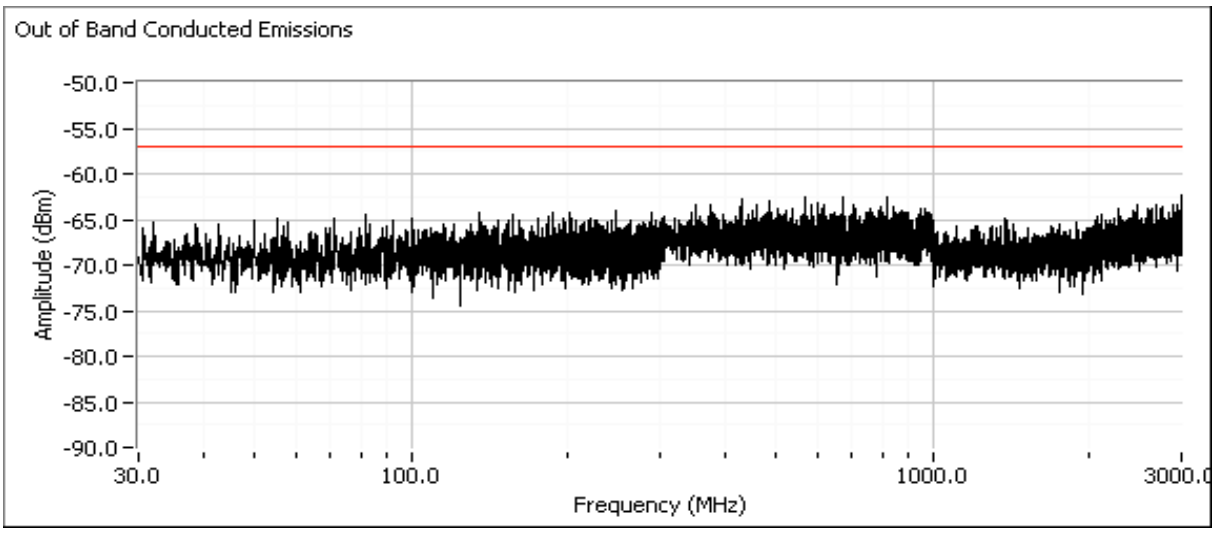


EXHIBIT 3: Test Configuration Photographs

Uploaded as A Separate Attachment

EXHIBIT 4: Theory of Operation GE MDS LLC Model SD9

Uploaded as A Separate Attachment

EXHIBIT 5: Proposed FCC ID Label & Label Location

Uploaded as A Separate Attachment

EXHIBIT 6: Detailed Photographs GE MDS LLC Model SD9

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EXHIBIT 7: Installation Guide GE MDS LLC Model SD9

Uploaded as A Separate Attachment

EXHIBIT 8: Block Diagram GE MDS LLC Model SD9

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EXHIBIT 9: Schematic Diagrams GE MDS LLC Model SD9

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EXHIBIT 10: RF Exposure

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