Radio Test Report

FCC Part 90
(896-901 MHz and 935-940 MHz)

Model: SD9

COMPANY:	GE MDS LLC 175 Science Parkway Rochester, NY 14620
TEST SITE(S):	Elliott Laboratories 41039 Boyce Road. Fremont, CA. 94538-2435
REPORT DATE:	October 20, 2011
FINAL TEST DATES:	September 21 and 26, 2011
TOTAL NUMBER OF PAGES:	45

PROGRAM MGR /
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Testing Cert #2016.01

REVISION HISTORY

Rev#	Date	Comments	Modified By
1		First release	

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SCOPE

Tests have been performed on the GE MDS LLC model SD9, pursuant to the relevant requirements of the following standard(s) in order to obtain device certification against the regulatory requirements of the Federal Communications Commission and Industry Canada.

- Code of Federal Regulations (CFR) Title 47 Part 2
- CFR 47 Part 90 (Private Land Mobile Radio Service) Subpart S

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 Elliott Laboratories test procedures:

ANSI C63.4:2003
ANSI TIA-603-C August 17, 2004

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

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.

The test results recorded herein are based on a single type test of the GE MDS LLC model SD9 and therefore apply only to the tested sample. The sample was selected and prepared by Dennis McCarthy of GE MDS LLC.

OBJECTIVE

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

Prior to marketing in the USA, the device requires certification. Prior to marketing in Canada, Class I transmitters, receivers and transceivers require certification.

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 GE MDS LLC model SD9 complied with the requirements of the standards and frequency bands declared in the scope of this test report.

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.

DEVIATIONS FROM THE STANDARDS

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

TEST RESULTS

FCC Part 90

FCC		Description	Measured	Limit	Result
Transmitter Modulation, output power and other characteristics					
§2.1033 (c) (5) § 90.613		Frequency range(s)	896-901/935-940	896-901/935-940	Complies
§2.1033 (c) (6) §2.1033 (c) (7) §2.1046 § 90.635		RF power output at the antenna terminals	20 dBm to 37 dBm	50 dBm	Complies
§2.1033 (c) (4) §2.1047 § 90.210		Emission types	F1D, F2D, F3D	-	-
		Emission mask	Within Mask	Mask J	Complies
§2.1049 § 90.209		Occupied Bandwidth	10.2 kHz	11 kHz	Complies
Transmitter spurious emissions					
§2.1051 §2.1057		At the antenna terminals	All > -20dBm	-20dBm	Complies
§2.1053 §2.1057		Field strength	All > 20dB below the limit	-20 dBm	Complies
Receiver spurious emissions					
15.109		Field strength	Same as original certification	See limit table on page 17	Complies
Other details					
§2.1055 § 90.213		Frequency stability	Same as original certification	0.17 ppm	Complies
§2.1093		RF Exposure	Same as original certification	0.62 mW/cm^2	Complies
§2.1033 (c) (8)		Final radio frequency amplifying circuit's dc voltages and currents for normal operation over the power range	Same as original certification	-	-
-	-	Antenna Gain	5, 10 or 16.5 dBi	-	-
Notes					

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 (based on a coverage factor (k=2) and were calculated in accordance with NAMAS document NIS 81 and M3003.

Measurement Type	Measurement Unit	Frequency Range	Expanded Uncertainty
RF frequency	Hz	25 to 7,000 MHz	1.7×10^{-7}
RF power, conducted	dBm	25 to 7,000 MHz	± 0.52 dB
Conducted emission of transmitter	dBm	25 to 40,000 MHz	± 0.7 dB
Conducted emission of receiver	dBm	25 to 40,000 MHz	± 0.7 dB
Radiated emission (substitution method)	dBm	25 to 40,000 MHz	± 2.5 dB
Radiated emission (field strength)	dBµV/m	25 to 1,000 MHz 1 to 40 GHz	± 3.6 dB ± 6.0 dB

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The GE MDS LLC model SD9 is an industrial radio operating in the 896-901, 928-930 and 935-940 MHz bands under Part 90, 928-960 MHz bands under Part 101 and 901-902, 930-931 and 940-941 MHz bands under FCC Part 24. 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 samples were received on September 21, 2011 and tested on September 21 and 26, 2011. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
GE MDS LLC	SD9	Industrial Radio	2124579	E5MDS-SD9
GE MDS LLC	SD9	Industrial Radio	2127726	E5MDS-SD9

OTHER EUT DETAILS

The radio can operate on 6.25, 12.5, 25 or 50 kHz channels (F1D, F2D and F3D modulations) depending on the licensed operation in the specific rule part.

EUT ANTENNA

The EUT antenna is determined at the time of licensing.

ENCLOSURE

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

MODIFICATIONS

No modifications were made to the EUT during the time the product was at Elliott.

SUPPORT EQUIPMENT

The following equipment was used as support equipment for testing:

Company	Model	Description	Serial Number	FCC ID
Winbook	Winbook XL	Computer	H1106677	-
Netgear	RP614v3	Network Switch	RP6114ADB03 9891	-

EUT INTERFACE PORTS

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

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Com2	Computer	Serial multiwire	Shielded	2
DC Power	Power Supply	Two wire	Unshielded	2
Ethernet	Network switch	Cat 5	Shielded	7

EUT OPERATION

During testing, the EUT was set to transmit continuously at the maximum power.

TESTING

GENERAL INFORMATION

Antenna port measurements were taken at the Elliott Laboratories test site located at 41039 Boyce Road, Fremont, CA 94538-2435.

Radiated spurious emissions measurements were taken at the Elliott Laboratories Anechoic Chambers and/or Open Area Test Site(s) listed below. The sites conform to the requirements of ANSI C63.4: 2003 *American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz* and CISPR 16-1-4:2007 - *Specification for radio disturbance and immunity measuring apparatus and methods Part 1-4: Radio disturbance and immunity measuring apparatus Ancillary equipment Radiated disturbances*. They are on file with the FCC and industry Canada.

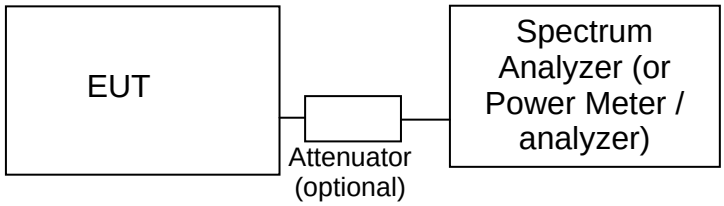
Site	Registration Numbers		Location
	FCC	Canada	
Chamber 7	A2LA Accredited	IC 2845B-7	41039 Boyce Road Fremont, CA 94538-2435

In the case of Open Area Test Sites, ambient levels are at least 6 dB below the specification limits with the exception of predictable local TV, radio, and mobile communications traffic.

Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements.

RF PORT MEASUREMENT PROCEDURES

Conducted measurements are performed with the EUT's rf input/output connected to the input of a spectrum analyzer, power meter or modulation analyzer. When required an attenuator, filter and/or dc block is placed between the EUT and the spectrum analyzer to avoid overloading the front end of the measurement device. Measurements are corrected for the insertion loss of the attenuators and cables inserted between the rf port of the EUT and the measurement equipment.



Test Configuration for Antenna Port Measurements

For devices with an integral antenna the output power and spurious emissions are measured as a field strength at a test distance of (typically) 3m and then converted to an eirp using a substitution measurement (refer to RADIATED EMISSIONS MEASUREMENTS). All other measurements are made as detailed below but with the test equipment connected to a measurement antenna directed at the EUT.

OUTPUT POWER

Output power is measured using a power meter and an average sensor head, a spectrum analyzer or a power meter and peak power sensor head as required by the relevant rule part(s). Where necessary measurements are gated to ensure power is only measured over periods that the device is transmitting.

Power measurements made directly on the rf power port are, when appropriate, converted to an EIRP by adding the gain of the highest gain antenna that can be used with the device under test, as specified by the manufacturer.

BANDWIDTH MEASUREMENTS

The 6dB, 20dB and/or 26dB signal bandwidth is measured in using the bandwidths recommended by ANSI C63.4. When required, the 99% bandwidth is measured using the methods detailed in RSS GEN. The measurement bandwidth is set to be at least 1% of the instrument's frequency span.

CONDUCTED SPURIOUS EMISSIONS

Initial scans are made using a peak detector (RBW=VBW) and using scan rates to ensure that the EUT transmits before the sweep moves out of each resolution bandwidth (for transmit mode measurements). Where the limits are expressed as an average power the spectrum analyzer is tunes to that frequency with a narrow span (wide enough to capture the emission and its sidebands) and the resolution and video bandwidths are adjusted as required by the reference measurement standards. For transmitter measurements the appropriate detector (average, peak, normal ,sample, quasi-peak) is used when making measurements for licensed devices. For receiver conducted spurious measurements the detector is set to peak.

TRANSMITTER MASK MEASUREMENTS

The transmitter mask measurements are made using resolution bandwidths as specified in the pertinent rule part(s). Where narrower bandwidths are used the measurement is corrected to account for the reduced bandwidth by either using the adjacent channel power function of the spectrum analyzer to sum the power across the required measurement bandwidth. The frequency span of the analyzer is set to ensure the fundamental signal and all significant sidebands are displayed.

The top of the mask may be set by the total output power of the signal, the power of the unmodulated signal or the peak value of the signal in the reference bandwidth being used for the mask measurement.

FREQUENCY STABILITY

The EUT is placed inside a temperature chamber with all support and test equipment located outside of the chamber. The temperature is varied across the specified frequency range in 10 degree increments with frequency measurements made at each temperature step. The EUT is allowed enough time to stabilize at each temperature variation.

The spectrum analyzer is configured to give a 5- or 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. Where possible the device is set to transmit an unmodulated signal. Where this is not possible the frequency drift is determined by finding a stable point on the signal (e.g. the null at the centre of an OFDM signal) or by calculating a centre frequency based on the upper and lower XdB points (where X is typically 6dB or 10dB) on the signal’s skirts.

TRANSIENT FREQUENCY BEHAVIOR:

The TIA/EIA 603 procedure is used to determine compliance with transient frequency timing requirements as the radio is keyed on and off.

The EUTs rf output is connected via a combiner/splitter to the test receiver/spectrum analyzer and to a diode detector. The test receiver or spectrum analyzer video output is connected to an oscilloscope, which is triggered by the output from the diode detector.

Plots showing Ton, T1, and T2 are made when turning on the transmitter and showing T3 when turning off the transmitter.

RADIATED EMISSIONS MEASUREMENTS

Receiver radiated spurious emissions measurements are made in accordance with ANSI ANSI C63.4:2003 by measuring the field strength of the emissions from the device at a specific test distance and comparing them to a field strength limit. Where the field strength limit is specified at a longer distance than the measurement distance the measurement is extrapolated to the limit distance.

Transmitter radiated spurious emissions are initially measured as a field strength. The eirp or erp limit as specified in the relevant rule part(s) is converted to a field strength at the test distance and the emissions from the EUT are then compared to that limit. Emissions within 20dB of this limit are the subjected to a substitution measurement.

All radiated emissions measurements are performed in two phases. A preliminary scan of emissions is conducted in either an anechoic chamber or on an OATS during which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed across the complete frequency range of interest and at each operating frequency identified in the reference standard. One or more of these is with the antenna polarized vertically while the one or more of these is with the antenna polarized horizontally. Initial scans are made using a peak detector (RBW=VBW) and using scan rates to ensure that the EUT transmits before the sweep moves out of each resolution bandwidth (for transmit mode).

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 transmitter spurious emissions, where the limit is expressed as an effective radiated power, the eirp or erp is converted to a field strength limit.

Final measurements are made on an OATS or in a semi-anechoic chamber at the significant frequencies observed during the preliminary scan(s) using the same process of rotating the EUT and raising/lowering the measurement antenna to find the highest level of the emission. The field strength is recorded and, for receiver spurious emissions, compared to the field strength limit. For the final measurement the appropriate detectors (average, peak, normal, sample, quasi-peak) are used. For receiver measurements below 1GHz the detector is a Quasi-Peak detector, above 1GHz a peak detector is used and the peak value (RB=VB=1MHz) and average value (RB=1MHz, VB=10Hz) are recorded.

For transmitter spurious emissions, the radiated power of all emissions within 20dB of the calculated field strength limit are determined using a substitution measurement. The substitution measurement is made by replacing the EUT with an antenna of known gain (typically a dipole antenna or a double-ridged horn antenna), connected to a signal source. The output power of the signal generator is adjusted until the maximum field strength from the substitution antenna is similar to the field strength recorded from the EUT. The erp of the EUT is then calculated.

INSTRUMENTATION

An EMI receiver as specified in CISPR 16-1-1 is used for radiated emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 7000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary.

For measurements above the frequency range of the receivers and for all conducted measurements a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis.

Measurement bandwidths for the test instruments are set in accordance with the requirements of the standards referenced in this document.

Software control is used to correct the measurements for transducer factors (e.g. antenna) and the insertion loss of cables, attenuators and other series elements to obtain the final measurement value. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are exported in a graphic and/or tabular format, as appropriate.

FILTERS/ATTENUATORS

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

ANTENNAS

A combination of biconical, log periodic or bi-log antennas are used to cover the range from 30 MHz to 1000 MHz. Broadband antennas or tuned dipole antennas are used over the entire 25 to 1000 MHz frequency range as the reference antenna for substitution measurements.

Above 1000 MHz, a dual-ridge guide horn antenna or octave horn antenna are used as reference and measurement antennas.

The antenna calibration factors are included in site factors that are programmed into the test receivers and instrument control software when measuring the radiated field strength.

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.

Table mounted devices are placed on a non-conductive table at a height of 80 centimeters above the floor. Floor mounted equipment is 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. The EUT is positioned on a motorized turntable to allow it to be rotated during testing to determine the angel with the highest level of emissions.

SAMPLE CALCULATIONS

SAMPLE CALCULATIONS - CONDUCTED SPURIOUS EMISSIONS

Measurements are compared directly to the conducted emissions specification limit (decibel form). The calculation is as follows:

$$R_r - S = M$$

where:

R_r = Measured value in dBm
S = Specification Limit in dBm
M = Margin to Specification in +/- dB

SAMPLE CALCULATIONS –RADIATED FIELD STRENGTH

Measurements of radiated field strength are compared directly to the specification limit (decibel form). The receiver and/or control software 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 is sued when measurements are made at a test distance that is different to the specified limit distance 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:

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

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 –RADIATED POWER

The erp/eirp limits for transmitter spurious measurements are converted to a field strength in free space using the following formula:

$$E = \frac{\sqrt{30\ P\ G}}{d}$$

where:

E = Field Strength in V/m
P = Power in Watts
G = Gain of isotropic antenna (numeric gain) = 1
D = measurement distance in meters

The field strength limit is then converted to decibel form (dBuV/m) and the margin of a given emission peak relative to the limit is calculated (refer to *SAMPLE CALCULATIONS –RADIATED FIELD STRENGTH*).

When substitution measurements are required (all signals with less than 20dB of margin relative to the calculated field strength limit) the eirp of the spurious emission is calculated using:

$$P_{EUT} = P_S - (E_S - E_{EUT})$$

and

$$P_S = G + P_{in}$$

where:

P_S = effective isotropic radiated power of the substitution antenna (dBm)
P_{in} = power input to the substitution antenna (dBm)
G = gain of the substitution antenna (dBi)
E_S = field strength the substitution antenna (dBm) at eirp P_S
E_{EUT} = field strength measured from the EUT

Where necessary the effective isotropic radiated power is converted to effective radiated power by subtracting the gain of a dipole (2.2dBi) from the eirp value.

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

Appendix A Test Equipment Calibration Data

Radio Antenna Port (Power and Spurious Emissions), 21-Sep-11
Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
Agilent	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	26-Jan-12

Radiated Emissions, 30 - 1,000 MHz, 26-Sep-11
Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	EMC Spectrum Analyzer, 9 KHz - 22 GHz	8593EM	1319	22-Nov-11
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1548	24-Jun-12
Com-Power Corp.	Preamplifier, 30-1000 MHz	PA-103	1632	29-Apr-12

Radiated Emissions, 30 - 10,000 MHz, 5-Oct-11
Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	15-Aug-12
Narda West	High Pass Filter 1.9 GHz	HPF-161	248	23-Mar-12
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	08-Dec-11
EMCO	Antenna, Horn, 1-18 GHz	3115	487	06-Jul-12

Appendix B Test Data

T84737 Pages 20 - 44

Client:	GE MDS LLC	Job Number:	J84685
Model:	SD9	T-Log Number:	T84737
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		-
Emissions Standard(s):	FCC Parts 24, 90 and 101	Class:	-
Immunity Standard(s):	-	Environment:	Radio

EMC Test Data

For The

GE MDS LLC

Model

SD9

Date of Last Test: 10/5/2011

Client:	GE MDS LLC	Job Number:	J84685
Model:	SD9	T-Log Number:	T84737
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 24, 90 and 101	Class:	N/A

FCC Part 24 and 90

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: 18-23 °C
Rel. Humidity: 30-40 %

Summary of Results

Run #	Spacing	Data Rate	Test Performed	Limit	Pass / Fail	Result / Margin
1	50kHz	65000N	Output Power		PASS	37.3dBm (5.4W)
2	-	-	Spectral Mask		PASS	Refer to plots
3	-	-	99% or Occupied Bandwidth		-	Refer to table
4	-	-	Spurious Emissions (conducted)		PASS	Refer to plots
5	-	-	Spurious Emissions (Ratiated)		PASS	>20dB below limit

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:	J84685
Model:	SD9	T-Log Number:	T84737
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 24, 90 and 101	Class:	N/A

Run #1: Output Power

Date: 9/21/2011 Engineer: Mehran Birgani Location: Lab #4

Cable Loss: 0.2 dB Attenuator: 30.0 dB Total Loss: 30.2 dB

Cable ID(s): Attenuator IDs: 1878

Modem 9600 for 12.5kHz

Power Setting[2]	Frequency (MHz)	Output Power (dBm)[1]	W	Power Setting[2]	Frequency (MHz)	Output Power (dBm)[1]	W
37	896.000	36.9	4.9	20	896.000	19.4	0.1
37	901.000	36.7	4.7	20	901.000	19.6	0.1

Modem 9600 for 12.5kHz

Power Setting[2]	Frequency (MHz)	Output Power (dBm)[1]	W	Power Setting[2]	Frequency (MHz)	Output Power (dBm)[1]	W
37	935.000	37.0	5.0	20	935.000	19.0	0.1
37	940.000	36.9	4.9	20	940.000	18.3	0.1

Modem 65000N for 50kHz

Power Setting[2]	Frequency (MHz)	Output Power (dBm)[1]	W	Power Setting[2]	Frequency (MHz)	Output Power (dBm)[1]	W
36	901.500	37.3	5.4	20	901.500	21.2	0.1

Note 1:	Output power measured using a spectrum analyzer with RBW=1MHz, VB=3MHz, Peak detector
Note 2:	Power setting - the software power setting used during testing, included for reference only.

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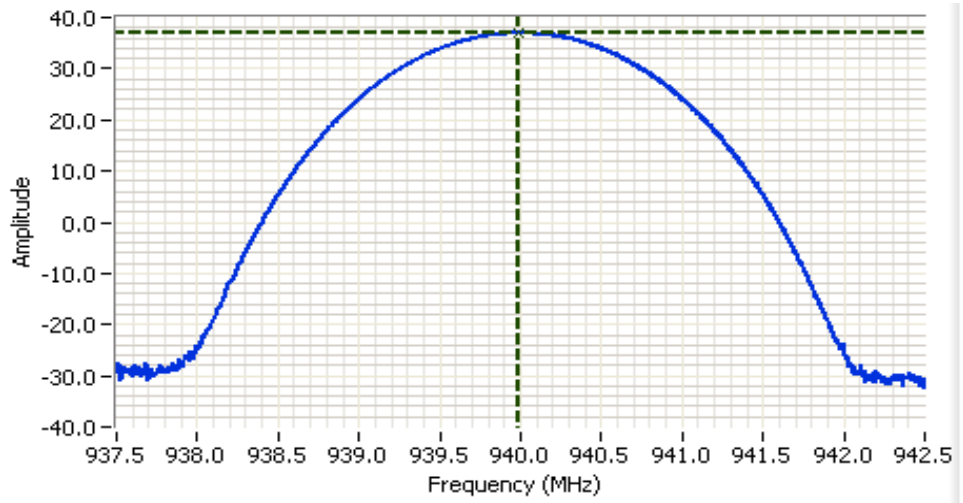
Standard:	FCC Parts 24, 90 and 101	Class:	N/A

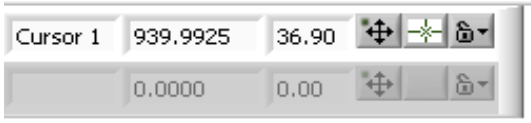


Analyzer Settings

Agilent Technologies, E4446A
CF: 940.000 MHz
SPAN: 5.000 MHz
RB: 1.000 MHz
VB: 3.000 MHz
Detector: POS
Attn: 20 DB
RL Offset: 30.2 DB
Sweep Time: 1.1ms
Ref Lvl: 40.2 DBM

Comments

Power 37 dBm



Elliott

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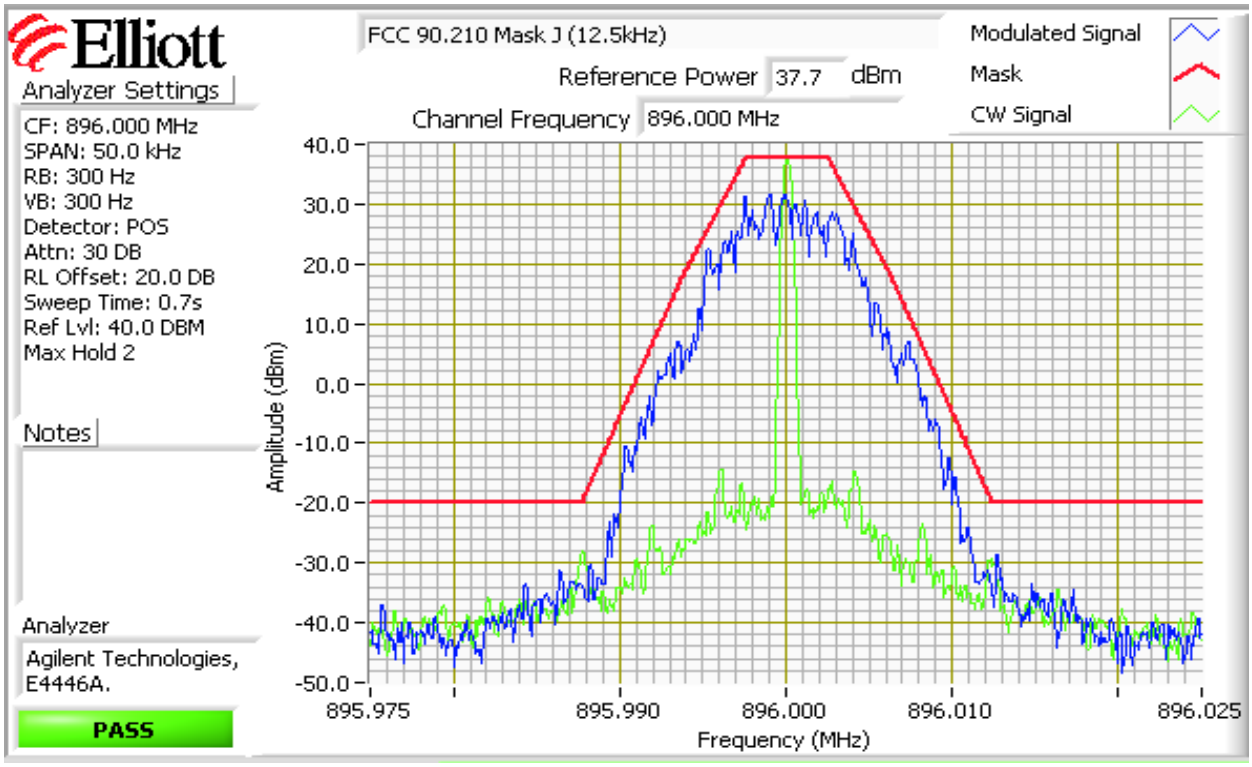
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 24, 90 and 101	Class:	N/A

Run #2: Spectral Mask, FCC Part 90.210 Mask J, FCC Part 24.133 (a)(1) and 24.133 (a)(2)

Date: 9/21/2011 Engineer: Mehran Birgani Location: Lab #4



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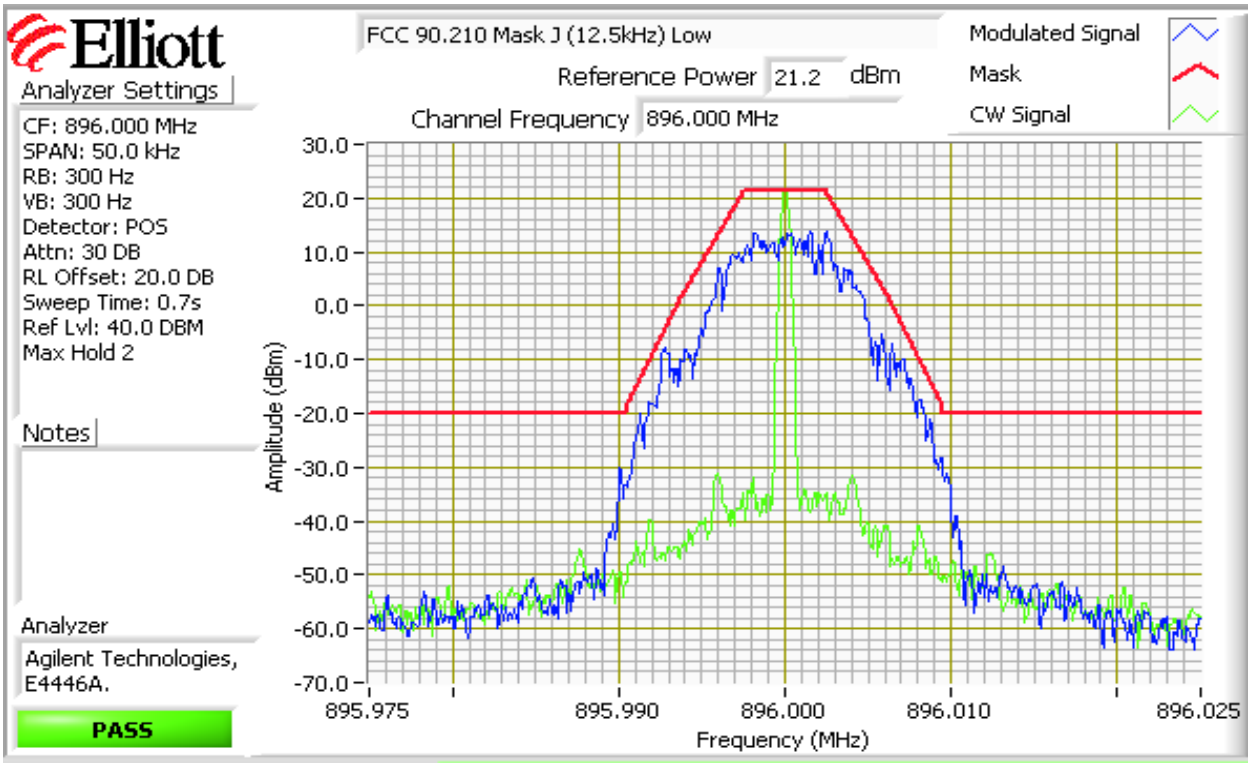

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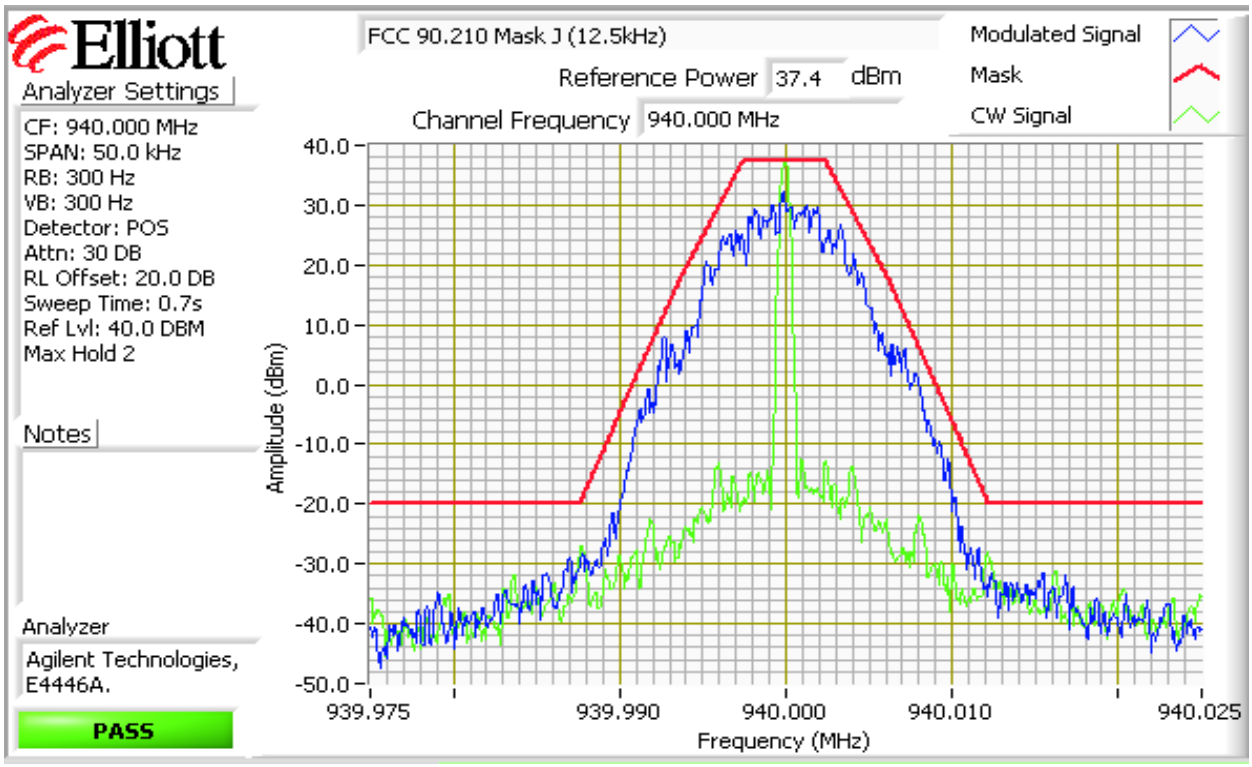
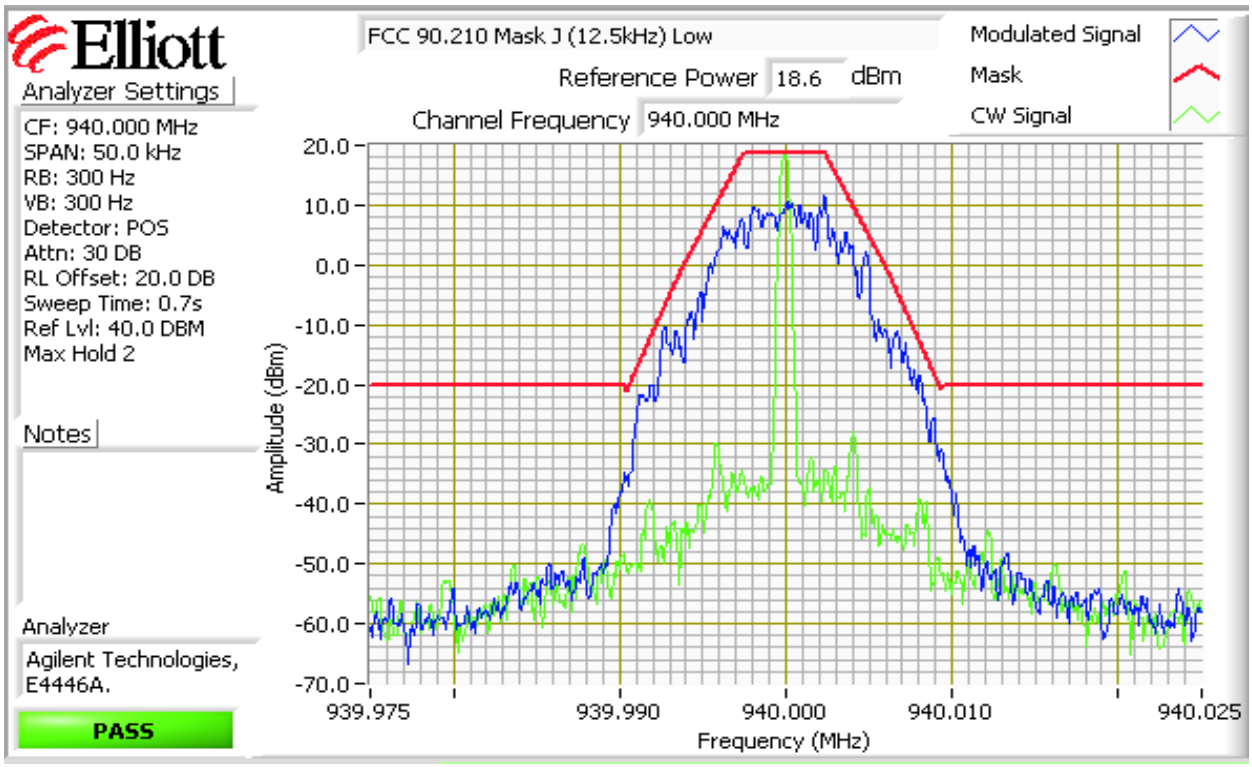
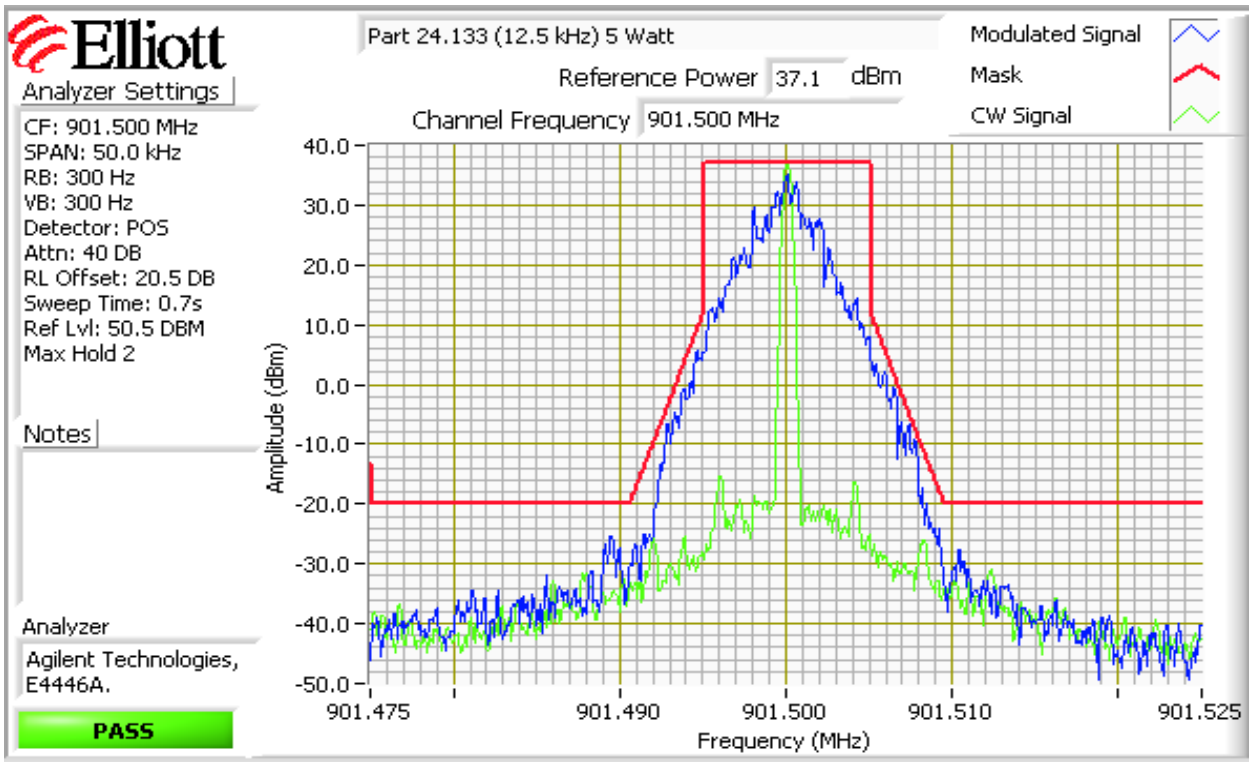
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 24, 90 and 101	Class:	N/A



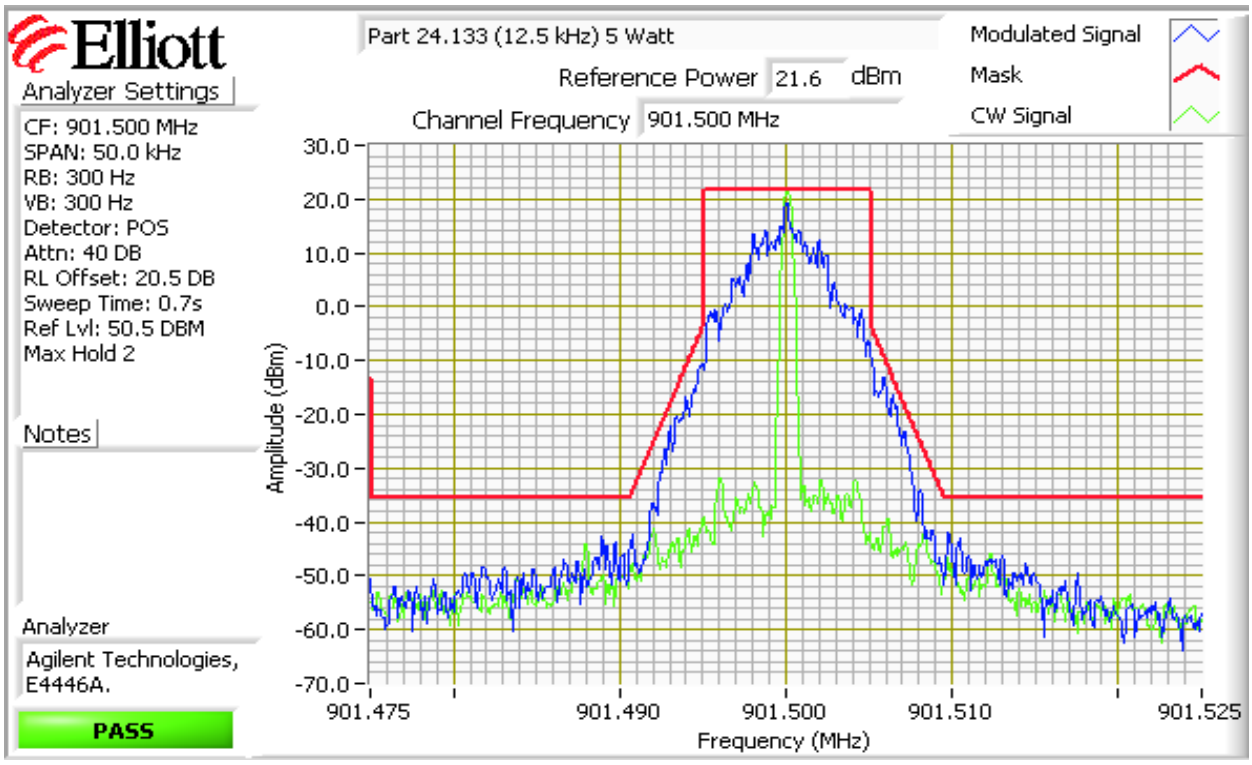
Client:	GE MDS LLC	Job Number:	J84685
Model:	SD9	T-Log Number:	T84737
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 24, 90 and 101	Class:	N/A



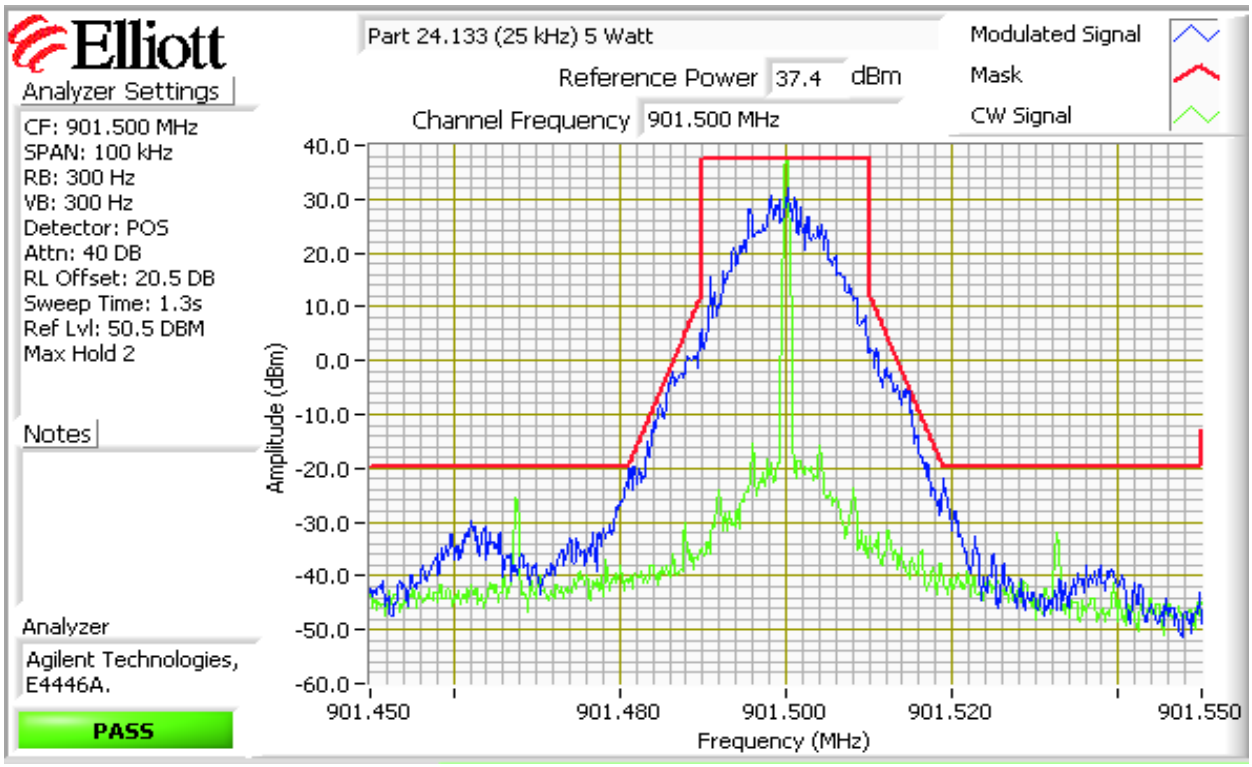
Client:	GE MDS LLC	Job Number:	J84685
Model:	SD9	T-Log Number:	T84737
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 24, 90 and 101	Class:	N/A



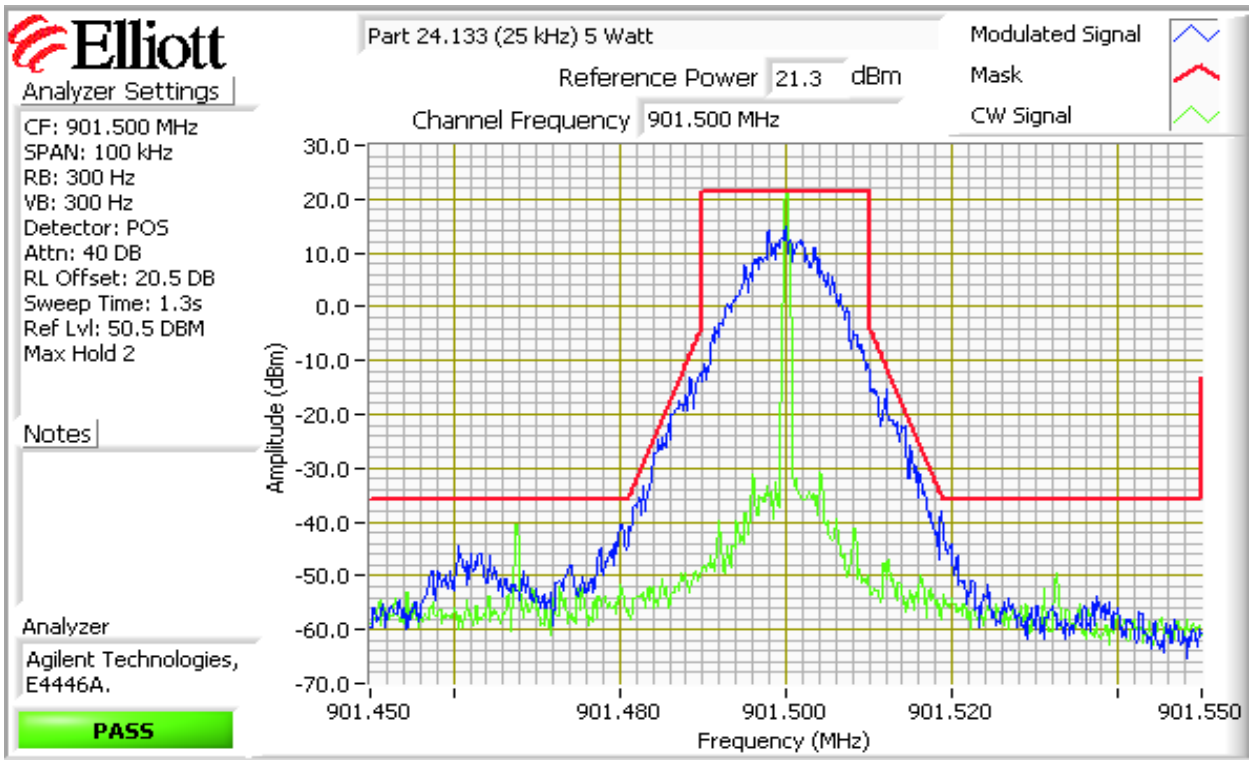
Client:	GE MDS LLC	Job Number:	J84685
Model:	SD9	T-Log Number:	T84737
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 24, 90 and 101	Class:	N/A



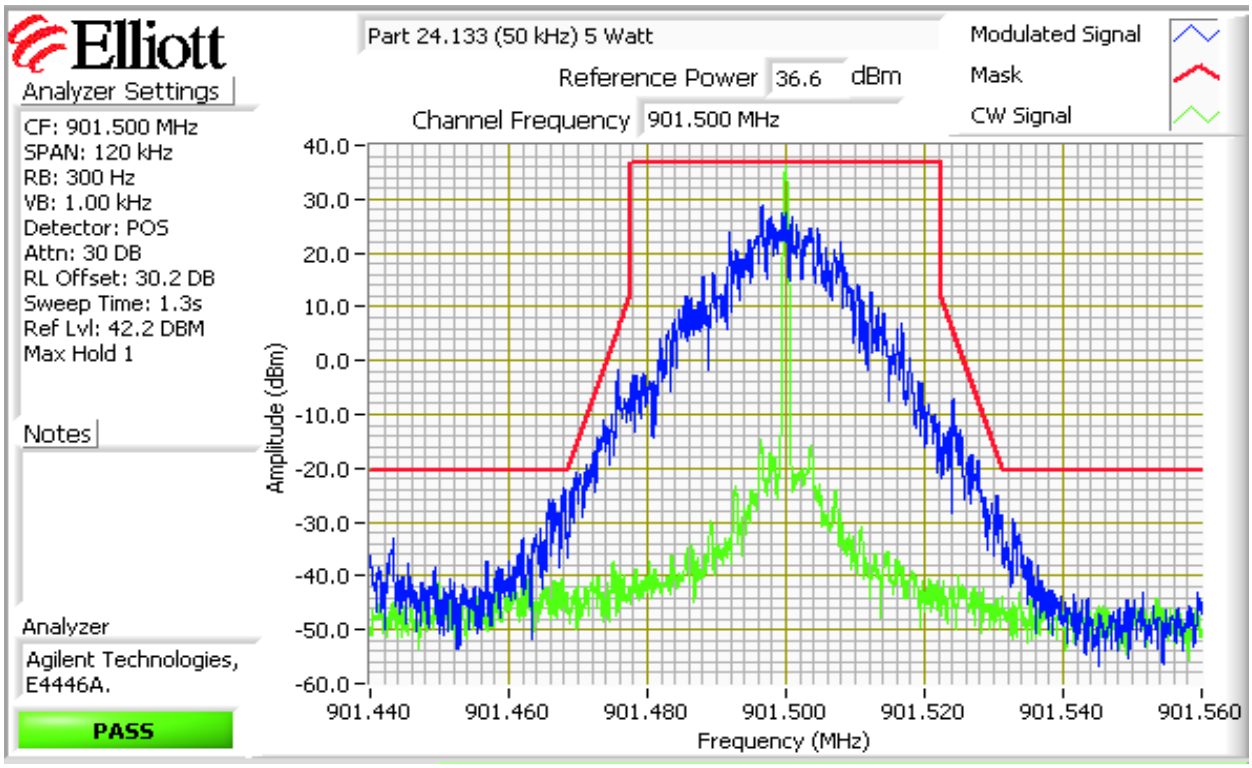
Client:	GE MDS LLC	Job Number:	J84685
Model:	SD9	T-Log Number:	T84737
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 24, 90 and 101	Class:	N/A



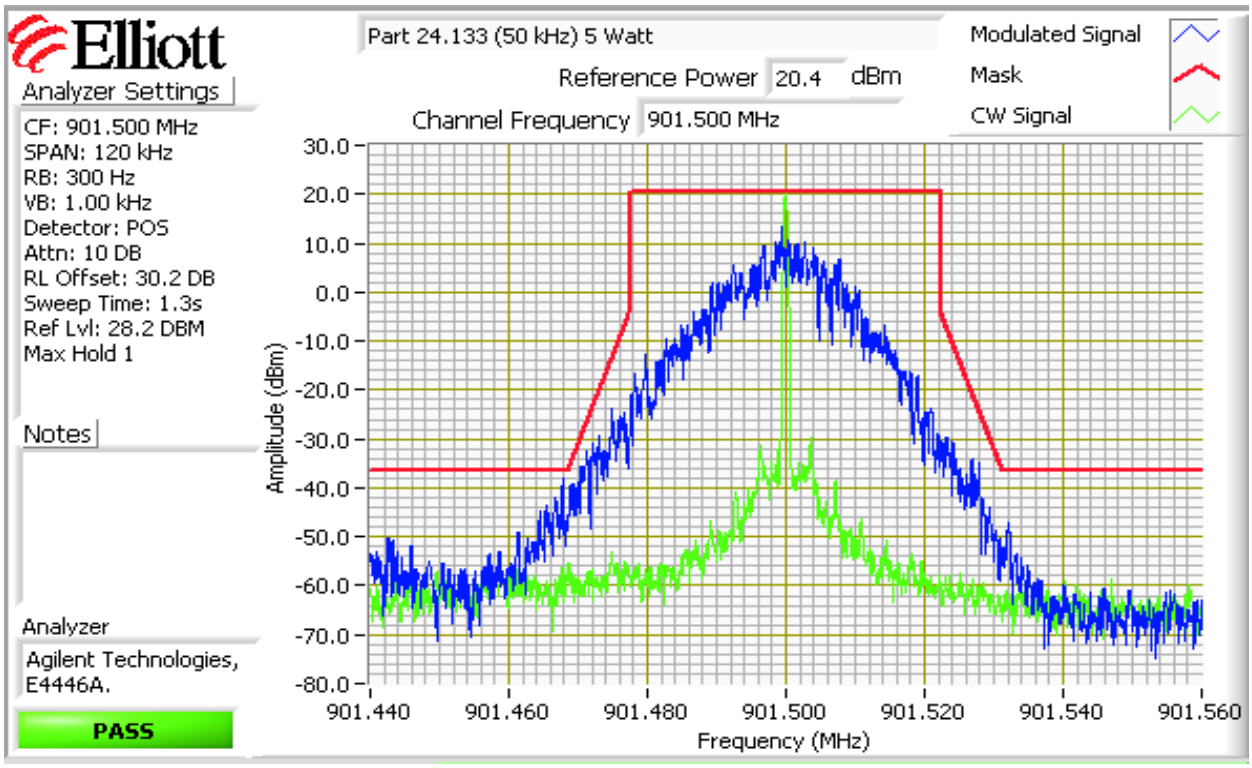
Client:	GE MDS LLC	Job Number:	J84685
Model:	SD9	T-Log Number:	T84737
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 24, 90 and 101	Class:	N/A



Client:	GE MDS LLC	Job Number:	J84685
Model:	SD9	T-Log Number:	T84737
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 24, 90 and 101	Class:	N/A



Client:	GE MDS LLC	Job Number:	J84685
Model:	SD9	T-Log Number:	T84737
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 24, 90 and 101	Class:	N/A



Client:	GE MDS LLC	Job Number:	J84685
Model:	SD9	T-Log Number:	T84737
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 24, 90 and 101	Class:	N/A

Run #3: Signal Bandwidth

Date: 9/21/2011 Engineer: Mehran Birgani Location: Lab #4

Run #3a: Signal Bandwidth (12.5 kHz channels)

Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (kHz) 26dB	99%
37	896	1 kHz		9.8
37	901	1 kHz		9.9
37	935	1 kHz		10.2
37	940	1 kHz		10.1
36	901.5	1 kHz		7.2

Run #3b: Signal Bandwidth (25 kHz channels)

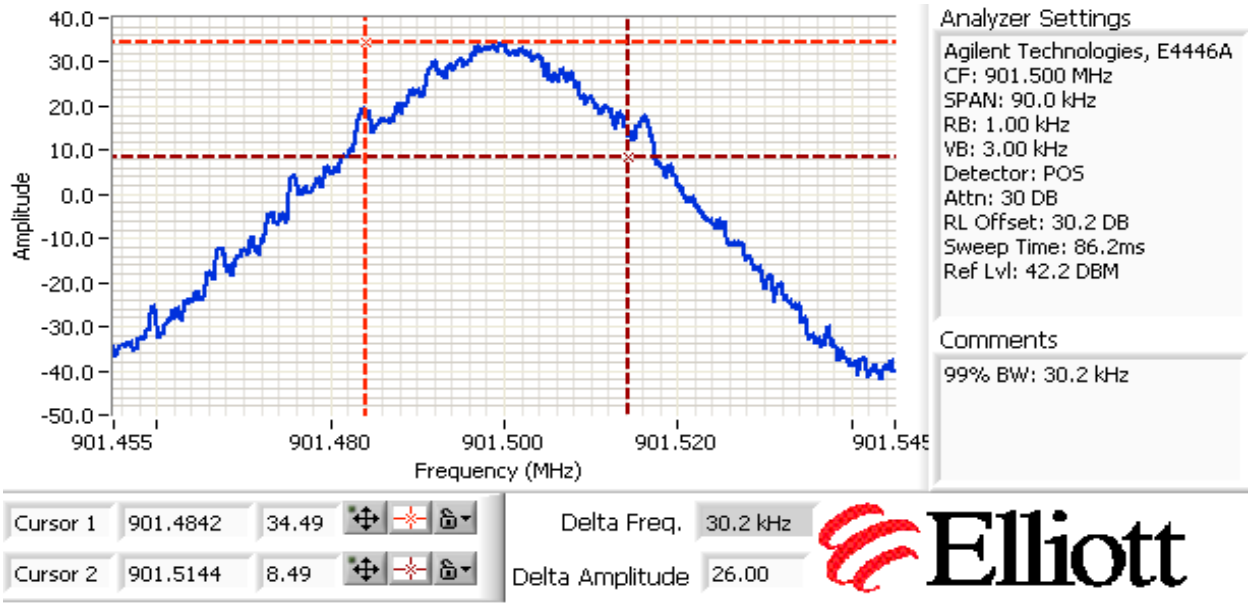
Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (kHz) 26dB	99%
36	901.5	1 kHz		16.2

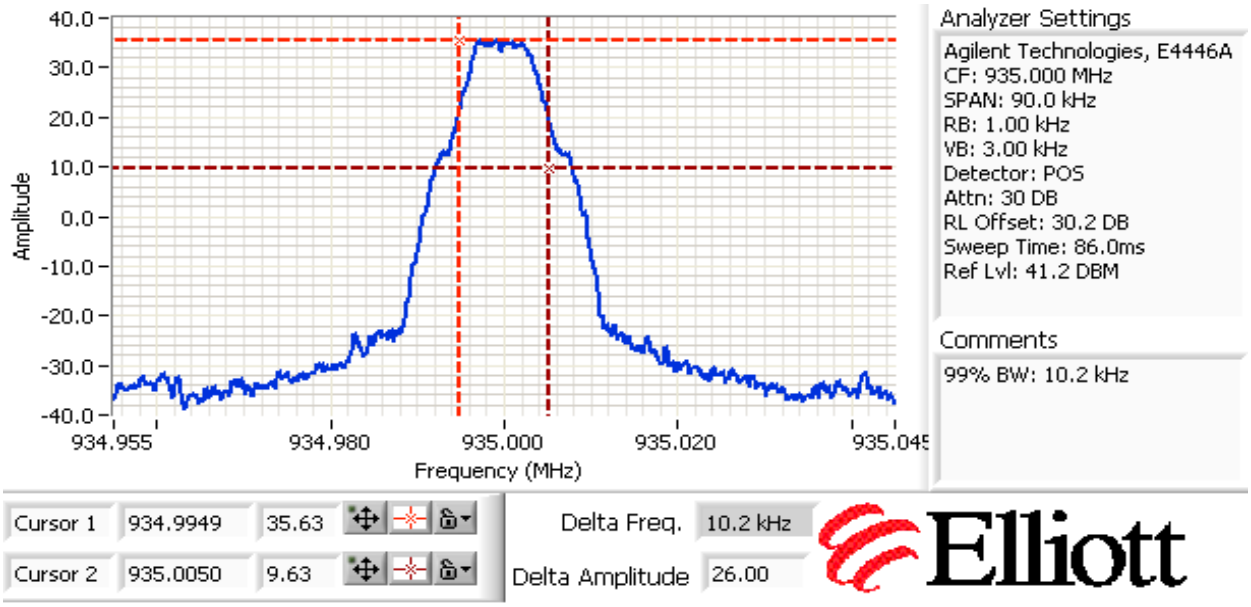
Run #3c: Signal Bandwidth (50 kHz channels)

Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (kHz) 26dB	99%
36	901.5	1 kHz		30.2

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

Client:	GE MDS LLC	Job Number:	J84685
Model:	SD9	T-Log Number:	T84737
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 24, 90 and 101	Class:	N/A





Client:	GE MDS LLC	Job Number:	J84685
Model:	SD9	T-Log Number:	T84737
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 24, 90 and 101	Class:	N/A

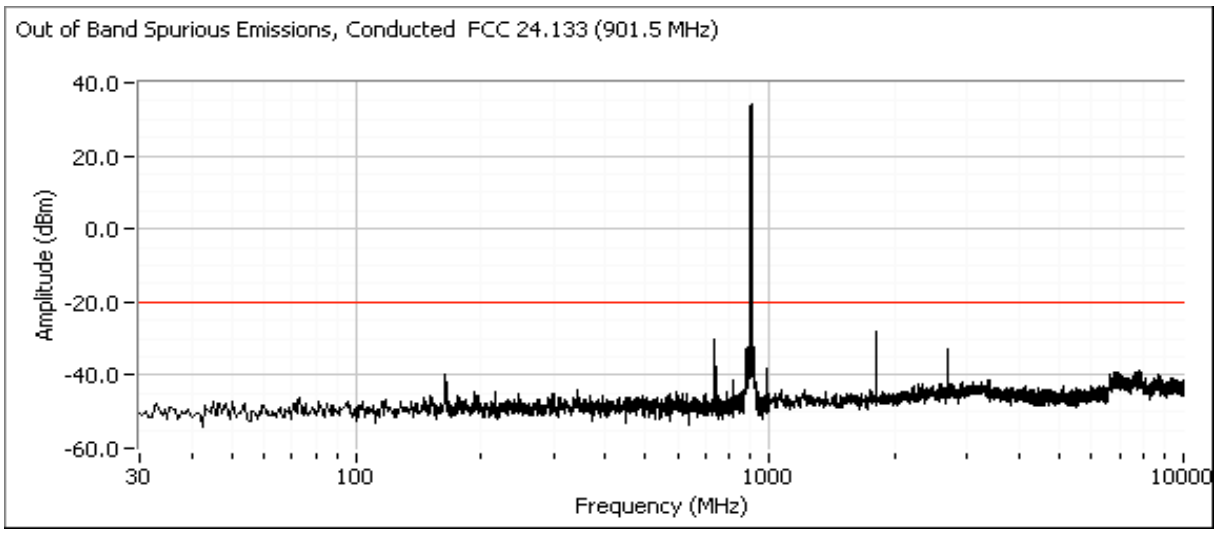
Run #4: Out of Band Spurious Emissions, Conducted

Date: 9/21/2011 Engineer: Mehran Birgani Location: Lab #4

Frequency (MHz)	Limit	Result
896	-20dBm	PASS
901	-20dBm	PASS
935	-20dBm	PASS
940	-20dBm	PASS
901.5	-20dBm	PASS

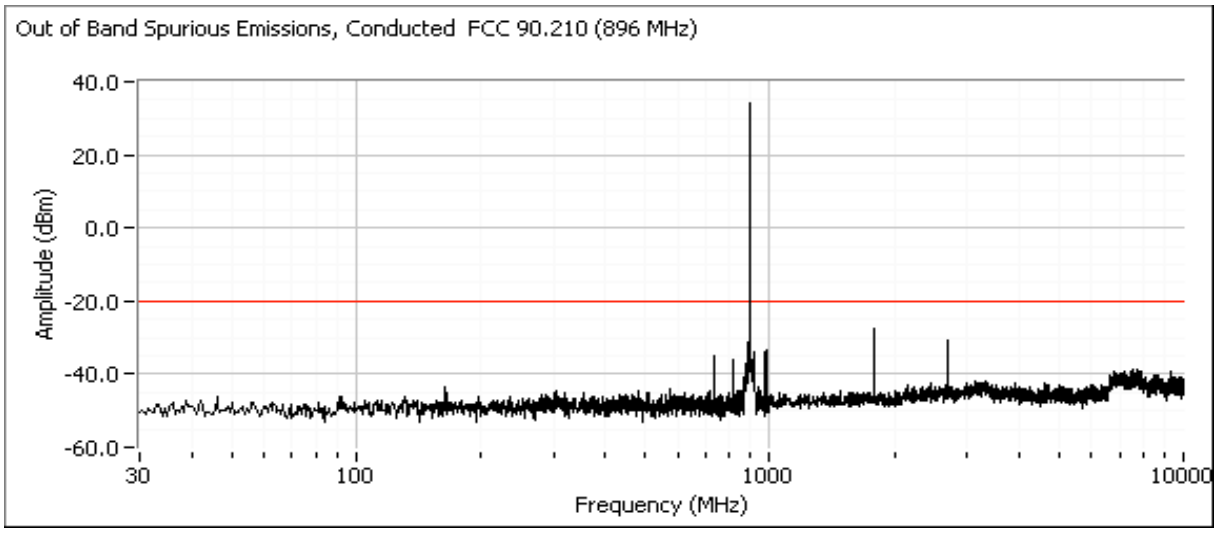
The limit is taken from FCC Part 24.133

Plots for Part 24, power setting(s) = 36

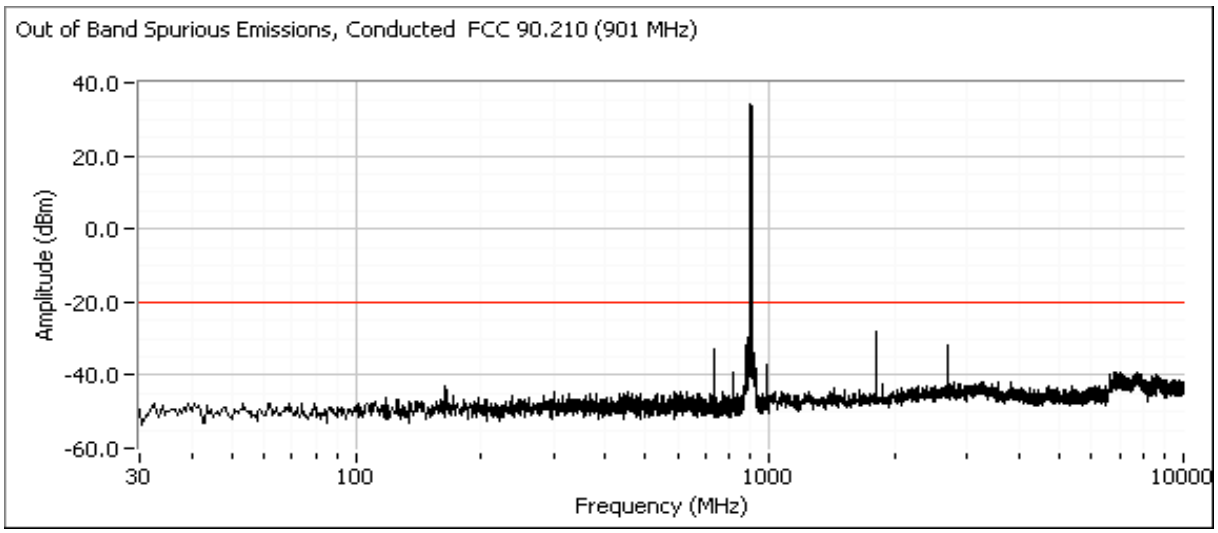


Client:	GE MDS LLC	Job Number:	J84685
Model:	SD9	T-Log Number:	T84737
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 24, 90 and 101	Class:	N/A

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

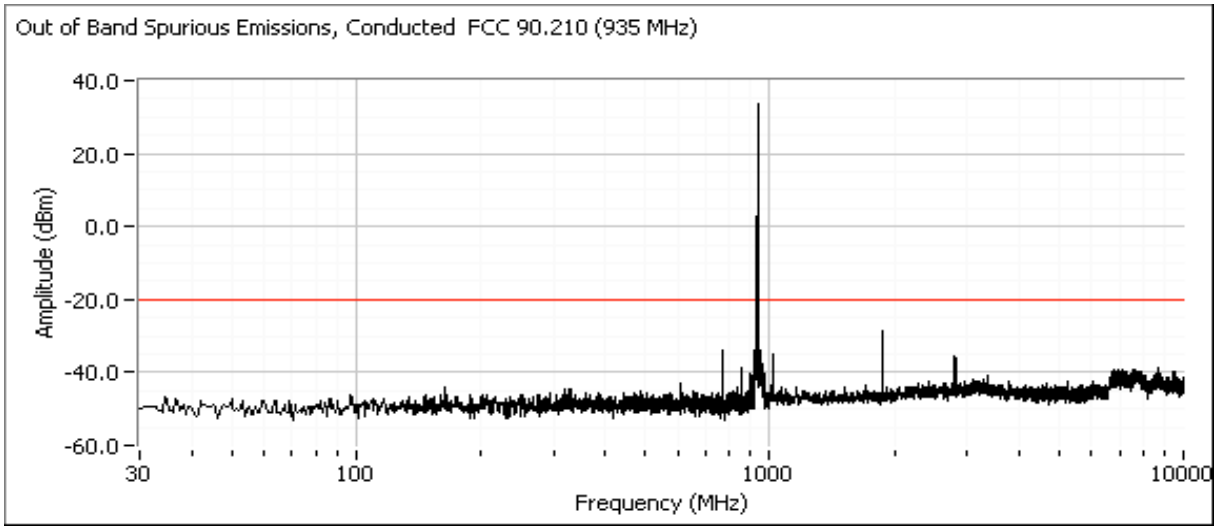


Plots for high channel, power setting(s) = 37

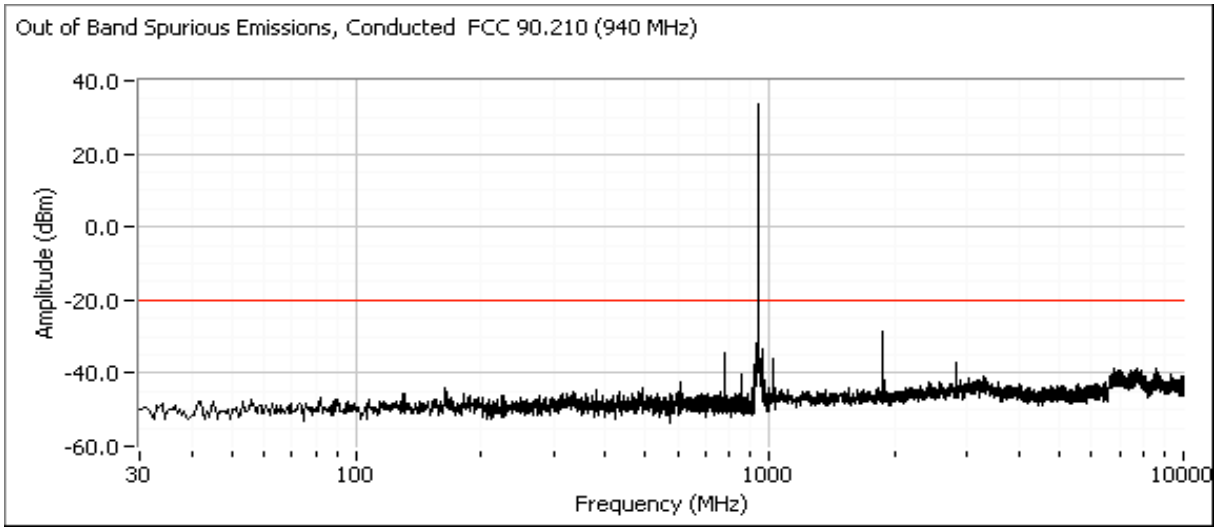


Client:	GE MDS LLC	Job Number:	J84685
Model:	SD9	T-Log Number:	T84737
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 24, 90 and 101	Class:	N/A

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



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



Client:	GE MDS LLC	Job Number:	J84685
Model:	SD9	T-Log Number:	T84737
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 24, 90 and 101	Class:	N/A

Run #5: Out of Band Spurious Emissions, Radiated

Conducted limit (dBm): -20

Approximate field strength limit @ 3m: 75.3

The limit is taken from FCC Part 90.210 Mask J

Field Strength Measurements and Substitution Measurements

Date: 9/26/11, 10/5/11 Engineer: M. Birgani, D. Bare Location: FT Chamber #7

Frequency	Level	Pol	FCC 90.210		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters		
78.500	34.6	V	75.3	-40.7	Peak	88	1.0	BW 12.5BW	896
107.600	31.2	V	75.3	-44.1	Peak	0	1.0	BW 12.5BW	896
177.925	33.6	H	75.3	-41.7	Peak	310	1.5	BW 12.5BW	896
376.775	41.9	H	75.3	-33.4	Peak	122	1.0	BW 12.5BW	896
815.700	43.1	H	75.3	-32.2	Peak	74	1.0	BW 12.5BW	896
878.750	45.5	H	75.3	-29.8	Peak	249	1.0	BW 12.5BW	896
2688.350	43.6	V	75.3	-31.7	Peak	167	1.0	BW 12.5BW	896
4480.080	45.3	V	75.3	-30.0	Peak	159	1.0	BW 12.5BW	896
5376.190	43.5	V	75.3	-31.8	Peak	226	1.9	BW 12.5BW	896
78.500	36.5	V	75.3	-38.8	Peak	210	1.0	BW 12.5BW	901
110.025	31.8	V	75.3	-43.5	Peak	198	1.0	BW 12.5BW	901
221.575	32.6	H	75.3	-42.7	Peak	248	1.5	BW 12.5BW	901
376.775	43.3	H	75.3	-32.0	Peak	268	1.0	BW 12.5BW	901
410.725	37.1	H	75.3	-38.2	Peak	296	1.0	BW 12.5BW	901
878.750	46.6	H	75.3	-28.7	Peak	120	1.0	BW 12.5BW	901
7320.000	51.5	H	75.3	-23.8	Peak	168	1.6	BW 12.5BW	901
4573.330	52.0	V	75.3	-23.3	Peak	169	1.0	BW 12.5BW	901
2733.330	45.3	V	75.3	-30.0	Peak	192	1.0	BW 12.5BW	901

Client:	GE MDS LLC	Job Number:	J84685
Model:	SD9	T-Log Number:	T84737
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 24, 90 and 101	Class:	N/A

Frequency	Level	Pol	FCC 90.210		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters		
878.750	42.0	V	75.3	-33.3	Peak	352	1.5	BW 12.5BW	935
854.500	39.4	H	75.3	-35.9	Peak	111	1.0	BW 12.5BW	935
752.650	35.3	V	75.3	-40.0	Peak	231	1.5	BW 12.5BW	935
628.975	36.9	H	75.3	-38.4	Peak	126	1.5	BW 12.5BW	935
78.500	36.8	V	75.3	-38.5	Peak	133	1.0	BW 12.5BW	935
376.775	33.7	H	75.3	-41.6	Peak	257	1.0	BW 12.5BW	935
119.725	30.3	V	75.3	-45.0	Peak	117	1.0	BW 12.5BW	935
4666.670	49.3	V	75.3	-26.0	Peak	152	1.3	BW 12.5BW	935
2013.330	40.2	V	75.3	-35.1	Peak	164	1.3	BW 12.5BW	935
7480.000	45.8	V	75.3	-29.5	Peak	160	1.9	BW 12.5BW	935
73.789	36.5	V	75.3	-38.8	Peak	135	1.0	BW 12.5BW	940
127.516	29.2	V	75.3	-46.1	Peak	28	1.0	BW 12.5BW	940
249.996	29.4	V	75.3	-45.9	Peak	16	1.5	BW 12.5BW	940
175.012	26.4	V	75.3	-48.9	Peak	251	1.0	BW 12.5BW	940
350.043	32.6	H	75.3	-42.7	Peak	252	1.0	BW 12.5BW	940
625.024	34.8	H	75.3	-40.5	Peak	88	3.0	BW 12.5BW	940
875.017	44.5	H	75.3	-30.8	Peak	1	1.0	BW 12.5BW	940
1000.000	49.5	H	75.3	-25.8	Peak	240	1.5	BW 12.5BW	940
4693.330	51.7	V	75.3	-23.6	Peak	165	1.6	BW 12.5BW	940

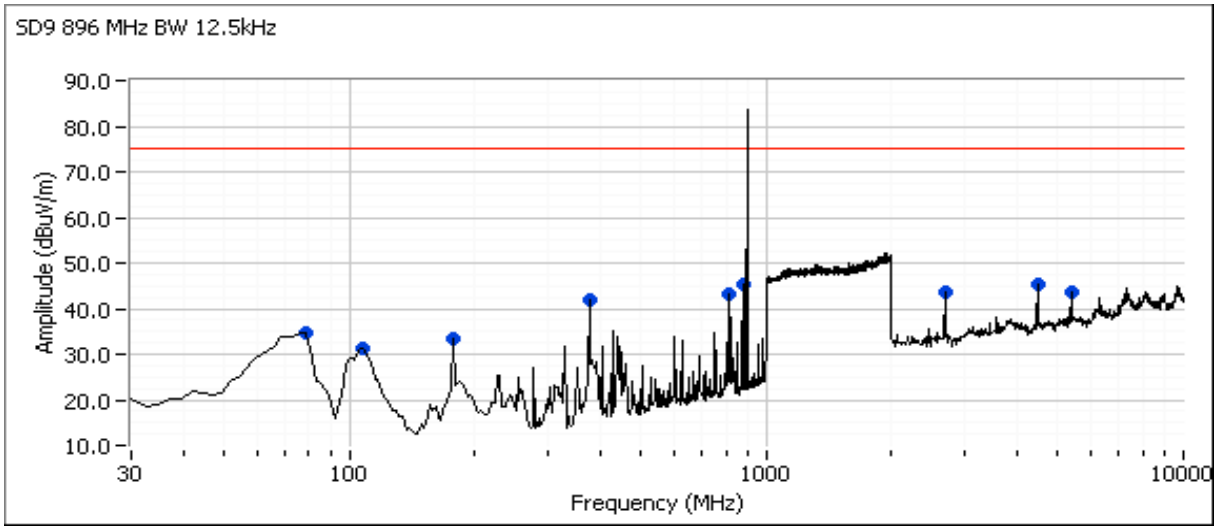
Client:	GE MDS LLC	Job Number:	J84685
Model:	SD9	T-Log Number:	T84737
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 24, 90 and 101	Class:	N/A

Frequency	Level	Pol	FCC 90.210		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters		
176.475	28.7	H	75.3	-46.6	Peak	261	2.0	BW 50BW	901.5
226.425	32.7	V	75.3	-42.6	Peak	347	1.0	BW 50BW	901.5
276.375	28.1	V	75.3	-47.2	Peak	163	1.0	BW 50BW	901.5
73.875	38.1	V	75.3	-37.2	Peak	112	1.0	BW 50BW	901.5
1000.000	49.3	H	75.3	-26.0	Peak	234	1.5	BW 50BW	901.5
875.750	48.2	H	75.3	-27.1	Peak	113	1.0	BW 50BW	901.5
819.750	44.1	H	75.3	-31.2	Peak	242	1.0	BW 50BW	901.5
751.500	40.8	H	75.3	-34.5	Peak	242	1.0	BW 50BW	901.5
625.500	34.7	H	75.3	-40.6	Peak	164	1.5	BW 50BW	901.5
315.750	48.2	H	75.3	-27.1	Peak	60	1.0	BW 50BW	901.5
377.000	38.6	H	75.3	-36.7	Peak	168	1.0	BW 50BW	901.5
3546.670	45.2	H	75.3	-30.1	Peak	4	1.0	BW 50BW	901.5
4493.330	43.5	V	75.3	-31.8	Peak	149	1.9	BW 50BW	901.5
7213.330	49.4	V	75.3	-25.9	Peak	149	1.9	BW 50BW	901.5
8120.000	48.4	V	75.3	-26.9	Peak	141	1.6	BW 50BW	901.5

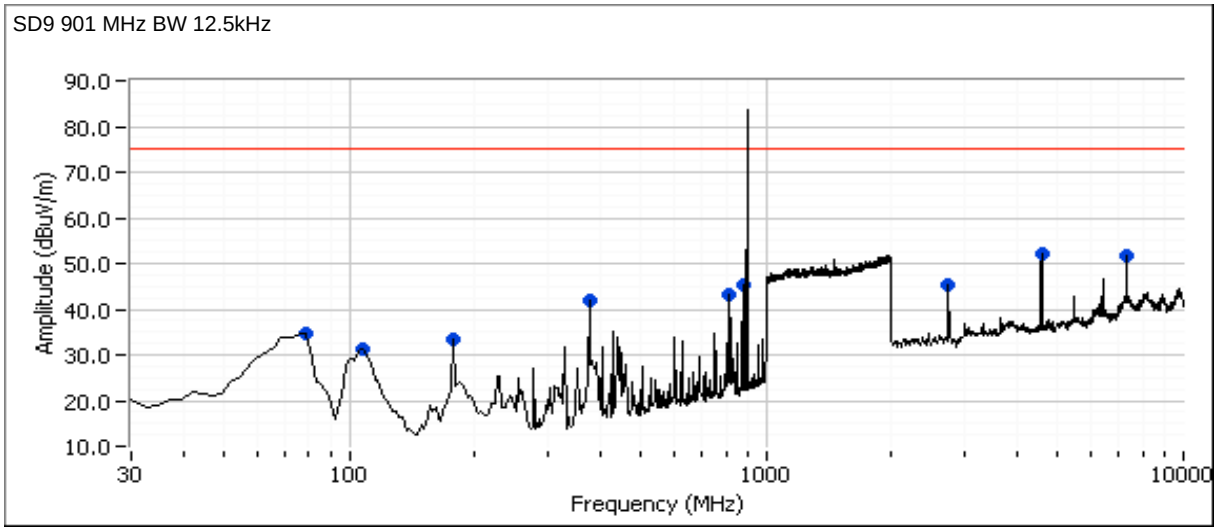
Note 1:	The field strength limit in the tables above was calculated from the erp/eirp limit detailed in the standard using the free space propagation equation: E=√(30PG)/d. This limit is conservative - it does not consider the presence of the ground plane and, for erp limits, the dipole gain (2.2dBi) 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.
Note 3:	From 30 MHz to 10GHz RB=VB= 1 MHz, and 1-2 GHz no amplifier and no filter was used.

Client:	GE MDS LLC	Job Number:	J84685
Model:	SD9	T-Log Number:	T84737
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 24, 90 and 101	Class:	N/A

Plots for low channel (896MHz and BW 12.5kHz), power setting = 37

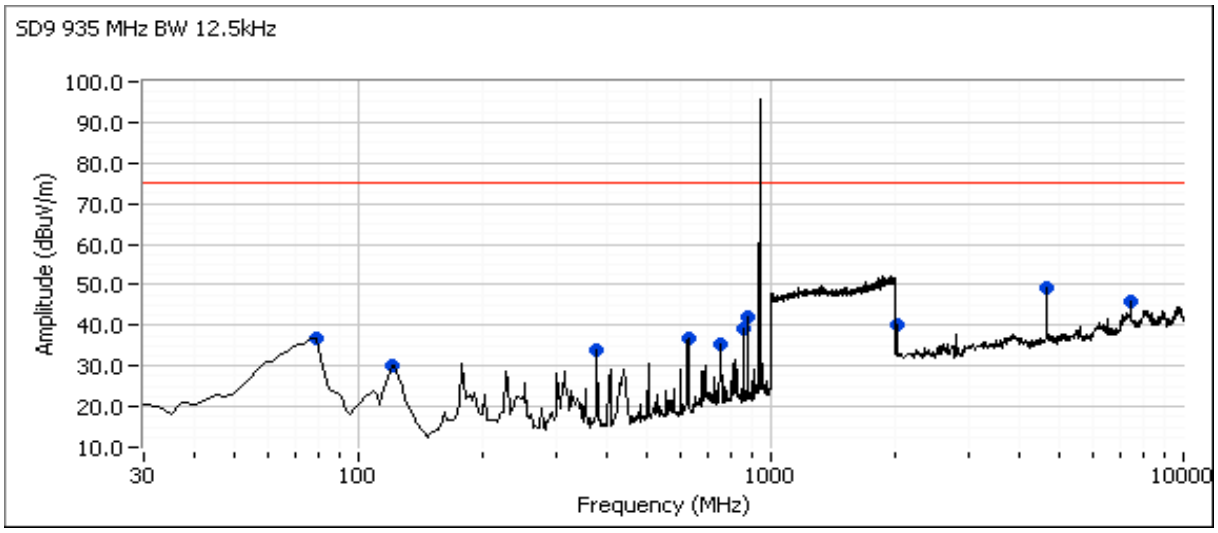


Plots for high channel (901MHz and BW 12.5kHz), power setting = 37

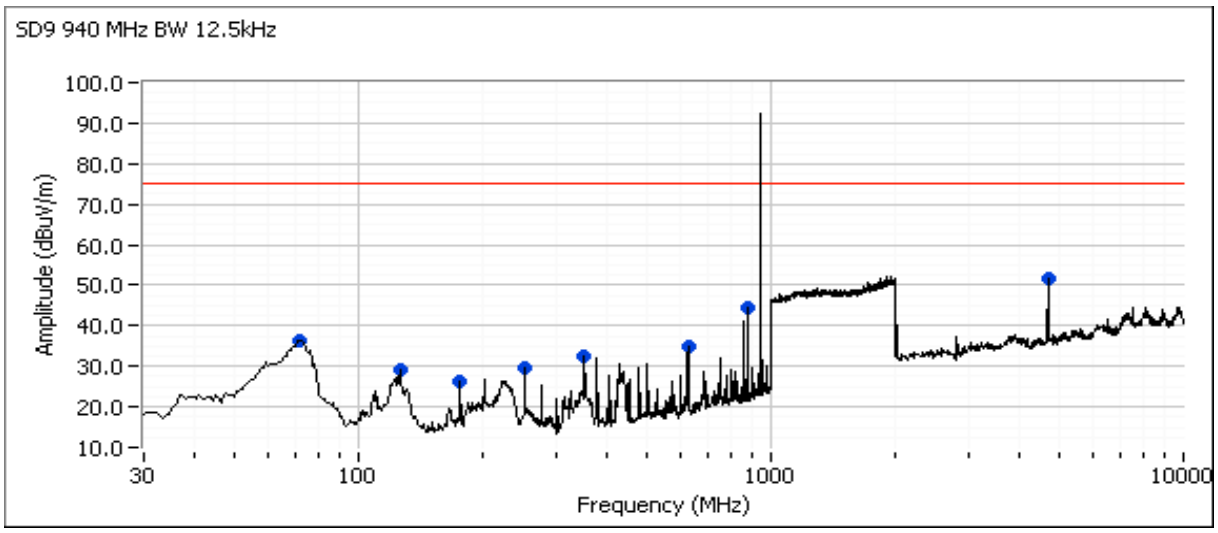


Client:	GE MDS LLC	Job Number:	J84685
Model:	SD9	T-Log Number:	T84737
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 24, 90 and 101	Class:	N/A

Plots for low channel (935MHz and BW 12.5kHz), power setting = 37

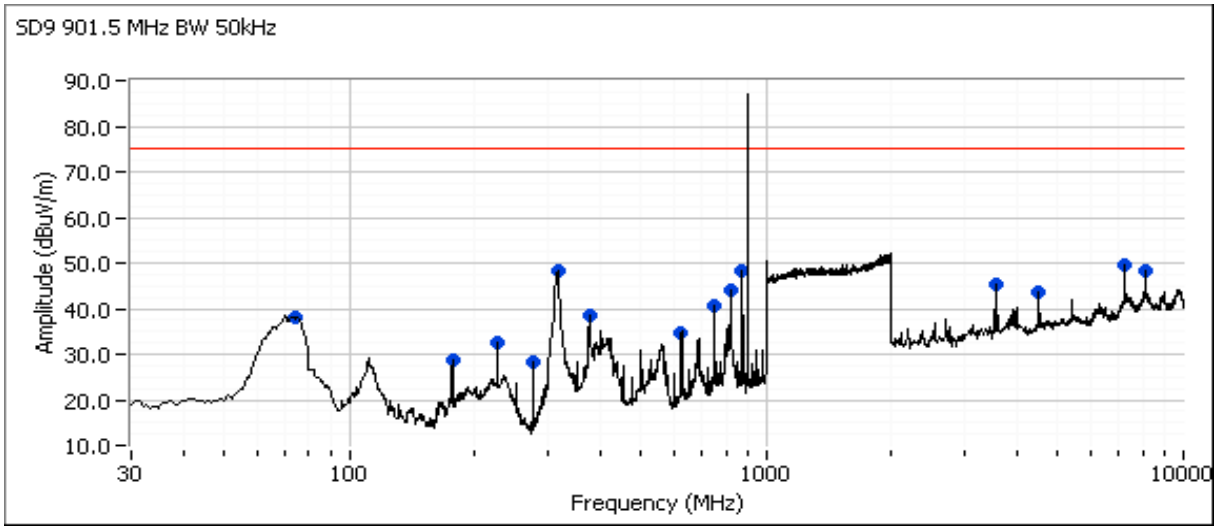


Plots for high channel (940MHz and BW 12.5kHz), power setting = 37



Client:	GE MDS LLC	Job Number:	J84685
Model:	SD9	T-Log Number:	T84737
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 24, 90 and 101	Class:	N/A

Plots for 901.5MHz and BW 50kHz, power setting = 36



Substitution measurements
Horizontal/ Vertical

Frequency	Substitution measurements			Site	EUT measurements			eirp Limit	erp Limit	Margin
MHz	Pin[1]	Gain[2]	FS[3]	Factor[4]	FS[5]	eirp (dBm)	erp (dBm)	dBm	dBm	dB
All signals were more than 20dB below the calculatedfield strength limit so no substitutions measurements were performed.										

Note 1:	Pin is the input power (dBm) to the substitution antenna
Note 2:	Gain is the gain (dBi) for the substitution antenna.
Note 3:	FS is the field strength (dBuV/m) measured from the substitution antenna.
Note 4:	Site Factor - this is the site factor to convert from a field strength in dBuV/m to an eirp in dBm.
Note 5:	EUT field strength as measured during initial run.

Frequency stability is not changed from the original product as the TCXO is the same. The VCO is just tuned lower.

End of Report

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marks the last page of this test report.