

Radio Test Report

**FCC Part 101 and RSS-119
(928 MHz to 960 MHz)**

Model: SD9

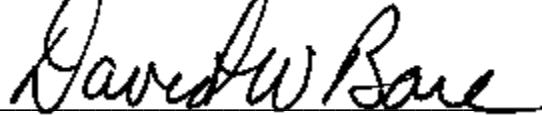
COMPANY: GE MDS LLC
175 Science Parkway
Rochester, NY 14620

TEST SITE(S): Elliott Laboratories
41039 Boyce Road.
Fremont, CA. 94538-2435

REPORT DATE: November 12, 2010
REISSUED DATE: November 17, 2010

FINAL TEST DATES: October 28 and November 2, 2010

AUTHORIZED SIGNATORY:



David W. Bare
Chief Engineer
Elliott Laboratories



Testing Cert #2016.01

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REVISION HISTORY

Rev#	Date	Comments	Modified By
-	11-12-2010	First release	
2	11-17-2010	Added notes to results table for bandwidths and RSS-119 Mask	dwb

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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
- Industry Canada RSS-Gen Issue 2
- CFR 47 Part 101 (Fixed Microwave Services) Subpart C
- RSS-119, Issue 6 (Land Mobile and Fixed Radio Transmitters and Receivers, 27.41 to 960 MHz)

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 101 and RSS 119**

FCC	Canada	Description	Measured	Limit	Result
Transmitter Modulation, output power and other characteristics					
§2.1033 (c) (5) § 101.101	RSP 100 7.2 (a) RSS 119	Frequency range(s)	Same as original certification	928 – 960 MHz	Complies
§2.1033 (c) (6) §2.1033 (c) (7) §2.1046 § 101.113	RSP 100 7.2 (a) RSS 119	RF power output at the antenna terminals	20.3 dBm to 37.2 dBm	47 dBm EIRP ¹	Complies
§2.1033 (c) (4) §2.1047 § 101.111(a)(6)	RSP 100 7.2 (b) (iii) RSS 119 (mask G)	Emission types	F1D, F2D, F3D	-	-
		Emission mask	Within mask	Within Mask	Complies
	RSS GEN 4.4.1 RSS 119	99% Bandwidth	30.5 kHz	50 kHz ²	Complies
§2.1049 § 101.109		Occupied Bandwidth	30.5 kHz	200 kHz	Complies
Transmitter spurious emissions					
§2.1051 §2.1057		At the antenna terminals	Same as original certification ³	-13dBm	Complies
§2.1053 §2.1057		Field strength	Same as original certification ³	-13 dBm	Complies
Receiver spurious emissions					
15.109	RSS GEN 7.2.3 Table 1	Field strength	Same as original certification	See limit table on page 11	Complies
Other details					
§2.1055 § 101.107		Frequency stability	Same as original certification	0.17 ppm	Complies
§2.1093	RS 102	RF Exposure	Same as original certification	0.62 mW/cm ²	Complies
§2.1033 (c) (8)	RSP 100 7.2 (a)	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 and 16.5 dBi ¹	-	-
Notes					
1 – Power is adjusted to comply with 47dBm EIRP power limitation as needed depending on antenna gain.					
2 – Aggregated occupied BW per RSS-119 clause 5.6.					
3 – The results from the original certification tests are not affected due to the use of a wider bandwidth as the measurement bandwidth for spurious emissions are greater than the transmitter bandwidth(s).					

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)	dB μ V/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 a industrial radio operating in the 928-960 MHz bands for FCC Part 101, in the 928-930 MHz bands for FCC Part 90 and in the 930-931 and 940-941 MHz bands under 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 sample was received on October 28, 2010 and tested on October 28 and November 2, 2010. The EUT consisted of the following component(s):

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

OTHER EUT DETAILS

The radio can operate on 6.25, 12.5, 25 and 50KHz channels (F1D, F2D and F3D modulations) depending on rule part 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	-
Hewlett Packard	6654A	Power Source	US36390821	-

No equipment was used as remote support equipment for emissions testing.

EUT INTERFACE PORTS

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

Port	Connected To	Description	Cable(s)	
			Shielded or Unshielded	Length(m)
COM2	Computer	Serial	Shielded	2
DC Power	Power Source	two wire	Unshielded	2

EUT OPERATION

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.

TESTING

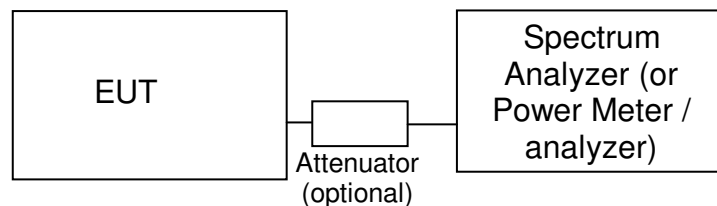
GENERAL INFORMATION

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

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

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.

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.

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), 27-Oct-10

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Cal Due</u>
Agilent	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	1/6/2011

Radio Antenna Port (Power and Spurious Emissions), 28-Oct-10

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Cal Due</u>
Rohde & Schwarz	Power Meter, Dual Channel	NRVD	1071	6/1/2011
Rohde & Schwarz	Power Sensor 100 uW - 2 Watts (w/ 20 dB pad, SN BJ5155)	NRV-Z32	1536	9/13/2011
Agilent	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	1/6/2011

Radio Antenna Port (Power and Spurious Emissions), 02-Nov-10

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Cal Due</u>
Rohde & Schwarz	Power Meter, Dual Channel	NRVD	1071	6/1/2011
Rohde & Schwarz	Power Sensor 100 uW - 2 Watts (w/ 20 dB pad, SN BJ5155)	NRV-Z32	1536	9/13/2011

Appendix B Test Data

T81032 9 Pages



EMC Test Data

Client:	GE MDS LLC	Job Number:	J80919
Model:	SD9	T-Log Number:	T81032
		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: 11/3/2010

Client:	GE MDS LLC	Job Number:	J80919
Model:	SD9	T-Log Number:	T81032
Contact:	Dennis McCarthy	Account Manager:	Susan Pelzl
Standard:	FCC Parts 24, 90 and 101	Class:	N/A

RSS 119 and FCC Parts 24, 90 and 101 Power, Occupied Bandwidth and Masks

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 placed 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:	18-20 °C
Rel. Humidity:	40-50 %

Summary of Results

Run #	Spacing	Data Rate	Test Performed	Limit	Pass / Fail	Result / Margin
1	25kHz	19200	Output Power		PASS	37.2dBm (5.2W)
2	-	-	Spectral Mask		PASS	Refer to plots
3	-	-	99% or Occupied Bandwidth		-	Refer to table

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: J80919
Model: SD9	T-Log Number: T81032
Contact: Dennis McCarthy	Account Manager: Susan Pelzi
Standard: FCC Parts 24, 90 and 101	Class: N/A

Run #1: Output Power

Date: 10/28/2010

Engineer: Mehran Birgani

Location: Lab #4

Cable Loss:

Attenuator: 20.0 dB

Total Loss: 20.0 dB

Cable ID(s):

Attenuator IDs: 1878

Modem 9600N for 6.25kHz

Power Setting ²	Frequency (MHz)	Output Power		Power Setting ²	Frequency (MHz)	Output Power	
		(dBm) ¹	W			(dBm) ¹	W
37	928.000	37.0	5.0	20	928.000	20.3	0.1
37	944.000	36.9	4.9	20	944.000	20.2	0.1
37	960.000	35.8	3.8	20	960.000	18.9	0.1

Modem 9600M for 12.5kHz

Power Setting ²	Frequency (MHz)	Output Power		Power Setting ²	Frequency (MHz)	Output Power	
		(dBm) ¹	W			(dBm) ¹	W
37	928.000	37.1	5.1	20	928.000	20.4	0.1
37	944.000	36.8	4.8	20	944.000	20.1	0.1
37	960.000	35.6	3.6	20	960.000	18.7	0.1

Modem 19200 for 25kHz

Power Setting ²	Frequency (MHz)	Output Power		Power Setting ²	Frequency (MHz)	Output Power	
		(dBm) ¹	W			(dBm) ¹	W
37	928.000	37.2	5.2	20	928.000	20.6	0.1
37	944.000	36.9	4.9	20	944.000	20.3	0.1
37	960.000	35.7	3.7	20	960.000	18.9	0.1

Modem 65000N for 50kHz

Power Setting ²	Frequency (MHz)	Output Power		Power Setting ²	Frequency (MHz)	Output Power	
		(dBm) ¹	W			(dBm) ¹	W
37	928.000	36.9	4.9	20	928.000	20.3	0.1
37	944.000	36.8	4.8	20	944.000	20.1	0.1
37	960.000	35.8	3.8	20	960.000	18.8	0.1

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: J80919
Model: SD9	T-Log Number: T81032
Contact: Dennis McCarthy	Account Manager: Susan Pelzl
Standard: FCC Parts 24, 90 and 101	Class: N/A

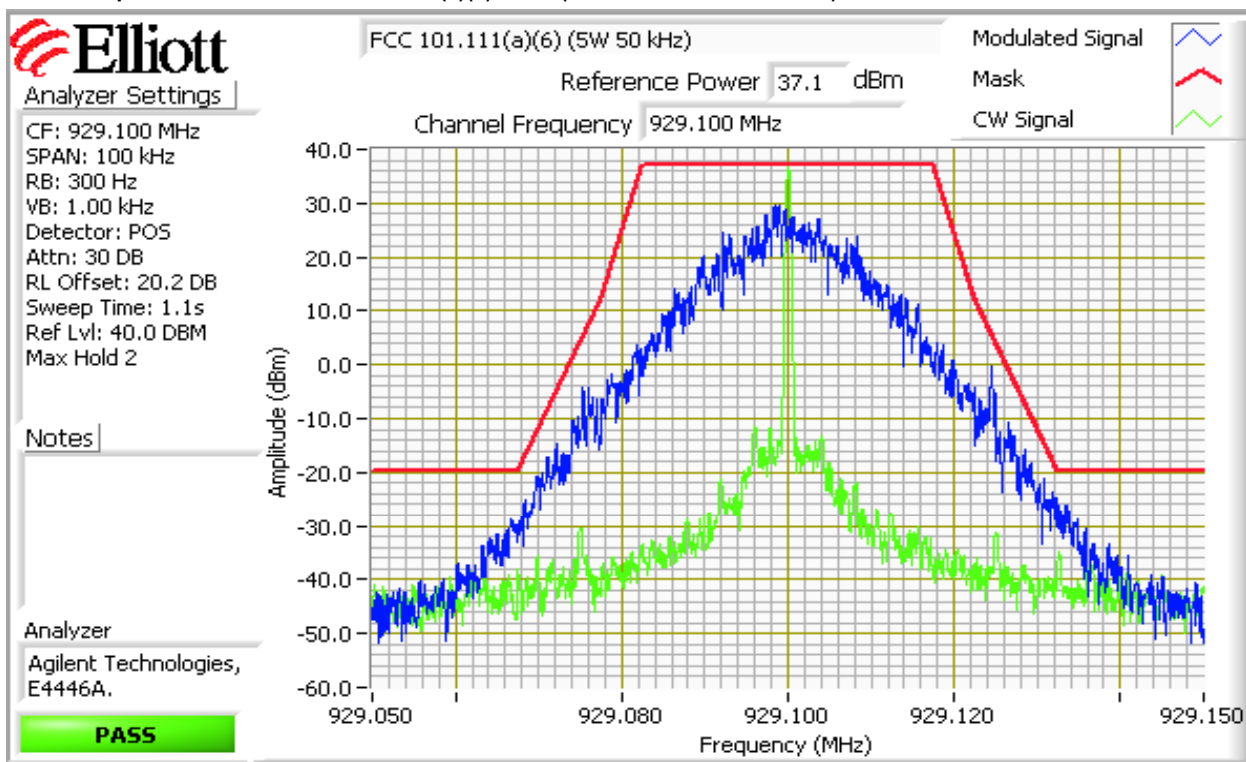
Run #2: Spectral Mask

Date: 11/2/2010

Engineer: David Bare

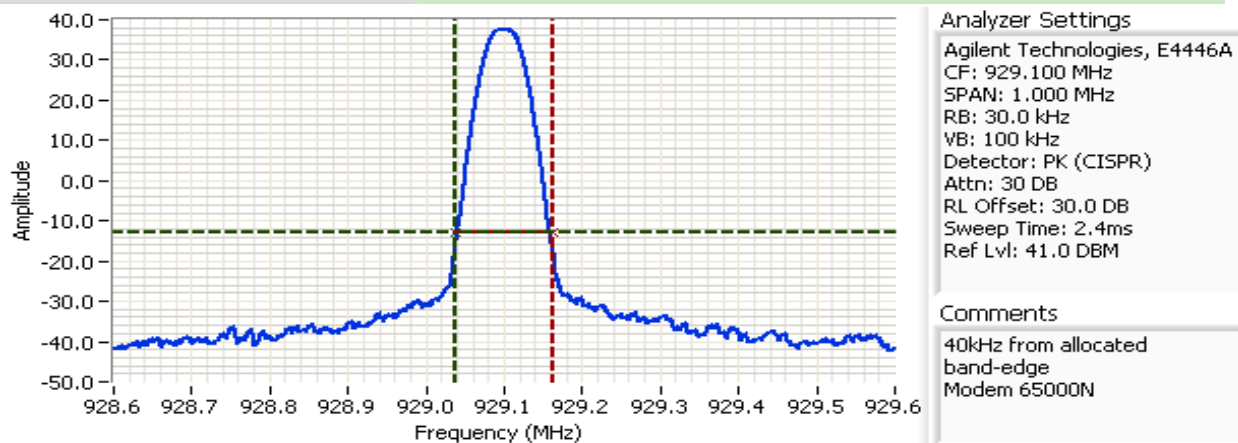
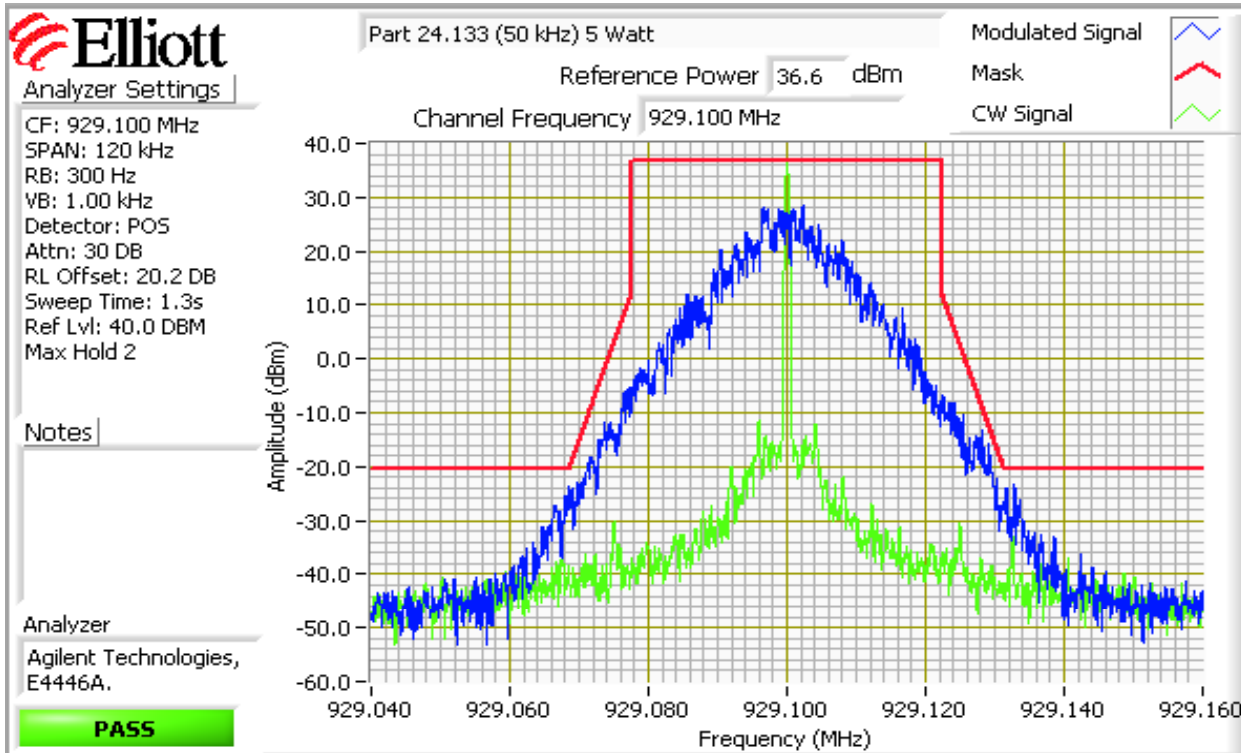
Location: Lab #4

Run #2a: Spectral Mask, FCC Part 101.111(a)(6) Mask (Modem 65000N for 50kHz)



Client: GE MDS LLC	Job Number: J80919
Model: SD9	T-Log Number: T81032
Contact: Dennis McCarthy	Account Manager: Susan Pelzi
Standard: FCC Parts 24, 90 and 101	Class: N/A

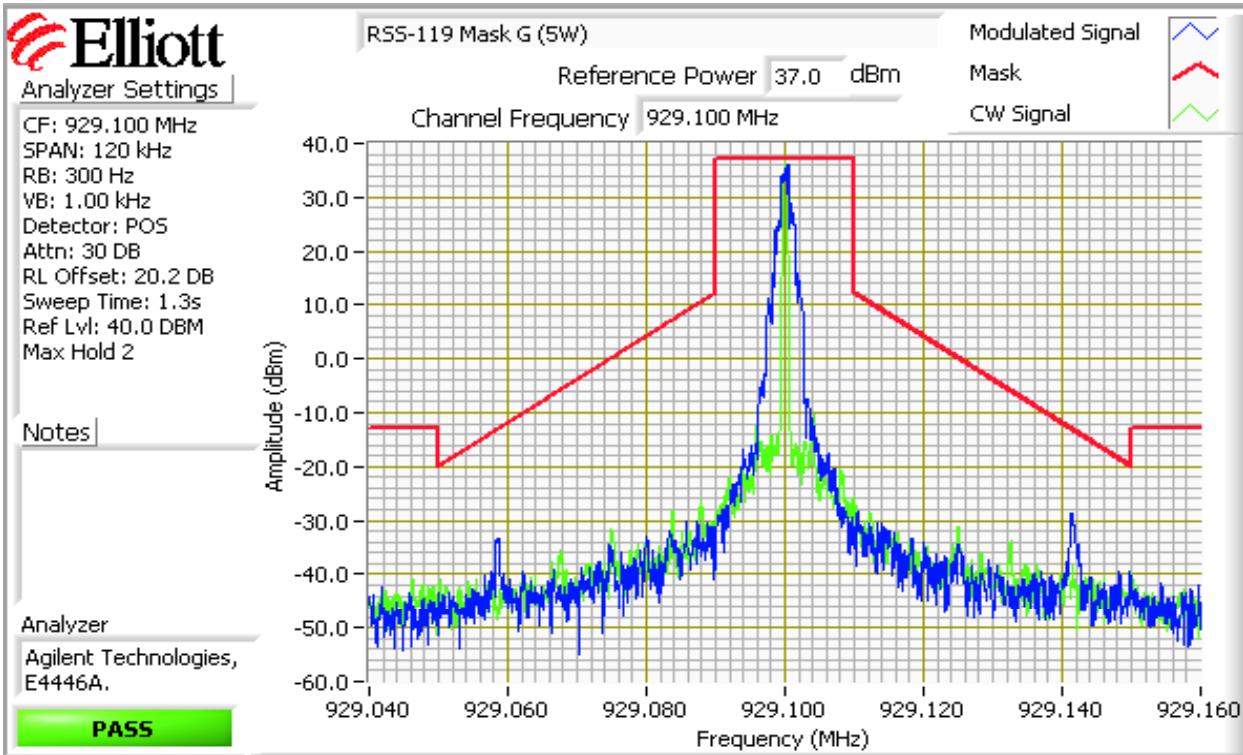
Run #2b: Spectral Mask, FCC Part 24.133(a)(1) Mask (Modem 65000N for 50kHz)



Cursor 1	929.0375	-13.00	+	-	+	-	Delta Freq.	125 kHz
Cursor 2	929.1625	-13.00	+	-	+	-	Delta Amplitude	0.00

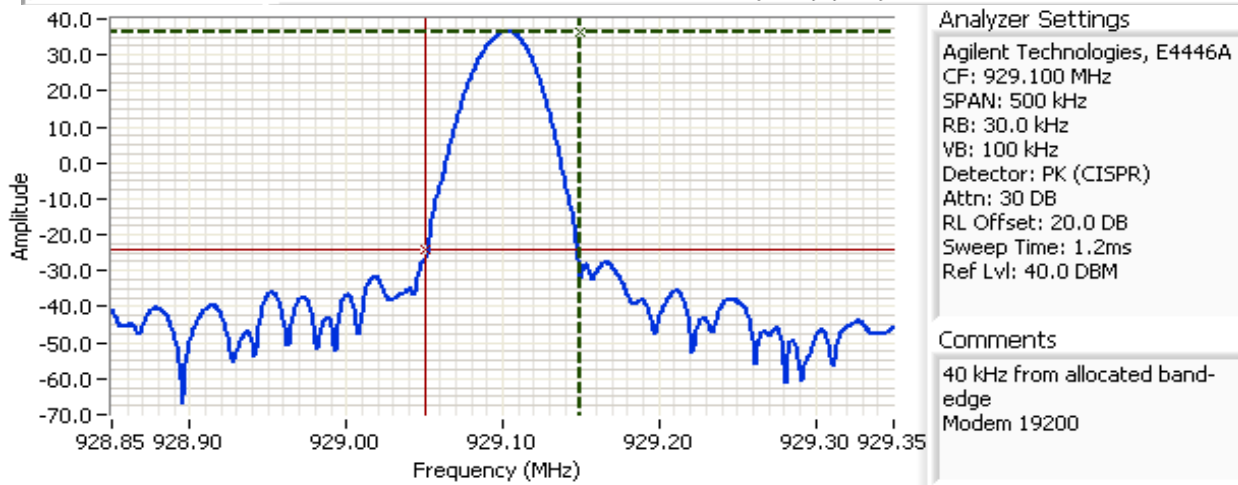
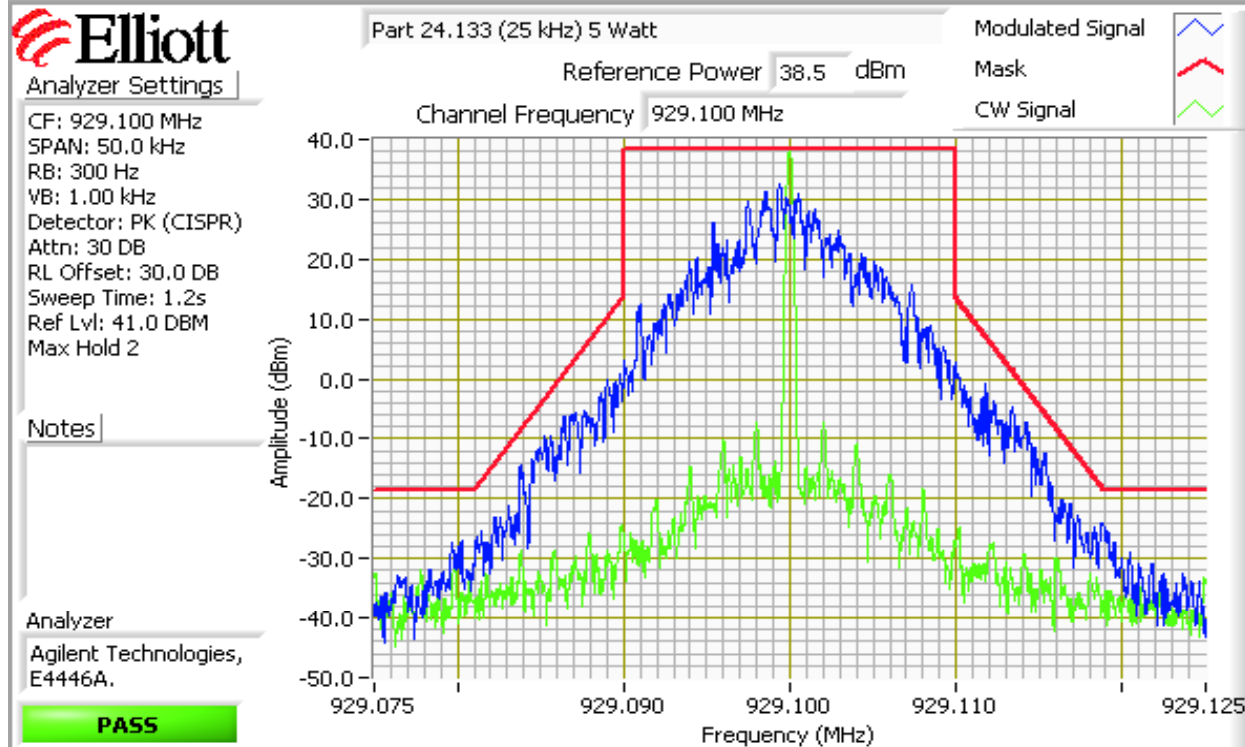
Client: GE MDS LLC	Job Number: J80919
Model: SD9	T-Log Number: T81032
Contact: Dennis McCarthy	Account Manager: Susan Pelzi
Standard: FCC Parts 24, 90 and 101	Class: N/A

Run #2c: Spectral Mask, FCC Part 90.210(g) Mask (Modem 9600N for 6.25kHz)



Client: GE MDS LLC	Job Number: J80919
Model: SD9	T-Log Number: T81032
Contact: Dennis McCarthy	Account Manager: Susan Pelzi
Standard: FCC Parts 24, 90 and 101	Class: N/A

Run #2d: Spectral Mask, FCC Part 24.133(a)(1) Mask (Modem 19200 for 25kHz with reduced deviation)

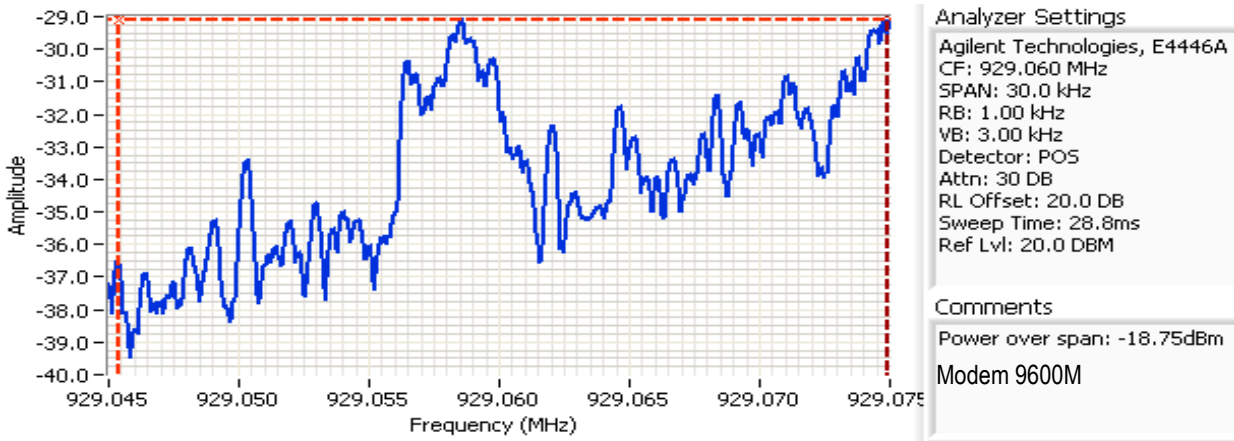
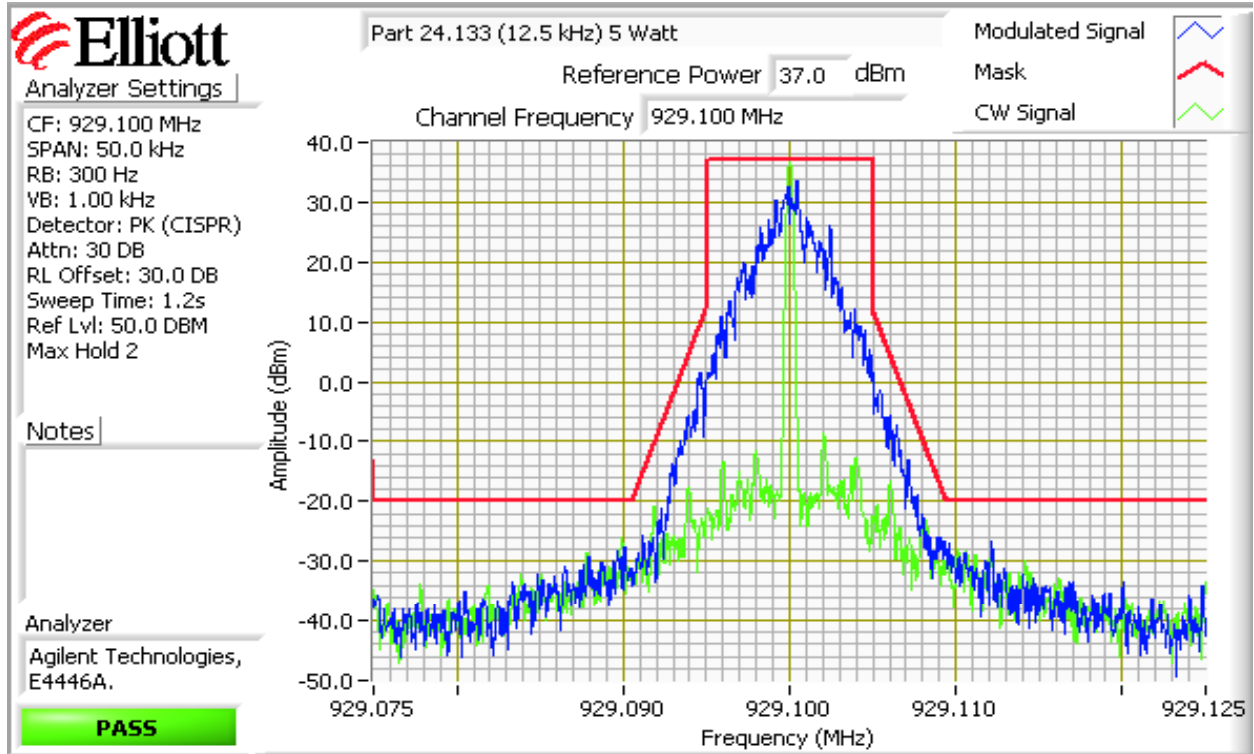


Cursor 1 929.1500 36.45  Delta Freq. 100 kHz 

Cursor 2 929.0500 -24.00  Delta Amplitude 60.45

Client: GE MDS LLC	Job Number: J80919
Model: SD9	T-Log Number: T81032
Contact: Dennis McCarthy	Account Manager: Susan Pelzi
Standard: FCC Parts 24, 90 and 101	Class: N/A

Run #2e: Spectral Mask, FCC Part 24.133(a)(2) Mask (Modem 9600M for 12.5kHz)



Cursor 1: 929.0454 -29.08   

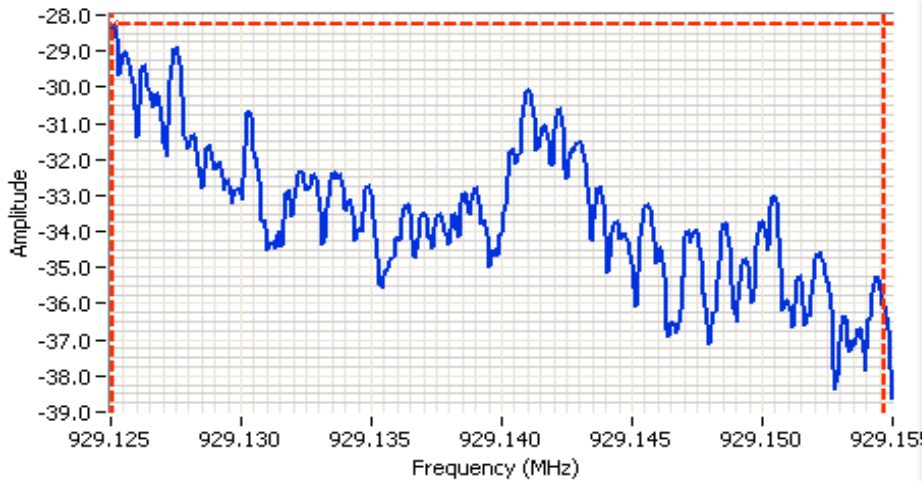
Cursor 2: 929.0750 -55.08   

Delta Freq. 29.6 kHz 

Delta Amplitude 26.00

Note: Power in 30 kHz band that is adjacent to a point 40 kHz from the edge of the allocated band is less than -13 dBm

Client: GE MDS LLC	Job Number: J80919
Model: SD9	T-Log Number: T81032
Contact: Dennis McCarthy	Account Manager: Susan Pelzi
Standard: FCC Parts 24, 90 and 101	Class: N/A



Analyzer Settings
 Agilent Technologies, E4446A
 CF: 929.140 MHz
 SPAN: 30.0 kHz
 RB: 1.00 kHz
 VB: 3.00 kHz
 Detector: POS
 Attn: 30 DB
 RL Offset: 20.0 DB
 Sweep Time: 28.7ms
 Ref Lvl: 20.0 DBM

Comments
 Power over span: -18.50dBm
 Modem 9600M

Cursor 1 929.1250 -28.28  Delta Freq. 29.6 kHz
 Cursor 2 929.1547 -54.28  Delta Amplitude 26.00



Note: Power in 30 kHz band that is adjacent to a point 40 kHz from the edge of the allocated band is less than -13 dBm

Run #3: Signal Bandwidth

Date: 10/28/2010 Engineer: Mehran Birgani Location: Lab #4

Power Setting	Frequency (MHz), Modem	Resolution Bandwidth	Bandwidth (MHz)	99%
37	929.1, 9600N	1.0 kHz		4.2
37	929.1, 9600M	1.0 kHz		7.2
37	929.1, 19200	3.0 kHz		18.2
37	929.1, 65000N	3.0 kHz		30.5

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