



41039 Boyce Road
Fremont, CA. 94538

510-578-3500 Phone
510-440-9525 Fax

***Radio Test Report
For Class II Permissive Change
FCC Part 101
(928 To 960 MHz)***

Model: LN900

FCC ID: E5MDS-LN900

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

TEST SITE(S): National Technical Systems
41039 Boyce Road.
Fremont, CA. 94538-2435

PROJECT NUMBER: PR085381

REPORT DATE: September 13, 2018

FINAL TEST DATES: August 29 and 30, 2018

TOTAL NUMBER OF PAGES: 20



This report and the information contained herein represent the results of testing test articles identified and selected by the client performed to specifications and/or procedures selected by the client. National Technical Systems (NTS) makes no representations, expressed or implied, that such testing is adequate (or inadequate) to demonstrate efficiency, performance, reliability, or any other characteristic of the articles being tested, or similar products. This report should not be relied upon as an endorsement or certification by NTS of the equipment tested, nor does it represent any statement whatsoever as to its merchantability or fitness of the test article, or similar products, for a particular purpose. This report shall not be reproduced except in full



VALIDATING SIGNATORIES

PROGRAM MGR

David W. Bare
Chief Engineer

TECHNICAL REVIEWER:

David W. Bare
Chief Engineer

FINAL REPORT PREPARER:

David Guidotti
Senior Technical Writer

QUALITY ASSURANCE DELEGATE

Gary Izard
Technical Writer



REVISION HISTORY

Rev#	Date	Comments	Modified By
1	September 13, 2018	First release	

TABLE OF CONTENTS

COVER PAGE.....	1
VALIDATING SIGNATORIES	2
REVISION HISTORY	3
TABLE OF CONTENTS	4
SCOPE.....	5
OBJECTIVE	6
STATEMENT OF COMPLIANCE.....	6
DEVIATIONS FROM THE STANDARDS.....	6
TEST RESULTS.....	7
FCC PART 101.....	7
MEASUREMENT UNCERTAINTIES.....	8
EQUIPMENT UNDER TEST (EUT) DETAILS.....	9
GENERAL.....	9
ENCLOSURE.....	9
MODIFICATIONS.....	9
SUPPORT EQUIPMENT.....	9
EUT INTERFACE PORTS	10
EUT OPERATION	10
TESTING	11
GENERAL INFORMATION.....	11
RF PORT MEASUREMENT PROCEDURES	11
OUTPUT POWER.....	11
BANDWIDTH MEASUREMENTS	12
TRANSMITTER MASK MEASUREMENTS.....	12
APPENDIX A TEST EQUIPMENT CALIBRATION DATA	13
APPENDIX B TEST DATA	14
END OF REPORT	20

SCOPE

Tests have been performed on the GE MDS LLC model LN900, 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 Innovation Science and Economic Development Canada.

- Code of Federal Regulations (CFR) Title 47 Part 2
- CFR 47 Part 101 Fixed Microwave Service

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards and as outlined in National Technical Systems test procedures:

ANSI C63.26:2015

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant Innovation Science and Economic Development 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.

National Technical Systems is accredited by the A2LA, certificate number 0214.26, to perform the test(s) listed in this report, except where noted otherwise.

The test results recorded herein are based on a single type test of the GE MDS LLC model LN900 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 LN900 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

FCC		Description	Measured	Limit	Result
Transmitter Modulation, output power and other characteristics					
§2.1033 (c) (5) §101.111		Frequency range(s)	928-960 MHz	928-960 MHz	Complied
		RF power output at the antenna terminals	20 - 41 dBm	-	-
§2.1033 (c) (6) §2.1033 (c) (7) §2.1046 §1.1.113		EIRP / ERP	36.5 dBm to 57.5 dBm	70 dBm	Complied
§2.1033 (c) (4) §2.1047 §101.111		Emission types	D1D		
		Emission mask	Within Mask	101.111(a)(6)	Complied
§2.1049 §101.109 §101.147		Occupied Bandwidth	43.2 kHz	45 kHz	Complied
Transmitter spurious emissions					
§2.1051 §2.1057 §101.111		At the antenna terminals	No change form original filing		
§2.1053 §2.1057 §101.111		Field strength	No change form original filing		
Other details					
§2.1055 §101.107		Frequency stability	No change form original filing		
§2.1093		RF Exposure	No change form original filing		
§2.1033 (c) (8)		Final radio frequency amplifying circuit's dc voltages and currents for normal operation over the power range	No change form original filing		
-	-	Antenna Gain	Up to 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

EQUIPMENT UNDER TEST (EUT) DETAILS**GENERAL**

The GE MDS LLC model LN900 is a 900 MHz radio module that is designed for licensed operation under FCC rule parts 90 and 101 using QAM modulations. Since the EUT could be placed in any position, the EUT and interface adapter board were treated as tabletop equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 11.8-52.2 Volts DC.

The sample was received on August 24, 2018 and tested on August 29 and 30, 2018. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
GE MDS LLC	LN900	Wireless Transceiver Module	2954264	E5MDS-LN900

ENCLOSURE

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

MODIFICATIONS

No modifications were made to the EUT during the time the product was at National Technical Systems.

SUPPORT EQUIPMENT

The following equipment was used as support equipment for testing:

Company	Model	Description	Serial Number	FCC ID
HP	ProBook 6570b	Laptop	5CB2480TRQ	-
HP	6024A	Power Supply	2430A-03013	-
GE MDS LLC	-	Interface adapter board		-

EUT INTERFACE PORTS

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

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
RF	Termination	-	-	-

Additional on Support Equipment

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Adapter Board PS Input	Power Supply	Four wire	Unshielded	1.5
Adapter Board Serial	Laptop	Multiwire	Shielded	2

EUT OPERATION

During emissions testing the EUT was configured using the laptop to transmit a continuous modulated signal on the selected frequency at the programmed power setting.

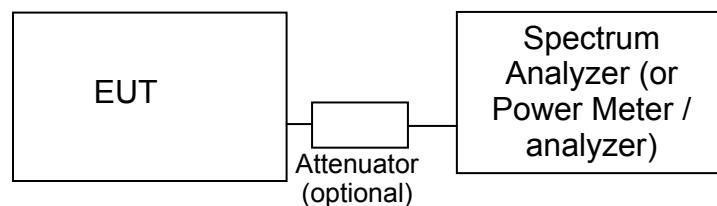
TESTING

GENERAL INFORMATION

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

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 **Error! Reference source not found.**). 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.

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.



Appendix A Test Equipment Calibration Data

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Calibrated</u>	<u>Cal Due</u>
Radio Antenna Port (Power and Spurious Emissions), 29, 30 -Aug-18					
National Technical Systems	NTS Mask Software (rev 3.8)	N/A	0		N/A
National Technical Systems	NTS Capture Analyzer Software (rev 3.8)	N/A	0		N/A
Rohde & Schwarz	Power Meter, Dual Channel	NRVD	1071	4/4/2018	4/4/2019
Rohde & Schwarz	Peak Power Sensor 100 uW - 2 Watts	NRV-Z32	1536	6/21/2018	6/21/2019
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	7/27/2018	7/27/2019



Appendix B Test Data

TL085381-RA Pages 15 - 19



EMC Test Data

Client:	GE MDS LLC	PR Number:	PR085381
Product	LN900	T-Log Number:	TL085381-RA
System Configuration:	Module on test PCB	Project Manager:	Christine Krebill
Contact:	Jack Priebe	Project Engineer:	David Bare
Emissions Standard(s):	FCC parts 24, 90 and 101	Class:	-
Immunity Standard(s):	-	Environment:	Radio

EMC Test Data

For The

GE MDS LLC

Product

LN900

Date of Last Test: 9/4/2018



EMC Test Data

Client:	GE MDS LLC	Job Number:	PR085381
Model:	LN900	T-Log Number:	TL085381-RA
Contact:	Jack Priebe	Project Manager:	Christine Krebill
Standard:	FCC parts 24, 90 and 101	Project Coordinator:	David Bare
		Class:	N/A

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 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: 23 °C

Rel. Humidity: 44 %

Summary of Results

Run #		Test Performed	Limit	Pass / Fail	Result / Margin
1		Output Power	Depends on license	Pass	20 - 41 dBm Conducted
2		Spectral Mask	Within Mask	Pass	
3		99% or Occupied Bandwidth	45 kHz	-	43.2 kHz

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.

Test Notes

Based on the previous testing of this product, QAM4, QAM16 and QAM64 all produce the same results. Therefore testing for part 24 is limited to QAM4 modulation.



EMC Test Data

Client:	GE MDS LLC	Job Number:	PR085381
Model:	LN900	T-Log Number:	TL085381-RA
Contact:	Jack Priebe	Project Manager:	Christine Krebill
Standard:	FCC parts 24, 90 and 101	Project Coordinator:	David Bare
		Class:	N/A

Run #1: Output Power

Date of Test: 8/30/2018

Test Engineer: David Bare

Test Location: Fremont EMC Lab #4B

Config. Used: 1

Config Change: None

EUT Voltage: 13.8 VDC

Cable Loss: XXXXXXXXXX

Cable ID(s): -

Attenuator: 20.0 dB

Attenuator IDs: WC068107

Total Loss: 20.0 dB

Power Setting ²	Frequency (MHz)	Output Power		Antenna Gain (dBi)	Result	EIRP	
		(dBm) ¹	mW			dBm	W
40	928	40.8	12022.6	16.5	Pass	57.3	537.032
40	944	41.0	12589.3	16.5	Pass	57.5	562.341
40	960	41.0	12589.3	16.5	Pass	57.5	562.341

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.



EMC Test Data

Client:	GE MDS LLC	Job Number:	PR085381
Model:	LN900	T-Log Number:	TL085381-RA
Contact:	Jack Priebe	Project Manager:	Christine Krebill
Standard:	FCC parts 24, 90 and 101	Project Coordinator:	David Bare
		Class:	N/A

Run #2: Spectral Mask, FCC Part 101 Mask 101.111(a)(6)

Date of Test: 8/29/2018

Test Engineer: David Bare

Test Location: Fremont EMC Lab #4B

Config. Used: 1

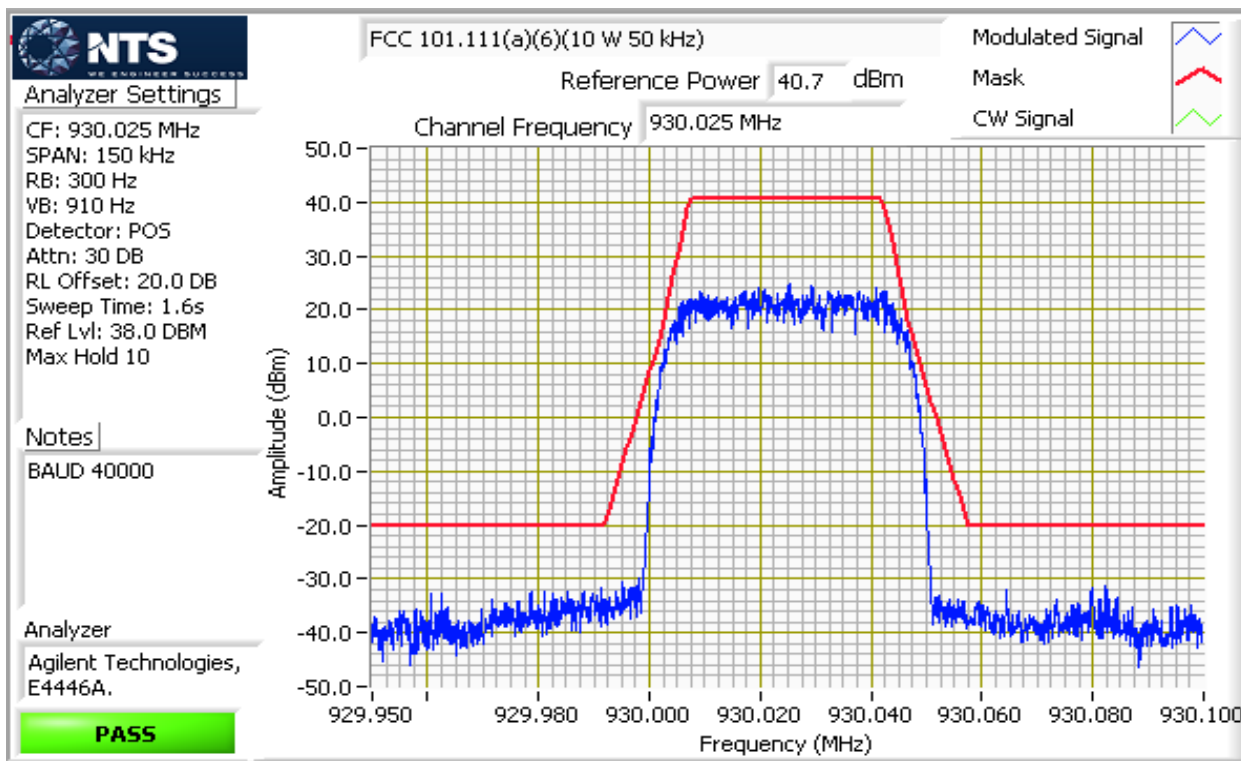
Config Change: None

EUT Voltage: 13.8 VDC

Note 1: Describe settings used and how the reference for the top of the mask was determined.

928 - 960 MHz, 50 kHz channel spacing.

FCC 101.147(b) and RSS-119 section 5.6 allow up to 50 kHz channels





EMC Test Data

Client:	GE MDS LLC	Job Number:	PR085381
Model:	LN900	T-Log Number:	TL085381-RA
Contact:	Jack Priebe	Project Manager:	Christine Krebill
Standard:	FCC parts 24, 90 and 101	Project Coordinator:	David Bare
		Class:	N/A

Run #3: Signal Bandwidth

Date of Test: 8/29/2018

Test Engineer: David Bare

Test Location: Fremont EMC Lab #4B

Config. Used: 1

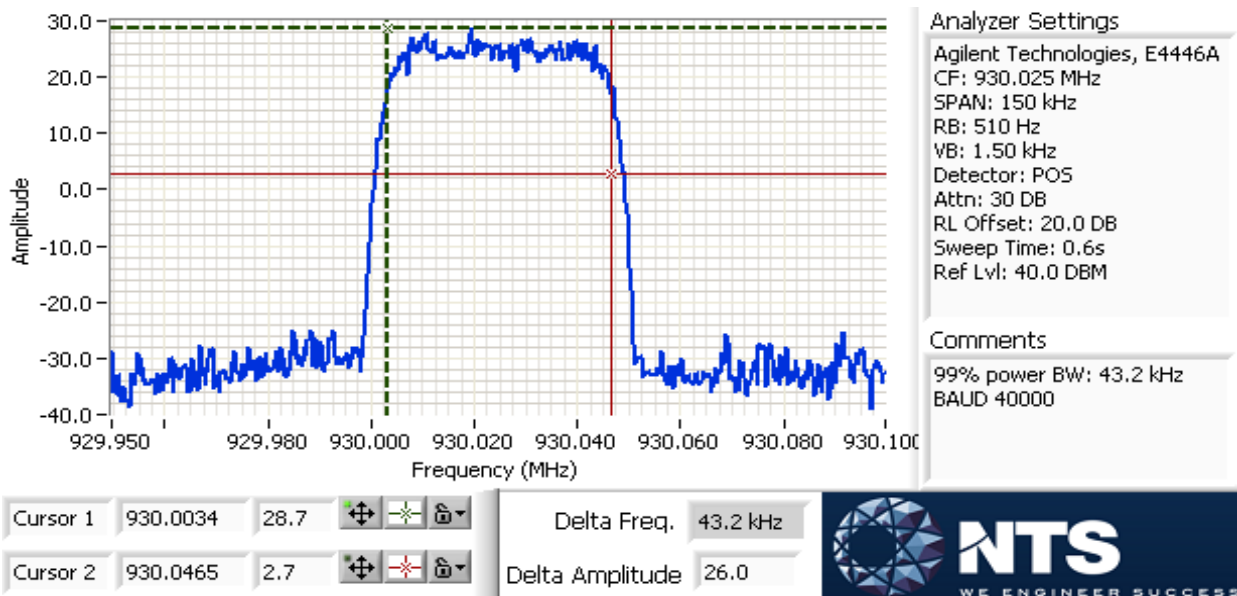
Config Change: None

EUT Voltage: 13.8 VDC

Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (kHz)
40	930	510 Hz	99% 43.20

BAUD 40000

Note 1: 99% bandwidth measured in accordance with ANSI C63.10, with RB between 1% and 5% of the measured bandwidth and VB $\geq 3 \times RB$ and Span $\geq 1.5\%$ and $\leq 5\%$ of measured bandwidth.



End of Report

This page is intentionally blank and marks the last page of this test report.