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Radio Test Report

FCC Part 90 and RSS-119
(150 MHz to 174 MHz)

Model: LN1

IC CERTIFICATION #:	101D-LN100
FCC ID:	E5MDS-LN100
COMPANY:	GE MDS LLC 175 Science Parkway Rochester, NY 14620
TEST SITE(S):	National Technical Systems - Silicon Valley 41039 Boyce Road. Fremont, CA. 94538-2435
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VALIDATING SIGNATORIES

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SCOPE

Tests have been performed on the GE MDS LLC model LN1, 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
- RSS-Gen Issue 4, November 2014
- CFR 47 Part 90 (Private Land Mobile Radio Service) Subpart I
- RSS-119, Issue 12, May 2015 (Land Mobile and Fixed Equipment Operating in the Frequency Range 27.41-960 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 National Technical Systems - Silicon Valley test procedures:

ANSI C63.4:2014
ANSI TIA-603-D June 2010
FCC KDB 971168 Licensed Digital Transmitters

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.

The test results recorded herein are based on a single type test of the GE MDS LLC model LN1 and therefore apply only to the tested samples. The samples were 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 LN1 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 and RSS-119

FCC	Canada	Description	Measured	Limit	Result
Transmitter Modulation, output power and other characteristics					
§2.1033 (c) (5) § 90.35	RSS-119	Frequency range(s)	150-174	150-174	Complied
	RSS-119	RF power output at the antenna terminals	20 to 41.4 dBm	47.8 dBm	Complied
§2.1033 (c) (6) §2.1033 (c) (7) § 2.1046 § 90.205		ERP	23.0 to 51.6 dBm	57.0 dBm	Complied
§2.1033 (c) (4) § 2.1047 § 90.210	RSS-119	Emission types	F1D, F2D, F3D, D1D[1]	-	Complied
		Emission mask	C, D and E	Within mask	Complied
§ 2.1049 § 90.209	RSS-GEN 6.6 RSS-119	Occupied Bandwidth	5.19 kHz 8.59 kHz 10.4 kHz 10.8 kHz 17.2 kHz	6 kHz 11.25 kHz 11.25 kHz 11.25 kHz 20 kHz	Complied
§ 90.214	RSS-119	Transient Frequency Behaviour	Within the limits.	Within the limits	Complied
Transmitter spurious emissions					
§ 2.1051 § 2.1057	RSS-119	At the antenna terminals	-29.9 dBm @ 149.267 MHz (-4.9 dB)	-25 dBm	Complied
§ 2.1053 § 2.1057	RSS-119	Field strength (Substitution)	-46.4 dBm @ 1566.1 MHz (-21.8 dB)	-25 dBm	Complied
Other details					
§ 2.1055 § 90.213	RSS-119	Frequency stability	0.3 ppm	5 ppm	Complied
§ 2.1093	RSS-102	RF Exposure	Refer to separate exhibits		
§2.1033 (c) (8)	-	Final radio frequency amplifying circuit's dc voltages and currents for normal operation over the power range	35.5 VDC, 755 mA (Full power)		
-	-	Antenna Gain	Max 12.3 dBi	-	-
Notes 1 – Refer to separate waiver allowing D1D emissions type for part 90 operation.					

EXTREME CONDITIONS

Frequency stability is determined over extremes of temperature and voltage. The extremes of voltage were 10 to 60 Vdc which are the lowest operating voltage and highest operation voltages specified by GE MDS.

The extremes of temperature were -30°C to +50°C as specified in FCC §2.1055(a)(1).

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 LN1 is an industrial radio module operating in the 150-174 MHz bands and uses CPFSK and QAM modulations. Since the EUT could be placed in any position during operation, the EUT was treated as table-top equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 10-60 Volts DC, 2.0 Amps max.

The samples were received on March 21, 2017 and tested on March 21, 22, 23 and 24, 2017. The following samples were tested:

Company	Model	Description	Serial Number	FCC ID
GE MDS LLC	LN1	Industrial Radio Module	2791301 (conducted)	E5MDS-LN100 (IC: 101D-LN100)
GE MDS LLC	LN1	Industrial Radio Module	2791296 (radiated)	E5MDS-LN100 (IC: 101D-LN100)

OTHER EUT DETAILS

The highest internal source of an EUT is defined as the highest frequency generated or used within the EUT or on which the EUT operates or tunes. In some cases, the highest internal source determines the frequency range of test for radiated emissions. The highest internal source of the EUT was declared as: 696.3 MHz. There is also a switch mode power operating at 350 kHz.

ENCLOSURE

The EUT does not have an enclosure as it is intended to be installed in a complete product. The PCB measures approximately 11 cm wide by 3.8 cm deep 0.6 cm high.

MODIFICATIONS

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

SUPPORT EQUIPMENT

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

Company	Model	Description	Serial Number
HP	Probook 6555b	Laptop	CNU0502BCT

No remote support equipment was used during testing.

EUT INTERFACE PORTS

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

Port		Cable(s)		
From	To	Description	Shielded/Unshielded	Length(m)
DC power	Power Suorce	two wire	Unshielded	1.2
Com1	RJ45 to DB9 adapter	Cat 5	Unshielded	1

Additional on Support Equipment

Port		Cable(s)		
From	To	Description	Shielded/Unshielded	Length(m)
Laptop Serial	RJ45 to DB9 adapter	Multiwire	Shielded	2.0

EUT OPERATION

During emissions testing the EUT was set in continuous transmit mode on the selected channel using various modem and baud settings as noted depending on the test or in receive mode on the selected channel.

TESTING

GENERAL INFORMATION

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

Radiated spurious emissions measurements were taken at the National Technical Systems - Silicon Valley Anechoic Chambers and/or Open Area Test Site(s) listed below. The sites conform to the requirements of ANSI C63.4: 2014 *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 Innovation Science and Economic Development Canada.

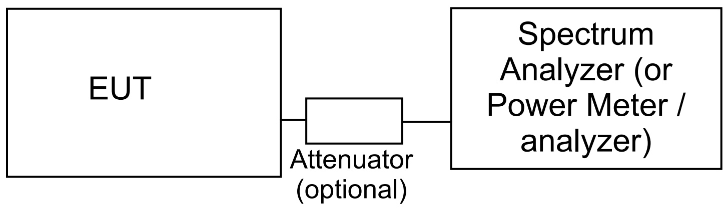
Site	Designation / Registration Numbers FCC	Canada	Location
Chamber 4	US0027	IC 2845B-4	41039 Boyce Road Fremont, CA 94538-2435

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.

Appendix A Test Equipment Calibration Data

Manufacturer	Description	Model	Asset #	Calibrated	Cal Due
Antenna port measurements: RF Power, Mask, OBW, Spurious, Frequency Stability, 21-Mar-17					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	0		N/A
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, Single Channel	NRVS	1422	3/10/2017	3/10/2018
Fluke	Multimeter, True RMS	111	1480	3/28/2016	4/28/2017
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	6/24/2016	6/24/2017
Watlow	Temp Chamber (w/ F4 Watlow Controller)	F4	2170	7/8/2016	7/8/2017
Rohde & Schwarz	Peak Power Sensor 100 uW - 2 Watts use with 20dB attenuator sn:1031.6959.00 only	NRV-Z32	3225	10/27/2016	10/27/2017
Mini-Circuits	2 way power divider, 50 MHz-2GHz	15542	3435	12/28/2016	12/28/2018
Transient Frequency Behavior, 22-Mar-17					
Werlatone	Directional Coupler, 80-1000 MHz, 40dB, 200W	C3910	917		N/A
Tektronix	1 GHz, 4 CH, 5GS/s Oscilloscope	TDS5104	1435	8/2/2016	8/2/2017
Agilent Technologies	MXG Analog Signal Generator 6 GHz	N5181A	2146	3/14/2017	3/14/2018
Mini-Circuits	2 way power divider, 50 MHz-2GHz	15542	3435	12/28/2016	12/28/2018
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB 7	9482	10/28/2016	10/28/2017
Spurious Emissions (Rx), 22-Mar-17					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	0		N/A
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	6/24/2016	6/24/2017
Antenna port measurements, 23-Mar-17					
Fluke	Multimeter, True RMS	111	1480	3/28/2016	4/28/2017
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	6/24/2016	6/24/2017
Radiated Emissions, 30 - 1,000 MHz, 23-Mar-17					
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1657	7/27/2016	7/27/2018
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	6/24/2016	6/24/2017
Com-Power	Preamplifier, 30-1000 MHz	PA-103	2465	9/16/2016	9/16/2017

Manufacturer	Description	Model	Asset #	Calibrated	Cal Due
Radiated Emissions, 30 - 3,000 MHz, 24-Mar-17					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	0		N/A
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	10/5/2016	10/5/2017
Hewlett Packard	Spectrum Analyzer (SA40) Blue 9 kHz - 40 GHz	8564E (84125C)	1393	3/28/2016	4/28/2017
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1657	7/27/2016	7/27/2018
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	6/24/2016	6/24/2017
Com-Power	Preamplifier, 30-1000 MHz	PA-103	2465	9/16/2016	9/16/2017
EMCO	Antenna, Horn, 1-18 GHz	3115	2870	8/31/2015	8/31/2017
Radiated Emissions, 30 - 4,000 MHz, 24-Mar-17					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	0		N/A
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	10/5/2016	10/5/2017
Hewlett Packard	Spectrum Analyzer (SA40) Blue 9 kHz - 40 GHz	8564E (84125C)	1393	3/28/2016	4/28/2017
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1657	7/27/2016	7/27/2018
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	6/24/2016	6/24/2017
Com-Power	Preamplifier, 30-1000 MHz	PA-103	2465	9/16/2016	9/16/2017
EMCO	Antenna, Horn, 1-18 GHz	3115	2870	8/31/2015	8/31/2017
Substitution Measurements, 24-Mar-17					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	0		N/A
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1422	3/10/2017	3/10/2018
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1657	7/27/2016	7/27/2018
Compliance Design	Tuned Dipole Antenna	Roberts (65-180MHz)	1895	1/19/2016	1/19/2018
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	6/24/2016	6/24/2017
Agilent Technologies	MXG Analog Signal Generator 6 GHz	N5181A	2146	3/14/2017	3/14/2018
Com-Power	Preamplifier, 30-1000 MHz	PA-103	2465	9/16/2016	9/16/2017
Rohde & Schwarz	Peak Power Sensor 1uW - 20mW	NRV-Z31	3428	12/14/2016	12/14/2017
Conducted Emissions - Antenna Port, 27-Mar-17					
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	6/24/2016	6/24/2017
Radiated Emissions, 30 - 1,000 MHz, 27-Mar-17					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	0		N/A
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1657	7/27/2016	7/27/2018
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	6/24/2016	6/24/2017

Manufacturer	Description	Model	Asset #	Calibrated	Cal Due
Com-Power	Preamplifier, 30-1000 MHz	PA-103	2465	9/16/2016	9/16/2017
Radiated Emissions, 30 - 2,100 MHz, 28-Mar-17					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	0		N/A
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	10/5/2016	10/5/2017
Hewlett Packard	Spectrum Analyzer (SA40) Blue 9 kHz - 40 GHz	8564E (84125C)	1393	3/28/2016	4/28/2017
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1657	7/27/2016	7/27/2018
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	6/24/2016	6/24/2017
Com-Power	Preamplifier, 30-1000 MHz	PA-103	2465	9/16/2016	9/16/2017
EMCO	Antenna, Horn, 1-18 GHz	3115	2870	8/31/2015	8/31/2017
Conducted Emissions - AC Power Ports, 28-Mar-17					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	0		N/A
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	1401	2/3/2017	2/3/2018
Com-Power	9KHz-30MHz, 50uH, 15Aac, 10Adc, max CISPR 15	LI-215A	2672	7/13/2016	6/26/2017
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB 7	9482	10/28/2016	10/28/2017

Appendix B Test Data

T103939 Pages 23 - 48

Client:	GE MDS LLC	Job Number:	JD103878
Product	LN1	T-Log Number:	T103939
System Configuration:	-	Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Emissions Standard(s):	FCC Part 90, FCC Part 15B	Class:	-
Immunity Standard(s):	-	Environment:	Radio

EMC Test Data

For The

GE MDS LLC

Product

LN1

Date of Last Test: 3/28/2017

Client:	GE MDS LLC	Job Number:	JD103878
Model:	LN1	T-Log Number:	T103939
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Part 90, FCC Part 15B	Class:	N/A

RSS 119 and FCC Part 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: 21 °C
Rel. Humidity: 55 %

Summary of Results

Run #	Spacing	Test Performed	Limit	Pass / Fail	Result / Margin
1	-	Output Power	500 W ERP (FCC) 60W (ISEDC)	Pass	41.4 dBm
2	6.25 kHz, 12.5 kHz and 25 kHz	Spectral Mask	Emission within mask	Pass	Within mask for all modulations
3	6.25 kHz, 12.5 kHz and 25 kHz	99% or Occupied Bandwidth	NA	-	Various, see below
4	-	Spurious Emissions (conducted)	-25.0 dBm	Pass	-29.9 dBm @ 149.267 MHz (-4.9 dB)
5	-	Spurious emissions (radiated)	-25.0 dBm	Pass	-46.4 dBm @ 1566.1 MHz (-21.8 dB)
6	6.25 kHz, 12.5 kHz and 25 kHz	Transient Frequency Behavior	±6.25 kHz ±3.125 kHz	Pass	Within the limits.
7	-	Frequency Stability	5 ppm	Pass	0.3 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.

EMC Test Data

Client:	GE MDS LLC	Job Number:	JD103878
Model:	LN1	T-Log Number:	T103939
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Part 90, FCC Part 15B	Class:	N/A

Run #1: Output Power

Date of Test: 3/21/2017
Test Engineer: David Bare
Test Location: Fremont EMC Lab 4A

Config. Used: 1
Config Change: None
EUT Voltage: 13.8 VDC

Cable/splitter Loss: 3.0 dB
Cable/splitter ID(s): 3435

Attenuator: 20.0 dB
Attenuator IDs: 1878

Total Loss: 23.0 dB

Power Setting[2]	Frequency (MHz)	Output Power (dBm)[1]	Output Power mW	Antenna Gain (dBi)	Result	EIRP dBm	EIRP W
40	150.0000000	41.0	12589.3	12.3	Pass	53.3	213.796
40	162.0000000	41.4	13803.8	12.3	Pass	53.7	234.423
40	174.0000000	41.4	13803.8	12.3	Pass	53.7	234.423

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. FB 26 for CPFSK

EMC Test Data

Client:	GE MDS LLC	Job Number:	JD103878
Model:	LN1	T-Log Number:	T103939
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Part 90, FCC Part 15B	Class:	N/A

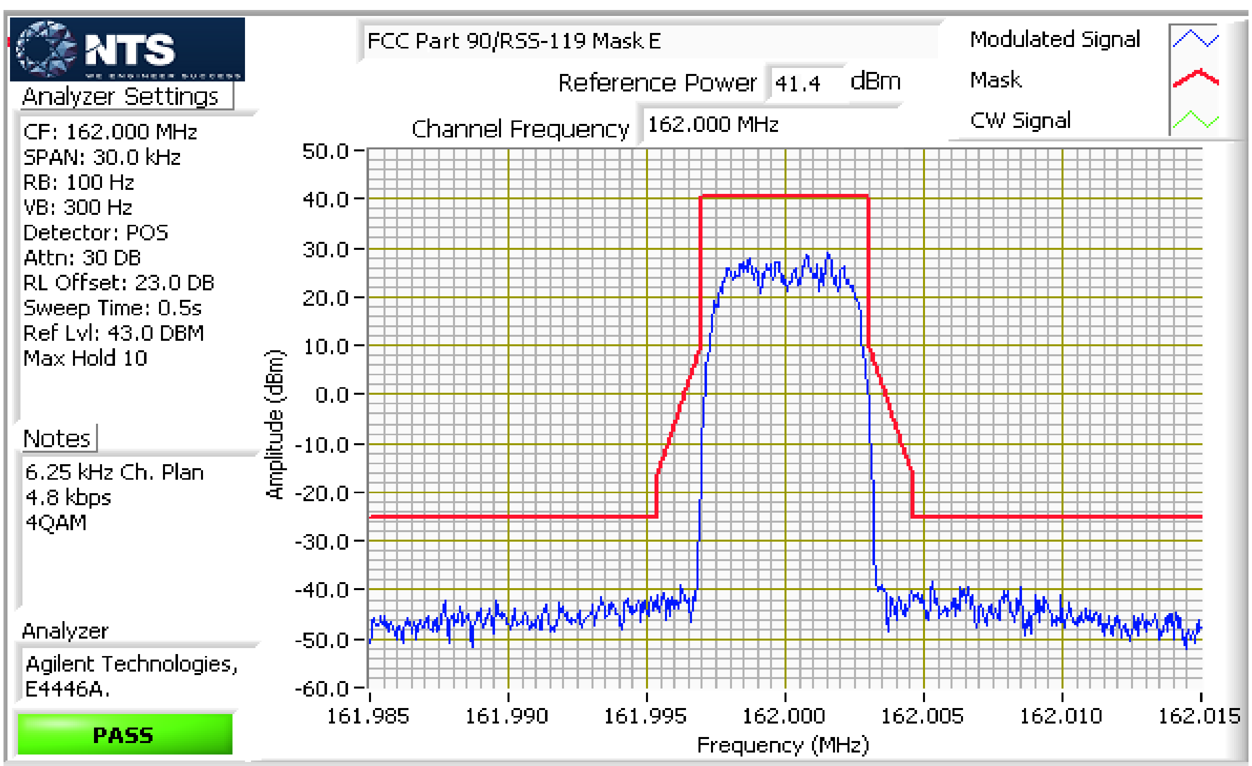
Run #2: Spectral Mask, FCC Part 90 Masks C, D and E

Date of Test: 3/21/2017
Test Engineer: David Bare
Test Location: Fremont EMC Lab 4A

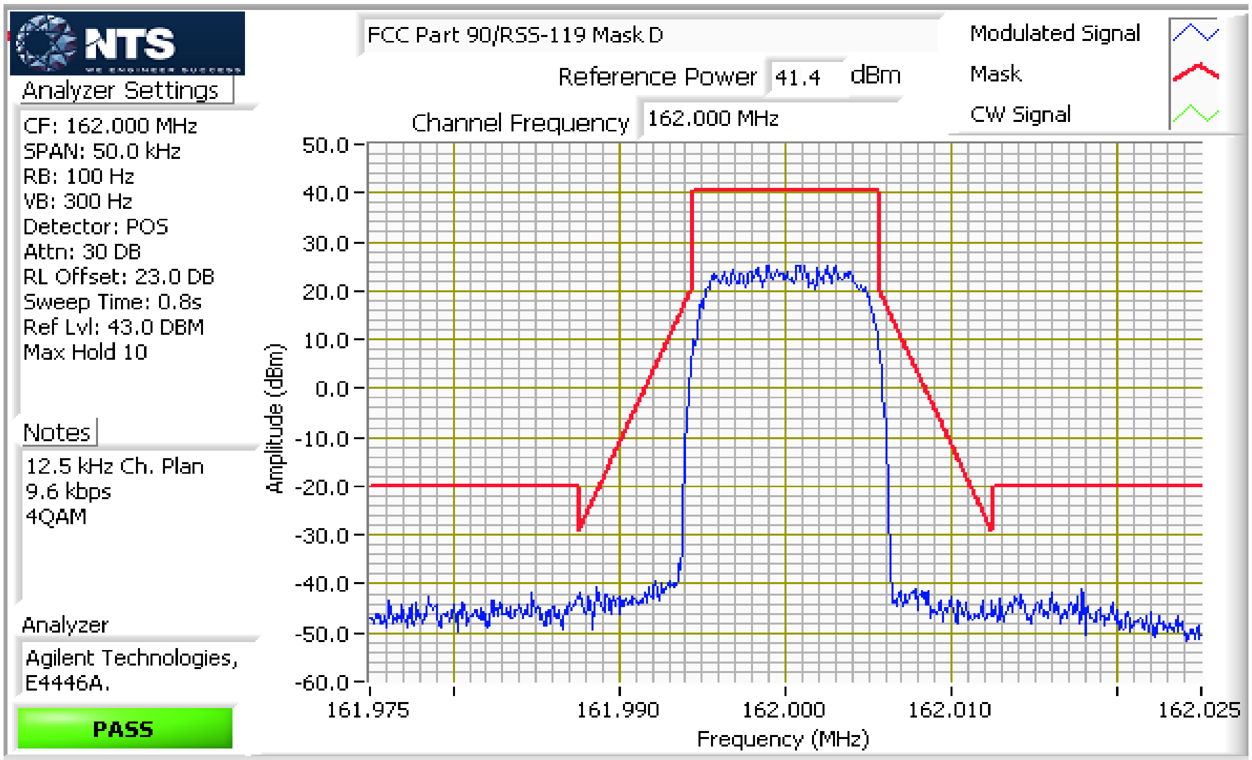
Config. Used: 1
Config Change: None
EUT Voltage: 13.8 VDC

Power setting	Baud / Modem	Modem	Channel plan	Modulation	Channel Frequency (MHz)	Mask	Result Pass/Fail
40	4.8 kbps	4QAM	6.25 kHz	QAM	162.000000	E	Pass
40	9.6 kbps	4QAM	12.5 kHz	QAM	162.000000	D	Pass
40	10.0 kbps	4QAM	12.5 kHz	QAM	162.000000	D	Pass
40	16.0 kbps	4QAM	25.0 kHz	QAM	162.000000	C	Pass
40	9.6 kbps	9600	12.5 kHz	CPFSK	162.000000	D	Pass
40	19.2 kbps	19200	25.0 kHz	CPFSK	162.000000	C	Pass

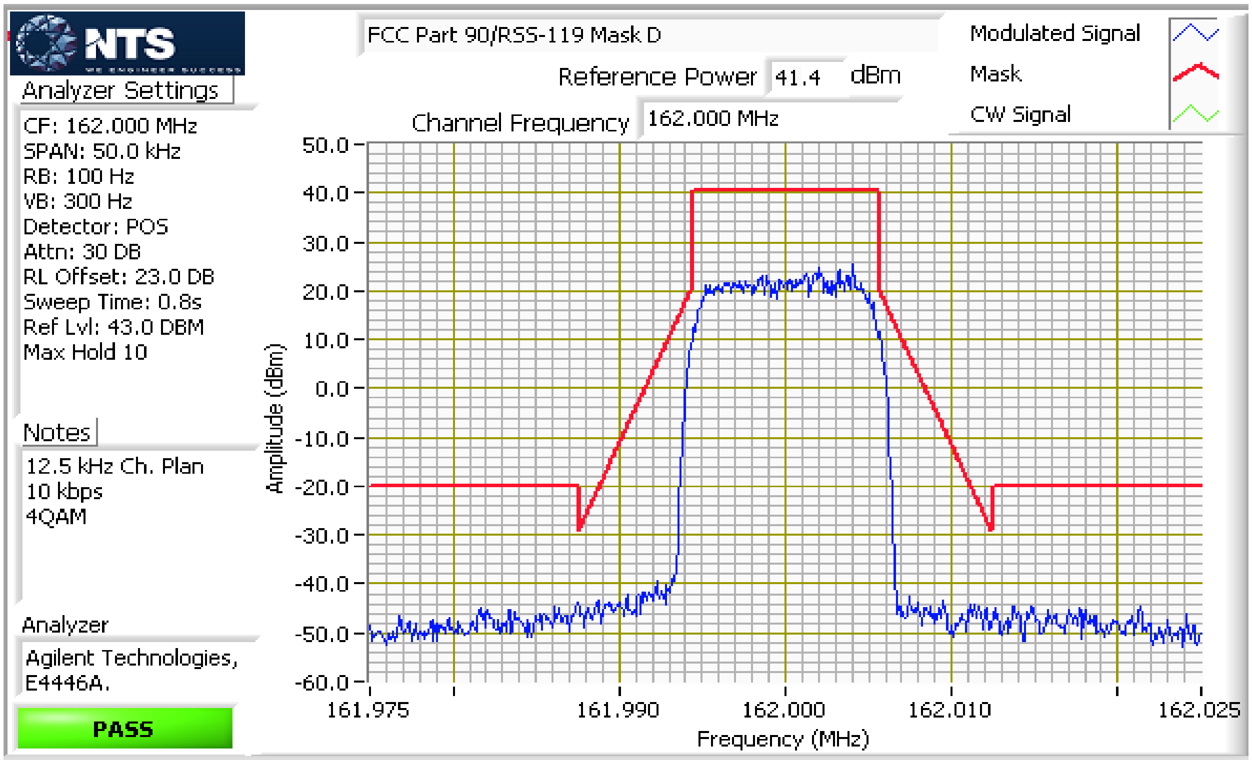
Note 1: Mask reference based on measured total power from Run #1.



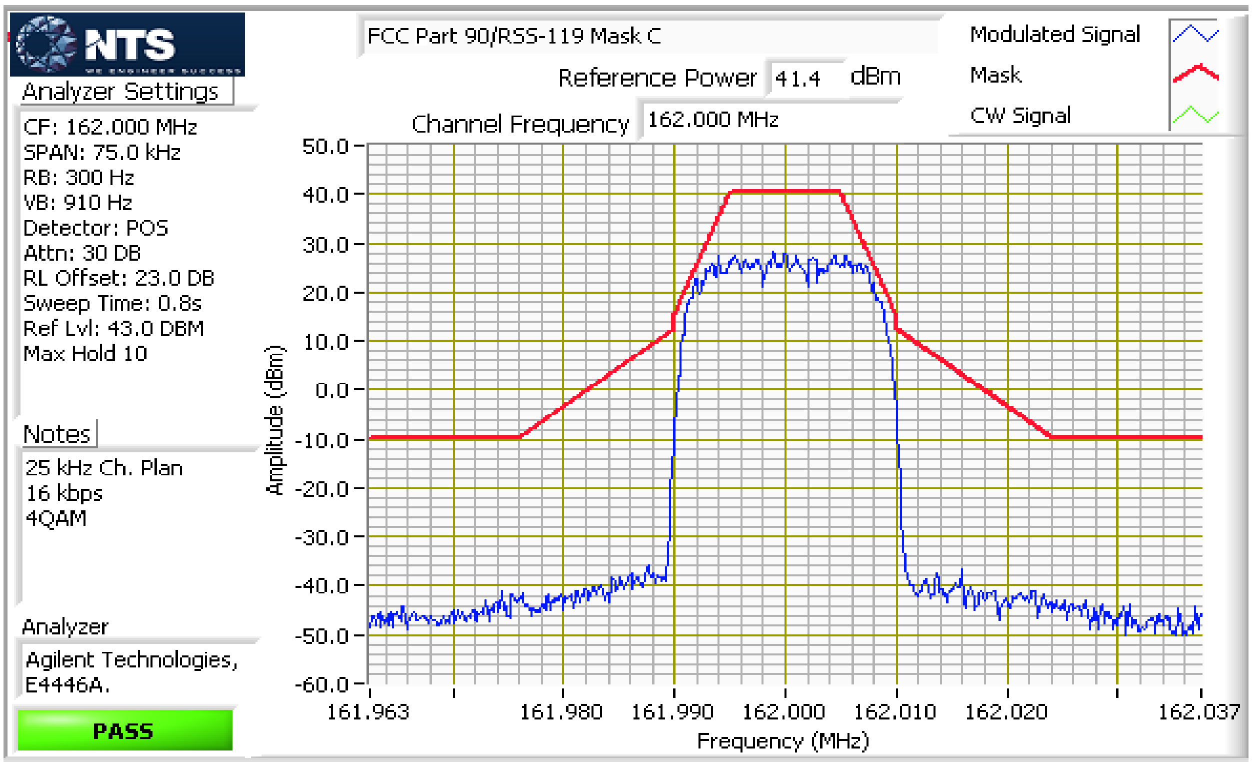
Client:	GE MDS LLC	Job Number:	JD103878
Model:	LN1	T-Log Number:	T103939
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Part 90, FCC Part 15B	Class:	N/A



Client:	GE MDS LLC	Job Number:	JD103878
Model:	LN1	T-Log Number:	T103939
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Part 90, FCC Part 15B	Class:	N/A

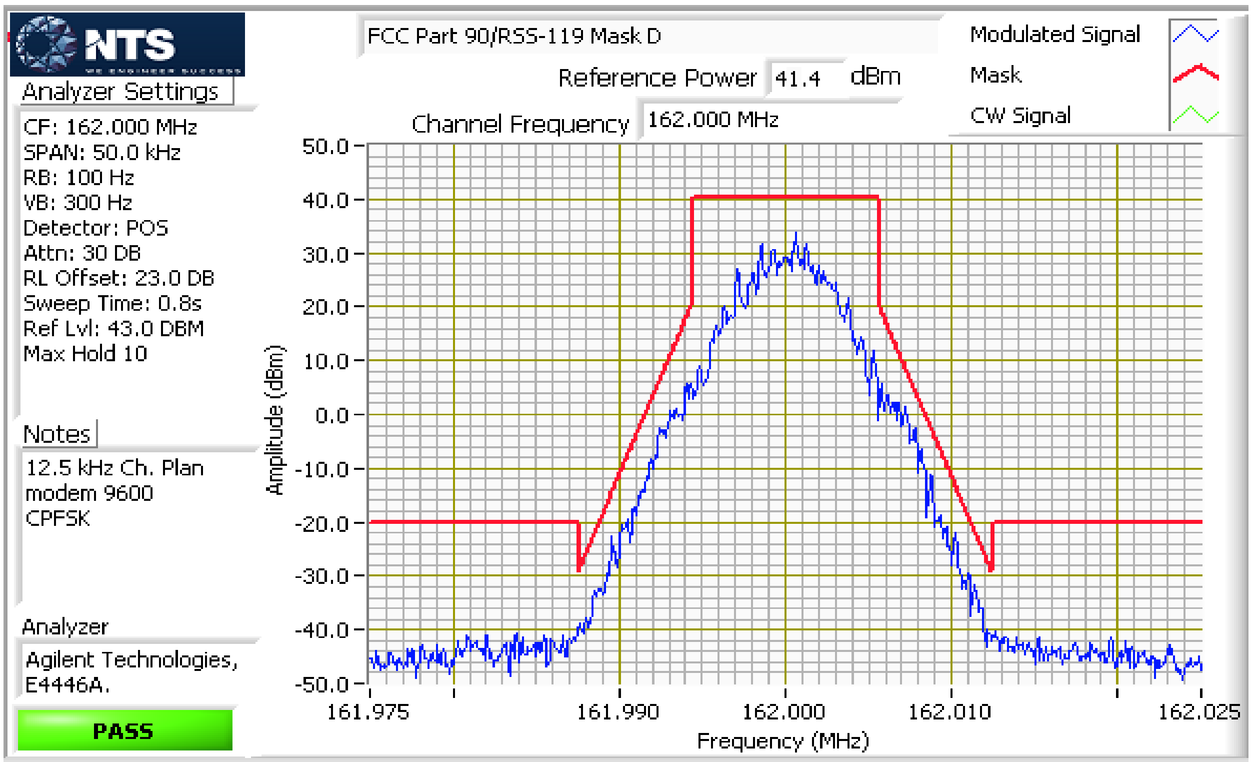


Client:	GE MDS LLC	Job Number:	JD103878
Model:	LN1	T-Log Number:	T103939
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Part 90, FCC Part 15B	Class:	N/A



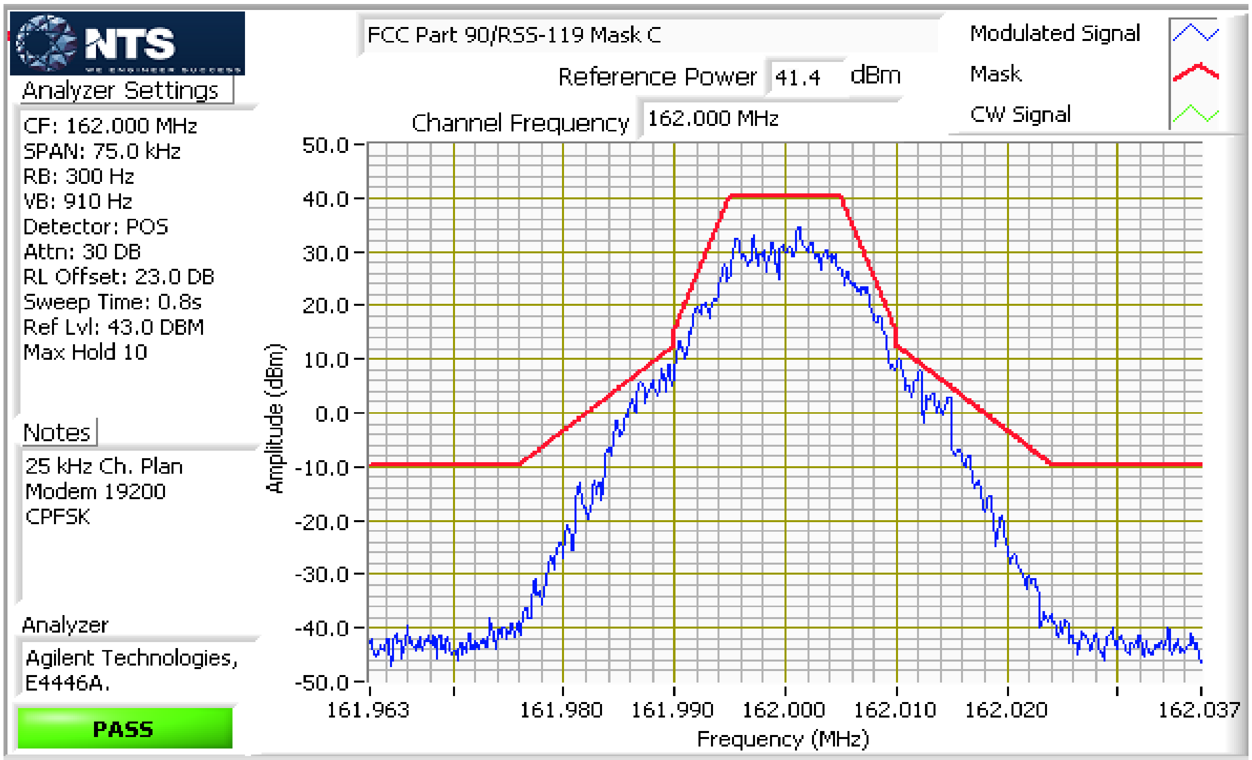
EMC Test Data

Client:	GE MDS LLC	Job Number:	JD103878
Model:	LN1	T-Log Number:	T103939
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Part 90, FCC Part 15B	Class:	N/A



EMC Test Data

Client:	GE MDS LLC	Job Number:	JD103878
Model:	LN1	T-Log Number:	T103939
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Part 90, FCC Part 15B	Class:	N/A



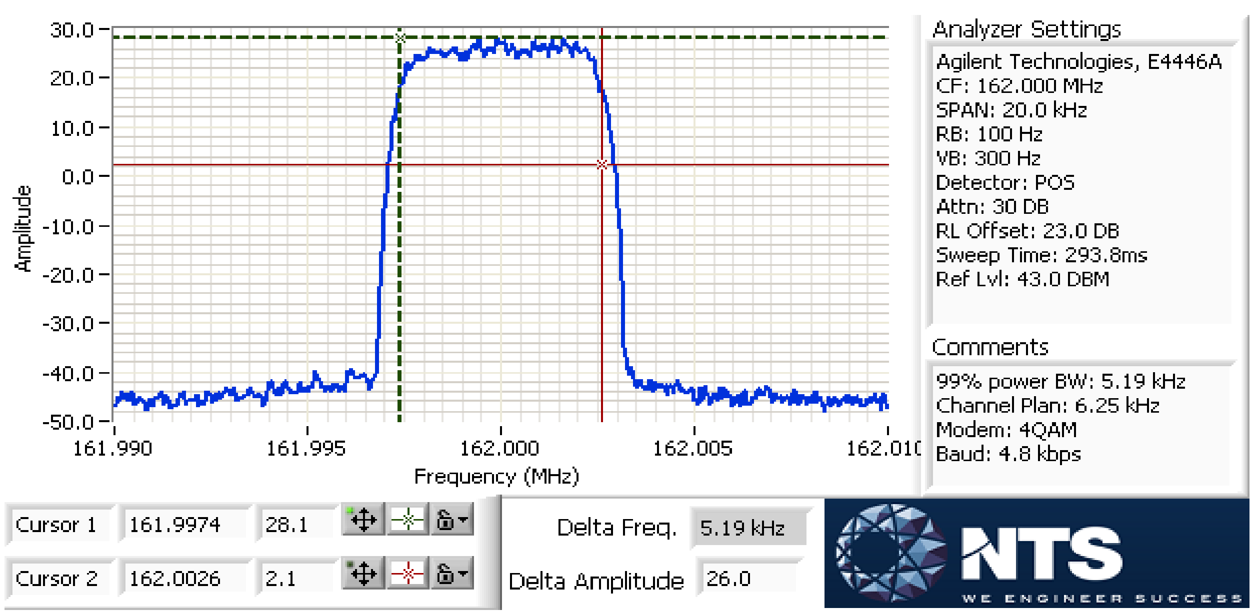
Client:	GE MDS LLC	Job Number:	JD103878
Model:	LN1	T-Log Number:	T103939
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Part 90, FCC Part 15B	Class:	N/A

Run #3: Signal Bandwidth

Date of Test: 3/21/2017 Config. Used: 1
Test Engineer: David Bare Config Change: None
Test Location: Fremont EMC Lab 4A EUT Voltage: 13.8 VDC

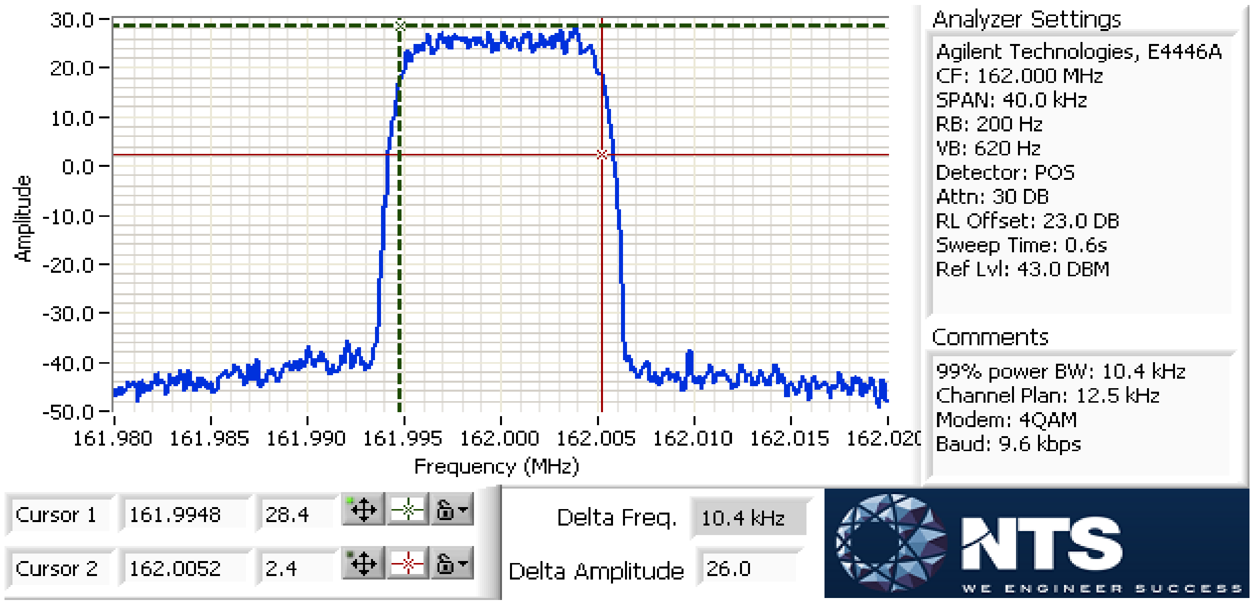
Power Setting	Data Rate	Modulation	Frequency (MHz)	Resolution Bandwidth	Bandwidth (kHz)		Authorized bandwidth
						99%	
40	4800	QAM	162	100 Hz		5.19	6 kHz
40	9600	QAM	162	200 Hz		10.4	11.25 kHz
40	10000	QAM	162	200 Hz		10.8	11.25 kHz
40	16000	QAM	162	300 Hz		17.2	20 kHz
40	9600	CPFSK	162	200 Hz		8.59	11.25 kHz
40	19200	CPFSK	162	300 Hz		17.2	20 kHz

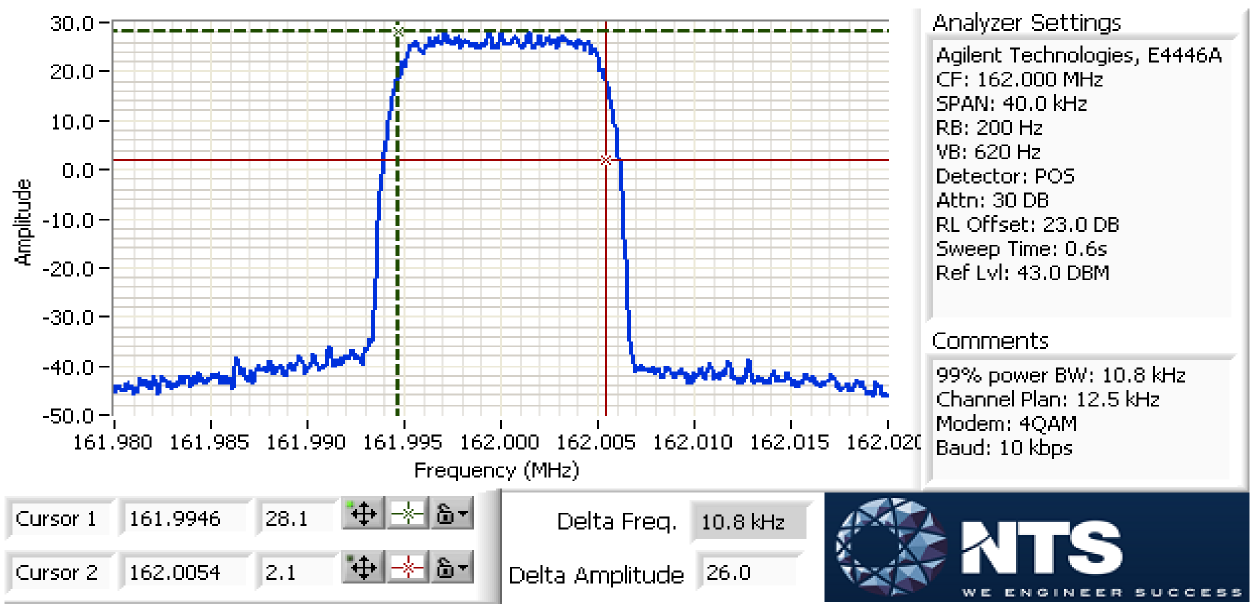
Note 1: 99% bandwidth measured in accordance with ANSI C63.10, with RB between 1% and 5% of the measured bandwidth and VB ≥ 3*RB and Span ≥ 1.5% and ≤ 5% of measured bandwidth.



EMC Test Data

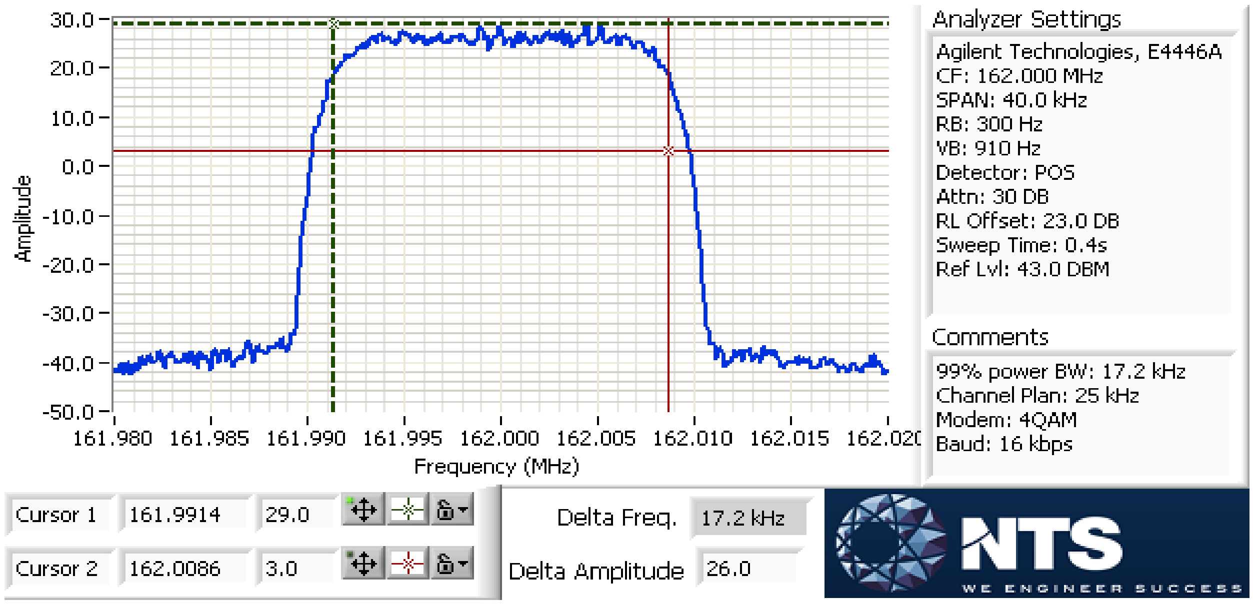
Client:	GE MDS LLC	Job Number:	JD103878
Model:	LN1	T-Log Number:	T103939
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Part 90, FCC Part 15B	Class:	N/A

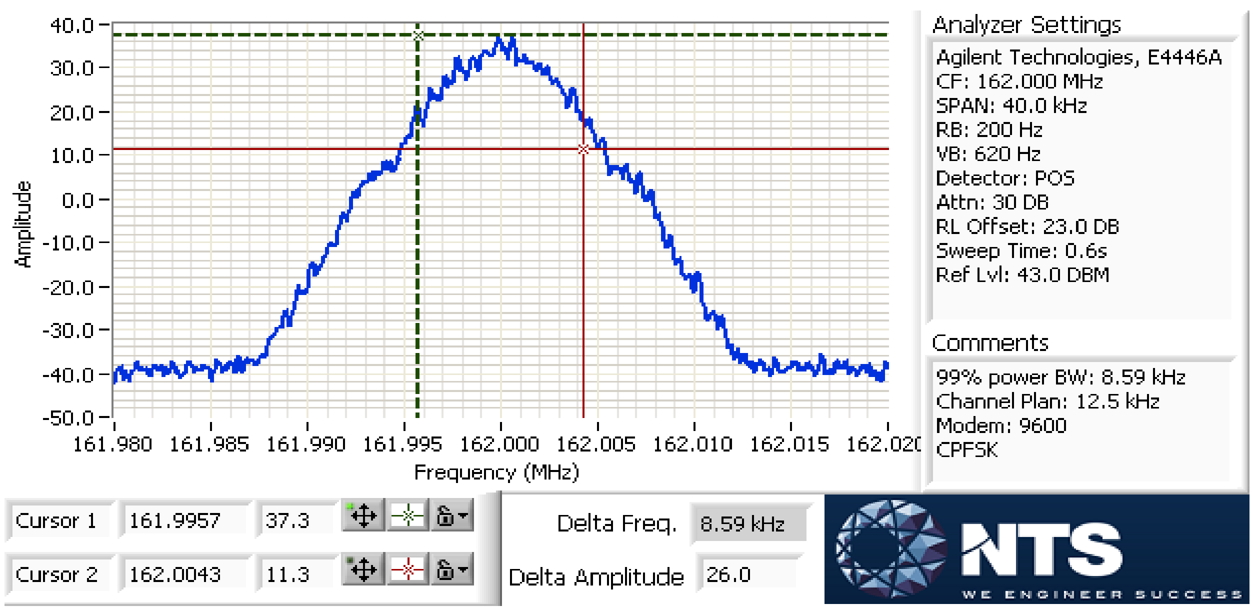




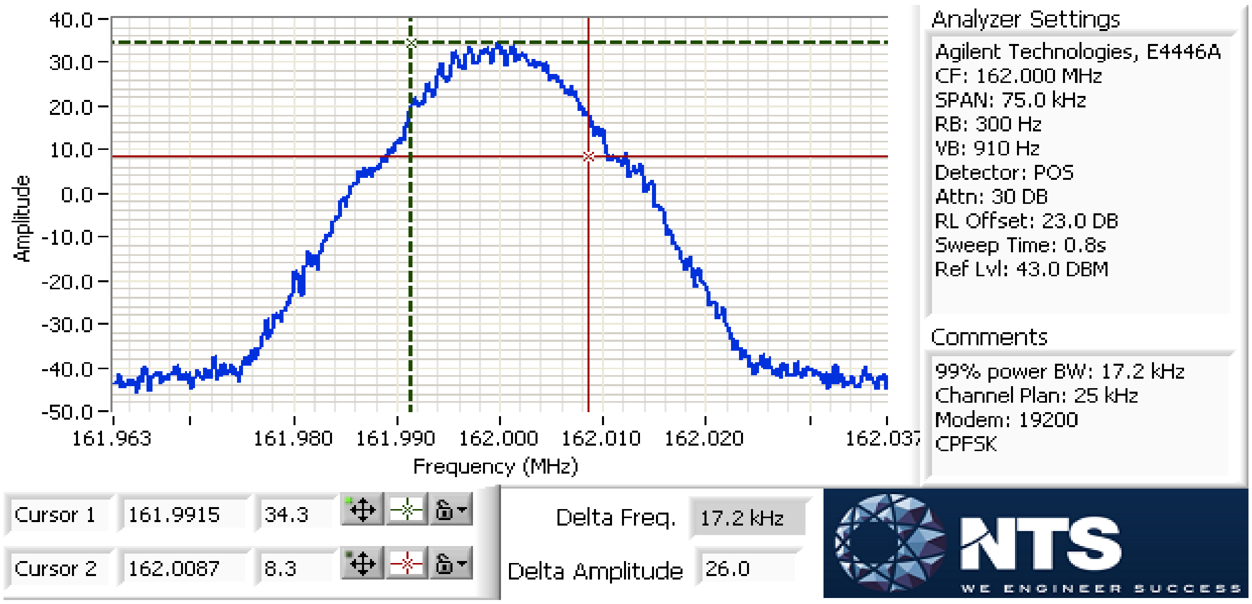
EMC Test Data

Client:	GE MDS LLC	Job Number:	JD103878
Model:	LN1	T-Log Number:	T103939
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Part 90, FCC Part 15B	Class:	N/A





Client:	GE MDS LLC	Job Number:	JD103878
Model:	LN1	T-Log Number:	T103939
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Part 90, FCC Part 15B	Class:	N/A



Client:	GE MDS LLC	Job Number:	JD103878
Model:	LN1	T-Log Number:	T103939
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Part 90, FCC Part 15B	Class:	N/A

Run #4: Out of Band Spurious Emissions, Conducted (lowest frequency to 10X highest transmit frequency)

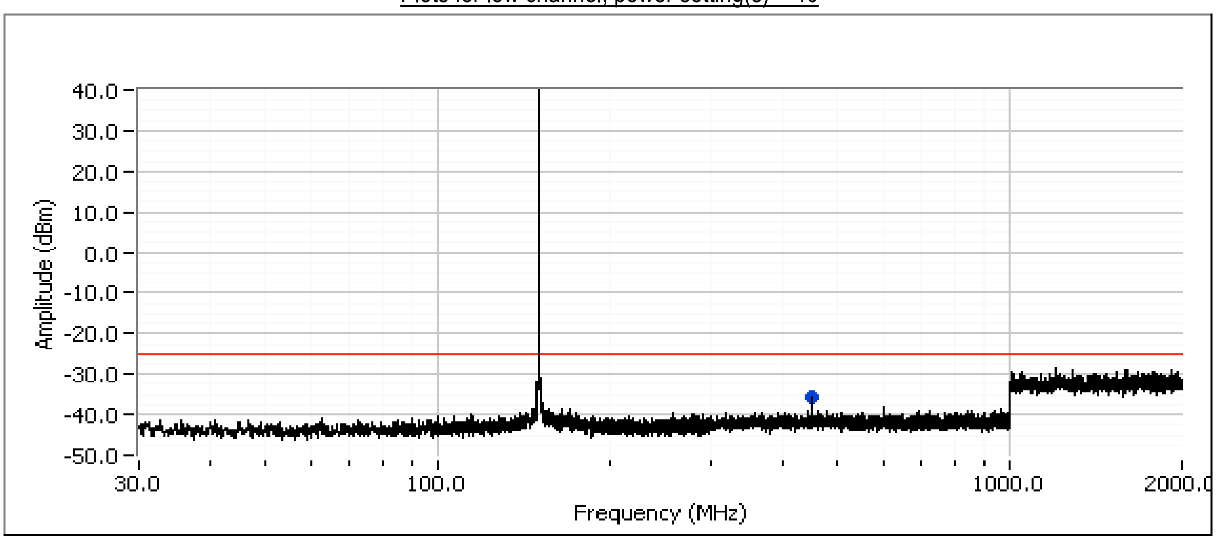
Date of Test: 3/21/2017
Test Engineer: David Bare
Test Location: Fremont EMC Lab 4A
Config. Used: 1
Config Change: None
EUT Voltage: 13.8 VDC

Frequency (MHz)	Limit	Result
150	-25 dBm	Pass
162	-25 dBm	Pass
174	-25 dBm	Pass

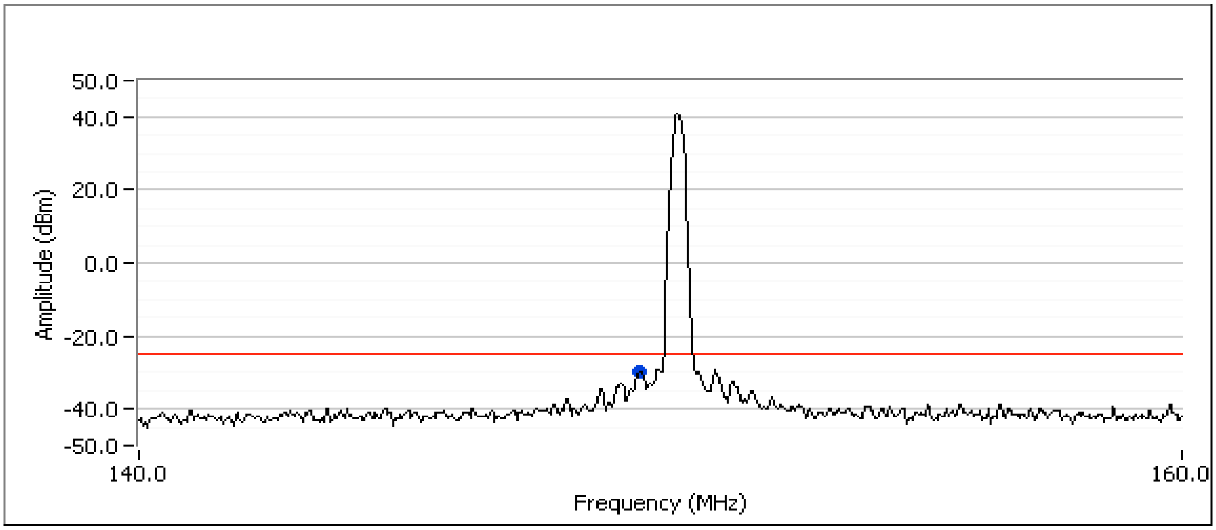
The limit is taken from FCC Part 90 Mask E.
Plots 20 MHz wide centered on the signal frequency also provided.

Frequency	Level	Port	FCC 90.210(e)		Detector	Ch. Freq.	Comments
MHz	dBm		Limit	Margin	Pk/QP/Avg	MHz	
486.018	-33.6	RF Port	-25.0	-8.6	PK	162.0	PK (CISPR)-RB 120 kHz; VB: 1 MHz
1394.180	-48.5	RF Port	-25.0	-23.5	PK	162.0	PK (CISPR)-RB 1 MHz; VB: 8 MHz
160.914	-32.8	RF Port	-25.0	-7.8	PK	162.0	PK (CISPR)-RB 120 kHz; VB: 1 MHz
149.267	-29.9	RF Port	-25.0	-4.9	PK	150.0	PK (CISPR)-RB 120 kHz; VB: 1 MHz
450.083	-35.5	RF Port	-25.0	-10.5	PK	150.0	PK (CISPR)-RB 120 kHz; VB: 1 MHz
173.300	-31.5	RF Port	-25.0	-6.5	Peak	174.0	PK (CISPR)-RB 120 kHz; VB: 1 MHz
348.083	-33.1	RF Port	-25.0	-8.1	Peak	174.0	PK (CISPR)-RB 120 kHz; VB: 1 MHz

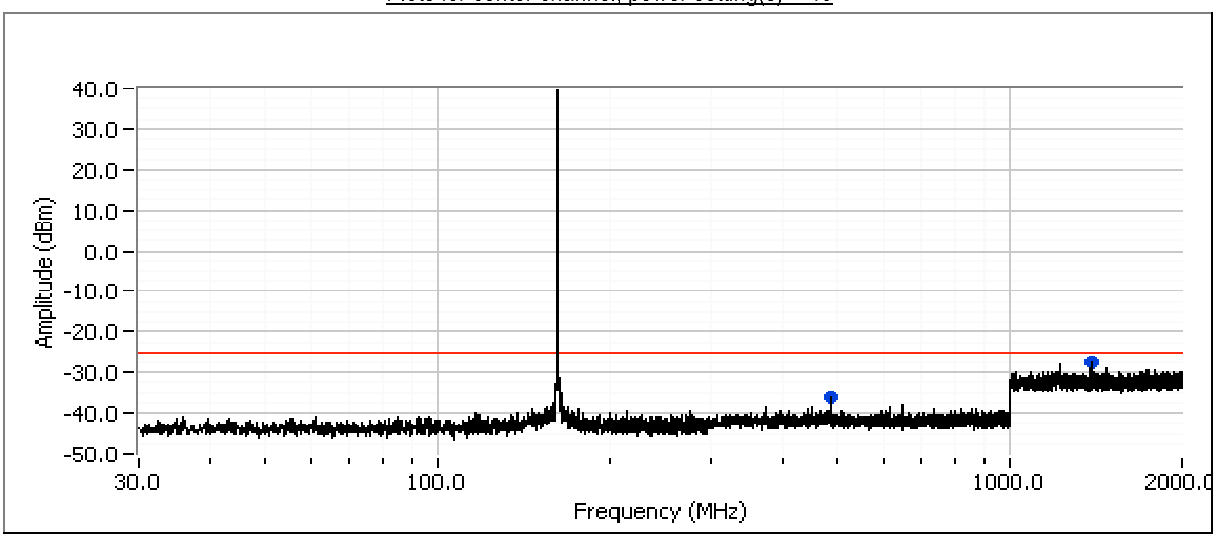
Plots for low channel, power setting(s) = 40



Client:	GE MDS LLC	Job Number:	JD103878
Model:	LN1	T-Log Number:	T103939
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Part 90, FCC Part 15B	Class:	N/A

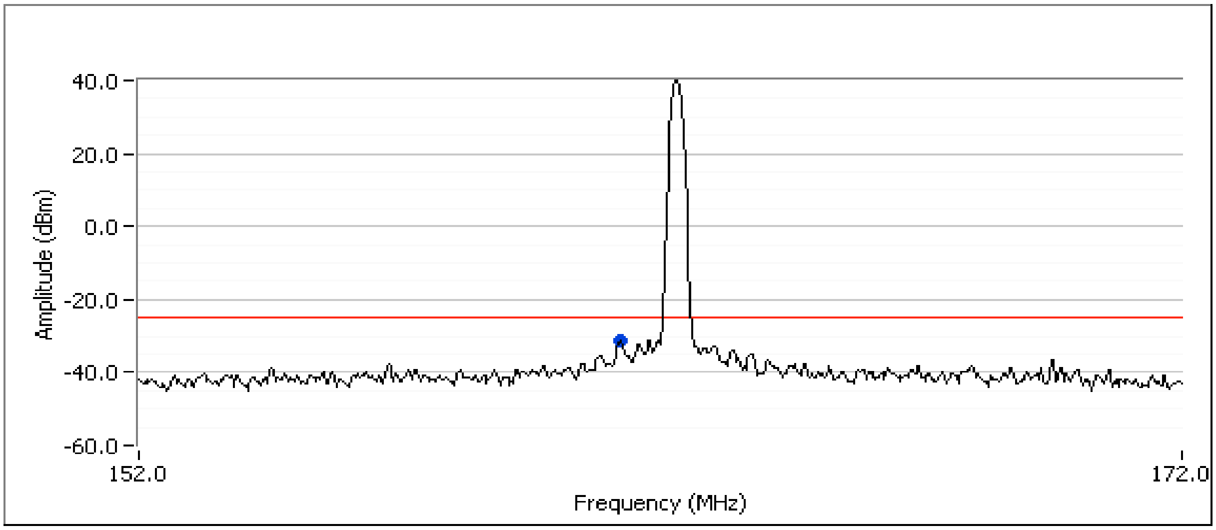


Plots for center channel, power setting(s) = 40

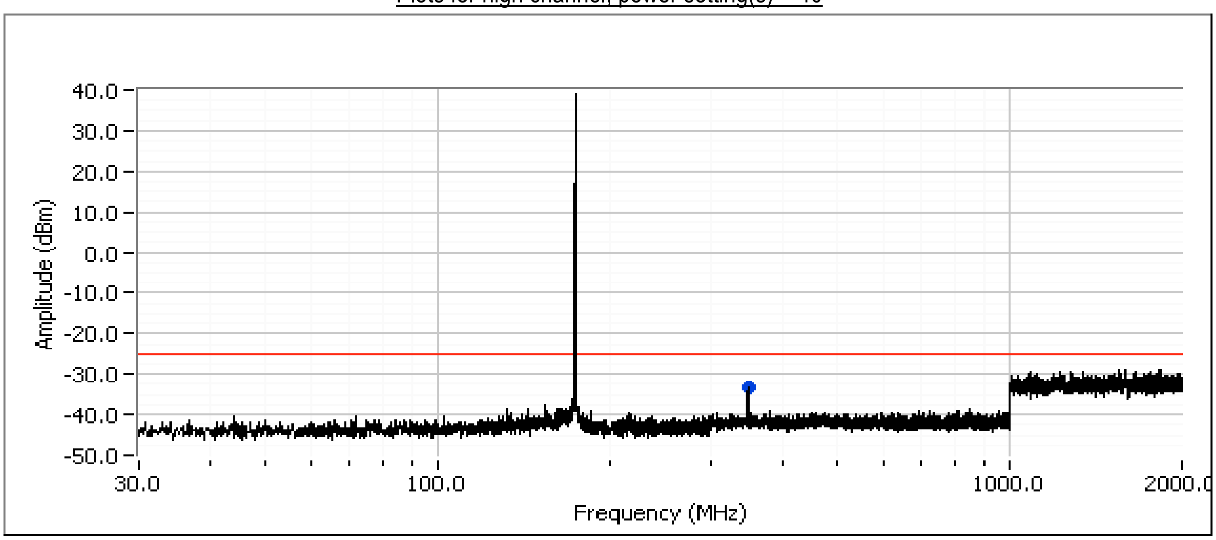


EMC Test Data

Client:	GE MDS LLC	Job Number:	JD103878
Model:	LN1	T-Log Number:	T103939
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Part 90, FCC Part 15B	Class:	N/A

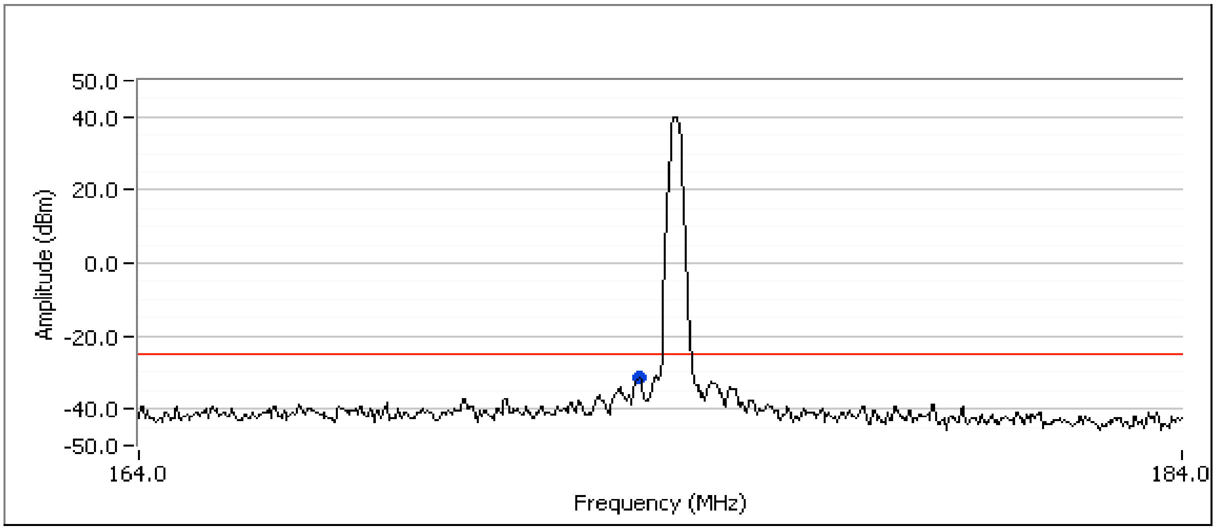


Plots for high channel, power setting(s) = 40



450

Client:	GE MDS LLC	Job Number:	JD103878
Model:	LN1	T-Log Number:	T103939
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Part 90, FCC Part 15B	Class:	N/A



Client:	GE MDS LLC	Job Number:	JD103878
Model:	LN1	T-Log Number:	T103939
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Part 90, FCC Part 15B	Class:	N/A

Run #5: Out of Band Spurious Emissions, Radiated

Date of Test: 3/23/2017, 3/24/2017
Test Engineer: Deniz Demirci
Test Location: FT Ch #4

Config. Used: 1
Config Change: None
EUT Voltage: 13.8 Vdc and 5.25 Vdc

Frequency (MHz)	Limit	Result
150.0000000	-25 dBm	Pass
162.0000000	-25 dBm	Pass
174.0000000	-25 dBm	Pass

The limit is taken from FCC Part 90 Mask E

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

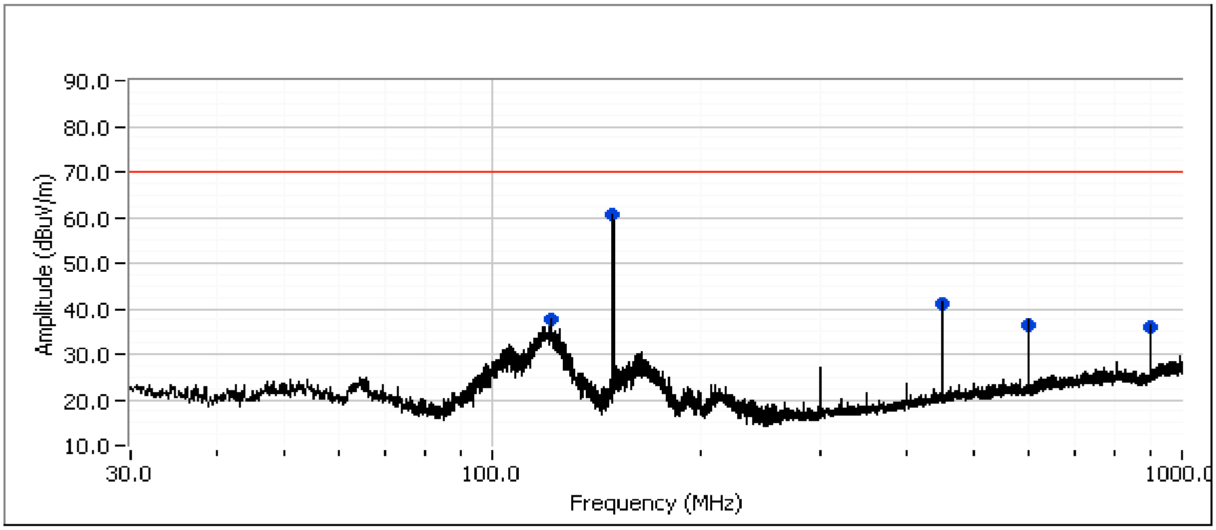
Run #5a - Preliminary measurements - chamber scans

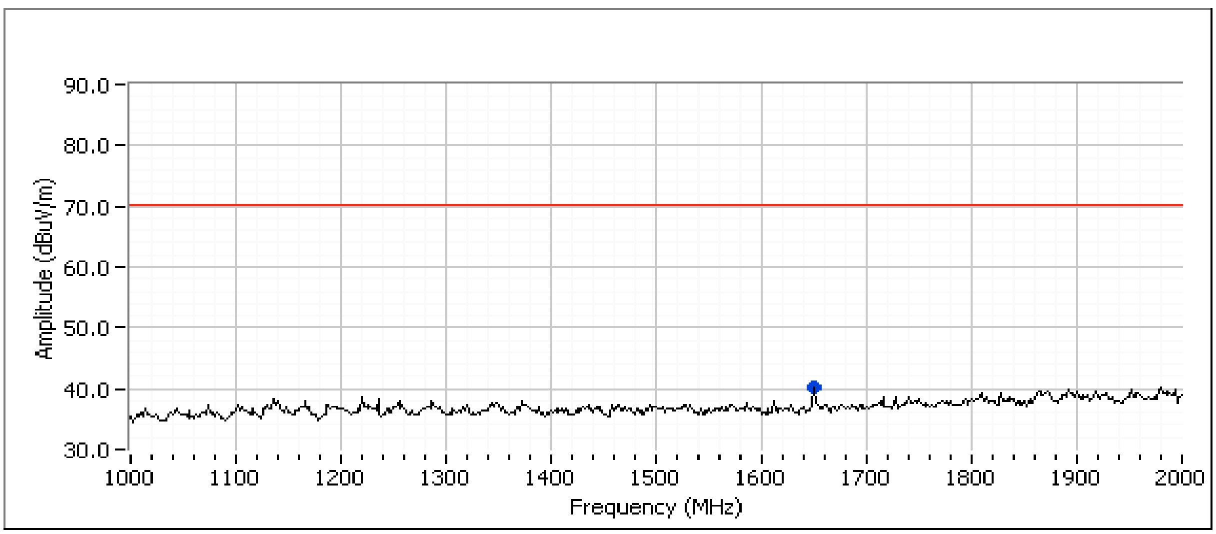
Frequency	Level	Pol	FCC 90.210(e)		Detector	Azimuth	Height	Comments	Channel
MHz	dBμV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		
122.191	*37.7*	*V*	*70.2*	*-32.5*	*Peak*	*351*	*1.0*		*150 MHz*
150.010	*60.7*	*V*	*NA*	*-*	*Peak*	*118*	*1.0*	*Carrier*	*150 MHz*
449.850	*41.1*	*H*	*70.2*	*-29.1*	*Peak*	*278*	*2.0*		*150 MHz*
600.167	*36.5*	*V*	*70.2*	*-33.7*	*Peak*	*111*	*1.5*		*150 MHz*
899.867	*36.1*	*H*	*70.2*	*-34.1*	*Peak*	*122*	*1.0*		*150 MHz*
121.651	*41.4*	*V*	*70.2*	*-28.8*	*Peak*	*60*	*1.0*		*162 MHz*
161.994	*61.2*	*V*	*70.2*	*-9.0*	*Peak*	*90*	*1.0*	*Carrier*	*162 MHz*
486.029	*44.6*	*H*	*70.2*	*-25.6*	*Peak*	*114*	*2.0*		*162 MHz*
971.991	*41.5*	*H*	*70.2*	*-28.7*	*Peak*	*64*	*1.0*		*162 MHz*
1620.000	*48.6*	*H*	*70.2*	*-21.6*	*Peak*	*226*	*1.5*		*162 MHz*
121.110	*43.3*	*V*	*70.2*	*-26.9*	*Peak*	*0*	*1.0*		*174 MHz*
174.008	*53.5*	*H*	*70.2*	*-16.7*	*Peak*	*218*	*1.5*	*Carrier*	*174 MHz*
521.974	*42.6*	*H*	*70.2*	*-27.6*	*Peak*	*318*	*2.0*		*174 MHz*
869.990	*38.0*	*H*	*70.2*	*-32.2*	*Peak*	*129*	*1.0*		*174 MHz*
1566.670	*48.1*	*H*	*70.2*	*-22.1*	*Peak*	*278*	*1.8*		*174 MHz*

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 (2.2 dBi) has not been included. The erp or eirp for all signals with less than **20 dB** 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:	JD103878
Model:	LN1	T-Log Number:	T103939
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Part 90, FCC Part 15B	Class:	N/A

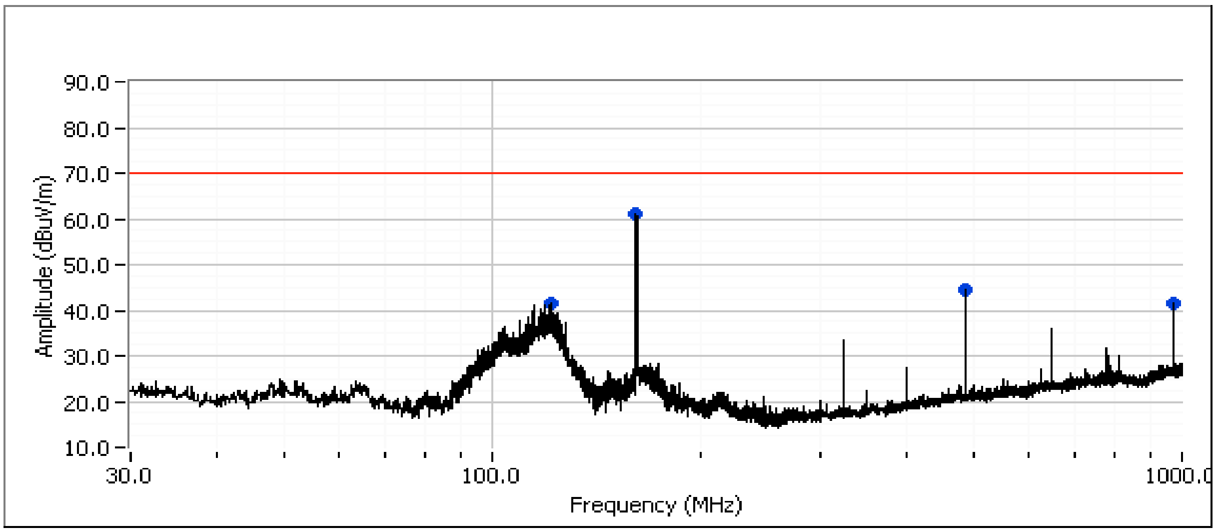
Plots for low channel, power setting(s) = 40 dBm

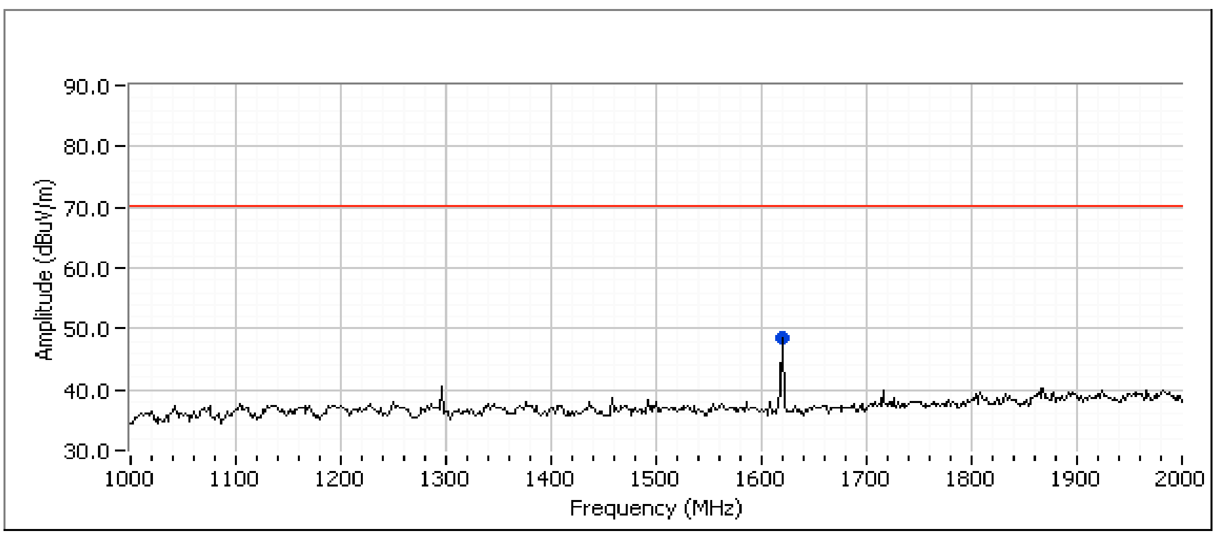




Client:	GE MDS LLC	Job Number:	JD103878
Model:	LN1	T-Log Number:	T103939
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Part 90, FCC Part 15B	Class:	N/A

Plots for center channel, power setting(s) = 40 dBm



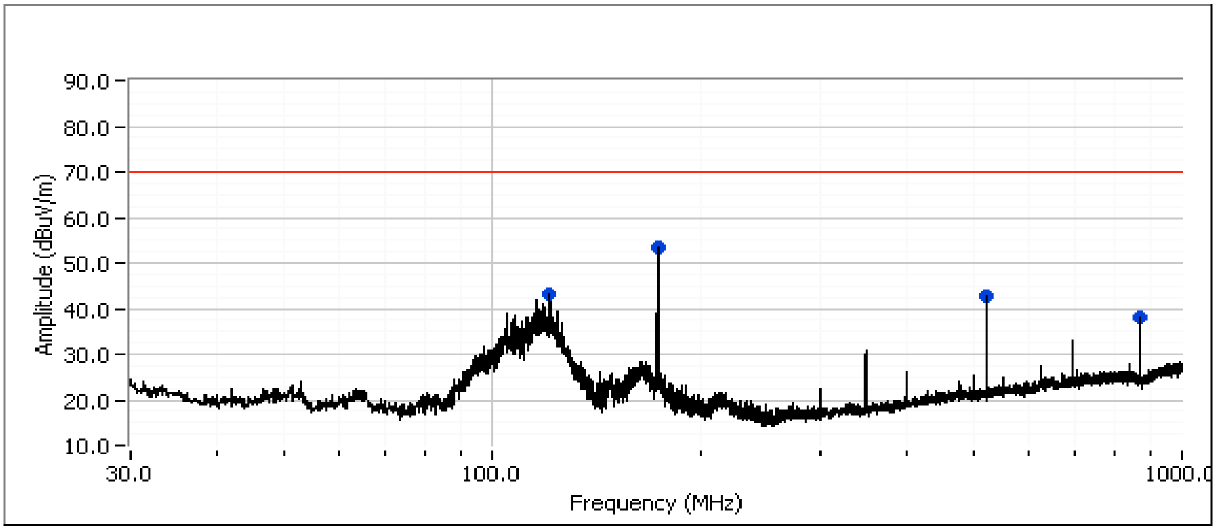


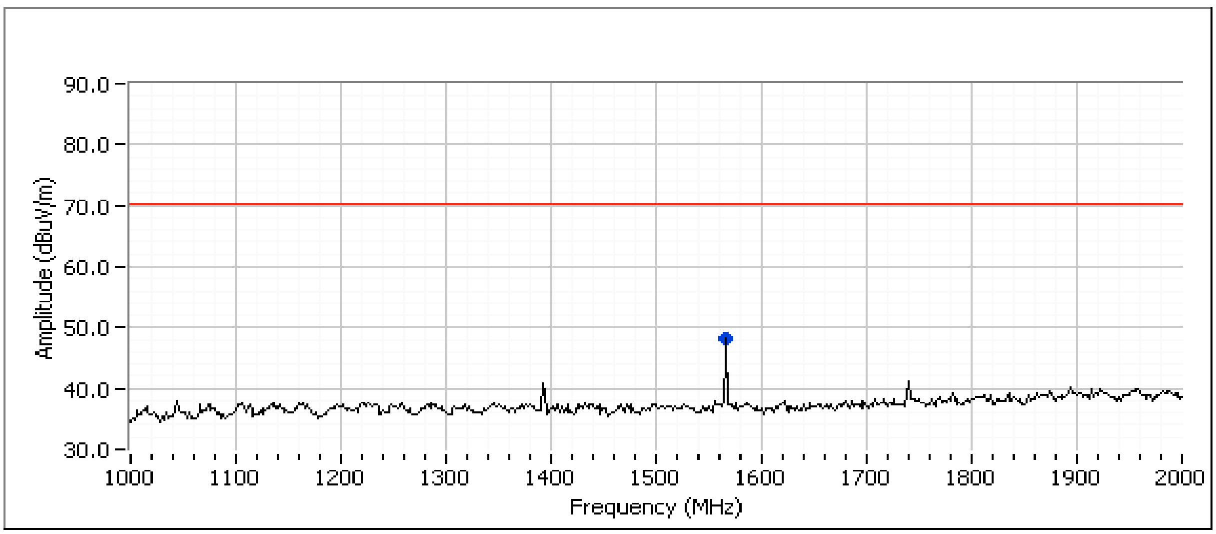
NTS
WE ENGINEER SUCCESS

EMC Test Data

Client:	GE MDS LLC	Job Number:	JD103878
Model:	LN1	T-Log Number:	T103939
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Part 90, FCC Part 15B	Class:	N/A

Plots for high channel, power setting(s) = 40 dBm





EMC Test Data

Client:	GE MDS LLC	Job Number:	JD103878
Model:	LN1	T-Log Number:	T103939
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Part 90, FCC Part 15B	Class:	N/A

Run #5b:Field Strength Measurements and Substitution Measurements

Date of Test: 3/23/2017, 3/24/2017
Test Engineer: Deniz Demirci
Test Location: FT Ch #4

Config. Used: 1
Config Change: None
EUT Voltage: 13.8 Vdc and 5.25 Vdc

EUT Field Strength

Frequency	Level	Pol	FCC 90.210(e)		Detector	Azimuth	Height	Comments	Channel
MHz	dBμV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		
122.244	38.6	V	70.2	-31.6	PK	350	1.0	PK (CISPR)-RB 120 kHz; VB: 1 MHz	
449.979	42.0	H	70.2	-28.2	PK	277	2.0	PK (CISPR)-RB 120 kHz; VB: 1 MHz	
599.907	27.9	V	70.2	-42.3	PK	111	1.5	PK (CISPR)-RB 120 kHz; VB: 1 MHz	
899.994	37.8	H	70.2	-32.4	PK	122	1.0	PK (CISPR)-RB 120 kHz; VB: 1 MHz	
121.794	39.8	V	70.2	-30.4	PK	60	1.0	PK (CISPR)-RB 120 kHz; VB: 1 MHz	
486.016	46.3	H	70.2	-23.9	PK	114	2.0	PK (CISPR)-RB 120 kHz; VB: 1 MHz	
972.035	41.3	H	70.2	-28.9	PK	63	1.0	PK (CISPR)-RB 120 kHz; VB: 1 MHz	
1620.080	47.6	H	70.2	**-22.6**	PK	226	1.5	RB 1 MHz;VB 3 MHz;Peak	
121.074	41.5	V	70.2	-28.7	PK	0	1.0	PK (CISPR)-RB 120 kHz; VB: 1 MHz	
522.006	42.2	H	70.2	-28.0	PK	318	2.0	PK (CISPR)-RB 120 kHz; VB: 1 MHz	
869.991	38.7	H	70.2	-31.5	PK	129	1.0	PK (CISPR)-RB 120 kHz; VB: 1 MHz	
1566.100	48.4	H	70.2	**-21.8**	PK	278	1.8	RB 1 MHz;VB 3 MHz;Peak	

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 (2.2 dBi) has not been included. The erp or eirp for all signals with less than **20 dB** of margin relative to this field strength limit is determined using substitution measurements.
Note 2:	Measurements are made with the antenna port terminated.

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
-										

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.

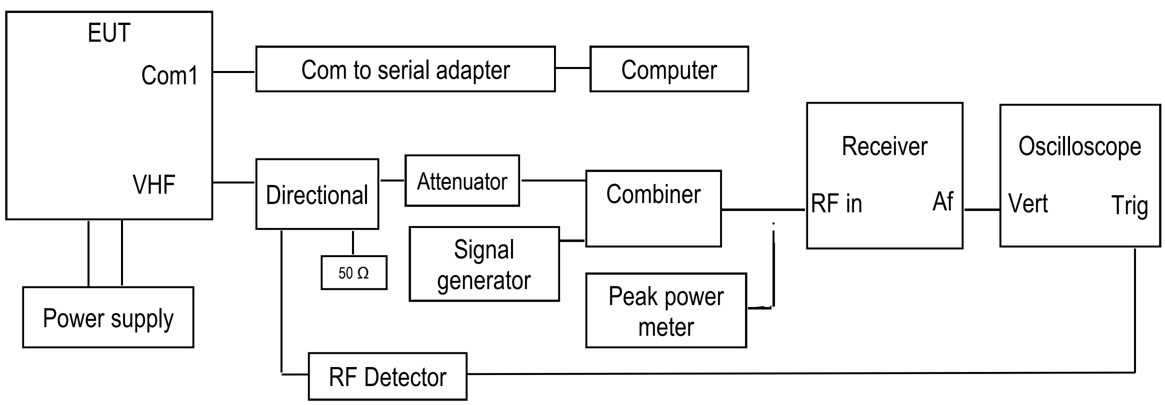
Client:	GE MDS LLC	Job Number:	JD103878
Model:	LN1	T-Log Number:	T103939
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Part 90, FCC Part 15B	Class:	N/A

Run #6: Transient Frequency Behavior

Date of Test:	3/22/2017	Config. Used:	1
Test Engineer:	Deniz Demirci	Config Change:	None
Test Location:	FT Lab #4a	EUT Voltage:	13.8 Vdc

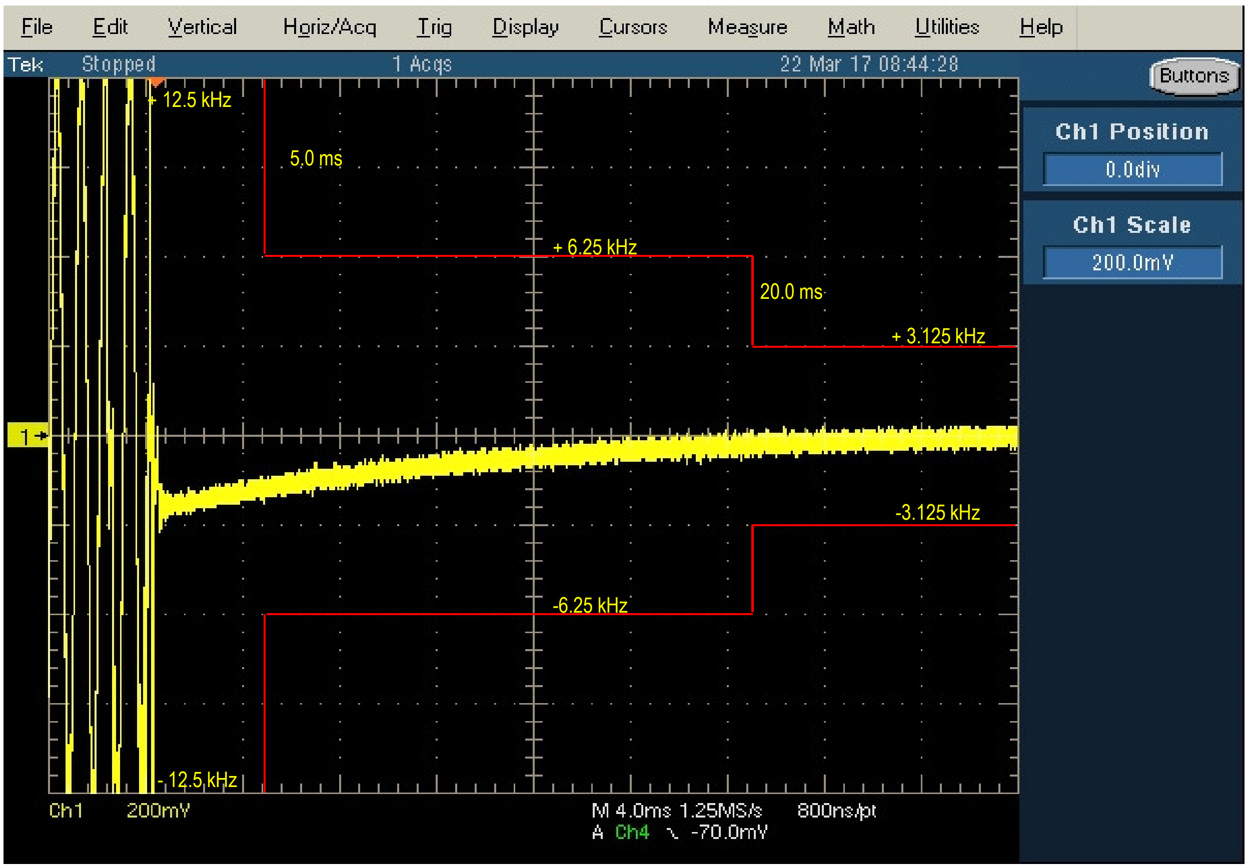
Transient frequency Behavior measurements setup

Note: The test has been performed with the method given in ANSI / TIA 603-D (2.2.19.3)



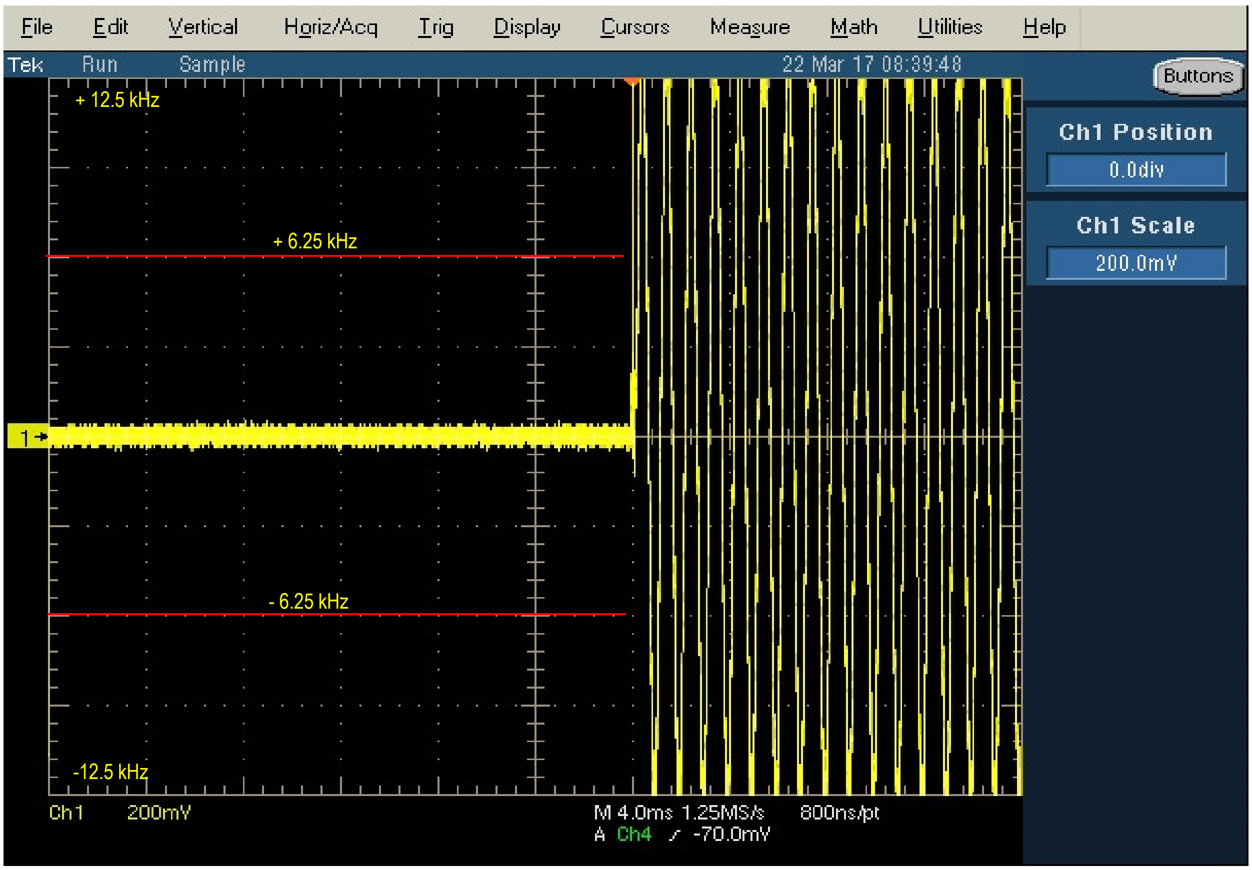
Client:	GE MDS LLC	Job Number:	JD103878
Model:	LN1	T-Log Number:	T103939
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Part 90, FCC Part 15B	Class:	N/A

Run #6a
Carrier Frequency: 162.000000 MHz
Channel Spacing: 6.25 kHz (worst case)
Modulation: CW
Description: Switch on condition t_{on}, t_1, and t_2
Limit: t_1: ±6.25 kHz, 5 ms; t_2: ±3.125 kHz, 20 ms



NTS WE ENGINEER SUCCESS			**EMC Test Data**
Client:	GE MDS LLC	Job Number:	JD103878
Model:	LN1	T-Log Number:	T103939
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Part 90, FCC Part 15B	Class:	N/A

Run #6b
Carrier Frequency: 162.000000 MHz
Channel Spacing: 6.25 kHz (worst case)
Modulation: CW
Description: Switch off condition t_3 and t_{off}
Limit: t_3: ±6.25 kHz, 5 ms



NTS WE ENGINEER SUCCESS

EMC Test Data

Client:	GE MDS LLC	Job Number:	JD103878
Model:	LN1	T-Log Number:	T103939
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Part 90, FCC Part 15B	Class:	N/A

Run #7: Frequency Stability

Date of Test: 3/21/2017
Test Engineer: Deniz Demirci
Test Location: FT Lab #4a

Config. Used: 1
Config Change: None
EUT Voltage: 13.8 Vdc

Nominal Frequency: 162.00000 MHz

Frequency Stability Over Temperature

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

Temperature	Frequency Measured	Drift	
(Celsius)	(MHz)	(Hz)	(ppm)
-30	161.999993	-7	0.0
-20	162.000020	20	0.1
-10	162.000020	20	0.1
0	162.000034	34	0.2
10	162.000045	45	0.3
20	162.000051	51	0.3
30	162.000038	38	0.2
40	162.000030	30	0.2
50	162.000014	14	0.1
	Worst case:	51	0.3

Frequency Stability Over Input Voltage

Nominal Voltage range is 11.8 - 52.2 Vdc.

Voltage	Frequency Measured	Drift	
(DC)	(MHz)	(Hz)	(ppm)
10	162.000013	13	0.1
60	162.000011	11	0.1
	Worst case:	13	0.3

Note 1:	Maximum drift of fundamental frequency before it shut down at 8.7 Vdc is 11 Hz.

End of Report

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