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Radio Test Report

FCC Part 90
(406.1 MHz to 512 MHz)

Model: SD4-1

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
REPORT DATE:	February 18, 2015
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A2LA ACCREDITED
Testing Cert #0214.26

REVISION HISTORY

Rev#	Date	Comments	Modified By
-	February 18, 2015	First release	
1.0	March 6, 2015	Added Data for Transient Frequency Behavior	David Bare
2.0	March 10, 2015	Revised to update model name	David Guidotti

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SCOPE

Tests have been performed on the GE MDS LLC model SD4-1, 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)

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 C63.4:2009
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 SD4-1 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 samples of GE MDS LLC model SD4-1 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	Description	Measured	Limit	Result
Transmitter Modulation, output power and other characteristics				
§2.1033 (c) (5) § 90.35	Frequency range(s)	406.1 – 512 MHz	406.1 – 512 MHz	Pass
§2.1033 (c) (6) §2.1033 (c) (7) § 2.1046 § 90.205	RF power output at the antenna terminals	20 - 37.4 dBm conducted	Determined based on License	Pass
§2.1033 (c) (4) § 2.1047 § 90.210	Emission types	F1D, F2D, F3D		
	Emission mask	Within mask	Shall be within mask	Pass
§ 2.1049 § 90.209	Occupied Bandwidth	3.51 kHz 9.03 kHz 16.7 kHz	6.0 kHz 11.25 kHz 20.0 kHz	Pass
§ 2.1049 § 90.209	Necessary Bandwidth	6.0 kHz 11.2 kHz 20.0 kHz	6.0 kHz 11.25 kHz 20.0 kHz	Pass
§ 90.214	Transient Frequency Behavior	Complies, within limits		
Transmitter spurious emissions				
§ 2.1051 § 2.1057	At the antenna terminals	-28.9 dBm @ 429.80 MHz (-3.9 dB)	-25.0 dBm	Pass
§ 2.1053 § 2.1057	Field strength	-43.5 dBm @ 1024.00 MHz (-18.5 dB)	-25.0 dBm	Pass
Receiver spurious emissions				
15.109	At the antenna terminals	-59.2 dBm @ 1958.65 MHz (-2.2 dB)	< 1GHz: 2nW > 1GHz: 5nW	Pass
15.109	Field strength	39.0 dBµV/m @ 875.02 MHz (-7.0 dB)	See limit table on page 18	Pass
Other details				
§ 2.1055 § 90.213	Frequency stability	0.4ppm	2.5 ppm	Pass
§ 2.1093	RF Exposure	Complies, see separate exhibit		
§2.1033 (c) (8)	Final radio frequency amplifying circuit's dc voltages and currents for normal operation over the power range	13.8 V and 2.2 A		
Notes				

EXTREME CONDITIONS

Frequency stability is determined over extremes of temperature and voltage. The extremes of voltage were 10 to 30 VDC.

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 SD4-1 is an industrial radio operating in the 406.1-512 MHz band. Since the EUT would be placed on a table top 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 10.0-30.0 Volts DC, 2.2 Amps max.

The samples were received on January 19, 2015 and tested on January 19, 20, 21, February 11 and 12, 2015. The following samples of the EUT were tested:

Company	Model	Description	Serial Number	FCC ID
GE MDS	SD4-1	Industrial Radio	2613864	E5MDS-SD4-1
GE MDS	SD4-1	Industrial Radio	2613860	E5MDS-SD4-1

OTHER EUT DETAILS

The samples tested use a Maxim MAX2870 Fractional-N PLL with a built-in VCO. The existing product uses an Analog Devices ADF4252 Fractional-N PLL and a discrete VCO. This is the only change for this permissive change application.

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 National Technical Systems - Silicon Valley.

SUPPORT EQUIPMENT

The following equipment was used as support equipment for testing:

Company	Model	Description	Serial Number	FCC ID
HP	6024A	DC Power Supply	104129	-

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

Company	Model	Description	Serial Number	FCC ID
HP	dv6000	Laptop	CNF73411TR	-

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 out	TNC-N connector	Direct connect	-	-
TNC-N connector	30dB pad 10W	Attenuator	-	-
30dB pad	PSA	RF ccable	Shielded	3
DC Power	DC power supply	DC mains	Unshielded	1

Additional on Support Equipment

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Serial DB9 (com1)	Laptop USB	DB9 to USB converter	Shielded	1

EUT OPERATION

During emissions testing the EUT was set to transmit at 20dBm, 37dBm 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.

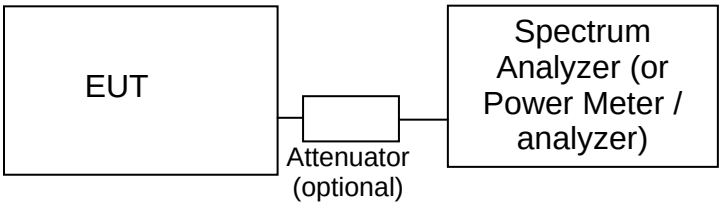
Radiated spurious emissions measurements were taken at the National Technical Systems - Silicon Valley Anechoic Chambers and/or Open Area Test Site(s) listed below. The sites conform to the requirements of ANSI C63.4: 2009 *American National Standard for Methods of Measurement of Radio-Noise Emissions 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	Designation / Registration Numbers		Location
	FCC	Canada	
Chamber 3	US0027	IC 2845B-3	41039 Boyce Road Fremont, CA 94538-2435
Chamber 4	US0027	IC 2845B-4	

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

Manufacturer	Description	Model	Asset #	Calibrated	Cal Due
Radio Antenna Port (Power), 19-Jan-15					
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1290	12/17/2014	12/17/2015
Rohde & Schwarz	Power Sensor 100 uW - 2 Watts (w/ 20 dB pad, SN BJ5155)	NRV-Z32	1536	1/15/2015	1/15/2016
Radio Antenna Port (Power and Spurious Emissions), 20-Jan-15					
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1290	12/17/2014	12/17/2015
Rohde & Schwarz	Power Sensor 100 uW - 2 Watts (w/ 20 dB pad, SN BJ5155)	NRV-Z32	1536	1/15/2015	1/15/2016
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	4/8/2014	4/8/2015
Radio Antenna Port (Power and Spurious Emissions), 20-Jan-15					
Watlow	Temp Chamber (w/ F4 Watlow Controller)	F4	2170	7/18/2014	7/18/2015
Radiated Emissions, 30 - 1,000 MHz, 21-Jan-15					
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1630	6/21/2014	6/21/2015
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	2237	8/29/2014	8/29/2016
Com-Power	Preamplifier, 1-1000 MHz	PAM-103	2885	10/22/2014	10/22/2015
Radiated Emissions, 1,000 - 12,750 MHz, 21-Jan-15					
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	3/25/2014	3/25/2015
EMCO	Antenna, Horn, 1-18 GHz	3115	487	7/29/2014	7/29/2016
Filtek	Filter, 1 GHz High Pass	HP12/1000-5BA	957	5/14/2014	5/14/2015
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	9/20/2014	9/20/2015
Radio Antenna Port (Power and Spurious Emissions), 21-Jan-15					
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	4/8/2014	4/8/2015
Radio Antenna Port (Power and Spurious Emissions), 11-Feb-15					
Rohde & Schwarz	Signal Analyzer 20 Hz - 26.5 GHz	FSQ26	2327	4/28/2014	4/28/2015

Radiated Emissions, 30 - 6,000 MHz, 12-Feb-15

Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	10/31/2014	10/31/2015
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	870	2/20/2014	2/20/2015
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	9/20/2014	9/20/2015
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1657	6/25/2014	6/25/2016
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1756	6/14/2014	6/14/2015
Hewlett Packard	9KHz-1300MHz pre-amp	8447F	2777	3/5/2014	3/5/2015

Transient Frequency Behavior, 04-Mar-15

Manufacturer	Description	Model	Asset #	Calibrated	Cal Due
Rohde & Schwarz	Test Receiver, 20-1300 MHz	ESVP	213	7/31/2014	7/31/2015
Tektronix	1 GHz, 4 CH, 5GS/s Oscilloscope	TDS5104	1435	8/1/2014	8/1/2015
Rohde & Schwarz	Signal Analyzer 20 Hz - 26.5 GHz	FSQ26	2327	4/28/2014	4/28/2015
Hewlett Packard	Signal Generator, 0.1-990 MHz	8656A	295	N/A	N/A

Appendix B Test Data

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Client:	GE MDS LLC	Job Number:	J96255
Product	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	
Emissions Standard(s):	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	B
Immunity Standard(s):	EN 301 489-5	Environment:	Radio

EMC Test Data

For The

GE MDS LLC

Product

SD4-1

Date of Last Test: 3/4/2015

Client:	GE MDS LLC	Job Number:	J96255
Model:	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	N/A

FCC Part 90

Power, Mask, 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: 20-24 °C
Rel. Humidity: 35-40 %

Summary of Results

Run #			Test Performed	Limit	Pass / Fail	Result / Margin
1			Output Power	Determined at time of Licensing	-	37.4 dBm conducted
2			Spectral Mask	Masks C, D, E	Pass	Masks C, D, E
3			99% or Occupied Bandwidth	FCC Part 90	Pass	See run for details
4			Spurious Emissions (conducted)	FCC Part 90	Pass	-28.9 dBm @ 429.80 MHz (-3.9 dB)
5			Spurious emissions (radiated)	FCC Part 90	Pass	-43.5 dBm @ 1024.00 MHz (-18.5 dB)
6			Frequency Stability	FCC Part 90	Pass	0.4ppm
7			Transient Frequency Behaviour	FCC Part 90	Pass	Within allowed deviation

Modifications Made During Testing

During the radiated test: Bent the RJ45 connector ground finger pins to touch the face plate

Deviations From The Standard

No deviations were made from the requirements of the standard.

Sample Note

Sample S/N:2613864 (NTS2015-1253) for Antenna port tests and Tx mode radiated Spurious emissions test
Sample S/N:2613860 (NTS2015-1252) for Tx standby/ Receive mode radiated Spurious emissions test

Client:	GE MDS LLC	Job Number:	J96255
Model:	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	N/A

Run #1: Output Power

Date of Test: 1/19/2015 Config. Used: 1
Test Engineer: Jack Liu Config Change: None
Test Location: FT Lab#4B EUT Voltage: 13.8Vdc

Cable Loss: 0.0 dB Attenuator: 30.0 dB Total Loss: 30.0 dB
Cable ID(s): - Attenuator IDs: JFW 50FH-030-10

Power settings from 20 to 37 are avaialble corresponding to 0.1 to 5 Watts.

Power Setting[2]	Frequency (MHz)	Output Power (dBm) [1]	Output Power mW	Antenna Gain (dBi)	Result	EIRP dBm	EIRP W
High power							
37	406.1	37.4	5495.4	16.5	Pass	53.9	245.471
37	450	37.4	5495.4	16.5	Pass	53.9	245.471
37	512	37.1	5128.6	16.5	Pass	53.6	229.087
Low power							
20	406.1	20.0	100.0	16.5	Pass	36.5	4.467
20	450	20.0	100.0	16.5	Pass	36.5	4.467
20	512	20.0	100.0	16.5	Pass	36.5	4.467

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.
Note 3:	This is the highest gain antenna that is described in the install manual. It is the responsibility of the installer to configure operation in accordance with the License.

Client:	GE MDS LLC	Job Number:	J96255
Model:	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	N/A

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

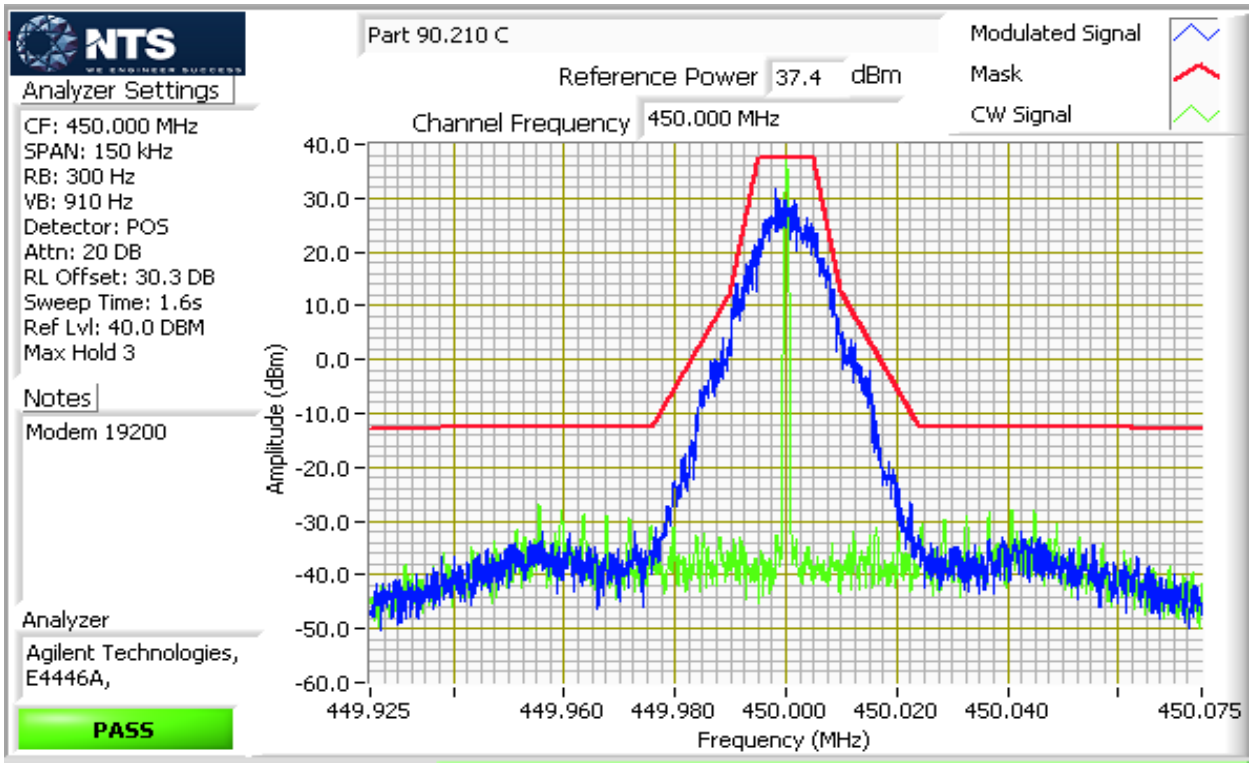
Date of Test: 1/20/2015 Config. Used: 1

Test Engineer: Jack Liu Config Change: None

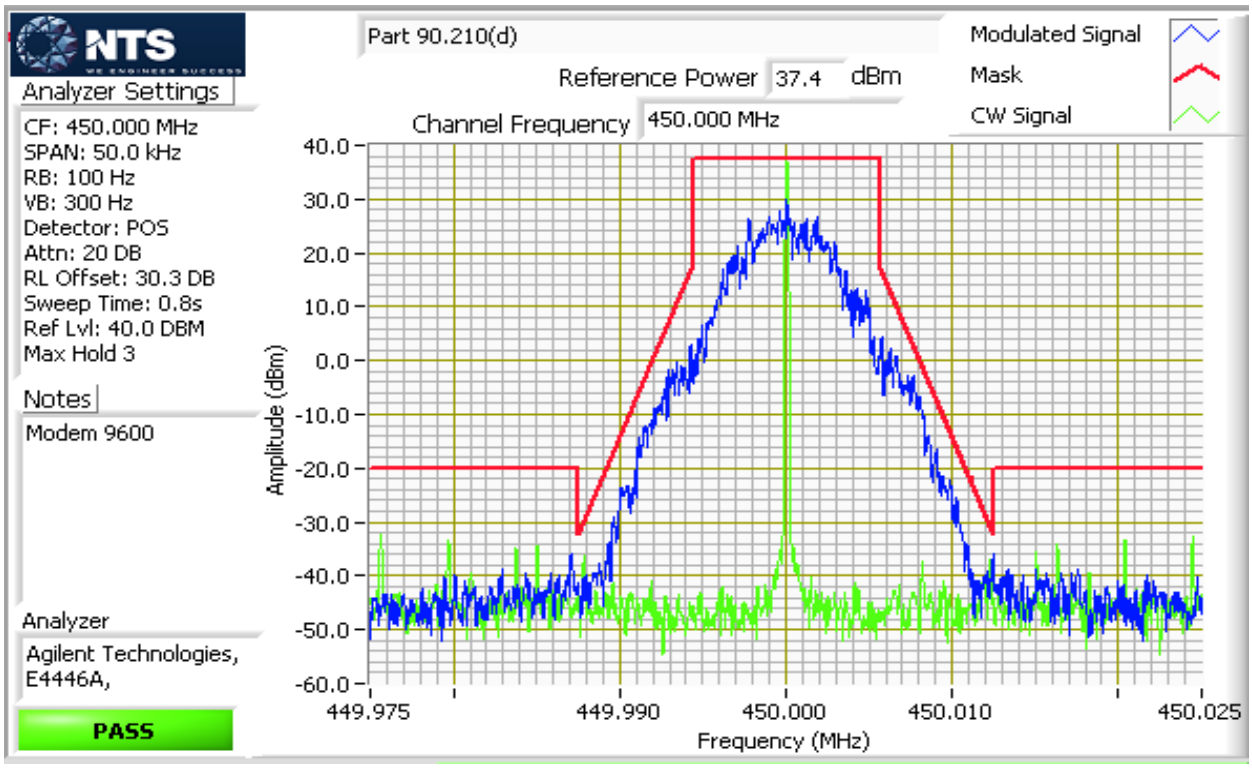
Test Location: FT Lab#4A EUT Voltage: 13.8Vdc

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

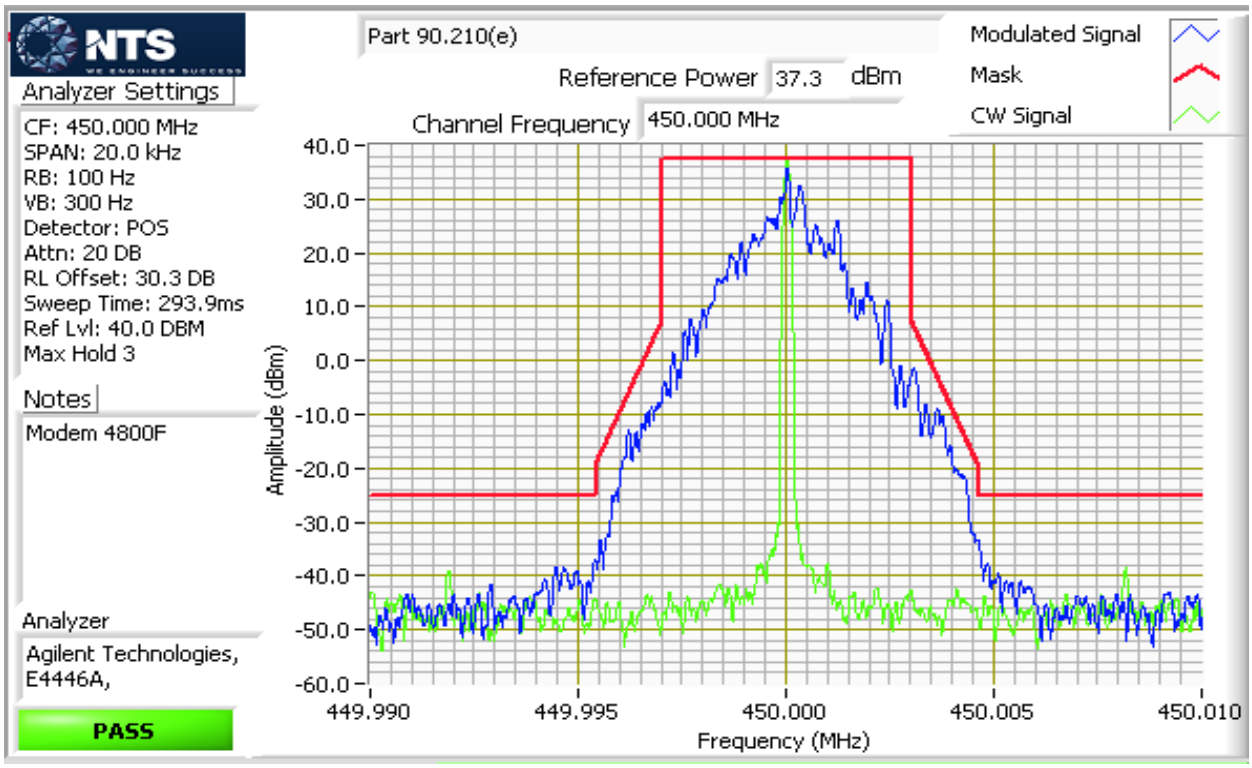
3 level FSK used for 25 kHz channel spacings, Modem 19200
3 level FSK used for 12.5 kHz channel spacings, Modem 9600
7 level FSK used for 6.25 kHz channel spacings, Modem 4800F



Client:	GE MDS LLC	Job Number:	J96255
Model:	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	N/A



Client:	GE MDS LLC	Job Number:	J96255
Model:	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	N/A



Client:	GE MDS LLC	Job Number:	J96255
Model:	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	N/A

Run #3: Signal Bandwidth

Date of Test: 1/20/2015 Config. Used: 1

Test Engineer: Jack Liu Config Change: None

Test Location: FT Lab#4A EUT Voltage: 13.8Vdc

Modem 4800F

Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (kHz) 99%
37	450	51Hz	3.51

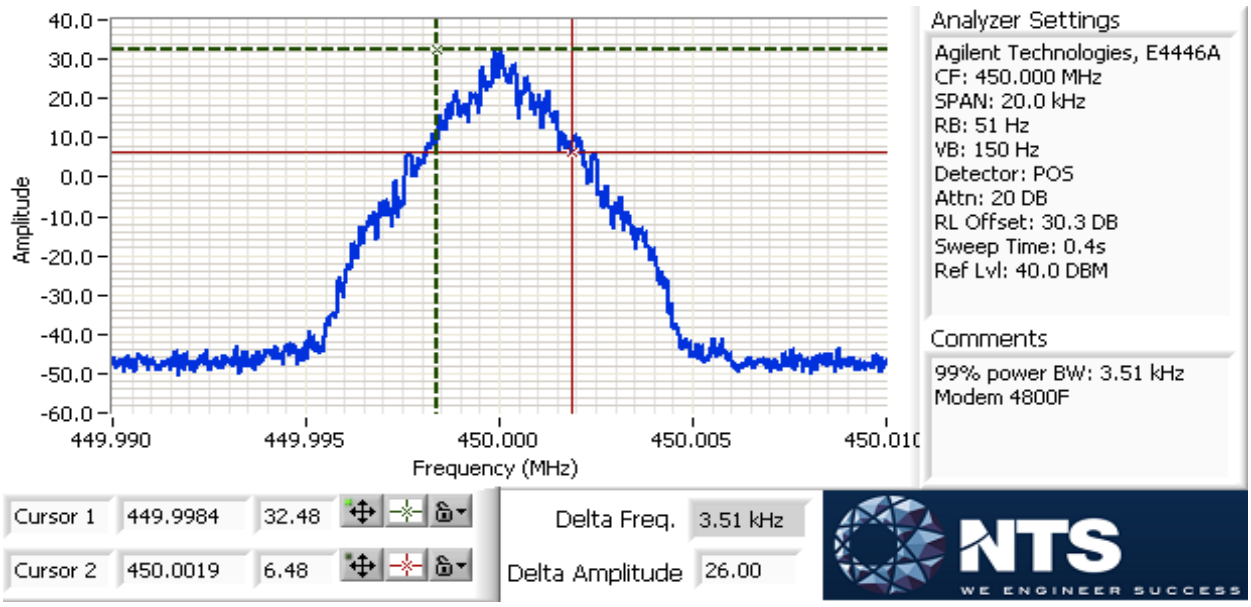
Modem 9600

Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (kHz) 99%
37	450	100Hz	9.03

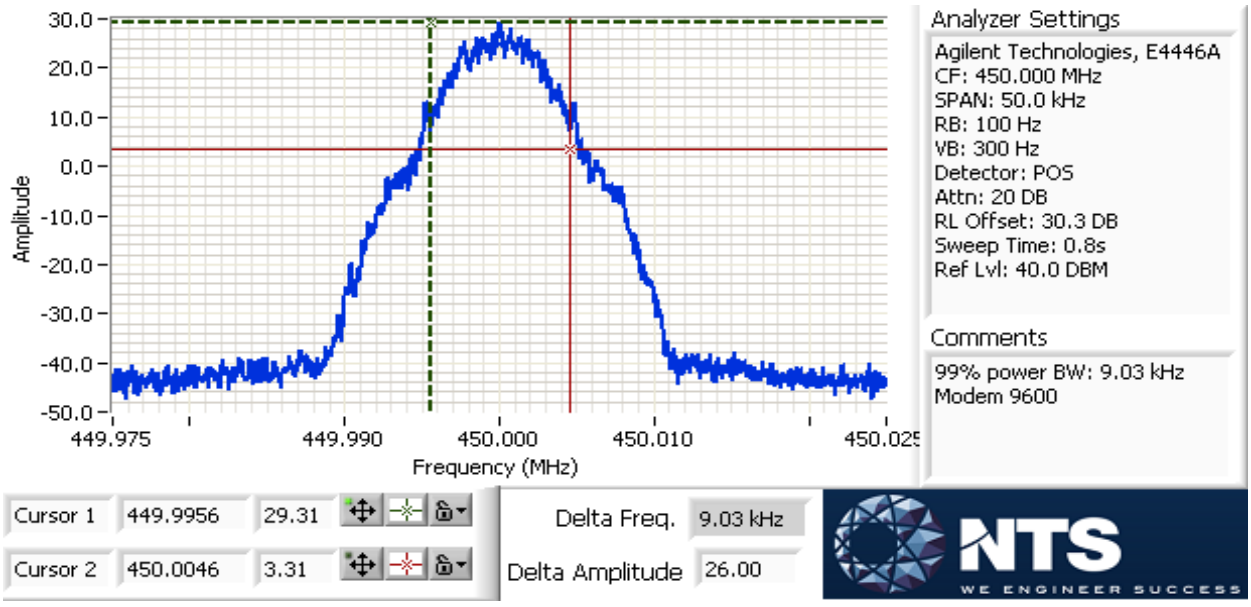
Modem 19200

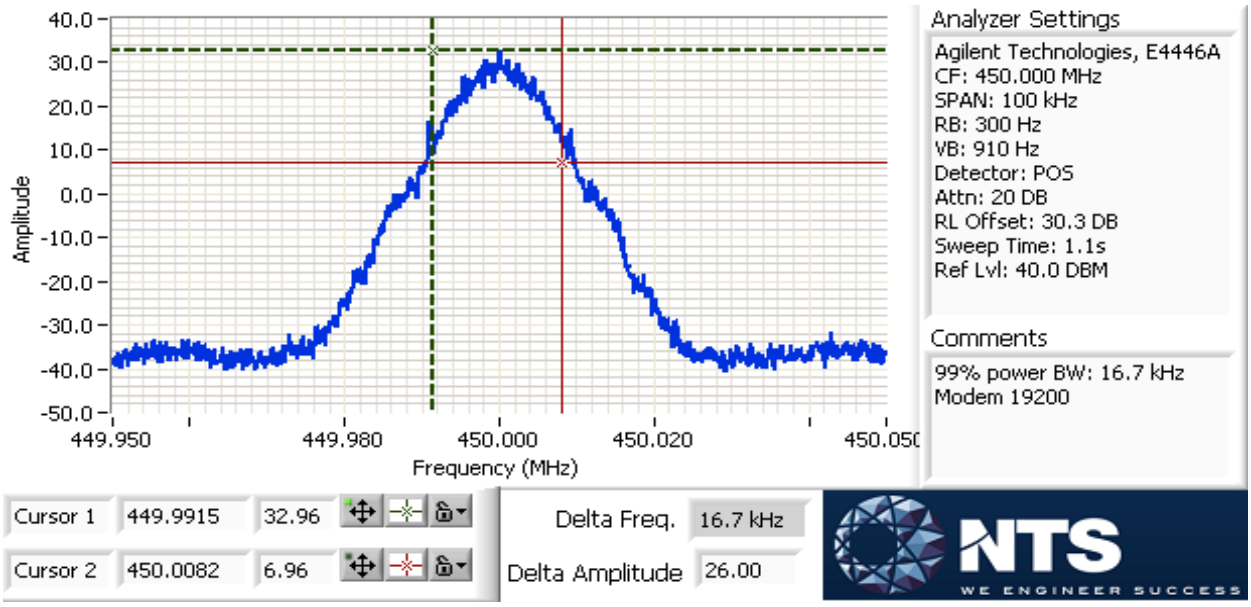
Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (kHz) 99%
37	450	300Hz	16.7

Note 1:	99% bandwidth measured in accordance with RSS GEN, with RB > 1% of the span and VB > 3xRB
Note 2:	Emisiosns designators are 20K0FxD, 11K2FxD and 6K00FxD, where x = 1, 2 or 3 based on necessary bandwidth calculations



Client:	GE MDS LLC	Job Number:	J96255
Model:	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	N/A





Client:	GE MDS LLC	Job Number:	J96255
Model:	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	N/A

Run #4: Out of Band Spurious Emissions, Conducted

Date of Test: 1/20/15 & 2/11/15 — Config. Used: 1

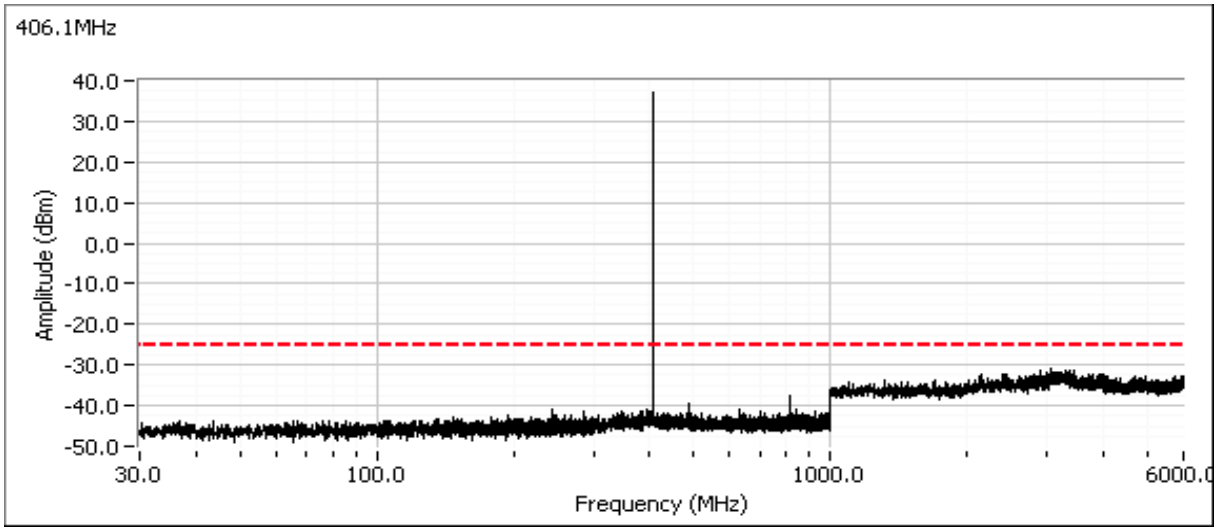
Test Engineer: Jack Liu & David Bare — Config Change: None

Test Location: FT Lab#4A — EUT Voltage: 13.8Vdc

Frequency (MHz)	Limit	Result
406.1	-25 dBm	Pass
450	-25 dBm	Pass
512	-25 dBm	Pass

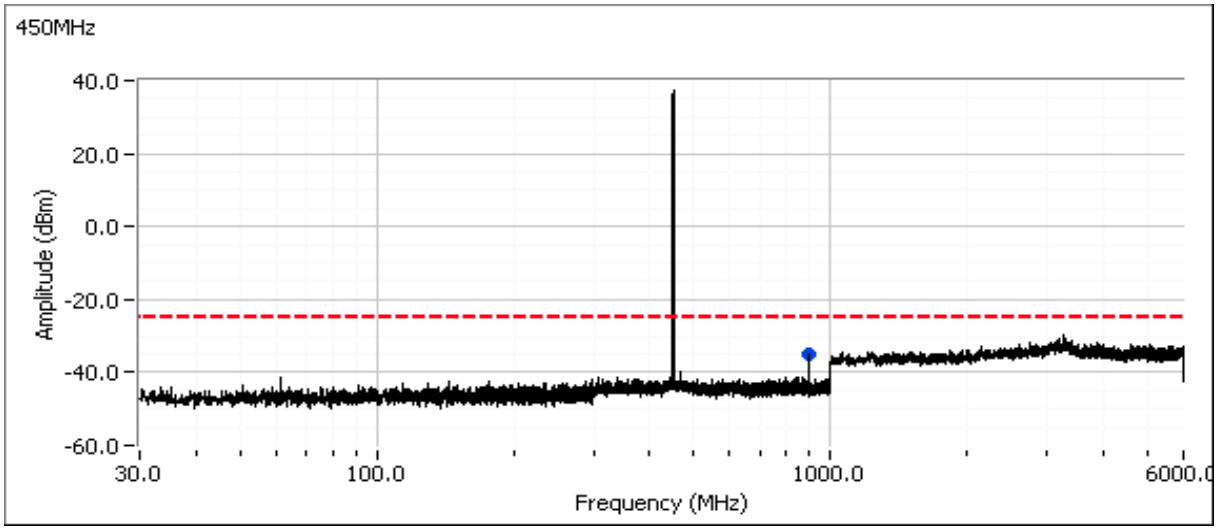
The limit is taken from FCC Part 90 Mask E (55+10*log(P) = -25 dBm)

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

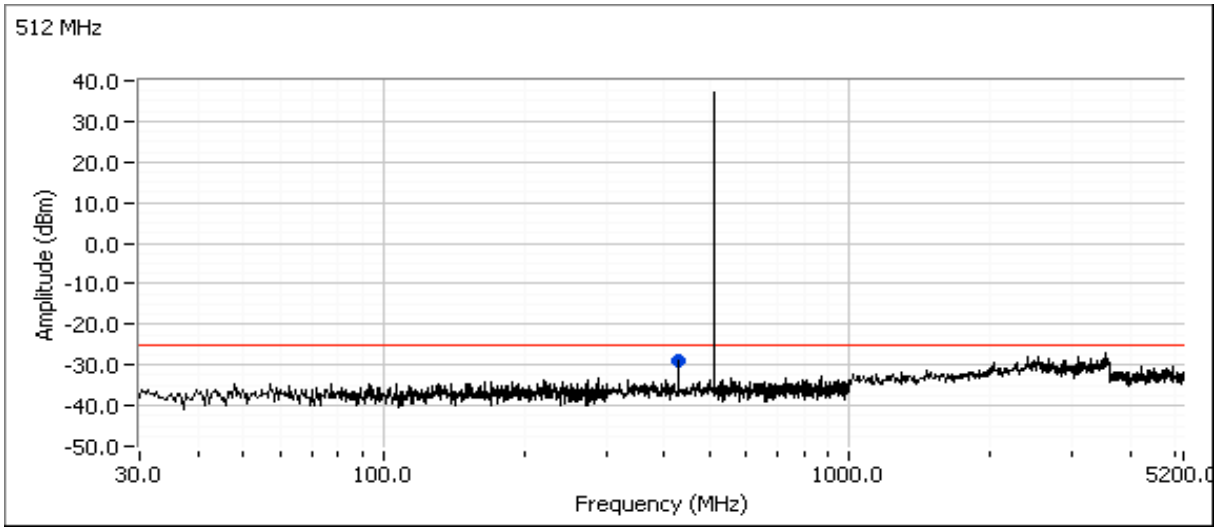


Client:	GE MDS LLC	Job Number:	J96255
Model:	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	N/A

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



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



Frequency MHz	Level dBm	Port	FCC Part 90 Limit	FCC Part 90 Margin	Detector	Channel	Mode	Comments
899.995	-34.9	RF Port	-25.0	-9.9	Peak	450.0	-	
429.798	-28.9	RF Port	-25.0	-3.9	Peak	512.0	-	

Client:	GE MDS LLC	Job Number:	J96255
Model:	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	N/A

Run #5: Out of Band Spurious Emissions, Radiated

Conducted limit (dBm): -25

Approximate field strength limit @ 3m: 72.4

The limit is taken from FCC Part 90 Mask E (55+10*log(P) = -25 dBm)

Run #5a - Preliminary measurements

Date of Test: 1/21/2015 & 2/12/15 Config. Used: 2

Test Engineer: Jack Liu /Mehran Birgani/David Bare Config Change: None

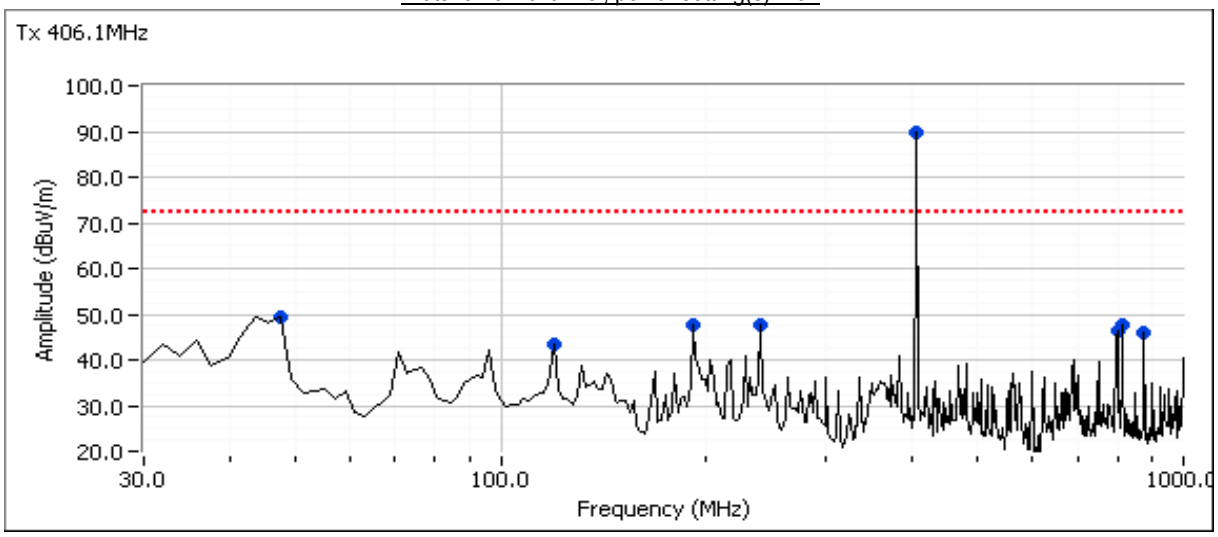
Test Location: Fremont Chamber#4 and #3 EUT Voltage: 13.8Vdc

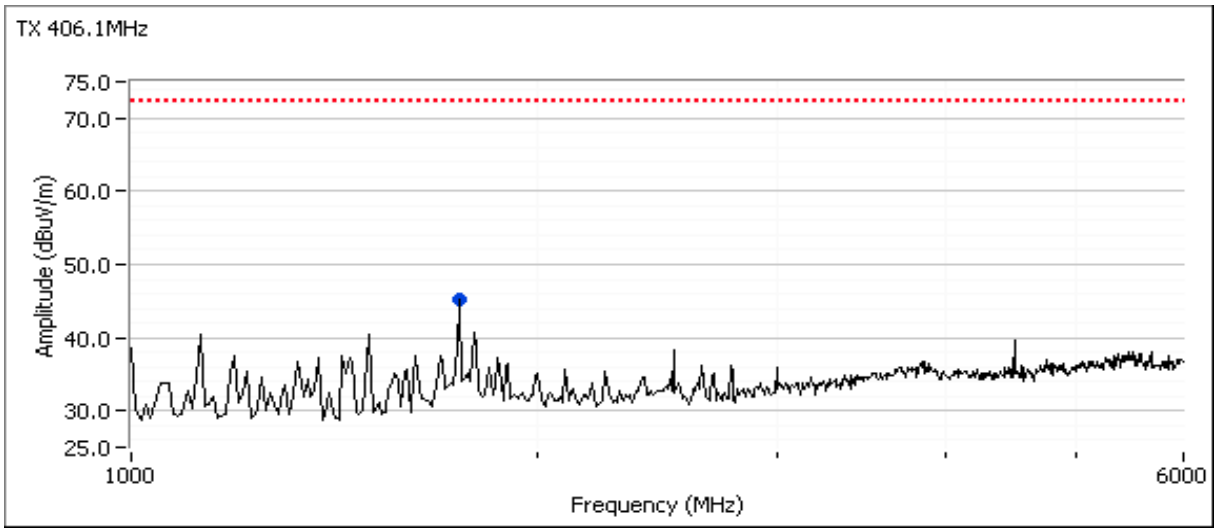
Frequency	Level	Pol	FCC Part 90		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		
48.008	49.5	V	72.4	-22.9	Peak	140	1.0		406.1
875.016	45.8	H	72.4	-26.6	Peak	155	2.0		406.1
799.655	46.5	H	72.4	-25.9	Peak	200	1.5		406.1
812.190	47.8	H	72.4	-24.6	Peak	200	1.0		406.1
120.025	43.4	H	72.4	-29.0	Peak	210	1.5		406.1
192.012	47.7	H	72.4	-24.7	Peak	225	1.0		406.1
240.018	47.8	H	72.4	-24.6	Peak	236	1.0		406.1
1750.000	45.2	V	72.4	-27.2	Peak	144	2.5		406.1
48.008	49.1	V	72.4	-23.3	Peak	136	1.0		450.0
875.016	44.1	H	72.4	-28.3	Peak	176	1.0		450.0
900.007	46.9	H	72.4	-25.5	Peak	205	1.0		450.0
119.994	44.6	H	72.4	-27.8	Peak	219	2.0		450.0
192.012	47.9	H	72.4	-24.5	Peak	220	1.0		450.0
796.825	46.3	V	72.4	-26.1	Peak	236	1.0		450.0
240.018	46.4	H	72.4	-26.0	Peak	245	1.0		450.0
1750.000	44.0	V	72.4	-28.4	Peak	160	2.5		450.0
33.246	52.2	V	72.4	-20.2	Peak	63	1.0		512.0
57.595	50.3	V	72.4	-22.1	Peak	229	2.0		512.0
1000.000	51.9	H	72.4	-20.5	Peak	210	1.5		512.0
1024.000	54.1	H	72.4	-18.3	Peak	135	1.0		512.0
1733.330	49.5	V	72.4	-22.9	Peak	0	2.2		512.0

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.

Client:	GE MDS LLC	Job Number:	J96255
Model:	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	N/A

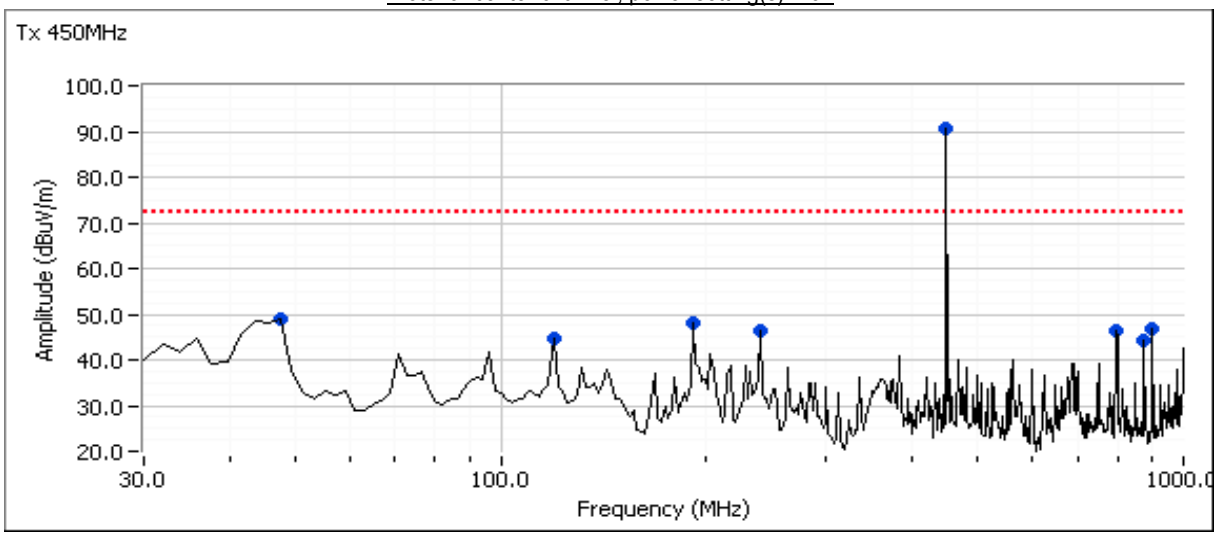
Plots for low channel, power setting(s) = 37

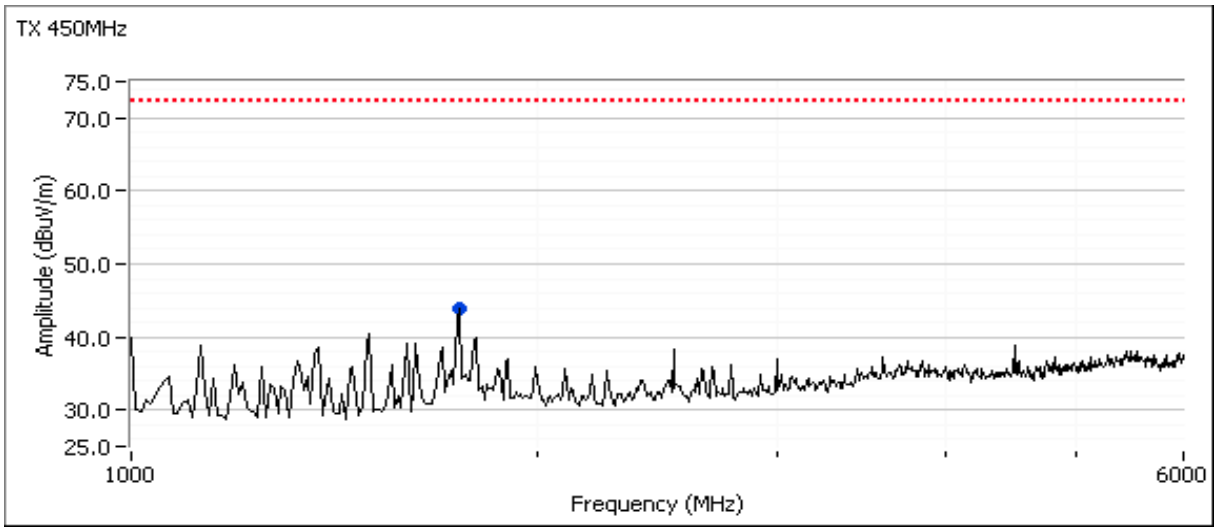




Client:	GE MDS LLC	Job Number:	J96255
Model:	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	N/A

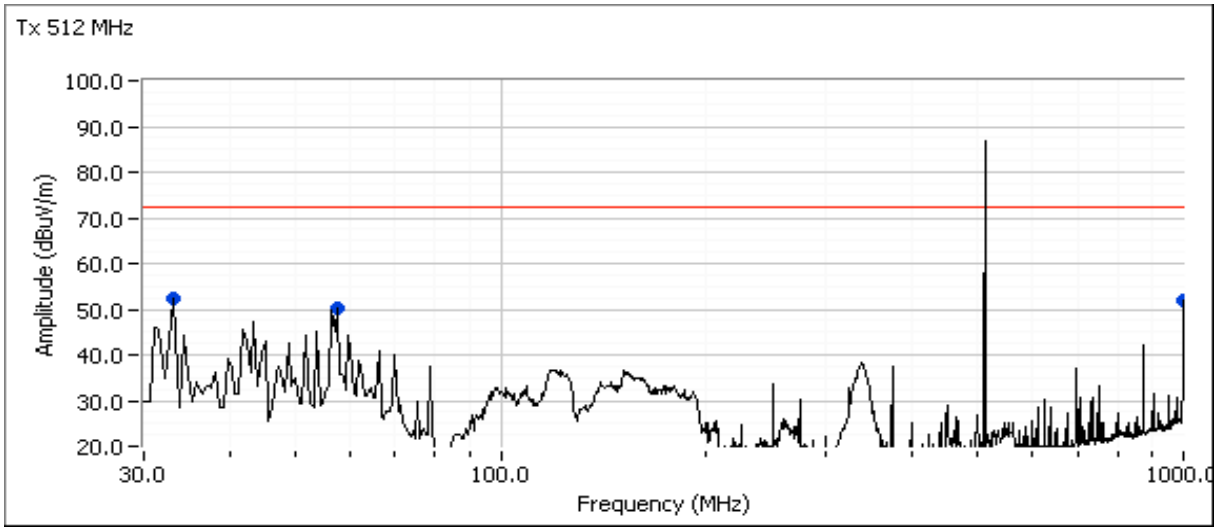
Plots for center channel, power setting(s) = 37

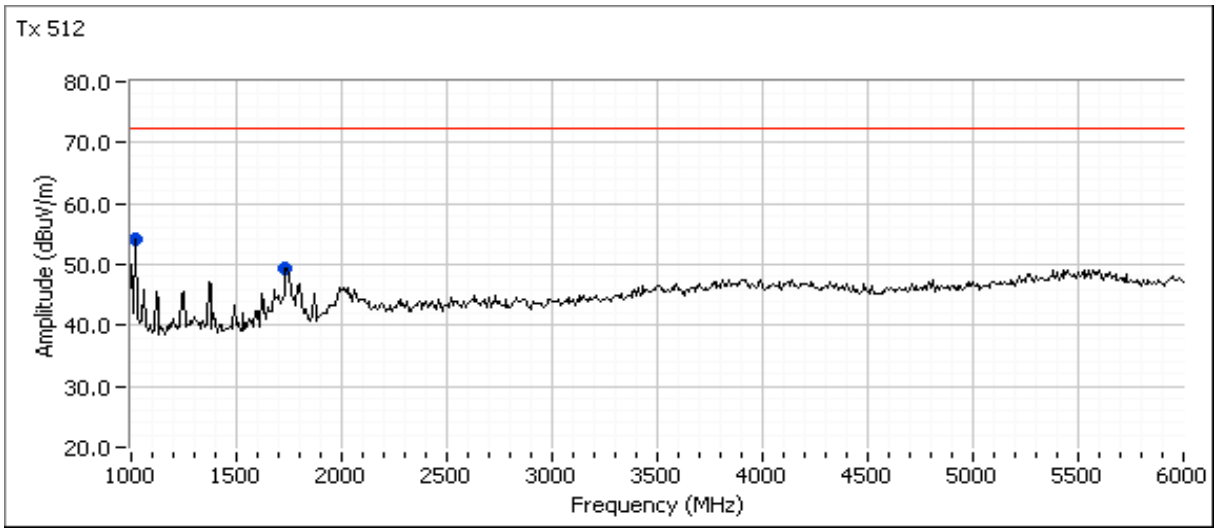




Client:	GE MDS LLC	Job Number:	J96255
Model:	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	N/A

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





Client:	GE MDS LLC	Job Number:	J96255
Model:	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	N/A

Run #5b: - Final Field Strength Measurements and Substitution Measurements

Date of Test: 2/12/2015 Config. Used: 2

Test Engineer: David Bare Config Change: None

Test Location: Fremont Chamber #3 EUT Voltage: 13.8Vdc

EUT Field Strength

Frequency	Level	Pol	FCC Part 90		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		
1024.000	55.1	H	72.4	-17.3	PK	135	1.0	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=√(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.

Substitution measurements

Horizontal

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
1024.000	-40.0	2.2	58.6	96.4	55.1	-41.3	-43.5		-25.0	-18.5

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:	J96255
Model:	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	N/A

Run #6: Frequency Stability

Date of Test: 1/20/2015 Config. Used: 1

Test Engineer: Jack Liu Config Change: None

Test Location: FT Lab#4A EUT Voltage: 13.8Vdc

Nominal Frequency: 450 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	450.000195	195	0.4
-20	450.000167	167	0.4
-10	450.000112	112	0.2
0	450.000048	48	0.1
10	450.000015	15	0.0
20	450.000055	55	0.1
30	449.999992	-8	0.0
40	449.999985	-15	0.0
50	450.000043	43	0.1
	Worst case:	195	0.4

Frequency Stability Over Input Voltage

Nominal Voltage is 13.8Vdc.

Voltage	Frequency Measured	Drift	
(DC)	(MHz)	(Hz)	(ppm)
10.0	450.000055	55	0.1
30.0	450.000057	57	0.1
	Worst case:	57	0.4

Note 1:	Maximum drift of fundamental frequency before it shut down at ~ 9 Vdc was 0 Hz.

Client:	GE MDS LLC	Job Number:	J96255
Model:	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	N/A

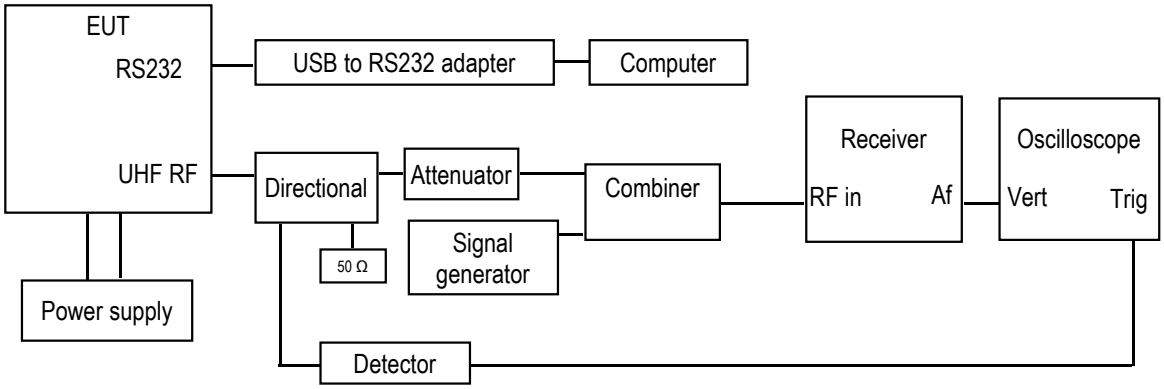
Run #7: Transient Frequency Behaviour

Date of Test: 3/4/2015
Test Engineer: David Bare
Test Location: FT Lab#4A

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

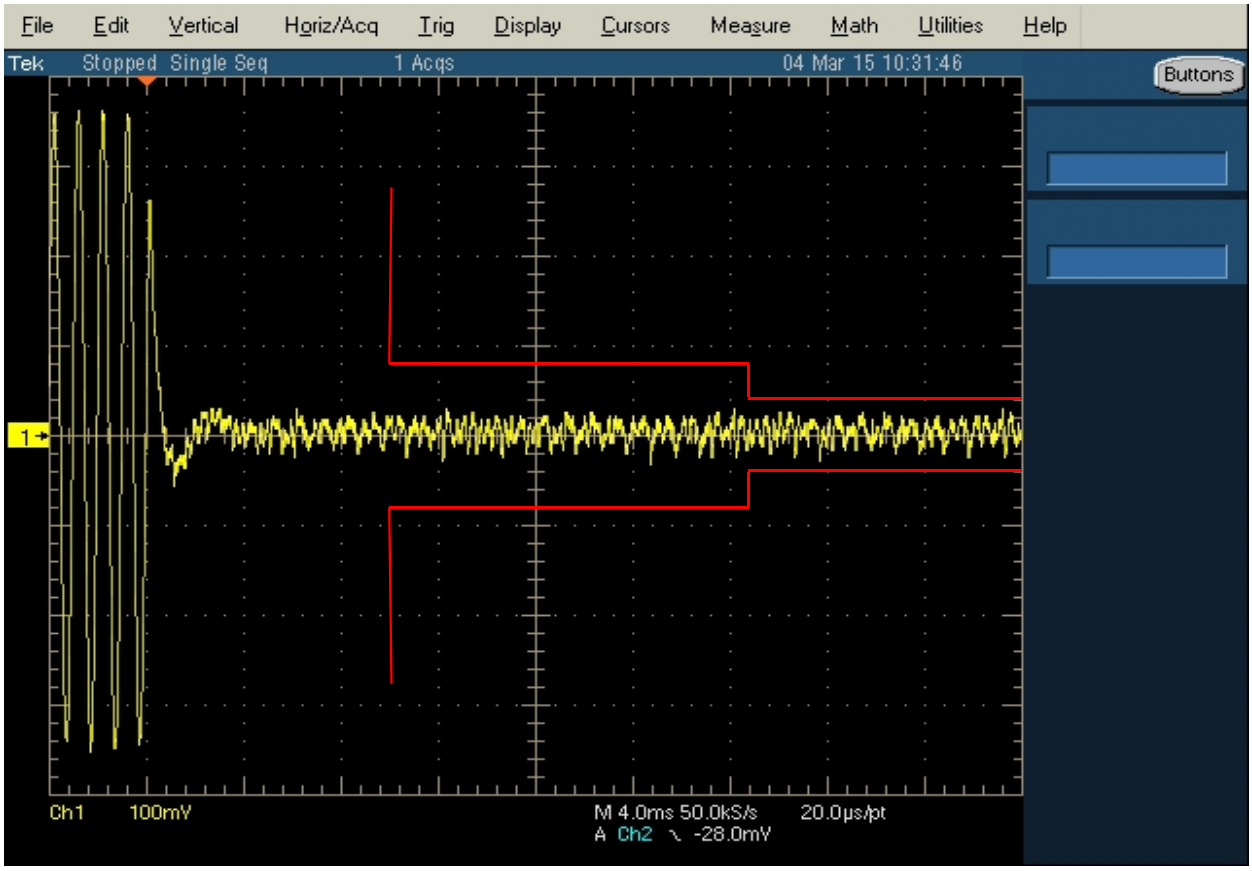
Transient frequency Behaviour measurements setup

Note: The test has been performed using the method given in ANSI / TIA 603-C (2.2.19)



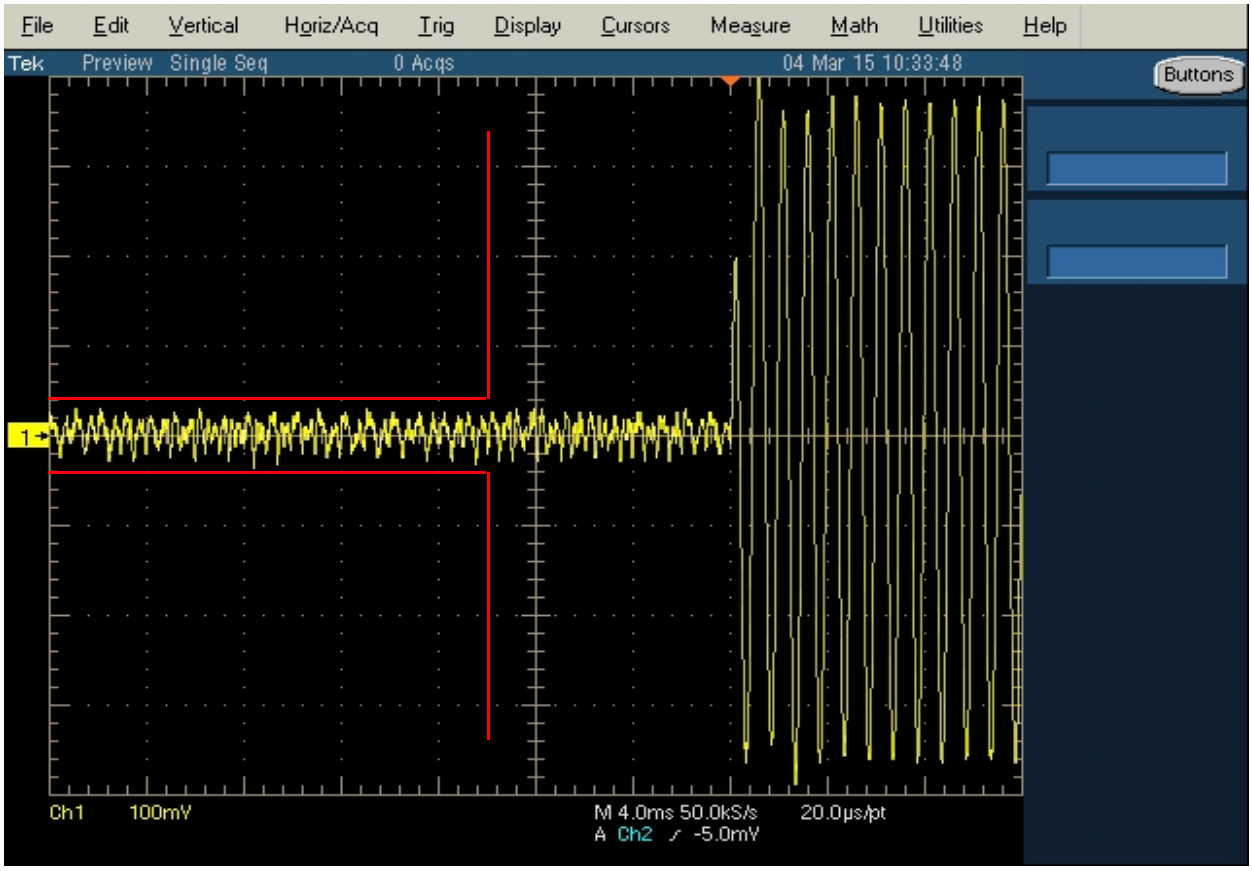
Client:	GE MDS LLC	Job Number:	J96255
Model:	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	N/A

Run #7a
Carrier Frequency: 450 MHz
Channel Spacing: 25 kHz
Modulation: CW
Description: Switch on condition ton, t1, and t2



Client:	GE MDS LLC	Job Number:	J96255
Model:	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	N/A

Run #7b
Carrier Frequency: 420 MHz
Channel Spacing: 25 kHz
Modulation: CW
Description: Switch off condition t3 and toff



Client:	GE MDS LLC	Job Number:	J96255
Model:	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	B

Conducted Emissions

(Elliott Laboratories Fremont Facility, Semi-Anechoic Chamber)

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 1/21/2015 & 2/11/15
Test Engineer: Jack Liu & David Bare
Test Location: FT Lab#4A

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

General Test Configuration

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.

Ambient Conditions:

Temperature: 20-22 °C
Rel. Humidity: 35-38 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	Conducted Emissions 30 - 6000 MHz	FCC Part 15.111 (2 nW)		-59.2 dBm @ 1958.65 MHz (-2.2 dB)

Modifications Made During Testing

During the radiated test: Bend the RJ45 connector ground finger pins to touch the face plate

Deviations From The Standard

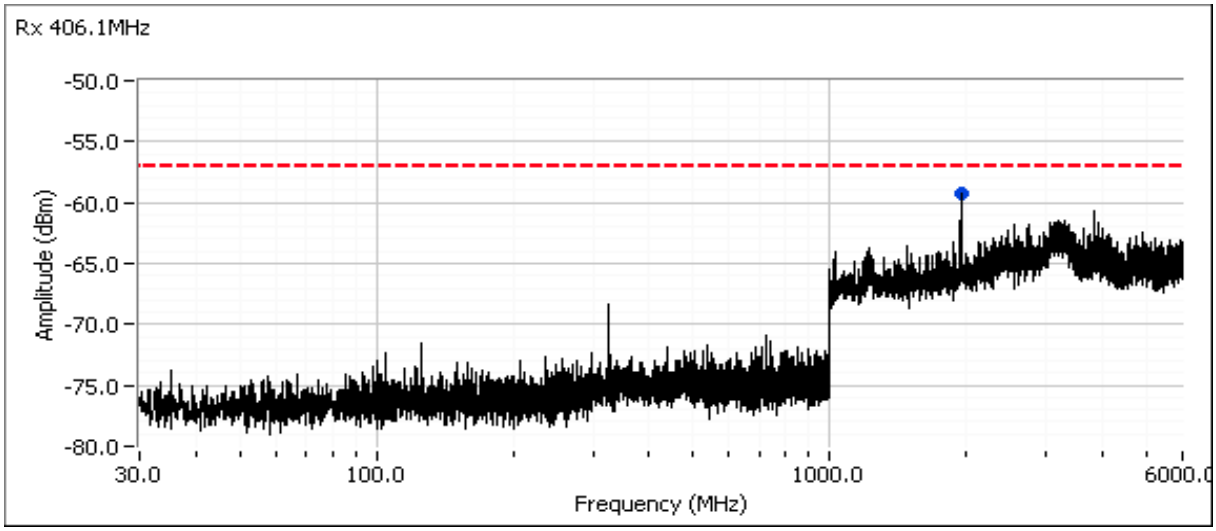
No deviations were made from the requirements of the standard.

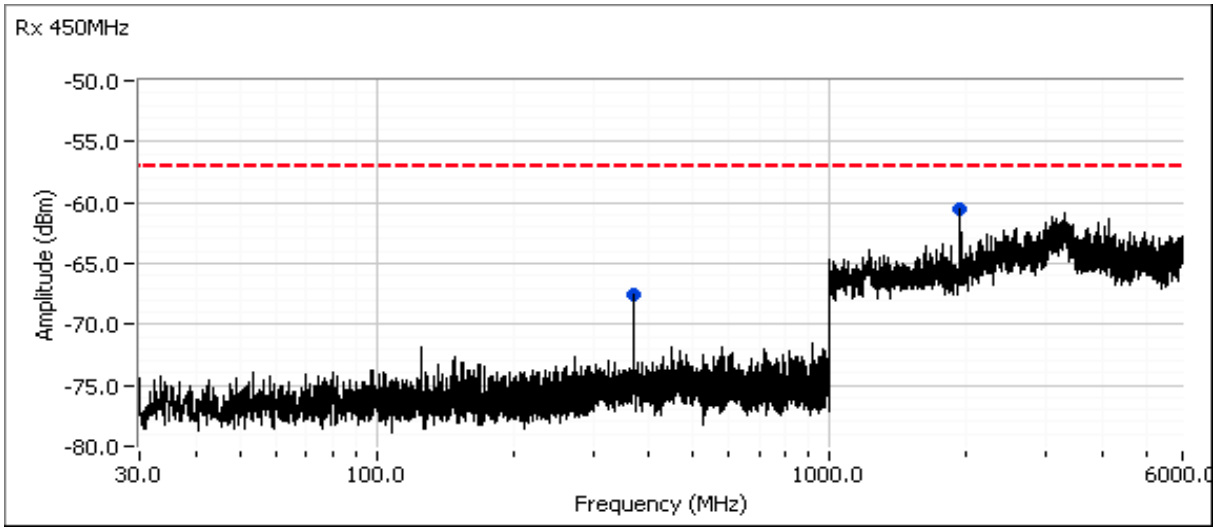
Sample Note

Sample S/N:2613864 (NTS2015-1253) for testing 406.1 and 450 MHz
Sample S/N:???? (NTS2015-????) for 512 MHz

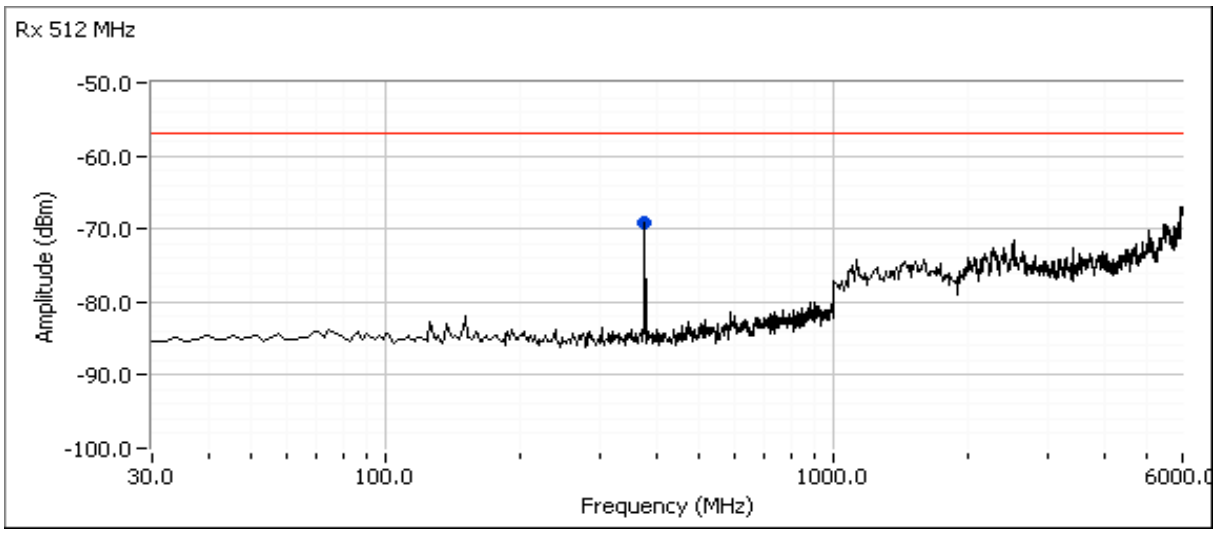
Client:	GE MDS LLC	Job Number:	J96255
Model:	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	B

Run #1: Conducted Spurious Emissions, 30 - 6000 MHz





Client:	GE MDS LLC	Job Number:	J96255
Model:	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	B



Frequency	Level	Port	FCC Part 15		Detector	Comments	Channel
MHz	dBm		Limit	Margin	Pk/QP/Avg		
1958.650	-59.2	RF	-57.0	-2.2	Peak		406.1
367.689	-67.5	RF	-57.0	-10.5	Peak		450.0
1931.980	-60.5	RF	-57.0	-3.5	Peak		450.0
378.000	-69.1	RF	-57.0	-12.1	Peak		512.0

Client:	GE MDS LLC	Job Number:	J96255
Model:	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	B

Radiated Emissions

(Elliott Laboratories Fremont Facility, Semi-Anechoic Chamber)

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 1/21/2015
Test Engineer: Jack Liu
Test Location: FT Chamber #4

Config. Used: 3
Config Change: None
EUT Voltage: 13.8 Vdc

General Test Configuration

The EUT and any local support equipment were located on the turntable for radiated emissions testing. Any remote support equipment was located outside the semi-anechoic chamber. Any cables running to remote support equipment where routed through metal conduit and when possible passed through a ferrite clamp upon exiting the chamber.
Radiated emissions tests above 1 GHz to FCC Part 15 were performed with floor absorbers in place in accordance with the test methods of ANSI C63.4:2009.
The test distance and extrapolation factor (if applicable) are detailed under each run description.
Note, preliminary testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. Maximized testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

Ambient Conditions:

Temperature: 23 °C
Rel. Humidity: 39 %

Summary of Results (ANSI C63.4:2009)

Run #	Test Performed	Limit	Result	Margin
1	Radiated Emissions 30 - 5120 MHz, Preliminary	FCC Part 15	Eval	Refer to individual runs
2	Radiated Emissions 30 - 5120 MHz, Maximized	FCC Part 15	Pass	39.0 dBµV/m @ 875.02 MHz (-7.0 dB)

Modifications Made During Testing

Bend the RJ45 connector ground finger pins to touch the face plate

Deviations From The Standard

No deviations were made from the requirements of the standard.

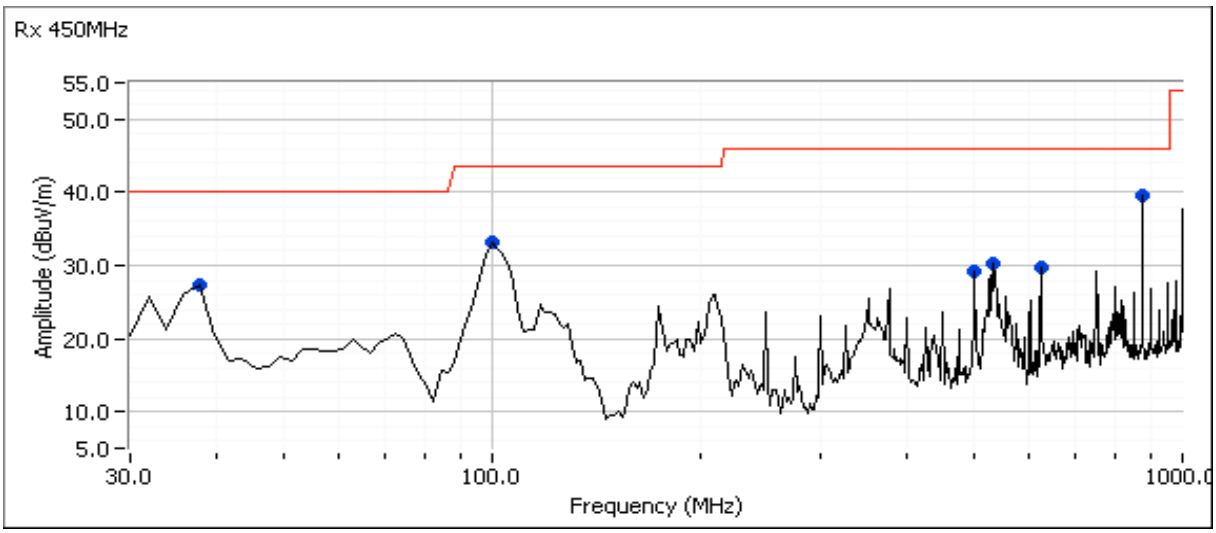
Client:	GE MDS LLC	Job Number:	J96255
Model:	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	B

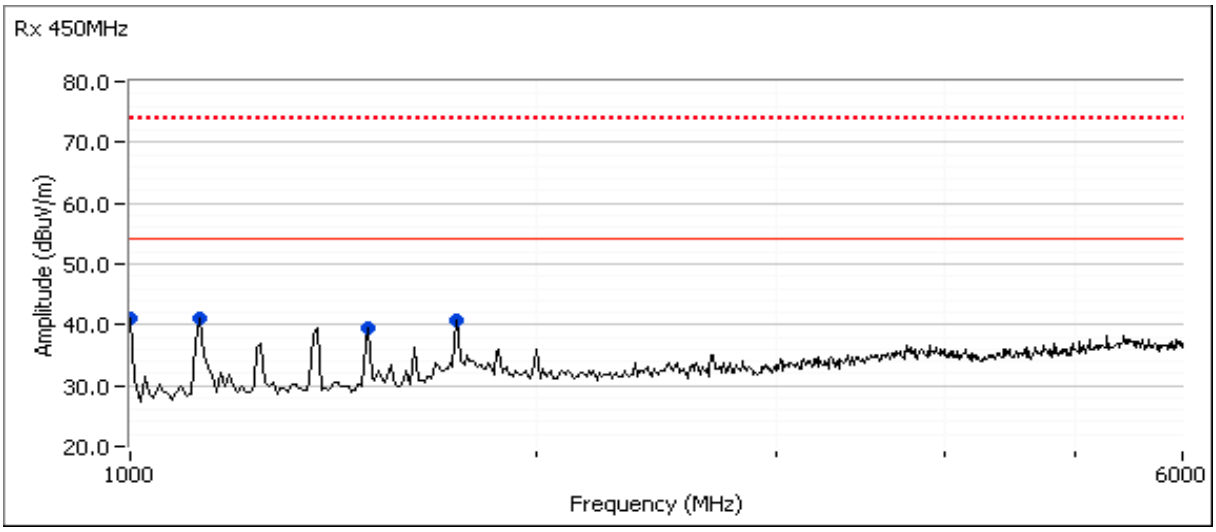
Sample Note

Sample S/N:2613864 (NTS2015-1253) for Antenna port test and Tx mode radiated Spurious emissions test
Sample S/N:2613860 (NTS2015-1252) for Tx standby/ Receive mode radiated Spurious emissions test

Run #1: Preliminary Radiated Emissions, 30 - 5120 MHz

Test Parameters for Preliminary Scan(s)			
Frequency Range (MHz)	Prescan Distance (meters)	Limit Distance (meters)	Extrapolation Factor (dB, applied to data)
30 - 5120	3	3	0.0





Client:	GE MDS LLC	Job Number:	J96255
Model:	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	B

Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	FCC Part 15		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
875.016	39.6	H	46.0	-6.4	Peak	29	1.0	
625.001	29.8	H	46.0	-16.2	Peak	199	1.0	
499.970	29.3	V	46.0	-16.7	Peak	250	1.5	
37.543	27.4	V	40.0	-12.6	Peak	290	1.0	
105.718	33.2	V	43.5	-10.3	Peak	310	1.0	
536.344	30.3	V	46.0	-15.7	Peak	348	1.0	
1750.100	40.8	H	54.0	-13.2	Peak	107	1.0	
1000.060	41.1	V	54.0	-12.9	Peak	140	1.0	
1500.220	39.4	V	54.0	-14.6	Peak	261	1.3	
1125.220	41.2	V	54.0	-12.8	Peak	267	1.3	

Note 1:	The serial port and Ethernet port are mutually exclusive. Preliminary tests showed that emissions were highest with respect to the limits with the Ethernet port. Therefore this configuration was used for final measurements.
Note 2:	Preliminary tests showed that digital circuitry and recevier emisisons form the EUT are independent of the selected receive frequency. Therefore all tests were performed with the recevier set at 450 MHz.

Client:	GE MDS LLC	Job Number:	J96255
Model:	SD4-1	T-Log Number:	T96301
		Project Manager:	Christine Krebill
Contact:	Dennis McCarthy	Project Coordinator:	-
Standard:	FCC Parts 15 and 90, RSS-119, EN 300 113-1	Class:	B

Run #2: Maximized Readings From Run #1

Test Parameters for Maximized Reading(s)			
Frequency Range (MHz)	Test Distance (meters)	Limit Distance (meters)	Extrapolation Factor (dB, applied to data)
30 - 5120	3	3	0.0

Maximized quasi-peak readings (includes manipulation of EUT interface cables)

Frequency	Level	Pol	FCC Part 15		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
875.016	39.0	H	46.0	-7.0	QP	29	1.0	QP (1.00s)
625.001	30.8	H	46.0	-15.2	QP	199	1.0	QP (1.00s)
499.970	25.7	V	46.0	-20.3	QP	194	1.6	QP (1.00s)
37.543	27.1	V	40.0	-12.9	QP	262	1.0	QP (1.00s)
105.718	27.4	V	43.5	-16.1	QP	310	1.0	QP (1.00s)
536.344	25.1	V	46.0	-20.9	QP	347	1.0	QP (1.00s)
1749.710	34.1	H	54.0	-19.9	AVG	106	1.0	RB 1 MHz;VB 10 Hz;Peak
1749.660	44.1	H	74.0	-29.9	PK	106	1.0	RB 1 MHz;VB 3 MHz;Peak
1500.080	34.7	V	54.0	-19.3	AVG	260	1.3	RB 1 MHz;VB 10 Hz;Peak
1500.090	42.4	V	74.0	-31.6	PK	260	1.3	RB 1 MHz;VB 3 MHz;Peak
1124.950	37.9	V	54.0	-16.1	AVG	267	1.3	RB 1 MHz;VB 10 Hz;Peak
1125.010	46.6	V	74.0	-27.4	PK	267	1.3	RB 1 MHz;VB 3 MHz;Peak
1000.010	39.0	V	54.0	-15.0	AVG	135	1.0	RB 1 MHz;VB 10 Hz;Peak
1000.040	44.7	V	74.0	-29.3	PK	135	1.0	RB 1 MHz;VB 3 MHz;Peak

End of Report

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