Elliott Laboratories Inc.
www.elliottlabs.com
684 West Maude Avenue
Sunnyvale, CA 94085-3518
408-245-7800 Phone
408-245-3499 Fax

Electromagnetic Emissions Test Report
Class II Permissive Change
In Accordance With
FCC Part 90 / RSS-119 Issue 9
on the
GE MDS LLC
Transmitter
Model: MDS1710D

FCC ID:	E5MDS-MDS1710D
IC:	3738A-MDS1710
GRANTEE:	GE MDS LLC 175 Science Parkway Rochester, NY 14620
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Avenue Sunnyvale, CA 94086
REPORT DATE:	September 14, 2007
FINAL TEST DATE:	September 6, 2007
AUTHORIZED SIGNATORY:	David W. Bare Chief Technical Officer

A2LA ACCREDITED
2016-01

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FCC CERTIFICATION INFORMATION

The following information is in accordance with FCC Rules, 47CFR Part 2, Subpart J, Section 2.1033(C) & to Industry Canada RSP-100.

2.1033(c)(1) Applicant:

GE MDS LLC
175 Science Parkway
Rochester, NY 14620

2.1033(c)(2) & RSP-100 (4) FCC ID: E5MDS-MDS1710
IC ID: 3738A-MDS1710

2.1033(c)(3) & RSP-100 (7.2(a)) Instructions/Installation Manual

Exhibit 7

2.1033(c)(4) & RSP-100 (7.2(b)(iii)) Type of emissions

FCC 90 & RSS-119**:** 6.25kHz Channel (4K00G1D)

2.1033(c)(5) & RSP-100 (7.2(a)) Frequency Range

FCC 90 & RSS-119**:** 150.3 – 173.9 MHz

2.1033(c)(6) & RSP-100 (7.2(a)) Range of Operation Power

FCC 90 & RSS-119**:** 0.1 Watts (20 dBm), Lowest Setting
FCC 90 & RSS-119**:** .5 Watts (37 dBm), Highest Setting

2.1033(c)(7) & RSP-100 (7.2(a)) Maximum FCC & IC Allowed Power Level

FCC 90.205(d) & RSS-119 clause 5.4: 150-174 MHz - Limitation on power based on height of antenna.

2.1033(c)(8) & RSP-100 (7.2(a)) Applied voltage and currents into the final transistor elements

Not applicable this is for class II permissive change

2.1033(c)(9) & RSP-100 (7.2(a)) Tune-up Procedure

Not applicable this is for class II permissive change

2.1033(c)(10) & RSP 100 (7.2(a)) Schematic Diagram of the Transmitter

Not applicable this is for class II permissive change

2.1033(c)(10) & RSP-100 (7.2(a)) Means for Frequency Stabilization

Not applicable this is for class II permissive change

2.1033(c)(10) & RSP-100 (7.2(a)) Means for Suppression of Spurious radiation

Not applicable this is for class II permissive change

2.1033(c)(10) & RSP-100 (7.2(a)) Means for Limiting Modulation

Not applicable this is for class II permissive change

2.1033(c)(10) & RSP-100 (7.2(a)) Means for Limiting Power

Not applicable this is for class II permissive change

2.1033(c)(11) & RSP-100 (7.2(g)) Photographs or Drawing of the Equipment Identification Plate or Label

Not applicable this is for class II permissive change

2.1033(c)(12) & RSP-100 (7.2(c)) Photographs of equipment

Not applicable this is for class II permissive change

2.1033(c)(13) & RSP-100 (7.2(a)) Equipment Employing Digital Modulation & 90.203 (Certification Requirements)

Not applicable this is for class II permissive change

2.1033(c)(14) & RSP-100 (7.2(b)(ii)) Data taken per Section 2.1046 to 2.1057 and RSS-133 issue 2, Rev. 1.

Refer to Exhibit 2

DECLARATIONS OF COMPLIANCE

Equipment Name and Model:
MDS1710D

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

Tested to applicable standards:
RSS-119, Issue 9 (Land Mobile and Fixed Radio Transmitters and Receivers, 27.41 to 960 MHz).
FCC Part 90 (Private Land Mobile Radio Service)

Measurement Facility Description Filed With Department of Industry:

Departmental Acknowledgement Number: IC2845A-1 Dated August 23, 2007

I declare that the testing was performed or supervised by me; that the test measurements were made in accordance with the above mentioned departmental standards (through the use of TIA/EIA-603 and the specific RSS standards applicable to this device); and that the equipment performed in accordance with the data submitted in this report.

Signature	
Name	David W. Bare
Title	Chief Technical Officer Elliott Laboratories Inc.
Address	684 W. Maude Ave Sunnyvale, CA 94086 USA
Date:	September 14, 2007

Maintenance of compliance with the above standards 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.).

SCOPE

FCC Part 90 & IC RSS-119 testing was performed for the equipment mentioned in this report. The equipment was tested in accordance with the procedures specified in Sections 2.1046 to 2.1057 of the FCC Rules & IC RSS-119. TIA-603 was also used as a test procedure guideline to perform some of the required tests.

The intentional radiator above was tested in a simulated typical installation to demonstrate compliance with the relevant FCC & RSS performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

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.

OBJECTIVE

The primary objective of the manufacturer is compliance with the FCC Part 90 & IC RSS-119. Certification of these devices is required as a prerequisite to marketing as defined in Section 2.1033 & RSP-100.

Certification is a procedure where the manufacturer or a contracted laboratory makes measurements and submits the test data and technical information to FCC & Industry Canada. FCC & Industry Canada issues a grant of equipment authorization and a certification number upon successful completion of their review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product that 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.).

SUMMARY OF TEST RESULTS

Part 90 and RSS-119 Test Summary

Measurement Required	FCC Part 2 & 90 Sections	RSS-119 Section	Test Performed	Measured Value	Test Procedure Used	Result
Modulation Tested	2.1047	5.2	-	Binary CPFSK	-	-
Modulation characteristic	2.1047	5.2	Modulated with appropriated signal	830 Hz	H	Complies
Conducted RF power output	2.1046 / 90.205(d)	5.4	Conducted Output Power Test	37.7dBm (5.9 Watts)	B	Complies
Spurious emissions at antenna Port	2.1051/ 90.210(e)	5.8.4	Emission Limits and/or Unwanted Emission 30MHz – 1.75GHz	-28.5dBm @ 324.031MHz (-3.0dB)	J	Complies
Occupied Bandwidth	2.1049/ 90.210(e)	5.8.4	Emission Mask and 99% Bandwidth	Refer to Plots	C & D	Complies
Field strength of spurious radiation	2.1053 / 90.210(e)	5.8.4	Radiated Spurious Emissions 30MHz – 5GHz	51.5dBm @ 324.0MHz (-26.5dB)	N	Complies
Frequency stability	2.1055 / 90.213		Frequency Vs. Temperature	N/A	K	Note 1
Frequency stability	2.1055 / 90.213		Frequency Vs. Voltage	N/A	L & M	Note 1
Transient Frequency Behavior	90.214	5.9	Transient Behavior	Refer to Exhibit 2	I	Complies
Exposure to Mobile devices	2.1091		Exposure of Humans to RF Fields	N/A	-	Note 1
Receiver	15.109	5.11	Receiver Spurious Emissions	N/A	-	Note 1

Note 1: Test data for this item was considered unnecessary for this permissive change to add 6.25 KHz bandwidth, as bandwidth changes do not affect the results.

MEASUREMENT UNCERTAINTIES

ISO Guide 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 and were calculated in accordance with UKAS document LAB 34.

Measurement Type	Frequency Range (MHz)	Calculated Uncertainty (dB)
Conducted Emissions	0.15 to 30	± 2.4
Radiated Emissions	30 to 1000	± 3.6

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The GE MDS LLC model MDS1710D is a half duplex data transceiver which is designed to transmit data wirelessly. Normally, the EUT would be placed on a tabletop during operation. The EUT was, therefore, placed on a table during emissions testing to simulate the end user environment. The electrical rating of the EUT is 10-16Vdc, nominal 13.8Vdc at 2 amps, max.

The sample was received on September 6, 2007 and tested on September 6, 2007. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number	FCC ID
GE MDS	MDS1710D	half duplex VHF data transceiver with 6.25KHz channels (sample for 150-165 MHz)	1659516	E5M-DS1710
GE MDS	MDS1710D	half duplex VHF data transceiver with 6.25KHz channels (sample for 165-174 MHz)	1659489	E5M-DS1710

OTHER EUT DETAILS

The EUT antenna uses antennas up to a maximum gain of 7dBd (9.15dBi).

ENCLOSURE

The EUT enclosure is primarily constructed of diecast with internal circuit board. It measures approximately 5.08 H x 14.29 W x 18.4 D cm. (2.0 H x 5.625 W x 7.25 D in.)

MODIFICATIONS

The EUT did not require modifications during testing in order to comply with the emission specifications.

SUPPORT EQUIPMENT

The following support equipment was used during emissions testing:

Manufacturer	Model	Description	Serial Number	FCC ID
Dell	PPX	Laptop Computer	F89AV	None

EUT INTERFACE PORTS

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

Port	Connected to	Description	Shielded or Unshielded	Length (m)
RF output	RF Load	Coaxial	Shielded	2.5
Data Interface	Laptop	Multiwire	Shielded	2.0
DC Power	Power source	Two wire	Unshielded	2.0

Note: The Daig port was not connected during testing. The manufacturer stated that this is for diagnostic and configuration purposes and therefore would not normally be connected. Note: The radio was configured for continuous transmission using the diag. port and special software.

EUT OPERATION DURING TESTING

During emissions testing the EUT was set to continuous transmit mode either unmodulated or with a 3200 bps modulation as required for testing.

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TEST SITE

GENERAL INFORMATION

Final test measurements were taken on September 6, 2007 at the Elliott Laboratories Test Site OATS #1 located at 684 West Maude Avenue, Sunnyvale, California. Pursuant to Section 2.948 of the FCC Rules, construction, calibration, and equipment data has been filed with the Commission.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing are performed in conformance with Section 2 of FCC Rules. Measurements are made with the EUT connected to a spectrum analyzer through an attenuator to prevent overloading the analyzer.

RADIATED EMISSIONS CONSIDERATIONS

Radiated measurements are performed in an open field environment or Anechoic Chamber. The test site is maintained free of conductive objects within the CISPR 16-1 defined elliptical area.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1 is used for emissions measurements. The receivers are capable of measuring over the frequency range of 9 kHz up to 2000 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. The receiver automatically sets the required bandwidth for the particular detector used during measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. If average measurements above 1000MHz are performed, the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz is used.

INSTRUMENT CONTROL COMPUTER

A personal computer is utilized to record the receiver measurements of the field strength at the antenna, which is then compared directly with the appropriate specification limit. The receiver is programmed with appropriate factors to convert the received voltage into filed strength at the antenna. Results are printed in a graphic and/or tabular format, as appropriate.

The test receiver also provides a visual display of the signal being measured.

PEAK POWER METER

A peak power meter and thermister mount may be used for output power measurements from transmitters as they provide a broadband indication of the power output.

FILTERS/ATTENUATORS

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

ANTENNAS

A biconical antenna is used to cover the range from 30 MHz to 300 MHz and a log periodic antenna is utilized from 300 MHz to 1000 MHz. Narrowband tuned dipole antennas are used over the 30 to 1000 MHz range for precision measurements of field strength. Above 1000 MHz, a horn antenna is used. The antenna calibration factors are included in site factors programmed into the test receivers

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.

The requirements of ANSI C63.4:2003 were used for configuration of the equipment turntable. It specifies that the test height above ground for table-mounted devices shall be 80 centimeters. Floor mounted equipment shall be 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. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An appendix of this report contains the list of test equipment used and calibration information.

TEST PROCEDURES

General: For Transmitters with detachable antenna, direct measurements for output power, modulation characterization, occupied bandwidth, and frequency stability are performed with the antenna port of the EUT connected to either the power meter, modulation analyzer, or spectrum analyzer via a suitable attenuator and/or filter. The attenuators and/or filters are used to ensure that the transmitter fundamental will not overload the front end of the measurement instrument.

Procedure B – Power Measurement (Conducted Method): The following procedure was used for transmitters that do use external antennas.

1) Set the EUT to maximum power and to the lowest channel.
2) Either a power meter or a spectrum analyzer was used to measure the power output.
3) If a spectrum analyzer was used a resolution and video bandwidth 10kHz was used to measure the power output. Corrected for any external attenuation used for the protection of the input of analyzer. In addition, For CDMA or TDMA modulations set spectrum analyzer resolution to 1MHz and video to 30 kHz. Use video averaging with a 100-sample rate.
4) If a power meter was used, corrected for any external attenuation used for the protection of the input of the sensor head. Also set the power sensor correction by setting up the frequency range that will be measured.
5) Repeat this for the high channel and all modulations that will be used and all output ports used for transmission

Procedure C - Occupied Bandwidth (Conducted Method): Either for analog, digital, or data modulations, occupied bandwidth was performed. The EUT was set to transmit the appropriate modulation at maximum power. The bandwidth was measured using following methods:

1) The built-in 99% function of the spectrum analyzer was used.
2) If the built-in 99% is not available then the following method is used:

   26-dB or 20-dB was subtracted to the maximum peak of the emission. Then the display line function was used, in conjunction with the marker delta function, to measure the emissions bandwidth.

3) For the above two methods a resolution and video bandwidth of 100 or 300 Hz was used to measure the emission's bandwidth.

Procedure D - Occupied Bandwidth (Conducted Emission Mask): Either for analog, digital, or data modulations, emission mask was performed. The EUT was set to transmit the appropriate modulation at maximum power. The following method was used:

1) The EUT was connected directly to the spectrum analyzer and used an attenuator to protect the input of the analyzer. The EUT antenna was removable, so conducted measurements was performed. The EUT was set to transmit continuous packets of data and the Fundamental Frequency set to the middle of the EUT frequency range.

2) Since EUT is designed with a 6.25 kHz channel Section 90.210 (e)(1)(2)(3) was used to show compliance to the emission mask.

3) Any emission must be attenuated below the power (P) as follow:

90.210 (e)(1): 3 kHz: 0 dB

90.210(e)(2): 3 kHz – 4.6kHz: 30 + 16.67(fd-3 kHz) or 55 + 10 log (P) or 65 dB, whichever is the lesser attenuation

90.210(e)(3): more than 4.6 kHz: -25 dBm (55+10*log(P))

The following Resolution and Video bandwidth was used to show compliance for the above requirement: 100 Hz.

Procedure H - Other Types of Equipment: Either digital or data modulated signals were simulated, by software or external sources, to performed the required tests. The EUT was set to transmit the appropriate digital modulation.

Procedure J – Antenna Conducted Emissions: For spurious emission measurements at the antenna terminal the following procedure was performed:

1) Set the transmitting signal at the middle of the operating range of the transmitter, as specified in the standard. Power is set to maximum and then to minimum.
2) Set the spectrum analyzer display line function to –25dBm.
3) Set the spectrum analyzer bandwidth to 10kHz <1GHz and 1 MHz >1GHz.
4) For the spectrum analyzer, the start frequency was set to 30 MHz and the stop frequency set to the 10^{th} harmonic of the fundamental. All spurious or intermodulation emission must not exceed the –25dBm limit.
5) Steps 1 to 4 were repeated for all modulations and output ports that will be used for transmission.

Procedure K - Frequency Stability: The EUT is placed inside a temperature chamber with all support and test equipment located outside of the chamber. The spectrum analyzer is configured to give a 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. The Temperature chamber was varied from –30 to +50° C (or +60° C for some IC RSS standards, if applicable) in 10 degrees increment. The EUT was allowed enough time to stabilize for each temperature variation.

Procedure L - Frequency Stability: For AC or DC operated devices the nominal voltage is varied to 85% and to 115% at either room temperature or at a controlled +20°C temperature.

Procedure M - Frequency Stability: For battery-powered devices the voltage battery end-point is determined by reducing the dc voltage until the unit ceases to function. This is performed at either room temperature or at a controlled +20°C temperature.

Procedure N - Field Strength Measurement: The EUT was set on the turntable and the search antenna position 3 meters away. The output antenna terminal was terminated with a 50-ohm terminator. The EUT was set at the middle of the frequency band and set at maximum output power.

For the first scan, a pre-liminary measurement is performed. A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. One or more of these is with the antenna polarized vertically while the one or more of these are with the antenna polarized horizontally. 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 the final measurement, Substitution method is performed on spurious emissions not being 20-dB below the calculated radiated limit. Substitution method is performed by replacing the EUT with a horn antenna and signal generator. The horn antenna factors can be reference to a half-wave dipole in dBi. The signal generator power level was adjusted until a similar level, which was measured on the first scan, is achieved on the spectrum analyzer. The level on the signal generator is than added to the antenna factor, in dBi, which will give the corrected value.

Procedure I – Transient Frequency Behavior: The TIA/EIA 603 procedure was used to determine compliance to radio being keyed on and off.

1) Connected the Test Receiver DOP or Video Output to Channel 1 of the oscilloscope. The output of the RF crystal detector was connected to Auxiliary channel 1, which served as a trigger input. The output of the combiner was connected to the Test Receiver.

2) Set the EUT to maximum power and connected as illustrated above. Set the signal generator to the assigned transmitter frequency and modulate it with a 1 kHz tone at 6.25kHz, 12.5 kHz, or 25 kHz deviation and set its output to –100 dBm, then turn on the EUT.

3) The Combiner output side was connected to the Test Receiver, which was used to measure the Power. Used enough external attenuation so that the output at the combiner was set to 40 dB below the maximum input of the Test Receiver, then turn off the EUT.

4) Set the signal generator output to the same level in step 3. This level was maintained for the remainder of the test.

5) Set the horizontal sweep rate on the storage oscilloscope to 10 milliseconds per division and adjusted the display to continuously view the 1 kHz tone from the DOP or Video Output. Adjusted the vertical amplitude control to display the 1 kHz at +/- 4 divisions vertically centered on the display.

6) Set the oscilloscope to trigger at the AUX channel 1 input port.

7) Removed enough external attenuation so that the input to the RF detector and combiner is increased by 30 dB.

8) Turn on the transmitter and plotted the result for **Ton**, **T1**, and **T2**.

9) Set the oscilloscope to trigger in decreasing magnitude from the RF crystal detector.

10) Turn off the transmitter and plotted the result for **T3**.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

RADIATED EMISSIONS SPECIFICATION LIMITS

The limits for radiated emissions are based on the power of the transmitter at the operating frequency. Data is measured in the logarithmic form of decibels relative to one milliwatt (dBm) or one microvolt/meter (dBuV/m,). The field strength of the emissions from the EUT is measured on a test site with a receiver.

Below is a formula example used to calculate the attenuation requirement, relative to the transmitters power output, in dBuV/m. For this example an operating power range of 3 watts is used. The radiated emissions limit for spurious signals outside of the assigned frequency block is $43+10\text{Log}_{10}$(mean output power in watts) dB below the measured amplitude at the operating power.

CALCULATIONS – EFFECTIVE RADIATED POWER

$$E(V/m) = \frac{\sqrt{30 * P * G}}{d}$$

E= Field Strength in V/m
P= Power in Watts (for this example we use 3 watts)
G= Gain of antenna in numeric gain (Assume 1.64 for ERP)
d= distance in meters

$$E(V/m) = \frac{\sqrt{30 * 3 \text{ watts} * 1.64 \text{ dB}}}{3 \text{ meters}}$$

20 * log (4.049 V/m * 1,000,000) = 132.14 dBuV/m @ 3 meters

FCC Rules request an attenuation of 43 + 10 log (3) or 47.8 dB for all emissions outside the assigned block, the limit for spurious and harmonic emissions is:

132.1 dBuV/m – 47.8 dB = 84.3 dBuV/m @ 3 meter.

Note: Substitution Method is performed for spurious emission not being 20-dB below the calculated field strength.

EXHIBIT 1: Test Equipment Calibration Data

1 Page

FCC Part 90, Radiated Prescan and Antenna Port Measurements, 06-Sep-07
Engineer: Mark Hill

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	SpecAn 9 KHz-26.5 GHz, Non-Program	8563E	284	21-Jun-08
EMCO	Log Periodic Antenna, 0.3-1 GHz	3146A	364	01-Dec-07
Elliott Laboratories	Biconical Antenna, 30-300 MHz	DM-105-T1	382	01-Dec-07
Fischer Custom Comm.	ISN Adapter, RJ11, SV	ISNT4-AE-RJ11-6-1 Mod T2	1275	28-Feb-08
Rohde & Schwarz	Power Sensor 100 uW - 2 Watts (w/ 20 dB pad, SN BJ5155)	NRV-Z32	1536	12-Jul-08
EMCO	Antenna, Horn, 1-18 GHz	3117	1662	21-Mar-08
Hewlett Packard	Preamplifier	8447D OPT 010	1826	25-May-08

Radio Antenna (Spurious Emissions), 07-Sep-07
Engineer: Joseph Cadigal

Manufacturer	Description	Model #	Asset #	Cal Due
Rohde & Schwarz	Test Receiver, 20-1300 MHz	ESVP	273	16-Feb-09
Hewlett Packard	EMC Spectrum Analyzer, 9 KHz - 22 GHz	8593EM	1319	18-May-08
EMCO	Log Periodic Antenna, 0.2-2 GHz	3148	1347	28-Sep-07
Compliance Design	Dipole 180-400MHz	Dipole	1894	04-Jan-08

EXHIBIT 2: Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T69220 17 Pages

Elliott	EMC Test Data

Client:	GE MDS	Job Number:	J69032
Model:	MDS1710D	T-Log Number:	J69220
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		-
Emissions Standard(s):	FCC Part 90, RSS-119	Class:	Radio
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

GE MDS

Model

MDS1710D

Date of Last Test: 9/7/2007

Client:	GE MDS	Job Number:	J69032
Model:	MDS1710D	T-Log Number:	J69220
		Account Manger:	Susan Pelzl
Contact:	Dennis McCarthy		
Emissions Standard(s):	FCC Part 90, RSS-119	Class:	Radio
Immunity Standard(s):	-	Environment:	-

EUT INFORMATION

The following information was collected during the test session(s).

General Description

The EUT is a wireless data transceiver which is designed to transmit and receive data. Normally, the EUT would be placed on a tabletop or rack mounted during operation. The EUT was, therefore, placed on a table during emissions testing to simulate the end user environment. The electrical rating of the EUT is 10-16Vdc, nominal 13.8Vdc at 2 amps, max.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
GE MDS	MDS1710D	half duplex VHF data transceiver with 6.25KHz channels (sample for 150-165 MHz)	1659516	E5M-DS1710
GE MDS	MDS1710D	half duplex VHF data transceiver with 6.25KHz channels (sample for 165-174 MHz)	1659489	E5M-DS1710

EUT Antenna (Intentional Radiators Only)

The EUT antenna uses antennas up to a maximum gain of 7dBd (9.15dBi).

EUT Enclosure

The EUT enclosure is primarily constructed of diecast with internal circuit board . It measures approximately 5.08 H x 14.29 W x 18.4 D cm. (2.0 H x 5.625 W x 7.25 D in.)

Modification History

Mod. #	Test	Date	Modification
1	-	-	-

Modifications applied are assumed to be used on subsequent tests unless otherwise stated as a further modification.

Client:	GE MDS	Job Number:	J69032
Model:	MDS1710D	T-Log Number:	J69220
		Account Manger:	Susan Pelzl
Contact:	Dennis McCarthy		
Emissions Standard(s):	FCC Part 90, RSS-119	Class:	Radio
Immunity Standard(s):	-	Environment:	-

Test Configuration #1

The following information was collected during the test session(s).

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Dell	PPX	Laptop Computer	F89AV	None

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None	-	-	-	-

Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
RF output	RF Load	Coaxial	Shielded	2.5
Data Interface	Laptop	Multiwire	Shielded	2.0
DC Power	Power source	Two wire	Unshielded	2.0

Note: The Daig port was not connected during testing. The manufacturer stated that this is for diagnostic and configuration purposes and therefore would not normally be connected. Note: The radio was configured for continuous transmission using the diag. port and special software.

EUT Operation During Emissions Tests

During emissions testing the EUT was set to continuous transmit mode either unmodulated or with a 3200 bps modulation as required for testing.

Client:	GE MDS	Job Number:	J69032
Model:	MDS1710D	T-Log Number:	J69220
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 90, RSS-119	Class:	N/A

Radiated Spurious Emissions, FCC Part 90, RSS-119

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: 9/6/2007 8:31
Test Engineer: Mark Hill/Joseph Cadigal
Test Location: Chamber #2/ OATS#1

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

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing. All remote support equipment was located approximately 30 meters from the EUT with all I/O connections running on top of the groundplane or routed in overhead in the GR-1089 test configuration.

The measurement antenna was located 3 meters from the EUT.

Ambient Conditions:

Temperature: 23.3 °C
Rel. Humidity: 53 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
2	Spurious Emissions Transmit Mode, 30 - 1750 MHz	FCC Part 90	Pass	51.5dBm @ 324.0MHz (26.5dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Test Notes

No receiver spurious tests were performed per RSS-119 as previuos tests showed that changing the transmitter bandwidth did not affect the receiver emissions.

Client:	GE MDS	Job Number:	J69032
Model:	MDS1710D	T-Log Number:	J69220
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 90, RSS-119	Class:	N/A

Run #1: Radiated Spurious Emissions, Transmit Mode, 30 - 1750 MHz
Measurements made at 3m

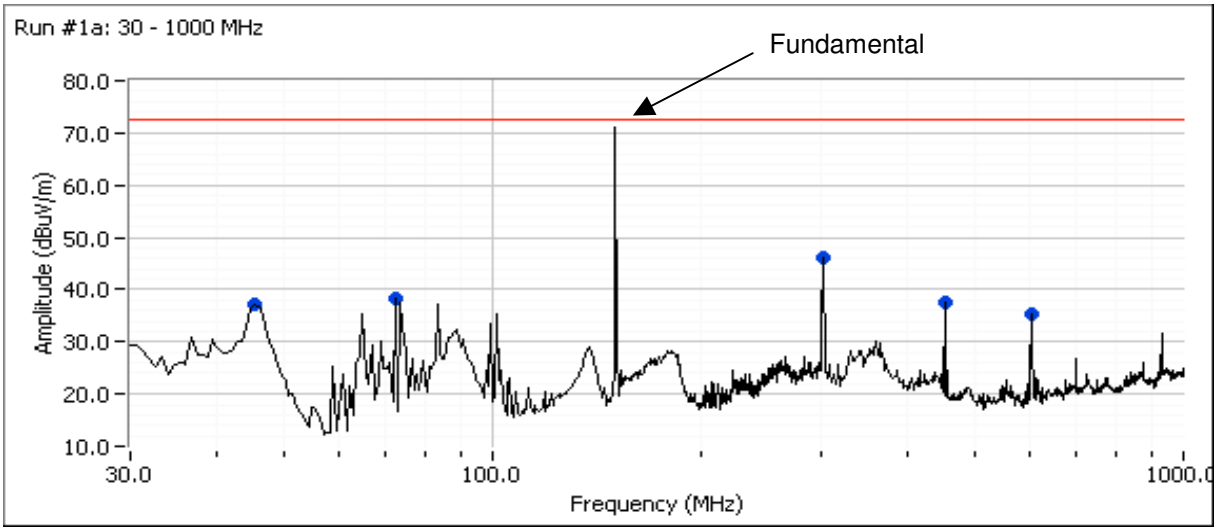
Date of Test: 9/6/2007 8:31
Test Engineer: Mark Hill
Test Location: Chamber #2

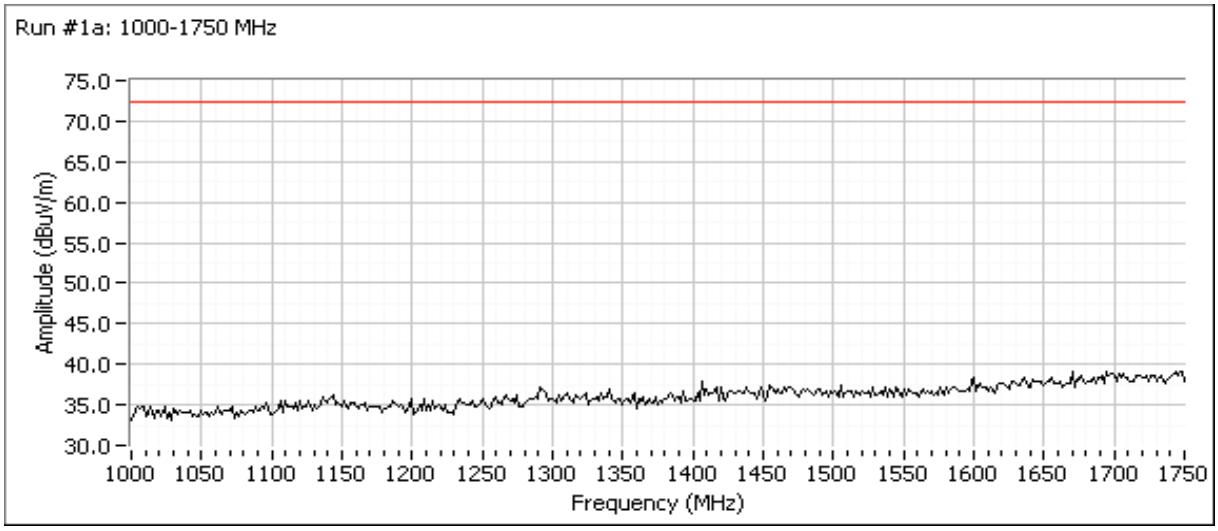
Config. Used: 1
Config Change:
EUT Voltage: 13.8 Vdc

Ambient Conditions:

Temperature: 23.3 °C
Rel. Humidity: 53 %

Run #1a: EUT @ 150.3 MHz
Power setting 37 dBm





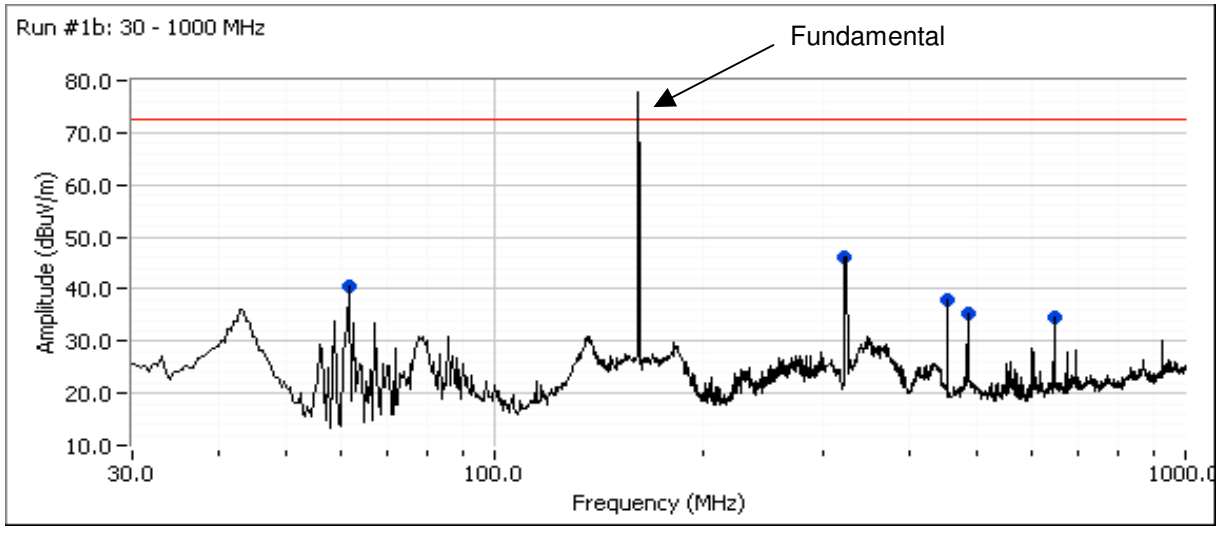
Client:	GE MDS	Job Number:	J69032
Model:	MDS1710D	T-Log Number:	J69220
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 90, RSS-119	Class:	N/A

Run #1a: EUT @ 150.3 MHz

Frequency	Level	Pol	90.210(e)(3)		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
45.262	37.3	V	72.4	-35.1	Peak	93	1.7	
71.889	38.3	V	72.4	-34.1	Peak	181	1.7	
300.579	46.2	H	72.4	-26.2	Peak	106	1.7	
450.915	37.5	H	72.4	-34.9	Peak	104	1.7	
601.192	35.2	H	72.4	-37.2	Peak	244	1.7	

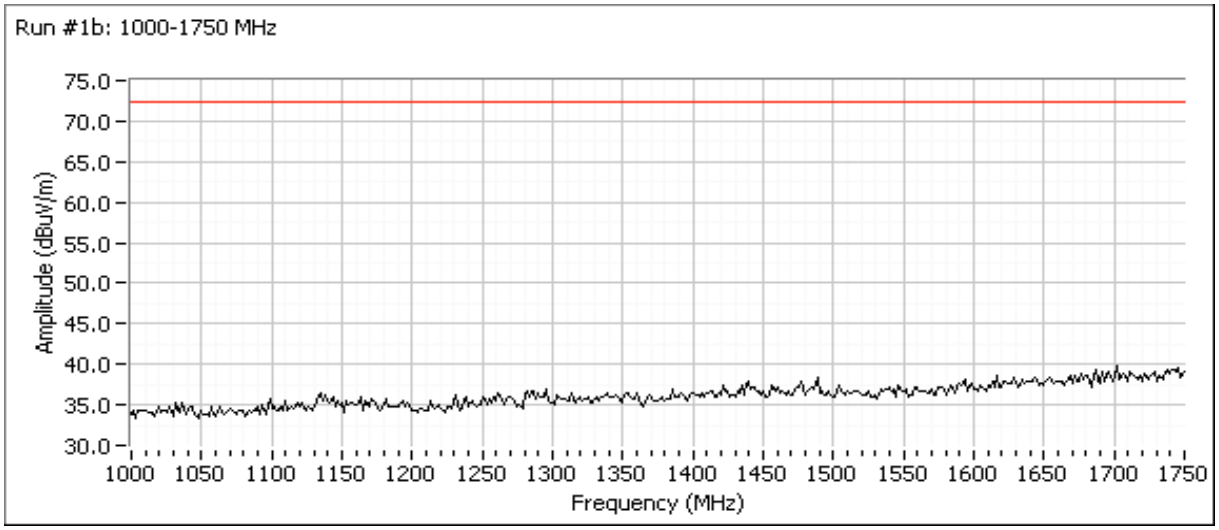
Note 1:	The field strength limit in the tables above was calculated from the erp/eirp limit detailed in the standard using the free space propagation equation: E=√(30PG)/d. This limit is conservative - it does not consider the presence of the ground plane and, for erp limits, the dipole gain (2.2dBi) has not been included. The erp or eirp for all signals with less than 10dB of margin relative to this field strength limit is determined using substitution measurements.

Run #1b: EUT @ 162 MHz



Client:	GE MDS	Job Number:	J69032
Model:	MDS1710D	T-Log Number:	J69220
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 90, RSS-119	Class:	N/A

Run #1b: EUT @ 162 MHz

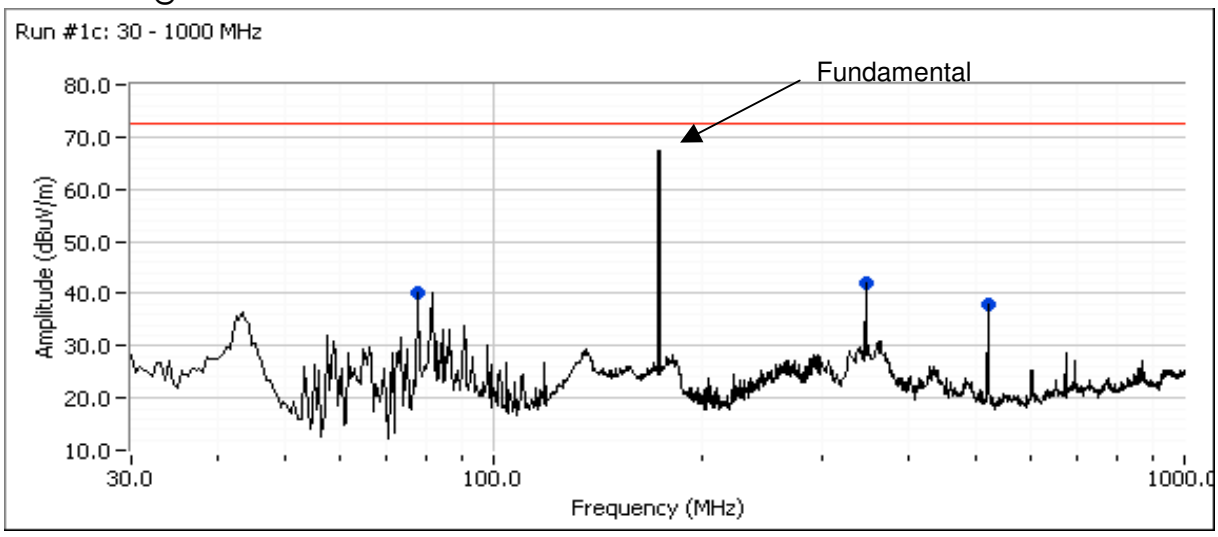


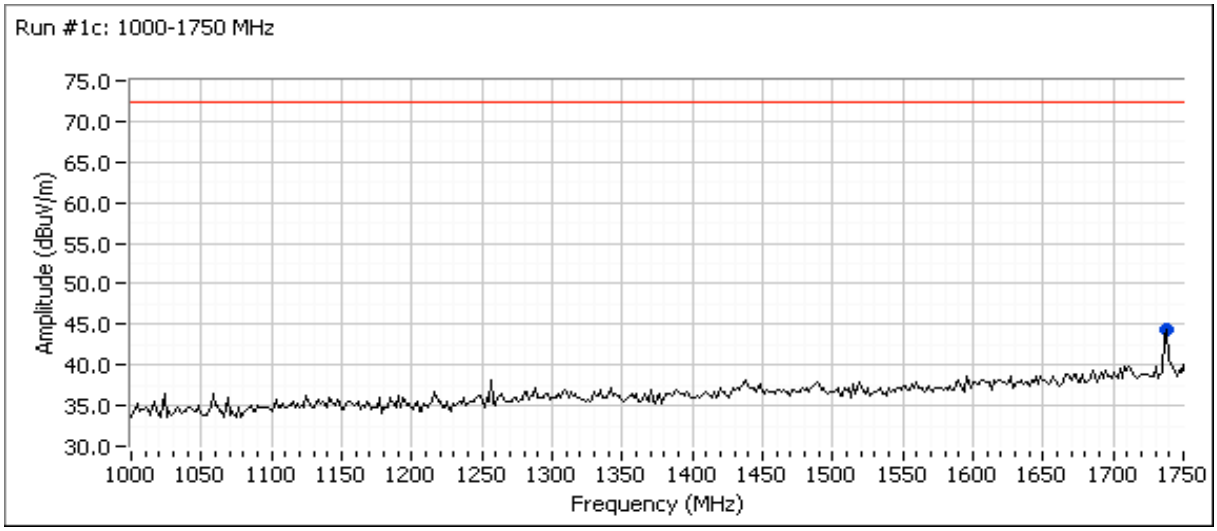
Frequency	Level	Pol	90.210(e)(3)		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
323.035	46.2	H	72.4	-26.2	Peak	245	1.7	
453.043	37.9	V	72.4	-34.5	Peak	0	1.7	
485.049	35.4	H	72.4	-37.0	Peak	249	1.7	
648.037	34.5	H	72.4	-37.9	Peak	222	1.7	
61.950	40.5	V	72.4	-31.9	Peak	313	1.7	

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 10dB of margin relative to this field strength limit is determined using substitution measurements.

Client:	GE MDS	Job Number:	J69032
Model:	MDS1710D	T-Log Number:	J69220
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 90, RSS-119	Class:	N/A

Run #1c: EUT @ 173.9 MHz





Client:	GE MDS	Job Number:	J69032
Model:	MDS1710D	T-Log Number:	J69220
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 90, RSS-119	Class:	N/A

Run #1c: EUT @ 173.9 MHz

Frequency	Level	Pol	90.210(e)(3)		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
77.406	40.3	V	72.4	-32.1	Peak	169	1.7	
347.832	42.1	H	72.4	-30.3	Peak	129	1.7	
521.045	38.1	H	72.4	-34.3	Peak	314	1.7	
1738.310	44.3	V	72.4	-28.1	Peak	139	1.7	

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 10dB of margin relative to this field strength limit is determined using substitution measurements.

Run #2: Radiated Spurious Emissions, Transmit Mode: Final Field Strength and Substitution Measurements

Frequency	Level	Pol	EN 300 XXX Note 1		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
300.579	46.2	H	72.4	-26.2	Peak	106	1.7	
323.035	46.2	H	72.4	-26.2	Peak	245	1.7	
347.832	42.1	H	72.4	-30.3	Peak	129	1.7	

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
300.600	-20.1	2.6	78.7	96.2	44.4	-51.8	-54.0		-25.0	-29.0
324.000	-20.0	2.2	79.1	96.9	46.4	-50.5	-52.7		-25.0	-27.7
347.800	-20.1	2.1	76.5	94.5	43.8	-50.7	-52.9		-25.0	-27.9

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
300.600	-20.1	2.6	77.0	94.5	44.5	-50.0	-52.2		-25.0	-27.2
324.000	-20.0	2.2	76.6	94.4	45.1	-49.3	-51.5		-25.0	-26.5
347.800	-20.1	2.1	76.4	94.4	43.5	-50.9	-53.1		-25.0	-28.1

Note 1:	Pin is the input power (dBm) to the substitution antenna
Note 2:	Gain is the gain (dBi) for the substitution antenna. A dipole has a gain of 2.2dBi.
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	Job Number:	J69032
Model:	MDS1710D	T-Log Number:	J69220
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 90, RSS-119	Class:	N/A

Radio Performance Test - FCC Part 90 / RSS-119
RF Port Measurements - 6.25 kHz

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: 9/6/2007 8:31
Test Engineer: Mark Hill
Test Location: Chamber #2
Config. Used: 1
Config Change: None
EUT Voltage: 13.8VDC

General Test Configuration

The EUT's rf port was connected to the measurement instrument's rf port, via an attenuator or dc-block if necessary.

Ambient Conditions:

Temperature: 21 °C
Rel. Humidity: 42 %

Summary of Results

Run #	Test Performed	Limit	Result	Limit
1	Maximim Output Power	FCC Part 90	37.6 dBm	Determined at time of licensing
2	Unwanted emissions (Mask)	FCC Part 90	Within Mask	Mask E
3	Bandwidth	FCC Part 90	4 kHz	<= 6 kHz
4	Transmitter spurious emissions, 30MHz - 1,750MHz (rf port)	FCC Part 90	-28.5dBm	-25dBm
5	Transient Frequency Behavior	FCC Part 90	Within limit	See limit on plot

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	GE MDS	Job Number:	J69032
Model:	MDS1710D	T-Log Number:	J69220
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 90, RSS-119	Class:	N/A

Normal and Extreme Operating Conditions:

Extreme operating conditions are defined in FCC Part 2 as:
Voltage extremes:
0.85 and 1.15 times the nominal voltage of 13.8Vdc
Temperature extremes:
Unrestricted use: -20°C to +55°C

Run #1: Maximum Power Measurements, modulated

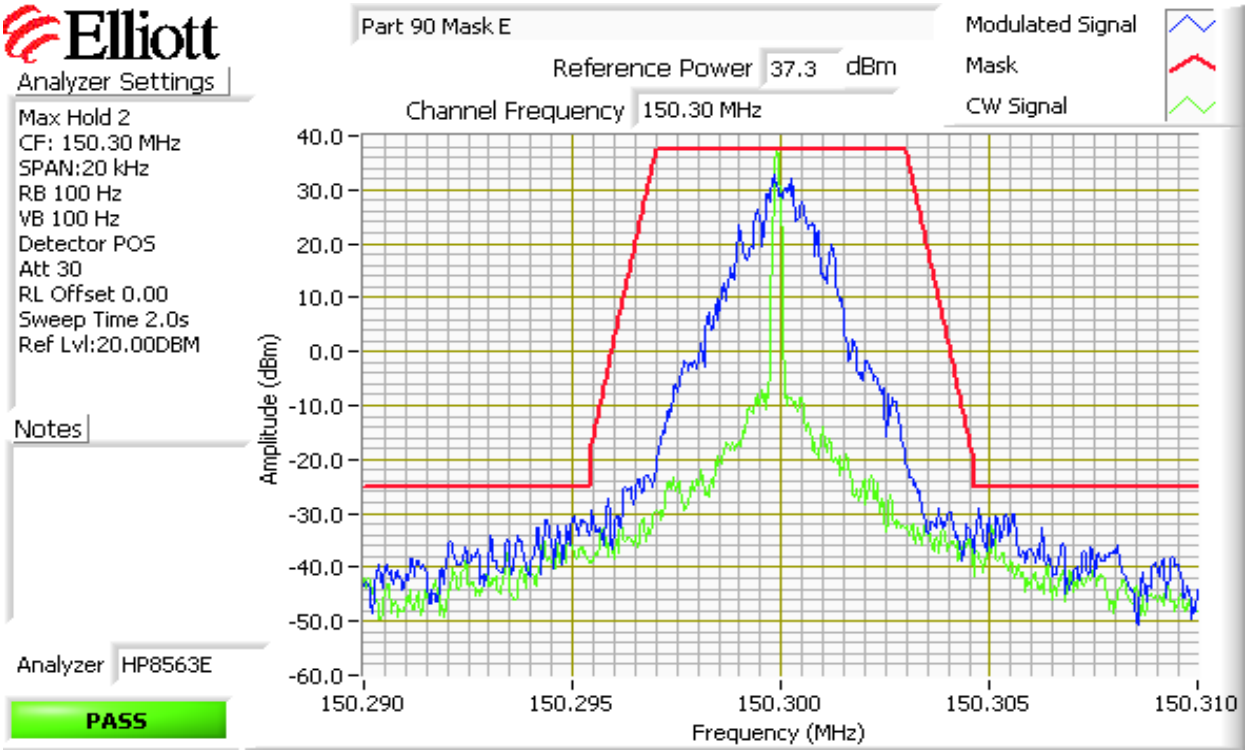
Power settings from 20 to 37 are available corresponding to 0.1 to 5 Watts.

Freq.	Setting	Pmeas	Duty Cycle	Pout
150.3	37	37.6	100%	37.6
162	37	37.5	100%	37.5
173.9	37	37.5	100%	37.5

Setting: software power setting of EUT
Pmeas: Measured output power (PEP) using power meter
Duty Cycle: Duty cycle of transmissions

Note: The peak FM modulation deviation was 830 Hz.

Run #2: Masks



Client:	GE MDS	Job Number:	J69032
Model:	MDS1710D	T-Log Number:	J69220
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 90, RSS-119	Class:	N/A

Elliott

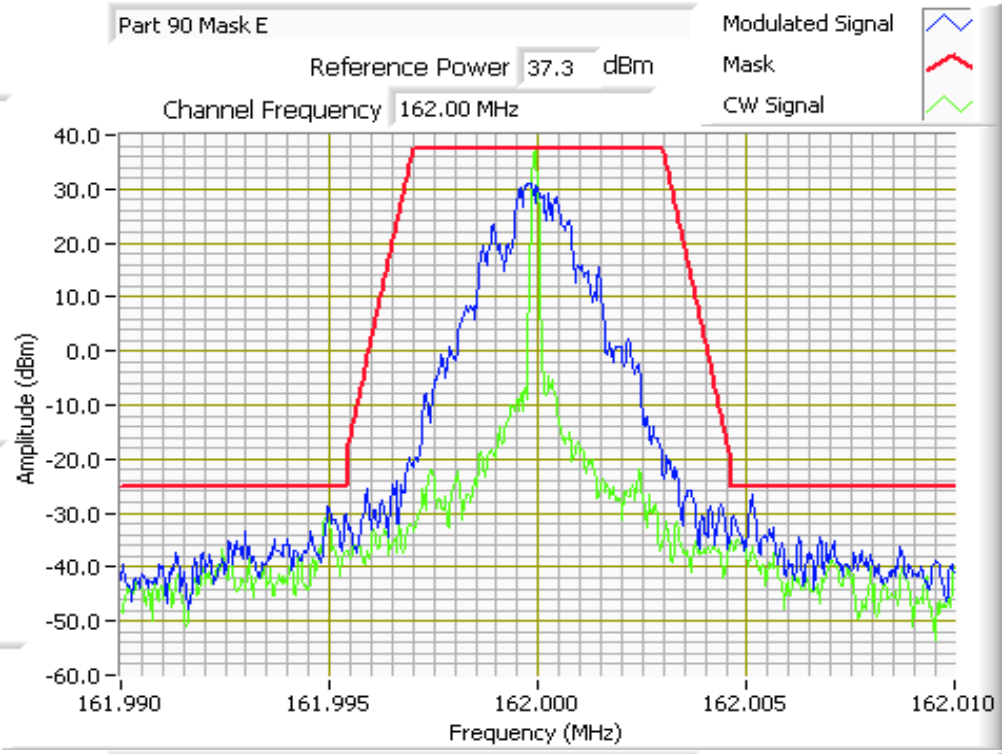
Analyzer Settings

Max Hold 2
CF: 162.00 MHz
SPAN:20 kHz
RB 100 Hz
VB 100 Hz
Detector POS
Att 30
RL Offset 0.00
Sweep Time 2.0s
Ref Lvl:20.00DBM

Notes

Analyzer HP8563E

PASS



Elliott

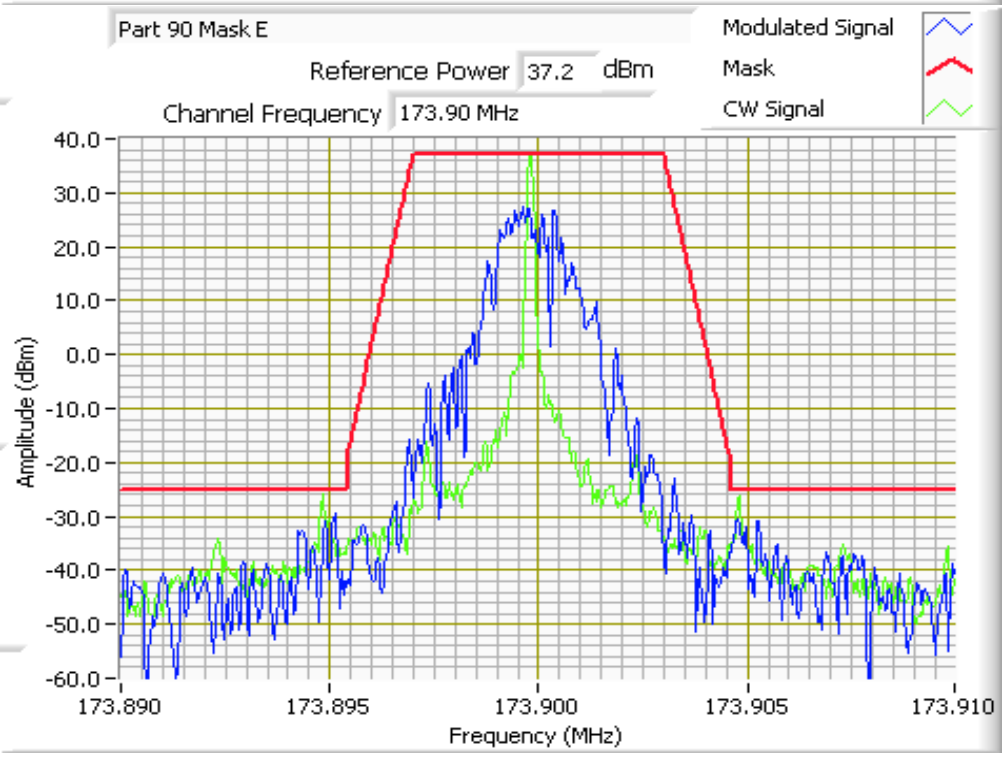
Analyzer Settings

VAVG 1
CF: 173.90 MHz
SPAN:20 kHz
RB 100 Hz
VB 100 Hz
Detector POS
Att 30
RL Offset 0.00
Sweep Time 2.0s
Ref Lvl:20.00DBM

Notes

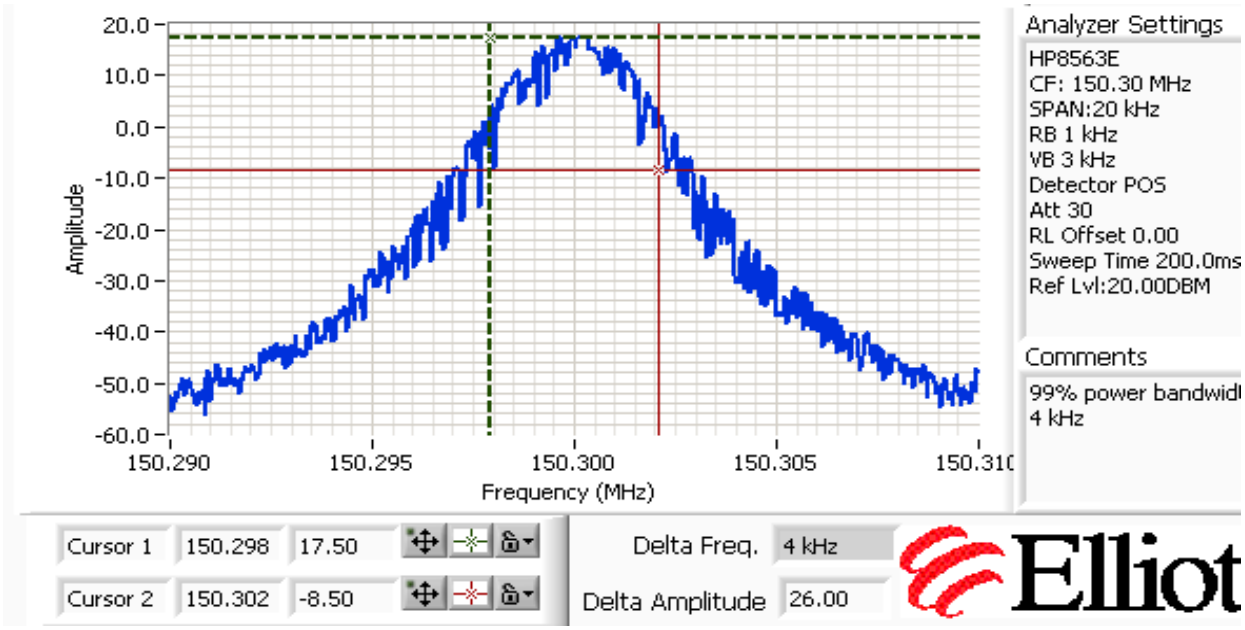
Analyzer HP8563E

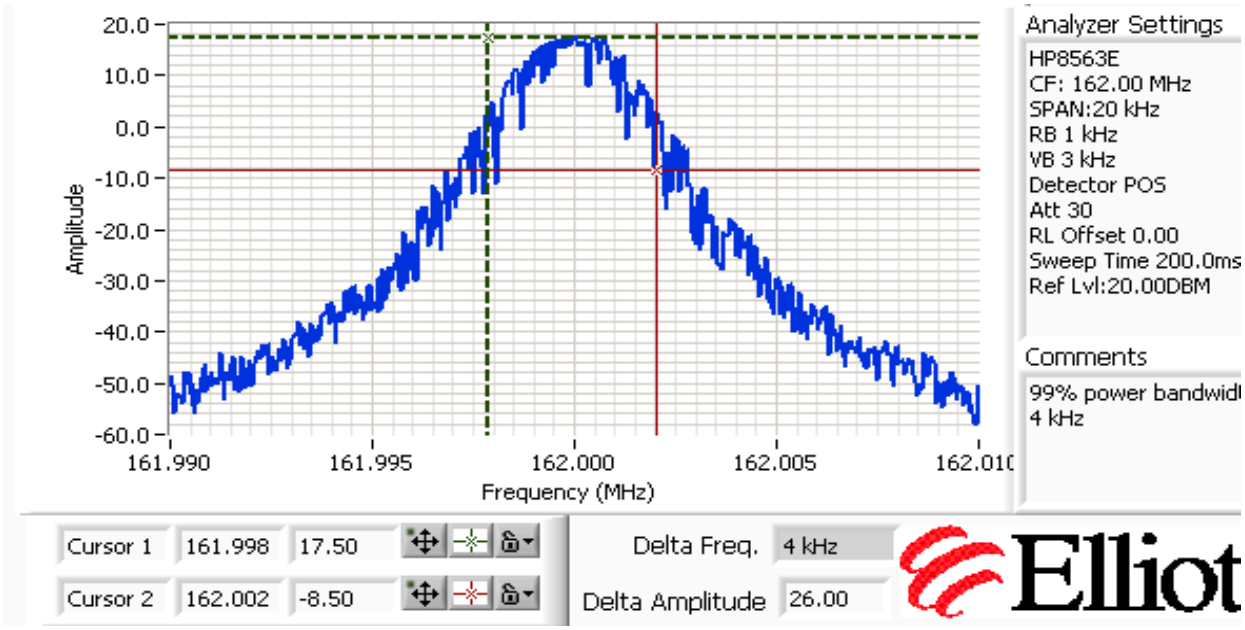
PASS



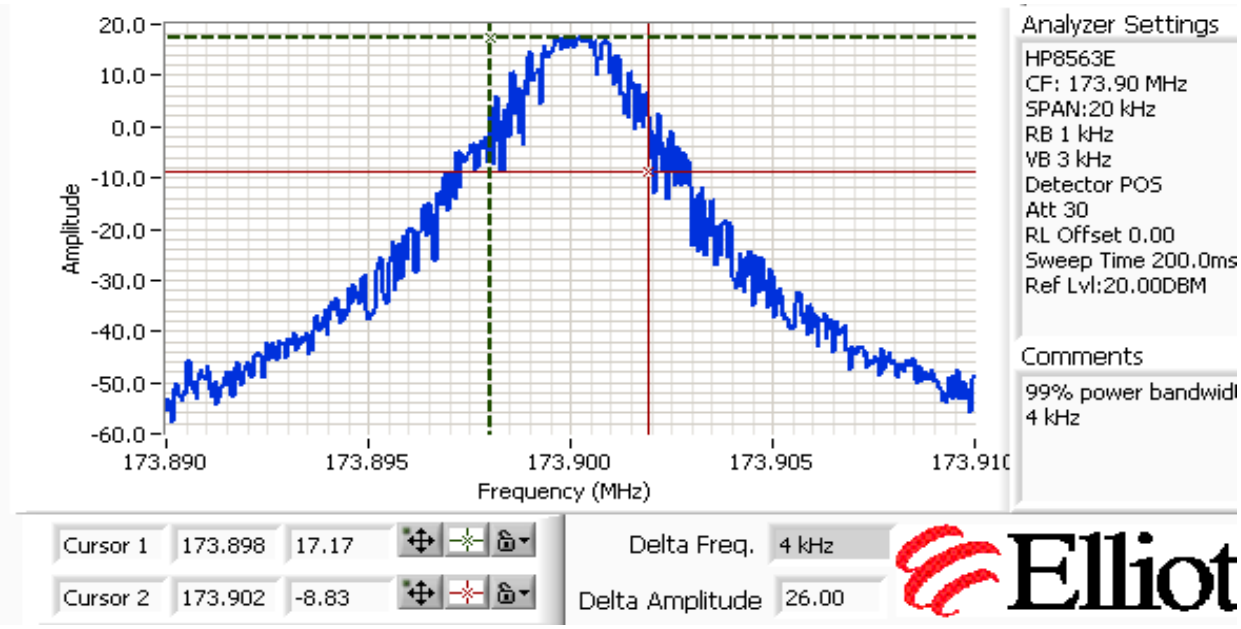
Client:	GE MDS	Job Number:	J69032
Model:	MDS1710D	T-Log Number:	J69220
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 90, RSS-119	Class:	N/A

Run #3: Bandwidth

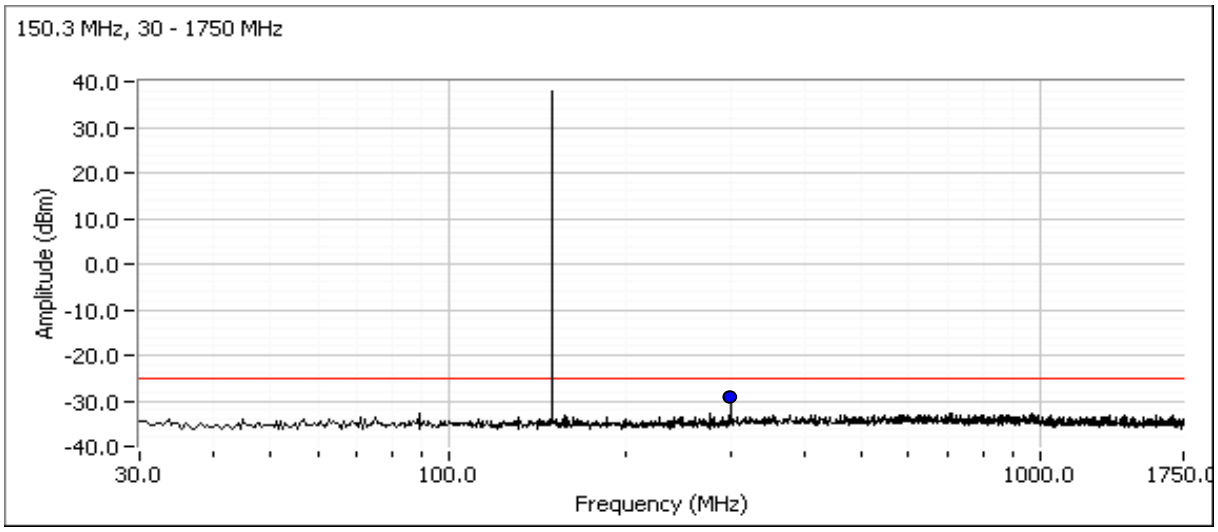




Client:	GE MDS	Job Number:	J69032
Model:	MDS1710D	T-Log Number:	J69220
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 90, RSS-119	Class:	N/A



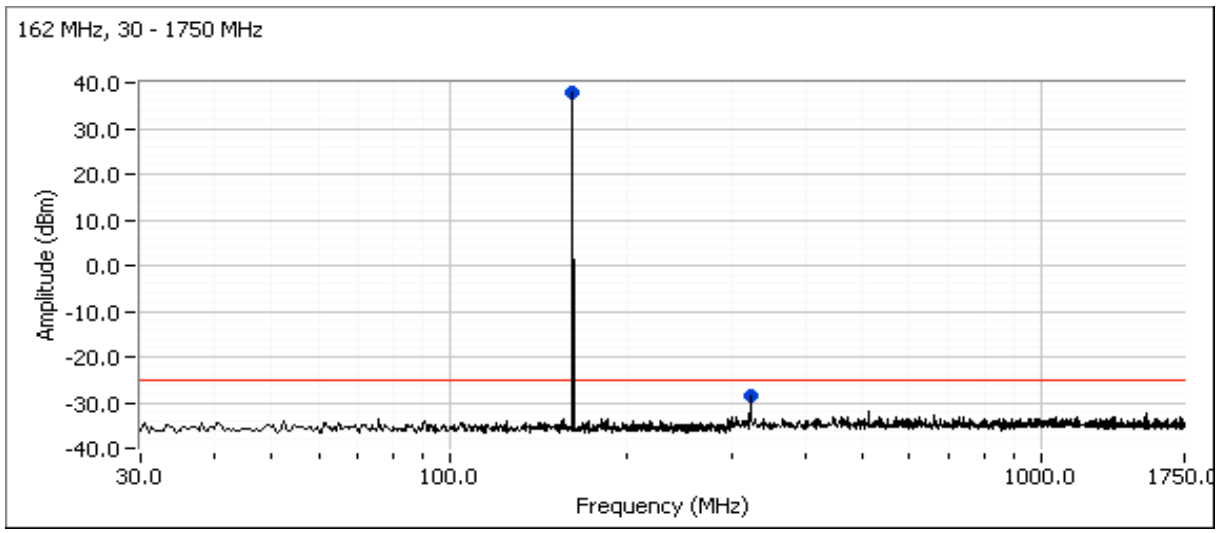
Run #4: Antenna Port Conducted Spurious Emissions 30 - 1750 MHz
Run #4a: 150.3 MHz



Frequency MHz	Level dBm	Port	FCC Part 90 Limit	FCC Part 90 Margin	Detector	Channel	Mode	Comments
300.605	-29.8	RF port	-25.0	-4.8	Peak	150.3 MHz	6.25 kHz	

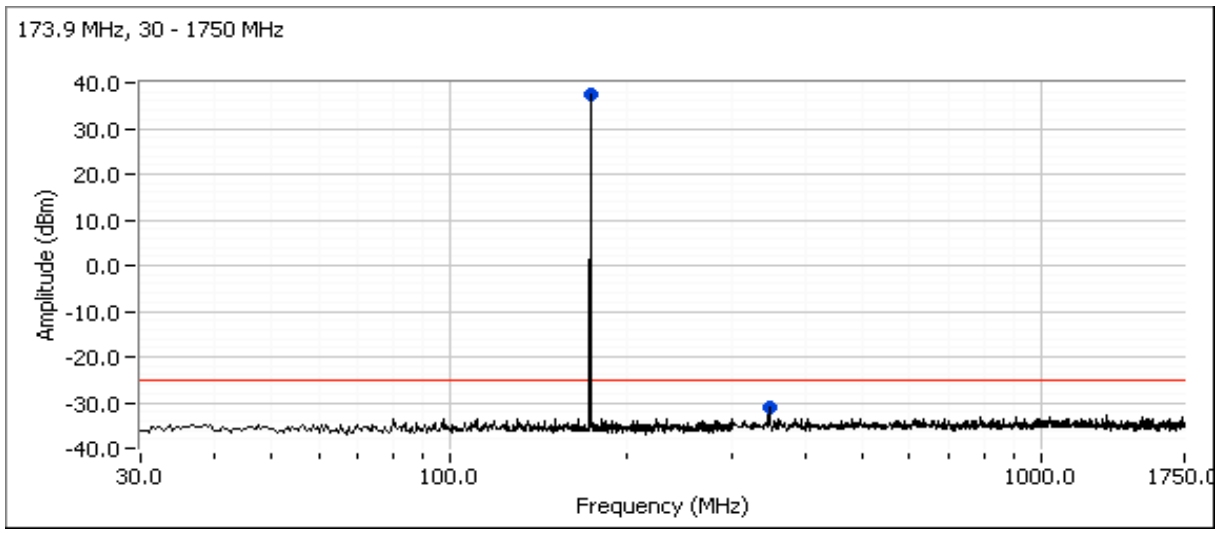
Client:	GE MDS	Job Number:	J69032
Model:	MDS1710D	T-Log Number:	J69220
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 90, RSS-119	Class:	N/A

Run #4b: 162 MHz



Frequency MHz	Level dBm	Port	FCC Part 90 Limit	FCC Part 90 Margin	Detector	Channel	Mode	Comments
324.031	-28.5	Rf Port	-25.0	-3.5	Peak	162 MHz	6.25kHz	

Run #4c: 173.9 MHz

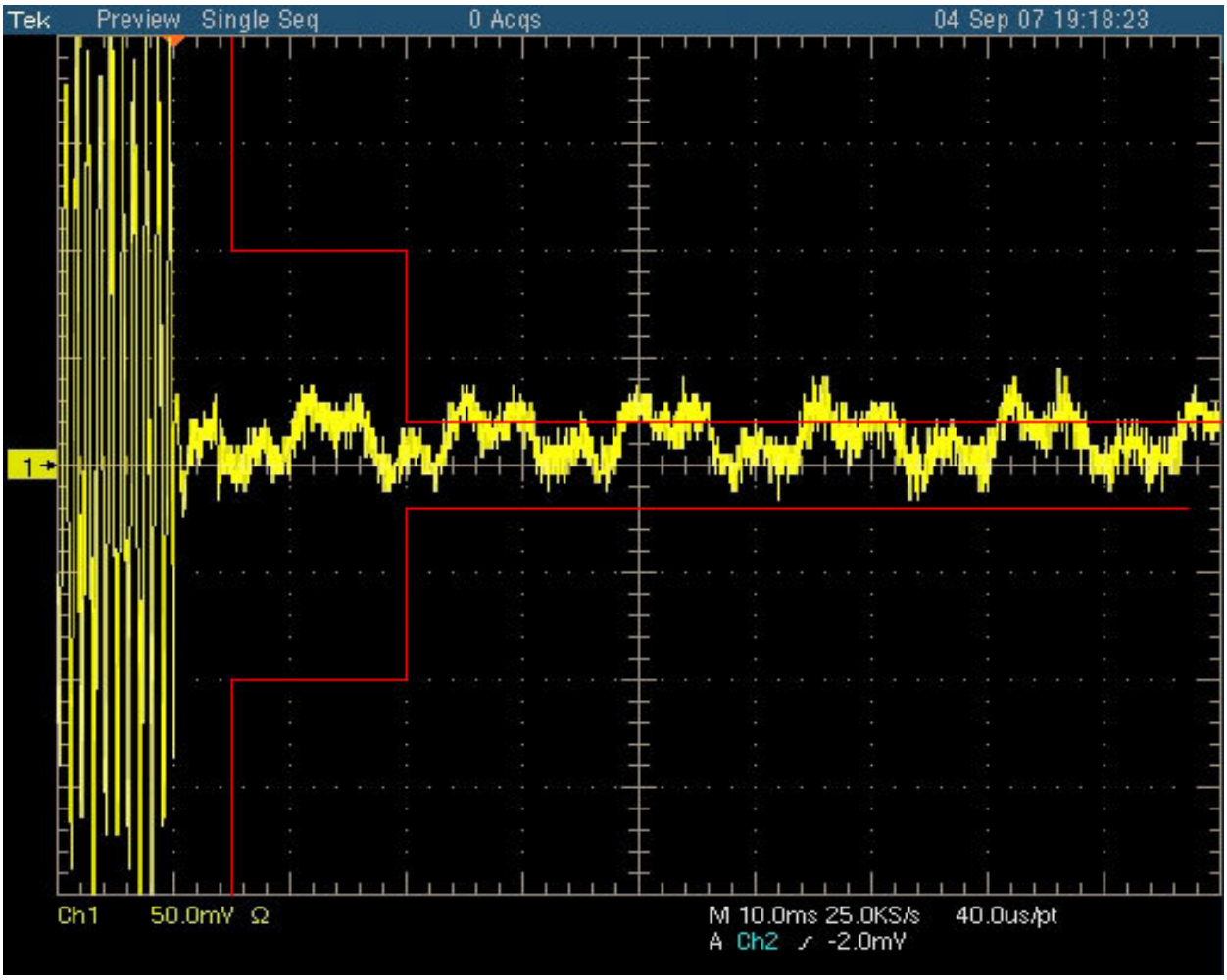


Frequency MHz	Level dBm	Port	FCC Part 90 Limit	FCC Part 90 Margin	Detector	Channel	Mode	Comments
347.878	-31.0	Rf Port	-25.0	-6.0	Peak	173.9 MHz	6.25kHz	

Client:	GE MDS	Job Number:	J69032
Model:	MDS1710D	T-Log Number:	J69220
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 90, RSS-119	Class:	N/A

Run #5: Transient Frequency Behavior

Carrier Frequency: 150.3 MHz
Channel Spacing: 6.25 kHz
Modulation: FM with 3200 bps data rate.
Description: Switch on condition ton, t1, and t2



Client:	GE MDS	Job Number:	J69032
Model:	MDS1710D	T-Log Number:	J69220
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Part 90, RSS-119	Class:	N/A

Run #5: Transient Frequency Behavior

Carrier Frequency: 150.3 MHz
Channel Spacing: 6.25 kHz
Modulation: FM with 3200 bps data rate.
Description: Switch off condition t3 and toff

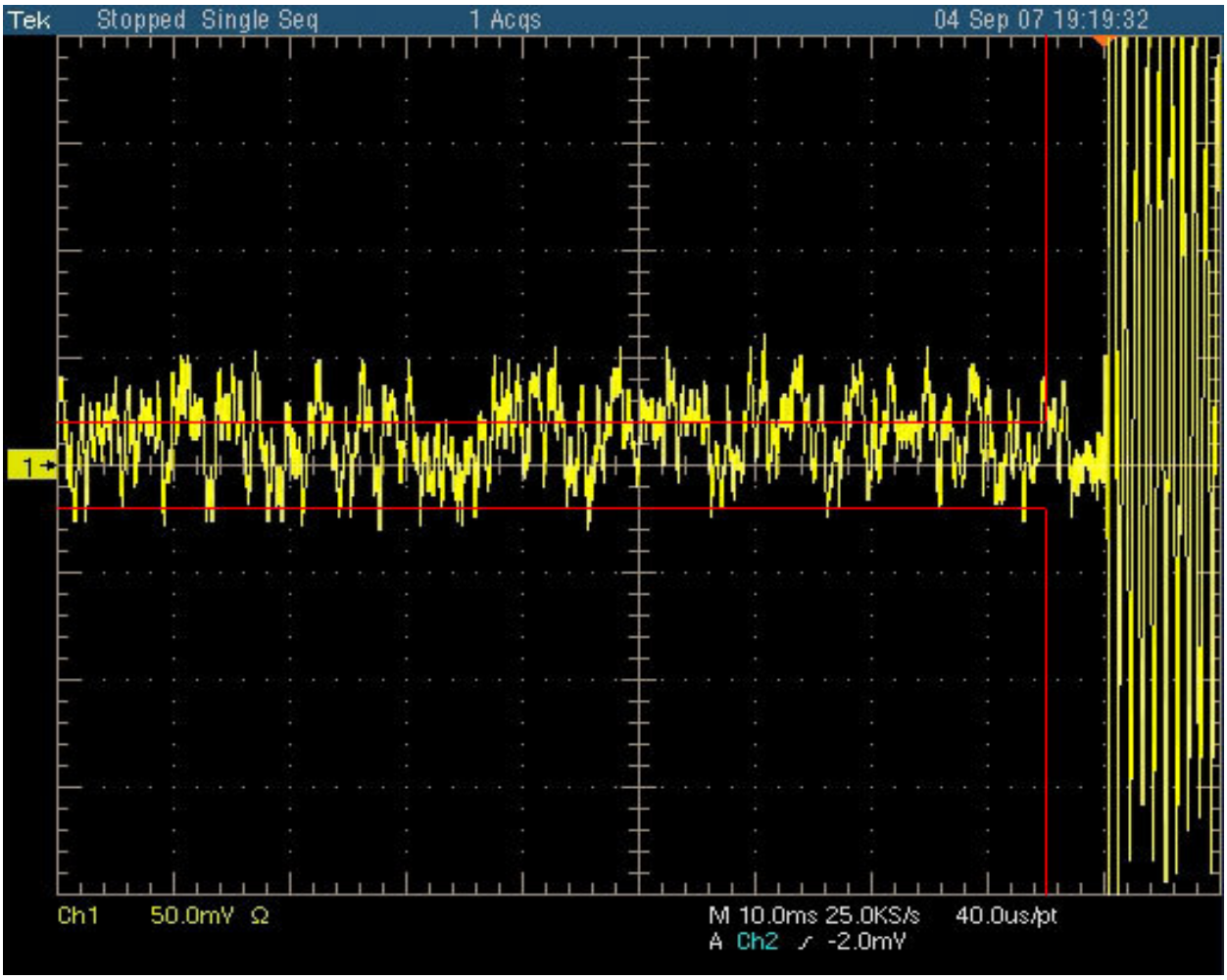


EXHIBIT 3: Test Configuration Photographs

EXHIBIT 4: Theory of Operation GE MDS LLC Model MDS1710D

EXHIBIT 5: Proposed FCC ID Label & Label Location

Unchanged from original application

EXHIBIT 6: Detailed Photographs GE MDS LLC Model MDS1710D

Unchanged from original application

EXHIBIT 7: Installation Guide GE MDS LLC Model MDS1710D

EXHIBIT 8: Block Diagram GE MDS LLC Model MDS1710D

EXHIBIT 9: Schematic Diagrams GE MDS LLC Model MDS1710D

EXHIBIT 10: RF Exposure