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Electromagnetic Emissions Test Report In Accordance With Industry Canada Radio Standards Specification 119 Issue 9, FCC Parts 80 and 90 on the GE MDS LLC Transmitter Models: MDS2710A/C data transceiver

FCC ID NUMBER:	E5MDS-2710AC
IC CERTIFICATION NUMBER:	3837A-2710AC
GRANTEE:	GE MDS LLC 175 Science Parkway Rochester, NY 14620
TEST SITE:	Elliott Laboratories 684 W. Maude Avenue Sunnyvale, CA 94086
REPORT DATE:	July 31, 2008
FINAL TEST DATES:	July 17 and July 21, 2008
AUTHORIZED SIGNATORY:	David W. Bare Chief Engineer

ACCREDITED

Testing Cert #2016-01

REVISION HISTORY

Revision #	Date	Comments	Modified By
	August 11, 2008	Initial Release	

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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-2710AC
UPN: 3837A-2710AC

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

Not submitted as no change from original submittal

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

FCC 90 & RSS-119**: Same as original submittal**

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

FCC 90 & RSS-119**: Same as original submittal**

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

FCC 90 & RSS-119**: Same as original submittal**

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

FCC 90 & RSS-119**:** 90.205(f)(g): **Same as original submittal**

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

Not submitted as no change from original submittal

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

Not submitted as no change from original submittal

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

Not submitted as no change from original submittal

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

Not submitted as no change from original submittal

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

Not submitted as no change from original submittal

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

Not submitted as no change from original submittal

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

Not submitted as no change from original submittal

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

Not submitted as no change from original submittal

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

Not submitted as no change from original submittal

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

90.203(J)(2)(ii)&(iii): 421–512 MHz bands, received on or after February 14, 1997, must include a certification that the equipment meets a spectrum efficiency standard of one voice channel per 12.5 kHz of channel bandwidth. Additionally, if the equipment is capable of transmitting data, has transmitter output power greater than 500 mW, and has a channel bandwidth of more than 6.25 kHz, the equipment must be capable of sup-porting a minimum data rate of 4800 bits per second per 6.25 kHz of channel bandwidth.

GSMK modulation is used with the following settings:

- BAUD=19.2Kbps, BT=.3, BW=25.0KHz
- BAUD=16.0kbps, BT=.3, BW=25.0KHz
- BAUD=9.6kbps, BT=.5, BW=25.0KHz
- BAUD=9.6kbps, BT=.3, BW=12.5KHz
- BAUD=8.0kbps, BT=.5, BW=25.0KHz
- BAUD=8.0kbps, BT=.3, BW=12.5KHz
- BAUD=4.8kbps, BT=.5, BW=25.0KHz
- BAUD=4.8kbps, BT=.5, BW=12.5KHz

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

Bill of Materials

Uploaded as a separate file.

DECLARATIONS OF COMPLIANCE

Equipment Name and Model:
MDS2710A/C data transceiver

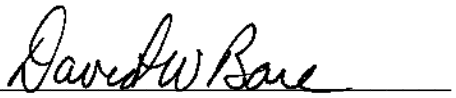
Manufacturer:
GE MDS LLC
175 Science Parkway
Rochester, NY 14620

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: IC2845 SV2 Dated August 16, 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 Engineer
Elliott Laboratories
Address 684 W. Maude Ave
Sunnyvale, CA 94086
USA

Date: July 31, 2008

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 Parts 80 and 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 Parts 80 and 90 & IC RSS-119. Certification of these devices is required as a prerequisite to marketing as defined in Section 2.1033 & RSP-100. In this case, a permissive change and/or reassessment are being sought to a previously certified product due to changes in the product design.

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 Parts 2, 80 & 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/	5.7	Modulated with appropriated signal	-	H	-
Conducted RF power output	2.1046 / 90.279 & 90.205(g) 80.215	6.2	Conducted Output Power Test	33.8dBm (2.4 Watts)	B	Complies
Spurious emissions at antenna Port	2.1051/ 90.210(d)	6.3 & 6.4(d)	Emission Limits and/or Unwanted Emission 30MHz – 5GHz (Antenna Conducted)	-	J	N/A
Occupied Bandwidth	2.1049/ 90.210(c) & (d)	6.4(c) & 6.4(d)	Emission Mask and 99% Bandwidth	-	C & D	N/A
Field strength of spurious radiation	2.1053 / 80.211(f) 90.210(d)	6.3 & 6.4(d)	Radiated Spurious Emissions 30MHz – 5GHz	55.2dBµV/m @ 1098.6MHz (-20.1dB)	N	Complies
Frequency stability	2.1055 / 90.213	7	Frequency Vs. Temperature	-	K	N/A
Frequency stability	2.1055 / 90.213	7	Frequency Vs. Voltage	-	L & M	N/A
Transient Frequency Behavior	90.214	6.5	Transient Behavior	-	I	N/A
Exposure to Mobile devices	2.1091	9	Exposure of Humans to RF Fields	-	-	N/A
Receiver	15.109	8	Receiver Spurious Emissions	-	N/A	N/A

Due to the nature of the changes made to the EUT, only the above-recorded tests were deemed necessary. Refer to the EUT description in this report.

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 were calculated using the approach described in CISPR 16-4-2:2003 using a coverage factor of k=2, which gives a level of confidence of approximately 95%. The levels were found to be below levels of *U*cispr and therefore no adjustment of the data for measurement uncertainty is required.

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 models MDS2710A/C are narrowband wireless transceivers that are designed to transmit and receive data in the 216 to 220 MHz band. Normally, the EUT would be placed on a tabletop or in a rack 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 13.8vdc, 6 Amps.

The sample was received on July 17, 2008 and tested on July 17 and July 21, 2008. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number	FCC ID
GE MDS	MDS2710A/C	DSP Data Transciever	N/A	E5M-DS2710AC

OTHER EUT DETAILS

The EUT can be used with any antenna and feed line depending on the installation site conditions.

ENCLOSURE

The EUT enclosure is primarily constructed of steel sheet metal. It measures approximately 14.0cm wide by 17.0cm deep by 5.0cm high.

MODIFICATIONS

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

PERMISSIVE CHANGE ITEMS

The MDS2710A and MDS2710C radio power amplifier integrated circuit has been changed due to obsolescence of the previous part.

SUPPORT EQUIPMENT

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

Manufacturer	Model	Description	Serial Number	FCC ID
Microwave Data System	TT1EAR2-2	Handhold controller	HH171101	DoC
Microwave	44003	50 ohm termination	7943	-

No remote support equipment was used during emissions testing.

EUT INTERFACE PORTS

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

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Antenna	50 ohms Termination	-	-	-
DIAG	Controller	Cat 3	Unshielded	0.5
Data Interface	Loop back	DB25	Shielded	2.0
DC Power	13.8V DC Source	2 wire	Unshielded	2.0

EUT OPERATION DURING TESTING

During emissions testing the EUT was set to transmit mode either unmodulated or modulated as required for testing.

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TEST SITE

GENERAL INFORMATION

Final test measurements were taken on July 17 and July 21, 2008 at the Elliott Laboratories Open Area Test Site #2 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 12.5 kHz channel Section 90.210 (d)(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 (d)(1): 5.625 kHz: 0 dB

90.210(d)(2): 5.625 kHz: 20 dB
12.5 kHz: 70 dB

90.210(d)(3): more than 12.5 kHz: -20 dBm (50+10*log(P))

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

4) Since EUT is designed with a 25 kHz channel Section 90.210 (c)(1)(2)(3) was used to show compliance to the emission mask.

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

90.210 (c)(1): 5 kHz but no more then 10kHz: 83*log(F_d / 5) dB

90.210(c)(2): 10kHz but no more then 250%: At least 29 log (fd 2/11) dB or 50 dB, whichever is the lesser attenuation

90.210(c)(3): more than 250%: -13 dBm (43+10*log(P))

The following Resolution and Video bandwidth was used to show compliance for the above requirement: 300 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 –20-dBm.
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 –20dBm 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

Radiated Emissions, 30 - 2,500 MHz, 17-Jul-08
Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
EMCO	Log Periodic Antenna, 0.2-1 GHz	3146	1294	28-Aug-08
Rohde & Schwarz	Test Receiver, 0.009-2750 MHz	ESN	1332	29-Jan-09

Radiated Emissions, 1000 - 2200 MHz, 21-Jul-08
Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	870	08-Nov-08
Filtek	Filter, 1 GHz High Pass	HP12/1000-5BA	955	17-Jul-09
EMCO	Antenna, Horn, 1-18 GHz	3115	1242	N/A
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40)	8564E	CH5273	20-Sep-08
Rohde & Schwarz	Power Meter, Dual Channel	NRVD	1786	07-Jan-09
Rohde & Schwarz	Power Sensor, 1 nW-20 mW, 10 MHz-18 GHz, 50ohms	NRV-Z1	1798	21-Aug-08
Compliance Design	Tuned Dipole Antenna	Roberts (400-1000MHz)	1896	06-Dec-09

EXHIBIT 2: Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T72343 6 Pages

Client:	GE MDS LLC	Job Number:	J72298
Model:	MDS2710A	T-Log Number:	T72343
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		-
Emissions Standard(s):	RSS 119, FCC Part 90 and 15	Class:	A
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

GE MDS LLC

Model

MDS2710A

Date of Last Test: 7/17/2008

Client:	GE MDS LLC	Job Number:	J72298
Model:	MDS2710A	T-Log Number:	T72343
		Account Manger:	Susan Pelzl
Contact:	Dennis McCarthy		
Emissions Standard(s):	RSS 119, FCC Part 90 and 15	Class:	A
Immunity Standard(s):	-	Environment:	-

EUT INFORMATION

General Description

The EUT is a narrowband wireless transceiver which is designed to transmit and receive data in the 216 to 220 MHz band. Normally, the EUT would be placed on a tabletop or in a rack 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 13.8vdc, 6 Amps.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
GEMDS	MDS2710A/C	DSP Data Transciever	N/A	N/A

Other EUT Details

None

EUT Antenna (Intentional Radiators Only)

The EUT can be used with any antenna and feed line depending on the installation site conditions.

EUT Enclosure

The EUT enclosure is primarily constructed of steel sheet metal. It measures approximately 14.0cm wide by 17.0cm deep by 5.0cm high.

Client:	GE MDS LLC	Job Number:	J72298
Model:	MDS2710A	T-Log Number:	T72343
		Account Manger:	Susan Pelzl
Contact:	Dennis McCarthy		
Emissions Standard(s):	RSS 119, FCC Part 90 and 15	Class:	A
Immunity Standard(s):	-	Environment:	-

Test Configuration #1

FCC Part 90

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Microwave Data System	TT1EAR2-2	Handhold controller	HH171101	DoC
Microwave	44003	50 ohm termination	7943	-

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)
Antenna	50 ohms Termination	-	-	-
DIAG	Controller	Cat 3	Unshielded	0.5
Data Interface	Loop back	DB25	Shielded	2.0
DC Power	13.8V DC Source	2 wire	Unshielded	2.0

EUT Operation During Emissions Tests

During emissions testing the EUT was set to transmit mode either unmodulated or modulated as required for testing.

Client:	GE MDS LLC	Job Number:	J72298
Model:	MDS2710A	T-Log Number:	T72343
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	RSS 119, FCC Part 90 and 15	Class:	A

Radiated 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.

Date of Test: 7/17 & 7/21/2008
Test Engineer: Mehran Birgani
Test Location: SV OATS #2

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

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated emissions testing.

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:

	7/17/08	7/21/08	
Temperature:	21	19	°C
Rel. Humidity:	41	61	%

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	Power Measurment	FCC	-	33.8 dBm (2.4W)
2	RE, 30 - 1000MHz Maximized Emissions	FCC	Pass	-42.2dBm @ 434.000MHz (-22.2dB)
3	RE, 1000 - 2200MHz Maximized Emissions	FCC	Pass	55.2dBµV/m @ 1098.6MHz (-20.1dB)

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.

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
30 - 2200 MHz	3	3	0.0

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Run #1: Power Measurements

Freq.	Setting	Pmeas	Duty Cycle	Pout
216	33	33.2	1	33.2
217	33	33.4	1	33.4
220	33	33.8	1	33.8

Setting: software power setting of EUT
Pmeas: Measured output power (average)
Duty Cycle: Duty cycleof transmissions (1 = 100%)

Run #2: Maximized Readings, 30-1000 MHz

Run #2a: Maximized Readings, 30-1000 MHz (216 MHz)

Frequency	Level	Pol	FCC		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
864.000	54.6	V	75.3	-20.7	PK	194	1.0	PK (0.10s)
648.000	53.9	H	75.3	-21.4	PK	47	1.0	PK (0.10s)
432.000	53.7	H	75.3	-21.6	PK	320	1.0	PK (0.10s)
648.000	52.4	V	75.3	-22.9	PK	258	1.0	PK (0.10s)
864.000	51.4	H	75.3	-23.9	PK	219	1.0	PK (0.10s)
432.000	46.2	V	75.3	-29.1	PK	334	1.3	PK (0.10s)

Run #2b: Maximized Readings, 30-1000 MHz (217 MHz)

Frequency	Level	Pol	FCC		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
434.000	56.3	H	75.3	-19.0	PK	322	1.0	PK (0.10s)
651.000	54.6	V	75.3	-20.7	PK	304	1.5	PK (0.10s)
651.000	52.7	H	75.3	-22.6	PK	92	1.0	PK (0.10s)
868.000	47.1	H	75.3	-28.2	PK	223	1.0	PK (0.10s)
434.000	47.0	V	75.3	-28.3	PK	335	1.0	PK (0.10s)
868.000	45.4	V	75.3	-29.9	PK	298	1.0	PK (0.10s)

Run #2c: Maximized Readings, 30-1000 MHz (220 MHz)

Frequency	Level	Pol	FCC		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
440.000	56.3	H	75.3	-19.0	PK	324	1.0	PK (0.10s)
660.000	53.4	V	75.3	-21.9	PK	309	1.0	PK (0.10s)
660.000	52.2	H	75.3	-23.1	PK	56	1.0	PK (0.10s)
880.000	47.1	H	75.3	-28.2	PK	229	1.0	PK (0.10s)
440.000	46.5	V	75.3	-28.8	PK	101	1.2	PK (0.10s)
880.000	43.9	V	75.3	-31.4	PK	325	1.0	PK (0.10s)

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Run #3: Maximized readings, 1000 - 2200 MHz

Run #3a: Maximized Readings, 1000-2200 MHz (216 MHz)

Frequency	Level	Pol	FCC		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
1080.375	53.6	H	75.3	-21.7	PK	58	1.4	RB 1 MHz; VB: 1 MHz
2160.250	44.6	V	75.3	-30.7	PK	264	1.0	RB 1 MHz; VB: 1 MHz
2160.020	43.6	H	75.3	-31.7	PK	99	1.5	RB 1 MHz; VB: 1 MHz
1079.835	43.4	V	75.3	-31.9	PK	283	1.0	RB 1 MHz; VB: 1 MHz
1512.050	39.4	V	75.3	-35.9	PK	88	1.1	RB 1 MHz; VB: 1 MHz
1511.940	38.1	H	75.3	-37.2	PK	98	1.0	RB 1 MHz; VB: 1 MHz

Run #3b: Maximized Readings, 1000-2200 MHz (217 MHz)

Frequency	Level	Pol	FCC		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2169.970	46.3	V	75.3	-29.0	PK	85	1.0	RB 1 MHz; VB: 1 MHz
2169.890	45.1	H	75.3	-30.2	PK	261	1.5	RB 1 MHz; VB: 1 MHz
1084.980	44.3	V	75.3	-31.0	PK	101	1.0	RB 1 MHz; VB: 1 MHz
1085.100	43.3	H	75.3	-32.0	PK	79	1.0	RB 1 MHz; VB: 1 MHz
1518.800	40.6	V	75.3	-34.7	PK	80	1.0	RB 1 MHz; VB: 1 MHz
1302.060	35.7	V	75.3	-39.6	PK	180	1.0	RB 1 MHz; VB: 1 MHz

Run #3c: Maximized Readings, 1000-2200 MHz (220 MHz)

Frequency	Level	Pol	FCC		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
1098.600	55.2	V	75.3	-20.1	PK	294	1.0	RB 1 MHz; VB: 1 MHz
1099.950	52.6	H	75.3	-22.7	PK	273	1.0	RB 1 MHz; VB: 1 MHz
2200.000	44.5	V	75.3	-30.8	PK	276	1.0	RB 1 MHz; VB: 1 MHz
2200.200	43.3	H	75.3	-32.0	PK	289	1.3	RB 1 MHz; VB: 1 MHz
1320.000	38.5	V	75.3	-36.8	PK	206	1.0	RB 1 MHz; VB: 1 MHz

Substitution measurements for emissions within 20dB of the calculated field strength limit
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
434.000	-0.3	2.2	98.2	96.3	56.3	-40.0	-42.2		-20.0	-22.2
440.000	-0.3	2.2	98.4	96.5	56.3	-40.2	-42.4		-20.0	-22.4

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.

EXHIBIT 3: Test Configuration Photographs

Uploaded as A Separate Attachment