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Electromagnetic Emissions Test Report and Application for Grant of Equipment Authorization Class II Permissive Change pursuant to

Industry Canada RSS-Gen Issue 2 / RSS 210 Issue 7 FCC Part 15 Subpart C

on the
GE MDS LLC
Transmitter
Model: MDS 9810

UPN:	3738A-MDS9810
FCC ID:	E5MDS-9810
GRANTEE:	GE MDS LLC 175 Science Parkway Rochester, NY 14620
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Ave Sunnyvale, CA 94086
REPORT DATE:	October 2, 2007
FINAL TEST DATE:	September 17, 2007
AUTHORIZED SIGNATORY:	Mark E. Hill Staff Engineer

ACCREDITED
2016-01

REVISION HISTORY

Revision #	Date	Comments	Modified By
1	October 5, 2007	Initial Release	David Guidotti

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SCOPE

An electromagnetic emissions test has been performed on the GE MDS LLC model MDS 9810 pursuant to the following rules:

Industry Canada RSS-Gen Issue 2
RSS 210 Issue 7 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
FCC Part 15 Subpart C

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 Elliott Laboratories test procedures:

ANSI C63.4:2003

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant Industry Canada 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.

The test results recorded herein are based on a single type test of the GE MDS LLC model MDS 9810 and therefore apply only to the tested sample. The sample was selected and prepared by Dennis McCarthy of GE MDS LLC

OBJECTIVE

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section.

Prior to marketing in the USA, all unlicensed transmitters and transceivers require certification. Receive-only devices operating between 30 MHz and 960 MHz are subject to either certification or a manufacturer's declaration of conformity, with all other receive-only devices exempt from the technical requirements.

Prior to marketing in Canada, Class I transmitters, receivers and transceivers require certification. Class II devices are required to meet the appropriate technical requirements but are exempt from certification requirements.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body's review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

STATEMENT OF COMPLIANCE

The tested sample of GE MDS LLC model MDS 9810 complied with the requirements of the following regulations:

Industry Canada RSS-Gen Issue 2
RSS 210 Issue 7 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
FCC Part 15 Subpart C

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.).

TEST RESULTS SUMMARY

FREQUENCY HOPPING SPREAD SPECTRUM (902 – 928 MHz, 49 channels or less)

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.247 (a) (1)	RSS 210 A8.1 (1)	20dB Bandwidth	-	-	N/A – Note 1
15.247 (a) (1)	RSS 210 A8.1 (2)	Channel Separation	-		N/A – Note 1
15.247 (a) (1) (i)	RSS 210 A8.1 (3)	Number of Channels	-	-	N/A – Note 1
15.247 (a) (1) (i)	RSS 210 A8.1 (3)	Channel Dwell Time (*average time of occupancy)*	-	-	N/A – Note 1
15.247 (a) (1)	RSS 210 A8.1 (1)	Channel Utilization	-	-	N/A – Note 1
15.247 (b) (3)	RSS 210 A8.4 (1)	Output Power	Power level was verified to ensure output was equivalent to granted levels	-	N/A – Note 1
15.247(c)	RSS 210 A8.5	Antenna Port Spurious Emissions 30MHz – 9.28 GHz	-	-	N/A – Note 1
15.247(c) / 15.209	RSS 210 A8.5 Table 2, 3	Radiated Spurious Emissions 30MHz – 9.28 GHz	39.9dBµV/m (98.9µV/m) @ 960.000MHz (-6.1dB)	15.207 in restricted bands, all others < -20dBc	Complies
	RSS 210 A8.1(2)	Receiver bandwidth	-	-	N/A – Note 1

Note 1: Test/Evaluation not performed. Not applicable to a permissive change for a new antenna.

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

FCC Rule Part	RSS Rule part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203	-	RF Connector	EUT is professionally installed		Complies
15.109	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	38.2dBµV/m (81.3µV/m) @ 55.294MHz (-1.8dB)		Complies
15.207	RSS GEN Table 2	AC Conducted Emissions	-	-	N/A – Note 1
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	Refer to MPE calculations in Exhibit 11, RSS 102 declaration and User Manual statements.	Refer to OET 65, FCC Part 1 and RSS 102	Complies
	RSP 100 RSS GEN 7.1.5	User Manual		Statement required regarding non-interference	Complies
	RSP 100 RSS GEN 7.1.5	User Manual		Statement required regarding detachable antenna	Complies

Note 1: Test/Evaluation not performed. Not applicable to a permissive change for a new antenna.

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 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	0.015 to 30	± 3.0
Radiated Emissions	30 to 1000	± 3.6
Radiated Emissions	1000 to 40000	± 6.0

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The GE MDS LLC model MDS 9810 is a 902-928 MHz FHSS radio that is designed to provide a radio communications link. 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 6-30 Volts DC.

The sample was received on September 17, 2007 and tested on September 17, 2007. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number	FCC ID
GE MDS	MDS 9810	Half Duplex wireless data Transciever 900MHz		E5MDS-9810

OTHER EUT DETAILS

The EUT requires professional installation and therefore is exempt from the requirement of 15.203. The output power is configured for each antenna to ensure the EIRP does not exceed 4 Watts, and the output power at the rf connector cannot exceed the maximum value reported in this test data. Radiated emissions were measured with the output power set to maximum and with the EUT antennas connected via a short length of cable, with negligible loss at the fundamental frequency.

ANTENNA SYSTEM

The EUT antenna is Katherein, model OGB9-915, Omnidirectional antenna, 9 dBd (11.2 dBi).

ENCLOSURE

The EUT enclosure is primarily constructed of Die cast casting . Dimensions: 5.0 H x 14.3 W x 18.41 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 emissions specifications.

SUPPORT EQUIPMENT

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

Manufacturer	Model	Description	Serial Number	FCC ID
GE MDS	-	Hand Controller	-	-
TopWard	3603D	DC Power Supply	-	-

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)
Serial	Hand controller	4 wire	Unshielded	1.0
DC Power	DC Power Supply	2 wire	Unshielded	2.0
RF Port	Antenna	Coax	Shielded	1.0
Serial - DB25	Not Connected			

EUT OPERATION

The EUT was configured to continuously transmit on the desired frequency. The output power level was also adjusted, as needed.

PROPOSED MODIFICATION DETAILS

GENERAL

This section details the modifications to the GE MDS LLC model MDS 9810 being proposed. All performance and construction deviations from the characteristics originally reported to the FCC are addressed

The only change to the system is the addition of a new antenna. Katherein, model OGB9-915, Omnidirectional antenna, 9 dBd (11.2 dBi).

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on September 17, 2007 at the Elliott Laboratories semi anechoic chamber #Chamber 3 located at 41039 Boyce Road, Fremont, California Pursuant to section 2.948 of the FCC's Rules and section 3.3 of RSP-100, construction, calibration, and equipment data has been filed with the Commission.

ANSI C63.4:2003 recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement with the exception of predictable local TV, radio, and mobile communications traffic. The test site contains separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements of ANSI C63.4:2003.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.4:2003. Measurements are made with the EUT connected to the public power network through a nominal, standardized RF impedance, which is provided by a line impedance stabilization network, known as a LISN. A LISN is inserted in series with each current-carrying conductor in the EUT power cord.

RADIATED EMISSIONS CONSIDERATIONS

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment or in a semi-anechoic chamber. The test sites are maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4:2003 guidelines and meet the Normalized Site Attenuation (NSA) requirements of ANSI C63.4:2003.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1 is used for emissions measurements. The receivers used can measure 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 CISPR detector used during measurements. If the repetition frequency of the signal being measured is below 20Hz, peak measurements are made in lieu of Quasi-Peak 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. Average measurements above 1000MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz, unless the signal is pulsed in which case the average (or video) bandwidth of the measuring instrument is reduced to onset of pulse desensitization and then increased.

INSTRUMENT CONTROL COMPUTER

The receivers utilize either a Rohde & Schwarz EZM Spectrum Monitor/Controller or contain an internal Spectrum Monitor/Controller to view and convert the receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurements made with the receivers.

The Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer run automated data collection programs which control the receivers. This provides added accuracy since all site correction factors, such as cable loss and antenna factors are added automatically.

LINE IMPEDANCE STABILIZATION NETWORK (LISN)

Line conducted measurements utilize a fifty microhenry Line Impedance Stabilization Network as the monitoring point. The LISN used also contains a 250 uH CISPR adapter. This network provides for calibrated radio frequency noise measurements by the design of the internal low pass and high pass filters on the EUT and measurement ports, respectively.

FILTERS/ATTENUATORS

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

ANTENNAS

A loop antenna is used below 30 MHz. For the measurement range 30 MHz to 1000 MHz either a combination of a biconical antenna and a log periodic or a bi-log antenna is used. Above 1000 MHz, horn antennas are used. The antenna calibration factors to convert the received voltage to an electric field strength are included with appropriate cable loss and amplifier gain factors to determine an overall site factor, which is then programmed into the test receivers or incorporated into the test software.

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. Measurements below 30 MHz are made with the loop antenna at a fixed height of 1m above the ground plane.

ANSI C63.4:2003 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 exhibit of this report contains the list of test equipment used and calibration information.

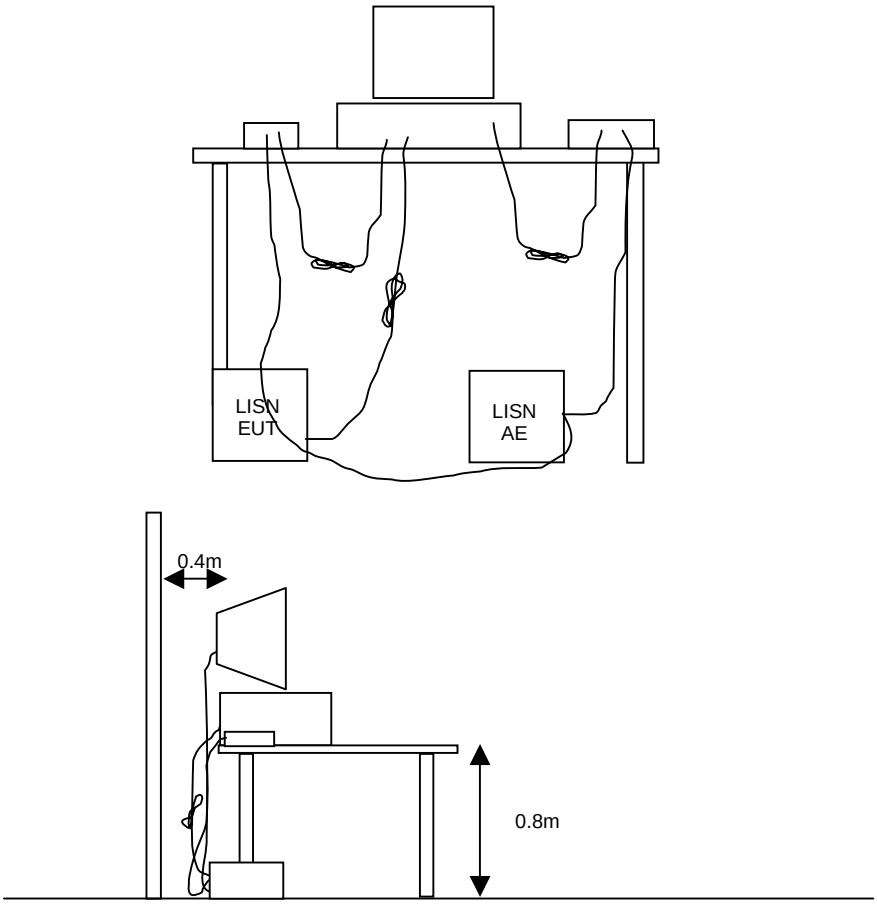
TEST PROCEDURES

EUT AND CABLE PLACEMENT

The regulations require that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of ANSI C63.4:2003, and the worst-case orientation is used for final measurements.

CONDUCTED EMISSIONS

Conducted emissions are measured at the plug end of the power cord supplied with the EUT. Excess power cord length is wrapped in a bundle between 30 and 40 centimeters in length near the center of the cord. Preliminary measurements are made to determine the highest amplitude emission relative to the specification limit for all the modes of operation. Placement of system components and varying of cable positions are performed in each mode. A final peak mode scan is then performed in the position and mode for which the highest emission was noted on all current carrying conductors of the power cord.

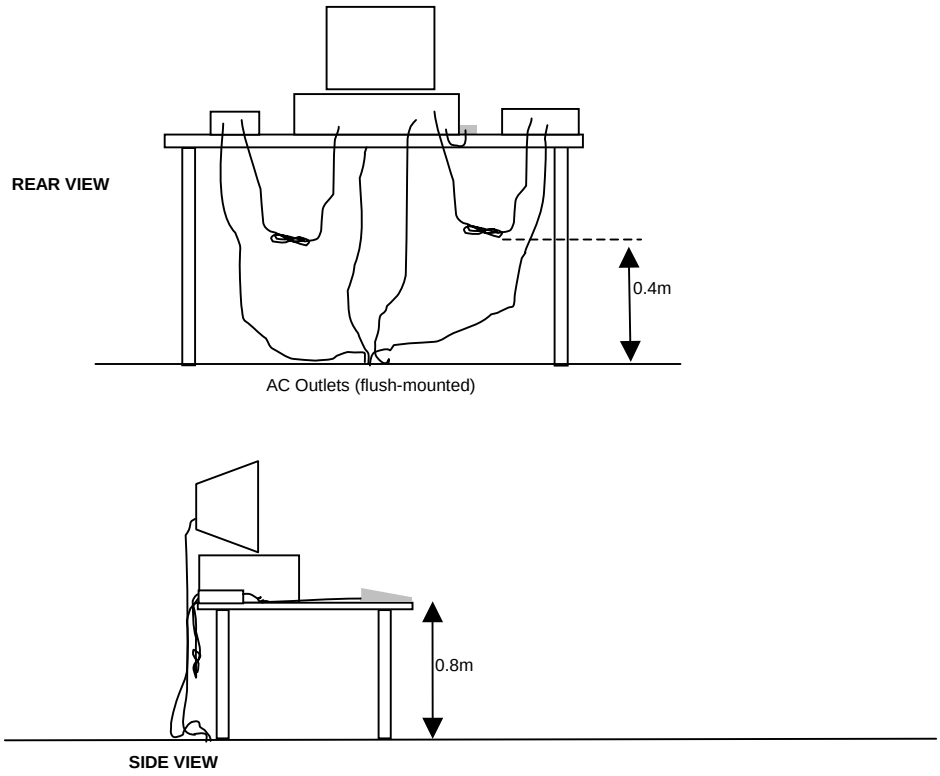


A preliminary scan of the radiated emissions is performed in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed, one scan for each antenna polarization (horizontal and vertical; loop parallel and perpendicular to the EUT). During the preliminary scans, the EUT is rotated through 360˚, the antenna height is varied (for measurements above 30 MHz) and cable positions are varied to determine the highest emission relative to the limit. Preliminary scans may be performed in a fully anechoic chamber for the purposes of identifying the frequencies of the highest emissions from the EUT.

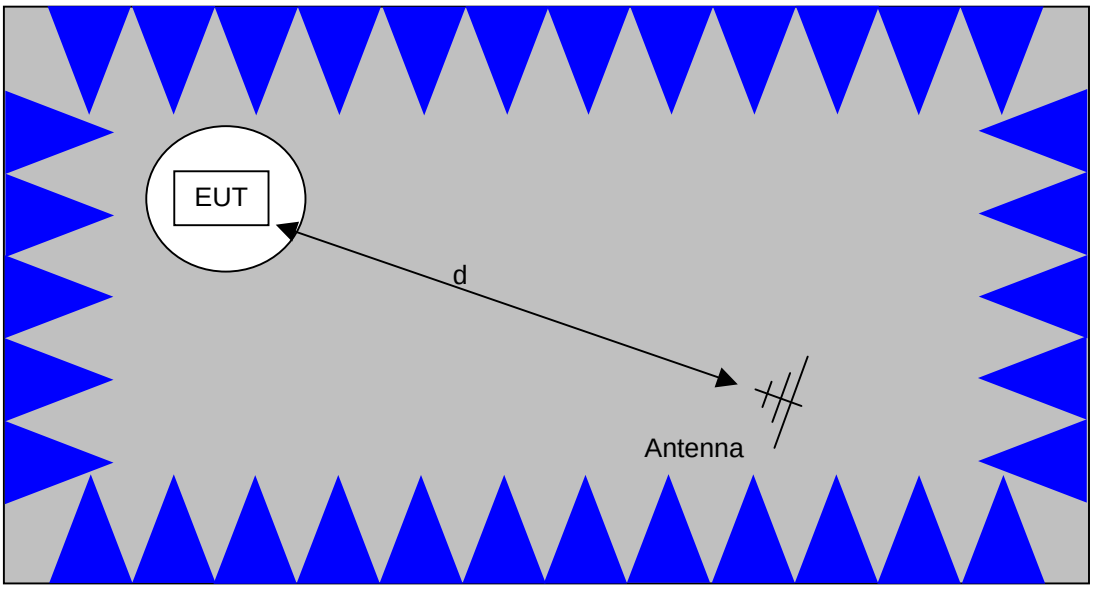
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth, which results in the highest emission is then maintained while varying the antenna height from one to four meters (for measurements above 30 MHz, measurements below 30 MHz are made with the loop antenna at a fixed height of 1m). The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain.

When testing above 18 GHz, the receive antenna is located at 1meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.

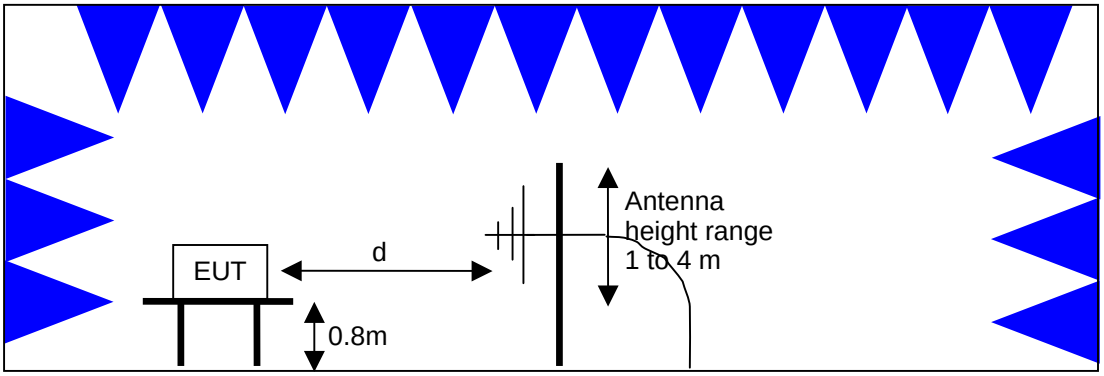


Typical Test Configuration for Radiated Field Strength Measurements



The anechoic materials on the walls and ceiling ensure compliance with the normalized site attenuation requirements of CISPR 16 / CISPR 22 / ANSI C63.4 for an alternate test site at the measurement distances used.

Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.



Test Configuration for Radiated Field Strength Measurements
Semi-Anechoic Chamber, Plan and Side Views

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.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

The limits for conducted emissions are given in units of microvolts, and the limits for radiated emissions are given in units of microvolts per meter at a specified test distance. Data is measured in the logarithmic form of decibels relative to one microvolt, or dB microvolts (dBuV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBuV/m). The results are then converted to the linear forms of uV and uV/m for comparison to published specifications.

For reference, converting the specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. These limits in both linear and logarithmic form are as follows:

GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands[1] (with the exception of transmitters operating under FCC Part 15 Subpart D and RSS 210 Annex 9), the limits for all emissions from a low power device operating under the general rules of RSS 310 (tables 3 and 4), RSS 210 (table 2) and FCC Part 15 Subpart C section 15.209.

Frequency Range (MHz)	Limit (uV/m)	Limit (dBuV/m @ 3m)
0.009-0.490	$2400/F_{KHz}$ @ 300m	$67.6-20*\log_{10}(F_{KHz})$ @ 300m
0.490-1.705	$24000/F_{KHz}$ @ 30m	$87.6-20*\log_{10}(F_{KHz})$ @ 30m
1.705 to 30	30 @ 30m	29.5 @ 30m
30 to 88	100 @ 3m	40 @ 3m
88 to 216	150 @ 3m	43.5 @ 3m
216 to 960	200 @ 3m	46.0 @ 3m
Above 960	500 @ 3m	54.0 @ 3m

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

OUTPUT POWER LIMITS – FHSS SYSTEMS

The table below shows the limits for output power based on the number of channels available for the hopping system.

Operating Frequency (MHz)	Number of Channels	Output Power
902 – 928	≥ 50	1 Watt (30 dBm)
902 – 928	25 to 49	0.25 Watts (24 dBm)

[1] The restricted bands are detailed in FCC 15.203, RSS 210 Table 1 and RSS 310 Table 2

2400 – 2483.5	≥ 75	1 Watt (30 dBm)
2400 – 2483.5	< 75	0.125 Watts (21 dBm)
5725 – 5850	75	1 Watt (30 dBm)

The maximum permitted output power is reduced by 1dB for every dB the antenna gain exceeds 6dBi. Fixed point-to-point applications using the 5725 – 5850 MHz band are not subject to this restriction.

TRANSMIT MODE SPURIOUS RADIATED EMISSIONS LIMITS – FHSS and DTS SYSTEMS

The limits for unwanted (spurious) emissions from the transmitter falling in the restricted bands are those specified in the general limits sections of FCC Part 15 and RSS 210. All other unwanted (spurious) emissions shall be at least 20dB below the level of the highest in-band signal level (30dB if the power is measured using the sample detector/power averaging method).

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

Receiver readings are compared directly to the conducted emissions specification limit (decibel form) as follows:

$$R_r - S = M$$

where:

R_r = Receiver Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

SAMPLE CALCULATIONS - RADIATED EMISSIONS

Receiver readings are compared directly to the specification limit (decibel form). The receiver internally 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, when used for electric field measurements above 30MHz, is calculated 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:

$$F_d = 40*LOG_{10} (D_m/D_s)$$

Measurement Distance is the distance at which the measurements were taken and Specification Distance is the distance at which the specification limits are based. The antenna factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

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 - FIELD STRENGTH TO EIRP CONVERSION

Where the radiated electric field strength is expressed in terms of the equivalent isotropic radiated power (eirp), or where a field strength measurement of output power is made in lieu of a direct measurement, the following formula is used to convert between eirp and field strength at a distance of 3m from the equipment under test:

$$E = \frac{1000000 \sqrt{30 P}}{3} \text{ microvolts per meter}$$

where P is the eirp (Watts)

EXHIBIT 1: Test Equipment Calibration Data

1 Page

Radiated Emissions, 30 - 10,000 MHz, 17-Sep-07
Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	16-Mar-08
EMCO	Antenna, Horn, 1-18 GHz	3115	786	28-Nov-07
Hewlett Packard	EMC Spectrum Analyzer, 9 KHz-26.5 GHz	8593EM	1141	30-Oct-07
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1548	12-Apr-08
Hewlett Packard	Preamplifier, 100 kHz - 1.3 GHz	8447E	1606	07-Feb-08
Hewlett Packard	High Pass filter, 1.5 GHz (Purple System)	P/N 84300-80037 (84125C)	1769	08-Nov-07

EXHIBIT 2: Test Measurement Data

8 Pages

Client:	GE MDS LLC	Job Number:	J69049
Model:	MDS 9810 (FCC ID: E5MDS-9810) with 9dBd Omni Antenna	T-Log Number:	T69314
		Account Manager:	Susan Pelzl
Contact:	Dennis Mccathy		-
Emissions Standard(s):	15.209, 15.247, RSS 210	Class:	-
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

GE MDS LLC

Model

MDS 9810 (FCC ID: E5MDS-9810) with 9dBd Omni Antenna

Date of Last Test: 9/17/2007

Client:	GE MDS LLC	Job Number:	J69049
Model:	MDS 9810 (FCC ID: E5MDS-9810) with 9dBd Omni Antenna	T-Log Number:	T69314
		Account Manger:	Susan Pelzl
Contact:	Dennis Mccathy		
Emissions Standard(s):	15.209, 15.247, RSS 210	Class:	-
Immunity Standard(s):	-	Environment:	-

EUT INFORMATION

General Description

The EUT is a 902-928 MHz FHSS radio that is designed to provide a radio communications link. 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 6-30 Volts DC.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
GE MDS	MDS 9810	Half Duplex wireless data Transciever 900MHz	-	E5MDS-9810

EUT Antenna (Intentional Radiators Only)

The EUT antenna is Katherein, model OGB9-915, Omnidirectional antenna, 9 dBd (11.2 dBi).

The EUT requires professional installation and therefore is exempt from the requirement of 15.203. The output power is configured for each antenna to ensure the EIRP does not exceed 4 Watts, and the output power at the rf connector cannot exceed the maximum value reported in this test data. Radiated emissions were measured with the output power set to maximum and with the EUT antennas connected via a short length of cable, with negligible loss at the fundamental frequency.

EUT Enclosure

The EUT enclosure is primarily constructed of Die cast casting . Dimensions: 5.0 H x 14.3 W x 18.41 D cm. (2.0 H x 5.625 W x 7.25 D in.)

Modification History

Mod. #	Test	Date	Modification
1			
2			
3			

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

Client:	GE MDS LLC	Job Number:	J69049
Model:	MDS 9810 (FCC ID: E5MDS-9810) with 9dBd Omni Antenna	T-Log Number:	T69314
		Account Manger:	Susan Pelzl
Contact:	Dennis Mccathy		
Emissions Standard(s):	15.209, 15.247, RSS 210	Class:	-
Immunity Standard(s):	-	Environment:	-

Test Configuration #1

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
GE MDS	-	Hand Controller	-	-
TopWard	3603D	DC Power Supply	-	-

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
-	-	-	-	-

Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Serial	Hand controller	4 wire	Unshielded	1.0
DC Power	DC Power Supply	2 wire	Unshielded	2.0
RF Port	Antenna	Coax	Shielded	1.0
Serial - DB25	Not Connected			

EUT Operation During Emissions Tests

The EUT was configured to continuously transmit on the desired frequency. The output power level was also adjusted, as needed.

Client:	GE MDS LLC	Job Number:	J69049
Model:	MDS 9810 (FCC ID: E5MDS-9810) with 9dBd Omni Antenna	T-Log Number:	T69314
		Account Manager:	Susan Pelzl
Contact:	Dennis Mccathy		
Standard:	15.209, 15.247, RSS 210	Class:	N/A

FCC 15.247 FHSS - Power, Bandwidth 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.

Date of Test: 9/17/2007
Test Engineer: Mehran Birgani
Test Location: Fremont Chamber #3
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 spurious emissions testing.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

When measuring the conducted emissions from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected to allow for the external attenuators used.

Unless stated otherwise the EUT was operating such that it constantly hopped on either the low, center or high channels.

Ambient Conditions:

Temperature: 22 °C
Rel. Humidity: 45 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	30 - 10,000 MHz Transmit Mode Radiated Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	39.9dBµV/m (98.9µV/m) @ 960.000MHz (-6.1dB)
2	30 - 2,800 MHz Receive/ Standby Mode Radiated Spurious Emissions	RSS 210	Pass	38.2dBµV/m (81.3µV/m) @ 55.294MHz (-1.8dB)

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

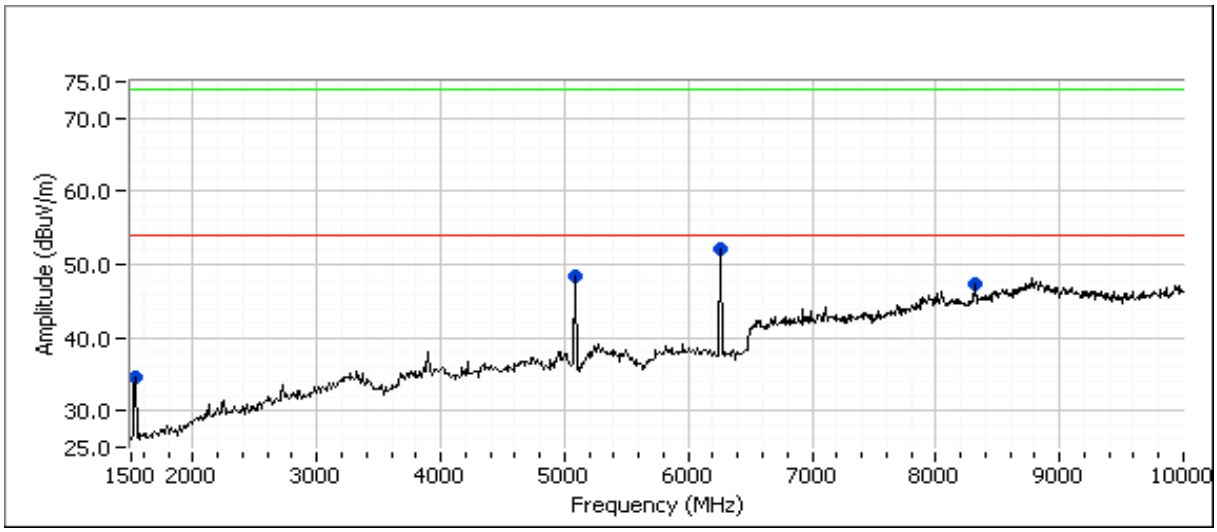
No deviations were made from the requirements of the standard.

Client:	GE MDS LLC	Job Number:	J69049
Model:	MDS 9810 (FCC ID: E5MDS-9810) with 9dBd Omni Antenna	T-Log Number:	T69314
		Account Manager:	Susan Pelzl
Contact:	Dennis Mccathy		
Standard:	15.209, 15.247, RSS 210	Class:	N/A

Run #1a: Radiated Spurious Emissions, 30 - 10,000 MHz. Transmit Mode
Low Channel @ 902.5 MHz (Power setting: 30dBm) with 9dBd Omni antenna

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
902.500	125.7	V	-	-	PK	49	1.4	
902.500	107.1	H	-	-	PK	214	1.3	

Fundamental emission level @ 3m in 100kHz RBW:	125.7 dBµV/m	
Limit for emissions outside of restricted bands:	105.7 dBµV/m	Limit is -20dBc



Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
5414.970	47.8	V	54.0	-6.2	AVG	213	1.6	
1570.090	34.6	V	54.0	-19.4	PK	188	1.6	Peak reading with average limit
8342.630	33.3	V	54.0	-20.7	AVG	76	1.0	
5414.970	50.7	V	74.0	-23.3	PK	213	1.6	
8342.630	44.3	V	74.0	-29.7	PK	76	1.0	
6317.460	53.9	V	105.7	-51.8	PK	151	1.6	Not restricted

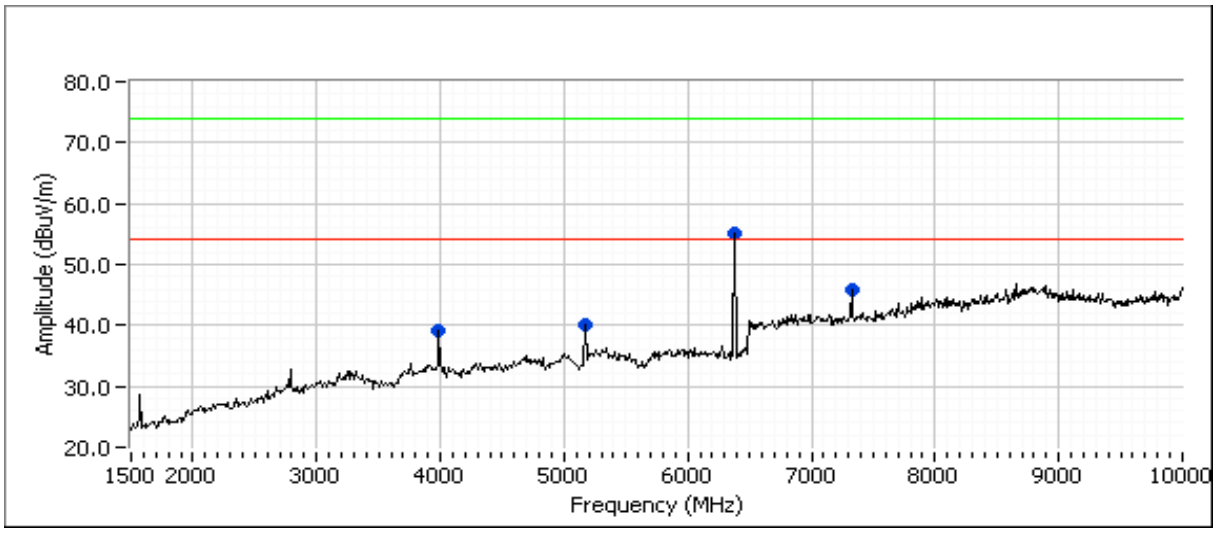
Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.

Client:	GE MDS LLC	Job Number:	J69049
Model:	MDS 9810 (FCC ID: E5MDS-9810) with 9dBd Omni Antenna	T-Log Number:	T69314
		Account Manager:	Susan Pelzl
Contact:	Dennis Mccathy		
Standard:	15.209, 15.247, RSS 210	Class:	N/A

Run #1b: Radiated Spurious Emissions, 30 - 10,000 MHz. Transmit Mode
Center Channel @ 915.2 MHz (Power setting: 30dBm) with 9dBd Omni antenna

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
915.200	126.1	V	-	-	PK	50	1.4	
915.200	109.8	H	-	-	PK	213	1.3	

Fundamental emission level @ 3m in 100kHz RBW:	126.1 dBµV/m	
Limit for emissions outside of restricted bands:	106.1 dBµV/m	Limit is -20dBc



Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
7322.500	45.8	V	54.0	-8.2	Peak	180	1.9	
5175.000	40.0	V	54.0	-14.0	Peak	209	1.6	
3987.500	39.1	V	54.0	-14.9	Peak	211	1.3	
6404.940	57.0	V	106.1	-49.1	PK	147	1.3	Not restricted

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.

Client:	GE MDS LLC	Job Number:	J69049
Model:	MDS 9810 (FCC ID: E5MDS-9810) with 9dBd Omni Antenna	T-Log Number:	T69314
		Account Manager:	Susan Pelzl
Contact:	Dennis Mccathy		
Standard:	15.209, 15.247, RSS 210	Class:	N/A

Run #1c: Radiated Spurious Emissions, 30 - 10,000 MHz. Transmit Mode
High Channel @ 927.5 MHz (Power setting: 30dBm) with 9dBd Omni antenna

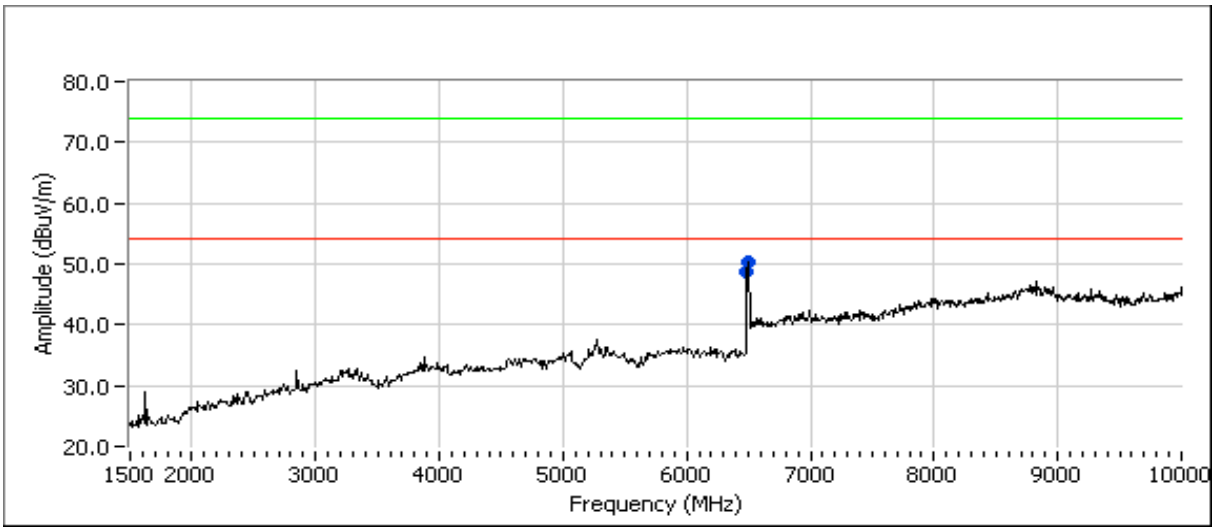
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
927.500	127.2	V	-	-	PK	50	1.4	
927.500	107.6	H	-	-	PK	214	1.3	

Fundamental emission level @ 3m in 100kHz RBW:	127.2 dBµV/m	
Limit for emissions outside of restricted bands:	107.2 dBµV/m	Limit is -20dBc

Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
960.000	39.9	V	46.0	-6.1	QP	305	1.1	
960.000	27.0	H	46.0	-19.0	QP	296	1.0	

Note 1:	Calculated by subtracting the marker delta values from the fundamental field strength measurements.



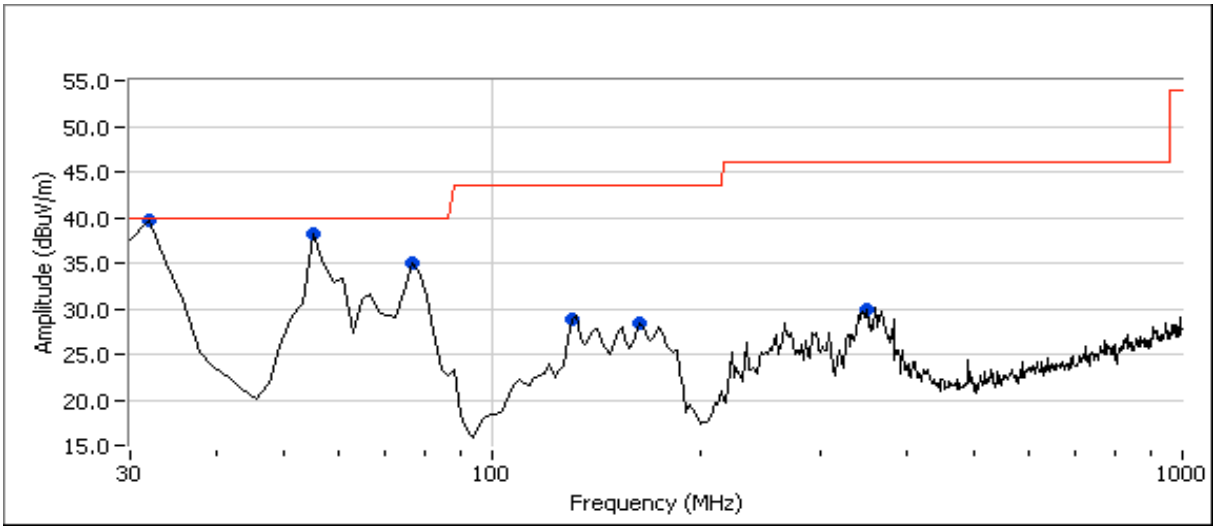
Other Spurious Emissions

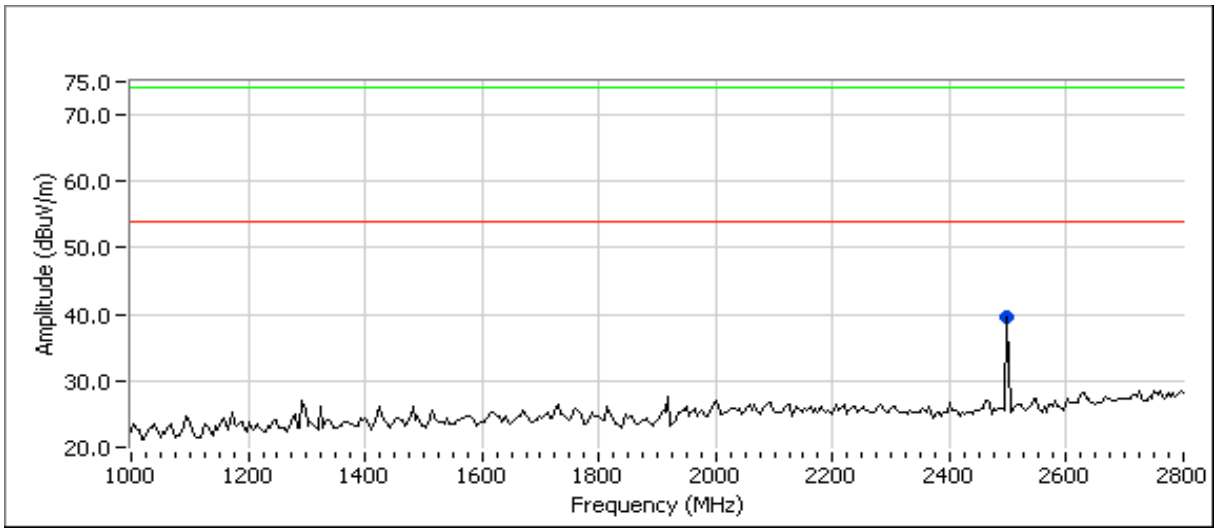
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
6492.480	51.7	V	107.2	-55.5	PK	145	2.0	Not restricted

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.

Client:	GE MDS LLC	Job Number:	J69049
Model:	MDS 9810 (FCC ID: E5MDS-9810) with 9dBd Omni Antenna	T-Log Number:	T69314
		Account Manager:	Susan Pelzl
Contact:	Dennis Mccathy		
Standard:	15.209, 15.247, RSS 210	Class:	N/A

Run #2: Radiated Spurious Emissions, 30 - 2,800 MHz. Recieve Mode
Center Channel @ 915.2 MHz with 9dBd Omni antenna





Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
55.294	38.2	V	40.0	-1.8	QP	173	1.0	
33.158	37.2	V	40.0	-2.8	QP	247	1.0	
66.319	27.8	V	40.0	-12.2	QP	172	1.7	
2499.060	39.6	V	54.0	-14.4	Peak	197	1.0	Peak reading with average limit
131.082	28.9	H	43.5	-14.6	Peak	297	2.5	Peak reading with QP limit
164.128	28.3	H	43.5	-15.2	Peak	84	2.0	Peak reading with QP limit
348.798	29.9	H	46.0	-16.1	Peak	233	1.0	Peak reading with QP limit

EXHIBIT 3: Photographs of Test Configurations

2 Pages

EXHIBIT 4: Proposed FCC ID Label & Label Location

EXHIBIT 5: Detailed Photographs of GE MDS LLC Model MDS 9810Construction

Pages

EXHIBIT 6: Operator's Manual for GE MDS LLC Model MDS 9810

Pages

EXHIBIT 7: Block Diagram of GE MDS LLC Model MDS 9810

Pages

EXHIBIT 8: Schematic Diagrams for GE MDS LLC Model MDS 9810

Pages

EXHIBIT 9: Theory of Operation for GE MDS LLC Model MDS 9810

Pages

EXHIBIT 10: RF Exposure Information

Pages