EMC Test Report

Industry Canada RSS-Gen Issue 3 / RSS 210 Issue 8
FCC Part 15 Subpart C

Model: EL806

IC CERTIFICATION #:	3738A-MDSEL806
FCC ID:	E5MDS-EL806
APPLICANT:	GEMDS 175 Science Parkway Rochester, NY 14820
TEST SITE(S):	Elliott Laboratories 41039 Boyce Road. Fremont, CA. 94538-2435
IC SITE REGISTRATION #:	2845B-7
REPORT DATE:	April 26, 2011
FINAL TEST DATES:	March 25, 2011

AUTHORIZED SIGNATORY:

Mark Briggs
Staff Engineer
Elliott Laboratories

Testing Cert #2016.01

REVISION HISTORY

Rev#	Date	Comments	Modified By
-	04-21-2011	First release	
1	04-26-2011	Corrected all references to the model number.	Briggs

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SCOPE

An electromagnetic emissions test has been performed on the GEMDS model EL806, pursuant to the following rules:

Industry Canada RSS-Gen Issue 3
RSS 210 Issue 8 "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
FCC DTS Measurement Procedure KDB558074, March 2005

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.

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 GEMDS model EL806 complied with the requirements of the following regulations:

Industry Canada RSS-Gen Issue 3
RSS 210 Issue 8 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
FCC Part 15 Subpart B (Receivers)
FCC Part 15 Subpart C

Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

The test results recorded herein are based on a single type test of GEMDS model EL806 and therefore apply only to the tested sample. The sample was selected and prepared by Jake Bryner of GEMDS.

DEVIATIONS FROM THE STANDARDS

No deviations were made from the published requirements listed in the scope of this report. It is to be noted that as the scope of testing was to evaluate a new antenna type only radiated spurious emissions were measured.

TEST RESULTS SUMMARY

FREQUENCY HOPPING SPREAD SPECTRUM (902 – 928 MHz, 50 channels or more)

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.247 (a) (1)	RSS 210 A8.1 (1)	20dB Bandwidth	The scope of testing was to evaluate a new antenna type (dipole antenna with nominal gain of 2.2dBi). Output power was verified to be within 0.5dB of the highest powers reported in the original equipment filing prior to performing the radiated tests. As the antenna gain is less than 6dBi the device can operate at its maximum rated power of 1 Watt (30dBm).		
		Channel Separation			
15.247 (a) (1) (i)	RSS 210 A8.1 (3)	Number of Channels			
15.247 (a) (1) (i)	RSS 210 A8.1 (3)	Channel Dwell Time			
15.247 (a) (1)	RSS 210 A8.1 (1)	Channel Utilization			
15.247 (b) (3)	RSS 210 A8.4 (1)	Output Power			
15.247 (c)	RSS 210 A8.5	Antenna Port Spurious Emissions 30MHz – 9.28 GHz			
15.247 (c) 15.209	RSS 210 A8.5 Table 2, 3	Radiated Spurious Emissions 30MHz – 9.28 GHz	53.6dBµV/m @ 2782.8MHz (-0.4dB)	15.209 in restricted bands, all others < -20dBc	Complies

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

FCC Rule Part	RSS Rule part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.207	RSS GEN Table 2	AC Conducted Emissions	Not evaluated – the proposed change in antenna would not affect the conducted emissions from the module.		
15.109	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	42.7dBµV/m @ 401.50MHz	Refer to page 16	Complies (-3.3 dB)
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	The antenna may be used in a body-worn host device - refer to SAR report and RSS 102 declarations for that specific exposure condition. MPE calculations provided for installation in mobile application	Refer to OET 65, FCC Part 1 and RSS 102	Complies
-	RSP 100 RSS GEN 7.1.5	User Manual	Host manual provided to show English and French language statements.	Statement required regarding non-interference	Complies
-	RSP 100 RSS GEN 7.1.5	User Manual	Not applicable	Statement for products with detachable antenna	N/A

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	Measurement Unit	Frequency Range	Expanded Uncertainty
RF power, conducted (power meter)	dBm	25 to 7000 MHz	± 0.52 dB
RF power, conducted (Spectrum analyzer)	dBm	25 to 7000 MHz	± 0.7 dB
Conducted emission of transmitter	dBm	25 to 26500 MHz	± 0.7 dB
Conducted emission of receiver	dBm	25 to 26500 MHz	± 0.7 dB
Radiated emission (substitution method)	dBm	25 to 26500 MHz	± 2.5 dB
Radiated emission (field strength)	dBµV/m	25 to 1000 MHz	± 3.6 dB
		1000 to 40000 MHz	± 6.0 dB
Conducted Emissions (AC Power)	dBµV	0.15 to 30 MHz	± 2.4 dB

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The GEMDS model EL806 is a 902-928 MHz frequency hopping spread spectrum wireless module that is designed for OEM use. The scope of testing was to evaluate a 2dBi dipole antenna (Antenna Factor model number ANT-916-MHW) with this module. The module was configured for testing with the module exposed (outside of a host system) as required by Industry Canada and FCC rules for the approvals of modular transmitters.

The sample was received on March 25, 2011 and tested on March 25, 2011. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
GEMDS	EL806	900MHz FHSS module	-	E5MDS-EL806

ENCLOSURE

The EUT does not have an enclosure as it is designed to be installed within the enclosure of a host computer or system..

MODIFICATIONS

No modifications were made to the EUT during the time the product was at Elliott.

SUPPORT EQUIPMENT

The following equipment was used as support equipment for testing:

Company	Model	Description	Serial Number	FCC ID
-	-	DC Power Source	-	-
GEMDS	-	Module fixture	-	-

EUT INTERFACE PORTS

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

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
DC In	DC Power source	2-wire	Unshielded	0.8

EUT OPERATION

During testing for transmitter spurious emissions the EUT was configured to transmit continuously on the low, center or high channel as required. For receiver spurious emissions the receiver was tuned to the low, center or high frequency as required.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken at the test sites listed below. 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 and with industry Canada.

Site	Registration Numbers		Location
	FCC	Canada	
Chamber 7	A2LA accreditation	2845B-7	41039 Boyce Road Fremont, CA 94538-2435

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. The test site(s) contain 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 16-1-1 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.

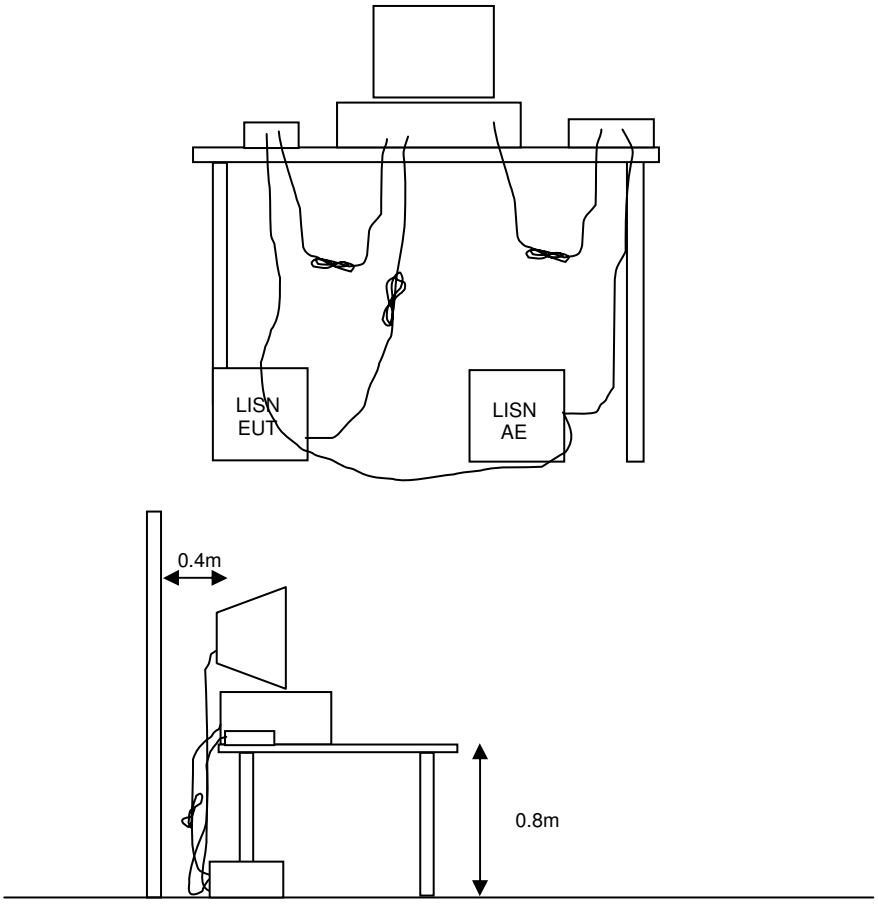


Figure 1 Typical Conducted Emissions Test Configuration

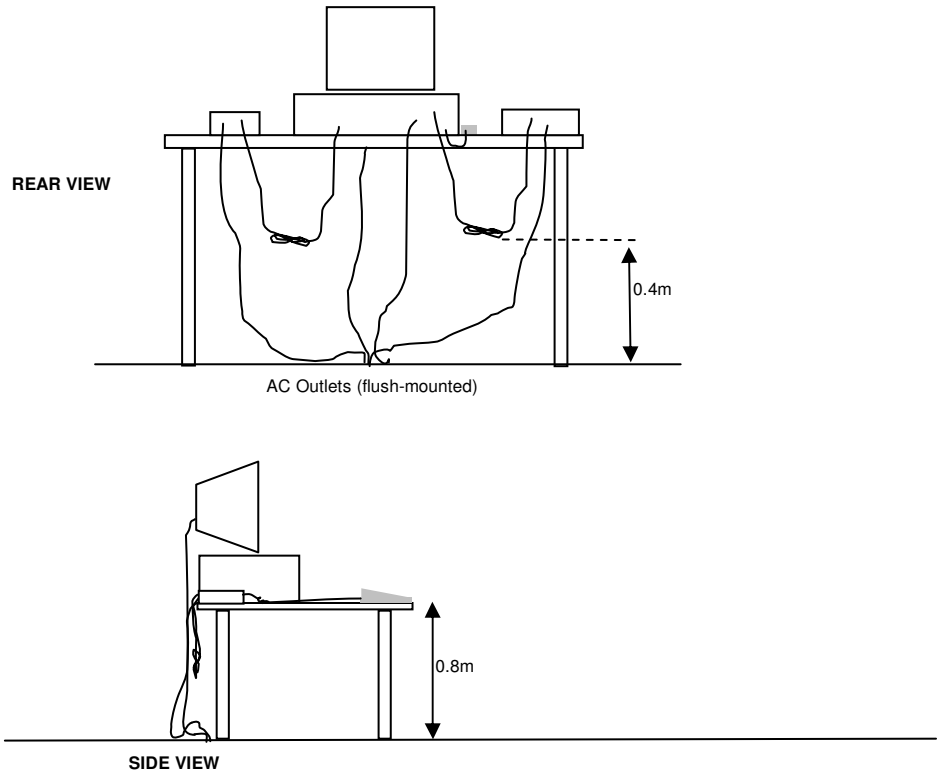
RADIATED EMISSIONS

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.

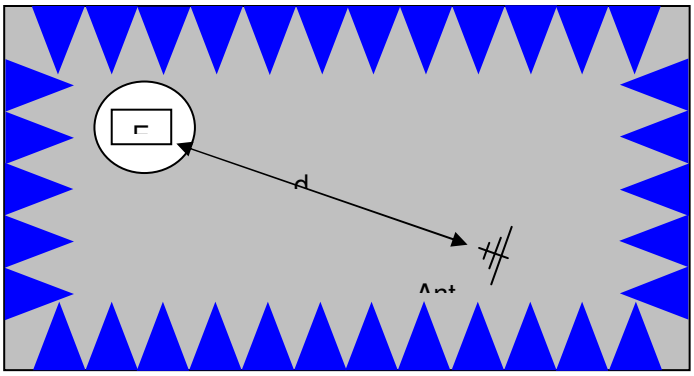
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

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.

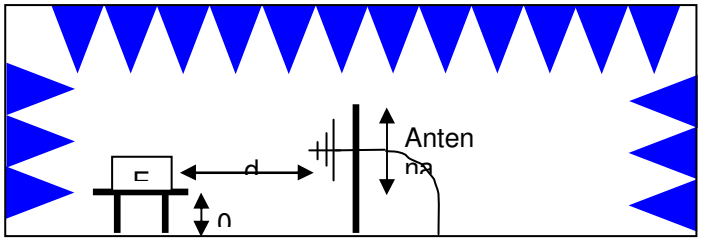
When testing above 18 GHz, the receive antenna is located at 1meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.



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



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

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

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).

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

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).

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

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

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

Appendix A Test Equipment Calibration Data

Radiated Emissions, 30 - 9,300 MHz, 25-Mar-11

Manufacturer	Description	Model	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	5/26/2011
Hewlett Packard	EMC Spectrum Analyzer, 9 KHz - 22 GHz	8593EM	1319	11/22/2011
Rohde & Schwarz	Test Receiver, 0.009-2750 MHz	ESN	1332	1/17/2012
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	4/14/2011
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1548	6/24/2012
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	6/22/2012
Com-Power Corp.	Preamplifier, 30-1000 MHz	PA-103A	2359	2/15/2012

Appendix B Test Data

T82623 8 Pages

Client:	Control Chief / GE MDS	Job Number:	J82521
Model:	EL 806	T-Log Number:	T82623
		Account Manager:	Susan Pelzl
Contact:	Jake Bryner (Dennis McCarthy)		Mark Briggs
Emissions Standard(s):	FCC Part 15 B, FCC 15.247, RSS 210	Class:	-
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

Control Chief / GE MDS

Model

EL 806

Date of Last Test: 3/31/2011

Client:	Control Chief / GE MDS	Job Number:	J82521
Model:	EL 806	T-Log Number:	T82623
		Account Manager:	Susan Pelzl
Contact:	Jake Bryner (Dennis McCarthy)		
Standard:	FCC Part 15 B, FCC 15.247, RSS 210	Class:	N/A

RSS 210 and FCC 15.247 (DTS) Radiated Spurious Emissions

Test Specific Details

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

General Test Configuration

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.

Ambient Conditions:

Temperature: 20.4 °C

Rel. Humidity: 36 %

Summary of Results - Device Operating in the 900 MHz Band

Run #	Mode	Channel	Target Power	Measured Power	Test Performed	Limit	Result / Margin
1a	Tx	902.2 MHz	30dBm	29.9	Radiated Emissions, 1000 MHz-9.3GHz	FCC Part 15.209 / 15.247(c)	50.5dBµV/m @ 8119.9MHz (-3.5dB)
1b	Tx	915.0 MHz	29.8dBm	29.7	Radiated Emissions, 1000 MHz-9.3GHz	FCC Part 15.209 / 15.247(c)	52.6dBµV/m @ 2745.0MHz (-1.4dB)
1c	Tx	927.6 MHz	29.7dBm	29.2	960 MHz Restricted Band	FCC Part 15.209 / 15.247(c)	35.8dBµV/m @ 960.00MHz (-18.2dB)
					Radiated Emissions, 1000 MHz-9.3GHz	FCC Part 15.209 / 15.247(c)	53.6dBµV/m @ 2782.8MHz (-0.4dB)

Output power measured using spectrum analyzer (RB=1MHz, VB=3MHz) or a peak power meter

Radiated emissions from the transmitter limited to the frequency range 1 - 10GHz and the restricted band 960 - 1240MHz based on the original tests performed on the module showing no emissions in the restricted bands below 902MHz and all emissions more than -20dBc at the antenna port.

Run #	Mode	Channel	Target Power	Measured Power	Test Performed	Limit	Result / Margin
2a	receive	902.2 MHz			Radiated Emissions, 30 MHz-3GHz	FCC Part 15.109	42.4dBµV/m @ 401.50MHz (-3.6dB)
2b		915.0 MHz				FCC Part 15.109 / RSS GEN	41.8dBµV/m @ 401.50MHz (-4.2dB)
2c		927.6 MHz				FCC Part 15.109	42.7dBµV/m @ 401.50MHz (-3.3dB)

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:	Control Chief / GE MDS	Job Number:	J82521
Model:	EL 806	T-Log Number:	T82623
		Account Manager:	Susan Pelzl
Contact:	Jake Bryner (Dennis McCarthy)		
Standard:	FCC Part 15 B, FCC 15.247, RSS 210	Class:	N/A

Run #1: Transmitter Radiated Spurious Emissions, 960 - 9300 MHz

Date of Test: 3/25/2011

Test Engineer: Rafael Varelas

Test Location: FT Chamber #7

Run #1a: Low Channel @ 902.2 MHz

Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

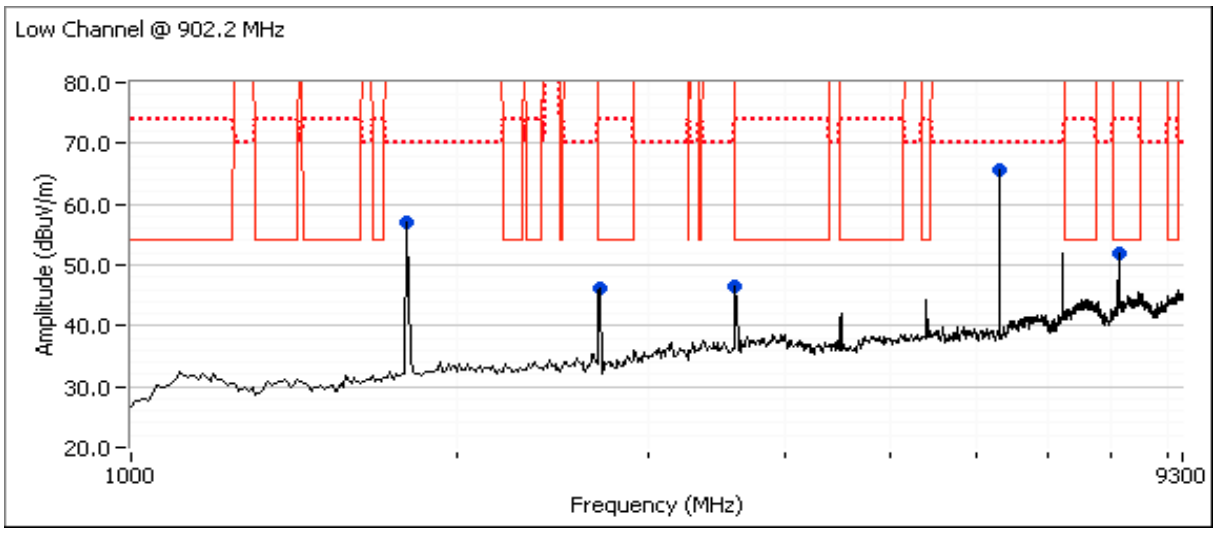
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
902.200	121.2	V	-	-	PK	72	1.0	PK (0.10s)
902.200	132.4	H	-	-	PK	17	1.3	PK (0.10s)

Fundamental emission level @ 3m in 100kHz RBW:	132.4	dBµV/m	
Limit for emissions outside of restricted bands:	112.4	dBµV/m	Limit is -20dBc (Peak power measurement)

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	
8119.850	50.5	H	54.0	-3.5	AVG	254	1.0	RB 1 MHz;VB 10 Hz;Pk
8119.850	54.5	H	74.0	-19.5	PK	254	1.0	RB 1 MHz;VB 3 MHz;Pk
3608.830	46.8	H	54.0	-7.2	AVG	355	1.0	RB 1 MHz;VB 10 Hz;Pk
3608.850	49.8	H	74.0	-24.2	PK	355	1.0	RB 1 MHz;VB 3 MHz;Pk
1804.410	57.4	H	112.4	-55.0	PK	360	1.6	RB 100 kHz;VB 100 kHz;Pk
6315.410	66.4	H	112.4	-46.0	PK	244	1.0	RB 100 kHz;VB 100 kHz;Pk
2706.640	48.5	V	54.0	-5.5	AVG	32	1.1	RB 1 MHz;VB 10 Hz;Pk
2706.650	50.3	V	74.0	-23.7	PK	32	1.1	RB 1 MHz;VB 3 MHz;Pk

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 and measured in 100kHz.



Client:	Control Chief / GE MDS	Job Number:	J82521
Model:	EL 806	T-Log Number:	T82623
		Account Manager:	Susan Pelzl
Contact:	Jake Bryner (Dennis McCarthy)		
Standard:	FCC Part 15 B, FCC 15.247, RSS 210	Class:	N/A

Run #1b: Center Channel @ 915 MHz

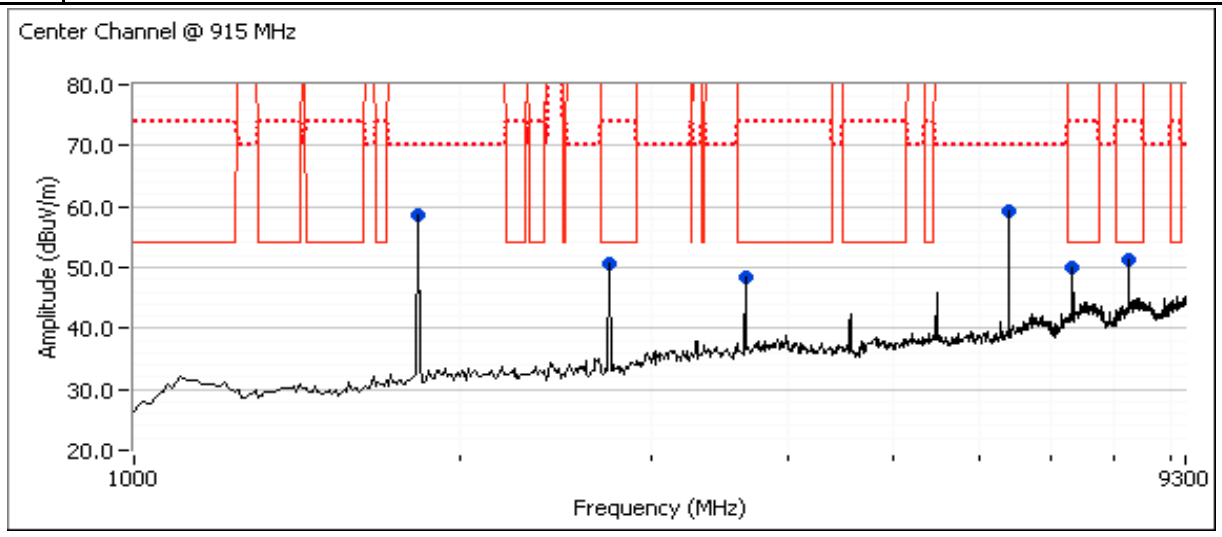
Fundamental emission level @ 3m in 100kHz RBW:	129.9	dBµV/m
Limit for emissions outside of restricted bands:	109.9	dBµV/m

Limit is -20dBc (Peak power measurement)

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	
2745.030	52.6	V	54.0	-1.4	AVG	324	1.1	RB 1 MHz;VB 10 Hz;Pk
2745.050	53.7	V	74.0	-20.3	PK	324	1.1	RB 1 MHz;VB 3 MHz;Pk
3660.030	48.2	H	54.0	-5.8	AVG	42	1.0	RB 1 MHz;VB 10 Hz;Pk
3660.040	50.8	H	74.0	-23.2	PK	42	1.0	RB 1 MHz;VB 3 MHz;Pk
6405.000	60.9	V	109.9	-49.0	PK	40	1.5	RB 100 kHz;VB 100 kHz;Pk
7320.000	47.6	V	54.0	-6.4	AVG	294	1.2	RB 1 MHz;VB 10 Hz;Pk
7319.990	52.2	V	74.0	-21.8	PK	294	1.2	RB 1 MHz;VB 3 MHz;Pk
8235.010	49.0	V	54.0	-5.0	AVG	319	1.3	RB 1 MHz;VB 10 Hz;Pk
8234.920	54.2	V	74.0	-19.8	PK	319	1.3	RB 1 MHz;VB 3 MHz;Pk
1830.020	59.7	H	109.9	-50.2	PK	345	1.6	RB 100 kHz;VB 100 kHz;Pk

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 and measured in 100kHz.



Client:	Control Chief / GE MDS	Job Number:	J82521
Model:	EL 806	T-Log Number:	T82623
		Account Manager:	Susan Pelzl
Contact:	Jake Bryner (Dennis McCarthy)		
Standard:	FCC Part 15 B, FCC 15.247, RSS 210	Class:	N/A

Run #1c: High Channel @ 927.6 MHz

Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

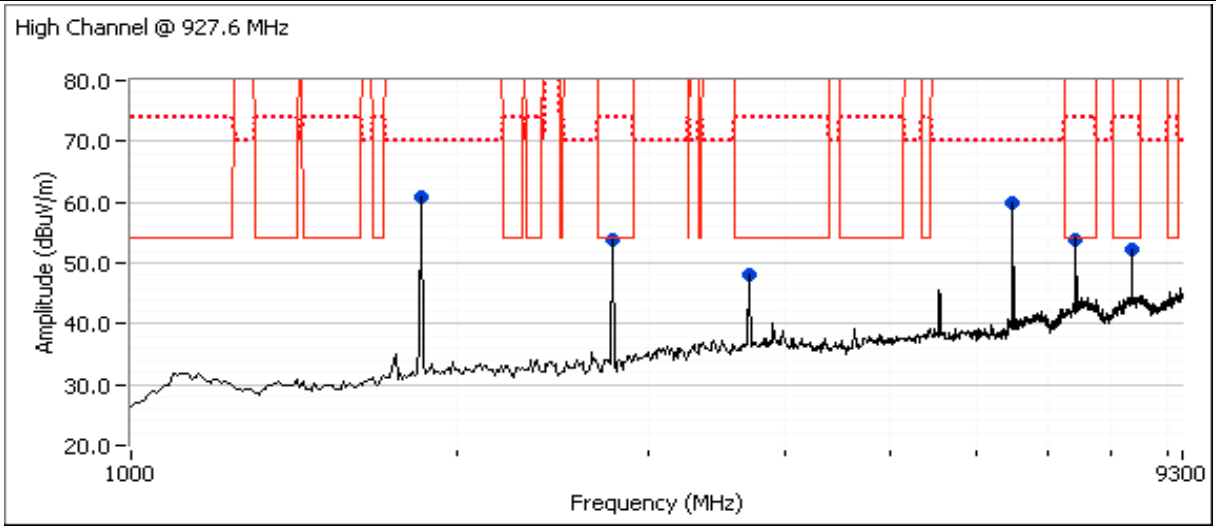
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
927.600	118.0	V	-	-	PK	110	1.0	PK (0.10s)
927.600	130.3	H	-	-	PK	28	1.3	PK (0.10s)

Fundamental emission level @ 3m in 100kHz RBW:	130.3	dBµV/m	
Limit for emissions outside of restricted bands:	110.3	dBµV/m	Limit is -20dBc (Peak power measurement)

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	
2782.800	53.6	V	54.0	-0.4	AVG	37	1.0	RB 1 MHz;VB 10 Hz;Pk
2782.840	54.8	V	74.0	-19.2	PK	37	1.0	RB 1 MHz;VB 3 MHz;Pk
960.000	35.8	H	54.0	-18.2	PK	289	1.0	PK (0.10s)
960.057	27.4	V	54.0	-26.6	PK	228	2.5	PK (0.10s)
1855.220	61.8	H	110.3	-48.5	PK	340	1.5	RB 100 kHz;VB 100 kHz;Pk
8348.400	52.1	H	54.0	-1.9	AVG	329	1.0	RB 1 MHz;VB 10 Hz;Pk
8348.380	56.2	H	74.0	-17.8	PK	329	1.0	RB 1 MHz;VB 3 MHz;Pk
7420.830	49.7	V	54.0	-4.3	AVG	274	1.1	RB 1 MHz;VB 10 Hz;Pk
7420.860	53.7	V	74.0	-20.3	PK	274	1.1	RB 1 MHz;VB 3 MHz;Pk
3710.420	47.8	V	54.0	-6.2	AVG	143	1.0	RB 1 MHz;VB 10 Hz;Pk
3710.340	50.6	V	74.0	-23.4	PK	143	1.0	RB 1 MHz;VB 3 MHz;Pk
6493.190	59.9	H	110.3	-50.4	PK	13	1.0	RB 100 kHz;VB 100 kHz;Pk

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 and measured in 100kHz.



Client:	Control Chief / GE MDS	Job Number:	J82521
Model:	EL 806	T-Log Number:	T82623
		Account Manager:	Susan Pelzl
Contact:	Jake Bryner (Dennis McCarthy)		
Standard:	FCC Part 15 B, FCC 15.247, RSS 210	Class:	N/A

Run #2: Receiver Radiated Spurious Emissions, 30 - 3000 MHz

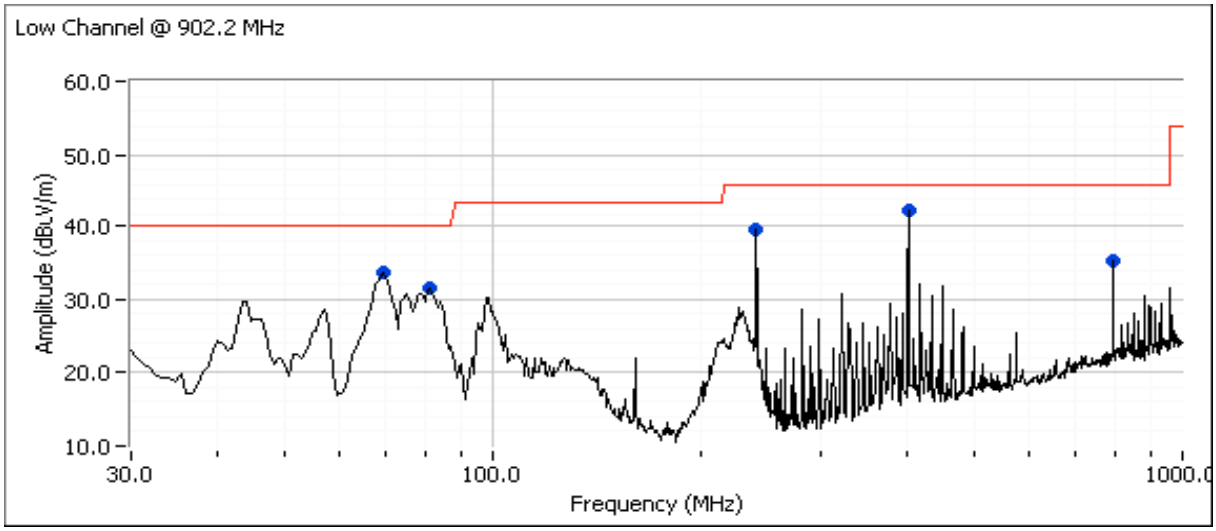
Date of Test: 3/25/2011

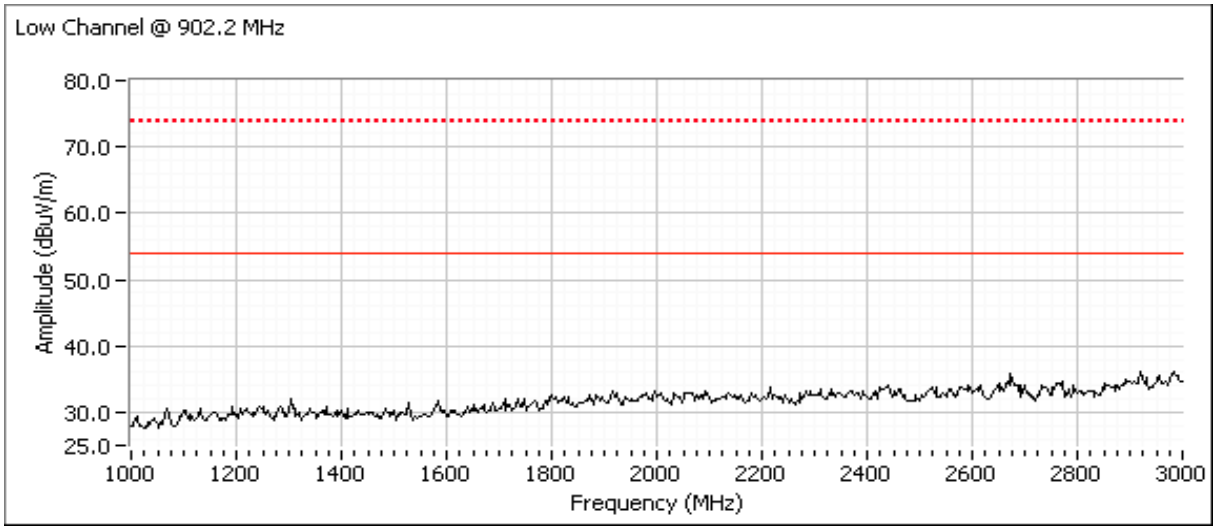
Test Engineer: Rafael Varelas

Test Location: FT Chamber #7

Run #2a: Low Channel @ 902.2 MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
401.500	42.4	H	46.0	-3.6	Peak	14	1.0	
69.825	33.8	V	40.0	-6.2	Peak	247	1.0	
81.300	31.5	V	40.0	-8.5	Peak	32	1.0	
241.275	39.4	H	46.0	-6.6	Peak	134	1.5	
793.500	35.2	H	46.0	-10.8	Peak	358	1.0	

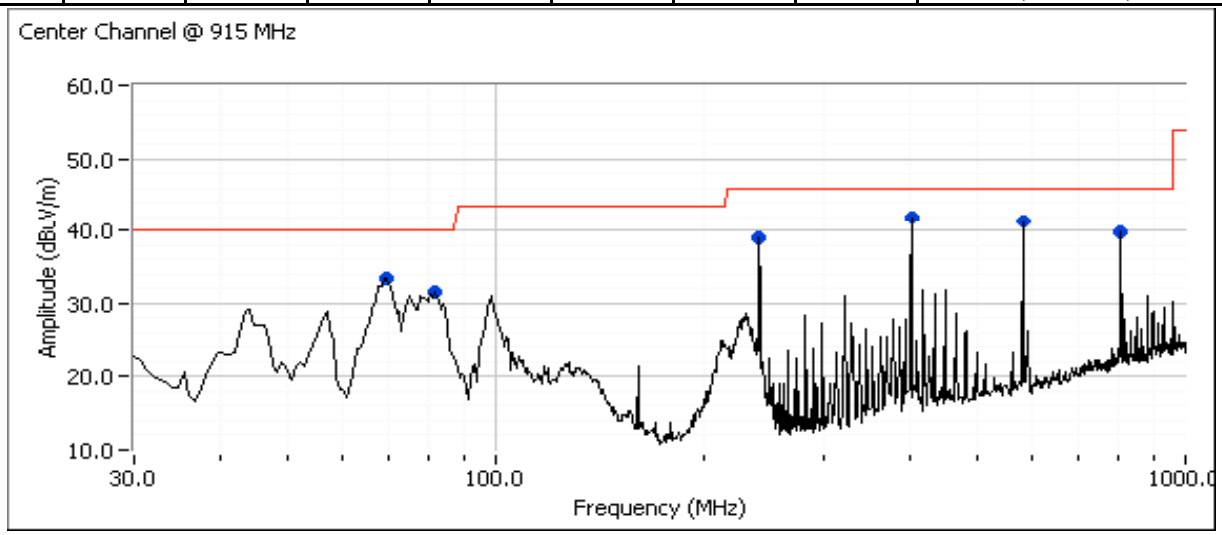


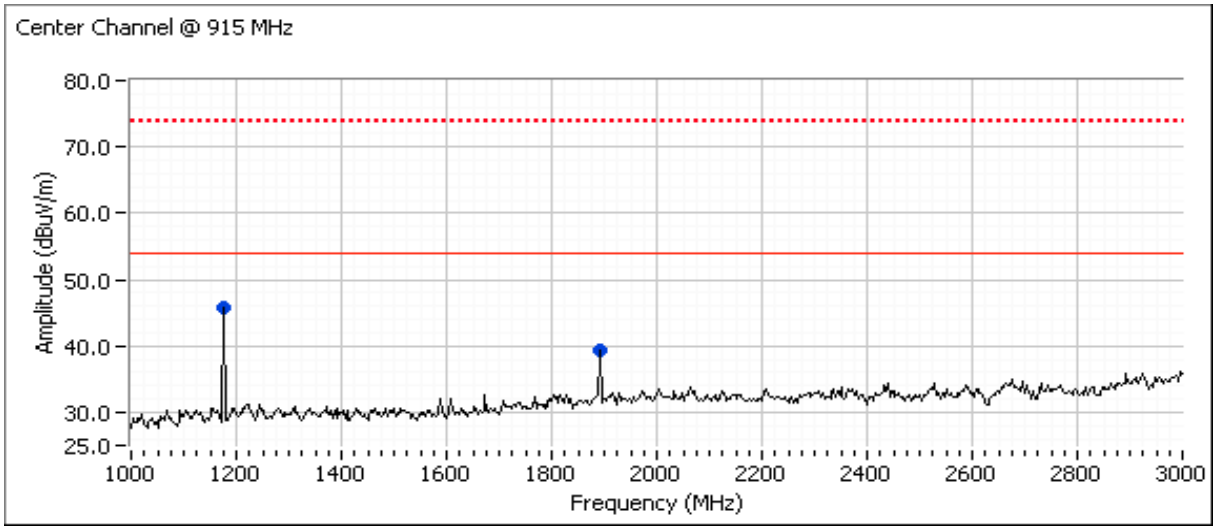


Client:	Control Chief / GE MDS	Job Number:	J82521
Model:	EL 806	T-Log Number:	T82623
		Account Manager:	Susan Pelzl
Contact:	Jake Bryner (Dennis McCarthy)		
Standard:	FCC Part 15 B, FCC 15.247, RSS 210	Class:	N/A

Run #2b: Center Channel @ 915 MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
401.500	41.8	H	46.0	-4.2	Peak	127	1.0	
69.825	33.5	V	40.0	-6.5	Peak	273	1.0	
81.975	31.5	V	40.0	-8.5	Peak	70	1.0	
241.275	39.1	H	46.0	-6.9	Peak	136	1.5	
581.750	41.3	H	46.0	-4.7	Peak	300	2.0	
805.750	39.7	H	46.0	-6.3	Peak	4	1.0	
1173.910	25.0	H	54.0	-29.0	AVG	189	1.0	RB 1 MHz;VB 10 Hz;Pk
1170.840	36.0	H	74.0	-38.0	PK	189	1.0	RB 1 MHz;VB 3 MHz;Pk
1885.840	27.3	H	54.0	-26.7	AVG	249	1.0	RB 1 MHz;VB 10 Hz;Pk
1888.640	38.8	H	74.0	-35.2	PK	249	1.0	RB 1 MHz;VB 3 MHz;Pk

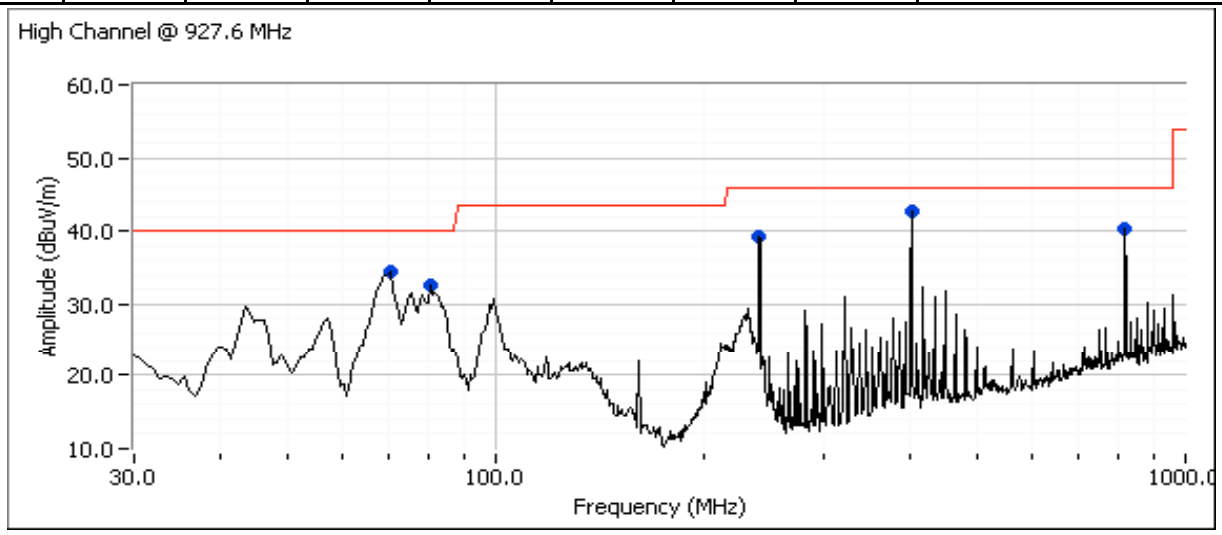


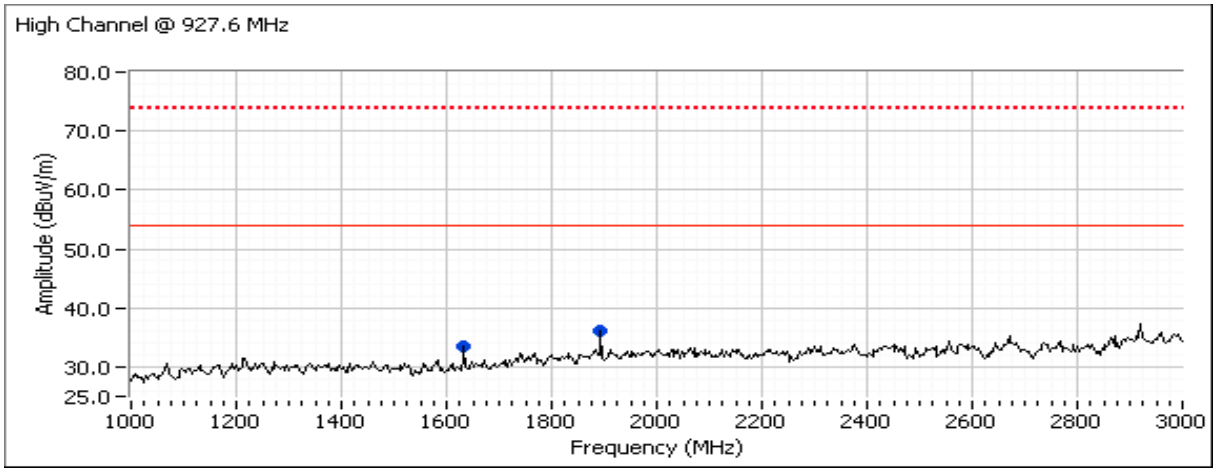


Client:	Control Chief / GE MDS	Job Number:	J82521
Model:	EL 806	T-Log Number:	T82623
		Account Manager:	Susan Pelzl
Contact:	Jake Bryner (Dennis McCarthy)		
Standard:	FCC Part 15 B, FCC 15.247, RSS 210	Class:	N/A

Run #2c: High Channel @ 927.6 MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
401.500	42.7	H	46.0	-3.3	Peak	7	1.0	
70.500	34.5	V	40.0	-5.5	Peak	73	1.0	
80.625	32.5	V	40.0	-7.5	Peak	30	1.0	
241.275	39.3	H	46.0	-6.7	Peak	138	1.5	
818.000	40.3	H	46.0	-5.7	Peak	5	1.5	
1633.330	33.4	V	54.0	-20.6	Peak	1	1.3	
1893.330	36.1	V	54.0	-17.9	Peak	111	1.0	





Appendix C Photographs of Test Configurations

Uploaded as a separate exhibit

Appendix D RF Exposure Information

Uploaded as a separate exhibit