

*Radio Test Report – Permissive Change/Reassessment*

*FCC Part 90 and RSS 119  
(450 MHz to 512 MHz)*

*Model: LCT450*

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

TEST SITE(S): Elliott Laboratories  
684 W. Maude Avenue  
Sunnyvale, CA 94085

REPORT DATE: May 3, 2010  
RE-ISSUED DATE: May 24, 2010

FINAL TEST DATES: March 31, April 2, April 15 and May 20, 2010

AUTHORIZED SIGNATORY:



---

David W. Bare  
Chief Engineer  
Elliott Laboratories.



Testing Cert #2016-01

Elliott Laboratories is accredited by the A2LA, certificate number 2016-01, to perform the test(s) listed in this report, except where noted otherwise. This report shall not be reproduced, except in its entirety, without the written approval of Elliott Laboratories

**REVISION HISTORY**

| Rev# | Date         | Comments   | Modified By |
|------|--------------|--|-------------|
| 1    | May 3, 2010  | First release  |             |
| 2    | May 20, 2010 | Changed issue number for RSS-119, corrected typographical error and updated power range in test results summary table      | dwb         |
| 3    | May 24, 2010 | Added notes to summary table about different out of band limits for different powers; added receiver spurious prescan data | dwb         |

---

**TABLE OF CONTENTS**

|  |           |
|--|-----------|
| <b>REVISION HISTORY .....</b>  | <b>2</b>  |
| <b>TABLE OF CONTENTS .....</b>   | <b>3</b>  |
| <b>SCOPE.....</b>  | <b>4</b>  |
| <b>OBJECTIVE .....</b>   | <b>5</b>  |
| <b>STATEMENT OF COMPLIANCE.....</b>                                    | <b>5</b>  |
| <b>DEVIATIONS FROM THE STANDARDS.....</b>                              | <b>5</b>  |
| <b>TEST RESULTS.....</b>   | <b>6</b>  |
| FCC PART 90 AND RSS-119 .....  | 6         |
| MEASUREMENT UNCERTAINTIES.....   | 7         |
| <b>EQUIPMENT UNDER TEST (EUT) DETAILS.....</b>                         | <b>8</b>  |
| GENERAL.....   | 8         |
| ENCLOSURE.....   | 8         |
| MODIFICATIONS.....   | 8         |
| SUPPORT EQUIPMENT.....   | 8         |
| EUT INTERFACE PORTS .....  | 8         |
| EUT OPERATION .....  | 8         |
| <b>PROPOSED MODIFICATION DETAILS.....</b>                              | <b>9</b>  |
| GENERAL.....   | 9         |
| <b>TESTING .....</b>   | <b>10</b> |
| GENERAL INFORMATION .....  | 10        |
| <b>RF PORT MEASUREMENT PROCEDURES .....</b>                            | <b>11</b> |
| OUTPUT POWER.....  | 11        |
| BANDWIDTH MEASUREMENTS.....  | 11        |
| CONDUCTED SPURIOUS EMISSIONS .....                                     | 11        |
| TRANSMITTER MASK MEASUREMENTS .....                                    | 12        |
| FREQUENCY STABILITY.....   | 12        |
| TRANSIENT FREQUENCY BEHAVIOR.....                                      | 12        |
| <b>RADIATED EMISSIONS MEASUREMENTS.....</b>                            | <b>13</b> |
| INSTRUMENTATION .....  | 14        |
| FILTERS/ATTENUATORS .....  | 14        |
| ANTENNAS.....  | 14        |
| ANTENNA MAST AND EQUIPMENT TURNTABLE.....                              | 14        |
| <b>SAMPLE CALCULATIONS .....</b>                                       | <b>15</b> |
| SAMPLE CALCULATIONS - CONDUCTED SPURIOUS EMISSIONS.....                | 15        |
| SAMPLE CALCULATIONS –RADIATED FIELD STRENGTH.....                      | 15        |
| SAMPLE CALCULATIONS –RADIATED POWER.....                               | 16        |
| <b>RECEIVER RADIATED SPURIOUS EMISSIONS SPECIFICATION LIMITS .....</b> | <b>17</b> |
| <b>APPENDIX A TEST EQUIPMENT CALIBRATION DATA .....</b>                | <b>1</b>  |
| <b>APPENDIX B TEST DATA .....</b>                                      | <b>2</b>  |
| <b>APPENDIX C PHOTOGRAPHS .....</b>                                    | <b>3</b>  |
| <b>APPENDIX D DETAILED PHOTOGRAPHS.....</b>                            | <b>4</b>  |
| <b>APPENDIX E OPERATOR'S MANUAL.....</b>                               | <b>5</b>  |
| <b>APPENDIX F PARTS LIST .....</b>                                     | <b>6</b>  |

## SCOPE

Tests have been performed on the GE MDS LLC model LCT450, pursuant to the relevant requirements of the following standard(s) in order to obtain device certification against the regulatory requirements of the Federal Communications Commission and Industry Canada.

- Code of Federal Regulations (CFR) Title 47 Part 2
- Industry Canada RSS-Gen Issue 2
- CFR 47 Part 90 (Private Land Mobile Radio Service)
- RSS-119, Issue 10 (Land Mobile and Fixed Radio Transmitters and Receivers, 27.41 to 960 MHz)

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  
ANSI TIA-603-C August 17, 2004

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

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

The test results recorded herein are based on a single type test of the GE MDS LLC model LCT450 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, the device requires certification. Prior to marketing in Canada, Class I transmitters, receivers and transceivers require certification.

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

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

## **STATEMENT OF COMPLIANCE**

The tested sample of GE MDS LLC model LCT450 complied with the requirements of the standards and frequency bands declared in the scope of this test report.

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

## **DEVIATIONS FROM THE STANDARDS**

No deviations were made from the published requirements listed in the scope of this report.

**TEST RESULTS****FCC Part 90 and RSS-119**

| FCC   | Canada                                 | Description   | Measured                     | Limit   | Result |
|---|--|---|------------------------------|---|--------|
| <b>Transmitter Modulation, output power and other characteristics</b>   |  |   |                              |   |        |
| §2.1033 (c) (5)   |  | Frequency range(s)  | 450-512 MHz                  | 450-512 MHz                                     | Pass   |
|   | RSP 100 7.2 (a)<br>RSS 119             | Frequency range(s)  | 450-470 MHz                  | 450-470 MHz                                     | Pass   |
| §2.1033 (c) (6)<br>§2.1033 (c) (7)<br>§2.1046<br>§ 90.279<br>§ 90.205(g)  |  | RF power output at the antenna terminals  | 30.0 dBm to 45.5 dBm         | 47 dBm  | Pass   |
|   | RSP 100 7.2 (a)<br>RSS 119<br>SRSP 501 | RF power output (ERP)   | 36.8 dBm to 51 dBm           | 51 dBm (ERP)                                    | Pass   |
| §2.1033 (c) (4)<br>§2.1047<br>§ 90.207  | RSP 100 7.2 (b) (iii)<br>RSS 119       | Emission types  | FSK (F1D, F2D, F3D)          | Any type  | Pass   |
|   |  | Emission mask   | Refer to Plots               | C, D and E                                      | Pass   |
|   | RSS GEN 4.4.1<br>RSS 119               | 99% Bandwidth   | 16.5 kHz<br>9.3 kHz<br>4 kHz | 20 kHz<br>11.25 kHz<br>6 kHz                    | Pass   |
| §2.1049<br>§ 90.209   |  | Occupied Bandwidth  | 16.5 kHz<br>9.3 kHz<br>4 kHz | 20 kHz<br>11.25 kHz<br>6 kHz                    | Pass   |
| <b>Transmitter spurious emissions</b>   |  |   |                              |   |        |
| §2.1051<br>§2.1057<br>§90.210   | RSS-119 4.2                            | At the antenna terminals (Mask E limit) <sup>2</sup>  | -21.0 dBm<br>-29.0 dBm       | -65dBc<br>-25dBm                                | Pass   |
| §2.1053<br>§2.1057<br>§90.210   | RSS-119 4.2                            | Field strength (Mask E limit) <sup>1</sup>  | -35.5 dBm (ERP)              | -25 dBm   | Pass   |
| <b>Receiver spurious emissions</b>  |  |   |                              |   |        |
| 15.109  | RSS GEN 7.2.3<br>Table 1               | Field strength  | 44.7 dBuV/m                  | See limit table on page 17                      | Pass   |
| <b>Other details</b>  |  |   |                              |   |        |
| §2.1055<br>§90.213  | RSS 119 5.3                            | Frequency stability   | 0.34 ppm                     | 0.5 ppm for base stations with 6.25 kHz spacing | Pass   |
| §90.214   | RSS 119 5.9                            | Transient Frequency Behavior  | Same as original filing      | Refer to standard                               | Pass   |
| §2.1093   | RS 102                                 | RF Exposure   | -                            | Considered at Licensing                         | Pass   |
| §2.1033 (c) (8)   | RSP 100 7.2 (a)                        | Final radio frequency amplifying circuit's dc voltages and currents for normal operation over the power range | Same as original filing      | -   | -      |
| -   | -                                      | Antenna Gain  | 9 dBi                        | -   | -      |
| <b>Notes</b><br>1. Spurious emissions performed at maximum power and complied with the -25dBm Mask E limit.<br>2. $55+10*\log(P)$ limit of -25dBm is the mask E limit for powers at or below 10W. Above 10W, the limit is -65dBc. Therefore spurious emissions were measured at the maximum output power against the -65dBc level and then at the 10W level against the -25dBm limit. |  |   |                              |   |        |

**MEASUREMENT UNCERTAINTIES**

ISO Guide 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2) and were calculated in accordance with NAMAS document NIS 81 and M3003.

| Measurement Type                        | Measurement Unit | Frequency Range                | Expanded Uncertainty         |
|---|------------------|--------------------------------|------------------------------|
| RF frequency                            | Hz               | 25 to 7,000 MHz                | $1.7 \times 10^{-7}$         |
| RF power, conducted                     | dBm              | 25 to 7,000 MHz                | $\pm 0.52$ dB                |
| Conducted emission of transmitter       | dBm              | 25 to 40,000 MHz               | $\pm 0.7$ dB                 |
| Conducted emission of receiver          | dBm              | 25 to 40,000 MHz               | $\pm 0.7$ dB                 |
| Radiated emission (substitution method) | dBm              | 25 to 40,000 MHz               | $\pm 2.5$ dB                 |
| Radiated emission (field strength)      | dB $\mu$ V/m     | 25 to 1,000 MHz<br>1 to 40 GHz | $\pm 3.6$ dB<br>$\pm 6.0$ dB |

**EQUIPMENT UNDER TEST (EUT) DETAILS****GENERAL**

The GE MDS LLC model LCT450 is narrowband (25, 12.5 and 6.25 kHz spacing) wireless transceiver, which is designed to transmit and receive data in the 450 to 512 MHz band using CPFSK modulation. 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, 9 Amps.

The sample was received on March 31, 2010 and tested on March 31, April 2, April 15 and May 20, 2010. The EUT consisted of the following component(s):

| Company    | Model  | Description       | Serial Number  | FCC ID       |
|------------|--------|-------------------|----------------|--------------|
| GE MDS LLC | LCT450 | Digital UHF Radio | Not serialized | E5MDS-LCT450 |

**ENCLOSURE**

The EUT enclosure is primarily constructed of die cast metal. It measures approximately 15.0cm wide by 17.0cm deep by 5.0cm high.

**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 |
|---------|-----------|--------------------|---------------|--------|
| Gateway | Solo 2500 | Laptop             | 0019336184    | DoC    |
| -       | -         | 50 ohm termination | -             | -      |

**EUT INTERFACE PORTS**

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

| Port           | Connected To       | Description | Cable(s)               |           |
|----------------|--------------------|-------------|------------------------|-----------|
|                |                    |             | Shielded or Unshielded | Length(m) |
| Antenna        | 50 ohm Termination | -           | -                      | -         |
| Data Interface | Laptop             | DB25        | Shielded               | 1.5       |
| DC Power       | 13.8V DC Source    | 2 wire      | Unshielded             | 2.0       |

**EUT OPERATION**

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



## ***PROPOSED MODIFICATION DETAILS***

### ***GENERAL***

This section details the modifications to the GE MDS LLC model LCT450 being proposed. All performance and construction deviations from the characteristics originally reported to the FCC are addressed.

Added 6.25 and 25 kHz channel spacing to the radio via software. The original grant was for 12.5 kHz channel spacing only.

Pig tailed the power cable.

Moved the RF connector and change from mini UHF to Full size UHF.

Added a DB9 data connector to remove the console interface from the original DB25 for serial data.

Added high voltage isolation circuits for the DB25 input.

**TESTING****GENERAL INFORMATION**

Antenna port measurements were taken at the Elliott Laboratories test site located at 684 West Maude Ave, Sunnyvale, CA 94085-3518.

Radiated spurious emissions measurements were taken at the Elliott Laboratories Anechoic Chambers and/or Open Area Test Site(s) listed below. The sites conform to the requirements of ANSI C63.4: 2003 *American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz* and CISPR 16-1-4:2007 - *Specification for radio disturbance and immunity measuring apparatus and methods Part 1-4: Radio disturbance and immunity measuring apparatus Ancillary equipment Radiated disturbances*. They are on file with the FCC and industry Canada.

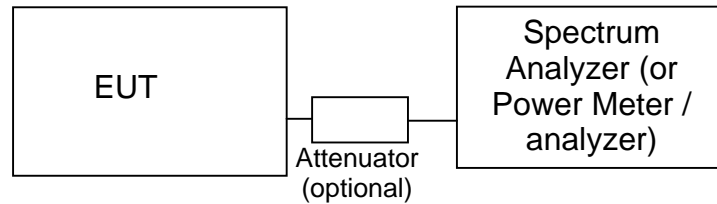
| Site      | Registration Numbers |            | Location  |
|-----------|----------------------|------------|---|
|           | FCC                  | Canada     |   |
| SVOATS #2 | 90593                | IC 2845A-2 | 684 West Maude Ave,<br>Sunnyvale<br>CA 94085-3518 |
| Chamber 3 | 769238               | IC 2845B-3 | 41039 Boyce Road<br>Fremont,<br>CA 94538-2435     |
| Chamber 5 | 211948               | IC 2845B-5 |   |

In the case of Open Area Test Sites, ambient levels are at least 6 dB below the specification limits with the exception of predictable local TV, radio, and mobile communications traffic.

Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements.

**RF PORT MEASUREMENT PROCEDURES**

Conducted measurements are performed with the EUT's rf input/output connected to the input of a spectrum analyzer, power meter or modulation analyzer. When required an attenuator, filter and/or dc block is placed between the EUT and the spectrum analyzer to avoid overloading the front end of the measurement device. Measurements are corrected for the insertion loss of the attenuators and cables inserted between the rf port of the EUT and the measurement equipment.

**Test Configuration for Antenna Port Measurements**

For devices with an integral antenna the output power and spurious emissions are measured as a field strength at a test distance of (typically) 3m and then converted to an eirp using a substitution measurement. All other measurements are made as detailed below but with the test equipment connected to a measurement antenna directed at the EUT.

**OUTPUT POWER**

Output power is measured using a power meter and an average sensor head, a spectrum analyzer or a power meter and peak power sensor head as required by the relevant rule part(s). Where necessary measurements are gated to ensure power is only measured over periods that the device is transmitting.

**BANDWIDTH MEASUREMENTS**

The 6dB, 20dB and/or 26dB signal bandwidth is measured in using the bandwidths recommended by ANSI C63.4. When required, the 99% bandwidth is measured using the methods detailed in RSS GEN. The measurement bandwidth is set to be at least 1% of the instrument's frequency span.

**CONDUCTED SPURIOUS EMISSIONS**

Initial scans are made using a peak detector (RBW=VBW) and using scan rates to ensure that the EUT transmits before the sweep moves out of each resolution bandwidth (for transmit mode measurements). Where the limits are expressed as an average power the spectrum analyzer is tuned to that frequency with a narrow span (wide enough to capture the emission and its sidebands) and the resolution and video bandwidths are adjusted as required by the reference measurement standards. For transmitter measurements the appropriate detector (average, peak, normal, sample, quasi-peak) is used when making measurements for licensed devices. For receiver conducted spurious measurements the detector is set to peak.

**TRANSMITTER MASK MEASUREMENTS**

The transmitter mask measurements are made using resolution bandwidths as specified in the pertinent rule part(s). Where narrower bandwidths are used the measurement is corrected to account for the reduced bandwidth by either using the adjacent channel power function of the spectrum analyzer to sum the power across the required measurement bandwidth. The frequency span of the analyzer is set to ensure the fundamental signal and all significant sidebands are displayed.

The top of the mask may be set by the total output power of the signal, the power of the unmodulated signal or the peak value of the signal in the reference bandwidth being used for the mask measurement.

**FREQUENCY STABILITY**

The EUT is placed inside a temperature chamber with all support and test equipment located outside of the chamber. The temperature is varied across the specified frequency range in 10 degree increments with frequency measurements made at each temperature step. The EUT is allowed enough time to stabilize at each temperature variation.

The spectrum analyzer is configured to give a 5- or 6-digit display for the marker-frequency function. The spectrum analyzer's built-in frequency counter is used to measure the maximum deviation of the fundamental frequency at each temperature. Where possible the device is set to transmit an unmodulated signal. Where this is not possible the frequency drift is determined by finding a stable point on the signal (e.g. the null at the centre of an OFDM signal) or by calculating a centre frequency based on the upper and lower XdB points (where X is typically 6dB or 10dB) on the signal's skirts.

**TRANSIENT FREQUENCY BEHAVIOR:**

The TIA/EIA 603 procedure is used to determine compliance with transient frequency timing requirements as the radio is keyed on and off.

The EUTs rf output is connected via a combiner/splitter to the test receiver/spectrum analyzer and to a diode detector. The test receiver or spectrum analyzer video output is connected to an oscilloscope, which is triggered by the output from the diode detector.

Plots showing Ton, T1, and T2 are made when turning on the transmitter and showing T3 when turning off the transmitter.

## **RADIATED EMISSIONS MEASUREMENTS**

Receiver radiated spurious emissions measurements are made in accordance with ANSI C63.4:2003 by measuring the field strength of the emissions from the device at a specific test distance and comparing them to a field strength limit. Where the field strength limit is specified at a longer distance than the measurement distance the measurement is extrapolated to the limit distance.

Transmitter radiated spurious emissions are initially measured as a field strength. The eirp or erp limit as specified in the relevant rule part(s) is converted to a field strength at the test distance and the emissions from the EUT are then compared to that limit. Emissions within 20dB of this limit are then subjected to a substitution measurement.

All radiated emissions measurements are performed in two phases. A preliminary scan of emissions is conducted in either an anechoic chamber or on an OATS during which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed across the complete frequency range of interest and at each operating frequency identified in the reference standard. One or more of these is with the antenna polarized vertically while the one or more of these is with the antenna polarized horizontally. Initial scans are made using a peak detector (RBW=VBW) and using scan rates to ensure that the EUT transmits before the sweep moves out of each resolution bandwidth (for transmit mode).

During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit. For transmitter spurious emissions, where the limit is expressed as an effective radiated power, the eirp or erp is converted to a field strength limit.

Final measurements are made on an OATS or in a semi-anechoic chamber at the significant frequencies observed during the preliminary scan(s) using the same process of rotating the EUT and raising/lowering the measurement antenna to find the highest level of the emission. The field strength is recorded and, for receiver spurious emissions, compared to the field strength limit. For the final measurement the appropriate detectors (average, peak, normal, sample, quasi-peak) are used. For receiver measurements below 1GHz the detector is a Quasi-Peak detector, above 1GHz a peak detector is used and the peak value (RB=VB=1MHz) and average value (RB=1MHz, VB=10Hz) are recorded.

For transmitter spurious emissions, the radiated power of all emissions within 20dB of the calculated field strength limit are determined using a substitution measurement. The substitution measurement is made by replacing the EUT with an antenna of known gain (typically a dipole antenna or a double-ridged horn antenna), connected to a signal source. The output power of the signal generator is adjusted until the maximum field strength from the substitution antenna is similar to the field strength recorded from the EUT. The erp of the EUT is then calculated.

## **INSTRUMENTATION**

An EMI receiver as specified in CISPR 16-1-1 is used for radiated emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 7000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary.

For measurements above the frequency range of the receivers and for all conducted measurements a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis.

Measurement bandwidths for the test instruments are set in accordance with the requirements of the standards referenced in this document.

Software control is used to correct the measurements for transducer factors (e.g. antenna) and the insertion loss of cables, attenuators and other series elements to obtain the final measurement value. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are exported in a graphic and/or tabular format, as appropriate.

## **FILTERS/ATTENUATORS**

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

## **ANTENNAS**

A combination of biconical, log periodic or bi-log antennas are used to cover the range from 30 MHz to 1000 MHz. Broadband antennas or tuned dipole antennas are used over the entire 25 to 1000 MHz frequency range as the reference antenna for substitution measurements.

Above 1000 MHz, a dual-ridge guide horn antenna or octave horn antenna are used as reference and measurement antennas.

The antenna calibration factors are included in site factors that are programmed into the test receivers and instrument control software when measuring the radiated field strength.

## **ANTENNA MAST AND EQUIPMENT TURNTABLE**

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height.

Table mounted devices are placed on a non-conductive table at a height of 80 centimeters above the floor. Floor mounted equipment is placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. The EUT is positioned on a motorized turntable to allow it to be rotated during testing to determine the angle with the highest level of emissions.

**SAMPLE CALCULATIONS****SAMPLE CALCULATIONS - CONDUCTED SPURIOUS EMISSIONS**

Measurements are compared directly to the conducted emissions specification limit (decibel form). The calculation is as follows:

$$R_r - S = M$$

where:

$$\begin{aligned} R_r &= \text{Measured value in dBm} \\ S &= \text{Specification Limit in dBm} \\ M &= \text{Margin to Specification in +/- dB} \end{aligned}$$

**SAMPLE CALCULATIONS - RADIATED FIELD STRENGTH**

Measurements of radiated field strength are compared directly to the specification limit (decibel form). The receiver and/or control software corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

A distance factor is used when measurements are made at a test distance that is different to the specified limit distance by using the following formula:

$$F_d = 20 * \log_{10} (D_m/D_s)$$

where:

$$\begin{aligned} F_d &= \text{Distance Factor in dB} \\ D_m &= \text{Measurement Distance in meters} \\ D_s &= \text{Specification Distance in meters} \end{aligned}$$

For electric field measurements below 30MHz the extrapolation factor is either determined by making measurements at multiple distances or a theoretical value is calculated using the formula:

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

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

- $R_r$  = Receiver Reading in dBuV/m  
 $F_d$  = Distance Factor in dB  
 $R_c$  = Corrected Reading in dBuV/m  
 $L_s$  = Specification Limit in dBuV/m  
 $M$  = Margin in dB Relative to Spec

#### **SAMPLE CALCULATIONS –RADIATED POWER**

The erp/eirp limits for transmitter spurious measurements are converted to a field strength in free space using the following formula:

$$E = \frac{\sqrt{30 P G}}{d}$$

where:

- $E$  = Field Strength in V/m  
 $P$  = Power in Watts  
 $G$  = Gain of isotropic antenna (numeric gain) = 1  
 $D$  = measurement distance in meters

The field strength limit is then converted to decibel form (dBuV/m) and the margin of a given emission peak relative to the limit is calculated (refer to *SAMPLE CALCULATIONS –RADIATED FIELD STRENGTH*).

When substitution measurements are required (all signals with less than 20dB of margin relative to the calculated field strength limit) the eirp of the spurious emission is calculated using:

$$P_{EUT} = P_s - (E_s - E_{EUT})$$

and

$$P_s = G + P_{in}$$

where:

- $P_s$  = effective isotropic radiated power of the substitution antenna (dBm)  
 $P_{in}$  = power input to the substitution antenna (dBm)  
 $G$  = gain of the substitution antenna (dBi)  
 $E_s$  = field strength the substitution antenna (dBm) at eirp  $P_s$   
 $E_{EUT}$  = field strength measured from the EUT

Where necessary the effective isotropic radiated power is converted to effective radiated power by subtracting the gain of a dipole (2.2dBi) from the eirp value.



**RECEIVER RADIATED SPURIOUS EMISSIONS SPECIFICATION LIMITS**

The table below shows the limits for the spurious emissions from receivers as detailed in FCC Part 15.109, RSS 210 Table 2, RSS GEN Table 1 and RSS 310 Table 3. Note that receivers operating outside of the frequency range 30 MHz – 960 MHz are exempt from the requirements of 15.109.

| Frequency Range (MHz) | Limit (uV/m @ 3m) | Limit (dBuV/m @ 3m) |
|-----------------------|-------------------|---------------------|
| 30 to 88              | 100               | 40                  |
| 88 to 216             | 150               | 43.5                |
| 216 to 960            | 200               | 46.0                |
| Above 960             | 500               | 54.0                |

## Appendix A Test Equipment Calibration Data

### Radiated Emissions, 30 - 1000 MHz, 31-Mar-10

| <u>Manufacturer</u> | <u>Description</u>             | <u>Model</u> | <u>Asset #</u> | <u>Cal Due</u> |
|---------------------|--------------------------------|--------------|----------------|----------------|
| Com-Power Corp.     | Preamplifier, 30-1000 MHz      | PA-103       | 1543           | 9/2/2010       |
| Sunol Sciences      | Biconilog, 30-3000 MHz         | JB3          | 1548           | 6/13/2010      |
| Rohde & Schwarz     | EMI Test Receiver, 20 Hz-7 GHz | ESIB7        | 1756           | 3/16/2011      |

### Radiated Emissions, 1000 - 1,600 MHz, 31-Mar-10

| <u>Manufacturer</u> | <u>Description</u>                     | <u>Model</u>   | <u>Asset #</u> | <u>Cal Due</u> |
|---------------------|--|----------------|----------------|----------------|
| Hewlett Packard     | Microwave Preamplifier, 1-26.5GHz      | 8449B          | 785            | 6/3/2010       |
| Hewlett Packard     | EMC Spectrum Analyzer, 9 kHz - 6.5 GHz | 8595EM         | 787            | 5/18/2010      |
| EMCO                | Antenna, Horn, 1-18GHz                 | 3115           | 868            | 6/10/2010      |
| Hewlett Packard     | SpecAn 30 Hz -40 GHz, SV (SA40) Red    | 8564E (84125C) | 1148           | 4/12/2010      |
| EMCO                | LISN, 10 kHz-100 MHz                   | 3825/2         | 1292           | 3/12/2011      |
| EMCO                | LISN, 10 kHz-100 MHz                   | 3825/2         | 1293           | 3/12/2011      |
| Rohde & Schwarz     | Test Receiver, 9 kHz-2750 MHz          | ESCS 30        | 1337           | 11/11/2010     |
| Rohde & Schwarz     | Pulse Limiter                          | ESH3 Z2        | 1593           | 6/9/2010       |

### Radio Antenna Port (Power and Spurious Emissions), 02-Apr-10

| <u>Manufacturer</u> | <u>Description</u>                                      | <u>Model</u>   | <u>Asset #</u> | <u>Cal Due</u> |
|---------------------|---|----------------|----------------|----------------|
| Hewlett Packard     | SpecAn 9 kHz - 40 GHz, FT (SA40) Blue                   | 8564E (84125C) | 1393           | 4/10/2010      |
| Rohde & Schwarz     | Power Sensor 100 uW - 2 Watts (w/ 20 dB pad, SN BJ5155) | NRV-Z32        | 1536           | 9/2/2010       |
| Rohde & Schwarz     | Power Meter, Dual Channel                               | NRVD           | 1786           | 2/5/2011       |

### Radiated Emissions, 30 - 5,120 MHz, 15-Apr-10

| <u>Manufacturer</u> | <u>Description</u>                | <u>Model</u> | <u>Asset #</u> | <u>Cal Due</u> |
|---------------------|-----------------------------------|--------------|----------------|----------------|
| EMCO                | Antenna, Horn, 1-18 GHz           | 3115         | 786            | 12/11/2011     |
| Hewlett Packard     | Microwave Preamplifier, 1-26.5GHz | 8449B        | 870            | 8/19/2010      |
| Rohde & Schwarz     | Test Receiver, 9 kHz-2750 MHz     | ESCS 30      | 1337           | 11/11/2010     |
| EMCO                | Log Periodic Antenna, 0.2-2 GHz   | 3148         | 1595           | 7/23/2010      |
| Hewlett Packard     | 9kHz-40GHz Analyzer               | 8564E        | 2190           | 6/8/2010       |

### Radiated and Conducted Emissions, 30 - 5,120 MHz, 20-May-10

| <u>Manufacturer</u> | <u>Description</u>  | <u>Model</u> | <u>Asset #</u> | <u>Cal Due</u> |
|---------------------|---|--------------|----------------|----------------|
| Rohde & Schwarz     | Test Receiver, 9 kHz-2750 MHz   | ESCS 30      | 1337           | 11-Nov-10      |
| EMCO                | Log Periodic Antenna, 0.2-2 GHz   | 3148         | 1347           | 02-Feb-11      |
| EMCO                | Biconical Antenna, 30-300 MHz   | 3110B        | 1497           | 15-Sep-10      |
| Agilent             | PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX, | E4446A       | 2139           | 06-Jan-11      |

## ***Appendix B Test Data***

T78830 43 Pages



## EMC Test Data

|                        |                             |                  |             |
|------------------------|-----------------------------|------------------|-------------|
| Client:                | GE MDS LLC                  | Job Number:      | J78683      |
| Model:                 | LCT450                      | T-Log Number:    | T78830      |
|                        |                             | 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

**LCT450**

Date of Last Test: 5/20/2010



## Radio Test Data

|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | N/A         |

### RSS 119 and FCC Part 90 Power 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: 4/2/2010  
Test Engineer: David Bare  
Test Location: Chamber #2

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

#### General Test Configuration

The EUT was connected to the spectrum analyzer or power meter via a suitable attenuator.

All measurements have been corrected to allow for the external attenuators used.

**Ambient Conditions:**  
Temperature: 21 °C  
Rel. Humidity: 44 %

#### Summary of Results

| Run # | Test Performed  | Limit                            | Pass / Fail | Result / Margin                   |
|-------|---|----------------------------------|-------------|-----------------------------------|
| 1     | Maximim Output Power                                    | FCC Part 90                      | Pass        | Max Power = 45.5 dBm,<br>35.5 W   |
| 2     | Antenna Port Conducted Spurious Emissions 30 - 5500 MHz | FCC Part 90                      | Pass        | -21.0dBm @<br>1350.20MHz (-1.0dB) |
| 3     | 99% Bandwidth   | -                                | N/A         | Refer to tables                   |
| 4     | Unwanted emissions (Mask)                               | FCC Part 90 - Mask C,<br>D and E | Pass        | Complied with mask                |

#### 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:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | N/A         |

**Run #1: Maximum Power Measurements, FSK modulated, 25 kHz channel**

Power settings from 1 to 30 are available corresponding to 1 to 30 Watts.

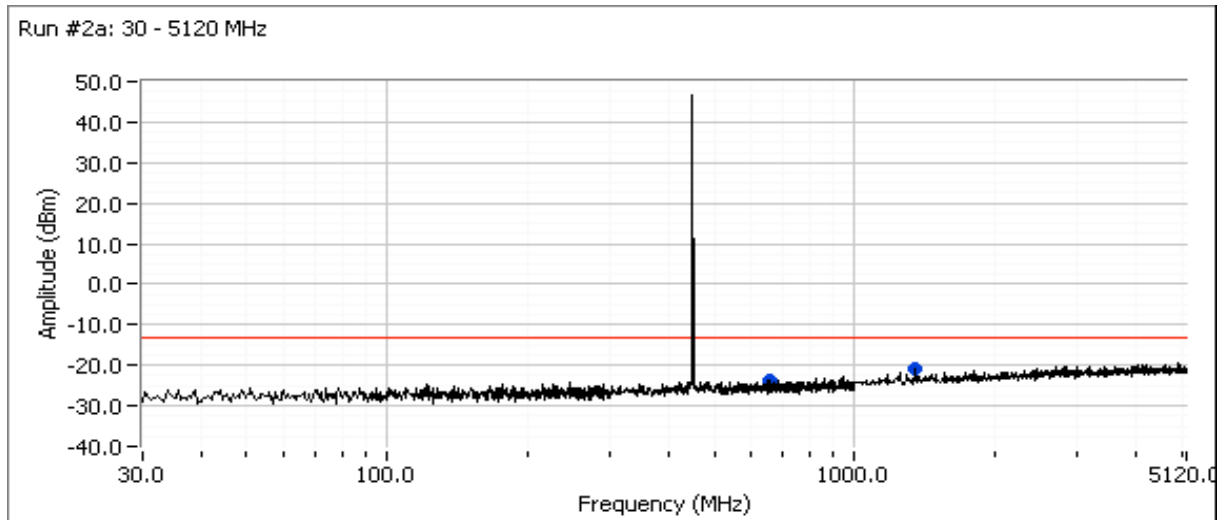
| Freq. | Setting <sup>2</sup> | Pmeas (dBm) | Duty Cycle | Pout |
|-------|----------------------|-------------|------------|------|
| 450   | 30                   | 45.5        | 100%       | 45.5 |
| 481   | 30                   | 45.5        | 100%       | 45.5 |
| 512   | 30                   | 45.5        | 100%       | 45.5 |

Setting: software power setting of EUT

Pmeas: Measured output power (PEP) using power meter

Duty Cycle: Duty cycle of transmissions

|         |   |
|---------|---|
| Note 1: | Output power measured using a peak power meter  |
| Note 2: | Power setting - the software power setting used during testing, included for reference only.  |
| Note 3: | Power setting used produced the closest power to original test data and was used for maximum power unwanted emissions tests. Original maximum power was 32 watts or 45.1 dBm. |

**Run #2: Antenna Port Conducted Spurious Emissions 30 - 5120 MHz, FSK modulated, 25 kHz channel**
**Run #2a: 450 MHz with power setting of 30**


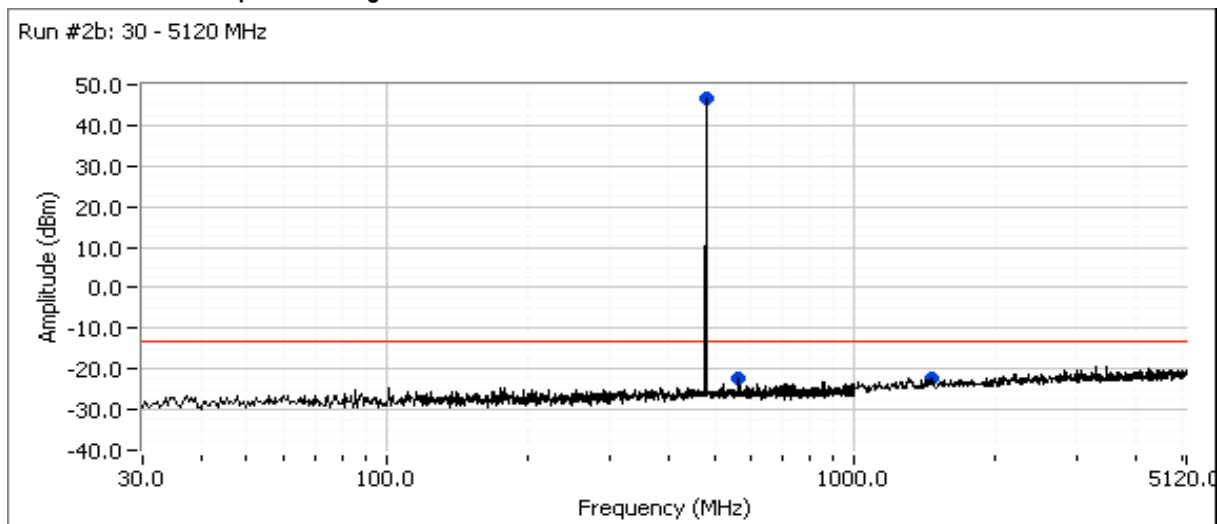
| Frequency MHz | Level dBm | Port    | FCC Part 90 Limit | FCC Part 90 Margin | Detector | Channel | Mode | Comments |
|---------------|-----------|---------|-------------------|--------------------|----------|---------|------|----------|
| 450.000       | 46.4      | RF Port | N/A               | -                  | Peak     |         |      |          |
| 654.667       | -23.7     | RF Port | -20.0             | -3.7               | Peak     |         |      |          |
| 1350.200      | -21.0     | RF Port | -20.0             | -1.0               | Peak     |         |      |          |



## Radio Test Data

|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | N/A         |

### Run #2b: 481MHz with power setting of 30



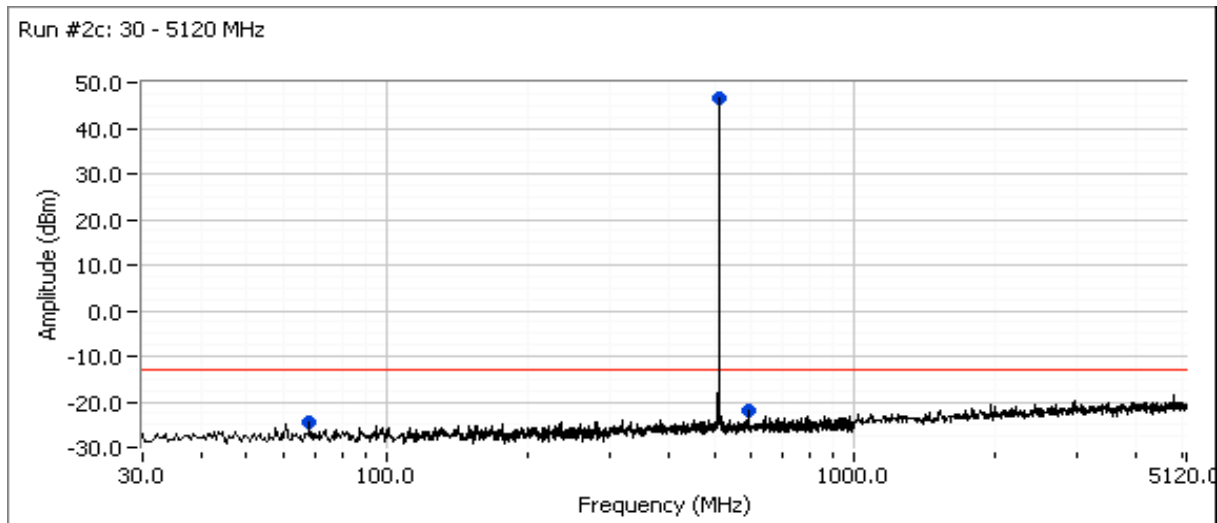
| Frequency<br>MHz | Level<br>dBm | Port    | FCC Part 90 |        | Detector | Channel | Mode | Comments |
|------------------|--------------|---------|-------------|--------|----------|---------|------|----------|
|                  |              |         | Limit       | Margin |          |         |      |          |
| 481.014          | 46.7         | RF Port | N/A         | -      | Peak     |         |      |          |
| 563.207          | -22.5        | RF Port | -20.0       | -2.5   | Peak     |         |      |          |
| 1443.000         | -22.3        | RF Port | -20.0       | -2.3   | Peak     |         |      |          |



## Radio Test Data

|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | N/A         |

### Run #2c: 512 MHz with power setting of 30



| Frequency<br>MHz | Level<br>dBm | Port    | FCC Part 90 |        | Detector | Channel | Mode | Comments |
|------------------|--------------|---------|-------------|--------|----------|---------|------|----------|
|                  |              |         | Limit       | Margin |          |         |      |          |
| 512.013          | 46.8         | RF Port | N/A         | -      | Peak     |         |      |          |
| 594.210          | -21.9        | RF Port | -20.0       | -1.9   | Peak     |         |      |          |
| 68.151           | -24.3        | RF Port | -20.0       | -4.3   | Peak     |         |      |          |

Note 1: Limits on Plots are for 25 and 12.5 kHz channel spacings. Limit for 6.25 kHz channel spacing is -20 dBm (-65dBc) as listed in the tabular data





## Radio Test Data

|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | N/A         |

### Run #3a: Signal Bandwidth, 25kHz

| Power Setting | Frequency (MHz) | Resolution Bandwidth | Bandwidth (kHz)<br>99% |
|---------------|-----------------|----------------------|------------------------|
| 30            | 450             | 300 Hz               | 16.0                   |
| 30            | 481             | 300 Hz               | 16.5                   |
| 30            | 512             | 300 Hz               | 16.5                   |

### Run #3b: Signal Bandwidth, 12.5kHz

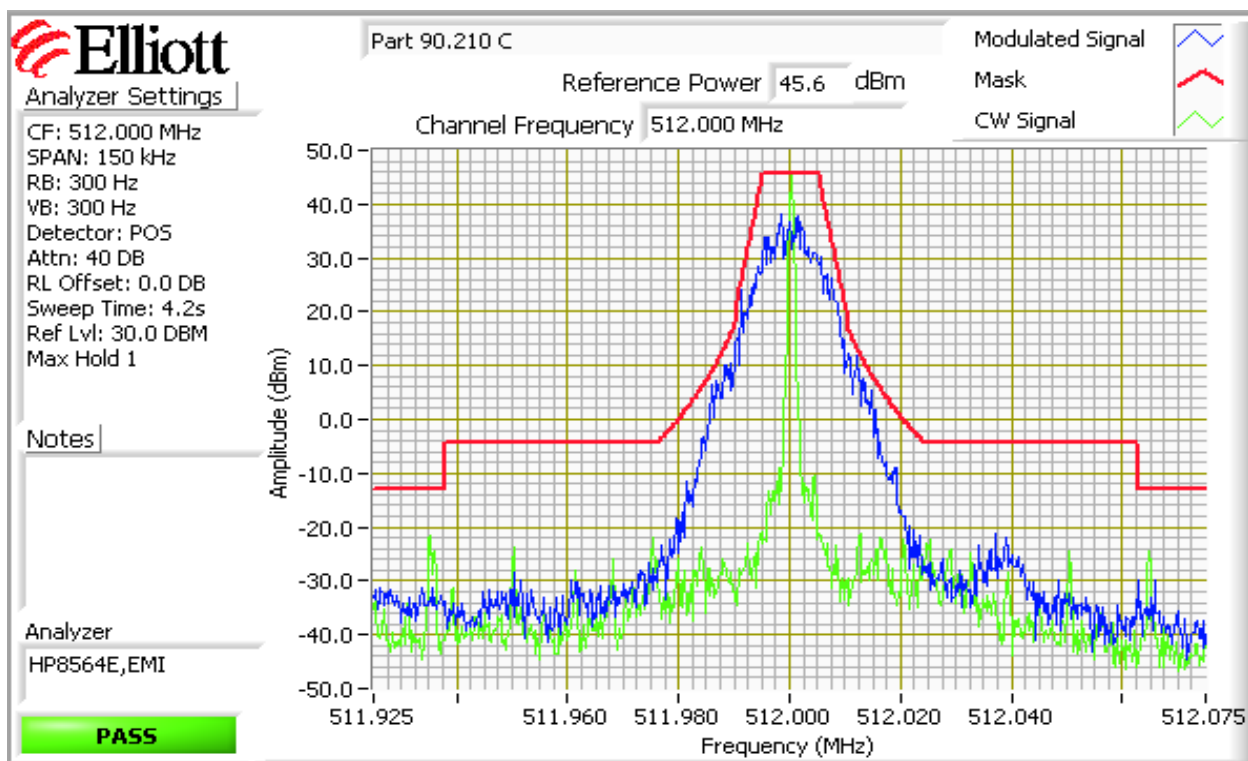
| Power Setting | Frequency (MHz) | Resolution Bandwidth | Bandwidth (kHz)<br>99% |
|---------------|-----------------|----------------------|------------------------|
| 30            | 450             | 300 Hz               | 9.1                    |
| 30            | 481             | 300 Hz               | 9.2                    |
| 30            | 512             | 300 Hz               | 9.3                    |

### Run #3c: Signal Bandwidth, 6.25kHz

| Power Setting | Frequency (MHz) | Resolution Bandwidth | Bandwidth (kHz)<br>99% |
|---------------|-----------------|----------------------|------------------------|
| 30            | 450             | 300 Hz               | 3.6                    |
| 30            | 481             | 300 Hz               | 3.8                    |
| 30            | 512             | 300 Hz               | 4.0                    |

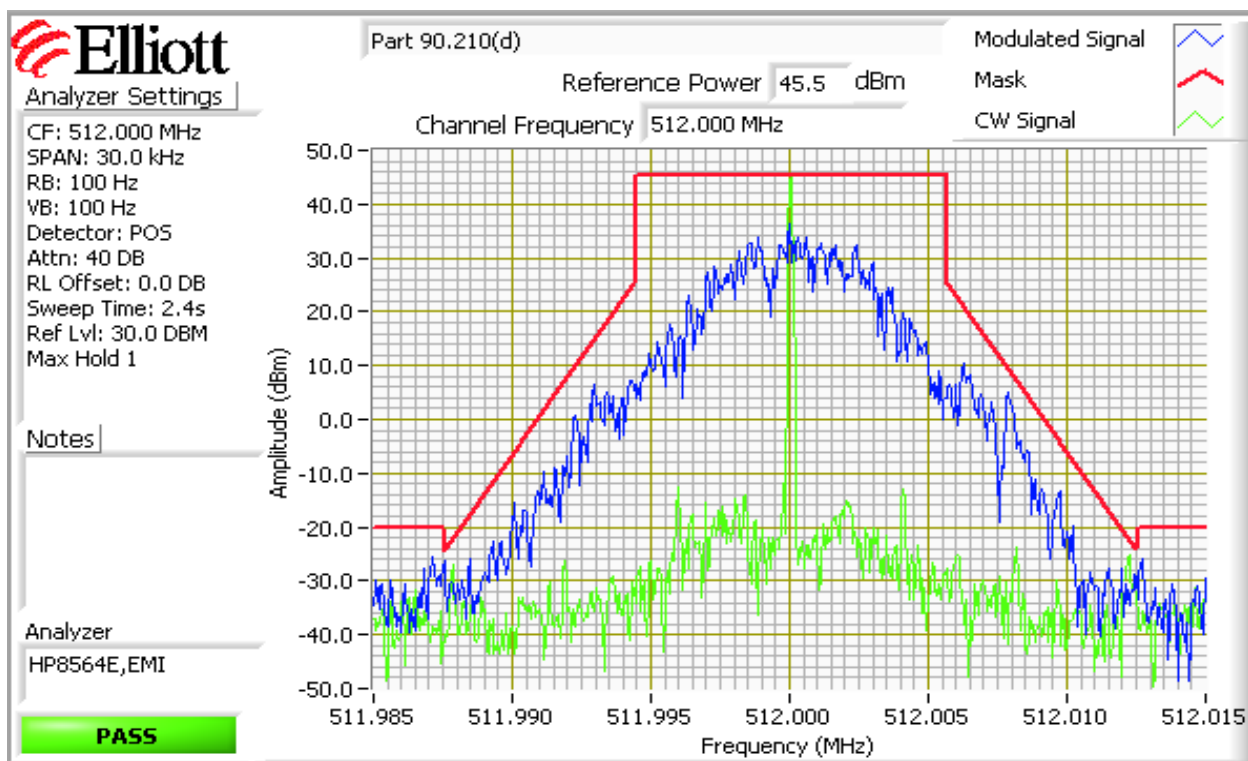
|                                       |                              |
|---------------------------------------|------------------------------|
| Client: GE MDS LLC                    | Job Number: J78683           |
| Model: LCT450                         | T-Log Number: T78830         |
| Contact: Dennis McCarthy              | Account Manager: Susan Pelzl |
| Standard: RSS 119, FCC Part 90 and 15 | Class: N/A                   |

**Run #4a: Unwanted emissions (Masks) 90.210(c), 25kHz**  
30 Watts



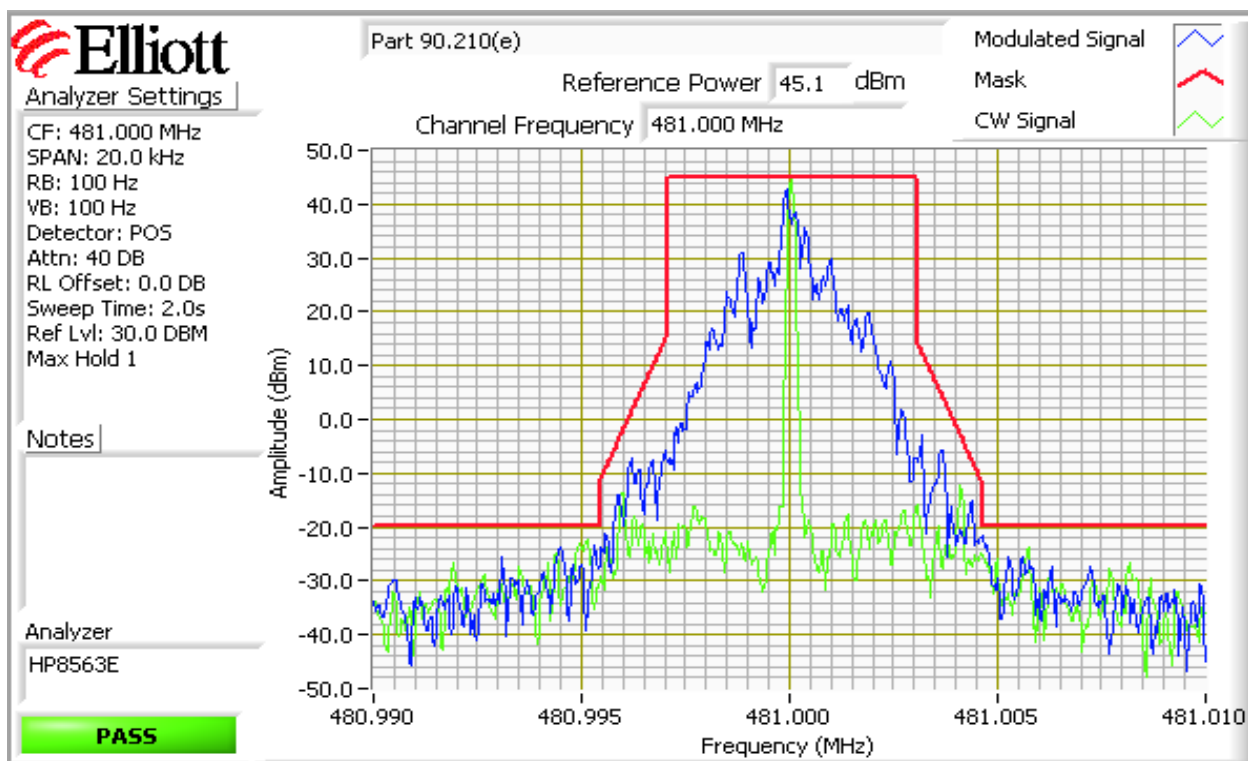
|                                       |                              |
|---------------------------------------|------------------------------|
| Client: GE MDS LLC                    | Job Number: J78683           |
| Model: LCT450                         | T-Log Number: T78830         |
| Contact: Dennis McCarthy              | Account Manager: Susan Pelzl |
| Standard: RSS 119, FCC Part 90 and 15 | Class: N/A                   |

**Run #4b: Unwanted emissions (Masks) 90.210(d), 12.5 kHz**  
30 watts



|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | N/A         |

**Run #4c: Unwanted emissions (Masks) 90.210(e), 6.25 kHz**  
30 watts





## Radio Test Data

|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | N/A         |

### RSS 119 and FCC Part 90 Power 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: 5/20/2010  
Test Engineer: David Bare  
Test Location: Environ #1

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

#### General Test Configuration

The EUT was connected to the spectrum analyzer or power meter via a suitable attenuator.

All measurements have been corrected to allow for the external attenuators used.

**Ambient Conditions:**  
Temperature: 19 °C  
Rel. Humidity: 41 %

#### Summary of Results

| Run # | Test Performed  | Limit                         | Pass / Fail | Result / Margin               |
|-------|---|-------------------------------|-------------|-------------------------------|
| 1     | Output Power  | FCC Part 90                   | Pass        | Power = 40.1 dBm, 10.2 W      |
| 2     | Antenna Port Conducted Spurious Emissions 30 - 5120 MHz | FCC Part 90                   | Pass        | -29.0dBm @ 429.80MHz (-4.0dB) |
| 3     | Unwanted emissions (Mask)                               | FCC Part 90 - Mask C, D and E | Pass        | Complied with mask            |

#### 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:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | N/A         |

**Run #1: Power Measurements, FSK modulated, 25 kHz channel**

Power settings from 1 to 30 are available corresponding to 1 to 30 Watts.

| Freq. | Setting <sup>2</sup> | Pmeas (dBm) | Duty Cycle | Pout |
|-------|----------------------|-------------|------------|------|
| 450   | 10                   | 40.0        | 100%       | 40.0 |
| 481   | 10                   | 40.1        | 100%       | 40.1 |
| 512   | 10                   | 40.1        | 100%       | 40.1 |

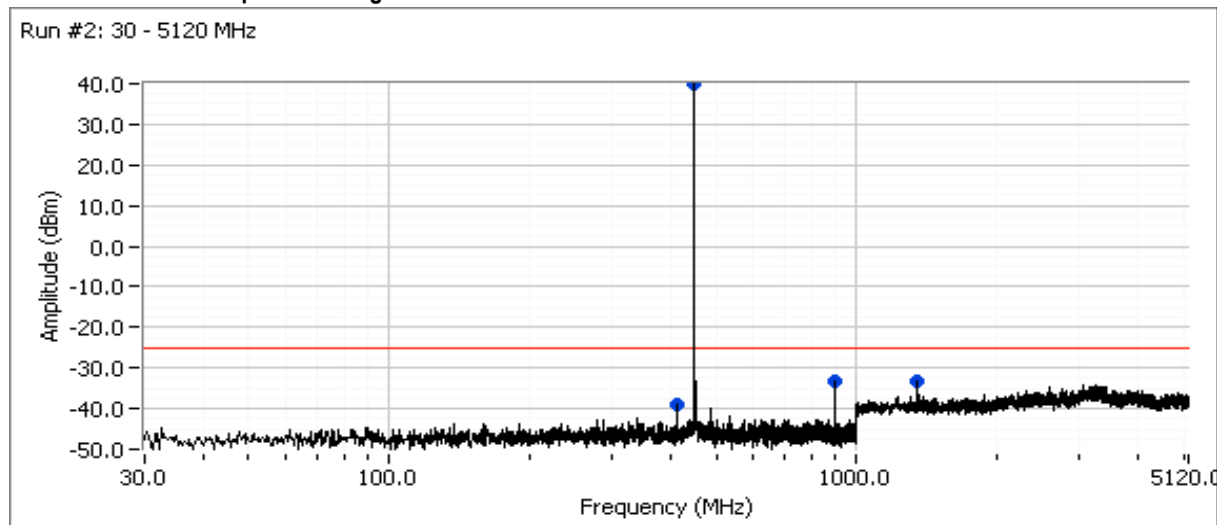
Setting: software power setting of EUT

Pmeas: Measured output power (PEP) using power meter

Duty Cycle: Duty cycle of transmissions

Note 1: Output power measured using a peak power meter

Note 2: Power setting - the software power setting used during testing, included for reference only.

**Run #2: Antenna Port Conducted Spurious Emissions 30 - 5120 MHz, FSK modulated, 25 kHz channel**
**Run #2a: 450 MHz with power setting of 10**


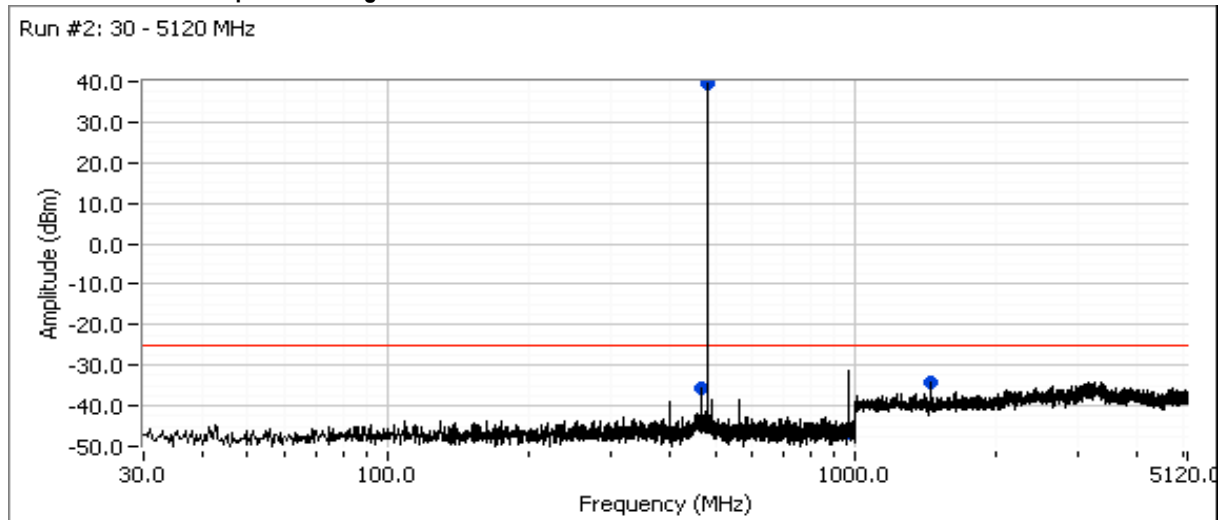
| Frequency MHz | Level dBm | Port    | FCC Part 90 Limit | FCC Part 90 Margin | Detector | Channel | Mode | Comments |
|---------------|-----------|---------|-------------------|--------------------|----------|---------|------|----------|
| 411.003       | -38.9     | RF Port | -25.0             | -13.9              | Peak     |         |      |          |
| 449.999       | 39.9      | RF Port | N/A               | -                  | Peak     |         |      |          |
| 900.003       | -33.3     | RF Port | -25.0             | -8.3               | Peak     |         |      |          |
| 1350.000      | -33.2     | RF Port | -25.0             | -8.2               | Peak     |         |      |          |



## Radio Test Data

|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | N/A         |

### Run #2b: 481MHz with power setting of 10



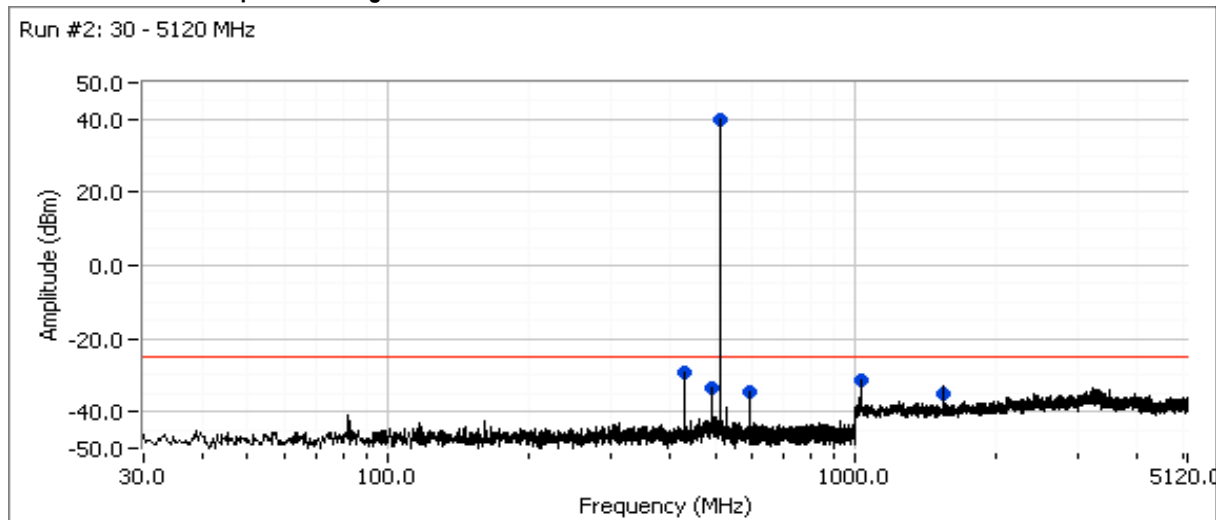
| Frequency<br>MHz | Level<br>dBm | Port    | FCC Part 90 |        | Detector | Channel | Mode | Comments |
|------------------|--------------|---------|-------------|--------|----------|---------|------|----------|
|                  |              |         | Limit       | Margin |          |         |      |          |
| 468.799          | -35.4        | RF Port | -25.0       | -10.4  | Peak     |         |      |          |
| 481.001          | 39.7         | RF Port | N/A         | -      | Peak     |         |      |          |
| 962.003          | -46.8        | RF Port | -25.0       | -21.8  | Peak     |         |      |          |
| 1443.050         | -34.1        | RF Port | -25.0       | -9.1   | Peak     |         |      |          |



## Radio Test Data

|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | N/A         |

### Run #2c: 512 MHz with power setting of 10



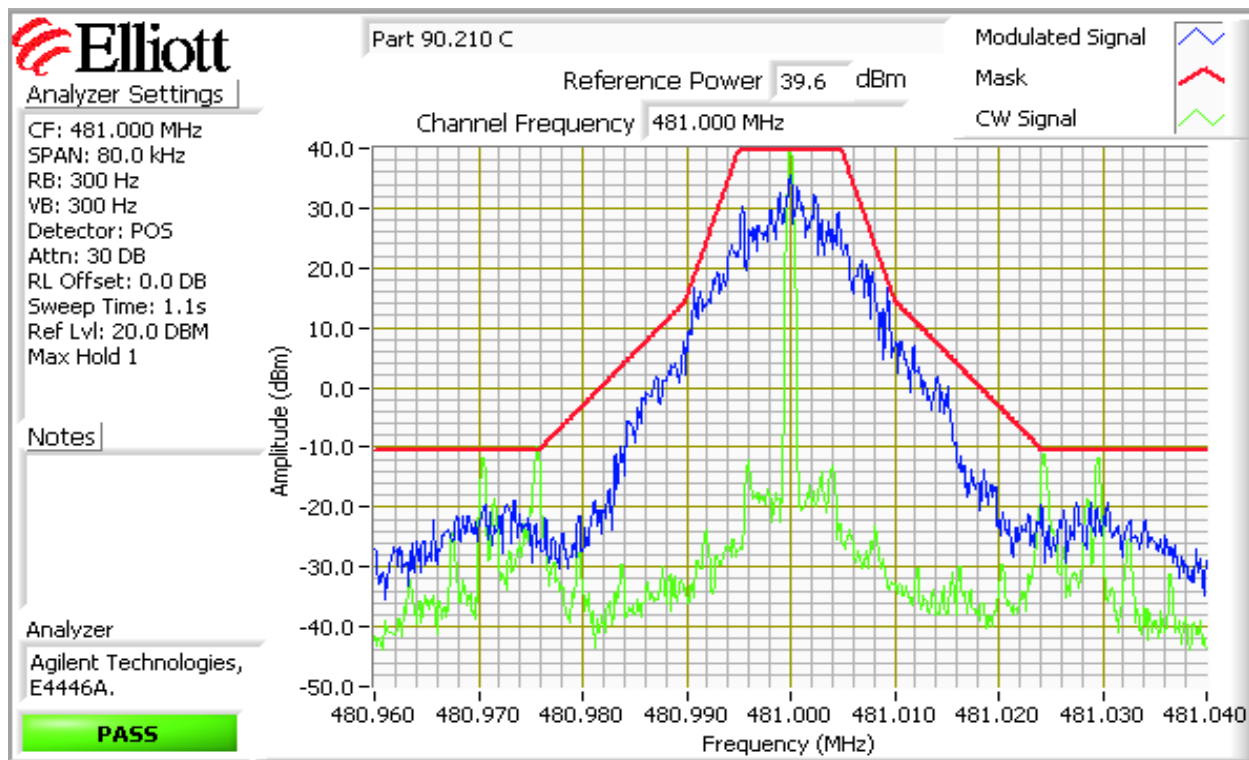
| Frequency<br>MHz | Level<br>dBm | Port    | FCC Part 90 |        | Detector | Channel | Mode | Comments |
|------------------|--------------|---------|-------------|--------|----------|---------|------|----------|
|                  |              |         | Limit       | Margin |          |         |      |          |
| 429.801          | -29.0        | RF Port | -25.0       | -4.0   | Peak     |         |      |          |
| 493.200          | -33.6        | RF Port | -25.0       | -8.6   | Peak     |         |      |          |
| 512.002          | 40.1         | RF Port | N/A         | -      | Peak     |         |      |          |
| 594.205          | -34.6        | RF Port | -25.0       | -9.6   | Peak     |         |      |          |
| 1024.020         | -31.5        | RF Port | -25.0       | -6.5   | Peak     |         |      |          |
| 1536.010         | -34.9        | RF Port | -25.0       | -9.9   | Peak     |         |      |          |



|                                       |                              |
|---------------------------------------|------------------------------|
| Client: GE MDS LLC                    | Job Number: J78683           |
| Model: LCT450                         | T-Log Number: T78830         |
| Contact: Dennis McCarthy              | Account Manager: Susan Pelzi |
| Standard: RSS 119, FCC Part 90 and 15 | Class: N/A                   |

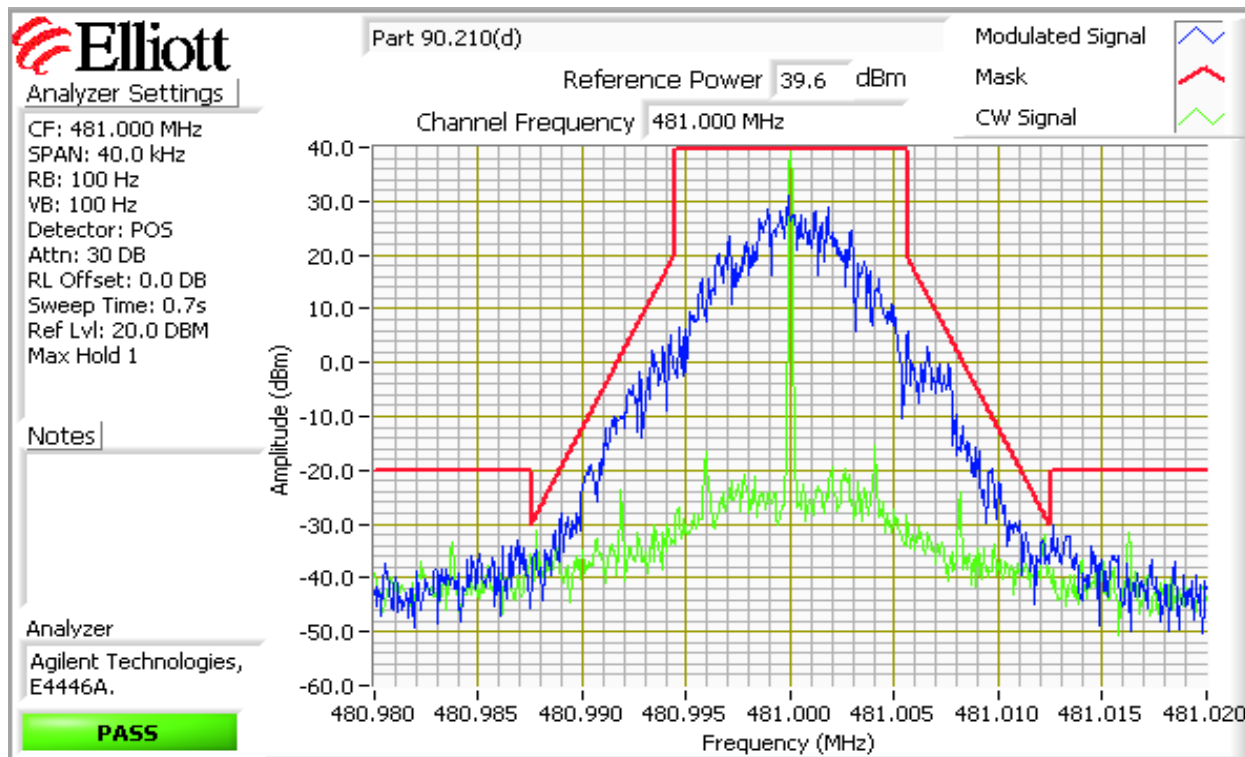
### Run #3a: Unwanted emissions (Masks) 90.210(c), 25kHz

10 watts



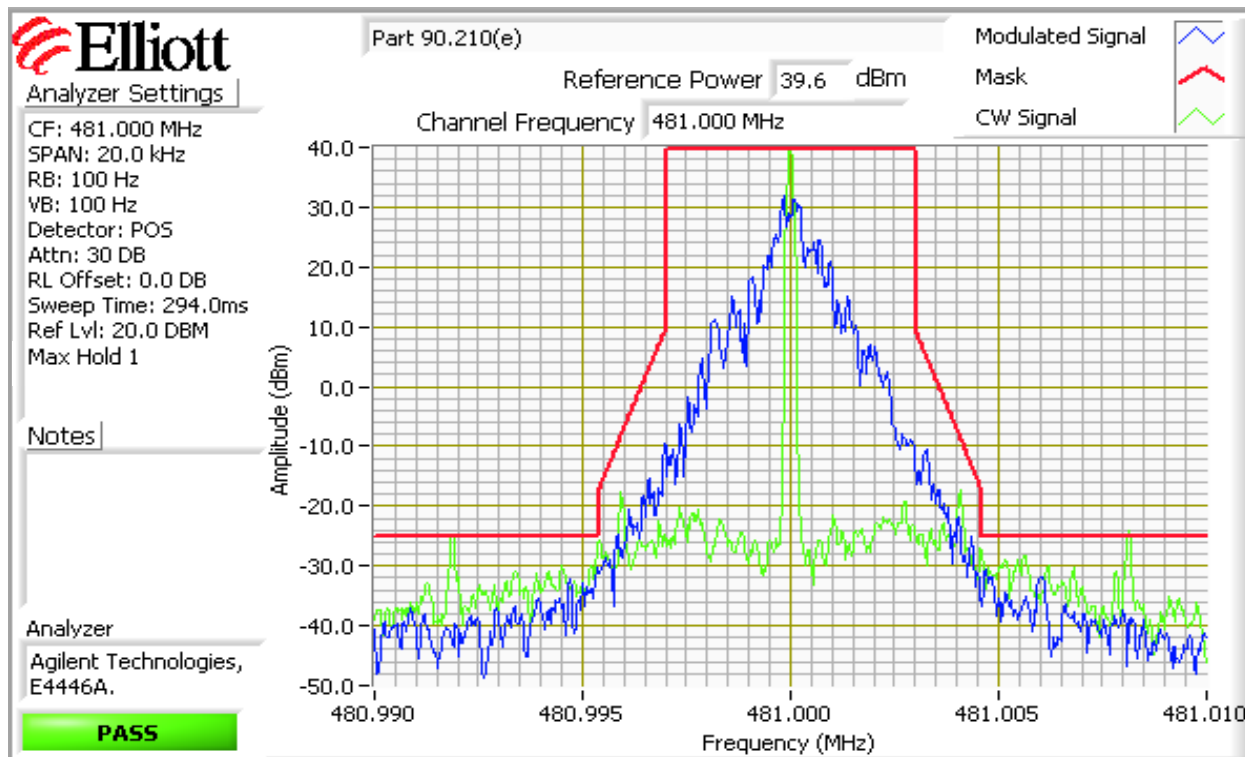
|                                       |                              |
|---------------------------------------|------------------------------|
| Client: GE MDS LLC                    | Job Number: J78683           |
| Model: LCT450                         | T-Log Number: T78830         |
| Contact: Dennis McCarthy              | Account Manager: Susan Pelzl |
| Standard: RSS 119, FCC Part 90 and 15 | Class: N/A                   |

**Run #3b: Unwanted emissions (Masks) 90.210(d), 12.5 kHz**  
10 watts



|                                       |                              |
|---------------------------------------|------------------------------|
| Client: GE MDS LLC                    | Job Number: J78683           |
| Model: LCT450                         | T-Log Number: T78830         |
| Contact: Dennis McCarthy              | Account Manager: Susan Pelzi |
| Standard: RSS 119, FCC Part 90 and 15 | Class: N/A                   |

**Run #3c: Unwanted emissions (Masks) 90.210(e), 6.25 kHz**  
10 watts





## Radio Test Data

|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | N/A         |

### RSS 119 and FCC Part 90 Power 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: 5/20/2010  
Test Engineer: David Bare  
Test Location: Environ #1

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

#### General Test Configuration

The EUT was connected to the spectrum analyzer or power meter via a suitable attenuator.

All measurements have been corrected to allow for the external attenuators used.

**Ambient Conditions:**  
Temperature: 19 °C  
Rel. Humidity: 41 %

#### Summary of Results

| Run # | Test Performed  | Limit                            | Pass / Fail | Result / Margin                   |
|-------|---|----------------------------------|-------------|-----------------------------------|
| 1     | Minimum Output Power                                    | FCC Part 90                      | Pass        | Min Power = 30.0 dBm,<br>1.0 W    |
| 2     | Antenna Port Conducted Spurious Emissions 30 - 5120 MHz | FCC Part 90                      | Pass        | -36.3dBm @<br>429.79MHz (-11.3dB) |
| 3     | Unwanted emissions (Mask)                               | FCC Part 90 - Mask C,<br>D and E | Pass        | Complied with mask                |

#### 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:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | N/A         |

**Run #1: Minimum Power Measurements, FSK modulated, 25 kHz channel**

Power settings from 1 to 30 are available corresponding to 1 to 30 Watts.

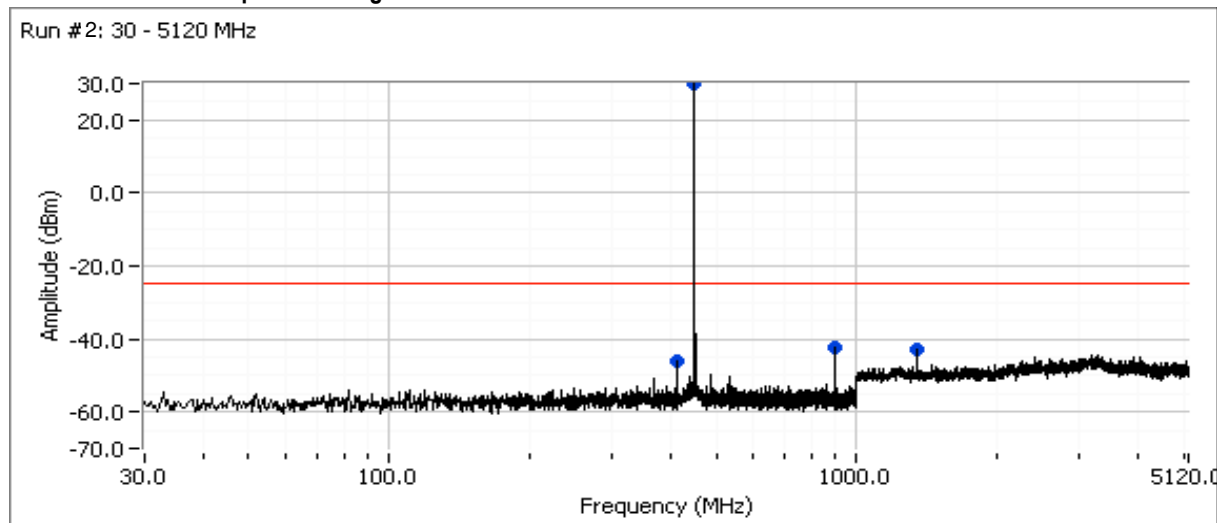
| Freq. | Setting <sup>2</sup> | Pmeas (dBm) | Duty Cycle | Pout |
|-------|----------------------|-------------|------------|------|
| 450   | 1                    | 30.0        | 100%       | 30.0 |
| 481   | 1                    | 29.9        | 100%       | 29.9 |
| 512   | 1                    | 30.0        | 100%       | 30.0 |

Setting: software power setting of EUT

Pmeas: Measured output power (PEP) using power meter

Duty Cycle: Duty cycle of transmissions

|         |  |
|---------|--|
| Note 1: | Output power measured using a peak power meter   |
| Note 2: | Power setting - the software power setting used during testing, included for reference only. |
| Note 3: | Normal minimum power is 5 watts but the radio can be set to 1 watt for certain applications. |

**Run #2: Antenna Port Conducted Spurious Emissions 30 - 5120 MHz, FSK modulated, 25 kHz channel**
**Run #2a: 450 MHz with power setting of 1**


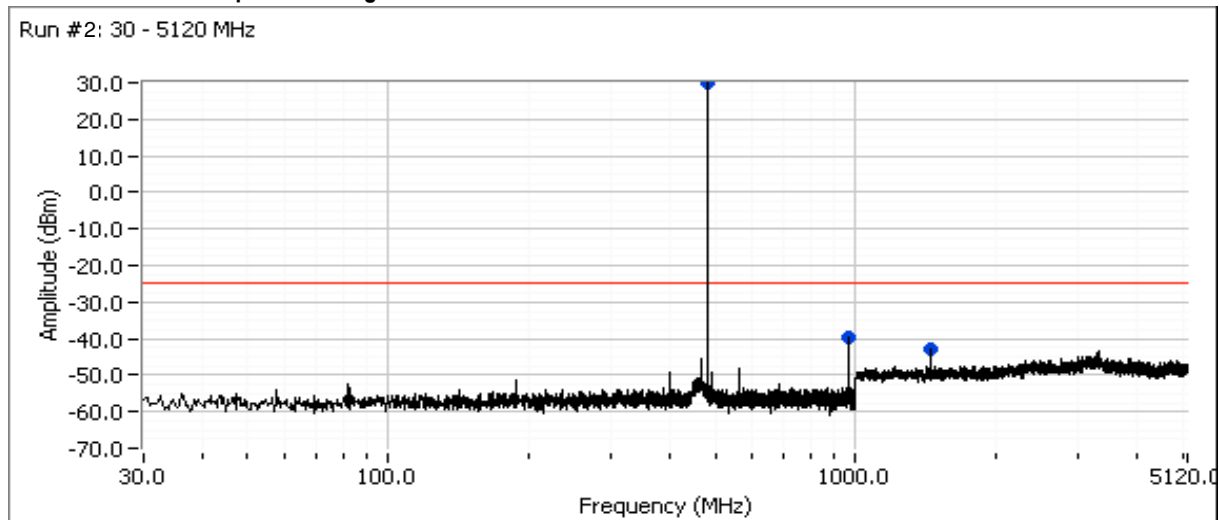
| Frequency MHz | Level dBm | Port    | FCC Part 90 Limit | FCC Part 90 Margin | Detector | Channel | Mode | Comments |
|---------------|-----------|---------|-------------------|--------------------|----------|---------|------|----------|
| 411.017       | -46.2     | RF Port | -25.0             | -21.2              | Peak     |         |      |          |
| 449.999       | 30.2      | RF Port | N/A               | -                  | Peak     |         |      |          |
| 900.003       | -42.2     | RF Port | -25.0             | -17.2              | Peak     |         |      |          |
| 1350.020      | -42.7     | RF Port | -25.0             | -17.7              | Peak     |         |      |          |



## Radio Test Data

|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | N/A         |

### Run #2b: 481MHz with power setting of 1



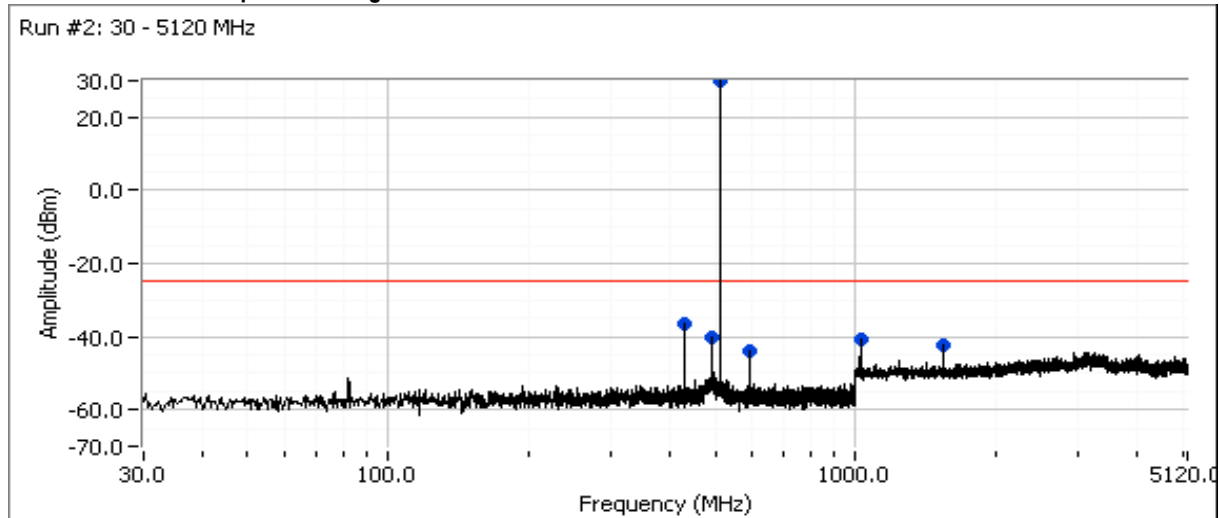
| Frequency<br>MHz | Level<br>dBm | Port    | FCC Part 90 |        | Detector | Channel | Mode | Comments |
|------------------|--------------|---------|-------------|--------|----------|---------|------|----------|
|                  |              |         | Limit       | Margin |          |         |      |          |
| 481.002          | 30.0         | RF Port | N/A         | -      | Peak     |         |      |          |
| 962.001          | -39.6        | RF Port | -25.0       | -14.6  | Peak     |         |      |          |
| 1443.000         | -43.1        | RF Port | -25.0       | -18.1  | Peak     |         |      |          |



## Radio Test Data

|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | N/A         |

### Run #2c: 512 MHz with power setting of 1

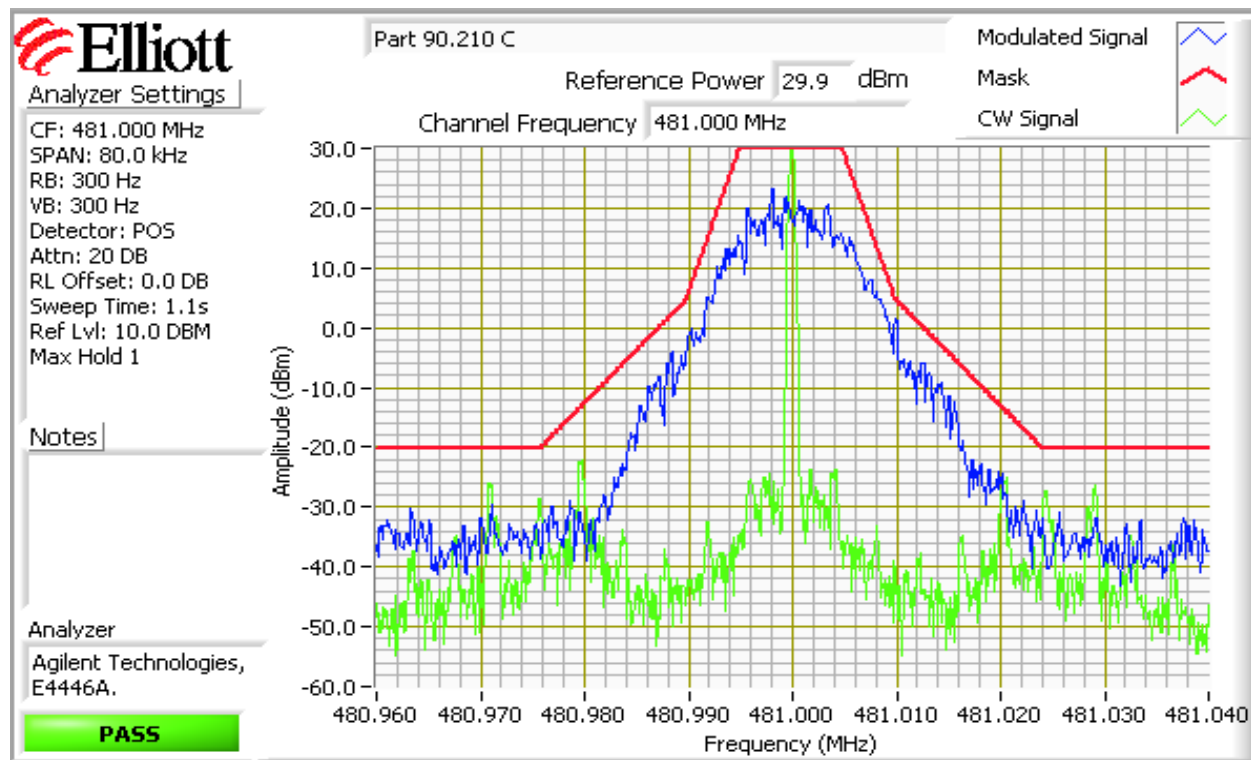


| Frequency<br>MHz | Level<br>dBm | Port    | FCC Part 90 |        | Detector | Channel | Mode | Comments |
|------------------|--------------|---------|-------------|--------|----------|---------|------|----------|
|                  |              |         | Limit       | Margin |          |         |      |          |
| 429.792          | -36.3        | RF Port | -25.0       | -11.3  | Peak     |         |      |          |
| 493.173          | -40.3        | RF Port | -25.0       | -15.3  | Peak     |         |      |          |
| 512.002          | 30.1         | RF Port | N/A         | -      | Peak     |         |      |          |
| 594.199          | -43.9        | RF Port | -25.0       | -18.9  | Peak     |         |      |          |
| 1023.950         | -40.6        | RF Port | -25.0       | -15.6  | Peak     |         |      |          |
| 1536.050         | -42.3        | RF Port | -25.0       | -17.3  | Peak     |         |      |          |

|                                       |                              |
|---------------------------------------|------------------------------|
| Client: GE MDS LLC                    | Job Number: J78683           |
| Model: LCT450                         | T-Log Number: T78830         |
| Contact: Dennis McCarthy              | Account Manager: Susan Pelzl |
| Standard: RSS 119, FCC Part 90 and 15 | Class: N/A                   |

### Run #3a: Unwanted emissions (Masks) 90.210(c), 25kHz

1 watt

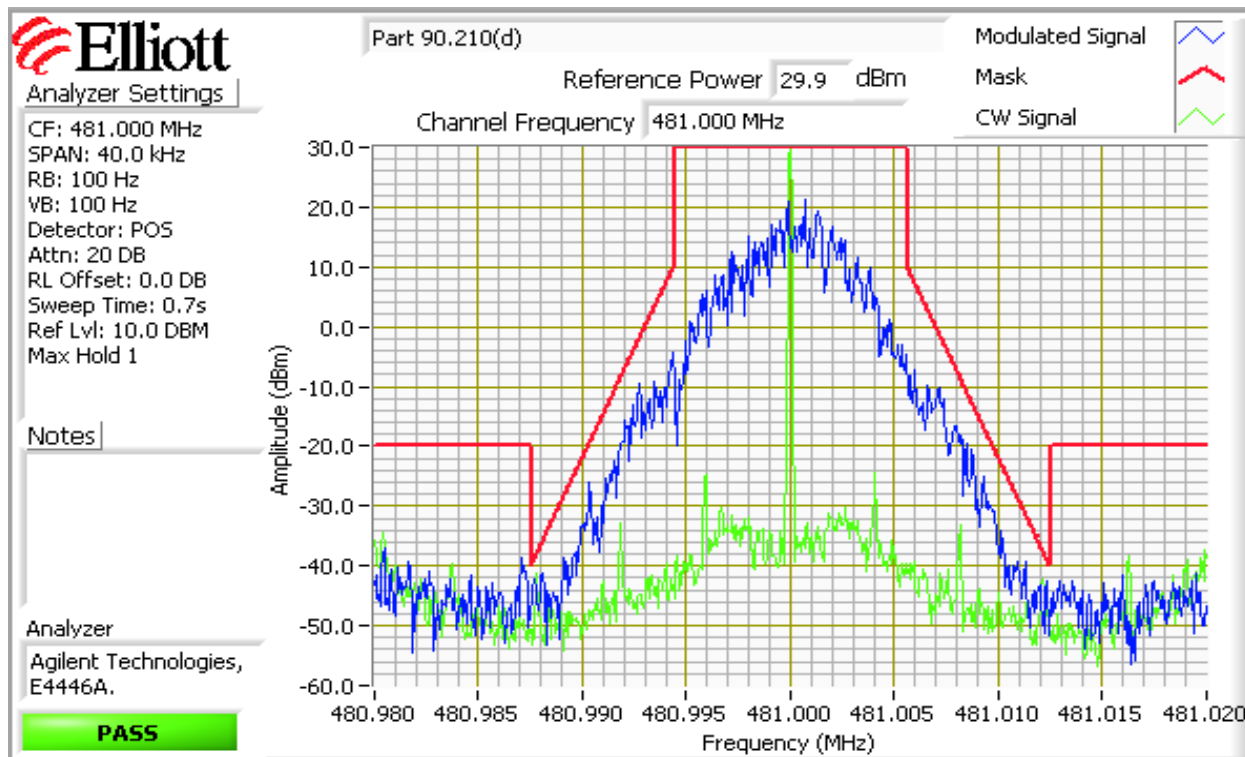




|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | N/A         |

### Run #3b: Unwanted emissions (Masks) 90.210(d), 12.5 kHz

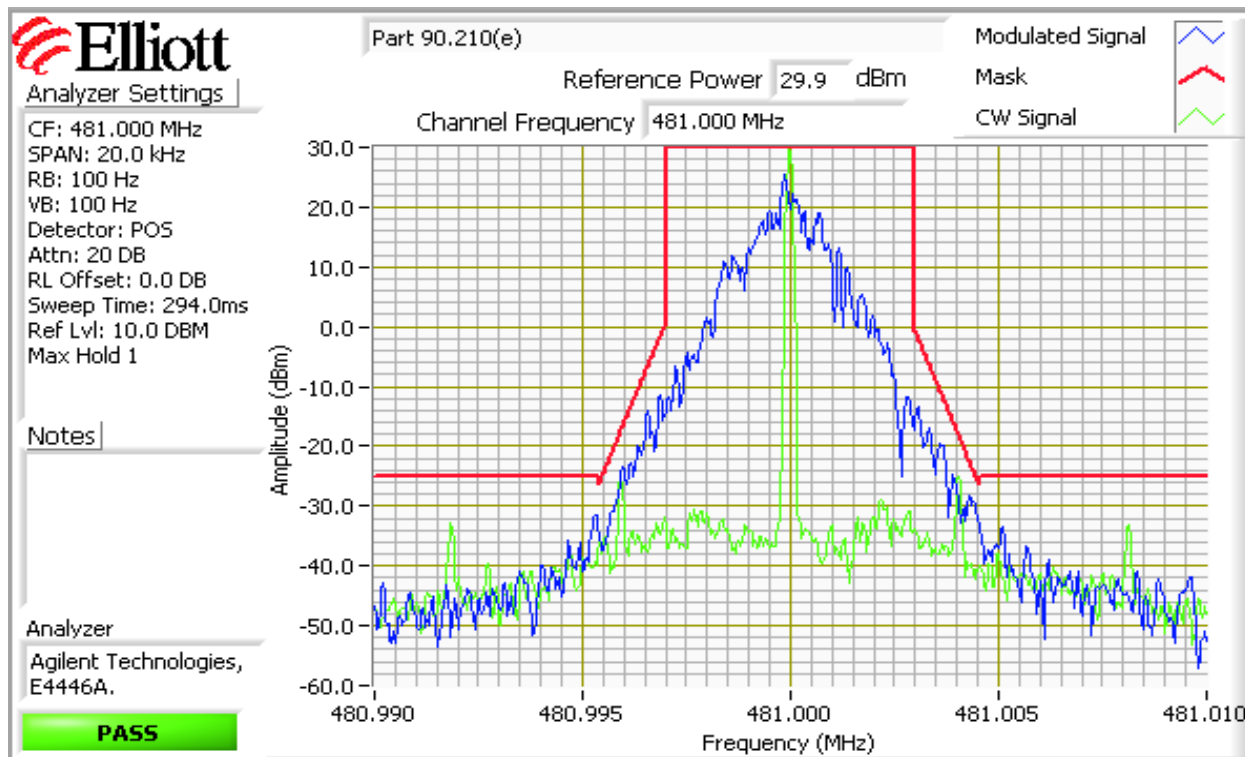
1 watt



|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzi |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | N/A         |

### Run #3c: Unwanted emissions (Masks) 90.210(e), 6.25 kHz

1 watt



|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | N/A         |

## RSS 119 and FCC Part 90 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: 4/15/2010  
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 spurious emissions testing.

The measurement antenna was located 3 meters from the EUT.

**Ambient Conditions:** Temperature: 15-20 °C  
Rel. Humidity: 30-40 %

### Summary of Results

| Run # | Test Performed                                  | Limit                             | Pass / Fail | Result / Margin                     |
|-------|---|-----------------------------------|-------------|-------------------------------------|
| 1     | Spurious Emissions Transmit Mode, 30 - 5120 MHz | FCC 90.210/ RSS 119<br>-25dBm erp | PASS        | -35.5dBm erp @<br>1024MHz (-10.5dB) |

### Modifications Made During Testing

No modifications were made to the EUT during testing

### Deviations From The Standard

No deviations were made from the requirements of the standard.

### Test Notes

All measurements made with FSK modulation, 25 kHz channel



## EMC Test Data

|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | N/A         |

### Run #1: Radiated Spurious Emissions, Transmit Mode: Final Field Strength and Substitution Measurements

Test performed at 3m Distance with radio power setting 30

| Frequency | Level  | Pol | FCC 90.210 |        | Detector  | Azimuth | Height | Comments | Operating |
|-----------|--------|-----|------------|--------|-----------|---------|--------|----------|-----------|
| MHz       | dBμV/m | v/h | Limit      | Margin | Pk/QP/Avg | degrees | meters |          | Frequency |
| 900.000   | 43.2   | V   | 75.3       | -32.1  | PK        | 270     | 1.0    |          | 450       |
| 1350.140  | 47.6   | V   | 75.3       | -27.7  | PK        | 30      | 1.0    |          | 450       |
| 1800.030  | 52.9   | V   | 75.3       | -22.4  | PK        | 141     | 1.0    |          | 450       |
| 1799.940  | 49.1   | H   | 75.3       | -26.2  | PK        | 46      | 1.0    |          | 450       |
| 2250.130  | 47.8   | V   | 75.3       | -27.5  | PK        | 154     | 1.0    |          | 450       |
| 2699.920  | 49.9   | V   | 75.3       | -25.4  | PK        | 69      | 1.0    |          | 450       |
| 3150.050  | 43.1   | V   | 75.3       | -32.2  | PK        | 164     | 1.0    |          | 450       |
| 962.000   | 44.2   | V   | 75.3       | -31.1  | PK        | 35      | 1.0    |          | 481       |
| 1443.100  | 46.2   | V   | 75.3       | -29.1  | PK        | 272     | 1.0    |          | 481       |
| 1924.100  | 53.1   | V   | 75.3       | -22.2  | PK        | 24      | 1.1    |          | 481       |
| 1924.050  | 52.5   | H   | 75.3       | -22.8  | AVG       | 153     | 1.0    |          | 481       |
| 2886.010  | 44.2   | V   | 75.3       | -31.1  | PK        | 171     | 1.2    |          | 481       |
| 3366.870  | 45.2   | V   | 75.3       | -30.1  | PK        | 172     | 1.0    |          | 481       |
| 1024.120  | 63.0   | V   | 75.3       | -12.3  | PK        | 101     | 1.0    |          | 512       |
| 1023.920  | 63.8   | H   | 75.3       | -11.5  | PK        | 136     | 1.0    |          | 512       |
| 1536.020  | 55.8   | V   | 75.3       | -19.5  | PK        | 83      | 1.0    |          | 512       |
| 2048.010  | 57.3   | V   | 75.3       | -18.0  | PK        | 30      | 1.0    |          | 512       |
| 2048.020  | 51.8   | H   | 75.3       | -23.5  | PK        | 157     | 1.0    |          | 512       |
| 2560.070  | 53.2   | V   | 75.3       | -22.1  | PK        | 127     | 1.1    |          | 512       |
| 3072.120  | 44.0   | V   | 75.3       | -31.3  | PK        | 9       | 1.0    |          | 512       |
| 3583.970  | 44.8   | V   | 75.3       | -30.5  | PK        | 171     | 1.0    |          | 512       |
| 4095.850  | 41.7   | V   | 75.3       | -33.6  | PK        | 34      | 1.0    |          | 512       |

### Horizontal

| Frequency | Substitution measurements |                   |                 | Site                | EUT measurements |            |           | eirp Limit | erp Limit | Margin |
|-----------|---------------------------|-------------------|-----------------|---------------------|------------------|------------|-----------|------------|-----------|--------|
| MHz       | Pin <sup>1</sup>          | Gain <sup>2</sup> | FS <sup>3</sup> | Factor <sup>4</sup> | FS <sup>5</sup>  | eirp (dBm) | erp (dBm) | dBm        | dBm       | dB     |
| 1024.120  | -15.0                     | 2.2               | 84.2            | 97.0                | 63.0             | -34.0      | -36.2     |            | -25.0     | -11.2  |

### Vertical

| Frequency | Substitution measurements |                   |                 | Site                | EUT measurements |            |           | eirp Limit | erp Limit | Margin |
|-----------|---------------------------|-------------------|-----------------|---------------------|------------------|------------|-----------|------------|-----------|--------|
| MHz       | Pin <sup>1</sup>          | Gain <sup>2</sup> | FS <sup>3</sup> | Factor <sup>4</sup> | FS <sup>5</sup>  | eirp (dBm) | erp (dBm) | dBm        | dBm       | dB     |
| 1024.120  | -15.0                     | 2.2               | 83.5            | 96.3                | 63.0             | -33.3      | -35.5     |            | -25.0     | -10.5  |
| 2048.010  | -15.0                     | 4.0               | 86.9            | 97.9                | 57.3             | -40.6      | -42.8     |            | -25.0     | -17.8  |

Note 1: Pin is the input power (dBm) to the substitution antenna

Note 2: Gain is the gain (dBi) for the substitution antenna. A dipole has a gain of 2.2dBi.

Note 3: FS is the field strength (dBuV/m) measured from the substitution antenna.

Note 4: Site Factor - this is the site factor to convert from a field strength in dBuV/m to an eirp in dBm.

Note 5: EUT field strength as measured during initial run.

|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | A           |

## Receiver Conducted and 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: 5/20/2010                 | Config. Used: 1      |
| Test Engineer: David Bare               | Config Change: None  |
| Test Location: SVOATS #2 and Environ #1 | EUT Voltage: 13.8VDC |

### General Test Configuration

The EUT and any 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.

|                            |                |       |
|----------------------------|----------------|-------|
| <b>Ambient Conditions:</b> | Temperature:   | 15 °C |
|                            | Rel. Humidity: | 41 %  |

### Summary of Results

| Run # | Test Performed                                 | Limit         | Result | Margin                             |
|-------|--|---------------|--------|------------------------------------|
| 1     | Radiated Emissions<br>30 - 1000 MHz, Maximized | FCC 15.109(a) | Pass   | 38.5dBμV/m @ 875.00MHz<br>(-7.5dB) |
| 2     | Conducted Emissions<br>30 - 1600 MHz           | FCC 15.111(a) | Pass   | -67.9dBm @ 1431.9MHz (-10.9dB)     |

### 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:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | A           |

**Run #1: Maximized Readings From Preliminary Test Run #2a performed on 3/31/10**

**Performed at SVOATS #2**

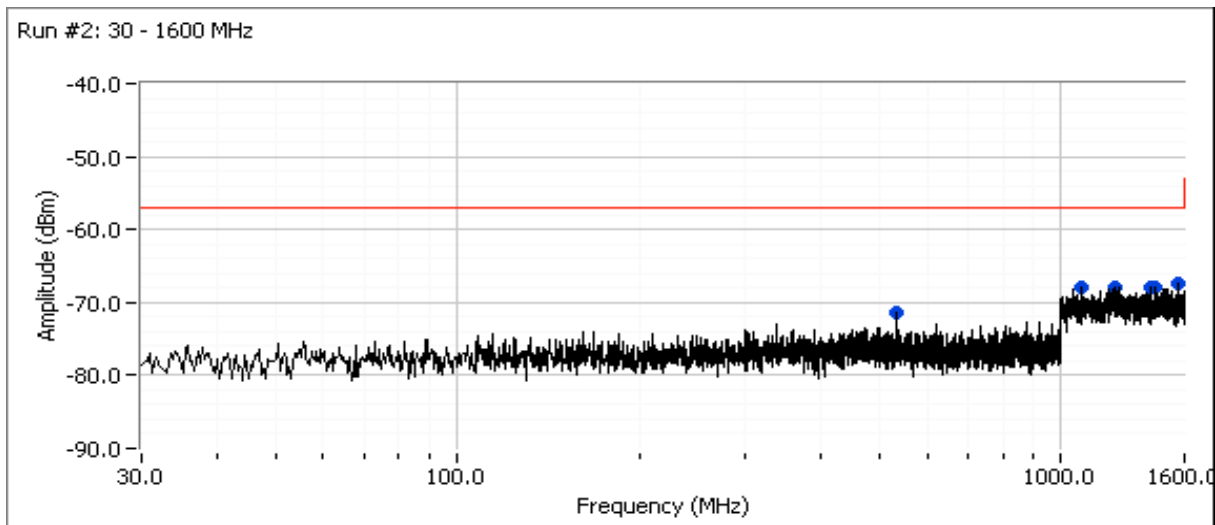
**RX 450 MHz**

| Frequency Range | Test Distance | Limit Distance | Extrapolation Factor |
|-----------------|---------------|----------------|----------------------|
| 30 - 1000 MHz   | 3             | 3              | 0.0                  |

| Frequency | Level  | Pol | FCC 15.109(a) |        | Detector  | Azimuth | Height | Comments   |
|-----------|--------|-----|---------------|--------|-----------|---------|--------|------------|
| MHz       | dBμV/m | v/h | Limit         | Margin | Pk/QP/Avg | degrees | meters |            |
| 874.999   | 38.5   | H   | 46.0          | -7.5   | QP        | 254     | 1.3    | QP (1.00s) |
| 341.309   | 37.9   | H   | 46.0          | -8.1   | QP        | 313     | 2.5    | QP (1.00s) |
| 511.967   | 36.4   | H   | 46.0          | -9.6   | QP        | 356     | 2.0    | QP (1.00s) |
| 184.152   | 33.4   | V   | 43.5          | -10.1  | QP        | 130     | 1.0    | QP (1.00s) |
| 255.977   | 35.0   | H   | 46.0          | -11.0  | QP        | 161     | 2.5    | QP (1.00s) |
| 30.477    | 28.7   | H   | 40.0          | -11.3  | QP        | 128     | 4.0    | QP (1.00s) |

**Run #2: Antenna Port Conducted Emissions (Rx at 450 MHz)**

**Performed at Environ #1**



| Frequency | Level | Port    | FCC 15.111(a) |        | Detector | Comments |
|-----------|-------|---------|---------------|--------|----------|----------|
| MHz       | dBμV  |         | Limit         | Margin | QP/Ave   |          |
| 1431.910  | -67.9 | RF Port | -57.0         | -10.9  | Peak     |          |
| 1078.760  | -68.0 | RF Port | -57.0         | -11.0  | Peak     |          |
| 1224.270  | -68.0 | RF Port | -57.0         | -11.0  | Peak     |          |
| 1402.190  | -68.0 | RF Port | -57.0         | -11.0  | Peak     |          |
| 532.202   | -71.3 | RF Port | -57.0         | -14.3  | Peak     |          |

|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | A           |

## Receiver Radiated Emissions

*(Elliott Laboratories Fremont Facility, Semi-Anechoic Chamber)*

### Test Specific Details

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

Date of Test: 3/31/2010  
Test Engineer: Vishal Narayan  
Test Location: Fremont Chamber #5

Config. Used: 1  
Config Change: None  
EUT Voltage: 13.8V DC

### General Test Configuration

The EUT and any 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:**

|                |       |
|----------------|-------|
| Temperature:   | 18 °C |
| Rel. Humidity: | 40 %  |

### Summary of Results

| Run # | Test Performed                                  | Limit       | Result | Margin                             |
|-------|---|-------------|--------|------------------------------------|
| 1     | Radiated Emissions<br>1 GHz - 1.6 GHz Maximized | FCC Class B | Pass   | 44.7dBμV/m @ 1000.0MHz<br>(-9.3dB) |

### Modifications Made During Testing

No modifications were made to the EUT during testing

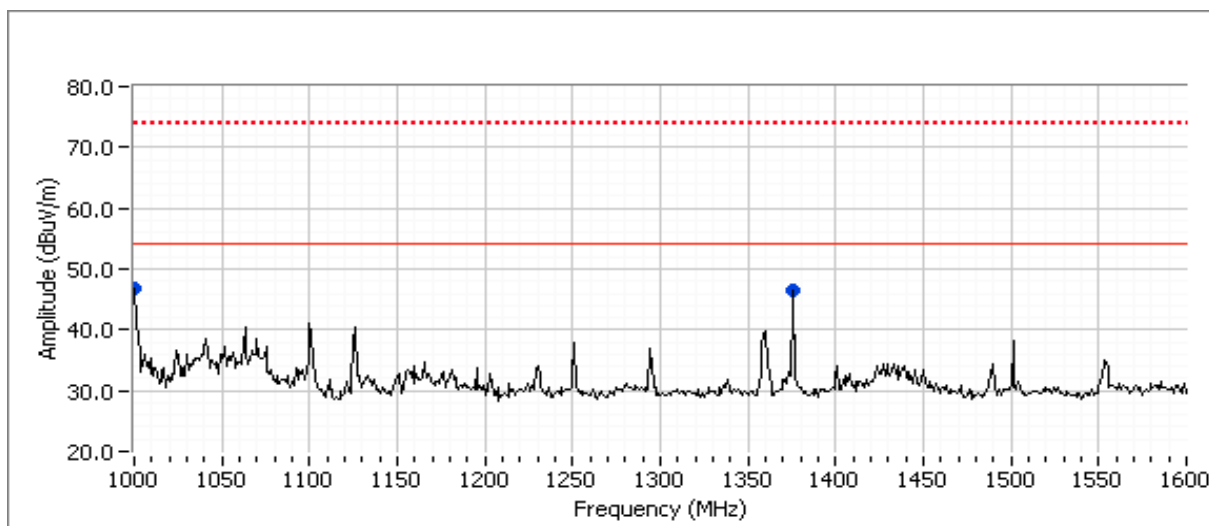
### Deviations From The Standard

No deviations were made from the requirements of the standard.

|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | A           |

## Run #1: Maximized Readings, 1000 - 1600 MHz

| Frequency Range | Test Distance | Limit Distance | Extrapolation Factor |
|-----------------|---------------|----------------|----------------------|
| 1000 - 1600 MHz | 3             | 3              | 0.0                  |



## Preliminary peak readings captured during pre-scan (peak readings vs. average limit)

| Frequency | Level  | Pol | FCC Class B |        | Detector  | Azimuth | Height | Comments |
|-----------|--------|-----|-------------|--------|-----------|---------|--------|----------|
| MHz       | dBuV/m | v/h | Limit       | Margin | Pk/QP/Avg | degrees | meters |          |
| 1000.050  | 46.9   | V   | 54.0        | -7.1   | Peak      | 172     | 1.3    |          |
| 1375.100  | 46.6   | V   | 54.0        | -7.4   | Peak      | 150     | 1.3    |          |

## Final peak and average readings

| Frequency | Level  | Pol | FCC Class B |        | Detector  | Azimuth | Height | Comments            |
|-----------|--------|-----|-------------|--------|-----------|---------|--------|---------------------|
| MHz       | dBuV/m | v/h | Limit       | Margin | Pk/QP/Avg | degrees | meters |                     |
| 1000.020  | 44.7   | V   | 54.0        | -9.3   | AVG       | 173     | 1.3    | RB 1 MHz; VB: 10 Hz |
| 1375.070  | 44.3   | V   | 54.0        | -9.7   | AVG       | 146     | 1.3    | RB 1 MHz; VB: 10 Hz |
| 1000.090  | 52.3   | V   | 74.0        | -21.7  | PK        | 173     | 1.3    | RB 1 MHz; VB: 1 MHz |
| 1374.660  | 49.9   | V   | 74.0        | -24.1  | PK        | 146     | 1.3    | RB 1 MHz; VB: 1 MHz |



|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | A           |

## Receiver Radiated Emissions

*(Elliott Laboratories Fremont Facility, Semi-Anechoic Chamber)*

### Test Specific Details

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

Date of Test: 3/31/2010 0:00  
 Test Engineer: Riaz Momand  
 Test Location: Fremont Chamber # 3

Config. Used: 1  
 Config Change: None (See note for Run #2)  
 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:**

|                |       |
|----------------|-------|
| Temperature:   | 20 °C |
| Rel. Humidity: | 40 %  |

### Summary of Results

| Run # | Test Performed                        | Limit       | Result | Margin                           |
|-------|---------------------------------------|-------------|--------|----------------------------------|
| 1     | RE, 30 - 1000MHz, Maximized Emissions | FCC Class A | Pass   | 38.4dBμV/m @ 194.09MHz (-1.6dB)  |
| 2     | RE, 30 - 1000MHz, Maximized Emissions | FCC Class B | Pass   | 20.0dBμV/m @ 184.15MHz (-10.0dB) |

### Modifications Made During Testing

No modifications were made to the EUT during testing

### Deviations From The Standard

No deviations were made from the requirements of the standard.

### Test Notes

All emissions above the receiver limits are sourced from the support computer. The EUT complies with the receiver limits and the configured system complies with the Class A digital device limits. Preliminary tests showed that there is no difference in emissions from the EUT with different receiver frequencies so 450 MHz was chosen for these final tests.

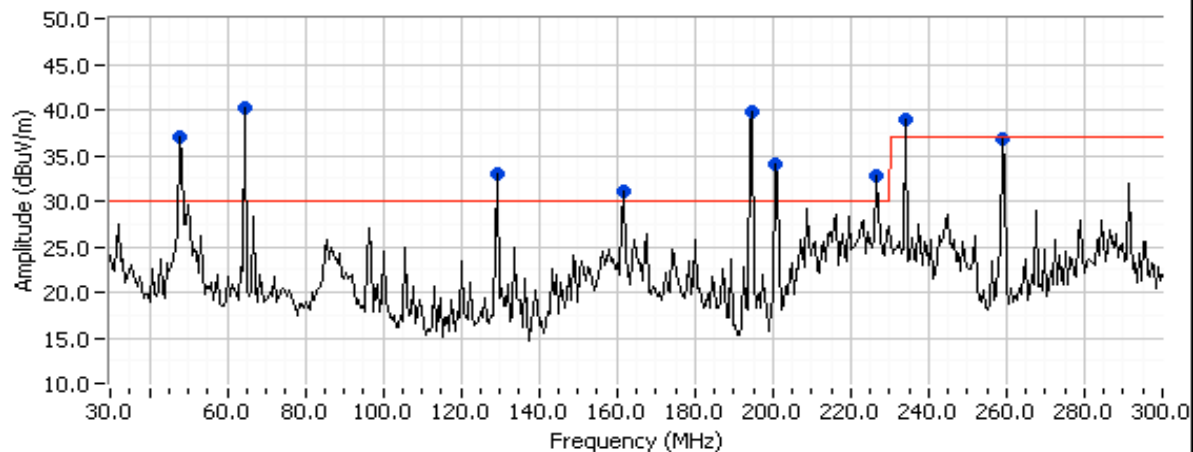
|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | A           |

## Run # 1a: Preliminary Radiated Emissions, 30-1000 MHz

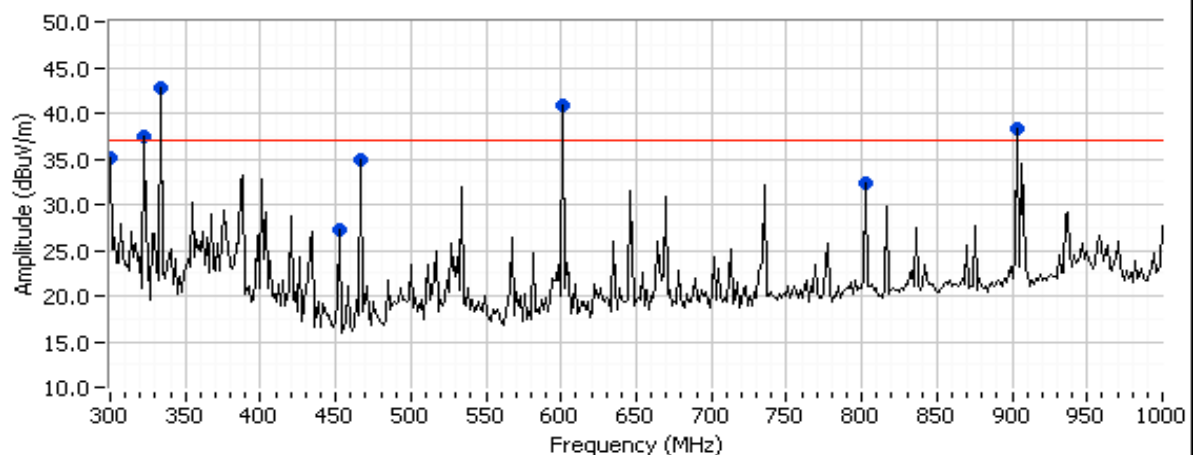
RX 450 MHz, with the laptop connected to data interface cable.

| Frequency Range | Test Distance | Limit Distance | Extrapolation Factor |
|-----------------|---------------|----------------|----------------------|
| 30 - 1000 MHz   | 10            | 10             | 0.0                  |

Run # 1:



Run # 1:



Run # 1a Continued on Next Page .....



# EMC Test Data

|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | A           |

..... Run # 1a Continued

## Preliminary peak readings captured during pre-scan

| Frequency | Level  | Pol | FCC Class B |        | Detector  | Azimuth | Height | Comments |
|-----------|--------|-----|-------------|--------|-----------|---------|--------|----------|
| MHz       | dBμV/m | v/h | Limit       | Margin | Pk/QP/Avg | degrees | meters |          |
| 48.193    | 37.1   | V   | 30.0        | 7.1    | Peak      | 234     | 3.0    |          |
| 64.704    | 40.3   | V   | 30.0        | 10.3   | Peak      | 274     | 3.5    |          |
| 129.400   | 33.0   | V   | 30.0        | 3.0    | Peak      | 156     | 1.5    |          |
| 161.758   | 31.1   | V   | 30.0        | 1.1    | Peak      | 360     | 1.5    |          |
| 194.088   | 39.7   | V   | 30.0        | 9.7    | Peak      | 0       | 1.0    |          |
| 200.481   | 34.0   | V   | 30.0        | 4.0    | Peak      | 0       | 1.0    |          |
| 226.424   | 32.8   | H   | 30.0        | 2.8    | Peak      | 104     | 3.5    |          |
| 233.895   | 38.9   | V   | 37.0        | 1.9    | Peak      | 321     | 1.0    |          |
| 258.782   | 36.8   | H   | 37.0        | -0.2   | Peak      | 81      | 3.0    |          |
| 299.799   | 35.1   | H   | 37.0        | -1.9   | Peak      | 32      | 3.0    |          |
| 323.486   | 37.5   | H   | 37.0        | 0.5    | Peak      | 2       | 2.5    |          |
| 334.136   | 42.8   | V   | 37.0        | 5.8    | Peak      | 36      | 1.0    |          |
| 452.875   | 27.2   | V   | 37.0        | -9.8   | Peak      | 167     | 3.5    |          |
| 467.793   | 34.9   | H   | 37.0        | -2.1   | Peak      | 171     | 2.0    |          |
| 601.438   | 40.8   | H   | 37.0        | 3.8    | Peak      | 61      | 1.0    |          |
| 801.918   | 32.3   | V   | 37.0        | -4.7   | Peak      | 313     | 2.5    |          |
| 902.148   | 38.2   | V   | 37.0        | 1.2    | Peak      | 13      | 2.0    |          |

## Preliminary quasi-peak readings (no manipulation of EUT interface cables)

| Frequency | Level  | Pol | FCC Class B |        | Detector  | Azimuth | Height | Comments   |
|-----------|--------|-----|-------------|--------|-----------|---------|--------|------------|
| MHz       | dBμV/m | v/h | Limit       | Margin | Pk/QP/Avg | degrees | meters |            |
| 194.088   | 37.0   | V   | 30.0        | 7.0    | QP        | 14      | 1.0    | QP (1.00s) |
| 902.148   | 43.0   | V   | 37.0        | 6.0    | QP        | 12      | 1.9    | QP (1.00s) |
| 64.704    | 35.5   | V   | 30.0        | 5.5    | QP        | 320     | 1.2    | QP (1.00s) |
| 601.438   | 41.3   | H   | 37.0        | 4.3    | QP        | 83      | 1.5    | QP (1.00s) |
| 48.193    | 36.4   | V   | 30.0        | 3.6    | QP        | 251     | 2.9    | QP (1.00s) |
| 233.895   | 40.0   | V   | 37.0        | 3.0    | QP        | 334     | 1.0    | QP (1.00s) |
| 200.481   | 32.2   | V   | 30.0        | 2.2    | QP        | 0       | 1.0    | QP (1.00s) |
| 334.136   | 38.6   | V   | 37.0        | 1.6    | QP        | 31      | 1.0    | QP (1.00s) |
| 226.424   | 31.5   | H   | 30.0        | 1.5    | QP        | 70      | 3.5    | QP (1.00s) |
| 129.400   | 31.0   | V   | 30.0        | 1.0    | QP        | 165     | 1.0    | QP (1.00s) |
| 323.486   | 37.6   | H   | 37.0        | 0.6    | QP        | 0       | 2.3    | QP (1.00s) |
| 258.782   | 36.3   | H   | 37.0        | -0.7   | QP        | 78      | 3.0    | QP (1.00s) |
| 467.793   | 35.5   | H   | 37.0        | -1.5   | QP        | 170     | 1.7    | QP (1.00s) |
| 801.918   | 32.7   | V   | 37.0        | -4.3   | QP        | 320     | 2.4    | QP (1.00s) |
| 161.758   | 24.5   | V   | 30.0        | -5.5   | QP        | 360     | 1.5    | QP (1.00s) |
| 452.875   | 25.7   | V   | 37.0        | -11.3  | QP        | 168     | 3.5    | QP (1.00s) |
| 299.799   | 18.3   | H   | 37.0        | -18.7  | QP        | 33      | 3.0    | QP (1.00s) |



## EMC Test Data

|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | A           |

### Run # 1b: Maximized Readings From Run # 1a

| Frequency Range | Test Distance | Limit Distance | Extrapolation Factor |
|-----------------|---------------|----------------|----------------------|
| 30 - 1000 MHz   | 10            | 10             | 0.0                  |

| Frequency | Level  | Pol | FCC Class B |        | Detector  | Azimuth | Height | Comments   |
|-----------|--------|-----|-------------|--------|-----------|---------|--------|------------|
| MHz       | dBμV/m | v/h | Limit       | Margin | Pk/QP/Avg | degrees | meters |            |
| 194.088   | 38.4   | V   | 30.0        | 8.4    | QP        | 7       | 1.0    | QP (1.00s) |
| 64.704    | 36.0   | V   | 30.0        | 6.0    | QP        | 322     | 1.3    | QP (1.00s) |
| 902.148   | 43.0   | V   | 37.0        | 6.0    | QP        | 12      | 1.9    | QP (1.00s) |
| 601.438   | 41.3   | H   | 37.0        | 4.3    | QP        | 83      | 1.5    | QP (1.00s) |
| 233.895   | 41.0   | V   | 37.0        | 4.0    | QP        | 326     | 1.0    | QP (1.00s) |
| 48.193    | 36.4   | V   | 30.0        | 3.6    | QP        | 251     | 2.9    | QP (1.00s) |

### Run # 1c: Maximized Readings From Run # 1a compared to the Class A limits

| Frequency Range | Test Distance | Limit Distance | Extrapolation Factor |
|-----------------|---------------|----------------|----------------------|
| 30 - 1000 MHz   | 10            | 10             | 0.0                  |

| Frequency | Level  | Pol | FCC Class A |        | Detector  | Azimuth | Height | Comments   |
|-----------|--------|-----|-------------|--------|-----------|---------|--------|------------|
| MHz       | dBμV/m | v/h | Limit       | Margin | Pk/QP/Avg | degrees | meters |            |
| 194.088   | 38.4   | V   | 40.0        | -1.6   | QP        | 7       | 1.0    | QP (1.00s) |
| 64.704    | 36.0   | V   | 40.0        | -4.0   | QP        | 322     | 1.3    | QP (1.00s) |
| 902.148   | 43.0   | V   | 47.0        | -4.0   | QP        | 12      | 1.9    | QP (1.00s) |
| 601.438   | 41.3   | H   | 47.0        | -5.7   | QP        | 83      | 1.5    | QP (1.00s) |
| 233.895   | 41.0   | V   | 47.0        | -6.0   | QP        | 326     | 1.0    | QP (1.00s) |
| 48.193    | 36.4   | V   | 47.0        | -10.6  | QP        | 251     | 2.9    | QP (1.00s) |

Note 1: All emissions observed above the receiver limits were determined to be sourced from the computer connected to the EUT.  
See run 2 below.

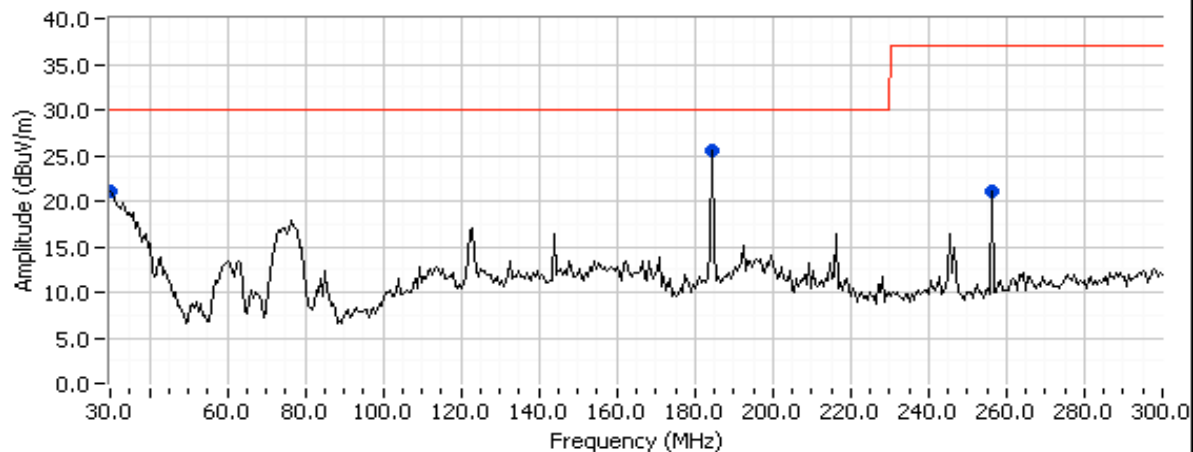
|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | A           |

**Run # 2a: Preliminary Radiated Emissions, 30-1000 MHz**

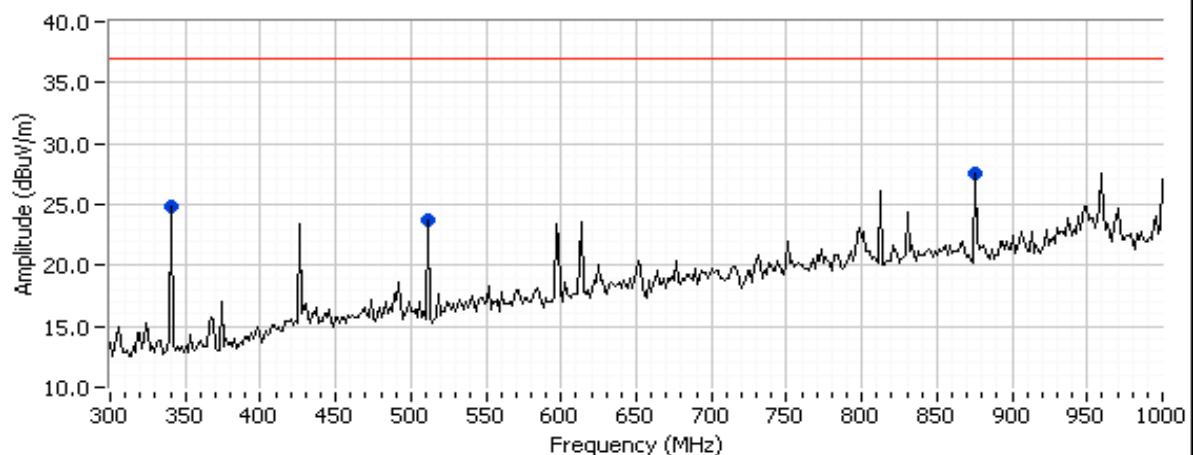
**RX 450 MHz, removed the laptop. Data interface port terminated.**

| Frequency Range | Test Distance | Limit Distance | Extrapolation Factor |
|-----------------|---------------|----------------|----------------------|
| 30 - 1000 MHz   | 10            | 10             | 0.0                  |

Run # 2:



Run # 2:



Run # 2a Continued on Next Page .....



## EMC Test Data

|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | A           |

### ..... Run # 2a Continued

#### Preliminary peak readings captured during pre-scan

| Frequency | Level        | Pol | FCC Class B |        | Detector  | Azimuth | Height | Comments |
|-----------|--------------|-----|-------------|--------|-----------|---------|--------|----------|
| MHz       | dB $\mu$ V/m | v/h | Limit       | Margin | Pk/QP/Avg | degrees | meters |          |
| 341.309   | 24.9         | H   | 37.0        | -12.1  | Peak      | 53      | 2.5    |          |
| 874.999   | 27.6         | H   | 37.0        | -9.4   | Peak      | 90      | 1.5    |          |
| 184.152   | 25.5         | V   | 30.0        | -4.5   | Peak      | 139     | 1.5    |          |
| 255.977   | 21.1         | H   | 37.0        | -15.9  | Peak      | 182     | 4.0    |          |
| 30.477    | 21.0         | H   | 30.0        | -9.0   | Peak      | 223     | 3.0    |          |
| 511.967   | 23.7         | H   | 37.0        | -13.3  | Peak      | 325     | 2.0    |          |

#### Run # 2: Maximized Readings

| Frequency Range | Test Distance | Limit Distance | Extrapolation Factor |
|-----------------|---------------|----------------|----------------------|
| 30 - 1000 MHz   | 10            | 10             | 0.0                  |

| Frequency | Level        | Pol | FCC Class B |        | Detector  | Azimuth | Height | Comments   |
|-----------|--------------|-----|-------------|--------|-----------|---------|--------|------------|
| MHz       | dB $\mu$ V/m | v/h | Limit       | Margin | Pk/QP/Avg | degrees | meters |            |
| 184.152   | 20.0         | V   | 30.0        | -10.0  | QP        | 138     | 1.5    | QP (1.00s) |
| 874.999   | 25.7         | H   | 37.0        | -11.3  | QP        | 91      | 1.5    | QP (1.00s) |
| 341.309   | 25.1         | H   | 37.0        | -11.9  | QP        | 52      | 2.5    | QP (1.00s) |
| 511.967   | 23.5         | H   | 37.0        | -13.5  | QP        | 324     | 2.0    | QP (1.00s) |
| 30.477    | 15.3         | H   | 30.0        | -14.7  | QP        | 224     | 3.0    | QP (1.00s) |
| 255.977   | 21.6         | H   | 37.0        | -15.4  | QP        | 183     | 4.0    | QP (1.00s) |

|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| 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: 3/30/2010  
Test Engineer: David Bare  
Test Location: Chamber #2

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

### General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated 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:**

|                |       |
|----------------|-------|
| Temperature:   | 18 °C |
| Rel. Humidity: | 39 %  |

### Summary of Results

| Run # | Test Performed   | Limit              | Result | Comment   |
|-------|--|--------------------|--------|---|
| 1     | Preliminary Radiated Emissions (Rx 450, 481 and 512 MHz) | Receiver 15.109(a) | Eval   | No difference in emissions for different receiver frequencies |
| 3     | Preliminary Radiated Emissions (Rx 450, 481 and 512 MHz) | Receiver 15.109(a) | Eval   | No difference in emissions for different receiver frequencies |

### 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.

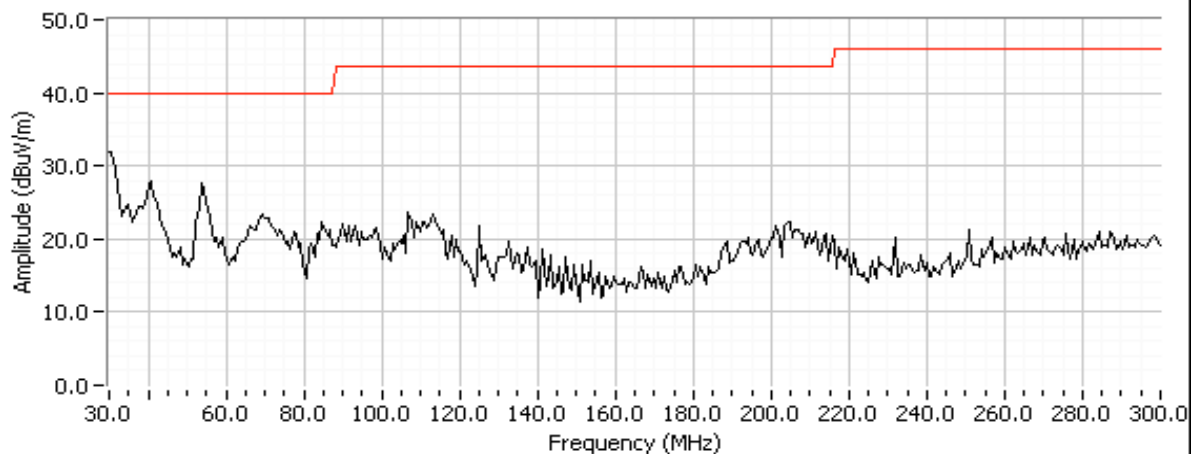
|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | A           |

## Run #1a: Preliminary Radiated Emissions, 30-1000 MHz

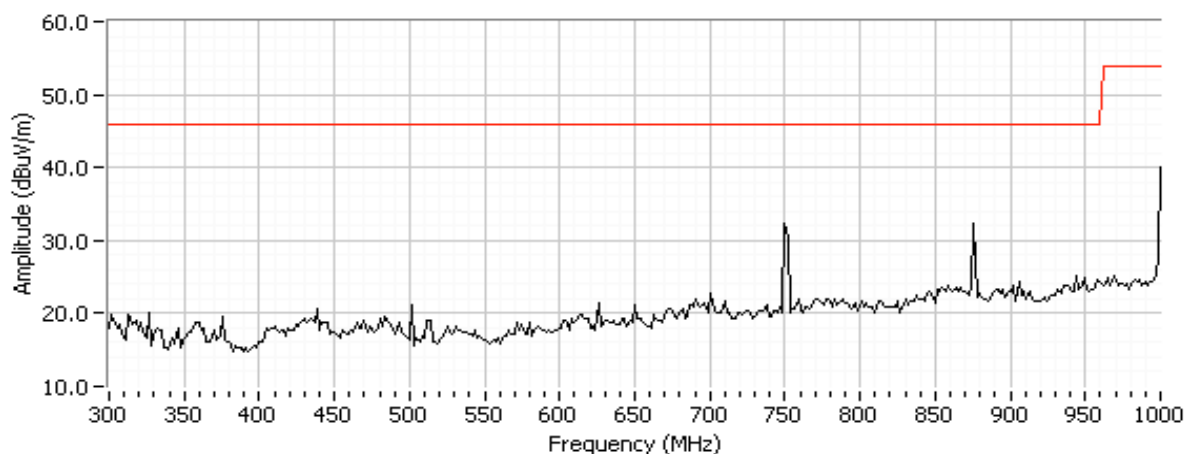
### RX 450 MHz

| Frequency Range | Test Distance | Limit Distance | Extrapolation Factor |
|-----------------|---------------|----------------|----------------------|
| 30 - 1000 MHz   | 3             | 3              | 0.0                  |

Run #1a:



Run #1a:



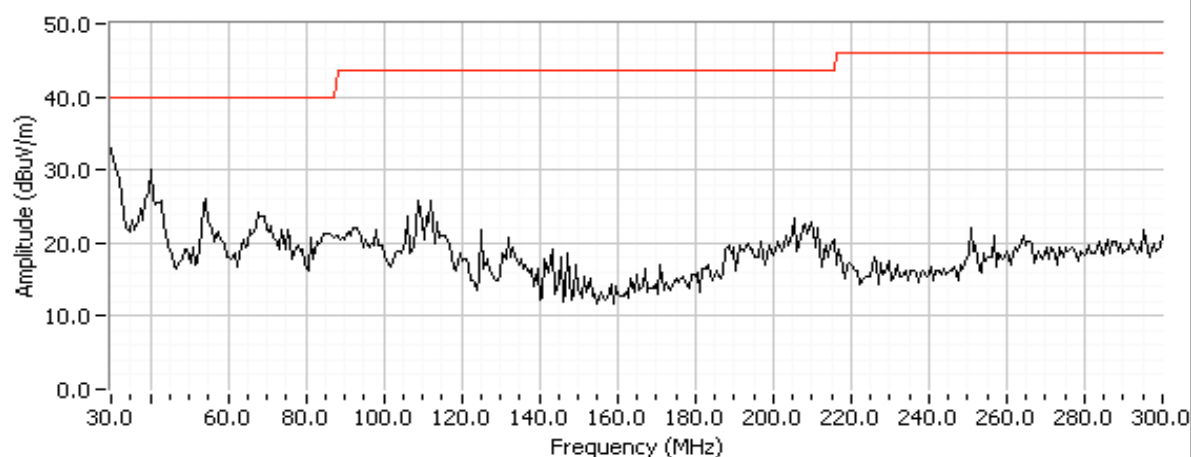


|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | A           |

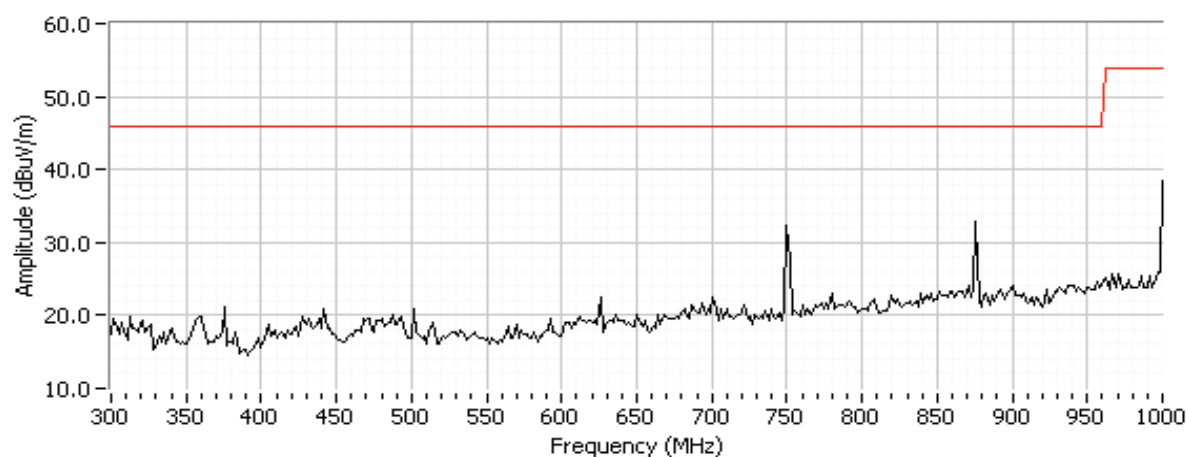
**Run #1b: Preliminary Radiated Emissions, 30-1000 MHz**

**RX 481 MHz**

Run #1b:



Run #1b:

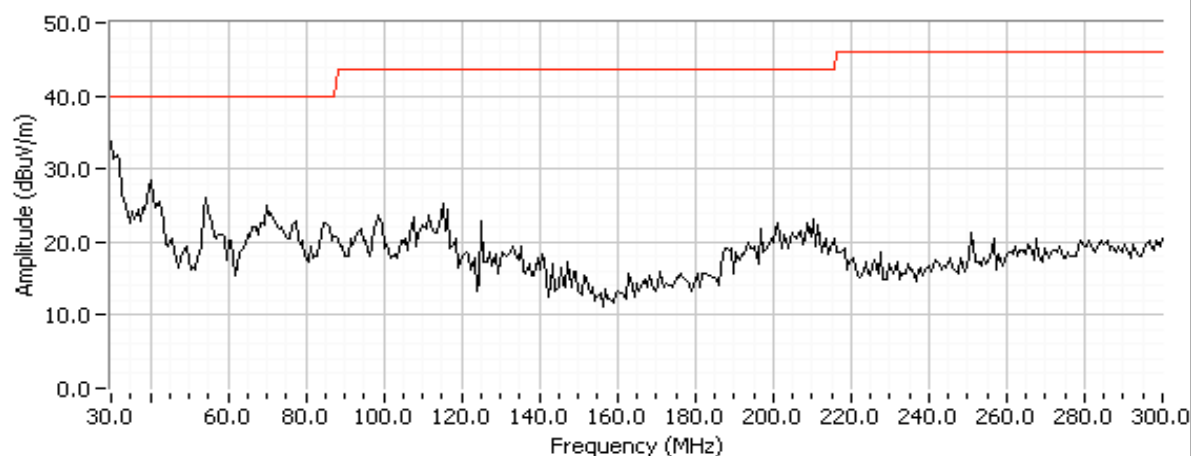


|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | A           |

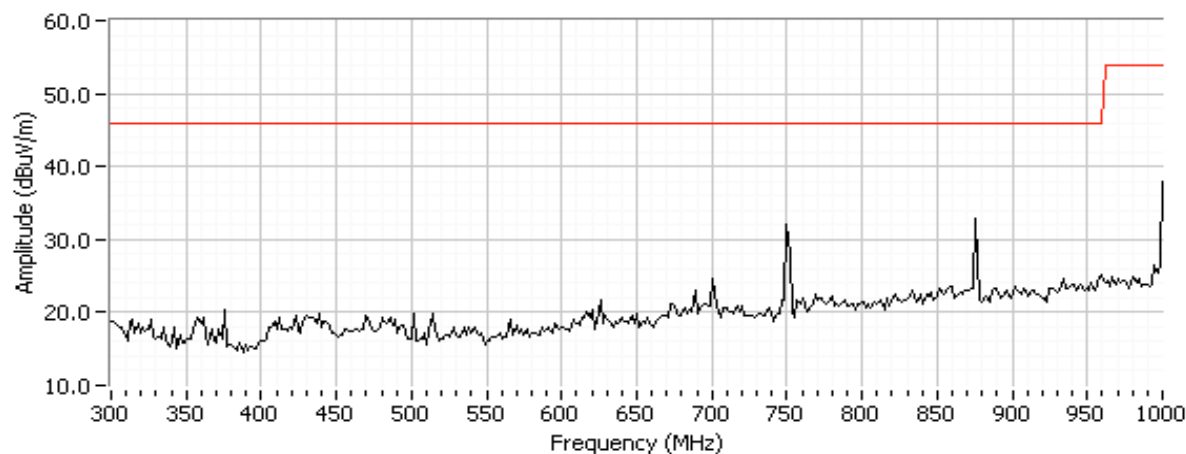
**Run #1c: Preliminary Radiated Emissions, 30-1000 MHz**

**RX 512 MHz**

Run #1c:



Run #1c:



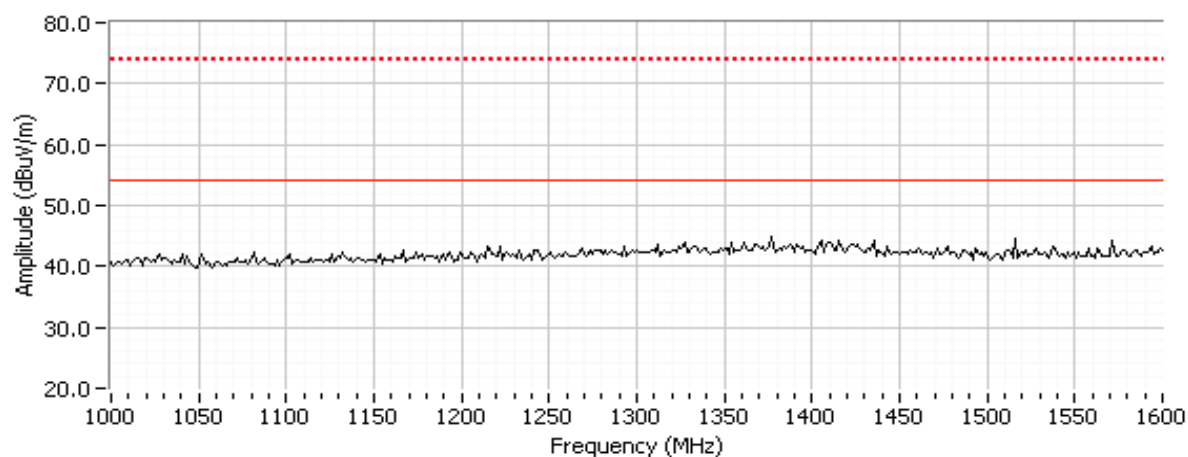
|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | A           |

## Run #3a: Preliminary Radiated Emissions, 1000-1600 MHz

RX 450 MHz

| Frequency Range | Test Distance | Limit Distance | Extrapolation Factor |
|-----------------|---------------|----------------|----------------------|
| 1000 - 1600 MHz | 3             | 3              | 0.0                  |

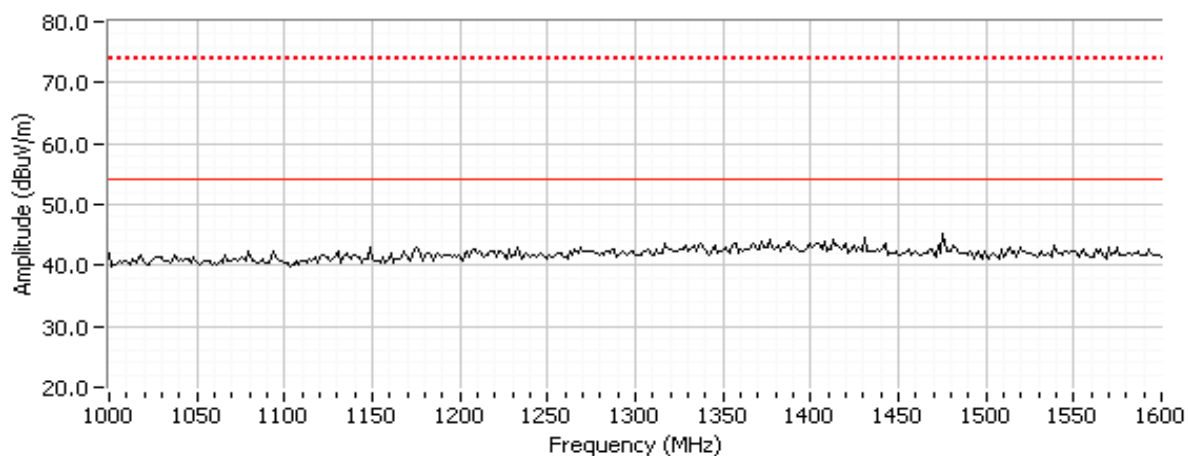
Run #3a:



## Run #3b: Preliminary Radiated Emissions, 1000-1600 MHz

RX 481 MHz

Run #3b:



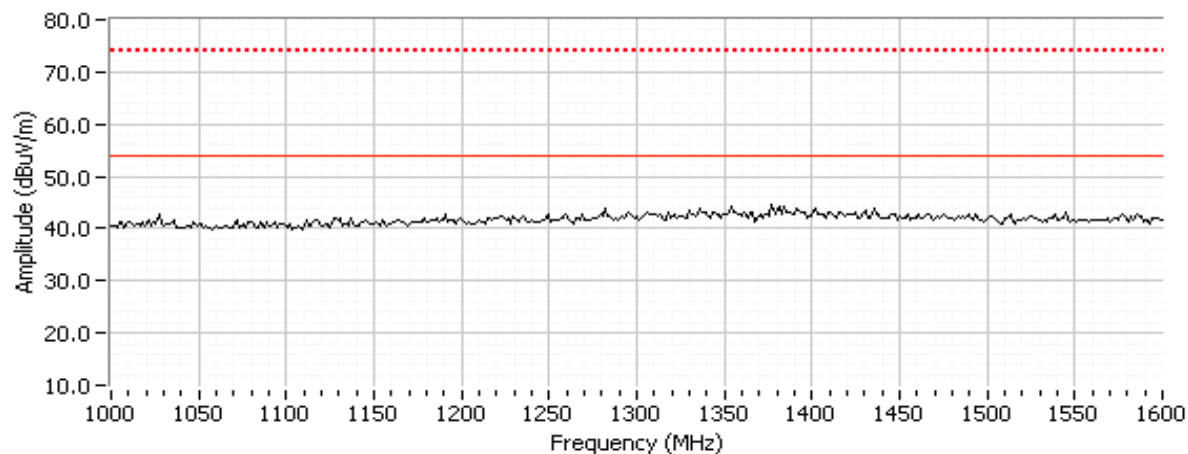
|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | A           |

**Run #3c: Preliminary Radiated Emissions, 1000-1600 MHz**

**RX 512 MHz**

| Frequency Range | Test Distance | Limit Distance | Extrapolation Factor |
|-----------------|---------------|----------------|----------------------|
| 1000 - 1600 MHz | 3             | 3              | 0.0                  |

Run #3c:



|           |                             |                  |             |
|-----------|-----------------------------|------------------|-------------|
| Client:   | GE MDS LLC                  | Job Number:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | N/A         |

## RSS 119 and FCC Part 90 Frequency Stability

### 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's rf port was connected to the measurement instrument's rf port, via an attenuator or dc-block if necessary. EUT was placed inside an environmental chamber.

### Ambient Conditions:

Temperature: 21 °C  
Rel. Humidity: 36 %

### Summary of Results

| Run # | Test Performed                  | Limit            | Result | Value / Margin |
|-------|---------------------------------|------------------|--------|----------------|
| 1-2   | Frequency and Voltage Stability | Part 90 - 0.5ppm | Pass   | 0.34 ppm       |

### 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:      | J78683      |
| Model:    | LCT450                      | T-Log Number:    | T78830      |
| Contact:  | Dennis McCarthy             | Account Manager: | Susan Pelzl |
| Standard: | RSS 119, FCC Part 90 and 15 | Class:           | N/A         |

## Run #1: Temperature Vs. Frequency (Fixed stations in the 450-512 MHz band)

| Drift | Freq.  | Limit |
|-------|--------|-------|
| (ppm) | (MHz)  | (Hz)  |
| 0.5   | 481.00 | 240.5 |

| Temperature | Reference Frequency | Measured frequency | Drift | Limit |
|-------------|---------------------|--------------------|-------|-------|
| (Celsius)   | (MHz)               | (MHz)              | (Hz)  | (Hz)  |
| -30         | 480.999730          | 480.999616         | 114   | 240.5 |
| -20         | 480.999730          | 480.999625         | 105   | 240.5 |
| -10         | 480.999730          | 480.999744         | 14    | 240.5 |
| 0           | 480.999730          | 480.999783         | 53    | 240.5 |
| 10          | 480.999730          | 480.999892         | 162   | 240.5 |
| 20          | 480.999730          | 480.999730         | 0     | 240.5 |
| 30          | 480.999730          | 480.999893         | 163   | 240.5 |
| 40          | 480.999730          | 480.999804         | 74    | 240.5 |
| 50          | 480.999730          | 480.999624         | 106   | 240.5 |

## Run #2: Voltage Vs. Frequency

**Nominal Voltage is 13.8Vdc.**

| Voltage | Reference Frequency | Frequency Drift | Drift | Limit |
|---------|---------------------|-----------------|-------|-------|
| (Dc)    | (MHz)               | (MHz)           | (Hz)  | (Hz)  |
| 85%     | 480.999706          | 480.999693      | 13    | 240.5 |
| 115%    | 480.999706          | 480.999658      | 48    | 240.5 |

Worst case drift: **163.0 Hz**  
**0.34 ppm**

## *Appendix C Photographs*

Uploaded as a separate exhibit

## *Appendix D Detailed Photographs*

Uploaded as a separate exhibit



## *Appendix E Operator's Manual*

Uploaded as a separate exhibit

## *Appendix F Parts List*

Uploaded as a separate exhibit