Radio Test Report

FCC Part 95
218 – 219 MHz

Model: TD220

COMPANY:	GE MDS LLC 175 Science Parkway Rochester, NY 14620
TEST SITE(S):	Elliott Laboratories 41039 Boyce Road. Fremont, CA. 94538-2435
REPORT DATE:	January 12, 2011
REISSUE DATE:	January 18, 2011
FINAL TEST DATES:	December 10 and 23, 2010

AUTHORIZED SIGNATORY:

David W. Bare
Chief Engineer
Elliott Laboratories

Testing Cert #2016.01

REVISION HISTORY

Rev#	Date	Comments	Modified By
-	1-12-2011	First release	
1	1-18-2011	Test data for transmitter spurious emissions at antenna terminal added	dwb

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SCOPE

Tests have been performed on the GE MDS LLC model TD220, 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
- CFR 47 Part 95 (218-219 MHz Service) Subpart F

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 FCC performance and procedural standards. It had been previously tested for operation under Part 90 of the FCC rules and this report shows compliance with Part 95 of the Rules. Only the tests performed were considered necessary based on the software changes needed to allow different bandwidths for the radio for operation under Part 95.

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 TD220 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 TD220 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 95

FCC Rule Part		Description	Measured Value / Comments	Limit / Requirement	Result
Transmitter Modulation, output power and other characteristics					
§2.1033 (c) (5) § 80.		Frequency ranges (Listed for each channel spacing)	12.5 kHz,218-219 MHz	218-219 MHz	Complies
§2.1033 (c) (6) §2.1033 (c) (7) §2.1046 § 80.215(h)(5)		Total power (218-219 MHz) (Maximum for each channel spacing)	12.5 kHz 43 dBm / 32.3 dBm[1]	4W ERP Mobile, 20 W ERP Fixed	Complies
§2.1033 (c) (4) §2.1047 § 80.211(f)		Emission types	F1D	Information only	-
		Emission mask	Device complies with spectral masks – refer to test data	§95.857	Complies
§2.1049		Occupied (99%) Bandwidth	6.06 & 10.2kHz	Must remain within frequency segment	Complies
Transmitter spurious emissions					
§2.1051 §2.1057 §80.211(f)		At antenna terminal	-21.8	-13 dBm	Complies
		Radiated (erp)	-30.1 dBm		Complies
Receiver spurious emissions					
15.109		Field strength	28.7 dBuV/m (From original filing)	Refer to RECEIVER RADIATED SPURIOUS EMISSIONS SPECIFICATION LIMITS	Complies
Other details					
§2.1055 §80.209		Frequency stability	0.954 ppm (From original filing)	Non specified (value is considered low enough so that emission remains in segment)	Complies
§1.1307(b) §2.1093 §80.227		RF Exposure	Although RF exposure compliance is addressed at the time of licensing an MPE calculation has been provided to demonstrate compliance with limits at distances of 114.8cm or more from the antennas.		
§2.1033 (c) (8)	-	Final radio frequency amplifying circuit's dc voltages and currents for normal operation over the power range	13.8V, 6A	Information only	-
-	-	Antenna Gain	This application is for antennas of up to 12.2 dBi gain. Refer to TD220 Manual.		

Notes
1) Licensee ensures Fixed and Mobile units limited to 20W and 4W ERP respectively.

EXTREME CONDITIONS

Frequency stability is determined over extremes of temperature and voltage. As the device is hand carried, battery powered equipment, the supply voltage was reduced to the battery operating end point of 3.3Vdc as specified by the manufacturer.

The extremes of temperature were 25°C to 45°C as specified in FCC §95.628(e)(1).

The extremes of temperature were 0°C to +55°C as specified in FCC §95.628(e)(2) for stations in the Medical Device Radiocommunication Service.

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	1.7×10^{-7}
RF power, conducted	dBm	25 to 7,000 MHz	± 0.52 dB
Conducted emission of transmitter	dBm	25 to 40,000 MHz	± 0.7 dB
Conducted emission of receiver	dBm	25 to 40,000 MHz	± 0.7 dB
Radiated emission (substitution method)	dBm	25 to 40,000 MHz	± 2.5 dB
Radiated emission (field strength)	dBμV/m	25 to 1,000 MHz 1 to 40 GHz	± 3.6 dB ± 6.0 dB

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The GE MDS LLC model TD220 is a narrowband wireless transceiver which is designed to transmit and receive data in the 216 to 220 MHz bands for FCC Parts 80, 90 and 95. Normally, the EUT would be placed on a tabletop or in a rack during operation. The EUT was, therefore, placed on a table during emissions testing to simulate the end user environment. The electrical rating of the EUT is 13.8vdc, 6 Amps.

The sample was received on December 10, 2010 and tested on December 10 and 23, 2010. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
GE MDS LLC	TD220	Digital Microwave Radio	1892922	E5MDS-TD220

OTHER EUT DETAILS

The EUT can be used with antennas up to 12.2 dBi.

ENCLOSURE

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

MODIFICATIONS

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
Power Designs Inc.	6150D	Power Supply	None	-

No remote support equipment was used during testing.

EUT INTERFACE PORTS

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

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Serial	Terminator	Multiwire	Shielded	2
Antenna	Terminator	No cable	-	-
DC Power	Power Supply	Two wire	Unshielded	4

Note: The USB port was not connected during testing. GE MDS stated that this are for configuration purposes and therefore would not normally be connected.

EUT OPERATION

During emissions testing the EUT was set to transmit a modulated signal at the selected frequency.

TESTING

GENERAL INFORMATION

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.

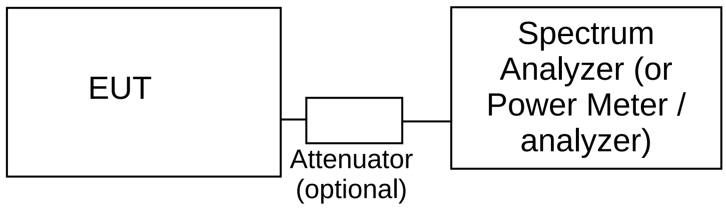
Site	Registration Numbers		Location
	FCC	Canada	
Chamber 3	769238	IC 2845B-3	41039 Boyce Road Fremont, CA 94538-2435
Chamber 4	211948	IC 2845B-4	
Chamber 5	211948	IC 2845B-5	

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

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.

Power measurements made directly on the rf power port are, when appropriate, converted to an EIRP by adding the gain of the highest gain antenna that can be used with the device under test, as specified by the manufacturer.

For devices with an integral antenna the output power is measured as a field strength at a test distance of (typically) 3m and then converted to an eirp using far field equations as shown in SAMPLE CALCULATIONS –RADIATED POWER.

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.

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.

RADIATED EMISSIONS MEASUREMENTS

Receiver radiated spurious emissions measurements are made in accordance with ANSI 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 the 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 angel 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:

R_r = Measured value in dBm
S = Specification Limit in dBm
M = Margin to Specification in +/- dB

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 sued 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:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_s = Specification Distance in meters

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

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

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. 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

For MedRadio, the above limits also apply to the transmitter per §95.635(d).

Appendix A Test Equipment Calibration Data

Radiated Emissions, 30 - 2,300 MHz, 10-Dec-10

Manufacturer	Description	Model	Asset #	Cal Due
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1657	5/28/2012
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1756	3/16/2011

Radio Antenna Port (Power and Mask), 10-Dec-10

Manufacturer	Description	Model	Asset #	Cal Due
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1422	12/1/2011
Rohde & Schwarz	Attenuator, 20 dB, 10W, DC-18 GHz	20dB, 10W, Type N	1795	6/2/2011
Rohde & Schwarz	Power Sensor 100 uW - 10 Watts	NRV-Z53	1796	6/2/2011
Agilent	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	1/6/2011

FCC Masks, 23-Dec-10

Manufacturer	Description	Model	Asset #	Cal Due
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1630	3/31/2011

Spurious Emissions, 18-Jan-11

Manufacturer	Description	Model	Asset #	Cal Due
Agilent	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	2/6/2011

Appendix B Test Data

T81418 20 Pages

Elliott An ACET company

EMC Test Data

Client:	GE MDS LLC	Job Number:	J81361
Model:	TD220	T-Log Number:	T81418
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		-
Emissions Standard(s):	FCC Parts 80, 90 and 95	Class:	Radio
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

GE MDS LLC

Model

TD220

Date of Last Test: 1/18/2011

Client:	GE MDS LLC	Job Number:	J81361
Model:	TD220	T-Log Number:	T81418
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 80, 90 and 95	Class:	Radio

FCC Parts 80 and 95

Power, Occupied Bandwidth, Frequency Stability 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.

General Test Configuration

All measurements are made with the EUT's rf port connected to the measurement instrument via an attenuator or dc-block if necessary. All amplitude measurements are adjusted to account for the attenuation between EUT and measuring instrument.

Radiated measurements are made with the EUT located on a non-conductive table, 3m from the measurement antenna.

Ambient Conditions:

Temperature: 20 °C
Rel. Humidity: 41 %

Summary of Results

Run #	Spacing	Data Rate	Test Performed	Limit	Pass / Fail	Result / Margin
1	12.5 kHz		Output Power	Depends on Usage	Pass	44.4 dBm / 32.3 dBm
2	12.5 kHz		Spectral Mask	Within Mask	Pass	Within Mask
3	12.5 kHz		99% or Occupied Bandwidth	20 kHz	-	10.2 kHz

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.

Elliott
An NTS company

Radio Test Data

Client:	GE MDS LLC	Job Number:	J81361
Model:	TD220	T-Log Number:	T81418
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 80, 90 and 95	Class:	Radio

Run #1: Output Power

Date: 12/10/2010 Engineer: David Bare Location: EMC Lab #4

Cable Loss: 0.0 dB Attenuator: 30.0 dB Total Loss: 30.0 dB
Cable ID(s): None used Attenuator IDs: 1878 & 2102

Power Setting[2]	Frequency (MHz)	Output Power (dBm) [1]	Output Power W	Antenna Gain (dBi)	Result	EIRP dBm	EIRP W
XL	216	32.3	1.7		Pass	32.3	1.698
H	216	44.4	27.5		Pass	44.4	27.542
XL	217.5	32.2	1.7		Pass	32.2	1.660
H	217.5	44.4	27.5		Pass	44.4	27.542
XL	219	32.2	1.7		Pass	32.2	1.660
H	219	44.3	26.9		Pass	44.3	26.915
XL	222	32.0	1.6		Pass	32.0	1.585
H	222	44.1	25.7		Pass	44.1	25.704

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:	Maximum power was within 0.1dB of original FCC Part 90 measured power.

Elliott

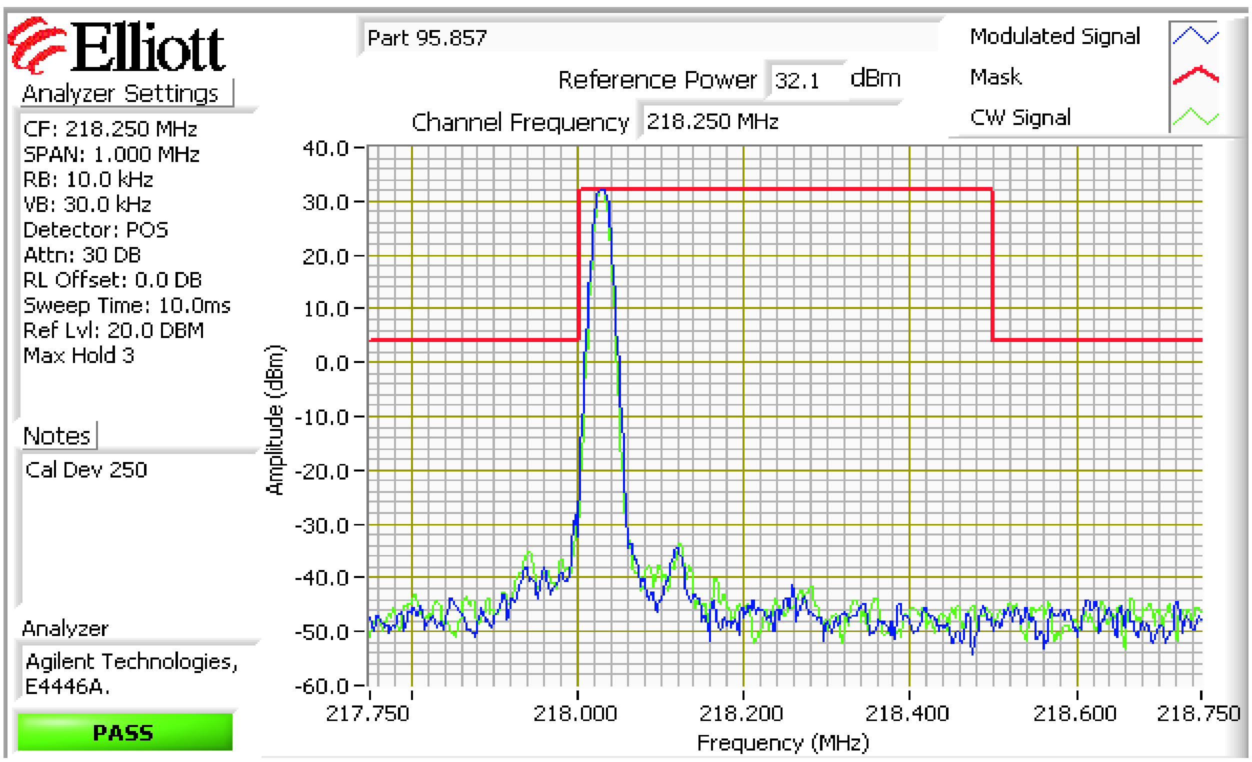
Radio Test Data

Client:	GE MDS LLC	Job Number:	J81361
Model:	TD220	T-Log Number:	T81418
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 80, 90 and 95	Class:	Radio

Run #2: Spectral Mask, FCC Part 80 Mask 80.211(f) and FCC Part 95.857, 2 and 25 watts

Date: 12/10/2010 Engineer: David Bare Location: EMC Lab #4

Note 1:	For Part 95.857, RBW = 10 kHz, VBW = 30 kHz. Frequency segment midpoint is 218.25 MHz. For Part 80.211(f), RBW=300Hz, VBW=1 kHz, Max hold used for each plot. Reference for the top of the mask is from the amplitude of the unmodulated carrier.



EUT at low channel in segment (218.025 MHz)

Radio Test Data

Client:	GE MDS LLC	Job Number:	J81361
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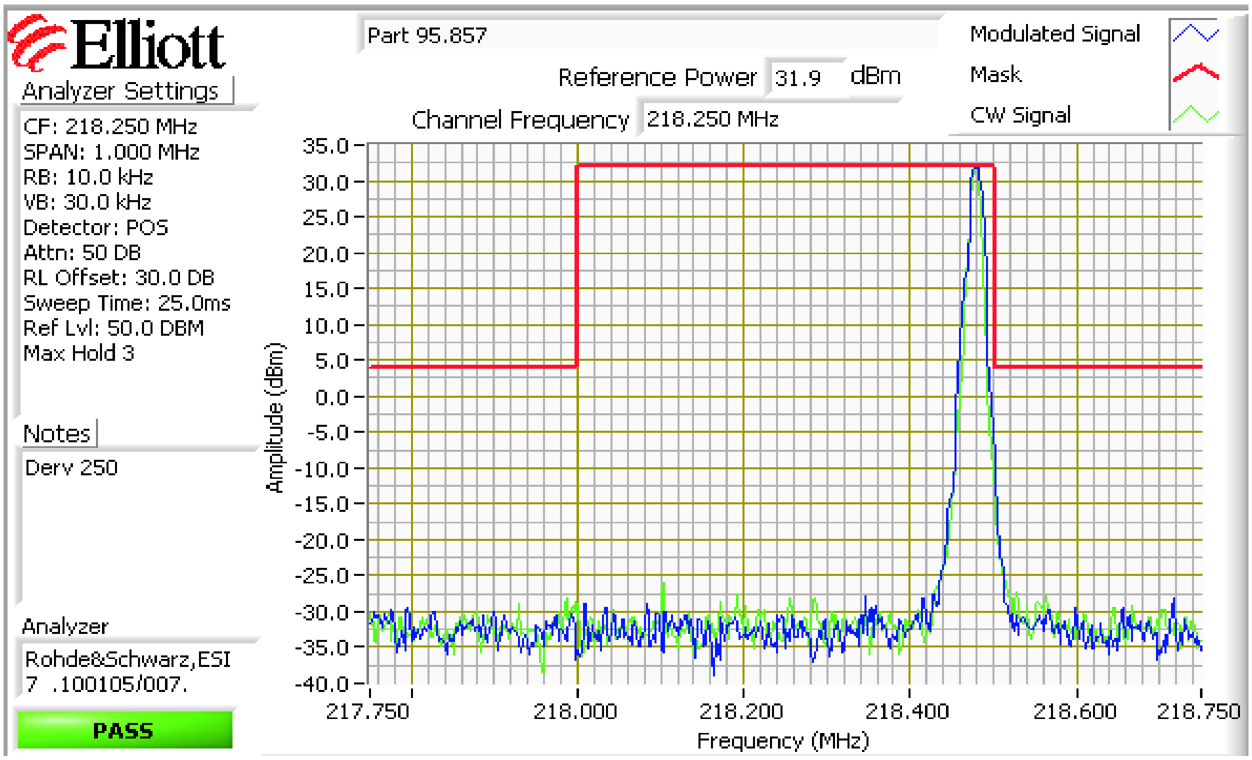
Standard:	FCC Parts 80, 90 and 95	Class:	Radio



EUT at high channel in segment (218.475 MHz)

Radio Test Data

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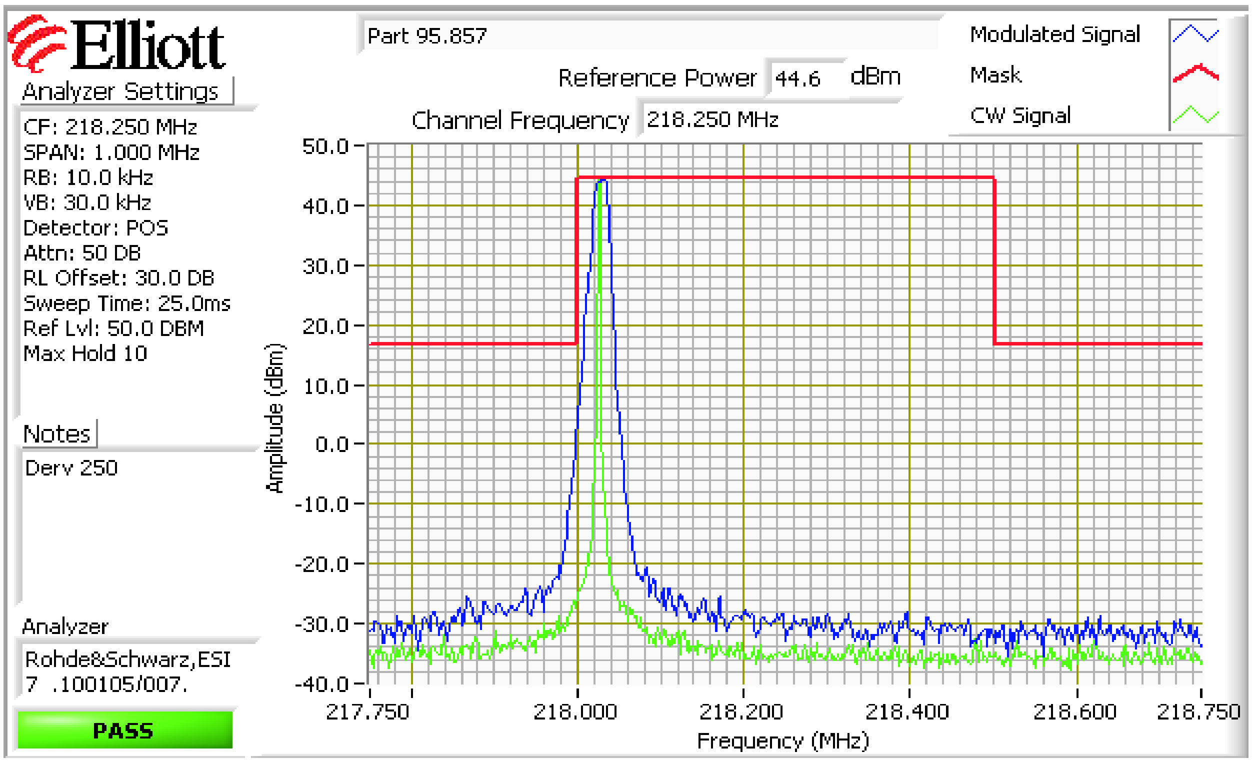
Model:	TD220	T-Log Number:	T81418
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 80, 90 and 95	Class:	Radio



EUT at low channel in segment (218.025 MHz)

Radio Test Data

Client:	GE MDS LLC	Job Number:	J81361
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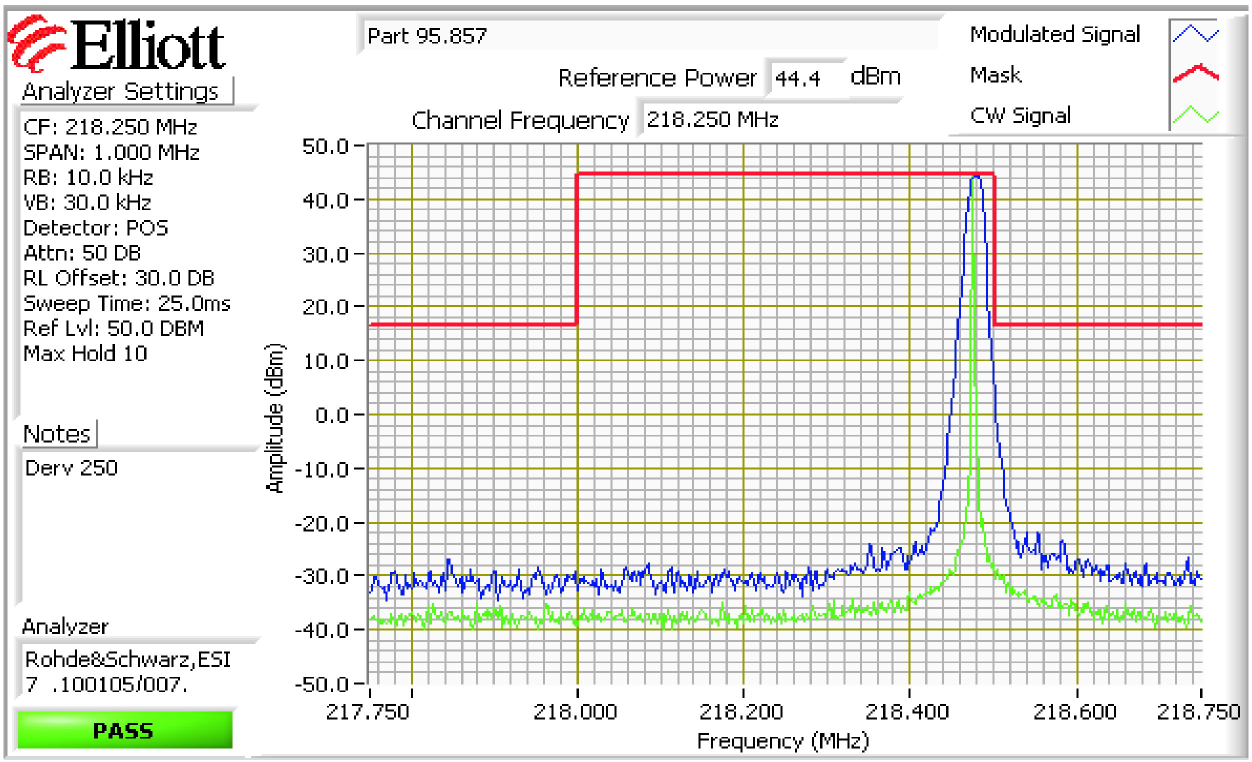
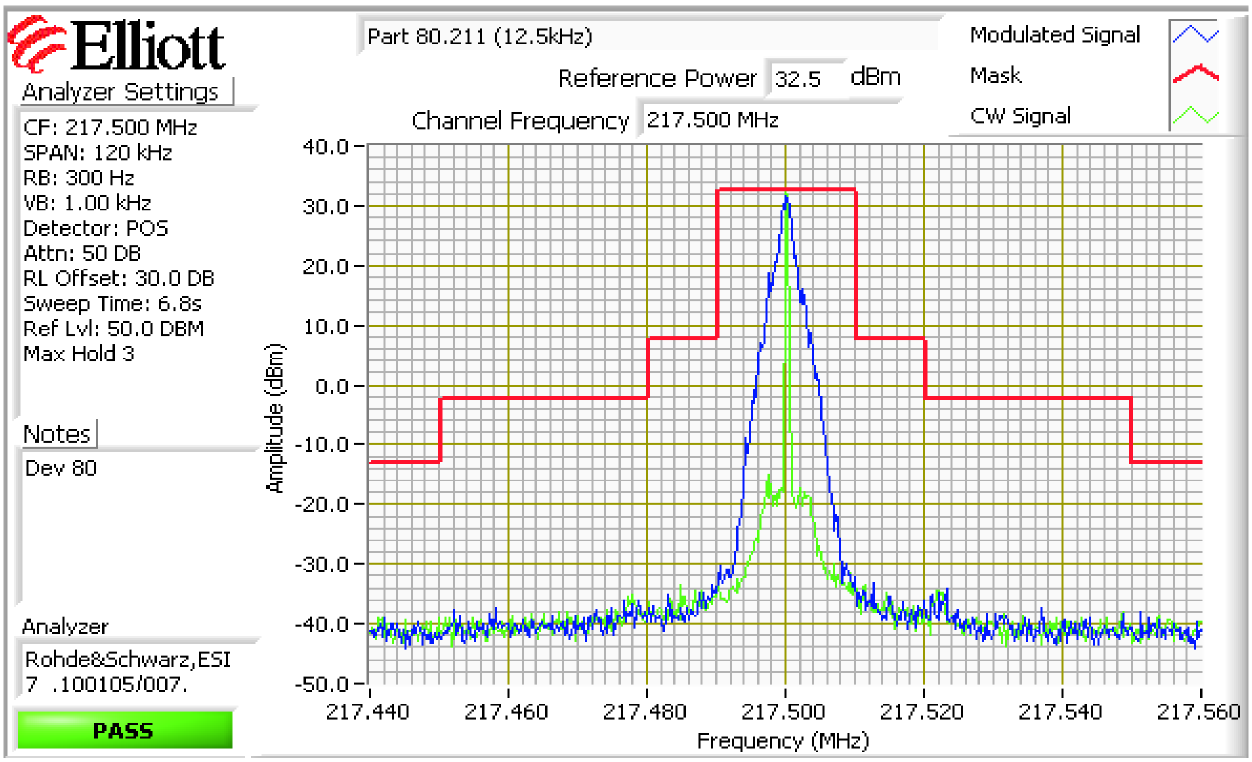
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 80, 90 and 95	Class:	Radio



EUT at high channel in segment (218.475 MHz)

Radio Test Data

Client:	GE MDS LLC	Job Number:	J81361
Model:	TD220	T-Log Number:	T81418
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 80, 90 and 95	Class:	Radio



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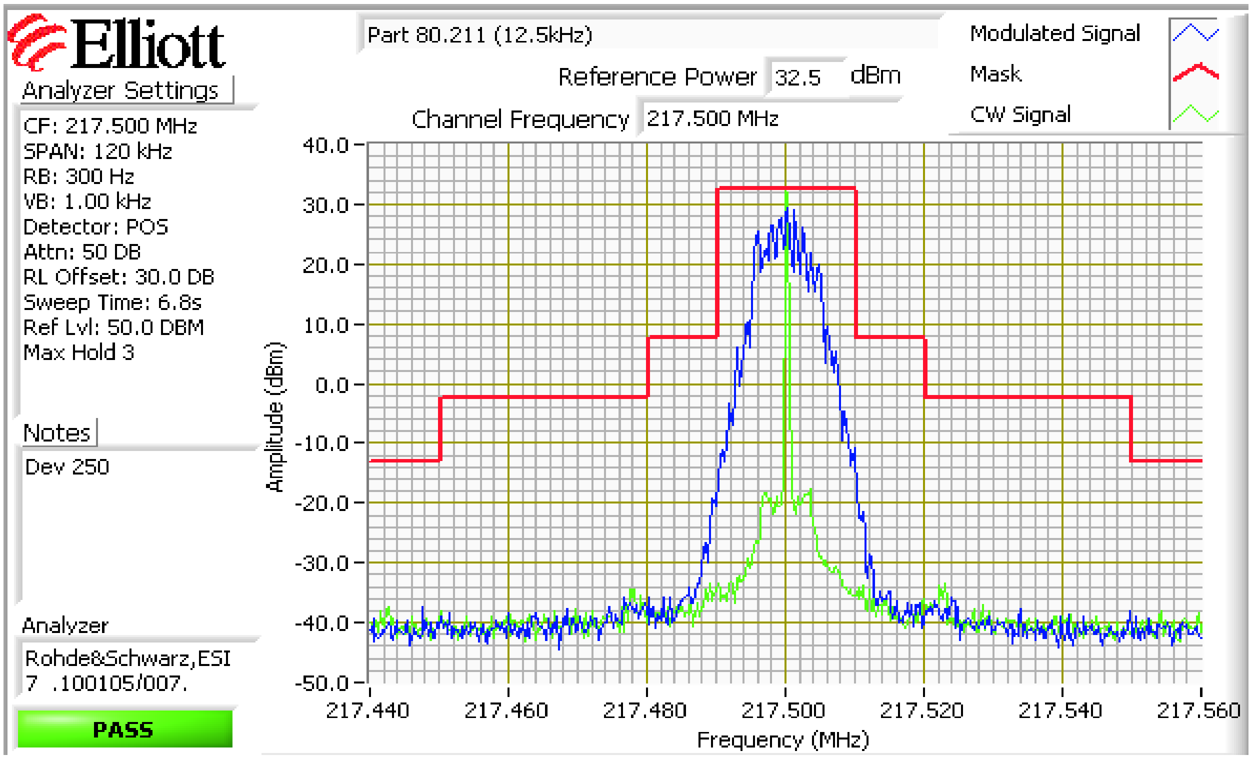

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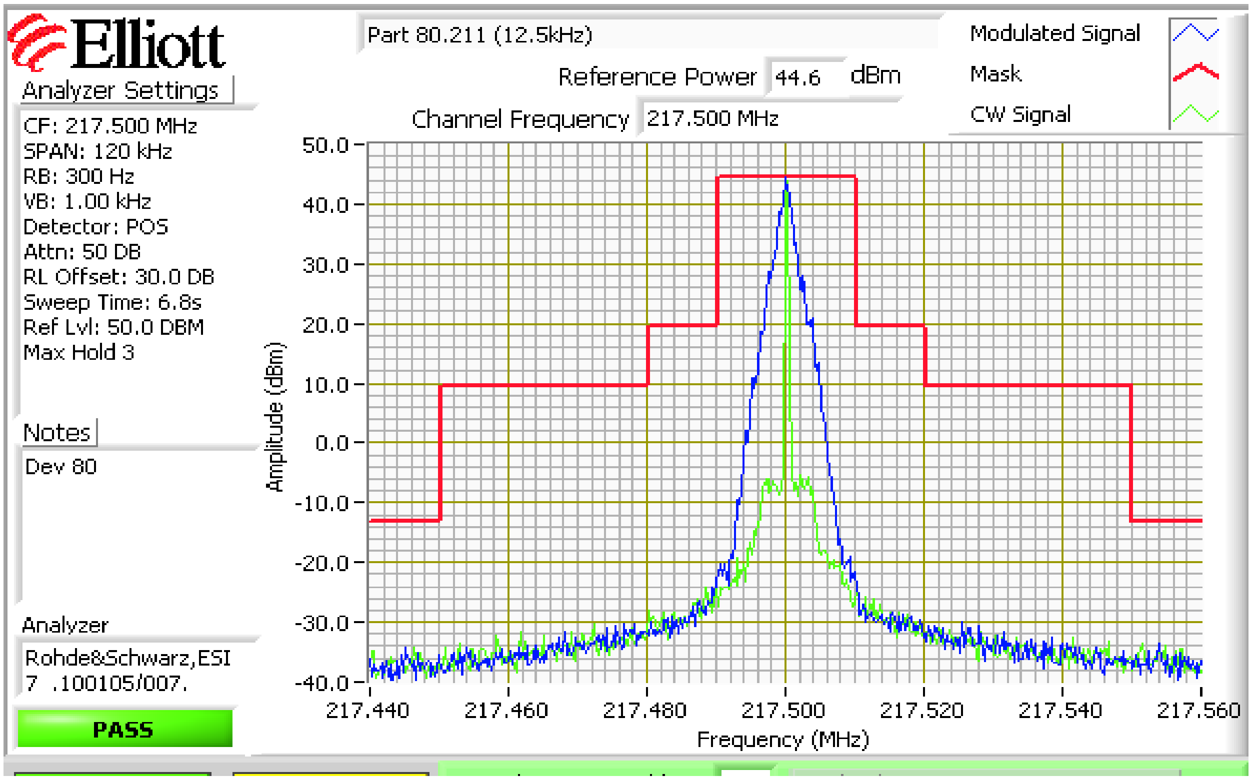
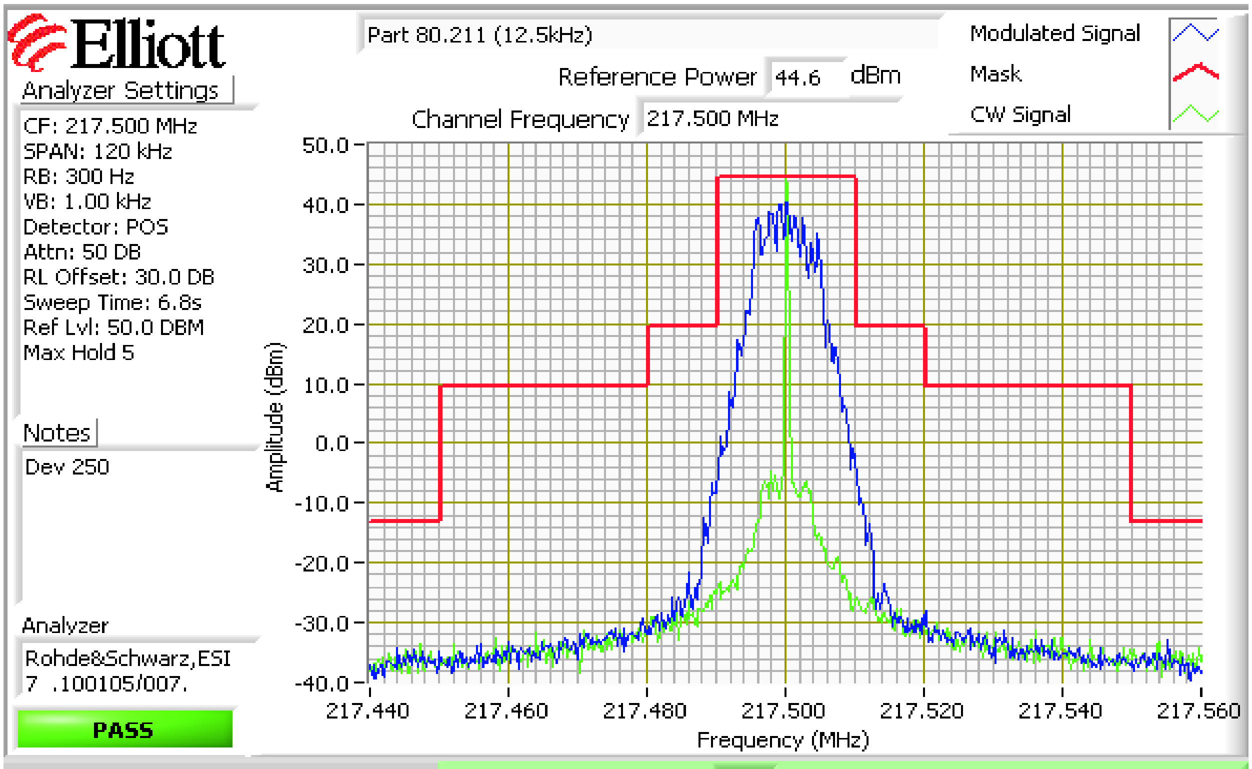
Client:	GE MDS LLC	Job Number:	J81361
Model:	TD220	T-Log Number:	T81418
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 80, 90 and 95	Class:	Radio



Elliott

Radio Test Data

Client:	GE MDS LLC	Job Number:	J81361
Model:	TD220	T-Log Number:	T81418
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 80, 90 and 95	Class:	Radio



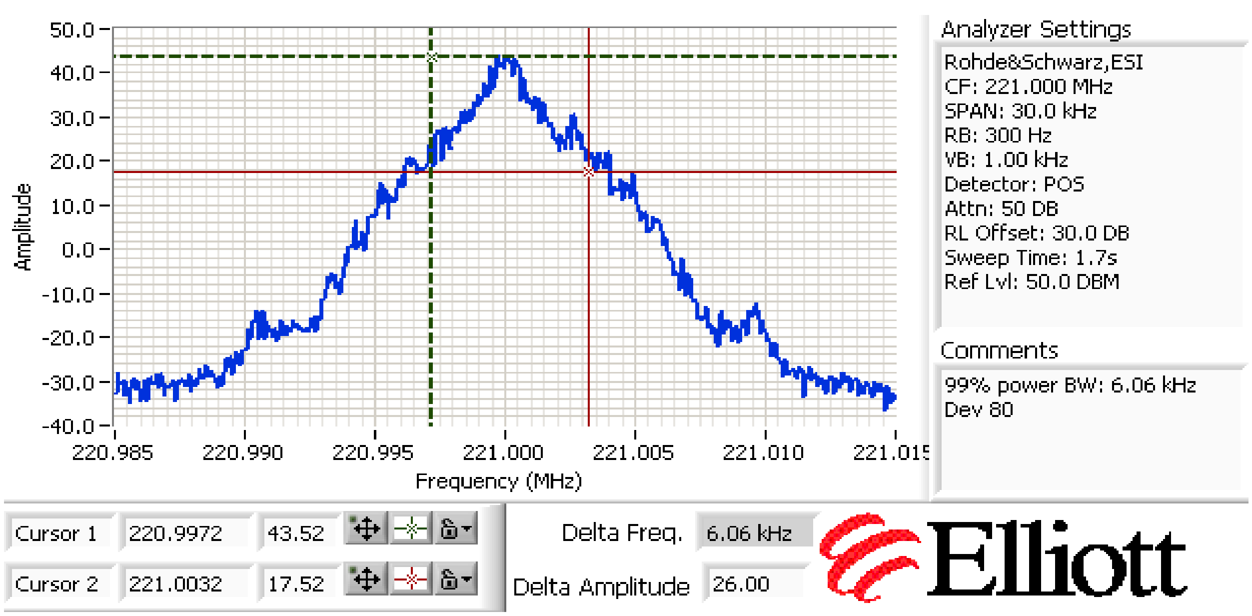
Client:	GE MDS LLC	Job Number:	J81361
Model:	TD220	T-Log Number:	T81418
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 80, 90 and 95	Class:	Radio

Run #3: Signal Bandwidth

Date: 12/10/2010 Engineer: David Bare Location: EMC Lab #4

Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (kHz)		Dev
			26dB	99%	
H	221	300 Hz		6.06	80
H	221	300 Hz		10.2	250

Note 1: 99% bandwidth measured in accordance with RSS GEN, with RB > 1% of the span and VB > 3xRB



Elliott

Radio Test Data

Client:	GE MDS LLC	Job Number:	J81361
Model:	TD220	T-Log Number:	T81418
		Account Manager:	Susan Pelzl
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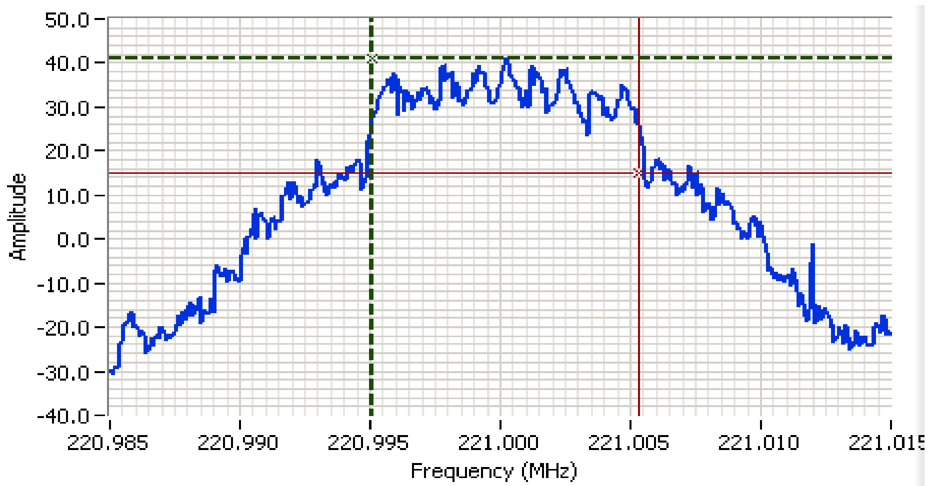
Standard:	FCC Parts 80, 90 and 95	Class:	Radio



Analyzer Settings

Rohde&Schwarz,ESI
CF: 221.000 MHz
SPAN: 30.0 kHz
RB: 300 Hz
VB: 1.00 kHz
Detector: POS
Attn: 50 DB
RL Offset: 30.0 DB
Sweep Time: 1.7s
Ref Lvl: 50.0 DBM

Comments

99% power BW: 10.2 kHz
Dev 250

Cursor 1	220.9951	40.87
Cursor 2	221.0053	14.87

Delta Freq. 10.2 kHz

Delta Amplitude 26.00

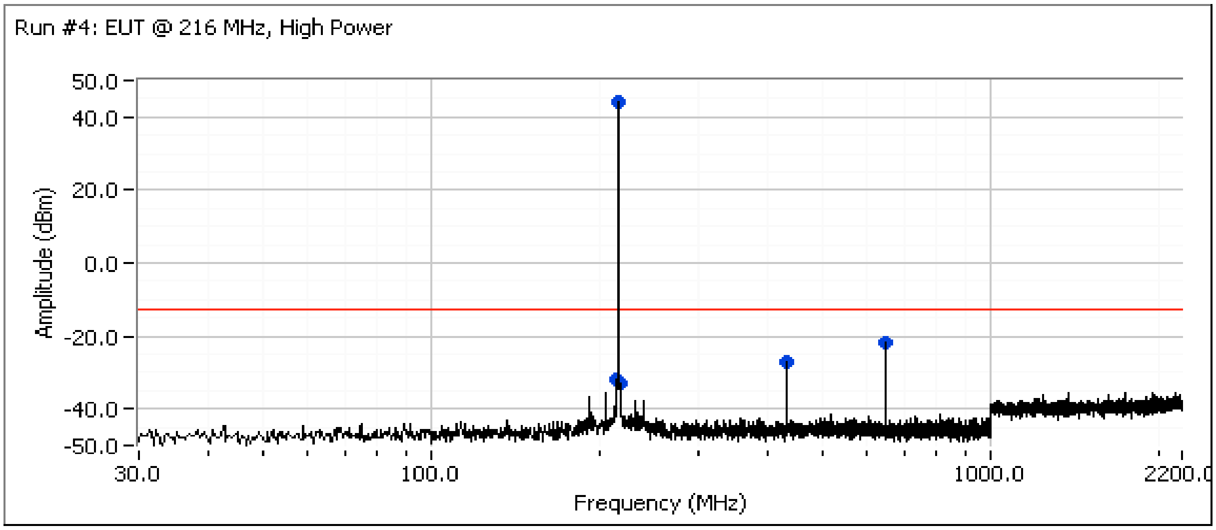
Elliott

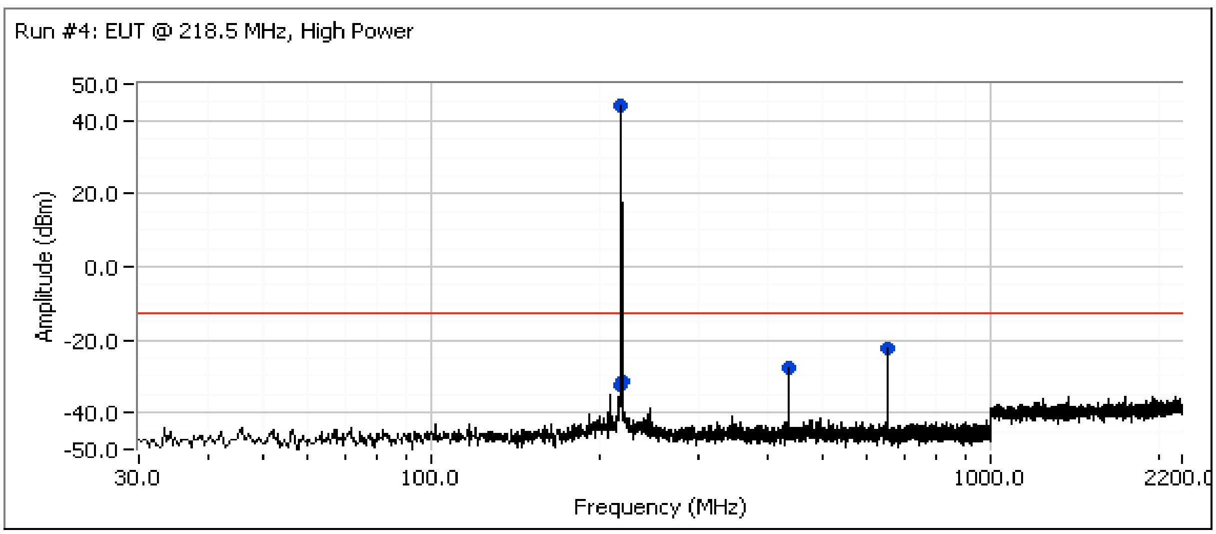
Radio Test Data

Client:	GE MDS LLC	Job Number:	J81361
Model:	TD220	T-Log Number:	T81418
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 80, 90 and 95	Class:	Radio

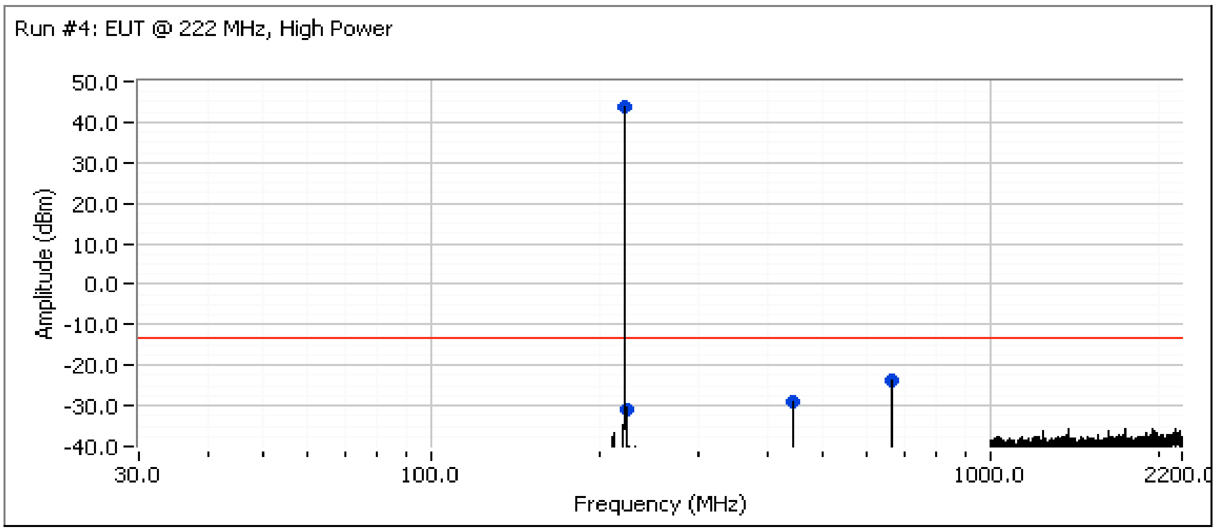
Run #4: Out of Band Spurious Emissions, Conducted

Date: 1/17/2011 Engineer: David W. Bare Location: EMC Lab #4





Client:	GE MDS LLC	Job Number:	J81361
Model:	TD220	T-Log Number:	T81418
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 80, 90 and 95	Class:	Radio



Frequency	Level		FCC 80.211(f)		Detector	Comments	Channel
MHz	dBμV/m		Limit	Margin	Pk/QP/Avg		
214.685	-31.8	RF Port	-13.0	-18.8	Peak		216 MHz
216.000	44.0	RF Port			Peak	Fundamental	216 MHz
217.272	-33.0	RF Port	-13.0	-20.0	Peak		216 MHz
432.037	-27.1	RF Port	-13.0	-14.1	Peak		216 MHz
648.096	-21.8	RF Port	-13.0	-8.8	Peak		216 MHz
217.272	-32.5	RF Port	-13.0	-19.5	Peak		218.5 MHz
218.500	43.9	RF Port			Peak	Fundamental	218.5 MHz
219.860	-31.2	RF Port	-13.0	-18.2	Peak		218.5 MHz
436.889	-27.9	RF Port	-13.0	-14.9	Peak		218.5 MHz
655.535	-22.6	RF Port	-13.0	-9.6	Peak		218.5 MHz
222.000	43.8	RF Port			Peak	Fundamental	222 MHz
223.418	-30.9	RF Port	-13.0	-17.9	Peak		222 MHz
444.005	-29.1	RF Port	-13.0	-16.1	Peak		222 MHz
665.885	-23.5	RF Port	-13.0	-10.5	Peak		222 MHz

Client:	GE MDS LLC	Job Number:	J81361
Model:	TD220	T-Log Number:	T81418
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 80, 90 and 95	Class:	Radio

FCC Parts 80 and 95
Spurious Emissions

Test Specific Details

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

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing. All remote support equipment was located approximately 30 meters from the EUT.

Radiated measurements are made with the EUT located on a non-conductive table, 3m from the measurement antenna.

Ambient Conditions:

Temperature: 18 °C
Rel. Humidity: 42 %

Summary of Results

Run #	Spacing		Test Performed	Limit	Pass / Fail	Result / Margin
1a	12.5 kHz		Spurious emissions (radiated)	-13 dBm	Eval	Refer to Run
1b	12.5 kHz		Spurious emissions (substitutions)	-13 dBm	Pass	-30.1 dBm

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.

Elliott	Radio Test Data

Client:	GE MDS LLC	Job Number:	J81361
Model:	TD220	T-Log Number:	T81418
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		
Standard:	FCC Parts 80, 90 and 95	Class:	Radio

Run #1: Out of Band Spurious Emissions, Radiated

Low Channel = 216.0125 MHz, Mid Channel = 219 MHz, High Channel = 221.975 MHz

Conducted limit (dBm): -13 Approximate field strength limit @ 3m: 82.3

The limit is taken from FCC Part 80 Mask F and § 95.857

Run #1a - Preliminary measurements

Date: 12/10/2010 Engineer: David Bare Location: Chamber #5

Frequency	Level	Pol	FCC		Detector	Azimuth	Height	Comments	Channel
MHz	dBμV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		
194.070	53.1	H	82.2	-29.1	Peak	128	1.0		216.125
216.125	73.5	H	N/A	-	Peak	144	1.0	Fundamental	216.125
334.130	53.1	H	82.2	-29.1	Peak	128	1.0		216.125
864.500	62.4	H	82.2	-19.8	Peak	210	1.0		216.125
1039.970	38.5	H	82.2	-43.7	Peak	56	1.0		216.125
1080.530	46.6	V	82.2	-35.6	Peak	130	1.0		216.125
1358.050	40.4	H	82.2	-41.8	Peak	125	1.0		216.125
64.696	52.0	H	82.2	-30.2	Peak	46	3.0		219
194.076	55.1	H	82.2	-27.1	Peak	88	1.0		219
219.000	70.6	H	N/A	-	Peak	93	1.5		219
334.121	55.8	H	82.2	-26.4	Peak	171	1.0		219
467.781	45.9	H	82.2	-36.3	Peak	94	1.5		219
876.009	64.0	H	82.2	-18.2	Peak	206	1.0		219
1093.790	49.3	V	82.2	-32.9	Peak	134	1.0		219
1198.000	37.0	V	82.2	-45.2	Peak	115	1.0		219
1314.000	39.9	V	82.2	-42.3	Peak	27	1.0		219
64.696	52.4	H	82.2	-29.8	Peak	243	4.0		221.975
194.084	53.9	H	82.2	-28.3	Peak	115	2.0		221.975
221.978	70.2	H	N/A	-	Peak	89	1.0	Fundamental	221.975
334.133	54.2	H	82.2	-28.0	Peak	166	1.0		221.975
887.900	59.7	H	82.2	-22.5	Peak	208	1.0		221.975
1109.870	42.5	H	82.2	-39.7	Peak	49	1.0		221.975
1358.150	38.0	V	82.2	-44.2	Peak	7	2.5		221.975
1885.770	47.0	H	82.2	-35.2	Peak	35	1.0	Cell phone pickup at test receiver	
1896.190	48.7	H	82.2	-33.5	Peak	270	2.0	Cell phone pickup at test receiver	

Note 1:	The field strength limit in the tables above was calculated from the erp/eirp limit detailed in the standard using the free space propagation equation: E=√(30PG)/d. This limit is conservative - it does not consider the presence of the ground plane and, for erp limits, the dipole gain (2.2dBi) has not been included. The erp or eirp for all signals with less than 20dB of margin relative to this field strength limit is determined using substitution measurements.
Note 2:	Measurements are made with the antenna port terminated.
Note 3:	The change in noise floor above 1GHz is due to the use of less input attenuation used above 1 GHz.

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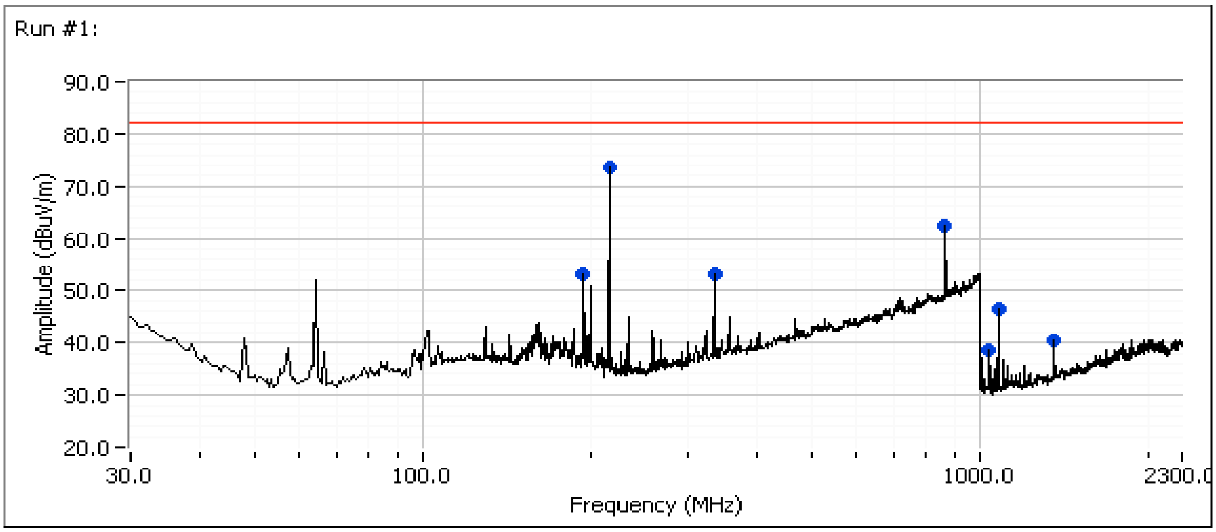
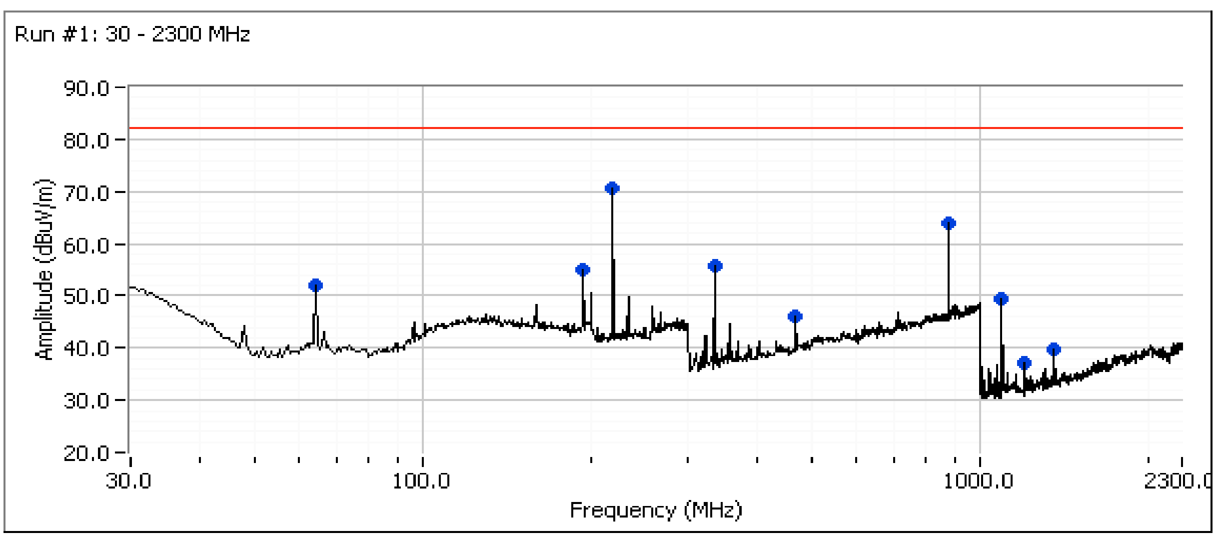
Standard:	FCC Parts 80, 90 and 95	Class:	Radio



Plots for low channel (216.125 MHz), power setting(s) = H



Plots for center channel (219 MHz), power setting(s) = H

Elliott	Radio Test Data		
Client:	GE MDS LLC	Job Number:	J81361
Model:	TD220	T-Log Number:	T81418
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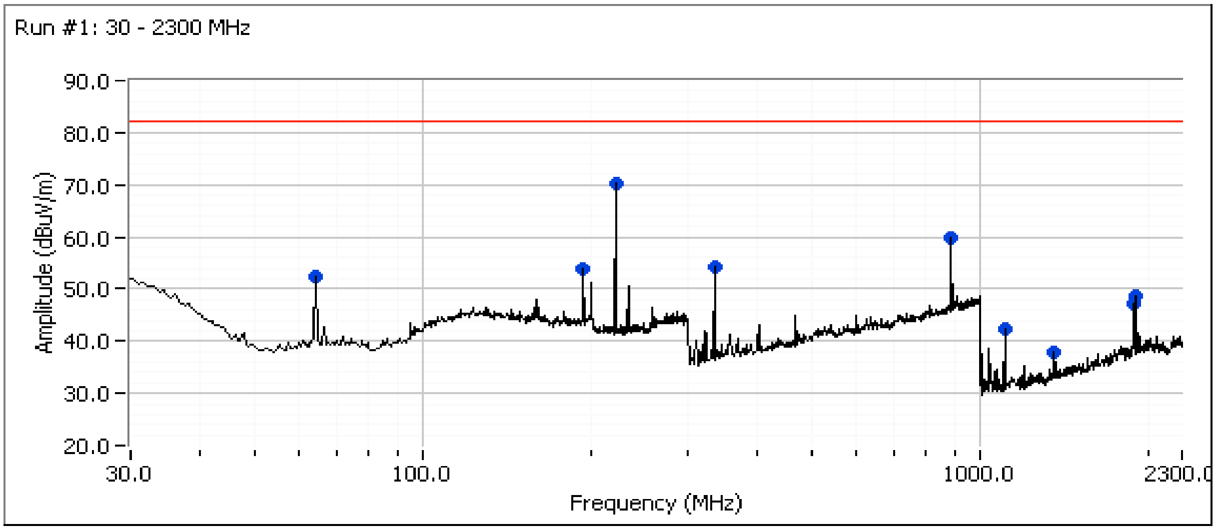
Contact:	Dennis McCarthy		
Standard:	FCC Parts 80, 90 and 95	Class:	Radio



Plots for high channel (221.975), power setting(s) = H

Run #1b: - Final Field Strength Measurements and Substitution Measurements

Date: 12/10/2010 Engineer: David Bare Location: Chamber #5

Frequency	Level	Pol	FCC		Detector	Azimuth	Height	Comments	Channel
MHz	dBμV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		
876.000	64.9	H	82.2	-17.3	Pk	210	1.2		219
864.500	63.5	H	82.2	-18.7	Peak	209	1.2		216.125

Substitution measurements

Horizontal

Frequency	Substitution measurements			Site	EUT measurements			eirp Limit	erp Limit	Margin
MHz	Pin[1]	Gain[2]	FS[3]	Factor[4]	FS[5]	eirp (dBm)	erp (dBm)	dBm	dBm	dB
876.000	-11.0	2.2	84.0	92.8	64.9	-27.9	-30.1		-13.0	-17.1
864.500	-11.0	2.2	84.5	93.3	63.5	-29.8	-32.0		-13.0	-19.0

Note 1:	Pin is the input power (dBm) to the substitution antenna
Note 2:	Gain is the gain (dBi) for the substitution antenna.
Note 3:	FS is the field strength (dBuV/m) measured from the substitution antenna.
Note 4:	Site Factor - this is the site factor to convert from a field strength in dBuV/m to an eirp in dBm.
Note 5:	EUT field strength as measured during initial run.

Client:	GE MDS LLC	Job Number:	J81361
Model:	TD220	T-Log Number:	T81418
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Contact:	Dennis McCarthy		
Standard:	FCC Parts 80, 90 and 95	Class:	Radio