EMISSION TEST REPORT

Report Number: 3171911BOX-002

Project Number: 3171911

Testing performed on the

Palm Antenna

Model: 62000

To

FCC Part 15 Subpart F – Ultra-Wideband Operation

For

Geophysical Survey Systems, Inc.

Test Performed by:	Test Authorized by:
Intertek – ETL SEMKO	Geophysical Survey Systems, Inc.
70 Codman Hill Road	12 Industrial Way
Boxborough, MA 01719	Salem, NH 03079

Prepared by: _____ Date: 2/17/09
Kouma Sinn, Sr. Project Engineer

Reviewed by: _____ Date: 02/18/09
Jeff Goulet, Engineering Team Leader, EMC

1.0 Job Description

1.1 Client Information:

This equipment under test (EUT) has been tested at the request of:

Company:	Geophysical Survey Systems, Inc. 12 Industrial Way Salem, NH 03079
Contact:	Alan Schutz
Telephone:	(603) 893-1109
Fax:	(603) 889-3984
Email:	alan.s@geophysical.com

1.2 Equipment Under Test:

Equipment Type:	Palm Antenna
Model Number(s):	62000
Serial number(s):	PROTO1
Manufacturer:	Geophysical Survey Systems, Inc.
EUT receive date:	2/12/09
EUT received condition:	A prototype unit was received with no visible damage.
Test start date:	2/12/09
Test end date:	2/12/09

1.3 Test Plan Reference: ANSI C63.4-2003

1.4 Test Configuration:

As shown in the block diagram

1.4.1 EUT Voltage Range:

The EUT powers from SIR20

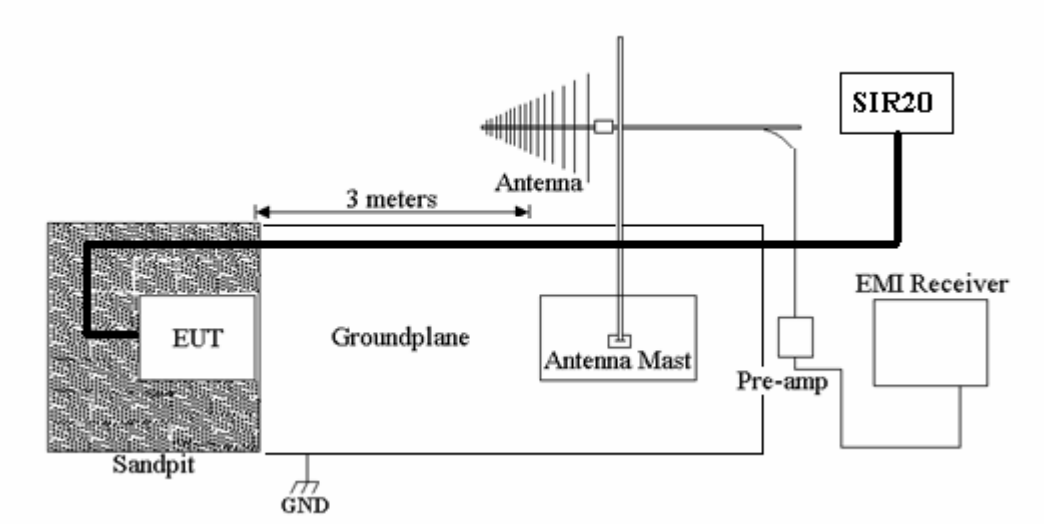
1.4.2 Cables:

Cable	Shielding	Connector	Length(m)	Qty.
Control/Power	Braid	Metal	13	1

1.4.3 Support Equipment:

Description	Manufacturer	Model	Serial No.
SIR20 Survey Controller	GSSI	MF-200/1000	1
AC Adapter	Panasonic AC Adapter	CF-AA 1653	03800001A
AC Adapter	Sceptre	84/9	350

1.4.4 Block Diagram:



1.5 Mode(s) of Operation:

The EUT was continuous transmitting and collecting data during testing.

1.6 Modifications Required For Compliance:

None

2.0 Test Summary:

TEST STANDARD	RESULTS	
FCC Part 15 Subpart F – Ultra-Wideband Operation		
SUB-TEST	**TEST PARAMETER**	**PASS/FAIL**
Radiated Emissions	Per Standard Specifications	Pass
Line-Conducted Emissions	N/A	N/A
10 dB Bandwidth	The UWB bandwidth is the frequency band bounded by the points that are 10 dB below the highest radiated emission, as based on the complete transmission system including the antenna. The fractional bandwidth shall be equal to or greater than 0.20 or has a UWB bandwidth equal to or greater than 500 MHz, regardless of the fractional bandwidth.	Pass

REVISION SUMMARY – The following changes have been made to this Report:

Date	Project No.	Project Handler	Page(s)	Item	**Description of Change**

3.0 Sample Calculations:

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

Level in μV/m = [10(32 dBμV/m)/20] = 39.8 μV/m

The following is how net line-conducted readings were determined:

NF = RF + LF + CF + AF
Where NF = Net Reading in dBμV
RF = Reading from receiver in dBμV
LF = LISN Correction Factor in dB
CF = Cable Correction Factor in dB
AF = Attenuator Loss Factor in dB

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV

Example:

NF = RF + LF + CF + AF = 28.5 + 0.2 + 0.4 + 20.0 = 49.1 dBμV
$UF = 10^{(48.1\ dB\mu V / 20)}$ = 254 μV/m

4.0 Measurement Uncertainty:

Compliance of the product is based on the measured value. However, the measurement uncertainty is included for informational purposes.
The expanded uncertainty (k = 2) for radiated emissions from 30 to 1000 MHz has been determined to be:

±3.5 dB at 10m and ±3.8 dB at 3m

The expanded uncertainty (k = 2) for mains conducted emissions from 150 kHz to 30 MHz has been determined to be:

±2.6 dB

The expanded uncertainty (k = 2) for telecom port conducted emissions from 150 kHz to 30 MHz has been determined to be:

±3.2 for ISN and voltage probe measurements
±3.1 for current probe measurements

5.0 Site Description:

Test Site(s): 1

Our OATS are 3m and 10m sheltered emissions measurement ranges located in a light commercial environment in Boxborough, Massachusetts. They meet the technical requirements of ANSI C63.4-2003 and CISPR 22:1993/EN 55022:1994 for radiated and conducted emission measurements. The shelter structure is entirely fiberglass and plastic, with outside dimensions of 33 ft x 57 ft. The structure resembles a quonset hut with a center ceiling height of 16.5 ft.

The testing floor is covered by a galvanized sheet metal groundplane that is earth-grounded via copper rods around the perimeter of the site. The joints between individual metal sheets are bridged with a 2 inch wide metal strips to provide low RF impedance contact throughout. The sheets are screwed in place with stainless steel, round-head screws every three inches. Site illumination and HVAC are provided from beneath the ground reference plane through flush entry ports, the port covers are electrically bonded to the ground plane.

A flush metal turntable with 12 ft. diameter and 5000 lb. load capacity (12,000 lb. in Site 3) is provided for floor-standing equipment. A wooden table 80 cm high is used for table-top equipment. The turntable is electrically connected to the ground plane with three copper straps. The straps are connected to the turntable at the center of it with ground braid. The copper strap is directly connected to the groundplane at the edges of the turntable. The turntable is located on the south end of the structure and the antennas are mounted 3 and 10 meters away to the north. The antenna mast is a non-conductive with remote control of antenna height and polarization. The antenna height is adjustable from 1 to 4 meters.

All final radiated emission measurements are performed with the testing personnel and measurement equipment located below the ground reference plane. The site has a full basement underneath the turntable where support equipment may be remotely located. Operation of the antenna, turntable and equipment under test is controlled by remote controls that manipulate the antenna height and polarization and with a turntable control. Test personnel are located below the ellipse when measurements are performed, however the site maintains the ability of having personnel manipulate cables while monitoring test equipment. Ambient radiated emissions are 6 dB or more below the relevant FCC emission limits.

AC mains power is brought to the equipment under test through a power line filter, to remove ambient conducted noise. 50 Hz (240 VAC single phase), 60 Hz power (120 VAC single phase, 208 VAC three phase), and 60 Hz (480 VAC three phase) are available. Conducted emission measurements are performed with a Line Impedance Stabilization Network (LISN) or Artificial Mains Network (AMN) bonded to the ground reference plane. A removable vertical groundplane (2 meter X 2 meter area) is used for line-conducted measurements for table top equipment. The vertical groundplane is electrically connected to the reference groundplane.

Sandpit

The sandpit test site used during testing was made in according with FCC Part 15F. The test site was constructed with a dimension of 16.40ft x 16.40ft x 30inches deep. The whole area was filled with dry sand. The equipment under test (EUT) was placed directly on the sand while the receiving antenna was placed at a distance of 3m from the closest point of the EUT. A groundplane with a dimension of 15.75ft x 19.50ft was placed between the EUT and receiving antenna and connected to earth ground via a ground rod.

6.0 Testing Procedure

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.4 (2003).

All support equipment was remotely located. The EUT was placed directly on the sand 3 meters away from the receiving antenna with groundplane in between.

Initial testing was performed to maximize the emissions. The system was rotated every 45° and cables were oriented to get the worst emissions, the antenna height was varied from 1 meter to 4 meters above the ground, and the antenna polarization was changed. The EUT azimuth of maximum emissions was recorded. The worst-case orientation will be used in the final testing.

Test Results: Pass

Test Standard: FCC Part 15 Subpart F – Ultra-Wideband Operation

Test: Radiated Emissions

Performance Criterion: Not Applicable

EUT Operating Voltage: EUT powers from SIR20

Test Environment:

Environmental Conditions During Testing:		Ambient (°C):	16	Humidity (%):	44	Pressure (hPa):	915
Pretest Verification Performed:		Yes		Equipment under Test:		62000	
Test Engineer(s):	Kouma Sinn			EUT Serial Number:		PROTO1	

Maximum Test Disturbance Parameters: Emissions below specified limits

Test Equipment Used:

TEST EQUIPMENT LIST					
Item	**Equipment Type**	**Make**	**Model No.**	**Serial No.**	**Next Cal. Due**
1	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	12/01/2009
2	Digital 4 Line Barometer	Mannix	0ABA116	BAR3	06/01/2009
3	ANTENNA	EMCO	3142	9701-1116	12/02/2009
4	40GHz Cable	Megaphase	TM40-K1K1-197	7030801 001	06/05/2009
5	40 GHz Cable	Megaphase	TM40-K1K1-197	7030801 002	06/05/2009
6	40 GHz Cable	Megaphase	TM40-K1K1-80	7030802 002	06/05/2009
7	100MHz-40GHz Preamp	MITEQ	NSP4000-NFG	1260417	03/27/2009
8	HORN ANTENNA	EMCO	3115	9610-4980	03/03/2009

Software Utilized:

Name	Manufacturer	Version
EXCEL 2000	Microsoft Corporation	9.0.6926 SP-3
EMI BOXBOROUGH	Intertek	2/07/05 Revision

Test Details:

Test Point	Standard Limit (as published)	Compliance Level	Pass/Fail N/A	Comment
Around the EUT	Per Standard	Per Standard	Pass	None

Test Results:

Radiated Emissions (30-960MHz)

Company: GSSI
Model #: 62000
Serial #: PROTO1
Engineers: Kouma Sinn
Project #: 3171911
Standard: FCC Part 15 Subpart F - Ultra-wideband Operation
Receiver: 145-092
PreAmp: PRE9 03-27-09.txt
PreAmp Used? (Y or N): N
Location: 1
Date(s): 02/12/09
Limit Distance (m): 3
Test Distance (m): 3
Antenna & Cables: N
Bands: N, LF, HF, SHF
Antenna: LOG1 12-02-2009 V3.txt LOG1 12-02-2009 H3.txt
Cable(s): MEG001 06-05-09.txt MEG002 06-05-09.txt
Barometer: BAR3
Temp/Humidity/Pressure: 16C 44% 915mbar
Voltage/Frequency: Powered from SIR20
Frequency Range: 30-960MHz

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	
PRF = 200kHz												
QP	V	52.820	13.0	8.3	0.8	0.0	0.0	22.1	40.0	-17.9	120/300 kHz	
QP	V	62.700	12.2	8.1	0.8	0.0	0.0	21.2	40.0	-18.8	120/300 kHz	
QP	V	74.550	12.3	7.4	0.9	0.0	0.0	20.6	40.0	-19.4	120/300 kHz	
QP	V	84.900	16.0	7.7	1.0	0.0	0.0	24.7	40.0	-15.3	120/300 kHz	
QP	V	45.860	13.2	9.7	0.7	0.0	0.0	23.6	40.0	-16.4	120/300 kHz	
QP	V	118.000	3.5	7.2	1.2	0.0	0.0	11.8	43.5	-31.7	120/300 kHz	
QP	V	148.000	6.6	8.5	1.3	0.0	0.0	16.4	43.5	-27.1	120/300 kHz	
QP	V	170.195	6.2	9.6	1.4	0.0	0.0	17.2	43.5	-26.3	120/300 kHz	
QP	V	201.025	7.1	11.1	1.5	0.0	0.0	19.8	43.5	-23.7	120/300 kHz	
QP	V	214.843	8.9	11.5	1.6	0.0	0.0	21.9	43.5	-21.6	120/300 kHz	
QP	V	230.055	5.3	11.9	1.6	0.0	0.0	18.8	46.0	-27.2	120/300 kHz	
QP	V	242.075	6.9	12.4	1.7	0.0	0.0	21.0	46.0	-25.0	120/300 kHz	
QP	V	265.000	7.3	13.0	1.7	0.0	0.0	22.0	46.0	-24.0	120/300 kHz	
QP	V	288.935	5.3	13.9	1.8	0.0	0.0	21.0	46.0	-25.0	120/300 kHz	
QP	V	311.960	4.6	14.4	1.9	0.0	0.0	20.9	46.0	-25.1	120/300 kHz	
QP	V	340.000	3.8	14.8	2.0	0.0	0.0	20.6	46.0	-25.4	120/300 kHz	
QP	V	362.000	4.8	15.2	2.1	0.0	0.0	22.1	46.0	-23.9	120/300 kHz	
QP	V	406.000	3.0	15.6	2.2	0.0	0.0	20.8	46.0	-25.2	120/300 kHz	
QP	V	434.000	3.8	16.6	2.3	0.0	0.0	22.7	46.0	-23.3	120/300 kHz	
QP	V	464.123	5.3	17.9	2.4	0.0	0.0	25.5	46.0	-20.5	120/300 kHz	
QP	V	486.945	4.6	18.6	2.4	0.0	0.0	25.6	46.0	-20.4	120/300 kHz	
QP	V	521.000	4.5	19.2	2.5	0.0	0.0	26.2	46.0	-19.8	120/300 kHz	
QP	V	538.000	2.7	19.2	2.5	0.0	0.0	24.4	46.0	-21.6	120/300 kHz	
QP	V	556.000	3.2	19.1	2.6	0.0	0.0	24.9	46.0	-21.1	120/300 kHz	
QP	V	588.055	3.4	19.1	2.7	0.0	0.0	25.1	46.0	-20.9	120/300 kHz	
QP	V	608.075	1.6	19.3	2.7	0.0	0.0	23.6	46.0	-22.4	120/300 kHz	
QP	V	628.910	0.4	19.4	2.8	0.0	0.0	22.5	46.0	-23.5	120/300 kHz	
QP	V	664.000	0.3	19.9	2.9	0.0	0.0	23.1	46.0	-22.9	120/300 kHz	
QP	V	688.800	-1.8	20.3	2.9	0.0	0.0	21.4	46.0	-24.6	120/300 kHz	
QP	V	718.000	0.0	20.5	3.0	0.0	0.0	23.6	46.0	-22.4	120/300 kHz	
QP	V	737.000	-1.8	20.8	3.0	0.0	0.0	22.0	46.0	-24.0	120/300 kHz	
QP	V	767.400	-1.5	21.9	3.1	0.0	0.0	23.5	46.0	-22.5	120/300 kHz	
QP	V	791.000	-2.4	22.0	3.1	0.0	0.0	22.7	46.0	-23.3	120/300 kHz	
QP	V	800.300	-3.7	21.8	3.2	0.0	0.0	21.3	46.0	-24.7	120/300 kHz	NF
QP	V	898.000	-4.5	23.2	3.4	0.0	0.0	22.1	46.0	-23.9	120/300 kHz	NF
QP	V	969.000	-4.6	23.3	3.5	0.0	0.0	22.2	54.0	-31.8	120/300 kHz	NF
QP	V	960.000	-4.3	23.2	3.5	0.0	0.0	22.4	46.0	-23.6	120/300 kHz	NF

Test Results Continued:

Radiated Emissions (960-18000MHz)

Company: GSSI
Model #: 62000
Serial #: PROTO1
Engineers: Kouma Sinn
Project #: 3171911
Standard: FCC Part 15 Subpart F - Ultra-Wideband Operation
Receiver: R&S FSEK-30 (ROS001)
PreAmp: PRE9 03-27-09.txt

Location: 1
Date(s): 02/12/09
Limit Distance (m): 3
Test Distance (m): 1

Antenna & Cables: LF Bands: N, LF, HF, SHF
Antenna: HORN3 V1m 3-03-09.txt HORN3 H1m 3-03-09.txt
Cable(s): MEG001 06-05-09.txt MEG004 06-05-09.txt
Barometer: BAR3
Temp/Humidity/Pressure: 16C 44% 915mbar

PreAmp Used? (Y or N): Y Voltage/Frequency: Powered from SIR20 Frequency Range: 960MHz-18GHz

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)

Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	
PRF = 200kHz												
RMS	V	960.000	32.6	24.0	2.5	29.1	9.5	20.4	29.9	-9.5	1/3MHz	
RMS	V	964.000	33.0	24.0	2.5	29.1	9.5	20.8	29.9	-9.1	1/3MHz	
RMS	V	968.000	32.6	24.0	2.5	29.1	9.5	20.4	29.9	-9.5	1/3MHz	
RMS	V	988.000	33.4	24.1	2.5	29.1	9.5	21.5	29.9	-8.4	1/3MHz	
RMS	V	1000.000	31.5	24.2	2.6	29.1	9.5	19.7	29.9	-10.2	1/3MHz	
RMS	V	1011.220	34.9	24.2	2.6	29.1	9.5	23.1	29.9	-6.8	1/3MHz	
RMS	V	1275.750	36.0	25.1	2.9	29.1	9.5	25.4	29.9	-4.5	1/3MHz	
RMS	V	1522.645	35.2	26.0	3.2	29.1	9.5	25.8	29.9	-4.1	1/3MHz	
RMS	V	2000.000	31.0	28.0	3.8	29.2	9.5	24.1	41.9	-17.8	1/3MHz	NF
RMS	V	5000.000	32.0	34.7	6.4	29.3	9.5	34.3	53.9	-19.6	1/3MHz	NF
RMS	V	8000.000	30.8	37.7	8.5	28.1	9.5	39.3	53.9	-14.6	1/3MHz	NF
RMS	V	10000.000	32.6	40.6	9.7	27.3	9.5	46.0	53.9	-7.9	1/3MHz	NF
1164-1240MHz & 1559-1610MHz. Spectrum Analyzer sweep time 50ms												
RMS	V	1164.000	7.3	24.8	2.8	29.1	9.5	-3.8	19.9	-23.7	1/3kHz	
RMS	V	1185.770	10.7	24.8	2.8	29.1	9.5	-0.3	19.9	-20.2	1/3kHz	
RMS	V	1216.392	12.7	24.9	2.8	29.1	9.5	1.8	19.9	-18.1	1/3kHz	
RMS	V	1227.960	12.7	25.0	2.9	29.1	9.5	1.9	19.9	-18.0	1/3kHz	
RMS	V	1234.000	11.0	25.0	2.9	29.1	9.5	0.2	19.9	-19.7	1/3kHz	
RMS	V	1240.000	8.0	25.0	2.9	29.1	9.5	-2.8	19.9	-22.7	1/3kHz	
RMS	V	1559.000	10.4	26.1	3.3	29.1	9.5	1.2	19.9	-18.7	1/3kHz	
RMS	V	1568.000	7.2	26.2	3.3	29.1	9.5	-2.0	19.9	-21.9	1/3kHz	
RMS	V	1581.128	11.9	26.2	3.3	29.1	9.5	2.7	19.9	-17.2	1/3kHz	
RMS	V	1597.633	11.2	26.3	3.3	29.1	9.5	2.2	19.9	-17.7	1/3kHz	
RMS	V	1610.000	8.0	26.4	3.3	29.1	9.5	-1.0	19.9	-20.9	1/3kHz	

Setup Photo 1

Setup Photo 2

Setup Photo 3

Test Results: Pass

Test Standard: FCC Part 15 Subpart F – Ultra-Wideband Operation

Test: 10 dB Bandwidth

Performance Criterion: Not Applicable

EUT Operating Voltage: EUT powers from SIR20

Test Environment:

Environmental Conditions During Testing:		Ambient (°C):	16	Humidity (%):	44	Pressure (hPa):	915
Pretest Verification Performed:		Yes		Equipment under Test:		62000	
Test Engineer(s):	Kouma Sinn			EUT Serial Number:		PROTO1	

Maximum Test Disturbance Parameters: The UWB bandwidth is the frequency band bounded by the points that are 10 dB below the highest radiated emission, as based on the complete transmission system including the antenna. The fractional bandwidth shall be equal to or greater than 0.20 or has a UWB bandwidth equal to or greater than 500 MHz, regardless of the fractional bandwidth.

Test Equipment Used:

TEST EQUIPMENT LIST					
Item	**Equipment Type**	**Make**	**Model No.**	**Serial No.**	**Next Cal. Due**
1	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	12/01/2009
2	Digital 4 Line Barometer	Mannix	0ABA116	BAR3	06/01/2009
3	ANTENNA	EMCO	3142	9701-1116	12/02/2009
4	40GHz Cable	Megaphase	TM40-K1K1-197	7030801 001	06/05/2009
5	40 GHz Cable	Megaphase	TM40-K1K1-197	7030801 002	06/05/2009
6	100MHz-40GHz Preamp	MITEQ	NSP4000-NFG	1260417	03/27/2009

Software Utilized:

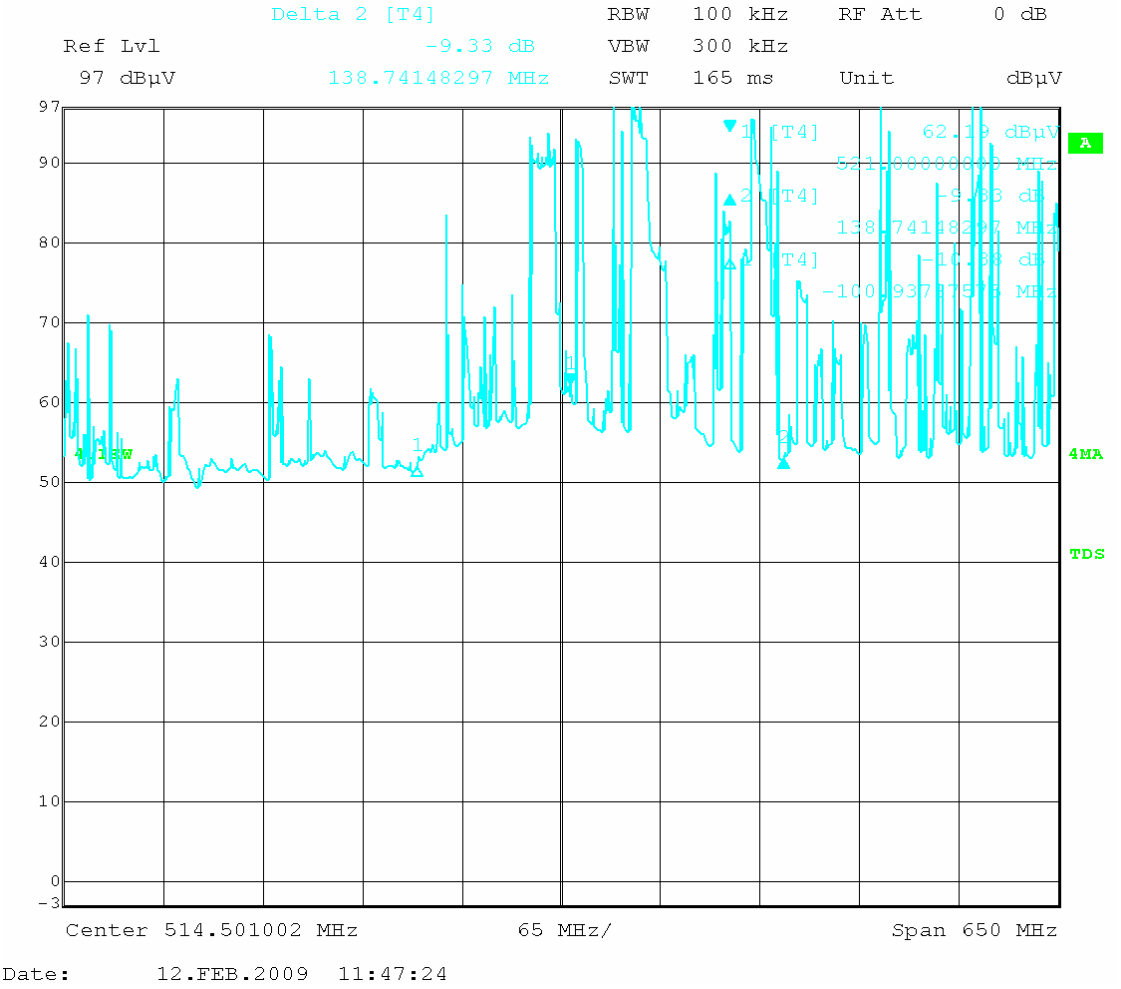
None

Test Details:

Test Point	Standard Limit (as published)	Compliance Level	Pass/Fail N/A	Comment
Highest Peak	Per Standard	Per Standard	Pass	None

Test Results:

10dB Bandwidth



Notes: The peak signal includes the pre-amp factor. Cable and antenna factors were added internally to the spectrum analyzer.

F_L = 521.000 -100.937MHz
F_L = 420.063MHz

F_H = 521.000 + 138.741MHz
F_H = 659.741MHz

Fractional Bandwidth = $2(F_H - F_L)/ (F_H + F_L)$
Fractional Bandwidth = 2(239.678)/(1079.804)
Fractional Bandwidth = 0.4439