



EMISSION TEST REPORT

Report Number: 3153005BOX-001c

Project Number: 3153005

Testing performed on the
Ground Penetration Radar

Model: 5103A

To

FCC Part 15 Subpart F – Ultra-Wideband Operation

For

Geophysical Survey Systems, Inc.

Test Performed by:
Intertek – ETL SEMKO
70 Codman Hill Road
Boxborough, MA 01719

Test Authorized by:
Geophysical Survey Systems, Inc.
12 Industrial Way
Salem, NH 03079

Prepared by:  Date: 10/03/08

Kouma Sinn, Sr. Project Engineer

Reviewed by:  Date: 10/03/08

Jeff Goulet, Engineering Team Leader, EMC

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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: Ground Penetration Radar
Model Number(s): 5103A
Serial number(s): 415
Manufacturer: Geophysical Survey Systems, Inc.
EUT receive date: May 22, 2008
EUT received condition: Production unit was received with no visible damage
Test start date: May 22, 2008
Test end date: May 22, 2008

1.3 Test Plan Reference: ANSI C63.4-2003

1.4 Test Configuration:

1.4.1 EUT Voltage Range:

The EUT powers from Survey Controller, Model SIR20.

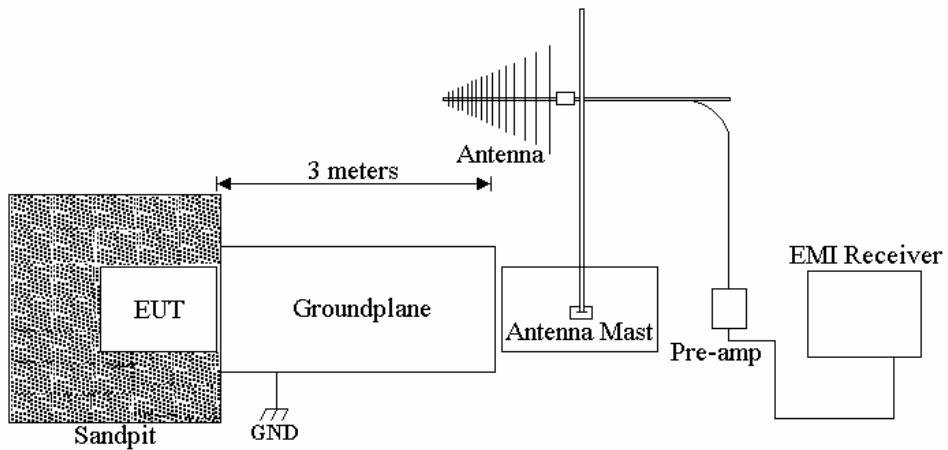
1.4.2 Cables:

Description	Shielding	Connector	Length (m)	Qty.
AC Mains	None	Plastic	2	1
AC Adapter	None	Plastic	2	1
Control	Braid	Metal	5	1

1.4.3 Support Equipment:

Description	Manufacturer	Model	Serial No.
Survey Controller	GSSI	SIR-20 MF-20/1000	001
Power Supply	GSSI	08/4	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
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
Line Conducted Emissions		Not Applicable	--

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

<u>Date</u>	<u>Project No.</u>	<u>Project Handler</u>	<u>Page(s)</u>	<u>Item</u>	<u>Description of Change</u>
5/30/08	3153005	Kouma Sinn	12, 13, 16, 17, 20, 21	Radiated Emissions Data	Changed data from 960MHz-10GHz from AVG to RMS
7/14/08	3153005	Kouma Sinn	Whole report	Model # change	Changed model # from 4105A to 42000
7/14/08	3153005		28	10 dB BW for Model 4105A	Changed the statement “The UWB Bandwidth >500MHz” to “The UWB Bandwidth is greater than 500MHz, therefore, fractional bandwidth calculation is not necessary”
10/02/08	3153005	Kouma Sinn	Whole Report	Separated report for each model #	The original report has three models in it. Need to separate report for each model for FCC certification.

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 $\text{dB}\mu\text{V}/\text{m}$

RA = Receiver Amplitude (including preamplifier) in $\text{dB}\mu\text{V}$

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 $\text{dB}\mu\text{V}$ 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 $\text{dB}\mu\text{V}/\text{m}$. This value in $\text{dB}\mu\text{V}/\text{m}$ was converted to its corresponding level in $\mu\text{V}/\text{m}$.

$$RA = 52.0 \text{ dB}\mu\text{V}$$

$$AF = 7.4 \text{ dB}/\text{m}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$FS = 32 \text{ dB}\mu\text{V}/\text{m}$$

$$\text{Level in } \mu\text{V}/\text{m} = [10(32 \text{ dB}\mu\text{V}/\text{m})/20] = 39.8 \mu\text{V}/\text{m}$$

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

$$NF = RF + LF + CF + AF$$

Where NF = Net Reading in $\text{dB}\mu\text{V}$

RF = Reading from receiver in $\text{dB}\mu\text{V}$

LF = LISN Correction Factor in dB

CF = Cable Correction Factor in dB

AF = Attenuator Loss Factor in dB

To convert from $\text{dB}\mu\text{V}$ to μV or mV the following was used:

$$UF = 10^{(NF/20)} \text{ where } UF = \text{Net Reading in } \mu\text{V}$$

Example:

$$NF = RF + LF + CF + AF = 28.5 + 0.2 + 0.4 + 20.0 = 49.1 \text{ dB}\mu\text{V}$$

$$UF = 10^{(49.1 \text{ dB}\mu\text{V}/20)} = 254 \mu\text{V}/\text{m}$$

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): 2

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.

Extended Site 2 For FCC Part 15 Subpart F – Ultra-Wideband Testing:

The test site used during testing was made in according with FCC Part 15F. The test site was constructed with a dimension of 9 ft x 9 ft x 48 inches 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 on the blacktop at a distance of 3m from the closest point of the EUT. A groundplane with a dimension of 8 ft x 12 ft 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: Powered from survey controller

Test Environment:

Environmental Conditions During Testing:	Ambient (°C):	17	Humidity (%):	39	Pressure (hPa):	986
Pretest Verification Performed:	Yes		Equipment under Test:	5103A		
Test Engineer(s):	Kouma Sinn			EUT Serial Number:	415	

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	9kHz to 3GHz EMI Test Receiver	Rohde & Schwartz	ESCI 1166.5950K03	100067	01/25/2009
2	ANTENNA	EMCO	3142	9711-1225	06/05/2008
3	Thermo/Hygro Meter	Fisher Scientific	11-661-13	51200654	08/17/2008
4	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 197	CBL027	12/06/2008
5	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 197	CBL028	12/06/2008
6	HORN ANTENNA	EMCO	3115	9610-4980	06/18/2008
7	100MHz-40GHz Preamp	MITEQ	NSP4000-NFG	1260417	03/27/2009

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 From 30-960MHz

Company: GSSI
 Model #: 5103A
 Serial #: 415

Engineers: Kouma Sinn

Project #: 3153005

Date(s): 05/22/08

Location: 2

Antenna & Cables: N Bands: N, LF, HF, SHF
 Antenna: LOG4 06-05-08 V3.txt LOG4 06-05-08 H3.txt
 Cable(s): CBL027 12-06-08.txt CBL028 12-06-08.txt
 Barometer: FIS005

Standard: FCC Part 15 Subpart F

Receiver: R&S ESCI (ROS002)

PreAmp: PRE9 03-27-09.txt

PreAmp Used? (Y or N): N

Limit Distance (m): 3

Test Distance (m): 3

Temp/Humidity/Pressure: 17C 39% 986mbar

Voltage/Frequency: DC Power 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
QP	V	30.229	12.2	17.0	0.6	0.0	0.0	29.8	40.0	-10.2	120/300 kHz
QP	V	37.236	16.1	13.1	0.6	0.0	0.0	29.8	40.0	-10.2	120/300 kHz
QP	V	50.646	19.1	8.7	0.7	0.0	0.0	28.5	40.0	-11.5	120/300 kHz
QP	V	61.950	20.1	8.9	0.8	0.0	0.0	29.8	40.0	-10.2	120/300 kHz
QP	V	73.767	21.9	7.5	0.9	0.0	0.0	30.3	40.0	-9.7	120/300 kHz
QP	V	79.973	24.5	7.4	0.9	0.0	0.0	32.8	40.0	-7.2	120/300 kHz
QP	V	87.181	22.2	7.8	1.0	0.0	0.0	31.0	40.0	-9.0	120/300 kHz
QP	V	89.980	22.2	8.0	1.0	0.0	0.0	31.2	43.5	-12.3	120/300 kHz
QP	V	94.988	21.3	8.1	1.0	0.0	0.0	30.4	43.5	-13.1	120/300 kHz
QP	V	99.090	25.6	8.2	1.1	0.0	0.0	34.8	43.5	-8.7	120/300 kHz
QP	V	102.995	22.2	8.1	1.1	0.0	0.0	31.5	43.5	-12.0	120/300 kHz
QP	V	106.980	22.7	8.1	1.1	0.0	0.0	31.9	43.5	-11.6	120/300 kHz
QP	V	112.904	22.4	7.8	1.1	0.0	0.0	31.3	43.5	-12.2	120/300 kHz
QP	V	120.010	21.5	6.9	1.2	0.0	0.0	29.6	43.5	-13.9	120/300 kHz
QP	V	129.019	23.8	6.6	1.2	0.0	0.0	31.6	43.5	-11.9	120/300 kHz
QP	V	138.000	23.1	7.1	1.2	0.0	0.0	31.4	43.5	-12.1	120/300 kHz
QP	V	156.000	25.8	8.4	1.3	0.0	0.0	35.5	43.5	-8.0	120/300 kHz
QP	V	172.059	23.7	8.6	1.4	0.0	0.0	33.7	43.5	-9.8	120/300 kHz
QP	V	198.984	17.2	10.6	1.5	0.0	0.0	29.3	43.5	-14.2	120/300 kHz
QP	V	205.990	12.6	11.0	1.6	0.0	0.0	25.2	43.5	-18.3	120/300 kHz
QP	V	214.000	15.5	11.5	1.6	0.0	0.0	28.6	43.5	-14.9	120/300 kHz
QP	V	226.008	11.0	12.2	1.6	0.0	0.0	24.8	46.0	-21.2	120/300 kHz
QP	V	237.919	15.4	12.4	1.7	0.0	0.0	29.6	46.0	-16.4	120/300 kHz
QP	V	251.031	10.7	12.7	1.7	0.0	0.0	25.2	46.0	-20.8	120/300 kHz
QP	V	277.956	15.9	13.2	1.8	0.0	0.0	30.9	46.0	-15.1	120/300 kHz
QP	V	291.970	14.6	13.5	1.9	0.0	0.0	29.9	46.0	-16.1	120/300 kHz
QP	V	299.977	11.6	13.6	1.9	0.0	0.0	27.1	46.0	-18.9	120/300 kHz
QP	V	325.000	14.2	14.6	2.0	0.0	0.0	30.8	46.0	-15.2	120/300 kHz
QP	V	367.939	11.1	15.4	2.1	0.0	0.0	28.7	46.0	-17.3	120/300 kHz
QP	V	399.000	10.3	15.3	2.2	0.0	0.0	27.9	46.0	-18.1	120/300 kHz
QP	H	419.987	10.9	16.3	2.3	0.0	0.0	29.6	46.0	-16.4	120/300 kHz
QP	H	458.122	9.0	17.4	2.4	0.0	0.0	28.8	46.0	-17.2	120/300 kHz
QP	H	485.270	8.1	18.0	2.5	0.0	0.0	28.6	46.0	-17.4	120/300 kHz
QP	H	533.000	6.6	19.0	2.6	0.0	0.0	28.2	46.0	-17.8	120/300 kHz
QP	H	596.047	4.7	19.8	2.8	0.0	0.0	27.3	46.0	-18.7	120/300 kHz
QP	H	663.000	1.8	21.3	3.0	0.0	0.0	26.1	46.0	-19.9	120/300 kHz
QP	H	719.000	0.2	21.9	3.1	0.0	0.0	25.2	46.0	-20.8	120/300 kHz
QP	H	817.000	-2.7	22.5	3.3	0.0	0.0	23.2	46.0	-22.8	120/300 kHz
QP	H	905.000	-2.2	23.5	3.5	0.0	0.0	24.8	46.0	-21.2	120/300 kHz
QP	H	960.000	-1.8	23.7	3.6	0.0	0.0	25.5	46.0	-20.5	120/300 kHz
											NF
											NF

Test Results Continued:
Radiated Emissions From 960MHz-10GHz

Company: GSSI

Model #: 5103A

Serial #: 415

Engineers: Kouma Sinn

Project #: 3153005

Standard: FCC Part 15 Subpart F

Receiver: R&S ESCI (ROS001)

PreAmp: PRE9 03-27-09.txt

PreAmp Used? (Y or N): Y

Date(s): 05/22/08

Location: 2

Antenna & Cables: LF Bands: N, LF, HF, SHF

Antenna: HORN3 V1m 3-03-09.txt HORN3 H1m 3-03-09.txt

Cable(s): CBL027 12-06-08.txt CBL028 12-06-08.txt

Barometer: FIS005

Limit Distance (m): 3

Temp/Humidity/Pressure: 17C 39% 986mbar

Test Distance (m): 1

Frequency Range: 960MHz-10GHz

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
RMS	V	960.000	40.0	24.0	3.6	29.1	9.5	28.9	29.9	-1.0	1/3MHz
RMS	V	978.236	40.5	24.1	3.7	29.1	9.5	29.6	29.9	-0.3	1/3MHz
RMS	V	996.473	40.2	24.2	3.7	29.1	9.5	29.4	29.9	-0.5	1/3MHz
RMS	V	1035.751	40.1	24.3	3.8	29.1	9.5	29.6	29.9	-0.3	1/3MHz
RMS	V	1058.196	39.5	24.4	3.8	29.1	9.5	29.1	29.9	-0.8	1/3MHz
RMS	V	1115.710	37.1	24.6	3.9	29.1	9.5	27.0	29.9	-2.9	1/3MHz
RMS	V	1204.789	34.0	24.9	4.1	29.1	9.5	24.4	29.9	-5.5	1/3MHz
RMS	V	1256.690	33.0	25.1	4.2	29.1	9.5	23.6	29.9	-6.3	1/3MHz
RMS	V	1559.670	26.0	26.2	4.8	29.1	9.5	18.3	29.9	-11.6	1/3MHz
RMS	V	2195.990	26.0	28.4	5.9	29.2	9.5	21.6	43.9	-22.3	1/3MHz
RMS	V	2833.066	26.5	30.0	6.9	29.2	9.5	24.7	43.9	-19.2	1/3MHz
RMS	V	4000.000	24.0	33.0	8.3	29.3	9.5	26.5	53.9	-27.4	1/3MHz
RMS	V	5000.000	27.0	34.7	9.9	29.3	9.5	32.7	53.9	-21.2	1/3MHz
RMS	V	6657.310	25.4	35.8	12.5	28.6	9.5	35.5	53.9	-18.4	1/3MHz
RMS	V	8484.960	23.7	38.1	14.7	27.9	9.5	39.1	53.9	-14.8	1/3MHz
RMS	V	10000.000	22.5	40.6	15.7	27.3	9.5	41.9	53.9	-12.0	1/3MHz
											NF

Test Results Continued:
1164-1240MHz, 1559-1610MHz

Company: GSSI

Model #: 5103A

Serial #: 415

Engineers: Kouma Sinn

Project #: 3153005

Date(s): 05/22/08

Location: 2

Antenna & Cables: LF Bands: N, LF, HF, SHF

Antenna: HORN3 V1m 3-03-09.txt HORN3 H1m 3-03-09.txt

Cable(s): CBL027 12-06-08.txt CBL028 12-06-08.txt

Barometer: FIS005

Standard: FCC Part 15 Subpart F

Temp/Humidity/Pressure: 17C 39% 986mbar

Receiver: R&S ESCI (ROS001)

Limit Distance (m): 3

PreAmp: PRE9 03-27-09.txt

Test Distance (m): 1

PreAmp Used? (Y or N): Y Voltage/Frequency: DC Power Frequency Range: 1164-1240MHz, 1559-1610MHz

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
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1164-1240MHz with 1kHz ResBW

RMS	V	1164.000	4.7	24.8	4.0	29.1	9.5	-5.1	19.9	-25.0	1/30kHz
RMS	V	1170.853	12.0	24.8	4.1	29.1	9.5	2.2	19.9	-17.7	1/30kHz
RMS	V	1204.360	10.6	24.9	4.1	29.1	9.5	1.0	19.9	-18.9	1/30kHz
RMS	V	1217.000	10.6	24.9	4.1	29.1	9.5	1.0	19.9	-18.9	1/30kHz
RMS	V	1240.000	10.2	25.0	4.2	29.1	9.5	0.8	19.9	-19.1	1/30kHz

1559-1610MHz with 1kHz ResBW

RMS	V	1559.000	4.4	26.1	4.8	29.1	9.5	-3.3	19.9	-23.2	1/30kHz	NF
RMS	V	1571.366	13.0	26.2	4.8	29.1	9.5	5.4	19.9	-14.5	1/30kHz	NF
RMS	V	1588.741	10.0	26.3	4.9	29.1	9.5	2.5	19.9	-17.4	1/30kHz	NF
RMS	V	1602.845	14.0	26.3	4.9	29.1	9.5	6.5	19.9	-13.4	1/30kHz	NF
RMS	V	1610.000	6.0	26.4	4.9	29.1	9.5	-1.4	19.9	-21.3	1/30kHz	NF

Test Results Continued:
Highest Emissions Above 960MHz

Company: GSSI

Model #: 5103A

Serial #: 415

Engineers: Kouma Sinn

Project #: 3153005

Date(s): 05/22/08

Location: 2

Standard: FCC Part 15 Subpart F

Receiver: R&S ESCI (ROS001)

Limit Distance (m): 3

PreAmp: PRE9 03-27-09.txt

Test Distance (m): 1

PreAmp Used? (Y or N): Y Voltage/Frequency: DC Power Frequency Range: 965.00MHz

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
PK	V	965.000	37.6	24.0	3.6	29.1	9.5	26.6	70.8	-44.19759	3/3MHz

The highest radiated emission occurs, f_M , above 960MHz, there is a limit on the peak level of the emissions contained within a 50MHz bandwidth centered on f_M . That limit is 0 dBm EIRP which is 95 dBuV/m in field strength. The resolution bandwidth of 3MHz was used so, the new limit is $95.2 - 20 \cdot \log(3\text{MHz}/50\text{MHz}) = 95.2 - 24.437 = 70.763$ dBuV/m.

Setup Photo



Test Results: Pass

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

Test: 10 dB Bandwidth

Performance Criterion: Not Applicable

EUT Operating Voltage: Powered from survey controller

Test Environment:

Environmental Conditions During Testing:	Ambient (°C):	17	Humidity (%):	39	Pressure (hPa):	986
Pretest Verification Performed:	Yes		Equipment under Test:	5103A		
Test Engineer(s):	Kouma Sinn			EUT Serial Number:	415	

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	9kHz to 3GHz EMI Test Receiver	Rohde & Schwartz	ESCI 1166.5950K03	100067	01/25/2009
2	ANTENNA	EMCO	3142	9711-1225	06/05/2008
3	Thermo/Hygro Meter	Fisher Scientific	11-661-13	51200654	08/17/2008
4	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 197	CBL027	12/06/2008
5	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 197	CBL028	12/06/2008

Software Utilized:

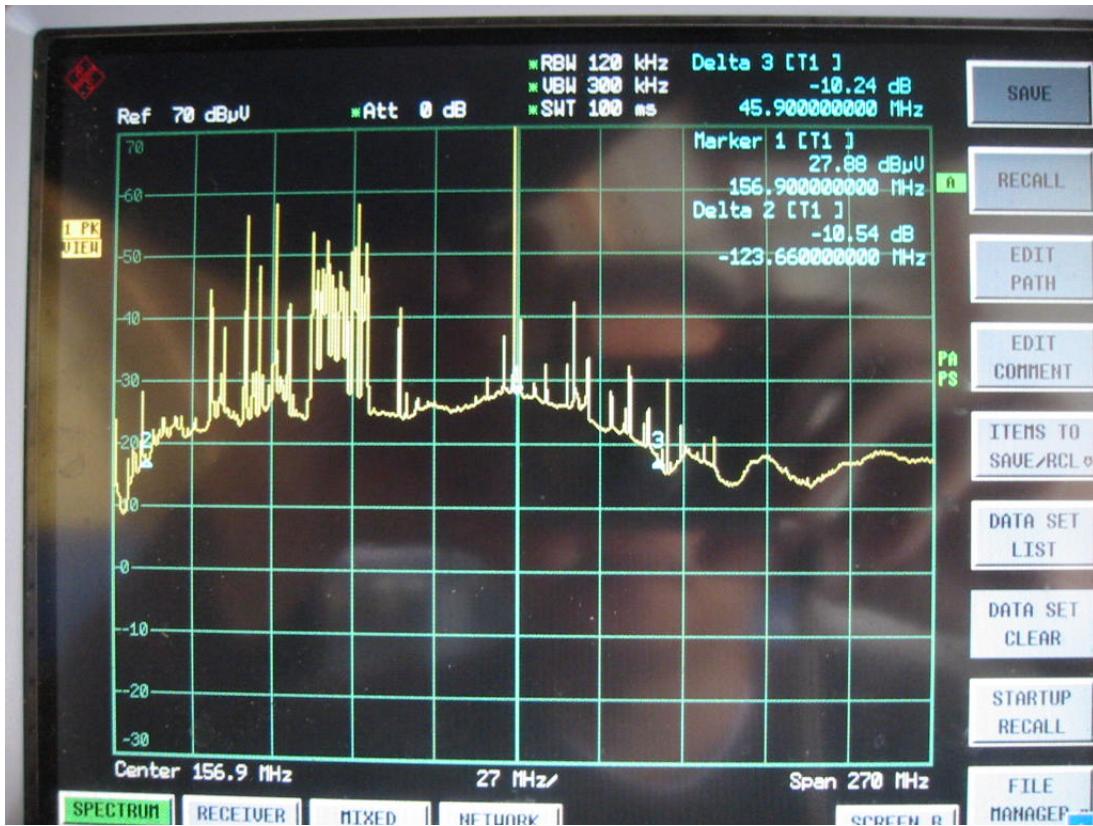
None

Test Details:

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

Test Results:

10 dB Bandwidth



$$f_l = 33.24 \text{ MHz}$$

$$f_h = 202.8 \text{ MHz}$$

$$f_c = (f_h + f_l)/2$$

$$f_c = (202.8 \text{ MHz} + 33.24 \text{ MHz})/2$$

$$f_c = 118.02 \text{ MHz}$$

$$\text{Fractional Bandwidth} = 2(f_h - f_l)/(f_h + f_l)$$

$$\text{Fractional Bandwidth} = 2(202.8 \text{ MHz} - 33.24 \text{ MHz})/(202.8 \text{ MHz} + 33.24 \text{ MHz})$$

$$\text{Fractional Bandwidth} = 339.12/236.04 \text{ MHz}$$

$$\text{Fractional Bandwidth} = 1.4367$$