



**FCC CFR47 PART 95 SUBPART G
LOW POWER RADIO SERVICE**

**CERTIFICATION TEST REPORT
FOR**

**GSM MULTI-BAND SELF-CONTAINED GPS TRACKING DEVICE
WITH BEACON TECHNOLOGY**

MODEL NAME: GT1040 & SNT-250

FCC ID: Q2USNT250

REPORT NUMBER: 06U10619-2

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Prepared for
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*Details of specific model(s) tested and model differences are identified in body of report



Revision History

Rev.	Issue Date	Revisions	Revised By
--	11/08/06	Initial Issue	Thu

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: GEOTRAX PROTECTION LLC
P O BOX 6021
SCOTTSDALE AZ 85261, U.S.A

EUT DESCRIPTION: GSM MULTI-BAND SELF-CONTAINED GPS TRACKING DEVICE
WITH BEACON TECHNOLOGY

MODEL TESTED: GT1040

SERIAL NUMBER: 010666000084422

DATE TESTED: OCTOBER 9-13, 2006

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 95 SUBPART G	NO NON-COMPLIANCE NOTED

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

Tested By:



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EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with TIA/EIA 603C (2004), ANSI C63.4-2003, FCC CFR 47 Part 95, 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055 and 2.1057.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 200 MHz	+/- 3.3 dB
Radiated Emission, 200 to 1000 MHz	+4.5 / -2.9 dB
Radiated Emission, 1000 to 2000 MHz	+4.5 / -2.9 dB
Power Line Conducted Emission	+/- 2.9 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a GSM multi-band self-contained GPS device with beacon technology. It only operates on channel 50 at 216.475MHz in extra band channel 50 kHz. The device is manufactured by Geotrax Protection LLC.

The device is a battery-power electronic device as depicted in Figure 1. It is comprised of a GSM (Global System for Mobile Communications) transceiver, a GPS receiver, an RF beacon transmitter, the necessary antennas, a battery, power conditioning circuits, an external connector for charging and on/off control, and a hard-case enclosure made of plastic. Unlike its related product, the SNT-250, the GT1040 does not have a magnet underneath for quick mounting as its weight is somewhat prohibitive for that application

5.2. MANUFACTURER'S DESCRIPTION OF MODEL DIFFERENCES

Both models SNT-250 & GT1040 used the same consists of a rugged, plastic shell encasing the device electronics, except the GT1040 has a large case & (10) additional batteries.

5.3. WORST-CASE CONFIGURATION AND MODE

All radiated emissions tests were performed on the GT1040 as worst case condition described above.

The portable configuration at Z-Axis has the worst field strength emissions for portable configuration. So, all radiated emissions tests were performed at Z-axis portable configuration.

5.4. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

RF Beacon

Frequency Range (MHz)	Modulation	Conducted Output Power (dBm)	Conducted Output Power (mW)
216.475	Beacon	-7.682	0.17

5.5. DESCRIPTION OF AVAILABLE ANTENNAS

The device uses a loop type antenna with a maximum gain of 0dBi for the RF Beacon transmitter.

5.6. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was V7.29.10

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

N/A

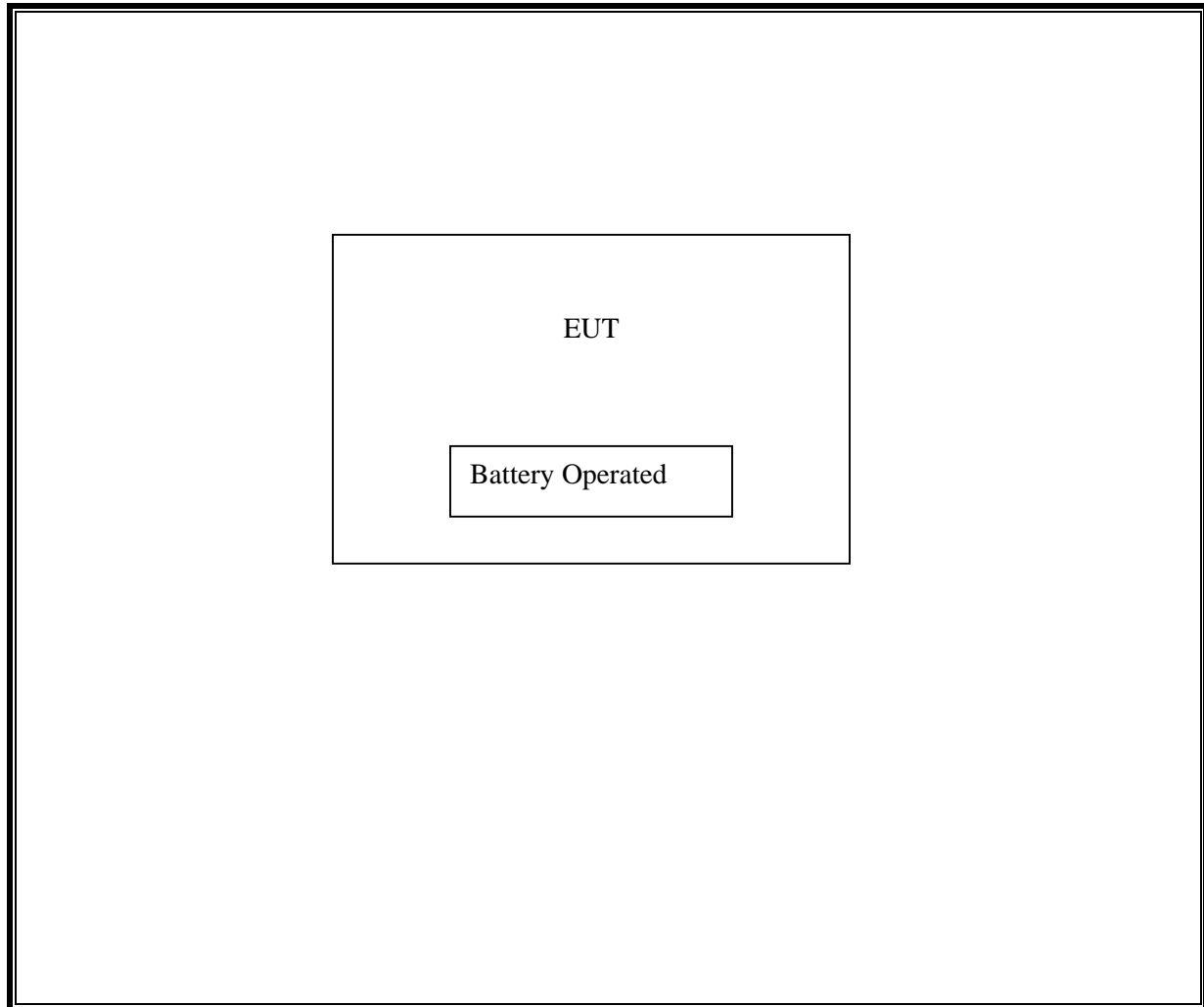
I/O CABLES

N/A

TEST SETUP

The EUT was tested stand alone

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	Cal Due
Temperature / Humidity Chamber	Thermotron	SE 600-10-10	8/2/1981	6/10/07
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A121003	9/3/07
EMI Receiver, 9 kHz ~ 2.9 GHz	Agilent / HP	8542E	3942A00286	2/4/07
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A121003	9/3/07
Preamplifier, 1300 MHz	Agilent / HP	8447D	1937A02062	1/23/07
Antenna, Horn 1 ~ 18 GHz	ETS	3117	29310	4/22/07
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent / HP	E4446A	MY43360112	5/3/07
EMI Test Receiver	R & S	ESHS 20	827129/006	9/3/07
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	8/30/07

7. LIMITS AND RESULTS

7.1. OCCUPIED BANDWIDTH

LIMIT

95.633 (d)(3) The channel bandwidth for extra band frequency is 50 kHz.

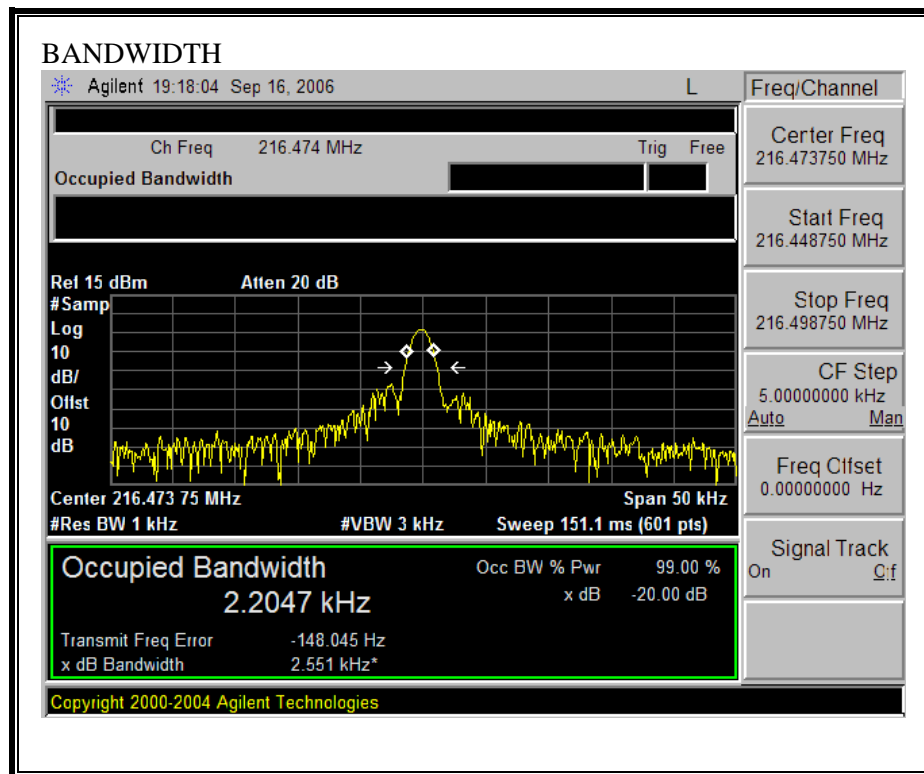
TEST PROCEDURE

95.633 (e)(3) The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the -20 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal -20 dB bandwidth function is utilized.

RESULTS

No non-compliance noted:

Frequency	Bandwidth
(MHz)	(Hz)
216.475	2551

26dB BANDWIDTH

7.1. RF POWER OUTPUT

LIMIT

95.639 (e) _The maximum transmitter output power authorized for LPRS stations is 100mW.

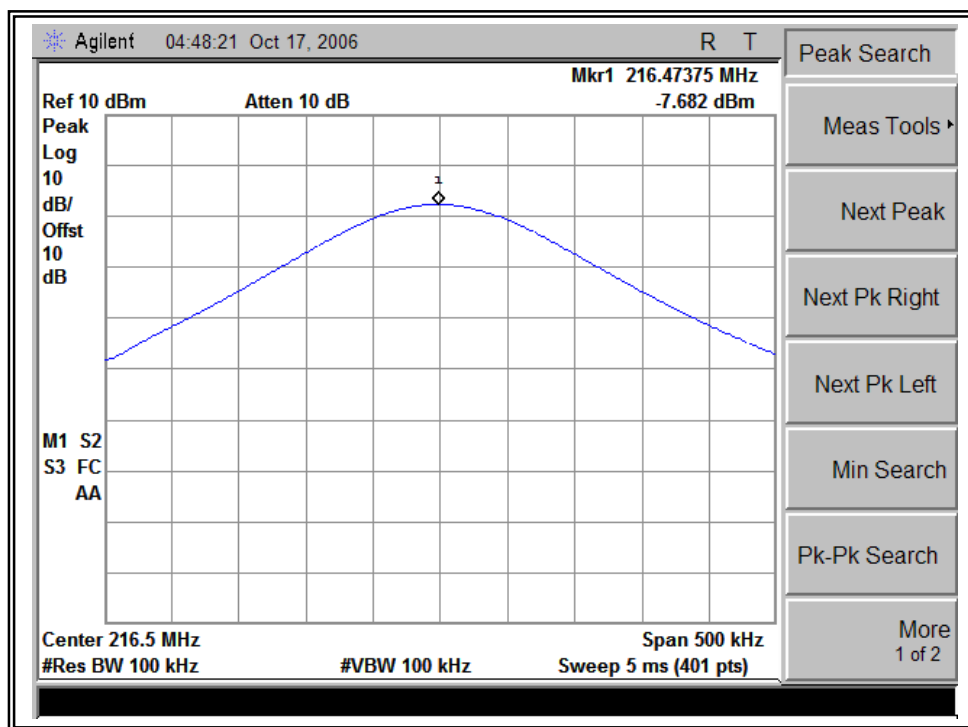
TEST PROCEDURE

ANSI / TIA / EIA 603 Clause 2.2.17

RESULTS

No non-compliance noted.

CONDUCTED PEAK OUTPUT



RADIATED OUTPUT POWER - ERP

30 - 1000MHz Substitution Measurement										
Compliance Certification Services, Morgan Hill 5m Chamber Site										
Company: Geotrax Project #: 06U10619 Date: 10/16/2006 Test Engineer: Chin Pang Configuration: EUT Only Mode: TX (261.475MHz) Model: GT1040 Test Equipment:										
Bilog Antenna		Cable		Pre-amplifier 8447D		Limit				
5m Chamber Sunol Bilog		5m Chamber Cable				ERP				
f MHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
X Pos										
216.48	63.7	H	-19.3	1.9	5.8	3.6	-17.6	20.0	-37.6	
216.48	60.1	V	-22.9	1.9	5.8	3.6	-21.1	20.0	-41.1	
Y Pos										
216.48	63.6	H	-19.4	1.9	5.8	3.6	-17.7	20.0	-37.7	
216.48	59.3	V	-23.7	1.9	5.8	3.6	-21.9	20.0	-41.9	
Z Pos										
216.48	64.2	H	-18.8	1.9	5.8	3.6	-17.0	20.0	-37.0	
216.48	60.6	V	-22.4	1.9	5.8	3.6	-20.6	20.0	-40.6	
Rev. 5.1.6										

7.2. FREQUENCY STABILITY

LIMIT

- a). According to CFR 47 section 1055(a)(1), the frequency stability shall be measured with variation of ambient temperature from -30°C to $+50^{\circ}\text{C}$ centigrade.
 - b). According to CFR 47 section 1055(d)(2), for hand carried battery powered equipment, the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point, which is specified by the manufacture.
 - c). According to CFR 47 section 95.629 (c)(2), LPRS transmitters operating on standard band channels must be maintained within a frequency stability of 50 parts per million.
- .

TEST PROCEDURE

ANSI / TIA / EIA 603 Clause 2.3.1 and 2.3.2

RESULTS

No non-compliance noted.

Reference Frequency: CW 216.473605MHz @ 25°C				
Limit: to stay ± 50 ppm = 10823.680 Hz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.70	50	216.473494	0.51	± 50
3.70	40	216.473517	0.41	± 50
3.70	30	216.473568	0.17	± 50
3.70	25	216.473605	0.00	± 50
3.70	20	216.473620	-0.07	± 50
3.70	10	216.473742	-0.63	± 50
3.70	0	216.473848	-1.12	± 50
3.70	-10	216.473975	-1.71	± 50
3.70	-20	216.474158	-2.55	± 50
3.70	-30	216.474233	-2.90	± 50
2.90 (end point)	25	216.473554	0.24	± 50
3.4	25	216.473596	0.04	± 50
4	25	216.473602	0.01	± 50

7.3. SPURIOUS EMISSION AT ANTENNA TERMINAL

LIMIT

95.635(c)(3), the channel bandwidth for extra band channels (50 kHz) shall be attenuated below the un-modulated carrier in accordance with the following:

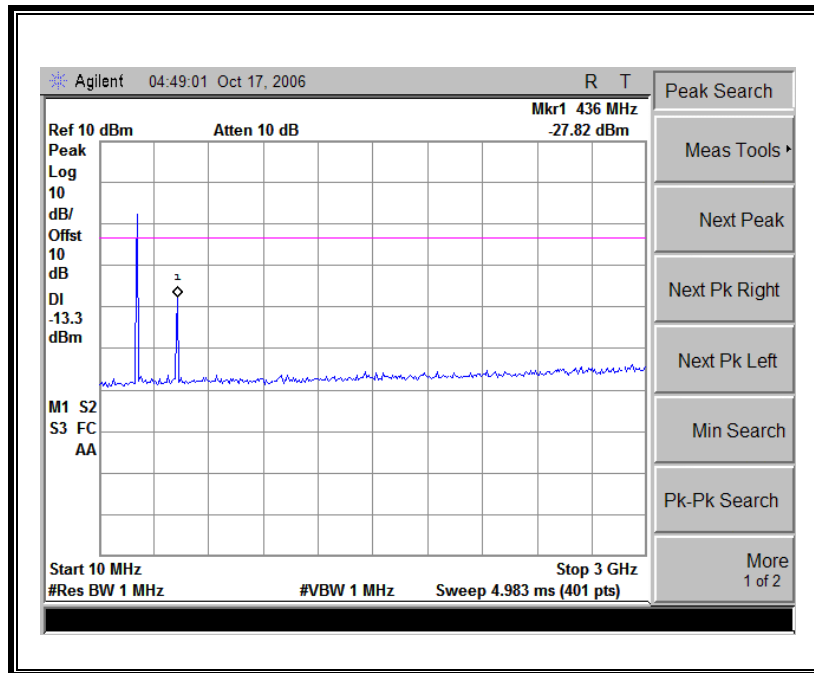
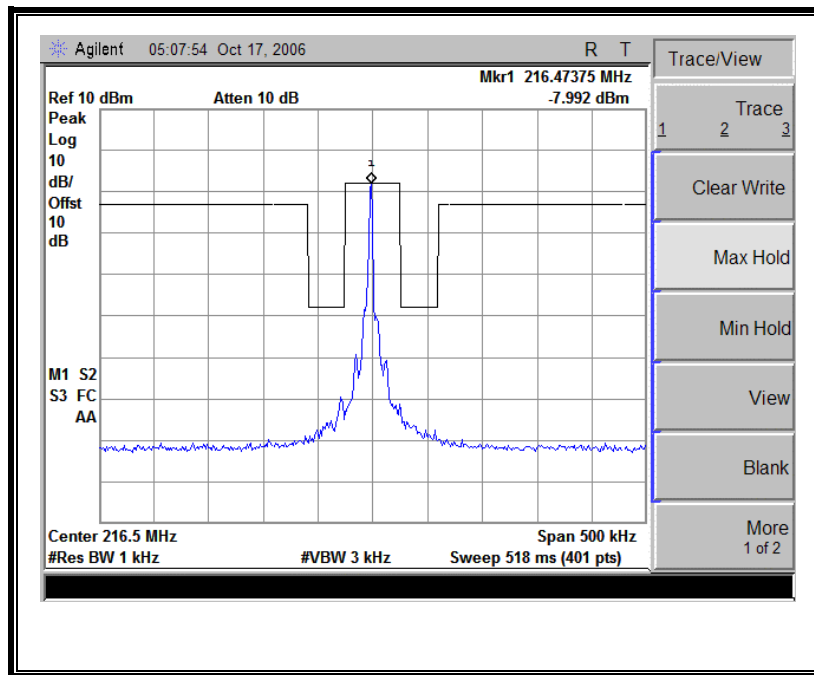
- (i) Emissions 25 kHz to 35 kHz from the channel center frequency: at least 30 dB; and
- (ii) Emissions more than 35 kHz away from the channel center frequency: at least $43 + 10 \log_{10}(\text{carrier power in watts})$ dB.

TEST PROCEDURE

ANSI / TIA / EIA 603 Clause 3.2.12

RESULTS

No non-compliance noted.

216.475MHz EMISSION MASK AND OUT OF BAND

7.4. FIELD STRENGTH OF SPURIOUS RADIATION

LIMIT

95.635(c)(3), the channel bandwidth for extra band channels (50 kHz) shall be attenuated below the un-modulated carrier in accordance with the following:

- (i) Emissions 25 kHz to 35 kHz from the channel center frequency: at least 30 dB; and
- (ii) Emissions more than 35 kHz away from the channel center frequency: at least $43 + 10 \log_{10}(\text{carrier power in watts})$ dB.

TEST PROCEDURE

ANSI / TIA / EIA 603 Clause 3.2.12

RESULTS

No non-compliance noted.

30-1000MHz SPURIOUS EMISSIONS

30 - 1000MHz Substitution Measurement										
Compliance Certification Services, Morgan Hill 5m Chamber Site										
Company: Geotrax										
Project #: 06U10619										
Date: 10/16/2006										
Test Engineer: Chin Pang										
Configuration: EUT Only (GT1040)										
Mode: TX (216.475MHz)										
Test Equipment:										
Bilog Antenna		Cable		Pre-amplifier 8447D		Limit				
5m Chamber Sunol Bilog		5m Chamber Cable		T5 8447D		ERP				

f MHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
433.00	56.7	H	-47.6	2.5	6.1	3.9	-46.1	-13.0	-33.1	
650.00	65.0	H	-37.0	3.0	6.8	4.7	-35.3	-13.0	-22.3	
867.00	45.5	H	-52.6	3.5	6.7	4.6	-51.5	-13.0	-38.5	
433.00	62.8	V	-41.3	2.5	6.1	3.9	-39.9	-13.0	-26.9	
650.00	60.0	V	-41.3	3.0	6.8	4.7	-39.7	-13.0	-26.7	
867.00	42.5	V	-55.1	3.5	6.7	4.6	-54.1	-13.0	-41.1	

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ABOVE 1GHZ HARMONIC SPURIOUS EMISSIONS

High Frequency Substitution Measurement
Compliance Certification Services, Morgan Hill 5m Chamber Site

Company: Geotrax
Project #: 06U10619
Date: 10/16/2006
Test Engineer: Chin Pang
Configuration: EUT only
Mode: TX at 216.475MHz
RF Beacon transmitter, Model: SNT-250

Test Equipment:

EMCO Horn 1-18 GHz

T120; S/N: 29310 @3m

Horn >18GHz

Limit

ERP

☐ High Pass Filter

Hi Frequency Cables

☐ (2 ft)

☒ (2~3 ft)

☐ (4~6 ft)

☒ (12 ft)

Pre-amplifier 1-26GHz

T145 Agilent 3008A

Pre-amplifier 26-40GHz

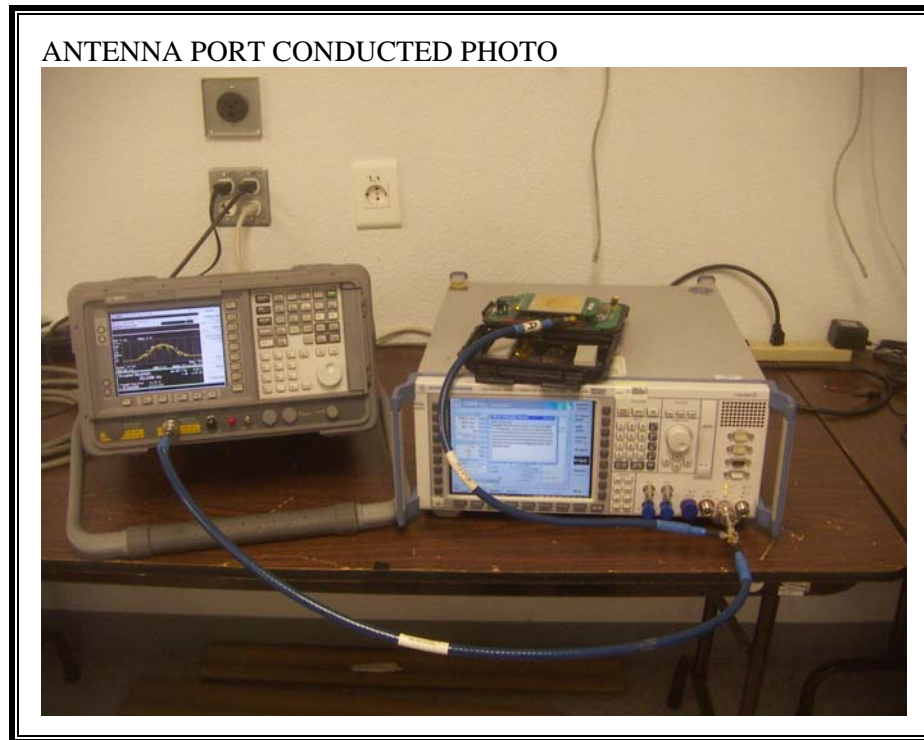
f GHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
216.475MHz										
1.083	65.4	V	-39.5	1.4	2.5	0.4	-40.5	-13.0	-27.5	
1.299	56.1	V	-48.2	1.5	3.0	0.9	-48.7	-13.0	-35.7	
1.083	63.1	H	-41.1	1.4	2.5	0.4	-42.0	-13.0	-29.0	
1.516	52.0	H	-50.9	1.5	3.5	1.4	-51.1	-13.0	-38.1	

Note: No other emissions were detected above the system noise floor.

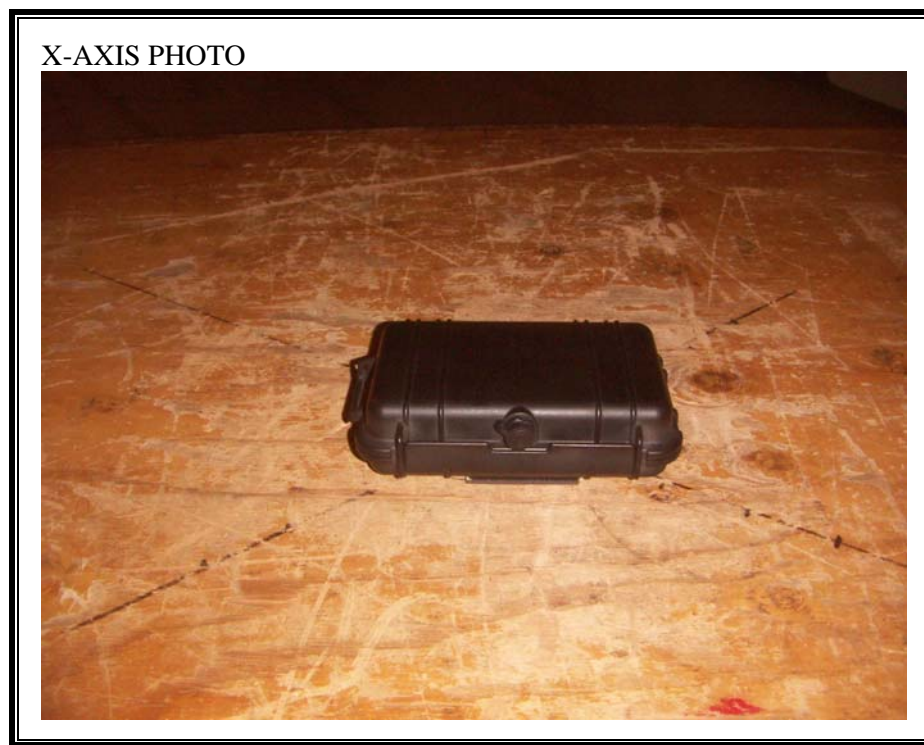
Rev. 5.1.6

8. SETUP PHOTOS

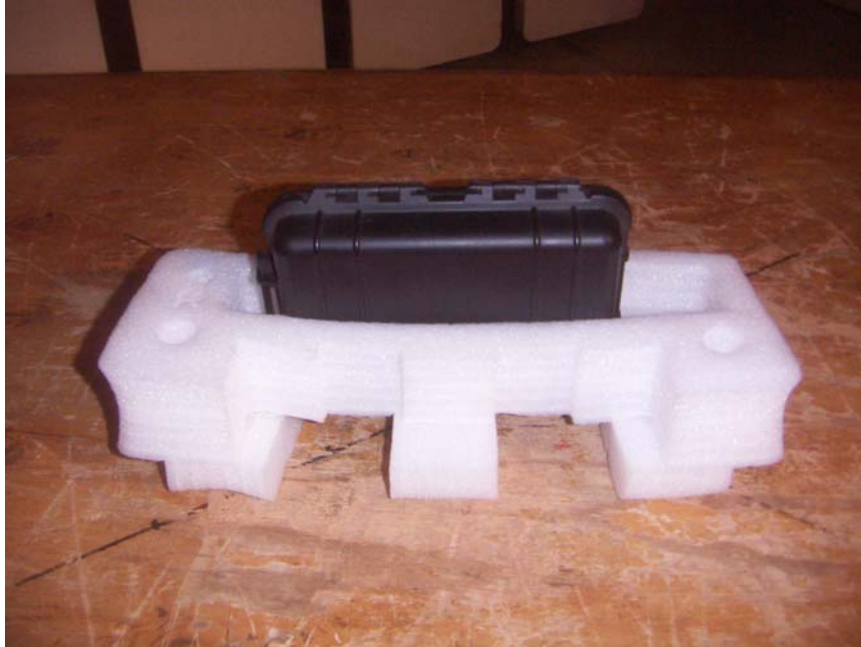
ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



RADIATED RF MEASUREMENT SETUP FOR PORTABLE CONFIGURATION



Y-AXIS PHOTO



Z-AXIS PHOTO



END OF REPORT