

**Geonautics Int'l., Inc.**  
**FCC INFORMATION**

## RF Measurement Report

Prepared by:

### National Certification Laboratory

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Ellicott City, Maryland 21043  
(410) 461-5548

In Support of:

### FCC APPLICATION FOR CERTIFICATION

For:

Geonautics Int'l., Inc.  
100 N. Central Expressway, Suite 500  
Richardson, TX 75080

FCCID: P6K-T1-DLOGGER

### Demonstration of Compliance with FCC Rules Part 15.249

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January, 2002

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***NCL PROJ.# Geonautics-TAGT1***

## **1.0 General Information:**

This report has been prepared on behalf of **Geonautics International, Inc.**, to support the attached Application for a Certification of a Part 15 Covert transmitter. The Equipment Under Test (EUT) was the **Model: TAG T1 Covert Transmitter**. The test results reported in this document relate only to the item that was tested.

Radio-Noise Emissions tests were performed according to **ANSI C63.4-1992 "Methods of Measurement of RFI from Low-Voltage Electronic Equipment in the Range of 9 KHz - 40 GHz"**. The measuring equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

## **1.1 Summary:**

The **Geonautics International, Inc. Model: TAG T1 Covert Transmitter** complies with the FCC limits of Part (15.249) for an Intentional Radiator.

## **1.2 Test Methodology:**

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 1992. Radiated testing was performed at an antenna to EUT distance of three (3) meters.

## **1.3 Test Facility:**

The open area test site and conducted measurement facility used to collect the radiated data is located on the parking lot of National Certification Laboratory 8370 Court Avenue, Suite B-1, Ellicott City, Maryland 21043. This site has been fully described in a report dated May 26, 1993, submitted to and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing.

## **2.0 Description of Equipment Under Test (EUT):**

The EUT features:

Transmitter is used by authorized officials for covert operations. The device is generally attached to a vehicle.

**External Antenna with unique connector per 15.203**

**916.91 MHz Frequency only (15.249)**

**292 kHz 20 dB Emission Bandwidth**

**GPS logging function**

**AM Pulse Modulation**

**19,200 BAUD Rate**

**Battery Operation only**

## **2.1 EMI Countermeasure:**

The following modifications were made to the EUT, by the project engineer to assure compliance to specifications:

None.

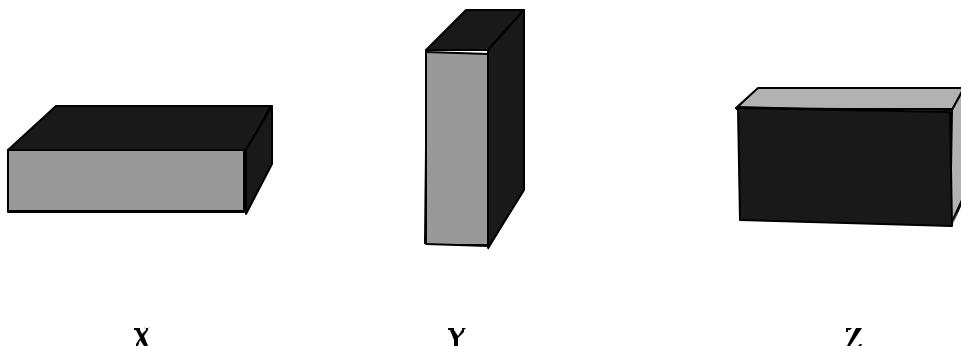
## **3.0 Test Program:**

This report contains measurement charts and data as evidence for the following tests performed:

1. Part (15.249) Field strength of harmonics and spurious out-of-band emissions.
2. Part (15.249) Field strength of fundamental frequency.
3. Part (15.247d) 20 dB Bandwidth measurement of fundamental frequency.

#### **4.0 Test Configuration:**

The EUT was setup on the test table in a manner, which follows the general guidelines of ANSI C63.4, Section 6 "**General Operating Conditions and Configurations**". The EUT was configured in 3 orthogonal positions to determine the maximum RF level at each emission frequency. The data tables give the EUT position designation that produces worst-case field strength, in an X, Y, Z system. This is described below:



**X**

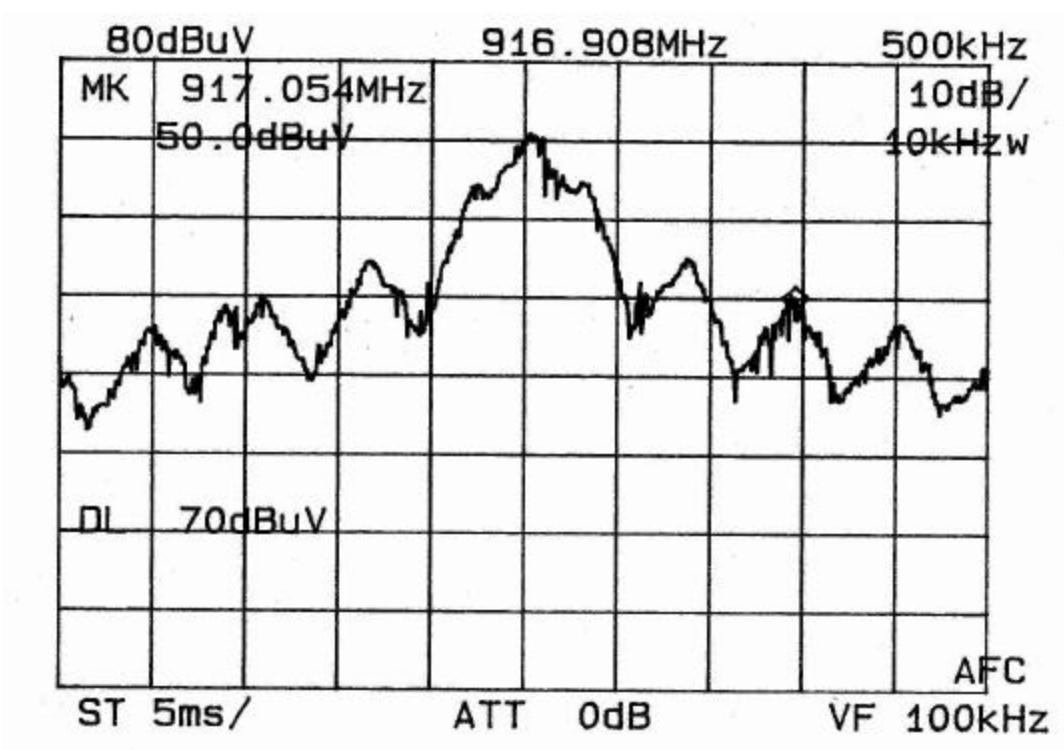
**Y**

**Z**

#### **4.1 20 dB Bandwidth of Fundamental Results:**

MODULATED CARRIER: (10 kHz RES. BW): (500 kHz SPAN)

##### **4.1.1 Bandwidth Emission Plot: BW = 292 kHz**



## **5.0 Radiated Emissions Scheme:**

The EUT is placed on an 80 cm high 1 X 1.5 meter non-conductive motorized turntable for radiated testing on the 3 meter open area test site. The emissions from the EUT are measured continuously at every azimuth by rotating the turntable. Guided horn and log periodic broadband antennas are mounted on an antenna mast to determine the height of the maximum emissions. The heights of the antennas are varied between 1 and 4 meters. Both the horizontal and vertical field components are measured.

The RF spectrum is searched from 30 MHz to 10 GHz.

The output from the antenna is connected to the input of the preamplifier. The pre-amp out is connected to the spectrum analyzer. The detector function is set to PEAK. The resolution bandwidth of the spectrum analyzer is set at 100 kHz for the frequency range of 30-1000 MHz, and 1 MHz for the frequency range of 1-10 GHz. A 10Hz video BW setting is used to average readings above 1 GHz when applicable. All emissions within 20 dB of the limit are recorded in the data tables.

To convert the spectrum analyzer reading into a quantified E-field level to allow comparison with the FCC limits, it is necessary to account for various calibration factors. These factors include cable loss (CL) and antenna factors (AF). The AF/CL in dB/m is algebraically added to the Spectrum Analyzer Voltage in dB $\mu$ V/m. This level is then compared to the FCC limit.

### **EXAMPLE**

**Spectrum Analyzer Voltage:**  $V \text{ dBmV}$

**Composite Factor:**  $AF/CL \text{ dB/m}$

**Electric Field:**  $E \text{ dBmV/m} = V \text{ dBmV} + AF/CL \text{ dB/m}$

**Linear Conversion:**  $E \text{ mV/m} = \text{Antilog}(E \text{ dBmV/m} / 20)$

## 5.1 Radiated Emissions Data Table

### FCC RADIATED EMISSIONS DATA

**CLIENT:** Geonautics  
**EUT:** TAG T1 TRANSMITTER  
**ANTENNA:** Ext. Stubby  
**FREQ.:** 916.91 MHZ  
**POWER:** N/A

3 METER TEST      PEAK DETECT      DATE: 12/15/2001

FREQUENCY MHz	POLARITY		SPEC A dBuV	AF/C dB/m	AMP Gain dB	Average Factor dB	Peak E-Field dbuV/m	Q-Peak Limit dBuV/m	MARGIN dB	CONDITION
	H	V								
904.00	H		64.00	24.00	0.00	0.00	88.00	94.00	6.00	PASS
1,833.82	H		43.00	30.60	25.00	0.00	48.60	54.00	5.40	PASS
2,750.73	H		35.00	34.30	25.00	0.00	44.30	54.00	9.70	PASS
3,667.64		V	32.00	36.70	25.00	0.00	43.70	54.00	10.30	PASS
4,584.55		V	30.00	38.80	25.00	0.00	43.80	54.00	10.20	PASS
5,501.46	H		31.00	32.00	25.00	0.00	38.00	54.00	16.00	PASS
6,418.37		V	29.00	32.00	25.00	0.00	36.00	54.00	18.00	PASS
7,335.28	H		26.00	33.50	25.00	0.00	34.50	54.00	19.50	PASS

**TABLE 1**  
**SUPPORT EQUIPMENT**

MANUFACTURER	FCC ID #	SERIAL #
(3) AA Batteries		
GPS Antenna	N/A	N/A

**TABLE 2**  
**MEASUREMENT EQUIPMENT USED**

The following equipment is used to perform measurements:

EQUIPMENT	SERIAL #
HP 434A RF Peak Power Meter	1362016
EMCO Model 3110 Biconical Antenna	1619
Antenna Research MWH-1825B Horn Antenna	1005
EMCO Model 3115 Ridged Horn Antenna	3007
HP 8348A Pre-Amplifier	197-2564A
Solar 8012-50-R-24-BNC LISN	924867
Bird 8306-300-N-30dB Attenuator	29198391515
HP 14IT w/8555A Spectrum Analyzer	6-95-1124
4 Meter Antenna Mast	
Motorized Turntable	
Heliax FSJ1-50A 1/4" Superflex Coax Cable (12 Ft.)	
4 Meter Antenna Mast	

**EXHIBIT 1.1**  
**RADIATED EMISSIONS PHOTOGRAPHS**

