

**Neptune Technology Group, Inc.  
FCC Part 15, Certification Application  
Model Advantage (M/N 12025-000)**

**December 18, 2001**

## MEASUREMENT/TECHNICAL REPORT

**COMPANY NAME:** Neptune Technology Group, Inc.

**MODEL:** Advantage (M/N 12025-000)

**FCC ID:** P2SNTGADV1201

**DATE:** December 18, 2001

This report concerns (check one): Original grant X  
Class II change \_\_\_\_\_

Equipment type: **Low Power Transmitter Under 15.249**

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? yes \_\_\_\_\_ No X

If yes, defer until: \_\_\_\_\_  
date

N.A. agrees to notify the Commission by N.A.  
date

of the intended date of announcement of the product so that the grant can be issued on that date.

Report prepared by:

United States Technologies, Inc.  
3505 Francis Circle  
Alpharetta, GA 30004

Phone Number: (770) 740-0717  
Fax Number: (770) 740-1508

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# SECTION 1

## GENERAL INFORMATION

## **GENERAL INFORMATION**

### **Product Description**

The Equipment Under Test (EUT) is a Neptune Technology Group, Inc., Advantage (M/N 12025-000). Hand held probe to interrogate and read water meter encoders. One end of the probe has an inductive coupling and the other end has a pin lock to interface with the water meter encoders. It has 6 keypads, 2x16 LCD display and a rechargeable NiCd battery. It reads an encoder by interrogating it with 1200 or 19.2 kHz clock. Returned signal are filtered and read stored in an EEPROM. Data can be reviewed and retransmitted using the keypad. It transmits data at 1200 Bi-Phase. It's an unlicensed 914 MHz Saw device from RFM. The transmitter used in the design is a model TX6004.

The unit contains two PCB sandwiched together. The MPU board is a digital micro board and it has the slot antenna printed on the PCB. The I/O board is an analog board, which produces clock to read the encoder and filters data before going to the MPU board. A trigger in the unit starts the encoder reading process. If not used within 5 minutes unit will go into a deep sleep mode until the trigger was activated again. The operating voltage is 3.65 volts.

### **Related Submittal(s)/Grant(s)**

The EUT will be used with an approved receiver.

## SECTION 2

# TESTS AND MEASUREMENTS

## **TESTS AND MEASUREMENTS**

### **Configuration of Tested System**

The sample was tested per ANSI C63.4, Methods of Measurement from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (1992). Conducted and radiated emissions data were taken with the test receiver or spectrum analyzer's resolution bandwidth adjusted to 9 kHz and 120 kHz, respectively. All measurements are peak unless stated otherwise. The video filter associated with the spectrum analyzer was off throughout the evaluation process. Interconnecting cables were manipulated as necessary to maximize emissions. A block diagram of the tested system is shown in Figure 1. Test configuration photographs for spurious and fundamental emissions are shown in Figure 2.

Since the EUT is a hand held device, it was placed into a continuous mode of transmit and rotated about all 3 axis to obtain worse case results.

### **Test Facility**

Testing was performed at US Tech's measurement facility at 3505 Francis Circle, Alpharetta, GA. This site has been fully described and submitted to the FCC, and accepted in their letter marked 31040/SIT. Additionally this site has also been fully described and submitted to Industry Canada (IC), and has been approved under file number IC2982.

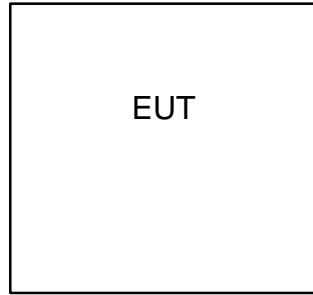
### **Modifications**

No modifications were made to bring the EUT into compliance with FCC Part 15, Class B Requirements.

### **Test Equipment**

Table 2 describes test equipment used to evaluate this product.

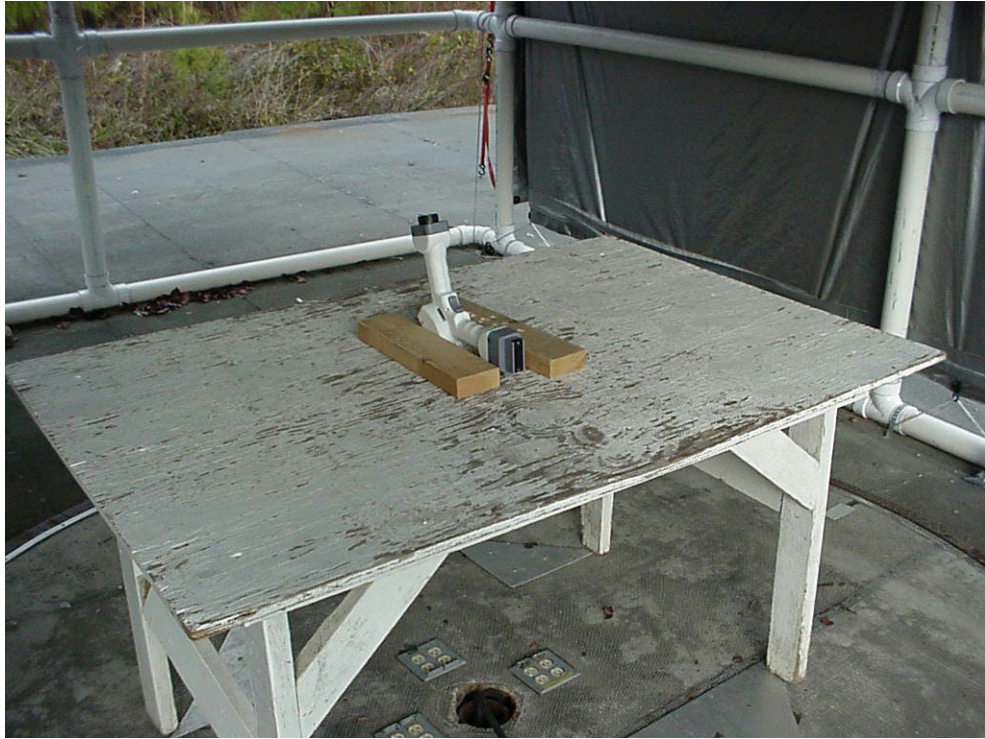
**FIGURE 1**  
**TEST CONFIGURATION**





**FIGURE 2a**

**Photograph(s) for Spurious and Fundamental Emissions**



**FIGURE 2b**

**Photograph(s) for Spurious and Fundamental Emissions**



**FIGURE 2c**

**Photograph(s) for Spurious and Fundamental Emissions**



TABLE 1

EUT and Peripherals

PERIPHERAL MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID:	CABLES P/D
Transmitter Neptune Technology Group, Inc. (EUT)	Advantage (M/N 12025-000)	AG0001884	P2SNTGADV1201 (Pending)	None

**TABLE 2****TEST INSTRUMENTS**

<b>TYPE</b>	<b>MANUFACTURER</b>	<b>MODEL</b>	<b>SN.</b>
SPECTRUM ANALYZER	HEWLETT-PACKARD	8593E	3205A00124
SPECTRUM ANALYZER	HEWLETT-PACKARD	8558B	2332A09900
S A DISPLAY	HEWLETT-PACKARD	853A	2404A02387
COMB GENERATOR	HEWLETT-PACKARD	8406A	1632A01519
RF PREAMP	HEWLETT-PACKARD	8447D	1937A03355
RF PREAMP	HEWLETT-PACKARD	8449B	3008A00480
HORN ANTENNA	EMCO	3115	3723
BICONICAL ANTENNA	EMCO	3110	9307-1431
LOG PERIODIC ANTENNA	EMCO	3146	9110-3600
LISN	SOLAR ELE.	8028	910495 & 910494
THERMOMETER	FLUKE	52	5215250
MULTIMETER	FLUKE	85	53710469
PLOTTER	HEWLETT-PACKARD	7475A	2325A65394
BILOG	CHASE	CBL6112A	2238

## **2.6 Antenna Description (Paragraph 15.203)**

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

The Model Neptune Technology Group, Inc. Advantage (M/N 12025-000) incorporates an internal antenna only.

## **2.7 Field Strength of Fundamental within the Band 902-928 MHz per FCC Section 15.249(a)**

Peak power within the band 902-928 MHz has been measured with a spectrum analyzer. Peak measurements were made using a peak or quasi-peak detector. Average emissions are not considered applicable since the measurement was below 1000 MHz.

The results of the measurements for peak fundamental emissions are given in Table 3 and Figure 3.

**Table 3**  
**FIELD STRENGTH OF FUNDAMENTAL EMISSION**

**Test Date:** November 26, 2001  
**UST Project:** 01-0664  
**Customer:** Neptune Technology Group, Inc.  
**Model:** Advantage (M/N 12025-000)

FREQ. (MHz)	TEST DATA (dBm) @ 3m	ANTENNA FACTOR + CABLE ATTENUATION	RESULTS (uV/m) @ 3m	PEAK FCC LIMITS (uV/m) @ 3m
914.0	-58.5	28.9	7053.1	50,000

**SAMPLE CALCULATIONS:**

RESULTS uV/m @ 3m = Antilog  $((-58.5 + 28.9 + 107)/20)$  = 7053.1  
 CONVERSION FROM dBm TO dBuV = 107 dB

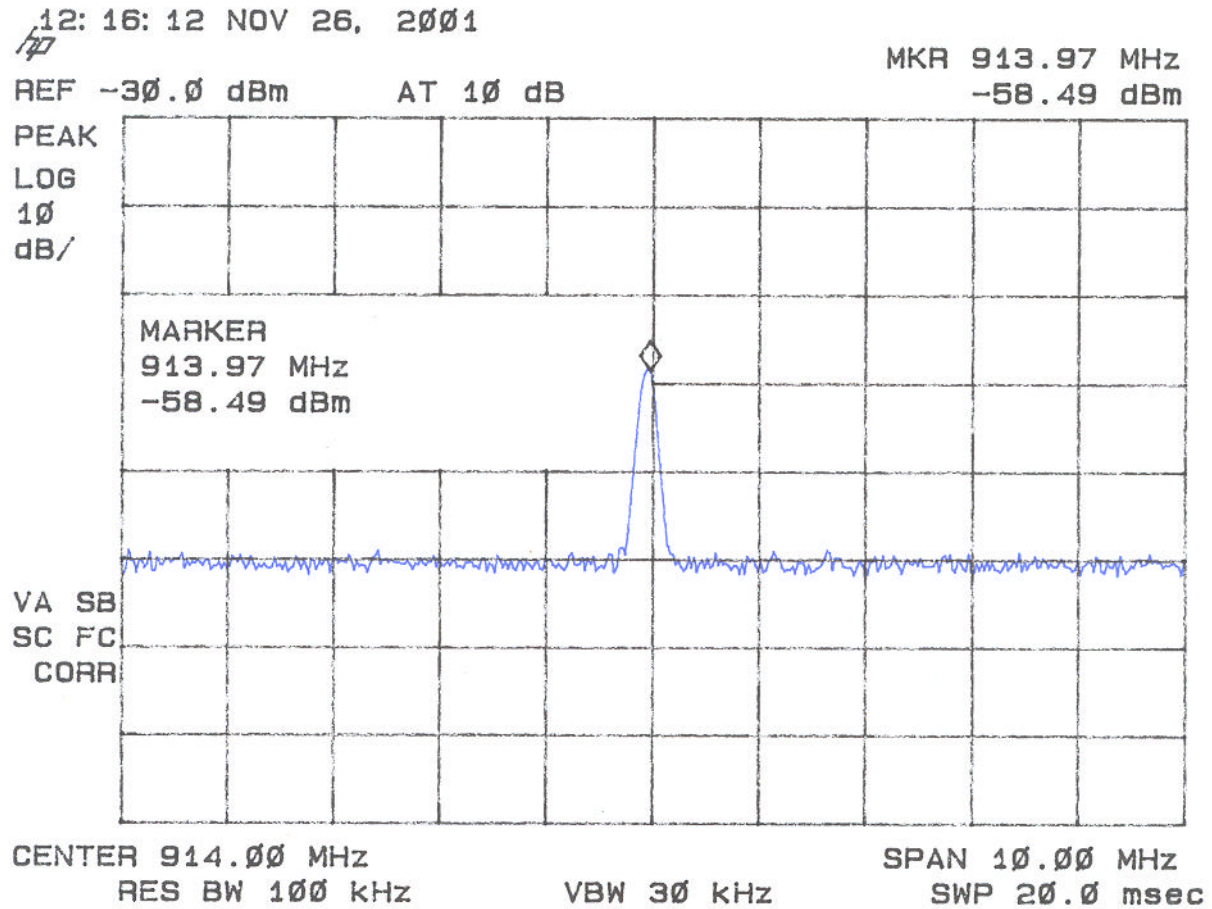
**Test Results**  
**Reviewed By:**



**Name:** Tim R. Johnson



**Figure 3.**  
**Field Strength of Fundamental Emissions 15.249(a)**



## **2.8 Peak Radiated Spurious Emissions in the Frequency Range 30 - 10000 MHz (FCC Section 15.249(c))**

A preliminary scan was performed on the EUT to determine frequencies that were caused by the transmitter portion of the product. Radiated measurements below 1 GHz were tested with a RBW = 120 kHz. Radiated measurements above 1 GHz were measured using a RBW = VBW = 1 MHz. The results of peak radiated spurious emissions are given in Table 4 and Figure 4.

**Table 4 Peak Radiated Spurious Emissions**

Freq. (GHz)	Test Data* (dBm) @3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) @3m	FCC Limits (uV/m) @3m
No emissions were detected within 10 dB of the FCC Limit						

\* = Data adjusted by + 1 dB for high pass filter

\*\* = Instrumentation ground floor

**SAMPLE CALCULATION:**

N/A

Tester   
 Signature: \_\_\_\_\_ Name: David Blethen

**Figure 4**  
**Peak Radiated Spurious Emission 15.247(c)**

No Emissions were detected within 10 dB of the FCC Limit

## **2.9 Average Spurious Emission in the Frequency Range 30 - 10000 MHz (FCC Section 15.249(c))**

The Average measurement was derived from applying any possible duty cycle correction to the peak reading. The results of average radiated spurious emissions are given in Table 5 and Figure 5.

### **Duty Cycle Correction During 100 msec:**

Not Necessary

**Table 5 Average Radiated Spurious Emissions**

Freq. (GHz)	Test Data* (dBm) @3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) @3m	FCC Limits (uV/m) @3m
No emissions were detected within 10 dB of the FCC Limit						

**SAMPLE CALCULATION:**

N/A

Tester  
Signature:  Name: David Blethen

**Figure 5**  
**Average Radiated Spurious Emission 15.247(c)**

No Emissions were detected within 10 dB of the FCC Limit

## **2.10 Power Line Conducted Emissions for Transmitter FCC Section 15.207**

The conducted voltage measurements have been carried out in accordance with FCC Section 15.207, with a spectrum analyzer connected to a LISN and the EUT placed into a continuous mode of transmit. The results are given in Table 6.



**Table 6. Conducted Emissions Data  
Class B**

**Test Date:** November 26, 2001  
**UST Project:** 01-0664  
**Customer:** Neptune Technology Group, Inc.  
**Product:** Advantage (M/N 12025-000)

Frequency (MHz)	Test Data (dBm)		RESULTS (uV)		FCC Limits (uV)
	Phase	Neutral	Phase	Neutral	
Conducted Emissions were considered not applicable since the EUT is portable and only battery powered.					

**SAMPLE CALCULATIONS:**

N/A

**Tester**  
**Signature:** David B. Blethen

**Name:** David Blethen

**2.11 Radiated Emissions (47 CFR 15.109a)**

Radiated emissions were evaluated from 30 to 5000 MHz. Measurements were made with the analyzer's bandwidth set to 120 kHz for measurements made less than 1 GHz and 1 MHz for measurements made 1 GHz and higher. Results for less than 1 GHz are shown in Table 7a. Measurements made over 1 GHz results are shown in Table 7b.

**Table 7a. Radiated Emissions Data****Class B**

**Test Date:** November 26, 2001  
**UST Project:** 01-0664  
**Customer:** Neptune Technology Group, Inc.  
**Product:** Advantage (M/N 12025-000)

Frequency (MHz)	Receiver Reading (dBm) @3m	Correction Factor (dB)	Corrected Reading (uV/m)	FCC Limit (uV/m) @3m
No emissions were detected within 10 dB of the FCC Limit				

**\*= Quasi Peak**

**SAMPLE CALCULATIONS:**

N/A

**Tester**  
**Signature:** David B. Blethen

**Name:** David Blethen

**Table 7b Radiated Emissions Data****Class B**

**Test Date:** November 26, 2001  
**UST Project:** 01-0664  
**Customer:** Neptune Technology Group, Inc.  
**Model:** Advantage (M/N 12025-000)

**Measurements >1GHz**

Frequency (MHz)	Receiver Reading (dBm) @3m	Correction Factor (dB)	Corrected Reading (uV/m)	FCC Limit (uV/m) @3m
No emissions were detected within 10 dB of the FCC Limit				

**SAMPLE CALCULATIONS:**

N/A

**Tested By**  
**Signature:** David P. Blethen **Name:** David Blethen

## **2.12 Power Line Conducted Emissions for Digital Device FCC Section 15.107**

The conducted voltage measurements have been carried out in accordance with FCC Section 15.107, with a spectrum analyzer connected to a LISN and the EUT placed into a continuous mode of transmit. The results are given in Table 8.

**Table 8. Conducted Emissions Data – Digital Device  
Class B**

**Test Date:** November 26, 2001  
**UST Project:** 01-0664  
**Customer:** Neptune Technology Group, Inc.  
**Product:** Advantage (M/N 12025-000)

Frequency (MHz)	Test Data (dBm)		RESULTS (uV)		FCC Limits (uV)
	Phase	Neutral	Phase	Neutral	
Conducted Emissions were considered not applicable since the EUT is portable and only battery powered.					

**Tester**  
**Signature:** 

**Name:** David Blethen