

REPORT OF MEASUREMENTS
PART 15C (15.249) - INTENTIONAL RADIATOR

DEVICE: TRANSMITTER FOR 3D POSITION SENSOR
MODEL: TXM-900-HP-II
MANUFACTURER: PHOENIX TECHNOLOGIES INC.
ADDRESS: 550 – 655 WEST KENT AVENUE NORTH
VANCOUVER BRITISH COLUMBIA
CANADA V6P 6T7

THE DATA CONTAINED IN THIS REPORT WAS
COLLECTED ON 2 NOVEMBER 1999 AND COMPILED BY:

PAUL G. SLAVENS
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1. General

1.1 Purpose

The purpose of this report is to show compliance to the FCC regulations for unlicensed devices operating under section 15.249 of the Code of Federal Regulations title 47.

1.2 Manufacturer

Company Name: Phoenix Technologies Inc.
Contact: Chris Cheung
Street Address: 550 – 655 West Kent Avenue North
City/Province: Vancouver British Columbia
Country/Postal Code: Canada V6P 6T7
Telephone: 604 321-3238
Fax: 604 321-3286

1.3 Test location

Company: Acme Testing Inc.
Street Address: 2002 Valley Highway
Mailing Address: PO Box 3
City/State/Zip: Acme WA 98220-0003
Laboratory: Test Site 2
Telephone: 888 226-3837
Fax: 360 595-2722
E-mail: acmetest@acmetesting.com
Web: www.acmetesting.com
Receipt of EUT: 2 November 1999

1.4 Test Personnel

Paul G. Slavens
Leonard G. Belisle

2. Test Results Summary

Summary of Test Results
Transmitter for 3D Position Sensor, model TXM-900-HP-II

Requirement	CFR Section	Test Result
Antenna Requirement	15.203	PASS
Conducted Emissions < 48.0 dBuV	15.207	PASS
Field Strength Limits	15.249	PASS

The signed original of this report, supplied to the client, represents the only “official” copy. Retention of any additional copies (electronic or non-electronic media) is at Acme Testing’s discretion to meet internal requirements only. The client has made the determination that EUT Condition, Characterization, and Mode of Operation are representative of production units, and meet the requirements of the specifications referenced herein.

Consistent with Industry practice, measurement and test equipment not directly involved in obtaining measurement results but having an impact on measurements (such as cable loss, antenna factors, etc.) are factored into the “Correction Factor” documented in certain test results. Instrumentation employed for testing meets tolerances consistent with known Industry Standards and Regulations.

The measurements contained in this report were made in accordance with the referenced standards and all applicable Public Notices received prior to the date of testing. Acme Testing assumes responsibility only for the accuracy and completeness of this data as it pertains to the sample tested.

Paul G. Slavens
Chief EMC Engineer

Date of Issuance

3. Description of Equipment and Peripherals

3.1 Equipment Under Test (EUT)

Device: Transmitter for 3D Position Sensor
Model Number: TXM-900-HP-II
Serial Number: None
FCC ID*: OUK-VSLZ9931
Power: 120 V/ 60 Hz
Grounding: Local
Antenna Distance: 3 meters

3.2 Mode of Operation During Tests

The EUT was exercised in its normal mode of operation.

3.3 Modifications Required for Compliance

1. None.

3.4 EUT Peripherals

<u>Device</u>	<u>Manufacturer</u>	<u>Model Number</u>	<u>FCC ID</u>	<u>Serial Number</u>
Power Supply for Visualeyex	GlobTek, Inc.	TR9CM3000N00-A	None	261708
Target Control Module	Phoenix Technologies Inc.	#3	None	TCM99090811
Power Supply for TCM	Importé par: MCI	M500R	None	None
Personal Computer for TCM	USTR	Bootleg	None	None
Monitor	ViewSonic	VCDTS21366	GSS17019	JP72701267
Keyboard	Fugitsu	FKB4725	C9SKB4725	L8051746
Mouse	Logitech	M-S38	DZL211107	LZA82356141

3.5 Description of Interface Cables

EUT/Power Supply (GlobTek)

Shielded	Unshielded	Flat	Round	Length	Ferrite
Yes	No	No	Yes	2 m	No

EUT/Target Control Module

Shielded	Unshielded	Flat	Round	Length	Ferrite
Yes	No	No	Yes	3 m	No

EUT/Personal Computer

Shielded	Unshielded	Flat	Round	Length	Ferrite
Yes	No	No	Yes	3 m	Yes (PC End)

Personal Computer/Monitor

Shielded	Unshielded	Flat	Round	Length	Ferrite
Yes	No	No	Yes	1 m	Yes

Personal Computer/Keyboard

Shielded	Unshielded	Flat	Round	Length	Ferrite
Yes	No	No	Yes	1 m	Yes

Personal Computer/Mouse

Shielded	Unshielded	Flat	Round	Length	Ferrite
Yes	No	No	Yes	1.5 m	No

ARRANGEMENT OF INTERFACE CABLES: All interface cables were positioned for worst case maximum emissions within the manner assumed to be a typical operation condition (please reference photographs).

4. Antenna requirement

4.1 Regulation

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 Part 15C. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

4.2 Result

The intentional radiator uses a wire soldered directly to the PCB.

5. Conducted Emissions Tests

Test Requirement: FCC CFR47, Part 15C

Test Procedure: ANSI C63.4:1992

5.1 Test Equipment

Spectrum Analyzer: Hewlett-Packard 8566B, Serial Number 2410A-00168, Calibrated: 12 March 1999, Calibration due Date: 12 March 2000

RF Preselector: Hewlett-Packard 85685, Serial Number 2648A-00519, Calibrated: 12 March 1999, Calibration due Date: 12 March 2000

Quasi Peak Adapter: Hewlett-Packard 85650A, Serial Number 2043A-00327, Calibrated: 17 March 1999, Calibration due Date: 17 March 2000

Line Impedance Stabilization Network: Rhode & Schwarz ESH2-Z5, Serial Number ACMERS1, Calibrated: 1 September 1999, Calibration due Date: 1 September 2000

5.2 Purpose

The purpose of this test is to evaluate the level of conducted noise the EUT imposes on the AC mains.

5.3 Test Procedures

For tabletop equipment, the EUT is placed on a 1 meter by 1.5 meters wide and 0.8 meter high nonconductive table that is placed above the groundplane. Floor standing equipment is placed directly on the groundplane. Any supplemental grounding mechanisms are connected, if appropriate. The EUT is connected to its associated peripherals, with any excess I/O cabling bundled to approximately 1 meter. The EUT is connected to a dedicated LISN and all peripherals are connected to a second separate LISN circuit. The LISNs are bonded to the groundplane.

Preview tests are performed to determine the “worst case” mode of operation. With the EUT operating in “worst case” mode, final conducted measurements are taken. Conducted measurements are made on each current carrying conductor with respect to ground.

Conducted Emissions Test Characteristics

Frequency range	0.45 MHz - 30.0 MHz
Test instrumentation resolution bandwidth	9 kHz
Lines Tested	Line 1/Line 2

5.4 Test Results

A summary of the highest amplitude emissions is listed below. For detailed plots of all emissions from 0.15 MHz - 30 MHz, please refer to the accompanying data in the list of attachments.

LINE 1

PEAK #	FREQ. (MHz)	AMPL (dBuV)
1	2.207	35.0
2	4.877	34.7
3	7.451	40.9
4	8.775	38.6
5	14.04	37.9
6	21.54	34.7

LINE 2

PEAK #	FREQ. (MHz)	AMPL (dBuV)
1	1.415	34.6
2	1.745	35.3
3	1.89	34.6
4	4.857	35.2
5	7.451	39.5
6	8.344	38.5
7	13.29	40.3

6. Radiated Emissions

6.1 Regulation

- (a) The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
902 - 928 MHz	50	500
2400 - 2483.5 MHz	50	500
5725 - 5875 MHz	50	500
24.0 - 24.25 GHz	250	2500

- (b) Field strength limits are specified at a distance of 3 meters.
- (c) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.
- (d) As shown in Section 15.35(b), for frequencies above 1000 MHz, the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

6.2 Test Equipment

Spectrum Analyzer: Hewlett-Packard 8566B, Serial Number 2410A-00168, Calibrated: 12 March 1999, Calibration due Date: 12 March 2000

RF Preselector: Hewlett-Packard 85685, Serial Number 2648A-00519, Calibrated: 12 March 1999, Calibration due Date: 12 March 2000

Quasi Peak Adapter: Hewlett-Packard 85650A, Serial Number 2043A-00327, Calibrated: 17 March 1999, Calibration due Date: 17 March 2000

Line Impedance Stabilization Network: Rhode & Schwarz ESH2-Z5, Serial Number ACMERS1, Calibrated: 1 September 1999, Calibration due Date: 1 September 2000

Broadband Biconical Antenna (20 MHz to 200 MHz): EMCO 3110, Serial Number 1115, Calibrated: 28 September 1999, Calibration due Date: 28 September 2000

Broadband Log Periodic Antenna (200 MHz to 1000 MHz): EMCO 3146, Serial Number 2853, Calibrated: 10 October 1999, Calibration due Date: 10 October 2000

EUT Turntable Position Controller: EMCO 1061-3M, Serial Number 9003-1441, No Calibration Required

Antenna Mast: EMCO 1051, Serial Number 9002-1457, No Calibration Required

2 GHz to 10 GHz Low Noise Preamplifier: Milliwave 593-2898, Serial Number 2494, Calibrated: 22 January 1999, Calibration due Date: 22 January 2000

Double Ridge Guide Horn Antenna: EMCO 3115, Serial Number 9807-5534, Calibrated: 28 December 1998, Calibration due Date: 28 December 1999

6.3 Test Procedures

For tabletop equipment, the EUT is placed on a 1 meter by 1.5 meters wide and 0.8 meter high nonconductive table that sits on a flush mounted metal turntable. Floor standing equipment is placed directly on the flush mounted metal turntable. The EUT is connected to its associated peripherals with any excess I/O cabling bundled to approximately 1 meter.

Preview tests are performed to determine the “worst case” mode of operation. With the EUT operating in “worst case” mode, emissions from the unit are maximized by adjusting the polarization and height of the receive antenna and rotating the EUT on the turntable. Manipulating the system cables also maximizes EUT emissions.

Radiated Emissions Test Characteristics

Frequency range	30 MHz – 10,000 MHz
Test distance	3 m
Test instrumentation resolution bandwidth	120 kHz (30 MHz – 1,000 MHz) 1 MHz (1,000 MHz – 10,000 MHz)
Receive antenna scan height	1 m - 4 m
Receive antenna polarization	Vertical/Horizontal

6.4 Test Results

PRODUCT EMISSIONS AVERAGE DATA

No	EMISSION	SPEC LIMIT	MEASUREMENTS			POL	SITE	
	FREQUENCY MHz		ABS	dLIM dB	MODE		HGT cm	AZM deg
1	1806.53	54.0	43.2	-10.8	AVG	H	127	95
2	2710.00	54.0	33.7	-20.3	AVG	H	100	87

PEAK DATA*

No	EMISSION	SPEC LIMIT	MEASUREMENTS			POL	SITE	
	FREQUENCY MHz		ABS	dLIM dB	MODE		HGT cm	AZM deg
1	903.278	94.0	73.7	-20.4	PK	H	100	71
2	1806.60	54.0	49.5	-4.5	PK	H	127	95
3	2709.5	54.0	43.1	-10.9	PK	H	100	87

* To show 15.35 compliance for average measurements over 1,000 MHz.

7. Miscellaneous Comments and Notes

1. None.