
ENGINEERING TEST REPORT

**TEKLOGIX HANDHELD TERMINAL
MODEL 7025**

**FCC CFR 47 (1992), PART 15
SUBPART C:- Section 15.247, Operation Within The
Band 902-928 MHz**

and

**SUBPART B:- Sections 15.111, 15.107 and 15.109,
Unintentional Radiators**

UltraTech's FILE NO.: TEK-032-7025FCC

TESTED FOR:

**TEKLOGIX INC.
1331 Crestlawn Drive
Mississauga, Ontario
Canada, L4W 2P9**

TESTED BY:

**UltraTech Engineering Labs Inc.
4181 Sladeview Crescent, Unit 33
Mississauga, Ontario
Canada L5L 5R2**

DATE: Mar. 10; 1994

UltraTech

Engineering Labs Inc.

**4181 Sladeview Crescent, Unit 33
Mississauga, Ontario, Canada L5L 5R2
Telephone (905) 589-2550
Facsimile (905) 589-2480**

TABLE OF CONTENTS

1. GENERAL INFORMATION	
1.1 Product Description	
1.2 Equipment Specifications	
1.3 Related Submittal(s)/Grant(s)	
1.4 Tested Systems Details	
1.5 Test Methodology	
1.6 Test Facility	
1.7 Unit of Measurements	
2. PRODUCT LABELING	
3. SYSTEM TEST CONFIGURATION	
3.1 Justification	
3.2 EUT Exercise Software	
3.3 Special Accessories	
3.4 Equipment Modifications	
3.5 Configuration of Tested System	
3.6 System Block Diagram(s) of EUT	
3.7 Measurement Photos	
4. SUMMARY OF TEST RESULTS	
STATEMENT OF CERTIFICATION	
5. TRANSMITTER MEASUREMENT DATA (Certification)	
6. RECEIVER MEASUREMENT DATA (Verification)	
 General Test Procedures for Conducted and Radiated Emission Measurements and Calculation of Field Strengths	Appendix A
Instrumentation Record	Appendix B
Photographs of Tested Unit	Appendix C
Schematic Diagrams & User Manual	Appendix D

1. GENERAL INFORMATION

1.1 Product Description

Applicant

TEKLOGIX INC.
1331 Crestlawn Drive
Mississauga, Ontario
Canada, L4W 2P9

Applicant's Representative: Mr. Dan Merringer

Manufacturer

TEKLOGIX INC.
1331 Crestlawn Drive
Mississauga, Ontario
Canada, L4W 2P9

Applicant's Representative: Mr. Dan Merringer

Equipment Unit Tested

PRODUCT NAME: TEKLOGIX HANDHELD TERMINAL

PRODUCT MODEL: 7025

TRADE NAME: TEKLOGIX 7025 HANDHELD TERMINAL

SERIAL NUMBER: Pre-production

TYPE OF EQUIPMENT: Intentional Radiator

OSCILLATORS' FREQUENCY(IES): Main Board: 8 MHz

CPU SPEED: 8 MHz

INTERFACE PORTS: (1) Serial printer interface (DB15)
(2) Laser scanner interface

INPUT SUPPLY: 7.2 Vdc

ASSOCIATED DEVICES: Dipole antenna, antenna gain: 2.5 dBi
The antenna is coupled to the model 7025
using a unique connector. The method of
connection is shown in the following
attached drawing.

FCC ID: GM332D7025-7410A

The EUT consists of the following parts/components:

- (1) Teklogix Proxim RXA Direct Sequence Spread Spectrum Transceiver, Teklogix Model TRX-7410A.
- (2) Teklogix main Logic Interface board, Xtal Freq: 8 MHz.
- (3) Teklogix keyboard
- (4) Teklogix display board.

1.2 Equipment Specifications

Receiver

FREQUENCY RANGE: 902 - 928 MHz
OPERATING FREQUENCY: 906, 909, 912, 915, 918, 921 and 924 MHz
NO. OF CHANNEL: 7
INTERMEDIATE FREQUENCIES: 45 MHz
INPUT IMPEDANCE: 50 Ohms
AUDIO POWER OUTPUT: N/A
CRYSTAL FREQUENCY(IES): synthesized.

TRANSMITTER

FREQUENCY RANGE: 902 - 928 MHz
OPERATING FREQUENCY: 906, 909, 912, 915, 918, 921 and 924 MHz
NO. OF CHANNEL: 7
BANDWIDTH: 2 MHz
TYPE OF EMISSIONS: Direct sequence spread spectrum
OUTPUT IMPEDANCE: 50 Ohms
CRYSTAL FREQUENCY(IES): synthesized.
DUTY CYCLE: 25%
DATA RATE: 9600 bps, 19200 bps and 122 Kbps
POWER OUTPUT: 260 mW peak max.
POWER ADJUSTMENT: None

1.3 Related Submittal(s)/Grant

Teklogix model 8045/8050 uses the same Proxim RXA Transceiver (Teklogix Model No. : TRX7410A) as as other Teklogix models (7025, 9130 and 9200). The only differences are digital circuits, packaging and operating software. The application for FCC certification of each model is submitted separately.

1.4 Tested System Details

The following peripherals, FCC identifiers and types interconnecting cables were used with the EUT for testing:

- (1) TEKLOGIX VEHICAL MOUNT TERMINAL, Model 8045, SN: Pre-production, Xtal freq.: 8 MHz (mainboard), FCC ID: GM332D80XX-7410A.
I/O CABLE: Shielded
POWER SUPPLY CABLE: Non-shielded
- (2) TEKLOGIX VEHICAL MOUNT TERMINAL, Model 8050, SN: Pre-production, Xtal freq.: 16/2 MHz (mainboard), FCC ID: GM332D80XX-7410A.
I/O CABLE: Shielded
POWER SUPPLY CABLE: Non-shielded
- (3) Symbol Technologies Laser Scanner, Model LS-8500-H400A, SN: 038607, FCC Class A Verified.
Power & I/O CABLE: Shielded
- (4) Hewlett Packard Serial Printer, Model 2225D, SN: 2507920810, FCC ID: BS46XU2225D.
I/O CABLE: Shielded
POWER SUPPLY CABLE: Non-shielded

1.5 Test Methodology

These tests were conducted on a sample of the equipment for the purpose of certification compliance with Code of Federal Regulations (CFR47-1991), Part 15, Subpart C, Section 15.247 - Operation Within The Band 902-928 MHz and verifications compliance with Part 15, Subpart B - Unintentional Radiators.

Both conducted and radiated emissions measurements were conducted in accordance with FCC Measurement Procedure MP-1 (1983) - "FCC Methods of Measurements for Determining Compliance of Radio Control and Security Alarm Devices and Associated Receivers" and FCC/OET MP-1 (1987) - "FCC Procedure for Measuring RF Emissions from Digital Devices".

1.6 Test Facility

AC Powerline Conducted Emissions were performed in UltraTech's shielded room, 16' (L) by 12' (W) by 12' (H).

Radiated Emissions were performed at the Ultratech's 3 Meter Open Field Test Site (OFTS) situated in the Town of Flamorough, province of Ontario.

The above sites have been fully described in a report submitted to FCC office, and accepted in a letter dated Oct. 03, 1989 (31040/SIT).

1.7 Units of Measurements

Measurements of conducted emissions are reported in units of dB referenced to one microvolt [dB(uV)] or dB referenced to one milli-watt [dBm].

Measurements of radiated emissions are reported in units of dB referenced to one microvolt per meter [dB(uV)/m] at the distance specified in the report, wherever it is applicable.

2. PRODUCT LABELING

See attached drawing

3. SYSTEM TEST CONFIGURATION

3.1 Justification

For testing convenience, the transmitter was specially programmed to transmit in continuous mode. The continuous transmission is not a normal operation.

3.2 EUT Exercise Software

Not applicable

3.3 Special Accessories

Not applicable

3.4 Equipment Modifications

Not applicable.

3.5 Configuration of Tested System

See attached drawing.

3.6 System Block Diagram(s) of Model 7025

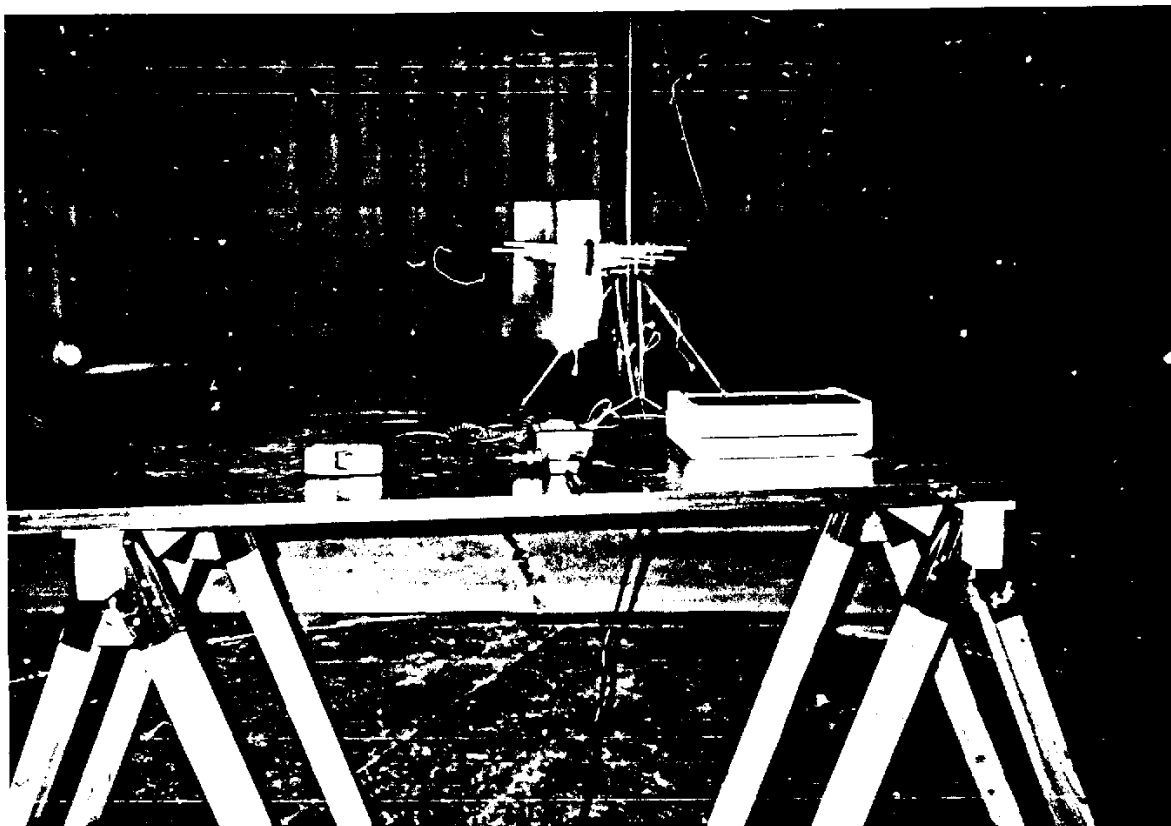
See attached drawing.

3.7 Conducted and Radiated Measurement Photos

Refer to the attached photos of rf emission test set-up(s).

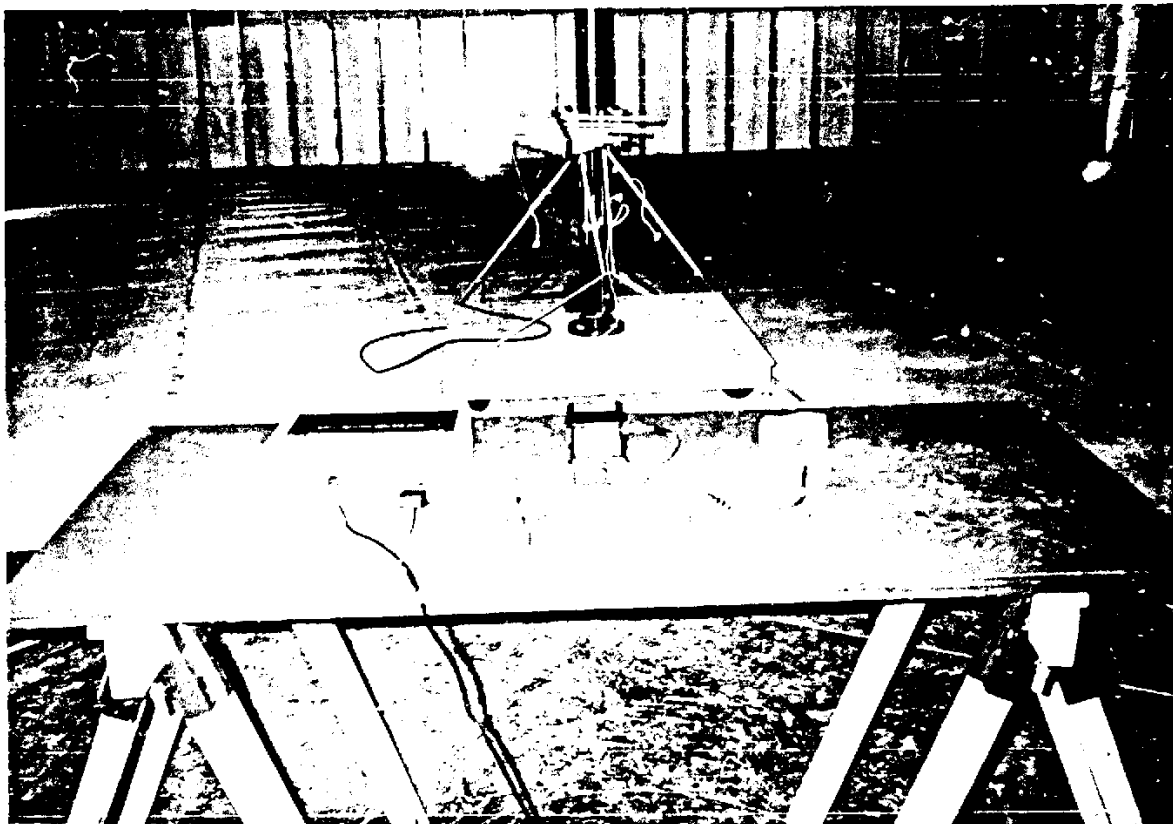
EQUIPMENT CONFIGURATION

*Arrangements of EUT, Peripheral Devices and Interconnecting
Cables for Radiated Emission Measurements (front).*



EQUIPMENT CONFIGURATION

*Arrangements of EUT, Peripheral Devices and Interconnecting
Cables for Radiated Emission Measurements (rear).*



4. SUMMARY OF TEST RESULTS AND STATEMENT OF CERTIFICATION

SUMMARY OF TEST RESULTS

TRANSMITTER TESTS - FCC PART 15, SUBPART C, INTENTIONAL RADIATORS

<u>FCC SECTION</u>	<u>TEST DESCRIPTION</u>	<u>COMPLIANCE (YES/NO)</u>
15.247(a)(2)	Spectrum Bandwidth of A Direct Sequence System	YES
15.247(b)	Maximum Peak Output Power	YES
15.247(c)	Out-of-Band Conducted Spurious Emissions	YES
15.205 15.209(a) 14.247(c)	Restricted Bands of Operation and Out-of-Band Radiated Emissions	YES
15.247(d)	Transmitted Power Density of A Direct Sequence System	YES
15.247(e)	Processing Gain of A Direct Sequence System.	YES (1)

(1) Please refer to Proxim's attached data for details of processing gain measurements and results.

RECEIVER - FCC PART 15, SUBPART B, UNINTENTIONAL RADIATOR

<u>FCC SECTION</u>	<u>TEST DESCRIPTION</u>	<u>COMPLIANCE (YES/NO)</u>
15.107(a)	AC Power-line Conducted Emissions	N/A
15.109(a)	Radiated Emissions	YES
15.111(a)	Antenna Power Conducted Emissions	YES

TESTIMONIAL AND STATEMENT OF CERTIFICATION

THIS IS TO CERTIFY:

- (1) *THAT the application was prepared either by, or under the direct supervision of the undersigned.*
- (2) *THAT the measurement data supplied with the application was taken under my direction and supervision.*
- (3) *THAT the data was obtained on representative production units, randomly selected.*
- (4) *THAT, to the best of my knowledge and belief, the facts set forth in the application and accompanying technical data are true and correct.*

Certified by:



A circular professional engineer seal for Tri Minh Luu. The outer ring contains the text "LICENSED PROFESSIONAL ENGINEER" at the top and "STATE OF CALIFORNIA" at the bottom. The center of the seal contains the name "T. M. LUU" and a stylized signature. A horizontal line is drawn across the bottom of the seal.

***Tri Minh Luu, P. Eng.
V.P., Engineering***

DATE: Mar. 10; 1994

5. TRANSMITTER MEASUREMENT DATA

The transmitter was tested in accordance with FCC CFR 47 (1992), Part 15, Subpart C, Intentional Radiators (Sec. 15.247 - Operation within the band 902-928 MHz), and the results found were recorded as shown on the following pages.

PRODUCT NAME: TEKLOGIX HANDHELD TERMINAL, MODEL 7025

NAME OF TEST: 6dB Bandwidth of A Direct Sequence System

FCC LIMIT: FCC CFR 47 (1992), Section 15.247(a)(2)

For a direct sequence system, the minimum 6dB bandwidth shall be at least 500 KHz.

TEST CONDITION: Standard Temperature and Humidity.
Power Input: 7.2 Vdc.
The transmitter was set to transmit the carrier signal continuously.

TEST EQUIPMENT: Advantest R3271 (100HZ-26.5GHZ) Spectrum Analyzer, HP 7475 Plotter, 10 dB Attenuator.

METHOD OF MEASUREMENTS: The transmitter was connected to the spectrum analyzer system through the attenuator, and the 6dB Bandwidth of the transmitted spectrum was measured.

TEST RESULTS: Conforms.

TEST CONDITION	6dB BW (MHz)	SPEC. MIN. (MHz)	PASS/FAIL
Ch. #1: 906 MHz, 9600 bps data rate	1.9	0.500	PASS
Ch. #1: 906 MHz, 19200 bps data rate	2.1	0.500	PASS
Ch. #1: 906 MHz, 122 kbps data rate	2.1	0.500	PASS
Ch. #4: 915 MHz, 9600 bps data rate	1.9	0.500	PASS
Ch. #4: 915 MHz, 19200 bps data rate	1.9	0.500	PASS
Ch. #4: 915 MHz, 122 kbps data rate	2.0	0.500	PASS
Ch. #7: 924 MHz, 9600 bps data rate	1.7	0.500	PASS
Ch. #7: 924 MHz, 19200 bps data rate	1.9	0.500	PASS
Ch. #7: 924 MHz, 122 kbps data rate	1.9	0.500	PASS

CONDUCTED BY: Mr. Tri M. Luu; P.Eng.

TEST DATE: Feb. 28 & Mar. 01; 1994

PRODUCT NAME: TEKLOGIX HANDHELD TERMINAL, MODEL 7025

NAME OF TEST: Maximum Peak Output Power

FCC LIMIT: **FCC 90-233, Section 15.247(b)**
The maximum peak output power of the transmitter shall not exceed 1 Watt.

If the antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST CONDITION: Standard Temperature and Humidity.
Power Input: 7.2 Vdc.
The transmitter was set to transmit the carrier signal continuously.

TEST EQUIPMENT: HP 8900 Peak Power Meter (50 Ohm Input) and 10dB Attenuator.

METHOD OF MEASUREMENTS: The transmitter was terminated by a 50-Ohm RF load and the maximum peak output power was measured using a RF wattmeter.

TEST RESULTS:

Conforms

PEAK OUTPUT POWER

TEST CONDITION	MEASURED OUTPUT RF POWER (Watts)	MAX. LIMIT (Watts)	PASS/FAIL
Ch. #1: 906 MHz, 9600 bps data rate	0.244	1.0	PASS
Ch. #1: 906 MHz, 19200 bps data rate	0.262	1.0	PASS
Ch. #1: 906 MHz, 122 Kbps data rate	0.242	1.0	PASS
Ch. #4: 915 MHz, 9600 bps data rate	0.229	1.0	PASS
Ch. #4: 915 MHz, 19200 bps data rate	0.210	1.0	PASS
Ch. #4: 915 MHz, 122 Kbps data rate	0.210	1.0	PASS
Ch. #7: 924 MHz, 9600 bps data rate	0.159	1.0	PASS
Ch. #7: 924 MHz, 19200 bps data rate	0.172	1.0	PASS
Ch. #7: 924 MHz, 122 Kbps data rate	0.164	1.0	PASS

CONDUCTED BY:

Mr. Tri M. Luu; P.Eng.

TEST DATE:

Feb. 28 & Mar. 01; 1994

PRODUCT NAME: TEKLOGIX HANDHELD TERMINAL, MODEL 7025

NAME OF TEST: Out-of-Band Conducted Spurious Emissions.

FCC LIMIT: FCC CFR 47 (1992), Section 15.247(c)

In any 100 KHz bandwidth outside the operating band, the radio frequency power that is produced by modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20dB below that in any 100KHz bandwidth within the band that contains the highest level of the desired power.

TEST CONDITION: Standard Temperature and Humidity.
Power Input: 7.2 Vdc.
The transmitter was set to transmit the modulated signal continuously.

TEST EQUIPMENT: Advantest R3271 (100HZ-26.5GHZ) Spectrum Analyzer, UltraTech's EMI softwares, 10 dB Attenuator, 500MHz/1.6GHz cut-off highpass filter.

METHOD OF MEASUREMENTS: Refer to FCC MP-1.

A scan was made by using spectrum analyzer system with the detector function set to PEAK mode (100KHz Bandwidth minimum).

All measurements were recorded in WORST CASE.

TEST RESULTS: Conforms.

CONDUCTED BY: Mr. Tri M. Luu; P.Eng.

TEST DATE: Feb. 28 & Mar. 01; 1994

MEASUREMENT DATA

OUT-OF-BAND CONDUCTED SPURIOUS EMISSIONS

- (1) TEST CONDITIONS: Ch.# 1 (906 MHz), baud rate: 9.6 Kb/s.
Maximum In-Band Power Level = 18.3 dBm
LIMIT = 18.3 dBm - 20 dB = -1.7 dBm

FREQ. (MHz)	R.F. POWER (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL (P/F)
100.9	-43.9	-1.7	-42.2	P
140.9	-45.0	-1.7	-43.3	P
267.9	-43.5	-1.7	-41.8	P
877.3	-44.2	-1.7	-42.5	P
1,797.0	-29.5	-1.7	-27.8	P
2,710.0	-43.1	-1.7	-41.4	P
3,610.0	-48.3	-1.7	-46.6	P
4,510.0	-42.7	-1.7	-41.0	P
5,423.0	-45.7	-1.7	-44.0	P
6,323.0	-45.0	-1.7	-43.3	P

* The rf output emissions were scanned from 1MHz to 10GHz, and all emission levels less than 50 dB below the calculated limit.

- (2) TEST CONDITIONS: Ch.# 1 (906 MHz), baud rate: 19.2 Kb/s.
Maximum In-Band Power Level = 18.3 dBm
LIMIT = 18.3 dBm - 20 dB = -1.7 dBm

FREQ. (MHz)	R.F. POWER (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL (P/F)
36.7	-47.0	-1.7	-45.3	P
100.9	-43.3	-1.7	-41.6	P
140.9	-44.6	-1.7	-42.9	P
267.9	-43.6	-1.7	-41.9	P
646.1	-50.4	-1.7	-48.7	P
875.8	-45.1	-1.7	-43.4	P
1,797.0	-29.5	-1.7	-27.8	P
2,710.0	-42.6	-1.7	-40.9	P
4,510.0	-40.6	-1.7	-38.9	P
5,410.0	-45.5	-1.7	-43.8	P
6,323.0	-44.9	-1.7	-43.2	P

* The rf output emissions were scanned from 1MHz to 10GHz, and all emission levels less than 50 dB below the calculated limit.

- (3) TEST CONDITIONS: Ch.# 1 (906 MHz), baud rate: 122 Kb/s.
Maximum In-Band Power Level = 18.2 dBm
LIMIT = 18.2 dBm - 20 dB = -1.8 dBm

FREQ. (MHz)	R.F. POWER (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL (P/F)
19.6	-47.9	-1.8	-46.1	P
100.9	-45.5	-1.8	-43.7	P
140.9	-44.6	-1.8	-42.8	P
269.3	-43.8	-1.8	-42.0	P
644.6	-51.4	-1.8	-49.6	P
898.7	-40.2	-1.8	-38.4	P
1,810.0	-29.3	-1.8	-27.5	P
2,697.0	-43.0	-1.8	-41.2	P
4,523.0	-39.7	-1.8	-37.9	P
5,423.0	-45.0	-1.8	-43.2	P
6,323.0	-45.2	-1.8	-43.4	P

* The rf output emissions were scanned from 1MHz to 10GHz, and all emission levels less than 50 dB below the calculated limit.

- (4) TEST CONDITIONS: Ch.# 4 (915 MHz), baud rate: 9.6 Kb/s.
Maximum In-Band Power Level = 18.2 dBm
LIMIT = 18.2 dBm - 20 dB = -1.8 dBm

FREQ. (MHz)	R.F. POWER (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL (P/F)
36.7	-44.9	-1.8	-43.1	P
100.9	-42.2	-1.8	-40.4	P
140.9	-45.2	-1.8	-43.4	P
267.9	-39.6	-1.8	-37.8	P
654.6	-49.3	-1.8	-47.5	P
885.8	-42.8	-1.8	-41.0	P
930.1	-43.7	-1.8	-41.9	P
1,810.0	-30.1	-1.8	-28.3	P
2,736.0	-41.4	-1.8	-39.6	P
3,649.0	-45.1	-1.8	-43.3	P
4,561.0	-40.0	-1.8	-38.2	P
5,474.0	-47.3	-1.8	-45.5	P
6,387.0	-46.6	-1.8	-44.8	P

* The rf output emissions were scanned from 1MHz to 10GHz, and all emission levels less than 50 dB below the calculated limit.

- (5) TEST CONDITIONS: Ch.# 4 (915 MHz), baud rate: 19.2 Kb/s.
Maximum In-Band Power Level = 18.1 dBm
LIMIT = 18.1 dBm - 20 dB = -1.9 dBm

FREQ. (MHz)	R.F. POWER (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL (P/F)
83.8	-42.8	-1.9	-40.9	P
267.9	-41.2	-1.9	-39.3	P
653.2	-50.1	-1.9	-48.2	P
887.3	-43.3	-1.9	-41.4	P
1,810.0	-29.8	-1.9	-27.9	P
2,736.0	-41.3	-1.9	-39.4	P
3,649.0	-45.3	-1.9	-43.4	P
4,561.0	-38.4	-1.9	-36.5	P
5,474.0	-45.4	-1.9	-43.5	P
6,387.0	-46.8	-1.9	-44.9	P

* The rf output emissions were scanned from 1MHz to 10GHz, and all emission levels less than 50 dB below the calculated limit.

- (6) TEST CONDITIONS: Ch.# 4 (915 MHz), baud rate: 122 Kb/s.
Maximum In-Band Power Level = 17.6 dBm
LIMIT = 17.6 dBm - 20 dB = -2.4 dBm

FREQ. (MHz)	R.F. POWER (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL (P/F)
99.5	-41.8	-2.4	-39.4	P
115.2	-44.0	-2.4	-41.6	P
267.9	-40.3	-2.4	-37.9	P
653.2	-50.2	-2.4	-47.8	P
885.8	-42.3	-2.4	-39.9	P
1,810.0	-30.2	-2.4	-27.8	P
2,736.0	-41.2	-2.4	-38.8	P
3,649.0	-45.6	-2.4	-43.2	P
4,561.0	-38.3	-2.4	-35.9	P
5,461.0	-45.3	-2.4	-42.9	P
6,374.0	-47.0	-2.4	-44.6	P

* The rf output emissions were scanned from 1MHz to 10GHz, and all emission levels less than 50 dB below the calculated limit.

- (7) TEST CONDITIONS: Ch.# 7 (924 MHz), baud rate: 9.6 Kb/s.
Maximum In-Band Power Level = 16.5 dBm
LIMIT = 16.5 dBm - 20 dB = -3.5 dBm

FREQ. (MHz)	R.F. POWER (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL (P/F)
83.8	-41.3	-3.5	-37.8	P
132.3	-43.5	-3.5	-40.0	P
269.3	-39.9	-3.5	-36.4	P
464.8	-41.6	-3.5	-38.1	P
901.5	-41.5	-3.5	-38.0	P
1,836.0	-30.6	-3.5	-27.1	P
2,761.0	-42.4	-3.5	-38.9	P
3,687.0	-48.1	-3.5	-44.6	P
4,613.0	-37.8	-3.5	-34.3	P
5,526.0	-47.5	-3.5	-44.0	P
6,451.0	-46.8	-3.5	-43.3	P

* The rf output emissions were scanned from 1MHz to 10GHz, and all emission levels less than 50 dB below the calculated limit.

- (8) TEST CONDITIONS: Ch.# 7 (924 MHz), baud rate: 19.2 Kb/s.
Maximum In-Band Power Level = 16.7 dBm
LIMIT = 16.7 dBm - 20 dB = -3.3 dBm

FREQ. (MHz)	R.F. POWER (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL (P/F)
83.8	-41.4	-3.3	-38.1	P
100.9	-42.1	-3.3	-38.8	P
267.9	-36.9	-3.3	-33.6	P
466.2	-35.7	-3.3	-32.4	P
654.6	-47.2	-3.3	-43.9	P
894.4	-42.8	-3.3	-39.5	P
1,836.0	-30.6	-3.3	-27.3	P
2,749.0	-42.3	-3.3	-39.0	P
3,687.0	-47.1	-3.3	-43.8	P
4,613.0	-40.9	-3.3	-37.6	P
5,539.0	-45.7	-3.3	-42.4	P
6,451.0	-45.7	-3.3	-42.4	P

* The rf output emissions were scanned from 1MHz to 10GHz, and all emission levels less than 50 dB below the calculated limit.

- (9) TEST CONDITIONS: Ch.# 7 (924 MHz), baud rate: 122 Kb/s.
Maximum In-Band Power Level = 16.8 dBm
LIMIT = 16.8 dBm - 20 dB = -3.2 dBm

FREQ. (MHz)	R.F. POWER (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL (P/F)
99.5	-40.9	-3.2	-37.7	P
267.9	-36.9	-3.2	-33.7	P
464.8	-33.9	-3.2	-30.7	P
663.2	-46.7	-3.2	-43.5	P
894.4	-41.9	-3.2	-38.7	P
1,836.0	-30.4	-3.2	-27.2	P
2,761.0	-42.2	-3.2	-39.0	P
3,687.0	-45.9	-3.2	-42.7	P
4,613.0	-37.4	-3.2	-34.2	P
5,526.0	-45.4	-3.2	-42.2	P
6,439.0	-46.1	-3.2	-42.9	P

* The rf output emissions were scanned from 1MHz to 10GHz, and all emission levels less than 50 dB below the calculated limit.

PRODUCT NAME: TEKLOGIX HANDHELD TERMINAL, MODEL 7025

NAME OF TEST: Restricted Bands of Operation and Out-of-Band Radiated Emissions.

FCC LIMIT: FCC CFR 47 (1992), Sections 15.205, 15.209 and 15.247(c).

The RF radiated emissions within the restricted bands of operation specified in Section 15.205(a) of FCC CFR 47 (1992) measured at 3 Meter distance shall not exceed the field strength below:

FREQUENCY (MHz)	FIELD STRENGTH @3 METERS	
	(uV)	(dBuV)
0.009 - 0.49	240000/F(KHz)	107.6-20logF(KHz)
0.49 - 1.705	24000/F(KHz)	107.6-20logF(KHz)
1.705 - 30	300	49.5
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
960 - 10,000	500	54.0

Outside of the restricted bands, specified in 15.205(a), the rf radiated emissions shall be attenuated at least 20dB below the highest power level of the carrier measured at 100KHz bandwidth.

TEST CONDITION: Standard Temperature and Humidity.
Power Input: 7.2 Vdc.
The transmitter was set to transmit the carrier signal continuously.

TEST EQUIPMENT: Advantest R3361 (10KHz-2.6GHz) / R3271 (100Hz-26.5GHz) Spectrum Analyzer, R3551 Preselector option (30dB Gain), HP 8349A Microwave Amplifier (30dB nominal 2-20GHz), UltraTech's EMI softwares, HP 7475 Plotter, Emco Biconical Antenna (20-300MHz), Emco Log Periodic Antenna (200-1000MHz), A.H. Systems Periodic Antenna (1-18GHz) FCC Listed Open Field Test Site, 500MHz/1.6GHz cut-off highpass filter.

METHOD OF MEASUREMENTS: Refer to FCC MP-1.

At frequencies below 1000MHz, a scan was made by using spectrum analyzer system with the resolution bandwidth set to 100 KHz and the detector set to PEAK, over the frequency range 30 to 1000 MHz. When the emissions were found to be near or exceeds the specified limits, the detector function set to CISPR QUASI-PEAK mode (120KHz Bandwidth) and the results were recorded.

At frequencies above 1000 MHz the
emissions were measured in AVERAGE mode
with the spectrum analyzer set as follows:

RBW = 1 MHz
VBW = 300 Hz
SWEEP TIME = AUTO

All measurements were recorded in WORST
CASE.

TEST RESULTS:

Conforms

CONDUCTED BY:

Mr. Tri M. Luu; P.Eng.

TEST DATE:

Mar. 04; 1994

MEASUREMENT DATA:

RADIATED EMISSIONS (@ 3 METERS)

FREQ. (MHz)	FIELD STRENGTH (dBuV/m)	PEAK/ QUASI (P/Q)	ANTENNA PLANE (V/H)	FCC LIMIT (dBuV/m)	MARGIN (dB)	PASS/ FAIL (P/F)
Transmitter Output: Channel #1, 906 MHz						
906.00	112.7	V	P	N/A	N/A	N/A
906.00	111.5	H	P	N/A	N/A	N/A
1,812.00	69.5	V	P	92.7	-23.2	P
1,812.00	71.0	H	P	92.7	-21.7	P
2,718.00	52.0	V	P	54.0	-2.0	P
2,718.00	49.6	H	P	54.0	-4.4	P
3,624.00	40.5	V	P	54.0	-13.5	P
3,624.00	38.6	H	P	54.0	-15.4	P
4,530.00	48.5	V	P	54.0	-5.5	P
4,530.00	46.5	H	P	54.0	-7.5	P
Transmitter Output: Channel #4, 915 MHz						
915.00	113.6	V	P	N/A	N/A	N/A
915.00	113.0	H	P	N/A	N/A	N/A
1,830.00	70.8	V	P	93.6	-22.8	P
1,830.00	71.5	H	P	93.6	-22.1	P
2,745.00	51.6	V	P	54.0	-2.4	P
2,745.00	48.3	H	P	54.0	-5.7	P
3,660.00	45.6	V	P	54.0	-8.4	P
3,660.00	40.0	H	P	54.0	-14.0	P
4,575.00	51.1	V	P	54.0	-2.9	P
4,575.00	48.2	H	P	54.0	-5.8	P
Transmitter Output: Channel #7, 924 MHz						
924.00	113.8	V	P	N/A	N/A	N/A
924.00	114.3	H	P	N/A	N/A	N/A
1,848.00	69.1	V	P	94.3	-25.2	P
1,848.00	71.0	H	P	94.3	-23.3	P
2,772.00	51.5	V	P	54.0	-2.5	P
2,772.00	48.5	H	P	54.0	-5.5	P
3,696.00	43.7	V	P	54.0	-10.3	P
3,696.00	40.6	H	P	54.0	-13.4	P
4,620.00	51.5	V	P	54.0	-2.5	P
4,620.00	48.0	H	P	54.0	-6.0	P

**** The rf emissions were scanned from 1 MHz to 10 GHz and all rf level greater than 30 dBuV/m were recorded.**

PRODUCT NAME: TEKLOGIX HANDHELD TERMINAL, MODEL 7025

NAME OF TEST: Transmitted Power Density of A Direct Sequence System.

FCC LIMIT: FCC CFR 47 (1992), Section 15.247(d)

For direct sequence systems, the transmitted power density average over any 1 second interval shall not be greater than 8dBm in any 3 KHz bandwidth within this band.

TEST CONDITION: Standard Temperature and Humidity.
Power Input: 7.2 Vdc.
The transmitter was set to transmit the carrier signal continuously.

TEST EQUIPMENT: Advantest R3271 (100HZ-26.5GHZ) Spectrum Analyzer, 10 dB Attenuator.

METHOD OF MEASUREMENTS: The transmitter power density in 3 KHz bandwidth shall be measured with the spectrum analyzer set as follows:
RBW = 3 KHz, VBW = 10 KHz, SPAN = 3 MHz and SWEEP TIME = 1000 seconds. Since the transmitter is designed with 25% duty cycle, the transmitter will not be in good condition to operate in continuous rf transmission for that long, the following alternative method was employed to perform.

The spectrum analyzer was set as follows:
RBW = 3 KHz, VBW = 10 KHz, SPAN = 3 MHz and SWEEP TIME = AUTO. With the transmitter was connected to the spectrum analyzer through an attenuator, the maximum peak was searched.

When the maximum peak was certain it was moved to the centre of the spectrum analyzer's screen, and the setting of the spectrum analyzer was changed as follows:
RBW = 3 KHz, VBW = 10 KHz, SPAN = 200 KHz and SWEEP TIME = 200 seconds.

TEST RESULTS: Conforms.

CONDUCTED BY: Mr. Tri M. Luu; P.Eng.

TEST DATE: Feb. 28 & Mar. 01; 1994

MEASUREMENT DATA:

TRANSMITTED POWER DENSITY @ 3KHz Bandwidth

TEST CONDITION	MEASURED RF POWER @ 3KHz	MAX. LIMIT (dBm)	PASS/FAIL
CHANNEL 1: 906 MHz 9.6 Kb/s baud rate	7.3	8.0	PASS
CHANNEL 1: 906 MHz 19.2 Kb/s baud rate	7.2	8.0	PASS
CHANNEL 4: 915 MHz 9.6 Kb/s baud rate	7.4	8.0	PASS
CHANNEL 4: 915 MHz 19.2 Kb/s baud rate	6.8	8.0	PASS
CHANNEL 4: 915 MHz 122 Kb/s baud rate	5.9	8.0	PASS
CHANNEL 7: 924 MHz 9.6 Kb/s baud rate	6.9	8.0	PASS
CHANNEL 7: 924 MHz 19.2 Kb/s baud rate	5.8	8.0	PASS
CHANNEL 7: 924 MHz 122 Kb/s baud rate	5.4	8.0	PASS

PRODUCT NAME:

TEKLOGIX HANDHELD TERMINAL, MODEL 7025

NAME OF TEST:

The Processing Gain of A Direct Sequence System.

REMARKS:

Please kindly refer to the attached data for details of measurements and results of the processing gain conducted by Proxim Inc.

6. RECEIVER MEASUREMENT DATA

The receiver was tested in accordance with FCC CFR 47 (1992), Part 15, Subpart B, Class B Unintentional Radiators and the results found were recorded as shown on the following pages.

PRODUCT NAME: TEKLOGIX HANDHELD TERMINAL, MODEL 7025

NAME OF TEST: RF Radiated Emissions.

FCC CLASS A/B LIMIT: **FCC Part 15, Sub. B, Para. 15.109(a)&(b)**
The RF radiated emissions measured at 3
Meter distance shall not exceed the field
strength below:

CLASS B - RADIO RECEIVERS		
FREQUENCY	FIELD STRENGTH @3 METERS	
(MHz)	(uV)	(dBuV)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

CLASS A - DIGITAL DEVICES		
FREQUENCY	FIELD STRENGTH @3 METERS	
(MHz)	(uV)	(dBuV)
30 - 88	300	49.5
88 - 216	500	54.0
216 - 960	700	56.9
Above 960	1000	60.0

TEST CONDITION: Standard Temperature and Humidity.
Power Input: 7.2 Vdc.
Operating Speed: 8 MHz

TEST EQUIPMENT: Advantest R3361 Spectrum Analyzer (9KHz-2.6GHz), Advantest R3551 Preselector (9KHz-1GHz, 30dB gain), Advantest R3271 Spectrum Analyzer (100Hz-26.5GHz), HP 8349A Microwave Amplifier (2-20GHz, 30dB gain nominal) UltraTech's EMI softwares, HP 7475 Plotter, Emco Biconical Antenna (20-300MHz), Emco Log Periodic Antenna (200-1000MHz), AH System Log Periodic Antenna (1GHz-18GHz), FCC Listed Open Field Test Site.

METHOD OF MEASUREMENTS: Refer to FCC/OET MP-1 (1987).

TEST RESULTS: Conforms

CONDUCTED BY: Mr. Tri M. Luu; P.Eng.

TEST DATE: Mar. 03; 1994

MEASUREMENT DATA:

RADIATED EMISSIONS (@ 3 METERS)

MODEL 7025 - CLASS A DIGITAL DEVICE

FREQ. (MHz)	FIELD STRENGTH (dBuV/m)	PEAK/ QUASI (P/Q)	ANTENNA PLANE (V/H)	CLASS A LIMIT (dBuV/m)	MARGIN (dB)	PASS/ FAIL (P/F)
32.03	44.6	P	V	49.5	-4.9	P
32.03	42.9	P	H	49.5	-6.6	P
120.00	38.1	P	V	54.0	-15.9	P
120.00	40.5	P	H	54.0	-13.5	P
136.00	38.1	P	H	54.0	-15.9	P
136.00	33.5	P	V	54.0	-20.5	P
248.00	41.6	P	H	54.0	-12.4	P
264.00	38.3	P	H	54.0	-15.7	P
307.99	32.7	P	V	54.0	-21.3	P
307.99	34.7	P	H	54.0	-19.3	P
311.99	38.6	P	H	54.0	-15.4	P
323.99	32.1	P	H	54.0	-21.9	P
328.00	35.0	P	H	54.0	-19.0	P
335.99	33.0	P	H	54.0	-21.0	P
343.93	36.0	P	H	54.0	-18.0	P
343.93	34.0	P	V	54.0	-20.0	P
359.99	33.8	P	H	54.0	-20.2	P
376.00	34.9	P	H	54.0	-19.1	P
388.00	33.5	P	H	54.0	-20.5	P
391.99	37.5	P	H	54.0	-16.5	P
391.99	32.0	P	V	54.0	-22.0	P
408.00	35.7	P	H	54.0	-18.3	P
416.00	37.6	P	H	54.0	-16.4	P
416.00	32.7	P	V	54.0	-21.3	P
424.00	35.7	P	H	54.0	-18.3	P
432.00	33.0	P	V	54.0	-21.0	P
432.00	38.8	P	H	54.0	-15.2	P
440.00	33.7	P	H	54.0	-20.3	P
448.00	35.2	P	H	54.0	-18.8	P
456.01	32.0	P	H	54.0	-22.0	P
472.00	38.0	P	H	54.0	-16.0	P
472.00	39.3	P	V	54.0	-14.7	P
480.00	32.5	P	H	54.0	-21.5	P

**** The rf emissions were scanned from 30 MHz to 1 GHz and all rf level greater than 30 dBuV/m were recorded.**

*** P: Peak Detector, 100KHz RBW, 100KHz VBW**

*** Q: CISPR QUASI-PEAK, 120KHz RBW, 1MHz VBW.**

*** A: AVERAGE, 1MHz RBW, 300Hz VBW .**

MODEL 7025 - RADIO RECEIVER

FREQ. (MHz)	FIELD STRENGTH (dBuV/m)	PEAK/ QUASI (P/Q)	ANTENNA PLANE (V/H)	CLASS B LIMIT (dBuV/m)	MARGIN (dB)	PASS/ FAIL (P/F)
RECEIVING FREQUENCY: 906 MHz						
951.0	42.0	P	V	46.0	-4.0	P
951.0	43.6	P	H	46.0	-2.4	P
1900.0	32.5	P	V	54.0	-21.5	P
1900.0	33.5	P	H	54.0	-20.5	P
RECEIVING FREQUENCY: 915 MHz						
960.0	40.0	P	V	46.0	-6.0	P
960.0	43.0	P	H	46.0	-3.0	P
RECEIVING FREQUENCY: 924 MHz						
968.0	43.9	P	V	54.0	-10.1	P
968.0	44.9	P	H	54.0	-9.1	P

** *The rf emissions were scanned from 1 MHz to 5 GHz and all rf level greater than 30 dBuV/m were recorded.*

* *P: Peak Detector, 100KHz RBW, 100KHz VBW*

* *Q: CISPR QUASI-PEAK, 120KHz RBW, 1MHz VBW.*

* *A: AVERAGE, 1MHz RBW, 300Hz VBW.*

PRODUCT NAME: TEKLOGIX HANDHELD TERMINAL, MODEL 7025

NAME OF TEST: Antenna Power Conducted Emissions.

FCC MINIMUM STANDARD: FCC Part 15, Sub. B, Para. 15.111(a)
With the receiver antenna terminal connected to a resistive termination equal to the impedance specified or employed for the antenna, the power at the antenna terminal in the frequency range 30-960 MHz shall not exceed 2.0 nanowatts or -57 dBm or 50 dBuV.

TEST CONDITION: Standard Temperature and Humidity.
Power Input: 7.2 Vdc.
The EUT was set to "receive" mode.

TEST EQUIPMENT: Advantest R3271 (100HZ-26.5GHZ) Spectrum Analyzer, HP 7475 Plotter.

METHOD OF MEASUREMENTS: A scan was made by using spectrum analyzer system with the resolution bandwidth set to 100 KHz and the detector set to PEAK, over the frequency range 30 to 1000 MHz.

TEST RESULTS: Conforms.

CONDUCTED BY: Mr. Tri M. Luu; P.Eng.

TEST DATE: Mar. 01; 1994

MEASUREMENT DATA

ANTENNA POWER CONDUCTED EMISSIONS

TEST CONDITION: The receiver was tuned to: 906 MHz

FREQUENCY. (MHz)	R.F. VOLTAGE (dBuV)	PEAK/ QUASI (P/Q)	SPEC. LIMIT (dBuV)	PASS/ FAIL (P/F)	MARGIN (dB)
52.60	-71.7	P	-57.0	P	-14.7
68.50	-72.8	P	-57.0	P	-15.8
156.20	-77.3	P	-57.0	P	-20.3
396.70	-86.0	P	-57.0	P	-29.0
427.20	-90.6	P	-57.0	P	-33.6
443.20	-91.1	P	-57.0	P	-34.1
476.40	-87.9	P	-57.0	P	-30.9
953.40	-61.6	P	-57.0	P	-4.6

* All signal levels less than 35 dB below the limits were recorded.

TEST CONDITION: The receiver was tuned to: 915 MHz

FREQUENCY. (MHz)	R.F. VOLTAGE (dBuV)	PEAK/ QUASI (P/Q)	SPEC. LIMIT (dBuV)	PASS/ FAIL (P/F)	MARGIN (dB)
69.90	-87.0	P	-57.0	P	-30.0
92.40	-84.7	P	-57.0	P	-27.7
127.00	-79.7	P	-57.0	P	-22.7
156.20	-80.8	P	-57.0	P	-23.8
172.20	-80.0	P	-57.0	P	-23.0
205.40	-81.5	P	-57.0	P	-24.5
317.00	-84.0	P	-57.0	P	-27.0
396.70	-88.4	P	-57.0	P	-31.4

* All signal levels less than 35 dB below the limits were recorded.

TEST CONDITION: The receiver was tuned to: 924 MHz

FREQUENCY. (MHz)	R.F. VOLTAGE (dBuV)	PEAK/ QUASI (P/Q)	SPEC. LIMIT (dBuV)	PASS/ FAIL (P/F)	MARGIN (dB)
52.60	-72.6	P	-57.0	P	-15.6
68.50	-74.4	P	-57.0	P	-17.4
84.50	-77.3	P	-57.0	P	-20.3
156.20	-78.1	P	-57.0	P	-21.1
267.80	-87.4	P	-57.0	P	-30.4
283.80	-85.8	P	-57.0	P	-28.8
315.60	-83.7	P	-57.0	P	-26.7
331.60	-83.3	P	-57.0	P	-26.3

* All signal levels less than 35 dB below the limits were recorded.

APPENDIX A
***GENERAL TEST PROCEDURES
FOR
CONDUCTED AND RADIATED EMISSION MEASUREMENTS***

AC Power-line Conducted Emission Testing - General Test Procedures :

- [X] AC Powerline Conducted Emissions were performed in the shielded room, 16' (L) by 12' (W) by 12' (H).
- [X] Conducted power-line measurements were made over the frequency range from 450 KHz to 30 MHz to determine the line-to-ground radio noise voltage which was conducted from the EUT power-input terminals that were directly (or directly via separate transformers, power supplies) connected to a public power network.
- [] The EUT normally received power from another device that connects to the public utility ac power lines, measurements would be made on that device with the EUT in operation to ensure that the device continues to comply with the appropriate limits while providing the EUT with power.
- [] The EUT was operated only from internal or dedicated batteries, with no provisions for connection to the public utility ac power lines, ac power-line conducted measurements were not required.
- [X] Table-top devices were placed on a platform of nominal size 1 m by 1.5m raised 80 cm above the conducting ground plane.
- [X] The EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN to the power source. All unused 50-Ohm connectors of the LISN was terminated in 50-ohm when not connected to the measuring instruments.
- [X] The line cord of the EUT connected to one LISN which was connected to the measuring instrument. Those power cords for the units of devices not under measurement were connected to a separate multiple ac outlets. Drawings and photographs of typically conducted emission test setups were shown in the Test Report. Each current-carrying conductor of the EUT shall be individually tested.

- [X] The EUT was normally operated with a ground (safety) connection, the EUT was connected to the ground at the LISN through a conductor provided in the lead from the ac power mains to the LISN.
- [X] The excess length of the power cord was folded back and forth in an 8-shape on a wooden strip with a vertical prong located on the top of the LISN case.
- [X] The EUT was set-up in its typical configuration and operated in its various modes as described in 3.2 of the test report.
- [X] A preliminary scan was made by using spectrum analyzer system with the detector function set to PEAK mode (10 KHz RBW, 10 KHz VBW), frequency span 450KHz-30MHz.

The maximum conducted emission for a given mode of operation was found by using the following step-by-step procedure:

- Step 1: Monitor the frequency range of interest at a fixed EUT azimuth.
 - Step 2: Manipulate the system cables and peripheral devices to produce highest amplitude signal relative to the limit. Note the amplitude and frequency of the suspect signal.
 - Step 3: The effects of various modes of operation is examined. This is done by varying the equipment modes as step 2 is being performed.
 - Step 4: After completing steps 1 through 3, record EUT and peripheral device configuration, mode of operation, cable configuration, signal levels and frequencies for the final test.
- [X] Each highest signal level at the maximized test configuration was zoomed in a small frequency span on the spectrum analyzer's display (the manipulation of cables and peripheral devices and EUT operation modes might have to be repeated to obtain the highest signal level with the spectrum analyzer set to PEAK detector mode 10 KHz RBW and 10 KHz VBW). The spectrum analyzer was then set to CISPR QUASI-PEAK detector mode (9 KHz RBW, 1 MHz VBW) and the final highest RF signal level and frequency was record.

Electric Field Radiated Emission Testing - General Test Procedures:

- [X] The radiated emission measurements were performed at the Ultratech's 3 Meter Open Field Test Site (OFTS) situated in the Town of Flamborough, province of Ontario. The Attenuation Characteristics of OFTS have been filed to FCC.
- [X] Radiated emissions measurements were made using the following test instruments:
 - (1) Calibrated EMCO biconical antenna in the frequency range from 30 MHz to 300 MHz.
 - (2) Calibrated EMCO log periodic antenna in the frequency range from 300 MHz to 1000 MHz.
 - (3) Calibrated A.H. Systems log periodic antenna in the frequency range above 1000 MHz (1GHz - 18 GHz).
 - (4) Calibrated Advantest spectrum analyzer and pre-selector. In general, the spectrum analyzer would be used as follows:
 - The rf electric field levels were measured with the spectrum analyzer set to PEAK detector (100 KHz RBW and 100 KHz VBW).
 - If any rf emission was observed to be a broadband noise, the spectrum analyzer's CISPR QUASI-PEAK detector (120 KHz RBW and 1MHz VBW) was then set to measure the signal level.
 - If the signal being measured was narrowband and the ambient field was broadband, the bandwidth of the spectrum analyzer was reduced.
- [X] The EUT was set-up in its typical configuration and operated in its various modes as described in 3.2 of the test report.
- [X] The frequencies of emissions was first detected. Then the amplitude of the emissions was measured at the specified measurement distance using required antenna height, polarization, and detector characteristics.
- [X] During this process, cables and peripheral devices were manipulated within the range of likely configuration.

- [X] For each mode of operation required to be tested, the frequency spectrum was monitored. Variations in antenna heights (from 1 meter to 4 meters above the ground plane), antenna polarization (horizontal plane and vertical plane), cable placement and peripheral placement (each variable within bounds specified elsewhere) were explored to produce the highest amplitude signal relative to the limit.

The maximum radiated emission for a given mode of operation was found by using the following step-by-step procedure:

- Step 1: Monitor the frequency range of interest at a fixed antenna height and EUT azimuth.
- Step 2: Manipulate the system cables to produce highest amplitude signal relative to the limit. Note the amplitude and frequency of the suspect signal.
- Step 3: Rotate the EUT 360 degrees to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more, go back to the azimuth and repeat Step 2. Otherwise, orient the EUT azimuth to repeat the highest amplitude observation and proceed.
- Step 4: Move the antenna over its full allowed range of travel (1 to 4 meters) to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more, return to Step 2 with the highest amplitude observation and proceed.
- Step 5: Change the polarity of the antenna and repeat Step 2 through 4. Compare the resulting suspected highest amplitude signal with that found for the other polarity. Select and note the higher of the two signals. This signal is termed the highest observed signal with respect to the limit for this EUT operational mode.

Step 6: The effects of various modes of operation is examined. This is done by varying the equipment modes as steps 2 through 5 are being performed.

Step 7: After completing steps 1 through 6, record the final highest emission level, frequency, antenna polarization and detector mode of the measuring instrument.

Calculation of Field Strength:

The field strength is calculated by adding the calibrated 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
 RA = Antenna Factor
 CF = Cable Attenuation Factor
 AG = Amplifier Gain

Example: If a receiver reading of 60.0 dBuV is obtained, the antenna factor of 7.0 dB and cable factor of 1.0 dB are added, and the amplifier gain of 30 dB is subtracted. The actual field strength will be:

$$\begin{aligned} \text{Level in dBuV/m} &= 60 + 7.0 + 1.0 - 30 \\ &= 38.0 \text{ dBuV/m} \end{aligned}$$

$$\text{Level in uV/m} = 10^{(38/20)} = 79.43 \text{ uV/m}$$

Notes:

The frequency and amplitude of at least six highest conducted emissions relative to the limit are recorded unless such emissions are more than 20 dB below the limit. If less than six emissions are within 20dB of the limit, the background or receiver noise level shall be reported at representative frequencies.

APPENDIX B
INSTRUMENTATION RECORD
UltraTech Engineering Labs Inc.

RF RECEIVING EQUIPMENT

- (1) **Spectrum Analyzer**, Advantest, Model 3261A, SN 91720151, Input +25dBm max., 9KHz-2.6GHz, 50 Ohms, built-in Quasi-Peak Detector.
- (2) **Spectrum Analyzer**, Advantest, Model R3361B, SN 81730072, Input +25dBm max., 9KHz-3.6GHz, 50 Ohm input., built-in Quasi-Peak Detector.
- (3) **Spectrum Analyzer**, Advantest, Model R3271, SN 15050203, +30dBm max., 100 Hz - 32 GHz, 50 Ohms.
- (4) **Digital (FFT) Spectrum Analyzer**, Advantest, Model R9211E, Input Impedance: 1 M-Ohms, Maximum Input Sensitivity: -140dBV in 2 KHz range, Input Voltage: ± 200 V; Frequency Range: 10mHz to 100 KHz.
- (5) **Communication Analyzer**, Rohde & Schwarz, SMFP2, SN 879988/047, 0.4-1000 MHz, including SINAD, S/N, Modulation meters, AF & RF signal generators and etc....
- (6) **RF Peak Power Meter**, HP, model 8900, SN 2131A00124.
- (7) **RF Peak Power Sensor**, HP, Model 84811A, SN 2551A01965, frequency range 0.1 - 18 GHz.
- (8) **RF Wattmeter**, Bird, model 43, SN 206175, impedance: 50 Ohms, power rating: 10, 50 or 100 Watts, frequency range 2MHz - 1000 MHz.
- (9) **Digital Storage Oscilloscope**, by Phillips, model 3320A, SN DQ 646.

RF SIGNAL GENERATOR, PRE-SELECTORS & POWER AMPLIFIERS

- (10) **RF Preselector**, Advantest Model R3551, SN 92970002, 9KHz-1GHz, 50 Ohms input/output, input +25 dBm max.
- (11) **Pre-amplifier**, Advantest, Model R14601, Frequency Range: 9 KHz-1 GHz, Gain: 30 dB, SN: 13120035
- (12) **Microwave Amplifier**, HP, Model 8349A, SN: 2340A00206, Frequency Range 2 to 20 GHz, 30dB gain nominal.
- (13) **Audio Oscillator**, HP, Model 204C, SN: 0989A08798, Output: 0-1.2 MHz, 5 Vrms.
- (14) **Synthesized RF Signal Generator**, Fluke, Model 6061A, SN 4770301, frequency range 10KHz-1050MHz, power output 13dBm max.
- (15) **RF Power Amplifier**, Realistic, Model MPA-45, 35 Watts max. output, frequency 0 to 3 MHz.
- (16) **RF Power Amplifier**, Amplifier Research, Model 50A220, 50 watts max. output, frequency range: 10 KHz - 220MHz
- (17) **Broadband Power Amplifier**, Eaton Advanced Electronics, Model 3551B, frequency range: 100 MHz - 520 MHz
- (18) **Wideband RF Amplifier**, Kalmus, Model 720FC, 25 watss output max., frequency range: 400 MHz - 1000MHz, 40 dB gain.

- (19) **Electrostatic Discharge Simulator**, Schaffner, Model No.: NSG-433, S/N: 00940, Calibration Date: Oct./92, c/w contact discharge adaptor.

The characteristics of the discharge network and operating parameters are as follows.

Charge Voltage U_0 : 2-18kV $\pm 10\%$
Rise Time t_r : 5nS $\pm 30\%$ @ 4kV
Half-Value width t_w : 30nS $\pm 30\%$ @ 4kV
Polarity: Pos./Neg. According to HV cascade
Discharge Capacitors C_s : 150pF $\pm 10\%$
Discharge Resistor R_d : 330 Ohms $\pm 10\%$
Max. Discharge Energy: 350mJ
Test Finger: According to IEC 801-2 (8mm DIA.)

Contact Discharge Adaptor

Charge Voltage: 2-8kV
Rise time t_r : < 1 ns
Polarity: Pos./Neg. According to HV module
Peak Discharge Current: 30A @ 8kV (min.)
Test Finger: According to IEC 801-2 (Point)

- (20) **Microprocessor Controlled E-Class Series 400 EFT/Burst Test Generator**, by KeyTek Instrument Corp., Model E420, Serial No.: 9205213:

The characteristics and performance of the generator are as follows:

- Test Level:
 - Open Circuit Output Voltage: upto 4.4 kV (10kHz) and upto 8kV (2.5kHz)
 - Short Circuit Output Current: 0.25kA min, 2kA max.
 - Waveshape of Surge Voltage and Current: meet figure 2 and 3 of table 2 specified in IEC 801-4 (Third Impression 1991)
 - . Pulse Rise Time: 5nS $\pm 30\%$
 - . Pulse Duration: 50nS $\pm 30\%$
 - . Burst Train Repetition Rate: 1 kHz to 10 kHz
 - . Burst Train Duration: 1 to 20mS
 - . Burst Period: 0.3 to 5 seconds
- Generator Source Impedance: 50 Ohms
- Polarity of the Surge: positive/negative
- Internal or External Generator Trigger: internal
- Number of Tests: at least 5 positive and 5 negative at the selected points.

RECEIVING ANTENNAS & TRANSDUCERS

- (21) **Active Loop Antenna**, Emco, Model 6507, SN 8906-1167, Frequency Range 1 KHz - 30 MHz, @ 50 Ohms.
- (22) **Active Loop Antenna**, Emco, Model 6502, SN 9104-2611, Frequency Range 1 KHz - 30 MHz, @ 50 Ohms.
- (23) **Dipole Antenna Set**, Emco, Model 3121C, SN 8907-434, 20-1000MHz, @ 50 ohms.
- (24) **Dipole Antenna Set**, Emco, Model 3121C, SN 8907-440, 20-1000MHz, @ 50 ohms.
- (25) **Biconical Antenna**, Emco, Model 3110, SN 1019, 20 - 300MHz, @ 50 ohms.
- (26) **Biconical Antenna**, A.H. Systems, Model SAS-200/542, SN 544, 20 - 330MHz, @ 50 ohms.
- (27) **Log Periodic Antenna**, Emco, Model 3146, SN 2524, 200 - 1000MHz, @ 50 ohms.
- (28) **Log Periodic Antenna**, A.H. Systems Model SAS-200/512, SN 130, 200 - 1800MHz, @ 50 ohms.
- (29) **Log Periodic Antenna**, A.H. Systems, Model SAS-200/518, SN 343, Frequency Range: 1 - 18 GHz, @ 50 Ohms.
- (30) **Double Ridged Guide Horn Antenna**, Emco, Model 3116, SN 9210-2192, Frequency Range: 18-40GHz, Impedance: 50 ohms.
- (31) **Horn Antenna**, Emco, Model 3160-09, 18-26.5GHz
- (32) **Horn Antenna**, Emco, Model 3160-10, 26.5-40GHz
- (33) **Mixer**, Tektronix, P/N 118-0098-00, 18-26.5GHz
- (34) **Mixer**, Tektronix, P/N 119-0098-00, 26.5-40GHz
- (35) **Mixer**, HP, P/N R3434A, 12.4-18GHz
- (36) **Mixer**, HP, P/N R3434B, 18-26.5GHz
- (37) **Mixer**, HP, P/N R3434C, 26.5-40GHz
- (38) **Absorbing Clamp**, Rohde & Schwarz, Model MDS-21, SN: 8332231/005, 50 Ohms, 30-1000MHz, 17 dB insertion loss.
- (39) **Broadband Field Strength Meter and Probe**, Holiday Industries, Model HI-3004, SN: 56562, measuring levels: 0-30V/m, measuring frequency range: 300KHz-1.5GHz.
- (40) **RF Current Probe**, Electro-Metrics, Model PCL-10, SN: 1727, @ 50 ohms, Frequency Range 20 Hz - 50 KHz.
- (41) **RF Current Probe**, Stoddart AirCraft, Model 91550-1, SN: 345-118, @ 50 ohms, Frequency Range 30 Hz - 100 MHz.
- (42) **Current Injection Probe**, Solar Electronics, Type 9108-1N, SN: 935003, Frequency Range: 10 KHz to 100 MHz.
- (43) **LISN**, Emco, Model 3825/2, SN: 8907-1431, 10KHz-100MHz, 50 ohms/50uH and 50 ohms/250uH.
- (44) **LISN**, Schwarzbeck Mess - Elektronik, Model NLSK8127, SN 8127276, 10KHz-30MHz, 50 ohms//50uH + 5 ohms.
- (45) **2-Wire T-LISN**, built by UltraTech Engineering in accord with CISPR 16 and BSI EN 55022.
- (46) **4-Wire T-LISN**, built by UltraTech Engineering in accord with CISPR 16 and BSI EN 55022.
- (47) **Coupling Clamp**, by KeyTek Instrument, Model CCL-801/S, S/N: 9211339. Characteristics: typical coupling capacitance between cable and clamp: 50 pF to 200pF, usable diameter range of round cables: 4mm to 40mm, insulation withstanding capability: 5kV min (test pulse 1.2/50uS)
- (48) **Helmholz Coil**, by UltraTech Eng. Labs., Coil Radius = 0.5 meters, number of turns/coil = 103

- (49) **80x80x80cm StripLine**, by UltraTech Eng. Labs
- (50) **25mLONGx22mmDIA. Long-Wire Chamber**, by UltraTech Eng. Labs.
- (51) **12'x12'16' RF Shielded Enclosure**, by RF Shielding, 10KHz to 10 GHz, minimum 100 dB attenuation.
- (52) **2 x 10 MFD R.F. Capacitors**, Solar Electronics, Type 7314-1016R, 600V DC at 85°C, 330Vrms 60Hz, 300Vrms 400Hz, 100 APMS, continuous, 200 AMPS intermittent.
- (53) **RF Load**, model 4050, by Coaxial Dynamics Inc., 50W max.
- (54) **Directional Coupler**, model 4275-025, By Bird Electronic Corp., Frequency Range: 20-1000MHz.
- (55) **RF Attenuator**, P/N: 8306-200-N20DB, by Bird Electronic Corp., 25W max, 20dB.
- (56) **RF Attenuator**, Model 766-10, by Narda MicroLine, 20W max, 10dB.

OTHER SUPPORT EQUIPMENT

- (57) **Plotter**, HP, Model HP7475, SN 2325A23009
- (58) **ThinkJet Printer**, HP, Model 2225A, SN 2627530563.
- (59) **Temp & Humidity Chamber**, TENNEY, Model T5, SN 9723B.
- (60) **DC Power Supply**, Sorensen, Model DCR60-30B, SN 0576, Adjustable, DC Output: 0-60 V, 30 A Max.
- (61) **AC Power Supply**, Elgar, Model 1751B, SN 1438, Adjustable, Output Voltage: 0 - 260 V, Output Power: 0 -1750 VA. Output Frequency Range: 0.2 Hz - 4 KHz.
- (62) **Transient Limiter**, HP, Model 11947A, Frequency Range: 9KHz-200MHz, Attenuation: 10dB.
- (63) **3-to-10 Meter Fully Enclosed Open Field Test Site**, by UltraTech Eng. Labs.

APPENDIX C

**PHOTOGRAPHS OF TESTED UNIT
TEKLOGIX INC.
TEKLOGIX HANDHELD TERMINAL, MODEL 7025**

(Please refer to the attached photos)

APPENDIX D

**SCHEMATIC DIAGRAMS & USER MANUAL
TEKLOGIX INC.
TEKLOGIX HANDHELD TERMINAL, MODEL 7025**

Please refer to the attached
schematics diagrams and user manual