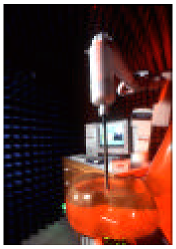
APPENDIX E – MEASUREMENT REPORT



PCTEST Engineering Laboratory, Inc.

6660-B Dobbin Road • Columbia, MD 21045 • U.S.A.
TEL (410) 290-6652 • FAX (410) 290-6654
http://www.pctestlab.com

CERTIFICATE OF COMPLIANCE
FCC Parts 24/22 Certification

PANASONIC
Matsushita Mobile Communications
Development Corporation of U.S.A.
1225 Northbrook Parkway, Suite 2-400
Suwanee, GA 30024
Attn: Pieter C. Seidel, Sr. System Test Engineer

Dates of Tests: August 25 & 28-30, 2000
Test Report S/N: 24/22.200824439.NWJ
Test Site: PCTEST Lab, Columbia MD

FCC ID	**NWJ10A002A**
APPLICANT	**PANASONIC**

Classification:	**Licensed Portable Transmitter Held to Ear (PCE)**
FCC Rule Part(s):	**§24(E), §22(H), §2**
EUT Type:	**Tri-Mode Dual-Band Phone (AMPS/TDMA)**
Trade Name/Model:	***PANASONIC EBTX-210 / EBTX-220***
Tx Frequency Range:	**824.04 – 848.97 MHz (AMPS) / 824.64 – 848.37 MHz (TDMA)** **1850.01 – 1909.99 MHz (PCS TDMA)**
Rx Frequency Range:	**869.04 – 893.97 MHz (AMPS) / 869.64 – 893.97 MHz (TDMA)** **1930.05 – 1989.95 MHz (PCS TDMA)**
Max. RF Output Power:	**0.569W ERP AMPS (27.548dBm) / 0.697W ERP TDMA (28.433dBm)** **0.600W EIRP PCS TDMA (27.781dBm)**
Max. SAR Measurement:	**1.490mW/g AMPS Head SAR; 0.909mW/g AMPS Body SAR** **0.699mW/g TDMA Head SAR; 0.419mW/g TDMA Body SAR** **1.230mW/g PCS TDMA Head SAR; 0.518mW/g PCS TDMA Body SAR**
Emission Designator(s):	**40K0F8W, 40K0F1D, 1M25F9W**

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947. (See Test Report)

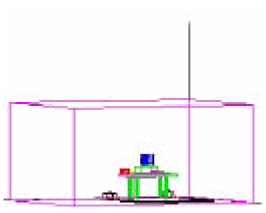
I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

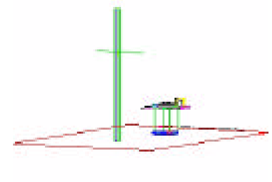
PCTEST certifies that no party to this application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 853(a).

Randy Ortanez
President & Chief Engineer

NVLAP LAB CODE 100431-0

MEASUREMENT REPORT





Scope

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.

General Information

Applicant Name:	**PANASONIC** **Matsushita Mobile Communications** **Development Corporation of U.S.A.**
Address:	**1225 Northbrook Parkway, Suite 2-400** **Suwanee, GA 30024**
Attention:	**Pieter C. Seidel, Sr. System Test Engineer**

• FCC ID:	**NWJ10A002A**
• Quantity:	Quantity production is planned
• Emission Designator:	1M25F9W, 40K0F8W, 40K0F1D
• Tx Freq. Range:	824.04 – 848.97 MHz (AMPS) / 824.64 – 848.37 MHz (TDMA) 1850.01 –1909.99 MHz (PCS TDMA)
• Rx Freq. Range:	869.04 – 893.97 MHz (AMPS) / 869.64 – 893.97 MHz (TDMA) 1930.05 – 1989.95 MHz (PCS TDMA)
• Max. RF Power Rating:	0.569W ERP AMPS (27.548dBm) / 0.697W ERP TDMA (28.433dBm) 0.600W EIRP PCS TDMA (27.781dBm)
• FCC Classification(s):	Licensed Portable Tx Held to Ear (PCE)
• Equipment (EUT) Type:	Tri-Mode Dual-Band Analog/TDMA Phone
• Frequency Tolerance:	± 0.00025% (2.5 ppm)
• FCC Rule Part(s):	§ 24(E), §22(H), §22.901(d); §2
• Dates of Tests:	August 25 & 28-30, 2000
• Place of Tests:	PCTEST Lab, Columbia, MD U.S.A.
• Test Report S/N:	24/22.200824439.NWJ

NVLAP® Lab Code 100431-0

INTRODUCTION

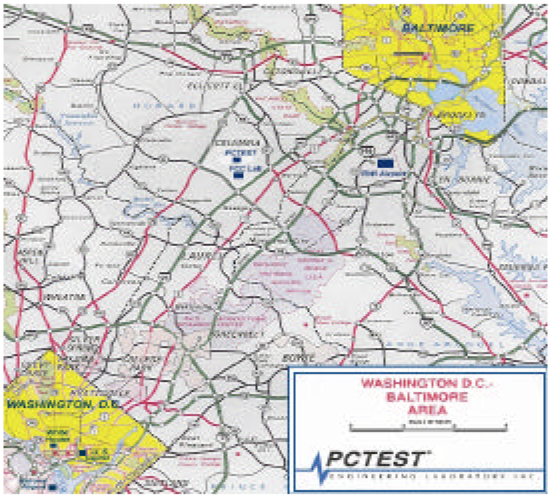


Figure 1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area.

These measurement tests were conducted at ***PCTEST Engineering Laboratory, Inc.*** facility in New Concept Business Park, Guilford Industrial Park, Columbia, Maryland. The site address is 6660-B Dobbin Road, Columbia, MD 21045. The test site is one of the highest points in the Columbia area with an elevation of 390 feet above mean sea level. The site coordinates are 39° 11'15" N latitude and 76° 49'38" W longitude. The facility is 1.5 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. There are no FM or TV transmitters within 15 miles of the site. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4 on October 19, 1992 and Industry Canada Lab file no. 2451.

Measurement Procedure

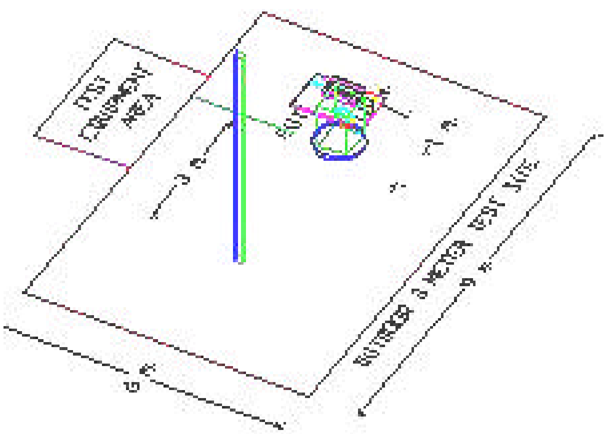


Figure 2. 3-meter Outdoor Test Site

The radiated and spurious measurements were made outdoors at 3-meter test range (see Figure2). The equipment under test is placed on the turntable connected to a RF wattmeter and a dummy RF load, and then its power is adjusted to its rated output. A receiving antenna located 2 meters from the turntable picks up any signal radiated from the transmitter. The turntable containing the system was rotated; the receiving antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission. The testing procedure is repeated for both horizontal and vertical polarization of the receiving antenna. The actual radiated signal strength is obtained by substitution method with a signal generator with a calibrated output. The signal generator is adjusted in output until the reading is identical to that obtained when the receiving antenna is connected to the receiver. Signal strength is then read directly from the signal generator.

Test Data (EBTX-210 w/Standard Battery)

§ 22.913 Effective Radiated Power Output

A. POWER: **Low (Analog Mode)**

Freq. Tuned (MHz)	LEVEL (dBm)	POL (H/V)	ERP (W)	ERP (dBm)
824.04	-34.532	V	0.00473	6.74
836.49	-34.100	V	0.00542	7.33
848.97	-34.860	V	0.00472	6.72

A. POWER: **High (Analog Mode)**

Freq. Tuned (MHz)	LEVEL (dBm)	POL (H/V)	ERP (W)	ERP (dBm)	BATTERY
824.04	-14.130	V	0.51800	27.14	Standard
836.49	-14.022	V	0.55041	27.41	Standard
848.97	-14.750	V	0.48249	26.83	Standard

NOTES:

ERP Measurements by Substitution Method:
The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This ERP level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.

Test Data (EBTX-210 w/Standard Battery)

§ 22.913 Effective Radiated Power Output

A. POWER: **High (TDMA Mode)**

Freq. Tuned (MHz)	LEVEL (dBm)	POL (H/V)	ERP (W)	ERP (dBm)	BATTERY
824.70	-13.120	V	0.65487	28.16	Standard
835.89	-13.147	V	0.67211	28.27	Standard
848.31	-13.790	V	0.60071	27.79	Standard

NOTES:

ERP Measurements by Substitution Method:
The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This ERP level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.

Test Data (EBTX-210 w/Standard Battery)

Equivalent Isotropic Radiated Power (E.I.R.P.)

Radiated measurements at 3 meters

Supply Voltage: 4.2 VDC

Modulation: PCS TDMA

FREQ. (MHz)	LEVEL (dBm)	POL (H/V)	Azimuth (o angle)	EIRP (dBm)	EIRP (W)	Battery
1851.25	-19.450	V	70.0	27.63	0.581	Standard
1880.00	-19.470	V	70.0	27.78	0.600	Standard
1908.75	-20.860	V	70.0	26.56	0.453	Standard

NOTES:

ERP Measurements by Substitution Method:
The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This ERP level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.

Test Data (EBTX-210 w/Extended Battery)

§ 22.913 Effective Radiated Power Output

A. POWER: **Low (Analog Mode)**

Freq. Tuned (MHz)	LEVEL (dBm)	POL (H/V)	ERP (W)	ERP (dBm)
824.04	-34.530	V	0.00474	6.74
836.49	-34.210	V	0.00528	7.22
848.97	-34.855	V	0.00472	6.73

A. POWER: **High (Analog Mode)**

Freq. Tuned (MHz)	LEVEL (dBm)	POL (H/V)	ERP (W)	ERP (dBm)	BATTERY
824.04	-14.197	V	0.51007	27.08	Extended
836.49	-13.885	V	0.56805	27.54	Extended
848.97	-14.550	V	0.50523	27.03	Extended

NOTES:

ERP Measurements by Substitution Method:
The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This ERP level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.

Test Data (EBTX-210 w/Extended Battery)

§ 22.913 Effective Radiated Power Output

A. POWER: **High (TDMA Mode)**

Freq. Tuned (MHz)	LEVEL (dBm)	POL (H/V)	ERP (W)	ERP (dBm)	BATTERY
824.70	-13.105	V	0.65713	28.18	Extended
835.89	-13.000	V	0.69525	28.42	Extended
848.31	-13.600	V	0.62757	27.98	Extended

NOTES:

ERP Measurements by Substitution Method:
The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This ERP level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.

Test Data (EBTX-210 w/Extended Battery)

Equivalent Isotropic Radiated Power (E.I.R.P.)

Radiated measurements at 3 meters

Supply Voltage: **4.2** **VDC**

Modulation: **PCS TDMA**

FREQ. (MHz)	LEVEL (dBm)	POL (H/V)	Azimuth (o angle)	EIRP (dBm)	EIRP (W)	Battery
1851.25	-19.750	V	70.0	27.33	0.542	Extended
1880.00	-19.540	V	70.0	27.71	0.590	Extended
1908.75	-20.680	V	70.0	26.74	0.472	Extended

NOTES:

ERP Measurements by Substitution Method:

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This ERP level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.

Test Data (EBTX-220 w/Standard Battery)

§ 22.913 Effective Radiated Power Output

A. POWER: **Low (Analog Mode)**

Freq. Tuned (MHz)	LEVEL (dBm)	POL (H/V)	ERP (W)	ERP (dBm)
824.04	-34.475	V	0.00480	6.80
836.49	-34.002	V	0.00554	7.43
848.97	-34.799	V	0.00478	6.79

A. POWER: **High (Analog Mode)**

Freq. Tuned (MHz)	LEVEL (dBm)	POL (H/V)	ERP (W)	ERP (dBm)	BATTERY
824.04	-14.470	V	0.47899	26.80	Standard
836.49	-13.984	V	0.55525	27.44	Standard
848.97	-15.050	V	0.45029	26.53	Standard

NOTES:

ERP Measurements by Substitution Method:
The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This ERP level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.

Test Data (EBTX-220 w/Standard Battery)

§ 22.913 Effective Radiated Power Output

A. POWER: **High (TDMA Mode)**

Freq. Tuned (MHz)	LEVEL (dBm)	POL (H/V)	ERP (W)	ERP (dBm)	BATTERY
824.64	-13.100	V	0.65778	28.18	Standard
835.89	-13.050	V	0.68729	28.37	Standard
848.37	-13.860	V	0.59121	27.72	Standard

NOTES:

ERP Measurements by Substitution Method:
The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This ERP level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.

Test Data (EBTX-220 w/Standard Battery)

Equivalent Isotropic Radiated Power (E.I.R.P.)

Radiated measurements at 3 meters

Supply Voltage: 4.2 VDC

Modulation: PCS TDMA

FREQ. (MHz)	LEVEL (dBm)	POL (H/V)	Azimuth (o angle)	EIRP (dBm)	EIRP (W)	Battery
1851.25	-19.550	V	70.0	27.53	0.568	Standard
1880.00	-19.480	V	70.0	27.77	0.599	Standard
1908.75	-20.845	V	70.0	26.58	0.455	Standard

NOTES:

ERP Measurements by Substitution Method:
The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This ERP level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.

TEST EQUIPMENT

Type	Model	Cal. Due Date	S/N
Microwave Spectrum Analyzer	*HP 8566B (100Hz-22GHz)*	*08/15/01*	*3638A08713*
Microwave Spectrum Analyzer	*HP 8566B (100Hz-22GHz)*	*04/17/01*	*2542A11898*
Spectrum Analyzer/Tracking Gen.	*HP 8591A (100Hz-1.8GHz)*	*08/10/01*	*3144A02458*
*Signal Generator**	*HP 8640B (500Hz-1GHz)*	*06/03/01*	*2232A19558*
*Signal Generator**	*HP 8640B (500Hz-1GHz)*	*06/03/01*	*1851A09816*
*Signal Generator**	*Rohde & Schwarz (0.1-1000MHz)*	*09/11/01*	*894215/012*
Ailtech/Eaton Receiver	*NM 37/57A-SL (30-1000MHz)*	*04/12/01*	*0792-03271*
Ailtech/Eaton Receiver	*NM 37/57A (30-1000MHz)*	*03/11/01*	*0805-03334*
Ailtech/Eaton Receiver	*NM 17/27A (0.1-32MHz)*	*09/17/01*	*0608-03241*
Quasi-Peak Adapter	*HP 85650A*	*08/15/01*	*2043A00301*
Ailtech/Eaton Adapter	*CCA-7 CISPR/ANSI QP Adapter*	*03/11/01*	*0194-04082*
Gigatronics Universal Power Meter	*8657A*		*1835256*
Gigatronics Power Sensor	*80701A (0.05-18GHz)*		*1833460*
Signal Generator	*HP 8648D (9kHz-4GHz)*		*3613A00315*
Amplifier Research	*5S1G4 (5W, 800MHz-4.2GHz)*		*22322*
Network Analyzer	*HP 8753E (30kHz-3GHz)*		*JP38020182*
Audio Analyzer	*HP 8903B*		*3011A09025*
Modulation Analyzer	*HP 8901A*		*2432A03467*
Power Meter	*HP 437B*		*3125U24437*
Power Sensor	*HP 8482H (30µW-3W)*		*2237A02084*
Harmonic/Flicker Test System	*HP 6841A (IEC 555-2/3)*		*3531A00115*
Broadband Amplifier (2)	*HP 8447D*		*1145A00470, 1937A03348*
Broadband Amplifier	*HP 8447F*		*2443A03784*
Horn Antenna	*EMCO Model 3115 (1-18GHz)*		*9704-5182*
Horn Antenna	*EMCO Model 3115 (1-18GHz)*		*9205-3874*
Horn Antenna	*EMCO Model 3116 (18-40GHz)*		*9203-2178*
Biconical Antenna (4)	*Eaton 94455/Eaton 94455-1/Singer 94455-1/Compliance Design*		*1295, 1332, 0355*
Log-Spiral Antenna (3)	*Ailtech/Eaton 93490-1*		*0608, 1103, 1104*
Roberts Dipoles	*Compliance Design (1 set)*		
Ailtech Dipoles	*DM-105A (1 set)*		*33448-111*
EMCO LISN (6)	*3816/2*		*1079*
Microwave Preamplifier 40dB Gain	*HP 83017A (0.5-26.5GHz)*		*3123A00181*
Microwave Cables	*MicroCoax (1.0-26.5GHz)*		
Ailtech/Eaton Receiver	*NM37/57A-SL*		*0792-03271*
Spectrum Analyzer	*HP 8594A*		*3051A00187*
Spectrum Analyzer (2)	*HP 8591A*		*3034A01395, 3108A02053*
Microwave Survey Meter	*Holaday Model 1501 (2.450GHz)*		*80931*
Digital Thermometer	*Extech Instruments 421305*		*426966*
Attenuator	*HP 8495A (0-70dB) DC-4GHz*		
Bi-Directional Coax Coupler	*Narda 3020A (50-1000MHz)*		
Shielded Screen Room	*RF Lindgren Model 26-2/2-0*		*6710 (PCT270)*
Shielded Semi-Anechoic Chamber	*Ray Proof Model S81*		*R2437 (PCT278)*
Enviromental Chamber	*Associated Systems Model 1025 (Temperature/Humidity)*		*PCT285*

* *Calibration traceable to the National Institute of Standards and Technology (NIST).*

SAMPLE CALCULATIONS

A. ERP Sample Calculation

Level µ/Vm @ 3 meters = $\text{Log } 10^{-1} \dfrac{(\text{dBm} + 107 + \text{AFCL})}{20}$

$\text{Log } 10^{-1} \dfrac{(-14 + 107 + 31.7)}{20}$

1717908.4 µ/Vm @ 3 meters

Sample Calculation (relative to a dipole)

ERP (dBm) = $10 \text{ Log}_{10} (((r(\mu V/m)1x10^{6})^{2}/49.2/1x10^{-3})$

ERP (dBm) = $10 \text{ Log}_{10}(((3(1717908.4)1x10^{6})^{2}/49.2/1x10^{-3})$

ERP (dBm) = 27.32

B. Emission Designator per §2.201

CDMA Sample

2M + 2DK

CDMA BW = 1.25 MHz

F = Frequency Modulation

9 = Composite Digital Info

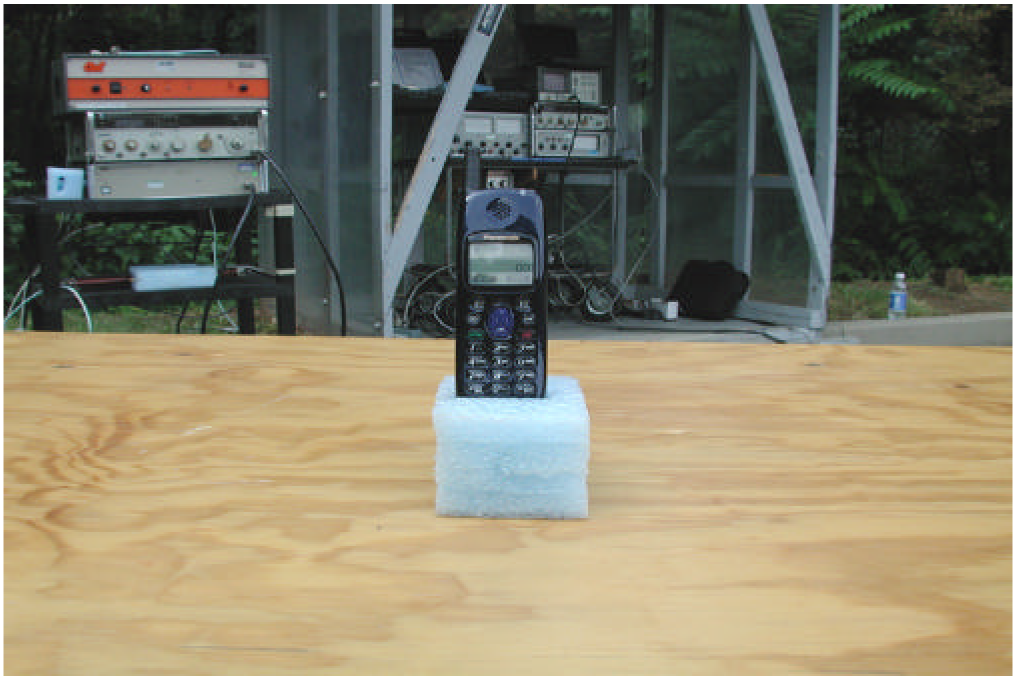
W = Combination (Audio/Data)

Emission Designator = 1M25F9W

APPENDIX F – RADIATED TEST SETUP PHOTOGRAPHS

PANASONIC Model: EBTX-210

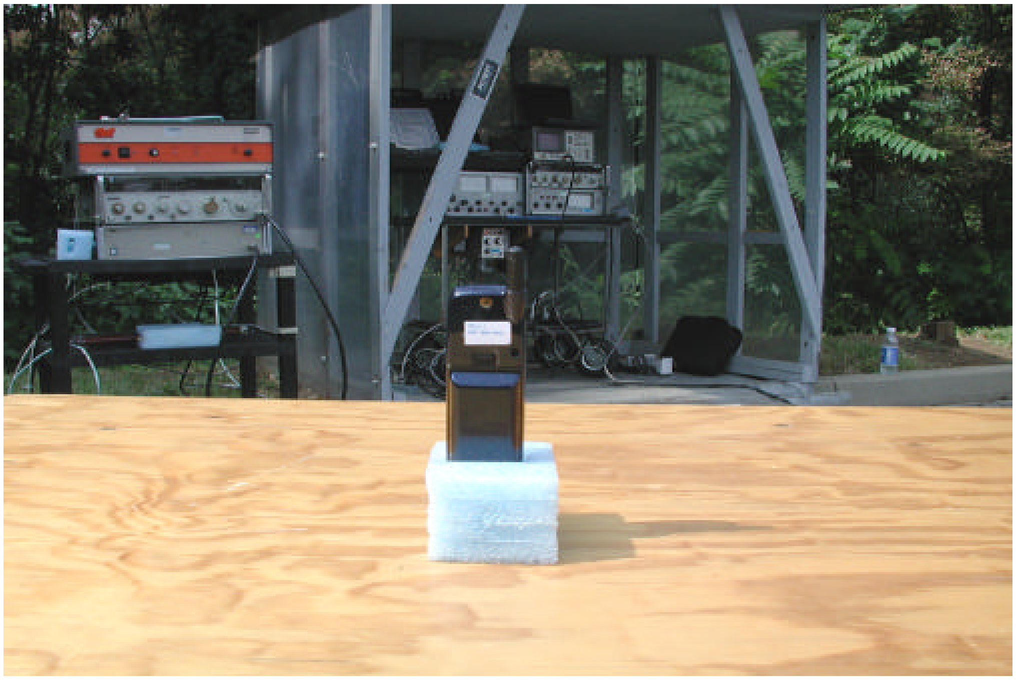

PCTEST




PCTEST

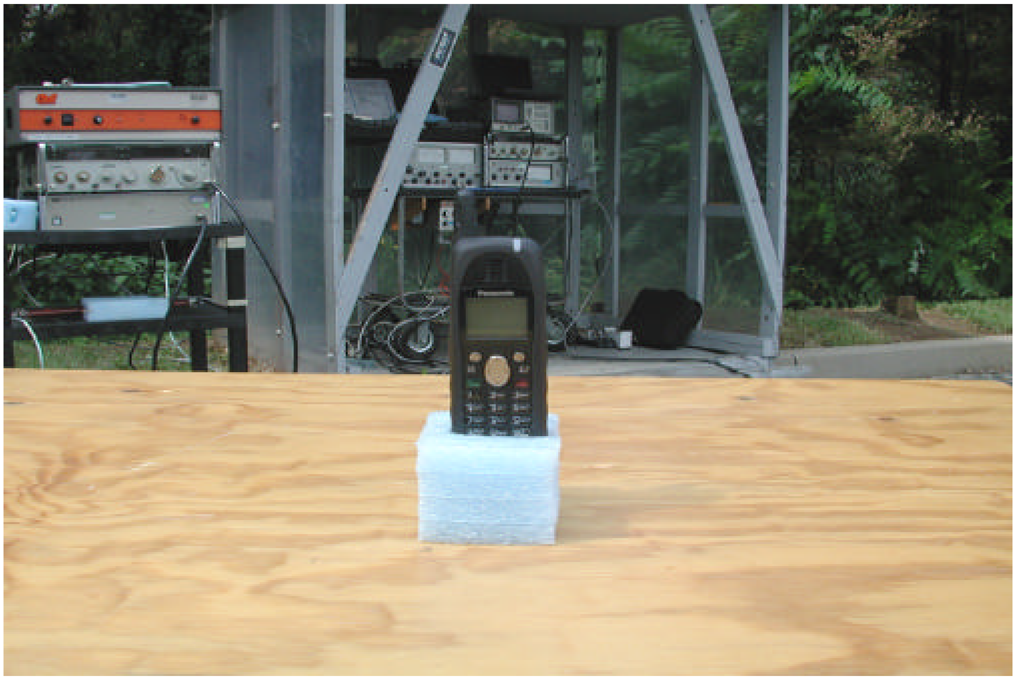

PCTEST


PCTEST



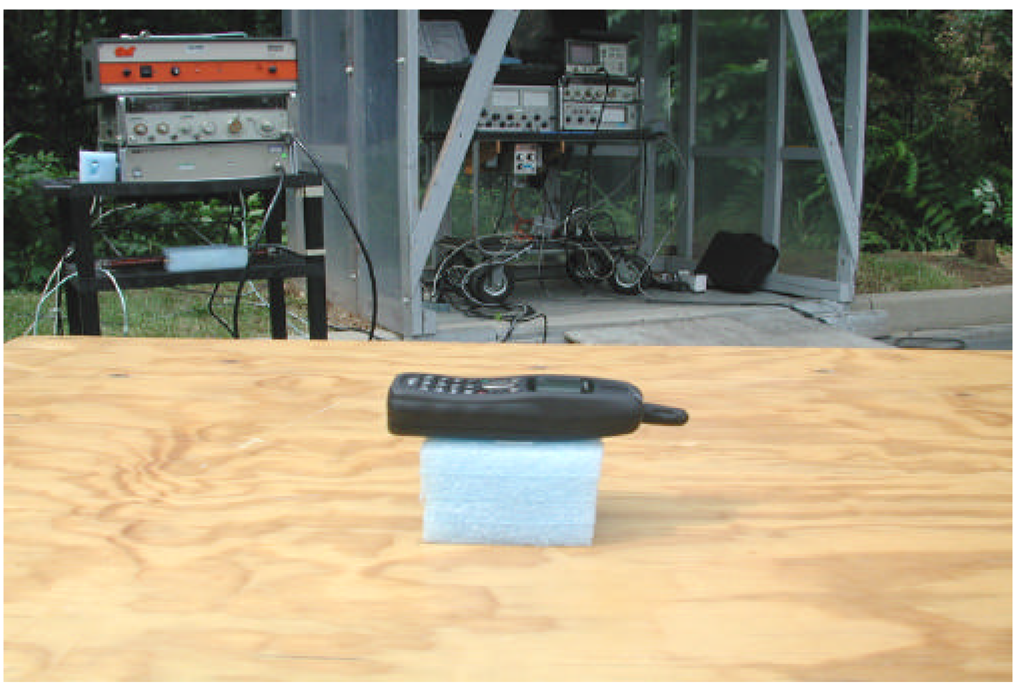
PANASONIC Model: EBTX-220


PCTEST




PCTEST


PCTEST




PCTEST