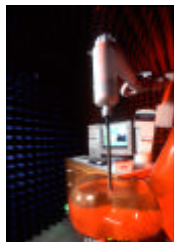


APPENDIX E – MEASUREMENT REPORT



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

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 |



INTRODUCTION

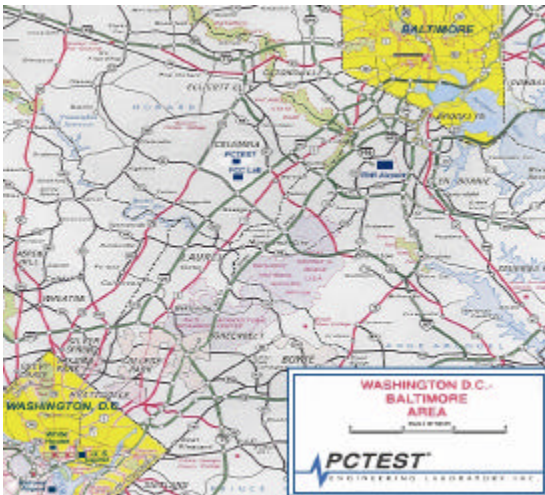


Figure 1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area.

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

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.

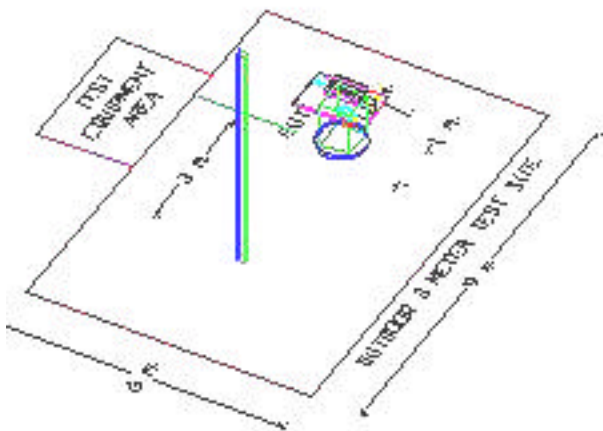


Figure 2. 3-meter Outdoor Test Site

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)
Environmental 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

$$\text{Level } \mu\text{V/m @ 3 meters} = \text{Log } 10^{-1} \frac{(\text{dBm} + 107 + \text{AFCL})}{20}$$

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

$$1717908.4 \mu\text{V/m @ 3 meters}$$

Sample Calculation (relative to a dipole)

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

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

$$\text{ERP (dBm)} = 27.32$$

B. Emission Designator per §2.201

CDMA Sample

2M + 2DK

CDMA BW = 1.25 MHz

F = Frequency Modulation

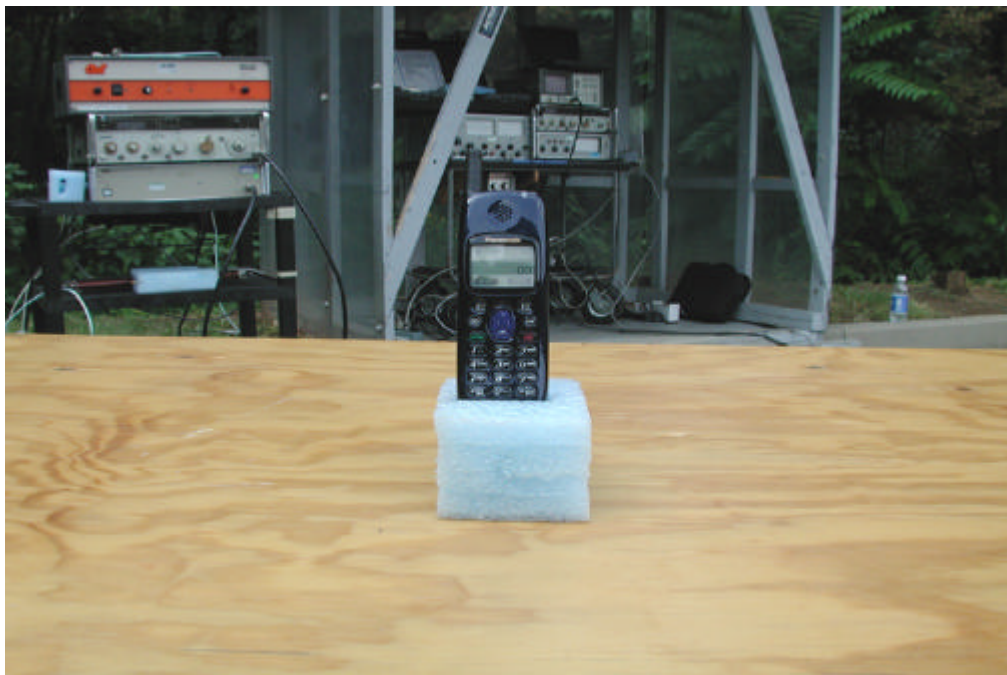
9 = Composite Digital Info

W = Combination (Audio/Data)

Emission Designator = 1M25F9W

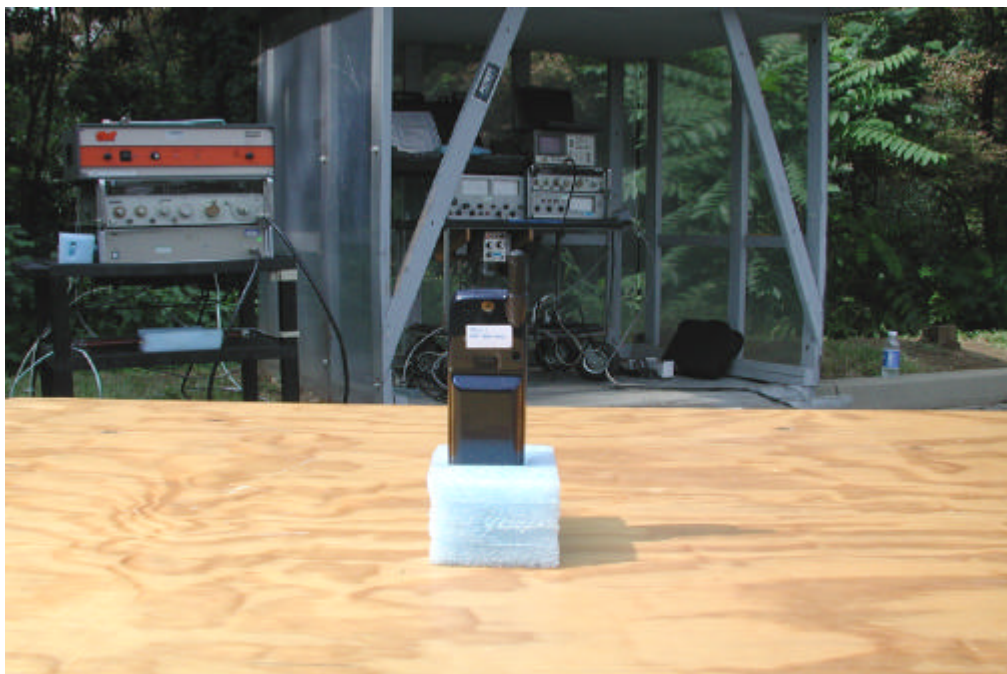
APPENDIX F – RADIATED TEST SETUP PHOTOGRAPHS

PANASONIC Model: EBTX-210









PANASONIC Model: EBTX-220





