PCTEST Engineering Laboratory, Inc.

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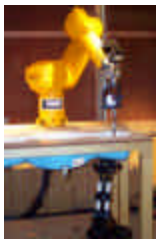

CERTIFICATE OF COMPLIANCE
FCC Part 24 & 22 Certification

Matsushita Electric Industrial Co., Ltd.
1006 Oaza Kadoma, Kadoma
Osaka, 571 JAPAN

Dates of Tests: October 25-27, 2004
Test Report S/N: 22/24.241025628.ACJ
Test Site: PCTEST Lab, Columbia MD
Project No.: ITPD-04-F129A

FCC ID	**ACJ9TGCF-299A**
APPLICANT	**Matsushita Electric Industrial Co., Ltd.**

Classification:	**PCS Licensed Transmitter (PCB)**
FCC Rule Part(s):	**§24(E), §22H; §2**
EUT Type:	**Panasonic Toughbook CF-29 w/ Intel WLAN & Sony Ericsson PCMCIA Card**
Model:	***CF-29***
Tx Frequency Range:	**824.20 – 848.80MHz (GPRS) / 1851.20MHz – 1909.80MHz (PCS GPRS)**
Rx Frequency Range:	**869.20 – 893.80MHz (GPRS) / 1931.20MHz – 1989.80MHz (PCS GPRS)**
Max. RF Output Power:	**0.636 W ERP GPRS (28.033 dBm) / 0.844 W EIRP PCS GPRS (29.251 dBm)**
(w/ External Antenna)	**0.554 W ERP GPRS (27.433 dBm)/ 0.904 W EIRP PCS GPRS (29.551 dBm)**
Emission Designator(s):	**300KGXW (GSM)**
Test Device Serial No.	**Identical Prototype [S/N: 4DKSA0008S]**

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.

The Sony Ericsson PCMCIA Card is electrically identical to previously authorized FCC ID: PY7FF031011. RF conducted data is from that test report and is included in this application.

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. 862.

Alfred Cirwithian
Vice President Engineering

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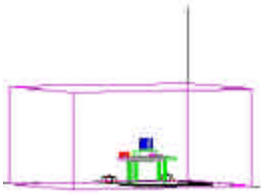
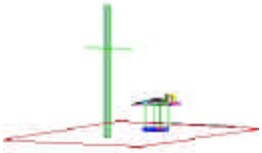
MEASUREMENT REPORT





1.1 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.

§2.1033 General Information

Applicant Name:	**Matsushita Electric Industrial Co., Ltd.**
Address:	**1006 Oaza Kadoma, Kadoma** **Oaza, 571 JAPAN**

- FCC ID: **ACJ9TGCF-299A**
- Quantity: Quantity production is planned
- Emission Designators: 300KGXW (GSM)
- Tx Freq. Range: 824.20 – 848.80 MHz (GPRS)
1851.20 – 1909.80 MHz (PCS GPRS)
- Rx Freq. Range: 869.20 – 893.80 MHz (GPRS)
1931.20 – 1989.80 MHz (PCS GPRS)
- Max. Power Rating: (w/ External Antenna)
0.636 W ERP GPRS (28.033 dBm) / 0.844 W EIRP PCS GPRS (29.251 dBm)
0.554 W ERP GPRS (27.433 dBm)/ 0.904 W EIRP PCS GPRS (29.551 dBm)
- FCC Classification(s): PCS Licensed Transmitter (PCB)
- Equipment (EUT) Type: Panasonic Toughbook CF-29 w/ Intel WLAN & Sony Ericsson PCMCIA Card
- Modulation(s): GPRS
- Frequency Tolerance: ± 0.00025% (2.5 ppm)
- FCC Rule Part(s): § 24(E), §22H
- Dates of Tests: October 25-27, 2004
- Place of Tests: PCTEST Lab, Columbia, MD U.S.A.
- Test Report S/N: 22/24.241025628.ACJ
- Project No.: ITPD-04-F129A
- There is a provision for connection to an external antenna.
The antenna will be professionally installed via a uniquely couple docking station.
- Deviation from measurement procedure.....NONE

2.1 INTRODUCTION

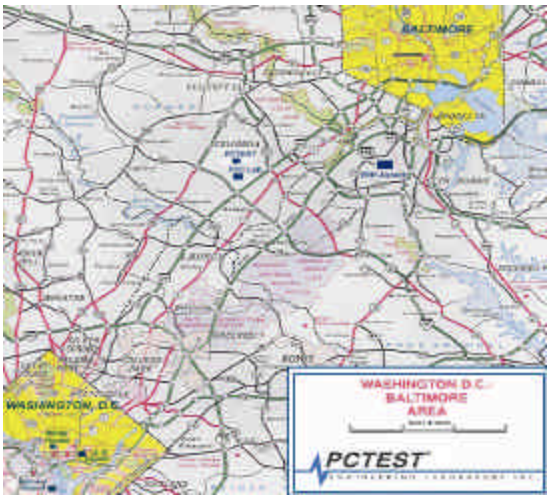


Figure 1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area.

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.

Measurement Procedure

The radiated and spurious measurements were made outdoors at a 3-meter test range (see Figure2). The equipment under test is placed on a wooden turntable 3-meters from the receive antenna. The receive antenna height and turntable rotations were 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 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.

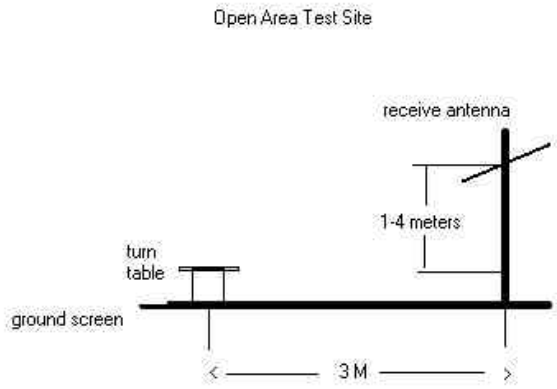


Figure 2. Diagram of 3-meter outdoor test range

3.1 INSERTS

Function of Active Devices (Confidential)

The Function of active devices are shown in Attachment K.

Block & Schematic Diagrams (Confidential)

The block diagrams are shown in Attachment I, and the schematic diagrams are shown in Attachment J.

Operating Instructions

The instruction manual is shown in Attachment M.

Parts List & Tune-Up Procedure (Confidential)

The parts list & tune-up procedure is shown in Attachment L.

Description of Freq. Stabilization Circuit (Confidential)

The description of frequency stabilization circuit is shown in Attachment K.

Description for Suppression of Spurious Radiation, for Limiting Modulation, and Harmonic Suppresion Circuits (Confidential)

The description of suppression stabilization circuits is shown in Attachment K.

4.1 DESCRIPTION OF TESTS (CONTINUED)

4.2 Occupied Bandwidth Emission Limits

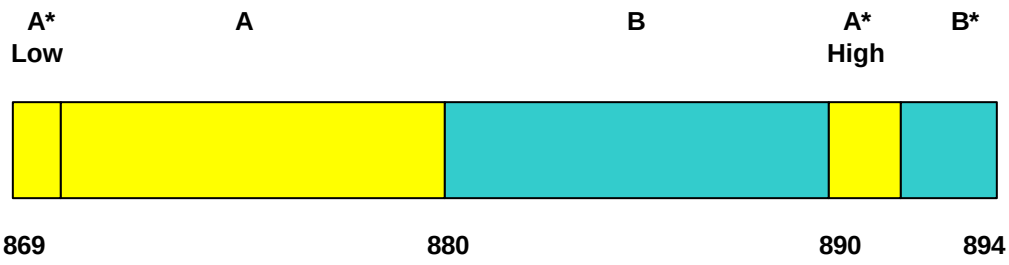
(a) On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log(P) dB.

(b) Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

(c) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.

(d) The measurement of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

4.3 Cellular - Base Frequency Blocks



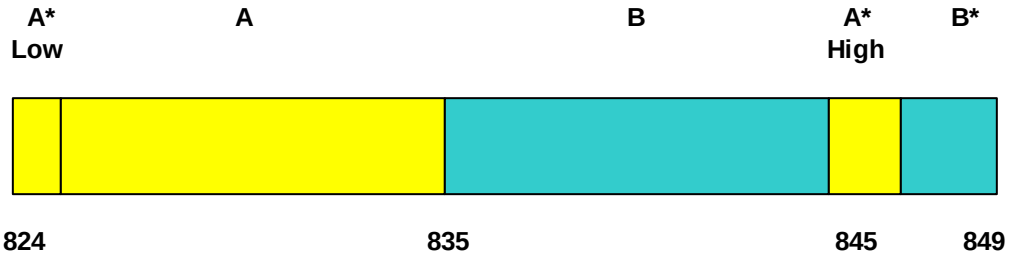
BLOCK 1: 869 – 880 MHz (A* Low + A)

BLOCK 2: 880 – 890 MHz (B)

BLOCK 3: 890 – 891.5 MHz (A* High)

BLOCK 4: 891.5 – 894 MHz (B*)

4.4 Cellular - Mobile Frequency Blocks



BLOCK 1: 824 – 835 MHz (A* Low + A)

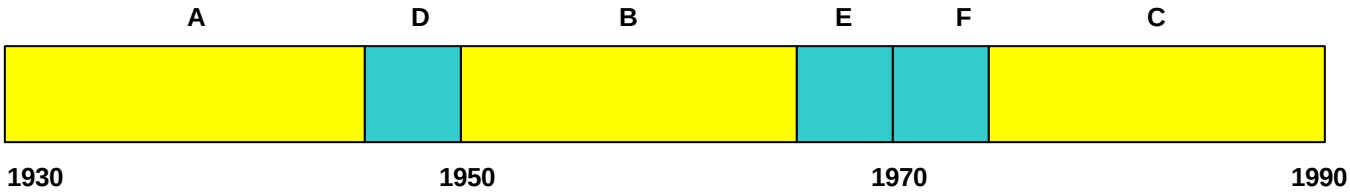
BLOCK 2: 835 – 845 MHz (B)

BLOCK 3: 845 – 846.5 MHz (A* High)

BLOCK 4: 846.5 – 849 MHz (B*)

4.1 DESCRIPTION OF TESTS (CONTINUED)

4.5 PCS - Base Frequency Blocks



BLOCK 1: 1930 – 1945 MHz (A)

BLOCK 2: 1945 – 1950 MHz (D)

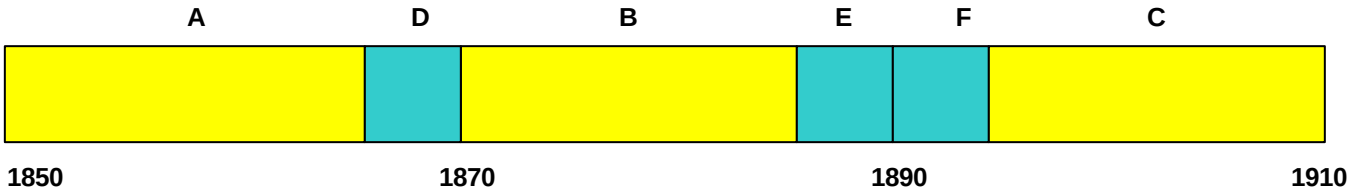
BLOCK 3: 1950 – 1965 MHz (B)

BLOCK 4: 1965 – 1970 MHz (E)

BLOCK 5: 1970 – 1975 MHz (F)

BLOCK 6: 1975 – 1990 MHz (C)

4.6 PCS - Mobile Frequency Blocks



BLOCK 1: 1850 – 1865 MHz (A)

BLOCK 2: 1865 – 1870 MHz (D)

BLOCK 3: 1870 – 1885 MHz (B)

BLOCK 4: 1885 – 1890 MHz (E)

BLOCK 5: 1890 – 1895 MHz (F)

BLOCK 6: 1895 – 1910 MHz (C)

4.7 Spurious and Harmonic Emissions at Antenna Terminal

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to the 10 Harmonic. The transmitter is modulated with a 2500Hz tone at a level of 16dB greater than that required to provided 50% modulation.

For AMPS signal, the input terminals of the spectrum analyzer, an isolator (RF circulator with on port terminated with 50 ohms) and an 870 MHz to 890 MHz bandpass filter is connected between the test transceiver (for conducted tests) or the receive antenna (for radiated tests) and the analyzer. The rejection of the bandpass filter to signals in the 825 – 845 MHz range is adequate to limit the transmit energy from the test transceiver which appears to a level which will allow the analyzer to measure signals less than –90dBm. Calibration of the test receiver is performed in the 870 – 890 MHz range to insure accuracy to allow variation in the bandpass filter insertion loss to be calibrated.

4.8 Frequencies

At the input terminals of the spectrum analyzer, an isolator (RF pad) and a high-pass filter are connected between the test transceiver (for conducted tests) or the receive antenna (for radiated tests) and the analyzer. The high-pass filter (signals below 1.6 GHz) is to limit the fundamental frequency from interfering with the measurement of low-level spurious and harmonic emissions and to ensure that the preamplifier is not saturated.

4.9 Radiation Spurious and Harmonic Emissions

Radiation and harmonic emissions are measured outdoors at our 3-meter test range. The equipment under test is placed on a wooden turntable 3-meters from the receive antenna. The receive antenna height and turntable rotations were 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 with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer reading. This 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 or dipole antenna are taken into consideration.

5.0 Frequency Stability/Temperature Variation.

The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from -30°C to +60°C using an environmental chamber.

b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

Specification – The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.00025 (±2.5 ppm) of the center frequency.

Time Period and Procedure:

1. The carrier frequency of the transmitter and the individual oscillators is measured at room temperature (22°C to 25°C to provide a reference).
2. The equipment is subjected to an overnight "soak" at -30°C without any power applied.
3. After the overnight "soak" at -30°C (usually 14-16 hours), the equipment is turned on in a "standby" condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter and the individual oscillators is made within a three minute interval after applying power to the transmitter.
4. Frequency measurements are made at 10°C interval up to room temperature. At least a period of one and one half-hour is provided to allow stabilization of the equipment at each temperature level.
5. Again the transmitter carrier frequency and the individual oscillators is measured at room temperature to begin measurement of the upper temperature levels.
6. Frequency measurements are at 10 intervals starting at -30°C up to +50°C allowing at least two hours at each temperature for stabilization. In all measurements the frequency is measured within three minutes after re-applying power to the transmitter.
7. The artificial load is mounted external to the temperature chamber.

NOTE: The EUT is tested down to the battery endpoint.

5.1 Test Data

5.2 Effective Radiated Power Output

A. POWER: (GSM **Mode)**

Freq. Tuned (MHz)	REF. LEVEL (dBm)	POL (H/V)	ERP (W)	ERP (dBm)	BATTERY
824.20	-13.600	V	0.585	27.673	Standard
836.60	-13.400	V	0.636	28.033	Standard
848.00	-14.000	V	0.573	27.583	Standard

Note: Standard batteries are the only options for this phone

NOTES:

Effective Radiated Power Output Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

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. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. 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. The conducted power at the terminals of the dipole is measured. The ERP is recorded.

6.1 Test Data

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

Radiated measurements at 3 meters

Supply Voltage: 3.7 VDC

Modulation: PCS GSM

FREQ. (MHz)	REF. LEVEL (dBm)	POL (H/V)	Azimuth (o angle)	EIRP (dBm)	EIRP (W)	Battery
1851.25	-13.900	V	50	29.181	0.830	Standard
1880.00	-14.000	V	50	29.251	0.844	Standard
1908.75	-14.500	V	50	28.921	0.782	Standard

Note: Standard batteries are the only options for this phone

NOTES:

Equivalent Isotropic Radiated Power Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

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. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A Horn antenna was substituted in place of the EUT. This Horn antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminals of the Horn antenna is measured. The difference between the gain of the horn and an isotropic antenna is taken into consideration and the EIRP is recorded.

7.1 Test Data (Continued)

7.2 GSM850 Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 824.20 MHz
CHANNEL: 128 (Low)
MEASURED OUTPUT POWER: 28.033 dBm = 0.636 W
MODULATION SIGNAL: GSM (Internal)
DISTANCE: 3 meters
LIMIT: $43 + 10 \log_{10} (W)$ = 41.03 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBd)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
1648.40	-44.88	6.10	-38.78	V	66.8
2472.60	-48.28	6.70	-41.58	V	69.6
3296.80	-50.78	6.80	-43.98	V	72.0

NOTES:

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

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. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. 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 spurious 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 or dipole antenna are taken into consideration.

7.1 Test Data (Continued)

7.3 GSM850 Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 836.60 MHz
CHANNEL: 190 (Mid)
MEASURED OUTPUT POWER: 28.033 dBm = 0.636 W
MODULATION SIGNAL: GSM (Internal)
DISTANCE: 3 meters
LIMIT: $43 + 10 \log_{10} (W)$ = 41.03 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBd)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
1673.20	-43.98	6.10	-37.88	V	65.9
2509.80	-45.08	6.70	-38.38	V	66.4
3346.40	-49.48	6.80	-42.68	V	70.7

NOTES:

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

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. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. 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 spurious 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 or dipole antenna are taken into consideration.

7.1 Test Data (Continued)

7.4 GSM850 Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 848.80 MHz
CHANNEL: 251 (High)
MEASURED OUTPUT POWER: 28.033 dBm = 0.636 W
MODULATION SIGNAL: GSM (Internal)
DISTANCE: 3 meters
LIMIT: $43 + 10 \log_{10} (W)$ = 41.03 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBd)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
1697.60	-42.08	6.10	-35.98	V	64.0
2546.40	-44.98	6.70	-38.28	V	66.3
3395.20	-51.38	6.80	-44.58	V	72.6

NOTES:

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

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. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. 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 spurious 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 or dipole antenna are taken into consideration.

7.1 Test Data (Continued)

7.5 PCS GSM Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 1850.20 MHz
CHANNEL: 512 (Low)
MEASURED OUTPUT POWER: 29.251 dBm = 0.844 W
MODULATION SIGNAL: GSM (Internal)
DISTANCE: 3 meters
LIMIT: $43 + 10 \log_{10} (W)$ = 42.26 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBi)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
3700.40	-41.13	8.70	-32.43	V	61.7
5550.60	-45.23	9.70	-35.53	V	64.8
7400.80	-59.83	9.90	-49.93	V	79.2

NOTES:

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

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. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. 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 spurious 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 or dipole antenna are taken into consideration.

7.1 Test Data (Continued)

7.6 PCS GSM Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 1880.00 MHz
CHANNEL: 661 (Mid)
MEASURED OUTPUT POWER: 29.251 dBm = 0.844 W
MODULATION SIGNAL: GSM (Internal)
DISTANCE: 3 meters
LIMIT: $43 + 10 \log_{10} (W)$ = 42.26 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBi)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
3760.00	-39.53	8.70	-30.83	V	60.1
5640.00	-41.93	9.70	-32.23	V	61.5
7520.00	-56.73	9.90	-46.83	V	76.1

NOTES:

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

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. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. 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 spurious 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 or dipole antenna are taken into consideration.

7.1 Test Data (Continued)

7.7 PCS GSM Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 1909.80 MHz
CHANNEL: 810 (High)
MEASURED OUTPUT POWER: 29.251 dBm = 0.844 W
MODULATION SIGNAL: GSM (Internal)
DISTANCE: 3 meters
LIMIT: $43 + 10 \log_{10} (W)$ = 42.26 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBi)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
3819.60	-39.03	8.70	-30.33	V	59.6
5729.40	-41.83	9.70	-32.13	V	61.4
7639.20	-57.53	9.90	-47.63	V	76.9

NOTES:

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

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. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. 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 spurious 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 or dipole antenna are taken into consideration.

8.1 Test Data - External Antenna

8.2 Effective Radiated Power Output

A. POWER: (GSM **Mode)**

Freq. Tuned (MHz)	REF. LEVEL (dBm)	POL (H/V)	ERP (W)	ERP (dBm)	BATTERY
824.20	-14.000	V	0.534	27.273	Standard
836.60	-14.000	V	0.554	27.433	Standard
848.00	-14.200	V	0.547	27.383	Standard

Note: Standard batteries are the only options for this phone

NOTES:

Effective Radiated Power Output Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

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. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. 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. The conducted power at the terminals of the dipole is measured. The ERP is recorded.

9.1 Test Data - External Antenna

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

Radiated measurements at 3 meters

Supply Voltage: 3.7 VDC

Modulation: PCS GSM

FREQ. (MHz)	REF. LEVEL (dBm)	POL (H/V)	Azimuth (o angle)	EIRP (dBm)	EIRP (W)	Battery
1851.25	-13.600	V	180	29.481	0.890	Standard
1880.00	-13.700	V	180	29.551	0.904	Standard
1908.75	-14.100	V	180	29.321	0.857	Standard

Note: Standard batteries are the only options for this phone

NOTES:

Equivalent Isotropic Radiated Power Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

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. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A Horn antenna was substituted in place of the EUT. This Horn antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminals of the Horn antenna is measured. The difference between the gain of the horn and an isotropic antenna is taken into consideration and the EIRP is recorded.

10.1 Test Data (Continued) - External Antenna

10.2 GSM850 Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 824.20 MHz
CHANNEL: 128 (Low)
MEASURED OUTPUT POWER: 27.433 dBm = 0.554 W
MODULATION SIGNAL: GSM (Internal)
DISTANCE: 3 meters
LIMIT: 43 + 10 $\log_{10}$ (W) = 40.43 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBd)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
1648.40	-39.88	6.10	-33.78	V	61.2
2472.60	-42.28	6.70	-35.58	V	63.0
3296.80	-44.58	6.80	-37.78	V	65.2
4121.00	-56.68	6.50	-50.18	V	77.6

NOTES:

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

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. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. 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 spurious 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 or dipole antenna are taken into consideration.

10.1 Test Data (Continued) - External Antenna

10.3 GSM850 Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 836.60 MHz
CHANNEL: 190 (Mid)
MEASURED OUTPUT POWER: 27.433 dBm = 0.554 W
MODULATION SIGNAL: GSM (Internal)
DISTANCE: 3 meters
LIMIT: 43 + 10 $\log_{10}$ (W) = 40.43 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBd)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
1673.20	-39.68	6.10	-33.58	V	61.0
2509.80	-41.58	6.70	-34.88	V	62.3
3346.40	-43.68	6.80	-36.88	V	64.3
4183.00	-54.78	6.50	-48.28	V	75.7

NOTES:

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

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. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. 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 spurious 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 or dipole antenna are taken into consideration.

10.1 Test Data (Continued) - External Antenna

10.4 GSM850 Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 848.80 MHz
CHANNEL: 251 (High)
MEASURED OUTPUT POWER: 27.433 dBm = 0.554 W
MODULATION SIGNAL: GSM (Internal)
DISTANCE: 3 meters
LIMIT: 43 + 10 $\log_{10}$ (W) = 40.43 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBd)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
1697.60	-41.68	6.10	-35.58	V	63.0
2546.40	-40.98	6.70	-34.28	V	61.7
3395.20	-44.08	6.80	-37.28	V	64.7
4244.00	-56.68	6.50	-50.18	V	77.6

NOTES:

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

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. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. 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 spurious 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 or dipole antenna are taken into consideration.

10.1 Test Data (Continued) - External Antenna

10.5 PCS GSM Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 1850.20 MHz
CHANNEL: 512 (Low)
MEASURED OUTPUT POWER: 29.551 dBm = 0.904 W
MODULATION SIGNAL: GSM (Internal)
DISTANCE: 3 meters
LIMIT: 43 + 10 $\log_{10}$ (W) = 42.56 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBi)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
3700.40	-29.53	8.70	-20.83	V	50.4
5550.60	-28.23	9.70	-18.53	V	48.1
7400.80	-28.43	9.90	-18.53	V	48.1
9251.00	-33.43	11.40	-22.03	V	51.6
11101.20	-32.33	12.10	-20.23	V	49.8

NOTES:

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

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. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. 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 spurious 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 or dipole antenna are taken into consideration.

10.1 Test Data (Continued) - External Antenna

10.6 PCS GSM Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 1880.00 MHz
CHANNEL: 661 (Mid)
MEASURED OUTPUT POWER: 29.551 dBm = 0.904 W
MODULATION SIGNAL: GSM (Internal)
DISTANCE: 3 meters
LIMIT: 43 + 10 $\log_{10}$ (W) = 42.56 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBi)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
3760.00	-29.73	8.70	-21.03	V	50.6
5640.00	-28.03	9.70	-18.33	V	47.9
7520.00	-27.73	9.90	-17.83	V	47.4
9400.00	-33.23	11.40	-21.83	V	51.4
11280.00	-31.13	12.10	-19.03	V	48.6

NOTES:

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

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. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. 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 spurious 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 or dipole antenna are taken into consideration.

10.1 Test Data (Continued) - External Antenna

10.7 PCS GSM Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 1909.80 MHz
CHANNEL: 810 (High)
MEASURED OUTPUT POWER: 29.551 dBm = 0.904 W
MODULATION SIGNAL: GSM (Internal)
DISTANCE: 3 meters
LIMIT: 43 + 10 $\log_{10}$ (W) = 42.56 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBi)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
3819.60	-30.93	8.70	-22.23	V	51.8
5729.40	-28.83	9.70	-19.13	V	48.7
7639.20	-27.93	9.90	-18.03	V	47.6
9549.00	-33.53	11.40	-22.13	V	51.7
11458.80	-32.33	12.10	-20.23	V	49.8

NOTES:

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

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. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. 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 spurious 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 or dipole antenna are taken into consideration.

11.1 Test Data

11.2 FREQUENCY STABILITY (850 GSM)

OPERATING FREQUENCY: 836,600,007 Hz

CHANNEL: 190

REFERENCE VOLTAGE: 3.7 VDC

DEVIATION LIMIT: ± 0.00025 % or 2.5 ppm

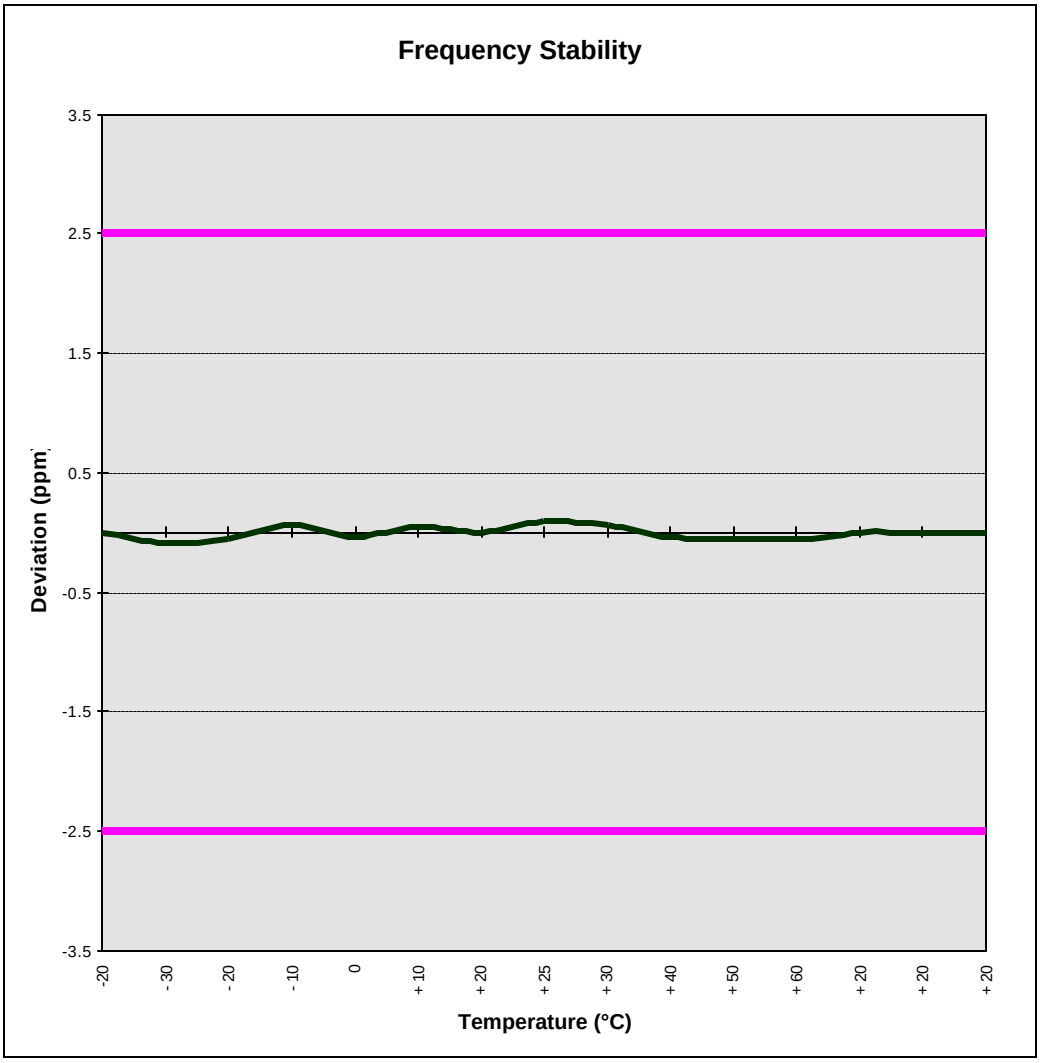
11/4/2004

GSM 850

VOLTAGE (%)	POWER (VDC)	TEMP (ºC)	FREQ. (Hz)	Deviation (%)
100 %	3.70	+ 20 (Ref)	836,600,007	0.000000
100 %		- 30	836,600,082	-0.000009
100 %		- 20	836,600,049	-0.000005
100 %		- 10	836,599,957	0.000006
100 %		0	836,600,040	-0.000004
100 %		+ 10	836,599,965	0.000005
100 %		+ 20	836,600,007	0.000000
100 %		+ 25	836,599,932	0.000009
100 %		+ 30	836,599,957	0.000006
100 %		+ 40	836,600,040	-0.000004
100 %		+ 50	836,600,049	-0.000005
100 %		+ 60	836,600,057	-0.000006
85 %	3.17	+ 20	836,600,007	0.000000
115 %	4.26	+ 20	836,600,007	0.000000
BATT. ENDPOINT	2.94	+ 20	836,600,007	0.000000

11.1 Test Data (Continued)

11.3 FREQUENCY STABILITY (850 GSM)



11.1 Test Data

11.4 FREQUENCY STABILITY (PCS GSM)

OPERATING FREQUENCY: 1,880,000,003 Hz

CHANNEL: 661

REFERENCE VOLTAGE: 3.7 VDC

DEVIATION LIMIT: ± 0.00025 % or 2.5 ppm

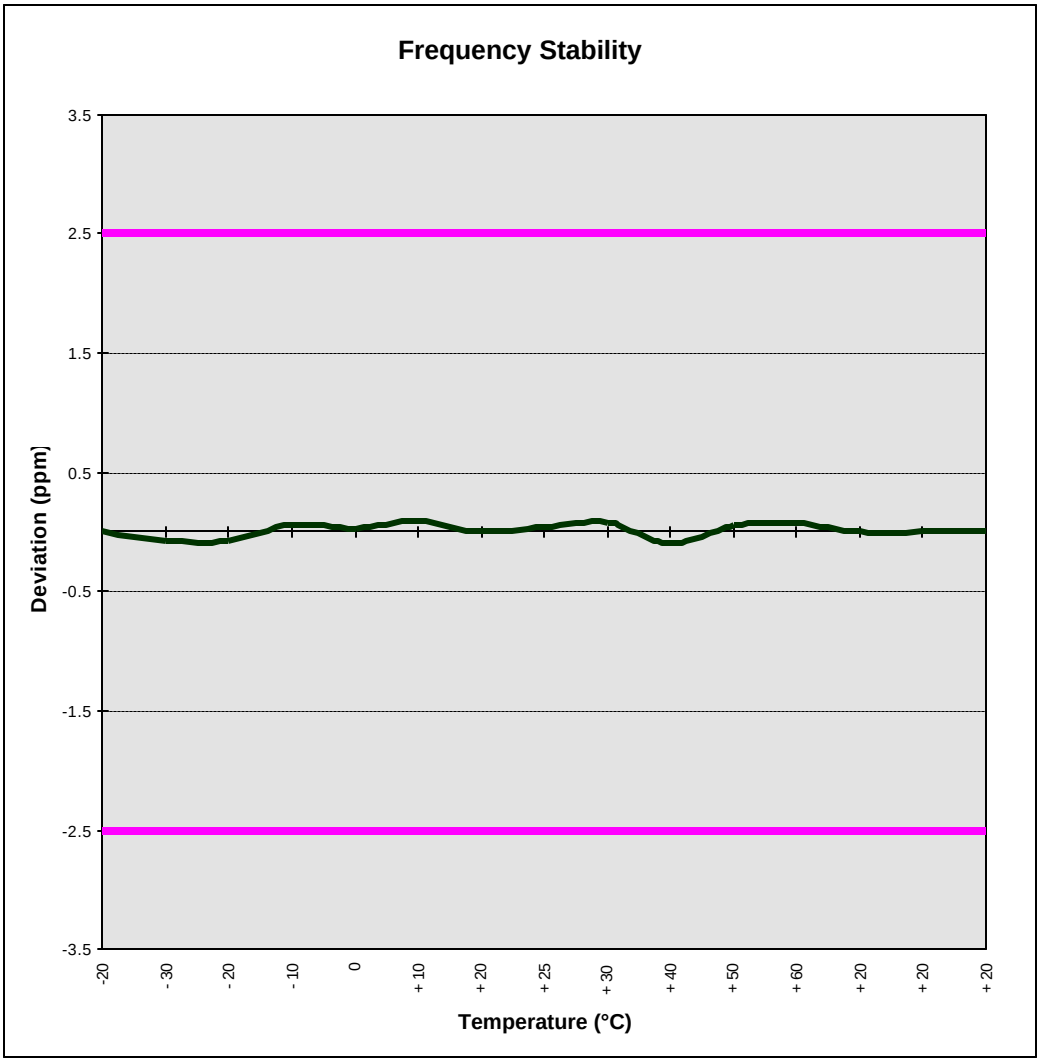
Panasonic 11/3/2004

PCS PC

VOLTAGE (%)	POWER (VDC)	TEMP (ºC)	FREQ. (Hz)	Deviation (%)
100 %	3.70	+ 20 (Ref)	1,880,000,003	0.000000
100 %		- 30	1,880,000,135	-0.000007
100 %		- 20	1,880,000,153	-0.000008
100 %		- 10	1,879,999,890	0.000006
100 %		0	1,879,999,947	0.000003
100 %		+ 10	1,879,999,834	0.000009
100 %		+ 20	1,880,000,003	0.000000
100 %		+ 25	1,879,999,928	0.000004
100 %		+ 30	1,879,999,853	0.000008
100 %		+ 40	1,880,000,191	-0.000010
100 %		+ 50	1,879,999,909	0.000005
100 %		+ 60	1,879,999,871	0.000007
85 %	3.17	+ 20	1,880,000,003	0.000000
115 %	4.26	+ 20	1,880,000,003	0.000000
BATT. ENDPOINT	2.95	+ 20	1,880,000,003	0.000000

11.1 Test Data (Continued)

11.5 FREQUENCY STABILITY (PCS CDMA)



12.1 PLOT(S) OF EMISSIONS

(SEE ATTACHMENT D)

13.1 TEST EQUIPMENT

Type	Model	Cal. Due Date	S/N
Microwave Spectrum Analyzer	8566B (100Hz-22GHz) HP	08/15/05	3638A08713
Microwave Spectrum Analyzer	HP 8566B (100Hz-22GHz)	04/17/05	2542A11898
Spectrum Analyzer/Tracking Gen.	HP 8591A (100Hz-1.8GHz)	08/10/05	3144A02458
Signal Generator*	HP 8640B (500Hz-1GHz)	06/03/05	2232A19558
Signal Generator*	HP 8640B (500Hz-1GHz)	06/03/05	1851A09816
Signal Generator*	Rohde & Schwarz (0.1-1000MHz)	09/11/05	894215/012
Ailtech/Eaton Receiver	NM 37/57A-SL (30-1000MHz)	04/12/05	0792-032
Ailtech/Eaton Receiver	NM 37/57A (30-1000MHz)	03/11/05	0805-03334
Ailtech/Eaton Receiver	NM 17/27A (0.1-32MHz)	09/17/05	0608-03241
Quasi-Peak Adapter	HP 85650A	08/15/05	2043A00301
Ailtech/Eaton Adapter	CCA-7 CISPR/ANSI QP Adapter	03/11/05	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).

14.1 SAMPLE CALCULATIONS

A. Emission Designator

Emission Designator = 1M25F9W

CDMA BW = 1.25 MHz
F = Frequency Modulation
9 = Composite Digital Info
W = Combination (Audio/Data)
(Measured at the 99.75% power bandwidth)

B. Spurious Radiated Emission - PCS Band

Example: Channel 25 PCS Mode 2nd Harmonic (3702.50 MHz)

The receive analyzer reading at 3 meters with the EUT on the turntable was –81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of –81.0 dBm on the receive analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 3702.50 MHz. So 6.1 dB is added to the signal generator reading of –30.9 dBm yielding –24.80 dBm. The fundamental EIRP was 25.501 dBm so this harmonic was 25.501 dBm – (-24.80) = 50.3 dBc

15.1 CONCLUSION

The data collected shows that the **Panasonic Toughbook w/ Intel WLAN & SONY Ericsson PCMCIA Card FCC ID: ACJ9TGCF-299A** complies with all the requirements of Parts 2, 22, and 24 of the FCC rules.