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CERTIFICATE OF COMPLIANCE (Part 24 & 22 Certification)

SAMSUNG ELECTRONICS CO., LTD.
416 Maetan-3 Dong, Paldal-Ku
Suwon City Kyungki-Do 441-742, KOREA
Attention: D. H. KIM, General Manager

Dates of Tests: January 04-08, 1999
Test Report S/N: 24/22.981218840.A3L
Test Site: PCTEST Lab, Columbia MD

FCC ID	**A3LSCH2500**
APPLICANT	**SAMSUNG ELECTRONICS CO., LTD.**

Classification:	**Licensed Portable Transmitter Held to Ear (PCE)**
FCC Rule Part(s):	**§§§24(E), 22(H), 2.983, 2.987**
EUT Type:	**Tri-Mode Dual-Band Analog/PCS Phone (AMPS/CDMA)**
Trade Name:	***SAMSUNG***
Model(s):	***SCH-2500***
Tx Frequency Range:	**1851.25MHz – 1908.75MHz (CDMA) / 824.04MHz – 848.97MHz (AMPS/CDMA)**
Rx Frequency Range:	**1931.25MHz – 1988.75MHz (CDMA) / 869.04MHz – 893.97MHz (AMPS/CDMA)**
Max Output Power:	**0.6 W ERP (AMPS) / 0.2 W ERP (CDMA) / 0.2 W EIRP (CDMA)**

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 with the following remarks (Note Codes):

** (BC) The output power is continuously variable from the value listed in this entry to 5%-10% of the value listed.*

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

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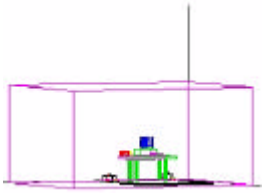
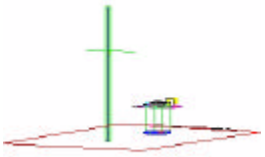


MEASUREMENT REPORT



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.

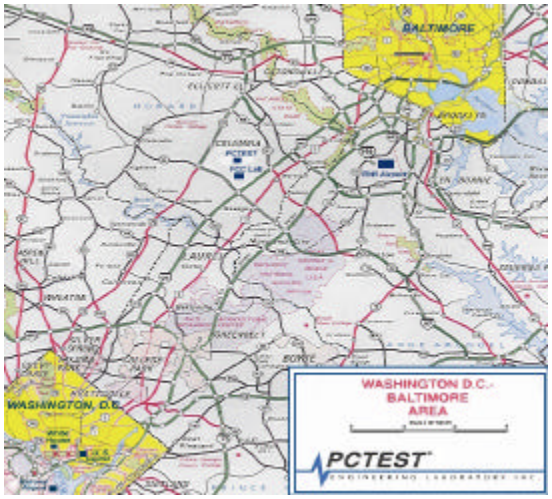
§2983(a) General Information

Applicant Name:	**SAMSUNG ELECTRONICS CO., LTD.**
Address:	**416 Maetan-3 Dong, Paldal-Ku, Suwon City, Kyungki-Do 441-742, KOREA**
Attention:	**D. H. KIM, General Manager**

- §2983(b) FCC ID: **A3LSCH2500**
- §2983(c) Quantity: Quantity production is planned
- §2.983(d) Emission Designator: 1M25F9W, 40K0F8W, 40K0F1D
- §2.983(d) Tx Freq. Range: 824.04 – 848.97 MHz (AMPS)
824.04 – 848.97 MHZ (CDMA)
1851.25 – 1908.75 MHz (CDMA)
- §2.983(d) Tx Freq. Range: 869.04 – 893.97 MHz (AMPS)
869.04 – 893.97 MHZ (CDMA)
1931.25 – 1988.75 MHz (CDMA)
- §2.983(d) Max Power Rating: 0.2W EIRP (CDMA) / 0.2W ERP (CDMA) / 0.6W ERP (AMPS)
- Battery Pack: 3.6 VDC Li-Ion Battery Back (Model: BTL2763L)
- FCC Classification(s): Licensed Portable Tx Held to Ear (PCE)
- Equipment (EUT) Type: Tri-Mode Dual-Band Analog/PCS Phone
- Modulation: AMPS / CDMA
- Frequency Tolerance: ± 0.00025% (2.5 ppm)
- FCC Rule Part(s): §§§§ 24(E), 22(H), 2.983, 2.987
- Dates of Tests: January 04-08, 1999
- Place of Tests: PCTEST Lab, Columbia, MD U.S.A.
- Test Report S/N: 24/22.981218840.A3L

NVLAP Lab Code 100431-0

1.1 INTRODUCTION



gure 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.

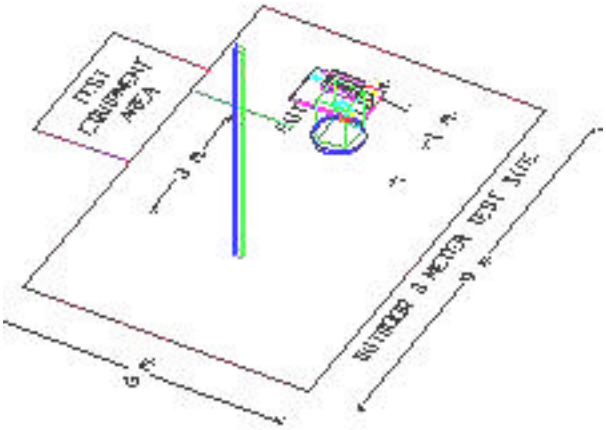


Figure 2. Diagram of 3-meter outdoor test range

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 its 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.

2.1 INSERTS PER §2.983(d)

§2.983(d) Function of Active Devices

The Function of active devices are shown in Attachment K.

§2.983(d) Circuit Diagrams & Description (Confidential)

The circuit diagrams & description are shown in Attachment J and the Block Diagram(s) are shown in Attachment I.

§2.983(d) Operating Instructions

The instruction manual is shown in Attachment M.

§2.983(d) Tune-Up Procedure

The tune-up procedure is shown in Attachment L.

§2.983(d) Description of Freq. Stabilization Circuit

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

§2.983(d) Description for Suppression of Spurious Radiation, for Limiting Modulation, and Harmonic Suppresion Circuits

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

3.1 DESCRIPTION OF TESTS

3.2 §2.987(a) Transmitter Audio Frequency Response

The frequency response of the audio modulating circuit over the frequency range 100 – 5000 Hz is measured. The audio signal generator is connected to the audio input circuit/microphone of the EUT. The audio signal input is adjusted to obtain 50% modulation at 1kHz and this point is taken as the 0dB reference. With the input held constant and below the limit at all frequencies, the audio signal generator is varied from 100 to 50 kHz. The response in dB relative to 1kHz is measured using the HP8901 a Modulation Analyzer. For the frequency response of the audio low-pass filter, the audio input is connected at the input to the modulation limiter and the modulated stage. The audio output is connected at the output of the modulated stage. The corresponding plots are shown herein

3.3 §2.987(b) Modulation Limiting.

The audio signal generator is connected to the audio input circuit/microphone of the EUT. The modulation response is measured for each of the three modulating frequencies (300Hz, 1000 Hz, and 2990Hz), and the input voltage is varied from 30% modulation (±3.6kHz deviation) to at least 20dB higher than the saturation point. Measurements of modulation and the plots are attached herein.

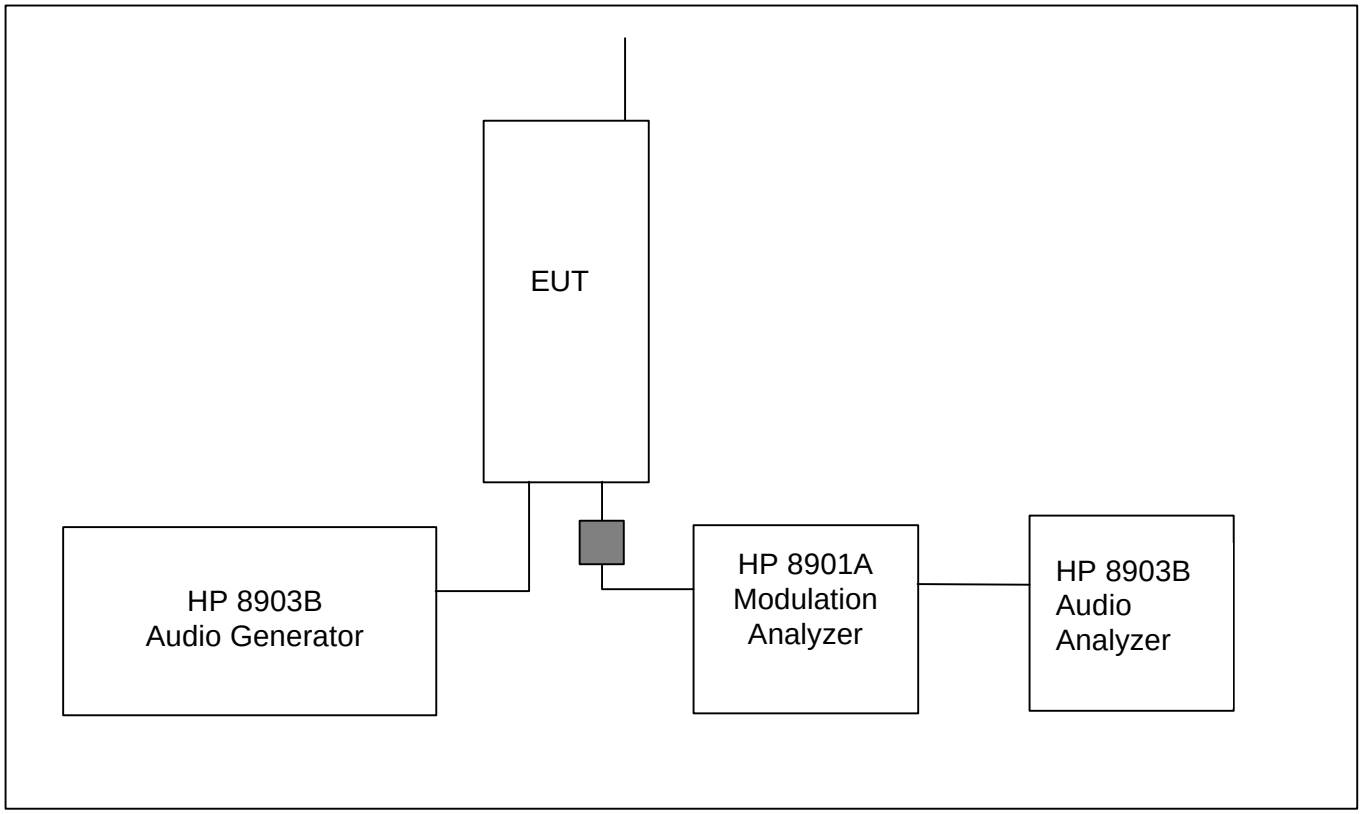


Fig. 3. Transmitter Audio Freq. Test Setup

3.1 DESCRIPTION OF TESTS (CONTINUED)

3.4 §24.238 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.

BLOCK	Freq. Range (MHz) Transmitter (Tx)	Freq. Range (MHz) Receiver (Rx)
A	1850 - 1865	1930 - 1945
B	1870 - 1885	1950 - 1965
C	1895 - 1910	1975 - 1990
D	1865 - 1870	1945 - 1950
E	1885 - 1890	1965 - 1970
F	1890 - 1895	1970 - 1975

Table 1. Broadband PCS Service Frequency Blocks.

3.1 DESCRIPTION OF TESTS (CONTINUED)

3.4 §2.989(c)(1) Occupied Bandwidth

The audio signal generator is adjusted to 1kHz. The output level is set to ±6kHz deviation. With the level constant, the frequency is set to 2500Hz. Then the audio signal level is increased by 16dB. The occupied bandwidth data is obtained for the SAT (Supervisory Audio Tone), ST (Signaling Tone), WBD (Wideband data), and DTMF (Dual Tone Multi Frequencies). The results are shown on the attached graphs.

Specified Limits:

a. On any frequency removed from the assigned carrier frequency by more than 20 kHz, up to and including 45kHz, the sideband is at least 26dB below the carrier.

b. On any frequency removed from the assigned carrier frequency by more than 45 kHz, up to and including 90kHz, the sideband is at least 45dB below the carrier.

c. On any frequency removed from the assigned carrier frequency by more than 90 kHz, up to the first multiple of the carrier frequency, the sideband is at least 60dB below the carrier or 40 + $\log_{10}$ (mean power output in Watts) dB, whichever is the smaller attenuation.

3.5 §2.991 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 10 GHz. The transmitter is modulated with a 2500Hz tone at a level of 16dB greater than that required to provided 50% modulation.

At 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 passband filter insertion loss to be calibrated.

3.6 §24.229 Frequencies

At the input terminals of the spectrum analyzer, an isolator (RF pad) and an 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 2 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.

3.7 §2.993 Radiation Spurious and Harmonic Emissions

Radiation and harmonic emissions above 1 GHz is measured at out 3-meter indoor site. The EUT is placed on the turntable connected to a dummy load in normal operation using the intended power source. A receiving antenna located 3 meters from the turntable receives any signal radiated from the transmitter and its operating accessories. The antenna is varied from 1 to 4 meters and the polarization is varied (horizontal and vertical) to determine the worst-case emission level. To obtain actual radiated signal strength, a signal generator is adjusted in output until a reading identical to that obtained with the actual transmitter is obtained at the receiver. Signal strength is read directly from the generator and recorded on the attached table.3.8 §24.135 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 ±0.0001 (±1 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 (25°C to 27°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 is 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 were made 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 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.

Test Data

§ 22.913 Effective Radiated Power Output

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

Freq. Tuned (MHz)	LEVEL (dBm)	AFCL (dB)	POL (H/V)	F/S (μV/m)	ERP (W)	ERP (dBm)
824.04	-33.30	31.65	V	185151	0.00629	7.97
836.49	-33.30	31.81	V	188498	0.00652	8.13
848.97	-33.70	31.96	V	183276	0.00616	7.88

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

Freq. Tuned (MHz)	LEVEL (dBm)	AFCL (dB)	POL (H/V)	F/S (μV/m)	ERP (W)	ERP (dBm)
824.04	-13.70	31.65	V	1768174	0.57327	27.57
836.49	-13.70	31.81	V	1800140	0.59418	27.73
848.97	-14.20	31.96	V	1730240	0.54893	27.38

NOTES:

The EUT is placed 3m. away from the receiving antenna and the ERP is calculated using the formula:

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

ERP (dBm) = $10 \text{ Log}_{10} [(3 \times FS/1 \times 10^{6})^2 / (49.2) \times 1000]$

ERP (Watts) = $\{(3 \times FS)/1 \times 10^{6}\}^2 / 49.2$

Test Data

§ 22.913 Effective Radiated Power Output

B. POWER: **High (CDMA Mode)**

Freq. Tuned (MHz)	LEVEL (dBm)	AFCL (dB)	POL (H/V)	F/S (μV/m)	ERP (W)	ERP (dBm)
824.04	-18.0	31.65	V	1077767	0.21299	23.27
836.49	-17.8	31.81	V	1122810	0.23116	23.63
848.97	-18.2	31.96	V	1091707	0.21853	23.38

NOTES:

The EUT is placed 3m. away from the receiving antenna and the ERP is calculated using the formula:

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

ERP (dBm) = $10 \text{ Log}_{10} [(3 \times FS/1 \times 10^6)^2 / (49.2) \times 1000]$

ERP (Watts) = $\{(3 \times FS)/1 \times 10^6\}^2 / 49.2$

Test Data

§ 24.232(b) Equivalent Isotropically Radiated Power (E.I.R.P.)

The RF output power is measured via HP436A Power Meter and Sensor.

Supply Voltage: 3.6 VDC

Modulation: CDMA

Channel No.	Nominal FREQ. (MHz)	Measured Power Output (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)
0025	1851.25	23.0	0.1	23.1	0.204
0600	1880.00	23.0	0.3	23.3	0.214
1175	1908.75	23.0	0	23.0	0.200

Mobile / portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

Test Data

Radiated Measurements

§ 2.993 Field Strength of SPURIOUS Radiation (CDMA)

OPERATING FREQUENCY:	824.04	MHz	
CHANNEL:	991 (Low)		
MEASURED OUTPUT POWER:	23.00 dBm =	0.20	W
MODULATION SIGNAL:	CDMA (Internal)		
DISTANCE:	3	meters	
LIMIT:	43 + 10 log10 (W) =	36.01	dBc

FREQ. (MHz)	LEVEL (dBm)	AFCL (dB)	POL (H/V)	F/S (μV/m)	ERP (dBm)	(dBc)
1648.08	-80.2	34.5	V	1161.4	-36.08	59.1
2472.12	-88.8	38.8	V	707.9	-40.38	63.4
3296.16	-94.0	42.5	V	595.7	-41.88	64.9
4120.20	-105.0	46.1	V	254.1	-49.28	72.3
4944.24	< -130					

NOTES:

1. The bandwidth is set per §22.917 (RBW = 1MHz, VBW = 1MHz).
2. The spectrum was checked from 25 MHz up to the 10th harmonic.
3. All emissions not listed were found to be more than 20dB below the limit.
4. < -130dBm is below the floor of the spectrum analyzer.
5. The EUT is manipulated through 3 orthogonal axis and the worst-case are reported.
6. The EUT is placed 3m. away from the receiving antenna and the ERP is calculated using the formula:

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

   ERP (dBm) $= 10 \text{ Log}_{10} [(3 \times FS/1 \times 10^6)^2 / (49.2) \times 1000]$

   ERP (Watts) $= \{(3 \times FS)/1 \times 10^6\}^2 / 49.2$

Test Data

Radiated Measurements

§ 2.993 Field Strength of SPURIOUS Radiation (CDMA)

OPERATING FREQUENCY:	836.49	MHz	
CHANNEL:	383 (Middle)		
MEASURED OUTPUT POWER:	23.00 dBm =	0.20	W
MODULATION SIGNAL:	CDMA (Internal)		
DISTANCE:	3	meters	
LIMIT:	43 + 10 log10 (W) =	36.01	dBc

FREQ. (MHz)	LEVEL (dBm)	AFCL (dB)	POL (H/V)	F/S (μV/m)	ERP (dBm)	(dBc)
1672.98	-80.0	34.5	V	1188.5	-35.88	58.9
2509.47	-88.5	39.0	V	749.9	-39.88	62.9
3345.96	-93.8	42.7	V	623.7	-41.48	64.5
4182.45	-104.0	46.2	V	288.4	-48.18	71.2
5018.94	< -130					

NOTES:

1. The bandwidth is set per §22.917 (RBW = 1MHz, VBW = 1MHz).
2. The spectrum was checked from 25 MHz up to the 10th harmonic.
3. All emissions not listed were found to be more than 20dB below the limit.
4. < -130dBm is below the floor of the spectrum analyzer.
5. The EUT is manipulated through 3 orthogonal axis and the worst-case are reported.
6. The EUT is placed 3m. away from the receiving antenna and the ERP is calculated using the formula:

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

   ERP (dBm) $= 10 \text{ Log}_{10} [(3 \times FS/1 \times 10^{6})^2 / (49.2) \times 1000]$

   ERP (Watts) $= \{(3 \times FS)/1 \times 10^{6}\}^2 / 49.2$

Test Data

Radiated Measurements

§ 2.993 Field Strength of SPURIOUS Radiation (CDMA)

OPERATING FREQUENCY:	848.97	MHz	
CHANNEL:	799 (High)		
MEASURED OUTPUT POWER:	23.00 dBm =	0.20	W
MODULATION SIGNAL:	CDMA (Internal)		
DISTANCE:	3	meters	
LIMIT:	43 + 10 log10 (W) =	36.01	dBc

FREQ. (MHz)	LEVEL (dBm)	AFCL (dB)	POL (H/V)	F/S (μV/m)	ERP (dBm)	(dBc)
1697.94	-81.0	34.9	V	1109.2	-36.48	59.5
2546.91	-89.0	39.2	V	724.4	-40.18	63.2
3395.88	-94.5	42.9	V	588.8	-41.98	65.0
4244.85	-106.0	46.1	V	226.5	-50.28	73.3
5093.82	< -130					

NOTES:

1. The bandwidth is set per §22.917 (RBW = 1MHz, VBW = 1MHz).
2. The spectrum was checked from 25 MHz up to the 10th harmonic.
3. All emissions not listed were found to be more than 20dB below the limit.
4. < -130dBm is below the floor of the spectrum analyzer.
5. The EUT is manipulated through 3 orthogonal axis and the worst-case are reported.
6. The EUT is placed 3m. away from the receiving antenna and the ERP is calculated using the formula:

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

   ERP (dBm) $= 10 \text{ Log}_{10} [(3 \times FS/1 \times 10^{6})^2 / (49.2) \times 1000]$

   ERP (Watts) $= \{(3 \times FS)/1 \times 10^{6}\}^2 / 49.2$

Test Data

Radiated Measurements

§ 2.993 Field Strength of SPURIOUS Radiation (AMPS)

OPERATING FREQUENCY:	824.04	MHz	
CHANNEL:	991 (Low)		
MEASURED OUTPUT POWER:	27.80 dBm =	0.60	W
MODULATION SIGNAL:	ST (Signalling Tone)		
DISTANCE:	3	meters	
LIMIT:	43 + 10 log10 (W) =	40.81	dBc

FREQ. (MHz)	LEVEL (dBm)	AFCL (dB)	POL (H/V)	F/S (μV/m)	ERP (dBm)	(dBc)
1648.08	-78.0	34.5	V	1496.2	-33.88	61.7
2472.12	-86.8	38.8	V	891.3	-38.38	66.2
3296.16	-92.0	42.5	V	749.9	-39.88	67.7
4120.20	-103.0	46.1	V	319.9	-47.28	75.1
4944.24	< -130	48.0	V			
5768.28		50.1	V			

NOTES:

1. The bandwidth is set per §22.917 (RBW = 1MHz, VBW = 1MHz).
2. The spectrum was checked from 25 MHz up to the 10th harmonic.
3. All emissions not listed were found to be more than 20dB below the limit.
4. < -130dBm is below the floor of the spectrum analyzer.
5. The EUT is manipulated through 3 orthogonal axis and the worst-case are reported.
6. The EUT is placed 3m. away from the receiving antenna and the ERP is calculated using the formula:

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

   ERP (dBm) $= 10 \text{ Log}_{10} [(3 \times \text{FS}/1 \times 10^6)^2 / (49.2) \times 1000]$

   ERP (Watts) $= \{(3 \times \text{FS})/1 \times 10^6\}^2 / 49.2$

Test Data

Radiated Measurements

§ 2.993 Field Strength of SPURIOUS Radiation (AMPS)

OPERATING FREQUENCY:	836.49	MHz	
CHANNEL:	383 (Middle)		
MEASURED OUTPUT POWER:	27.80 dBm =	0.60	W
MODULATION SIGNAL:	ST (Signalling Tone)		
DISTANCE:	3	meters	
LIMIT:	43 + 10 log10 (W) =	40.81	dBc

FREQ. (MHz)	LEVEL (dBm)	AFCL (dB)	POL (H/V)	F/S (μV/m)	ERP (dBm)	(dBc)
1672.98	-77.5	34.5	V	1584.9	-33.38	61.2
2509.47	-86.0	39.0	V	1000.0	-37.38	65.2
3345.96	-91.8	42.7	V	785.2	-39.48	67.3
4182.45	-103.0	46.2	V	323.6	-47.18	75.0
5018.94	< -130	48.5	V			
5855.43		50.3	V			

NOTES:

1. The bandwidth is set per §22.917 (RBW = 1MHz, VBW = 1MHz).
2. The spectrum was checked from 25 MHz up to the 10th harmonic.
3. All emissions not listed were found to be more than 20dB below the limit.
4. < -130dBm is below the floor of the spectrum analyzer.
5. The EUT is manipulated through 3 orthogonal axis and the worst-case are reported.
6. The EUT is placed 3m. away from the receiving antenna and the ERP is calculated using the formula:

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

   ERP (dBm) $= 10 \text{ Log}_{10} [(3 \times FS/1 \times 10^{6})^2 / (49.2) \times 1000]$

   ERP (Watts) $= \{(3 \times FS)/1 \times 10^{6}\}^2 / 49.2$

Test Data

Radiated Measurements

§ 2.993 Field Strength of SPURIOUS Radiation (AMPS)

OPERATING FREQUENCY:	848.97	MHz	
CHANNEL:	799 (High)		
MEASURED OUTPUT POWER:	27.80 dBm =	0.60	W
MODULATION SIGNAL:	ST (Signalling Tone)		
DISTANCE:	3	meters	
LIMIT:	43 + 10 log10 (W) =	40.81	dBc

FREQ. (MHz)	LEVEL (dBm)	AFCL (dB)	POL (H/V)	F/S (μV/m)	ERP (dBm)	(dBc)
1697.94	-78.0	34.9	V	1566.8	-33.48	61.3
2546.91	-87.2	39.2	V	891.3	-38.38	66.2
3395.88	-92.2	42.9	V	767.4	-39.68	67.5
4244.85	-103.0	46.1	V	319.9	-47.28	75.1
5093.82	< -130	46.1	V			
5942.79		48.4	V			

NOTES:

1. The bandwidth is set per §22.917 (RBW = 1MHz, VBW = 1MHz).
2. The spectrum was checked from 25 MHz up to the 10th harmonic.
3. All emissions not listed were found to be more than 20dB below the limit.
4. < -130dBm is below the floor of the spectrum analyzer.
5. The EUT is manipulated through 3 orthogonal axis and the worst-case are reported.
6. The EUT is placed 3m. away from the receiving antenna and the ERP is calculated using the formula:

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

   ERP (dBm) $= 10 \text{ Log}_{10} [(3 \times FS/1 \times 10^{6})^2 / (49.2) \times 1000]$

   ERP (Watts) $= \{(3 \times FS)/1 \times 10^{6}\}^2 / 49.2$

Test Data

Radiated Measurements

§ 2.993 Field Strength of SPURIOUS Radiation (CDMA)

OPERATING FREQUENCY:	1851.25	MHz	
CHANNEL:	025 (Low)		
MEASURED OUTPUT POWER:	23.00 dBm =	0.20	W
MODULATION SIGNAL:	CDMA (Internal)		
DISTANCE:	3	meters	
LIMIT:	43 + 10 log10 (W) =	36.01	dBc

FREQ. (MHz)	LEVEL (dBm)	AFCL (dB)	POL (H/V)	F/S (μV/m)	EIRP (dBm)	(dBc)
3702.50	-81.8	44.4	V	3020.0	-25.63	48.6
5553.75	-89.0	49.7	V	2426.6	-27.53	50.5
7405.00	-98.2	53.7	V	1333.5	-32.73	55.7
9256.25	-107.0	57.2	V	724.4	-38.03	61.0
11107.50	< -130					

NOTES:

1. The bandwidth is set per §24.238 (RBW = 1MHz, VBW = 1MHz).
2. The spectrum was checked from 25 MHz up to the 10th harmonic.
3. All emissions not listed were found to be more than 20dB below the limit.
4. < -130dBm is below the floor of the spectrum analyzer.
5. The EUT is manipulated through 3 orthogonal axis and the worst-case are reported.
6. The EUT is placed 3m. away from the receiving antenna and the EIRP is calculated using the formula:

   EIRP (dBm) = 10 Log 10 (((r(mV/m)/1 x 106)2 / 30.0/1 x 10-3)

   EIRP (dBm) = 10 Log 10 [(3 x FS/1 x 106)2 / (30.0) x 1000]

   EIRP (Watts) = {(3 x FS)/1 x 106}2 / 30.0

Test Data

Radiated Measurements

§ 2.993 Field Strength of SPURIOUS Radiation (CDMA)

OPERATING FREQUENCY:	1880.00	MHz	
CHANNEL:	600 (Middle)		
MEASURED OUTPUT POWER:	23.00 dBm =	0.20	W
MODULATION SIGNAL:	CDMA (Internal)		
DISTANCE:	3	meters	
LIMIT:	43 + 10 log10 (W) =	36.01	dBc

FREQ. (MHz)	LEVEL (dBm)	AFCL (dB)	POL (H/V)	F/S (μV/m)	EIRP (dBm)	(dBc)
3760.00	-82.2	44.7	V	2985.4	-25.73	48.7
5640.00	-88.8	49.9	V	2541.0	-27.13	50.1
7520.00	-98.0	54.0	V	1412.5	-32.23	55.2
9400.00	-106.0	57.4	V	831.8	-36.83	59.8
11280.00	< -130					

NOTES:

1. The bandwidth is set per §24.238 (RBW = 1MHz, VBW = 1MHz).
2. The spectrum was checked from 25 MHz up to the 10th harmonic.
3. All emissions not listed were found to be more than 20dB below the limit.
4. < -130dBm is below the floor of the spectrum analyzer.
5. The EUT is manipulated through 3 orthogonal axis and the worst-case are reported.
6. The EUT is placed 3m. away from the receiving antenna and the EIRP is calculated using the formula:

   EIRP (dBm) = 10 Log 10 (((r(mV/m)/1 x 106)2 / 30.0/1 x 10-3)
   EIRP (dBm) = 10 Log 10 [(3 x FS/1 x 106)2 / (30.0) x 1000]
   EIRP (Watts) = {(3 x FS)/1 x 106}2 / 30.0

Test Data

Radiated Measurements

§ 2.993 Field Strength of SPURIOUS Radiation (CDMA)

OPERATING FREQUENCY:	1908.75	MHz	
CHANNEL:	1175 (High)		
MEASURED OUTPUT POWER:	23.00 dBm =	0.20	W
MODULATION SIGNAL:	CDMA (Internal)		
DISTANCE:	3	meters	
LIMIT:	43 + 10 log10 (W) =	36.01	dBc

FREQ. (MHz)	LEVEL (dBm)	AFCL (dB)	POL (H/V)	F/S (μV/m)	EIRP (dBm)	(dBc)
3817.50	-82.5	45.0	V	2985.4	-25.73	48.7
5726.25	-89.8	50.1	V	2317.4	-27.93	50.9
7635.00	-99.0	54.2	V	1288.2	-33.03	56.0
9543.75	-108.0	57.7	V	683.9	-38.53	61.5
11452.50	< -130					

NOTES:

1. The bandwidth is set per §24.238 (RBW = 1MHz, VBW = 1MHz).
2. The spectrum was checked from 25 MHz up to the 10th harmonic.
3. All emissions not listed were found to be more than 20dB below the limit.
4. < -130dBm is below the floor of the spectrum analyzer.
5. The EUT is manipulated through 3 orthogonal axis and the worst-case are reported.
6. The EUT is placed 3m. away from the receiving antenna and the EIRP is calculated using the formula:

   EIRP (dBm) = 10 Log 10 (((r(mV/m)/1 x 106)2 / 30.0/1 x 10-3)
   EIRP (dBm) = 10 Log 10 [(3 x FS/1 x 106)2 / (30.0) x 1000]
   EIRP (Watts) = {(3 x FS)/1 x 106}2 / 30.0

Test Data

§ 24.135 FREQUENCY STABILITY (CDMA)

OPERATING FREQUENCY: 1,880,000,160 Hz

CHANNEL: 600

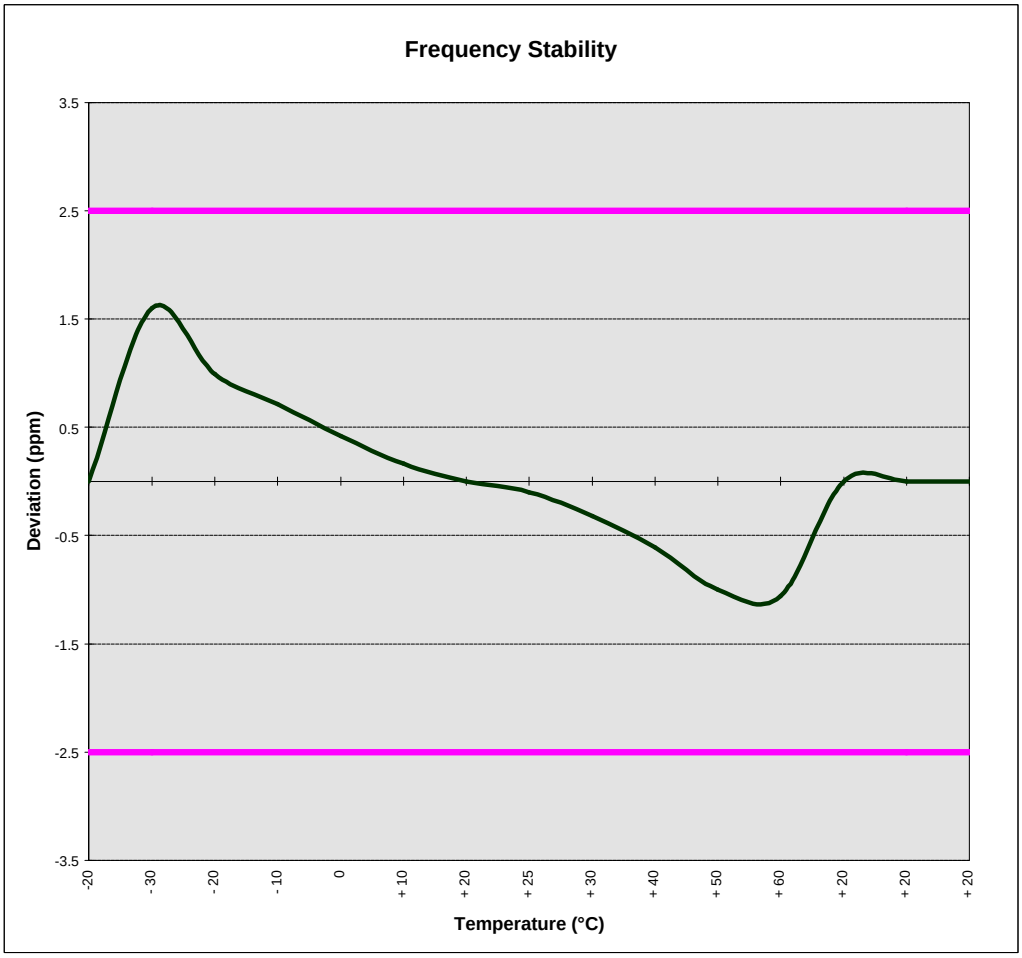
REFERENCE VOLTAGE: 4.0 VDC

DEVIATION LIMIT: ± 0.00025 % or 2.5 ppm

VOLTAGE (%)	POWER (VDC)	TEMP (ºC)	FREQ. (Hz)	Deviation (%)
100 %	4.00	+ 20 (Ref)	1,880,000,160	0.000000
100 %		- 30	1,879,997,152	0.000160
100 %		- 20	1,879,998,299	0.000099
100 %		- 10	1,879,998,825	0.000071
100 %		0	1,879,999,370	0.000042
100 %		+ 10	1,879,999,859	0.000016
100 %		+ 20	1,880,000,160	0.000000
100 %		+ 25	1,880,000,348	-0.000010
100 %		+ 30	1,880,000,762	-0.000032
100 %		+ 40	1,880,001,307	-0.000061
100 %		+ 50	1,880,002,040	-0.000100
100 %		+ 60	1,880,002,153	-0.000106
85 %	3.40	+ 20	1,880,000,160	0.000000
115 %	4.60	+ 20	1,880,000,160	0.000000
BATT. ENDPOINT	2.50	+ 20	1,880,000,160	0.000000

Test Data

§ 24.135 FREQUENCY STABILITY (CDMA)



Test Data

§ 2.995 FREQUENCY STABILITY (AMPS)

OPERATING FREQUENCY: 836,490,082 Hz

CHANNEL: 383

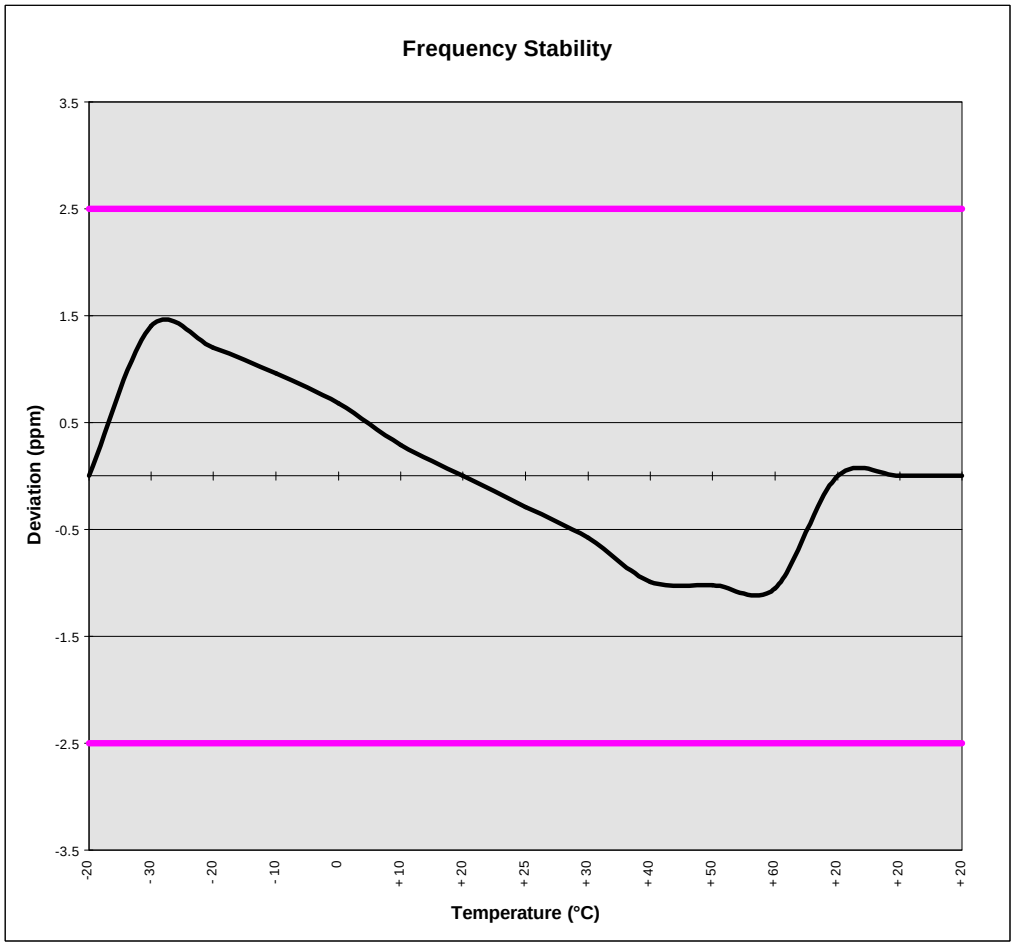
REFERENCE VOLTAGE: 4 VDC

DEVIATION LIMIT: ± 0.00025 % or 2.5 ppm

VOLTAGE (%)	POWER (VDC)	TEMP (ºC)	FREQ. (Hz)	Deviation (%)
100 %	4.00	+ 20 (Ref)	836,490,082	0.000000
100 %		- 30	836,488,911	0.000140
100 %		- 20	836,489,078	0.000120
100 %		- 10	836,489,279	0.000096
100 %		0	836,489,513	0.000068
100 %		+ 10	836,489,839	0.000029
100 %		+ 20	836,490,082	0.000000
100 %		+ 25	836,490,325	-0.000029
100 %		+ 30	836,490,567	-0.000058
100 %		+ 40	836,490,910	-0.000099
100 %		+ 50	836,490,935	-0.000102
100 %		+ 60	836,490,960	-0.000105
85 %	3.40	+ 20	836,490,082	0.000000
115 %	4.60	+ 20	836,490,082	0.000000
BATT. ENDPOINT	2.50	+ 20	836,490,082	0.000000

Test Data

§ 2.995 FREQUENCY STABILITY (AMPS)



5.1 PLOT(S) OF EMISSIONS

(SEE ATTACHMENT D)

6.1 TEST EQUIPMENT

6.2 Type	Model	Cal. Due Date	S/N
Microwave Spectrum Analyzer	HP 8566B (100Hz-22GHz)	08/15/99	3638A08713
Microwave Spectrum Analyzer	HP 8566B (100Hz-22GHz)	04/17/99	2542A11898
Spectrum Analyzer/Tracking Gen.	HP 8591A (100Hz-1.8GHz)	08/10/99	3144A02458
Signal Generator*	HP 8640B (500Hz-1GHz)	08/09/99	2232A19558
Signal Generator*	HP 8640B (500Hz-1GHz)	08/09/99	1851A09816
Signal Generator*	Rohde & Schwarz (0.1-1000MHz)	09/11/99	894215/012
Ailtech/Eaton Receiver	NM 37/57A-SL (30-1000MHz)	04/12/99	0792-03271
Ailtech/Eaton Receiver	NM 37/57A (30-1000MHz)	03/11/99	0805-03334
Ailtech/Eaton Receiver	NM 17/27A (0.1-32MHz)	09/17/99	0608-03241
Quasi-Peak Adapter	HP 85650A	08/15/99	2043A00301
Ailtech/Eaton Adapter	CCA-7 CISPR/ANSI QP Adapter	03/11/99	0194-04082
RG58 Coax Test Cable	No. 167		n/a
Harmonic/Flicker Test System	HP 6841A (IEC 555-2/3)		3531A00115
Broadband Amplifier (2)	HP 8447D		1145A00470, 1937A03348
Broadband Amplifier	HP 8447F		2443A03784
Transient Limiter	HP 11947A (9kHz-200MHz)	2820A00300	
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	3816/2		1079
EMCO LISN	3816/2		1077
EMCO LISN	3725/2		2009
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
Modulation Analyzer	HP 8901A		2432A03467
NTSC Pattern Generator	Leader 408		0377433
Noise Figure Meter	HP 8970B		3106A02189
Noise Figure Meter	Ailtech 7510		TE31700
Noise Generator	Ailtech 7010		1473
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).

7.1 SAMPLE CALCULATIONS

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

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

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

8.1 RECOMMENDATION/CONCLUSION

The data collected shows that the **SAMSUNG Tri-Mode Dual-Band Analog/PCS (AMPS/CDMA) Phone FCC ID: A3LSCH2500** complies with all the requirements of Parts 2, 22, and 24 of the FCC rules.