

ATTACHMENT C – TEST REPORT



PCTEST Engineering Laboratory, Inc.

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CERTIFICATE OF COMPLIANCE FCC Part 22 Certification

SAMSUNG Electronics Co., Ltd.
146 Maetun-3 Dong, Paldal-Ku,
Suwon City, Kyungki-Do, KOREA 441-742
Attn: Wallace Oh, Engineering Manager
Samsung Electronics America (QA Lab)

Dates of Tests: June 1-4, 2001
Test Report S/N: 22.210530336.A3L
Test Site: PCTEST Lab, Columbia, MD

FCC ID

A3LSCHA301

APPLICANT

SAMSUNG Electronics Co., Ltd.

Classification:	Non-Broadcast Transmitter Held to Ear (TNE)
FCC Rule Part(s):	§22.901(d), §2
EUT Type:	Single-Mode Cellular CDMA Phone
Trade Name/Model(s):	SAMSUNG SCH-A301
Tx Frequency Range:	824.70 ~ 848.31 MHz
Rx Frequency Range:	869.70 ~ 893.31 MHz
Max. RF Output Power:	0.271 W ERP (24.321 dBm)
Max. SAR Measurement(s):	1.4762 W/kg (1g) Cellular CDMA Brain SAR; 0.7553 W/kg (1g) Cellular CDMA Body SAR 0.8048 W/kg (10g) Cellular CDMA Hand SAR
Frequency Tolerance:	0.00025% (2.5 ppm)
Emission Designator:	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.

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.


Randy Ortanez
President & Chief Engineer

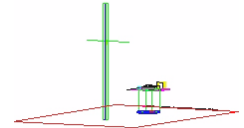
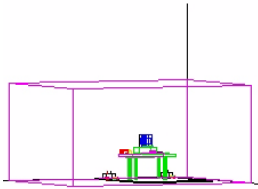


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MEASUREMENT REPORT



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.

General Information

Applicant Name:	SAMSUNG Electronics Co., Ltd.
Address:	146 Maetun-3 Dong, Paldal-Ku, Suwon City, Kyungki-Do, KOREA 441-742
Attention:	Wallace Oh, Engineering Manager Samsung Electronics America (QA Lab)

- FCC ID: **A3LSCHA301**
- Trade Name: **SAMSUNG**
- Model(s): **SCH-A301**
- Quantity: Quantity production is planned
- Emission Designator: 1M25F9W
- Tx Freq. Range: 824.70 – 848.31 MHz
Rx Freq. Range: 869.70 – 893.31 MHz
- Equipment Class: Non-Broadcast Transmitter Held to Ear (TNE)
- Equipment Type: Single-Mode Cellular CDMA Phone
- Modulation: CDMA
- Frequency Tolerance: $\pm 0.00025\%$ (2.5 ppm)
- Max. RF Output Power: 0.271W ERP (24.321 dBm)
- FCC Rule Part(s): §22.201(d), §2
- Battery Pack: 3.6 VDC Li-Ion (Model: BEX0257RK)
- Dates of Tests: June 1-4, 2001
- Place of Tests: PCTEST Lab, Columbia, MD U.S.A.
- Test Report S/N: 22.210530336.A3L



2.1 INTRODUCTION

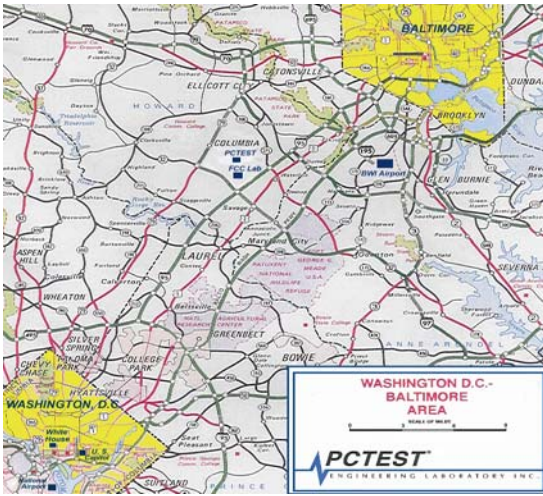


Figure 1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area.

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 testing was placed on a wooden turntable, 3-meters from the receive antenna. The receive antenna height and turntable rotations 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 level was recorded.

For readings above 1 GHZ, the above procedure would be repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.

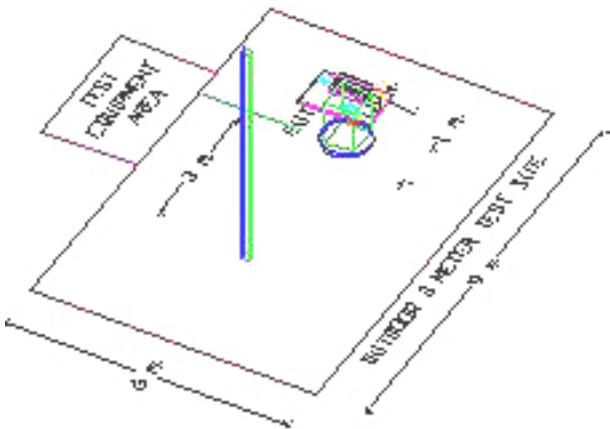


Figure 2. 3-Meter Outdoor Test Site

3.1 DESCRIPTION OF INSERTS

Function of Active Devices

The Function of active devices are shown in Attachment L.

Block/Schematic Diagrams (Confidential)

The block diagrams are shown in Attachment I. The schematic diagrams are shown in Attachment J.

Operating Instructions

The instruction manual is shown in Attachment M.

Parts List & Tune-Up Procedure

The parts list & tune-up procedure are shown in Attachment K.

Description of Freq. Stabilization Circuit

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

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

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

4.1 DESCRIPTION OF TESTS

4.2 Occupied Bandwidth

The audio signal generator is adjusted to 1kHz. The output level is set to +/- 6kHz deviation. With the level constant, the freq. is set to 2,500Hz. 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 20kHz, 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 45kHz, 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 90kHz, up to the first multiple of the carrier frequency, the sideband is at least 60dB below the carrier of $40 + \log_{10}$ (mean power output in Watts) dB, whichever is the smaller attenuation.

4.3 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 provide 50% modulation.

At the input terminals of the spectrum analyzer, an isolator (RF circulator with one 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.

4.4 Radiation Spurious and Harmonic Emissions

Radiation and harmonic emissions above 1 GHz is measured at our 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.

4.1 DESCRIPTION OF TESTS (CONTINUED)

4.5 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 minimum frequency stability shall be +/- 0.00025% at any time during normal operation.

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.

5.1 Test Data

5.2 Effective Radiated Power Output

POWER: **High (CDMA Mode)**

Freq . Tuned (M H z)	LEVEL (dBm)	P O L (H /V)	ERP (W)	ERP (dBm)	BATTERY
824.70	-17.200	H	0.256	24.082	Standard
835.89	-17.100	H	0.271	24.321	Standard
848.31	-17.400	H	0.262	24.177	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.

6.1 Test Data

6.2 CELLULAR CDMA Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 824.70 MHz
CHANNEL: 1013 (Low)
MEASURED OUTPUT POWER: 24.321 dBm = 0.270 W
MODULATION SIGNAL: CDMA (Internal)
DISTANCE: 3 meters
LIMIT: $43 + 10 \log_{10} (W) =$ 37.32 dBc

FREQ . (M H z)	LEVEL (dBm)	POL (H /V)	(dBc)
1649.40	-99.00	H	79.2
2474.10	-117.00	H	92.9
3298.80	-94.00	H	66.2
4123.50	-114.00	H	82.6
4948.20	-117.00	H	92.9

NOTES:

Radiated Spurious Emission 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 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.

6.1 Test Data

6.3 CELLULAR CDMA Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 835.89 MHz
CHANNEL: 0363 (Mid)
MEASURED OUTPUT POWER: 24.321 dBm = 0.270 W
MODULATION SIGNAL: CDMA (Internal)
DISTANCE: 3 meters
LIMIT: $43 + 10 \log_{10} (W) =$ 37.32 dBc

FREQ . (M H z)	LEVEL (dBm)	POL (H /V)	(dBc)
1671.78	-110.00	H	90.2
2507.67	-118.00	H	93.7
3343.56	-113.00	H	85.0
4179.45	-118.00	H	86.5
5015.34	< -130		

NOTES:

Radiated Spurious Emission 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 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.

6.1 Test Data

6.4 CELULAR CDMA A Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 848.31 MHz
CHANNEL: 0777 (High)
MEASURED OUTPUT POWER: 24.321 dBm = 0.270 W
MODULATION SIGNAL: CDMA (Internal)
DISTANCE: 3 meters
LIMIT: $43 + 10 \log_{10} (W) =$ 37.32 dBc

FREQ . (M H z)	LEVEL (dBm)	POL (H /V)	(dBc)
1696.62	-103.00	H	82.8
2544.93	-112.00	H	87.5
3393.24	-103.20	H	75.0
4241.55	-121.00	H	89.4
5089.86	< -130		

NOTES:

Radiated Spurious Emission 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 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

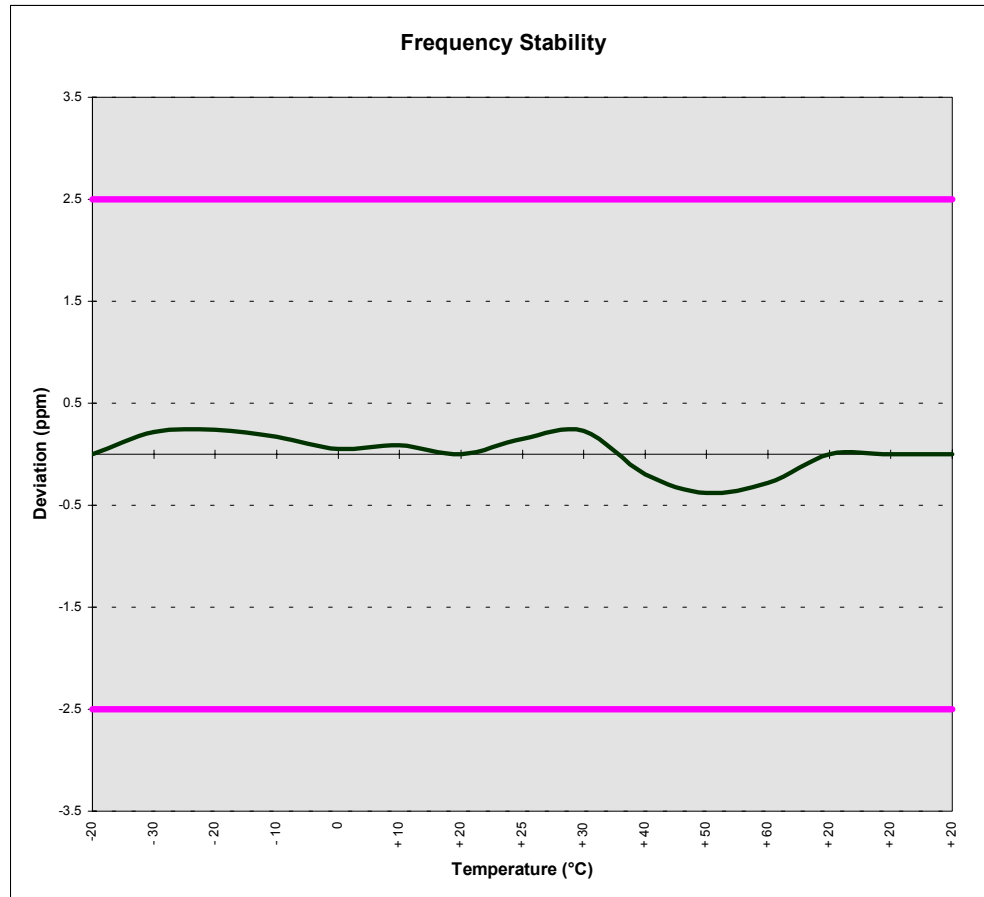
7.2 FREQUENCY STABILITY

OPERATING FREQUENCY: 835,890,008 Hz
 CHANNEL: 363
 REFERENCE VOLTAGE: 3.8 VDC
 DEVIATION LIMIT: ± 0.00025 % or 2.5 ppm

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQ . (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	835,890,008	0.000000
100 %		- 30	835,889,824	0.000022
100 %		- 20	835,889,807	0.000024
100 %		- 10	835,889,866	0.000017
100 %		0	835,889,966	0.000005
100 %		+ 10	835,889,933	0.000009
100 %		+ 20	835,890,008	0.000000
100 %		+ 25	835,889,883	0.000015
100 %		+ 30	835,889,816	0.000023
100 %		+ 40	835,890,175	-0.000020
100 %		+ 50	835,890,326	-0.000038
100 %		+ 60	835,890,242	-0.000028
85 %	3.23	+ 20	835,890,008	0.000000
115 %	4.37	+ 20	835,890,008	0.000000
BATT. ENDPOINT	2.47	+ 20	835,890,008	0.000000

7.1 Test Data (Continued)

7.3 FREQUENCY STABILITY



8.1 PLOT(S) OF EMISSIONS

(SEE ATTACHMENT D)

9.1 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)	04/17/02	2542A11898
Spectrum Analyzer/Tracking Gen.	HP 8591A (100Hz-1.8GHz)	08/10/01	3144A02458
Signal Generator*	P 8640B (500Hz-1GHz)	06/03/02	2232A19558
Signal Generator*	HP 8640B (500Hz-1GHz)	06/03/02	1851A09816
Signal Generator*	Rohde & Schwarz (0.1-1000MHz)	09/11/01	894215/012
Ailtech/Eaton Receiver	NM 37/57A-SL (30-1000MHz)	04/12/02	0792-03271
Ailtech/Eaton Receiver	NM 37/57A (30-1000MHz)	03/11/02	0805-03334
Ailtech/Eaton Receiver	NM17/27A (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	03/11/02	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).

10.1 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

CDMA Sample

2M + 2DK

CDMA BW = 1.25 MHz

F = Frequency Modulation

9 = Composite Digital Info

W = Combination (Audio/Data)

Emission Designator = 1M25F9W

11.1 CONCLUSION

The data collected shows that the **SAMSUNG Single-Mode Cellular CDMA Phone FCC ID: A3LSCHA301** complies with all the requirements of Parts 2 and 22 of the FCC rules.