KTL Test Report:	8L0265E
Applicant:	Samsung Telecommunications America, Inc. 1130 Arapaho Road Richardson, Tx 75081
Equipment Under Test: (E.U.T.)	Outdoor Mini-BTS
FCC ID:	NP817-4WODMINI
In Accordance With:	FCC Part 24, Subpart E Broadband PCS Base Station
Tested By:	KTL Dallas Inc. 802 North Kealy Lewisville, TX 75057-3136
Authorized By:	
	Tom Tidwell, RF Group Manager
Date:	
Total Number of Pages:	

Table of Contents

Section 1. Summary of Test Results

General Summary of Test Data

Section 2. General Equipment Specification

Specifications Description of Modifications for Class II Permissive Change Modifications Made During Testing Theory of Operation System Diagram

Section 3. RF Power Output

Test Results Measurement Data Power Over Bandwidth Graphs

Section 4. Occupied Bandwidth

Occupied Bandwidth (CDMA) Test Results CDMA Input and Output Graphs Occupied Bandwidth (GSM) Test Results GSM Input and Output Graphs Occupied Bandwidth (NADC) Test Results NADC Input and Output Graphs

Section 5. Spurious Emissions at Antenna Terminals

Test Results Test Data Graphs

Section 6. Field Strength of Spurious

Test Results Test Data Test Data - Radiated Emissions - Uplink Test Data - Radiated Emissions - Downlink Photographs of Test Setup Pre-Scan Data

Table of Contents, continued

Section 7. Frequency Stability

Test Results Measurement Data Graphs

Section 8. Test Equipment List

Annex A - Test Methodologies

RF Power Output Occupied Bandwidth (CDMA) Occupied Bandwidth (GSM) Occupied Bandwidth (NADC) Spurious Emission at Antenna Terminals Field Strength of Spurious Frequency Stability

Annex B - Test Diagrams

R.F. Power Output Occupied Bandwidth Spurious Emissions at Antenna Terminals Field Strength of Spurious Frequency Stability

Section 1. Summary of Test Results

Manufacturer: Samsung Telecommunication America, Inc.

Model No.: Outdoor Mini-BTS

Serial No.: None

General: All measurements are traceable to national standards.

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 24, Subpart E.

\square	New Submission	\square	Production Unit
	Class II Permissive Change		Pre-Production Unit
P C B	Equipment Code		

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.

See "Summary of Test Data".

NVU

NVLAP LAB CODE: 100351-0

TESTED BY:

_____ DATE: _____

Ron Gaytan, Technician

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This report applies only to the items tested.

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	MEAS.	RESULT
RF Power Output	24.232	100W	17.4 W	Complies
Occupied Bandwidth (CDMA)	24.238	Plots	Plots	Complies
Occupied Bandwidth (GSM)	24.238	N/A	N/A	N/A
Occupied Bandwidth (NADC)	24.238	N/A	N/A	N/A
Spurious Emissions at Antenna Terminals	24.238(a)	-13 dBm	-15 dBm	Complies
Field Strength of Spurious Emissions	24.238(a)	-13 dBm	-26.3 dBm	Complies
		E.I.R.P.	E.I.R.P.	-
Frequency Stability	24.235	$\pm 0.05 \text{ ppm}$	-0.00356 ppm	Complies

Note:

Waveform Quality was measured under voltage and temperature extremes in order to characterize the modulation characteristics as per FCC Part 2.1047 This data is reported with Frequency Stability data.

Footnotes For N/A's: The E.U.T. is a CDMA only base station transmitter.

Test Conditions:	LAB:	Temperature: Humidity:	24 °C 52 %
	OATS:	Temperature: Humidity:	22 °C 41 %

Change

 \square

Coverage

 $|\times|$

EQUIPMENT: Outdoor Mini BTS FCC ID:NP817-4WODMINI

Section 2. General Equipment Specification

Supply	Voltage Input	: 27 VAC
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Frequency Range(s):	Blocks A,D,B,E,C & F				
	Α	1931.250-1943.	750		
	D	1946.250-1948.	750		
	В	1951.250-1963.	750		
	Ε	1966.250-1968.	750		
	F	1971.250-1973.	750		
	С	1976.250-1988.	750		
Type of Modulation and			CDMA	GSM	NADC
Designator:			(F9W)	(GXW)	(DXW)
			\square		
Emission & Bandwidth	1M25F9W				
Designator:					
Output Impedance:	50 ohm				
• •					
RF Output (Rated):	17.4 Watts (+42.4 dBm)				
Band Selection:			Software	Duplexer	Fullband

Description of Modifications For Class II Permissive Change

Not Applicable

Modifications Made During Testing

Not Applicable

System Description

The E.U.T. is a base station transmitter that operates in the PCS 1900 frequency blocks. The access method is CDMA and the air interface is designed to the IEC IS-95 standard. Output power of the transmitter is rated as 17.4 watts. Multiple sectors can be configured with one CDMA channel per sector.

The system is intended to operate on the valid CDMA frequency assignments defined in J-STD-008 and listed below.

Block Designator	Valid CDMA Frequency	CDMA Channel Number	Personal Station Frequency(MHz)	Base Station Frequency(MHz)
	Assignments Not Valid	0-24	1850.000-1851.200	1930.000-1931.200
А	Valid	25-275	1851.250-1863.75	1930.000-1931.200 1931.250-1943.750
А	Cond. Valid	276-299	1863.800-1864.950	1943.800-1944.950
	Cond. Valid	300-324	1865.000-1866.200	1945.000-1946.200
D	Valid	300 324 325-375	1866.250-1868.750	1946.250-1948.750
Ľ	Cond. Valid	376-399	1868.800-1869.950	1948.800-1949.950
	Cond. Valid	400-424	1870.000-1871.200	1950.000-1951.200
В	Valid	<mark>425-675</mark>	1871.250-1883.750	1951.250-1963.750
	Cond. Valid	676-699	1883.800-1884.950	1963.800-1964.950
	Cond. Valid	700-724	1885.000-1886.200	1965.000-1966.200
E	Valid	725-775	1886.250-1888.750	1966.250-1968.750
	Cond. Valid	776-799	1888.800-1889.950	1968.800-1969.950
	Cond. Valid	800-824	1890.000-1891.200	1970.000-1971.200
F	Valid	<mark>825-875</mark>	1891.250-1893.750	1971.250-1973.750
	Cond. Valid	876-899	1893.800-1894.950	1973.800-1974.950
	Cond. Valid	900-924	1895.000-1896.200	1975.000-1976.200
С	Valid	<mark>925-1175</mark>	1896.250-1908.750	1976.250-1988.750
	Not Valid	1176-1199	1908.800-1909.950	1988.800-1989.950

Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: Ron Gaytan	DATE: 1/25/99

Test Results: Complies.

Measurement Data:

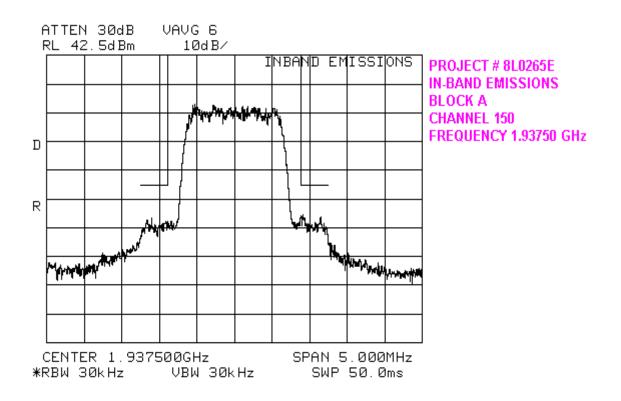
Modulation Type	Measured Output Power (dBm)	Rated Output Power (dBm)
CDMA	42.4	42.4
GSM	N/A	N/A
NADC	N/A	N/A

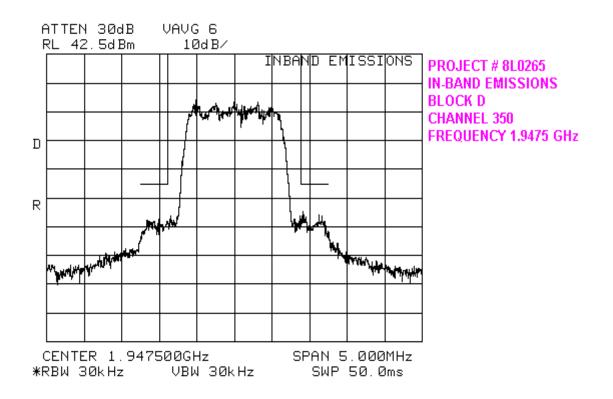
Section 4. Occupied Bandwidth

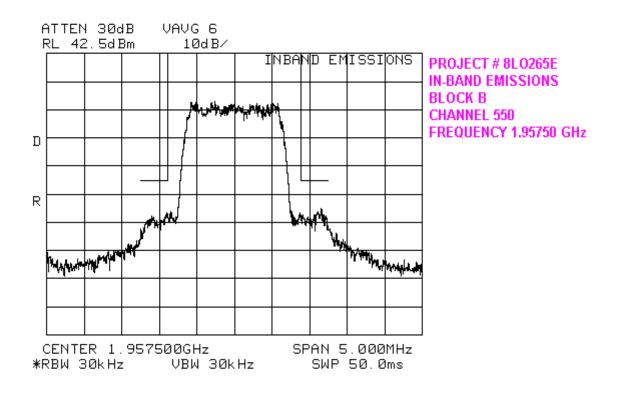
NAME OF TEST: Occupied Bandwidth (CDMA)	PARA. NO.: 2.1049
TESTED BY: Ron Gaytan	DATE: 1/26/99

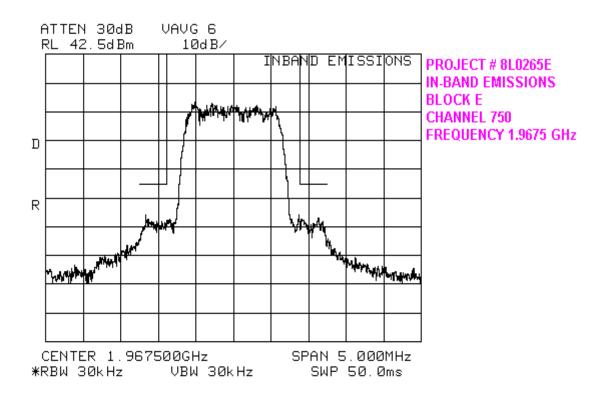
Test Results: Complies.

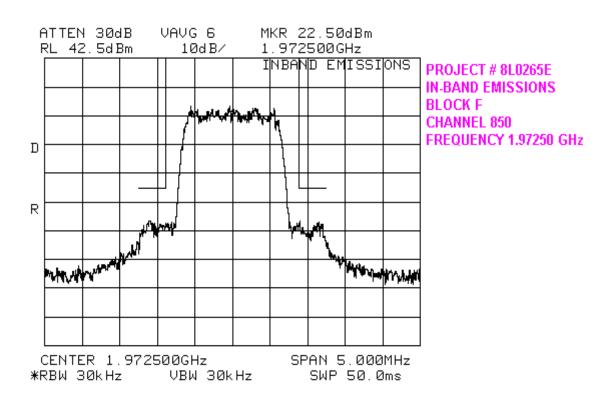
Test Data: See attached graph(s).

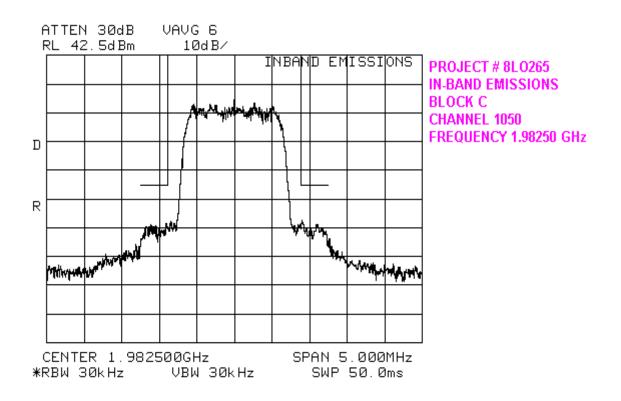












NAME OF TEST: Occupied Bandwidth (GSM)	PARA. NO.: 2.1049
TESTED BY:	DATE:

Test Results:

Complies/Does Not Comply.

Test Data:

Not Applicable

NAME OF TEST: Occupied Bandwidth (NADC)	PARA. NO.: 2.1049	
TESTED BY:	DATE:	

Test Results:

Complies/Does Not Comply.

Test Data:

see attached graph(s). Not Applicable

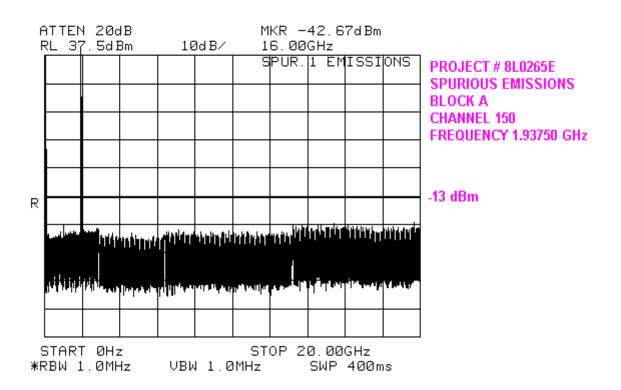
Section 5. Spurious Emissions at Antenna Terminals

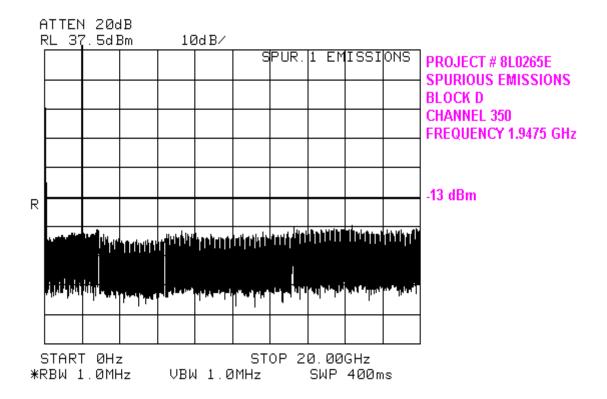
NAME OF TEST: Spurious Emissions @ Antenna Te	erminals PARA. NO.: 2.1051
TESTED BY: Ron Gaytan	DATE: 1/26/99 & 1/27/99

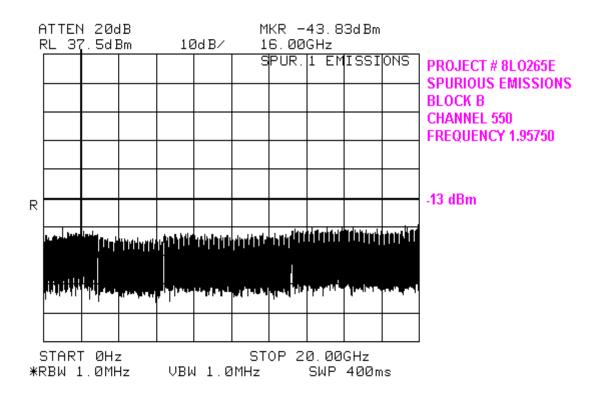
Test Results: Complies.

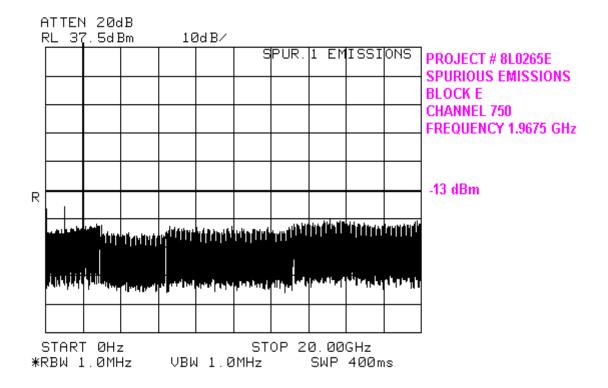
Test Data:

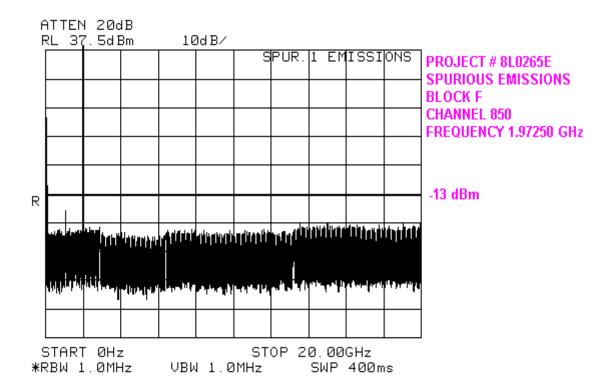
NAME OF TEST	WORST-CASE SURIOUS LEVEL(dBm)
0 to 20 GHz Spurious	-17
Lower Band Edge	-15
Upper Band Edge	-19

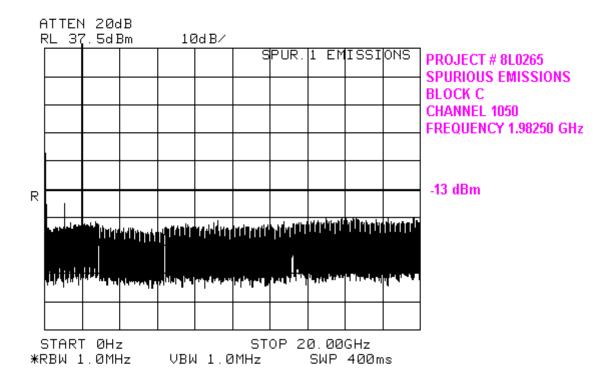


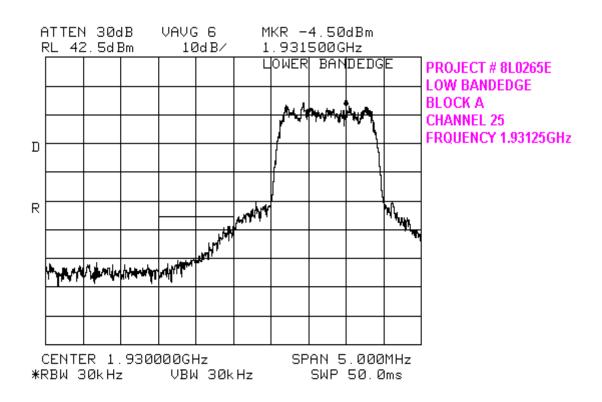


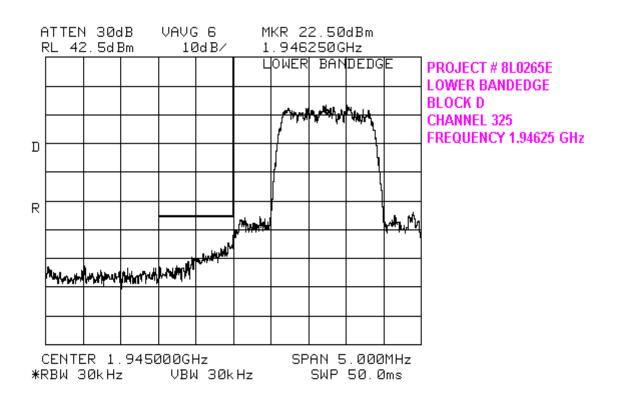


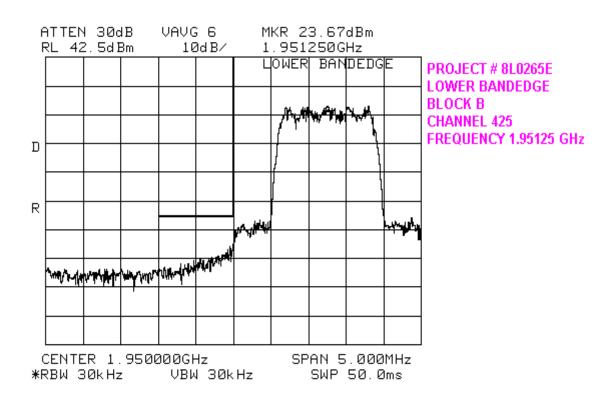


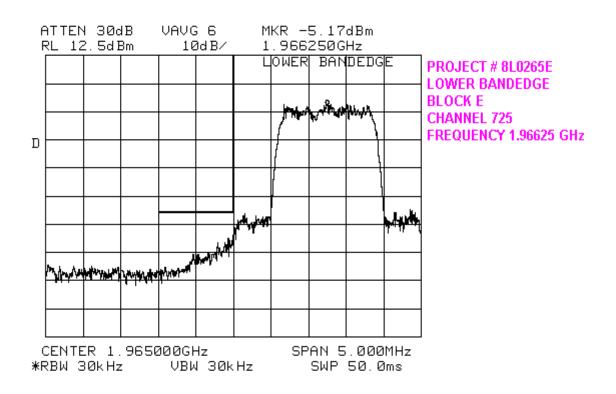




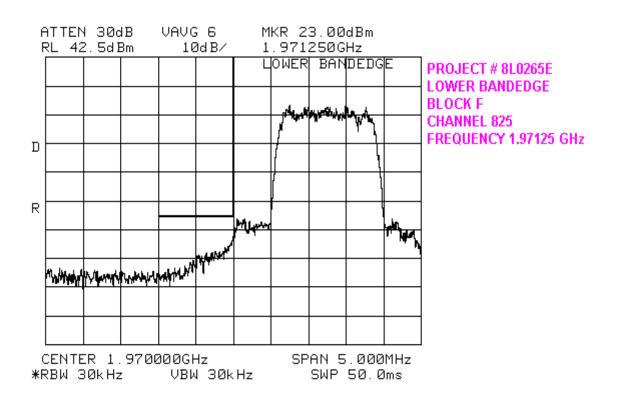


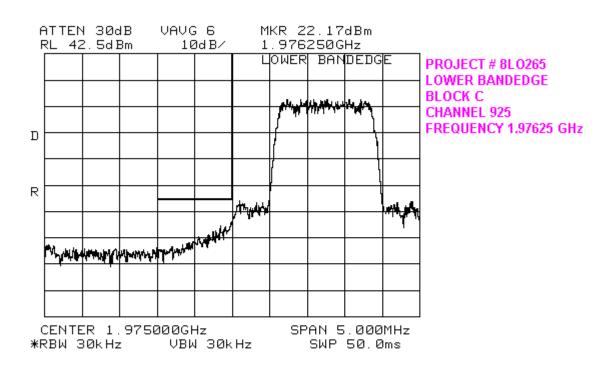


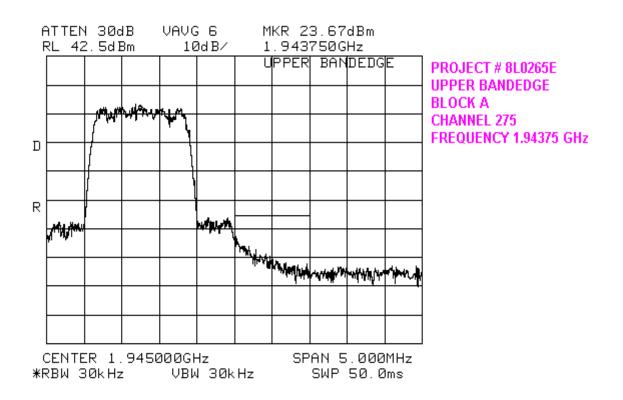


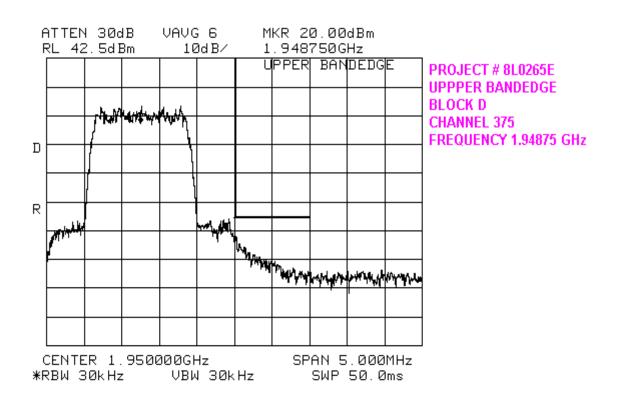


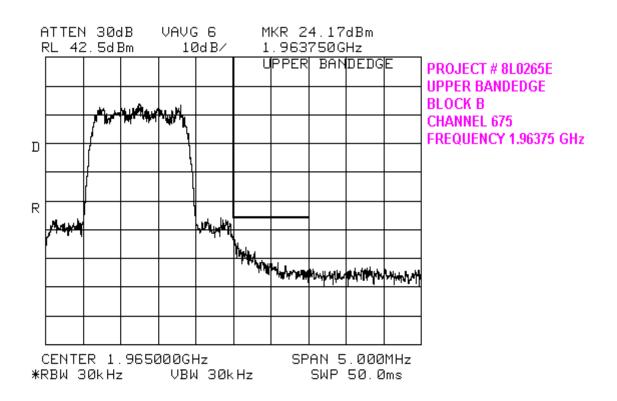
Reference level should be read as 42.5 dBm due to external attenuation of 30dB not compensated for in the above plot.

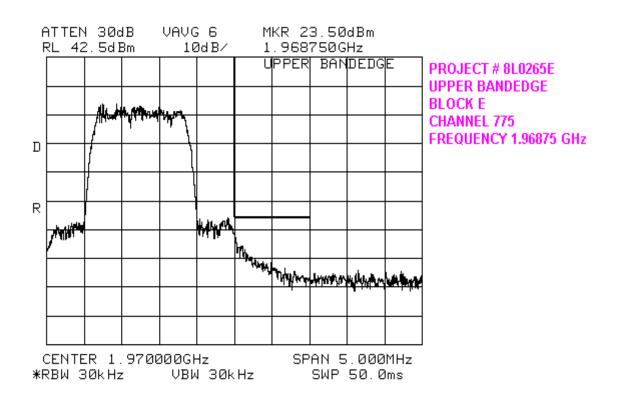


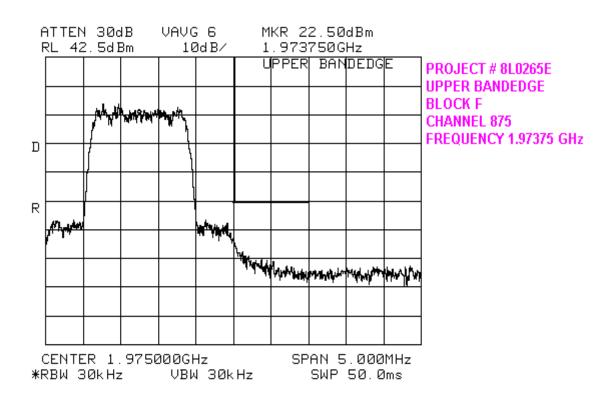


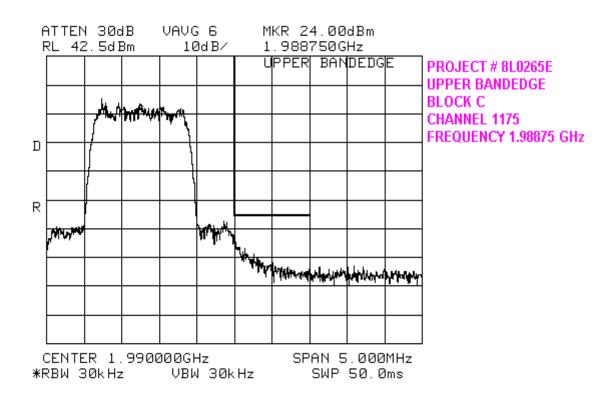












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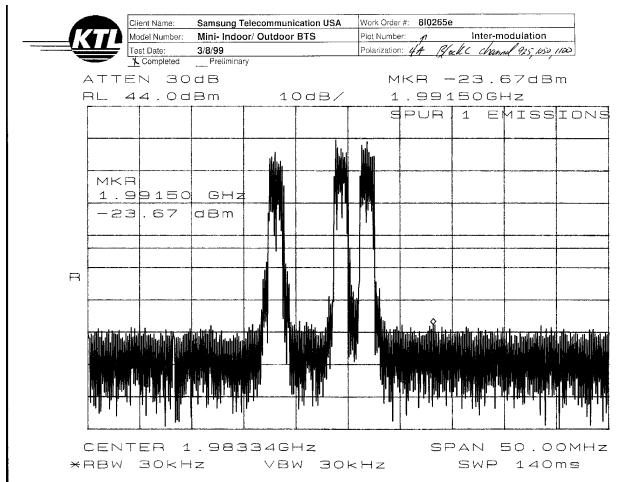
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EQUIPMENT: Outdoor Mini BTS FCC ID:NP817-4WODMINI



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M	odel Number:	Mini- Indo	or/ Outdoor	BTS		er: 🖌		odulation	
	est Date:	3/8/99			Polarizatio	1: Black C	channel	925,1050	1100
4	Completed	Prelimina	ry						
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	ient Name:	Samsung T	elecommuni	cation USA		r#: 810265e			
M	odel Number:	Mini- Indo	or/ Outdoor	BTS		er: 🖌		odulation	
	est Date:	3/8/99			Polarizatio	1: Black C	channel	925,1050	1100
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A	Client Na	ame: Samsung	Telecommuni	cation USA		r #: 810265e			
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*RBW 300kHz VBW 300kHz SWP 50.0ms

NAME OF TEST: Field Strength of Spurious	PARA. NO.: 2.1053
TESTED BY:	DATE:

Test Results:

Complies.

The maximum field strength is 69 dB μ V/m @ 3m.

Test Data:

Test Data-Radiated Microwave Emissions MW-1

Freq. (GHz)	Meter Reading (dBm)	Antenna Factor (dB)	Cable Loss (dB)	RF Gain (dB)	Conver. Factor	Corrected Reading (dBuV/m)	Spec. Limit (dBuV/m)	Pol.	Comments:
1.816	-42	27.3	3.4	30.9	107	65	82.3	Н	
3.614	-60	31.2	5.4	31.7	107	52	82.3	H	
3.632	-60	31.2	5.4	31.7	107	52	82.3	H	
5.462	-72	35.6	6.5	30	107	47	82.3	Н	
9.035	-70	37.9	9.0	33	107	51	82.3	Н	
1.815	-38	27.3	3.4	30.9	107	69	82.3	V	
3.619	-60	31.2	5.4	31.7	107	52	82.3	V	
3.632	-58	31.2	5.4	31.7	107	54	82.3	V	
5.462	-68	35.6	6.5	30	107	51	82.3	V	
9.038	-72	37.9	9.0	33	107	49	82.3	V	
									Scanned from 1-20GHz

Test Data - Radiated Emissions RE-1

Frequency Frequency <t< th=""><th>Emission</th><th>Ant.</th><th>Det.</th><th>Meter</th><th>Antenna</th><th>Path</th><th>RF</th><th>Corrected</th><th>Spec.</th><th>CRISE</th><th>Pass</th><th>Notes</th></t<>	Emission	Ant.	Det.	Meter	Antenna	Path	RF	Corrected	Spec.	CRISE	Pass	Notes
(MHz) (dB) (dB) <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>110105</td></t<>												110105
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990 V 00 588 96 22 275 431 740 309 Pass REFER TO QP. 660 V 00 550 94 22 275 401 740 -332 Pass QP. 660 V 00 550 94 22 275 401 740 -330 Pass QP. 667 V 00 550 85 22 275 410 -331 Pass REFER TO QP. 677 V 00 550 85 24 270 389 740 -351 Pass REFER TO QP. 787 V 00 300 103 30 270 285 740 -351 Pass REFER TO QP. 1183 V 00 326 113 34 271 446 740 -334 Pass QP. 1283 V 00 350 113 34 271 <td></td>												
390 V 00 575 9.6 22 275 418 740 332 Pass Q.P. 660 V 00 550 9.4 22 275 390 740 330 Pass Q.P. 660 V 00 570 93 22 275 390 740 330 Pass Q.P. 697 V 00 556 93 22 275 396 740 331 Pass Q.P. 787 V 00 350 85 2.4 270 369 740 331 Pass Q.P. 1137 V 00 400 1007 30 270 265 740 -333 Pass Q.P. 1283 V 00 350 118 34 271 466 740 -274 Pass Q.P. 1283 V 00 350 113 34 271												
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$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	53.3	Н	0.0	39.0	10.2	2.2	27.5	23.8	74.0	-50.2	Pass	
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$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	59.4	Н	0.0	50.0	9.6	2.2		34.3	74.0	-39.7	Pass	Q.P.
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		Н	0.0									
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360.0 H 0.0 38.7 5.9 27.3 17.3 74.0 -56.7 Pass 495.0 H 0.0 29.0 18.9 7.0 27.8 27.1 74.0 -46.9 Pass 799.8 H 0.0 50.0 21.0 10.0 28.2 52.8 74.0 -21.2 Pass AMBIENT	799.8	V	0.0	48.0		10.0	28.2	41.8	74.0	-32.2	Pass	AMBIENT
495.0 H 0.0 29.0 18.9 7.0 27.8 27.1 74.0 -46.9 Pass 799.8 H 0.0 50.0 21.0 10.0 28.2 52.8 74.0 -21.2 Pass AMBIENT					12.0			1.5 -	-			
799.8 H 0.0 50.0 21.0 10.0 28.2 52.8 74.0 -21.2 Pass AMBIENT												
Scanned from 30-1000MHz	799.8	H	0.0	50.0	21.0	10.0	28.2	52.8	74.0	-21.2	Pass	
												Scanned from 30-1000MHz

Photographs of Test Setup

FRONT VIEW



Note: Photo on D oats is unavailable, However the preliminary Microwave setup was an identical test configuration.

BICONICAL ANTENNA VIEW



FCC PART 24, SUBPART E BROADBAND PCS BASE STATION PROJECT NO.:8L0265EUS

EQUIPMENT: Outdoor Mini BTS FCC ID:NP817-4WODMINI

HORN ANTENNA VIEW



Section 7. Frequency Stability

NAME OF TEST: Frequency Stability

TESTED BY: Ron Gaytan

PARA. NO.: 24.235

DATE: February 17, 1999

Test Results:CompliesMeasurement Data:Standard Test Frequency: 1967.5 MHz
Standard Test Voltage: 27 VAC

See attached tables.

Frequency Stability (OUTDOOR)

Nominal

VOLTAGE	FREQUENCY TOLERANCE(Hz)	TIME REF .(μSec.)	RHO	POWER (dBm)
27 VDC	2.5	.33	.97	42.4

VOLTAGE VARIATION

VOLTAGE	FREQUENCY TOLERANCE (Hz)	TIME REF. (µSec.)	RHO	POWER (dBm)
85% S.T.V. (22.95 VDC)	6.0	.33	.97	42.4
100% S.T.V. (27.0 VDC)	2.5	.33	.97	42.4
115% S.T.V. (31.05 VDC)	Unable	e to take Me	asurem	ents
91% S.T.V (29.4 VDC)	-3	.5	.97	42.4

Note: Transmitter shuts down at 29.7 VDC as measured at Transmitter

TEMPERATURE VARIATION

TEMPERATURE (°C)	FREQUENCY TOLERANCE (Hz)	TIME REF. (µSec.)	RHO	POWER (dBm)
-30	-3.0	.5	.97	42.4
-20	-5.0	.29	.97	42.4
-10	-7.0	.34	.97	42.4
0	-5.0	.33	.97	42.4
10	-3.3	.32	.97	42.4
30	-3	.32	.97	42.4
40	2.6	.32	.97	42.4
50	3.0	.32	.97	42.4

Section 8. Test Equipment List

The listing below indicates the test equipment utilized for the test (s). Calibration interval on all items is typically 12 months from the calibration date shown.

KTL(ICC) ID	Nomenclature	<u>Manufacturer</u> <u>Model Number</u>	<u>Serial Number</u>	Calibration Date
C5D	D O.A.T.S. Cable Set			12/14/98
CF01	Storm Cable (7.7 meters)			04/28/98
CF30	Storm Cable (1.0 meter)	Semi Flex		01/13/99
151	Receiver (20-1000 MHz)	Rohde & Schwarz ESVS 30	843710/0001	04/01/99
156	Digital Power Meter	Hewlett Packard 436A	2512A22082	02/09/99
183	Limiter	Fischer FCC-450B-1.2	NSN	02/27/98
200	Log-Periodic Antenna (300 MHz - 1.8 GHz)	A.H. Systems SAS-200/510	121	01/25/99
228	Antenna-Biconical	ICC BCON-30300		11/17/98
243	Dipole Antenna	A.H. Systems TDS-200/335	151	03/09/99
494	Horn Antenna	A.H. Systems SAS-200/571	162	08/13/98
934	Horn Antenna (18-26.5 GHz)	EMCO 3160-09	9705-1079	CNR
946	27dB Gaing Preamp	ICC 27dB LNA	946	04/09/98
960	Power Sensor	Hewlett Packard 8482H	1926A01090	02/16/99
G1017B	Attenuator	Narda 776B-20	None	08/14/98
G1018	Attenuator	Narda 10 dB	776B-10	10/27/98
EM2200	Amplifier	Hewlett Packard 8449A	2749A00159	05/22/98

Test Equipment List (Continued):

The listing below indicates the test equipment utilized for the test (s). Calibration interval on all items is typically 12 months from the calibration date shown.

KTL(ICC) ID	<u>Nomenclature</u>	<u>Manufacturer</u> <u>Model Number</u>	<u>Serial Number</u>	Calibration Date
G2624	Spectrum Analyzer	Hewlett Packard 8563E	3551A04428	10/05/98
ETL # 017	Temperature Chamber	Thermotron		CNR
ETL # 1020	Temperature Controller	Micristar		10/14/99
ETL # 1107	Temperature Recorder	Honeywell		05/18/99
		LAB #3 OPEN AREA (INDOOR)		
		SITE D O.A.T.S. (OPEN AREA TEST SITE) 30 Meter Site		
	Turntable Flush Mounted, Metal Covered, 12 Foot	A.H. Systems (Automated)		CNR
	Antenna Mast, 5 Meter	ICC (Automated)		CNR

ANNEX A

TEST METHODOLOGIES

NAME OF TEST: RF Power Output PARA. NO.: 2.1046

Minimum Standard:	Para. No.24.232. Base stations are limited to 1640 watts peak E.I.R.P. with an antenna height up to 300 meters HAAT. In no case may the peak output power of a base station transmitter exceed 100 watts.
Method Of Measurement:	CDMA Per ANSI/I-STD-014

Method Of Measurement: CDMA Per ANSI/J-STD-014 TDMA Per ANSI/J-STD-010

Detachable Antenna:

The peak power at antenna terminals is measured using an in-line peak power meter or a spectrum analyzer.

Integral Antenna:

If the antenna is not detachable from the circuit then the Peak Power Output is derived from the peak radiated field strength of the fundamental emission by using the plane wave relation GP/4 π R² = E²/120 π and proceeding as follows:

$$P = \frac{E^2 R^2}{30G} = \frac{E^2 3^2}{30G}$$

where,

P = the equivalent isotropic radiated power in watts

E = the maximum measured field strength in V/m

R = the measurement range (3 meters)

G = the numeric gain of the transmit antenna in relation to an isotropic radiator

NAME OF TEST: Occupied Bandwidth

PARA. NO.: 2.1049

Minimum Standard: Para. No. 24.238(b). 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 emissions are attenuated at least 26 dB.

Method Of Measurement:

CDMA Per ANSI/J-STD-014

Spectrum analyzer settings: RBW: 30 kHz VBW: ≥ RBW Span: 5 MHz Sweep: Auto

GSM Per ANSI/J-STD-010

RBW: 3 kHz VBW: ≥ RBW Span: 2 MHz Sweep: Auto

NADC Per IS-136

RBW: 1 kHz VBW: ≥ RBW Span: 1 MHz Sweep: Auto

NAME OF TEST: Spurious Emission at Antenna Terminals PARA. NO.: 2.1051

Minimum Standard:Para. No.24.238(a). On any frequency outside a licensee's
frequency block, the power of any emission shall be attenuated
below the transmitter power by at least 43 + 10 log (P) dB.

Method Of Measurement:

Spectrum analyzer settings:

CDMA Per ANSI/J-STD-014

RBW: 1 MHz (> 1 MHz from Band Edge) RBW: 30 kHz (< 1MHz from Band Edge) VBW: ≥ RBW Sweep: Auto Video Avg: 6 Sweeps

GSM Per ANSI/J-STD-010

RBW: 1 MHz (> 1 MHz from Band Edge) RBW: 3 kHz (< 1 MHz from Band Edge) VBW: ≥ RBW Sweep: Auto Video Avg: Disabled

NADC Per IS-136

RBW: 1 MHz (> 1 MHz from Band Edge) RBW: 3 kHz (< 1 MHz from Band Edge) VBW: ≥ RBW Sweep: Auto Video Avg: Disabled

To demonstrate compliance at band edges the frequency of the input signal is set to the lowest and highest assigned channel and the center frequency of the spectrum analyzer is set to the upper and lower edges of the appropriate frequency block.

NAME OF TEST: Field Strength of Spurious Radiation PARA. NO.: 2.1053

Minimum Standard:Para. No.24.238(a). On any frequency outside a licensee's
frequency block, the power of any emission shall be attenuated
below the transmitter power by at least 43 + 10 log (P) dB.

Calculation Of Field Strength Limit

An example of attenuation requirement of 43 + 10 Log P is equivalent to $-13 \text{ dBm} (5 \times 10^{-5} \text{ Watts})$ at the antenna terminal. We determine the field strength limit by using the plane wave relation.

 $GP/4\pi R^2 = E^2/120\pi$

For emissions ≤ 1 GHz:

G = 1.64 (Dipole Gain) $P = 10^{-5}$ Watts (Maximum spurious output power) R = 3m (Measurement Distance)

$$E = \frac{\sqrt{30GP}}{R}$$
$$E = \frac{\sqrt{30 \times 1.64 \times 5 \times 10^{-5}}}{3} = 0.016533 \text{ V} / \text{m} = 84.4 \text{ dB}\mu\text{V} / \text{m}$$

For emissions > 1 GHz:

G = 1 (Isotropic Gain) $P = 1 \times 10^{-5}$ Watts (Maximum spurious output power) R = 3m (Measurement Distance)

$$E = 84.4 - 20 \log \sqrt{1.64} = 82.3 dB \mu V / m@3m$$

NAME OF TEST: Frequency Stability PARA. NO.: 2.1055

- **Minimum Standard:** Para. No. 24.235. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.
- Method Of Measurement: CDMA Per ANSI/J-STD-014 TDMA Per ANSI/J-STD-010 NADC Per IS-136

Frequency Stability With Voltage Variation

The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. With the voltage input to the E.U.T. set to 85% S.T.V., the frequency is measured in 30 second intervals for a period of 5 minutes. This procedure is repeated at 100% S.T.V. and 115% S.T.V.

Frequency Stability With Temperature Variation

The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

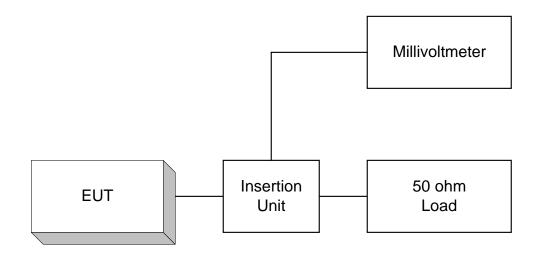
FCC PART 24, SUBPART E BROADBAND PCS BASE STATION PROJECT NO.: 8LO265EUS ANNEX B

EQUIPMENT: Outdoor Mini BTS FCC ID: NP817-4WODMINI

ANNEX B

TEST DIAGRAMS

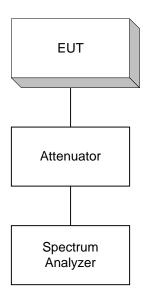
Para. No. 2.1046 - R.F. Power Output



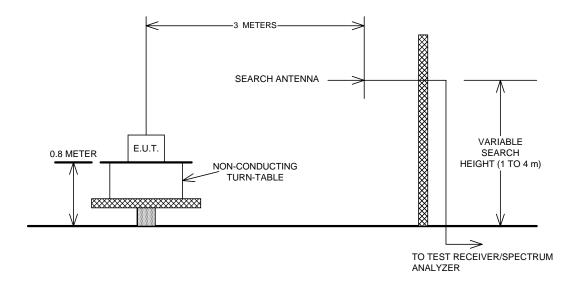
Para. No. 2.1049 - Occupied Bandwidth



Para. No. 2.1051 Spurious Emissions at Antenna Terminals



Para. No. 2.1053 - Field Strength of Spurious Radiation



Para. No. 2.1055 - Frequency Stability

