KTL Test Report No.:	0L0471RUS2
Applicant:	Samsung Telecommunications America 1130 Arapaho Road Richardson, Texas 75081
Equipment Under Test:	Indoor BTS
FCC ID:	NP8SCBS-419L
In Accordance With:	**FCC Part 24, Subpart E** Broadband PCS Base Station Transmitter
Tested By:	KTL Dallas Inc. 802 N. Kealy Lewisville, Texas 75057-3136
Authorized By:	Tom Tidwell, Wireless Group Manager
Date:	6/11/03
Total Number of Pages:	36

Table of Contents

Section 1. Summary of Test Results

Manufacturer: Samsung Telecommunications

Model No.: SCBS-419L

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.

☒ New Submission ☒ Production Unit

☐ Class II Permissive Change ☐ Pre-Production Unit

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".

NVLAP LAB CODE: 100426-0

Summary Of Test Data

RF Power Output	24.232	100W	18W	Complies
Occupied Bandwidth (CDMA)	24.238	Graph	Graph	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	> -13 dBm	Complies
Field Strength of Spurious Emissions	24.238(a)	-13 dBm E.R.P.	< -39 dBm	Complies
Frequency Stability	24.235	Must remain within the authorized band	Maximum freq. error -106 Hz	Complies

Footnotes:

1. The E.U.T. is CDMA only.

Measurement uncertainty is expressed to a confidence level of 95%.

Section 2. General Equipment Specification

Supply Voltage Input:		+26 Vdc
Frequency Bands:	**TX**	☒ Block A : 1930 – 1945 MHz ☒ Block D : 1945 – 1950 MHz ☒ Block B : 1950 – 1965 MHz ☒ Block E : 1965 – 1970 MHz ☒ Block F : 1970 – 1975 MHz ☒ Block C : 1975 – 1990 MHz
Frequency Bands:	**RX**	☒ Block A : 1850 – 1865 MHz ☒ Block B : 1865 – 1870 MHz ☒ Block C : 1870 – 1885 MHz ☒ Block D : 1885 – 1890 MHz ☒ Block E : 1890 – 1895 MHz ☒ Block F : 1895 – 1910 MHz
		CDMA (1M25G7W) ☒ **GSM (200KGXW)** ☐ **NADC (40K0DXW)** ☐
Maximum No. of Carriers:		3
Output Impedance:		50 ohms
		Per channel: 20 W Total: 60 W
		Software ☒ **Duplexer** ☒ **Fullband** ☐

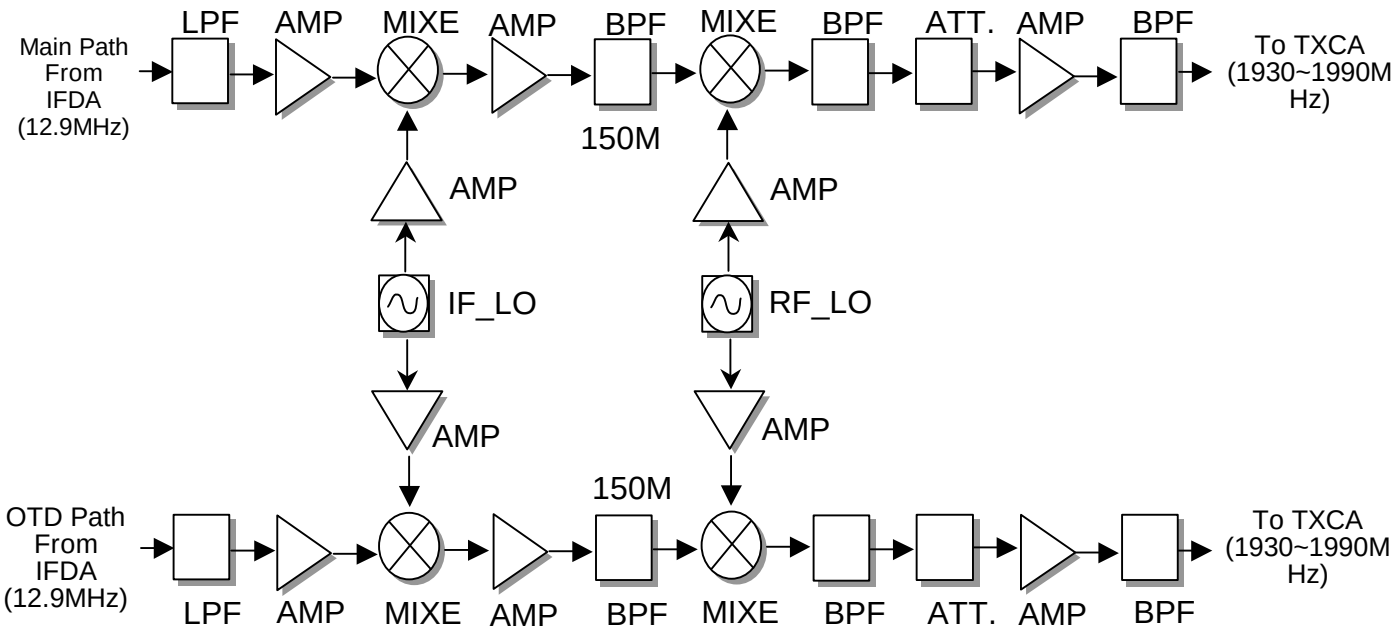
Description of Modifications For Class II Permissive Change

System Description

The SCBS-419L BTS is a PCS band base station transceiver for use in CDMA wireless systems. The modulation used is QPSK and the access protocol is CDMA IS-98. The BTS can transmit up to 3 carriers with a nominal rf power output level of 20W/carrier. The maximum total rf output power is, therefore, 60 W.

The SCBS-419L is housed in an indoor type enclosure but is connected to an antenna mounted on a permanent outdoor structure.

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: David Light	DATE: 12/14/00

Test Results: Complies.

Measurement Data:

Modulation Type	Measured Output Power (dBm)	External Cable Loss (dB)	Corrected Output Power (dBm)	Rated Output Power (dBm)	Measured/Rated Output Power (dB)
CDMA	+41.75	0.8	+42.55	+43.0	-0.45
GSM	N/A	N/A		N/A	N/A
NADC	N/A	N/A		N/A	N/A

Test Data - RF Power Output

Test Plot: RF POWER OUT

Page 1 of 1

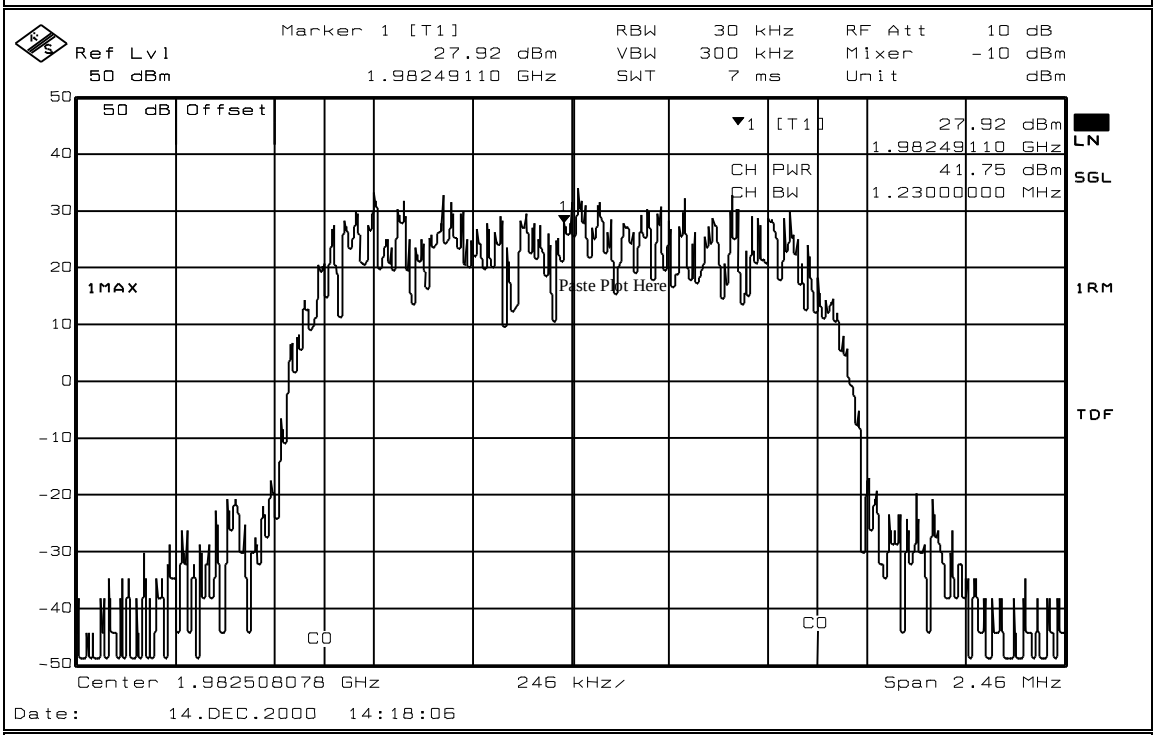
Job No.:	0L0471R	Date:	12/14/00
Specification:	PART 24	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	50
E.U.T.:	INDOOR BTS		
Configuration:	TRANSMIT ONE CDMA CHANNEL - FULL POWER - C BLOCK		
Serial Number:	NONE		
Location:	SAMSUNG (IN SITU)	RBW:	30 kHz
Detector Type:	Rms	VBW:	300 kHz

Test Equipment Used

Antenna:	#N/A	Directional Coupler:	#N/A
Pre-Amp:	#N/A	Cable #1:	#N/A
Filter:	#N/A	Cable #2:	#N/A
Receiver:	1036	Cable #3:	#N/A
Attenuator #1	1471	Cable #4:	#N/A
Attenuator #2:	#N/A	Mixer:	#N/A

Additional equipment used: 1048 BIRD ATTENUATOR MODEL 1000-WA-FFN-30 (PROPERTY OF SAMSUNG)

Measurement Uncertainty: #N/A



Notes:

NAME OF TEST: Occupied Bandwidth (CDMA)	PARA. NO.: 2.1049
TESTED BY: David Light	DATE: 12/14/00

Test Results: Complies.

Test Data: See attached plot(s).

Test Data - Occupied Bandwidth (CDMA)

Test Plot: RF POWER OUT

Page 1 of 1

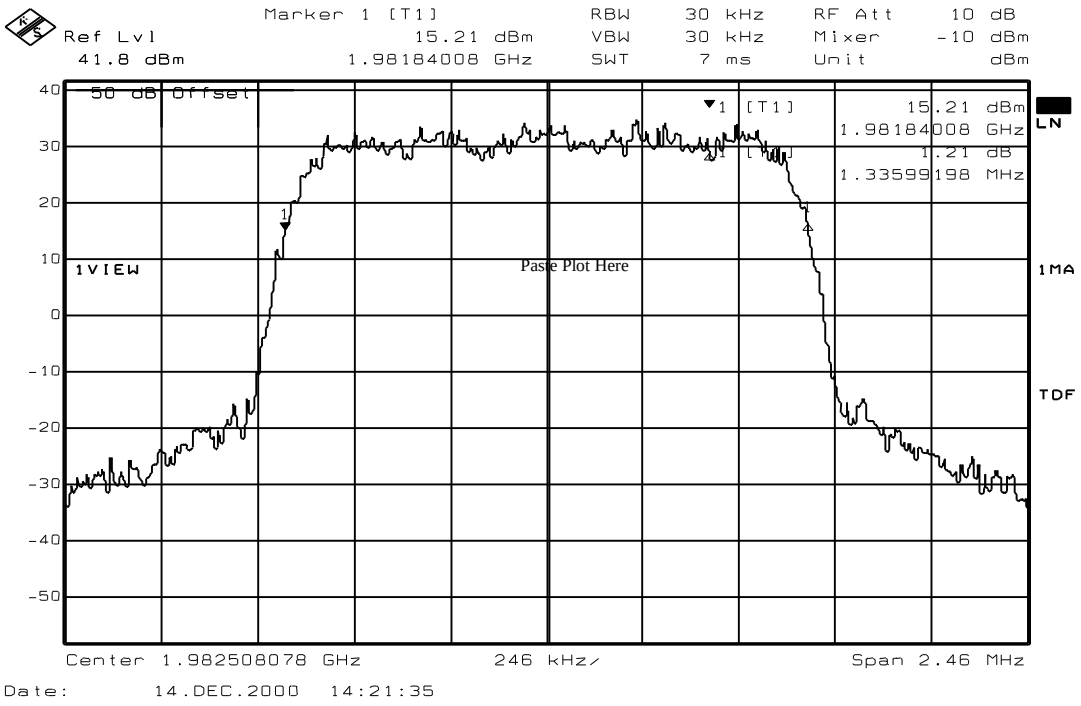
Job No.:	0L0471R	Date: 12/14/00	
Specification:	PART 24	Temperature(°C): 22	
Tested By:	David Light	Relative Humidity(%) 50	
E.U.T.:	INDOOR BTS		
Configuration:	TRANSMIT ONE CDMA CHANNEL - FULL POWER - C BLOCK		
Serial Number:	NONE		
Location:	SAMSUNG (IN SITU)	RBW: 30 kHz	
Detector Type:	Peak	VBW: 30 kHz	

Test Equipment Used

Antenna:	#N/A	Directional Coupler:	#N/A
Pre-Amp:	#N/A	Cable #1:	#N/A
Filter:	#N/A	Cable #2:	#N/A
Receiver:	1036	Cable #3:	#N/A
Attenuator #1	1471	Cable #4:	#N/A
Attenuator #2:	#N/A	Mixer:	#N/A

Additional equipment used: 1048 BIRD ATTENUATOR MODEL 1000-WA-FFN-30 (PROPERTY OF SAMSUNG)

Measurement Uncertainty: #N/A



Notes:

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

Test Results: Complies.

Test Data: See attached plots

Not Applicable

Equipment Used:

Measurement Uncertainty: +/- 1.6 dB

Temperature: °C

Relative Humidity: %

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

Test Results: Complies.

Test Data: See attached plots.

Equipment Used:

Not Applicable

Measurement Uncertainty: +/- 1.6 dB

Temperature: °C

Relative Humidity: %

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.1051
TESTED BY: David Light	DATE: 12/14/00

Test Results: Complies.

Test Data:

See attached plots

Test Data - Spurious Emissions at Antenna Terminals

Test Plot: ANTENNA PORT SPURIOUS

Page 1 of 2

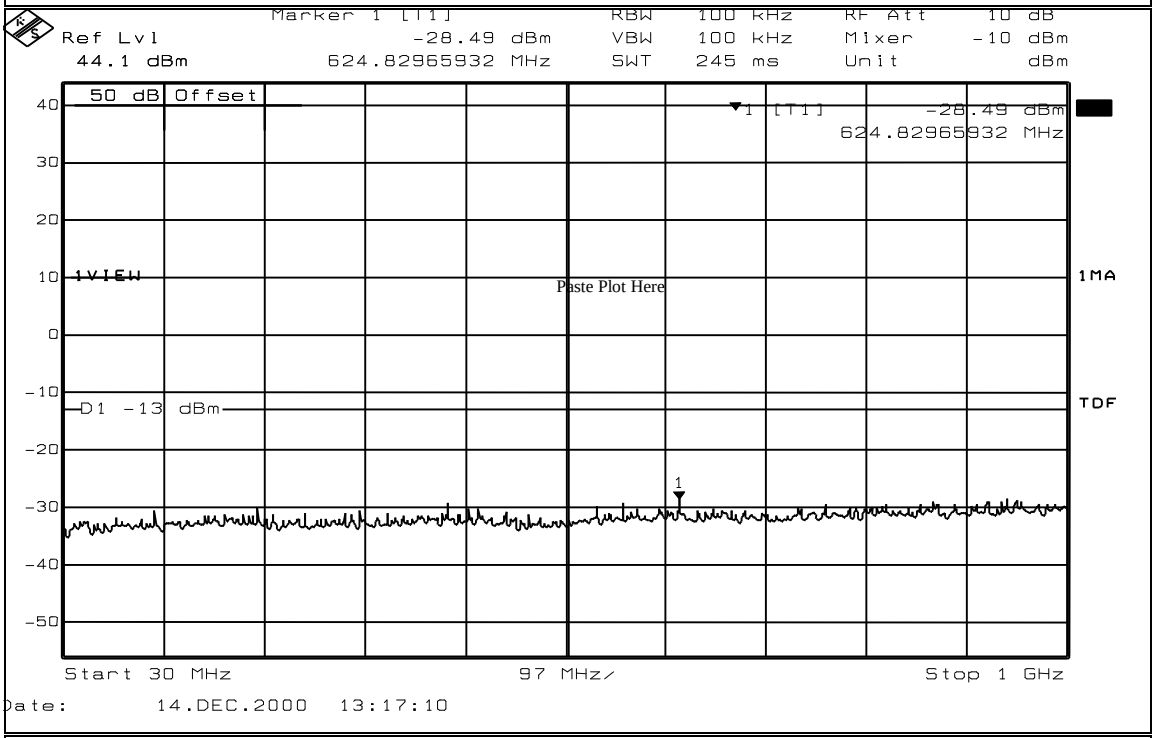
Job No.:	0L0471R	Date: 12/14/00	
Specification:	PART 24	Temperature(°C): 22	
Tested By:	David Light	Relative Humidity(%) 50	
E.U.T.:	INDOOR BTS		
Configuration:	TRANSMIT ONE CDMA CHANNEL - FULL POWER - C BLOCK		
Serial Number:	NONE		
Location:	SAMSUNG (IN SITU)	RBW: 100 kHz < 1 GHz, 1 MHz > 1 GHz	
Detector Type:	Peak	VBW: 100 kHz < 1 GHz, 1 MHz > 1 GHz	

Test Equipment Used

Antenna:	#N/A	Directional Coupler:	#N/A
Pre-Amp:	#N/A	Cable #1:	#N/A
Filter:	#N/A	Cable #2:	#N/A
Receiver:	1036	Cable #3:	#N/A
Attenuator #1	1471	Cable #4:	#N/A
Attenuator #2:	#N/A	Mixer:	#N/A

Additional equipment used: 1048 BIRD ATTENUATOR MODEL 1000-WA-FFN-30 (PROPERTY OF SAMSUNG)

Measurement Uncertainty: #N/A



Notes:

Test Data - Spurious Emissions at Antenna Terminals

Test Plot: ANTENNA PORT SPURIOUS

Page 2 of 2

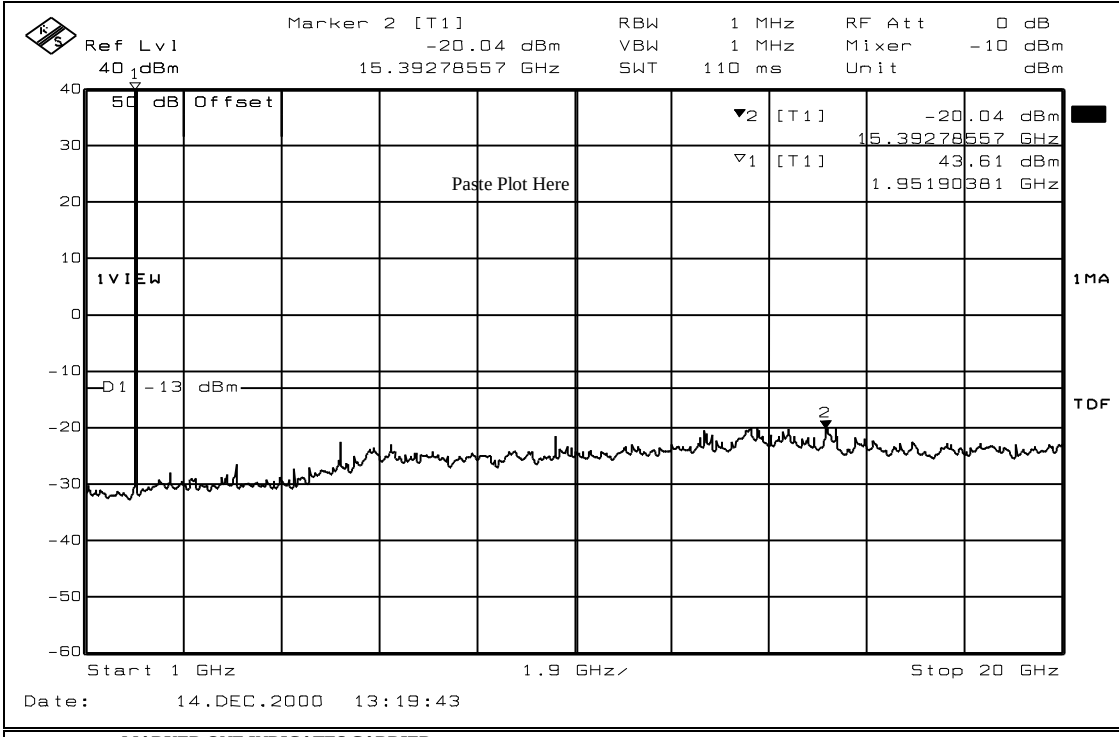
Job No.: 0L0471R Date: 12/14/00

Specification: PART 24 Temperature(°C): 22

Tested By: David Light Relative Humidity(%) 50

E.U.T.: INDOOR BTS

Configuration: TRANSMIT ONE CDMA CHANNEL - FULL POWER - C BLOCK



Notes:

MARKER ONE INDICATES CARRIER

MARKER TWO INDICATES HIGHEST SPURIOUS EMISSION

Test Data - Spurious Emissions at Antenna Terminals

Test Plot: LOWER BANDEDGE

Page 1 of 1

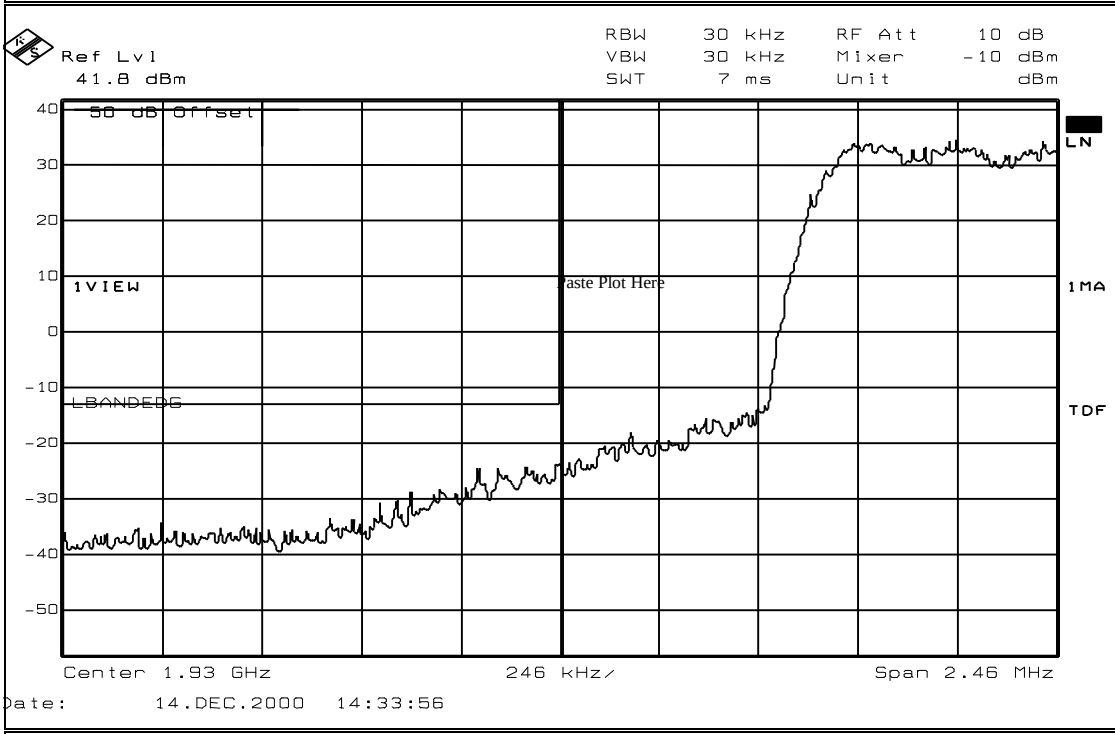
Job No.:	0L0471R	Date: 12/14/00	
Specification:	PART 24	Temperature(°C): 22	
Tested By:	David Light	Relative Humidity(%) 50	
E.U.T.:	INDOOR BTS		
Configuration:	TRANSMIT ONE CDMA CHANNEL - FULL POWER - CHANNEL 25		
Serial Number:	NONE		
Location:	SAMSUNG (IN SITU)	RBW: 30 kHz	
Detector Type:	Peak	VBW: 30 kHz	

Test Equipment Used

Antenna:	#N/A	Directional Coupler:	#N/A
Pre-Amp:	#N/A	Cable #1:	#N/A
Filter:	#N/A	Cable #2:	#N/A
Receiver:	1036	Cable #3:	#N/A
Attenuator #1	1471	Cable #4:	#N/A
Attenuator #2:	#N/A	Mixer:	#N/A

Additional equipment used: 1048 BIRD ATTENUATOR MODEL 1000-WA-FFN-30 (PROPERTY OF SAMSUNG)

Measurement Uncertainty: #N/A



Notes:

Test Data - Spurious Emissions at Antenna Terminals

Test Plot: UPPER BANDEDGE

Page 1 of 1

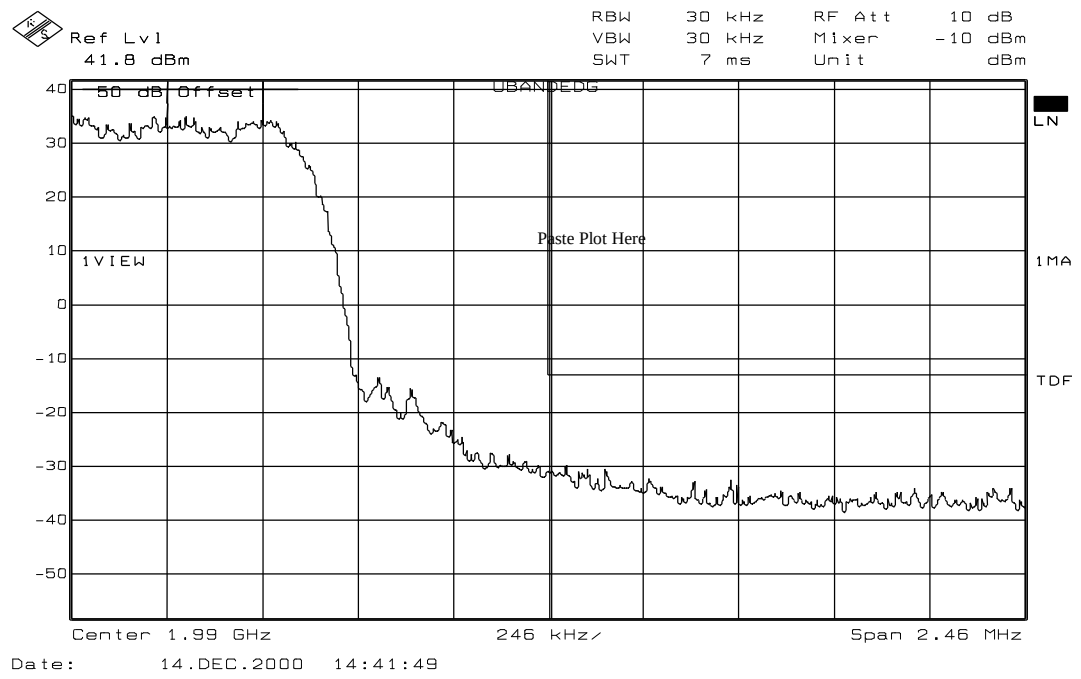
Job No.:	0L0471R	Date: 12/14/00	
Specification:	PART 24	Temperature(°C): 22	
Tested By:	David Light	Relative Humidity(%) 50	
E.U.T.:	INDOOR BTS		
Configuration:	TRANSMIT ONE CDMA CHANNEL - FULL POWER - CHANNEL 1175		
Serial Number:	NONE		
Location:	SAMSUNG (IN SITU)	RBW: 30 kHz	
Detector Type:	Peak	VBW: 30 kHz	

Test Equipment Used

Antenna:	#N/A	Directional Coupler:	#N/A
Pre-Amp:	#N/A	Cable #1:	#N/A
Filter:	#N/A	Cable #2:	#N/A
Receiver:	1036	Cable #3:	#N/A
Attenuator #1	1471	Cable #4:	#N/A
Attenuator #2:	#N/A	Mixer:	#N/A

Additional equipment used: 1048 BIRD ATTENUATOR MODEL 1000-WA-FFN-30 (PROPERTY OF SAMSUNG)

Measurement Uncertainty: #N/A



Notes:

Test Data - Spurious Emissions at Antenna Terminals

Test Plot: INTERMODULATION CHARACTERISTICS

Page 1 of 1

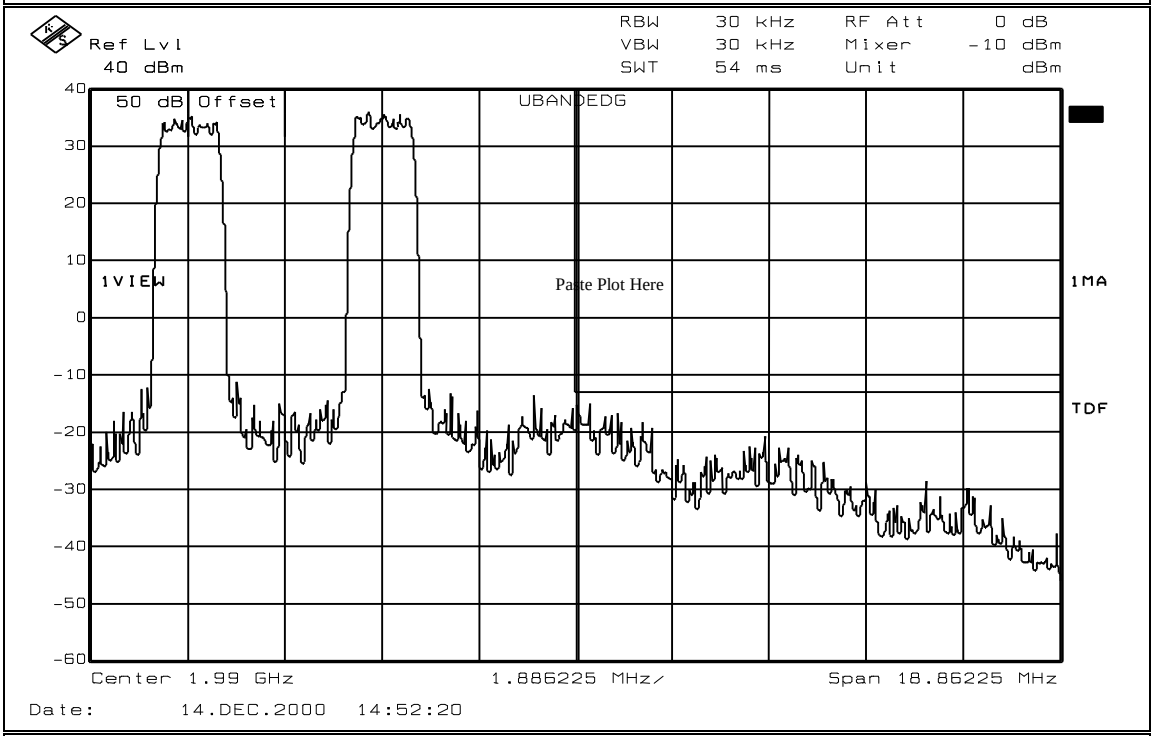
Job No.:	0L0471R	Date: 12/14/00	
Specification:	PART 24	Temperature(°C): 22	
Tested By:	David Light	Relative Humidity(%) 50	
E.U.T.:	INDOOR BTS		
Configuration:	TRANSMIT TWO CDMA CHANNELS - FULL POWER - C BLOCK		
Serial Number:	NONE		
Location:	SAMSUNG (IN SITU)	RBW: 30 kHz	
Detector Type:	Peak	VBW: 30 kHz	

Test Equipment Used

Antenna:	#N/A	Directional Coupler:	#N/A
Pre-Amp:	#N/A	Cable #1:	#N/A
Filter:	#N/A	Cable #2:	#N/A
Receiver:	1036	Cable #3:	#N/A
Attenuator #1	1471	Cable #4:	#N/A
Attenuator #2:	#N/A	Mixer:	#N/A

Additional equipment used: 1048 BIRD ATTENUATOR MODEL 1000-WA-FFN-30 (PROPERTY OF SAMSUNG)

Measurement Uncertainty: #N/A



Notes:

Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.1051
TESTED BY: David Light	DATE: 12/20/00

Test Results: Complies.

Test Data: See attached table.

Test Data – Field Strength of Spurious Emissions

Field Strength of Spurious Emissions

Page 1 of 1 Complete X
Job No.: 0L0471R Date: 12/20/00 Preliminary
Specification: Part 24 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 50
E.U.T.: 20 PCS Base Station
Configuration: Transmit Channel 600 - Full Power - Into 50 ohm Load
Sample Number: 1
Location: AC 1 RBW: 1 MHz Measurement Distance 3 m
Detector Type: Peak VBW: 1 MHz

Test Equipment Used

Antenna:	993	Directional Coupler:	#N/A
Pre-Amp:	1016	Cable #1:	#N/A
Filter:	#N/A	Cable #2:	1483
Receiver:	1283	Cable #3:	#N/A
Attenuator #1	#N/A	Cable #4:	#N/A
Attenuator #2:	#N/A	Mixer:	#N/A

Additional equipment used:
Measurement Uncertainty: +/-3.6 dB

Frequency (GHz)	Meter Reading (dBm)	Antenna Factor (dB)	Cable Loss (dB)	Pre-Amp Gain (dB)	Conversion Factor	Corrected Reading (dBuV/m)	ERP (mW)	ERP (dBm)	Polarity	Comments
1.960	-4.2	28.5	2.7	33.3	107.0	100.7	3.52	5.5	H	Carrier
3.920	-75.3	31.6	3.9	33.4	107.0	33.8	0.00	-61.4	H	NF=Noise Floor
5.880	-69.1	34.4	5.2	32.0	107.0	45.5	0.00	-49.7	H	NF
7.840	-72.1	37.8	5.8	33.4	107.0	45.1	0.00	-50.1	H	NF
9.800	-73.5	37.2	7.1	36.1	107.0	41.7	0.00	-53.5	H	NF
11.760	-72.4	39.6	8.0	36.6	107.0	45.6	0.00	-49.6	H	NF
13.720	-68.9	43.0	9.4	34.2	107.0	56.3	0.00	-38.9	H	NF
1.960	-3.3	28.5	2.7	33.3	107.0	101.6	4.34	6.4	V	Carrier
3.920	-75.3	31.6	3.9	33.4	107.0	33.8	0.00	-61.4	V	NF
5.880	-69.1	34.4	5.2	32.0	107.0	45.5	0.00	-49.7	V	NF
7.840	-72.1	37.8	5.8	33.4	107.0	45.1	0.00	-50.1	V	NF
9.800	-73.5	37.2	7.1	36.1	107.0	41.7	0.00	-53.5	V	NF
11.760	-72.4	39.6	8.0	36.6	107.0	45.6	0.00	-49.6	V	NF
13.720	-68.9	43.0	9.4	34.2	107.0	56.3	0.00	-38.9	V	NF
	Note: The carrier level was measured for reference only. The transmitter was configured to operate full power into a 50 ohm load.									

Notes: **Scanned to 10th harmonic of carrier frequency**

Photographs of Test Setup

FRONT VIEW

Photographs of Test Setup

REAR VIEW

Section 7. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 2.1055
TESTED BY: David Light	DATE: 12/19/00

Test Results: Complies

Measurement Data: Standard Test Frequency: 1960 MHz
Standard Test Voltage: 26 Vdc

Test data - Frequency Stability

Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Frequency Stability

Client: Samsung W.O.# 0L0471R

EUT: 20 Watt Base Station S/N: None

Date: 12/19/00 Tech: D. Light

KTL Test Equipment: Spectrum analyzer #1036

ETL Equipment: Temperature chamber controller (asset #1020) cal'd 10/13/00 - Due 10/13/01
Chart recorder (asset #1225) cal'd 8/30/00 due 2/3/01

Temperature	Voltage	Rho	Frequency Error
20 °C	+26 VDC (Nominal)	0.9920	-62.99 Hz
20 °C	+22.1 VDC	0.9904	-70.02 Hz
20 °C	+29.9 VDC	0.9906	-80.86
-30° C	+26 VDC	0.9905	+19.6 Hz
-20° C	+26 VDC	0.9893	+69.42 Hz
-10° C	+26 VDC	0.9902	-74.41 Hz
0° C	+26 VDC	0.9906	-70.8 Hz
+10° C	+26 VDC	0.9900	-106.05 Hz
+30° C	+26 VDC	0.9904	-87.4 Hz
+40° C	+26 VDC	0.9906	-80.16 Hz
+50° C	+26 VDC	0.9903	-90.8 Hz

Temperature chamber controller - Thermatron
Chart recorder - Eclipse Controls

Section 8. Test Equipment List

KTL ID	Description	Manufacturer Model Number	Serial Number	Calibration Date
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	06/14/99 2 Yr. Cycle
1471	10 dB Attenuator	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU
1048	50 OHM LOAD	NARDA 27470	254	02/15/00
993	Horn antenna	A.H. Systems SAS-200/571	XXX	07/16/99 2 Yr. Cycle
1016	AMPLIFIER	HEWLETT PACKARD 8449A	2749A00159	05/24/00
1283	Spectrum analyzer display	Hewlett Packard 85662A	1811A00223	10/05/00
1483	Cable 4m	Storm PR90-010-144	N/A	05/23/00
	Temperature Chamber Controller	ETL	1020	10/13/00
	Chart Recorder	ETL	1225	8/30/00
	30 dB Power Attenuator	Bird 1000-WA-FFN-30	Property of Samsung	CBU

ANNEX A - TEST DETAILS

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/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 $GP/4\pi R^2 = E^2/120\pi$ 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: 1 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 dBm (5×10^{-5} 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)

$$E = \frac{\sqrt{30GP}}{R}$$

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

For emissions > 1 GHz:

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

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

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

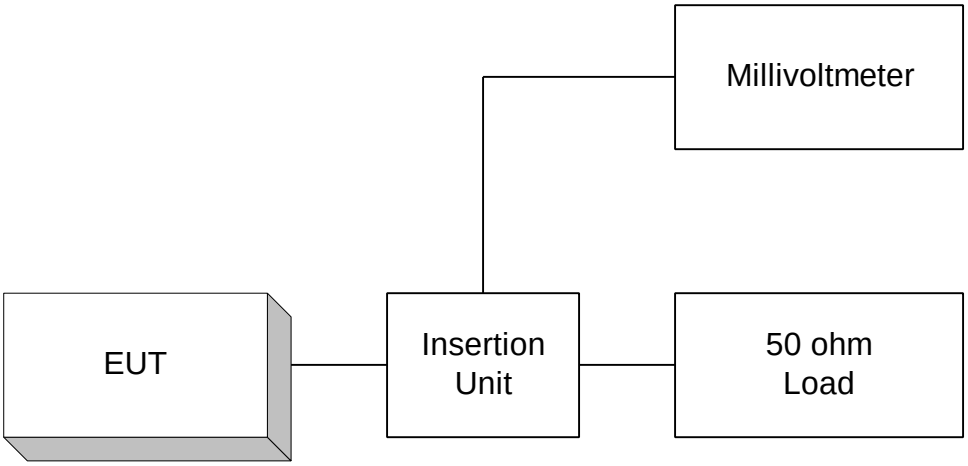
The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. With the voltage input to the E.U.T. set to 85% S.T.V., the frequency is measured in 30 second intervals for a period of 5 minutes. This procedure is repeated at 100% S.T.V. and 115%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

Frequency Stability With Temperature Variation

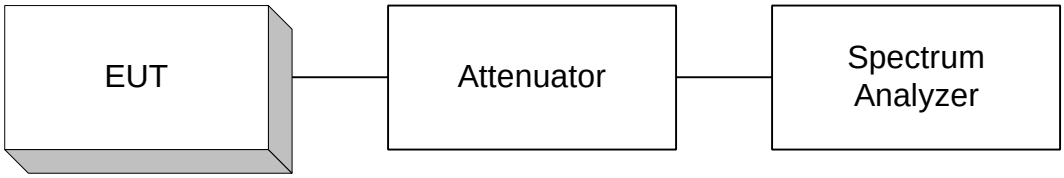
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

ANNEX B - TEST DIAGRAMS

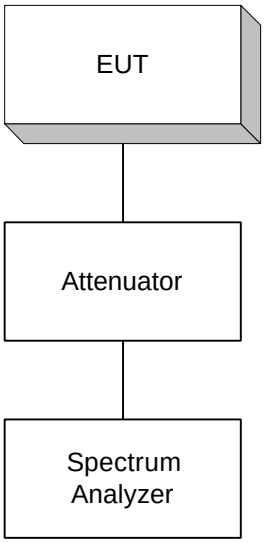
Para. No. 2.985 - R.F. Power Output



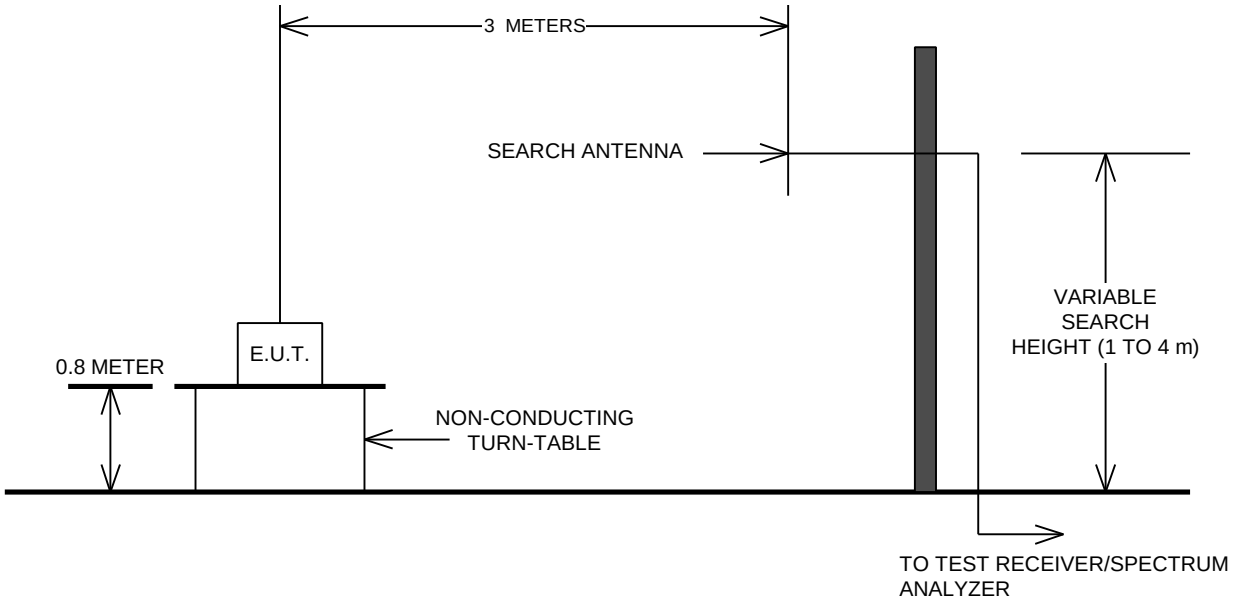
Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability