KTL

[illegible] 8L021[illegible]

[illegible] Sam[illegible]unications [illegible]
11[illegible]oad
R[illegible]
[illegible]

[illegible] Version Hardware
[illegible]

Equipment Under Test
(E.U.T.)

FCC ID: [illegible]

In Accordance With: [illegible] Part 24, Subpart E
[illegible] Base Station

Tested By: KTL Dallas Inc.
802 N. Kealy
Lewisville, TX 75057-3136
USA

Authorized By: W. Waterhouse, RF Engineering Lab Manager

10th November 1998

test report

Table of Contents

Table of Contents, continued

Section 1. Summary of Test Results

Manufacturer: Samsung Telecommunications America

Model No.: 5 Watt PRU with P4 Version Hardware

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

P	C	B

Equipment Code (Licensed Part 24 Transmitter)

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

NVLAP LAB CODE: 100351-0

TESTED BY: _____ DATE: 4 Nov. 1998
Tom Tidwell, Wireless Group Manager

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	MEAS.	RESULT
RF Power Output	24.232	100W	5.6W	Complies
Occupied Bandwidth (CDMA)	24.238	-45 dBc	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	-14 dBm	Complies
Field Strength of Spurious Emissions	24.238(a)	-13 dBm E.I.R.P.	-33.9 dBm E.I.R.P	Complies
Frequency Stability	24.235	± 0.05 ppm	0.04 ppm	Complies

Note: Waveform Quality was measured under voltage and temperature extremes in order to characterize the modulation characteristics as per FCC Part 2.987. This data is reported with Frequency Stability data.

Footnotes For N/A's:

Test Conditions:

LAB: Temperature: 23 °C
Humidity: 29.8 %

OATS: Temperature: 22 °C
Humidity: 42 %

Section 2. General Equipment Specification

Supply Voltage Input:	120 VAC to PMU
Frequency Range(s):	Blocks A,D, B,E,C & F
Type of Modulation and Designator:	**CDMA (F9W)** ☒ **GSM (GXW)** ☐ **NADC (DXW)** ☐
Emission & Bandwidth Designator:	1M25F9W
Output Impedance:	50 ohm
RF Output (Rated):	5 Watts (+37.0 dBm)
Band Selection:	**Software** ☒ **Duplexer Change** ☐ **Fullband Coverage** ☒

Description of Modifications For Class II Permissive Change

NOT APPLICABLE

Modifications Made During Testing

NOT APPLICABLE

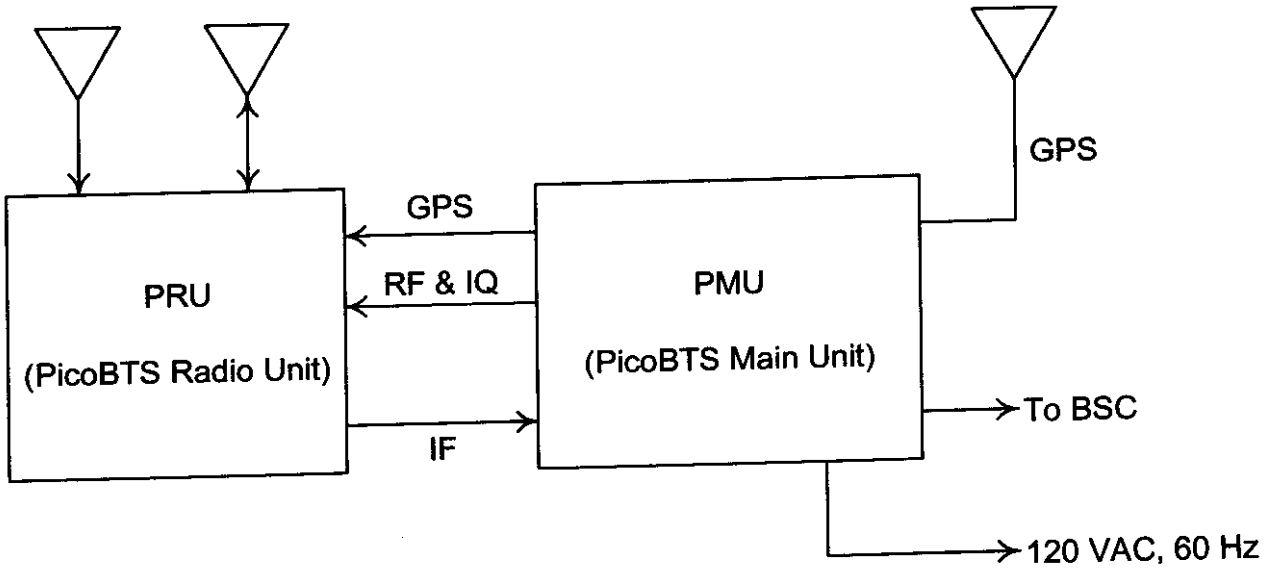
System Description

The PicoBTS (Base Transceiver Subsystem) identifies the complete system which consists of Tx/Rx antenna, PMU (PicoBTS Main Unit) and PRU (PicoBTS Radio Unit).

The PMU controls the overall operation of the system, provides frequency and time references via an internal GPS receiver and serves as the interface between the PRU and the BSC (Base Station Controller).

The PRU is the radio transceiver unit. Maximum power output is 5 watts. This version of the PRU is for single channel operation only.

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.985
TESTED BY: Tom Tidwell	DATE: October 19, 1998

Test Results: Complies.

Measurement Data:

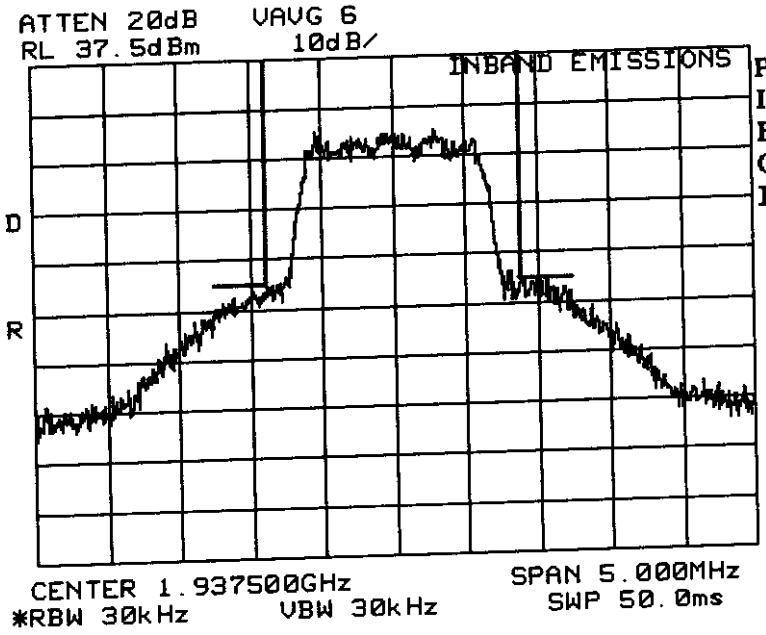
Modulation Type	Measured Output Power (dBm)	Rated Output Power (w)
CDMA	+37.5	+37.0
GSM	N/A	N/A
NADC	N/A	N/A

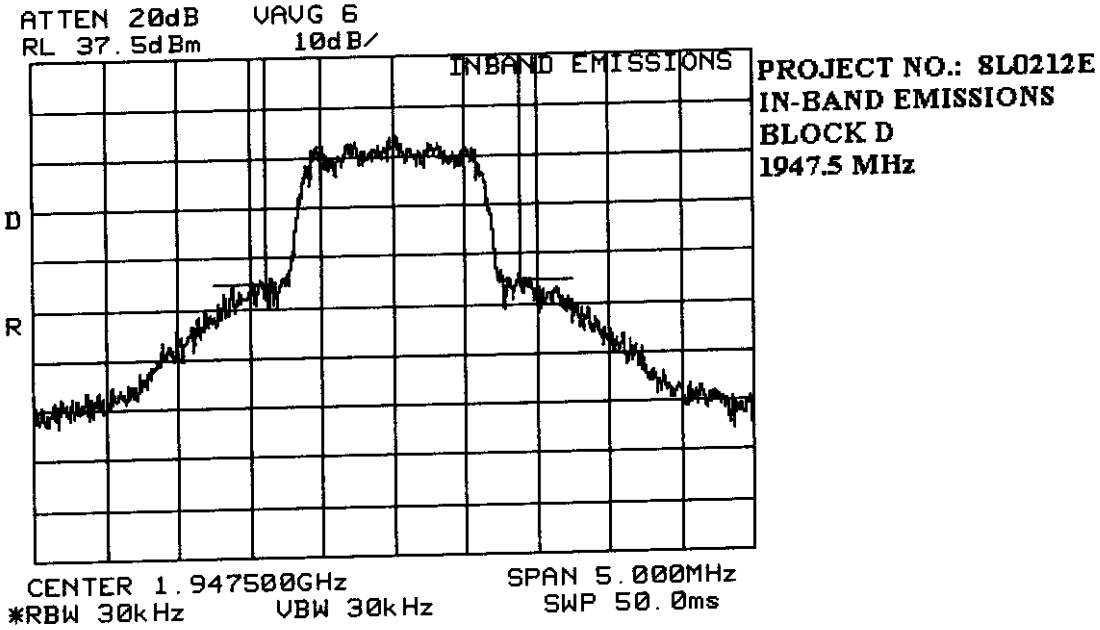
Section 4. Occupied Bandwidth

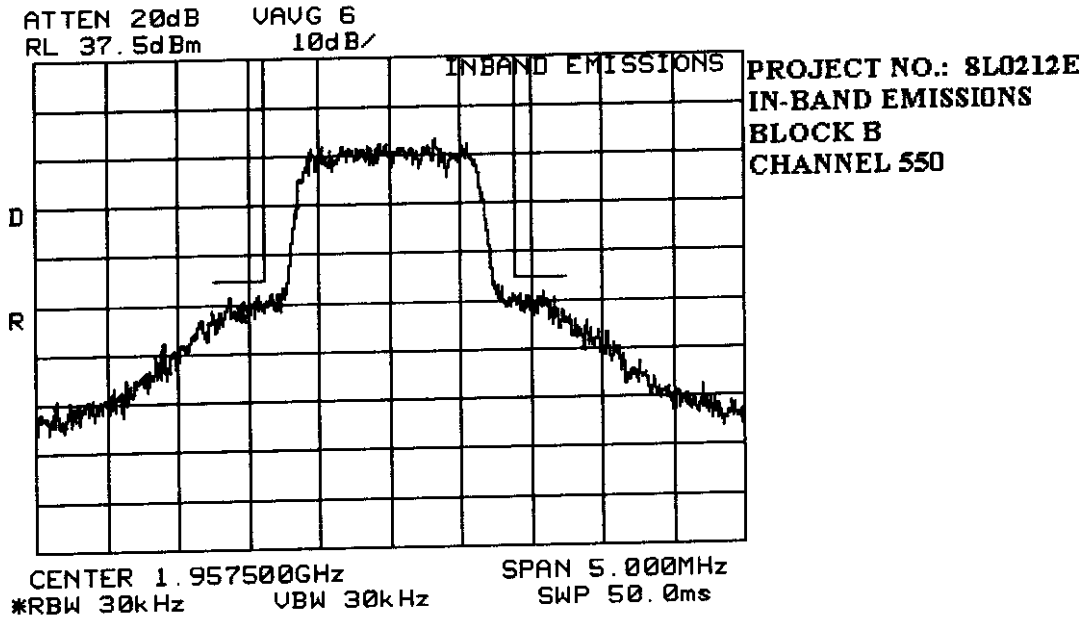
NAME OF TEST: Occupied Bandwidth (CDMA)	PARA. NO.: 2.917(c)
TESTED BY: Tom Tidwell	DATE: October 19, 1998

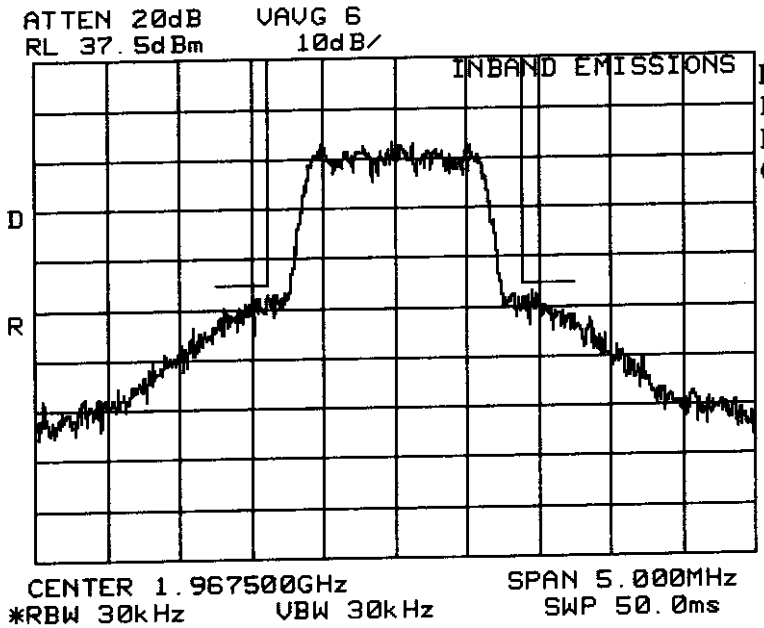
Test Results: Complies.

Test Data: See attached graph(s).

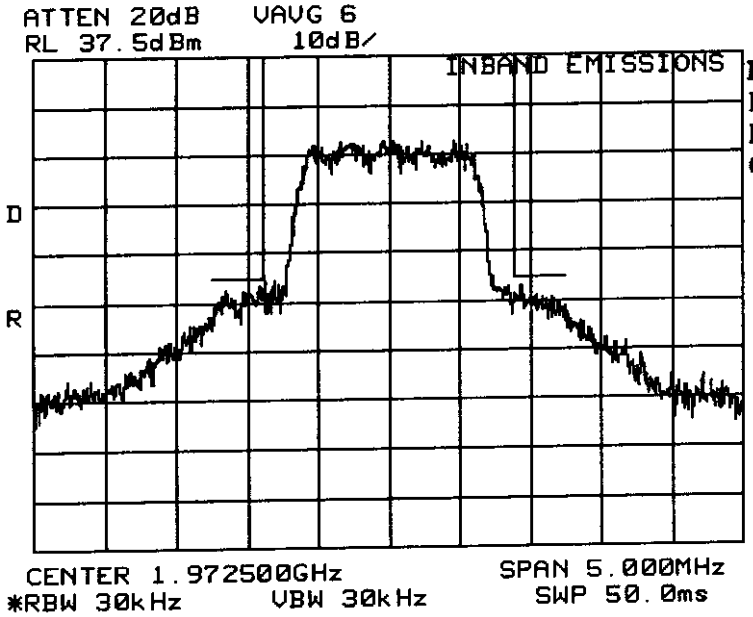

ATTEN 20dB
RL 37.5dBm
VAVG 6
10dB/
INBAND EMISSIONS
D
R
CENTER 1.937500GHz
*RBW 30kHz
VBW 30kHz
SPAN 5.000MHz
SWP 50.0ms
PROJECT NO.: 8L0212E
IN-BAND EMISSIONS
BLOCK A
CHANNEL 150
1937.5 MHz


ATTEN 20dB
RL 37.5dBm
VAVG 6
10dB/
INBAND EMISSIONS
D
R
CENTER 1.947500GHz
*RBW 30kHz
VBW 30kHz
SPAN 5.000MHz
SWP 50.0ms
PROJECT NO.: 8L0212E
IN-BAND EMISSIONS
BLOCK D
1947.5 MHz

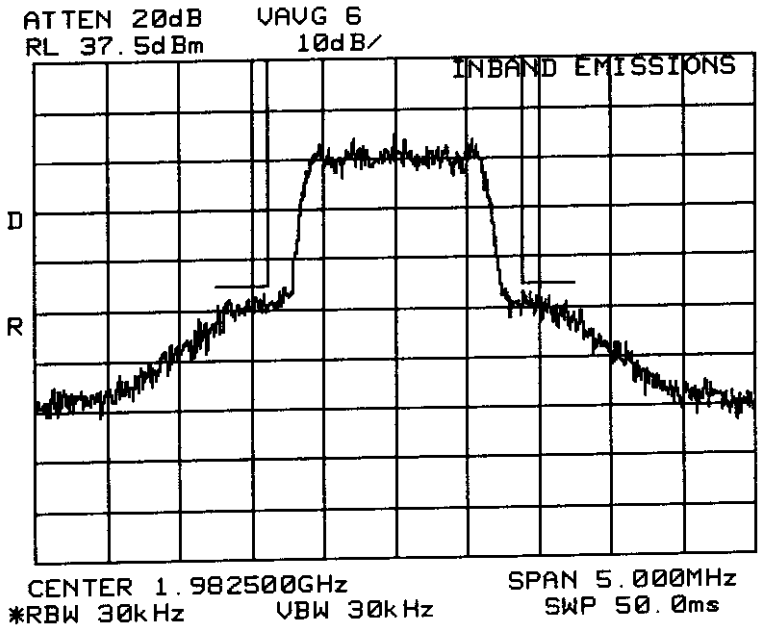

ATTEN 20dB
RL 37.5dBm
VAVG 6
10dB/
INBAND EMISSIONS
D
R
CENTER 1.957500GHz
*RBW 30kHz
VBW 30kHz
SPAN 5.000MHz
SWP 50.0ms
PROJECT NO.: 8L0212E
IN-BAND EMISSIONS
BLOCK B
CHANNEL 550



PROJECT NO.: 8L0212E
IN-BAND EMISSIONS
BLOCK E
CHANNEL 750



PROJECT NO.: 8L0212E
IN-BAND EMISSIONS
BLOCK F
CHANNEL 850



PROJECT NO.: 8L0212E
IN-BAND EMISSIONS
BLOCK C
CHANNEL 1050

NAME OF TEST: Occupied Bandwidth (GSM)	PARA. NO.: 2.917(c)
TESTED BY:	DATE:

Test Results: Complies/Does Not Comply.

Test Data: See attached graph(s).

NAME OF TEST: Occupied Bandwidth (NADC)	PARA. NO.: 2.917(c)
TESTED BY:	DATE:

Test Results: Complies/Does Not Comply.

Test Data: See attached graph(s).

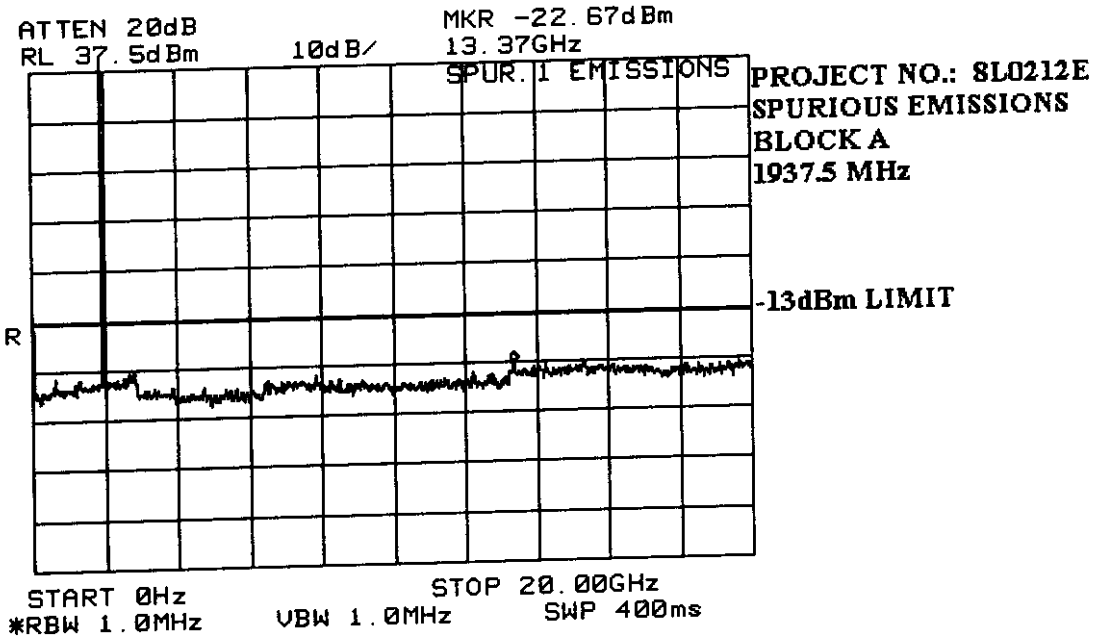
Section 5. Spurious Emissions at Antenna Terminals

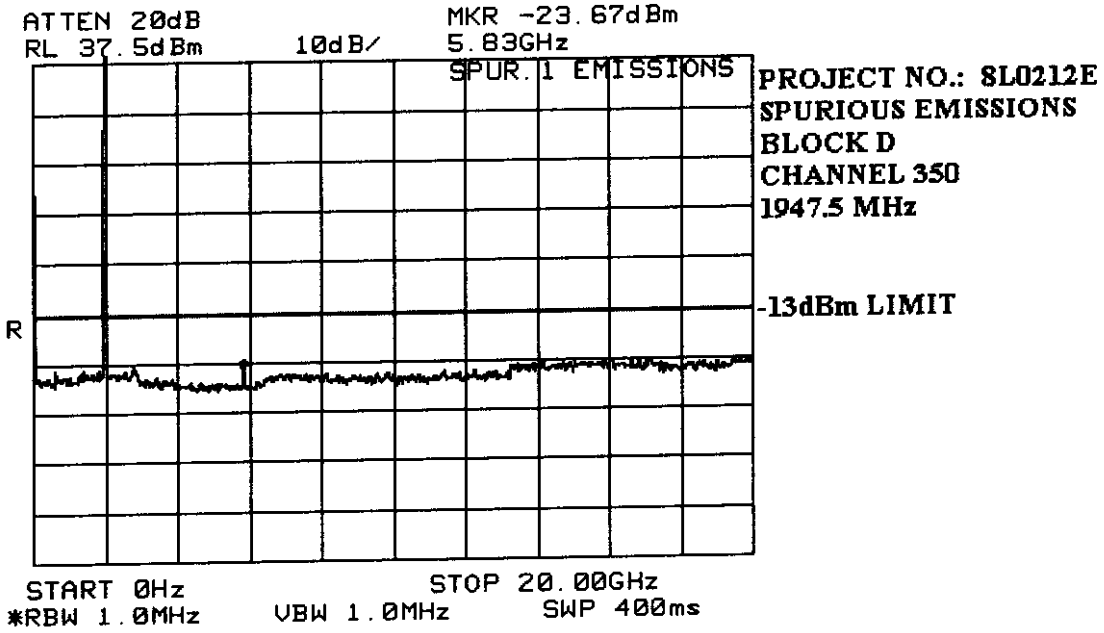
NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.917(e)
TESTED BY: Tom Tidwell	DATE: October 19, 1998

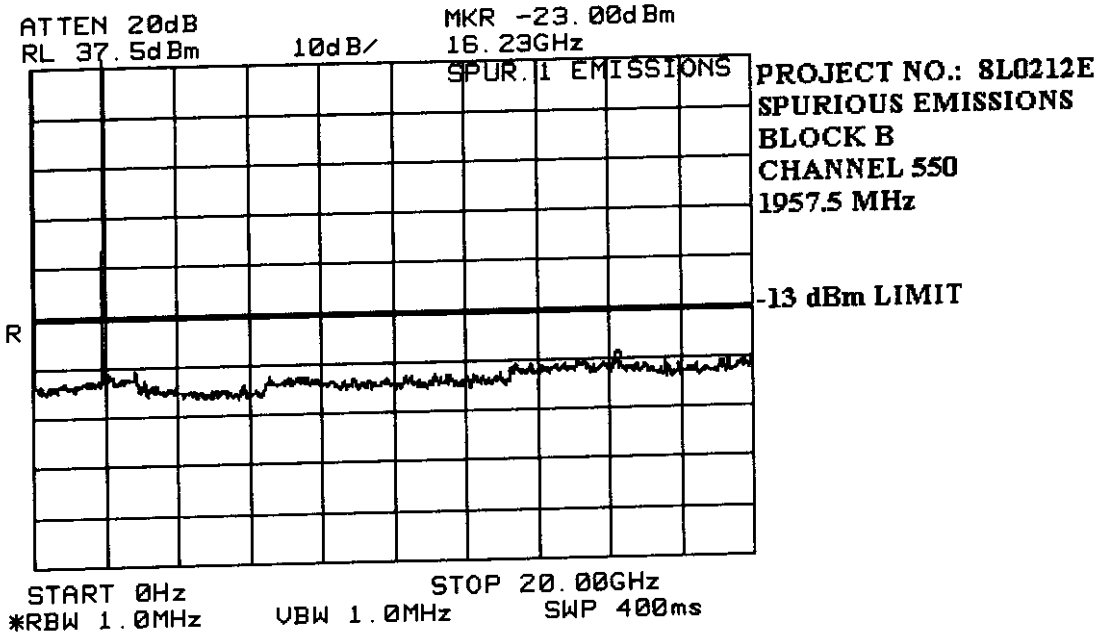
Test Results: Complies.

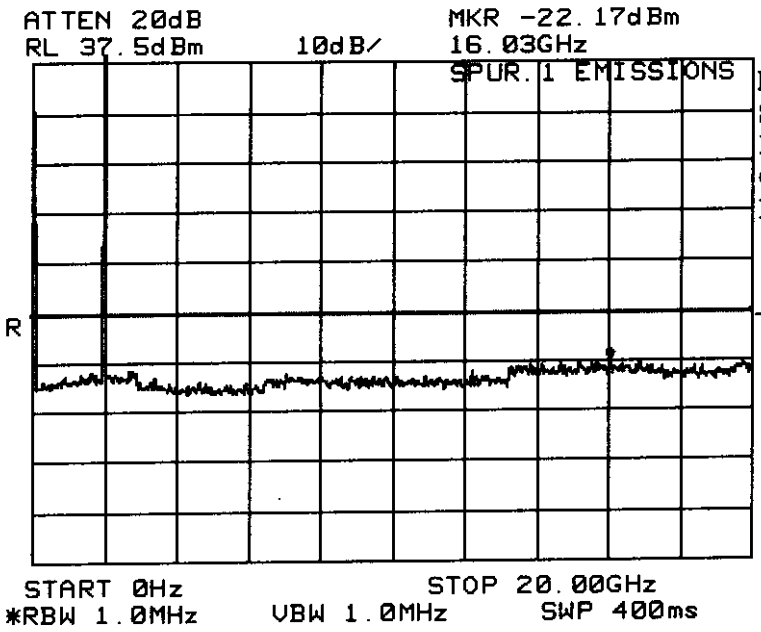
Test Data:

NAME OF TEST	WORST-CASE SPURIOUS LEVEL(dBm)
0 to 20 GHz Spurious	-21.7
Lower Band Edge	-15.0
Upper Band Edge	-14.0


ATTEN 20dB
RL 37.5dBm
10dB/
MKR -22.67dBm
13.37GHz
SPUR.I EMISSIONS
PROJECT NO.: 8L0212E
SPURIOUS EMISSIONS
BLOCK A
1937.5 MHz
-13dBm LIMIT
R
START 0Hz
*RBW 1.0MHz
VBW 1.0MHz
STOP 20.00GHz
SWP 400ms

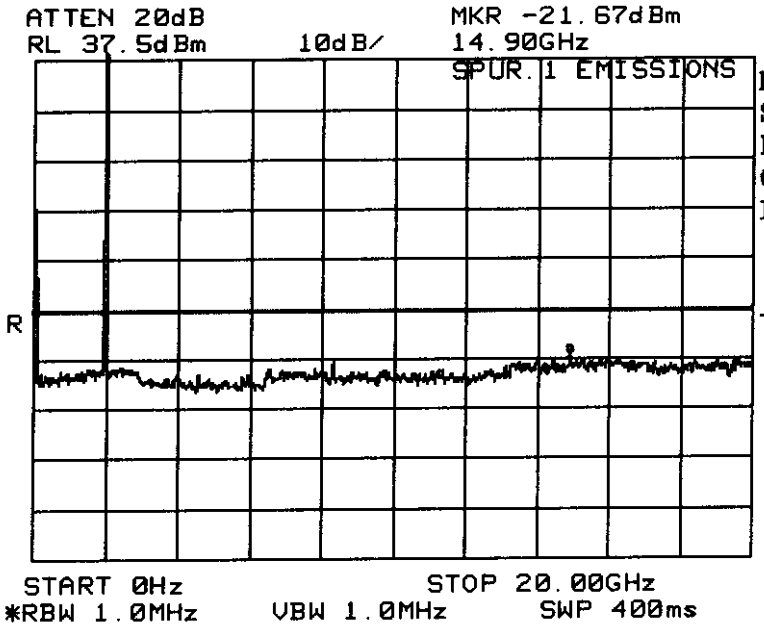

ATTEN 20dB
RL 37.5dBm
10dB/
MKR -23.67dBm
5.83GHz
SPUR.1 EMISSIONS
PROJECT NO.: 8L0212E
SPURIOUS EMISSIONS
BLOCK D
CHANNEL 350
1947.5 MHz
-13dBm LIMIT
R
START 0Hz
*RBW 1.0MHz
VBW 1.0MHz
STOP 20.00GHz
SWP 400ms

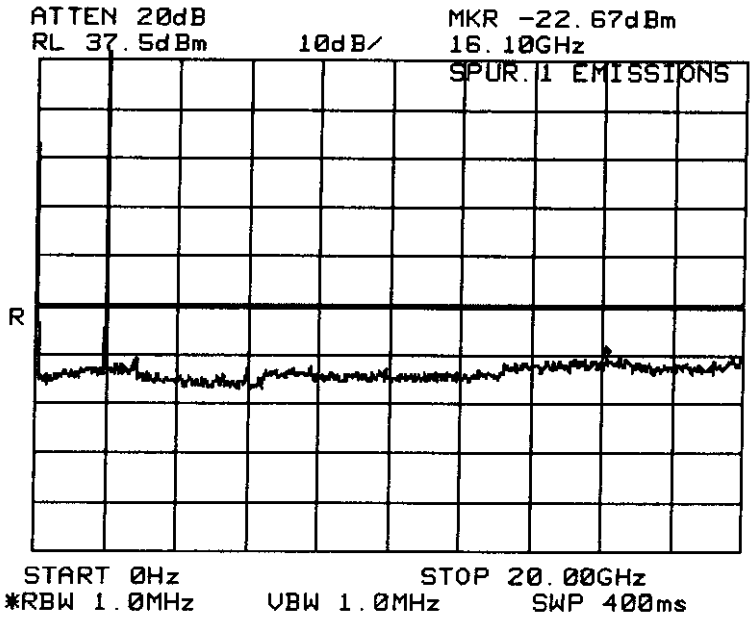

ATTEN 20dB
RL 37.5dBm
10dB/
MKR -23.00dBm
16.23GHz
SPUR.I EMISSIONS
PROJECT NO.: 8L0212E
SPURIOUS EMISSIONS
BLOCK B
CHANNEL 550
1957.5 MHz
-13 dBm LIMIT
R
START 0Hz
*RBW 1.0MHz
VBW 1.0MHz
STOP 20.00GHz
SWP 400ms



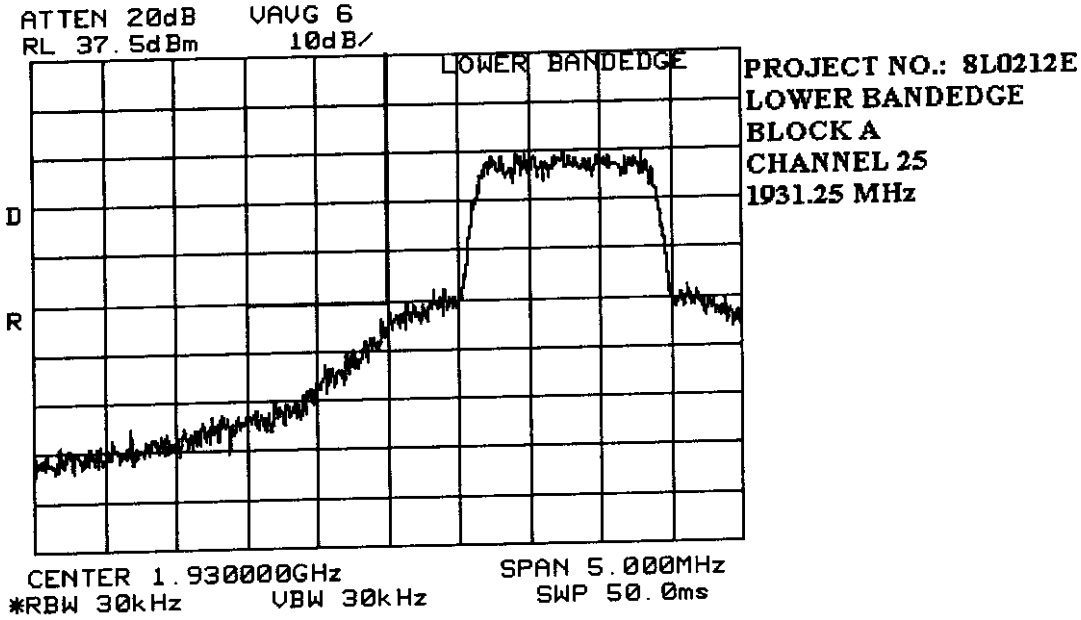
PROJECT NO.: 8L0212E
SPURIOUS EMISSIONS
BLOCK E
CHANNEL 750
1967.5 MHz

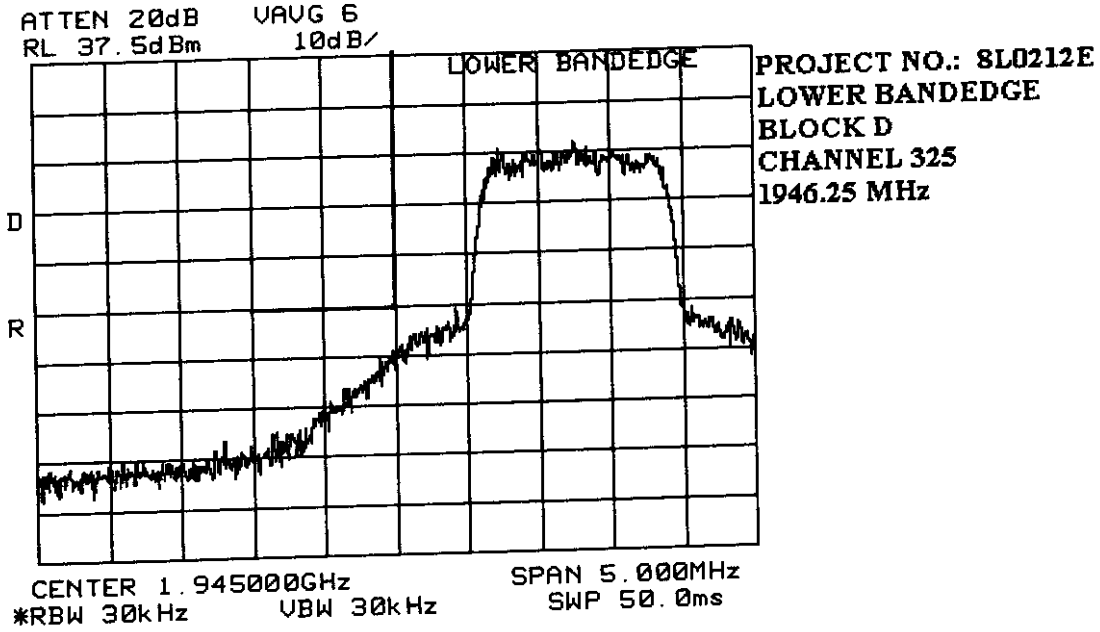
-13 dBm

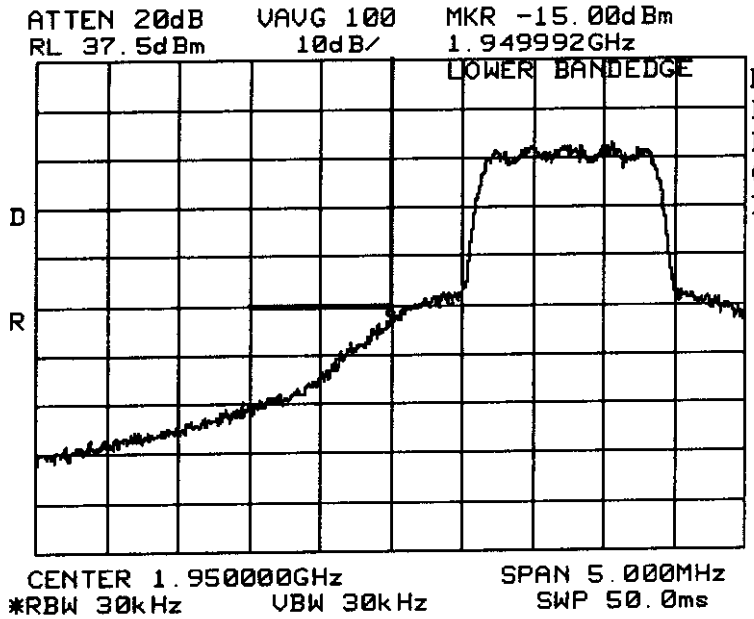

ATTEN 20dB
RL 37.5dBm
10dB/
MKR -21.67dBm
14.90GHz
SPUR.1 EMISSIONS
R
START 0Hz
STOP 20.00GHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 400ms
PROJECT NO.: 8L0212E
SPURIOUS EMISSIONS
BLOCK F
CHANNEL 850
1972.5 MHz
-13 dBm LIMIT



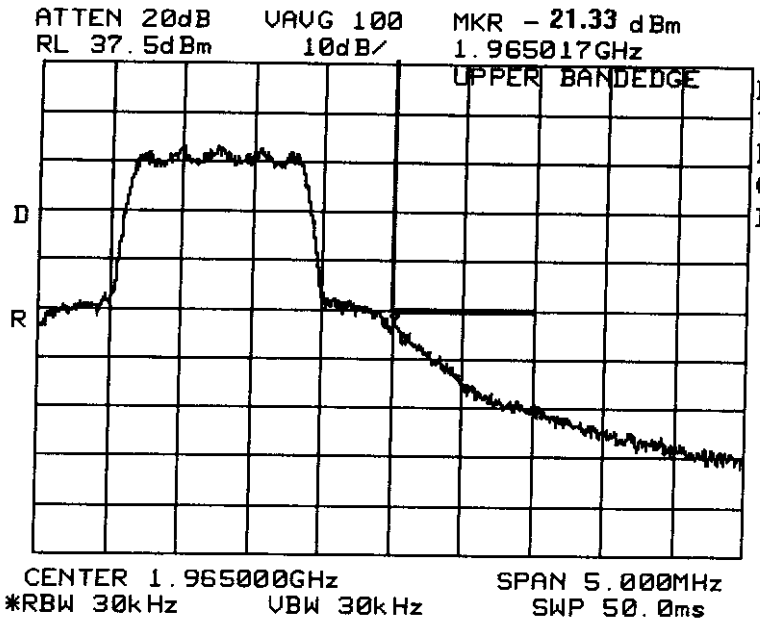
PROJECT NO.: 8L0212E
SPURIOUS EMISSIONS
BLOCK C
CHANNEL 1050
1982.5 MHz


ATTEN 20dB
RL 37.5dBm
VAVG 6
10dB/
LOWER BANDEDGE
D
R
CENTER 1.930000GHz
*RBW 30kHz
VBW 30kHz
SPAN 5.000MHz
SWP 50.0ms
PROJECT NO.: 8L0212E
LOWER BANDEDGE
BLOCK A
CHANNEL 25
1931.25 MHz

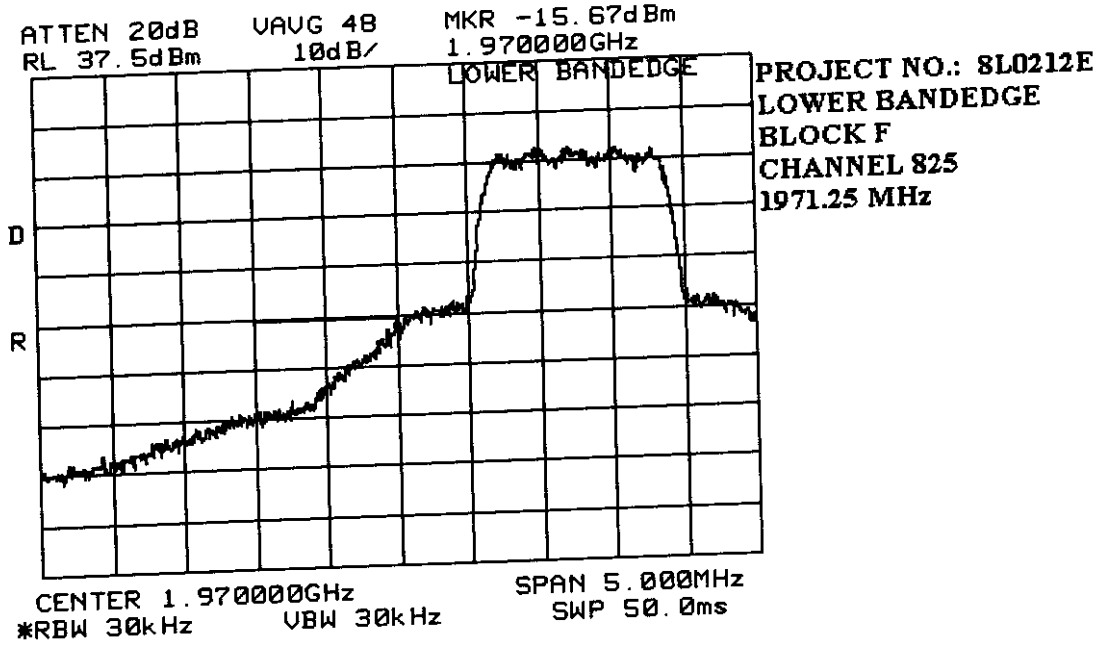

ATTEN 20dB
RL 37.5dBm
VAVG 6
10dB/
LOWER BANDEDGE
D
R
CENTER 1.945000GHz
*RBW 30kHz
VBW 30kHz
SPAN 5.000MHz
SWP 50.0ms
PROJECT NO.: 8L0212E
LOWER BANDEDGE
BLOCK D
CHANNEL 325
1946.25 MHz

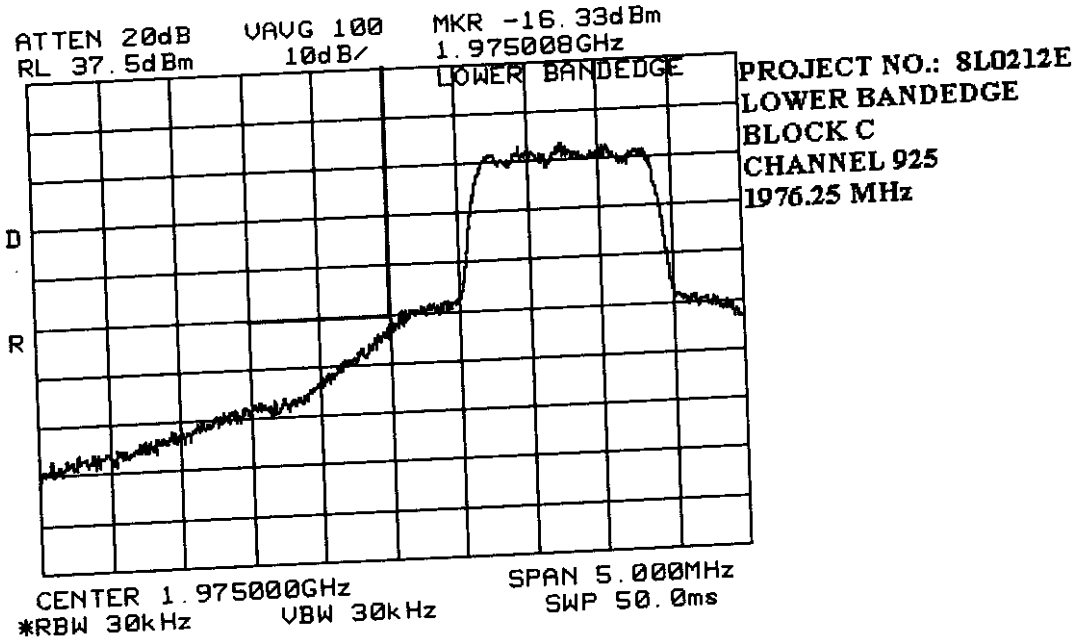


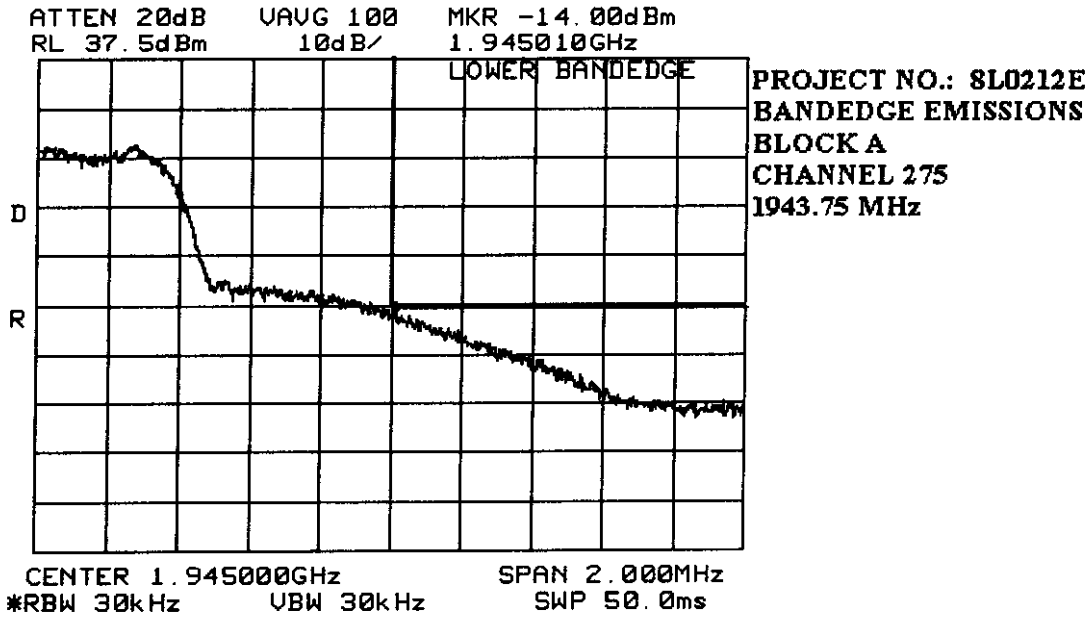
PROJECT NO.: 8L0212E
LOWER BANDEDGE
BLOCK B
CHANNEL 425
1951.25 MHz

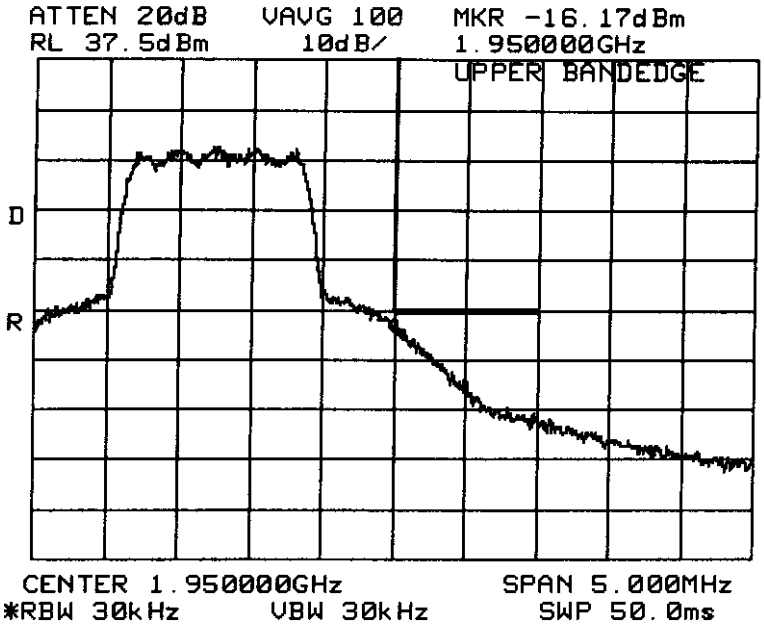


PROJECT NO.: 8L0212E
UPPER BANDEDGE
BLOCK B
CHANNEL 675
1963.75 MHz

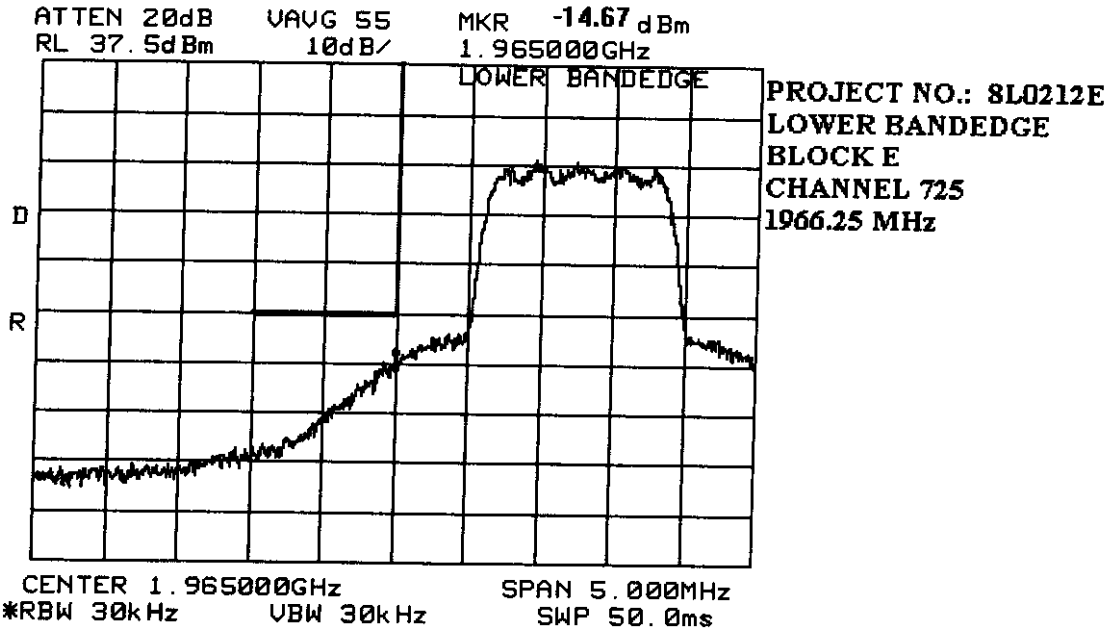

ATTEN 20dB
RL 37.5dBm
VAVG 48
10dB/
MKR -15.67dBm
1.970000GHz
LOWER BANDEDGE
D
R
CENTER 1.970000GHz
*RBW 30kHz
VBW 30kHz
SPAN 5.000MHz
SWP 50.0ms
PROJECT NO.: 8L0212E
LOWER BANDEDGE
BLOCK F
CHANNEL 825
1971.25 MHz

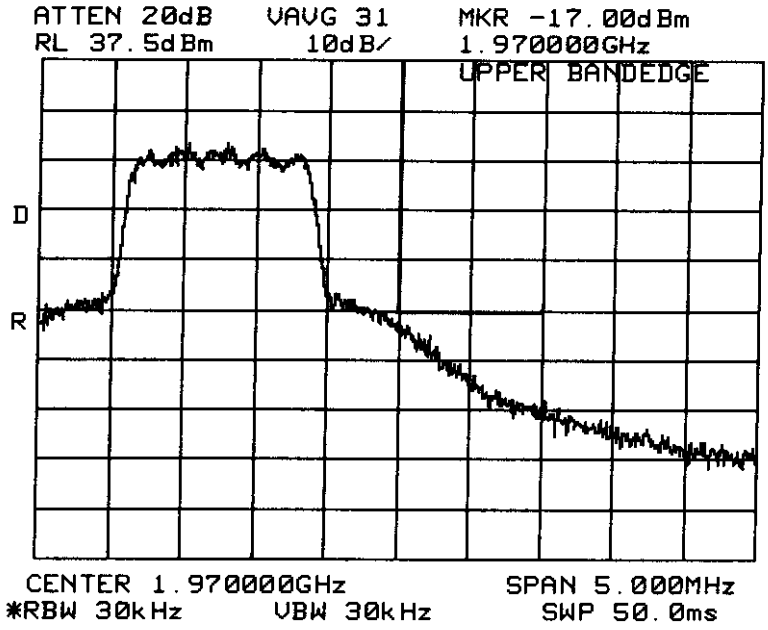

ATTEN 20dB
RL 37.5dBm
VAVG 100
10dB/
MKR -16.33dBm
1.975008GHz
LOWER BANDEDGE
D
R
CENTER 1.975000GHz
*RBW 30kHz
VBW 30kHz
SPAN 5.000MHz
SWP 50.0ms
PROJECT NO.: 8L0212E
LOWER BANDEDGE
BLOCK C
CHANNEL 925
1976.25 MHz


ATTEN 20dB
RL 37.5dBm
VAVG 100
10dB/
MKR -14.00dBm
1.945010GHz
LOWER BANDEDGE
D
R
CENTER 1.945000GHz
*RBW 30kHz
VBW 30kHz
SPAN 2.000MHz
SWP 50.0ms
PROJECT NO.: 8L0212E
BANDEDGE EMISSIONS
BLOCK A
CHANNEL 275
1943.75 MHz

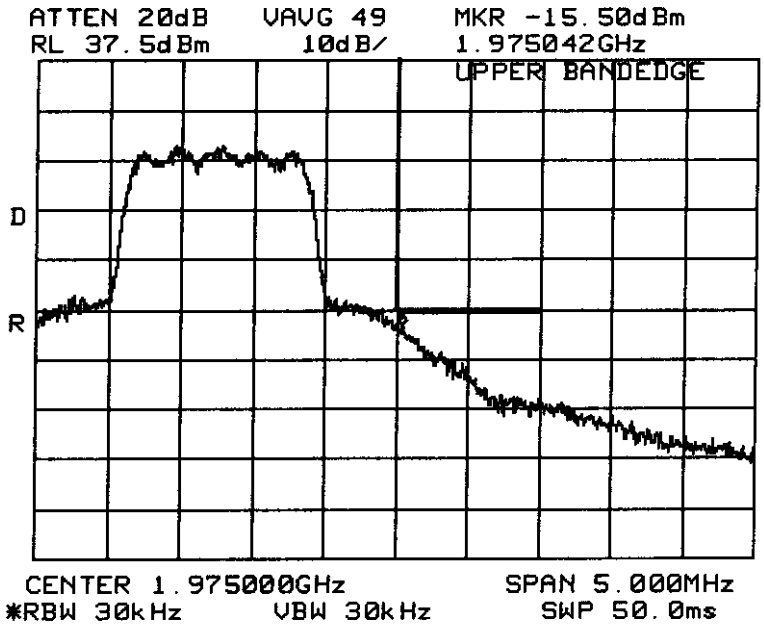


PROJECT NO.: 8L0212E
UPPER BANDEDGE
BLOCK D
CHANNEL 375
1948.75 MHz

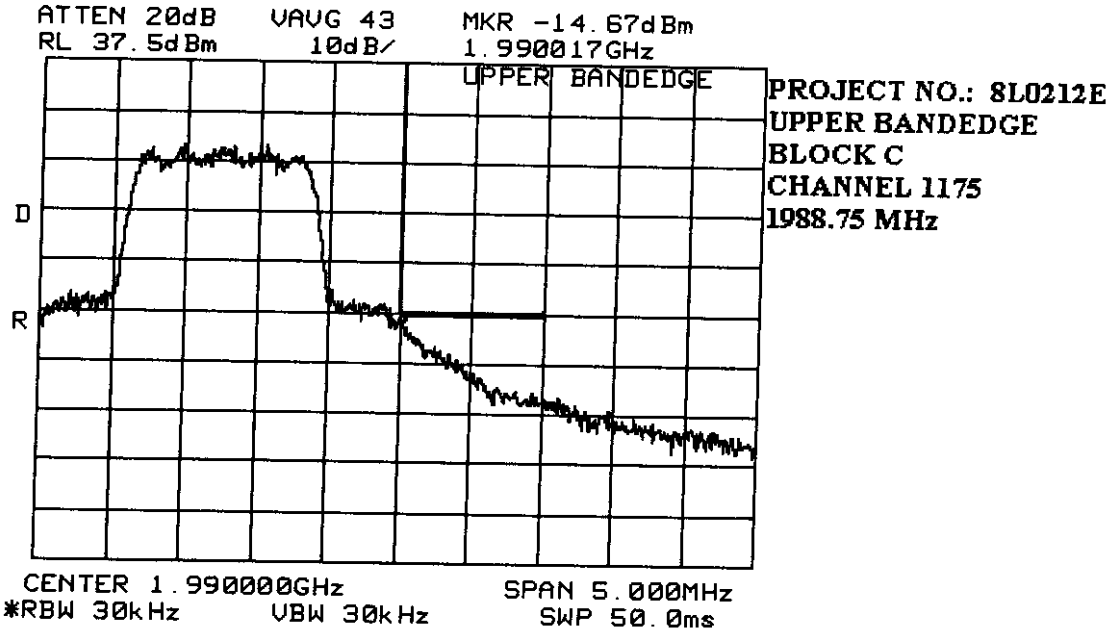

ATTEN 20dB
RL 37.5dBm
VAVG 55
10dB/
MKR -14.67 dBm
1.965000GHz
LOWER BANDEDGE
D
R
CENTER 1.965000GHz
*RBW 30kHz
VBW 30kHz
SPAN 5.000MHz
SWP 50.0ms
PROJECT NO.: 8L0212E
LOWER BANDEDGE
BLOCK E
CHANNEL 725
1966.25 MHz



PROJECT NO.: 8L0212E
UPPER BANDEDGE
BLOCK E
CHANNEL 775
1968.75 MHz



PROJECT NO.: 8L0212E
UPPER BANDEDGE
BLOCK F
CHANNEL 875
1973.75 MHz


ATTEN 20dB
RL 37.5dBm
VAVG 43
10dB/
MKR -14.67dBm
1.990017GHz
UPPER BANDEDGE
D
R
CENTER 1.990000GHz
*RBW 30kHz
VBW 30kHz
SPAN 5.000MHz
SWP 50.0ms
PROJECT NO.: 8L0212E
UPPER BANDEDGE
BLOCK C
CHANNEL 1175
1988.75 MHz

Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious	PARA. NO.: 2.917(e)
TESTED BY: Ron Gayton	DATE: October 28, 1998

Test Results: Complies.
The maximum field strength is 61.3 dBμV/m @ 3m. This is 20.9 dB below the specification limit.

Test Data: See attached table.

Test Data - Radiated Emissions

Test Distance (meters) : 10		Range: B OATS		Receiver:		RBW: 120 kHz		Detector: Peak			
Freq. (MHz)	Ant. *	Pol. (V/H)	Ant. HGT. (m)	Table (deg.)	RCVD Signal (dBµV/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Path Loss	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
39.8	B/C	V			24.0	10.3	15.0	1.4	20.7	74.0	-53.3
83.2	B/C	V			26.0	8.5	14.9	2.3	21.9	74.0	-52.1
118.0	B/C	V			24.0	11.1	14.8	2.5	22.8	74.0	-51.2
137.6	B/C	V			26.0	12.5	14.8	2.8	26.5	74.0	-47.5
157.3	B/C	V			22.0	13.5	14.8	2.8	23.5	74.0	-50.5
39.8	B/C	H			20.0	10.3	15.0	1.4	16.7	74.0	-57.3
111.2	B/C	H			20.0	10.8	14.8	2.5	18.5	74.0	-55.5
118.0	B/C	H			20.0	11.1	14.8	2.5	18.8	74.0	-55.2
129.6	B/C	H			20.0	12.1	14.8	2.8	20.1	74.0	-53.9
157.3	B/C	H			24.0	13.5	14.8	2.8	25.5	74.0	-48.5
300.0	L/P	V			26.0	15.9	14.7	4.6	31.9	74.0	-42.1
609.0	L/P	V			26.0	20.5	14.6	7.3	39.2	74.0	-34.9
900.0	L/P	V			26.0	21.7	14.5	9.2	42.4	74.0	-31.7
300.0	L/P	H			26.0	15.9	14.7	4.6	31.9	74.0	-42.1
305.6	L/P	H			26.0	14.9	14.7	4.6	30.9	74.0	-43.1
609.0	L/P	H			26.0	20.5	14.6	7.3	39.2	74.0	-34.9
900.0	L/P	H			26.0	21.7	14.5	9.2	42.4	74.0	-31.7

Notes:
The spectrum was search up to the 10th harmonic of the fundamental frequency.
B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole
* Includes cable loss when amplifier is not used.
** Includes cable loss.
( ) Denotes failing emission level.

KTL Dallas, Inc.

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

Microwave Radiated Emissions Data

Complete X Preliminary ___ Page 1 of 1

Client: SAMSUNG Test #: MW-3A W.O.#: 8L0212e

EUT: 5 WATT PRU P4 VERSION HARDWARE S/N: NONE Photo ID: 8L0212E MW-3

Technician: R. GAYTAN Specification: CFR 47 Part 2.993 Lab: BOATS Date: 10/28/98

Equipment Used: CF01, CF30, 494, G2624, 421, 103, 430 ,425

Configuration: Full Power (Changed 3 Duplexer Rf cables to shipped product)

Bandwidth: 1MHz Video Bandwidth: 1MHz Antenna Distance 3 m Detector:

Climatic Conditions:
Temperature: 22 C
Relative Humidity: 42 %
Atmospheric Pressure: 998 mbar
Conversion: N/A dBpW= N/A dBuV/m @ N/A m

EUT Power: ___ 115 V.A.C. ___ 60 Hz X Peak
___ 208 V.A.C. ___ 50 Hz X Average
___ 230 V.A.C.
X Other 9V DC ___ 1 Phase ___ 3 Phase

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:
1.0	-78	23.4	2.5	22.9	107.0	32.0	82.2	V	
1.927	**-38**	**28.8**	**3.6**	**22.7**	**107.0**	**78.7**	**82.2**	**V**	**Fundamental Freq.**
4	-72	32.7	5.9	19.8	107.0	53.8	82.2	V	
5.192	-70	35.4	6.6	36.5	107.0	42.5	**82.2**	**V**	
7	-70	37.3	8.0	38.1	107.0	44.2	82.2	V	
13.0	-66	40.7	11.8	44.0	107.0	49.5	**82.2**	V	
13.9	-64	42.0	11.6	45.2	107.0	51.4	82.2	V	
17.0	-66	45.1	12.7	46.9	107.0	51.9	**82.2**	V	
18	-66	46.2	14.2	46.9	107.0	54.5	82.2	V	
1.0	-78	23.4	2.5	22.9	107.0	32.0	82.2	H	
1.927	**-36**	**28.8**	**3.6**	**22.7**	**107.0**	**80.7**	**82.2**	**H**	**Fundamental Freq.**
4	-72	32.7	5.9	19.8	107.0	53.8	82.2	H	
5.192	-70	35.4	6.6	36.5	107.0	42.5	**82.2**	H	
7	-70	37.3	8.0	38.1	107.0	44.2	82.2	H	
13.0	-66	40.7	11.8	44.0	107.0	49.5	**82.2**	H	
17.0	-66	45.1	12.7	46.9	107.0	51.9	82.2	H	
18	-66	46.2	14.2	46.9	107.0	54.5	**82.2**	H	
									Scanned 1GHz to
									18 GHz.

DATACOMMON\FORMS\TESTDATASHEETS\MICRORE REV 030597

KTL Dallas, Inc.

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

Microwave Radiated Emissions Data

Complete X Preliminary ___ Page 1 of 1

Client: SAMSUNG Test #: MW-4A W.O.#: 8L0212e

EUT: 5 WATT PRU P4 VERSION HARDWARE S/N: NONE Photo ID: 8L0212E MW-4

Technician: R. GAYTAN Specification: CFR Part 2.993 Lab: BOATS Date: 10/28/98

Equipment Used: CF01, CF30, Horn Antenna Emco 3160, Wave Guide P/N RA42-K-F-4B-C, G2624

Configuration: Full Power (Changed 3 Duplexer Rf cables to shipped product)

Bandwidth: 1MHz Video Bandwidth: 1MHz Antenna Distance 3 m Detector:

Climatic Conditions:
Temperature: 22 C
Relative Humidity: 42 %
Atmospheric Pressure: 998 mbar
Conversion: N/A dBpW= N/A dBuV/m @ N/A m

EUT Power: ___ 115 V.A.C. ___ 60 Hz
___ 208 V.A.C. ___ 50 Hz
___ 230 V.A.C.
X Other 9V DC ___ 1 Phase ___ 3 Phase

X Peak
X Average

Freq. (GHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	RF Gain (dB)	Conver. Factor	Corrected Reading (dBuV/m)	Spec. Limit (dBuV/m)	Pol.	Comments:
18	44	40.3	12.2	40	0	56.5	82.2	V	Peak Noise Floor
19	44.6	40.3	13.6	40	0	58.5	82.2	V	Noise Floor
20	46	40.3	15	40	0	61.3	82.2	V	Noise Floor
18	35	40.3	12.2	40	0	47.5	82.2	V	Video Avg. N F
19	35.6	40.3	13.6	40	0	49.5	82.2	V	Noise Floor
20	37	40.3	15	40	0	52.3	82.2	V	Noise Floor
18	44	40.3	12.2	40	0	56.5	82.2	H	Peak Noise Floor
19	44.6	40.3	13.6	40	0	58.5	82.2	H	Noise Floor
20	46	40.3	15	40	0	61.3	82.2	H	Noise Floor
18	35	40.3	12.2	40	0	47.5	82.2	H	Video Avg. N F
19	35.6	40.3	13.6	40	0	49.5	82.2	H	Noise Floor
20	37	40.3	15	40	0	52.3	82.2	H	Noise Floor
									Scanned 18 GHz
									to 20 GHz.

DATACOMMON\FORMS\TESTDATASHEETS\MICRORE REV 030597

Section 7. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 24.235
TESTED BY: Tom Tidwell	DATE: October 20, 1998

Test Results: Complies.

Measurement Data: Standard Test Frequency: 1951.25 MHz
Standard Test Voltage: 120 VAC

See attached tables.

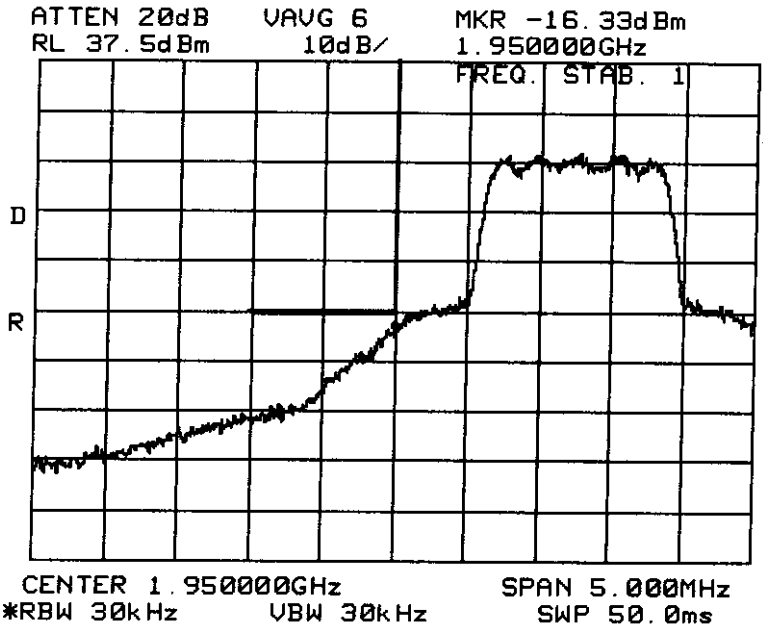
Frequency Stability

VOLTAGE VARIATION

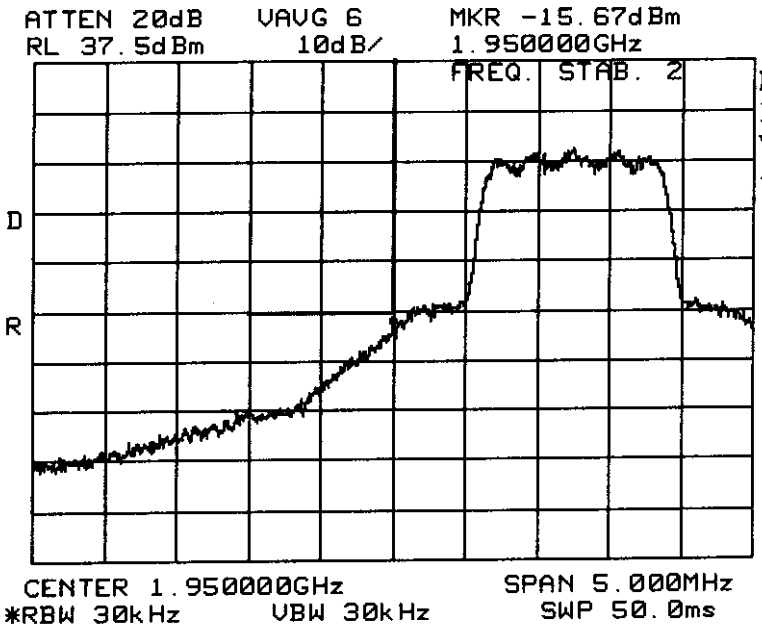
VOLTAGE	FREQUENCY TOLERANCE(Hz)	TIME REF.(µSec.)	RHO	POWER (dBm)
85% S.T.V.	-85.7	-2.12	0.9902	37.1
100% S.T.V.	-60.4	-2.12	0.9904	37.0
115% S.T.V.	-55.9	-2.13	0.9933	37.4

TEMPERATURE VARIATION

TEMPERATURE (°C)	FREQUENCY TOLERANCE(Hz)	TIME REF.(µSec.)	RHO	POWER (dBm)
-30	47.0	-2.11	0.978	38.9
-20	-25.7	-1.91	0.979	38.3
-10	58.0	-2.12	NOT MEASURED	
0	86.0	-2.12	NOT MEASURED	
10	-41.7	-2.09	0.948	37.0
30	-47.3	-2.12	0.983	37.4
40	-78.5	-2.12	0.982	36.5
50	-24.1	-2.12	0.983	36.2



PROJECT NO.: 8L0212E
FREQ. STAB. WITH
VOLTAGE VARIATION
+20 DEG. CELSIUS/102VAC



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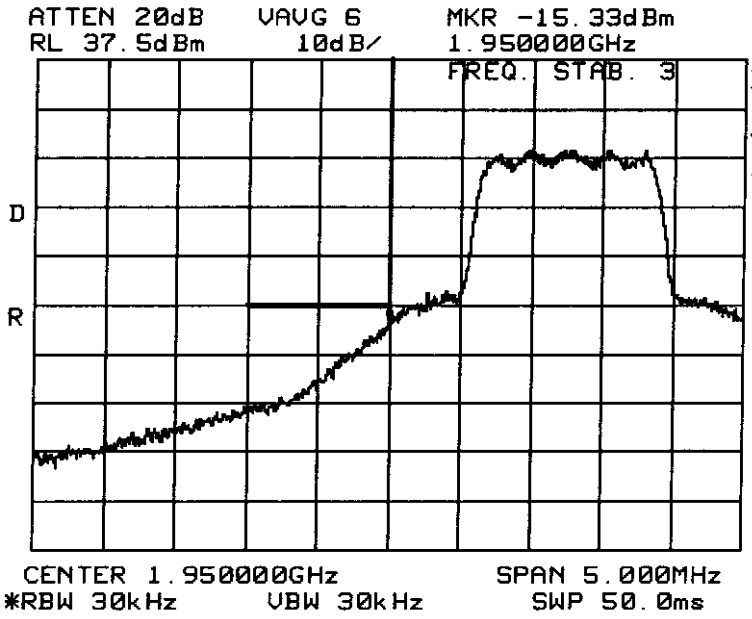
FREQ. STABILITY WITH
VOLTAGE VARIATION
+20 DEG. CELSIUS/120VAC



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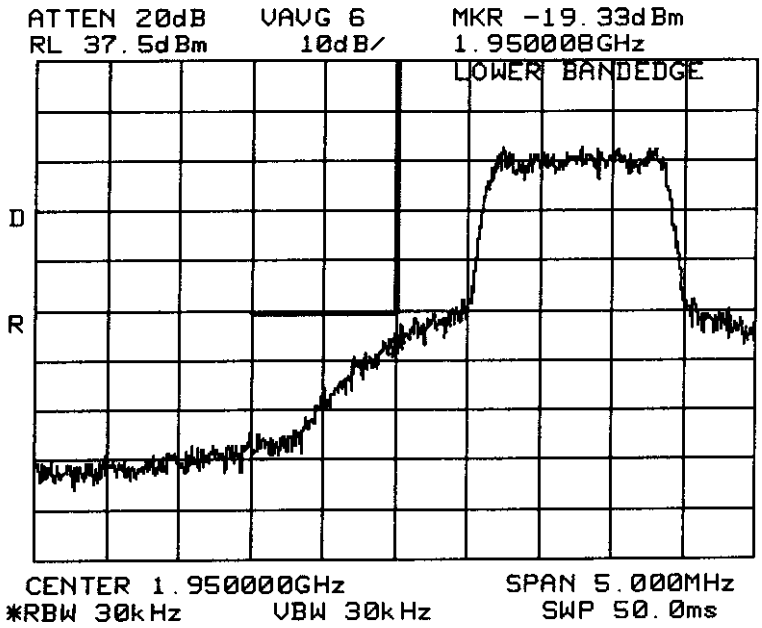
FREQ. STABILITY WITH
VOLTAGE VARIATIONS
+20 DEG. CELSIUS/138VAC



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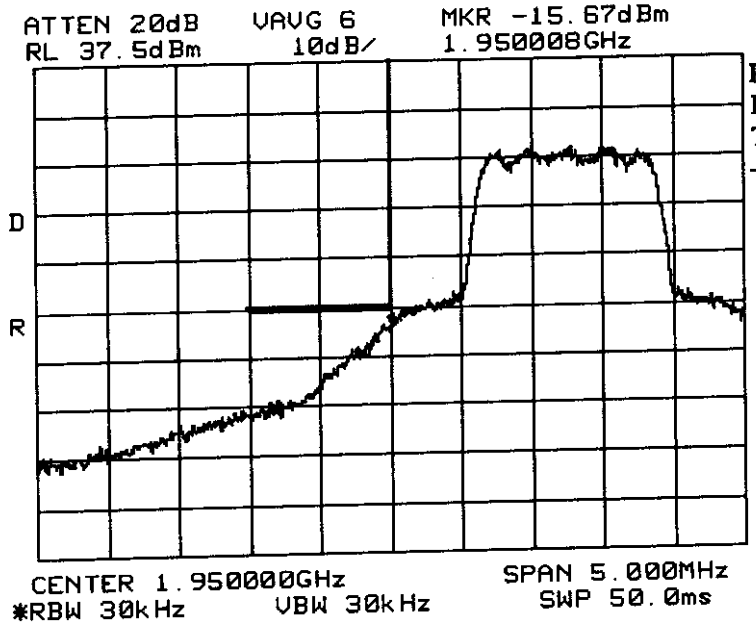
FREQ. STAB. WITH
TEMPERATURE VAR
-30 DEG.
CELSIUS/120VAC



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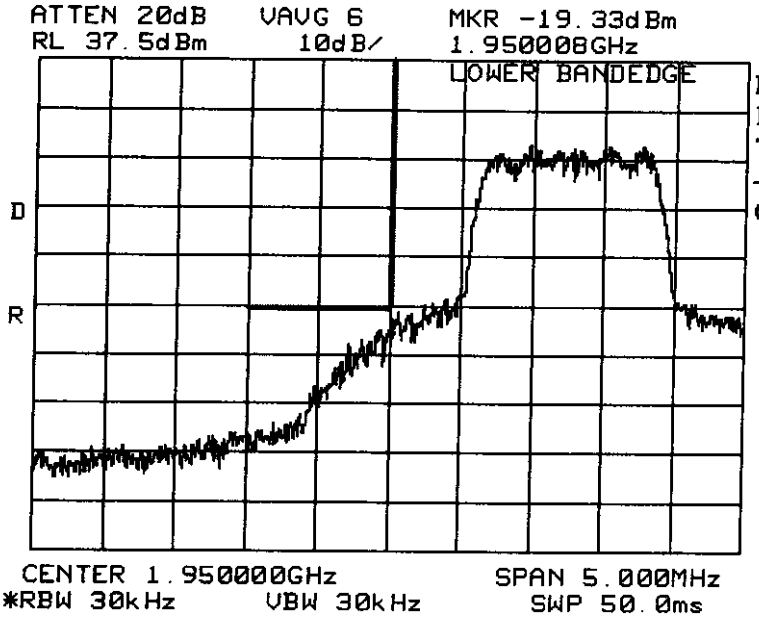
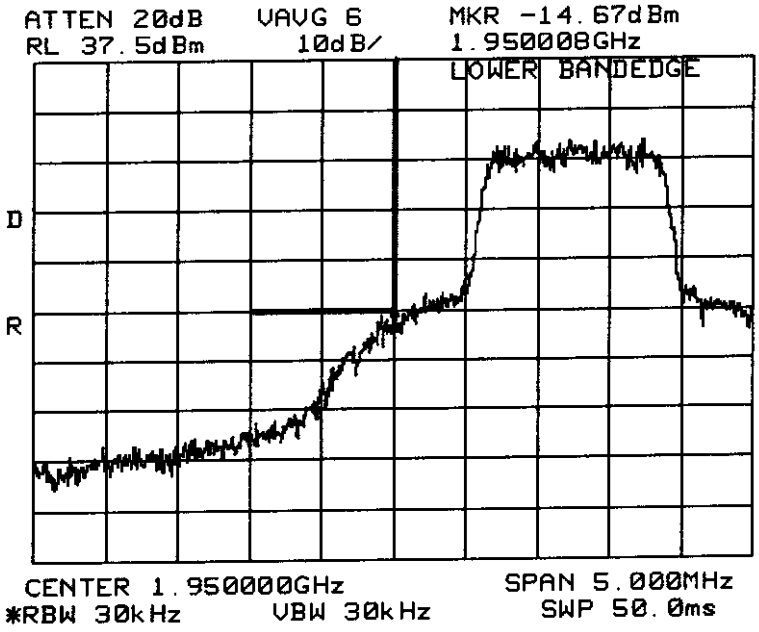
FREQ. STAB. WITH
TEMPERATURE VAR.
-20 DEG. CELSIUS/120VAC



PROJECT NO.: 8L0212E
FREQ. STAB. WITH
TEMPERATURE VAR.
-10 DEG.
CELSIUS/120VAC



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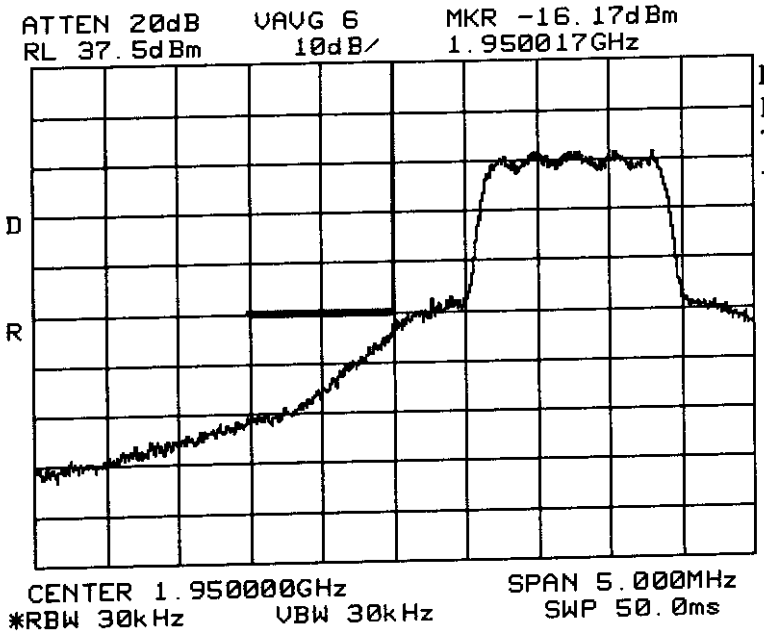
FREQ. STAB. WITH
TEMPERATURE VAR.
0 DEG. CELSIUS/120VAC



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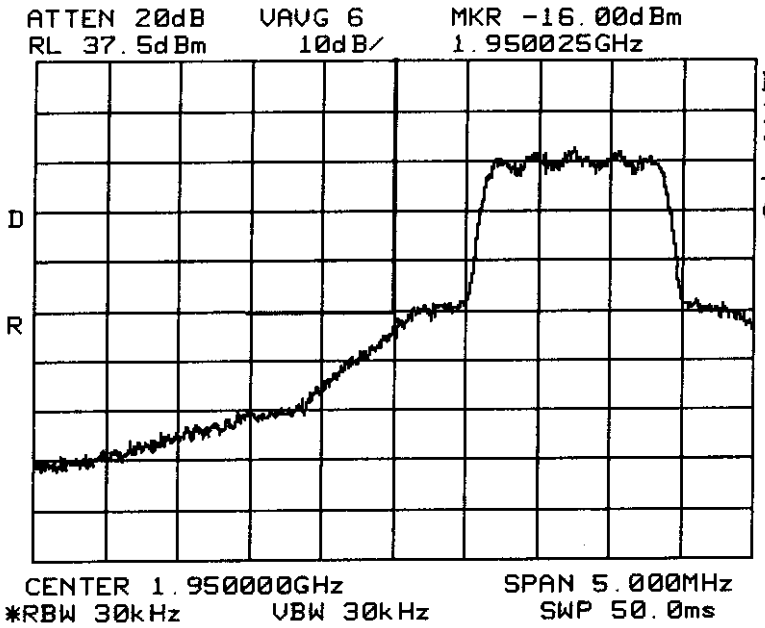
FREQ. STAB. WITH
TEMPERATURE VAR.
+10 DEG. CELSIUS/120VAC



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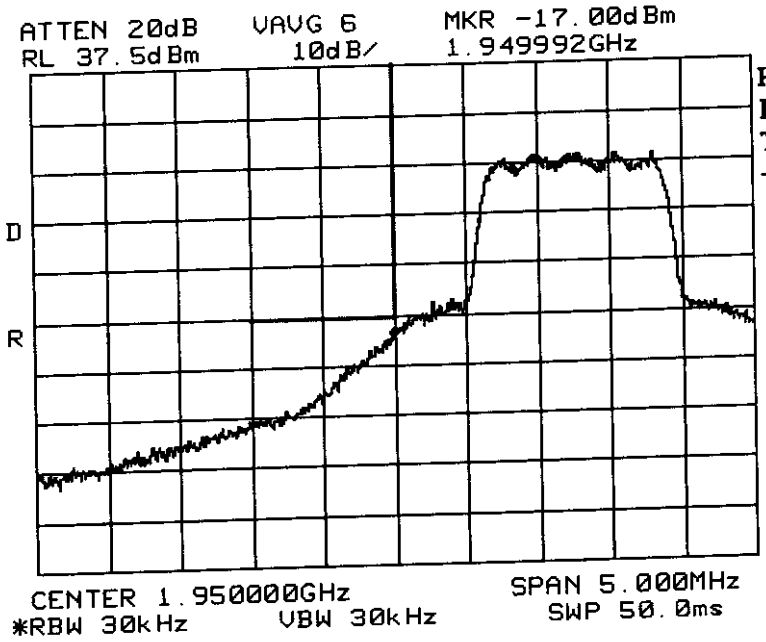
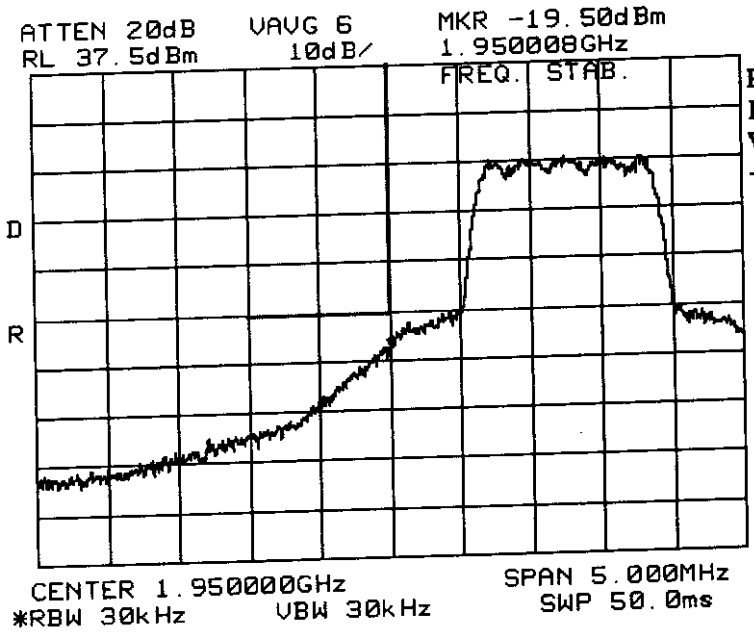
FREQ. STAB. WITH
TEMPERATURE VAR.
+30 DEG.
CELSIUS/120VAC



PROJECT NO.: 8L0212E
FREQ. STAB. WITH
TEMPERATURE VAR.
+40 DEG. CELSIUS/120VAC



PROJECT NO.: 8L0212E
FREQ. STAB. WITH TEMP. VARIATION
+50 DEG. CELSIUS/120VAC

Section 8. Test Equipment List

CAL Cycle	Equipment	Manufacturer	Model #	Serial/Asset #	Last Cal.	Next Cal.
1Year	Coaxial Cable	Storm	None	CF30	Dec. 3/97	Dec. 3/98
1Year	Coaxial Cable	Storm	None	CF31	April 28/98	April 28/99
1Year	Coaxial Cable	Storm	None	CF32	Sept. 22/98	Sept. 22/99
1Year	Spectrum Analyzer	Hewlett Packard	8563E	G2624	Oct. 5/98	Oct. 5/99
1Year	Environmental Chamber	Environtronics	None	739	Nov. 6/97	Nov. 6/98
1Year	Power Meter	Wavetek	8531	608	May 15/98	May 15/99
1Year	Attenuator 20 dB	Narda	7768-20	None	Aug. 14/98	Aug. 14/99
1 Year	Attenuator 10 dB	Narda	7768B-10	None	June 4/98	June 4/99
1 Year	Power Head	Wavetek	85310	609	May 15/98	May 15/99
1 Year	Coaxial Cable	Storm	None	CF01	April 28/98	April 28/99
1 Year	Spectrum Analyzer	Tektronic	492P	B043495	Nov. 11/97	Nov. 11/98
1 Year	Signal Generator	Hewlett Packard	8614A	2015A08365	NCR	NCR
1 Year	RF Amplifier (5GHz–12 GHz)	ICC	None	None	April 27/98	April 27/99
1 Year	Low Noise Amplifier (1 MHz-1GHz)	ICC	None	None	April 27/98	April 27/99
1 Year	Horn Antenna	A.H. Systems	SAS-200/571	162	April 29/98	April 29/99
1 Year	Biconical Antenna	ICC	BCON-30300	210	Jan. 17/98	Jan. 17/99
1 Year	Log Periodic Antenna	EMCO	3146	1349	Jan. 24/98	Jan. 24/99
1 Year	Low Noise Amplifier	ICC	LN22	None	April 22/98	April 22/99
1 Year	Spectrum Analyzer	Hewlett Packard	8591E	3412A02996	April 22/98	April 22/99
	Waveguide	EMCO	PA42-IT-F-YB-C	None	NCR	NCR
	Horn Antenna	EMCO	3160	None	NCR	NCR
	Limiter	Fischer	FCC-45013-1.2	None	Feb. 12/98	Feb. 12/99

ANNEX A

TEST METHODOLOGIES

NAME OF TEST: RF Power Output **PARA. NO.: 2.985**

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

EQUIPMENT: PicoBTS 5 Watt PRU with P4 Version Hardware
FCC ID: NP85WPRU

NAME OF TEST: Occupied Bandwidth **PARA. NO.: 2.989**

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.: 2.991

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.: 2.993**

Test Conditions: Outdoor Range
Standard Test Voltage

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)

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

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

For emissions > 1 GHz:

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

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

NAME OF TEST: Frequency Stability **PARA. NO.: 2.995**

Test Conditions: As per measurement data.

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.

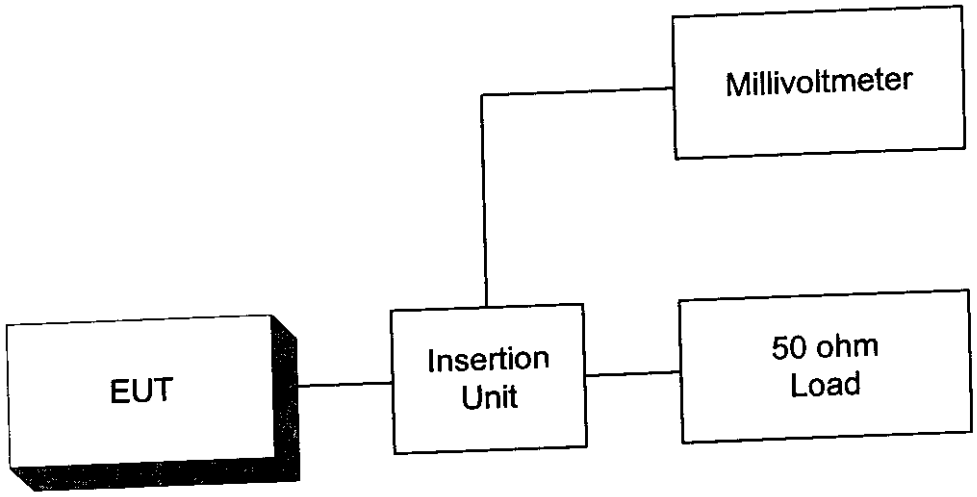
Frequency Stability With Temperature Variation

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.

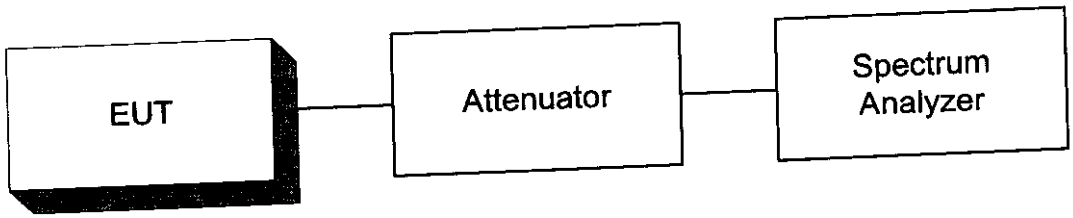
ANNEX B

TEST DIAGRAMS

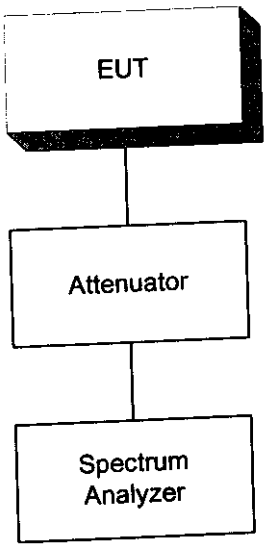
Para. No. 2.985 - R.F. Power Output



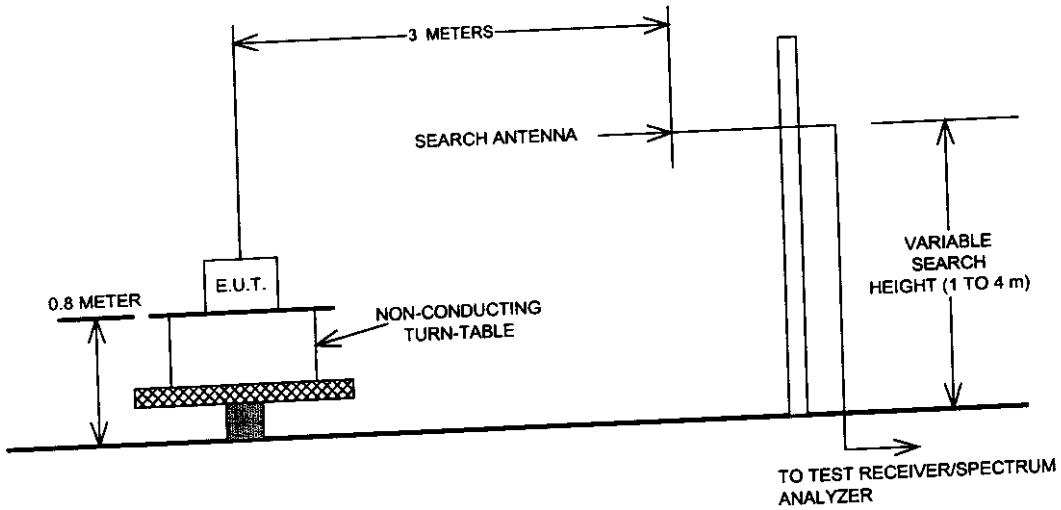
Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability