KTL Test Report:	8R01059
Applicant:	Allen Telecom Group 140 Vista Centre Drive Forest, Virginia 24551
Equipment Under Test: (E.U.T.)	Brite Cell PCS
In Accordance With:	**FCC Part 24, Subpart E** Broadband PCS Repeaters
Tested By:	KTL Ottawa Inc. 3325 River Road, R.R. 5 Ottawa, Ontario K1V 1H2
Authorized By:	_____ T. Tidwell, Wireless Group Manager
Date:	_____
Total Number of Pages:	61

Table of Contents

Table of Contents, continued

Section 1. Summary of Test Results

Manufacturer: Allen Telecom Group

Model No.: Brite Cell PCS

Serial No.: 982701926

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

T	N	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. None
See " Summary of Test Data".

NVLAP®

NVLAP LAB CODE: 100351-0

TESTED BY: _____ DATE: _____
Kevin Carr, Technologist

TECHNICAL REVIEW:_____ DATE:_____

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	MEAS.	RESULT
RF Power Output	24.232	100W	0.063 W	Complies
Occupied Bandwidth (CDMA)	24.238	Input/Output	Plot	Complies
Occupied Bandwidth (GSM)	24.238	Input/Output	Plot	Complies
Occupied Bandwidth (NADC)	24.238	Input/Output	Plot	Complies
Spurious Emissions at Antenna Terminals	24.238(a)	-13 dBm	-13.0	Complies
Field Strength of Spurious Emissions	24.238(a)	-13 dBm E.I.R.P.	-19.6 dBm	Complies
Frequency Stability	24.235		N/A	N/A

Footnotes For N/A's:

Test Conditions: Temperature: 18 °C
Humidity: 25 %

Section 2. General Equipment Specification

Supply Voltage Input:		120 VAC, 60 Hz
Frequency Range:	**Downlink:**	1930 – 1990 GHz
Frequency Range:	**Uplink:**	Not Tested

Type of Modulation and Designator:	**CDMA (F9W)** ☒	**GSM (GXW)** ☒	**NADC (DXW)** ☒

AGC Threshold:		Not Applicable
Output Impedance:		50 ohm
Gain:		4.5 dB Nominal
Max Input Power:		16.0 dBm
RF Output (Rated):	**Single:**	15.0 dBm
	Composite:	18.0 dBm / 2 Channel

Frequency Translation:	**F1-F1** ☒	**F1-F2** ☐	**N/A** ☐

Band Selection:	**Software** ☐	**Duplexer Change** ☐	**Fullband Coverage** ☒

Description of Modifications For Class II Permissive Change

NOT APPLICABLE

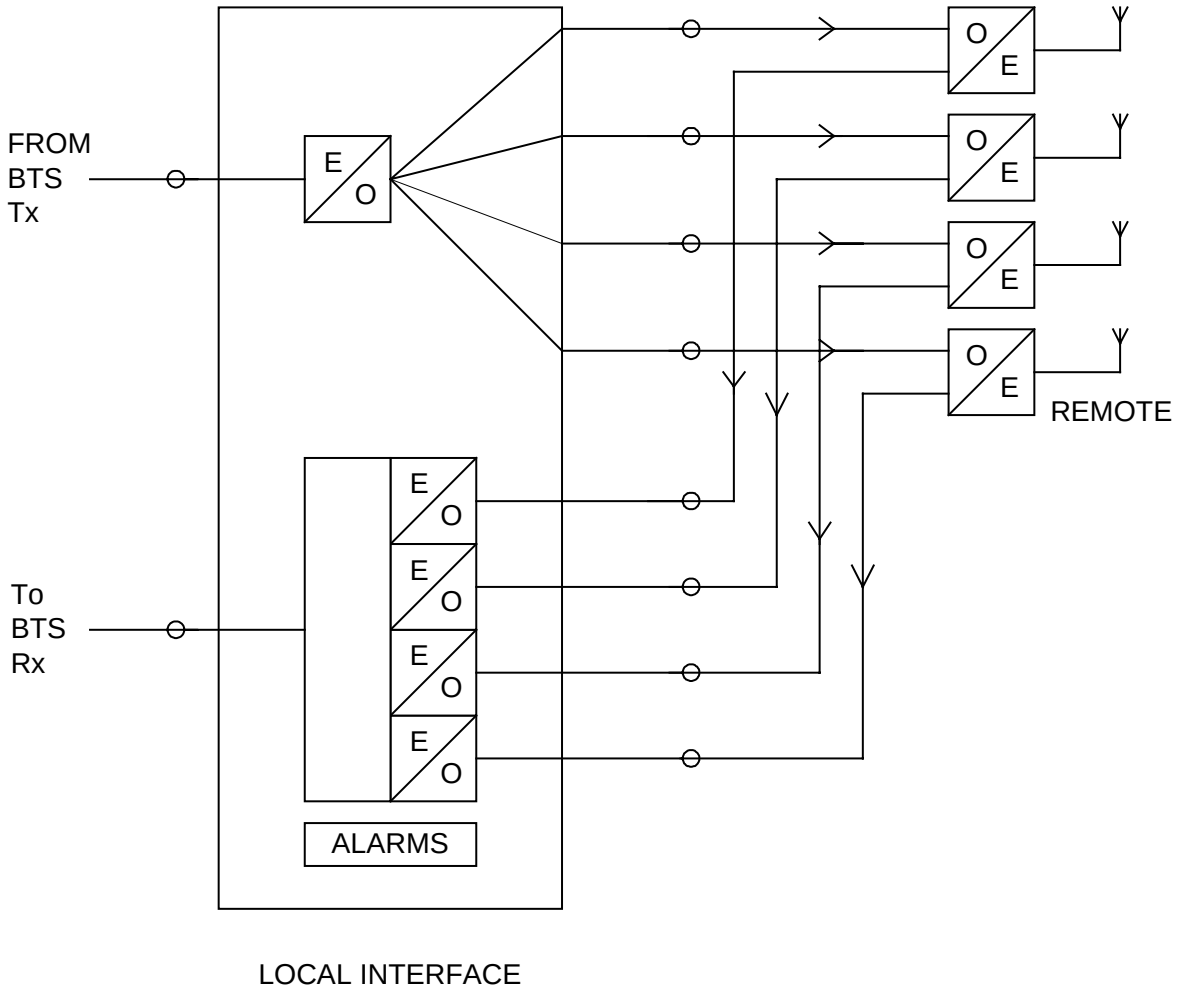
Modifications Made During Testing

NOT APPLICABLE

Theory of Operation

The Brite Cell Dual Band is an active indoor coverage system incorporating fibre optic and RF technologies. The device operates in the 800 MHz cell band and the 1990 MHz band. It features dual RF outputs and can operate from a 120 VAC line or battery. This system is hardwired to the base station and only re-transmits the downlink signal.

System Diagram



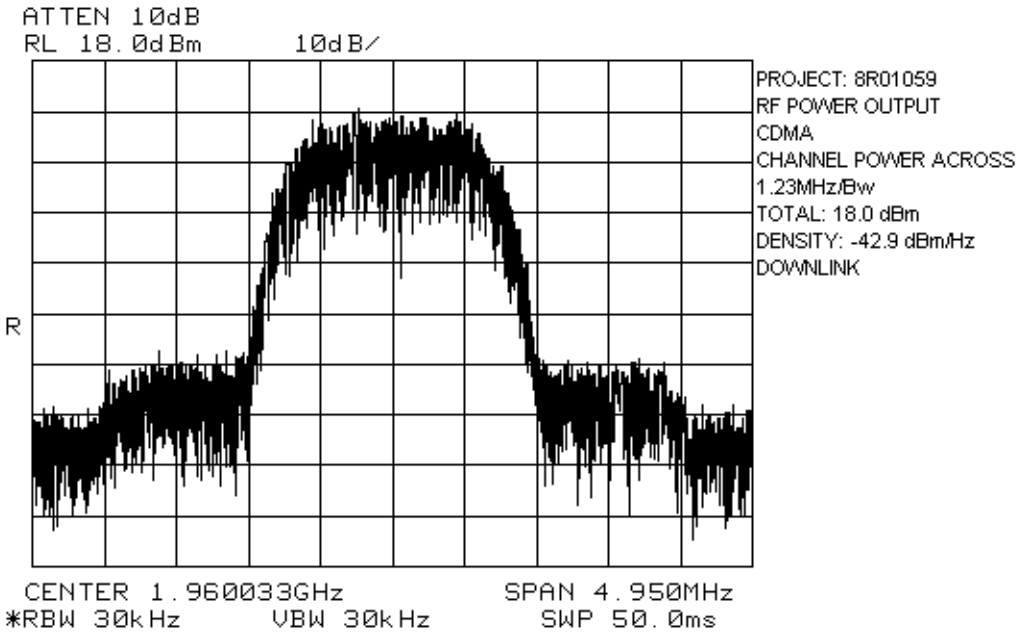
Section 3. RF Power Output

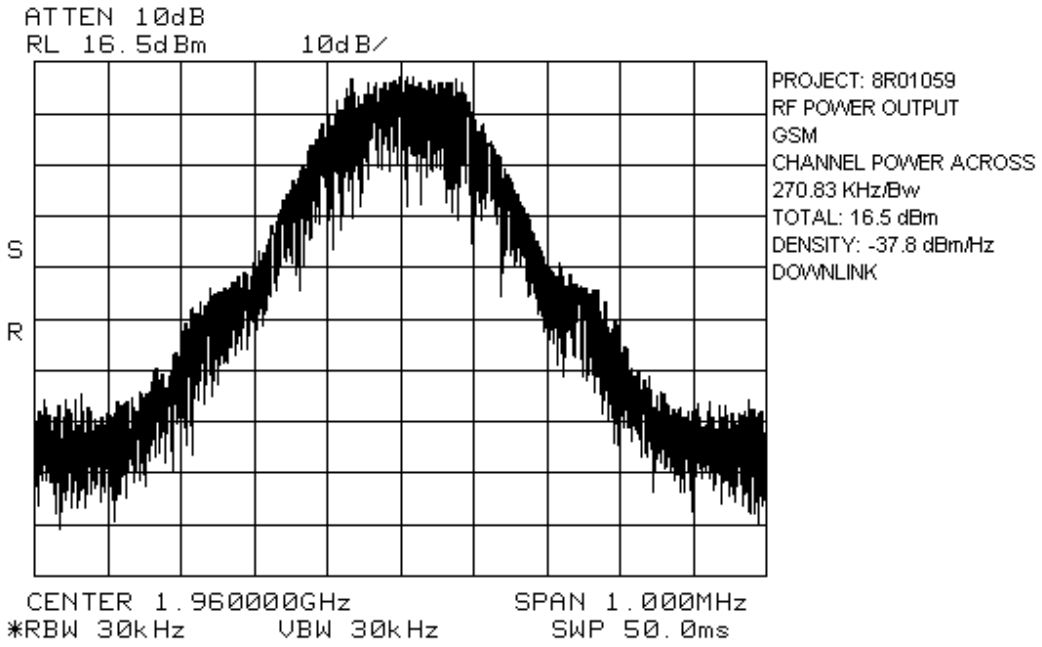
NAME OF TEST: RF Power Output	PARA. NO.: 2.985
TESTED BY: Kevin Carr	DATE: December 23, 1998

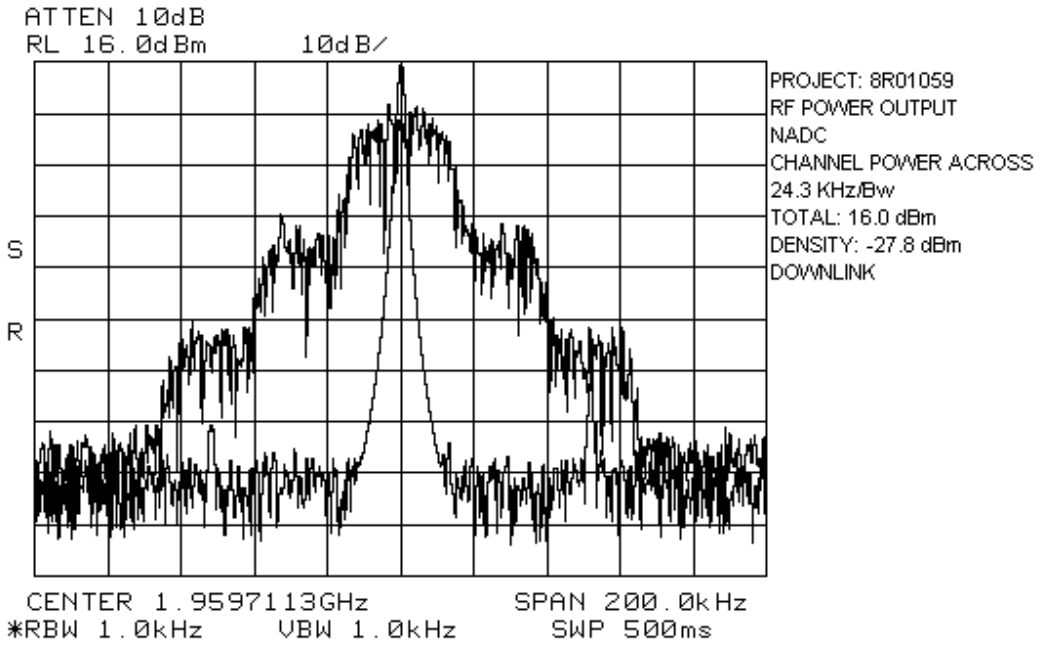
Test Results: Complies.

Measurement Data:

	Modulation Type	Per Channel Output Power (dBm)	Composite Output Power (dBm)
Downlink	CDMA	15.0	18.0
Downlink	GSM	13.5	16.5
Downlink	NADC	13.0	16.0


ATTEN 10dB
RL 18.0dBm
10dB/
R
PROJECT: 8R01059
RF POWER OUTPUT
CDMA
CHANNEL POWER ACROSS
1.23MHz/Bw
TOTAL: 18.0 dBm
DENSITY: -42.9 dBm/Hz
DOWNLINK
CENTER 1.960033GHz
SPAN 4.950MHz
*RBW 30kHz
VBW 30kHz
SWP 50.0ms


ATTEN 10dB
RL 16.5dBm
10dB/
S
R
PROJECT: 8R01059
RF POWER OUTPUT
GSM
CHANNEL POWER ACROSS
270.83 KHz/Bw
TOTAL: 16.5 dBm
DENSITY: -37.8 dBm/Hz
DOWNLINK
CENTER 1.960000GHz
SPAN 1.000MHz
*RBW 30kHz
VBW 30kHz
SWP 50.0ms

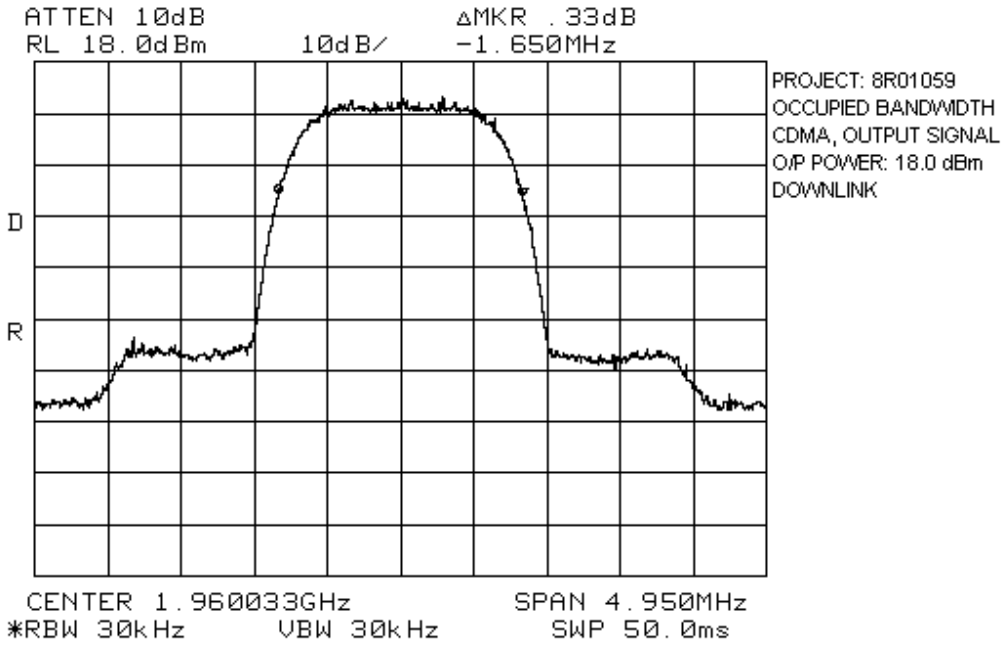

ATTEN 10dB
RL 16.0dBm
10dB/
S
R
PROJECT: 8R01059
RF POWER OUTPUT
NADC
CHANNEL POWER ACROSS
24.3 KHz/Bw
TOTAL: 16.0 dBm
DENSITY: -27.8 dBm
DOWNLINK
CENTER 1.9597113GHz
SPAN 200.0kHz
*RBW 1.0kHz
VBW 1.0kHz
SWP 500ms

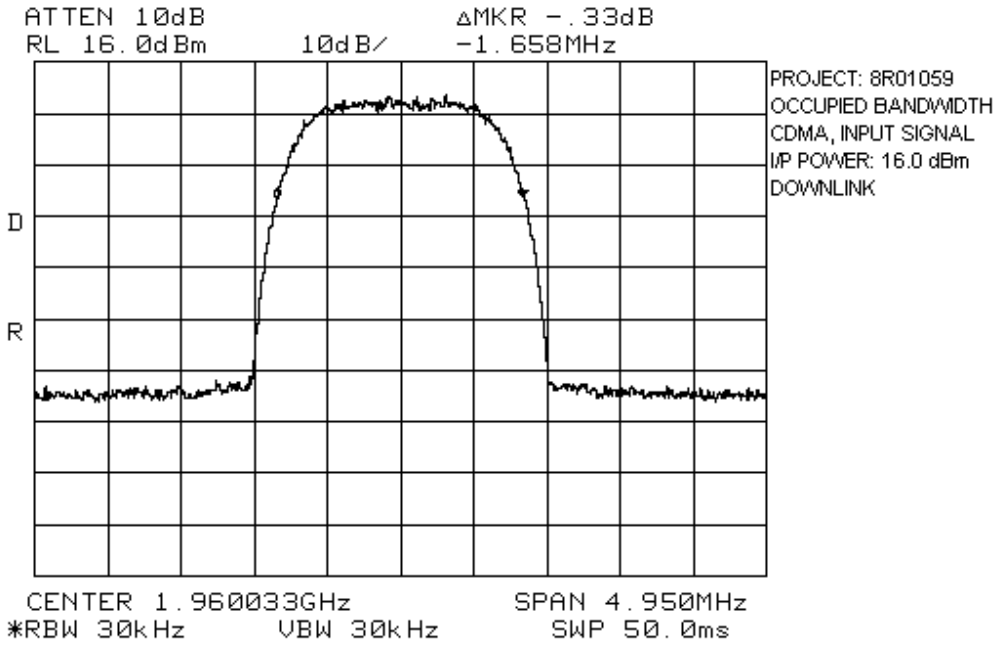
Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth (CDMA)	PARA. NO.: 2.917(c)
TESTED BY: Kevin Carr	DATE: December 23, 1998

Test Results: Complies.

Test Data: See attached graph(s).

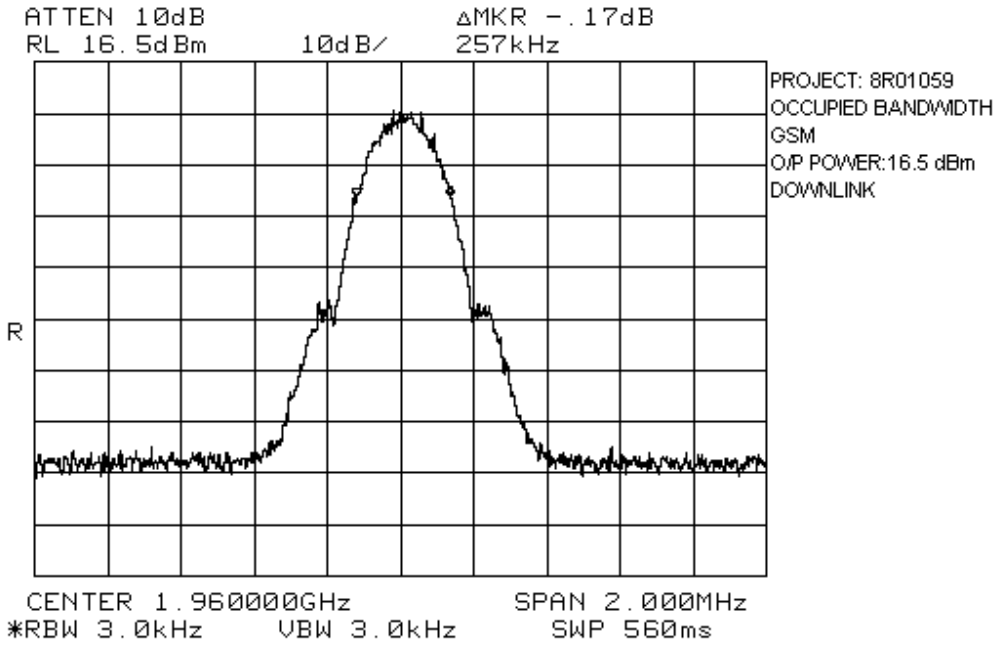

ATTEN 10dB
RL 18.0dBm
10dB/
ΔMKR .33dB
-1.650MHz
PROJECT: 8R01059
OCCUPIED BANDWIDTH
CDMA, OUTPUT SIGNAL
O/P POWER: 18.0 dBm
DOWNLINK
D
R
CENTER 1.960033GHz
SPAN 4.950MHz
*RBW 30kHz
VBW 30kHz
SWP 50.0ms

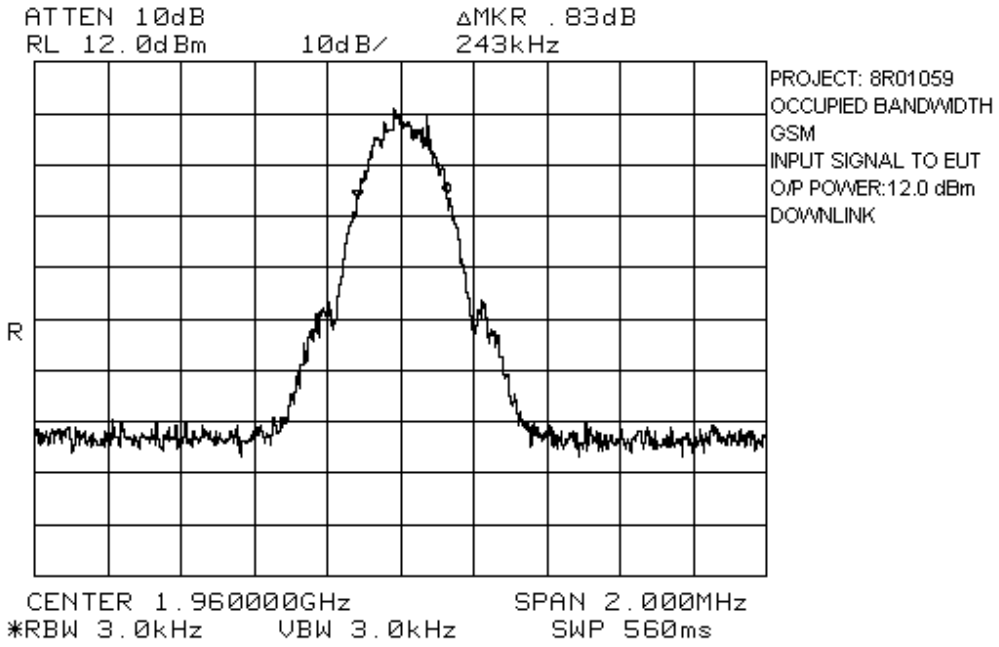

ATTEN 10dB
RL 16.0dBm
10dB/
ΔMKR -.33dB
-1.658MHz
PROJECT: 8R01059
OCCUPIED BANDWIDTH
CDMA, INPUT SIGNAL
I/P POWER: 16.0 dBm
DOWNLINK
D
R
CENTER 1.960033GHz
SPAN 4.950MHz
*RBW 30kHz
VBW 30kHz
SWP 50.0ms

NAME OF TEST: Occupied Bandwidth (GSM)	PARA. NO.: 2.917(c)
TESTED BY: Kevin Carr	DATE: November 30, 1998

Test Results: Complies.

Test Data: See attached graph(s).

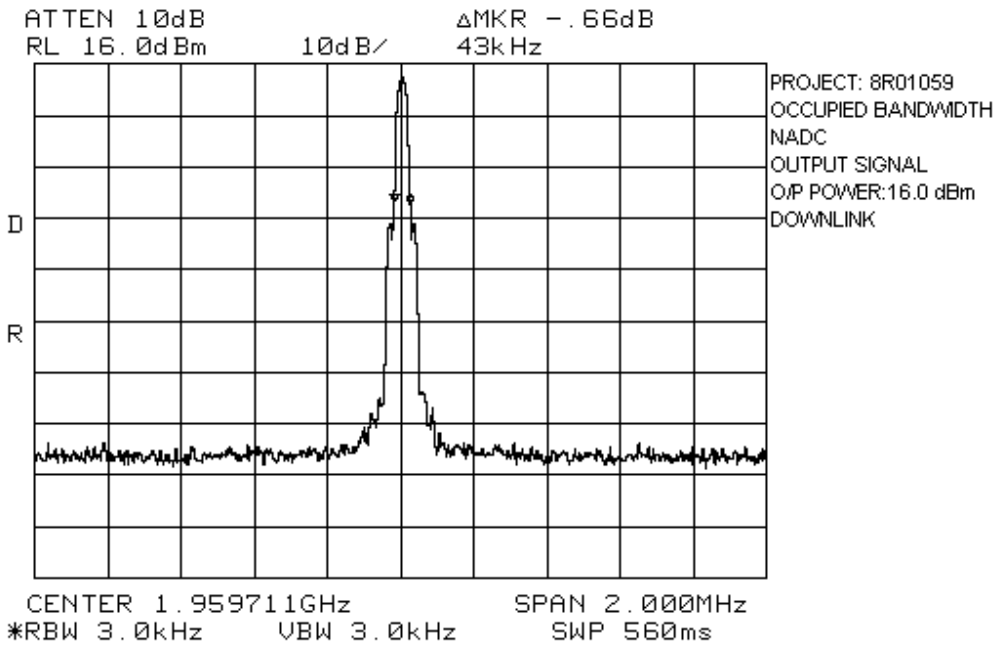

ATTEN 10dB
RL 16.5dBm
10dB/
ΔMKR -.17dB
257kHz
PROJECT: 8R01059
OCCUPIED BANDWIDTH
GSM
O/P POWER:16.5 dBm
DOWNLINK
R
CENTER 1.960000GHz
SPAN 2.000MHz
*RBW 3.0kHz
VBW 3.0kHz
SWP 560ms

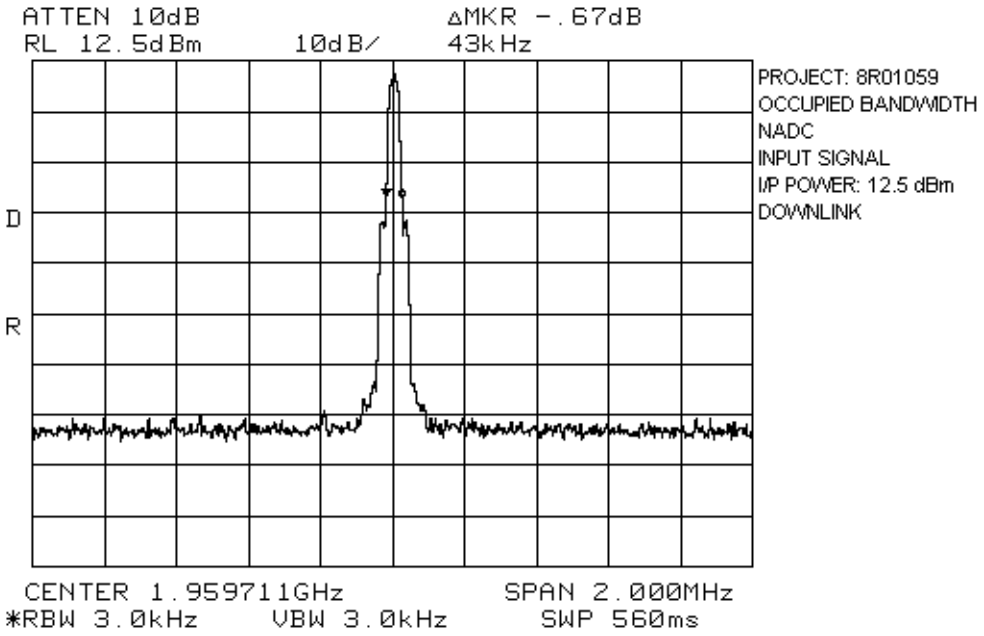

ATTEN 10dB
RL 12.0dBm
10dB/
ΔMKR .83dB
243kHz
PROJECT: 8R01059
OCCUPIED BANDWIDTH
GSM
INPUT SIGNAL TO EUT
O/P POWER:12.0 dBm
DOWNLINK
R
CENTER 1.960000GHz
SPAN 2.000MHz
*RBW 3.0kHz
VBW 3.0kHz
SWP 560ms

NAME OF TEST: Occupied Bandwidth (NADC)	PARA. NO.: 2.917(c)
TESTED BY: Kevin Carr	DATE: December 17, 1998

Test Results: Complies.

Test Data: See attached graph(s).


ATTEN 10dB
RL 16.0dBm
10dB/
ΔMKR -.66dB
43kHz
PROJECT: 8R01059
OCCUPIED BANDWIDTH
NADC
OUTPUT SIGNAL
O/P POWER:16.0 dBm
DOWNLINK
D
R
CENTER 1.959711GHz
SPAN 2.000MHz
*RBW 3.0kHz
VBW 3.0kHz
SWP 560ms


ATTEN 10dB
RL 12.5dBm
10dB/
ΔMKR -.67dB
43kHz
PROJECT: 8R01059
OCCUPIED BANDWIDTH
NADC
INPUT SIGNAL
I/P POWER: 12.5 dBm
DOWNLINK
D
R
CENTER 1.959711GHz
SPAN 2.000MHz
*RBW 3.0kHz
VBW 3.0kHz
SWP 560ms

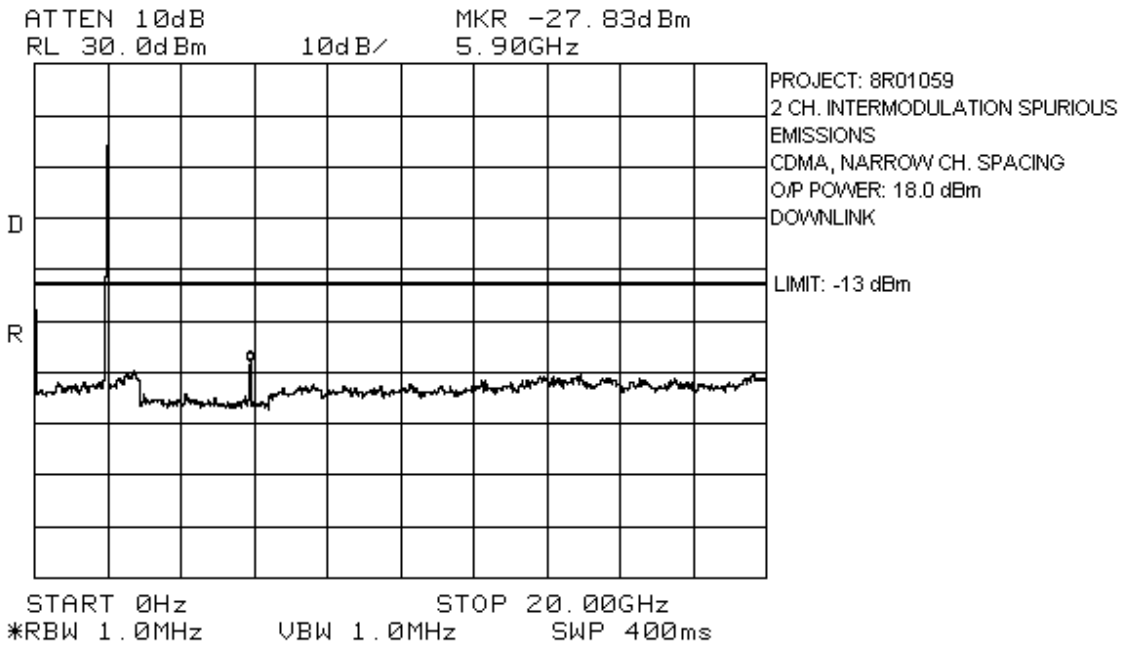
Section 5. Spurious Emissions at Antenna Terminals

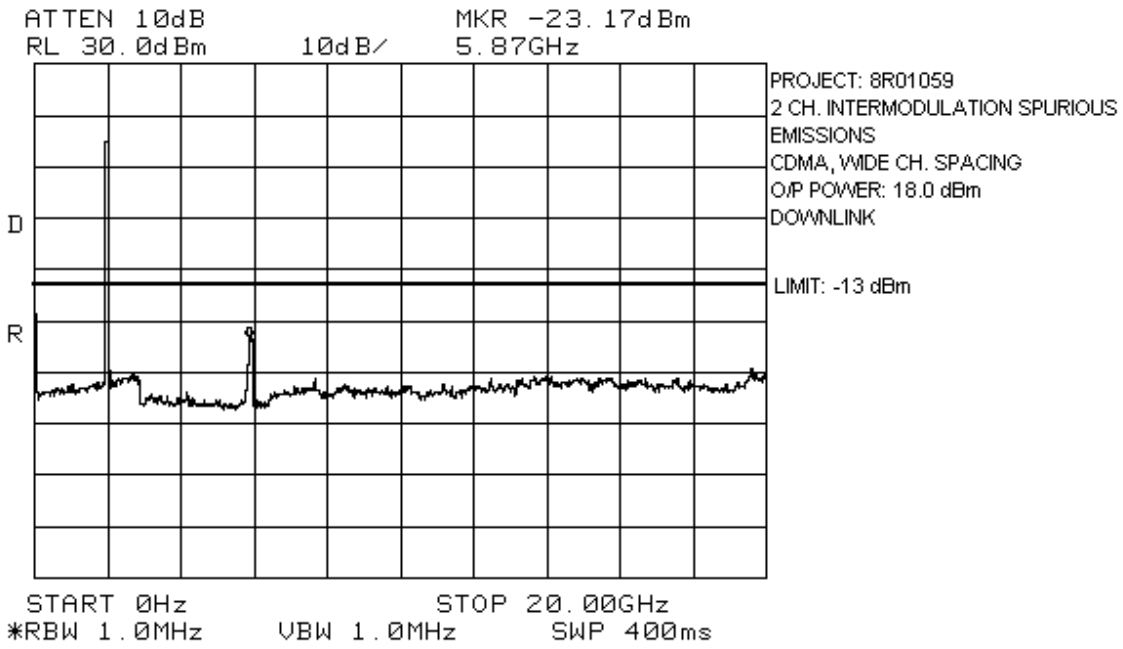
NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.917(e)
TESTED BY: Kevin Carr	DATE: December 23, 1998

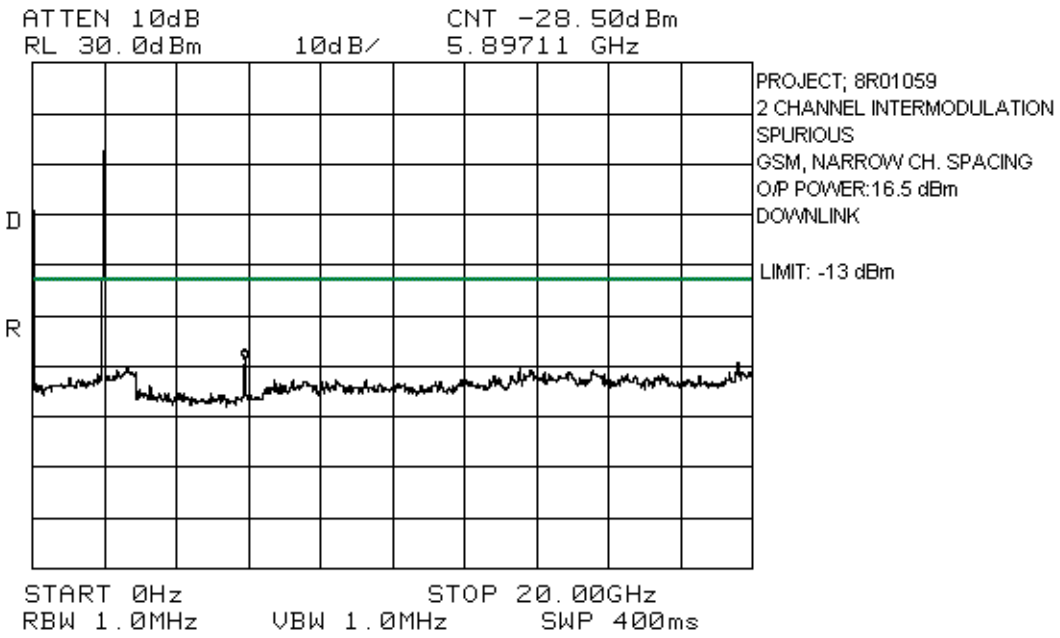
Test Results: Complies.

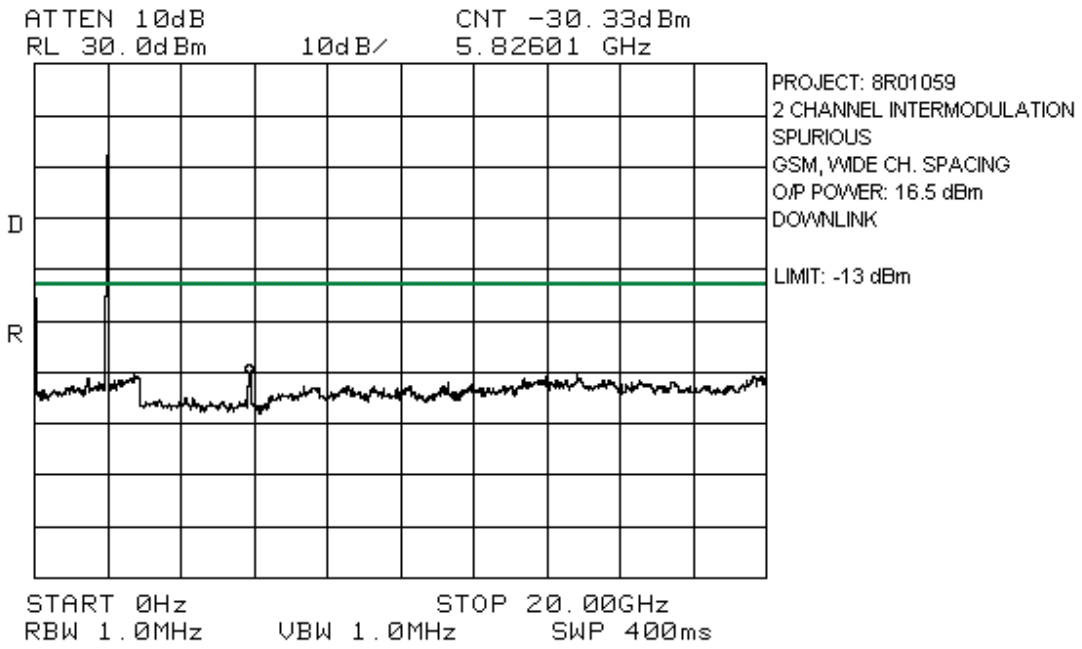
Test Data:

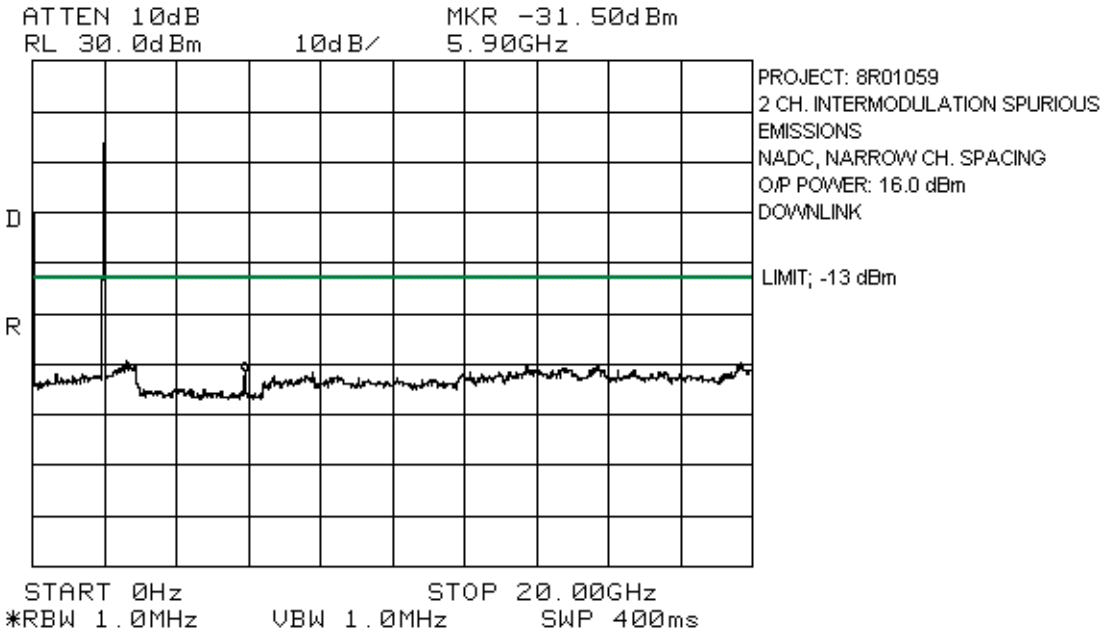
NAME OF TEST	WORST-CASE SPURIOUS LEVEL(dBm)
0 to 20 GHz spurious (Downlink)	-23.83
2 - signal intermodulation (Downlink)	-13.0
Lower band edge spurious (Downlink)	-33.5
Upper band edge spurious (Downlink)	-33.17

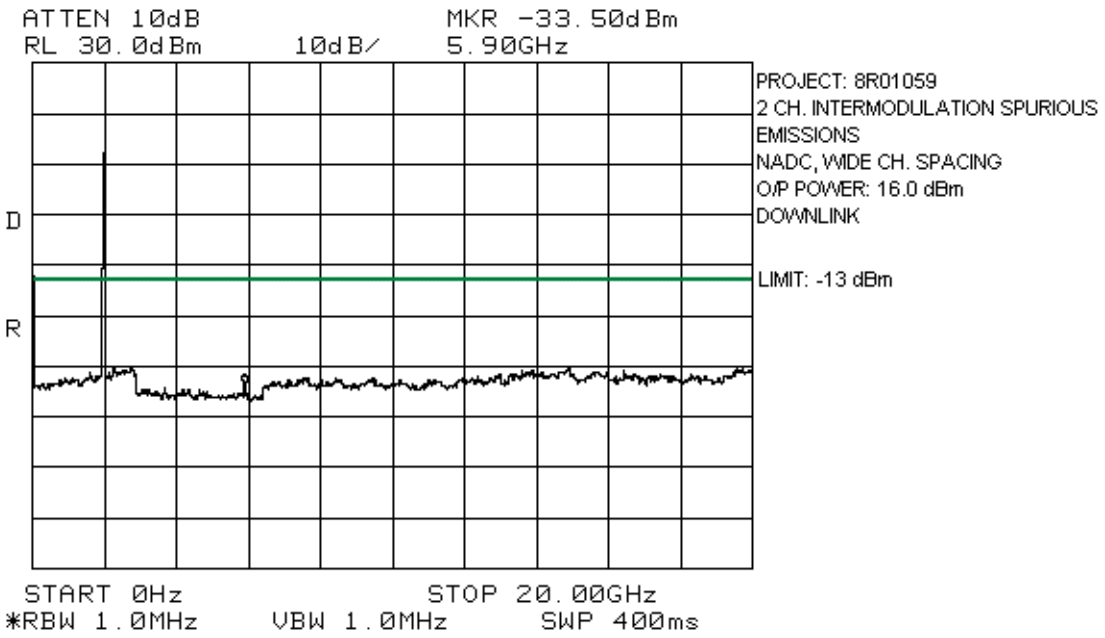

ATTEN 10dB
RL 30.0dBm
10dB/
MKR -27.83dBm
5.90GHz
D
R
PROJECT: 8R01059
2 CH. INTERMODULATION SPURIOUS EMISSIONS
CDMA, NARROW CH. SPACING
O/P POWER: 18.0 dBm
DOWNLINK
LIMIT: -13 dBm
START 0Hz
STOP 20.00GHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 400ms

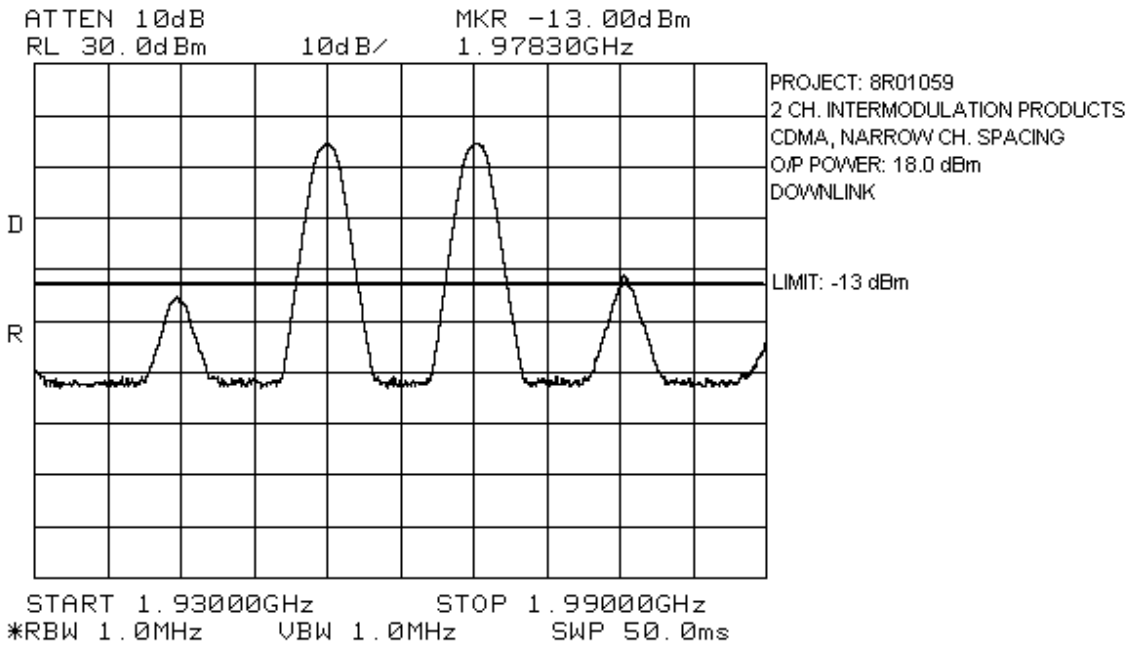

ATTEN 10dB
RL 30.0dBm
10dB/
MKR -23.17dBm
5.87GHz
PROJECT: 8R01059
2 CH. INTERMODULATION SPURIOUS EMISSIONS
CDMA, WIDE CH. SPACING
O/P POWER: 18.0 dBm
DOWNLINK
LIMIT: -13 dBm
D
R
START 0Hz
STOP 20.00GHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 400ms

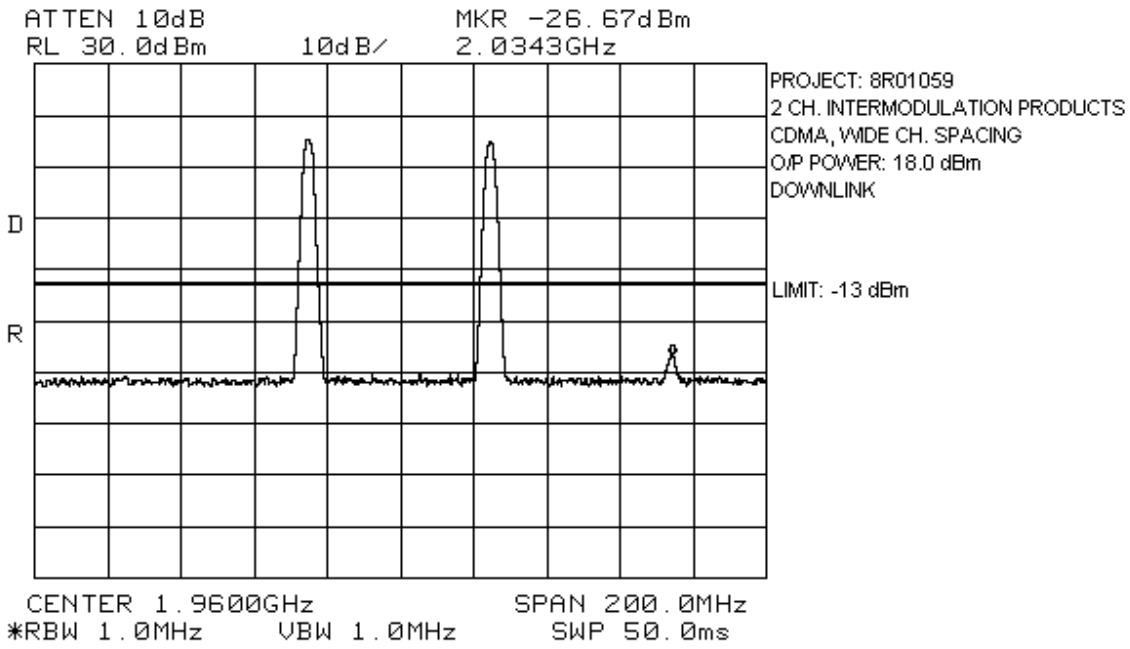

ATTEN 10dB
RL 30.0dBm
10dB/
CNT -28.50dBm
5.89711 GHz
PROJECT; 8R01059
2 CHANNEL INTERMODULATION
SPURIOUS
GSM, NARROW CH. SPACING
O/P POWER:16.5 dBm
DOWNLINK
LIMIT: -13 dBm
D
R
START 0Hz
STOP 20.00GHz
RBW 1.0MHz
VBW 1.0MHz
SWP 400ms

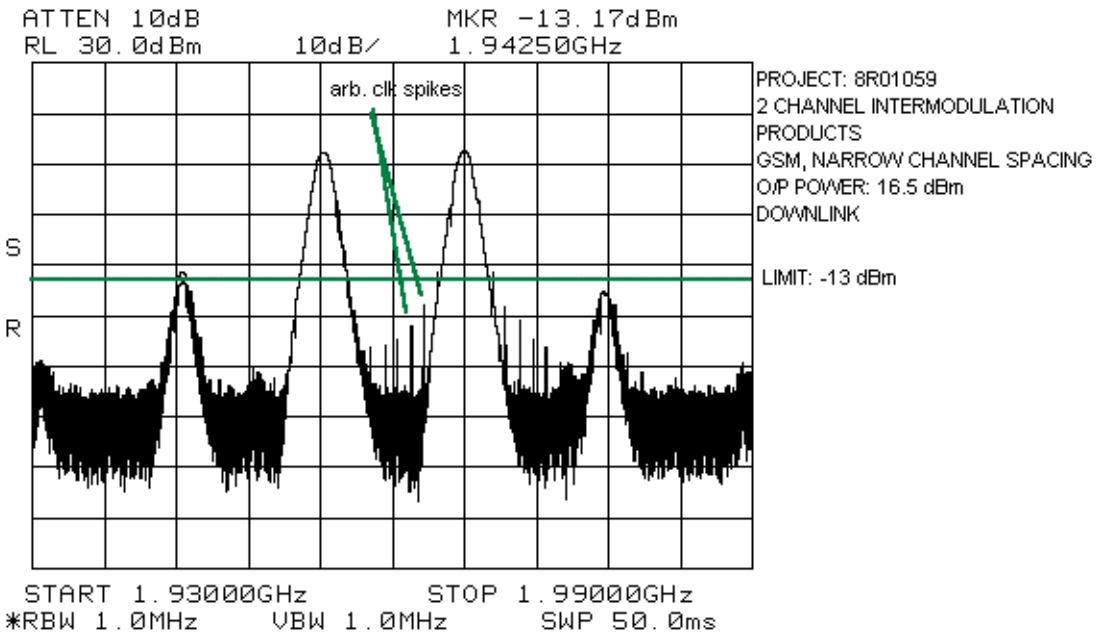

ATTEN 10dB
RL 30.0dBm
10dB/
CNT -30.33dBm
5.82601 GHz
PROJECT: 8R01059
2 CHANNEL INTERMODULATION
SPURIOUS
GSM, WIDE CH. SPACING
O/P POWER: 16.5 dBm
DOWNLINK
LIMIT: -13 dBm
D
R
START 0Hz
STOP 20.00GHz
RBW 1.0MHz
VBW 1.0MHz
SWP 400ms

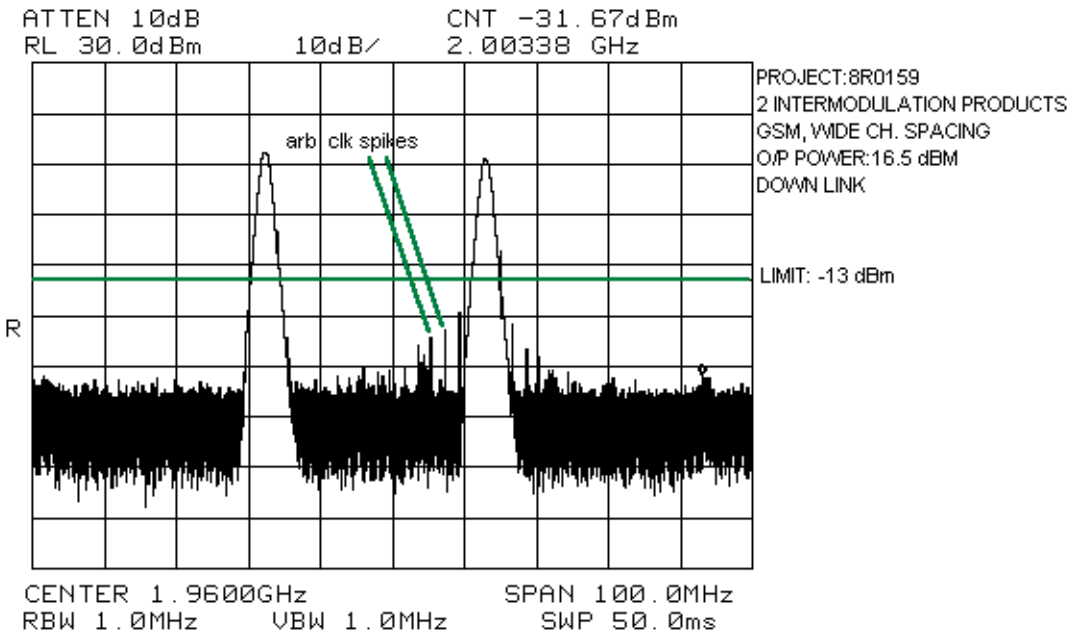

ATTEN 10dB
RL 30.0dBm
10dB/
MKR -31.50dBm
5.90GHz
PROJECT: 8R01059
2 CH. INTERMODULATION SPURIOUS EMISSIONS
NADC, NARROW CH. SPACING
O/P POWER: 16.0 dBm
DOWNLINK
LIMIT; -13 dBm
D
R
START 0Hz
STOP 20.00GHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 400ms

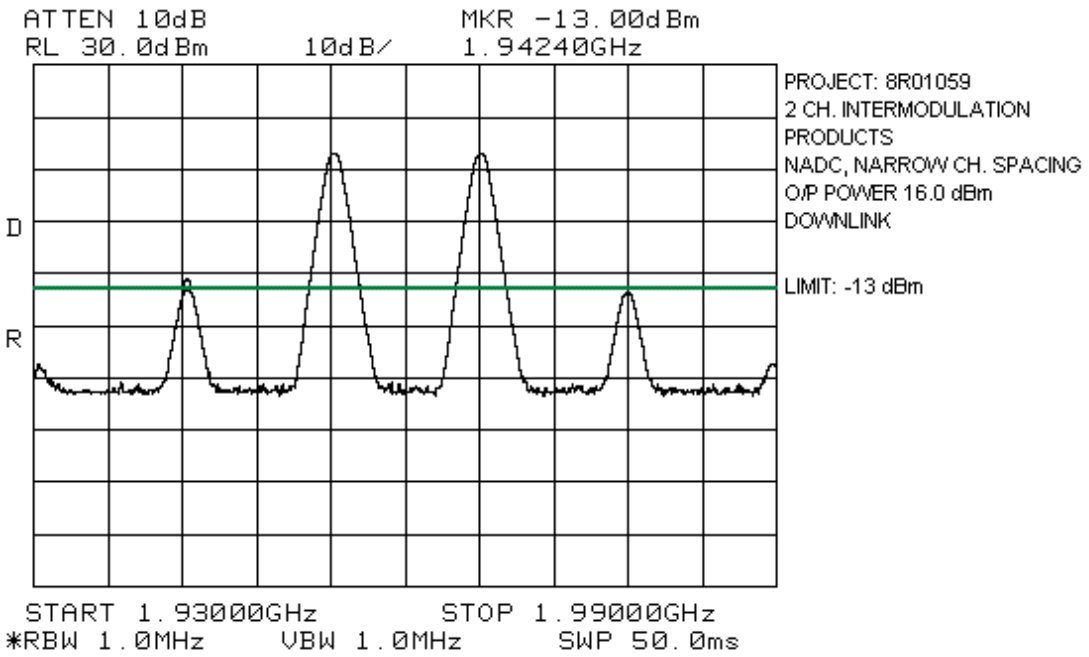

ATTEN 10dB
RL 30.0dBm
10dB/
MKR -33.50dBm
5.90GHz
PROJECT: 8R01059
2 CH. INTERMODULATION SPURIOUS EMISSIONS
NADC, WIDE CH. SPACING
O/P POWER: 16.0 dBm
DOWNLINK
LIMIT: -13 dBm
D
R
START 0Hz
STOP 20.00GHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 400ms

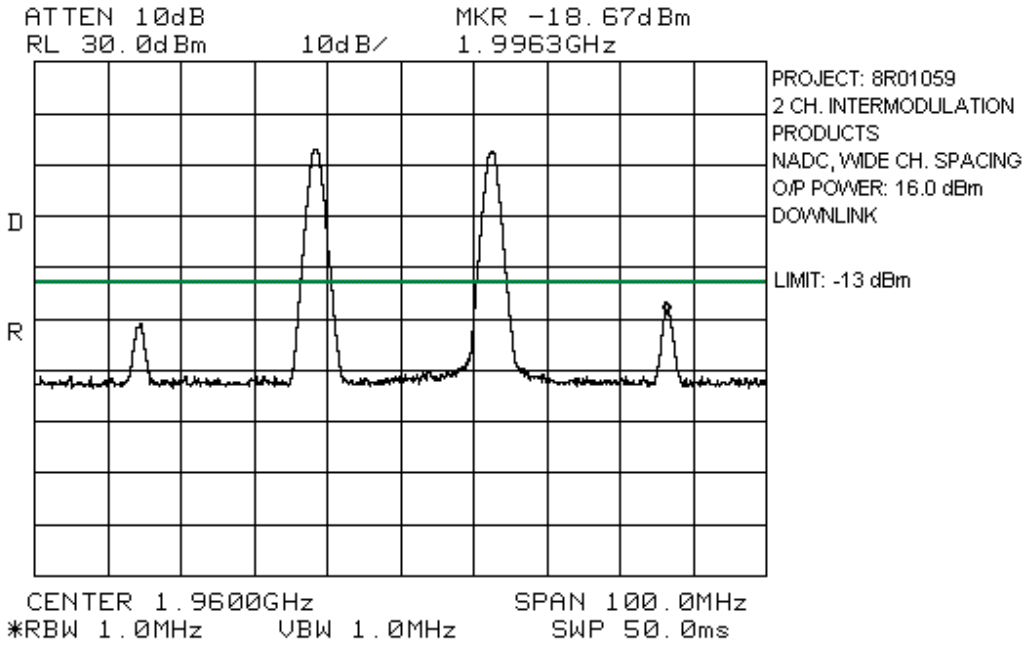

ATTEN 10dB
RL 30.0dBm
10dB/
MKR -13.00dBm
1.97830GHz
PROJECT: 8R01059
2 CH. INTERMODULATION PRODUCTS
CDMA, NARROW CH. SPACING
O/P POWER: 18.0 dBm
DOWNLINK
LIMIT: -13 dBm
D
R
START 1.93000GHz
STOP 1.99000GHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 50.0ms

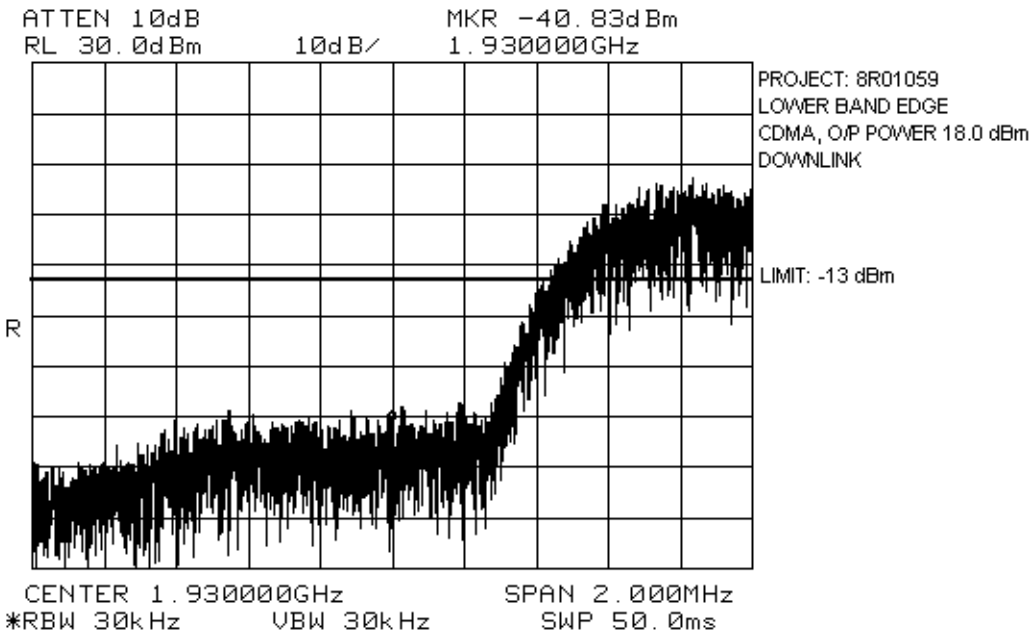

ATTEN 10dB
RL 30.0dBm
10dB/
MKR -26.67dBm
2.0343GHz
PROJECT: 8R01059
2 CH. INTERMODULATION PRODUCTS
CDMA, WIDE CH. SPACING
O/P POWER: 18.0 dBm
DOWNLINK
D
LIMIT: -13 dBm
R
CENTER 1.9600GHz
SPAN 200.0MHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 50.0ms

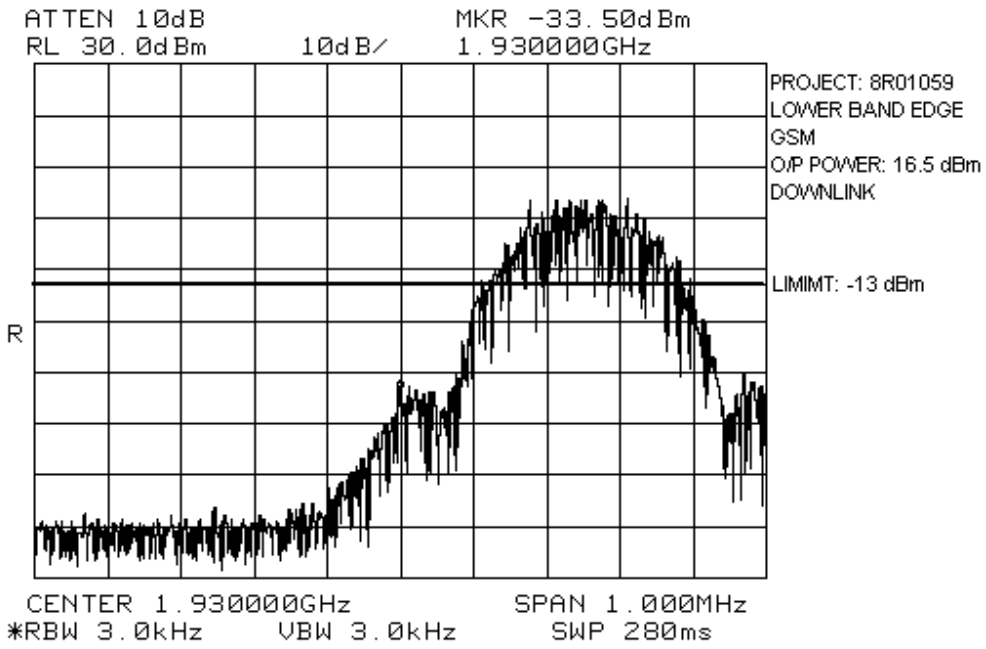

ATTEN 10dB
RL 30.0dBm
10dB/
MKR -13.17dBm
1.94250GHz
arb. clk spikes
PROJECT: 8R01059
2 CHANNEL INTERMODULATION
PRODUCTS
GSM, NARROW CHANNEL SPACING
O/P POWER: 16.5 dBm
DOWNLINK
LIMIT: -13 dBm
S
R
START 1.93000GHz
STOP 1.99000GHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 50.0ms

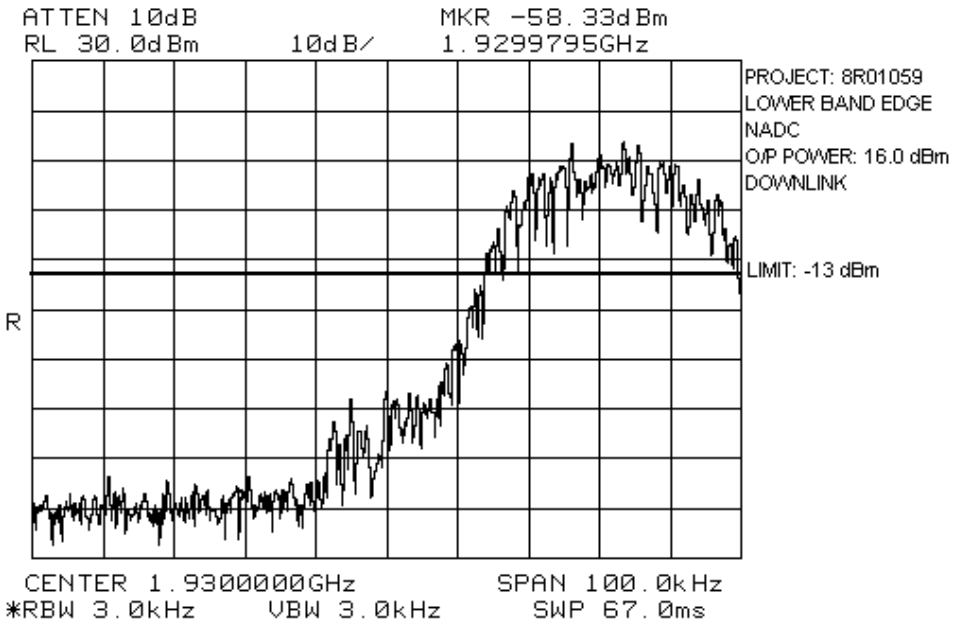

ATTEN 10dB
RL 30.0dBm
10dB/
CNT -31.67dBm
2.00338 GHz
PROJECT:8R0159
2 INTERMODULATION PRODUCTS
GSM, WIDE CH. SPACING
O/P POWER:16.5 dBM
DOWN LINK
arb clk spikes
LIMIT: -13 dBm
R
CENTER 1.9600GHz
SPAN 100.0MHz
RBW 1.0MHz
VBW 1.0MHz
SWP 50.0ms

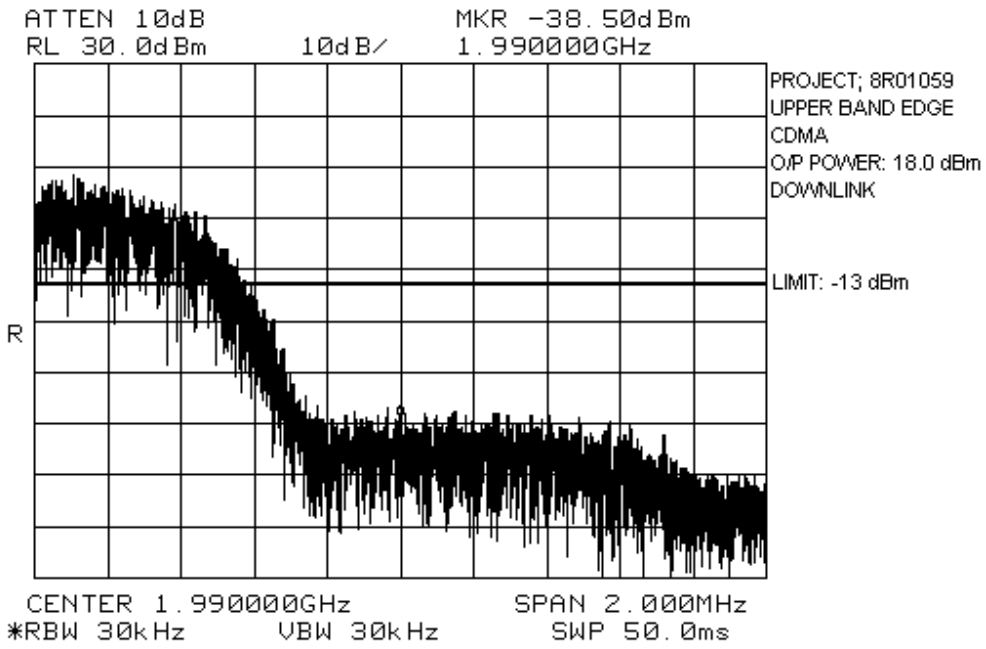

ATTEN 10dB
RL 30.0dBm
10dB/
MKR -13.00dBm
1.94240GHz
D
R
PROJECT: 8R01059
2 CH. INTERMODULATION
PRODUCTS
NADC, NARROW CH. SPACING
O/P POWER 16.0 dBm
DOWNLINK
LIMIT: -13 dBm
START 1.93000GHz
STOP 1.99000GHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 50.0ms

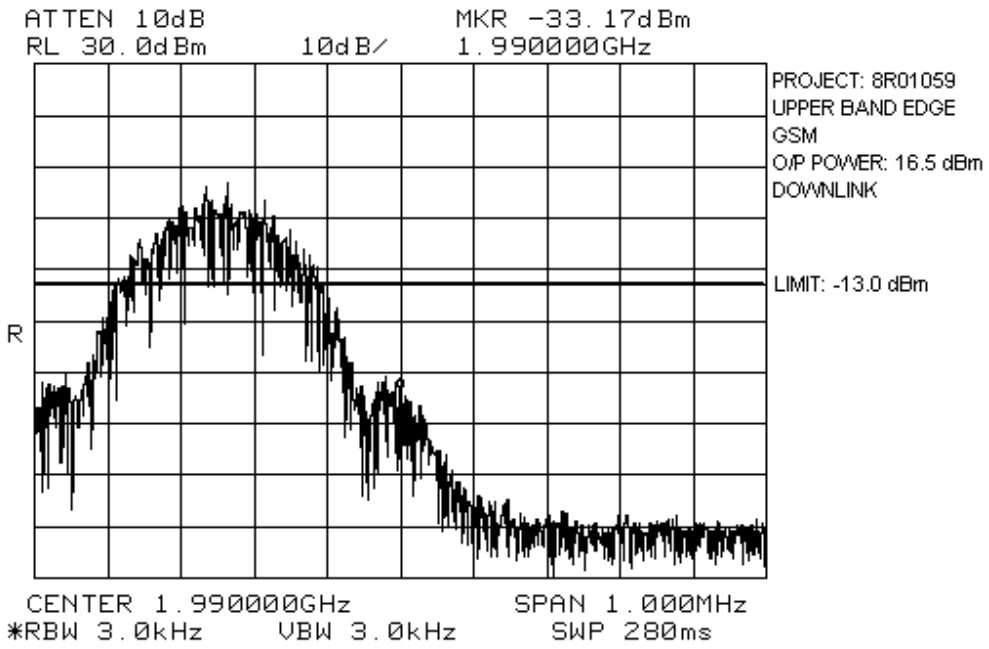

ATTEN 10dB
RL 30.0dBm
10dB/
MKR -18.67dBm
1.9963GHz
PROJECT: 8R01059
2 CH. INTERMODULATION
PRODUCTS
NADC, WIDE CH. SPACING
O/P POWER: 16.0 dBm
DOWNLINK
LIMIT: -13 dBm
D
R
CENTER 1.9600GHz
SPAN 100.0MHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 50.0ms

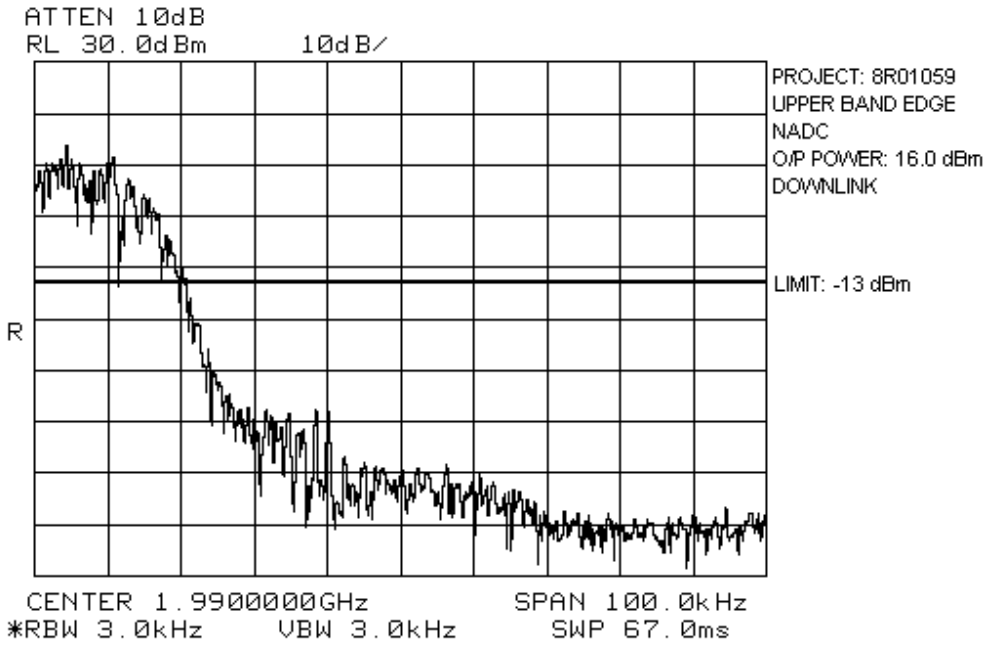

ATTEN 10dB
RL 30.0dBm
10dB/
MKR -40.83dBm
1.930000GHz
PROJECT: 8R01059
LOWER BAND EDGE
CDMA, O/P POWER 18.0 dBm
DOWNLINK
LIMIT: -13 dBm
R
CENTER 1.930000GHz
SPAN 2.000MHz
*RBW 30kHz
VBW 30kHz
SWP 50.0ms


ATTEN 10dB
RL 30.0dBm
10dB/
MKR -33.50dBm
1.930000GHz
PROJECT: 8R01059
LOWER BAND EDGE
GSM
O/P POWER: 16.5 dBm
DOWNLINK
LIMIMT: -13 dBm
R
CENTER 1.930000GHz
SPAN 1.000MHz
*RBW 3.0kHz
VBW 3.0kHz
SWP 280ms


ATTEN 10dB
RL 30.0dBm
10dB/
MKR -58.33dBm
1.9299795GHz
PROJECT: 8R01059
LOWER BAND EDGE
NADC
O/P POWER: 16.0 dBm
DOWNLINK
LIMIT: -13 dBm
R
CENTER 1.9300000GHz
SPAN 100.0kHz
*RBW 3.0kHz
VBW 3.0kHz
SWP 67.0ms


ATTEN 10dB
RL 30.0dBm
10dB/
MKR -38.50dBm
1.990000GHz
PROJECT; 8R01059
UPPER BAND EDGE
CDMA
O/P POWER: 18.0 dBm
DOWNLINK
LIMIT: -13 dBm
R
CENTER 1.990000GHz
SPAN 2.000MHz
*RBW 30kHz
VBW 30kHz
SWP 50.0ms


ATTEN 10dB
RL 30.0dBm
10dB/
MKR -33.17dBm
1.990000GHz
PROJECT: 8R01059
UPPER BAND EDGE
GSM
O/P POWER: 16.5 dBm
DOWNLINK
LIMIT: -13.0 dBm
R
CENTER 1.990000GHz
SPAN 1.000MHz
*RBW 3.0kHz
VBW 3.0kHz
SWP 280ms


ATTEN 10dB
RL 30.0dBm
10dB/
PROJECT: 8R01059
UPPER BAND EDGE
NADC
O/P POWER: 16.0 dBm
DOWNLINK
LIMIT: -13 dBm
R
CENTER 1.9900000GHz
SPAN 100.0kHz
*RBW 3.0kHz
VBW 3.0kHz
SWP 67.0ms

Section 6. Field Strength of Spurious

NAME OF TEST: Radiated Emissions	PARA. NO.: 2.917(e)
TESTED BY: Kevin Carr	DATE: December 23, 1998

Test Results: Complies.
The maximum field strength is 75.8 dBμV/m @ 3m.

Test Data:

Test Data - Radiated Emissions - Downlink

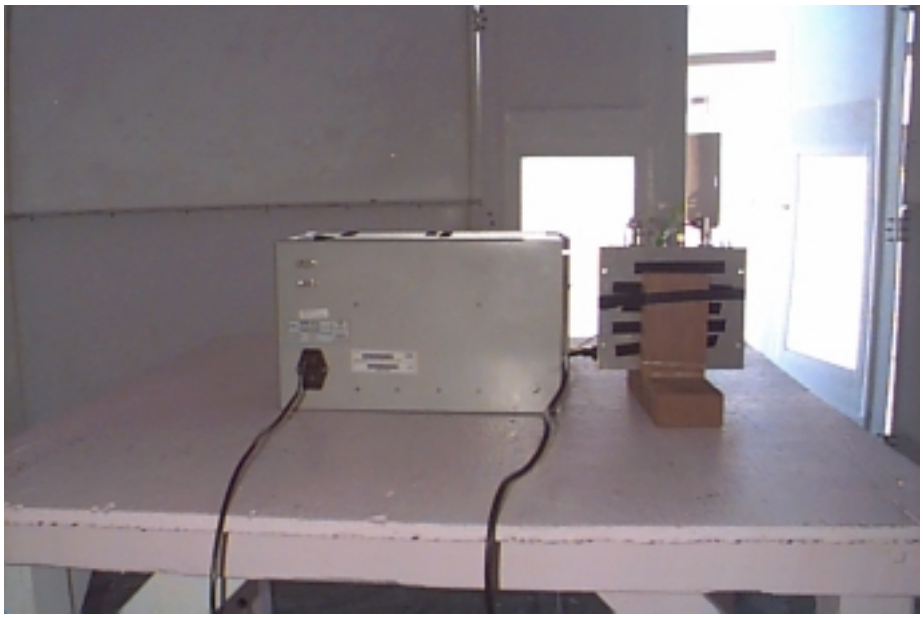
Test Distance (meters) : 3		Range: Shield Room		Receiver: HP 8566B		RBW 100 kHz		Detector: Peak			
Freq. (MHz)	Ant. *	Pol. (V/H)	Ant. HGT. (m)	Table (deg.)	RCVD Signal (dBµV/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Dist. Corr. (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
3920.0	H2	V			56.0	33.7	-42.6		47.1	82.3	35.2
3920.0	H2	H			59.9	33.7	-42.6		51.0	82.3	31.3
5880.0	H2	V			51.3	36.3	-44.5		43.1	82.3	39.2
5880.0	H2	H			50.6	36.3	-44.5		42.4	82.3	39.9
7840	H2	V			45.2	38.4	-43.7		39.9	82.3	42.4
7840	H2	H			47.0	38.4	-43.7		41.7	82.3	40.6
9800	H2	V			37.8	39.8	-44.3		33.3	82.3	49.0
9800	H2	H			37.3	39.8	-44.3		32.8	82.3	44.5
11760.0	H2	V			37.7	39.9	-44.8		33.8	82.3	48.5
11760.0	H2	H			37.9	39.9	-44.8		34.0	82.3	48.3
13720.0	H2	V			38.6	41.5		-9.54	70.6	82.3	11.7
13720.0	H2	H			38.3	41.5		-9.54	70.2	82.3	12.0
15680	H2	V			38.6	39.5		-9.54	68.6	82.3	13.7
15680	H2	H			39.4	39.5		-9.54	69.4	82.3	12.9
17640.0	H2	V			40.8	44.5		-9.54	75.8	82.3	6.5
17640.0	H2	H			39.8	44.5		-9.54	74.8	82.3	7.5
19600.0	SH50-1	V			38.9	40.46		-9.54	68.8	82.3	13.5
19600.0	SH50-1	H			39.0	40.46		-9.54	69.9	82.3	12.4

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.
Measurements incorporating Dist. Connection were taken at 1 meter.

Photographs of Test Setup

Front View

Rear View



Pre-Scan Data

INSERT PRESCAN GRAPHS

Prescan Data

Project Number : 8R01059
Project Filename : 8R1059.LST
Date : January 5, 1999
Start Frequency : 30 MHz
Stop Frequency : 1000 MHz
Display Line Value: 24 dBuV

Vertical Prescan

Top 6 Emissions below 300 MHz from the vertical prescan list:

74.11 MHz, 27.1 dBuV.
73.42 MHz, 26.5 dBuV.
73.7 MHz, 26.4 dBuV.
74.25 MHz, 25.6 dBuV.
73.01 MHz, 24.7 dBuV.
75.22 MHz, 24.3 dBuV.

Full Emission List below 300 MHz:

72.59 MHz, 24.1 dBuV. Peak.
73.01 MHz, 24.7 dBuV. Peak.
73.42 MHz, 26.5 dBuV. Peak.
73.7 MHz, 26.4 dBuV. Peak.
73.84 MHz, 26.4 dBuV. Peak.
74.11 MHz, 27.1 dBuV. Peak.
74.25 MHz, 25.6 dBuV. Peak.
75.22 MHz, 24.3 dBuV. Peak.

Top 6 Emissions above 300 MHz from the vertical prescan list:

462.31 MHz, 26.8 dBuV.
531.08 MHz, 26.5 dBuV.
452.5 MHz, 25.9 dBuV.
491.79 MHz, 25.7 dBuV.
472.13 MHz, 25.3 dBuV.
550.73 MHz, 25 dBuV.

Full Emission List above 300 MHz:

300 MHz, 16.5 dBuV. Peak.
305.06 MHz, 20.4 dBuV. Peak.
314.89 MHz, 22.4 dBuV. Peak.
324.72 MHz, 17 dBuV. Peak.
334.54 MHz, 20.8 dBuV. Peak.
373.86 MHz, 22.7 dBuV. Peak.
383.7 MHz, 18.2 dBuV. Peak.
393.53 MHz, 16 dBuV. Peak.
423.02 MHz, 16.2 dBuV. Peak.
432.84 MHz, 20.5 dBuV. Peak.
442.66 MHz, 22.4 dBuV. Peak.
452.5 MHz, 25.9 dBuV. Peak.
462.31 MHz, 26.8 dBuV. Peak.
472.13 MHz, 25.3 dBuV. Peak.
481.95 MHz, 23.5 dBuV. Peak.
491.79 MHz, 25.7 dBuV. Peak.
500.01 MHz, 17.2 dBuV. Peak.
501.62 MHz, 22.7 dBuV. Peak.
511.43 MHz, 16.4 dBuV. Peak.
521.27 MHz, 24.7 dBuV. Peak.
531.08 MHz, 26.5 dBuV. Peak.
540.91 MHz, 25.7 dBuV. Peak.
550.73 MHz, 25 dBuV. Peak.
560.55 MHz, 25 dBuV. Peak.
570.37 MHz, 22.6 dBuV. Peak.
580.19 MHz, 17.3 dBuV. Peak.
658.77 MHz, 18.1 dBuV. Peak.
668.63 MHz, 16.6 dBuV. Peak.
678.45 MHz, 20.4 dBuV. Peak.
698.08 MHz, 16.7 dBuV. Peak.
717.7 MHz, 16.9 dBuV. Peak.

Horizontal Prescan

Top Emissions below 300 MHz from the horizontal prescan list:

Full Emission List below 300 MHz:

Top Emissions above 300 MHz from the horizontal prescan list:

369.99 MHz, 23.3 dBuV.
500.01 MHz, 21.3 dBuV.
507.24 MHz, 16 dBuV.

Full Emission List above 300 MHz:

369.99 MHz, 23.3 dBuV. Peak.
370 MHz, 23.3 dBuV. Peak.
500.01 MHz, 21.3 dBuV. Peak.
507.24 MHz, 16 dBuV. Peak.

Section 7. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 24.235
TESTED BY:	DATE:

Test Results: Complies/Does Not Comply

Measurement Data: Standard Test Frequency: _____ MHz
Standard Test Voltage: _____ Vdc

NOT APPLICABLE

Section 8. Test Equipment List

CAL CYCLE	EQUIPMENT	MANUFACTURER	MODEL	SERIAL	LAST CAL.	NEXT CAL.	
1 Year	Spectrum Analyzer	Hewlett Packard	8565E	FA000981	May 20/98	May 20/99	
1 Year	Spectrum Analyzer-**2**	Hewlett Packard	8566B	1950A00400	July 22/98	July 22/99	
1 Year	Spectrum Analyzer Display-**2**	Hewlett Packard	85662A	1950A01177	July 22/98	July 22/99	
1 Year	Quasi Peak Adaptor-**2**	Hewlett Packard	85650A	2251A00620	July 22/98	July 22/99	
	Power Supply	Astron	VS-50M	8405071	NCR	NCR	
1 Year	Attenuator	Narda	768-20	9507	July 24/98	July 24/99	
1 Year	Attenuator	Narda	765-20	9510	July 24/98	July 24/99	
1 Year	RF Millivoltmeter	Rohde & Schwarz	URV5	FA000420	July 23/98	July 23/99	
1 Year	Insertion Unit	Rohde & Schwarz	URV5-Z4	FA000905	July 23/98	July 23/99	
2 Year	Horn Antenna	EMCO #2	3115	4336	Oct. 30/97	Oct. 30/99	
1 Year	50 ohm Combiner Pad	Mini Circuits	ZA3PD-2	9746	July 23/98	July 23/99	
1 Year	Low Noise Amplifier	Avantek	AWT-8035	1005	Aug. 4/98	Aug. 4/99	
1 Year	Low Noise Amplifier	DBS Microwave	DWT-13035	9623	Aug. 4/98	Aug. 4/99	
1 Year	Signal Generator	Rohde & Schwarz	SM1Q03	1084-8004-03	July 23/98	July 23/99	
1 Year	Arbitrary Waveform Gen.	Sony/Tektronix	AWG2021	J310495	NCR	NCR	
3 Year	Standard Gain Horn	Electro-Metrics	SH-50/60-1	FA000479	July 29/97	July 29/00	
3 Year	RF Generator	Rohde & Schwarz	SME3	DE14439	June 29/96	June 29/99	
1 Year	RF Amp.	Comtest	GPA301	BCS320-1040	NCR	NCR	

NA: Not Applicable
NCR: No Cal Required

ANNEX A

TEST METHODOLOGIES

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

Test Conditions: Standard Temperature & Humidity
Standard Test Voltage

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:

Detachable Antenna:
The peak power at antenna terminals is measured using an in-line peak power meter. Power output is measured with the maximum rated input level.

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.: 2.989**

Test Conditions: Standard Temperature & Humidity
Standard Test Voltage

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

Spectrum analyzer settings:
RBW: 30 kHz
VBW: ≥ RBW
Span: 5 MHz
Sweep: Auto
Mask: Set markers to -26 dB from peak of CW.

GSM

RBW: 3 kHz
VBW: ≥ RBW
Span: 2 MHz
Sweep: Auto
Mask: Set markers to -26 dB from peak of CW.

NADC

RBW: 1 kHz
VBW: ≥ RBW
Span: 1 MHz
Sweep: Auto
Mask: Set markers to -26 dB from peak of CW.

NAME OF TEST: Spurious Emission at Antenna Terminals PARA. NO.: 2.991

Test Conditions: Standard Temperature & Humidity
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.

Method Of Measurement:

Spectrum analyzer settings:

CDMA

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

GSM

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

NADC

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)

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

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

For emissions > 1 GHz:

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

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

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:

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. The frequency counter and signal generator are phase locked with the same 10 MHz reference frequency by connecting the 10 MHz ref. out of the counter to the 10 MHz ref, in of the signal generator. 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.

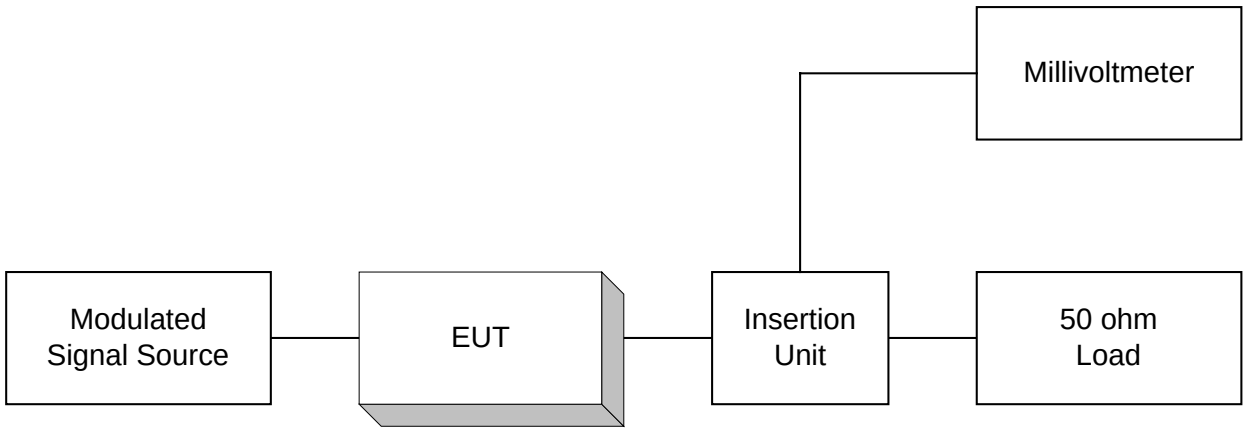
Frequency Stability With Temperature Variation

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.

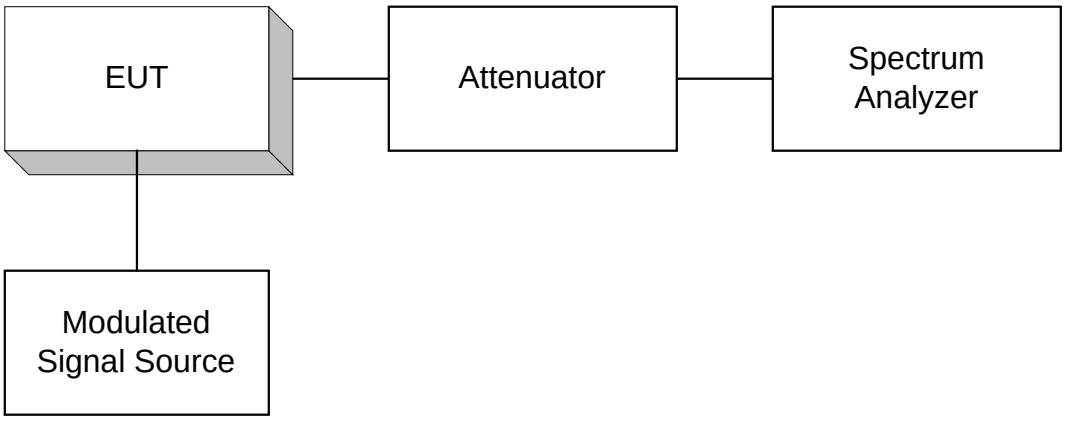
ANNEX B

TEST DIAGRAMS

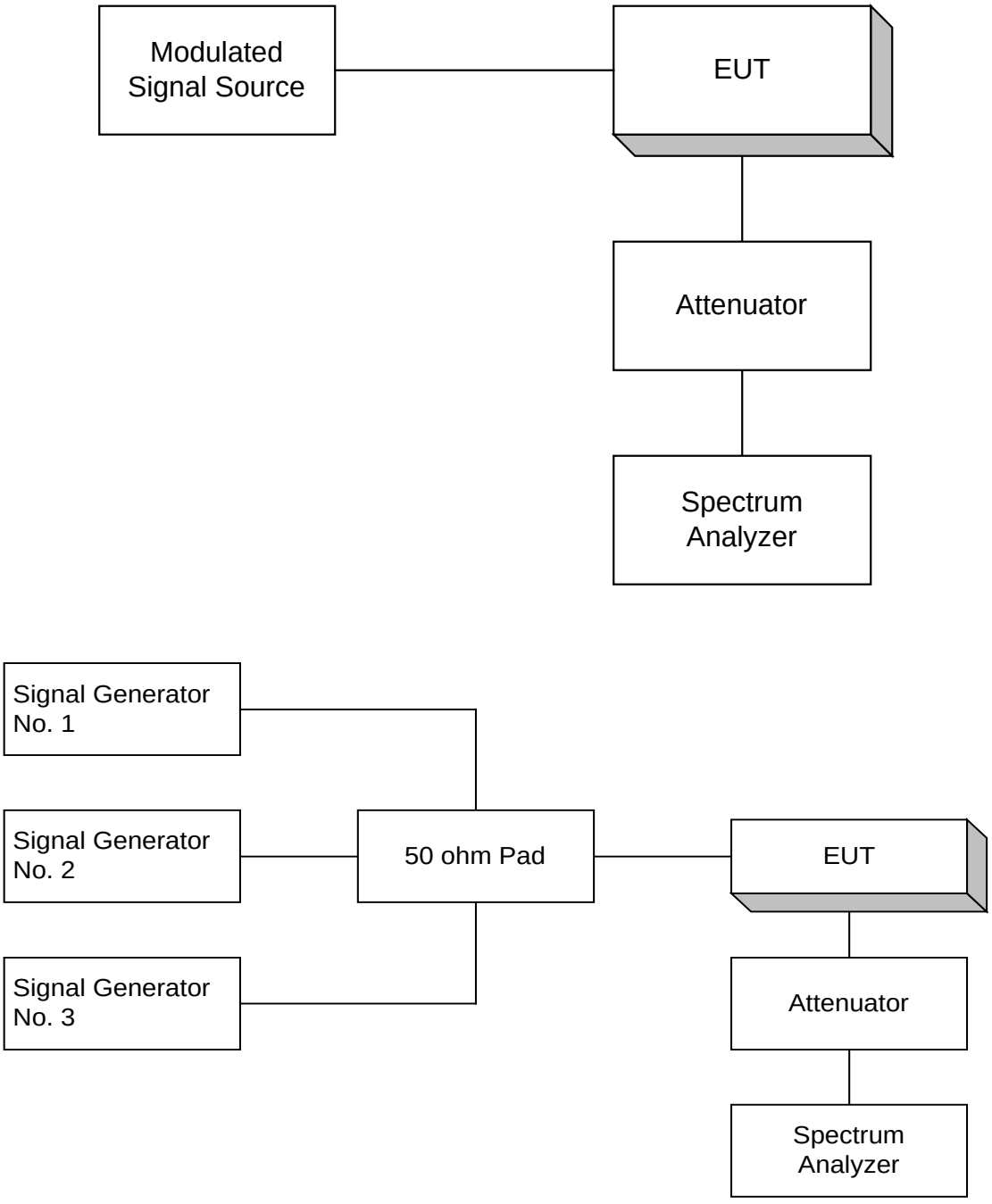
Para. No. 2.985 - R.F. Power Output



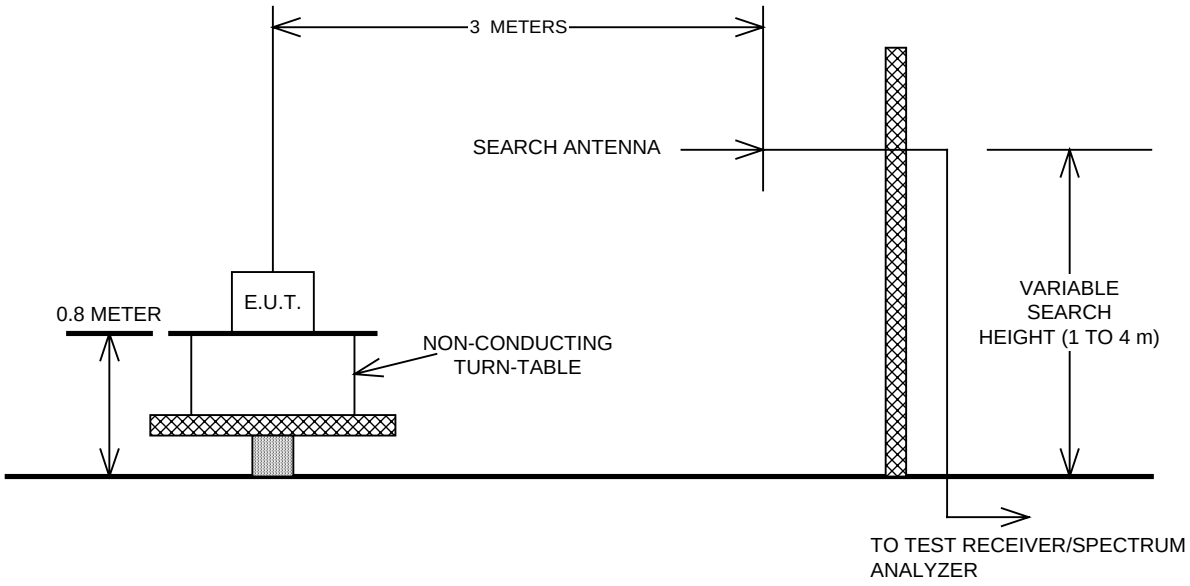
Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability