

**KTL Test Report No.:**

0L0296RUS3

**Applicant:**

Andrew Corporation

**Equipment Under Test:**

InCell Fiber Optic Distributed Antenna  
System  
Model: InCell-1900

**FCC ID:**

KUWINCELL1900

**In Accordance With:**

**FCC Part 24, Subpart E**  
Broadband PCS Repeaters

**Tested By:**

KTL Dallas Inc.  
802 N. Kealy  
Lewisville, Texas 75057-3136



**Authorized By:**

Tom Tidwell, RF Group Manager

**Date:**

February, 2001

**Total Number of Pages:**

49

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*EQUIPMENT:* InCell-1900*FCC ID:* KUWINCELL1900PROJECT NO.: 0L0296RUS3

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**Section 1. Summary of Test Results**

Manufacturer: Andrew Corporation

Model No.: InCell 1900

Serial No.: S02

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**

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*EQUIPMENT:* InCell-1900*FCC ID:* KUWINCELL1900PROJECT NO.: 0L0296RUS3

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**Summary Of Test Data**

NAME OF TEST	PARA. NO.	SPEC.	MEAS.	RESULT
RF Power Output (CDMA)	24.232	100W	0.011W	Complies
RF Power Output (GSM)	24.232	100W	0.032W	Complies
RF Power Output (NADC)	24.232	100W	0.039	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 dBm	Complies
Field Strength of Spurious Emissions	24.238(a)	-13 dBm E.I.R.P.	<-13 dBm	Complies
Frequency Stability	24.235	N/A	N/A	N/A

**Footnotes:**

(1) Modulation characteristics were not tested since the E.U.T. simply re-transmits a modulated waveform but does not generate this waveform.

**Measurement uncertainty for each test configuration is expressed to 95% probability.**

EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

PROJECT NO.: 0L0296RUS3

**Section 2. General Equipment Specification**

<b>Supply Voltage Input(CDU):</b>	120 VAC via power mains		
<b>Supply Voltage Input(RAU):</b>	24 VDC from CDU		
<b>Frequency Bands: Downlink:</b>	<input checked="" type="checkbox"/> Block A : 1930 – 1945 MHz <input checked="" type="checkbox"/> Block D : 1945 – 1950 MHz <input checked="" type="checkbox"/> Block B : 1950 – 1965 MHz <input checked="" type="checkbox"/> Block E : 1965 – 1970 MHz <input checked="" type="checkbox"/> Block F : 1970 – 1975 MHz <input checked="" type="checkbox"/> Block C : 1975 – 1990 MHz		
<b>Frequency Bands: Uplink:</b>	<input checked="" type="checkbox"/> Block A : 1850 – 1865 MHz <input checked="" type="checkbox"/> Block B : 1865 – 1870 MHz <input checked="" type="checkbox"/> Block C : 1870 – 1885 MHz <input checked="" type="checkbox"/> Block D : 1885 – 1890 MHz <input checked="" type="checkbox"/> Block E : 1890 – 1895 MHz <input checked="" type="checkbox"/> Block F : 1895 – 1910 MHz		
<b>Type of Modulation and Designator:</b>	<b>CDMA (F9W)</b> <input checked="" type="checkbox"/>	<b>GSM (GXW)</b> <input checked="" type="checkbox"/>	<b>NADC (DXW)</b> <input checked="" type="checkbox"/>
<b>System Gain:</b>	15 dB		
<b>Output Impedance:</b>	50 ohms		
<b>Max Input:</b>	+0 dBm		
<b>RF Output (Rated): Downlink</b>	CDMA .011 W GSM .032 W NADC .040 W		
<b>Frequency Translation:</b>	<b>F1-F1</b> <input checked="" type="checkbox"/>	<b>F1-F2</b> <input type="checkbox"/>	<b>N/A</b> <input type="checkbox"/>
<b>Band Selection:</b>	<b>Software</b> <input type="checkbox"/>	<b>Duplexer</b> <input type="checkbox"/>	<b>Fullband</b> <input checked="" type="checkbox"/>

*EQUIPMENT:* InCell-1900*FCC ID:* KUWINCELL1900PROJECT NO.: 0L0296RUS3

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## Description of Operation

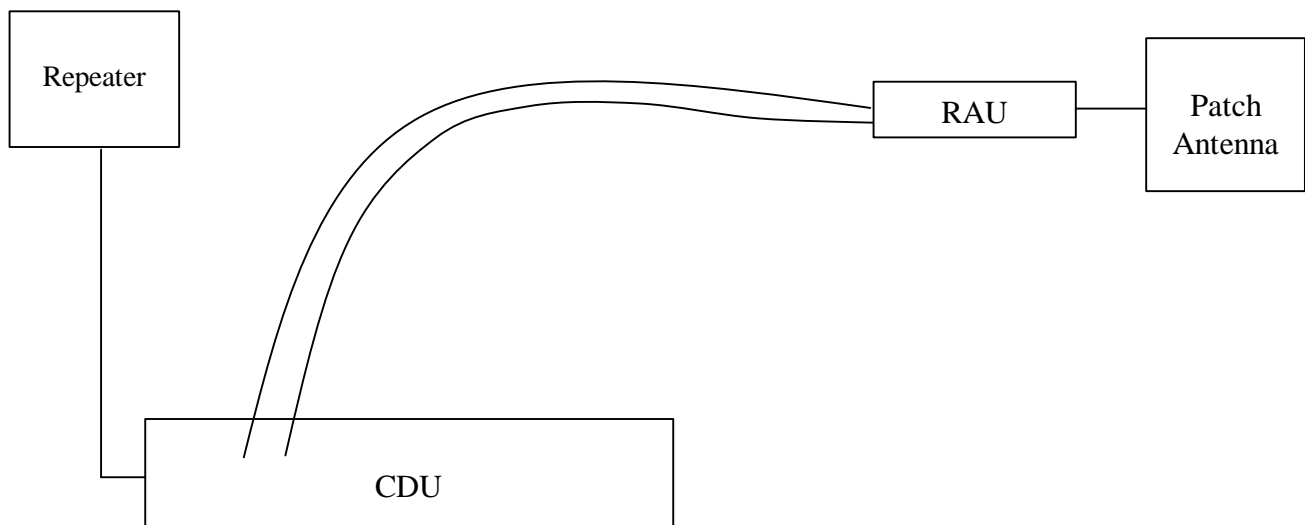
The EUT is a PCS band repeater system that uses fiber optic to distribute modulated rf signals from a base station or repeater to locations throughout a building. The system operates with a direct connection in the uplink direction.

The system is made up of two components:

- 1) CDU (Central Distribution Unit) - This unit is typically located in a wiring closet. Each CDU can interface to six RAU (Remote Antenna Units). The CDU collects and distributes voice and data signals through fiber cable pairs. The CDU connects to the output of a repeater unit. The Uplink direction is a directly wired connection and cannot connect directly to an antenna. The transmit signals from the repeater are converted from rf to optical and distributed via the fiber cables to a RAU.
- 1) RAU (Remote Antenna Unit) - This unit converts the signal received from the CDU back to rf and transmits the rf to subscriber units within its coverage range. Conversely it receives the rf signals transmitted by the subscriber units, converts the rf to an optical signal and sends it to the CDU via fiber.

The overall rf gain of the system in the downlink direction is nominally 15 dB.

## System Diagram



*EQUIPMENT:* InCell-1900*FCC ID:* KUWINCELL1900PROJECT NO.: 0L0296RUS3

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**Section 3. RF Power Output**

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: David Light	DATE: 2/1/01

**Test Results:** Complies.**Measurement Data:**

	Modulation Type	Per Channel Output Power (dBm)	Composite Output Power (dBm)
Downlink	CDMA 3 Carriers	5.5	10.25
Downlink	GSM 5 Carriers	8.0	15.0
Downlink	NADC 2 Carriers	12.9	15.9

**Equipment Used:** 1436-1081-1471**Measurement Uncertainty:** +/- 1.6 dB**Temperature:** 22 °C**Relative  
Humidity:** 50 %

*EQUIPMENT:* InCell-1900*FCC ID:* KUWINCELL1900PROJECT NO.: 0L0296RUS3

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**Section 4.        Occupied Bandwidth**

NAME OF TEST: Occupied Bandwidth (CDMA)	PARA. NO.: 2.1049
TESTED BY: David Light	DATE: 2/2/01

**Test Results:**                Complies.**Test Data:**                See attached plot(s).**Equipment Used:**    1036-1471-1081**Measurement Uncertainty:**    +/- 1.6   dB**Temperature:**            22   °C**Relative  
Humidity:**            50   %



EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

PROJECT NO.: 0L0296RUS3

## Test Data – Occupied Bandwidth - CDMA

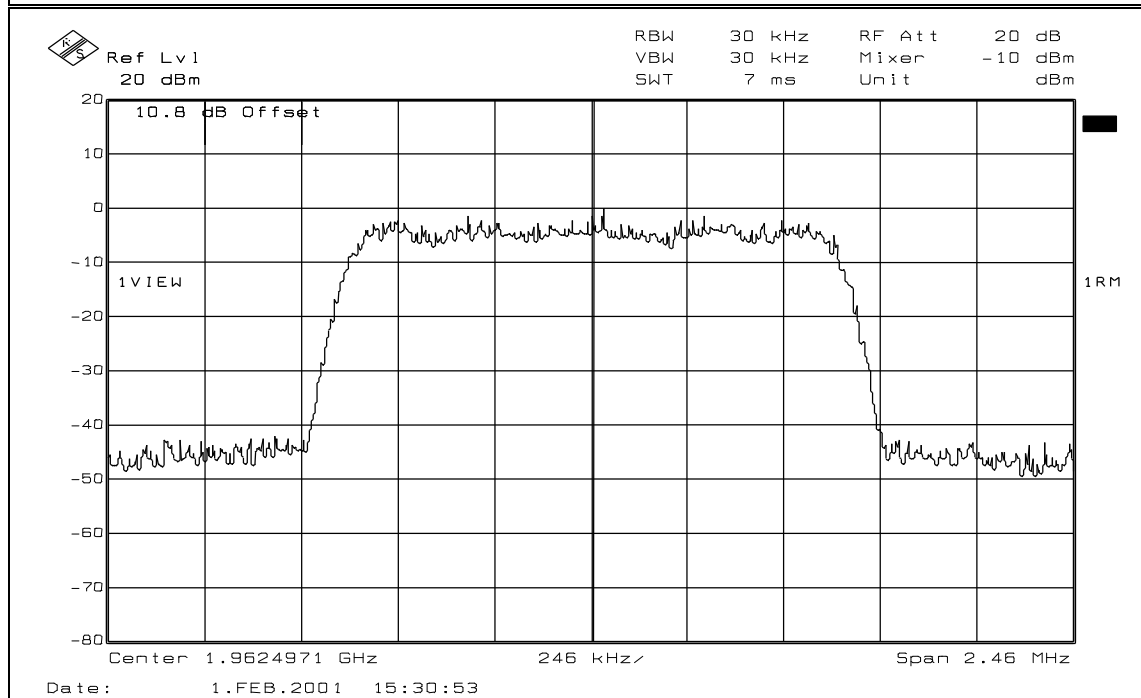
**Data Plot OCCUPIED BANDWIDTH**

Page 1 of 2

Job No.: 0L0296R Date: 2/1/01 Complete X  
Specification: PART 24 Temperature(°C): 22 Preliminary \_\_\_\_\_  
Tested By: David Light Relative Humidity(%) 50  
E.U.T.: PCS REPEATER  
Configuration: TX CDMA SIGNAL  
Sample No.: S02  
Location: Lab 1 RBW: 20 kHz  
Detector Type: Peak VBW: 20 kHz

**Test Equipment Used**

Antenna: \_\_\_\_\_ Directional Coupler: \_\_\_\_\_  
Pre-Amp: \_\_\_\_\_ Cable #1: 1081  
Filter: \_\_\_\_\_ Cable #2: \_\_\_\_\_  
Receiver: 1036 Cable #3: \_\_\_\_\_  
Attenuator #1: 1471 Cable #4: \_\_\_\_\_  
Attenuator #2: \_\_\_\_\_ Mixer: \_\_\_\_\_  
Additional equipment used: \_\_\_\_\_  
Measurement  
Uncertainty: +/-3.6 dB

Notes: **OUTPUT**

EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

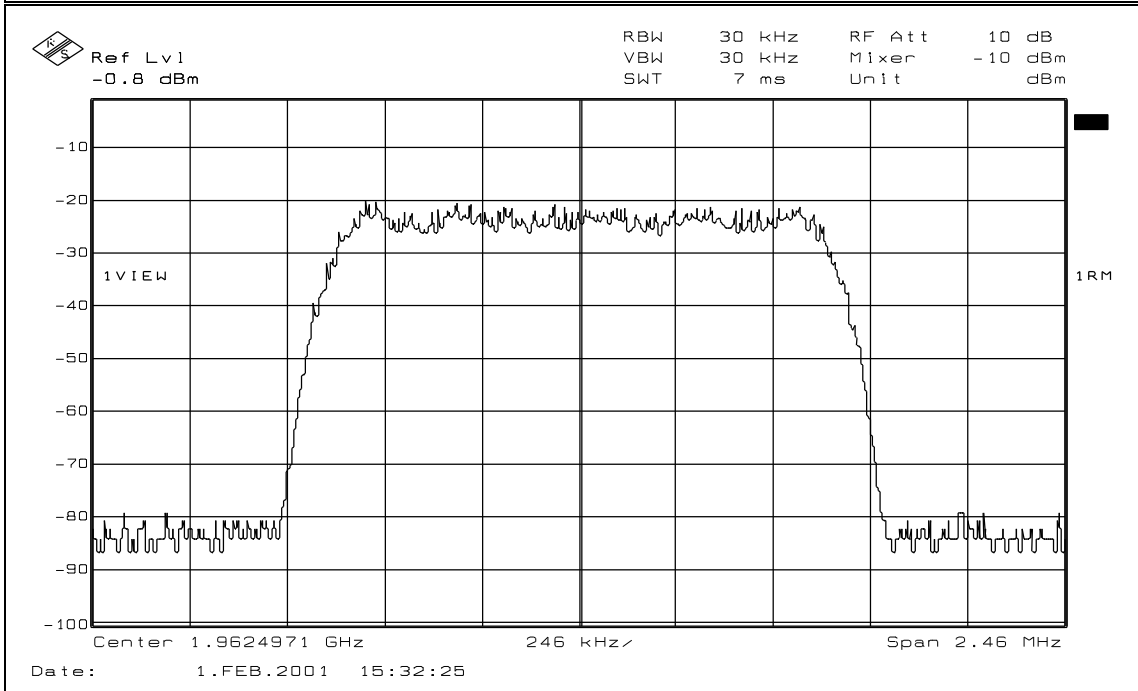
PROJECT NO.: 0L0296RUS3

## Test Data – Occupied Bandwidth - CDMA

**Data Plot OCCUPIED BANDWIDTH**

Page 2 of 2

Job No.: 0L0296R Date: 2/1/01  
Specification: PART 24 Temperature(°C): 22  
Tested By: David Light Relative Humidity(%) 50  
E.U.T.: PCS REPEATER  
Configuration: TX CDMA SIGNAL



Notes: INPUT SIGNAL

**KTL Dallas****FCC PART 24, SUBPART E  
BROADBAND PCS REPEATERS***EQUIPMENT:* InCell-1900*FCC ID:* KUWINCELL1900**PROJECT NO.:** 0L0296RUS3

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NAME OF TEST: Occupied Bandwidth (GSM)	PARA. NO.: 2.1049
TESTED BY: David Light	DATE:2/2/01

**Test Results:** Complies.**Test Data:** See attached plot(s).**Equipment Used:** 1036-1471-1081**Measurement Uncertainty:** +/- 1.6 dB**Temperature:** 22 °C**Relative  
Humidity:** 50 %

EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

PROJECT NO.: 0L0296RUS3

## Test Data – Occupied Bandwidth - GSM

<b>Data Plot OCCUPIED BANDWIDTH</b>	
Page 1 of 2	Complete <input checked="" type="checkbox"/> X Preliminary <input type="checkbox"/>
Job No.: 0L0296R	Date: 2/1/01
Specification: PART 24	Temperature(°C): 22
Tested By: David Light	Relative Humidity(%) 50
E.U.T.: PCS REPEATER	
Configuration: TX GSM SIGNAL	
Sample No.: S02	
Location: Lab 1	RBW: 20 kHz
Detector Type: Peak	VBW: 20 kHz
<b>Test Equipment Used</b>	
Antenna:	Directional Coupler:
Pre-Amp:	Cable #1: 1081
Filter:	Cable #2:
Receiver: 1036	Cable #3:
Attenuator #1: 1471	Cable #4:
Attenuator #2:	Mixer:
Additional equipment used:	
Measurement	
Uncertainty: +/-3.6 dB	

Ref Lvl	
20 dBm	10.8 dB Offset

RBW 20 kHz RF Att 30 dB  
VBW 20 kHz Unit dBm  
SWT 7.5 ms

Center 1.96 GHz 100 kHz Span 1 MHz

Date: 1.FEB.2001 15:03:41

Notes:
OUTPUT

EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

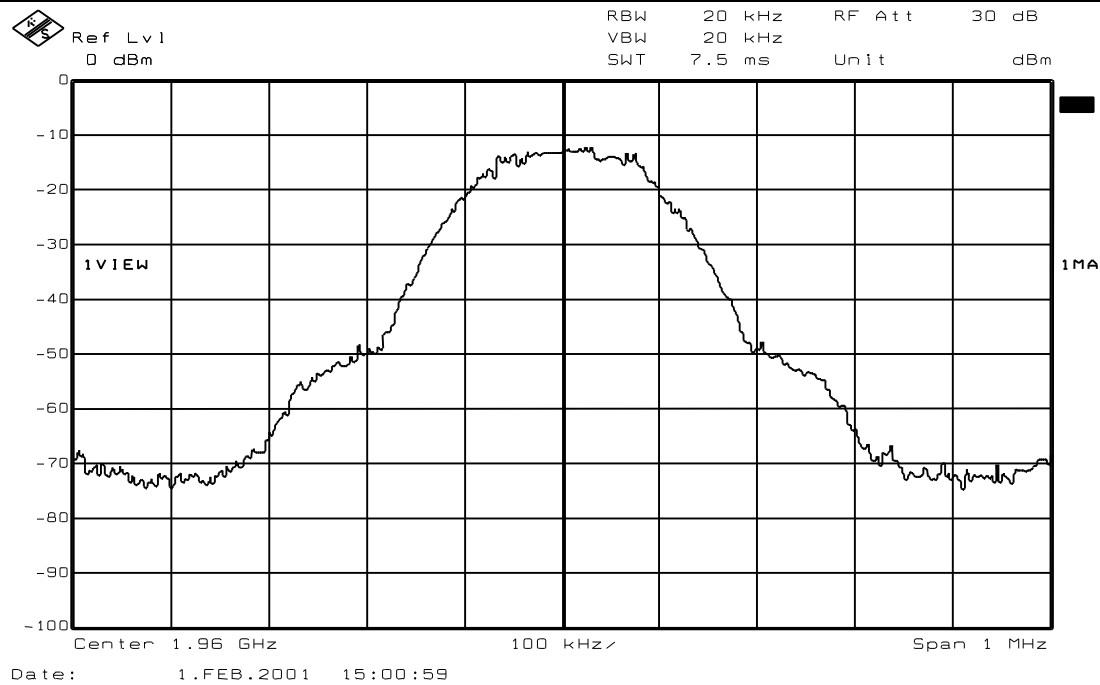
PROJECT NO.: 0L0296RUS3

## Test Data – Occupied Bandwidth - GSM

**Data Plot OCCUPIED BANDWIDTH**

Page 2 of 2

Job No.: 0L0296R Date: 2/1/01  
Specification: PART 24 Temperature(°C): 22  
Tested By: David Light Relative Humidity(%) 50  
E.U.T.: PCS REPEATER  
Configuration: TX GSM SIGNAL



Notes: INPUT SIGNAL

**KTL Dallas****FCC PART 24, SUBPART E  
BROADBAND PCS REPEATERS***EQUIPMENT:* InCell-1900*FCC ID:* KUWINCELL1900**PROJECT NO.:** 0L0296RUS3

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**NAME OF TEST:** Occupied Bandwidth (NADC)**PARA. NO.:** 2.1049**TESTED BY:** David Light**DATE:** 2/2/01**Test Results:** Complies.**Test Data:** See attached plot(s).**Equipment Used:** 1036-1471-1081**Measurement Uncertainty:** +/- 1.6 dB**Temperature:** 22 °C**Relative  
Humidity:** 50 %

EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

PROJECT NO.: 0L0296RUS3

## Test Data – Occupied Bandwidth - NADC

Data Plot OCCUPIED BANDWIDTH	
Page 1 of 2	Complete <input checked="" type="checkbox"/> X Preliminary <input type="checkbox"/>
Job No.: 0L0296R	Date: 2/1/01
Specification: PART 24	Temperature(°C): 22
Tested By: David Light	Relative Humidity(%) 50
E.U.T.: PCS REPEATER	
Configuration: TX TDMA SIGNAL	
Sample No.: S02	
Location: Lab 1	RBW: 300 Hz
Detector Type: Peak	VBW: 300 Hz
<b>Test Equipment Used</b>	
Antenna:	Directional Coupler:
Pre-Amp:	Cable #1: 1081
Filter:	Cable #2:
Receiver: 1036	Cable #3:
Attenuator #1: 1471	Cable #4:
Attenuator #2:	Mixer:
Additional equipment used:	
Measurement	
Uncertainty: +/-3.6 dB	

Ref Lvl	RBW	VBW	SWT	RF Att	Unit
20 dBm	300 Hz	300 Hz	5.6 s	30 dB	dBm

The spectrum plot shows a signal centered at 1.96 GHz with a 100 kHz span. The y-axis represents power in dBm, ranging from -80 to 20. The signal has a peak power of approximately 0 dBm and a bandwidth of about 10 kHz. The plot is labeled '10.8 dB Offset' and '1 VIEW'. The x-axis is labeled 'Center 1.96 GHz', '10 kHz', and 'Span 100 kHz'.

Date: 1.FEB.2001 14:46:03

Notes: OUTPUT

EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

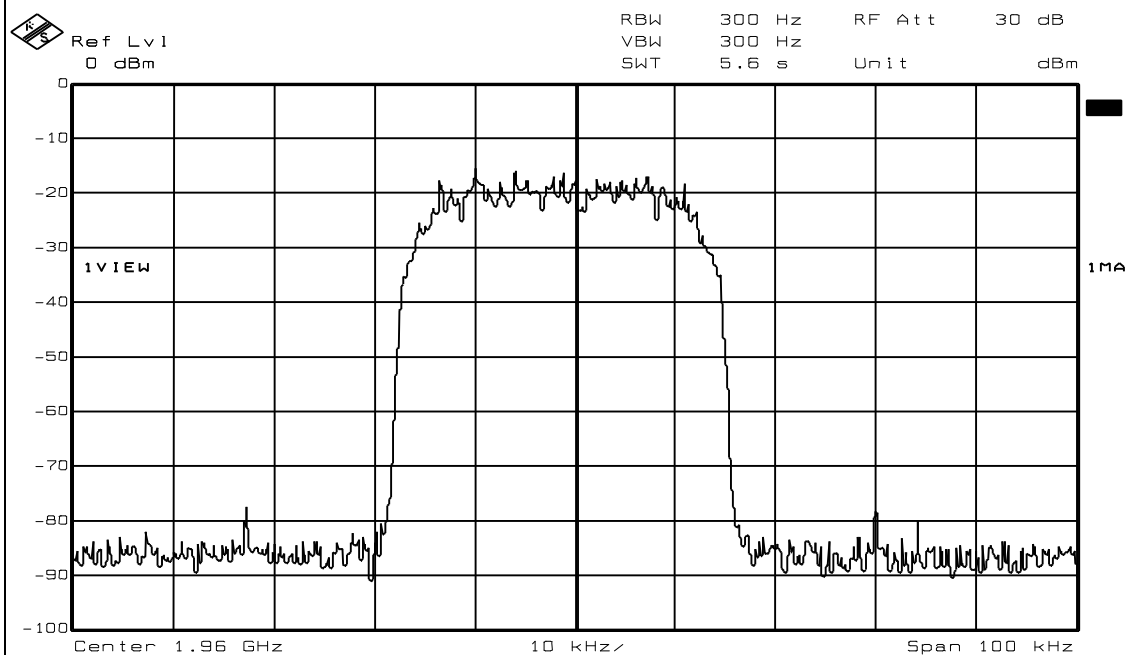
PROJECT NO.: 0L0296RUS3

## Test Data – Occupied Bandwidth - NADC

**Data Plot OCCUPIED BANDWIDTH**

Page 2 of 2

Job No.: 0L0296R Date: 2/1/01  
Specification: PART 24 Temperature(°C): 22  
Tested By: David Light Relative Humidity(%) 50  
E.U.T.: PCS REPEATER  
Configuration: TX TDMA SIGNAL



Date: 1.FEB.2001 14:52:25

Notes: INPUT SIGNAL



*EQUIPMENT:* InCell-1900*FCC ID:* KUWINCELL1900PROJECT NO.: 0L0296RUS3

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**Section 5. Spurious Emissions at Antenna Terminals**

NAME OF TEST: Spurious Emissions @ Antenna Terminals PARA. NO.: 2.1051

TESTED BY: David Light

DATE: 02/05/01

**Test Results:** Complies.**Test Data:** See attached plot(s).**Equipment Used:** 1036-1081-1471**Measurement Uncertainty:** +/- 1.6 dB**Temperature:** 22 °C**Relative Humidity:** 50 %

EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

PROJECT NO.: 0L0296RUS3

## Test Data - Spurious Emissions at Antenna Terminals (CDMA)

Data Plot <u>ANTENNA PORT SPURIOUS EMISSIONS</u>	
Page <u>1</u> of <u>4</u>	Complete <u>X</u> Preliminary _____
Job No.: <u>0L0296R</u>	Date: <u>2/2/01</u>
Specification: <u>Part 24</u>	Temperature(°C): <u>22</u>
Tested By: <u>David Light</u>	Relative Humidity(%) <u>50</u>
E.U.T.: <u>PCS REPEATER</u>	
Configuration: <u>Tx CDMA signal</u>	
Sample No.: <u>S02</u>	
Location: <u>Lab 1</u>	RBW: <u>REFER TO PLOTS</u>
Detector Type: <u>Peak</u>	VBW: <u>REFER TO PLOTS</u>
<b>Test Equipment Used</b>	
Antenna: _____	Directional Coupler: _____
Pre-Amp: _____	Cable #1: <u>1081</u>
Filter: _____	Cable #2: _____
Receiver: <u>1036</u>	Cable #3: _____
Attenuator #1: <u>1471</u>	Cable #4: _____
Attenuator #2: _____	Mixer: _____
Additional equipment used: _____	
Measurement uncertainty: <u>+/-3.6 dB</u>	

Ref Lvl	RBW	VBW	SWT	RF Att	Mixer	Unit
30 dBm	30 kHz	30 kHz	7 ms	30 dB	-20 dBm	dBm

Center 1.93 GHz 246 kHz Span 2.46 MHz

Date: 1.FEB.2001 15:50:29

Notes: LOWER BAND EDGE

EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

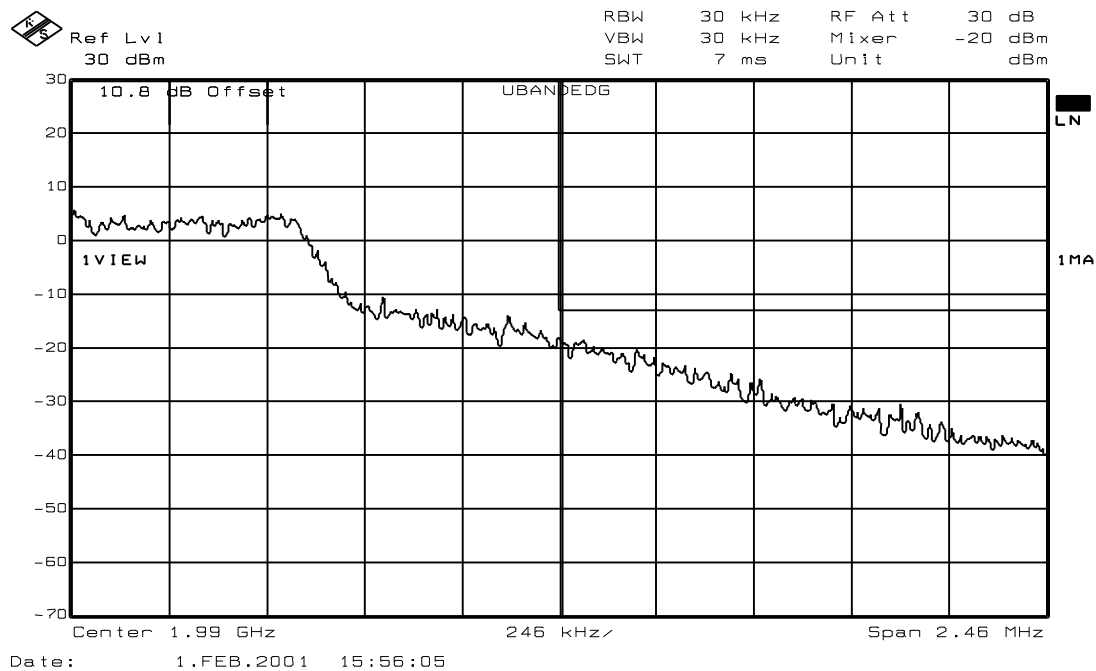
PROJECT NO.: 0L0296RUS3

## Test Data - Spurious Emissions at Antenna Terminals (CDMA)

**Data Plot ANTENNA PORT SPURIOUS EMISSIONS**

Page 2 of 4

Job No.: 0L0296R Date: 2/2/01  
Specification: Part 24 Temperature(°C): 22  
Tested By: David Light Relative Humidity(%) 50  
E.U.T.: PCS REPEATER  
Configuration: Tx CDMA signal



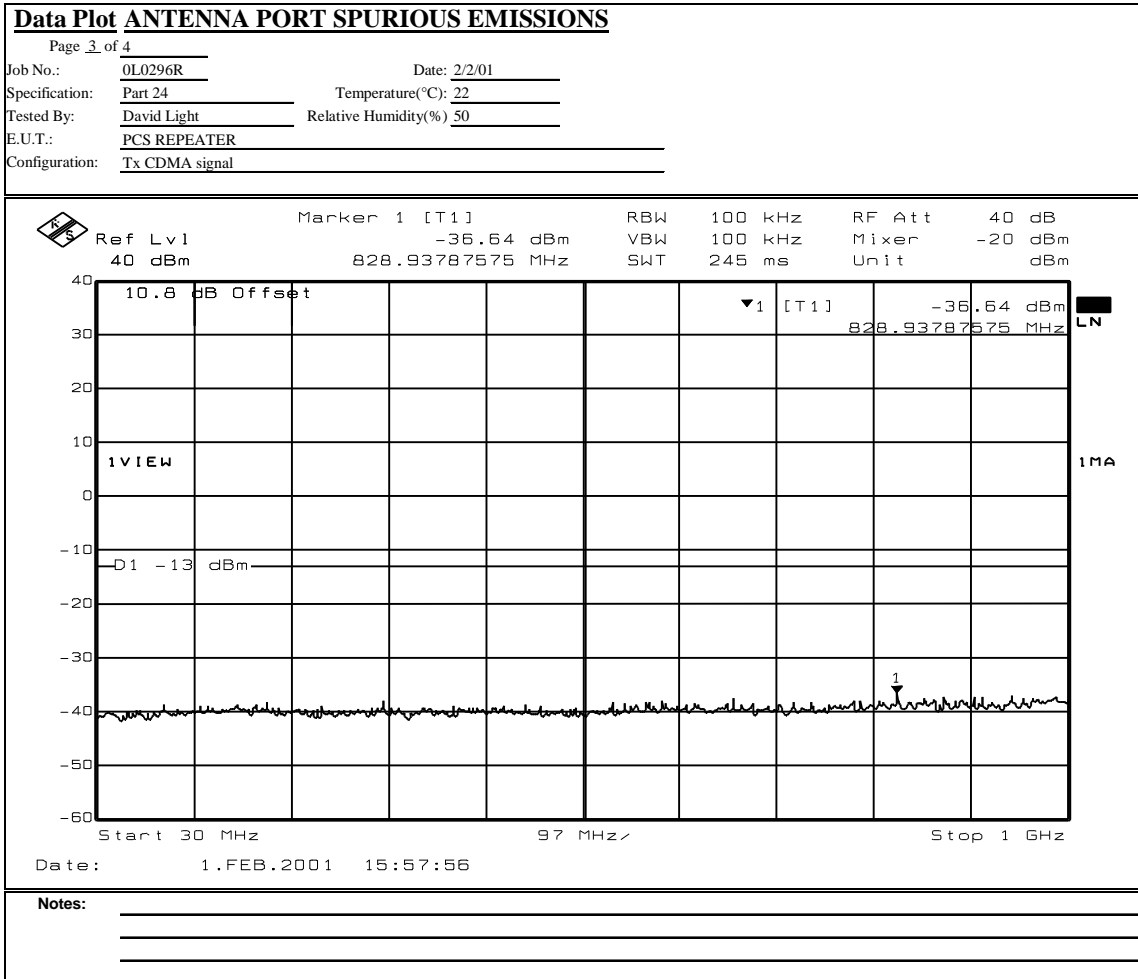
Notes: UPPER BAND EDGE

EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

PROJECT NO.: 0L0296RUS3

## Test Data - Spurious Emissions at Antenna Terminals (CDMA)



EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

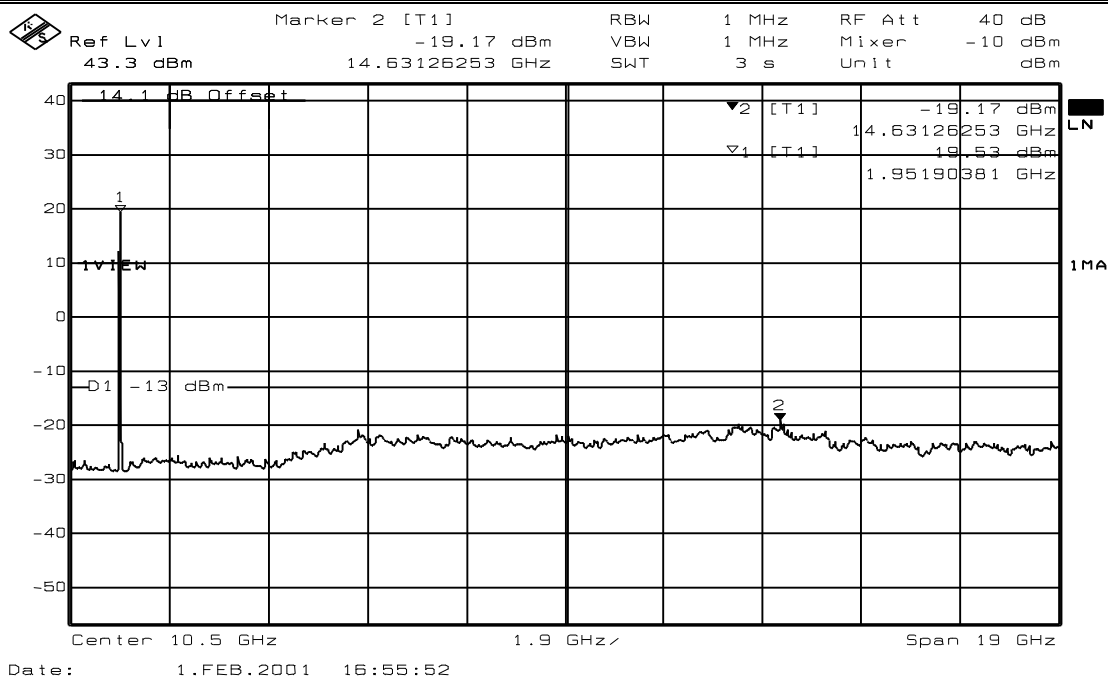
PROJECT NO.: 0L0296RUS3

## Test Data - Spurious Emissions at Antenna Terminals (CDMA)

**Test Plot: ANTENNA PORT SPURIOUS EMISSIONS**

Page 4 of 4

Job No.: 0L0296R Date: 2/2/01  
Specification: Part 24 Temperature(°C): 22  
Tested By: David Light Relative Humidity(%) 50  
E.U.T.: PCS REPEATER  
Configuration: Tx CDMA signal



Notes:

EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

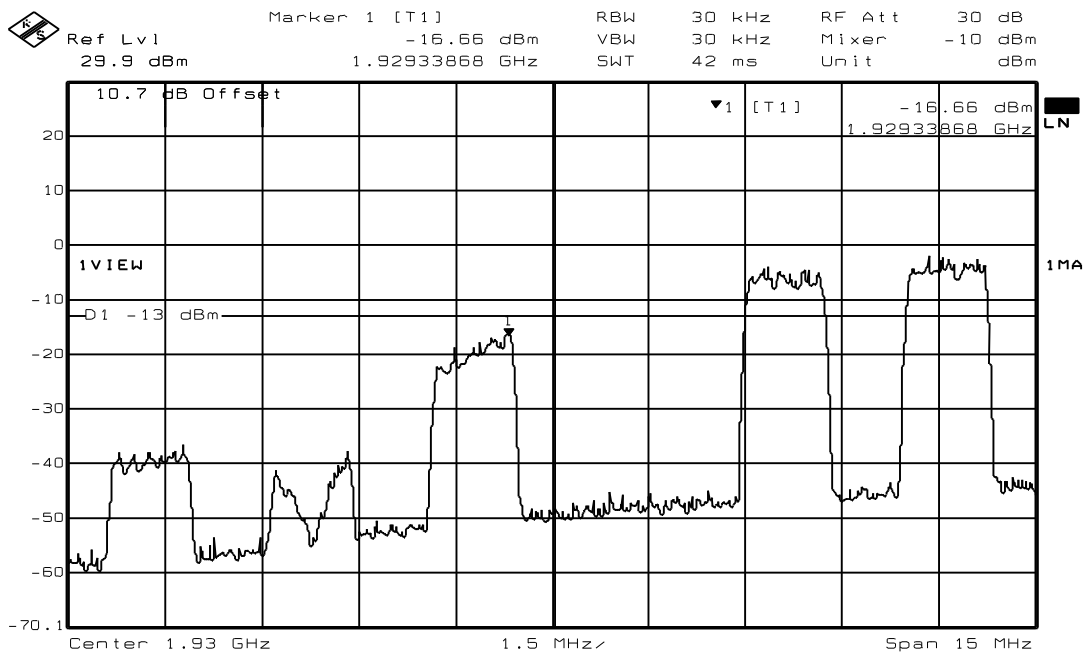
PROJECT NO.: 0L0296RUS3

## Test Data - Spurious Emissions at Antenna Terminals (CDMA)

**Test Plot: INTERMODULATION CHARACTERISTICS**

Page 5 of 6

Job No.: 0L0296R Date: 2/5/01  
Specification: PART 24 Temperature(°C): 22  
Tested By: David Light Relative Humidity(%) 50  
E.U.T.: PCS REPEATER  
Configuration: TX FULL POWER



Date: 5.FEB.2001 11:09:32

Notes: LOWER BAND EDGE INTERMODULATION  
CDMA

EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

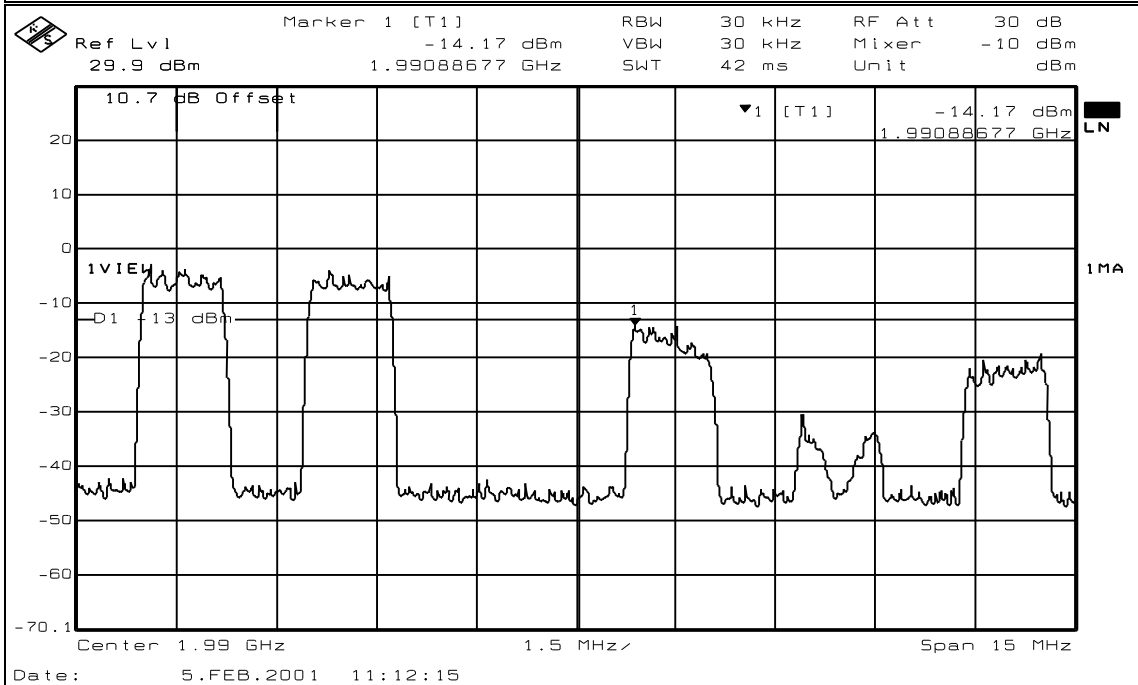
PROJECT NO.: 0L0296RUS3

## Test Data - Spurious Emissions at Antenna Terminals (CDMA)

**Test Plot: INTERMODULATION CHARACTERISTICS**

Page 6 of 6

Job No.: 0L0296R Date: 2/5/01  
Specification: PART 24 Temperature(°C): 22  
Tested By: David Light Relative Humidity(%) 50  
E.U.T.: PCS REPEATER  
Configuration: TX FULL POWER



Notes: UPPER BAND EDGE INTERMODULATION  
CDMA

EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

PROJECT NO.: 0L0296RUS3

## Test Data - Spurious Emissions at Antenna Terminals (GSM)

Data Plot <u>ANTENNA PORT SPURIOUS EMISSIONS</u>	
Page <u>1</u> of <u>4</u>	Complete <u>X</u> Preliminary _____
Job No.: <u>0L0296R</u>	Date: <u>2/2/01</u>
Specification: <u>PART 24</u>	Temperature(°C): <u>22</u>
Tested By: <u>David Light</u>	Relative Humidity(%) <u>50</u>
E.U.T.: <u>PCS REPEATER</u>	
Configuration: <u>Tx GSM signal</u>	
Sample No.: <u>S02</u>	
Location: <u>Lab 1</u>	RBW: <u>REFER TO PLOTS</u>
Detector Type: <u>Peak</u>	VBW: <u>REFER TO PLOTS</u>
<b>Test Equipment Used</b>	
Antenna: _____	Directional Coupler: _____
Pre-Amp: _____	Cable #1: <u>1081</u>
Filter: _____	Cable #2: _____
Receiver: <u>1036</u>	Cable #3: _____
Attenuator #1: <u>1471</u>	Cable #4: _____
Attenuator #2: _____	Mixer: _____
Additional equipment used: _____	
Measurement uncertainty: <u>+/-3.6 dB</u>	

Ref Lvl 39.9 dBm	
RBW	20 kHz
VBW	20 kHz
SWT	7.5 ms
RF Att	40 dB
Mixer	-10 dBm
Unit	dBm

10.7 dB Offset

1VIEW

1MA

Center 1.93 GHz 47.36328125 kHz Span 473.6328125 kHz

Date: 1.FEB.2001 17:10:58

Notes: LOWER BAND EDGE



EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

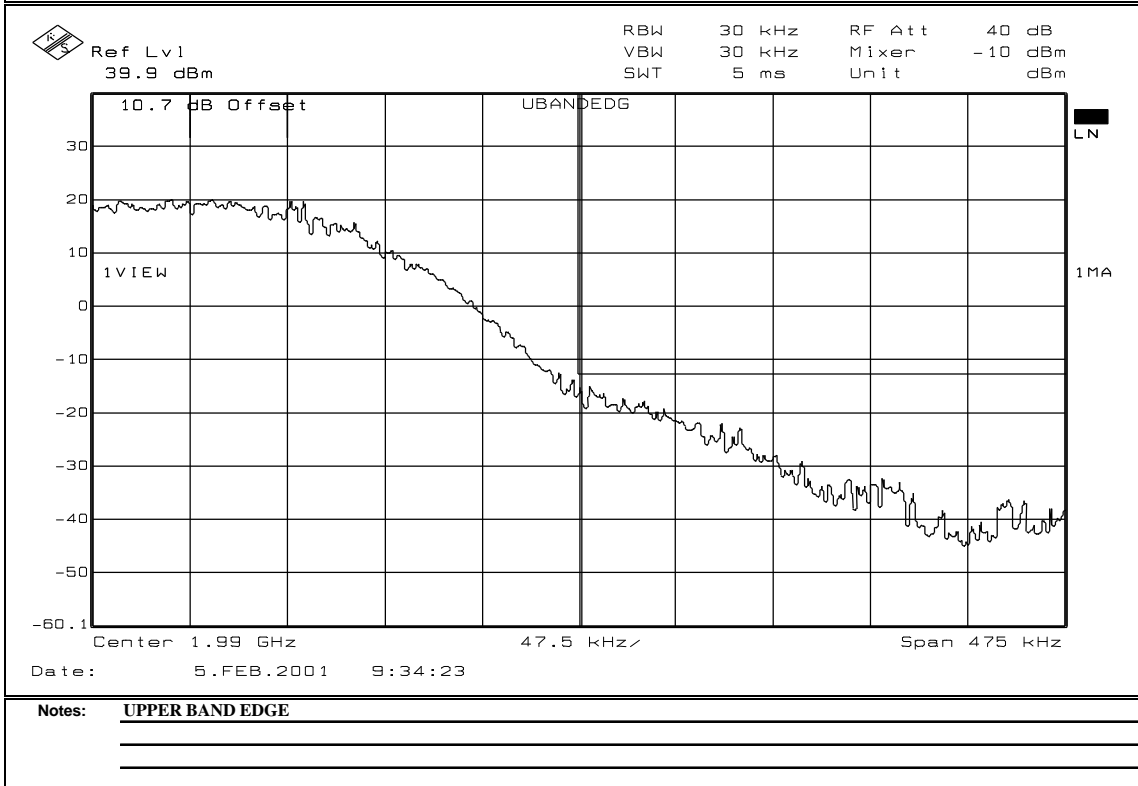
PROJECT NO.: 0L0296RUS3

## Test Data - Spurious Emissions at Antenna Terminals (GSM)

**Data Plot ANTENNA PORT SPURIOUS EMISSIONS**

Page 2 of 4

Job No.: 0L0296R Date: 2/2/01  
Specification: PART 24 Temperature(°C): 22  
Tested By: David Light Relative Humidity(%) 50  
E.U.T.: PCS REPEATER  
Configuration: Tx GSM signal

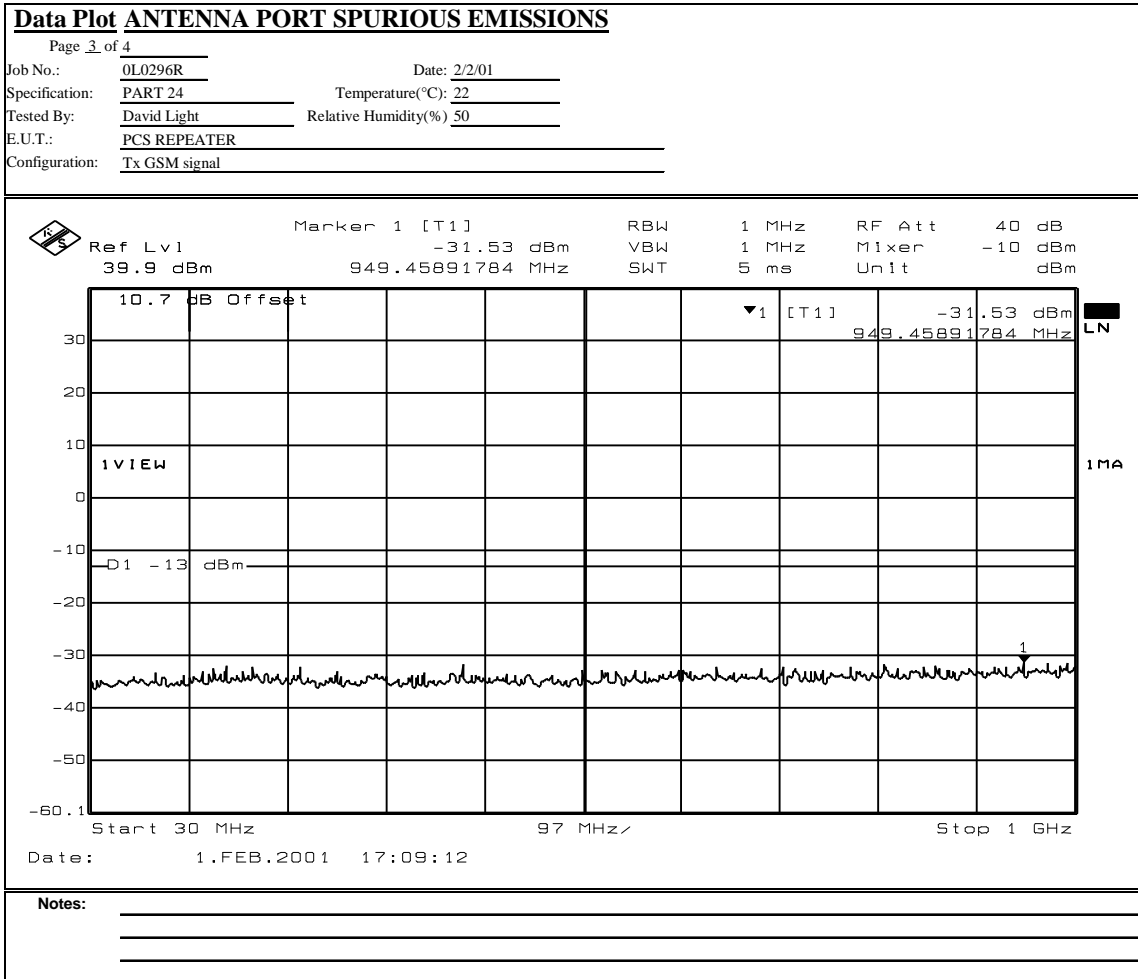


EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

PROJECT NO.: 0L0296RUS3

## Test Data - Spurious Emissions at Antenna Terminals (GSM)



EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

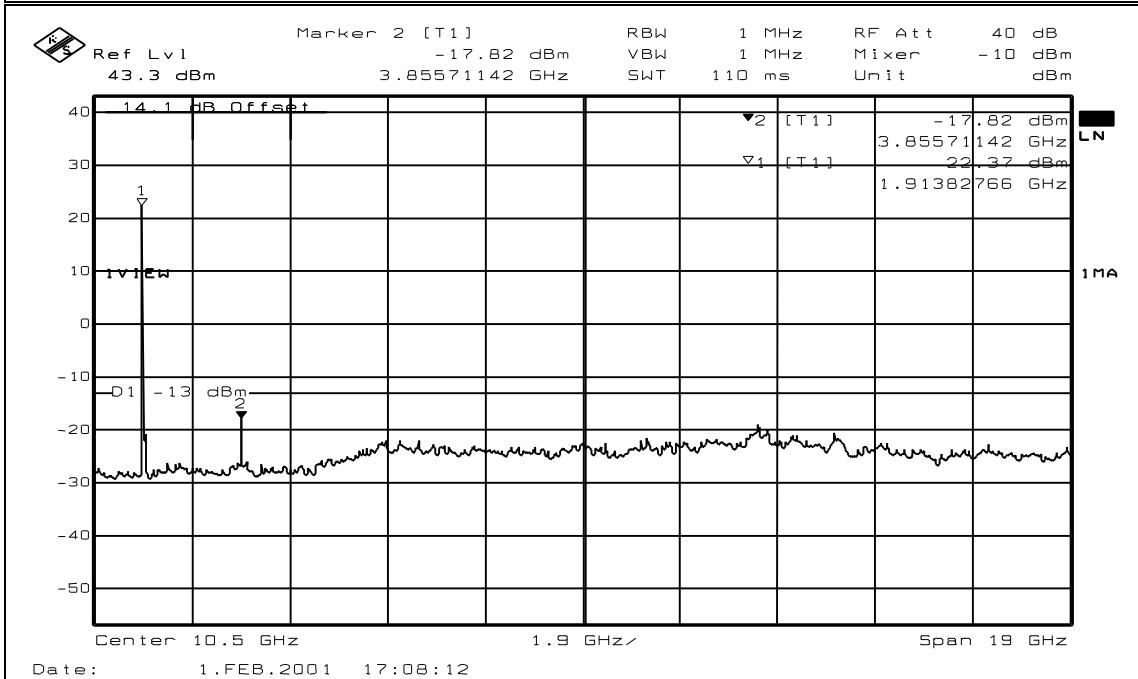
PROJECT NO.: 0L0296RUS3

## Test Data - Spurious Emissions at Antenna Terminals (GSM)

**Test Plot: ANTENNA PORT SPURIOUS EMISSIONS**

Page 4 of 4

Job No.: 0L0296R Date: 2/2/01  
Specification: PART 24 Temperature(°C): 22  
Tested By: David Light Relative Humidity(%) 50  
E.U.T.: PCS REPEATER  
Configuration: Tx GSM signal



Notes: MARKER 1 INDICATES CARRIER  
MARKER 2 INDICATES EMISSION

EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

PROJECT NO.: 0L0296RUS3

## Test Data - Spurious Emissions at Antenna Terminals (GSM)

Data Plot INTERMODULATION CHARACTERISTICS	
Page 1 of 6	Complete <input checked="" type="checkbox"/> X Preliminary <input type="checkbox"/>
Job No.: 0L0296R	Date: 2/5/01
Specification: PART 24	Temperature(°C): 22
Tested By: David Light	Relative Humidity(%) 50
E.U.T.: PCS REPEATER	
Configuration: TX FULL POWER	
Sample No.: S02	
Location: Lab 2	RBW: REFER TO PLOTS
Detector Type: Peak	VBW: REFER TO PLOTS
<b>Test Equipment Used</b>	
Antenna:	Directional Coupler:
Pre-Amp:	Cable #1: 1081
Filter:	Cable #2:
Receiver: 1036	Cable #3:
Attenuator #1: 1471	Cable #4:
Attenuator #2:	Mixer:
Additional equipment used:	
Measurement	
Uncertainty: +/-3.6 dB	

Ref Lvl	Marker 1 [T1]	RBW	30 kHz	RF Att	30 dB
29.9 dBm	-27.97 dBm	VBW	30 kHz	Mixer	-10 dBm
	1.92954008 GHz	SWT	8.5 ms	Unit	dBm

10.7 dB Offset

1 VIEW

D1 -13 dBm

1

1MA

LN

Center 1.93 GHz 300 kHz Span 3 MHz

Date: 5.FEB.2001 10:21:33

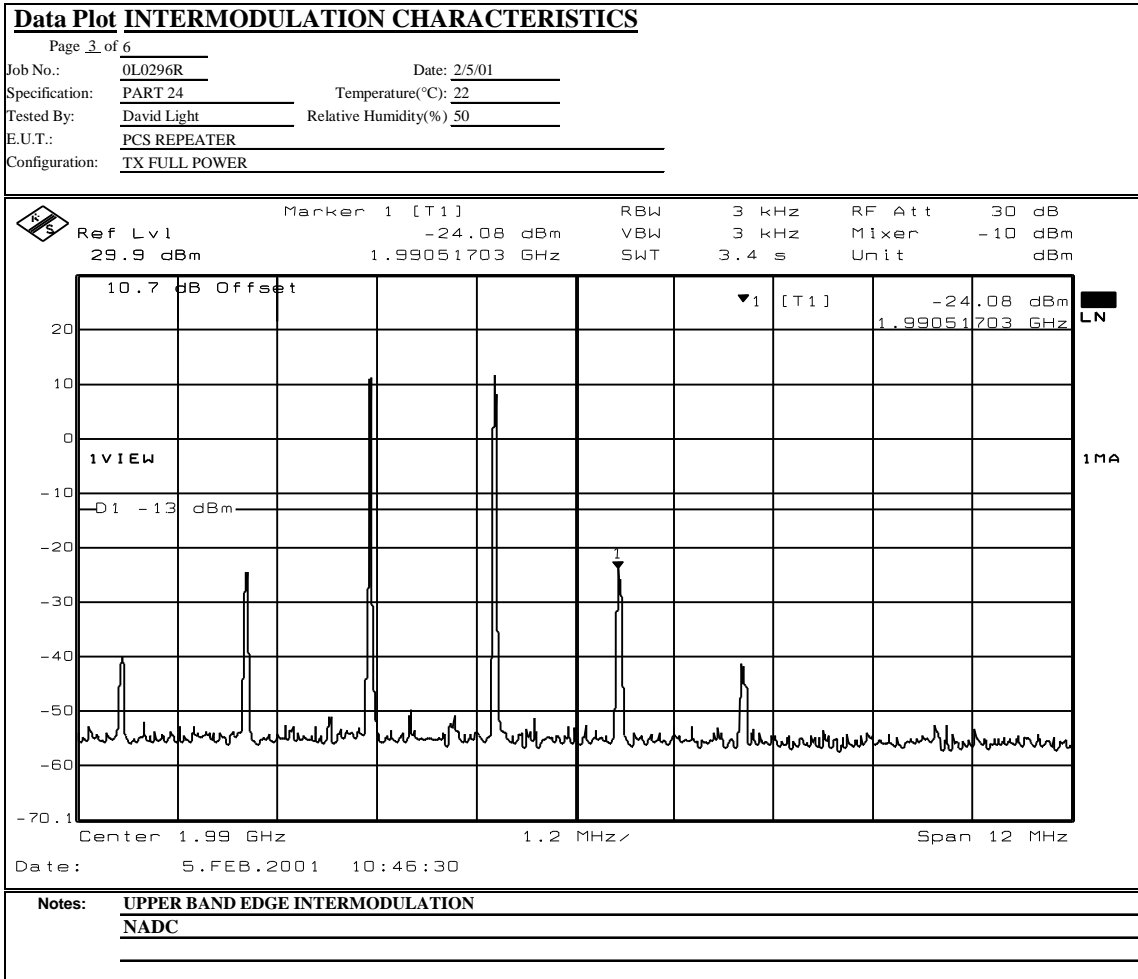
Notes: LOWER BANDEDGE INTERMODULATION  
GSM

EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

PROJECT NO.: 0L0296RUS3

## Test Data - Spurious Emissions at Antenna Terminals (GSM)



EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

PROJECT NO.: 0L0296RUS3

## Test Data - Spurious Emissions at Antenna Terminals (NADC)

Data Plot <u>ANTENNA PORT SPURIOUS EMISSIONS</u>	
Page <u>1</u> of <u>4</u>	Complete <u>X</u> Preliminary _____
Job No.: <u>0L0296R</u>	Date: <u>2/2/01</u>
Specification: <u>PART24</u>	Temperature(°C): <u>22</u>
Tested By: <u>David Light</u>	Relative Humidity(%) <u>50</u>
E.U.T.: <u>PCS REPEATER</u>	
Configuration: <u>Tx GSM signal</u>	
Sample No.: <u>S02</u>	
Location: <u>Lab 1</u>	RBW: <u>REFER TO PLOTS</u>
Detector Type: <u>Peak</u>	VBW: <u>REFER TO PLOTS</u>
<b>Test Equipment Used</b>	
Antenna: _____	Directional Coupler: _____
Pre-Amp: _____	Cable #1: <u>1081</u>
Filter: _____	Cable #2: _____
Receiver: <u>1036</u>	Cable #3: _____
Attenuator #1: <u>1471</u>	Cable #4: _____
Attenuator #2: _____	Mixer: _____
Additional equipment used: _____	
Measurement Uncertainty: <u>+/-3.6 dB</u>	

Ref Lvl 1 39.9 dBm	
RBW	300 Hz
VBW	300 Hz
SWT	5.6 s
RF Att	40 dB
Mixer	-10 dBm
Unit	dBm

10.7 dB Offset

1 VIEW

LBANDEGE

1 MA

LN

Center 1.93 GHz

10 kHz

Span 100 kHz

Date: 5.FEB.2001 9:41:15

Notes: LOWER BAND EDGE

EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

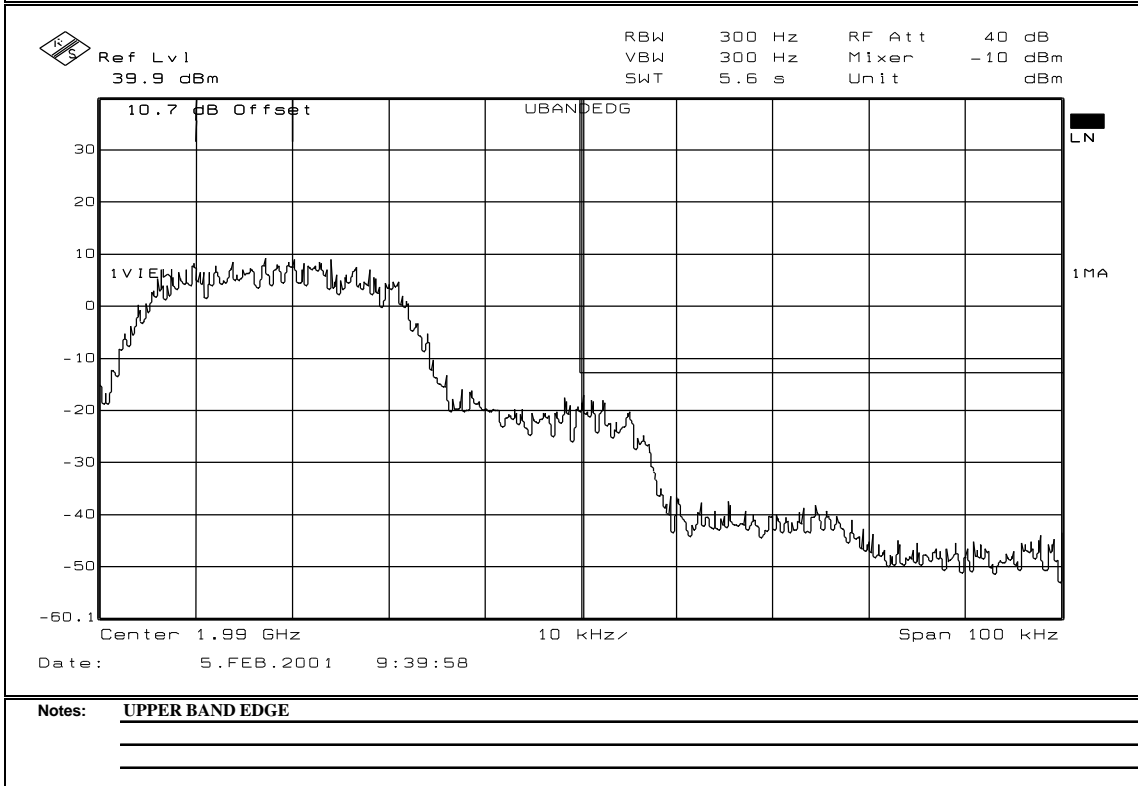
PROJECT NO.: 0L0296RUS3

## Test Data - Spurious Emissions at Antenna Terminals (NADC)

**Data Plot ANTENNA PORT SPURIOUS EMISSIONS**

Page 2 of 4

Job No.: 0L0296R Date: 2/2/01  
Specification: PART24 Temperature(°C): 22  
Tested By: David Light Relative Humidity(%) 50  
E.U.T.: PCS REPEATER  
Configuration: Tx GSM signal

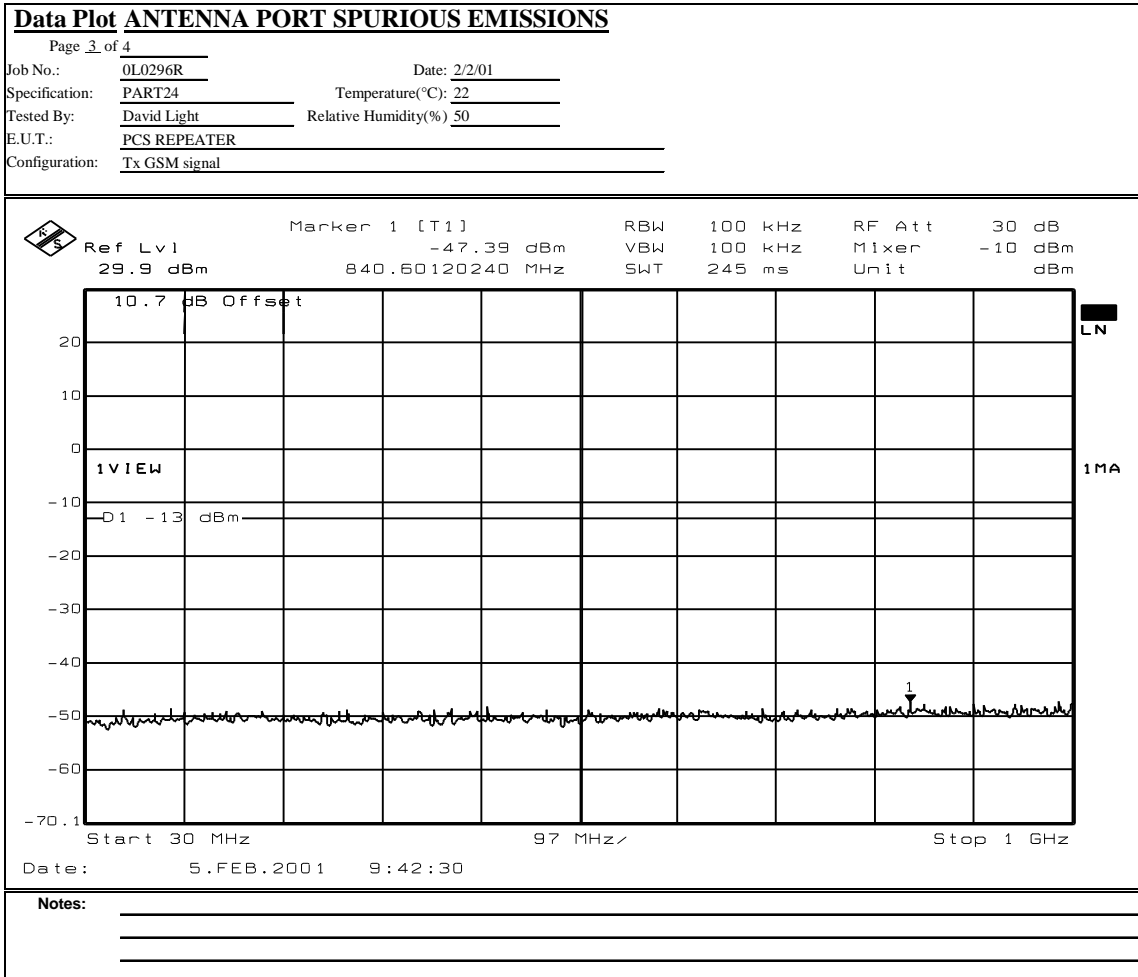


EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

PROJECT NO.: 0L0296RUS3

## Test Data - Spurious Emissions at Antenna Terminals (NADC)





EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

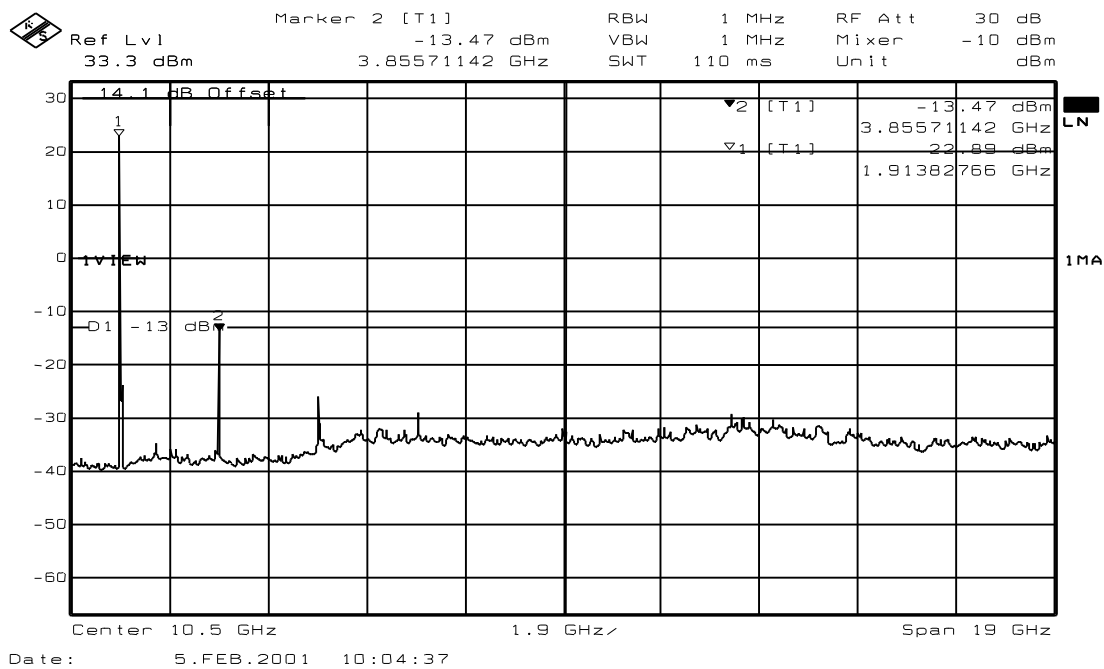
PROJECT NO.: 0L0296RUS3

## Test Data - Spurious Emissions at Antenna Terminals (NADC)

**Test Plot: ANTENNA PORT SPURIOUS EMISSIONS**

Page 4 of 4

Job No.: 0L0296R Date: 2/2/01  
Specification: PART24 Temperature(°C): 22  
Tested By: David Light Relative Humidity(%) 50  
E.U.T.: PCS REPEATER  
Configuration: Tx GSM signal



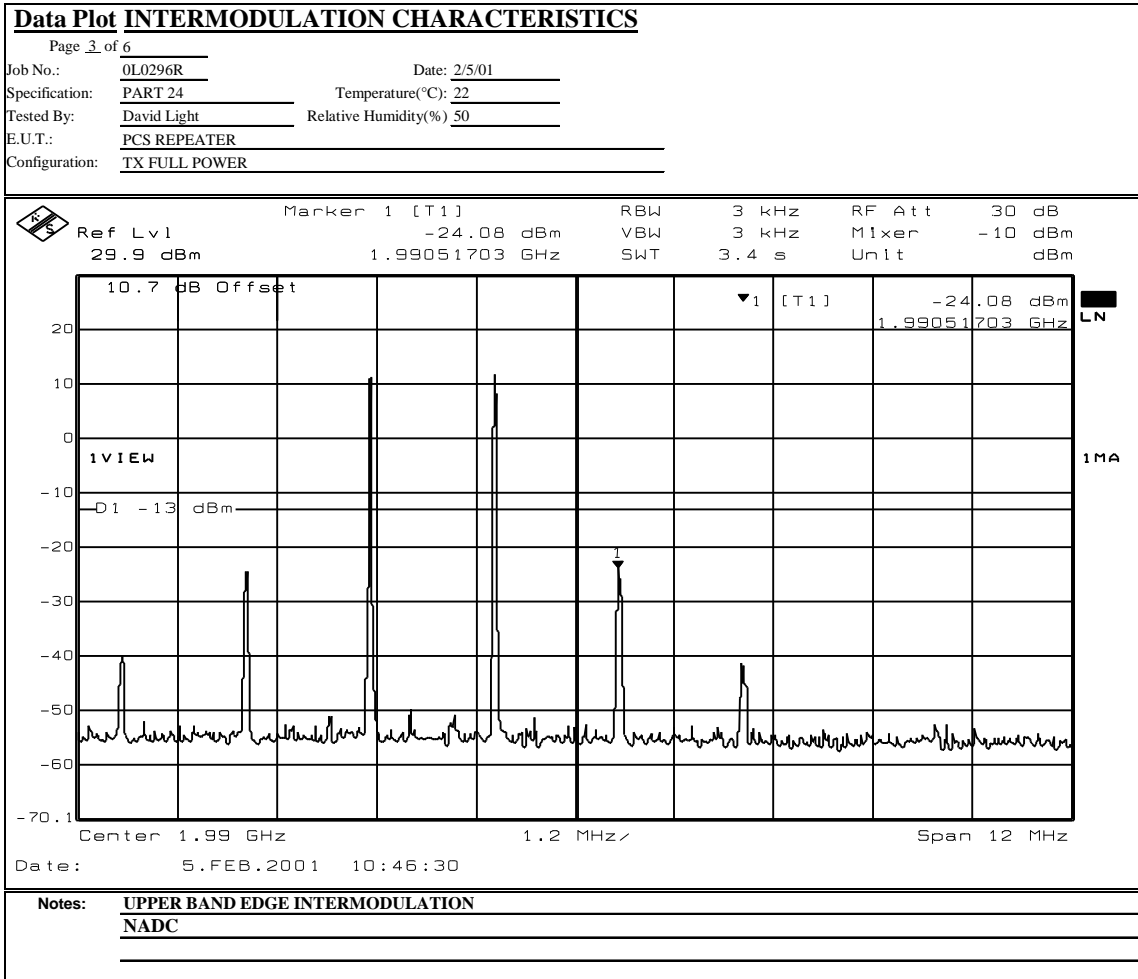
Notes: MARKER 1 INDICATES CARRIER  
MARKER 2 INDICATES EMISSION

EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

PROJECT NO.: 0L0296RUS3

## Test Data - Spurious Emissions at Antenna Terminals (NADC)



EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

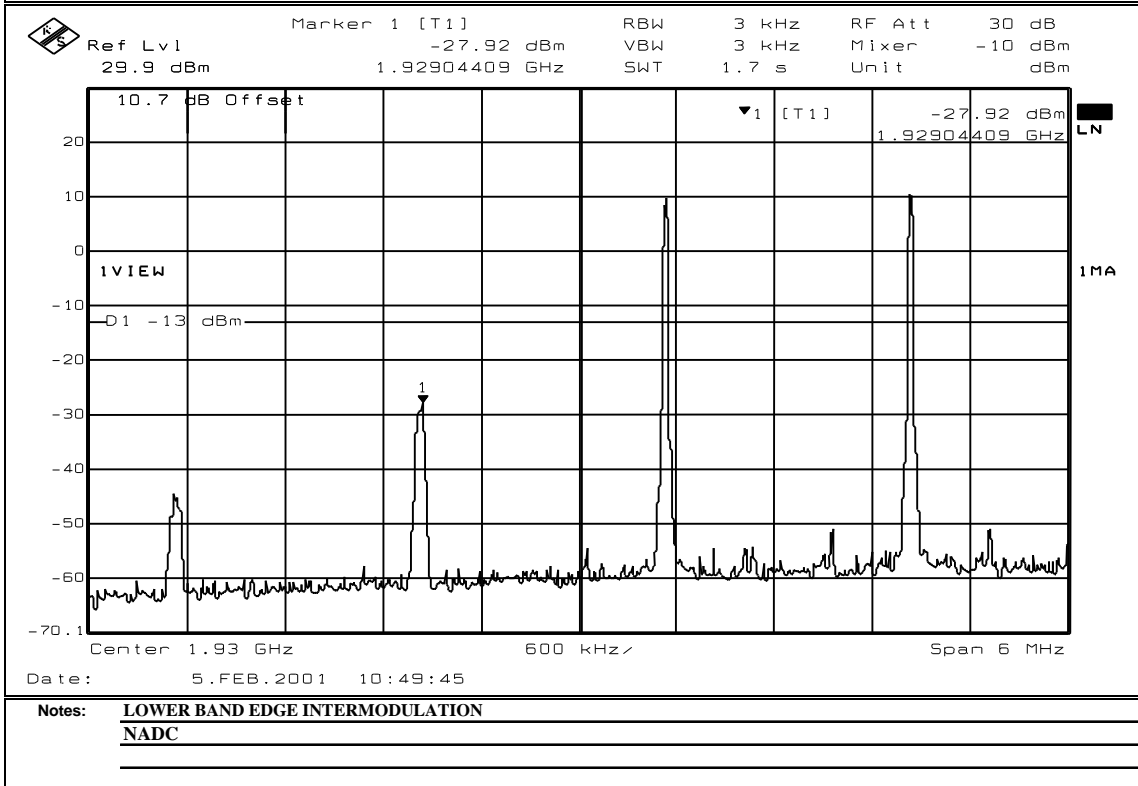
PROJECT NO.: 0L0296RUS3

## Test Data - Spurious Emissions at Antenna Terminals (NADC)

**Test Plot: INTERMODULATION CHARACTERISTICS**

Page 4 of 6

Job No.: 0L0296R Date: 2/5/01  
Specification: PART 24 Temperature(°C): 22  
Tested By: David Light Relative Humidity(%) 50  
E.U.T.: PCS REPEATER  
Configuration: TX FULL POWER



*EQUIPMENT:* InCell-1900*FCC ID:* KUWINCELL1900PROJECT NO.: 0L0296RUS3

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**Section 6.        Field Strength of Spurious**

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.1051
TESTED BY: David Light	DATE: 2/5/01

**Test Results:**                      Complies.**Test Data:**                        See attached table.**Equipment Used:**    1464-1484-1485-1016**Measurement Uncertainty:**    +/- 6   dB**Temperature:**                22   °C**Relative  
Humidity:**                50   %

**EQUIPMENT:** InCell-1900

FCC ID: KUWINCELL1900

PROJECT NO.: 0L0296RUS3

## Test Data - Radiated Emissions - Downlink

<div></div> <div>Page 1 of 1</div>							Field Strength of Spurious Emissions					
Job No.: 0L0296R				Date: 2/5/01		Complete X		Preliminary				
Specification: PART 24				Temperature(°C): 22								
Tested By: David Light				Relative Humidity(%) 50								
E.U.T.: PCS REPEATER												
Configuration: TX CW SIGNAL, FULL POWER, MID BAND												
Sample Number: S02												
Location: AC 3				RBW: 1 MHz		Measurement						
Detector Type: Peak				VBW: 1 MHz		Distance: 3 m						
Test Equipment Used												
Antenna:				Directional Coupler:								
Pre-Amp: 1016				Cable #1: 1484								
Filter:				Cable #2: 1485								
Receiver: 1464				Cable #3:								
Attenuator #1				Cable #4:								
Attenuator #2:				Mixer:								
Additional equipment used:												
Measurement Uncertainty: +/-3.6 dB												
Frequency  (MHz)	Meter Reading  (dBm)	Correction Factor  (dB)		Pre-Amp Gain  (dB)	Substitution Antenna Gain  (dBd)		ERP  (dBm)	ERP  (mW)	Polarity	Comments		
3920	-55.5	34.3		33.4	8.0		-46.6	0.000022	H			
5880	-52.1	36.0		32	9.1		-39.0	0.000125	H			
7840	-58.0	39.8		33.4	9.4		-42.2	0.000061	H			
9800	-59.0	42.6		36.1	10.5		-42.0	0.000063	H			
11760	-61.8	46.0		36.6	11.0		-41.4	0.000073	H	NOISE FLOOR		
13720	-60.7	50.8		34.2	10.4		-33.7	0.000432	H	NOISE FLOOR		
15680	-61.3	44.0		34.7	13.6		-38.4	0.000144	H	NOISE FLOOR		
3920	-52.7	40.4		33.4	8.0		-37.7	0.000169	V			
5880	-50.1	38.5		32	9.1		-34.5	0.000352	V			
7840	-56.0	40.4		33.4	9.4		-39.5	0.000111	V			
9800	-58.3	40.4		36.1	10.5		-43.5	0.000045	V			
11760	-61.8	42.5		36.6	11.0		-44.9	0.000033	V	NOISE FLOOR		
13720	-60.7	47.6		34.2	10.4		-36.9	0.000206	V	NOISE FLOOR		
15680	-61.3	43.2		34.7	13.6		-39.2	0.000121	V	NOISE FLOOR		
Notes: SCANNED TO 10TH HARMONIC OF CARRIER												

*EQUIPMENT:* InCell-1900

*FCC ID:* KUWINCELL1900

PROJECT NO.: 0L0296RUS3

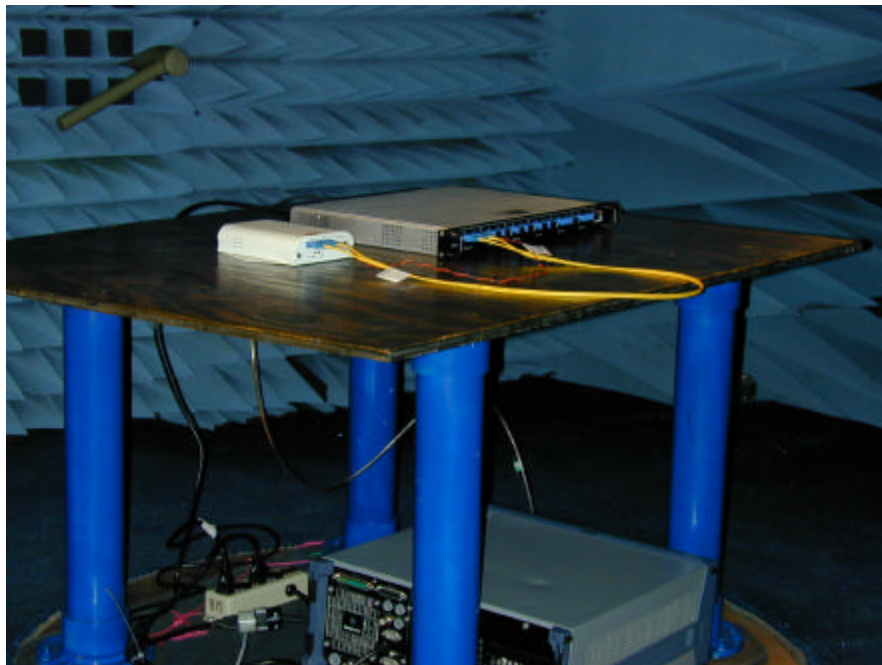
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**Photographs of Test Setup**

FRONT VIEW



REAR VIEW



*EQUIPMENT:* InCell-1900*FCC ID:* KUWINCELL1900PROJECT NO.: 0L0296RUS3

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**Section 7. Test Equipment List**

ID	Description	Manufacturer	Serial Number	Cal.	Cal. Due
		Model Number		Date	Date
1436	Line coiplers	Mini-circuits ZFDC-10-21075	0	CNR	CNR
1081	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	05/23/00	05/23/01
1471	10 db Attenuator DC 18 Ghz	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU	N/A
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	06/14/99	06/14/02
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/02/01	01/02/02
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	05/25/00	05/25/01
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	05/25/00	05/25/01
1016	AMPLIFIER	HEWLETT PACKARD 8449A	2749A00159	05/24/00	05/24/01

**KTL Dallas**

FCC PART 24, SUBPART E  
BROADBAND PCS REPEATERS

*EQUIPMENT:* InCell-1900

*FCC ID:* KUWINCELL1900

PROJECT NO.: 0L0296RUS3

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## **Annex A - Test Details**



EQUIPMENT: InCell-1900

FCC ID: KUWINCELL1900

PROJECT NO.: 0L0296RUS3

**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:**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

*EQUIPMENT:* InCell-1900*FCC ID:* KUWINCELL1900PROJECT NO.: 0L0296RUS3

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**NAME OF TEST: Occupied Bandwidth****PARA. NO.: 2.1047**

**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:  $\geq$  RBW

Span: 5 MHz

Sweep: Auto

Mask: Set markers to -26 dB from peak of CW.

GSM

RBW: 3 kHz

VBW:  $\geq$  RBW

Span: 2 MHz

Sweep: Auto

Mask: Set markers to -26 dB from peak of CW.

NADC

RBW: 1 kHz

VBW:  $\geq$  RBW

Span: 1 MHz

Sweep: Auto

Mask: Set markers to -26 dB from peak of CW.

*EQUIPMENT:* InCell-1900*FCC ID:* KUWINCELL1900PROJECT NO.: 0L0296RUS3

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<b>NAME OF TEST: Spurious Emission at Antenna Terminals</b>	<b>PARA. NO.: 2.1051</b>
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**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 (< 1 MHz from Band Edge)  
VBW:  $\geq$  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:  $\geq$  RBW  
Sweep: Auto  
Video Avg: Disabled

NADC

RBW: 1 MHz (> 1 MHz from Band Edge)  
RBW: 3 kHz (< 1 MHz from Band Edge)  
VBW:  $\geq$  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.

*EQUIPMENT:* InCell-1900*FCC ID:* KUWINCELL1900PROJECT NO.: 0L0296RUS3

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<b>NAME OF TEST: Field Strength of Spurious Radiation</b>	<b>PARA. NO.: 2.1053</b>
---	--------------------------

**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.

**Test Method:** TIA/EIA-603-1992, Section 2.2.12

The antenna substitution method was used to determine the equivalent radiated power at spurious frequencies. The spurious emissions were measured at a distance of 3 meters. The EUT was then replaced with a reference substitution antenna with a known gain referenced to a dipole. This antenna was fed with a signal at the spurious frequency. The level of the signal was adjusted to repeat the previously measured level. The resulting erp is the signal level fed to the reference antenna corrected for gain referenced to a dipole.

*EQUIPMENT:* InCell-1900*FCC ID:* KUWINCELL1900PROJECT NO.: 0L0296RUS3

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**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:**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.

**KTL Dallas**

FCC PART 24, SUBPART E  
BROADBAND PCS REPEATERS

*EQUIPMENT:* InCell-1900

*FCC ID:* KUWINCELL1900

PROJECT NO.: 0L0296RUS3

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## **Annex B - Test Diagrams**

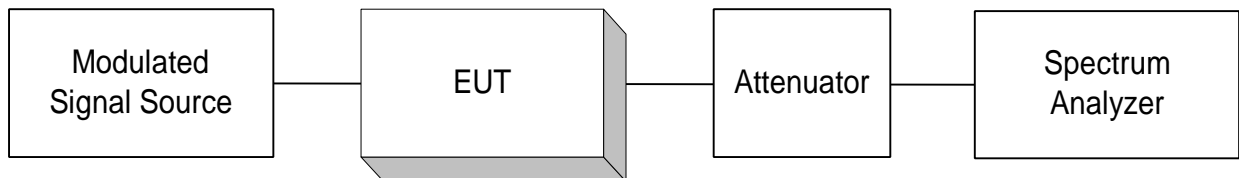
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*FCC ID:* KUWINCELL1900

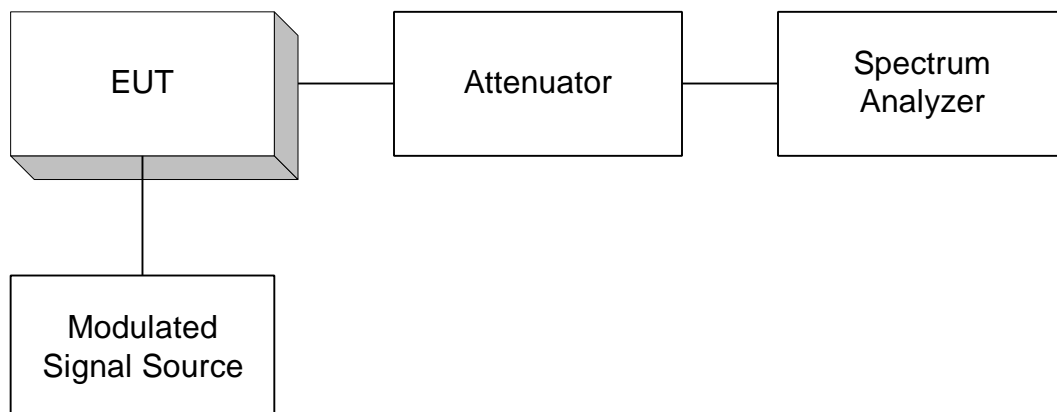
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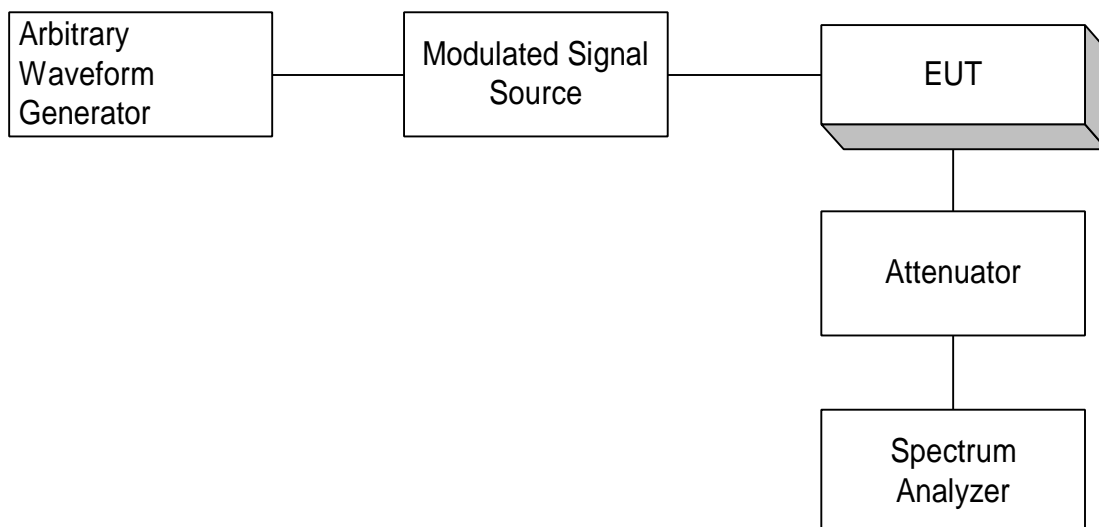
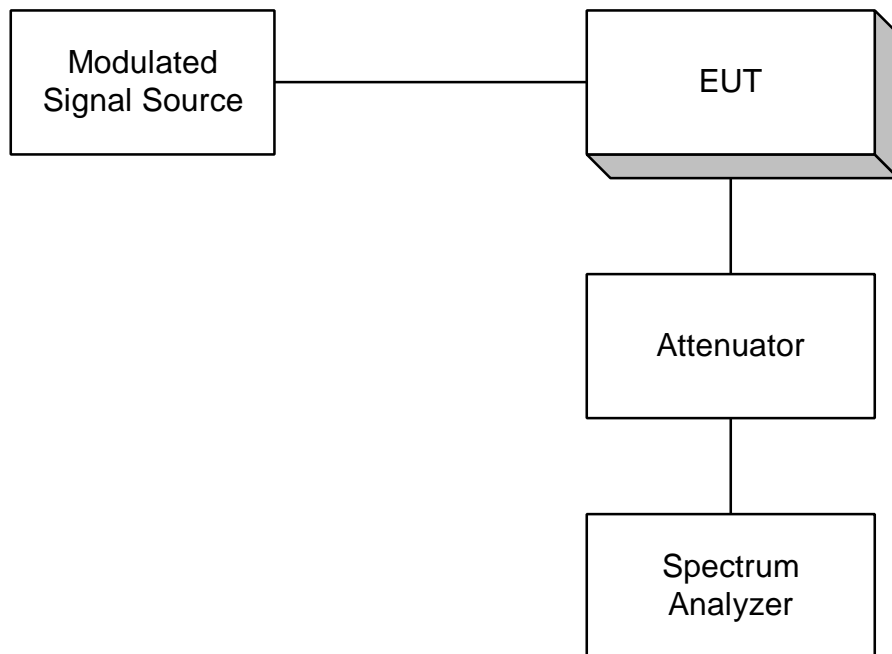
**Para. No. 2.985 - R.F. Power Output**



**Para. No. 2.989 - Occupied Bandwidth**

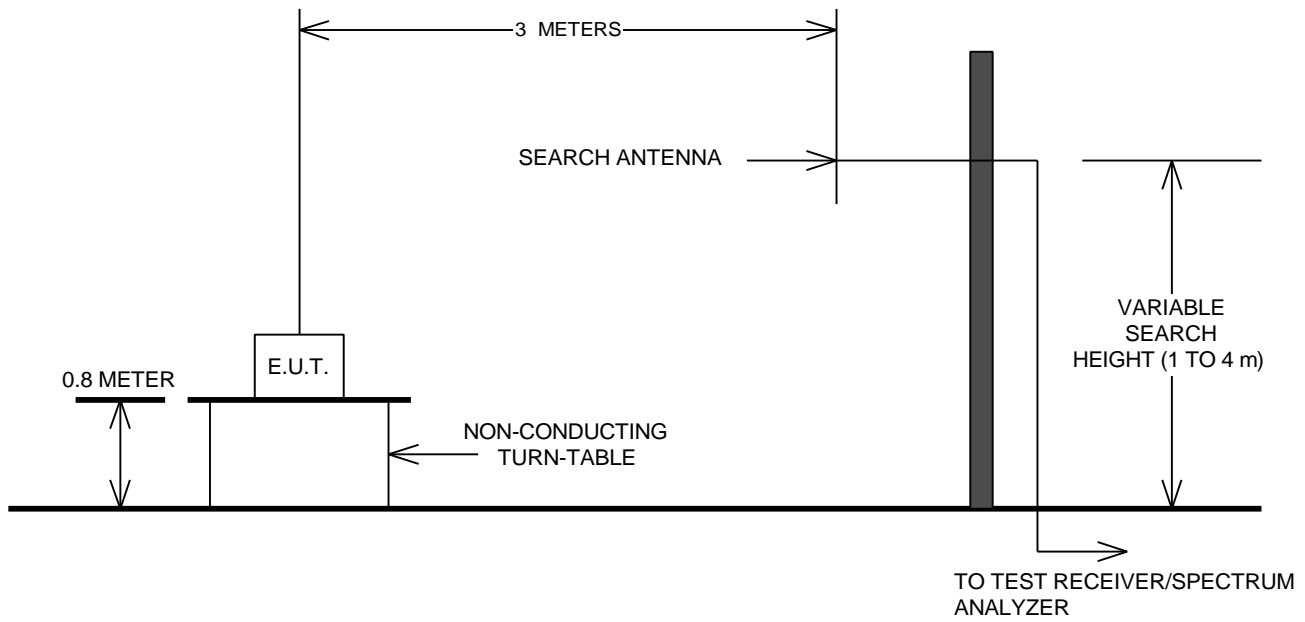


**Para. No. 2.991 Spurious Emissions at Antenna Terminals**





**Para. No. 2.993 - Field Strength of Spurious Radiation**



**Para. No. 2.995 - Frequency Stability**

