

KTL Test Report: 0L0296RUS1

Applicant: Andrew Corporation
2601 Telecom Parkway
Richardson, Texas 75082-3521

Equipment Under Test: InCell Fiber Optic Distributed Antenna System
Model: InCell-800

FCC ID: KUWINCELL800

In Accordance With: **FCC Part 22, Subpart H**
Cellular Band Repeaters

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

Authorized By:



Dale Reynolds, EMC Group Manager

Date: 12/6/00

Total Number of Pages: 56

EQUIPMENT: [InCell-800 Fiber Optic Distributed Antenna System](#)

FCC ID: [KUWINCELL800](#)

PROJECT NO.: [0L0296RUS1](#)

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EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Section 1. Summary of Test Results

Manufacturer: Andrew Corporation

Model No.: InCell-800

Serial No.: CDU S/N. P001, RAU S/N. P001

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 22, Subpart H.



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-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

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Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	22.913(a)	500W ERP	Complies
Occupied Bandwidth (Voice & SAT)	22.917(c)	Mask	Complies
Occupies Bandwidth (Wideband Data)	22.917(d)	Mask	Complies
Occupied Bandwidth (ST)	22.917(d)	Mask	Complies
Occupied Bandwidth (Digital)	None	None	Complies
Spurious Emissions at Antenna Terminals	22.917	-13 dBm	Complies
Field Strength of Spurious Emissions	22.917	-13 dBm E.I.R.P.	Complies
Frequency Stability	22.355	1.5 ppm	Not Applicable

Footnotes:

1. The E.U.T. does not perform frequency conversion. The frequency stability of the transmitted signal is entirely dependant on the frequency stability of the rf input signal.

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

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EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

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Section 2. General Equipment Specification

Supply Voltage Input(CDU):	120 VAC via power mains		
Supply Voltage Input(RAU):	24 VDC from CDU		
Frequency Range	Downlink:	869 – 894 MHz	
	Uplink:	824 – 849 MHz (Distributed to the Repeater or BTS via fiber optic and coaxial cable. This is not a wireless link.)	
Type of Modulation and Designator:	CDMA (F9W)	NADC (DXW)	AMPS (F8W, F1D)
	☒	☒	☒
Output Impedance:	50 ohms		
Max. Input Power (before damage):	+20 dBm		
Max. Input Power:	+0 dBm		
RF Output (Rated):	Downlink:	<u>Voice</u>	<u>NADC</u>
		15 dBm, 2 carriers	15 dBm, 2 carriers
		12 dBm, 4 carriers	12 dBm, 4 carriers
		9 dBm, 8 carriers	9 dBm, 8 carriers
		<u>CDMA</u>	
		10 dBm, 1 carrier	
		4 dBm, 2 carriers	
Frequency Translation:	F1-F1	F1-F2	N/A
	☒	☐	☒
Band Selection:	Software	Duplexer Change	Fullband Coverage
	☐	☐	☒

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

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Description of Operation

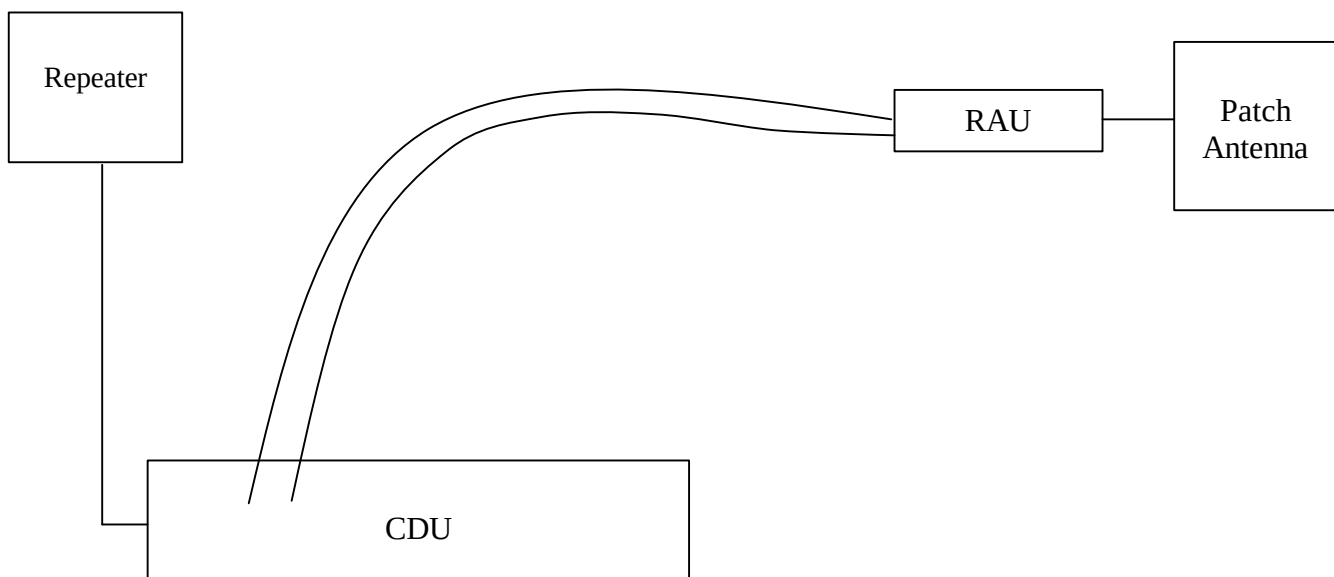
The DUT (Device Under Test) is a distributed antenna system designed to extend rf coverage into buildings and hard to penetrate indoor areas that experience rf coverage problems.

This 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.
- 2) 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-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

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Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: Tom Tidwell	DATE: 10/24/00

Test Results: [Complies.](#)**Test Data:**

	Modulation Type	Per Channel Power Output (dBm)	Composite Power Output (dBm)
Uplink	AMPS	N/A	N/A
Downlink	AMPS	+12..0	+15.0
Uplink	CDMA	N/A	N/A
Downlink	CDMA	+10 single or +1.0 w/ 2 carriers	+10 single, +4 w 2 carriers
Uplink	NADC	N/A	N/A
Downlink	NADC	+11.9	+14.9

Equipment Used: [1464, 1477, 1081, 1083](#)**Measurement Uncertainty:** +/- [0.6](#) dB**Temperature:** [27](#) °C**Relative Humidity:** [43](#) %

EQUIPMENT: [InCell-800 Fiber Optic Distributed Antenna System](#)FCC ID: [KUWINCELL800](#)PROJECT NO.: [0L0296RUS1](#)

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth (Digital Mod.)	PARA. NO.: 2.1049
TESTED BY: Tom Tidwell	DATE: 10/25/00

Test Results: [Complies.](#)**Test Data:** [See attached plots](#)**Measurement Uncertainty:** +/- [2.3](#) dB**Temperature:** [25](#) °C**Relative
Humidity:** [70](#) %

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Test Plot: Occupied Bandwidth

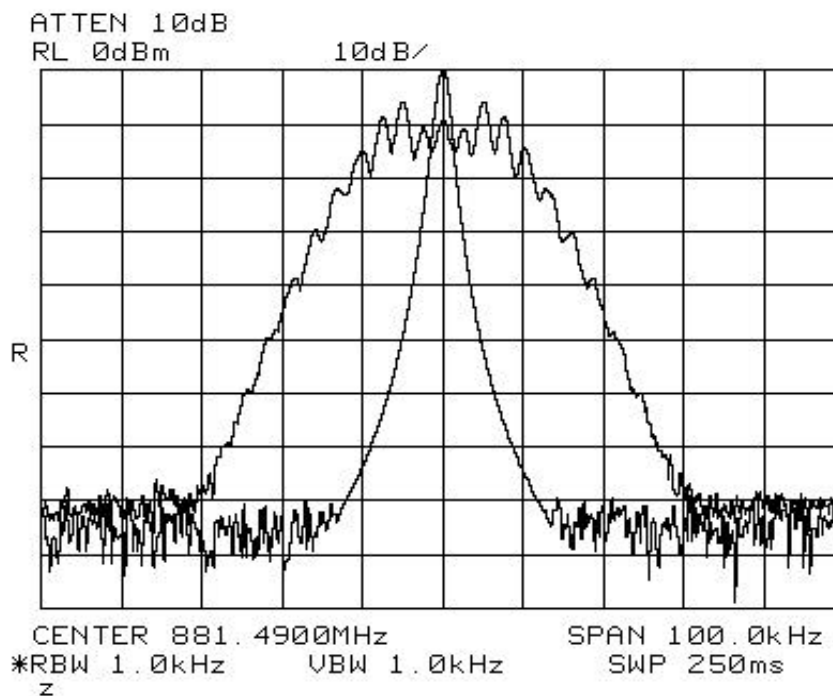
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Job No.: 0L0296R Date: 10/25/00
Specification: CFR 47, Part 22 Temperature(°C): 25
Tested By: Tom Tidwell Relative Humidity(%) 70
E.U.T.: CDU and RAU
Configuration:
Serial Number: P001
Location: Lab 1 RBW: 1 kHz
Detector Type: Peak VBW: 1 kHz

Test Equipment Used

Antenna: #N/A Directional Coupler: #N/A
Pre-Amp: #N/A Cable #1: 1081
Filter: #N/A Cable #2: 1083
Receiver: 1464 Cable #3: #N/A
Attenuator #1: 1477 Cable #4: #N/A
Attenuator #2: #N/A Mixer: #N/A

Additional equipment used:
Measurement
Uncertainty: +/-2.3 dB



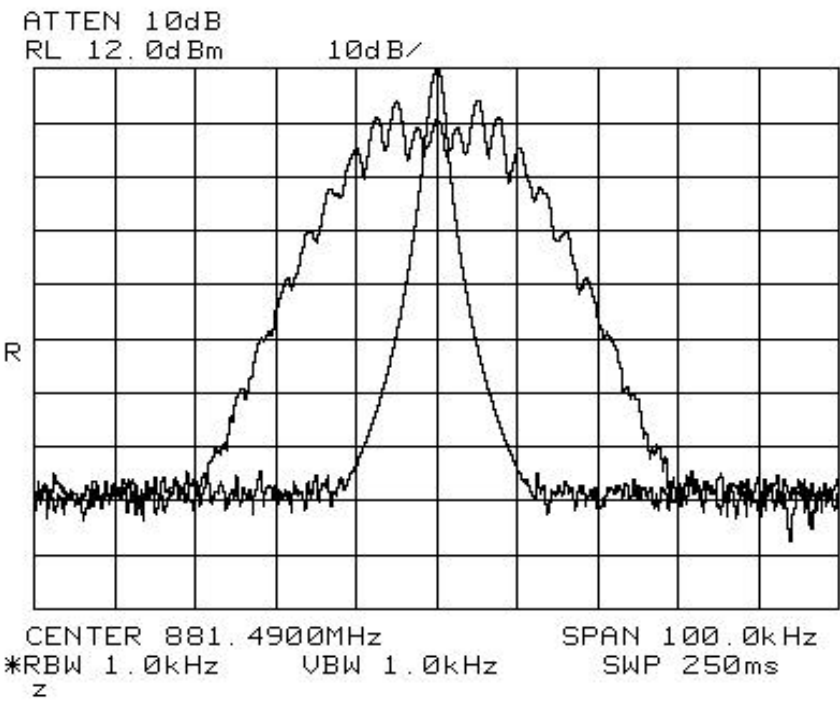
Notes: Occupied Bandwidth, Input Signal, Voice and SAT, 881.49MHz
Modulation: 2.5 kHz Voice @ +/-8 kHz dev. Plus 6 kHz SAT @ +/- 2kHz dev.

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Test Plot: Occupied Bandwidth	
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Job No.:	0L0296R
Date:	10/25/00
Specification:	CFR 47, Part 22
Temperature(°C):	25
Tested By:	Tom Tidwell
Relative Humidity(%)	70
E.U.T.:	CDU and RAU
Configuration:	



Notes:	Occupied Bandwidth, Output Signal, Voice and SAT, 881.49MHz
	Modulation: 2.5 kHz Voice @ +/-8 kHz dev. Plus 6 kHz SAT @ +/- 2kHz dev.

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Test Plot: Occupied Bandwidth

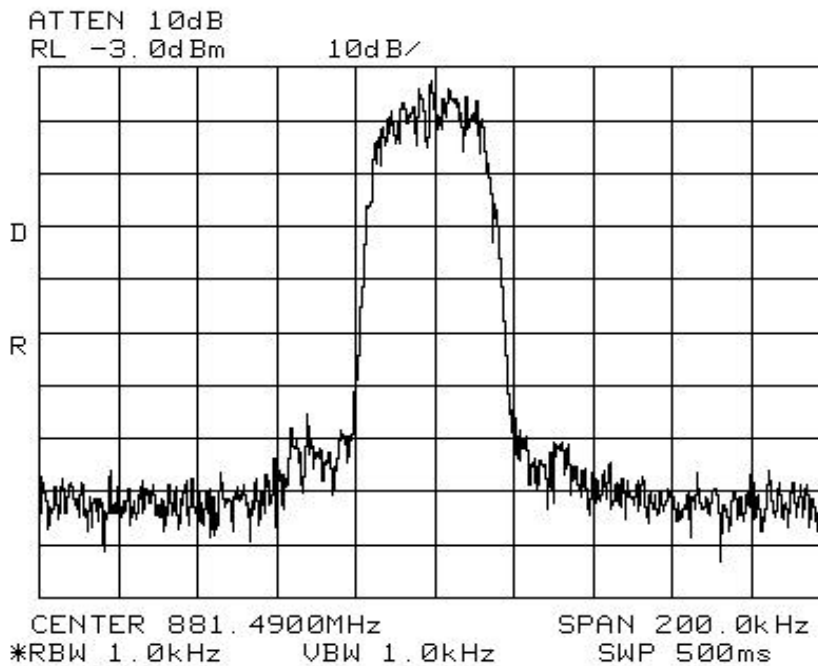
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Job No.: 0L0296R Date: 10/25/00
Specification: CFR 47, Part 22 Temperature(°C): 25
Tested By: Tom Tidwell Relative Humidity(%) 70
E.U.T.: CDU and RAU
Configuration:
Serial Number: P001
Location: Lab 3 RBW: 1 kHz
Detector Type: Peak VBW: 1 kHz

Test Equipment Used

Antenna: #N/A Directional Coupler: #N/A
Pre-Amp: #N/A Cable #1: 1081
Filter: #N/A Cable #2: 1083
Receiver: 1464 Cable #3: #N/A
Attenuator #1: 1477 Cable #4: #N/A
Attenuator #2: #N/A Mixer: #N/A

Additional equipment used:
Measurement
Uncertainty: +/-2.3 dB



Notes: Occupied Bandwidth, Input Signal, NADC, 881.49MHz

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

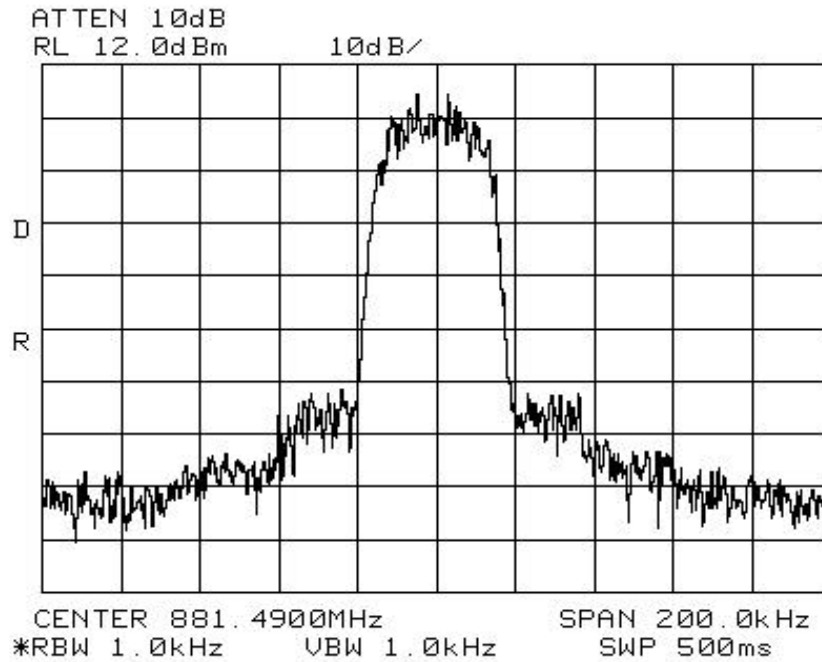
FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Test Plot: Occupied Bandwidth

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Job No.:	0L0296R	Date:	10/25/00
Specification:	CFR 47, Part 22	Temperature(°C):	25
Tested By:	Tom Tidwell	Relative Humidity(%):	70
E.U.T.:	CDU and RAU		
Configuration:			



Notes: Occupied Bandwidth, Output Signal, NADC, 881.49MHz

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Test Plot: Occupied Bandwidth

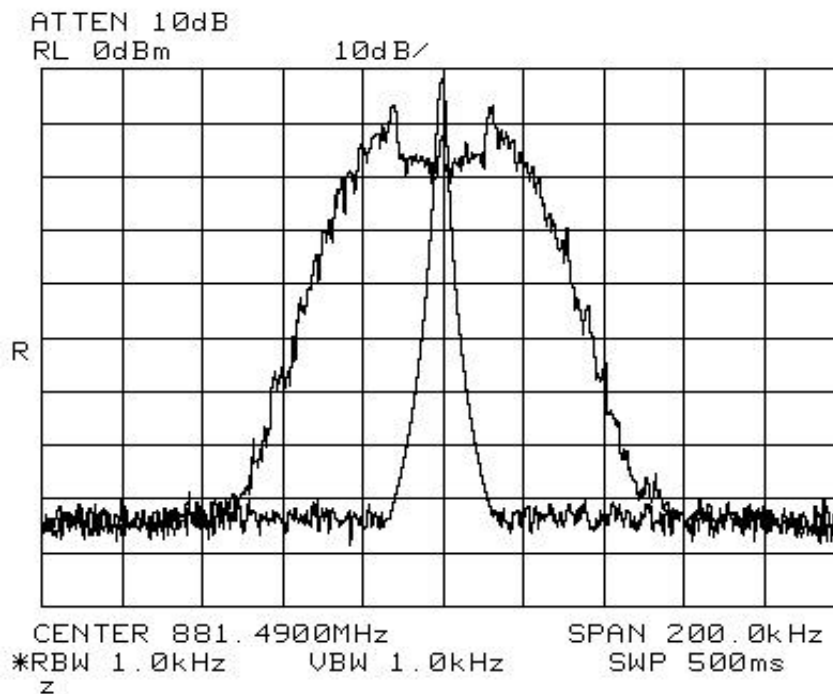
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Job No.: 0L0296R Date: 10/25/00
Specification: CFR 47, Part 22 Temperature(°C): 25
Tested By: Tom Tidwell Relative Humidity(%) 70
E.U.T.: CDU and RAU
Configuration:
Serial Number: P001
Location: Lab 1 RBW: 1 kHz
Detector Type: Peak VBW: 1 kHz

Test Equipment Used

Antenna: #N/A Directional Coupler: #N/A
Pre-Amp: #N/A Cable #1: 1081
Filter: #N/A Cable #2: 1083
Receiver: 1464 Cable #3: #N/A
Attenuator #1: 1477 Cable #4: #N/A
Attenuator #2: #N/A Mixer: #N/A

Additional equipment used:
Measurement
Uncertainty: +/-2.3 dB



Notes: Occupied Bandwidth, Input Signal, Wideband Data, 881.49MHz
Modulation: Pseudorandom Wideband Data @ +/- 12 kHz dev.

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

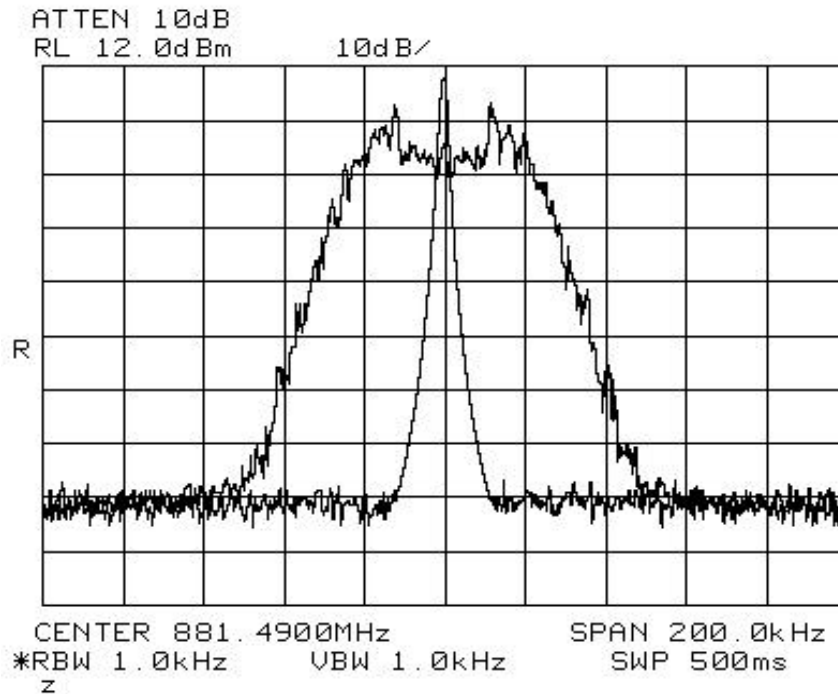
FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Test Plot: Occupied Bandwidth

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Job No.:	0L0296R	Date:	10/25/00
Specification:	CFR 47, Part 22	Temperature(°C):	25
Tested By:	Tom Tidwell	Relative Humidity(%)	70
E.U.T.:	CDU and RAU		
Configuration:			



Notes: Occupied Bandwidth, Output Signal, Wideband Data, 881.49MHz
Modulation: Pseudorandom Wideband Data @ +/- 12 kHz dev.

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Test Plot: Occupied Bandwidth

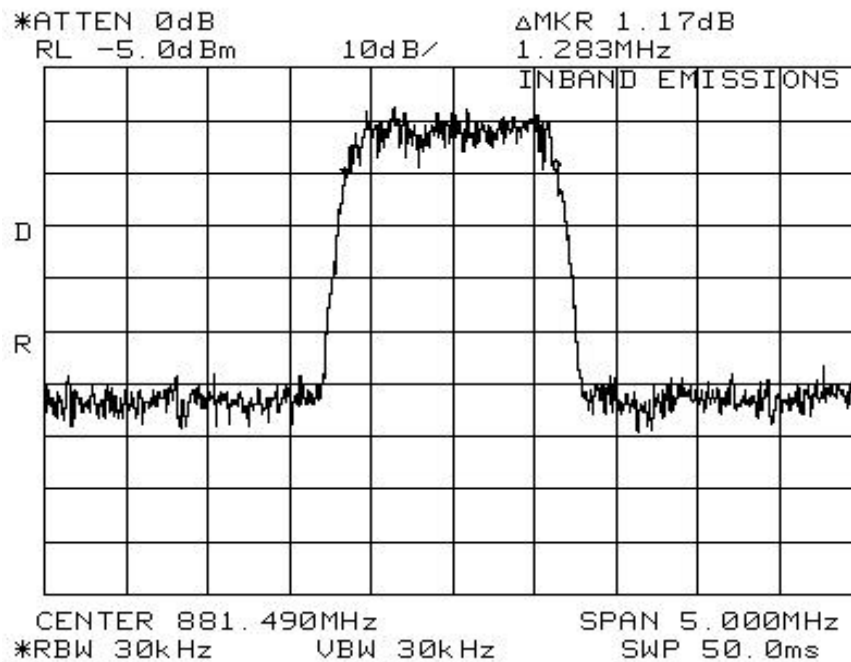
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Job No.: 0L0296R Date: 10/25/00
Specification: CFR 47, Part 22 Temperature(°C): 25
Tested By: Tom Tidwell Relative Humidity(%) 70
E.U.T.: CDU and RAU
Configuration:
Serial Number: P001
Location: Lab 3 RBW: 30 kHz
Detector Type: Peak VBW: 30 kHz

Test Equipment Used

Antenna: #N/A Directional Coupler: #N/A
Pre-Amp: #N/A Cable #1: 1081
Filter: #N/A Cable #2: 1083
Receiver: 1464 Cable #3: #N/A
Attenuator #1: 1477 Cable #4: #N/A
Attenuator #2: #N/A Mixer: #N/A

Additional equipment used:
Measurement
Uncertainty: +/-2.3 dB



Notes: Occupied Bandwidth, Input Signal, CDMA, 881.49MHz

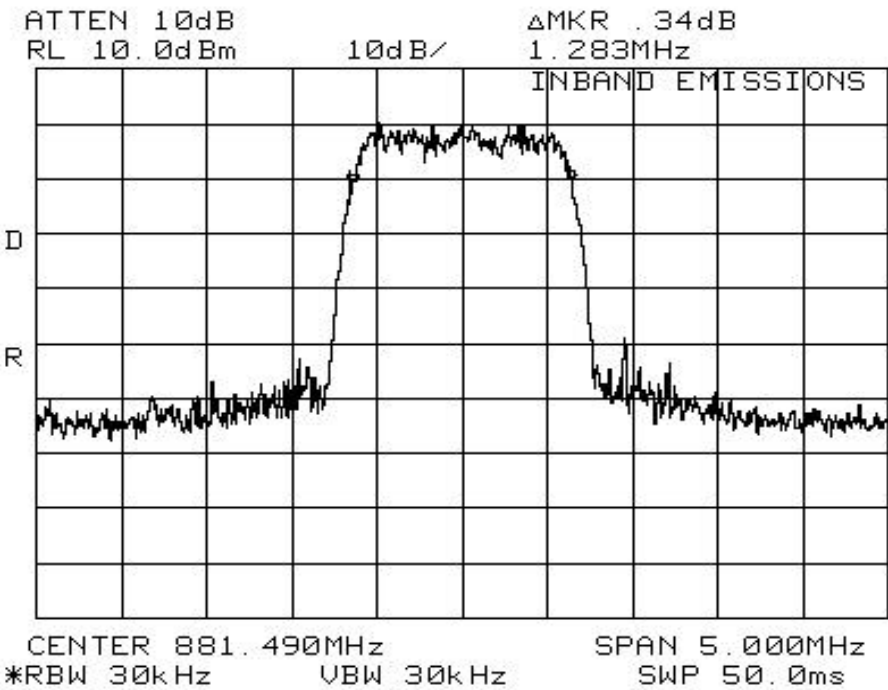
EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Test Plot: Occupied Bandwidth

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Job No.: 0L0296R	Date: 10/25/00
Specification: CFR 47, Part 22	Temperature(°C): 25
Tested By: Tom Tidwell	Relative Humidity(%) 70
E.U.T.: CDU and RAU	
Configuration:	



Notes:	Occupied Bandwidth, Output Signal, CDMA, 881.49MHz

EQUIPMENT: [InCell-800 Fiber Optic Distributed Antenna System](#)

FCC ID: [KUWINCELL800](#)

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Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.1051
TESTED BY: Tom Tidwell	DATE: 11/01/00

Test Results: [Complies.](#)

Test Data: [See attached plots](#)

Measurement Uncertainty: +/- [1.6](#) dB

Temperature: [27](#) °C

Relative Humidity: [68](#) %

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Test Plot: Antenna Spurious Emissions

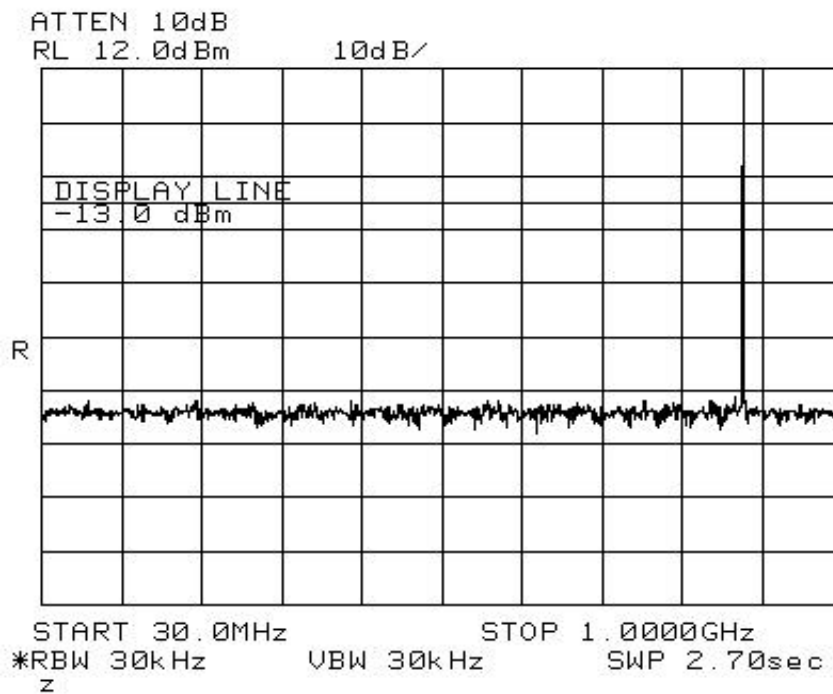
Page 1 of 2

Job No.: 0L0296R Date: 11/01/00
Specification: CFR 47, Part 22 Temperature(°C): 27
Tested By: Tom Tidwell Relative Humidity(%) 68
E.U.T.: CDU and RAU
Configuration:
Serial Number: P001
Location: Lab 1
Detector Type: Peak

Test Equipment Used

Antenna:	#N/A	Directional Coupler:	#N/A
Pre-Amp:	#N/A	Cable #1:	1081
Filter:	#N/A	Cable #2:	1083
Receiver:	1464	Cable #3:	#N/A
Attenuator #1:	1477	Cable #4:	#N/A
Attenuator #2:	#N/A	Mixer:	#N/A

Additional equipment used:
Measurement
Uncertainty: +/-2.3 dB



Notes: Antenna Conducted Spurious Emissions, Analogue, 881.49MHz

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

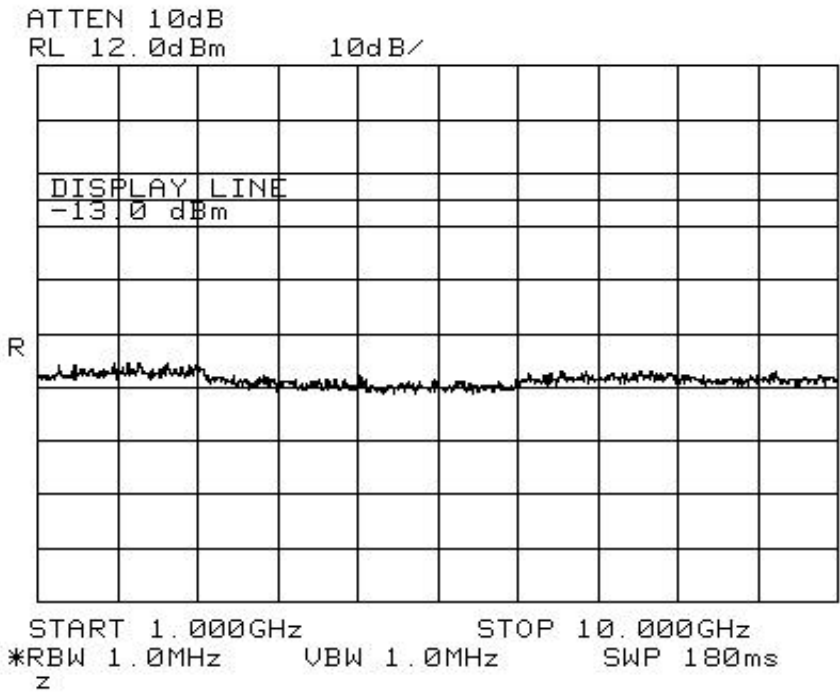
FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Test Plot: Antenna Spurious Emissions

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Job No.:	0L0296R	Date:	11/1/00
Specification:	CFR 47, Part 22	Temperature(°C):	27
Tested By:	Tom Tidwell	Relative Humidity(%)	68
E.U.T.:	CDU and RAU		
Configuration:			



Notes:	Antenna Conducted Spurious Emissions, Analogue, 881.49MHz

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Test Plot: Antenna Spurious Emissions

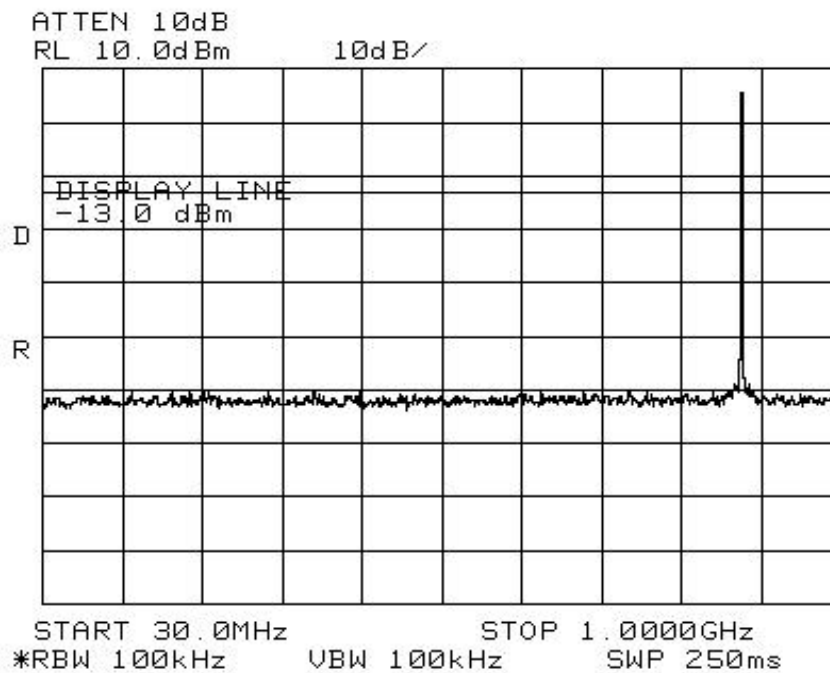
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Job No.: 0L0296R Date: 11/01/00
Specification: CFR 47, Part 22 Temperature(°C): 27
Tested By: Tom Tidwell Relative Humidity(%) 68
E.U.T.: CDU and RAU
Configuration:
Serial Number: P001
Location: Lab 1
Detector Type: Peak

Test Equipment Used

Antenna:	#N/A	Directional Coupler:	#N/A
Pre-Amp:	#N/A	Cable #1:	1081
Filter:	#N/A	Cable #2:	1083
Receiver:	1464	Cable #3:	#N/A
Attenuator #1:	1477	Cable #4:	#N/A
Attenuator #2:	#N/A	Mixer:	#N/A

Additional equipment used:
Measurement
Uncertainty: +/-2.3 dB



Notes: Antenna Conducted Spurious Emissions, CDMA, 881.49MHz

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

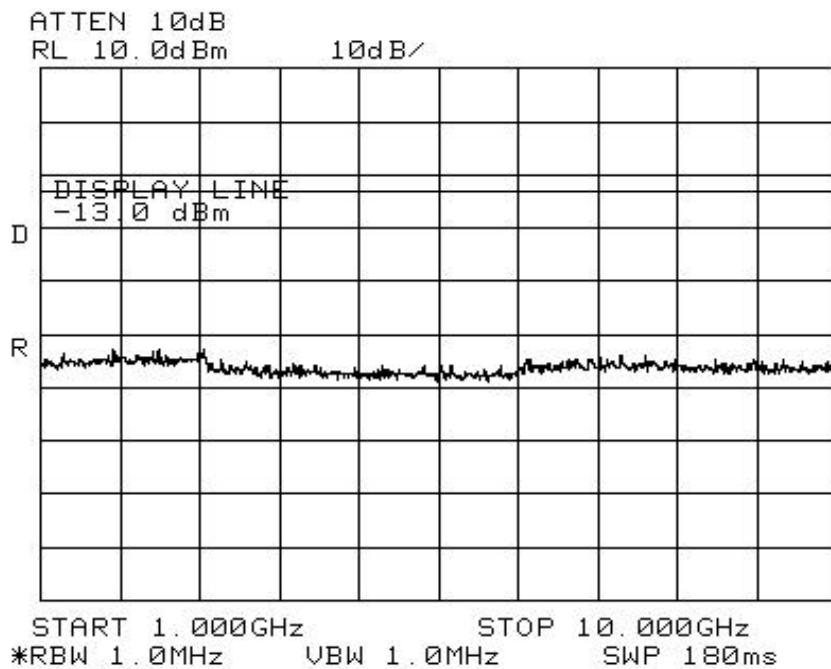
FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Test Plot: Antenna Spurious Emissions

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Job No.:	0L0296R	Date:	11/1/00
Specification:	CFR 47, Part 22	Temperature(°C):	27
Tested By:	Tom Tidwell	Relative Humidity(%)	68
E.U.T.:	CDU and RAU		
Configuration:			



Notes: Antenna Conducted Spurious Emissions, CDMA, 881.49MHz

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

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Test Plot: Antenna Spurious Emissions

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Job No.: 0L0296R Date: 11/01/00

Specification: CFR 47, Part 22 Temperature(°C): 27

Tested By: Tom Tidwell Relative Humidity(%) 68

E.U.T.: CDU and RAU

Configuration:

Serial Number: P001

Location: Lab 1

Detector Type: Peak

Test Equipment Used

Antenna: #N/A

Directional Coupler: #N/A

Pre-Amp: #N/A

Cable #1: 1081

Filter: #N/A

Cable #2: 1083

Receiver: 1464

Cable #3: #N/A

Attenuator #1: 1477

Cable #4: #N/A

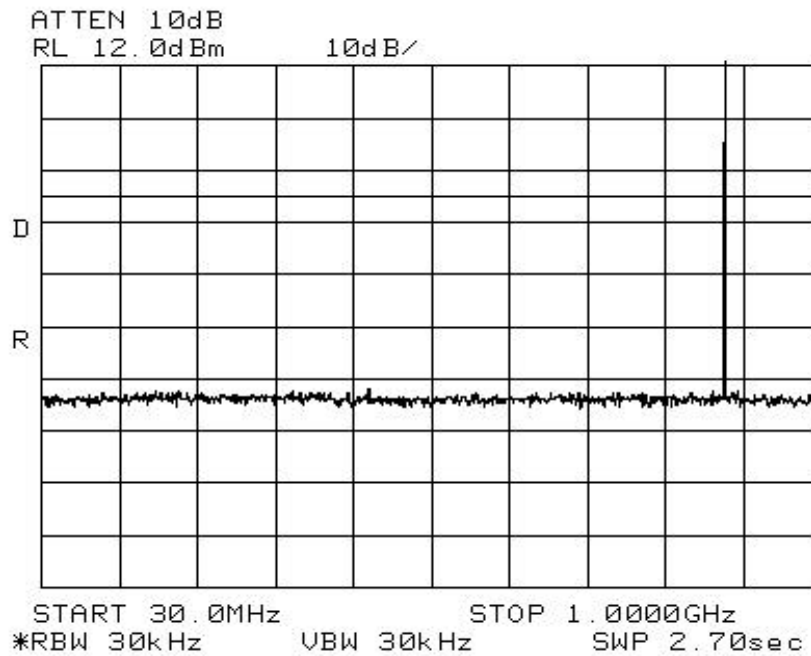
Attenuator #2: #N/A

Mixer: #N/A

Additional
equipment used:

Measurement

Uncertainty: +/-2.3 dB



Notes: Antenna Conducted Spurious Emissions, NADC, 881.49MHz

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

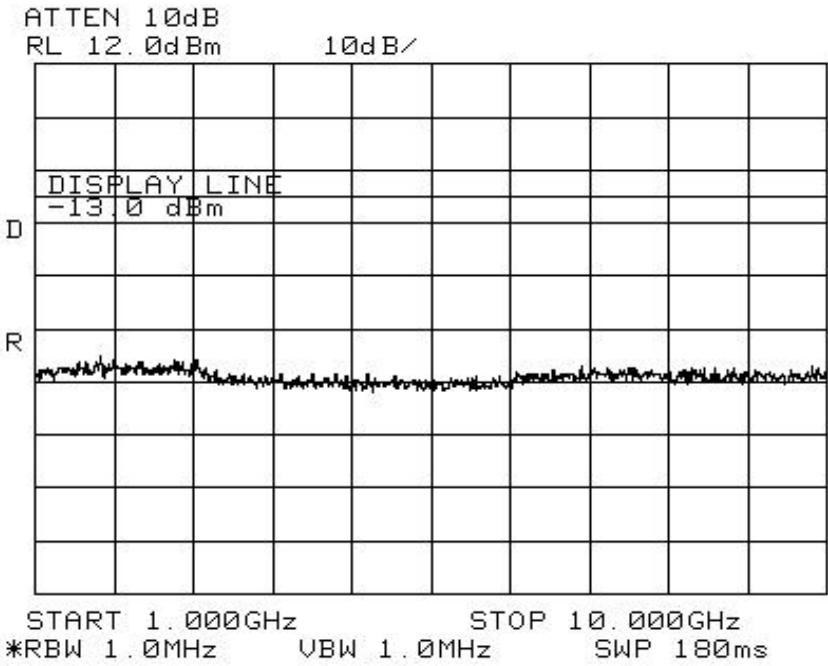
FCC ID: KUWINCELL800

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Test Plot: Antenna Spurious Emissions

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Job No.:	0L0296R	Date:	11/1/00
Specification:	CFR 47, Part 22	Temperature(°C):	27
Tested By:	Tom Tidwell	Relative Humidity(%)	68
E.U.T.:	CDU and RAU		
Configuration:			



Notes:	Antenna Conducted Spurious Emissions, NADC, 881.49MHz

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Test Plot: Spurious Emissions

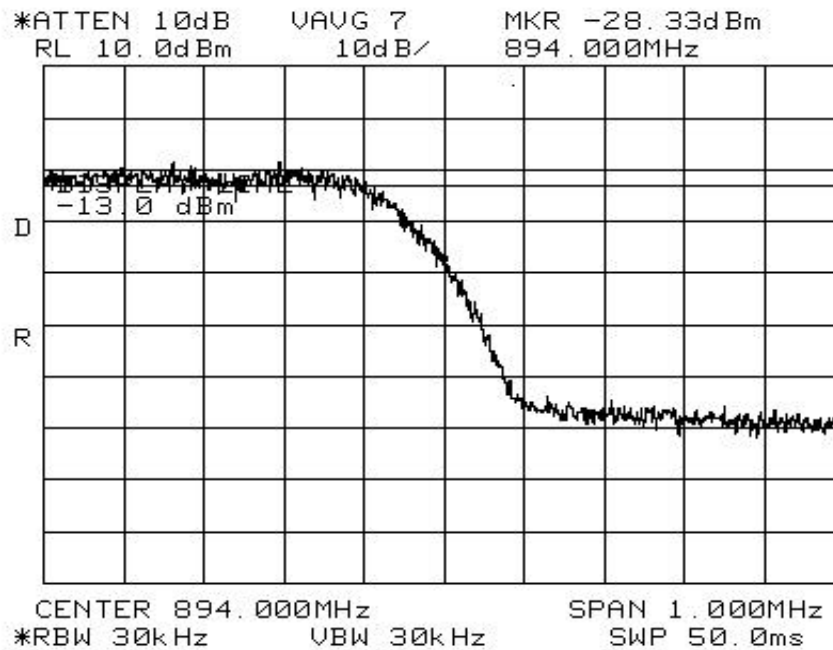
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Job No.: 0L0296R Date: 10/24/00
Specification: CFR 47, Part 22 Temperature(°C): 27
Tested By: Tom Tidwell Relative Humidity(%) 43
E.U.T.: CDU and RAU
Configuration:
Serial Number: P001
Location: Lab 3 RBW: 30 kHz
Detector Type: Sample VBW: 30 kHz

Test Equipment Used

Antenna: #N/A Directional Coupler: #N/A
Pre-Amp: #N/A Cable #1: 1081
Filter: #N/A Cable #2: 1083
Receiver: 1464 Cable #3: #N/A
Attenuator #1: 1477 Cable #4: #N/A
Attenuator #2: #N/A Mixer: #N/A

Additional equipment used:
Measurement
Uncertainty: +/-2.3 dB



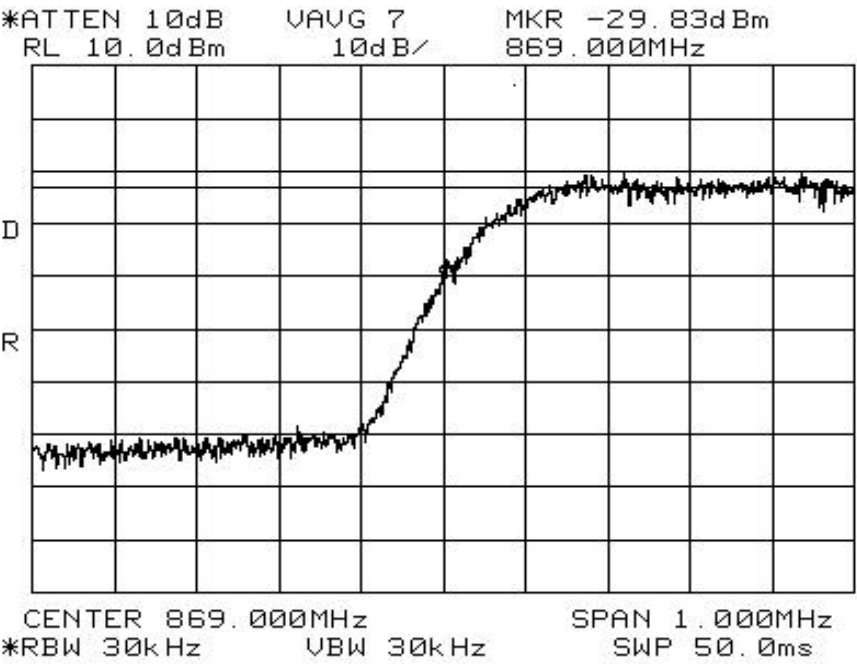
Notes: Upper Band Edge Spurious, IS-95 CDMA, Channel 777, 893.31MHz

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Test Plot: Spurious Emissions	
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Job No.:	0L0296R
Specification:	CFR 47, Part 22
Tested By:	Tom Tidwell
E.U.T.:	CDU and RAU
Configuration:	
Date:	10/24/00
Temperature(°C):	1/27/00
Relative Humidity(%):	2/12/00



Notes:	Lower Band Edge Spurious, IS-95 CDMA, Channel 1013, 869.7MHz

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Test Plot: Spurious Emissions

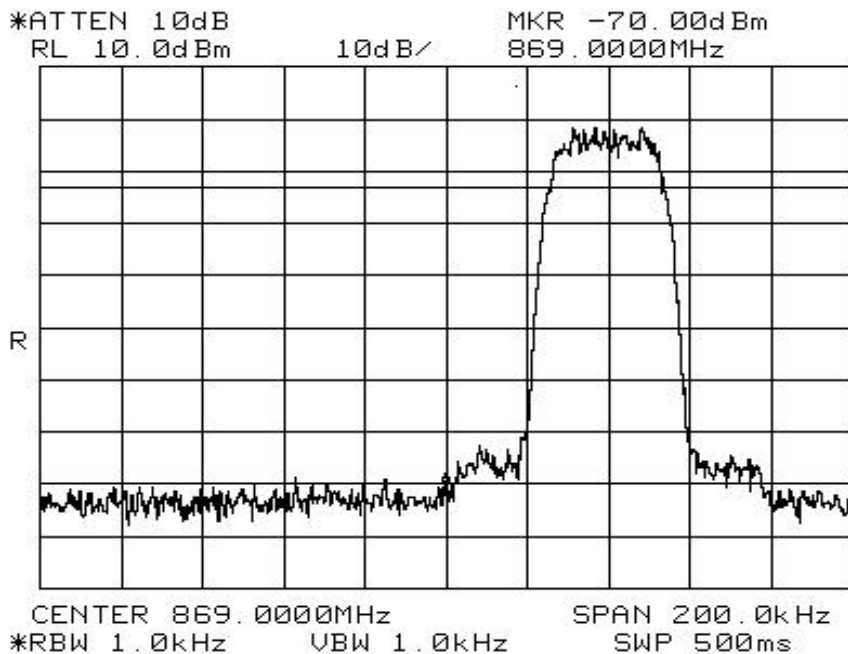
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Job No.: 0L0296R Date: 10/24/00
Specification: CFR 47, Part 22 Temperature(°C): 27
Tested By: Tom Tidwell Relative Humidity(%) 43
E.U.T.: CDU and RAU
Configuration:
Serial Number: P001
Location: Lab 3 RBW: 1 kHz
Detector Type: Sample VBW: 1 kHz

Test Equipment Used

Antenna: #N/A Directional Coupler: #N/A
Pre-Amp: #N/A Cable #1: 1081
Filter: #N/A Cable #2: 1083
Receiver: 1464 Cable #3: #N/A
Attenuator #1: 1477 Cable #4: #N/A
Attenuator #2: #N/A Mixer: #N/A

Additional equipment used:
Measurement
Uncertainty: +/-2.3 dB



Notes: Lower Band Edge Spurious, NADC, Channel 991, 869.04MHz

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

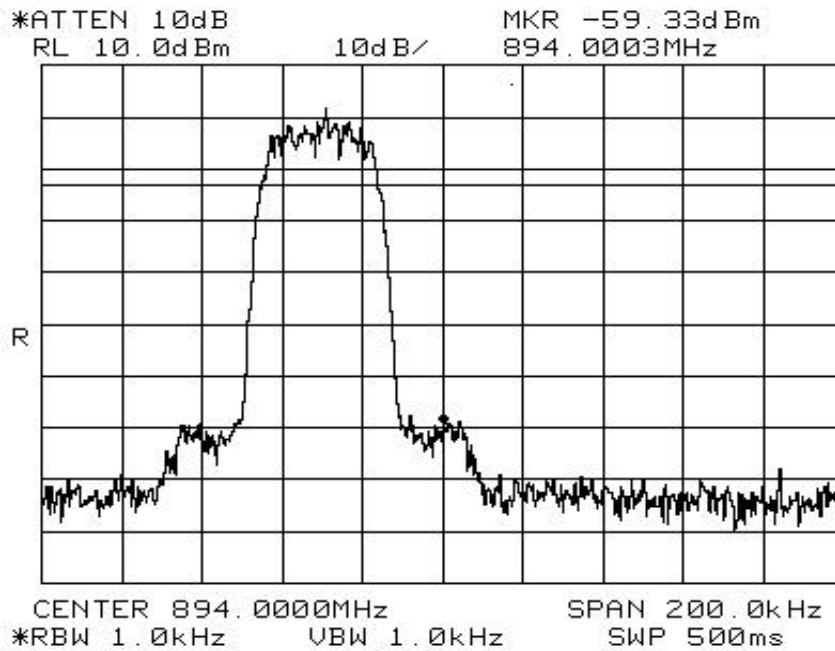
FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Test Plot: Spurious Emissions

Page 2 of 2

Job No.:	0L0296R	Date:	10/24/00
Specification:	CFR 47, Part 22	Temperature(°C):	1/27/00
Tested By:	Tom Tidwell	Relative Humidity(%)	2/12/00
E.U.T.:	CDU and RAU		
Configuration:			



Notes: Upper Band Edge Spurious, NADC, Channel 799, 893.97MHz

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Test Plot: Antenna Spurious Emissions

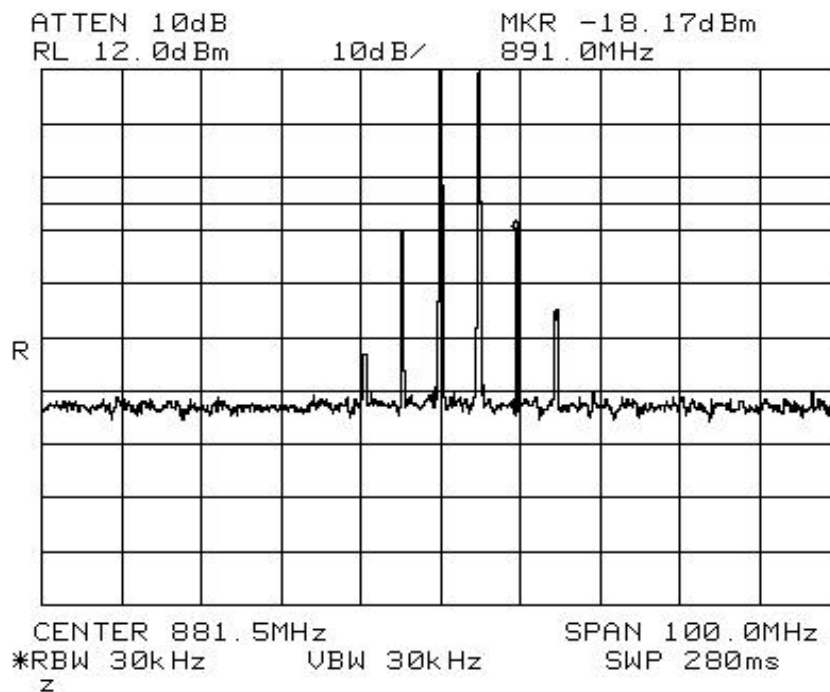
Page 1 of 2

Job No.: 0L0296R Date: 11/01/00
Specification: CFR 47, Part 22 Temperature(°C): 27
Tested By: Tom Tidwell Relative Humidity(%) 68
E.U.T.: CDU and RAU
Configuration:
Serial Number: P001
Location: Lab 1 RBW: 30 kHz
Detector Type: Peak VBW: 30 kHz

Test Equipment Used

Antenna: #N/A Directional Coupler: #N/A
Pre-Amp: #N/A Cable #1: 1081
Filter: #N/A Cable #2: 1083
Receiver: 1464 Cable #3: 1082
Attenuator #1: 1477 Cable #4: 1043
Attenuator #2: #N/A Mixer: #N/A

Additional
equipment used: 91, 1053, 1051
Measurement
Uncertainty: +/-2.3 dB



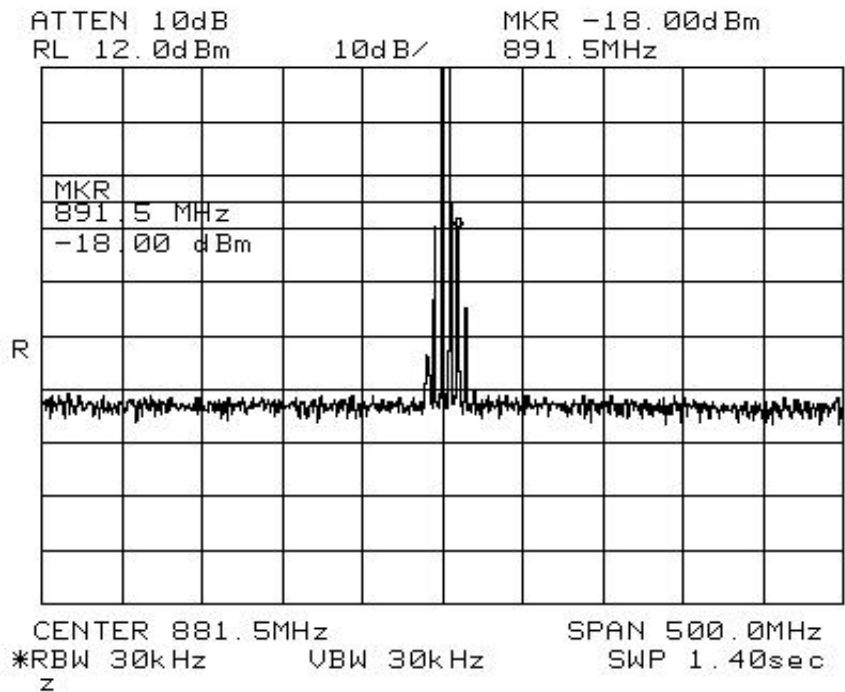
Notes: Antenna Conducted Spurious Emissions, Analogue, 881.49MHz and 886.29 MHz, +12 dBm/carrier

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Test Plot: Antenna Spurious Emissions	
Page 2 of 2	
Job No.: 0L0296R	Date: 11/1/00
Specification: CFR 47, Part 22	Temperature(°C): 27
Tested By: Tom Tidwell	Relative Humidity(%) 68
E.U.T.: CDU and RAU	
Configuration:	

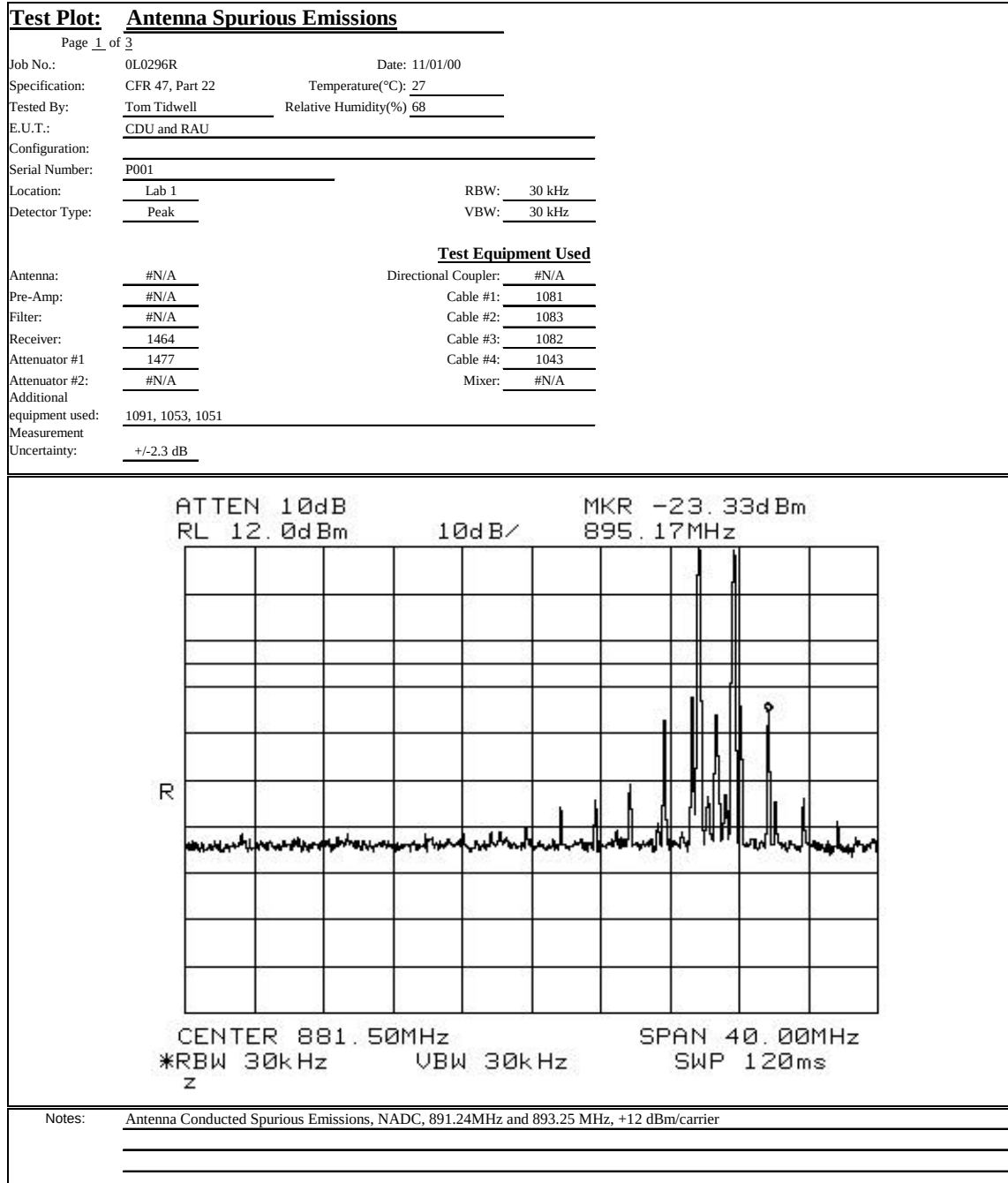


Notes:	Antenna Conducted Spurious Emissions, Analogue, 881.49MHz and 886.29 MHz, +12 dBm/carrier

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1



EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

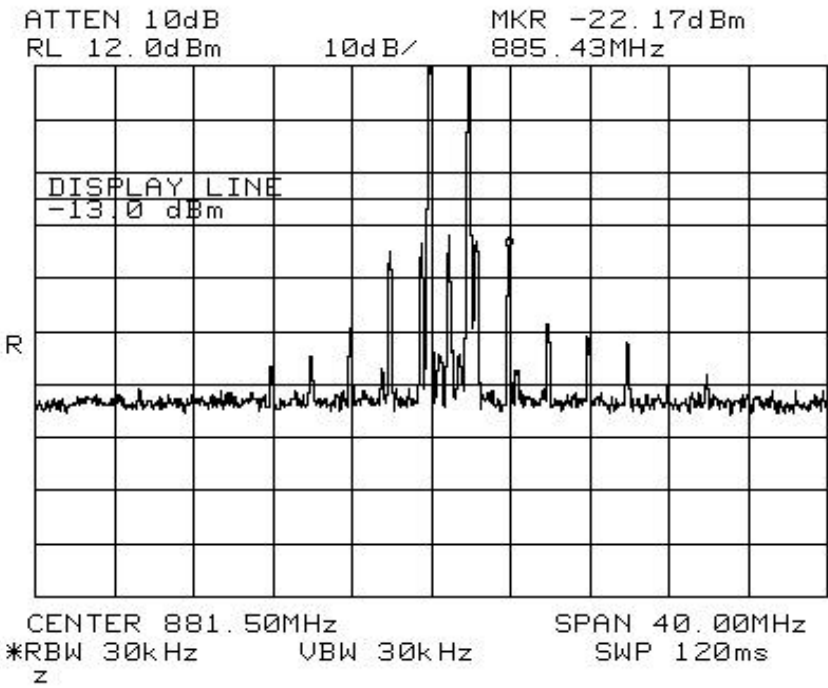
FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Test Plot: Antenna Spurious Emissions

Page 2 of 3

Job No.:	0L0296R	Date:	11/1/00
Specification:	CFR 47, Part 22	Temperature(°C):	27
Tested By:	Tom Tidwell	Relative Humidity(%)	68
E.U.T.:	CDU and RAU		
Configuration:			



Notes: Antenna Conducted Spurious Emissions, NADC, 881.49MHz and 882.48 MHz, +12 dBm/carrier

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

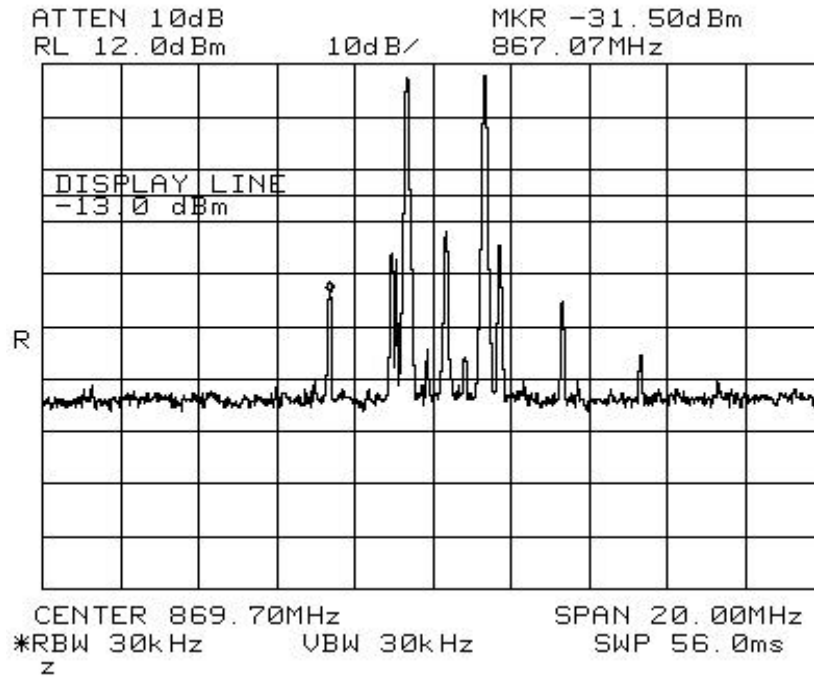
FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Test Plot: Antenna Spurious Emissions

Page 3 of 3

Job No.:	0L0296R	Date:	11/1/00
Specification:	CFR 47, Part 22	Temperature(°C):	1/27/00
Tested By:	Tom Tidwell	Relative Humidity(%)	3/8/00
E.U.T.:	CDU and RAU		
Configuration:			



Notes: Antenna Conducted Spurious Emissions, NADC, 869.04MHz and 871.05 MHz, +12 dBm/carrier

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

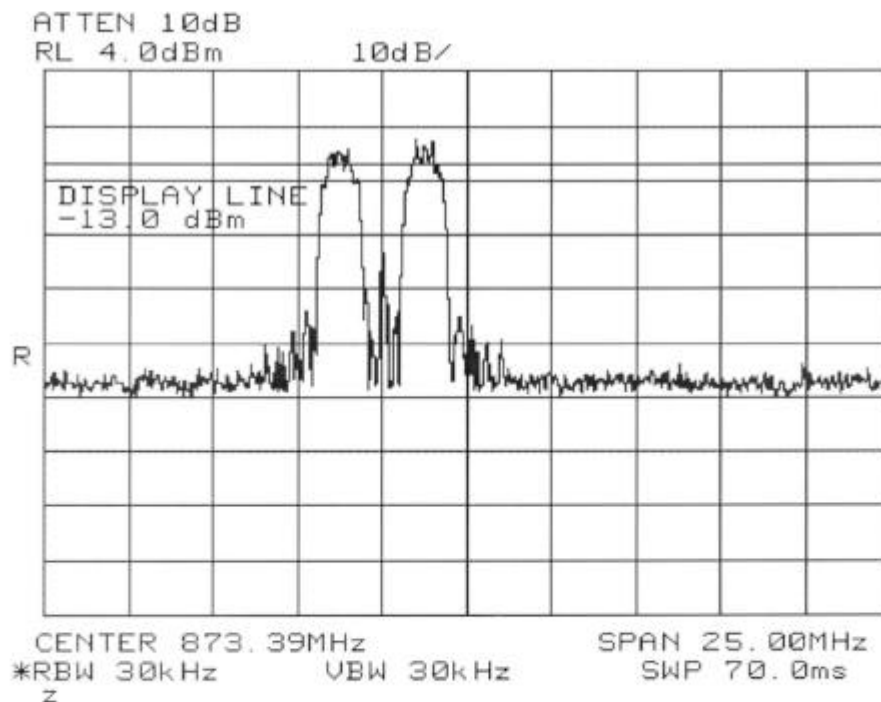
FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Test Plot: Antenna Spurious Emissions

Job No.:	0L0296R	Date:	11/01/00
Specification:	CFR 47, Part 22	Temperature(°C):	27
Tested By:	Tom Tidwell	Relative Humidity(%)	68
E.U.T.:	Illuminator 2000, PN. 2000-1000-000		
Configuration:	CDU and RAU		
Serial Number:	P001		
Location:	Lab 1	RBW:	30 kHz
Detector Type:	Peak	VBW:	30 kHz

Test Equipment Used	
Antenna:	#N/A
Pre-Amp:	#N/A
Filter:	#N/A
Receiver:	1464
Attenuator #1:	1477
Attenuator #2:	#N/A
Additional equipment used:	991, 1053, 1051
Measurement Uncertainty:	+/-2.3 dB



Notes: Antenna Conducted Spurious Emissions, CDMA, 869.70MHz and 872.19 MHz, +1 dBm/carrier

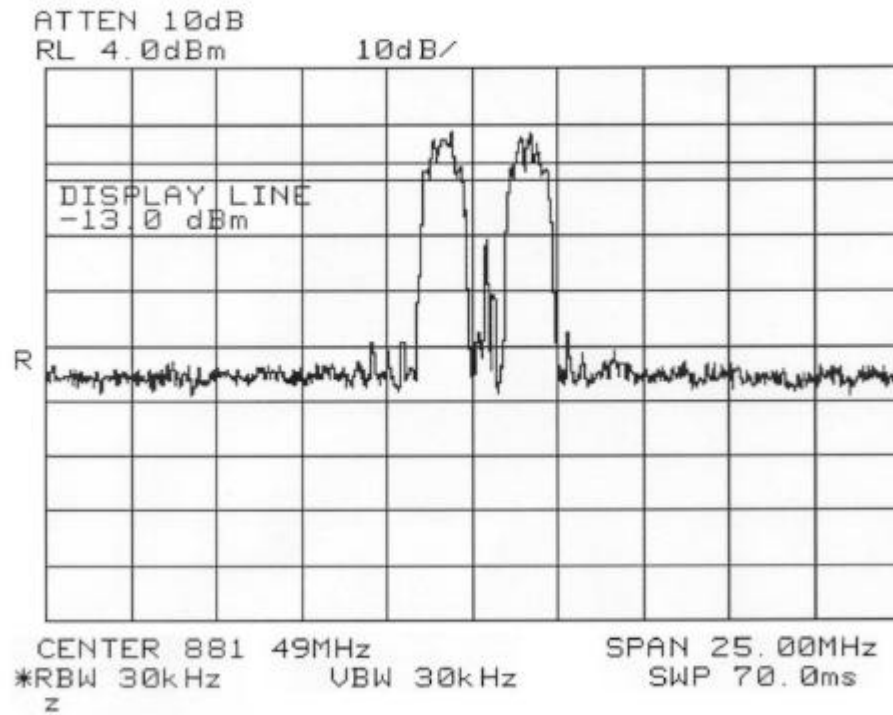
EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Test Plot: Antenna Spurious Emissions

Job No.: 0L0296R Date: 11/1/00
Specification: CFR 47, Part 22 Temperature(°C): 27
Tested By: Tom Tidwell Relative Humidity(%) 68
E.U.T.: CDU and RAU
Configuration: _____



Notes: Antenna Conducted Spurious Emissions, CDMA, 880.68MHz and 883.17 MHz, +1 dBm/carrier

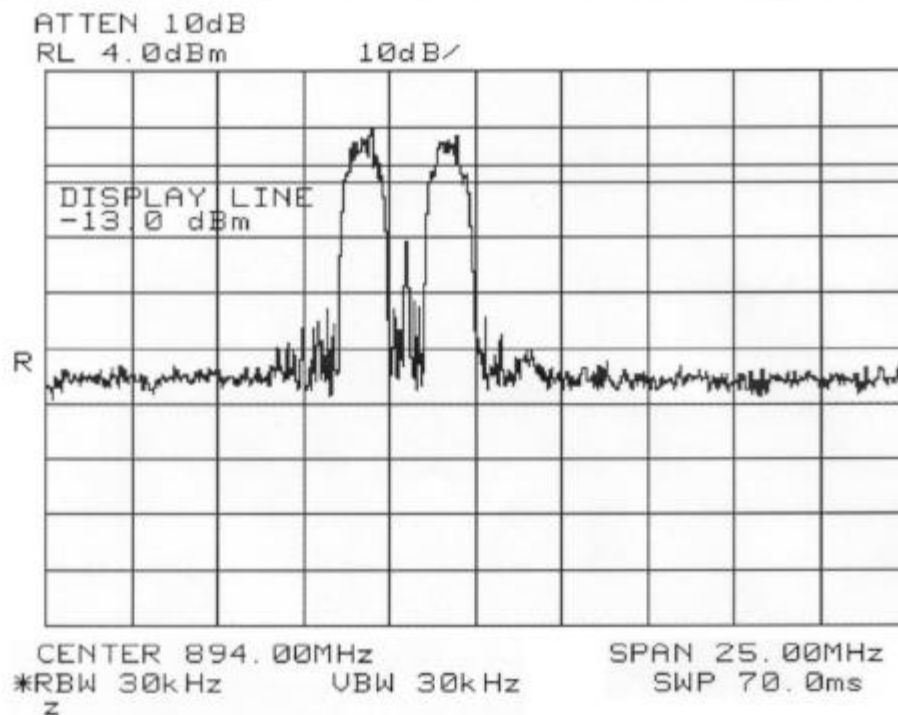
EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Test Plot: Antenna Spurious Emissions

Job No.:	0L0296R	Date:	11/1/00
Specification:	CFR 47, Part 22	Temperature(°C):	1/27/00
Tested By:	Tom Tidwell	Relative Humidity(%):	3/8/00
E.U.T.:	CDU and RAU		
Configuration:			



Notes: Antenna Conducted Spurious Emissions, CDMA, 890.82MHz and 893.31 MHz, +1 dBm/carrier

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious	PARA. NO.: 2.1053
TESTED BY: David Light	DATE: 11/2/00

Test Results: Complies. There were no emissions detected. The noise floor was -45 dBm e.i.r.p.

Test Data: See attached table.

Measurement Uncertainty: +/- 3.6 dB

Temperature: 22 °C

Relative Humidity: 50 %

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Field Strength of Spurious Emissions

Page 1 of 1

Complete X

Job No.: 0L0296R

Date: 11/2/00

Preliminary _____

Specification:

Temperature(°C): 22

Tested By: David Light

Relative Humidity(%) 50

E.U.T.: CDU and RAU

Configuration: TRANSMIT CW SIGNAL @881.49 MHz, +15 dBm

Peak rf power output(dBm): 15

Sample Number: _____

Location: AC 3

RBW: 1 MHz

Measurement

Detector Type: Peak

VBW: 300 kHz

Distance 3 m

Test Equipment Used

Antenna: 993

Directional Coupler: #N/A

Pre-Amp: 1016

Cable #1: 1485

Filter: #N/A

Cable #2: 1484

Receiver: 1464

Cable #3: #N/A

Attenuator #1: #N/A

Cable #4: #N/A

Attenuator #2: #N/A

Mixer: #N/A

Additional
equipment used:

Measurement

Uncertainty: +/-3.4 dB

Frequency (GHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Pre-Amp Gain (dB)	Corrected Reading (dBuV/m)	EIRP (W)	EIRP (dBm)	dBc	Polarity	Comments
1.763	50.3	26.7	2.7	31.7	48	0.00	-47.23	-62.23	H	
2.644	45.8	29.2	3.5	32.5	46	0.00	-49.23	-64.23	H	NOISE FLOOR
3.526	46	30	3.5	31.9	48	0.00	-47.63	-62.63	H	NOISE FLOOR
4.407	41.3	31.9	4.1	31.3	46	0.00	-49.23	-64.23	H	NOISE FLOOR
5.289	38.8	33.7	4.5	28.9	48	0.00	-47.13	-62.13	H	NOISE FLOOR
6.17	38.5	34.7	4.9	31.6	47	0.00	-48.73	-63.73	H	NOISE FLOOR
7.052	38.8	35.7	5	33.4	46	0.00	-49.13	-64.13	H	NOISE FLOOR
7.933	40	37.6	5.7	33.1	50	0.00	-45.03	-60.03	H	NOISE FLOOR
8.815	39.2	36.9	5.5	33.2	48	0.00	-46.83	-61.83	H	NOISE FLOOR
1.763	47.7	26.7	2.7	31.7	45	0.00	-49.83	-64.83	V	
2.644	45.8	29.2	3.5	32.5	46	0.00	-49.23	-64.23	V	NOISE FLOOR
3.526	46	30	3.5	31.9	48	0.00	-47.63	-62.63	V	NOISE FLOOR
4.407	41.3	31.9	4.1	31.3	46	0.00	-49.23	-64.23	V	NOISE FLOOR
5.289	38.8	33.7	4.5	28.9	48	0.00	-47.13	-62.13	V	NOISE FLOOR
6.17	38.50	34.70	4.90	31.60	46.50	0.00	-48.73	-63.73	V	NOISE FLOOR
7.052	38.8	35.7	5	33.4	46	0.00	-49.13	-64.13	V	NOISE FLOOR
7.933	40	37.6	5.7	33.1	50	0.00	-45.03	-60.03	V	NOISE FLOOR
8.815	39.2	36.9	5.5	33.2	48	0.00	-46.83	-61.83	V	NOISE FLOOR

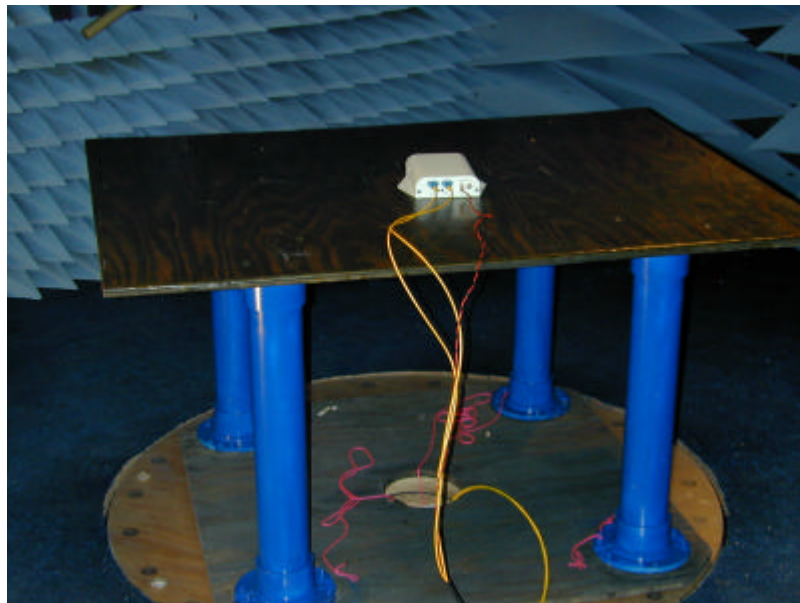
Notes: SCANNED EUT TO THE 10TH HARMONIC

EQUIPMENT: [InCell-800 Fiber Optic Distributed Antenna System](#)

FCC ID: [KUWINCELL800](#)

PROJECT NO.: [0L0296RUS1](#)

Test Setup Photos



EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Section 7. Frequency Stability

NAME OF TEST: Frequency Stability

PARA. NO.: 2.1055

TESTED BY:

DATE:

Test Results:

Complies.

Test Data:See attached report.
Standard test frequency:
Standard test voltage:

MHz

Equipment Used:**Measurement Uncertainty:** +/- 1×10^{-7} ppm**Temperature:** °C**Relative Humidity:** %**Not Applicable**

EQUIPMENT: [InCell-800 Fiber Optic Distributed Antenna System](#)FCC ID: [KUWINCELL800](#)PROJECT NO.: [0L0296RUS1](#)**Section 8. Test Equipment List**

KTL ID	Description	Manufacturer	Serial Number	Calibration
		Model Number		Date
993	Horn antenna	A.H. Systems SAS-200/571	XXX	07/16/99 2 yr. cycle
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	11/03/99 2 yr. cycle
1485	Cable 2.0-18.0 GHz	Storm PR90-010-216	N/A	05/25/00
1484	Cable 2.0-18.0 GHz	Storm PR90-010-072	N/A	05/25/00
1477	20db Attenuator DC 18 GHz	MCL Inc. BW-S20W5	NONE	CBU
1081	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	05/23/00
1083	Cable 2m	Astrolab 32027-2-29094-72TC	N/A	05/23/00
1091	COMBINER	MINI-CIRCUITS ZA3PD-1.5	NONE	CBU
1053	SIGNAL GENERATOR	ROHDE & SCHWARZ SMIQ 03	DE22081	04/27/00
1051	Communication Analyzer	Rhode & Schwarz CMTA-54	835875/002	03/14/00

EQUIPMENT: [InCell-800 Fiber Optic Distributed Antenna System](#)

FCC ID: [KUWINCELL800](#)

PROJECT NO.: [0L0296RUS1](#)

ANNEX A - TEST DETAILS

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

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

Minimum Standard: Para. No. 22.913(a). The maximum effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 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-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

NAME OF TEST: Occupied Bandwidth (Voice & SAT)	PARA. NO.: 2.1049
--	-------------------

Minimum Standard: 22.917(c) The mean power of any emission removed from the carrier frequency by a displacement frequency (f_d in kHz) must be attenuated below the mean power of the unmodulated carrier (P) as follows:

- (i) On any frequency removed from the carrier frequency by more than 12 kHz but not more than 20 kHz:

at least $117 \log(f_d/12)$

- (ii) On any frequency removed from the carrier frequency by more than 20 kHz, up to the first multiple of the carrier frequency:

at least $100 \log(f_d/11)$ dB or $43 + 10 \log(P)$ dB, whichever is the lesser attenuation.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: 300 Hz

VBW: $\geq$ RBW

Span: 100 kHz

Sweep: Auto

Input Signal Characteristics (F3E/F3D):

RF level: Maximum recommended by manufacturer

AF1 frequency: 6 kHz

AF1 level: sufficient to produce 2 kHz deviation

AF2 frequency: 2.5 kHz

AF2 level: sufficient to produce 12 kHz deviation.

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

NAME OF TEST: Occupied Bandwidth (WB Data)**PARA. NO.: 2.1049**

Minimum Standard: 22.917(c) The mean power of any emission removed from the carrier frequency by a displacement frequency (f_d in kHz) must be attenuated below the mean power of the unmodulated carrier (P) as follows:

(1) On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45 kHz:

at least 26 dB

(2) On any frequency removed from the carrier frequency by more than 45 kHz but not more than 90 kHz:

at least 45 dB

(3) On any frequency removed from the carrier frequency by more than 90 kHz, up to the first multiple of the carrier frequency:

at least 60 dB or $43 + 10 \log (P)$ dB, whichever is the lesser attenuation.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: 300 Hz

VBW: $\geq$ RBW

Span: 200 kHz

Sweep: Auto

Input Signal Characteristics:

RF level: Maximum recommended by manufacturer

AF1 frequency: 10 kHz, random bit sequence

AF1 level: sufficient to produce 8 kHz deviation

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

NAME OF TEST: Occupied Bandwidth (ST)**PARA. NO.: 2.1049**

Minimum Standard: 22.917(c) The mean power of any emission removed from the carrier frequency by a displacement frequency (f_d in kHz) must be attenuated below the mean power of the unmodulated carrier (P) as follows:

(1) On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45 kHz:

at least 26 dB

(2) On any frequency removed from the carrier frequency by more than 45 kHz but not more than 90 kHz:

at least 45 dB

(3) On any frequency removed from the carrier frequency by more than 90 kHz, up to the first multiple of the carrier frequency:

at least 60 dB or $43 + 10 \log (P)$ dB, whichever is the lesser attenuation.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: 300 Hz

VBW: $\geq$ RBW

Span: 200 kHz

Sweep: Auto

Input Signal Characteristics:

RF level: Maximum recommended by manufacturer

AF1 frequency: 10 kHz tone

AF1 level: sufficient to produce 8 kHz deviation

EQUIPMENT: [InCell-800 Fiber Optic Distributed Antenna System](#)

FCC ID: [KUWINCELL800](#)

PROJECT NO.: [0L0296RUS1](#)

NAME OF TEST: Occupied Bandwidth (Digital Modulation) PARA. NO.: 2.1049

Minimum Standard: Not defined by FCC. Input vs. Output.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: CDMA (30 kHz), GSM (30 kHz), NADC (1 kHz) and CDPD (1 kHz)

VBW: $\geq$ RBW

Span: As required

Sweep: Auto

Input Signal Characteristics:

RF level: Maximum recommended by manufacturer

EQUIPMENT: [InCell-800 Fiber Optic Distributed Antenna System](#)

FCC ID: [KUWINCELL800](#)

PROJECT NO.: [0L0296RUS1](#)

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

Minimum Standard: Para. No. 22.917(e). The mean power of emissions must be attenuated below the mean power of the unmodulated carrier on any frequency twice or more than twice the fundamental emission by at least $43 + 10 \log P$. This is equivalent to -13 dBm absolute power.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: 30 kHz (AMPS). As required for digital modulations.

VBW: $\geq$ RBW

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

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

Para. No. 22.917(e). The mean power of emissions must be attenuated below the mean power of the unmodulated carrier on any frequency twice or more than twice the fundamental emission by at least $43 + 10 \log P$. This is equivalent to -13 dBm absolute power.

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)

$R = 3\text{m}$ (Measurement Distance)

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

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

For emissions > 1 GHz:

$G = 1$ (Isotropic Gain)

$P = 1 \times 10^{-5}$ Watts (Maximum spurious output power)

$R = 3\text{m}$ (Measurement Distance)

$$E = 84.4 - 20 \log \sqrt{1.64} = 82.3 \text{ dBmV / m@3m}$$

The spectrum is searched to 10 GHz.

EQUIPMENT: [InCell-800 Fiber Optic Distributed Antenna System](#)FCC ID: [KUWINCELL800](#)PROJECT NO.: [0L0296RUS1](#)**NAME OF TEST: Frequency Stability****PARA. NO.: 2.1055**

Minimum Standard: Para. No. 22.355. The transmitter carrier frequency shall remain within the tolerances given in Table C-1.

Table C-1

Freq. Range (MHz)	Base, fixed	Mobile > 3 W	Mobile ≤ 3 W
821 to 896	1.5	2.5	2.5

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.

EQUIPMENT: [InCell-800 Fiber Optic Distributed Antenna System](#)

FCC ID: [KUWINCELL800](#)

PROJECT NO.: [0L0296RUS1](#)

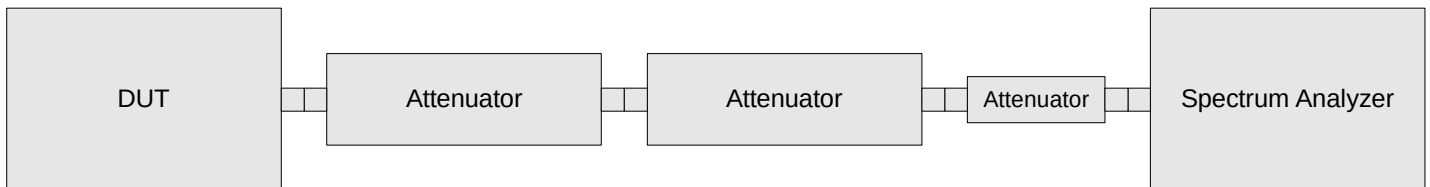
ANNEX B - TEST DIAGRAMS

EQUIPMENT: [InCell-800 Fiber Optic Distributed Antenna System](#)

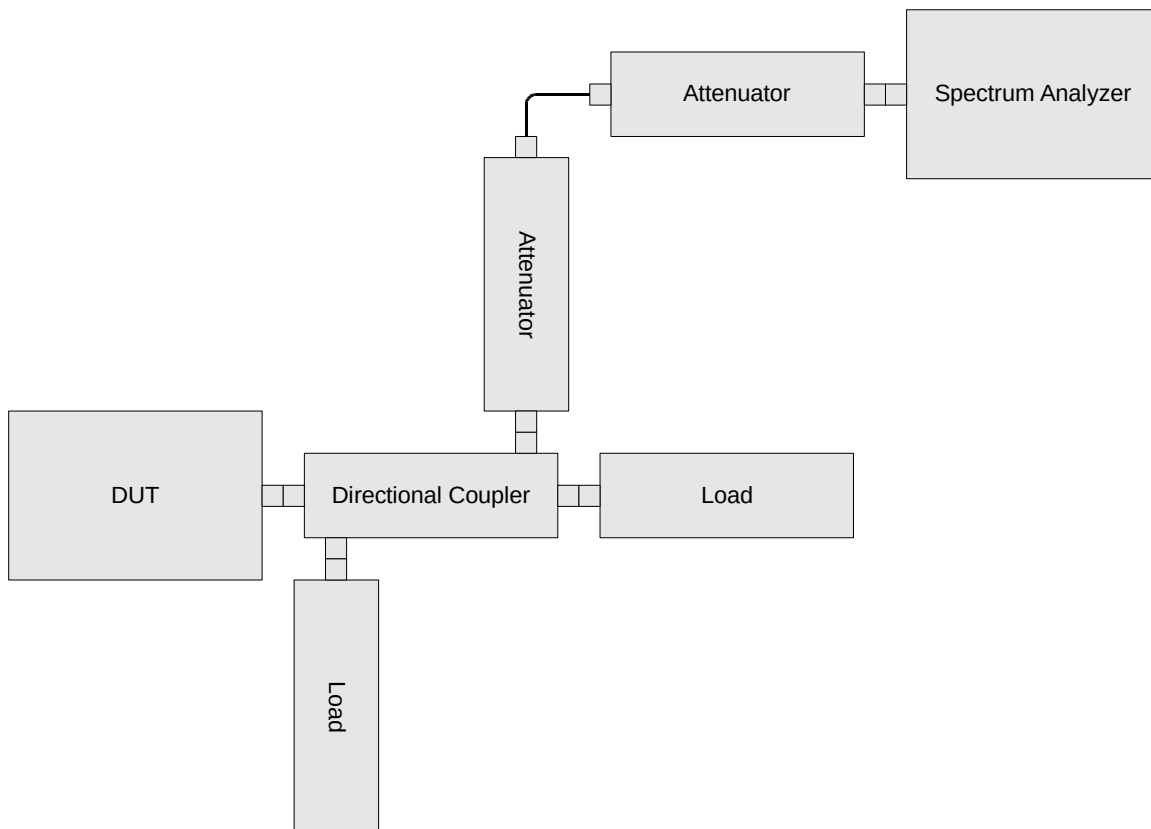
FCC ID: [KUWINCELL800](#)

PROJECT NO.: [0L0296RUS1](#)

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



Para. No. 2.1049 - Occupied Bandwidth

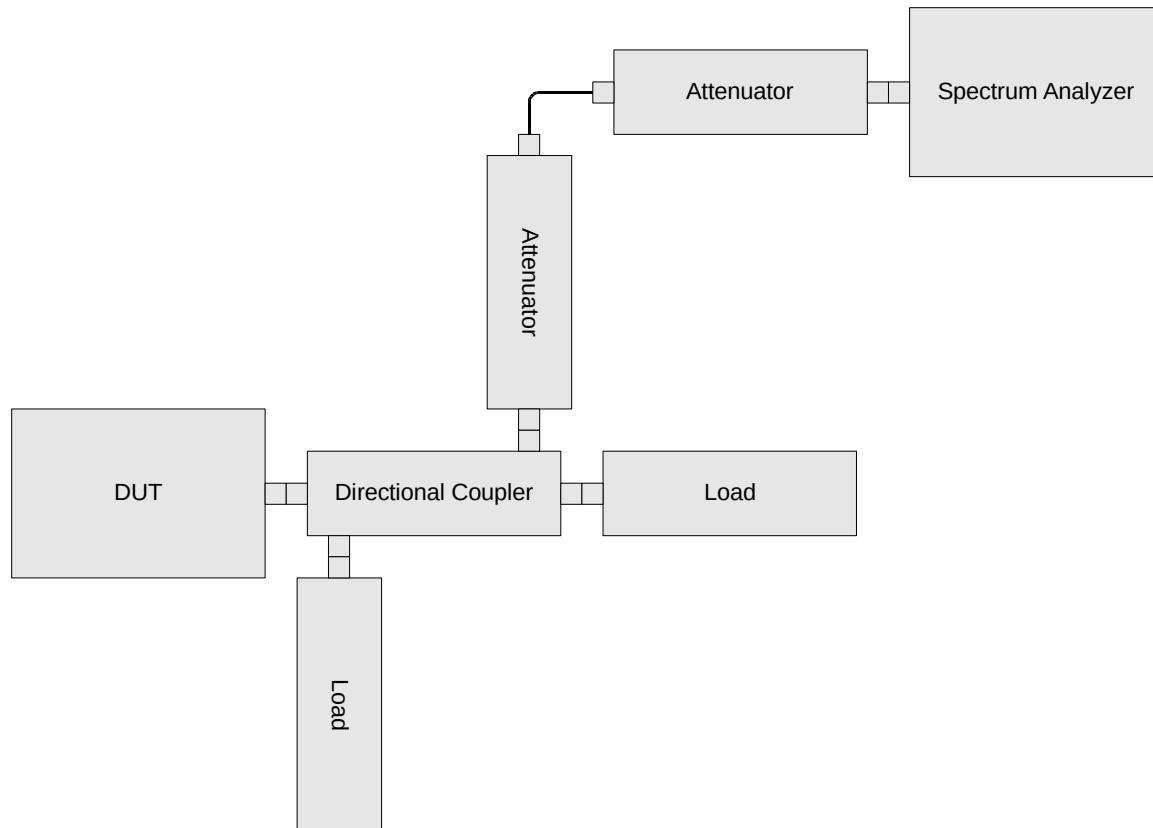


EQUIPMENT: [InCell-800 Fiber Optic Distributed Antenna System](#)

FCC ID: [KUWINCELL800](#)

PROJECT NO.: [0L0296RUS1](#)

Para. No. 2.1051 Spurious Emissions at Antenna Terminals

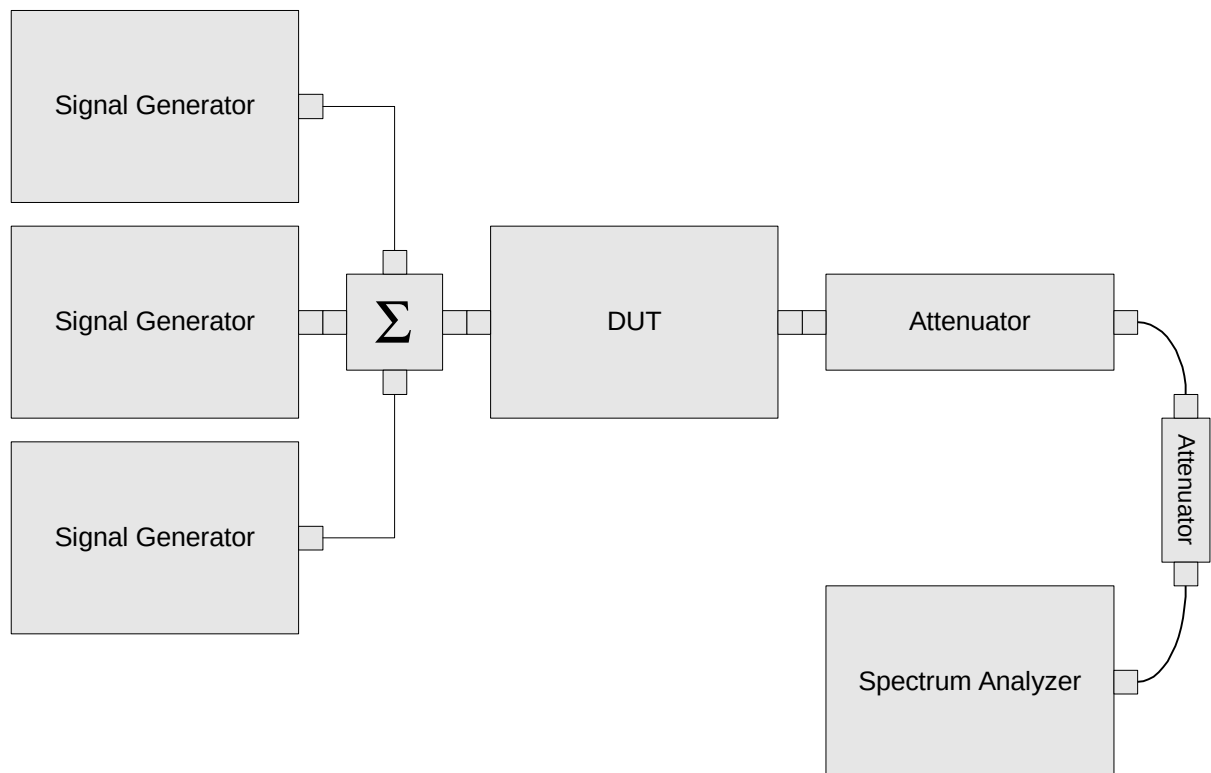


EQUIPMENT: [InCell-800 Fiber Optic Distributed Antenna System](#)

FCC ID: [KUWINCELL800](#)

PROJECT NO.: [0L0296RUS1](#)

Intermodulation Spurious Emissions

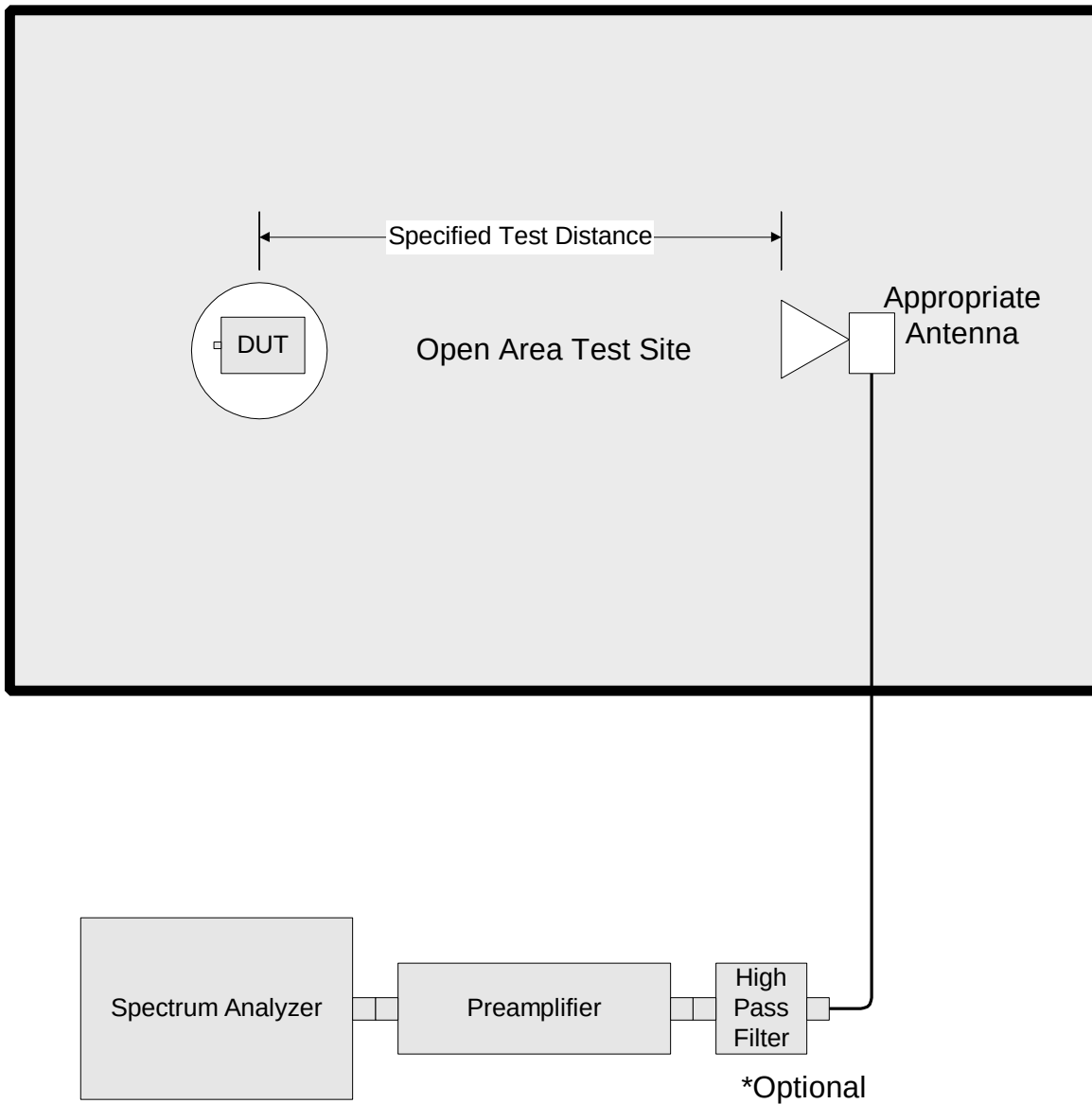


EQUIPMENT: [InCell-800 Fiber Optic Distributed Antenna System](#)

FCC ID: [KUWINCELL800](#)

PROJECT NO.: [0L0296RUS1](#)

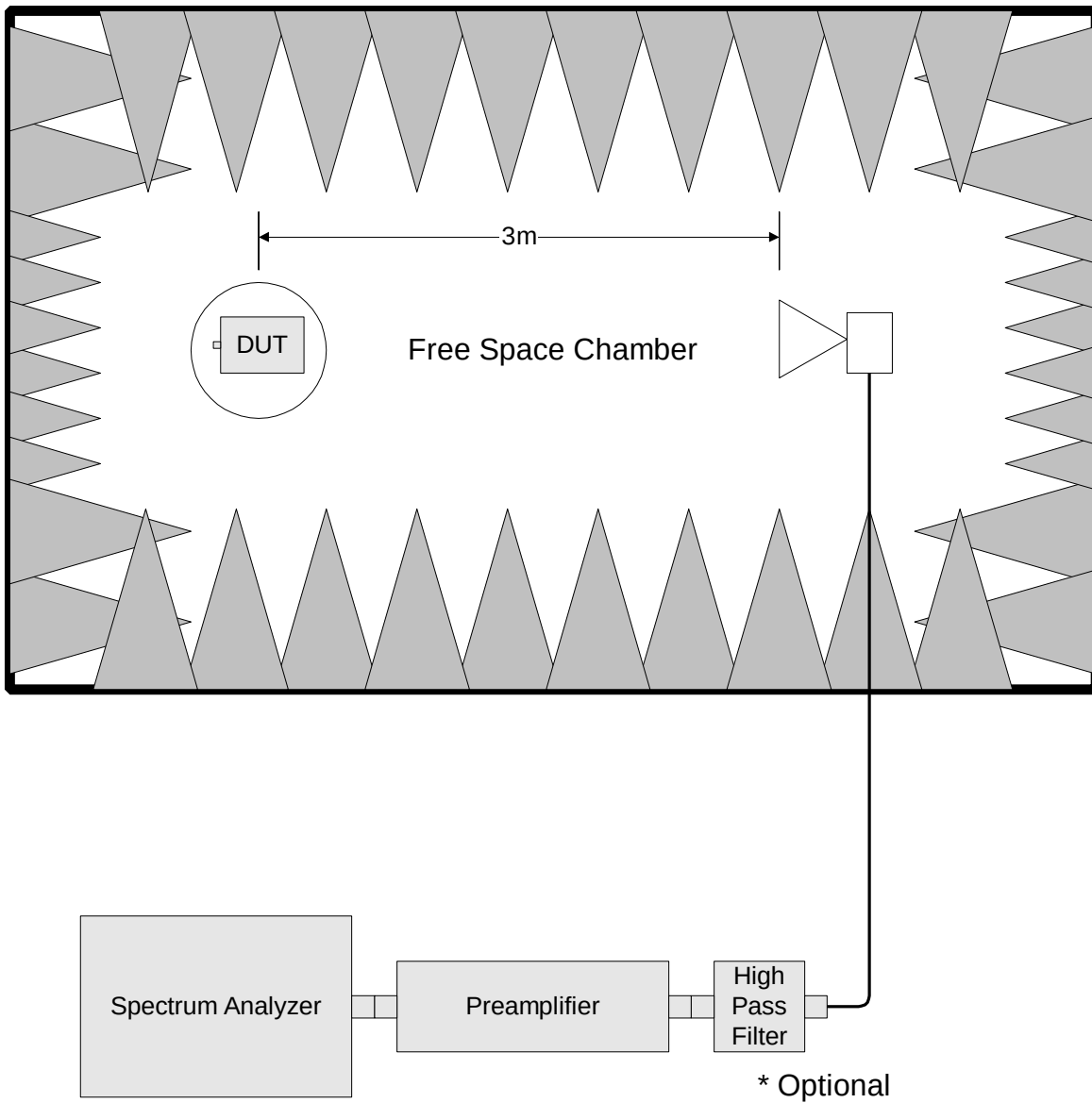
Para. No. 2.1053 - Field Strength of Spurious Radiation



EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1



EQUIPMENT: [InCell-800 Fiber Optic Distributed Antenna System](#)

FCC ID: [KUWINCELL800](#)

PROJECT NO.: [0L0296RUS1](#)

Para. No. 2.1055 - Frequency Stability

