

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](#)

Table of Contents

SECTION 1. SUMMARY OF TEST RESULTS3

SECTION 2. GENERAL EQUIPMENT SPECIFICATION.....5

SECTION 3. RF POWER OUTPUT7

SECTION 4. OCCUPIED BANDWIDTH8

SECTION 5. SPURIOUS EMISSIONS AT ANTENNA TERMINALS 17

SECTION 6. FIELD STRENGTH OF SPURIOUS36

SECTION 7. FREQUENCY STABILITY39

SECTION 8. TEST EQUIPMENT LIST40

ANNEX A - TEST DETAILS.....41

ANNEX B - TEST DIAGRAMS.....50

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

KTL Dallas Inc. authorizes the above named company to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. KTL Dallas Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This report applies only to the items tested.

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

FCC ID: [KUWINCELL800](#)

PROJECT NO.: [0L0296RUS1](#)

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:

- 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.

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

FCC ID: [KUWINCELL800](#)

PROJECT NO.: [0L0296RUS1](#)

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) <input checked="" type="checkbox"/>	NADC (DXW) <input checked="" type="checkbox"/>	AMPS (F8W, F1D) <input checked="" type="checkbox"/>	
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>	<u>CDMA</u>
		15 dBm, 2 carriers	15 dBm, 2 carriers	10 dBm, 1 carrier
		12 dBm, 4 carriers	12 dBm, 4 carriers	4 dBm, 2 carriers
		9 dBm, 8 carriers	9 dBm, 8 carriers	
Frequency Translation:	F1-F1 <input checked="" type="checkbox"/>	F1-F2 <input type="checkbox"/>	N/A <input checked="" type="checkbox"/>	
Band Selection:	Software <input type="checkbox"/>	Duplexer Change <input type="checkbox"/>	Fullband Coverage <input checked="" type="checkbox"/>	

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: **KUWINCELL800**

PROJECT NO.: 0L0296RUS1

Description of Operation

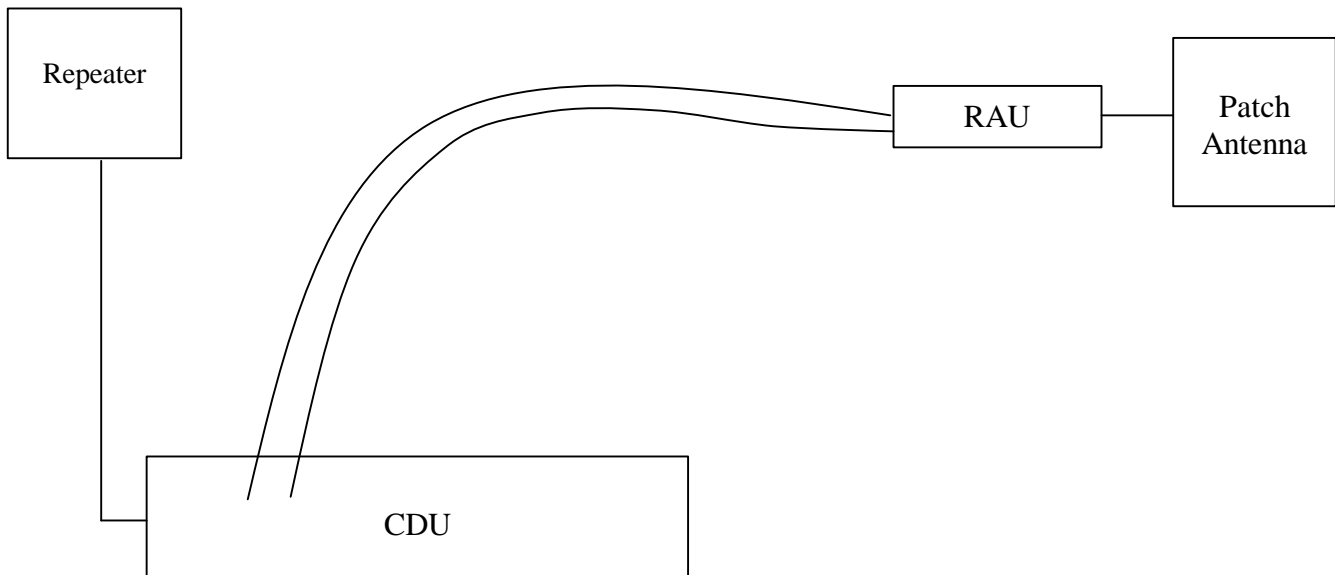
The DUT (Device Under Test) is a distributed antenna system designed to extend rf coverage into buildings and hard to penetrate indoor areas that experience rf coverage problems.

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](#)

PROJECT NO.: [0L0296RUS1](#)

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](#)

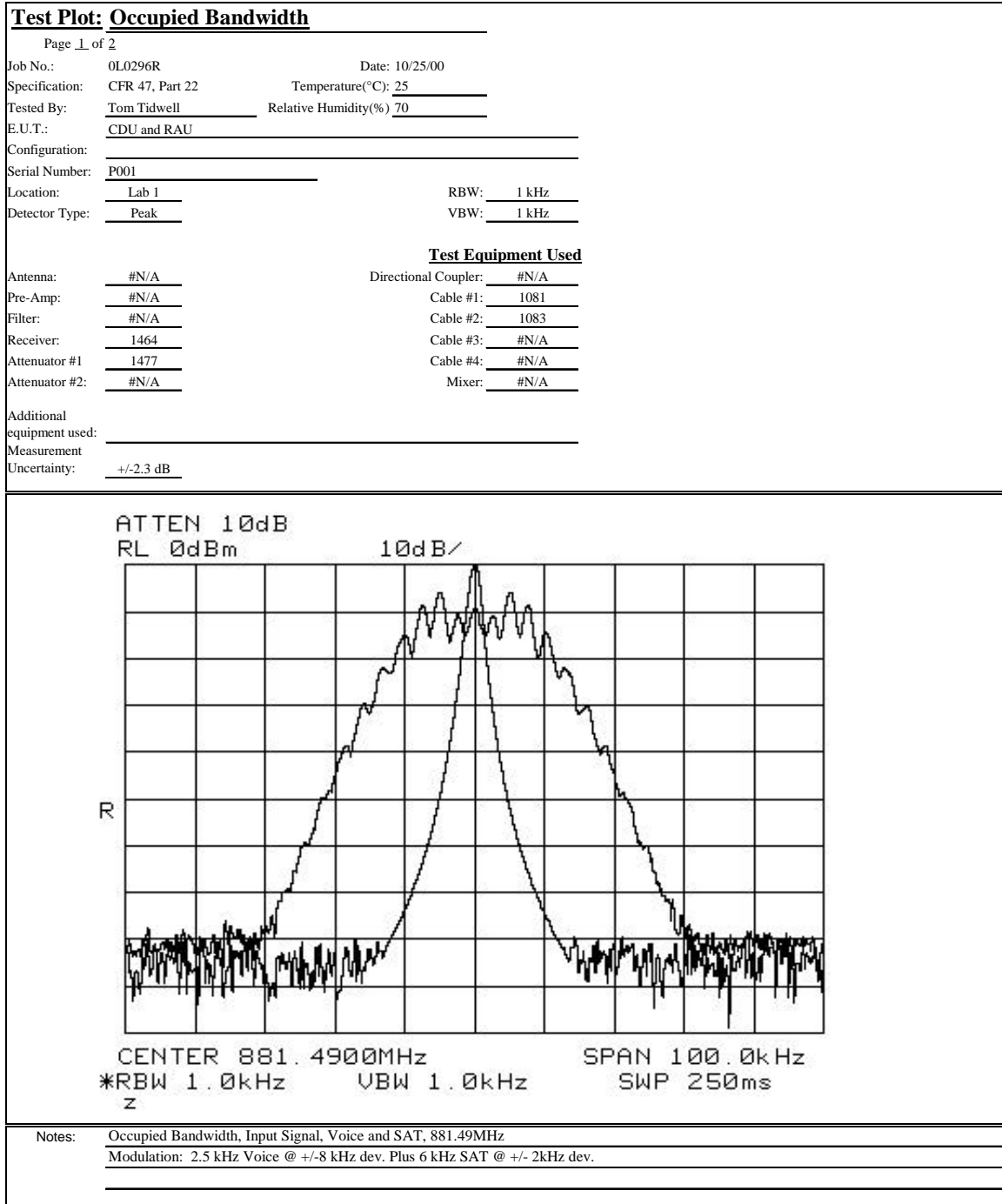
Temperature: [25 °C](#)

Relative Humidity: [70 %](#)

EQUIPMENT: **InCell-800 Fiber Optic Distributed Antenna System**

FCC ID: **KUWINCELL800**

PROJECT NO.: **0L0296RUS1**



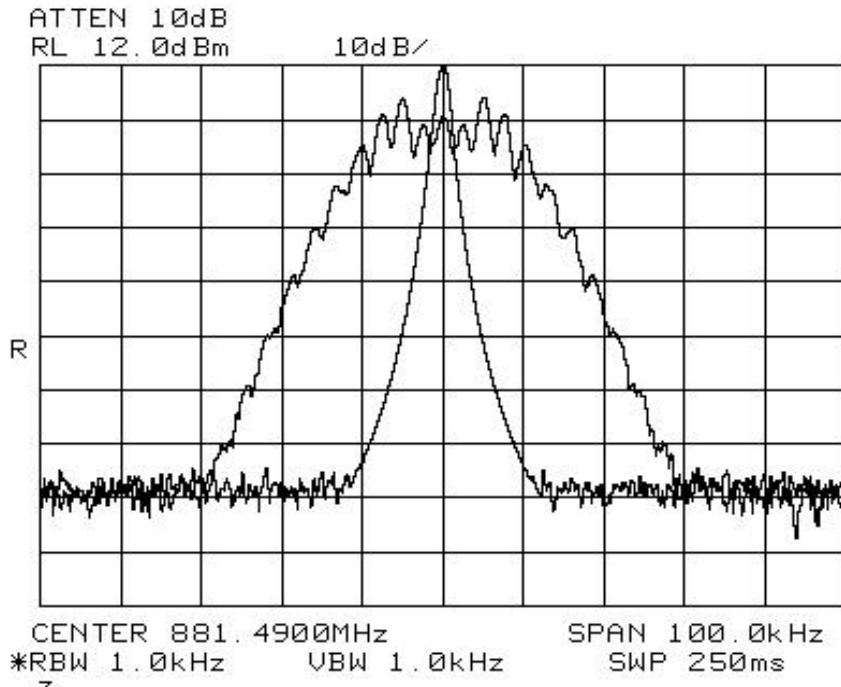
EQUIPMENT: [InCell-800 Fiber Optic Distributed Antenna System](#)

FCC ID: [KUWINCELL800](#)

PROJECT NO.: [0L0296RUS1](#)

Test Plot: Occupied Bandwidth

Page 2 of 2
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: _____

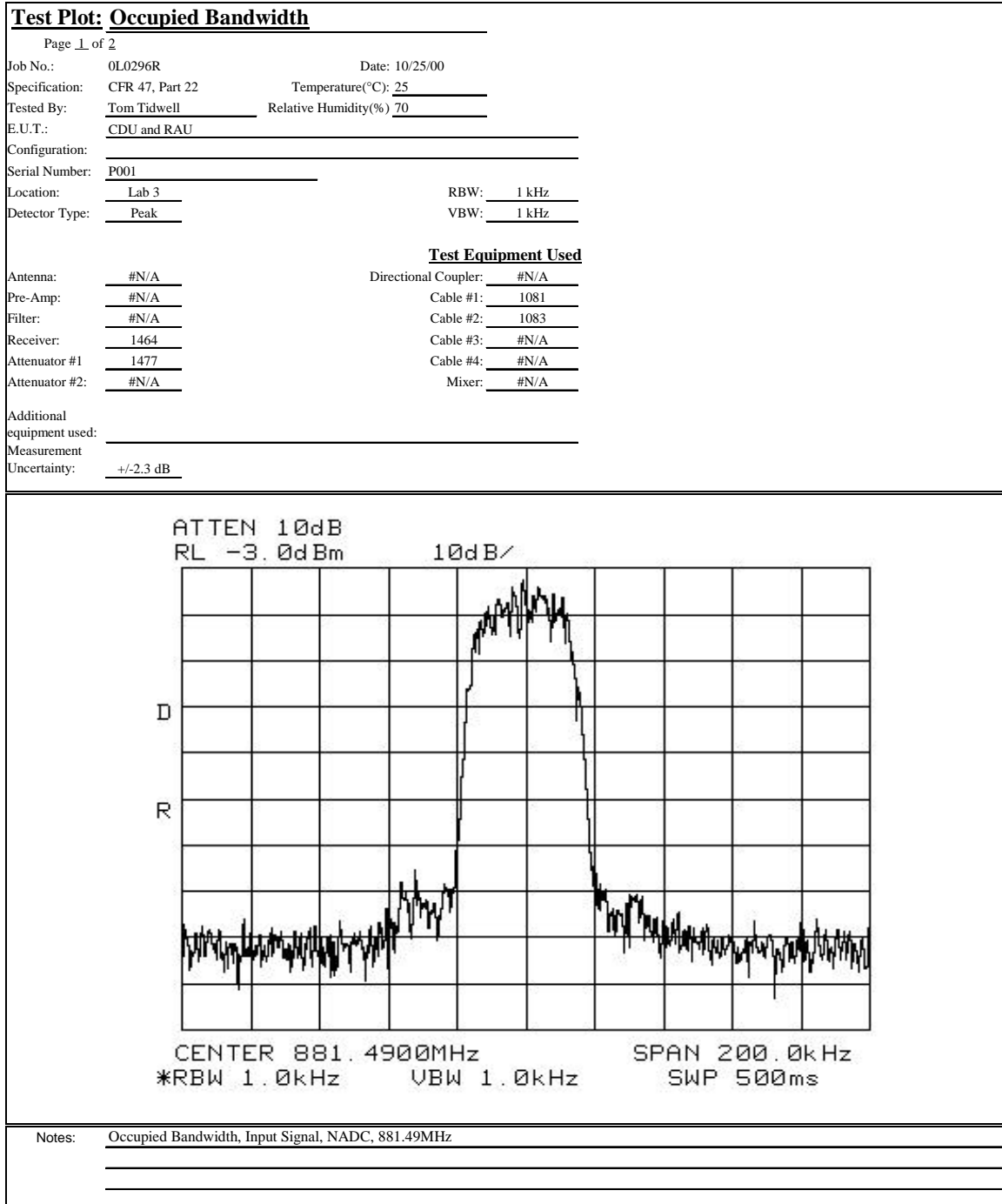


Notes: Occupied Bandwidth, Output Signal, Voice and SAT, 881.49MHz
Modulation: 2.5 kHz Voice @ +/-8 kHz dev. Plus 6 kHz SAT @ +/- 2kHz dev.

EQUIPMENT: **InCell-800 Fiber Optic Distributed Antenna System**

FCC ID: **KUWINCELL800**

PROJECT NO.: **0L0296RUS1**

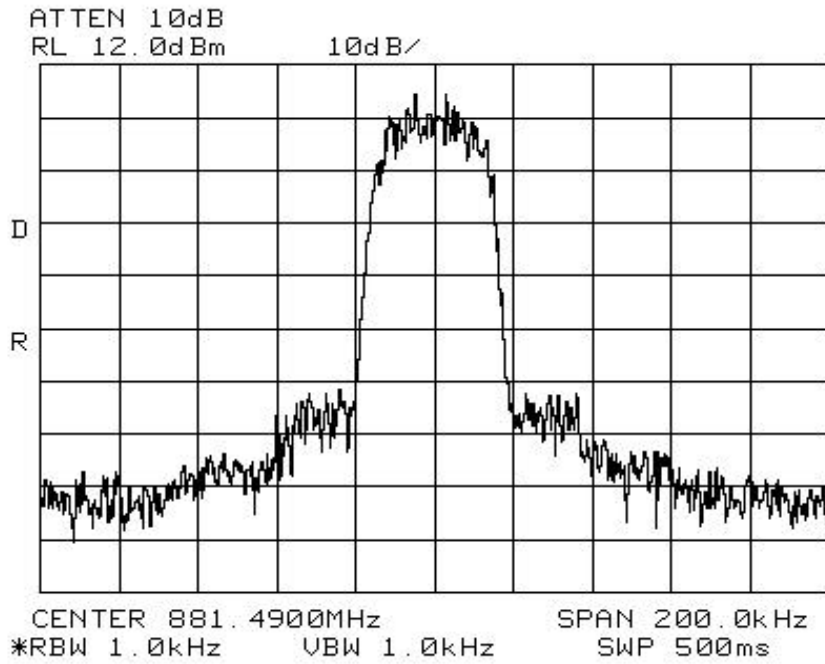


EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Test Plot: Occupied Bandwidth	
Page 2 of 2	
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:	

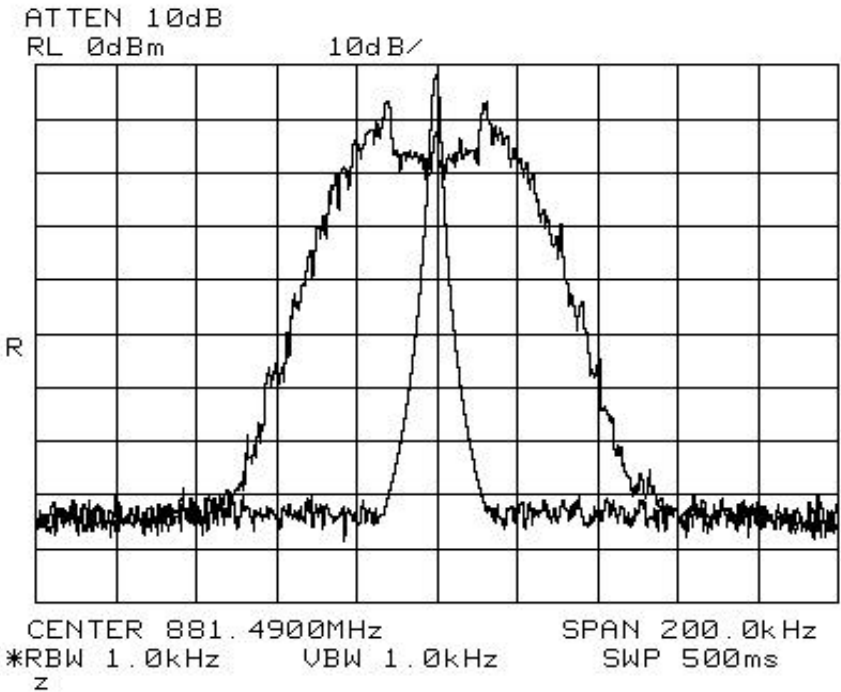


Notes:	Occupied Bandwidth, Output Signal, NADC, 881.49MHz

EQUIPMENT: **InCell-800 Fiber Optic Distributed Antenna System**

FCC ID: **KUWINCELL800**

PROJECT NO.: **0L0296RUS1**

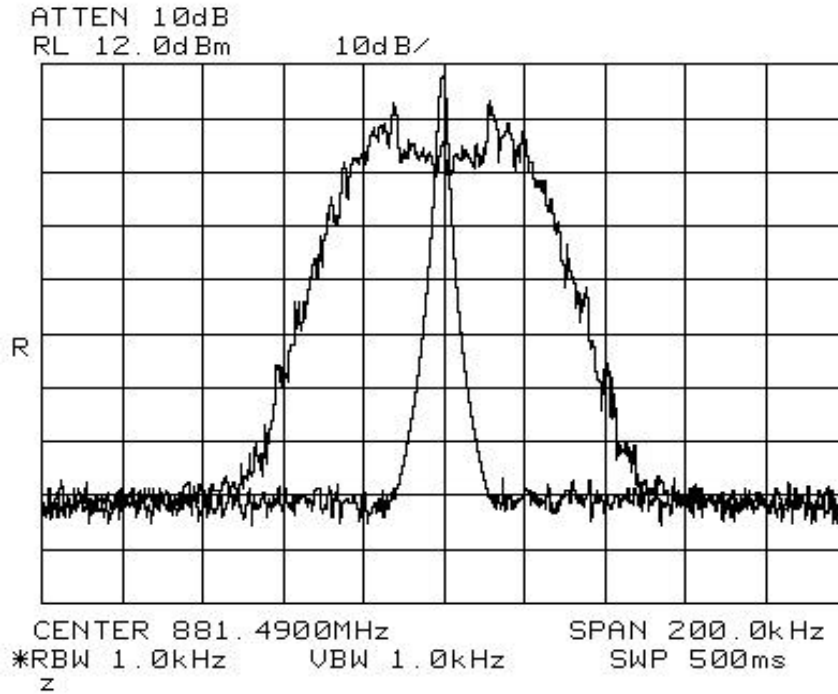
Test Plot: Occupied Bandwidth	
Page 1 of 2	
Job No.: 0L0296R	Date: 10/25/00
Specification: CFR 47, Part 22	Temperature(°C): 25
Tested By: Tom Tidwell	Relative Humidity(%) 70
E.U.T.: CDU and RAU	
Configuration: _____	
Serial Number: P001	
Location: Lab 1	RBW: 1 kHz
Detector Type: Peak	VBW: 1 kHz
Test 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	
 <p style="font-family: monospace; font-size: 0.8em;"> ATTEN 10dB RL 0dBm 10dB/ </p> <p style="font-family: monospace; font-size: 0.8em;"> CENTER 881.4900MHz SPAN 200.0kHz *RBW 1.0kHz VBW 1.0kHz SWP 500ms Z </p>	
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	
Page 2 of 2	
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:	

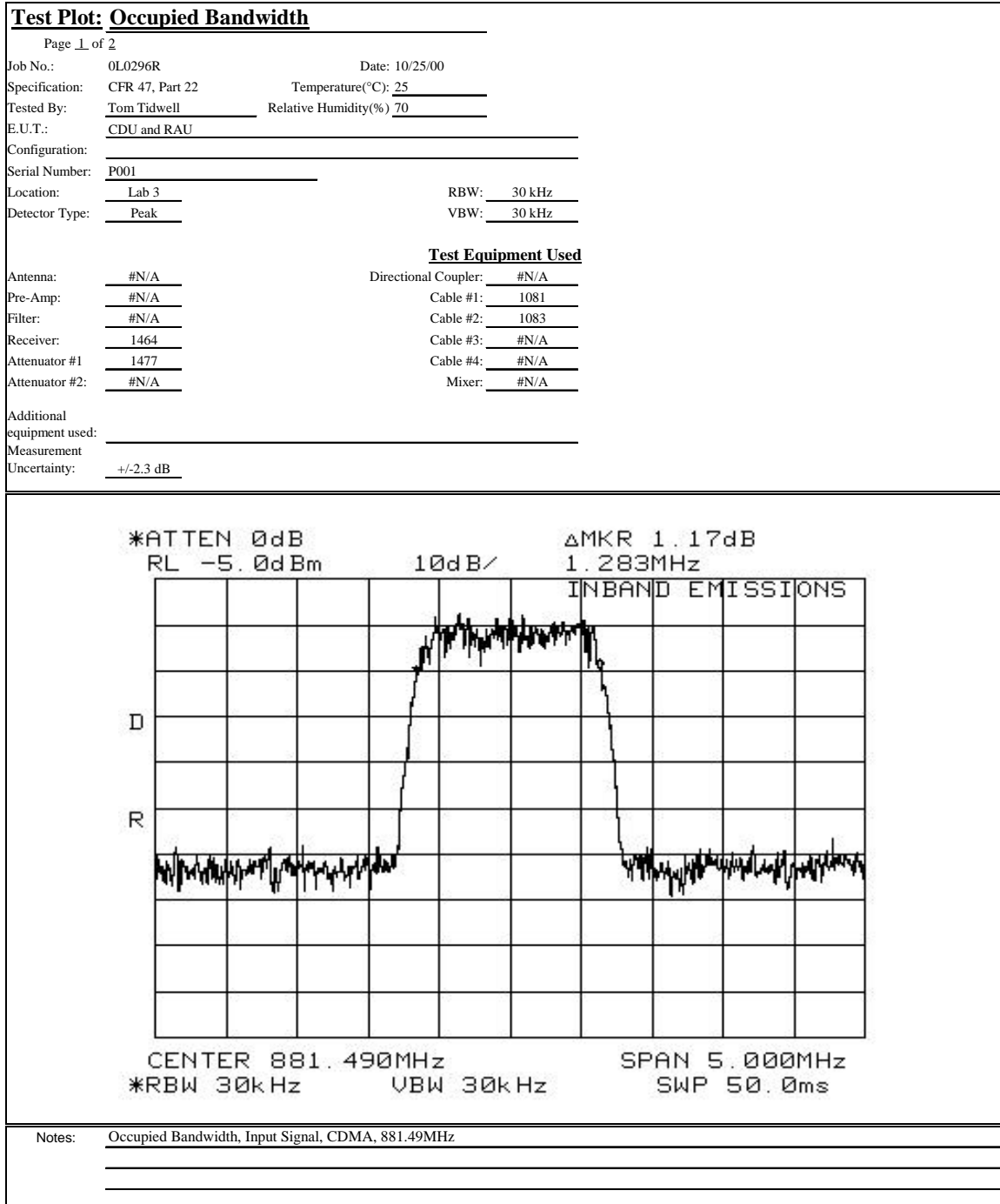


Notes:	Occupied Bandwidth, Output Signal, Wideband Data, 881.49MHz
	Modulation: Pseudorandom Wideband Data @ +/- 12 kHz dev.

EQUIPMENT: **InCell-800 Fiber Optic Distributed Antenna System**

FCC ID: **KUWINCELL800**

PROJECT NO.: **0L0296RUS1**

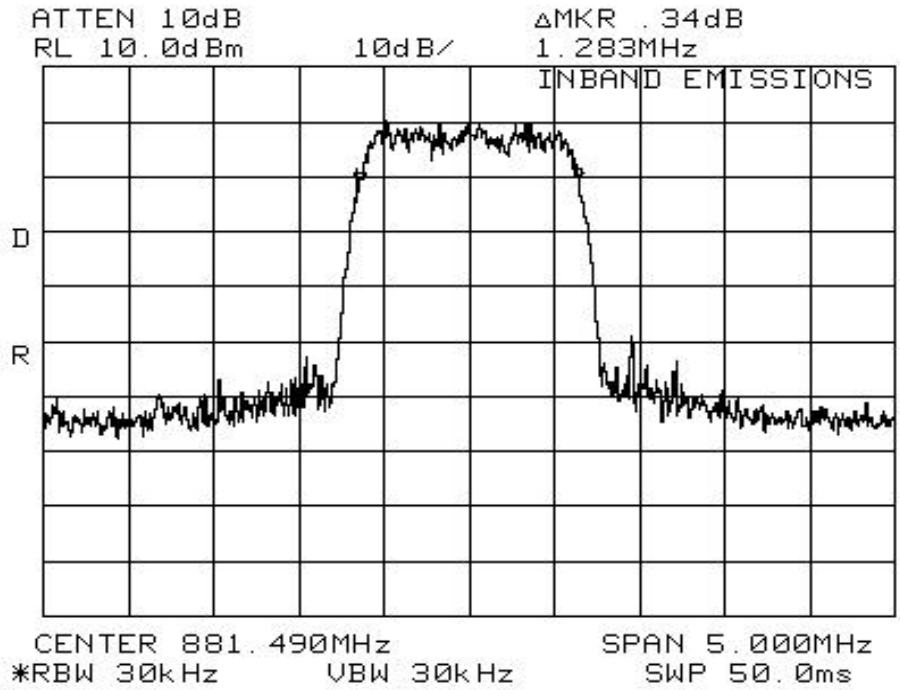


EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

Test Plot: Occupied Bandwidth	
Page 2 of 2	
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](#)

PROJECT NO.: [0L0296RUS1](#)

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	
<p style="font-family: monospace; font-size: 12px;"> ATTEN 10dB RL 12.0dBm 10dB/ DISPLAY LINE -13.0 dBm R START 30.0MHz STOP 1.0000GHz *RBW 30kHz UBW 30kHz SWP 2.70sec z </p>	
Notes: Antenna Conducted Spurious Emissions, Analogue, 881.49MHz	

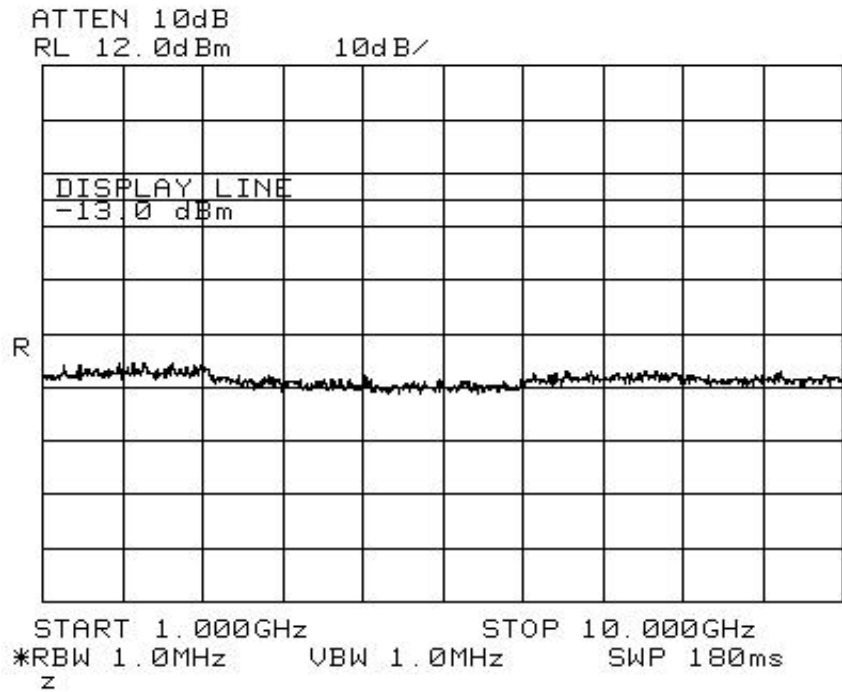
EQUIPMENT: **InCell-800 Fiber Optic Distributed Antenna System**

FCC ID: **KUWINCELL800**

PROJECT NO.: **0L0296RUS1**

Test Plot: Antenna Spurious Emissions

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

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1

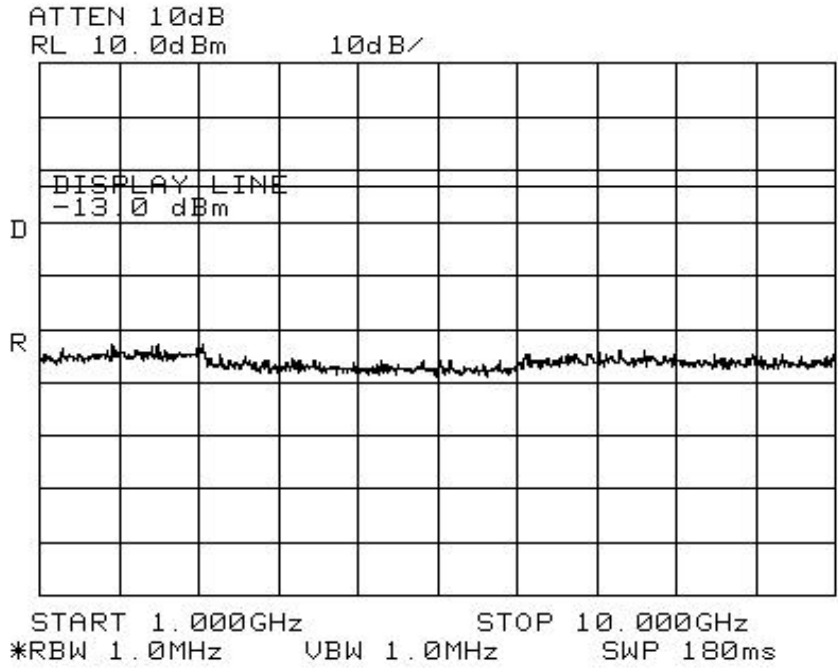
Test Plot: <u>Antenna Spurious Emissions</u>	
Page 1 of 2	
Job No.: <u>0L0296R</u>	Date: <u>11/01/00</u>
Specification: <u>CFR 47, Part 22</u>	Temperature(°C): <u>27</u>
Tested By: <u>Tom Tidwell</u>	Relative Humidity(%) <u>68</u>
E.U.T.: <u>CDU and RAU</u>	
Configuration: _____	
Serial Number: <u>P001</u>	
Location: <u>Lab 1</u>	
Detector Type: <u>Peak</u>	
Test Equipment Used	
Antenna: <u>#N/A</u>	Directional Coupler: <u>#N/A</u>
Pre-Amp: <u>#N/A</u>	Cable #1: <u>1081</u>
Filter: <u>#N/A</u>	Cable #2: <u>1083</u>
Receiver: <u>1464</u>	Cable #3: <u>#N/A</u>
Attenuator #1: <u>1477</u>	Cable #4: <u>#N/A</u>
Attenuator #2: <u>#N/A</u>	Mixer: <u>#N/A</u>
Additional equipment used: _____	
Measurement Uncertainty: <u>+/-2.3 dB</u>	
<p style="text-align: center;">ATTEN 10dB RL 10.0dBm 10dB/</p> <p style="text-align: center;">DISPLAY LINE -13.0 dBm</p> <p style="text-align: center;">D</p> <p style="text-align: center;">R</p> <p style="text-align: center;">START 30.0MHz STOP 1.0000GHz *RBW 100kHz VBW 100kHz SWP 250ms</p>	
Notes: <u>Antenna Conducted Spurious Emissions, CDMA, 881.49MHz</u>	

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:	

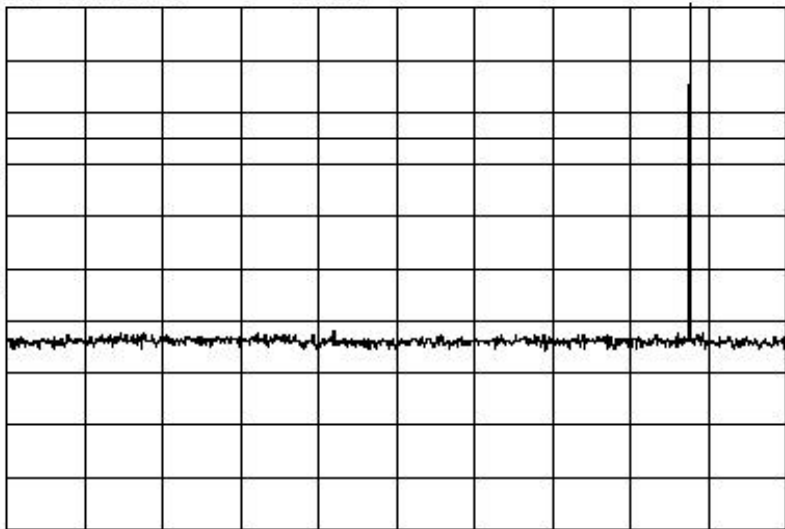


Notes: Antenna Conducted Spurious Emissions, CDMA, 881.49MHz

EQUIPMENT: **InCell-800 Fiber Optic Distributed Antenna System**

FCC ID: **KUWINCELL800**

PROJECT NO.: **0L0296RUS1**

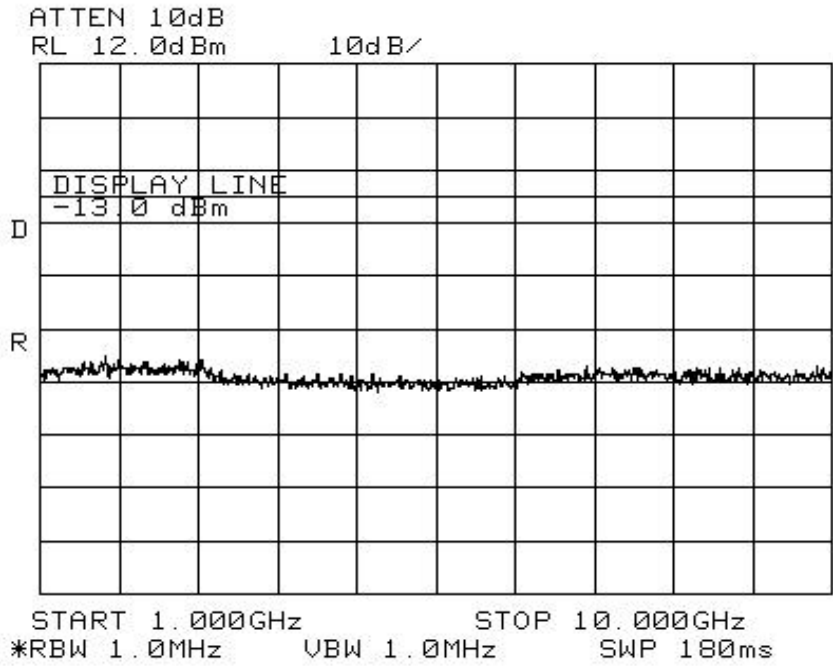
Test Plot: <u>Antenna Spurious Emissions</u>	
Page 1 of 2	
Job No.: 0L0296R	Date: 11/01/00
Specification: CFR 47, Part 22	Temperature(°C): 27
Tested By: Tom Tidwell	Relative Humidity(%) 68
E.U.T.: CDU and RAU	
Configuration: _____	
Serial Number: P001	
Location: Lab 1	
Detector Type: Peak	
Test Equipment 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	
<div style="display: flex; justify-content: space-between; font-family: monospace; font-size: 1.2em;"> ATTEN 10dB RL 12.0dBm 10dB/ </div>  <div style="display: flex; justify-content: space-between; font-family: monospace; font-size: 1.2em; margin-top: 10px;"> START 30.0MHz STOP 1.0000GHz </div> <div style="display: flex; justify-content: space-between; font-family: monospace; font-size: 1.2em; margin-top: 5px;"> *RBW 30kHz VBW 30kHz SWP 2.70sec </div>	
Notes: Antenna Conducted Spurious Emissions, NADC, 881.49MHz	

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:	

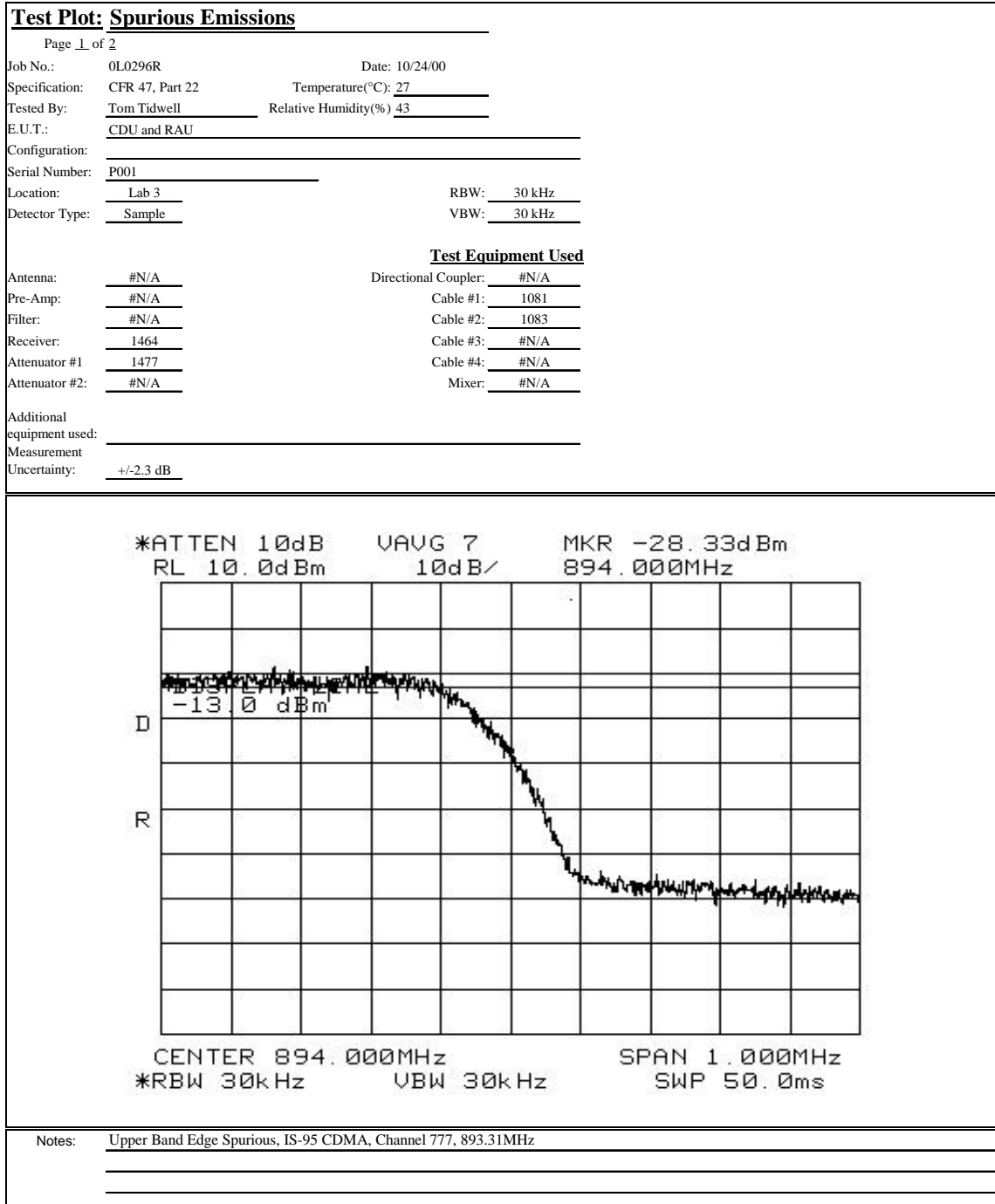


Notes:	Antenna Conducted Spurious Emissions, NADC, 881.49MHz

EQUIPMENT: **InCell-800 Fiber Optic Distributed Antenna System**

FCC ID: **KUWINCELL800**

PROJECT NO.: **0L0296RUS1**



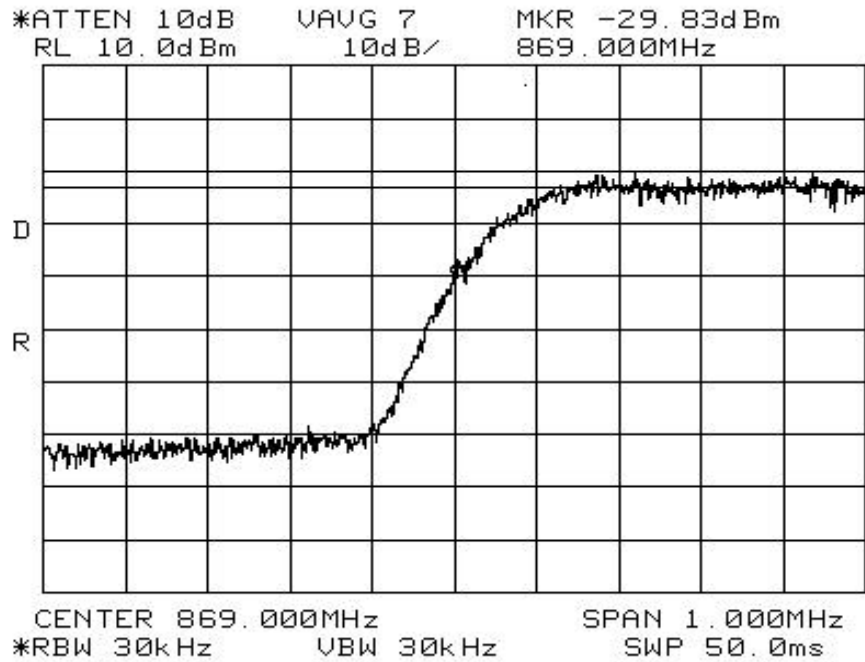
EQUIPMENT: **InCell-800 Fiber Optic Distributed Antenna System**

FCC ID: **KUWINCELL800**

PROJECT NO.: **0L0296RUS1**

Test Plot: Spurious Emissions

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

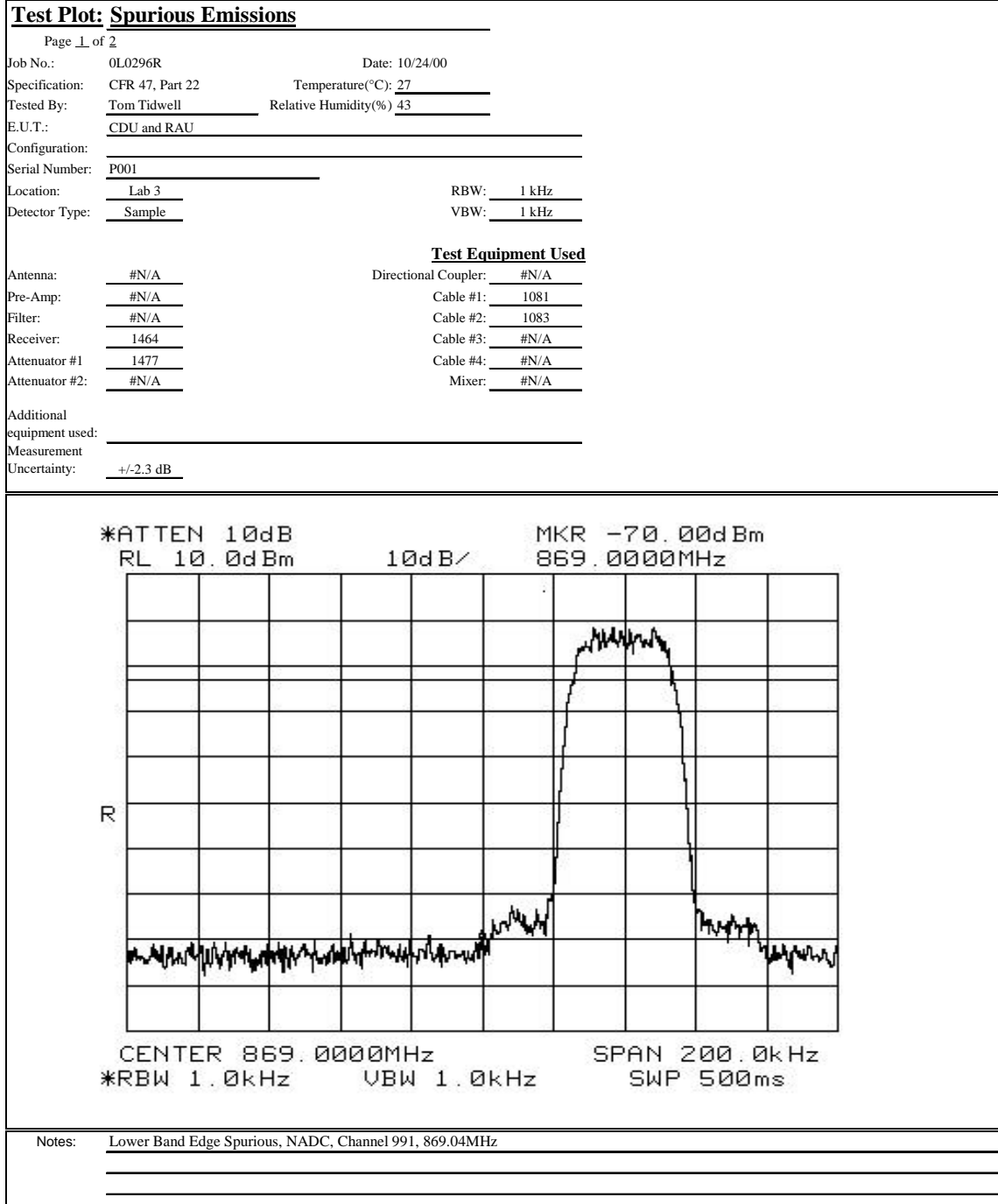


Notes:	Lower Band Edge Spurious, IS-95 CDMA, Channel 1013, 869.7MHz

EQUIPMENT: **InCell-800 Fiber Optic Distributed Antenna System**

FCC ID: **KUWINCELL800**

PROJECT NO.: **0L0296RUS1**

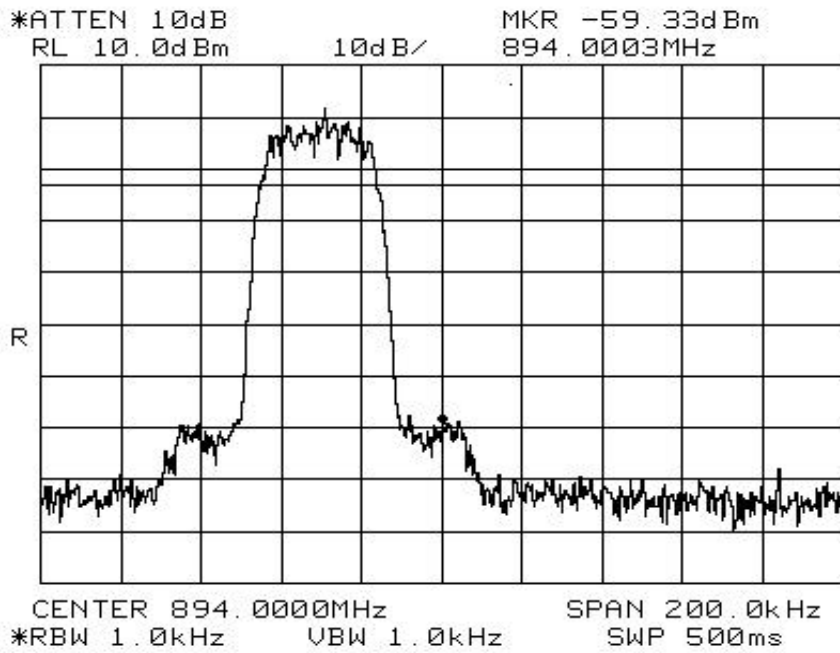


EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KWINCELL800

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:	

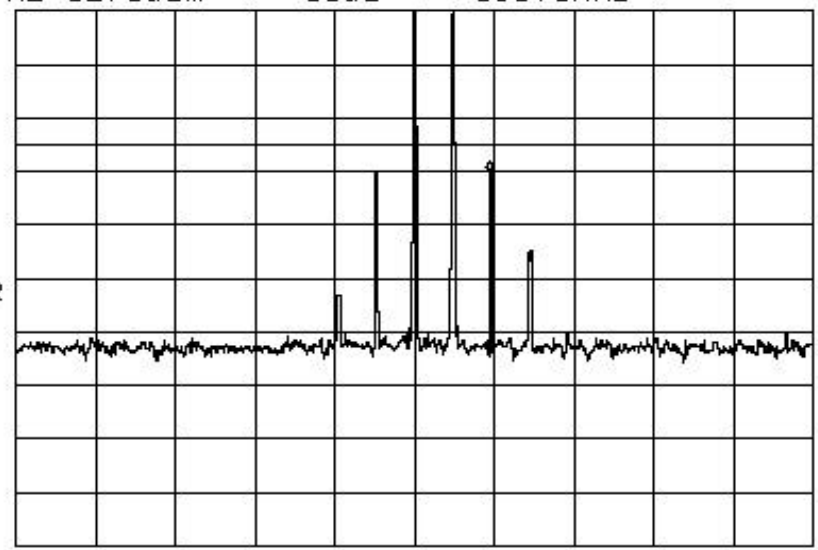


Notes: Upper Band Edge Spurious, NADC, Channel 799, 893.97MHz

EQUIPMENT: **InCell-800 Fiber Optic Distributed Antenna System**

FCC ID: **KUWINCELL800**

PROJECT NO.: **0L0296RUS1**

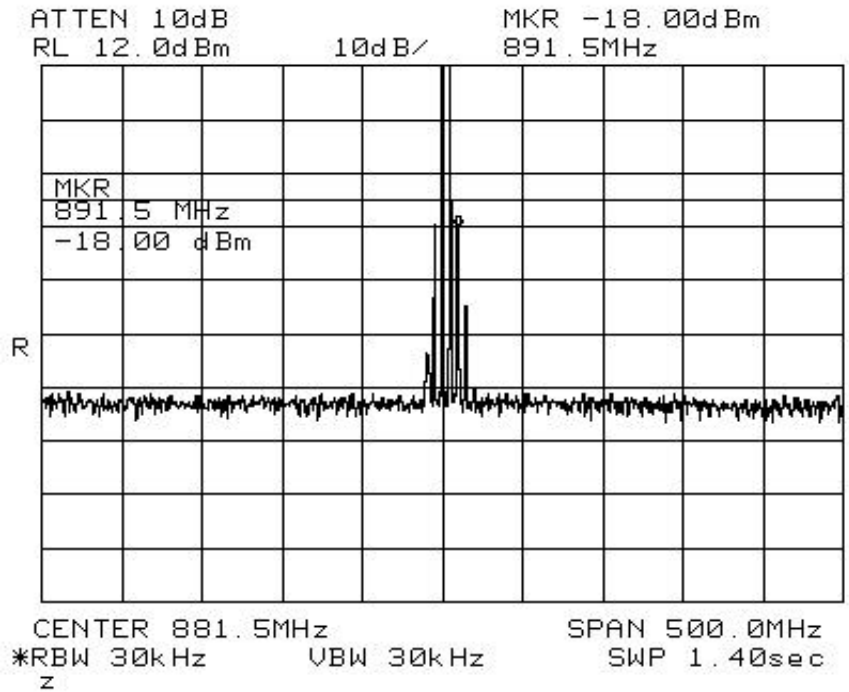
Test Plot: Antenna Spurious Emissions	
Page 1 of 2	
Job No.: 0L0296R	Date: 11/01/00
Specification: CFR 47, Part 22	Temperature(°C): 27
Tested By: Tom Tidwell	Relative Humidity(%) 68
E.U.T.: CDU and RAU	
Configuration: _____	
Serial Number: P001	
Location: Lab 1	RBW: 30 kHz
Detector Type: Peak	VBW: 30 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: 091, 1053, 1051	
Measurement Uncertainty: +/-2.3 dB	
<div style="display: flex; justify-content: space-between; font-family: monospace;"> ATTEN 10dB MKR -18.17dBm </div> <div style="display: flex; justify-content: space-between; font-family: monospace;"> RL 12.0dBm 10dB/ 891.0MHz </div>  <div style="display: flex; justify-content: space-between; font-family: monospace; margin-top: 10px;"> CENTER 881.5MHz SPAN 100.0MHz </div> <div style="display: flex; justify-content: space-between; font-family: monospace;"> *RBW 30kHz VBW 30kHz SWP 20ms </div>	
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.: <u>0L0296R</u>	Date: <u>11/1/00</u>
Specification: <u>CFR 47, Part 22</u>	Temperature(°C): <u>27</u>
Tested By: <u>Tom Tidwell</u>	Relative Humidity(%) <u>68</u>
E.U.T.: <u>CDU and RAU</u>	
Configuration: _____	



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

EQUIPMENT: **InCell-800 Fiber Optic Distributed Antenna System**

FCC ID: **KUWINCELL800**

PROJECT NO.: **0L0296RUS1**

Test Plot: Antenna Spurious Emissions

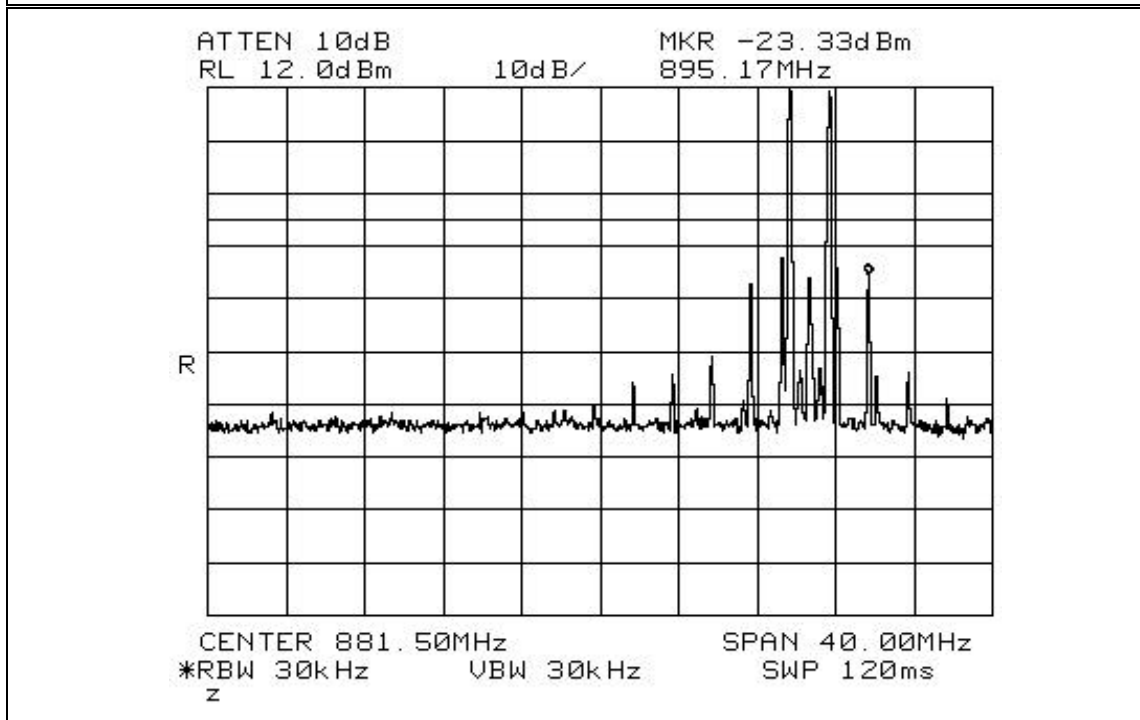
Page 1 of 3

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: 1091, 1053, 1051
 Measurement Uncertainty: +/-2.3 dB



Notes: Antenna Conducted Spurious Emissions, NADC, 891.24MHz and 893.25 MHz, +12 dBm/carrier

EQUIPMENT: **InCell-800 Fiber Optic Distributed Antenna System**

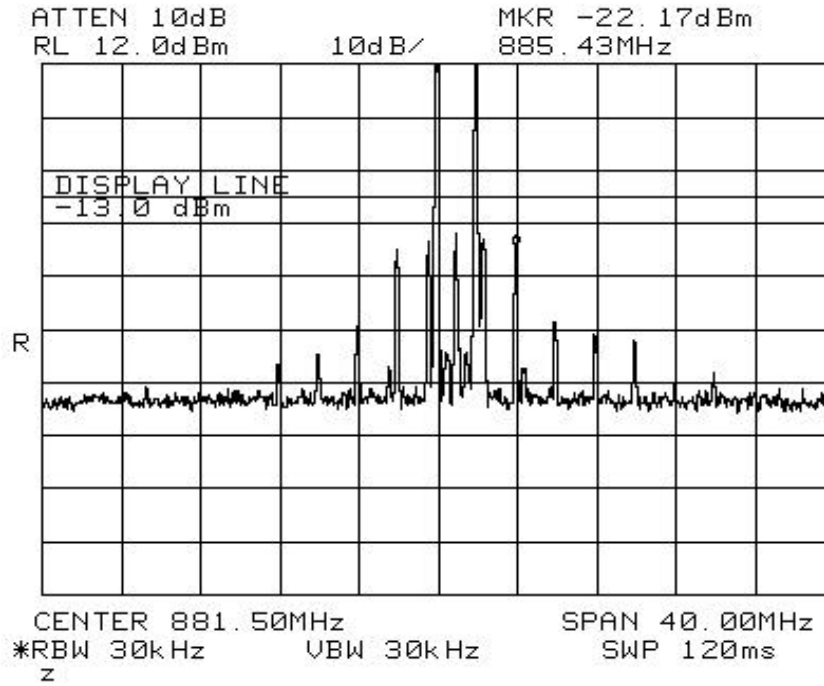
FCC ID: **KUWINCELL800**

PROJECT NO.: **0L0296RUS1**

Test Plot: Antenna Spurious Emissions

Page 2 of 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

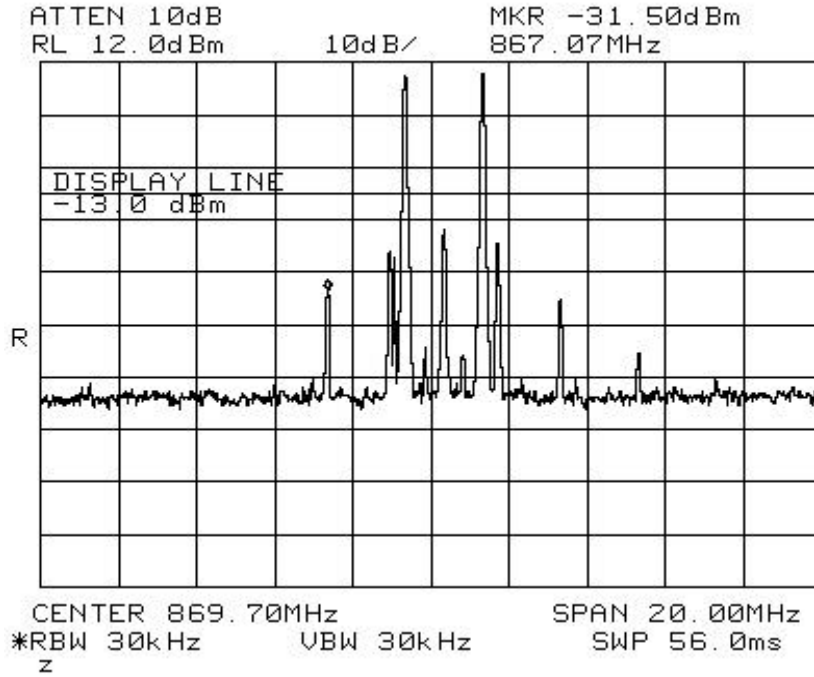
FCC ID: KUWINCELL800

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:

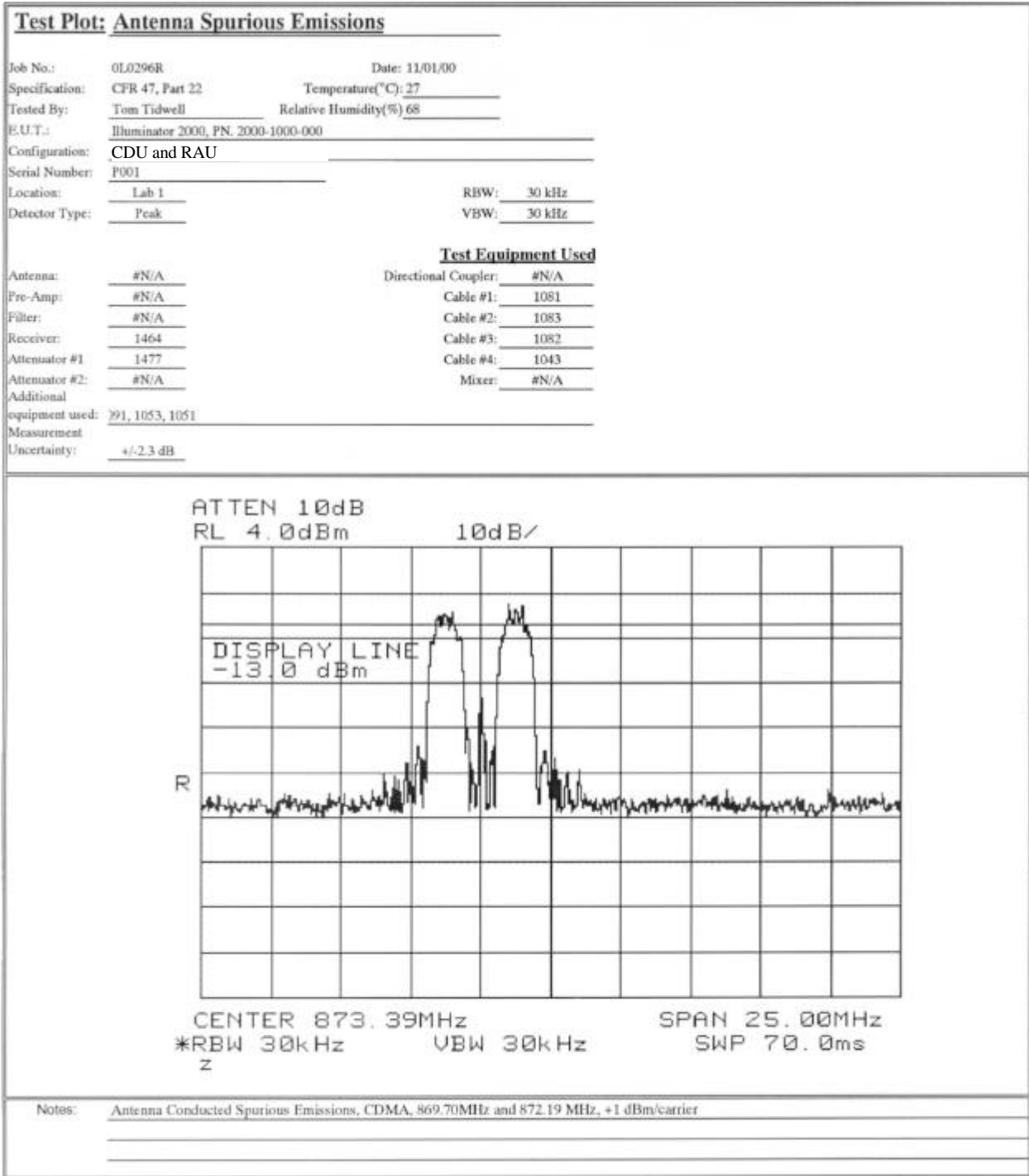


Notes: Antenna Conducted Spurious Emissions, NADC, 869.04MHz and 871.05 MHz, +12 dBm/carrier

EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

FCC ID: KUWINCELL800

PROJECT NO.: 0L0296RUS1



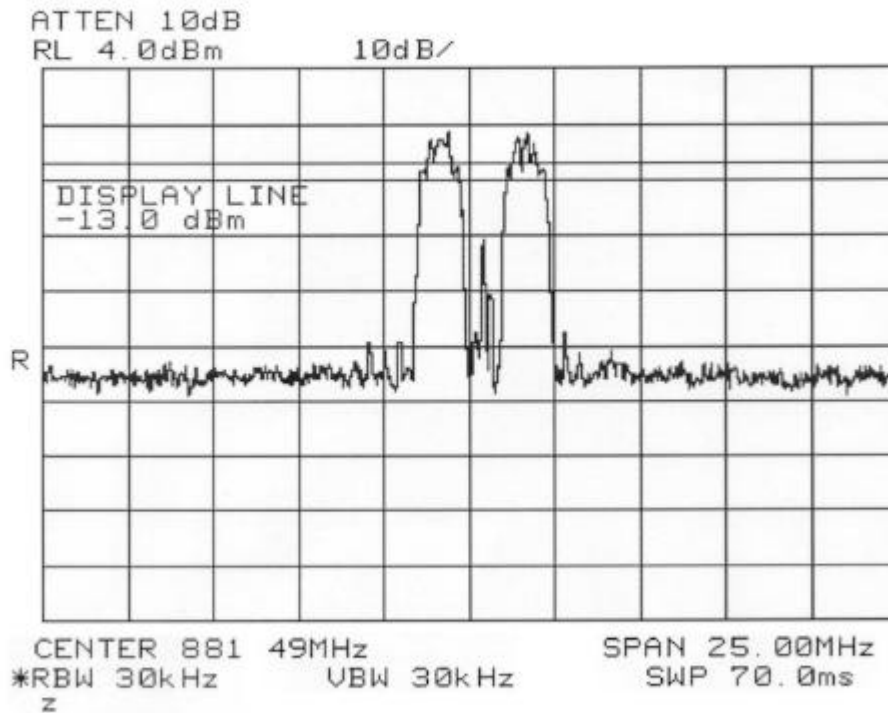
EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

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

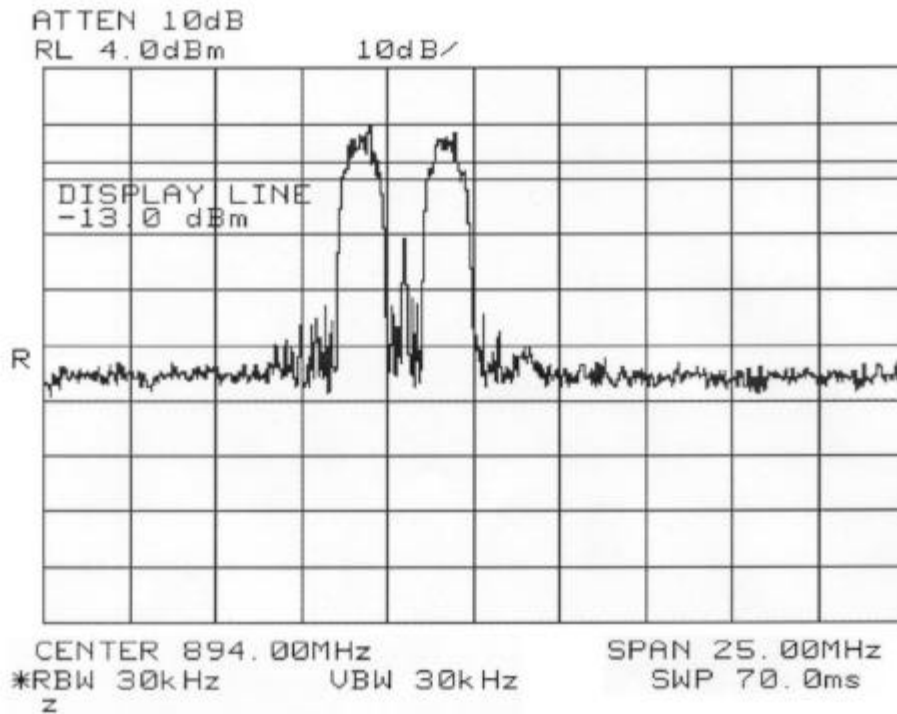
EQUIPMENT: InCell-800 Fiber Optic Distributed Antenna System

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

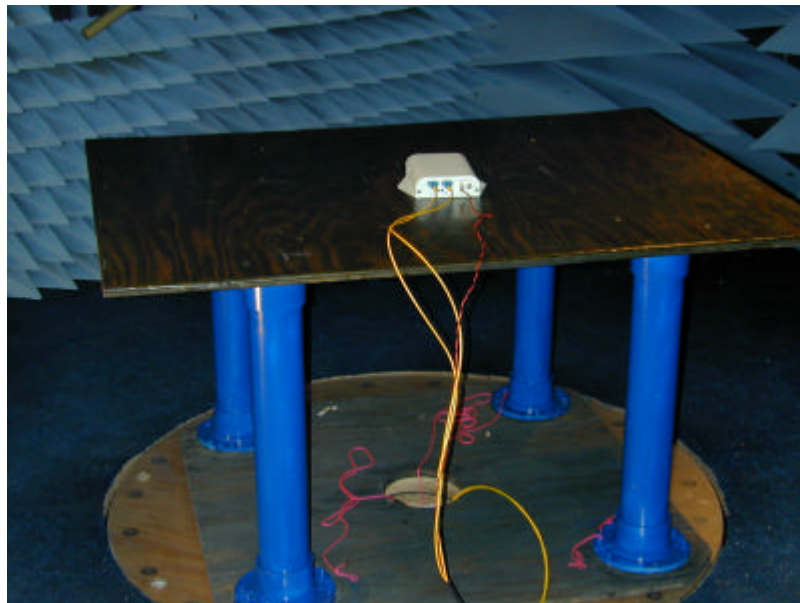
Field Strength of Spurious Emissions											
Page <u>1</u> of <u>1</u>									Complete <u>X</u>		
Job No.:	<u>0L0296R</u>	Date:	<u>11/2/00</u>					Preliminary			
Specification:					Temperature(°C):	<u>22</u>					
Tested By:	<u>David Light</u>	Relative Humidity(%):	<u>50</u>								
E.U.T.:	<u>CDU and RAU</u>										
Configuration:	<u>TRANSMIT CW SIGNAL @881.49 MHz, +15 dBm</u>				Peak rf power output(dBm):	<u>15</u>					
Sample Number:											
Location:	<u>AC 3</u>	RBW:	<u>1 MHz</u>		Measurement Distance	<u>3 m</u>					
Detector Type:	<u>Peak</u>	VBW:	<u>300 kHz</u>								
Test Equipment Used											
Antenna:	<u>993</u>	Directional Coupler:	<u>#N/A</u>								
Pre-Amp:	<u>1016</u>	Cable #1:	<u>1485</u>								
Filter:	<u>#N/A</u>	Cable #2:	<u>1484</u>								
Receiver:	<u>1464</u>	Cable #3:	<u>#N/A</u>								
Attenuator #1:	<u>#N/A</u>	Cable #4:	<u>#N/A</u>								
Attenuator #2:	<u>#N/A</u>	Mixer:	<u>#N/A</u>								
Additional equipment used:											
Measurement Uncertainty:	<u>+/-3.4 dB</u>										
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: <u>SCANNED EUT TO THE 10TH HARMONIC</u>											

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 test report for test results. Standard test frequency: _____ MHz
Standard test voltage: _____

Not Applicable

Equipment Used:

Measurement Uncertainty: +/- 1×10^{-7} ppm

Temperature: _____ °C

Relative Humidity: _____ %

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)

$R = 3$ 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)

$R = 3$ 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](#)

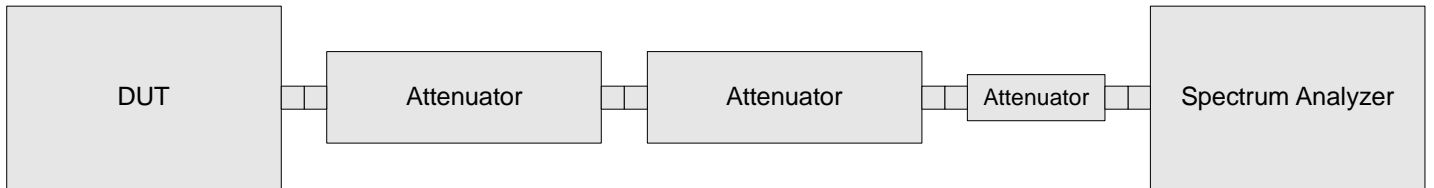
ANNEX B - TEST DIAGRAMS

EQUIPMENT: **InCell-800 Fiber Optic Distributed Antenna System**

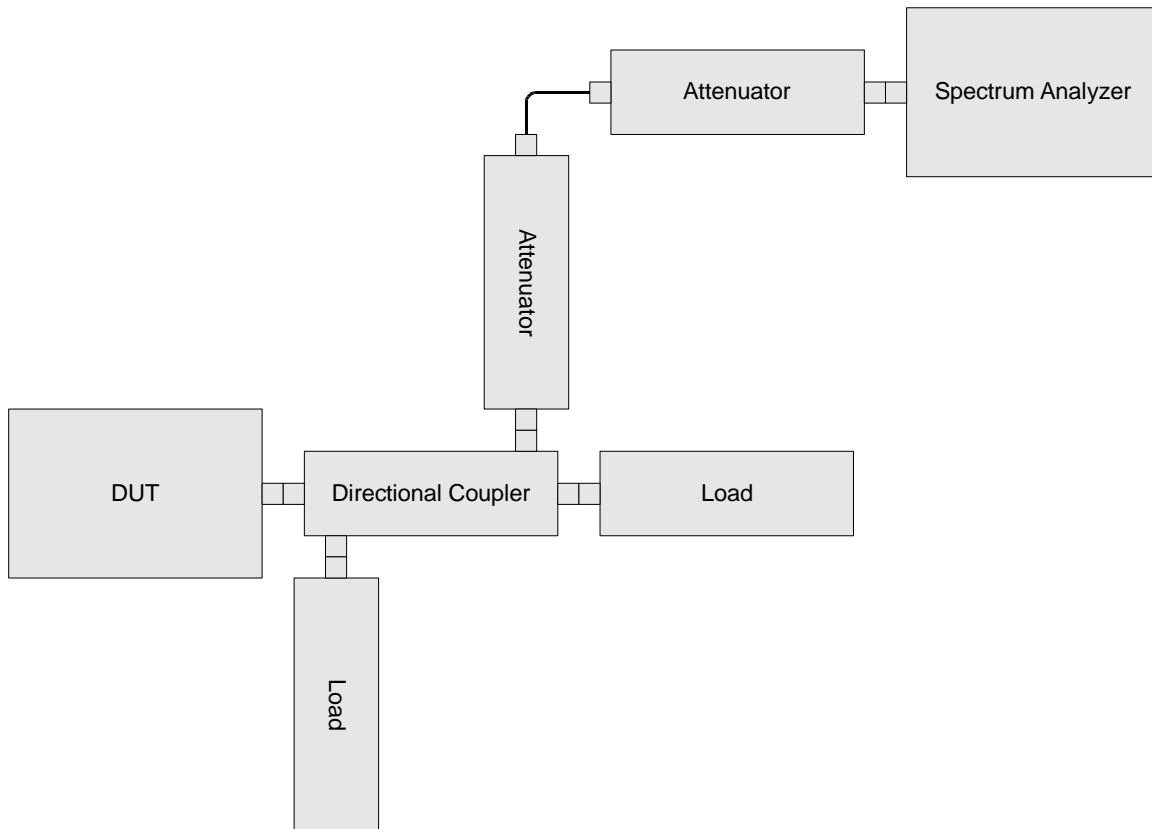
FCC ID: **KUWINCELL800**

PROJECT NO.: **0L0296RUS1**

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



Para. No. 2.1049 - Occupied Bandwidth

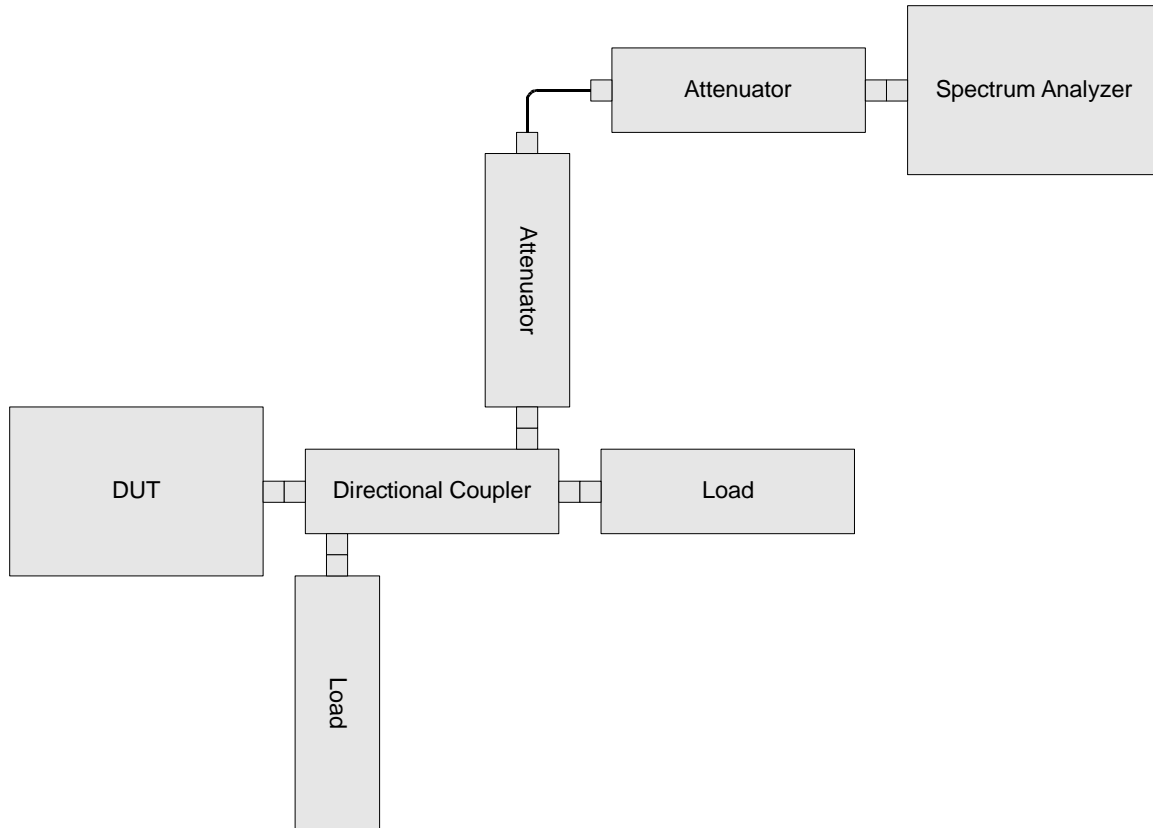


EQUIPMENT: [InCell-800 Fiber Optic Distributed Antenna System](#)

FCC ID: [KUWINCELL800](#)

PROJECT NO.: [0L0296RUS1](#)

Para. No. 2.1051 Spurious Emissions at Antenna Terminals

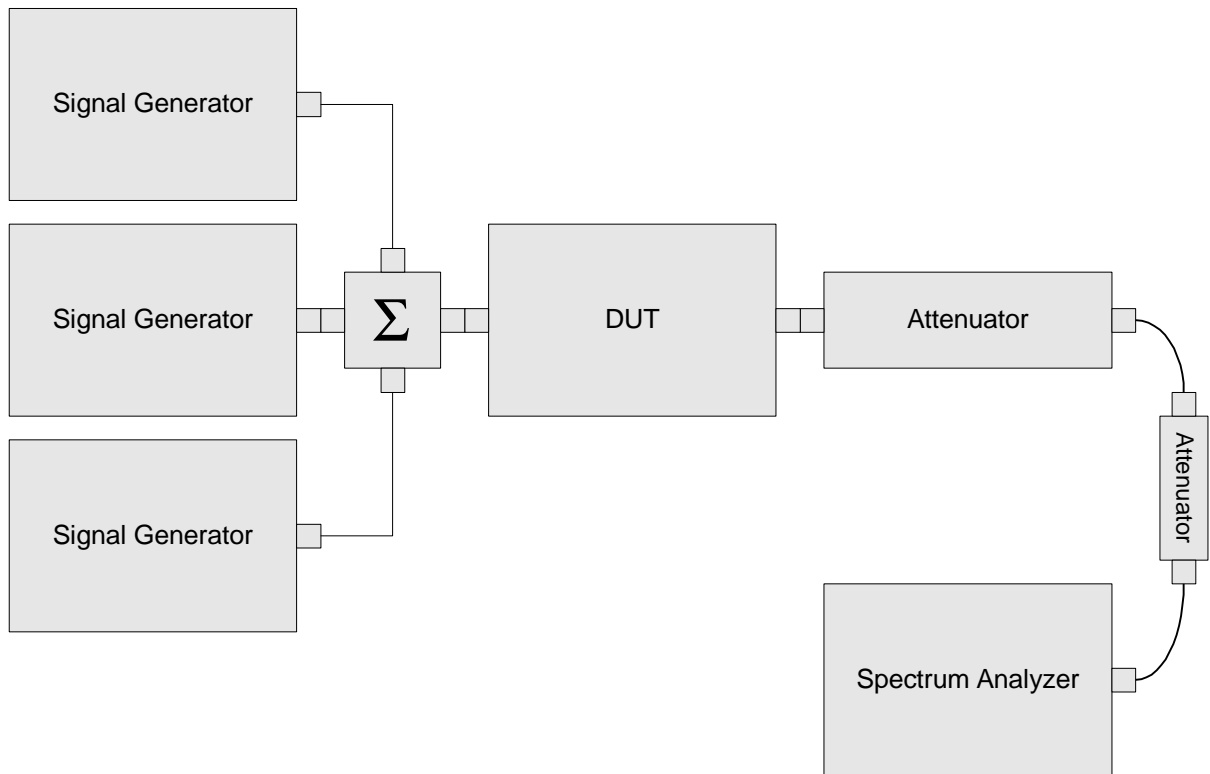


EQUIPMENT: [InCell-800 Fiber Optic Distributed Antenna System](#)

FCC ID: [KUWINCELL800](#)

PROJECT NO.: [0L0296RUS1](#)

Intermodulation Spurious Emissions

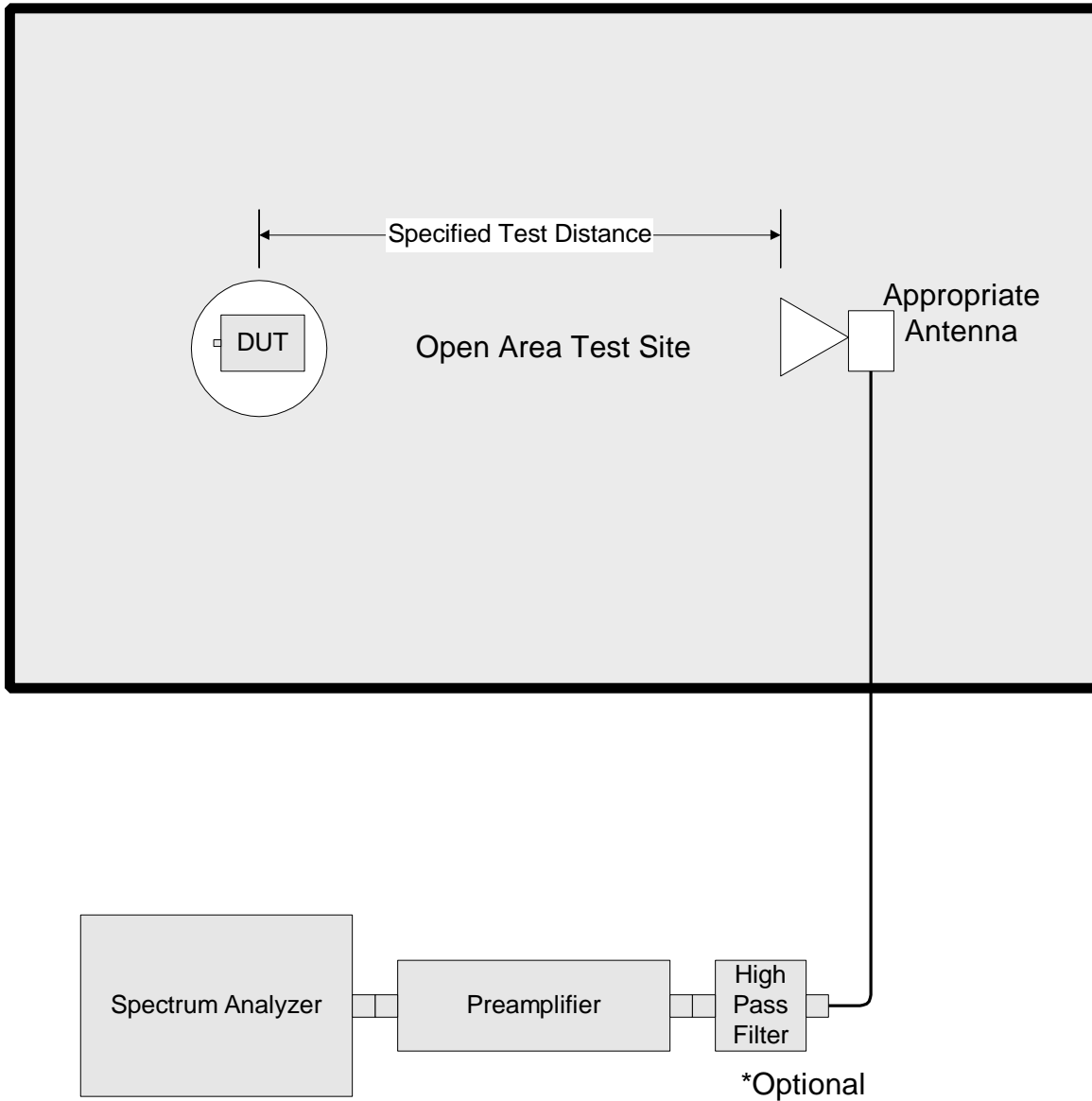


EQUIPMENT: [InCell-800 Fiber Optic Distributed Antenna System](#)

FCC ID: [KUWINCELL800](#)

PROJECT NO.: [0L0296RUS1](#)

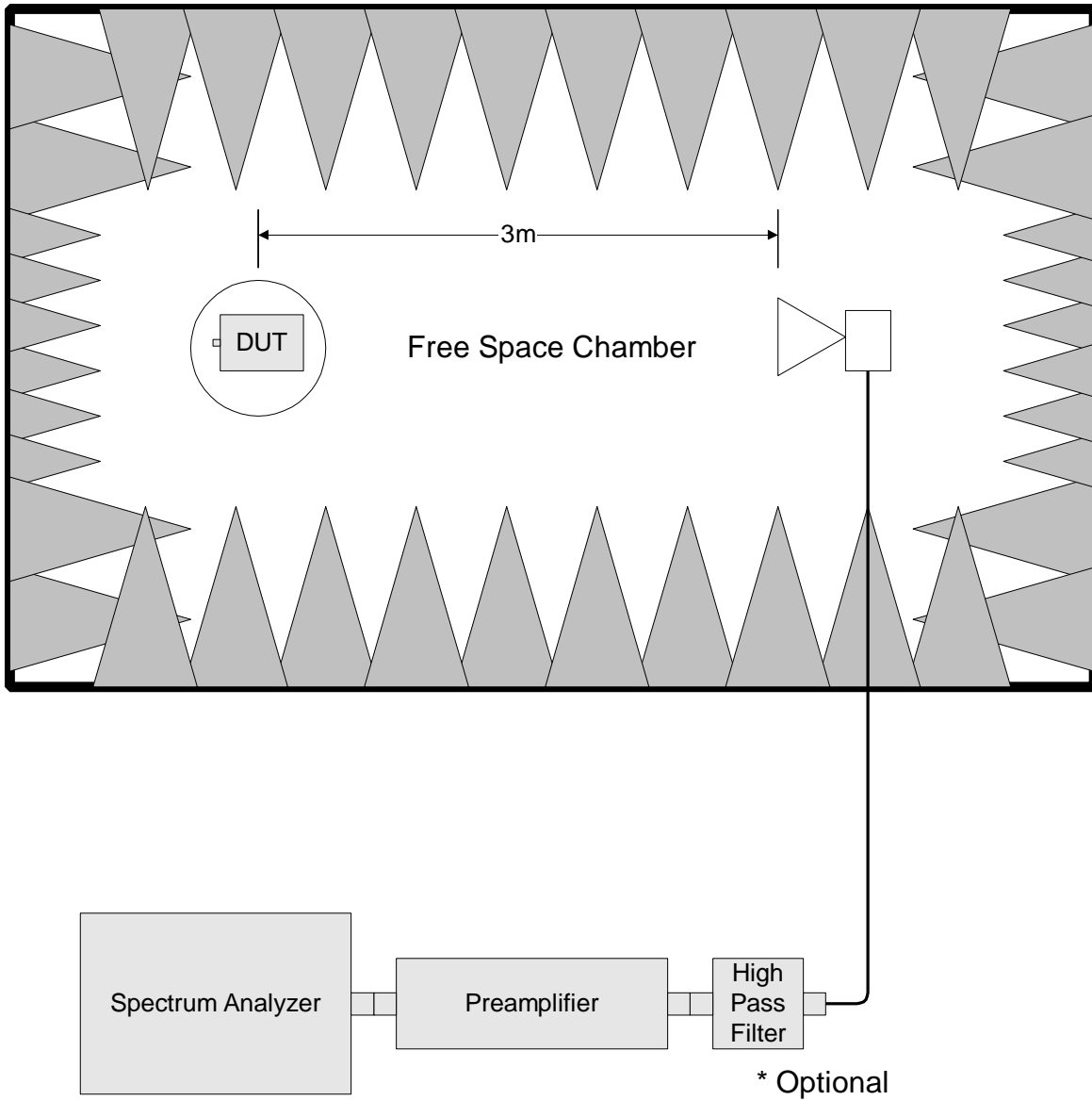
Para. No. 2.1053 - Field Strength of Spurious Radiation



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

