

Tranzeo EMC Labs Inc.  
19473 Fraser Way  
Pitt Meadows, BC  
Canada V3Y 2V4

**Unity Wireless Systems Corp.**  
**Osprey 35 W CDMA SCPA**  
**100.0188.001**  
**Power Amplifier**  
**EMC Test Report**

March 23, 2006

Report Number: TRL230306.1



Bruce Balston, EMC Engineer



Andrew Marles, EMC Coordinator

---

---

## Revision History

---

## Table of Contents

<b>1.0</b>	<b>General Information .....</b>	<b>4</b>
1.1	EUT Description .....	4
1.2	Operational Description .....	4
1.3	EUT Testing Configuration .....	4
1.4	EUT Modifications .....	5
1.5	Overview of Test Results .....	5
1.6	Test Facilities .....	6
1.7	Test Equipment .....	6
1.8	Test System Details .....	6
1.9	Test Results .....	6
<b>2.0</b>	<b>RF Output Power .....</b>	<b>7</b>
2.1	Test Standard .....	7
2.2	Test Limits .....	7
2.3	Test Setup .....	7
2.4	Test Results .....	7
<b>3.0</b>	<b>Transmitter Radiated Spurious Emissions .....</b>	<b>8</b>
3.1	Test Standard .....	8
3.2	Test Limits .....	8
3.3	Test Setup .....	8
3.4	Test Results .....	10
<b>4.0</b>	<b>Transmitter Conducted Harmonic and Spurious Emissions .....</b>	<b>11</b>
4.1	Test Standard .....	11
4.2	Test Limits .....	11
4.3	Test Setup .....	11
4.4	Test Results .....	12
<b>5.0</b>	<b>Band Edge .....</b>	<b>13</b>
5.1	Test Standard .....	13
5.2	Test Limits .....	13
5.3	Test Setup .....	13
5.4	Test Results .....	14
<b>6.0</b>	<b>Occupied Bandwidth/Linearity .....</b>	<b>15</b>
6.1	Test Standard .....	15
6.2	Test Limits .....	15
6.3	Test Setup .....	15
6.4	Test Results .....	16
<b>7.0</b>	<b>RF Exposure Evaluation .....</b>	<b>19</b>
7.1	Fries Formula .....	19
7.2	EUT Operating Condition .....	19
7.3	RF exposure evaluation distance calculation .....	19
<b>8.0</b>	<b>Test Photos .....</b>	<b>20</b>

## 1.0 General Information

### 1.1 EUT Description

Product Name	Osprey 35W CDMA SCPA
Company Name	Unity Wireless Systems Corp.
FCC ID	Pending
Model No.	100.0188.001
Frequency Range	869-894 MHz
Number of Channels	EXTENDER
Type of Modulation	One CDMA 1X carrier
Antenna Gain	n/a
Product Software	n/a
Test Software	n/a
Operator Channel Selection	Base station
Power Adapter	Manufacture supply power distribution unit

Product sample tested:

Manufacturer	Model No.	Serial No.
Unity Wireless Systems Corp.	100.0188.001	05080158

The Osprey 35W CDMA SCPA is tuned for the frequency range of 869-894 MHz Downlink. The product is only available in one configuration and is tuned at the factory to customer order.

The tests were performed on a production sample model to demonstrate compliance with FCC Parts 2 and 22.

### 1.2 Operational Description

The Osprey 35W CDMA SCPA is a compact high power amplifier (HPA) designed for CDMA 1X in the frequency range 869-894 MHz.

The amplifier is composed of an RF line-up and a function board. The RF line-up provides the necessary amplification of the input signal. The function board provides power supplies to the RF board, processes alarms and provides monitoring functions for the external user. The function board also provides for RF shut down in case of a major alarm condition. The SCPA requires forced air cooling appropriate to the efficiency.

An additional feature of the Osprey is the special alarming function. When an alarm occurs and extends beyond 2 seconds, the HPA will be shut down automatically. The alarm functions included are over power alarm, VSWR alarm and device failure alarm, additionally an over temperature alarm. To clear the alarm, the user must disable the HPA for 1 second, and then issue the enable command. This function is monitored by a micro-controller inside the HPA, which is unique to this HPA.

### 1.3 EUT Testing Configuration

Extensive prescanning for individual tests was performed to determine worst case. Data is presented for worst case measurements only.

The EUT is mounted to a custom non-metallic stand to ease polarization changes and to best represent a typical user installation.

The EUT was tested with the following modulation type: CDMA.

#### **1.4 EUT Modifications**

No modifications were necessary for this unit to comply with FCC Part 22.

#### **1.5 Overview of Test Results**

##### **FCC 2.1033(c)(3) USER'S MANUAL**

The necessary information is contained in a separate document.

##### **FCC 2.1033 (c)(4) TYPE OF EMISSIONS**

N1E.

##### **FCC 2.1033 (c)(5) FREQUENCY RANGE**

869-894 MHz.

##### **FCC 2.1033 (c)(6) OPERATING POWER**

35 Watts.

##### **FCC 2.1033 (c)(7) MAXIMUM POWER RATING**

500 Watts.

##### **FCC 2.1033 (c)(8) DC VOLTAGES**

The EUT has the following voltages:

-48 V nominal

-36 to -75 V operation range

Power consumption 300 W (max)

##### **FCC 2.1033 (c)(9) TUNE-UP PROCEDURE**

The necessary information is contained in a separate document.

##### **FCC 2.1033(c)(10) SCHEMATICS AND CIRCUITRY DESCRIPTION**

The necessary information is contained in a separate document.

##### **FCC 2.1033(c)(11) LABEL AND PLACEMENT**

The necessary information is contained in a separate document.

##### **FCC 2.1033(c)(12) SUBMITTAL PHOTOS**

The necessary information is contained in a separate document.

##### **FCC 2.1033 (c)(13) MODULATION INFORMATION**

EXTENDER.

## 1.6 Test Facilities

Tranzeo EMC Labs  
 19473 Fraser Way  
 Pitt Meadows, BC V3Y 2V4  
 Canada

Phone: (604) 460-6002  
 Fax: (604) 460-6005

FCC registration number: 960532  
 Industry Canada Number: 5238A

## 1.7 Test Equipment

Manufacturer	Model	Description	Serial No.	Cal Due Date
Hewlett Packard	85650A	Quasi Peak Adapter	2043A00187	13-Aug-06
Hewlett Packard	8566B	Spectrum Analyzer	2637A04169	07-Feb-06
Hewlett Packard	85685A	Preselector	3010A1095	07-Feb-06
Sunol Sciences	SM46C	Turntable	051204-2	N/R
Sunol Sciences	Custom	Mast Motor	TREML0001	N/R
Sunol Sciences	JB3	Antenna	A042004	05-May-06
Sunol Sciences	DRH-118	Antenna	A052804	02-Jun-06
FCC	FCC-LISN-50-25-2	LISN	105	02-Jun-06
Wavetek	8501	Power Meter	45-00218	27-Jul-06
Wavetek	17266	Power Detector	1509315	27-Jul-06
Hewlett Packard	11970A	Harmonic Mixer	2332A00886	N/R
Hewlett Packard	11975A	Amplifier	2517A00949	N/R
Rohde & Schwarz	FSP40	Spectrum Analyzer	100184	24-Aug-06
Rohde & Schwarz	NRP	Power Meter	100055	02-Aug-06

## 1.8 Test System Details

The following auxiliary equipment and cables were used for performing the tests:

Manufacturer	Model	Description	Serial No.
Rohde & Schwarz	SMJ100A	Vector Signal Generator	100151

## 1.9 Test Results

The Osprey 35W CDMA SCPA product complies with FCC Part 22.

## 2.0 RF Output Power

### 2.1 Test Standard

§22.913 *Effective radiated power limits. - The effective radiated power (ERP) of transmitters in the Cellular Radiotelephone Service must not exceed the limits in this section.*

(a) *Maximum ERP. The effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts. The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.*

The manufacturer does not provide an antenna for sale with the EUT, therefore EIRP is not measured nor calculated. Since the unit will only be used in a professional installation, the end-user of this product is to exercise proper engineering judgment to ensure the EIRP limits are met.

The RF power of the EUT was measured at the antenna port with a modulated carrier.

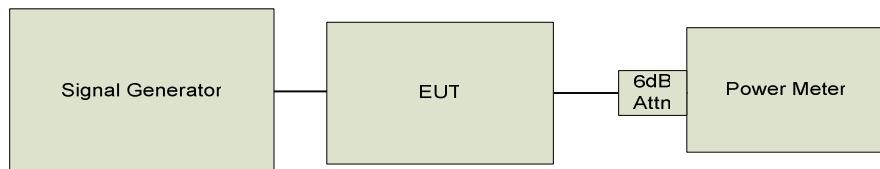
### 2.2 Test Limits

The ERP may not exceed 500 Watts.

### 2.3 Test Setup

The input of the EUT is connected to the digital signal generator and the output connected through a suitable attenuator to the measurement equipment.

#### 2.3.1 Test Setup Block Diagram



### 2.4 Test Results

Freq (MHz)	Meas Rdg (dBm)	Limit (dBm)	Margin (dB)	Result
869	46.30	57	-10.70	PASS
881	46.29	57	-10.71	PASS
894	46.70	57	-10.30	PASS

## 3.0 Transmitter Radiated Spurious Emissions

### 3.1 Test Standard

#### *§22.917 Emission limitations for cellular equipment*

(a) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

### 3.2 Test Limits

Required Attenuation =  $43 + 10 \log P$  dB

Conducted Limit = -13 dBm

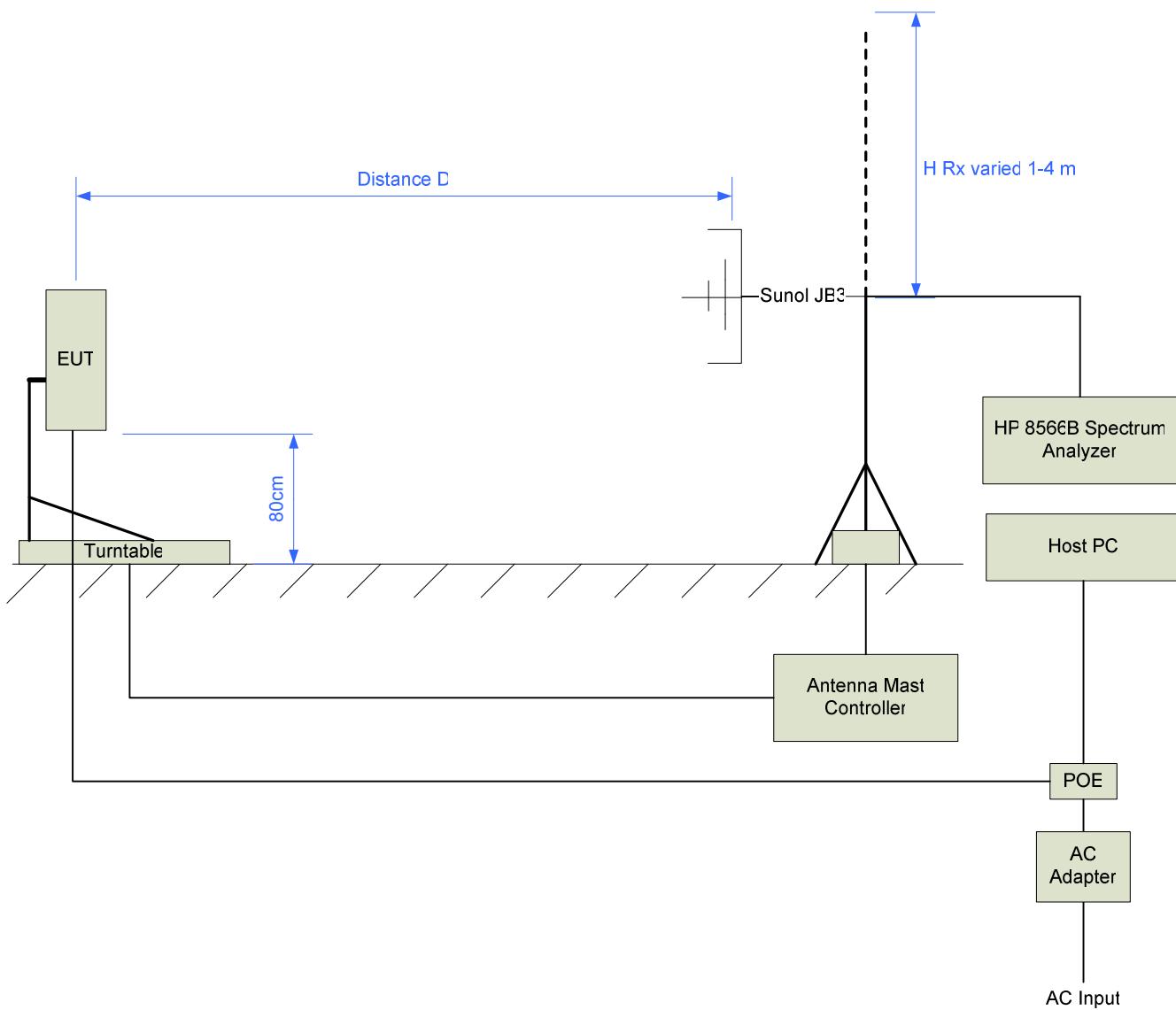
Radiated limit = 84.5 dBm

### 3.3 Test Setup

The unit was prescanned to determine worst case. The EUT was exercised with using CDMA modulation. The output of the transmitter was connected to 1 m of cable and terminated with a 50 ohms load. Emissions were measured from 30 MHz to 10 GHz. The EUT was rotated 360 degrees and the receive antenna swept from 1 m to 4 m to determine the maximum emissions level. The measurement distance was 3 m. Only the data taken from the worst is shown below.

Measurements above 1 GHz were taken with RBW, VBW = 1 MHz.

### 3.3.1 Test Setup Block Diagram



Note: Measurements below 1 GHz were performed with the Sunol JB3 antenna. Measurements above 1 GHz were performed with the Com-Power AHA-118 antenna. The measurement distance was 3 m.

### 3.4 Test Results

#### 3.4.1 Below 1 GHz

Frequency (MHz)	Meter (dBm)	Correction (dB)	Corr Reading (dBm)	Limit (dBm)	Margin (dB)	Polarization	Rtype	Result
35.640	-87.1	18.4	-68.7	-13.0	-55.7	Vert	Peak	PASS
63.660	-76.6	9.3	-67.3	-13.0	-54.3	Vert	Peak	PASS
122.200	-87.4	15.5	-71.9	-13.0	-58.9	Vert	Peak	PASS
693.500	-88.0	23.7	-64.3	-13.0	-51.3	Vert	Peak	PASS
907.000	-86.9	26.5	-60.4	-13.0	-47.4	Horiz	Peak	PASS
911.500	-87.1	26.4	-60.7	-13.0	-47.7	Horiz	Peak	PASS

#### 3.4.2 Above 1 GHz

Frequency (MHz)	Corr Reading (dBm)	Limit (dBm)	Margin (dB)	Polarization	Rtype	Result
1737.98	-23.05	-13	-10.05	Horiz	Peak	PASS
1763.09	-28.94	-13	-15.94	Horiz	Peak	PASS
1788.02	-33.9	-13	-20.9	Horiz	Peak	PASS

## 4.0 Transmitter Conducted Harmonic and Spurious Emissions

### 4.1 Test Standard

§22.917 *Emission limitations for cellular equipment*

(b) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

### 4.2 Test Limits

Required Attenuation =  $43 + 10 \log P$  dB

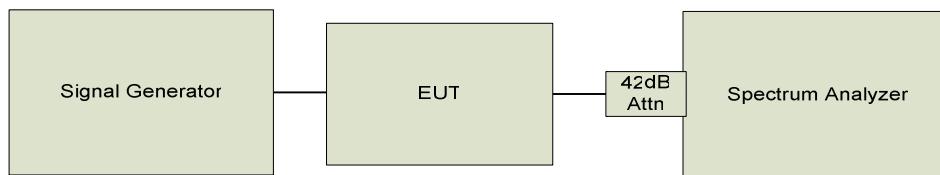
Conducted Limit = -13 dBm

Radiated limit = 84.5 dBm

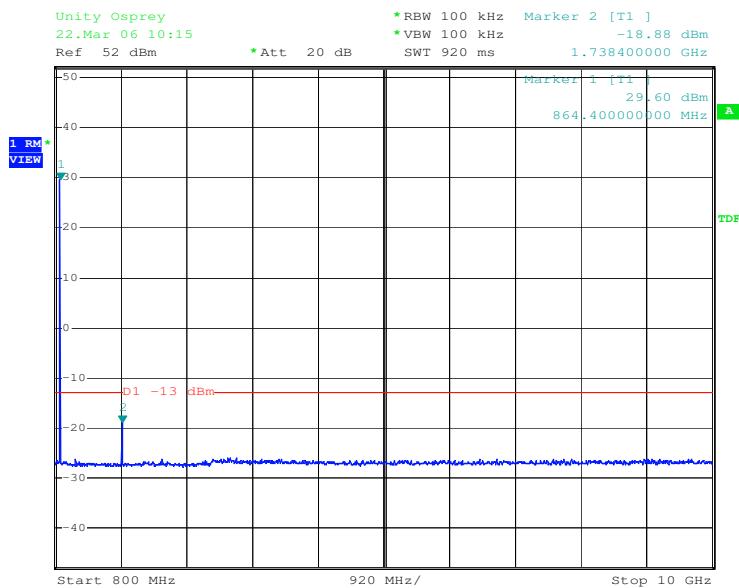
### 4.3 Test Setup

The input of the EUT is connected to the digital signal generator and the output connected through a suitable attenuator to the measurement equipment. Only worst case measurements are shown below.

#### 4.3.1 Test Setup Block Diagram – Conducted Measurements (Harmonics)



## 4.4 Test Results



Spurious Emissions CE 869M

Date: 22.MAR.2006 10:15:33

Pol	Freq (MHz)	Corr Rdg (dBm)	Limit (dBm)	Margin	Result
Cond	1738.4	-18.88	-13.0	-5.88	PASS

## 5.0 Band Edge

### 5.1 Test Standard

§22.917 *Emission limitations for cellular equipment*

(c) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

### 5.2 Test Limits

Required Attenuation =  $43 + 10 \log P$  dB

Conducted Limit = -13 dBm

Radiated limit = 84.5 dBm

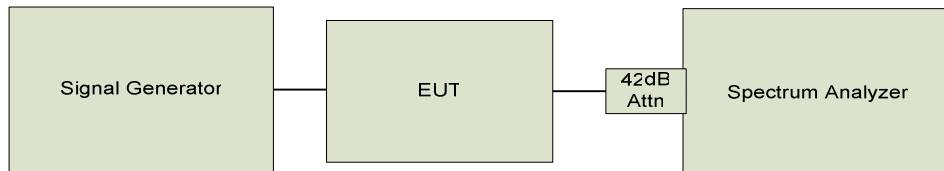
### 5.3 Test Setup

The input of the EUT is connected to the digital signal generator and the output connected through a suitable attenuator to the measurement equipment.

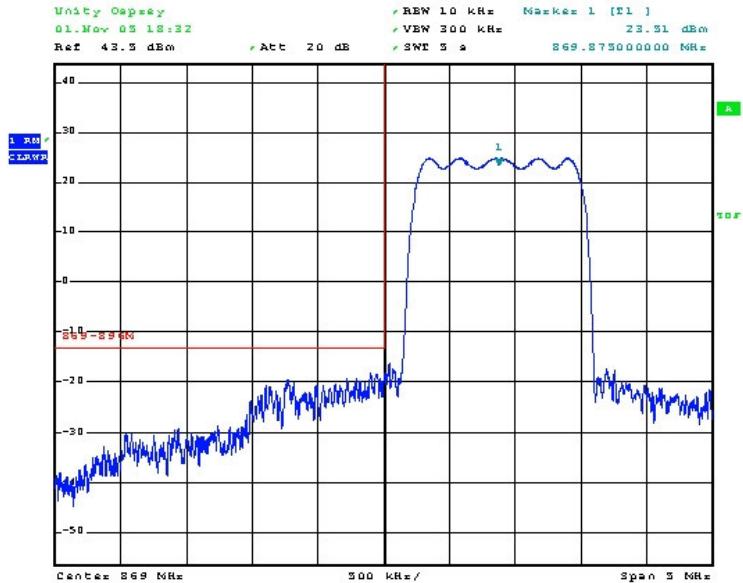
CDMA measurements are shown below.

#### 5.3.1 Test Setup Block Diagram

Conducted Setup

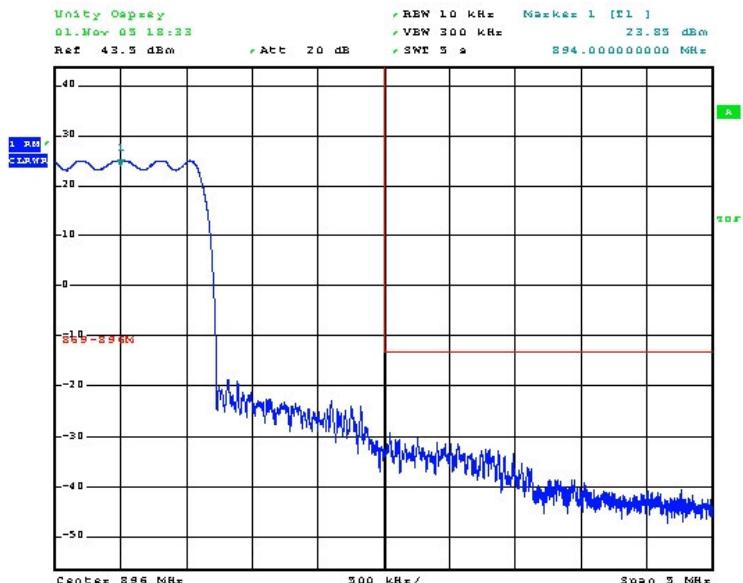


## 5.4 Test Results



CDMA Bandedge LO 869M

Date: 1.NOV.2005 18:32:40



CDMA Bandedge HI 896M

Date: 1.NOV.2005 18:33:55

Spurious emissions are below -13 dBm.

## 6.0 Occupied Bandwidth/Linearity

### 6.1 Test Standard

§22.917 *Emission limitations for cellular equipment*

(d) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

### 6.2 Test Limits

Required Attenuation =  $43 + 10 \log P$  dB

Conducted Limit = -13 dBm

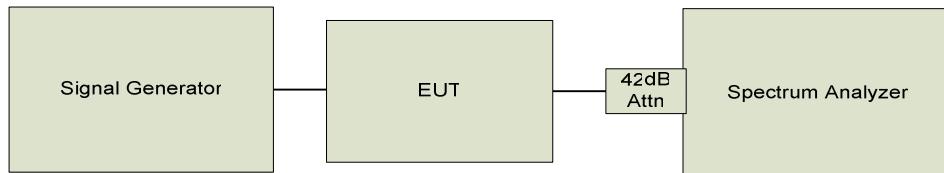
Radiated limit = 84.5 dBm

### 6.3 Test Setup

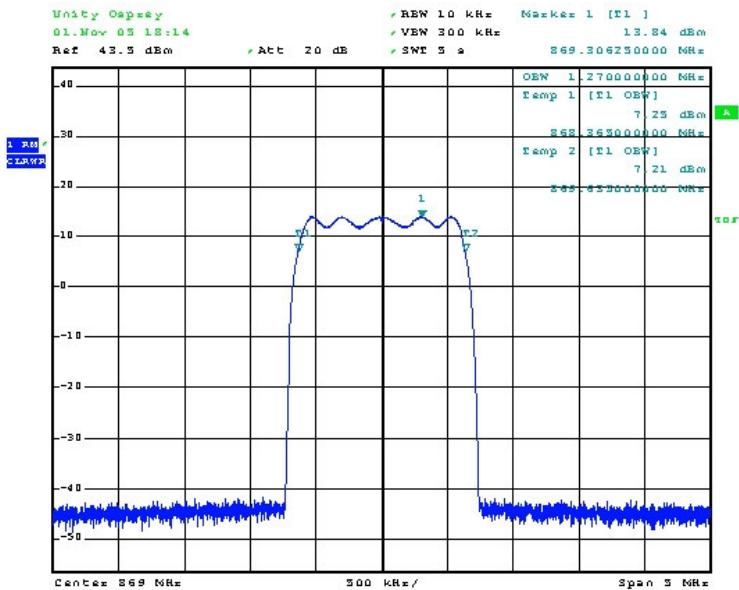
The input of the EUT is connected to the digital signal generator and the output connected through a suitable attenuator to the measurement equipment.

The occupied bandwidth was measured by comparison of the input signal to the output signal. This was done in order to determine if there was any degradation in the output signal due to amplification. Testing was performed on low, middle and high channels.

#### 6.3.1 Test Setup Block Diagram

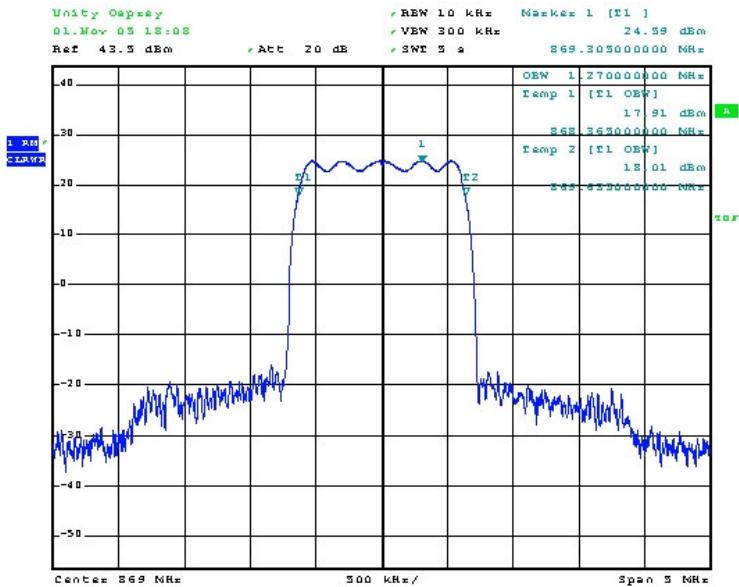


## 6.4 Test Results



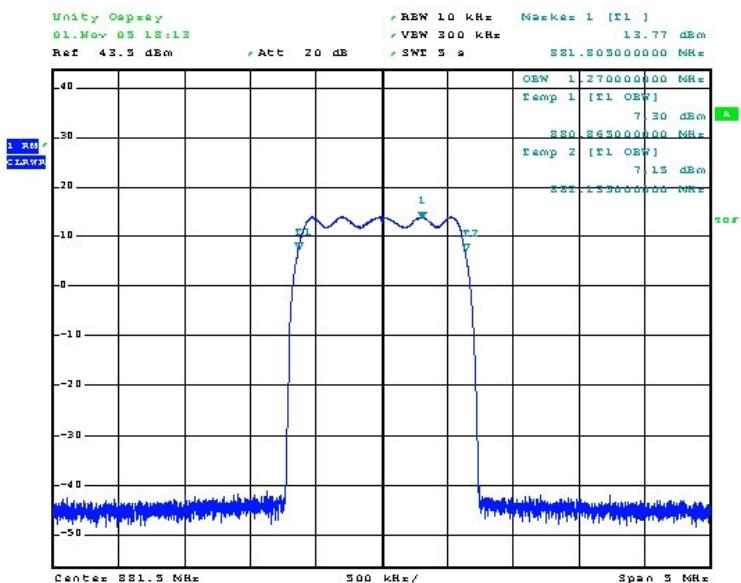
Occupied Bandwidth 869M I/P

Date: 1.NOV.2005 18:14:05



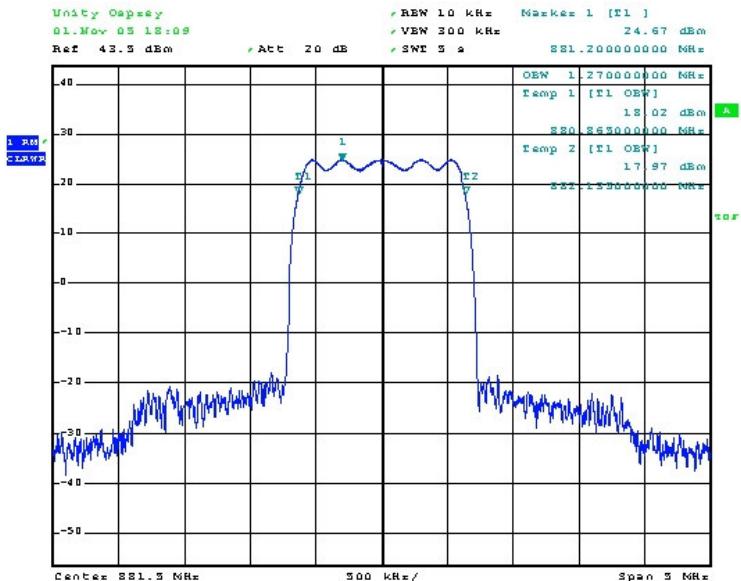
Occupied Bandwidth 869M

Date: 1.NOV.2005 18:08:17



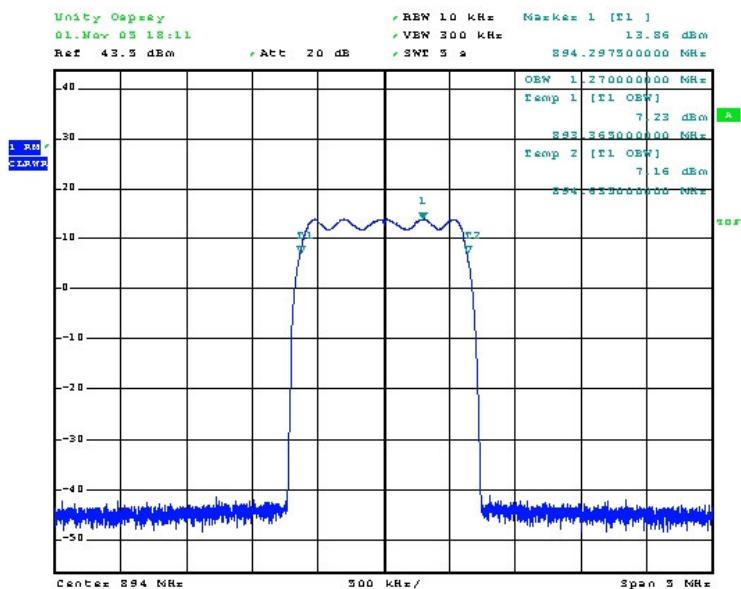
Occupied Bandwidth 881M I/P

Date: 1.NOV.2005 18:13:12



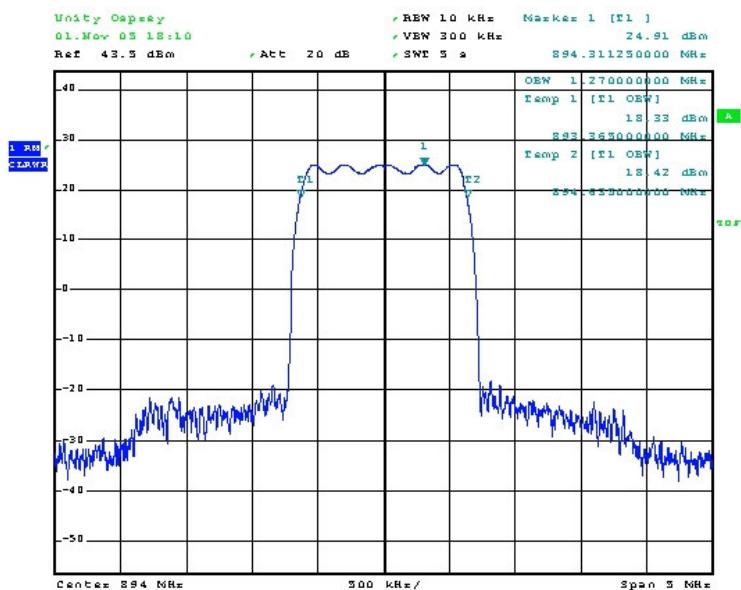
Occupied Bandwidth 881.5M

Date: 1.NOV.2005 18:09:15



Occupied Bandwidth 894M I/P

Date: 1.NOV.2005 18:11:52



Occupied Bandwidth 894M

Date: 1.NOV.2005 18:10:03

## 7.0 RF Exposure Evaluation

FCC 1.1310 states the criteria listed in the table below shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in Section 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of Section 2.1093 of this chapter. Further information on evaluating compliance with these limits can be found in the FCC's OST/OET Bulletin Number 65, "Evaluating Compliance with FCC-Specified Guidelines for Human Exposure to Radiofrequency Radiation".

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Average Time
(A) Limits for Occupational/Control Exposures				
300-1500	--	--	F/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/Uncontrolled Exposures				
300-1500	--	--	F/1500	6
1500-100,000	--	--	1	30

### 7.1 Transmission Formula

Fries transmission formula:  $P_d = (P_{out} * G) / (4 * \pi * r^2)$  Where

$P_d$  = power density in  $\text{mW/cm}^2$

$P_{out}$  = output power to antenna in  $\text{mW}$

$G$  = gain of antenna in the direction of interest relative to an isotropic radiator

$R$  = the distance between the observation point and the center of the radiator in  $\text{cm}$

$P_d$  is the limit of MPE,  $1 \text{ mW/cm}^2$ . If we know the maximum gain of the antenna and the total power input to the antenna we can calculate the distance  $r$  where the MPE limit is reached.

### 7.2 EUT Operating Condition

The maximum output power of the EUT is 46.5 dBm as tested. An antenna gain of 6 dBi is assumed.

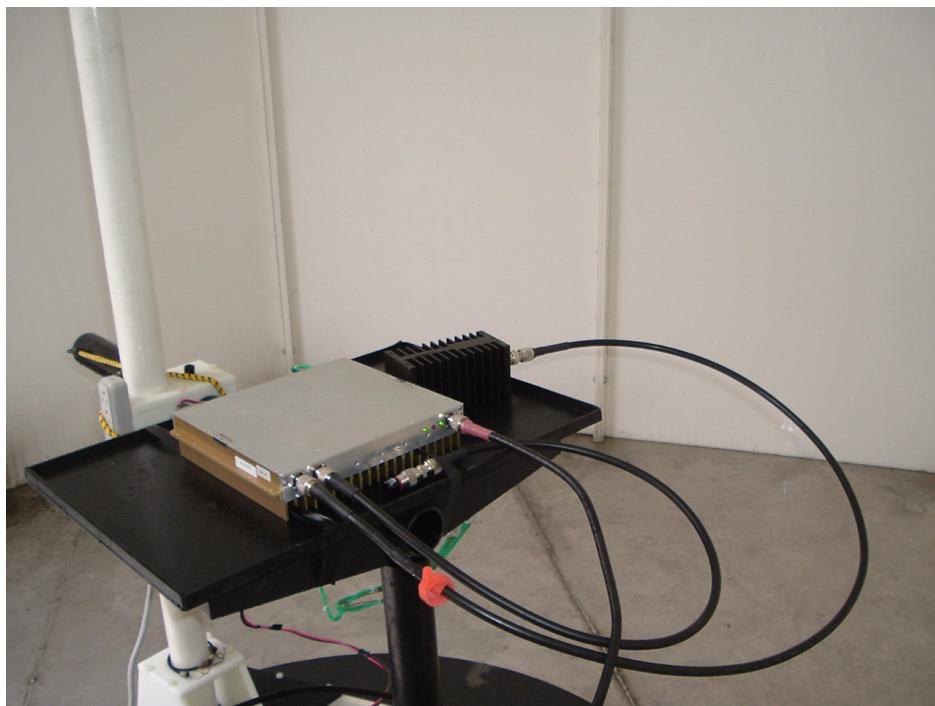
### 7.3 RF exposure evaluation distance calculation

Freq (MHz)	Output Power to Antenna (dBm)	Antenna Gain (dBi)	r (cm)
869	46.5	6	69
894	46.5	6	68

As shown above, the minimum distance where the MPE limit is reached is **69 cm** for this EUT.

---

## 8.0 Test Photos



Radiated emissions test setup.