



April 7, 2002

Federal Communications Commission  
Authorization and Evaluation Division  
7435 Oakland Mills Road  
Columbia, MD 21046

Attention: Applications Examiner

Applicant: REMEC Inc.  
300 S. Harbor Blvd. Suite 900  
Anaheim, CA 92805

Equipment: FiberDAS FD-3500A

FCC ID: PRQ-FD-3500A

Specification: 47 CFR 22 Licensed Certification

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Dear Examiner:

The following application for Grant of Equipment Authorization is presented on behalf of REMEC Inc. for the Licensed Certification of their Model: FiberDAS FD-3500A.

Enclosed, please find a complete data and documentation package demonstrating that this device complies with the technical requirements of 47 CFR, Part 22, for a Cellular Repeater.

If you have any questions, please contact the undersigned, who is authorized to act as Agent.

Sincerely,

A handwritten signature in blue ink that appears to read "Chris Harvey".

Chris Harvey  
Director, EMC Laboratory



**MET Laboratories, Inc.** *Safety Certification - EMI - Telecom Environmental Simulation*

914 WEST PATAPSCO AVENUE ! BALTIMORE, MARYLAND 21230-3432 ! PHONE (410) 354-3300 ! FAX (410) 354-3313

# ENGINEERING TEST REPORT

in support of the  
Application for Grant of Equipment Authorization

**EQUIPMENT:** FiberDAS FD-3500A

**FCC ID:** PRQ-FD-3500A

**Specification:** 47 CFR 22

**On Behalf of the Applicant:**  
REMEC Inc.  
300 S. Harbor Blvd.  
Suite 900  
Anaheim, CA 92805

**Manufacturer:**  
REMEC Inc.  
300 S. Harbor Blvd.  
Suite 900  
Anaheim, CA 92805

**Manufacturer's Representative** Mr. Gary Grimes

**Test Date(s):** March 12 thru March 28, 2002

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## ENGINEERING STATEMENT

**I ATTEST:** the measurements shown in this report were made in accordance with the procedures indicated, and that the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements. On the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Part 22 of the FCC Rules under normal use and maintenance.

Liming Xu  
EMC Engineer, MET Laboratories



## Summary of Test Results

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 22, of 47 CFR. All tests were conducted using measurement procedure ANSI C63.4-1992.

Type of Submission/Rule Part:	Original Filing/Part 22
EUT:	REMEC Inc. FiberDAS FD-3500A
FCC ID:	PRQ-FD-3500A
Type of Emissions:	GXW (GSM) GXW (TDMA) F9W ( CDMA ) F3E (AMPS)
RF Power output:	GXW (GSM) - 0.34 watts GXW (TDMA) - 0.33 watts F9W ( CDMA ) - 0.34 watts F3E (AMPS) - 0.33 watts
Frequency Range (MHz):	824 - 849 MHz receive 869 - 894 MHz transmit
Frequency Stability:	N/A

## Summary of Test Data

Name of Test	FCC Rule Part/Section	Results
Radiated Spurious Emissions	2.1053; 22.917(e); 22.901(d)(2)	Complies
Occupied Bandwidth - In vs. Out	2.1049	Complies
RF Power Output	2.1046; 22.913(a)	Complies
Spurious Emissions at Antenna Terminals	2.1051; 22.917(e)	Complies
Intermodulation Spurious Emissions	2.1051;	Complies



## 1.0 INTRODUCTION

The following data is presented on behalf of the Applicant, Repeater Technologies, as verification of the compliance of the REMEC Inc. FiberDAS FD-3500A to the requirements of 47CFR 22.

## 2.0 TEST SITE

All testing was conducted at MET Laboratories, Inc., 914 West Patapsco Avenue, Baltimore, Maryland 21230-3493. Radiated emissions measurements were performed in a semi-anechoic chamber. A complete site description is on file with the FCC Laboratory Division as 31040/SIT/MET.

## 3.0 TEST EQUIPMENT USED

Test Equipment	Manufacturer	Model #	Met Asset #	Cal Date	Cal Due
Receiver	HP	8546A	1T4302	08/11/01	08/11/02
Antenna	SCHAFFNER	1155	1T4303	08/26/01	08/26/02
Antenna	EMCO	3301B	1T3240	03/23/01	03/23/02
Test Room	ETS	CH1	1T4300	08/17/01	08/17/02

## 4.0 EQUIPMENT UNDER TEST CONFIGURATION

The PCS Repeater was configured with AC power supply modules and a digital signal generator was used to simulate various CDMA, TDMA, AMPS, and GSM cellular RF input signals to the EUT. The EUT with host external computer was configured for maximum signal gain and bandwidth. The EUT was operated in a manner representative of the typical usage of the equipment. During all testing, system components were manipulated within the confines of typical usage to maximize each emission.

## 5.0 TEST TYPE(S)

- 5.1 Radiated Emissions: 47 CFR 2.1053, 22.901(d)(2); 22.917(e)
- 5.2 Occupied Bandwidth In vs Out: 47 CFR 2.1049, Input vs. Output
- 5.3 RF Power Output: 47 CFR 2.1046, 22.913(a)
- 5.4 Spurious Emission at Antenna Terminals (downlink): 47 CFR 2.1051, 22.917(c)
- 5.5 Intermodulation Spurious Emissions-2 Tone Simultaneous RF Injection (uplink & downlink) at the lowest and highest sides of the band: 47 CFR 2.1051.



## 6.0 TEST RESULTS

### 6.1 TEST TYPE: Radiated Emissions

**6.1.1 TECHNICAL SPECIFICATION:** 47 CFR 2.1053; 22.901(d)(2); 22.917(e)

**6.1.2 TEST DATE(S):** March 12, 2002

### 6.1.3 MEASUREMENT PROCEDURES:

As required by §2.1053, *field strength of spurious radiation measurements* were made in accordance with the general procedures of ANSI C63.4-1992 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz". Preliminary and final radiated emission measurements were performed inside a semi-anechoic chamber with all digital signal generators on and . The frequency list from the preliminary measurements was used as a guide for making final measurements in the semi-anechoic chamber. The unit was scanned over the frequency range of 30MHz to 20 GHz.

The Radiated Spurious Emissions *Limit* is obtained by the following:

Based on an output power (as measured at the output of the Amplifier) of 0.34 watts:

$$P_o = 0.34 \text{ W}$$

the radiated power level of all spurious emissions must be attenuated by at least  $43 + 10\log(P_o)$  below  $P_o$ , yielding:

$$Po \& [43 \% 10\log(0.34)] \text{ } \& 13dBm$$

### 6.1.4 RESULTS:

All of the measurable radiated emissions are related to the digital device portion of the EUT, and thus are compared to the 47CFR 15 Class A field strength limit. Mathematical calculations indicate that these field strengths yield radiated power levels greater than 30 dB below the -13 dBm limit for spurious emissions from the transmitter portion of the EUT calculated above. There were no observable radiated emissions from the transmitter portion of the EUT.

The Spurious Radiated Emissions were measured from 1GHz to 10 Ghz for the EUT Module. There were no detectable spurious emissions in that frequency range.



Photograph of Radiated Emissions Test Configuration



**6.2 TEST TYPE:** Occupied Bandwidth ( Input vs. Output )

**6.2.1 TECHNICAL SPECIFICATION:** 47 CFR 2.1049

**6.2.2 TEST DATE(S):** Original filing EMC 9752 - June, 2000

**6.2.3 MEASUREMENT PROCEDURES:**

This EUT is identical to EUT tested in Project EMC #9752 on June, 2000. Original measurements are still representative in this requirement.

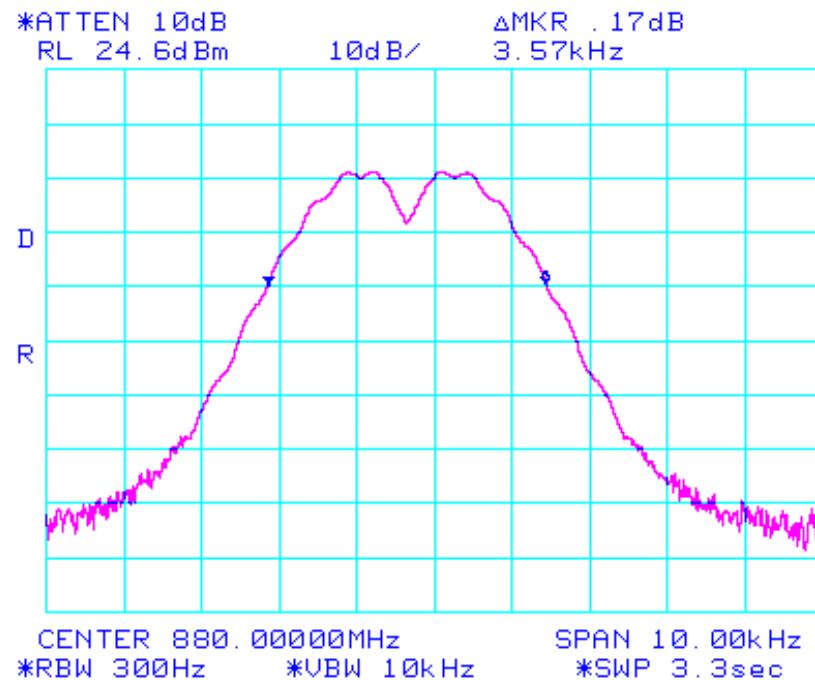
As required by §2.1049 of CFR 47, *occupied bandwidth measurements* were made on the Cellular Repeater pre- and post- repeater. A digital signal generator was configured to transmit an AMPS QPSK modulated carrier signal. Using a bandwidth of 300Hz for AMPS (FM) and 1 kHz for NADC (DAMPS) and CDMA (digital), we determined the occupied bandwidth of the emission at the lowest and highest selectable channel range was determined.

**6.2.4 RESULTS:**

Equipment complied with Section 2.1049 in EMC#9752. Additional testing was determined not to be necessary. Plots of the occupied bandwidth, as originally measured at the Repeater/Booster RF input port and at the antenna RF output port (post amplification) for this original project follow:

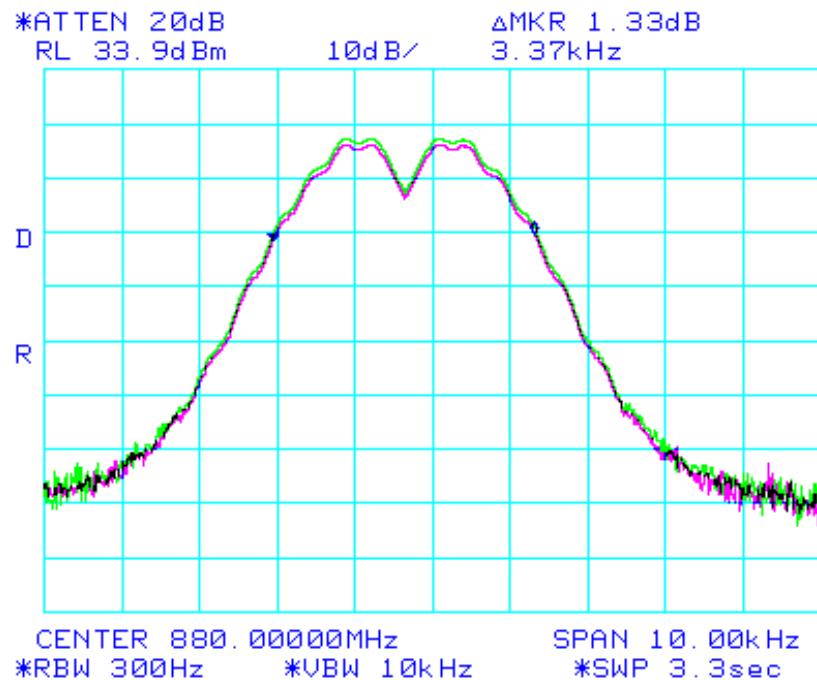


**FM Occupied B/W at input to HUb unit Downlink  
(Amps) emi9752**



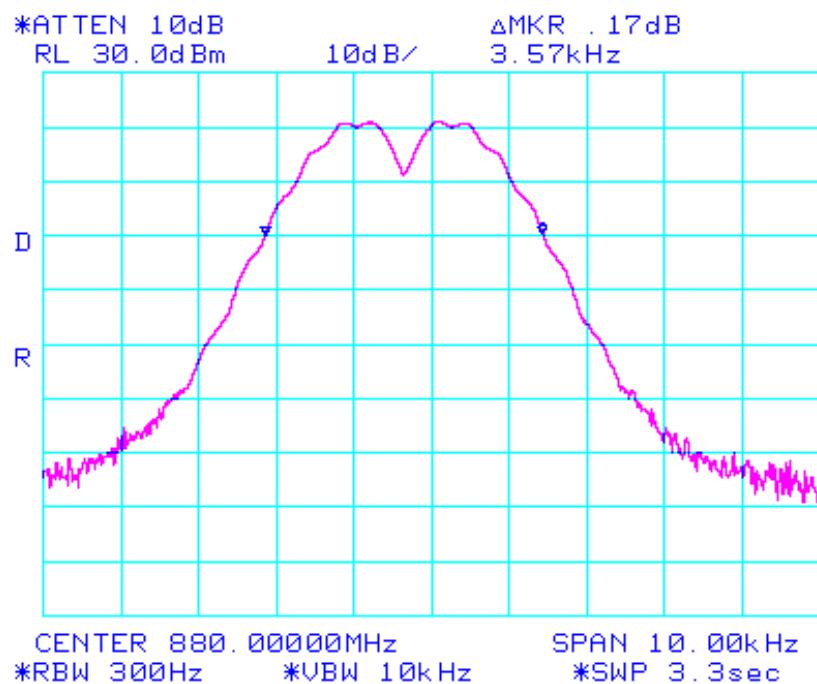


**Occupied B/W w/FM Input vs Output Downlink Amps**  
emi9752



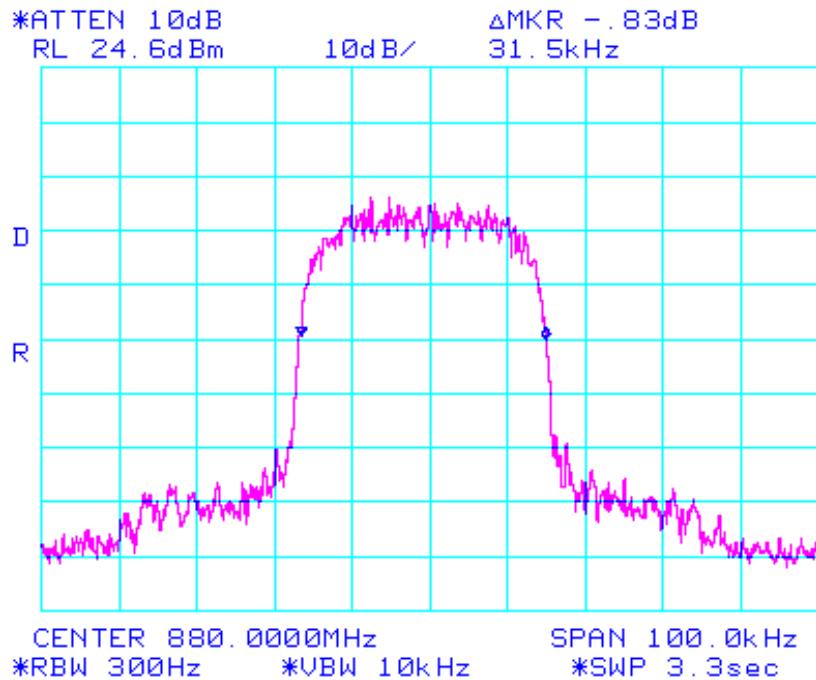


**FM Occupied B/W at Remote Antenna terminal Downlink  
(Amps) emi9752**



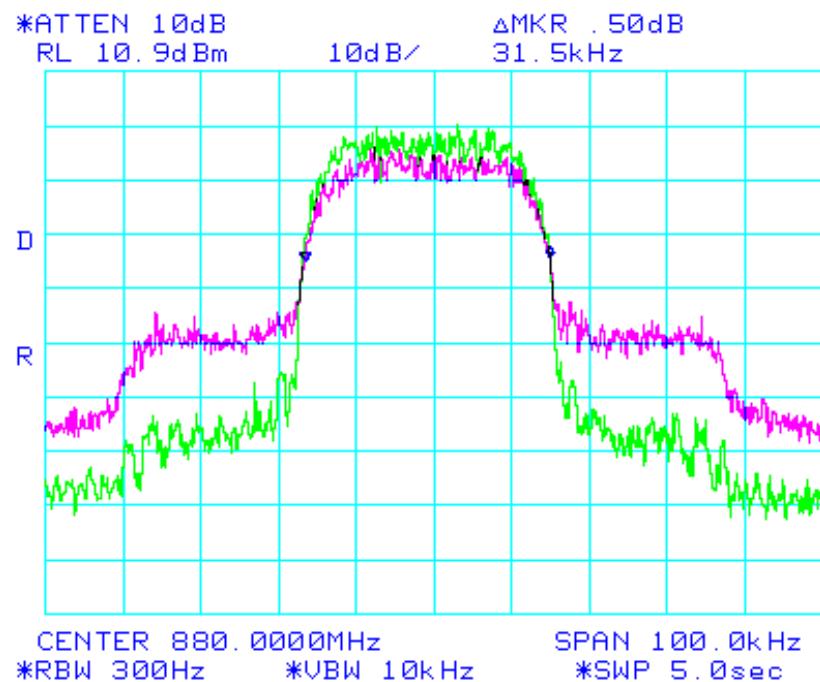


**NADC Occupied B/W at input to Hub unit Downlink  
(DAMPS) emi9752**



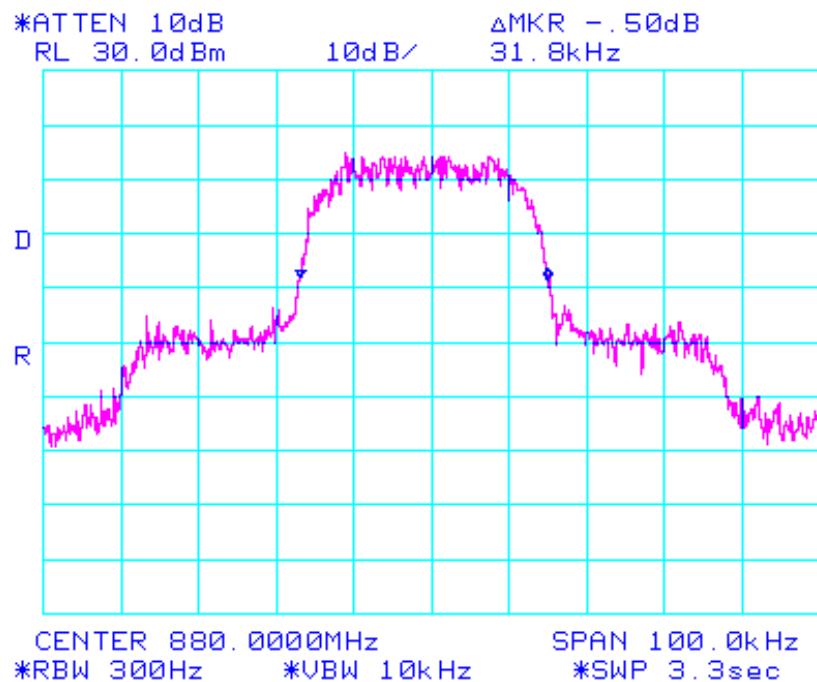


**Occupied B/W w/NADC Input vs output Downlink (Damps)**  
**emi9752**



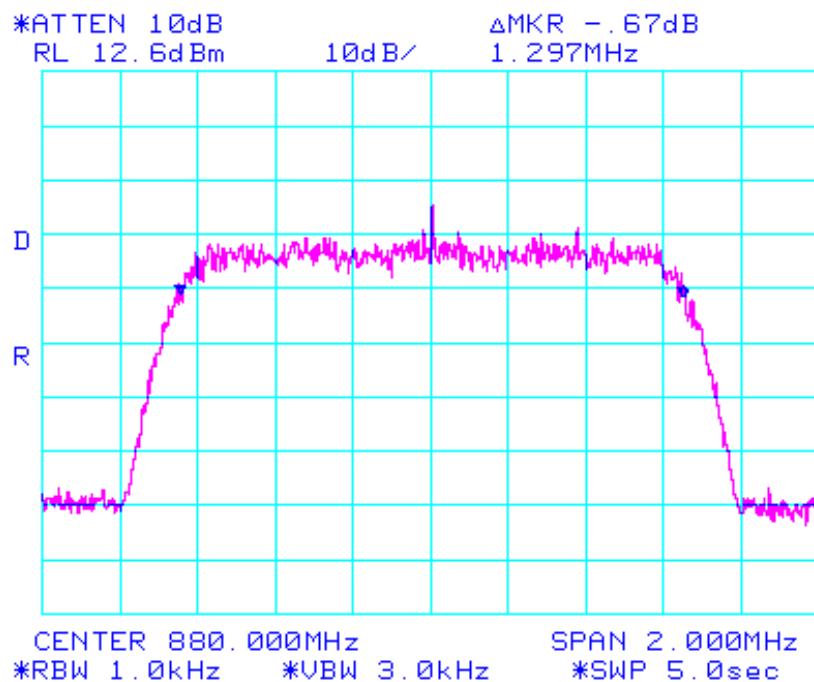


**NADC Occupied B/W at Remote Antenna terminal Downlink  
(Damps) emi9752**



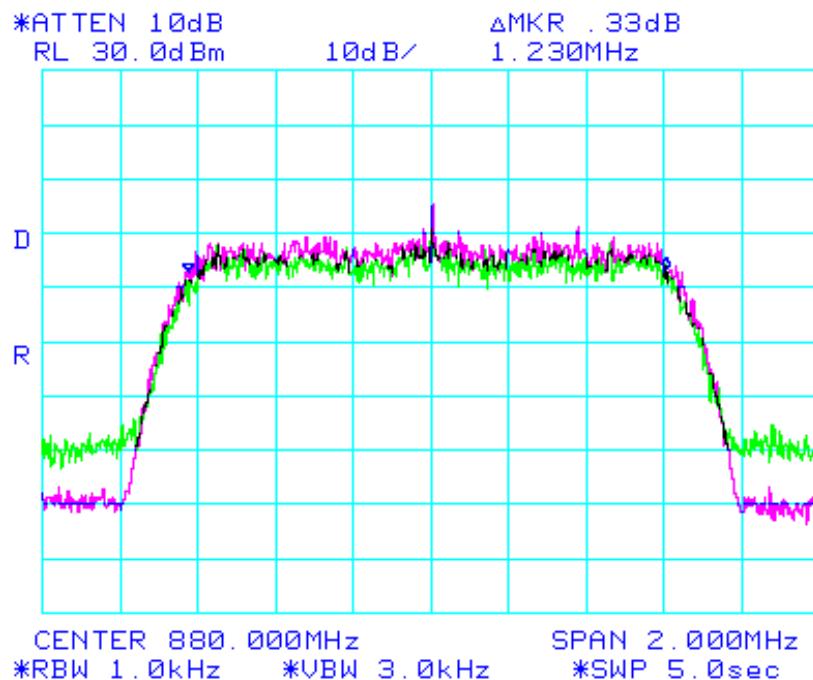


**CDMA Occupied B/W at input to Hub unit Downlink IS-95  
emi9752**



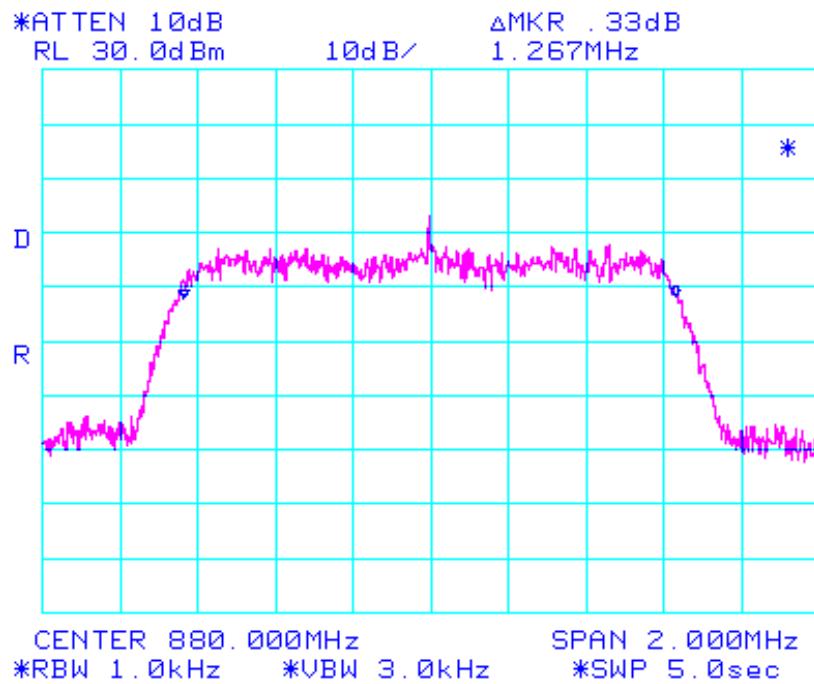


**Occupied B/W w/CDMA Input vs output Downlink IS-95  
emi9752**



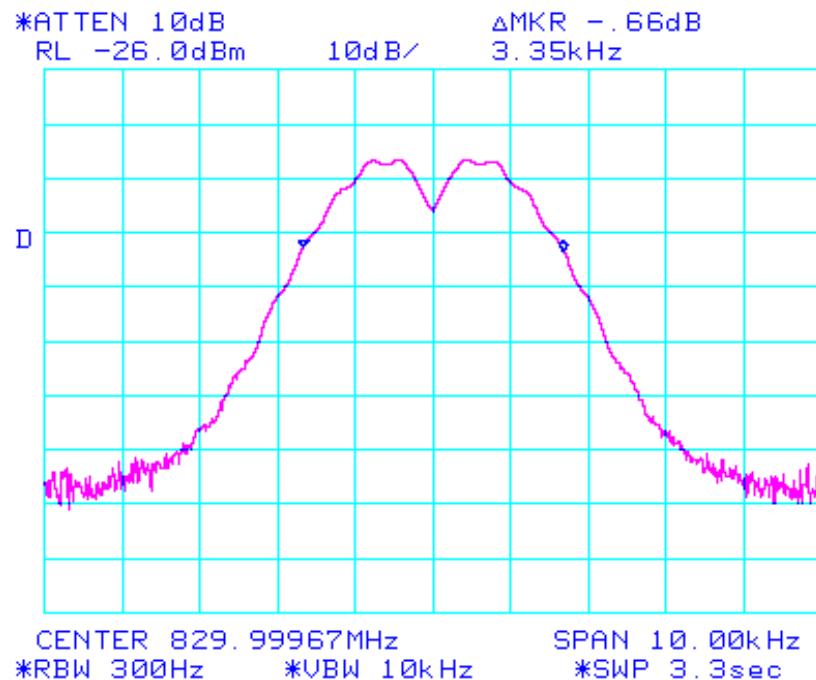


**CDMA Occupied B/W at remote Antenna terminal Downlink  
emi9752 IS-95**



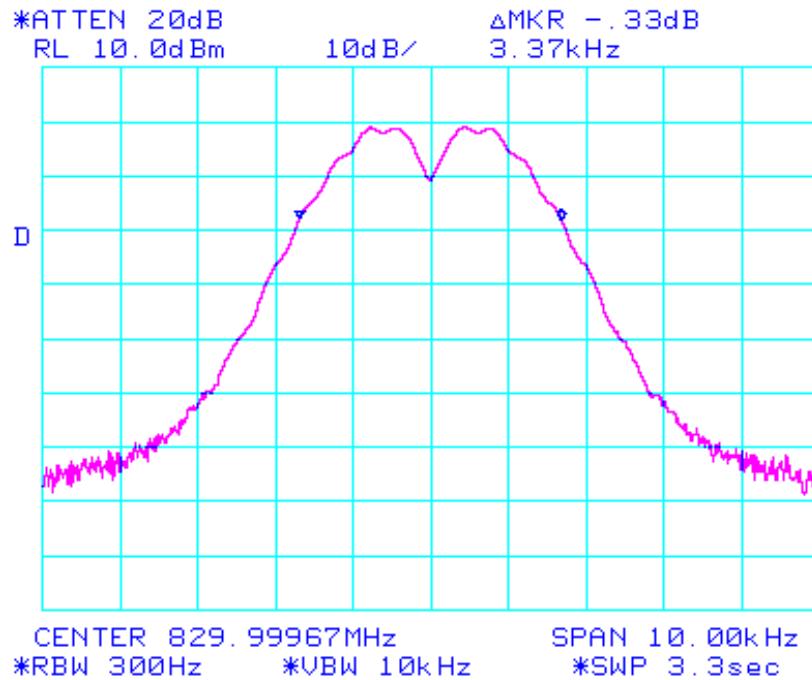


### FM Occupied B/W at Input side Uplink emi9752



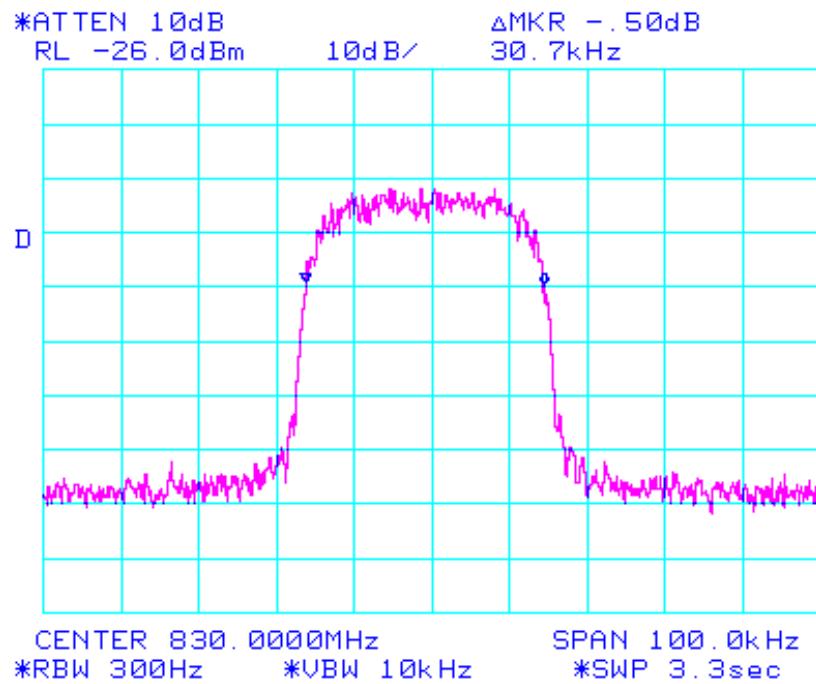


### FM Occupied B/W at Hub's output Uplink emi9752



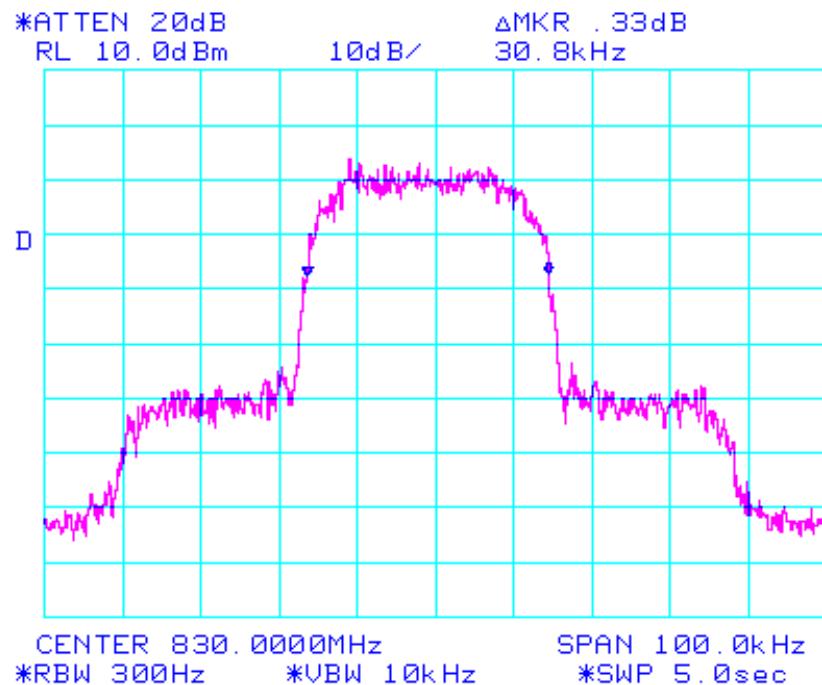


NADC Occupied B/W at input side Uplink emi9752



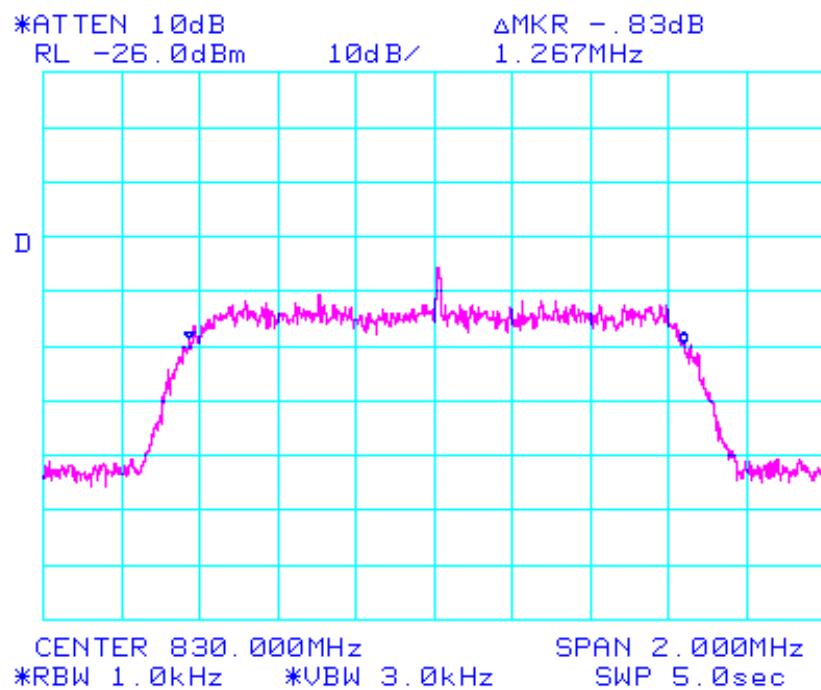


### NADC Occupied B/W at Hub's RF output Uplink emi9752



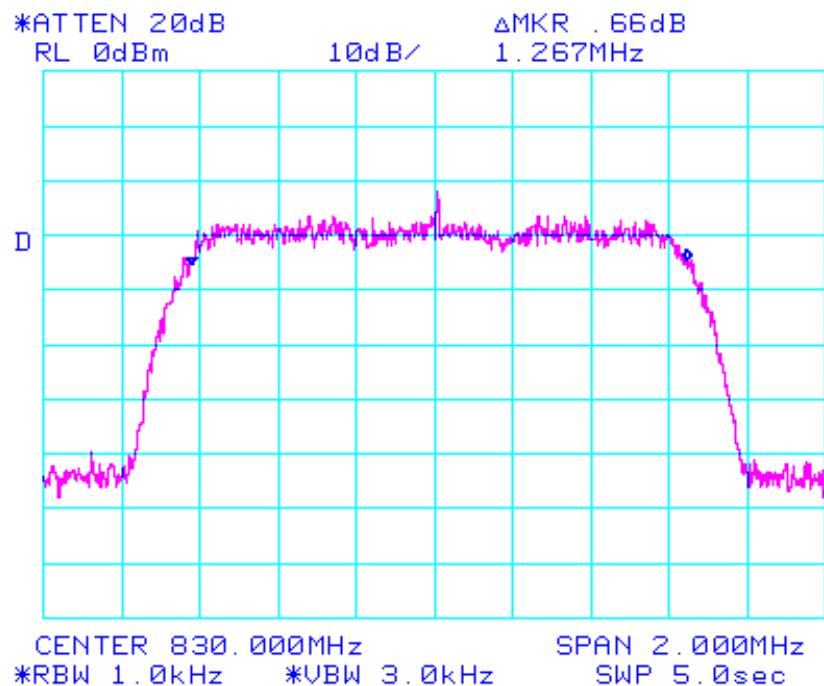


### CDMA Occupied B/W at Input side Uplink emi9752





**CDMA Occupied B/W at Hub's output Uplink emi9752**





### **6.3 TEST TYPE: RF Power Output**

**6.3.1 TECHNICAL SPECIFICATION:** 47 CFR 2.1046 and 22.913(a)

**6.3.2 TEST DATE(S):** March 21, 2002

#### **6.3.3 MEASUREMENT PROCEDURES:**

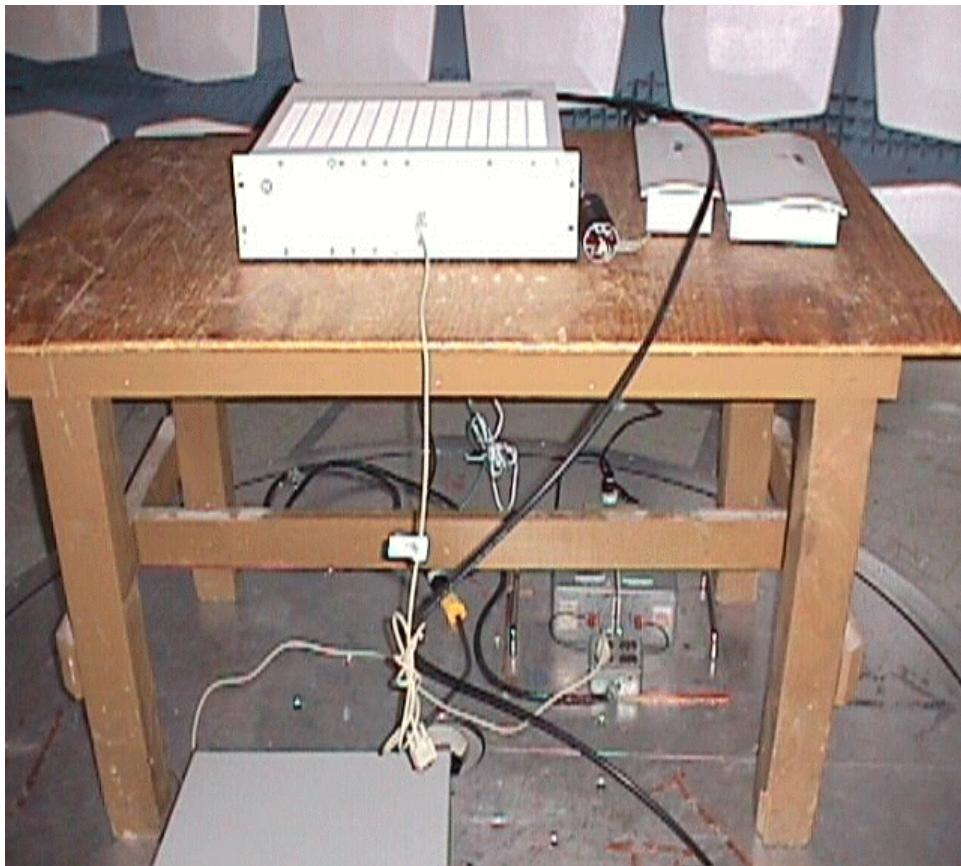
As required by 47 CFR 2.1046, *RF power output measurements* were made at the RF output terminals using an attenuator and spectrum analyzer.

Plots of the RF output Power level, as measured at the RF output of the signal generator and at the RF output terminals of the EUT are included in this application as file attachment

#### **6.3.4 RESULTS:**

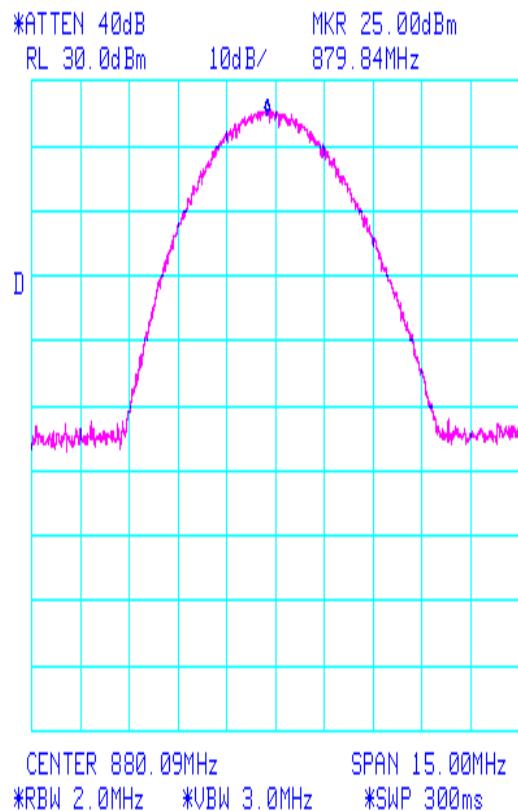
Equipment complies with 47 CFR 2.1046 and 22.913(a). The Cellular repeater/booster power does not exceed 500 W (57 dBm) at the carrier frequency.

Photograph of Antenna Conducted Spurious Emissions and  
RF Power Output Test Configuration



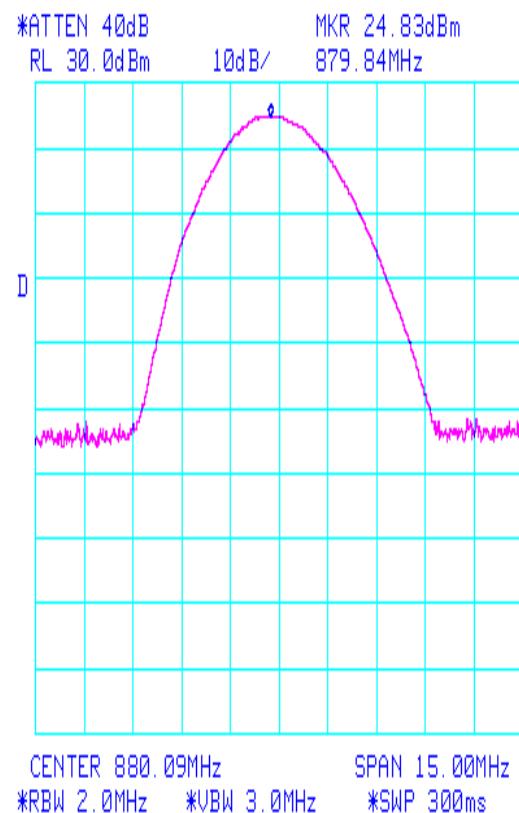


RF output power CDMA IS-95 Downlink Met 12061 With input 0dBm



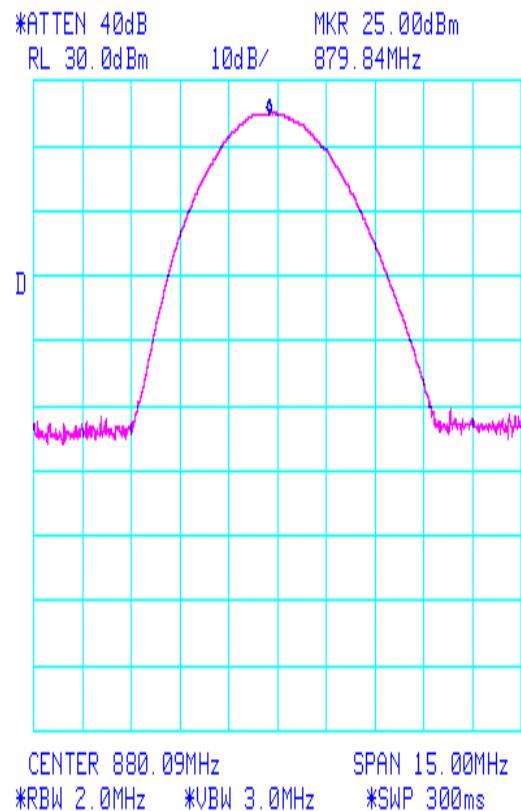


RF output power EDGE (TDMA) Downlink Met12061 With input 5dBm



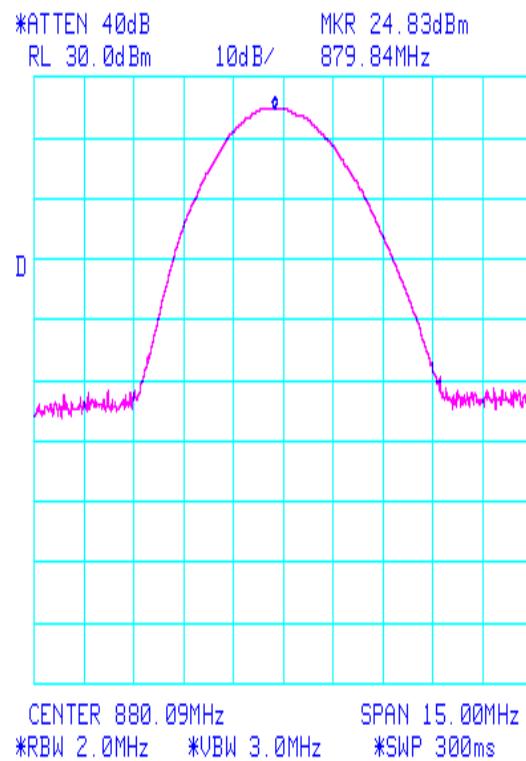


RF output power GSM Downlink Met 12061 With input 8.1 dBm





RF output power AMPS Downlink Met 12061 With input 8.1 dBm





## **6.5 TEST TYPE:** Spurious Emissions at Antenna Terminals— Downlink Channels

### **6.5.1 TECHNICAL SPECIFICATION:** 47 CFR 2.1051; 22.917(e)

### **6.5.2 TEST DATE(S):** March 21, 2002

### **6.5.3 MEASUREMENT PROCEDURES:**

As required by 47 CFR 2.1051, *spurious emissions at antenna terminal measurements* were made at the RF output terminals using a 50 S attenuator and spectrum analyzer set for a 100 kHz bandwidth. The RBW of 100 kHz was used to investigate and search for spurious emissions; any spurs found with this technique are to be re-measured with the appropriate 1MHz RBW. There were no detectable spurious emissions for this EUT. This test was performed with Digitally modulated carrier signals. The Digital signal generator was adjusted for continuous transmit on frequencies in both the uplink and down-link frequency bands. The frequency spectrum was investigated from 9.0 KHz to 10 GHz. For measuring emissions above 2 GHz, a high-pass filter was used to eliminate the fundamental transmit frequency to prevent possible saturation effects on the front end of the spectrum analyzer.

### **6.5.4 RESULTS:**

Equipment complies with Section 2.1051and 22.917(e).

As recommended in 47 CFR 22.917(e), a 100kHz bandwidth was chosen to measure the peak of any spurious emission. The unit was exercised using signal types required by 47 CFR 2.1051.

Spur limit =  $P_o - (43 + 10\log P) = 132.5 \text{ dB}\mu\text{V} - (38.44 \text{ dB}) = 94 \text{ dB}\mu\text{V} = -13.1 \text{ dBm}$

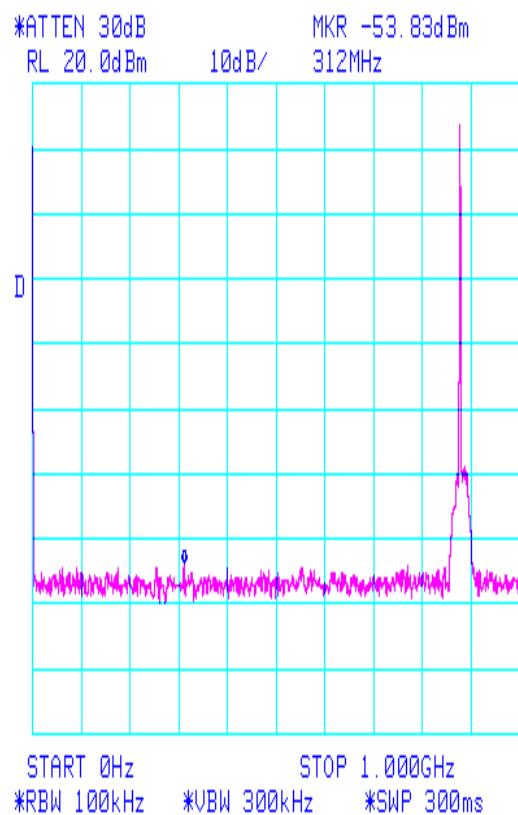
### **SUMMARY OF SPURIOUS EMISSIONS AT ANTENNA TERMINALS - DownLink (Base)**

Frequency Range	Emission Frequency	Emission Level (dBm)	Limit (dBm)
0 kHz - 1 GHz	312 MHz	-53.83 (Noise Floor)	-13.1
1 GHz - 3 GHz	1.263 GHz	-52.67 (Noise Floor)	-13.1
3 GHz - 6 GHz	3.40 GHz	-52.67 (Noise Floor)	-13.1
6 GHz - 9 GHz	7.455 GHz	-51.33 (Noise Floor)	-13.1

Plots on the following pages illustrate compliance to the required rule parts.

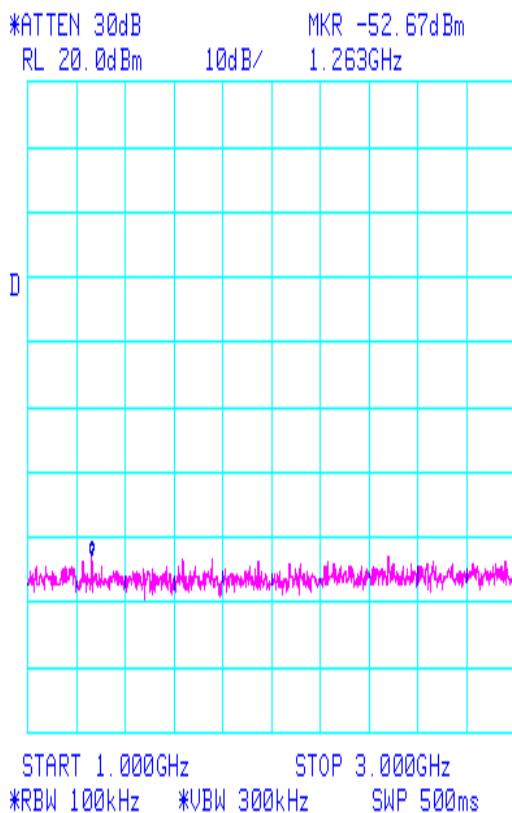


## Conducted spur emissions at antenna port Met 12061 Downlink



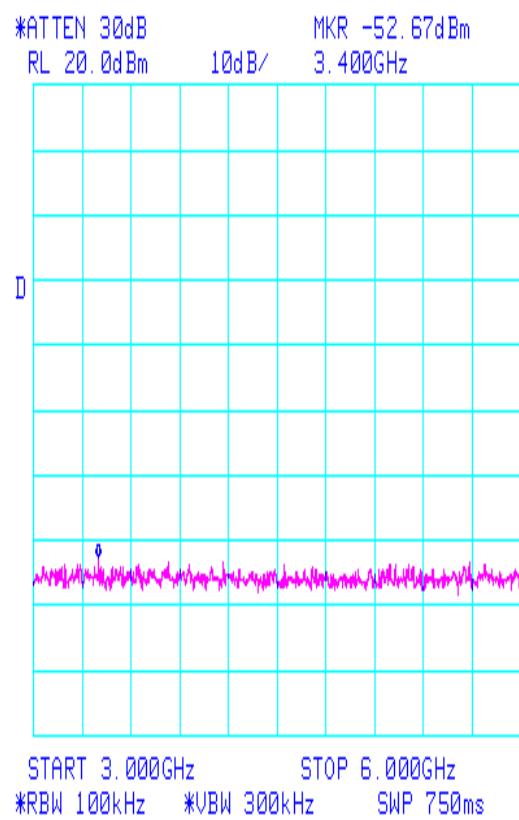


## Conducted spur emissions at antenna port downlink Met 12061



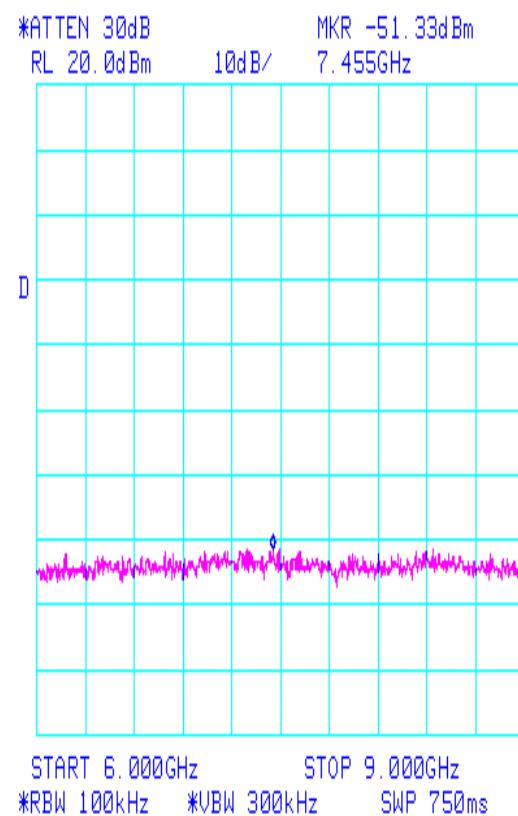


Conducted spur emissions at antenna port downlink Met 12061





Conducted spur emissions at antenna port downlink Met 12061





**6.7 TEST TYPE:** Intermodulation Spurious Emissions Antenna Terminals

**6.7.1 TECHNICAL SPECIFICATION:** 47 CFR 2.

**6.7.2 TEST DATE(S):** March 21, 2002

**6.7.3 MEASUREMENT PROCEDURES: (DOWNLINK)**

Modulation products outside of the authorized band are attenuated at least  $43 + 10 \log (P)$  below the level of the modulated carrier.

**6.7.4 RESULTS:**

Equipment complies with 47CFR 2.1051. Plots of the spurious emissions as measured at the antenna port are included in this application as follows:

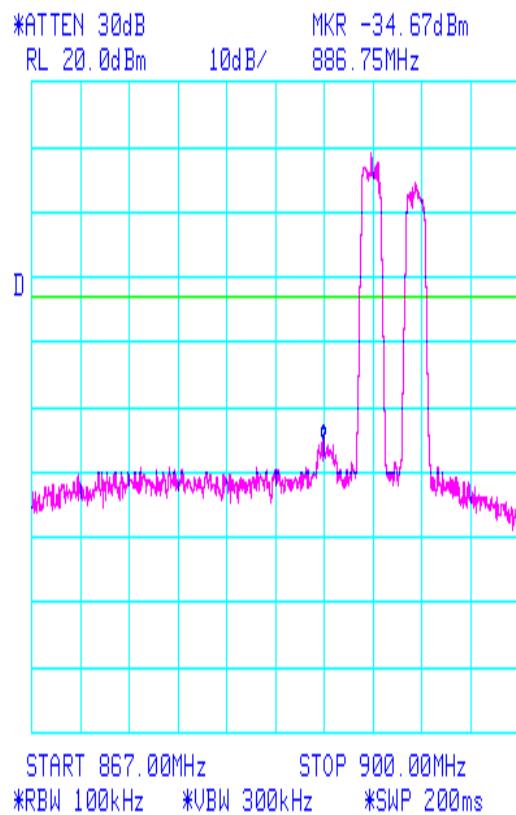
**Intermodulation Spurious Products from 2-tone Simultaneous RF Injection** At low side and high side of PCS band. **Downlink**

Spur limit =  $P_o - (43 + 10\log P) = 132.5 \text{ dB}\mu\text{V} - (38.44 \text{ dB}) = 94 \text{ dB}\mu\text{V} = -13.1 \text{ dBm}$

modulation type	Intermodulation products (MHz)	Emission Level (dBm)	Limit (dBm)
CDMA	886.75 866.55	-34.67 -37.33	-13.1



Intermodulation products @ high side of downlink 800MHz band Met12061





Intermodulation products @ low side of downlink 800MHz band Met12061

