

# FCC PART 22 & PART 24 TYPE APPROVAL EMI MEASUREMENT AND TEST REPORT

For

## AXESSTEL, INC.

6305 Lusk Blvd.  
San Diego, CA 92121

**FCC ID: PH7VZ1-3DWCB**

2003-08-15

<b>This Report Concerns:</b> <input checked="" type="checkbox"/> Original Report	<b>Equipment Type:</b> Cellular Phone
<b>Test Engineer:</b> Benjamin Jin / 	
<b>Report No.:</b> R0307291	
<b>Test Date:</b> 2003-08-02	
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**Note:** This test report is specially limited to the above client company and the product model only. It may not be duplicated without prior written consent of Bay Area Compliance Laboratory Corporation. This report **must not** be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

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## 1 - GENERAL INFORMATION

### 1.1 Product Description for Equipment Under Test (EUT)

The *Axesstel, Inc.* 's product, FCC ID:PH7VZ1-3DWCB or the "EUT" as referred to in this report is a hybrid cordless/cellular phone. The EUT measures approximately 2.2" L x 0.9" W x 6.25" H.

\* *The test data gathered is from typical production samples provided by the manufacturer.*

### 1.2 Objective

This type approval report is prepared on behalf of *Axesstel, Inc.* in accordance with Part 2, Subpart J, Part 15, Subparts A and B, and Part 22 Subpart H, of the Federal Communication Commissions rules.

It is also prepared in accordance with Part 2, Subpart J, Part 15, Subparts A and B, and Part 24 Subpart E, of the Federal Communication Commissions rules.

The objective of the manufacturer is to demonstrate compliance with FCC rules for output power, modulation characteristic, occupied bandwidth, spurious emission at antenna terminal, band edge, conducted and radiated margin.

### 1.3 Related Submittal(s)/Grant(s)

No Related Submittals

### 1.4 Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following parts:

Part 15 Subpart B – Unintentional Radiators  
Part 22 Subpart H - Public Mobile Services  
Part 24 - Personal Communications Services

Applicable Standards: TIA EIA 137-A, TIA EIA 98-C, ANSI 63.4-1992, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

## 1.5 Test Facility

The Open Area Test site used by Bay Area Compliance Laboratory Corporation to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA.

Test site at Bay Area Compliance Laboratory Corporation has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-1992.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratory Corporation is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (NVLAP). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices, IEC/CISPR 22: 1998, and AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods under NVLAP Lab Code 200167.

## 1.6 Test Equipment List

Manufacturer	Description	Model	Serial Number	Cal. Due Date
HP	Spectrum Analyzer	8568B	2517A01610	2003-10-30
HP	Spectrum Analyzer	8593A	29190A00242	2004-05-01
HP	Amplifier	8447E	1937A01054	2004-05-01
HP	Quasi-Peak Adapter	85650A	2521A00718	2004-05-01
Com-Power	Biconical Antenna	AB-100	14012	2004-05-01
Com-Power	LISN	LI-200	12005	2004-03-28
Com-Power	LISN	LI-200	12008	2004-03-28
Com-Power	Log Periodic Antenna	AL-100	16091	2004-05-01
Com-Power	Log Periodic Antenna	AB-900	15049	2004-05-01
Rohde & Schwarz	EMI Test Receiver	ESPI	1147 8007 07	2003-12-03
Agilent	Spectrum Analyzer (9KHz – 40GHz)	8564E	08303	2004-08-01
Agilent	Spectrum Analyzer (9KHz – 50GHz)	8565EC	06042	2004-05-03
HP	Amplifier (1-26.5GHz)	8449B	3147A00400	2004-03-14
A.H.System	Horn Antenna (700MHz-18GHz)	SAS-200/571	261	2004-05-31

\* **Statement of Traceability:** Bay Area Compliance Laboratory Corp. certifies that all calibration has been performed using suitable standards traceable to the NATIONAL INSTITUTE of STANDARDS and TECHNOLOGY (NIST).

## **2 - SYSTEM TEST CONFIGURATION**

### **2.1 Justification**

The EUT was configured for testing in a typical fashion (as normally used in a typical application).

The final qualification test was performed with the EUT operating at normal mode.

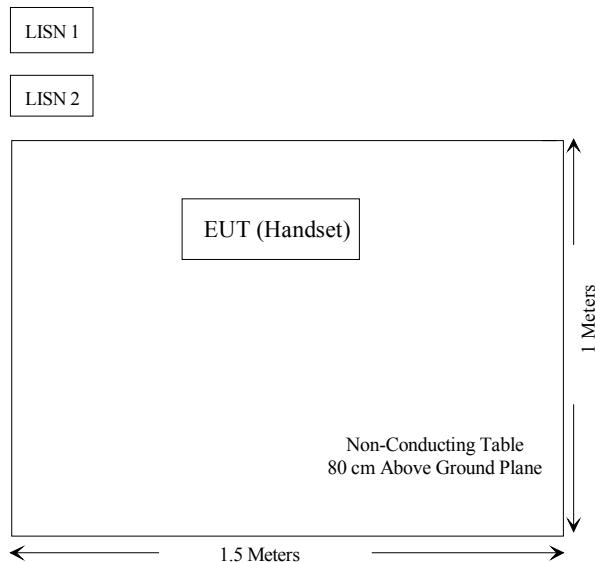
### **2.2 Block Diagram**

Please refer to Exhibit D.

### **2.3 Equipment Modifications**

No modifications were necessary for the EUT to comply with the applicable limits and requirements.

### **2.4 Test Setup Block Diagram**



### 3 - SUMMARY OF TEST RESULTS

FCC RULE	DESCRIPTION OF TEST	RESULT
§ 2.1046, § 22.913 (a), § 24.232 (b)	RF power output	Compliant
2.1047, 22.915 (a)	Modulation Characteristics	Compliant
§ 2.1049 § 22.917 § 24.238	Emission, Occupied Bandwidth	Compliant
§ 2.1051, § 22.917 § 24.238(a)	Spurious emissions at antenna terminals	Compliant
§ 2.1053, § 22.917 § 24.238 (a)	Radiated Spurious Emission	Compliant
§ 2.1055 (a) § 2.1055 (d) § 22.355 § 24.235	Frequency stability vs. temperature Frequency stability vs. voltage	Compliant
§ 2.1093 § 24.52	Radio frequency radiation exposure evaluation Portable Device	Compliant
§ 15.109	Radiated Emission Limit (Digital Portion)	Compliant
§ 15.205	Antenna Requirement	Compliant

## 4 – CONDUCTED OUTPUT POWER

### 4.1 Applicable Standard

According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts. According to FCC § 24.232(b), EIRP peak power for mobile/portable stations are limited to 2 watts.

### 4.2 Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

### 4.3 Test Equipment

Hewlett Packard HP8564E Spectrum Analyzer, Calibration Due Date: 2004-08-01.

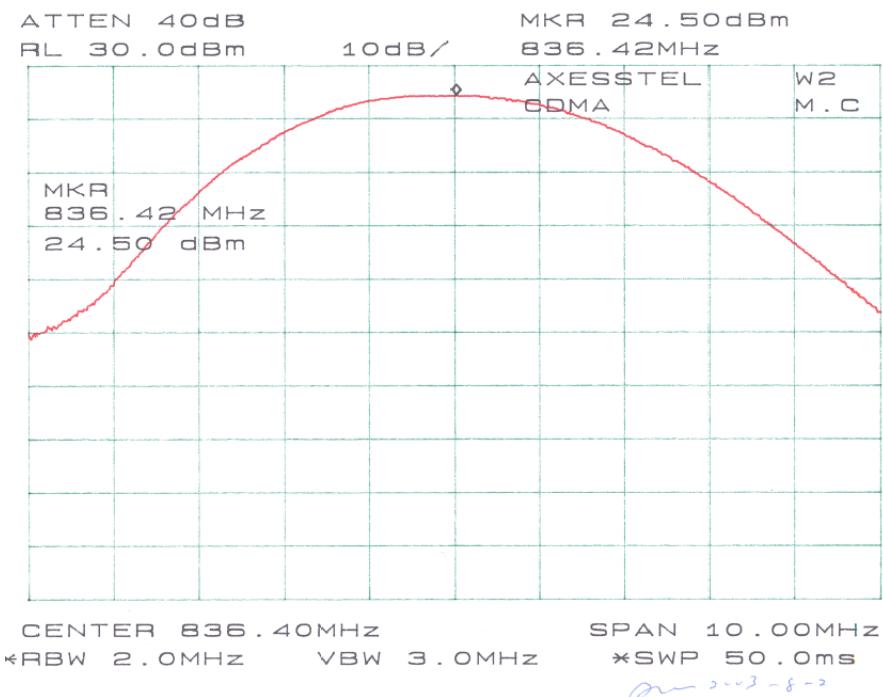
Hewlett Packard HP 7470A Plotter, Calibration not required.

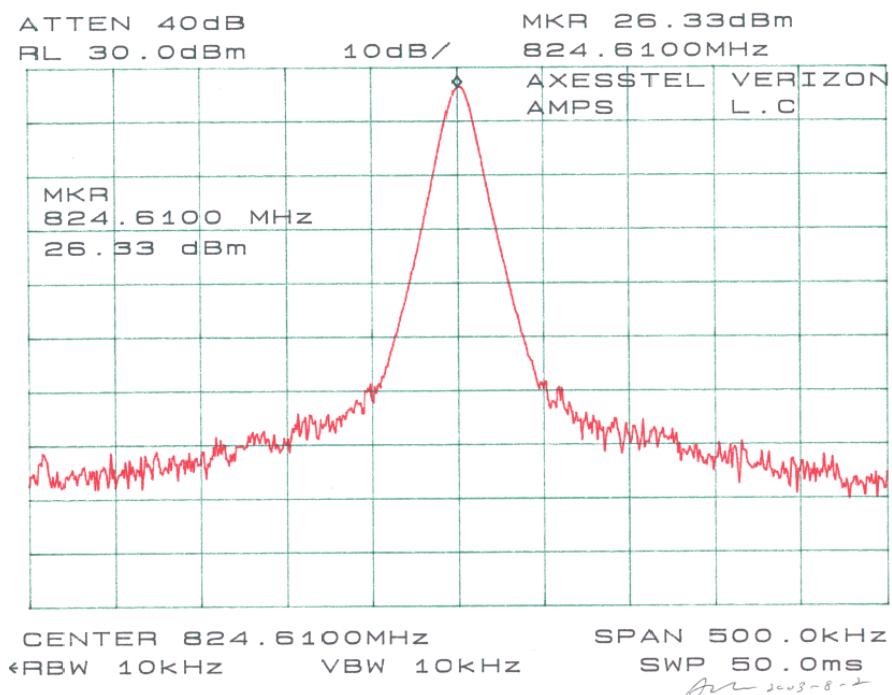
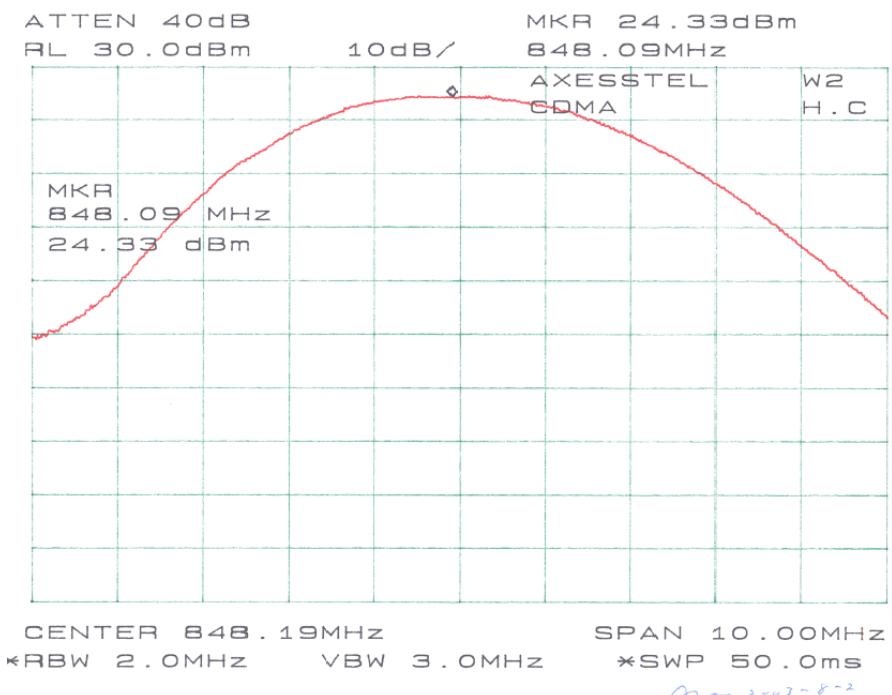
A.H. Systems SAS200 Horn Antenna, Calibration Due Date: 2004-05-31

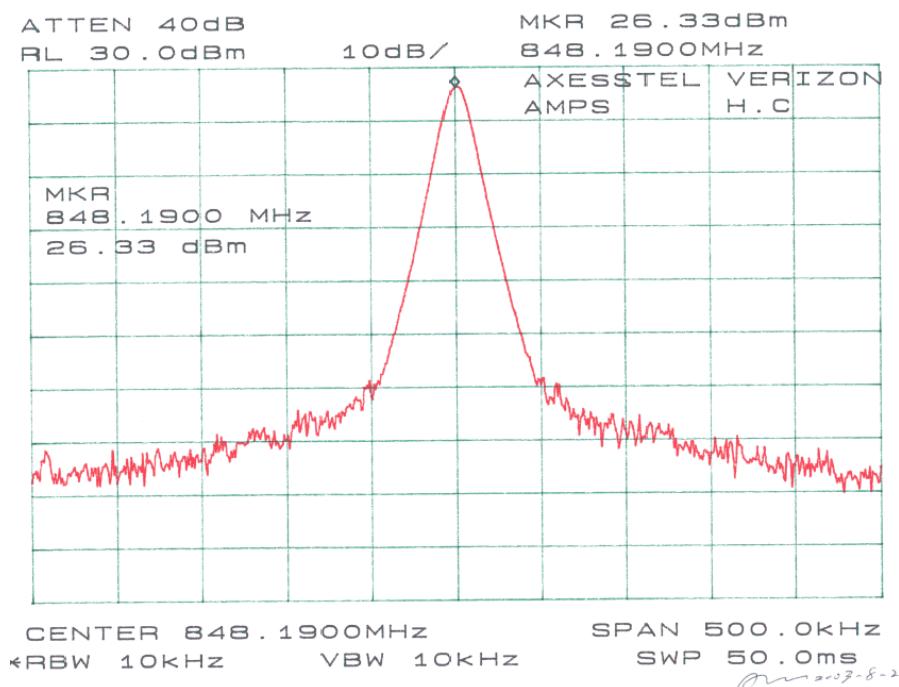
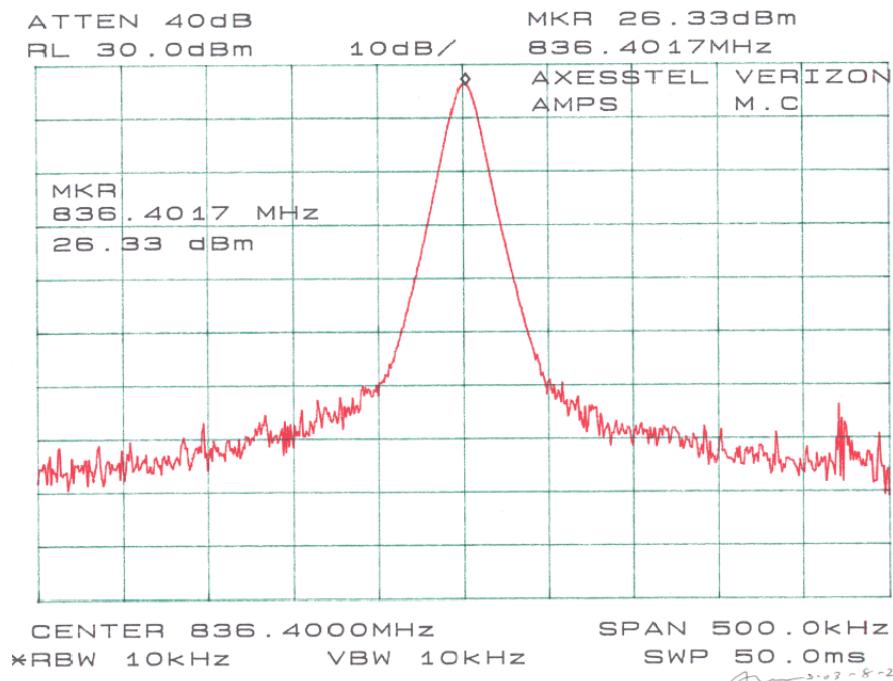
Com-Power AB-100 Dipole Antenna, Calibration Due Date: 2003-09-05

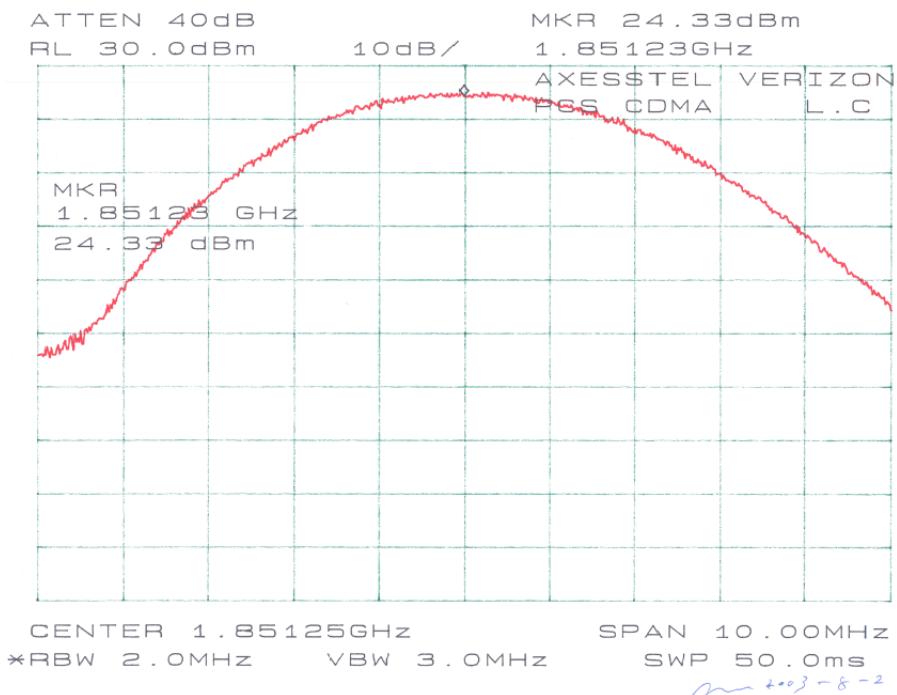
### 4.4 Test Results

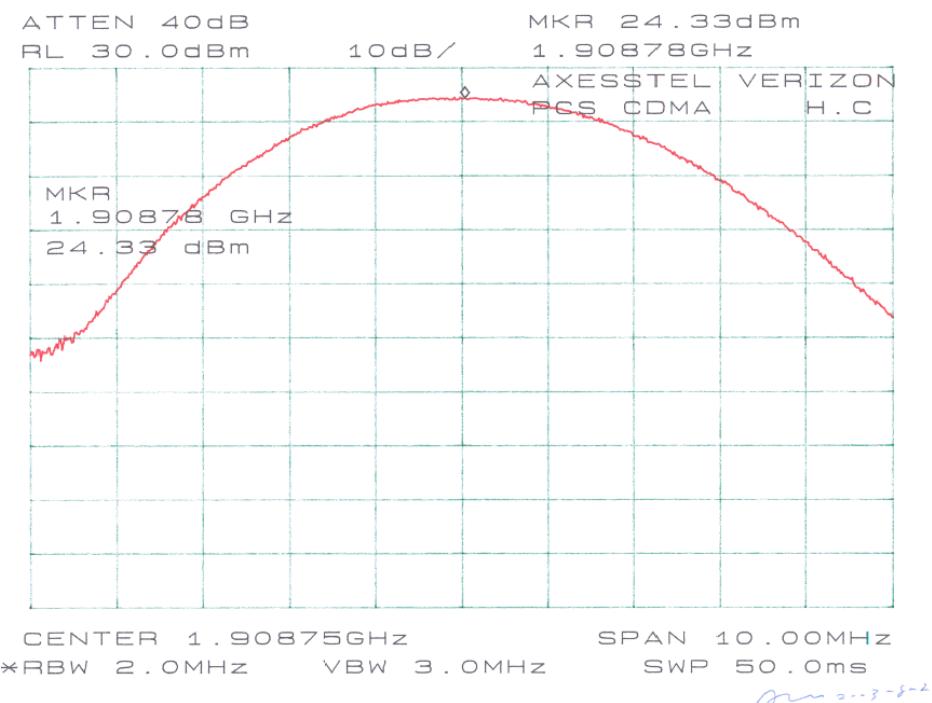
Modulation Type	Channel	Output Power in dBm	Output Power in W	Limit (W)
PMS	CDMA	Low	24.33	0.27
		Middle	24.50	0.28
		High	24.33	0.27
	AMPS	Low	26.33	0.43
		Middle	26.33	0.43
		High	26.33	0.43
PCS-CDMA	Low	24.33	0.27	2
	Middle	24.50	0.28	
	High	24.33	0.27	











## **5 - OCCUPIED BANDWIDTH**

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### **5.1 Applicable Standard**

Requirements: CFR 47, Section 2.1049, Section 22.905, and Section 22.911. All channels have a bandwidth of 40kHz and are designed by their center frequencies in MegaHertz.

According to FCC §2.1049 and §24.238 (b), the emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power.

### **5.2 Test Procedure**

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

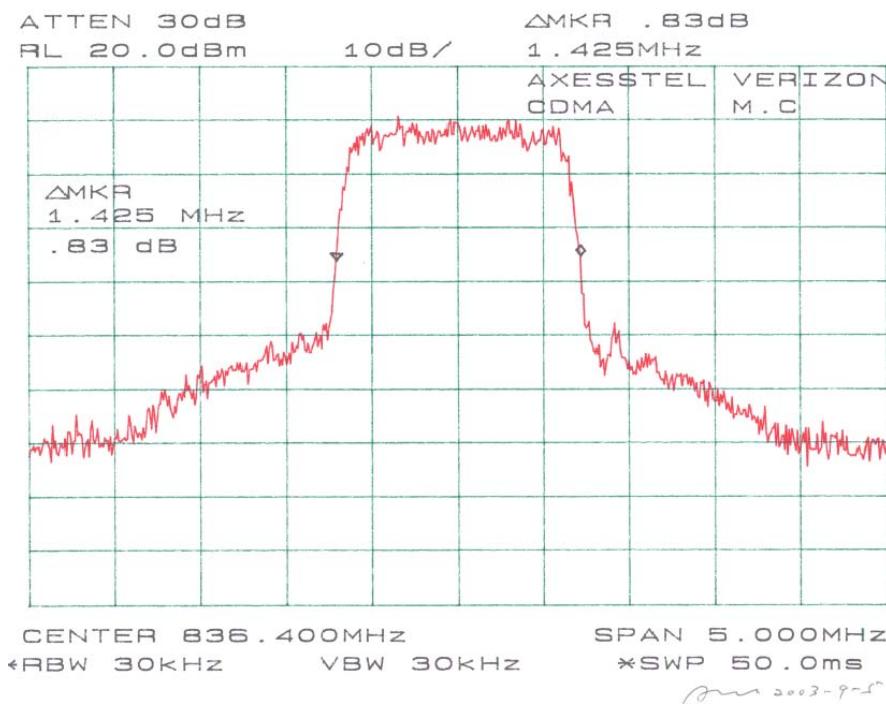
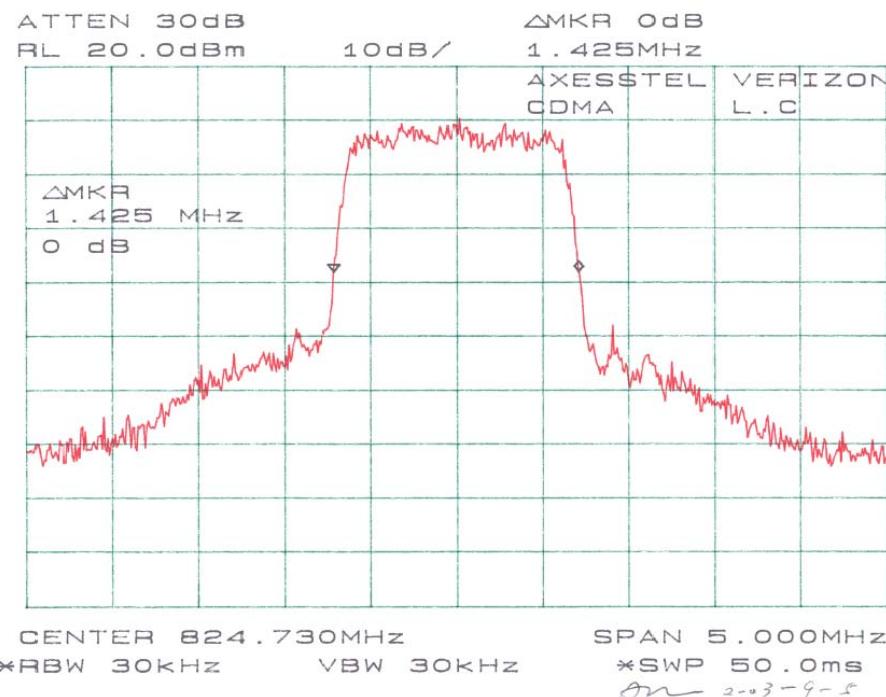
The resolution bandwidth of the spectrum analyzer was set at 30 KHz and the spectrum was recorded.

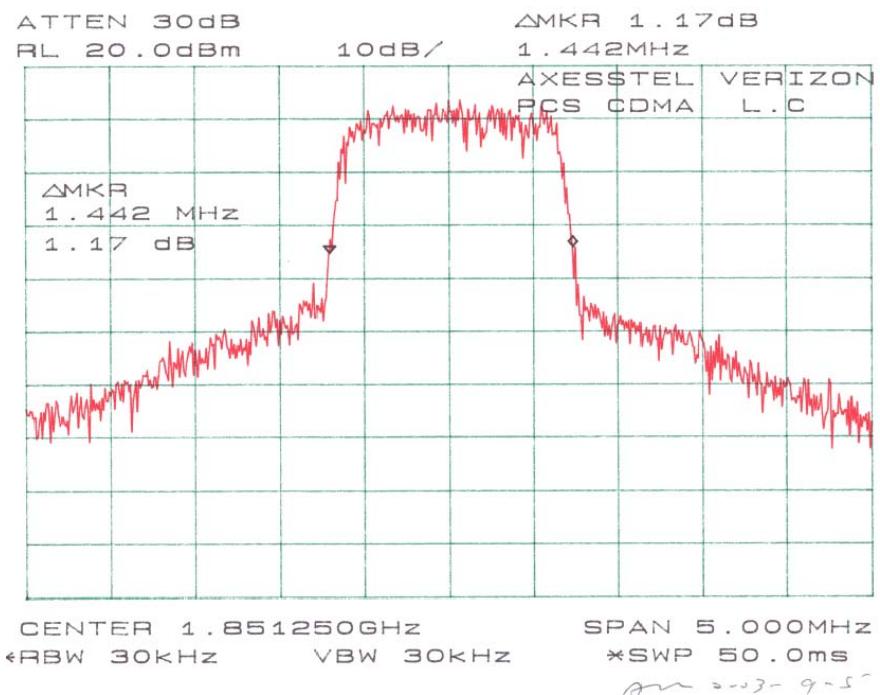
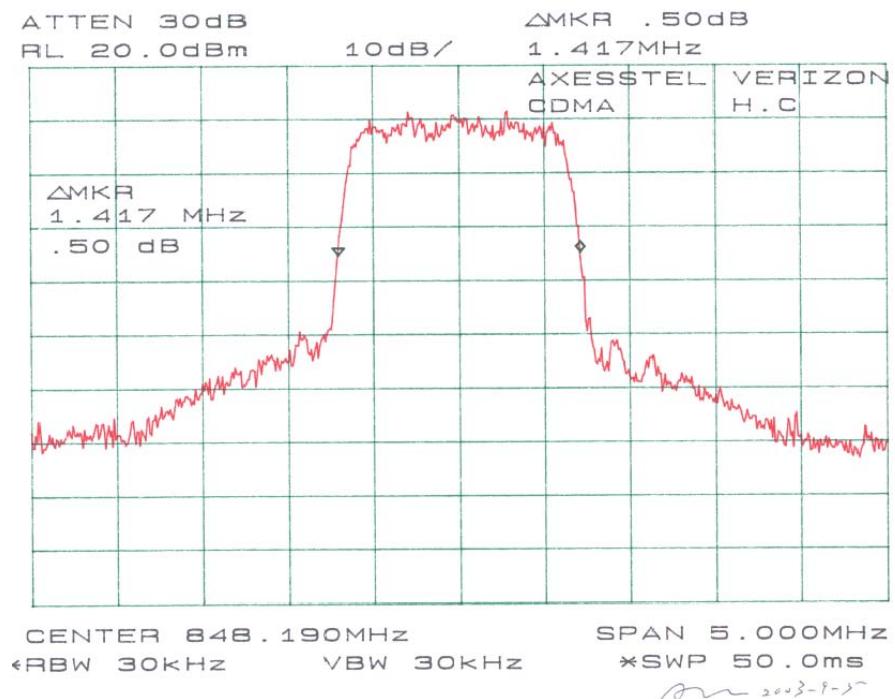
### **5.3 Test Equipment**

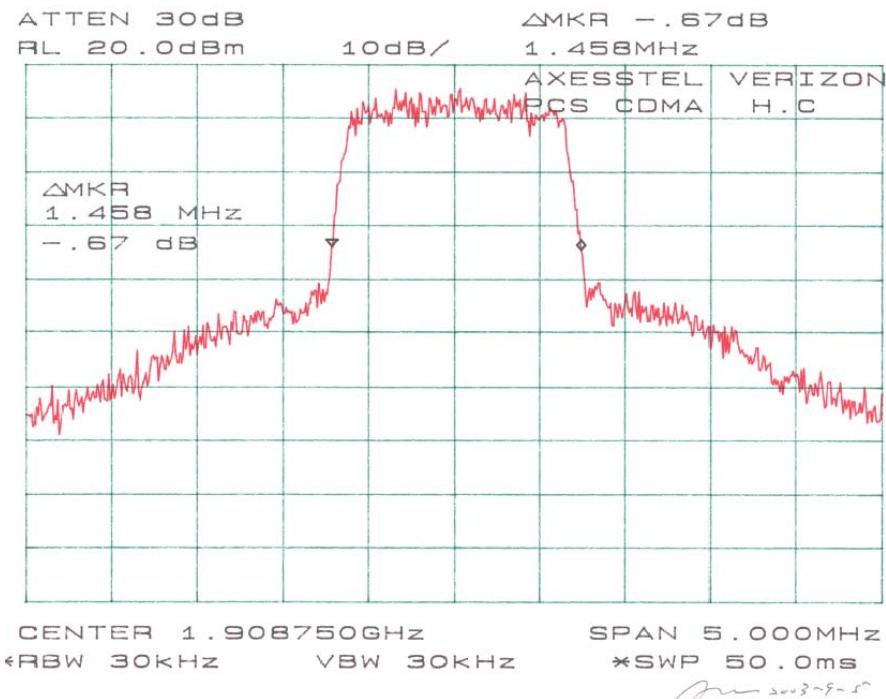
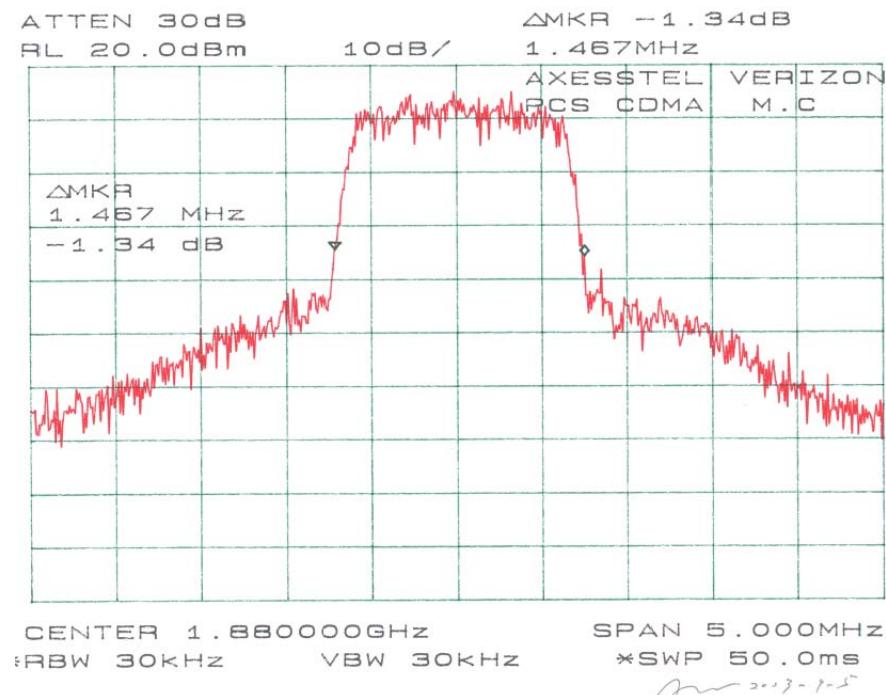
Hewlett Packard HP8566B Spectrum Analyzer  
Hewlett Packard HP 7470A Plotter

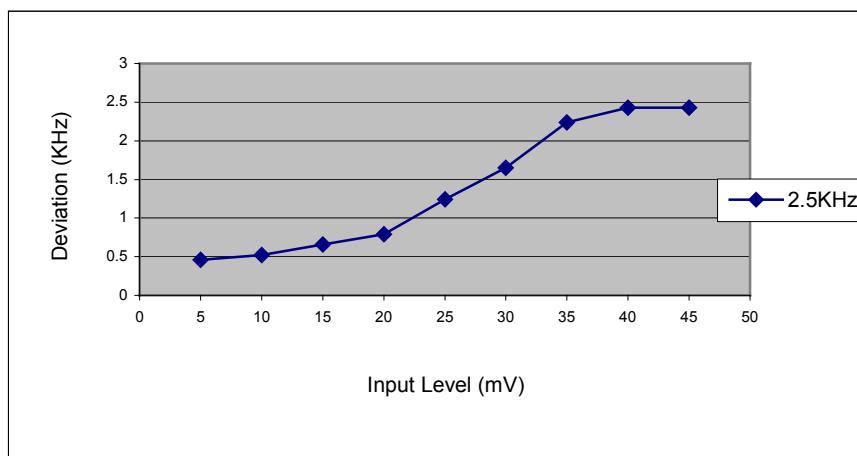
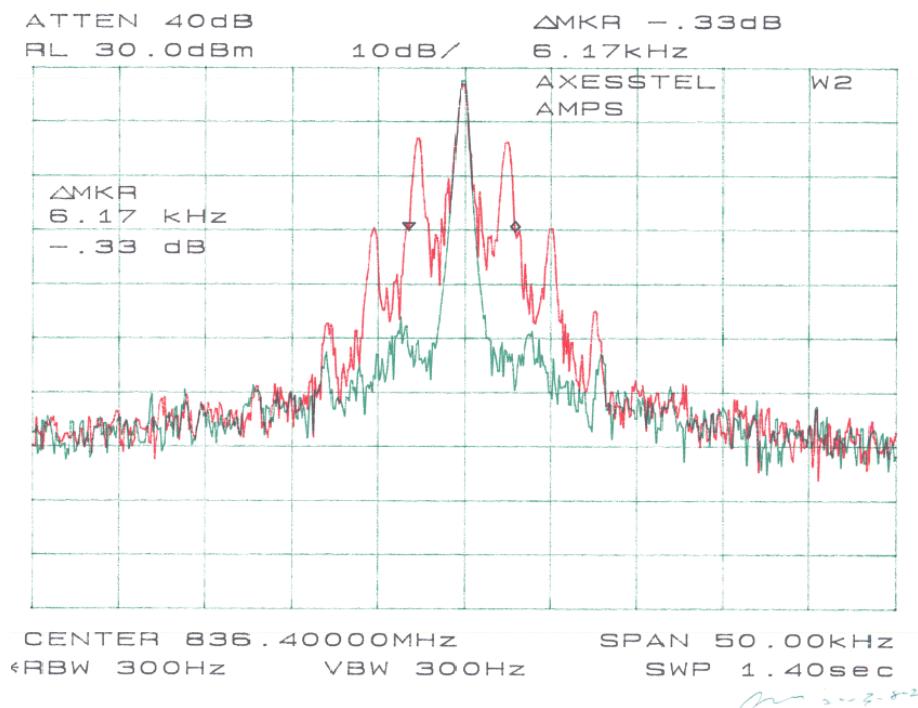
### **5.4 Test Results**

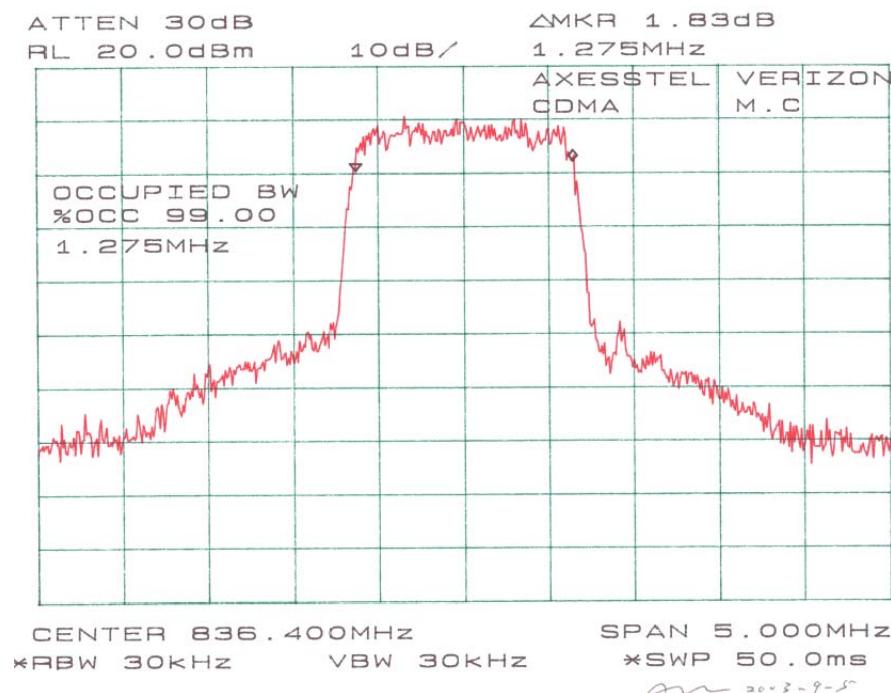
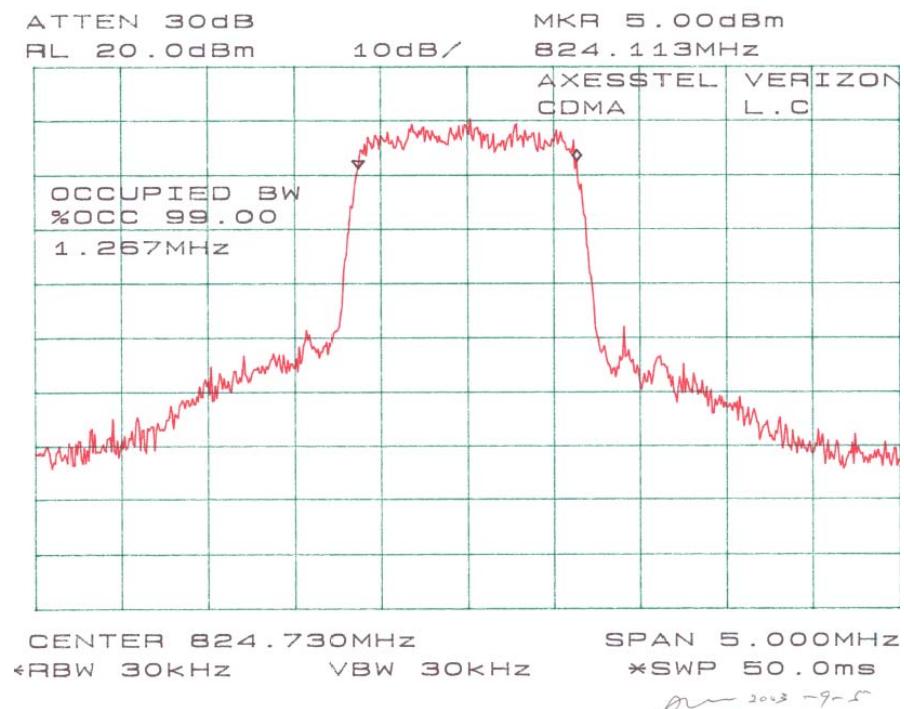
Please refer to the hereinafter plots.

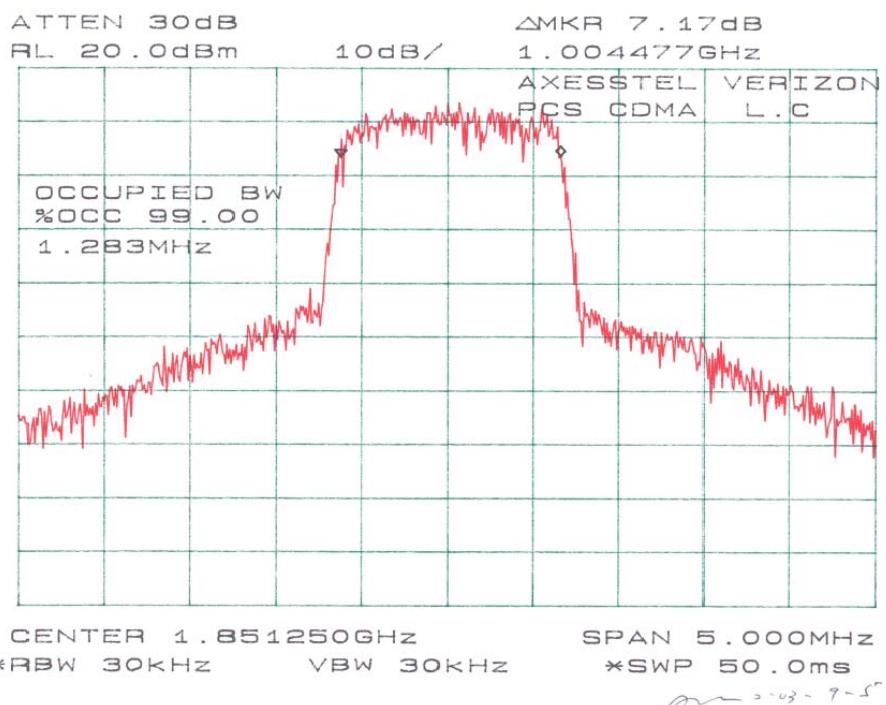
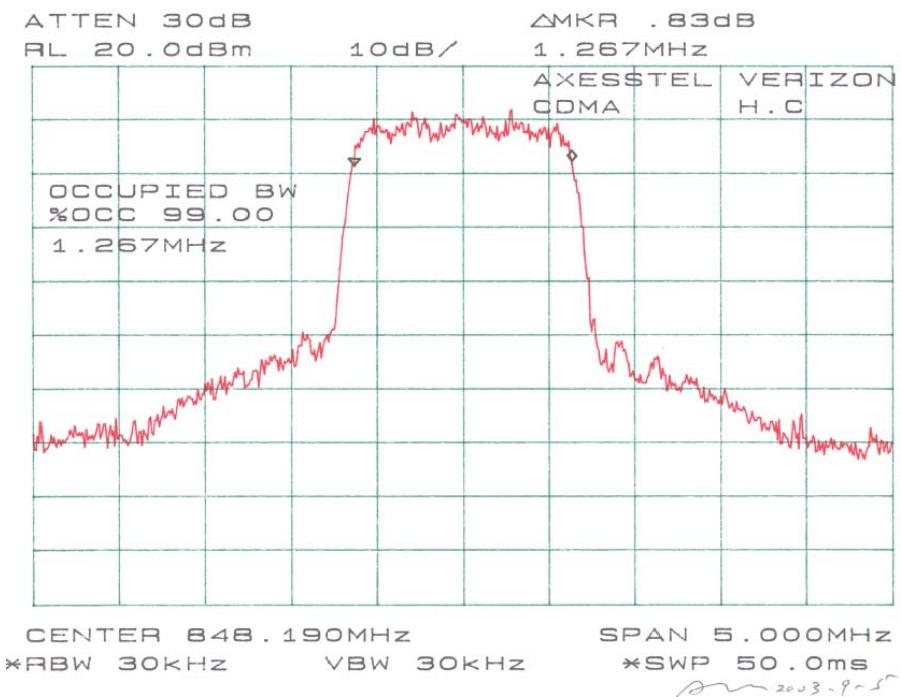


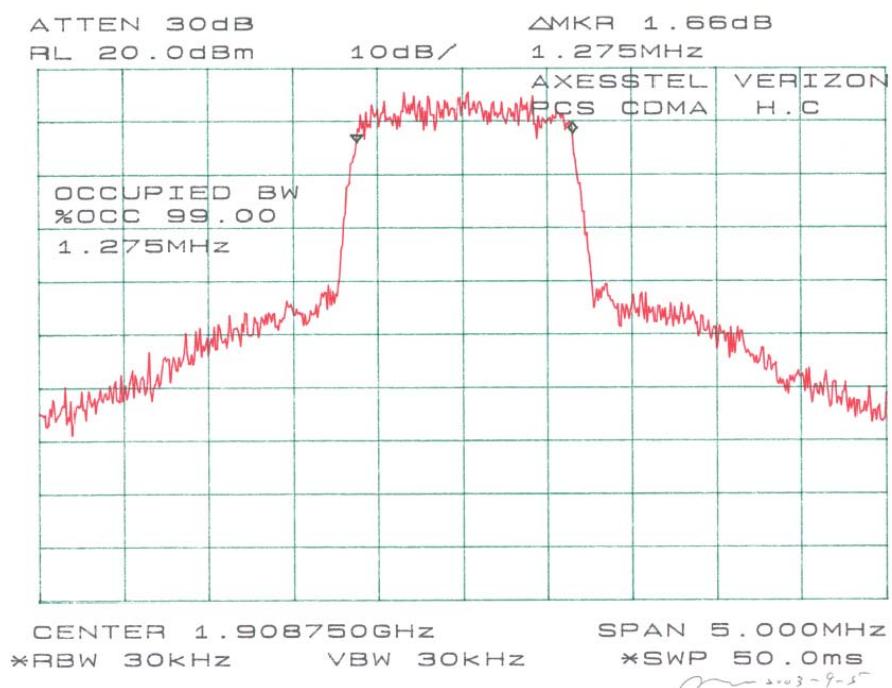
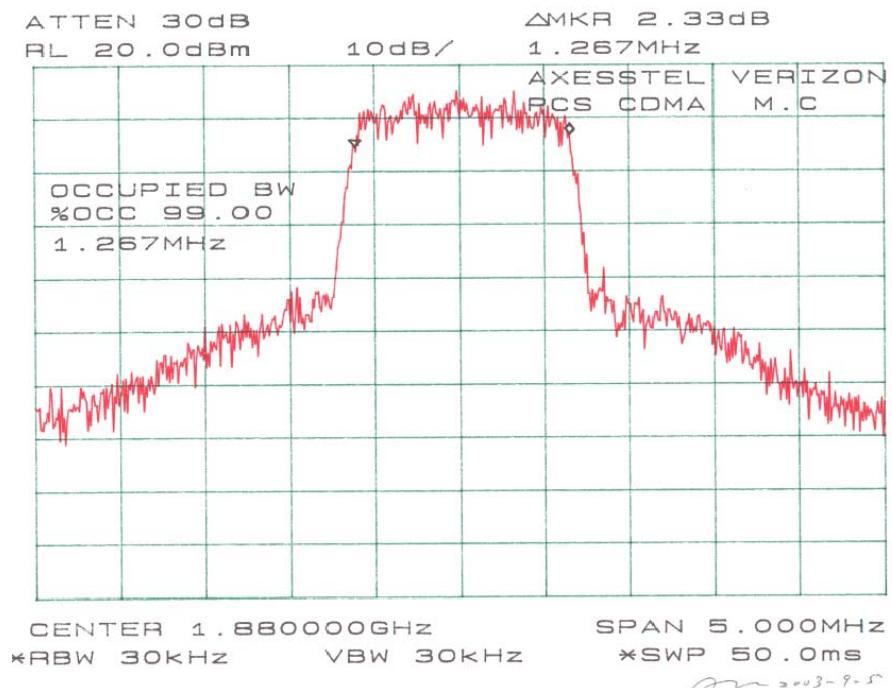






**Plots of 99% Occupied Bandwidth**





## **6 - MODULATION CHARACTERISTIC**

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### **6.1 Applicable Standard**

Requirement: FCC § 2.1047, § 22.915(a)

### **6.2 Test Procedure**

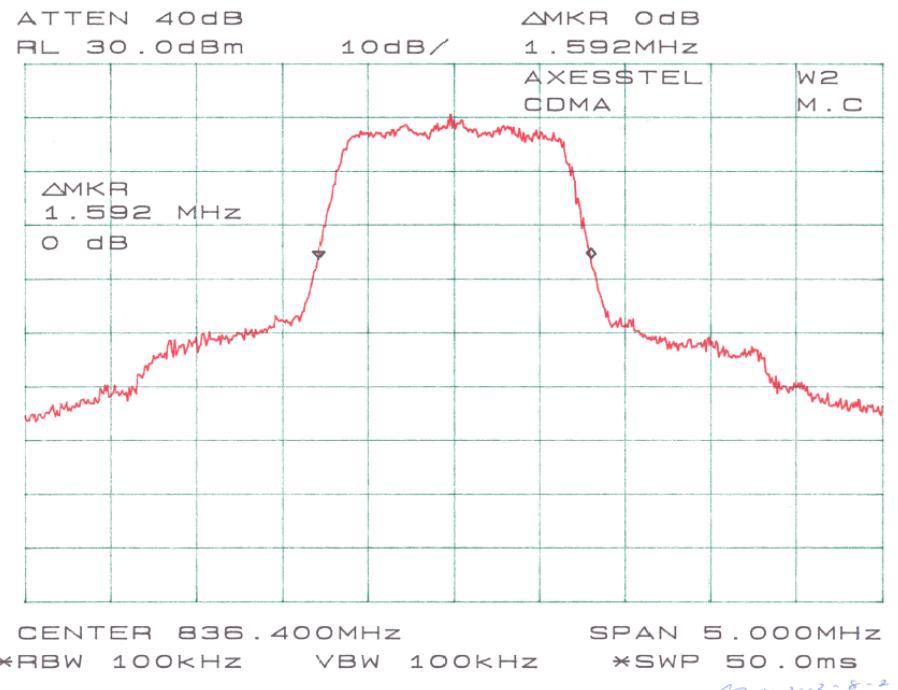
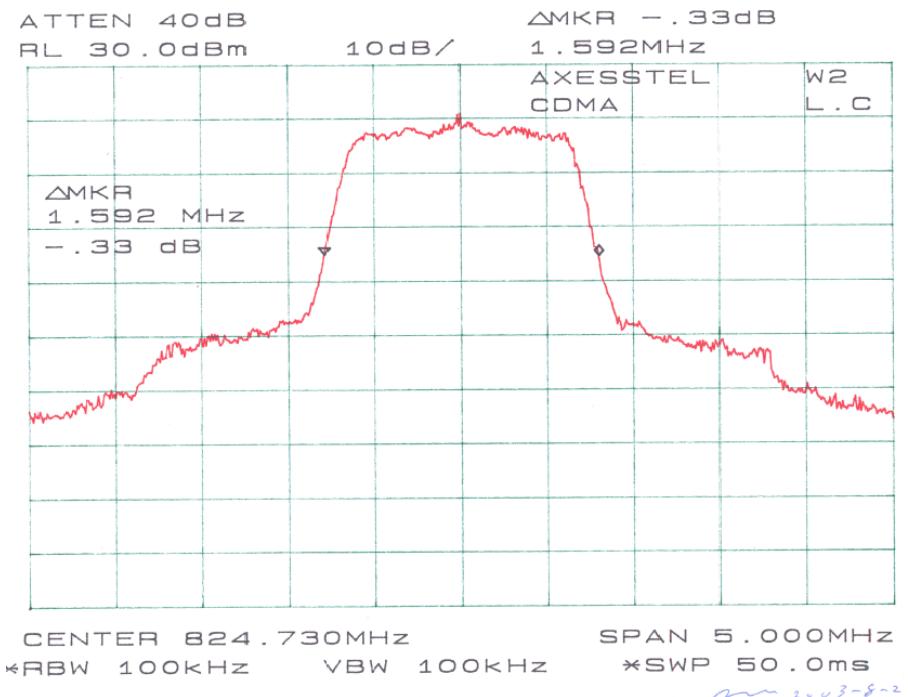
CDMA digital mode is used by EUT.

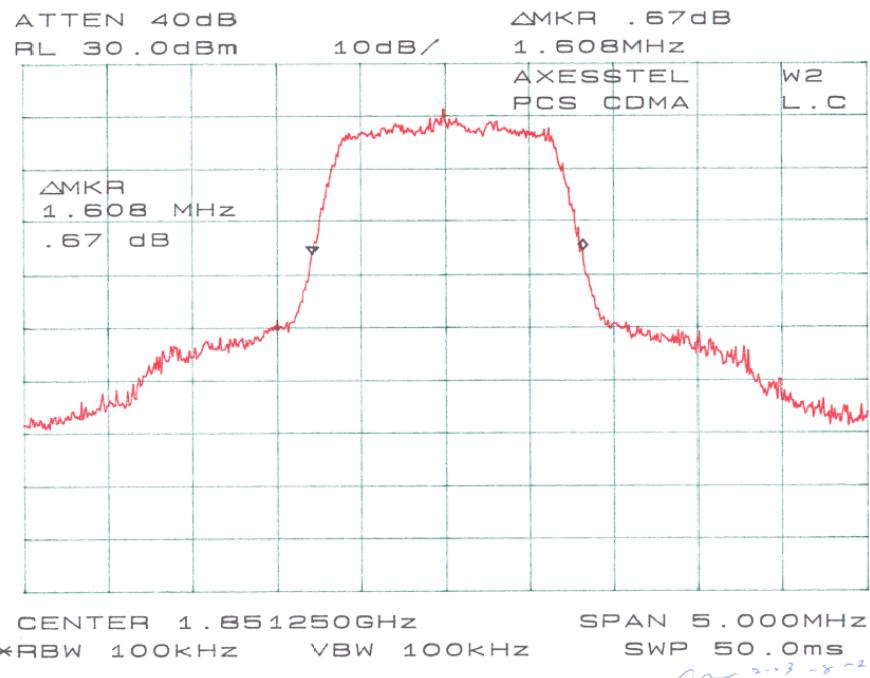
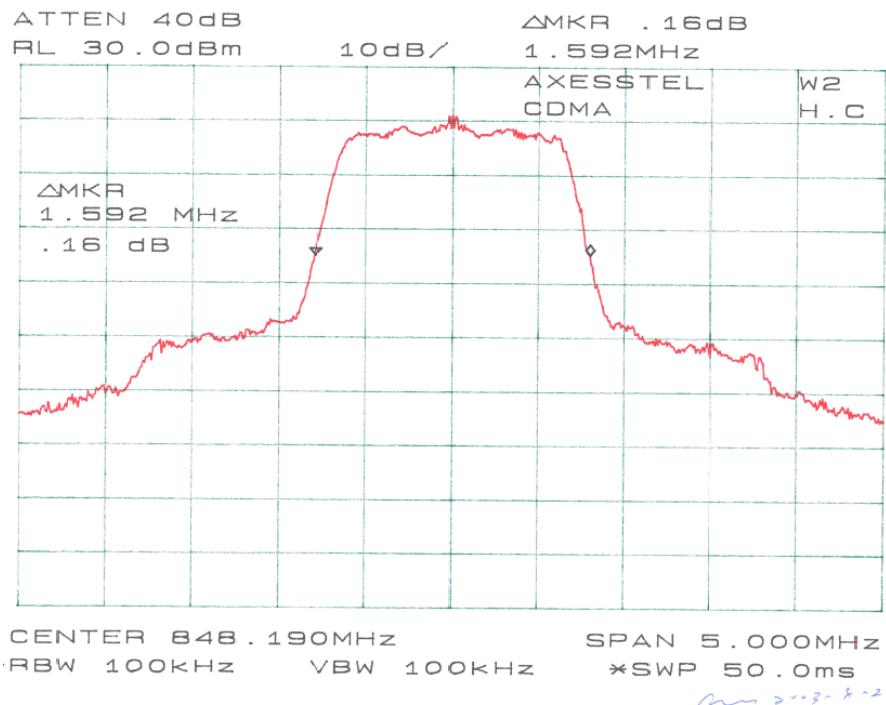
### **6.3 Test Equipment**

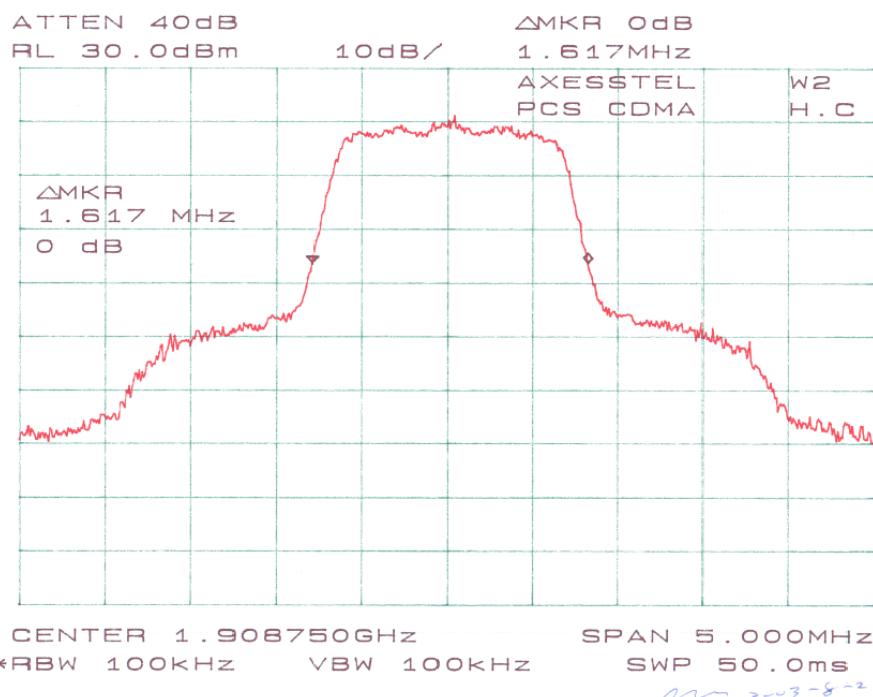
Hewlett Packard HP8566B Spectrum Analyzer  
Hewlett Packard HP 7470A Plotter

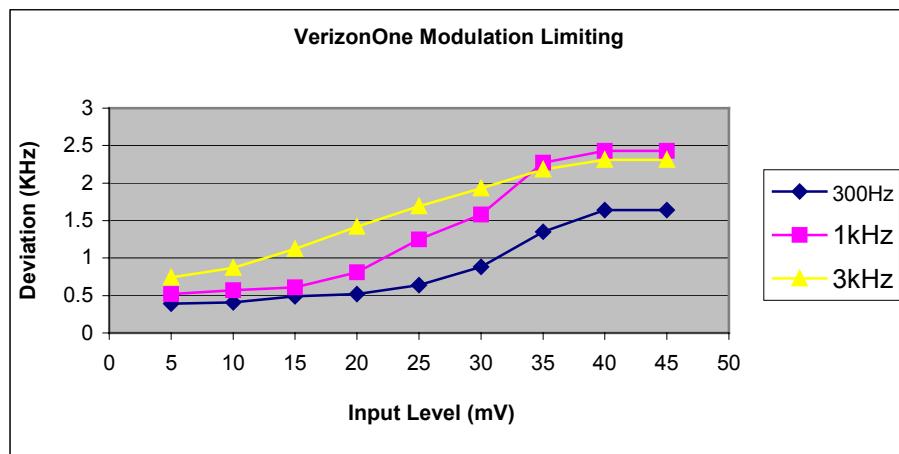
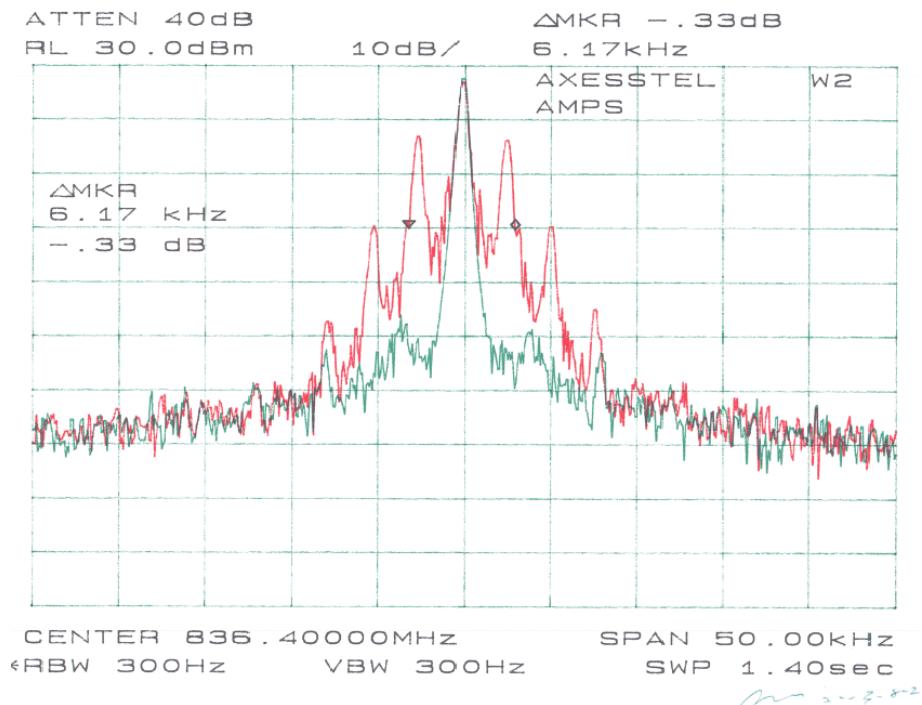
### **6.4 Test Results**

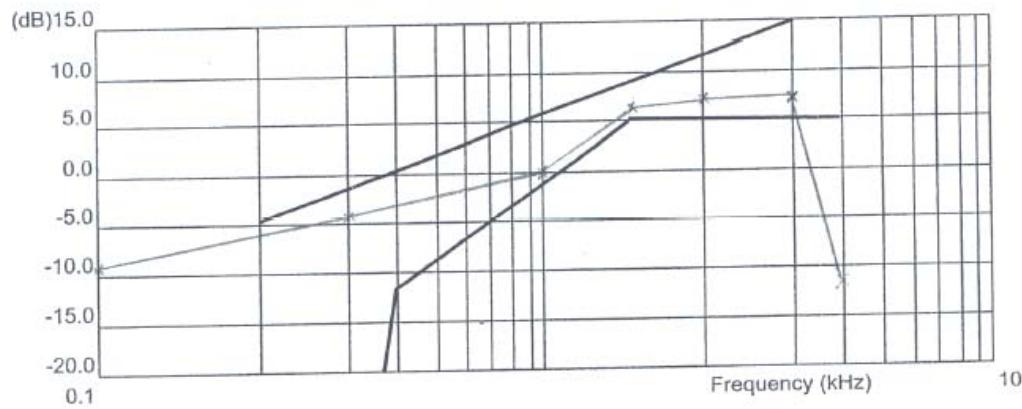
Please refer to the hereinafter plots.











## 7 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

### 7.1 Test Procedure

Requirements: CFR 47, § 22.917, § 2.1051, § 2.1057, § 24.238 (a)

(e) Out of Band Emissions.

The mean power of emissions must be attenuated below the mean power of the unmodulated carrier (P) on any frequency twice or more than twice the fundamental frequency by at least  $43 + 10 \log P$  dB.

(f) Mobile Emissions in Base Frequency Range.

The mean power of any emissions appearing in the base station frequency range from cellular mobile transmitters operated must be attenuated to a level not to exceed -80 dBm at the transmit antenna connector.

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049.

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in § 2.1057.

### 7.2 Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to 10<sup>th</sup> harmonic.

### 7.3 Test Equipment

HP 8566B Spectrum Analyzer

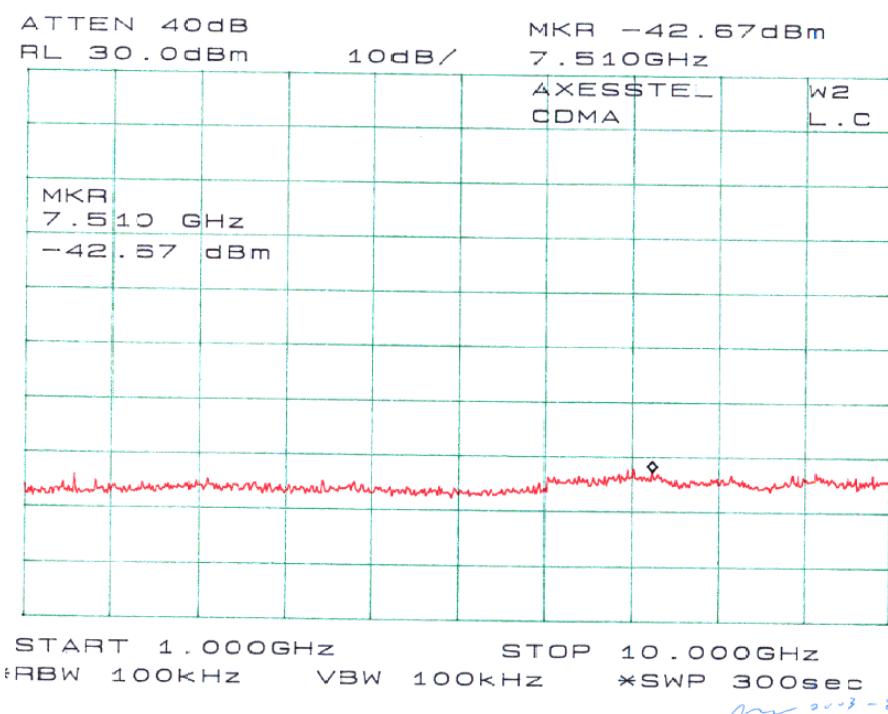
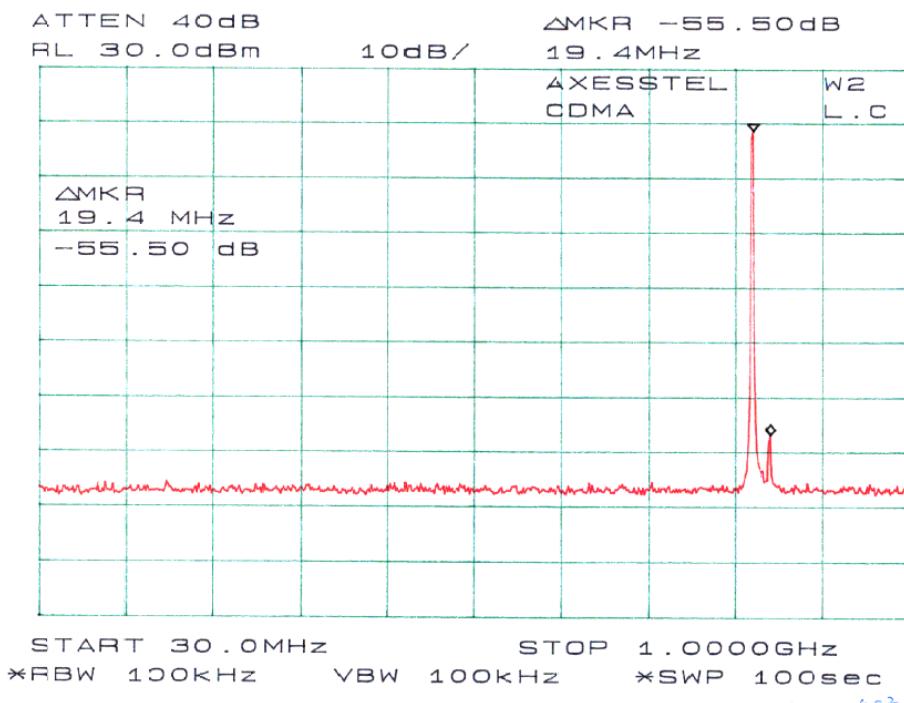
HP 7470A Plotter

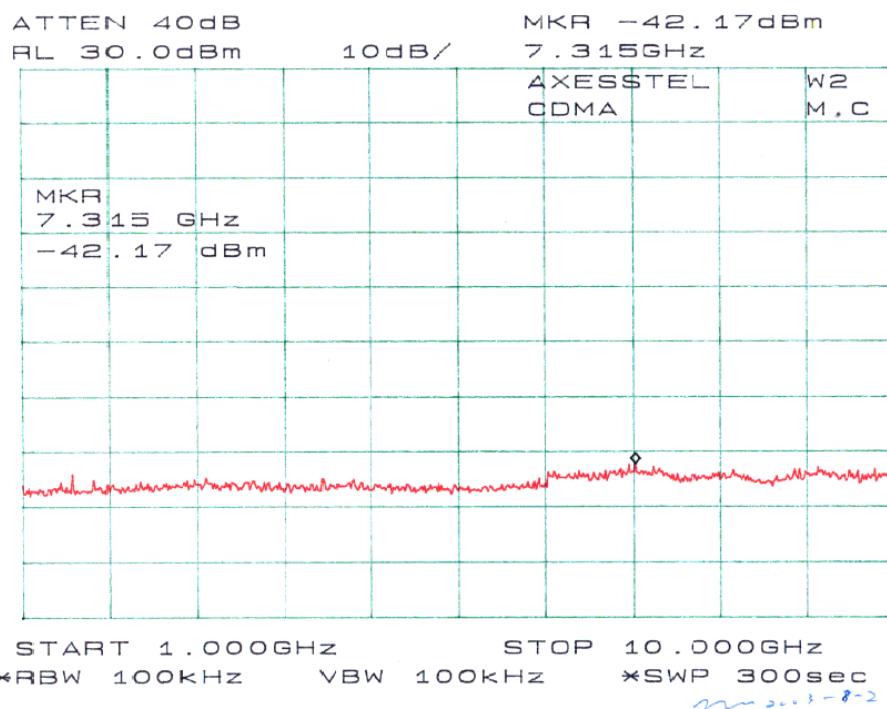
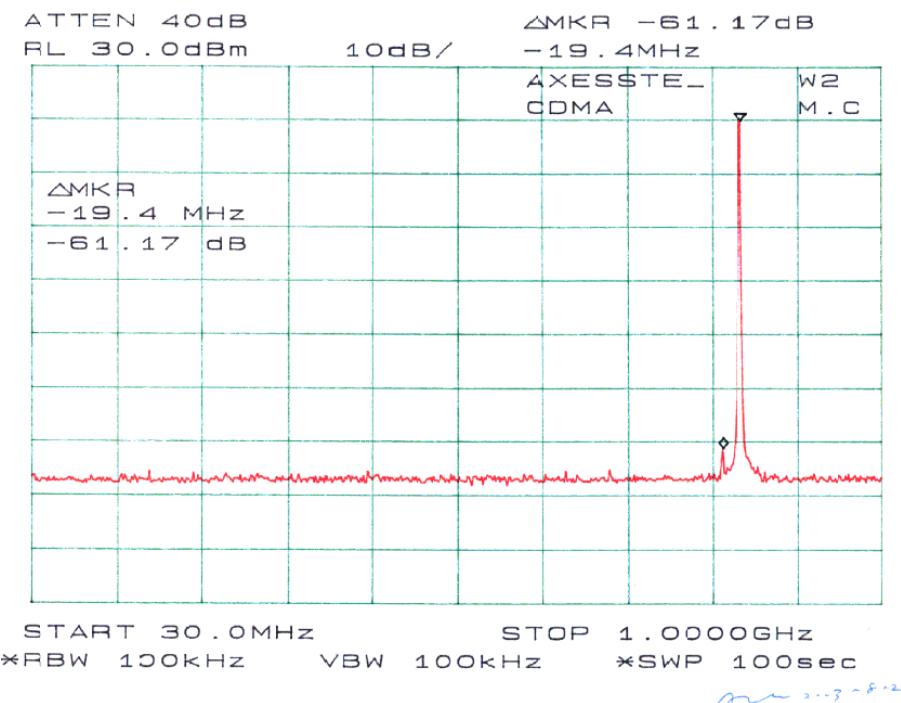
Hewlett Packard HP8566B Spectrum Analyzer

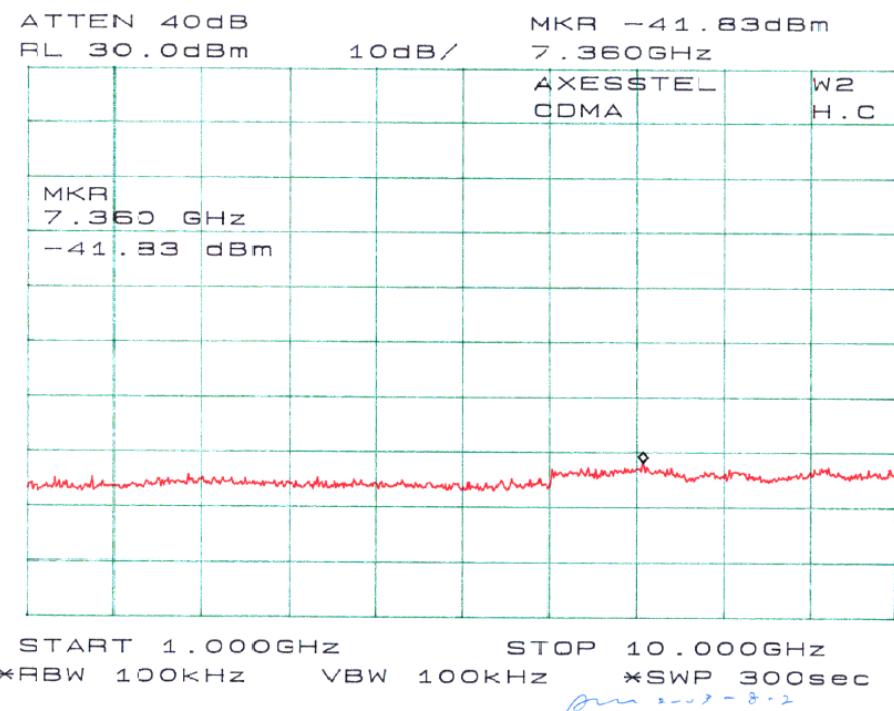
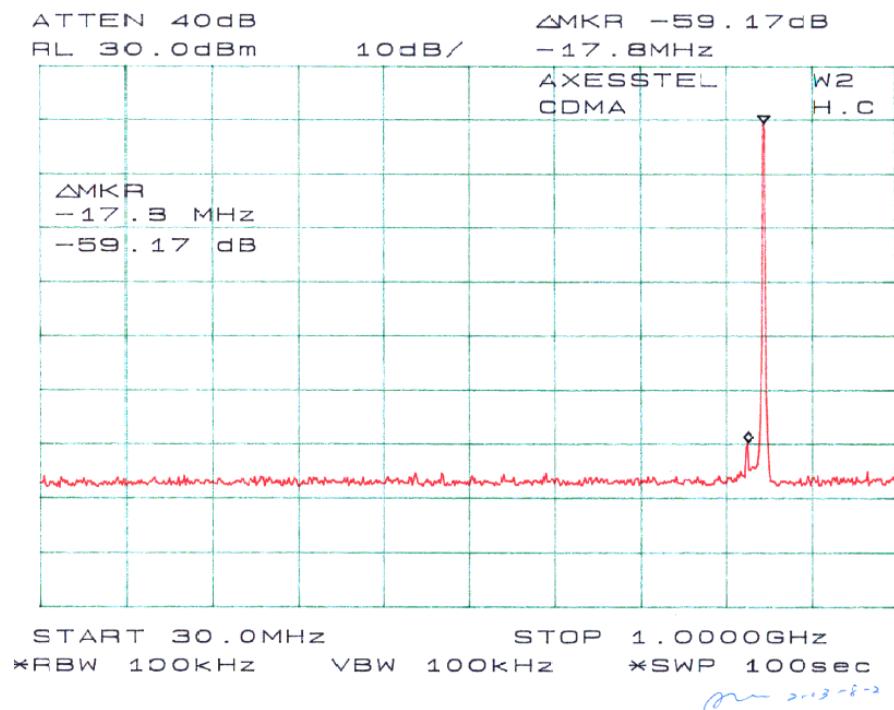
Hewlett Packard HP 7470A Plotter

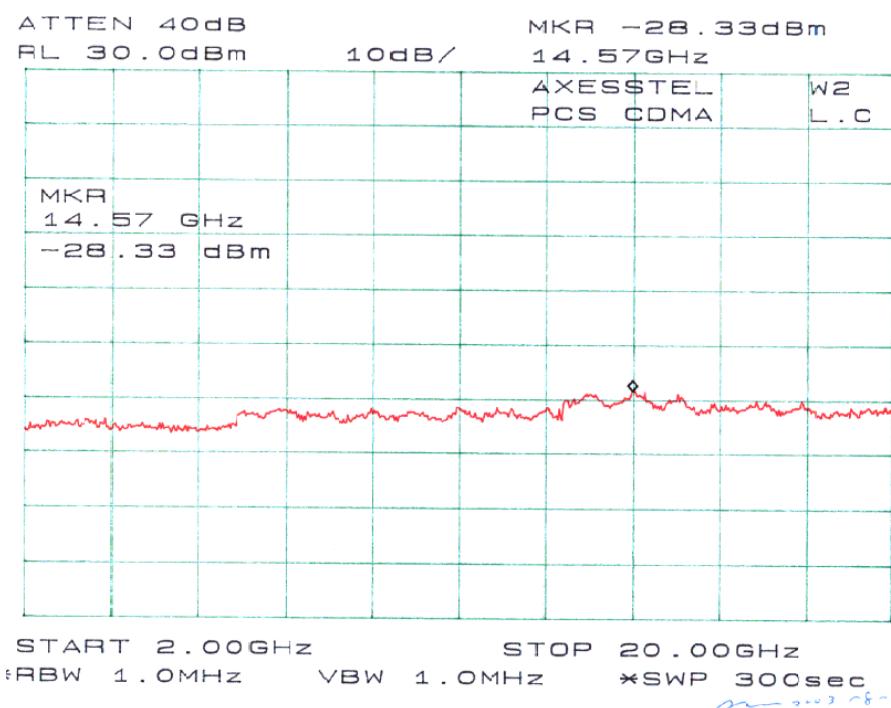
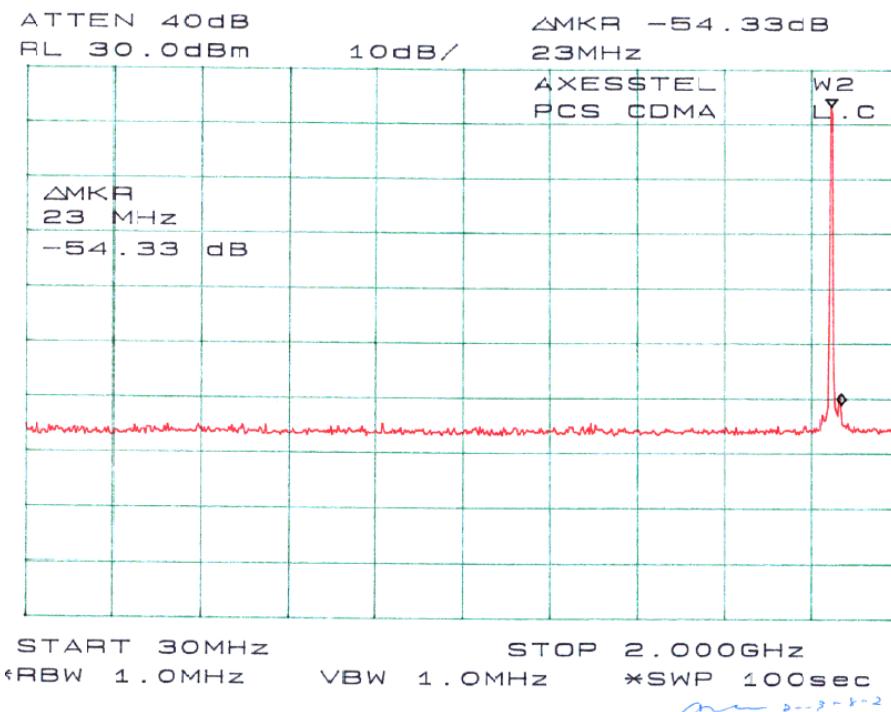
### 7.4 Test Results

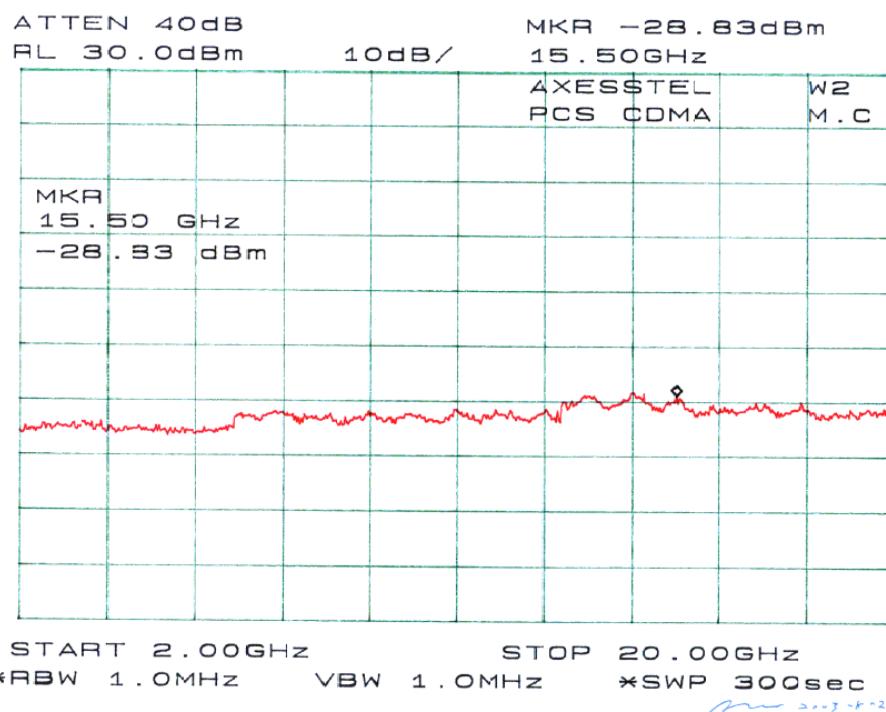
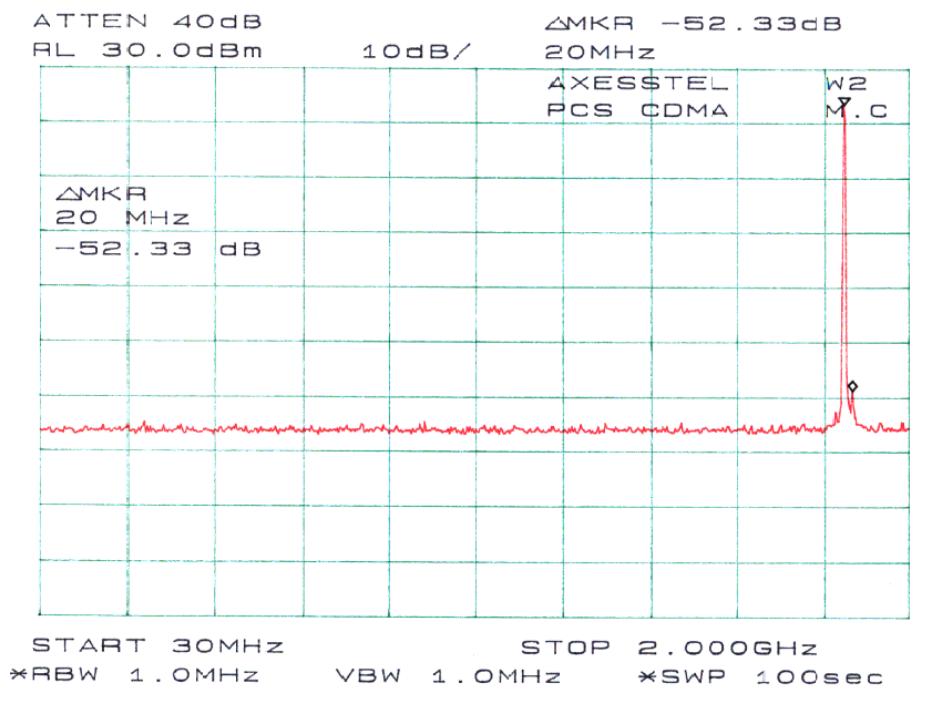
Please refer to the hereinafter plots.

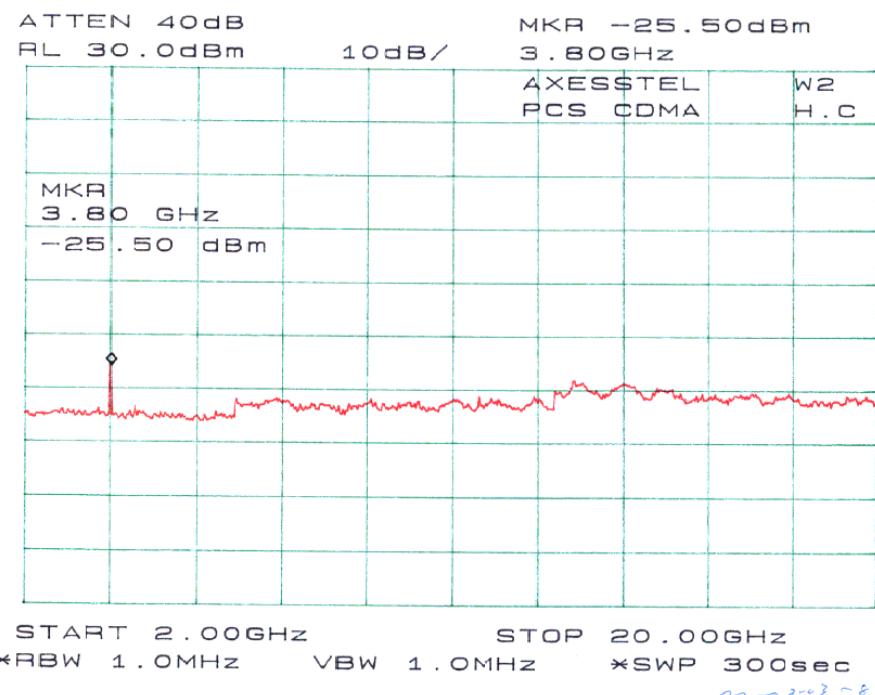
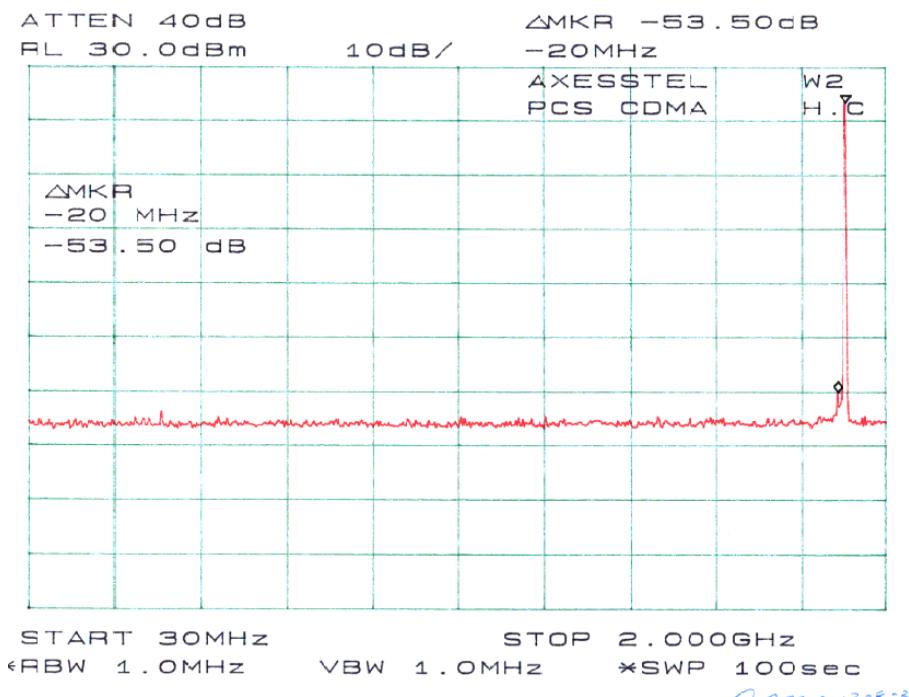












## 8 - RADIATED SPURIOUS EMISSION

### 8.1 Test Procedure

Requirements: CFR 47, § 2.1053, § 22.917 and § 24.238 (a).

### 8.2 Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB =  $10 \lg (\text{TXpwr in Watts}/0.001)$  – the absolute level

Spurious attenuation limit in dB =  $43 + 10 \log_{10} (\text{power out in Watts})$

### 8.3 Test Equipment

CDI B100/200/300 Biconical Antennas

EMCO Bi-logcon Antenna

EMCO 3115 Horn Antenna

HP 8566B Spectrum Analyzer

Preamplifiers

HP8640 Generator

Non-radiating Load

### 8.4 Test Result

PMS: Low Frequency: -20.5dB at 1649.46MHz

Middle Frequency: -21.6dB at 1672.8MHz

High Frequency: -20.5dB at 1696.38MHz

PCS: Low Frequency: -28.3dB at 3702.5MHz

Middle Frequency: -28.5dB at 3760MHz

High Frequency: -30.2dB at 3817.5MHz

### Compliance Statement

According to FCC Part 15, at 3-meter distance the emission from an intentional radiator shall not exceed the field strength level 40dB<sub>uV/m</sub> within 30-88MHz, 43.5dB<sub>uV/m</sub> within 88-216MHz, 46dB<sub>uV/m</sub> within 226-960MHz, 54dB<sub>uV/m</sub> above 960MHz. The level of any unwanted emissions shall not exceed the level of the fundamental frequency.

The levels of unwanted emission of this device were below the above limits. This device was compliant with the FCC Part 15.

**Test Data for PMS-CDMA**

EUT				Generator						Standard	
Indicated		Table	Test Antenna	Substitution			Antenna	Cable	Absolute	FCC	FCC
Frequency MHz	Ampl. dBuV/m	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dBm	Polar H/V	Gain Corrected	Loss dB	Level dBm	Limit dBm
LOW CHANNEL AT 824.73 MHZ											
824.73	118.7	0	1.5	V	824.73	21.9	V	0	0.1	21.8	
824.73	112.1	30	1.2	H	824.73	20.5	H	0	0.1	20.4	
1649.46	67.5	160	1.5	H	1649.46	-39.8	H	6.8	0.5	-33.5	-13
1649.46	64.2	90	1.5	V	1649.46	-42.5	V	6.8	0.5	-36.2	-13
2474.19	37.6	270	1.5	H	2474.19	-71.4	H	7.6	0.7	-64.5	-13
2474.19	34.2	210	1.2	V	2474.19	-73.8	V	7.6	0.7	-66.9	-13
MIDDLE CHANNEL AT 836.4 MHZ											
836.4	119.3	15	1.2	V	836.4	22.9	V	0	0.1	22.8	
836.4	113.2	30	1.2	H	836.4	21.3	H	0	0.1	21.2	
1672.8	65.9	130	1.5	H	1672.8	-40.9	H	6.8	0.5	-34.6	-13
1672.8	63.6	110	1.5	V	1672.8	-43.7	V	6.8	0.5	-37.4	-13
2507.4	38.2	45	1.5	H	2507.4	-69.5	H	7.6	0.7	-62.6	-13
2507.4	34.5	0	1.2	V	2507.4	-72.7	V	7.6	0.7	-65.8	-13
HIGH CHANNEL AT 848.19 MHZ											
848.19	119.2	45	1.5	V	848.19	22.7	V	0	0.1	22.6	
848.19	112.8	90	1.8	H	848.19	20.9	H	0	0.1	20.8	
1696.38	67.6	30	1.5	H	1696.38	-39.8	H	6.8	0.5	-33.5	-13
1696.38	64.3	0	1.2	V	1696.38	-42.1	V	6.8	0.5	-35.8	-13
2544.57	37.1	180	1	H	2544.57	-70.4	H	7.6	0.7	-63.5	-13
2544.57	34.4	160	1.5	V	2544.57	-73.1	V	7.6	0.7	-66.2	-13

**Test Data for PCS-CDMA**

EUT				Generator					Standard		
Indicated		Table	Test Antenna	Substitution			Antenna	Cable	Absolute	FCC	FCC
Frequency MHz	Ampl. dBuV/m	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dBm	Polar H/V	Gain Corrected	Loss dB	Level dBm	Limit dBm
LOW CHANNEL AT 1852.50 MHZ											
1851.25	122.9	270	1.5	V	1851.25	15.2	V	6.7	0.5	21.4	
1851.25	123.1	230	1.5	H	1851.25	16.5	H	6.7	0.5	22.7	
3702.5	49.3	110	1.5	H	3702.5	-49.3	H	8.8	0.8	-41.3	-13
3702.5	48.8	90	1.5	V	3702.5	-50.7	V	8.8	0.8	-42.7	-13
5553.75	43.9	0	1.2	V	5553.75	-73.8	V	9.1	1.1	-65.8	-13
5553.75	41.7	45	1.2	H	5553.75	-75.2	H	9.1	1.1	-67.2	-13
MIDDLE CHANNEL AT 1880.00 MHZ											
1880	122.1	15	1.8	V	1880	15.4	V	6.7	0.5	21.6	
1880	123.2	0	1.5	H	1880	16.2	H	6.7	0.5	22.4	
3760	49.1	270	1.2	H	3760	-49.5	H	8.8	0.8	-41.5	-13
3760	48.6	230	1.5	V	3760	-50.9	V	8.8	0.8	-42.9	-13
5640	43.7	160	1.2	V	5640	-74.1	V	9.1	1.1	-66.1	-13
5640	42.1	15	1.2	H	5640	-74.6	H	9.1	1.1	-66.6	-13
HIGH CHANNEL AT 1907.5 MHZ											
1908.75	121.2	150	1.5	V	1908.75	14.7	V	6.7	0.5	20.9	
1908.75	121.7	190	1.5	H	1908.75	15.1	H	6.7	0.5	21.3	
3817.5	47.6	30	1.5	H	3817.5	-51.2	H	8.8	0.8	-43.2	-13
3817.5	47.3	0	1.2	V	3817.5	-51.7	V	8.8	0.8	-43.7	-13
5726.25	42.5	270	1.5	V	5726.25	-74.9	V	9.1	1.1	-66.9	-13
5726.25	41.1	290	1	H	5726.25	-75.6	H	9.1	1.1	-67.6	-13

## **9 - FREQUENCY STABILITY**

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### **9.1 Applicable Standard**

Requirements: FCC § 2.1055 (a), § 2.1055 (d) and § 24.235

### **9.2 Test Procedure**

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the counter.

Frequency Stability vs. Voltage: An external variable DC power supply was connected to the battery terminals of the equipment under test. The voltage was set to 115% of the nominal value and was then decreased until the transmitter light no longer illuminated; i.e., the battery end point. The output frequency was recorded for each battery voltage.

### **9.3 Test Equipment**

Temperature Chamber  $-50^{\circ}\text{C}$  to  $+100^{\circ}\text{C}$   
Hewlett Packard 5383A Frequency Counter  
Goldstar DC Power Supply, GR303

## 9.4 Test Results

### Frequency Stability Versus Temperature

Reference Frequency: 835.8904 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency Measure with Time Elapsed	
		MCF (MHz)	PPM Error
50	9	835.89053	0.16
40	9	835.59052	0.14
30	9	835.89047	0.08
20	9	835.8904	0
10	9	835.8904	0
0	9	835.89038	-0.02
-10	9	835.89038	-0.02
-20	9	835.89037	-0.03
-30	9	835.89037	-0.03

### Frequency Stability Versus Input Voltage

Power Supplied (Vdc)	Reference Frequency: 835.8904MHz, Limit: 2.5 ppm			
	Frequency Measure with Time Elapsed			
	5 Minutes		10 Minutes	
MHz	PPM	MHz	PPM	
3.7	835.8904	0	836.001	0
3.7	835.89037	-0.04	835.89037	-0.04

Conclusion: The EUT complied with the applicable Frequency Stability Limits.

## **10 – CONDUCTED EMISSIONS**

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Not Applicable.