Israel Testing Laboratories

ACCREDITED
Cert. No. 1152.01
Electrical (EMC)

DATE: 28 July 2009

I.T.L. (PRODUCT TESTING) LTD.

FCC Radio Test Report

for

Mobile Access Networks

Equipment under test:

Remote Hub Unit

1000-CELL-PCS4E-HL

Written by: _____
D. Shidlowsky, Documentation

Approved by: _____
A. Sharabi, Test Engineer

Approved by: _____
I. Raz, EMC Laboratory Manager

Israel Testing Laboratories

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Cert. No. 1152.01
Electrical (EMC)

Measurement/Technical Report for

Mobile Access Networks

Remote Hub Unit

FCC ID: OJFMA1K-CP-HL

This report concerns: Original Grant: X
Class II change:
Class I change:

Equipment type: PCS Licensed Transmitter
Limits used:
47CFR Parts 2; 22, 24

Measurement procedure used is ANSI C63.4-2003.
Substitution Method used as in ANSI/TIA-603-B: 2002

Application for Certification prepared by:
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ITL (Product Testing) Ltd.
Kfar Bin Nun
D.N. Shimshon 99780
Israel
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Applicant for this device: (different from "prepared by")
Steve Blum
Mobile Access Networks
8391 Old Courthouse Rd., Suite #300
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Fax: +1-703-848-0260
e-mail: sblum@mobileaccess.com

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1. General Information

1.1 Administrative Information

Manufacturer:	Mobile Access Networks
Manufacturer's Address:	8391 Old Courthouse Rd. Suite #300 Vienna, VA 22182 U.S.A. Tel: +1-541-758-2880 Fax: +1-703-848-0260
Manufacturer's Representative:	Steve Blum
Equipment Under Test (E.U.T):	Remote Hub Unit
Equipment Model No.:	1000-CELL-PCS4E-HL
Equipment Serial No.:	09203D6
Date of Receipt of E.U.T:	12.07.09
Start of Test:	12.07.09
End of Test:	14.07.09
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	FCC Parts 2, 22, 24

1.2 List of Accreditations

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), Registration No. 90715.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-1350, R-1285.
5. Industry Canada (Canada), IC File No.: 46405-4025; Site No. IC 4025B-1.
6. TUV Product Services, England, ASLLAS No. 97201.
7. Nemko (Norway), Authorization No. ELA 207.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

1.3 Product Description

The Wireless Network System provides coverage by routing RF signals from BTS (base transmit station) units, trough optic fibers to remote areas where the signals are converted back to RF and interfaced to antennas covering the remote area. All system elements can be remotely controlled and monitored from a single location.

The system consists of the following elements:

Base Unit (BU):

Converts the RF signal received from the RIU to an optic signal that is then split and routed via optic fiber to Remote Hub Units located in remote locations.

Remote Hub Units (RHUs):

Converts the optic signal to an RF signal and feeds it to the antennas in the remote areas in order to provide the required coverage. The RHU provides coax connections to up to four antennas. The RHU filters and amplifiers the optic signal received from the BU according to the service it supports.

The E.U.T. is operated from DC.

1.4 Test Methodology

Radiated testing were performed according to the procedures in ANSI C63.4: 2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

The radiated emissions tests were performed at I.T.L.'s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing August 22, 2006).
I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

1.6 Measurement Uncertainty

Radiated Emission

The Open Site complies with the ±4 dB Normalized Site Attenuation requirements of ANSI C63.4-2003. In accordance with Paragraph 5.4.6.1 of this standard, this tolerance includes instrumentation calibration errors, measurement technique errors, and errors due to site anomalies.

2. System Test Configuration

2.1 Justification

The following changes were made to the E.U.T. in order to allow it to work co-existence with other, external modules of LTE700:

The cell UL Ceramic filter was modified in order to allow co-existence with LTE700 broadcasting.

2 LPF were added next to the Cell UL Ceramic filter in order to get better isolation between HB and LB (Interferences).

An LPF was added next to the DL Ceramic Cell filter to decrease second harmonics from Cell DL into AWS UL chain.

A coax cable was added for future passive external support in LTE Add on Module.

2.2 EUT Exercise Software

RHU S/W V3.8 B04, MCT S/W 10.26.01 was used.

2.3 Special Accessories

No special accessories were needed in order to achieve compliance.

2.4 Equipment Modifications

No modifications were needed in order to achieve compliance.

2.5 Configuration of Tested System

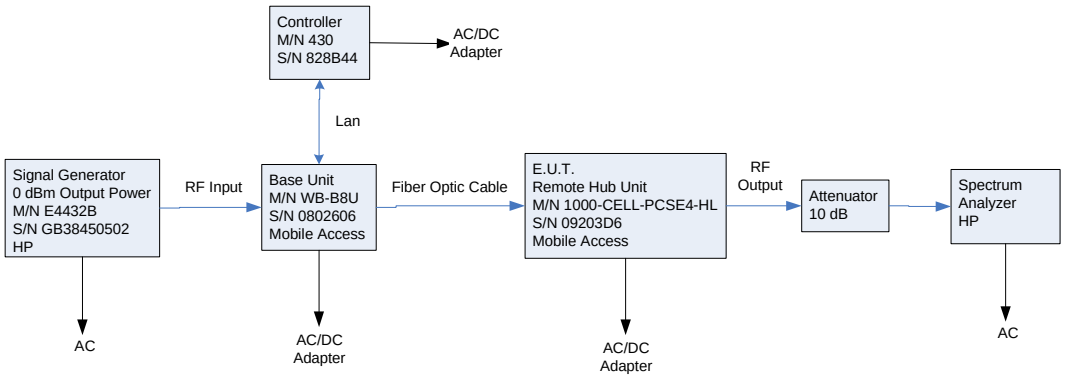


Figure 1. Conducted Tests Set-up

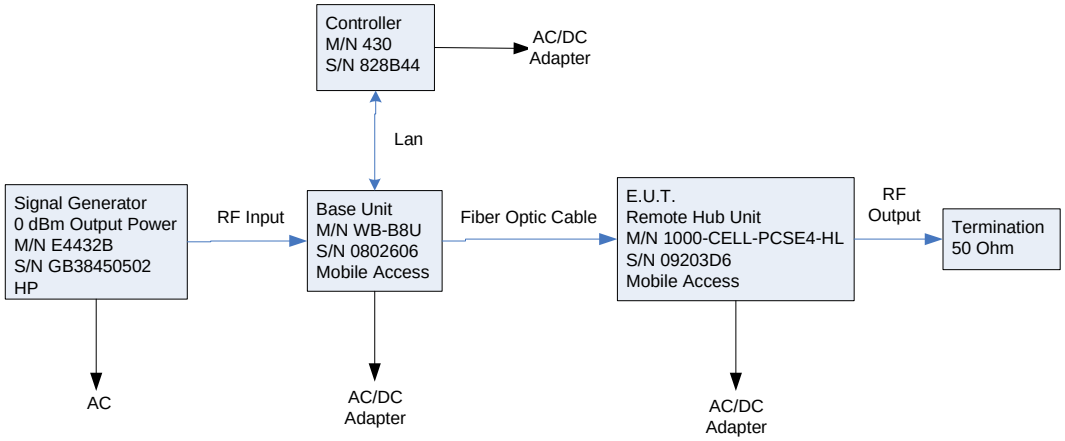


Figure 2. Radiated Tests Set-up

3. Peak Output Power CDMA

3.1 Test Specification

FCC Part 22.913

3.2 Test procedure

Peak Power Output must not exceed 500 Watts (57dBm).

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator (10 dB) and an appropriate coaxial cable (1dB). The E.U.T. RF output was CDMA modulated. Special attention was taken to prevent Spectrum Analyzer RF input overload. The Spectrum Analyzer was set to 1.0 MHz RBW. The output power level was measured at 870.20, 881.5, and 892.80 MHz.

CDMA:

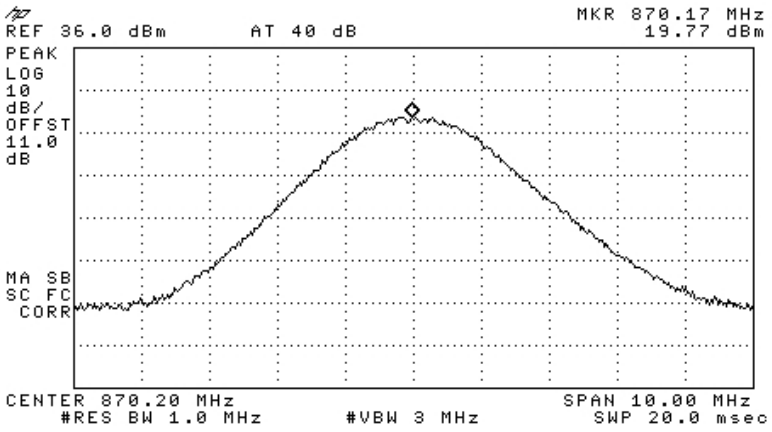


Figure 3.— 870.20 MHz

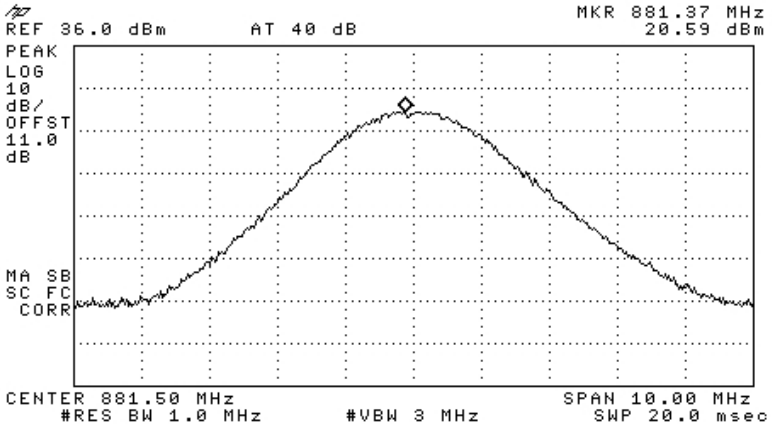


Figure 4.— 881.50 MHz

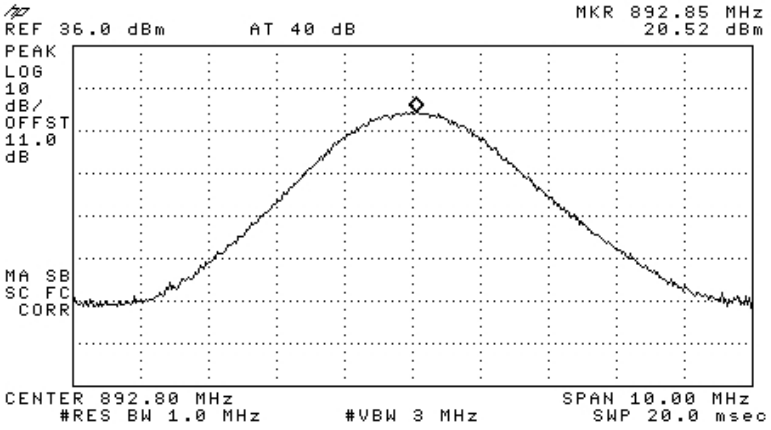


Figure 5.— 892.80 MHz

3.3 Results table

E.U.T. Description: Remote Hub Unit
Model No.: 1000-CELL-PCS4E-HL
Serial Number: 09203D6
Specification: FCC Part 22 Section 913, FCC Part 2, Section 1046

Modulation	Operation Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
CDMA	870.20	19.77	57.0	-37.23
	881.50	20.59	57.0	-36.41
	892.80	20.52	57.0	-36.48

Figure 6 Peak Output Power CDMA

JUDGEMENT: Passed by 36.41 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 29.07.09

Typed/Printed Name: A. Sharabi

3.4 Test Equipment Used.

Peak Output Power CDMA

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 17, 2009	1 year
Signal Generator	HP	E4433B ESG-D	3826A01204	March 17, 2009	1 year
Power Supply	Horizon Electronics	DHR 3653D-1.0	TE1232	N/A	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G 2W20	April 19, 2009	1 year
Cable	Rhophase	KPS-5000-KPS	A1674	April 19, 2009	1 year

Figure 7 Test Equipment Used

4. Occupied Bandwidth CDMA

4.1 Test Specification

FCC Part 2, Section 1049

4.2 Test Procedure

The E.U.T. was set to the applicable test frequency with CDMA modulation.
The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (at the output test) and an appropriate coaxial cable. The spectrum analyzer was set to 100 kHz resolution B.W.
The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limit, the mean powers radiated are each equal to 0.5% of the total mean power radiated by a given emission.
The occupied bandwidth of the E.U.T. at the points of 20 dB below maximum peak power was measured and recorded.
Occupied bandwidth measured was repeated in the input terminal of the E.U.T.

CDMA

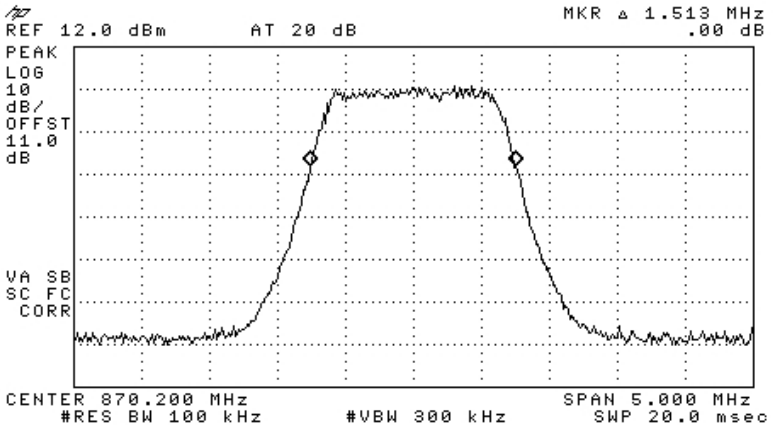


Figure 8.— Input 870.20

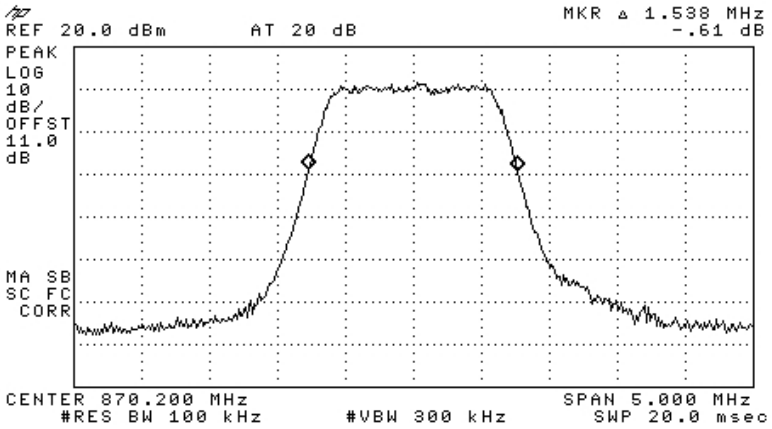


Figure 9.— Output 870.20

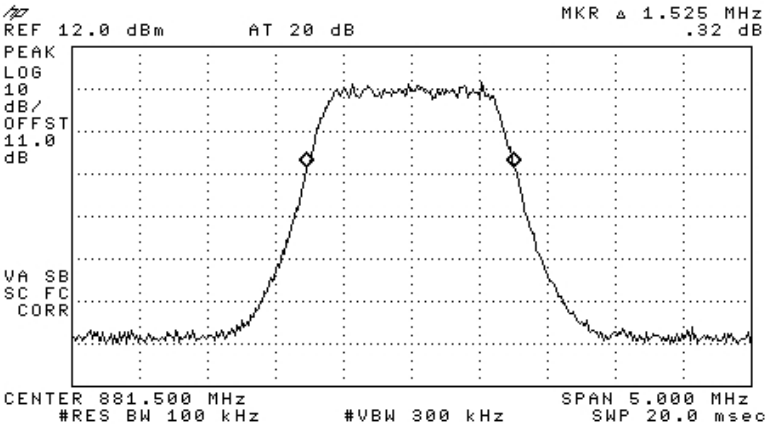


Figure 10.— Input 881.5 MHz.

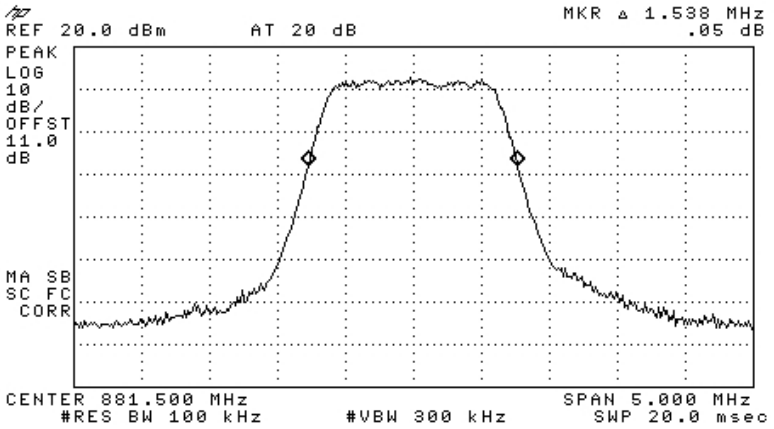


Figure 11.—Output 881.5Hz.

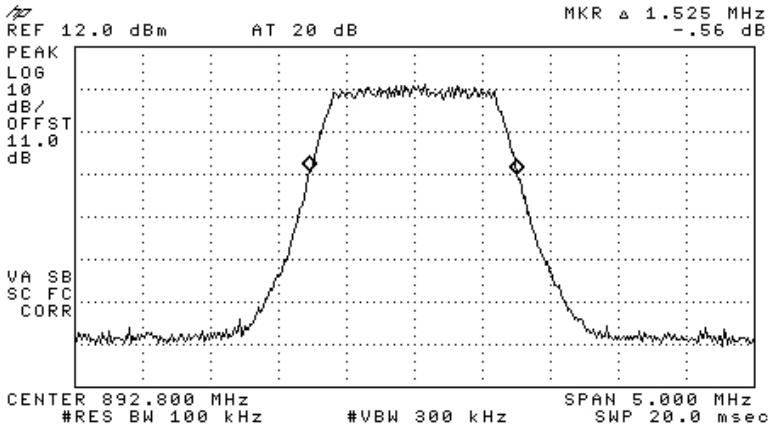


Figure 12.— Input 892.80 MHz.

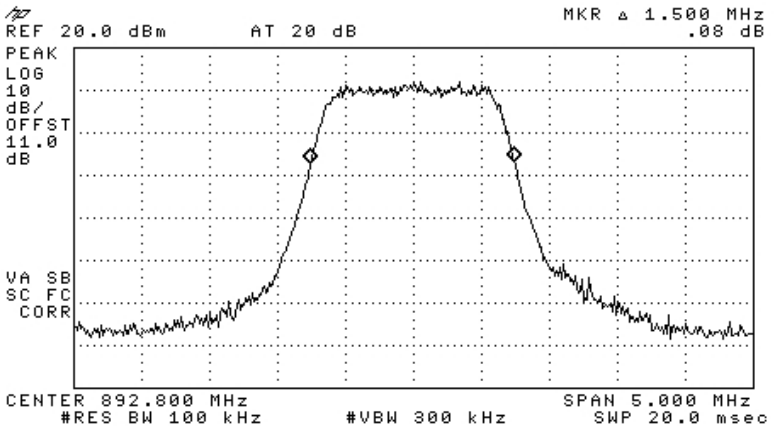


Figure 13.— Output 892.80 MHz.

4.3 Results Table

E.U.T. Description: Remote Hub Unit
Model No.: 1000-CELL-PCS4E-HL
Serial Number: 09203D6
Specification: FCC Part 2, Section 1049

Modulation		Operating Frequency	Reading (MHz)
CDMA	Input	870.20	1.513
CDMA	Output	870.20	1.538
CDMA	Input	881.50	1.525
CDMA	Output	881.50	1.538
CDMA	Input	892.80	1.525
CDMA	Output	892.80	1.500

Figure 14 Occupied Bandwidth CDMA

TEST PERSONNEL:

Tester Signature: _____ Date: 29.07.09

Typed/Printed Name: A. Sharabi

4.4 Test Equipment Used.

Occupied Bandwidth CDMA

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 17, 2009	1 year
Signal Generator	HP	E4433B ESG-D	3826A01204	March 17, 2009	1 year
Power Supply	Horizon Electronics	DHR 3653D-1.0	TE1232	N/A	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G 2W20	April 19, 2009	1 year
Cable	Rhophase	KPS-5000-KPS	A1674	April 19, 2009	1 year

Figure 15 Test Equipment Used

5. Out of Band Emissions at Antenna Terminals CDMA

5.1 Test Specification

FCC Part 22, Section 917; FCC Part 2.1051

5.2 Test procedure

The power of any emission outside of the authorized operating frequency ranges (869 - 894 MHz) must be attenuated below the transmitting power (P) by a factor of at least 43 + log (P) dB, yielding –13dBm.
The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (11 dB).
The spectrum analyzer was set to 100 kHz R.B.W.

CDMA:

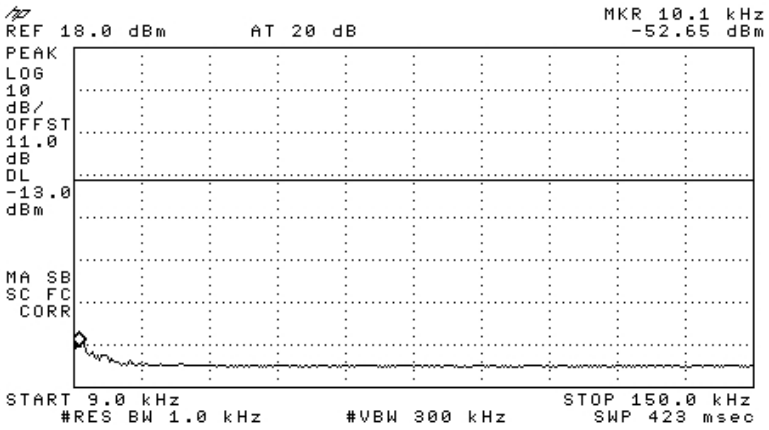


Figure 16.— 870.20 MHz

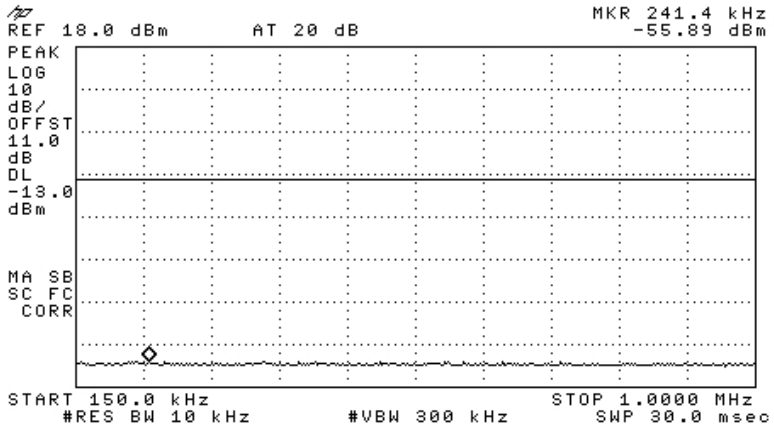


Figure 17.— 870.20 MHz

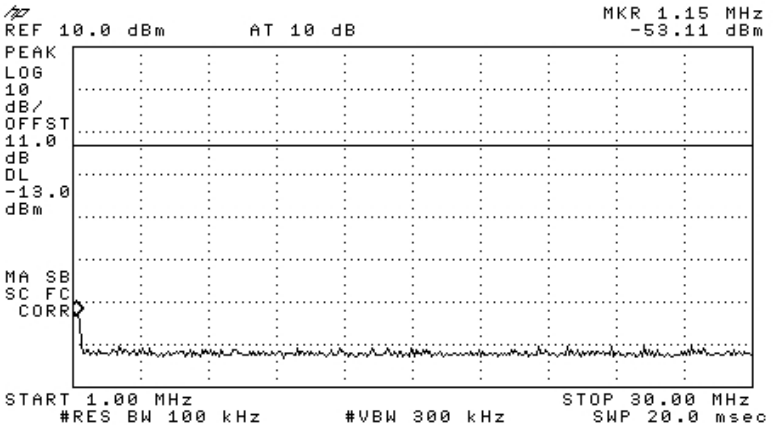


Figure 18.— 870.20 MHz

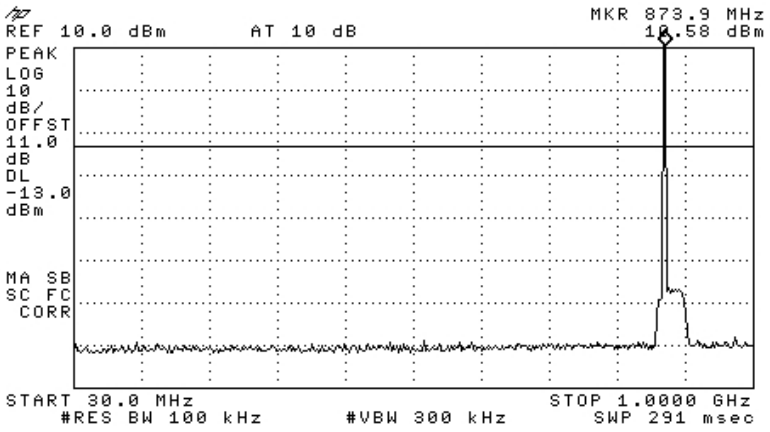


Figure 19.— 870.20 MHz

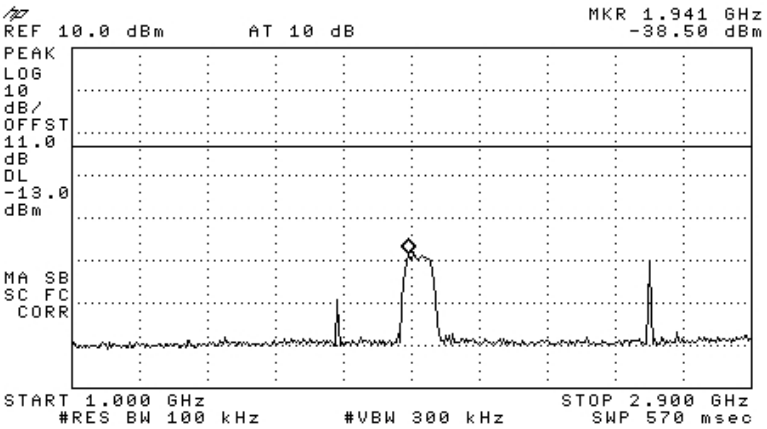


Figure 20.— 870.20 MHz

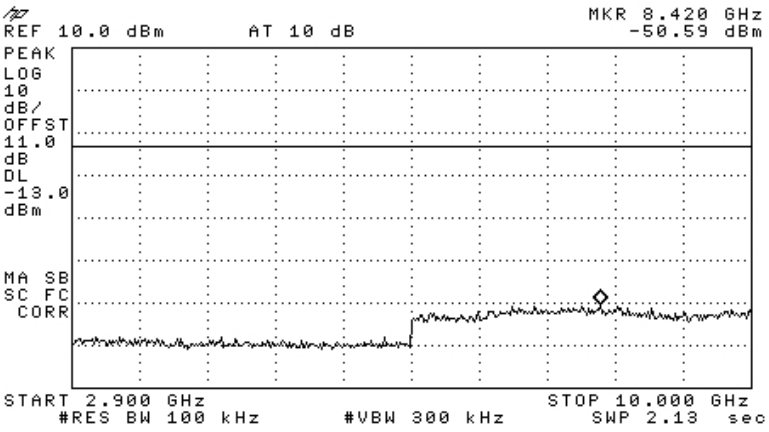


Figure 21.— 870.20 MHz

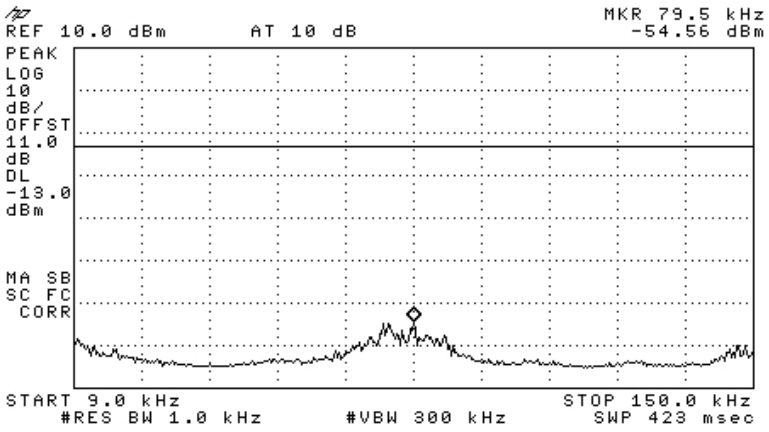


Figure 22.— 881.50 MHz

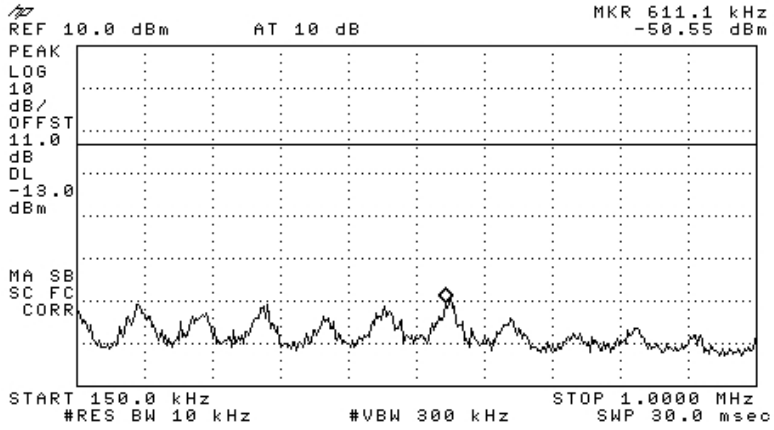


Figure 23.— 881.50 MHz

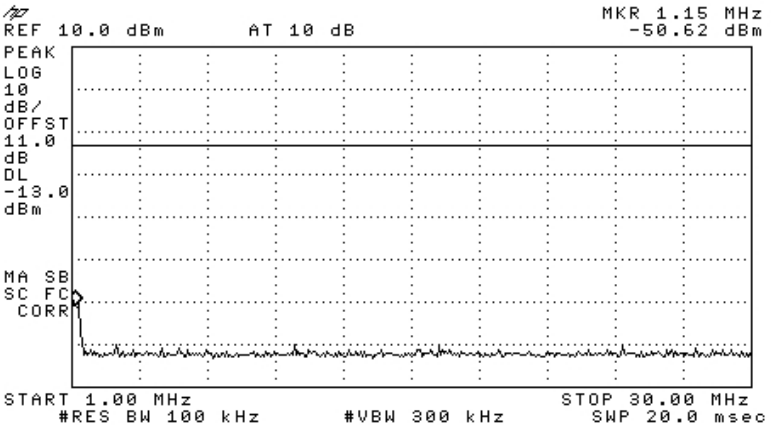


Figure 24.— 881.50 MHz

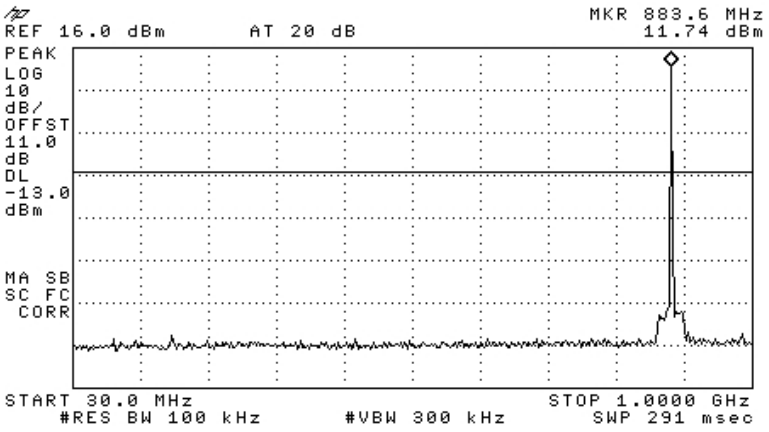


Figure 25.— 881.50 MHz

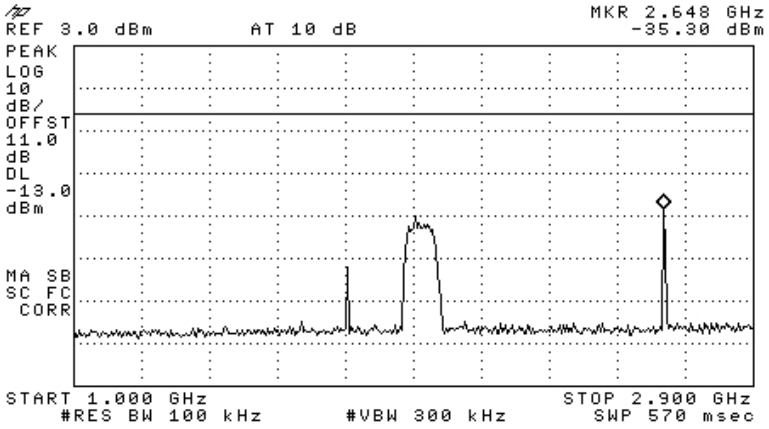


Figure 26.— 881.50 MHz

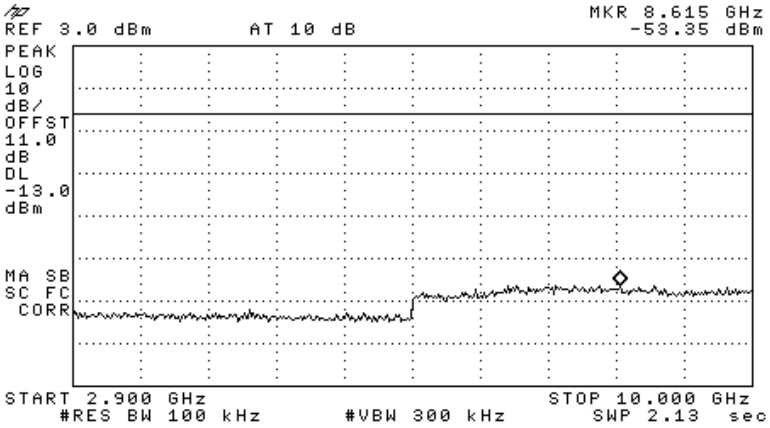


Figure 27.— 881.50 MHz

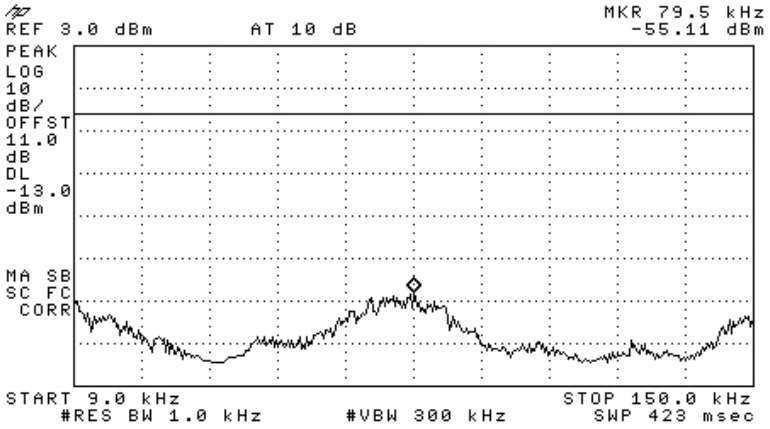


Figure 28.— 892.80 MHz

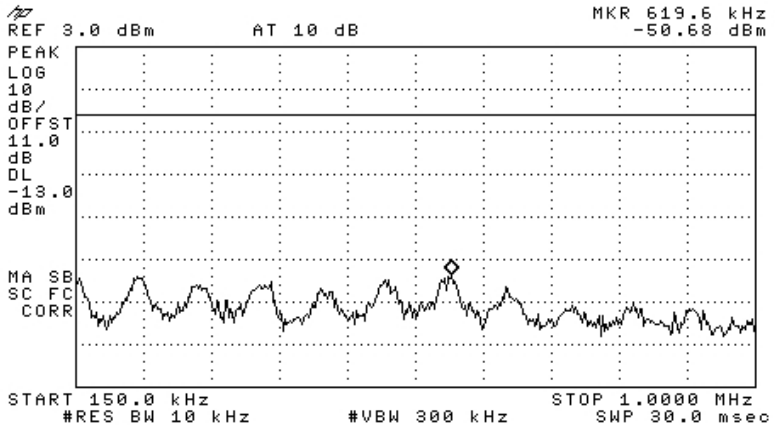


Figure 29.— 892.50 MHz

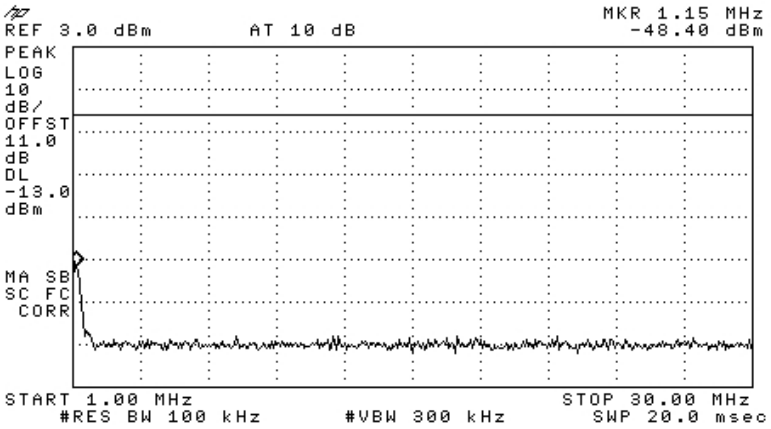


Figure 30.— 892.50 MHz

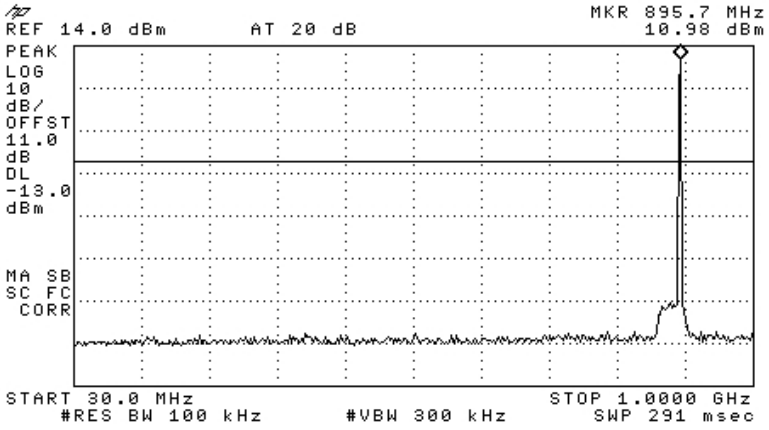


Figure 31.— 892.50 MHz

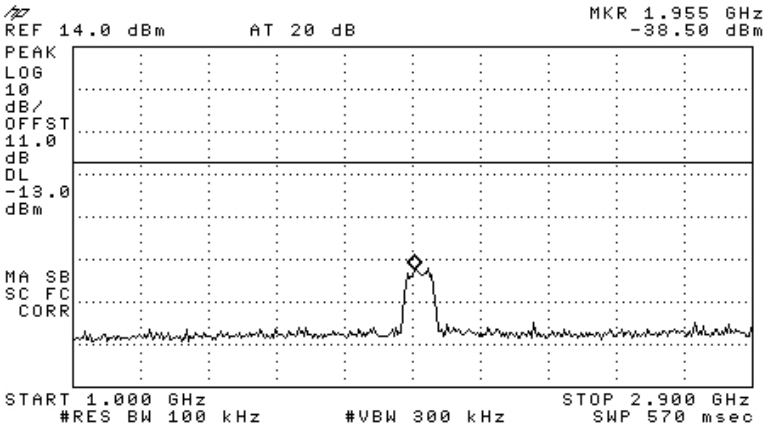


Figure 32.— 892.50 MHz

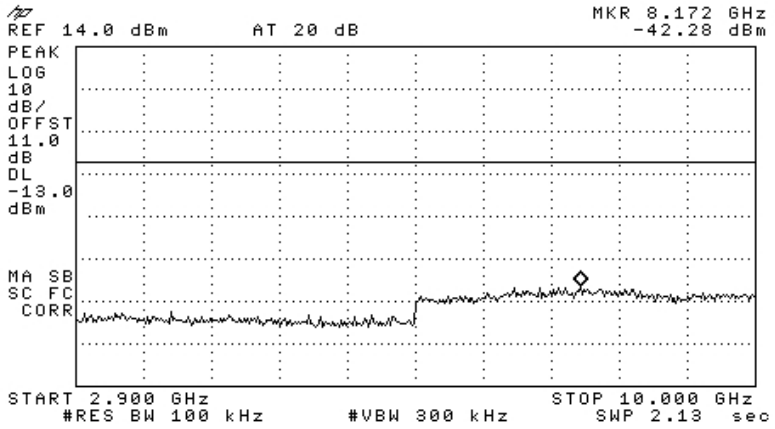


Figure 33.— 892.50 MHz

5.3 Results table

E.U.T. Description: Remote Hub Unit
Model No.: 1000-CELL-PCS4E-HL
Serial Number: 09203D6
Specification: FCC Part 24, Sub-part E, Section 238; Part 2 Section 1051

Modulation	Operation Frequency (MHz)	Frequency (GHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
CDMA	870.20	1.941	-38.50	-13.0	-25.5
	881.50	2.648	-35.30	-13.0	-22.3
	892.80	1.955	-38.50	-13.0	-25.5

Figure 34 Out of Band Emission Results CDMA

JUDGEMENT: Passed by 22.3 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 29.07.09

Typed/Printed Name: A. Sharabi

5.4 Test Equipment Used.

Out of Band Emission at Antenna Terminals CDMA

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 17, 2009	1 year
Signal Generator	HP	E4433B ESG-D	3826A01204	March 17, 2009	1 year
Power Supply	Horizon Electronics	DHR 3653D-1.0	TE1232	N/A	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G 2W20	April 19, 2009	1 year
Cable	Rhophase	KPS-5000-KPS	A1674	April 19, 2009	1 year

Figure 35 Test Equipment Used

6. Band Edge Spectrum CDMA

6.1 Test Specification

FCC Part 22, FCC Part 2.1051

6.2 Test procedure

Enclosed are spectrum analyzer plots for the lowest operation frequency (870.20 MHz) and the highest operation frequency (892.8 MHz) in which the E.U.T. is planned to be used.

The power of any emission outside of the authorized operating frequency ranges (869 - 894 MHz) must be attenuated below the transmitting power (P) by a factor of at least 43 + log (P) dB, yielding –13dBm.
The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (11 dB).
The spectrum analyzer was set to 100 kHz R.B.W.

CDMA:

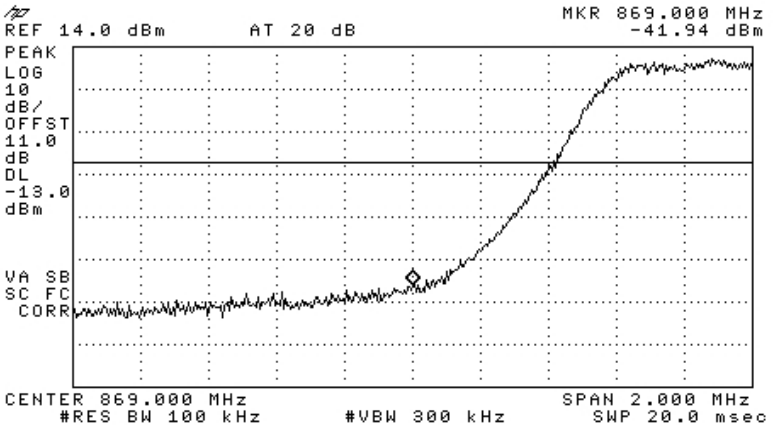


Figure 36.— 870.20 MHz

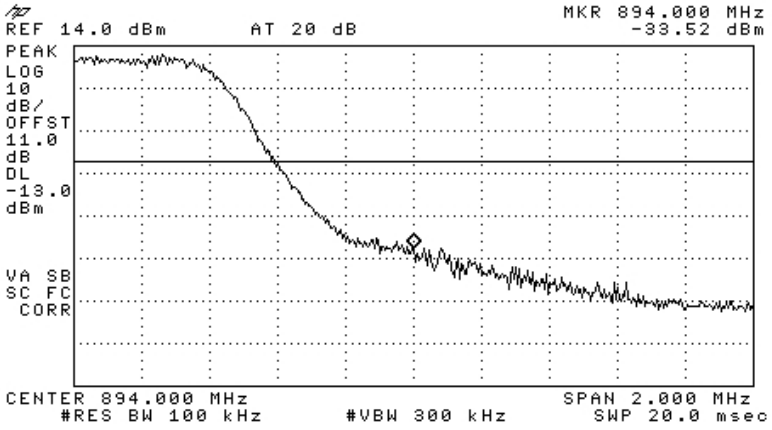


Figure 37.— 892.80 MHz

6.3 Results table

E.U.T. Description: Remote Hub Unit
Model No.: 1000-CELL-PCS4E-HL
Serial Number: 09203D6
Specification: FCC Part 24, Sub-part E, Section 238; Part 2 Section 1051

Modulation	Operation Frequency (MHz)	Band Edge Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
CDMA	870.20	869.00	-41.94	-13.0	-28.74
	892.80	894.00	-33.52	-13.0	-20.52

Figure 38 Band Edge Spectrum Results CDMA

JUDGEMENT: Passed by 20.5 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 29.07.09

Typed/Printed Name: A. Sharabi

6.4 Test Equipment Used.

Band Edge Spectrum CDMA

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 17, 2009	1 year
Signal Generator	HP	E4433B ESG-D	3826A01204	March 17, 2009	1 year
Power Supply	Horizon Electronics	DHR 3653D-1.0	TE1232	N/A	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G 2W20	April 19, 2009	1 year
Cable	Rhophase	KPS-5000-KPS	A1674	April 19, 2009	1 year

Figure 39 Test Equipment Used

7. Out of Band Emissions (Radiated) CDMA

7.1 Test Specification

FCC Part 22, Section 917; FCC Part 2.1053

7.2 Test Procedure

The test method was based on ANSI/TIA-603-B: 2002, Section 2.2.12 Unwanted Emissions: Radiated Spurious.
The power of any emission outside of the authorized operating frequency ranges (869 - 894 MHz) must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB, yielding –13dBm.

(a) The E.U.T. operation mode and test set-up are as described in Section 3. A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 1.5 meters above the ground. The configuration tested is shown in Figure 3.1.
The frequency range 9 kHz-20 GHz was scanned, and the list of the highest emissions was verified and updated accordingly.
The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.
The emissions were measured at a distance of 3 meters.

(b) The E.U.T. was replaced by a substitution antenna (dipole 30MHz-1GHz, Horn Antenna above 1GHz) driven by a signal generator. The height was readjusted for maximum reading. The signal generator level was adjusted to obtain the same reading on the EMI receiver as in step (a).
The signals observed in step (a) were converted to radiated power using:
$P_d(dBm) = P_g(dBm) – Cable\ Loss\ (dB) + Substitution\ Antenna\ Gain\ (dB)$
P_d = Dipole equivalent power (result).
P_g = Signal generator output level.

7.3 Test Data

CDMA:

Carrier Channel (MHz)	Freq. (MHz)	Antenna Pol.	Maximum Peak Level (dBµV/m)	Signal Generator RF Output (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Effective Radiated Power Level (dBm)	Spec. (dBm)	Margin (dB)
870.20	1740.4	V	50.6	-48.4	4.9	7.0	-46.3	-13	-33.3
870.20	1740.4	H	49.8	-49.2	4.9	7.0	-47.1	-13	-34.1
881.50	1763.0	V	51.5	-47.6	4.9	7.0	-45.5	-13	-32.5
881.50	1763.0	H	49.4	-49.6	4.9	7.0	-47.5	-13	-34.5
892.80	1785.6	V	51.3	-47.7	4.9	7.0	-45.6	-13	-32.6
892.80	1785.6	H	50.6	-48.4	4.9	7.0	-46.3	-13	-33.3

The E.U.T met the requirements of the FCC Part 22, Section 917;
FCC Part 2.1053 specifications.

TEST PERSONNEL:

Tester Signature: _____ Date: 29.07.09

Typed/Printed Name: A. Sharabi

7.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 17, 2008	1 year
RF Section	HP	85420E	3705A00248	November 16, 2008	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	March 25, 2009	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 06, 2008	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 15, 2008	1 year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 29, 2009	2 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	ThinkJet 2225	2738508357.0	N/A	N/A
Spectrum Analyzer	HP	8592L	3826A01204	March 17, 2009	1 year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	November 3, 2008	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	January 8, 2009	1 Year
Signal Generator	HP	E4432B ESG-D	GB38450502	March 17, 2009	1 year
Double Ridged Waveguide Horn Antenna	EMCO	3115	29845	March 16, 2008	2 year

8. Peak Output Power PCS

8.1 Test Specification

FCC Part 24, Sub-part E

8.2 Test procedure

Peak Power Output must not exceed 100 Watts (50dBm).

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator (10 dB) and an appropriate coaxial cable (1dB). The E.U.T. RF output was W-CDMA and GSM modulated. Special attention was taken to prevent Spectrum Analyzer RF input overload. The Spectrum Analyzer was set to 1.0 MHz RBW. The output power level was measured at 1932.50, 1960.00, and 1987.5 MHz.

W-CDMA

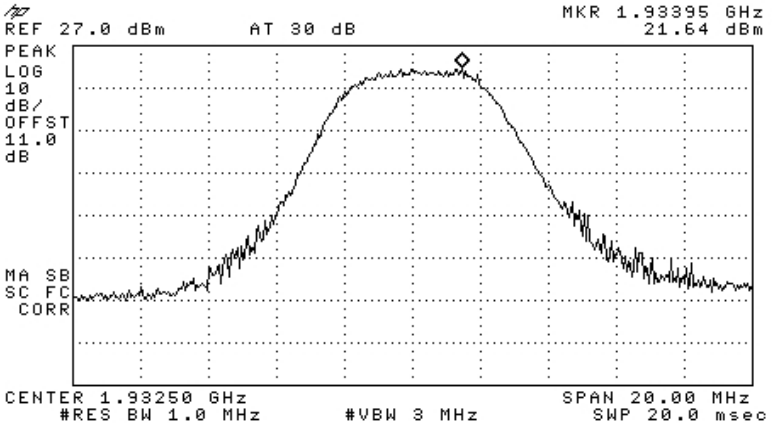


Figure 40.— 1932.50 MHz

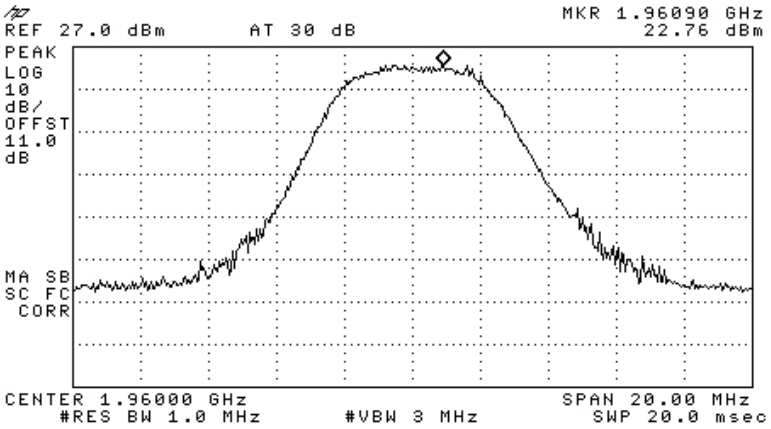


Figure 41.— 1960.00 MHz

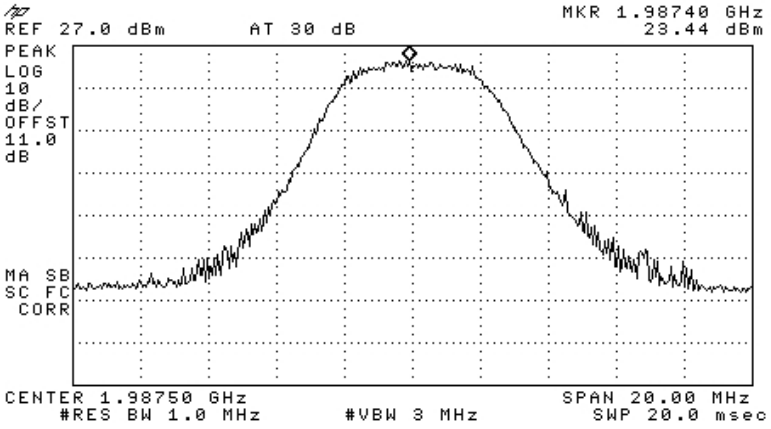


Figure 42.— 1987.50 MHz

GSM:

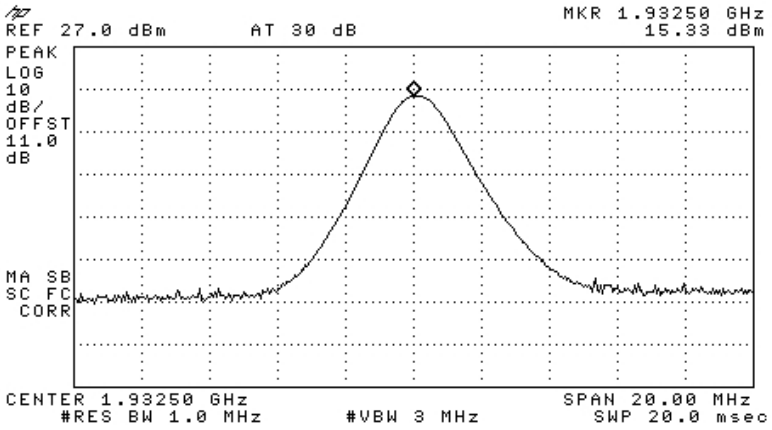


Figure 43.— 1932.50 MHz

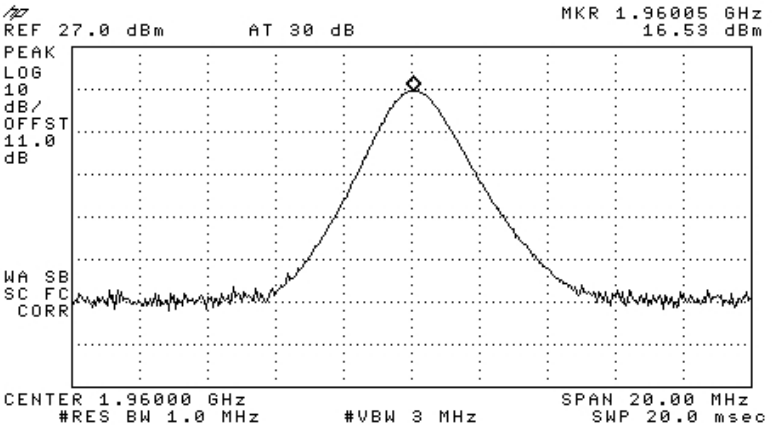


Figure 44.— 1960.00 MHz

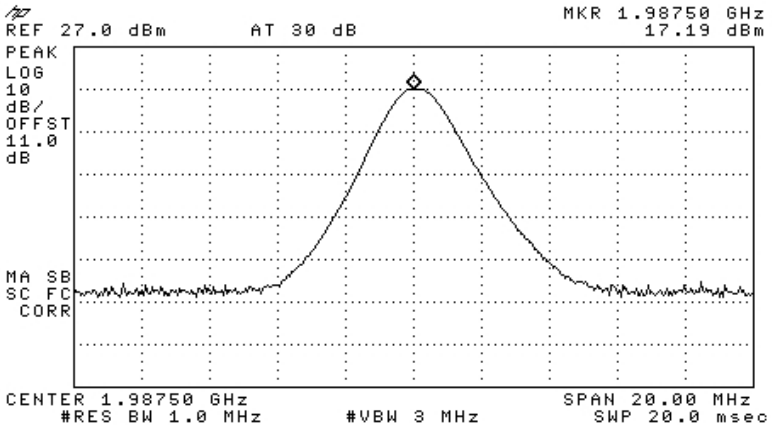


Figure 45.— 1987.50 MHz

8.3 Results table

E.U.T. Description: Remote Hub Unit
Model No.: 1000-CELL-PCS4E-HL
Serial Number: 09203D6
Specification: FCC Part 24, Sub-part E, Section 232, FCC Part 2, Section 1046

Modulation	Operation Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
W-CDMA	1932.50	21.64	50.0	-28.36
	1960.00	22.76	50.0	-27.24
	1987.50	23.44	50.0	-26.56
GSM	1932.50	15.33	50.0	-34.67
	1960.00	16.53	50.0	-33.47
	1987.50	17.19	50.0	-32.81

Figure 46 Peak Output Power PCS

JUDGEMENT: Passed by 26.56 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 29.07.09

Typed/Printed Name: A. Sharabi

8.4 Test Equipment Used.

Peak Output Power PCS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 17, 2009	1 year
Signal Generator	HP	E4433B ESG-D	3826A01204	March 17, 2009	1 year
Power Supply	Horizon Electronics	DHR 3653D-1.0	TE1232	N/A	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G 2W20	April 19, 2009	1 year
Cable	Rhophase	KPS-5000-KPS	A1674	April 19, 2009	1 year

Figure 47 Test Equipment Used

9. Occupied Bandwidth PCS

9.1 Test Specification

FCC Part 2, Section 1049

9.2 Test Procedure

The E.U.T. was set to the applicable test frequency with WCDMA, GSM modulation. The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (at the output test) and an appropriate coaxial cable. The spectrum analyzer was set to 100 kHz resolution B.W.
The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limit, the mean powers radiated are each equal to 0.5% of the total mean power radiated by a given emission.
The occupied bandwidth of the E.U.T. at the points of 20 dB below maximum peak power was measured and recorded.
Occupied bandwidth measured was repeated in the input terminal of the E.U.T.

W-CDMA

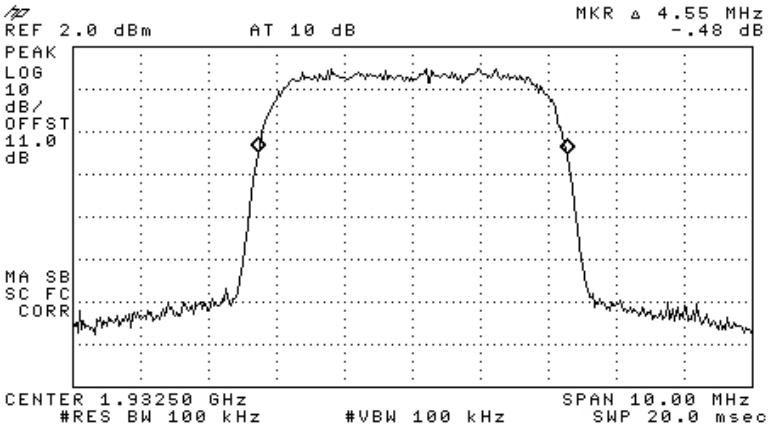


Figure 48.— Input 1932.50 MHz

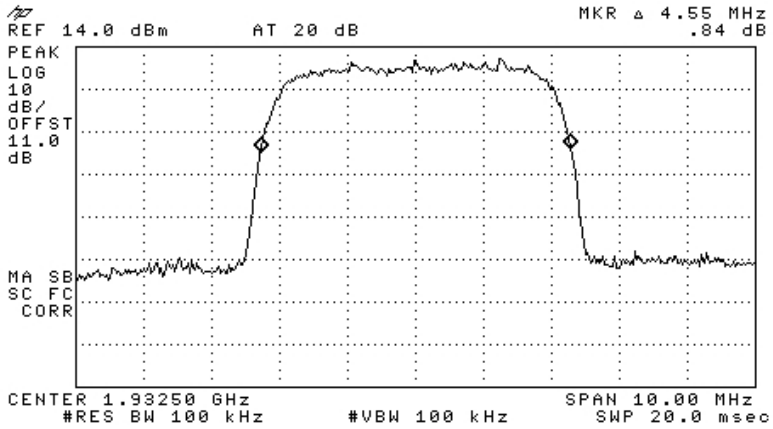


Figure 49.— Output 1932.50 MHz

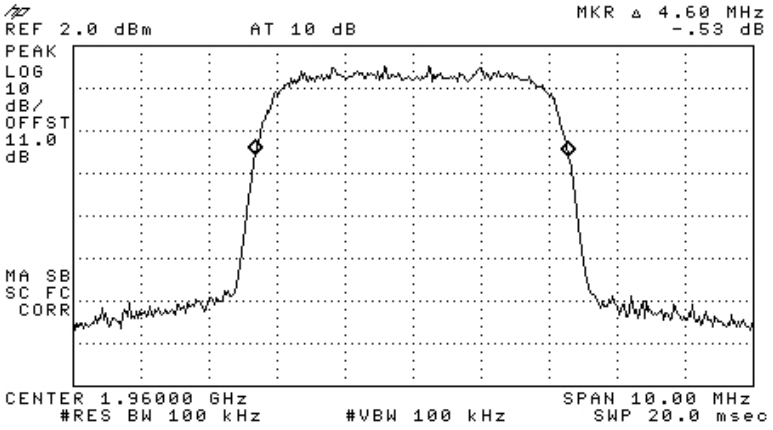


Figure 50.— Input 1960.00 MHz

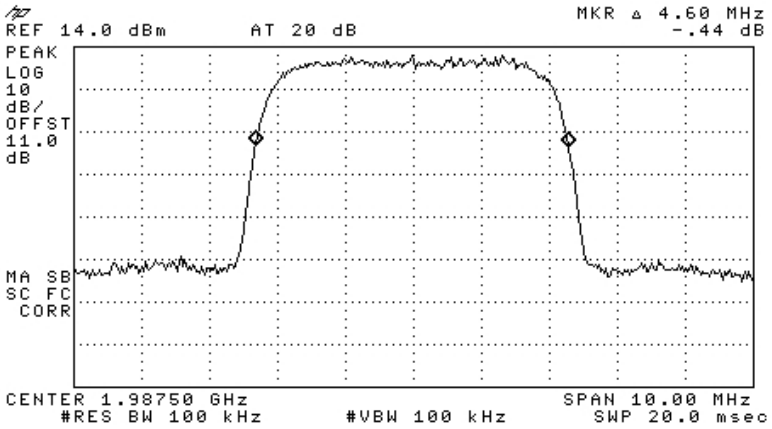


Figure 51.— Output 1960.00 MHz

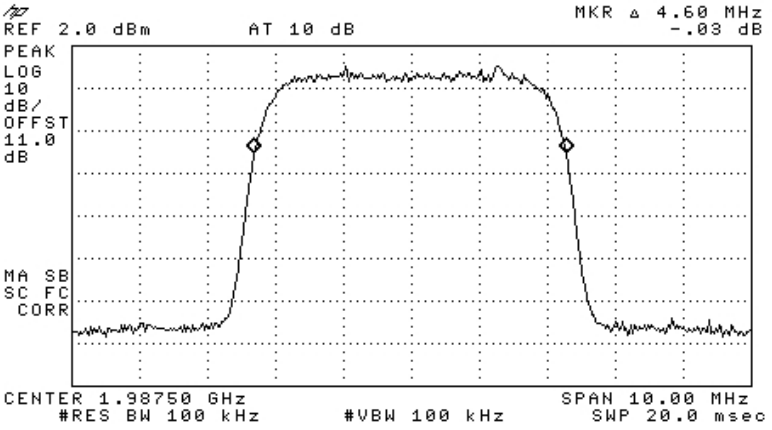


Figure 52.— Input 1987.50 MHz

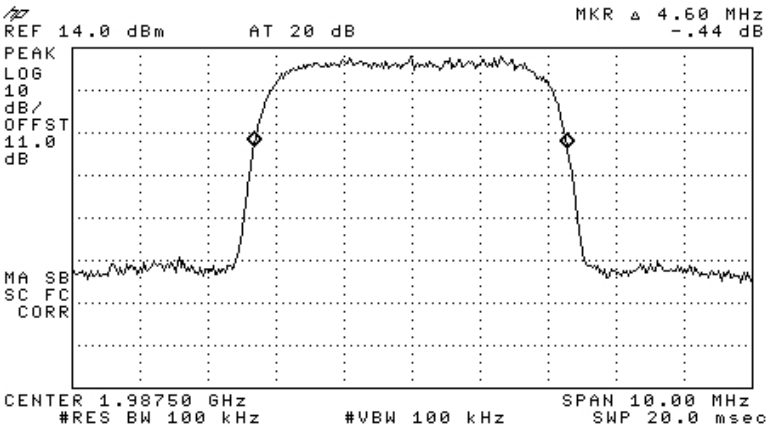


Figure 53.— Output 1987.50 MHz

GSM:

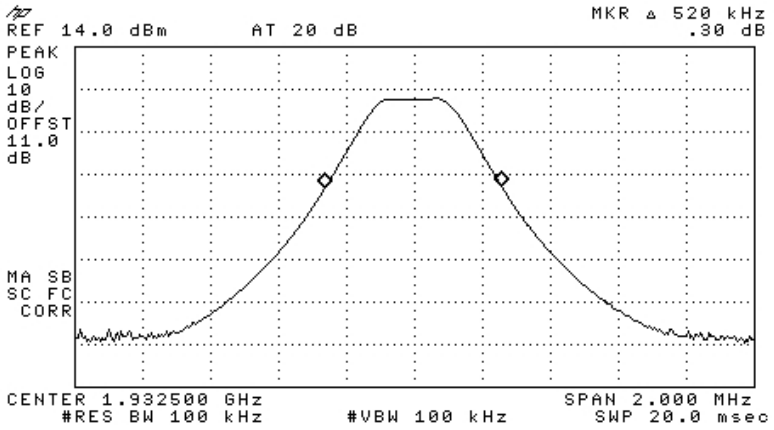


Figure 54.— Input 1932.50 MHz

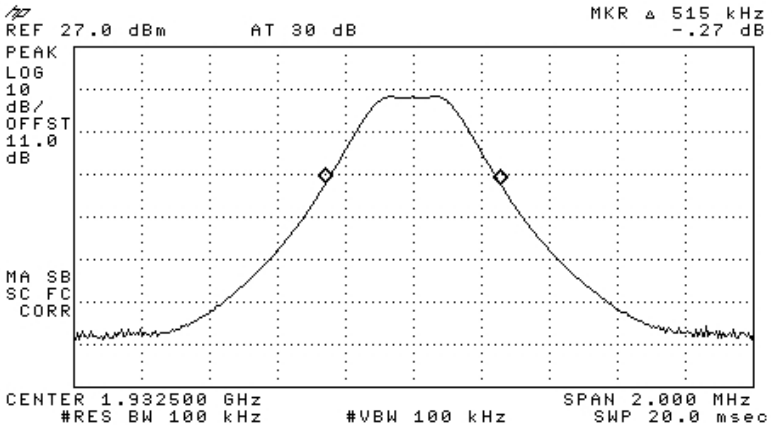


Figure 55.— Output 1932.50 MHz

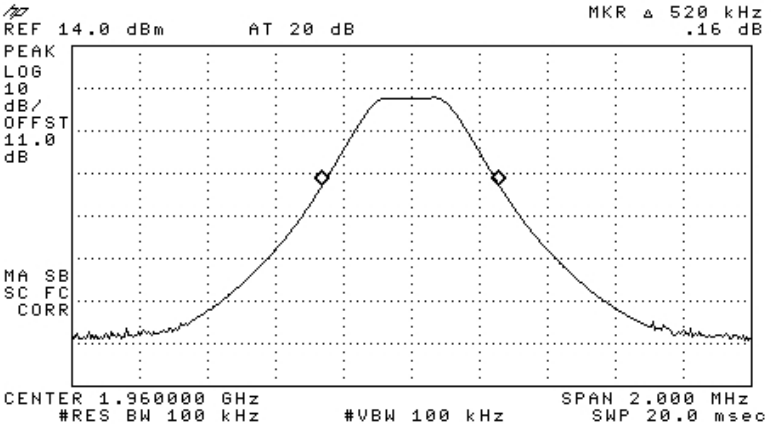


Figure 56.— Input 1960.00 MHz

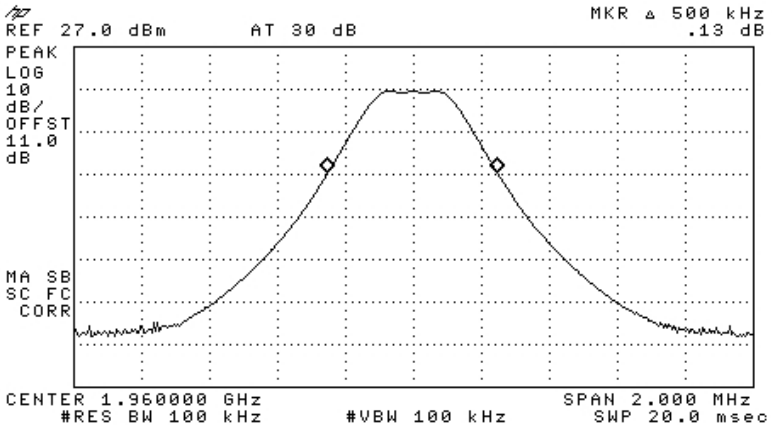


Figure 57.— Output 1960.00 MHz

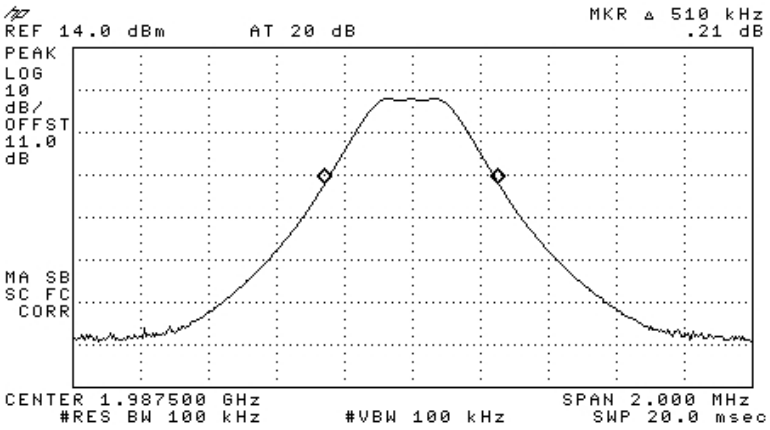


Figure 58.— Input 1987.50 MHz

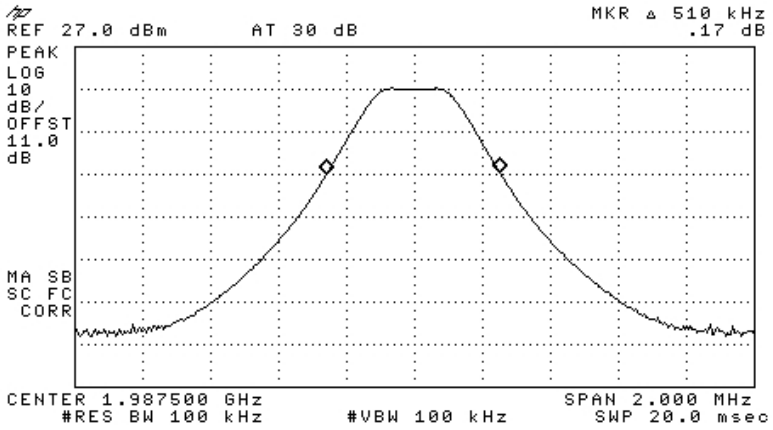


Figure 59.— Output 1987.50 MHz

9.3 Results Table

E.U.T. Description: Remote Hub Unit
Model No.: 1000-CELL-PCS4E-HL
Serial Number: 09203D6
Specification: FCC Part 2, Section 1049

Modulation		Operating Frequency	Reading (MHz)
W-CDMA	Input	1932.50	4.55
	Output	1932.50	4.55
	Input	1960.00	4.60
	Output	1960.00	4.60
	Input	1987.50	4.60
	Output	1987.50	4.60
GSM	Input	1932.50	0.52
	Output	1932.50	0.515
	Input	1960.00	0.52
	Output	1960.00	0.50
	Input	1987.50	0.51
	Output	1987.50	0.51

Figure 60 Occupied Bandwidth PCS

TEST PERSONNEL:

Tester Signature: _____ Date: 29.07.09

Typed/Printed Name: A. Sharabi

9.4 Test Equipment Used.

Occupied Bandwidth PCS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 17, 2009	1 year
Signal Generator	HP	E4433B ESG-D	3826A01204	March 17, 2009	1 year
Power Supply	Horizon Electronics	DHR 3653D-1.0	TE1232	N/A	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G 2W20	April 19, 2009	1 year
Cable	Rhophase	KPS-5000-KPS	A1674	April 19, 2009	1 year

Figure 61 Test Equipment Used

10. Out of Band Emissions at Antenna Terminals PCS

10.1 Test Specification

FCC Part 24, Sub-part E, Section 238; FCC Part 2.1051

10.2 Test procedure

The power of any emission outside of the authorized operating frequency ranges (1930-1990 MHz) must be attenuated below the transmitting power (P) by a factor of at least 43 + log (P) dB, yielding –13dBm.
The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (11 dB).
The spectrum analyzer was set to 100 kHz R.B.W.

W-CDMA:

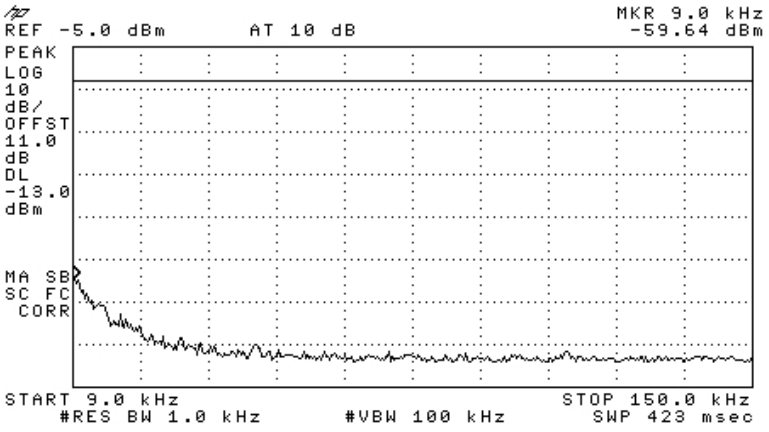


Figure 62.— 1932.50 MHz

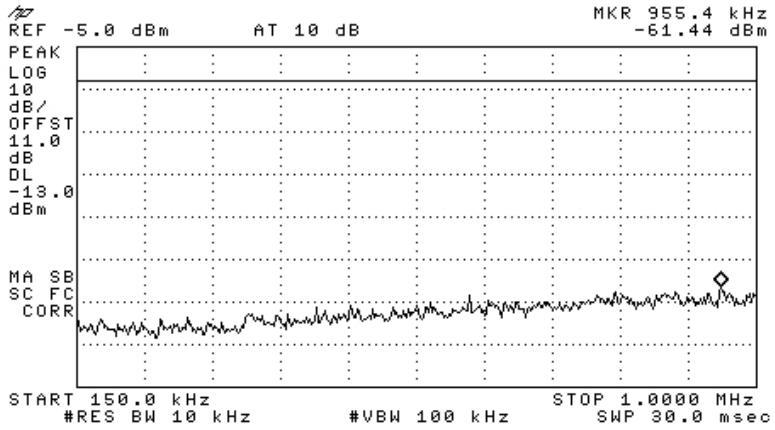


Figure 63.— 1932.50 MHz

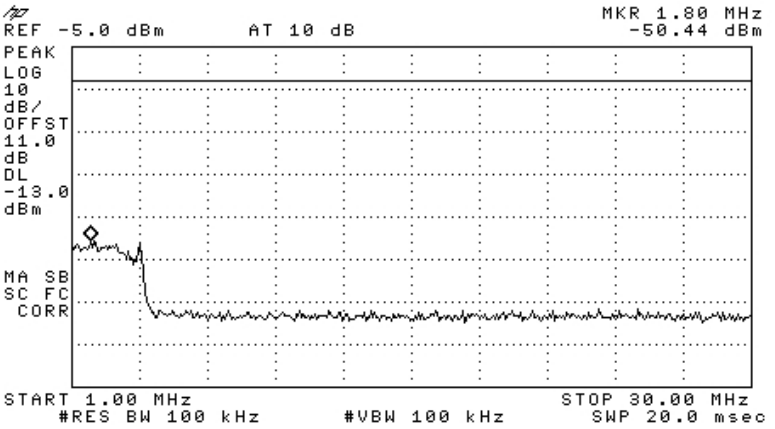


Figure 64.— 1932.50 MHz

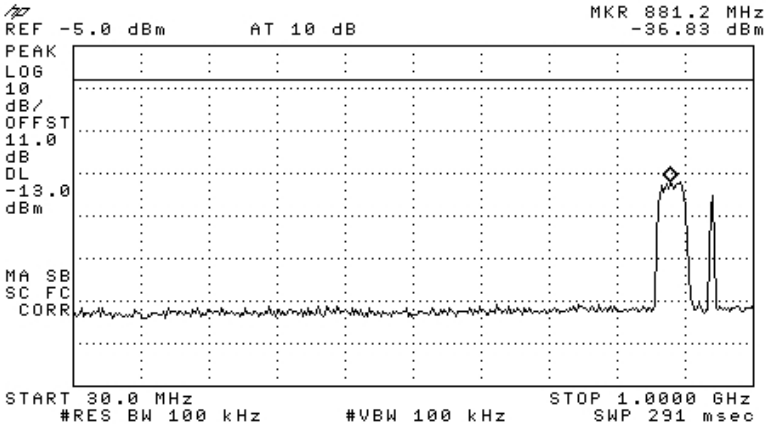


Figure 65.— 1932.50 MHz

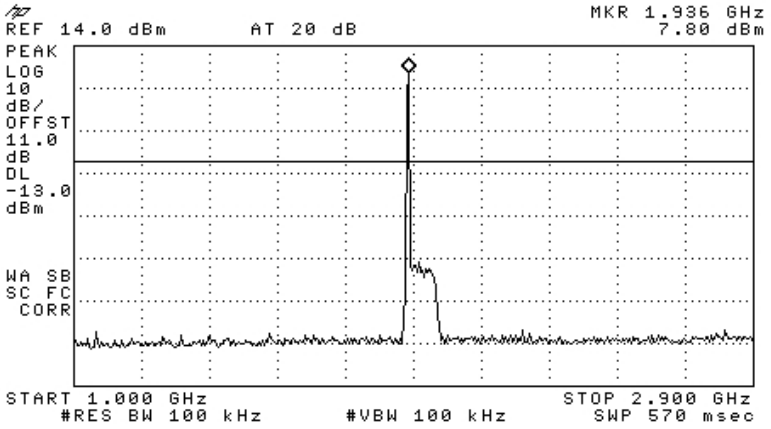


Figure 66.— 1932.50 MHz

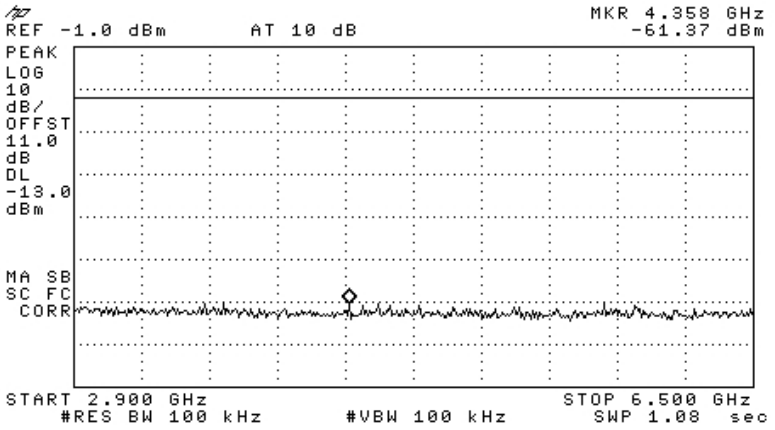


Figure 67.— 1932.50 MHz

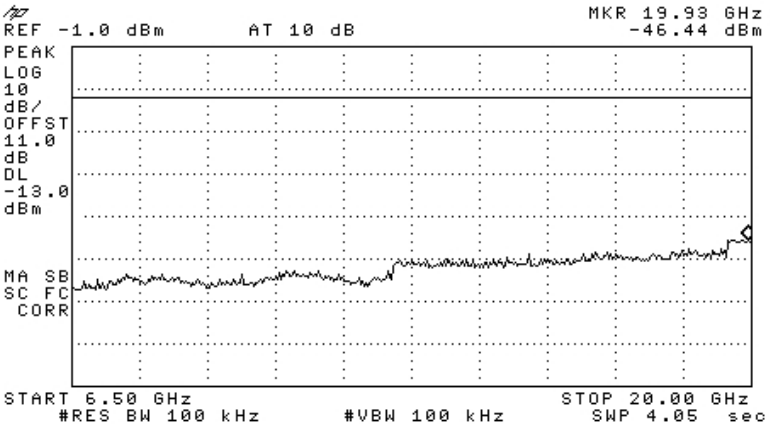


Figure 68.— 1932.50 MHz

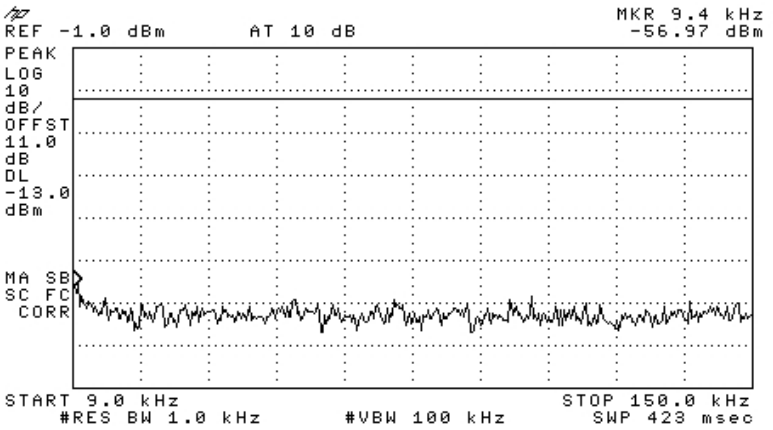


Figure 69.— 1960.00 MHz

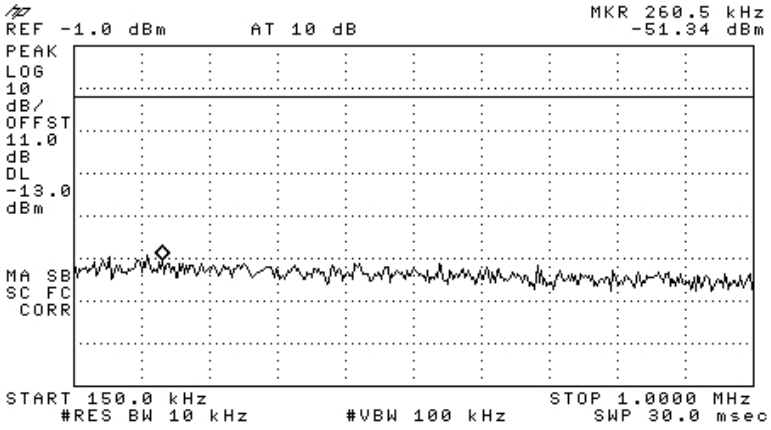


Figure 70.— 1960.00 MHz

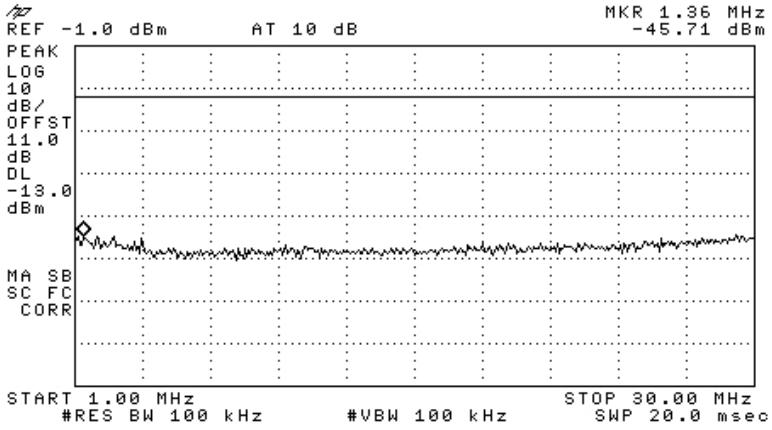


Figure 71.— 1960.00 MHz

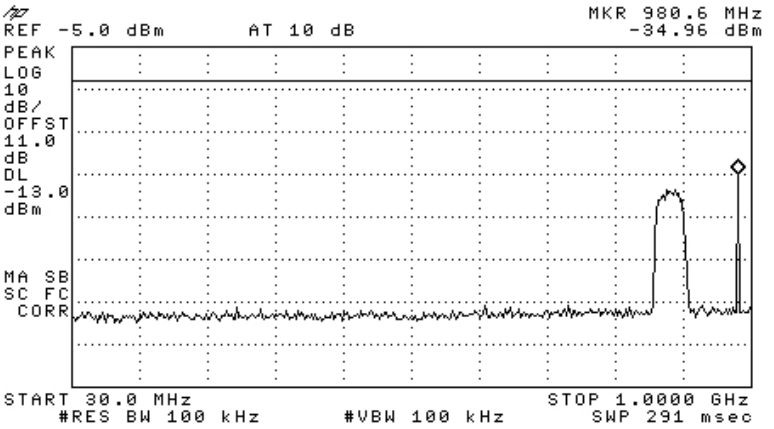


Figure 72.— 1960.00 MHz

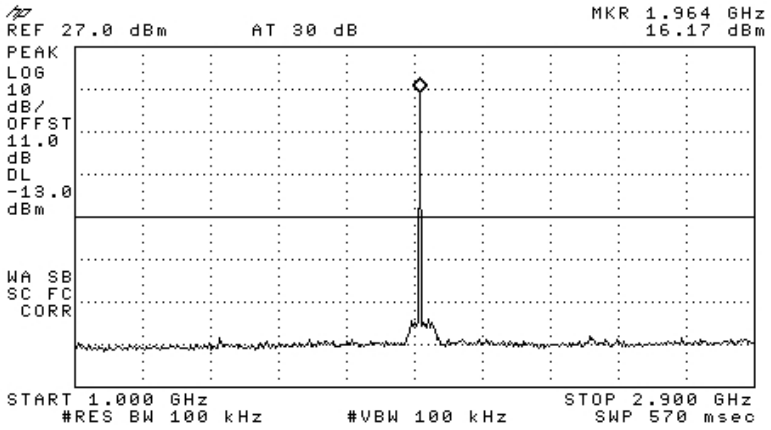


Figure 73.— 1960.00 MHz

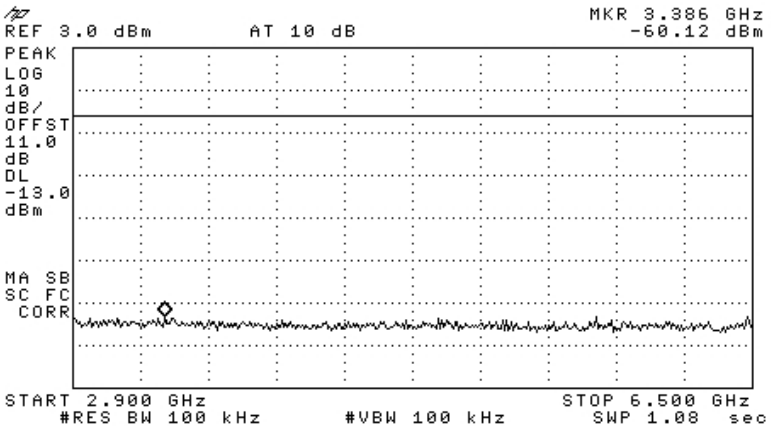


Figure 74.— 1960.00 MHz

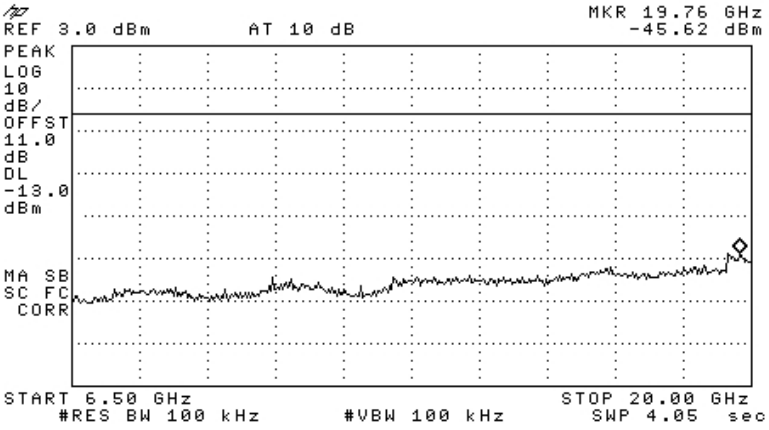


Figure 75.— 1960.00 MHz

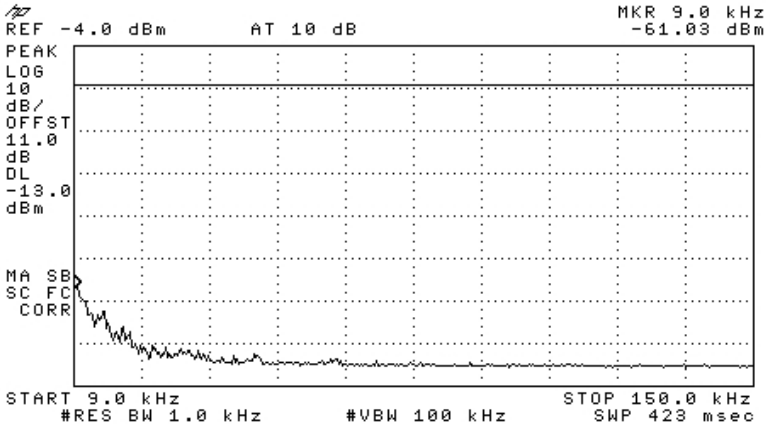


Figure 76.— 1987.50 MHz

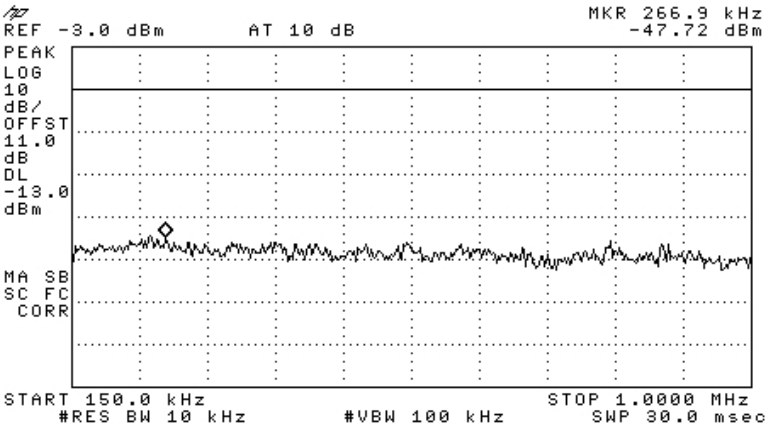


Figure 77.— 1987.50 MHz

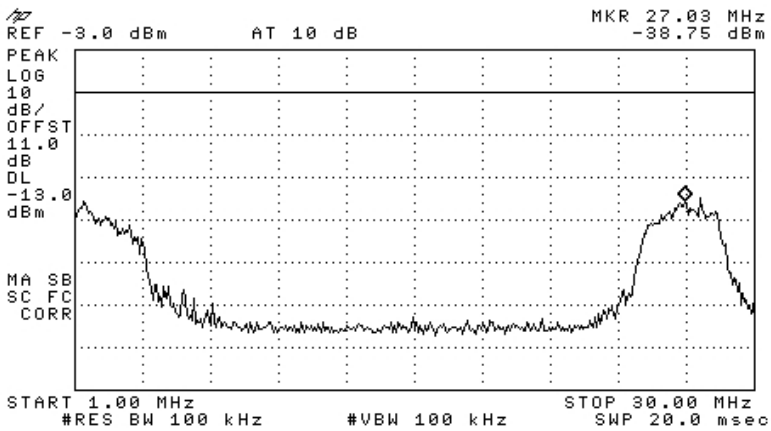


Figure 78.— 1987.50 MHz

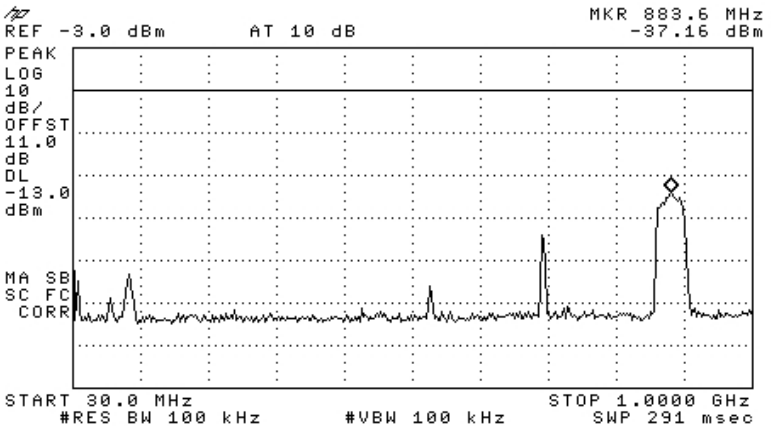


Figure 79.— 1987.50 MHz

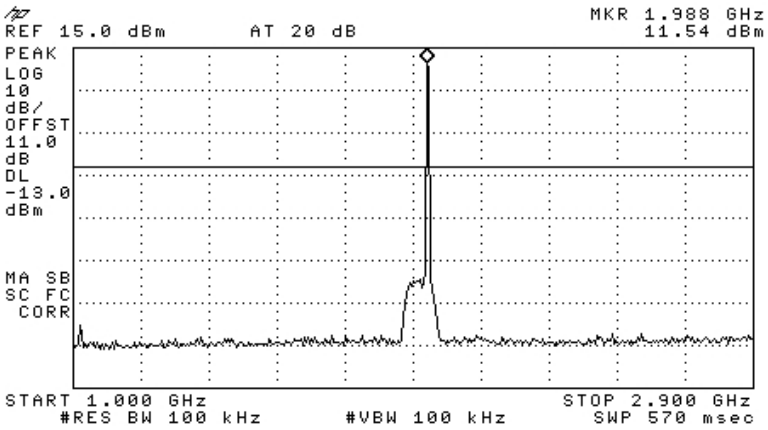


Figure 80.— 1987.50 MHz

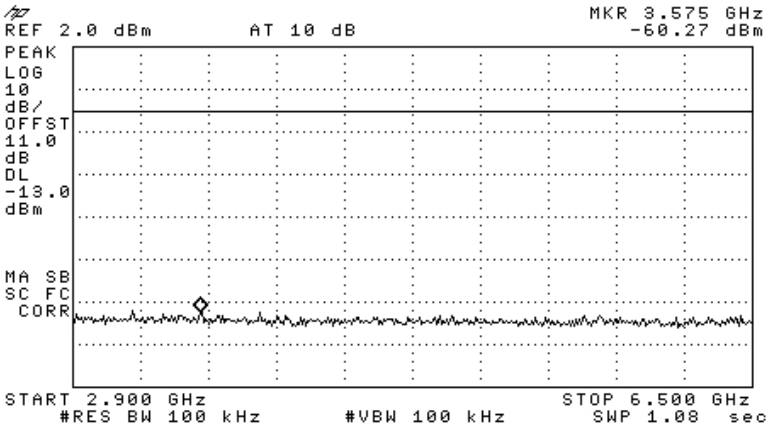


Figure 81.— 1987.50 MHz

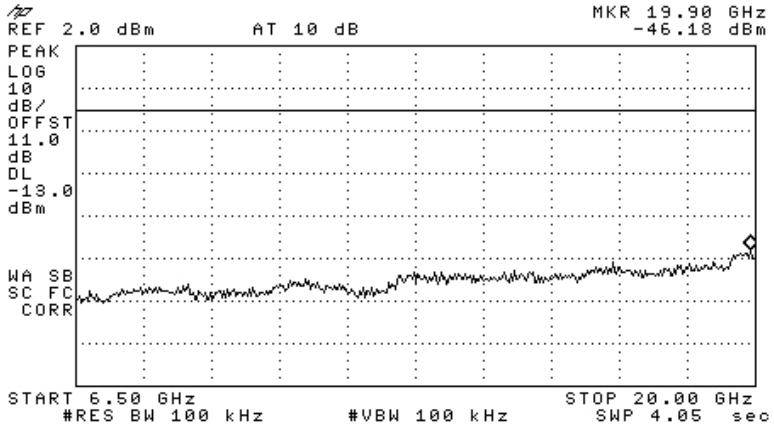


Figure 82.— 1987.50 MHz

GSM:

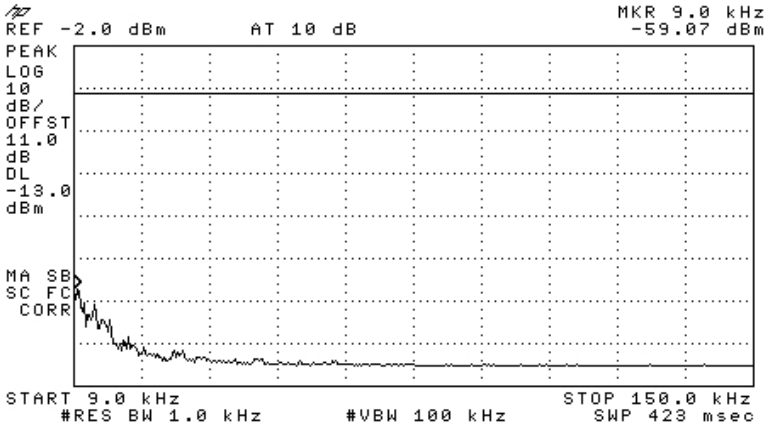


Figure 83.— 1932.50 MHz

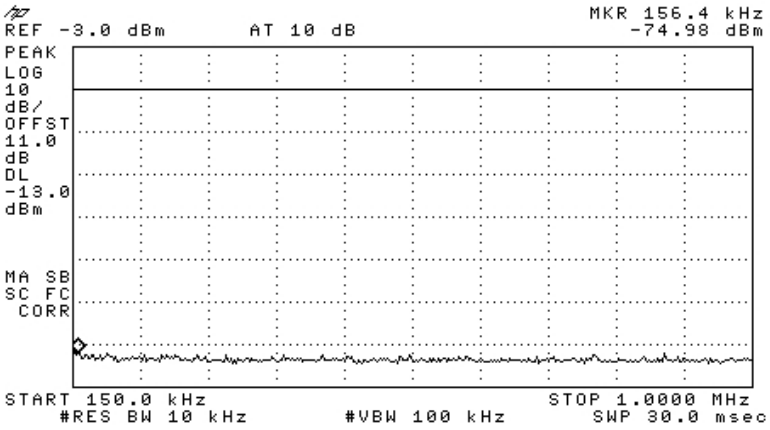


Figure 84.— 1932.50 MHz

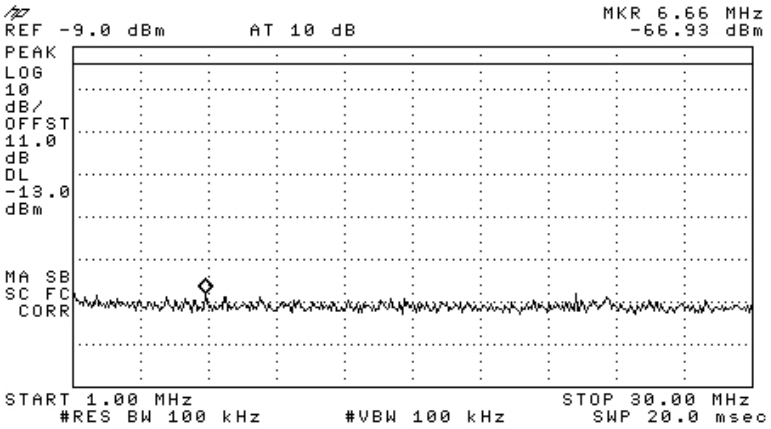


Figure 85.— 1932.50 MHz

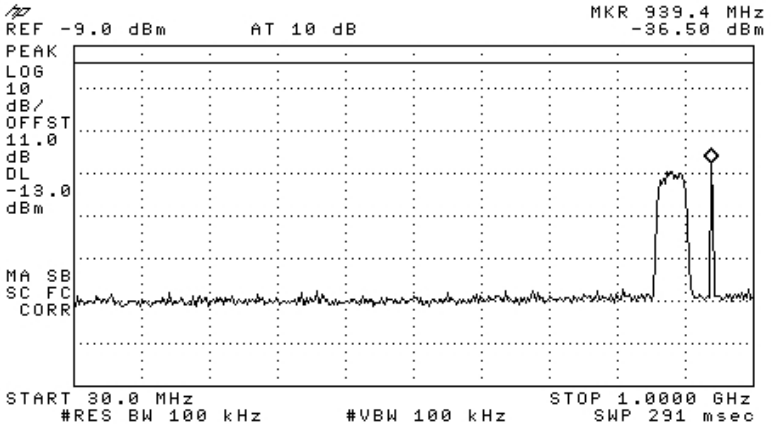


Figure 86.— 1932.50 MHz

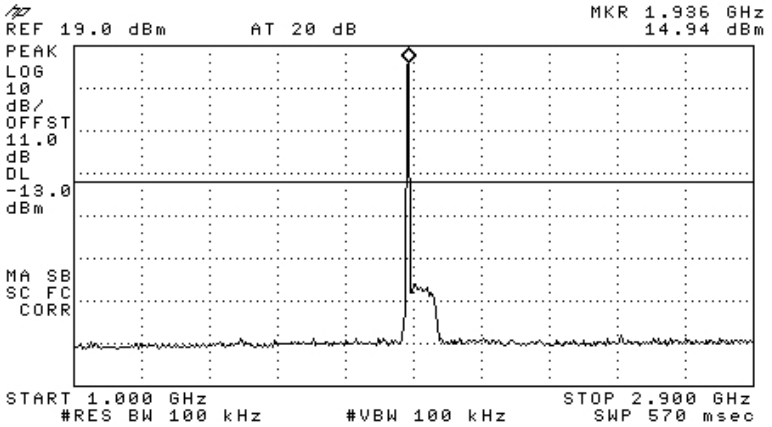


Figure 87.— 1932.50 MHz

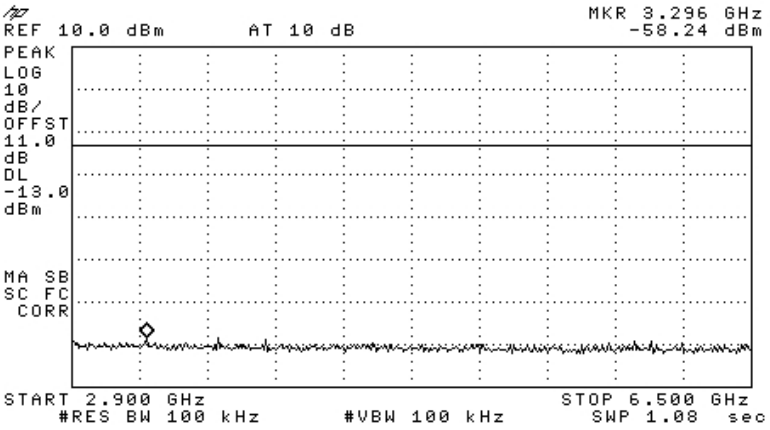


Figure 88.— 1932.50 MHz

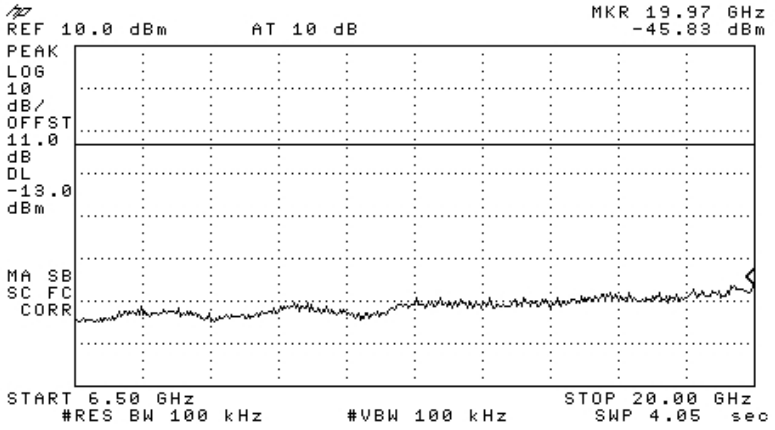


Figure 89.— 1932.50 MHz

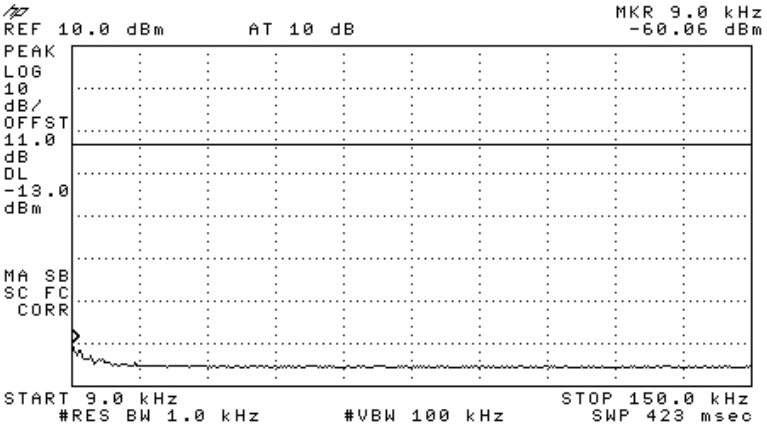


Figure 90.— 1960.00 MHz

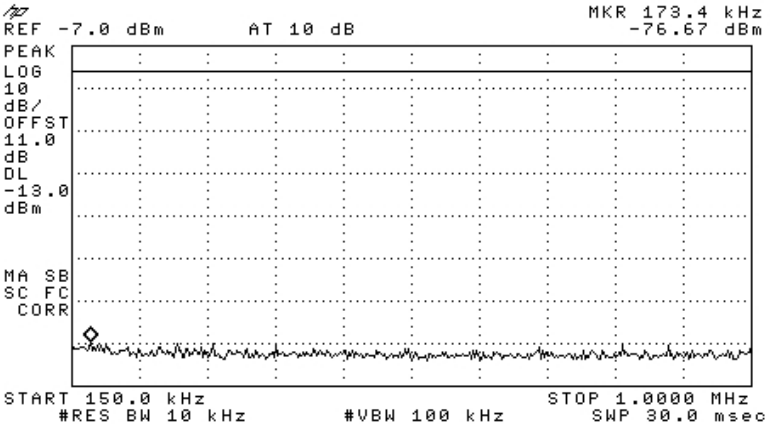


Figure 91.— 1960.00 MHz

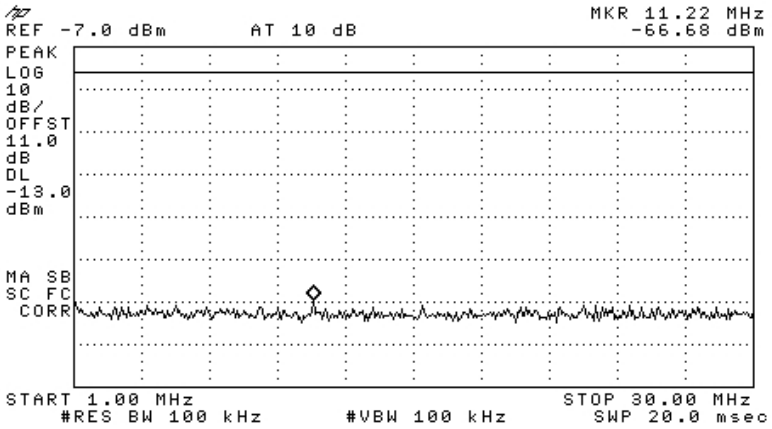


Figure 92.— 1960.00 MHz

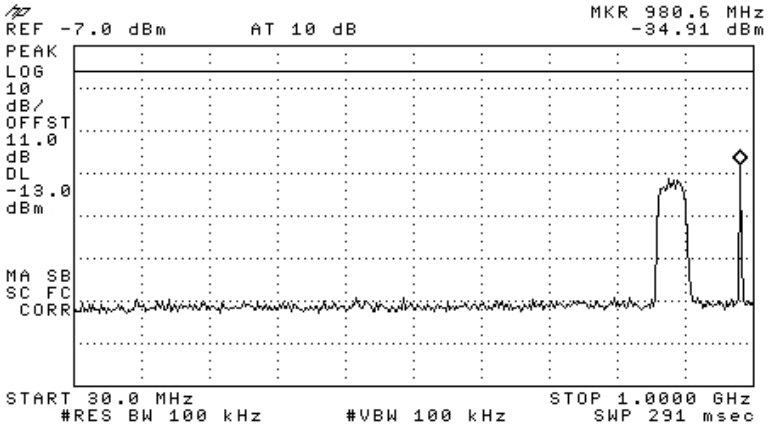


Figure 93.— 1960.00 MHz

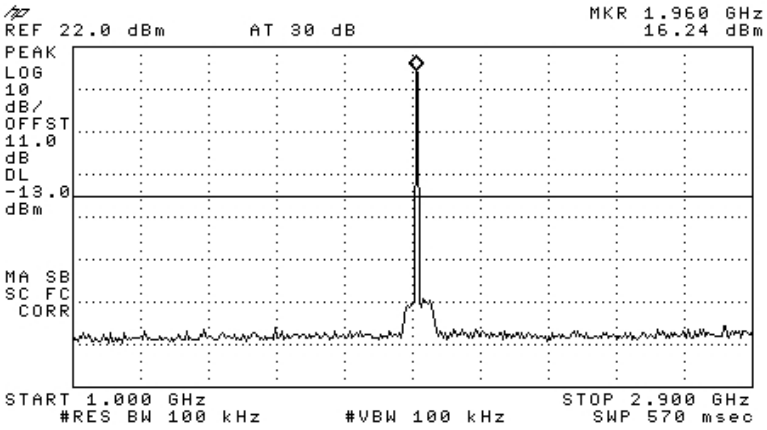


Figure 94.— 1960.00 MHz

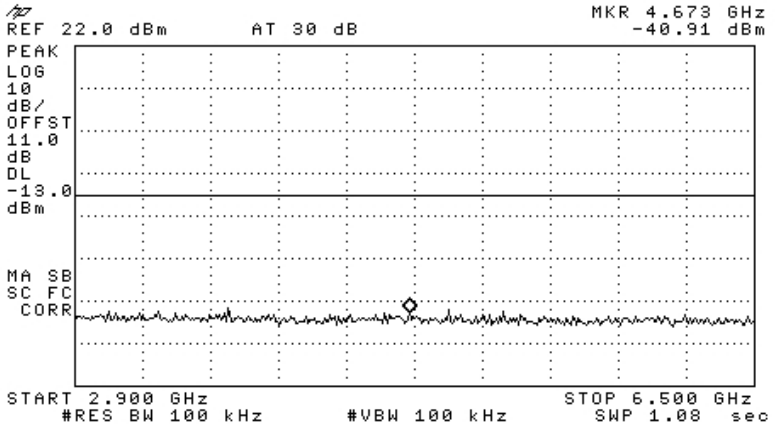


Figure 95.— 1960.00 MHz

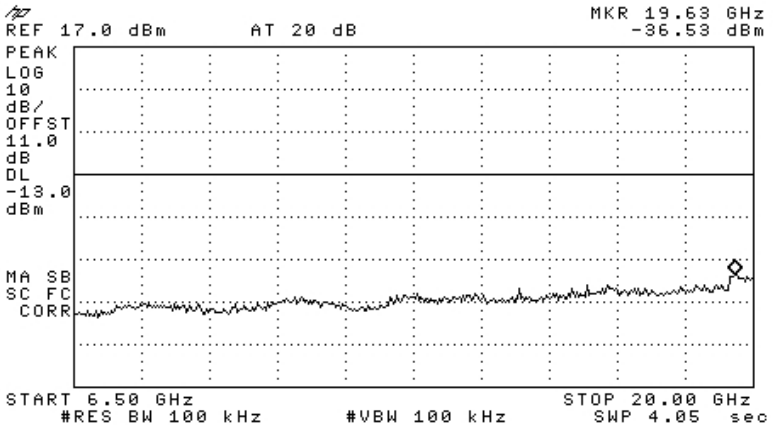


Figure 96.— 1960.00 MHz

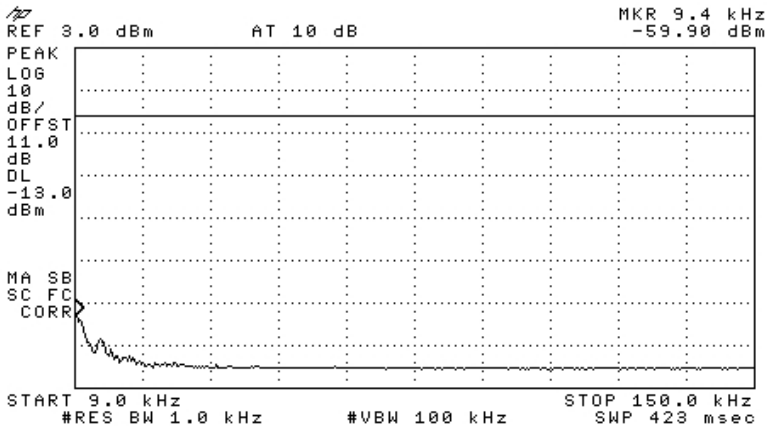
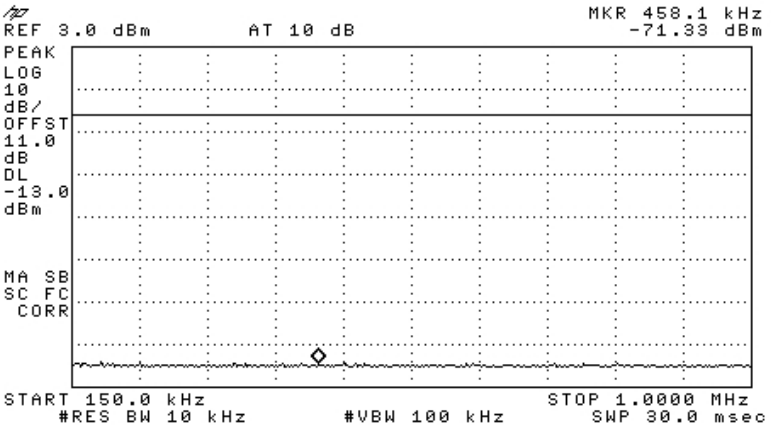
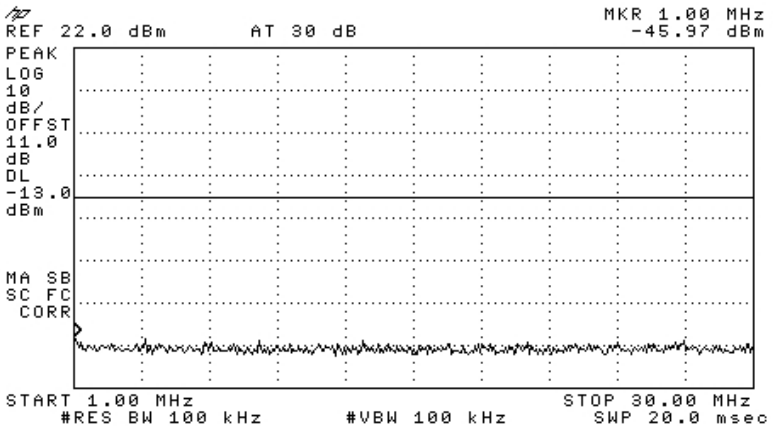


Figure 97.— 1987.50 MHz





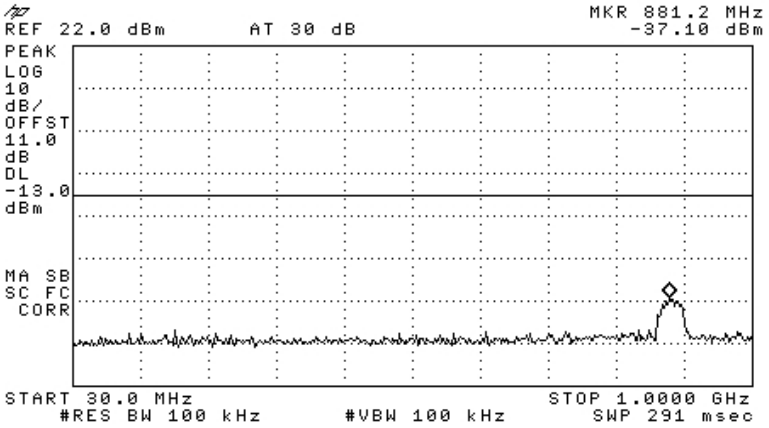


Figure 98.— 1987.50 MHz

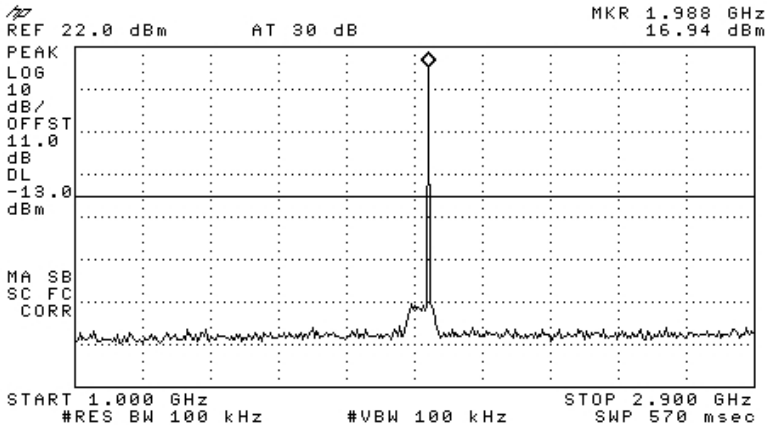


Figure 99.— 1987.50 MHz

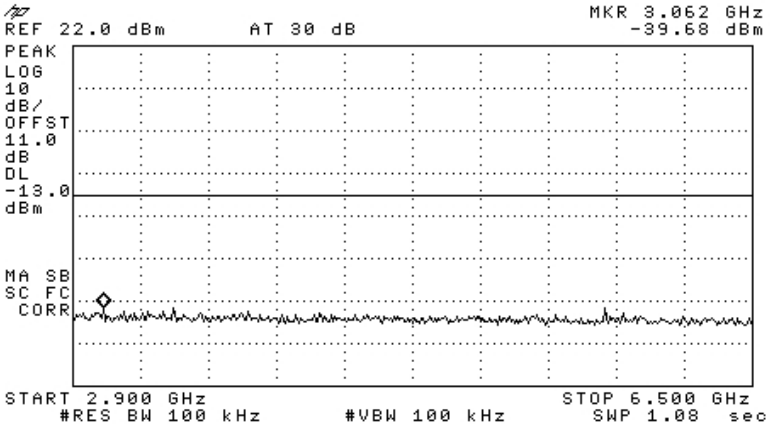


Figure 100.— 1987.50 MHz

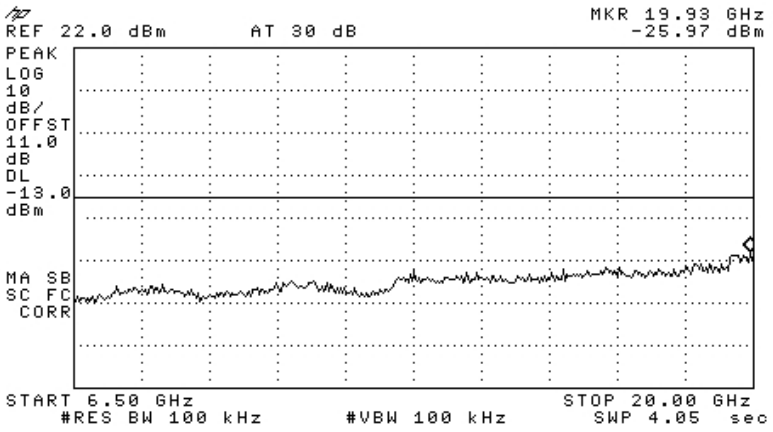


Figure 101.— 1987.50 MHz

10.3 Results table

E.U.T. Description: Remote Hub Unit
Model No.: 1000-CELL-PCS4E-HL
Serial Number: 09203D6
Specification: FCC Part 24, Sub-part E, Section 238; Part 2 Section 1051

Modulation	Operation Frequency (MHz)	Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
W-CDMA	1932.50	881.2	-36.83	-13.0	-23.83
	1960.00	980.6	-34.96	-13.0	-21.96
	1987.50	883.6	-37.16	-13.0	-24.16
GSM	1932.50	939.4	-36.50	-13.0	-23.5
	1960.00	980.6	-34.91	-13.0	-21.91
	1987.50	1993.0	-25.97	-13.0	-12.97

Figure 102 Out of Band Emission Results PCS

JUDGEMENT: Passed by 12.97 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 29.07.09

Typed/Printed Name: A. Sharabi

10.4 Test Equipment Used.

Out of Band Emission at Antenna Terminals PCS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 17, 2009	1 year
Signal Generator	HP	E4433B ESG-D	3826A01204	March 17, 2009	1 year
Power Supply	Horizon Electronics	DHR 3653D-1.0	TE1232	N/A	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G 2W20	April 19, 2009	1 year
Cable	Rhophase	KPS-5000-KPS	A1674	April 19, 2009	1 year

Figure 103 Test Equipment Used

11. Band Edge Spectrum

11.1 Test Specification

FCC Part 24, Sub-part E, Section 238; FCC Part 2.1051

11.2 Test procedure

Enclosed are spectrum analyzer plots for the lowest operation frequency (1932.5 MHz) and the highest operation frequency (1987.5 MHz) in which the E.U.T. is planned to be used.

The power of any emission outside of the authorized operating frequency ranges (1930.00-1990.00 MHz) must be attenuated below the transmitting power (P) by a factor of at least 43 + log (P) dB, yielding –13dBm.
The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (11 dB).
The spectrum analyzer was set to 100 kHz R.B.W.

W-CDMA:

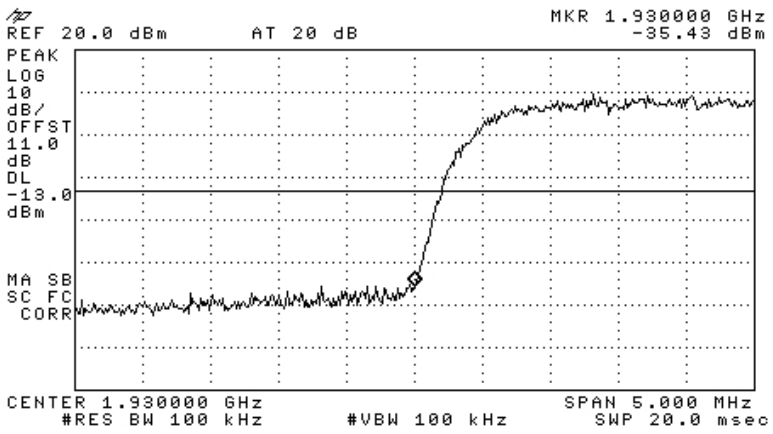


Figure 104.— 1932.50 MHz

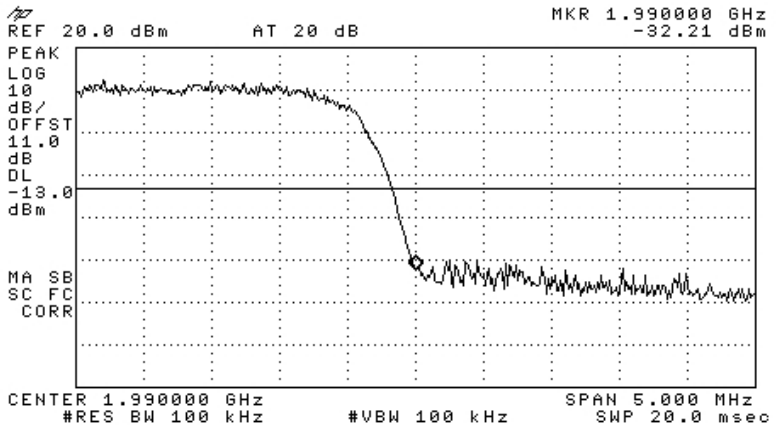


Figure 105.— 1987.50 MHz

GSM:

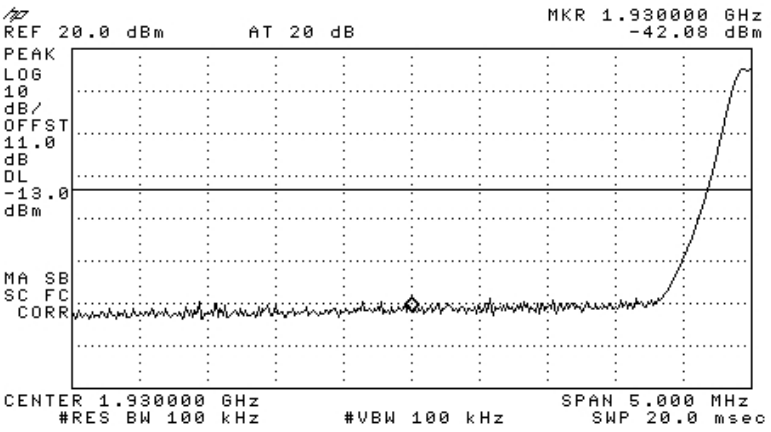


Figure 106.— 1932.50 MHz

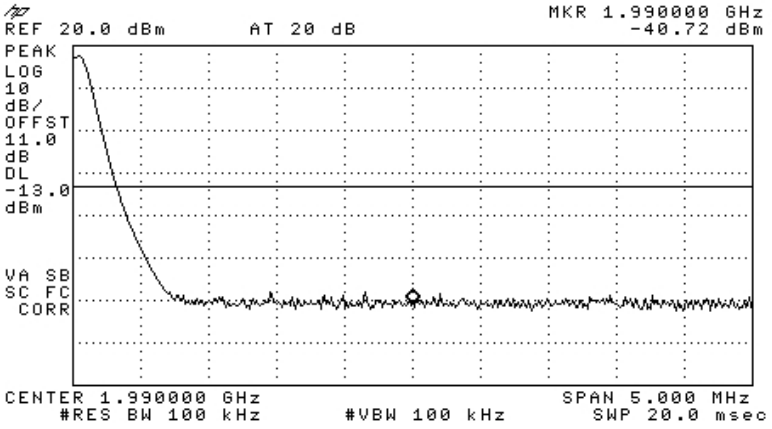


Figure 107.— 1987.50 MHz

11.3 Results table

E.U.T. Description: Remote Hub Unit
Model No.: 1000-CELL-PCS4E-HL
Serial Number: 09203D6
Specification: FCC Part 24, Sub-part E, Section 238; Part 2 Section 1051

Modulation	Operation Frequency (MHz)	Band Edge Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
W-CDMA	1932.50	1930.00	-35.43	-13.0	-22.43
	1987.50	1990.00	-32.21	-13.0	-19.21
GSM	1932.50	1930.00	-42.08	-13.0	-29.08
	1987.50	1990.00	-40.72	-13.0	-27.72

Figure 108 Band Edge Spectrum Results PCS

JUDGEMENT: Passed by 19.2 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 29.07.09

Typed/Printed Name: A. Sharabi

11.4 Test Equipment Used.

Band Edge Spectrum PCS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 17, 2009	1 year
Signal Generator	HP	E4433B ESG-D	3826A01204	March 17, 2009	1 year
Power Supply	Horizon Electronics	DHR 3653D-1.0	TE1232	N/A	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G 2W20	April 19, 2009	1 year
Cable	Rhophase	KPS-5000-KPS	A1674	April 19, 2009	1 year

Figure 109 Test Equipment Used

12. Out of Band Emissions (Radiated) PCS

12.1 Test Specification

FCC, Part 24, Sub-part E Section 238, FCC Part 2.1053

12.2 Test Procedure

The test method was based on ANSI/TIA-603-B: 2002, Section 2.2.12 Unwanted Emissions: Radiated Spurious.
The power of any emission outside of the authorized operating frequency ranges (1930-1990 MHz) must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB, yielding –13dBm.

(a) The E.U.T. operation mode and test set-up are as described in Section 3. A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 1.5 meters above the ground. The configuration tested is shown in Figure 3.1.
The frequency range 9 kHz-20 GHz was scanned, and the list of the highest emissions was verified and updated accordingly.
The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.
The emissions were measured at a distance of 3 meters.

(c) The E.U.T. was replaced by a substitution antenna (dipole 30MHz-1GHz, Horn Antenna above 1GHz) driven by a signal generator. The height was readjusted for maximum reading. The signal generator level was adjusted to obtain the same reading on the EMI receiver as in step (a).
The signals observed in step (a) were converted to radiated power using:
P_d(dBm) = P_g(dBm) – Cable Loss (dB) + Substitution Antenna Gain (dB)
P_d = Dipole equivalent power (result).
P_g = Signal generator output level.

12.3 Test Data

W-CDMA:

Carrier Channel (MHz)	Freq. (MHz)	Antenna Pol.	Maximum Peak Level (dBµV/m)	Signal Generator RF Output (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Effective Radiated Power Level (dBm)	Spec. (dBm)	Margin (dB)
1932.5	3865.0	V	46.7	-50.5	7.9	7.9	-50.5	-13	-37.5
1932.5	3865.0	H	45.7	-40.7	7.9	7.9	-40.7	-13	-27.7
1960.0	3920.0	V	47.8	-49.6	7.9	7.9	-49.6	-13	-36.6
1960.0	3920.0	H	46.5	-40.9	7.9	7.9	-40.9	-13	-27.9
1987.5	3975.0	V	46.4	-51.0	7.9	7.9	-51	-13	-38
1987.5	3975.0	H	47.5	-50.3	7.9	7.9	-50.3	-13	-37.3

GSM:

Carrier Channel (MHz)	Freq. (MHz)	Antenna Pol.	Maximum Peak Level (dBµV/m)	Signal Generator RF Output (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Effective Radiated Power Level (dBm)	Spec. (dBm)	Margin (dB)
1932.5	3865.0	V	46.7	-50.5	7.9	7.9	-50.5	-13	-37.5
1932.5	3865.0	H	45.7	-40.7	7.9	7.9	-40.7	-13	-27.7
1960.0	3920.0	V	47.8	-49.6	7.9	7.9	-49.6	-13	-36.6
1960.0	3920.0	H	46.5	-40.9	7.9	7.9	-40.9	-13	-27.9
1987.5	3975.0	V	46.4	-51.0	7.9	7.9	-51	-13	-38
1987.5	3975.0	H	47.5	-50.3	7.9	7.9	-50.3	-13	-37.3

The E.U.T met the requirements of the FCC, Part 24, Sub-part E, Section 238; FCC Part 2.1053 specifications.

TEST PERSONNEL:

Tester Signature: _____ Date: 29.07.09

Typed/Printed Name: A. Sharabi

12.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 17, 2008	1 year
RF Section	HP	85420E	3705A00248	November 16, 2008	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	March 25, 2009	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 06, 2008	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 15, 2008	1 year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 29, 2009	2 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	ThinkJet 2225	2738508357.0	N/A	N/A
Spectrum Analyzer	HP	8592L	3826A01204	March 17, 2009	1 year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	November 3, 2008	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	January 8, 2009	1 Year
Signal Generator	HP	E4432B ESG-D	GB38450502	March 17, 2009	1 year
Double Ridged Waveguide Horn Antenna	EMCO	3115	29845	March 16, 2008	2 year

13. APPENDIX A - CORRECTION FACTORS

13.1. Correction factors for CABLE

from EMI receiver to test antenna at 3 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3
20.0	0.6
30.0	0.8
40.0	0.9
50.0	1.1
60.0	1.2
70.0	1.3
80.0	1.4
90.0	1.6
100.0	1.7
150.0	2.0
200.0	2.3
250.0	2.7
300.0	3.1
350.0	3.4
400.0	3.7
450.0	4.0
500.0	4.3
600.0	4.7
700.0	5.3
800.0	5.9
900.0	6.3
1000.0	6.7

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
1200.0	7.3
1400.0	7.8
1600.0	8.4
1800.0	9.1
2000.0	9.9
2300.0	11.2
2600.0	12.2
2900.0	13.0

NOTES:

1. The cable type is RG-214.

2. The overall length of the cable is 27 meters.

3. The above data is located in file 27MO3MO.CBL on the disk marked "Radiated Emission Tests EMI Receiver".

13.2. Correction factors for CABLE

from EMI receiver to test antenna at 3 meter range.

FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.2
2.0	1.6
3.0	2.0
4.0	2.4
5.0	3.0
6.0	3.4
7.0	3.8
8.0	4.2
9.0	4.6
10.0	5.0
12.0	5.8

NOTES:

1. The cable type is RG-8.

2. The overall length of the cable is 10 meters.

13.3. Correction factors for CABLE

from spectrum analyzer
to test antenna above 2.9 GHz

FREQUENCY (GHz)	CORRECTION FACTOR (dB)	FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.9	14.0	9.1
2.0	2.7	15.0	9.5
3.0	3.5	16.0	9.9
4.0	4.2	17.0	10.2
5.0	4.9	18.0	10.4
6.0	5.5	19.0	10.7
7.0	6.0	20.0	10.9
8.0	6.5	21.0	11.2
9.0	7.0	22.0	11.6
10.0	7.5	23.0	11.9
11.0	7.9	24.0	12.3
12.0	8.3	25.0	12.6
13.0	8.7	26.0	13.0

NOTES:

1. The cable type is SUCOFLEX 104 E manufactured by SUHNER.

2. The cable is used for measurements above 2.9 GHz.

3. The overall length of the cable is 10 meters.

13.4. Correction factors for LOG PERIODIC ANTENNA

Type LPD 2010/A
at 3 and 10 meter ranges.

Distance of 3 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.1
250.0	10.2
300.0	12.5
400.0	15.4
500.0	16.1
600.0	19.2
700.0	19.4
800.0	19.9
900.0	21.2
1000.0	23.5

Distance of 10 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.0
250.0	10.1
300.0	11.8
400.0	15.3
500.0	15.6
600.0	18.7
700.0	19.1
800.0	20.2
900.0	21.1
1000.0	23.2

NOTES:

1. *Antenna serial number is 1038.*
2. *The above lists are located in file number 38M3O.ANT for a 3 meter range, and file number 38M100.ANT for a 10 meter range.*
3. *The files mentioned above are located on the disk marked "Radiated Emission Test EMI Receiver".*

13.5. Correction factors for LOG PERIODIC ANTENNA

Type SAS-200/511
at 3 meter range.

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
1.0	24.9
1.5	27.8
2.0	29.9
2.5	31.2
3.0	32.8
3.5	33.6
4.0	34.3
4.5	35.2
5.0	36.2
5.5	36.7
6.0	37.2
6.5	38.1

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
7.0	38.6
7.5	39.2
8.0	39.9
8.5	40.4
9.0	40.8
9.5	41.1
10.0	41.7
10.5	42.4
11.0	42.5
11.5	43.1
12.0	43.4
12.5	44.4
13.0	44.6

NOTES:

1. *Antenna serial number is 253.*
2. *The above lists are located in file number SAS3M0.ANT for a 3 meter range.*
3. *The files mentioned above are located on the disk marked "Antenna Factors".*

13.6. Correction factors for BICONICAL ANTENNA

Type BCD-235/B,
at 3 meter range

FREQUENCY (MHz)	AFE (dB/m)
20.0	19.4
30.0	14.8
40.0	11.9
50.0	10.2
60.0	9.1
70.0	8.5
80.0	8.9
90.0	9.6
100.0	10.3
110.0	11.0
120.0	11.5
130.0	11.7
140.0	12.1
150.0	12.6
160.0	12.8
170.0	13.0
180.0	13.5
190.0	14.0
200.0	14.8
210.0	15.3
220.0	15.8
230.0	16.2
240.0	16.6
250.0	17.6
260.0	18.2
270.0	18.4
280.0	18.7
290.0	19.2
300.0	19.9
310	20.7
320	21.9
330	23.4
340	25.1
350	27.0

NOTES:

1. Antenna serial number is 1041.

2. The above list is located in file 19BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".

13.7. Correction factors for Double-Ridged Waveguide Horn

Model: 3115, S/N 29845
at 3 meter range.

FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)	FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)
1.0	24.8	5.4	10.0	38.8	11.4
1.5	26.1	7.6	10.5	38.9	11.8
2.0	28.6	7.7	11.0	39.0	12.1
2.5	29.8	8.4	11.5	39.6	11.8
3.0	31.4	8.4	12.0	39.8	12.0
3.5	32.4	8.7	12.5	39.6	12.5
4.0	33.7	8.6	13.0	40.0	12.5
4.5	33.4	9.9	13.5	39.8	13.0
5.0	34.5	9.7	14.0	40.2	13.0
5.5	35.1	9.9	14.5	40.6	12.9
6.0	35.4	10.4	15.0	41.3	12.4
6.5	35.6	10.8	15.5	39.5	14.6
7.0	36.2	10.9	16.0	38.8	15.5
7.5	37.3	10.4	16.5	40.0	14.6
8.0	37.7	10.6	17.0	41.4	13.4
8.5	38.3	10.5	17.5	44.8	10.3
9.0	38.5	10.8	18.0	47.2	8.1
9.5	38.7	11.1			

13.8. Correction factors for ACTIVE LOOP ANTENNA

Model 6502
S/N 9506-2950

FREQUENCY (MHz)	Magnetic Antenna Factor (dB)	Electric Antenna Factor (dB)
.009	-35.1	16.4
.010	-35.7	15.8
.020	-38.5	13.0
.050	-39.6	11.9
.075	-39.8	11.8
.100	-40.0	11.6
.150	-40.0	11.5
.250	-40.0	11.6
.500	-40.0	11.5
.750	-40.1	11.5
1.000	-39.9	11.7
2.000	-39.5	12.0
3.000	-39.4	12.1
4.000	-39.7	11.9
5.000	-39.7	11.8
10.000	40.2	11.3
15.000	-40.7	10.8
20.000	-40.5	11.0
25.000	-41.3	10.2
30.000	42.3	9.2