

**DATE: 28 April 2010**

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

# **FCC Radio Test Report**

**for**

## **Mobile Access Networks**

**Equipment under test:**

**Remote Hub Unit**

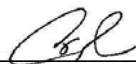
**2000-CELL-PCSH**

Written by:



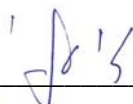
D. Shidlowsky, Documentation

Approved by:



A. Sharabi, Test Engineer

Approved by:



I. Raz, EMC Laboratory Manager

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This report relates only to items tested.

## Measurement/Technical Report for Mobile Access Networks

### Remote Hub Unit

**FCC ID: OJFMA2K-CELL-PCSH**

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:

Ishaishou Raz

ITL (Product Testing) Ltd.

Kfar Bin Nun

D.N. Shimshon 99780

Israel

e-mail Sraz@itl.co.il

Applicant for this device:

(different from "prepared by")

Steve Blum

Mobile Access Networks

8391 Old Courthouse Rd., Suite #300

Vienna, VA. 22182

U.S.A.

Tel: +1-541-758-2880

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.:	2000-CELL-PCSH
Equipment Serial No.:	0822372
Date of Receipt of E.U.T:	14.03.10
Start of Test:	14.03.10
End of Test:	13.04.10; 27.04.10*
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	FCC Parts 2, 22, 24

\* Peak Output Power for GSM was re-tested on 27.04.10 according to the customer's request using Remote Hub Unit M/N 2000-CELL-PCSH, S/N . 0A050E2 since unit S/N 0822372 was unavailable .

## **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

#### Data Sheet



## MobileAccess2000 Data Sheet

The MobileAccess2000 provides enterprise level indoor coverage for a wide range of wireless services over a single broadband infrastructure.

The MA2000 is a multi-operator, multi-service system based on combining a number of services, voice and data, and distributing them to each remote location through a common antenna infrastructure.

Wireless RF services are bi-directionally transmitted between the capacity source (BTS/BDA) and remote locations using low loss fiber and broadband coax.

WLAN services from WiFi Access Points (802.11a/b/g/n) can be integrated with the Wireless RF services at the remote locations for transport over a single cabling infrastructure to the antenna.

Two types of MA2000 deployment solutions are available:

- **MA2000-Lite** – Coverage solution for up to six cellular services.
- **MA2000 Modular Remote Cabinet (MRC)** - Coverage solution for greater than six cellular services.

#### Features & Benefits:

- **Multi-Operator Platform:** Accommodates multiple operators seamlessly and transparently on one in-building network.
- **Multi-Service Platform:** Accommodates virtually any mix of wireless voice and data services, eliminating the need for separate overlay networks. Supported services and technologies include: GSM, CDMA, TDMA, iDEN, LMR, SMR, Paging, UMTS, DCS, EDGE, EV-DO, UHF/VHF, WMTS, and more.
- **Modular Design:** With its modular packaging, the MA2000 enables new wireless services to be added easily and cost-effectively without disruption to work spaces or existing services.
- **Scalable Packaging:** The MA2000 is available in two variants, the MA2000 Modular Remote Cabinet (MRC) and the MA2000-Lite. Customers can expand from the MA2000-Lite to the MA2000 MRC while re-purposing all components.
- **Carrier-Class Operation:** Advanced signal handling and management ensures optimal performance for all services involved in a multi-operator environment.
- **Robust Management:** Proactive, centralized end-to-end monitoring and management of MA2000 equipment and RF signals.
- **Reduce Operating Expenses:** Multi-operator, multi-service across common infrastructure; supports multimode fiber.



Figure 1: MA2000-Lite



Figure 2: MA2000 MRC



## System Architecture

The MobileAccess2000 solution deployment is comprised of the following elements. For more detailed information, refer to the MA2000 User Manual and Installation Guide.

### Head End Equipment

**Radio Interface Unit (RIU):** The RIU conditions the RF Downlink signals from base-transceiver stations (BTS) or bi-directional amplifiers (BDA) provided by the Wireless Service Providers (WSPs), ensuring a constant level of RF before passing them on to the Base Units (BU). RF Uplink signals from subscribers are received from the BU and transported back to the BTS or BDA.

**Base Unit (BU):** The BU converts the RF Downlink signals received from the RIU to an optical signal for transport on single or multi-mode fiber to the Remote Hub Units (RHU) located at the remote locations. Uplink optical signals from subscribers are received from the RHU and converted back to RF before passing them on to the RIU.

**System Controller:** The system controller enables remote management and control of all MA2000 elements from a single location. Refer to the System Controller datasheet for more information.

### Remote Location Equipment

**MA2000-Lite:** The MA2000-Lite is an entry level platform for deploying a multi-operator solution. It supports up to two RHUs, each with an Add-On, for a total of six services.

**MA2000 Modular Remote Cabinet (MRC):** The MRC is a cabinet capable of housing up to five RHUs (or two RHUs, each with an Add-On), power and appropriate filtration.

**Remote Hub Unit (RHU):** The RHU is a service specific module that performs optical to RF conversion on signals received from the BU. The signals are then filtered and amplified for transport across broadband coax to the antenna. Uplink signals from the antenna are then converted to optical signals before being transmitted back to the BU. Each RHU supports up to two services.

**Add-On (AO):** The Add-On is a single service unit that is coupled with an RHU to support an additional service. The Add-On receives filtered RF signal from the RHU and amplifies it for transport across the broadband coax.

**860 WLAN Module (860):** The 860 is mounted outside the MRC or MA200-Lite. It combines WLAN and cellular signals for transport across the broadband coax. The 860 is used with Wireless Coverage Expanders (WCE). Refer to the 860 WLAN Solution datasheet for more information.

## 1.4 Test Methodology

Both conducted and 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 September 03, 2009).

I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.



## **1.6      *Measurement Uncertainty***

### Conducted Emission

The uncertainty for this test is  $\pm 2$  dB.

### Radiated Emission

The Open Site complies with the  $\pm 4$  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 test setup was configured to closely resemble the standard installation. Changes were made to the original product to include G Block.

### 2.2 EUT Exercise Software

RHU Embedded SW version: V4.1B01  
EngGui version: Setup\_EngGui\_Suite\_1\_26\_08.exe  
MCT Version: Setup\_Mct\_10\_27\_07.exe  
NMS Version: Setup\_NMS\_Server\_22\_07\_01.exe

### 2.3 Special Accessories

No special accessories were needed to achieve compliance.

### 2.4 Equipment Modifications

No modifications were necessary in order o achieve compliance.

### 2.5 Configuration of Tested System

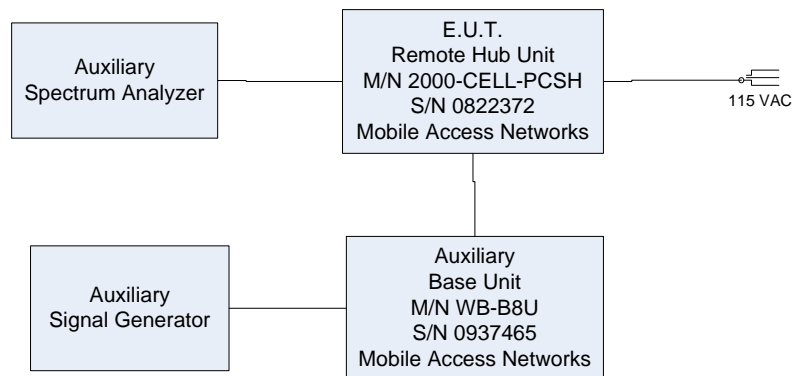


Figure 1. Test Set-up

### 3. Test Setup Photos



**Figure 2. Conducted Emission From AC Mains Test Set-up**



**Figure 3. Conducted Emission From Antenna Port Test Set-up**



**Figure 4. Radiated Emission Test Set-up**

## 4. Conducted Emission Data

### 4.1 Test Specification

F.C.C., Part 15, Subpart C

### 4.2 Test Procedure

The E.U.T operation mode and test set-up are as described in Section 3.1. In order to minimize background noise interference, the conducted emission testing was performed inside a shielded room, with the E.U.T placed on an 0.8 meter high wooden table, 0.4 meter from the room's vertical wall.

The E.U.T was powered from 115 V AC / 60 Hz via a 50 Ohm / 50  $\mu$ Hn Line Impedance Stabilization Network (LISN) on the phase and neutral lines. The LISN's were grounded to the shielded room ground plane (floor), and were kept at least 0.8 meters from the nearest boundary of the E.U.T

The center of the E.U.T AC cable was folded back and forth, in order to form a bundle less than 0.40 meters and a total cable length of 1 meter.

The emission voltages at the LISN's outputs were measured using a computerized receiver, complying with CISPR 16 requirements. The specification limits are loaded to the receiver via a 3.5" floppy disk and are displayed on the receiver's spectrum display.

A frequency scan between 0.15 and 30 MHz was performed at 9 kHz I.F. band width, and using peak detection.

The spectral components having the highest level on each line were measured using a quasi-peak and average detector.

### 4.3 Measured Data

JUDGEMENT: Passed by 11.6dB

The margin between the emission levels and the specification limit is, in the worst case, 11.6 dB for the phase line at 0.19 MHz and 11.6 dB at 0.19 MHz for the neutral line.

The EUT met the F.C.C. Part 15, Subpart C specification requirements.

The details of the highest emissions are given in *Figure 5* to *Figure 8*.

TEST PERSONNEL:

Tester Signature:  Date: 18.04.10

Typed/Printed Name: A. Sharabi

## Conducted Emission

E.U.T Description      Remote Hub Unit  
 Type                      2000-CELL-PCSH  
 Serial Number:          0822372

Specification:    F.C.C., Part 15, Subpart C  
 Lead:              Phase  
 Detectors:        Peak, Quasi-peak, Average

Signal Number	Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Delta L 1 (dB)	Avg (dBuV)	Av Delta L 2 (dB)	Corr (dB)
1	0.186012	50.1	48.6	-15.7	42.7	-11.6	0.0
2	0.267553	24.9	23.0	-38.3	18.7	-32.5	0.0
3	1.464633	15.4	13.9	-42.0	10.4	-35.6	0.0
4	5.323116	27.1	25.6	-34.4	24.4	-25.6	0.0
5	10.150560	39.0	35.7	-24.3	30.4	-19.6	0.0
6	25.944734	33.3	26.6	-33.4	19.9	-30.1	0.0


**Figure 5. Detectors: Peak, Quasi-peak, AVERAGE .**

*Note: QP Delta/Av Delta refer to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.*

## Conducted Emission

E.U.T Description    Remote Hub Unit  
 Type                    2000-CELL-PCSH  
 Serial Number:        0822372

Specification:    F.C.C., Part 15, Subpart C  
 Lead:              Phase  
 Detectors:        Peak, Quasi-peak, Average

 10:44:23 MAR 16, 2010

ACTV DET: PEAK  
 MEAS DET: PEAK QP AVG  
 MKR 100 kHz  
 47.99 dB $\mu$ V

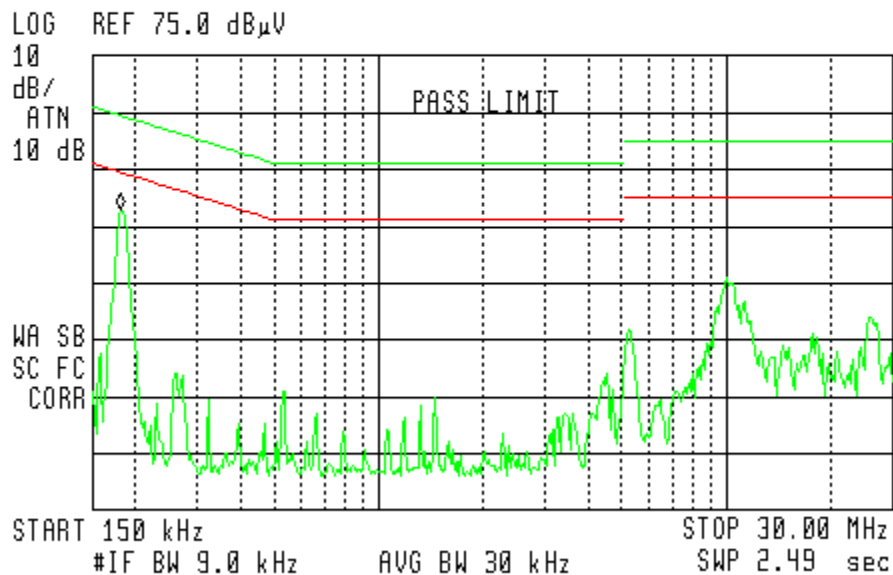


Figure 6. Detectors: Peak, Quasi-peak, Average

## Conducted Emission

E.U.T Description    Remote Hub Unit  
 Type                    2000-CELL-PCSH  
 Serial Number:        0822372

Specification:    F.C.C., Part 15, Subpart C  
 Lead:              Neutral  
 Detectors:        Peak, Quasi-peak, Average

Signal Number	Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Delta L 1 (dB)	Avg (dBuV)	Av Delta L 2 (dB)	Corr (dB)
1	0.186026	49.9	48.4	-15.8	42.7	-11.6	0.0
2	0.281486	21.4	12.9	-47.9	4.3	-46.5	0.0
3	5.351299	29.5	29.0	-31.0	27.9	-22.1	0.0
4	11.646322	27.2	26.1	-33.9	25.5	-24.5	0.0
5	16.202266	20.3	18.1	-41.9	14.7	-35.3	0.0
6	28.002819	26.2	24.0	-36.0	19.9	-30.1	0.0

**Figure 7. Detectors: Peak, Quasi-peak, AVERAGE**


*Note: QP Delta/Av Delta refer to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.*



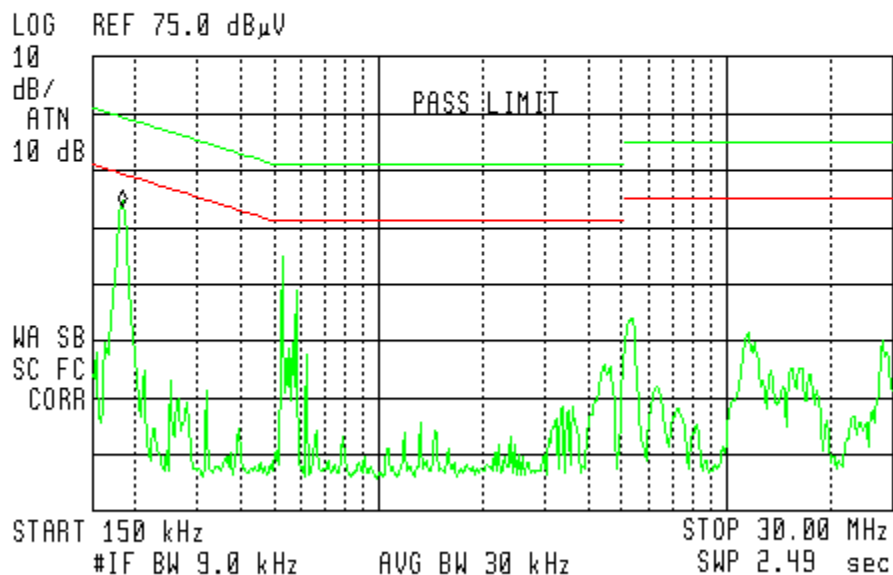
## Conducted Emission

E.U.T Description    Remote Hub Unit  
 Type                    2000-CELL-PCSH  
 Serial Number:        0822372

Specification:    F.C.C., Part 15, Subpart C  
 Lead:                Neutral  
 Detectors:         Peak, Quasi-peak, Average

 10:54:43 MAR 16, 2010

ACTV DET: PEAK  
 MEAS DET: PEAK QP AVG  
 MKR 100 kHz  
 48.64 dB $\mu$ V



**Figure 8 Conducted Emission: NEUTRAL**  
**Detectors: Peak, Quasi-peak, Average**

#### 4.4 Test Instrumentation Used, Conducted Measurement

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
LISN	Fischer	FCC-LISN-2A	127	March 3, 2010	1 Year
LISN	Fischer	FCC-LISN-2A	128	March 3, 2010	1 Year
EMI Receiver	HP	85422E	3906A00276	November 10, 2009	1 Year
RF Filter Section	HP	85420E	3705A00248	November 10, 2009	1 Year
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

## 5. Peak Output Power CDMA

### 5.1 Test Specification

FCC Part 22.913

### 5.2 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 (20 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. Signal generator output power -2dbm.

CDMA:

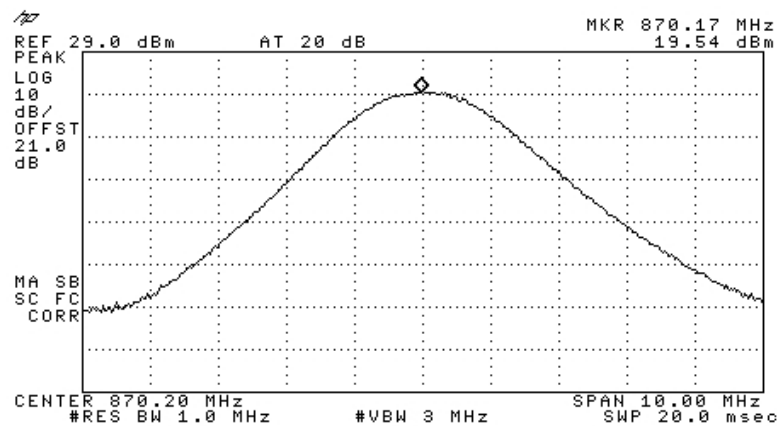


Figure 9.— 870.20 MHz

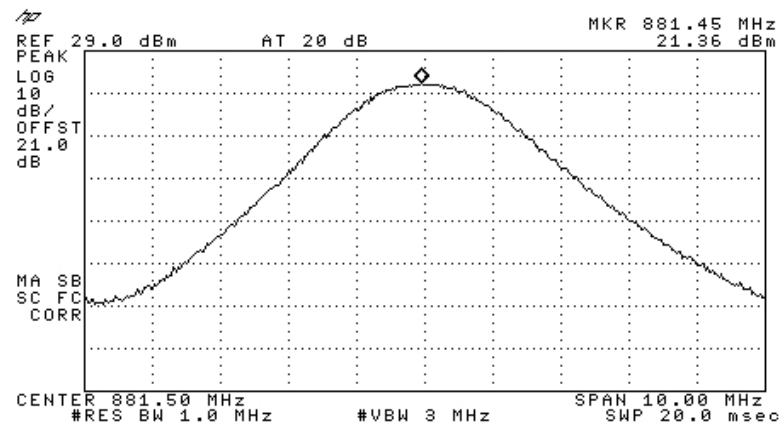


Figure 10.— 881.50 MHz

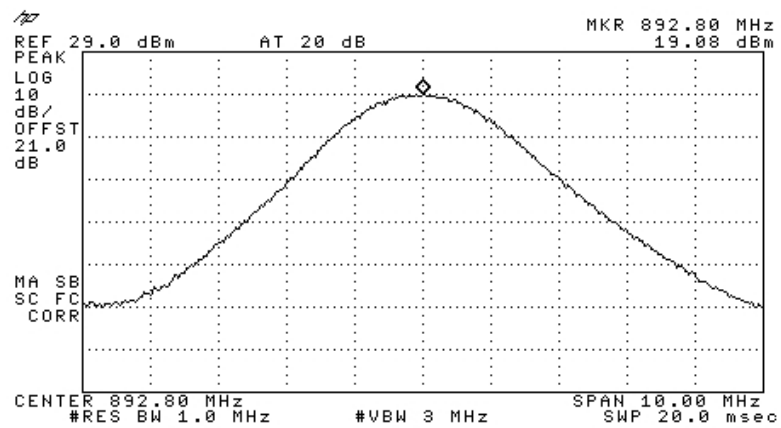


Figure 11.— 892.80 MHz

### 5.3 Results table

E.U.T. Description: Remote Hub Unit

Model No.: 2000-CELL-PCSH

Serial Number: 0822372

Specification: FCC Part 22 Section 913, FCC Part 2, Section 1046

Modulation	Operation Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
CDMA	870.20	19.54	57.0	-37.46
	881.50	21.36	57.0	-35.64
	892.80	19.08	57.0	-37.92

**Figure 12 Peak Output Power CDMA**

JUDGEMENT: Passed by 35.6 dB

TEST PERSONNEL:

Tester Signature: \_\_\_\_\_

Date: 18.04.10

Typed/Printed Name: A. Sharabi

#### 5.4 Test Equipment Used.

##### Peak Output Power CDMA

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 17, 2009	1 Year
Signal Generator (CDMA + GSM)	Agilent	E4432B	GB45001033	August 08, 2010	2 years
Signal Generator (W-CDMA)	Agilent	E4432B	GB45001392	August 20, 2010	2 years
Attenuator	Jyebao	-	FAT-AM5AF5G6G 2W20	October 19, 2009	1 year
Cable		SIM	705A009401	March 14, 2010	1 year

**Figure 13 Test Equipment Used**

## 6. Occupied Bandwidth CDMA

### 6.1 Test Specification

FCC Part 2, Section 1049

### 6.2 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

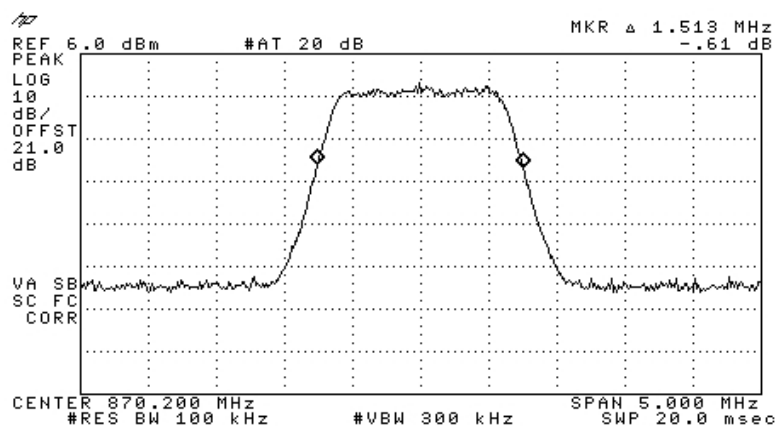


Figure 14.— Input 870.20

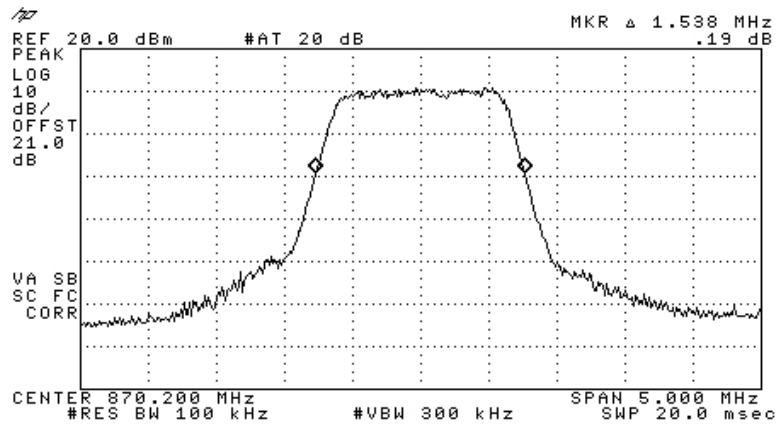


Figure 15.— Output 870.20

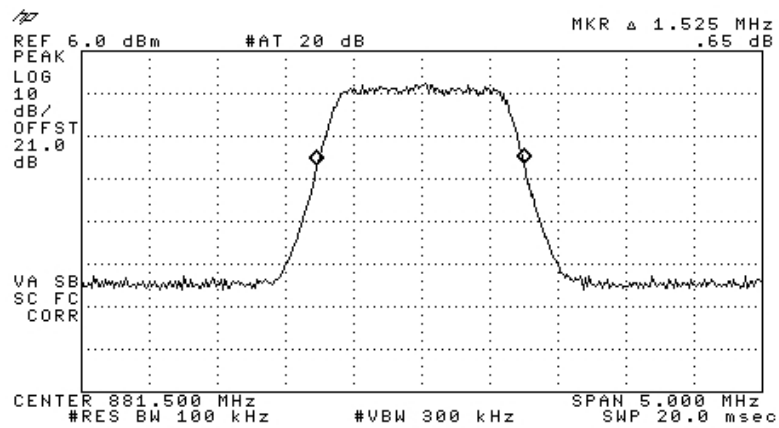


Figure 16.— Input 881.5 MHz.



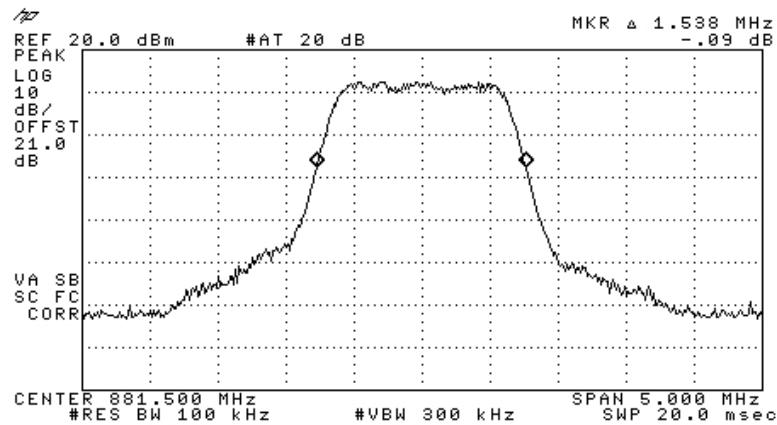


Figure 17.—Output 881.5Hz.

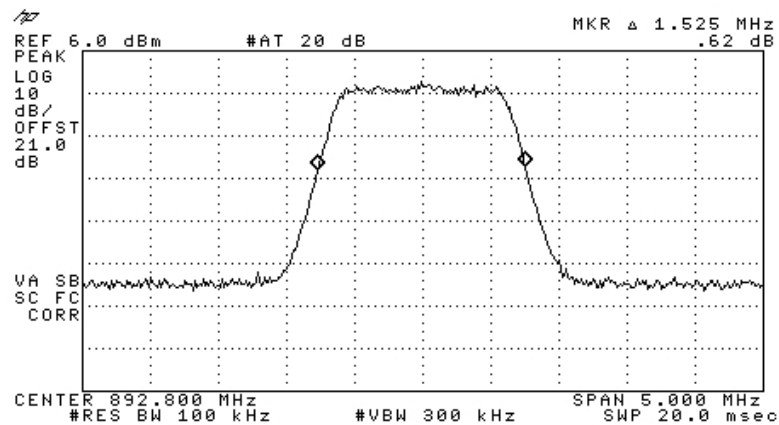


Figure 18.— Input 892.80 MHz.

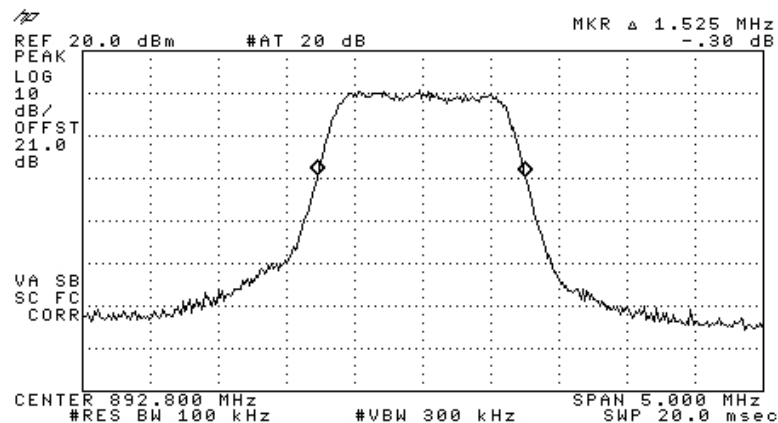


Figure 19.— Output 892.80 MHz.

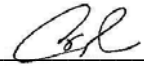
### 6.3 Results Table

E.U.T. Description: Remote Hub Unit  
Model No.: 2000-CELL-PCSH  
Serial Number: 0822372  
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	1.525

Figure 20 Occupied Bandwidth CDMA

TEST PERSONNEL:

Tester Signature: 

Date: 18.04.10

Typed/Printed Name: A. Sharabi

#### 6.4 Test Equipment Used.

##### Occupied Bandwidth CDMA

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 17, 2009	1 Year
Signal Generator (CDMA + GSM)	Agilent	E4432B	GB45001033	August 08, 2010	2 years
Signal Generator (W-CDMA)	Agilent	E4432B	GB45001392	August 20, 2010	2 years
Attenuator	Jyebao	-	FAT-AM5AF5G6G 2W20	October 19, 2009	1 year
Cable		SIM	705A009401	March 14, 2010	1 year

**Figure 21 Test Equipment Used**

## 7. Out of Band Emissions at Antenna Terminals CDMA

### 7.1 Test Specification

FCC Part 22, Section 917; FCC Part 2.1051

### 7.2 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  $-13\text{dBm}$ .

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (21 dB).

The spectrum analyzer was set to 100 kHz R.B.W.

CDMA:

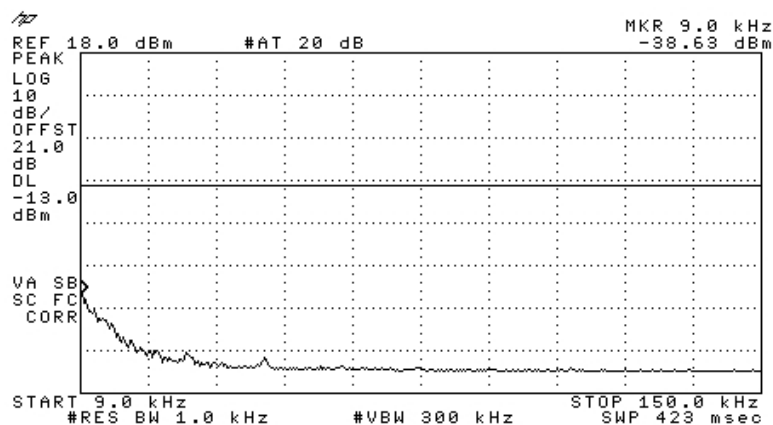


Figure 22.— 870.20 MHz

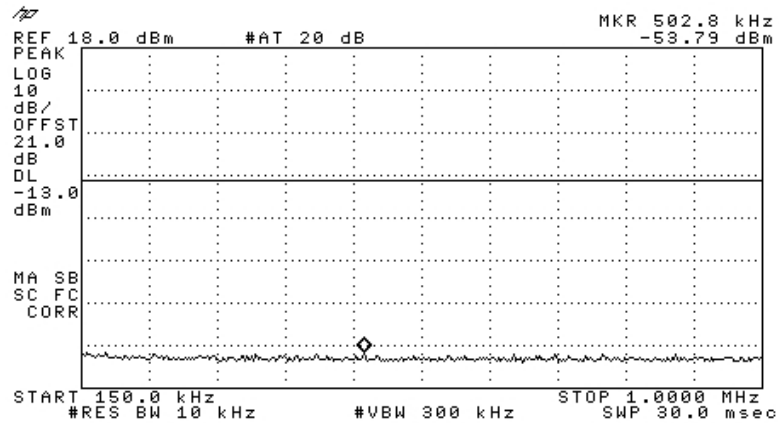


Figure 23.— 870.20 MHz

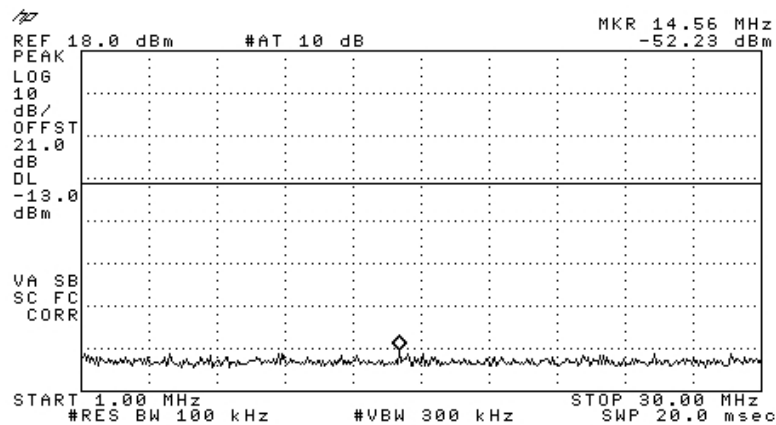


Figure 24.— 870.20 MHz

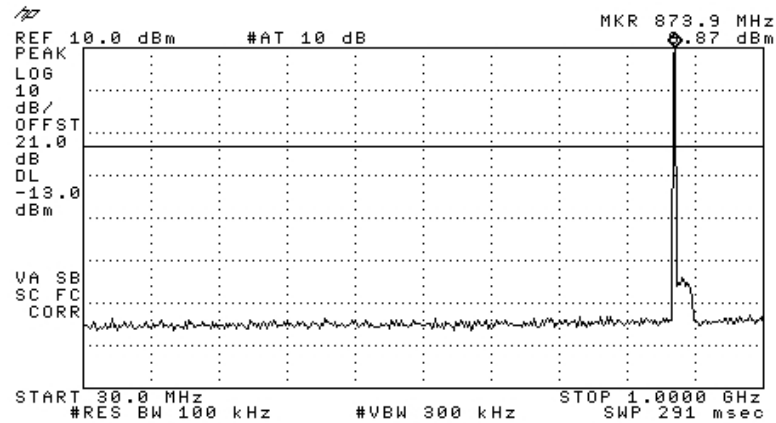


Figure 25.— 870.20 MHz

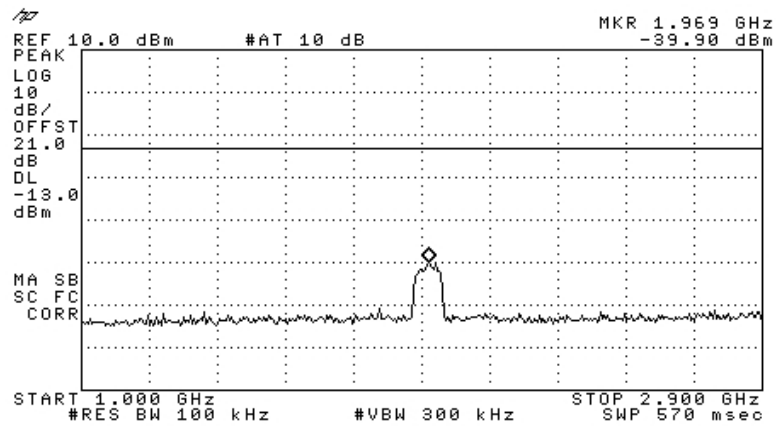


Figure 26.— 870.20 MHz

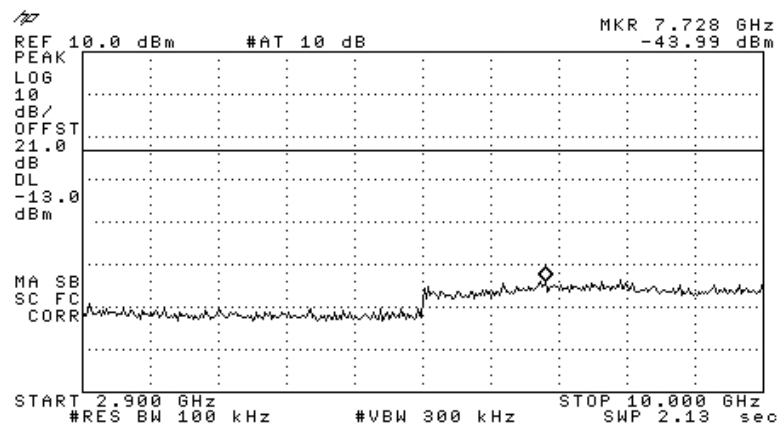


Figure 27.— 870.20 MHz

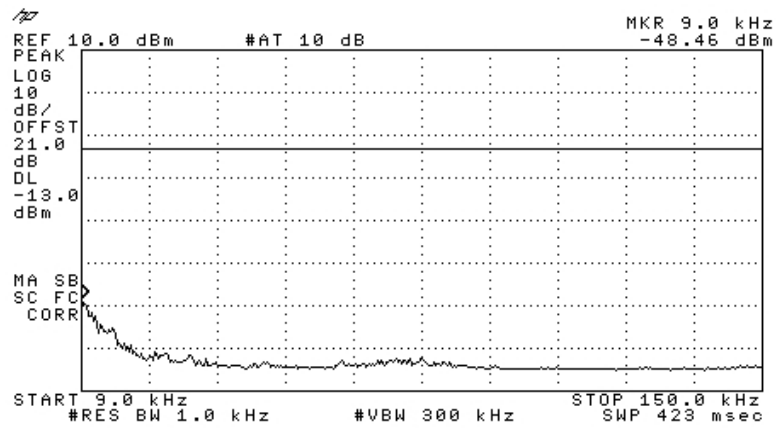


Figure 28.— 881.50 MHz

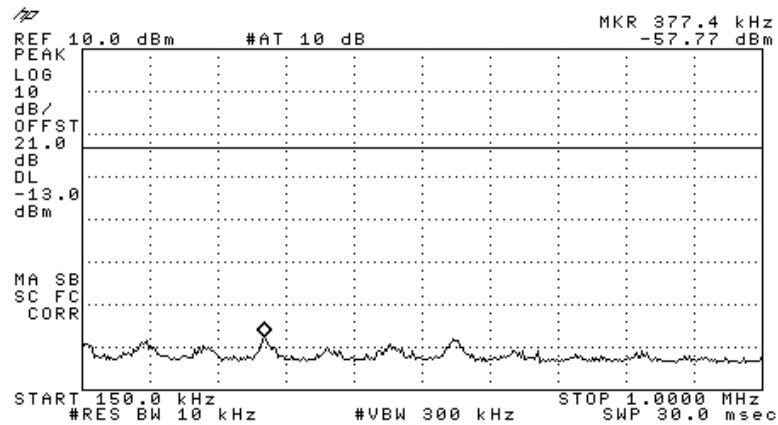


Figure 29.— 881.50 MHz

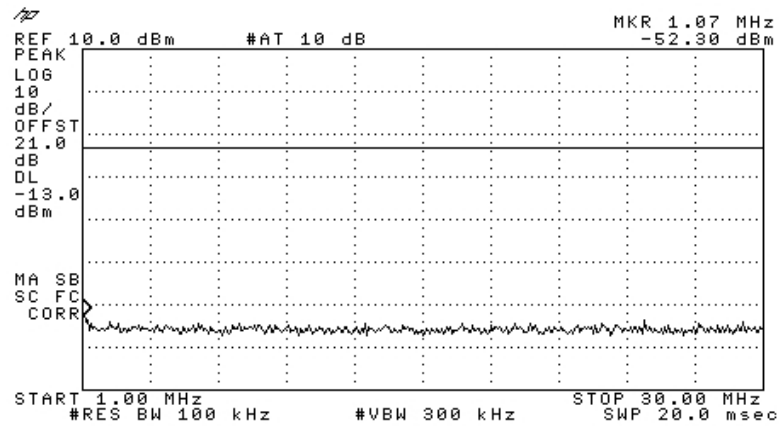


Figure 30.— 881.50 MHz



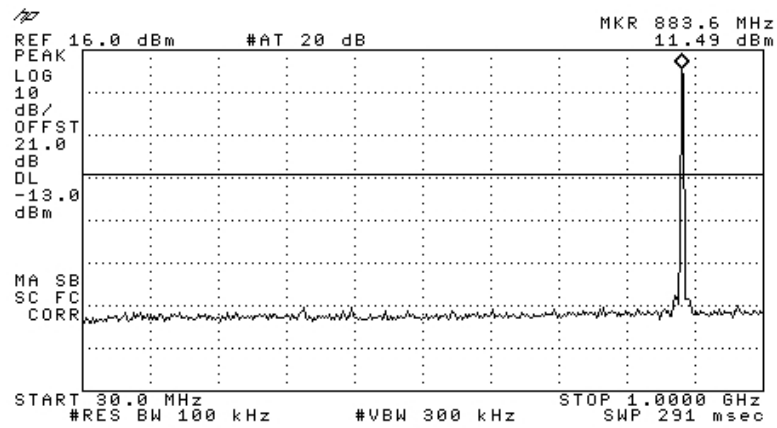


Figure 31.— 881.50 MHz

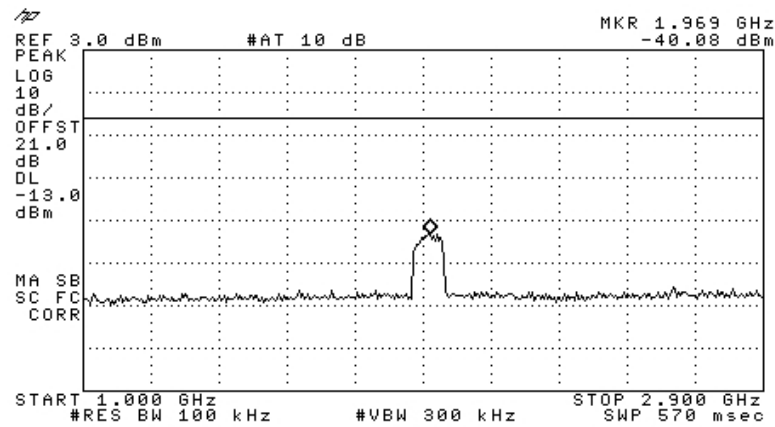


Figure 32.— 881.50 MHz

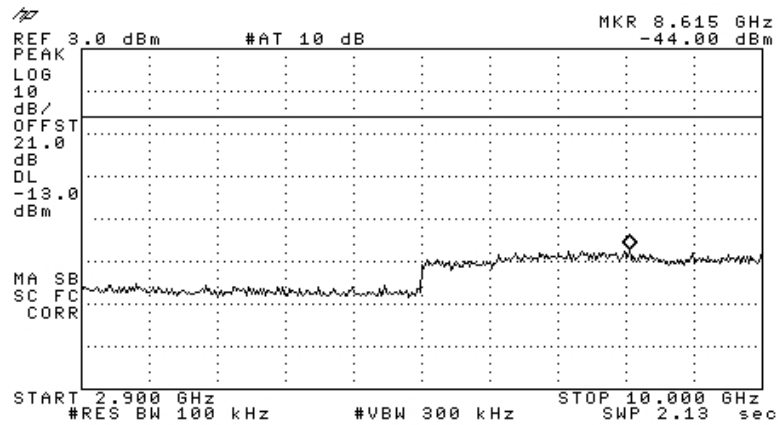


Figure 33.— 881.50 MHz

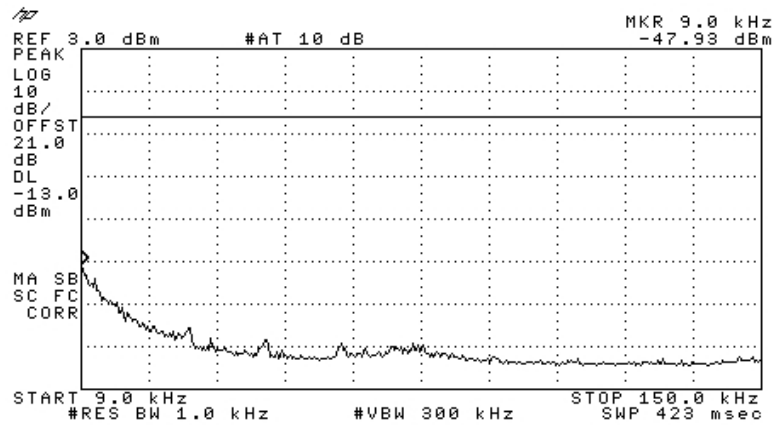


Figure 34.— 892.80 MHz

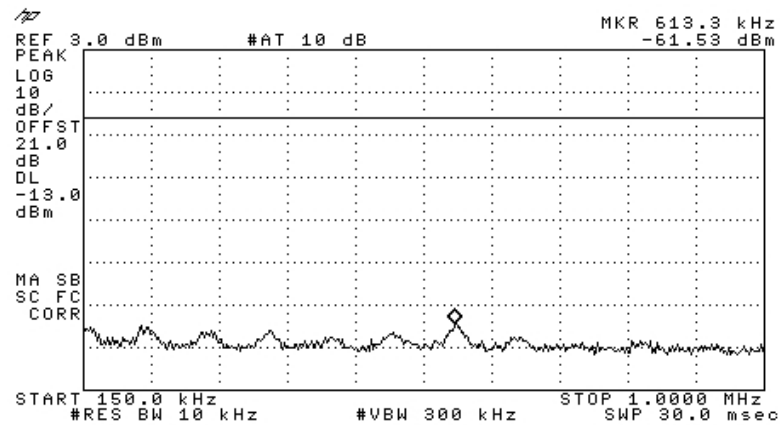


Figure 35.— 892.50 MHz

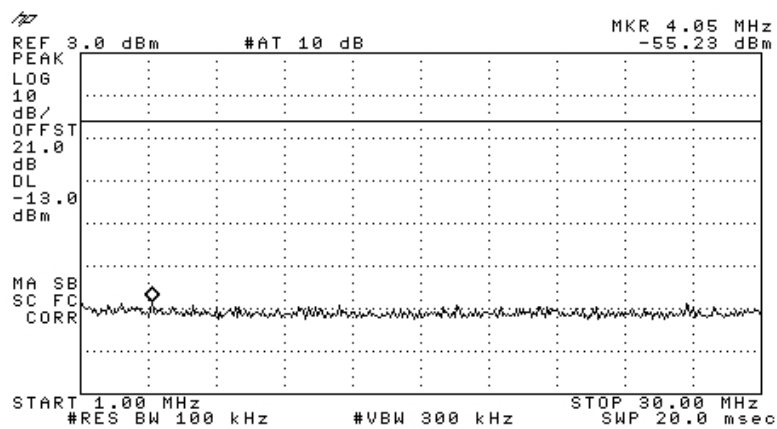


Figure 36.— 892.50 MHz

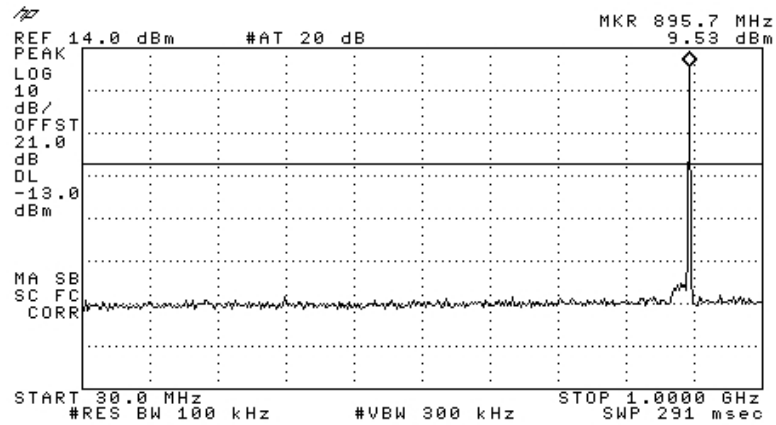


Figure 37.— 892.50 MHz

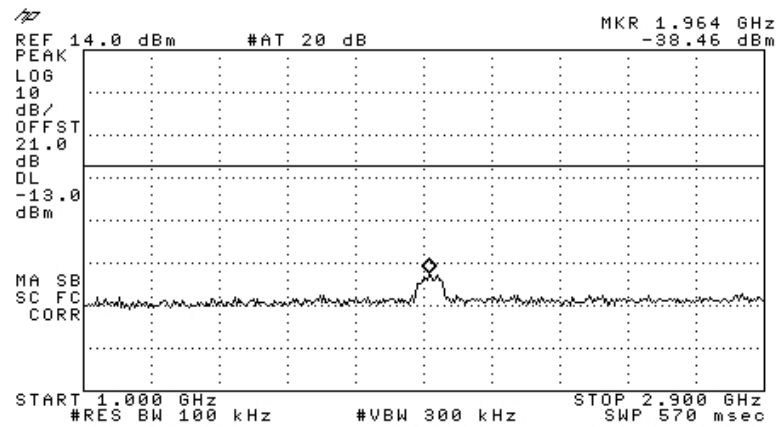


Figure 38.— 892.50 MHz

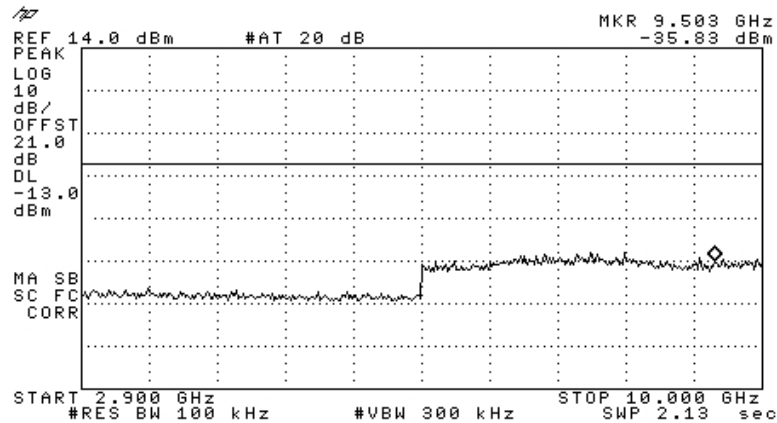


Figure 39.— 892.50 MHz

### 7.3 Results table

E.U.T. Description: Remote Hub Unit

Model No.: 2000-CELL-PCSH

Serial Number: 0822372

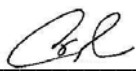
Specification: FCC Part 24, Sub-part E, Section 238; Part 2 Section 1051

Modulation	Operation Frequency (MHz)	Frequency (GHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
CDMA	870.20	0.000009	-38.63	-13.0	-25.63
	881.50	1.969	-40.08	-13.0	-27.08
	892.80	9.503	-35.83	-13.0	-22.83

Figure 40 Out of Band Emission Results CDMA

JUDGEMENT: Passed by 22.83 dB

TEST PERSONNEL:

Tester Signature: 

Date: 18.04.10

Typed/Printed Name: A. Sharabi

#### 7.4 Test Equipment Used.

##### Out of Band Emission at Antenna Terminals CDMA

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 17, 2009	1 Year
Signal Generator (CDMA + GSM)	Agilent	E4432B	GB45001033	August 08, 2010	2 years
Signal Generator (W-CDMA)	Agilent	E4432B	GB45001392	August 20, 2010	2 years
Attenuator	Jyebao	-	FAT-AM5AF5G6G 2W20	October 19, 2009	1 year
Cable		SIM	705A009401	March 14, 2010	1 year

**Figure 41 Test Equipment Used**

## 8. Band Edge Spectrum CDMA

### 8.1 Test Specification

FCC Part 22, FCC Part 2.1051

### 8.2 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 (21 dB).

The spectrum analyzer was set to 100 kHz R.B.W.

CDMA:

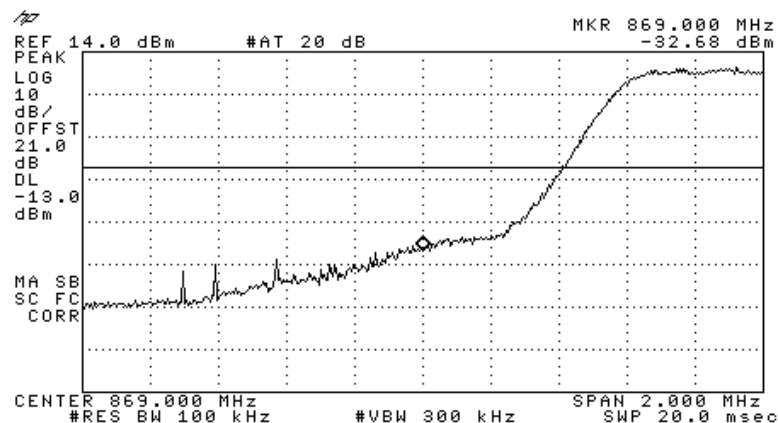


Figure 42.— 870.20 MHz

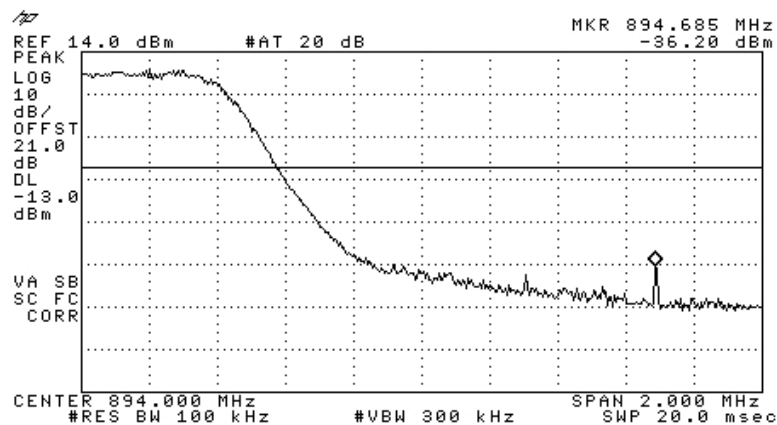


Figure 43.— 892.80 MHz

### 8.3 Results table

E.U.T. Description: Remote Hub Unit

Model No.: 2000-CELL-PCSH

Serial Number: 0822372

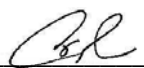
Specification: FCC Part 24, Sub-part E, Section 238; Part 2 Section 1051

Modulation	Operation Frequency (MHz)	Band Edge Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
CDMA	870.20	869.000	-32.68	-13.0	-19.68
	892.80	894.685	-36.20	-13.0	-23.20

Figure 44 Band Edge Spectrum Results CDMA

JUDGEMENT: Passed by 19.68 dB

TEST PERSONNEL:

Tester Signature: 

Date: 18.04.10

Typed/Printed Name: A. Sharabi



#### 8.4 Test Equipment Used.

##### Band Edge Spectrum CDMA

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 17, 2009	1 Year
Signal Generator (CDMA + GSM)	Agilent	E4432B	GB45001033	August 08, 2010	2 years
Signal Generator (W-CDMA)	Agilent	E4432B	GB45001392	August 20, 2010	2 years
Attenuator	Jyebao	-	FAT-AM5AF5G6G 2W20	October 19, 2009	1 year
Cable		SIM	705A009401	March 14, 2010	1 year

**Figure 45 Test Equipment Used**

## 9. Out of Band Emissions (Radiated) CDMA

### 9.1 Test Specification

FCC Part 22, Section 917; FCC Part 2.1053

### 9.2 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:

$$P_d(\text{dBm}) = P_g(\text{dBm}) - \text{Cable Loss (dB)} + \text{Substitution Antenna Gain (dB)}$$

$P_d$  = Dipole equivalent power (result).

$P_g$  = Signal generator output level.


### 9.3 Test Data

CDMA:

Carrier Channel	Freq.	Antenna Pol.	Maximum Peak Level	Signal Generator RF Output	Cable Loss	Antenna Gain	Effective Radiated Power Level	Spec.	Margin
(MHz)	(MHz)		(dBμV/m)	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
870.20	1740.4	V	52.13	-46.4	4.9	7.0	-44.3	-13	-31.3
870.20	1740.4	H	52.76	-46.5	4.9	7.0	-44.4	-13	-31.4
881.50	1763.0	V	53.14	-45.2	4.9	7.0	-43.1	-13	-30.1
881.50	1763.0	H	51.82	-47.8	4.9	7.0	-45.7	-13	-32.7
892.80	1785.6	V	53.14	-45.6	4.9	7.0	-43.5	-13	-30.5
892.80	1785.6	H	52.32	-46.3	4.9	7.0	-44.2	-13	-31.2

JUDGEMENT: Passed by 30.1 dB

TEST PERSONNEL:

Tester Signature: 

Date: 18.04.10

Typed/Printed Name: A. Sharabi

#### 9.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 10, 2009	1 year
RF Section	HP	85420E	3705A00248	November 10, 2009	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	March 25, 2009	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 26, 2009	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 19, 2009	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	January 13, 2010	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	January 13, 2010	1 Year
Signal Generator (CDMA + GSM)	Agilent	E4432B	GB45001033	August 08, 2010	2 years
Signal Generator (W-CDMA)	Agilent	E4432B	GB45001392	August 20, 2010	2 years
Double Ridged Waveguide Horn Antenna	EMCO	3115	29845	March 16, 2008	2 year

## 10. Peak Output Power PCS

### 10.1 Test Specification

FCC Part 24, Subpart E

### 10.2 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 (20 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 1992.5 MHz. Signal generator output power -2dbm.

W-CDMA

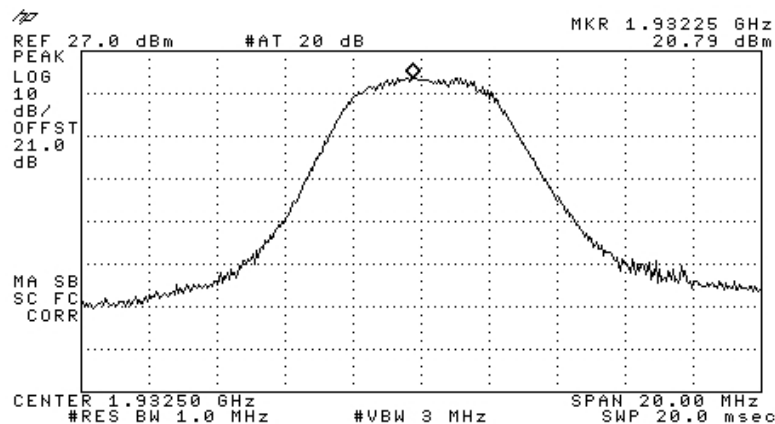


Figure 46.— 1932.50 MHz

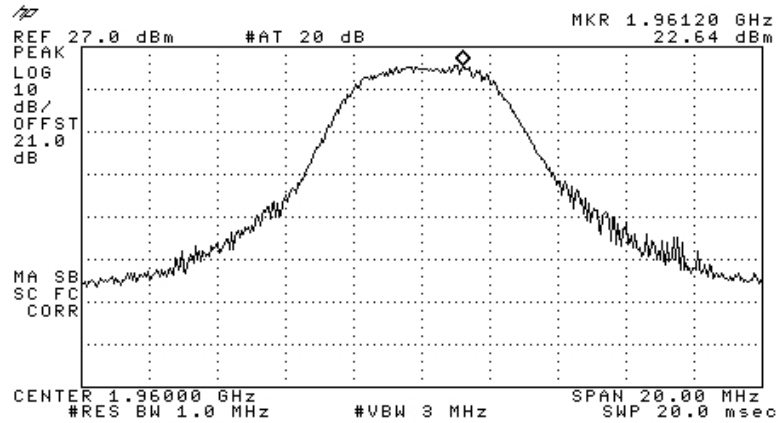


Figure 47.— 1960.00 MHz

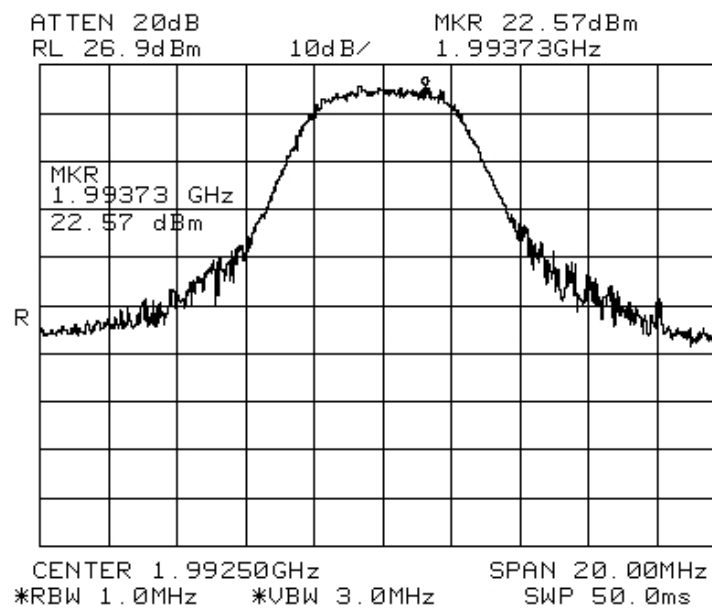


Figure 48.— 1992.50 MHz

GSM:

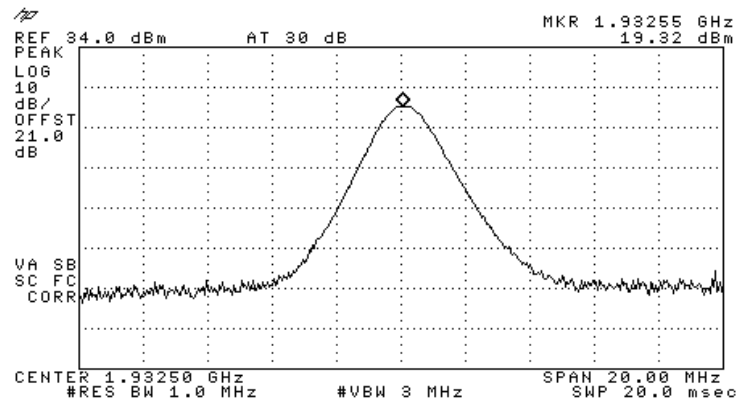


Figure 49.— 1932.50 MHz

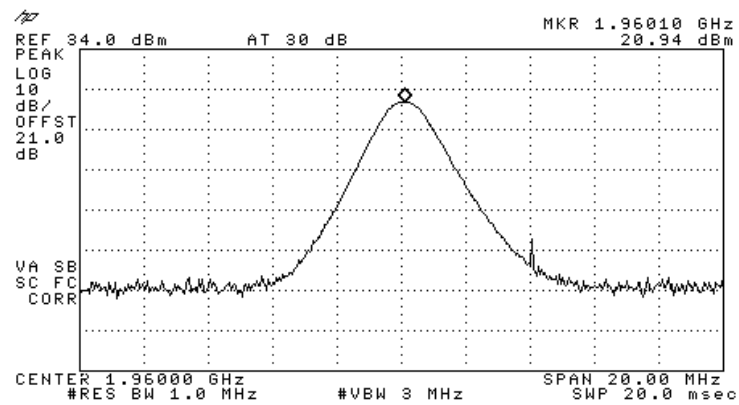
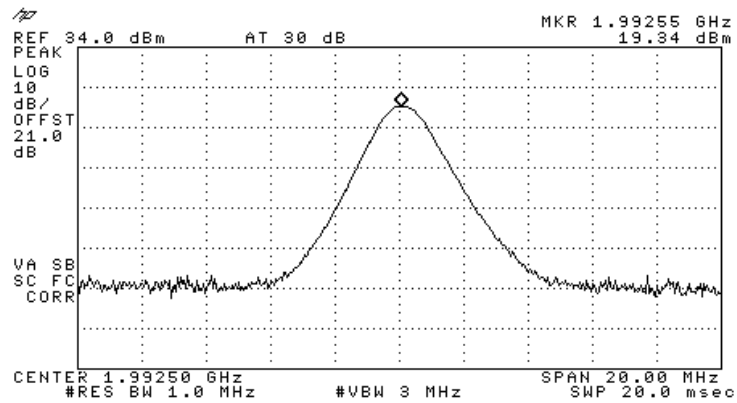


Figure 50.— 1960.00 MHz



**Figure 51.— 1992.50 MHz**



### 10.3 Results table

E.U.T. Description: Remote Hub Unit

Model No.: 2000-CELL-PCSH

Serial Number: 0822372

Specification: FCC Part 24, Subpart E, Section 232, FCC Part 2, Section 1046

Modulation	Operation Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
W-CDMA	1932.50	20.79	50.0	-29.21
	1960.00	22.64	50.0	-27.36
	1992.50	22.57	50.0	-27.43
GSM	1932.50	19.32	50.0	-30.68
	1960.00	20.94	50.0	-29.06
	1992.50	19.34	50.0	-30.66

**Figure 52 Peak Output Power PCS**

JUDGEMENT: Passed by 27.36 dB

TEST PERSONNEL:

Tester Signature: 

Date: 28.04.10

Typed/Printed Name: A. Sharabi

#### 10.4 Test Equipment Used.

##### Peak Output Power PCS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 17, 2009	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	March 14, 2010	1 Year
Spectrum Analyzer	HP	8546E	3442A00275	January 11, 2010	1 Year
Signal Generator (CDMA + GSM)	Agilent	E4432B	GB45001033	August 08, 2010	2 years
Signal Generator (W-CDMA)	Agilent	E4432B	GB45001392	August 20, 2010	2 years
Attenuator	Jyebao	-	FAT-AM5AF5G6G 2W20	October 19, 2009	1 year
Cable		SIM	705A009401	March 14, 2010	1 year

**Figure 53 Test Equipment Used**

## 11. Occupied Bandwidth PCS

### 11.1 Test Specification

FCC Part 2, Section 1049

### 11.2 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

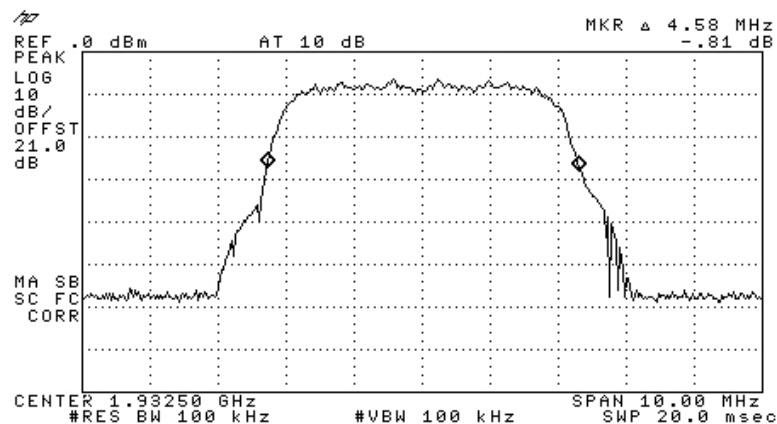


Figure 54.— Input 1932.50 MHz

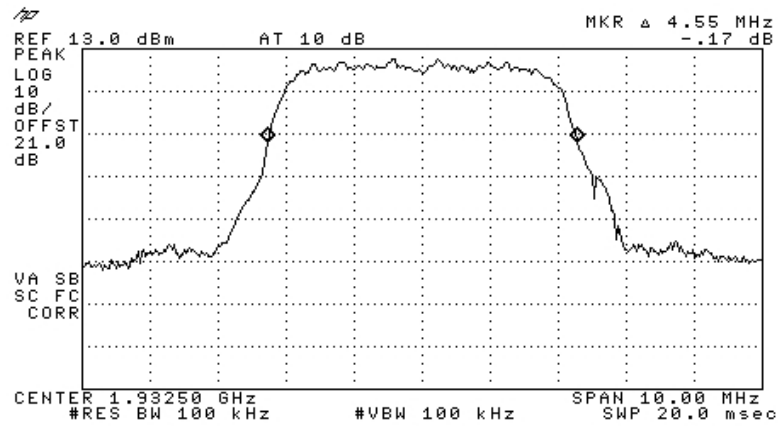


Figure 55.— Output 1932.50 MHz

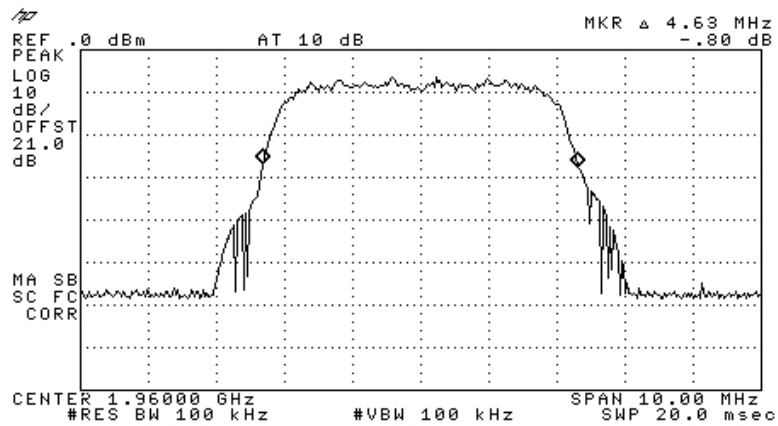


Figure 56.— Input 1960.00 MHz

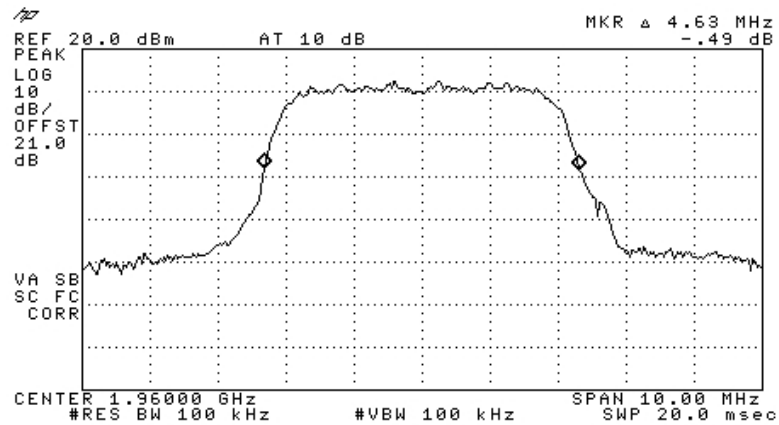


Figure 57.— Output 1960.00 MHz

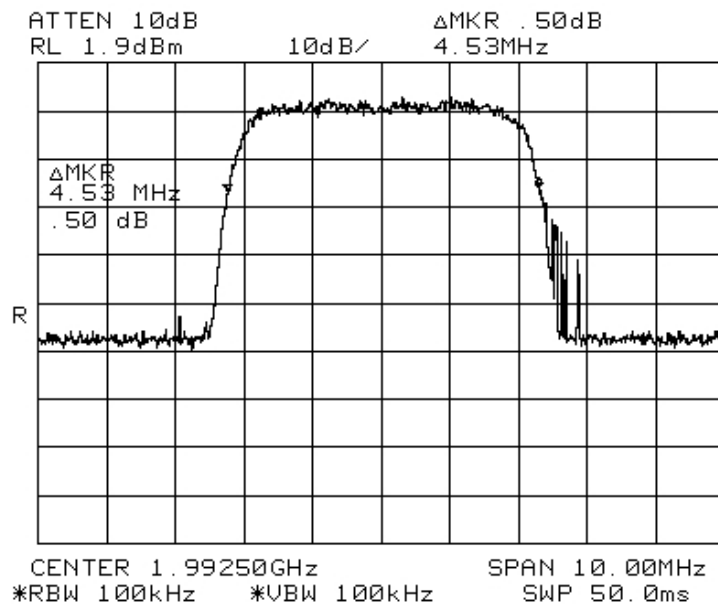


Figure 58.— Input 1992.50 MHz

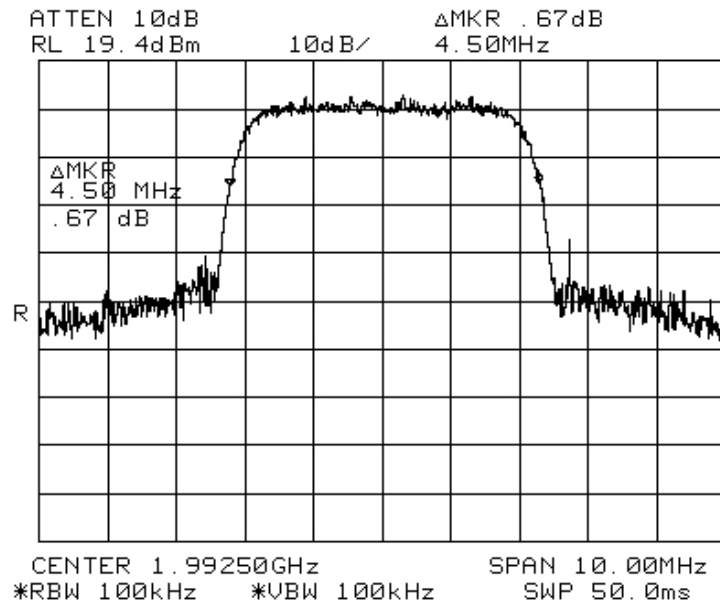


Figure 59.— Output 1992.50 MHz

GSM:

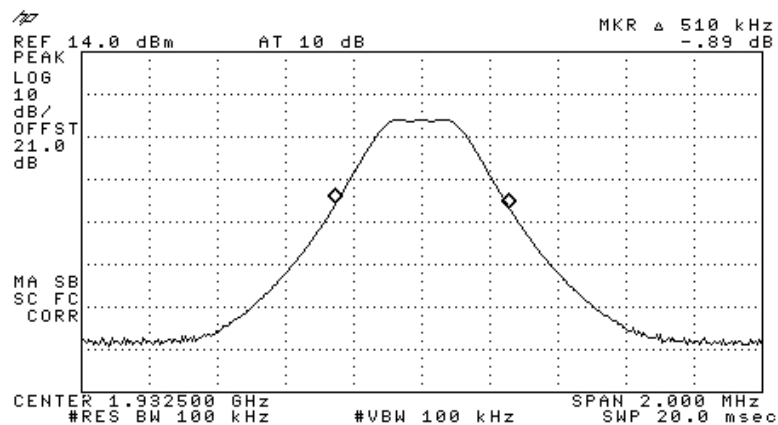


Figure 60.— Input 1932.50 MHz

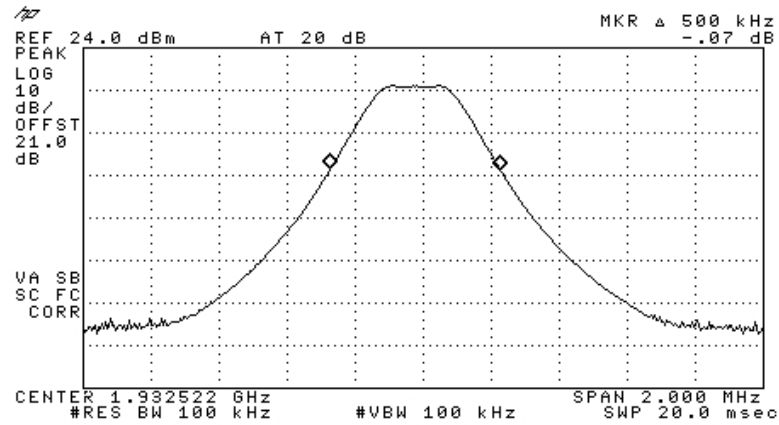


Figure 61.— Output 1932.50 MHz

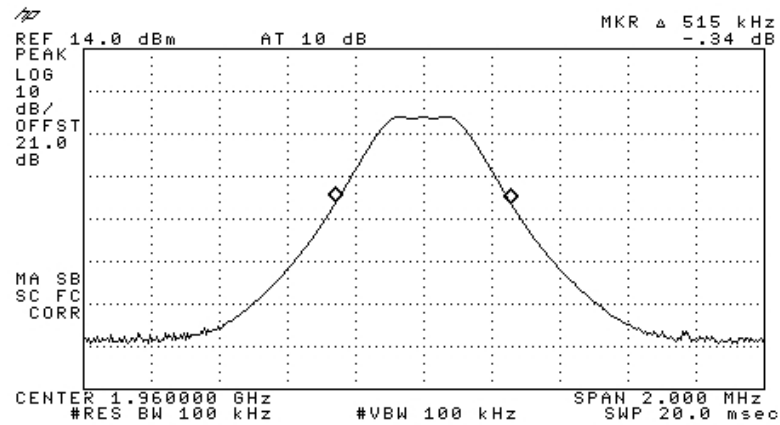


Figure 62.— Input 1960.00 MHz

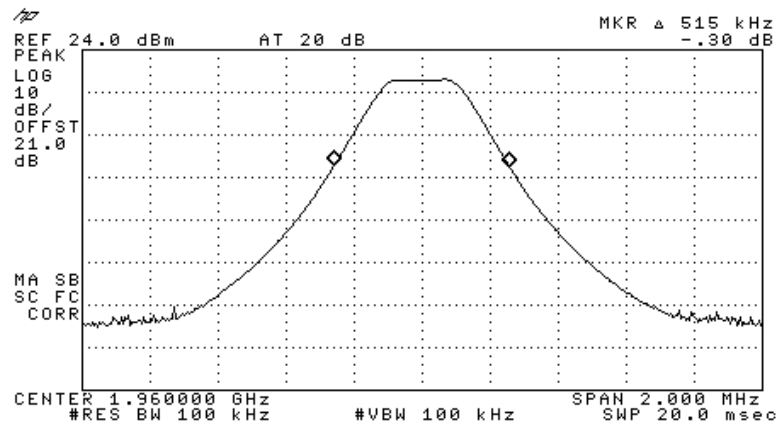


Figure 63.— Output 1960.00 MHz

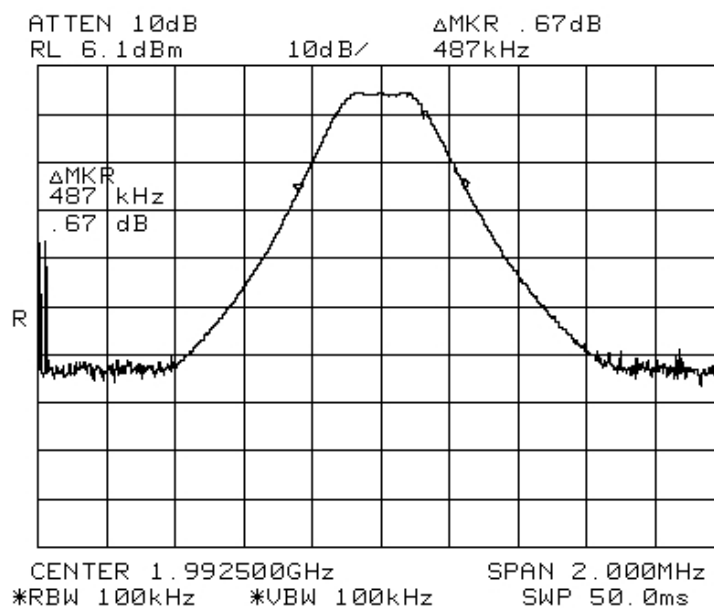
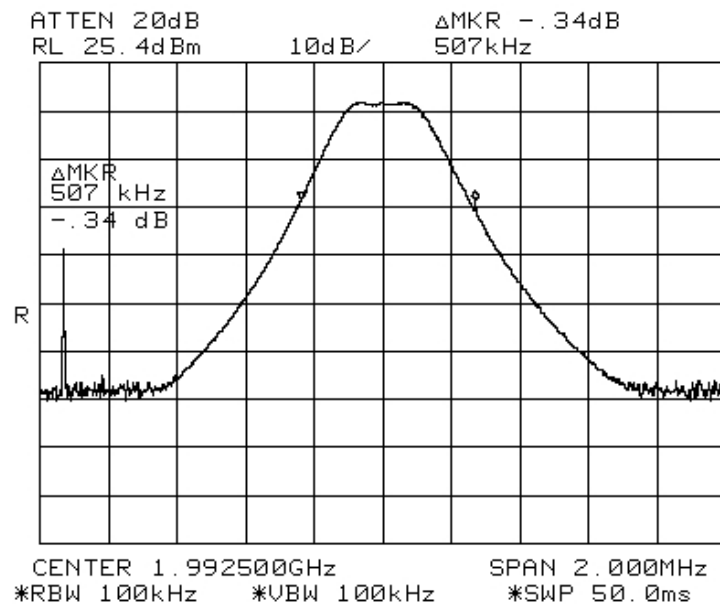


Figure 64.— Input 1992.50 MHz





**Figure 65.— Output 1992.50 MHz**

### 11.3 Results Table

E.U.T. Description: Remote Hub Unit  
Model No.: 2000-CELL-PCSH  
Serial Number: 0822372  
Specification: FCC Part 2, Section 1049

Modulation		Operating Frequency	Reading (MHz)
W-CDMA	Input	1932.50	4.58
	Output	1932.50	4.55
	Input	1960.00	4.63
	Output	1960.00	4.63
	Input	1992.50	4.53
	Output	1992.50	4.50
GSM	Input	1932.50	0.51
	Output	1932.50	0.50
	Input	1960.00	0.515
	Output	1960.00	0.515
	Input	1992.50	0.487
	Output	1992.50	0.507

**Figure 66 Occupied Bandwidth PCS**

TEST PERSONNEL:

Tester Signature: 

Date: 18.04.10

Typed/Printed Name: A. Sharabi

#### 11.4 Test Equipment Used.

##### Occupied Bandwidth PCS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 17, 2009	1 Year
Spectrum Analyzer	HP	8546E	3442A00275	January 11, 2010	1 Year
Signal Generator (CDMA + GSM)	Agilent	E4432B	GB45001033	August 08, 2010	2 years
Signal Generator (W-CDMA)	Agilent	E4432B	GB45001392	August 20, 2010	2 years
Attenuator	Jyebao	-	FAT-AM5AF5G6G 2W20	October 19, 2009	1 year
Cable		SIM	705A009401	March 14, 2010	1 year

**Figure 67 Test Equipment Used**

## 12. Out of Band Emissions at Antenna Terminals PCS

### 12.1 Test Specification

FCC Part 24, Subpart E, Section 238; FCC Part 2.1051

### 12.2 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  $-13\text{dBm}$ .

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:

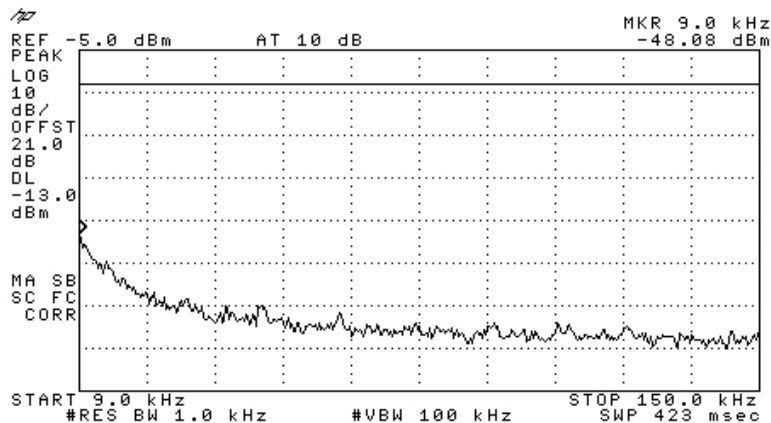


Figure 68.— 1932.50 MHz

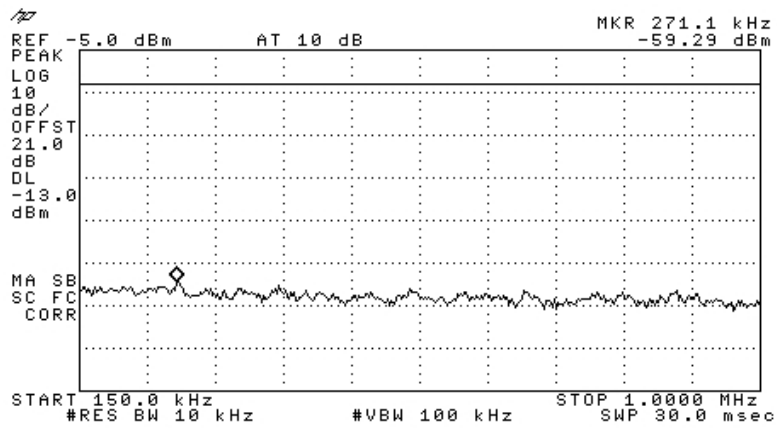


Figure 69.— 1932.50 MHz

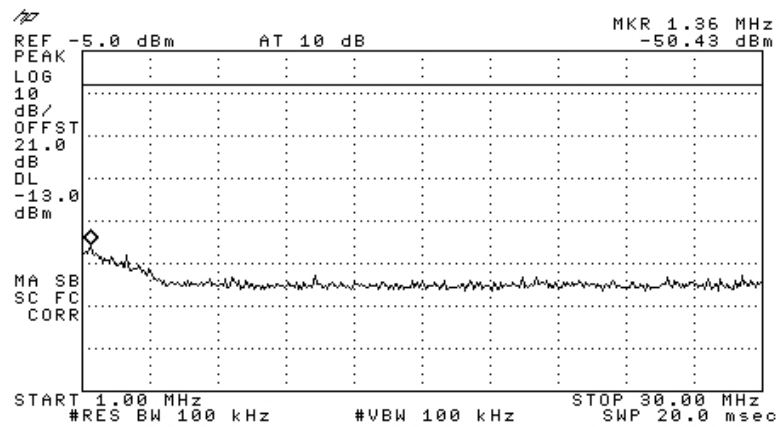


Figure 70.— 1932.50 MHz

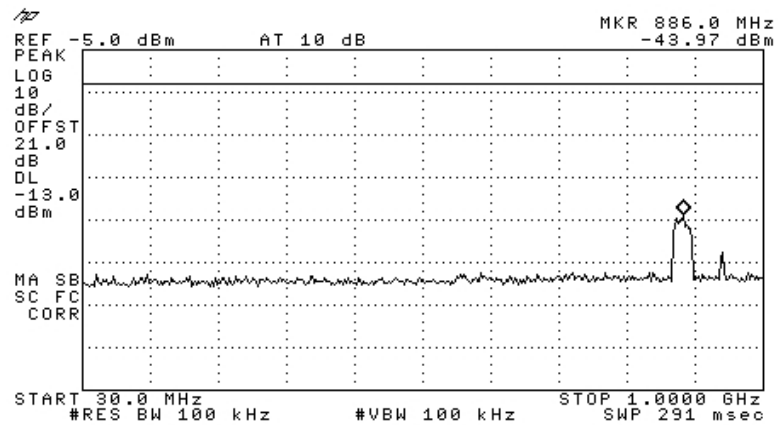


Figure 71.— 1932.50 MHz

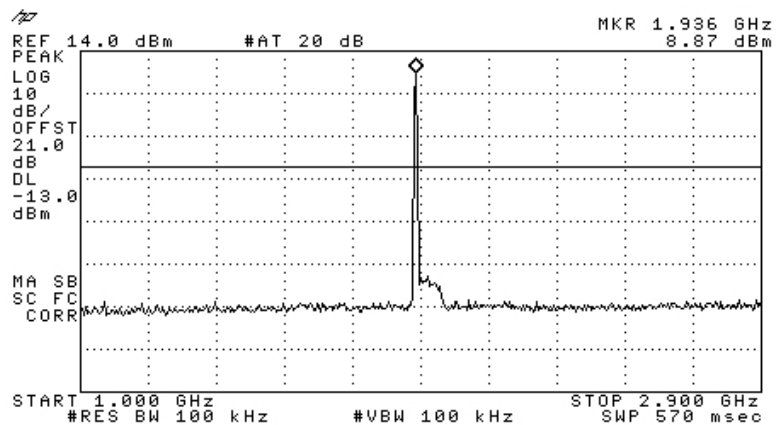


Figure 72.— 1932.50 MHz

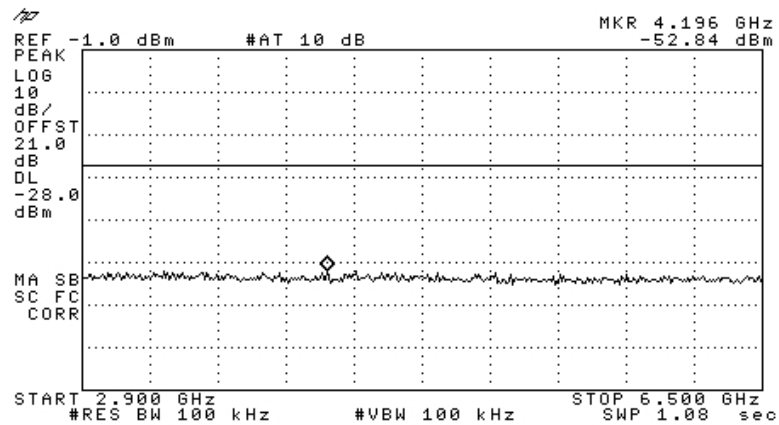


Figure 73.— 1932.50 MHz

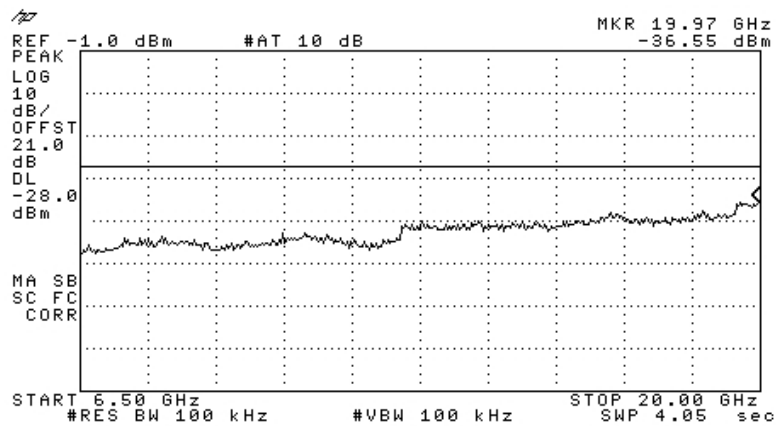


Figure 74.— 1932.50 MHz

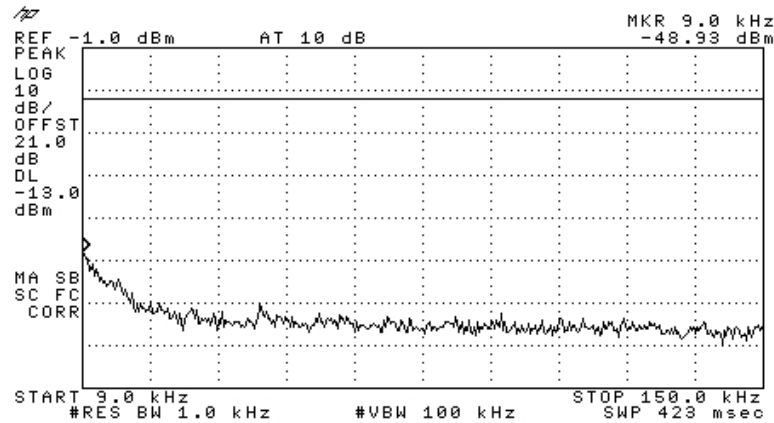


Figure 75.— 1960.00 MHz

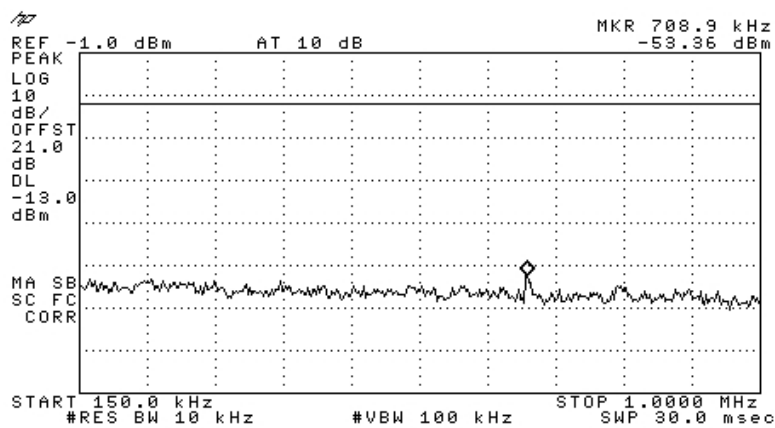


Figure 76.— 1960.00 MHz



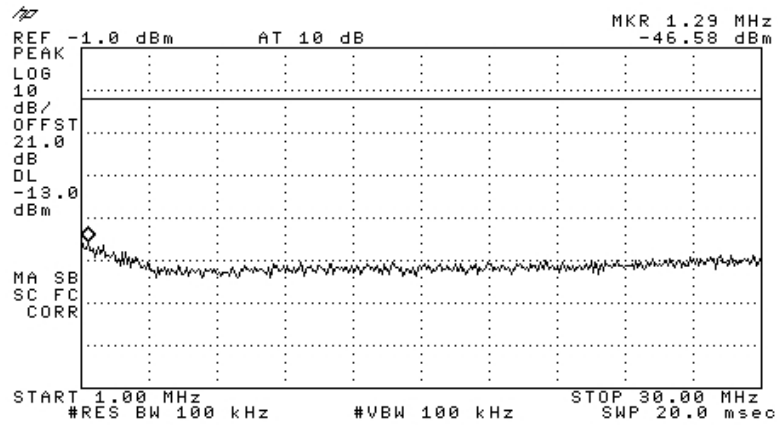


Figure 77.— 1960.00 MHz

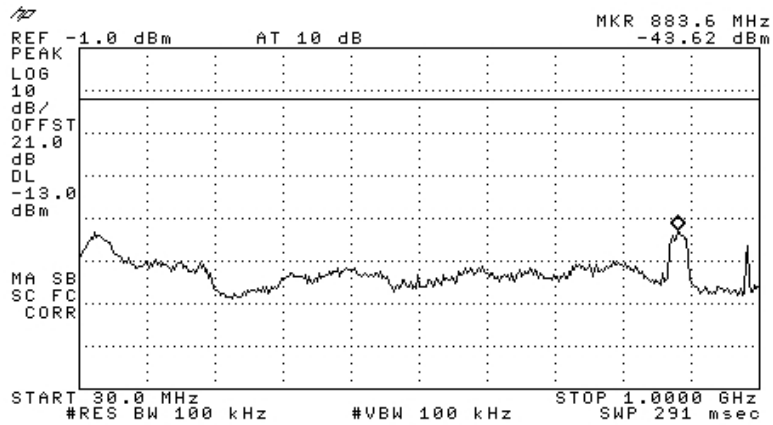


Figure 78.— 1960.00 MHz

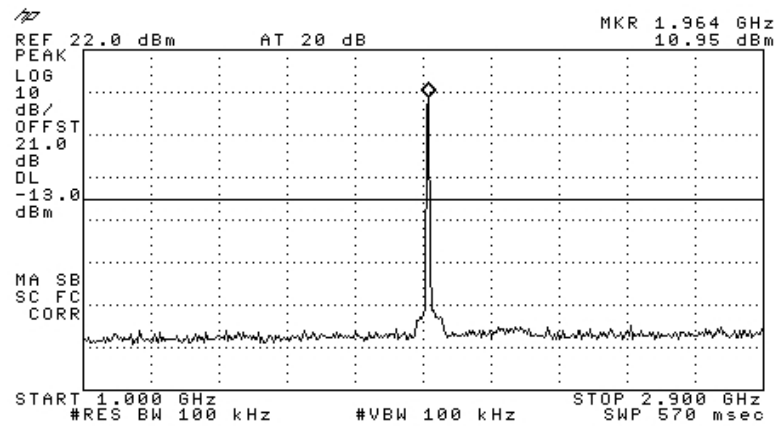


Figure 79.— 1960.00 MHz

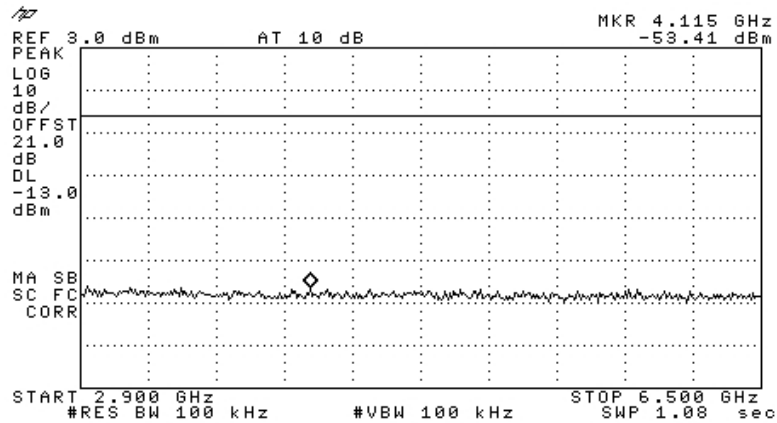


Figure 80.— 1960.00 MHz

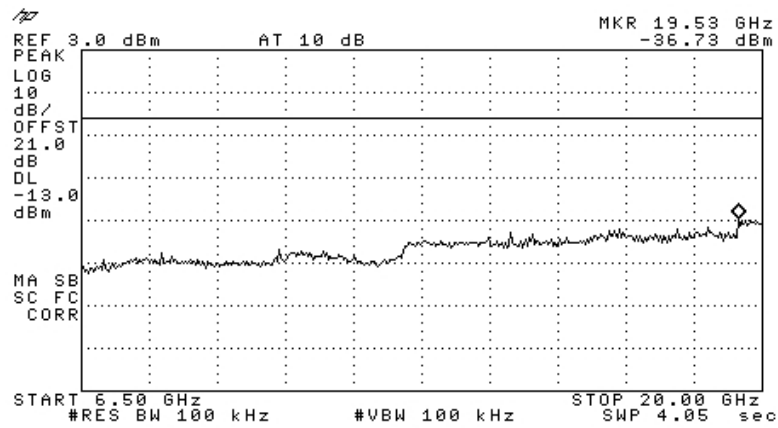


Figure 81.— 1960.00 MHz

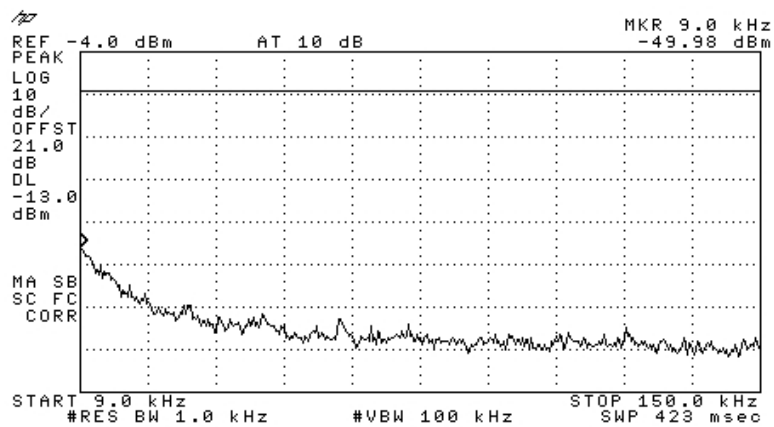


Figure 82.— 1992.50 MHz

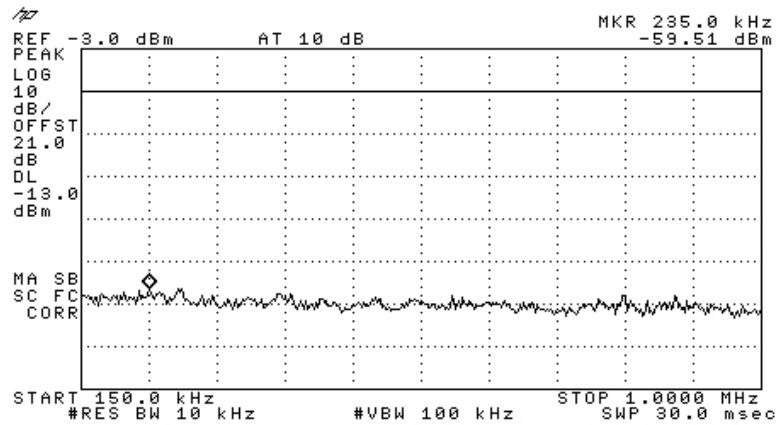


Figure 83.— 1992.50 MHz

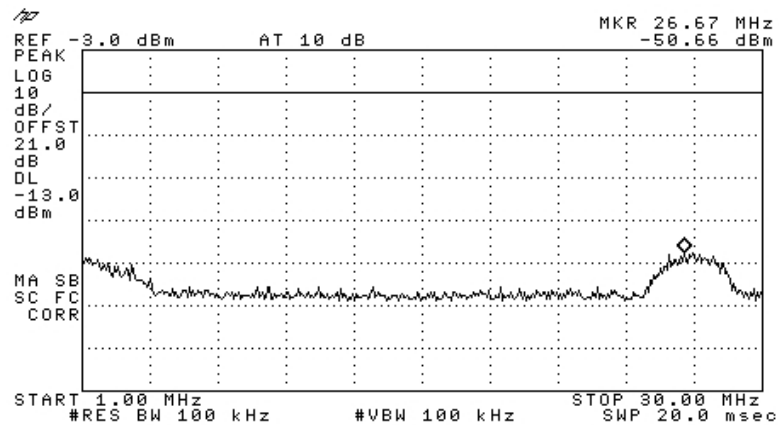


Figure 84.— 1992.50 MHz

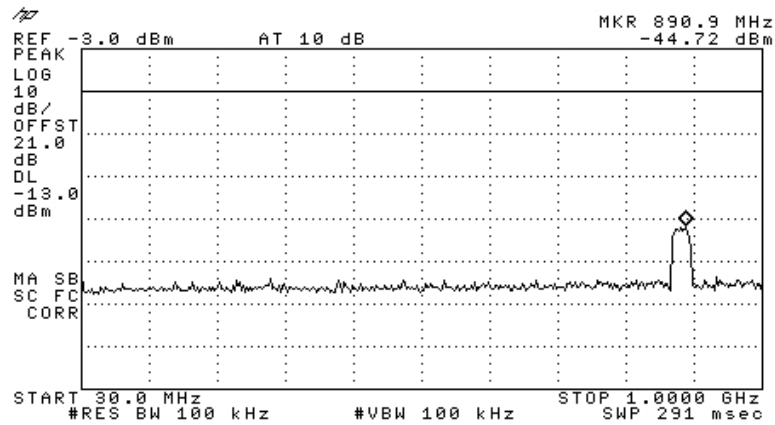


Figure 85.— 1992.50 MHz

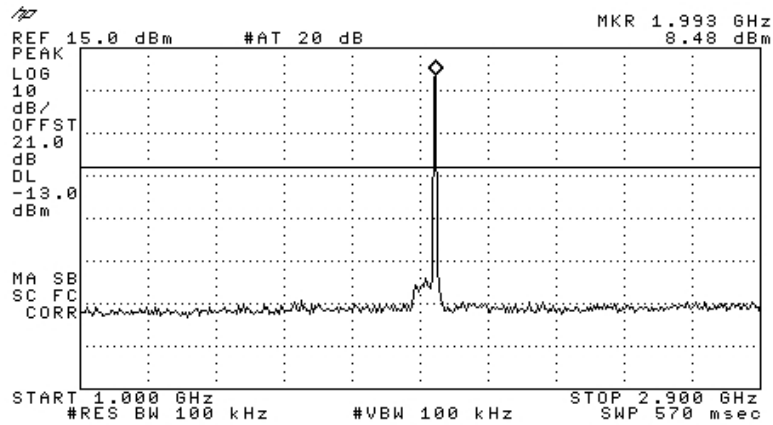


Figure 86.— 1992.50 MHz

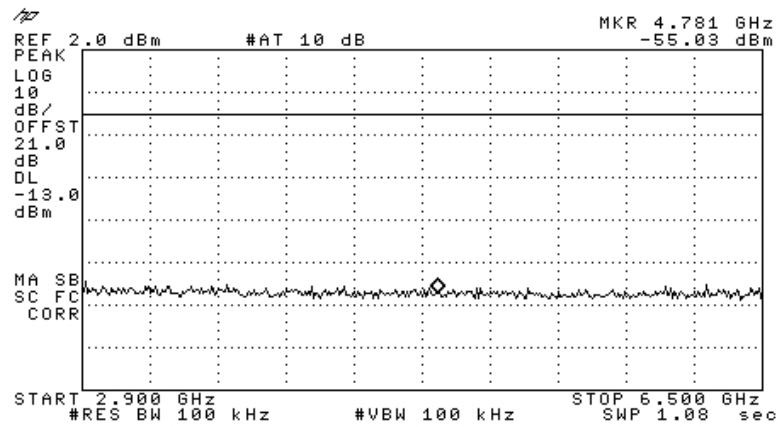


Figure 87.— 1992.50 MHz

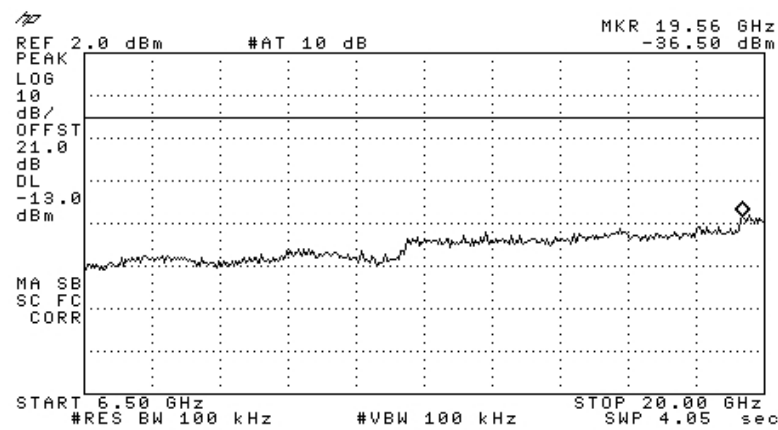


Figure 88.— 1992.50 MHz

GSM:

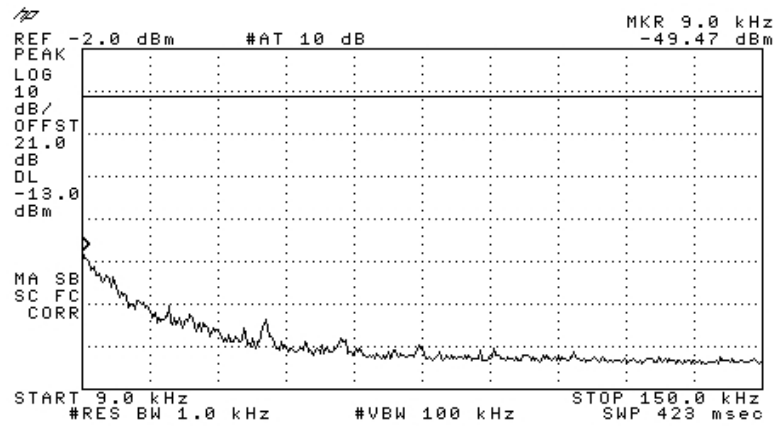


Figure 89.— 1932.50 MHz

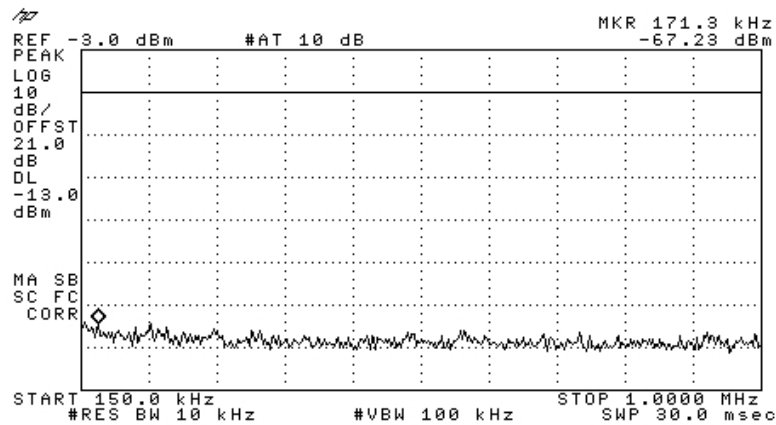


Figure 90.— 1932.50 MHz

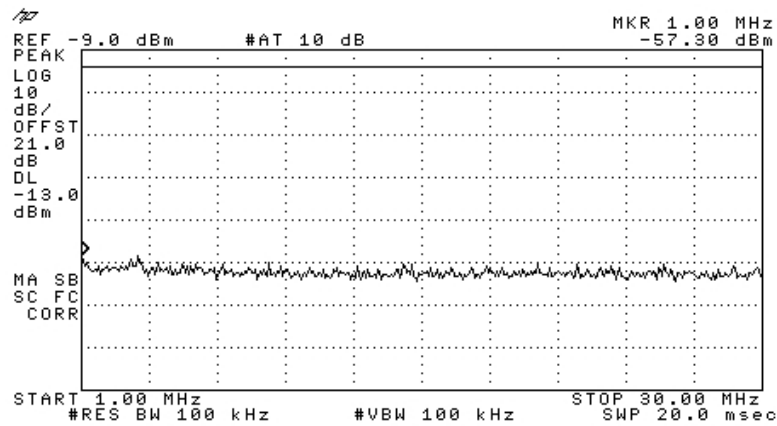


Figure 91.— 1932.50 MHz

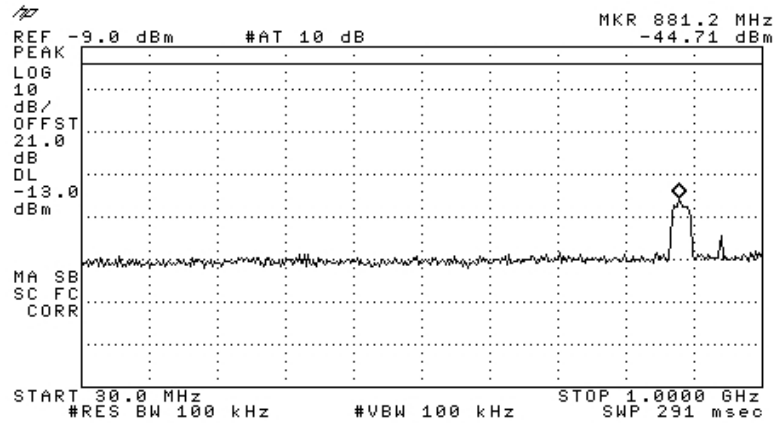


Figure 92.— 1932.50 MHz



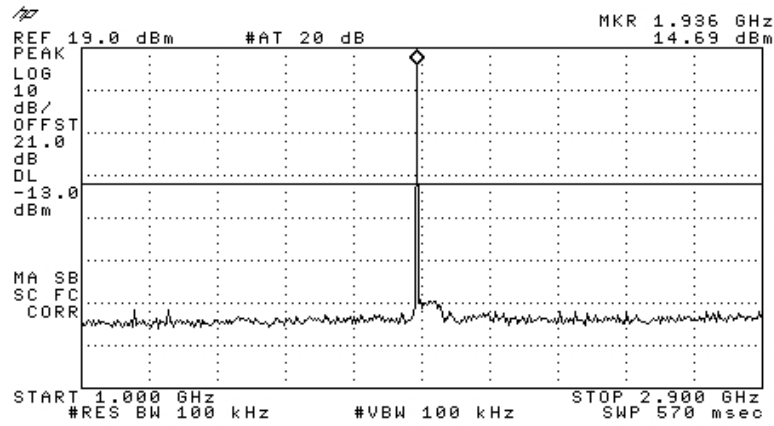


Figure 93.— 1932.50 MHz

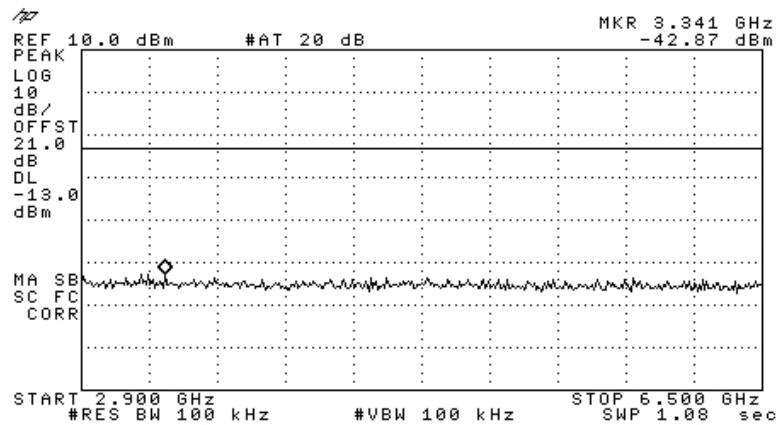


Figure 94.— 1932.50 MHz

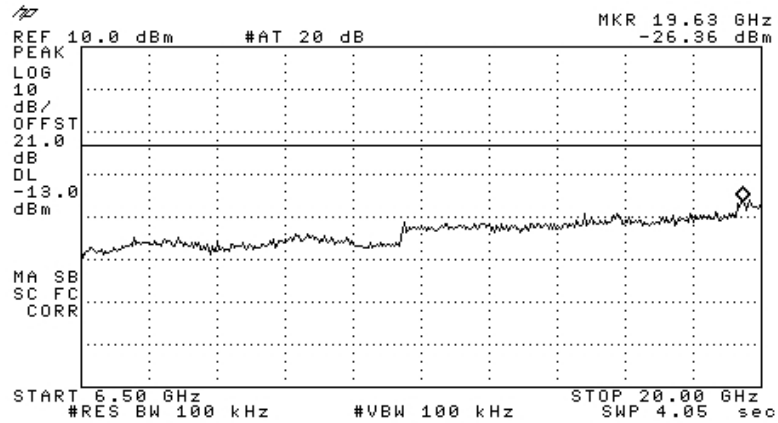


Figure 95.— 1932.50 MHz

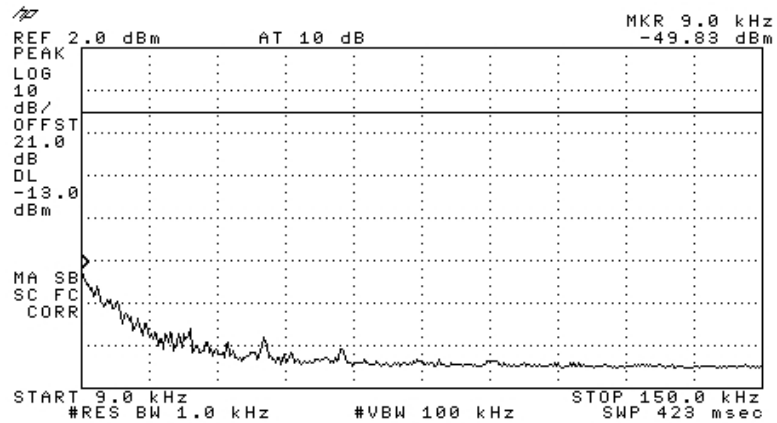


Figure 96.— 1960.00 MHz

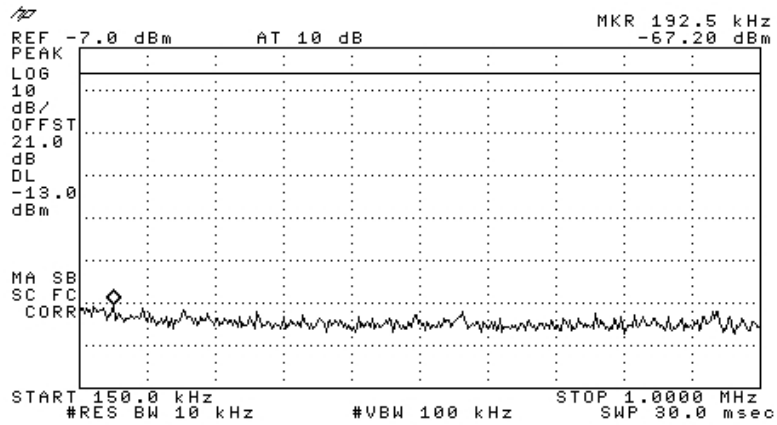


Figure 97.— 1960.00 MHz

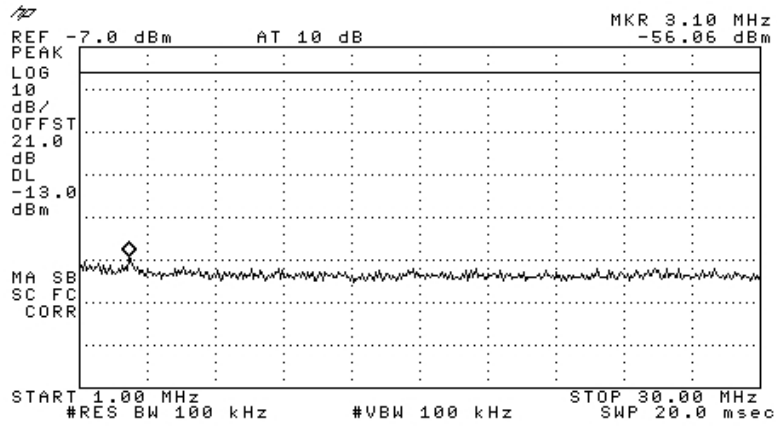


Figure 98.— 1960.00 MHz

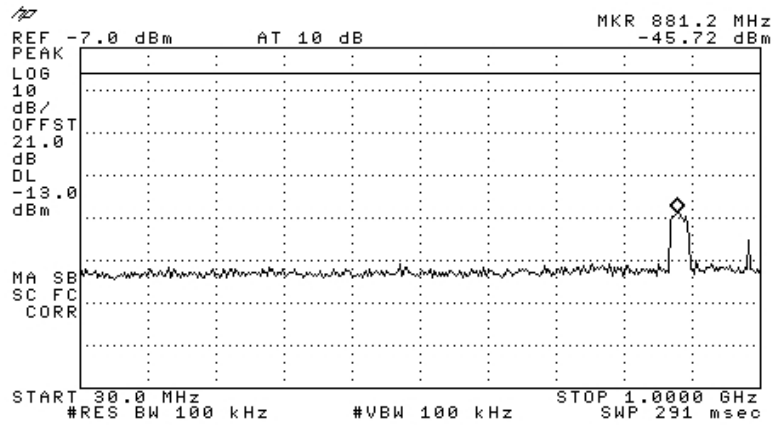


Figure 99.— 1960.00 MHz

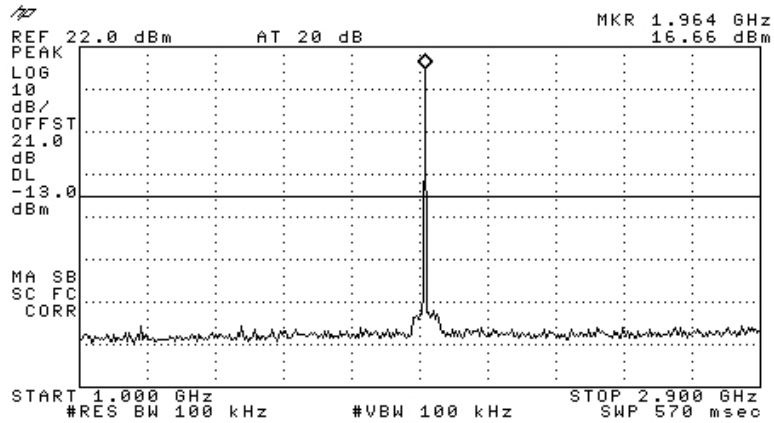


Figure 100.— 1960.00 MHz

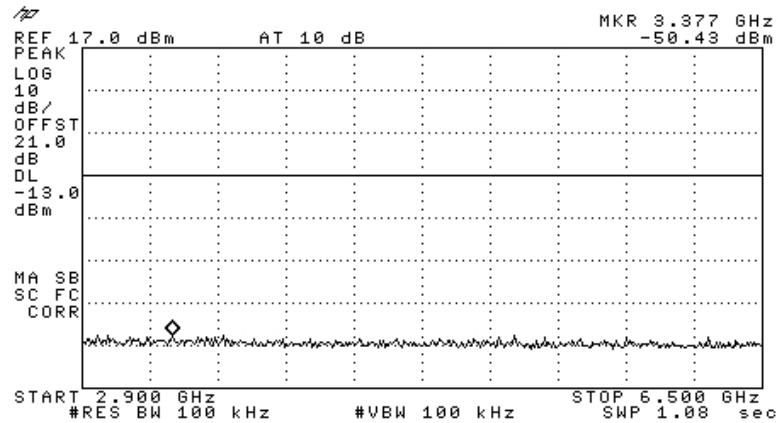


Figure 101.— 1960.00 MHz

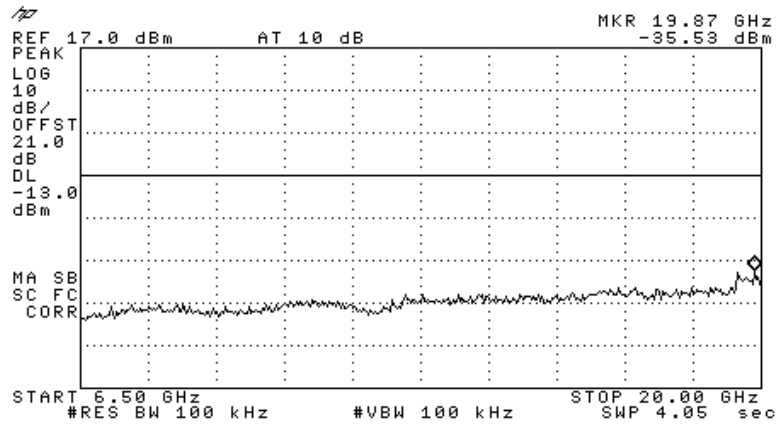


Figure 102.— 1960.00 MHz

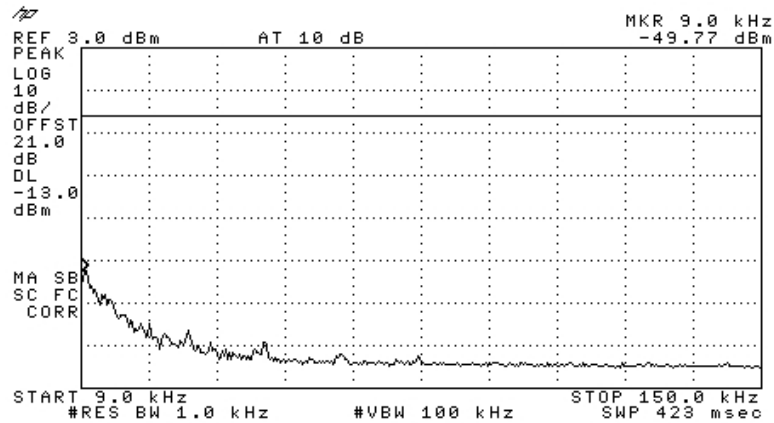


Figure 103.— 1992.50 MHz

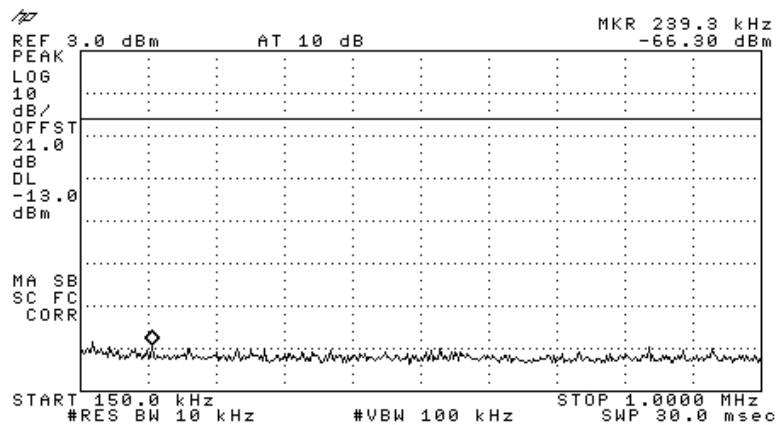


Figure 104.— 1992.50 MHz

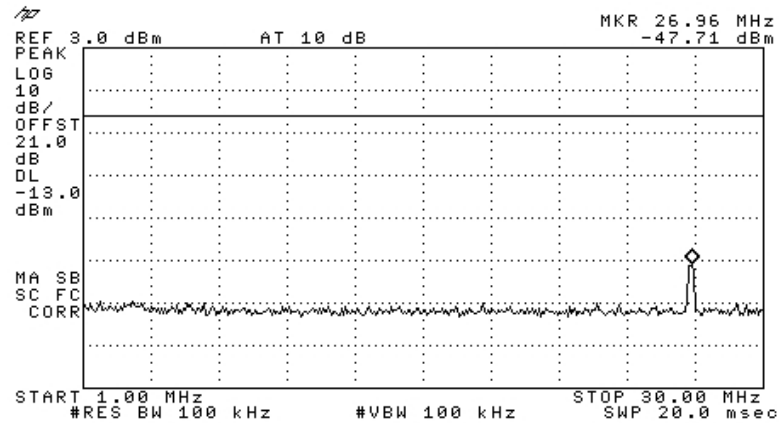


Figure 105.— 1992.50 MHz

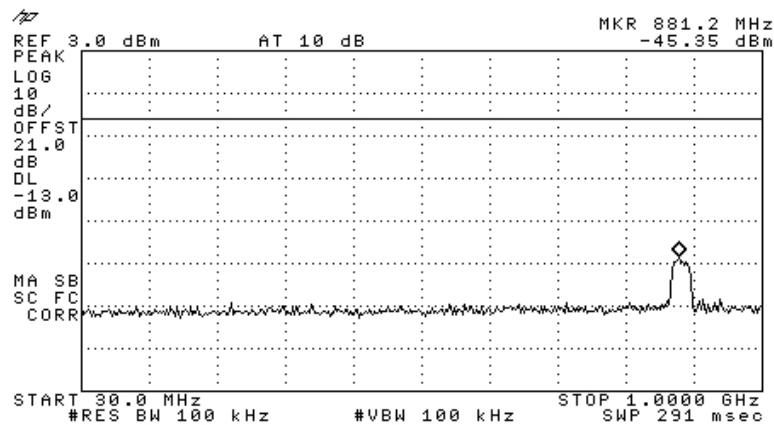


Figure 106.— 1992.50 MHz

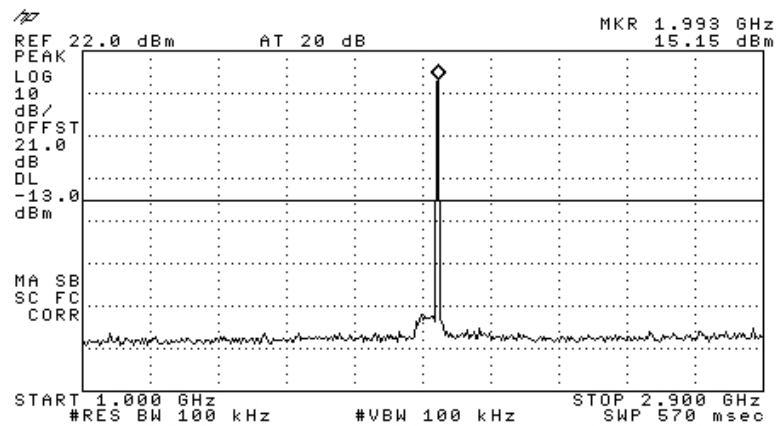


Figure 107.— 1992.50 MHz

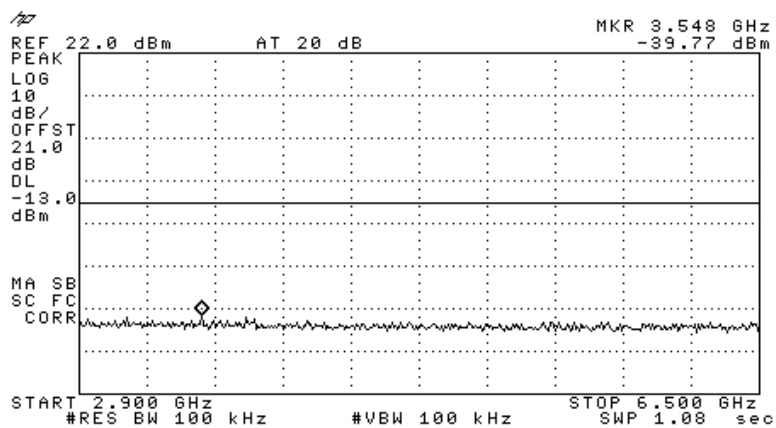


Figure 108.— 1992.50 MHz



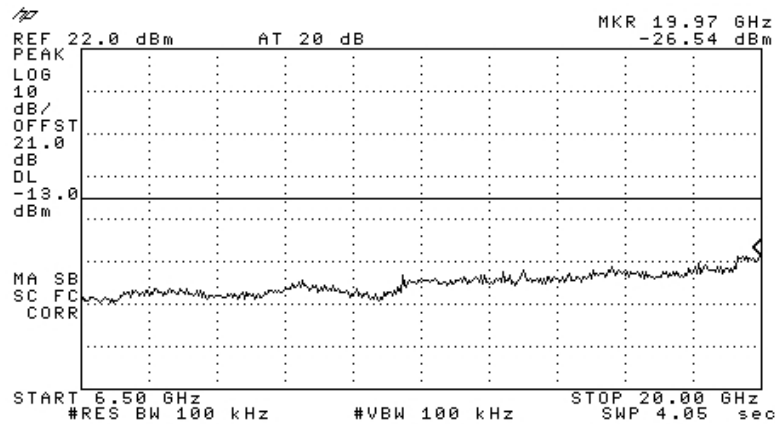


Figure 109.— 1992.50 MHz

### 12.3 Results table

E.U.T. Description: Remote Hub Unit

Model No.: 2000-CELL-PCSH

Serial Number: 0822372


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)
W-CDMA	1932.50	19.97	-36.55	-13.0	-23.55
	1960.00	19.53	-36.73	-13.0	-23.73
	1992.50	19.53	-36.50	-13.0	-23.50
GSM	1932.50	19.63	-26.36	-13.0	-13.36
	1960.00	19.87	-35.53	-13.0	-22.53
	1992.50	19.97	-26.54	-13.0	-13.54

Figure 110 Out of Band Emission Results PCS

JUDGEMENT: Passed by 13.36 dB

TEST PERSONNEL:

Tester Signature: 

Date: 18.04.10

Typed/Printed Name: A. Sharabi

## 12.4 Test Equipment Used.

Out of Band Emission at Antenna Terminals PCS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 17, 2009	1 Year
Signal Generator (CDMA + GSM)	Agilent	E4432B	GB45001033	August 08, 2010	2 years
Signal Generator (W-CDMA)	Agilent	E4432B	GB45001392	August 20, 2010	2 years
Attenuator	Jyebao	-	FAT-AM5AF5G6G 2W20	October 19, 2009	1 year
Cable		SIM	705A009401	March 14, 2010	1 year

**Figure 111 Test Equipment Used**

## 13. Band Edge Spectrum

### 13.1 Test Specification

FCC Part 24, Subpart E, Section 238; FCC Part 2.1051

### 13.2 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  $-13$  dBm.

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (21 dB).

The spectrum analyzer was set to 100 kHz R.B.W.

W-CDMA:

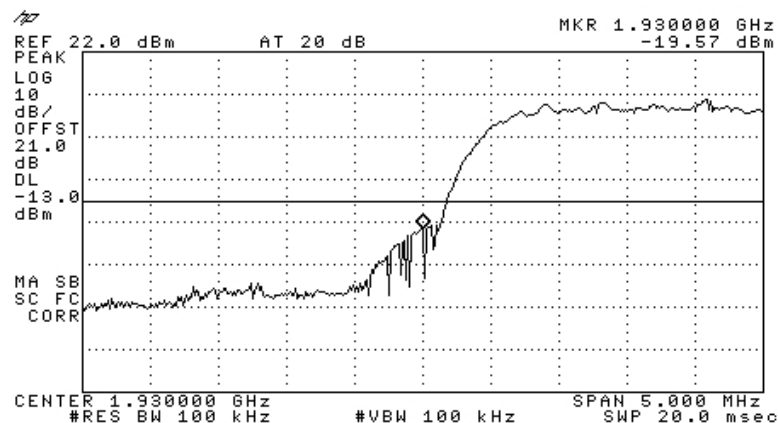


Figure 112.— 1932.50 MHz

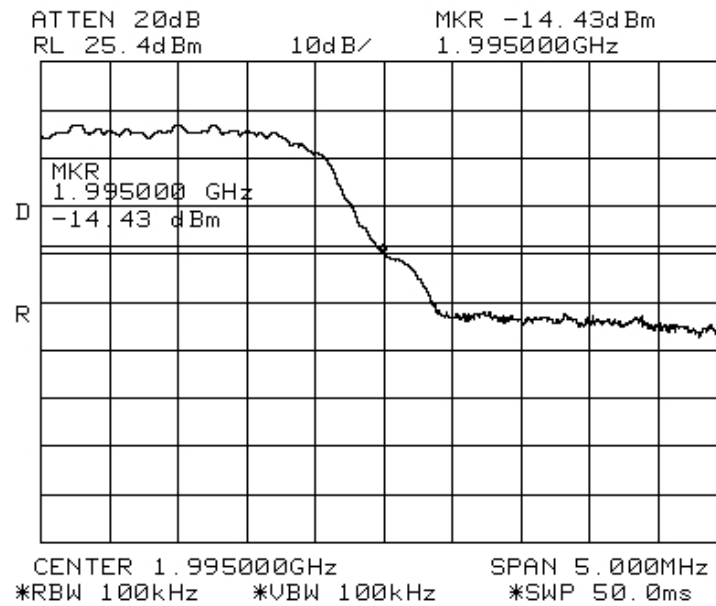


Figure 113.— 1992.50 MHz

GSM:

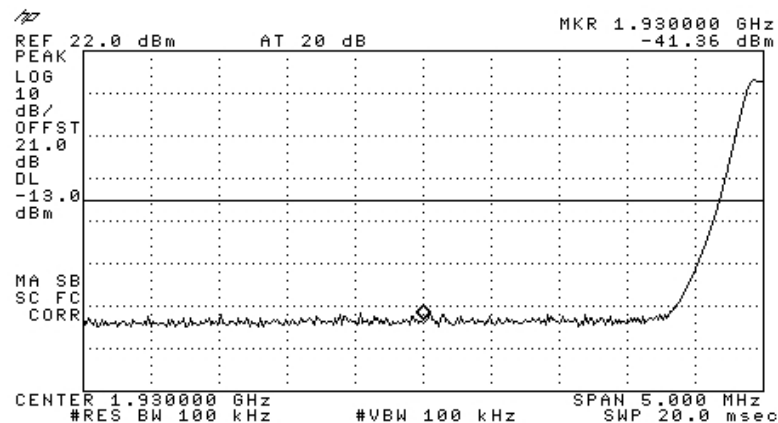


Figure 114.— 1932.50 MHz

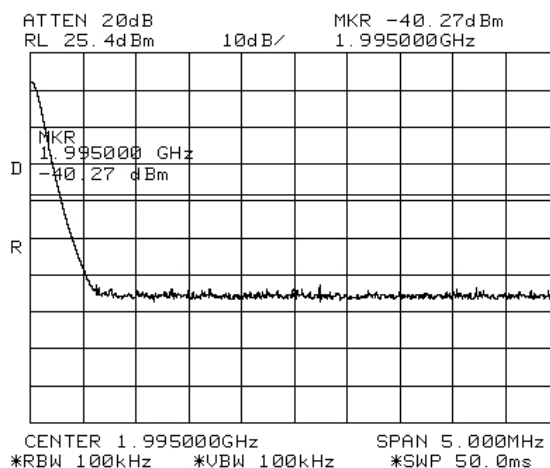


Figure 115.— 1992.50 MHz

### 13.3 Results table

E.U.T. Description: Remote Hub Unit

Model No.: 2000-CELL-PCSH

Serial Number: 0822372

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	-19.57	-13.0	-6.57
	1992.50	1995.00	-14.43	-13.0	-1.43
GSM	1932.50	1930.00	-41.36	-13.0	-28.36
	1992.50	1995.00	-40.27	-13.0	-27.27

Figure 116 Band Edge Spectrum Results PCS

JUDGEMENT: Passed by 6.57 dB

TEST PERSONNEL:

Tester Signature: 

Date: 18.04.10

Typed/Printed Name: A. Sharabi

### 13.4 Test Equipment Used.

#### Band Edge Spectrum PCS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 17, 2009	1 Year
Spectrum Analyzer	HP	8546E	3442A00275	January 11, 2010	1 Year
Signal Generator (CDMA + GSM)	Agilent	E4432B	GB45001033	August 08, 2010	2 years
Signal Generator (W-CDMA)	Agilent	E4432B	GB45001392	August 20, 2010	2 years
Attenuator	Jyebao	-	FAT-AM5AF5G6G2W20	October 19, 2009	1 year
Cable		SIM	705A009401	March 14, 2010	1 year

**Figure 117 Test Equipment Used**

## 14. Out of Band Emissions (Radiated) PCS

### 14.1 Test Specification

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

### 14.2 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  $-13\text{dBm}$ .

- (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:

$$P_d(\text{dBm}) = P_g(\text{dBm}) - \text{Cable Loss (dB)} + \text{Substitution Antenna Gain (dB)}$$

$P_d$  = Dipole equivalent power (result).

$P_g$  = Signal generator output level.

### 14.3 Test Data

W-CDMA:


Carrier Channel	Freq.	Antenna Pol.	Maximum Peak Level	Signal Generator RF Output	Cable Loss	Antenna Gain	Effective Radiated Power Level	Spec.	Margin
(MHz)	(MHz)		(dBμV/m)	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
1932.5	3865.0	V	42.85	-53.4	7.9	7.9	-53.4	-13	-40.4
1932.5	3865.0	H	43.29	-52.2	7.9	7.9	-52.2	-13	-39.2
1960.0	3920.0	V	43.21	-52.2	7.9	7.9	-52.2	-13	-39.2
1960.0	3920.0	H	44.42	-51.6	7.9	7.9	-51.6	-13	-38.6
1992.5	3985.0	V	44.32	-51.6	7.9	7.9	-51.6	-13	-38.6
1992.5	3985.0	H	46.51	49.0	7.9	7.9	-49.0	-13	-36.0

GSM:

Carrier Channel	Freq.	Antenna Pol.	Maximum Peak Level	Signal Generator RF Output	Cable Loss	Antenna Gain	Effective Radiated Power Level	Spec.	Margin
(MHz)	(MHz)		(dBμV/m)	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
1932.5	3865.0	V	43.8	-53.4	7.9	7.9	-53.4	-13	-40.4
1932.5	3865.0	H	43.2	-53.4	7.9	7.9	53.4	-13	-40.4
1960.0	3920.0	V	44.09	-52.4	7.9	7.9	-52.4	-13	-39.4
1960.0	3920.0	H	43.72	-53.2	7.9	7.9	-53.2	-13	-40.2
1992.5	3985.0	V	45.46	-51.2	7.9	7.9	-51.2	-13	-38.2
1992.5	3985.0	H	45.93	-51.0	7.9	7.9	-51.0	-13	-38.0

JUDGEMENT: Passed by 36.0 dB

TEST PERSONNEL:

Tester Signature: 

Date: 18.04.10

Typed/Printed Name: A. Sharabi



#### 14.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 10, 2009	1 year
RF Section	HP	85420E	3705A00248	November 10, 2009	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	March 25, 2009	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 26, 2009	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 19, 2009	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	January 13, 2010	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	January 13, 2010	1 Year
Signal Generator (CDMA + GSM)	Agilent	E4432B	GB45001033	August 08, 2010	2 years
Signal Generator (W-CDMA)	Agilent	E4432B	GB45001392	August 20, 2010	2 years
Double Ridged Waveguide Horn Antenna	EMCO	3115	29845	March 16, 2008	2 year

## 15. 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)	FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3	1200.0	7.3
20.0	0.6	1400.0	7.8
30.0	0.8	1600.0	8.4
40.0	0.9	1800.0	9.1
50.0	1.1	2000.0	9.9
60.0	1.2	2300.0	11.2
70.0	1.3	2600.0	12.2
80.0	1.4	2900.0	13.0
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		

#### 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**

<b>FREQUENCY</b> (MHz)	<b>AFE</b> (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**

<b>FREQUENCY</b> (MHz)	<b>AFE</b> (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 38M30.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	ANTENNA FACTOR
(GHz)	(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	ANTENNA FACTOR
(GHz)	(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**

<b>FREQUENCY</b> (MHz)	<b>AFE</b> (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)	ANTENN A 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**

<b>FREQUENCY</b>	<b>Magnetic Antenna Factor</b>	<b>Electric Antenna Factor</b>
(MHz)	(dB)	(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