DATE: 29 May 2011

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

FCC Radio Test Report

for

Mobile Access Networks

Equipment under test:

Mobile AccessHX High-Power DAS Remote Unit

HX-P19A17-AC-A
(P19=PCS; A17=AWS)

Written by: _____
D. Shidlowsky, Documentation

Approved by: _____
A. Sharabi, Test Engineer

Approved by: _____
I. Raz, EMC Laboratory Manager

Measurement/Technical Report for

Mobile Access Networks

Mobile AccessHX High-Power DAS Remote Unit

FCC ID: OJFHXP19A17

This report concerns:	Original Grant: X Class II change: Class I change:
Equipment type:	PCS Licensed Transmitter
Limits used: 47CFR Parts 2, 24; 27	

Measurement procedure used is ANSI C63.4-2003.
Substitution Method used as in ANSI/TIA-603-C: 2004

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):	Mobile AccessHX High-Power DAS Remote Unit
Equipment Model No.:	HX-P19A17-AC-A (P19=PCS; A17=AWS)
Equipment Serial No.:	Not Designated
Date of Receipt of E.U.T:	03.05.11
Start of Test:	03.05.11
End of Test:	29.05.11
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	FCC Parts 24, 27

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.

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 MobileAccess**HX** is a high power, Distributed Antenna System (DAS) solution for indoors or outdoors (model dependent). It is a fiber-fed, compact and scalable multi-service platform designed to provide complete RF open space coverage for large scale public venues, such as campuses, stadiums, convention centers, hotels, airports, and train stations.
HX supports multiple wireless technologies and operator services over a single broadband infrastructure. Using low loss fiber optic cabling remote units can cover distances of up to 2Km from the BTS signal sources at the head-end.
The solution can be deployed in new sites or alongside existing MobileAccess**1000** (MA1000) and/or MobileAccess**2000** (MA2000) systems, sharing a common head-end and element management system (EMS).
Alongside MA1000/MA2000 deployments, MobileAccess**HX** provides a comprehensive indoor and outdoor coverage solution for varying site requirements, supporting everything from high-rise buildings and campus topologies to stadiums and airports.

Features & Benefits:

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, UMTS, HSPA, LTE, EDGE, EV-DO, AWS, and more.

Cost-Effective High Power: Optimizes and reduces the number of antennas required to cover open areas by offering 33dBm (2W) composite power per frequency band.

Available in both Indoor and outdoor models – outdoor models are ingress protected whereas indoor models are field-upgradable. The combination of both provides maximum flexibility to match any deployment.

Pay-As-You-Grow Design: Can initially be deployed in dual-band, where tri-band or quad-band configurations can be enabled as needed.

Carrier-Grade Operation: Advanced signal handling and management ensures carrier-grade performance in multi-operator deployments.

Design and Deployment Flexibility:

Remote unit supports both SM and MM fiber connections.
Supports two to four wireless frequencies.

Compatible with Existing MA1000/MA2000 Deployment: Shares a common head-end and EMS in a single deployment.

System Architecture

MobileAccess**HX** provides a complete solution consisting of HX remote units at the remote locations and head-end elements that are shared with any existing MA1000/MA2000 system that is either installed or being installed at the site. In the downlink, at the head-end, the BTS or BDA signal is conditioned by the **RIU**, ensuring a constant RF level. The conditioned signal is then converted by the Base Unit to an optical signal for transport over single or multi-mode fiber to the HX remote units, which are located at the remote locations. In the uplink, the process is reversed. The **SC-450 Controller** enables local and remote management, as well as controls all MA1000, MA2000, and HX elements from a single, centralized location.

The **MobileAccessHX Remote Unit** (indoor and outdoor models) consists of a compact enclosure that houses the RF module, power elements, and the required interfaces. The RF module supports up to four services, where two services can be enabled initially and additional services can be enabled as needed. All mobile services are combined and distributed through a single antenna port over antennas installed at the remote locations.

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

Both conducted and 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 3, 2009).

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

1.6 Measurement Uncertainty

Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) for open site 30-1000MHz:

Expanded Uncertainty (95% Confidence, K=2):

± 4.96 dB

2. System Test Configuration

2.1 Justification

The test setup was configured to closely resemble the standard installation.
The EUT consists of the HX (High Power Remote Module) which is connected with the head-end DAS equipment using fiber optic cable.
The RF source signals (PCS and AWS) are represented in the setup by appropriate signal generators.
An "Exercise" SW on the computer was used to enable/disable transmission of the EUT, while the EUT output was connected to the spectrum analyzer.

The E.U.T. is available powered from AC or DC.

The E.U.T. is a hardware de-populated version of the full configuration model FCC ID: OJFHXC85P19L70A17. Based on the exploratory radiated emission tests performed on the full configuration, the AC powered version of the E.U.T. was selected for full testing. Following is a description of the exploratory radiated emission tests performed on the full configuration.

To select the worst case version to be fully tested, an exploratory radiated emission test was performed inside the shielded room.

The units were placed on a 0.8 meter high wooden table, 1meter from the tests antenna, which was 1 m high.

The results of the exploratory radiated emission tests are shown in the table below.

Frequency (MHz)	AC Configuration (dBµV/m)	DC Configuration (dBµV/m)
3920.00	40.0	39.5
4270.00	53.5	51.5
5880.00	34.5	34.5

Based on the above exploratory radiated emission test, the AC powered configuration was selected as the "worst case" host.

2.2 EUT Exercise Software

The Element Management System EngGUI ver. 1.00 build 10 used for commands delivery.
These commands are used to enable / disable of EUT transmission.
EUT Embedded SW version 01.00 build 14

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

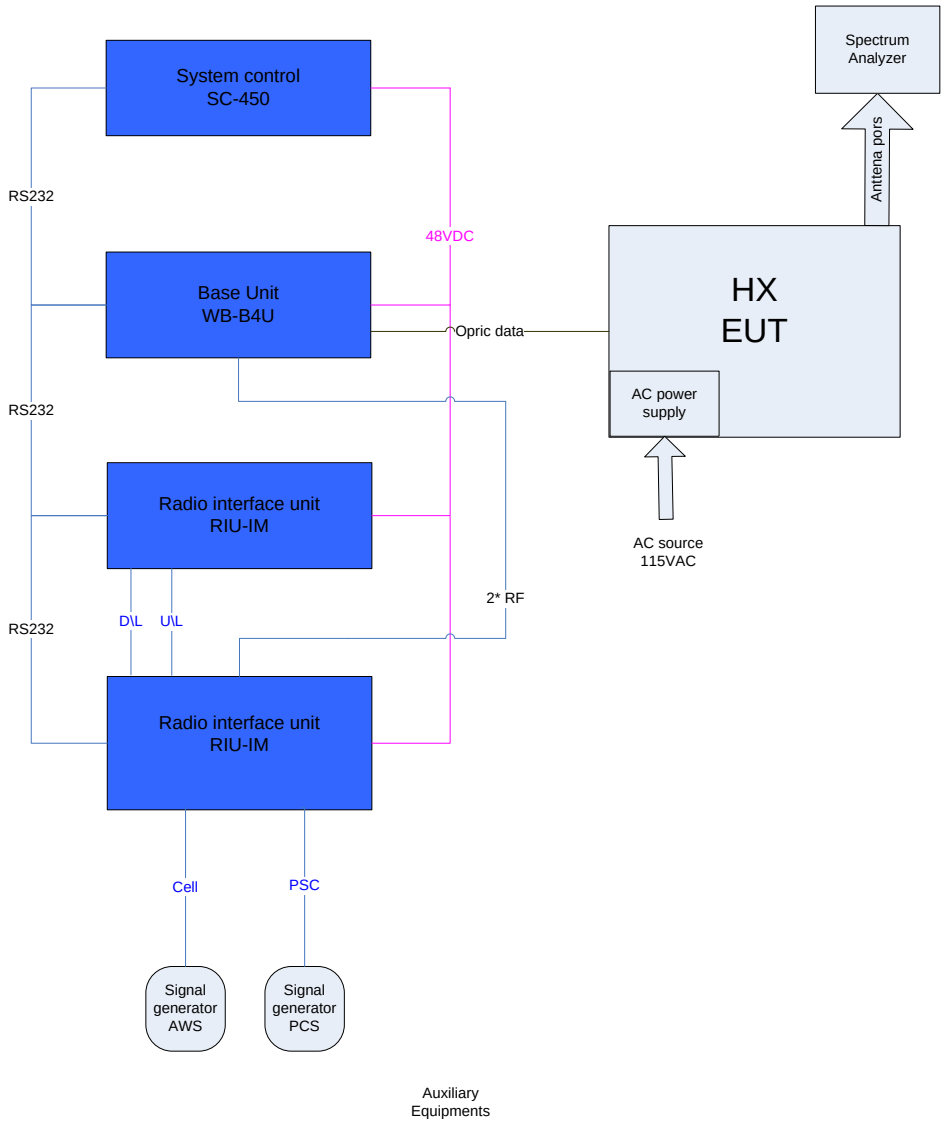

Figure 1. Tests Set-up

3. Conducted and Radiated Measurement Test Set-ups Photo

Figure 2. Conducted Emission From Antenna Ports Tests

Figure 3. Radiated Emission Test

4. Peak Output Power PCS

4.1 Test Specification

FCC Part 24, Subpart E

4.2 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 (40 dB) and an appropriate coaxial cable (1dB). The E.U.T. RF output was W-CDMA and GSM and CDMA modulated. Special attention was taken to prevent Spectrum Analyzer RF input overload. The Spectrum Analyzer was set to 30 kHz RBW.

CDMA

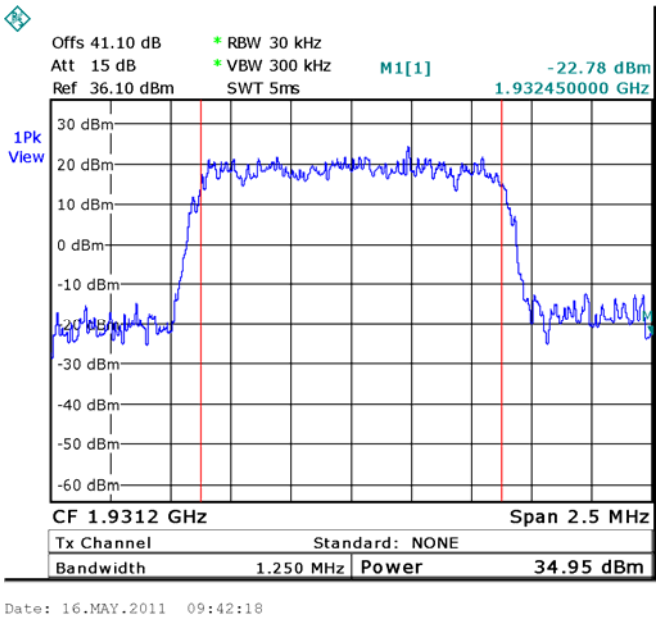

Figure 4.— 1931.20 MHz

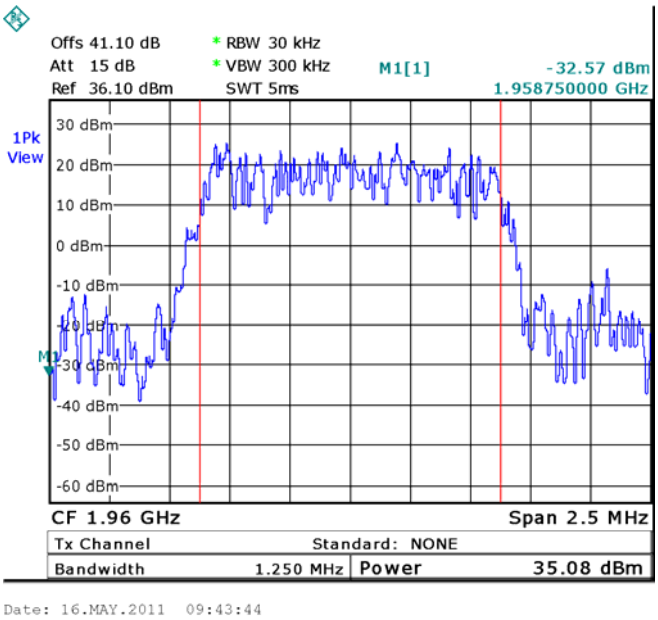

Figure 5.— 1960.00 MHz

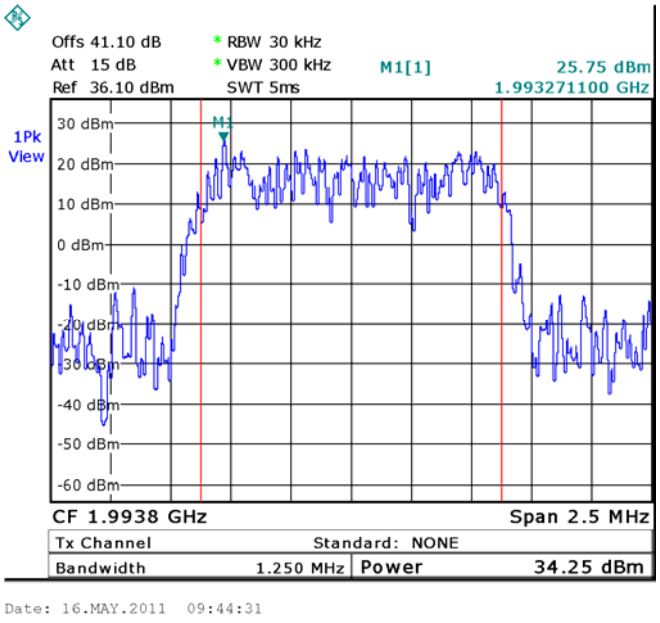

Figure 6.— 1993.80 MHz

GSM:

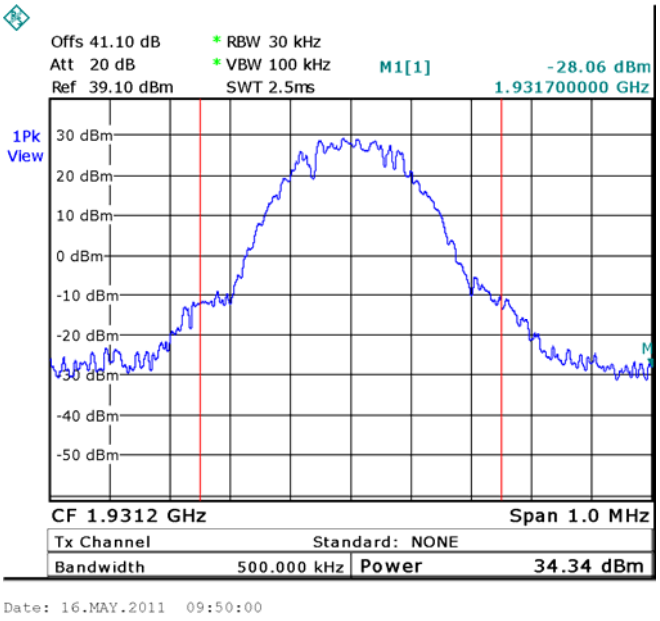

Figure 7.— 1931.20 MHz

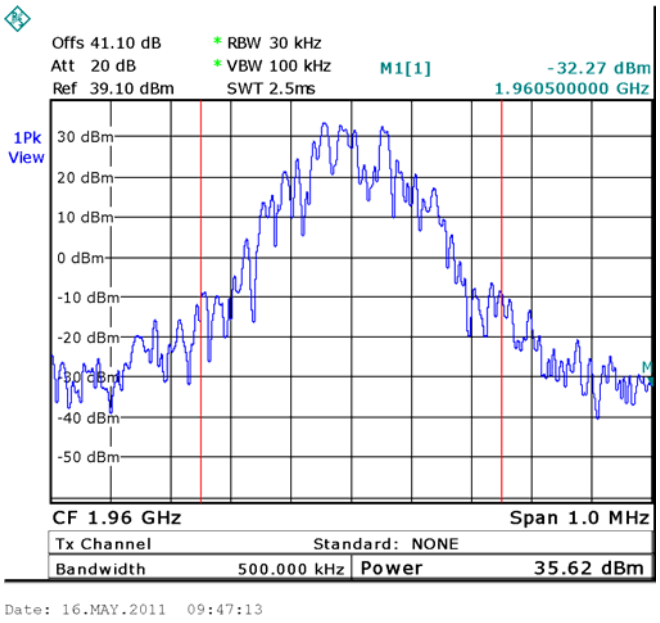

Figure 8.— 1960.00 MHz

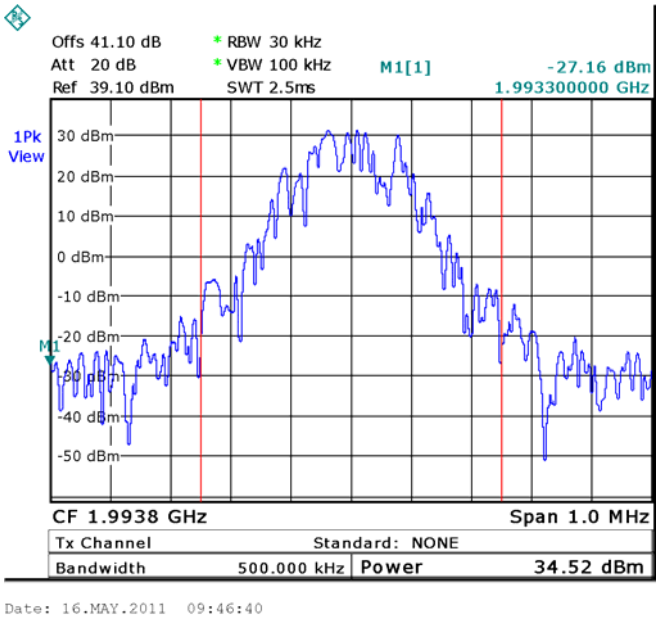

Figure 9.— 1993.80 MHz

W-CDMA:

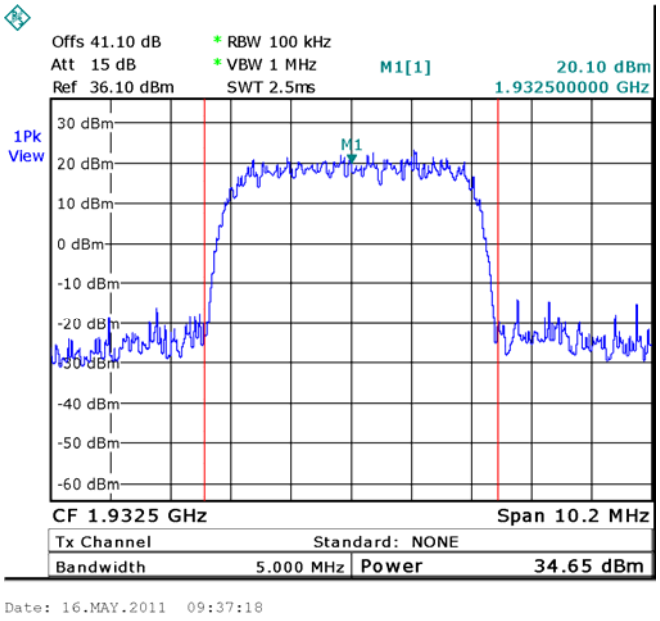

Figure 10.— 1932.50 MHz

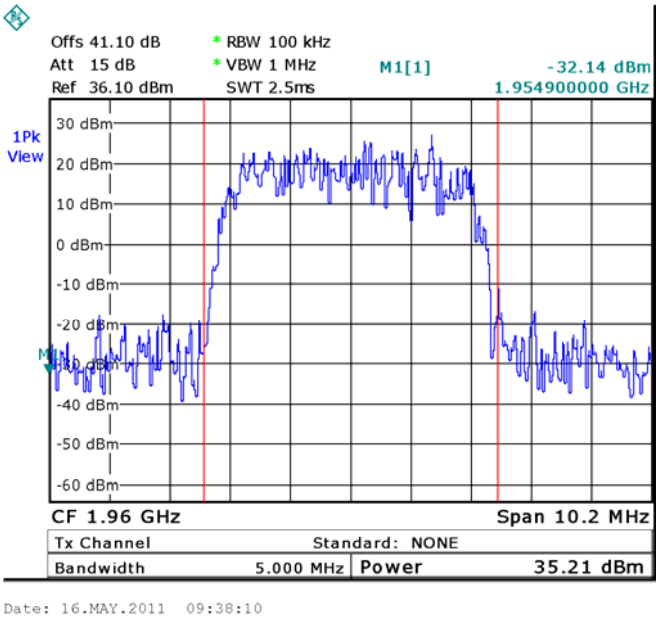

Figure 11.— 1960.00 MHz

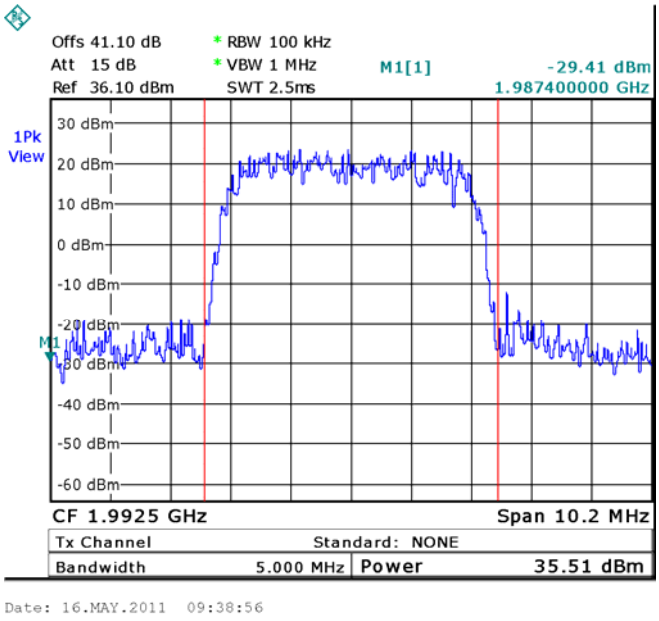

Figure 12.— 1992.50 MHz

4.3 Results Table

E.U.T. Description: Mobile AccessHX High-Power DAS Remote Unit
Model No.: HX-P19A17-AC-A (P19=PCS; A17=AWS)
Serial Number: Not Designated
Specification: FCC Part 24, Subpart E, Section 232, FCC Part 2, Section 1046

Modulation	Operation Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
CDMA	1931.20	34.65	50.0	-15.35
	1960.00	35.21	50.0	-14.79
	1993.80	35.51	50.0	-14.49
GSM	1931.20	34.95	50.0	-15.05
	1960.00	35.08	50.0	-14.92
	1993.80	34.25	50.0	-15.75
W-CDMA	1932.50	34.34	50.0	-15.66
	1960.00	35.62	50.0	-14.38
	1992.50	34.52	50.0	-15.48

Figure 13 Peak Output Power PCS

JUDGEMENT: Passed by 14.38 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 31.05.11

Typed/Printed Name: A. Sharabi

4.4 Test Equipment Used.

Peak Output Power PCS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	RHODE&SCHWARZ	FSL6	100194	July 22, 2010	1 year
Signal Generator	HP	E4438C ESG-	MY45091956	July 22, 2010	1 year
Signal Generator	HP	E4433B ESG-D	GB40050702	July 22, 2010	1 year
Attenuator	Narda	MOD 766-10	9409	December 22, 2010	1 year
Attenuator	Mini-Circuits	BW-S30W5	0533	December 22, 2010	1 year
Cable	Mini-Circuits	30091		February 10, 2011	1 year

Figure 14 Test Equipment Used

5. Occupied Bandwidth PCS

5.1 Test Specification

FCC Part 2, Section 1049

5.2 Test Procedure

The E.U.T. was set to the applicable test frequency with CDMA, GSM and W-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. for CDMA and W-CDMA and 30 kHz RBW for GSM.
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

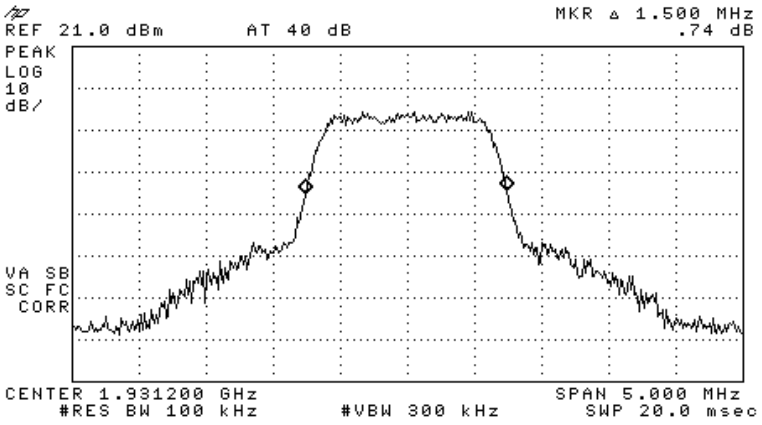

Figure 15.— Input 1931.20 MHz

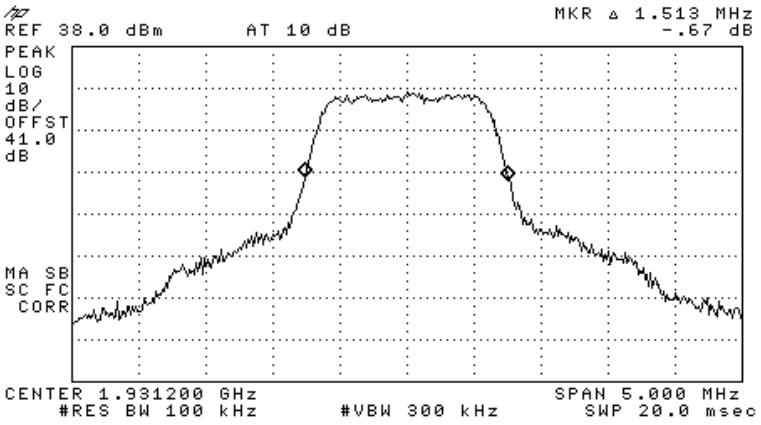

Figure 16.— Output 1931.20 MHz

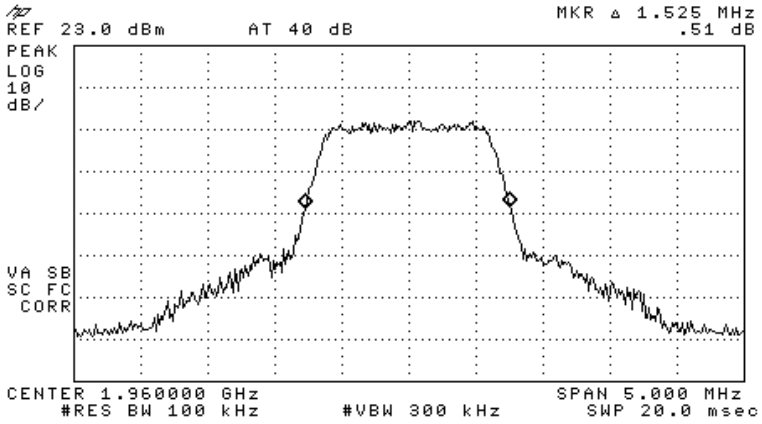

Figure 17.— Input 1960.00 MHz

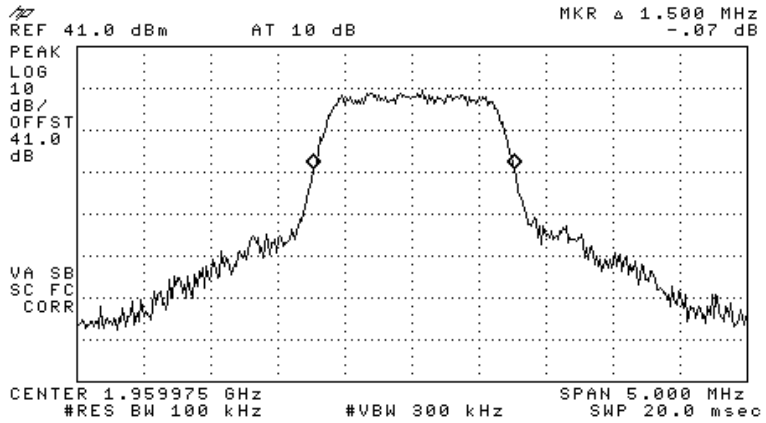

Figure 18.— Output 1960.00 MHz

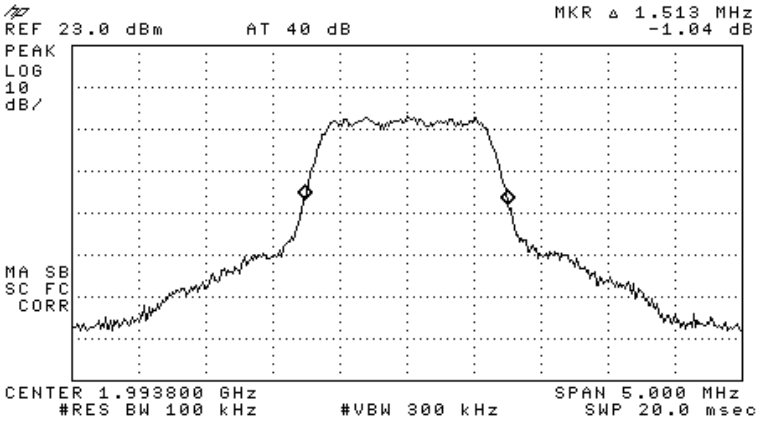

Figure 19.— Input 1993.80 MHz

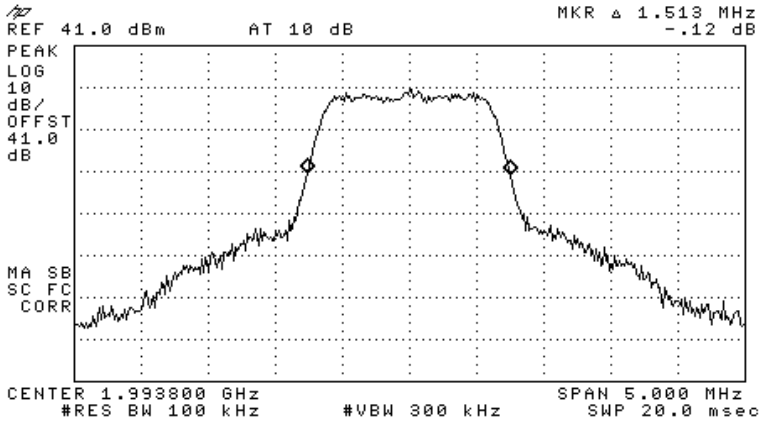

Figure 20.— Output 1993.80 MHz

GSM:

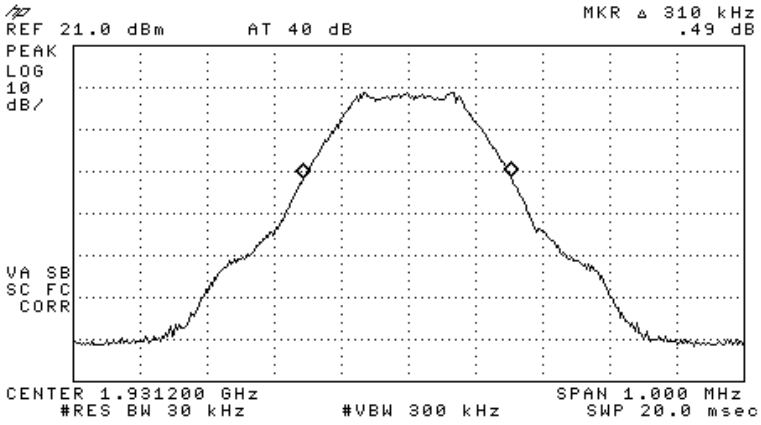

Figure 21.— Input 1931.20 MHz

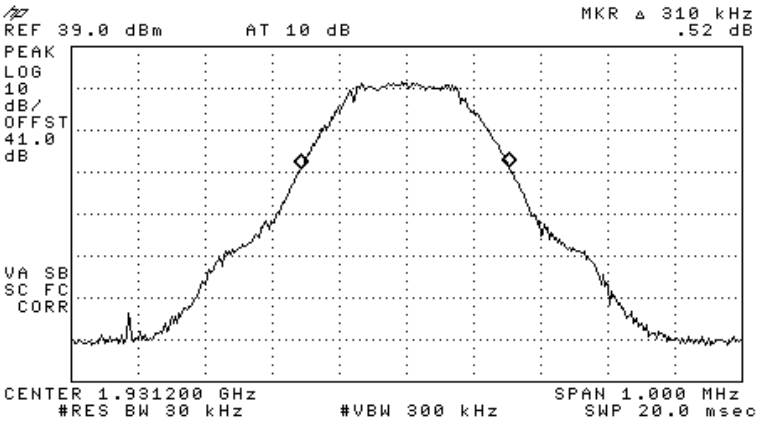

Figure 22.— Output 1931.20 MHz

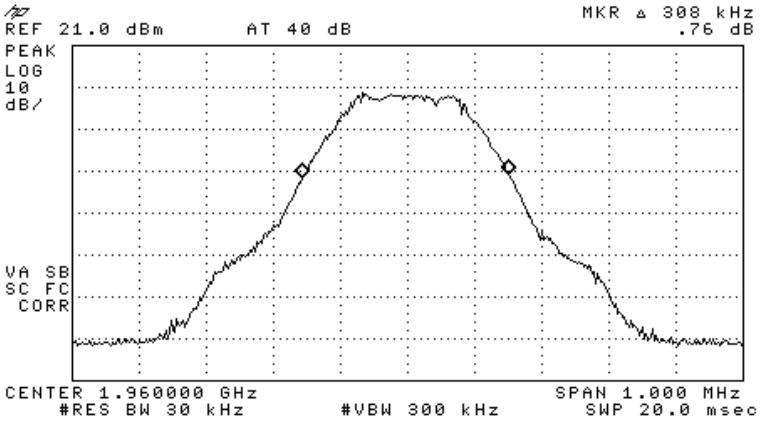

Figure 23.— Input 1960.00 MHz

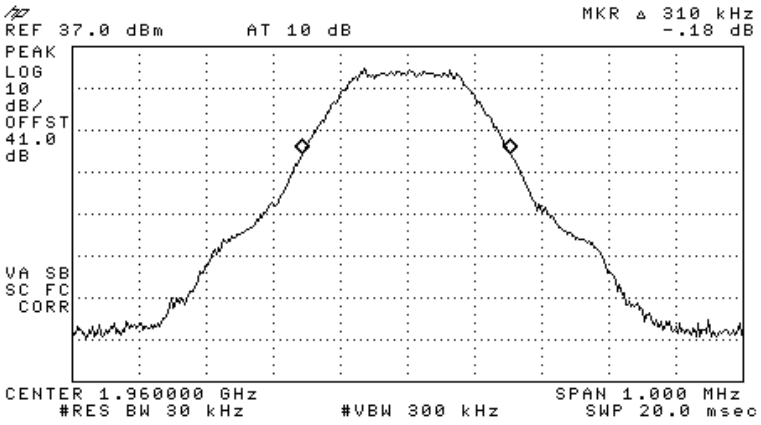

Figure 24.— Output 1960.00 MHz

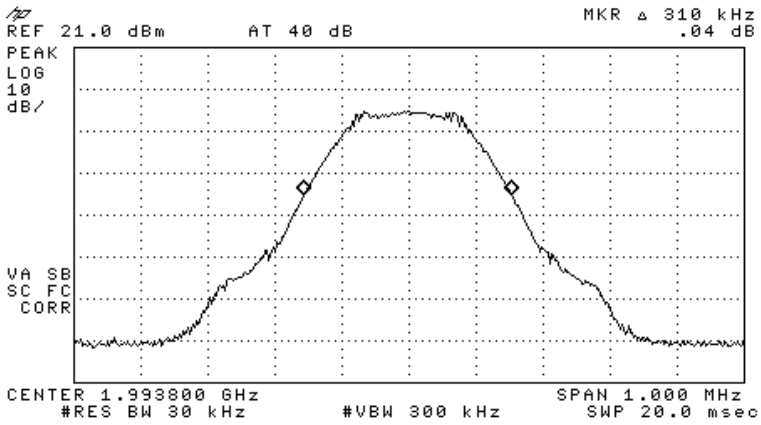

Figure 25.— Input 1993.80 MHz

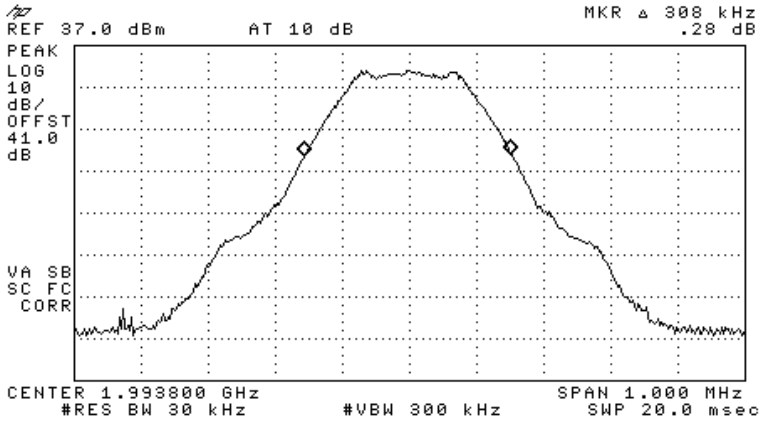

Figure 26.— Output 1993.80 MHz

W-CDMA:

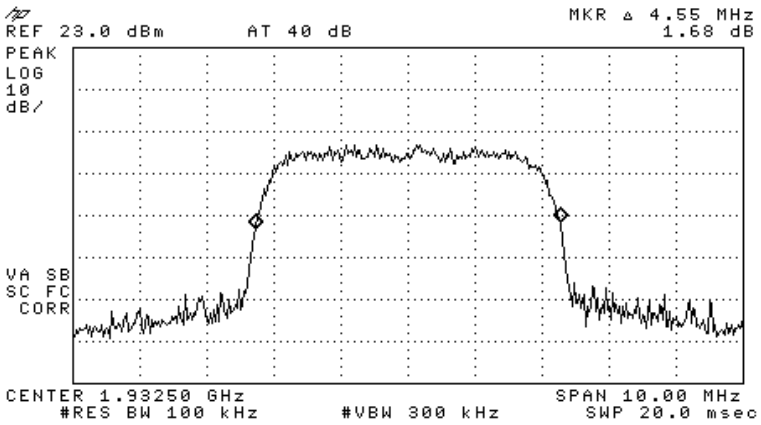

Figure 27.— Input 1932.50 MHz

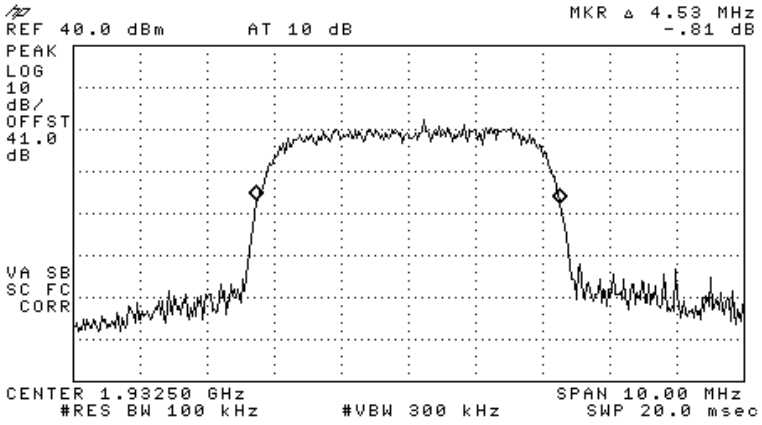

Figure 28.— Output 1932.50 MHz

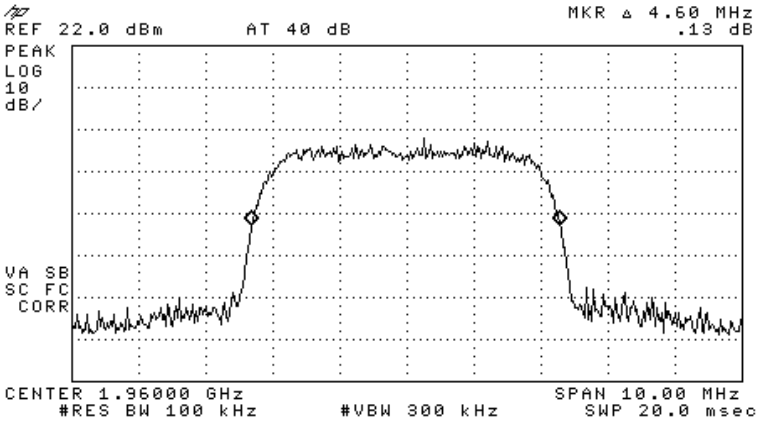

Figure 29.— Input 1960.00 MHz

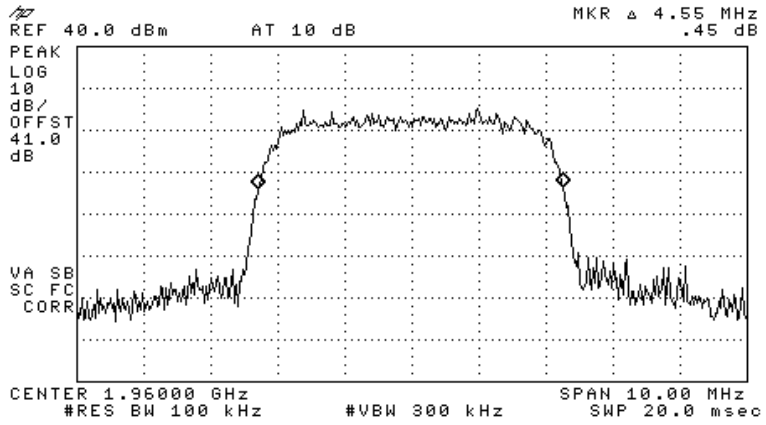

Figure 30.— Output 1960.00 MHz

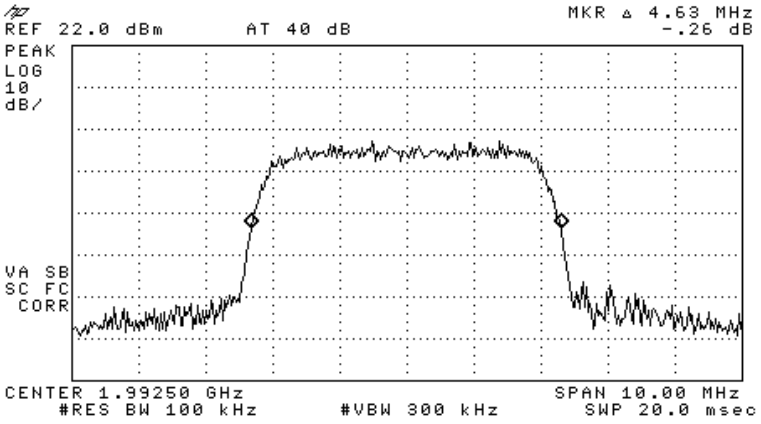

Figure 31.— Input 1992.50 MHz

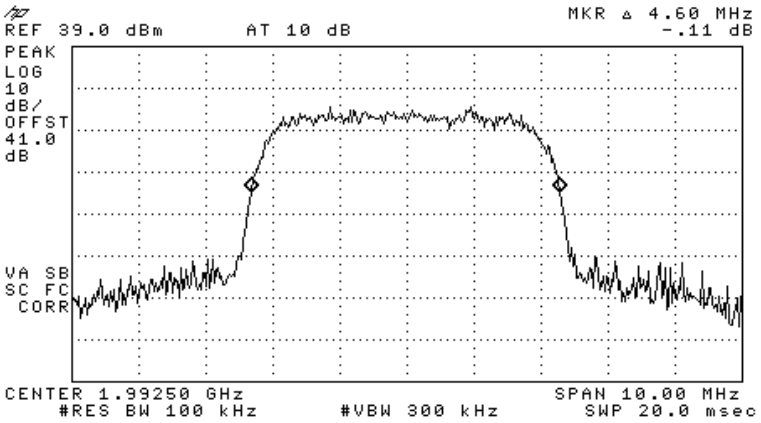

Figure 32.— Output 1992.50 MHz

5.3 Results Table

E.U.T. Description: Mobile AccessHX High-Power DAS Remote Unit
Model No.: HX-P19A17-AC-A (P19=PCS; A17=AWS)
Serial Number: Not Designated
Specification: FCC Part 2, Section 1049

Modulation		Operating Frequency (MHz)	Reading (MHz)
CDMA	Input	1931.20	1.500
	Output	1931.20	1.513
	Input	1960.00	1.525
	Output	1960.0	1.500
	Input	1993.80	1.513
	Output	1993.80	1.513
GSM	Input	1931.20	0.310
	Output	1931.20	0.310
	Input	1960.00	0.308
	Output	1960.00	0.310
	Input	1993.80	0.310
	Output	1993.80	0.308
W-CDMA	Input	1932.50	4.550
	Output	1932.50	4.530
	Input	1960.00	4.600
	Output	1960.00	4.550
	Input	1992.50	4.630
	Output	1992.50	4.600

Figure 33 Occupied Bandwidth PCS

TEST PERSONNEL:

Tester Signature: _____ Date: 31.05.11

Typed/Printed Name: A. Sharabi

5.4 Test Equipment Used.

Occupied Bandwidth PCS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8529L	3826A01204	February 21, 2011	1 year
Signal Generator	HP	E4438C ESG-	MY45091956	July 22, 2010	1 year
Signal Generator	HP	E4433B ESG-D	GB40050702	July 22, 2010	1 year
Attenuator	Narda	MOD 766-10	9409	December 22, 2010	1 year
Attenuator	Mini-Circuits	BW-S30W5	0533	December 22, 2010	1 year
Cable	Mini-Circuits	30091		February 10, 2011	1 year

Figure 34 Test Equipment Used

6. Out of Band Emissions at Antenna Terminals PCS

6.1 Test Specification

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

6.2 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 (41 dB).
The spectrum analyzer was set to 1 kHz RBW for the frequency range of 9 – 150 kHz, 10 kHz RBW for the frequency range of 150 kHz – 1 MHz, and 100 kHz RBW for the frequency range of 1 MHz – 20 GHz.
Signal power was +10 dBm to EUT.

CDMA:

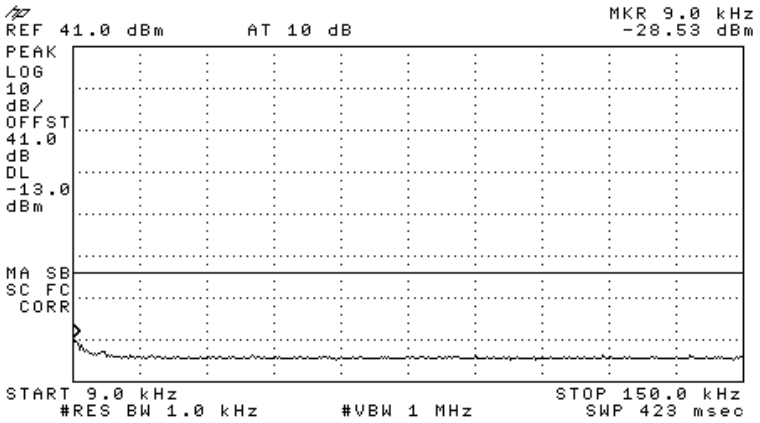

Figure 35.— 1931.20 MHz

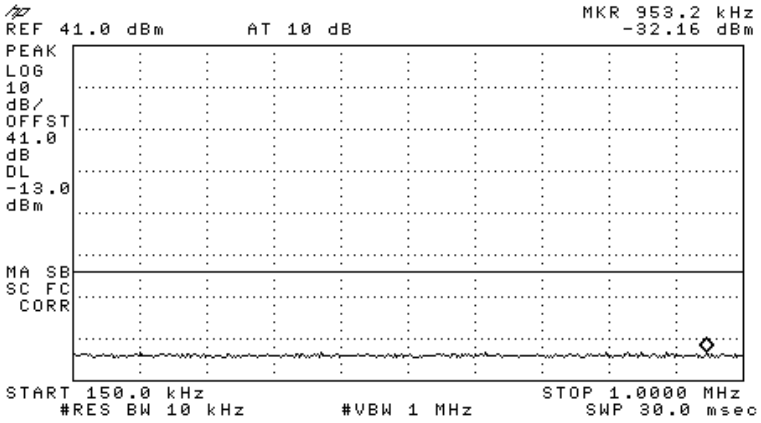

Figure 36.— 1931.20 MHz

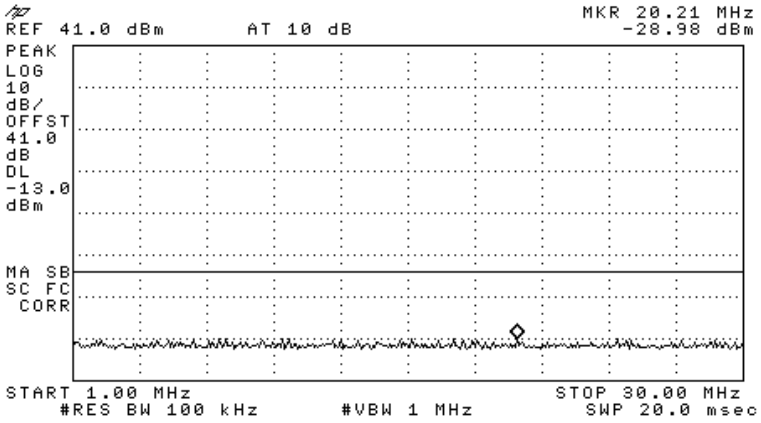

Figure 37.— 1931.20 MHz

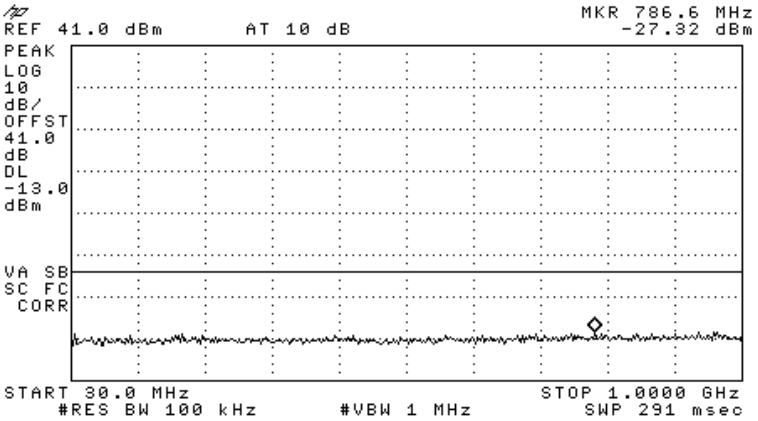

Figure 38.— 1931.20 MHz

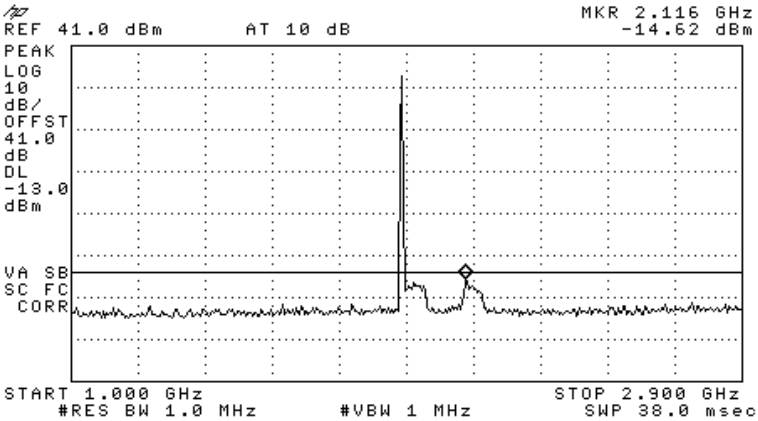

Figure 39.— 1931.20 MHz

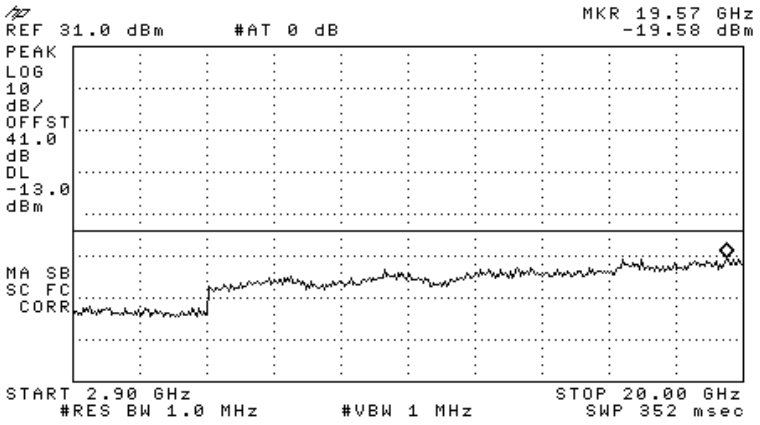

Figure 40.— 1931.20 MHz

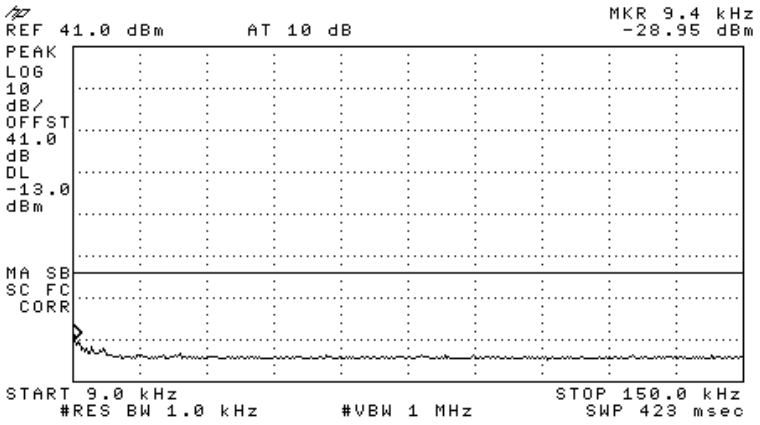

Figure 41.— 1960.00 MHz

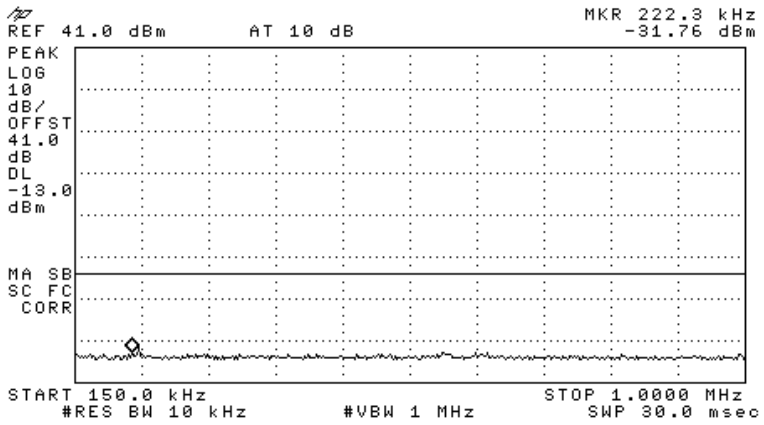

Figure 42.— 1960.00 MHz

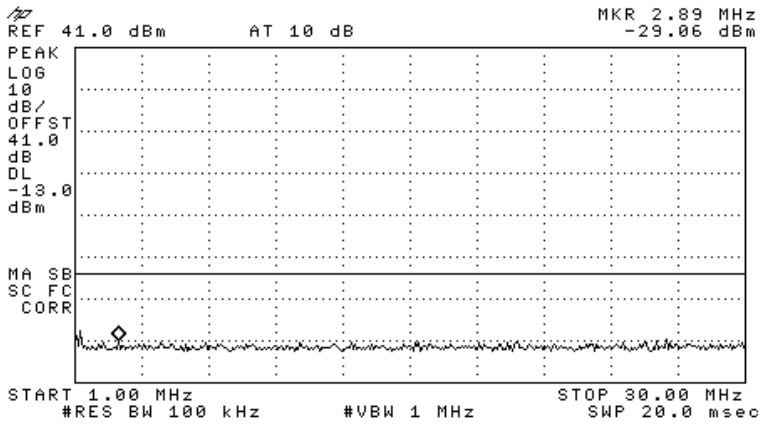

Figure 43.— 1960.00 MHz

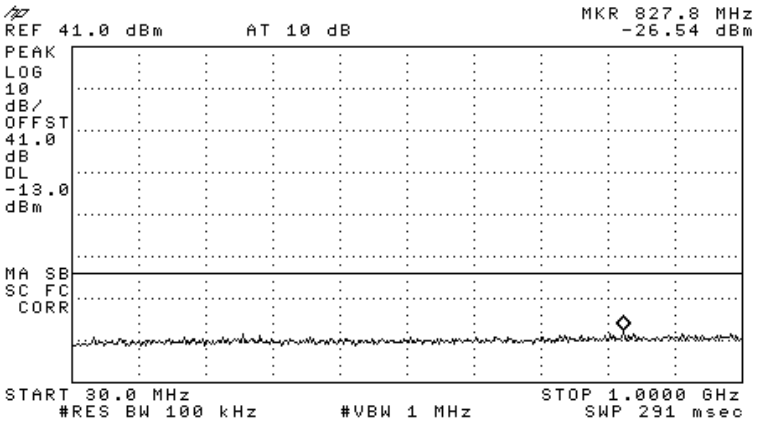

Figure 44.— 1960.00 MHz

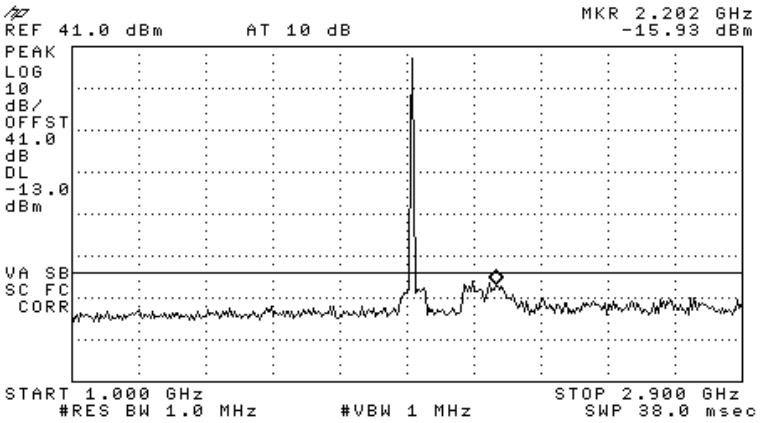

Figure 45.— 1960.00 MHz

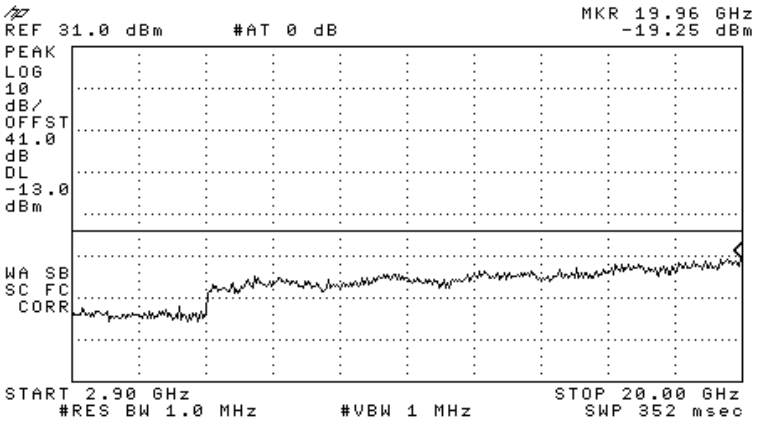

Figure 46.— 1960.00 MHz

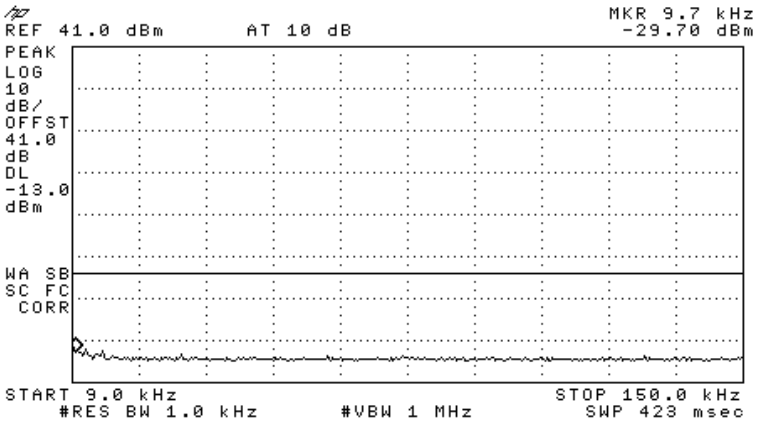

Figure 47.— 1993.80 MHz

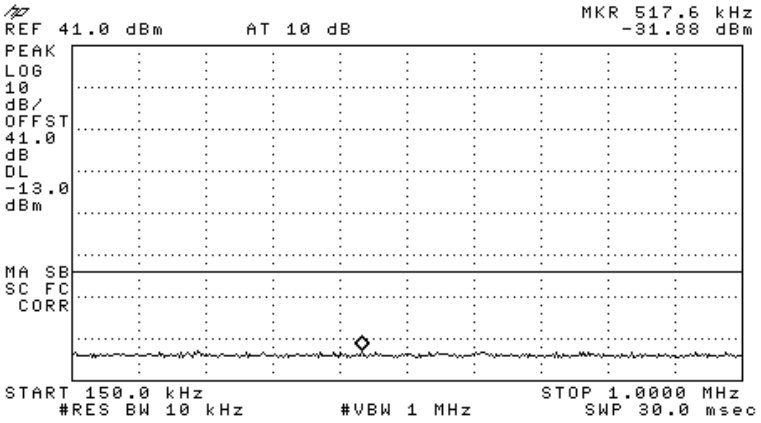

Figure 48.— 1993.80 MHz

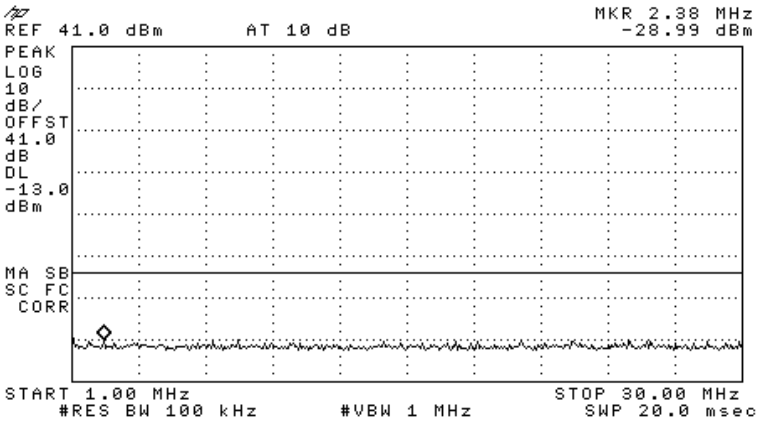

Figure 49.— 1993.80 MHz

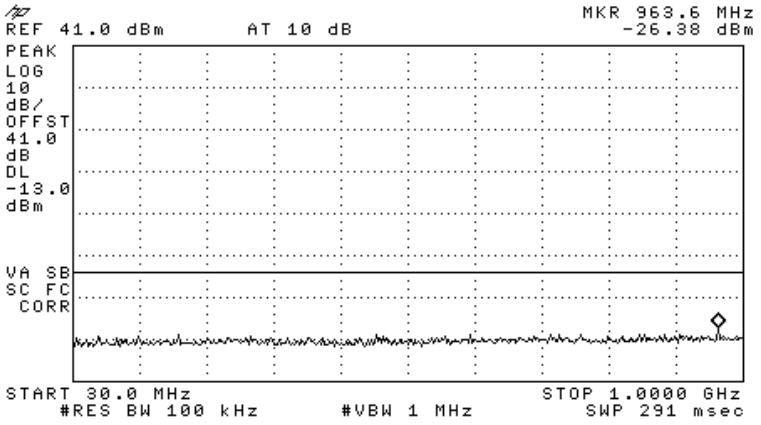

Figure 50.— 1993.80 MHz

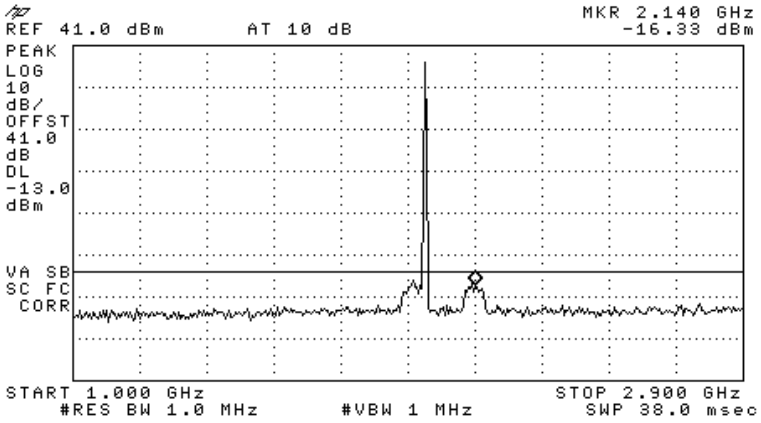

Figure 51.— 1993.80 MHz

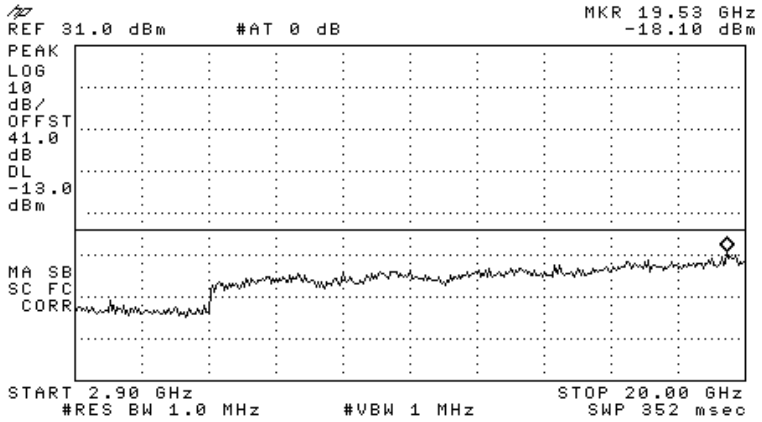

Figure 52.— 1993.80 MHz

GSM:

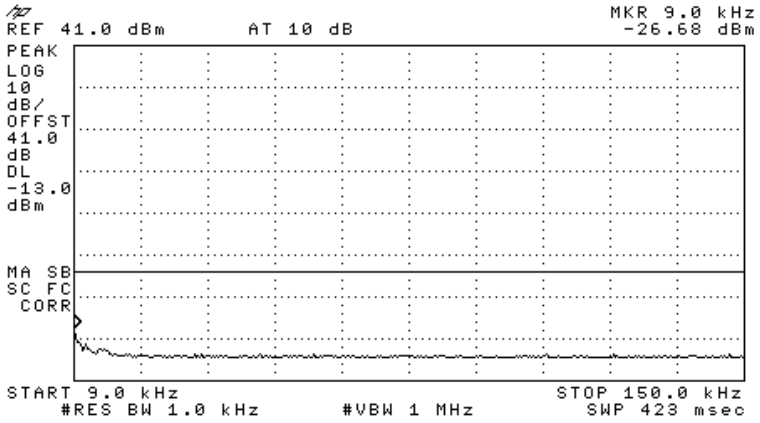

Figure 53.— 1931.20 MHz

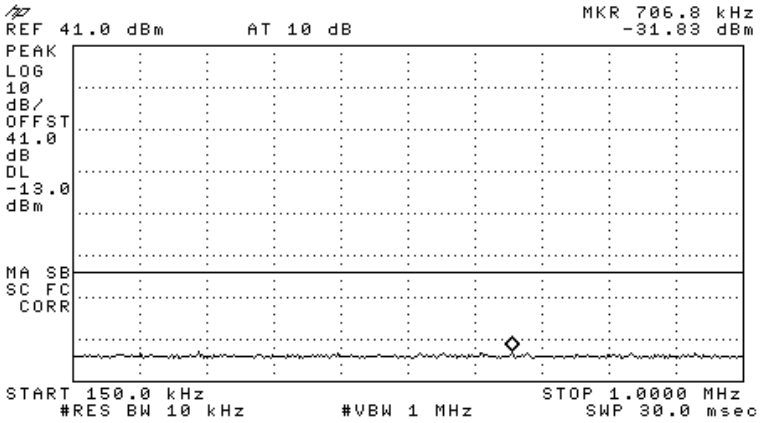

Figure 54.— 1931.20 MHz

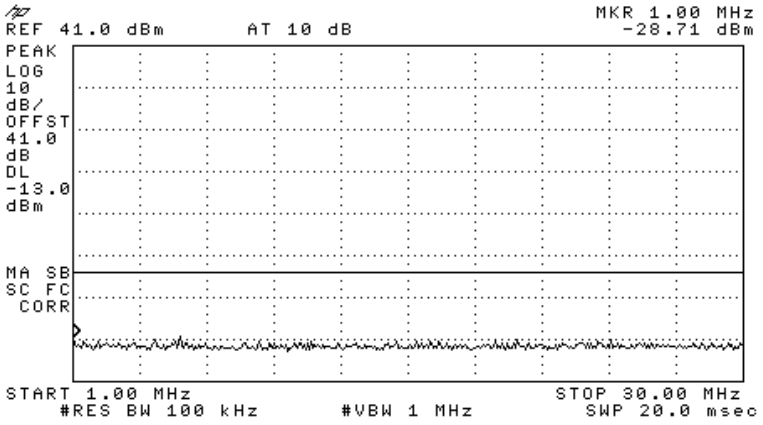

Figure 55.— 1931.20 MHz

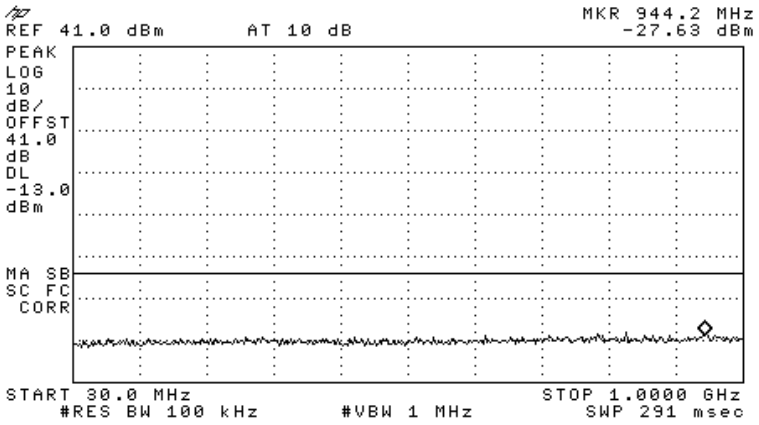

Figure 56.— 1931.20 MHz

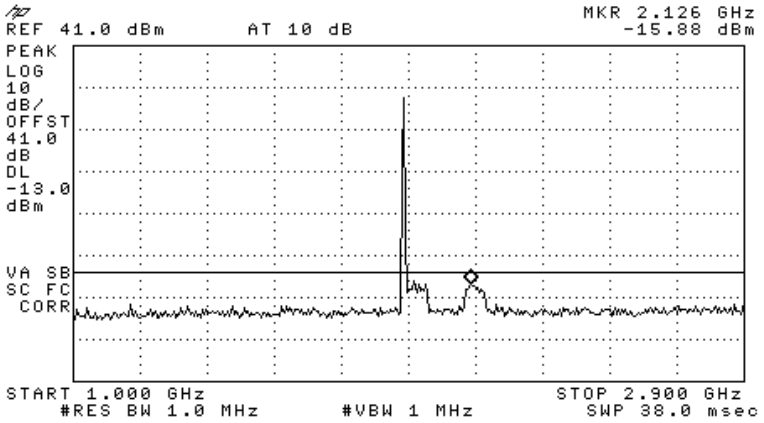

Figure 57.— 1931.20 MHz

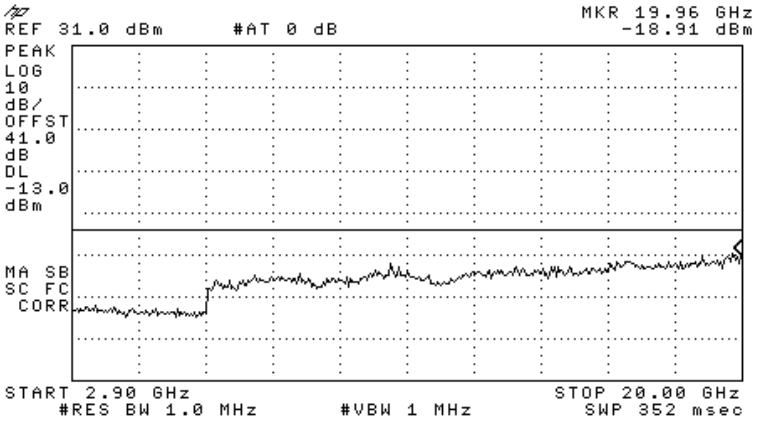

Figure 58.— 1931.20 MHz

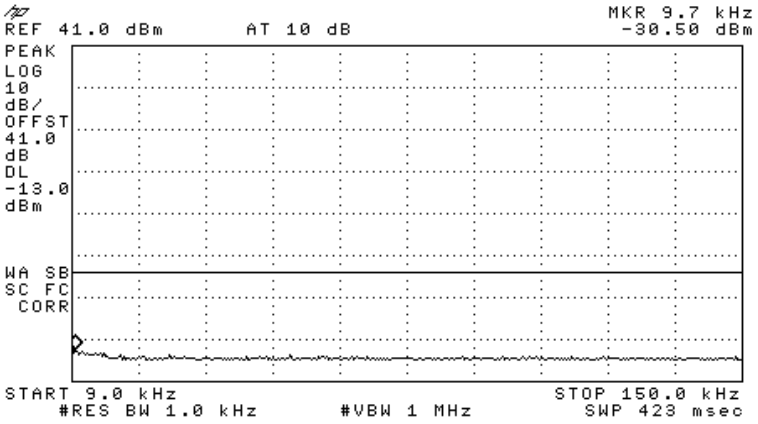

Figure 59.— 1960.00 MHz

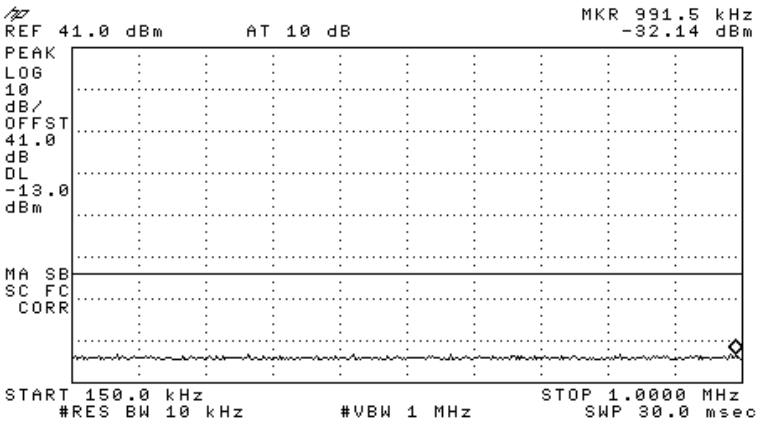

Figure 60.— 1960.00 MHz

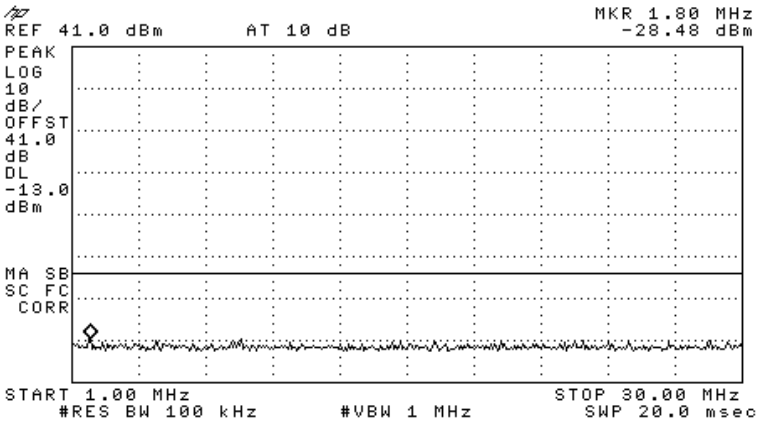

Figure 61.— 1960.00 MHz

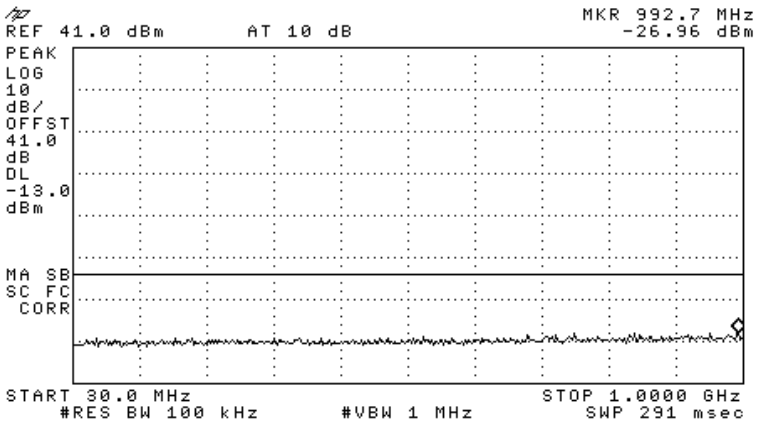

Figure 62.— 1960.00 MHz

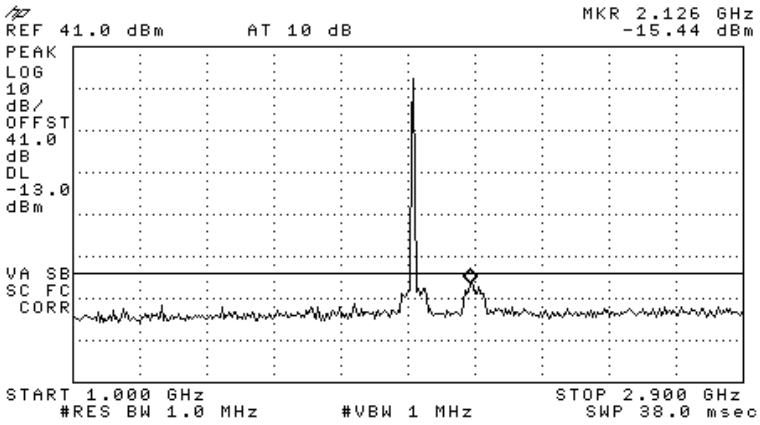

Figure 63.— 1960.00 MHz

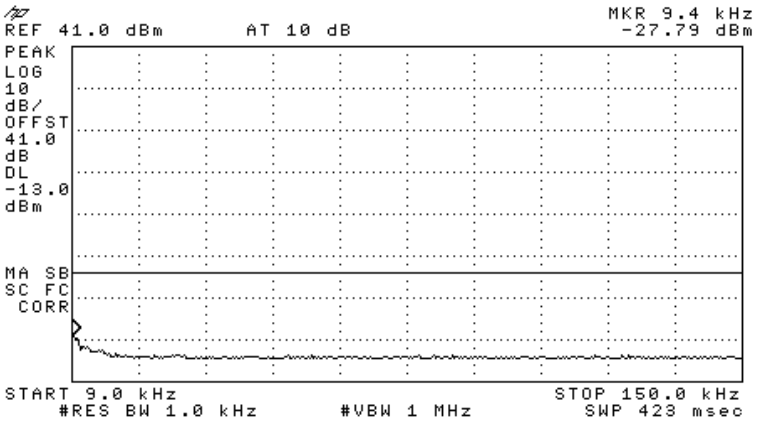

Figure 64.— 1960.00 MHz

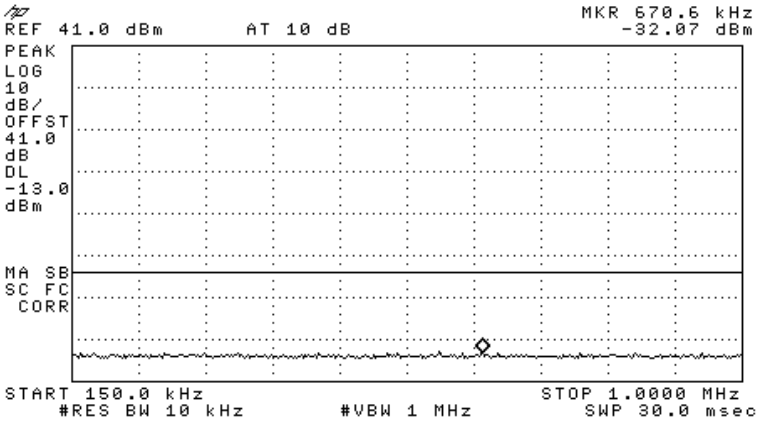

Figure 65.— 1993.80 MHz

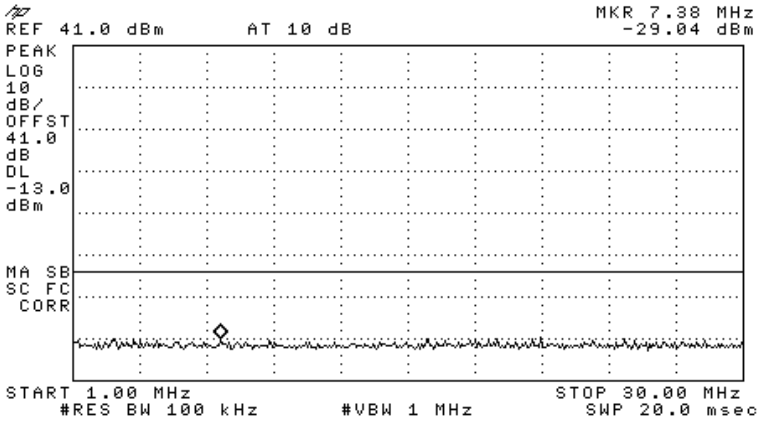

Figure 66.— 1993.80 MHz

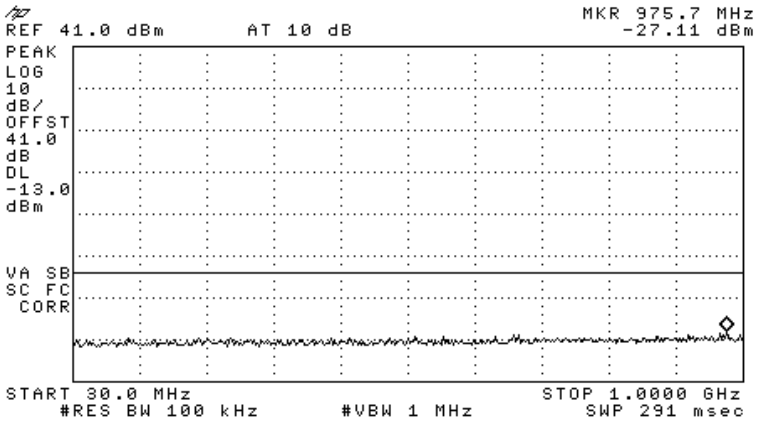

Figure 67.— 1993.80 MHz

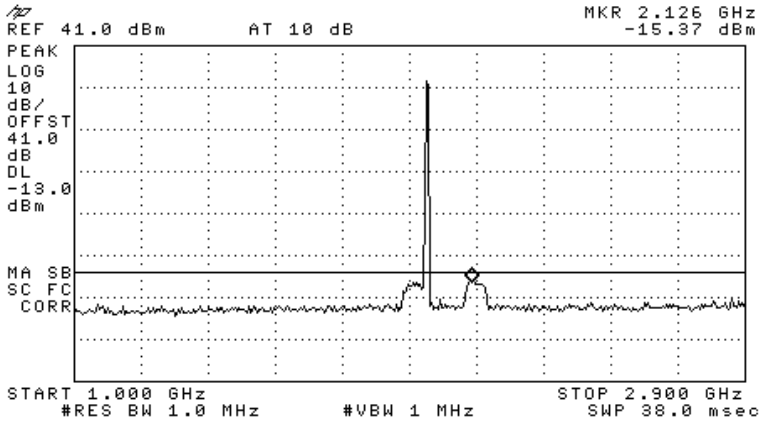

Figure 68.— 1993.80 MHz

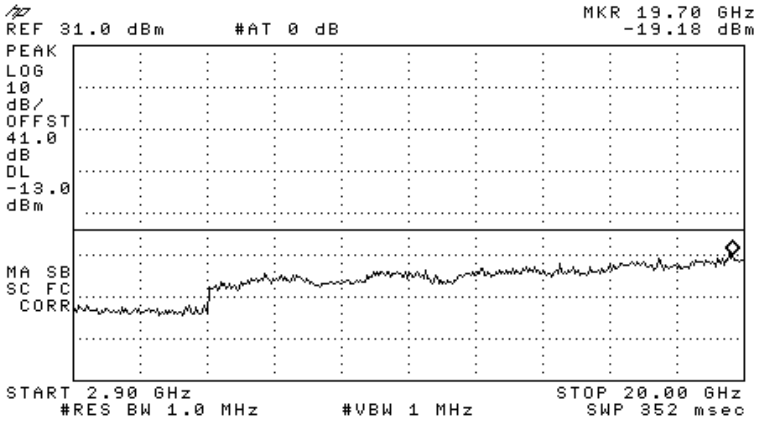

Figure 69.— 1993.80 MHz

W-CDMA:

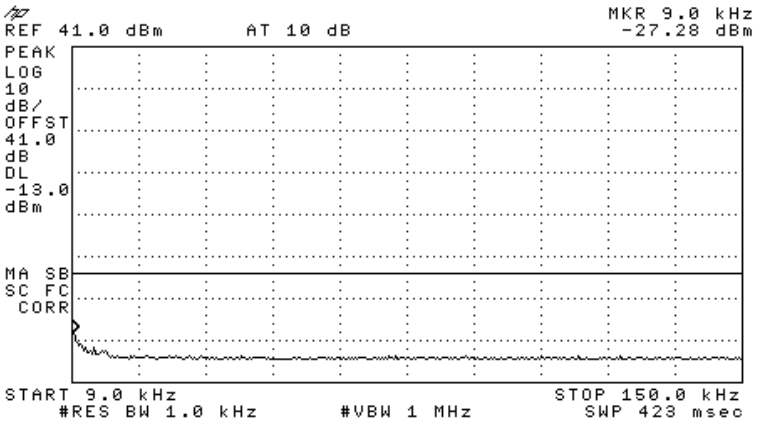

Figure 70.— 1932.50 MHz

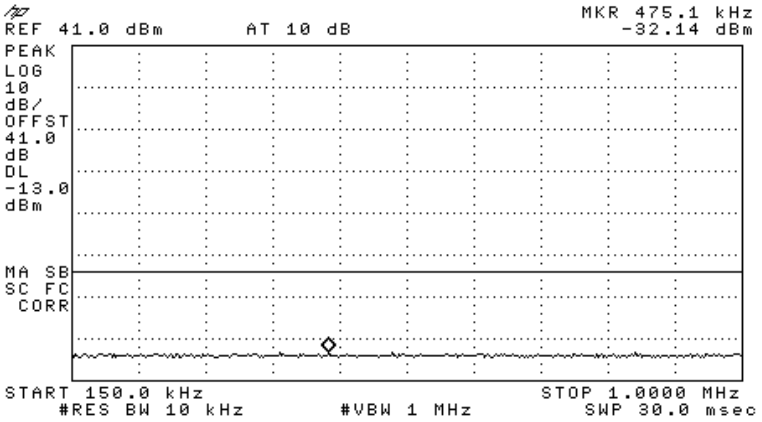

Figure 71.— 1932.50 MHz

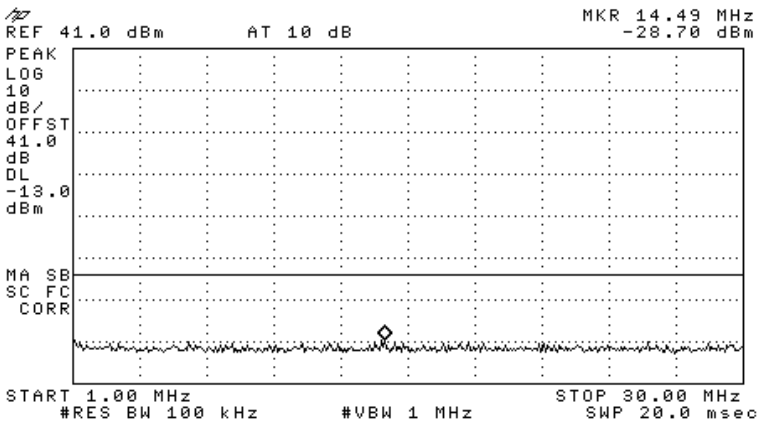

Figure 72.— 1932.50 MHz

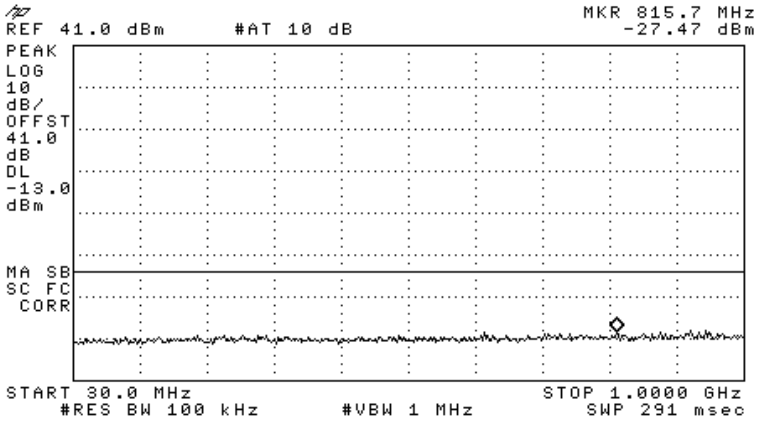

Figure 73.— 1932.50 MHz

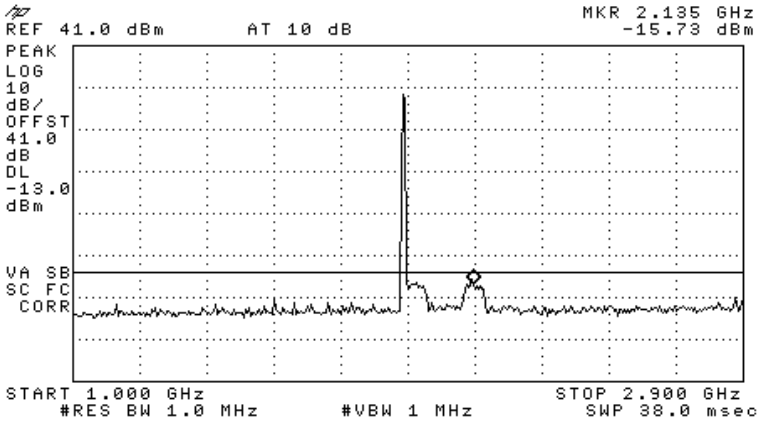

Figure 74.— 1932.50 MHz

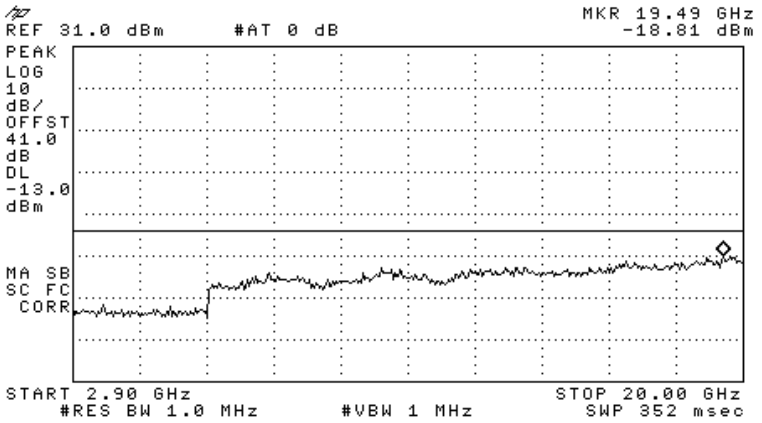

Figure 75.— 1932.50 MHz

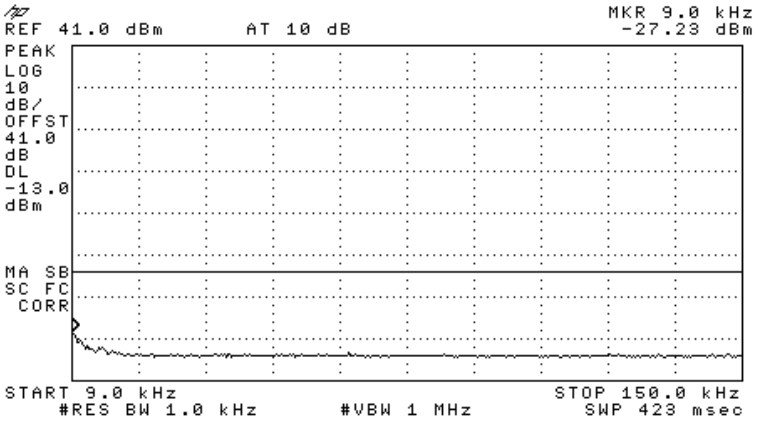

Figure 76.— 1960.00 MHz

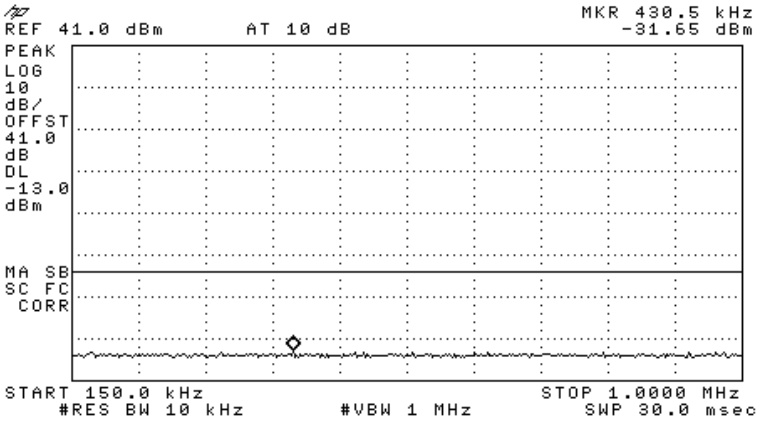

Figure 77.— 1960.00 MHz

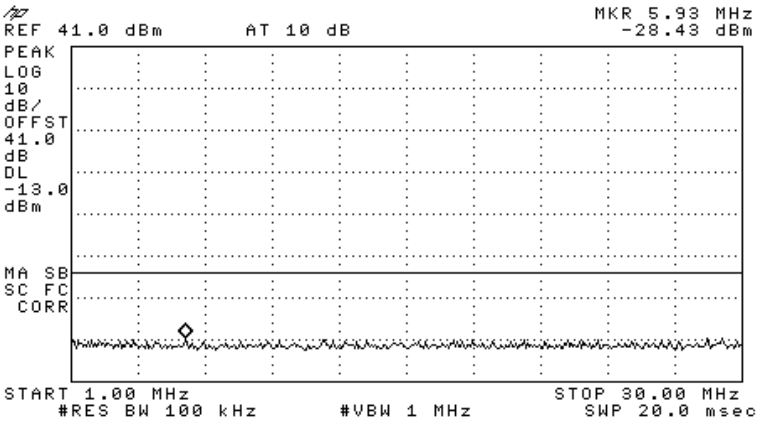

Figure 78.— 1960.00 MHz

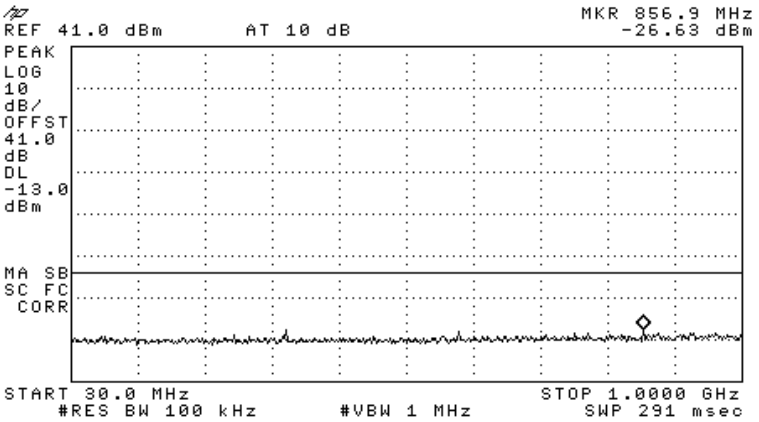

Figure 79.— 1960.00 MHz

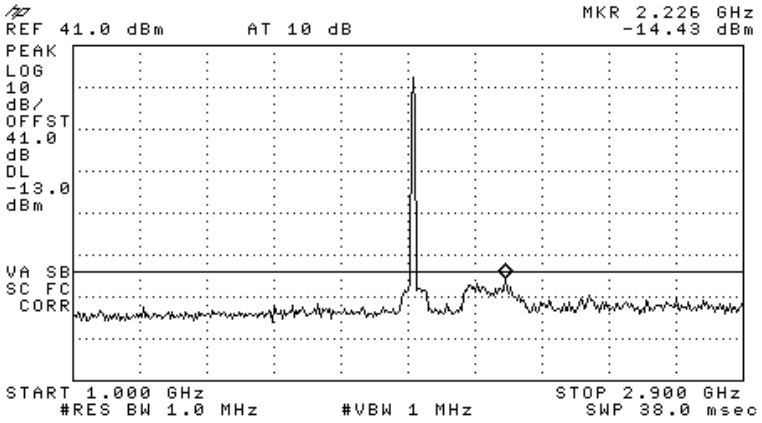

Figure 80.— 1960.00 MHz

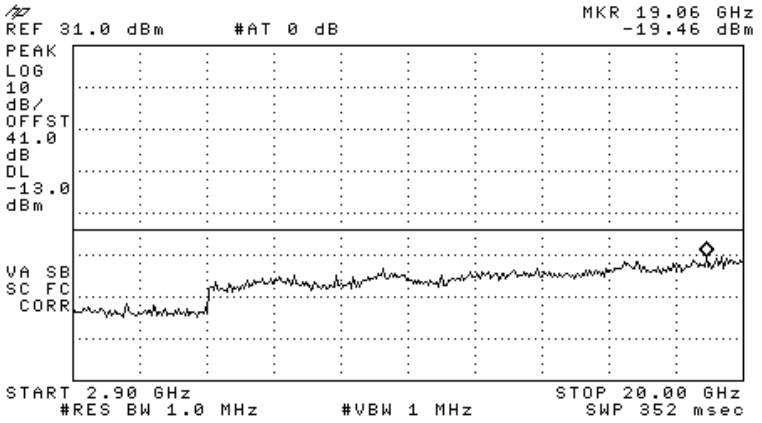

Figure 81.— 1960.00 MHz

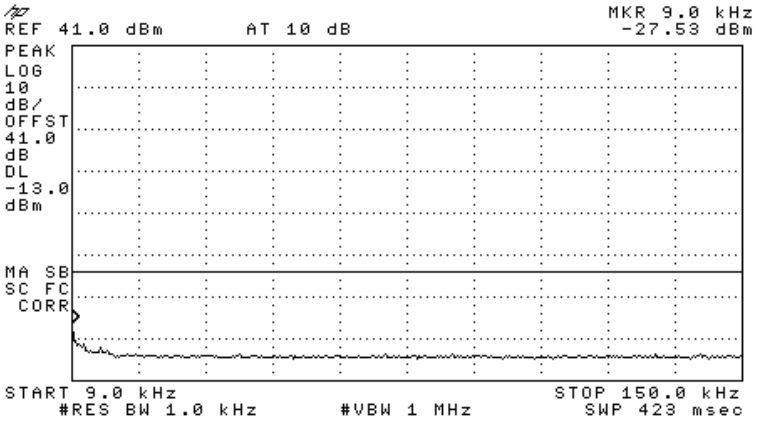

Figure 82.— 1992.50 MHz

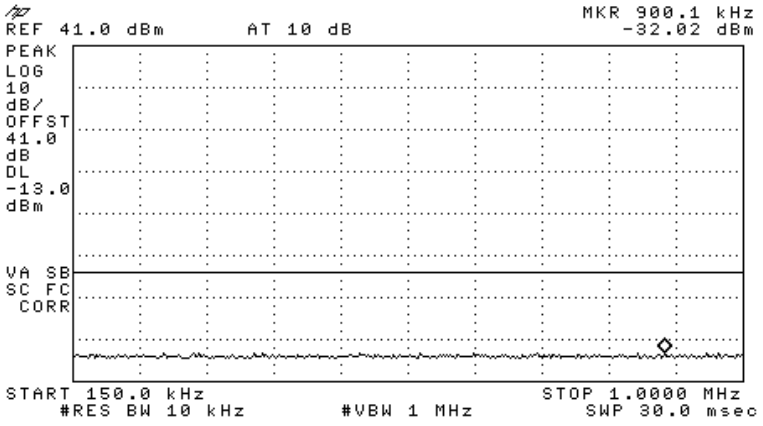

Figure 83.— 1992.50 MHz

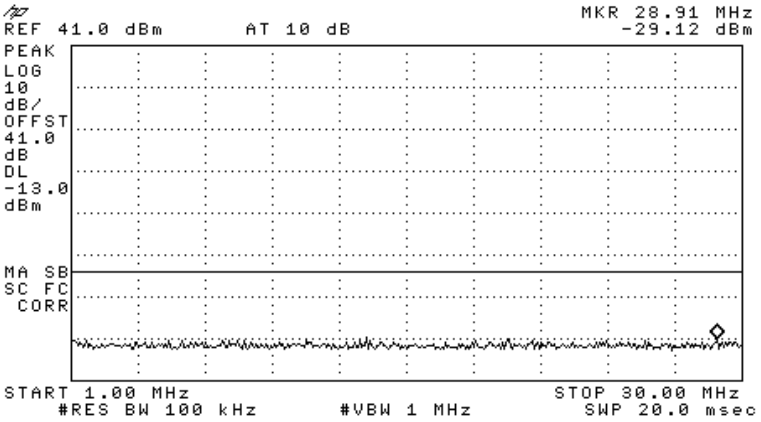

Figure 84.— 1992.50 MHz

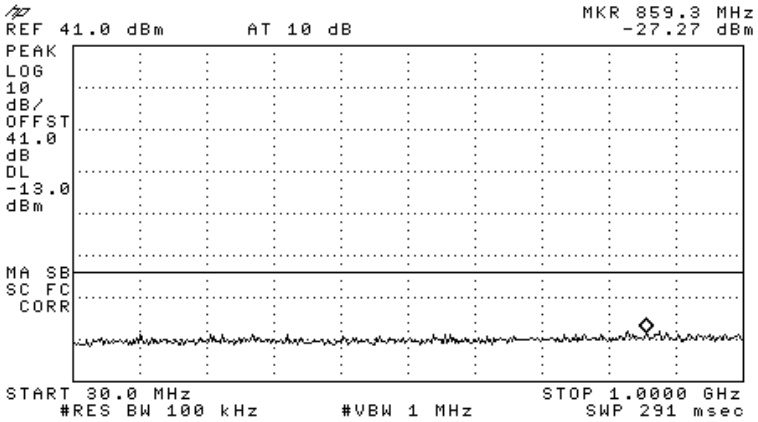

Figure 85.— 1992.50 MHz

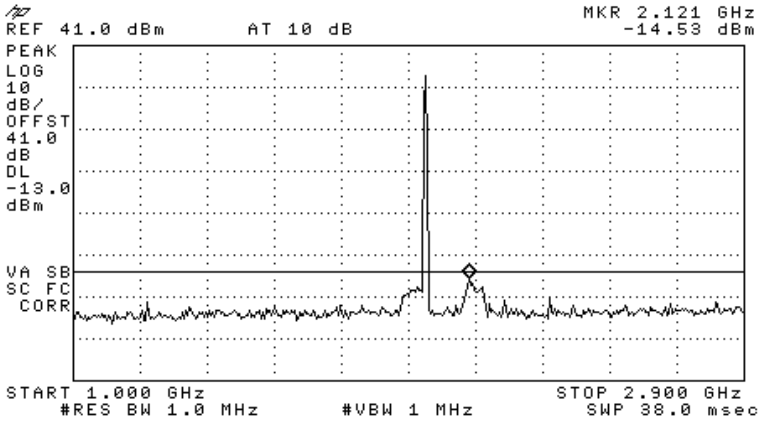

Figure 86.— 1992.50 MHz

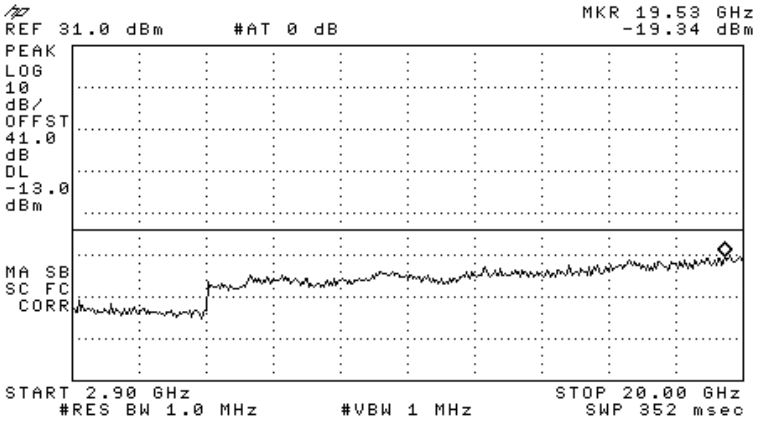

Figure 87.— 1992.50 MHz

6.3 Results Table

E.U.T. Description: Mobile AccessHX High-Power DAS Remote Unit
Model No.: HX-P19A17-AC-A (P19=PCS; A17=AWS)
Serial Number: Not Designated
Specification: FCC Part 24, Subpart E, Section 238; Part 2 Section 1051

Modulation	Operation Frequency (MHz)	Frequency (GHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
CDMA	1931.20	2.116	-14.62	-13.0	-1.62
	1960.00	2.202	-15.93	-13.0	-2.93
	1993.80	2.140	-16.33	-13.0	-3.33
GSM	1931.20	2.126	-15.88	-13.0	-2.88
	1960.00	2.126	-15.44	-13.0	-2.44
	1993.80	2.126	-15.37	-13.0	-2.37
W-CDMA	1932.50	2.135	-15.73	-13.0	-2.73
	1960.00	2.226	-14.43	-13.0	-1.43
	1992.50	2.121	-14.53	-13.0	-1.53

Figure 88 Out of Band Emission Results PCS

JUDGEMENT: Passed by 1.43 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 31.05.11

Typed/Printed Name: A. Sharabi

6.4 Test Equipment Used.

Out of Band Emission at Antenna Terminals PCS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8529L	3826A01204	February 21, 2011	1 year
Signal Generator	HP	E4438C ESG-	MY45091956	July 22, 2010	1 year
Signal Generator	HP	E4433B ESG-D	GB40050702	July 22, 2010	1 year
Attenuator	Narda	MOD 766-10	9409	December 22, 2010	1 year
Attenuator	Mini-Circuits	BW-S30W5	0533	December 22, 2010	1 year
Cable	Mini-Circuits	30091		February 10, 2011	1 year

Figure 89 Test Equipment Used

7. Band Edge Spectrum PCS

7.1 Test Specification

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

7.2 Test procedure

For CDMA and GSM:

Enclosed are spectrum analyzer plots for the lowest operation frequency (1931.2 MHz) and the highest operation frequency (1993.8 MHz) in which the E.U.T. is planned to be used.

For WCDMA:

Enclosed are spectrum analyzer plots for the lowest operation frequency (1932.5 MHz) and the highest operation frequency (1992.5 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 (21 dB).
The spectrum analyzer was set to 100 kHz R.B.W.

CDMA:

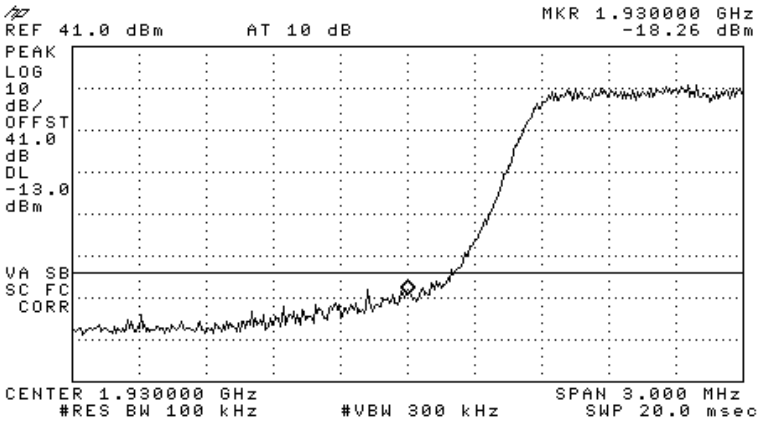

Figure 90.— 1931.20 MHz

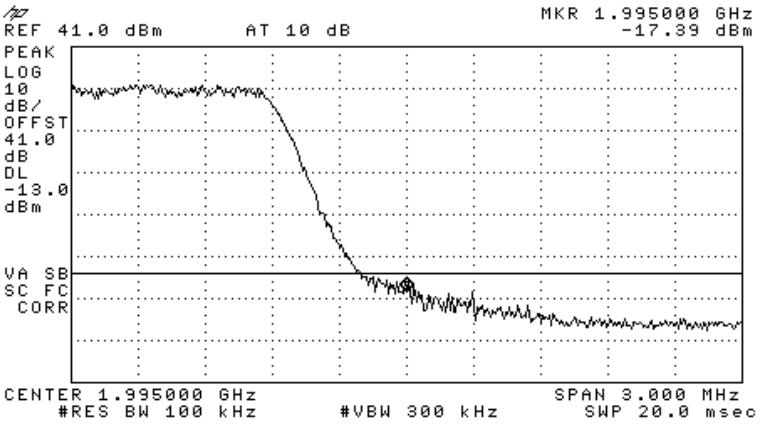

Figure 91.— 1993.80 MHz

GSM:

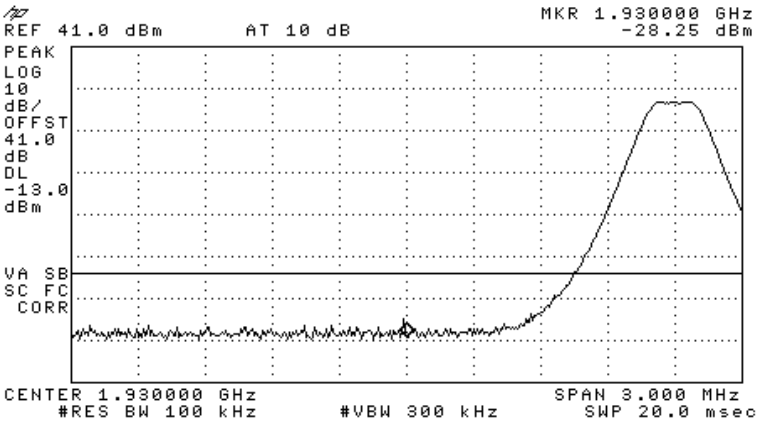

Figure 92.— 1931.20 MHz

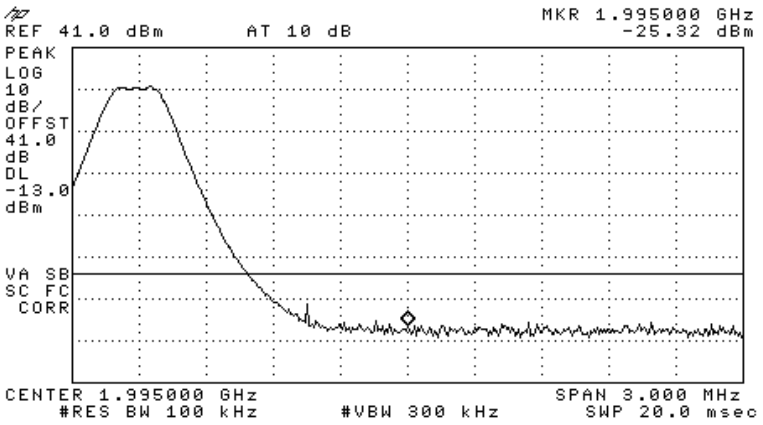

Figure 93.— 1993.80 MHz

W-CDMA:

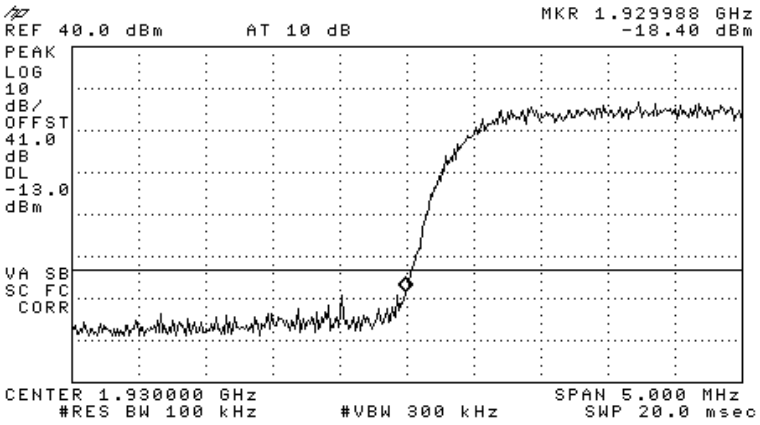

Figure 94.— 1932.50 MHz

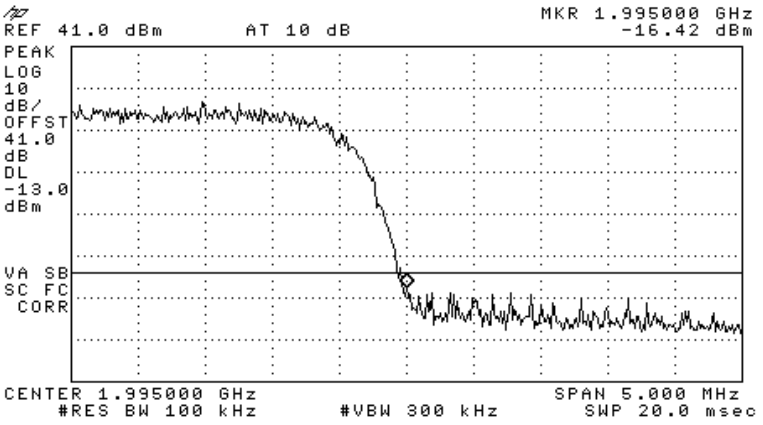

Figure 95.— 1992.50 MHz

7.3 Results Table

E.U.T. Description: Mobile AccessHX High-Power DAS Remote Unit
Model No.: HX-P19A17-AC-A (P19=PCS; A17=AWS)
Serial Number: Not Designated
Specification: FCC Part 24, Subpart E, Section 238; Part 2 Section 1051

Modulation	Operation Frequency (MHz)	Band Edge Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
CDMA	1931.20	1930.00	-18.26	-13.0	-5.26
	1993.80	1995.00	-17.39	-13.0	-4.39
GSM	1931.20	1930.00	-28.25	-13.0	-15.25
	1993.80	1995.00	-25.32	-13.0	-12.32
W-CDMA	1932.50	1929.98	-18.40	-13.0	-5.40
	1992.50	1995.00	-16.42	-13.0	-3.42

Figure 96 Band Edge Spectrum Results PCS

JUDGEMENT: Passed by 3.42 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 31.05.11

Typed/Printed Name: A. Sharabi

7.4 Test Equipment Used.

Band Edge Spectrum PCS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8529L	3826A01204	February 21, 2011	1 year
Signal Generator	HP	E4438C ESG-	MY45091956	July 22, 2010	1 year
Signal Generator	HP	E4433B ESG-D	GB40050702	July 22, 2010	1 year
Attenuator	Narda	MOD 766-10	9409	December 22, 2010	1 year
Attenuator	Mini-Circuits	BW-S30W5	0533	December 22, 2010	1 year
Cable	Mini-Circuits	30091		February 10, 2011	1 year

Figure 97 Test Equipment Used

8. Out of Band Emissions (Radiated) PCS

8.1 Test Specification

FCC, Part 24, Subpart E Section 238, FCC Part 2.1053

8.2 Test Procedure

The test method was based on ANSI/TIA-603-C: 2004, 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.

(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.

8.3 Results Table

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)
1931.2	3862.4	V	50.37	-51.45	4.3	8.62	-47.13	-13.0	-34.13
1931.2	3862.4	H	51.43	-49.53	4.3	8.62	-45.21	-13.0	-32.21
1960.0	3920.0	V	50.1	-51.72	4.3	8.62	-47.4	-13.0	-34.4
1960.0	3920.0	H	49.86	-51.1	4.3	8.62	-46.78	-13.0	-33.78
1993.8	3987.6	V	50.8	-51.5	4.3	8.6	-47.2	-13.0	-34.20
1993.8	3987.6	H	50.4	-50.95	4.3	8.6	-46.65	-13.0	-33.65

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

TEST PERSONNEL:

Tester Signature: _____ Date: 31.05.11

Typed/Printed Name: A. Sharabi

8.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 24, 2010	1 year
RF Section	HP	85420E	3705A00248	November 24, 2010	1 year
Active Loop Antenna	Emco	6502	2950	October 19, 2010	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	August 1, 2010	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 23, 2011	1 year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 27, 2011	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	February 21, 2011	1 year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	November 5, 2010	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	January 4, 2011	1 Year
Signal Generator	HP	E4432B ESG-D	GB40050702	July 22, 2010	1 year
Signal Generator	HP	E4438C ESG	MY45091956	July 22, 2010	1 year
Double Ridged Waveguide Horn Antenna	EMCO	3115	29845	March 14, 2010	2 year

9. RF Power Output AWS

9.1 Test Specification

FCC Part 27, Subpart C (27.50(d))

9.2 Test procedure

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator (40 dB) and an appropriate coaxial cable (1 dB). The E.U.T. RF output was modulated as follows:

CDMA at 1.25 MHz BW channels (2111.2 MHz, 2135 MHz and 2153.8 MHz)

WCDMA at 5 MHz BW channels (2112.5 MHz, 2135 MHz and 2152.5 MHz)

Special attention was taken to prevent Spectrum Analyzer RF input overload.

Signal generator input level 10dBm.

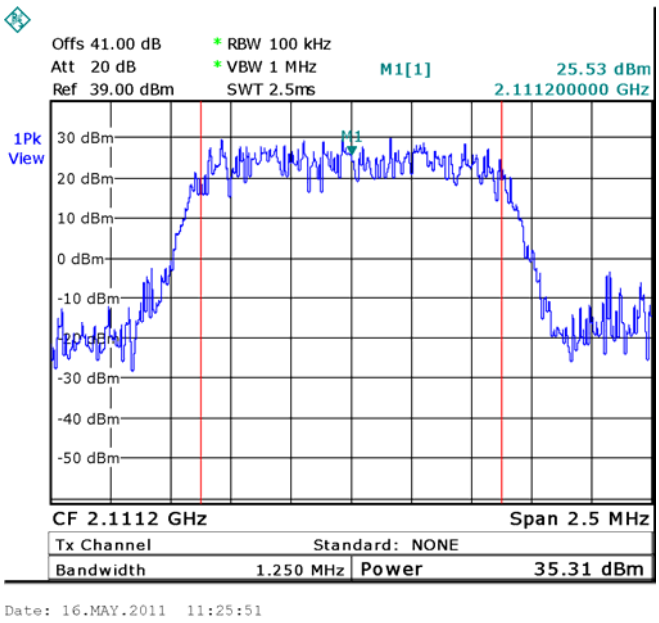

Figure 98.— CDMA (2111.2 MHz)

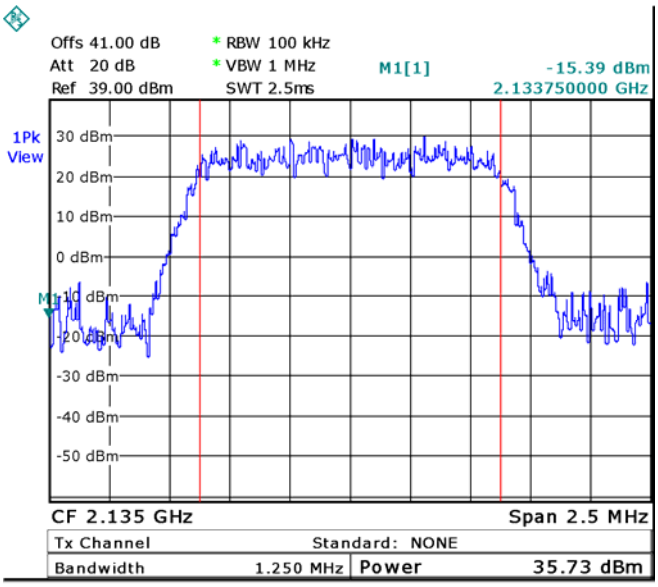

Figure 99.— CDMA (2135.0 MHz)

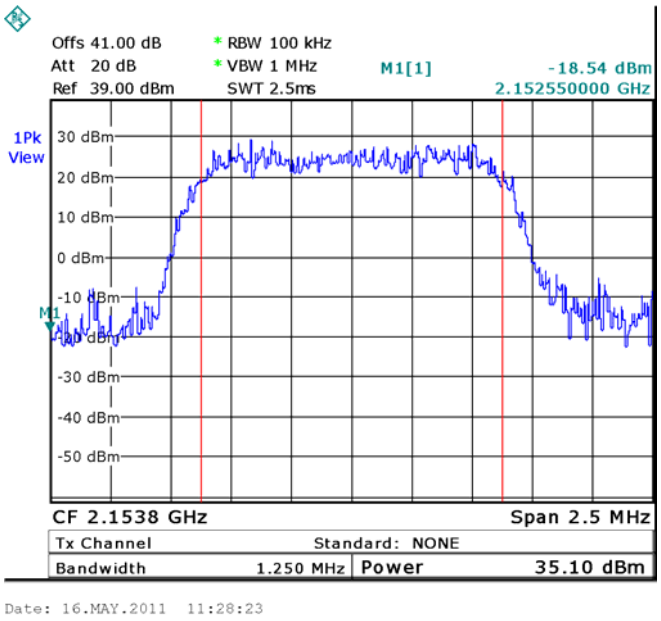

Figure 100.— CDMA (2153.8 MHz)

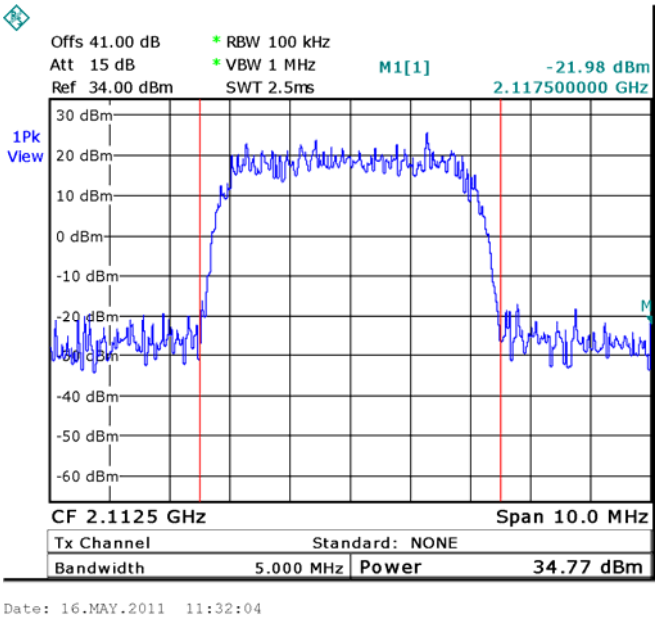

Figure 101.— W-CDMA (2112.5 MHz)

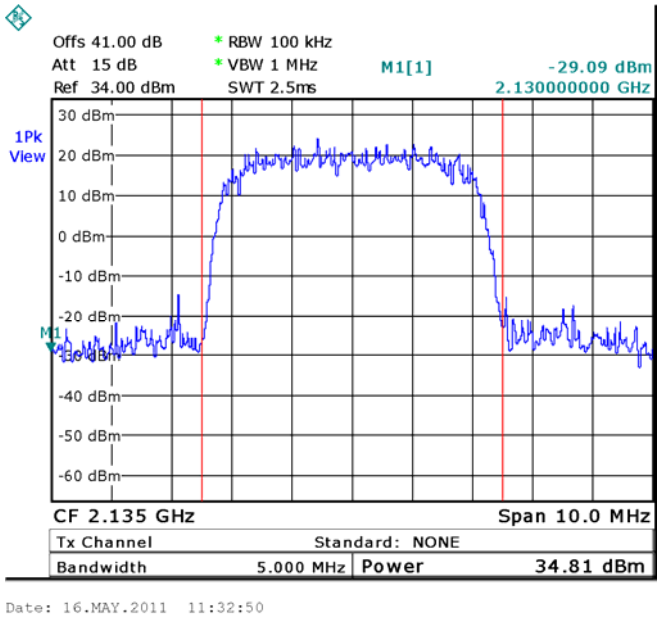

Figure 102.— W-CDMA (2135.0 MHz)

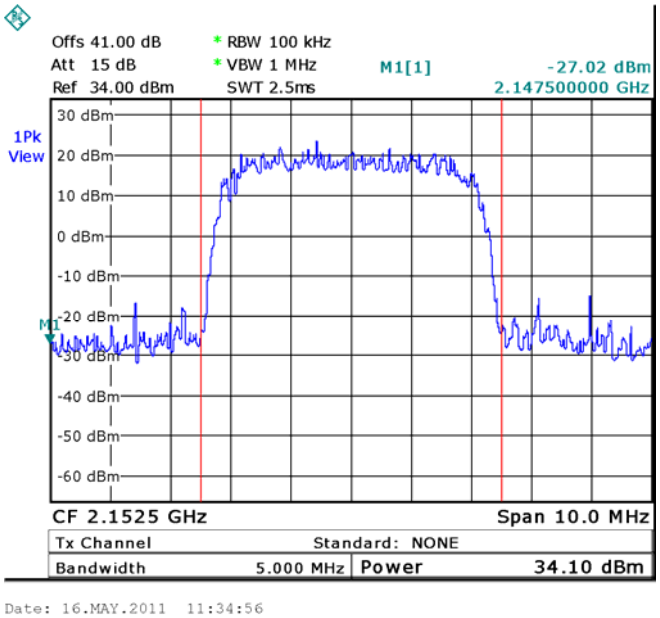

Figure 103.— W-CDMA (2152.5 MHz)

9.3 Results

E.U.T. Description: Mobile AccessHX High-Power DAS Remote Unit
Model No.: HX-P19A17-AC-A (P19=PCS; A17=AWS)
Serial Number: Not Designated
Specification: FCC Part 27, Subpart C, Section 27.50 (d)

Modulation	Operation Frequency (MHz)	Reading (dBm)
CDMA	2111.2	35.31
CDMA	2135.0	35.73
CDMA	2153.8	35.10
WCDMA	2112.5	34.77
WCDMA	2135.0	34.81
WCDMA	2152.5	34.10

Figure 104 RF Power Output AWS

TEST PERSONNEL:

Tester Signature: _____ Date: 31.05.11

Typed/Printed Name: A. Sharabi

9.4 Test Equipment Used.

RF Power Output AWS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	RHODE& SCHWARZ	FSL6	100194	July 22, 2010	1 year
Signal Generator	HP	E4433B ESG-D	GB40050702	July 22, 2010	1 year
Signal Generator	HP	E4438C ESG	MY45091956	July 22, 2010	1 year
Attenuator	Narda	MOD 766-10	9409	December 22, 2010	1 year
Attenuator	Mini-Circuits	BW-S30W5	0533	December 22, 2010	1 year
Cable	Mini-Circuits	30091		February 10, 2011	1 year

Figure 105 Test Equipment Used

10. Occupied Bandwidth AWS

10.1 Test Specification

FCC Part 2, Section 1049

10.2 Test Procedure

The E.U.T. was set to the applicable test frequency and 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 proper 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.
Occupied bandwidth measured was repeated in the input terminal of the E.U.T.

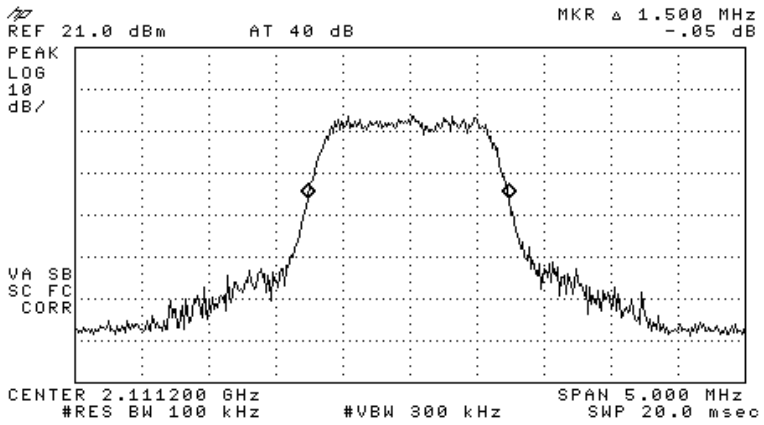

Figure 106.— CDMA (2111.20 MHz) IN

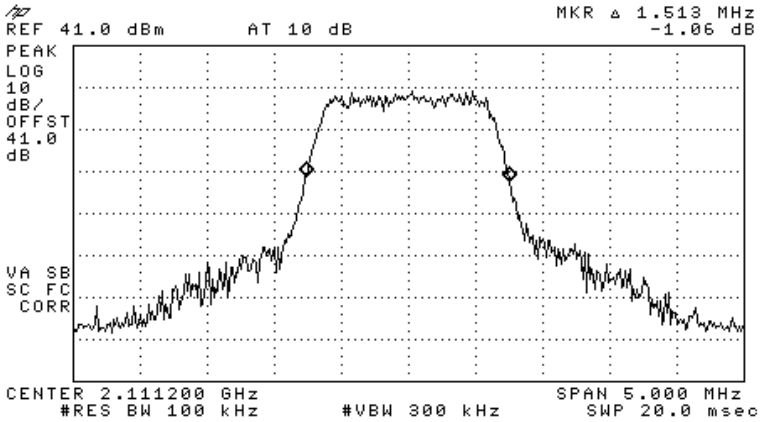

Figure 107.— CDMA (2112.0 MHz) OUT

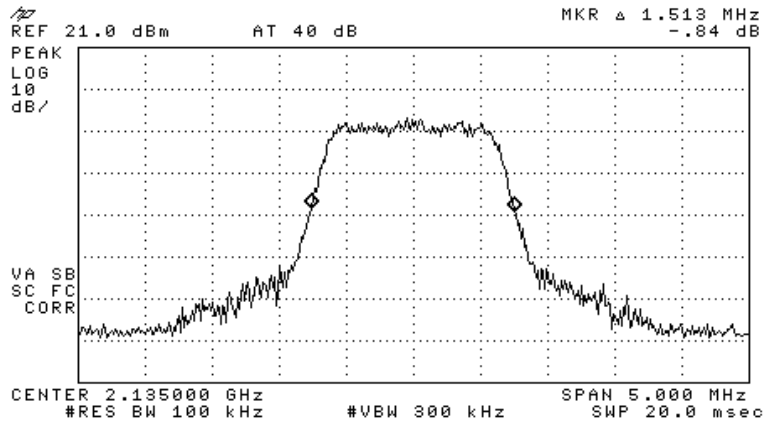

Figure 108.— CDMA (2135.0 MHz) IN

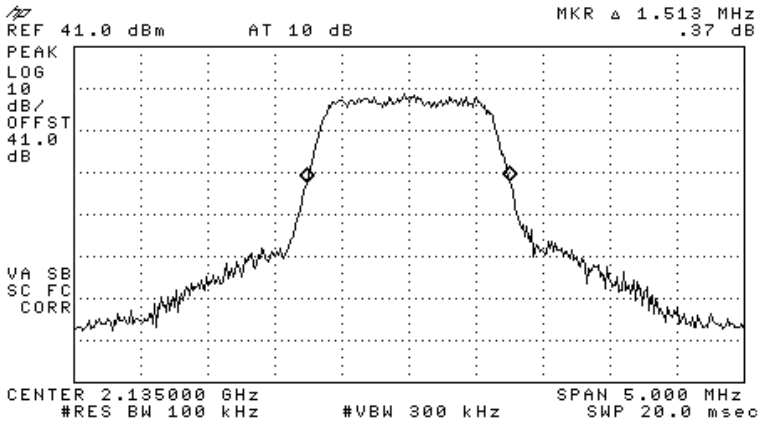

Figure 109.— CDMA (2135.0 MHz) OUT

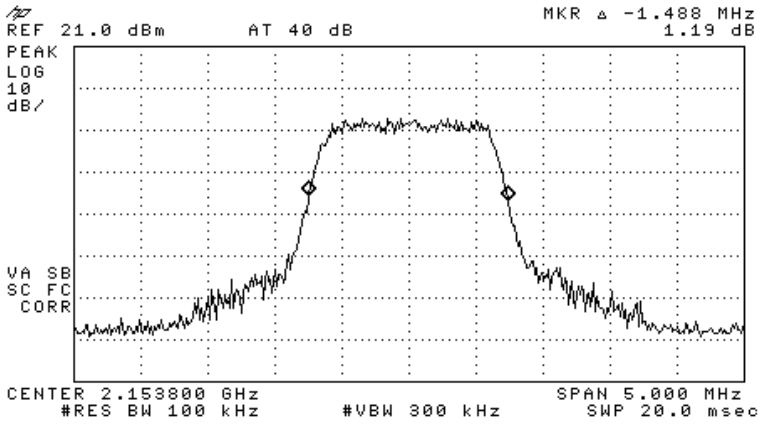

Figure 110.— CDMA (2153.8 MHz) IN

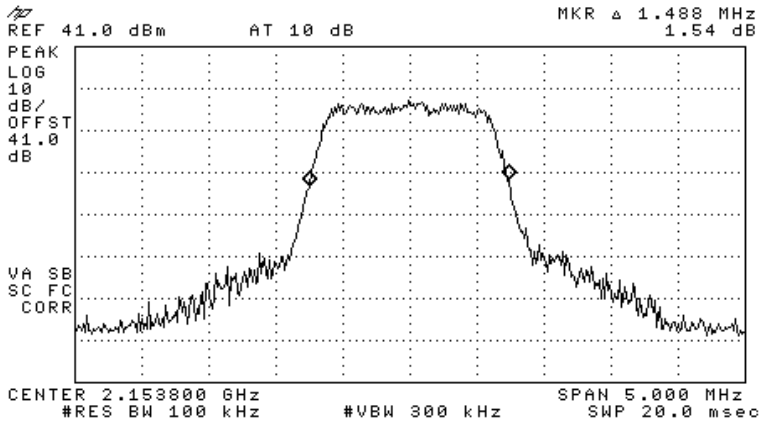

Figure 111.— CDMA (2153.8 MHz) OUT

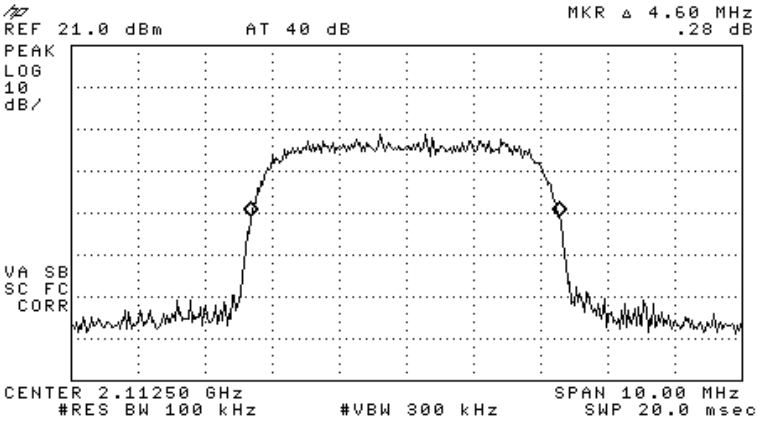

Figure 112.— W-CDMA (2112.5 MHz) IN

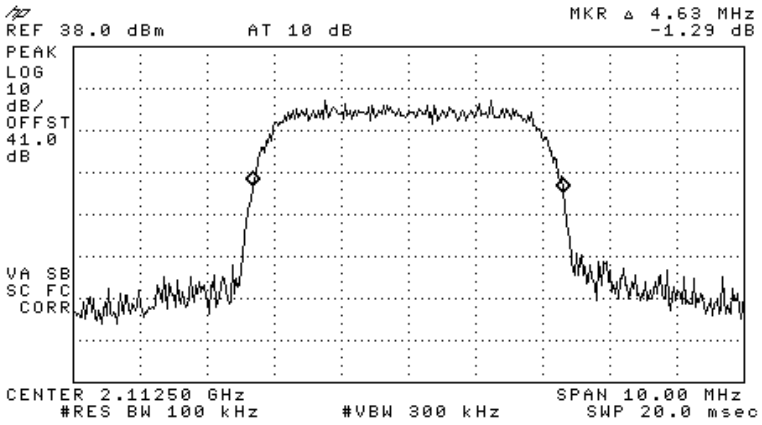

Figure 113.— W-CDMA (2112.5 MHz) OUT

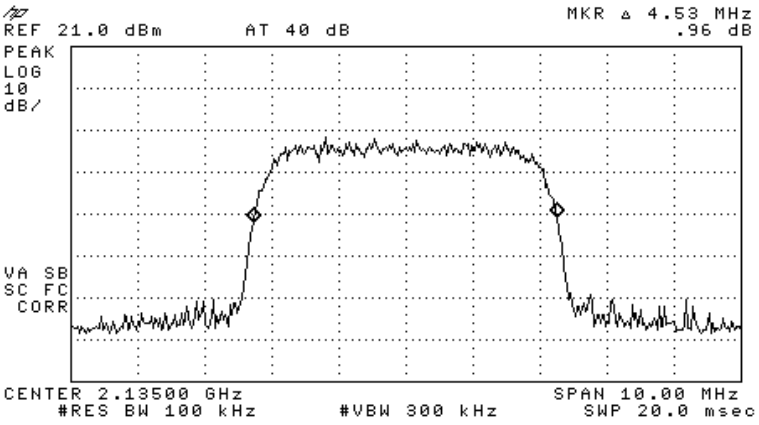

Figure 114.— W-CDMA (2135.0 MHz) IN

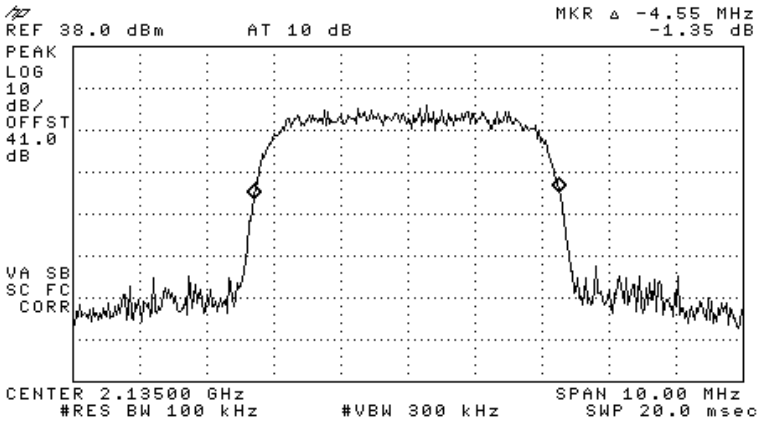

Figure 115.— W-CDMA (2135.0 MHz) OUT

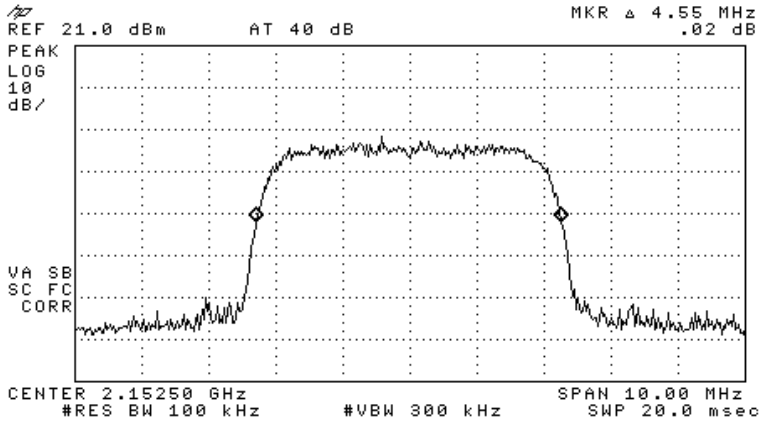

Figure 116.— W-CDMA (2152.5 MHz) IN

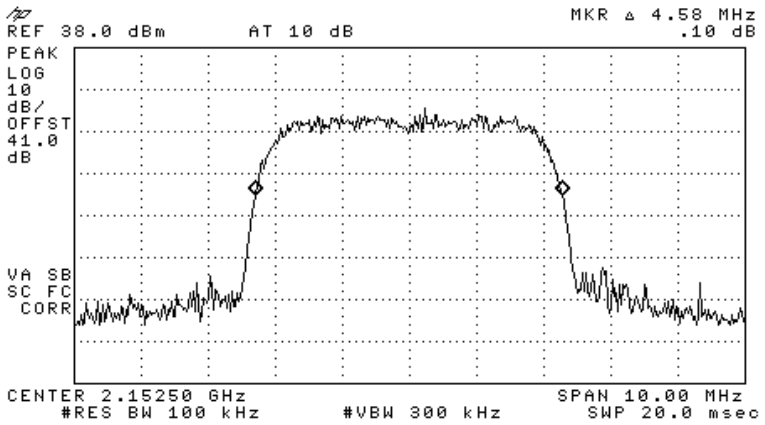

Figure 117.— W-CDMA (2152.5 MHz) OUT

10.3 Results

E.U.T. Description: Mobile AccessHX High-Power DAS Remote Unit
Model No.: HX-P19A17-AC-A (P19=PCS; A17=AWS)
Serial Number: Not Designated
Specification: FCC Part 2, Section 1049

Modulation		Operating Frequency (MHz)	Reading (MHz)
CDMA	Input	2111.2	1.500
	Output	2111.2	1.513
	Input	2135.0	1.513
	Output	2135.0	1.513
	Input	2153.8	1.488
	Output	2153.8	1.488
WCDMA	Input	2112.5	4.60
	Output	2112.5	4.63
	Input	2135.0	4.53
	Output	2135.0	4.55
	Input	2152.5	4.55
	Output	2152.5	4.58

Figure 118 Occupied Bandwidth AWS

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____ Date: 31.05.11

Typed/Printed Name: A. Sharabi

10.4 Test Equipment Used.

Occupied Bandwidth

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8529L	3826A01204	February 21, 2011	1 year
Signal Generator	HP	E4438C ESG-	MY45091956	July 22, 2010	1 year
Signal Generator	HP	E4433B ESG-D	GB40050702	July 22, 2010	1 year
Attenuator	Narda	MOD 766-10	9409	December 22, 2010	1 year
Attenuator	Mini-Circuits	BW-S30W5	0533	December 22, 2010	1 year
Cable	Mini-Circuits	30091		February 10, 2011	1 year

Figure 119 Test Equipment Used

11. Spurious Emissions at Antenna Terminals AWS

11.1 Test Specification

FCC Part 27, Subpart C, Section 27.53 (g)

11.2 Test procedure

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 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 (41.0 dB).

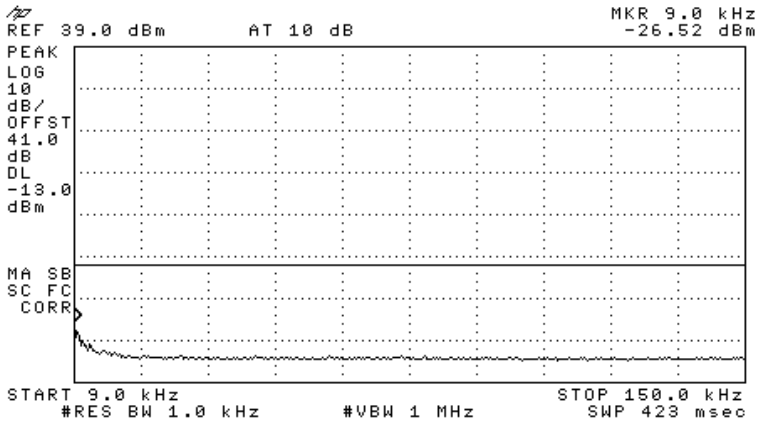

Figure 120.— 2111.20 MHz CDMA

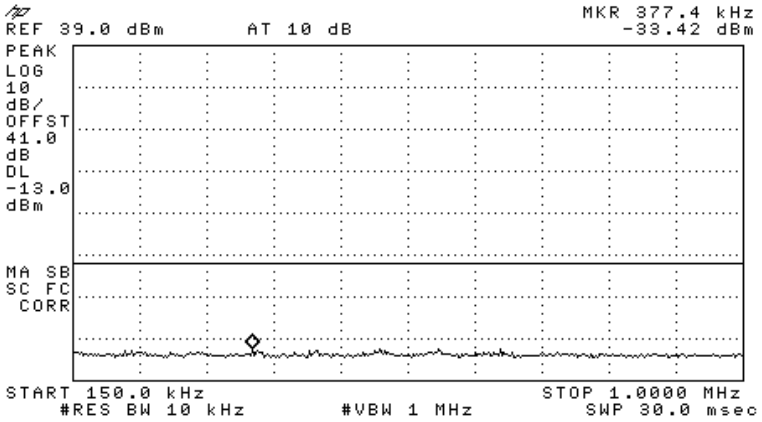

Figure 121.— 2111.20 MHz CDMA

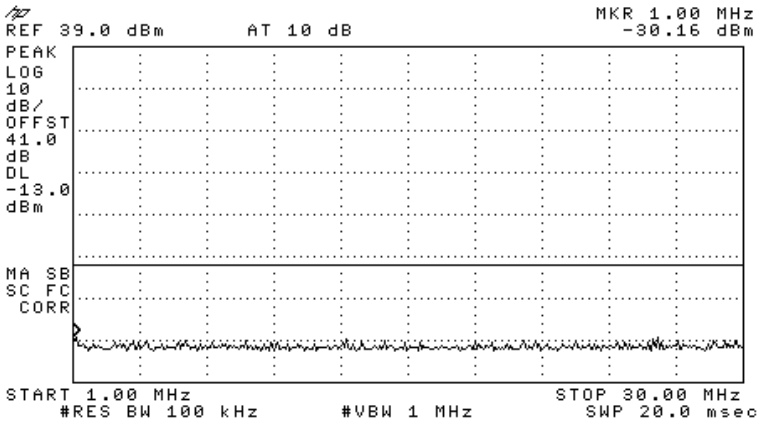

Figure 122.— 2111.20 MHz CDMA

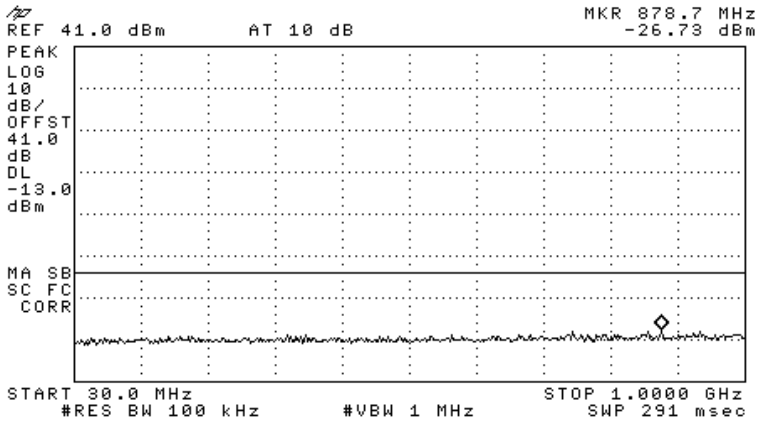

Figure 123.— 2111.20 MHz CDMA

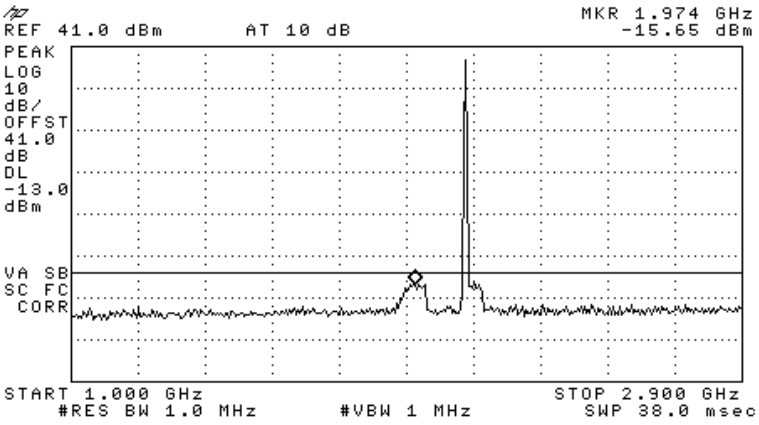

Figure 124.— 2111.20 MHz CDMA

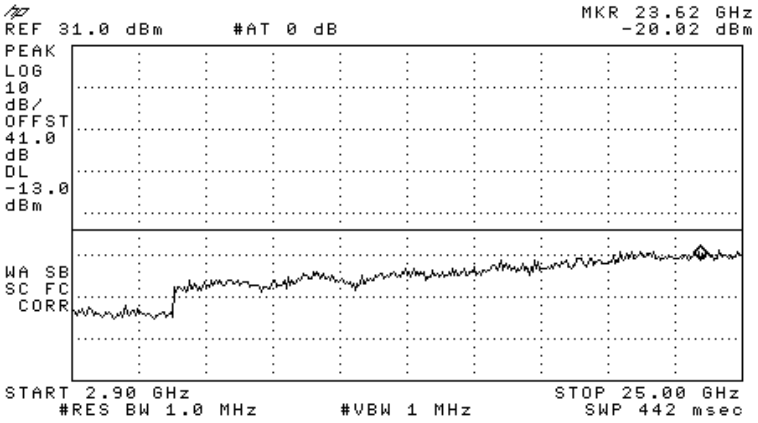

Figure 125.— 2111.20 MHz CDMA

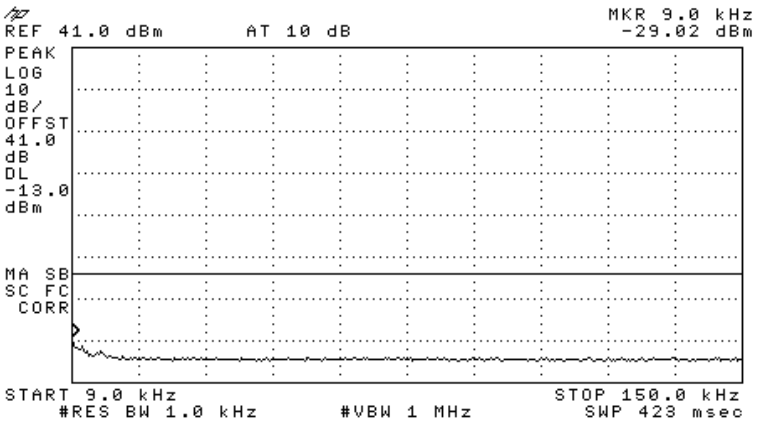

Figure 126.— 2135.00 MHz CDMA

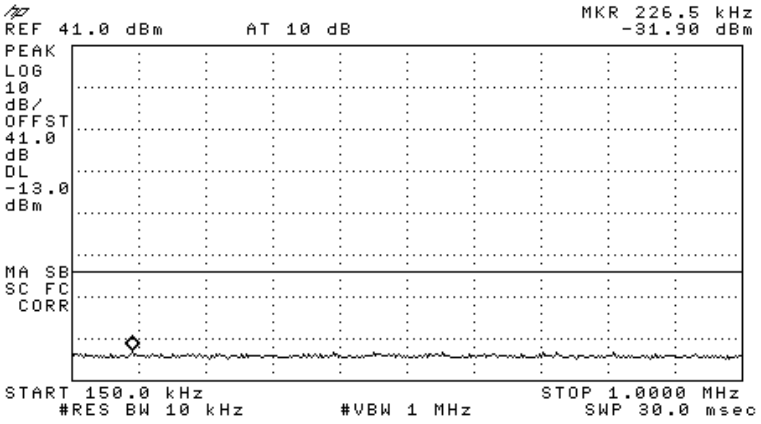

Figure 127.— 2135.00 MHz CDMA

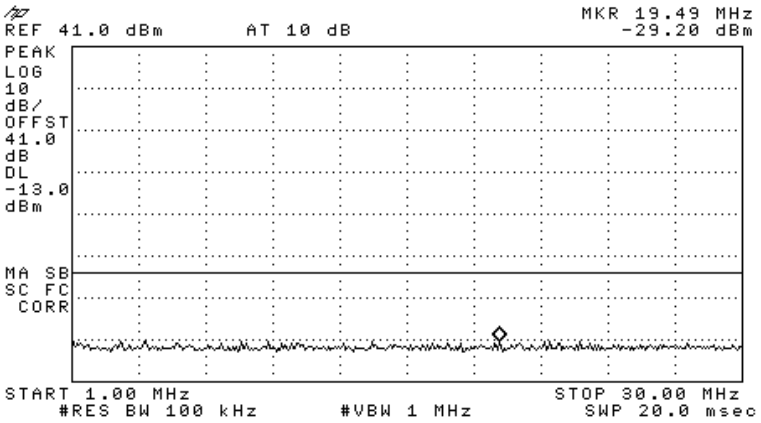

Figure 128.— 2135.00 MHz CDMA

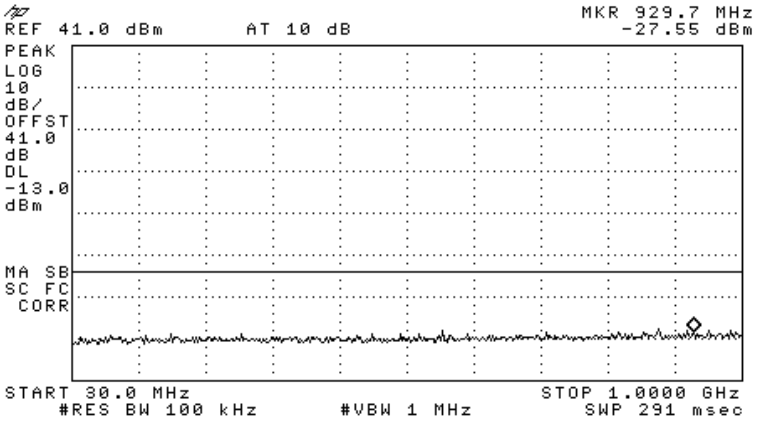

Figure 129.— 2135.00 MHz CDMA

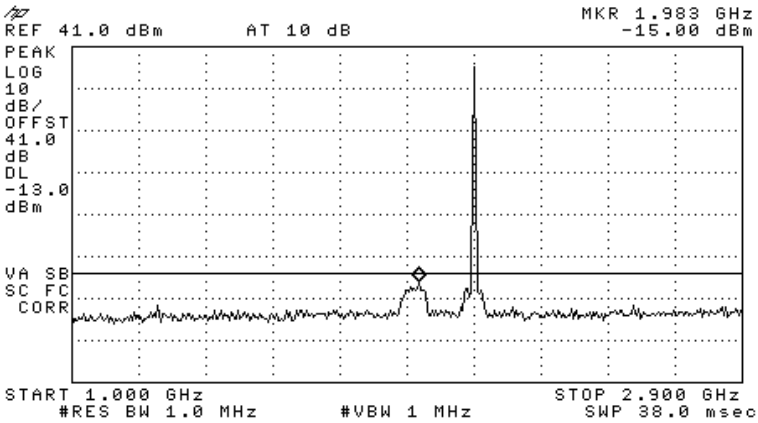

Figure 130.— 2135. 00 MHz CDMA

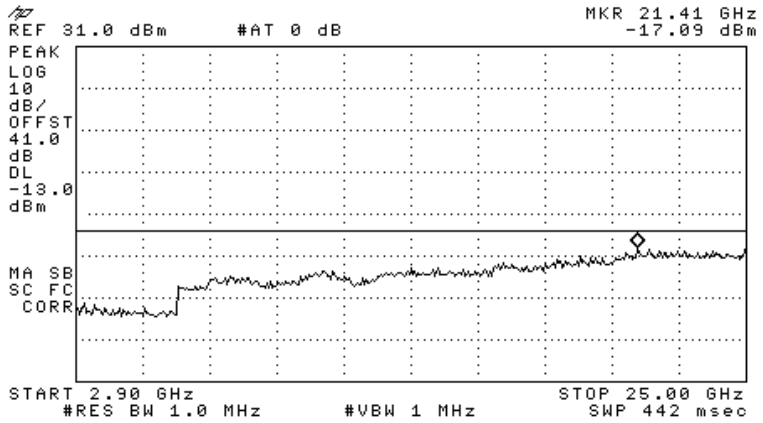

Figure 131.— 2135. 0 MHz CDMA

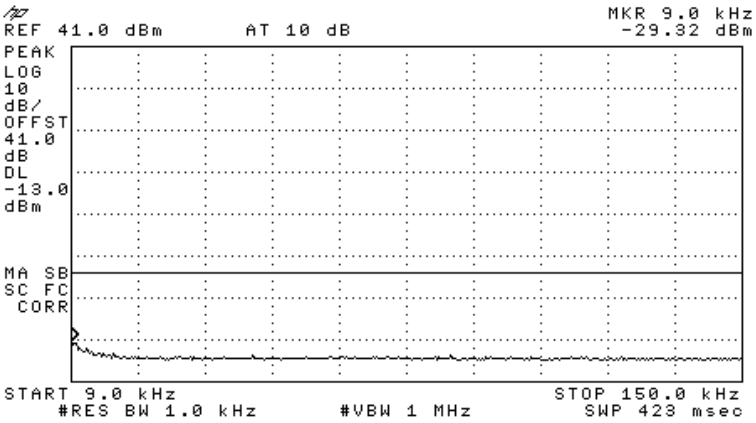

Figure 132.— 2153. 80 MHz CDMA

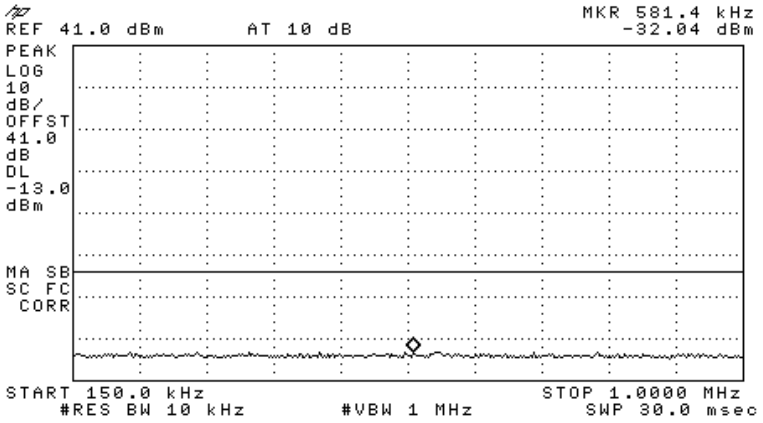

Figure 133.— 2153.80 MHz CDMA

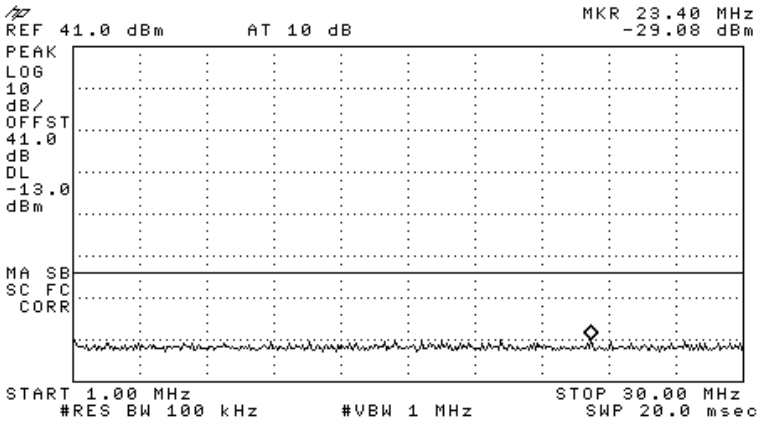

Figure 134.— 2153. 80 MHz CDMA

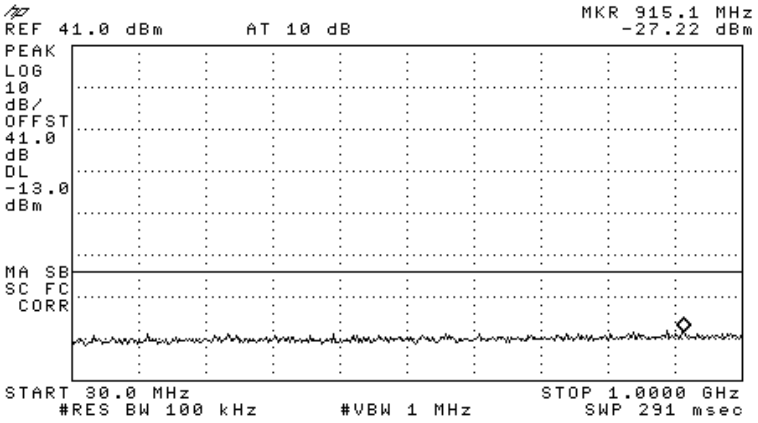

Figure 135.— 2153.80 MHz CDMA

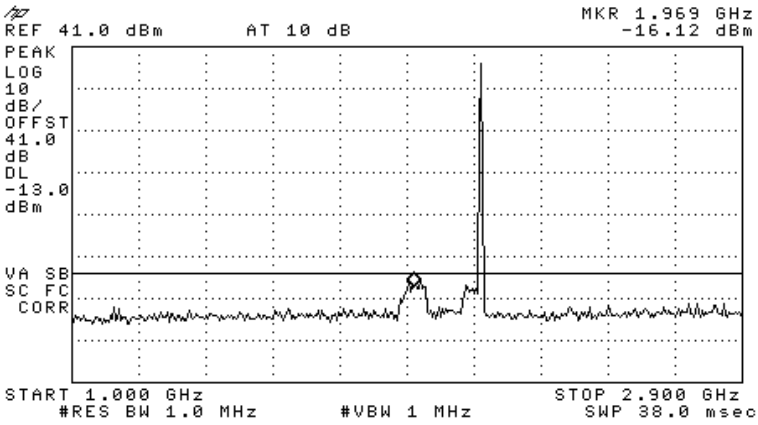

Figure 136.— 2153.80 MHz CDMA

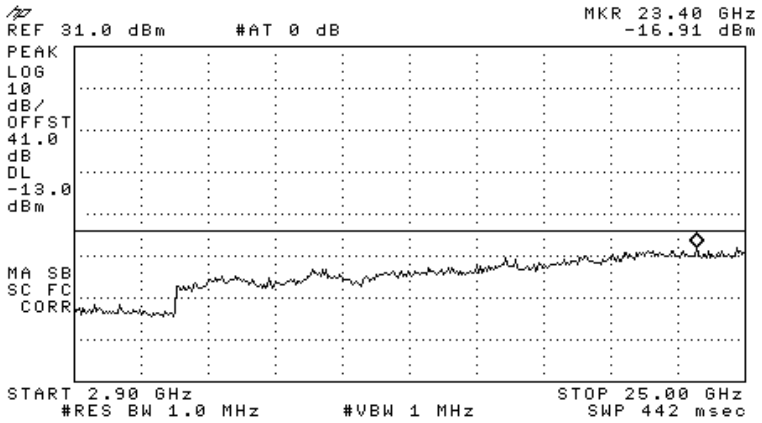

Figure 137.— 2153.80 MHz CDMA

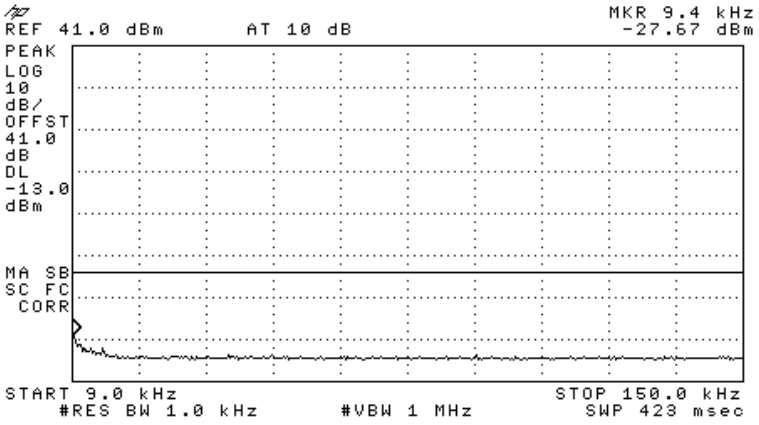

Figure 138.— 2112.50 MHz W-CDMA

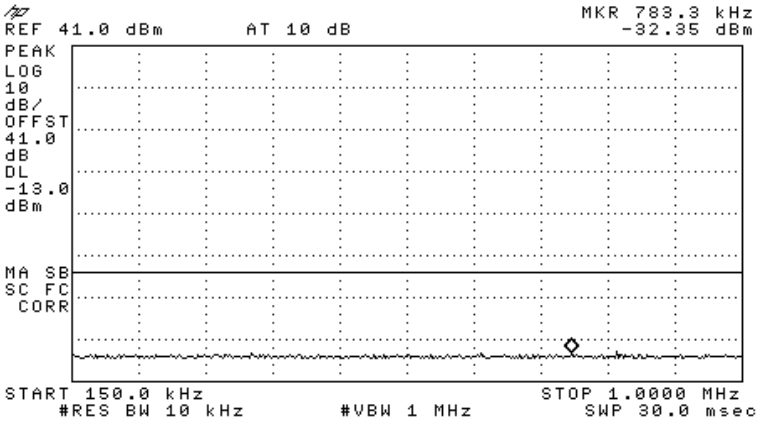

Figure 139.— 2112.50 MHz W-CDMA

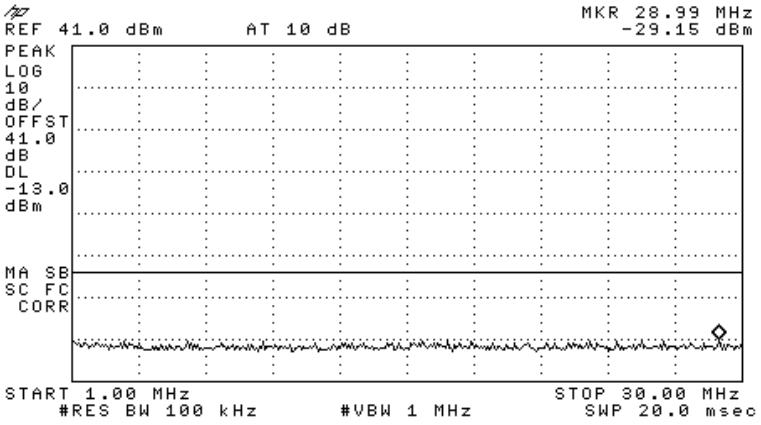

Figure 140.— 2112.50 MHz W-CDMA

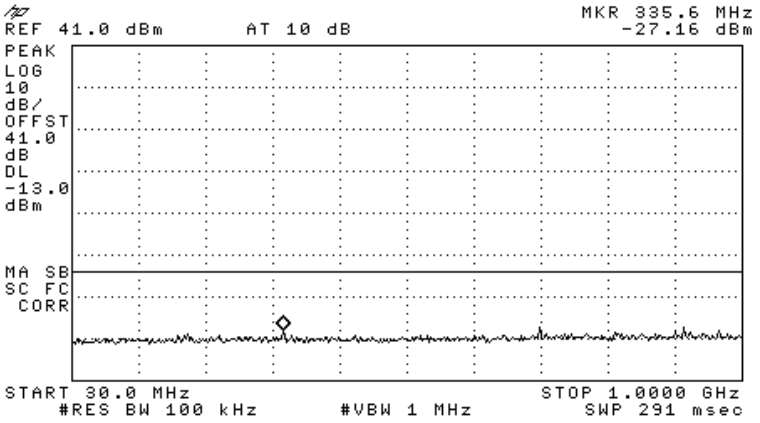

Figure 141.— 2112.50 MHz W-CDMA

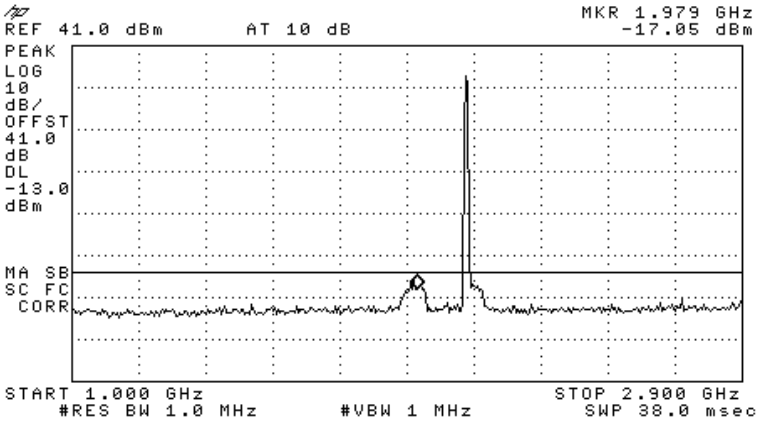

Figure 142.— 2112.50 MHz W-CDMA

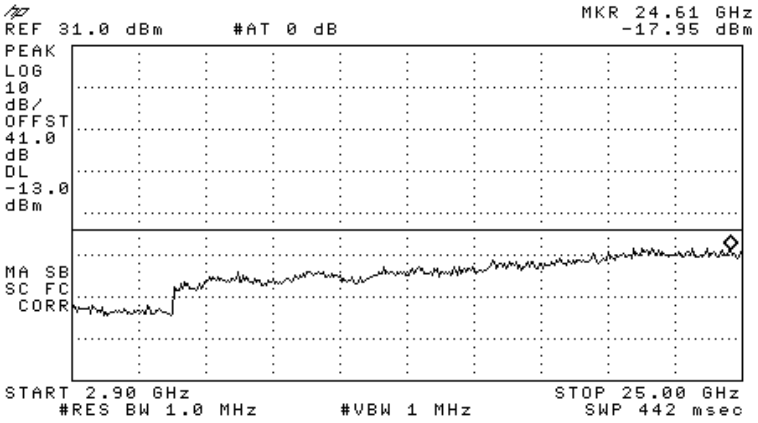

Figure 143.— 2112.50 MHz W-CDMA

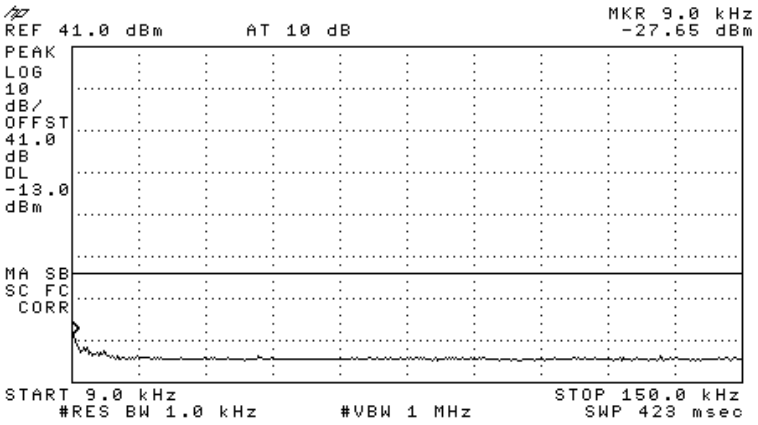

Figure 144.— 2135.00 MHz W-CDMA

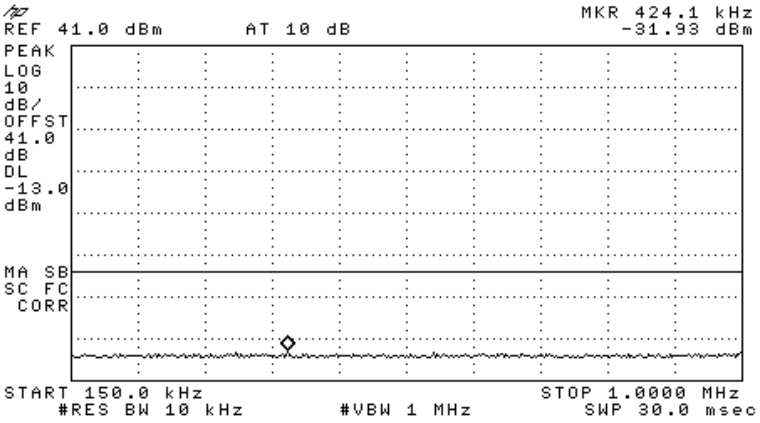

Figure 145.— 2135.00 MHz W-CDMA

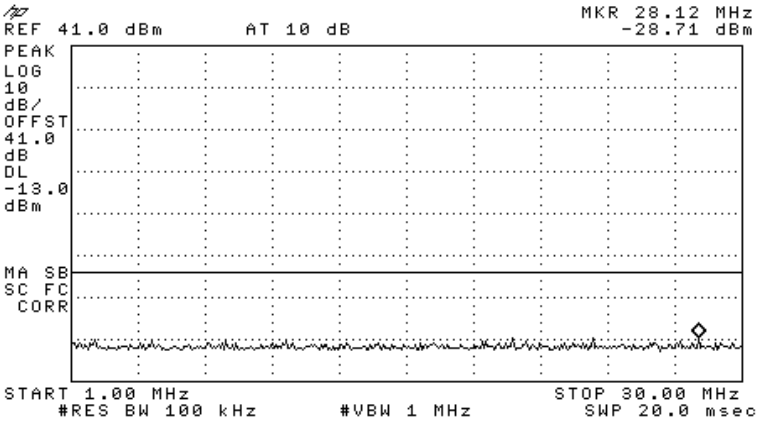

Figure 146.— 2135.00 MHz W-CDMA

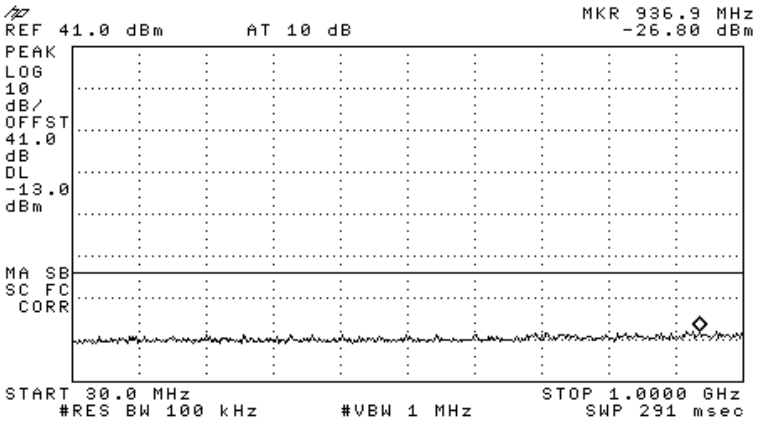

Figure 147.— 2135.00 MHz W-CDMA

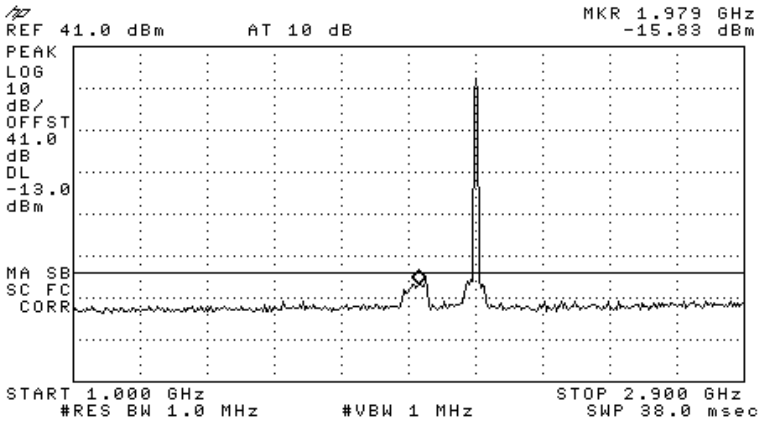

Figure 148.— 2135.00 MHz W-CDMA

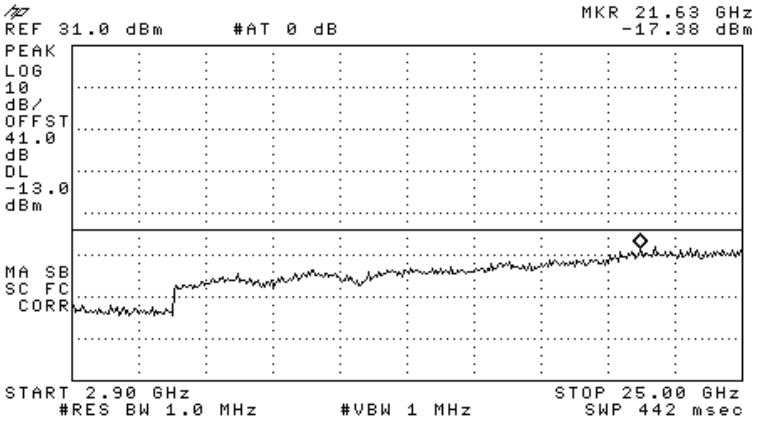

Figure 149.— 2135.00 MHz W-CDMA

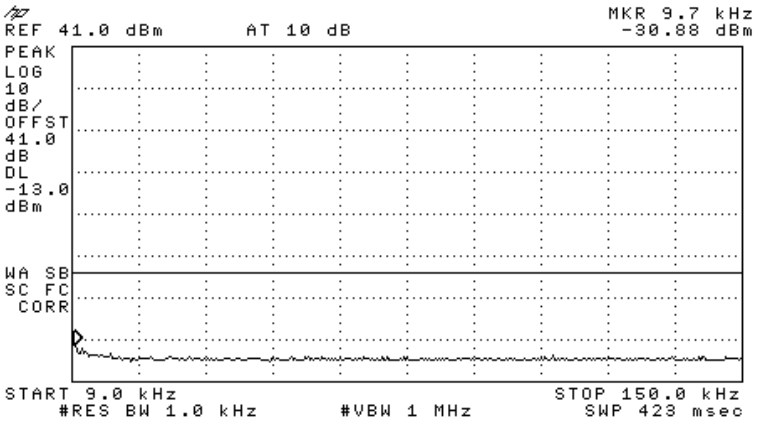

Figure 150.— 2152.50 MHz W-CDMA

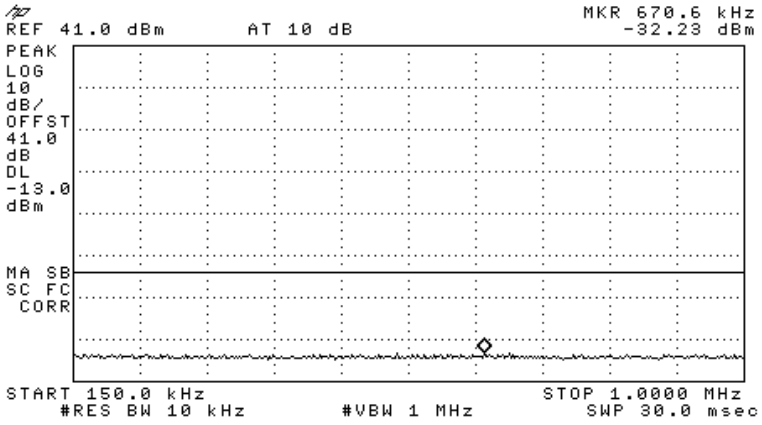

Figure 151.— 2152.50 MHz W-CDMA

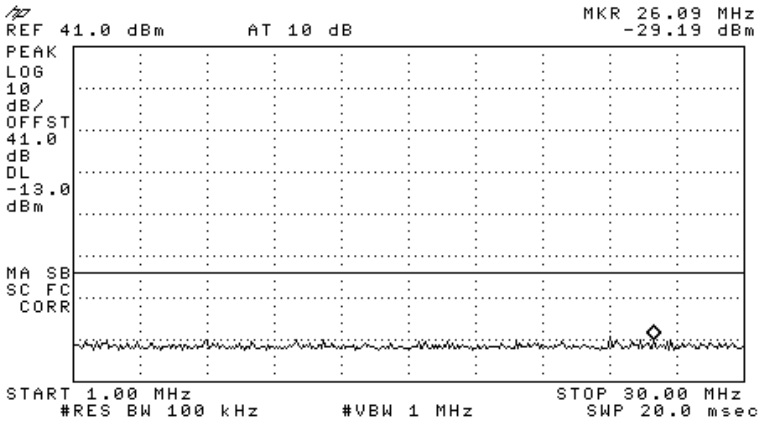

Figure 152.— 2152.50 MHz W-CDMA

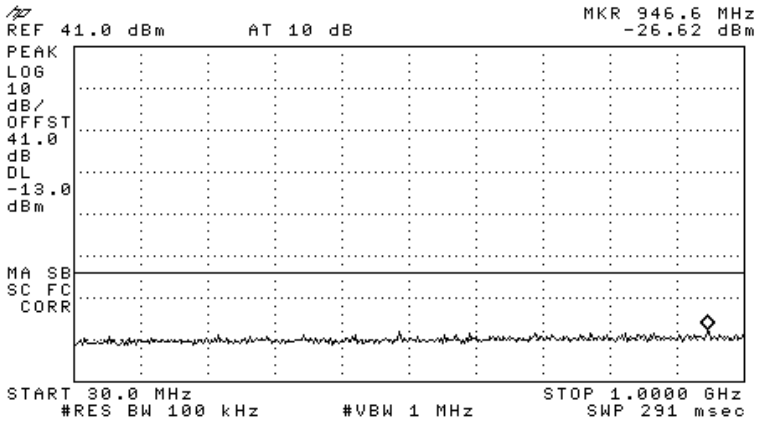

Figure 153.— 2152.50 MHz W-CDMA

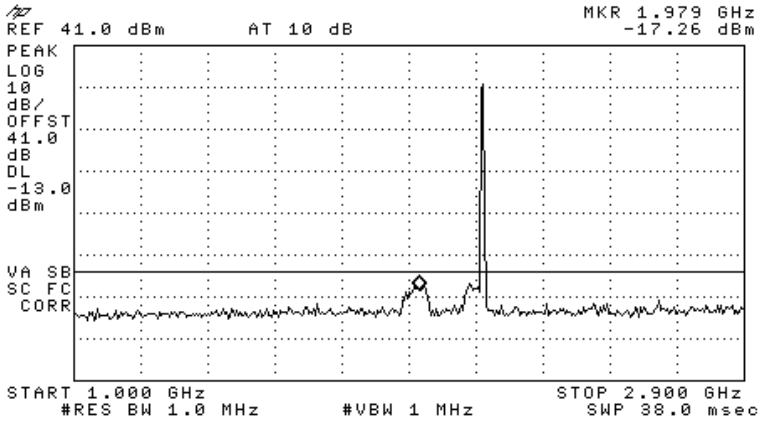

Figure 154.— 2152.50 MHz W-CDMA

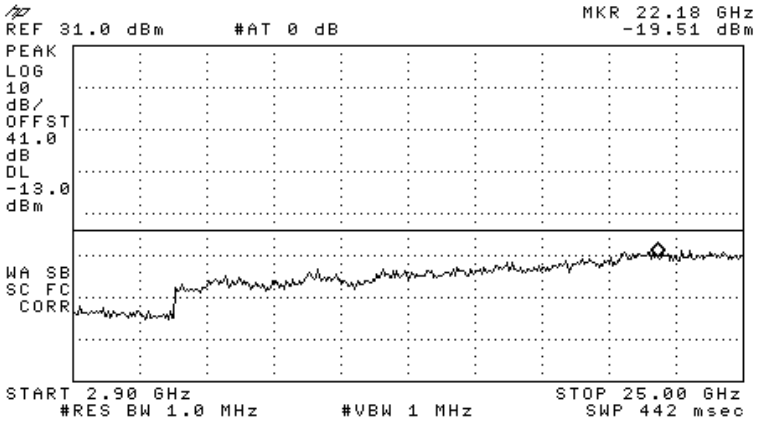

Figure 155.— 2152.50 MHz W-CDMA

11.3 Results

E.U.T. Description: Mobile AccessHX High-Power DAS Remote Unit
Model No.: HX-P19A17-AC-A (P19=PCS; A17=AWS)
Serial Number: Not Designated
Specification: FCC Part 27, Subpart C, Section 27.53 (g)

	Operation Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
CDMA	2111.20	-15.65	-13.0	-2.65
	2135.00	-15.00	-13.0	-2.00
	2153.80	-16.12	-13.0	-3.12
WCDMA	2112.50	-17.05	-13.0	-4.05
	2135.00	-15.83	-13.0	-2.83
	2152.50	-17.26	-13.0	-4.26

Figure 156 Spurious Emissions at Antenna Terminals Results AWS

JUDGEMENT: Passed by 2.00 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 31.05.11

Typed/Printed Name: A. Sharabi

11.4 Test Equipment Used.

Spurious Emissions at Antenna Terminals AWS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8529L	3826A01204	February 21, 2011	1 year
Signal Generator	HP	E4438C ESG-	MY45091956	July 22, 2010	1 year
Signal Generator	HP	E4433B ESG-D	GB40050702	July 22, 2010	1 year
Attenuator	Narda	MOD 766-10	9409	December 22, 2010	1 year
Attenuator	Mini-Circuits	BW-S30W5	0533	December 22, 2010	1 year
Cable	Mini-Circuits	30091		February 10, 2011	1 year

Figure 157 Test Equipment Used

12. Band Edge Spectrum AWS

12.1 Test Specification

FCC Part 27, Subpart C, Section 27.53 (m 4-6)

12.2 Test procedure

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

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 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 (41.0 dB).

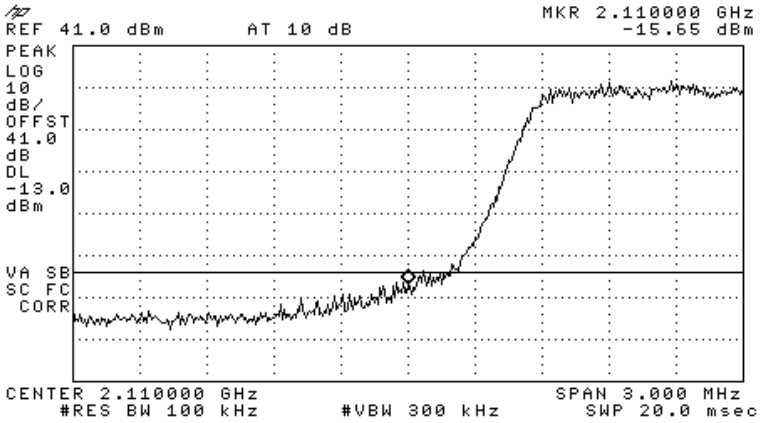

Figure 158.— CDMA 2111.20 MHz

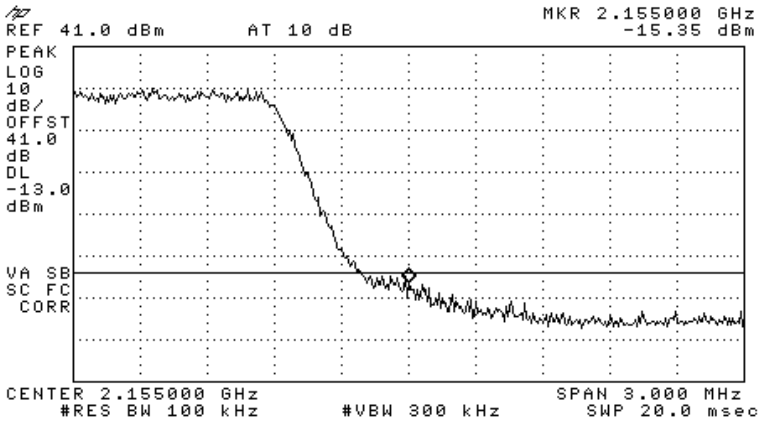

Figure 159.— CDMA 2153.80 MHz

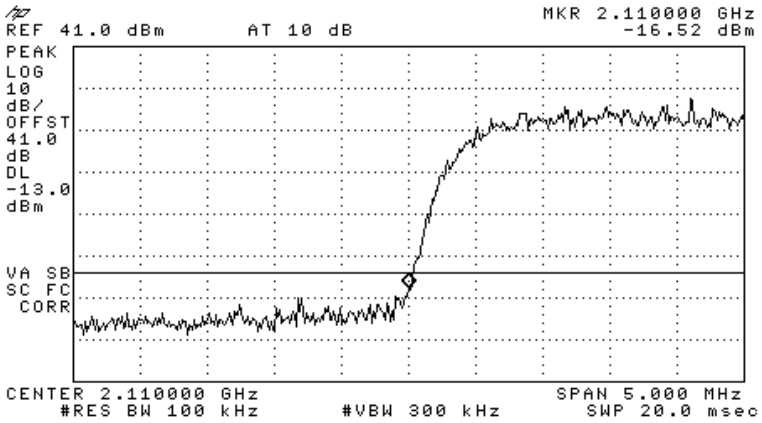

Figure 160.— W-CDMA 2112.50 MHz

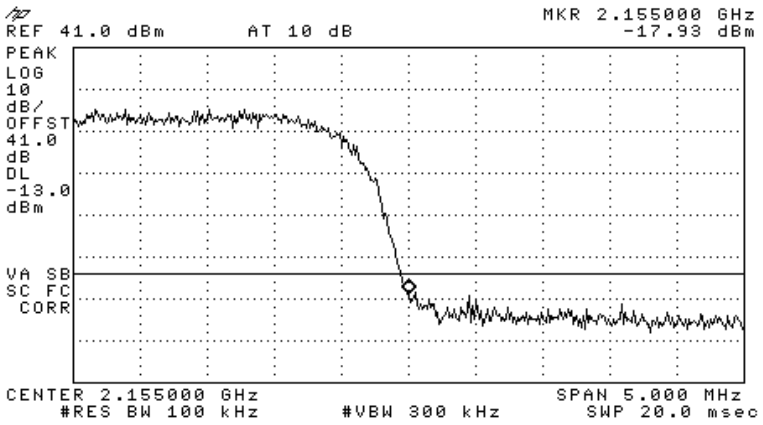

Figure 161.— W-CDMA 2152.50 MHz

12.3 Results

E.U.T. Description: Mobile AccessHX High-Power DAS Remote Unit
Model No.: HX-P19A17-AC-A (P19=PCS; A17=AWS)
Serial Number: Not Designated
Specification: FCC Part 27, Subpart C, Section 27.53 (m 4-6)

Modulation	Operation Frequency (MHz)	Band Edge Frequency (MHz)	Reading (dBm)	Specification (dBm)
CDMA	2111.20	2110.00	-15.65	-13.0
CDMA	2153.80	2155.00	-15.35	-13.0
W-CDMA	2112.50	2110.00	-16.52	-13.0
W-CDMA	2152.50	2155.00	-17.93	-13.0

Figure 162 Band Edge Spectrum Results AWS

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____ Date: 31.05.11

Typed/Printed Name: A. Sharabi

12.4 Test Equipment Used.

Band Edge Spectrum AWS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	RHODE&SCHWARZ	FSL6	100194	July 22, 2010	1 year
Signal Generator	HP	E4433B ESG-D	GB40050702	July 22, 2010	1 year
Signal Generator	HP	E4438C ESG	MY45091956	July 22, 2010	1 year
Attenuator	Narda	MOD 766-10	9409	December 22, 2010	1 year
Attenuator	Mini-Circuits	BW-S30W5	0533	December 22, 2010	1 year
Cable	Mini-Circuits	30091		February 10, 2011	1 year

Figure 163 Test Equipment Used

13. Spurious Radiated Emission AWS

13.1 Test Specification

FCC, Part 27, Subpart C Section 27.53 (g)

13.2 Test Procedure

The test method was based on ANSI/TIA-603-C: 2004, Section 2.2.12 Unwanted Emissions: Radiated Spurious.
The power of any emission outside of the authorized operating frequency ranges (2110-2155 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 2. 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, 0.8 meters above the ground. The configuration tested is shown in Figure 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.

13.3 Test Results

JUDGEMENT: Passed by 25.30 dB

The E.U.T met the requirements of the FCC, Part 27, Subpart C, Section 27.53 (g) specifications.

TEST PERSONNEL:

Tester Signature: _____ Date: 31.05.11

Typed/Printed Name: A. Sharabi

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)
2111.20	4222.40	V	60.42	-42.97	4.45	9.12	-38.3	-13.0	-25.30
2111.20	4222.40	H	54.65	-48.5	4.45	9.12	-43.83	-13.0	-30.83
2135.00	4270.00	V	55.13	-48.94	4.45	9.38	-44.01	-13.0	-31.01
2135.00	4270.00	H	55.07	-48.54	4.45	9.38	-43.61	-13.0	-30.61
2153.80	4307.60	V	60.12	-43.95	4.45	9.38	-39.02	-13.0	-26.02
2153.80	4307.60	H	57.45	-46.16	4.45	9.38	-41.23	-13.0	-28.23

13.4 Test Instrumentation Used, Radiated Measurements AWS

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 24, 2010	1 year
RF Section	HP	85420E	3705A00248	November 24, 2010	1 year
Active Loop Antenna	Emco	6502	2950	October 19, 2010	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	August 1, 2010	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 23, 2011	1 year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 27, 2011	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	February 21, 2011	1 year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	November 5, 2010	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	January 4, 2011	1 Year
Signal Generator	HP	E4432B ESG-D	GB40050702	July 22, 2010	1 year
Signal Generator	HP	E4438C ESG	MY45091956	July 22, 2010	1 year
Double Ridged Waveguide Horn Antenna	EMCO	3115	29845	March 14, 2010	2 year

14. Intermodulation Conducted

14.1 Test procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable(loss = 41.0 dB). The spectrum analyzer was set to 1 kHz resolution BW for the frequency range 9.0-150.0 kHz, 10 kHz for the frequency range 150 kHz–1 MHz, 100 kHz for the frequency range 1 – 30M Hz, and 1MHz for the frequency range 30 MHz - 26.0GHz.

2 input signals were sent simultaneously to the E.U.T. as follows:

PCS 1960 MHz CW 10 dBm

AWS: 2135 MHz W-CDMA 10 dBm

The frequency range of 9 kHz – 26.0GHz was scanned for unwanted signals.

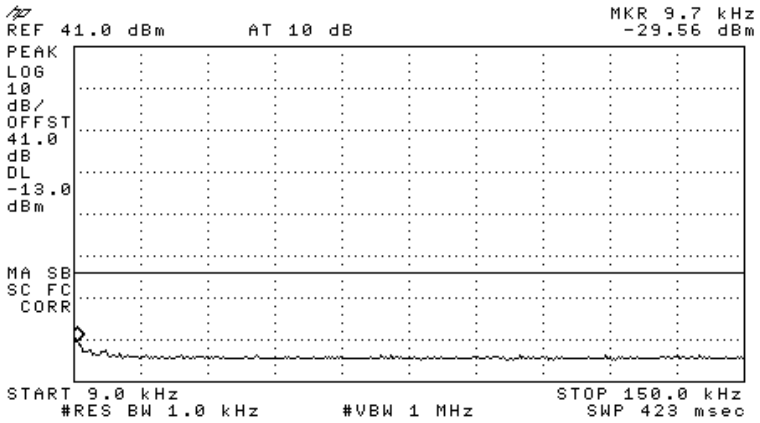

Figure 164 Intermodulation

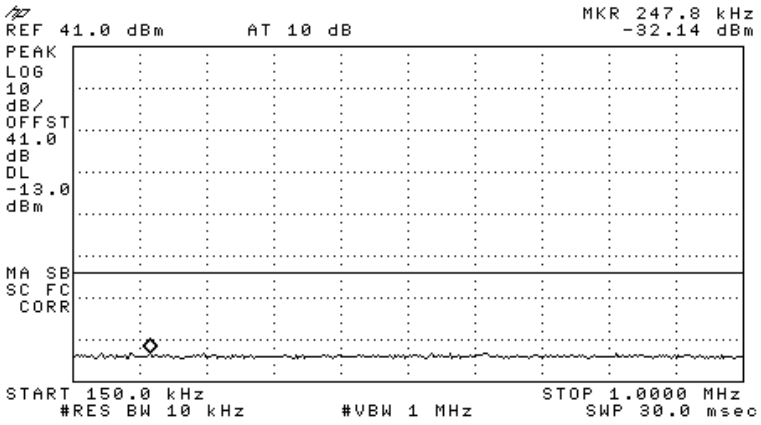

Figure 165 Intermodulation

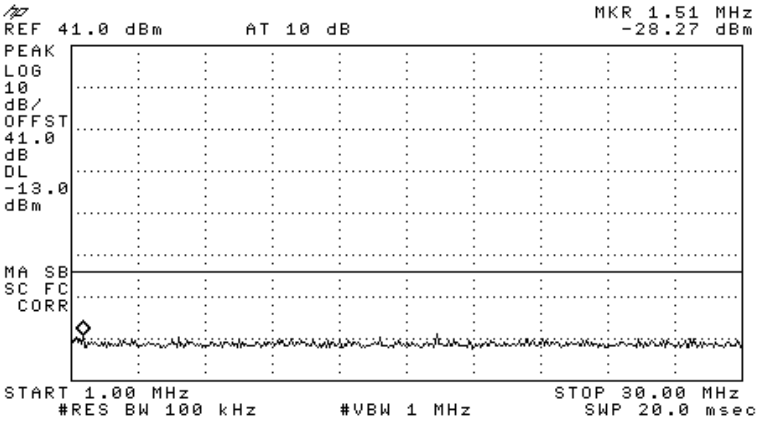

Figure 166 Intermodulation

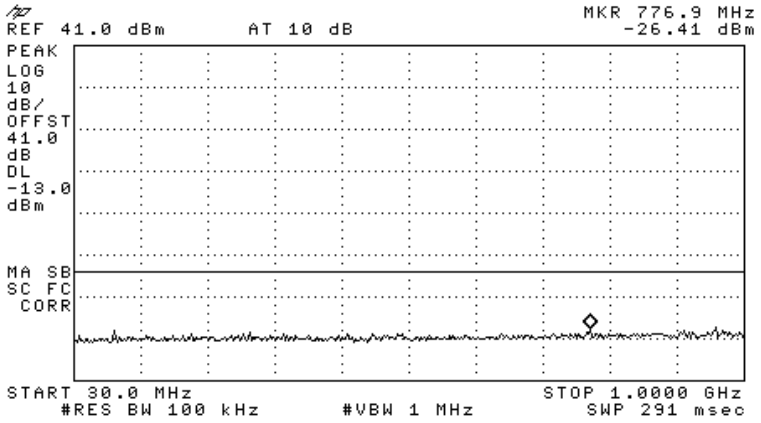

Figure 167 Intermodulation

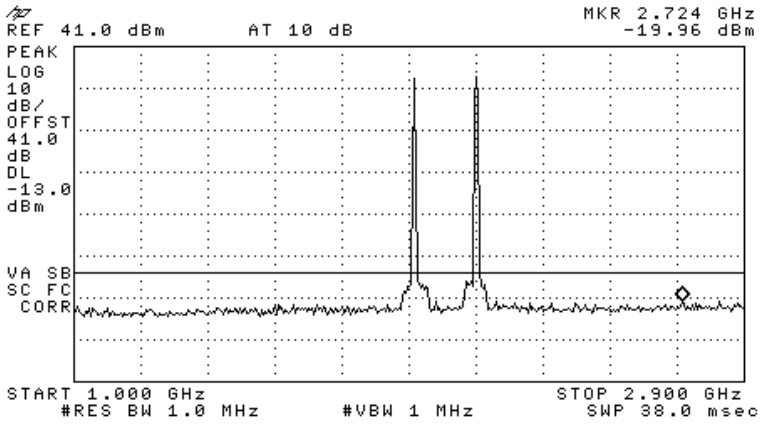

Figure 168 Intermodulation

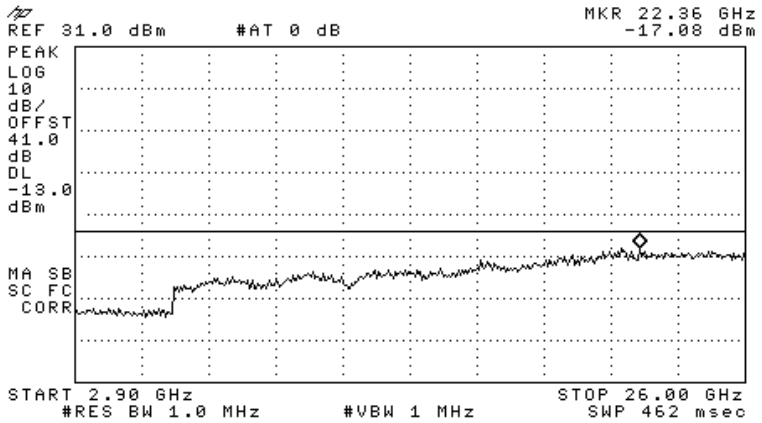

Figure 169 Intermodulation

14.2 Test Equipment Used.

Intermodulation Conducted

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8529L	3826A01204	February 21, 2011	1 year
Signal Generator	HP	E4438C ESG-	MY45091956	July 22, 2010	1 year
Signal Generator	HP	E4433B ESG-D	GB40050702	July 22, 2010	1 year
Attenuator	Narda	MOD 766-10	9409	December 22, 2010	1 year
Attenuator	Mini-Circuits	BW-S30W5	0533	December 22, 2010	1 year
Cable	Mini-Circuits	30091		February 10, 2011	1 year

Figure 170 Test Equipment Used

15. Intermodulation Radiated

15.1 Test procedure

The test method was based on ANSI/TIA-603-C: 2004, Section 2.2.12 Unwanted Emissions: Radiated Spurious.
The power of any emission outside of the authorized operating frequency ranges (1930-1990 MHz; 2110-2155 MHz) must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB, yielding –13dBm.

The E.U.T. was operated in Downlink mode at 2 different channels at center frequency of each band at the same time, transmitting at CW signal.

(a) The E.U.T. operation mode and test set-up are as described in Section 2.
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, 0.8 meters above the ground. The configuration tested is shown in Figure 1.

(b) The frequency range 9 kHz-25 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.

15.2 Test Results

JUDGEMENT: Passed

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)
2*1960-2135	1785.00	V	51.8	-47.99	5.6	7.66	-45.93	-13.0	-32.93
3*1960-2*2135	1610.00	H	49.9	-51.54	5.3	7.62	-49.22	-13.0	-36.22
2135-1960	175.00	V	34.8	-59.74	1.62	1.82	-59.54	-13.0	-46.54

15.3 Test Instrumentation Used, Radiated Measurements Intermodulation

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 24, 2010	1 year
RF Section	HP	85420E	3705A00248	November 24, 2010	1 year
Active Loop Antenna	Emco	6502	2950	October 19, 2010	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	August 1, 2010	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 23, 2011	1 year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 27, 2011	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	February 21, 2011	1 year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	November 5, 2010	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	January 4, 2011	1 Year
Signal Generator	HP	E4438C ESG-	MY45091956	July 22, 2010	1 year
Signal Generator	HP	E4433B ESG-D	GB40050702	July 22, 2010	1 year
Double Ridged Waveguide Horn Antenna	EMCO	3115	29845	March 14, 2010	2 year

16. APPENDIX A - CORRECTION FACTORS

16.1 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".

16.2 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.

16.3 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.

16.4 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".*

16.5 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".*

16.6 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".

16.7 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			

16.8 Correction factors for ACTIVE LOOP ANTENNA

Model 6502
S/N 9506-2950

FREQUENCY	Magnetic Antenna Factor	Electric Antenna Factor
(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