

DATE: 17 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-C85P19L70A17-AC-A

(C85=CELL; P19=PCS; L70=LTE; A17=AWS)

(LTE/AWS Section)

Written by: _____



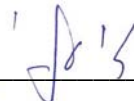
D. Shidlow, Documentation

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

Mobile AccessHX High-Power DAS Remote Unit

HX-C85P19L70A17-AC-A

(C85=CELL; P19=PCS; L70=LTE; A17=AWS)

FCC ID: OJFHXC85P19L70A17

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

Equipment type: PCS Licensed Transmitter

Limits used:
47CFR Parts 2; 27

Measurement procedure used is ANSI C63.4-2003.

Substitution Method used as in ANSI/TIA-603-C: 2004

Application for Certification

prepared by:

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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-C85P19L70A17-AC-A (C85=CELL; P19=PCS; L70=LTE; A17=AWS)
Equipment Serial No.:	Not Designated
Date of Receipt of E.U.T:	30.03.11
Start of Test:	30.03.11
End of Test:	20.04.11
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	FCC Parts 2; 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

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 3, 2009). I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

1.6 Measurement Uncertainty

Radiated Emission

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 (CELL, PCS, AWS and LTE) 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

To select the worst case host 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, 1 meter 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 (dB μ V/m)	DC Configuration (dB μ V/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 necessary in order to achieve compliance.

2.5 Configuration of Tested System

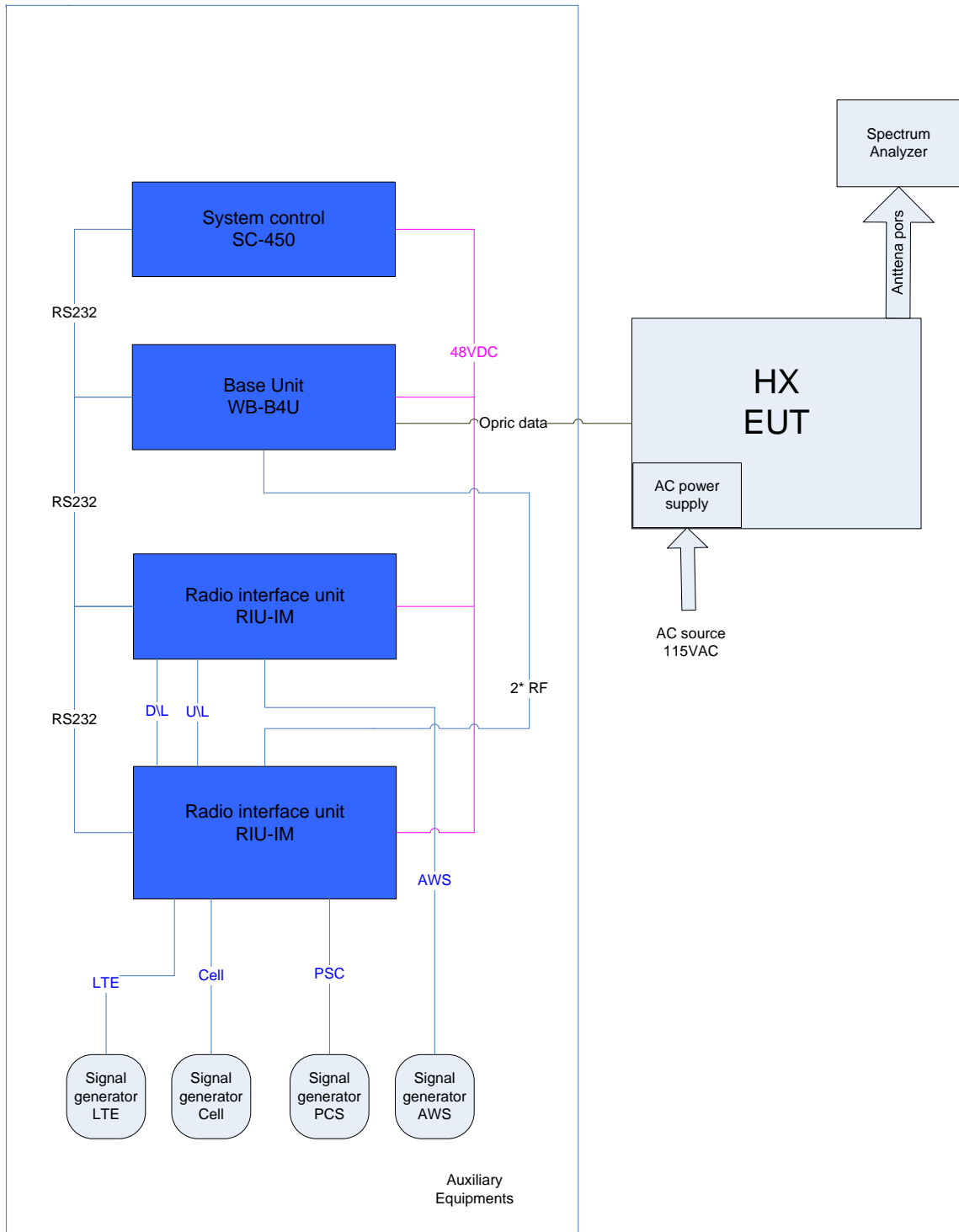


Figure 1. Test Set-up

3. Test Set-up Photos



Figure 2. Conducted Emission From Antenna Port Tests

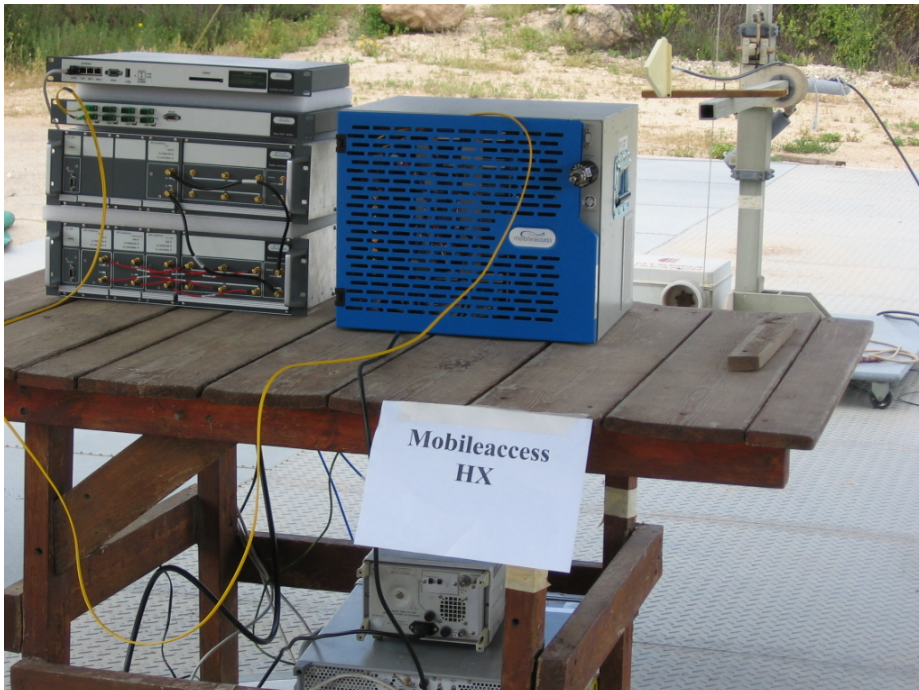


Figure 3. Radiated Emission Test

4. RF Power Output LTE

4.1 Test Specification

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

4.2 Test procedure

Peak Power Output must not exceed 1000W. The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator (41 dB) and an appropriate coaxial cable. The E.U.T. RF output was W-CDMA, QPSK, 16QAM, and 16QAM at 5 MHz bandwidth at the 728-758MHz bands. Special attention was taken to prevent Spectrum Analyzer RF input overload. The Spectrum Analyzer was set to 100 kHz RBW.

Signal generator output power was 0dBm.

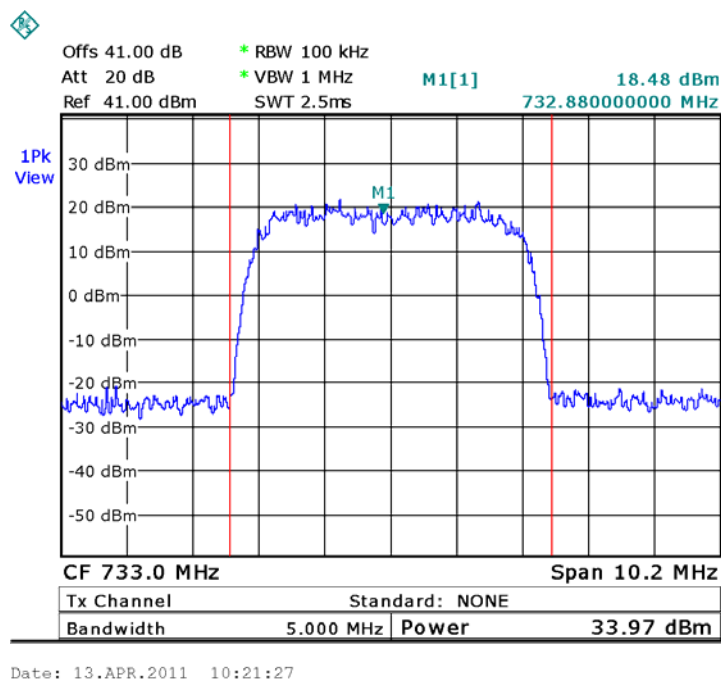
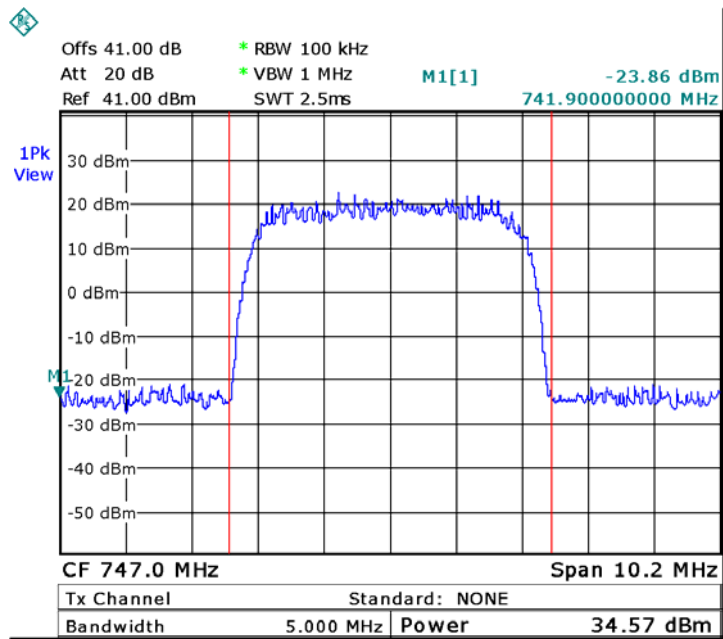
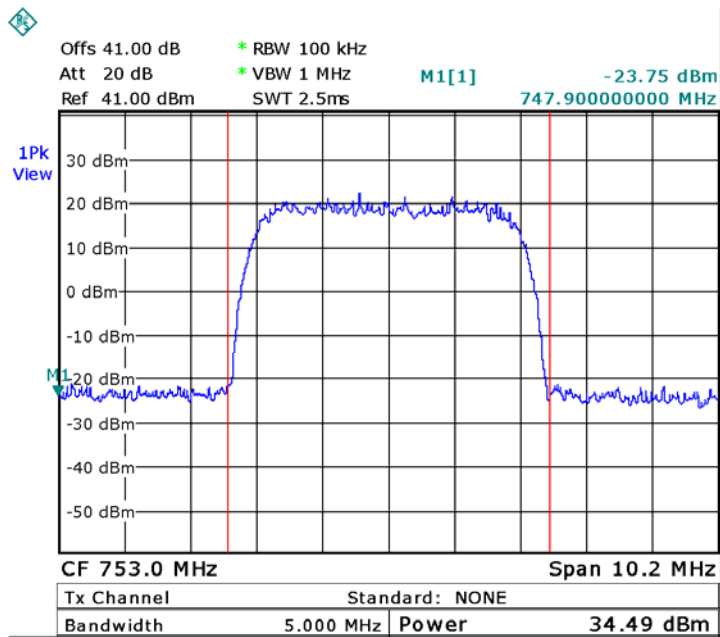


Figure 4.— W-CDMA (733 MHz)



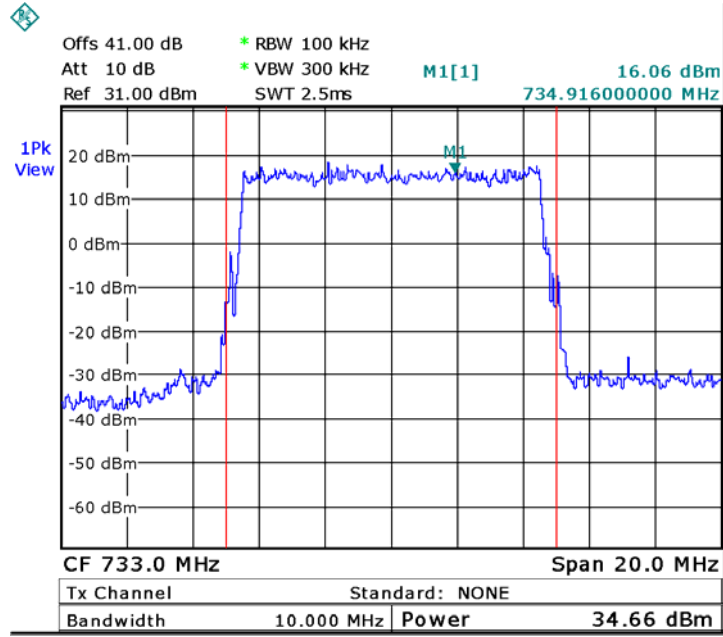
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Figure 5.— W-CDMA (747 MHz)



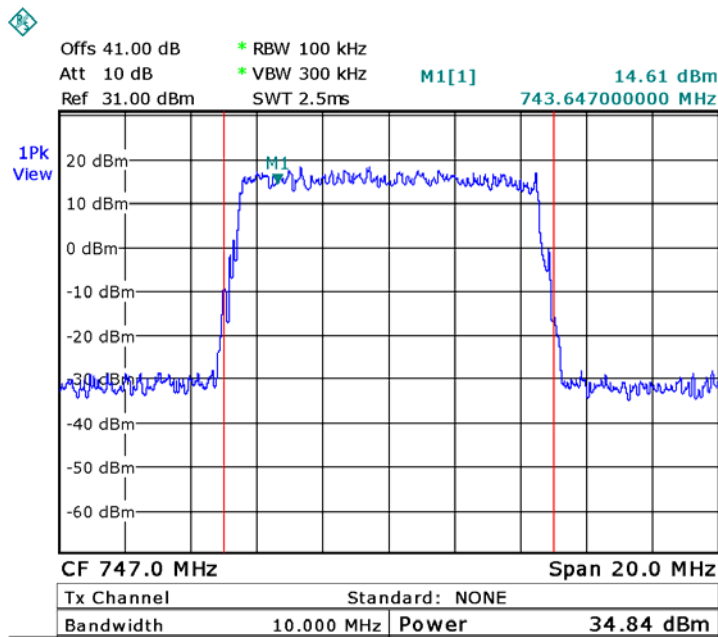
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Figure 6.— W-CDMA (753 MHz)



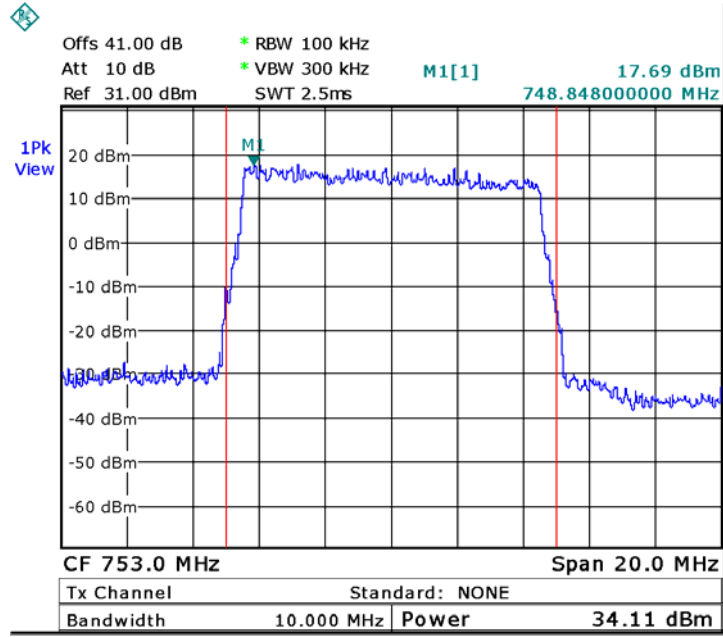
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Figure 7.— QPSK (733 MHz)



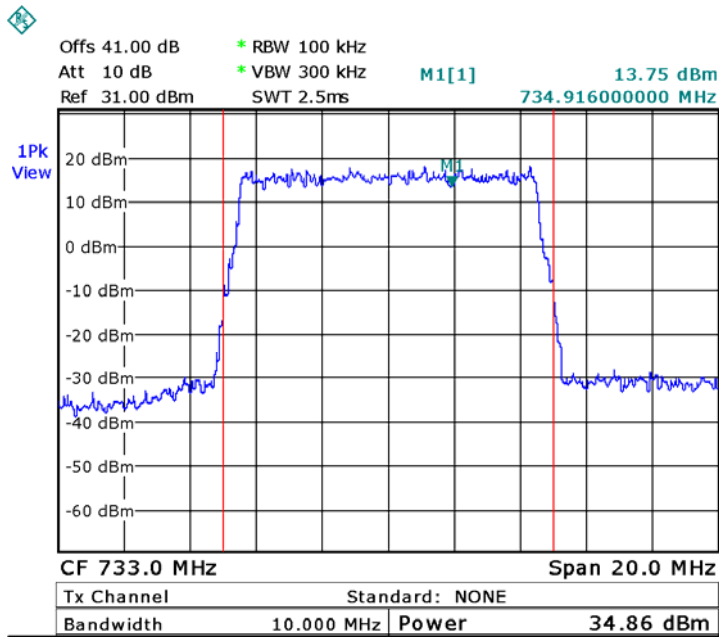
Date: 11.APR.2011 11:24:07

Figure 8.— QPSK (747 MHz)



Date: 11.APR.2011 11:25:03

Figure 9.— QPSK (753 MHz)



Date: 11.APR.2011 11:19:25

Figure 10.— 16QAM (733 MHz)

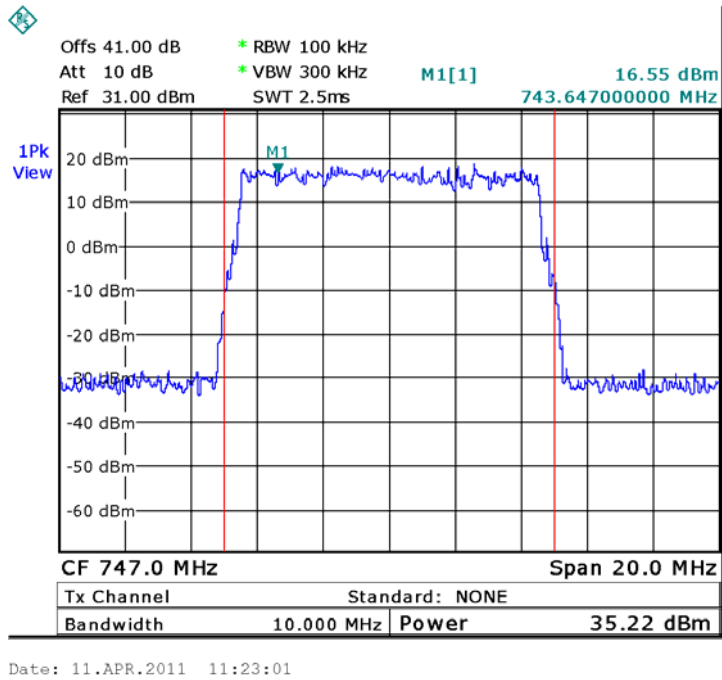


Figure 11.— 16QAM (747 MHz)

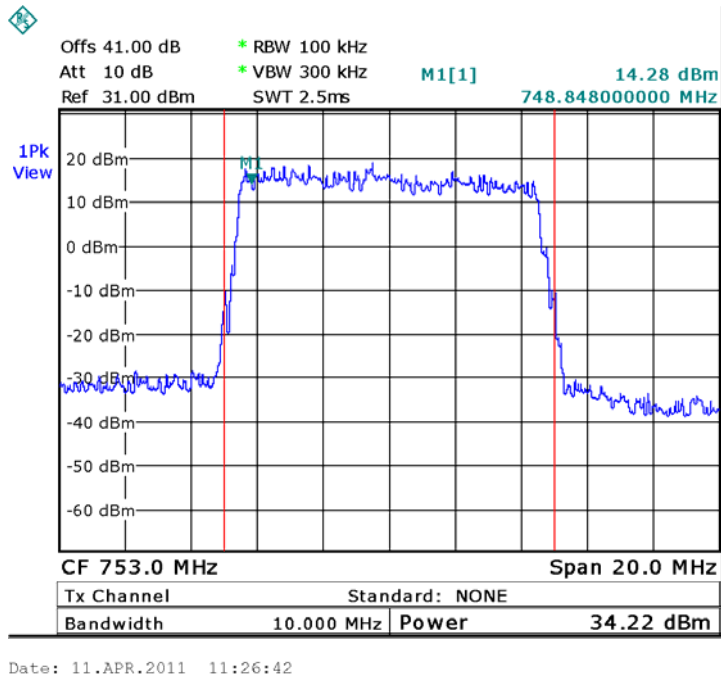
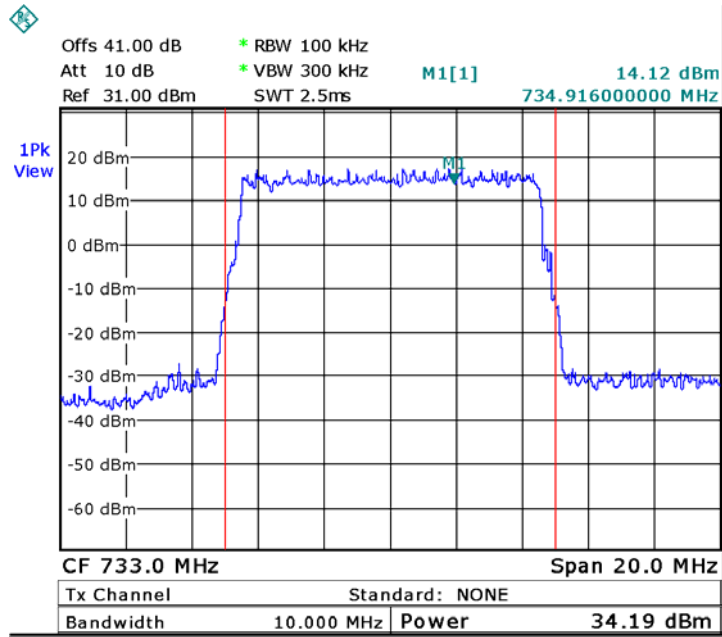
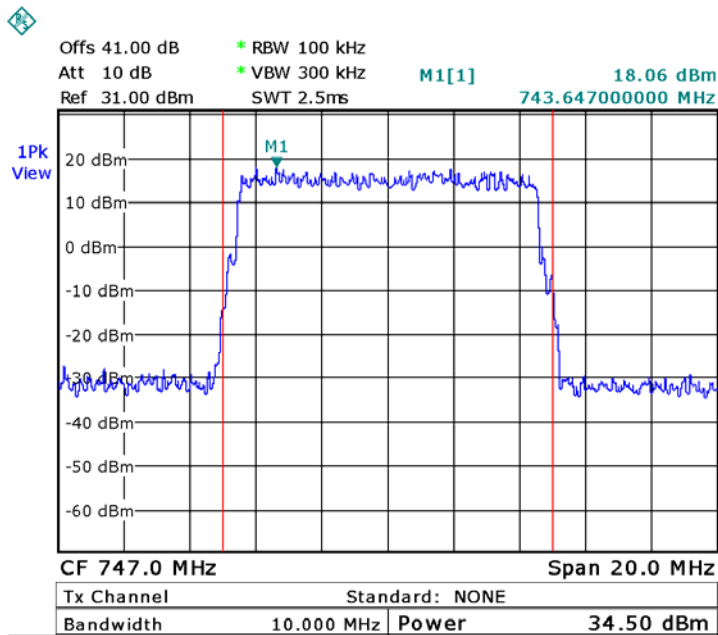


Figure 12.— 16QAM (753 MHz)



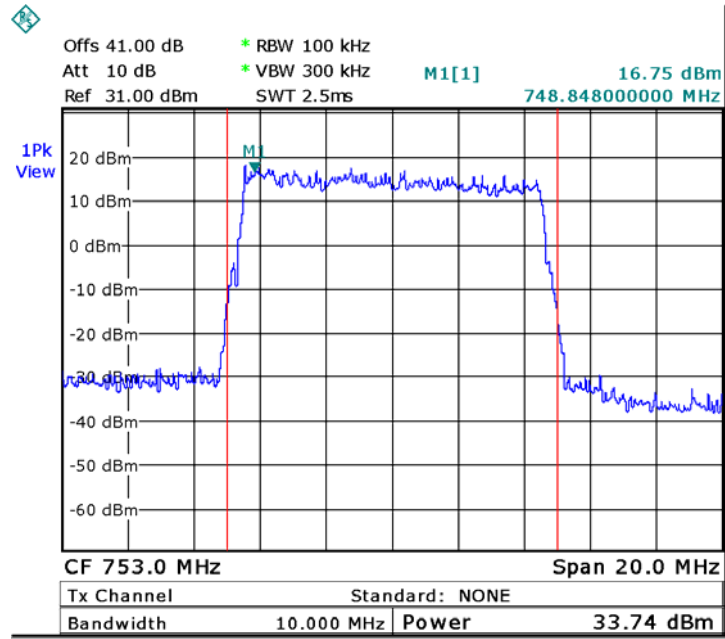
Date: 11.APR.2011 11:20:19

Figure 13.— 64QAM (733 MHz)



Date: 11.APR.2011 11:21:25

Figure 14.— 64QAM (747 MHz)



Date: 11.APR.2011 11:27:53

Figure 15.— 64QAM (753 MHz)

4.3 Results

E.U.T. Description: Mobile AccessHX High-Power DAS Remote Unit
 Model No.: HX-C85P19L70A17-AC-A (C85=CELL; P19=PCS; L70=LTE; A17=AWS)
 Serial Number: Not Designated
 Specification: FCC Part 27, Subpart C, Section 27.50 (d)

Modulation	Operation Frequency (MHz)	Reading (dBm)
WCDMA	733	33.97
WCDMA	747	34.57
WCDMA	753	34.49
QPSK	733	34.66
QPSK	747	34.84
QPSK	753	34.11
16QAM	733	34.86
16QAM	747	35.22
16QAM	753	34.22
64QAM	733	34.19
64QAM	747	34.50
64QAM	753	33.74

Figure 16 RF Power Output LTE

TEST PERSONNEL:

Tester Signature: _____

Date: 08.05.11

Typed/Printed Name: A. Sharabi

4.4 Test Equipment Used.

RF Power Output LTE

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	MY42082734	July 21, 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 17 Test Equipment Used

5. Occupied Bandwidth LTE

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 QPSK, WCDMA, 16QAM and 64QAM 10MHZ modulation in the 728-758MHz band.

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 (41.0dB). 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.

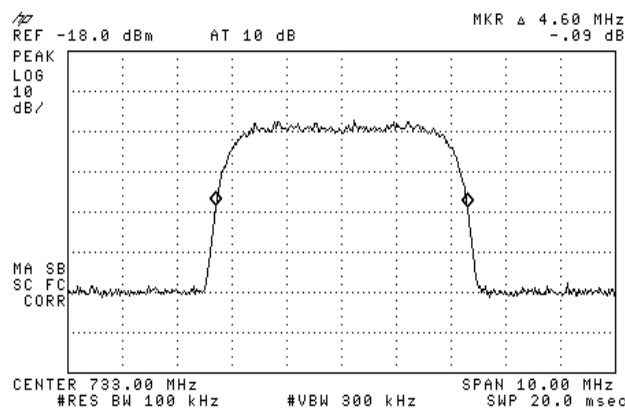


Figure 18.— W-CDMA (733 MHz) IN

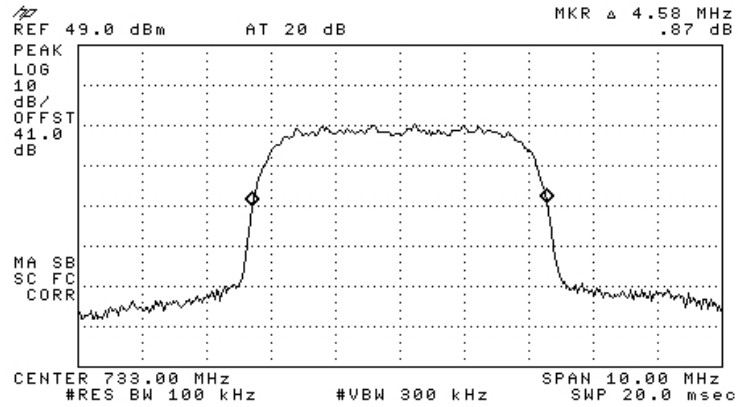


Figure 19.— W-CDMA (733 MHz) OUT

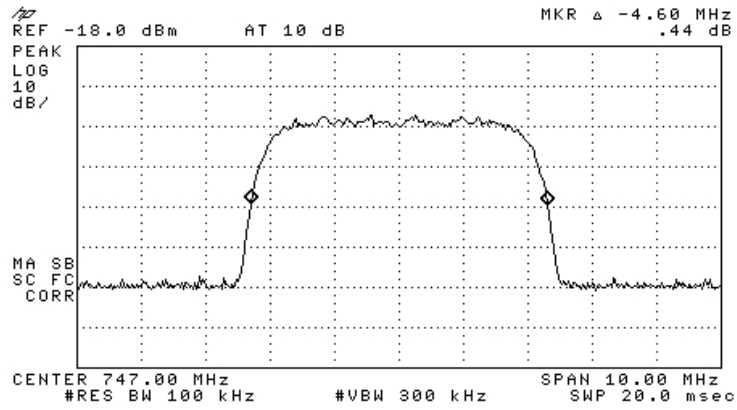


Figure 20.— W-CDMA (747 MHz) IN

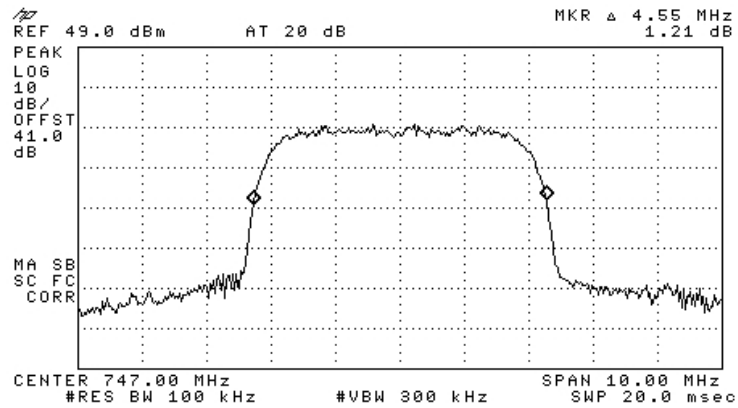


Figure 21.— W-CDMA (747 MHz) OUT

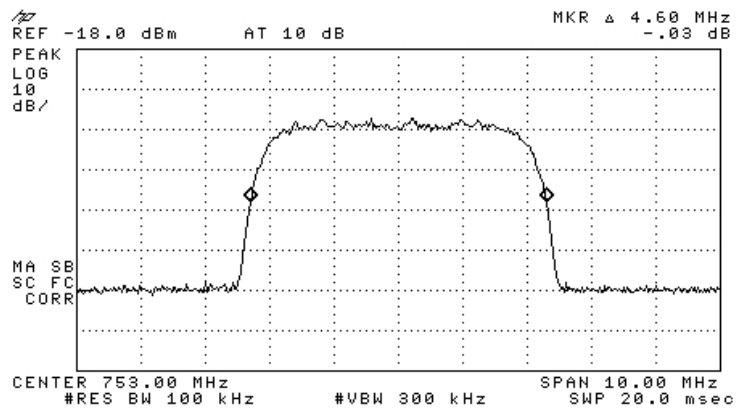


Figure 22.— W-CDMA (753 MHz) IN

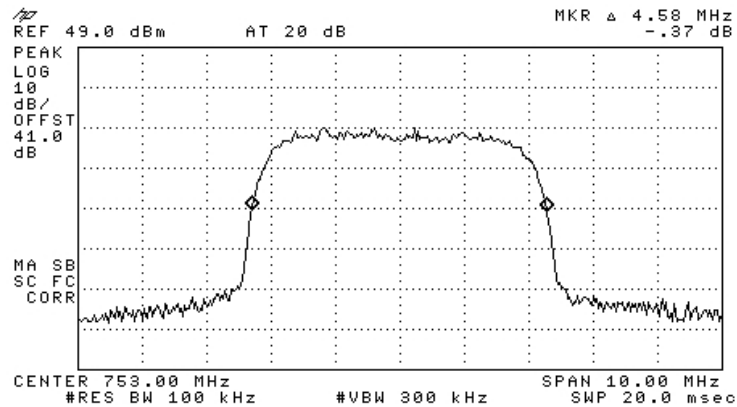


Figure 23.— W-CDMA (753 MHz) OUT

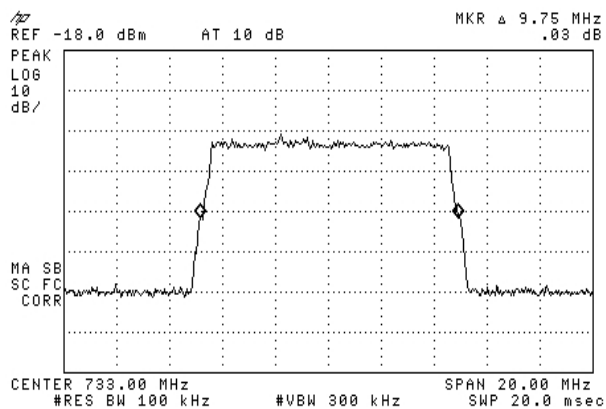


Figure 24.— QPSK (733 MHz) IN

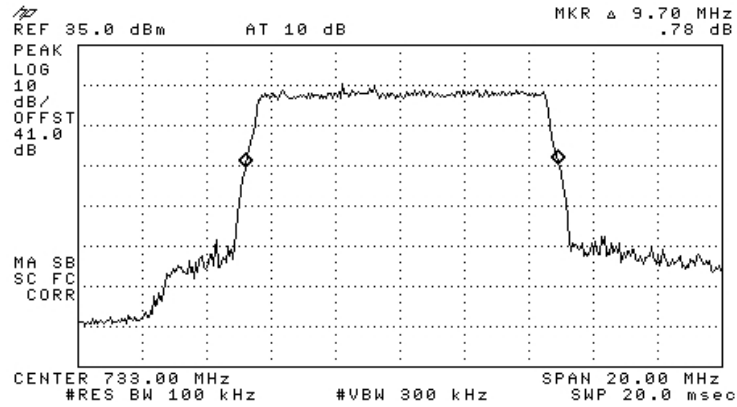


Figure 25.— QPSK (733 MHz) OUT

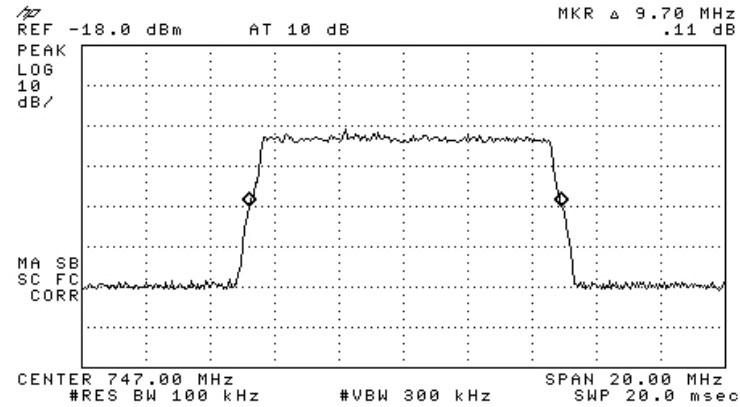


Figure 26.— QPSK (747 MHz) IN

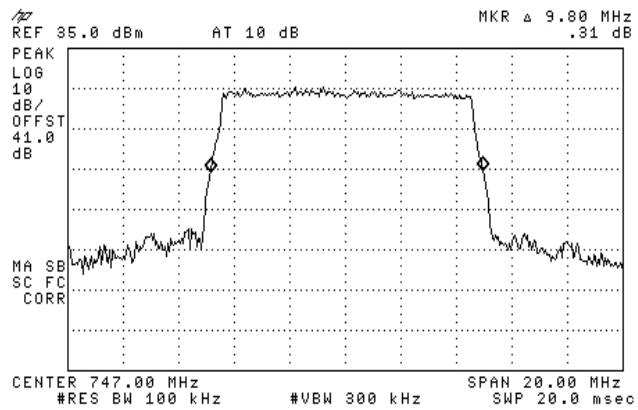


Figure 27.— QPSK (747 MHz) OUT

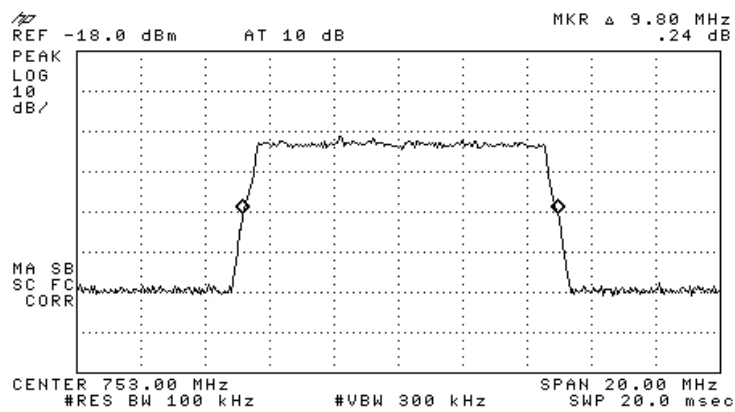


Figure 28.— QPSK (753 MHz) IN

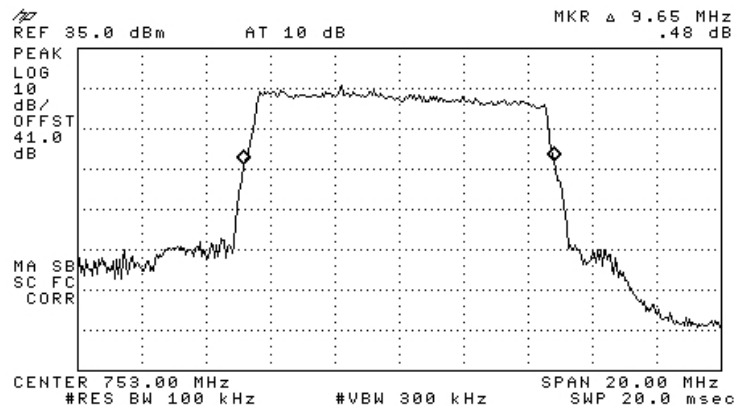


Figure 29.— QPSK (753 MHz) OUT

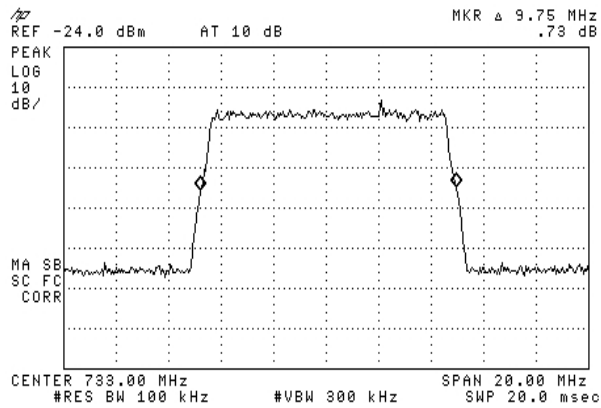


Figure 30.— 16QAM (733 MHz) IN

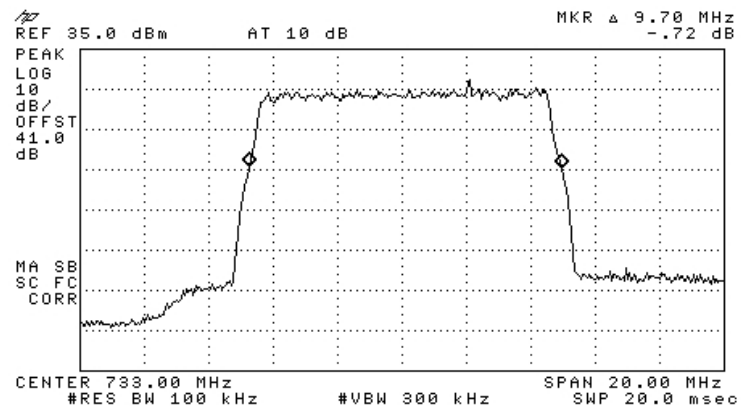


Figure 31.— 16QAM (733 MHz) OUT

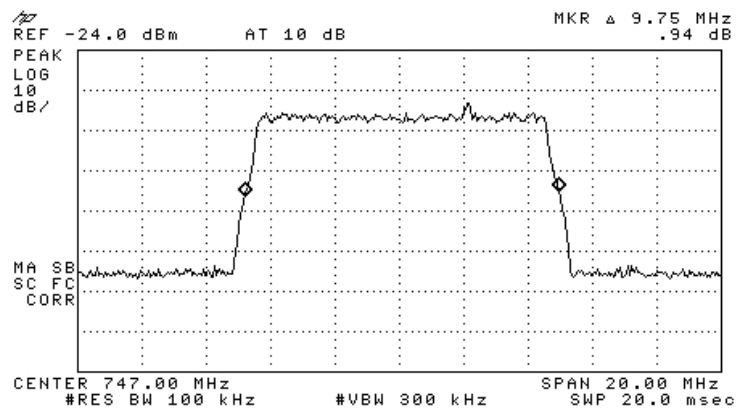


Figure 32.— 16QAM (747 MHz) IN

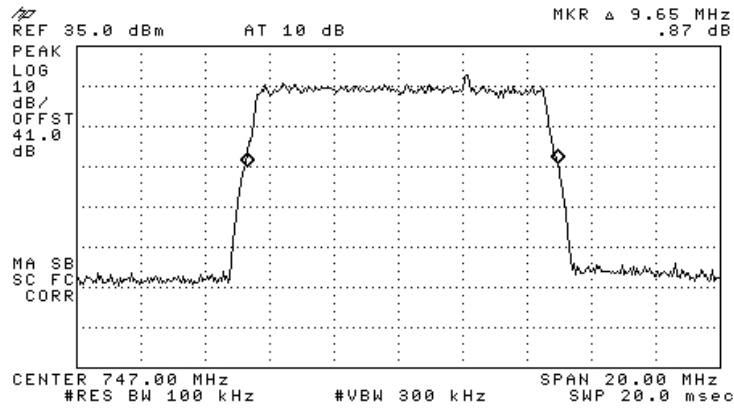


Figure 33.— 16QAM (747 MHz) OUT

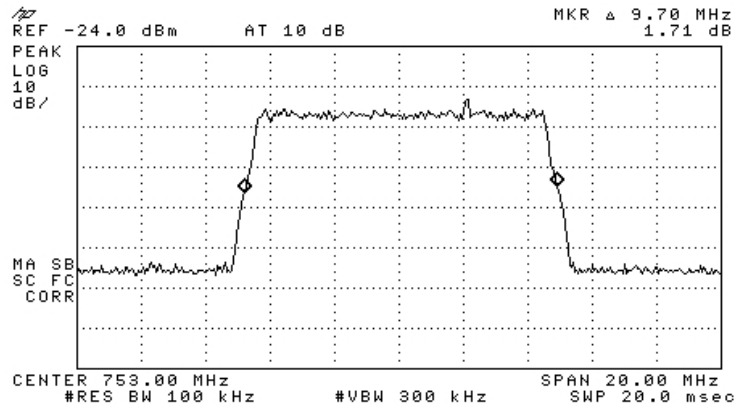


Figure 34.— 16QAM (753 MHz) IN

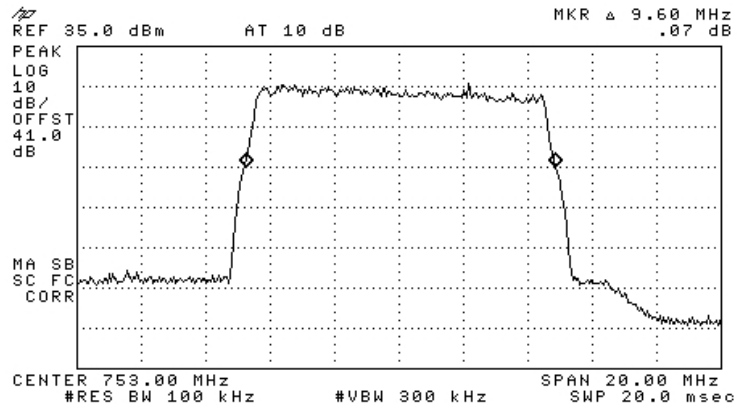


Figure 35.— 16QAM (753 MHz) OUT

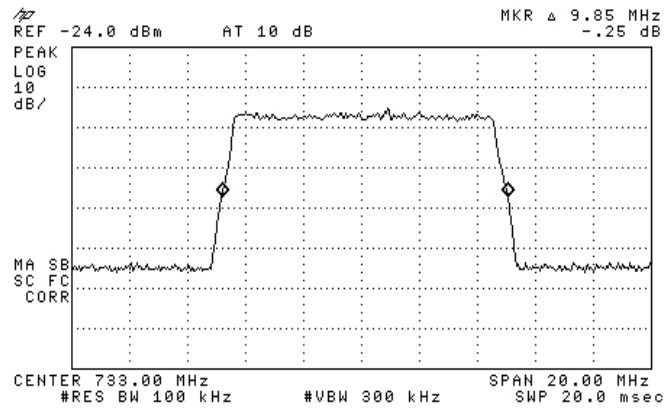


Figure 36.— 64QAM (733 MHz) IN

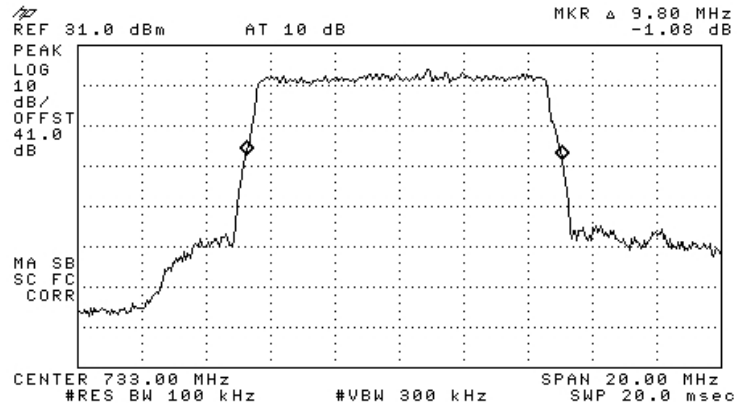


Figure 37.— 64QAM (733 MHz) OUT

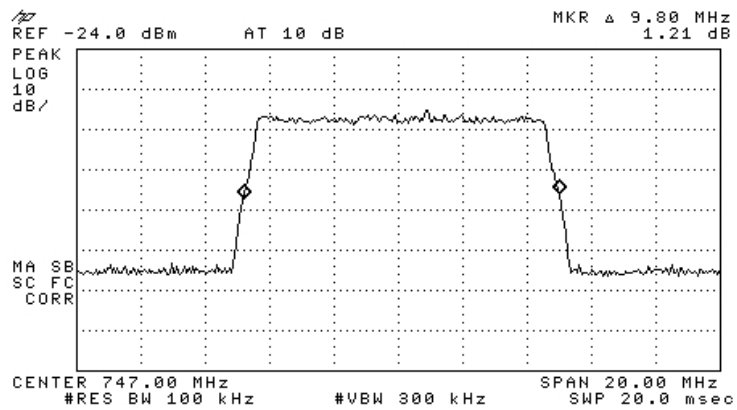


Figure 38.— 64QAM (747 MHz) IN

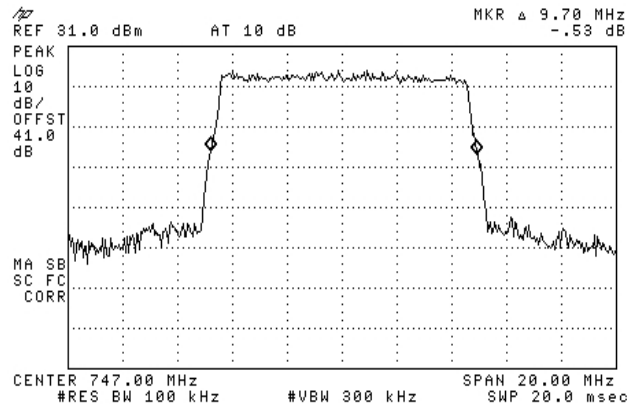


Figure 39.— 64QAM (747 MHz) OUT

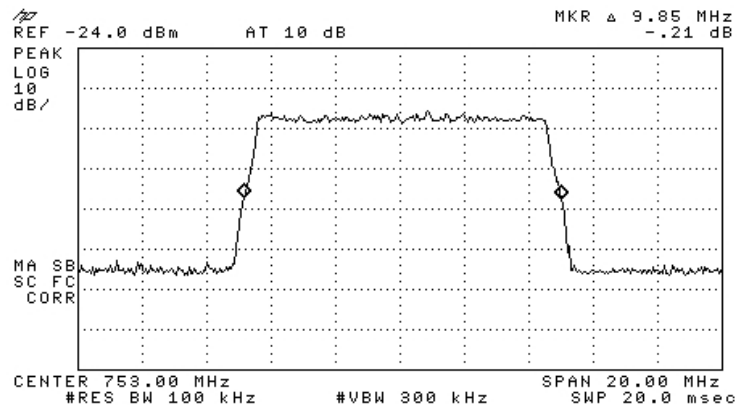


Figure 40.— 64QAM (753 MHz) IN

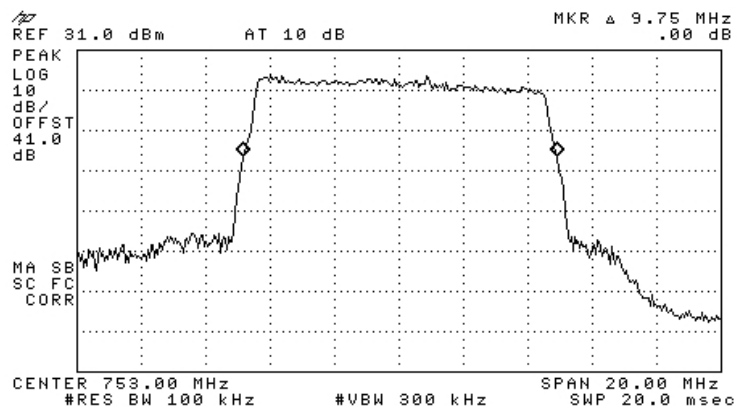


Figure 41.— 64QAM (753 MHz) OUT

5.3 Results

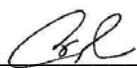
E.U.T. Description: Mobile AccessHX High-Power DAS Remote Unit
 Model No.: HX-C85P19L70A17-AC-A (C85=CELL; P19=PCS; L70=LTE; A17=AWS)
 Serial Number: Not Designated
 Specification: FCC Part 2, Section 1049

Modulation		Operating Frequency (MHz)	Reading (26dBc) (MHz)
WCDMA	Input	733	4.60
	Output	733	4.58
	Input	747	4.60
	Output	747	4.55
	Input	753	4.60
	Output	753	4.58
QPSK	Input	733	9.75
	Output	733	9.70
	Input	747	9.70
	Output	747	9.80
	Input	753	9.80
	Output	753	9.65
16QAM	Input	733	9.75
	Output	733	9.70
	Input	747	9.75
	Output	747	9.65
	Input	753	9.70
	Output	753	9.60
64QAM	Input	733	9.85
	Output	733	9.80
	Input	747	9.80
	Output	747	9.70
	Input	753	9.85
	Output	753	9.75

Figure 42 Occupied Bandwidth LTE

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 08.05.11

Typed/Printed Name: A. Sharabi

5.4 Test Equipment Used.

Occupied Bandwidth LTE

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8529L	3826A01204	February 21, 2011	1 year
Signal Generator	HP	E4438C	MY42082734	July 21, 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 43 Test Equipment Used

6. Spurious Emissions at Antenna Terminals LTE

6.1 Test Specification

FCC Part 27, Subpart C, Sections 27.53(c)(1) (3) 27.53 (g)

6.2 Test procedure

The power of any emission outside of the authorized operating frequency ranges 728 MHz-758 MHz must be attenuated below the transmitting power (P) by a factor of $43 + 10 \log (P)$ dB .

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (41dB).

The signal generator was configured for 0dBm output power and 10MHz LTE signal, modulated with W-CDMA, QPSK, 16QAM, 64QAM and 64QAM.

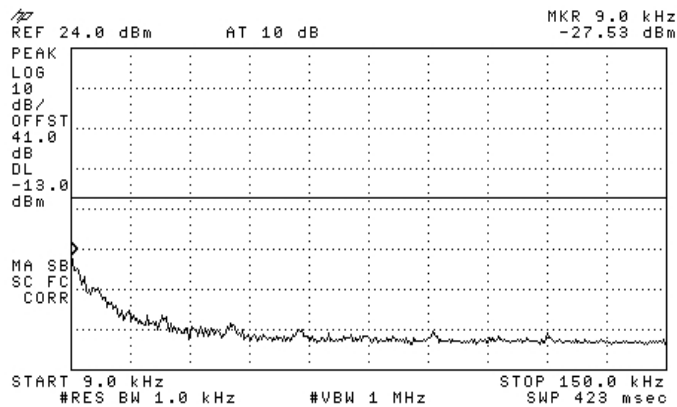


Figure 44.— 733 MHz W-CDMA

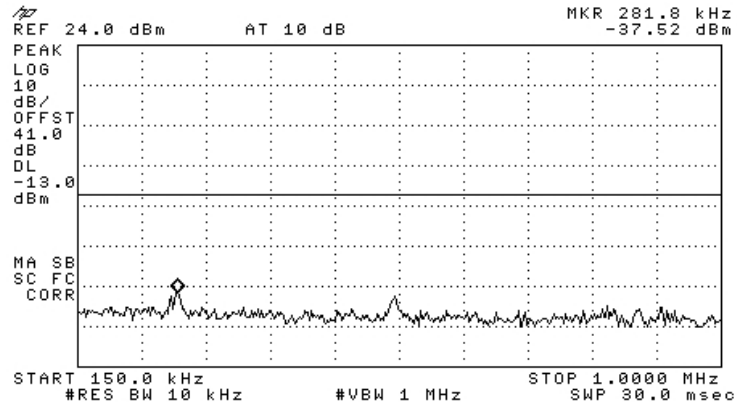


Figure 45.— 733 MHz W-CDMA

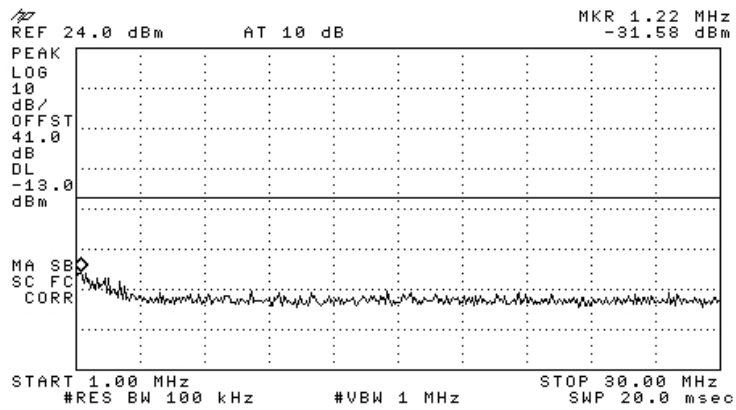


Figure 46.— 733 MHz W-CDMA

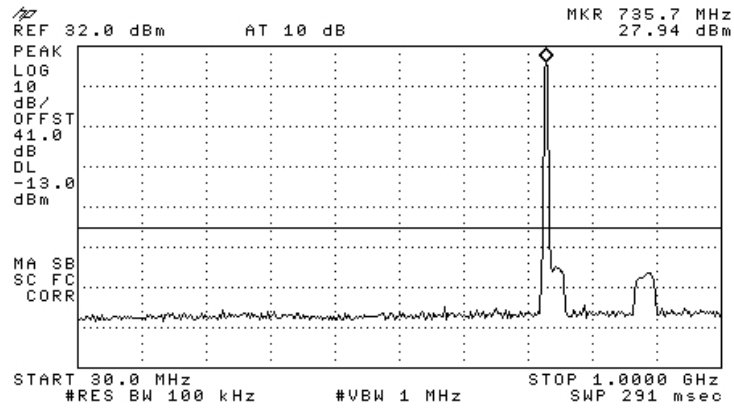


Figure 47.— 733 MHz W-CDMA

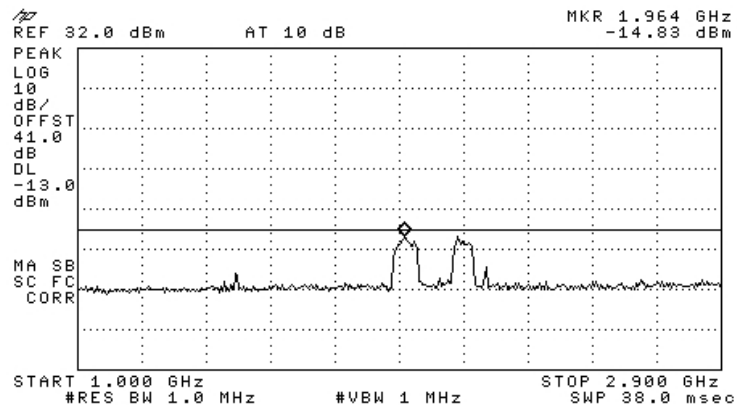


Figure 48.— 733 MHz W-CDMA

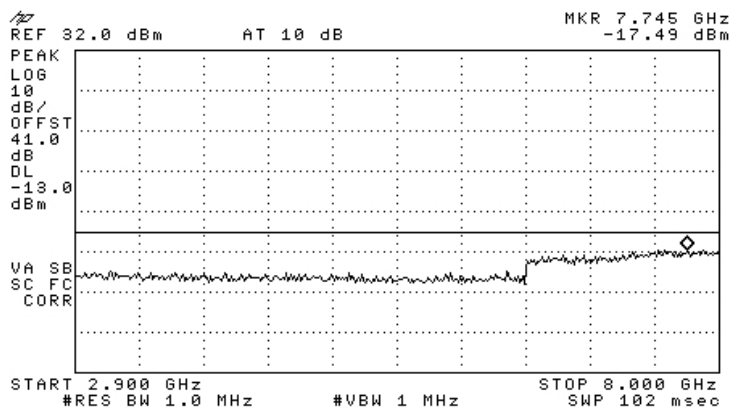


Figure 49.— 733 MHz W-CDMA

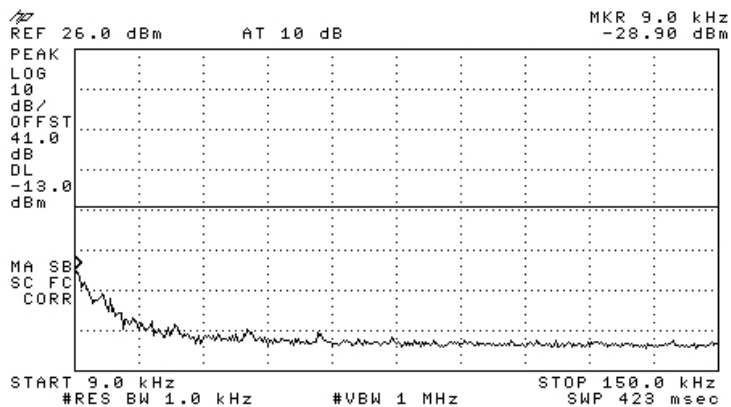


Figure 50.— 747 MHz W-CDMA

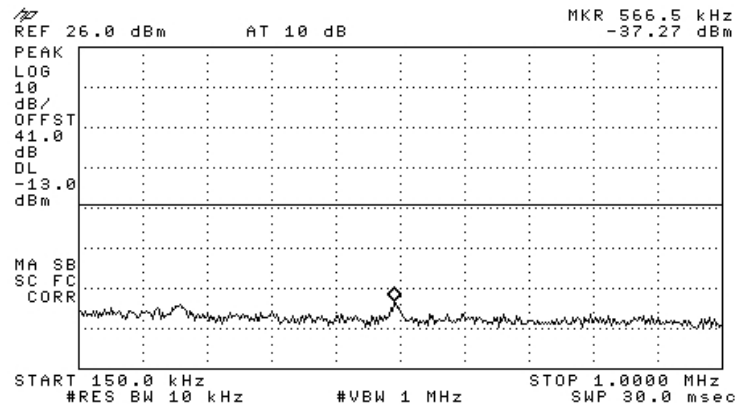


Figure 51.— 747 MHz W-CDMA

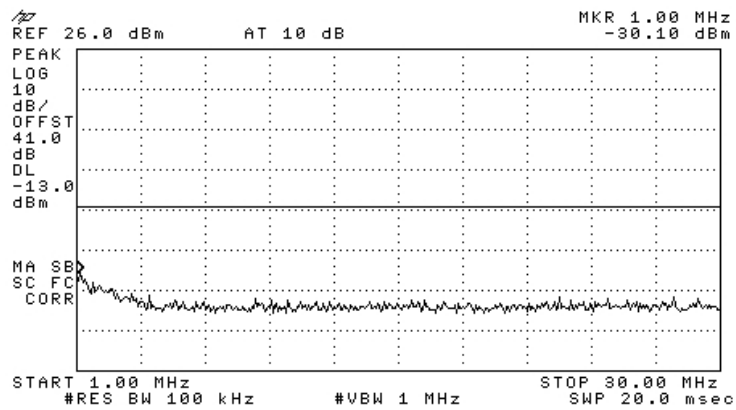


Figure 52.— 747 MHz W-CDMA

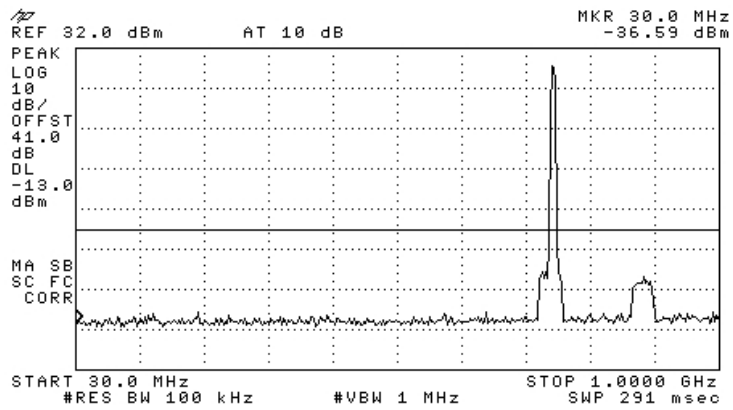


Figure 53.— 747 MHz W-CDMA

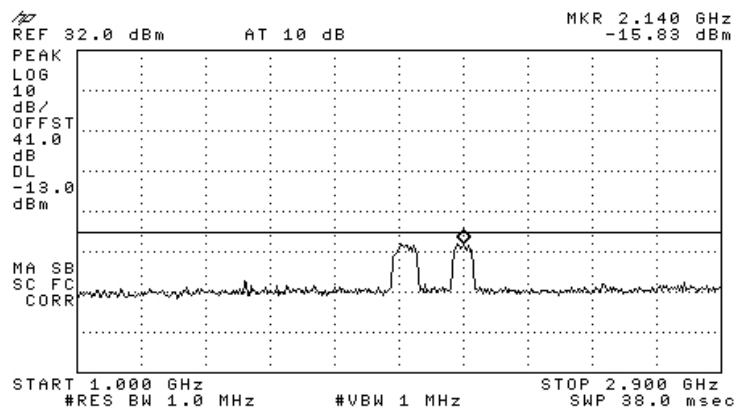


Figure 54.— 747 MHz W-CDMA

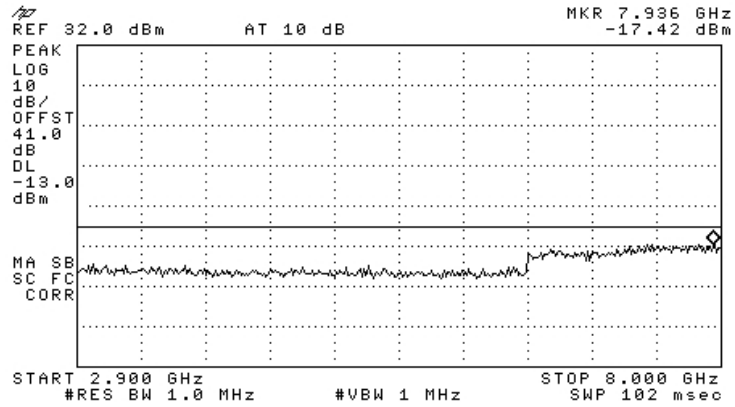


Figure 55.— 747 MHz W-CDMA

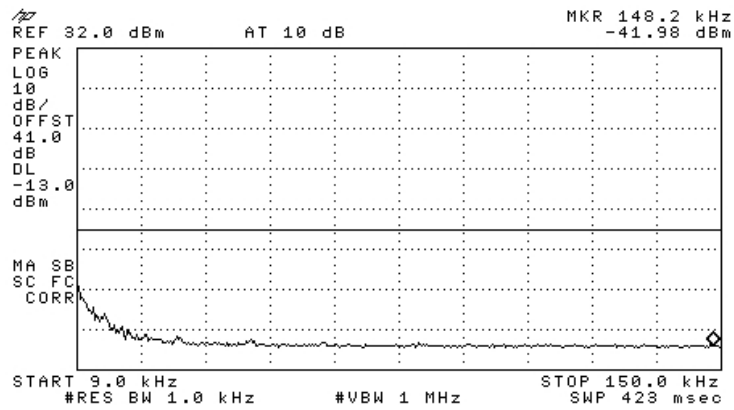


Figure 56.— 753 MHz W-CDMA

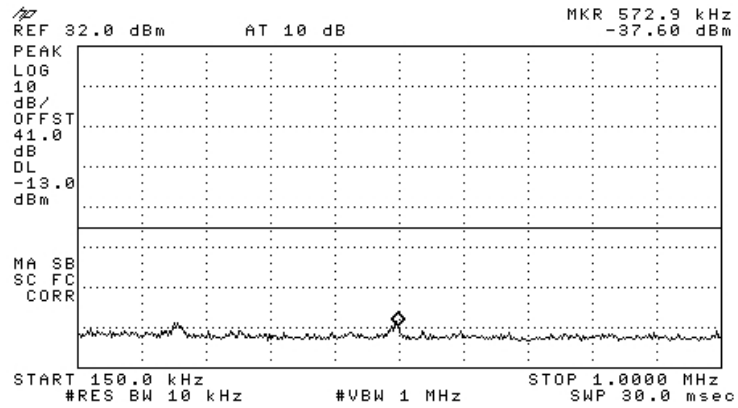


Figure 57.— 753 MHz W-CDMA

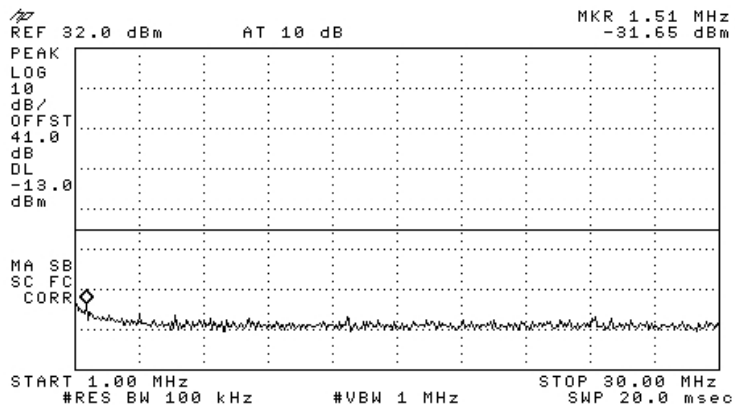


Figure 58.— 753 MHz W-CDMA

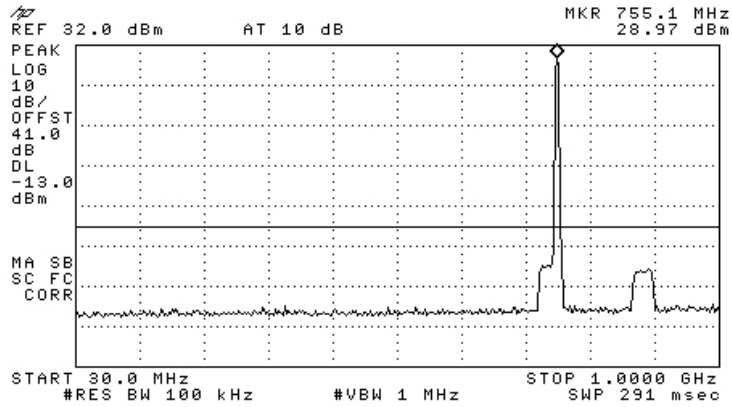


Figure 59.— 753 MHz W-CDMA

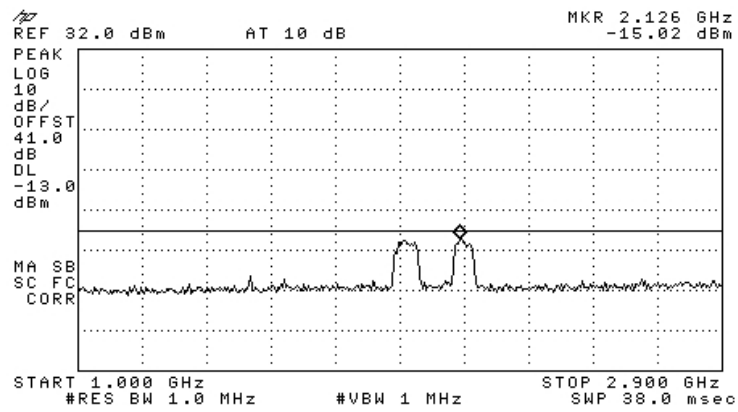


Figure 60.— 753 MHz W-CDMA

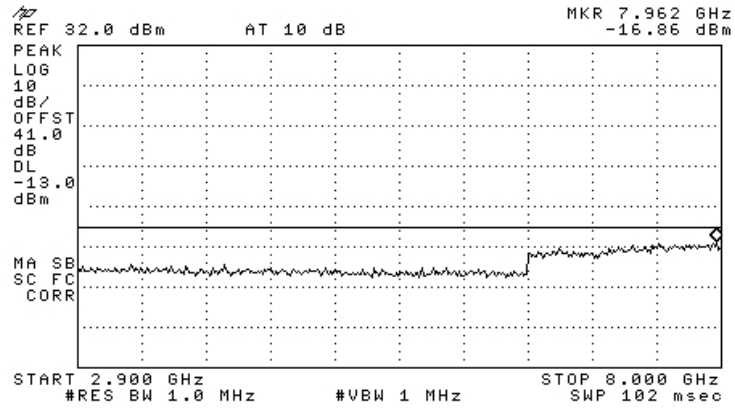


Figure 61.— 753 MHz W-CDMA

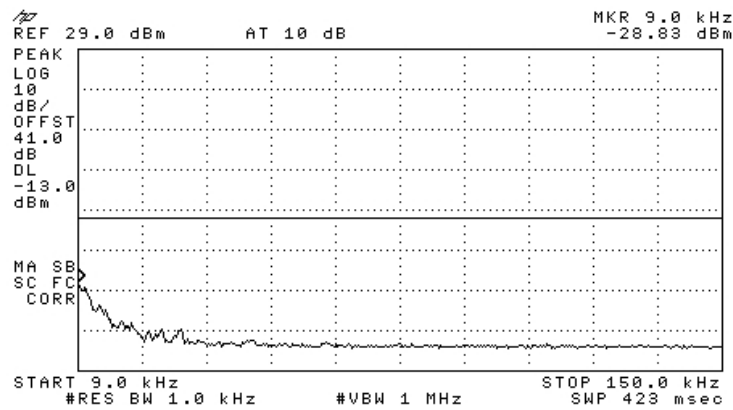


Figure 62.— 733 MHz QPSK

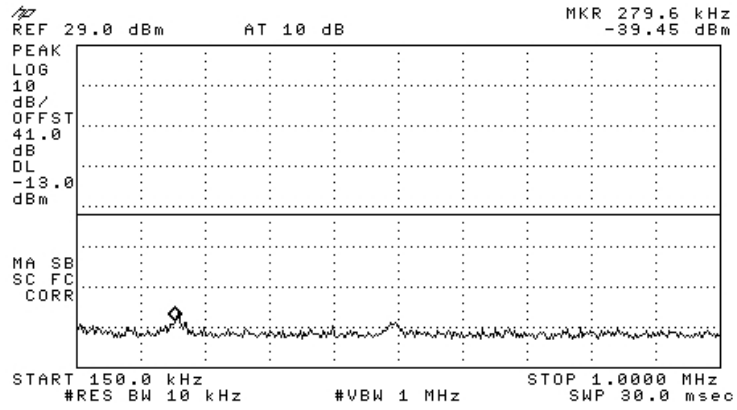


Figure 63.— 733 MHz QPSK

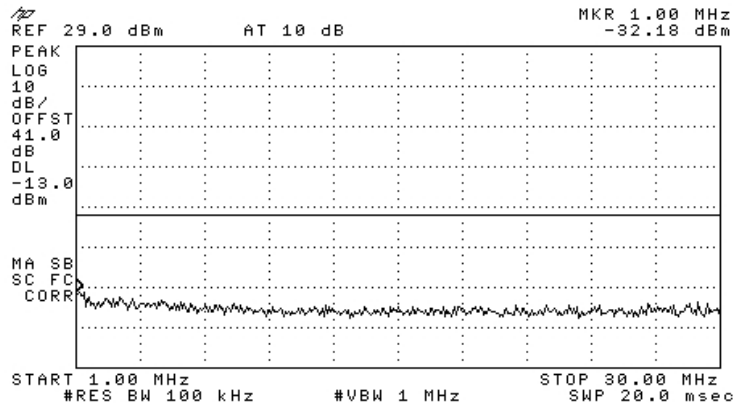


Figure 64.— 733 MHz QPSK

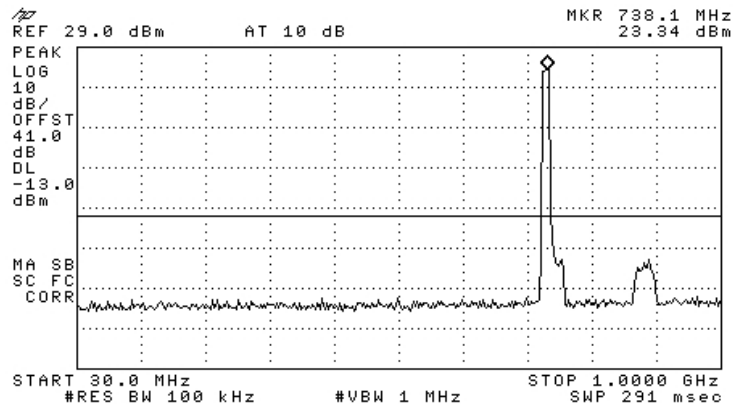


Figure 65.— 733 MHz QPSK

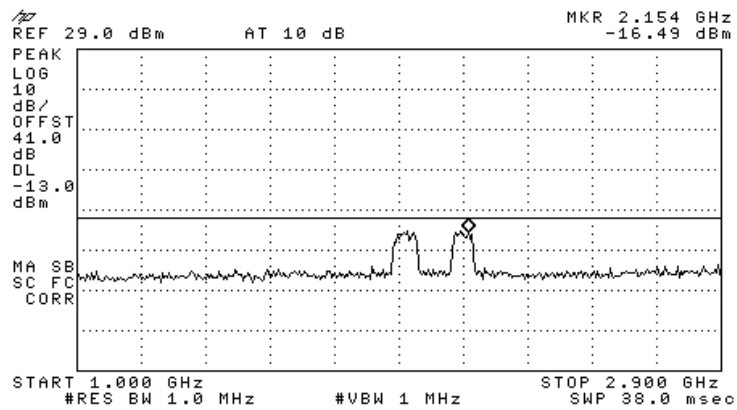


Figure 66.— 733 MHz QPSK

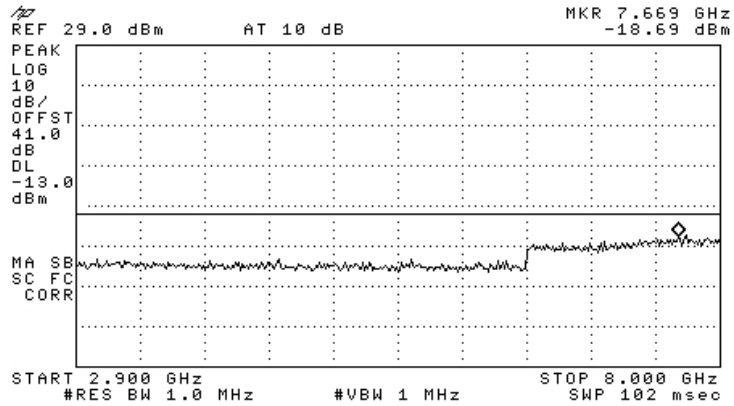


Figure 67.— 733 MHz QPSK

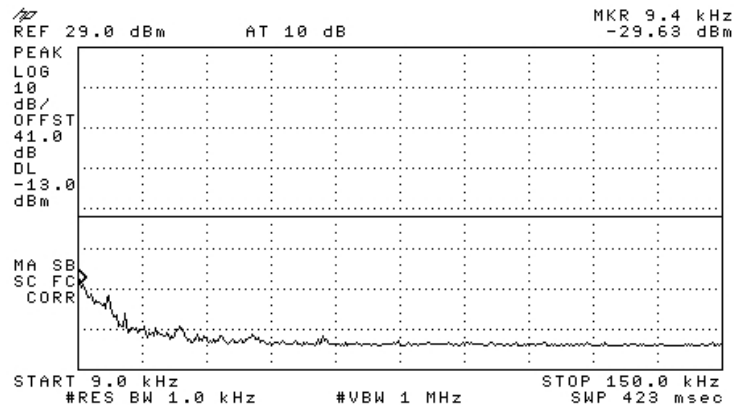


Figure 68.— 747 MHz QPSK

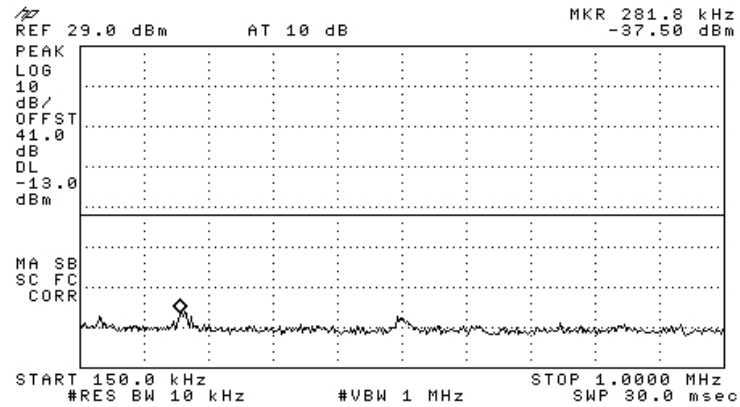


Figure 69.— 747 MHz QPSK

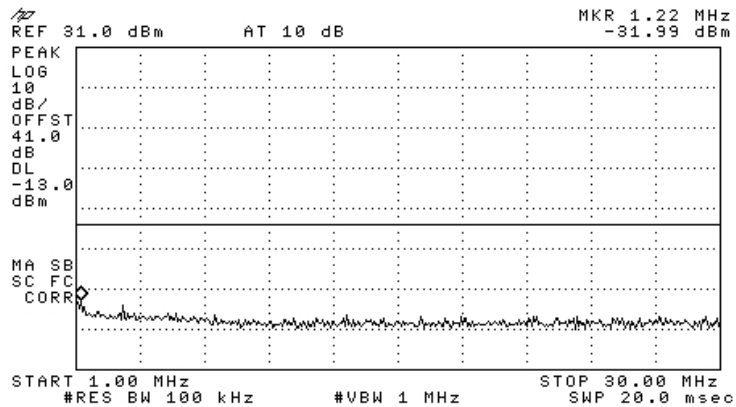


Figure 70.— 747 MHz QPSK

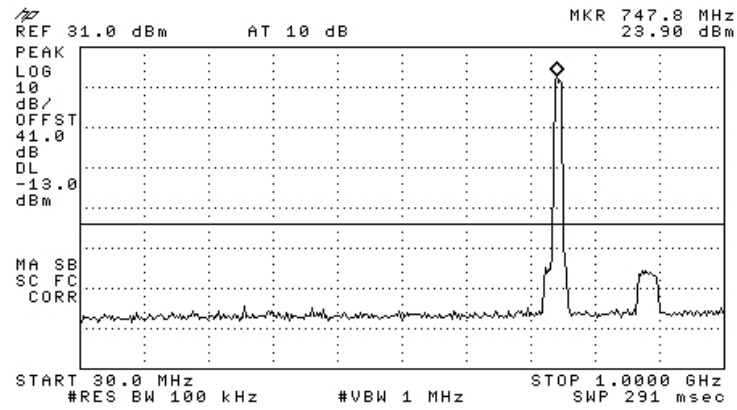


Figure 71.— 747 MHz QPSK

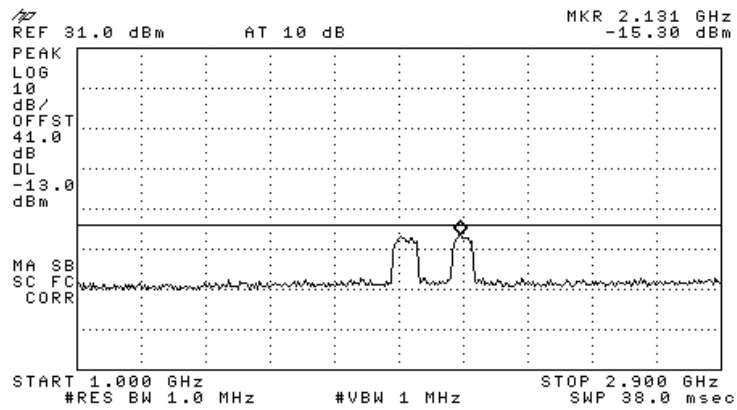


Figure 72.— 747 MHz QPSK

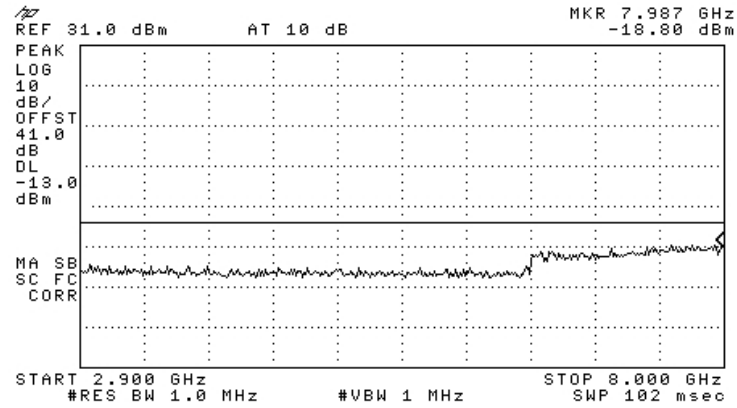


Figure 73.— 747 MHz QPSK

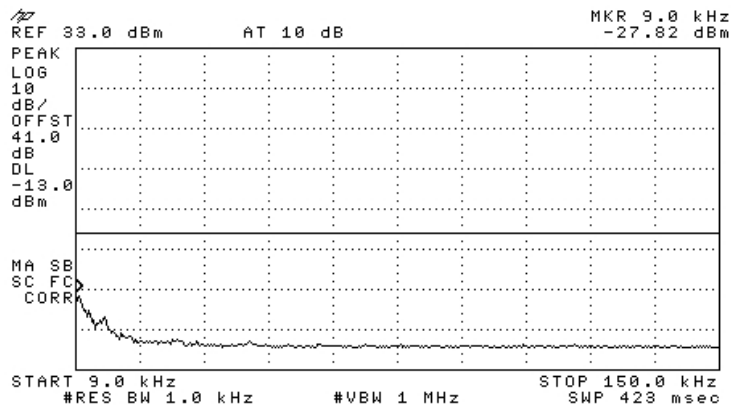


Figure 74.— 753 MHz QPSK

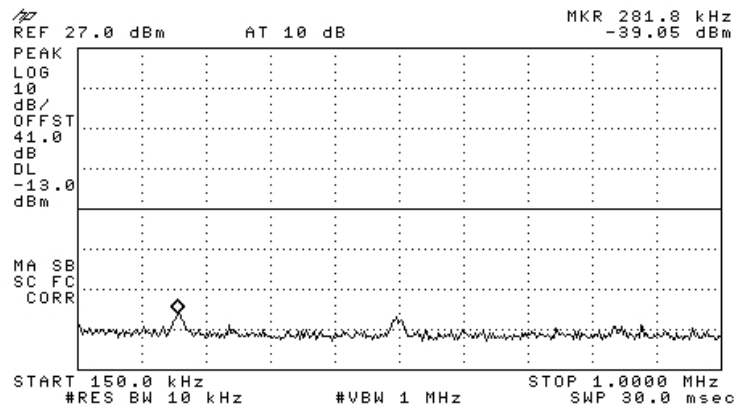


Figure 75.— 753 MHz QPSK

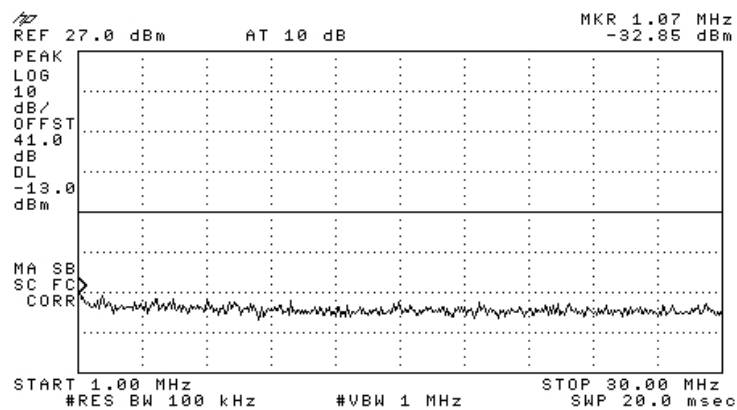


Figure 76.— 753 MHz QPSK

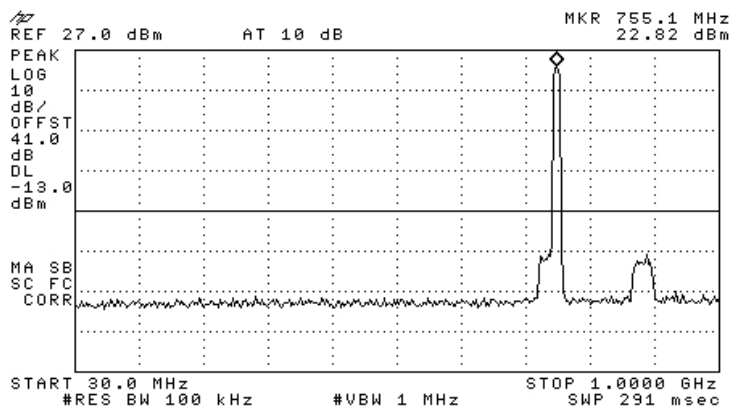


Figure 77.— 753 MHz QPSK

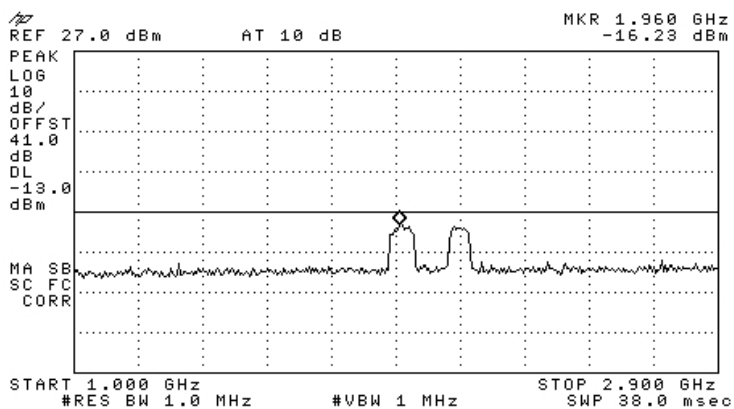


Figure 78.— 753 MHz QPSK

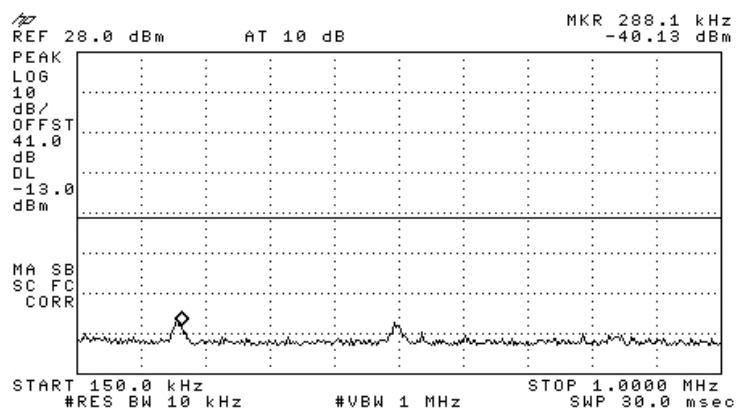


Figure 81.— 733 MHz 16QAM

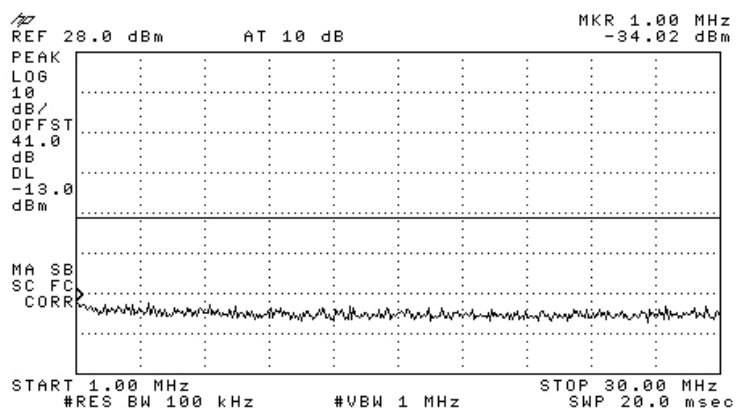


Figure 82.— 733 MHz 16QAM

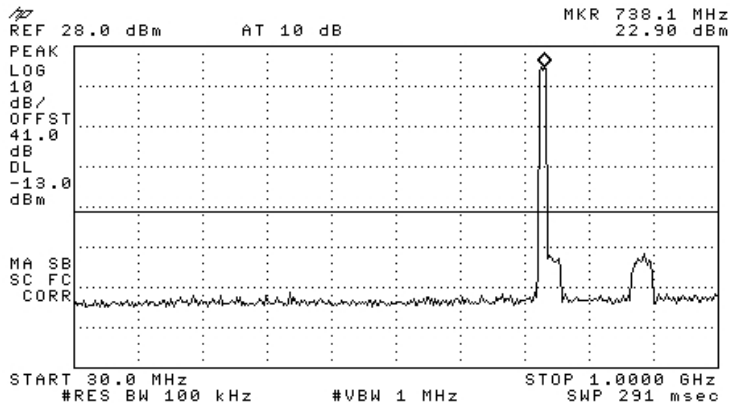


Figure 83.— 733 MHz 16QAM

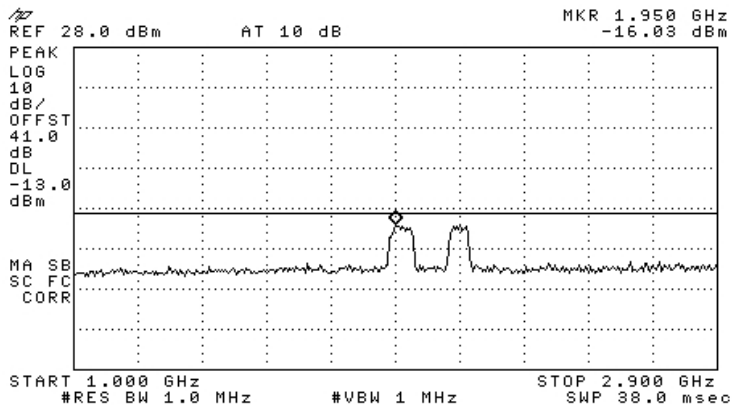


Figure 84.— 733 MHz 16QAM

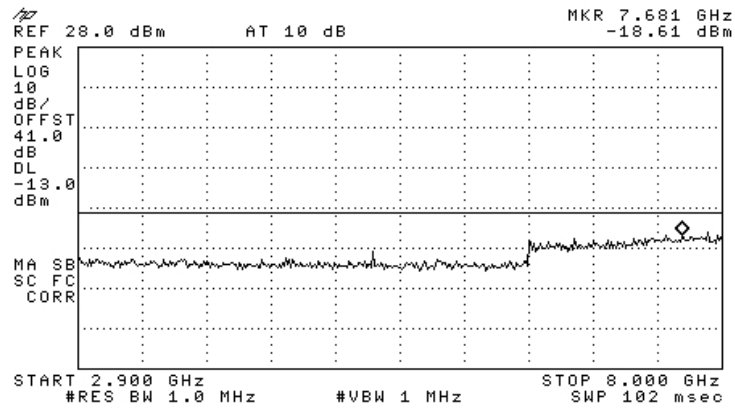


Figure 85.— 733 MHz 16QAM

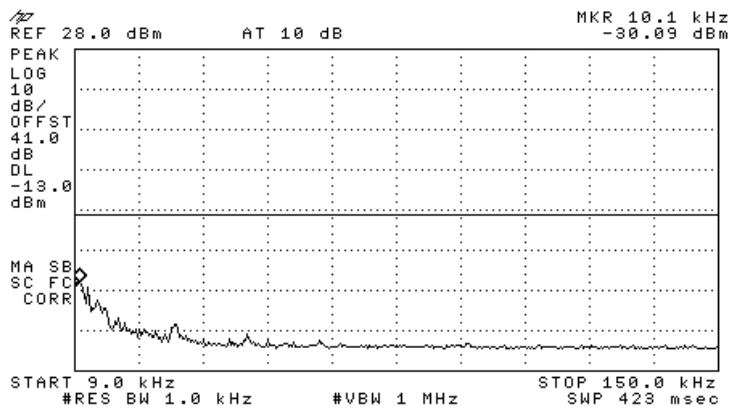


Figure 86.— 747 MHz 16QAM

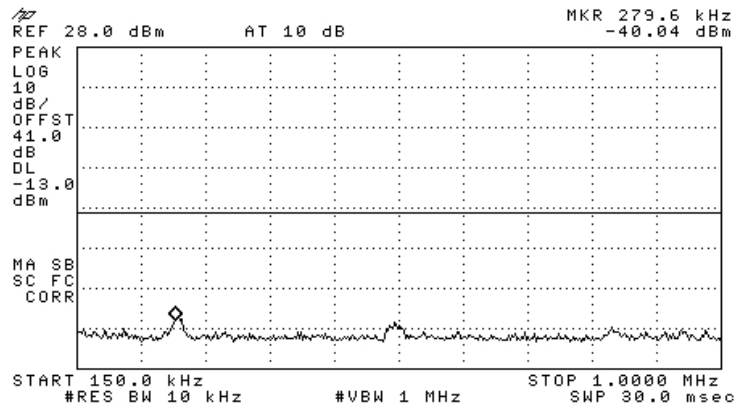


Figure 87.— 747 MHz 16QAM

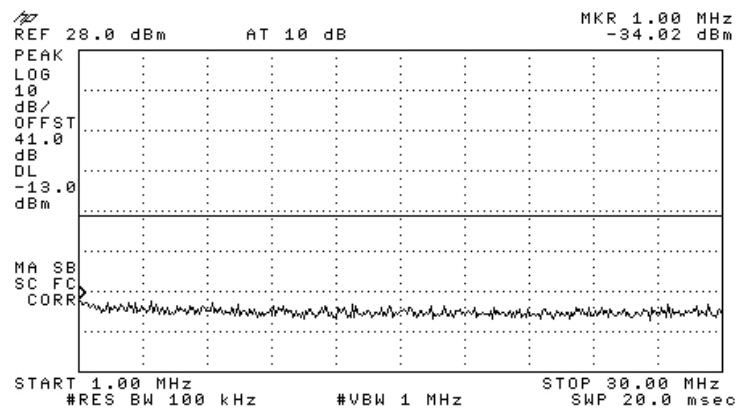


Figure 88.— 747 MHz 16QAM

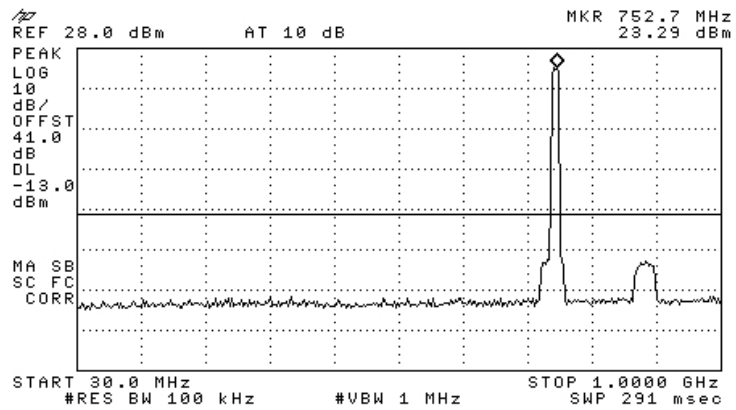


Figure 89.— 747 MHz 16QAM

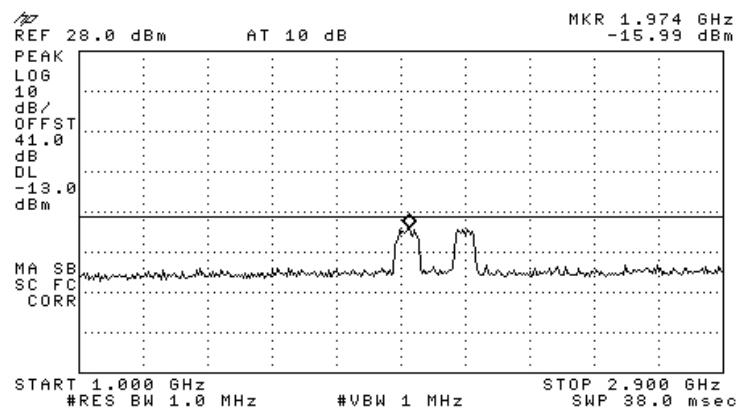


Figure 90.— 747 MHz 16QAM

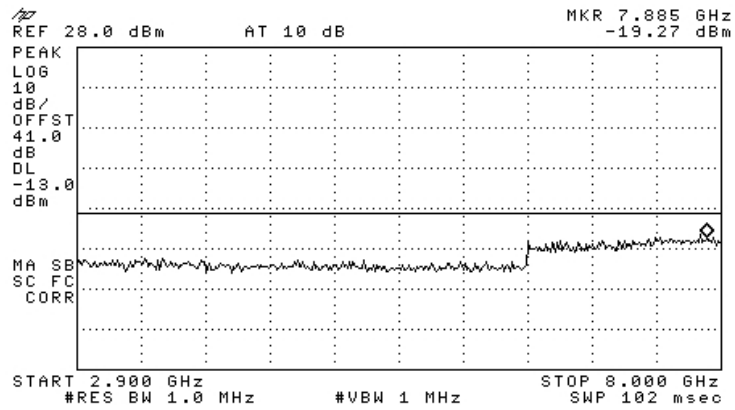


Figure 91.— 747 MHz 16QAM

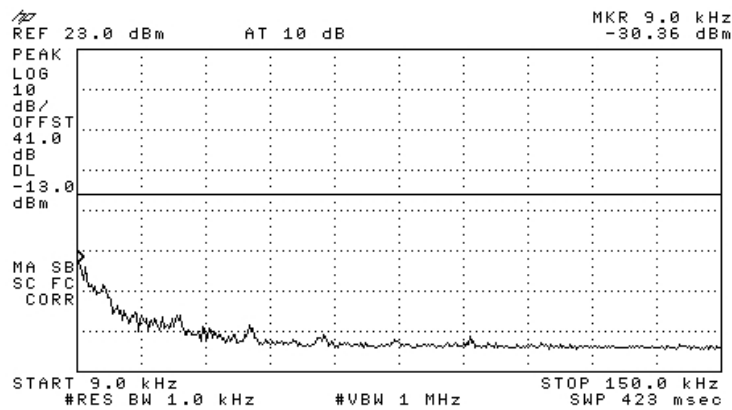


Figure 92.— 753 MHz 16QAM

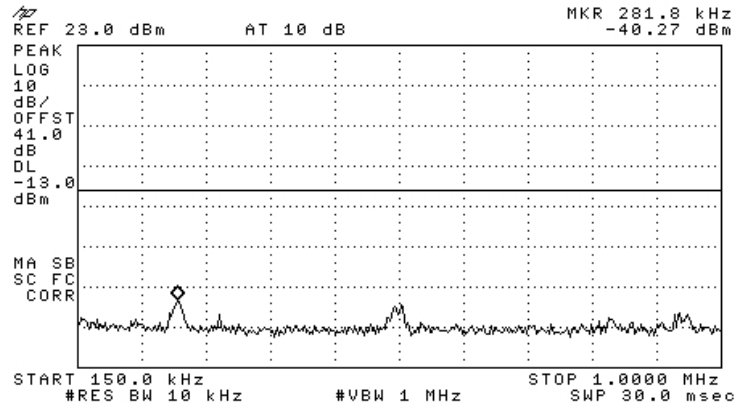


Figure 93.— 753 MHz 16QAM

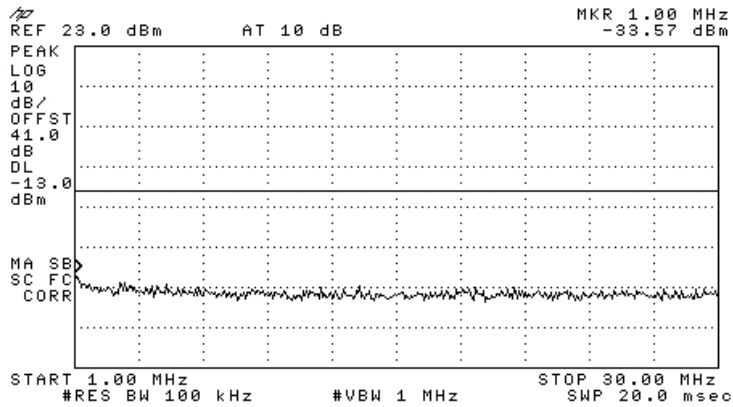


Figure 94.— 753 MHz 16QAM

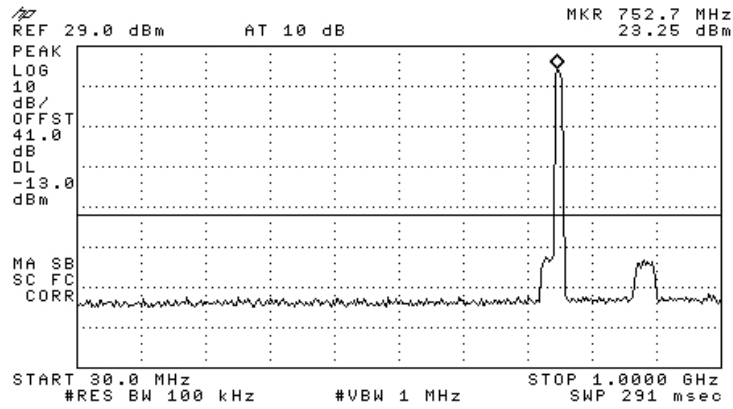


Figure 95.— 753 MHz 16QAM

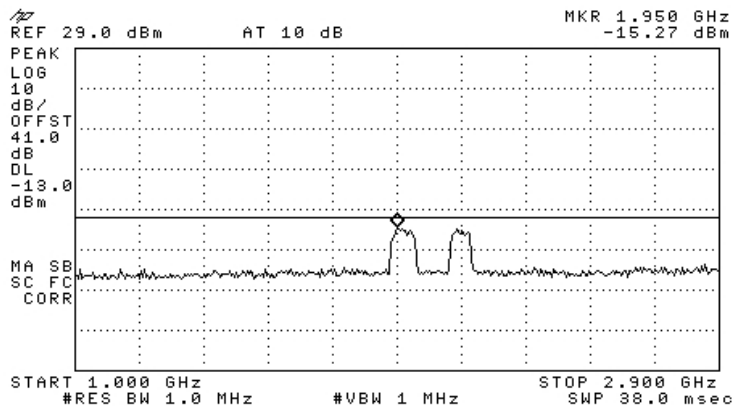


Figure 96.— 753 MHz 16QAM

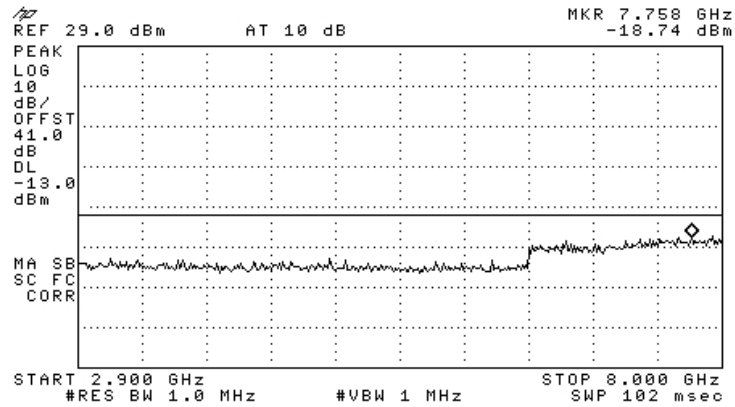


Figure 97.— 753 MHz 16QAM

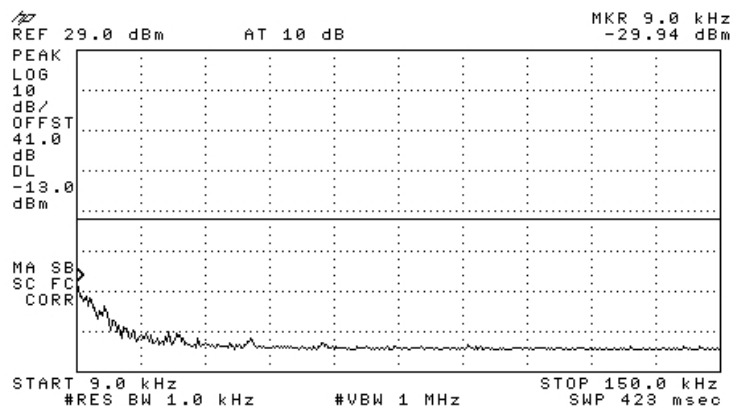


Figure 98.— 733 MHz 64QAM

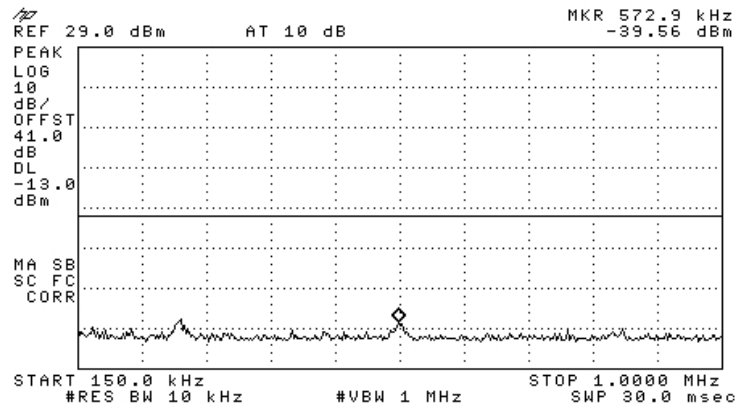


Figure 99.— 733 MHz 64QAM

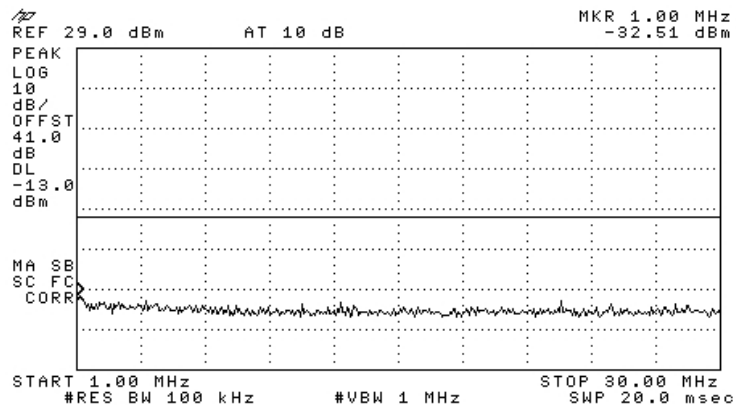


Figure 100.— 733 MHz 64QAM

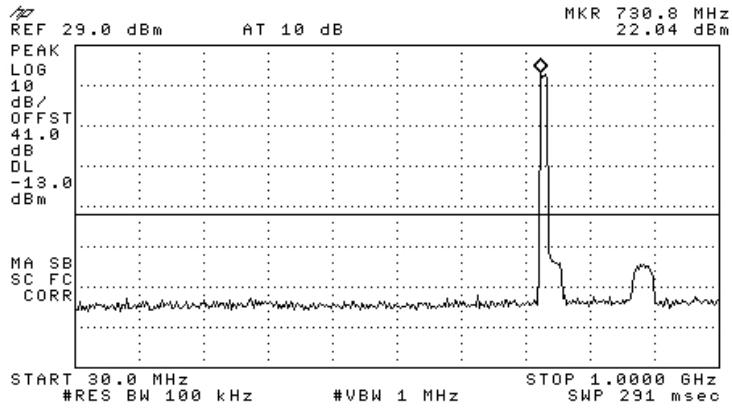


Figure 101.— 733 MHz 64QAM

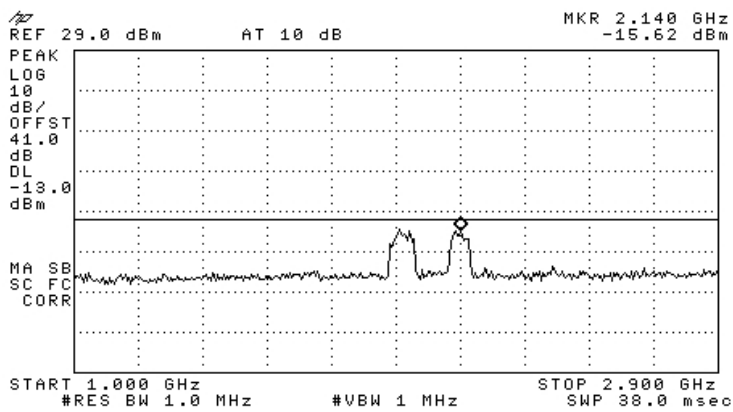


Figure 102.— 733 MHz 64QAM

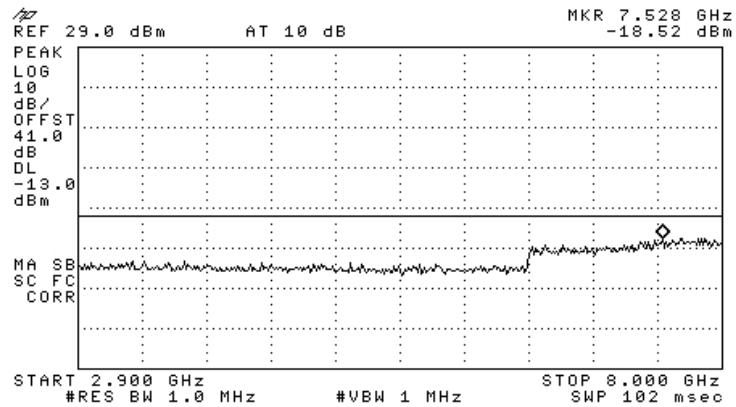


Figure 103.— 733 MHz 64QAM

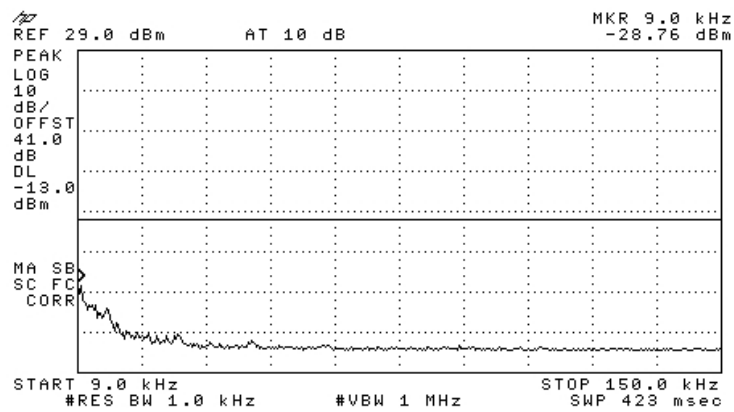


Figure 104.— 747 MHz 64QAM

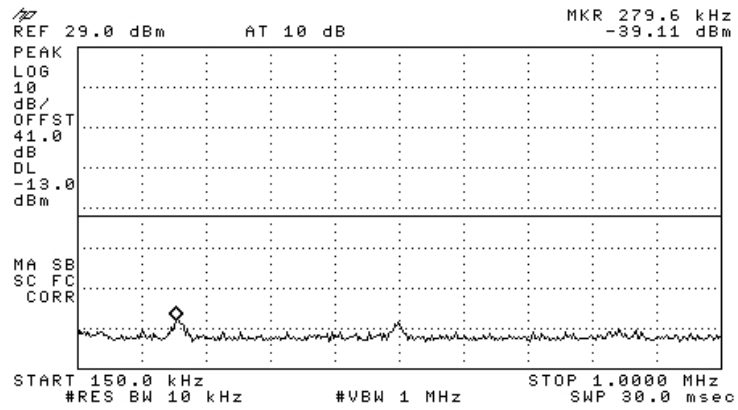


Figure 105.— 747 MHz 64QAM

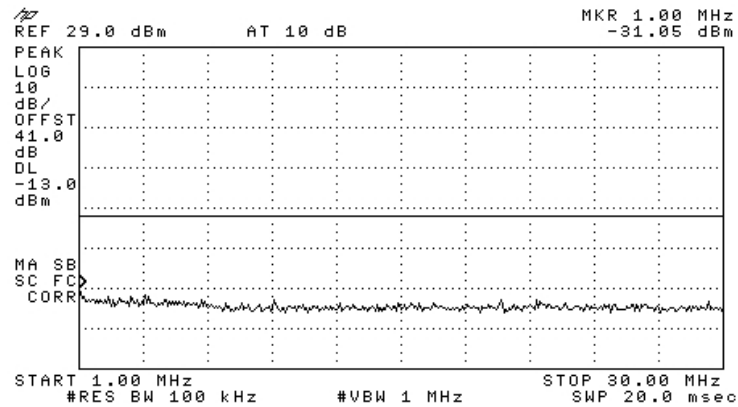


Figure 106.— 747 MHz 64QAM

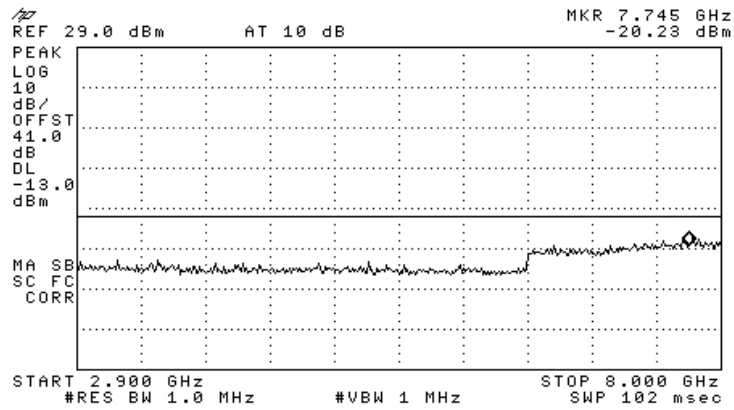


Figure 109.— 747 MHz 64QAM

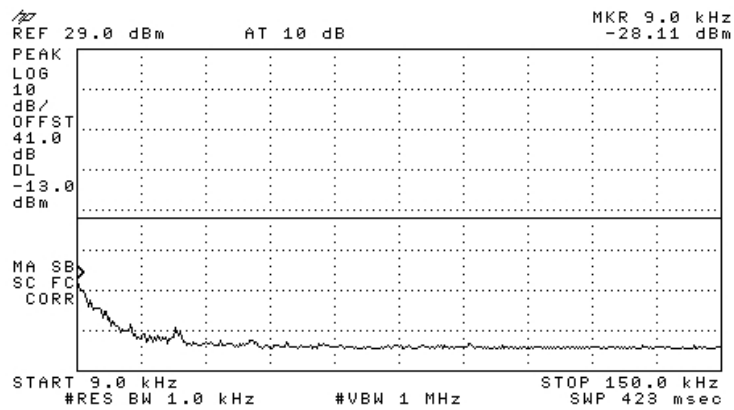


Figure 110.— 753 MHz 64QAM

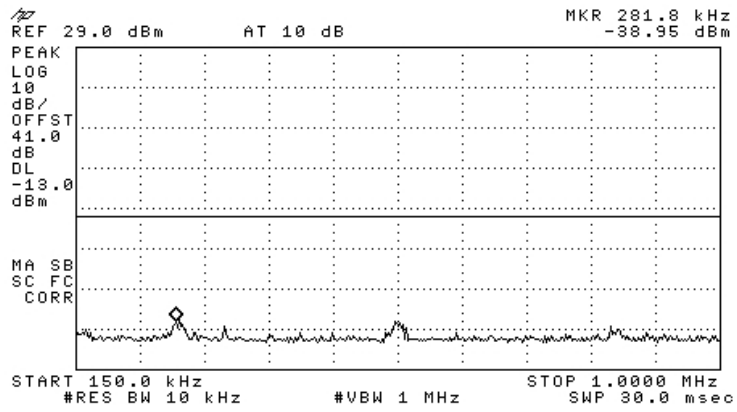


Figure 111.— 753 MHz 64QAM

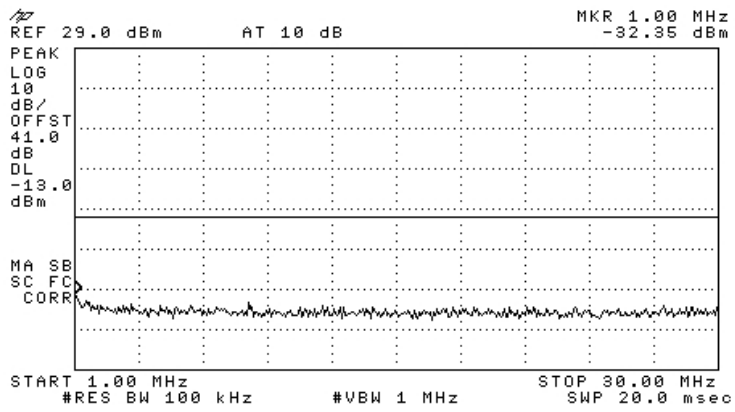


Figure 112.— 753 MHz 64QAM

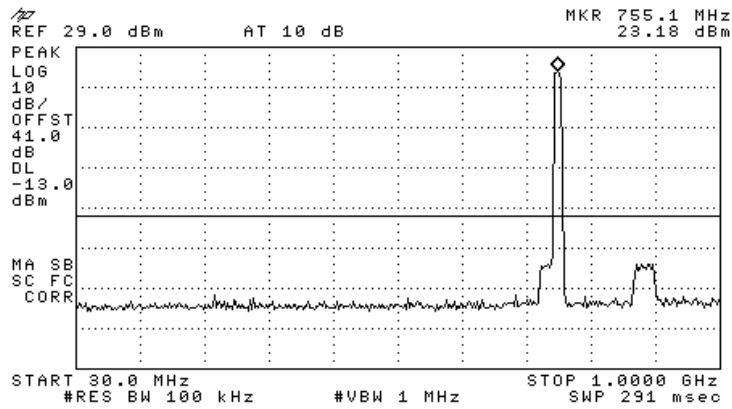


Figure 113.— 753 MHz 64QAM

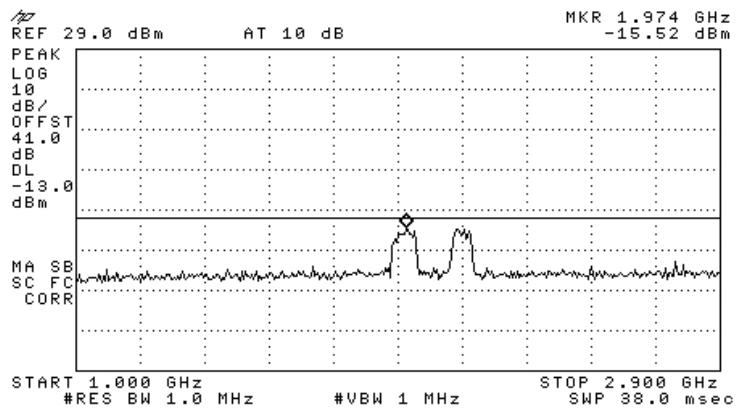


Figure 114.— 753 MHz 64QAM

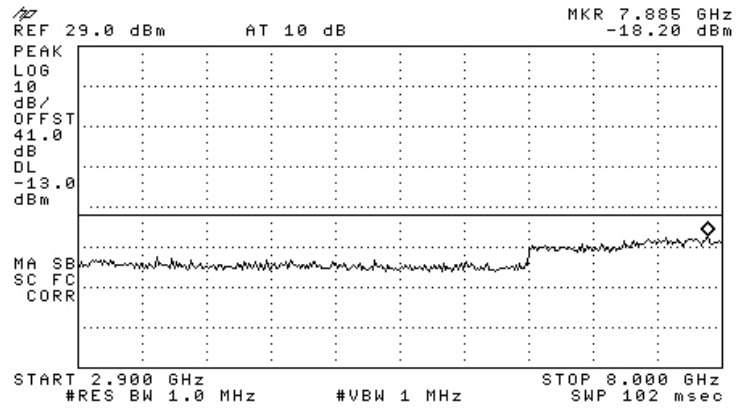


Figure 115.— 753 MHz 64QAM

6.3 Results


E.U.T. Description: Mobile AccessHX High-Power DAS Remote Unit
 Model No.: HX-C85P19L70A17-AC-A (C85=CELL; P19=PCS; L70=LTE; A17=AWS)
 Serial Number: Not Designated
 Specification: FCC Part 27, Subpart C, Sections 27.53(c)(1) (3) 27.53 (g)

	Operation Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
W-CDMA	733	-14.83	-13.0	-1.83
	747	-15.83	-13.0	-2.83
	753	-15.02	-13.0	-2.02
QPSK	733	-16.49	-13.0	-3.49
	747	-15.30	-13.0	-2.30
	753	-16.23	-13.0	-3.23
16QAM	733	-16.03	-13.0	-3.03
	747	-15.99	-13.0	-2.99
	753	-15.27	-13.0	-2.27
64QAM	733	-15.62	-13.0	-2.62
	747	-16.06	-13.0	-3.06
	753	-15.52	-13.0	-2.52

Figure 116 Spurious Emissions at Antenna Terminals Results LTE

JUDGEMENT: Passed by 1.83 dB

TEST PERSONNEL:

Tester Signature: 

Date: 08.05.11

Typed/Printed Name: A. Sharabi

6.4 Test Equipment Used.

Spurious Emissions at Antenna Terminals LTE

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8529L	3826A01204	February 21, 2011	1 year
Signal Generator	HP	E4438C -	MY42082734	July 21, 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 117 Test Equipment Used

7. Band Edge Spectrum LTE

7.1 Test Specification

FCC Part 27, Subpart C, Section 27.53 (c)(1)

7.2 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 -13 dBm.

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (41.0 dB).

The spectrum analyzer was set to 30kHz R.B.W.

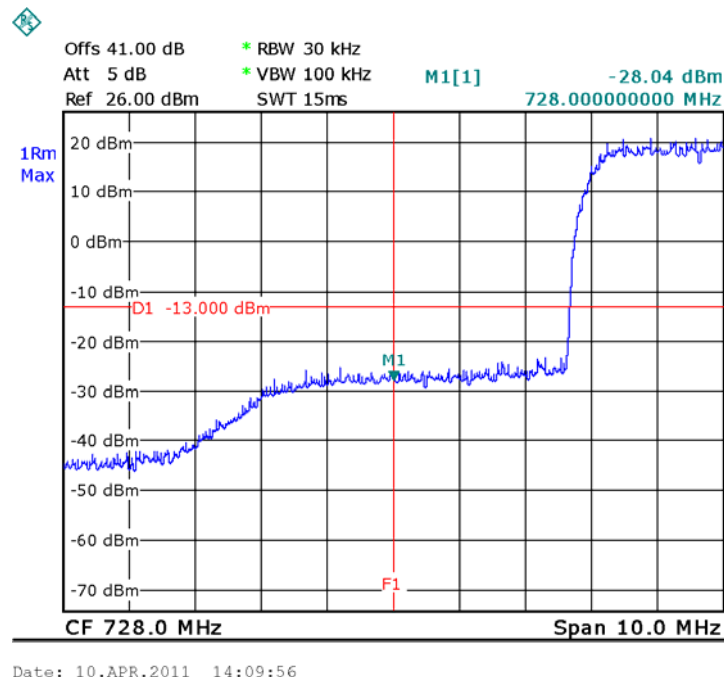
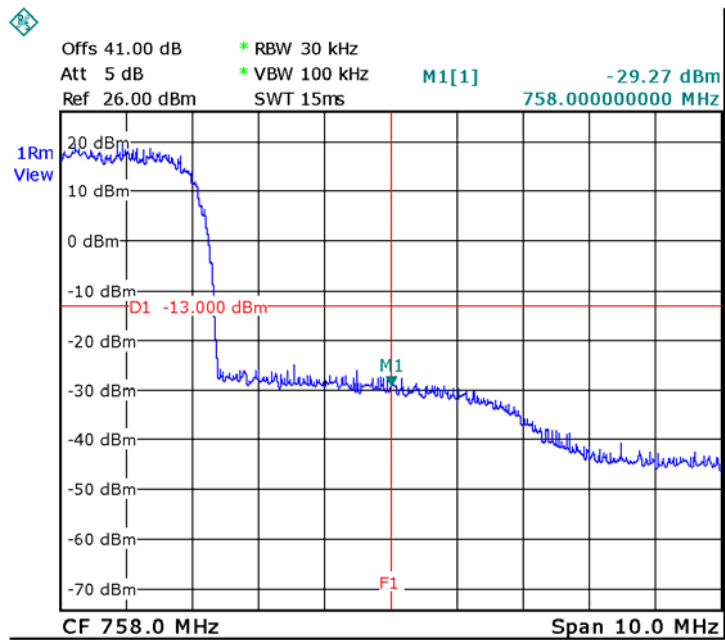
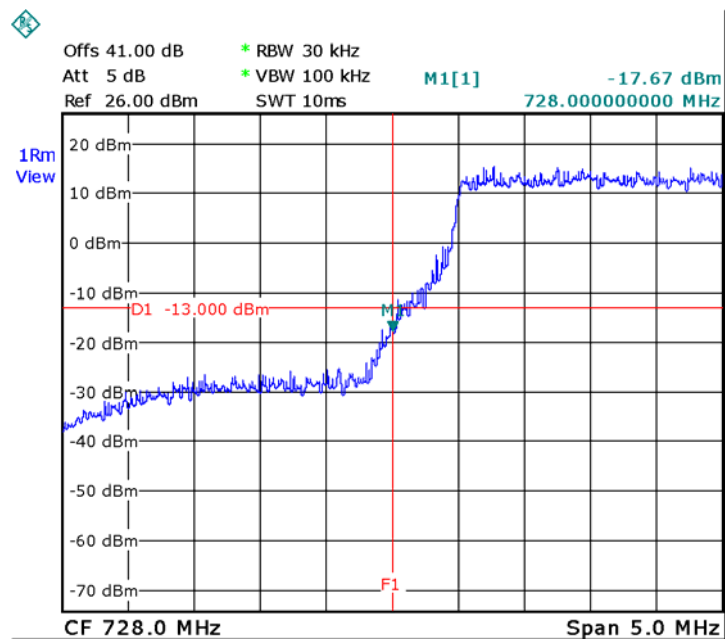


Figure 118.— W-CDMA 733.0 MHz



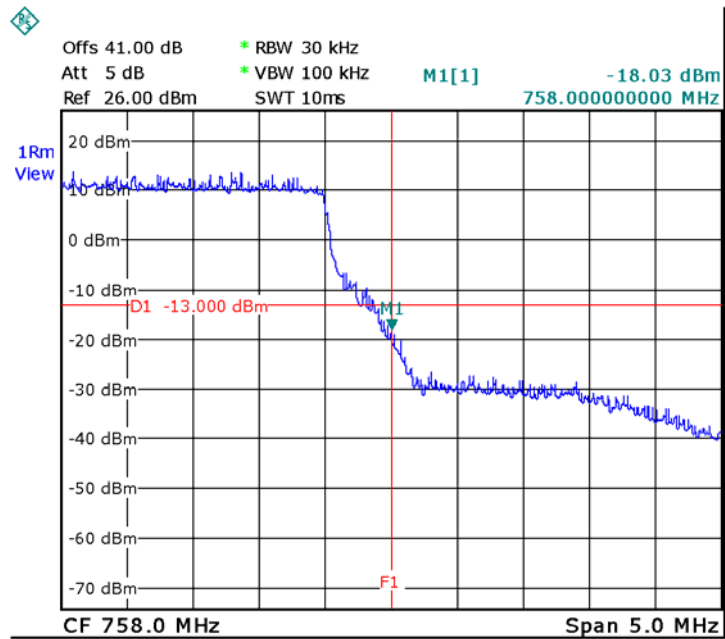
Date: 10.APR.2011 14:08:49

Figure 119.— W-CDMA 753.0 MHz



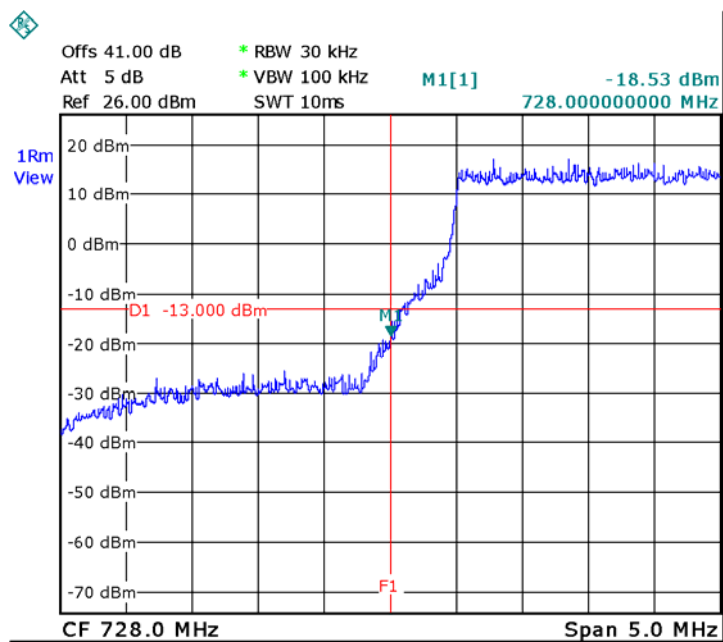
Date: 10.APR.2011 13:51:19

Figure 120.— QPSK 733.0 MHz



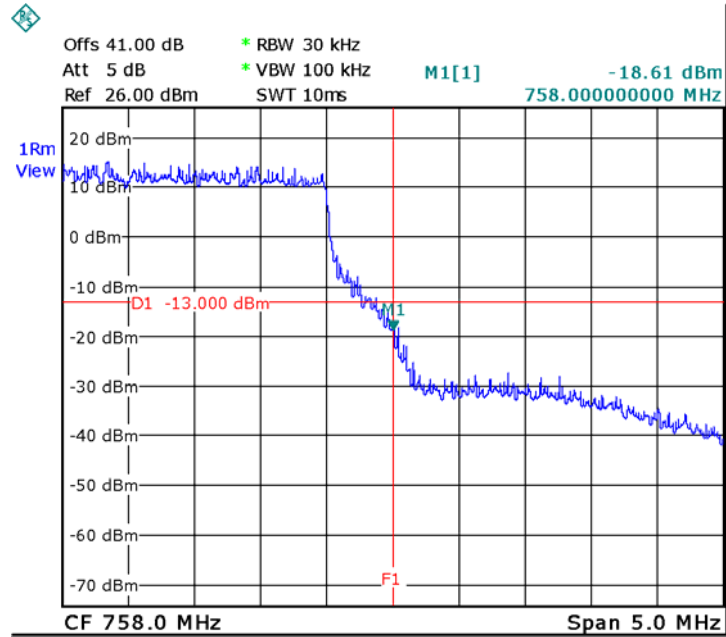
Date: 10.APR.2011 13:53:52

Figure 121.— QPSK 753.0 MHz



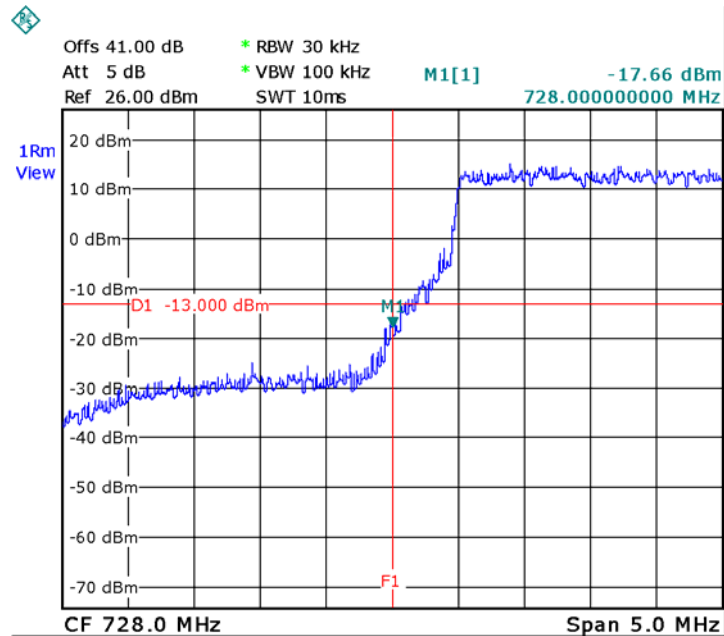
Date: 10.APR.2011 13:56:55

Figure 122.— 16QAM 733.0 MHz



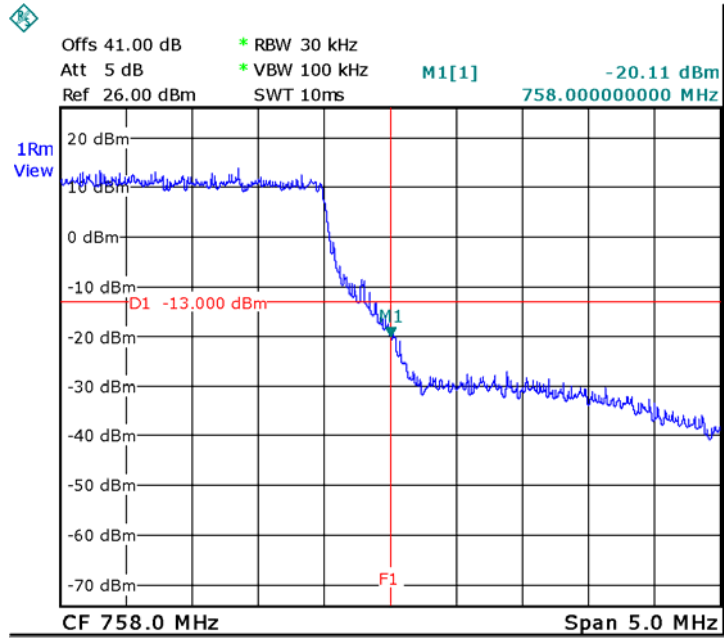
Date: 10.APR.2011 13:55:45

Figure 123.— 16QAM 753.0 MHz



Date: 10.APR.2011 13:58:14

Figure 124.— 64QAM 733.0 MHz



Date: 10.APR.2011 13:59:30

Figure 125.— 64QAM 753.0 MHz

7.3 Results

E.U.T. Description: Mobile AccessHX High-Power DAS Remote Unit
 Model No.: HX-C85P19L70A17-AC-A (C85=CELL; P19=PCS; L70=LTE; 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)
WCDMA	733.00	728.00	-28.04	-13.0
WCDMA	753.00	758.00	-29.27	-13.0
QPSK	733.00	728.00	-17.67	-13.0
QPSK	753.00	758.00	-18.03	-13.0
16QAM	733.00	728.00	-18.53	-13.0
16QAM	753.00	758.00	-18.61	-13.0
64QAM	733.00	728.00	-17.66	-13.0
64QAM	753.00	758.00	-20.11	-13.0

Figure 126 Band Edge Spectrum Results LTE

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 08.05.11

Typed/Printed Name: A. Sharabi

7.4 Test Equipment Used.

Band Edge Spectrum

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	RHODE& SCHWARZ	FSL6	100194	July 22, 2010	1 year
Signal Generator	HP	E4438C	MY42082734	July 21, 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 127 Test Equipment Used

8. Spurious Radiated Emission LTE

8.1 Test Specification

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

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 (728-758 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, 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:

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

P_d = Dipole equivalent power (result).


P_g = Signal generator output level.

8.3 Test Results

JUDGEMENT: Passed by 36.52 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: 08.05.11

Typed/Printed Name: A. Sharabi

Carrier Channel (MHz)	Freq. (MHz)	Antenna Pol.	Maximum Peak Level (dB μ V/m)	Signal Generator RF Output (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Effective Radiated Power Level (dBm)	Spec. (dBm)	Margin (dB)
733.00	1466.00	V	45.65	-55.64	5.15	7.6	-53.19	-13.0	-40.19
733.00	1466.00	H	48.94	-52.49	5.15	7.6	-50.04	-13.0	-37.04
747.00	1494.00	V	47.64	-53.65	5.15	7.6	-51.2	-13.0	-38.20
747.00	1494.00	H	48.61	-52.82	5.15	7.6	-50.37	-13.0	-37.37
753.00	1506.00	V	49.32	-51.97	5.15	7.6	-49.52	-13.0	-36.52
753.00	1506.00	H	47.32	-54.11	5.15	7.6	-51.66	-13.0	-38366

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	MY42082734	July 21, 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.

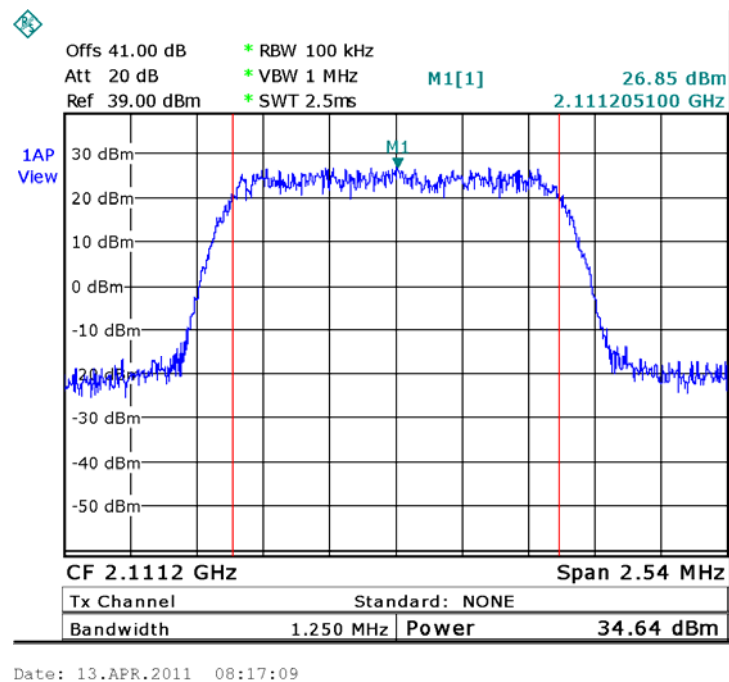
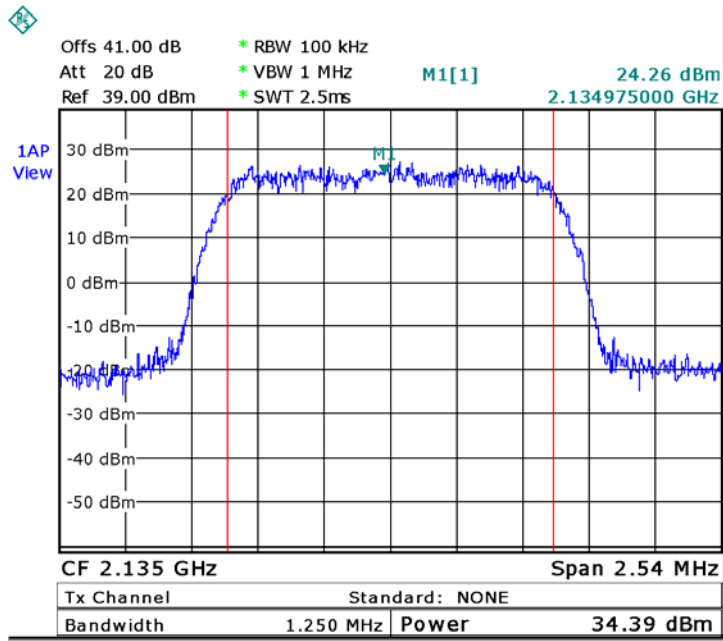
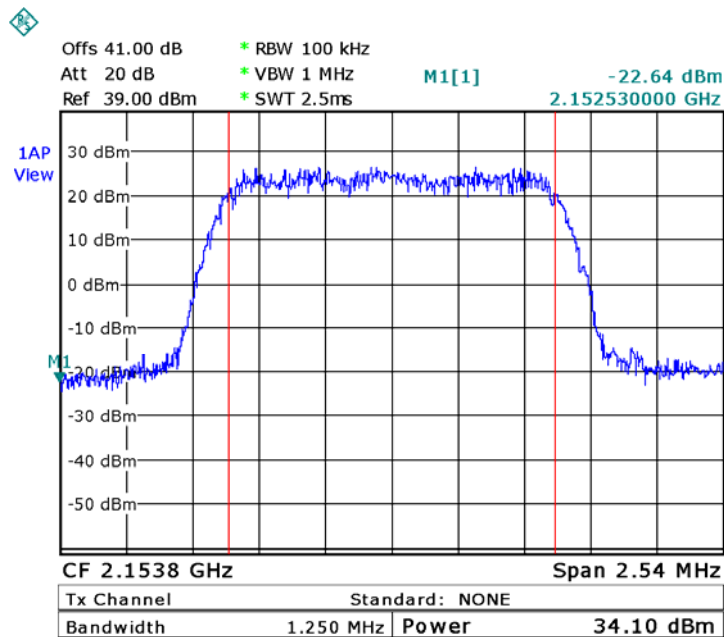


Figure 128.— CDMA (2111.2 MHz)



Date: 13.APR.2011 08:15:49

Figure 129.— CDMA (2135.0 MHz)



Date: 13.APR.2011 08:18:28

Figure 130.— CDMA (2153.8 MHz)

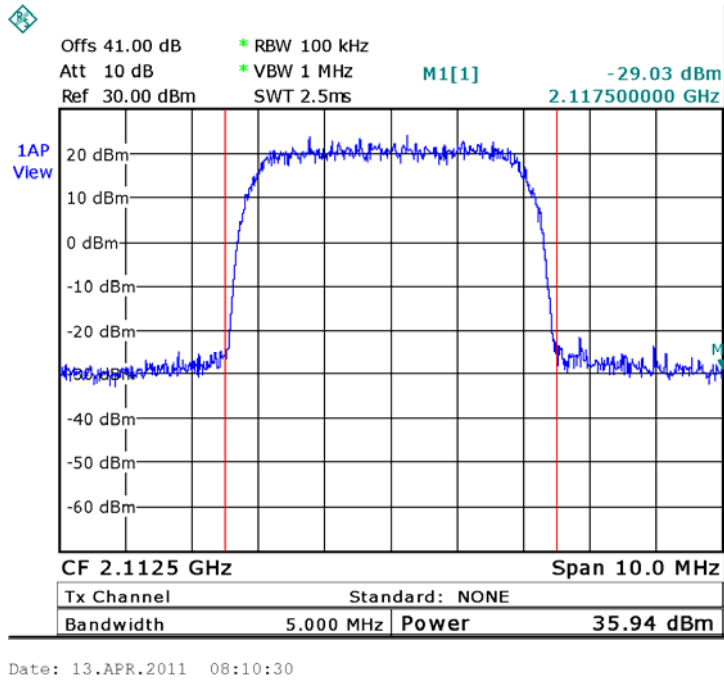


Figure 131.— W-CDMA (2112.5 MHz)

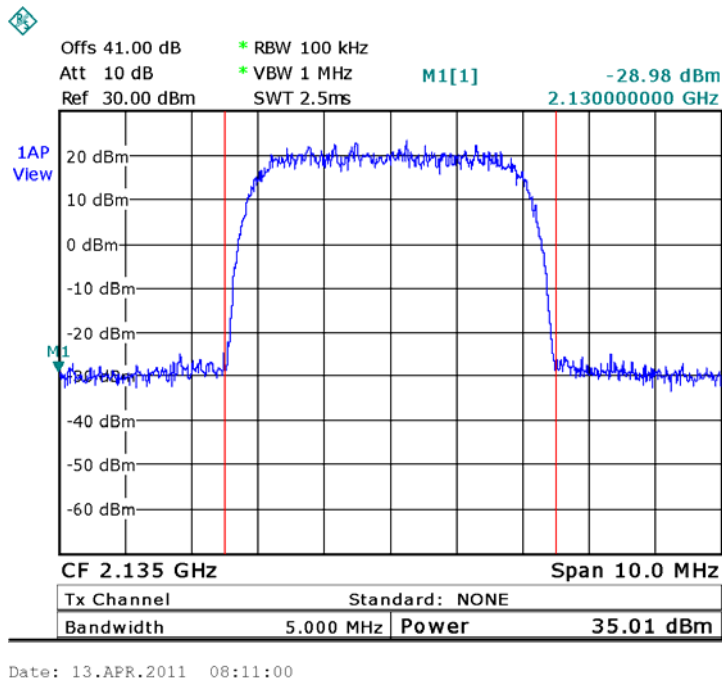
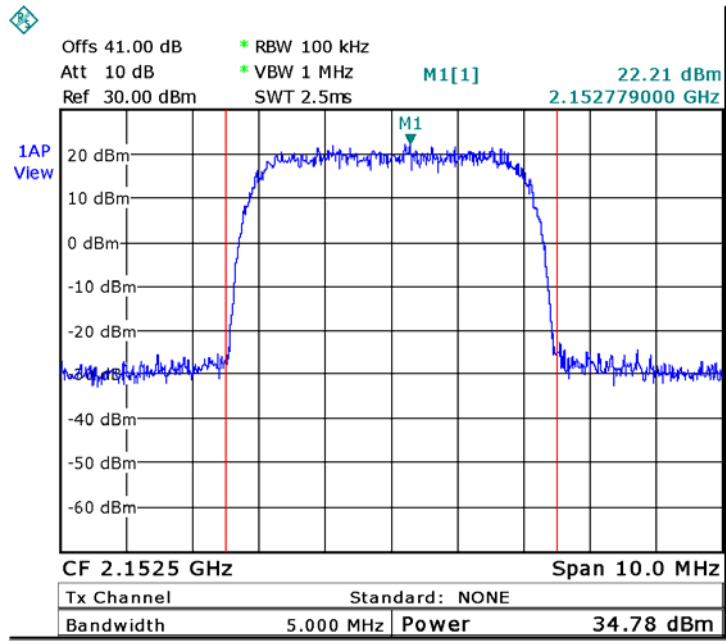


Figure 132.— W-CDMA (2135.0 MHz)



Date: 13.APR.2011 08:09:36

Figure 133.— W-CDMA (2152.5 MHz)

9.3 Results

E.U.T. Description: Mobile AccessHX High-Power DAS Remote Unit
 Model No.: HX-C85P19L70A17-AC-A (C85=CELL; P19=PCS; L70=LTE; 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	34.64
CDMA	2135.0	34.39
CDMA	2153.8	34.10
WCDMA	2112.5	35.94
WCDMA	2135.0	35.01
WCDMA	2152.5	34.78

Figure 134 RF Power Output AWS

TEST PERSONNEL:

Tester Signature: 

Date: 08.05.11

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 135 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.

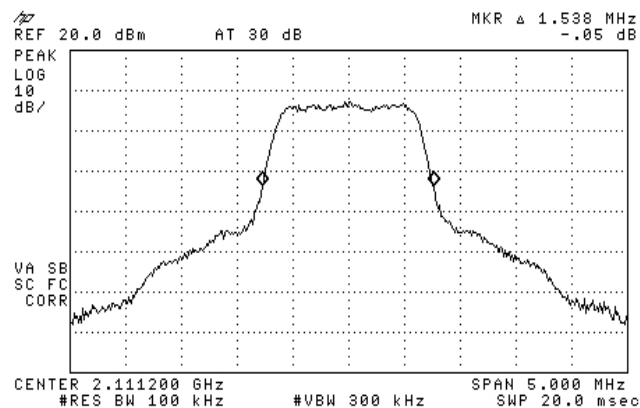


Figure 136.— CDMA (2111.20 MHz) IN

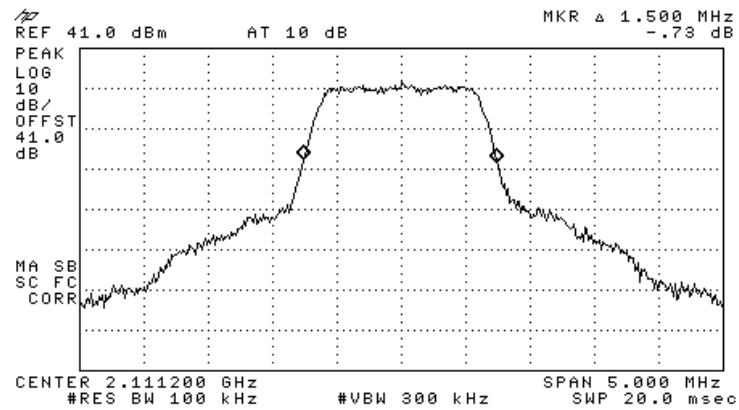


Figure 137.— CDMA (2112.0 MHz) OUT

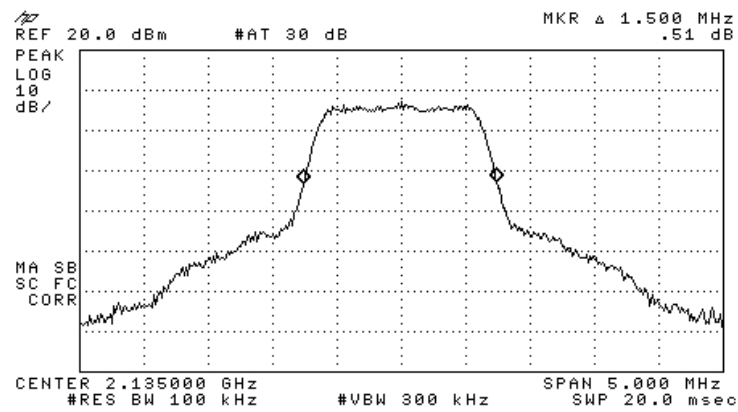


Figure 138.— CDMA (2135.0 MHz) IN

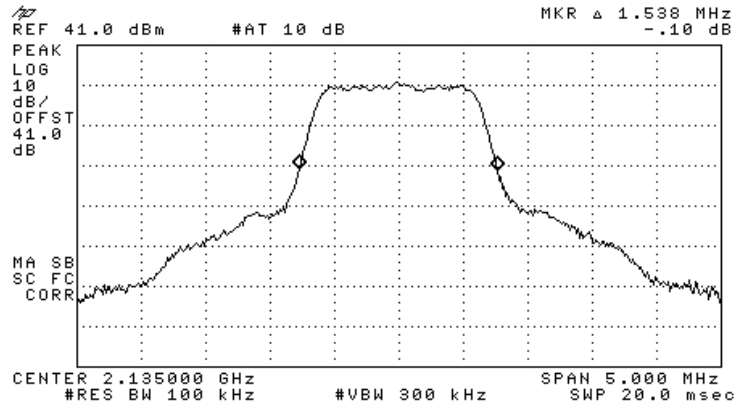


Figure 139.— CDMA (2135.0 MHz) OUT

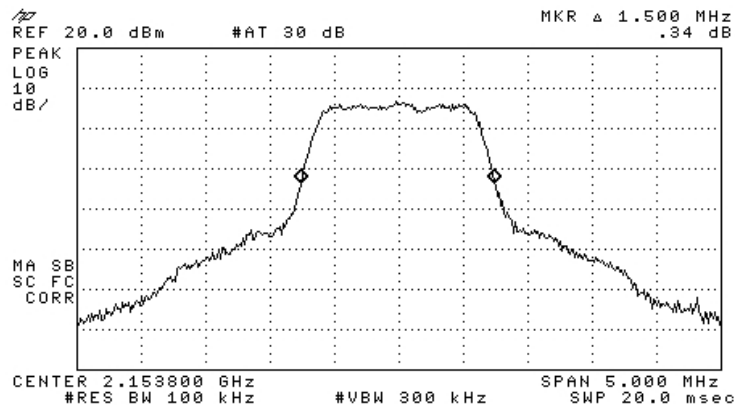


Figure 140.— CDMA (2153.8 MHz) IN

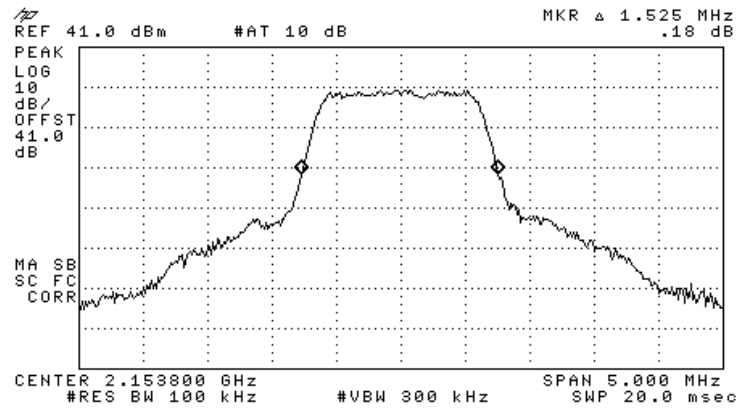


Figure 141.— CDMA (2153.8 MHz) IOU

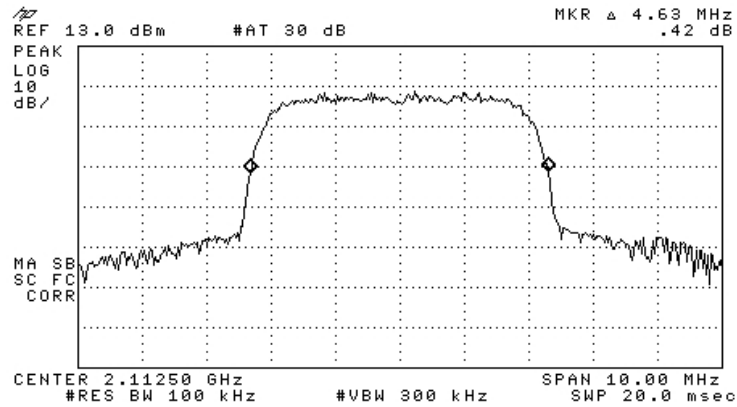


Figure 142.— W-CDMA (2112.5 MHz) IN

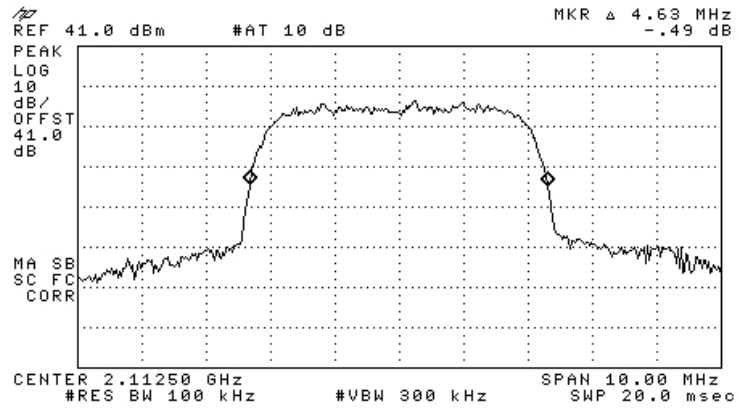


Figure 143.— W-CDMA (2112.5 MHz) OUT

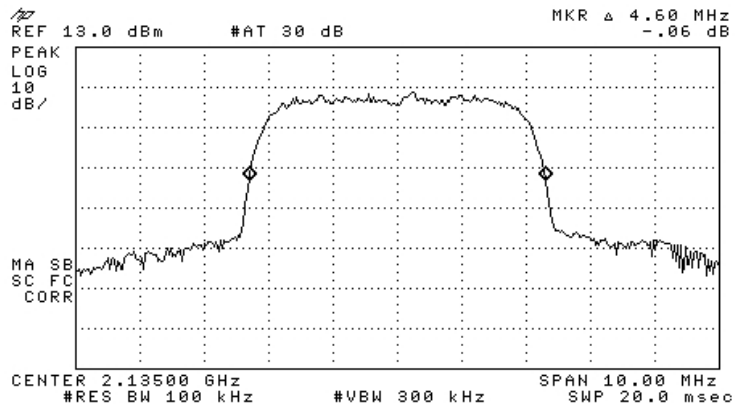


Figure 144.— W-CDMA (2135.0 MHz) IN

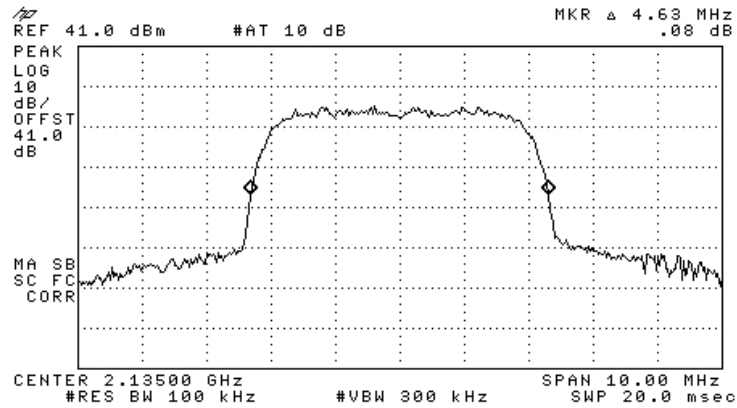


Figure 145.— W-CDMA (2135.0 MHz) OUT

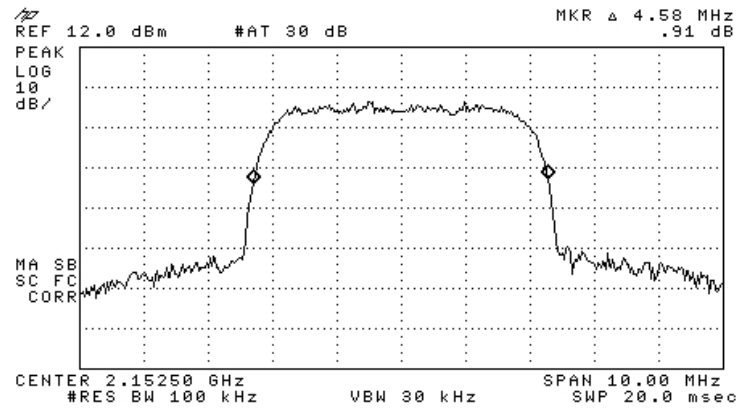


Figure 146.— W-CDMA (2152.5 MHz) IN

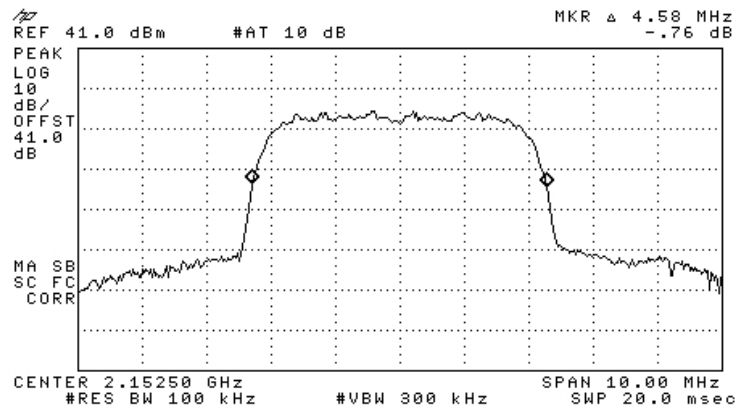


Figure 147.— W-CDMA (2152.5 MHz) OUT

10.3 Results


E.U.T. Description: Mobile AccessHX High-Power DAS Remote Unit
 Model No.: HX-C85P19L70A17-AC-A (C85=CELL; P19=PCS; L70=LTE; A17=AWS)
 Serial Number: Not Designated
 Specification: FCC Part 2, Section 1049

Modulation		Operating Frequency (MHz)	Reading (MHz)
CDMA	Input	2111.2	1.538
	Output	2111.2	1.500
	Input	2135.0	1.500
	Output	2135.0	1.538
	Input	2153.8	1.500
	Output	2153.8	1.525
WCDMA	Input	2112.5	4.630
	Output	2112.5	4.630
	Input	2135.0	4.600
	Output	2135.0	4.630
	Input	2152.5	4.580
	Output	2152.5	4.580

Figure 148 Occupied Bandwidth AWS

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 08.05.11

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 149 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).

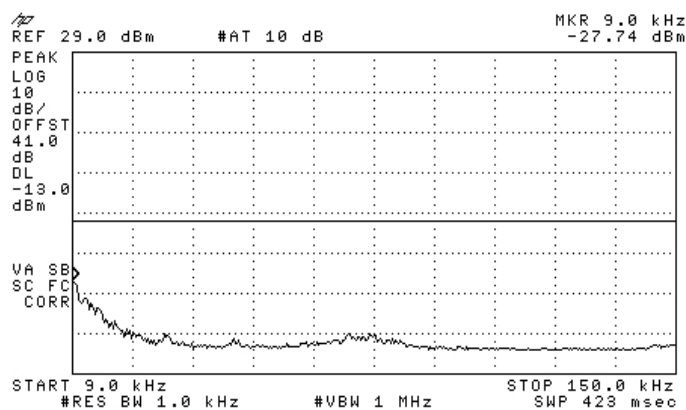


Figure 150.— 2111.20 MHz CDMA

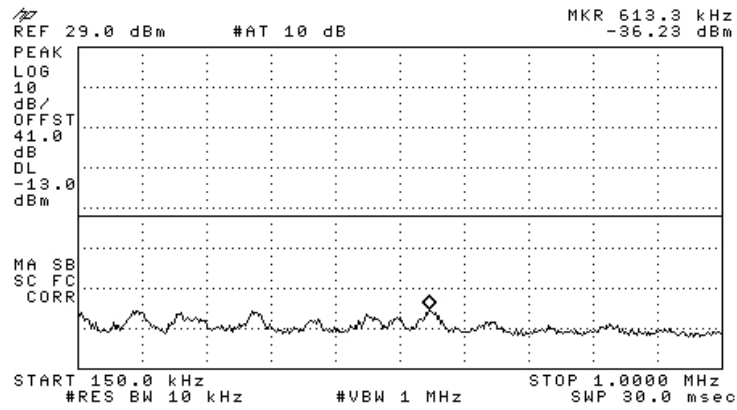


Figure 151.— 2111.20 MHz CDMA

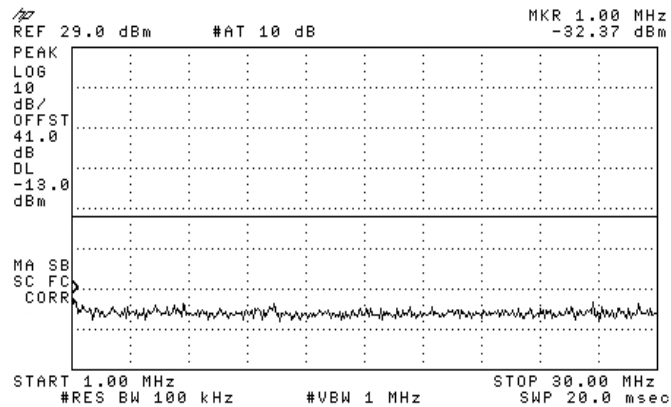


Figure 152.— 2111.20 MHz CDMA

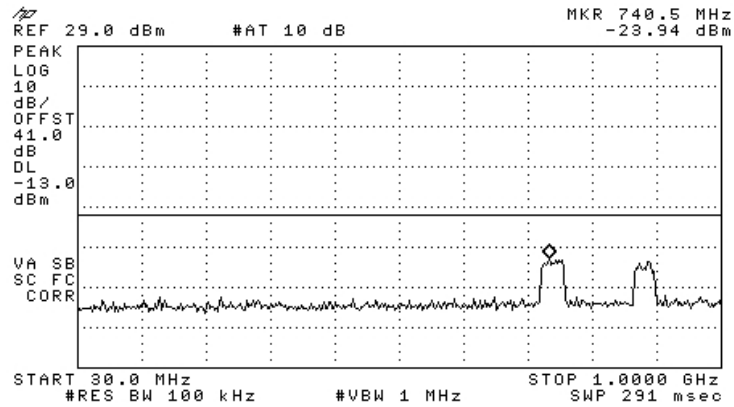


Figure 153.— 2111.20 MHz CDMA

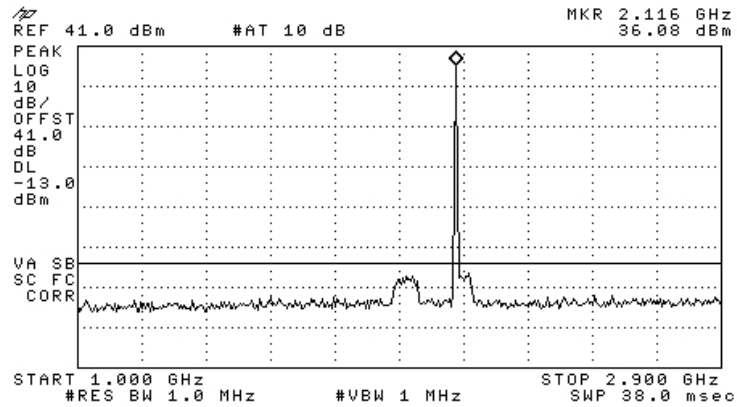


Figure 154.— 2111.20 MHz CDMA

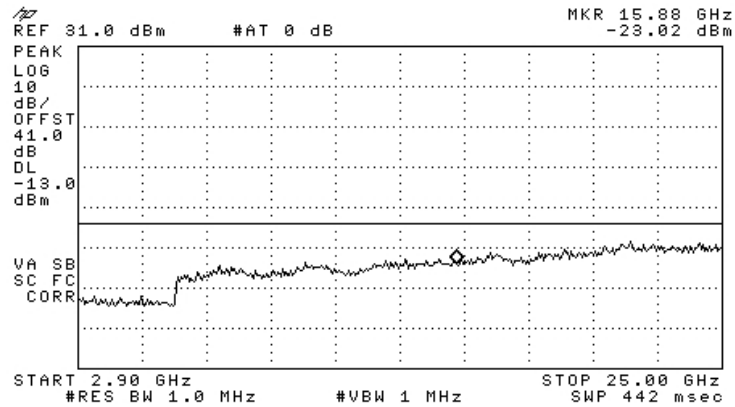


Figure 155.— 2111.20 MHz CDMA

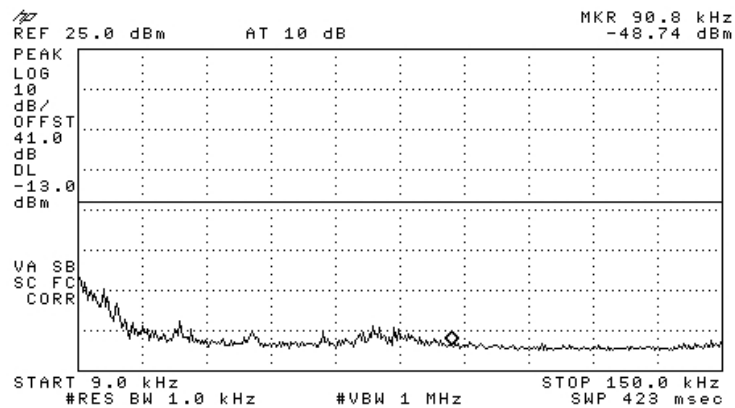


Figure 156.— 2135.00 MHz CDMA

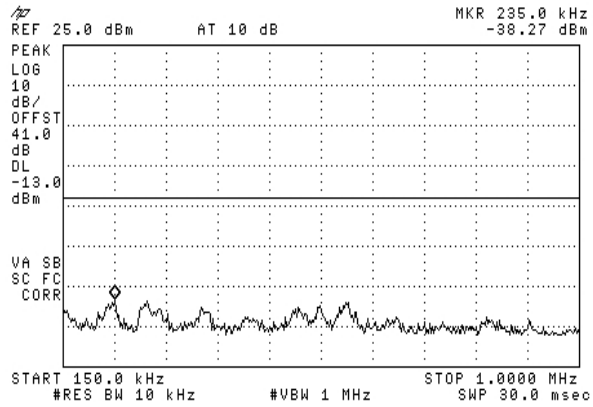


Figure 157.— 2135.00 MHz CDMA

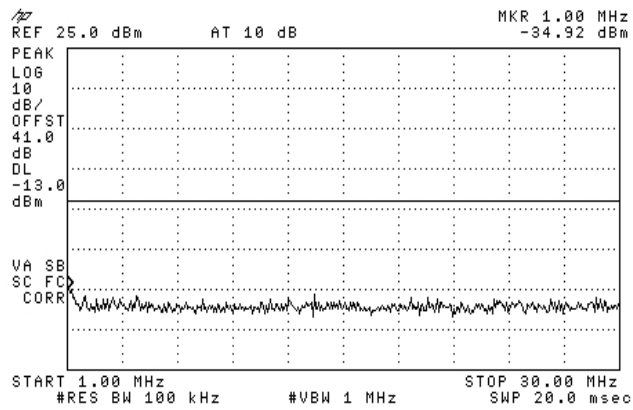


Figure 158.— 2135.00 MHz CDMA

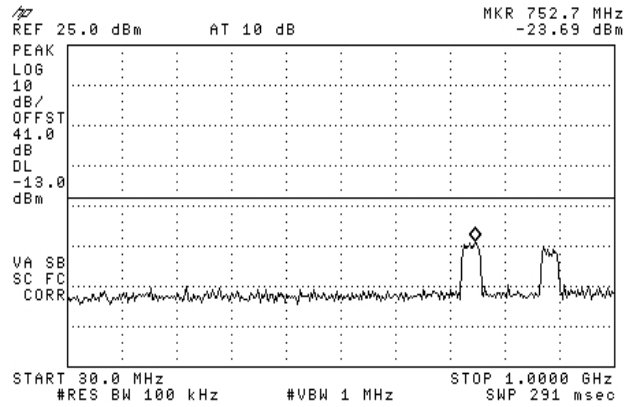


Figure 159.— 2135.00 MHz CDMA

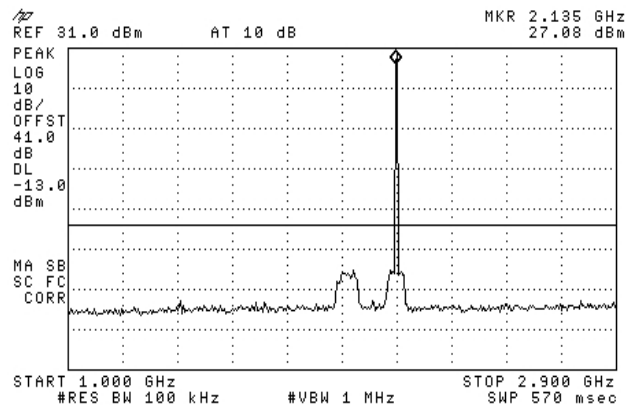


Figure 160.— 2135.00 MHz CDMA

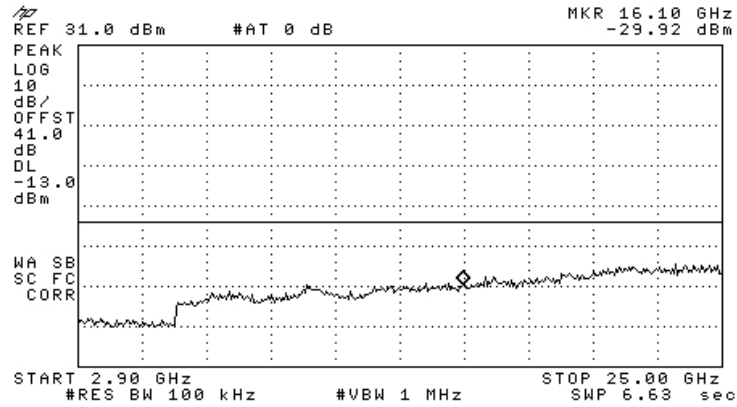


Figure 161.— 2135.0 MHz CDMA

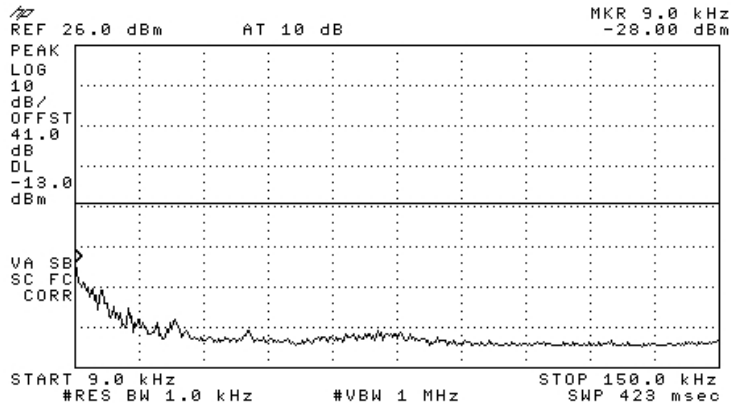


Figure 162.— 2153.80 MHz CDMA

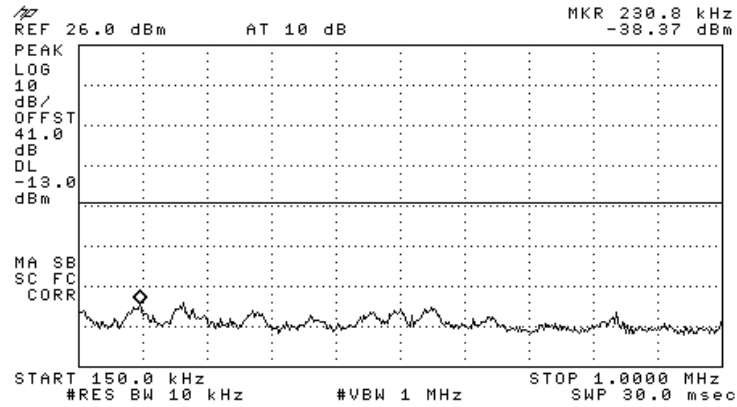


Figure 163.— 2153.80 MHz CDMA

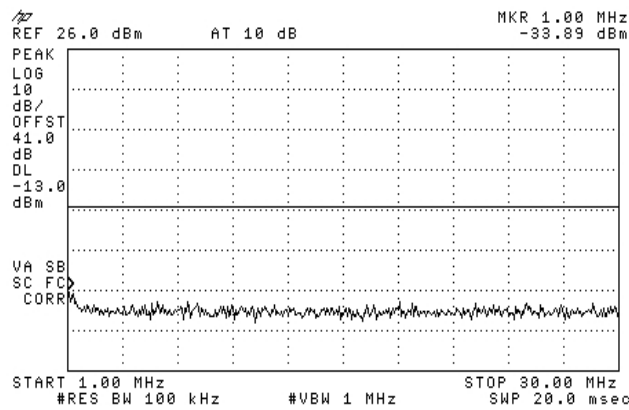
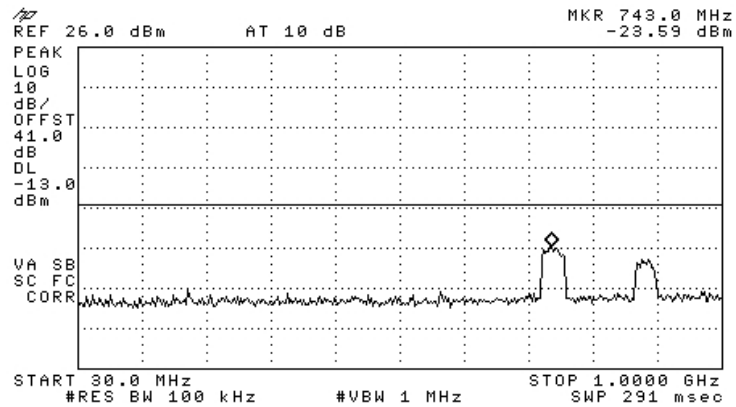


Figure 164.— 2153.80 MHz CDMA

Figure
165.—



2153.80 MHz CDMA

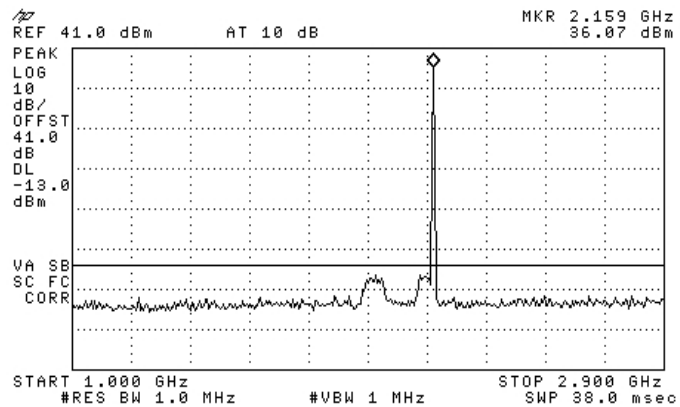


Figure 166.— 2153.80 MHz CDMA

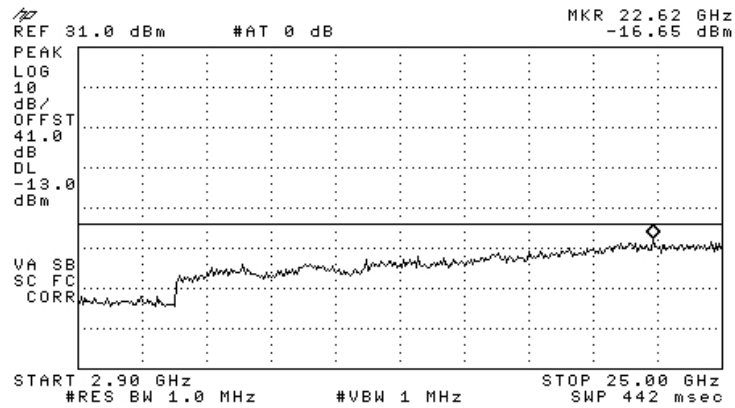


Figure 167.— 2153.80 MHz CDMA

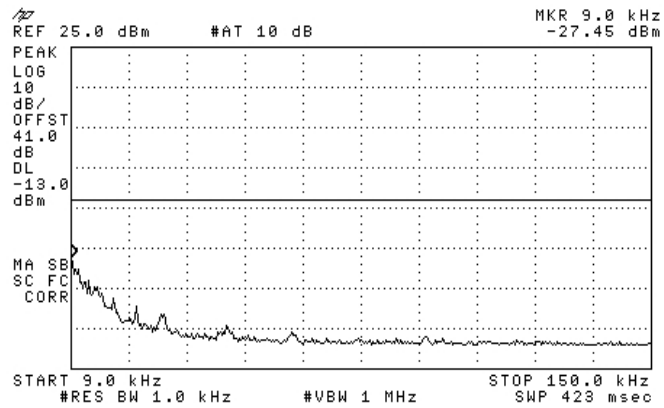


Figure 168.— 2112.50 MHz W-CDMA

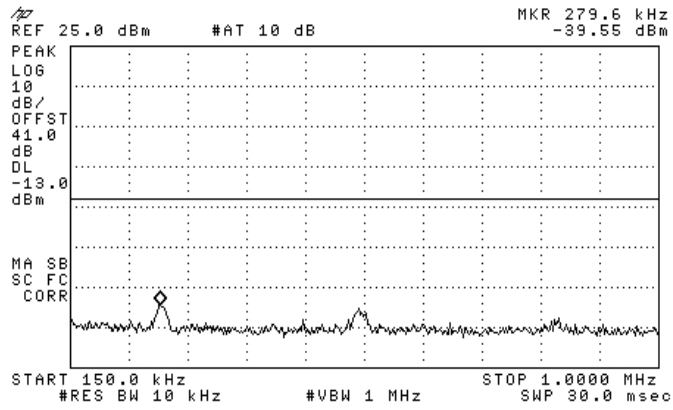


Figure 169.— 2112.50 MHz W-CDMA

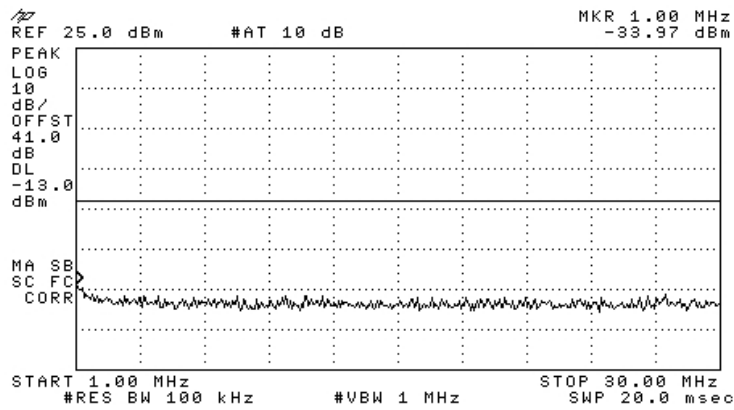


Figure 170.— 2112.50 MHz W-CDMA

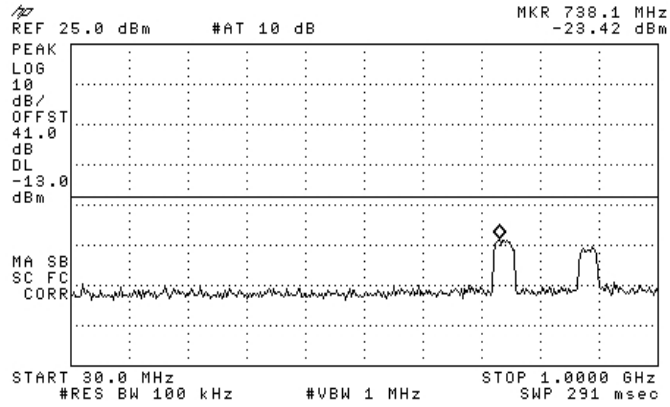


Figure 171.— 2112.50 MHz W-CDMA

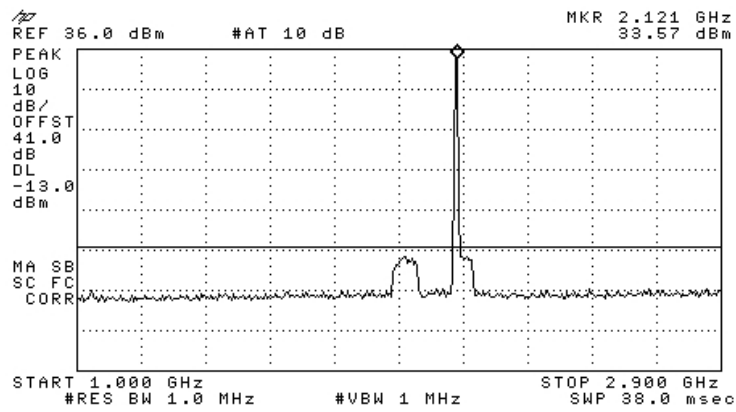


Figure 172.— 2112.50 MHz W-CDMA

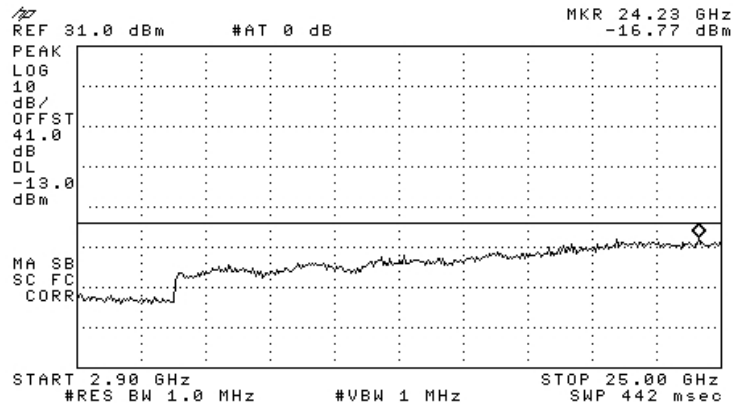


Figure 173.— 2112.50 MHz W-CDMA

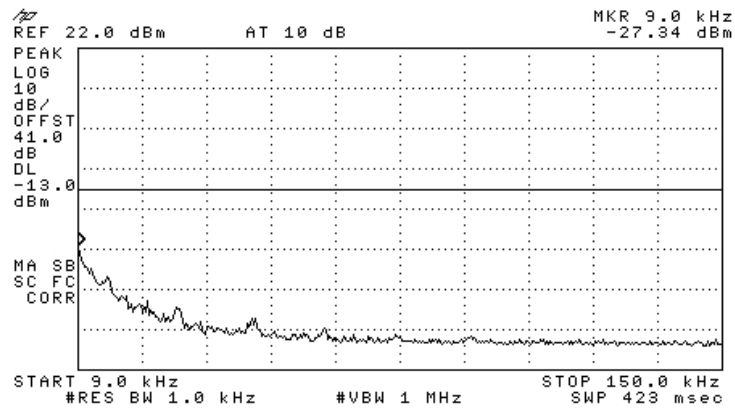


Figure 174.— 2135.00 MHz W-CDMA

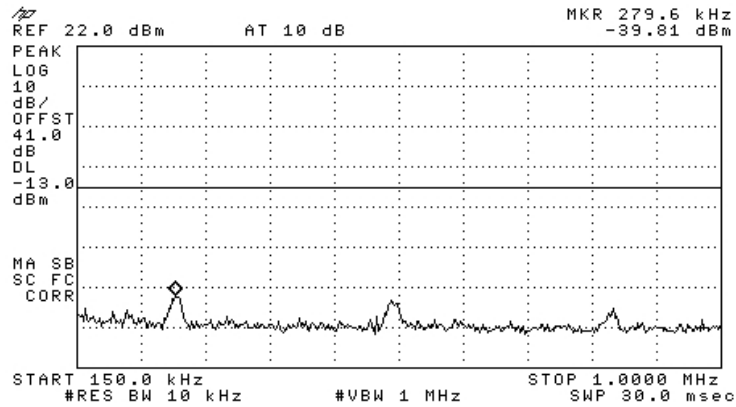


Figure 175.— 2135.00 MHz W-CDMA

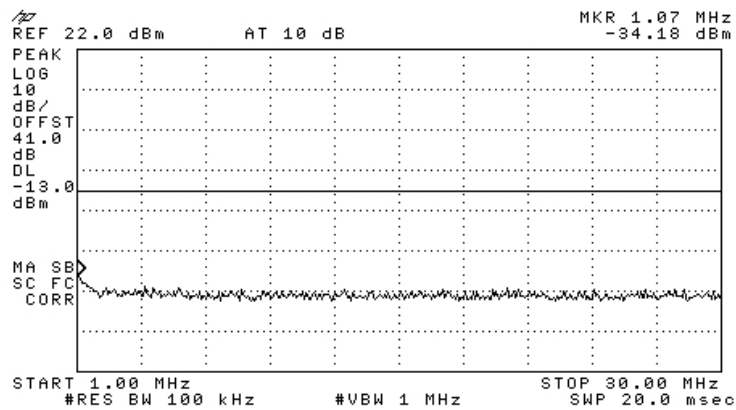


Figure 176.— 2135.00 MHz W-CDMA

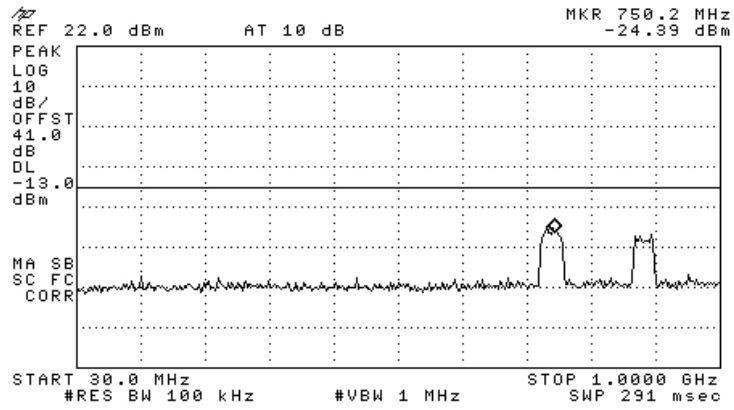


Figure 177.— 2135.00 MHz W-CDMA

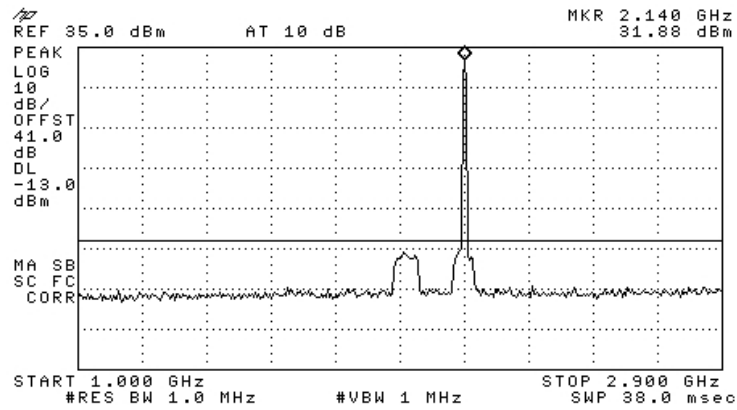


Figure 178.— 2135.00 MHz W-CDMA

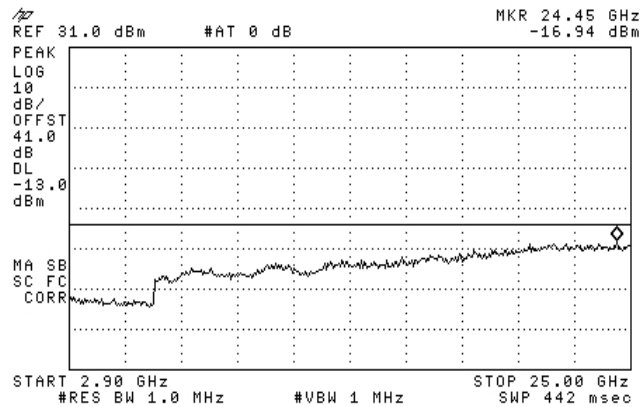


Figure 179.— 2135.00 MHz W-CDMA

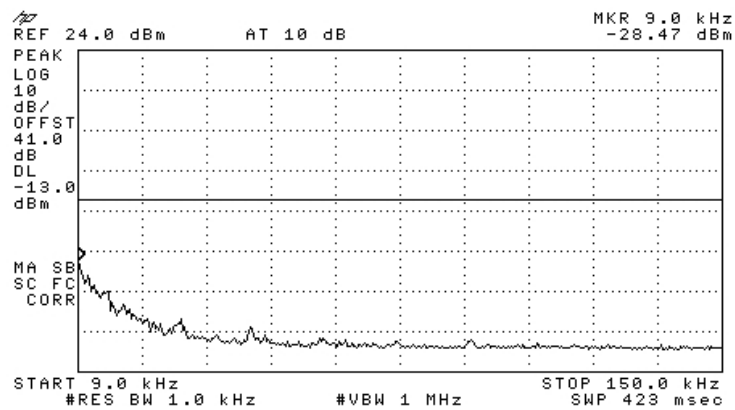


Figure 180.— 2152.50 MHz W-CDMA

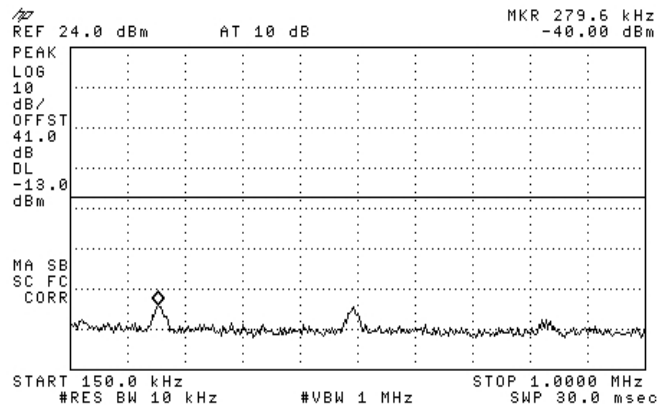


Figure 181.— 2152.50 MHz W-CDMA

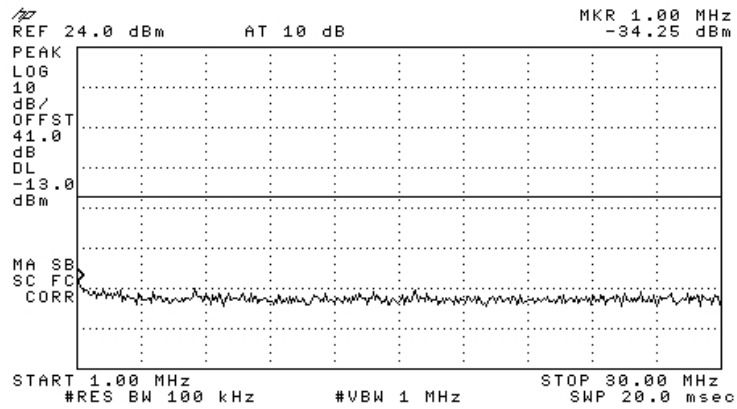


Figure 182.— 2152.50 MHz W-CDMA

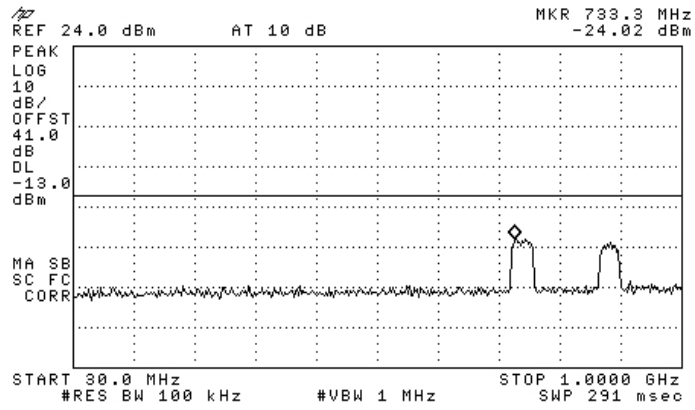


Figure 183.— 2152.50 MHz W-CDMA

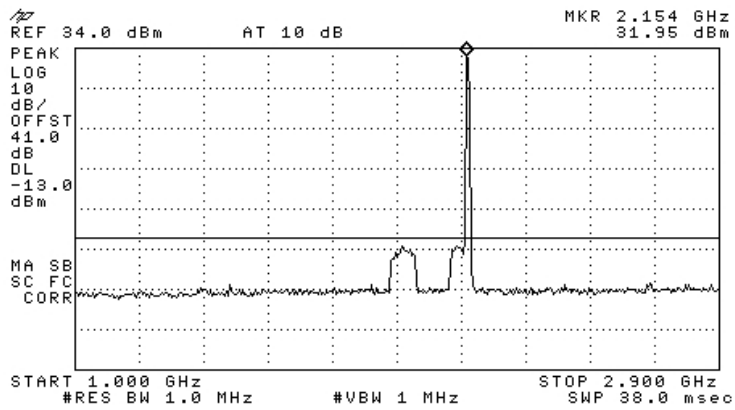


Figure 184.— 2152.50 MHz W-CDMA

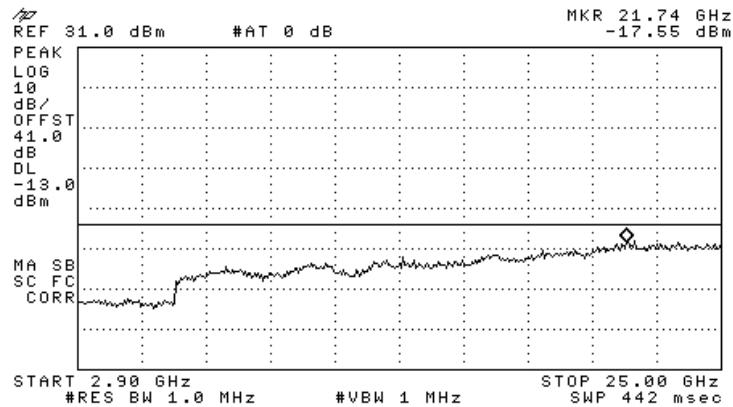


Figure 185.— 2152.50 MHz W-CDMA

11.3 Results

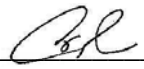
E.U.T. Description: Mobile AccessHX High-Power DAS Remote Unit
 Model No.: HX-C85P19L70A17-AC-A (C85=CELL; P19=PCS; L70=LTE; A17=AWS)
 Serial Number: Not Designated
 Specification: FCC Part 27, Subpart C, Section 27.53 (g)

	Operation Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
CDMA	2111.20	-23.02	-13.0	-10.02
	2135.00	-23.69	-13.0	-10.69
	2153.80	-16.65	-13.0	-3.65
WCDMA	2112.50	-16.77	-13.0	-3.77
	2135.00	-16.94	-13.0	-3.94
	2152.50	-17.55	-13.0	-4.55

Figure 186 Spurious Emissions at Antenna Terminals Results AWS

JUDGEMENT: Passed by 3.65 dB

TEST PERSONNEL:

Tester Signature: 

Date: 08.05.11

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 187 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 -13 dBm.

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (41.0 dB).

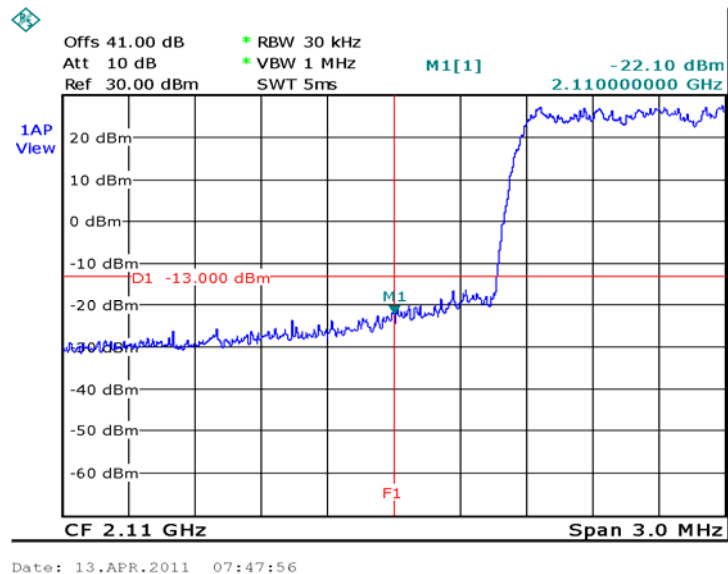


Figure 188.— CDMA 2111.20 MHz

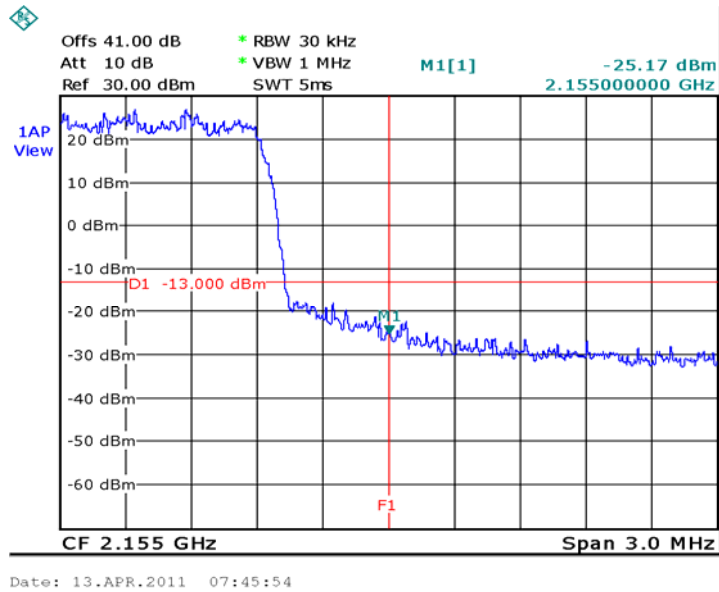


Figure 189.— CDMA 2153.80 MHz

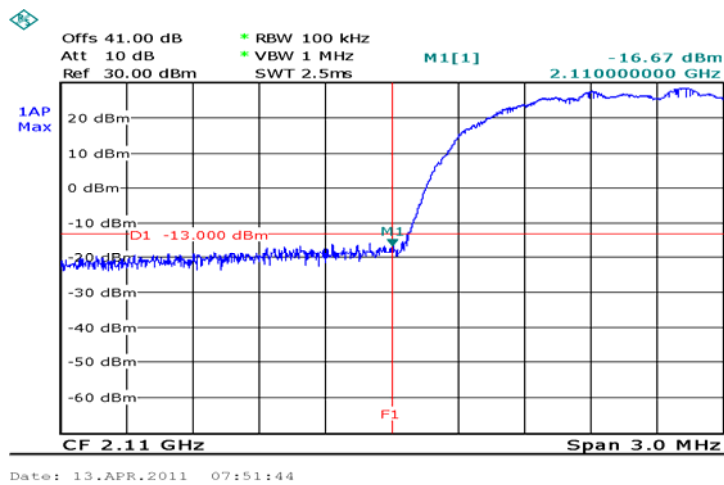


Figure 190.— W-CDMA 2112.50 MHz

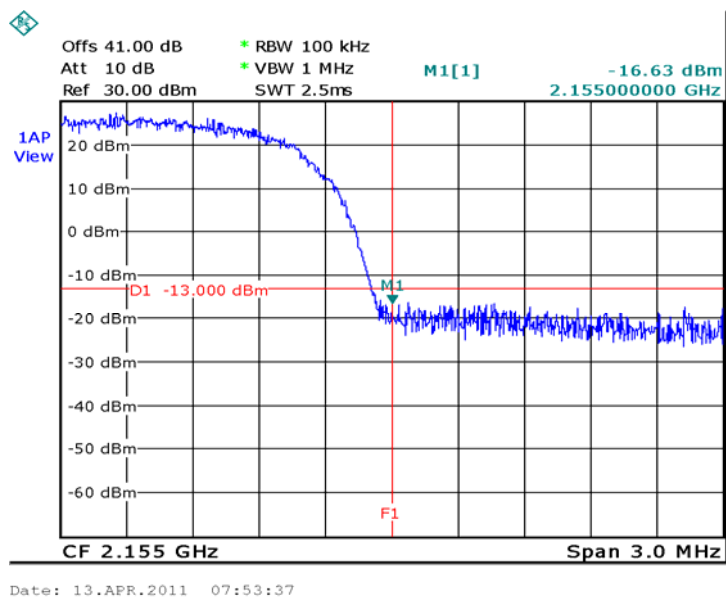


Figure 191.— W-CDMA 2152.50 MHz

12.3 Results

E.U.T. Description: Mobile AccessHX High-Power DAS Remote Unit
 Model No.: HX-C85P19L70A17-AC-A (C85=CELL; P19=PCS; L70=LTE; 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	-22.10	-13.0
CDMA	2153.80	2155.00	-25.17	-13.0
W-CDMA	2112.50	2110.00	-16.67	-13.0
W-CDMA	2152.50	2155.00	-16.63	-13.0

Figure 192 Band Edge Spectrum Results AWS

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 08.05.11

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 193 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.

(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.

13.3 Test Results

JUDGEMENT: Passed by 34.8 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: 08.05.11

Typed/Printed Name: A. Sharabi

Carrier Channel (MHz)	Freq. (MHz)	Antenna Pol.	Maximum Peak Level (dB μ V/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	49.56	-53.83	4.45	9.12	-49.16	-13.0	-36.16
2111.20	4222.40	H	48.35	-54.8	4.45	9.12	-50.13	-13.0	-37.13
2135.00	4270.00	V	49.56	-54.51	4.45	9.38	-49.58	-13.0	-36.52
2135.00	4270.00	H	50.88	-52.73	4.45	9.38	-47.8	-13.0	-34.80
2153.80	4307.60	V	50.06	-54.01	4.45	9.38	-49.08	-13.0	-36.08
2153.80	4307.60	H	47.92	-55.69	4.45	9.38	-50.76	-13.0	-37.76

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, 10kHz for the frequency range 10kHz-10.0MHz, 100kHz for the frequency range 10.0MHz-2.4385GHz, and 1MHz for the frequency range 2.4385-26.0GHz.

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

- LTE 747 MHz QPSK 0 dBm
- CELL 811 MHz GSM 10 dBm
- 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.

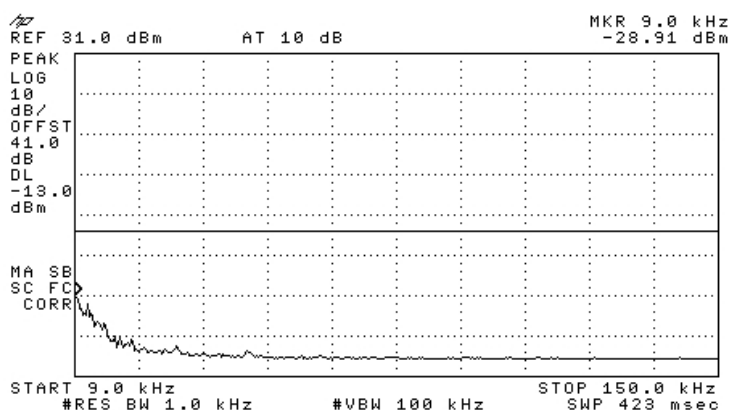


Figure 194 Intermodulation

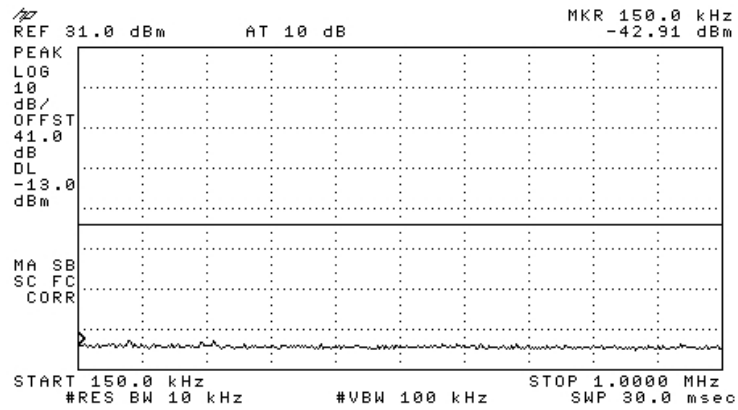


Figure 195 Intermodulation

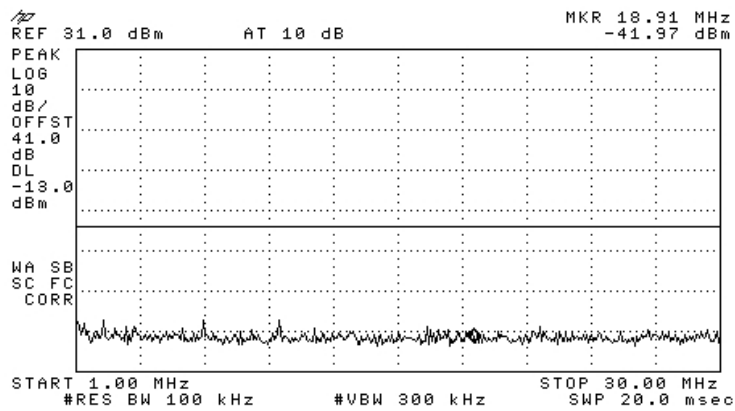


Figure 196 Intermodulation

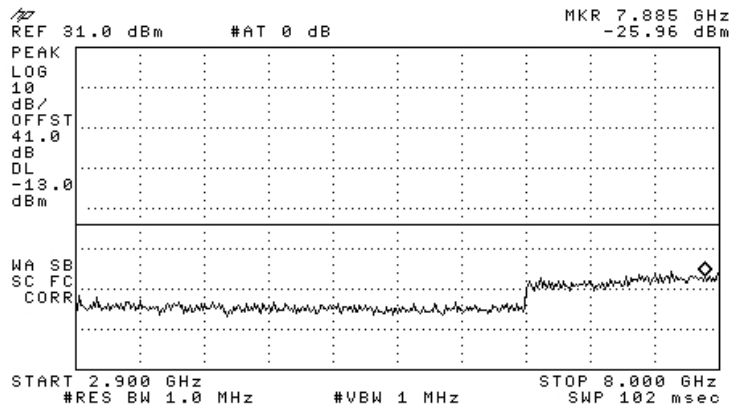


Figure 199 Intermodulation

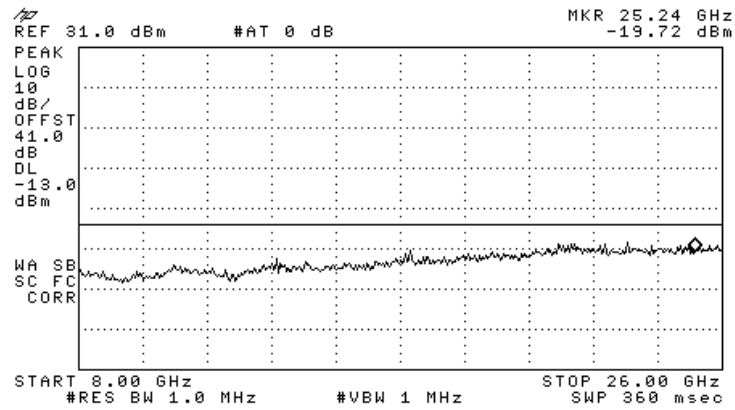


Figure 200 Intermodulation

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
Signal Generator	HP	E4438C	MY42082734	July 21, 2010	1 year
Signal Generator	HP	83731B	US37100653	February 21, 2011	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 201 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 (728-758; 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 E.U.T. was operated in Downlink mode at 4 different channels at center frequency of each band at the same time, transmitting at CW signal.

- (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.

- (d) 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.

15.2 Test Results

JUDGEMENT: Passed

Carrier Channel (MHz)	Freq. (MHz)	Antenna Pol.	Maximum Peak Level (dB μ V/m)	Signal Generator RF Output (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Effective Radiated Power Level (dBm)	Spec. (dBm)	Margin (dB)
2*747+881	2375	V	52.09	-48.6	7.4	8.26	-47.74	-13.0	-34.74
2*747+881	2375	H	53.32	-47.56	7.4	8.26	-46.7	-13.0	-33.7
2*747-881	613	V	39.84	-56.5	3.2	0.97	-58.73	-13.0	-45.73
2*747-881	613	H	39.18	-58.53	3.2	0.97	-60.76	-13.0	-47.76
2*881-747	1015	V	40.48	-61.31	4.2	5.4	-60.11	-13.0	-47.11
2*881-747	1015	H	41.6	-59.85	4.2	5.4	-58.65	-13.0	-45.65
2*881+747	2509	V	52.92	-47.84	7.7	8.4	-47.14	-13.0	-34.14
2*881+747	2509	H	54.8	-46.81	7.7	8.4	-46.11	-13.0	-33.11
3*747-2*881	579	V	39.18	-57.16	3.2	0.97	-59.39	-13.0	-46.39
3*747-2*881	579	H	39.54	-58.17	3.2	0.97	-60.4	-13.0	-47.4
3*881-2*747	1149	V	43.74	-57.75	4.45	5.84	-56.36	-13.0	-21.96
3*881-2*747	1149	H	41.9	-59.61	4.45	5.84	-58.22	-13.0	-45.22
2*1960-2135	1785	V	49.25	-50.54	5.6	7.66	-48.48	-13.0	-35.48
2*1960-2135	1785	H	48.61	-51.44	5.6	7.66	-49.38	-13.0	-36.38
2*2135-1960	2310	V	52.36	-49.22	7.1	8.12	-48.2	-13.0	-35.2
2*2135-1960	2310	H	52.68	-49.7	7.1	8.12	-48.68	-13.0	-35.68
3*2135-2*1960	2485	V	55.02	-45.74	7.7	8.4	-45.04	-13.0	-32.04
3*2135-2*1960	2485	H	55.25	-46.36	7.7	8.4	-45.66	-13.0	-32.66
2*2135-3*1960	1610	V	46.5	-54.5	5.3	7.62	-52.18	-13.0	-39.18
2*2135-3*1960	1610	H	46.28	-58.76	5.3	7.62	-56.44	-13.0	-43.44

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	E4432B ESG-D	GB40050702	July 22, 2010	1 year
Signal Generator	HP	E4432B ESG-D	GB40050702	July 22, 2010	1 year
Signal Generator	HP	E4438C	MY42082734	July 21, 2010	1 year
Signal Generator	HP	83731B	US37100653	February 21, 2011	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)	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".

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 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".

16.5 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			