



DATE: 25 June 2014

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

FCC Radio Test Report

for

Corning Optical Communication

Wireless

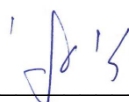
Equipment under test:

Mobile AccessHX High-Power DAS Remote Unit

HX-C85P19L70A17-AC-A
(C85=CELL; P19=PCS; L70=LTE; A17=AWS)
(CELL/PCS Section)

Written by: 
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Approved by: 
I. Raz, EMC Laboratory Manager

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This report relates only to items tested.



Measurement/Technical Report for Corning Optical Communication Wireless Mobile AccessHX High-Power DAS Remote Unit

HX-C85P19L70A17-AC-A
(C85=CELL; P19=PCS; L70=LTE; A17=AWS)
(CELL/PCS Section)

FCC ID: OJFHXC85P19L70A17

This report concerns:

Original Grant:

Class II change: X

Class I change:

Equipment type:

PCS Licensed Transmitter

Limits used:

47CFR Parts 2, 22, 24

Measurement procedure used is ANSI C63.4-2003.

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

Application for Certification

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Applicant for this device:

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1. General Information

1.1 Administrative Information

Manufacturer:	Corning Optical Communication Wireless
Manufacturer's Address:	13221 Woodland Park Rd., Suite #400 Herndon, VA. 20171 Vienna, VA 22182 U.S.A. Tel: +1-541-758-2880 Fax: +1-703-848-0260
Manufacturer's Representative:	Habib Riazi
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:	26.05.14
Start of Test:	27.05.14
End of Test:	03.06.14
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	FCC Parts 22, 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.

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

MobileAccessHX 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 November 21, 2012). I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

1.6 Measurement Uncertainty

Conducted Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4)

0.15 – 30 MHz:

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

± 3.44 dB

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

A FCC Grant was issued for the E.U.T. on 9/13/2013. The LTE modulation has been added to the CELL, PCS and AWS band requiring a C2PC. The following tests were performed:

RF power output
Occupied bandwidth
Spurious emissions at antenna terminals
Band edge spectrum

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

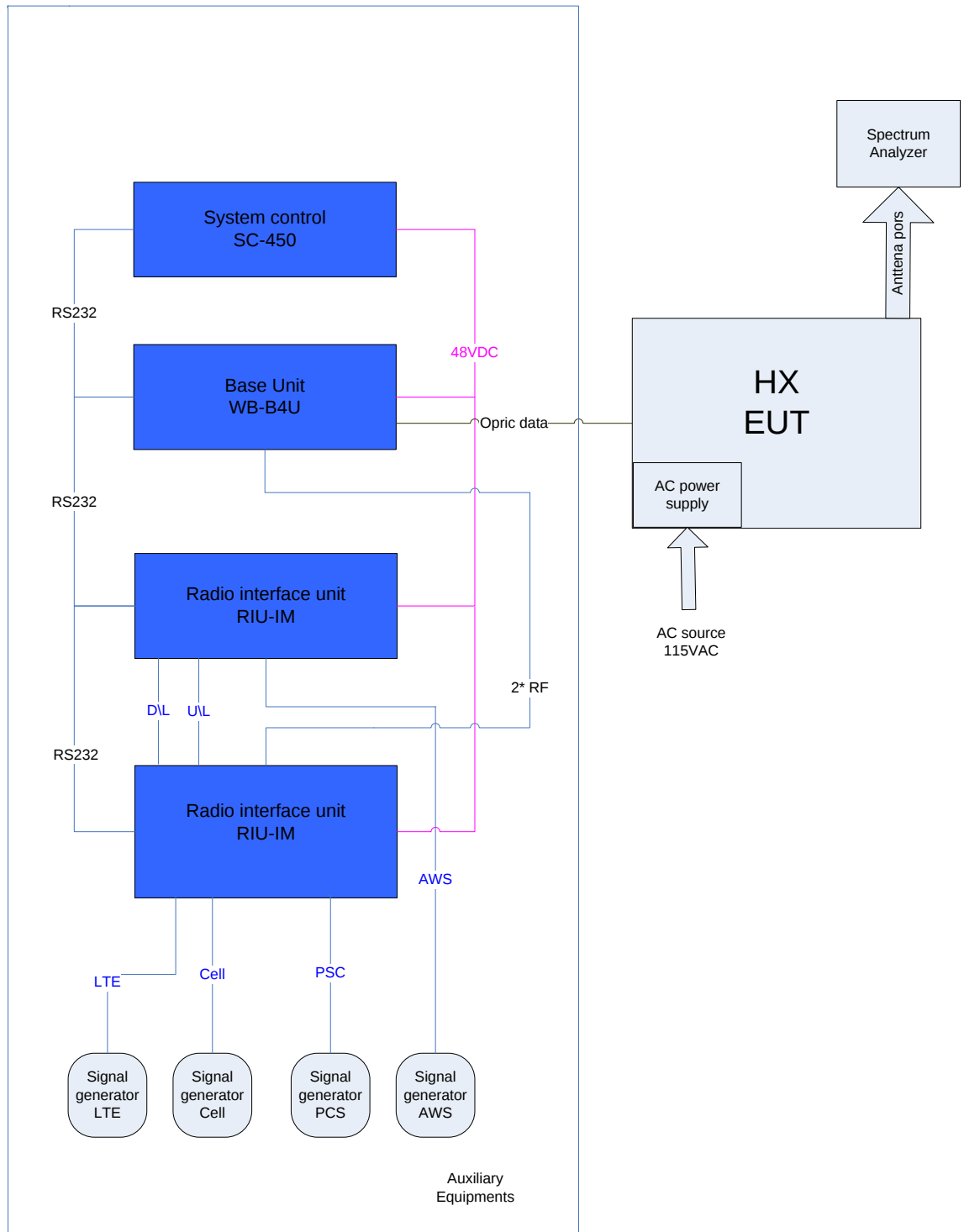


Figure 1. Tests Set-up

3. Conducted Measurement Test Set-Up Photo

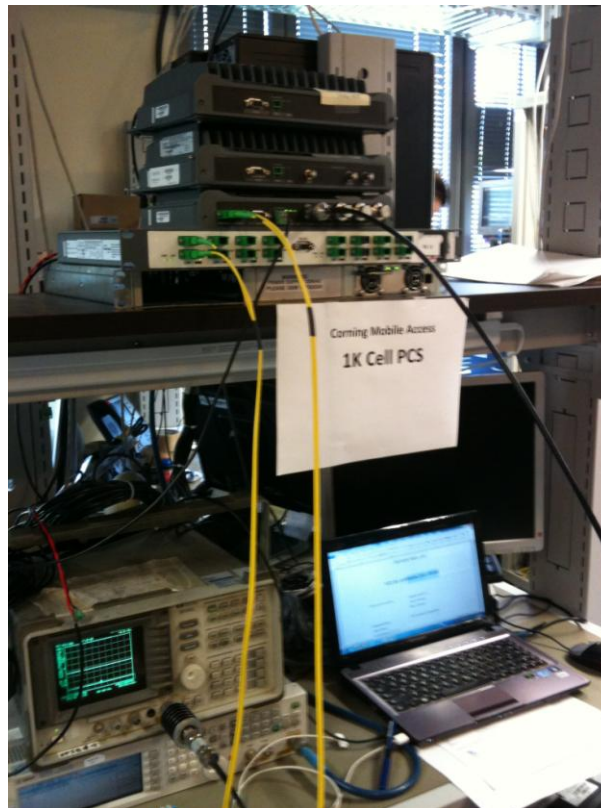


Figure 2. Conducted Emission Test Set-Up

4. Peak Output Power CELL

4.1 Test Specification

FCC Part 22.913

4.2 Test procedure

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

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator (30 dB) and an appropriate coaxial cable (0.5dB). The E.U.T. RF output was modulated. Special attention was taken to prevent Spectrum Analyzer RF input overload. The Spectrum Analyzer was set to 1.0 MHz RBW.

QPSK :

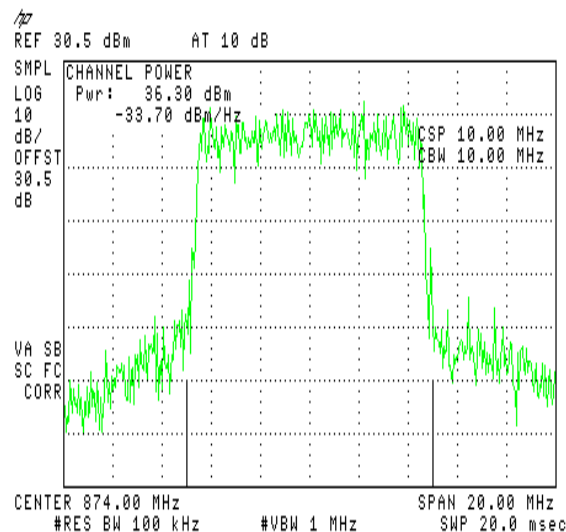


Figure 3.— 874 MHz

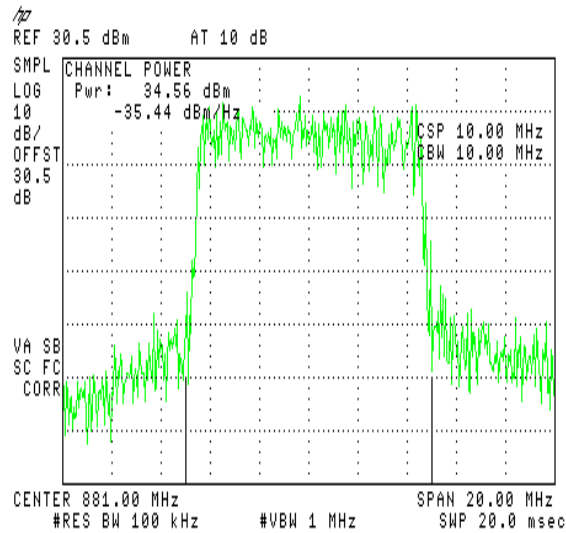


Figure 4.— 881 MHz

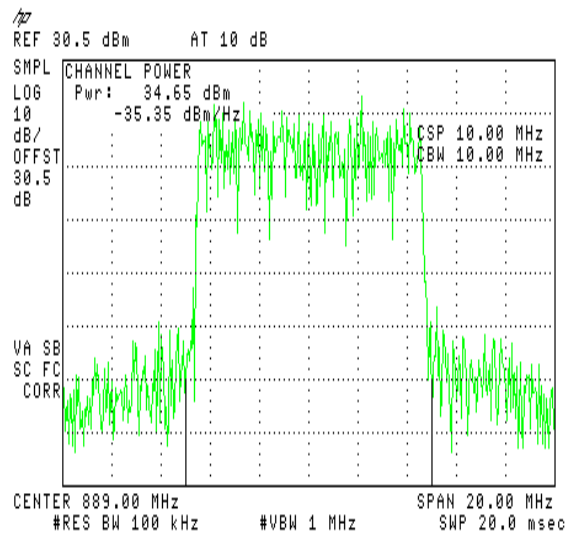


Figure 5.— 889 MHz



16QAM :

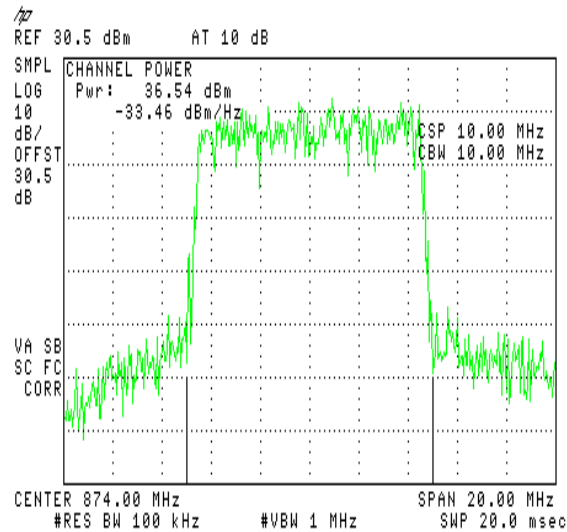


Figure 6.— 874 MHz

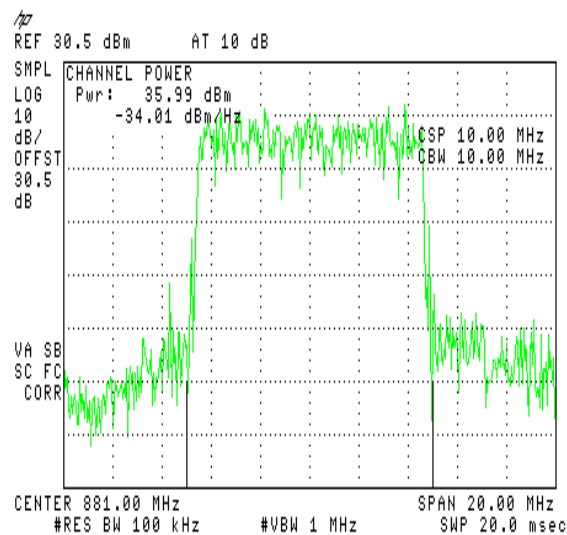


Figure 7.— 881 MHz

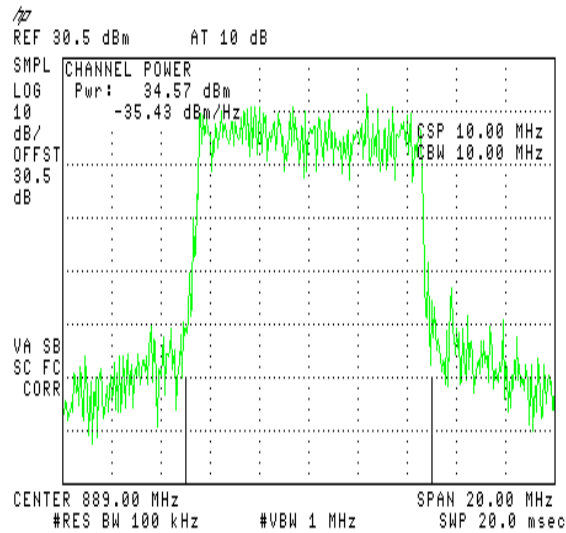


Figure 8.— 889 MHz

64QAM :

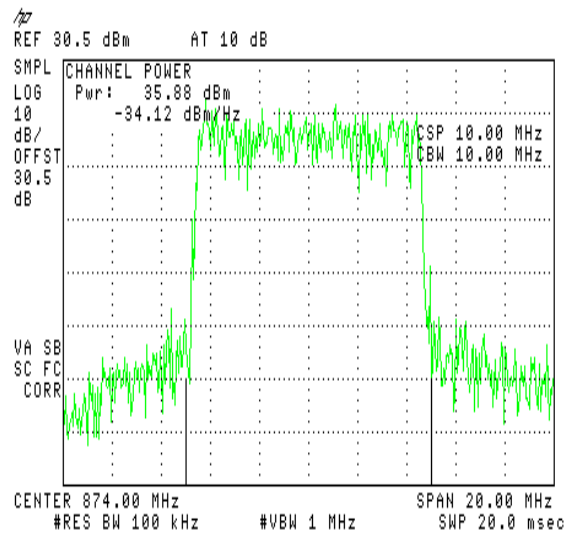


Figure 9.— 874 MHz

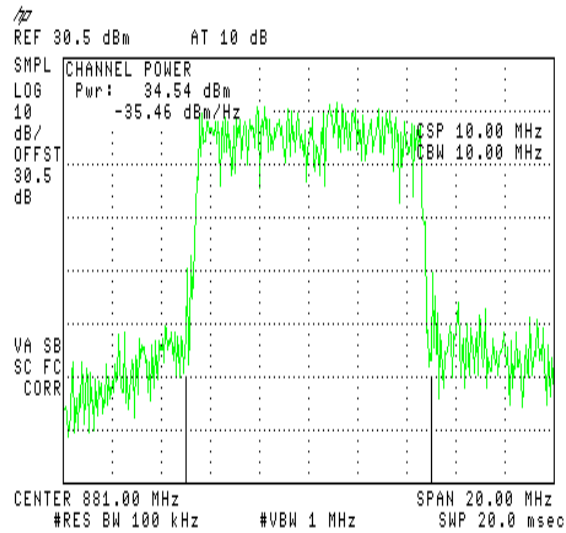


Figure 10.— 881 MHz

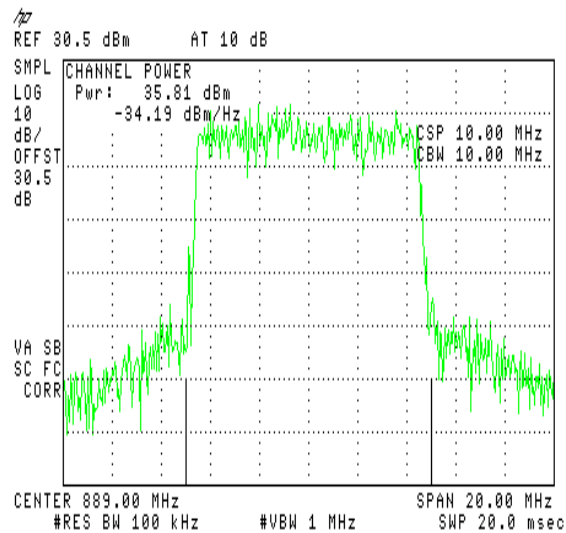


Figure 11.— 889 MHz

4.3 Results Table

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 22 Section 913, FCC Part 2, Section 1046

Modulation	Operation Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
QPSK	874	36.30	57.0	-20.70
	881	34.56	57.0	-22.44
	889	34.65	57.0	-22.35
16QAM	874	36.54	57.0	-20.46
	881	35.99	57.0	-21.01
	889	34.57	57.0	-22.43
64QAM	874	35.88	57.0	-21.12
	881	34.54	57.0	-22.46
	889	35.81	57.0	-21.19

Figure 12 Peak Output Power CELL

JUDGEMENT: Passed by 20.46 dB

TEST PERSONNEL:

Tester Signature: 

Date: 03.07.14

Typed/Printed Name: A. Sharabi

4.4 **Test Equipment Used Peak Output Power CELL**

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Signal Generator	HP	N5182A	MY48180244	July 28, 2013	1 year
Attenuator	MCE	46-30-34	-	May 22, 2014	1 year
Cable	Rhophase	KPS-5000-KPS	A1674	May 22, 2014	1 year

Figure 13 Test Equipment Used

5. Occupied Bandwidth CELL

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 modulation. The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (at the output test) and an appropriate coaxial cable. The spectrum analyzer was set to 100 kHz resolution B.W.

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limit, the mean powers radiated are each equal to 0.5% of the total mean power radiated by a given emission.

The occupied bandwidth of the E.U.T. at the points of 20 dB below maximum peak power was measured and recorded.

Occupied bandwidth measured was repeated in the input terminal of the E.U.T.

INPUT QPSK:

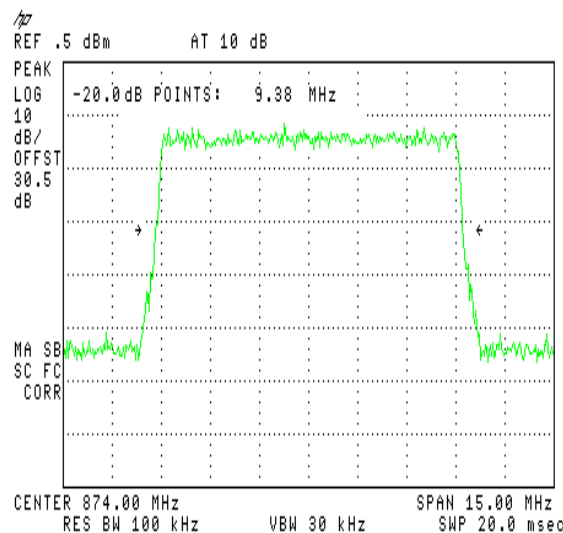


Figure 14.— 874 MHz

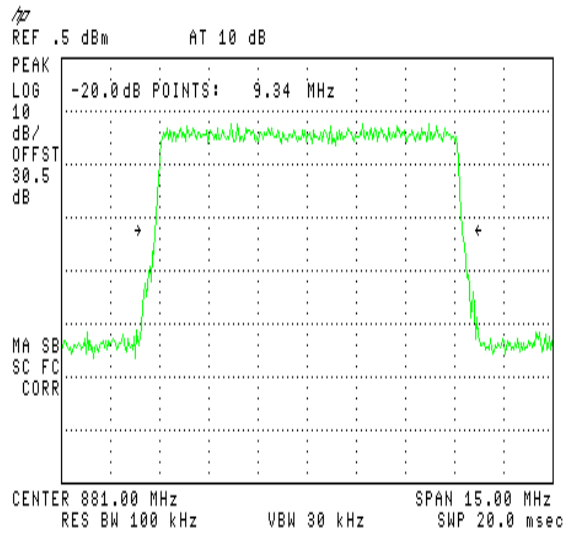


Figure 15.— 881 MHz

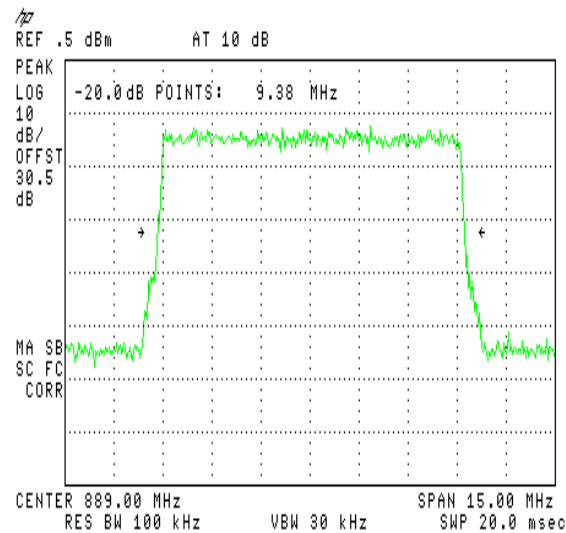


Figure 16.— 889 MHz

INPUT 16QAM:

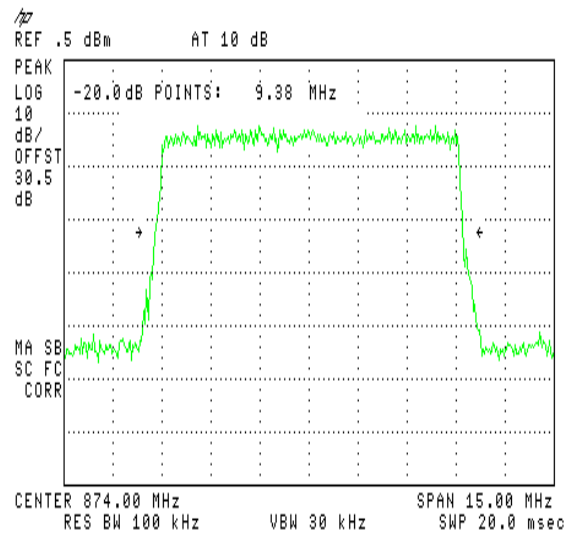


Figure 17.— 874 MHz

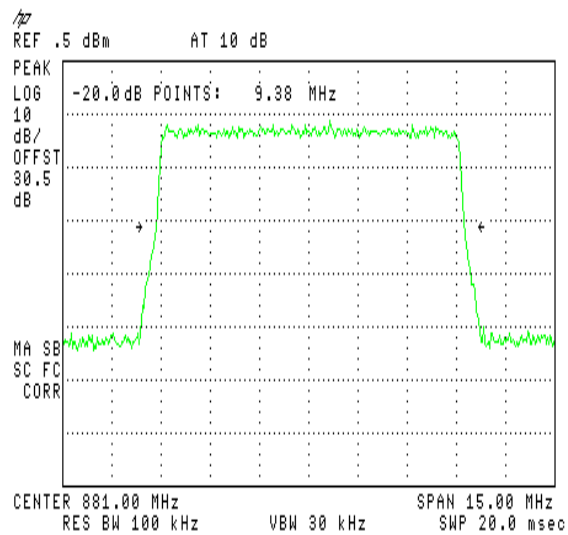


Figure 18.— 881 MHz

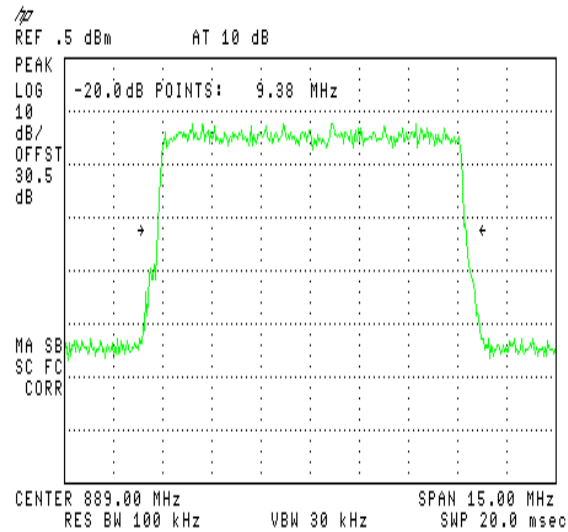


Figure 19.— 889 MHz

INPUT 64QAM:

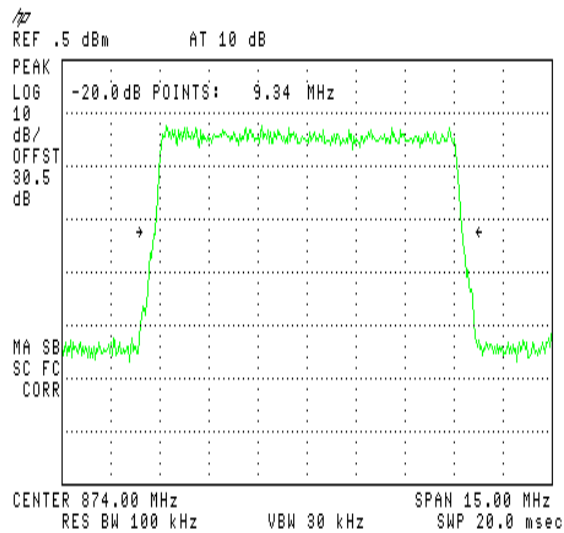


Figure 20.— 874 MHz

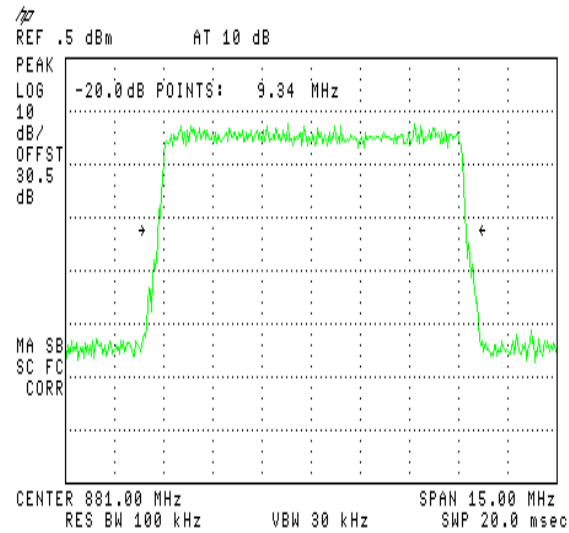


Figure 21.— 881 MHz

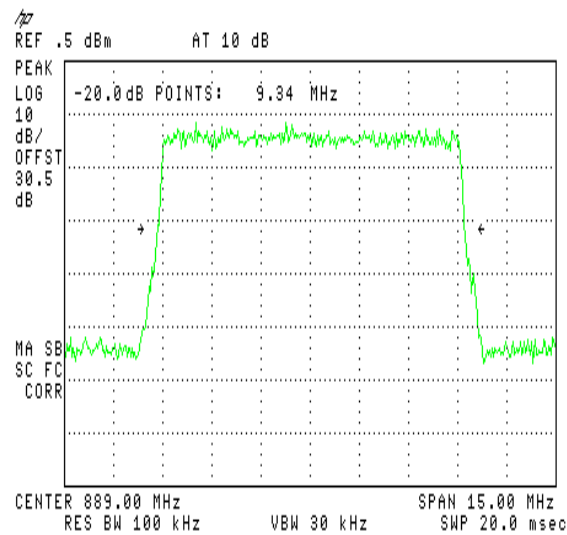


Figure 22.— 889 MHz

OUTPUT QPSK:

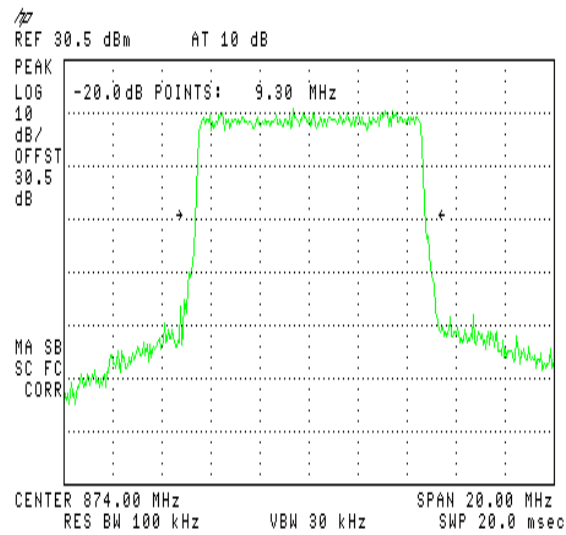


Figure 23.— 874 MHz

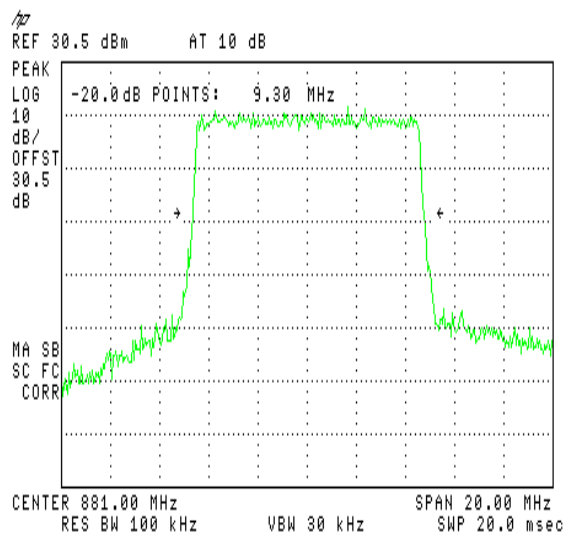


Figure 24.— 881 MHz

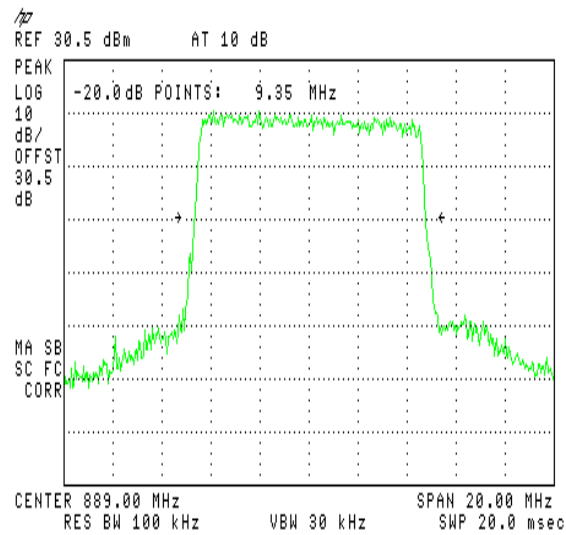


Figure 25.— 889 MHz

OUTPUT 16QAM:

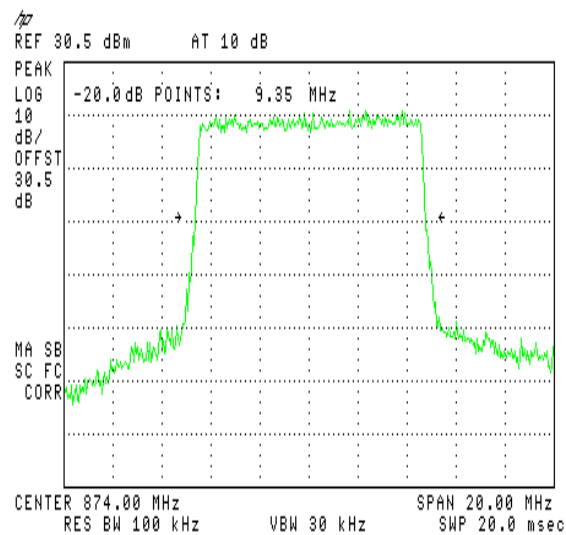


Figure 26.— 874 MHz

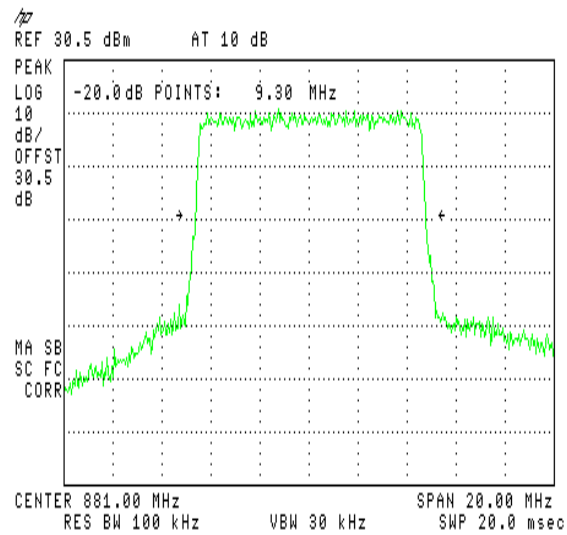


Figure 27.— 881 MHz

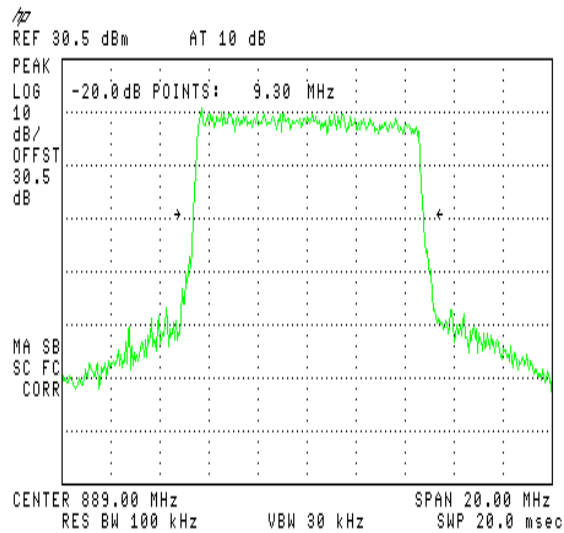


Figure 28.— 889 MHz



OUTPUT 64QAM:

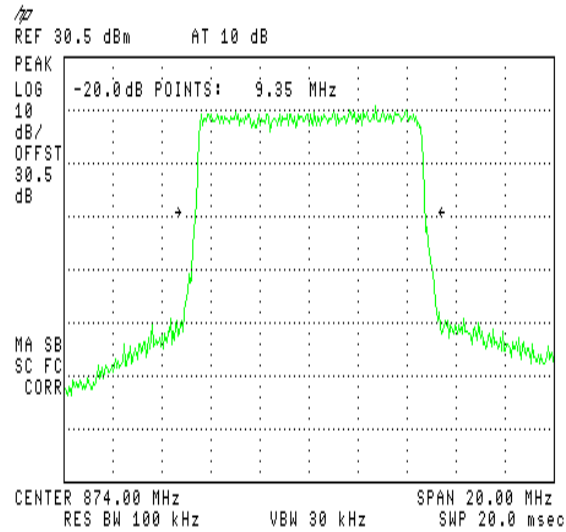


Figure 29.— 874 MHz

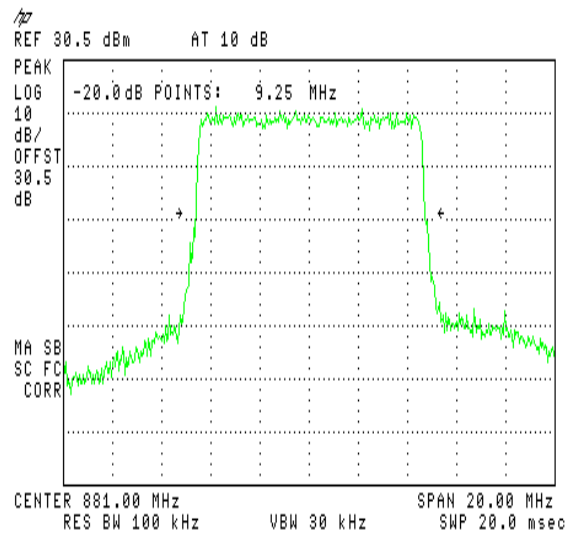


Figure 30.— 881 MHz

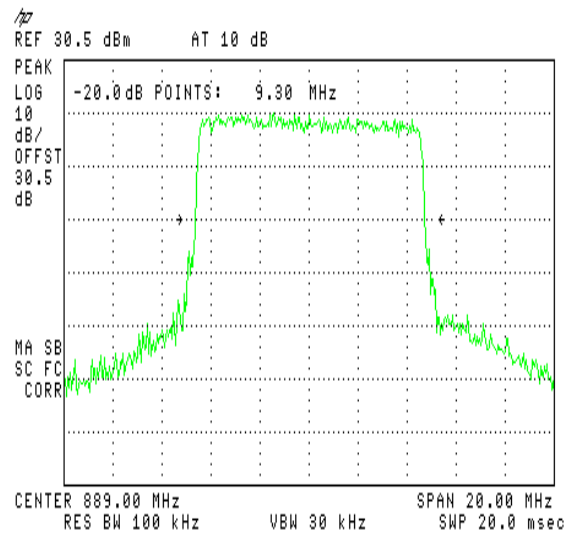


Figure 31.— 889 MHz

5.3 Results Table

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)
QPSK	Input	874	9.38
	Output	874	9.34
	Input	881	9.34
	Output	881	9.30
	Input	889	9.38
	Output	889	9.35
16QAM	Input	874	9.38
	Output	874	9.35
	Input	881	9.38
	Output	881	9.30
	Input	889	9.38
	Output	889	9.30
64QAM	Input	874	9.34
	Output	874	9.35
	Input	881	9.34
	Output	881	9.25
	Input	889	9.34
	Output	889	9.30

Figure 32 Occupied Bandwidth CELL

TEST PERSONNEL:

Tester Signature: 

Date: 03.07.14

Typed/Printed Name: A. Sharabi

5.4 **Test Equipment Used Occupied Bandwidth CELL**

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Signal Generator	HP	N5182A	MY48180244	July 28, 2013	1 year
Attenuator	MCE	46-30-34	-	May 22, 2014	1 year
Cable	Rhophase	KPS-5000-KPS	A1674	May 22, 2014	1 year

Figure 33 Test Equipment Used

6. Out of Band Emissions at Antenna Terminals CELL

6.1 Test Specification

FCC Part 22, Section 917; FCC Part 2.1051

6.2 Test procedure

The power of any emission outside of the authorized operating frequency ranges (869 - 894 MHz) must be attenuated below the transmitting power (P) by a factor of at least $43 + \log(P)$ dB, yielding -13dBm .

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (30.5 dB).

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

QPSK :

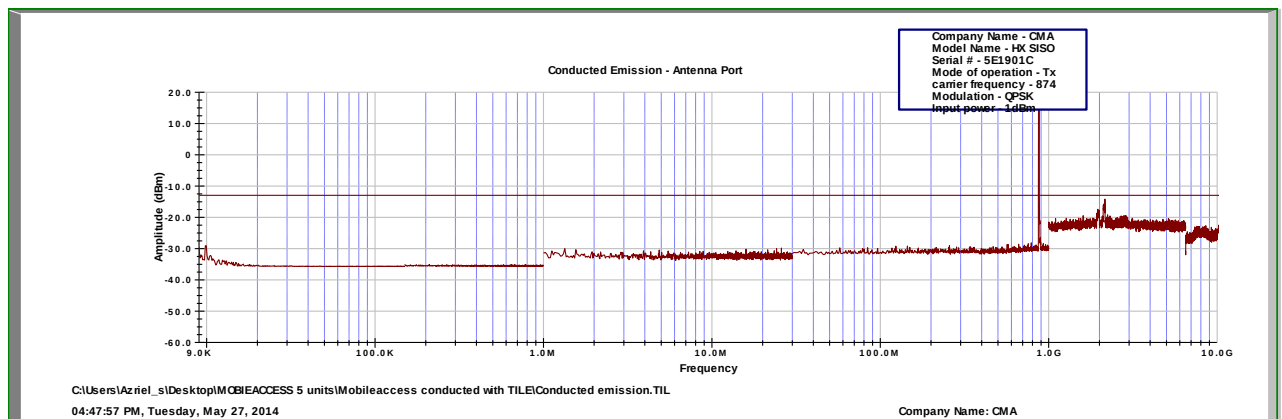


Figure 34.— 874 MHz

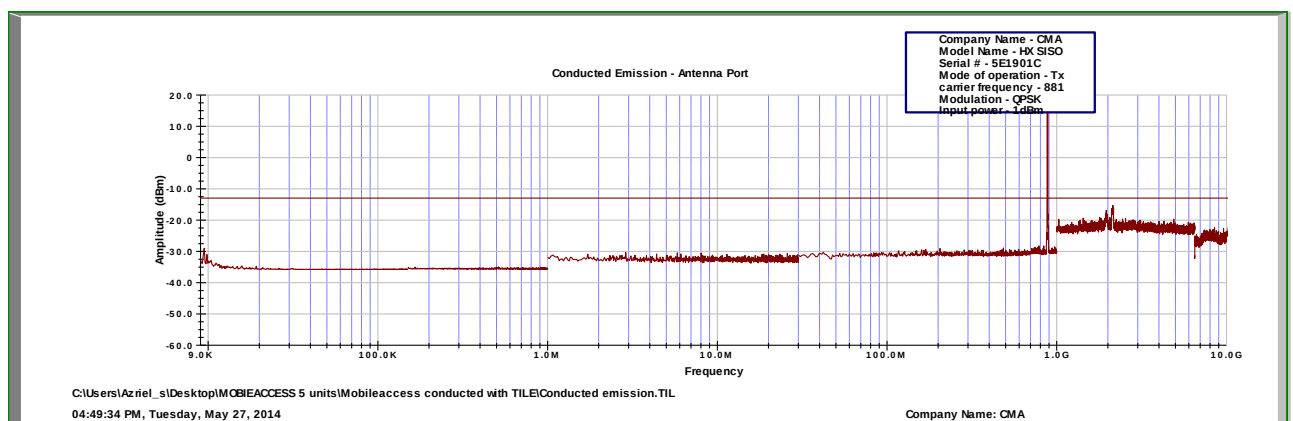


Figure 35.— 881 MHz

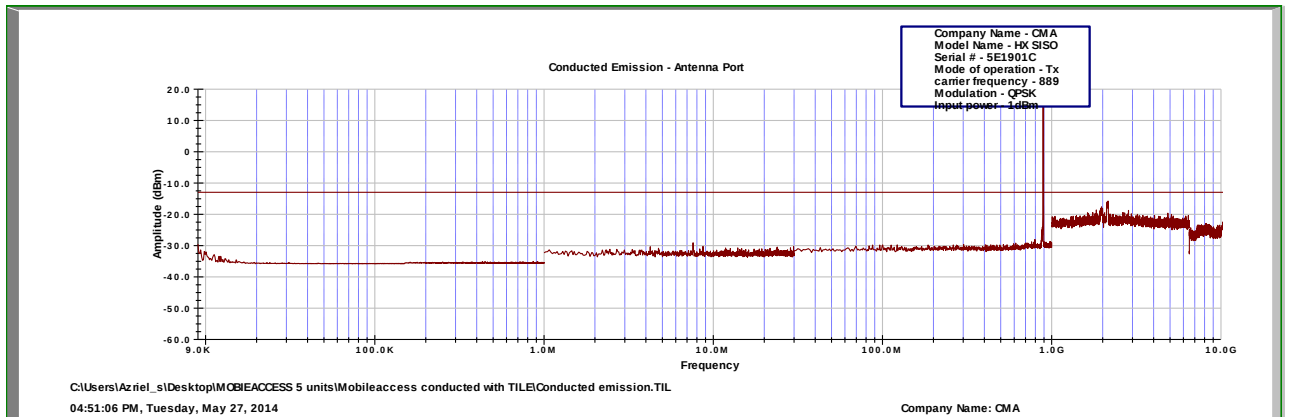


Figure 36.— 889 MHz

16QAM :

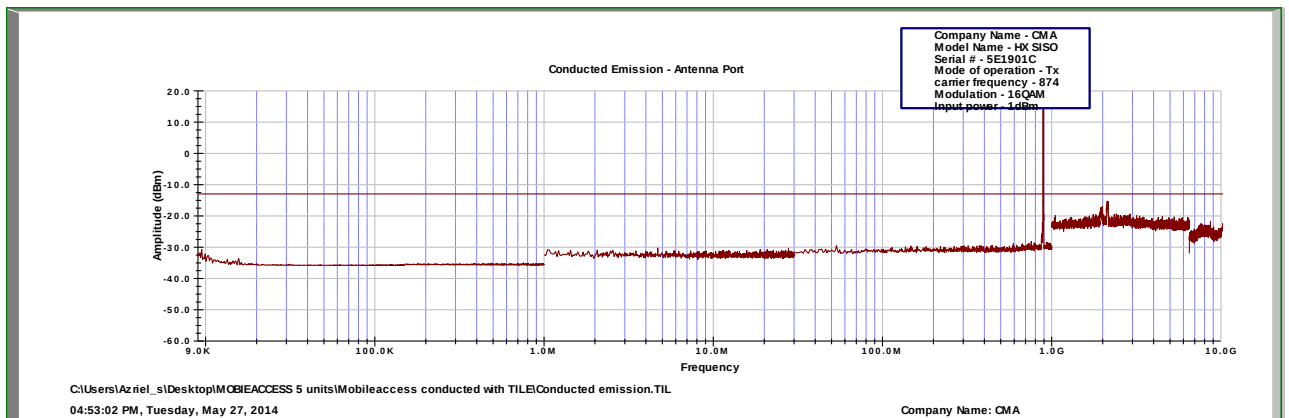


Figure 37.— 874 MHz

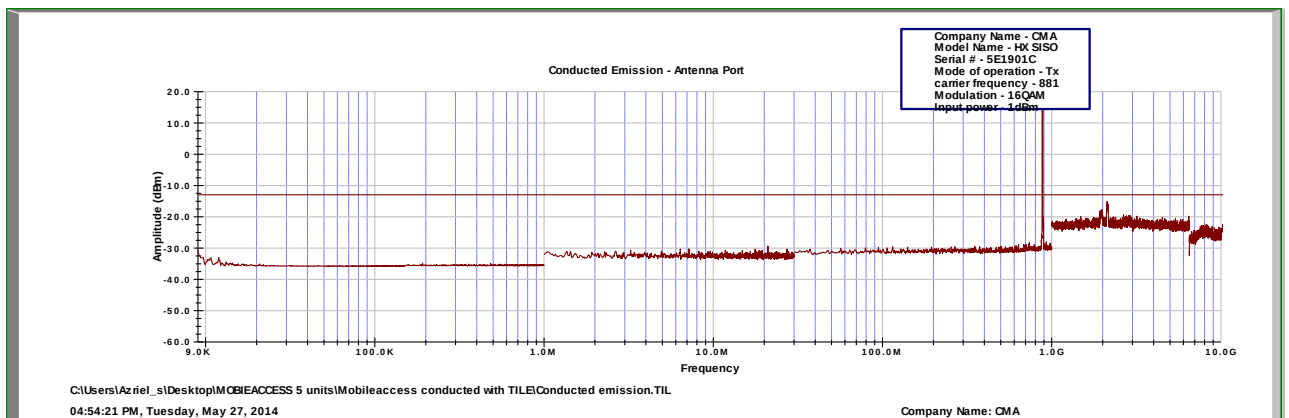


Figure 38.— 881 MHz

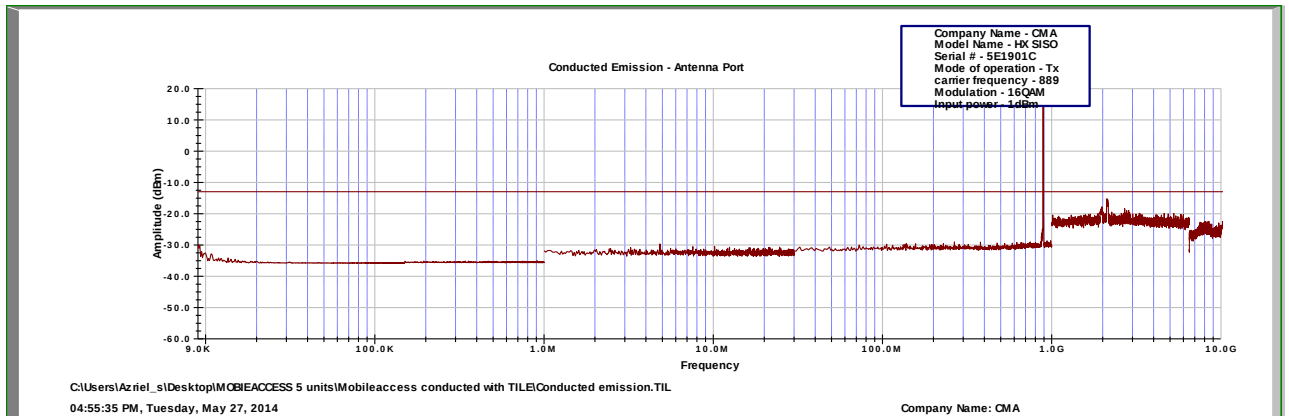


Figure 39.— 889 MHz

64QAM :

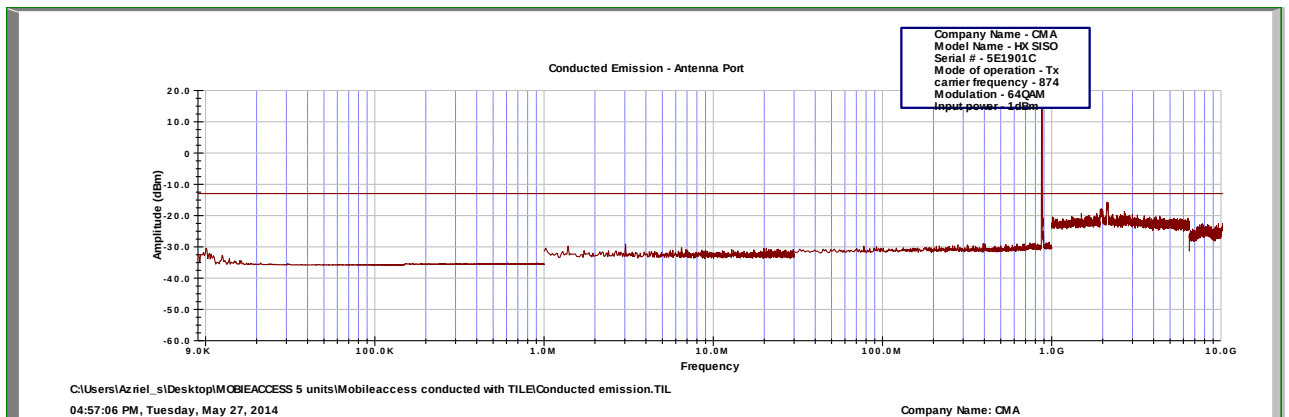


Figure 40.— 874 MHz

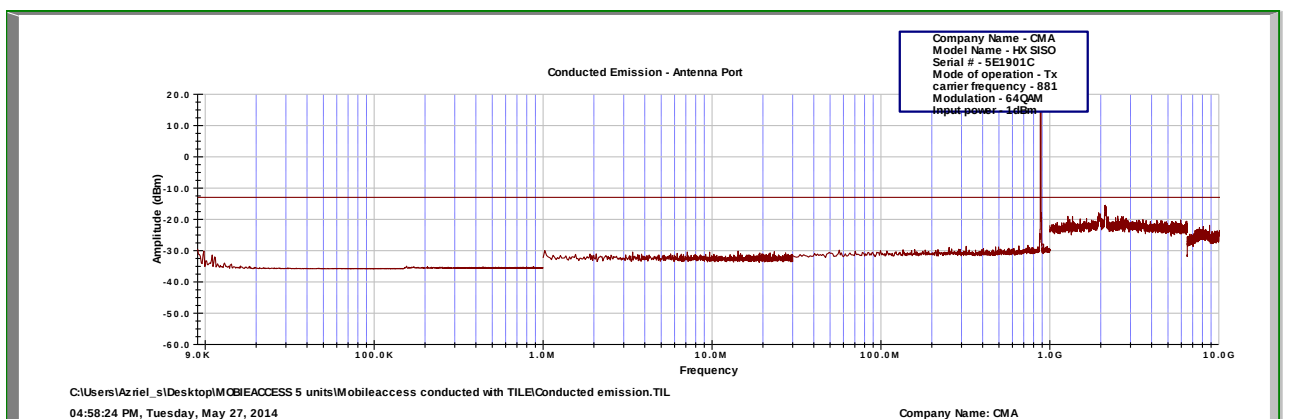


Figure 41.— 881 MHz

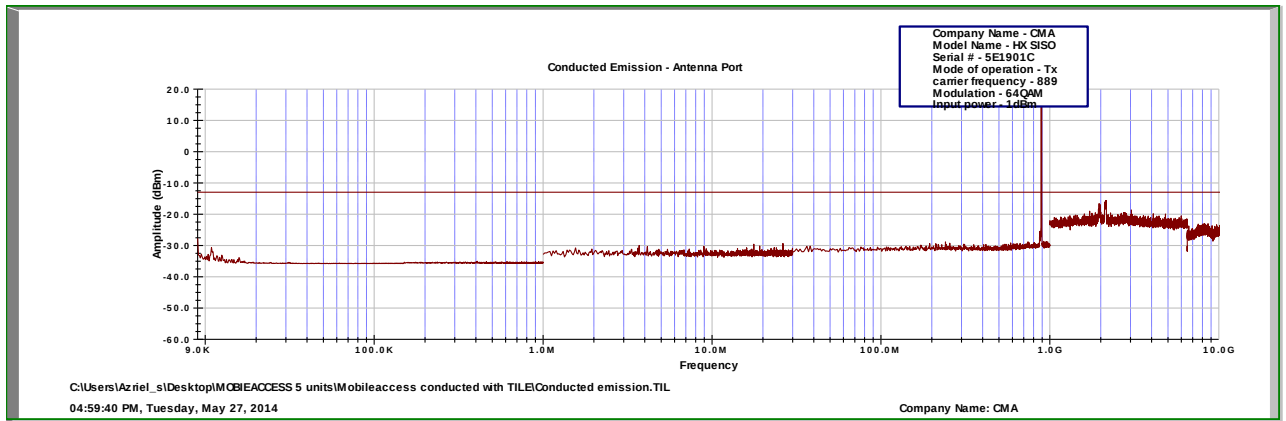


Figure 42.— 889 MHz



6.3 Results Table

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
FCC Part 22, Section 917; FCC Part 2.1051

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 03.07.14

Typed/Printed Name: A. Sharabi

6.4 **Test Equipment Used; Out of Band Emission at Antenna Terminals CELL**

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Signal Generator	HP	N5182A	MY48180244	July 28, 2013	1 year
Attenuator	MCE	46-30-34	-	May 22, 2014	1 year
Cable	Rhophase	KPS-5000-KPS	A1674	May 22, 2014	1 year

Figure 43 Test Equipment Used

7. Band Edge Spectrum CELL

7.1 Test Specification

FCC Part 22, FCC Part 2.1051

7.2 Test procedure

Enclosed are spectrum analyzer plots for the lowest operation frequency (874 MHz) and the highest operation frequency (889 MHz) in which the E.U.T. is planned to be used.

The power of any emission outside of the authorized operating frequency ranges (869 - 894 MHz) must be attenuated below the transmitting power (P) by a factor of at least $43 + \log(P)$ dB, yielding -13dBm.

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (30.5 dB).

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

QPSK :

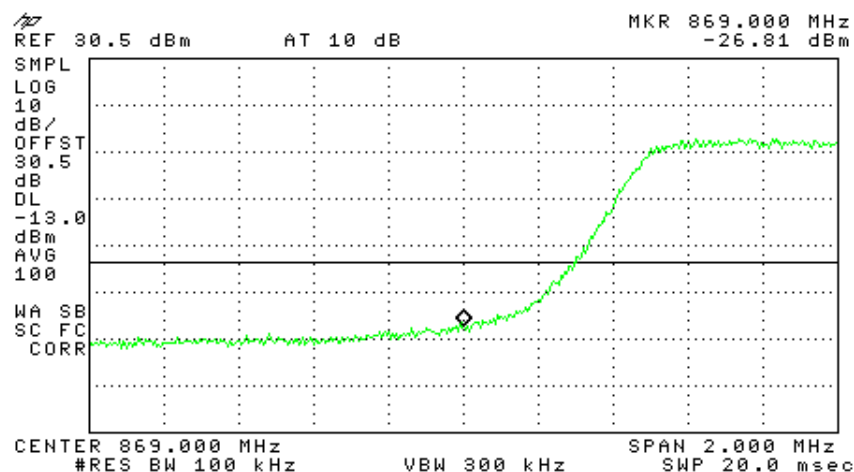


Figure 44.— 874 MHz

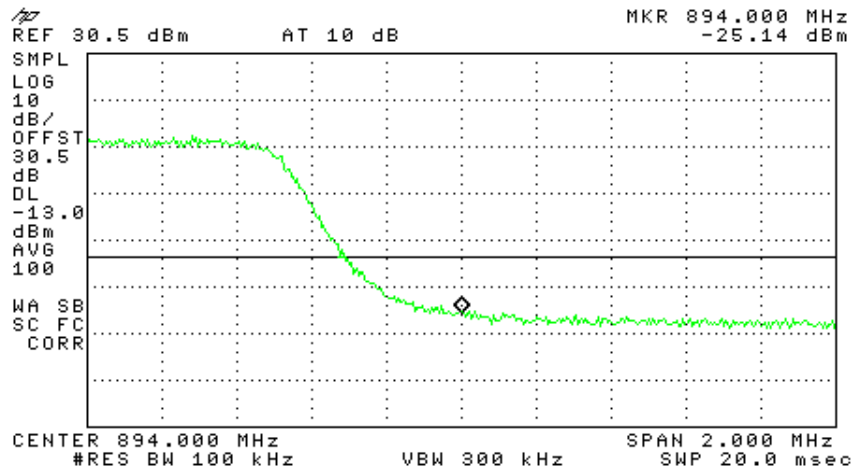


Figure 45.— 889 MHz

16QAM :

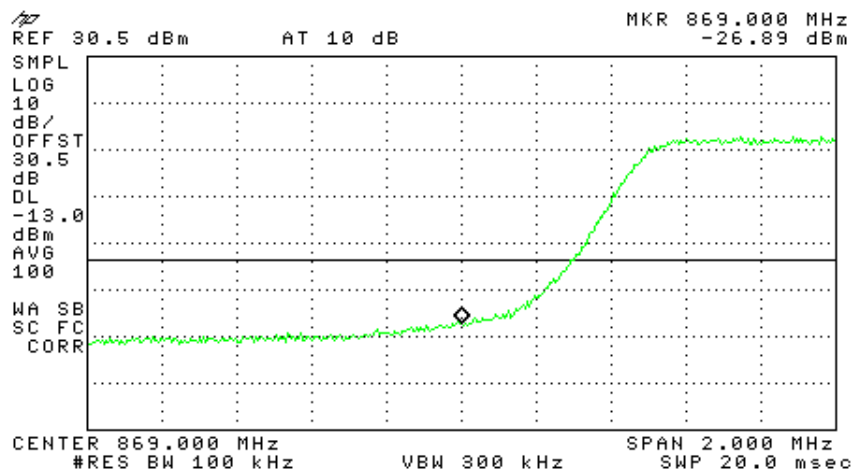


Figure 46.— 874 MHz

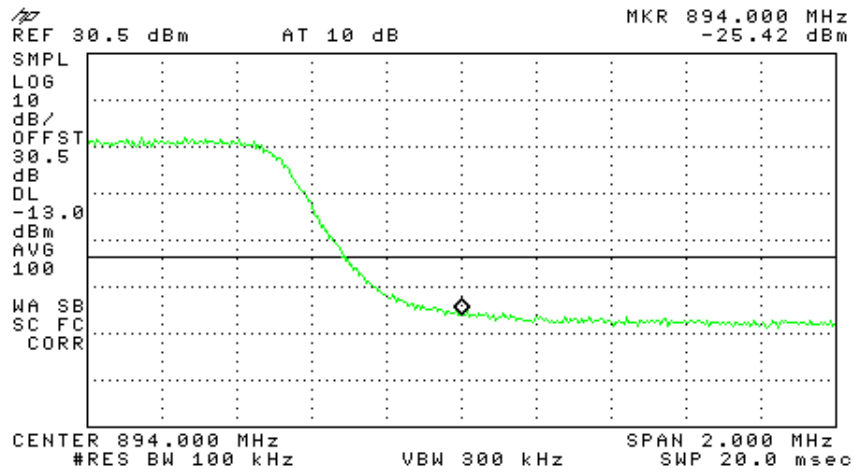


Figure 47.— 889 MHz

64QAM :

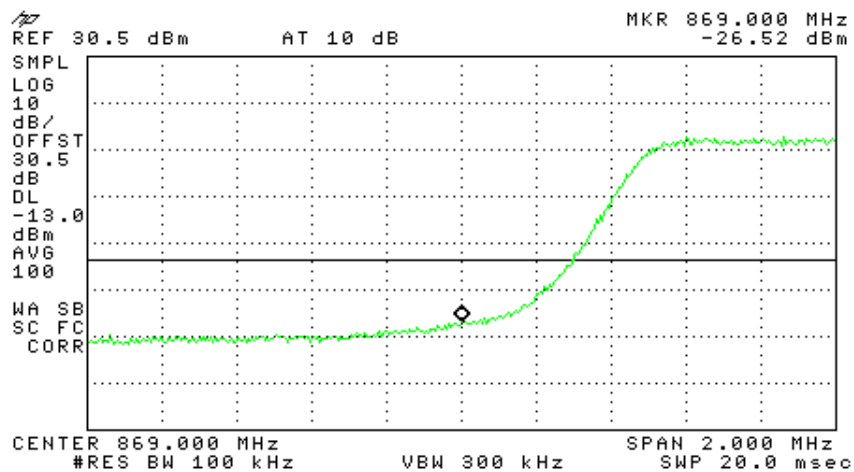


Figure 48.— 874 MHz

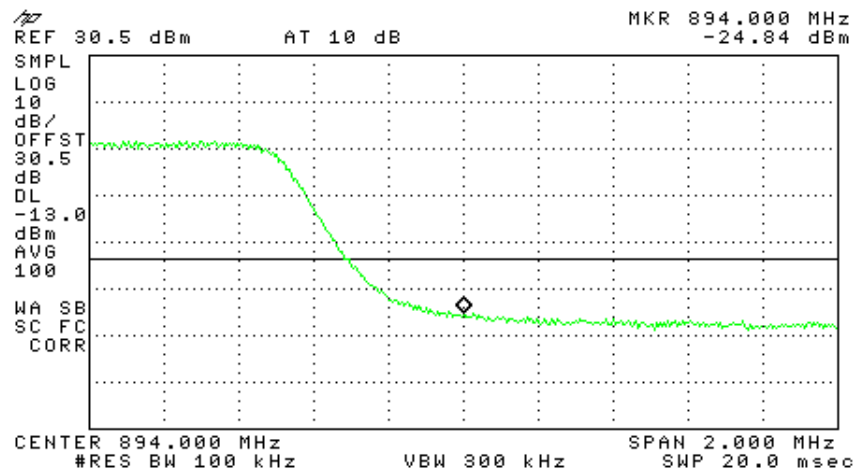


Figure 49.— 889 MHz



7.3 Results Table

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 24, Subpart E, Section 238; Part 2 Section 1051

Modulation	Operation Frequency (MHz)	Band Edge Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
QPSK	874.00	869.00	-26.81	-13.0	-13.81
	889.00	894.00	-25.14	-13.0	-12.14
16QAM	874.00	869.00	-26.89	-13.0	-13.89
	889.00	894.00	-25.42	-13.0	-12.42
64QAM	874.00	869.00	-26.52	-13.0	-13.52
	889.00	894.00	-24.84	-13.0	-11.84

Figure 50 Band Edge Spectrum Results CELL

JUDGEMENT: Passed by 11.84 dB

TEST PERSONNEL:

Tester Signature: 

Date: 03.07.14

Typed/Printed Name: A. Sharabi

7.4 **Test Equipment Used Band Edge Spectrum CELL**

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Signal Generator	HP	N5182A	MY48180244	July 28, 2013	1 year
Attenuator	MCE	46-30-34	-	May 22, 2014	1 year
Cable	Rhophase	KPS-5000-KPS	A1674	May 22, 2014	1 year

Figure 51 Test Equipment Used

8. Peak Output Power PCS

8.1 Test Specification

FCC Part 24, Subpart E

8.2 Test procedure

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

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator (30 dB) and an appropriate coaxial cable (0.5dB). The E.U.T. RF output was LTE modulated. Special attention was taken to prevent Spectrum Analyzer RF input overload.

QPSK:

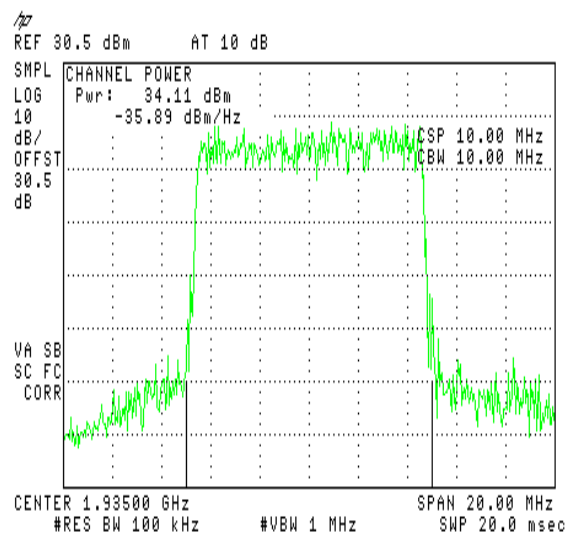


Figure 52.— 1935 MHz

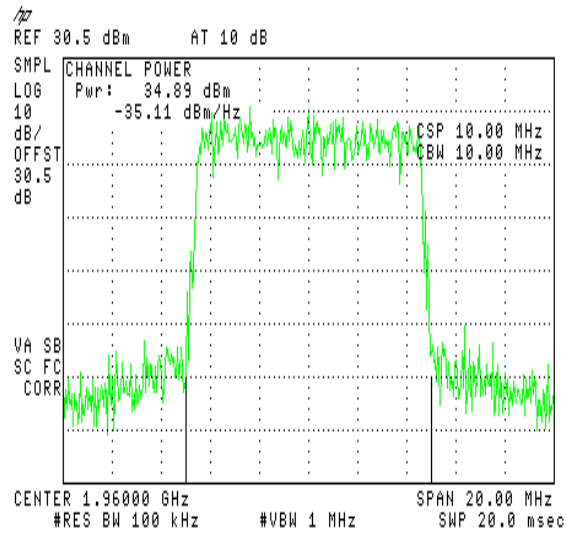


Figure 53.— 1960 MHz

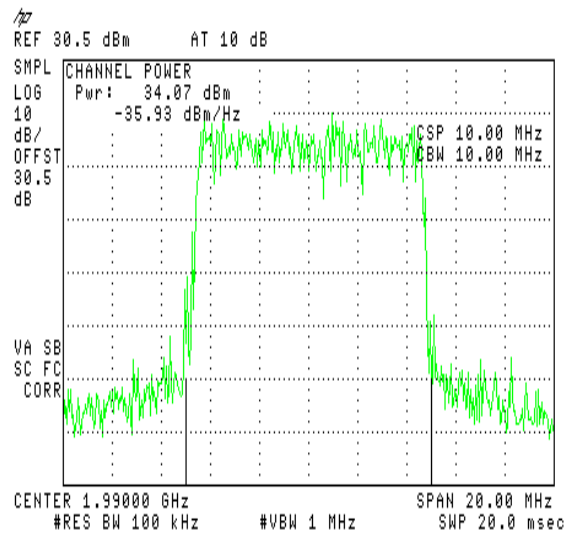


Figure 54.— 1990 MHz



16QAM:

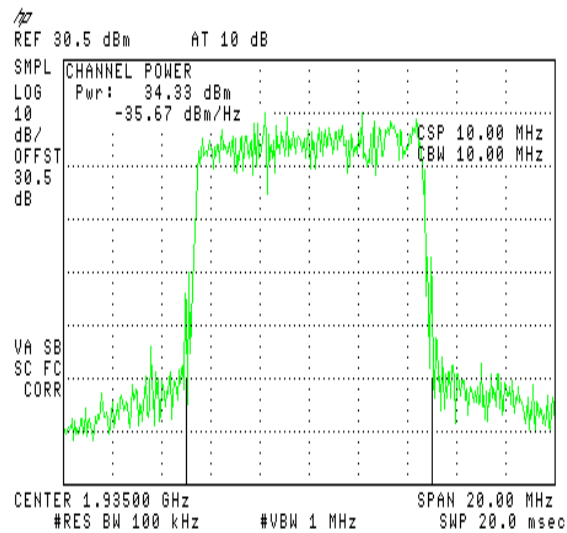


Figure 55.— 1935 MHz

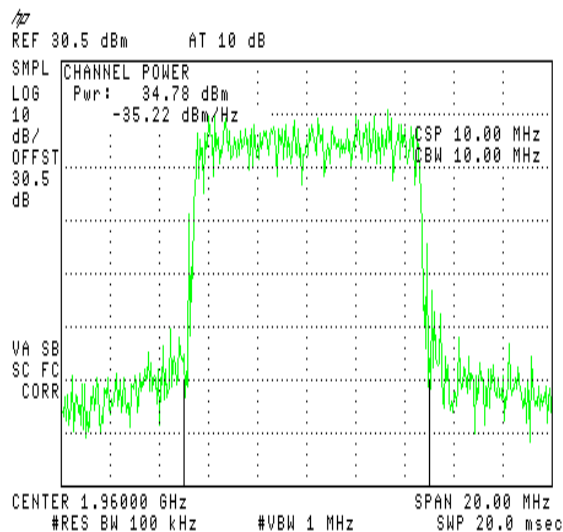


Figure 56.— 1960 MHz

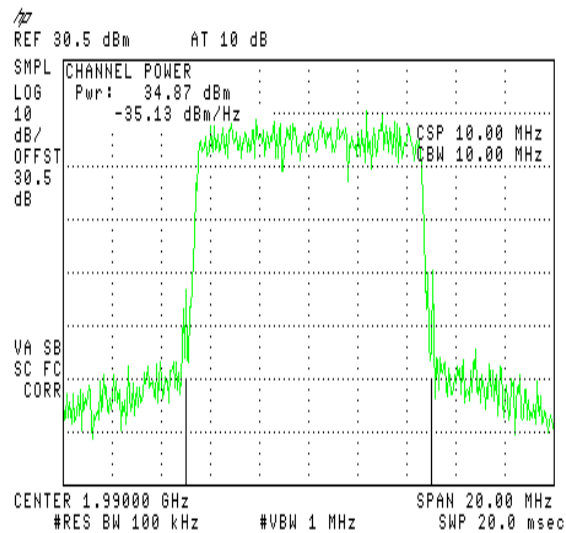


Figure 57.— 1990 MHz

64QAM:

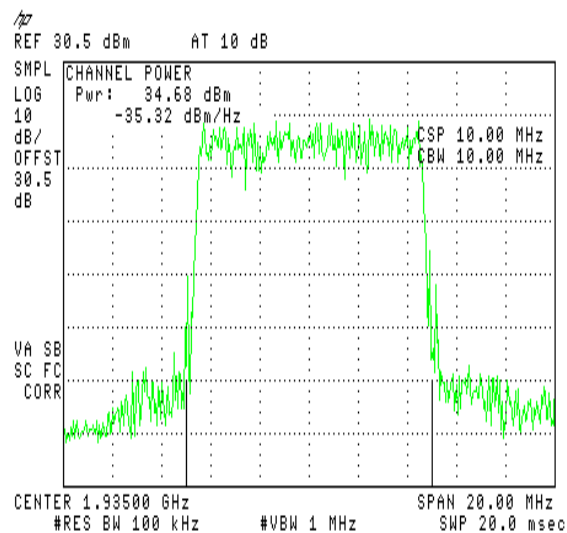


Figure 58.— 1935 MHz

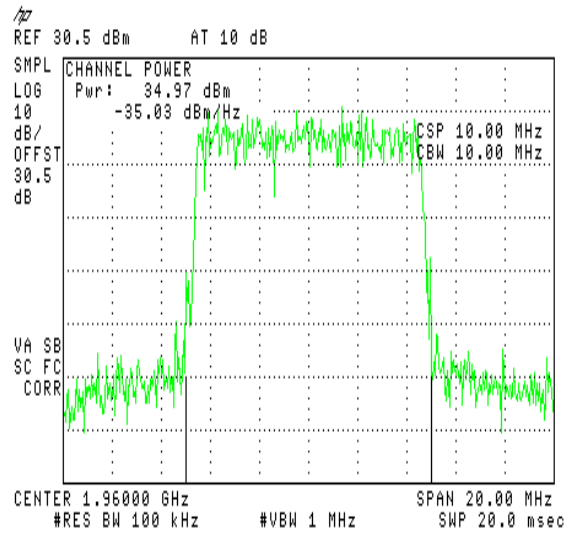


Figure 59.— 1960 MHz

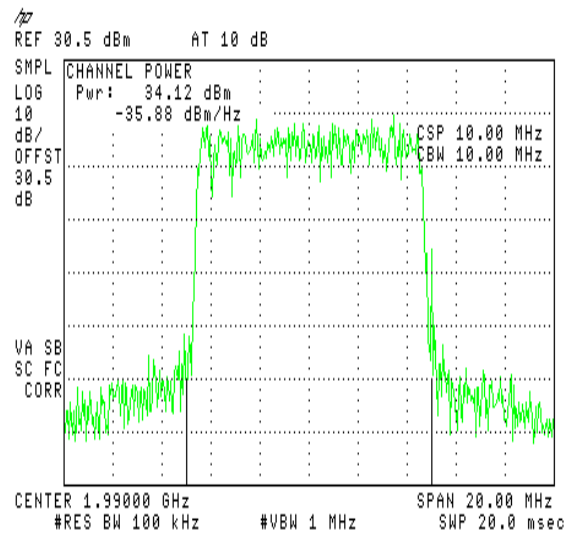


Figure 60.— 1990 MHz

8.3 Results Table

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

Modulation	Operation Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
QPSK	1935	34.11	50.0	-15.89
	1960	34.89	50.0	-15.11
	1990	34.07	50.0	-15.93
16QAM	1935	34.33	50.0	-15.67
	1960	34.78	50.0	-15.22
	1990	34.87	50.0	-15.13
64QAM	1935	34.68	50.0	-15.32
	1960	34.97	50.0	-15.03
	1990	34.12	50.0	-15.88

Figure 61 Peak Output Power PCS

JUDGEMENT: Passed by 15.03 dB

TEST PERSONNEL:

Tester Signature: 

Date: 03.07.14

Typed/Printed Name: A. Sharabi

8.4 *Test Equipment Used, Peak Output Power PCS*

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Signal Generator	HP	N5182A	MY48180244	July 28, 2013	1 year
Attenuator	MCE	46-30-34	-	May 22, 2014	1 year
Cable	Rhophase	KPS-5000-KPS	A1674	May 22, 2014	1 year

Figure 62 Test Equipment Used

9. Occupied Bandwidth PCS

9.1 Test Specification

FCC Part 2, Section 1049

9.2 Test Procedure

The E.U.T. was set to the applicable test frequency with 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.

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.

INPUT QPSK:

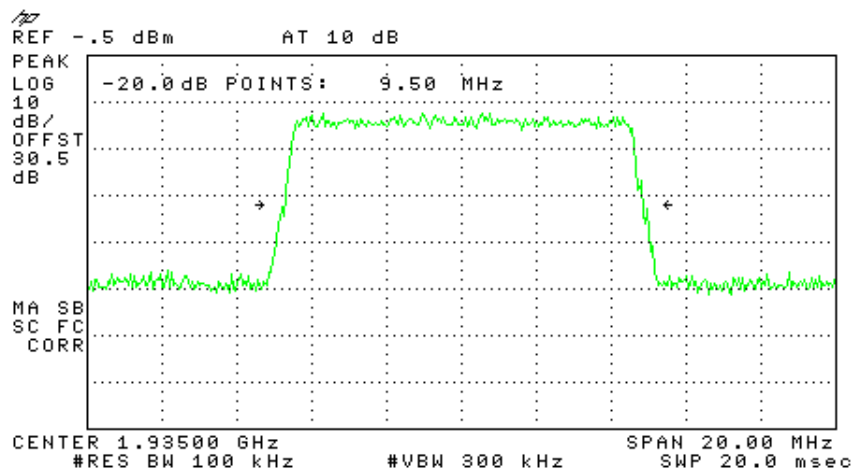


Figure 63.— 1935 MHz

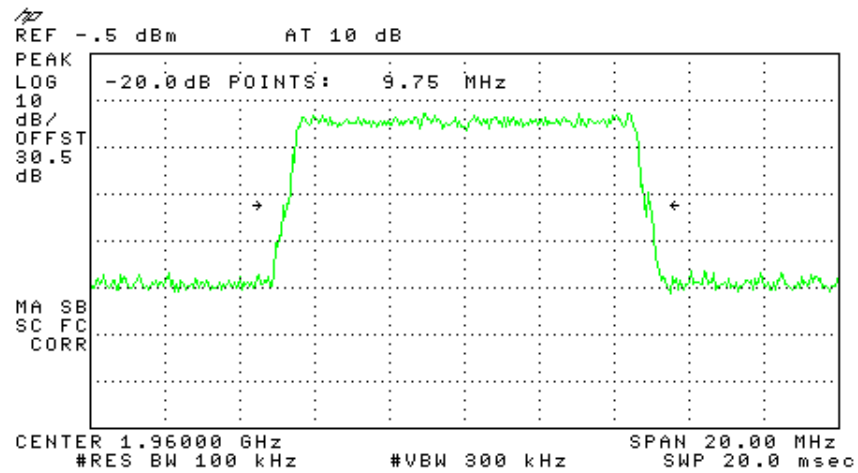


Figure 64.— 1960 MHz

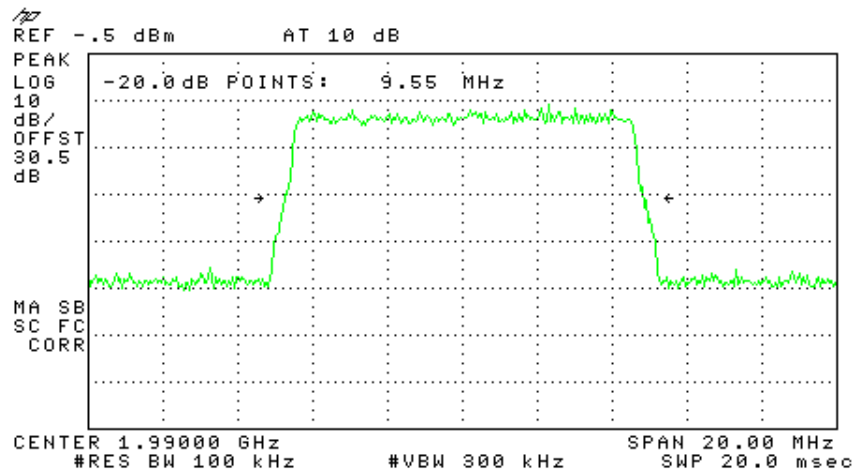


Figure 65.— 1990 MHz

INPUT 16QAM:

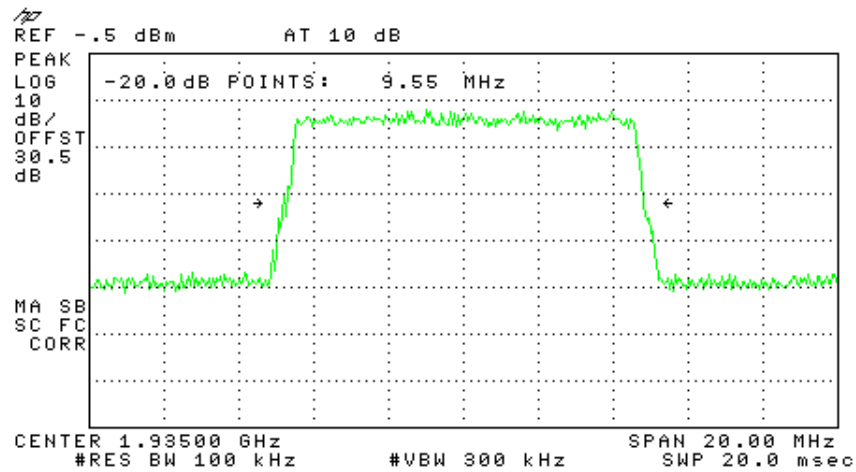


Figure 66.— 1935 MHz

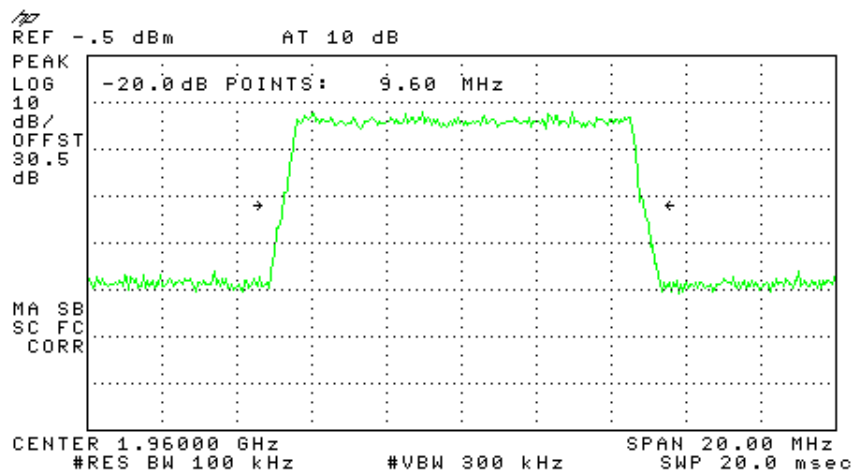


Figure 67.— 1960 MHz

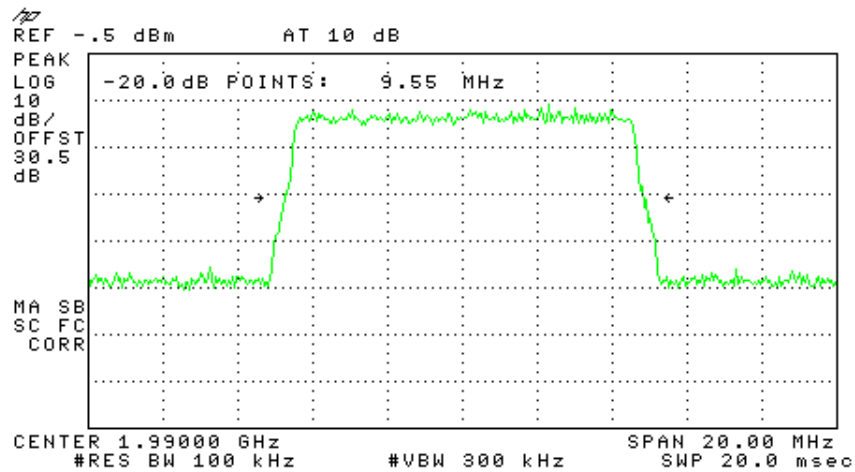


Figure 68.— 1990 MHz

INPUT 64QAM:

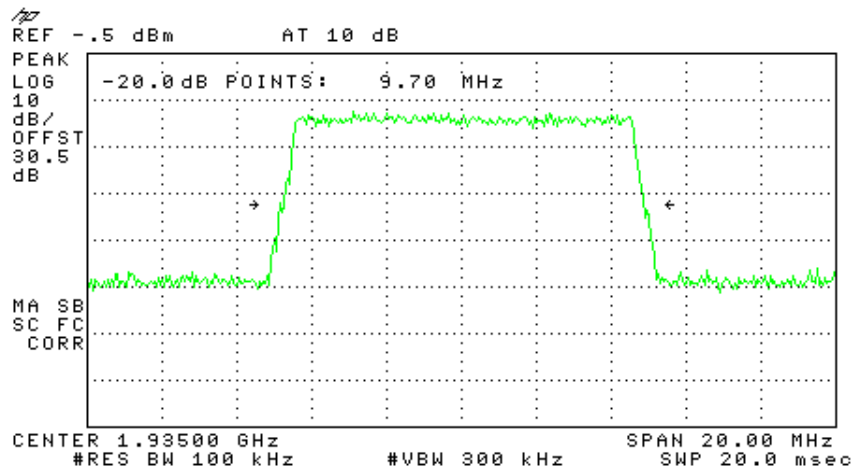


Figure 69.— 1935 MHz

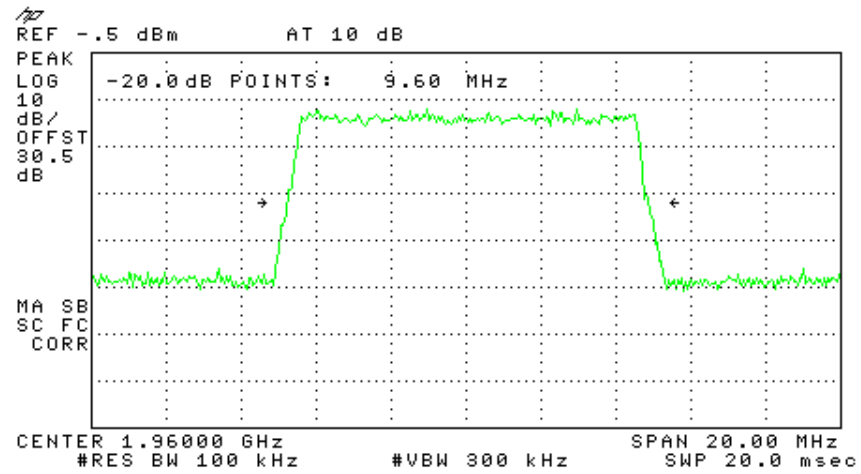


Figure 70.— 1960 MHz

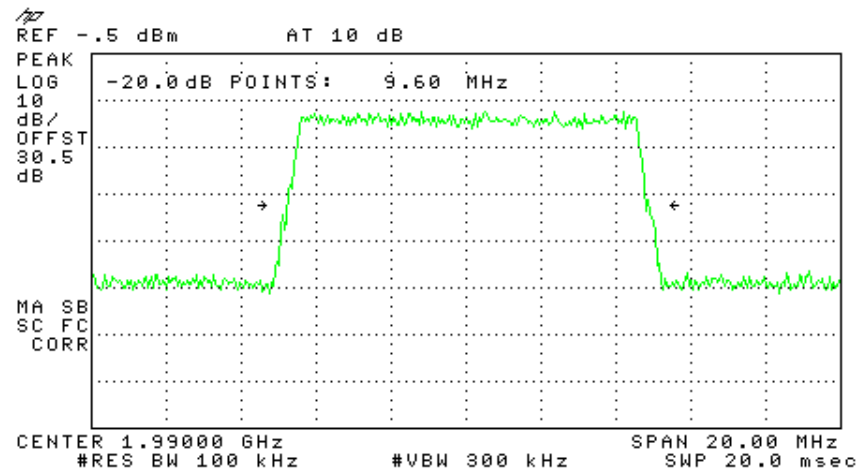


Figure 71.— 1990 MHz

OUTPUT QPSK:

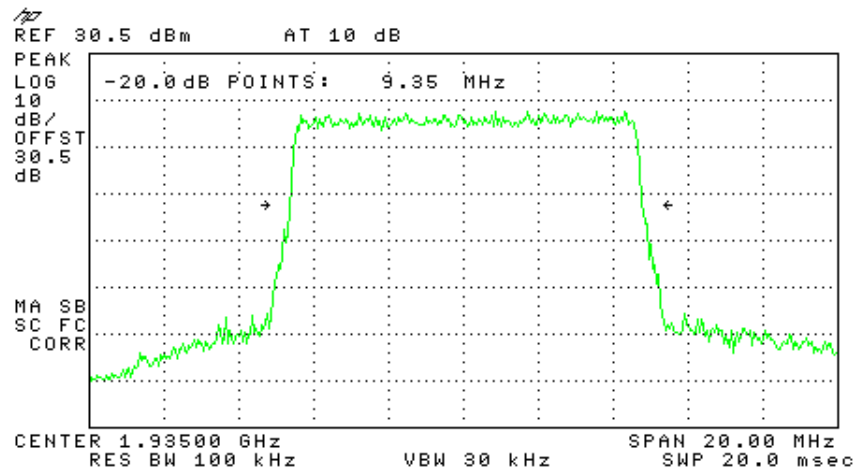


Figure 72.— 1935 MHz

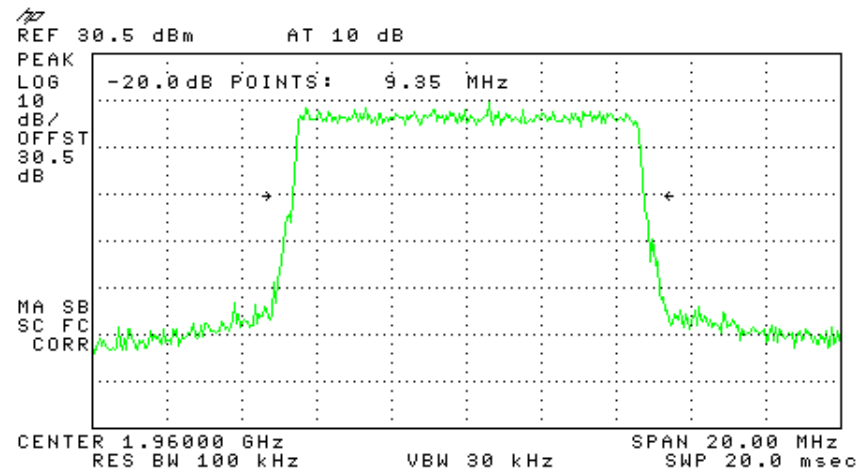


Figure 73.— 1960 MHz

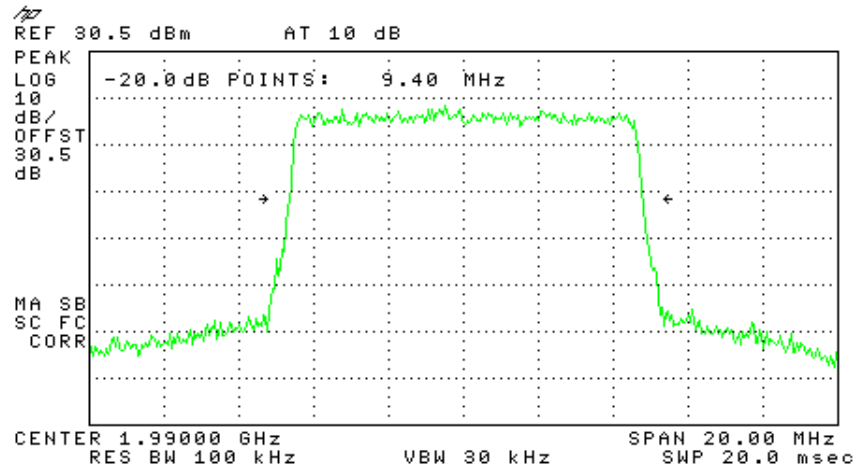


Figure 74.— 1990 MHz

OUTPUT 16QAM:

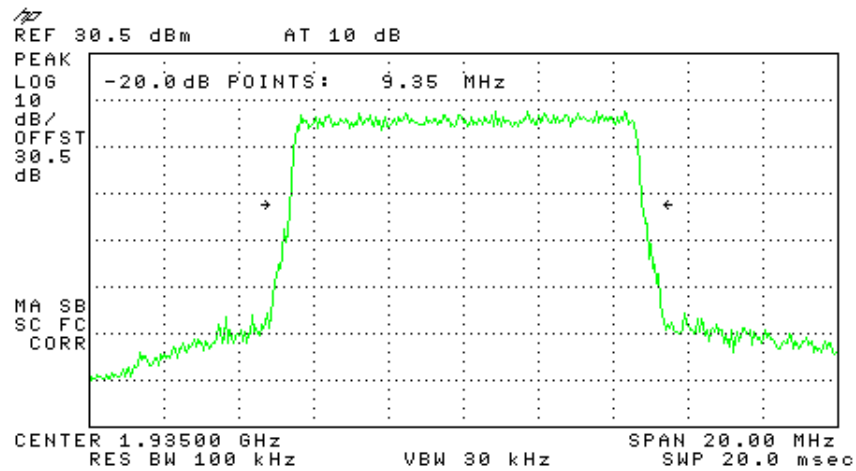


Figure 75.— 1935 MHz

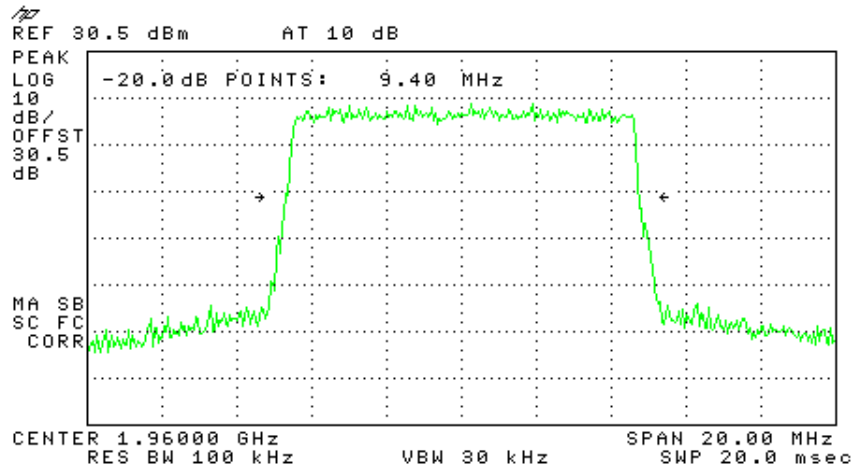


Figure 76.— 1960 MHz

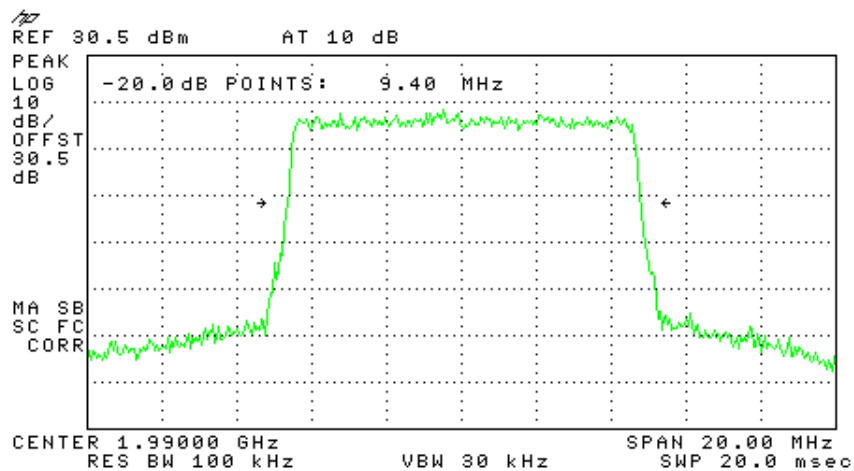


Figure 77.— 1990 MHz

OUTPUT 64QAM:

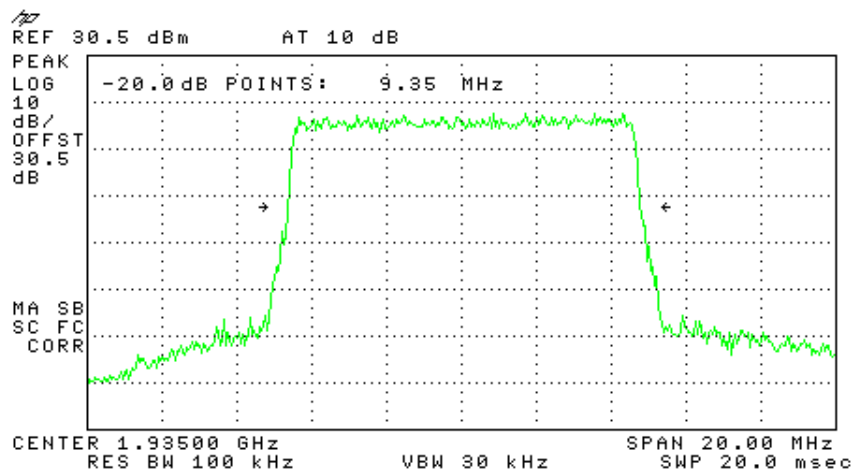


Figure 78.— 1935 MHz

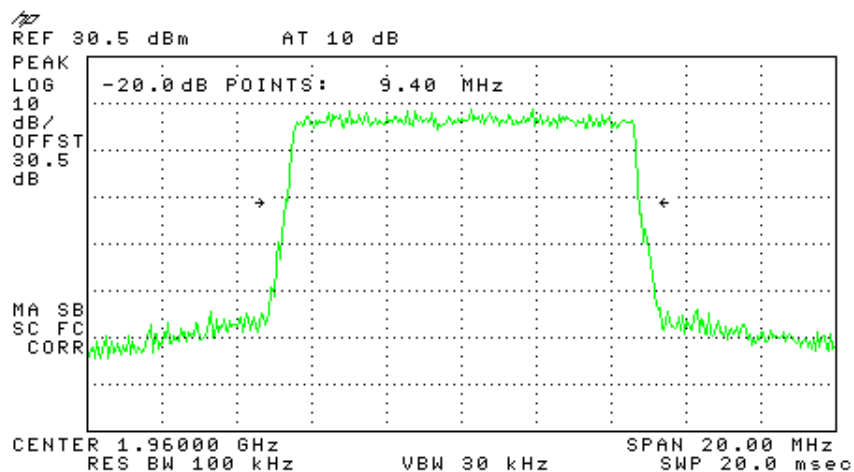


Figure 79.— 1960 MHz

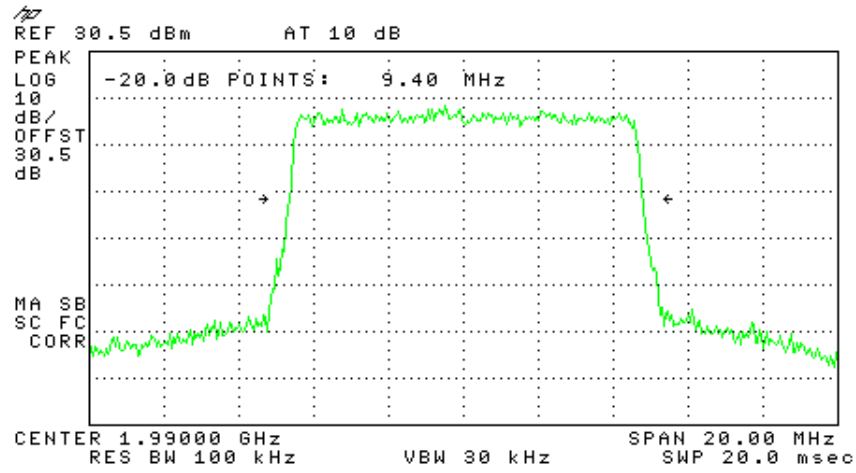


Figure 80.— 1990 MHz

9.3 Results Table

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)
QPSK	Input	1935	9.50
	Output	1935	9.35
	Input	1960	9.75
	Output	1960	9.35
	Input	1990	9.55
	Output	1990	9.40
16QAM	Input	1935	9.55
	Output	1935	9.35
	Input	1960	9.60
	Output	1960	9.40
	Input	1990	9.55
	Output	1990	9.40
64QAM	Input	1935	9.70
	Output	1935	9.35
	Input	1960	9.60
	Output	1960	9.40
	Input	1990	9.60
	Output	1990	9.40

Figure 81 Occupied Bandwidth PCS

TEST PERSONNEL:

Tester Signature: 

Date: 03.07.14

Typed/Printed Name: A. Sharabi

9.4 **Test Equipment Used; Occupied Bandwidth PCS**

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Signal Generator	HP	N5182A	MY48180244	July 28, 2013	1 year
Attenuator	MCE	46-30-34	-	May 22, 2014	1 year
Cable	Rhophase	KPS-5000-KPS	A1674	May 22, 2014	1 year

Figure 82 Test Equipment Used

10. Out of Band Emissions at Antenna Terminals PCS

10.1 Test Specification

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

10.2 Test procedure

The power of any emission outside of the authorized operating frequency ranges (1930-1990 MHz) must be attenuated below the transmitting power (P) by a factor of at least $43 + \log(P)$ dB, yielding -13dBm .

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

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

Signal power was +10 dBm to EUT.

QPSK:

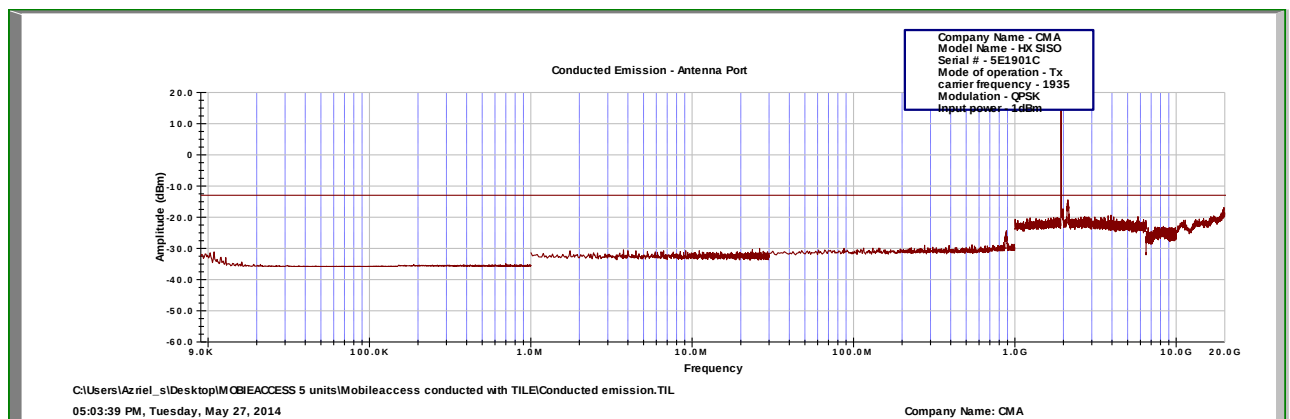


Figure 83.— 1935 MHz

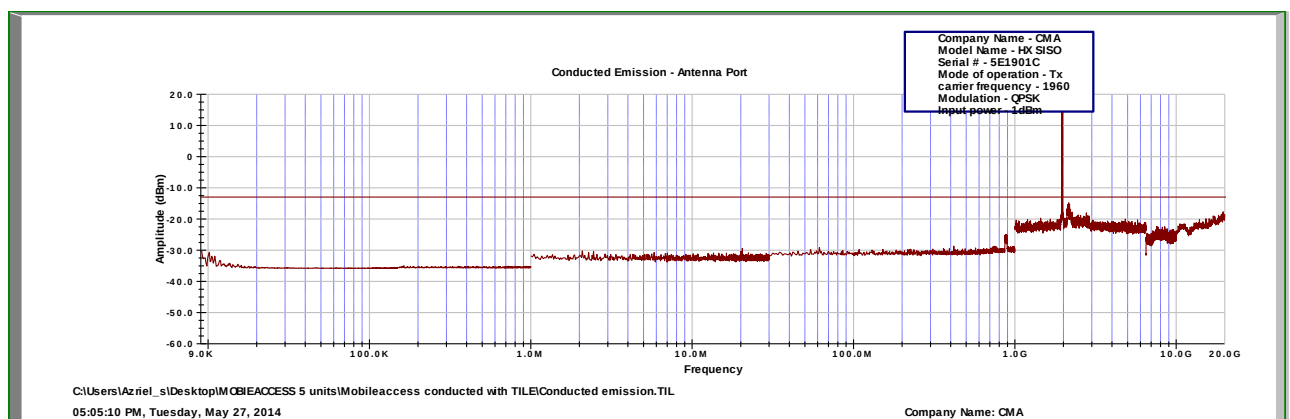


Figure 84.— 1960 MHz

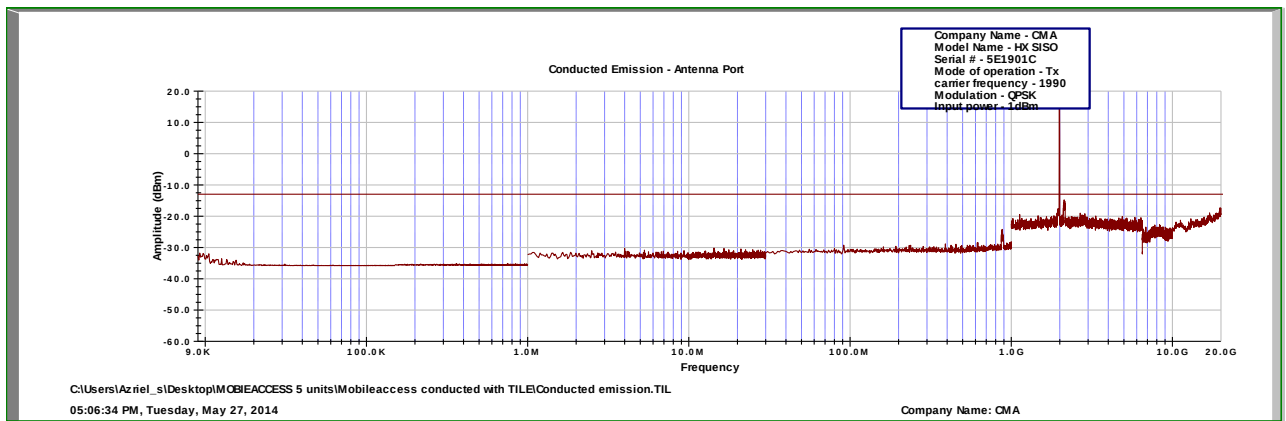


Figure 85.— 1990 MHz

16QAM:

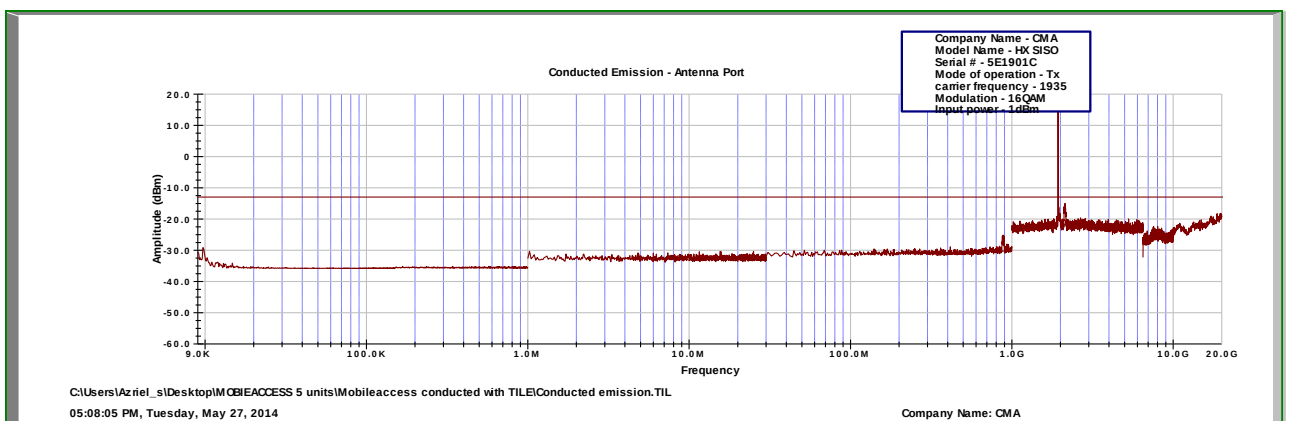


Figure 86.— 1935 MHz

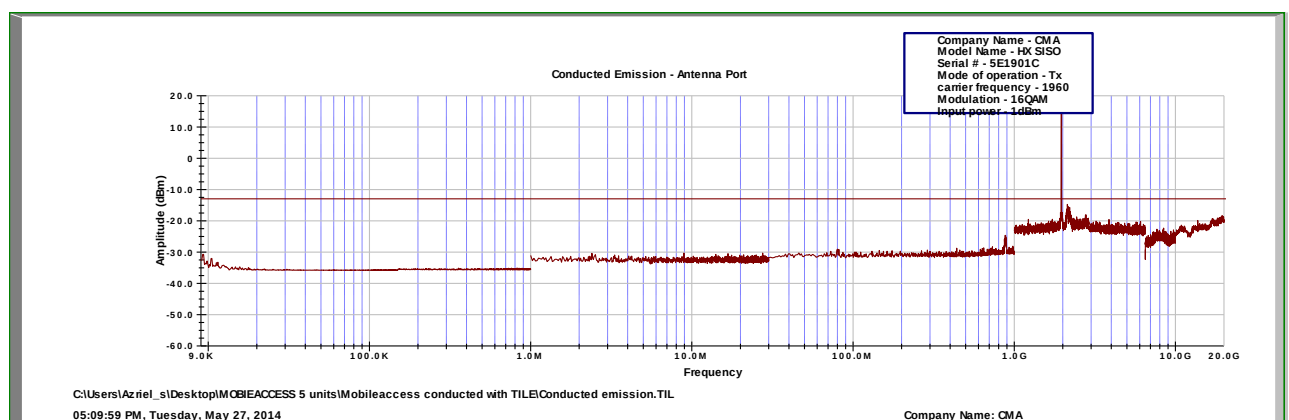


Figure 87.— 1960 MHz

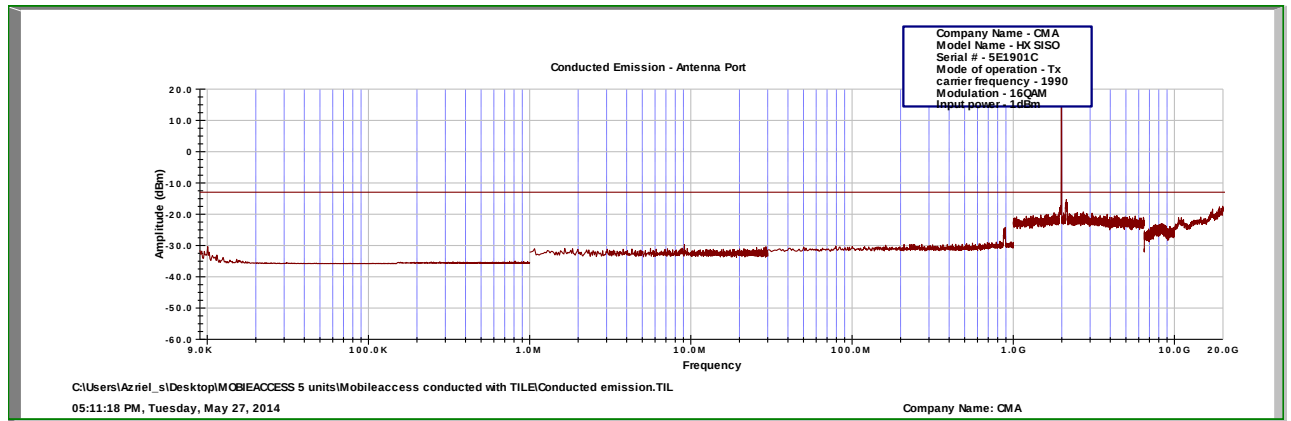


Figure 88.— 1990 MHz

64QAM:

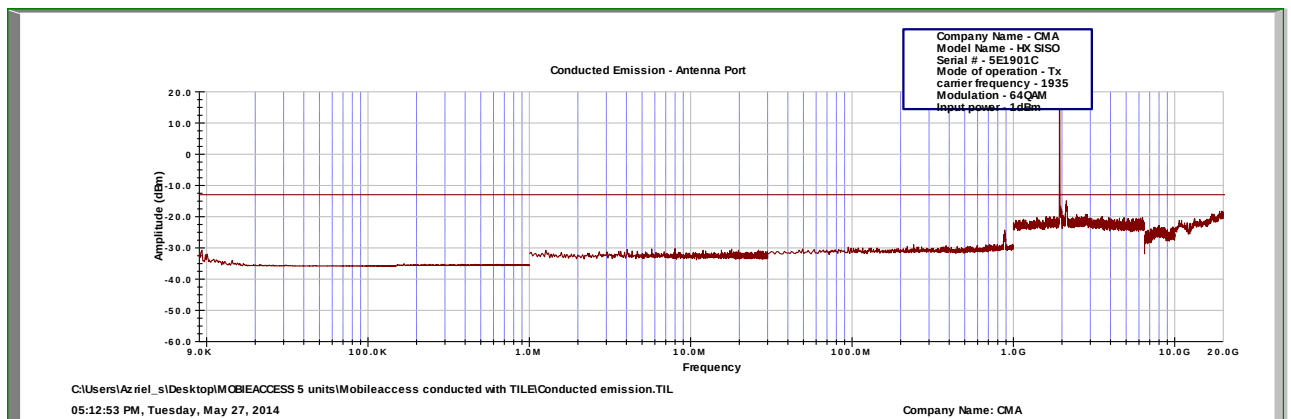


Figure 89.— 1935 MHz

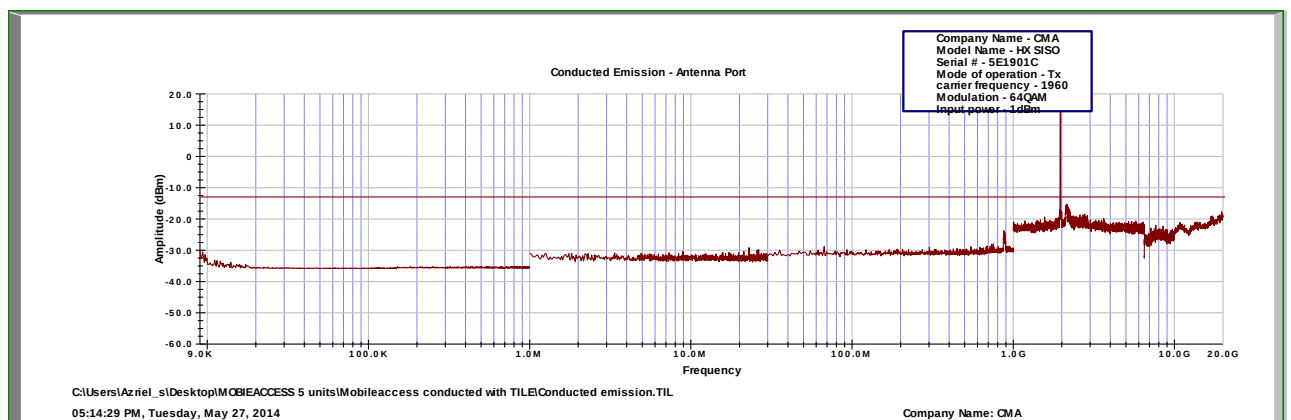


Figure 90.— 1960 MHz

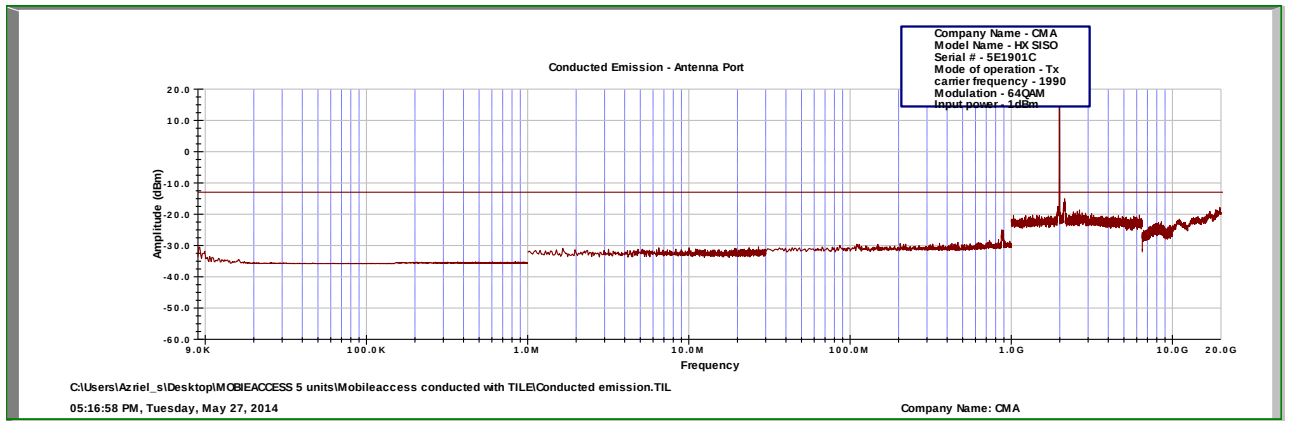


Figure 91.— 1990 MHz



10.3 Results Table

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 24, Subpart E, Section 238; Part 2 Section 1051

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____

Date: 03.07.14

Typed/Printed Name: A. Sharabi

10.4 **Test Equipment Used, Out of Band Emission at Antenna Terminals PCS**

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Signal Generator	HP	N5182A	MY48180244	July 28, 2013	1 year
Attenuator	MCE	46-30-34	-	May 22, 2014	1 year
Cable	Rhophase	KPS-5000-KPS	A1674	May 22, 2014	1 year

Figure 92 Test Equipment Used

11. Band Edge Spectrum PCS

11.1 Test Specification

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

11.2 Test procedure

Enclosed are spectrum analyzer plots for the lowest operation frequency (1935 MHz) and the highest operation frequency (1990 MHz) in which the E.U.T. is planned to be used.

The power of any emission outside of the authorized operating frequency ranges (1930.00-1995.00 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 (30.5 dB).

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

QPSK:

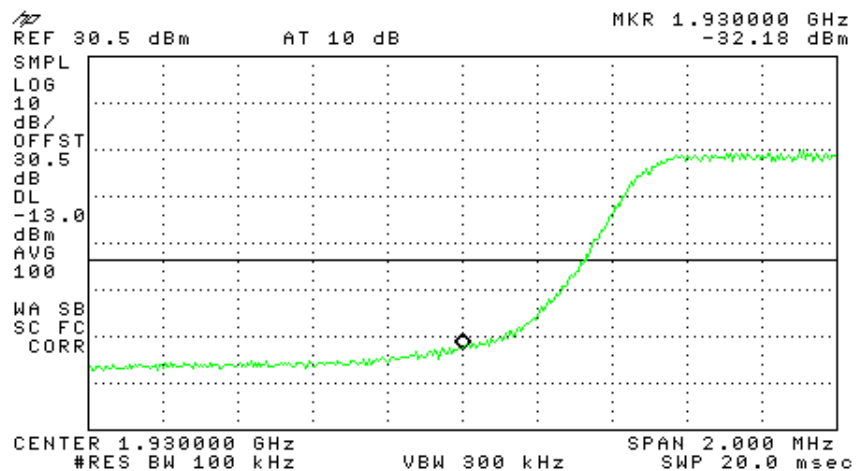


Figure 93.— 1935 MHz

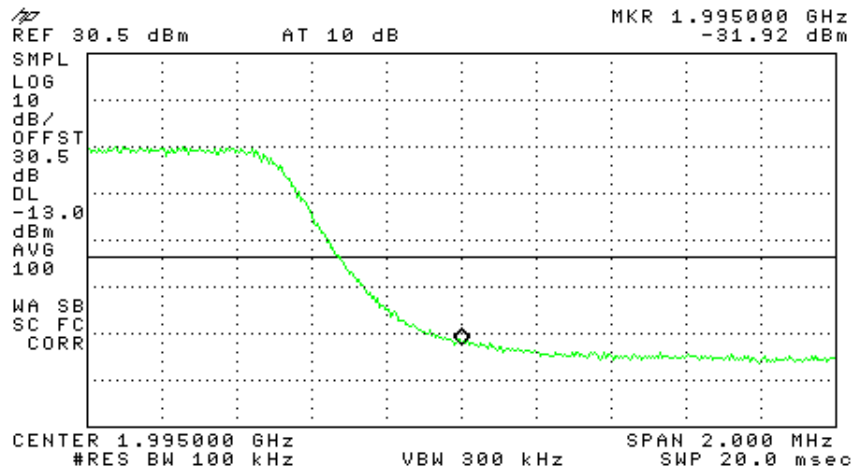


Figure 94.— 1990 MHz

16QAM:

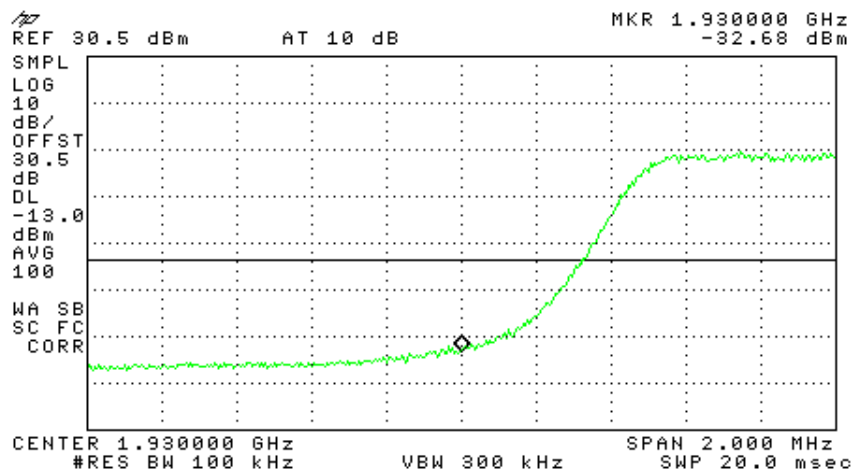


Figure 95.— 1935 MHz

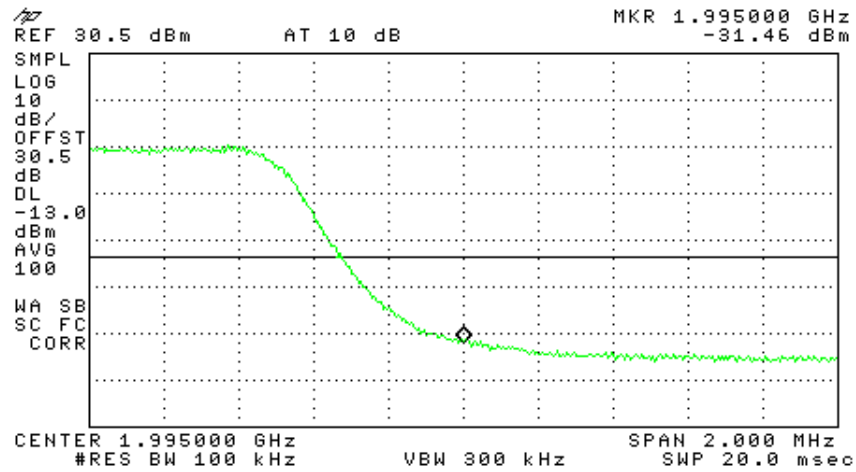


Figure 96.— 1990 MHz

64QAM:

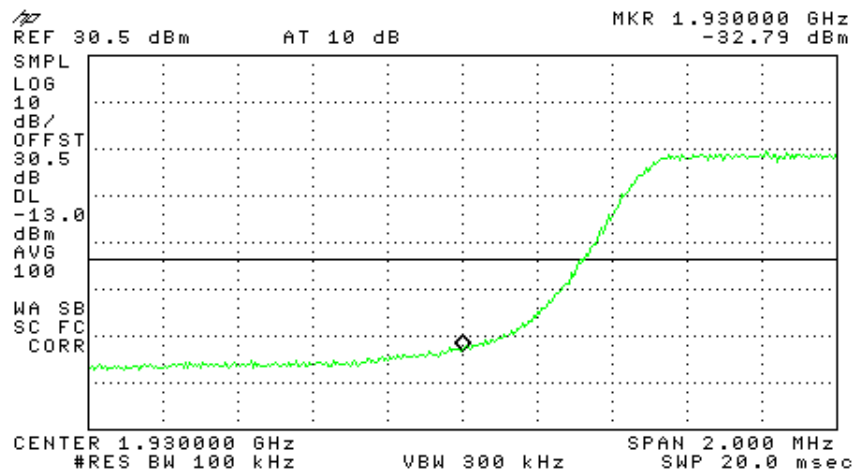


Figure 97.— 1935 MHz

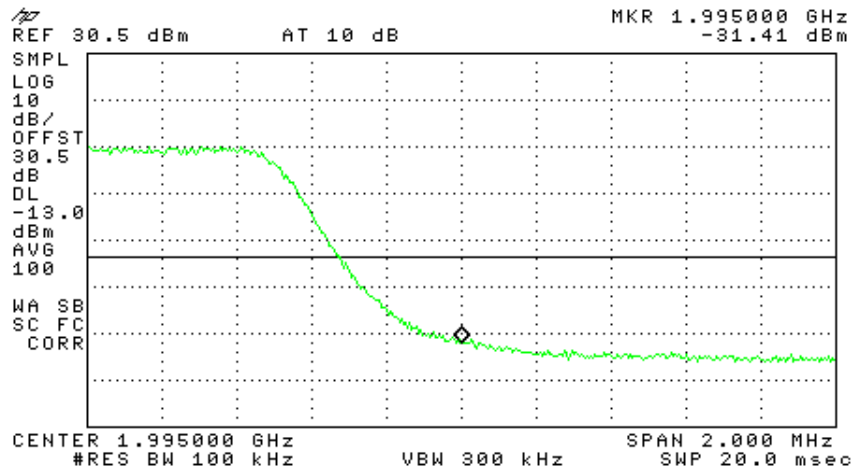


Figure 98.— 1990 MHz

11.3 Results Table

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 24, Subpart E, Section 238; Part 2 Section 1051

Modulation	Operation Frequency (MHz)	Band Edge Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
QPSK	1935	1930	-32.18	-13.0	-19.18
	1990	1995	-31.92	-13.0	-18.92
16QAM	1935	1930	-32.68	-13.0	-19.68
	1990	1995	-31.46	-13.0	-18.46
64QAM	1935	1930	-32.79	-13.0	-19.79
	1990	1995	-31.41	-13.0	-18.41

Figure 99 Band Edge Spectrum Results PCS

JUDGEMENT: Passed by 18.41 dB

TEST PERSONNEL:

Tester Signature: 

Date: 03.07.14

Typed/Printed Name: A. Sharabi



11.4 Test Equipment Used; Band Edge Spectrum PCS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Signal Generator	HP	N5182A	MY48180244	July 28, 2013	1 year
Attenuator	MCE	46-30-34	-	May 22, 2014	1 year
Cable	Rhophase	KPS-5000-KPS	A1674	May 22, 2014	1 year

Figure 100 Test Equipment Used

12. APPENDIX A - CORRECTION FACTORS

12.1 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".

12.2 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.

12.3 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.



12.4 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 38M30.ANT for a 3 meter range,
and file number 38M100.ANT for a 10 meter range.
3. The files mentioned above are located on the disk marked "Radiated Emission
Test EMI Receiver".



12.5 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".

12.6 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".



12.7 Correction factors for Double-Ridged Waveguide Horn

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

FREQUENCY	ANTENNA	ANTENN	FREQUENCY	ANTENNA	ANTENNA
(GHz)	FACTOR	A Gain	(GHz)	FACTOR	Gain
	(dB 1/m)	(dBi)		(dB 1/m)	(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			



12.8 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