



DATE: 23 December 2014

I.T.L. (PRODUCT TESTING) LTD.
FCC Radio Test Report
for
Corning Optical Communication
Wireless

Equipment under test:

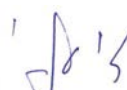
ONE- Optical Network Evolution DAS

RAU-5 Remote Antenna Unit P/N: RAU5US-AME
consisting of RXU P/N: RXU-L70A17-M and GEM

ESMR-CELL-PCS-LTE-AWS
(ESMR-CELL-PCS Section)

Written by: 
R. Pinchuck, Documentation

Approved by: 
M. Zohar, Test Engineer

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 ONE- Optical Network Evolution DAS

FCC ID: OJF1RAU5

This report concerns:

Original Grant: X

Class II change:

Class I change:

Equipment type:

PCS Licensed Transmitter

Limits used:

47CFR Parts 2, 22, 24, 27, 90

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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Applicant for this device:

(different from "prepared by")

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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 U.S.A. Tel: +1-541-758-2880 Fax: +1-703-848-0260
Manufacturer's Representative:	Habib Riazi
Equipment Under Test (E.U.T):	ONE- Optical Network Evolution DAS
Equipment Model No.:	RAU-5 Remote Antenna Unit P/N: RAU5US-AME consisting of RXU P/N: RXU-L70A17-M and GEM
Equipment Serial No.:	Not Designated
Date of Receipt of E.U.T:	14.09.14
Start of Test:	14.09.14
End of Test:	22.09.14
Test Laboratory Location:	I.T.L (Product Testing) Ltd. 1 Batsheva St, Lod, Israel 7116002
Test Specifications:	FCC Parts 22, 24, 27, 90



1.2 List of Accreditations

The EMC laboratory of I.T.L. is accredited by/registered with 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.), FCC Designation Number US1004.
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-3006, R-2729, T-1877, G-245.
5. Industry Canada (Canada), IC File No.: 46405-4025; Site No. IC 4025A-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 Optical Network Platform (ONE™) by Corning provides a flexible in-building RF and network digital coverage solution based on a fiber optic transport backbone.

The fiber-optics infrastructure is easily deployable via a wide range of pre-terminated composite cables and advanced end-to-end equipment. Easy to design, Plug and Play™ connectors, significantly reduce installation cost and deployment time.

The ONE™ solution is an ideal fit for large, high-rise or campus-style deployments. It generates significant CAPEX savings and OPEX savings through the use of user configurable sectorization and an infrastructure that is simple to deploy and efficient in usage.

Dynamic sectorization management allows precise service distribution control to meet changing density needs, and provides further savings by enabling sharing of equipment at various levels for service providers.

Radio source agnostic, remote units can be used as network extenders. Ethernet capability with dedicated fiber link for Wi-Fi offload brings a higher level of granularity and support for devices and applications with very high speed requirements.

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 in Lod, Israel. I.T.L.'s EMC Laboratory is accredited by A2LA, certificate No. 1152.01 and its FCC Designation Number is US1004.

1.6 Measurement Uncertainty

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

0.15 – 30 MHz:

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

± 4.98 dB

2. System Test Configuration

2.1 *Justification*

The test setup was configured to closely resemble the standard installation.

The EUT consists of the HEU, the OIU and the RAU-5.

All source signals are represented in the setup by appropriate signal generators.

An “Exercise” SW on the computer was used to enable / disable transmission of the RAU-5, while the EUT output was connected to the spectrum analyzer.

All channels transmitted during the testing.

The CELL-ESMR and PCS output antenna ports are SISO bands and the LTE and AWS antenna ports are MIMO.

There is neither an intermediate amplified nor donor antenna in the uplink.

All components included in the UL path are connected by cables.

2.2 *EUT Exercise Software*

HCM – 1.3 build 10

ACM_2A00_13.01

RIM_6A00_13.01

RMM_5A00_13.01

OIM_7A03_13.01

RAU5_9A64_13.01

RXU_AA00_13.01

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

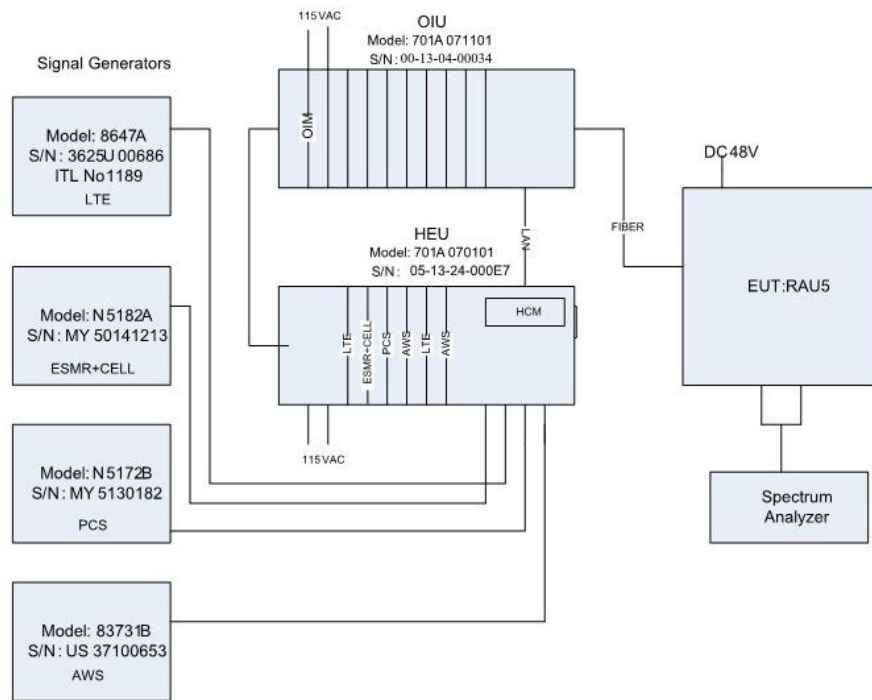


Figure 1. Test Set-up

3. Test Set-up Photos

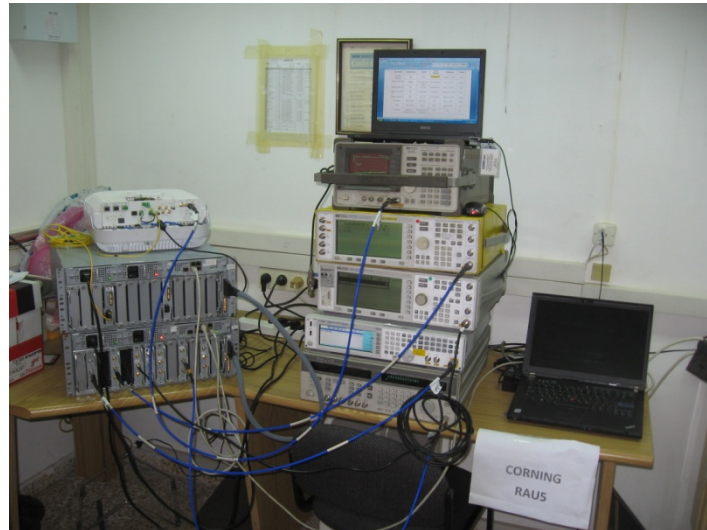


Figure 2. Conducted Emission From Antenna Port Tests



Figure 3. Radiated Emission Test



Figure 4. Radiated Emission Test



Figure 5. Radiated Emission Test

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 and an appropriate coaxial cable (loss=30.6 dB). 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 100 kHz RBW. The output power level was measured at the low, mid and high channels of each modulation.

4.3 Test Results

Modulation	Operation Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
LTE 64QAM	874.0	18.5	57.00	-38.5
	881.0	18.3	57.00	-38.7
	889.0	18.8	57.00	-38.2
GSM	870.2	16.7	57.00	-40.3
	881.0	16.5	57.00	-40.5
	892.8	16.9	57.00	-40.1
W-CDMA	871.5	18.5	57.00	-38.5
	881.0	18.8	57.00	-38.2
	891.5	18.9	57.00	-38.1

Figure 6 Peak Output Power CELL

See additional information in Figure 7 to Figure 15.

JUDGEMENT: Passed by 38.1 dB

TEST PERSONNEL:

Tester Signature: _____

Date: 4.12.14

Typed/Printed Name: M. Zohar

LTE 64QAM:

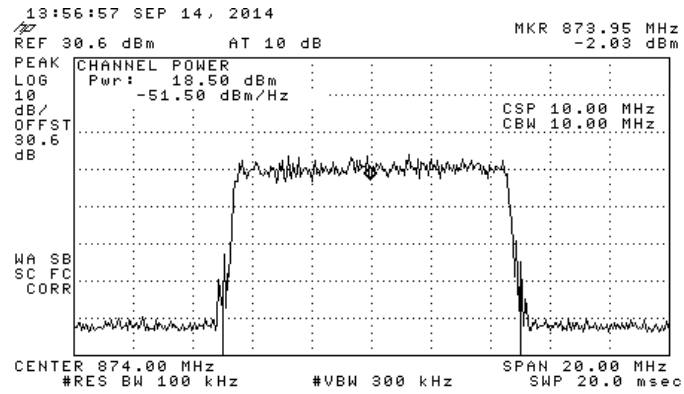


Figure 7.— 874.00 MHz

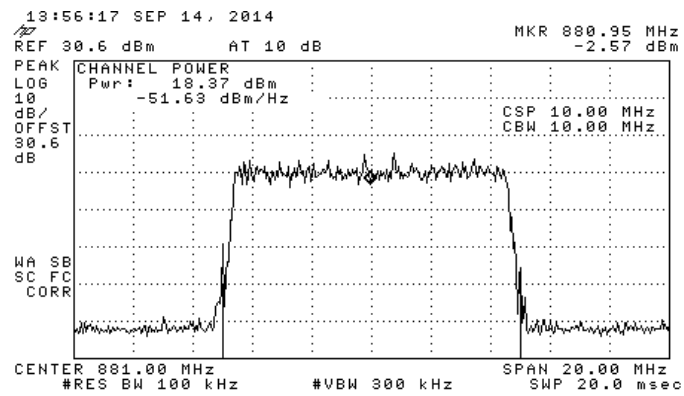


Figure 8.— 881.00 MHz

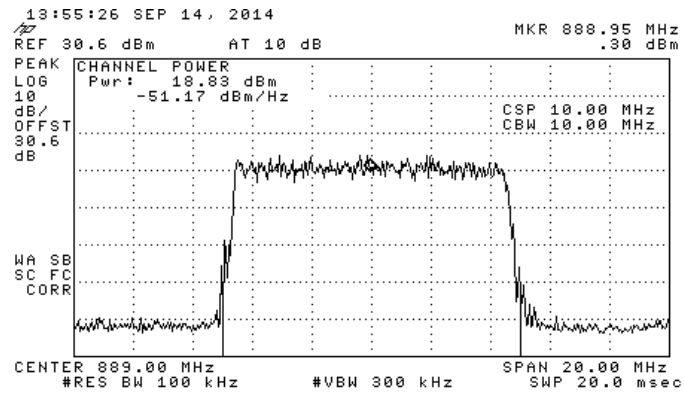


Figure 9.— 889.0 MHz



GSM:

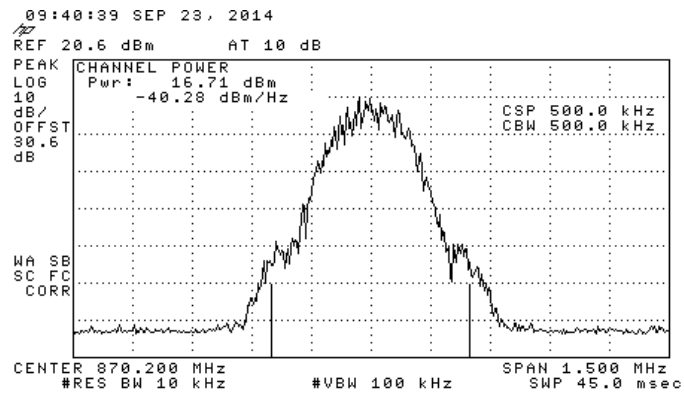


Figure 10.— 870.20 MHz

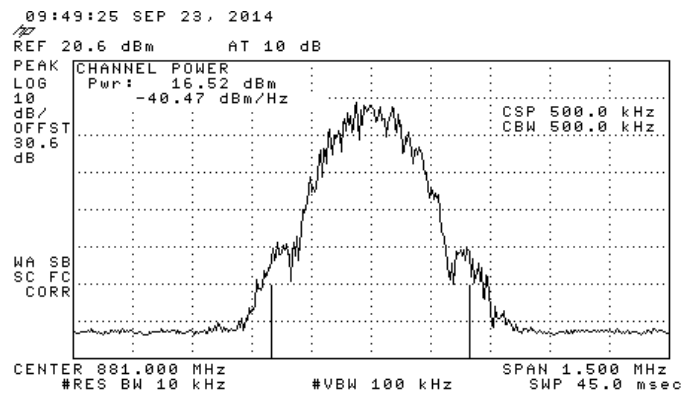


Figure 11.— 881.00 MHz

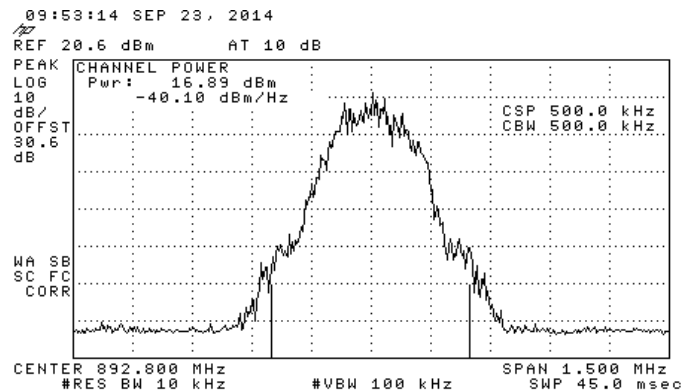


Figure 12.— 892.80 MHz



W-CDMA:

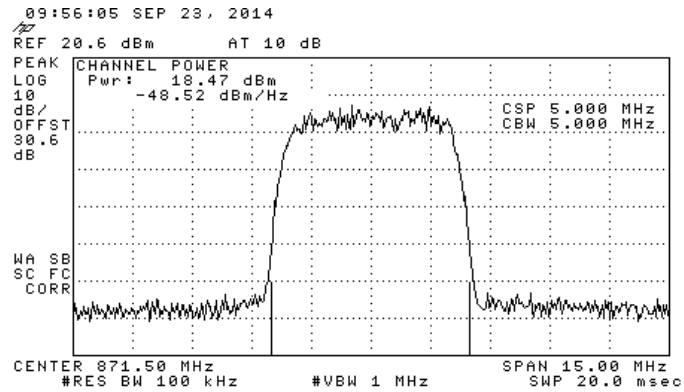


Figure 13.— 871.50 MHz

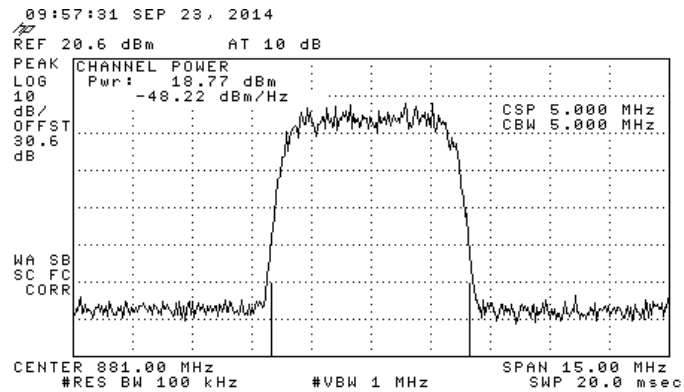


Figure 14.— 881.00 MHz

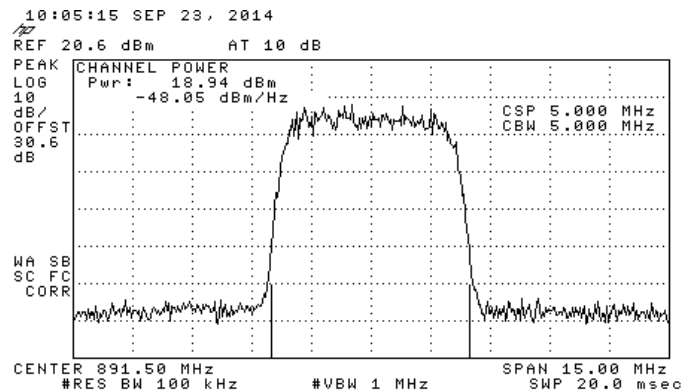


Figure 15.— 891.50 MHz



4.4 Test Equipment Used; Peak Output Power CELL

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8594E	3313U000346	March 6, 2014	1 year
Signal Generator	HP	8647A	3623U00686	March 6, 2014	1 year
Signal Generator	HP	83731B	US37100653	March 6, 2014	1 year
Signal Generator	Agilent	N5182A	MY50141213	May 15, 2014	3 years
Signal Generator	Agilent	N5172B	MY5130182	May 15, 2014	3 years
30 dB Attenuator	Weinschel Engineering	49-30-34	PD426	December 19, 2013	1 year

Figure 16 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 BW.

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.

5.3 Test Results

Modulation		Operating Frequency (MHz)	Reading (MHz)
LTE 64QAM	Input	874.0	9.400
LTE 64QAM	Output	874.0	9.400
LTE 64QAM	Input	881.0	9.450
LTE 64QAM	Output	881.0	9.450
LTE 64QAM	Input	889.0	9.450
LTE 64QAM	Output	889.0	9.400
GSM	Input	870.2	0.280
GSM	Output	870.2	0.282
GSM	Input	881.0	0.282
GSM	Output	881.0	0.287
GSM	Input	892.8	0.280
GSM	Output	892.8	0.287
W-CDMA	Input	871.5	4.630
W-CDMA	Output	871.5	4.650
W-CDMA	Input	881.0	4.600
W-CDMA	Output	881.0	4.600
W-CDMA	Input	891.5	4.580
W-CDMA	Output	891.5	4.600

Figure 17 Occupied Bandwidth CELL

See additional information in Figure 18 to Figure 35.

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____



Date: 4.12.14

Typed/Printed Name: M. Zohar



LTE:

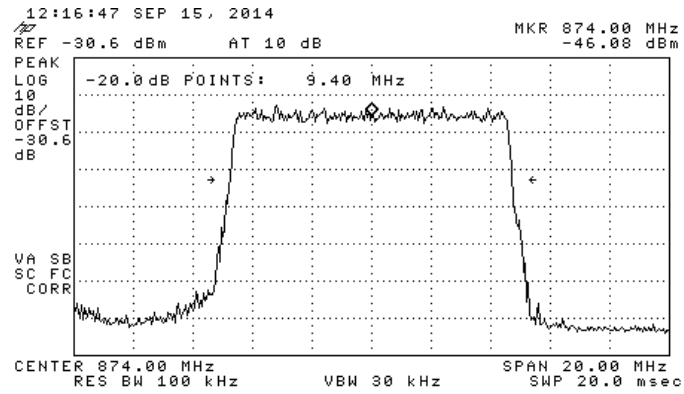


Figure 18.— 64QAM Input 874.0MHz.

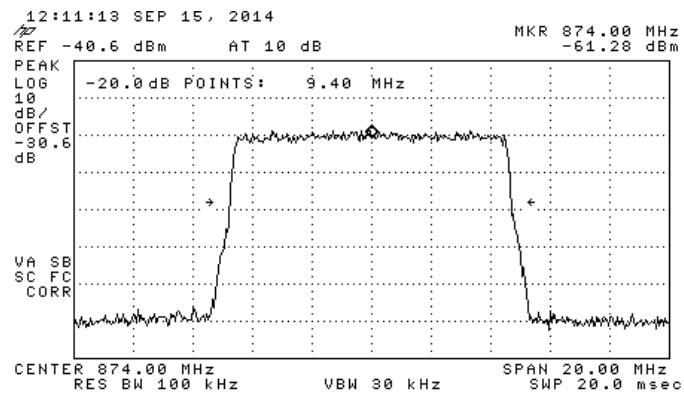


Figure 19.— 64QAM Output 874.0MHz.

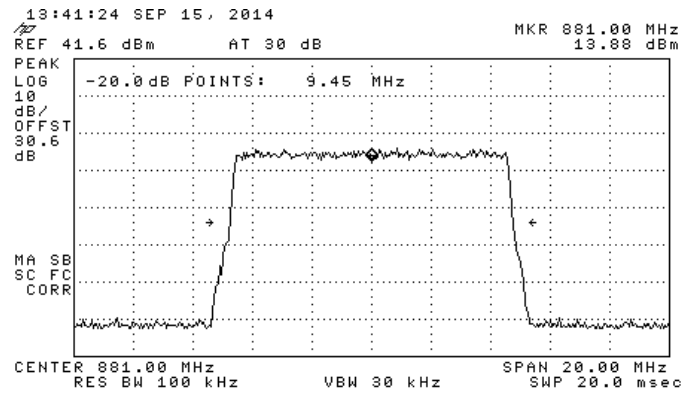


Figure 20.— 64QAM Input 881.0 MHz

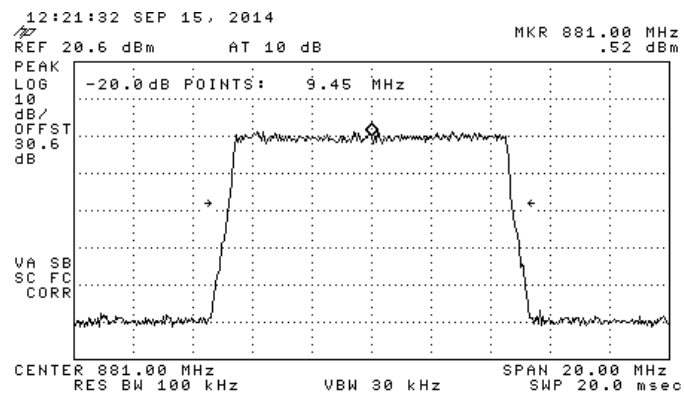


Figure 21.— 64QAM Output 881.0MHz.

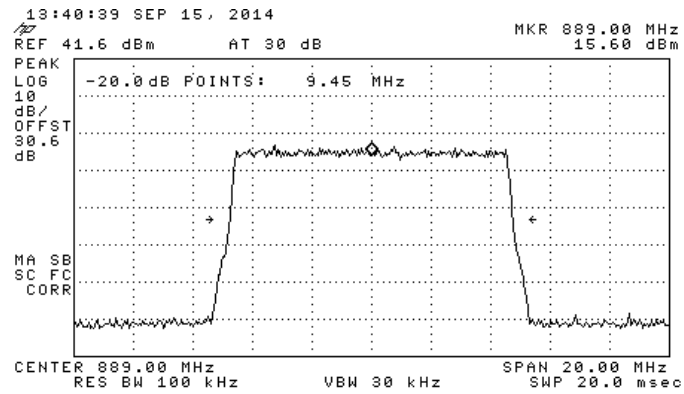


Figure 22.— 64QAM Input 889.00 MHz

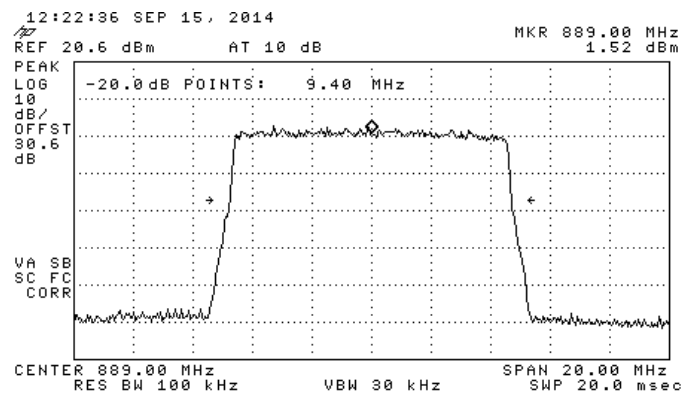


Figure 23.— 64QAM Output 889.00 MHz

GSM:

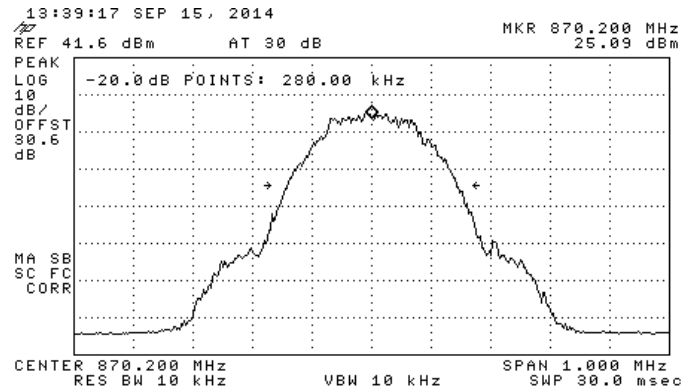


Figure 24.— Input 870.20MHz.

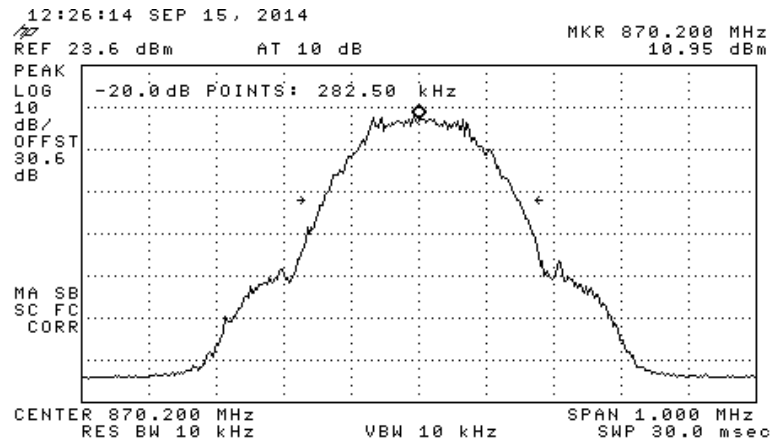


Figure 25.— Output 870.20MHz.

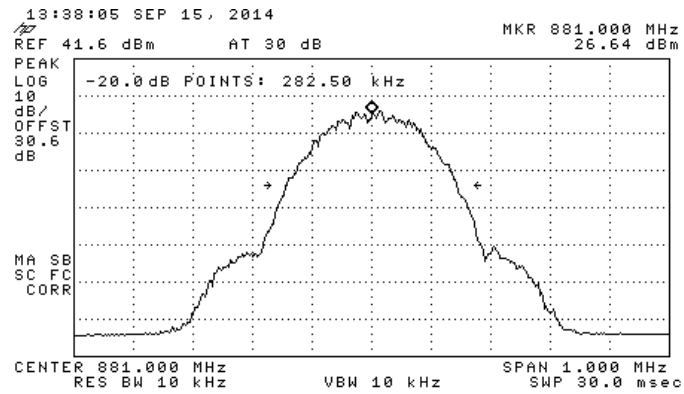


Figure 26.— Input 881.0 MHz .

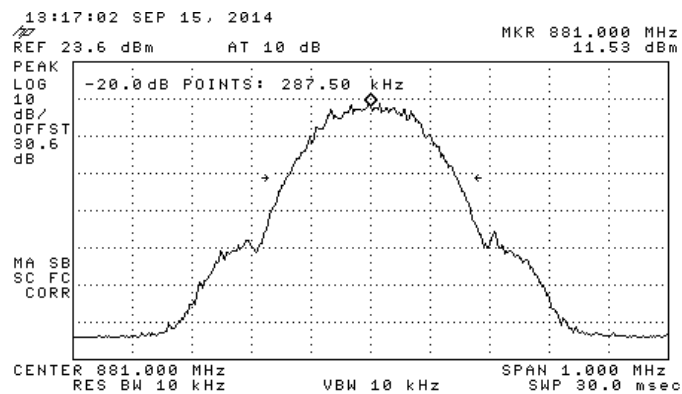


Figure 27.—Output 881.0MHz.

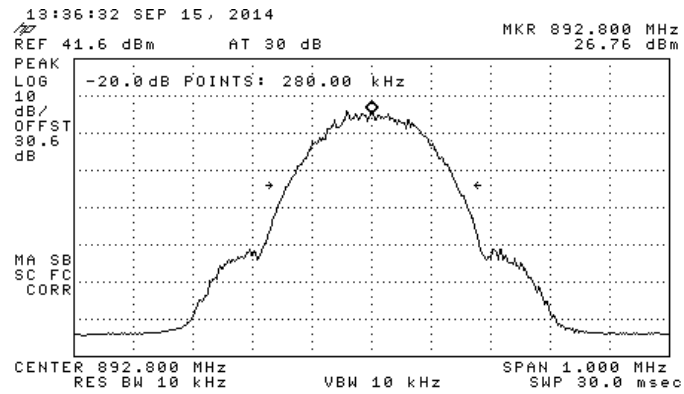


Figure 28.— Input 892.8 MHz.

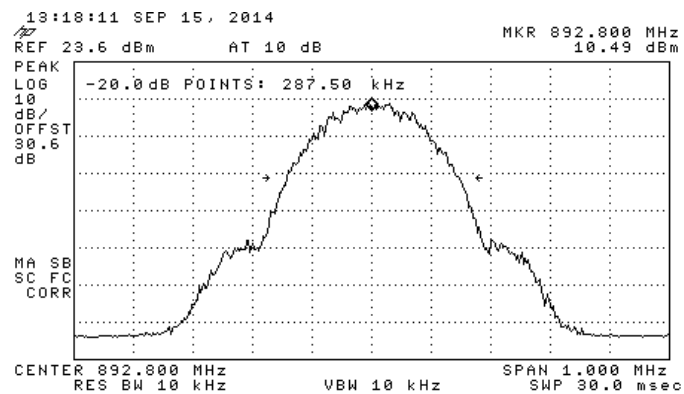


Figure 29.— Output 892.8 MHz.



W-CDMA:

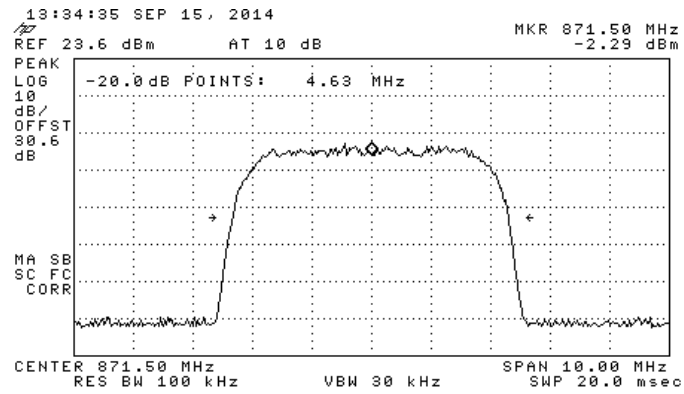


Figure 30.— Input 871.50MHz

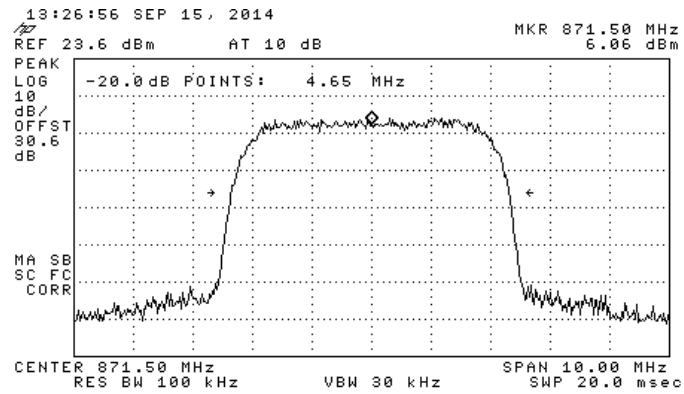


Figure 31.— Output 871.50MHz

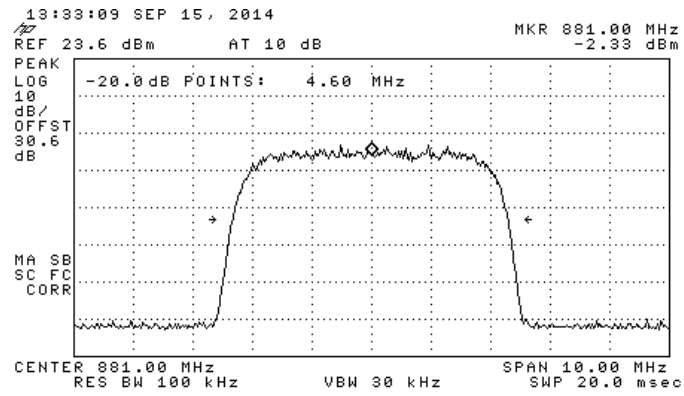


Figure 32.— Input 881.0 MHz.

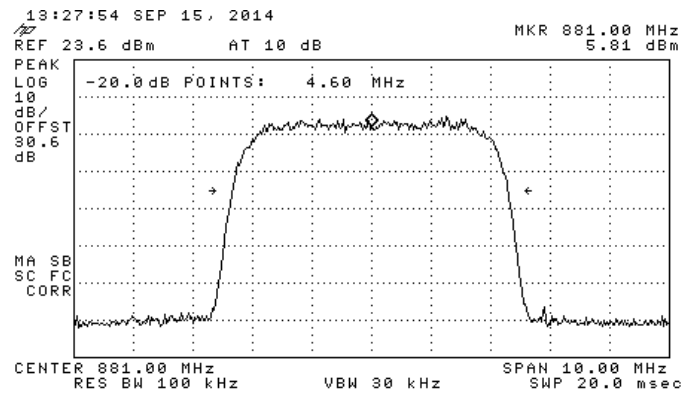


Figure 33.—Output 881.0MHz.

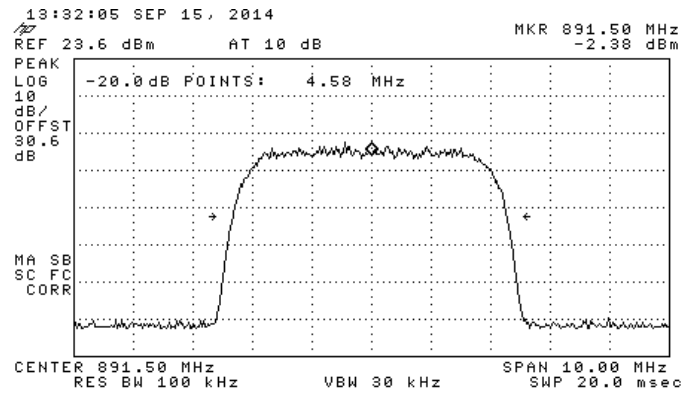


Figure 34.— Input 891.50 MHz.

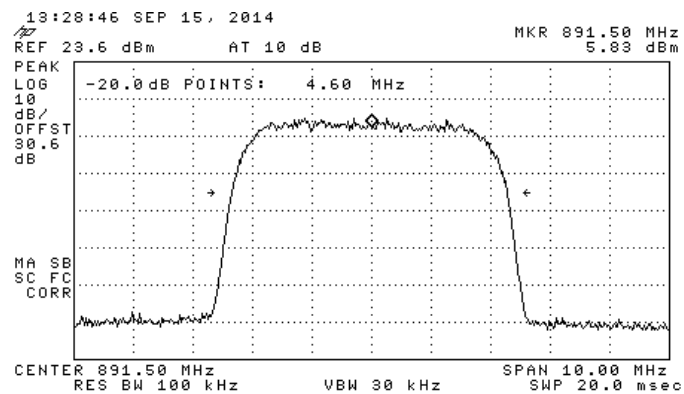


Figure 35.— Output 891.50 MHz.



5.4 Test Equipment Used; Occupied Bandwidth CELL

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8594E	3313U000346	March 6, 2014	1 year
Signal Generator	HP	8647A	3623U00686	March 6, 2014	1 year
Signal Generator	HP	83731B	US37100653	March 6, 2014	1 year
Signal Generator	Agilent	N5182A	MY50141213	May 15, 2014	3 years
Signal Generator	Agilent	N5172B	MY5130182	May 15, 2014	3 years
30 dB Attenuator	Weinschel Engineering	49-30-34	PD426	December 19, 2013	1 year

Figure 36 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 (30.6 dB).

The spectrum analyzer was set to 1 kHz R.B.W. for the frequency range of 9 kHz – 1 MHz, 100 kHz for the frequency range of 1 – 30 MHz, and 1 MHz for the frequency range of 30 MHz – 10 GHz.

6.3 Test Results

See additional information in Figure 37 to Figure 45.

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____

Date: 4.12.14

Typed/Printed Name: M. Zohar



LTE 64QAM:

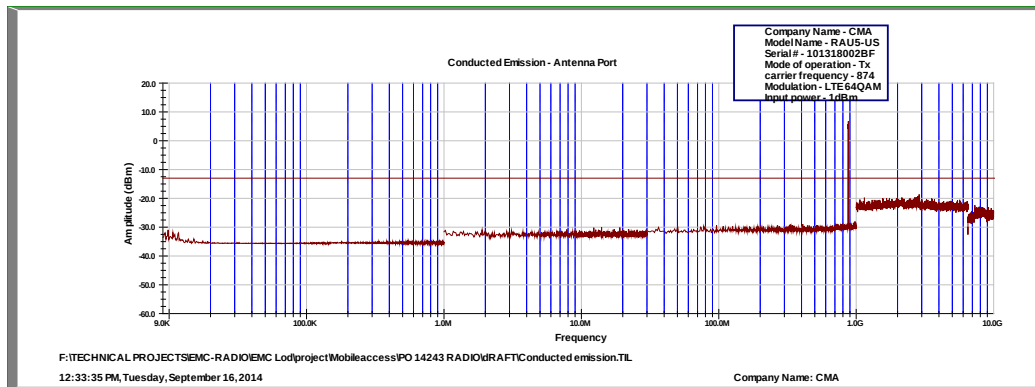


Figure 37.— 874.0 MHz

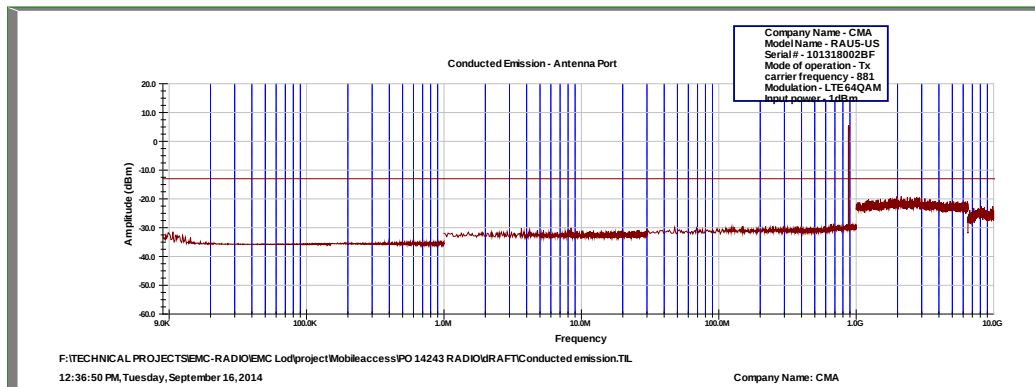


Figure 38.— 881.0 MHz

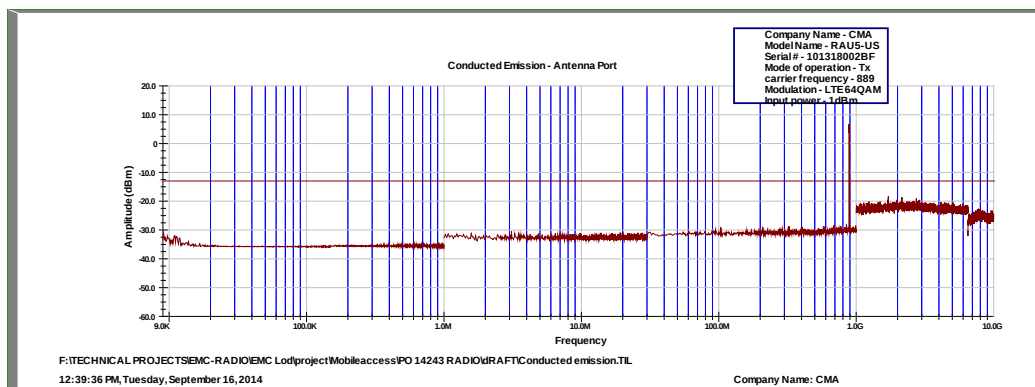


Figure 39.— 889.0 MHz



GSM:

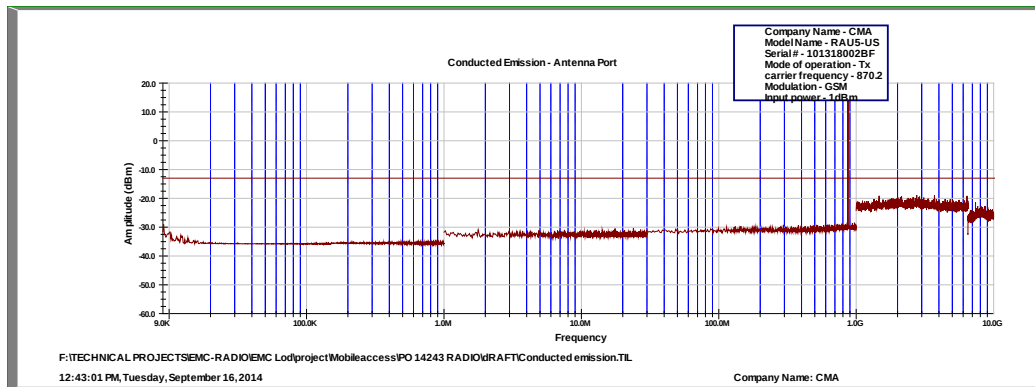


Figure 40.— 870.2 MHz

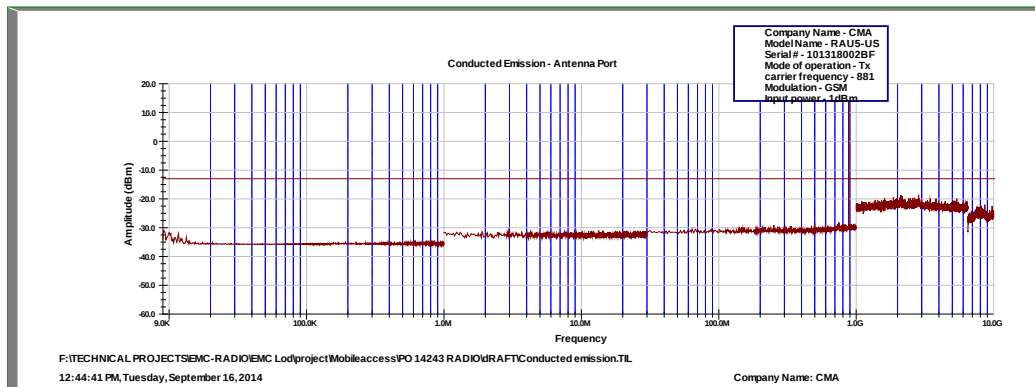


Figure 41.— 881.0 MHz

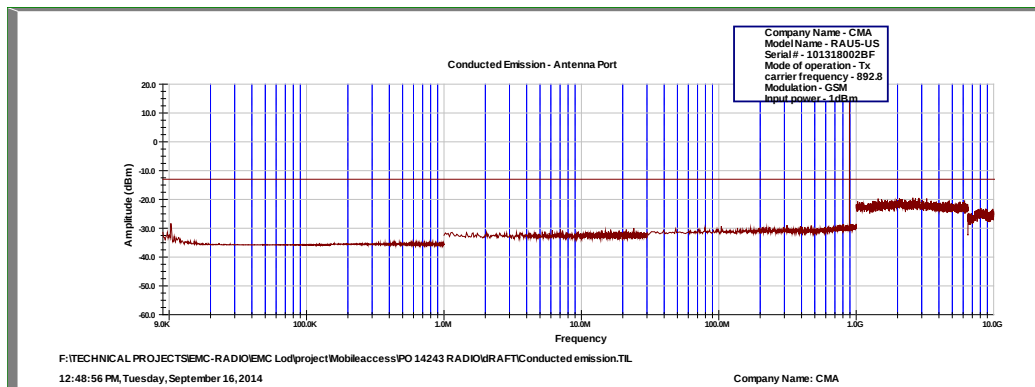


Figure 42.— 892.8 MHz



WCDMA:

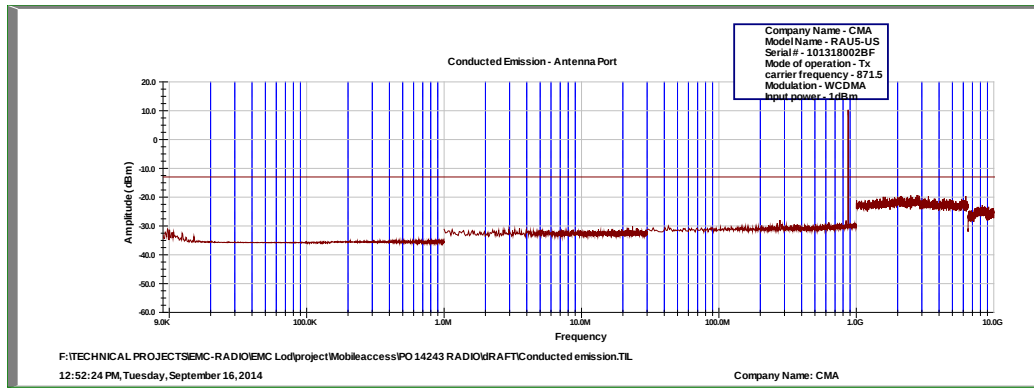


Figure 43.— 871.5 MHz

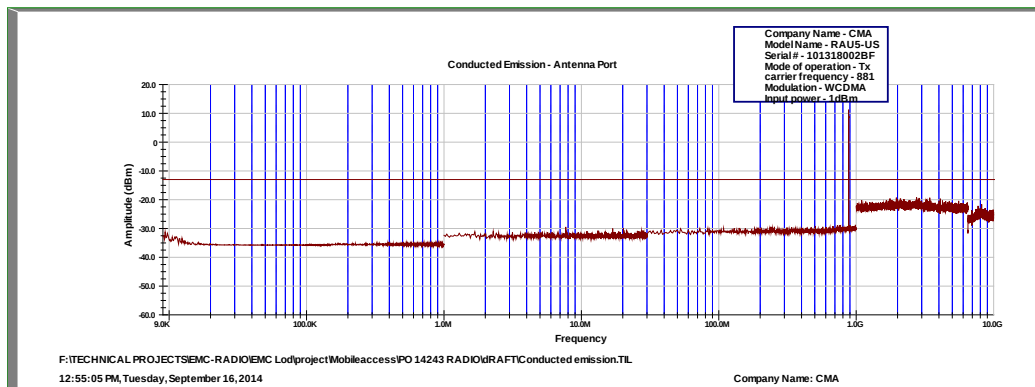


Figure 44.— 881.0 MHz

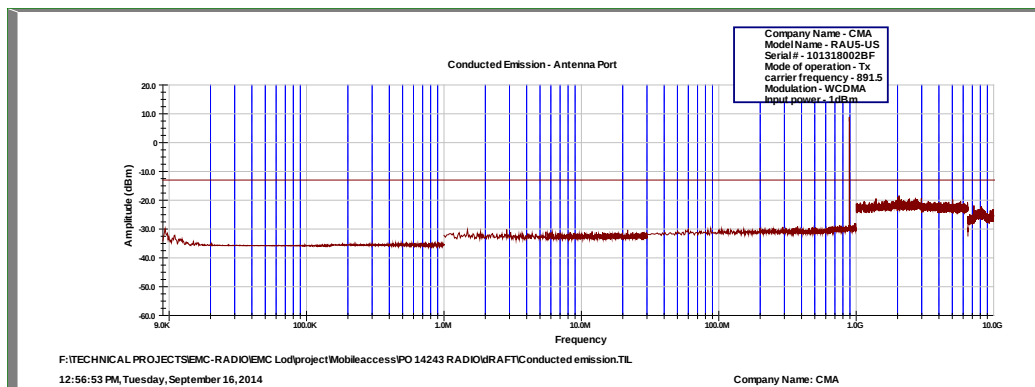


Figure 45.— 891.5 MHz



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	8594L	3826A01204	February 28, 2014	1 year
Signal Generator	HP	8647A	3623U00686	March 6, 2014	1 year
Signal Generator	HP	83731B	US37100653	March 6, 2014	1 year
Signal Generator	Agilent	N5182A	MY50141213	May 15, 2014	3 years
Signal Generator	Agilent	N5172B	MY5130182	May 15, 2014	3 years
30 dB Attenuator	Weinschel Engineering	49-30-34	PD426	December 19, 2013	1 year

Figure 46 Test Equipment Used

7. Band Edge Spectrum CELL

7.1 Test Specification

FCC Part 22, FCC Part 2.1051

7.2 Test procedure

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

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (30.6 dB).

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



7.3 Test Results

Modulation	Operation Frequency (MHz)	Band Edge Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
LTE 64QAM	874.00	869.00	-17.94	-13.0	-4.94
	889.00	894.00	-20.91	-13.0	-7.91
GSM	870.20	869.00	-43.21	-13.0	-30.21
	892.80	894.00	-44.38	-13.0	-31.38
W-CDMA	871.50	869.00	-27.52	-13.0	-14.52
	891.50	894.00	-31.11	-13.0	-18.11

Figure 47 Band Edge Spectrum Results CELL

See additional information in Figure 48 to Figure 53.

JUDGEMENT: Passed by 4.94 dB

TEST PERSONNEL:

Tester Signature:  _____

Date: 4.12.14

Typed/Printed Name: M. Zohar



LTE:

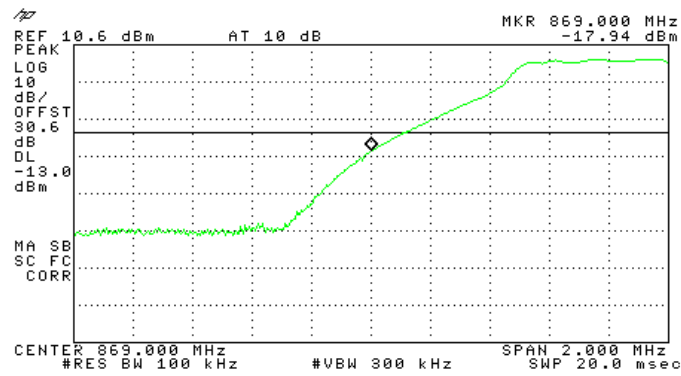


Figure 48.— 64QAM 874.00 MHz

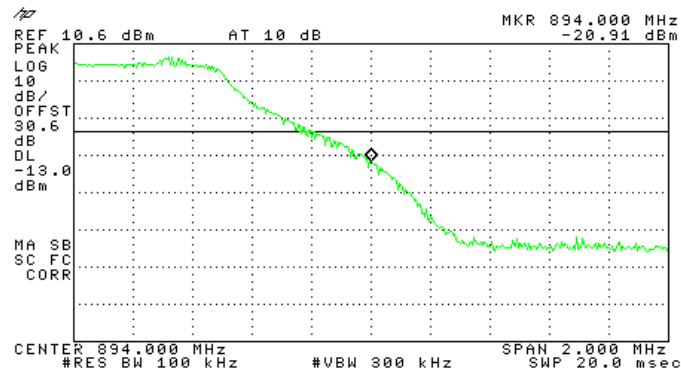


Figure 49.— 64QAM 889.00 MHz



GSM:

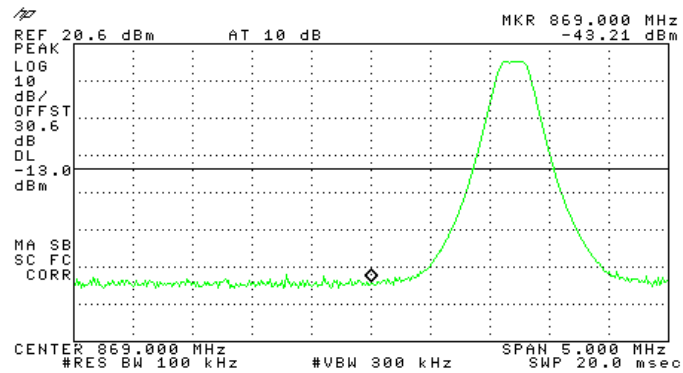


Figure 50.— 870.20 MHz

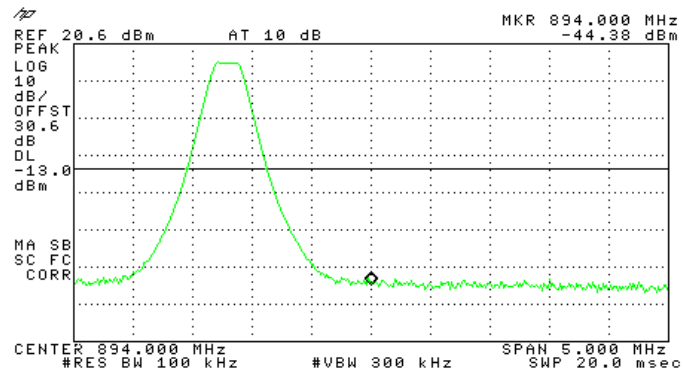


Figure 51.— 892.80 MHz

W-CDMA:

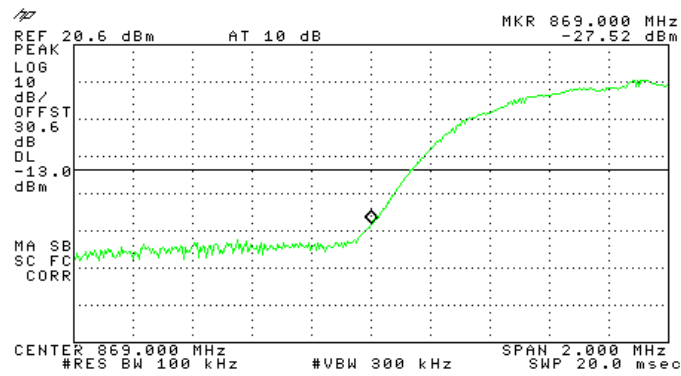


Figure 52.— 871.50 MHz

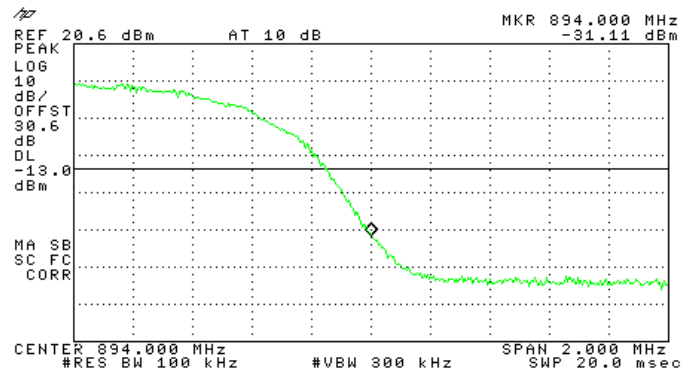


Figure 53.— 891.50 MHz



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	8647A	3623U00686	March 6, 2014	1 year
Signal Generator	HP	83731B	US37100653	March 6, 2014	1 year
Signal Generator	Agilent	N5182A	MY50141213	May 15, 2014	3 years
Signal Generator	Agilent	N5172B	MY5130182	May 15, 2014	3 years
30 dB Attenuator	Weinschel Engineering	49-30-34	PD426	December 19, 2013	1 year

Figure 54 Test Equipment Used

8. Out of Band Emissions (Radiated) CELL

8.1 Test Specification

FCC Part 22, Section 917; FCC Part 2.1053

8.2 Test Procedure

The test method was based on ANSI/TIA-603-C: 2004, Section 2.2.12

Unwanted Emissions: Radiated Spurious.

The power of any emission outside of the authorized operating frequency ranges (869 - 894 MHz) must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB, yielding -13dBm .

- (a) The E.U.T. operation mode and test set-up are as described in Section 3.
A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 1.5 meters above the ground. The configuration tested is shown in Figure 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

Carrier Channel	Freq.	Antenna Pol.	Maximum Peak Level	Signal Generator RF Output	Cable Loss	Antenna Gain	Effective Radiated Power Level	Spec.	Margin
(MHz)	(MHz)		(dB μ V/m)	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
870.20	1740.40	V	60.2	-39.1	6.7	7.6	-38.2	-13.0	-25.2
870.20	1740.40	H	58.9	-40.3	6.7	8.0	-39.0	-13.0	-26.0
881.00	1762.00	V	60.8	-36.4	6.7	7.6	-35.5	-13.0	-22.5
881.00	1762.00	H	59.1	-39.1	6.7	8.0	-37.8	-13.0	-24.8
892.80	1785.60	V	61.0	-36.4	6.7	7.6	-35.5	-13.0	-22.5
892.80	1785.60	H	59.8	-38.1	6.7	8.0	-36.8	-13.0	-23.8

Figure 55 Out of Band (Radiated) CELL

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

JUDGEMENT; Pass

TEST PERSONNEL:

Tester Signature: _____

Date: 4.12.14

Typed/Printed Name: M. Zohar



8.4 Test Instrumentation Used, Radiated Measurements CELL

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Active Loop Antenna	EMCO	6502	2950	November 4, 2013	1 year
Biconical Log Antenna	EMCO	3142B	1078	May 22, 2014	2 years
Horn Antenna	ETS	3115	29845	March 14, 2012	3 years
Signal Generator	HP	8647A	3623U00686	March 6, 2014	1 year
Signal Generator	HP	83731B	US37100653	March 6, 2014	1 year
Signal Generator	Agilent	N5182A	MY50141213	May 15, 2014	3 years
Signal Generator	Agilent	N5172B	MY5130182	May 15, 2014	3 years
EMI Receiver	R&S	FSL6	100194	December 1, 2013	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 29, 2014	1 Year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 22, 2014	1 Year
Antenna Mast	ETS	2070-2	-	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

Figure 56 Test Equipment Used



9. Peak Output Power (ESMR)

9.1 Test Specification

FCC Rule Part 20.21

9.2 Test Procedure

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through a 30 dB external attenuator and an appropriate coaxial cable (Cable Loss = 0.6 dB). Special attention was taken to prevent Spectrum Analyzer RF input overload.

9.3 Test Results

Modulation	Operation Frequency (MHz)	Reading (dBm)
LTE 64QAM	864.5	20.4
	866.5	20.5
GSM	863.2	15.9
	867.8	16.4
WCDMA	864.5	19.1
	866.5	19.3

Figure 57 Peak Output Power Test Results Table

See additional information in Figure 58 to Figure 63.

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____

Date: 4.12.14

Typed/Printed Name: M. Zohar



Peak Output Power (ESMR)

E.U.T Description	ONE- Optical Network Evolution DAS
Type	RAU-5 Remote Antenna Unit P/N: RAU5US-AME consisting of RXU P/N: RXU-L70A17-M and GEM
Serial Number:	Not Designated

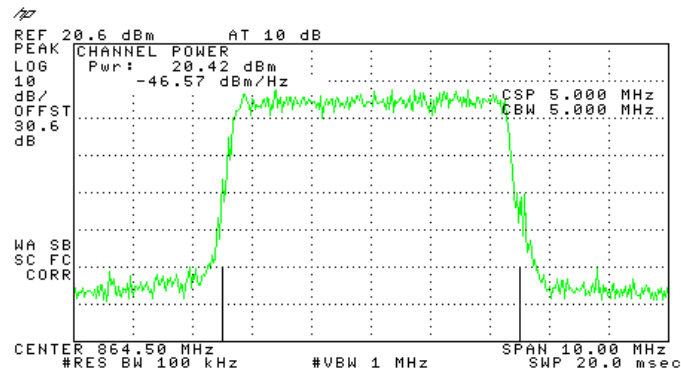


Figure 58.—864.5 MHz – LTE 64QAM

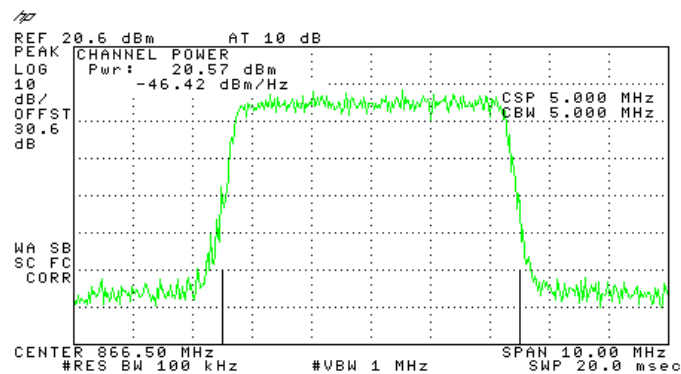


Figure 59.— 866.5 MHz – LTE 64QAM



Peak Output Power (ESMR)

E.U.T Description ONE- Optical Network Evolution DAS
Type RAU-5 Remote Antenna Unit P/N:
RAU5US-AME consisting of RXU P/N:
RXU-L70A17-M and GEM
Serial Number: Not Designated

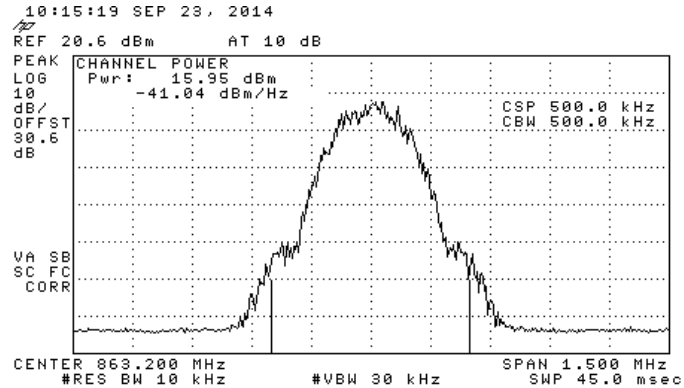


Figure 60.—863.2 MHz – GSM

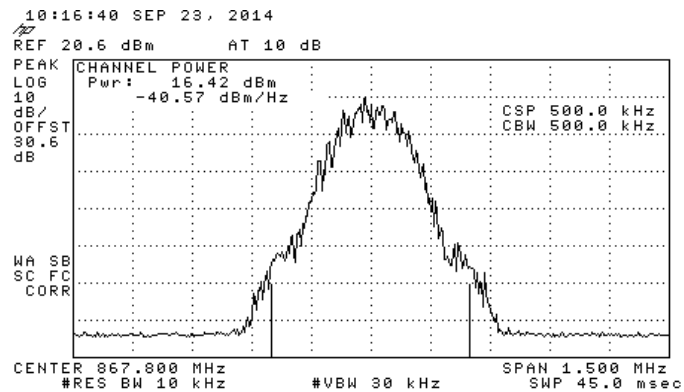


Figure 61.— 867.8 MHz – GSM



Peak Output Power (ESMR)

E.U.T Description ONE- Optical Network Evolution DAS
Type RAU-5 Remote Antenna Unit P/N:
RAU5US-AME consisting of RXU P/N:
RXU-L70A17-M and GEM
Serial Number: Not Designated

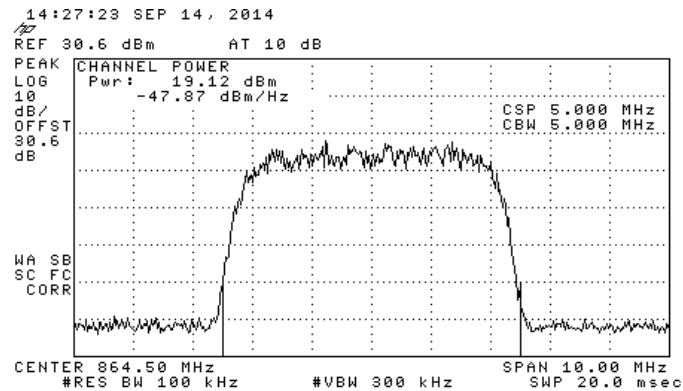


Figure 62.—864.5 MHz – WCDMA

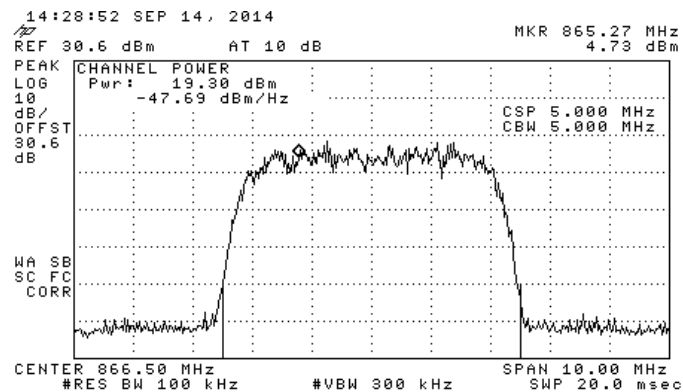


Figure 63.— 866.5 MHz – WCDMA



9.4 Test Equipment Used; Peak Power (ESMR)

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8594E	3313U000346	March 6, 2014	1 year
Signal Generator	HP	8647A	3623U00686	March 6, 2014	1 year
Signal Generator	HP	83731B	US37100653	March 6, 2014	1 year
Signal Generator	Agilent	N5182A	MY50141213	May 15, 2014	3 years
Signal Generator	Agilent	N5172B	MY5130182	May 15, 2014	3 years
30 dB Attenuator	Weinschel Engineering	49-30-34	PD426	December 19, 2013	1 year

Figure 64 Test Equipment Used Peak Output Power (ESMR)



10. Occupied Bandwidth (ESMR)

10.1 Test Specification

FCC Parts 2.1049; 90.2.09

10.2 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 a 30 dB external attenuator and appropriate coaxial cable (Cable Loss 0.6 dB). 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.

10.3 Test Results

Modulation		Operating Frequency	Reading (MHz)
LTE	Input	864.5	4.93
LTE	Output	864.5	4.93
LTE	Input	866.5	4.85
LTE	Output	866.5	4.88
W-CDMA	Input	864.5	4.58
W-CDMA	Output	864.5	4.60
W-CDMA	Input	866.5	4.60
W-CDMA	Output	866.5	4.63
GSM	Input	863.2	0.28
GSM	Output	863.2	0.28
GSM	Input	867.8	0.28
GSM	Output	867.8	0.28

Figure 65 Occupied Bandwidth Test Results Table

See additional information in Figure 66 to Figure 77.

TEST PERSONNEL:

Tester Signature: _____

Date: 4.12.14

Typed/Printed Name: M. Zohar



Occupied Bandwidth (ESMR)

E.U.T Description ONE- Optical Network Evolution DAS
Type RAU-5 Remote Antenna Unit P/N:
RAU5US-AME consisting of RXU P/N:
RXU-L70A17-M and GEM
Serial Number: Not Designated

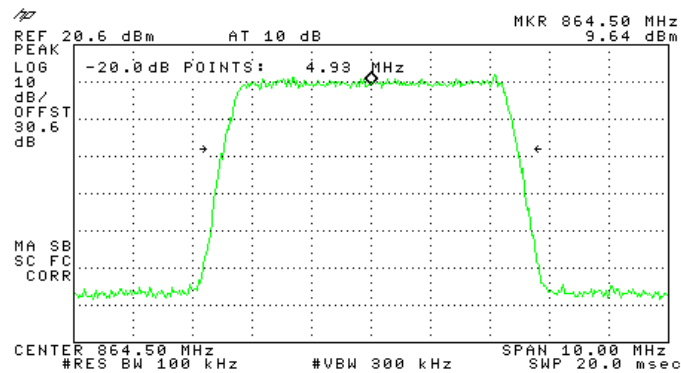


Figure 66.— 864.5MHz LTE 64QAM Input

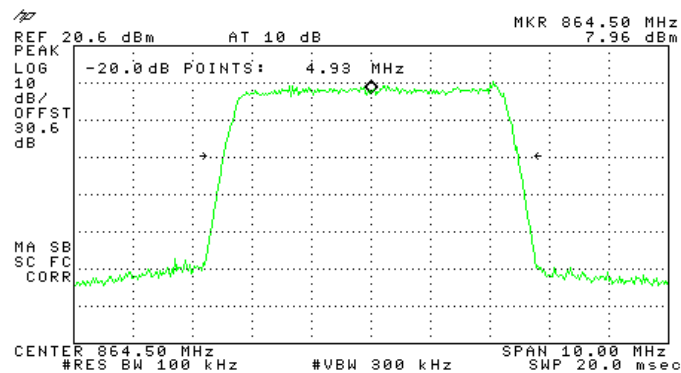


Figure 67.— 864.5MHz LTE 64QAM Output

Occupied Bandwidth (ESMR)

E.U.T Description ONE- Optical Network Evolution DAS
Type RAU-5 Remote Antenna Unit P/N:
RAU5US-AME consisting of RXU P/N:
RXU-L70A17-M and GEM
Serial Number: Not Designated

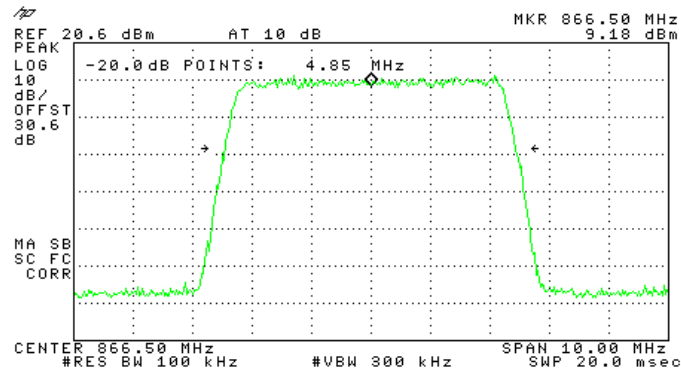


Figure 68.— 866.5MHz LTE 64QAM Input

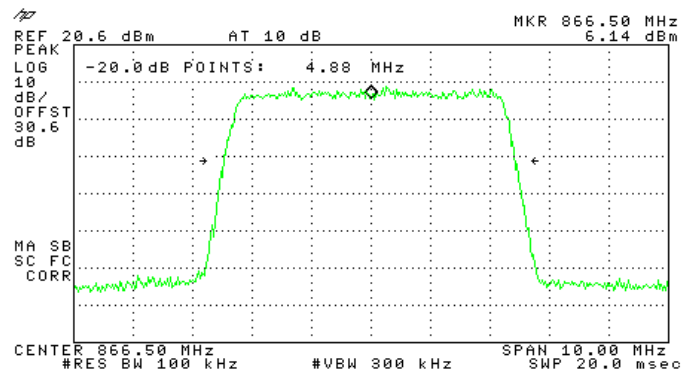


Figure 69.— 866.5MHz LTE 64QAM Output



Occupied Bandwidth (ESMR)

E.U.T Description ONE- Optical Network Evolution DAS
Type RAU-5 Remote Antenna Unit P/N:
RAU5US-AME consisting of RXU P/N:
RXU-L70A17-M and GEM
Serial Number: Not Designated

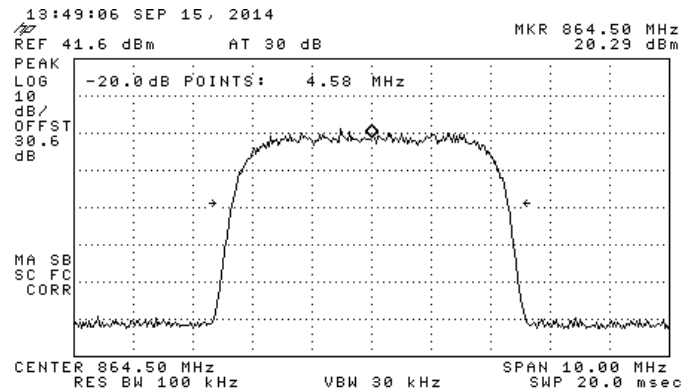


Figure 70.— 864.5MHz WCDMA Input

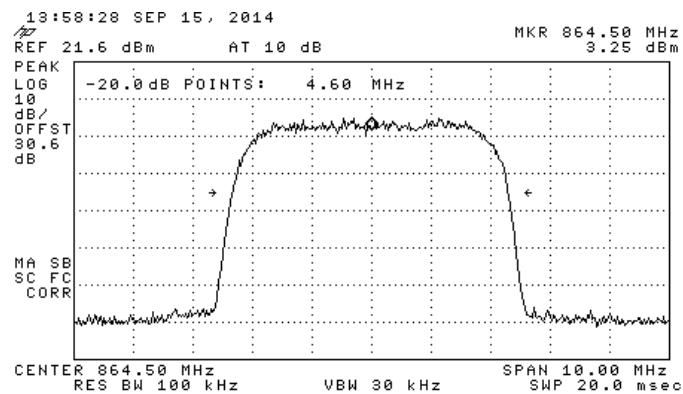


Figure 71.— 864.5MHz WCDMA Output



Occupied Bandwidth (ESMR)

E.U.T Description ONE- Optical Network Evolution DAS
Type RAU-5 Remote Antenna Unit P/N:
RAU5US-AME consisting of RXU P/N:
RXU-L70A17-M and GEM
Serial Number: Not Designated

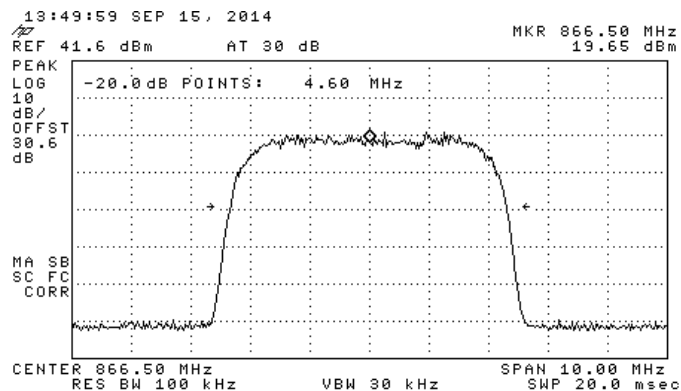


Figure 72.— 866.5MHz WCDMA Input

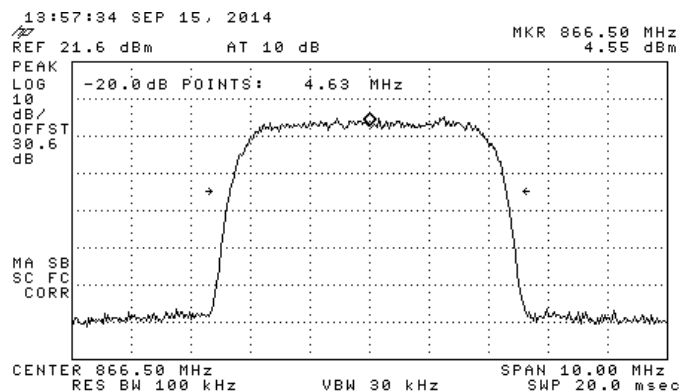


Figure 73.— 866.5MHz WCDMA Output



Occupied Bandwidth (ESMR)

E.U.T Description ONE- Optical Network Evolution DAS
Type RAU-5 Remote Antenna Unit P/N:
RAU5US-AME consisting of RXU P/N:
RXU-L70A17-M and GEM
Serial Number: Not Designated

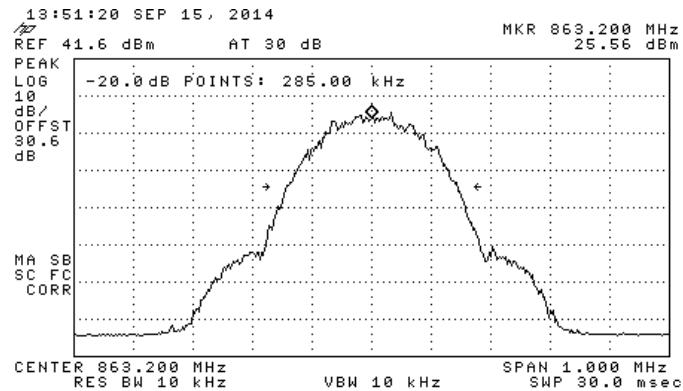


Figure 74.— 863.2MHz GSM Input

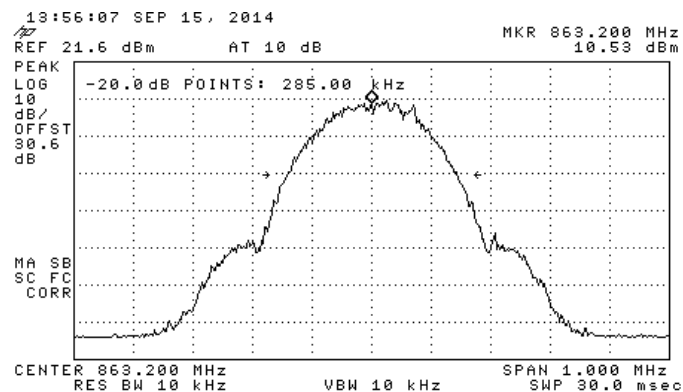


Figure 75.— 863.2MHz GSM Output



Occupied Bandwidth (ESMR)

E.U.T Description ONE- Optical Network Evolution DAS
Type RAU-5 Remote Antenna Unit P/N:
RAU5US-AME consisting of RXU P/N:
RXU-L70A17-M and GEM
Serial Number: Not Designated

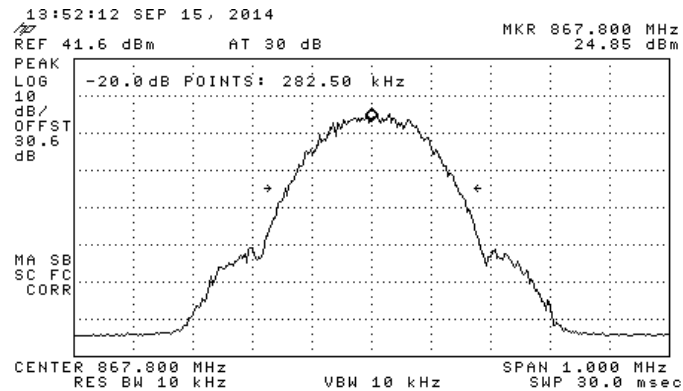


Figure 76.— 867.8MHz GSM Input

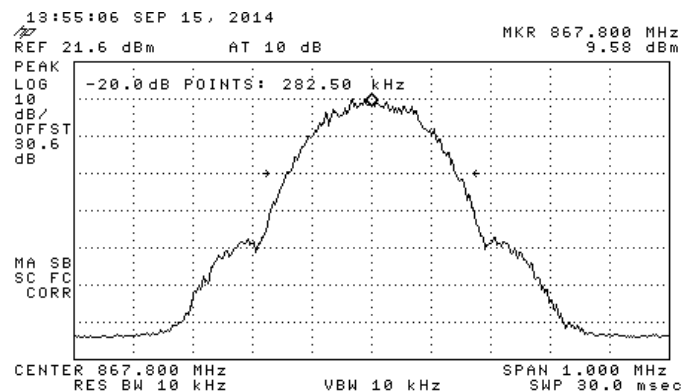


Figure 77.— 867.8MHz GSM Output



10.4 Test Equipment Used; Occupied Bandwidth (ESMR)

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8594E	3313U000346	March 6, 2014	1 year
Signal Generator	HP	8647A	3623U00686	March 6, 2014	1 year
Signal Generator	HP	83731B	US37100653	March 6, 2014	1 year
Signal Generator	Agilent	N5182A	MY50141213	May 15, 2014	3 years
Signal Generator	Agilent	N5172B	MY5130182	May 15, 2014	3 years
30 dB Attenuator	Weinschel Engineering	49-30-34	PD426	December 19, 2013	1 year

Figure 78 Test Equipment Used Occupied Bandwidth (ESMR)



11. Out of Band Emissions at Antenna Terminals (ESMR)

11.1 Test Specification

FCC Part 90, Section 90.210

11.2 Test Procedure

The power of any emission outside of the authorized bandwidth must be attenuated below the transmitting power (P) by a factor of at least $43 + \log(P)$ dB, yielding -13dBm. The resolution bandwidth was set to 1.0 kHz for the frequency range 9 kHz – 1 MHz, 100 kHz for the frequency range 1 MHz to 1 GHz, and 1 MHz in the frequency range 1 – 9 GHz.

The E.U.T. antenna terminal was connected to the spectrum analyzer through a 30 dB external attenuator and an appropriate coaxial cable (Cable Loss= 0.6 dB).

11.3 Test Results

See additional information in Figure 79 to Figure 84.

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____  _____

Date: 4.12.14

Typed/Printed Name: M. Zohar



Out of Band Emissions at Antenna Terminals (ESMR)

E.U.T Description ONE- Optical Network Evolution DAS
Type RAU-5 Remote Antenna Unit P/N:
RAU5US-AME consisting of RXU P/N:
RXU-L70A17-M and GEM
Serial Number: Not Designated

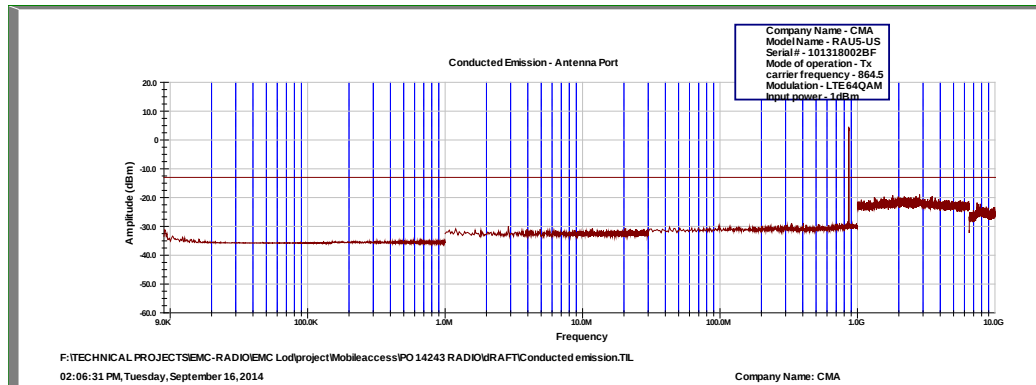


Figure 79.— 864.5 LTE 64QAM

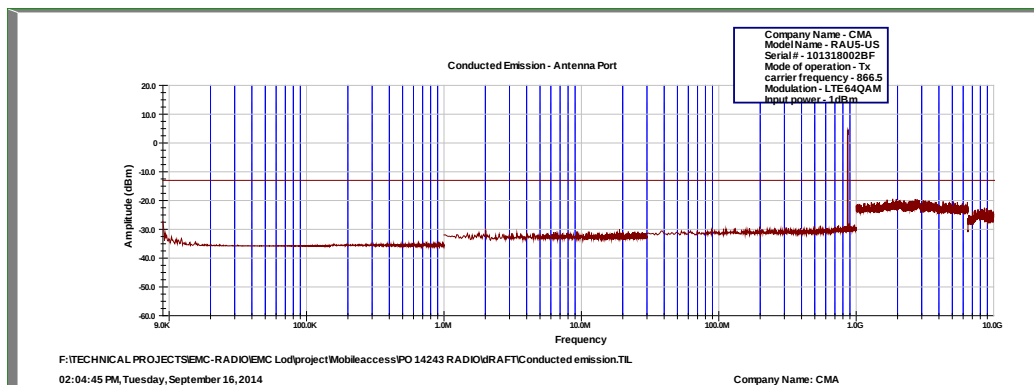


Figure 80.— 866.5 LTE 64QAM

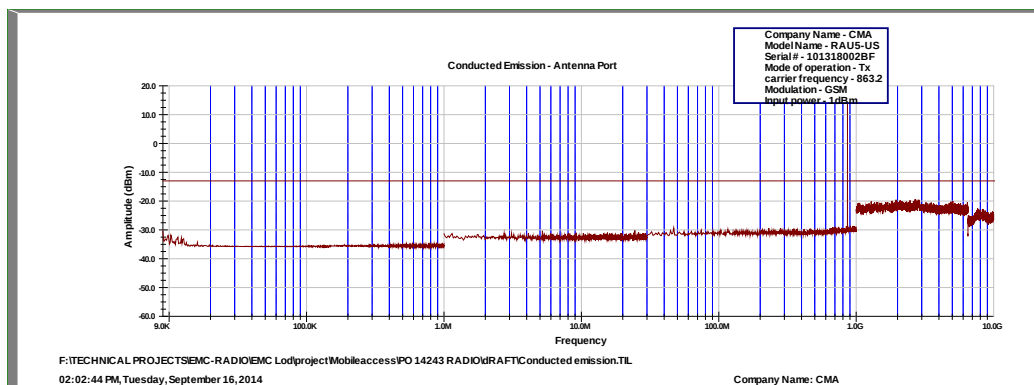


Figure 81.— 863.2 GSM

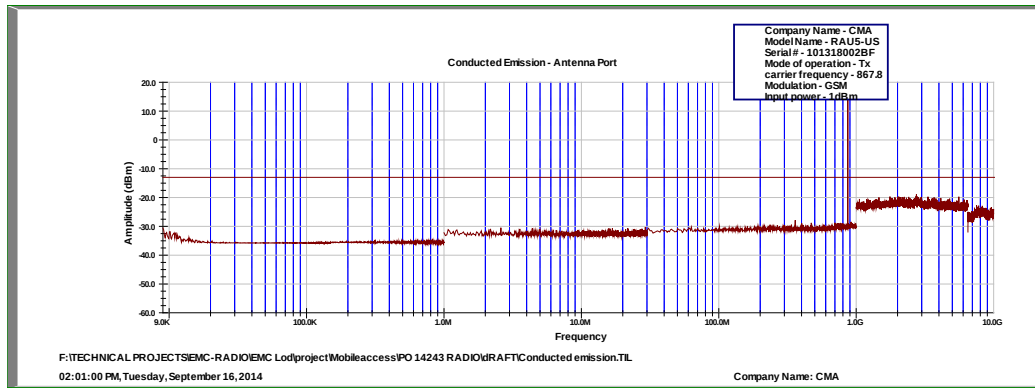


Figure 82.— 867.8 GSM

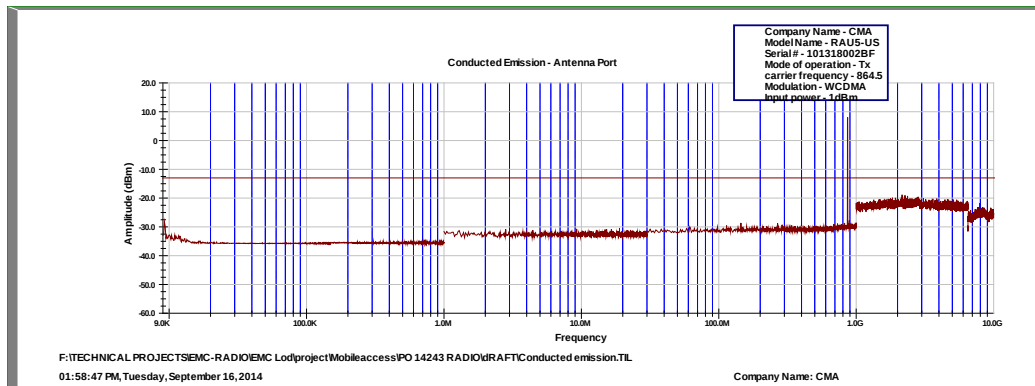


Figure 83.— 864.5 WCDMA

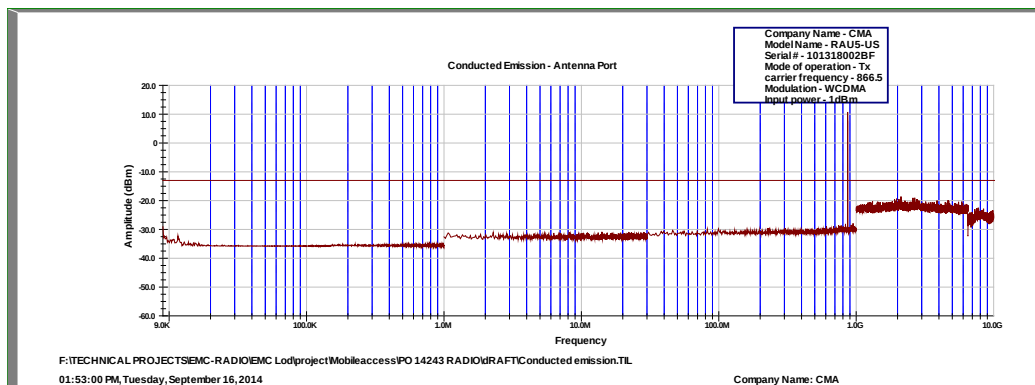


Figure 84.— 866.5 WCDMA



11.4 Test Equipment Used; Out of Band Emissions at Antenna Terminals (ESMR)

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8594L	3826A01204	February 28, 2014	1 year
Signal Generator	HP	8647A	3623U00686	March 6, 2014	1 year
Signal Generator	HP	83731B	US37100653	March 6, 2014	1 year
Signal Generator	Agilent	N5182A	MY50141213	May 15, 2014	3 years
Signal Generator	Agilent	N5172B	MY5130182	May 15, 2014	3 years
30 dB Attenuator	Weinschel Engineering	49-30-34	PD426	December 19, 2013	1 year

Figure 85 Test Equipment Used Out of Band Emissions at Antenna Terminals (ESMR)



12. Band Edge Spectrum ESMR

12.1 Test Specification

FCC Part 2.1051

12.2 Test procedure

Enclosed are spectrum analyzer plots for the lowest operation frequency and the highest operation frequency in which the E.U.T. is planned to be used. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + \log(P)$ dB, yielding -13dBm.

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (30.6 dB).

12.3 Test Results

Modulation	Operation Frequency (MHz)	Band Edge Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
LTE 64QAM	864.5	862.0	-32.3	-13.0	-19.3
	866.5	869.0	-33.9	-13.0	-20.9
GSM	863.2	862.0	-44.2	-13.0	-31.2
	867.8	869.0	-43.1	-13.0	-30.1
W-CDMA	864.5	862.0	-30.3	-13.0	-17.3
	866.5	869.0	-29.1	-13.0	-16.1

Figure 86 Band Edge Spectrum Results ESMR

See additional information in Figure 87 to Figure 92.

JUDGEMENT: Passed by 16.1 dB

TEST PERSONNEL:

Tester Signature: _____ 

Date: 4.12.14

Typed/Printed Name: M. Zohar



LTE:

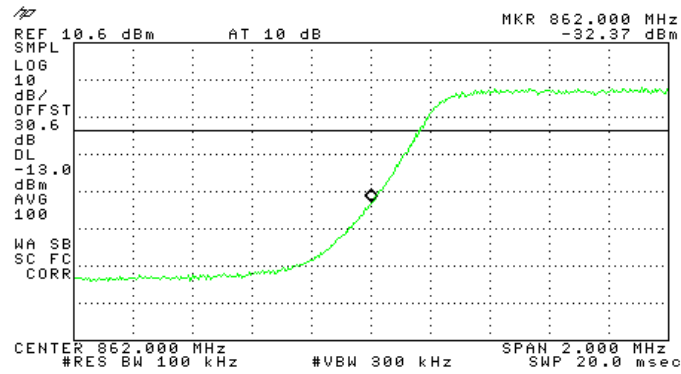


Figure 87.— 64QAM 864.5MHz

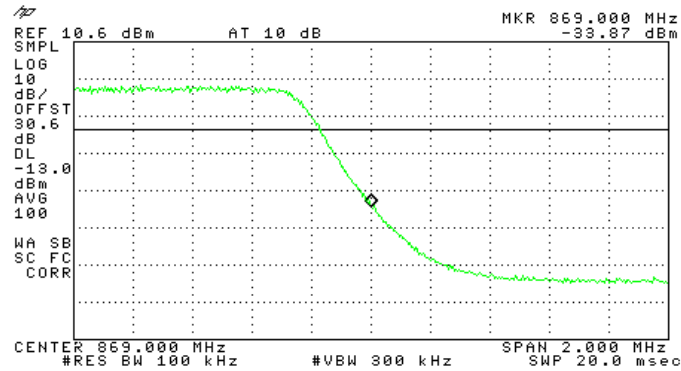


Figure 88.— 64QAM 866.5 MHz



GSM:

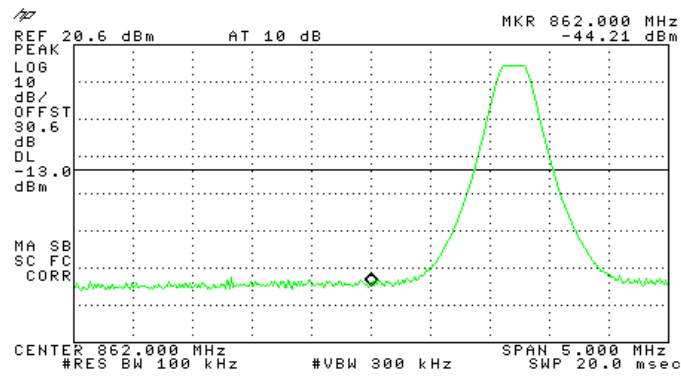


Figure 89.— 863.2MHz

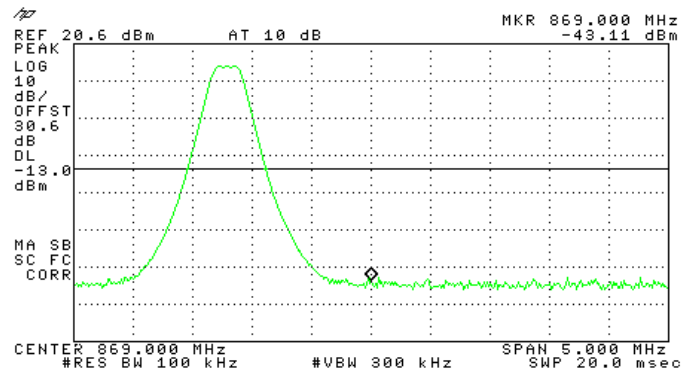


Figure 90.— 867.8 MHz



W-CDMA:

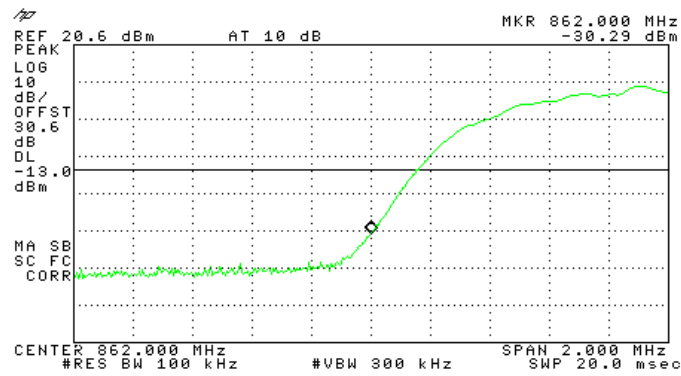


Figure 91.— 864.5 MHz

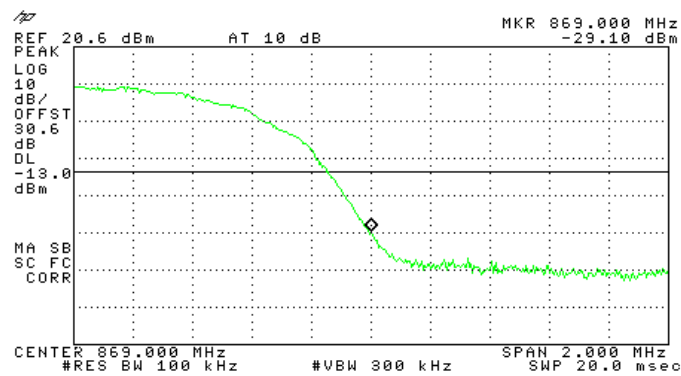


Figure 92.— 866.5 MHz



12.4 Test Equipment Used; Band Edge Spectrum ESMR

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Signal Generator	HP	8647A	3623U00686	March 6, 2014	1 year
Signal Generator	HP	83731B	US37100653	March 6, 2014	1 year
Signal Generator	Agilent	N5182A	MY50141213	May 15, 2014	3 years
Signal Generator	Agilent	N5172B	MY5130182	May 15, 2014	3 years
30 dB Attenuator	Weinschel Engineering	49-30-34	PD426	December 19, 2013	1 year

Figure 93 Test Equipment Used

13. Out of Band Emissions (Radiated) (ESMR)

13.1 Test Specification

FCC, Part 90, Section 90.210

13.2 Test Procedure

The power of any emission outside of the authorized bandwidth must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB, yielding -13dBm .

- (a) The E.U.T. operation mode and test set-up are as described in Section 3. A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 1.5 meters above the ground. The configuration tested is shown in Figure 3.5.

The frequency range 30 MHz-10 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:

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

P = Equivalent Isotropic Radiated Power.

P_g = Signal Generator Output Level.



13.3 Test Results

JUDGEMENT: Passed by dB

The E.U.T met the requirements of the FCC, Part 90, Section 90.210 specifications.

TEST PERSONNEL:

Tester Signature: _____

Date: 4.12.14

Typed/Printed Name: M. Zohar

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)
863.2	1726.4	V	58.9	-40.3	6.7	7.6	-39.4	-13.0	-26.4
863.2	1726.4	H	57.8	-41.3	6.7	8.0	-40.0	-13.0	-27.0
867.8	1735.9	V	58.8	-40.3	6.7	7.6	-39.4	-13.0	-26.4
867.8	1735.9	H	57.6	-41.3	6.7	8.0	-40.0	-13.0	-27.0

Figure 94 Out of Band (Radiated) (ESMR) Test Results Table



Out of Band Emissions (Radiated) (ESMR)

13.4 Test Equipment Used; Out of Band Emissions (Radiated) (ESMR)

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Active Loop Antenna	EMCO	6502	2950	November 4, 2013	1 year
Biconical Log Antenna	EMCO	3142B	1078	May 22, 2014	2 years
Horn Antenna	ETS	3115	29845	March 14, 2012	3 years
Signal Generator	HP	8647A	3623U00686	March 6, 2014	1 year
Signal Generator	HP	83731B	US37100653	March 6, 2014	1 year
Signal Generator	Agilent	N5182A	MY50141213	May 15, 2014	3 years
Signal Generator	Agilent	N5172B	MY5130182	May 15, 2014	3 years
EMI Receiver	R&S	FSL6	100194	December 1, 2013	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 29, 2014	1 Year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 22, 2014	1 Year
Antenna Mast	ETS	2070-2	-	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

Figure 95 Test Equipment Used Out of Band Emissions (Radiated) (ESMR)

14. Peak Output Power PCS

14.1 Test Specification

FCC Part 24, Subpart E

14.2 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 and an appropriate coaxial cable (loss = 30.6 dB). The E.U.T. RF output was modulated with W-CDMA , GSM and LTE 64QAM. Special attention was taken to prevent Spectrum Analyzer RF input overload. The Spectrum Analyzer was set to 100 kHz RBW.

14.3 Test Results

Modulation	Operation Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
LTE 64QAM	1935.0	21.4	50.0	-28.6
	1962.5	22.4	50.0	-27.6
	1990.0	20.3	50.0	-29.7
GSM	1931.2	20.7	50.0	-29.3
	1960.0	21.2	50.0	-28.8
	1993.8	21.2	50.0	-28.8
W-CDMA	1932.5	21.0	50.0	-29.0
	1960.0	22.6	50.0	-27.4
	1992.5	21.4	50.0	-28.6

Figure 96 Peak Output Power PCS

See additional information in Figure 97 to Figure 105.

JUDGEMENT: Passed by 27.4 dB

TEST PERSONNEL:

Tester Signature: _____

Date: 4.12.14

Typed/Printed Name: M. Zonar



LTE 64QAM:

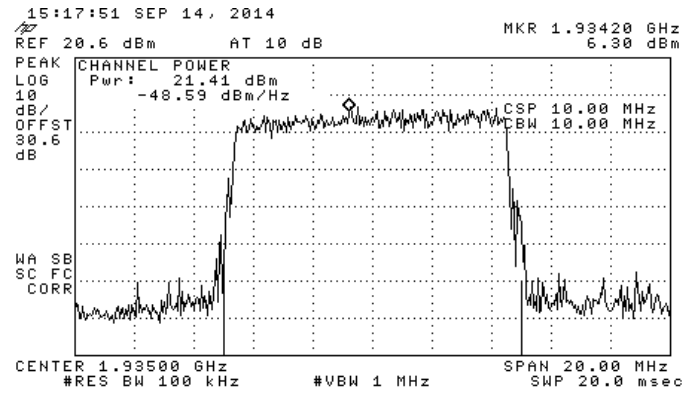


Figure 97.— 64QAM 1935.00 MHz

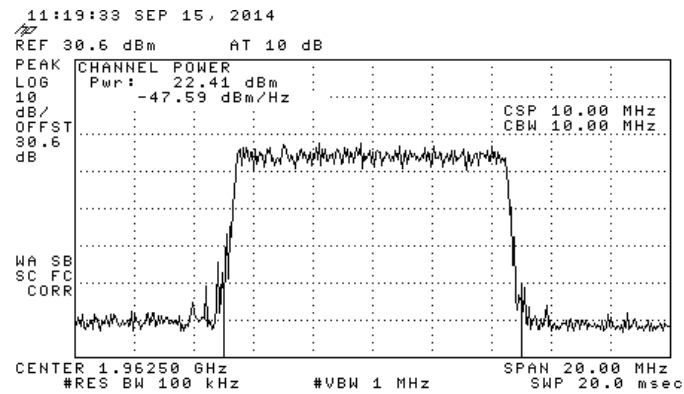


Figure 98.— 64QAM 1962.50 MHz

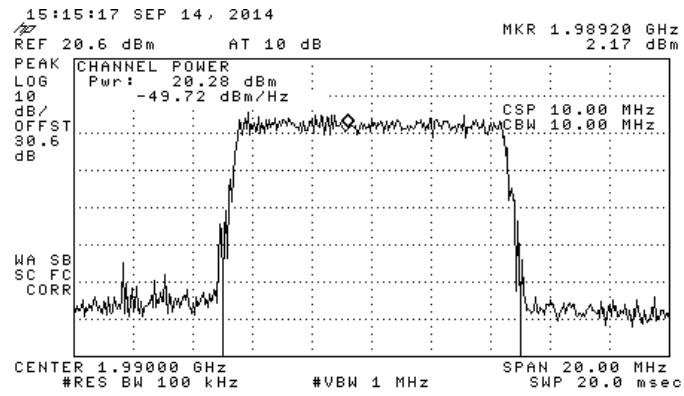


Figure 99.— 64QAM 1990.00 MHz



GSM:

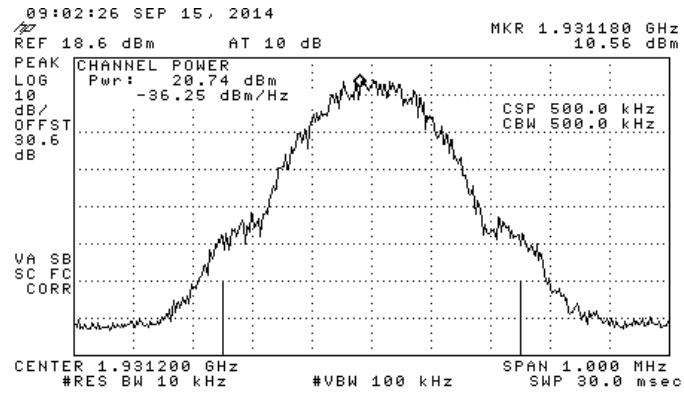


Figure 100.— 1931.20 MHz

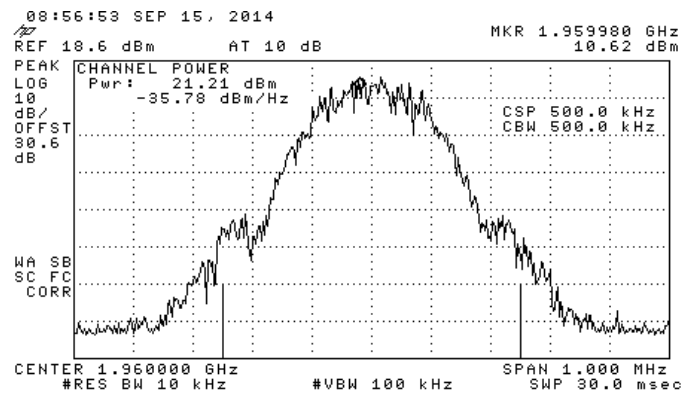


Figure 101.— 1960.00 MHz

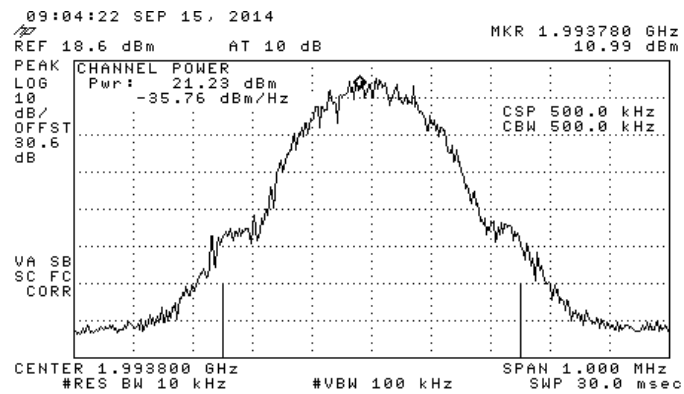


Figure 102.— 1993.80 MHz



W-CDMA:

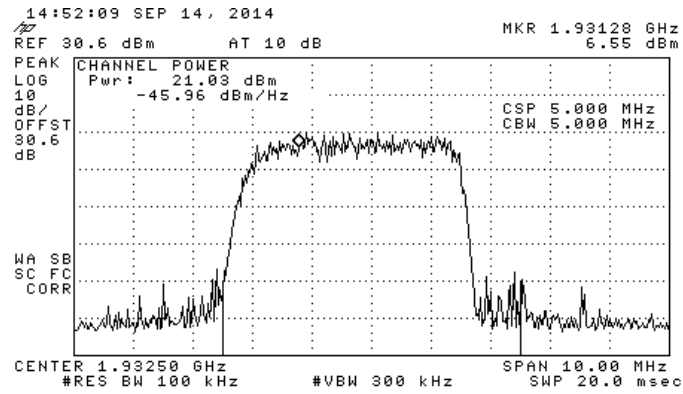


Figure 103.— 1932.50 MHz

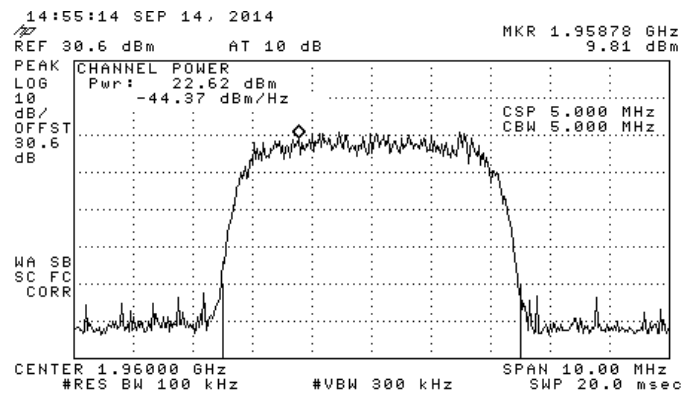


Figure 104.— 1960.00 MHz

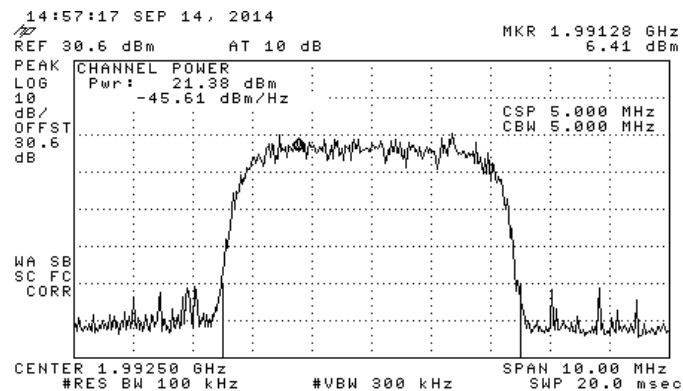


Figure 105.— 1992.50 MHz



14.4 Test Equipment Used; Peak Output Power PCS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8594E	3313U000346	March 6, 2014	1 year
Signal Generator	HP	8647A	3623U00686	March 6, 2014	1 year
Signal Generator	HP	83731B	US37100653	March 6, 2014	1 year
Signal Generator	Agilent	N5182A	MY50141213	May 15, 2014	3 years
Signal Generator	Agilent	N5172B	MY5130182	May 15, 2014	3 years
30 dB Attenuator	Weinschel Engineering	49-30-34	PD426	December 19, 2013	1 year

Figure 106 Test Equipment Used



15. Occupied Bandwidth PCS

15.1 Test Specification

FCC Part 2, Section 1049

15.2 Test Procedure

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

15.3 Test Results

Modulation		Operating Frequency (MHz)	Reading (MHz)
LTE 64QAM	Input	1935.00	9.40
	Output	1935.00	9.40
	Input	1962.50	9.40
	Output	1962.50	9.45
	Input	1990.00	9.45
	Output	1990.00	9.45
GSM	Input	1931.20	0.27
	Output	1931.20	0.27
	Input	1960.00	0.28
	Output	1960.00	0.28
	Input	1993.80	0.28
	Output	1993.80	0.28
W-CDMA	Input	1932.50	4.50
	Output	1932.50	4.55
	Input	1960.00	4.58
	Output	1960.00	4.58
	Input	1992.50	4.60
	Output	1992.50	4.58

Figure 107 Occupied Bandwidth PCS

See additional information in Figure 108 to Figure 125.

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____

Date: 4.12.14.

Typed/Printed Name: M. Zohar



LTE:

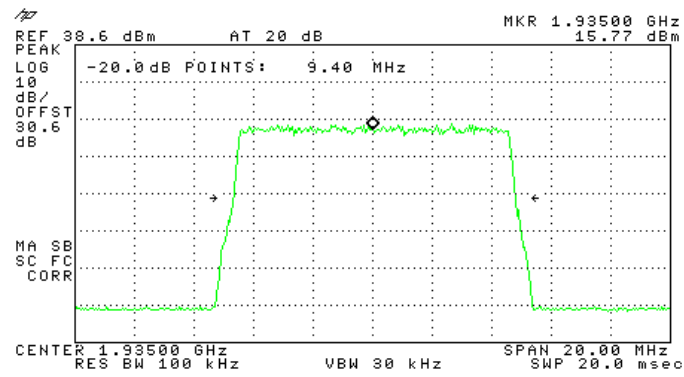


Figure 108.— 64QAM Input 1935.00 MHz

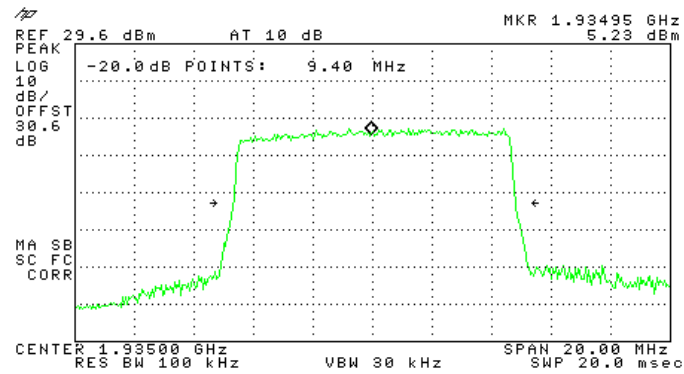


Figure 109.— 64QAM Output 1935.00 MHz

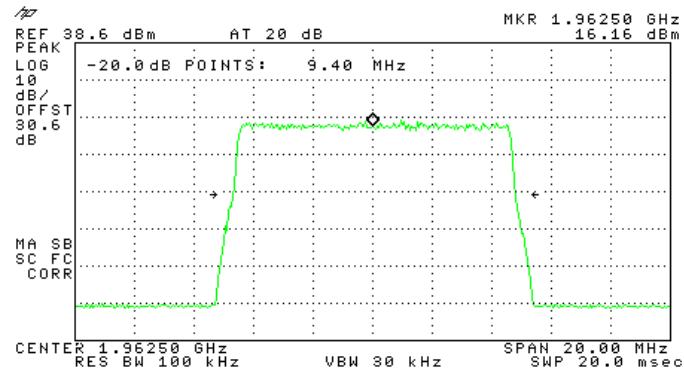


Figure 110.— 64QAM Input 1962.50 MHz

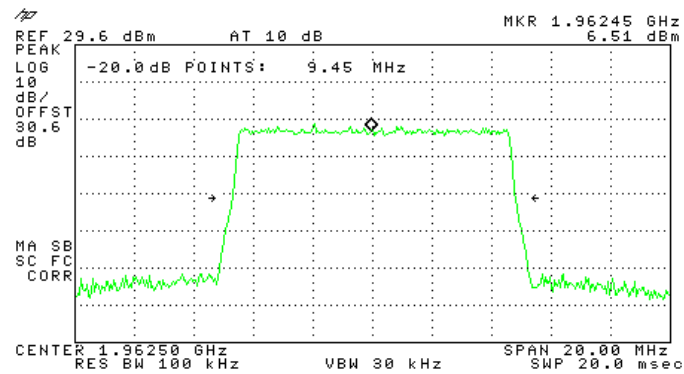


Figure 111.— 64QAM Output 1962.50 MHz

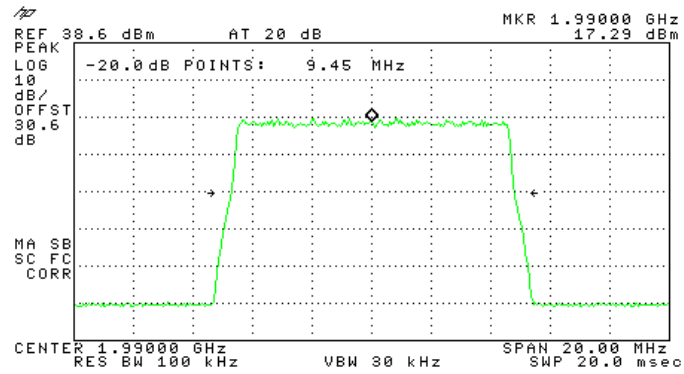


Figure 112.— 64QAM Input 1990.00 MHz

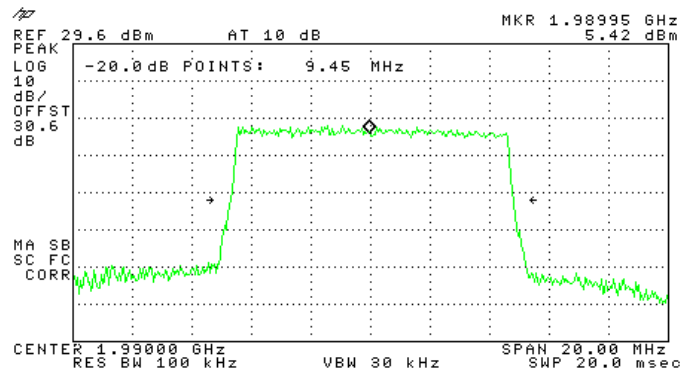


Figure 113.— 64QAM Output 1990.00 MHz

GSM:

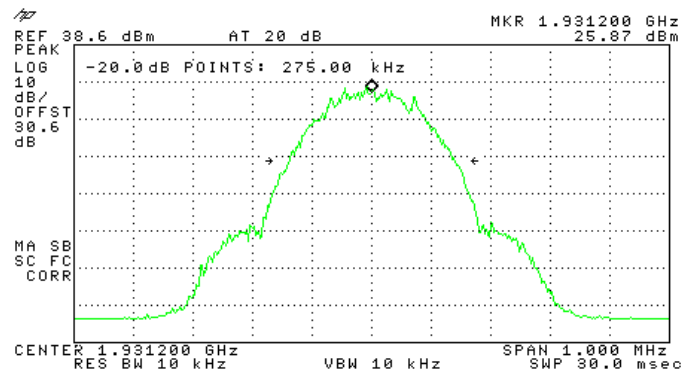


Figure 114.— Input 1931.20 MHz

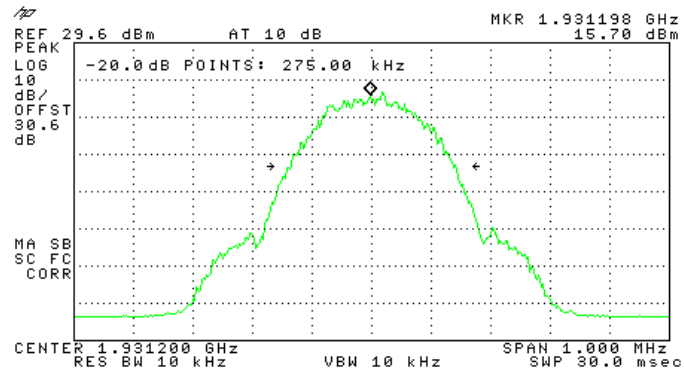


Figure 115.— Output 1931.20 MHz

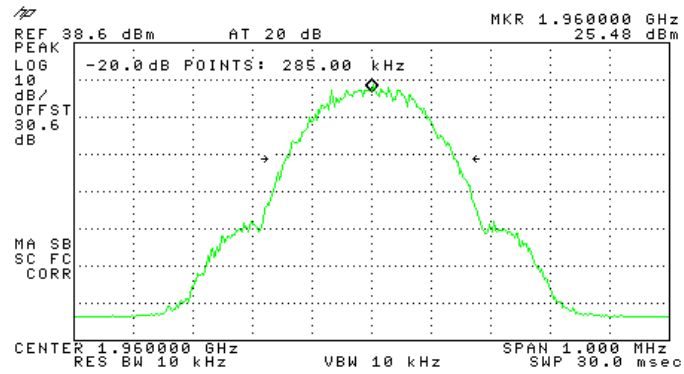


Figure 116.— Input 1960.00 MHz

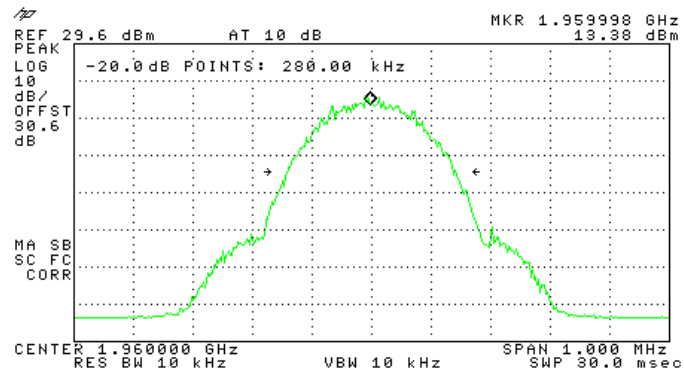


Figure 117.— Output 1960.00 MHz

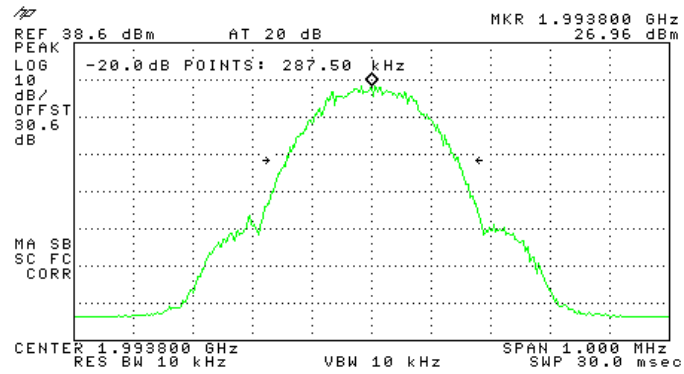


Figure 118.— Input 1993.80 MHz

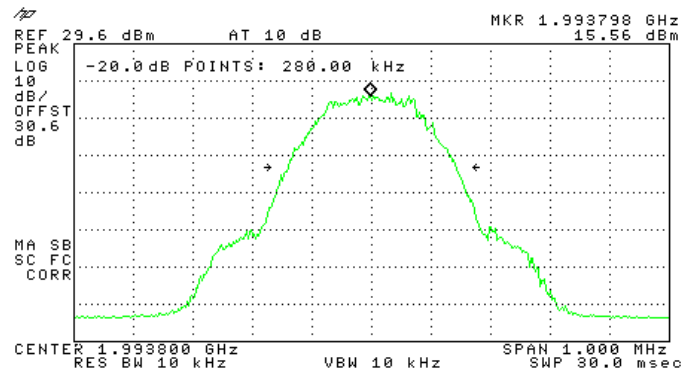


Figure 119.— Output 1993.80 MHz



W-CDMA:

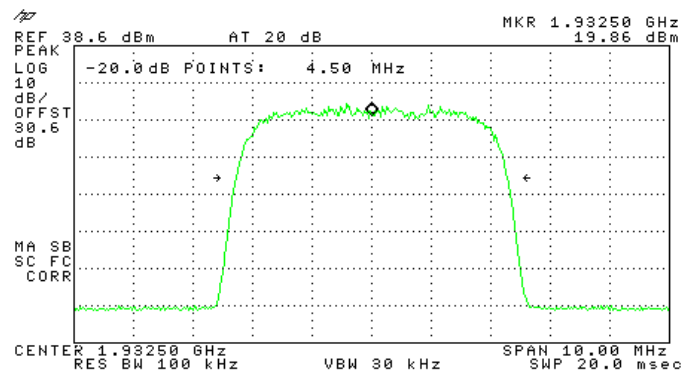


Figure 120.— Input 1932.50 MHz

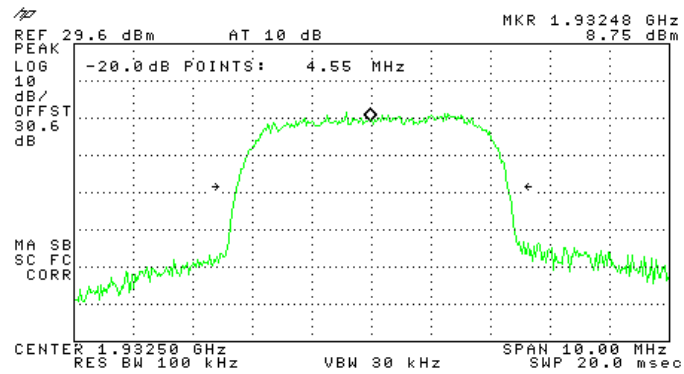


Figure 121.— Output 1932.50 MHz

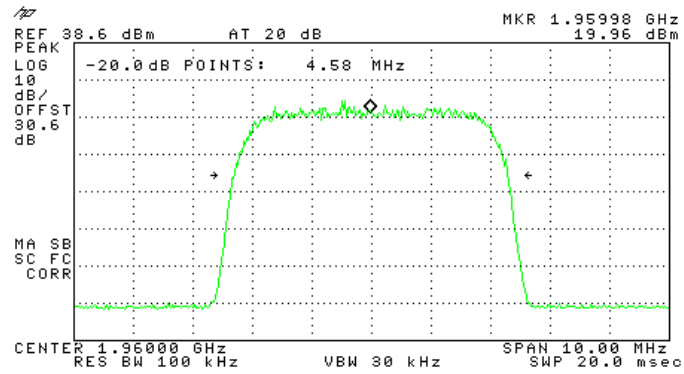


Figure 122.— Input 1960.00 MHz

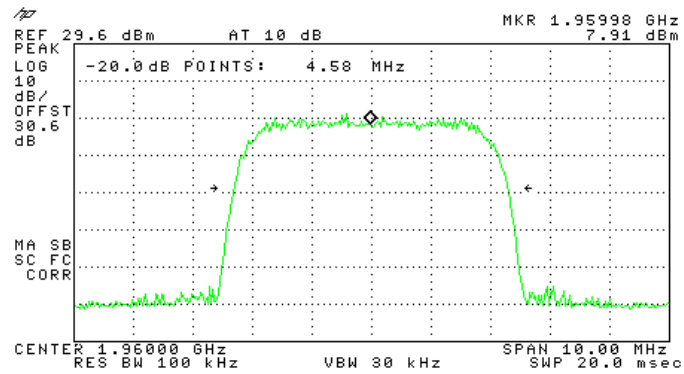


Figure 123.— Output 1960.00 MHz

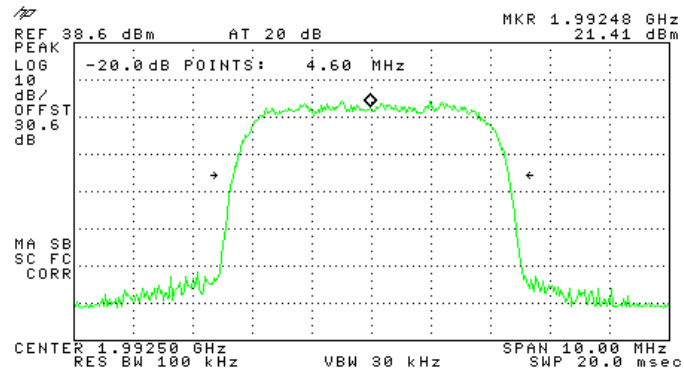


Figure 124.— Input 1992.50 MHz

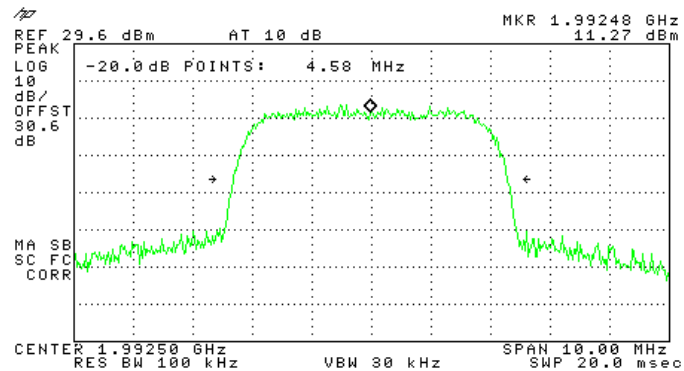


Figure 125.— Output 1992.50 MHz



15.4 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	8647A	3623U00686	March 6, 2014	1 year
Signal Generator	HP	83731B	US37100653	March 6, 2014	1 year
Signal Generator	Agilent	N5182A	MY50141213	May 15, 2014	3 years
Signal Generator	Agilent	N5172B	MY5130182	May 15, 2014	3 years
30 dB Attenuator	Weinschel Engineering	49-30-34	PD426	December 19, 2013	1 year

Figure 126 Test Equipment Used



16. Out of Band Emissions at Antenna Terminals PCS

16.1 Test Specification

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

16.2 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 (30.6 dB). The spectrum analyzer was set to 1 kHz resolution BW for the frequency range 9.0-150.0 kHz, 10 kHz for the frequency range 150 kHz-1.0 MHz, 100 kHz for the frequency range 1.0 MHz - 30 MHz, and 1MHz for the frequency range 30 MHz - 20.0 GHz. Signal power was +10 dBm to EUT.

16.3 Test Results

See additional information in Figure 127 to Figure 135.

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____

Date: 4.12.14

Typed/Printed Name: M. Zohar



LTE 64QAM:

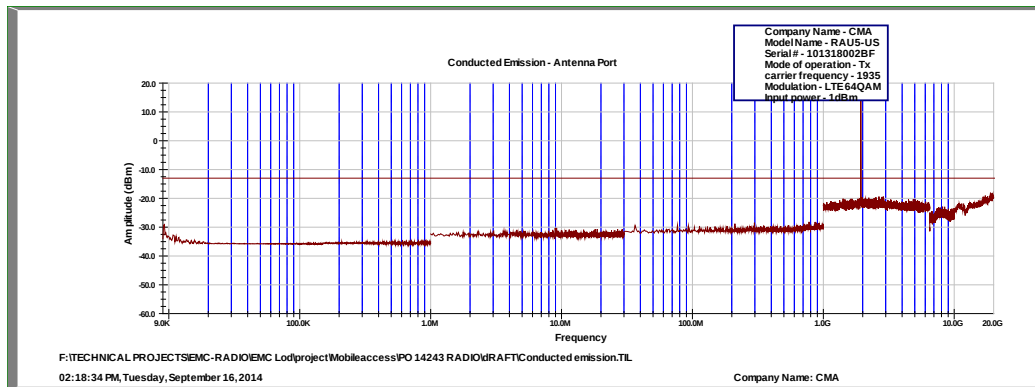


Figure 127.— 1935.0 MHz

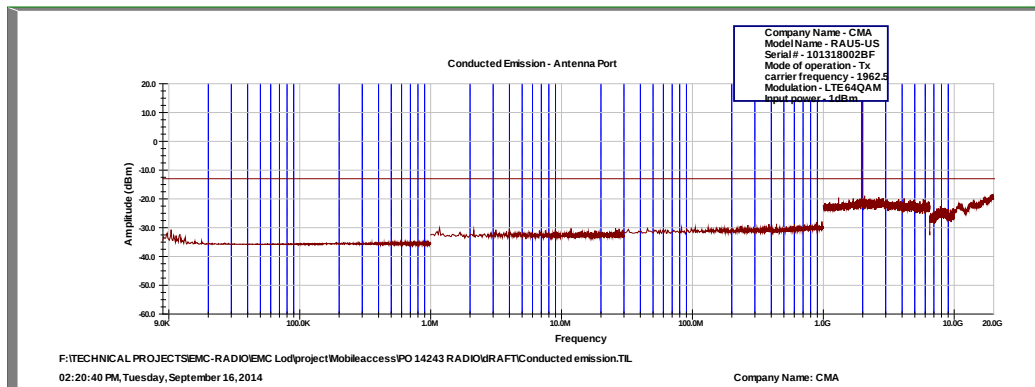


Figure 128.— 1962.5 MHz

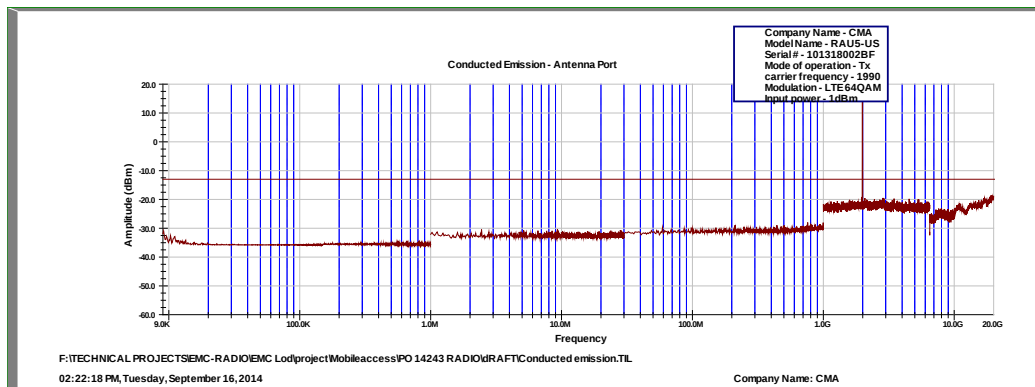


Figure 129.— 1990.0 MHz



GSM:

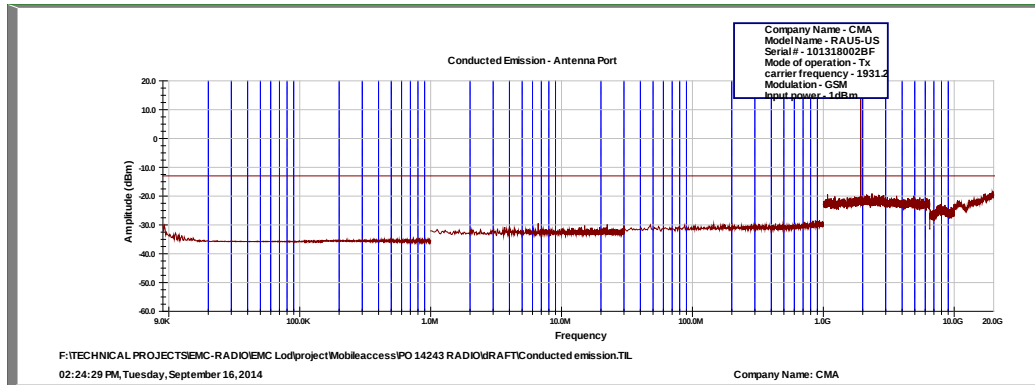


Figure 130.— 1931.2 MHz

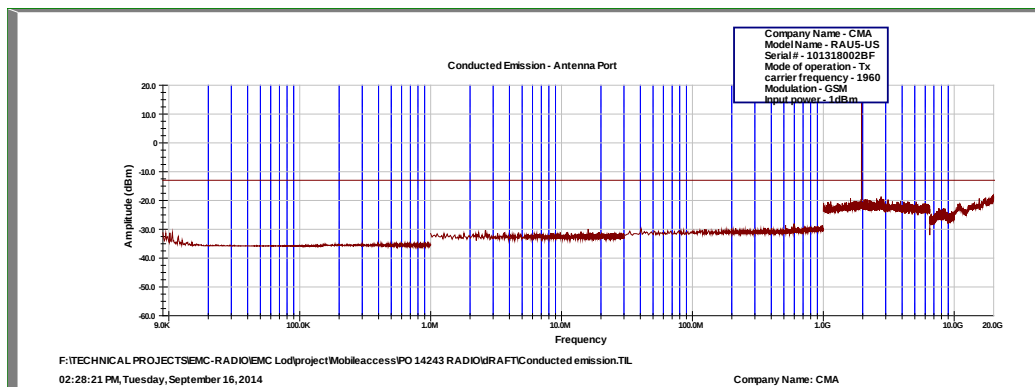


Figure 131.— 1960.0 MHz

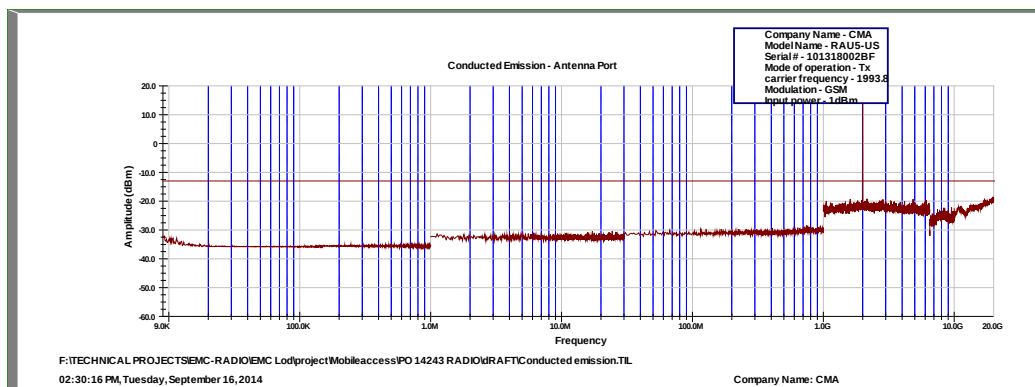


Figure 132.— 1993.8 MHz

WCDMA:

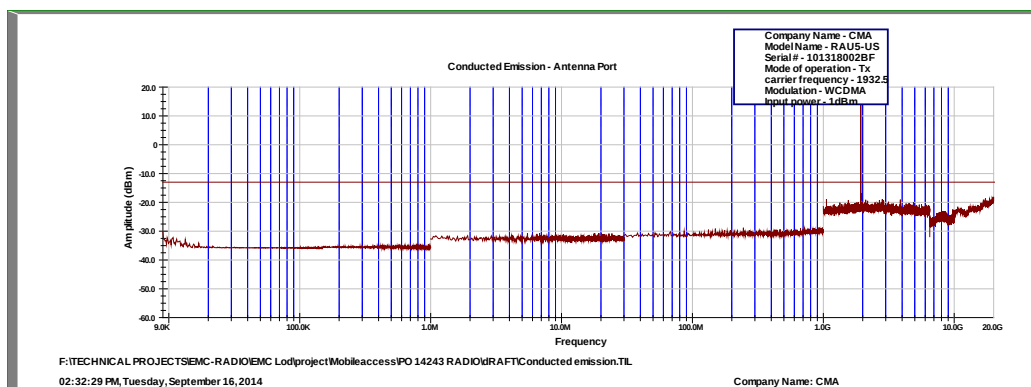


Figure 133.— 1932.5 MHz

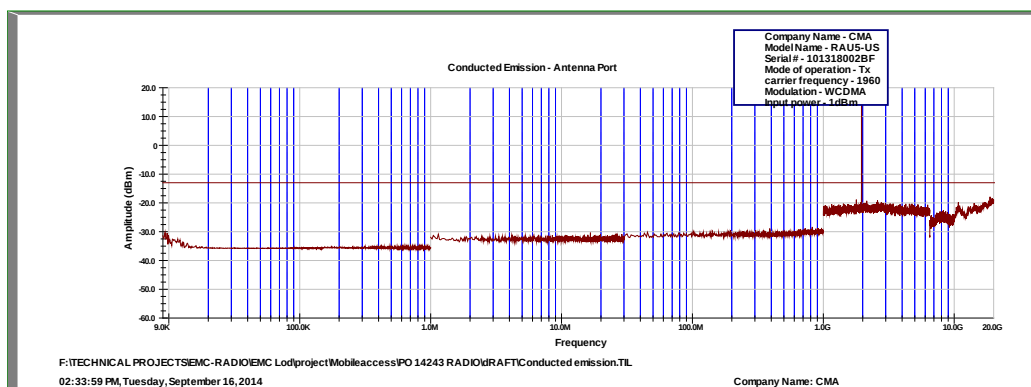


Figure 134.— 1960.0 MHz

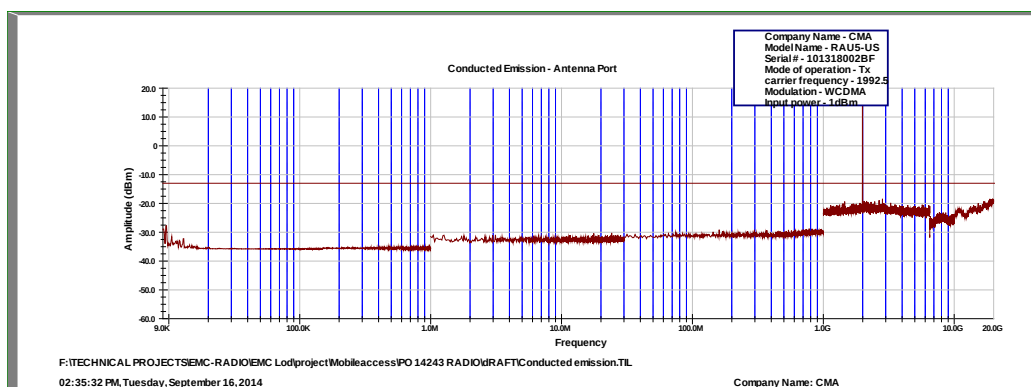


Figure 135.— 1992.5 MHz



**16.4 Test Equipment Used; Out of Band Emission at Antenna Terminals
PCS**

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8594L	3826A01204	February 28, 2014	1 year
Signal Generator	HP	8647A	3623U00686	March 6, 2014	1 year
Signal Generator	HP	83731B	US37100653	March 6, 2014	1 year
Signal Generator	Agilent	N5182A	MY50141213	May 15, 2014	3 years
Signal Generator	Agilent	N5172B	MY5130182	May 15, 2014	3 years
30 dB Attenuator	Weinschel Engineering	49-30-34	PD426	December 19, 2013	1 year

Figure 136 Test Equipment Used

17. Band Edge Spectrum PCS

17.1 Test Specification

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

17.2 Test procedure

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 (30.6 dB).

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

17.1 Test Results

Modulation	Operation Frequency (MHz)	Band Edge Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
LTE 64QAM	1935.00	1930.00	-17.67	-13.0	-4.67
	1990.00	1995.00	-18.10	-13.0	-5.10
GSM	1931.20	1930.00	-42.19	-13.0	-29.19
	1993.80	1995.00	-43.25	-13.0	-30.25
W-CDMA	1932.50	1930.00	-21.23	-13.0	-8.23
	1992.50	1995.00	-21.05	-13.0	-8.05

Figure 137 Band Edge Spectrum Results PCS

See additional information in Figure 138 to Figure 143.

JUDGEMENT: Passed by 4.67 dB

TEST PERSONNEL:

Tester Signature: _____



Date: 4.12.14

Typed/Printed Name: M. Zohar



LTE:

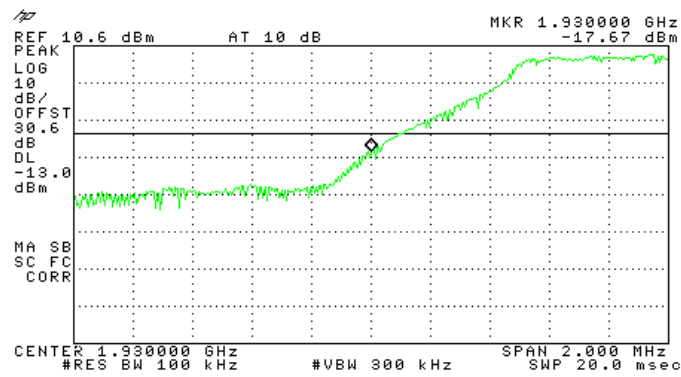


Figure 138.— 64QAM 1935.00 MHz

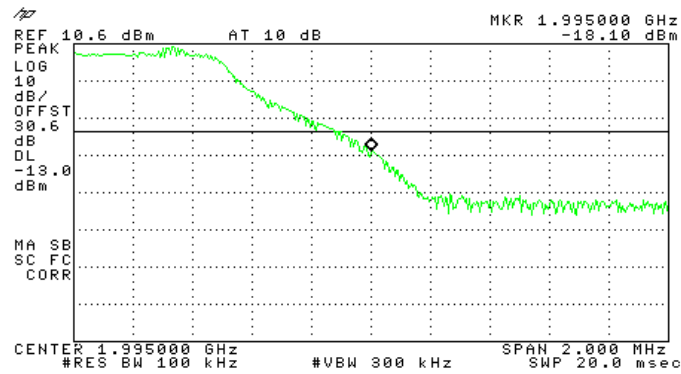


Figure 139.— 64QAM 1990.00 MHz



GSM:

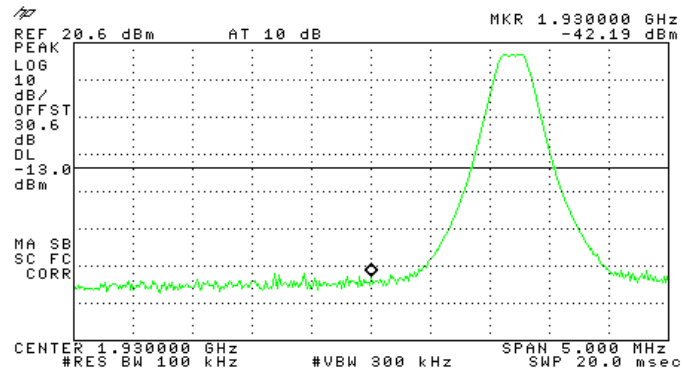


Figure 140.— 1931.20 MHz

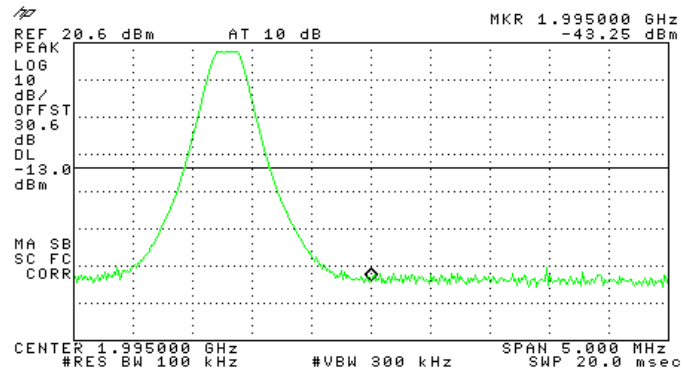


Figure 141.— 1993.80 MHz



W-CDMA:

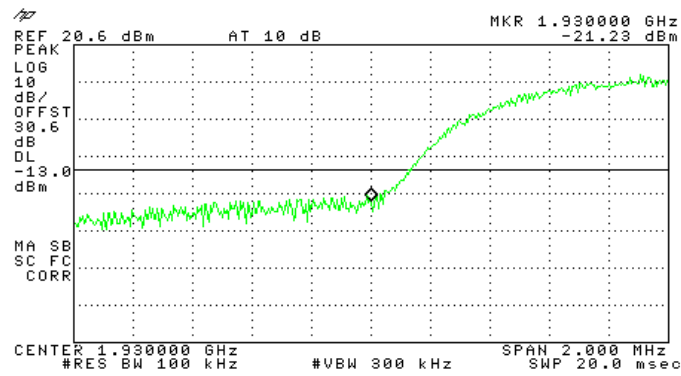


Figure 142.— 1932.50 MHz

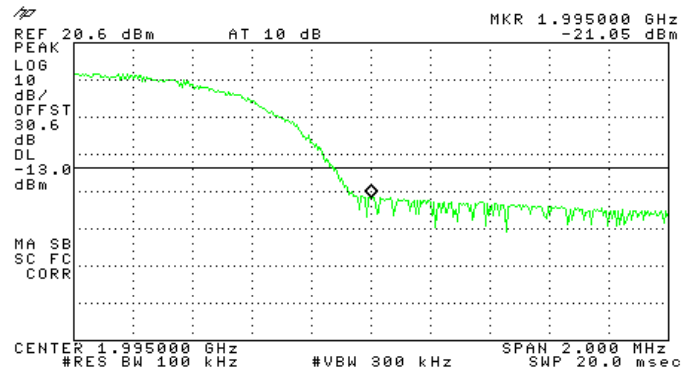


Figure 143.— 1992.50 MHz



17.2 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	8647A	3623U00686	March 6, 2014	1 year
Signal Generator	HP	83731B	US37100653	March 6, 2014	1 year
Signal Generator	Agilent	N5182A	MY50141213	May 15, 2014	3 years
Signal Generator	Agilent	N5172B	MY5130182	May 15, 2014	3 years
30 dB Attenuator	Weinschel Engineering	49-30-34	PD426	December 19, 2013	1 year

Figure 144 Test Equipment Used

18. Out of Band Emissions (Radiated) PCS

18.1 Test Specification

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

18.2 Test Procedure

The test method was based on ANSI/TIA-603-C: 2004, Section 2.2.12

Unwanted Emissions: Radiated Spurious.

The power of any emission outside of the authorized operating frequency ranges (1930-1990 MHz) must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB, yielding -13dBm .

- (a) The E.U.T. operation mode and test set-up are as described in Section 3. A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 1.5 meters above the ground. The configuration tested is shown in Figure 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.



18.3 Results Table

Carrier Channel (MHz)	Freq. (MHz)	Antenna Pol.	Maximum Peak Level (dBμV/m)	Signal Generator RF Output (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Effective Radiated Power Level (dBm)	Spec. (dBm)	Margin (dB)
1931.20	3862.4	V	66.0	-29.34	10.2	8.7	-30.84	-13.0	-17.84
1931.20	3862.4	H	65.8	-30.89	10.2	9.8	-31.29	-13.0	-18.29
1960.00	3920.0	V	66.1	-29.34	10.2	8.7	-30.84	-13.0	-17.84
1960.00	3920.0	H	64.5	-31.89	10.2	9.8	-32.29	-13.0	-19.29
1993.80	3987.6	V	62.5	-33.18	11.2	9.5	-34.88	-13.0	-21.88
1993.80	3987.6	H	62.1	-34.23	11.2	8.6	-36.83	-13.0	-23.83

Figure 145 Out of Band (Radiated) PCS

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

JUDGEMENT: Passed by 17.84 dB

TEST PERSONNEL:

Tester Signature:  Date: 4.12.14

Typed/Printed Name: Mr. Zohar



18.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Active Loop Antenna	EMCO	6502	2950	November 4, 2013	1 year
Biconical Log Antenna	EMCO	3142B	1078	May 22, 2014	2 years
Horn Antenna	ETS	3115	29845	March 14, 2012	3 years
Horn Antenna	ARA	SWH-28	1007	March 30, 2014	3 years
Signal Generator	HP	8647A	3623U00686	March 6, 2014	1 year
Signal Generator	HP	83731B	US37100653	March 6, 2014	1 year
Signal Generator	Agilent	N5182A	MY50141213	May 15, 2014	3 years
Signal Generator	Agilent	N5172B	MY5130182	May 15, 2014	3 years
EMI Receiver	R&S	FSL6	100194	December 1, 2013	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 29, 2014	1 Year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 22, 2014	1 Year
Antenna Mast	ETS	2070-2	-	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

Figure 146 Test Equipment Used

19. APPENDIX A - CORRECTION FACTORS

19.1 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".



19.2 Correction factors for Bilog ANTENNA

Model: 3142

Antenna serial number: 1250

3 meter range

FREQUENCY	AFE	FREQUENCY	AFE
(MHz)	(dB/m)	(MHz)	(dB/m)
30	18.4	1100	25
40	13.7	1200	24.9
50	9.9	1300	26
60	8.1	1400	26.1
70	7.4	1500	27.1
80	7.2	1600	27.2
90	7.5	1700	28.3
100	8.5	1800	28.1
120	7.8	1900	28.5
140	8.5	2000	28.9
160	10.8		
180	10.4		
200	10.5		
250	12.7		
300	14.3		
400	17		
500	18.6		
600	19.6		
700	21.1		
800	21.4		
900	23.5		
1000	24.3		



19.3 Correction factors for **Horn ANTENNA**

Model: 3115

Antenna serial number: 6142

3 meter range

FREQUENCY	Antenna Factor	FREQUENCY	Antenna Factor
(MHz)	(dB/m)	(MHz)	(dB/m)
1000	23.9	10500	38.4
1500	25.4	11000	38.5
2000	27.3	11500	39.4
2500	28.5	12000	39.2
3000	30.4	12500	39.4
3500	31.6	13000	40.7
4000	33	14000	42.1
4500	32.7	15000	40.1
5000	34.1	16000	38.2
5500	34.5	17000	41.7
6000	34.9	17500	45.7
6500	35.1	18000	47.7
7000	35.9		
7500	37.5		
8000	37.6		
8500	38.3		
9000	38.5		
9500	38.1		
10000	38.6		



19.4 Correction factors for Horn ANTENNA

Model: SWH-28

Antenna serial number: 1007

1 meter range

FREQUENCY	Antenna Factor
(MHz)	(dB/m)
18000	33.0
18500	32.9
19000	33.1
19500	33.3
20000	33.6
20500	33.6
21000	33.4
21500	33.8
22000	33.7
22500	33.9
23000	34.8
23500	34.5
24000	34.2
24500	34.8
25000	34.4
25500	35.2
26000	35.9
26500	36.0



19.5 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