



DATE: 29 August 2013

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

FCC Radio Test Report

for

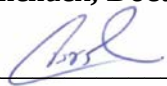
Corning MobileAccess

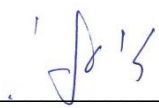
Equipment under test:

ONE Distributed Antenna System

Remote Extender Unit - RXU

Written by: 
R. Pinchuck, Documentation

Approved by: 
A. Sharabi, Test Engineer

Approved by: 
I. Raz, EMC Laboratory Manager

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This report relates only to items tested.



Measurement/Technical Report for
Corning MobileAccess
ONE Distributed Antenna System
Remote Extender Unit - RXU
(

FCC ID: OJF1RXU

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

Equipment type: PCB PCS Licensed Transmitter

Limits used:
47CFR Parts 2; 27

Measurement procedure used is ANSI C63.4-2003.

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

Application for Certification
prepared by:

Ishaishou Raz
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Kfar Bin Nun
D.N. Shimshon 99780
Israel
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Applicant for this device:

(different from "prepared by")

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Corning MobileAccess
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1. General Information

1.1 Administrative Information

Manufacturer:	Corning MobileAccess
Manufacturer's Address:	8391 Old Courthouse Rd. Suite #300 Vienna, VA 22182 U.S.A. Tel: +1-541-758-2880 Fax: +1-703-848-0260
Manufacturer's Representative:	Steve Blum
Equipment Under Test (E.U.T):	ONE Distributed Antenna System
Equipment Model No.:	Remote Extender Unit - RXU
Equipment Serial No.:	Not Designated
Date of Receipt of E.U.T:	03.04.13
Start of Test:	03.04.13
End of Test:	24.04.13
Test Laboratory Location:	I.T.L (Product Testing) Ltd. 1 Batsheva St, Lod, Israel 7116002
Test Specifications:	FCC Parts 2; 27



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.), Registration No. 861911.
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.
6. TUV Product Services, England, ASLLAS No. 97201.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.



1.3 Product Description

RXU is connected to main RAU module through RF and DC Connector. RXU is intended to add two additional frequency bands - LTE (728-757MHz) and AWS (2110-2155MHZ) – for MIMO 2x 2 operations. These two frequency bands are filtered and transmitted through additional antenna port via RF connector.

1.4 Test Methodology

Radiated testing was performed according to the procedures in ANSI C63.4: 2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

The radiated emissions tests were performed at I.T.L.'s testing facility in Lod, 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

Radiated Emission

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

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

± 4.98 dB



2. System Test Configuration

2.1 *Justification*

The test setup was configured to closely resemble the standard installation. The EUT was operated in host ONE – Optical Network Evolution DAS. 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 RXU, while the EUT output was connected to the spectrum analyzer. All channels transmitted during the testing. The LTE and AWS antenna ports of host unit are MIMO. The RXU provides the MIMO port for the host unit. All radiated tests were performed in conjunction with ONE – Optical Network Evolution DAS RAU transmitter. RF input signal level was 0 dBm for all bands. There is neither an intermediate amplifier nor donor antenna in the uplink. All components included in the UL path are connected by cables.

2.2 *EUT Exercise Software*

The HCM ver. 0.2 build 19 used for commands delivery.

RXU – RXU_AA00_00.44

2.3 *Special Accessories*

No special accessories were needed in order to achieve compliance.

2.4 *Equipment Modifications*

No modifications were necessary in order to achieve compliance.



2.5 Configuration of Tested System

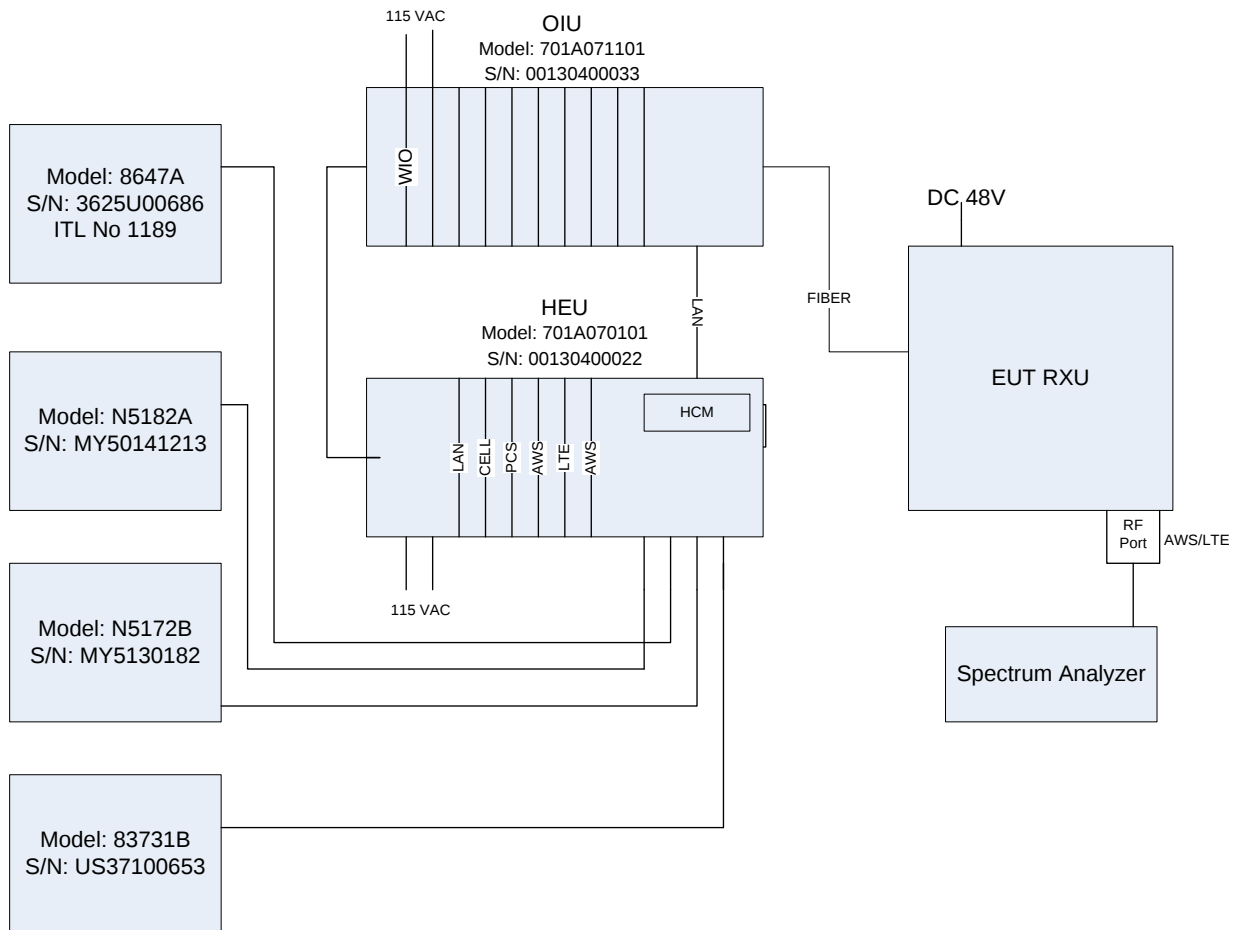


Figure 1. Test Set-up

3. Test Set-up Photos

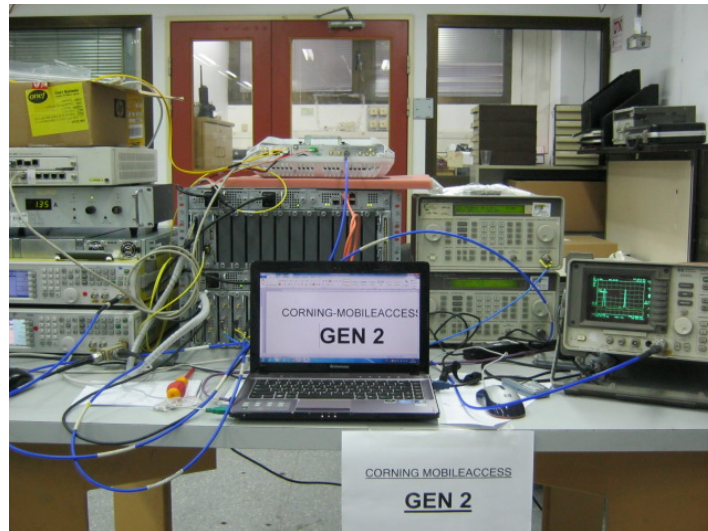


Figure 2. Conducted Emission From Antenna Port Tests

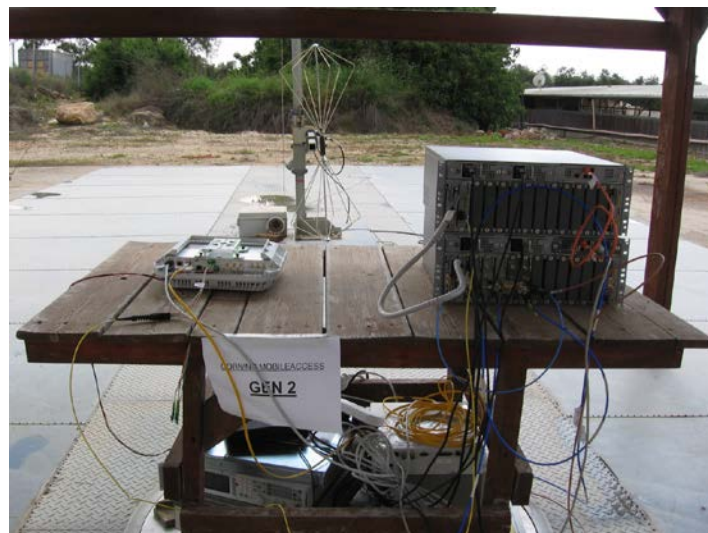


Figure 3. Radiated Emission Test



Figure 4. Radiated Emission Test



Figure 5. Radiated Emission Test

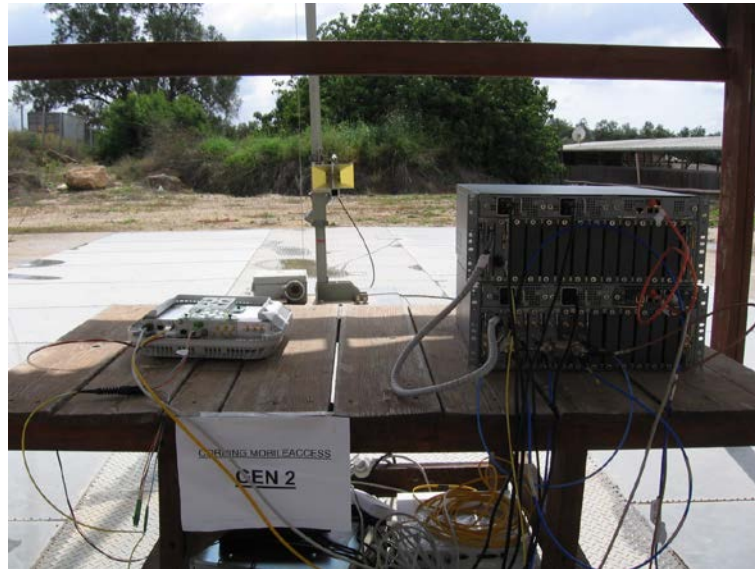


Figure 6. Radiated Emission Test



4. RF Power Output LTE

4.1 Test Specification

FCC Part 27, Subpart C (27.50)

4.2 Test procedure

Peak Power Output must not exceed 1000W. The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator (30.7 dB) and an appropriate coaxial cable. Special attention was taken to prevent Spectrum Analyzer RF input overload. The Spectrum Analyzer was set to 100 kHz RBW.

4.3 Test Results

	Operation Frequency (MHz)	Reading (dBm)
LTE 64QAM	733	14.33
LTE 64QAM	747	16.64
LTE 64QAM	753	15.69
LTE 16QAM	733	14.64
LTE 16QAM	747	16.60
LTE 16QAM	753	15.78
LTE QPSK	733	14.88
LTE QPSK	747	16.87
LTE QPSK	753	15.94

Figure 7 RF Power Output LTE

See additional information in Figure 8 to Figure 16.

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 07.05.13

Typed/Printed Name: A. Sharabi

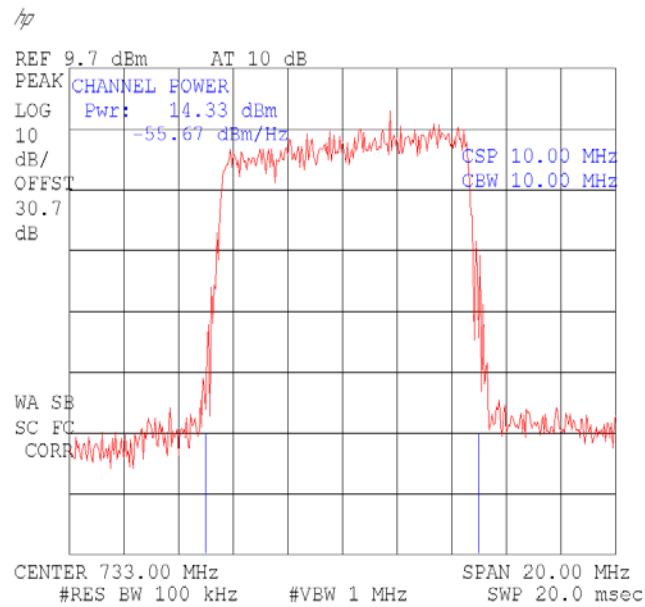


Figure 8.— 64QAM, 733 MHz

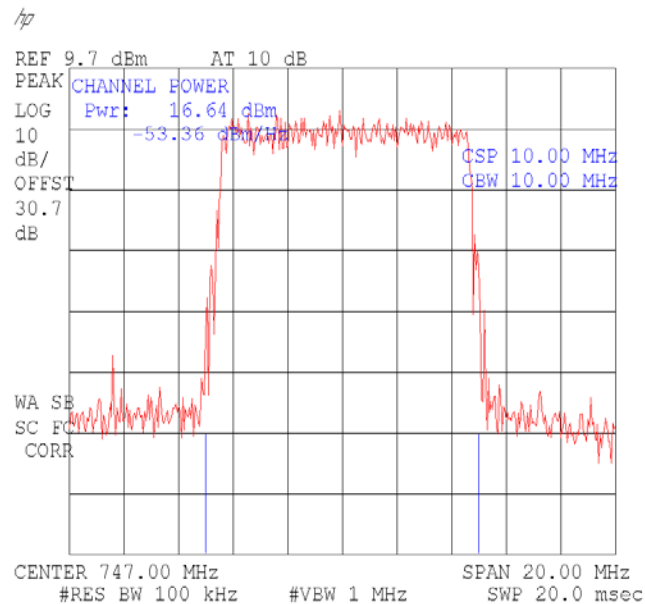


Figure 9.— 64QAM 747 MHz

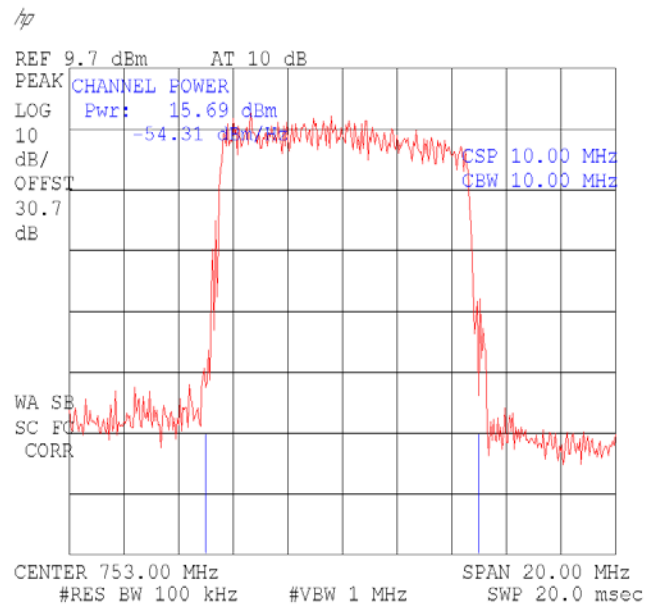


Figure 10.— 64QAM 753 MHz

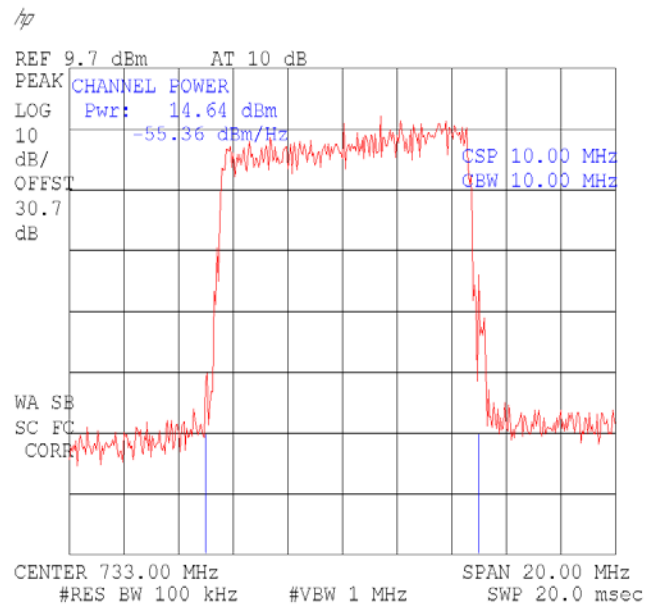


Figure 11.— 16QAM 733 MHz

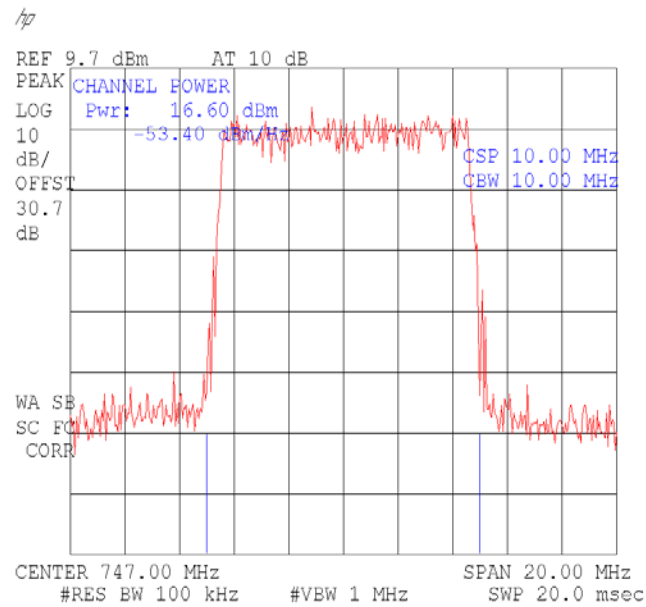


Figure 12.— 16QAM 747 MHz

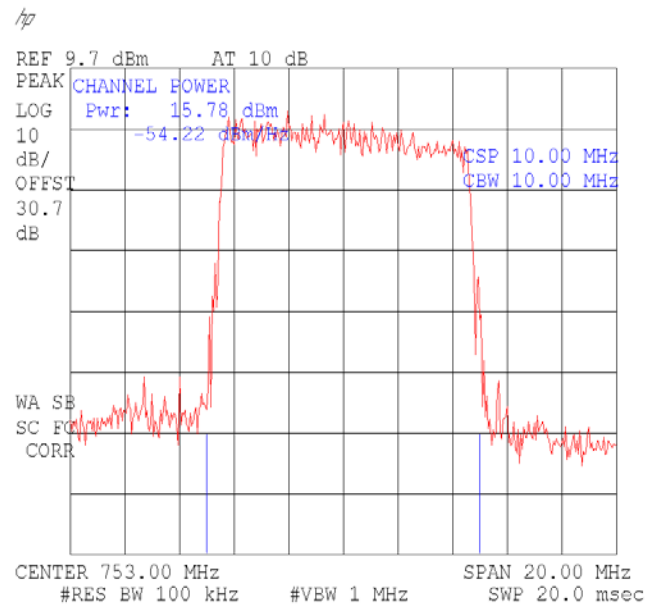


Figure 13.— 16QAM 753 MHz

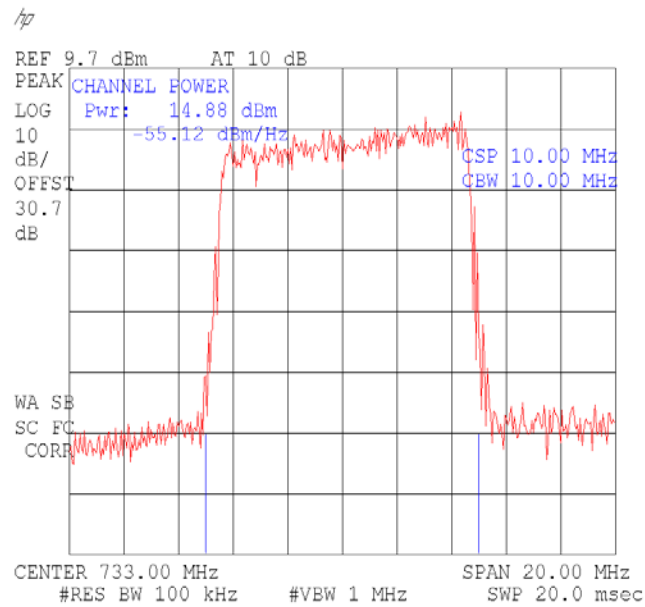


Figure 14.— QPSK 733 MHz

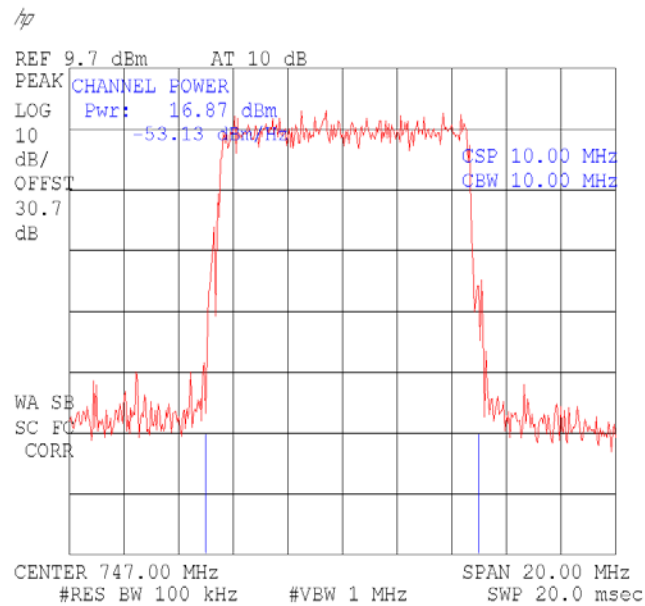


Figure 15.— QPSK 747 MHz

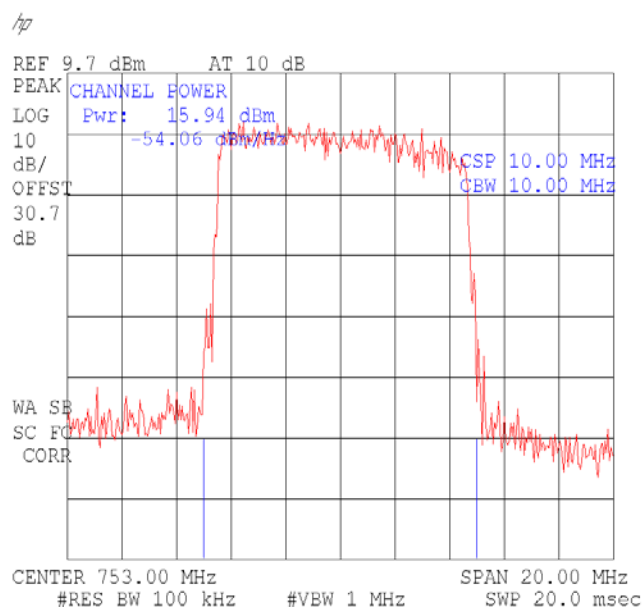


Figure 16.— QPSK 753 MHz

4.4 Test Equipment Used.

RF Power Output LTE

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8564E	3442A00275	February 13, 2013	1 year
Signal Generator	Agilent	N5172B ATO 10210	MY51350182	May 31, 2012	2 years
Attenuator	Mini-circuit	UNAT-30+	N/A	April 3, 2013	1 year
Cable	Mini-circuit	DCB	N/A	April 3, 2013	1 year
DC Block	MIDWEST MICROWAVE	DCDB-3624-10-NNN-02	N/A	N/A	N/A

Figure 17 Test Equipment Used



5. Occupied Bandwidth LTE

5.1 Test Specification

FCC Part 2, Section 1049

5.2 Test Procedure

The E.U.T. was set to the applicable test frequency in the 728-757 MHz band. The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (at the output test) and an appropriate coaxial cable (30.7 dB). The spectrum analyzer was set to proper resolution B.W.

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

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



5.3 Test Results

		Operating Frequency (MHz)	Reading (MHz)
LTE 64QAM	Input	733	9.30
LTE 64QAM	Output	733	9.30
LTE 64QAM	Input	747	9.30
LTE 64QAM	Output	747	9.35
LTE 64QAM	Input	753	9.30
LTE 64QAM	Output	753	9.30
LTE 16QAM	Input	733	9.25
LTE 16QAM	Output	733	9.30
LTE 16QAM	Input	747	9.30
LTE 16QAM	Output	747	9.30
LTE 16QAM	Input	753	9.30
LTE 16QAM	Output	753	9.20
LTE QPSK	Input	733	9.25
LTE QPSK	Output	733	9.30
LTE QPSK	Input	747	9.40
LTE QPSK	Output	747	9.40
LTE QPSK	Input	753	9.35
LTE QPSK	Output	753	9.25

Figure 18 Occupied Bandwidth LTE

See additional information in Figure 19 to Figure 36.

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 07.05.13

Typed/Printed Name: A. Sharabi

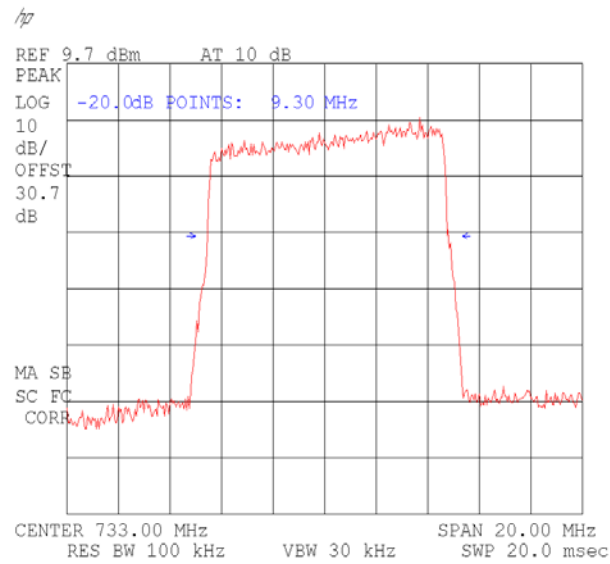


Figure 19.— 64QAM 733 MHz IN

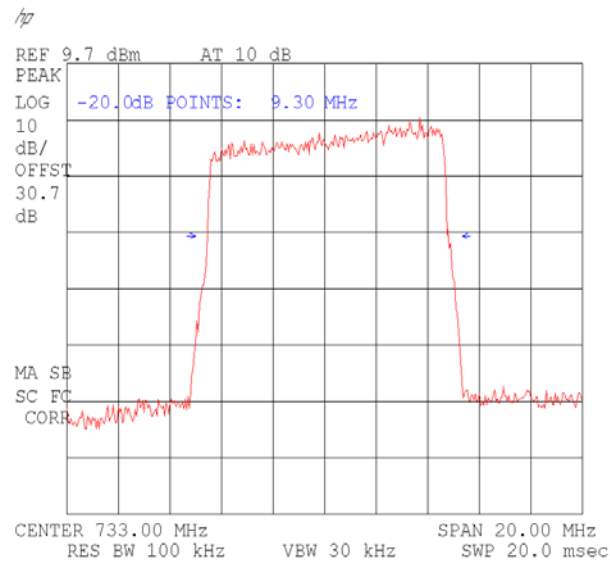


Figure 20.— 64QAM 733 MHz OUT

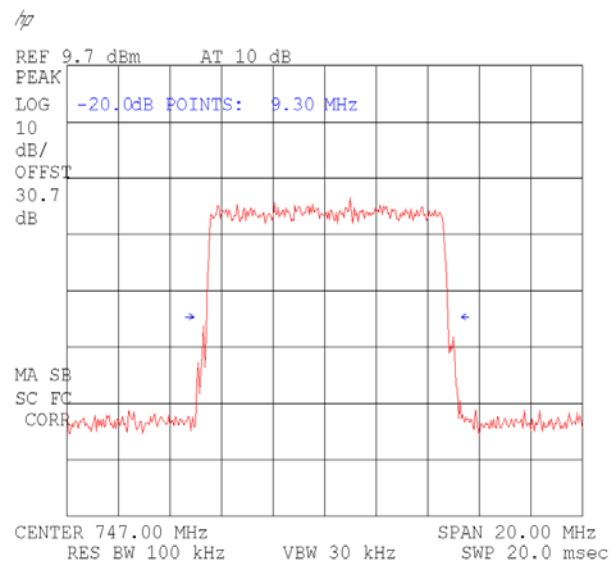


Figure 21.— 64QAM 747 MHz IN

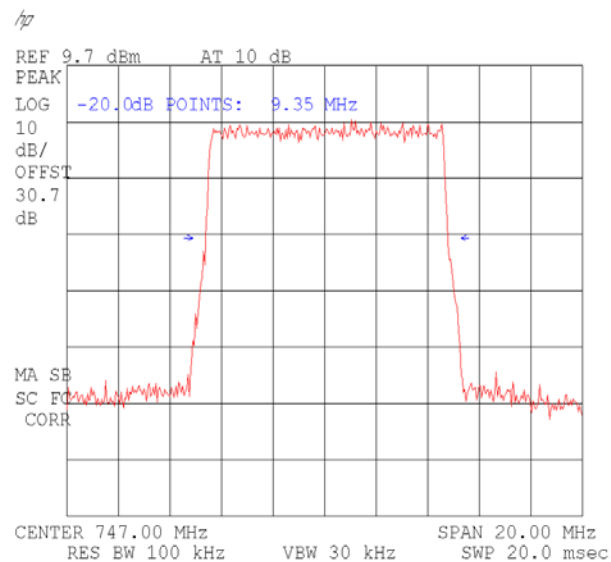


Figure 22.— 64QAM 747 MHz OUT

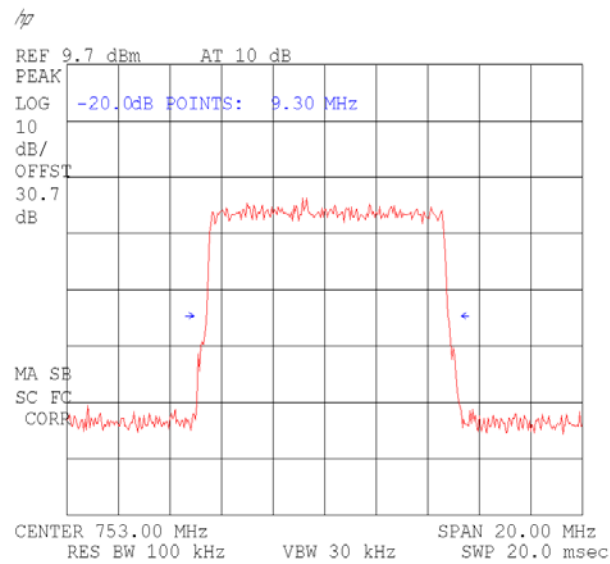


Figure 23.— 64QAM 753 MHz IN

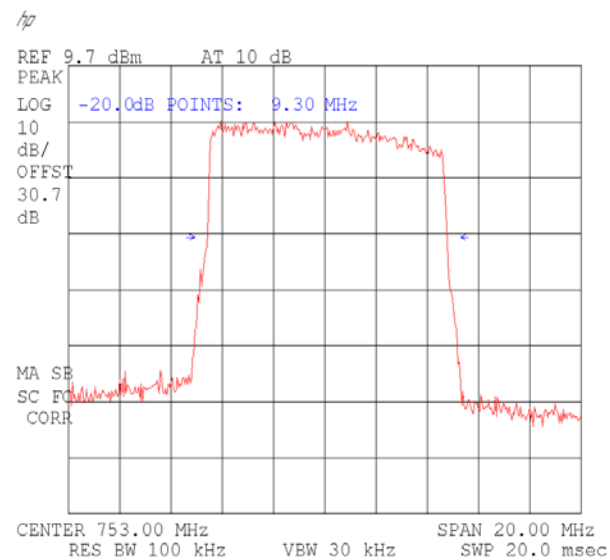


Figure 24.— 64QAM 753 MHz OUT

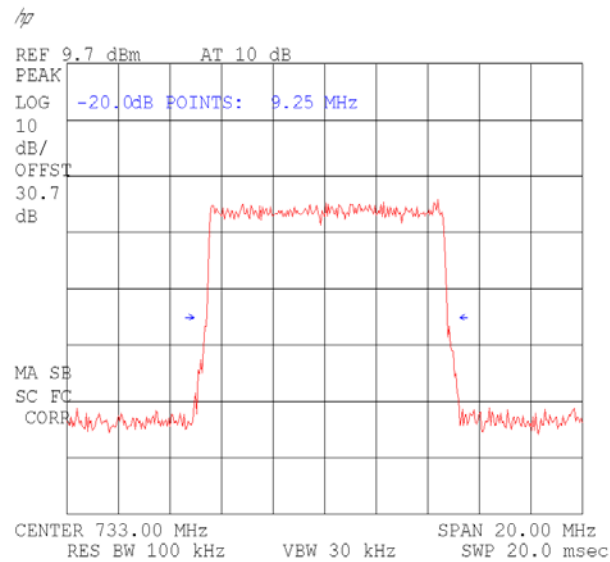


Figure 25.— 16QAM 733 MHz IN

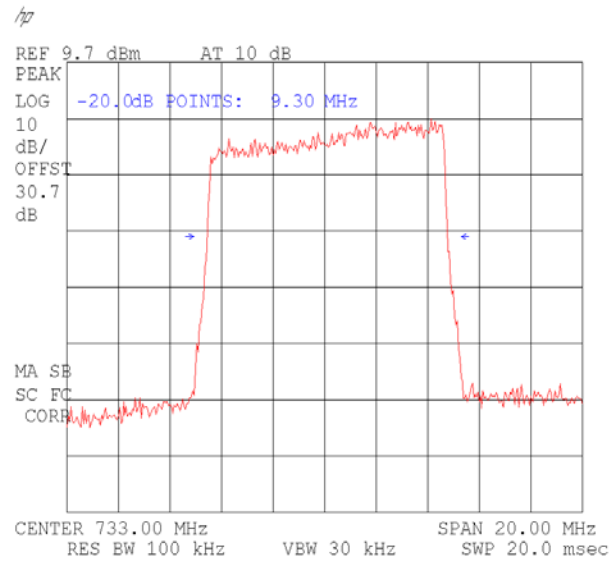


Figure 26.— 16QAM 733 MHz OUT

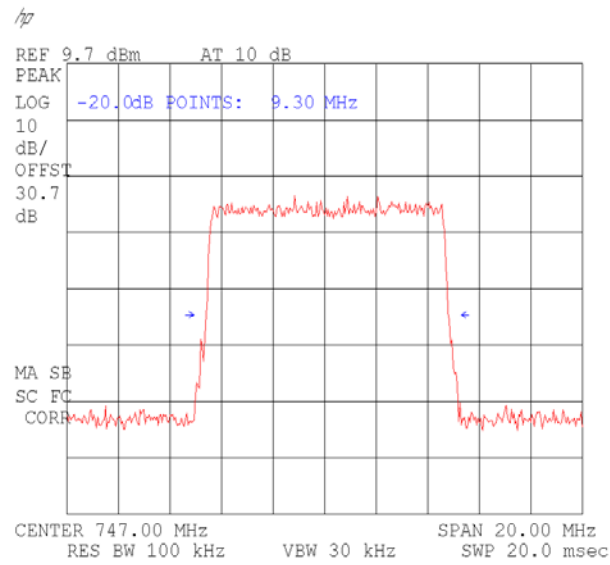


Figure 27.— 16QAM 747 MHz IN

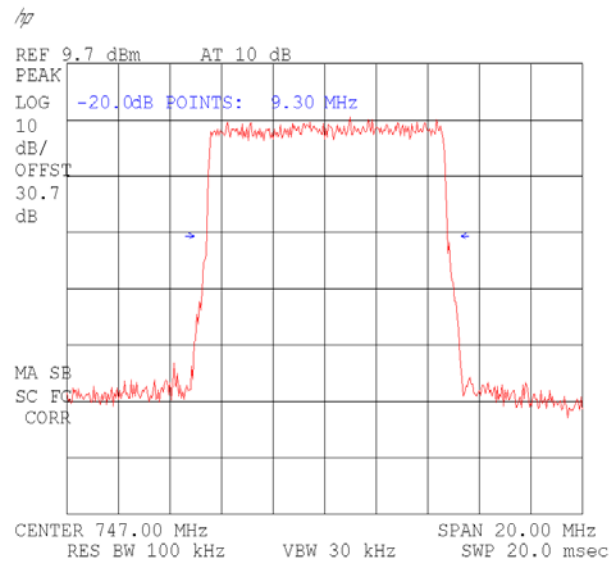


Figure 28.— 16QAM 747 MHz OUT

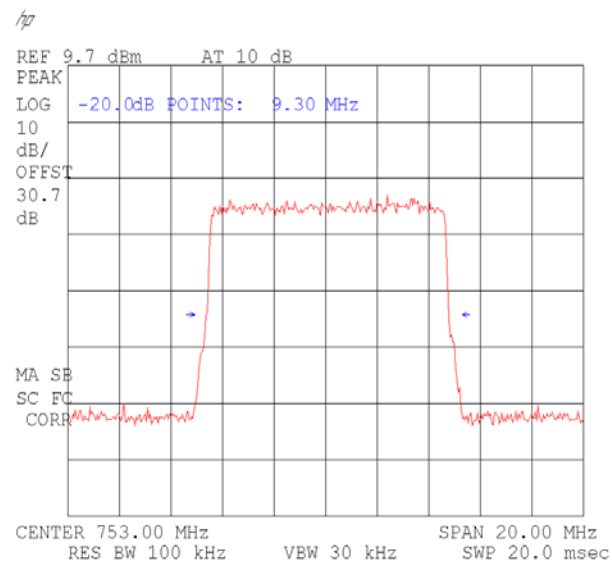


Figure 29.— 16QAM 753 MHz IN

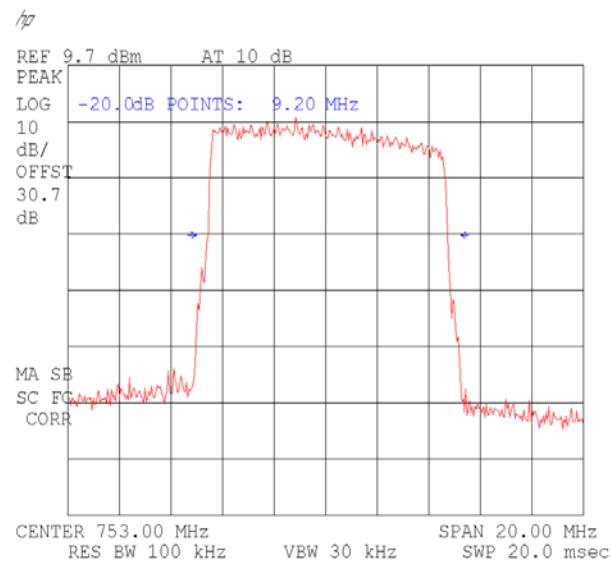


Figure 30.— 16QAM 753 MHz OUT

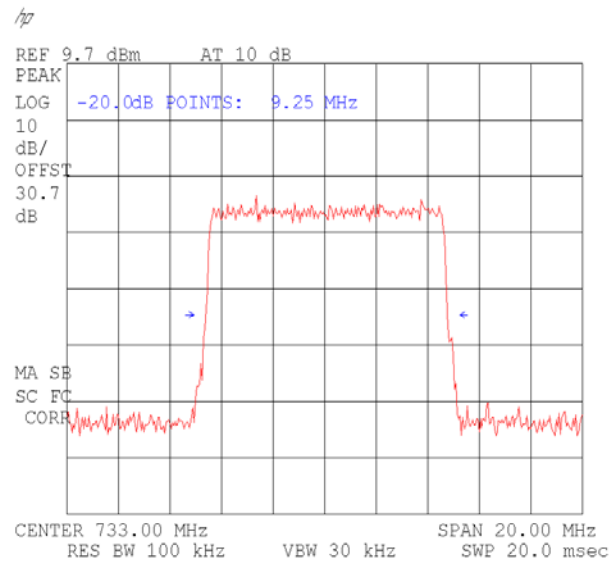


Figure 31.— QPSK 733 MHz IN

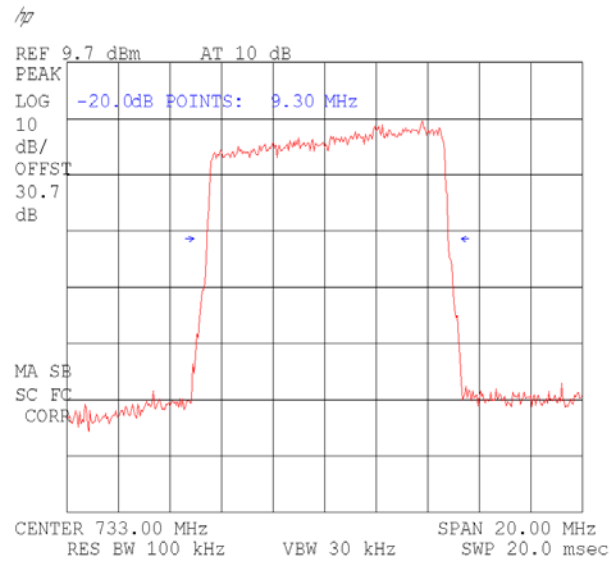


Figure 32.— QPSK 733 MHz OUT

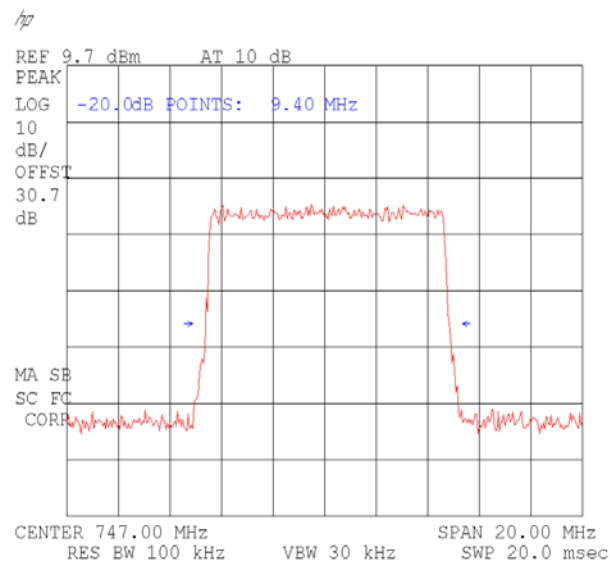


Figure 33.— QPSK 747 MHz IN

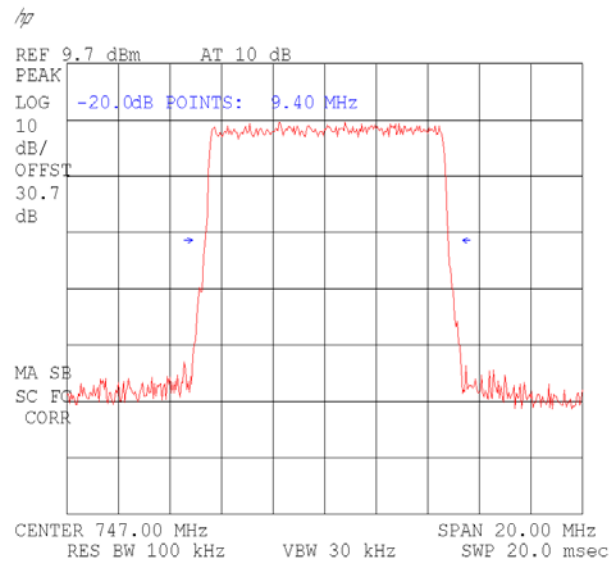


Figure 34.— QPSK 747 MHz OUT

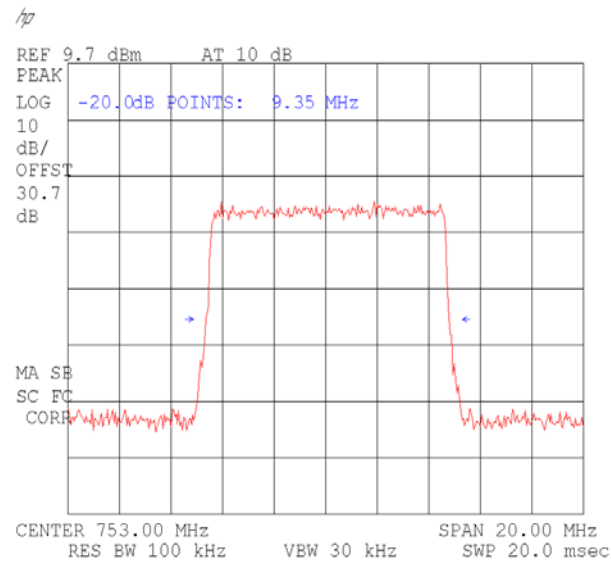


Figure 35.— QPSK 753 MHz IN

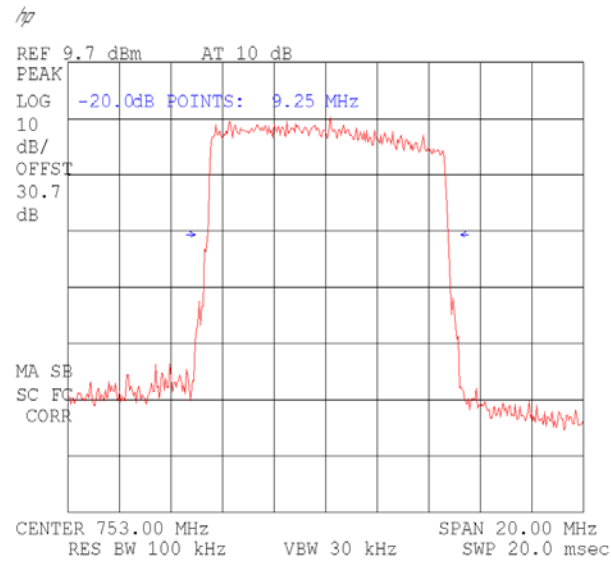


Figure 36.— QPSK 753 MHz OUT



5.4 Test Equipment Used.

Occupied Bandwidth LTE

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8564E	3442A00275	February 13, 2013	1 year
Signal Generator	Agilent	N5172B ATO 10210	MY51350182	May 31, 2012	2 years
Attenuator	Mini-circuit	UNAT-30+	N/A	April 3, 2013	1 year
Cable	Mini-circuit	DCB	N/A	April 3, 2013	1 year
DC Block	MIDWEST MICROWAVE	DCDB-3624-10-NNN-02	N/A	N/A	N/A

Figure 37 Test Equipment Used



6. Spurious Emissions at Antenna Terminals LTE

6.1 Test Specification

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

6.2 Test procedure

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

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (31.0dB). 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 1GHz - 22.0 GHz.

6.3 Test Results

See additional information in Figure 38 to Figure 46.

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 07.05.13

Typed/Printed Name: A. Sharabi

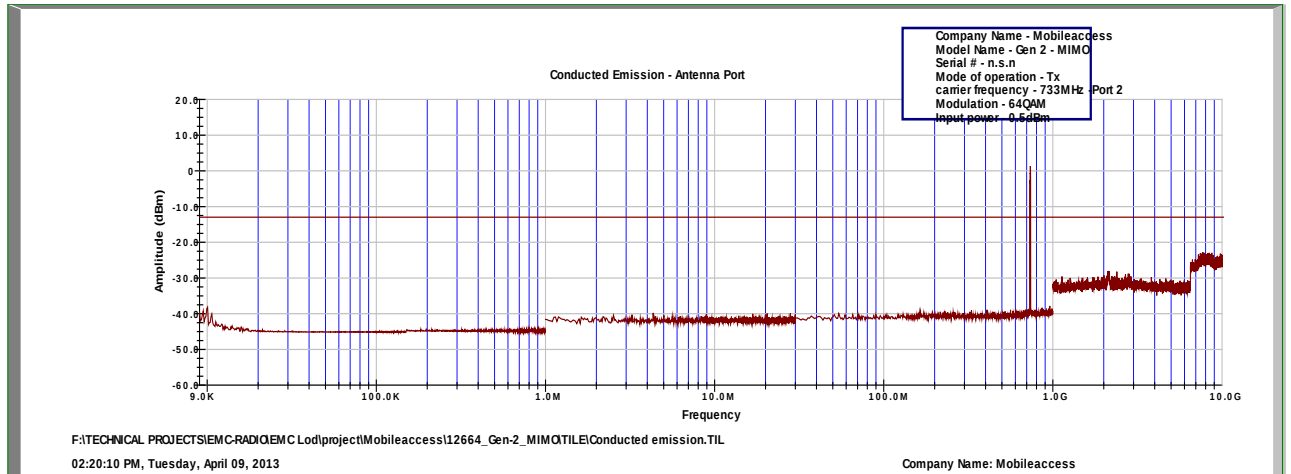


Figure 38 Spurious Emissions at Antenna Terminals 64QAM, 733MHz

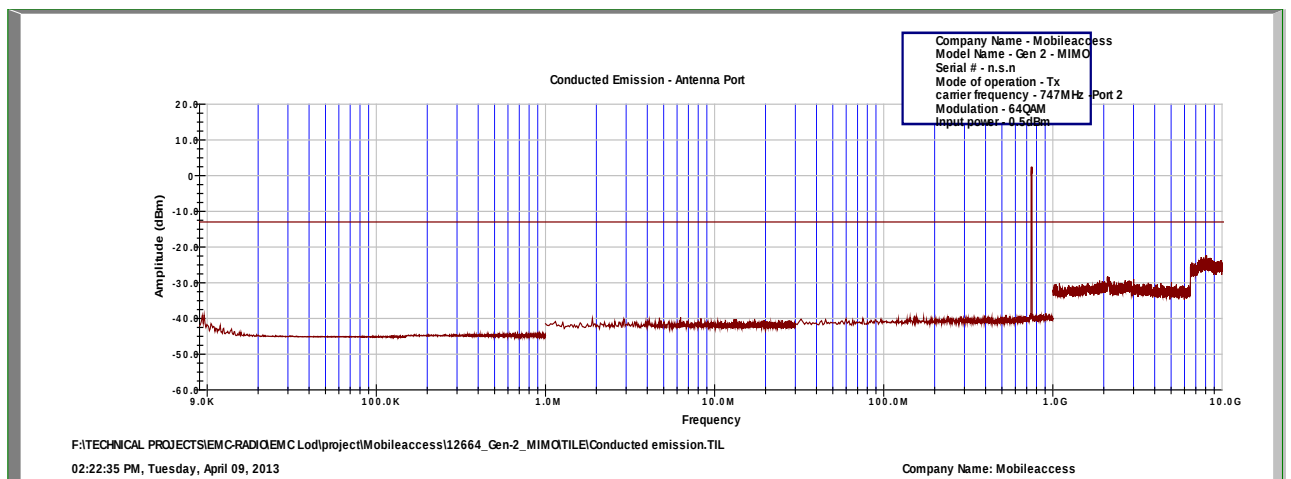


Figure 39 Spurious Emissions at Antenna Terminals 64QAM, 747MHz

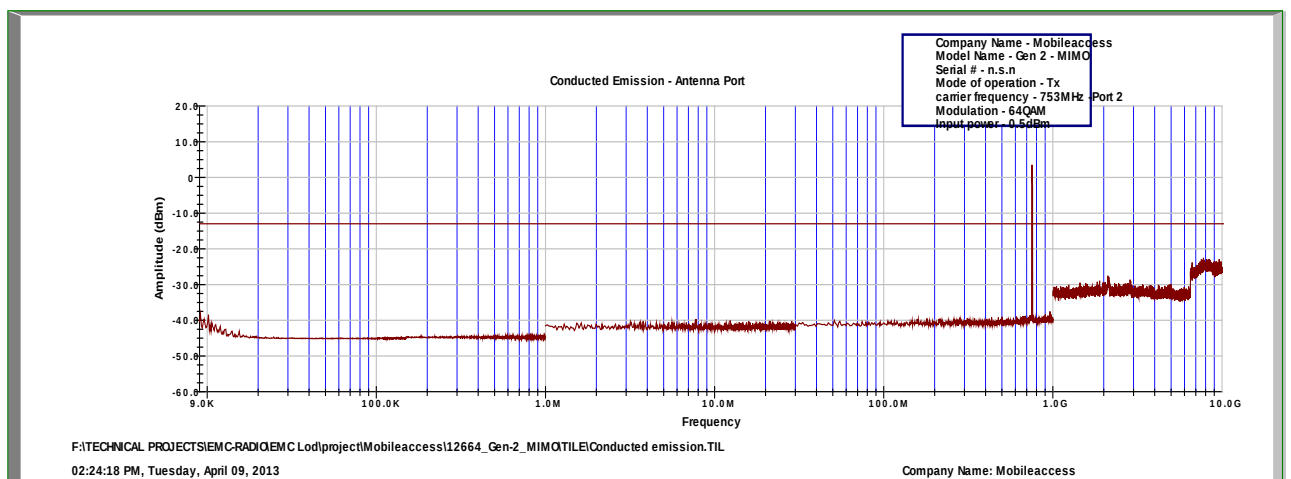


Figure 40 Spurious Emissions at Antenna Terminals 64QAM, 753MHz

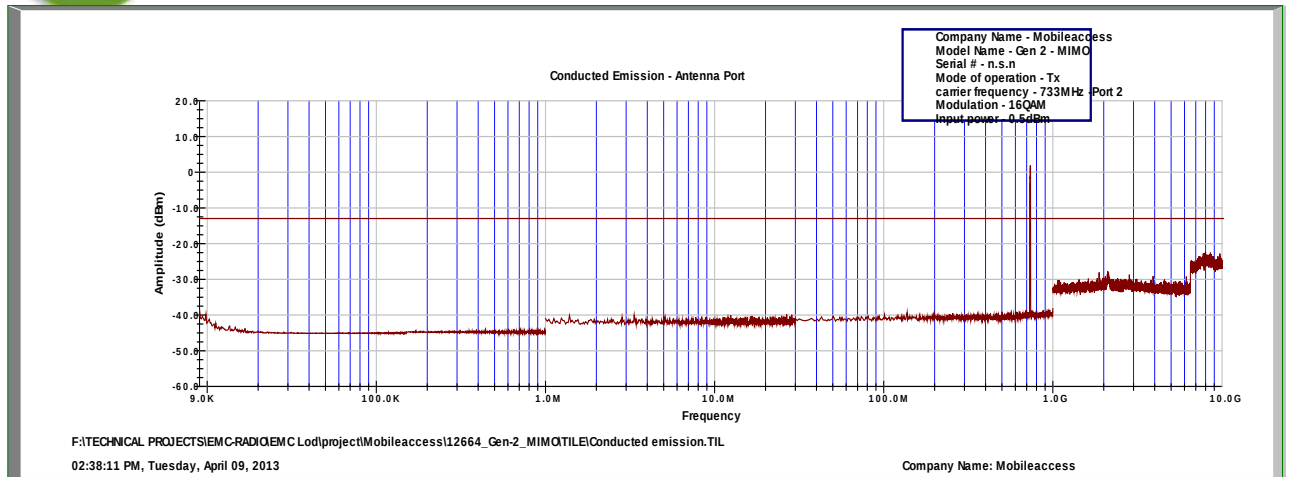


Figure 41 Spurious Emissions at Antenna Terminals 16QAM, 733MHz

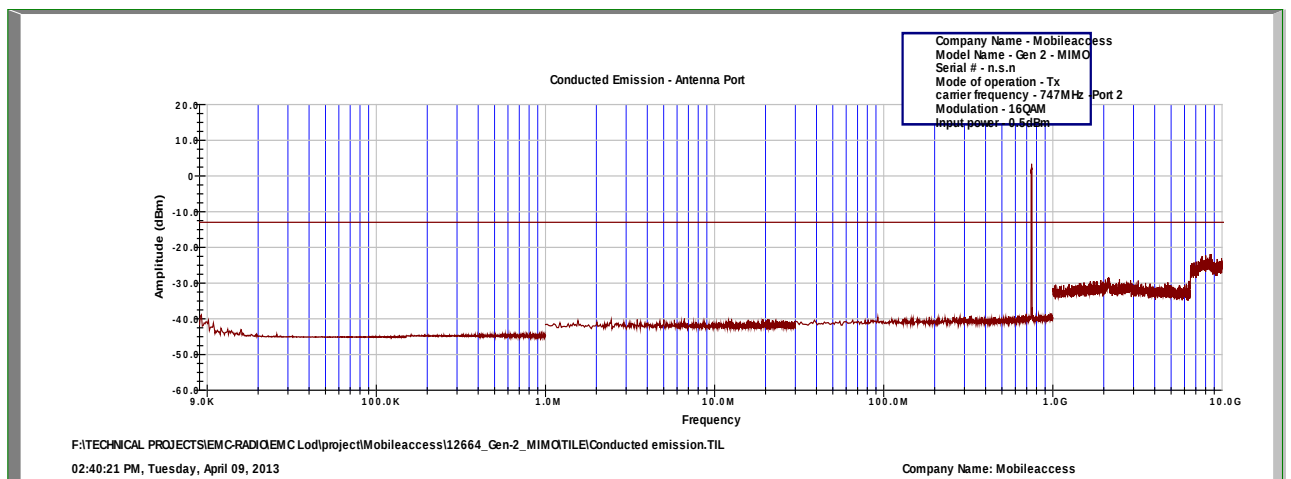


Figure 42 Spurious Emissions at Antenna Terminals 16QAM, 747MHz

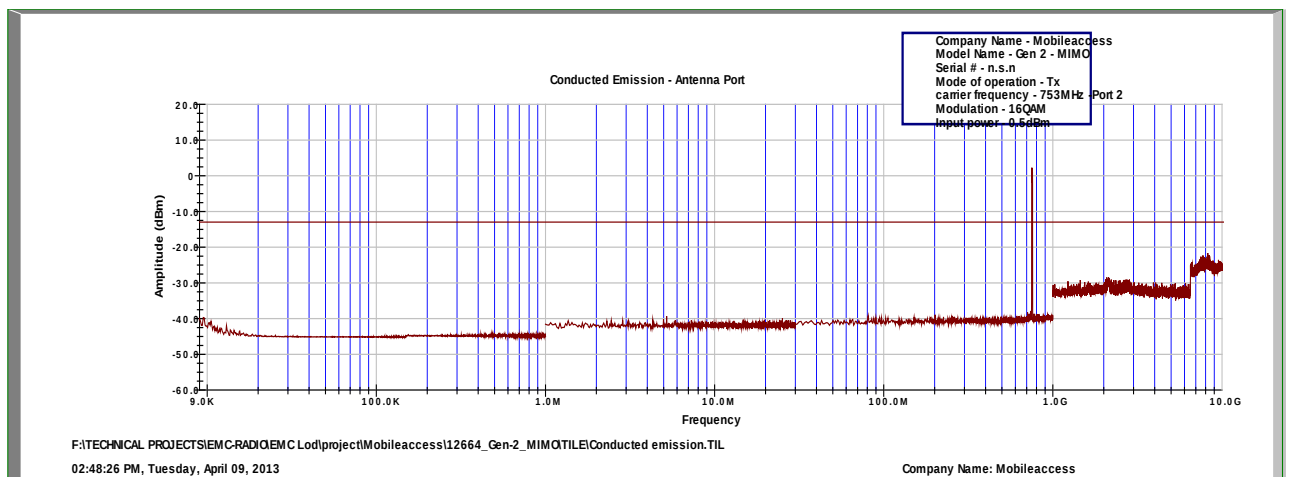


Figure 43 Spurious Emissions at Antenna Terminals 16QAM, 753MHz

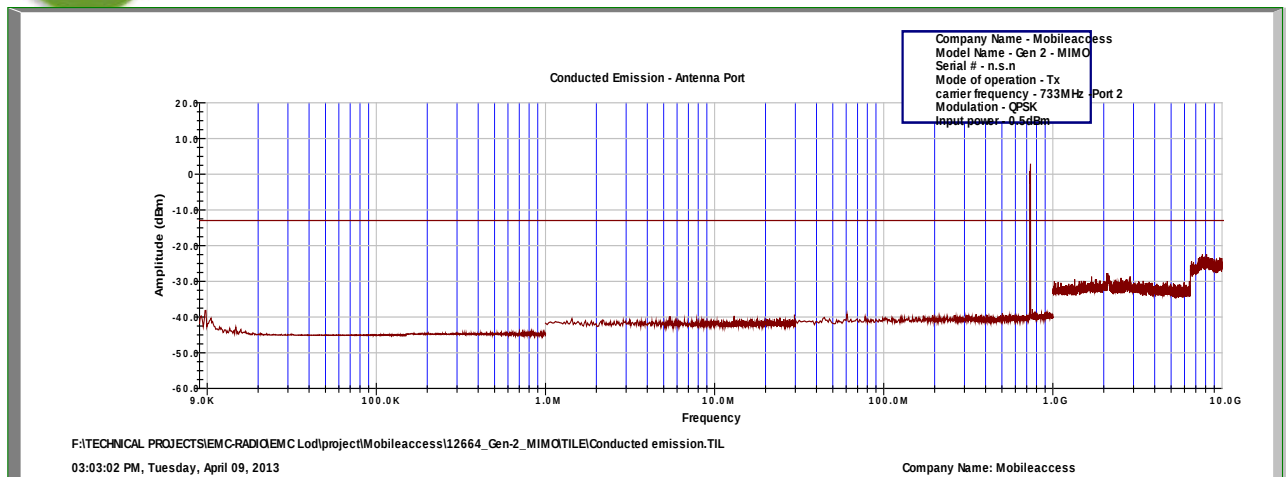


Figure 44 Spurious Emissions at Antenna Terminals QPSK, 733MHz

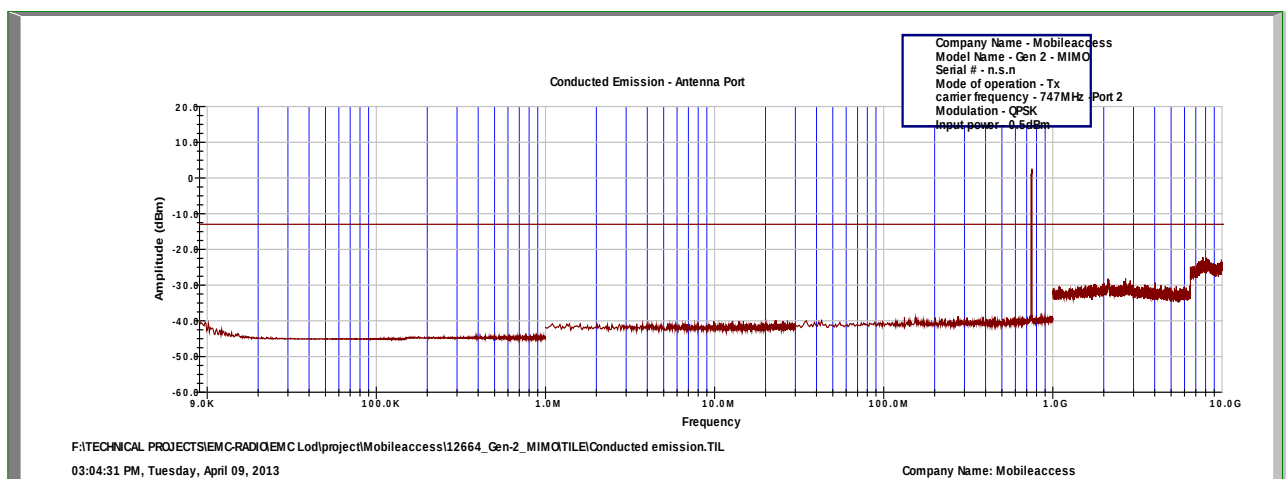


Figure 45 Spurious Emissions at Antenna Terminals QPSK, 747MHz

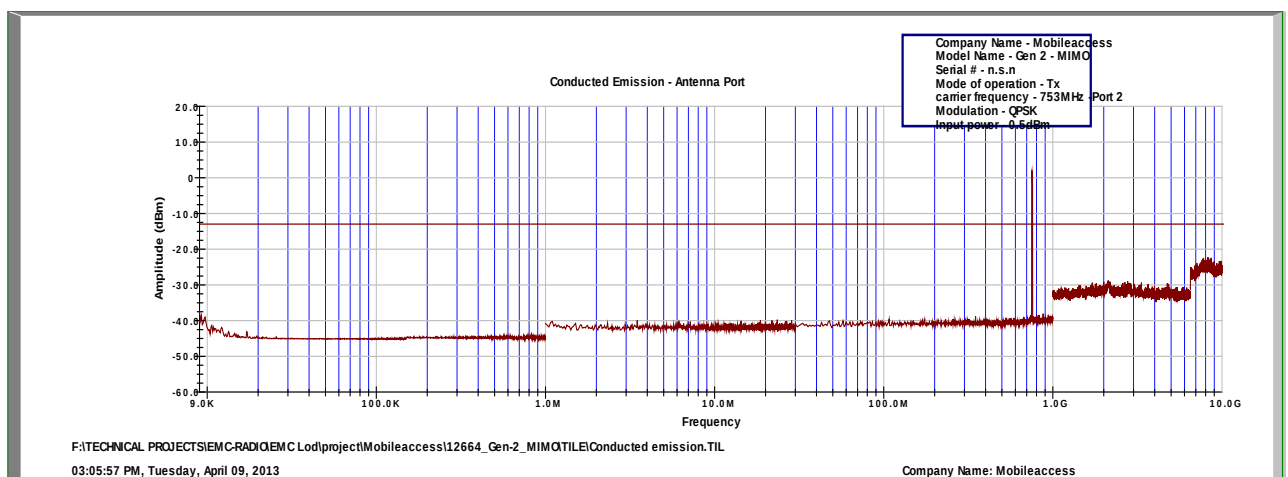


Figure 46 Spurious Emissions at Antenna Terminals QPSK, 753MHz



6.4 Test Equipment Used

Spurious Emissions at Antenna Terminals LTE

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8564E	3442A00275	February 13, 2013	1 year
Signal Generator	Agilent	N5172B ATO 10210	MY51350182	May 31, 2012	2 years
Attenuator	Mini-circuit	UNAT-30+	N/A	April 3, 2013	1 year
Cable	Mini-circuit	DCB	N/A	April 3, 2013	1 year
DC Block	MIDWEST MICROWAVE	DCDB-3624- 10-NNN-02	N/A	N/A	N/A

Figure 47 Test Equipment Used



7. Band Edge Spectrum LTE

7.1 Test Specification

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

7.2 Test procedure

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

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

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (30.7 dB).

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

7.3 Results

	Operation Frequency (MHz)	Band Edge Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
LTE64QAM	733.00	728.00	-39.32	-13.0	-26.32
LTE64QAM	753.00	758.00	-40.64	-13.0	-27.64
LTE16QAM	733.00	728.00	-40.61	-13.0	-27.61
LTE16QAM	753.00	758.00	-42.04	-13.0	-29.04
LTEQPSK	733.00	728.00	-42.38	-13.0	-29.38
LTEQPSK	753.00	758.00	-41.78	-13.0	-28.78

Figure 48 Band Edge Spectrum Results LTE

JUDGEMENT: Passed by 26.32 dB

See additional information in Figure 49 to Figure 54.

TEST PERSONNEL:

Tester Signature: 

Date: 07.05.13.

Typed/Printed Name: Azriel Sharabi

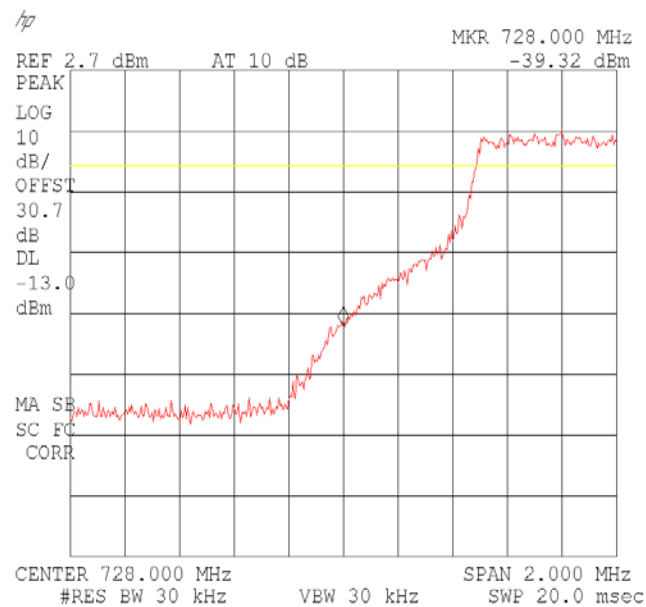


Figure 49.—64QAM 733.0 MHz

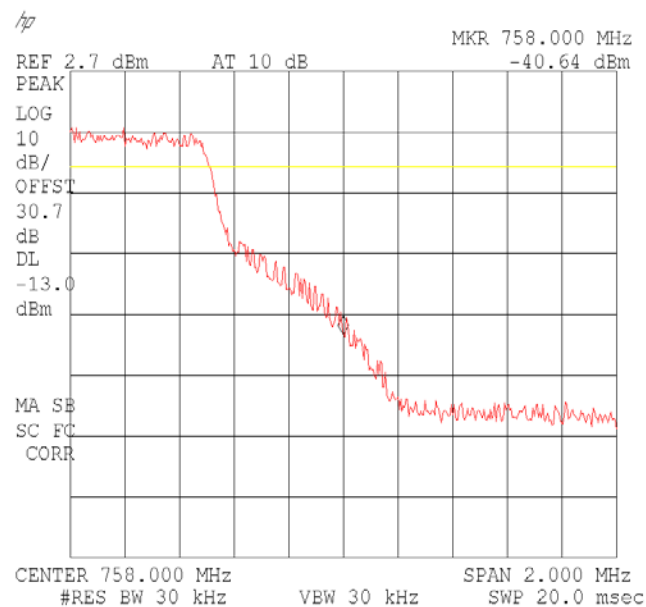


Figure 50.— 64QAM 753.0 MHz

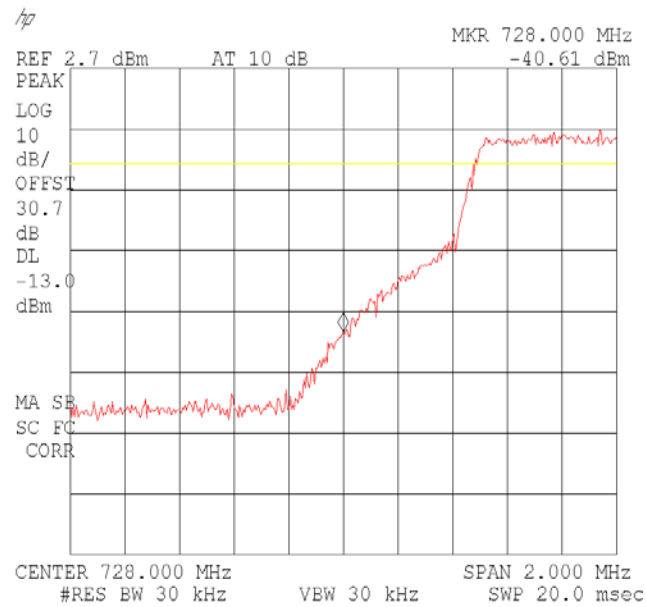


Figure 51.—16QAM 733.0 MHz

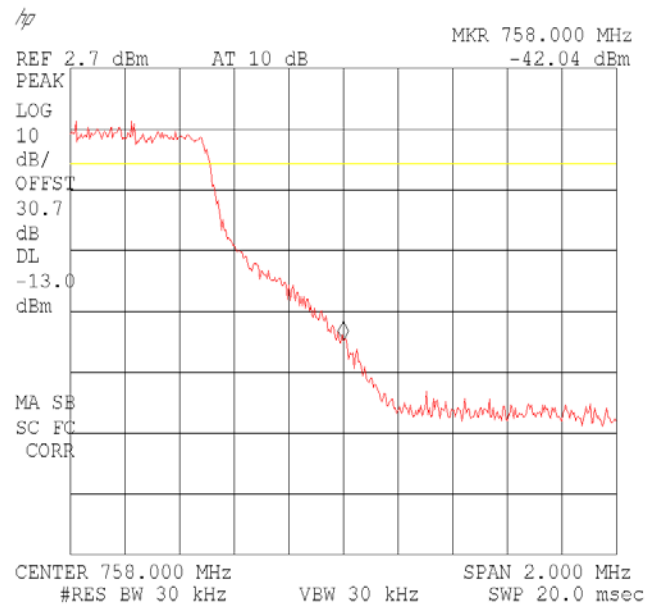


Figure 52.— 16QAM 753.0 MHz

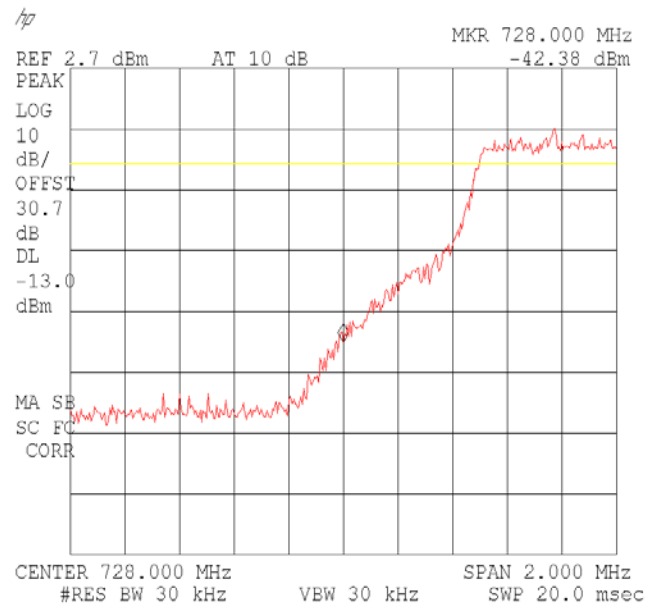


Figure 53.— QPSK 733.0 MHz

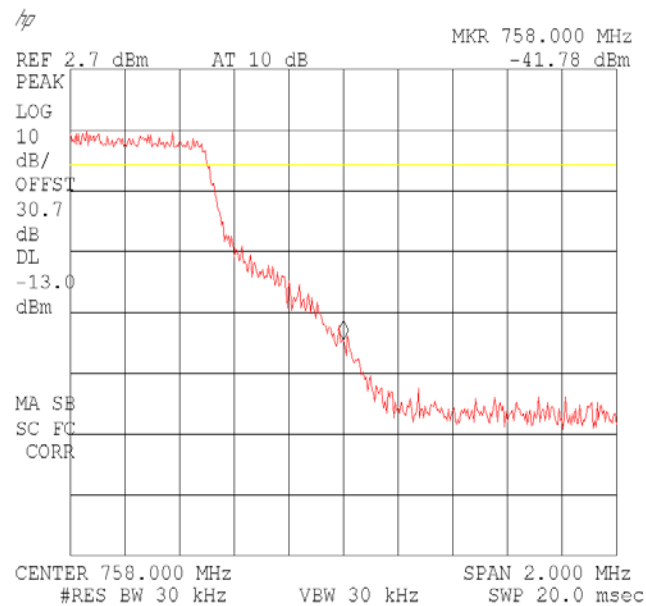


Figure 54.—QPSK 753.0 MHz



7.4 Test Equipment Used.

Band Edge Spectrum

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8564E	3442A00275	February 13, 2013	1 year
Signal Generator	Agilent	N5172B ATO 10210	MY51350182	May 31, 2012	2 years
Attenuator	Mini-circuit	UNAT-30+	N/A	April 3, 2013	1 year
Cable	Mini-circuit	DCB	N/A	April 3, 2013	1 year
DC Block	MIDWEST MICROWAVE	DCDB-3624-10-NNN-02	N/A	N/A	N/A

Figure 55 Test Equipment Used



8. Spurious Radiated Emission LTE

8.1 Test Specification

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

8.2 Test Procedure

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

Unwanted Emissions: Radiated Spurious.

The power of any emission outside of the authorized operating frequency ranges (728-758 MHz) must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB, yielding -13dBm .

- (a) The E.U.T. operation mode and test set-up are as described in Section 3. A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 1.

The frequency range 9 kHz-20 GHz was scanned, and the list of the highest emissions was verified and updated accordingly.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization. The emissions were measured at a distance of 3 meters.

- (b) The E.U.T. was replaced by a substitution antenna (dipole 30MHz-1GHz, Horn Antenna above 1GHz) driven by a signal generator. The height was readjusted for maximum reading. The signal generator level was adjusted to obtain the same reading on the EMI receiver as in step (a).

The signals observed in step (a) were converted to radiated power using:

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

P_d = Dipole equivalent power (result).

P_g = Signal generator output level.



8.3 Test Results

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)
733.00	1466	V	48.0	-53.29	5.15	7.6	-50.84	-13.00	-37.84
733.00	1466	H	49.7	-51.73	5.15	7.6	-49.28	-13.00	-36.28
747.00	1494	V	50.6	-50.69	5.15	7.6	-48.24	-13.00	-35.24
747.00	1494	H	49.7	-51.73	5.15	7.6	-49.28	-13.00	-36.28
753.00	1506	V	47.8	-53.49	5.15	7.6	-51.04	-13.00	-38.04
753.00	1506	H	47.9	-51.73	5.15	7.6	-49.28	-13.00	-36.28

Figure 56 Spurious Radiated emission LTE

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

JUDGEMENT: Passed by 35.24 dB

TEST PERSONNEL:

Tester Signature: 

Date: 07.05.013

Typed/Printed Name: A. Sharabi



8.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Spectrum Analyzer	HP	8564E	3442A00275	February 13, 2013	1 year
Signal Generator	Agilent	N5172B ATO 10210	MY51350182	May 31, 2012	2 years
Signal Generator	Agilent	N5182A	MY50141213	July 9, 2012	1 year
Signal Generator	Agilent	83731B	US37100653	October 23, 2012	1 year
Signal Generator	Agilent	8647A	3625U00686	March 5, 2012	2 years
Attenuator	Mini-circuit	UNAT-30+	N/A	April 3, 2013	1 year
Cable	Mini-circuit	DCB	N/A	April 3, 2013	1 year
DC Block	MIDWEST MICROWAVE	DCDB-3624-10-NNN-02	N/A	N/A	N/A



9. RF Power Output AWS

9.1 Test Specification

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

9.2 Test procedure

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (loss = 30.7 dB). The E.U.T. RF output was modulated as follows:

CDMA , LTE ,WCDMA and GSM.

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

9.3 Results

Modulation	Operation Frequency (MHz)	Reading (dBm)
CDMA	2111.2	20.63
CDMA	2132.5	19.70
CDMA	2153.8	17.24
GSM	2111.2	22.93
GSM	2132.5	21.93
GSM	2153.8	18.98
LTE 64QAM	2115.0	20.93
LTE 64QAM	2132.5	19.73
LTE 64QAM	2150.0	18.48
WCDMA	2112.5	21.64
WCDMA	2132.5	20.43
WCDMA	2152.5	18.42

Figure 57 RF Power Output AWS

See additional information in Figure 58 to Figure 69.

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 07.05.13

Typed/Printed Name: A. Sharabi

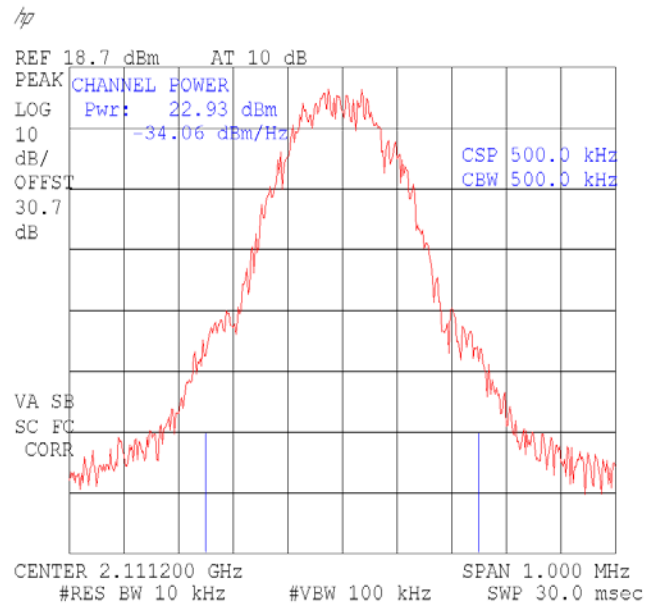


Figure 58.— GSM (2111.2 MHz)

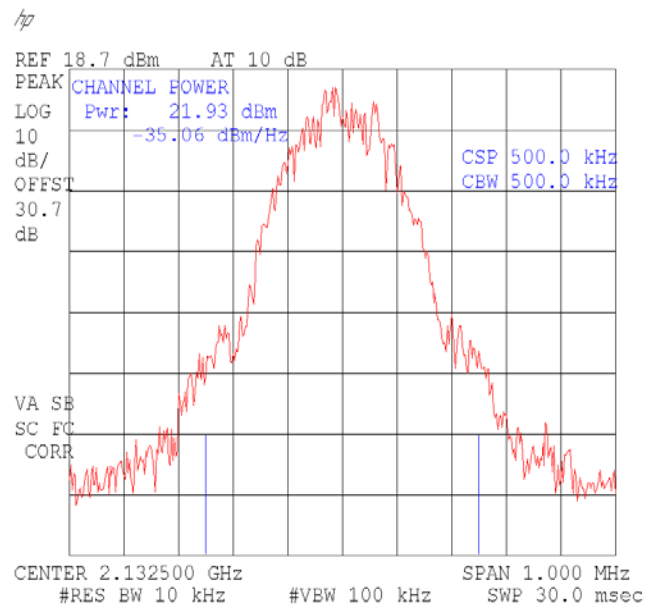


Figure 59.— GSM (2132.5 MHz)

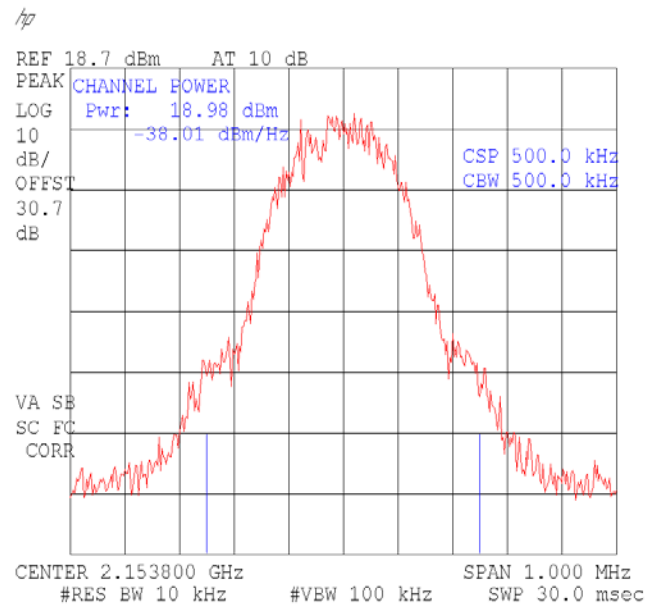


Figure 60.— GSM (2153.8 MHz)

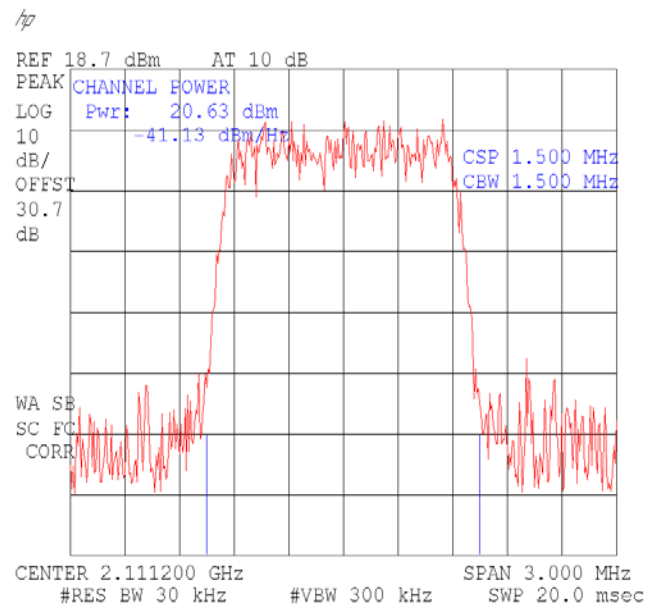


Figure 61.— CDMA (2111.2 MHz)

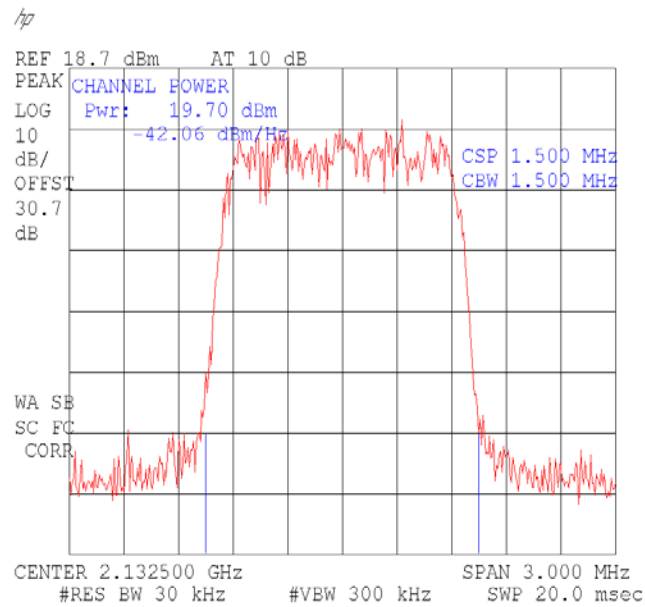


Figure 62.— CDMA (2132.5 MHz)

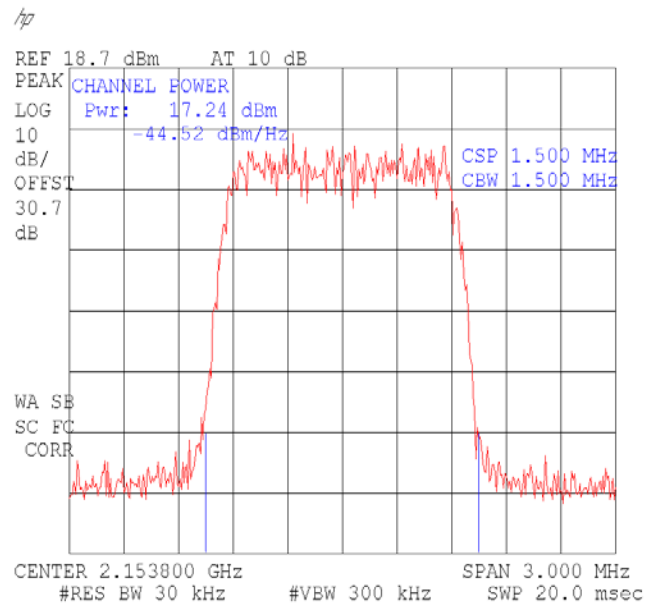


Figure 63.— CDMA (2153.8 MHz)

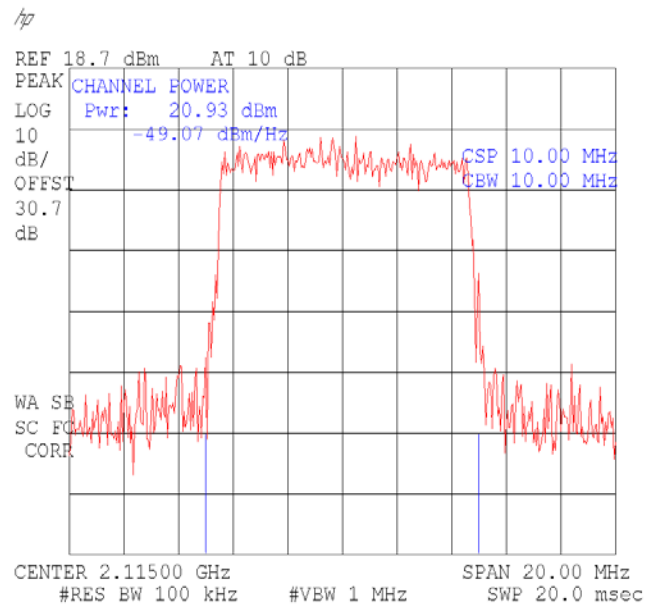


Figure 64.— LTE 64QAM(2115.0 MHz)

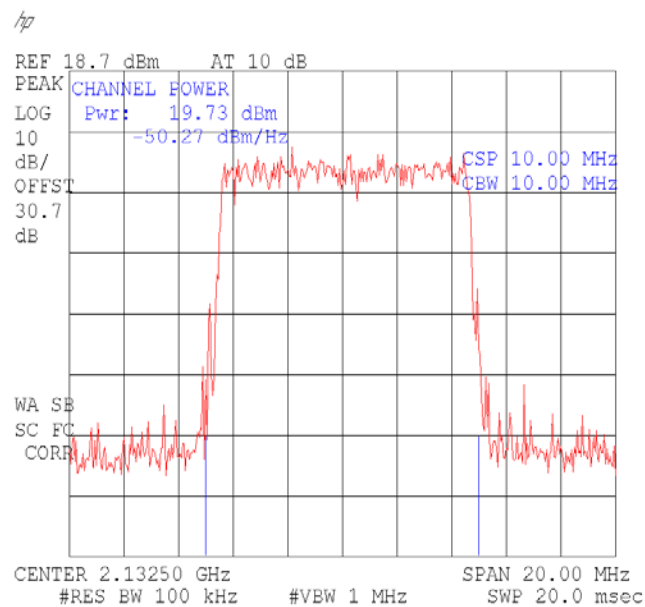


Figure 65.— LTE 64QAM (2132.5 MHz)

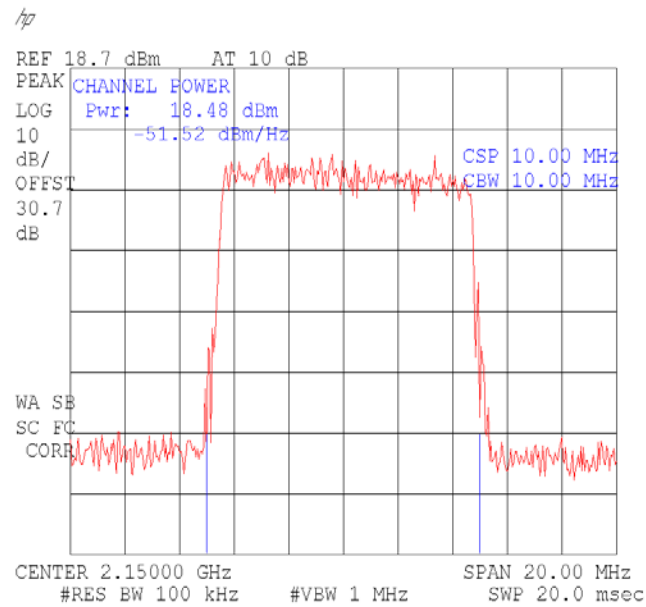


Figure 66.— LTE 64QAM (2150.0 MHz)

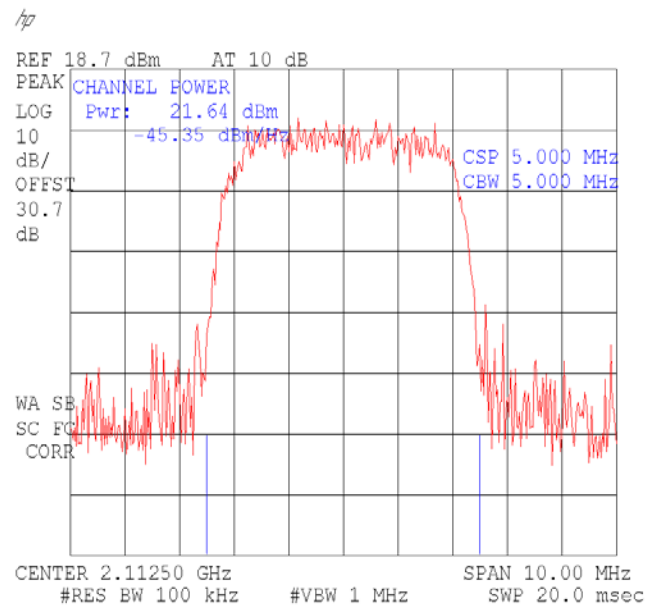


Figure 67.— W-CDMA (2112.5 MHz)

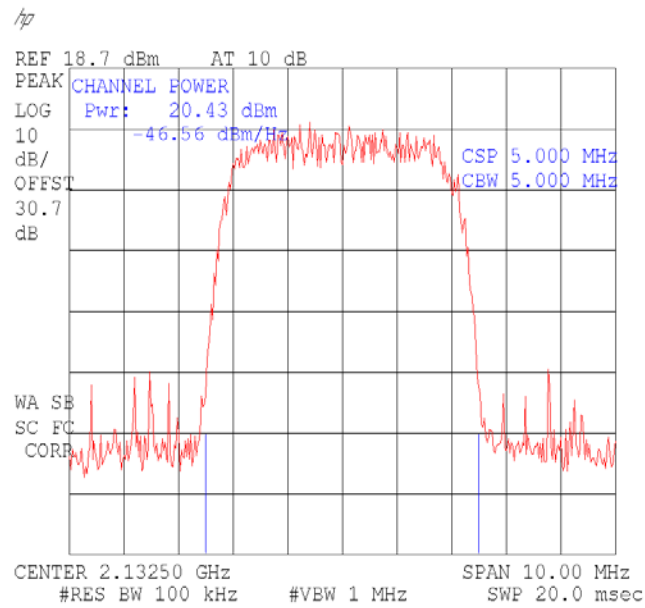


Figure 68.— W-CDMA (2132.5 MHz)

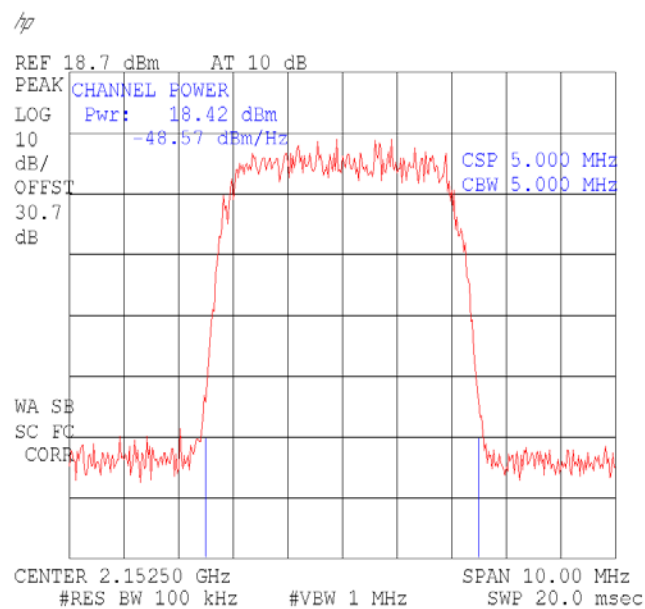


Figure 69.— W-CDMA (2152.5 MHz)



9.4 Test Equipment Used.

RF Power Output AWS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8564E	3442A00275	February 13, 2013	1 year
Signal Generator	Agilent	N5172B ATO 10210	MY51350182	May 31, 2012	2 years
Attenuator	Mini-circuit	UNAT-30+	N/A	April 3, 2013	1 year
Cable	Mini-circuit	DCB	N/A	April 3, 2013	1 year
DC Block	MIDWEST MICROWAVE	DCDB-3624- 10-NNN-02	N/A	N/A	N/A

Figure 70 Test Equipment Used



10. Occupied Bandwidth AWS

10.1 Test Specification

FCC Part 2, Section 1049

10.2 Test Procedure

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

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

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

10.3 Results

Modulation		Operating Frequency (MHz)	Reading (MHz)
CDMA	Input	2111.2	1.34
	Output	2111.2	1.34
	Input	2132.5	1.34
	Output	2132.5	1.33
	Input	2153.8	1.34
	Output	2153.8	1.34
LTE 64QAM	Input	2115.0	9.70
	Output	2115.0	9.60
	Input	2132.5	9.75
	Output	2132.5	9.65
	Input	2150.0	9.60
	Output	2150.0	9.65
GSM	Input	2111.2	0.285
	Output	2111.2	0.275
	Input	2132.5	0.282
	Output	2132.5	0.277
	Input	2153.8	0.270
	Output	2153.8	0.282
WCDMA	Input	2112.5	4.58
	Output	2112.5	4.60
	Input	2132.5	4.60
	Output	2132.5	4.55
	Input	2152.5	4.55
	Output	2152.5	4.58

Figure 71 Occupied Bandwidth AWS

See additional information in Figure 72 to Figure 95.

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 07.05.13

Typed/Printed Name: A. Sharabi

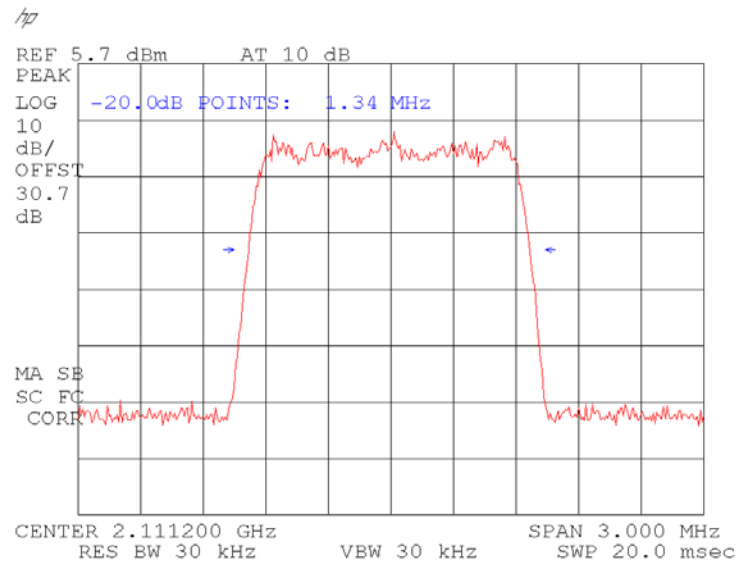


Figure 72.— CDMA (2111.2 MHz) IN

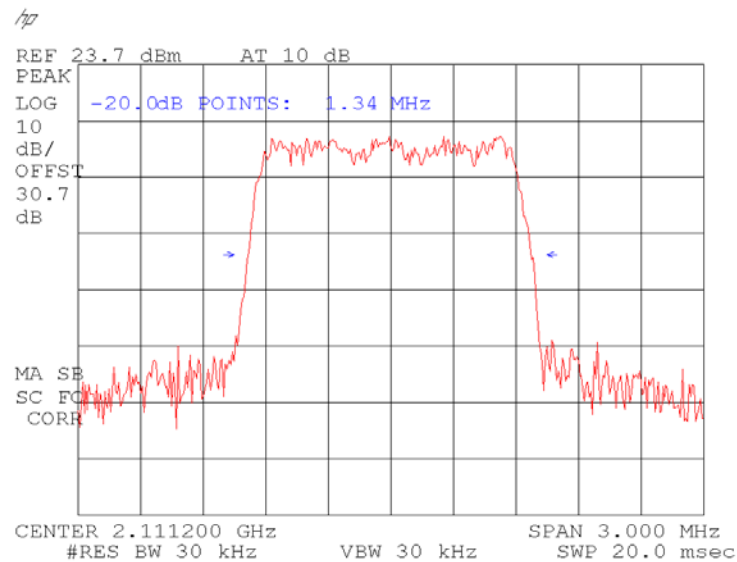


Figure 73.— CDMA (2111.2 MHz) OUT

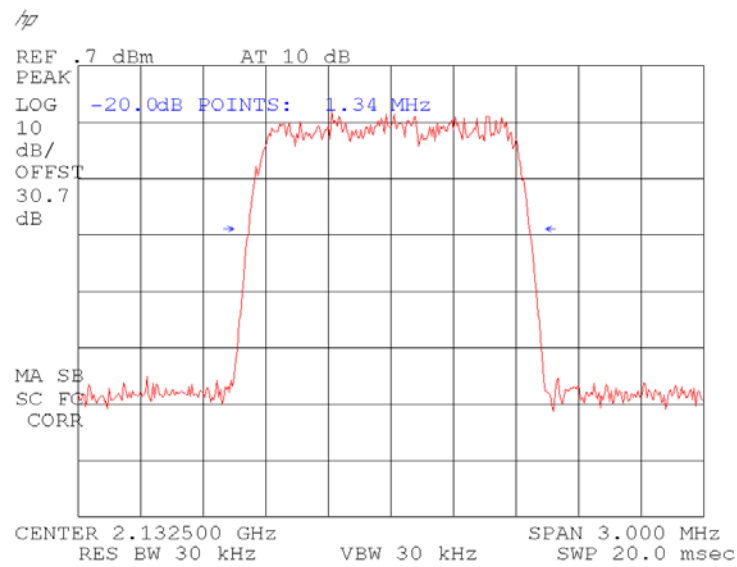


Figure 74.— CDMA (2132.5 MHz) IN

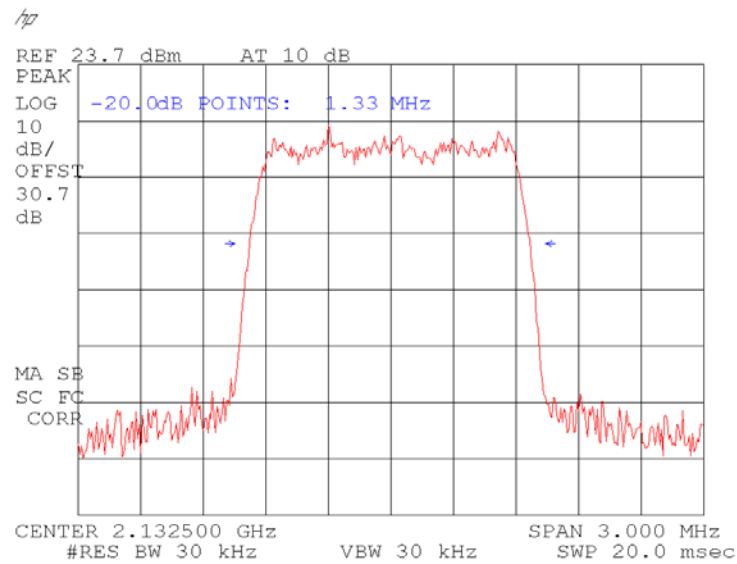


Figure 75.— CDMA (2132.5 MHz) OUT

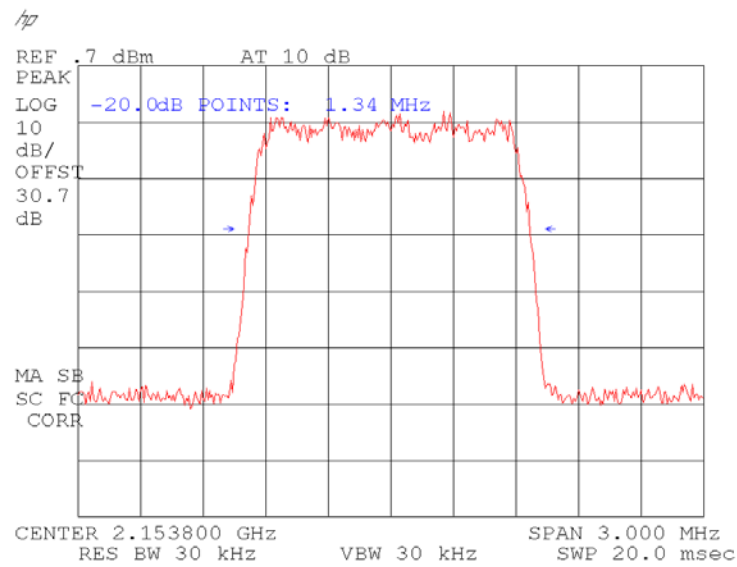


Figure 76.— CDMA (2153.8 MHz) IN

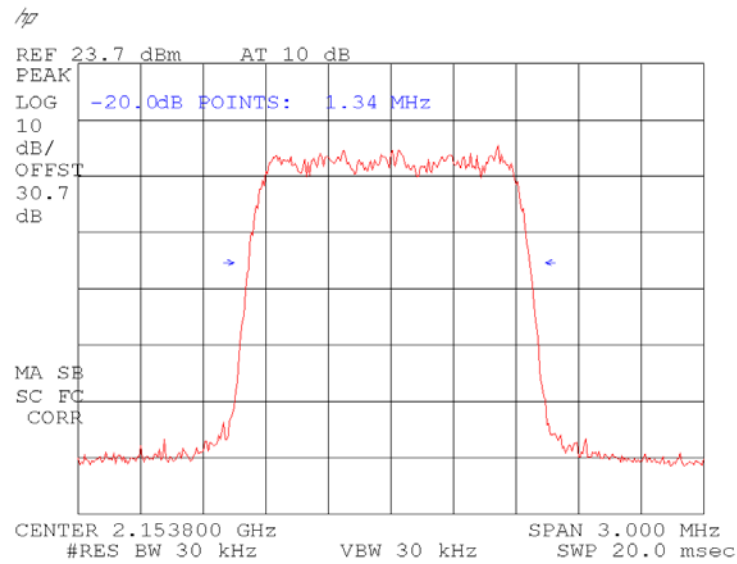


Figure 77.— CDMA (2153.8 MHz) OUT

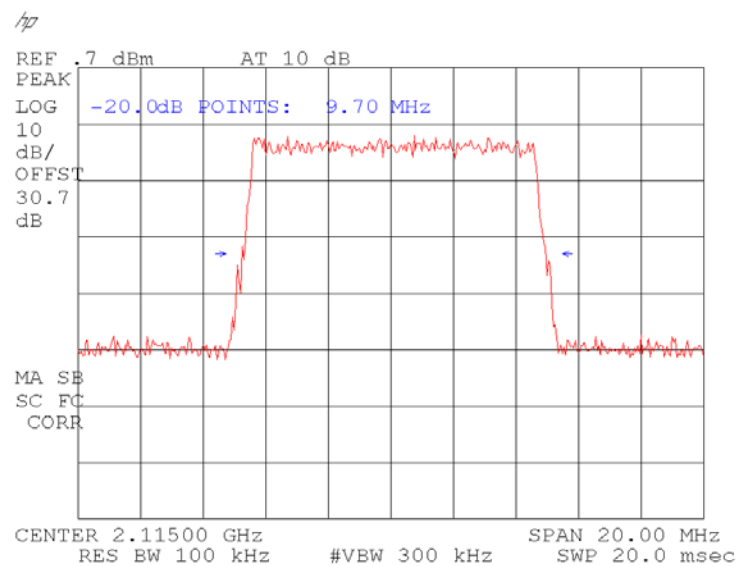


Figure 78.— LTE 64QAM(2115.0 MHz) IN

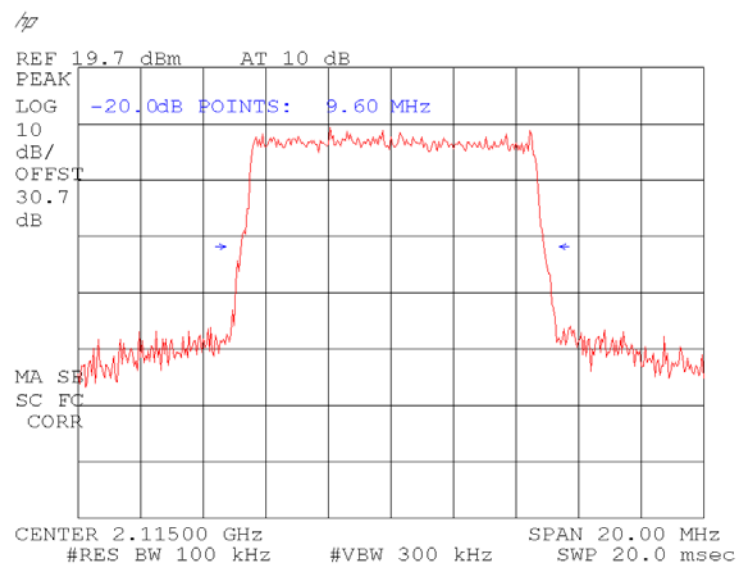


Figure 79.— LTE 64QAM (2115.0 MHz) OUT

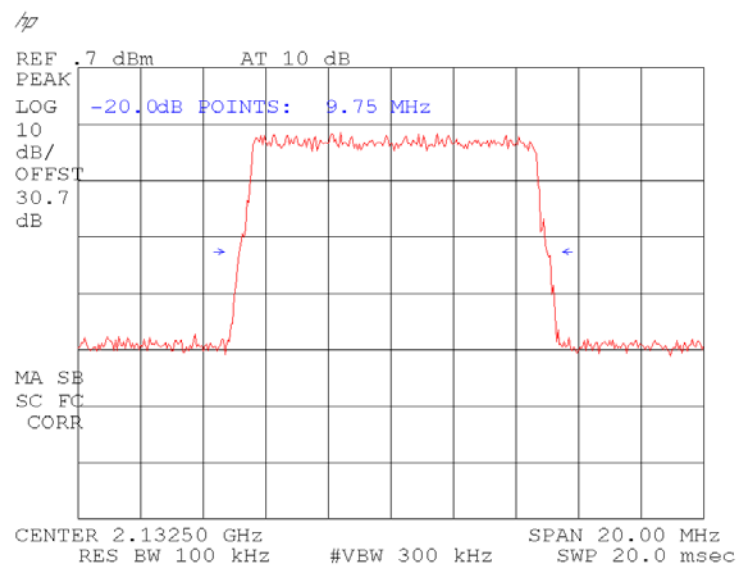


Figure 80.— LTE 64QAM (2132.5 MHz) IN

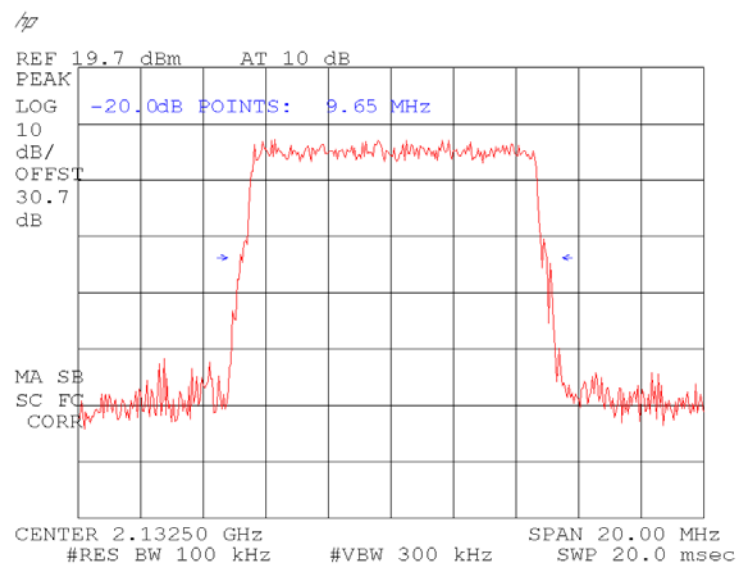


Figure 81.— LTE 64QAM (2132.5 MHz) OUT

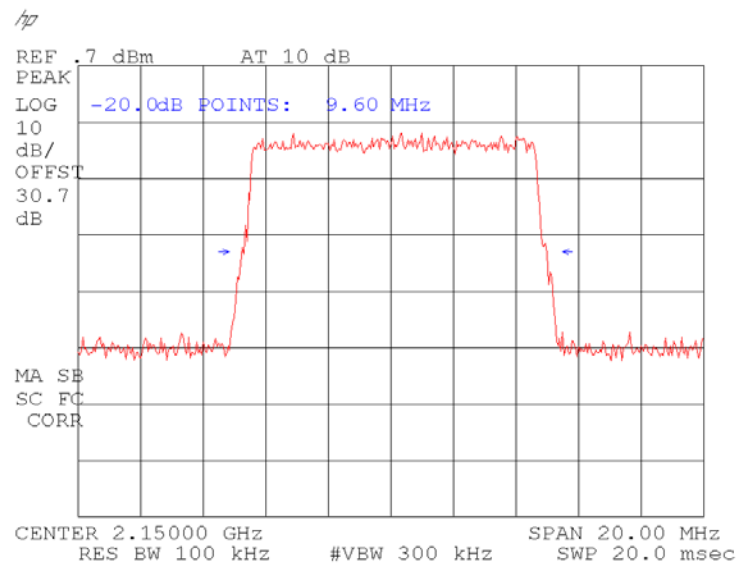


Figure 82.— LTE 64QAM (2150.0 MHz) IN

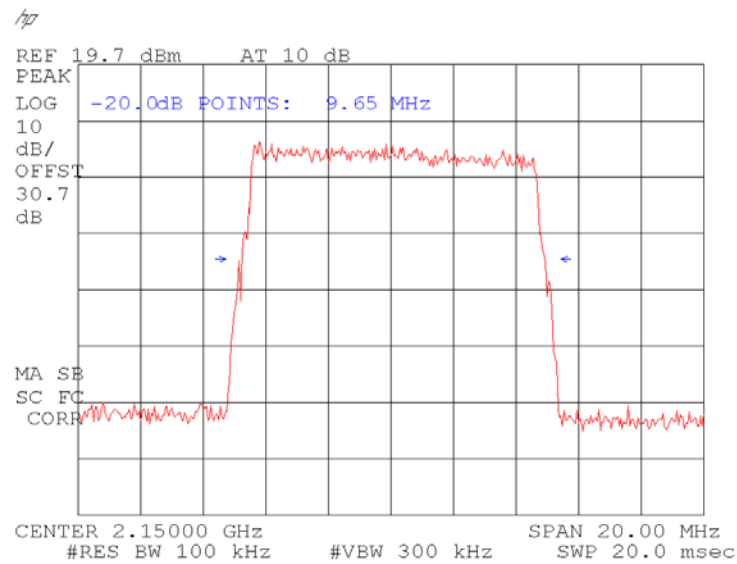


Figure 83.— LTE 64QAM (2150.0 MHz) OUT

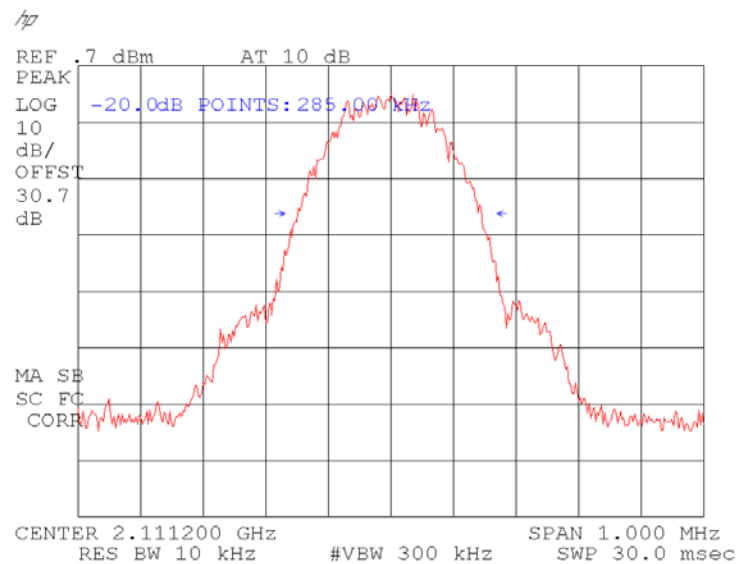


Figure 84.— GSM (2111.2 MHz) IN

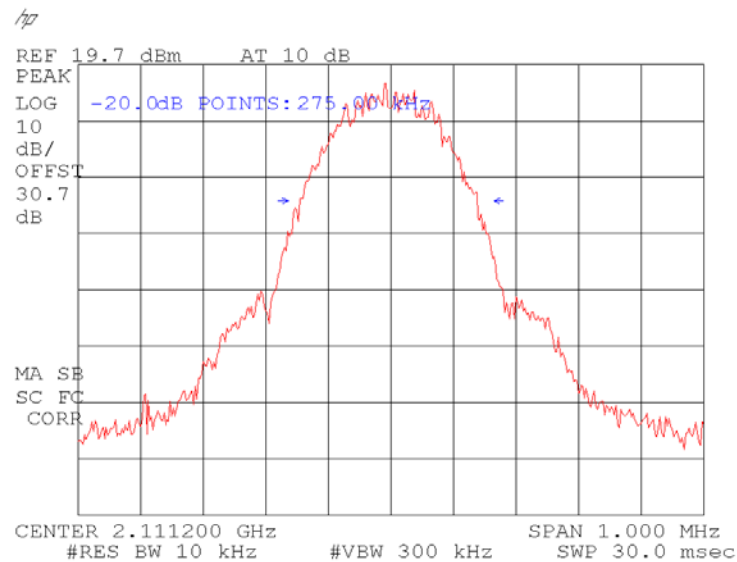


Figure 85.— GSM (2111.2 MHz) OUT

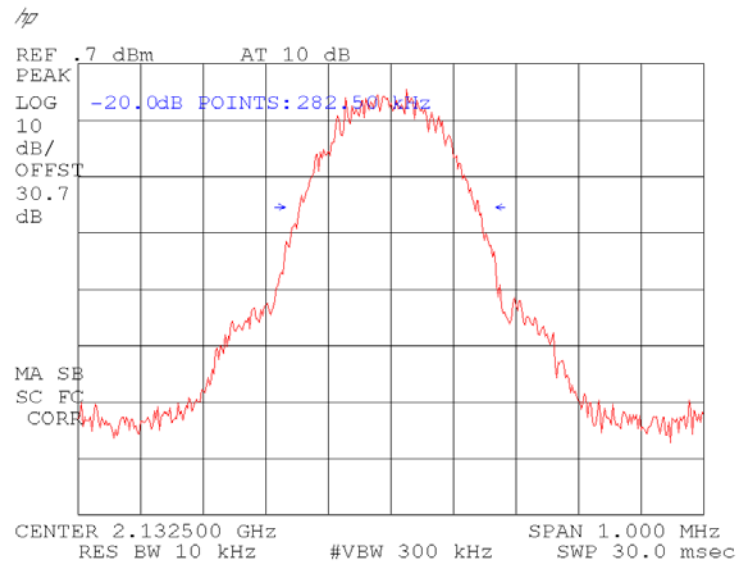


Figure 86.— GSM (2132.5 MHz) IN

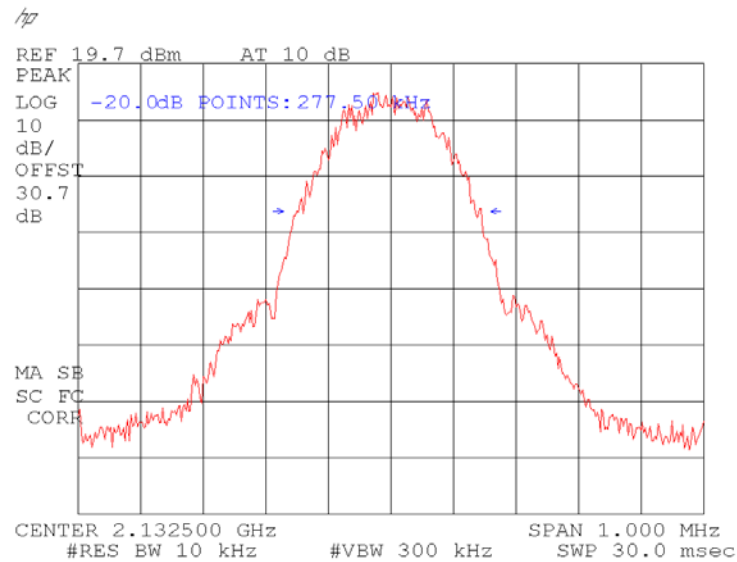


Figure 87.— GSM (2132.5 MHz) OUT

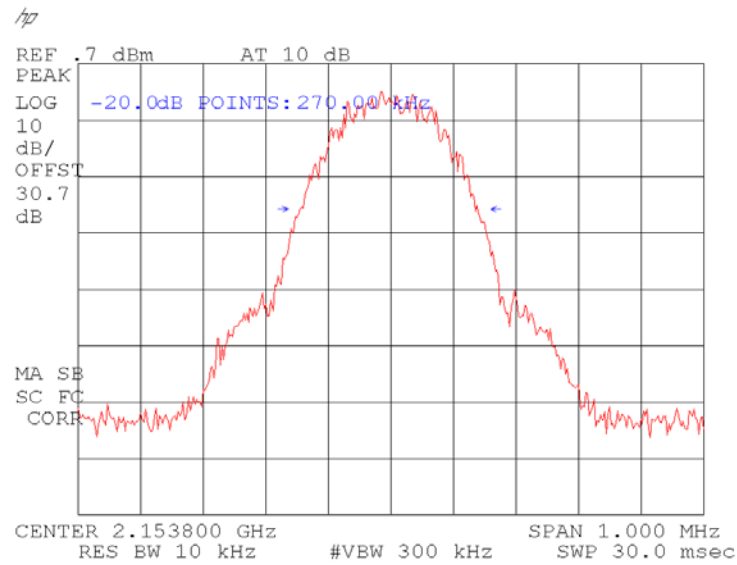


Figure 88.— GSM (2153.8 MHz) IN

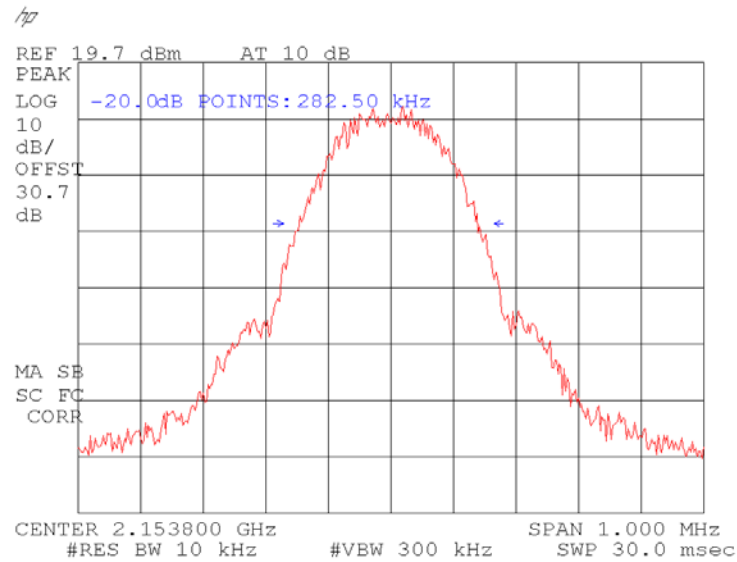


Figure 89.— GSM (2153.8 MHz) OUT

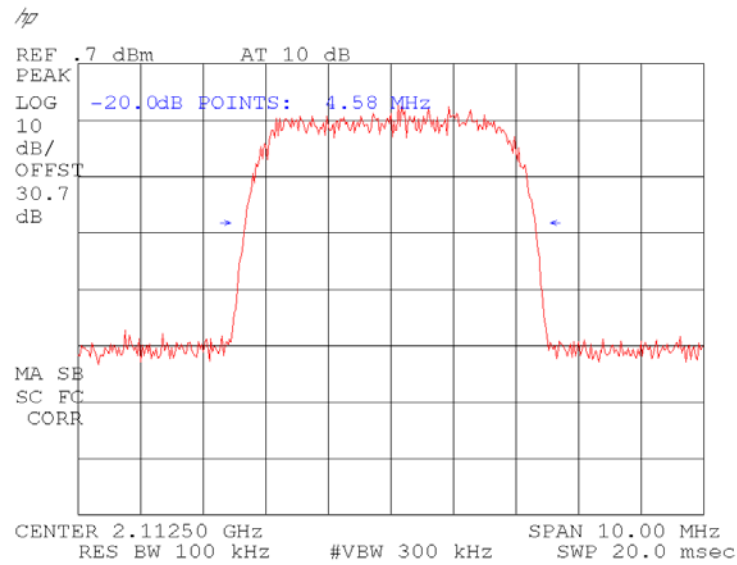


Figure 90.— W-CDMA (2112.5 MHz) IN

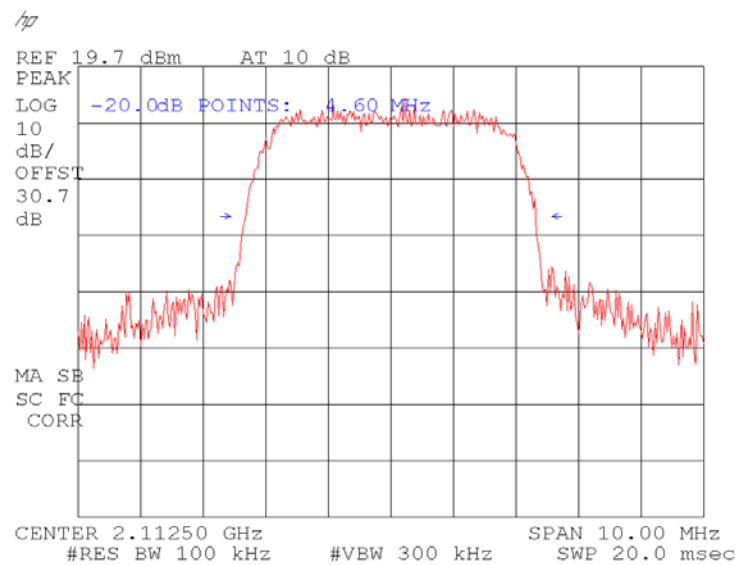


Figure 91.— W-CDMA (2112.5 MHz) OUT

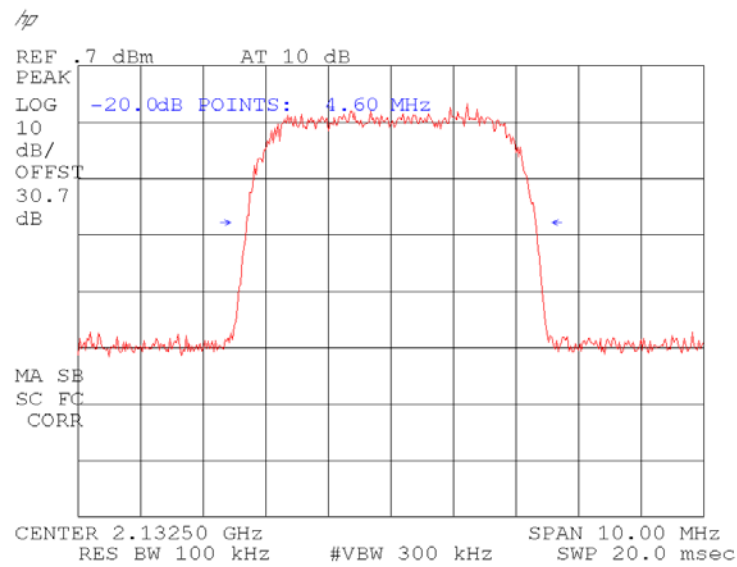


Figure 92.— W-CDMA (2132.5 MHz) IN

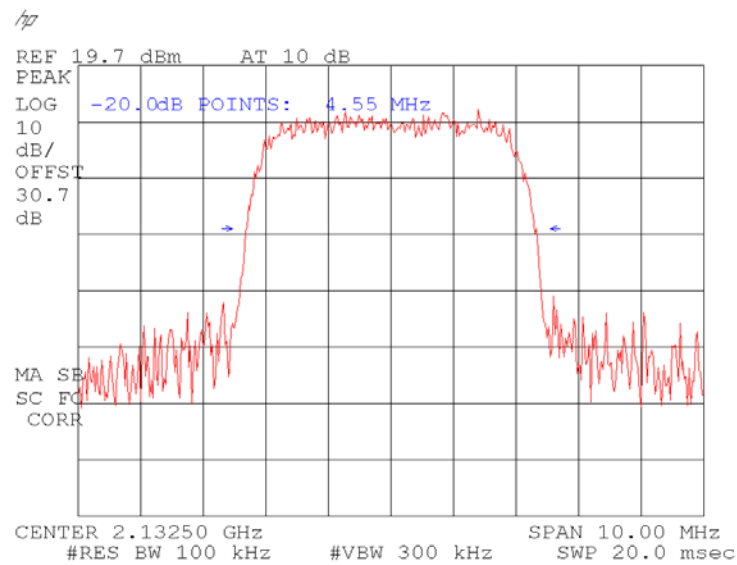


Figure 93.— W-CDMA (2132.5 MHz) OUT

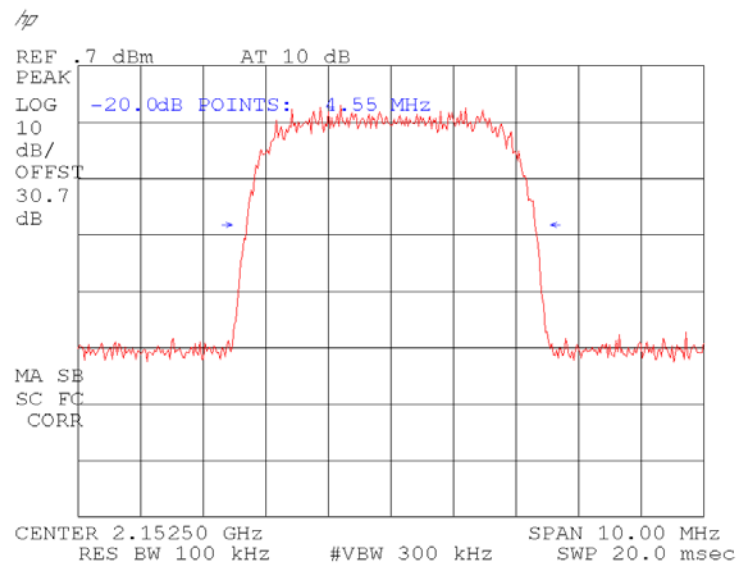


Figure 94.— W-CDMA (2152.5 MHz) IN

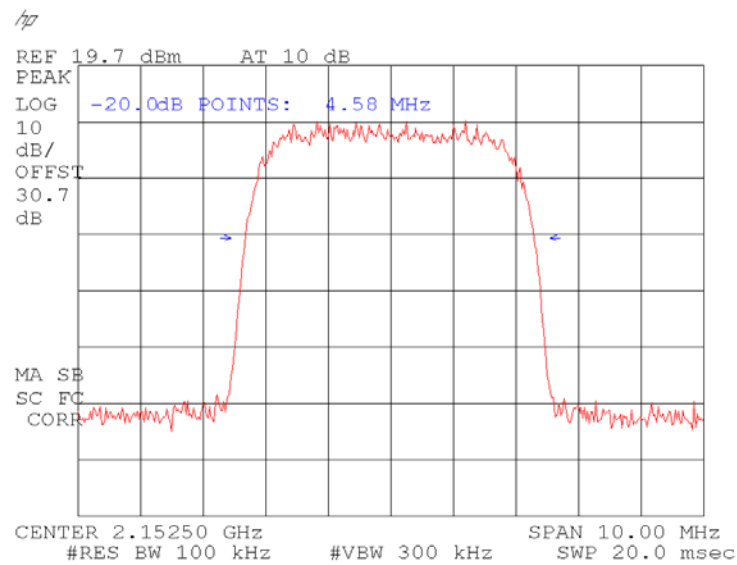


Figure 95.— W-CDMA (2152.5 MHz) OUT



10.4 Test Equipment Used.

Occupied Bandwidth

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8564E	3442A00275	February 13, 2013	1 year
Signal Generator	Agilent	N5172B ATO 10210	MY51350182	May 31, 2012	2 years
Attenuator	Mini-circuit	UNAT-30+	N/A	April 3, 2013	1 year
Cable	Mini-circuit	DCB	N/A	April 3, 2013	1 year
DC Block	MIDWEST MICROWAVE	DCDB-3624- 10-NNN-02	N/A	N/A	N/A

Figure 96 Test Equipment Used



11. Spurious Emissions at Antenna Terminals AWS

11.1 Test Specification

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

11.2 Test procedure

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + \log(P)$ dB, yielding -13dBm . The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (loss = 31.0 dB). The spectrum analyzer was set to 1 kHz resolution BW for the frequency range 9.0-150.0 kHz, 10 kHz for the frequency range 150 kHz–1.0 MHz, 100 kHz for the frequency range 1.0 MHz – 30 MHz, and 1MHz for the frequency range 30 MHz - 22.0 GHz.

11.3 Results

See additional information in Figure 97 to Figure 108.

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 07.05.013

Typed/Printed Name: A. Sharabi

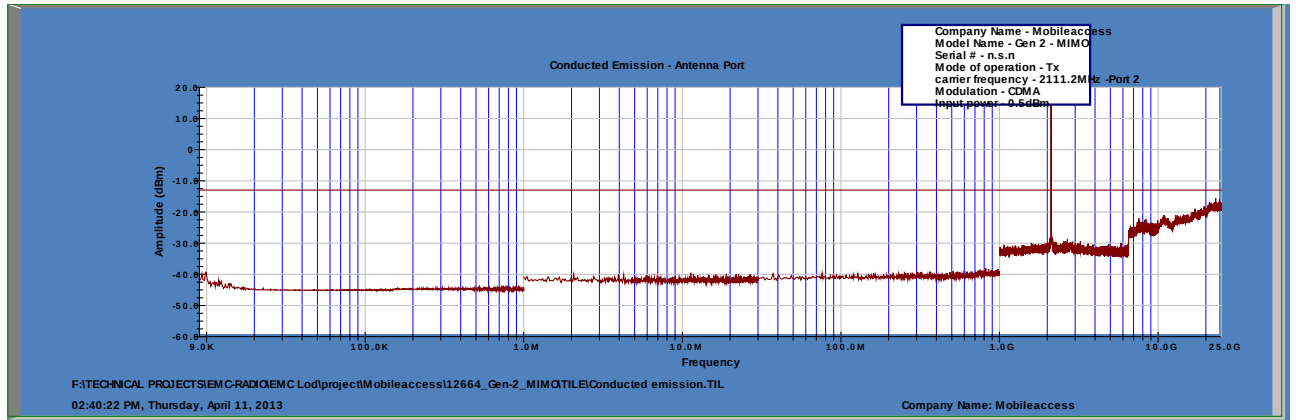


Figure 97 Spurious Emissions at Antenna Terminals CDMA, 2111.2MHz

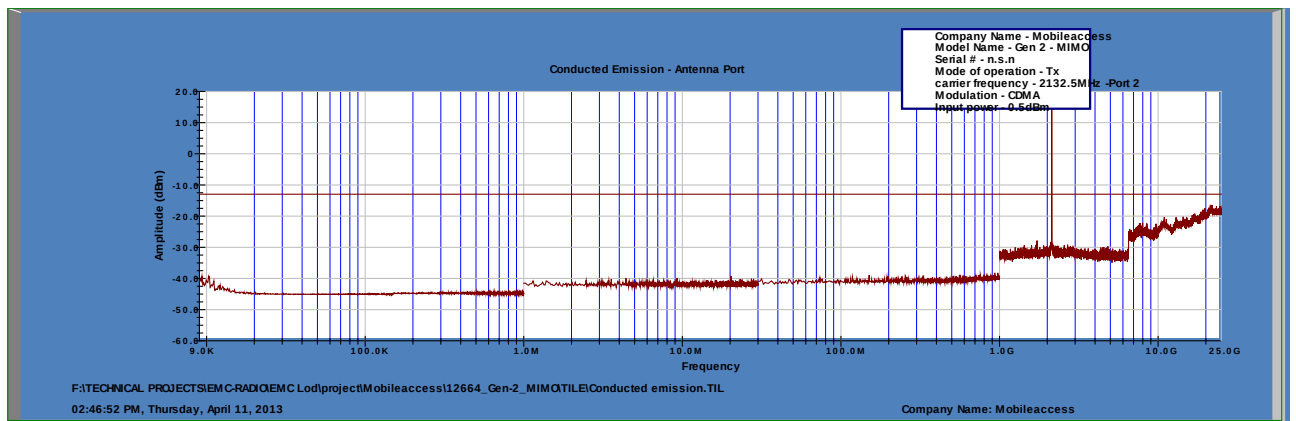


Figure 98 Spurious Emissions at Antenna Terminals CDMA, 2132.5MHz

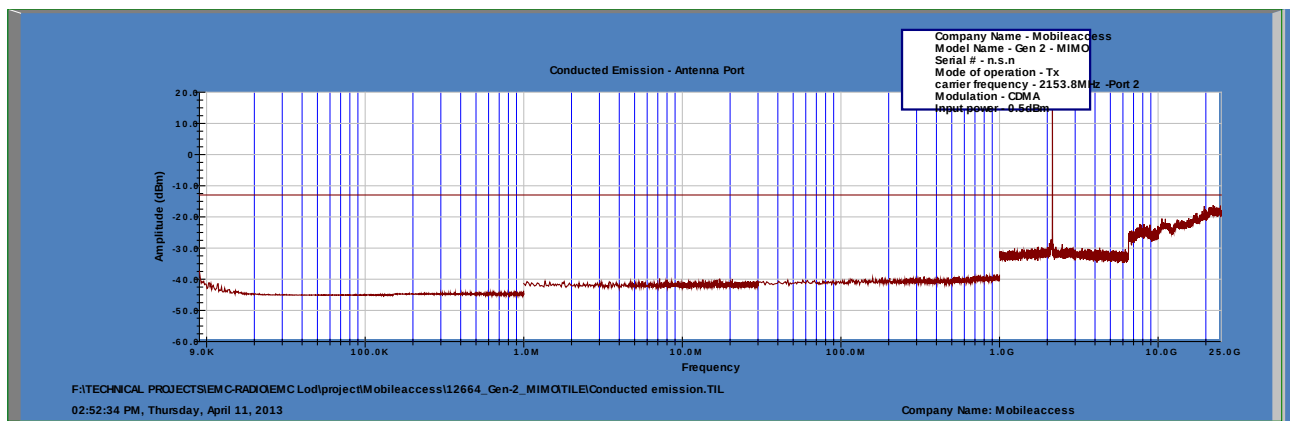


Figure 99 Spurious Emissions at Antenna Terminals CDMA, 2153.8MHz

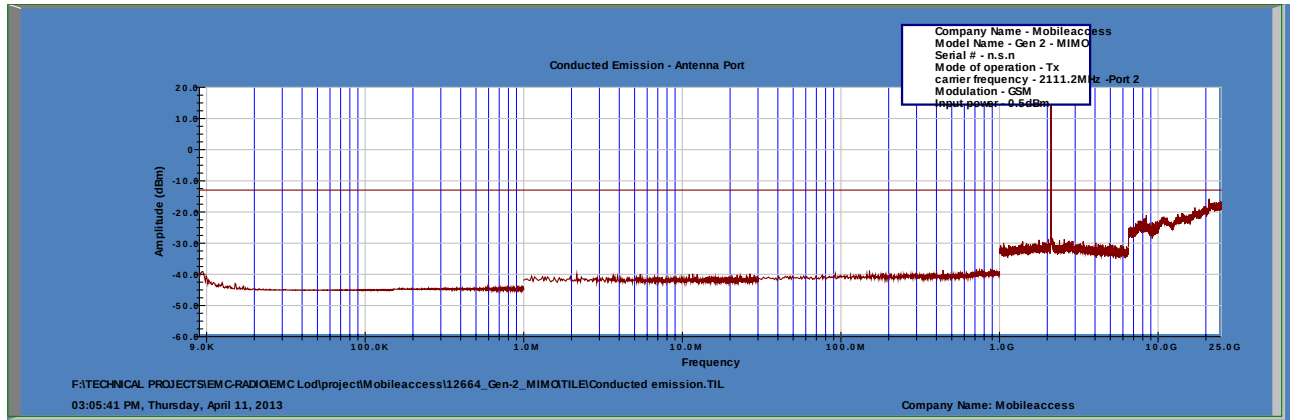


Figure 100 Spurious Emissions at Antenna Terminals GSM, 2111.2MHz

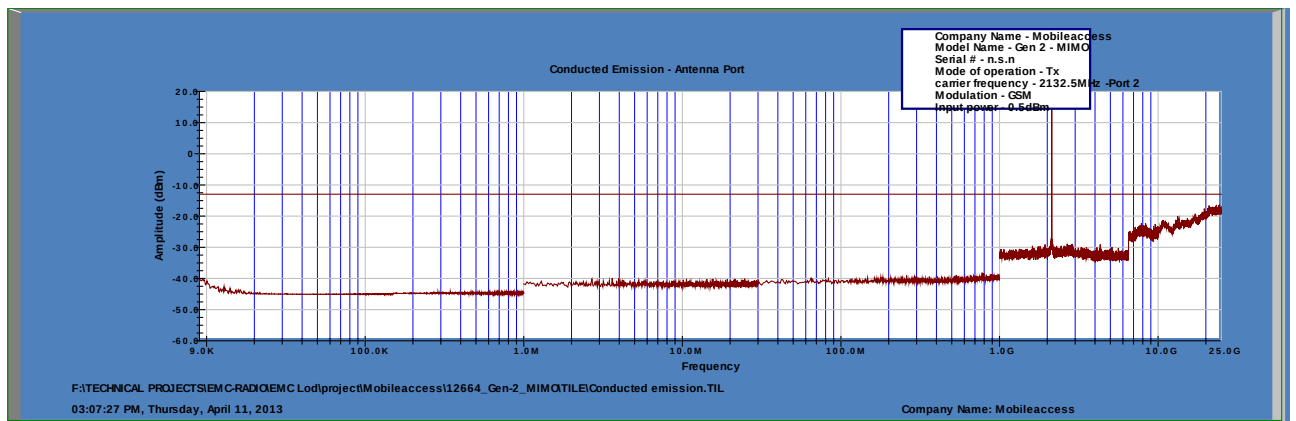


Figure 101 Spurious Emissions at Antenna Terminals GSM, 2132.5MHz

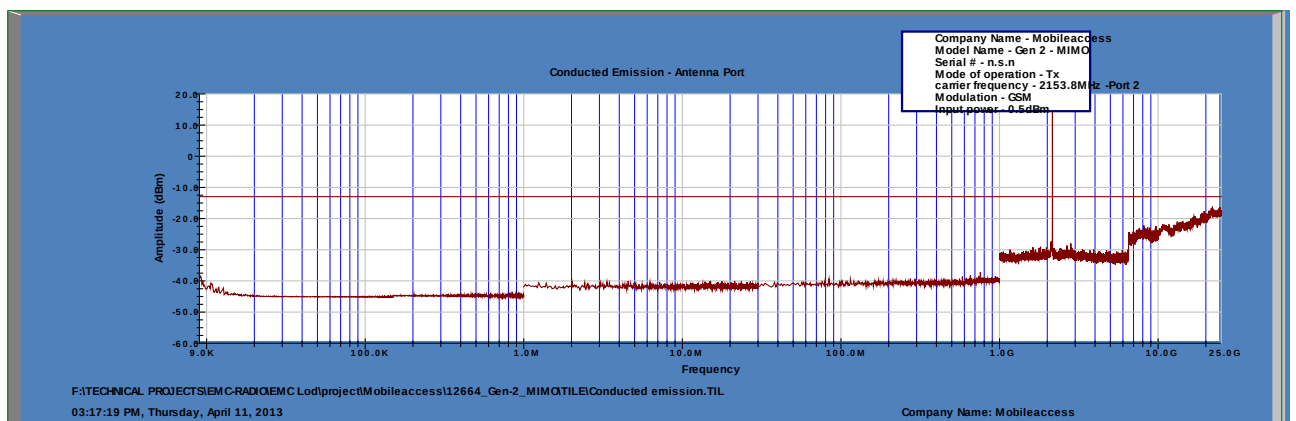


Figure 102 Spurious Emissions at Antenna Terminals GSM, 2153.8MHz

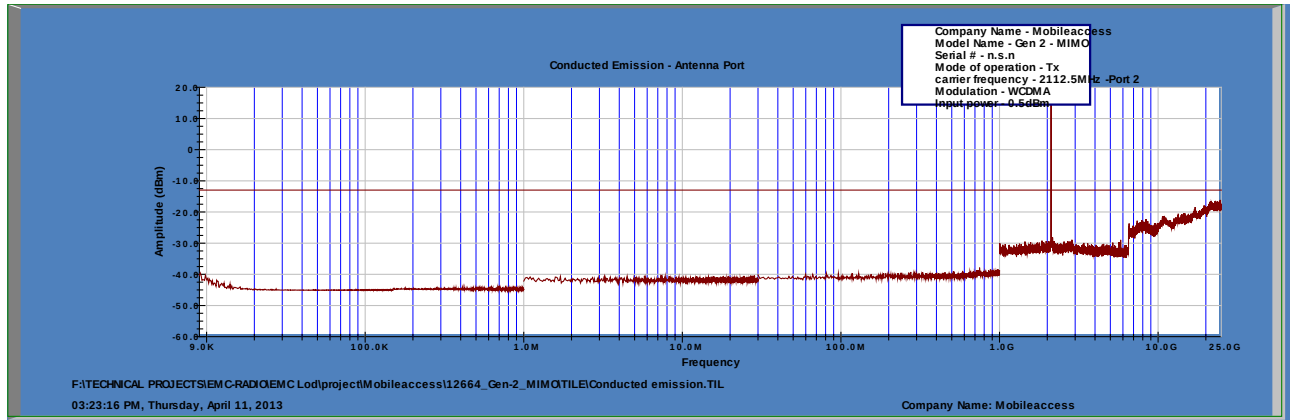


Figure 103 Spurious Emissions at Antenna Terminals WCDMA, 2112.5MHz

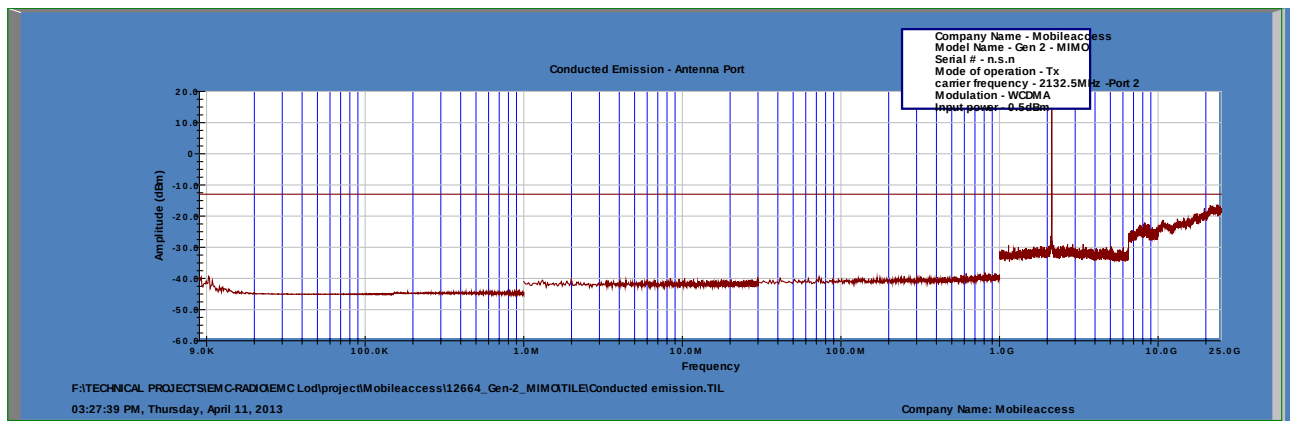


Figure 104 Spurious Emissions at Antenna Terminals WCDMA, 2132.5MHz

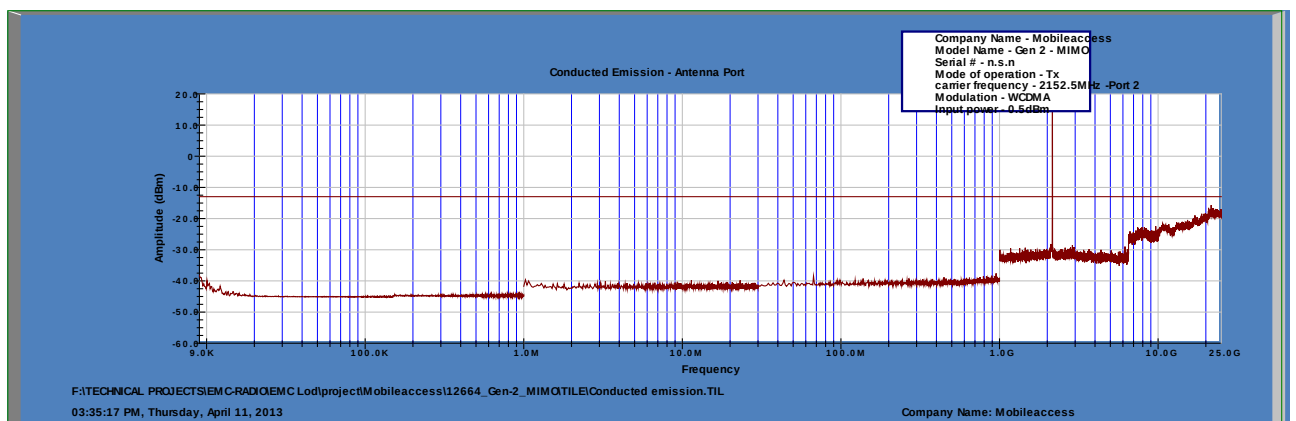


Figure 105 Spurious Emissions at Antenna Terminals WCDMA, 2152.5MHz

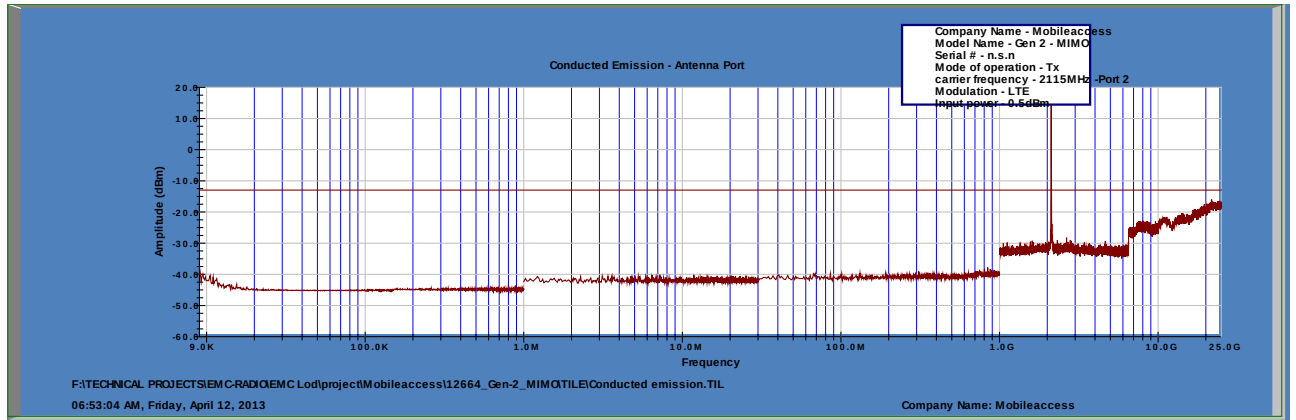


Figure 106 Spurious Emissions at Antenna Terminals LTE, 2115.0MHz

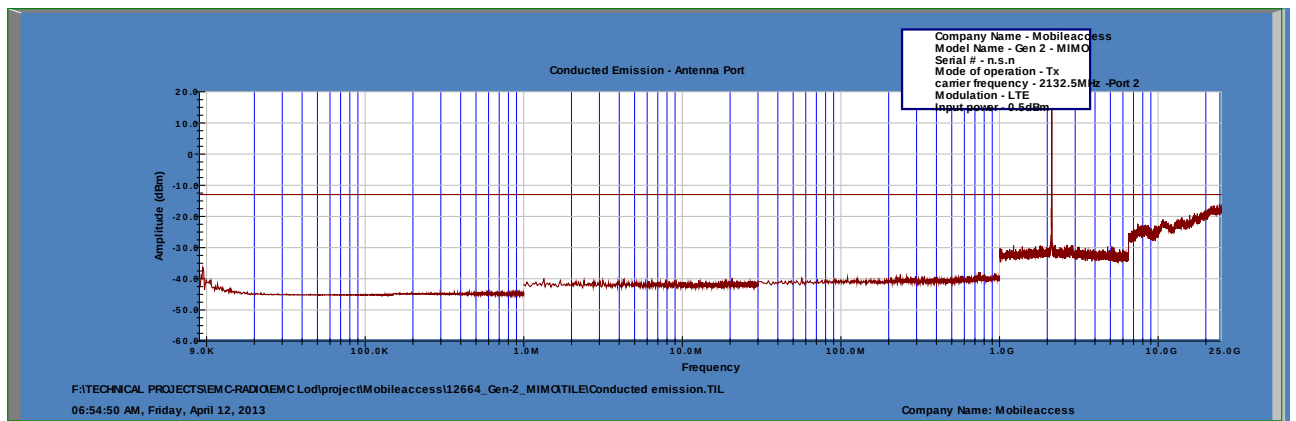


Figure 107 Spurious Emissions at Antenna Terminals LTE, 2132.5MHz

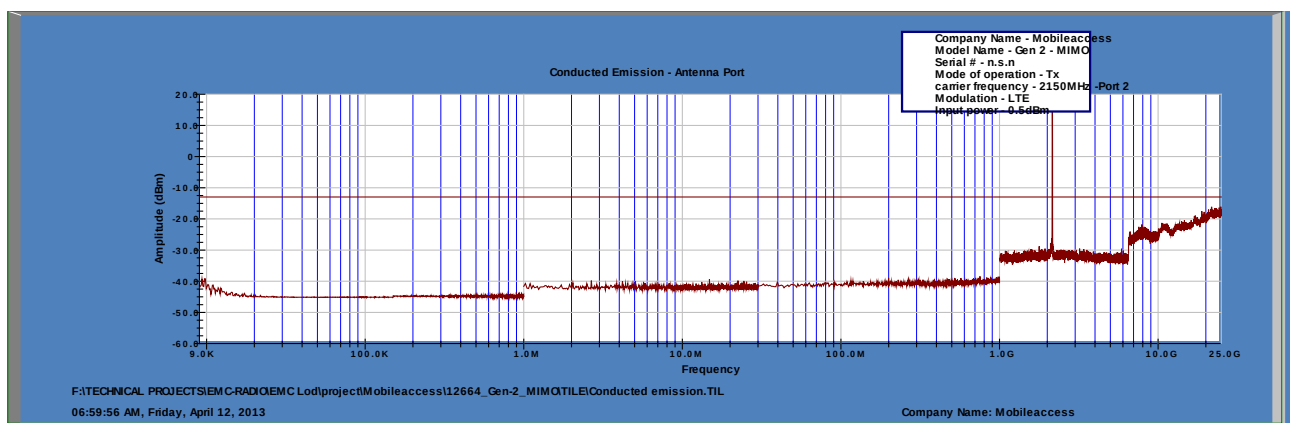


Figure 108 Spurious Emissions at Antenna Terminals LTE, 2150.0MHz



11.4 Test Equipment Used.

Spurious Emissions at Antenna Terminals AWS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8564E	3442A00275	February 13, 2013	1 year
Signal Generator	Agilent	N5172B ATO 10210	MY51350182	May 31, 2012	2 years
Attenuator	Mini-circuit	UNAT-30+	N/A	April 3, 2013	1 year
Cable	Mini-circuit	DCB	N/A	April 3, 2013	1 year
DC Block	MIDWEST MICROWAVE	DCDB-3624- 10-NNN-02	N/A	N/A	N/A

Figure 109 Test Equipment Used



12. Band Edge Spectrum AWS

12.1 Test Specification

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

12.2 Test procedure

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

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

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (loss = 30.7 dB).

12.3 Test Results

Modulation	Operation Frequency (MHz)	Band Edge Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
CDMA	2111.2	2110.00	-18.74	-13.0	-5.74
CDMA	2153.8	2155.00	-39.67	-13.0	-26.67
LTE 64QAM	2115.0	2110.00	-19.35	-13.0	-6.35
LTE 64QAM	2150.0	2155.00	-21.91	-13.0	-8.91
GSM	2111.2	2110.00	-40.77	-13.0	-27.77
GSM	2153.8	2155.00	-44.85	-13.0	-31.85
W-CDMA	2112.5	2110.00	-18.77	-13.0	-5.77
W-CDMA	2152.5	2155.00	-34.59	-13.0	-21.59

Figure 110 Band Edge Spectrum Results AWS

See additional information in Figure 111 to Figure 118.

JUDGEMENT: Passed by 4.62 dB

TEST PERSONNEL:

Tester Signature: 

Date: 07.05.013

Typed/Printed Name: A. Sharabi

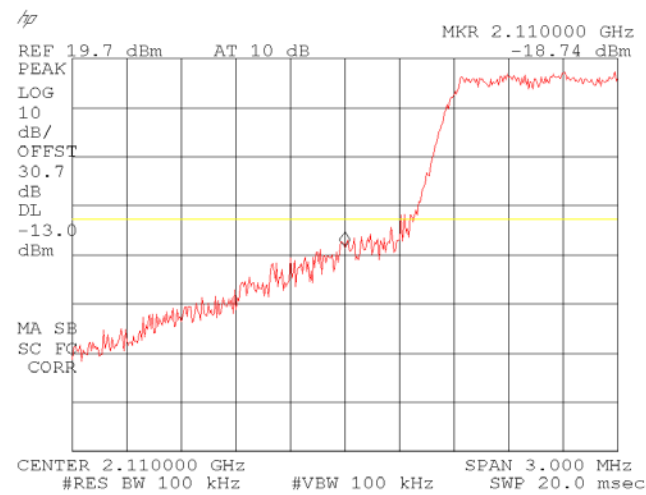


Figure 111.— CDMA 2111.20 MHz

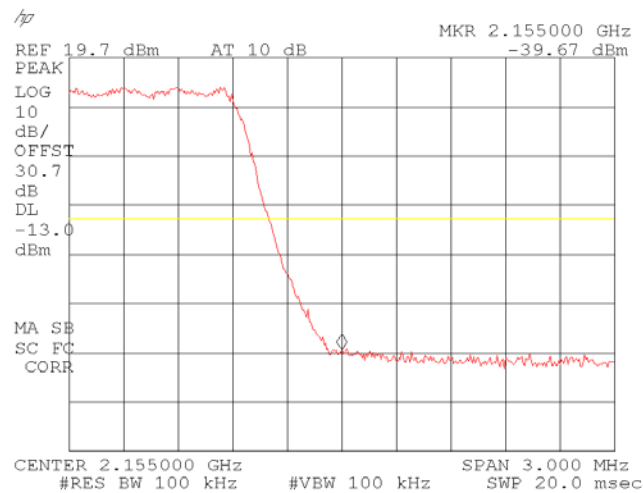


Figure 112.— CDMA 2153.80 MHz

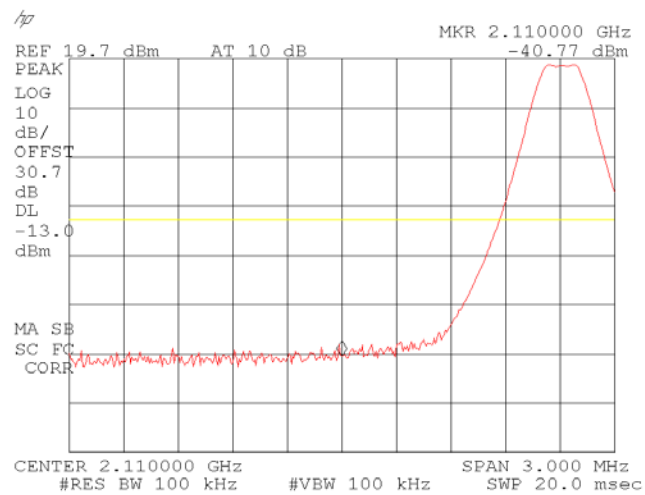


Figure 113.— GSM 2111.20 MHz

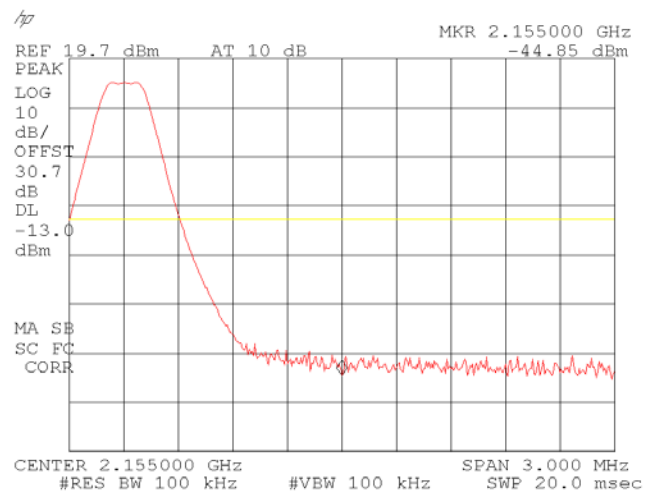


Figure 114.— GSM 2153.80 MHz

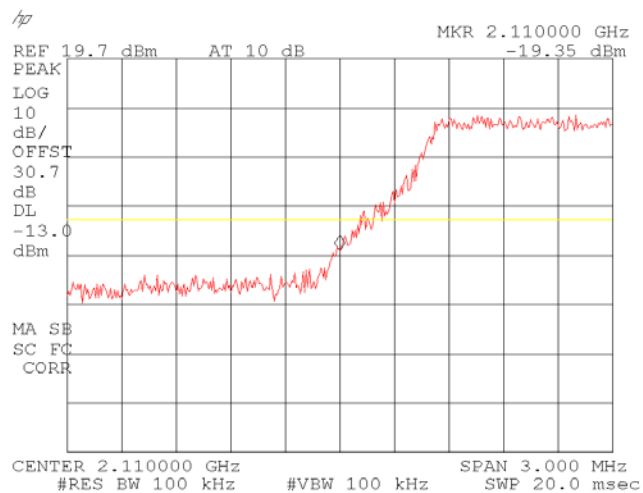


Figure 115.— LTE 64QAM 2115.00 MHz

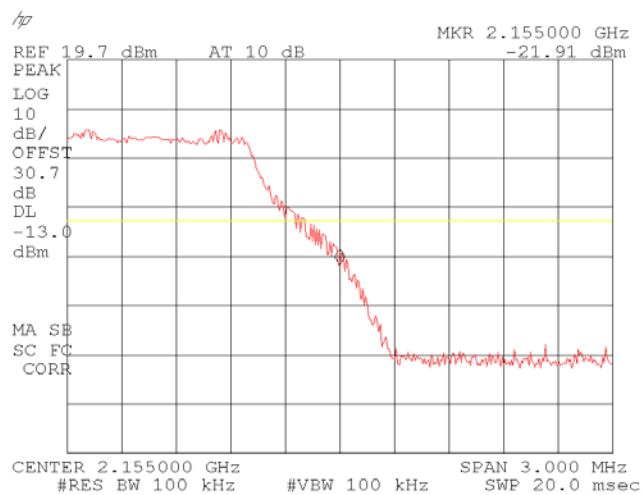


Figure 116.— LTE 64QAM 2150.00 MHz

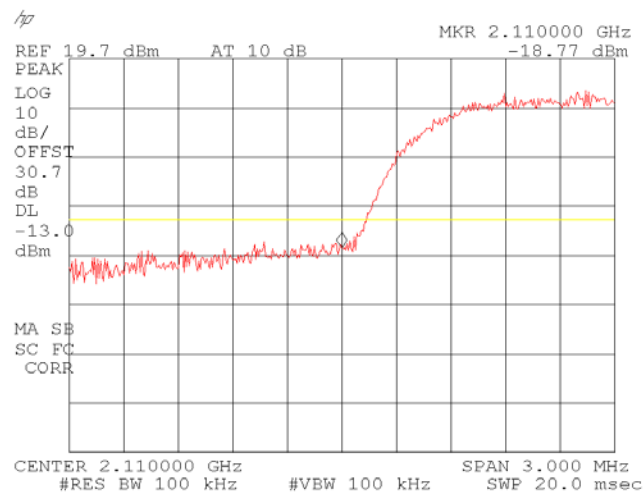


Figure 117.— W-CDMA 2112.50 MHz

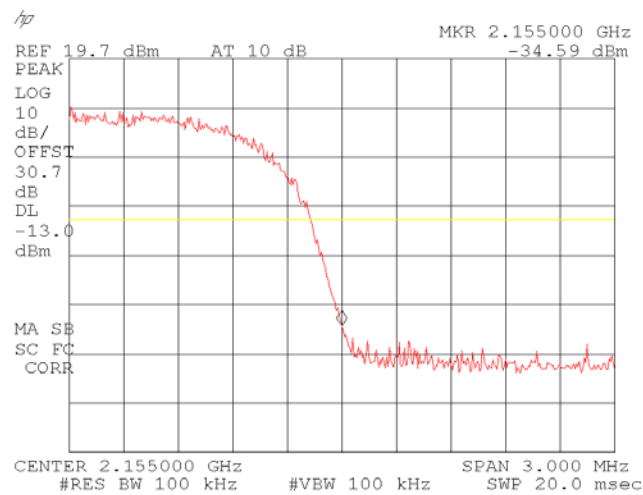


Figure 118.— W-CDMA 2152.50 MHz



12.4 Test Equipment Used.

Band Edge Spectrum AWS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8564E	3442A00275	February 13, 2013	1 year
Signal Generator	Agilent	N5172B ATO 10210	MY51350182	May 31, 2012	2 years
Attenuator	Mini-circuit	UNAT-30+	N/A	April 3, 2013	1 year
Cable	Mini-circuit	DCB	N/A	April 3, 2013	1 year
DC Block	MIDWEST MICROWAVE	DCDB-3624- 10-NNN-02	N/A	N/A	N/A

Figure 119 Test Equipment Used



13. Spurious Radiated Emission AWS

13.1 Test Specification

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

13.2 Test Procedure

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

Unwanted Emissions: Radiated Spurious.

The power of any emission outside of the authorized operating frequency ranges (2110-2155 MHz) must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB, yielding -13dBm.

- (a) The E.U.T. operation mode and test set-up are as described in Section 2. A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 1.

The frequency range 9 kHz-20 GHz was scanned, and the list of the highest emissions was verified and updated accordingly.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization. The emissions were measured at a distance of 3 meters.

- (c) The E.U.T. was replaced by a substitution antenna (dipole 30MHz-1GHz, Horn Antenna above 1GHz) driven by a signal generator. The height was readjusted for maximum reading. The signal generator level was adjusted to obtain the same reading on the EMI receiver as in step (a).

The signals observed in step (a) were converted to radiated power using:

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

P_d = Dipole equivalent power (result).

P_g = Signal generator output level.

13.3 Test Results

Carrier Channel (MHz)	Freq. (MHz)	Antenn a Pol.	Maximum Peak Level (dBμV/m)	Signal Generator RF Output (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Effective Radiated Power Level (dBm)	Spec. (dBm)	Margin (dB)
2111.20	4222.4	V	51.9	-51.49	4.45	9.12	-46.82	-13.0	-33.82
2111.20	4222.4	H	52.9	-50.25	4.45	9.12	-45.58	-13.0	-32.58
2135.00	4270.0	V	52.4	-51.67	4.45	9.38	-46.74	-13.0	-33.74
2135.00	4270.0	H	51.7	-51.91	4.45	9.38	-46.98	-13.0	-33.98
2153.80	4307.6	V	52.2	-51.87	4.45	9.38	-46.94	-13.0	-33.94
2153.80	4307.6	H	51.9	-51.71	4.45	9.38	-46.78	-13.0	-33.78

Figure 120 Spurious Radiated Emission AWS



JUDGEMENT: Passed by 32.58 dB

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

TEST PERSONNEL:

Tester Signature:  Date: 07.05.13

Typed/Printed Name: A. Sharabi

13.4 Test Instrumentation Used, Radiated Measurements AWS

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Spectrum Analyzer	HP	8564E	3442A00275	February 13, 2013	1 year
Signal Generator	Agilent	N5172B ATO 10210	MY51350182	May 31, 2012	2 years
Signal Generator	Agilent	N5182A	MY50141213	July 9, 2012	1 year
Signal Generator	Agilent	83731B	US37100653	October 23, 2012	1 year
Signal Generator	Agilent	8647A	3625U00686	March 5, 2012	2 years
Attenuator	Mini-circuit	UNAT-30+	N/A	April 3, 2013	1 year
Cable	Mini-circuit	DCB	N/A	April 3, 2013	1 year
DC Block	MIDWEST MICROWAVE	DCDB-3624-10-NNN-02	N/A	N/A	N/A

Figure 121 Test Equipment Used



14. Intermodulation Conducted

14.1 Test procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable(loss = 31.0 dB). The spectrum analyzer was set to 1 kHz resolution BW for the frequency range 9.0-150.0 kHz, 10 kHz for the frequency range 150 kHz–1.0 MHz, 100 kHz for the frequency range 1.0 MHz – 30 MHz, and 1MHz for the frequency range 30 MHz - 22.0 GHz.

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

LTE 747 MHz QPSK 0 dBm

AWS: 2135 MHz W-CDMA 0 dBm

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

14.2 Test Results

See additional information in Figure 122.

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature:  Date: 07.05.13

Typed/Printed Name: A. Sharabi

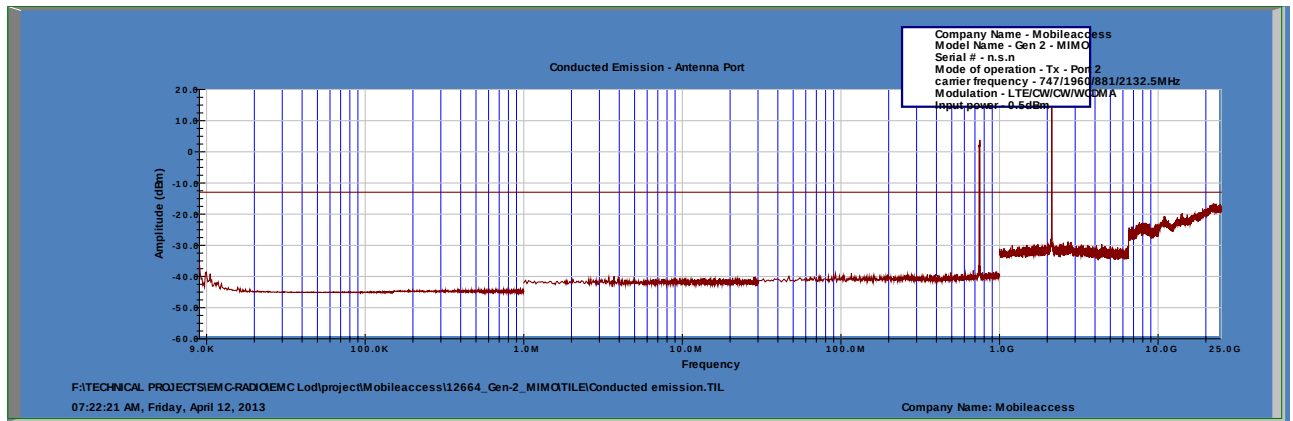


Figure 122 Intermodulation

14.3 Test Equipment Used.

Intermodulation Conducted

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8564E	3442A00275	February 13, 2013	1 year
Signal Generator	Agilent	N5172B ATO 10210	MY51350182	May 31, 2012	2 years
Attenuator	Mini-circuit	UNAT-30+	N/A	April 3, 2013	1 year
Cable	Mini-circuit	DCB	N/A	April 3, 2013	1 year
DC Block	MIDWEST MICROWAVE	DCDB-3624-10-NNN-02	N/A	N/A	N/A

Figure 123 Test Equipment Used



15. Intermodulation Radiated

15.1 Test procedure

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

Unwanted Emissions: Radiated Spurious.

The power of any emission outside of the authorized operating frequency ranges (728-758; 869-894; 1930-1990; 2110-2155 MHz) must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB, yielding – 13dBm.

- (a) The E.U.T. operation mode and test set-up are as described in Section 2.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 1.

The E.U.T. was operated in Downlink mode at 4 different channels at center frequency of each band at the same time, transmitting at CW signal.

- (b) The frequency range 9 kHz-25 GHz was scanned, and the list of the highest emissions was verified and updated accordingly. The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

The emissions were measured at a distance of 3 meters.

- (d) The E.U.T. was replaced by a substitution antenna (dipole 30MHz-1GHz, Horn Antenna above 1GHz) driven by a signal generator. The height was readjusted for maximum reading. The signal generator level was adjusted to obtain the same reading on the EMI receiver as in step (a).

The signals observed in step (a) were converted to radiated power using:

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

P_d = Dipole equivalent power (result).

P_g = Signal generator output level.

15.2 Test Results

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature:  Date: 07.05.13

Typed/Printed Name: A. Sharabi



Carrier Channel (MHz)	Freq. (MHz)	Antenna Pol.	Maximum Peak Level (dB μ V/m)	Signal Generator RF Output (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Effective Radiated Power Level (dBm)	Spec. (dBm)	Margin (dB)
2*747+881	2375	V	52.7	-47.99	7.4	8.26	-47.13	-13.0	-34.13
2*747+881	2375	H	51.6	-49.28	7.4	8.26	-48.42	-13.0	-35.42
2*747-881	613	V	39.7	-56.64	3.2	0.97	-58.87	-13.0	-45.87
2*747-881	613	H	39.8	-57.91	3.2	0.97	-60.14	-13.0	-47.14
2*881-747	1015	V	51.3	-50.49	4.2	5.4	-49.29	-13.0	-36.29
2*881-747	1015	H	41.6	-59.85	4.2	5.4	-58.65	-13.0	-45.65
2*881+747	2509	V	54.6	-46.16	7.7	8.4	-45.46	-13.0	-32.46
2*881+747	2509	H	54.2	-47.41	7.7	8.4	-46.71	-13.0	-33.71
3*747-2*881	579	V	38.2	-58.14	3.2	0.97	-58.14	-13.0	-45.14
3*747-2*881	579	H	38.5	-59.21	3.2	0.97	-61.44	-13.0	-48.44
3*881-2*747	1149	V	44.2	-57.29	4.45	5.84	-55.90	-13.0	-42.90
3*881-2*747	1149	H	44.5	-57.01	4.45	5.84	-55.62	-13.0	-42.62
2*1960-2135	1785	V	48.7	-51.09	5.6	7.66	-49.03	-13.0	-36.03
2*1960-2135	1785	H	49.2	-50.85	5.6	7.66	-48.79	-13.0	-35.79
2*2135-1960	2310	V	53.9	-47.68	7.1	8.12	-46.66	-13.0	-33.66
2*2135-1960	2310	H	52.8	-49.58	7.1	8.12	-48.56	-13.0	-35.56
3*2135-2*1960	2485	V	54.0	-46.76	7.7	8.4	-46.06	-13.0	-33.06
3*2135-2*1960	2485	H	54.0	-47.61	7.7	8.4	-46.91	-13.0	-33.91
2*2135-3*1960	1610	V	50.0	-51	5.3	7.62	-48.68	-13.0	-35.68
2*2135-3*1960	1610	H	49.3	-52.14	5.3	7.62	-49.82	-13.0	-36.82

Figure 124 Intermodulation Radiated Results



**15.3 Test Instrumentation Used, Radiated Measurements
Intermodulation**

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Spectrum Analyzer	HP	8564E	3442A00275	February 13, 2013	1 year
Signal Generator	Agilent	N5172B ATO 10210	MY51350182	May 31, 2012	2 years
Signal Generator	Agilent	N5182A	MY50141213	July 9, 2012	1 year
Signal Generator	Agilent	83731B	US37100653	October 23, 2012	1 year
Signal Generator	Agilent	8647A	3625U00686	March 5, 2012	2 years
Attenuator	Mini-circuit	UNAT-30+	N/A	April 3, 2013	1 year
Cable	Mini-circuit	DCB	N/A	April 3, 2013	1 year
DC Block	MIDWEST MICROWAVE	DCDB-3624-10-NNN-02	N/A	N/A	N/A

Figure 125 Test Equipment Used



16.

APPENDIX A - CORRECTION FACTORS

16.1 Correction factors for CABLE from EMI receiver to test antenna at 3 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)	FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3	1200.0	7.3
20.0	0.6	1400.0	7.8
30.0	0.8	1600.0	8.4
40.0	0.9	1800.0	9.1
50.0	1.1	2000.0	9.9
60.0	1.2	2300.0	11.2
70.0	1.3	2600.0	12.2
80.0	1.4	2900.0	13.0
90.0	1.6		
100.0	1.7		
150.0	2.0		
200.0	2.3		
250.0	2.7		
300.0	3.1		
350.0	3.4		
400.0	3.7		
450.0	4.0		
500.0	4.3		
600.0	4.7		
700.0	5.3		
800.0	5.9		
900.0	6.3		
1000.0	6.7		

NOTES:

1. The cable type is RG-214.
2. The overall length of the cable is 27 meters.
3. The above data is located in file 27MO3MO.CBL on the disk marked "Radiated Emission Tests EMI Receiver".



16.2 Correction factors for 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		



16.3 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		



16.4 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



16.5 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