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DATE: 22 July 2015

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

FCC Radio Test Report

for

Corning Optical Communication Wireless

Equipment under test:

ONE - Optical Network Evolution Wireless Platform

MRU (Mid Power Remote Unit)

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

Tested by: _____

M. Zohar

Approved by: _____

D. Shidlowsky

Measurement/Technical Report for
Corning Optical Communication Wireless

ONE - Optical Network Evolution Wireless Platform

MRU (Mid Power Remote Unit)

(LTE Section)

FCC ID: OJF1MRU70

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

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

Application for Certification
prepared by:
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ITL (Product Testing) Ltd.
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Applicant for this device:
(different from "prepared by")
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TABLE OF CONTENTS

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 Wireless Platform
Equipment Model No.:	MRU (Mid Power Remote Unit)
Equipment Serial No.:	Not Designated
Date of Receipt of E.U.T:	09.03.2015
Start of Test:	09.03.2015
End of Test:	22.03.2015
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.), FCC Designation Number is 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

Modular 7 band Enabled Mid Power Neutral Host Solution –

Supported modular frequency bands

700, ESMR+CELL, PCS, AWS, WCS

Integrated 2.5 GHz expansion ready

Composite Output Power

700, ESMR & CELL: 30dBm

PCS, AWS WCS: 33dBm

Specifications

100% Modularity

NEBS Class 2 Compliant

Small Footprint – 6 Rack Units

Highlights:

Extended ONE platform design Diversity

100% modular component design

Composite output power: 2W

Small Compact Form Factor (6U)

Non-Service Impacting Upgrades

Lower initial deployment costs

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

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% Confidence, K=2):

± 3.44 dB

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

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

± 4.98 dB

2. System Test Configuration

2.1 Justification

The test setup was configured to closely resemble the standard installation.
The EUT consists of the MRU (Mid-Power Remote Module) which is connected with the head-end ONE equipment using fiber optic cable.
The RF 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 EUT, while the EUT output was connected to the spectrum analyzer.
The system was tested under maximum gain conditions while input power level to the RIM is 0 dBm and output power at the antenna port of MRU is 33dBm for high frequency bands and 30dBm for low frequency bands.
Testing was performed on the following configurations:

Frequency Range (MHz)		
Service/Band	**Downlink (DL)**	**Technology**
700 MHz	728-757	LTE
ESMR 800	862- 869	WCDMA, LTE, GSM
CELL 850	869-894	WCDMA, LTE, GSM
PCS + G 1900	1930-1995	WCDMA, LTE, GSM
AWS 2100	2110-2155	WCDMA, LTE, GSM
WCS	2350-2360	WCDMA, LTE, GSM

2.2 EUT Exercise Software

The Element Management System ver. 1.6 used for commands delivery. These commands are used to enable/disable the EUT transmission. EUT Embedded SW versions is mru_da64_16_02.bin.

2.3 Special Accessories

OIU and HEU.

2.4 Equipment Modifications

No modifications were necessary in order to achieve compliance.

2.5 Configuration of Tested System

Product Name	ONE Wireless Platform
Model Name	MRU (Mid Power Remote Unit)
Working voltage	115VAC/48VDC
Mode of operation	Repeater
Modulations	QPSK, 16QAM, 64QAM
Frequency Range	728.0MHz-742.5MHz
Transmit power	30 dBm
Antenna Gain	12.5 dBi
DATA rate	N/A
Modulation BW	10MHz
Temperature (°C)/ Humidity (%RH)	22°C/32%

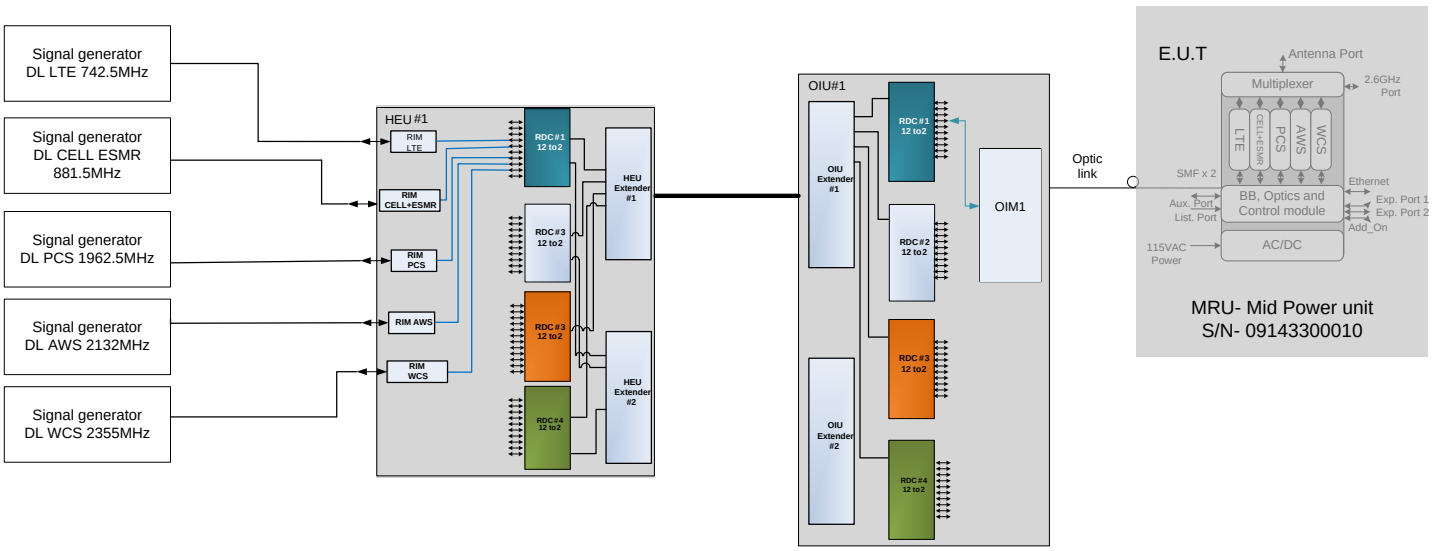

Figure 1. Test Set-up

3. Test Set-up Photos

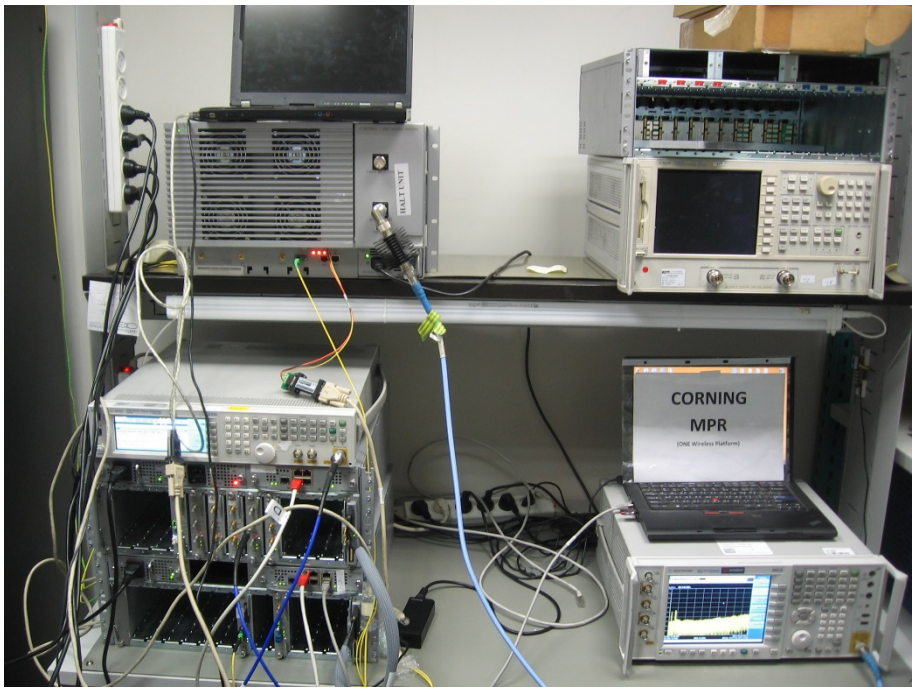

Figure 2. Conducted Emission From Antenna Port Tests

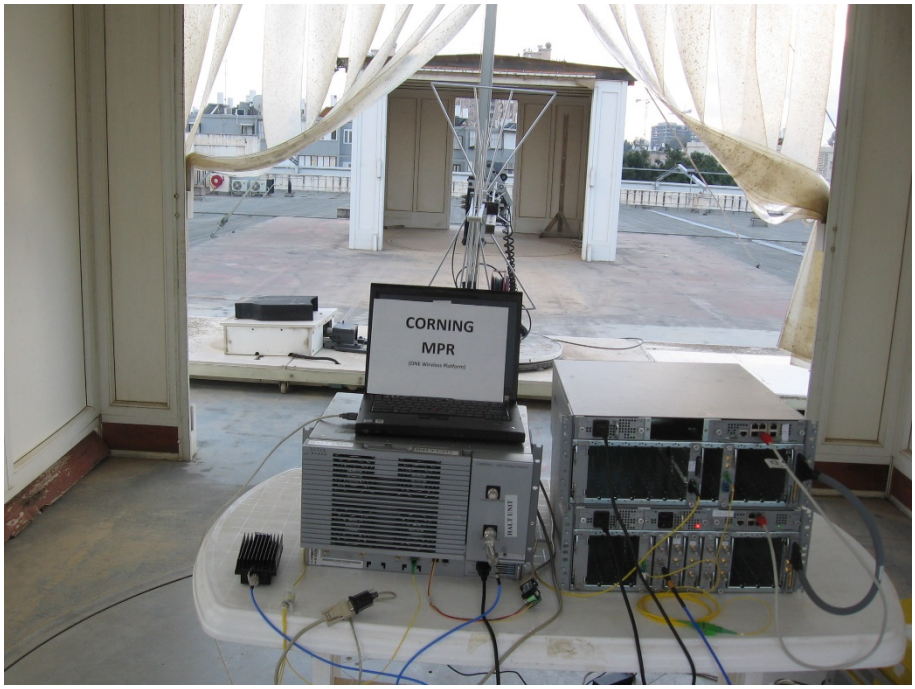

Figure 3. Radiated Emission Test

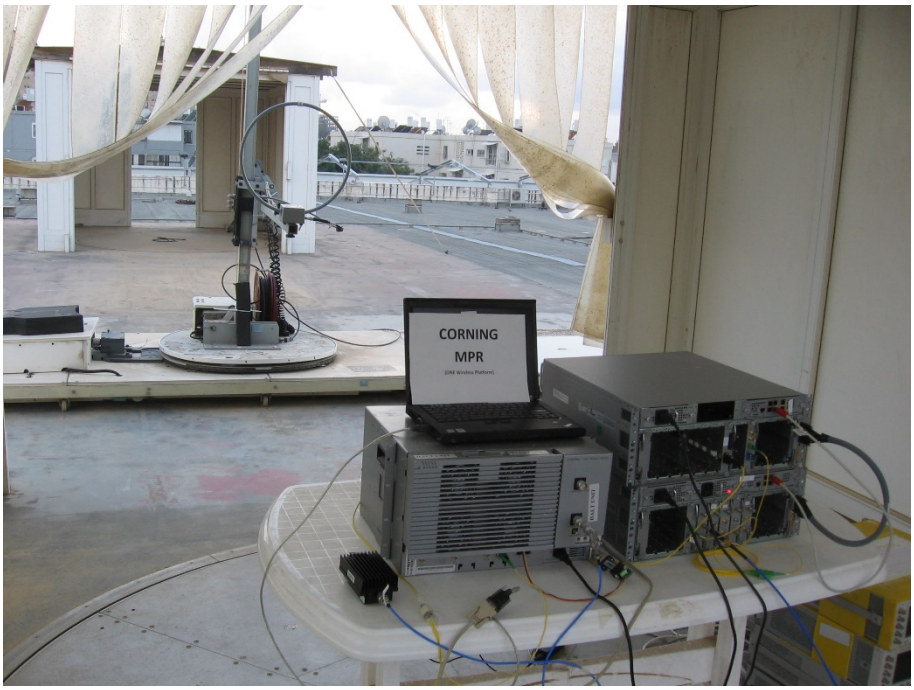

Figure 4. Radiated Emission Test

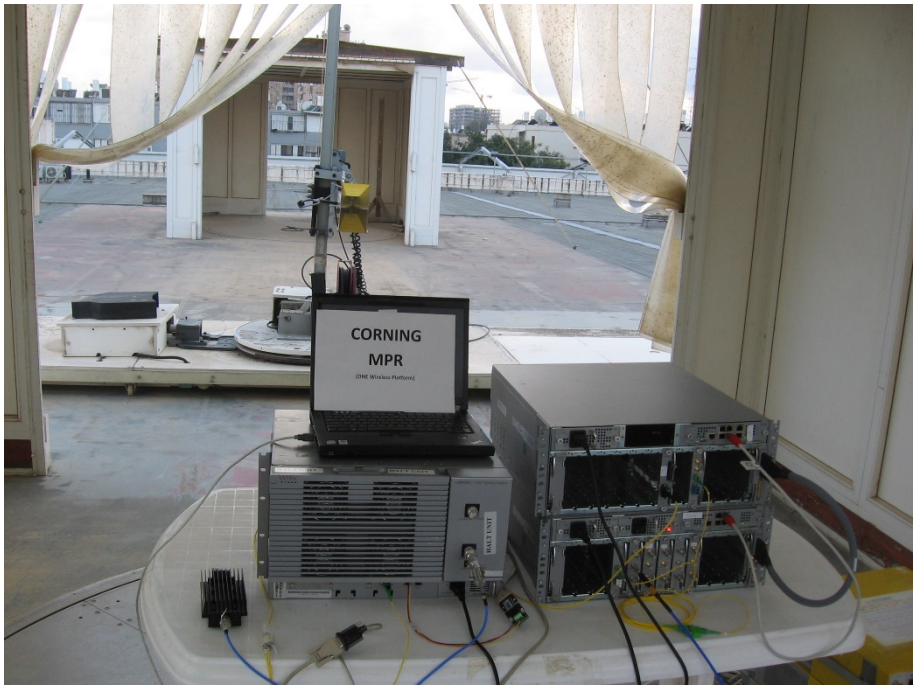

Figure 5. Radiated Emission Test

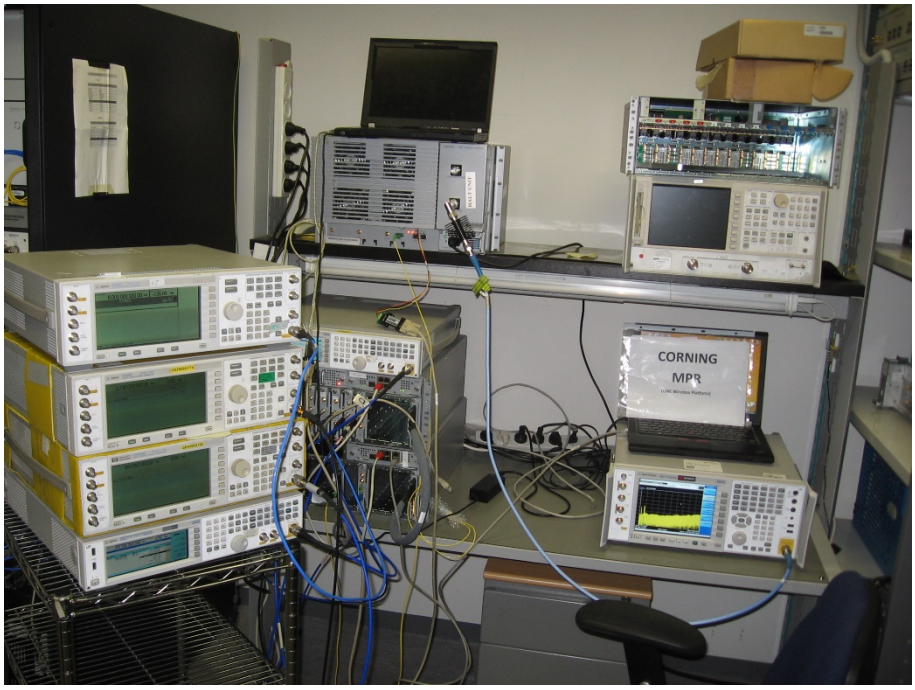

Figure 6. Intermodulation Conducted Emission Test

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 (60 dBm). The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator (31.3 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)	Antenna Gain (dBi)	EIRP (dBm)	Specification (dBm)	Margin (dB)
LTE 64QAM	733	33.0	12.5	45.5	60.0	-14.5
LTE 64QAM	747	34.1	12.5	46.6	60.0	-13.4
LTE 64QAM	753	32.3	12.5	44.8	60.0	-15.2
LTE 16QAM	733	33.3	12.5	45.8	60.0	-14.2
LTE 16QAM	747	33.6	12.5	46.1	60.0	-13.9
LTE 16QAM	753	32.6	12.5	45.1	60.0	-14.9
LTE QPSK	733	33.9	12.5	46.4	60.0	-13.6
LTE QPSK	747	33.6	12.5	46.1	60.0	-13.9
LTE QPSK	753	32.3	12.5	44.8	60.0	-15.2

Figure 7 RF Power Output LTE

See additional information in *Figure 8* to *Figure 16.*

JUDGEMENT: Passed

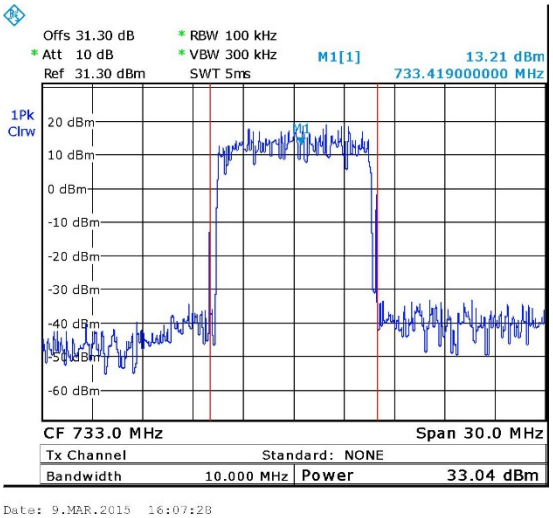

Figure 8. — 64QAM, 733 MHz

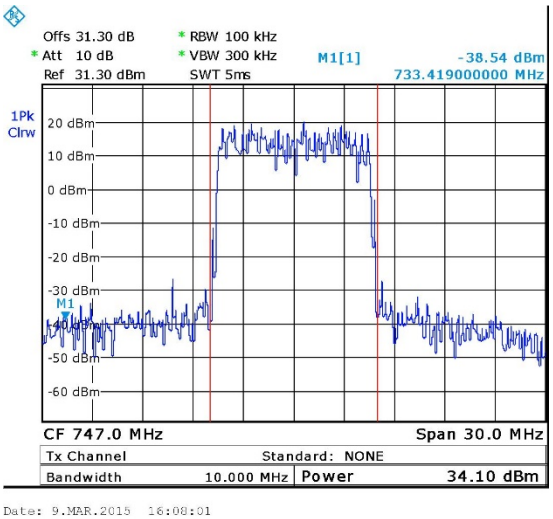

Figure 9. — 64QAM 747 MHz

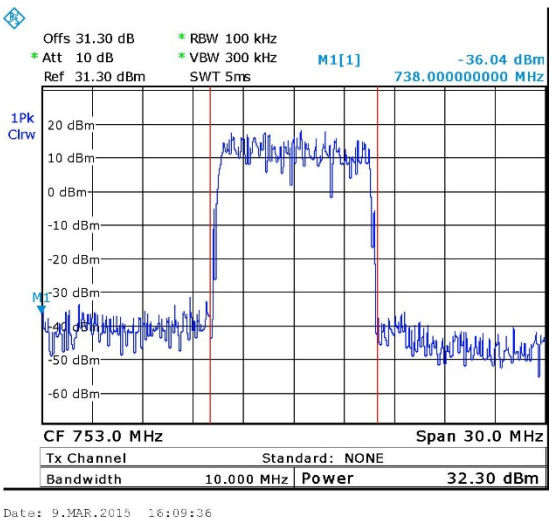

Figure 10. — 64QAM 753 MHz

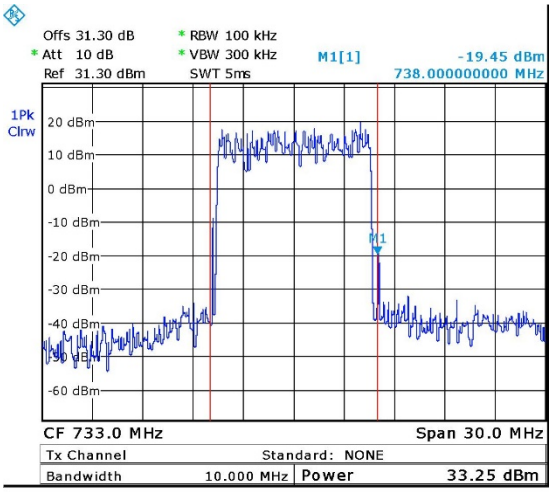

Figure 11. — 16QAM 733 MHz

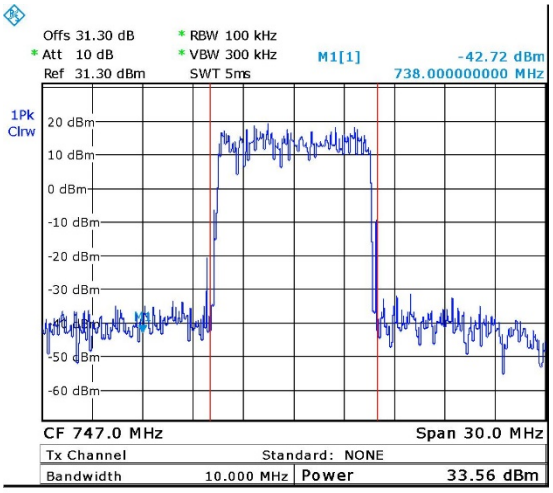

Figure 12. — 16QAM 747 MHz

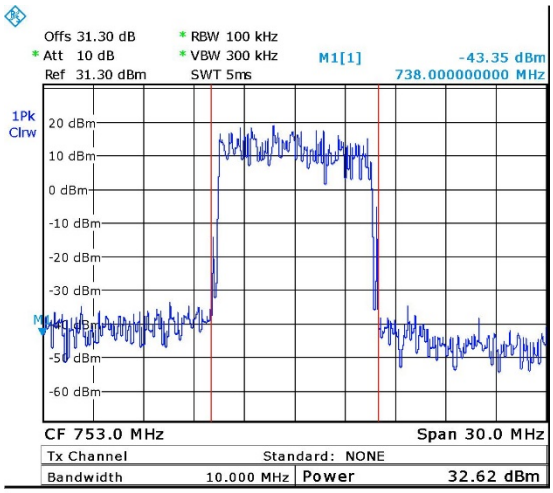

Figure 13. — 16QAM 753 MHz

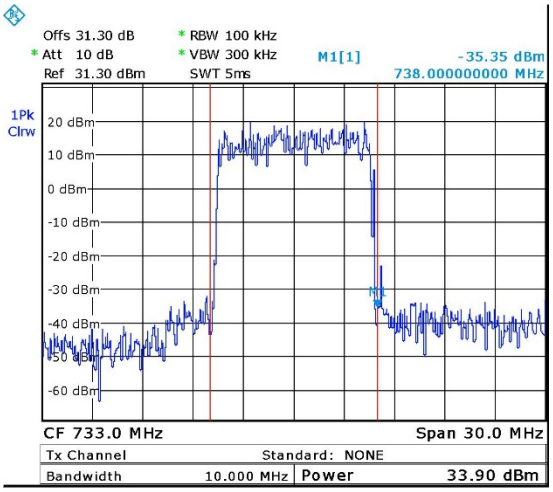

Figure 14. — QPSK 733 MHz

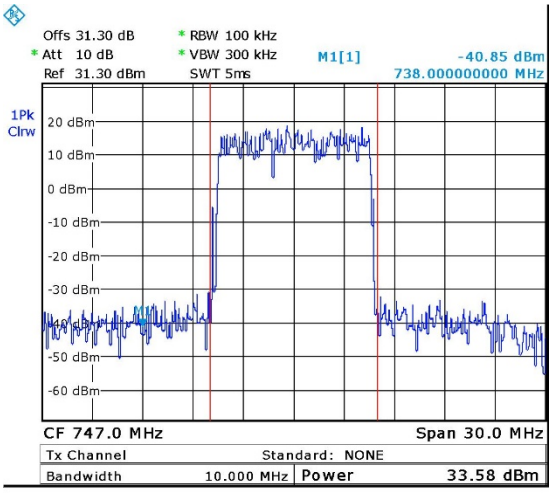

Figure 15. — QPSK 747 MHz

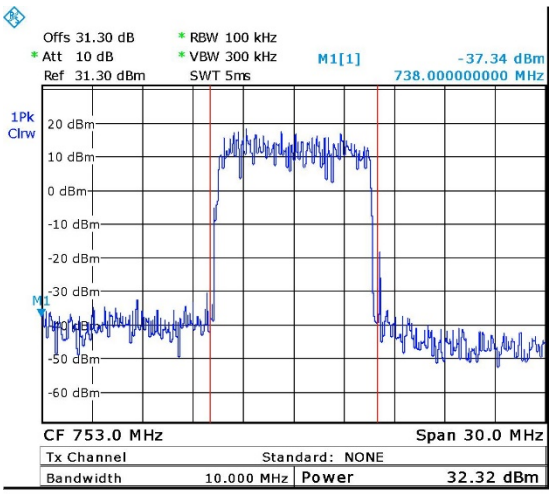

Figure 16. — QPSK 753 MHz

4.4 Test Equipment Used; RF Power Output LTE

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 4, 2015	1 year
Spectrum Analyzer	R&S	FSL6	100194	January 1, 2015	1 year
Vector Signal Generator	Agilent	N5182A	MY48180244	July 16, 2014	1 year
30 dB Attenuator	JFW	50FHC-030-50	43608 46-140-1	March 8, 2015	1 month

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 (loss=31.3 dB). The spectrum analyzer was set to proper resolution B.W. OBW function (99%) was employed for these evaluation.
Occupied bandwidth measured was repeated in the input terminal of the E.U.T.

5.3 Test Results

Modulation	Port	Operating Frequency (MHz)	Reading (MHz)
LTE 64QAM	Input	733	8.98
LTE 64QAM	Output	733	8.92
LTE 64QAM	Input	747	8.98
LTE 64QAM	Output	747	8.98
LTE 64QAM	Input	753	9.04
LTE 64QAM	Output	753	8.98
LTE 16QAM	Input	733	8.98
LTE 16QAM	Output	733	8.92
LTE 16QAM	Input	747	8.98
LTE 16QAM	Output	747	8.98
LTE 16QAM	Input	753	9.04
LTE 16QAM	Output	753	8.98
LTE QPSK	Input	733	8.98
LTE QPSK	Output	733	8.92
LTE QPSK	Input	747	8.98
LTE QPSK	Output	747	8.98
LTE QPSK	Input	753	9.04
LTE QPSK	Output	753	8.98

Figure 18 Occupied Bandwidth LTE

See additional information in *Figure 19* to *Figure 36.*

JUDGEMENT: Passed

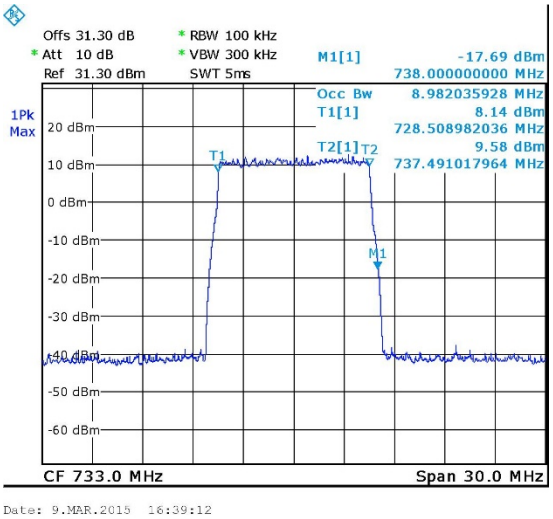

Figure 19. — 64QAM 733 MHz IN

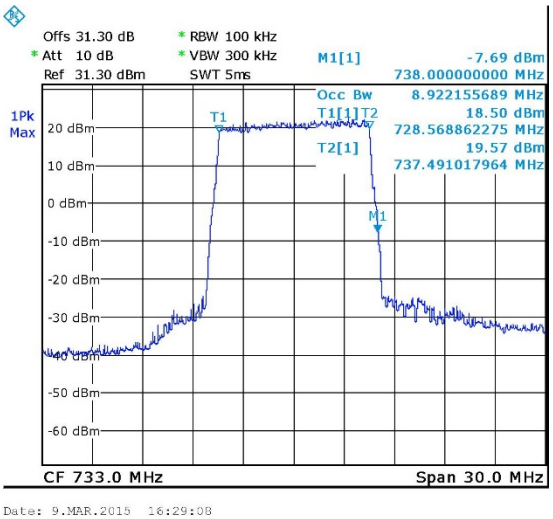

Figure 20. — 64QAM 733 MHz OUT

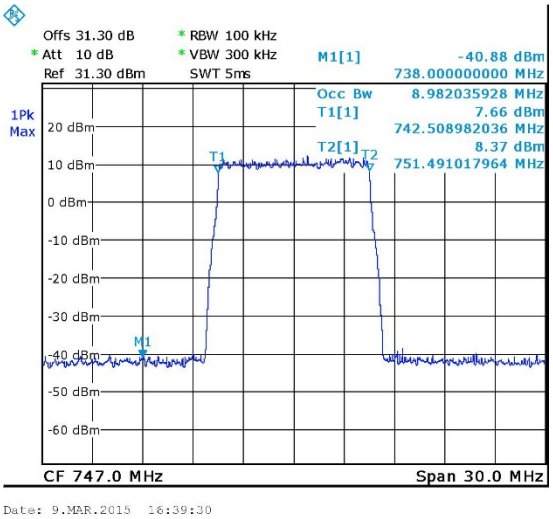

Figure 21. — 64QAM 747 MHz IN

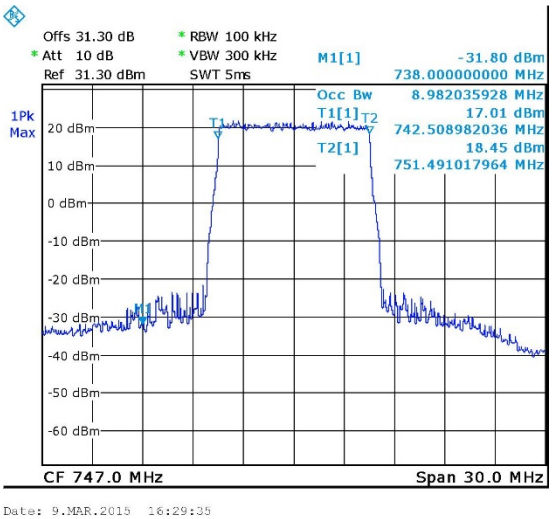

Figure 22. — 64QAM 747 MHz OUT

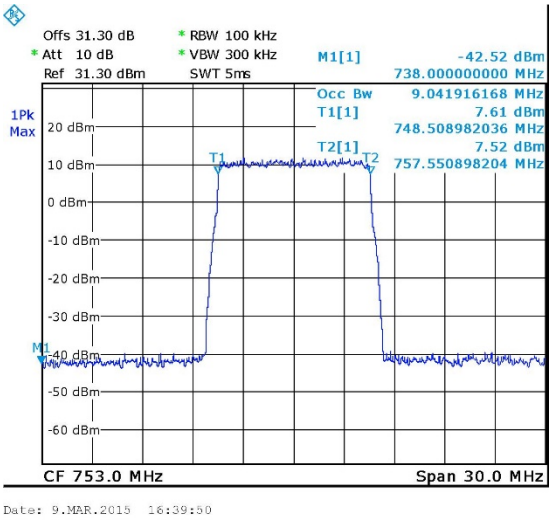

Figure 23. — 64QAM 753 MHz IN

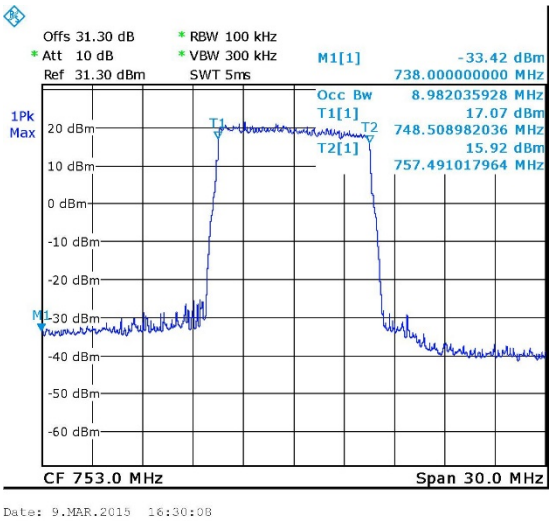

Figure 24. — 64QAM 753 MHz OUT

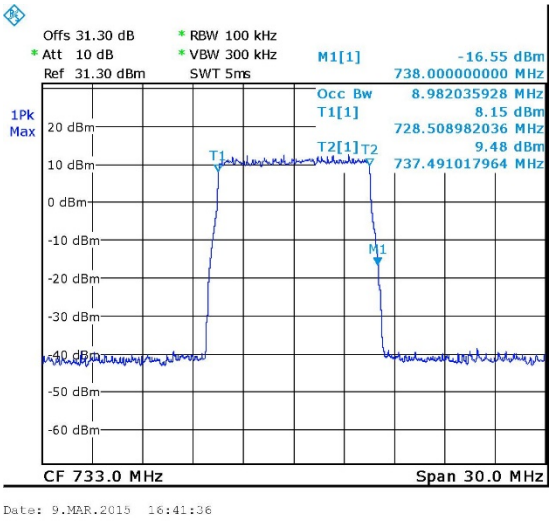

Figure 25. — 16QAM 733 MHz IN

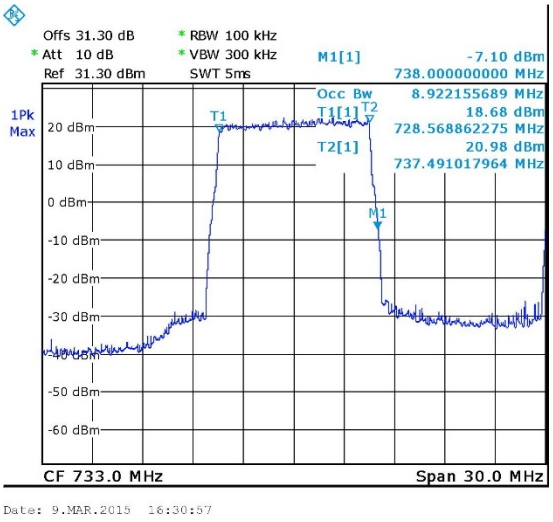

Figure 26. — 16QAM 733 MHz OUT

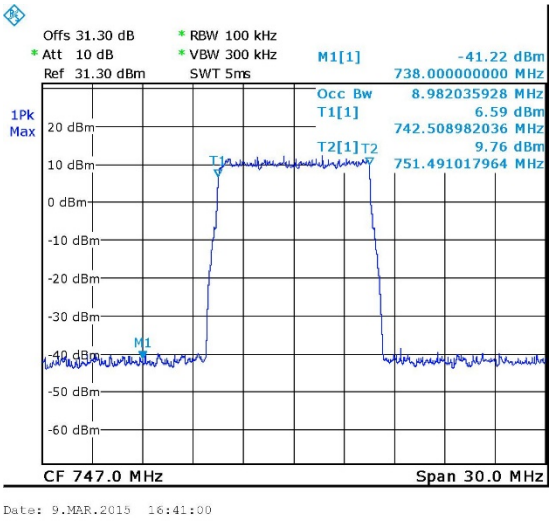

Figure 27. — 16QAM 747 MHz IN

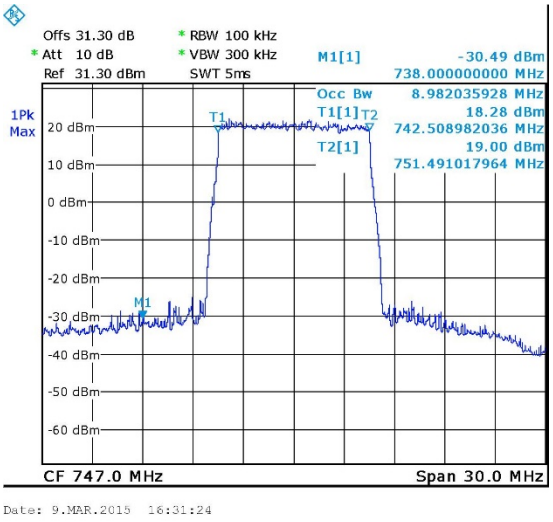

Figure 28. — 16QAM 747 MHz OUT

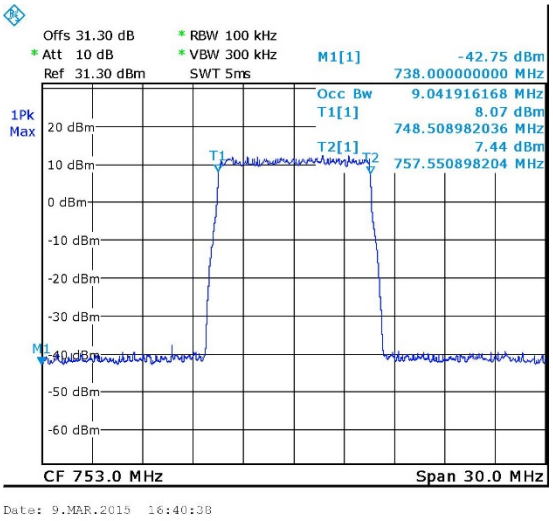

Figure 29. — 16QAM 753 MHz IN

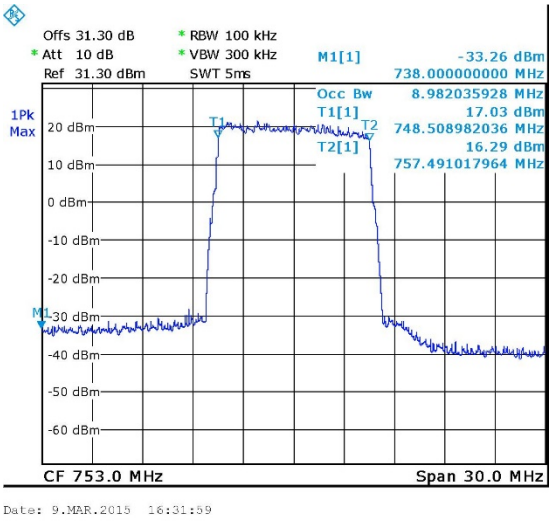

Figure 30. — 16QAM 753 MHz OUT

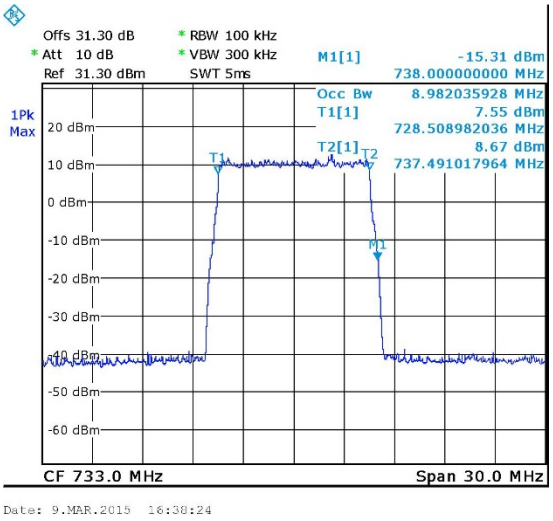

Figure 31. — QPSK 733 MHz IN

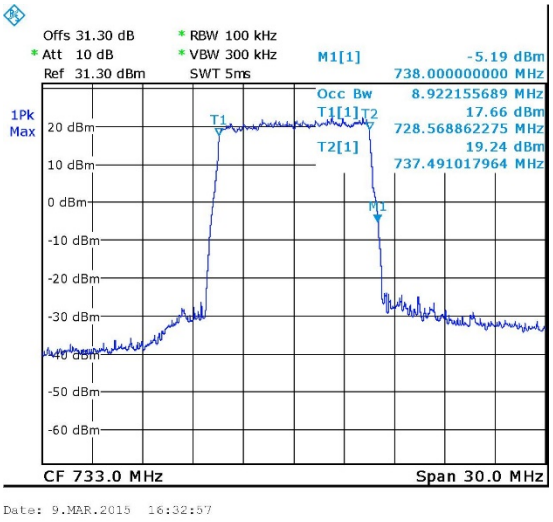

Figure 32. — QPSK 733 MHz OUT

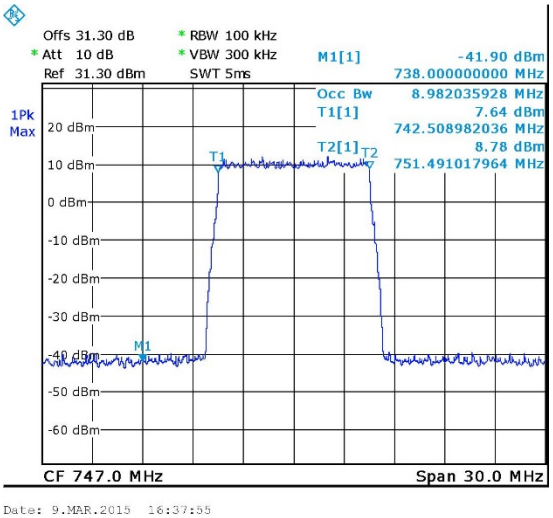

Figure 33. — QPSK 747 MHz IN

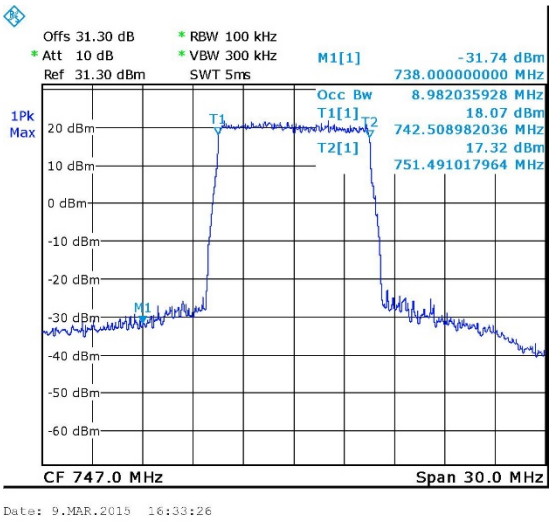

Figure 34. — QPSK 747 MHz OUT

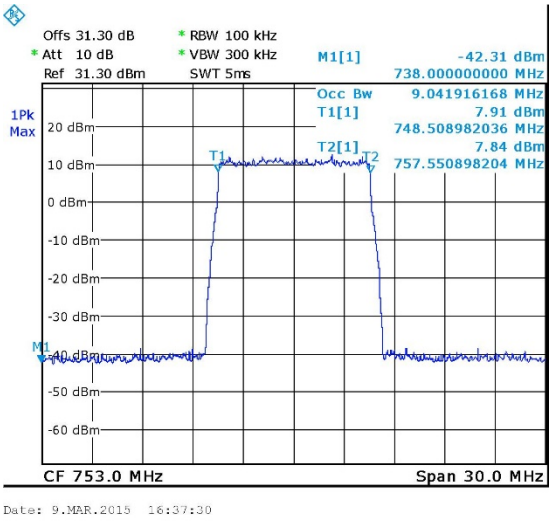

Figure 35. — QPSK 753 MHz IN

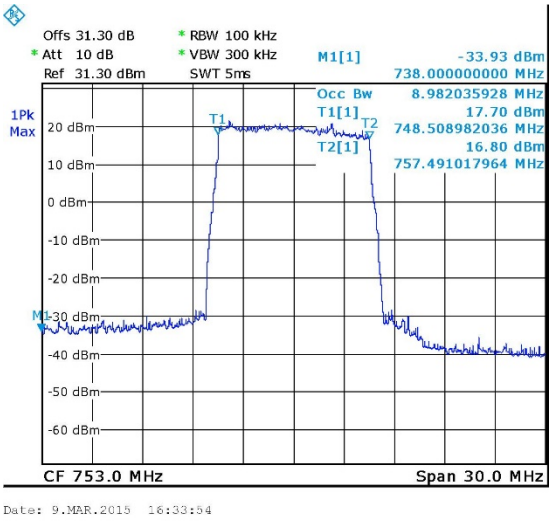

Figure 36. — QPSK 753 MHz OUT

5.4 Test Equipment Used; Occupied Bandwidth LTE

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 4, 2015	1 year
Spectrum Analyzer	R&S	FSL6	100194	January 1, 2015	1 year
Vector Signal Generator	Agilent	N5182A	MY48180244	July 16, 2014	1 year
30 dB Attenuator	JFW	50FHC-030-50	43608 46-140-1	March 8, 2015	1 month

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 (31.3dB). 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 - 10.0 GHz.

6.3 Test Results

See additional information in Figure 38 to *Figure 46*.

JUDGEMENT: Passed

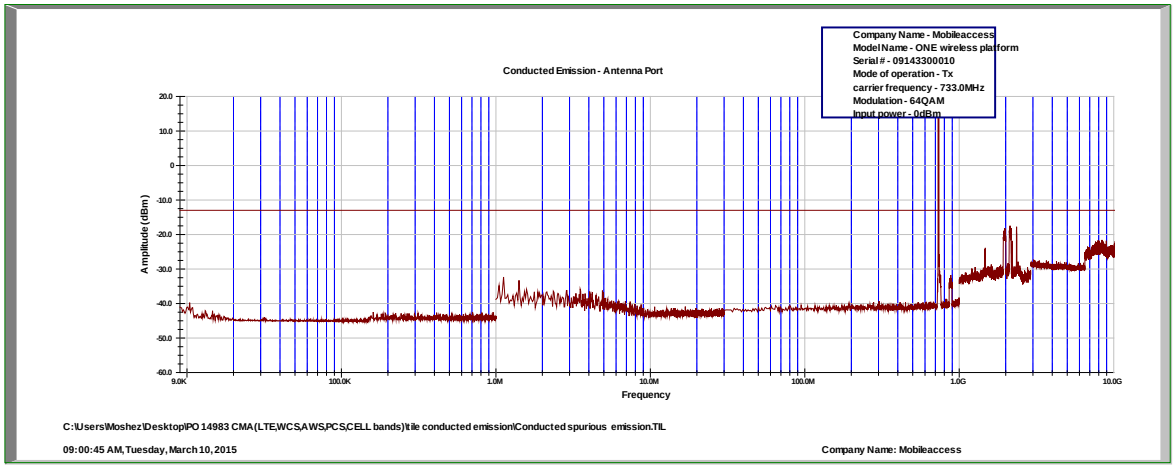

Figure 38 Spurious Emissions at Antenna Terminals 64QAM, 733MHz

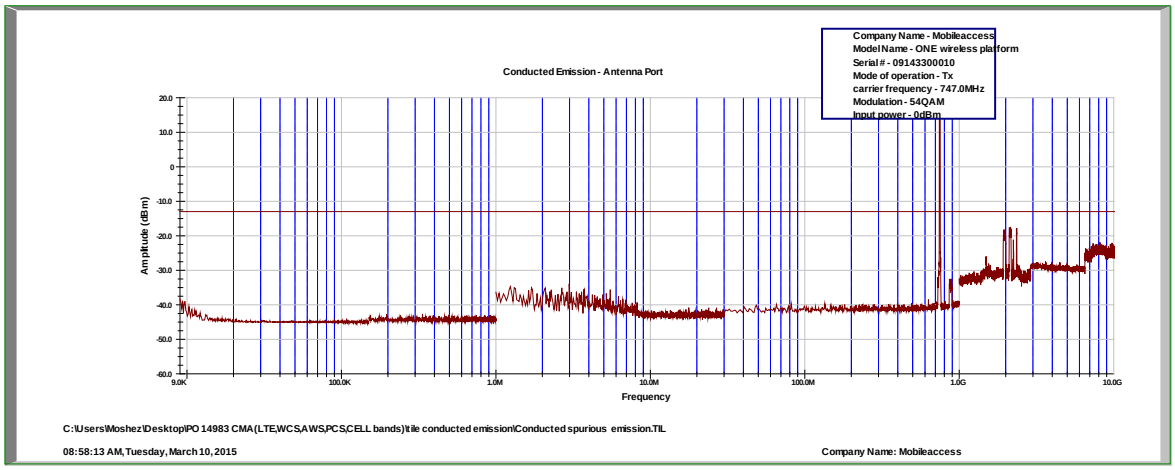

Figure 39 Spurious Emissions at Antenna Terminals 64QAM, 747MHz

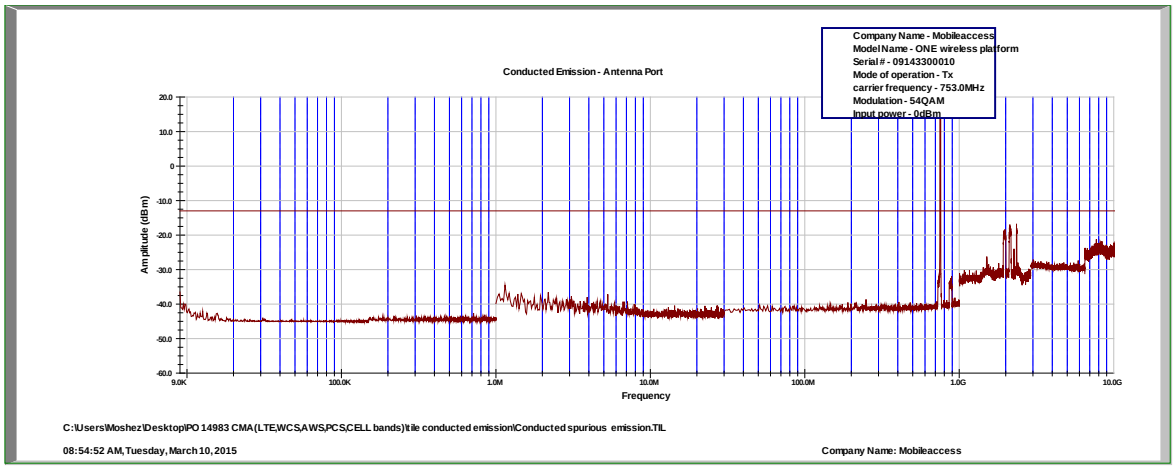

Figure 40 Spurious Emissions at Antenna Terminals 64QAM, 753MHz

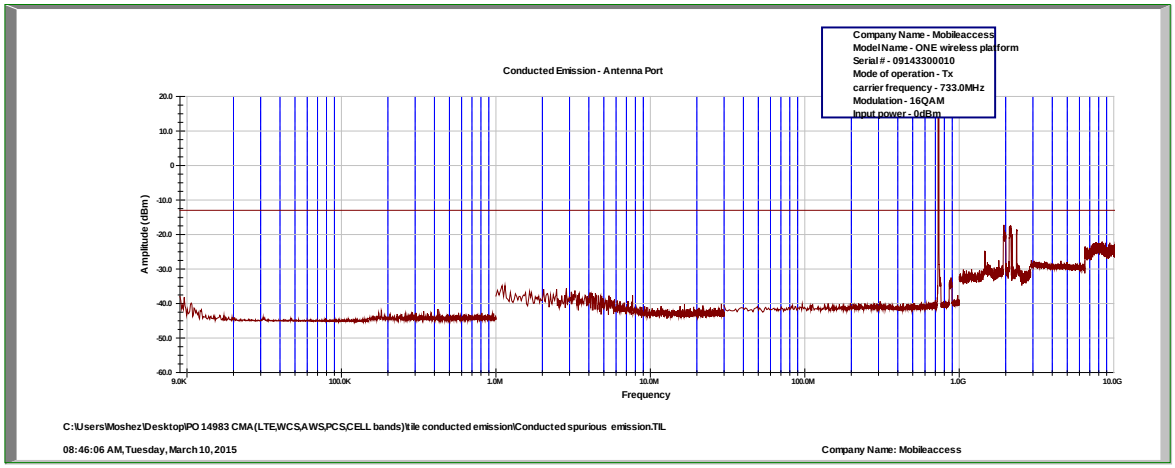

Figure 41 Spurious Emissions at Antenna Terminals 16QAM, 733MHz

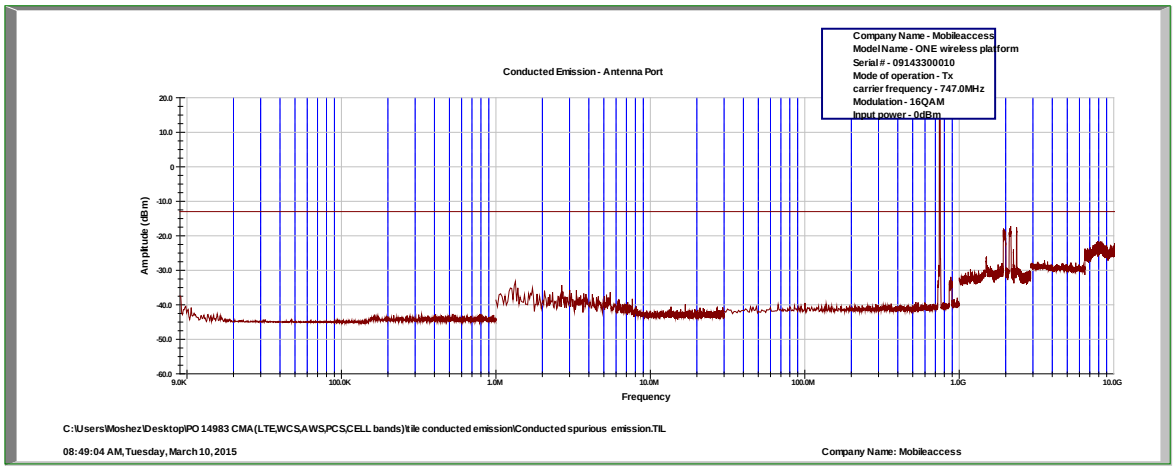

Figure 42 Spurious Emissions at Antenna Terminals 16QAM, 747MHz

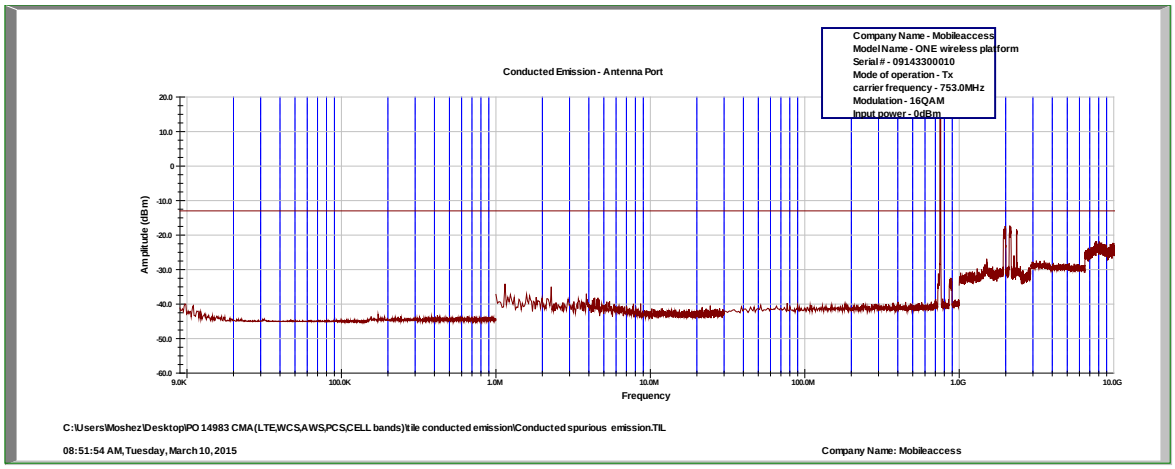

Figure 43 Spurious Emissions at Antenna Terminals 16QAM, 753MHz

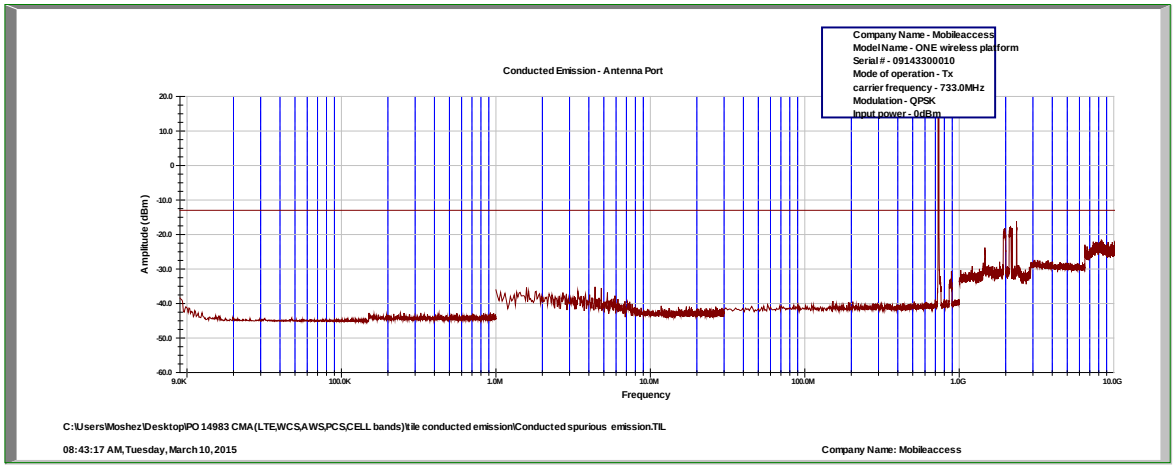

Figure 44 Spurious Emissions at Antenna Terminals QPSK, 733MHz

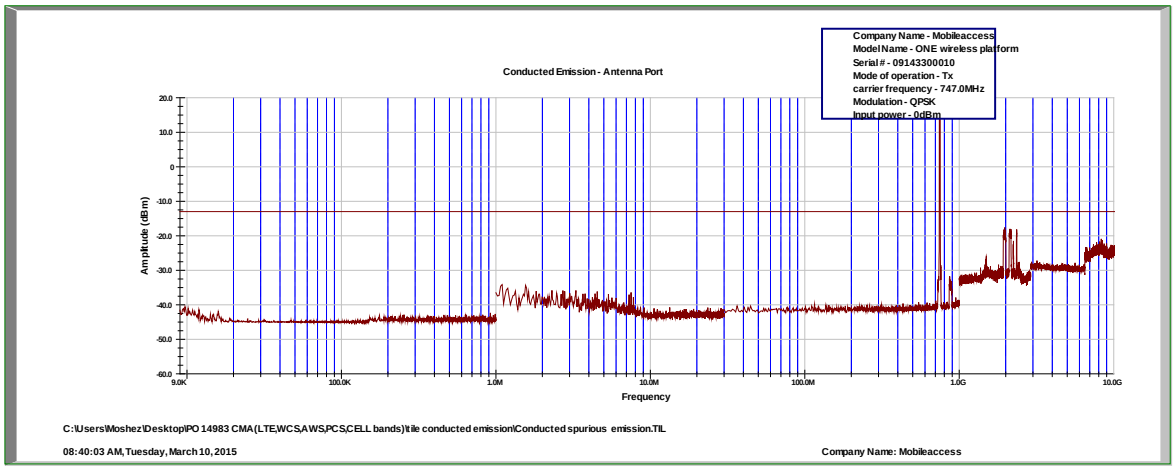

Figure 45 Spurious Emissions at Antenna Terminals QPSK, 747MHz

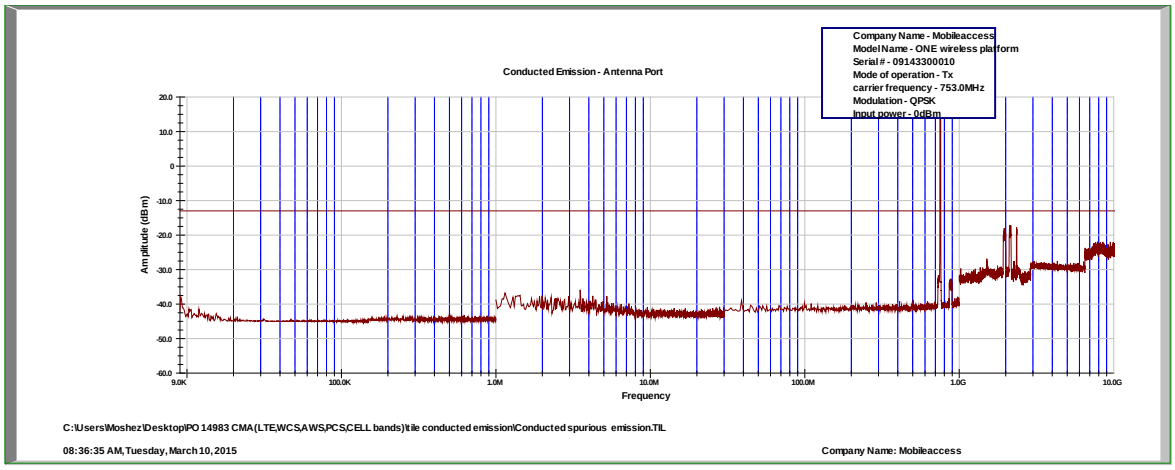

Figure 46 Spurious Emissions at Antenna Terminals QPSK, 753MHz

6.4 Test Equipment Used; Spurious Emissions at Antenna Terminals LTE

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 4, 2015	1 year
Spectrum Analyzer	R&S	FSL6	100194	January 1, 2015	1 year
Vector Signal Generator	Agilent	N5182A	MY48180244	July 16, 2014	1 year
30 dB Attenuator	JFW	50FHC-030-50	43608 46-140-1	March 8, 2015	1 month

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 (31.3 dB).
The spectrum analyzer was set to 30kHz R.B.W.

7.3 Results

	Operation Frequency (MHz)	Band Edge Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
LTE64QAM	733.00	728.00	-16.7	-13.0	-3.7
LTE64QAM	753.00	758.00	-16.6	-13.0	-3.6
LTE16QAM	733.00	728.00	-17.5	-13.0	-4.5
LTE16QAM	753.00	758.00	-17.6	-13.0	-4.6
LTEQPSK	733.00	728.00	-16.9	-13.0	-3.9
LTEQPSK	753.00	758.00	-15.6	-13.0	-2.6

Figure 48 Band Edge Spectrum Results LTE

JUDGEMENT: Passed by 2.6 dB

See additional information in *Figure 49* to *Figure 54.*

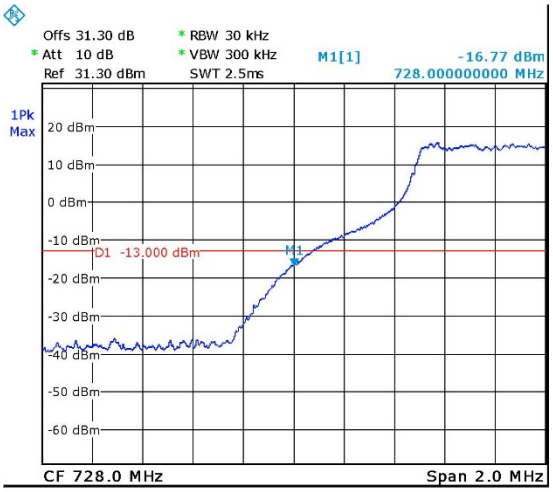

Figure 49.—64QAM 733.0 MHz

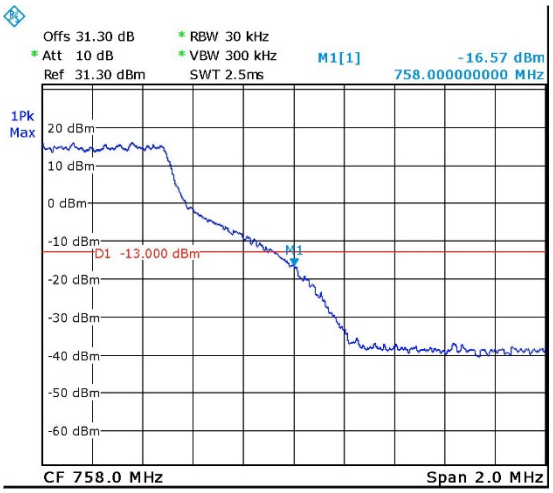

Figure 50. — 64QAM 753.0 MHz

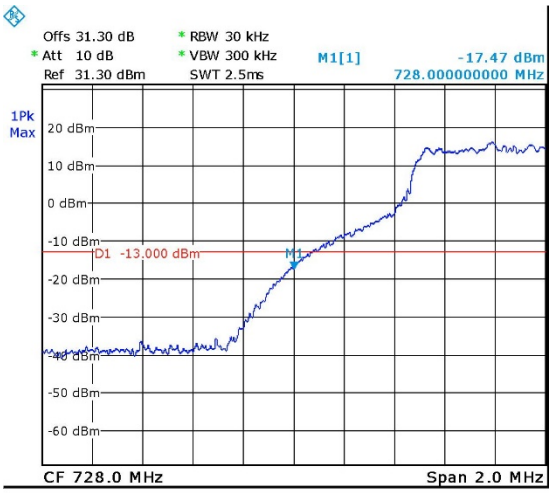

Figure 51.—16QAM 733.0 MHz

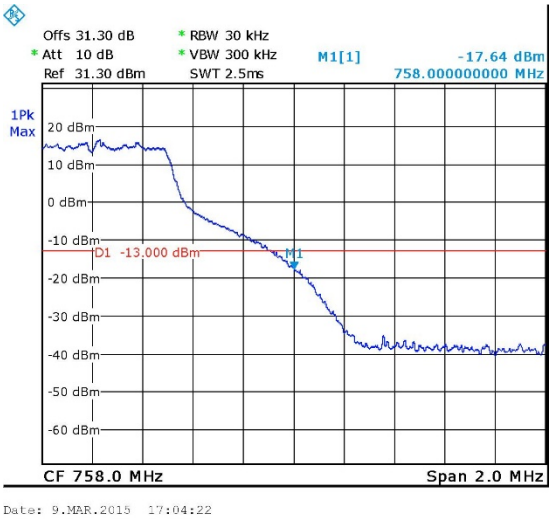

Figure 52. — 16QAM 753.0 MHz

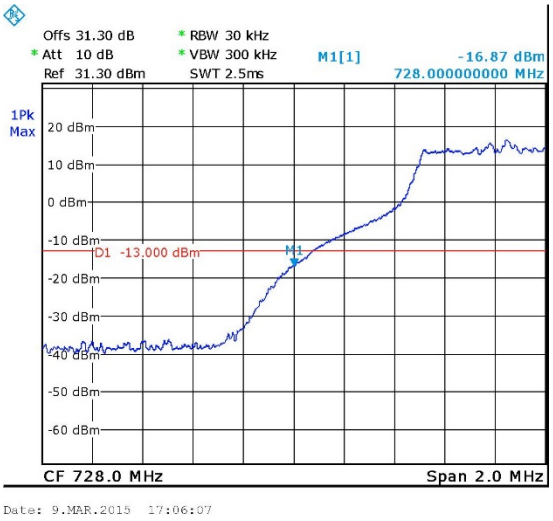

Figure 53. — QPSK 733.0 MHz

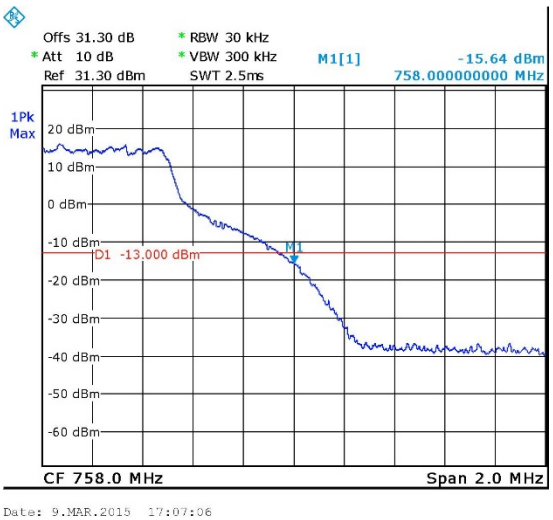

Figure 54. — QPSK 753.0 MHz

7.4 Test Equipment Used; Band Edge Spectrum LTE

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 4, 2015	1 year
Spectrum Analyzer	R&S	FSL6	100194	January 1, 2015	1 year
Vector Signal Generator	Agilent	N5182A	MY48180244	July 16, 2014	1 year
30 dB Attenuator	JFW	50FHC-030-50	43608 46-140-1	March 8, 2015	1 month

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-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_d(dBm) = P_g(dBm) – Cable Loss (dB) + Substitution Antenna Gain (dB)
P_d = Dipole equivalent power (result).
P_g = Signal generator output level.

8.3 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	69.1	-29.9	6.7	7.6	-29.0	-13.00	-16.0
733.00	1466	H	69.9	-29.5	6.7	8.0	-28.2	-13.00	-15.2
747.00	1494	V	69.5	-29.9	6.7	7.6	-29.0	-13.00	-16.0
747.00	1494	H	70.0	-29.5	6.7	8.0	-28.2	-13.00	-15.2
753.00	1506	V	68.9	-30.5	6.7	7.6	-29.2	-13.00	-16.2
753.00	1506	H	69.2	-30.3	6.7	8.0	-29.0	-13.00	-16.0

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 15.2 dB

8.4 Test Instrumentation Used; Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	R&S	ESIB7	100120	December 15, 2014	1 year
Spectrum Analyzer	HP	8592L	3826A01204	March 4, 2015	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	6142	March 14, 2012	3 years*
Horn Antenna	A.R.A	SWH-28	1007	March 30, 2014	2 years
40dB attenuator	Weinschel Engineering	WA-39-40-33	A1323	March 1, 2015	1 year
Signal Generator	HP	E4433B	GB40051245	July 16, 2014	1 year
Signal Generator	MARCONI	2022D	119196015	February 23, 2015	1 year
Signal Generator	HP	E4433B	GB40050702	May 16, 2013	2 years
Signal Generator	HP	E4436B	US39260774	January 7, 2015	2 years
Signal Generator	HP	ESG-4000A	1782	February 24, 2015	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

*Note – Extended to May 19, 2015

Figure 57 Test Equipment Used

9. Intermodulation Conducted

9.1 Test Procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (loss = 31.3dB). 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 - 24.0 GHz.

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

LTE 747 MHz CW 0 dBm

CELL 881 MHz CW 0 dBm

PCS 1960 MHz CW 0 dBm

AWS: 2135 MHz CW 0 dBm

WCS: 2355MHz CW 0 dBm

The frequency range of 9 kHz – 24.0 GHz was scanned for unwanted signals.

9.2 Test Results

See additional information in Figure 58.

JUDGEMENT: Passed

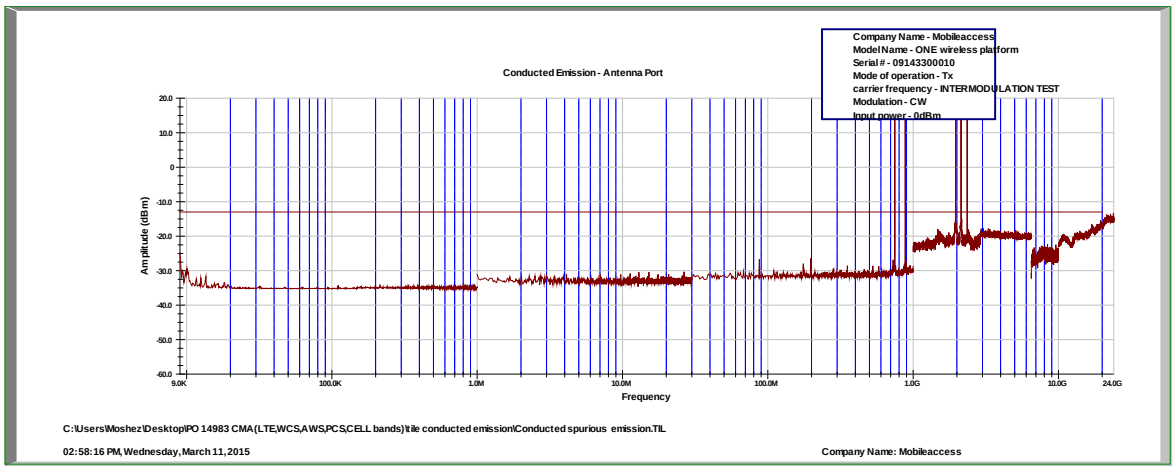

Figure 58 Intermodulation Conducted

9.3 Test Equipment Used; Intermodulation Conducted

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	1118	March 4, 2015	1 year
Spectrum Analyzer	R&S	FSL6	1499	January 1, 2015	1 year
Vector Signal Generator	Agilent	N5182A	MY48180244	July 16, 2014	1 year
Vector Signal Generator	Agilent	N5172B	MY51350518	May 03, 2013	3 years
Vector Signal Generator	Agilent	N5172B	MY51350584	May 07, 2013	3 years
Signal Generator	HP	E4433B	GB40050702	May 16, 2013	2 years
Signal Generator	HP	E4436B	US39260774	January 07 2015	2 years
30 dB Attenuator	JFW	50FHC-030-50	43608 46-140-1	March 8, 2015	1 month

Figure 59 Test Equipment Used

10. Intermodulation Radiated

10.1 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;2350-2360MHz) 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 5 different channels at center frequency of each band at the same time, transmitting at CW signal.

Peak detector was used for this test

(b) The frequency range 9 kHz-24 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.

In the frequency range 7-22.0 GHz, a spectrum analyzer including a low noise amplifier was used. During average measurements, the IF bandwidth was 1 MHz and the video bandwidth was 100 Hz. During peak measurements, the IF bandwidth was 1 MHz and the video bandwidth was 3 MHz.

(c) The E.U.T. was replaced by a substitution antenna (dipole 30MHz-1GHz, Horn Antenna above 1GHz) driven by a signal generator. The height was readjusted for maximum reading. The signal generator level was adjusted to obtain the same reading on the EMI receiver as in step (a).
The signals observed in step (a) were converted to radiated power using:
P_d(dBm) = P_g(dBm) – Cable Loss (dB) + Substitution Antenna Gain (dB)
P_d = Dipole equivalent power (result).
P_g = Signal generator output level.

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

LTE 747 MHz 0 dBm
CELL 881 MHz 0 dBm
PCS 1960 MHz 0 dBm
AWS: 2135 MHz 0 dBm
WCS: 2355MHz CW 0 dBm

A peak detector was used for this test.

10.2 Test Results

JUDGEMENT: Passed

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)
1565.0	V	68.0	-31.9	6.7	7.6	-30.9	-13.0	-17.9
1565.0	H	66.6	-30.7	6.7	8.0	-29.4	-13.0	-16.4
3039.0	V	75.7	-22.0	9.9	8.4	-23.6	-13.0	-10.6
3039.0	H	75.8	-22.8	9.9	9.6	-23.1	-13.0	-10.1
3434.0	V	75.0	-21.1	9.9	8.4	-22.7	-13.0	-9.7
3434.0	H	76.9	-20.8	9.9	9.6	-21.1	-13.0	-8.1
4118.0	V	79.9	-16.3	11.2	9.5	-18.0	-13.0	-5.0
4118.0	H	79.1	-16.6	11.2	8.6	-19.2	-13.0	-6.2
5303.0	V	81.5	-14.0	13.1	9.7	-17.4	-13.0	-4.4
5303.0	H	82.1	-12.8	13.1	10.4	-15.5	-13.0	-2.5
3523.0	V	74.9	-20.0	13.1	9.7	-23.4	-13.0	-10.4
3523.0	H	77.0	-16.8	13.1	10.4	-19.5	-13.0	-6.5
2249.0	V	69.8	-27.6	9.0	7.7	-28.9	-13.0	-15.9
2249.0	H	69.3	-28.4	9.0	8.5	-28.9	-13.0	-15.9
1915.0	V	70.6	-27.1	6.7	7.6	-26.2	-13.0	-13.2
1915.0	H	68.3	-28.6	6.7	8.0	-27.3	-13.0	-14.3
5571.0	V	82.3	-11.7	13.5	9.9	-15.3	-13.0	-2.3
5571.0	H	82.5	-12.4	13.5	10.8	-15.0	-13.0	-2.0
3303.0	V	75.6	-20.1	9.9	8.4	-21.6	-13.0	-8.6
3303.0	H	75.9	-21.5	9.9	9.6	-21.7	-13.0	-8.7

Figure 60 Intermodulation Radiated Results

10.3 Test Instrumentation Used; Radiated Measurements Intermodulation

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	R&S	ESIB7	100120	December 15, 2014	1 year
Spectrum Analyzer	HP	8592L	3826A01204	March 4, 2015	1 year
Active Loop Antenna	EMCO	6502	2950	November 4, 2014	1 year
Biconical Log Antenna	EMCO	3142B	1078	May 22, 2014	2 years
Horn Antenna	ETS	3115	6142	March 14, 2012	3 years*
Horn Antenna	A.R.A	SWH-28	1007	March 30, 2014	2 years
40dB attenuator	Weinschel Engineering	WA 39-40-33	A1323	March 1, 2015	1 year
Signal Generator	HP	E4433B	GB40051245	July 16, 2014	1 year
Signal Generator	MARCONI	2022D	119196015	February 23, 2015	1 year
Signal Generator	HP	E4433B	GB40050702	May 16, 2013	2 years
Signal Generator	HP	E4436B	US39260774	January 7, 2015	2 years
Signal Generator	HP	ESG-4000A	1782	February 24, 2015	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

*Note- Extended to May 19, 2015

Figure 61 Test Equipment Used

11. APPENDIX A - CORRECTION FACTORS

11.1 Correction factors for CABLE

from EMI receiver to test antenna at 3 meter range.

Frequency (MHz)	Cable Loss (dB)	Frequency (MHz)	Cable Loss (dB)
0.010	0.4	50.00	1.2
0.015	0.2	100.00	0.7
0.020	0.2	150.00	20.1
0.030	0.3	200.00	2.3
0.050	0.3	300.00	2.9
0.075	0.3	500.00	3.8
0.100	0.2	750.00	4.8
0.150	0.2	1000.00	5.4
0.200	0.3	1500.00	6.7
0.500	0.4	2000.00	9.0
1.00	0.4	2500.00	9.4
1.50	0.5	3000.00	9.9
2.00	0.5	3500.00	10.2
5.00	0.6	4000.00	11.2
10.00	0.8	4500.00	12.1
15.00	0.9	5000.00	13.1
20.00	0.8	5500.00	13.5
		6000.00	14.5

NOTES:

1. The cable type is SPUMA400 RF-11N(X2) and 39m long

2. The cable is manufactured by Huber + Suhner

11.2 Correction factors for Bilog ANTENNA

Model: 3142
Antenna serial number: 1250
3 meter range

FREQUENCY (MHz)	AFE (dB/m)	FREQUENCY (MHz)	AFE (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		

11.3 Correction factors for Horn ANTENNA

Model: 3115
Antenna serial number: 6142
3 meter range

FREQUENCY (MHz)	Antenna Factor (dB/m)	FREQUENCY (MHz)	Antenna Factor (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		

11.4 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**

11.5 Correction factors forACTIVE 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