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DATE: 07 September 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- CELL/ESMR -PCS-LTE-AWS
(CELL/ESMR Section)**

Tested by: _____

M. Zohar

Approved by: _____

D. Shidlowsky

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This report relates only to items tested.



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Measurement/Technical Report for Corning Optical Communication Wireless ONE- Optical Network Evolution Wireless Platform

FCC ID: OJF1MRU85

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

Equipment type: PCS Licensed Transmitter

Limits used: 47CFR Parts 2, 22, 20, 90

Measurement procedure used is ANSI C63.4-2003.

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

Application for Certification
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TABLE OF CONTENTS

1.	GENERAL INFORMATION	5
1.1	Administrative Information	5
1.2	List of Accreditations	6
1.3	Product Description	7
1.4	Test Methodology	7
1.5	Test Facility	7
1.6	Measurement Uncertainty	7
2.	SYSTEM TEST CONFIGURATION	8
2.1	Justification	8
2.2	EUT Exercise Software	8
2.3	Special Accessories	8
2.4	Equipment Modifications	8
2.5	Configuration of Tested System	9
3.	TEST SET-UP PHOTOS	10
4.	PEAK OUTPUT POWER CELL	13
4.1	Test Specification	13
4.2	Test Procedure	13
4.3	Test Results	13
4.4	Test Equipment Used; Peak Output Power CELL	17
5.	OCCUPIED BANDWIDTH CELL	18
5.1	Test Specification	18
5.2	Test Procedure	18
5.3	Test Results	19
5.4	Test Equipment Used; Occupied Bandwidth CELL	26
6.	SPURIOUS EMISSIONS AT ANTENNA TERMINALS CELL	27
6.1	Test Specification	27
6.2	Test procedure	27
6.3	Test Results	27
6.4	Test Equipment Used; Out of Band Emission at Antenna Terminals CELL	32
7.	BAND EDGE SPECTRUM CELL	33
7.1	Test Specification	33
7.2	Test Procedure	33
7.3	Test Results	33
7.4	Test Equipment Used; Band Edge Spectrum CELL	37
8.	SPURIOUS EMISSIONS (RADIATED) CELL	38
8.1	Test Specification	38
8.2	Test Procedure	38
8.3	Test Results	39
8.4	Test Instrumentation Used, Radiated Measurements CELL	40
9.	PEAK OUTPUT POWER (ESMR)	41
9.1	Test Specification	41
9.2	Test Procedure	41
9.3	Test Results	41
9.4	Test Equipment Used; Peak Power (ESMR)	45
10.	OCCUPIED BANDWIDTH (ESMR)	46
10.1	Test Specification	46
10.2	Test Procedure	46
10.3	Test Results	46
10.4	Test Equipment Used; Occupied Bandwidth (ESMR)	53



11.	SPURIOUS EMISSIONS AT ANTENNA TERMINALS (ESMR) -----	54
11.1	Test Specification	54
11.2	Test Procedure	54
11.3	Test Results	54
11.4	Test Equipment Used; Spurious Emissions at Antenna Terminals (ESMR).....	58
12.	BAND EDGE SPECTRUM ESMR -----	59
12.1	Test Specification	59
12.2	Test procedure	59
12.3	Test Results	59
12.4	Test Equipment Used; Band Edge Spectrum ESMR	63
13.	SPURIOUS EMISSIONS (RADIATED) (ESMR) -----	64
13.1	Test Specification	64
13.2	Test Procedure	64
13.3	Test Results	65
13.4	Test Equipment Used; Spurious Emissions (Radiated) (ESMR)	66
14.	INTERMODULATION CONDUCTED -----	67
14.1	Test Procedure	67
14.2	Test Results	67
14.3	Test Equipment Used; Intermodulation Conducted	69
15.	INTERMODULATION RADIATED -----	70
15.1	Test Procedure	70
15.2	Test Results	71
15.3	Test Instrumentation Used; Radiated Measurements Intermodulation.....	73
16.	APPENDIX A - CORRECTION FACTORS -----	74
16.1	Correction factors for CABLE	74
16.2	Correction factors for Bilog ANTENNA	75
16.3	Correction factors for Horn ANTENNA	76
16.4	Correction factors for Horn ANTENNA	77
16.5	Correction factors for ACTIVE LOOP ANTENNA	78



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:	08.03.2015
Start of Test:	08.03.2015
End of Test:	23.03.2015
Test Laboratory Location:	I.T.L (Product Testing) Ltd. 1 Batsheva St, Lod, Israel 7116002
Test Specifications:	FCC Parts 2, 22, 20,90



1.2 List of Accreditations

The EMC laboratory of I.T.L. is accredited by/registered with the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), FCC Designation Number US1004.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-3006, R-2729, T-1877, G-245.
5. Industry Canada (Canada), IC File No.: 46405-4025; Site No. IC 4025A-1.

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



1.3 Product Description

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

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

1.5 Test Facility

Both conducted and radiated emissions tests were performed at I.T.L.'s testing facility in Lod, Israel. I.T.L.'s EMC Laboratory is accredited by A2LA, certificate No. 1152.01 and its FCC Designation Number is US1004.

1.6 Measurement Uncertainty

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

0.15 – 30 MHz:

Expanded Uncertainty (95% 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

No special accessories were needed in order to achieve compliance.

2.4 Equipment Modifications

No modifications were needed in order to achieve compliance.

2.5 Configuration of Tested System

Product Name	ONE Wireless Platform
Model Name	MRU (Mid Power Remote Unit)
Working voltage	115VAC/48VDC
Mode of operation	Repeater
Modulations	WCDMA, LTE(64QAM), GSM
Frequency Range	CELL: 869MHz-894MHz ESMR:862MHZ-869MHz
Transmit power	30 dBm
Antenna Gain	12.5 dBi
DATA rate	N/A
Modulation BW	CELL: 0.5MHz(GSM), 10MHz(LTE), 5MHz(WCDMA) ESMR: 0.5MHz(GSM), 5MHz(LTE), 5MHz(WCDMA)
Temperature (°C)/ Humidity (%RH)	23°C /32%

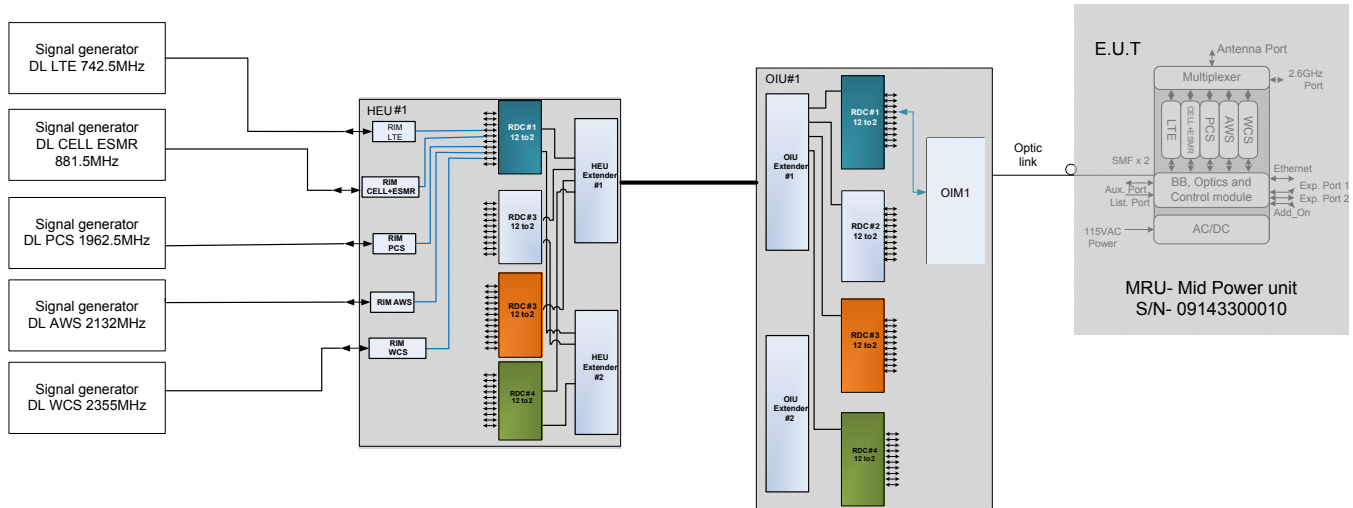


Figure 1. Test Set-up

3. Test Set-up Photos

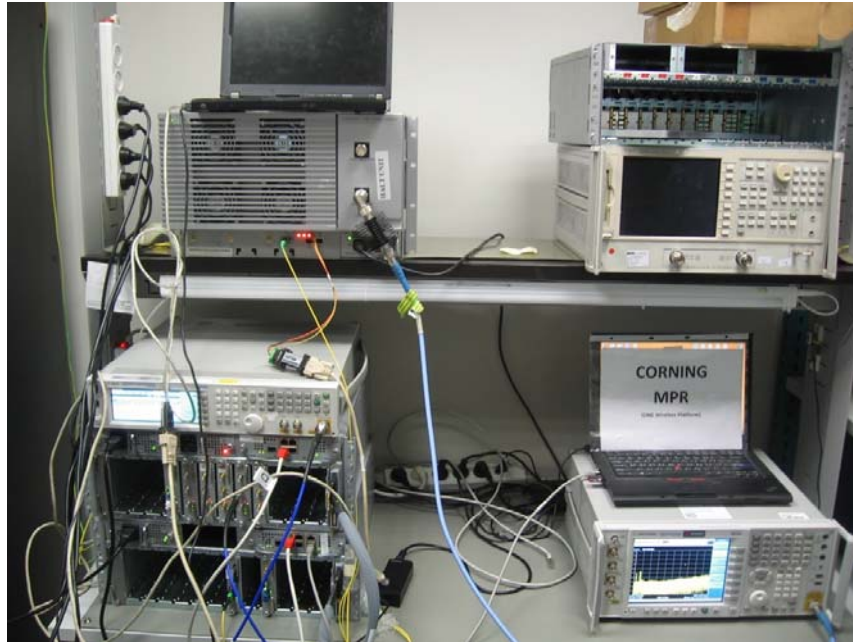


Figure 2. Conducted Emission From Antenna Port Tests



Figure 3. Radiated Emission Test

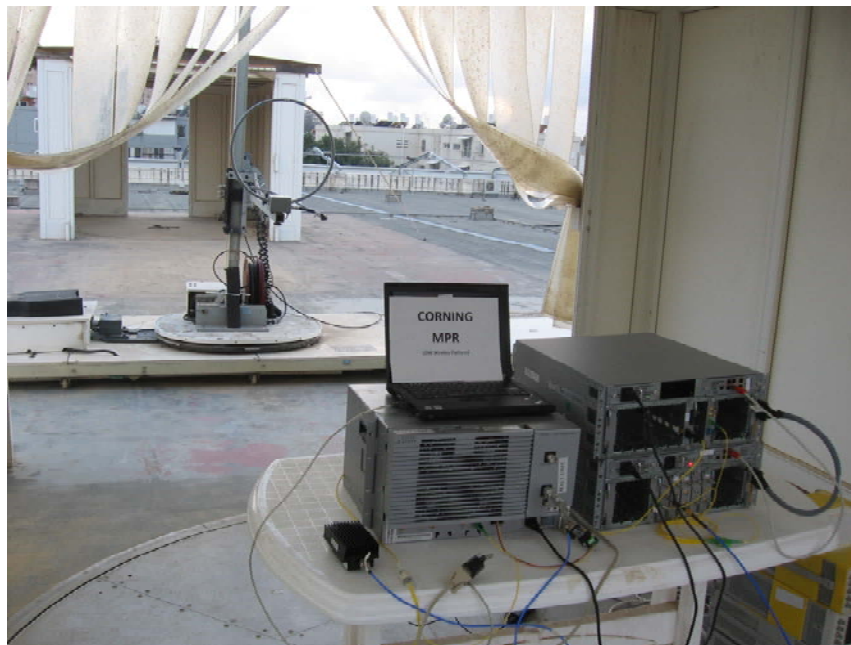


Figure 4. Radiated Emission Test

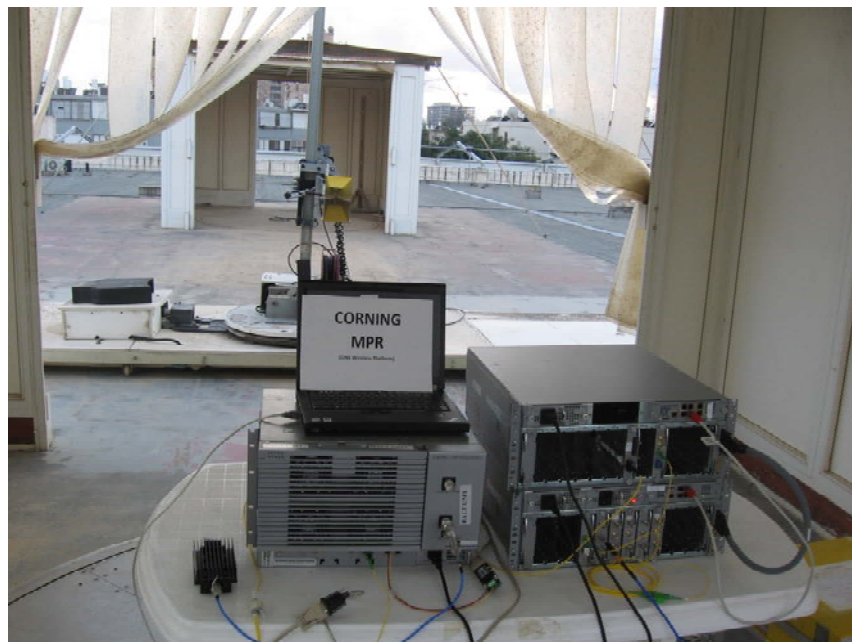


Figure 5. Radiated Emission Test

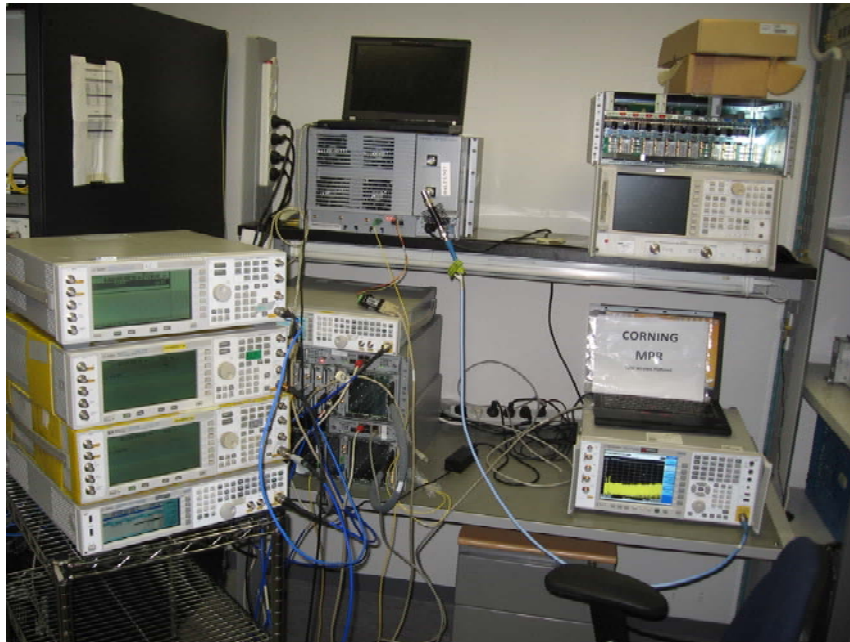


Figure 6. Intermodulation Conducted Emission Test

4. Peak Output Power CELL

4.1 Test Specification

FCC Part 22.913

4.2 Test Procedure

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (loss = 31.3 dB). The E.U.T. RF output was modulated with W-CDMA, GSM and LTE 64QAM. Special attention was taken to prevent Spectrum Analyzer RF input overload.

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

4.3 Test Results

Modulation	Operation Frequency (MHz)	Reading (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Specification (dBm)	Margin (dB)
LTE 64QAM	874.0	32.2	12.5	44.7	57.00	-12.3
	881.0	32.6	12.5	45.1	57.00	-11.9
	889.0	32.1	12.5	44.6	57.00	-12.4
GSM	870.2	30.9	12.5	43.4	57.00	-13.6
	881.0	32.0	12.5	44.5	57.00	-12.5
	892.8	31.0	12.5	43.5	57.00	-13.5
W-CDMA	871.5	32.6	12.5	45.1	57.00	-11.9
	881.0	32.7	12.5	45.2	57.00	-11.8
	891.5	33.0	12.5	45.5	57.00	-11.5

Figure 7 Peak Output Power CELL

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

JUDGEMENT: Passed by 11.5 dB

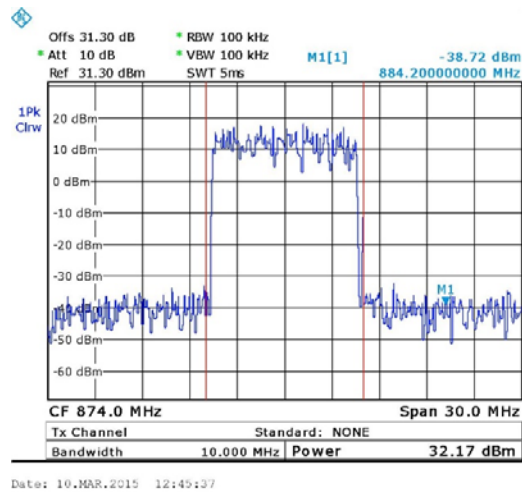


Figure 8. — LTE 64QAM - 874.00 MHz

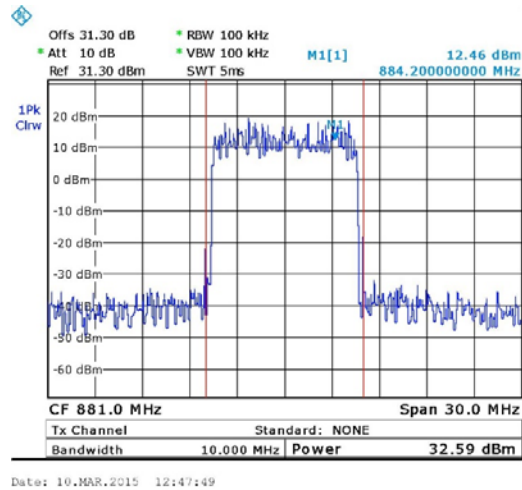


Figure 9. — LTE 64QAM - 881.00 MHz

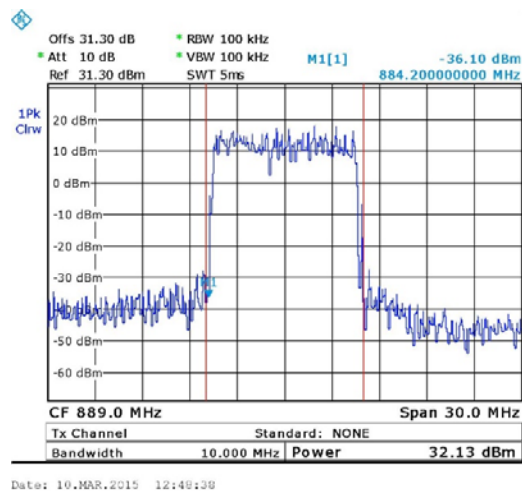
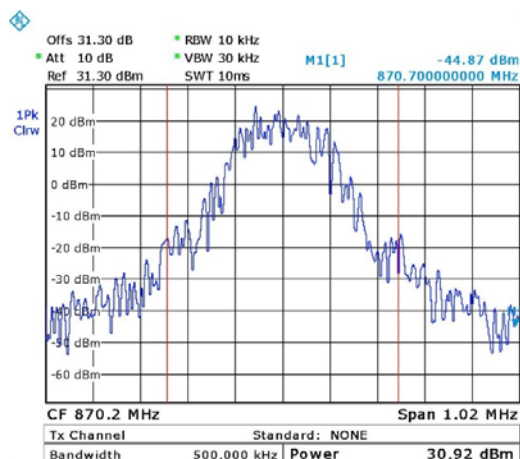
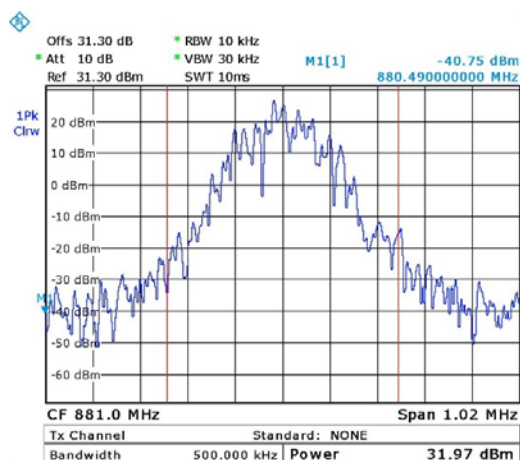


Figure 10. — LTE 64QAM - 889.0 MHz



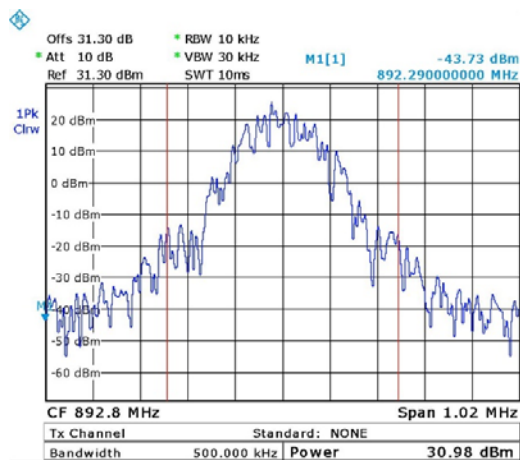
Date: 10.MAR.2015 12:50:54

Figure 11. — GSM - 870.20 MHz



Date: 10.MAR.2015 12:51:26

Figure 12. — GSM - 881.00 MHz



Date: 10.MAR.2015 12:52:31

Figure 13. — GSM - 892.80 MHz

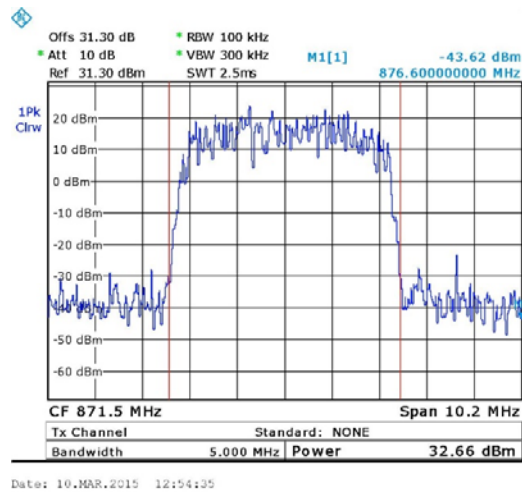


Figure 14. — W-CDMA - 871.50 MHz

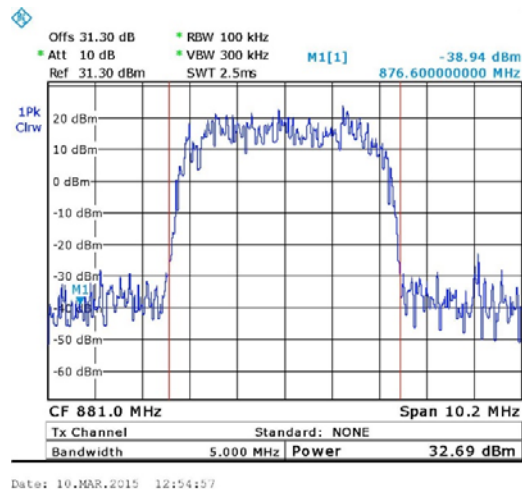


Figure 15. — W-CDMA - 881.00 MHz

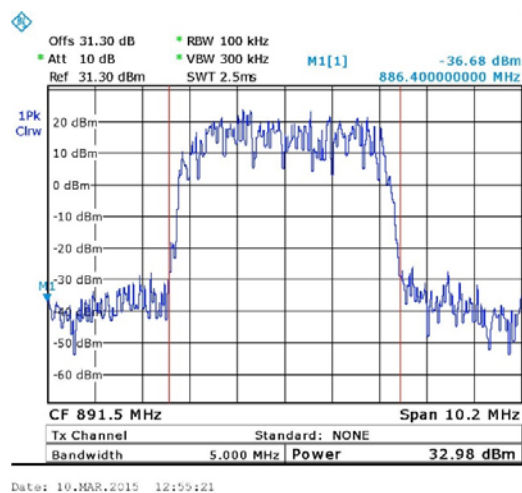


Figure 16. — W-CDMA - 891.50 MHz



4.4 Test Equipment Used; Peak Output Power CELL

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
Signal Generator	Agilent	N5172B	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 CELL

5.1 Test Specification

FCC Part 2, Section 1049

5.2 Test Procedure

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

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (at the output test) and an appropriate coaxial cable (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		Operating Frequency (MHz)	Reading (MHz)
LTE 64QAM	Input	874.0	8.98
LTE 64QAM	Output	874.0	8.98
LTE 64QAM	Input	881.0	8.98
LTE 64QAM	Output	881.0	8.98
LTE 64QAM	Input	889.0	8.94
LTE 64QAM	Output	889.0	8.94
GSM	Input	870.2	0.24
GSM	Output	870.2	0.24
GSM	Input	881.0	0.24
GSM	Output	881.0	0.24
GSM	Input	892.8	0.24
GSM	Output	892.8	0.24
W-CDMA	Input	871.5	4.17
W-CDMA	Output	871.5	4.17
W-CDMA	Input	881.0	4.17
W-CDMA	Output	881.0	4.19
W-CDMA	Input	891.5	4.17
W-CDMA	Output	891.5	4.17

Figure 18 Occupied Bandwidth CELL

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

JUDGEMENT: Passed

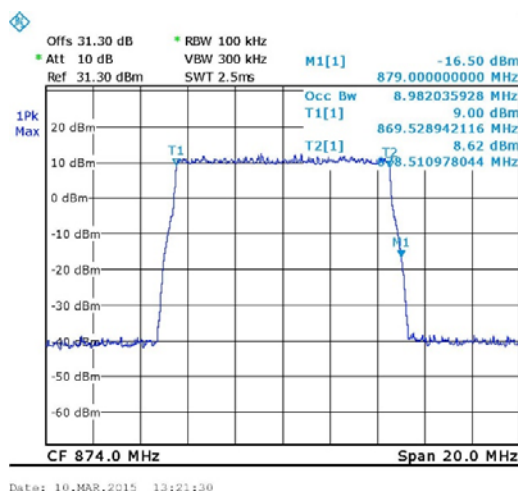


Figure 19. — LTE 64QAM Input 874.0MHz

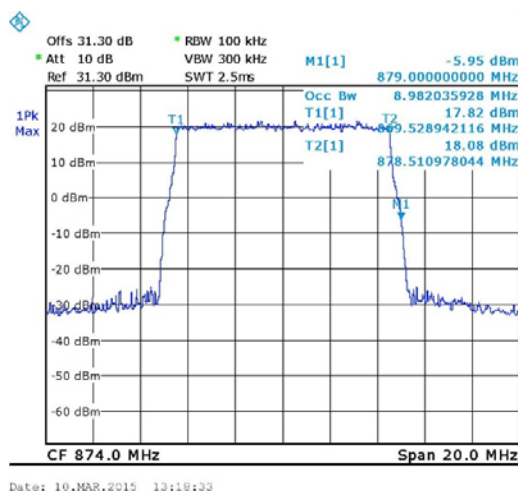


Figure 20. — LTE 64QAM Output 874.0MHz

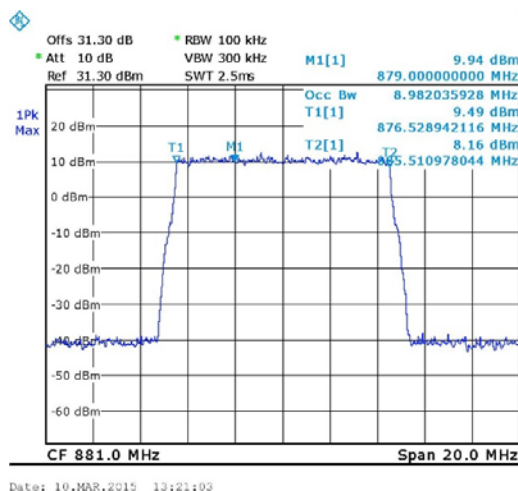


Figure 21. — LTE 64QAM Input 881.0 MHz

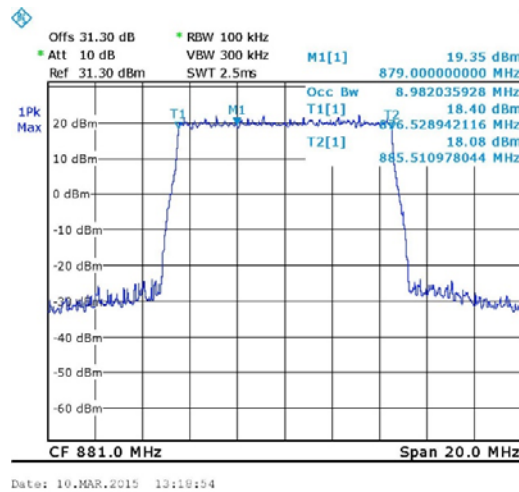


Figure 22. — LTE 64QAM Output 881.0MHz

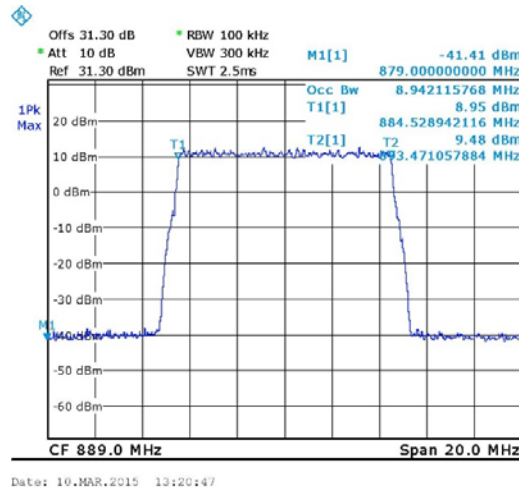


Figure 23. — LTE 64QAM Input 889.00 MHz

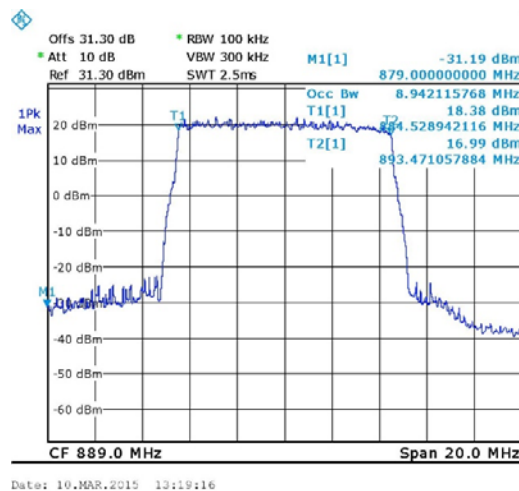


Figure 24. — LTE 64QAM Output 889.00 MHz

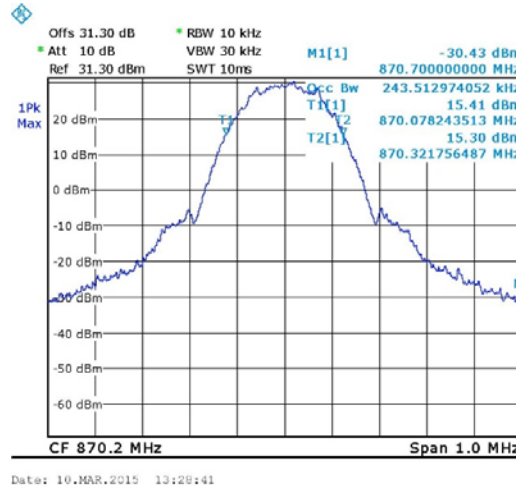


Figure 25. — GSM - Input 870.20MHz

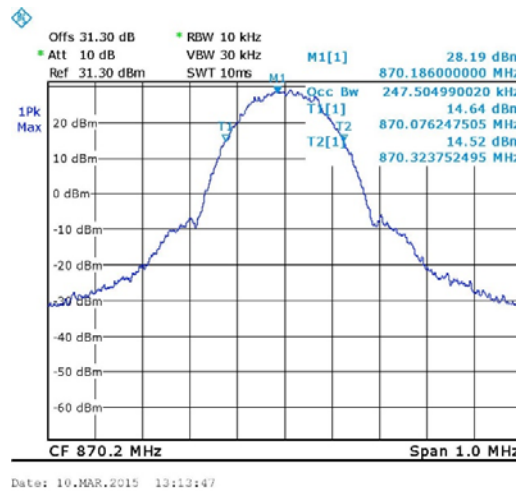


Figure 26. — GSM - Output 870.20MHz

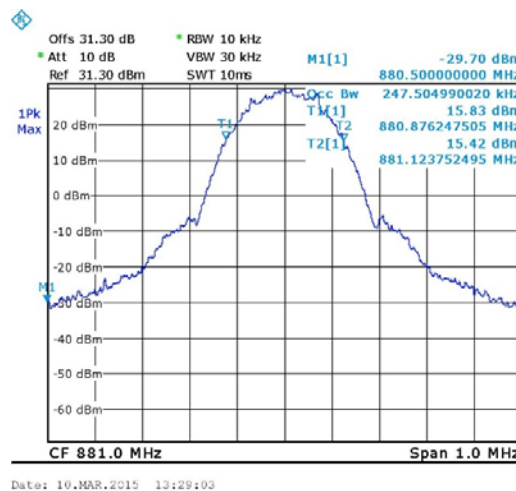


Figure 27. — GSM - Input 881.0 MHz

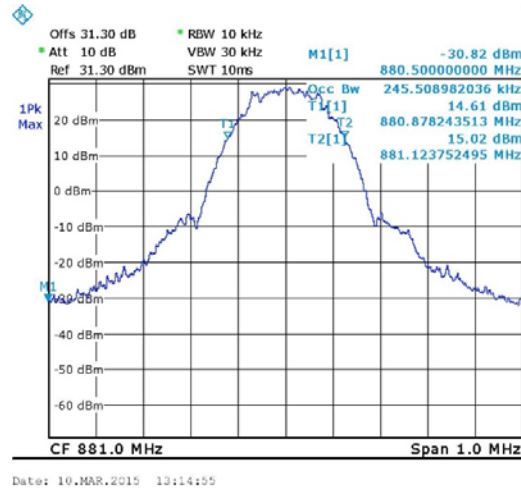


Figure 28. — GSM - Output 881.0MHz

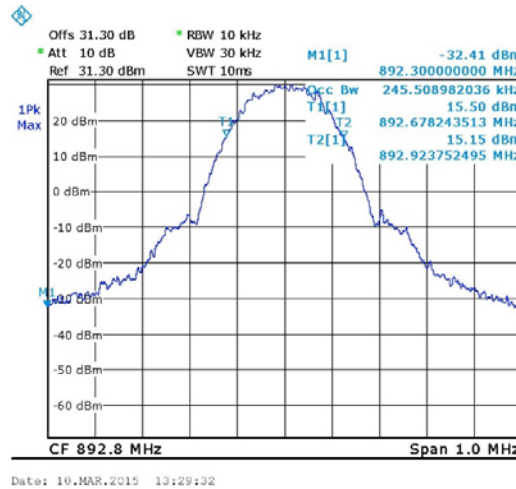


Figure 29. — GSM - Input 892.8 MHz

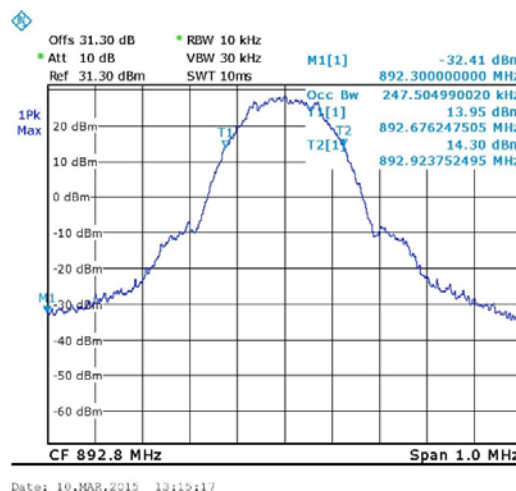


Figure 30. — GSM - Output 892.8 MHz

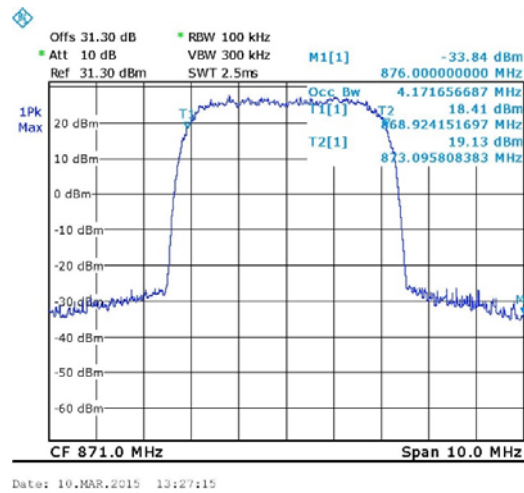


Figure 31. — W-CDMA - Input 871.50MHz

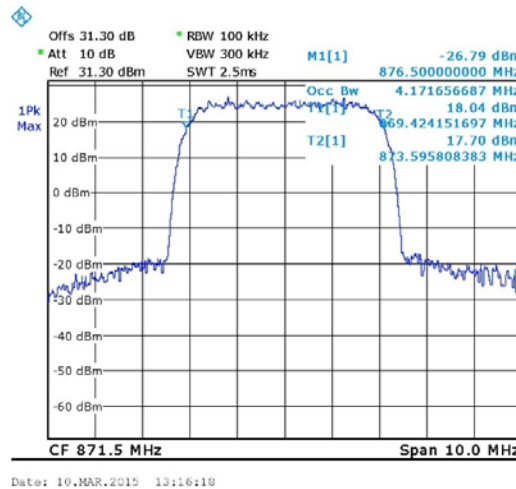


Figure 32. — W-CDMA - Output 871.50MHz

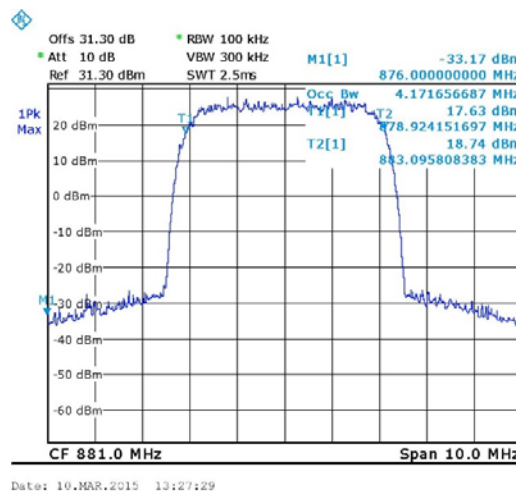


Figure 33. — W-CDMA - Input 881.0 MHz

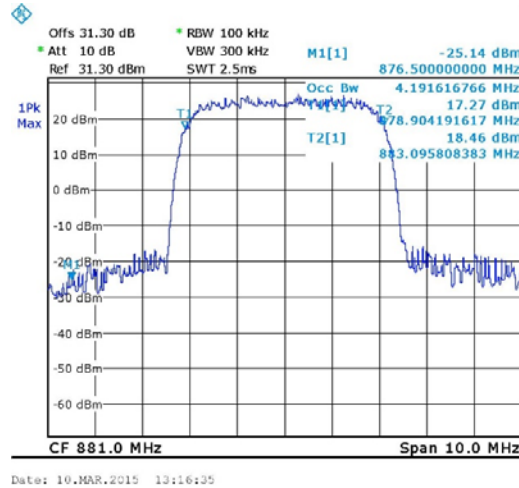


Figure 34. — W-CDMA - Output 881.0MHz

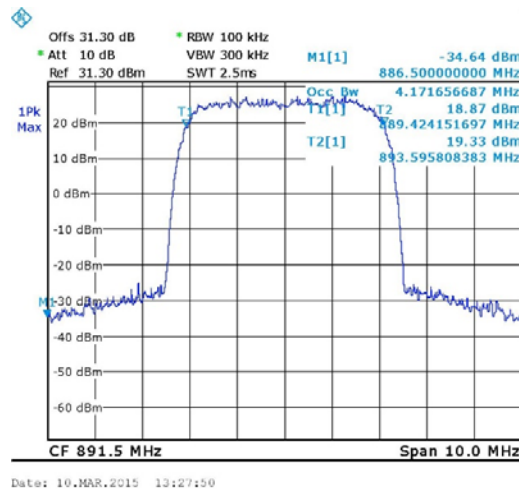


Figure 35. — W-CDMA - Input 891.50 MHz

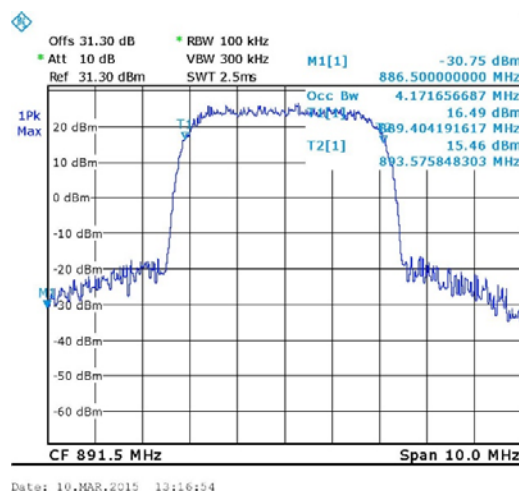


Figure 36. — W-CDMA - Output 891.50 MHz



5.4 Test Equipment Used; Occupied Bandwidth CELL

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
Signal Generator	Agilent	N5172B	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 CELL

6.1 Test Specification

FCC Part 22, Section 917; FCC Part 2.1051

6.2 Test procedure

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

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

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

6.3 Test Results

JUDGEMENT: Passed

See additional information in Figure 38 to Figure 46.

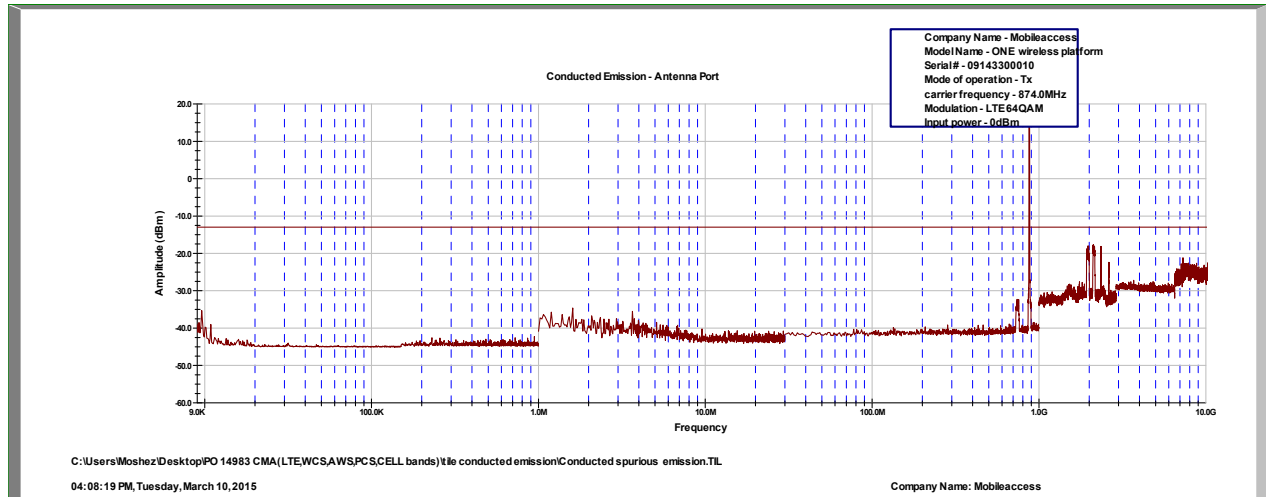


Figure 38. — LTE 64QAM - 874.0 MHz

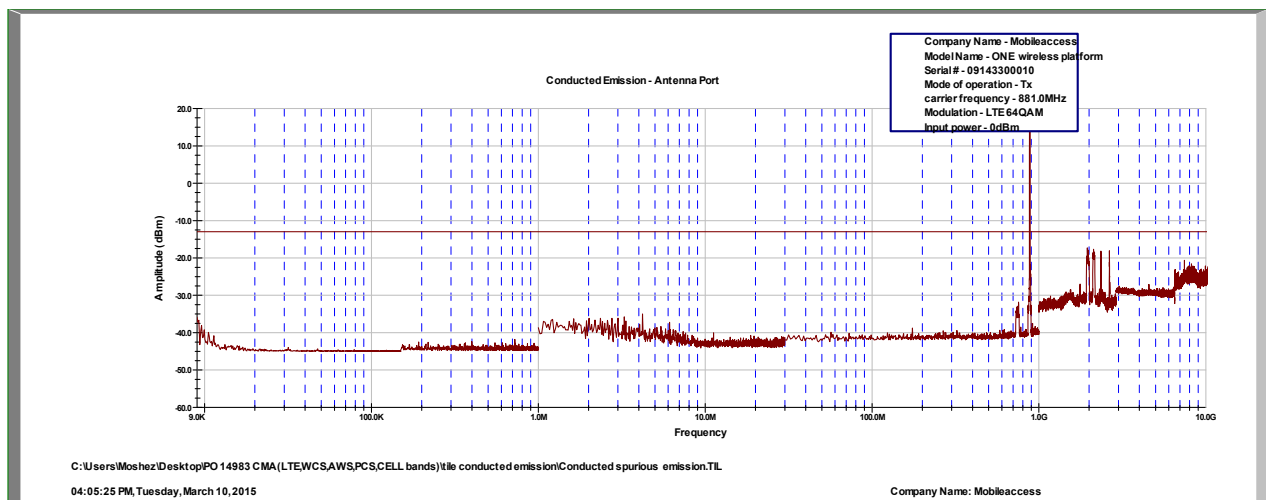


Figure 39. — LTE 64QAM - 881.0 MHz

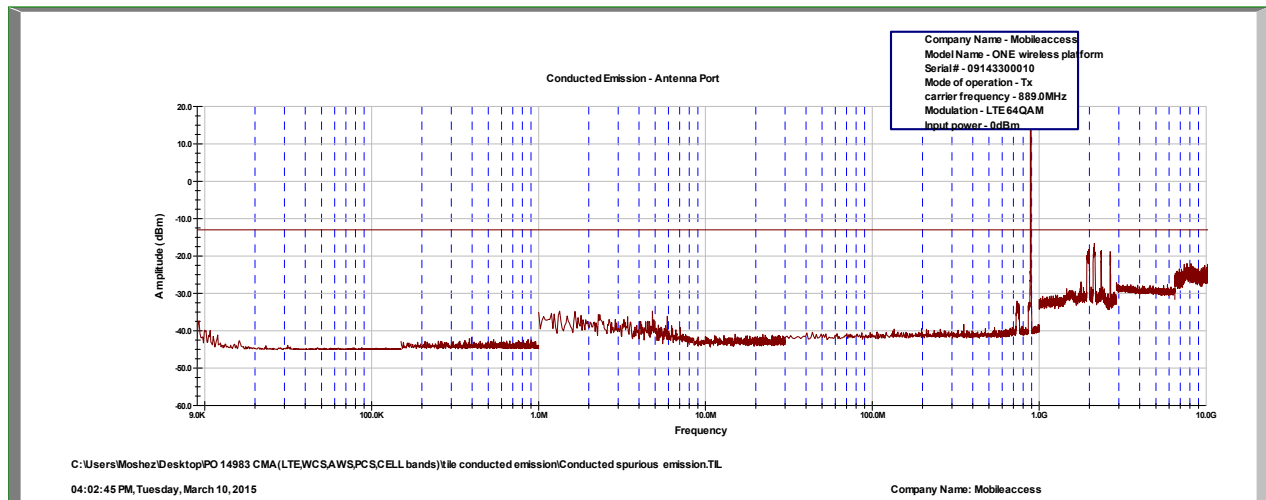


Figure 40. — LTE 64QAM - 889.0 MHz

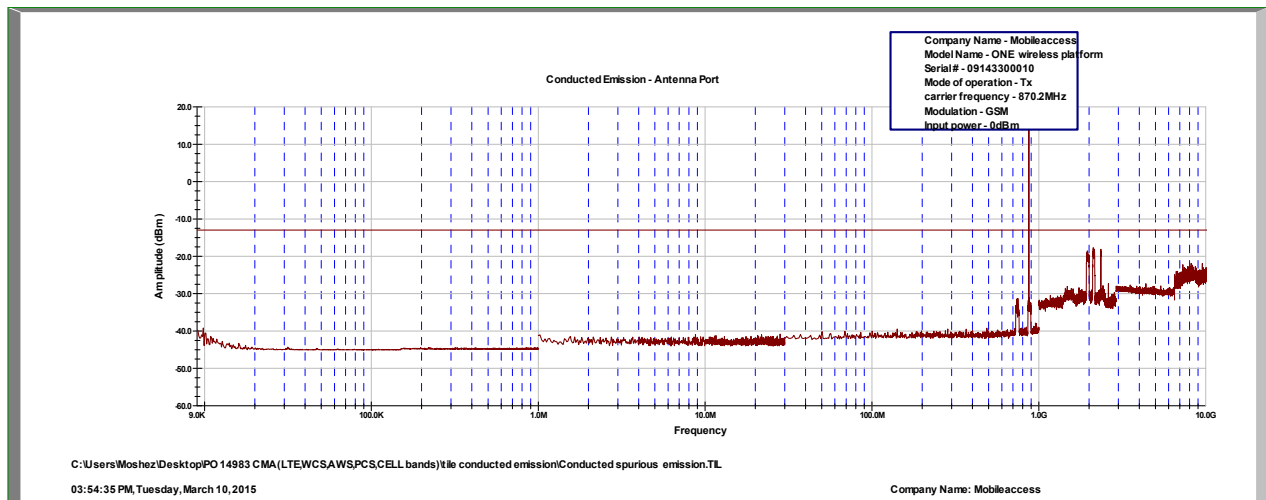


Figure 41. — GSM - 870.2 MHz

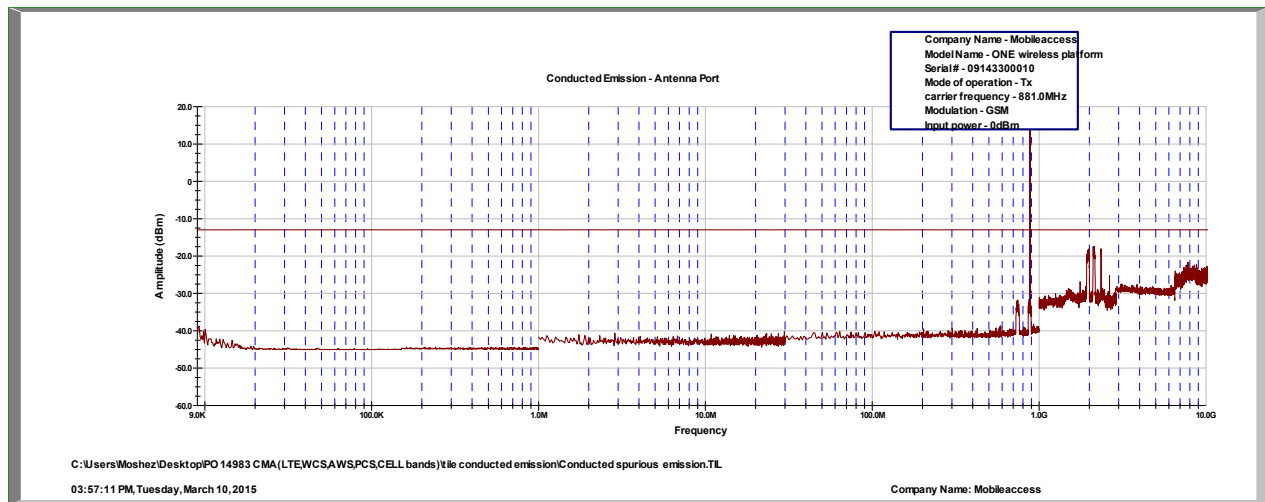


Figure 42. — GSM - 881.0 MHz

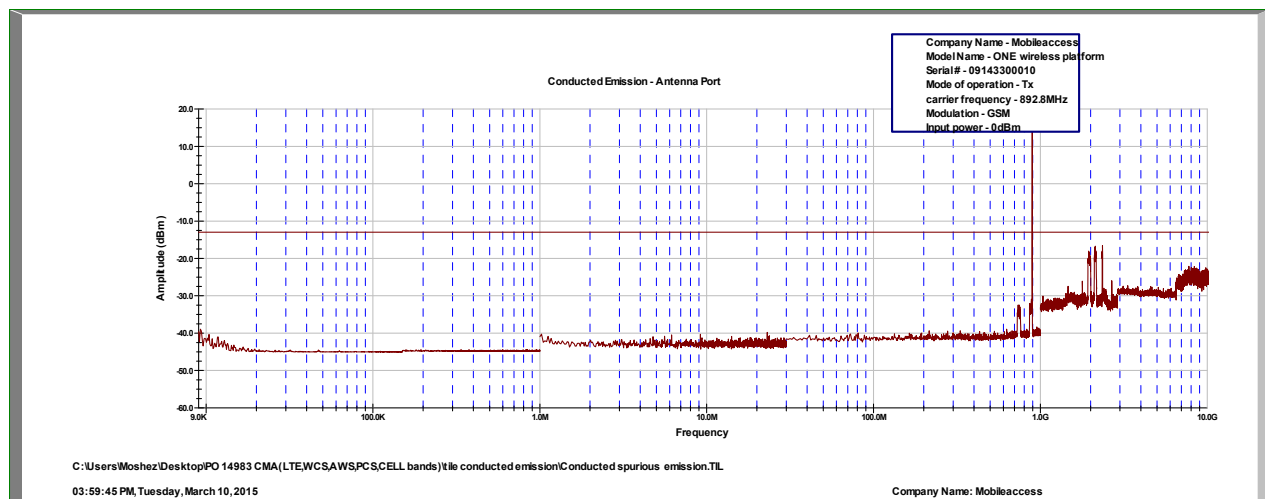


Figure 43. — GSM - 892.8 MHz

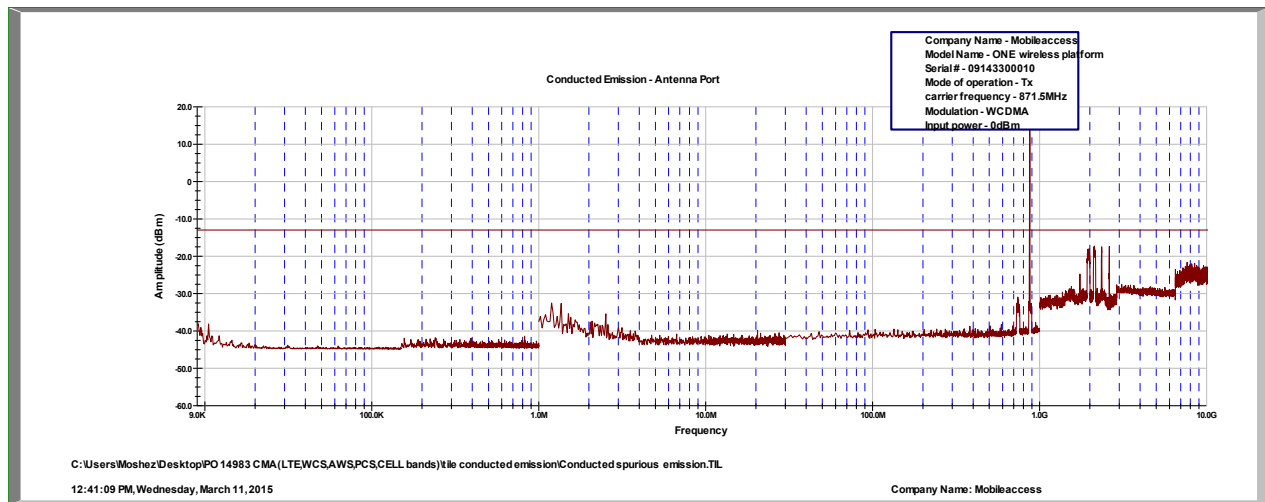


Figure 44. — W-CDMA - 871.5 MHz

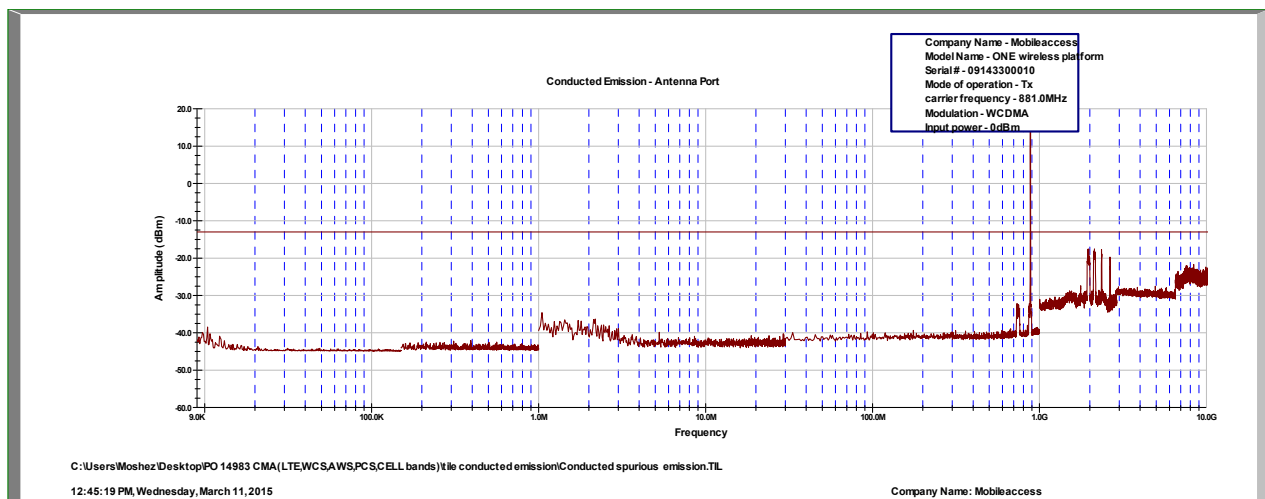


Figure 45. — W-CDMA - 881.0 MHz

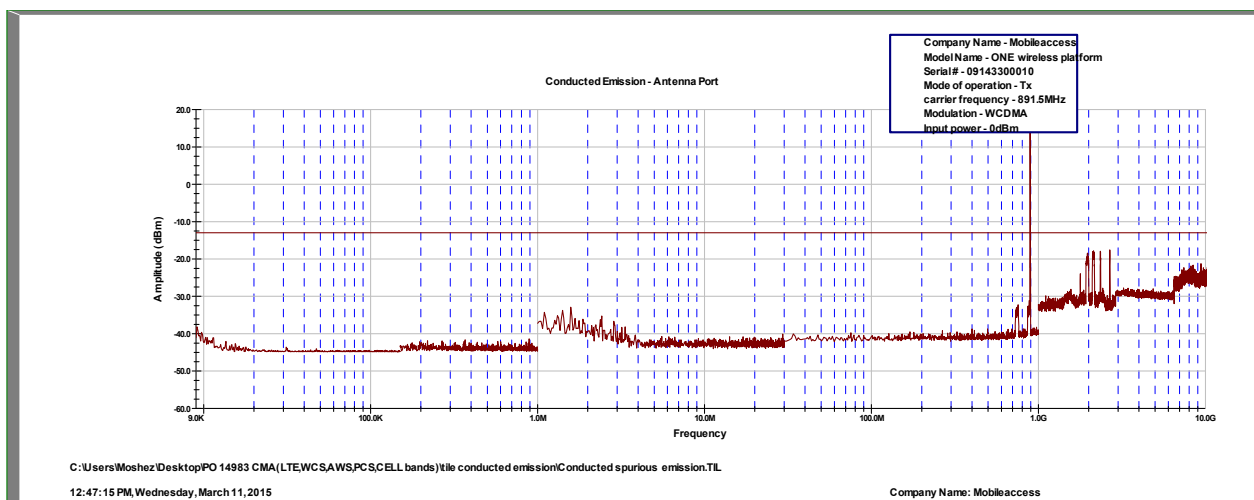


Figure 46. — W-CDMA - 891.5 MHz

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

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 4, 2015	1 year
Spectrum Analyzer	R&S	FSL6	100194	January 1, 2015	1 year
Signal Generator	Agilent	N5172B	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 CELL

7.1 Test Specification

FCC Part 22, FCC Part 2.1051

7.2 Test Procedure

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

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

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

7.3 Test Results

Modulation	Operation Frequency (MHz)	Band Edge Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
LTE 64QAM	874.00	869.00	-24.4	-13.0	-11.4
	889.00	894.00	-22.9	-13.0	-9.9
GSM	870.20	869.00	-29.9	-13.0	-16.9
	892.80	894.00	-27.8	-13.0	-14.8
W-CDMA	871.50	869.00	-19.3	-13.0	-6.3
	891.50	894.00	-17.5	-13.0	-4.5

Figure 48 Band Edge Spectrum Results CELL

JUDGEMENT: Passed by 4.5dB

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

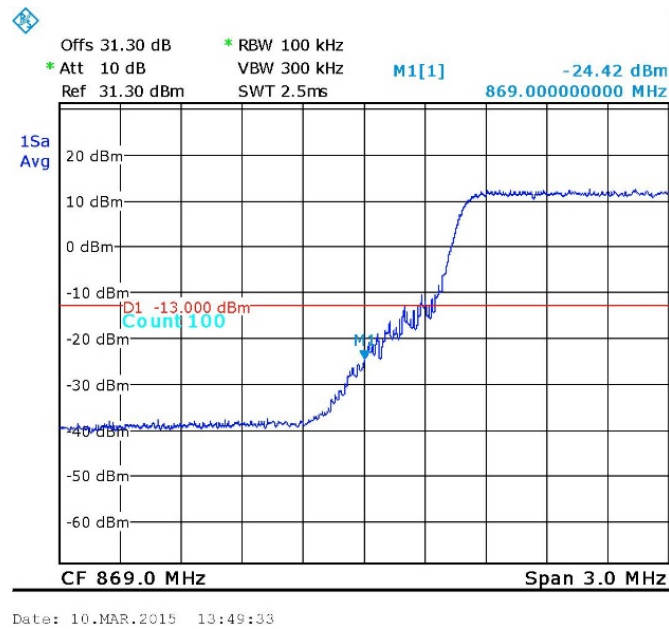


Figure 49. — LTE 64QAM 874.00 MHz

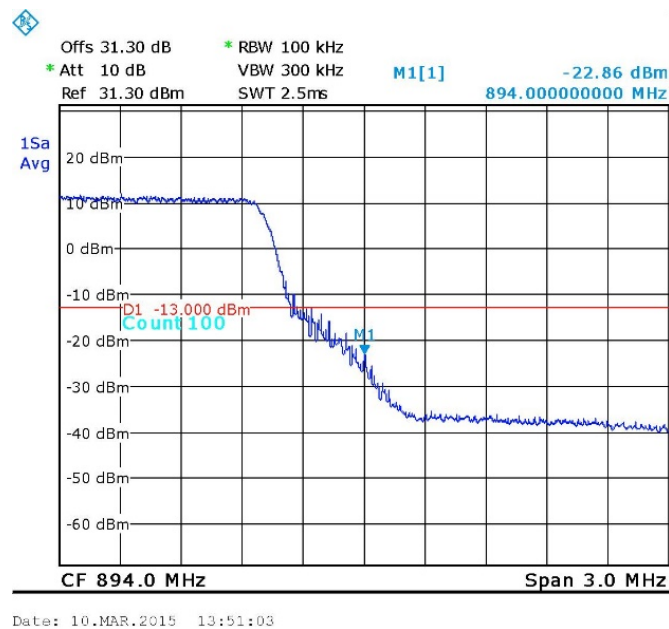


Figure 50. — LTE 64QAM 889.00 MHz

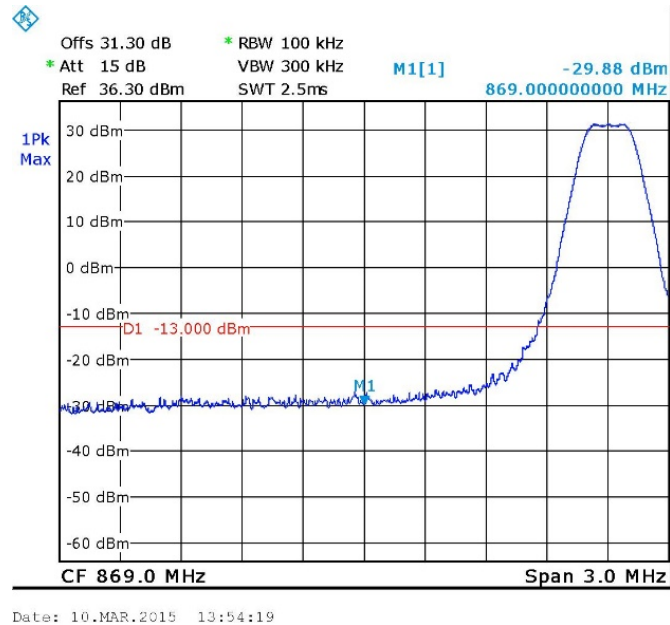


Figure 51. — GSM - 870.20 MHz

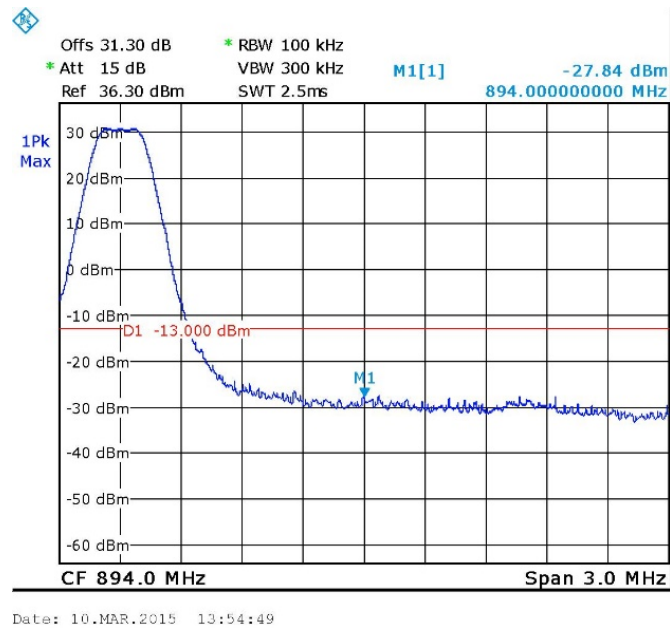


Figure 52. — GSM - 892.80 MHz

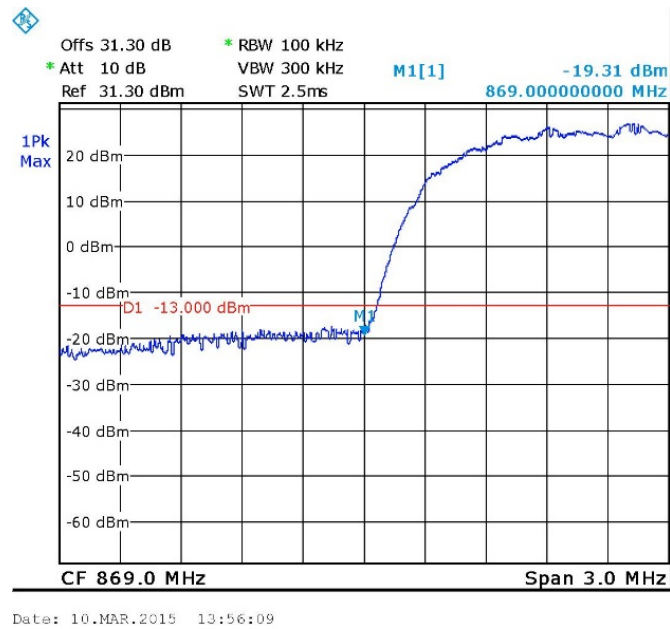


Figure 53. — W-CDMA - 871.50 MHz

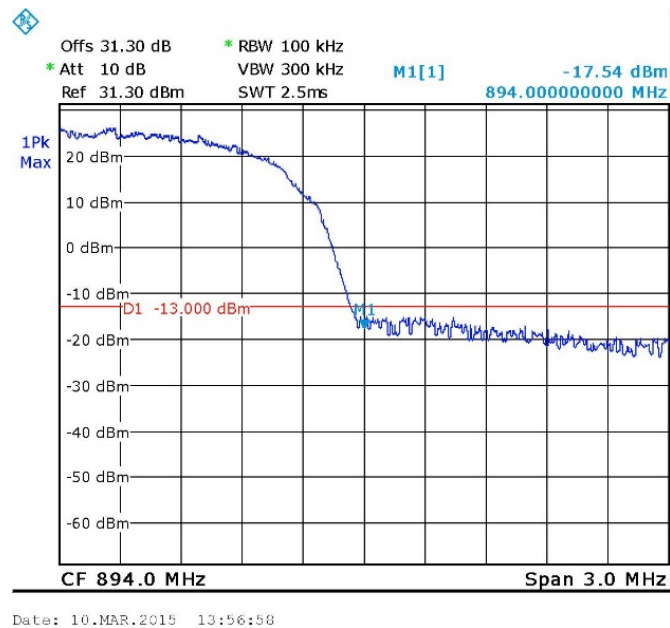


Figure 54. — W-CDMA - 891.50 MHz



7.4 Test Equipment Used; Band Edge Spectrum CELL

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 4, 2015	1 year
Spectrum Analyzer	R&S	FSL6	100194	January 1, 2015	1 year
Vector Signal Generator	Agilent	N5172B	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 Emissions (Radiated) CELL

8.1 Test Specification

FCC Part 22, Section 917; FCC Part 2.1053

8.2 Test Procedure

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

Unwanted Emissions: Radiated Spurious.

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

- (a) The E.U.T. operation mode and test set-up are as described in Section 3.
A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 1.5 meters above the ground. The configuration tested is shown in Figure 1.

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

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

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

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

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

P_d = Dipole equivalent power (result).

P_g = Signal generator output level.



8.3 Test Results

Carrier Channel	Freq.	Antenna Pol.	Maximum Peak Level	Signal Generator RF Output	Cable Loss	Antenna Gain	Effective Radiated Power Level	Spec.	Margin
(MHz)	(MHz)		(dB μ V/m)	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
870.20	1740.40	V	71.3	-28.3	6.7	7.6	-27.4	-13.0	-14.4
870.20	1740.40	H	70.5	-29.0	6.7	8.0	-27.7	-13.0	-14.7
881.00	1762.00	V	70.8	-26.5	6.7	7.6	-25.5	-13.0	-12.5
881.00	1762.00	H	70.2	-27.2	6.7	8.0	-25.8	-13.0	-12.8
892.80	1785.60	V	71.2	-26.5	6.7	7.6	-25.5	-13.0	-12.5
892.80	1785.60	H	69.7	-28.5	6.7	8.0	-27.2	-13.0	-14.2

Figure 56 Spurious Emission (Radiated) CELL

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

JUDGEMENT; Passed by 12.5 dB



8.4 Test Instrumentation Used, Radiated Measurements CELL

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	ARA	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