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DATE: 06 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-ESMR/CELL-PCS-LTE-AWS (WCS Section)

Tested by: _____
M. Zohar

Approved by: _____
D. Shidlowsky

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

FCC ID: OJF1MRU23

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:
R. Pinchuck
ITL (Product Testing) Ltd.
1 Bat Sheva St.
Lod 7120101
Israel
e-mail rpinchuck@itl.co.il

Applicant for this device:
(different from "prepared by")
Habib Riazi
Corning Optical Communication Wireless
13221 Woodland Park Rd., Suite #400
Herndon, VA. 20171
U.S.A.
Tel: +1-541-758-2880
Fax: +1-703-848-0260
e-mail: RiaziH@corning.com

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1. General Information

1.1 Administrative Information

Manufacturer:	Corning Optical Communication Wireless
Manufacturer's Address:	13221 Woodland Park Rd., Suite #400 Herndon, VA. 20171 U.S.A. Tel: +1-541-758-2880 Fax: +1-703-848-0260
Manufacturer's Representative:	Habib Riazi
Equipment Under Test (E.U.T):	ONE- Optical Network Evolution Wireless Platform
Equipment Model No.:	MRU (Mid Power Remote Unit)
Equipment Serial No.:	Not Designated
Date of Receipt of E.U.T:	15.03.2015
Start of Test:	15.03.2015
End of Test:	24.03.2015
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 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% ConfESMRce, K=2):

± 3.44 dB

Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) for open site 30-1000MHz:
Expanded Uncertainty (95% 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 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	100-240VAC/50-60Hz 48VDC
Mode of operation	Repeater
Modulations	WCDMA, LTE(64QAM), GSM
Frequency Range	2350MHz-2360MHz
Transmit power	33 dBm
Antenna Gain	12.5 dBi
DATA rate	N/A
Modulation BW	0.5MHz(GSM),10MHz(LTE),5MHz(WCDMA)
Temperature (°C)/ Humidity (%RH)	23°C /32%

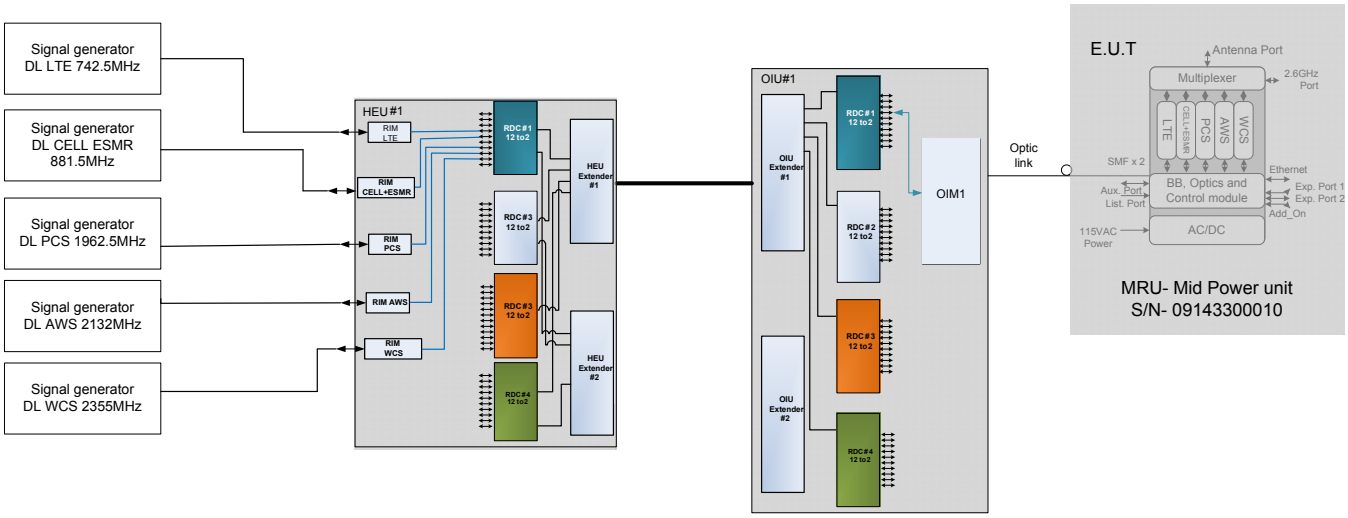

Figure 1. Test Set-up

3. Test Set-up Photos

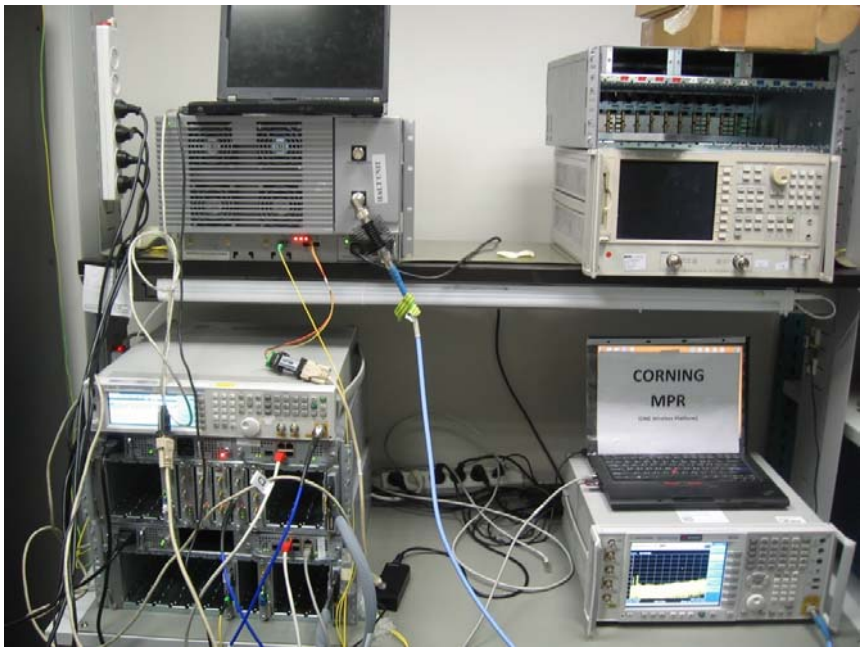

Figure 2. Conducted Emission From Antenna Port Tests

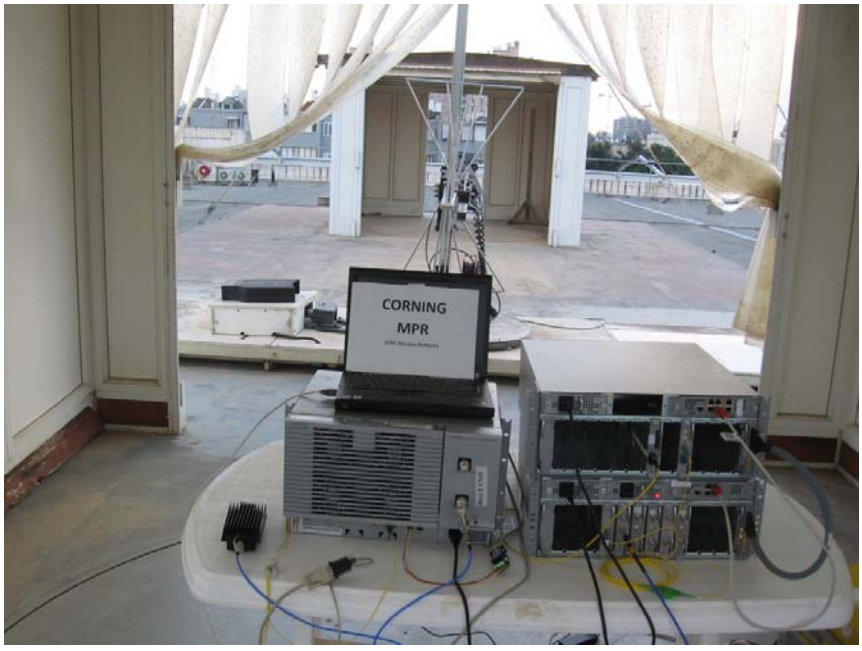

Figure 3. Radiated Emission Test

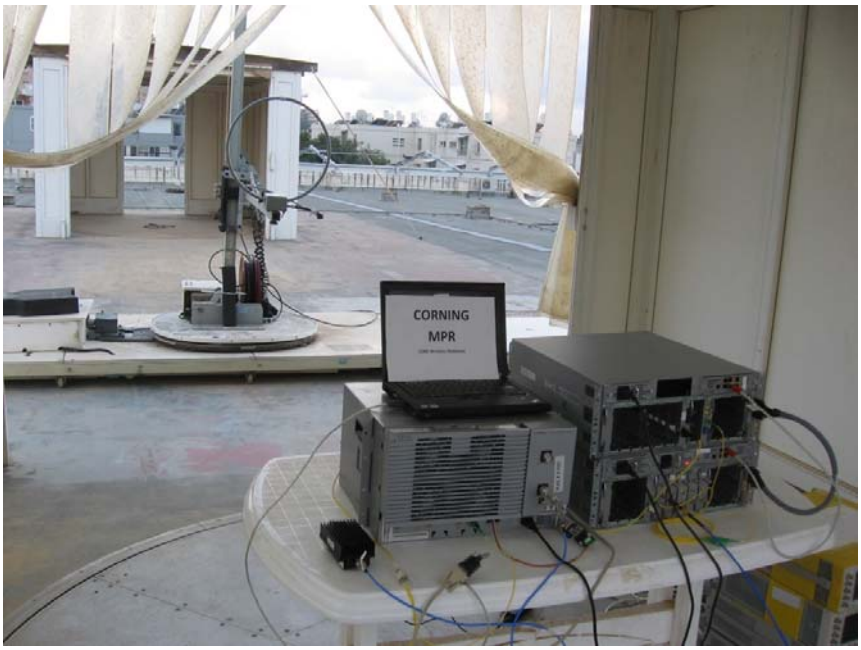

Figure 4. Radiated Emission Test

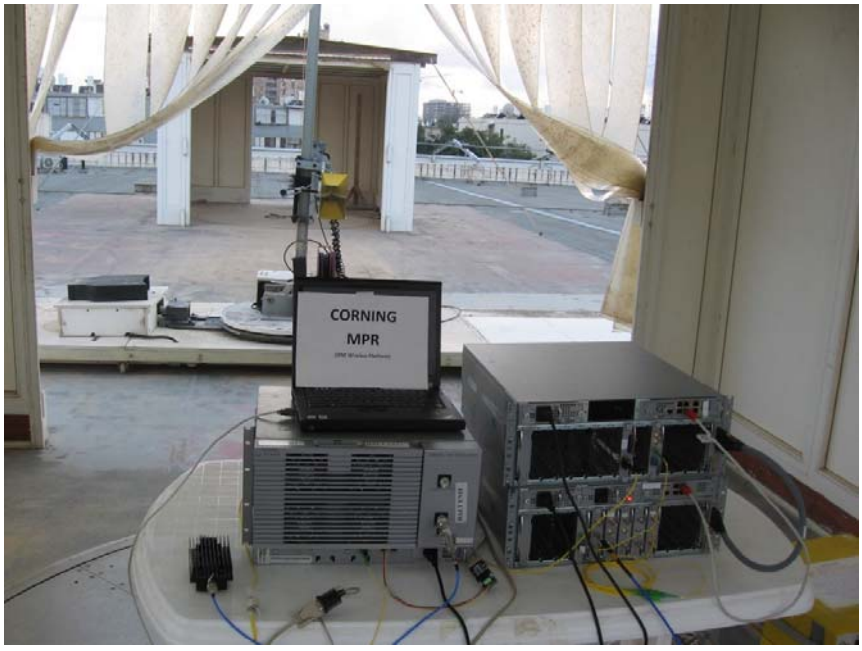

Figure 5. Radiated Emission Test

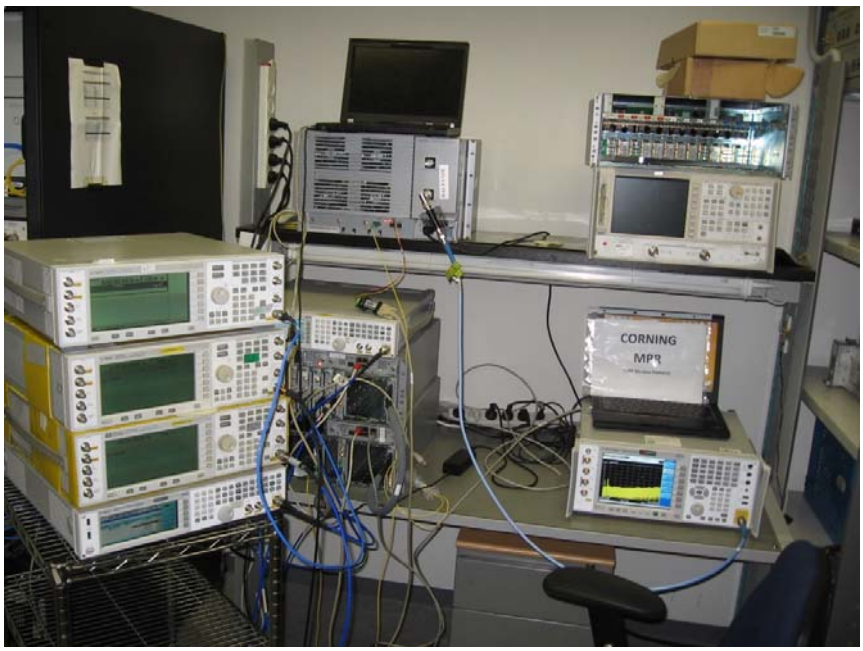

Figure 6. Intermodulation Conducted Emission Test

4. Peak Output Power

4.1 Test Specification

FCC Part 27.50(a)(ii)

4.2 Test Procedure

The method used is as detailed in FCC KDB 971168.

Peak Power Output must not exceed 2000 Watts (63dBm).

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

4.3 Test Results

Modulation	Operation Frequency (MHz)	Reading (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Specification (dBm)	Margin (dB)
GSM	2351.2	35.0	12.5	47.5	63.0	-15.5
GSM	2358.8	35.2	12.5	47.7	63.0	-15.3
LTE 64QAM	2355.0	35.6	12.5	48.1	63.0	-14.9
WCDMA	2352.5	35.5	12.5	48.0	63.0	-15.0
WCDMA	2357.5	35.5	12.5	48.0	63.0	-15.0

Figure 7 Peak Output Power

JUDGEMENT: Passed by 14.9 dB

See additional information in *Figure 8* to *Figure 12.*

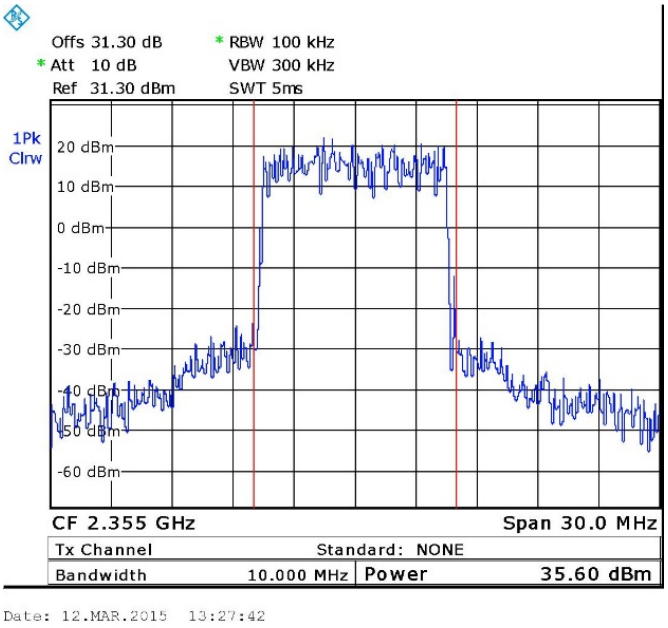

Figure 8. — 2355.0 MHz – LTE 64QAM

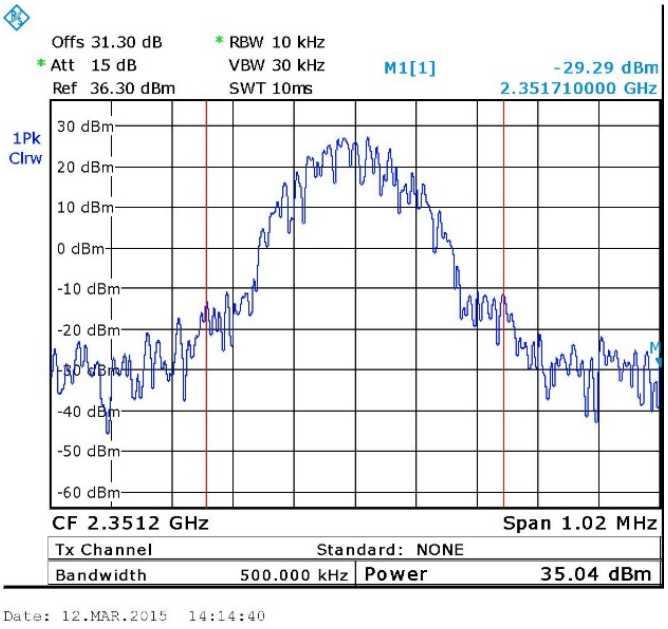

Figure 9. — 2351.2 MHz - GSM

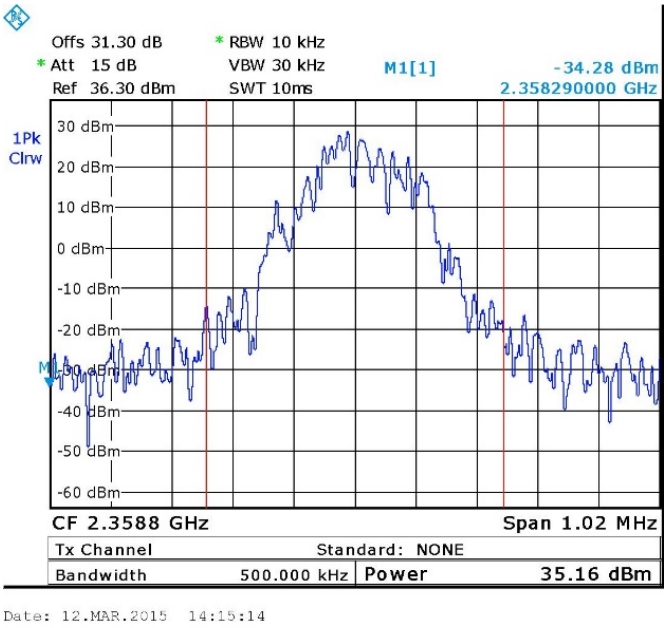

Figure 10. — 2358.8 MHz- GSM

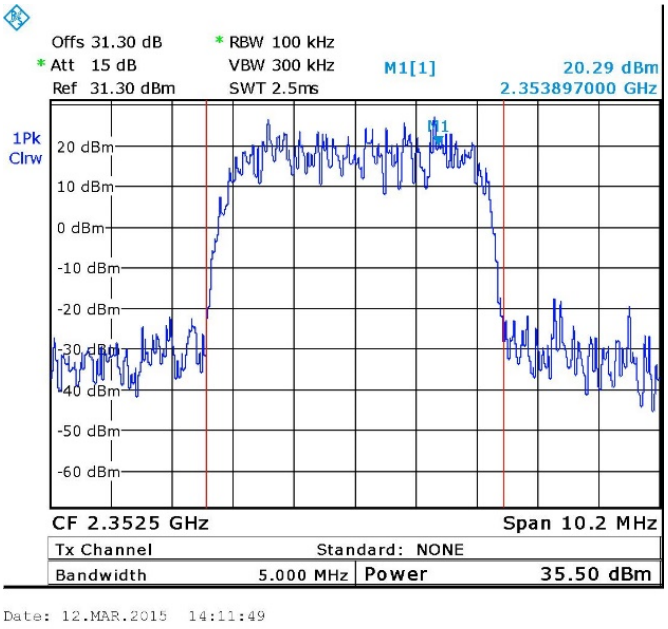

Figure 11. — 2352.5 MHz – W-CDMA

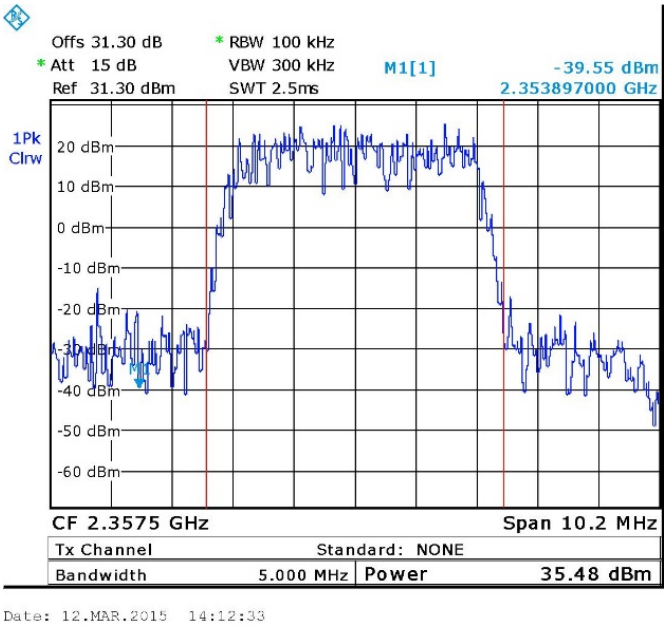

Figure 12. — 2357.5 MHz – W-CDMA

4.4 Test Equipment Used; Peak Output Power

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 13 Test Equipment Used

5. Average Power Spectral Density

5.1 Test Specification

FCC Part 27.50(a)(1)(A)

5.2 Test Procedure

The method used is detailed in FCC KDB 971168.

Average PSD in any 1 MHz must not exceed 400 Watts (56dBm) and in any 5MHz, must not exceed 2000 Watts (63dBm).

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. Special attention was taken to prevent Spectrum Analyzer RF input overload. The Spectrum Analyzer was set to 1000 kHz RBW. The output power level was measured at the low, mid and high channels of each modulation.

For PSD in any 5MHz the equation: $10\log\left(\frac{5MHz}{1MHz}\right) = 7dB$. This factor was added to the test results in 1MHz. The total results were compared to the PSD 5MHz limit as detailed above.

5.3 Test Results

Modulation	Operation Frequency (MHz)	Reading (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Specification (dBm)	Margin (dB)
LTE 64QAM	2355.0	35.2	12.1	47.3	56.0	-8.7
GSM	2351.2	33.6	12.1	45.7	56.0	-10.3
	2358.8	33.6	12.1	45.7	56.0	-10.3
W-CDMA	2352.5	39.2	12.1	51.3	56.0	-4.7
	2357.5	39.3	12.1	51.4	56.0	-4.6

Figure 14 1 MHz - Average Power Spectral Density

Modulation	Operation Frequency (MHz)	Reading (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Specification (dBm)	Margin (dB)
LTE 64QAM	2355.0	42.2	12.1	54.3	63.0	-8.7
GSM	2351.2	40.6	12.1	52.7	63.0	-10.3
	2358.8	40.6	12.1	52.7	63.0	-10.3
W-CDMA	2352.5	46.2	12.1	58.3	63.0	-4.7
	2357.5	46.3	12.1	58.4	63.0	-4.6

Figure 15 5 MHz - Average Power Spectral Density

JUDGEMENT: Passed by 4.6 dB

See additional information in *Figure 16* to *Figure 20.*

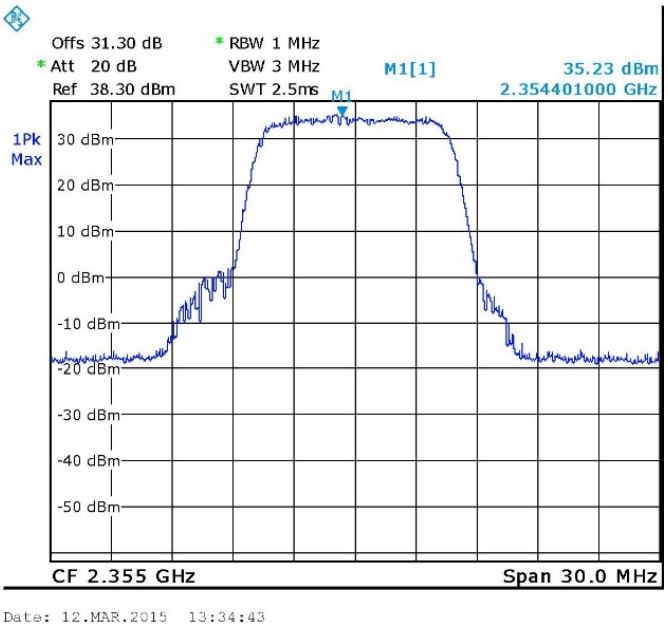

Figure 16. — 2355.0 MHz – LTE 64QAM

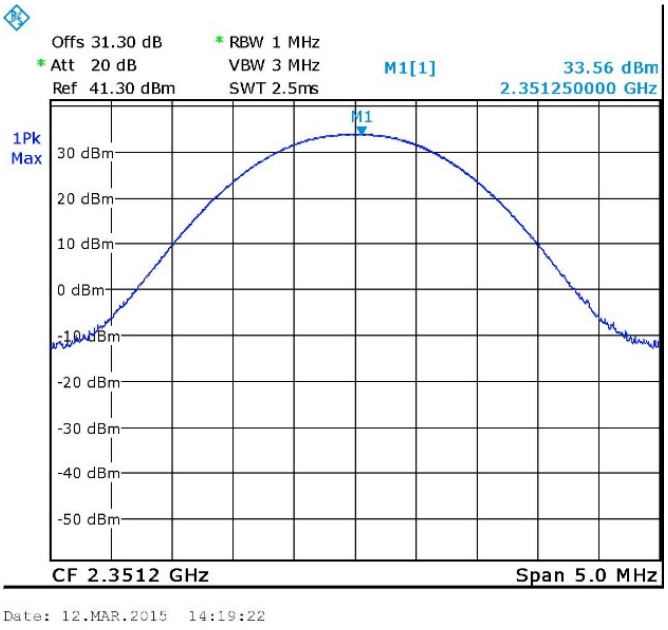

Figure 17 - 2351.2MHz – GSM

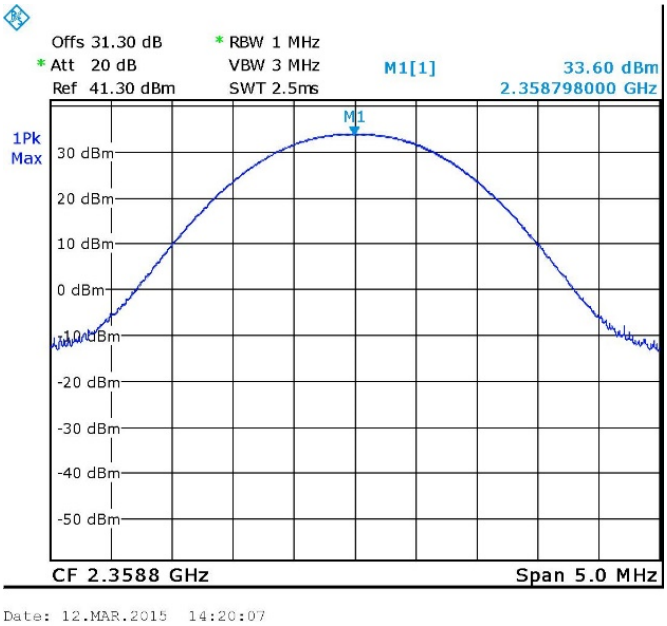

Figure 18.—2358.8 MHz- GSM

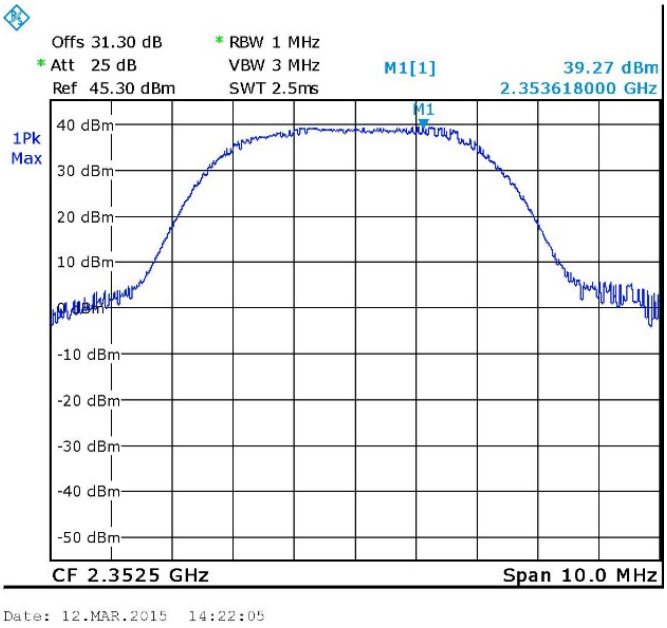

Figure 19. — 2352.5MHz – W-CDMA

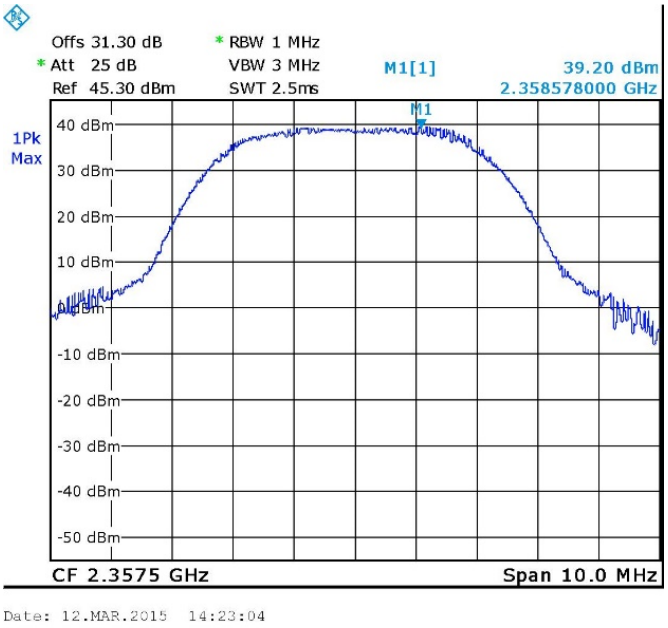

Figure 20. — 2357.5MHz- W-CDMA

5.4 Test Equipment Used; Peak Output Power

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 21 Test Equipment Used

6. Peak to Average Power Ratio

6.1 Test Specification

FCC Part 27.50(a)(1)(B)

6.2 Test Procedure

The method used is detailed in FCC KDB 971168.

Measurements was using CCDF function for each modulation.

6.3 Test Results

Modulation	Operation Frequency (MHz)	0.1% PAPR (dB)	Specification (dB)	Margin (dB)
LTE 64QAM	2355.0	6.69	13.0	-6.31
GSM	2355.0	0.06	13.0	-12.94
W-CDMA	2355.0	6.06	13.0	-6.94

Figure 22 Test Results Peak to Average Power Ratio

JUDGEMENT: Passed

For additional information see *Figure 23* to *Figure 25*.

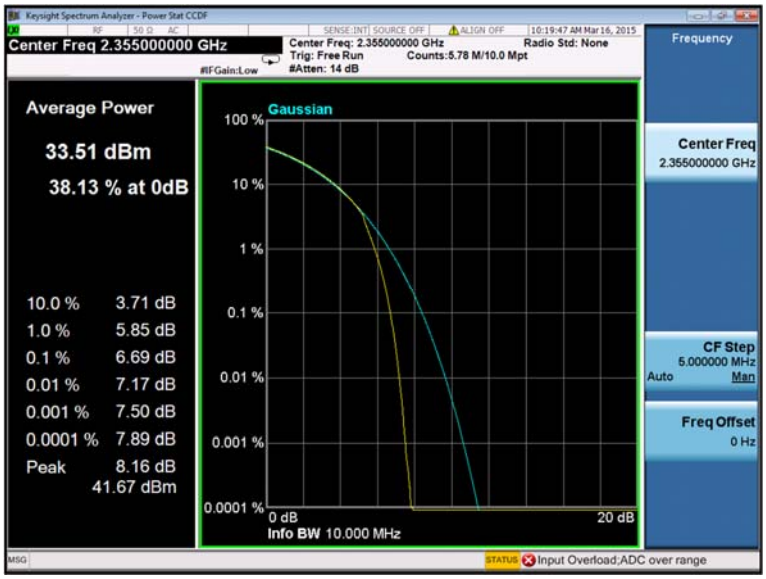

Figure 23. — LTE 64QAM, 2355.0 MHz

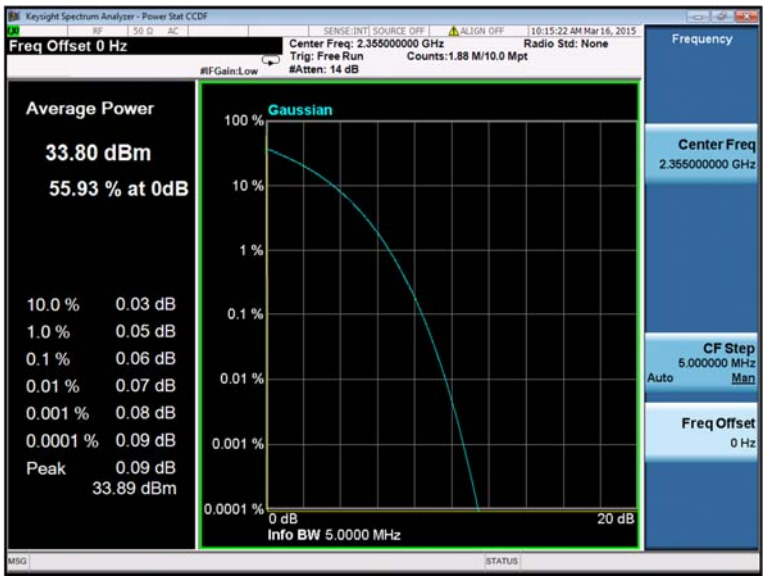

Figure 24. — GSM, 2355.0 MHz

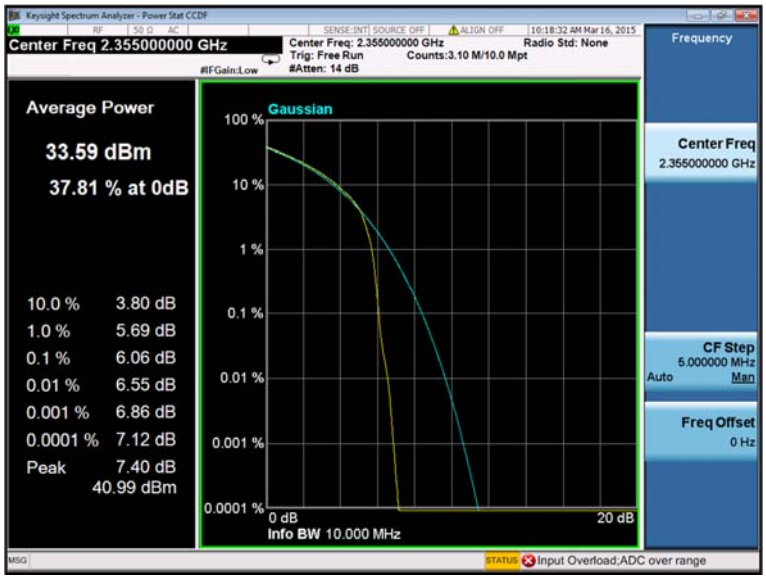

Figure 25. — WCDMA, 2355.0 MHz

6.4 Test Equipment Used; 0.1% PAPR

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Signal Analyzer	Agilent	N9020A	A27058	February 12, 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

7. Occupied Bandwidth

7.1 Test Specification

FCC Part 2, Section 1049

7.2 Test Procedure

The E.U.T. was set to the applicable test frequency with modulation. The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (at the output test) and an appropriate coaxial cable. The OBW function (99%) was using for these evaluation.
Occupied bandwidth measured was repeated for each modulation.

7.3 Test Results

Modulation	Port	Operating Frequency (MHz)	Reading (MHz)
LTE 64QAM	Input	2355.0	9.012
LTE 64QAM	Output	2355.0	8.982
WCDMA	Input	2352.5	4.191
WCDMA	Output	2352.5	4.171
WCDMA	Input	2357.5	4.171
WCDMA	Output	2357.5	4.171
GSM	Input	2351.2	0.245
GSM	Output	2351.2	0.245
GSM	Input	2358.8	0.245
GSM	Output	2358.8	0.245

Figure 26 Occupied Bandwidth

JUDGEMENT: Passed

See additional information in *Figure 27* to *Figure 36.*

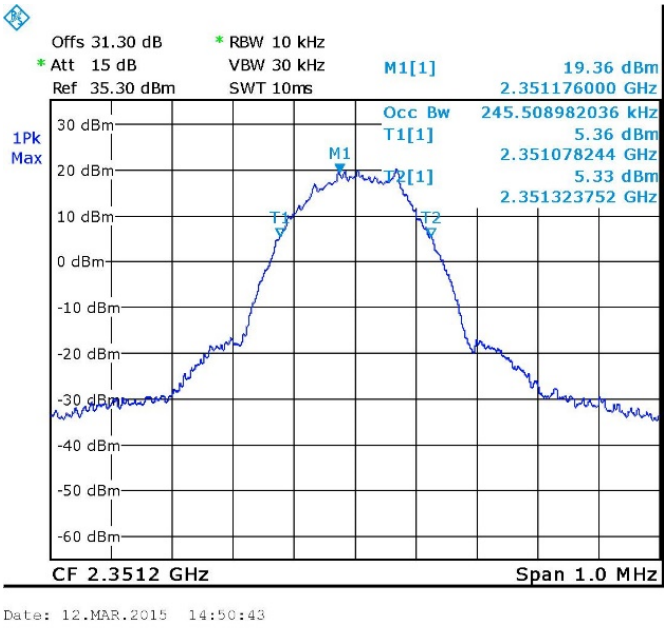

Figure 27 Occupied Bandwidth INPUT, GSM

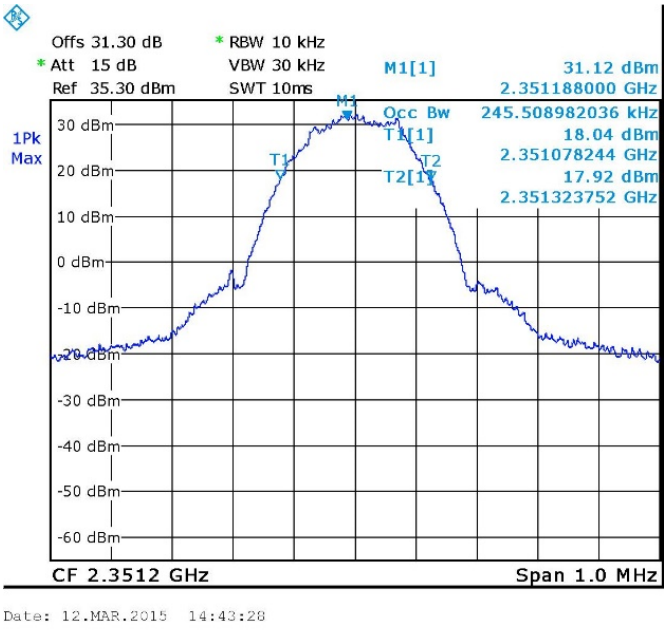

Figure 28 Occupied Bandwidth OUTPUT, GSM

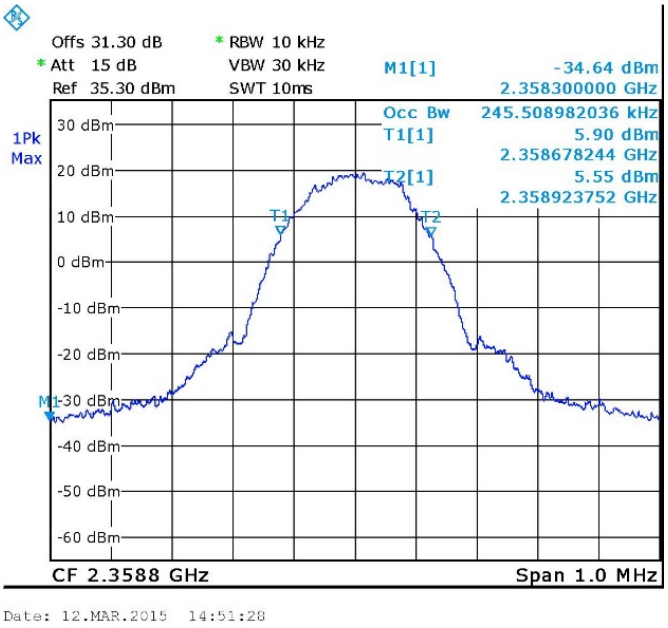

Figure 29 Occupied Bandwidth INPUT, GSM

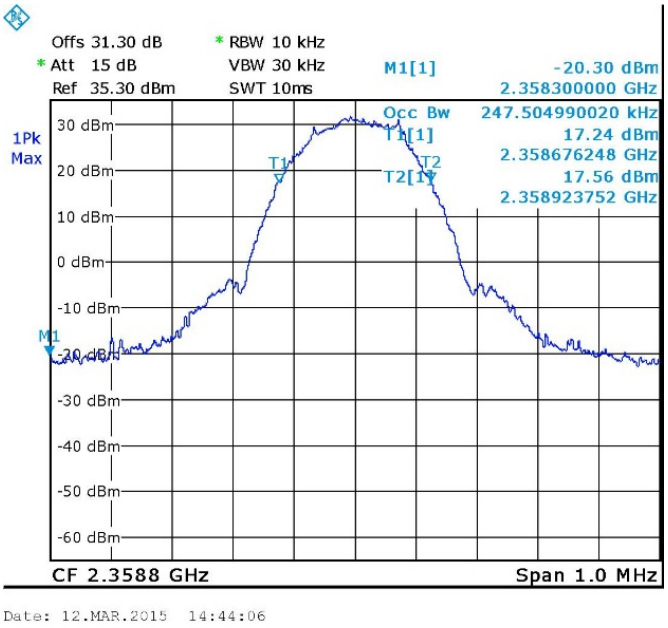

Figure 30 Occupied Bandwidth OUTPUT, GSM

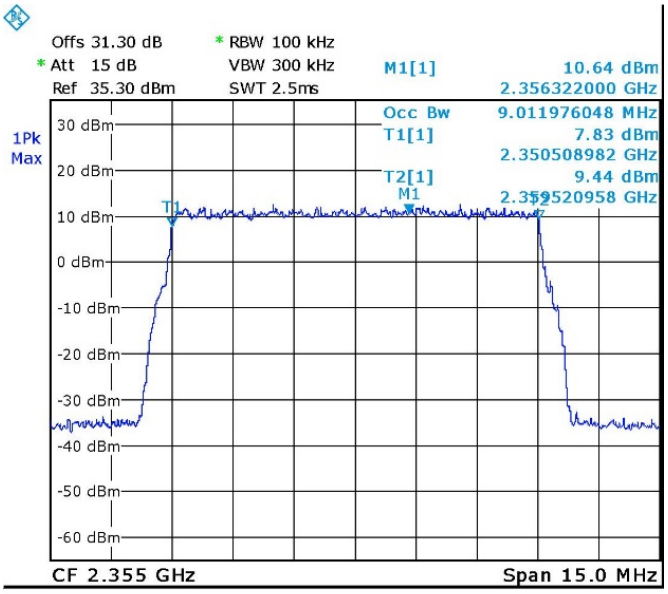

Figure 31 Occupied Bandwidth INPUT, LTE

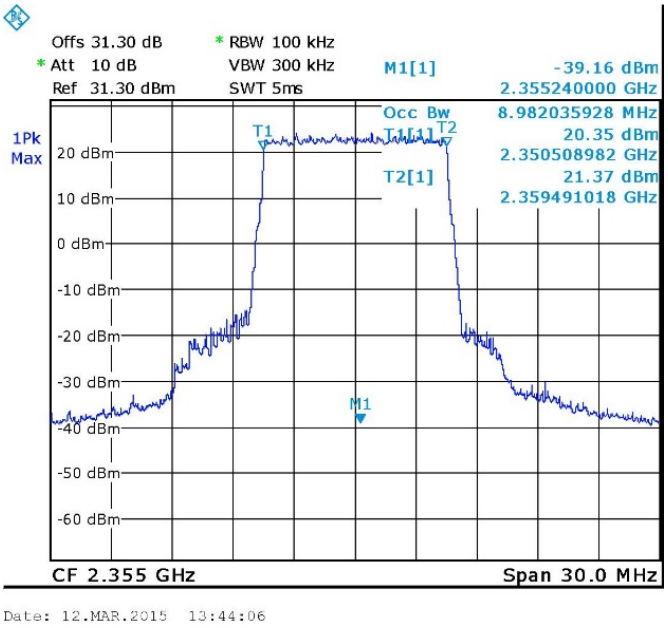

Figure 32 Occupied Bandwidth OUTPUT, LTE

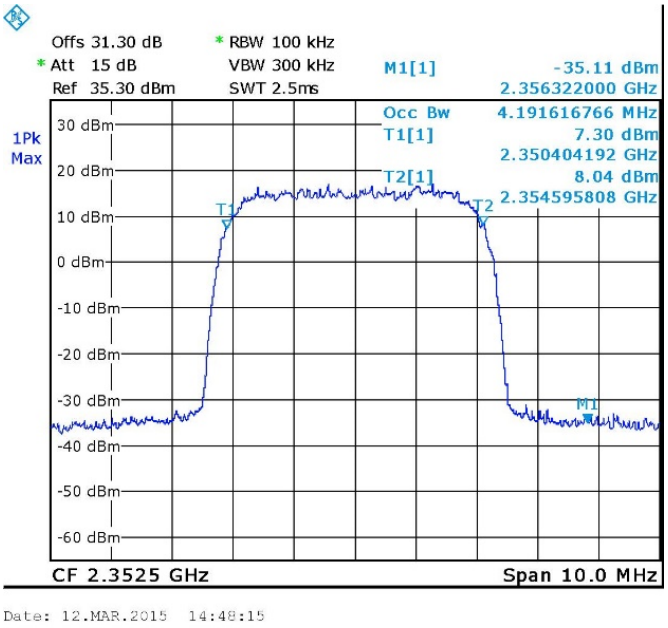

Figure 33 Occupied Bandwidth INPUT, WCDMA

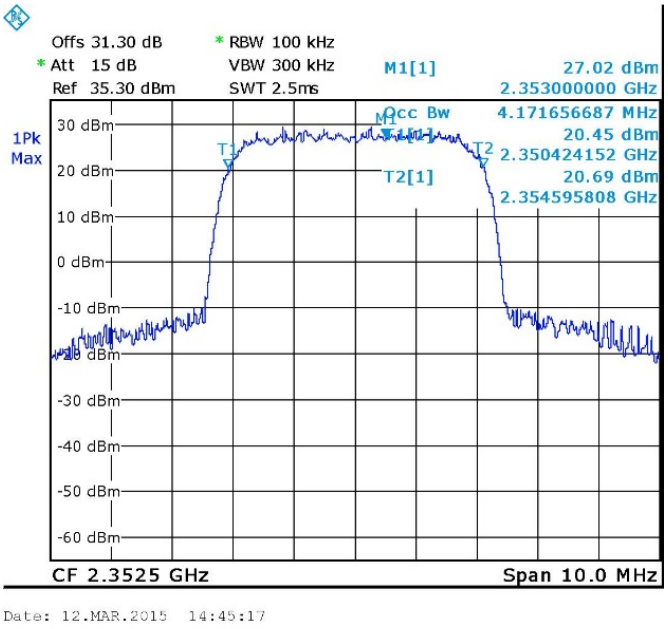

Figure 34 Occupied Bandwidth OUTPUT, WCDMA

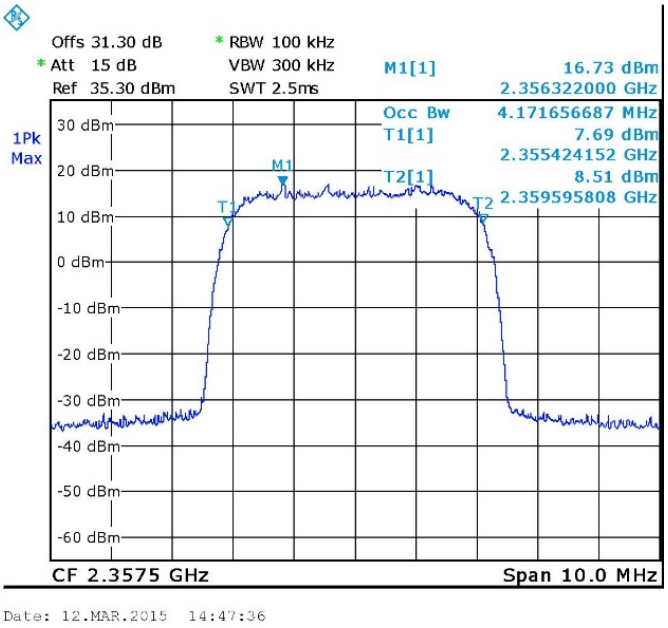

Figure 35 Occupied Bandwidth INPUT, WCDMA

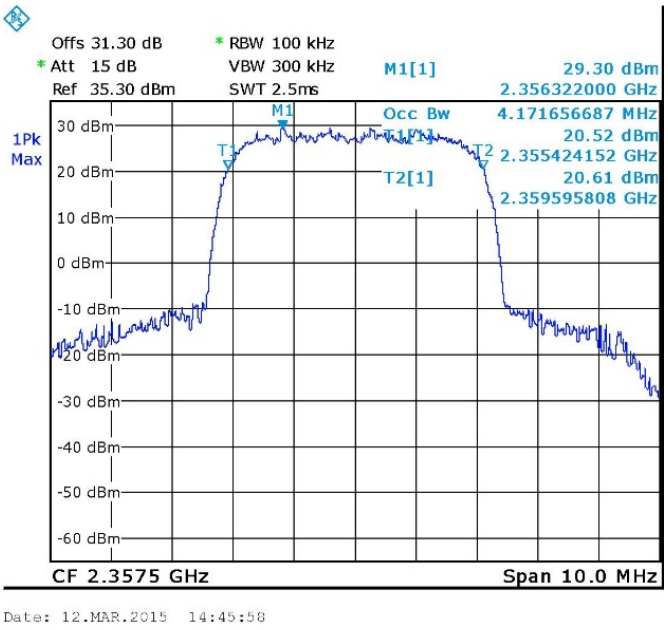

Figure 36 Occupied Bandwidth OUTPUT, WCDMA

7.4 Test Equipment Used; Occupied Bandwidth

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