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DATE: 24 September 2017

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

FCC Radio Test Report

for

Corning Optical Communication Wireless

Equipment under test:

ONE - Optical Network Evolution Wireless Platform

MXU (Mid Power Remote Unit) Add-On (TDD Section 2496-2690MHz Band)

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: OJF1MXU25

This report concerns:	Original Grant: X Class II change: Class I change:
Equipment type:	B21 – Part 20 Industrial Booster (CMRS)
Limits used:	47CFR Parts 2, 27

Measurement procedure used is KDB 971168 D03 v01 and
KDB 935210 D05 v01r01

Substitution Method used as in ANSI/TIA-603-D: 2010

Application for Certification
prepared by:
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ITL (Product Testing) Ltd.
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Lod 7120101
Israel
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Applicant for this device:
(different from "prepared by")
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1. General Information

1.1 Administrative Information

Manufacturer:	Corning Optical Communication Wireless
Manufacturer's Address:	13221 Woodland Park Rd., Suite #400 Herndon, VA. 20171 U.S.A. Tel: +1-541-758-2880 Fax: +1-703-848-0260
Manufacturer's Representative:	Habib Riazi
Equipment Under Test (E.U.T):	ONE - Optical Network Evolution Wireless Platform
Equipment Model No.:	MXU (Mid Power Remote Unit) Add-On
Equipment Serial No.:	Not designated
Date of Receipt of E.U.T:	August 6, 2017
Start of Test:	August 6, 2017
End of Test:	August 15, 2017
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 IL1005.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. Industry Canada (Canada), IC File No.: 46405-4025; Site No. IC 4025A-1, IC 4025A-2.

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

1.3 Product Description

The mid-power remote expansion unit (MxU) is a new addition to the Corning® optical network evolution (ONE™) solution mid-power product line which enables medium power transmission for the 2.5 GHz band (TDD). The MxU is a 1U add-on unit that enhances the scalable multiservice MRU solution, adding additional service support at a relatively low cost.
The MxU expands the MRUs service distribution at remote locations to include the 2.5 GHz LTE (TDD) band, enabling up to eight operator services (with the MRU) to be distributed over a single broadband infrastructure.
The MxU interfaces to the MRU, providing broadband frequency support over UL/DL RF expansion ports. It supports the 2.5 GHz frequency band in a single enclosure and includes a future option for connecting additional add-on units for even more band support. All eight services are distributed over the same infrastructure: routed to the MRU over a single optic fiber, distributed over the same footprint and managed as a single element via a web session to the headend control module (HCM) — as the MRU.

1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in KDB 971168 D03 v01 and KDB 935210 D05 v01r01. 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 IL1005.

1.6 Measurement Uncertainty

Conducted Emission
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

Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) for open site:
30-1000MHz:
Expanded Uncertainty (95% Confidence, K=2):
± 4.96 dB

1 GHz to 6 GHz
Expanded Uncertainty (95% Confidence, K=2):
±5.19 dB

>6 GHz
Expanded Uncertainty (95% Confidence, K=2):
±5.51 dB

2. System Test Configuration

2.1 Justification

The test setup was configured to closely resemble the standard installation.
The EUT consists of the MXU (Mid-Power TDD Add-On Remote Module) which is connected with the MRU. Both MRU and MXU are connected with 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.

2.2 EUT Exercise Software

SW version - 3.1 build 11
Firmware version - mxu_ab64_31_35.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 – Optical Network Evolution Wireless Platform
Model Name	MXU (Mid Power Remote Unit) Add-on
Working voltage	115VAC \48.0VDC
Mode of operation	Industrial Booster for TDD 2.5G band
Modulations	64QAM, 16QAM, QPSK
Assigned Frequency Range	2496.0MHz-2690.0MHz
Operation Frequency Range	2496.0MHz-2690.0MHz
Transmit power	~33.0dBm
Antenna Gain	12.5 dBi
DATA rate	N/A
Modulation BW	10.0MHz
DC Voltage and DC current applied to the final amplifying device	1.4A @ 28VDC

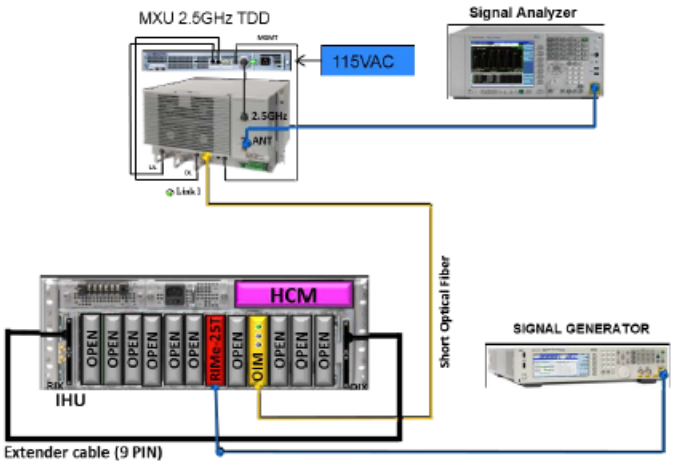

Figure 1. Test Set-Up – Conducted

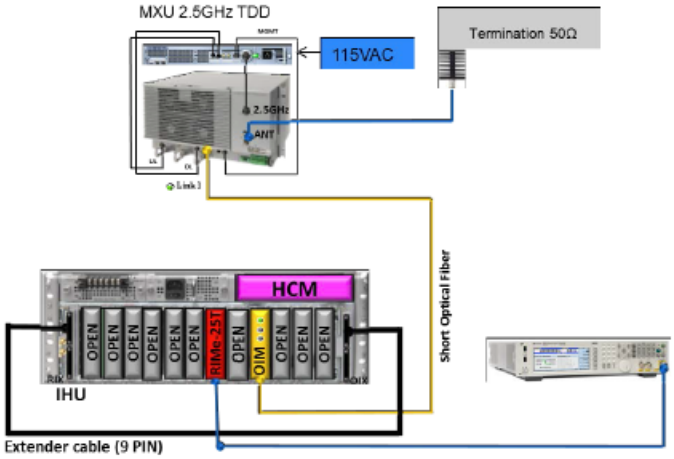

Figure 2. Test Set-Up - Radiated

3. Test Set-up Photos

Figure 3. Conducted Emission From Antenna Port Tests

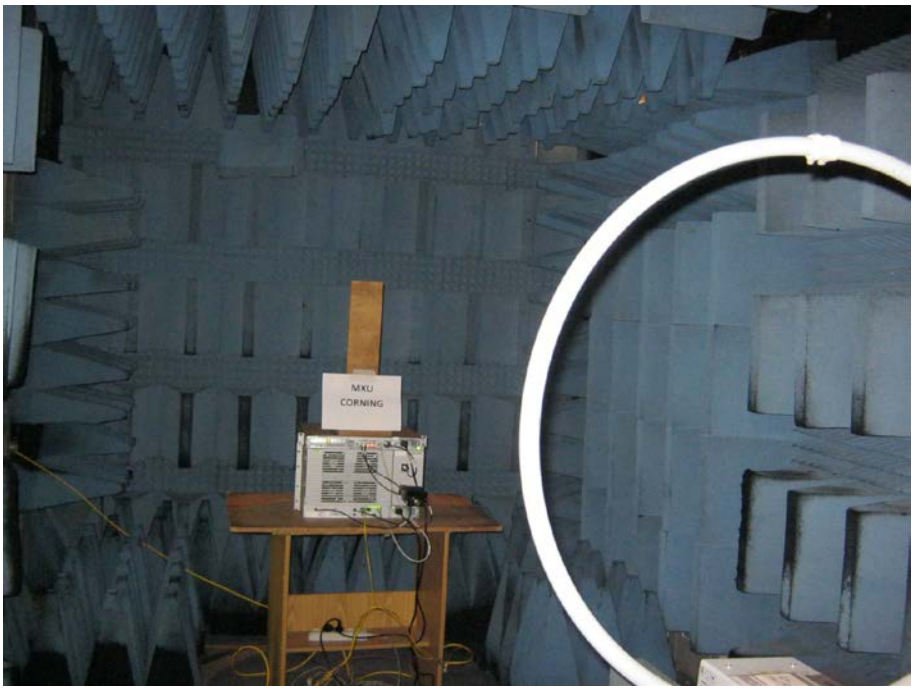

Figure 4. Radiated Emission Test - 0.009-30MHz

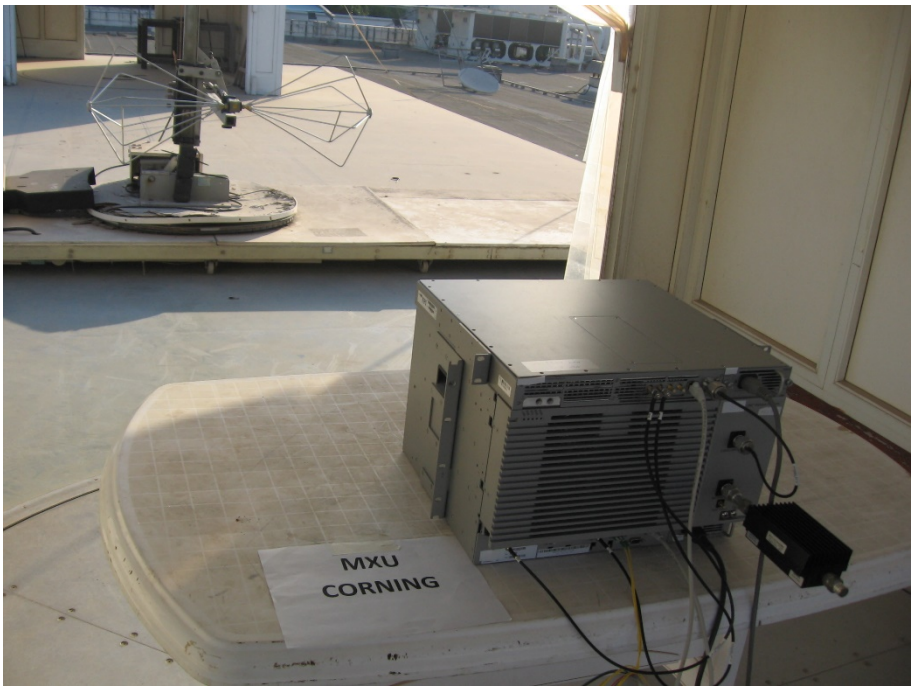

Figure 5. Radiated Emission Test - 30-200MHz

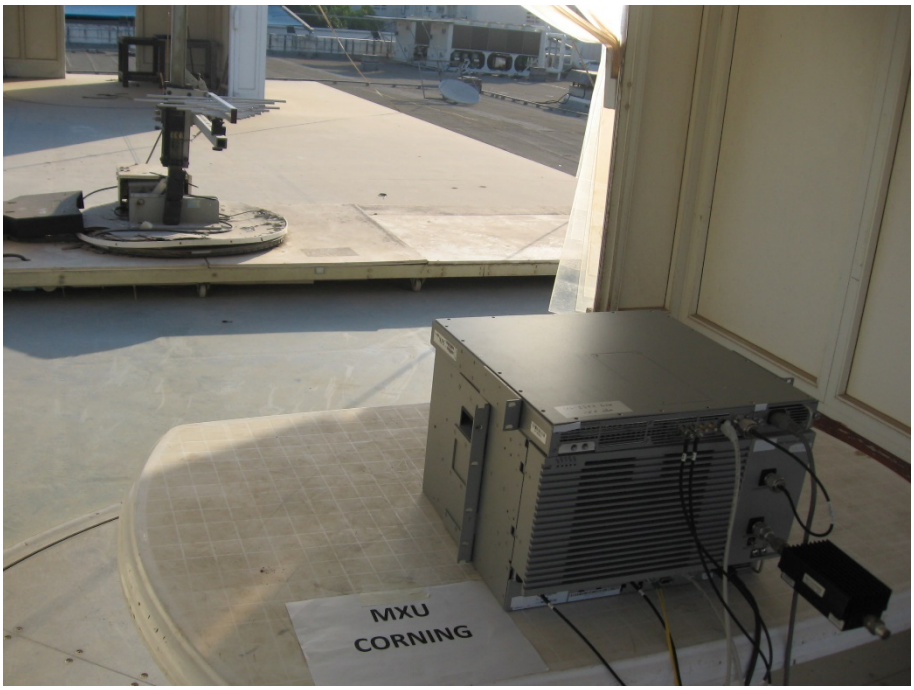

Figure 6. Radiated Emission Test - 200-1000MHz

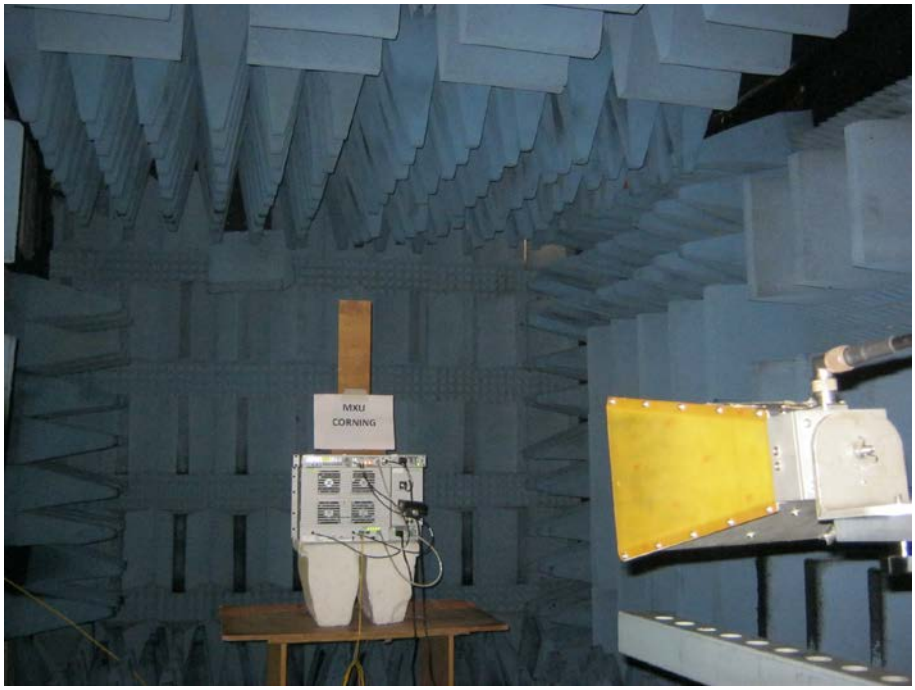

Figure 7. Radiated Emission Test – above 1GHz

4. Peak Output Power

4.1 Test Specification

FCC Part 27, Subpart C, Section: 27.50(h)(1)(i)

4.2 Test Procedure

(Temperature (22°C)/ Humidity (35%RH))

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (loss=41.0dB). The E.U.T. RF output was modulated with QPSK, 16QAM and 64QAM, at 10.0 MHz BW. Special attention was taken to prevent Spectrum Analyzer RF input overload.

4.3 Test Limit

The maximum EIRP of a main, booster or base station shall not exceed 33 dBW + 10log(X/Y) dBW, where X is the actual channel width in MHz and Y is either 6 MHz if prior to transition or the station is in the MBS following transition or 5.5 MHz if the station is in the LBS and UBS following transition. The limit is calculated to be: 63 + 10 log (10 MHz/12 MHz) = 62.2 dBm.

4.4 Test Results

Modulation	Operation Frequency	Reading	Antenna Gain	EIRP	Limit	Margin
	(MHz)	(dBm)	(dBi)	(dBm)	(dBm)	(dB)
64QAM	2501.0	33.9	12.5	46.4	62.2	-15.8
	2593.0	33.5	12.5	46.0	62.2	-16.2
	2685.0	33.7	12.5	46.2	62.2	-16.0
16QAM	2501.0	33.7	12.5	46.2	62.2	-16.0
	2593.0	33.4	12.5	45.9	62.2	-16.3
	2685.0	33.6	12.5	46.1	62.2	-16.1
QPSK	2501.0	33.9	12.5	46.4	62.2	-15.8
	2593.0	33.6	12.5	46.1	62.2	-16.1
	2685.0	33.7	12.5	46.2	62.2	-16.0

Figure 8 Peak Output Power

JUDGEMENT: Passed by 15.8 dB

See additional information in *Figure 9* to *Figure 17*.

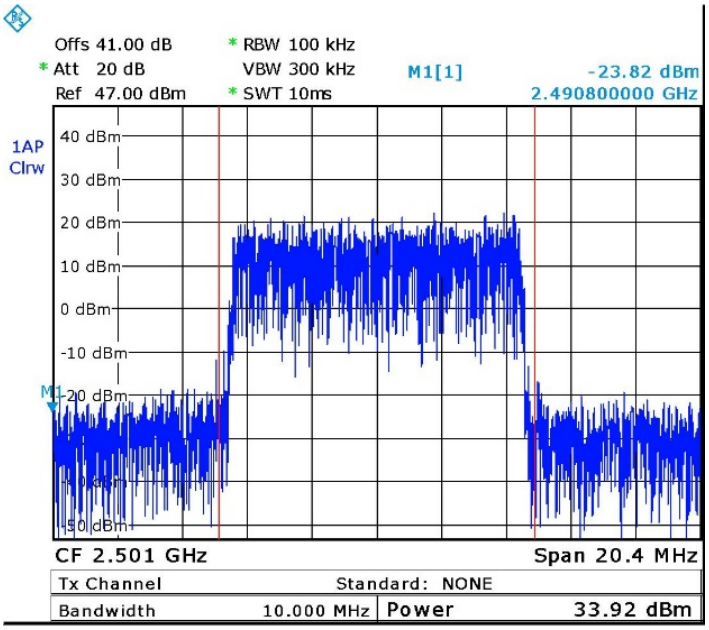

Figure 9. — 2501.0 MHz –64QAM

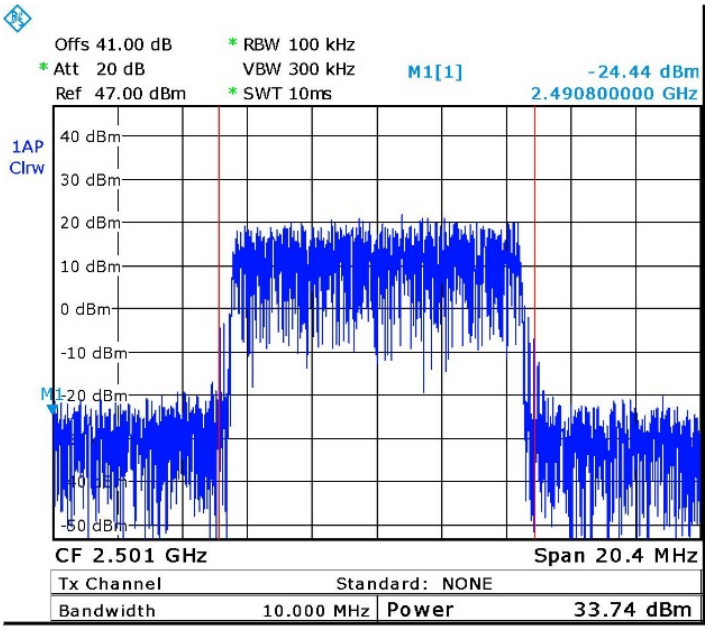

Figure 10. — 2501.0 MHz – 16QAM

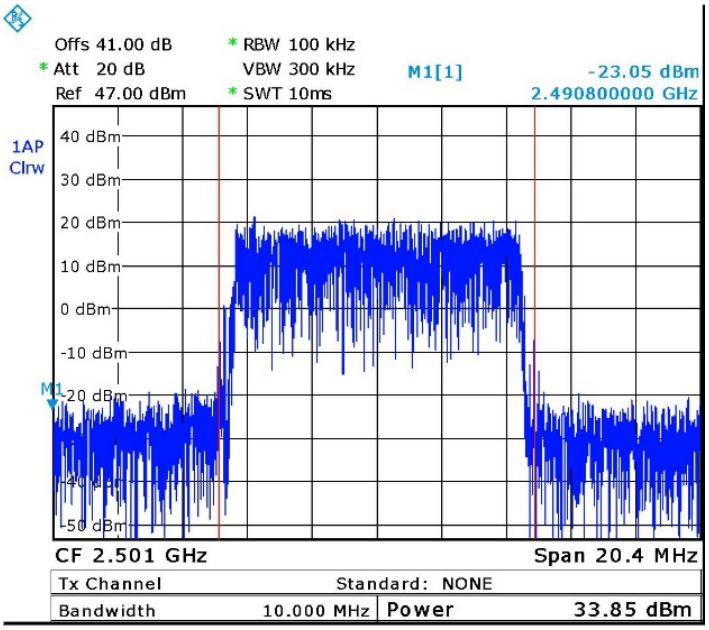

Figure 11. — 2501.0 MHz- QPSK

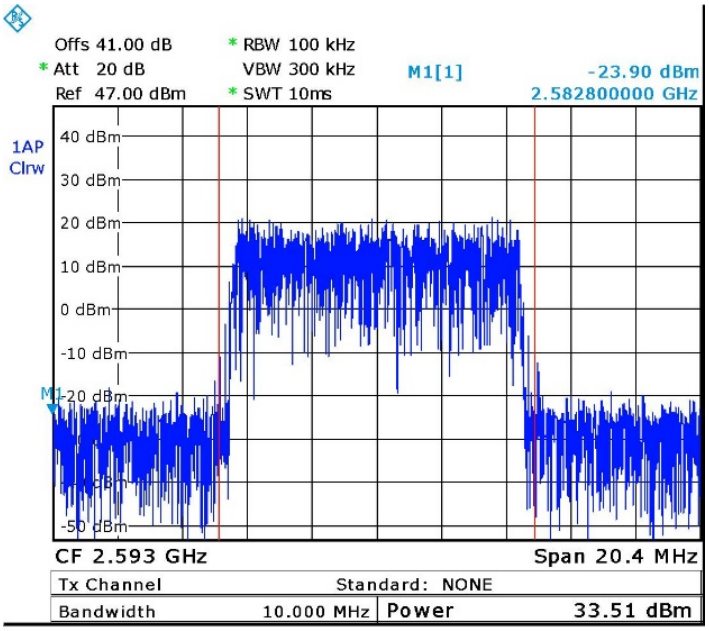

Figure 12. — 2593.0 MHz –64QAM

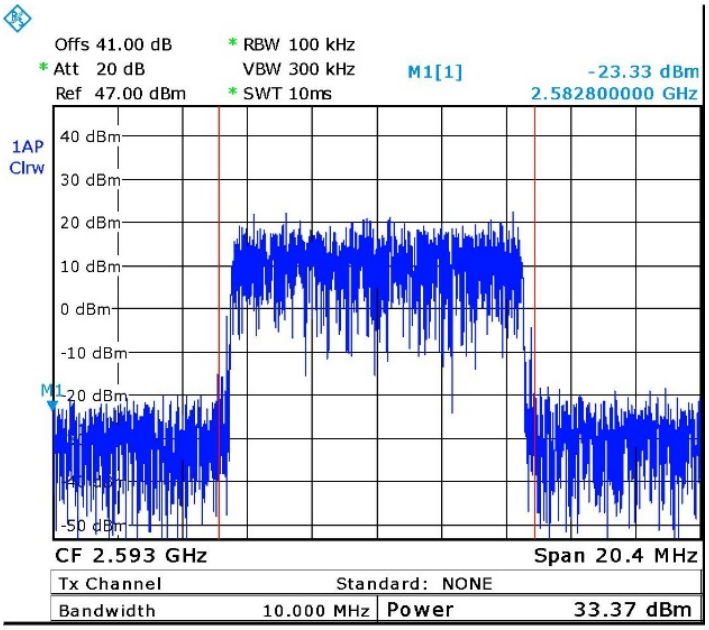

Figure 13. — 2593.0 MHz – 16QAM

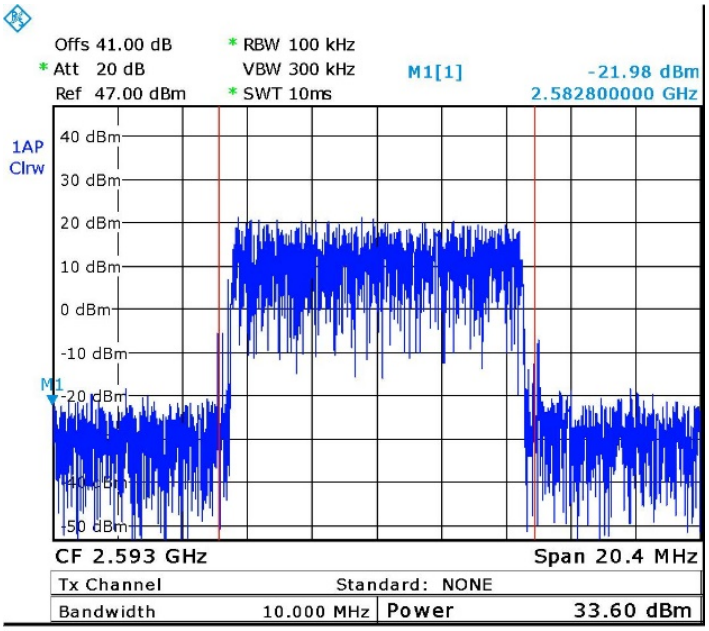

Figure 14. — 2593.0 MHz- QPSK

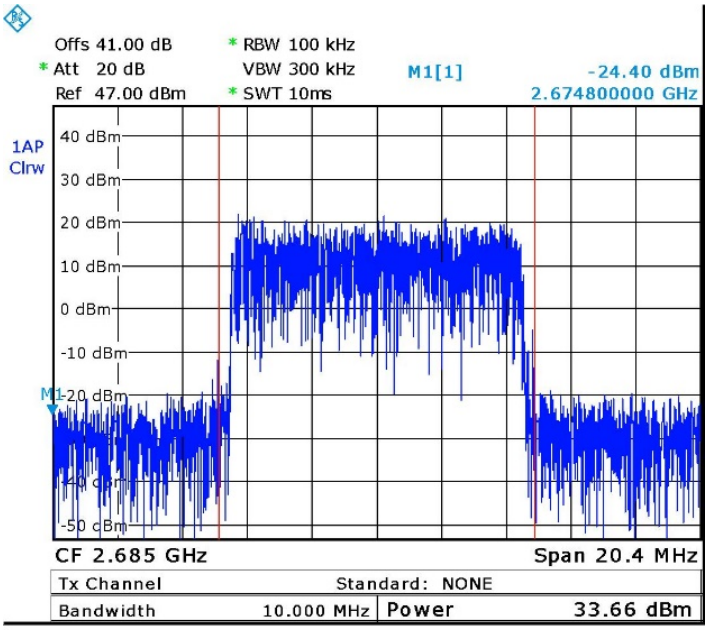

Figure 15. — 2685.0 MHz –64QAM

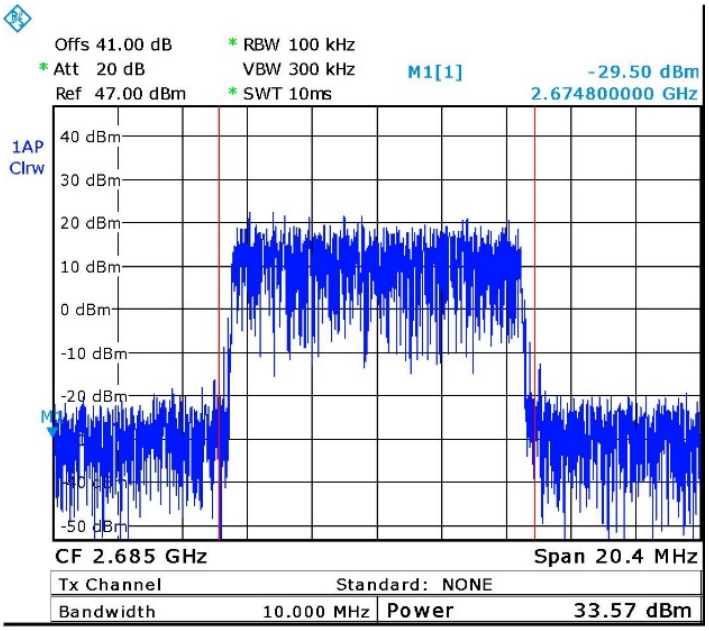

Figure 16. — 2685.0 MHz – 16QAM

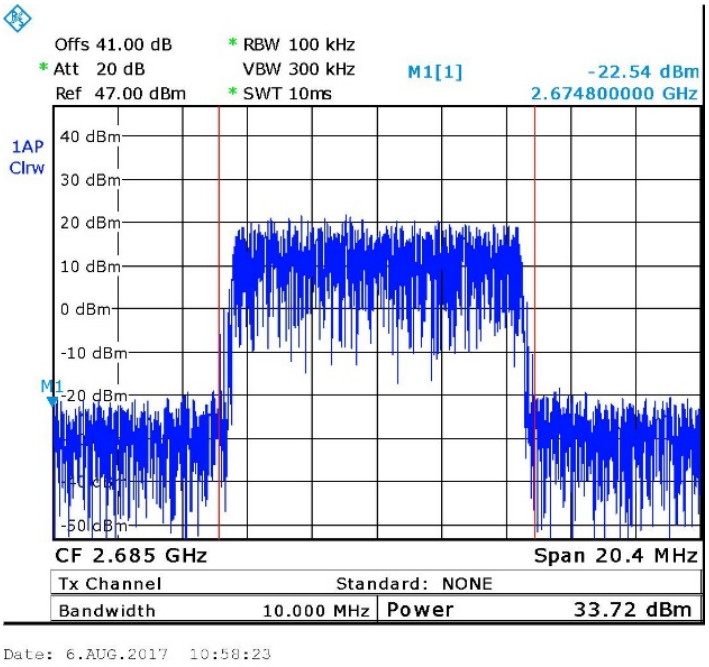

Figure 17. — 2685.0 MHz- QPSK

4.5 Test Equipment Used; Peak Output Power

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Date
Spectrum Analyzer	R&S	FSL6	100194	March 2, 2017	March 2, 2018
Vector Signal Generator	Agilent	N5182A	MY48180244	August 2 , 2016	Nov 2, 2019
40 dB Attenuator	Weinschel	WA 39-40-33	A1323	August 8, 2016	August 8, 2017

Figure 18 Test Equipment Used

5. Peak to Average Power Ratio

5.1 Test Specification

FCC Part 27, Subpart C, Section: 27.50(h)(1)(i)

5.2 Test Procedure

(Temperature (22°C)/ Humidity (35%RH))

Measurements were using CCDF function for each modulation.

5.3 Test Limit

In measuring transitions in this band using an average power technique, the PAPR of the transitions may not exceed 13dB.

5.4 Test Results

Modulation	Operation Frequency	0.1% PAPR	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
64QAM	2501.0	8.6	13.0	-4.4
	2593.0	8.6	13.0	-4.4
	2685.0	8.6	13.0	-4.4
16QAM	2501.0	8.4	13.0	-4.6
	2593.0	8.5	13.0	-4.5
	2685.0	8.7	13.0	-4.3
QPSK	2501.0	8.7	13.0	-4.3
	2593.0	8.6	13.0	-4.4
	2685.0	8.5	13.0	-4.5

Figure 19 Test Results Peak to Average Power Ratio

JUDGEMENT: Passed

For additional information see *Figure 20* to *Figure 28.*

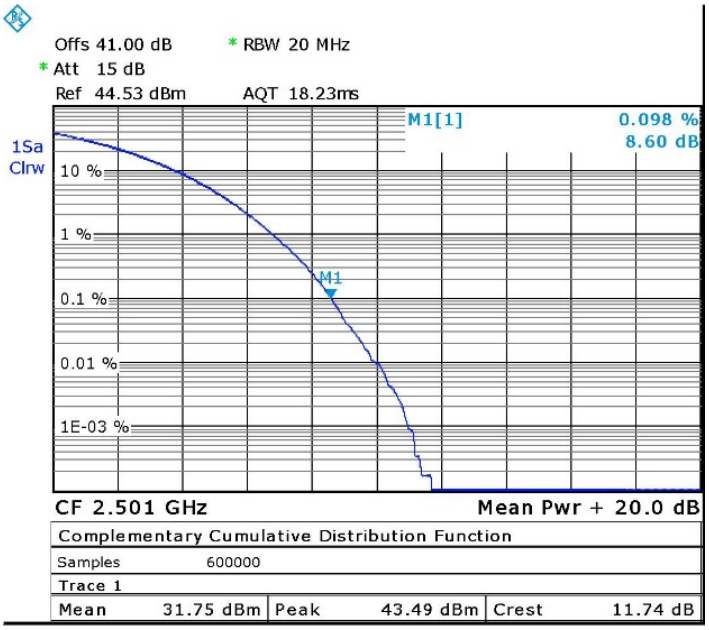

Figure 20. —64QAM, 2501.0 MHz

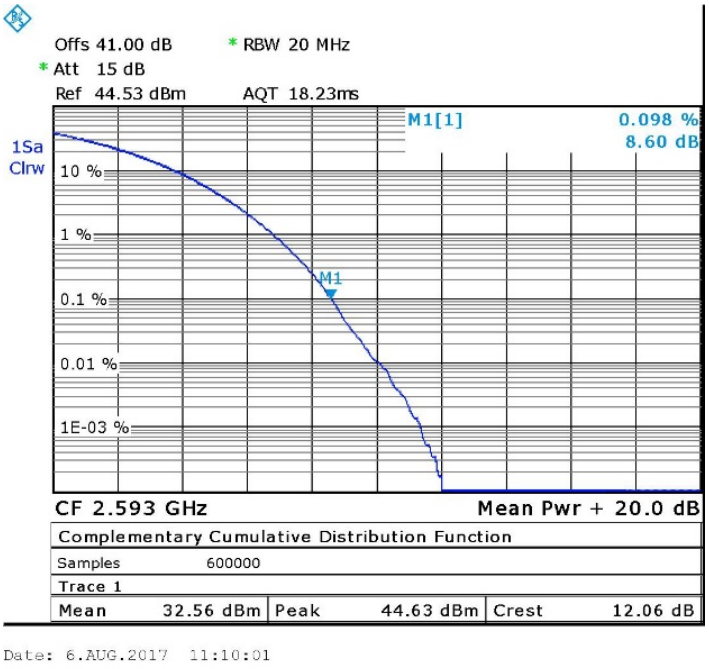

Figure 21. — 64QAM, 2593.0 MHz

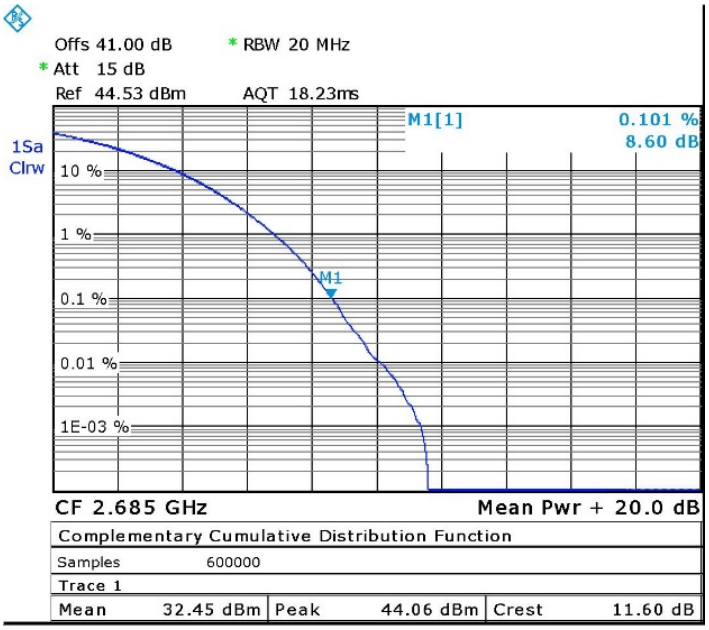

Figure 22. — 64QAM, 2685.0 MHz

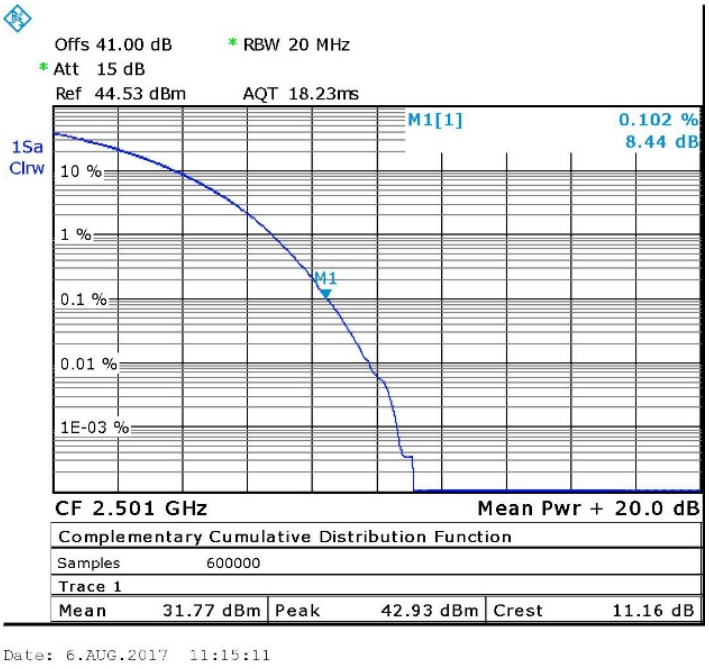

Figure 23. —16QAM, 2501.0 MHz

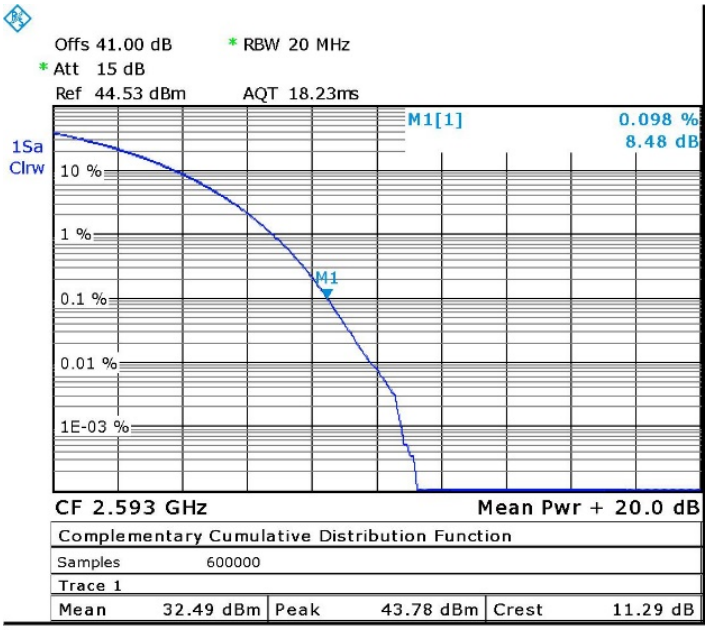

Figure 24. — 16QAM, 2593.0 MHz

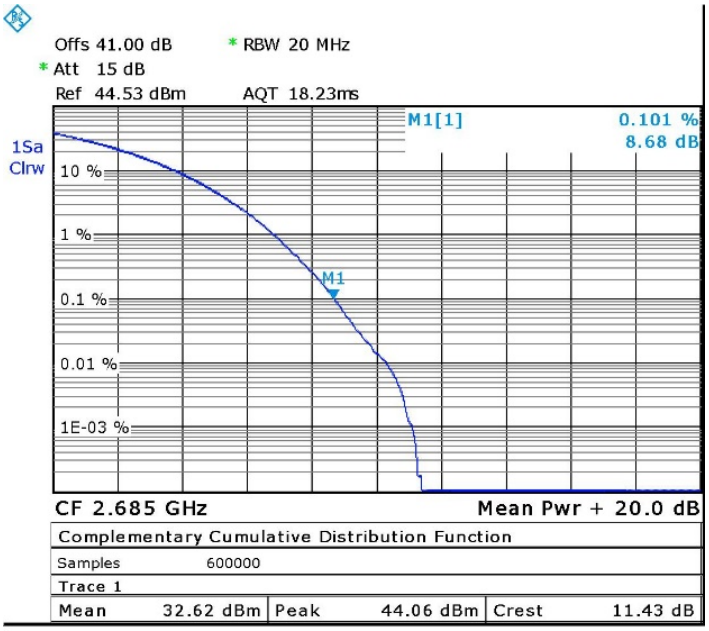

Figure 25. — 16QAM, 2685.0 MHz

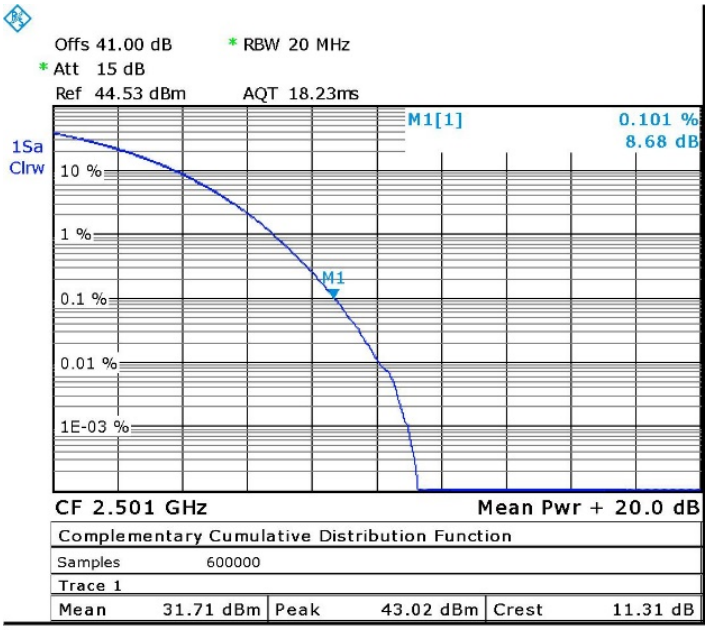

Figure 26. —QPSK, 2501.0 MHz

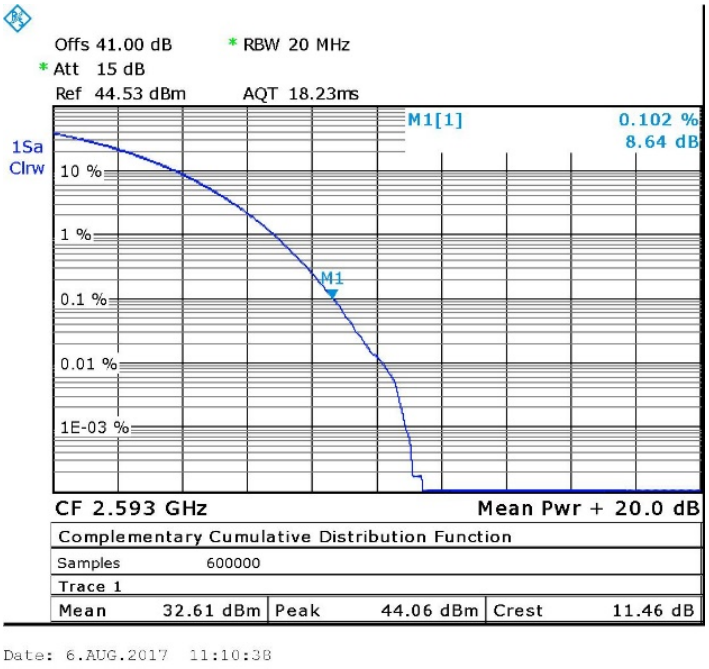

Figure 27. — QPSK, 2593.0 MHz

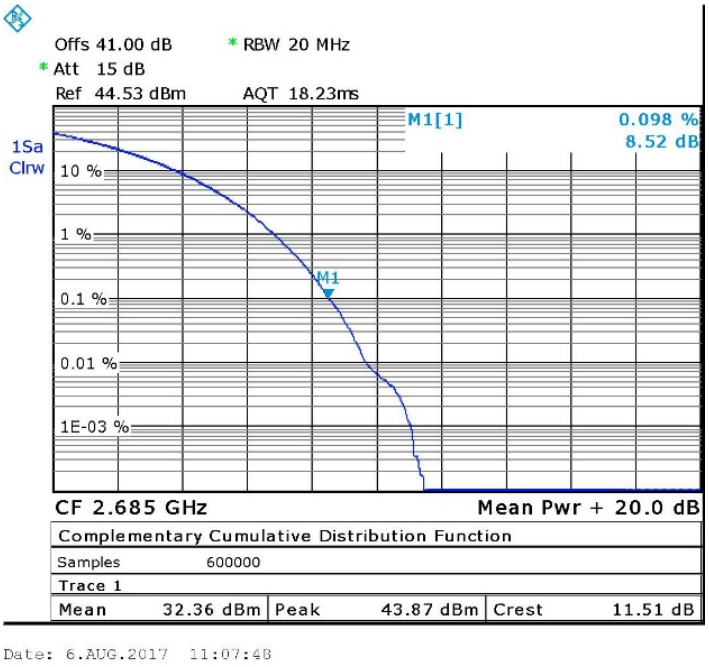

Figure 28. — QPSK, 2685.0 MHz

5.5 Test Equipment Used; 0.1% PAPR

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Date
Spectrum Analyzer	R&S	FSL6	100194	March 2, 2017	March 2, 2018
Vector Signal Generator	Agilent	N5182A	MY48180244	August 2 , 2016	Nov 2, 2019
40 dB Attenuator	Weinschel	WA 39-40-33	A1323	August 8, 2016	August 8, 2017

Figure 29 Test Equipment Used

6. Occupied Bandwidth

6.1 Test Specification

FCC Part 2, Section 1049

6.2 Test Procedure

(Temperature (22°C)/ Humidity (35%RH))
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 and an appropriate coaxial cable. The OBW function (99%) was using for these evaluation.
Occupied bandwidth measured was repeated for each modulation.

6.3 Test Limit

N/A

6.4 Test Results

Modulation	Port	Operating Frequency	Reading
	(Input/ Output)	(MHz)	(MHz)
64QAM	Input	2501.0	8.9
	Output	2501.0	8.9
	Input	2593.0	8.9
	Output	2593.0	8.9
	Input	2685.0	8.9
	Output	2685.0	8.9
16QAM	Input	2501.0	8.9
	Output	2501.0	8.9
	Input	2593.0	8.9
	Output	2593.0	8.9
	Input	2685.0	8.9
	Output	2685.0	8.9
QPSK	Input	2501.0	8.9
	Output	2501.0	8.9
	Input	2593.0	8.9
	Output	2593.0	8.9
	Input	2685.0	8.9
	Output	2685.0	8.9

Figure 30 Occupied Bandwidth Test Results

JUDGEMENT: Passed

See additional information in *Figure 31* to *Figure 48.*

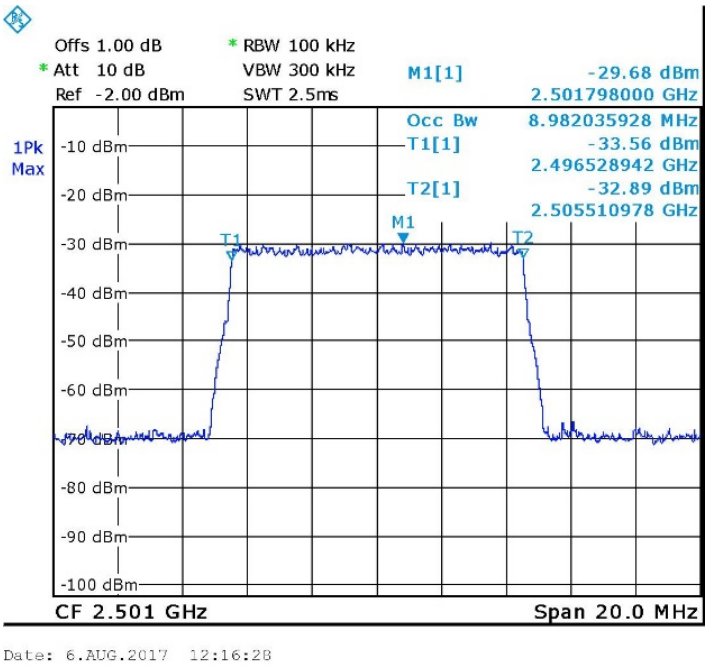

Figure 31 Occupied Bandwidth INPUT, 2501.0MHz, 64QAM

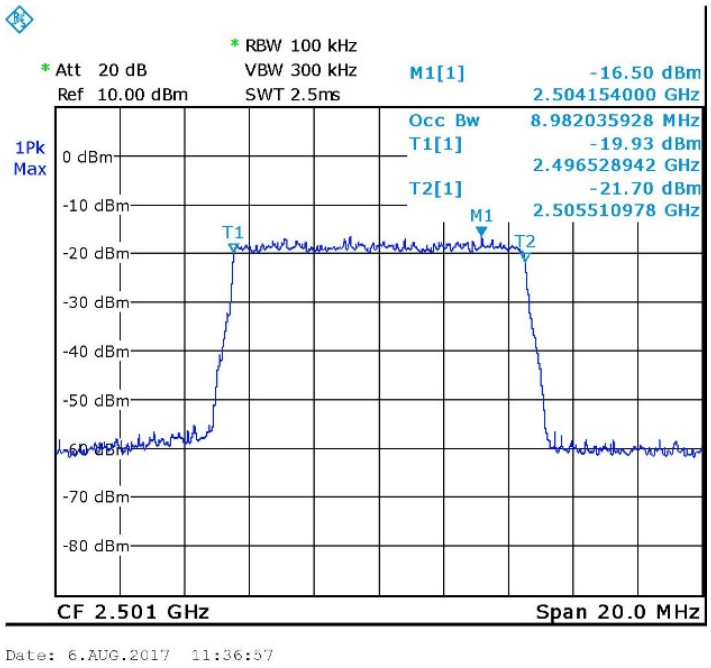

Figure 32 Occupied Bandwidth OUTPUT, 2501.0MHz, 64QAM

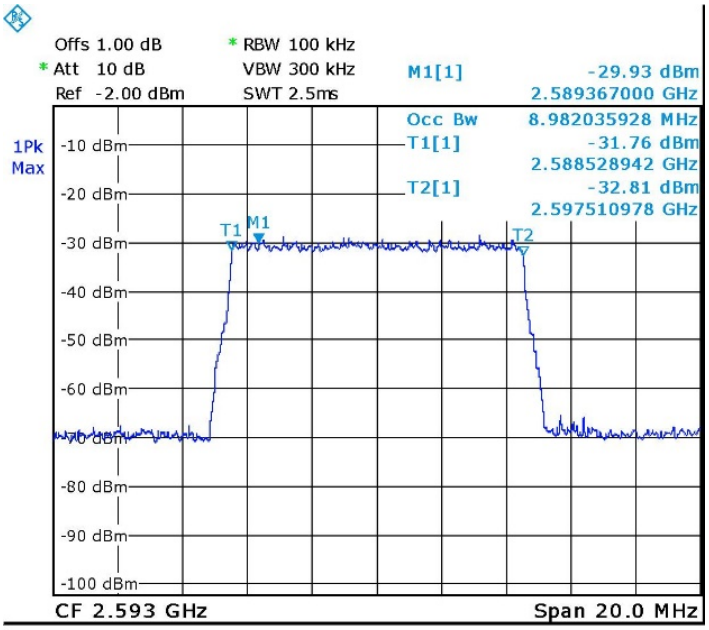

Figure 33 Occupied Bandwidth INPUT, 2593.0MHz, 64QAM

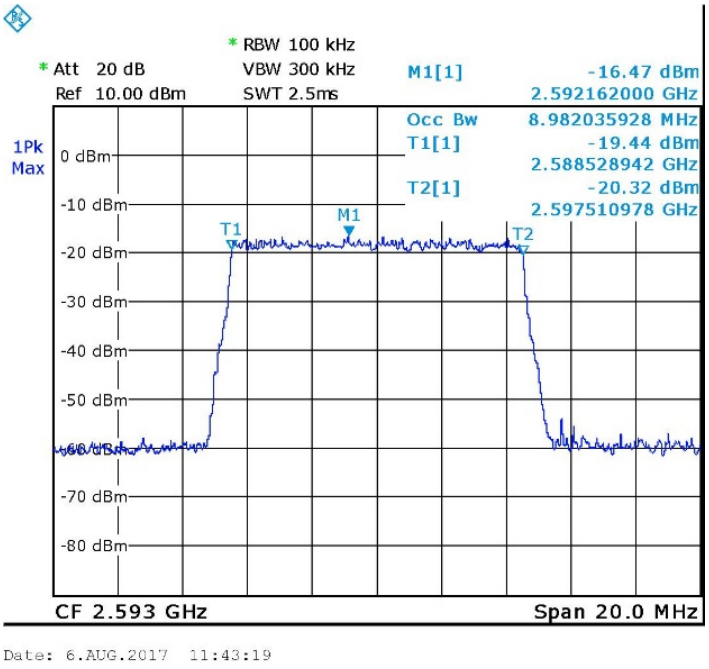

Figure 34 Occupied Bandwidth OUTPUT, 2593.0MHz, 64QAM

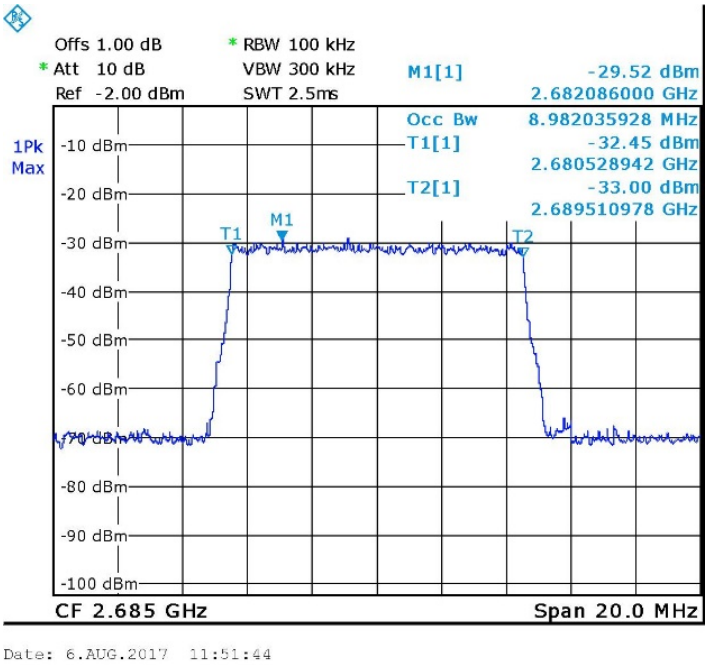

Figure 35 Occupied Bandwidth INPUT, 2685.0MHz, 64QAM

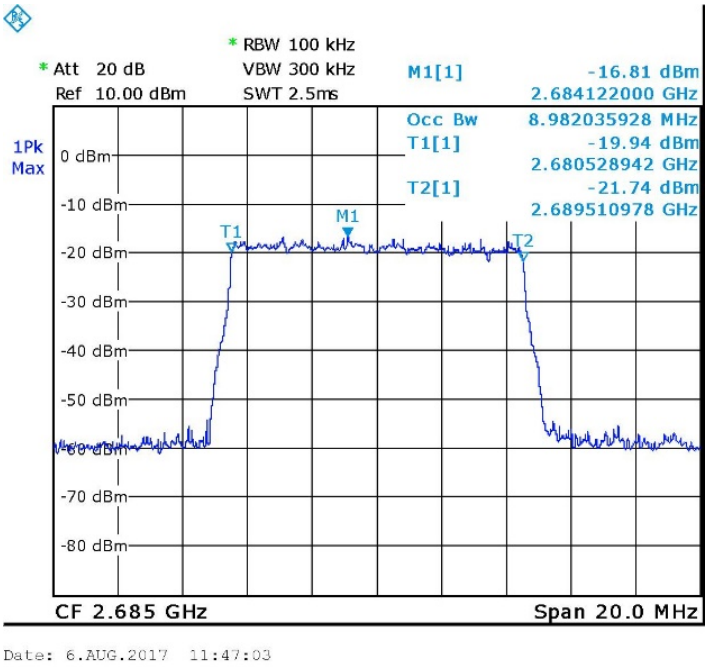

Figure 36 Occupied Bandwidth OUTPUT, 2685.0MHz, 64QAM

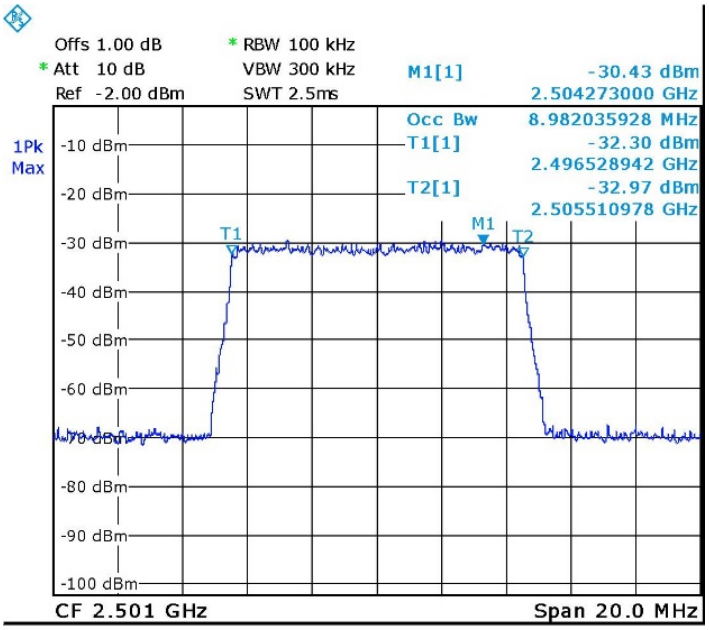

Figure 37 Occupied Bandwidth INPUT, 2501.0MHz, 16QAM

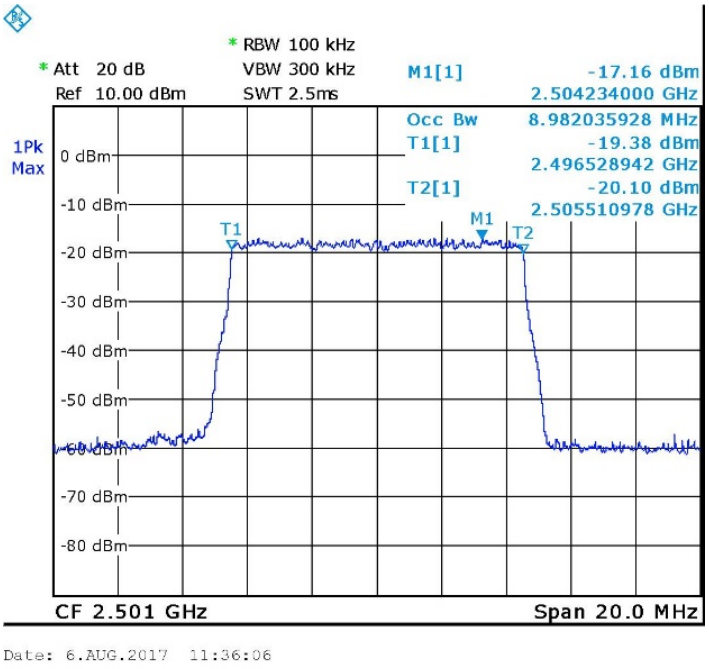

Figure 38 Occupied Bandwidth OUTPUT, 2501.0MHz, 16QAM

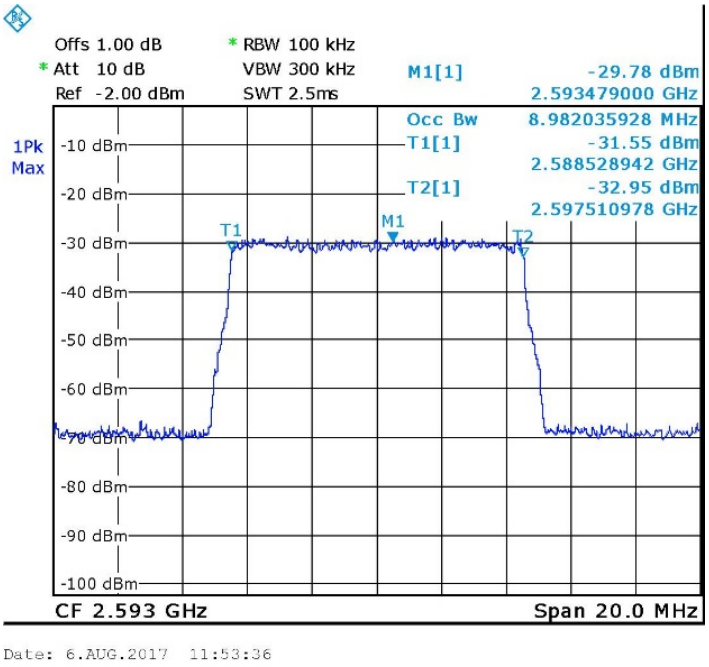

Figure 39 Occupied Bandwidth INPUT, 2593.0MHz, 16QAM

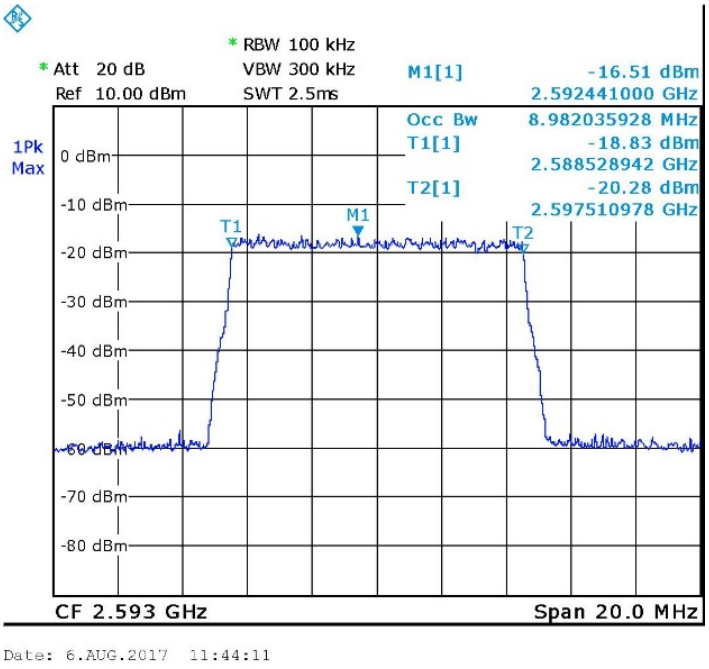

Figure 40 Occupied Bandwidth OUTPUT, 2593.0MHz, 16QAM

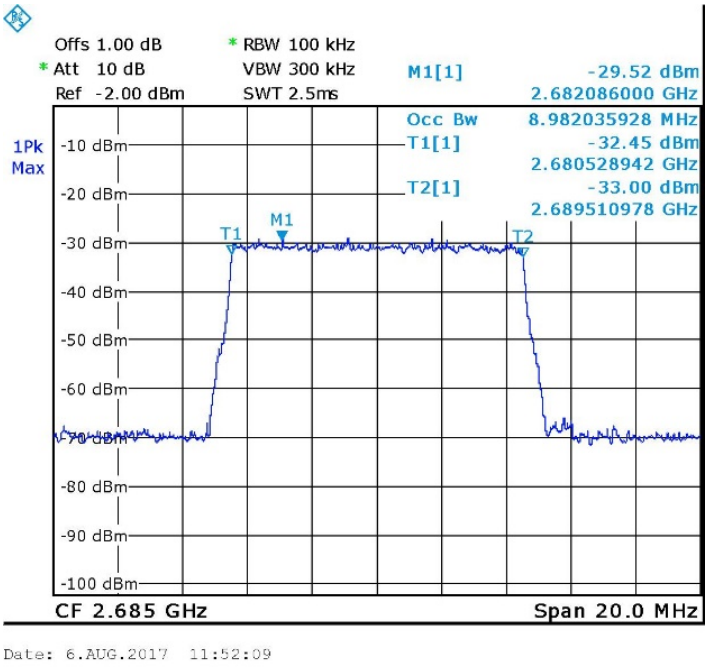

Figure 41 Occupied Bandwidth INPUT, 2685.0MHz, 16QAM

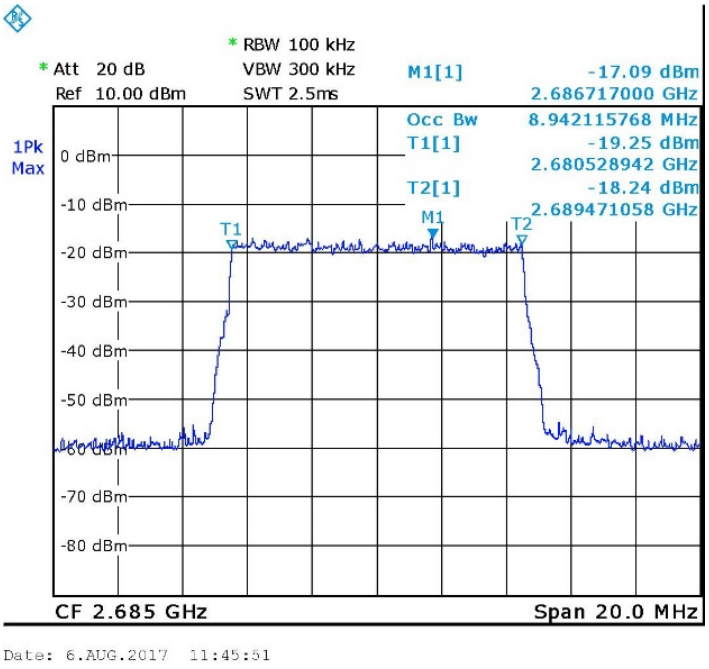

Figure 42 Occupied Bandwidth OUTPUT, 2685.0MHz, 16QAM

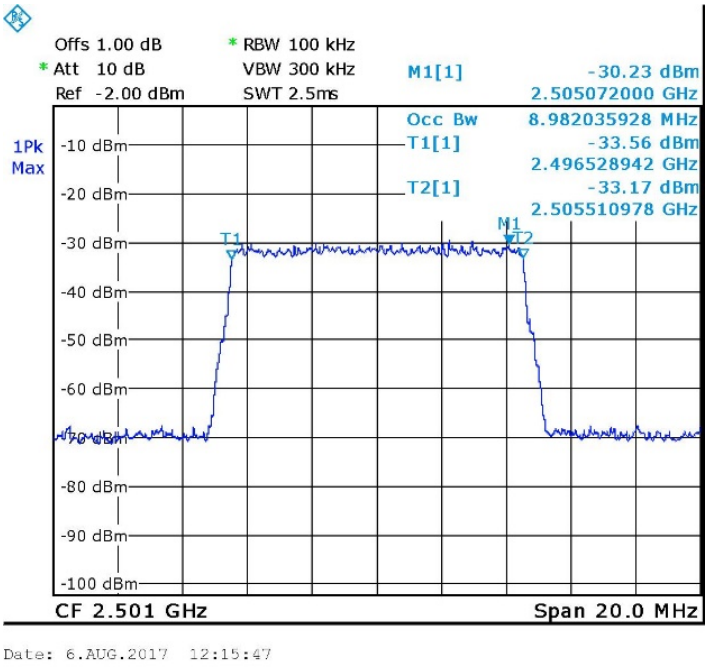

Figure 43 Occupied Bandwidth INPUT, 2501.0MHz, QPSK

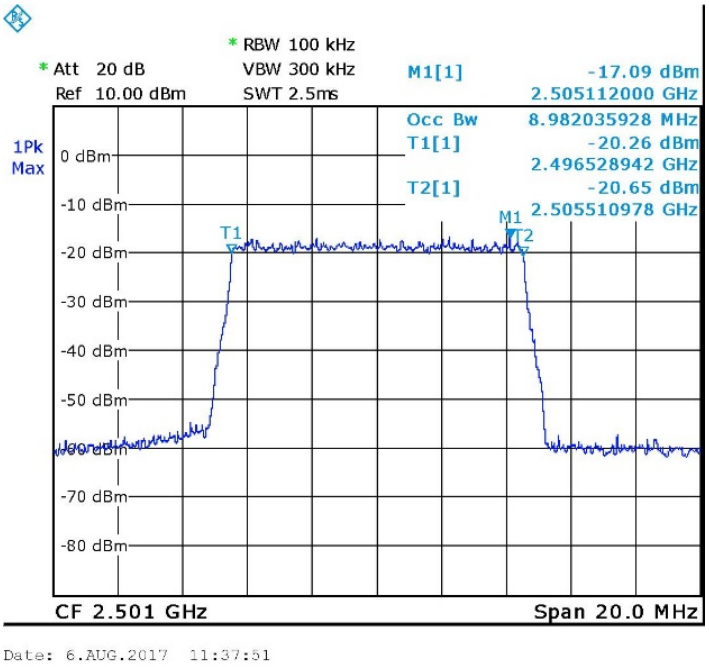

Figure 44 Occupied Bandwidth OUTPUT, 2501.0MHz, QPSK

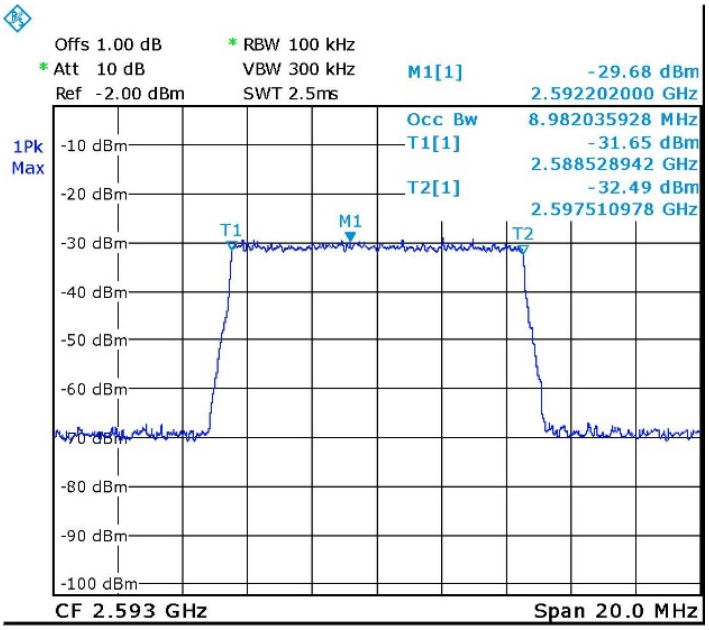

Figure 45 Occupied Bandwidth INPUT, 2593.0MHz, QPSK

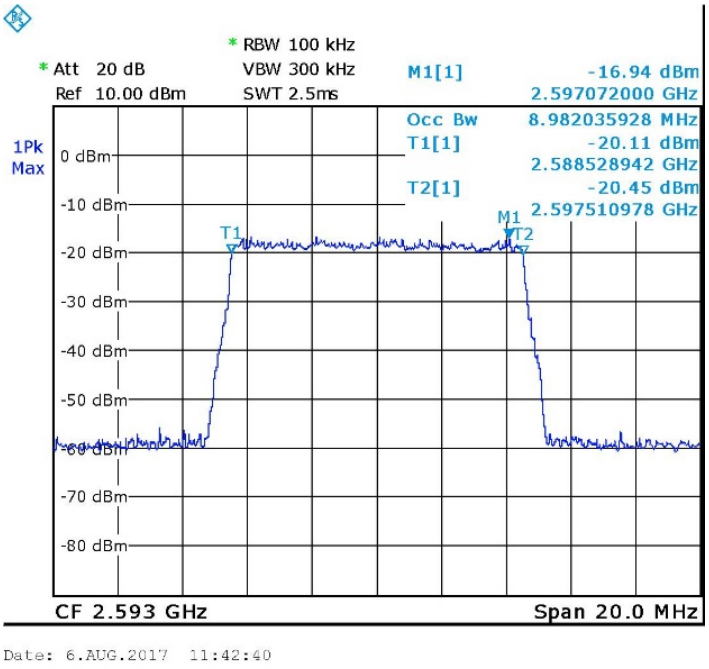

Figure 46 Occupied Bandwidth OUTPUT, 2593.0MHz, QPSK

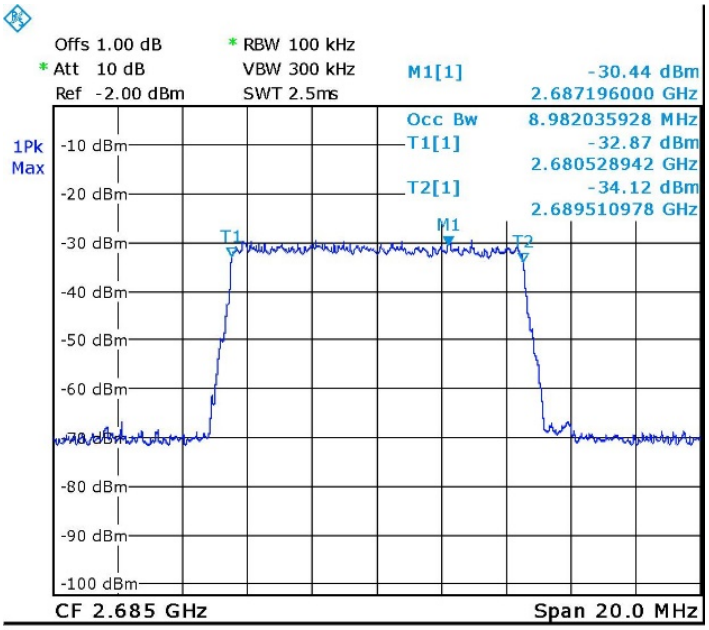

Figure 47 Occupied Bandwidth INPUT, 2685.0MHz, QPSK

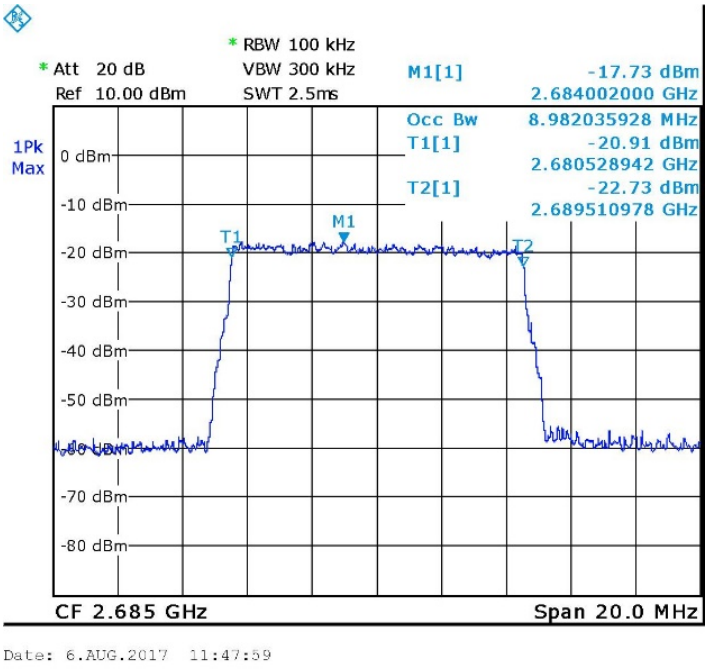

Figure 48 Occupied Bandwidth OUTPUT, 2685.0MHz, QPSK

6.5 Test Equipment Used; Occupied Bandwidth

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Date
Spectrum Analyzer	R&S	FSL6	100194	March 2, 2017	March 2, 2018
Vector Signal Generator	Agilent	N5182A	MY48180244	August 2 , 2016	Nov 2, 2019
40 dB Attenuator	Weinschel	WA 39-40-33	A1323	August 8, 2016	August 8, 2017

Figure 49 Test Equipment Used