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DATE: 24 March 2021

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

FCC Radio Test Report

For

Corning Optical Communication Wireless

Equipment under test:

Corning Everon 6000 DAS - dMRU

dMRU Medium Power Modular Remote Unit

(WCS)

Tested by: _____
M. Zohar

Approved by: _____
D. Shidlowsky

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Measurement/Technical Report for

Corning Optical Communication Wireless

Corning Everon 6000 DAS - dMRU

dMRU Medium Power Modular Remote Unit

(WCS)

FCC ID: OJFDMRUDPAM23

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

Measurement procedure used is KDB 935210 D05 v01r04 April 2020 and ANSI IEEE C63.26-2015

Substitution Method used as in ANSI TIA-603-E-2016

Application for Certification prepared by:	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:	8253 1st Avenue Vienna, VA 22812 U.S.A. Tel: +1-703 855-1773
Manufacturer's Representative:	Isaac Nissan
Equipment Under Test (E.U.T):	Corning Everon 6000 DAS - dMRU
Equipment Model No.:	dMRU Medium Power Modular Remote Unit
Equipment Serial No.:	Not Designated
Date of Receipt of E.U.T:	November 1, 2020
Start of Test:	November 2, 2020
End of Test:	February 23, 2021
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 IL1005.
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-20025, R-2729, T-20028, G-20068.
5. Department of Innovation, Science and Economic Development (ISED) Canada, CAB identifier: IL1002.

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

DMRU - Digital Medium-power Remote Unit.
The MRU is a medium power modular remote antenna unit with a single antenna port.
The Output power for the lower bands: 600/700 MHz Low/700 MHz High/FirstNet, 800/850 MHz is 33 dBm and the output power for the medium bands EAWS, PCS, WCS and 2.5GHz TDD is 37dBm.
The MRU modular structure and integrated high-performance cavity based multiplexing functionalities, enable setups of up to 6 RF modules, for a variety of licensed frequency bands within a single cabinet.
The MRU also provides CBRS/C-Band ready RF interface for future field upgrades.

1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in KDB 935210 D05 v01r04 April 2020 and ANSI/TIA-603-E-2016. 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 dMRU is a repeater supporting a broad range of cellular generations: 4G and 5G in the WCS band.
Evaluation was performed at the low, mid and high channels each one defined per the operation BW.
Evaluation was performed at 115VAC as the nominal power source.
Conducted tests were performed with an external attenuator connected to the spectrum analyzer.
Radiated emission tests were performed with a 50Ω termination connected to the E.U.T output terminal.

2.2 EUT Exercise Software

The Element Management System ver. 1.4 was used for commands delivery. These commands are used to enable/disable the EUT transmission. SW Ver. is 1.4 .

2.3 Special Accessories

No special accessories were needed in order to achieve compliance.

2.4 Equipment Modifications

No modifications were necessary in order to achieve compliance.

2.5 Configuration of Tested System

Product Name	Corning Everon 6000 DAS - dMRU
Model Name	dMRU medium power modular remote unit (WCS)
Working voltage(rated)	48 VDC, 115/230 VAC
Mode of operation	Repeater Booster supporting 4G and 5G
Modulations	4G: 16QAM, 64QAM, QPSK; 5G: 16QAM, 64QAM, 256QAM, QPSK
Frequency Range	(DL: 2350-2360, UL:2305-2315)
Transmit power	~38 dBm (Max) per band
DATA rate	N/A
Modulation BW	10MHz
DC Voltage applied to final RF stage band board (Driver and PA)	28.5V
DC Current applied to final RF stage band board (Driver and PA)	1.5A

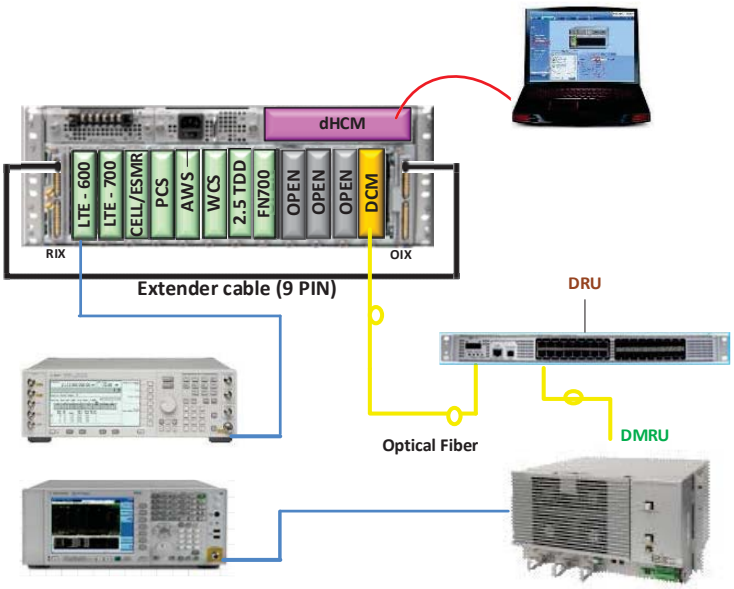

Figure 1. Conducted Test Set-Up

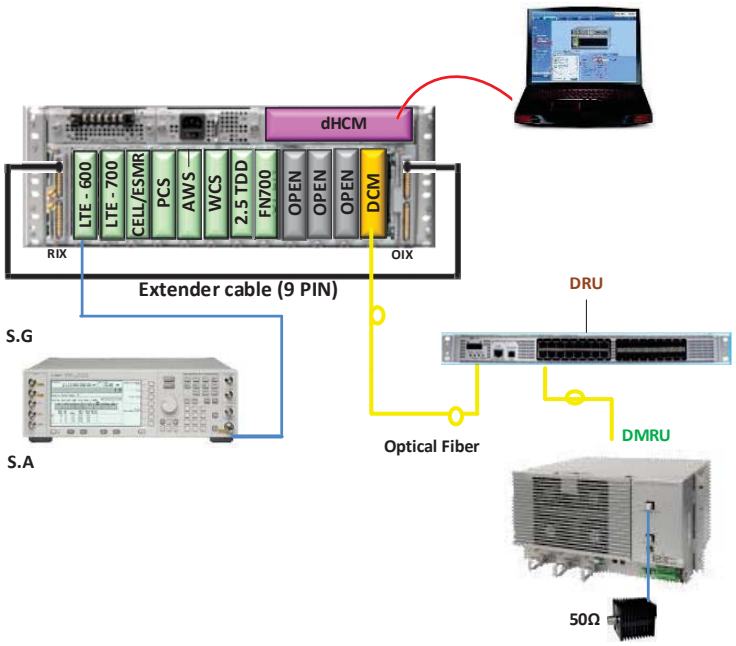

Figure 2. Radiated Test Set-Up

3. Test Set-Up Photos

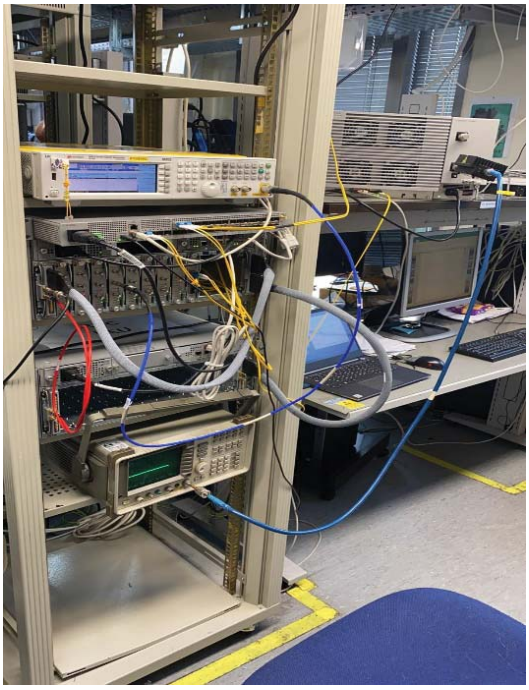

Figure 3. Conducted Emission From Antenna Port Tests

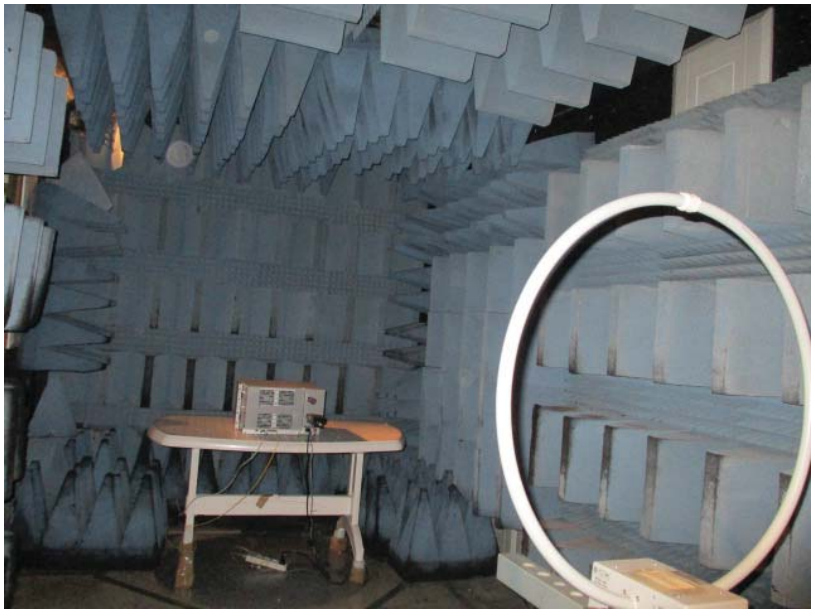

Figure 4. Radiated Emission Test 9kHz - 30MHz

Figure 5. Radiated Emission Test 30 - 200 MHz

Figure 6. Radiated Emission Test 200 - 1000MHz

Figure 7. Radiated Emission Test 1.0 -18.0GHz

Figure 8. Radiated Emission Test 18.0-25.0GHz

4. RF Power Output - 5G and 4G

4.1 Test Specification

FCC Part 27, Subpart C, Section 27.50(a)(ii)

4.2 Test Procedure

(Temperature (20°C)/ Humidity (54%RH))

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator (41.6 dB) and an appropriate coaxial cable. Special attention was taken to prevent Spectrum Analyzer RF input overload.

4.3 Test Limit

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

4.4 Test Results

JUDGEMENT: Passed

See additional information in Table 1 to Table 7 and Figure 9 to Figure 19.

Modulation	Bandwidth	Sub Carrier	Operation Frequency	Reading
	(MHz)	(kHz)	(MHz)	(dBm)
16QAM	10	15	2355	37.51
		30		37.52

Table 1 RF Power Output 16QAM – 5G

Modulation	Bandwidth	Sub Carrier	Operation Frequency	Reading
	(MHz)	(kHz)	(MHz)	(dBm)
64QAM	10	15	2355	37.18
		30		37.33

Table 2 RF Power Output 64QAM – 5G

Modulation	Bandwidth	Sub Carrier	Operation Frequency	Reading
	(MHz)	(kHz)	(MHz)	(dBm)
256QAM	10	15	2355	37.57
		30		37.58

Table 3 RF Power Output 256QAM – 5G

Modulation	Bandwidth	Sub Carrier	Operation Frequency	Reading
	(MHz)	(kHz)	(MHz)	(dBm)
QPSK	10	15	2355	37.01
		30		37.11

Table 4 RF Power Output QPSK – 5G

Modulation	Bandwidth	Operation Frequency	Reading
16QAM	(MHz)	(MHz)	(dBm)
	10	2355	37.49

Table 5 RF Power Output 64QAM – 4G

Modulation	Bandwidth	Operation Frequency	Reading
64QAM	(MHz)	(MHz)	(dBm)
	10	2355	37.37

Table 6 RF Power Output 16QAM – 4G

Modulation	Bandwidth	Operation Frequency	Reading
QPSK	(MHz)	(MHz)	(dBm)
	10	2355	37.59

Table 7 RF Power Output QPSK – 4G

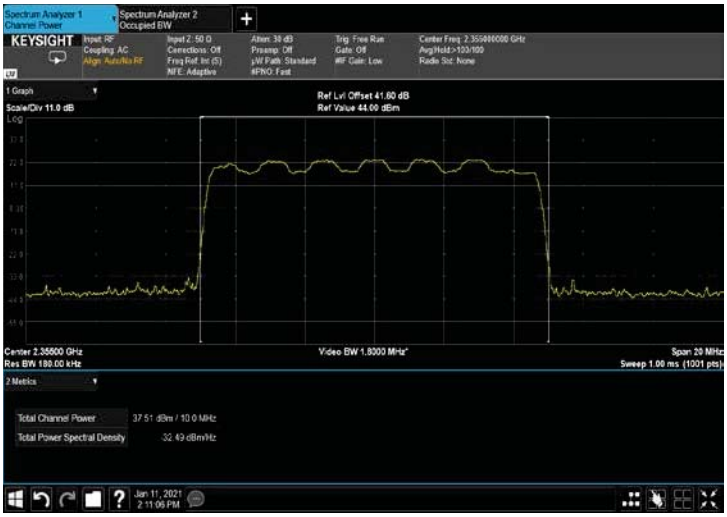

Figure 9: 16QAM 10MHz B.W; 2355MHz, 15kHz-5G

Figure 10: 16QAM 10MHz B.W; 2355MHz, 30kHz-5G

Figure 11: 64QAM 10MHz B.W; 2355MHz, 15kHz-5G

Figure 12: 64QAM 10MHz B.W; 2355MHz, 30kHz-5G

Figure 13: 256QAM 10MHz B.W; 2355MHz, 15kHz-5G

Figure 14: 256QAM 10MHz B.W; 2355MHz, 30kHz-5G

Figure 15: QPSK 10MHz B.W; 2355MHz, 15kHz-5G

Figure 16: QPSK 10MHz B.W; 2355MHz, 30kHz-5G

Figure 17: 16QAM 10MHz B.W; 2355MHz-4G

Figure 18: 64QAM 10MHz B.W; 2355MHz-4G

Figure 19: QPSK 10MHz B.W; 2355MHz-4G

4.5 Test Equipment Used; RF Output Power

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
EXA Signal Analyzer	Keysight	UXA N9040B	MY56080119	January 31, 2020	January 31, 2022
EXG Vector Signal Generator	Agilent Technologies	N5172B	MY53051952	January 17, 2019	January 17, 2022
40 dB Attenuator	Weinschel Associates	WA 39-40-33	-	November 1, 2020	November 1, 2021
RF Coaxial Cable	Huber-Suner	SLLS210B	-	November 1, 2020	November 1, 2021

Table 8 Test Equipment Used

5. Band Edge Spectrum - 5G and 4G

5.1 Test Specification

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

5.2 Test Procedure

(Temperature (20°C)/ Humidity (53%RH))
The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (41.6 dB).
The spectrum analyzer was set to 100 kHz R.B.W.

5.3 Test Limit

The power of any emission outside of the authorized operating frequency ranges (617-652 MHz) must be attenuated below the transmitting power (P) by a factor of at least 43 + log (P) dB, yielding –13dBm.

5.4 Test Results

JUDGEMENT: Passed

See additional information in Table 9 to Table 15 and Figure 20 to Figure 41.

Modulation	Bandwidth	Sub Carrier	Band Edge Frequency	Reading	Limit
	(MHz)	(kHz)	(MHz)	(dBm)	(dBm)
16QAM	10	15	2355 lower	-39.346	-13.0
			2355 upper	-39.559	-13.0
		30	2355 lower	-43.438	-13.0
			2355 upper	-41.234	-13.0

Table 9 Band Edge Spectrum Results 16QAM – 5G

Modulation	Bandwidth	Sub Carrier	Band Edge Frequency	Reading	Limit
	(MHz)	(kHz)	(MHz)	(dBm)	(dBm)
64QAM	10	15	2355 lower	-37.237	-13.0
			2355 upper	-37.010	-13.0
		30	2355 lower	-39.340	-13.0
			2355 upper	-43.682	-13.0

Table 10 Band Edge Spectrum Results 64QAM – 5G

Modulation	Bandwidth	Sub Carrier	Band Edge Frequency	Reading	Limit
	(MHz)	(kHz)	(MHz)	(dBm)	(dBm)
256QAM	10	15	2355 lower	-37.583	-13.0
			2355 upper	-39.969	-13.0
		30	2355 lower	-42.461	-13.0
			2355 upper	-40.061	-13.0

Table 11 Band Edge Spectrum Results 256QAM – 5G

Modulation	Bandwidth	Sub Carrier	Band Edge Frequency	Reading	Limit
	(MHz)	(kHz)	(MHz)	(dBm)	(dBm)
QPSK	10	15	2355 lower	-41.363	-13.0
			2355 upper	-37.018	-13.0
		30	2355 lower	-42.101	-13.0
			2355 upper	-38.992	-13.0

Table 12 Band Edge Spectrum Results QPSK – 5G

Modulation	Bandwidth	Band Edge Frequency	Reading	Limit
	(MHz)	(MHz)	(dBm)	(dBm)
16QAM	10	2355 lower	-37.337	-13.0
		2355 upper	-40.604	-13.0

Table 13 Band Edge Spectrum Results 16QAM – 4G

Modulation	Bandwidth	Band Edge Frequency	Reading	Limit
	(MHz)	(MHz)	(dBm)	(dBm)
64QAM	10	2355 lower	-34.442	-13.0
		2355 upper	-34.673	-13.0

Table 14 Band Edge Spectrum Results 64QAM – 4G

Modulation	Bandwidth	Band Edge Frequency	Reading	Limit
	(MHz)	(MHz)	(dBm)	(dBm)
QPSK	10	2355 lower	-30.243	-13.0
		2355 upper	-36.884	-13.0

Table 15 Band Edge Spectrum Results QPSK – 4G

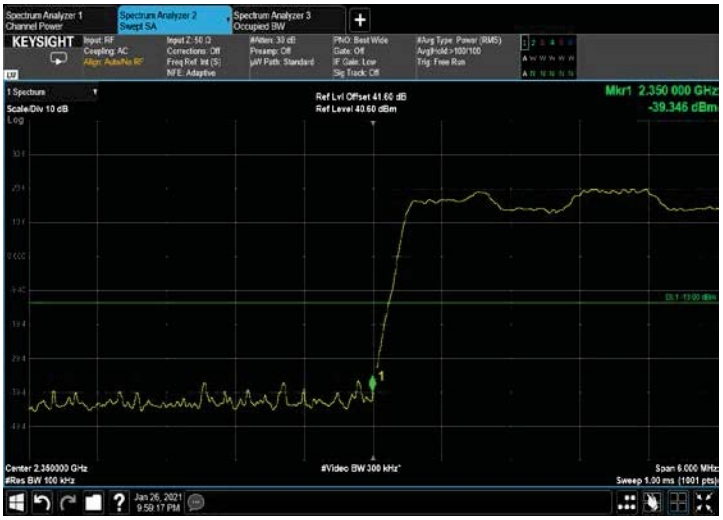

Figure 20: 16QAM 10MHz B.W.; 2355MHz, 15kHz-5G Lower Edge

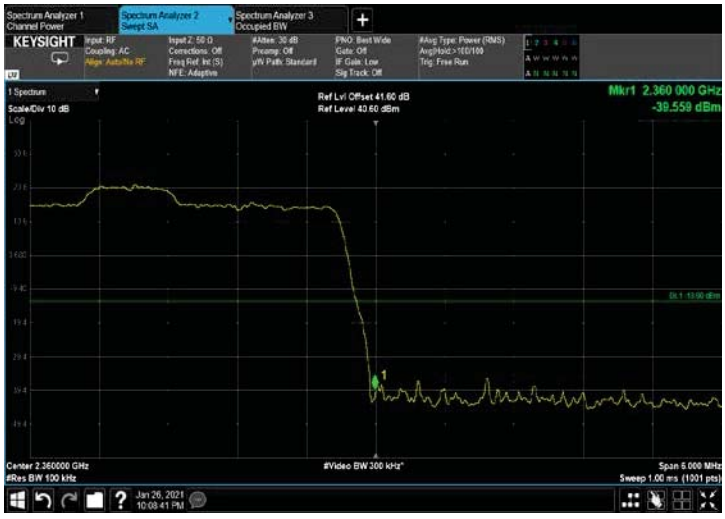

Figure 21: 16QAM 10MHz B.W.; 2355MHz, 15kHz-5G Upper Edge

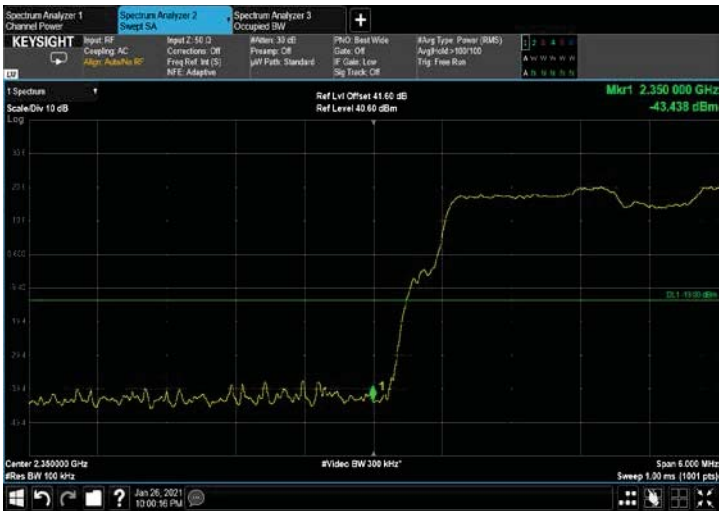

Figure 22: 16QAM 10MHz B.W.; 2355MHz, 30kHz-5G Lower Edge

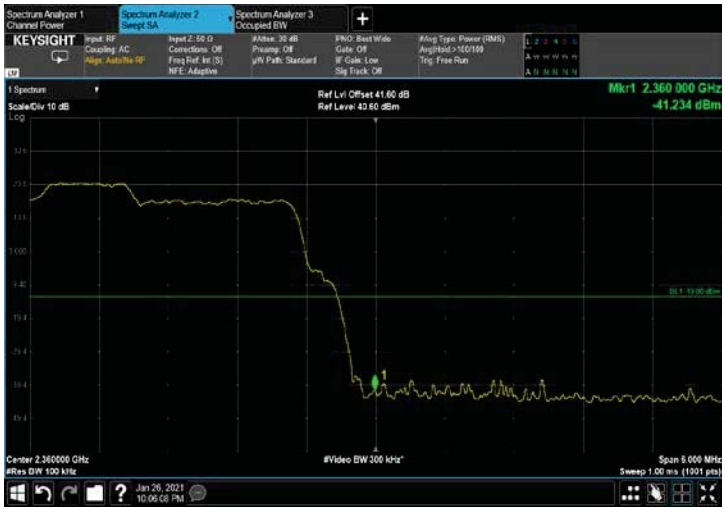

Figure 23: 16QAM 10MHz B.W.; 2355MHz, 30kHz-5G Upper Edge

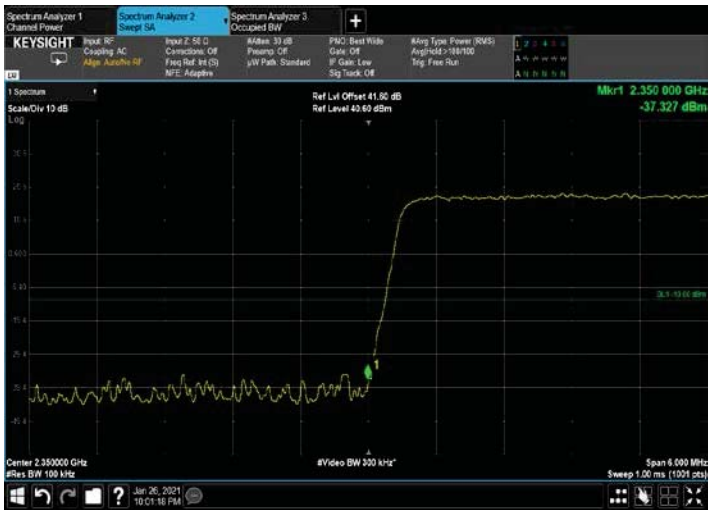

Figure 24: 64QAM 10MHz B.W.; 2355MHz, 15kHz-5G Lower Edge

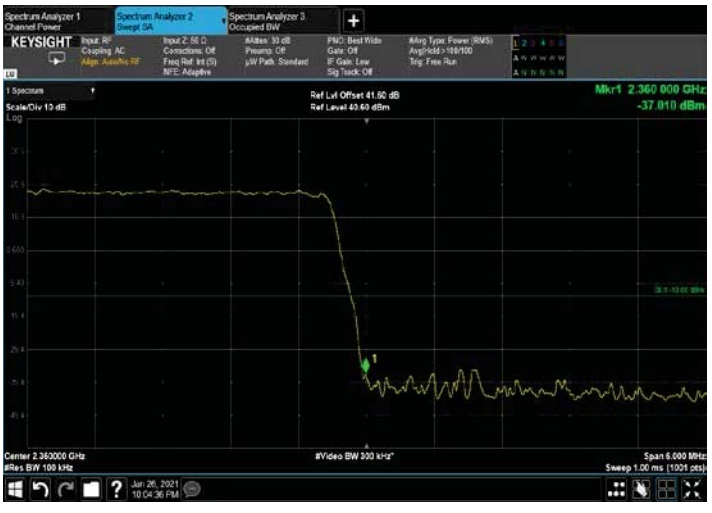

Figure 25: 64QAM 10MHz B.W.; 2355MHz, 15kHz-5G Upper Edge

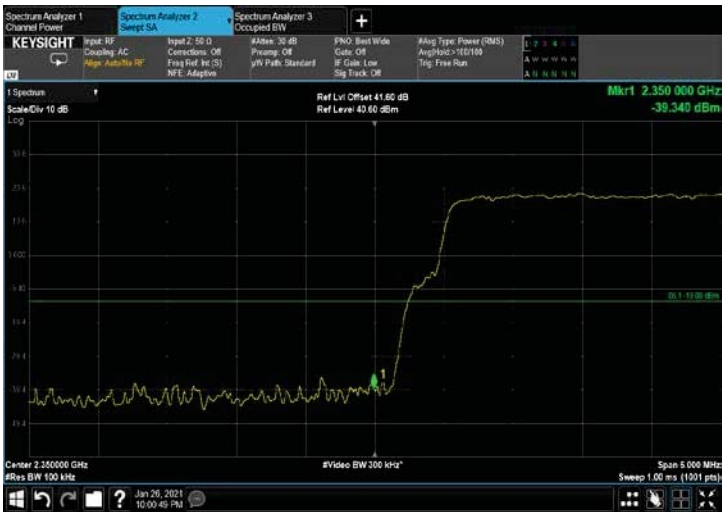

Figure 26: 64QAM 10MHz B.W.; 2355MHz, 30kHz-5G Lower Edge

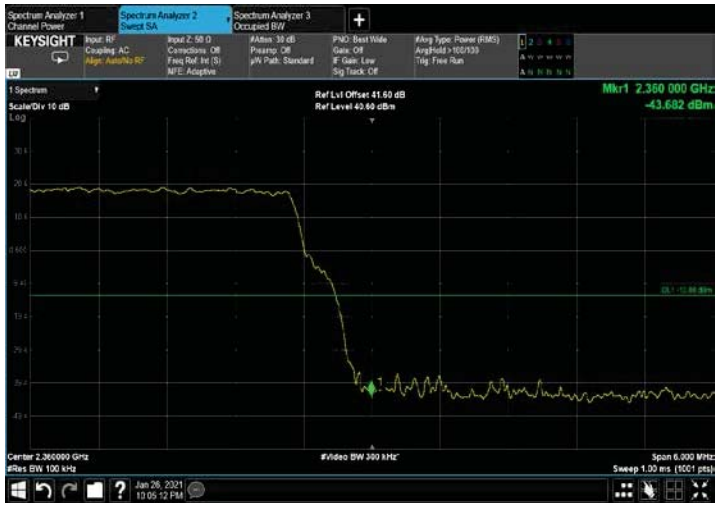

Figure 27: 64QAM 10MHz B.W.; 2355MHz, 30kHz-5G Upper Edge

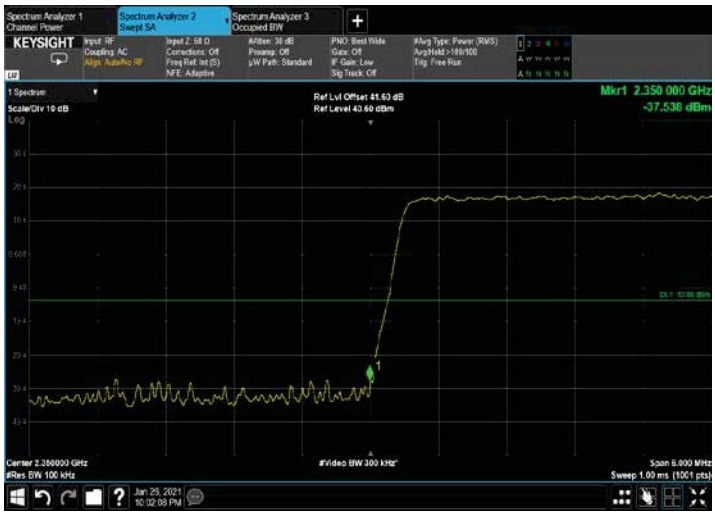

Figure 28: 256QAM 10MHz B.W.; 2355MHz, 15kHz-5G Lower Edge

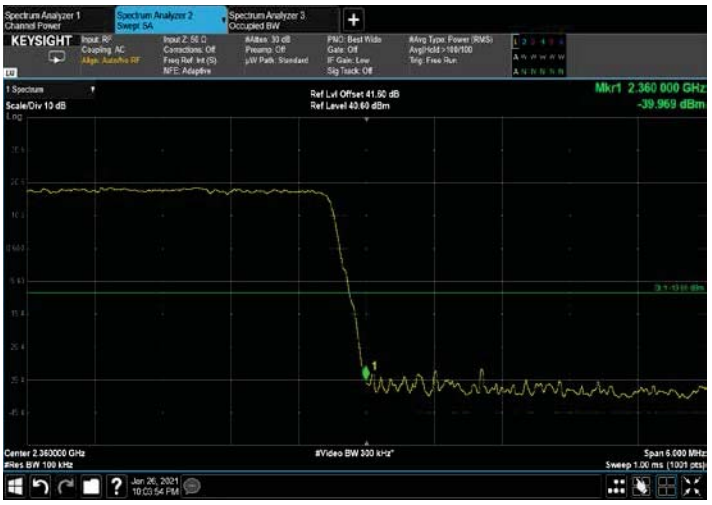

Figure 29: 256QAM 10MHz B.W.; 2355MHz, 15kHz-5G Upper Edge

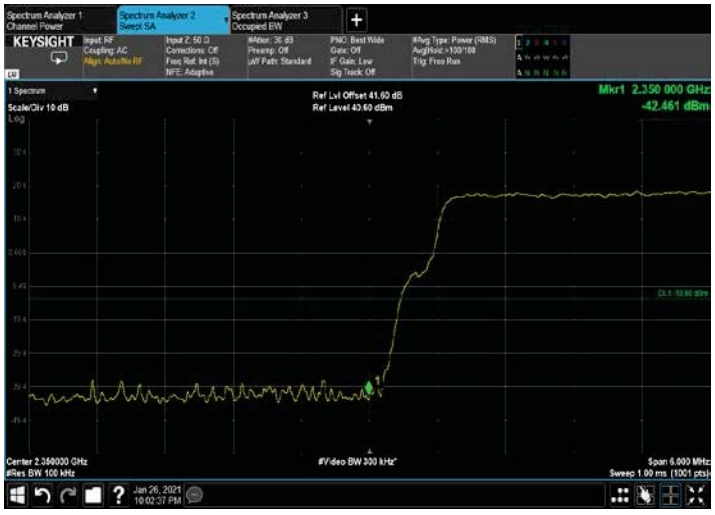

Figure 30: 256QAM 10MHz B.W.; 2355MHz, 30kHz-5G Lower Edge

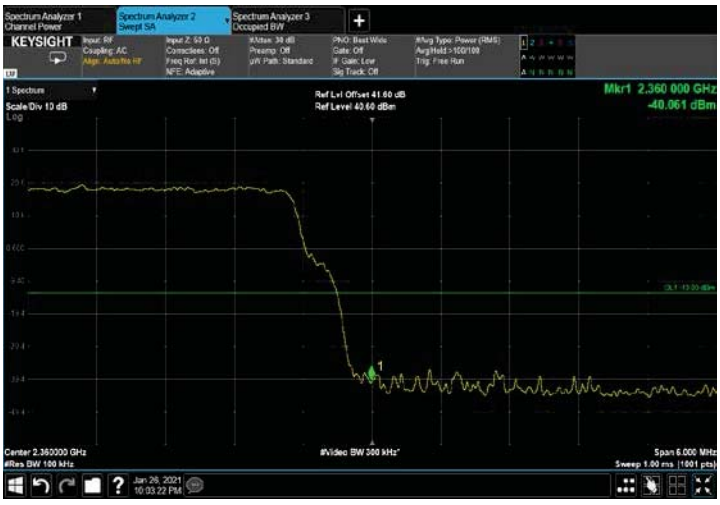

Figure 31: 256QAM 10MHz B.W.; 2355MHz, 30kHz-5G Upper Edge

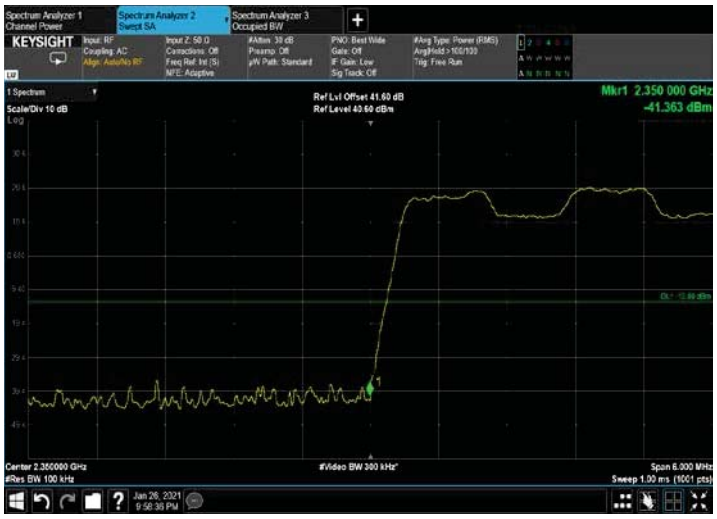

Figure 32: QPSK 10MHz B.W.; 2355MHz, 15kHz-5G Lower Edge

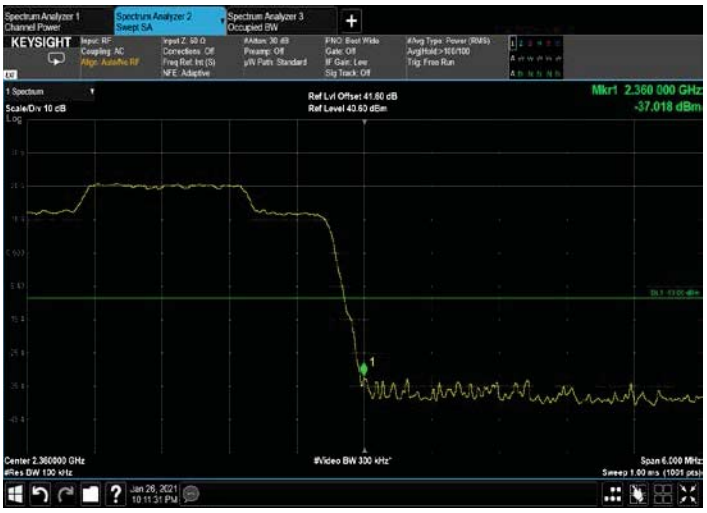

Figure 33: QPSK 10MHz B.W.; 2355MHz, 15kHz-5G Upper Edge

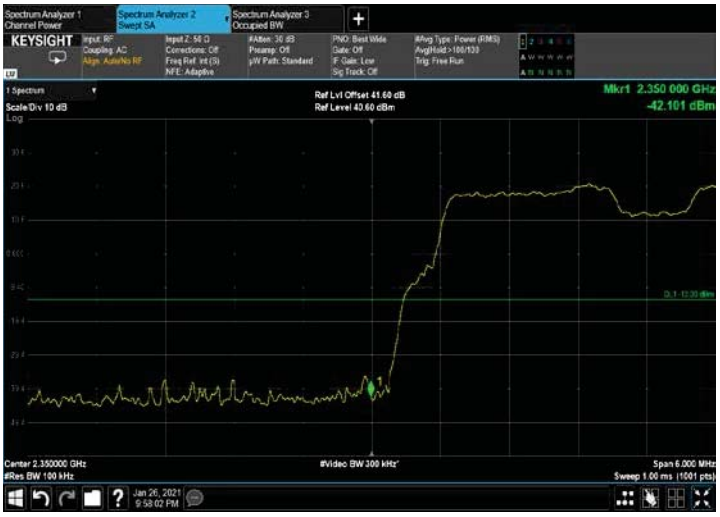

Figure 34: QPSK 10MHz B.W.; 2355MHz, 30kHz-5G Lower Edge

Figure 35: QPSK 10MHz B.W.; 2355MHz, 30kHz-5G Upper Edge

Figure 36: 16QAM 10MHz B.W.; 2355MHz-4G Lower Edge

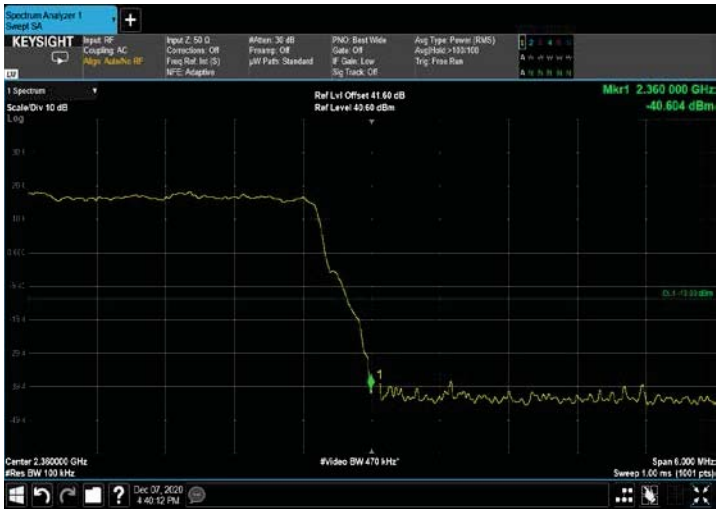

Figure 37: 16QAM 10MHz B.W.; 2355MHz-4G Upper Edge

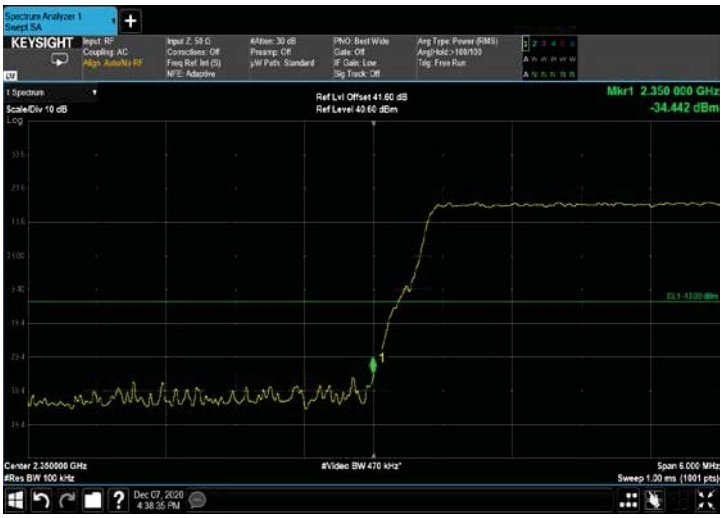

Figure 38: 64QAM 10MHz B.W.; 2355MHz-4G Lower Edge

Figure 39: 64QAM 10MHz B.W.; 2355MHz-4G Upper Edge

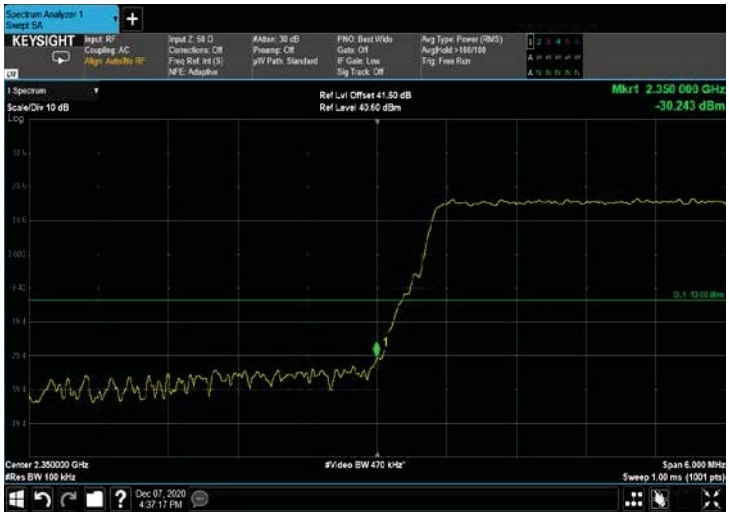

Figure 40: QPSK 10MHz B.W.; 2355MHz-4G Lower Edge

Figure 41: QPSK 10MHz B.W.; 2355MHz-4G Upper Edge

5.5 Test Equipment Used; Band Edge Spectrum

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
EXA Signal Analyzer	Keysight	UXA N9040B	MY56080119	January 31, 2020	January 31, 2022
EXG Vector Signal Generator	Agilent Technologies	N5172B	MY53051952	January 17, 2019	January 17, 2022
40 dB Attenuator	Weinschel Associates	WA 39-40-33	-	November 1, 2020	November 1, 2021
RF Coaxial Cable	Huber-Suner	SLLS210B	-	November 1, 2020	November 1, 2021

Table 16 Test Equipment Used

6. Average Power Spectral Density 5G and 4G

6.1 Test Specification

FCC, Part 27, Subpart C, Section 27.50(a)(1)(A)

6.2 Test Procedure

(Temperature (20°C)/ Humidity (54%RH))

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (loss=41.6 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 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 below.

6.3 Test Limit

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

6.4 Test Results

JUDGEMENT: Passed

See additional information in Table 17 to Table 23 and Figure 42 to Figure 52.

Modulation	Bandwidth	Sub Carrier	Operation Frequency	Reading 1MHz	Reading 5MHz
	(MHz)	(kHz)	(MHz)	(dBm)	(dBm)
16QAM	10	15	2355	38.710	45.710
		30		36.256	43.256

Table 17 Average Power Spectral Density – 5G

Modulation	Bandwidth	Sub Carrier	Operation Frequency	Reading 1MHz	Reading 5MHz
	(MHz)	(kHz)	(MHz)	(dBm)	(dBm)
64QAM	10	15	2355	37.432	44.432
		30		37.618	44.618

Table 18 Average Power Spectral Density – 5G

Modulation	Bandwidth	Sub Carrier	Operation Frequency	Reading 1MHz	Reading 5MHz
	(MHz)	(kHz)	(MHz)	(dBm)	(dBm)
256QAM	10	15	2355	38.451	45.451
		30		38.469	45.469

Table 19 Average Power Spectral Density – 5G

Modulation	Bandwidth	Sub Carrier	Operation Frequency	Reading 1MHz	Reading 5MHz
	(MHz)	(kHz)	(MHz)	(dBm)	(dBm)
QPSK	10	15	2355	38.985	45.985
		30		38.524	45.524

Table 20 Average Power Spectral Density – 5G

Modulation	Bandwidth	Operation Frequency	Reading 1MHz	Reading 5MHz
16QAM	(MHz)	(MHz)	(dBm)	(dBm)
	10	2355	41.48	48.48

Table 21 Average Power Spectral Density – 4G

Modulation	Bandwidth	Operation Frequency	Reading 1MHz	Reading 5MHz
64QAM	(MHz)	(MHz)	(dBm)	(dBm)
	10	2355	38.80	45.80

Table 22 Average Power Spectral Density – 4G

Modulation	Bandwidth	Operation Frequency	Reading 1MHz	Reading 5MHz
QPSK	(MHz)	(MHz)	(dBm)	(dBm)
	10	2355	39.01	46.01

Table 23 Average Power Spectral Density – 4G

Figure 42: 16QAM 10MHz B.W; 2355MHz, 15kHz-5G

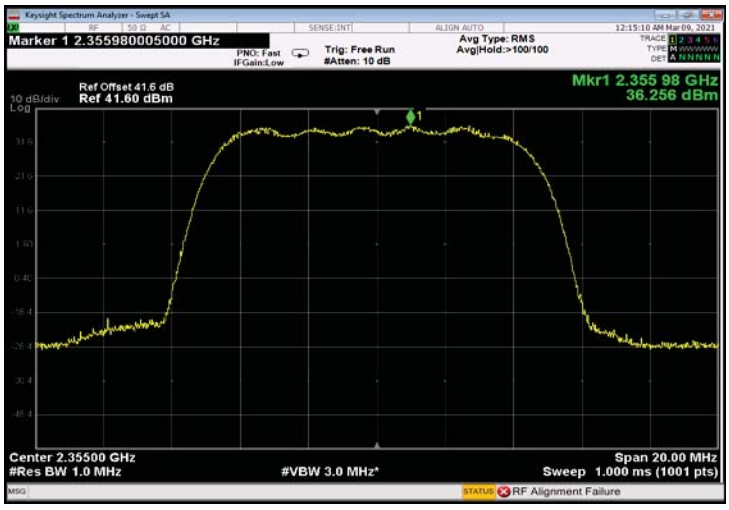

Figure 43: 16QAM 10MHz B.W; 2355MHz, 30kHz-5G

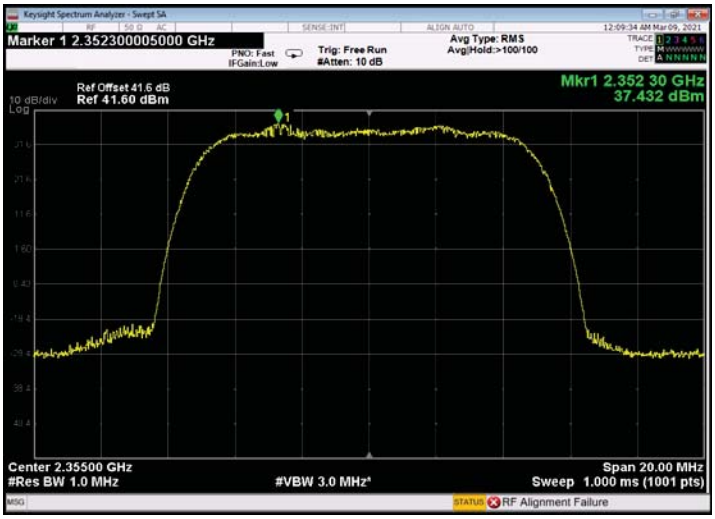

Figure 44: 64QAM 10MHz B.W; 2355MHz, 15kHz-5G

Figure 45: 64QAM 10MHz B.W; 2355MHz, 30kHz-5G

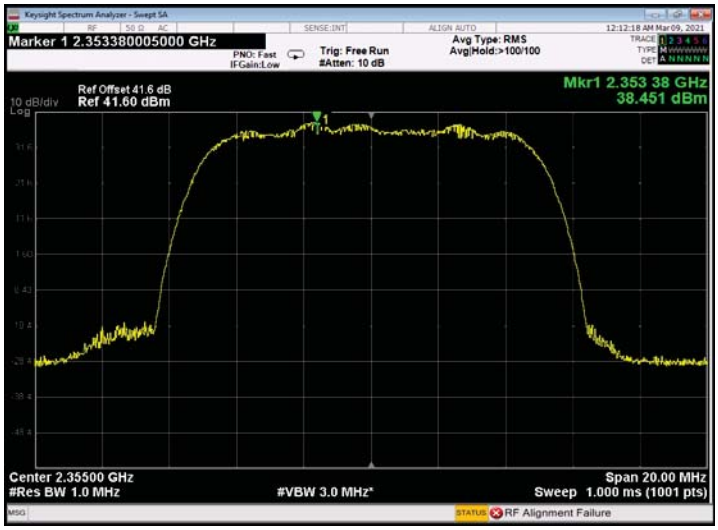

Figure 46: 256QAM 10MHz B.W; 2355MHz, 15kHz-5G

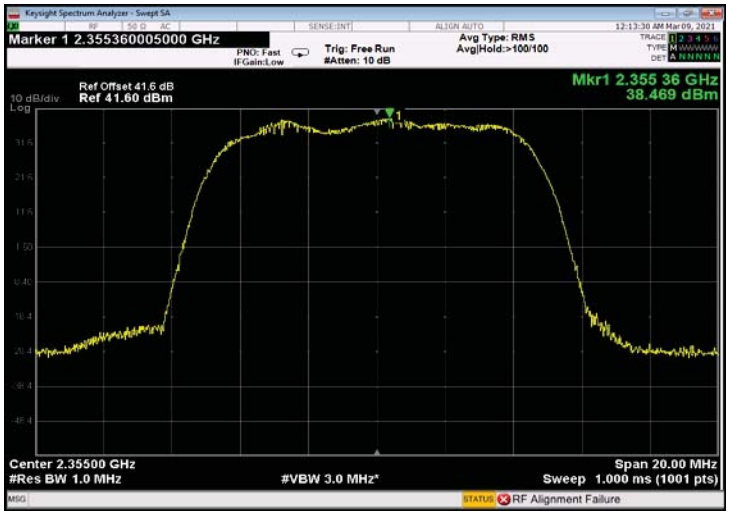

Figure 47: 256QAM 10MHz B.W; 2355MHz, 30kHz-5G

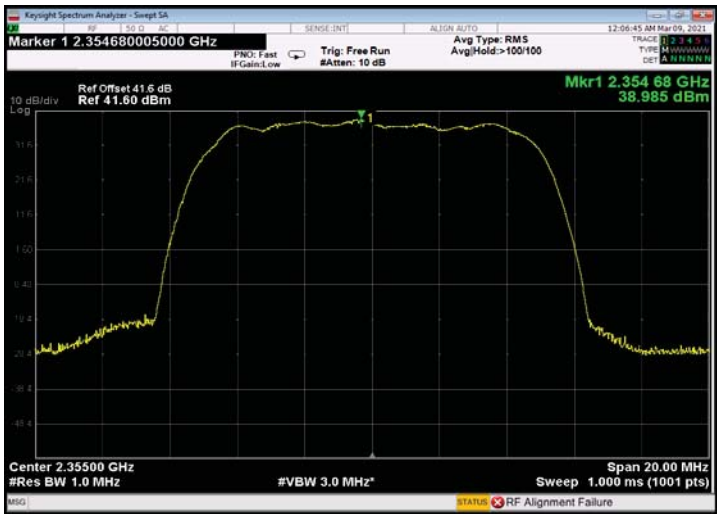

Figure 48: QPSK 10MHz B.W; 2355MHz, 15kHz-5G

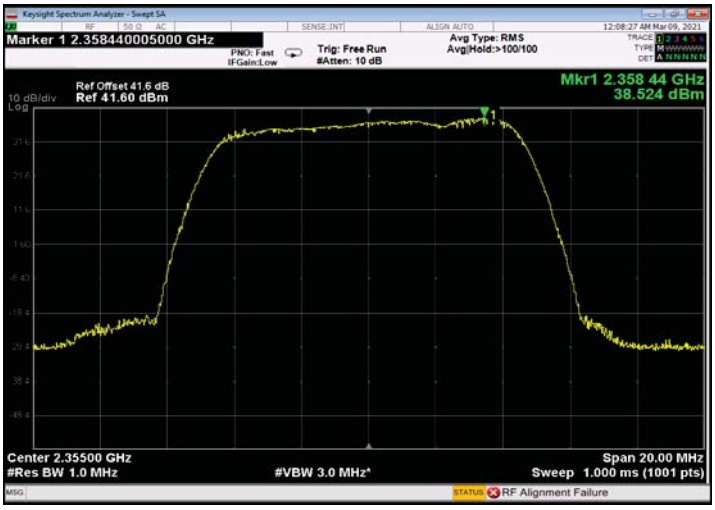

Figure 49: QPSK 10MHz B.W; 2355MHz, 30kHz-5G

Figure 50: 16QAM 10MHz B.W; 2355MHz-4G

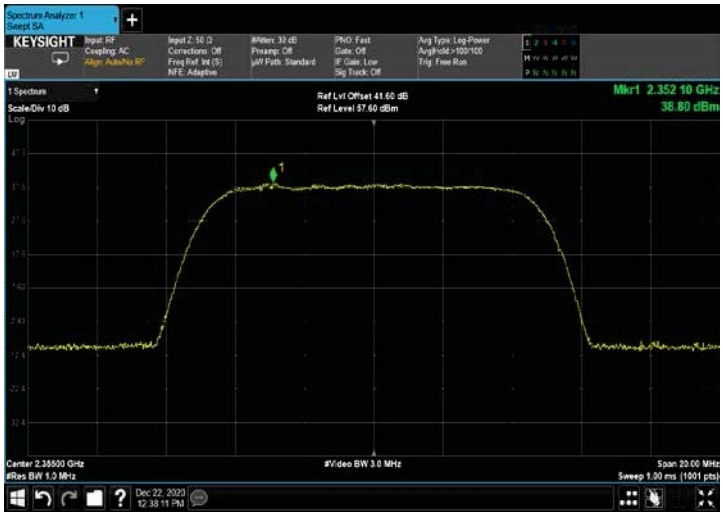

Figure 51: 64QAM 10MHz B.W; 2355MHz-4G

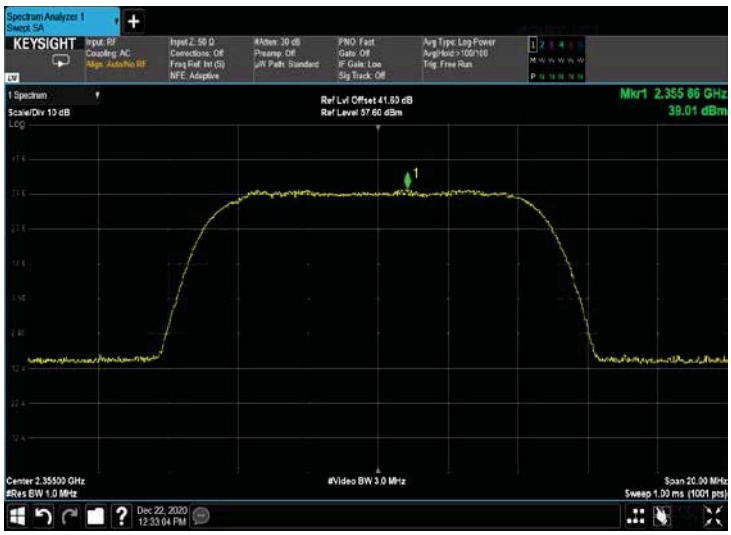

Figure 52: QPSK 10MHz B.W; 2355MHz-4G

6.5 Test Equipment Used; Average Power Spectral Density

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
EXA Signal Analyzer	Keysight	UXA N9040B	MY56080119	January 31, 2020	January 31, 2022
EXG Vector Signal Generator	Agilent Technologies	N5172B	MY53051952	January 17, 2019	January 17, 2022
40 dB Attenuator	Weinschel Associates	WA 39-40-33	-	November 1, 2020	November 1, 2021
RF Coaxial Cable	Huber-Suner	SLLS210B	-	November 1, 2020	November 1, 2021

Table 24 Test Equipment Used

7. Peak to Average Power Ratio - 5G and 4G

7.1 Test Specification

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

7.2 Test Procedure

(Temperature (20°C)/ Humidity (52%RH))
The method used is detailed in FCC KDB 971168 D03 v01

Measurements was using CCDF function for each modulation.

7.3 Test Limit

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB.

7.4 Test Results

JUDGEMENT: Passed

For additional information see Table 25 to Table 31 and Figure 53 to Figure 63.

Modulation	Bandwidth	Sub Carrier	Operation Frequency	0.1% PAPR	Limit
	(MHz)	(kHz)	(MHz)	(dB)	(dB)
16QAM	10	15	2355	8.53	13
		30		8.77	

Table 25 Test Results Peak to Average Power Ratio 16 QAM-5G

Modulation	Bandwidth	Sub Carrier	Operation Frequency	0.1% PAPR	Limit
	(MHz)	(kHz)	(MHz)	(dB)	(dB)
64QAM	10	15	2355	8.32	13
		30		8.49	

Table 26 Test Results Peak to Average Power Ratio 64 QAM-5G

Modulation	Bandwidth	Sub Carrier	Operation Frequency	0.1% PAPR	Limit
	(MHz)	(kHz)	(MHz)	(dB)	(dB)
256QAM	10	15	2355	8.56	13
		30		8.51	

Table 27 Test Results Peak to Average Power Ratio 256 QAM-5G

Modulation	Bandwidth	Sub Carrier	Operation Frequency	0.1% PAPR	Limit
	(MHz)	(kHz)	(MHz)	(dB)	(dB)
QPSK	10	15	2355	8.47	13
		30		8.33	

Table 28 Test Results Peak to Average Power Ratio QPSK-5G

Modulation	Bandwidth	Operation Frequency	0.1% PAPR	Limit
16QAM	(MHz)	(MHz)	(dB)	(dB)
	10	2355	6.42	13

Table 29 Test Results Peak to Average Power Ratio 16QAM-4G

Modulation	Bandwidth	Operation Frequency	0.1% PAPR	Limit
64QAM	(MHz)	(MHz)	(dB)	(dB)
	10	2355	6.44	13

Table 30 Test Results Peak to Average Power Ratio 64QAM-4G

Modulation	Bandwidth	Operation Frequency	0.1% PAPR	Limit
QPSK	(MHz)	(MHz)	(dB)	(dB)
	10	2355	6.45	13

Table 31 Test Results Peak to Average Power Ratio QPSK-4G

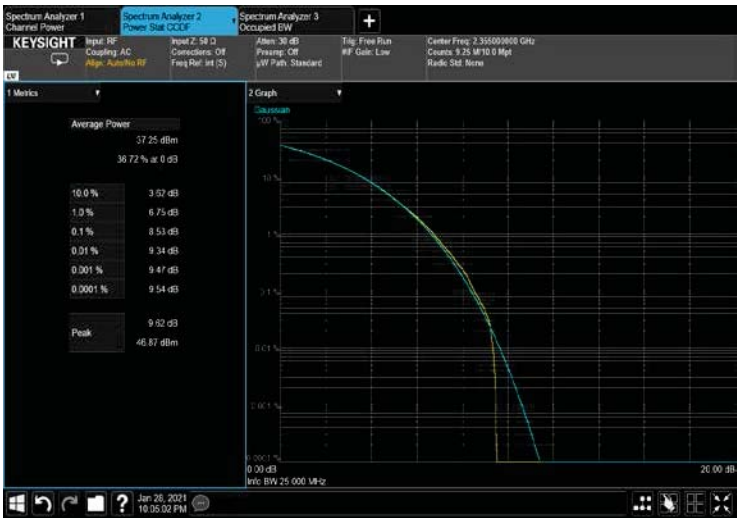

Figure 53: 16QAM 10MHz B.W; 2355MHz, 15kHz-5G

Figure 54: 16QAM 10MHz B.W; 2355MHz, 30kHz-5G

Figure 55: 64QAM 10MHz B.W; 2355MHz, 15kHz-5G

Figure 56: 64QAM 10MHz B.W; 2355MHz, 30kHz-5G

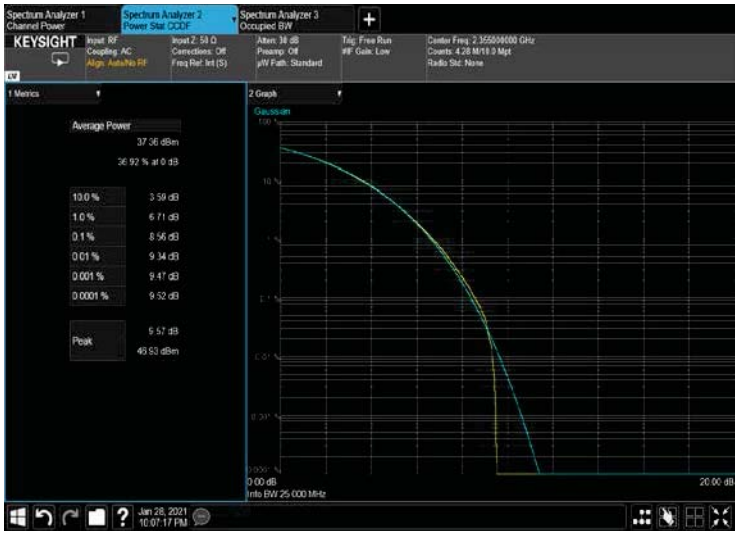

Figure 57: 256QAM 10MHz B.W; 2355MHz, 15kHz-5G

Figure 58: 256QAM 10MHz B.W; 2355MHz, 30kHz-5G

Figure 59: QPSK 10MHz B.W; 2355MHz, 15kHz-5G

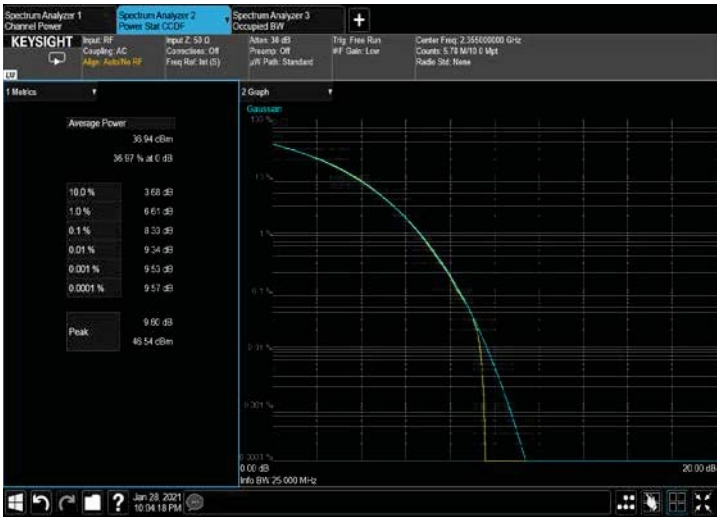

Figure 60: QPSK 10MHz B.W; 2355MHz, 30kHz-5G

Figure 61: 16QAM 10MHz B.W; 2355MHz-4G

Figure 62: 64QAM 10MHz B.W; 2355MHz-4G

Figure 63: QPSK 10MHz B.W; 2355MHz-4G

7.5 Test Equipment Used; 0.1% PAPR

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
EXA signal Analyzer	Keysight	UXA N9040B	MY56080119	January 31, 2020	January 31, 2022
EXG Vector Signal Generator	Agilent Technologies	N5172B	MY53051952	January 17, 2019	January 17, 2022
40 dB Attenuator	Weinschel Associates	WA 39-40-33	-	November 1, 2020	November 1, 2021
RF Coaxial Cable	Huber-Suner	SLLS210B	-	November 1, 2020	November 1, 2021

Table 32 Test Equipment Used

8. Occupied Bandwidth – 5G and 4G

8.1 Test Specification

FCC Part 2, Section 1049

8.2 Test Procedure

(Temperature (20°C)/ Humidity (53%RH))
The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (loss=41.6 dB). The spectrum analyzer was set to proper resolution B.W.
OBW function (99%) was employed for this evaluation.
Occupied bandwidth measured was repeated in the input terminal of the E.U.T.

8.3 Test Limit

N/A

8.4 Test Results

JUDGEMENT: Passed

See additional information in Table 33 to Table 46 and Figure 64 to Figure 85.

Modulation	Bandwidth	Sub Carrier	Operation Frequency	Reading
	(MHz)	(kHz)	(MHz)	(MHz)
16QAM	10	15	2355	9.2518
		30		8.5929

Table 33 Occupied Bandwidth 16 QAM Input - 5G

Modulation	Bandwidth	Sub Carrier	Operation Frequency	Reading
	(MHz)	(kHz)	(MHz)	(MHz)
64QAM	10	15	2355	9.3377
		30		8.6379

Table 34 Occupied Bandwidth 64 QAM Input - 5G

Modulation	Bandwidth	Sub Carrier	Operation Frequency	Reading
	(MHz)	(kHz)	(MHz)	(MHz)
256QAM	10	15	2355	9.3144
		30		8.6288

Table 35 Occupied Bandwidth 256 QAM Input - 5G

Modulation	Bandwidth	Sub Carrier	Operation Frequency	Reading
	(MHz)	(kHz)	(MHz)	(MHz)
QPSK	10	15	2355	9.1664
		30		8.5264

Table 36 Occupied Bandwidth QPSK Input - 5G

Modulation	Bandwidth	Operation Frequency	Reading
	(MHz)	(MHz)	(MHz)
16QAM	10	2355	8.9442

Table 37 Occupied Bandwidth 16 QAM Input - 4G

Modulation	Bandwidth	Operation Frequency	Reading
	(MHz)	(MHz)	(MHz)
64QAM	10	2355	8.9456

Table 38 Occupied Bandwidth 64 QAM Input - 4G

Modulation	Bandwidth	Operation Frequency	Reading
	(MHz)	(MHz)	(MHz)
QPSK	10	2355	8.9324

Table 39 Occupied Bandwidth QPSK Input - 4G

Modulation	Bandwidth	Sub Carrier	Operation Frequency	Reading
	(MHz)	(kHz)	(MHz)	(MHz)
16QAM	10	15	2355	9.2214
		30		8.5776

Table 40 Occupied Bandwidth 16 QAM OUTPUT - 5G

Modulation	Bandwidth	Sub Carrier	Operation Frequency	Reading
	(MHz)	(kHz)	(MHz)	(MHz)
64QAM	10	15	2355	9.3142
		30		8.6103

Table 41 Occupied Bandwidth 64 QAM OUTPUT - 5G

Modulation	Bandwidth	Sub Carrier	Operation Frequency	Reading
	(MHz)	(kHz)	(MHz)	(MHz)
256QAM	10	15	2355	9.2936
		30		8.6196

Table 42 Occupied Bandwidth 256 QAM OUTPUT - 5G

Modulation	Bandwidth	Sub Carrier	Operation Frequency	Reading
	(MHz)	(kHz)	(MHz)	(MHz)
QPSK	10	15	2355	9.1373
		30		8.4992

Table 43 Occupied Bandwidth QPSK OUTPUT - 5G

Modulation	Bandwidth	Operation Frequency	Reading
	(MHz)	(MHz)	(MHz)
16QAM	10	2355	8.9293

Table 44 Occupied Bandwidth 16 QAM OUTPUT - 4G

Modulation	Bandwidth	Operation Frequency	Reading
	(MHz)	(MHz)	(MHz)
64QAM	10	2355	8.9350

Table 45 Occupied Bandwidth 64 QAM OUTPUT - 4G

Modulation	Bandwidth	Operation Frequency	Reading
	(MHz)	(MHz)	(MHz)
QPSK	10	2355	8.9272

Table 46 Occupied Bandwidth QPSK OUTPUT - 4G

Figure 64: 16QAM 10MHz B.W; 2355MHz, 15kHz -5G INPUT

Figure 65: 16QAM 10MHz B.W; 2355MHz, 30kHz -5G INPUT

Figure 66: 64QAM 10MHz B.W; 2355MHz, 15kHz -5G INPUT

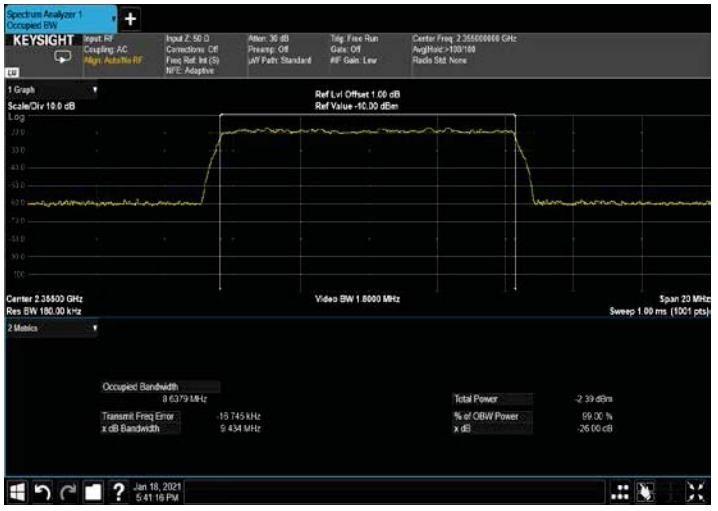

Figure 67: 64QAM 10MHz B.W; 2355MHz, 30kHz -5G INPUT

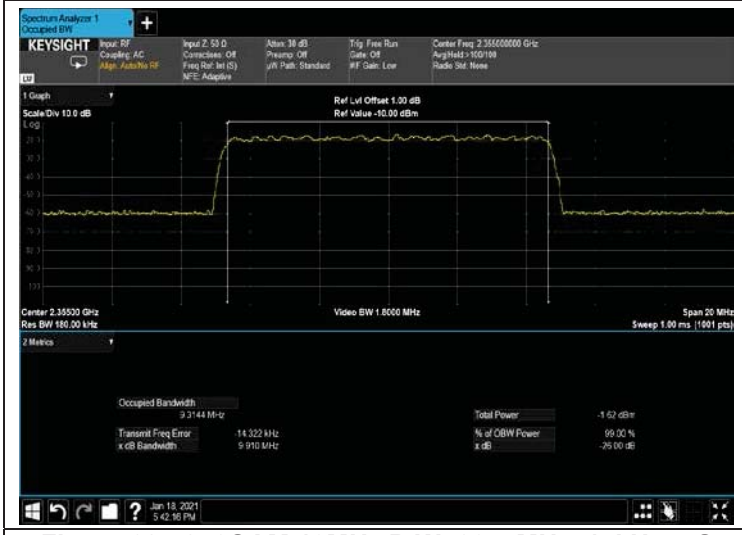

Figure 68: 256QAM 10MHz B.W; 2355MHz, 15kHz -5G INPUT

Figure 69: 256QAM 10MHz B.W; 2355MHz, 30kHz -5G INPUT

Figure 70: QPSK 10MHz B.W; 2355MHz, 15kHz -5G INPUT

Figure 71: QPSK 10MHz B.W; 2355MHz, 30kHz -5G INPUT

Figure 72: 16QAM 10MHz B.W; 2355MHz INPUT-4G

Figure 73: 64QAM 10MHz B.W; 2355MHz INPUT-4G

Figure 74: QPSK 10MHz B.W; 2355MHz INPUT-4G

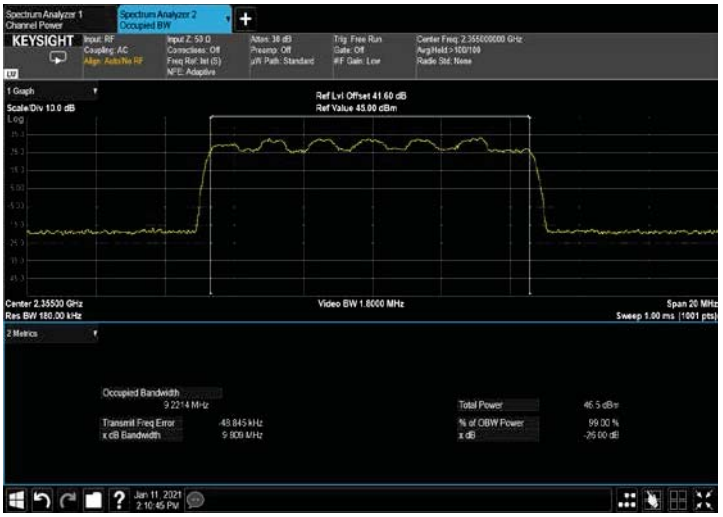

Figure 75: 16QAM 10MHz B.W; 2355MHz, 15kHz -5G OUTPUT

Figure 76: 16QAM 10MHz B.W; 2355MHz, 30kHz -5G OUTPUT

Figure 77: 64QAM 10MHz B.W; 2355MHz, 15kHz -5G OUTPUT

Figure 78: 64QAM 10MHz B.W; 2355MHz, 30kHz -5G OUTPUT

Figure 79: 256QAM 10MHz B.W; 2355MHz, 15kHz -5G OUTPUT

Figure 80: 256QAM 10MHz B.W; 2355MHz, 30kHz -5G OUTPUT

Figure 81: QPSK 10MHz B.W; 2355MHz, 15kHz -5G OUTPUT

Figure 82: QPSK 10MHz B.W; 2355MHz, 30kHz -5G OUTPUT

Figure 83: 16QAM 10MHz B.W; 2355MHz OUTPUT -4G

Figure 84: 64QAM 10MHz B.W; 2355MHz OUTPUT -4G

Figure 85: QPSK 10MHz B.W; 2355MHz OUTPUT - 4G

8.5 Test Equipment Used; Occupied Bandwidth

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
EXA Signal Analyzer	Keysight	UXA N9040B	MY56080119	January 31, 2020	January 31, 2022
EXG Vector Signal Generator	Agilent Technologies	N5172B	MY53051952	January 17, 2019	January 17, 2022
40 dB Attenuator	Weinschel Associates	WA 39-40-33	-	November 1, 2020	November 1, 2021
RF Coaxial Cable	Huber-Suner	SLLS210B	-	November 1, 2020	November 1, 2021

Table 47 Test Equipment Used