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# **Title 47 Code of Federal Regulations Test Report**

**Regulation:**

FCC Part 2 and 27

**Client:**

Nokia Mobile Networks

**Product Evaluated:**

AAHF 5G NR 40 MHz

FCC ID: VBNAAHF-01

**Report Number:**

TR-2019-0090-FCC2-27

**Date Issued:**

June 06, 2019

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**Revisions**

Date	Revision	Section	Change
06/06/19	0		Initial Release

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6/6/2019

## 1. System Information and Requirements

Report copies and other information not contained in this report are held by either the product engineer or in an identified file at the Global Product Compliance Laboratory in Murray-Hill, NJ.

<b>Equipment Under Test (EUT):</b>	AAHF 5G NR 40MHz
<b>FCC ID:</b>	VBNAAHF-01
<b>Part Number:</b>	474715A.M01
<b>Serial Number:</b>	6Q183702544
<b>Frequency Range:</b>	2496-2690 MHz
<b>GPCL Project Number:</b>	2019-0090
<b>Manufacturer:</b>	NOKIA SOLUTIONS AND NETWORKS OY KARAPORTTI 3, FI-02610 ESPOO FINLAND
<b>Test Requirement(s):</b>	Title 47 CFR Parts 2 and 27
<b>Test Standards:</b>	<ul style="list-style-type: none"> <li>• Title 47 CFR Parts 2 and 27</li> <li>• KDB 971168 D01 Power Measurement License Digital Systems v03r01 April 9, 2018.</li> <li>• KDB 662911 D01 Multiple Transmitter Output v02r01 Oct 2013</li> <li>• ANSI C63.26 (2015)</li> <li>• ANSI C63.4 (2014)</li> </ul>
<b>Measurement Procedure(s):</b>	<ul style="list-style-type: none"> <li>• FCC-IC-OB - GPCL Occupied Bandwidth and Power Measurement Test Procedure 12-4-2017</li> <li>• FCC-IC-SE - GPCL Spurious Emissions Test Procedure 12-4-2017</li> </ul>
<b>Test Date(s):</b>	May/June 2019
<b>Test Performed By:</b>	Nokia Global Product Compliance Laboratory 600-700 Mountain Ave. P.O. Box 636 Murray Hill, NJ 07974-0636
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<b>Product Engineer(s):</b>	Ron Remy
<b>Lead Engineer:</b>	W. Steve Majkowski NCE
<b>Test Engineer (s):</b>	Jaideep Yadav, Norm Albrecht, Mike Soli
<b>Test Results:</b> The AAHF 5G NR 40MHz, <i>as tested</i> met the above listed requirements. Report copies and other information not contained in this report are held by either the product engineer or in an identified file at the Global Product Compliance Laboratory in New Providence, NJ.	

## 1.1 Introduction

This Conformity test report applies to the AAHF 5G NR 40MHz, hereinafter referred to as the Equipment Under Test (EUT).

## 1.2 Purpose and Scope

The purpose of this document is to provide the Class II testing data required for qualifying the EUT in compliance with FCC Parts 2 and 27, measured in accordance with the procedures set out in Section 2.1033 (c) (14) of the Rules. This Class II Change is to add the 5G-NR Emissions Designator for 40 MHz bandwidth carriers.

## 1.3 EUT Description

The Nokia AirScale AAHF mMIMO Radio Head is a 64 port radio head that transmits up to 1.875W per port over the Band 41 spectrum of 2496 – 2690 MHz. The 64 individual transmit ports are identical in design, rated power and performance. The AAHF was originally filed for one to three 10MHz and/or 20MHz carriers in a 64x64 MIMO configuration with a maximum total combined RF output power of 120W. Each output can produce 1 to 3 RF carriers. Each 20 MHz of carrier bandwidth has a maximum power of 28 dBm which results in a total of 33 dBm per port for 60 MHz of carrier bandwidth. The maximum total 64 port output power of 120 Watts is for 60 MHz of bandwidth. A Class II change was previously processed for a single 60 MHz 5G-NR carrier at 120W total.

The testing described herein is to document operation with a single 40 MHz 5G-NR emissions designator. For a 40 MHz 5G-NR carrier the maximum power is 31 dBm/ 1.25 W/port which results in a total output power of 49 dBm / 80W for all 64 ports. There is no change to the products output power from the original filing.

The 40 MHz bandwidth 5G-NR carriers are addressed herein utilizing the same QPSK, 16QAM, 64QAM and 256QAM modulation formats as previously filed. Only the Signal Bandwidth has changed.

### 1.3.1 EUT Test Configurations

The EUT was configured with 5G-NR digital modulation in accordance to the latest guidelines of the following standards:

**3GPP TS 36.211:** 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical channels and modulation (Release 15)

**3GPP TS 38.141-1** 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Base Station (BS) conformance testing Part 1: Conducted conformance testing (Release 15)

**3GPP TS 38.104:** 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Base Station (BS) radio transmission and reception (Release 15)

The following Base Station Test Models were used:

<b>NR-FR1-TM1.1</b>	<b>QPSK</b>
<b>NR-FR1-TM3.1</b>	<b>64QAM</b>
<b>NR-FR1-TM 3.1a</b>	<b>256QAM</b>
<b>NR-FR1-TM 3.2</b>	<b>QPSK+16QAM</b>

The product was configured for single carrier configuration.

## 1.4 Test Requirements

Each required measurement is listed below:

47 CFR FCC Sections	Description of Tests	Test Required
2.1046, 27.53	RF Power Output	Yes
2.1047, 27.53	Modulation Characteristics	Yes
2.1049, 27.53	(a) Occupied Bandwidth (b) Out-of-Band Emissions	Yes
2.1051, 27.53	Spurious Emissions at Antenna Terminals	Yes
2.1053, 27.53	Field Strength of Spurious Radiation	Yes
2.1055, 27.53	Frequency Stability	Yes

## 1.5 Standards & Procedures

### 1.5.1 Standards

- Title 47 Code of Federal Regulations, Federal Communications Commission Part 2.
- Title 47 Code of Federal Regulations, Federal Communications Commission Part 27.
- ANSI C63.26, American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

### 1.5.2 Procedures

1. FCC-IC-0B and FCC-IC-SE
2. ANSI C63.4 (2014) entitled: "American National Standard for Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz", American National Standards Institute, Institute of Electrical and Electronic Engineers, Inc., New York, NY 10017-2394, USA.
3. FCC KDB 971168 D01 Power Measurement License Digital Systems v03r01 April 9, 2018.  
FCC KDB 662911 D01 Multiple Transmitter Output v02r01 Oct 2013
4. FCC KDB 971168 D01 v03r01 Measurement Guidance for Certification of Licensed Digital Transmitters

### 1.5.3 MEASUREMENT UNCERTAINTY

The results of the calculations to estimate uncertainties for the several test methods and standards are shown in the Table below. These are the worst-case values.

**Worst-Case Estimated Measurement Uncertainties**

Standard, Method or Procedure	Condition	Frequency MHz	Expanded Uncertainty (k=2)
a. Classical Emissions, ( <i>e.g.</i> , ANSI C63.4, CISPR 11, 14, 22, <i>etc.</i> , using ESHS 30,	Conducted Emissions	0.009 - 30	±3.5 dB
	Radiated Emissions (AR-6 Semi-Anechoic Chamber)	30 MHz – 200MHz H	±5.1 dB
		30 MHz – 200 MHz V	±5.1 dB
		200 MHz – 1000 MHz H	±4.7 dB
		200 MHz – 1000 MHz V	±4.7 dB
		1 GHz - 18 GHz	±3.3 dB

Antenna Port Test	Signal Bandwidth	Frequency Range	Expanded Uncertainty (k=2), Amplitude
Occupied Bandwidth, Edge of Band, Conducted Spurious Emissions	10 Hz 100 Hz 10 kHz to 1 MHz 1MHz	9 kHz to 20 MHz 20 MHz to 1 GHz 1 GHz to 10 GHz 10 GHz to 40 GHz:	1.78 dB
RF Power	10 Hz to 20 MHz	50 MHz to 18 GHz	0.5 dB

## 1.6 Executive Summary

Requirement	Description	Result
47 CFR FCC Parts 2 and 27		
2.1046, 27.53	RF Power Output Peak to Average Power Ratio	COMPLIES
2.1047, 27.53	Modulation Characteristics	COMPLIES
2.1049, 27.53	(a) Occupied Bandwidth (b) Edge of Band Emissions	COMPLIES
2.1051, 27.53	Spurious Emissions at Antenna Terminals	COMPLIES
2.1053, 27.53	Field Strength of Spurious Radiation	COMPLIES
2.1055, 27.53	Frequency Stability	COMPLIES Previously tested

1. **COMPLIES** - Passed all applicable tests.
2. **N/A** – Not Applicable.
3. **NT** – Not Tested.



## 2. FCC Section 2.1046 - RF Power Output

### 2.1 RF Power Output

This test is a measurement of the total RF power level transmitted at the antenna-transmitting terminal, as shown in the accompanying test set-up diagram.

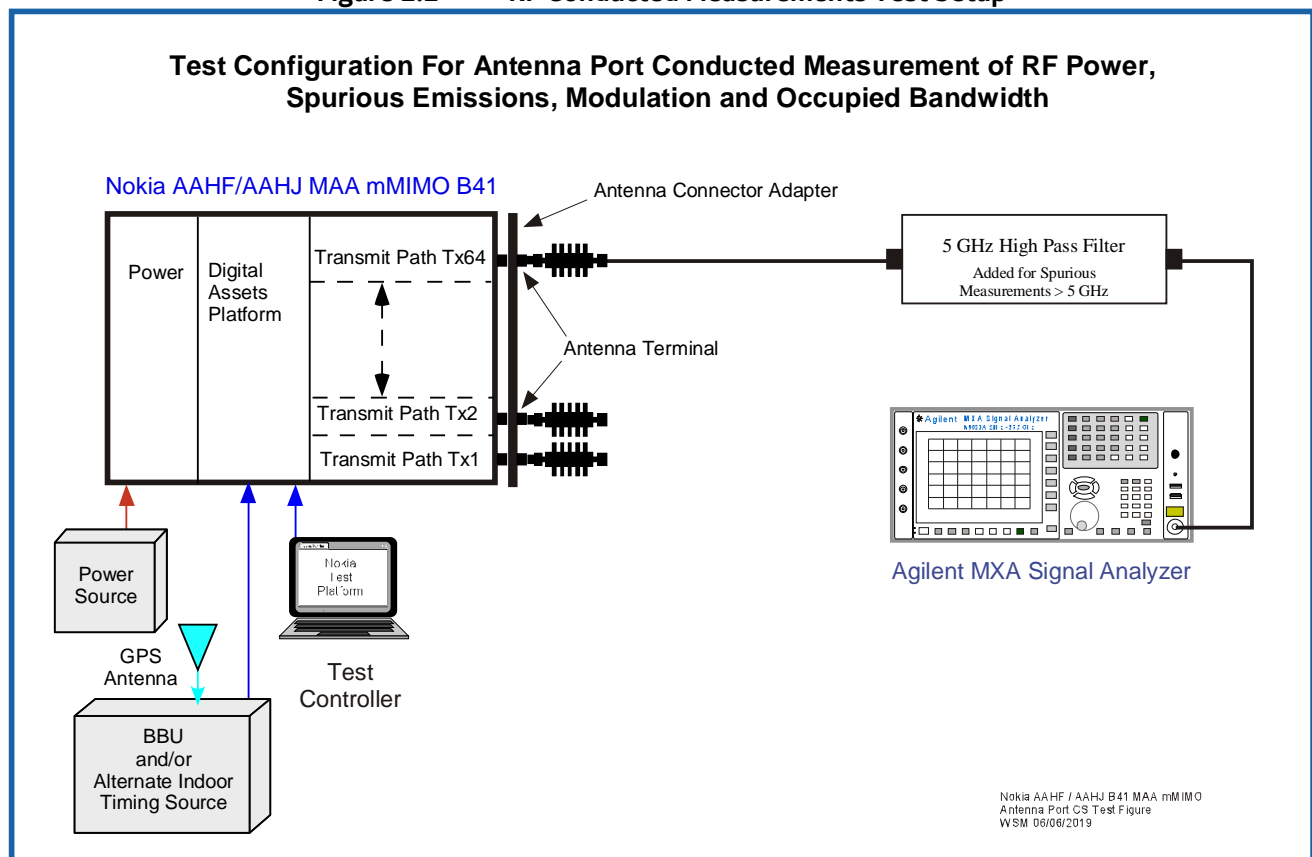
Power measurements were made using the MXA Channel Power Functionality. The transmit port was connected to the MXA with calibrated attenuators and cable whose path loss was verified before test. The Base Station was given sufficient “warm-up” period prior to testing as required by ANSI C63.26-2015.

NOTE: Only a sample of all the data taken has been used in this report. The full suite of raw data resides at the MH, New Jersey location.

### 2.2 RF Conducted Measurements Test Setup

The Test configuration in Figure 2.2 was used for antenna port measurement of RF Power, Modulation, Occupied Bandwidth, Out of Band Emissions and Conducted Spurious Emissions.

Figure 2.2 RF Conducted Measurements Test Setup



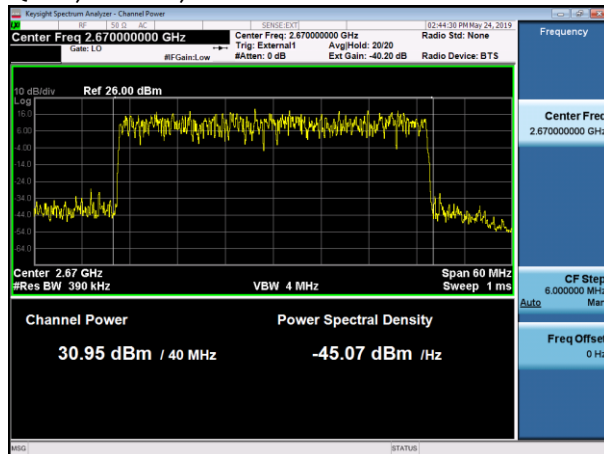
## 2.3 RF Power Output Results

The data below documents that the total sum power that the products 64 ports can provide is 80 Watts. That power is up to 1.25 Watts/port for a Total Rated power of 80W/40MHz carrier.

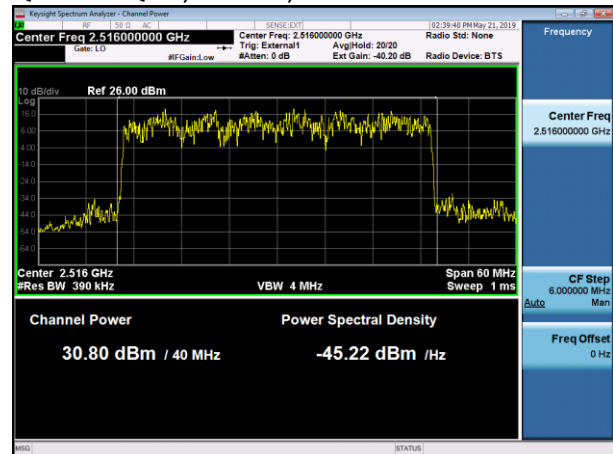
### 2.3.1 Single Carrier Channel Power – 40MHz BW

Channel Frequency MHz	Modulation Type	Channel Power dBm	Channel Power Watts
2670	QPSK	30.95	1.244
2516	QPSK+16QAM	30.80	1.202
2670	QPSK+16QAM	30.87	1.222
2593	64QAM	30.91	1.233
2670	64QAM	30.94	1.242
2516	256QAM	31.25	1.333
2593	256QAM	31.01	1.262
2670	256QAM	30.87	1.222

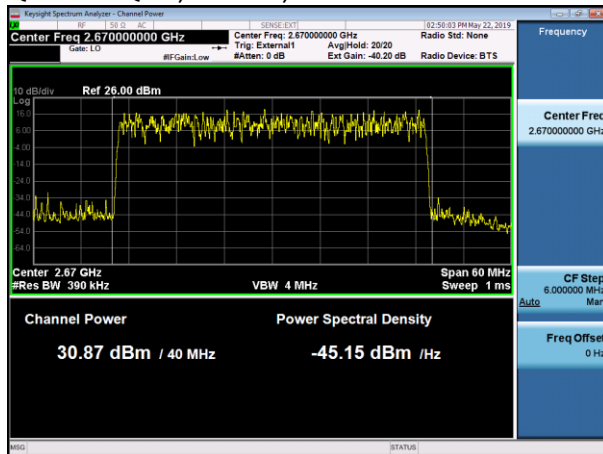
QPSK, 40MBW, 2670



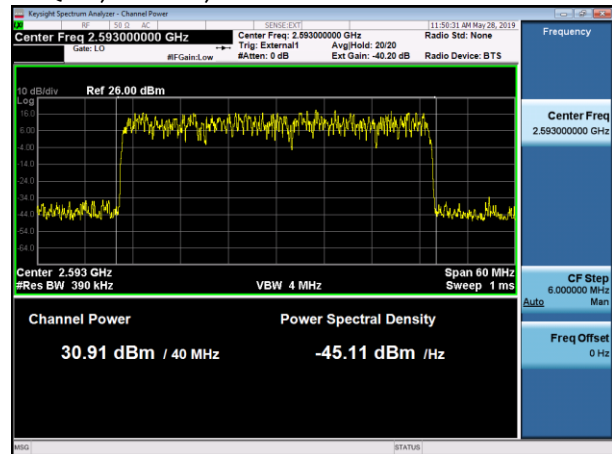
QPSK+16QAM, 40MBW, 2516



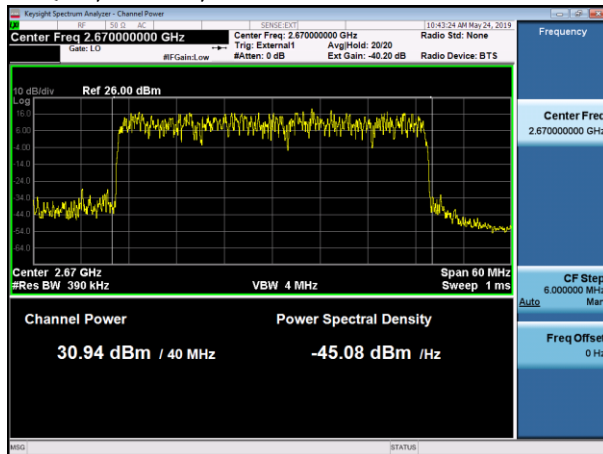
## QPSK+16QAM, 40MBW, 2670



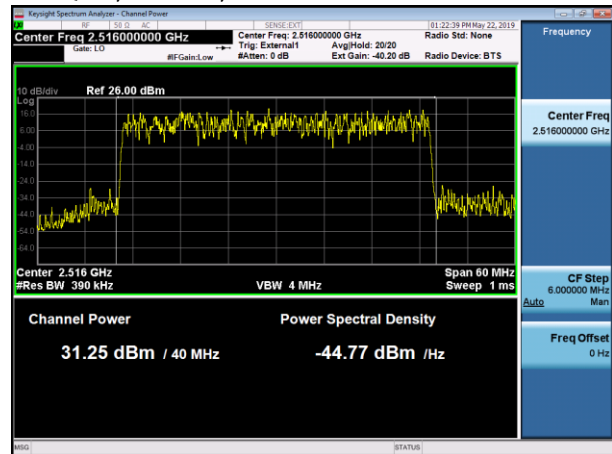
## 64QAM, 40MBW, 2593



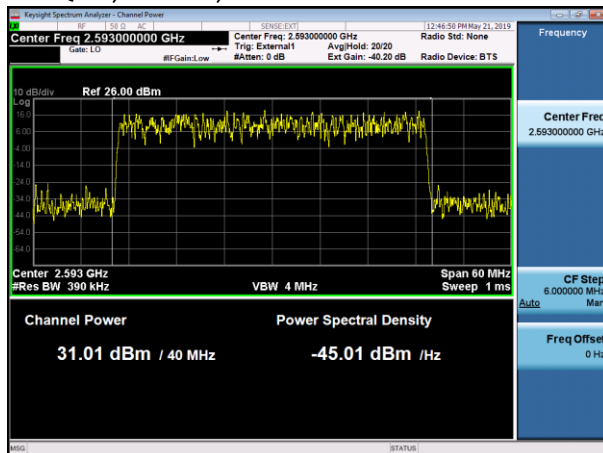
## 64QAM, 40MBW, 2670



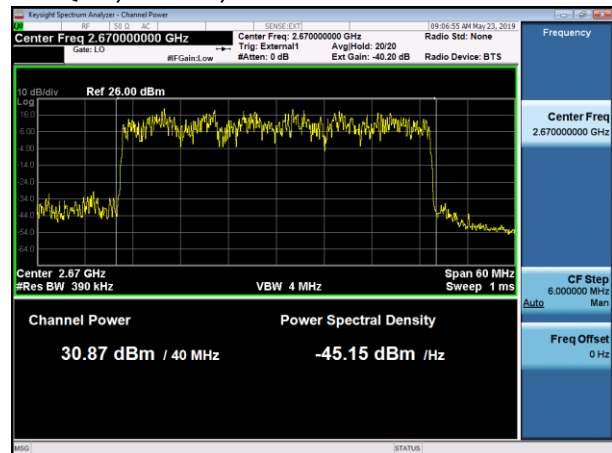
## 256QAM, 40MBW, 2516



## 256QAM, 40MBW, 2593



## 256QAM, 40MBW, 2670



## 2.4 Peak-to-Average Power Ratio (PAPR) 47CFR 27.50

The measurement of the Peak-to-Average Power Ratio (PAPR) was performed using the Complementary Cumulative Distribution Function (CCDF) feature of a Keysight MXA Signal Analyzer and the test setup of Figure 2.2.

NOTE: Only a sample of the plots are used in this report. The full suite of raw data resides at the MH, New Jersey location.

### 2.4.1 Single Carrier Peak to Average Ratio – 40MHz BW

All the measured values were below the required 13dB limit at the required 0.1 percent of the time.

Channel Frequency MHz	Modulation Type	PAR dB
2670	QPSK	11.0
2516	QPSK+16QAM	11.2
2670	QPSK+16QAM	10.8
2593	64QAM	10.8
2670	64QAM	11.0
2516	256QAM	11.0
2593	256QAM	10.8
2670	256QAM	11.0

### 3. FCC Section 2.1047 - Modulation Characteristics

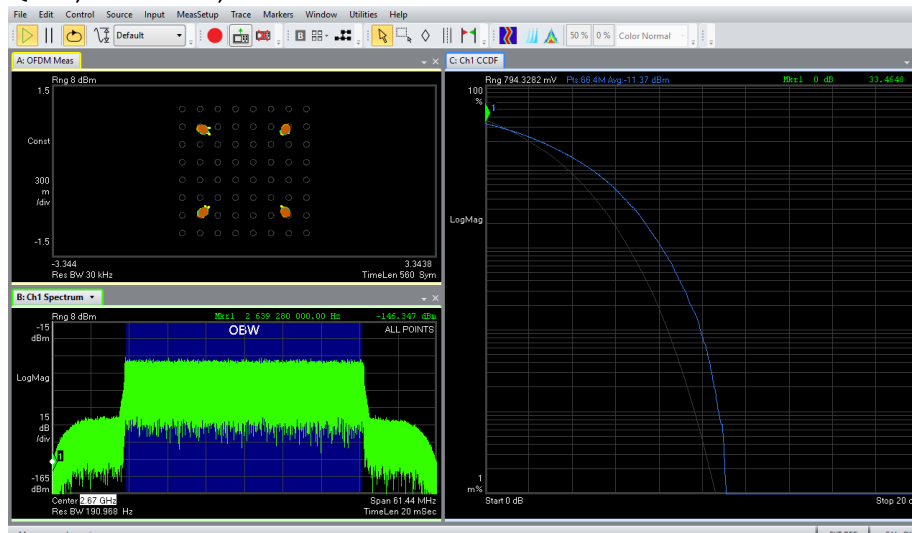
#### 3.1 Modulation Characteristics

The RF signal at the antenna port was evaluated with a Keysight MXA Signal Analyzer and the test setup of Figure 2.2. The Modulation was verified for correctness of the modulation signal used before each test was performed. For these products the operation of the 40 MHz 5G-NR carrier was verified as QPSK and 256QAM modulation. Samples of the Modulation configurations are shown below.

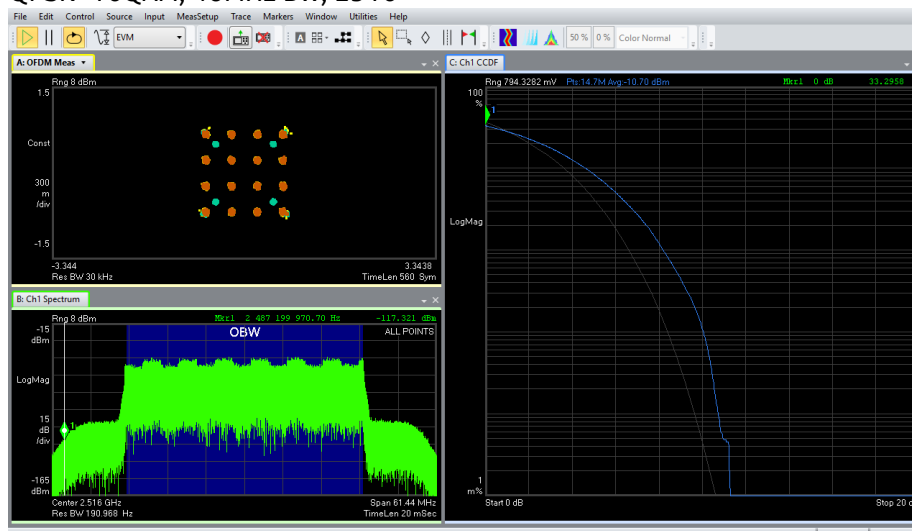
NOTE: Only a sample of the plots are used in this report. The full suite of raw data resides at the MH, New Jersey location.

##### 3.1.1 Single Carrier Modulation – 40MHz BW

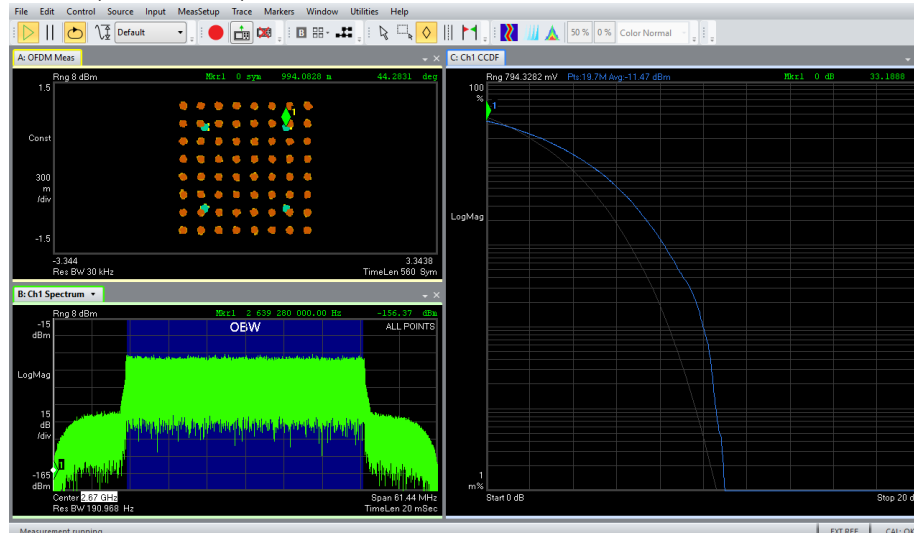
###### QPSK, 40MHz BW, 2670



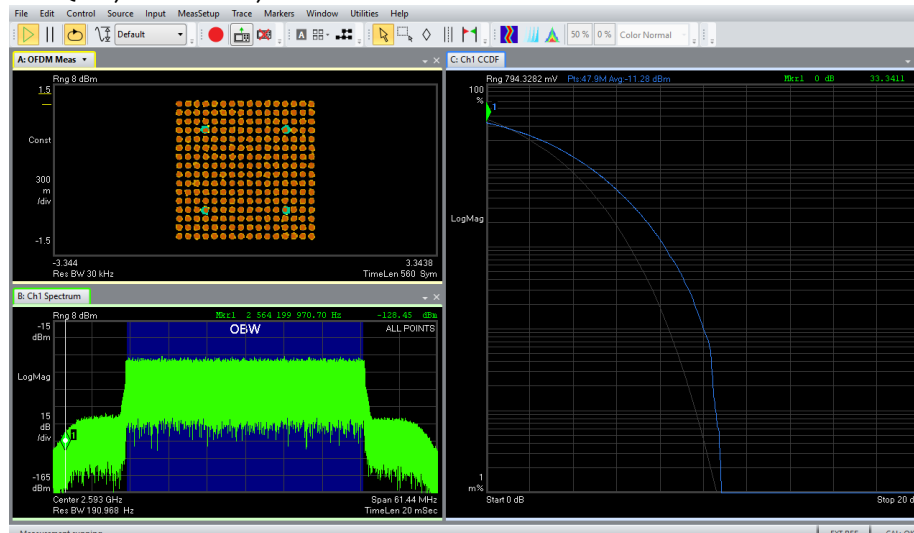
###### QPSK+16QAM, 40MHz BW, 2516



## 64QAM, 40MHz BW, 2670



## 256QAM, 40MHz BW, 2593



## 4. FCC Section 2.1049 – Occupied Bandwidth/Edge of Band Emissions

### 4.1 Occupied Bandwidth

In 47CFR 2.1049 the FCC requires:

“The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable.”

Per C63.26 section 5.4.3 b) The measurement shall be made with the resolution bandwidth set between 1% and 5 % of the expected bandwidth. For a 40 MHz nominal bandwidth, a 2MHz RBW is the 5% setpoint.

This required measurement is the 99% Occupied Bandwidth, also called the designated signal bandwidth and needs to be within the parameters of the products specified emissions designator. The -26 dB bandwidth values were also recorded.

The transmitted signal occupied bandwidth was measured using a Keysight MXA Signal Analyzer and the test setup of Figure 2.2.

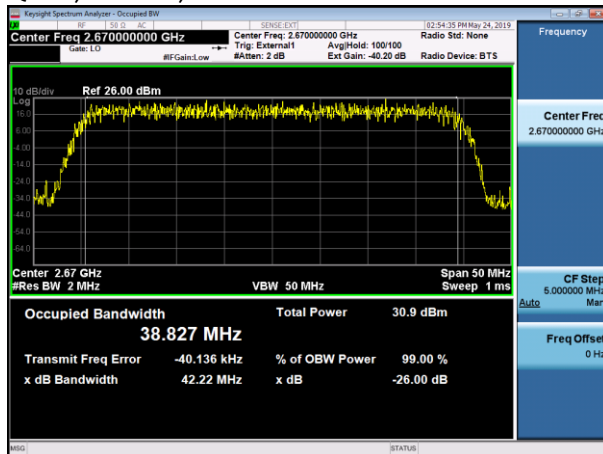
NOTE: Only a sample of all the data taken has been used in this report. The full suite of raw data resides at the MH, New Jersey location.

### 4.1.1 Single Carrier Occupied Bandwidth

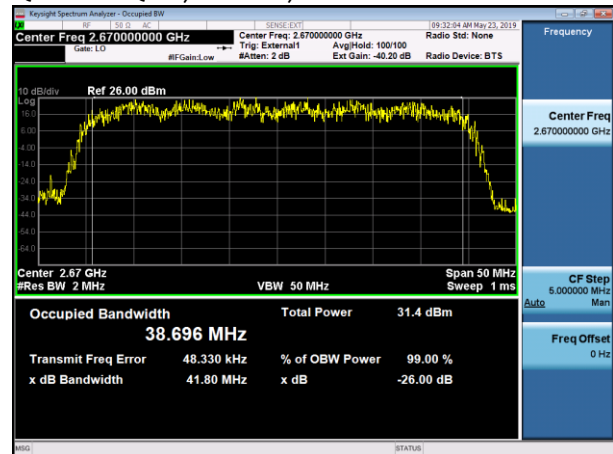
The single carrier bandwidth measurements are presented below for left, center and right side of band. They represent various 5G-NR modulation types.

Channel Frequency MHz	Modulation Type	Occupied Signal BW MHz
2516	256QAM	38.918
2593	64QAM	38.720
2670	QPSK+16QAM	38.696
2670	QPSK	38.827

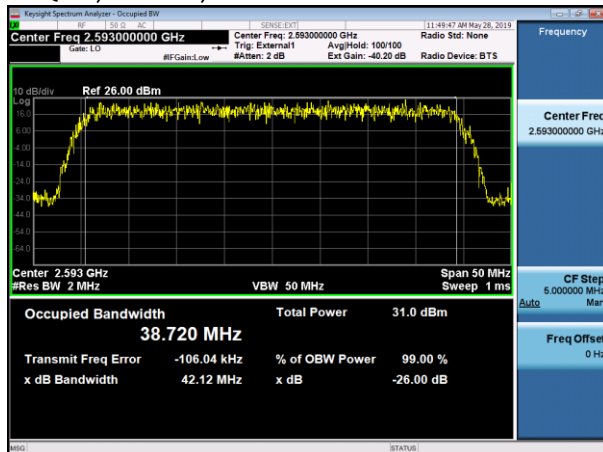
QPSK, 40MBW, 2670



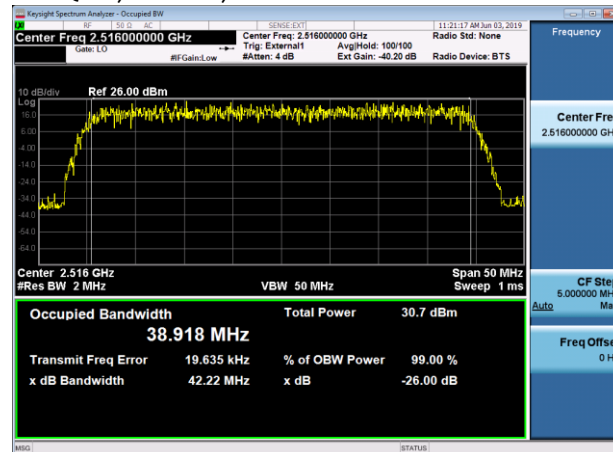
QPSK+16QAM, 40MBW, 2670



64QAM, 40MBW, 2593



256QAM, 40MBW, 2516





## 4.2 Edge of band Emissions

The Occupied Bandwidth / Out of Band Emissions (OOBE) of the EUT at the external antenna connector (EAC) were measured using a Keysight MXA Signal Analyzer and the test setup of Figure 2.2.

The RF power level and modulation was verified before measurement. The RF output from the EAC port to spectrum analyzer was reduced (to an amplitude usable by the spectrum analyzer) by using a calibrated attenuator and test cable. The maximum path attenuation was offset on the display and the signal was set to the maximum RF power level. The resolution bandwidth was set to 1% of the nominal bandwidth of the transmit signal (390 kHz) for the 1<sup>st</sup> MHz outside the band. Beyond the 1<sup>st</sup> MHz outside the transmit band the resolution bandwidth was set to 1 MHz. All mask values were adjusted based upon the designated signal bandwidth and measurement bandwidths as listed in Table 4.2 below.

The Block edge requirements as specified in 47CFR 27.53 were followed. The mask for emissions outside the band were set to be:

$$-43 + 10\text{LOG}_{10}(P) = -13 \text{ dBm}$$

The resolution bandwidth of 1% of the signal bandwidth was used for the 1<sup>st</sup> MHz outside the band.

The resolution bandwidth for measurements made greater than 1 MHz outside the band was 1 MHz.

The procedural direction of KDB 662911 D01 were followed and the mask limits were adjusted for a MIMO value corresponding to  $10\text{LOG}_{10}(N)$  where  $N=64$

For this product the MIMO adjustment is equal to:

$$10\text{LOG}(N) = 10(\text{LOG}_{10}(64)) = 18.06 \text{ dB}$$

**Table 4.2 - Mask values for OBW and Conducted Spurious measurements at various bandwidths**

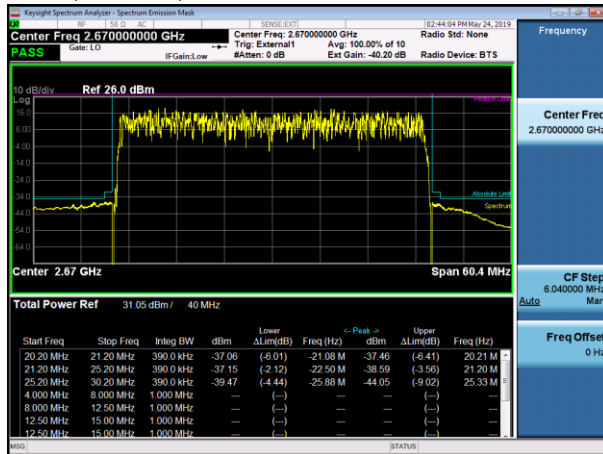
Carrier Power		Signal Bandwidth	Measurement RBW	Signal Offset Reference level		"n" x MIMO	MIMO Factor	1st MHz limit		Beyond the 1st MHz Limit	
W	dBm	MHz	MHz	dBc	dBm	integer	dB	dBm	dBc	dBm	dBc
1.25	30.97	40	0.390	-20.11	10.86	64	18.06	-31.17	-62.14	-35.15	-66.23
1.25	30.97	40	1	-16.02	14.95	64	18.06	-27.08	-58.05	-31.06	-62.14
80	49.04	40	0.390	-20.11	28.93	64	18.06	-31.17	-80.18	-35.15	-84.30
80	49.04	40	1	-16.02	33.02	64	18.06	-27.08	-76.09	-31.06	-80.21

#### 4.2.1 Single Carrier Out Of Band Emissions (OOBE) - 40 MHz BW

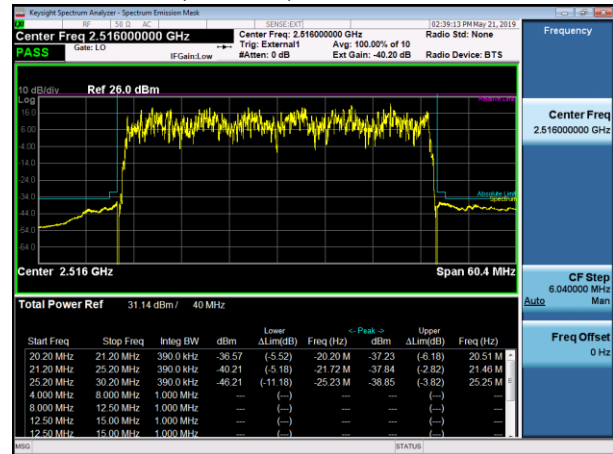
All of the measurements met the requirements of Part 27.53 when measured per Part 2.1049.

NOTE: Only a sample of the plots are used in this report. The full suite of raw data resides at the MH, New Jersey location.

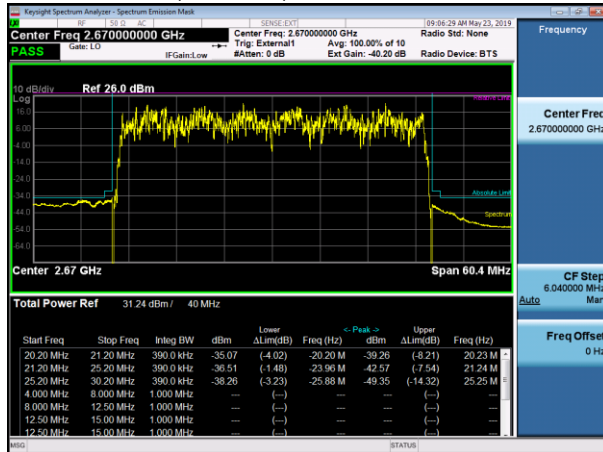
QPSK, 40MBW, 2670



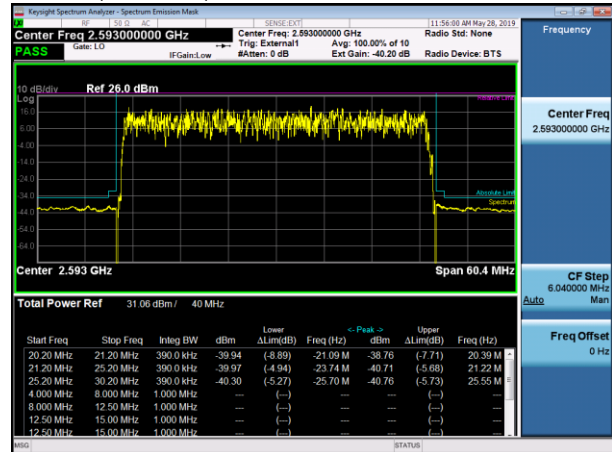
QPSK+16QAM, 40MBW, 2516



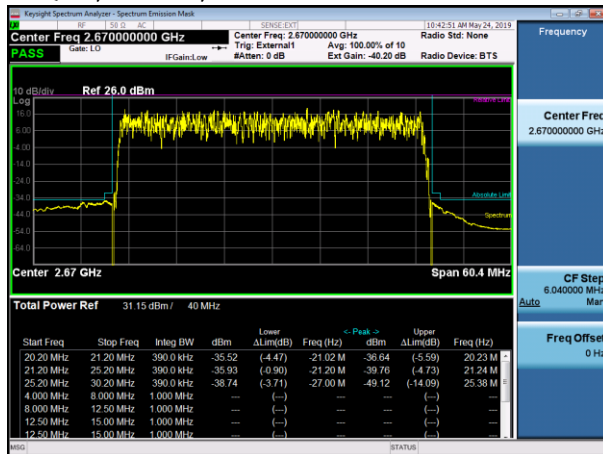
## QPSK+16QAM, 40MBW, 2670



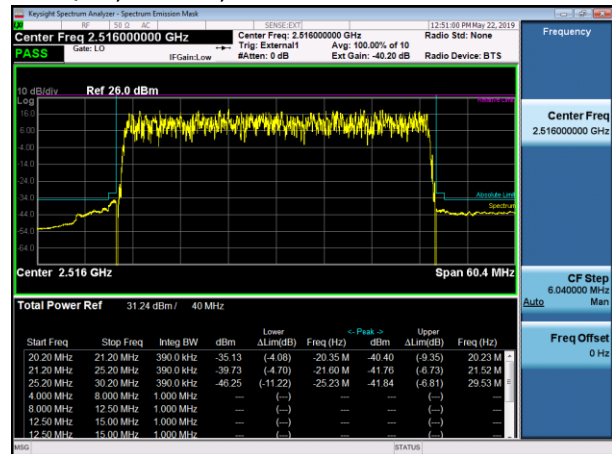
## 64QAM, 40MBW, 2593



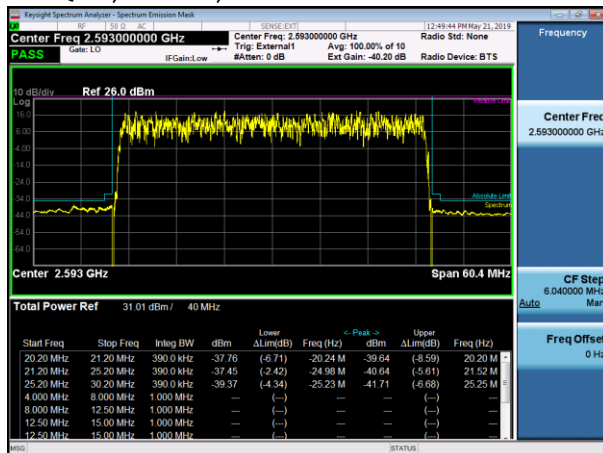
## 64QAM, 40MBW, 2670



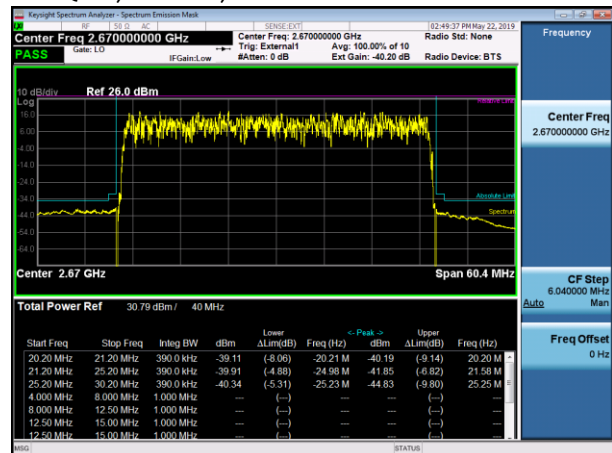
## 256QAM, 40MBW, 2516



## 256QAM, 40MBW, 2593



## 256QAM, 40MBW, 2670



## **5. FCC Section 2.1051 - Spurious Emissions at Transmit Antenna Port**

### **5.1 Measurement of Spurious Emissions at Transmit Antenna Port**

Spurious Emissions at the transmit-antenna terminals were investigated over the frequency range of 10 MHz to beyond the 10th harmonic of the specific transmit band. For this band of operation, the measurements were performed up to 27GHz. Measurements were made using a Keysight MXA Signal Analyzer. The RF output from the transmitter was reduced (to an amplitude usable by the receivers) using calibrated attenuators. The RF power level was continuously monitored via a coupled RF Power Meter.

The required emission limitation is specified as appropriate in 27.53. The measured spurious emission levels were plotted for the frequency range as specified in 2.1057. There were no reportable emissions. Data below documents performance up to 27 GHz.

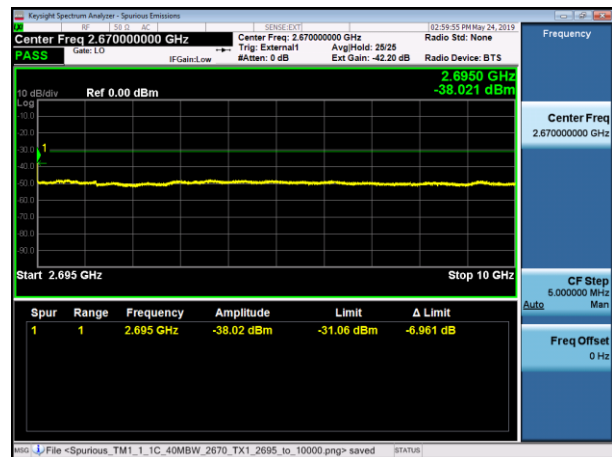
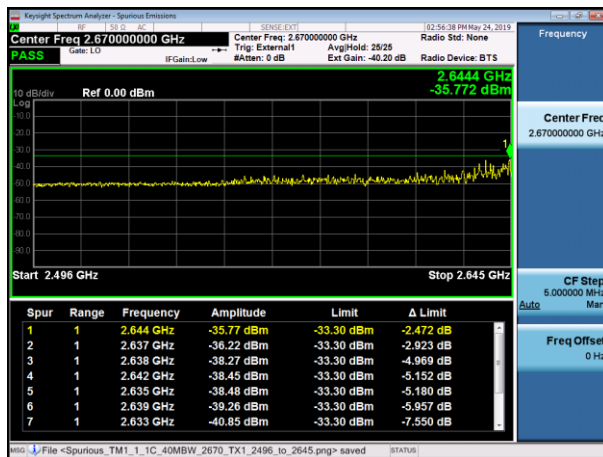
NOTE: Only a sample of the plots are used in this report. The full suite of raw data resides at the MH, New Jersey location.

### **5.2 Results - Measurement of Spurious Emissions at Transmit Antenna Port**

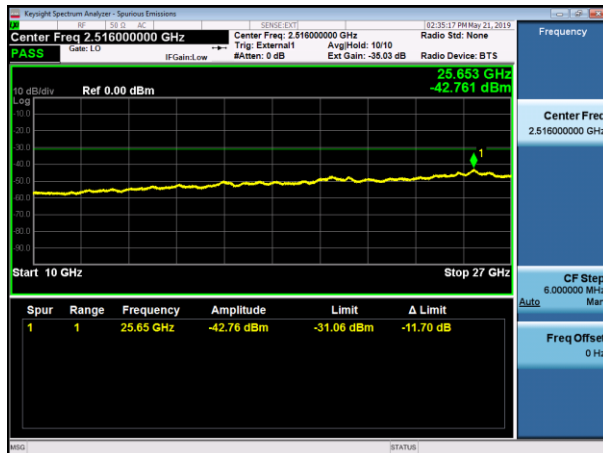
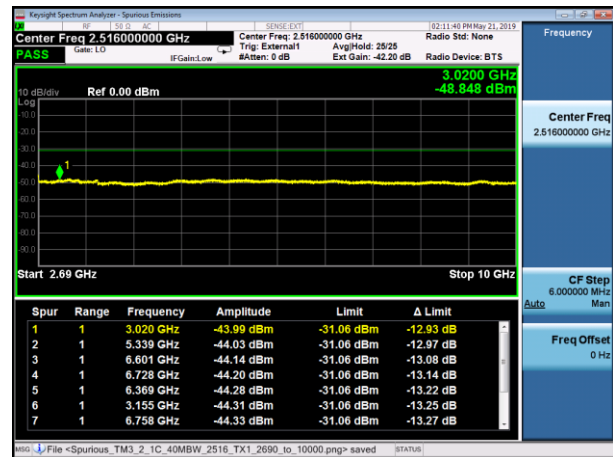
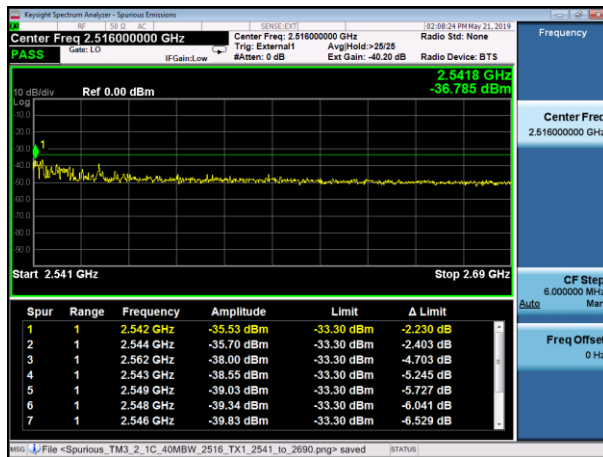
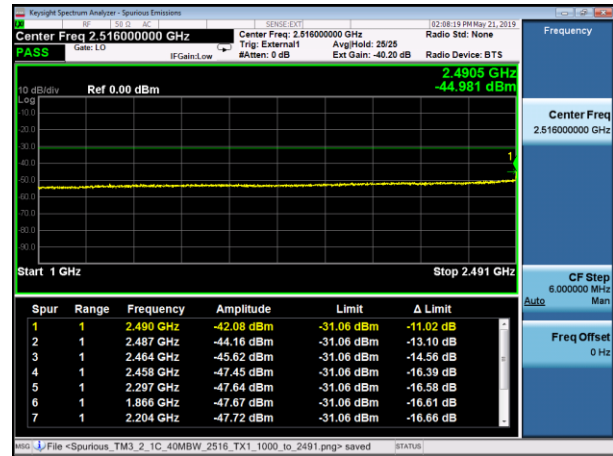
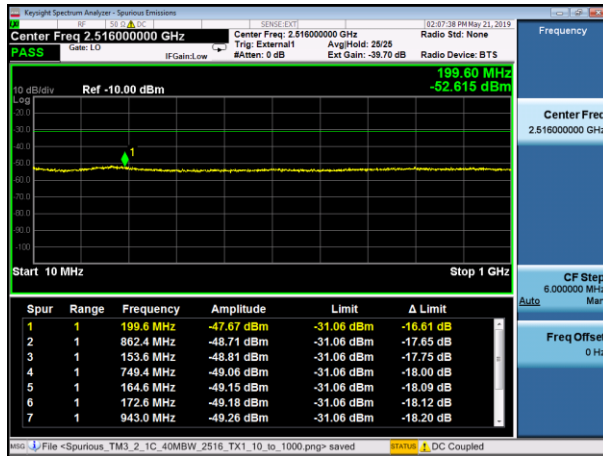
The Spurious Emissions at the transmit-antenna terminals were measured at left, center and right side of the band for every modulation configuration. All emissions were found to be compliant. A representative set of plots for the QPSK, QPSK+16QAM, 64QAM and 256QAM modulation configurations are presented below.

## 5.2.1 Spurious Emissions Data

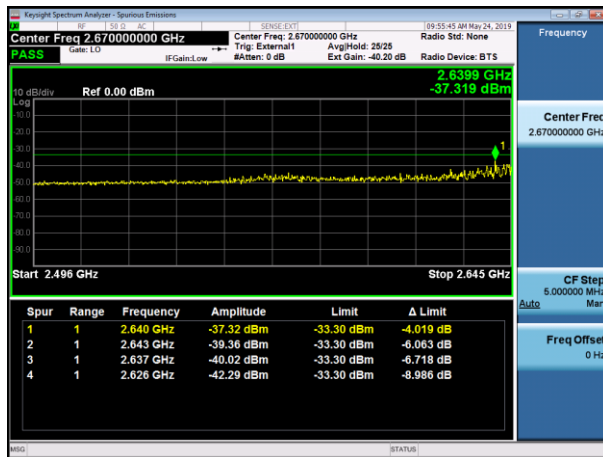
## 5.2.1.1 Spurious Emissions QPSK, 2670MHz



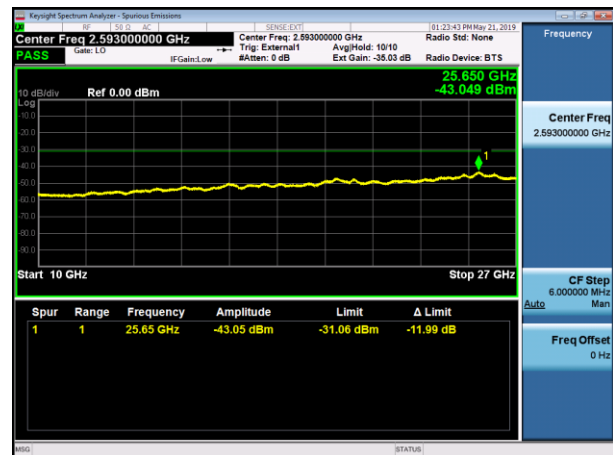
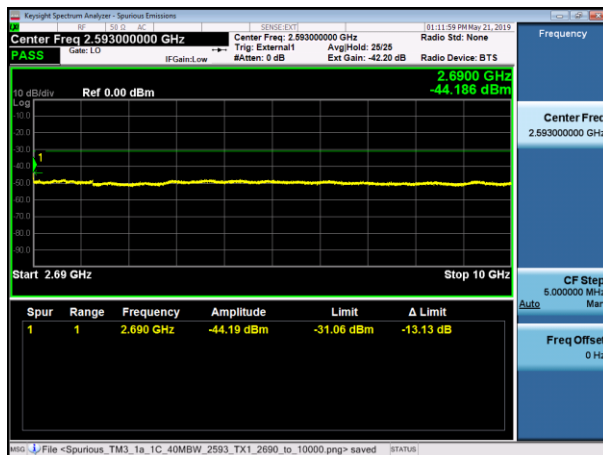
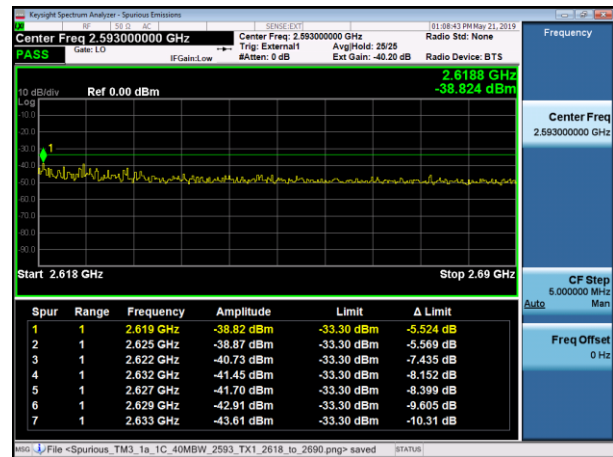
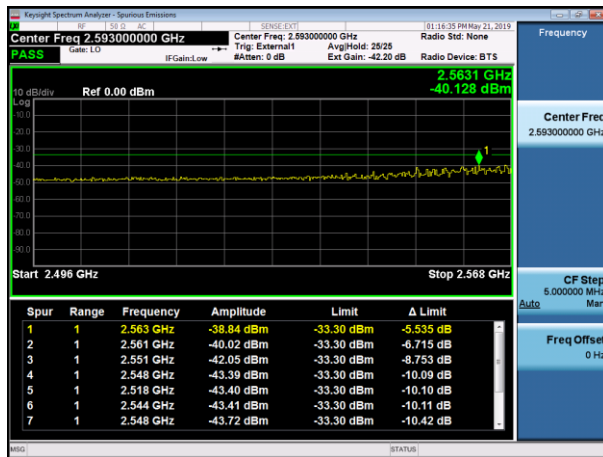
## 5.2.1.2 Spurious Emissions, QPSK+16QAM, 2516MHz



## 5.2.1.3 Spurious Emissions, 64QAM, 2670MHz



## 5.2.1.4 Spurious Emissions, 256QAM, 2593MHz





### 5.3 Antenna Port Measurements Test Setup Photographs

The Antenna Port Measurements Test Setup Photographs are detailed in the filing exhibits.

### 5.4 Antenna Port Measurements Test Equipment

Asset ID	Manufacturer	Type	Description	Model	Serial	Calibration Date	Calibration Due	Calibration Type	Status
<a href="#">E831</a>	Agilent Technologies	MXA Signal Analyzer	20Hz-26.5GHz	N9020A	MY48011791	2018-02-15	2020-02-15	Requires Calibration	Active
<a href="#">E1338</a>	KeySight Technologies	MXA Signal Analyzer		N9020B	MY57430927	2018-09-13	2020-09-13	Requires Calibration	Active
<a href="#">E1208</a>	RLC Electronics Inc	High Pass Filter	2.5Ghz to 26Ghz High Pass Filter	F-19391	1440-001	2019-02-25	2020-02-25	Calibration Not Required, Must Be Verified	Active
<a href="#">E1156</a>	Weinschel	Attenuator	10dB 0.05GHz-26GHz 25W	74-10-12	1069	2019-02-25	2020-02-25	Calibration Not Required, Must Be Verified	Active
<a href="#">E1155</a>	Weinschel	Attenuator	10dB 25Watt 0.05GHz - 26GHz	74-10-12	1068	2019-02-25	2020-02-25	Calibration Not Required, Must Be Verified	Active
<a href="#">E1154</a>	Weinschel	Attenuator	30dB 25W 0.05GHz-26GHz	74-30-12	1065	2019-02-25	2020-02-25	Calibration Not Required, Must Be Verified	Active
	UTIFLEX MICRO-COAX	Cable	UFB142A-0-0720-2G0200/A. MFR65639 227883-001	142A Series 503609-G		2019-02-25	2020-02-25	Pathloss verified with attenuators	

## 6. FCC Section 2.1053 and Part 15.109 - Field strength of spurious radiation

### 6.1 Section 2.1053 Field Strength of Spurious Emissions

Field strength measurements of radiated spurious emissions were made in an FCC registered 3m Semi-Anechoic Chamber which is maintained by Nokia Bell Labs in Murray Hill, New Jersey. A complete description and full measurement data for the site is on file with the Commission (Site Registration Number: 515091).

The spectrum from 30 MHz to beyond the tenth harmonic of the carrier, 27 GHz, was searched for spurious radiation. Measurements were made using both horizontally and vertically polarized broadband antennas. Per FCC regulations, the comparison of out of band spurious emissions directly to the limit is appropriately made using the substitution method. However, when the emissions are more than 20 dB below the specification limit, the use of field strength measurements for compliance determination is acceptable and those emissions are considered not reportable (Section 2.1053 and the FCC Interpretive database for 2.1053). For this case the evaluation of acceptable radiated field strength is as follows.

Sections 2.1053 and 27.53 contain the requirements for the levels of spurious radiation as a function of the level of the unmodulated carrier. The reference level for the unmodulated carrier is calculated as the field produced by an ideal dipole excited by the transmitter output power according to the following relation taken from Reference Data for Radio Engineers, page 676, 4<sup>th</sup> edition, IT&T Corp.

$$E = [(30 \cdot P)^{1/2}] / R$$

$$20 \log (E \cdot 10^6) - (43 + 10 \log P) = 82.23 \text{ dB}\mu\text{V}/\text{meter}$$

Where:

E = Field Intensity in Volts/meter

P = Transmitted Power in Watts

R = Measurement distance in meters = 3 m

The compliance limit is 82.23 dB $\mu$ V/m. The non-report level is 62.23 dB $\mu$ V/m which is higher than the FCC Part 15 Class B limit of 54 dB $\mu$ V/m.

The calculated emission levels were found by:

$$\text{Measured level (dB}\mu\text{V)} + \text{Cable Loss(dB)} + \text{Antenna Factor(dB)} = \text{Field Strength (dB}\mu\text{V/m)}$$

### 6.2 Results - Field Strength of Spurious Emissions

For compliance with 47CFR Parts 2 and 27, the field strength of any spurious radiation, measured at 3m, is required to be less than 82.23 dB $\mu$ V/meter (82.23 @ 3m). Emissions equal to or less than 62.23 dB $\mu$ V/meter at 3m are not reportable and may be verified using field strength measurements and broadband antennas. Over the out of band spectrum investigated from 30 MHz to beyond the tenth harmonic of the carrier (up to 27GHz), no reportable spurious emissions were detected.

The product was also compliant with Part 15 Class B.

### 6.3 Radiated Spurious Emissions Test Setup Photographs

The Radiated Emissions Test Setup Photographs are detailed in the filing exhibits.

### 6.4 Radiated Spurious Emissions Test Equipment

Asset ID	Manufacturer	Type	Description	Model	Serial	Calibration Date	Calibration Due	Calibration Type	Status
<a href="#">E602</a>	A.H. Systems Inc.	Biological Antenna	25 - 2000 MHz	SAS-521-2	410	2019-02-11	2021-02-11	Requires Calibration	Active
<a href="#">E555</a>	EMC Test Systems	Multi-Device Controller		2090	1577			Calibration Not Required	Active
<a href="#">F1119</a>	Extech	Data Logger	Pressure Humidity Temp data logger	SD700	Q668960	2018-12-10	2020-12-10	Requires Calibration	Active
<a href="#">E908</a>	Rohde & Schwarz	Test Receiver	EMI (20Hz to 40 GHz)-150 +30dBm	ESIB40	100100	2018-03-12	2020-03-12	Requires Calibration	Active
<a href="#">E507</a>	Sonoma Instrument Co.	Amplifier	9KHz-1GHz	310	185794	2018-08-14	2020-08-14	Requires Calibration	Active
<a href="#">E526</a>	A.H. Systems Inc.	Horn Antenna	Ridged Horn 26.5 GHz - 40 GHz	SAS-200/573	137	2017-10-04	2019-10-04	Requires Calibration	Active
<a href="#">E1166</a>	Agilent Technologies	Pre-Amplifier	Pre-Amplifier 1-26.5GHz	8449B	3008A01740	2018-10-24	2020-10-24	Requires Calibration	Active
<a href="#">E520</a>	EMC Test Systems	Horn Antenna	Double Ridged Horn 18-40 GHz	3116	2537	2018-08-09	2020-08-09	Requires Calibration	Active
<a href="#">E376</a>	Hewlett Packard	Pre-Amplifier	Preamplifier 1-26.5 GHz	8449B	3008A01270	2019-05-01	2020-05-01	Limited Use	Active
<a href="#">F1210</a>	RLC Electronics Inc	High Pass Filter	2.5GHz-26GHz High Pass filter	F-19391	1440-003			Calibration Not Required, Must Be Verified	Active
<a href="#">E889</a>	Weinschel	Attenuator	6 dB DC-18GHz 5 Watt	2-6	BX3438	2018-05-23	2020-05-23	Requires Calibration	Active

## 7. FCC Section 2.1055 - Measurement of Frequency Stability

There were no changes to the frequency generating and stabilizing circuitry of the AAHF, the subject of this test report and Class II Change. There have been no hardware changes. The Frequency Stability performance has not changed from the results initially reported to the FCC.

## 8. NVLAP Certificate of Accreditation

<p>United States Department of Commerce National Institute of Standards and Technology</p> <p><b>NVLAP</b><sup>®</sup></p> <hr/> <p><b>Certificate of Accreditation to ISO/IEC 17025:2005</b></p> <hr/> <p>NVLAP LAB CODE: 100275-0</p> <p><b>Nokia, Global Product Compliance Lab</b> Murray Hill, NJ</p> <p><i>is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:</i></p> <p><b>Electromagnetic Compatibility &amp; Telecommunications</b></p> <p><i>This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).</i></p> <table><tr><td><p>2018-09-05 through 2019-09-30 <i>Effective Dates</i></p></td><td></td><td><p> For the National Voluntary Laboratory Accreditation Program</p></td></tr></table>		<p>2018-09-05 through 2019-09-30 <i>Effective Dates</i></p>		<p> For the National Voluntary Laboratory Accreditation Program</p>
<p>2018-09-05 through 2019-09-30 <i>Effective Dates</i></p>		<p> For the National Voluntary Laboratory Accreditation Program</p>		