Global Product Compliance Laboratory
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TESTING
NVLAP LAB CODE: 100275-0

Title 47 Code of Federal Regulations Test Report

Regulation:
FCC Part 2 and 27

Client:
NOKIA SOLUTIONS AND NETWORKS

Product Evaluated:
Airscale MAA 64T64R 192AE n77 200W

Report Number:
TR-2020-0149-FCC2-27
Revision 1

Date Issued:
March 29, 2021

Table of Contents

Revisions

Date	Revision	Section	Change
11/24/2020	0		Initial Release
3/29/2021	1	Pages 2-48 Page 24 Page 25 Page 26	Update header Replace 3710.01MHz Plot Replace 3969.99 MHz Plot Replace all 3 40HMz BW Plots

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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.

Equipment Under Test (EUT):	**Airscale MAA 64T64R 192AE n77 200W**
Serial Number:	1M203637096(Radio) / 1M203637100 (Freq. Stability)
FCC ID:	VBNAEQK-01
Hardware Version:	475589A.X21
Software Version:	5G20B
Frequency Range:	3700-3980 MHz
GPCL Project Number:	2020-0149
Manufacturer:	NOKIA SOLUTIONS AND NETWORKS OY?? KARAKAARI 7, FI-02610 ESPOO FINLAND
Applicant	Nokia Solutions and Networks Steve Mitchell 3201 Olympus Blvd Dallas, TX 75019
Test Requirement(s):	Title 47 CFR Parts 2 and 27
Test Standards:	• Title 47 CFR Parts 2 and 27 • KDB 971168 D01 Power Measurement License Digital Systems v03r01 April 9, 2018. • KDB 662911 D01 Multiple Transmitter Output v02r01 Oct 2013 • ANSI C63.26 (2015) • ANSI C63.4 (2014)
Measurement Procedure(s):	• FCC-IC-OB - GPCL Power Measurement, Occupied Bandwidth & Modulation Test Procedure 6-20-2019 • FCC-IC-SE - GPCL Spurious Emissions Test Procedure 6-20-2019
Test Date(s):	10/21/2020 – 11/18/2020
Test Performed By:	Nokia Global Product Compliance Laboratory 600-700 Mountain Ave. P.O. Box 636 Murray Hill, NJ 07974-0636
Product Engineer(s):	Ron Remy
Lead Engineer:	Steve Gordon
Test Engineer (s):	Jaideep Yadav, Joe Bordonaro
Test Results: The EUT, *as tested* met the above listed Test Requirements. The decision rule employed is binary (Pass/Fail) based on the measured values without accounting for Measurement Uncertainty or any Guard Band. The measured values obtained during testing were compared to a value given in the referenced regulation or normative standard. 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 **Airscale MAA 64T64R 192AE n77 200W**, hereinafter referred to as the Equipment Under Test (EUT).

1.2 Purpose and Scope

The purpose of this document is to provide the 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.

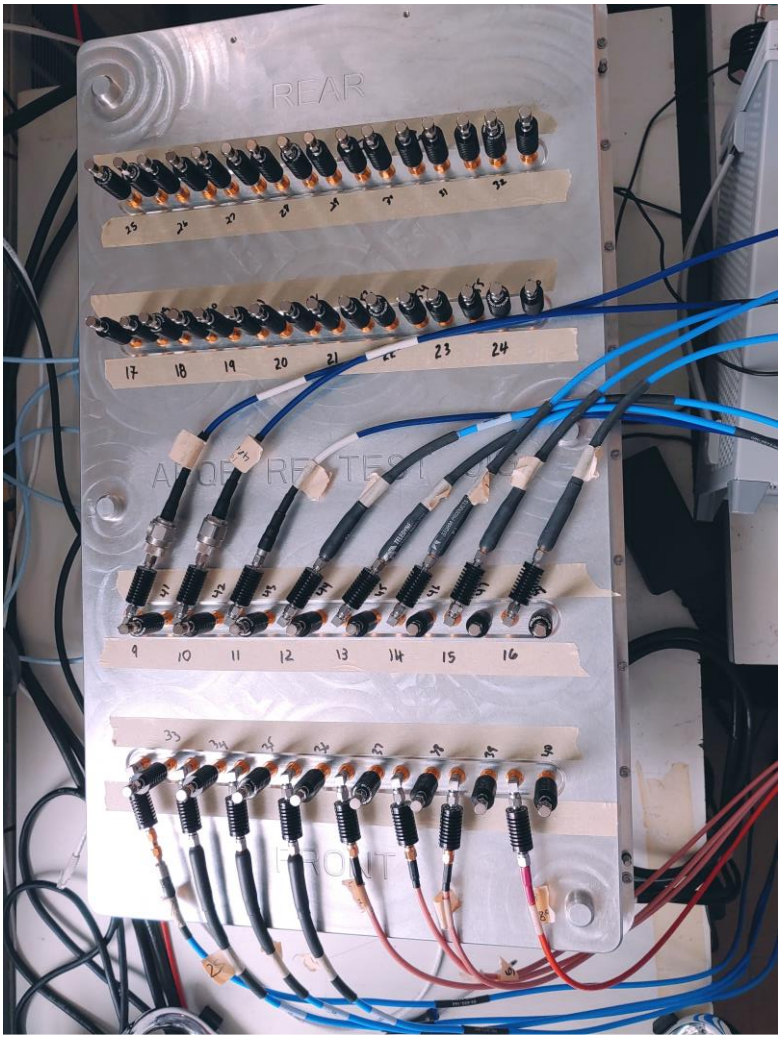
This test program demonstrates compliance of Single Carrier bandwidths of 20 MHz at 100 W, 40 MHz at 200 W, and 100 MHz at 200 W in the 5G-NR mode of operation in the frequency range of 3700 – 3980 MHz. The maximum power was determined through the measurement and summing of the 64 ports in Watts. Each port is rated for 3.125 W (34.95 dBm) per port or 200 W for the 64 ports (53.01 dBm +/- 2.0 dBm)

1.3 EUT Details

1.3.1 Specifications

Radio Characteristics	
Max RF Output Power	200W (3.125W per TRX)
TX/RX	64T64R
Band/Frequency Range	n77: 3700 - 3980 MHz
Instantaneous bandwidth (IBW)	200MHz (HW ready: 200+200 in split mode)
Occupied bandwidth (OBW)	100 MHz (HW ready: 100+100 in split mode)
Carrier bandwidth	20, 40, 50, 60, 70, 80,90, 100MHz; 20+20, 40+40, 40+50 MHz
Operating mode	64TRx Digital Beamforming
Other Characteristic	
External Interfaces	2 * SFP28 for CPRI 9.8Gbps, DC -48 V, AISG-ES-RAE 2.1, ext. alarms MDR-26
Installation Options	Pole / Wall with mechanical adjustment Fit into sPAA (stacked Hybrid Antenna)
Antenna Characteristics	
Antenna configurations	physical: 12, 8, 2 (192 AE) logical: 4, 8, 2
Minimum beamwidth	horizontal: 15° (boresight) vertical: 6° (boresight)
Beamsteering angle	horizontal: ±45° vertical: +6° (pre-tilt) ±7° (SLS>6dB)
Maximum antenna gain	>=24.5 dBi

1.3.2 Photographs



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 Test Standards & Measurement Procedures

1.5.1 Test Standards

- Title 47 Code of Federal Regulations, Federal Communications Commission Part 2.
- Title 47 Code of Federal Regulations, Federal Communications Commission Part 27.
- KDB 971168 D01 Power Measurement License Digital Systems v03r01 April 9, 2018.
- KDB 662911 D01 Multiple Transmitter Output v02r01 Oct 2013
- ANSI C63.26-2015, American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
- ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

1.5.2 Measurement Procedures

- FCC-IC-OB - GPCL Power Measurement, Occupied Bandwidth & Modulation Test Procedure 6-20-2019
- FCC-IC-SE - GPCL Spurious Emissions Test Procedure 6-20-2019

1.6 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, (*e.g.*, ANSI C63.4, CISPR 11, 14, 32, *etc.*, using ESHS 30,	Conducted Emissions	0.009 - 30	±3.5 dB
	Radiated Emissions (AR-6 Semi-Anechoic Chamber)	30 MHz – 200MHz H 30 MHz – 200 MHz V 200 MHz – 1000 MHz H 200 MHz – 1000 MHz V 1 GHz - 18 GHz	±5.1 dB ±5.1 dB ±4.7 dB ±4.7 dB ±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

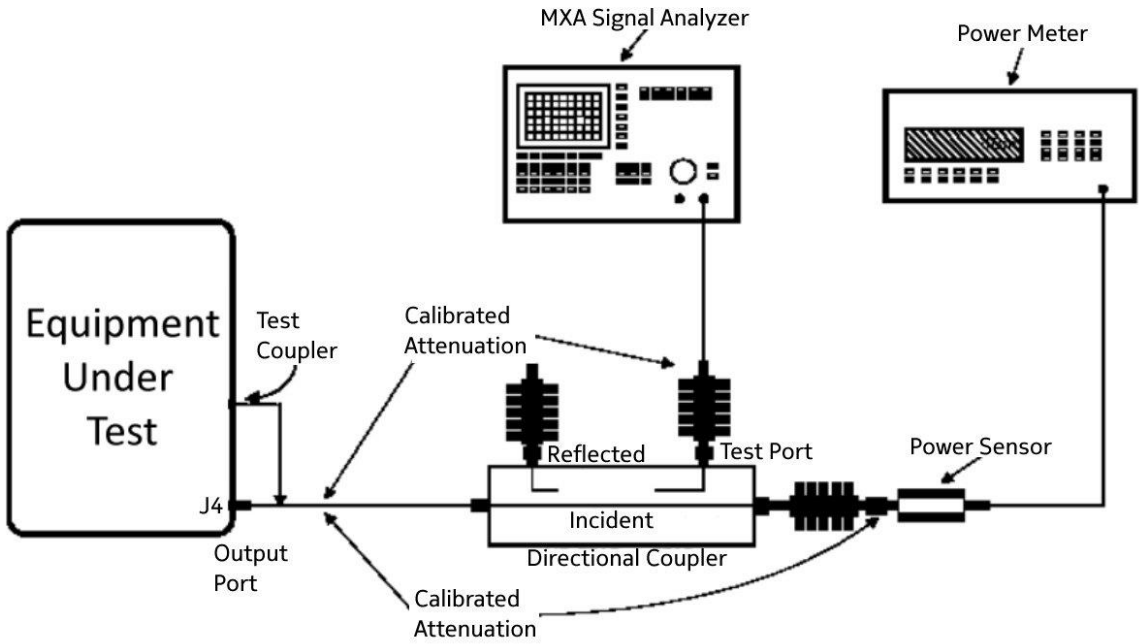
1.7 Executive Summary

Requirement	Description	Result
47 CFR FCC Parts 2 and 27		
2.1046, 27.50	RF Power Output Peak to Average Power Ratio	COMPLIES
2.1047	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, 27.54	Frequency Stability	COMPLIES

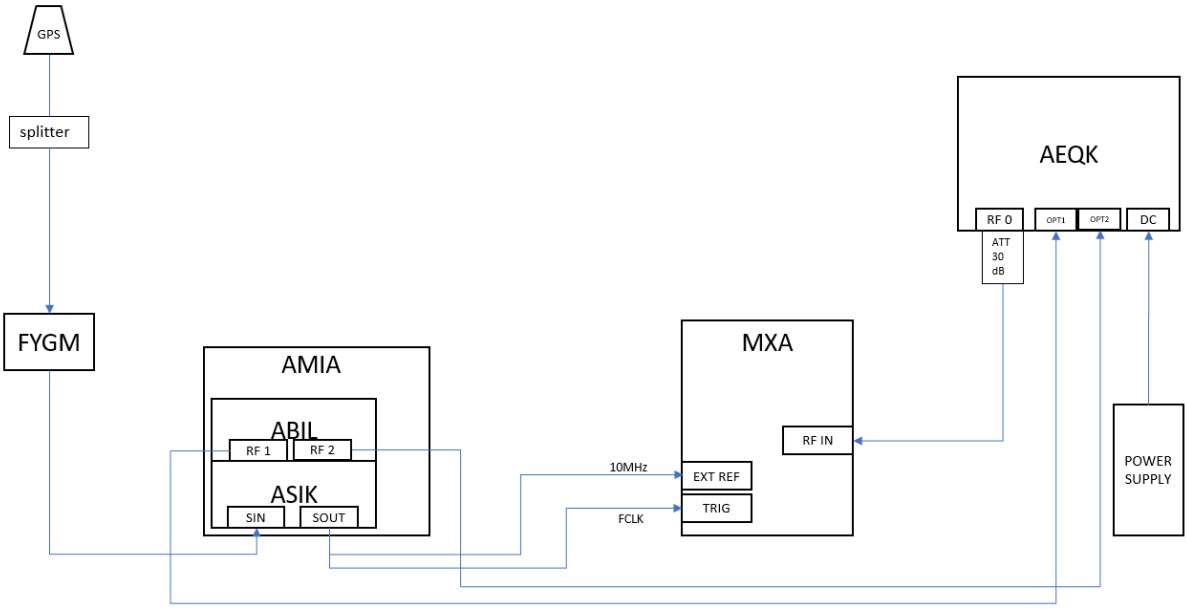
1. **COMPLIES -** Passed all applicable tests.
2. **N/A –** Not Applicable.
3. **NT –** Not Tested.

1.8 Test Configurations

Test Setup for all Antenna Port Measurements



Test Setup for Frequency Stability Test



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. The product was configured for test as shown in section above and allowed to warm up and stabilize per KDB 971168 D01 and ANSI C63.26. Power measurements were made with an MXA Signal Analyzer.

Per FCC 27.50(J)(2), the power of each fixed or base station transmitting in the 3700-3980MHz band is limited to an EIRP of 1640W/MHz, i.e., 62.15dBm/MHz EIRP. With 24.5dBi antenna gain, the total conducted power spectrum density limit is 38dBm/MHz per 32 ports (per polarization).

The Average Max RF Power Values are bolded in each configuration.

Tabular Data – Channel RF Power 20MHz BW

Test Model 3.1 Modulation 64QAM Channel Frequency 3710.1MHz				Test Model 3.2 Modulation QPSK/16QAM Channel Frequency 3840MHz				Test Model 3.1a Modulation 256QAM Channel Frequency 3969.99MHz			
TX Port	(dBm)	TX Port	(dBm)	TX Port	(dBm)	TX Port	(dBm)	TX Port	(dBm)	TX Port	(dBm)
1	31.97	33	31.39	1	31.95	33	31.90	1	31.97	33	31.63
2	32.32	34	31.65	2	32.17	34	32.21	2	32.29	34	31.80
3	32.07	35	31.53	3	32.07	35	32.04	3	32.21	35	31.75
4	32.11	36	31.80	4	32.05	36	32.01	4	32.18	36	31.68
5	32.16	37	31.67	5	32.18	37	32.31	5	32.46	37	32.18
6	32.20	38	31.76	6	32.12	38	**32.33**	6	32.55	38	32.26
7	32.15	39	31.74	7	32.00	39	32.22	7	32.34	39	32.04
8	32.01	40	31.59	8	32.02	40	32.04	8	32.15	40	31.77
9	**32.51**	41	31.91	9	32.12	41	32.02	9	32.39	41	31.65
10	32.19	42	31.72	10	31.85	42	31.68	10	32.15	42	31.32
11	32.34	43	31.83	11	31.94	43	31.54	11	32.17	43	31.84
12	32.02	44	31.67	12	31.76	44	31.38	12	31.97	44	31.71
13	32.18	45	31.74	13	31.83	45	32.13	13	32.20	45	31.60
14	32.04	46	31.58	14	31.82	46	31.83	14	32.12	46	31.67
15	32.17	47	31.66	15	31.94	47	32.11	15	32.18	47	31.85
16	32.16	48	31.71	16	31.89	48	32.07	16	32.21	48	31.87
17	31.43	49	31.50	17	31.67	49	31.65	17	31.36	49	31.57
18	31.80	50	31.77	18	31.98	50	31.79	18	31.65	50	31.69
19	31.60	51	31.72	19	31.86	51	31.80	19	31.56	51	31.70
20	31.62	52	31.72	20	31.83	52	31.76	20	**33.83**	52	31.66
21	31.79	53	31.88	21	32.05	53	32.09	21	31.84	53	32.11
22	31.64	54	31.89	22	31.96	54	32.03	22	31.95	54	32.09
23	31.69	55	31.78	23	31.92	55	31.91	23	31.85	55	31.91
24	31.51	56	31.61	24	31.69	56	31.75	24	31.51	56	31.65
25	31.94	57	31.85	25	32.01	57	32.02	25	31.70	57	31.94
26	31.67	58	31.73	26	31.78	58	31.85	26	31.54	58	31.78
27	31.68	59	31.71	27	31.39	59	31.66	27	31.25	59	31.48
28	31.63	60	31.64	28	31.74	60	31.72	28	31.51	60	31.54
29	31.70	61	31.81	29	31.83	61	32.03	29	31.67	61	31.85
30	31.51	62	31.62	30	31.67	62	31.87	30	31.52	62	31.70
31	31.77	63	31.87	31	31.90	63	32.04	31	31.77	63	31.86
32	31.60	64	31.67	32	31.69	64	32.15	32	31.62	64	31.71
Total Power (dBm)			49.90	Total Power (dBm)			49.98	Total Power (dBm)			49.96
Total Power (W)			97.26	Total Power (W)			99.59	Total Power (W)			99.14

Tabular Data – Channel RF Power 40MHz BW

Test Model 3.1 Modulation 64QAM Channel Frequency 3720MHz				Test Model 3.2 Modulation QPSK/16QAM Channel Frequency 3840MHz				Test Model 3.1a Modulation 256QAM Channel Frequency 3960MHz			
TX Port	(dBm)	TX Port	(dBm)	TX Port	(dBm)	TX Port	(dBm)	TX Port	(dBm)	TX Port	(dBm)
1	34.67	33	35.05	1	35.15	33	35.08	1	35.14	33	35.04
2	34.97	34	35.19	2	35.30	34	35.33	2	35.38	34	35.22
3	34.72	35	35.09	3	35.19	35	35.19	3	35.28	35	35.15
4	34.77	36	35.27	4	35.19	36	35.17	4	35.28	36	35.12
5	35.01	37	35.30	5	35.39	37	35.36	5	**35.69**	37	35.50
6	34.81	38	35.35	6	35.29	38	35.42	6	35.52	38	35.56
7	34.93	39	35.34	7	35.30	39	35.37	7	35.51	39	35.45
8	35.11	40	35.35	8	35.55	40	35.41	8	34.89	40	35.45
9	35.12	41	35.42	9	35.40	41	**35.57**	9	35.42	41	35.58
10	34.91	42	35.23	10	35.17	42	35.32	10	35.14	42	35.43
11	35.08	43	35.33	11	35.30	43	35.29	11	35.30	43	35.48
12	34.72	44	35.07	12	35.08	44	35.14	12	35.08	44	35.16
13	34.85	45	35.15	13	35.15	45	35.31	13	35.29	45	35.44
14	34.70	46	34.97	14	35.11	46	35.13	14	35.15	46	35.17
15	34.86	47	35.23	15	35.24	47	35.40	15	35.30	47	35.36
16	35.06	48	35.26	16	34.58	48	35.50	16	35.54	48	35.54
17	35.09	49	34.89	17	35.16	49	34.98	17	35.16	49	35.08
18	35.44	50	35.17	18	35.45	50	35.18	18	35.40	50	35.24
19	35.19	51	35.13	19	35.27	51	35.14	19	35.31	51	35.23
20	35.20	52	35.09	20	35.25	52	35.07	20	35.26	52	35.14
21	35.51	53	35.33	21	35.49	53	35.36	21	35.67	53	35.49
22	35.24	54	35.31	22	35.35	54	35.26	22	35.59	54	35.49
23	35.33	55	35.27	23	35.38	55	35.22	23	35.57	55	35.38
24	35.52	56	35.40	24	35.52	56	35.37	24	35.62	56	35.45
25	**35.59**	57	35.36	25	35.51	57	35.48	25	35.46	57	35.57
26	35.31	58	35.17	26	35.27	58	35.20	26	35.21	58	35.25
27	35.50	59	35.19	27	35.35	59	35.17	27	35.29	59	35.37
28	35.12	60	35.14	28	35.14	60	35.02	28	35.04	60	35.17
29	35.28	61	35.20	29	35.28	61	35.32	29	35.38	61	35.38
30	35.12	62	34.99	30	35.16	62	35.13	30	35.15	62	35.19
31	35.39	63	34.91	31	35.39	63	35.38	31	35.41	63	35.26
32	35.47	64	35.30	32	35.41	64	35.44	32	35.52	64	35.44
Total Power (dBm)			53.22	Total Power (dBm)			53.34	Total Power (dBm)			53.40
Total Power (W)			210.09	Total Power (W)			215.67	Total Power (W)			219.02

Tabular Data – Channel RF Power 100MHz BW

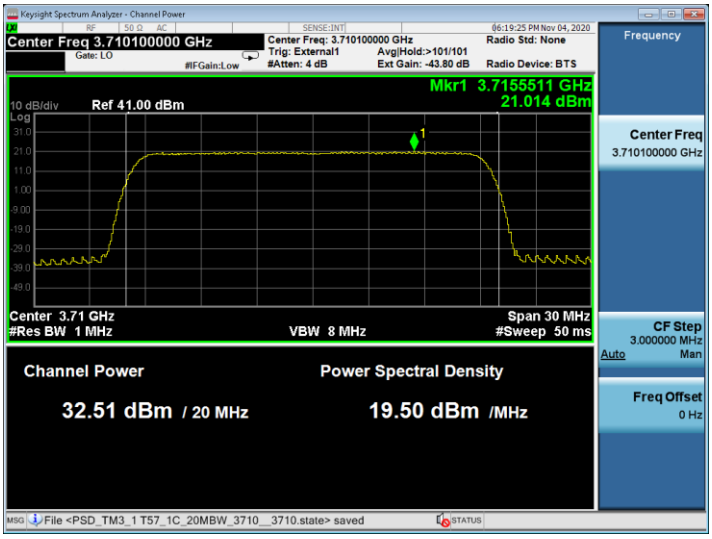
Test Model 3.1 Modulation 64QAM Channel Frequency 3750MHz				Test Model 3.2 Modulation QPSK/16QAM Channel Frequency 3840MHz				Test Model 3.1a Modulation 256QAM Channel Frequency 3930MHz			
TX Port	(dBm)	TX Port	(dBm)	TX Port	(dBm)	TX Port	(dBm)	TX Port	(dBm)	TX Port	(dBm)
1	34.56	33	34.88	1	34.85	33	34.97	1	34.82	33	34.80
2	34.85	34	34.89	2	35.04	34	35.19	2	34.98	34	34.98
3	34.60	35	34.89	3	34.92	35	35.07	3	34.86	35	34.90
4	34.64	36	35.00	4	34.92	36	35.05	4	34.93	36	34.85
5	35.21	37	35.19	5	35.19	37	35.25	5	35.35	37	35.21
6	34.86	38	35.20	6	35.00	38	35.32	6	35.20	38	35.34
7	34.96	39	35.23	7	35.00	39	35.29	7	35.21	39	35.16
8	35.12	40	35.25	8	35.24	40	35.38	8	35.45	40	35.24
9	34.89	41	35.21	9	35.10	41	35.41	9	35.07	41	35.40
10	34.96	42	34.95	10	34.93	42	35.19	10	34.85	42	35.27
11	34.97	43	35.02	11	35.05	43	35.21	11	34.98	43	35.34
12	34.65	44	34.80	12	34.86	44	34.98	12	34.73	44	34.99
13	34.77	45	34.92	13	34.94	45	35.19	13	35.02	45	35.35
14	34.69	46	34.74	14	34.87	46	35.02	14	34.85	46	35.02
15	34.84	47	35.01	15	35.04	47	35.26	15	35.05	47	35.21
16	34.89	48	35.01	16	35.13	48	35.28	16	35.21	48	35.30
17	34.71	49	34.62	17	35.06	49	34.89	17	34.92	49	34.75
18	35.09	50	34.92	18	35.37	50	35.10	18	35.23	50	35.05
19	34.81	51	34.91	19	35.12	51	35.02	19	35.03	51	35.02
20	34.81	52	34.88	20	35.15	52	34.98	20	35.03	52	34.87
21	**35.36**	53	35.22	21	35.37	53	35.29	21	**35.47**	53	35.28
22	35.09	54	35.20	22	35.28	54	35.28	22	35.45	54	35.27
23	35.17	55	35.14	23	35.34	55	35.18	23	35.42	55	35.22
24	35.31	56	35.21	24	**35.45**	56	35.34	24	35.45	56	35.19
25	35.31	57	35.13	25	35.41	57	35.33	25	35.27	57	35.34
26	35.00	58	34.90	26	35.19	58	35.10	26	35.04	58	35.07
27	35.15	59	34.88	27	35.30	59	35.11	27	35.09	59	35.13
28	34.86	60	34.80	28	35.10	60	35.01	28	34.87	60	35.01
29	34.99	61	35.02	29	35.25	61	35.20	29	35.15	61	35.27
30	34.83	62	34.77	30	35.05	62	34.99	30	34.94	62	34.98
31	35.09	63	35.08	31	35.30	63	35.28	31	35.20	63	35.28
32	35.28	64	35.05	32	35.42	64	35.30	32	35.33	64	35.29
Total Power (dBm)			53.04	Total Power (dBm)			53.22	Total Power (dBm)			53.19
Total Power (W)			201.308	Total Power (W)			209.71	Total Power (W)			208.38

Channel RF Power – Plots

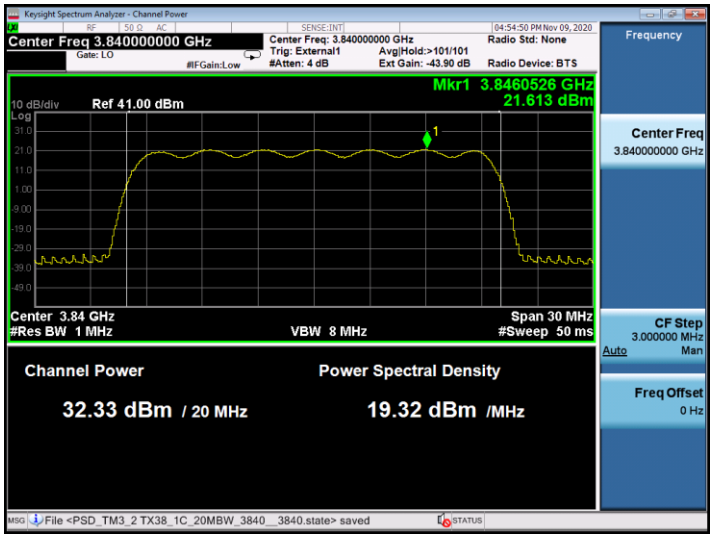
NOTE: Only a sample of the plots are used in this report. The full suite of raw data resides at the MH, New Jersey location.

20MHz BW

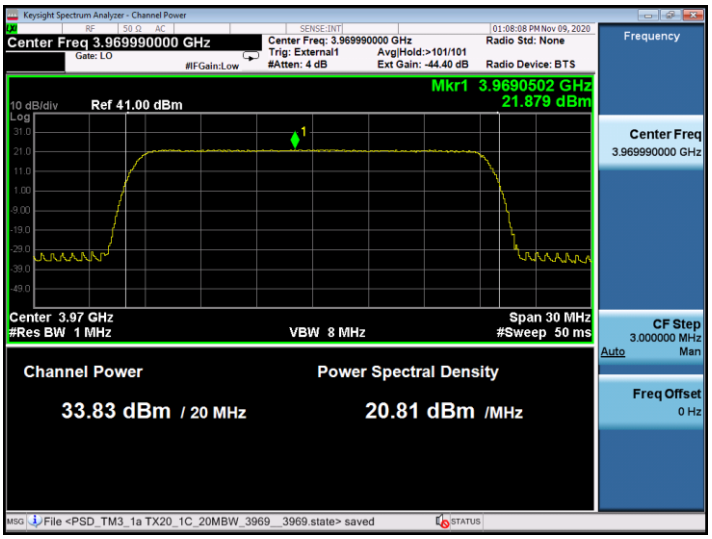
Test Model 3.1
Modulation 64QAM
Channel Frequency 3710.1MHz
TX9



Test Model 3.2
Modulation QPSK/16QAM
Channel Frequency 3840MHz
TX38

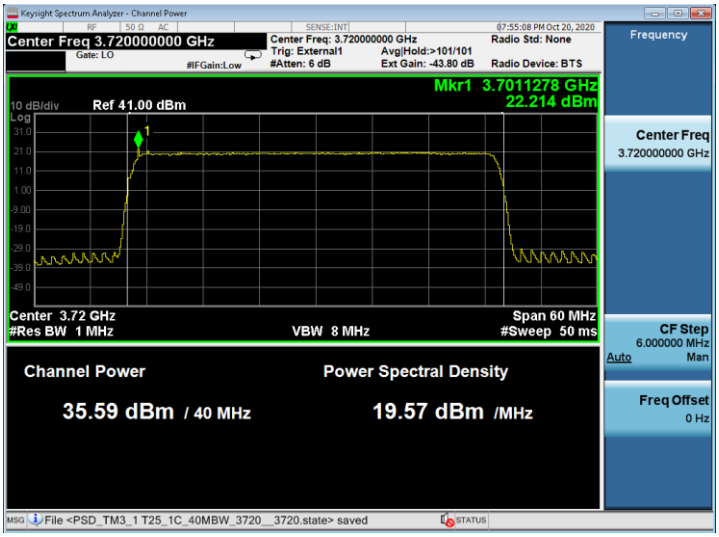


Test Model 3.1a
Modulation 256QAM
Channel Frequency 3969.99MHz
TX20

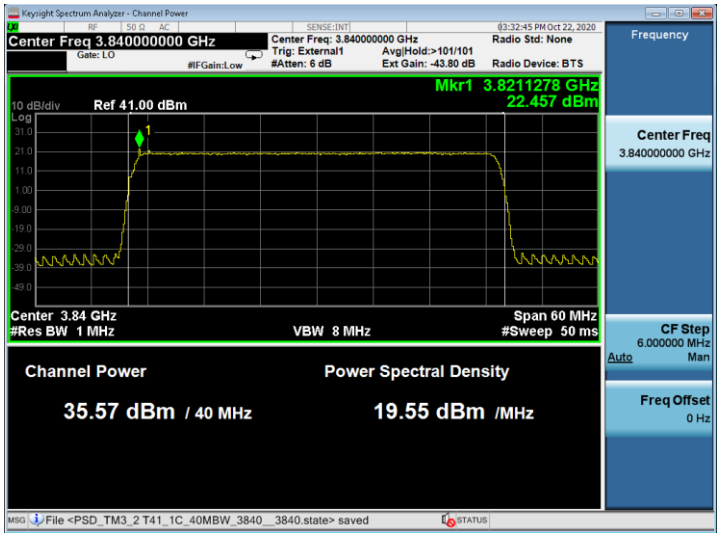


40MHz BW

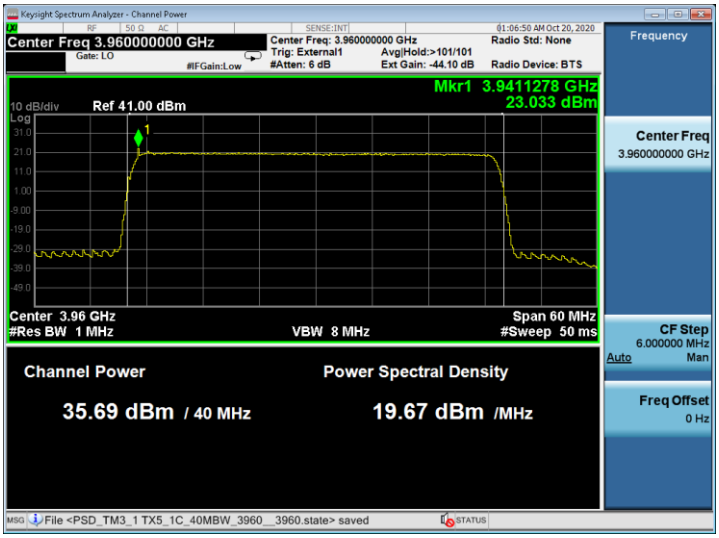
Test Model 3.1
Modulation 64QAM
Channel Frequency 3720MHz
TX25



Test Model 3.2
Modulation QPSK/16QAM
Channel Frequency 3840MHz
TX41

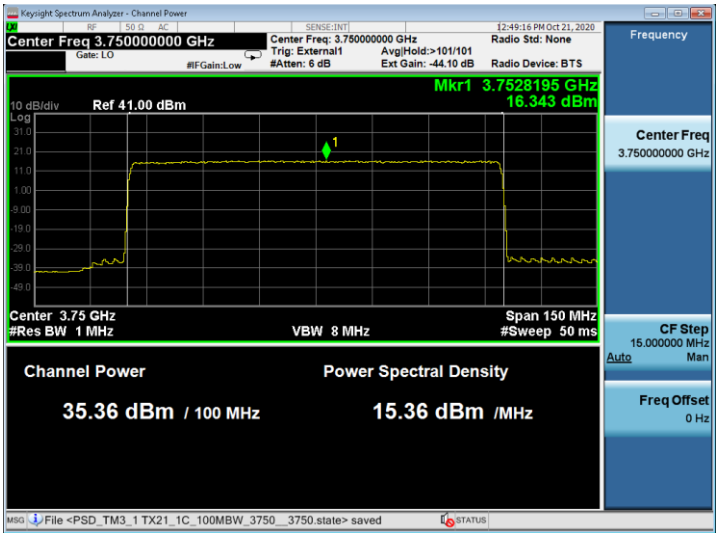


Test Model 3.1a
Modulation 256QAM
Channel Frequency 3960MHz
TX5

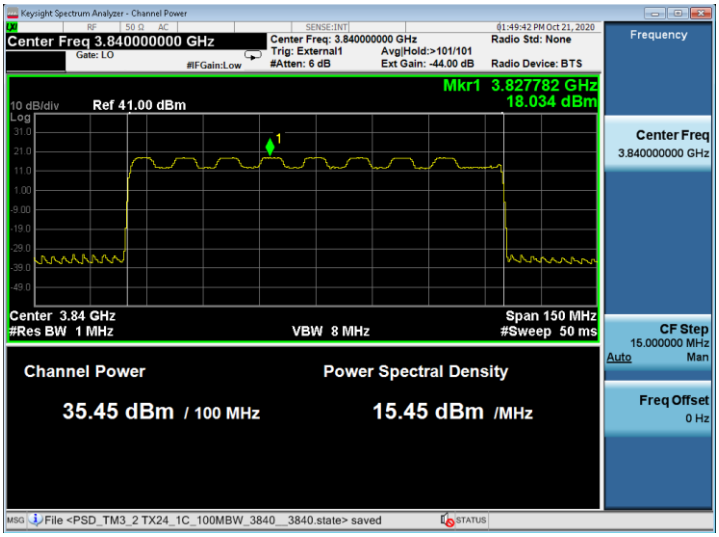


100MHz BW

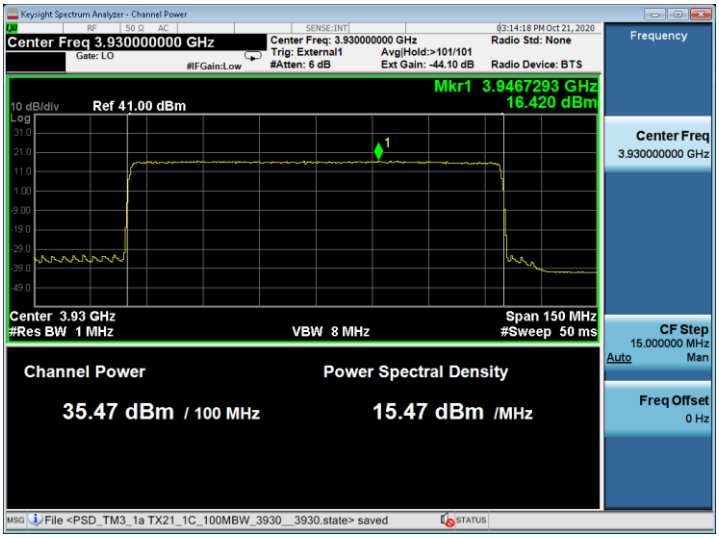
Test Model 3.1
Modulation 64QAM
Channel Frequency 3750MHz
TX21



Test Model 3.2
Modulation QPSK/16QAM
Channel Frequency 3840MHz
TX24



Test Model 3.1a
Modulation 256QAM
Channel Frequency 3930MHz
TX21

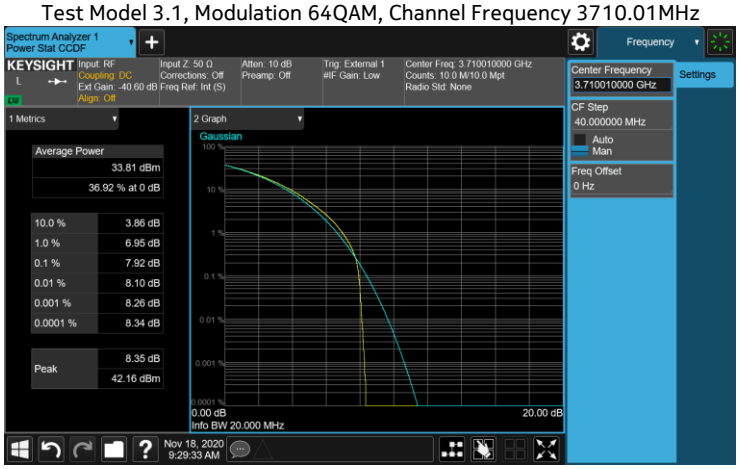


2.1.1 Peak-to-Average Power Ratio (PAPR) – Plots

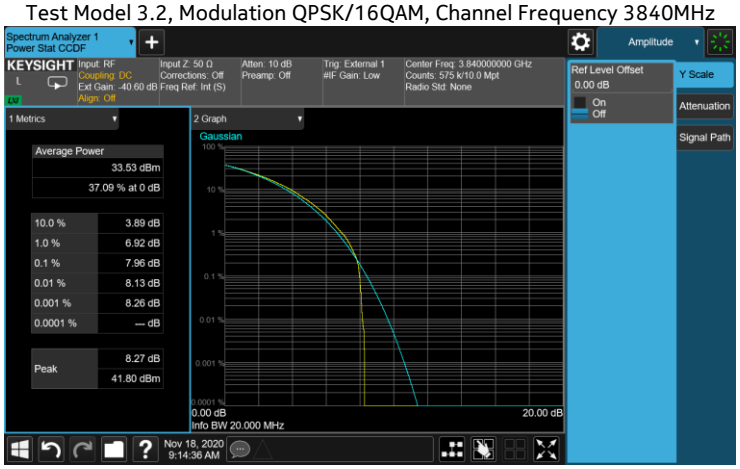
The Peak-to-Average Power Ratio (PAPR) was evaluated per KDB 971168 for 40 MHz, and 100 MHz bandwidths. The PAPR values of all carriers measured are below 13dB.

20 MHz BW

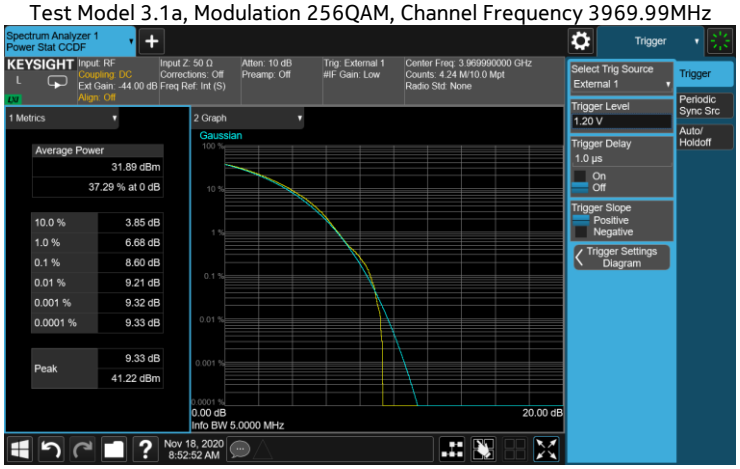
Test Model 3.1, Modulation 64QAM, Channel Frequency 3710.01MHz



Test Model 3.2, Modulation QPSK/16QAM, Channel Frequency 3840MHz

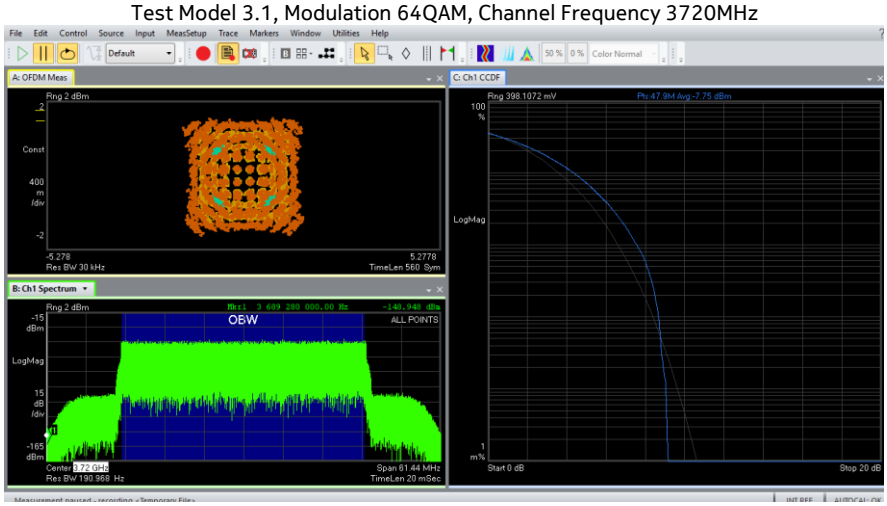


Test Model 3.1a, Modulation 256QAM, Channel Frequency 3969.99MHz

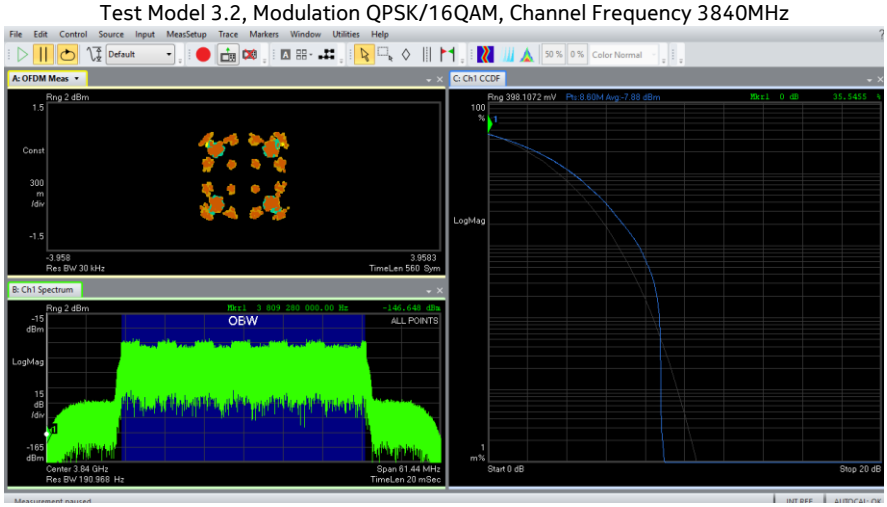


40 MHz BW

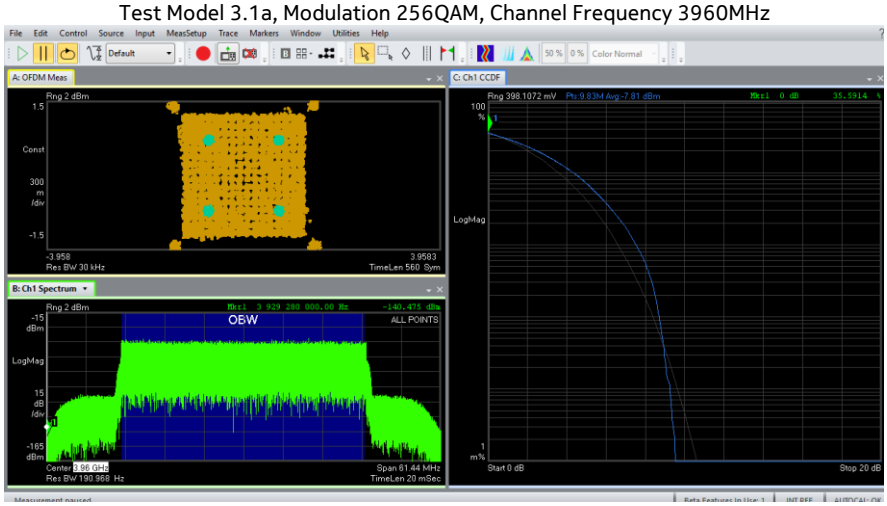
Test Model 3.1, Modulation 64QAM, Channel Frequency 3720MHz



Test Model 3.2, Modulation QPSK/16QAM, Channel Frequency 3840MHz

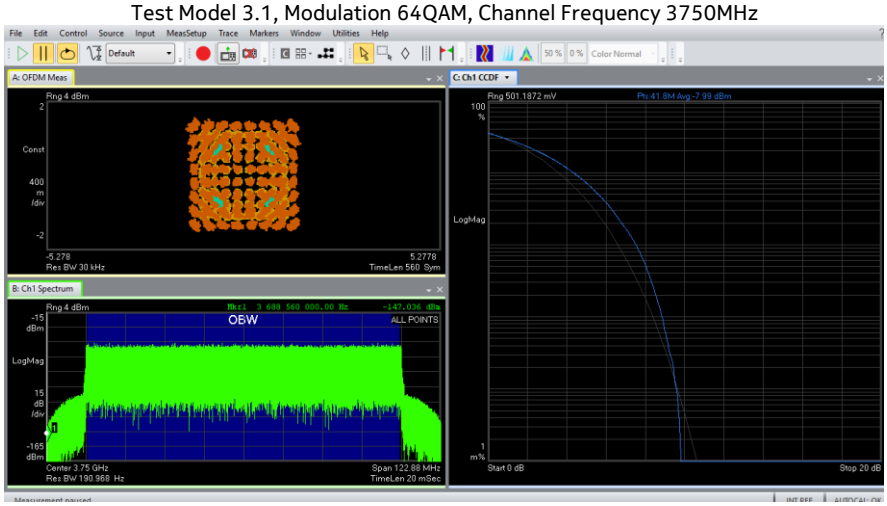


Test Model 3.1a, Modulation 256QAM, Channel Frequency 3960MHz

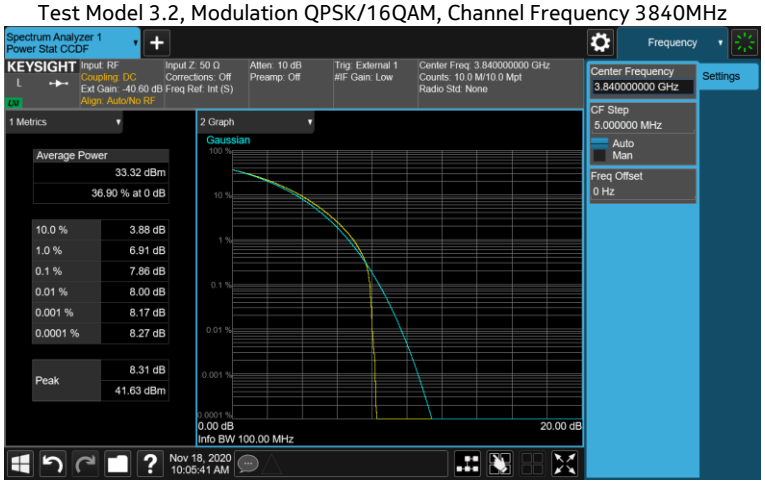


100 MHz BW

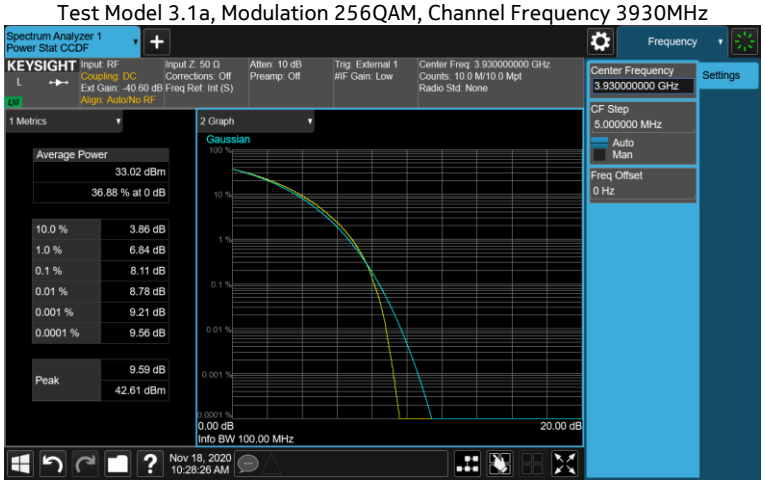
Test Model 3.1, Modulation 64QAM, Channel Frequency 3750MHz



Test Model 3.2, Modulation QPSK/16QAM, Channel Frequency 3840MHz



Test Model 3.1a, Modulation 256QAM, Channel Frequency 3930MHz



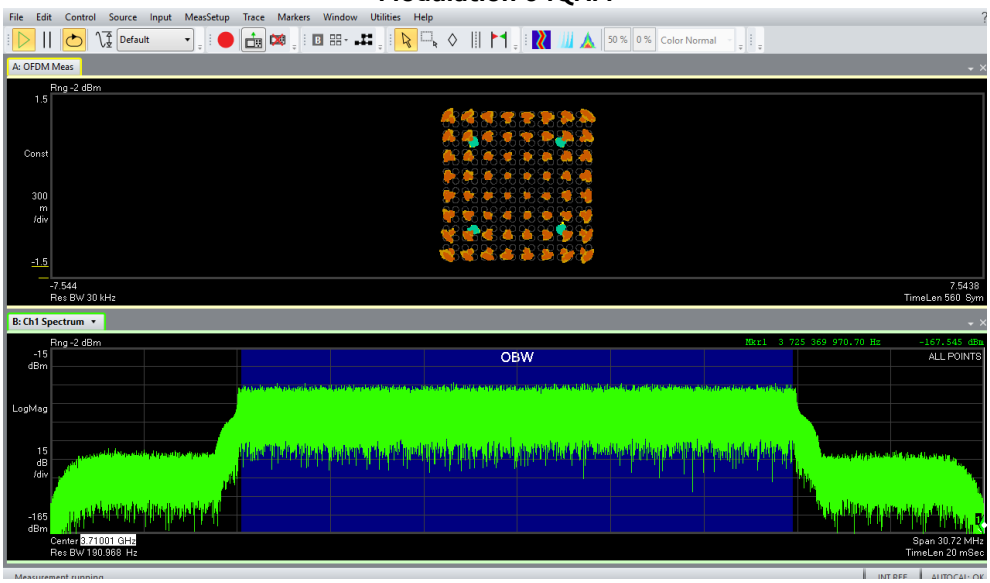
3. FCC Section 2.1047 - Modulation Characteristics

3.1 Modulation Characteristics

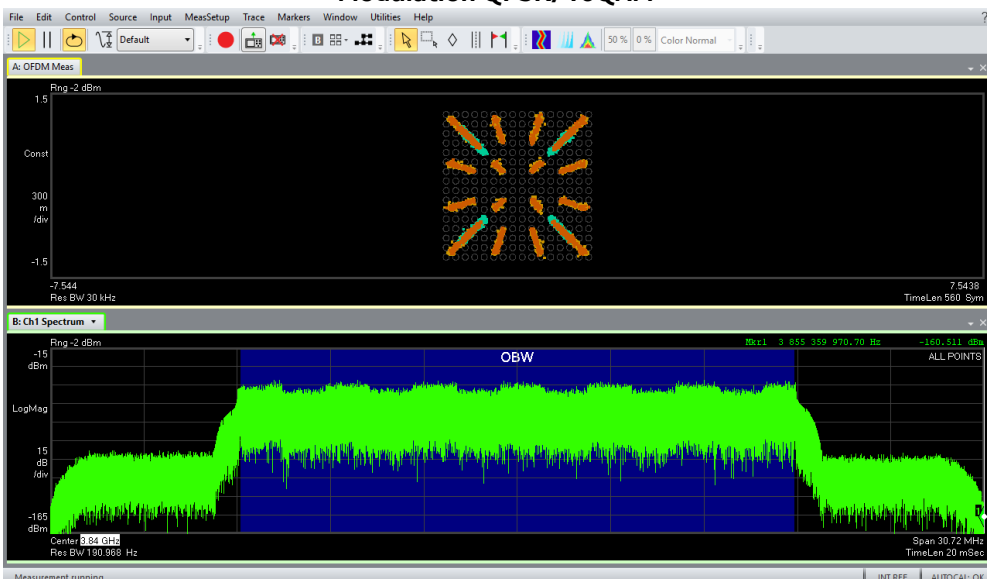
The RF signal at the antenna port was demodulated and verified for correctness of the modulation signal used before each test was performed.

3.1.1 Modulation Characteristics – Plots

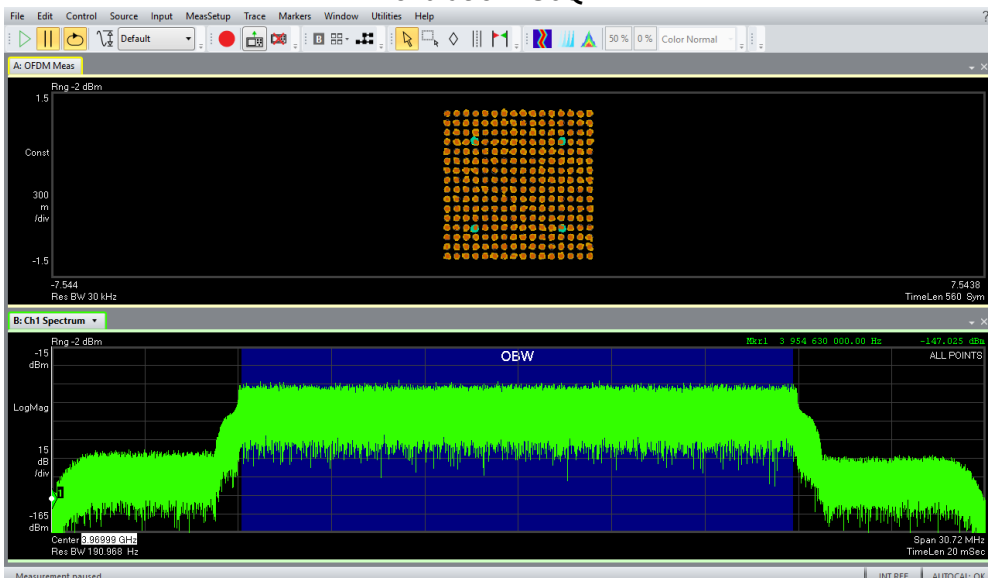
Modulation 64QAM



Modulation QPSK/16QAM



Modulation 256QAM



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."

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. During these measurements it is customary to evaluate the Edge of Band emissions at block/band edges.

The transmitted signal occupied bandwidth was measured using a Keysight MXA Signal Analyzer. All emissions were within the parameters as required.

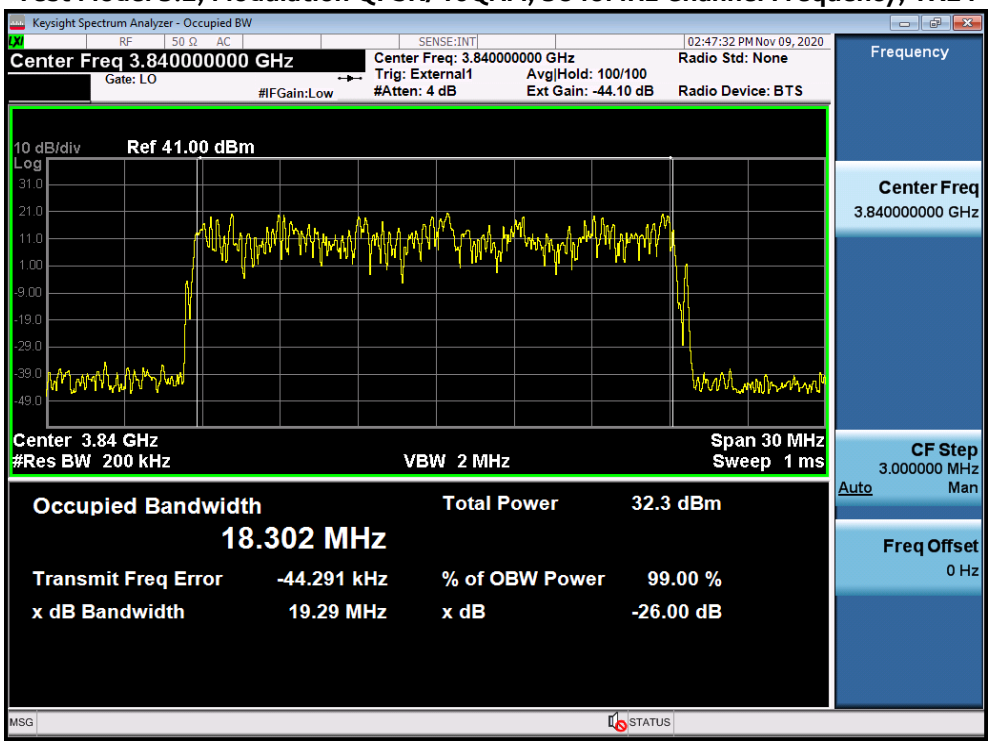
Tabular Data – 99% Occupied Bandwidth

Signal BW MHz	Test Model	Modulation	TX Port	Channel Frequency MHz	Occupied BW MHz
20	3.1	64QAM	9	3710.01	18.183
20	3.1	64QAM	25	3710.01	18.180
20	3.1	64QAM	41	3710.01	18.188
20	3.1	64QAM	54	3710.01	18.190
20	3.2	QPSK/16QAM	21	3840	**18.302**
20	3.2	QPSK/16QAM	38	3840	**18.302**
20	3.1	64QAM	53	3840	18.194
20	3.2	QPSK/16QAM	64	3840	**18.302**
20	3.1a	256QAM	22	3969.99	18.182
20	3.1a	256QAM	37	3969.99	18.201
20	3.1a	256QAM	53	3969.99	18.190
40	3.1	64QAM	25	3720	37.930
40	3.1	64QAM	41	3720	37.931
40	3.1	64QAM	56	3720	37.909
40	3.2	QPSK/16QAM	41	3840	37.794
40	3.2	QPSK/16QAM	57	3840	37.965
40	3.1a	256QAM	21	3960	37.838
40	3.1a	256QAM	41	3960	37.834
40	3.1a	256QAM	57	3960	**38.116**
100	3.1	64QAM	5	3750	96.957
100	3.1	64QAM	21	3750	97.120
100	3.1	64QAM	39	3750	97.015
100	3.1	64QAM	53	3750	97.136
100	3.2	QPSK/16QAM	24	3840	97.363
100	3.2	QPSK/16QAM	41	3840	**97.374**
100	3.2	QPSK/16QAM	56	3840	97.364
100	3.1a	256QAM	8	3930	96.685
100	3.1a	256QAM	21	3930	96.621
100	3.1a	256QAM	41	3930	96.721
100	3.1a	256QAM	57	3930	96.690

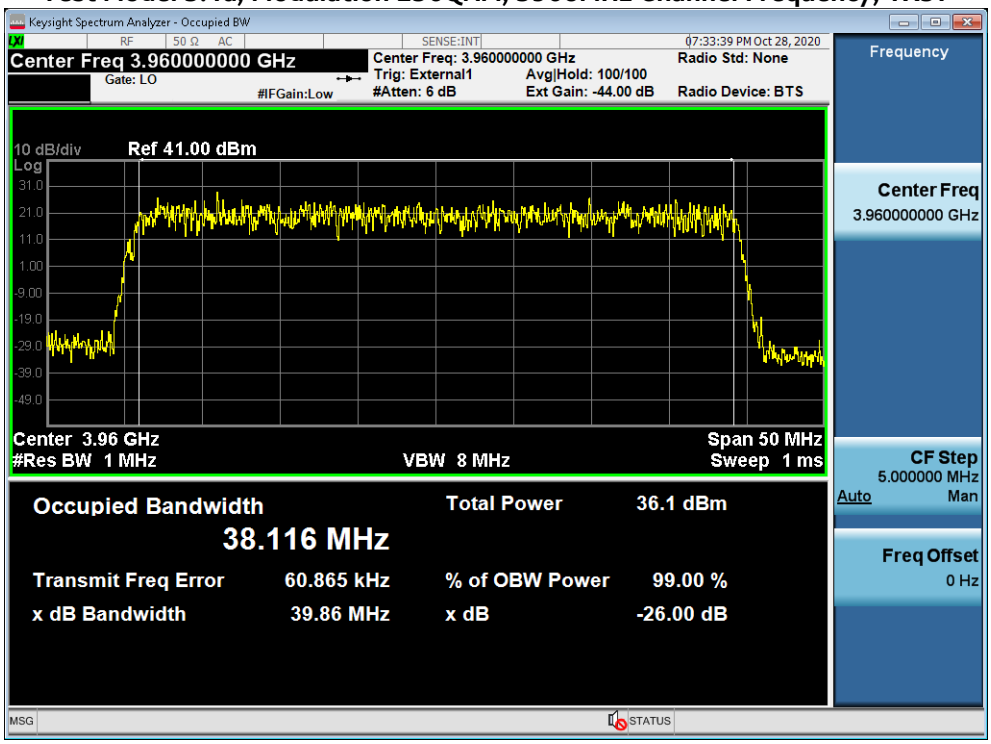
4.1.1 Occupied Bandwidth – Plots

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.

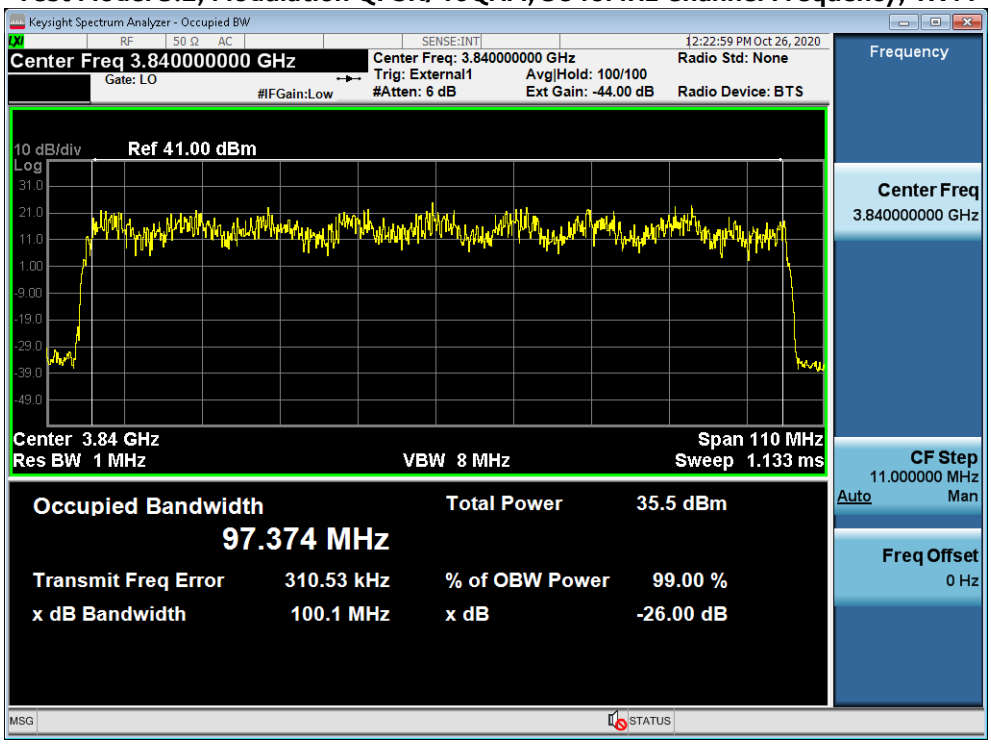
20MHz BW
Test Model 3.2, Modulation QPSK/16QAM, 3840MHz Channel Frequency, TX21



40MHz BW
Test Model 3.1a, Modulation 256QAM, 3960MHz Channel Frequency, TX57



100MHz BW
Test Model 3.2, Modulation QPSK/16QAM, 3840MHz Channel Frequency, TX41



4.2 Edge of band Emissions

The Edge of Band emissions of the EUT at the external antenna connector (EAC) were measured using a Keysight MXA Signal Analyzer. The RF power level was continuously measured using a RF broadband power meter. The RF output from the EAC port to signal analyzer was reduced (to an amplitude usable by the signal analyzer) by using a calibrated attenuator and test coupler. The path attenuation was offset on the display and the signal for the carrier was adjusted to the corrected RF power level for the resolution bandwidth used for the transmit signal. All mask values were adjusted based upon the designated signal bandwidth and measurement bandwidths. The Top of Mask corresponds to the set rated power level as confirmed by the RF power meter.

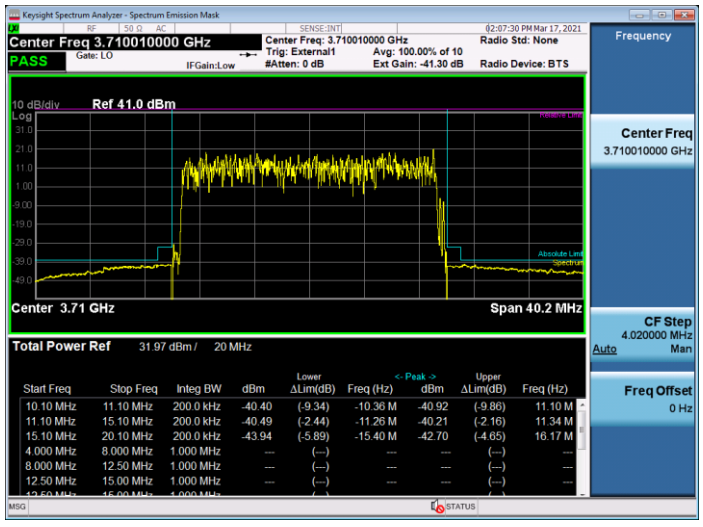
Per FCC Part 27.53 (L)(1), for base station operations in the 3700-3980 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed −13 dBm/MHz. Compliance with this paragraph (L)(1) is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 MHz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the 26dB emission bandwidth of the fundamental emission of the transmitter may be employed. Therefore, with 64 TX ports, the conducted limit per port is -31dBm/1% BW in the 1MHz immediately outside and adjacent to the licensee's frequency block and -31dBm/MHz outside the 1MHz.

4.2.1 Edge of Band Emissions - Plots.

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

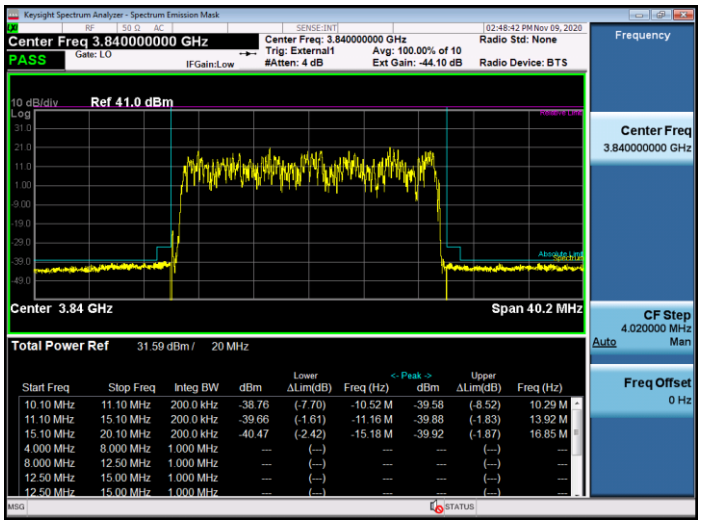
20MHz BW

Test Model 3.1
Modulation 64QAM
Channel Frequency 3710.01MHz
TX9



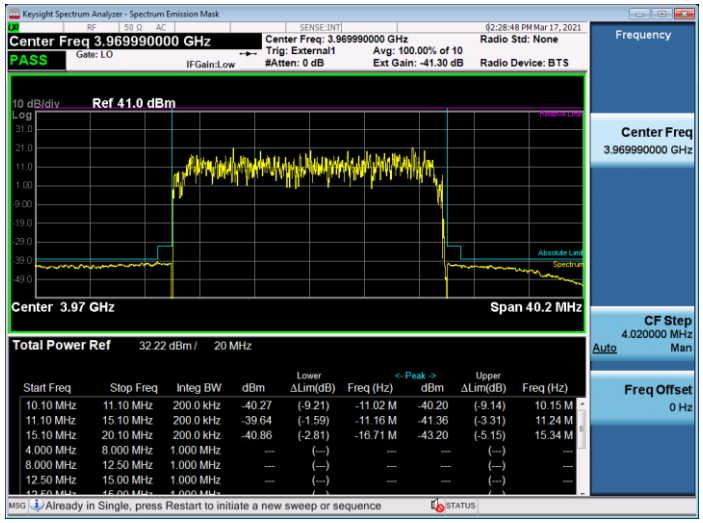
Start Freq	Stop Freq	Integ BW	dBm	Lower ΔLim(dB)	Lower Freq (Hz)	<- Peak -> dBm	Upper ΔLim(dB)	Upper Freq (Hz)
10.10 MHz	11.10 MHz	200.0 kHz	-40.40	(-9.34)	-10.36 M	-40.92	(-9.86)	11.10 M
11.10 MHz	15.10 MHz	200.0 kHz	-40.49	(-2.44)	-11.26 M	-40.21	(-2.16)	11.34 M
15.10 MHz	20.10 MHz	200.0 kHz	-43.94	(-5.89)	-15.40 M	-42.70	(-4.65)	16.17 M
4.000 MHz	8.000 MHz	1.000 MHz	---	(---)	---	---	(---)	---
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

Test Model 3.2
Modulation QPSK/16QAM
Channel Frequency 3840MHz
TX38



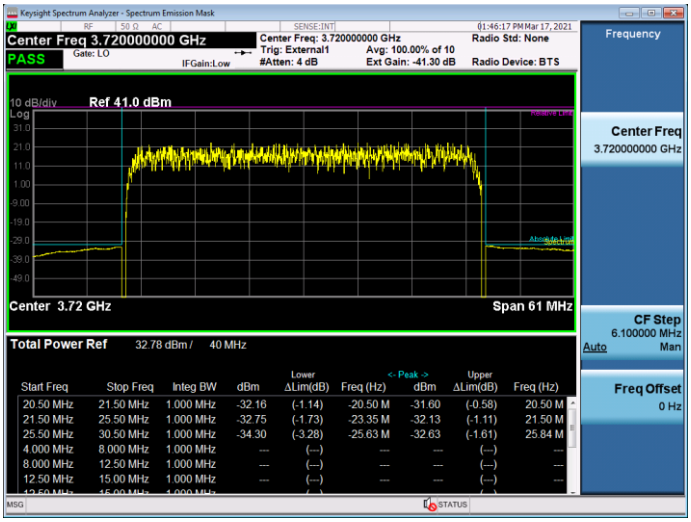
Start Freq	Stop Freq	Integ BW	dBm	Lower ΔLim(dB)	Lower Freq (Hz)	<- Peak -> dBm	Upper ΔLim(dB)	Upper Freq (Hz)
10.10 MHz	11.10 MHz	200.0 kHz	-38.76	(-7.70)	-10.52 M	-39.58	(-8.52)	10.29 M
11.10 MHz	15.10 MHz	200.0 kHz	-39.66	(-1.61)	-11.16 M	-39.88	(-1.83)	13.92 M
15.10 MHz	20.10 MHz	200.0 kHz	-40.47	(-2.42)	-15.18 M	-39.92	(-1.87)	16.85 M
4.000 MHz	8.000 MHz	1.000 MHz	---	(---)	---	---	(---)	---
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

Test Model 3.1
Modulation 64QAM
Channel Frequency 3969MHz
TX6



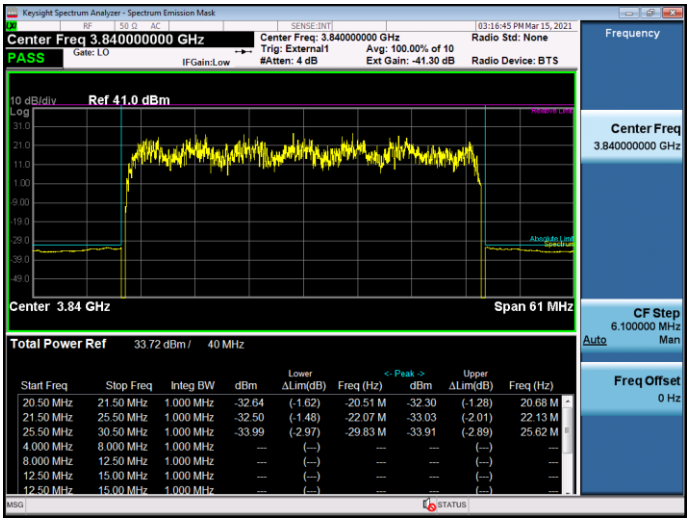
40MHz BW

Test Model 3.1
Modulation 64QAM
Channel Frequency 3720MHz
TX25



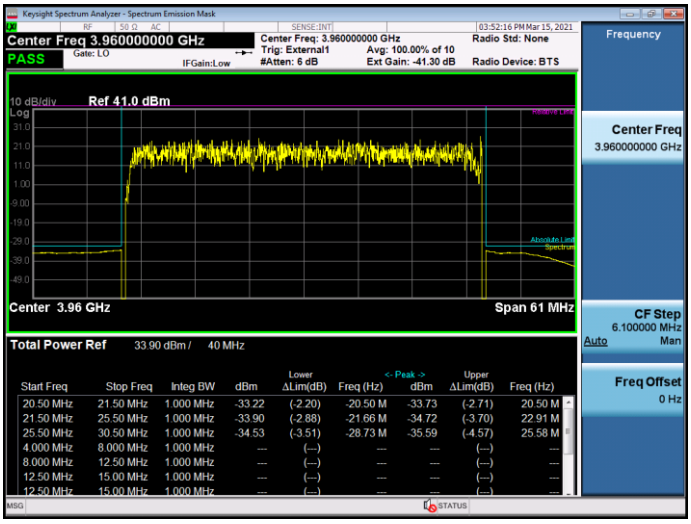
Start Freq	Stop Freq	Integ BW	dBm	Lower ΔLim(dB)	Lower Freq (Hz)	<- Peak -> dBm	Upper ΔLim(dB)	Upper Freq (Hz)
20.50 MHz	21.50 MHz	1.000 MHz	-32.16	(-1.14)	-20.50 M	-31.60	(-0.58)	20.50 M
21.50 MHz	25.50 MHz	1.000 MHz	-32.75	(-1.73)	-23.35 M	-32.13	(-1.11)	21.50 M
25.50 MHz	30.50 MHz	1.000 MHz	-34.30	(-3.28)	-25.63 M	-32.63	(-1.61)	25.84 M
4.000 MHz	8.000 MHz	1.000 MHz	---	(---)	---	---	(---)	---
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

Test Model 3.2
Modulation QPSK/16QAM
Channel Frequency 3840MHz
TX41



Start Freq	Stop Freq	Integ BW	dBm	Lower ΔLim(dB)	Lower Freq (Hz)	<- Peak -> dBm	Upper ΔLim(dB)	Upper Freq (Hz)
20.50 MHz	21.50 MHz	1.000 MHz	-32.64	(-1.62)	-20.51 M	-32.30	(-1.28)	20.68 M
21.50 MHz	25.50 MHz	1.000 MHz	-32.50	(-1.48)	-22.07 M	-33.03	(-2.01)	22.13 M
25.50 MHz	30.50 MHz	1.000 MHz	-33.99	(-2.97)	-29.83 M	-33.91	(-2.89)	25.62 M
4.000 MHz	8.000 MHz	1.000 MHz	---	(---)	---	---	(---)	---
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

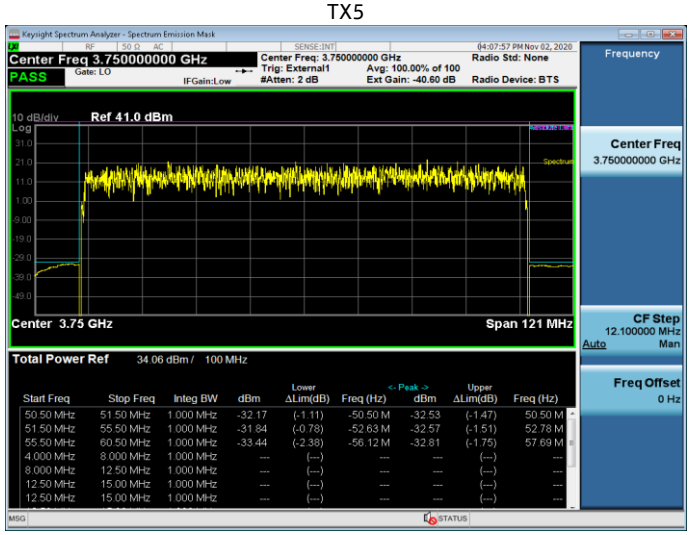
Test Model 3.1a
Modulation 256QAM
Channel Frequency 3960MHz
TX21



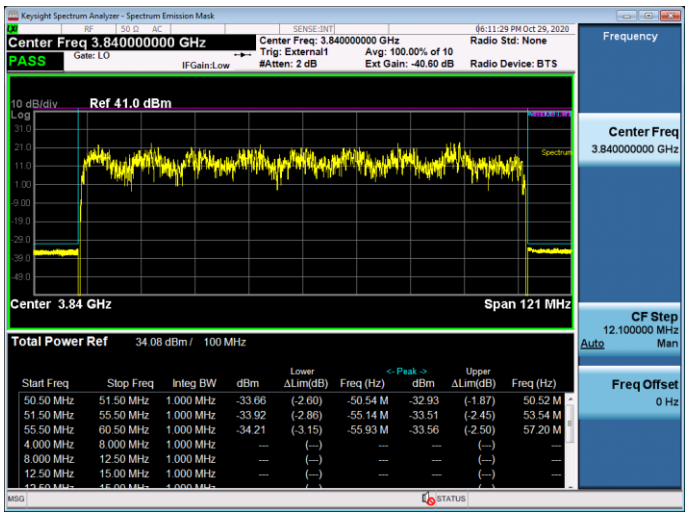
Start Freq	Stop Freq	Integ BW	dBm	Lower ΔLim(dB)	Lower Freq (Hz)	<- Peak -> dBm	Upper ΔLim(dB)	Upper Freq (Hz)
20.50 MHz	21.50 MHz	1.000 MHz	-33.22	(-2.20)	-20.50 M	-33.73	(-2.71)	20.50 M
21.50 MHz	25.50 MHz	1.000 MHz	-33.90	(-2.88)	-21.66 M	-34.72	(-3.70)	22.91 M
25.50 MHz	30.50 MHz	1.000 MHz	-34.53	(-3.51)	-28.73 M	-35.59	(-4.57)	25.58 M
4.000 MHz	8.000 MHz	1.000 MHz	---	(---)	---	---	(---)	---
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

100MHz BW

Test Model 3.1
Modulation 64QAM
Channel Frequency 3750MHz
TX5



Test Model 3.2
Modulation QPSK/16QAM
Channel Frequency 3840MHz
TX24



Test Model 3.1a
Modulation 256QAM
Channel Frequency 3930MHz
TX8