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Title 47 Code of Federal Regulations Test Report

Regulation:
FCC Part 2 and 27

Client:
Nokia of America Corporation

Product Evaluated:
AWS LTE B66a RRH 4x45W

Report Number:
TR-2020-0102-FCC2-27

Date Issued:
August 26, 2020

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Table of Contents

1. SYSTEM INFORMATION AND REQUIREMENTS.....	4
1.1 INTRODUCTION	5
1.2 PURPOSE AND SCOPE	5
1.3 EUT DETAILS	5
1.4 TEST REQUIREMENTS.....	7
1.5 STANDARDS & PROCEDURES	7
1.6 EXECUTIVE SUMMARY	9
1.7 TEST CONFIGURATION FOR ALL ANTENNA PORT MEASUREMENTS.	9
2. FCC SECTION 2.1046 - RF POWER OUTPUT	10
2.1 RF POWER OUTPUT.....	10
3. FCC SECTION 2.1047 - MODULATION CHARACTERISTICS	22
3.1 MODULATION CHARACTERISTICS.....	22
4. FCC SECTION 2.1049 – OCCUPIED BANDWIDTH/EDGE OF BAND EMISSIONS.....	24
4.1 OCCUPIED BANDWIDTH.....	24
4.2 EDGE OF BAND EMISSIONS.....	31
5. FCC SECTION 2.1051 - SPURIOUS EMISSIONS AT TRANSMIT ANTENNA PORT.....	42
5.1 MEASUREMENT OF SPURIOUS EMISSIONS AT TRANSMIT ANTENNA PORT.....	42
6. FCC SECTION 2.1053 - FIELD STRENGTH OF SPURIOUS RADIATION.	48
6.1 SECTION 2.1053 FIELD STRENGTH OF SPURIOUS EMISSIONS	48
6.2 FIELD STRENGTH OF SPURIOUS EMISSIONS - LIMITS	48
7. NVLAP CERTIFICATE OF ACCREDITATION	49

Revisions

Date	Revision	Section	Change
8/26/2020	0		Initial Release

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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):	AWS LTE B66a RRH 4x45W
FCC ID:	AS5BBTRX-28
Serial Number:	See Section 1.3.2
Hardware Version:	See Section 1.3.2
Software Version:	5G: 5G20C 4G: SBTS20C
Frequency Range:	2110-2180 MHz
GPCL Project Number:	2020-0102
Manufacturer:	NOKIA SOLUTIONS AND NETWORKS OY KARAKAARI 7, FI-02610 ESPOO FINLAND
Applicant:	Nokia of America Corporation 600-700 Mountain Avenue Murray Hill, NJ 07974
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 Occupied Bandwidth and Power Measurement Test Procedure 12-4-2017 • FCC-IC-SE - GPCL Spurious Emissions Test Procedure 12-4-2017
Test Date(s):	8/4/ 2020 – 8/11/2020
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
Test Results: The EUT, <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 **AWS LTE B66a RRH 4x45W**, 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.

The **AWS LTE B66a RRH 4x45W** supports 5G-NR and LTE. All LTE BW and modes of operation have been tested previously and are documented in the FCC filings for AS5BBTRX-28. This testing demonstrates compliance for an FCC Class II permissive change for 5G-NR modes of operation for 5 MHz, 10 MHz, 15 MHz and 20 MHz Bandwidths. Also, Concurrent 5G-NR and LTE operation with 2-Carrier Configuration (1x LTE + 1x 5G-NR) and 3-Carrier Configuration (2x LTE + 1x 5G-NR). The unit supports 90W operation with two ports or 45W operation over with all 4 ports. The Single carrier 5 MHz 5G-NR operation is limited to 33 W for 4XMIMO (132 W Total) and 40 W for 2XMIMO (80 W Total). Configurations supported are listed below:

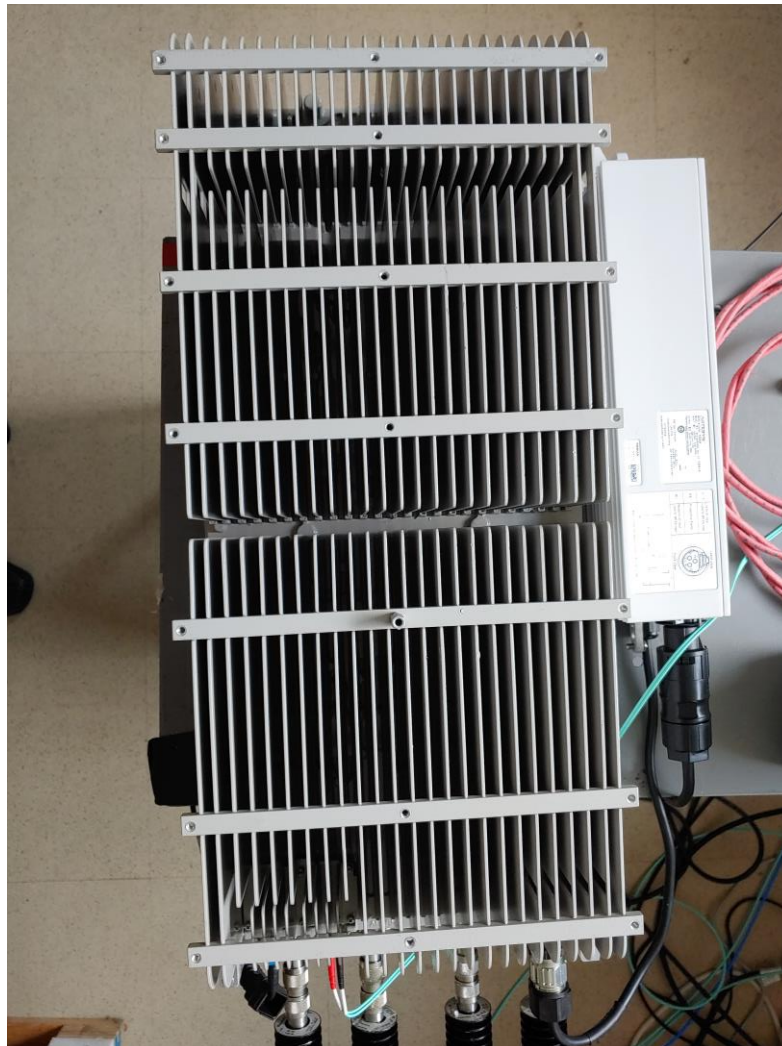
Radio	Dual carrier (1 LTE + 1 5G)	Tri carrier (2 LTE + 1 5G NR)
	Concurrent	Concurrent
UHIE B66a RRH4x45	5+5, 5+10, 5+15, 5+20, 10+10, 10+15, 10+20	5+5+5, 5+5+10, 5+5+15, 5+10+10, 5+10+15, 10+10+10

1.3 EUT Details

1.3.1 Specifications

Specification Items	Description
Radio Access Technology	LTE / 5G-NR
Duplex Mode	FDD
Modulation Type(s)	QPSK, 16QAM, 64QAM, 256QAM
Operation Frequency Range	2110-2180 MHz
Channel Bandwidth	5/10/15/20MHz
Number of Tx Ports per Unit	4
Number of Rx Ports Per Unit	4
MIMO	2x90W MIMO (Ports 1 and 2) and 4x45W MIMO (Ports 1-4)
Max Conducted Power	46.53 dBm per port for 4T4R and 49.54dBm per port for 2T2R
Min Conducted Power	30.53 dBm per port for 4T4R and 33.54dBm per port for 2T2R
Deployment Environment	Outdoor
Power Source	-48VDC

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	No*

*Note-The measurement of frequency stability was performed during the original filing tests. There has been no change to the frequency generating and stabilizing circuitry. Additional frequency stability testing is therefore not required.

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-OB 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

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

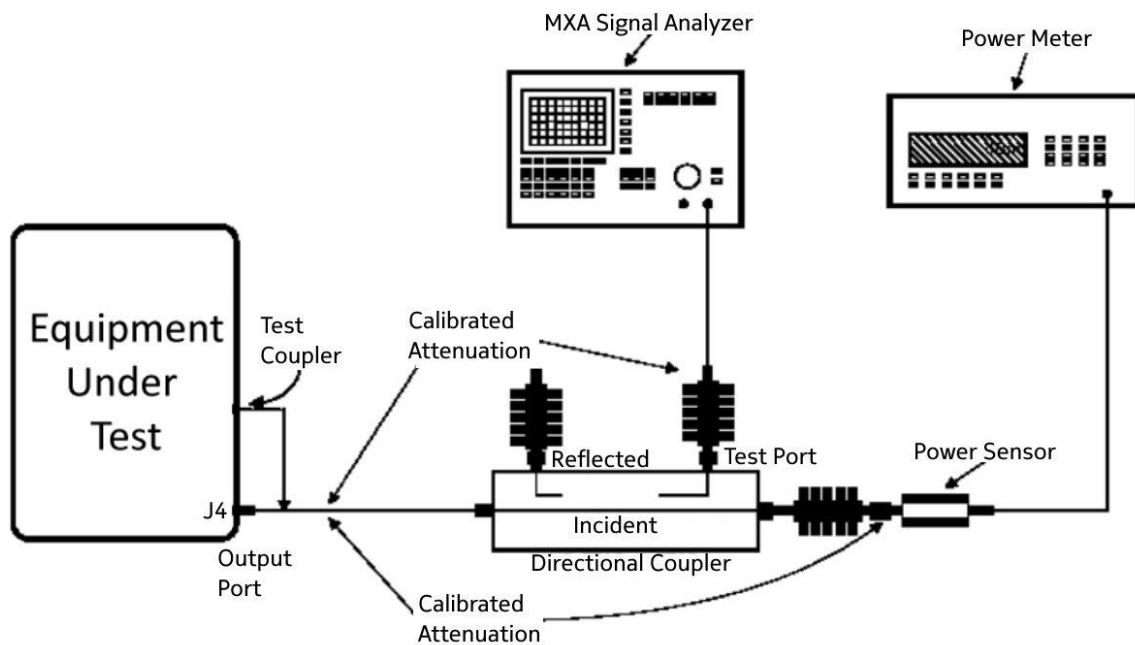
Antenna Port Test	Signal Bandwidth	Frequency Range	Expanded Uncertainty (k=2), Amplitude
Occupied Bandwidth, Edge of Band, Conducted Spurious Emissions	10 Hz 100 Hz 10 kHz to 1 MHz 1MHz	9 kHz to 20 MHz 20 MHz to 1 GHz 1 GHz to 10 GHz 10 GHz to 40 GHz:	1.78 dB
RF Power	10 Hz to 20 MHz	50 MHz to 18 GHz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

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

1.7 Test Configuration for all Antenna Port Measurements.



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

**The Maximum RF Output Power of the EUT- Measured for 5G-NR
Single Carrier, Double, and Three Carrier Combination per Antenna Port**

Transmit Configuration	Measurement Configuration	Maximum RF Output Power	
		Watts	dBm
2xMIMO	BW 5 MHz	33	45.19
4xMIMO	BW 5 MHz	20	43.01
2xMIMO	BW 10, 15, 20 MHz	90	49.54
4xMIMO	BW 10, 15, 20 MHz	45	46.53

Tabular Raw Data – Channel RF Power

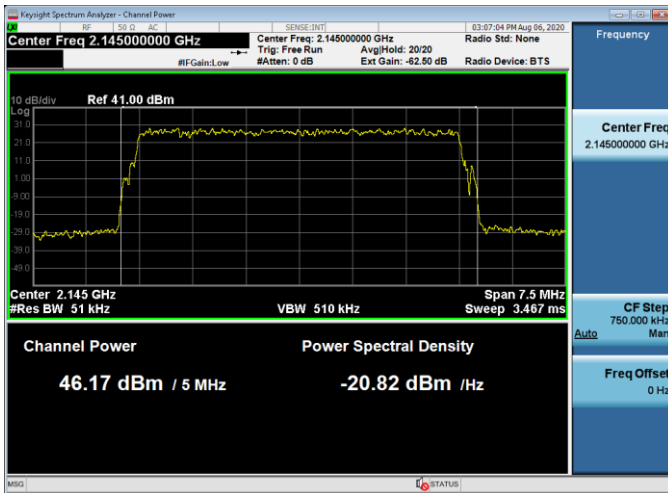
# of Carriers	Test Model	Modulation	TX Port	Channel Frequency MHz	Signal BW MHz	Radio Access Technology	Channel Power dBm
1	3.2	QPSK + 16QAM	1	2112.5	5	5G-NR	46.07
1	3.1	64QAM	1	2145	5	5G-NR	46.17
1	3.1	64QAM	1	2177.5	5	5G-NR	45.05
1	3.1a	256QAM	1	2115	10	5G-NR	49.46
1	3.2	QPSK + 16QAM	1	2145	10	5G-NR	49.74
1	3.1	64QAM	1	2175	10	5G-NR	49.45
1	3.2	QPSK + 16QAM	1	2117.5	15	5G-NR	49.77
1	3.1a	256QAM	1	2145	15	5G-NR	49.46
1	3.1	64QAM	1	2172.5	15	5G-NR	49.38
1	3.1	64QAM	1	2120	20	5G-NR	49.69
1	3.2	QPSK + 16QAM	1	2145	20	5G-NR	49.47
1	3.1a	256QAM	1	2170	20	5G-NR	49.48
2	3.1	64QAM	1	2112+2177	5+5	LTE+5G-NR	48.23
2	3.1	64QAM	4	2112+2175	5+10	LTE+5G-NR	46.68
2	3.1	64QAM	1	2112+2175	5+10	LTE+5G-NR	49.46
2	3.1	64QAM	2	2115+2175	10+10	5G-NR+LTE	46.33
2	3.1	64QAM	4	2115+2175	10+10	5G-NR+LTE	46.64
2	3.1	64QAM	1	2115+2175	10+10	5G-NR+LTE	49.91
2	3.1	64QAM	2	2115+2175	10+10	5G-NR+LTE	49.66
2	3.1a	256QAM	1	2115+2125	10+10	5G-NR+LTE	49.88
2	3.2	QPSK + 16QAM	4	2115+2172	10+15	5G-NR+LTE	46.89
2	3.2	QPSK + 16QAM	1	2115+2172	10+15	LTE+5G-NR	49.70
2	3.1a	256QAM	4	2115+2170	10+20	LTE+5G-NR	46.85
2	3.1a	256QAM	1	2115+2170	10+20	LTE+5G-NR	49.85
2	3.2	QPSK + 16QAM	4	2117+2177	15+5	5G-NR+LTE	46.20
2	3.2	QPSK + 16QAM	4	2117+2177	15+5	5G-NR+LTE	48.26
2	3.2	QPSK + 16QAM	1	2117+2177	15+5	5G-NR+LTE	49.05
2	3.1a	256QAM	4	2120+2177	20+5	5G-NR+LTE	46.446
2	3.1a	256QAM	1	2120+2177	20+5	5G-NR+LTE	49.33
3	3.2	QPSK + 16QAM	4	2112+2145+2177	5+5+5	LTE + LTE +5G-NR	43.73
3	3.2	QPSK + 16QAM	1	2112+2145+2177	5+5+5	LTE + LTE +5G-NR	46.37
3	3.2	QPSK + 16QAM	4	2112+2117+2175	5+5+10	LTE + LTE +5G-NR	46.61
3	3.2	QPSK + 16QAM	1	2112+2117+2175	5+5+10	LTE + LTE +5G-NR	49.59
3	3.1	64QAM	4	2112+2117+2172	5+5+15	LTE + LTE +5G-NR	46.88
3	3.1	64QAM	1	2112+2117+2172	5+5+15	LTE + LTE +5G-NR	49.75
3	3.1	64QAM	4	2112+2120+2175	5+10+10	LTE + LTE +5G-NR	46.71
3	3.1	64QAM	1	2112+2120+2175	5+10+10	5G-NR+LTE+LTE	49.615
3	3.1a	256QAM	4	2115+2165+2175	10+10+10	5G-NR+LTE+LTE	47.03
3	3.2	QPSK + 16QAM	1	2115+2165+2175	10+10+10	5G-NR+LTE+LTE	49.70
3	3.2	QPSK + 16QAM	4	2117+2170+2177	15+10+5	LTE + LTE +5G-NR	46.88
3	3.1	64QAM	1	2117+2170+2177	15+10+5	LTE + LTE +5G-NR	49.64

2.1.1 Channel RF Power - Plots.

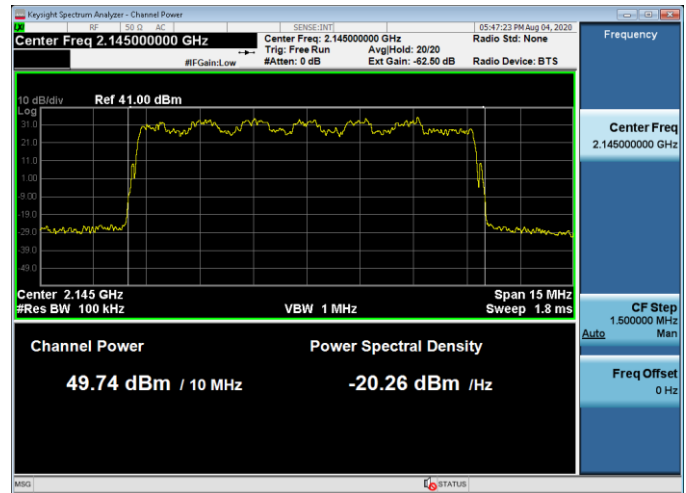
NOTE: Only the worst-case plots in each scenario are used in this report. The full suite of raw data resides at the MH, New Jersey location.

1C Data

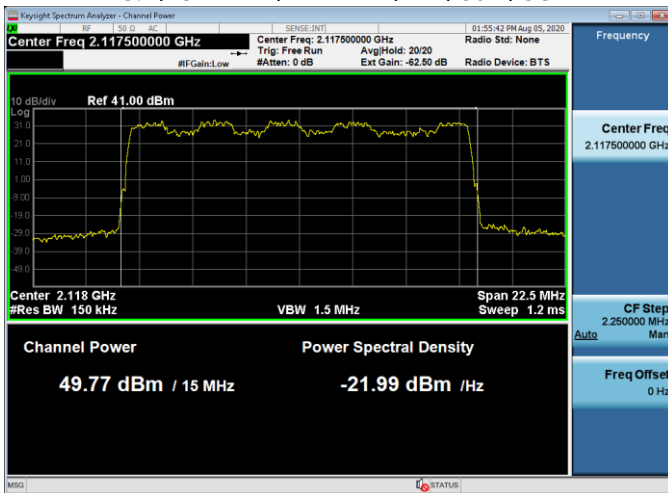
TM3.1 / 5MHz BW / 2145 MHz / TX1/ 40W /5G-NR



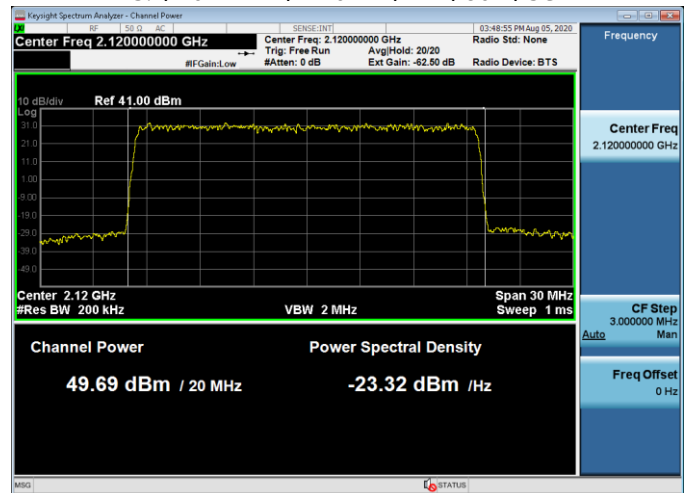
TM3.2 / 10MHz BW / 2145 MHz / TX1/ 90W / 5G-NR



TM3.2 / 15MHz BW / 2117 MHz / TX1/ 90W / 5G-NR

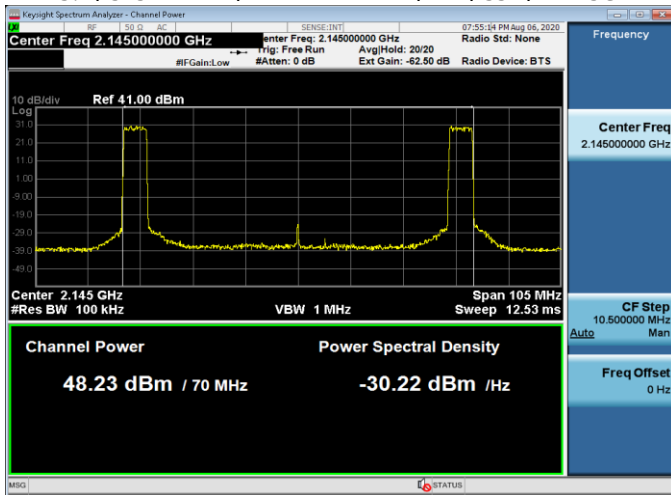


TM3.1 / 20MHz BW / 2120MHz / TX1 / 90W / 5G-NR

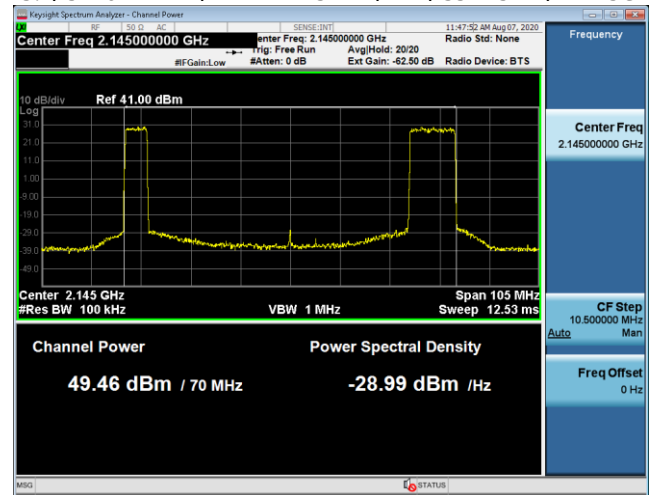


2C Data

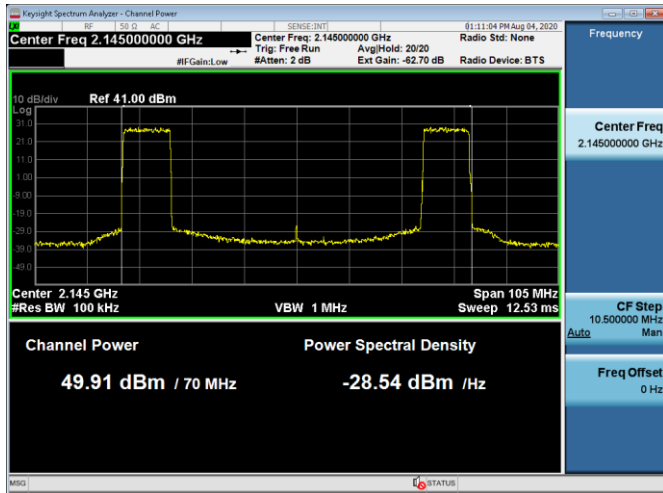
TM3.1 / 5+5 MHz BW / 2112+2177 MHz / TX1/ 33W/ LTE+5G-NR



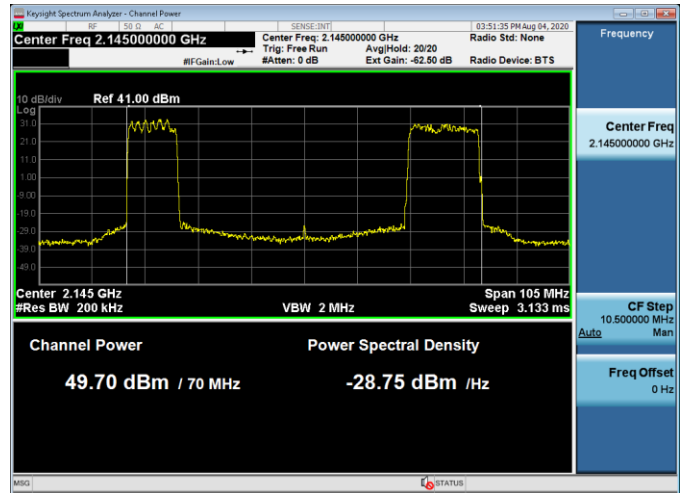
TM3.1/ 5+10 MHz BW/ 2112+2175MHz /TX1 / 33W+57W / LTE+5G-NR



TM3.1/ 10+10 MHz BW / 2115+2175 MHz / TX1/ 90W / 5G-NR+LTE

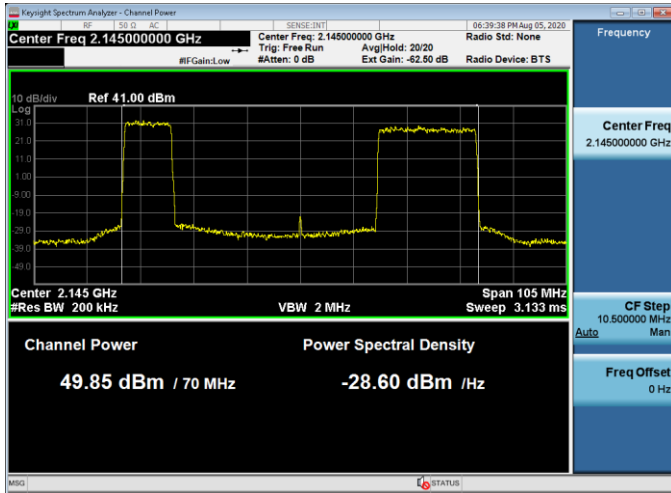


TM3.2 / 10+15 MHz BW / 2115+2172MHz / TX1 / 90W/ LTE+5G-NR

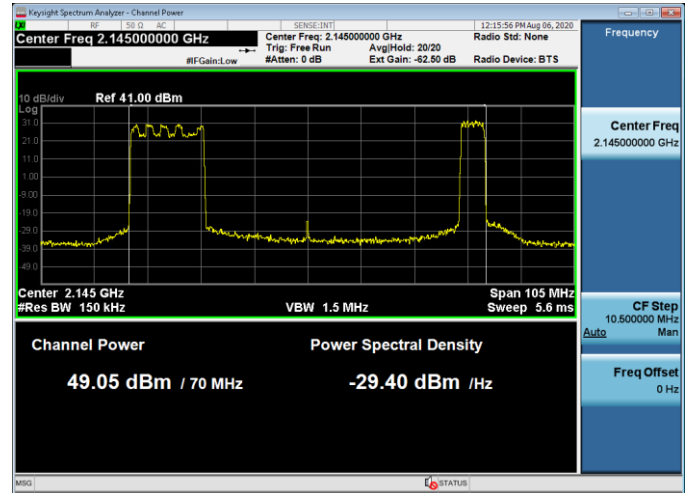


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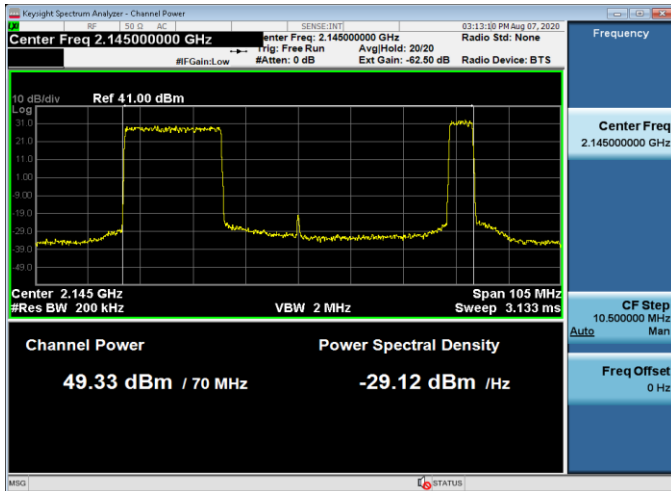
TM3.1a / 10+20 MHz BW / 2115+2170 MHz / TX1/ 90W/ LTE+5G-NR



TM3.2 / 15+5 MHz BW / 2117+2177 MHz / TX1 / 45W+33W / 5G-NR+LTE

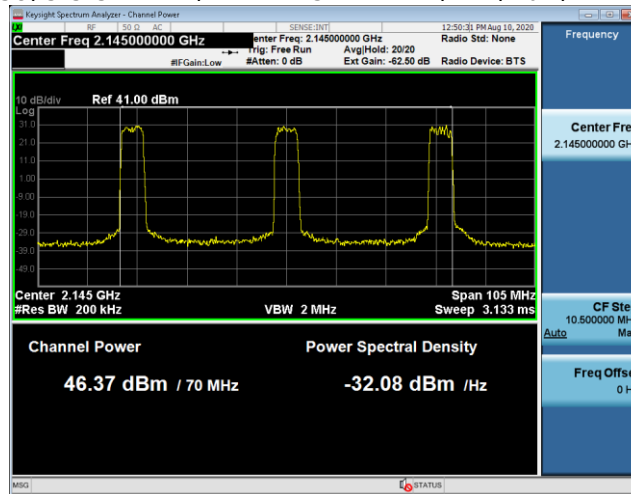


TM3.1a / 20+5 MHz BW / 2120+2177MHz / TX1/ 33W+57W/ 5G-NR+LTE

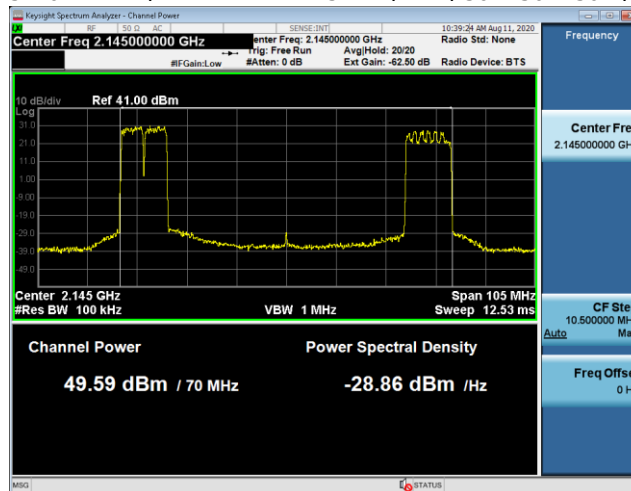


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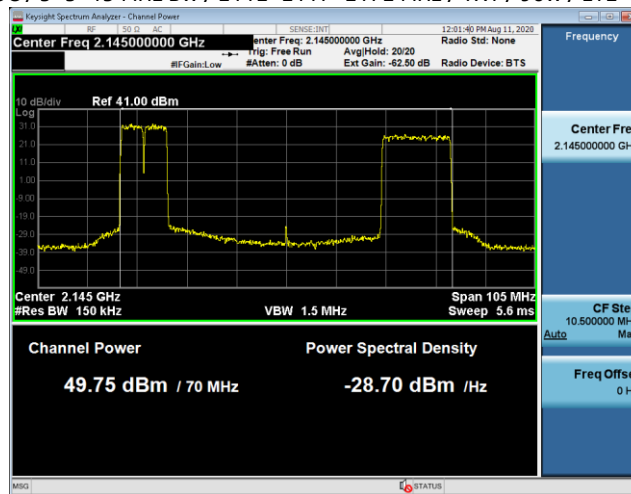
TM3.2 / 3C / 5+5+5 MHz BW / 2112+2145+2177 MHz / TX1 / 46W / LTE+LTE+5G-NR



TM3.2 / 3C / 5+5+10 MHz BW / 2112+2117+2175 MHz / TX1 / 30W+30W+30W / LTE+LTE+5G-NR

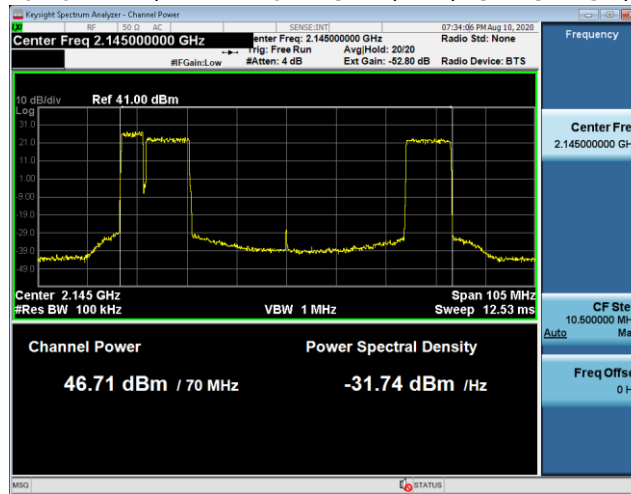


TM3.1 / 3C / 5+5+15 MHz BW / 2112+2117+2172 MHz / TX1 / 90W / LTE+LTE+5G-NR

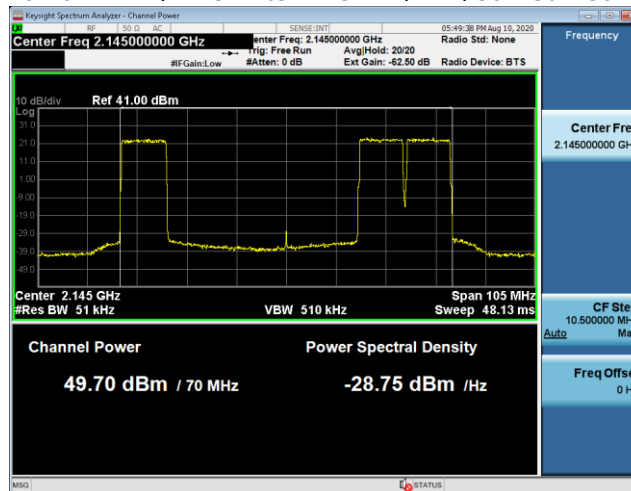


3C Data

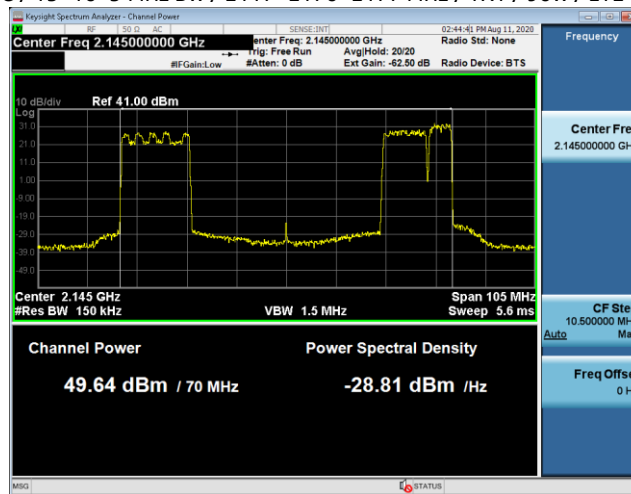
TM3.1 / 3C / 5+10+10MHz BW / 2112+2120+2175MHz / TX4 / 15W+15W+15W / LTE+LTE+5G-NR



TM3.2 / 3C / 10+10+10 MHz BW / 2115+2165+2175 MHz / TX1 / 30W+30W+30W / 5G-NR+LTE+LTE



TM3.1 / 3C / 15+10+5 MHz BW / 2117+2170+2177 MHz / TX1 / 90W / LTE+LTE+5G-NR

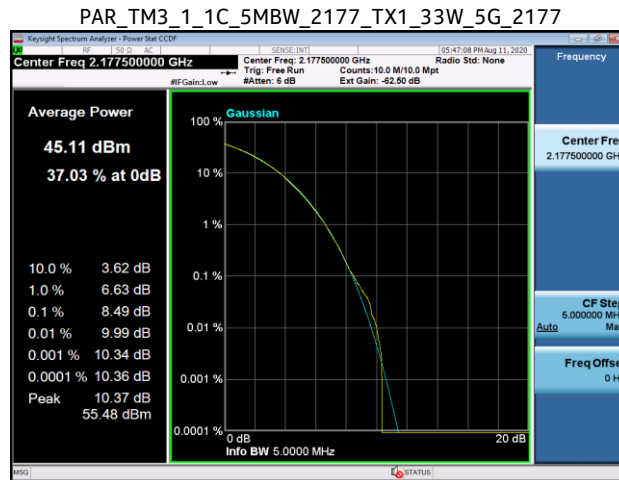


2.1.2 Peak-to-Average Power Ratio (PAPR) - Plots

The Peak-to-Average Power Ratio (PAPR) was evaluated per KDB 971168. The PAPR values of all carriers measured are below 13dB.

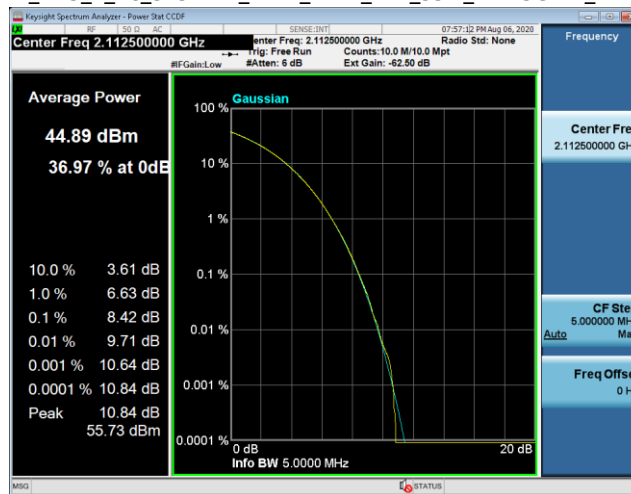
NOTE: Only the worst-case plots in each scenario are used in this report. The full suite of raw data resides at the MH, New Jersey location.

1C Data

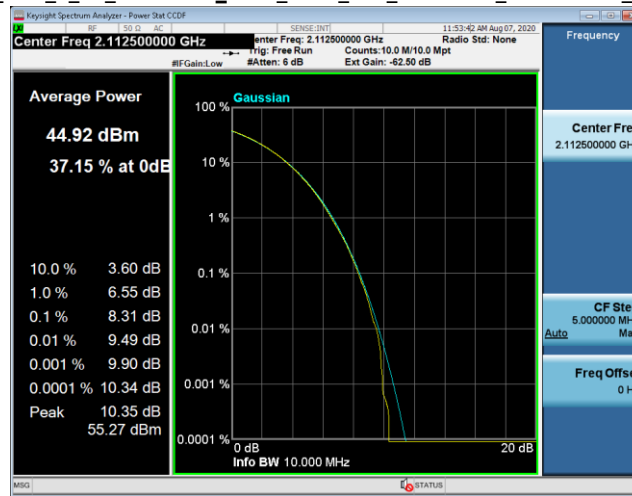


2C Data

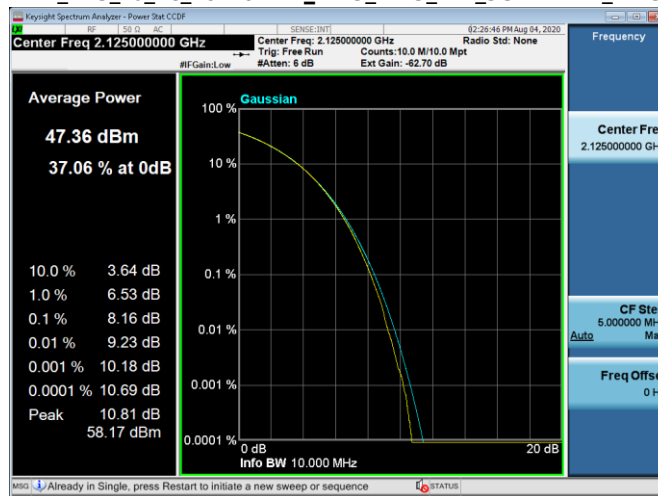
PAR_TM3_1_2C_5+5MBW_2112_2177_TX1_33W_LTE+5G-NR_2112.5



PAR_TM3_1_2C_5+10MBW_2112_2175_TX1_33W+57W_LTE+5G-NR_2112.5



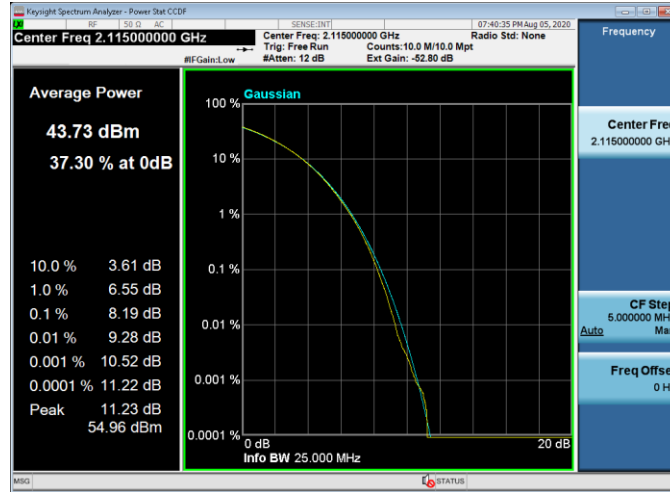
PAR_TM3_1a_2C_10+10MBW_2115_2125_TX1_5G-NR+LTE_2125



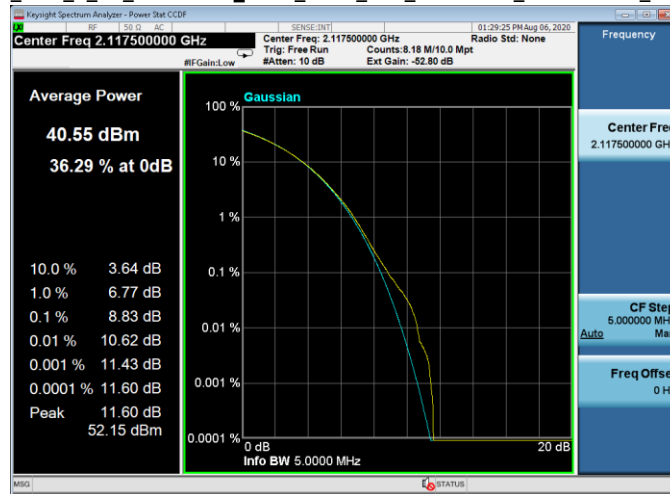
PAR_TM3_2_2C_10+15MBW_2115_2172_TX4_45W_5G-NR+LTE_2172.5



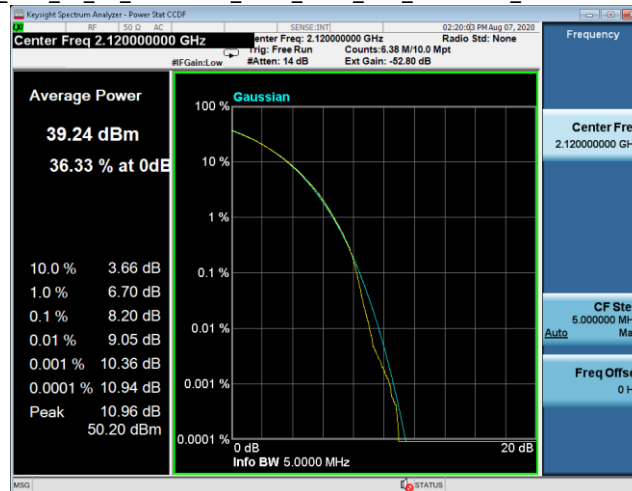
PAR_TM3_1a_2C_10+20MBW_2115_2170_TX4_45W_LTE+5G-NR_2115



PAR_TM3_2_2C_15+5MBW_2117_2177_TX4_25W+20W_5G-NR+LTE_2117.5

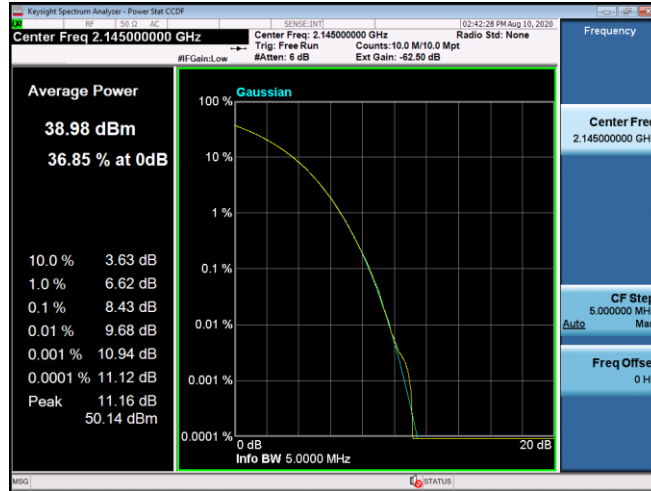


PAR_TM3_1a_2C_20+5MBW_2120_2177_TX4_25W+20W_5G-NR+LTE_2120

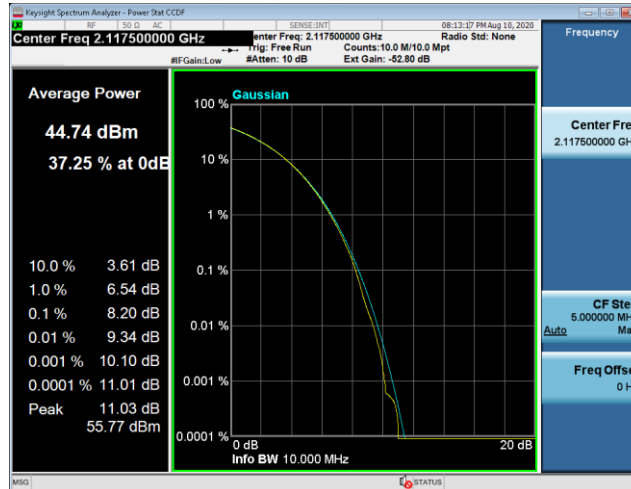


3C Data

PAR_TM3_2_3C_5+5+5MBW_2112_2145_2177_TX1_43W_LTE+LTE+5G-NR_2145



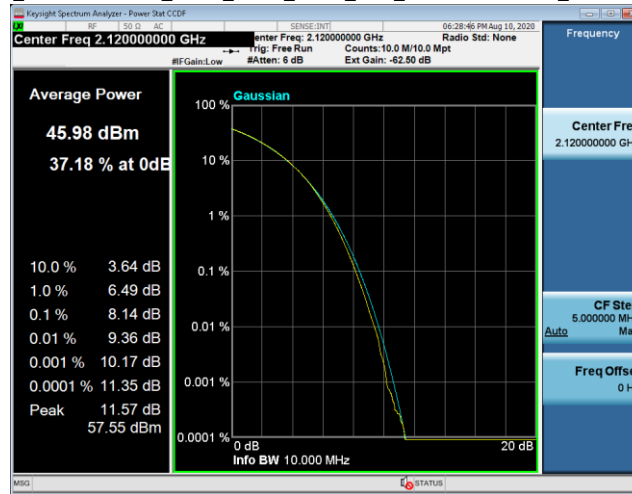
PAR_TM3_2_3C_5+5+10MBW_2112_2117_2175_TX4 15W+15W+15W_LTE+LTE+5G-NR_2117.5



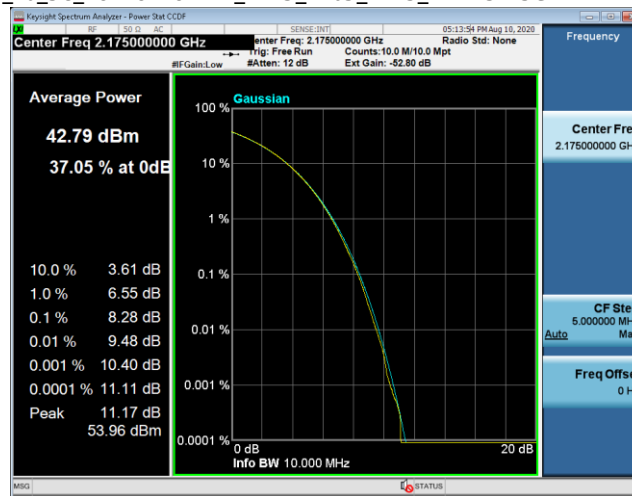
PAR_TM3_1_3C_5+5+15MBW_2112_2117_2172_TX4 15W+15W+15W_LTE+LTE+5G-NR_2172.5



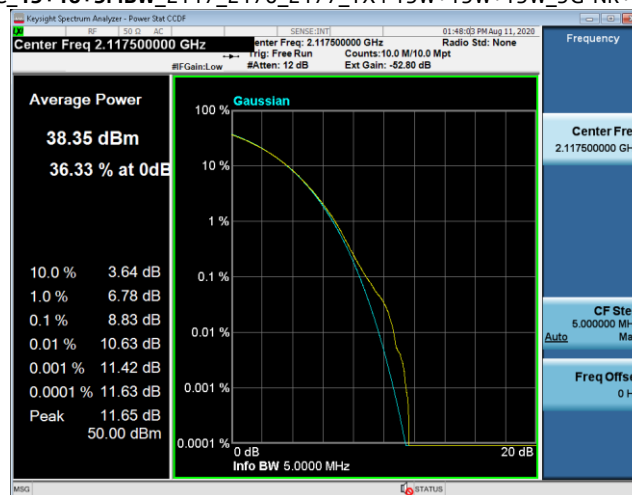
PAR_TM3_1_3C_5+10+10MBW_2112_2120_2175_TX1_30W+30W+30W_LTE+LTE+5G-NR_2120



PAR_TM3_1a_3C_10+10+10MBW_2115_2165_2175_TX4 45W 5G-NR+LTE+LTE_2175



PAR_TM3_2_3C_15+10+5MBW_2117_2170_2177_TX4 15W+15W+15W_5G-NR+LTE+LTE_2117.5



3. FCC Section 2.1047 - Modulation Characteristics

3.1 Modulation Characteristics

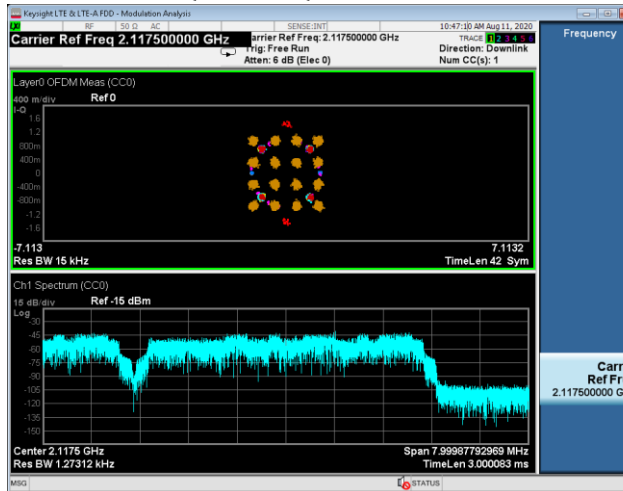
The RF signal at the antenna port was demodulated and verified for correctness of the modulation signal used before each test was performed. For these products the operation with QPSK, 16QAM, 64QAM and 256QAM modulation was evaluated and verified to demonstrate proper operation before testing.

3.1.1 Modulation Characteristics – Plots.

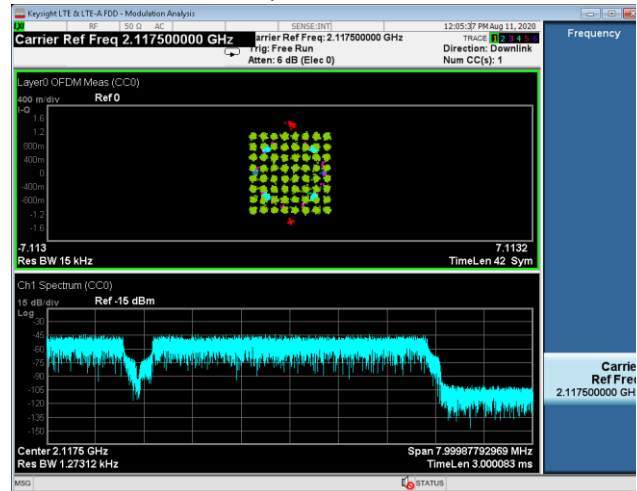
NOTE: Only a sample of the plots are used in this report. The full suite of raw data resides at the MH, New Jersey location.

LTE Data

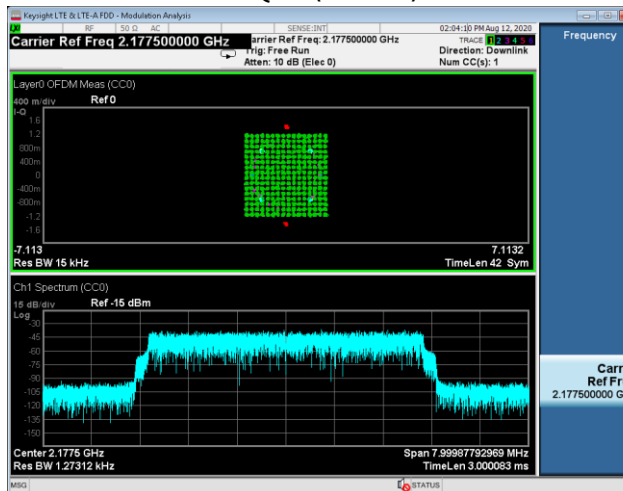
QPSK+16QAM (TM3.2)



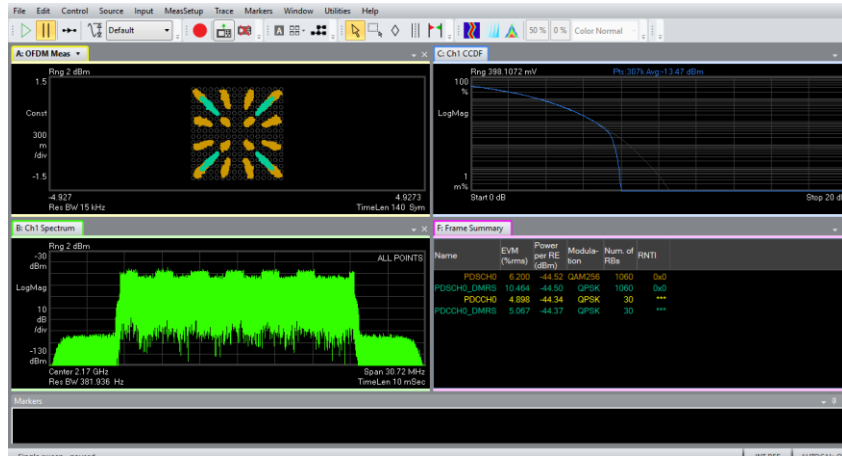
64QAM (TM3.1)



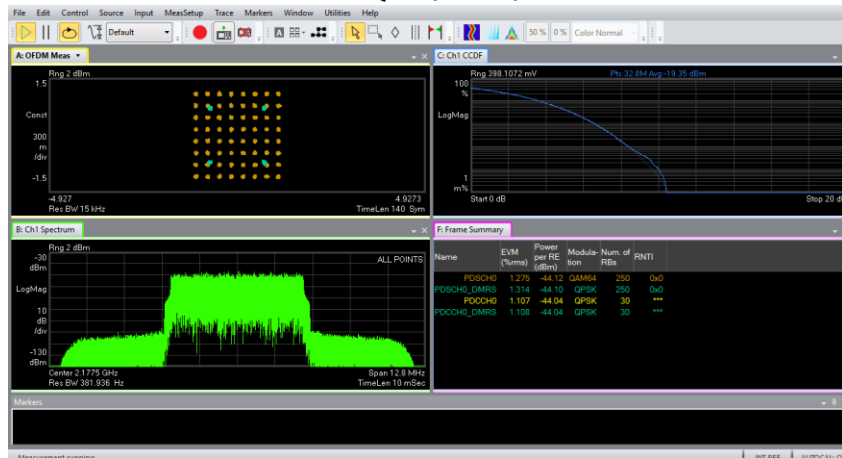
256QAM (TM3.1a)



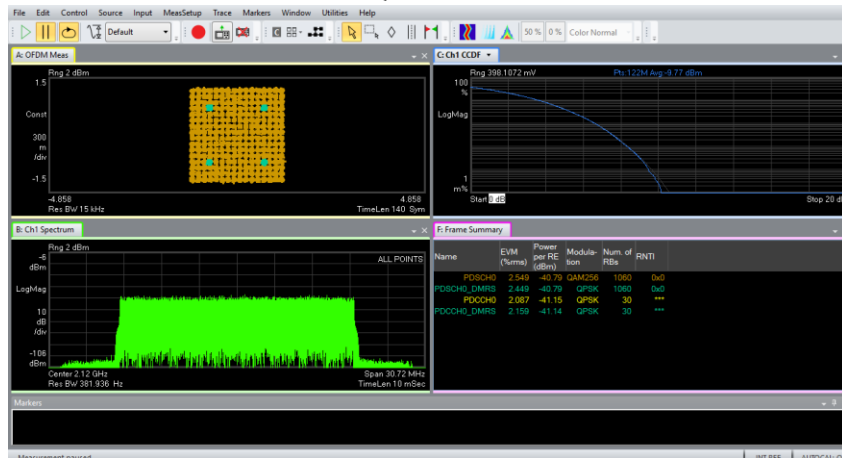
5G-NR Data QPSK+16QAM (TM3.2)



64QAM (TM3.1)



256QAM (TM3.1a)



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 – Occupied Bandwidth (1Carrier)

# of Carriers	Test Model	Modulation	TX Port	Channel Frequency MHz	Signal BW MHz	Radio Access Technology	Mode of operation	Occupied BW MHz
1	3.2	QPSK + 16QAM	1	2112.5	5	5G-NR	2T	4.4769
1	3.1	64QAM	1	2145	5	5G-NR	2T	4.4647
1	3.1	64QAM	1	2177.5	5	5G-NR	2T	4.4643
1	3.1a	256QAM	1	2115	10	5G-NR	2T	9.2665
1	3.2	QPSK + 16QAM	1	2145	10	5G-NR	2T	9.2288
1	3.1	64QAM	1	2175	10	5G-NR	2T	9.2777
1	3.2	QPSK + 16QAM	1	2117.5	15	5G-NR	2T	14.117
1	3.1a	256QAM	1	2145	15	5G-NR	2T	14.083
1	3.1	64QAM	1	2172.5	15	5G-NR	2T	14.080
1	3.1	64QAM	1	2120	20	5G-NR	2T	18.895
1	3.2	QPSK + 16QAM	1	2145	20	5G-NR	2T	18.945
1	3.1a	256QAM	1	2170	20	5G-NR	2T	18.891

Tabular Data – Occupied Bandwidth (2&3 Carriers)

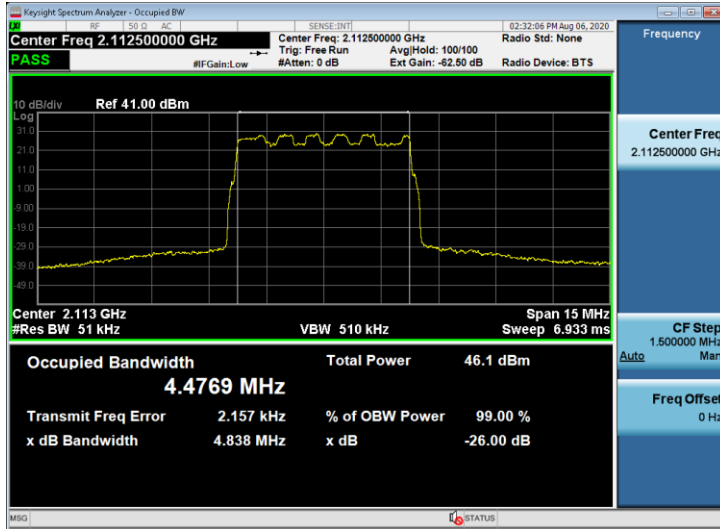
# of Carriers	Test Model	Modulation	TX Port	Channel Frequency MHz	Signal BW MHz	Radio Access Technology	Mode of operation	Occupied BW MHz
2	3.1	64QAM	1	2112+2177	5+5	LTE+5G-NR	2T	4.5016 + 4.4903
2	3.1	64QAM	4	2112+2175	5+10	LTE+5G-NR	4T	4.4766 + 9.2791
2	3.1	64QAM	1	2112+2175	5+10	LTE+5G-NR	2T	4.5094 + 9.2775
2	3.1	64QAM	1	2115+2175	10+10	5G-NR+LTE	2T	9.2769 + 8.9358
2	3.1a	256QAM	1	2115+2125	10+10	5G-NR+LTE	2T	19.013
2	3.2	QPSK + 16QAM	4	2115+2172	10+15	5G-NR +LTE	4T	9.2601 + 13.412
2	3.2	QPSK + 16QAM	1	2115+2172	10+15	LTE+5G-NR	2T	9.2790 + 13.397
2	3.1a	256QAM	4	2115+2170	10+20	LTE+5G-NR	4T	8.9668 + 18.882
2	3.1a	256QAM	1	2115+2170	10+20	LTE+5G-NR	2T	8.9947 + 18.893
2	3.2	QPSK + 16QAM	4	2117+2177	15+5	5G-NR +LTE	4T	14.146 + 4.5455
2	3.2	QPSK + 16QAM	4	2117+2177	15+5	5G-NR +LTE	4T	14.112 + 4.5117
2	3.2	QPSK + 16QAM	1	2117+2177	15+5	5G-NR +LTE	2T	14.129 + 4.5042
2	3.1a	256QAM	4	2120+2177	20+5	5G-NR +LTE	4T	18.912 + 4.5805
2	3.1a	256QAM	1	2120+2177	20+5	5G-NR +LTE	2T	18.911 + 4.5754
3	3.2	QPSK + 16QAM	4	2112+2145+2177	5+5+5	LTE+LTE+5G-NR	4T	4.4598 + 4.4639 + 4.4765
3	3.2	QPSK + 16QAM	1	2112+2145+2177	5+5+5	LTE+LTE+5G-NR	2T	4.5265 + 4.5406 + 4.5942
3	3.2	QPSK + 16QAM	4	2112+2117+2175	5+5+10	LTE+LTE+5G-NR	4T	9.4058 + 9.2283
3	3.2	QPSK + 16QAM	1	2112+2117+2175	5+5+10	LTE+LTE+5G-NR	2T	9.3977 + 9.2367
3	3.1	64QAM	4	2112+2117+2172	5+5+15	LTE+LTE+5G-NR	4T	9.4598 + 14.081
3	3.1	64QAM	1	2112+2117+2172	5+5+15	LTE+LTE+5G-NR	2T	9.4564 + 14.086
3	3.1	64QAM	1	2112+2120+2175	5+10+10	LTE+LTE+5G-NR	2T	14.147 + 9.2648
3	3.1	64QAM	4	2112+2120+2175	5+10+10	LTE+LTE+5G-NR	4T	14.138 + 9.2824
3	3.1a	256QAM	4	2115+2165+2175	10+10+10	5G-NR +LTE+LTE	4T	9.2908 + 18.841
3	3.2	QPSK + 16QAM	1	2115+2165+2175	10+10+10	5G-NR +LTE+LTE	2T	9.2582 + 18.84
3	3.2	QPSK + 16QAM	4	2117+2170+2177	15+10+5	5G-NR +LTE+LTE	4T	14.135 + 14.118
3	3.1	64QAM	1	2117+2170+2177	15+10+5	LTE+LTE+5G-NR	2T	14.115+14.103

4.1.1 Occupied Bandwidth – Plots.

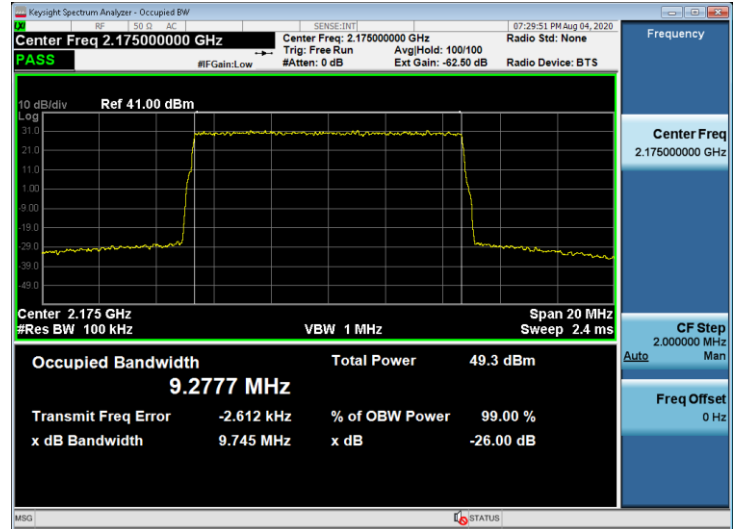
NOTE: Only a sample of the plots are used in this report. The full suite of raw data resides at the MH, New Jersey location.

1C Data

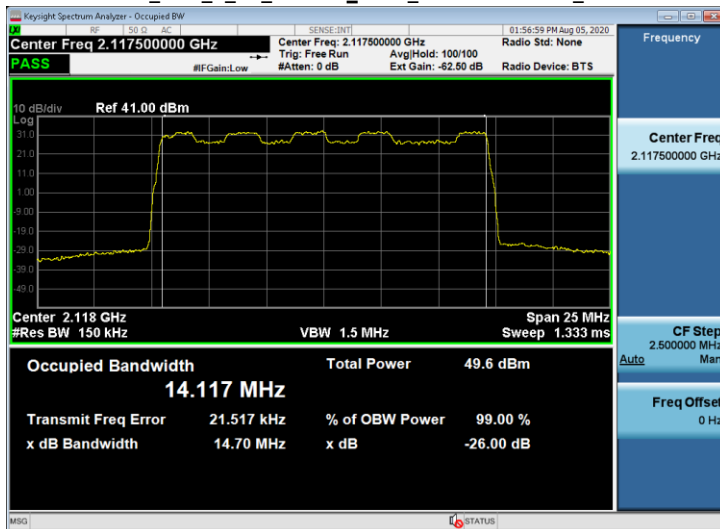
OBW_TM3_2_1C_5MBW_2112_TX1 40W 5G-NR_2112



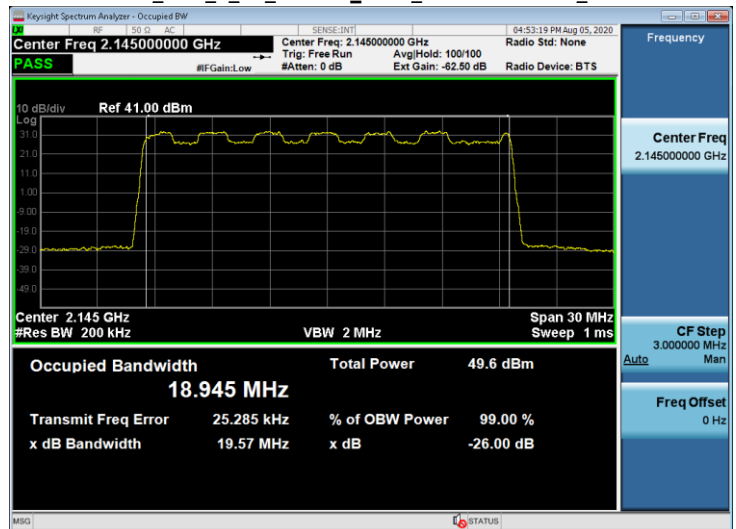
OBW_TM3_1_1C_10MBW_2175_TX1 90W 5G-NR_2175



OBW_TM3_2_1C_15MBW_2117_TX1 90W 5G-NR_2117

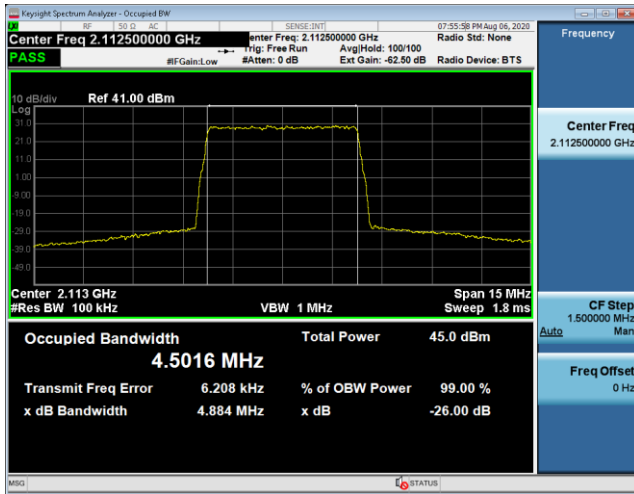


OBW_TM3_2_1C_20MBW_2145_TX1 90W 5G-NR_2145

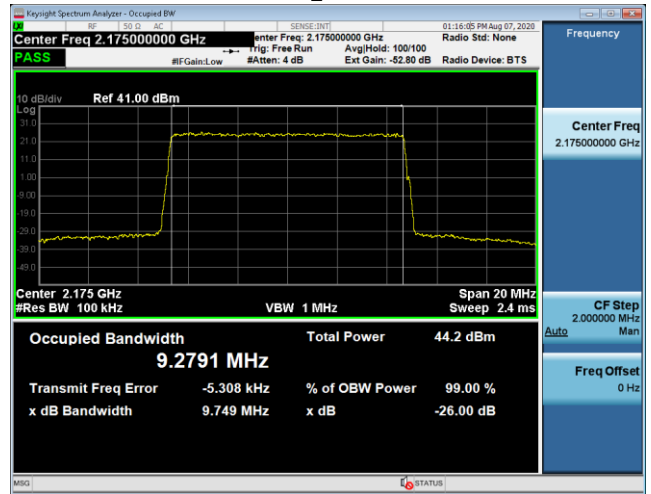


2C Data

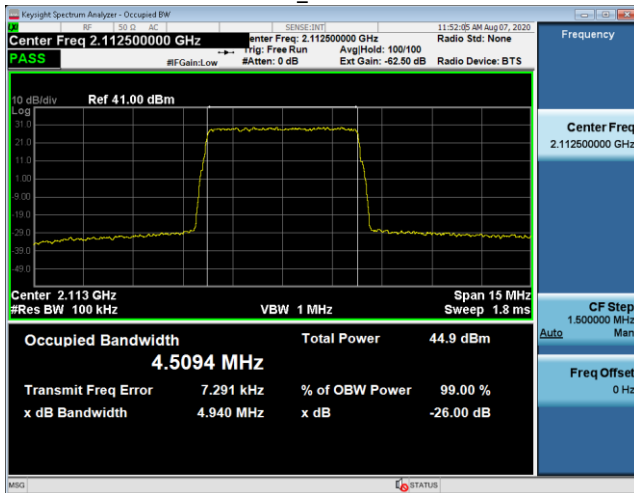
OBW_TM3_1_2C_5+5MBW_2112_2177_TX1 33W LTE+5G-NR_2112.5



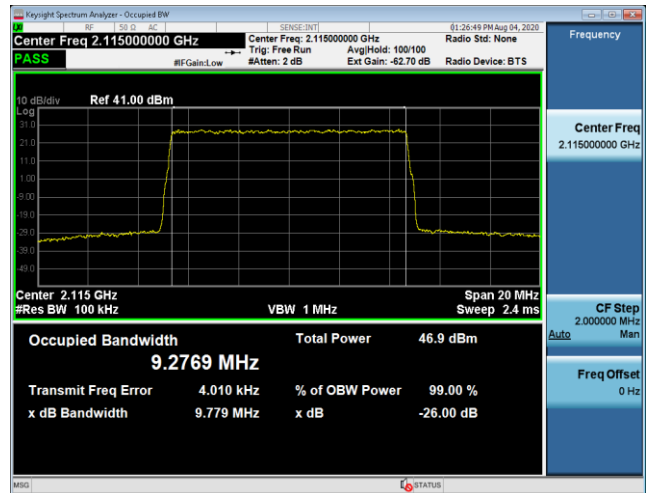
OBW_TM3_1_2C_5+10MBW_2112_2175_TX4 20W+25W LTE+5G-NR_2175



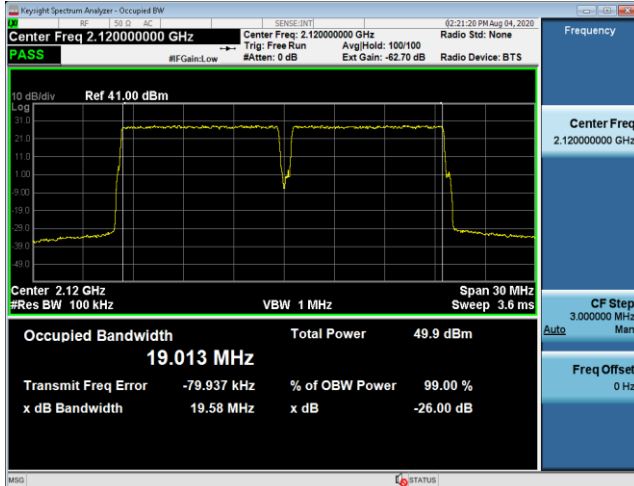
OBW_TM3_1_2C_5+10MBW_2112_2175_TX1_33W+57W_LTE+5G-NR_2112.5



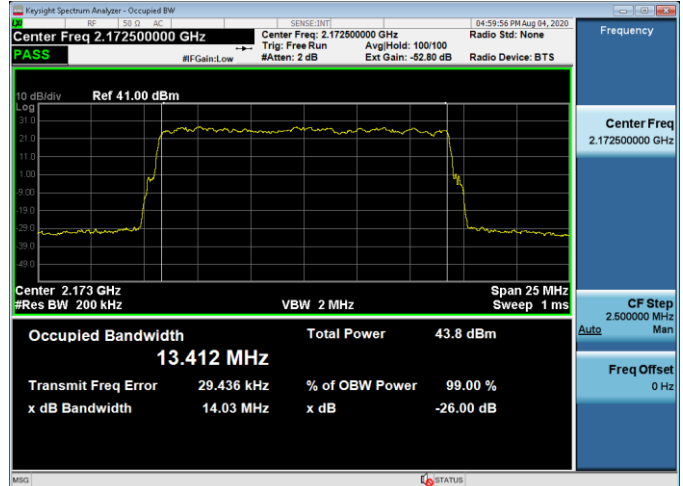
OBW_TM3_1_2C_10+10MBW_2115_2175_TX1_5G-NR+LTE_2115



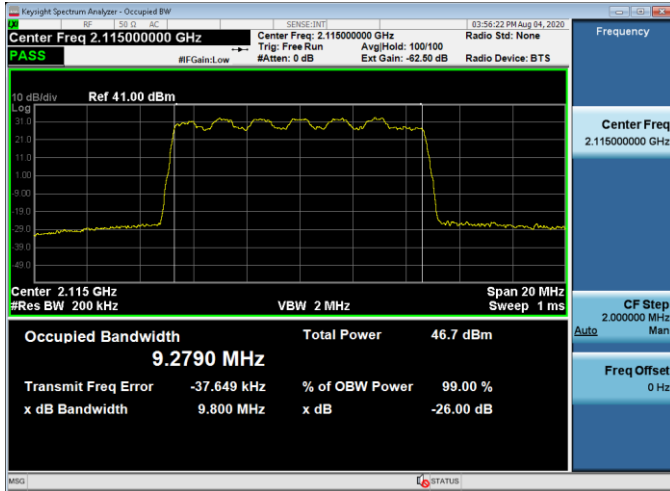
OBW_TM3_1a_2C_10+10MBW_2115_2125_TX1_5G-NR+LTE_2120



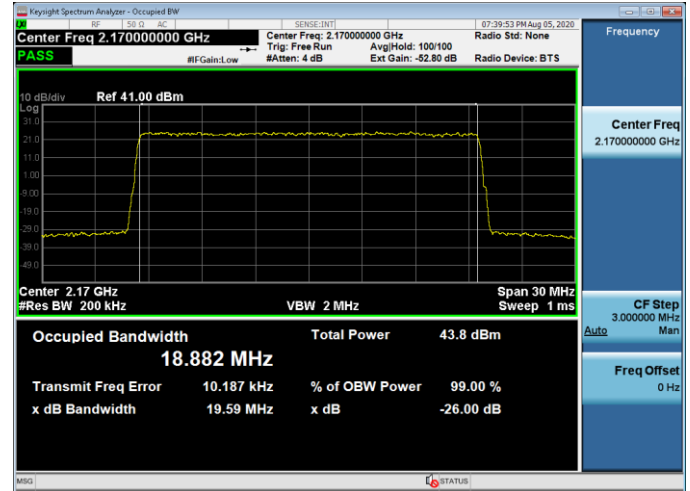
OBW_TM3_2_2C_10+15MBW_2115_2172_TX4 45W 5G-NR+LTE_2172



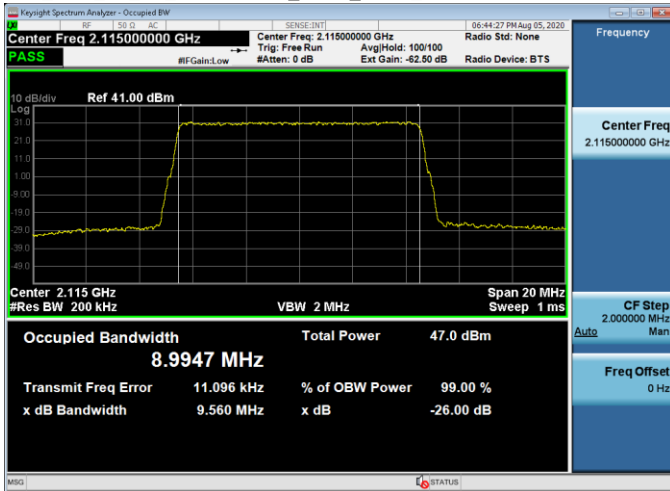
OBW_TM3_2_2C_10+15MBW_2115_2172_TX1 90W LTE+5G-NR_2115



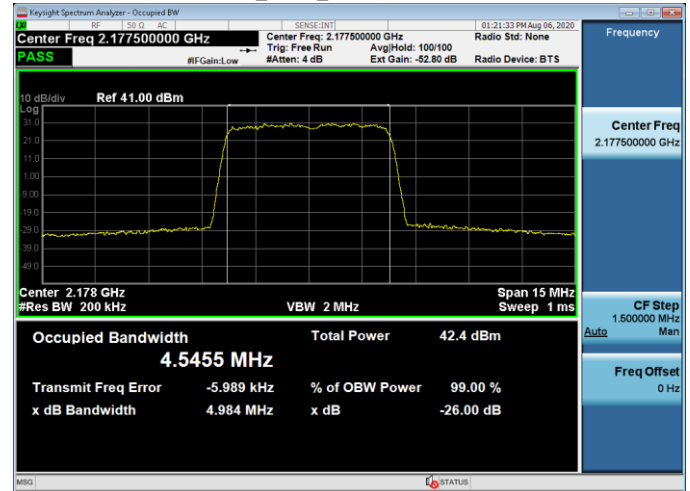
OBW_TM3_1a_2C_10+20MBW_2115_2170_TX4 45W LTE+5G-NR_2170



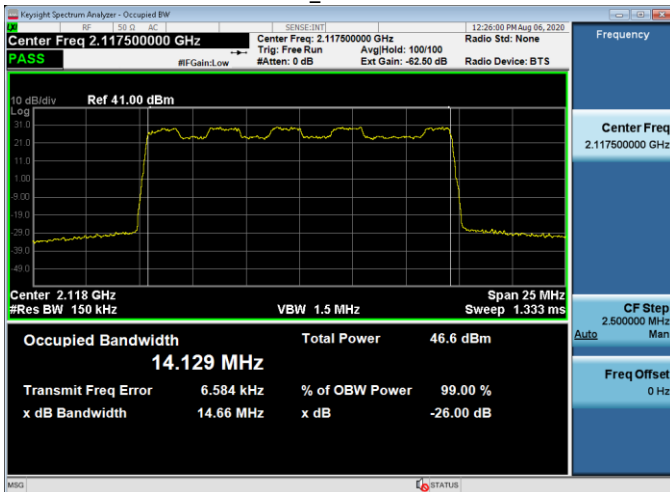
OBW_TM3_1a_2C_10+20MBW_2115_2170_TX1 90W LTE+5G-NR_2115



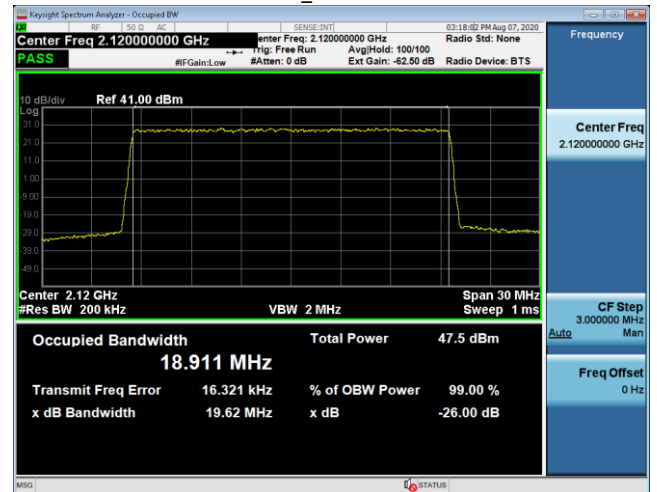
OBW_TM3_2_2C_15+5MBW_2117_2177_TX4 25W+20W 5G-NR+LTE_2177



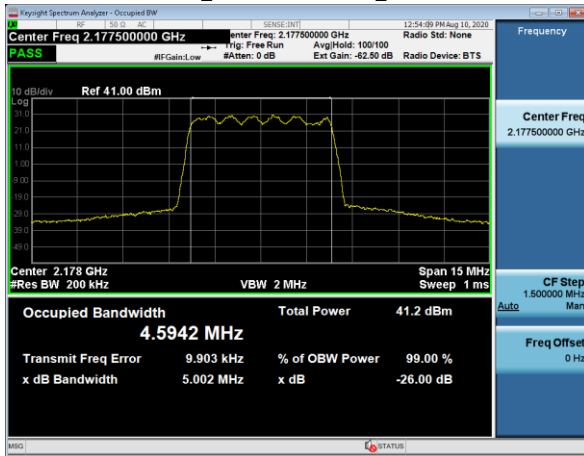
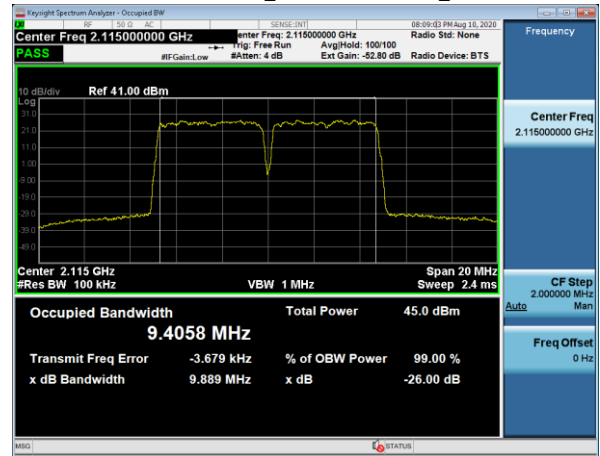
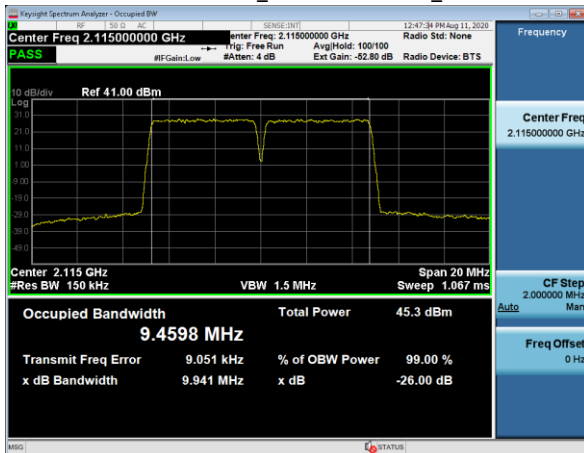
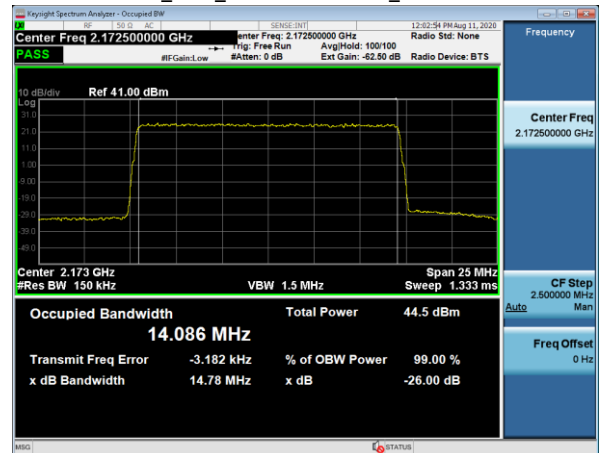
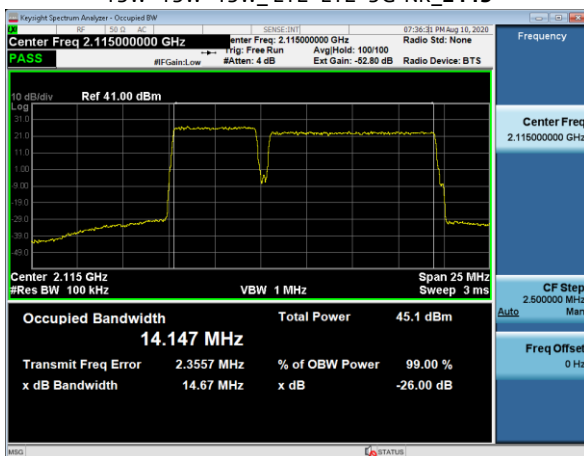
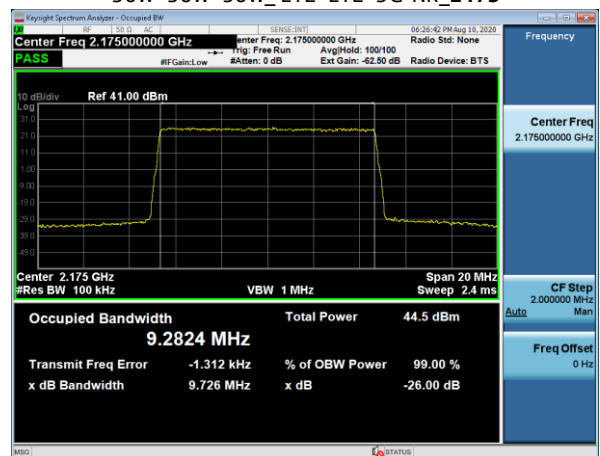
OBW_TM3_2_2C_15+5MBW_2117_2177_TX1 45W+33W 5G-NR+LTE_2117

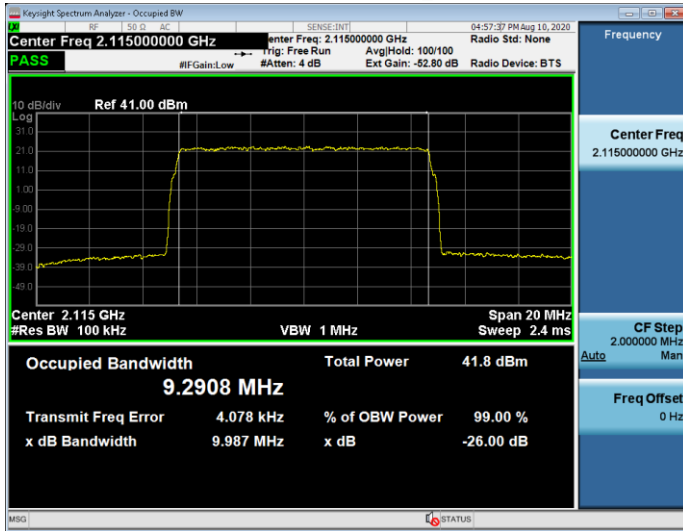
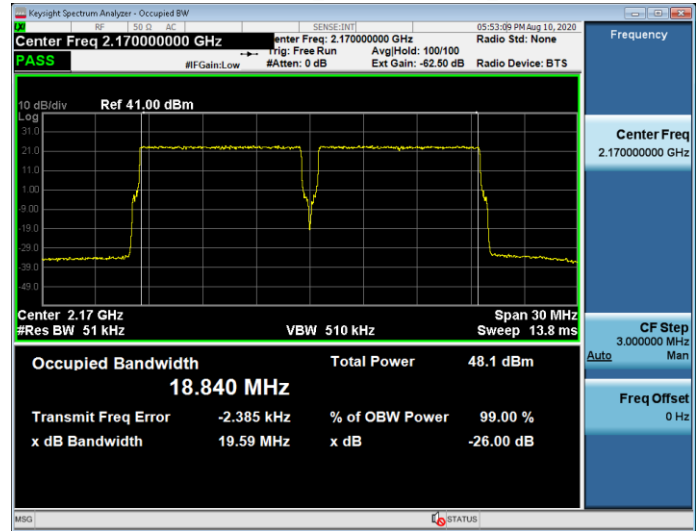
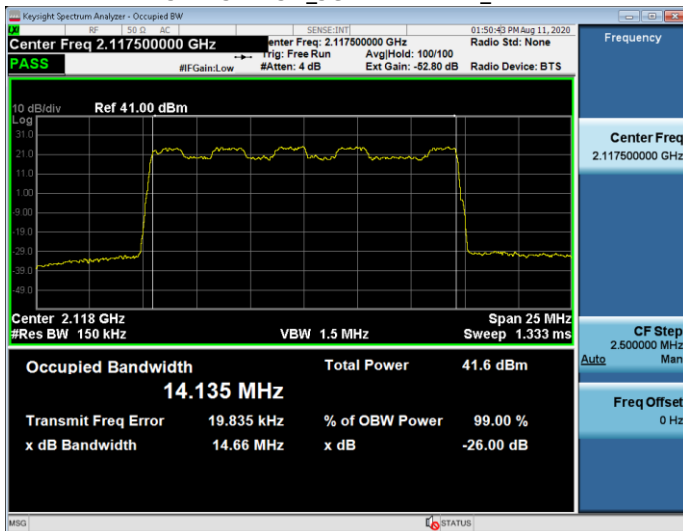


OBW_TM3_1a_2C_20+5MBW_2120_2177_TX1_33W+57W_5G-NR+LTE_2120



3C Data

OBW_TM3_2_3C_5+5+5MBW_2112_2145_2177_TX1
46W_LTE+LTE+5G-NR_2177OBW_TM3_2_3C_5+5+10MBW_2112_2117_2175_TX4
15W+15W+15W_LTE+LTE+5G-NR_2115OBW_TM3_1_3C_5+5+15MBW_2112_2117_2172_TX4
15W+15W+15W_LTE+LTE+5G-NR_2115OBW_TM3_1_3C_5+5+15MBW_2112_2117_2172_TX1
_90W_LTE+LTE+5G-NR_2172OBW_TM3_1_3C_5+10+10MBW_2112_2120_2175_TX4
15W+15W+15W_LTE+LTE+5G-NR_2115OBW_TM3_1_3C_5+10+10MBW_2112_2120_2175_TX1
30W+30W+30W_LTE+LTE+5G-NR_2175

OBW_TM3_1a_2C_10+10+10MBW_2115_2165_2175_TX4
45W 5G-NR+LTE+LTE_2115OBW_TM3_2_3C_10+10+10MBW_2115_2165_2175_TX1
30W+30W+30W_5G-NR+LTE+LTE_2170OBW_TM3_2_3C_15+10+5MBW_2117_2170_2177_TX4
15W+15W+15W_5G-NR+LTE+LTE_2117OBW_TM3_1_3C_15+10+5MBW_2117_2170_2177_TX1
90W_LTE+LTE+5G-NR_2117