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 22

Client:
NOKIA SOLUTIONS AND NETWORKS

Product Evaluated:
Airscale 2 Remote Radio Head – AHCA

Report Number:
TR-2021-0041-FCC2-22

Date Issued:
May 10, 2021

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Revisions

Date	Revision	Section	Change
5/10/21	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):	Airscale 2 Remote Radio Head - AHCA
FCC ID:	VBNAHCA-01
Serial Number:	L1171302323
Hardware Version:	473966A.101
Software Version:	SBTS20A
Frequency Range:	869-894MHz
GPCL Project Number:	2021-0041
Applicant	Nokia Solutions and Networks 3201 Olympus Blvd Dallas, Texas 75019 Steve Mitchell
Manufacturer:	NOKIA SOLUTIONS AND NETWORKS OY KARAKAARI 7, FI-02610 ESPOO FINLAND
Test Requirement(s):	Title 47 CFR Parts 2 and 22
Test Standards:	• Title 47 CFR Parts 2 and 22 • 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):	3/30/2021 – 4/3/2021
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):	Nilesh Patel
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 AHCA 5G NR 2X60 & 4X40, 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 22, per requirements for Class II permissive changes certification, measured in accordance with the procedures set out in Section 2.1033 (c) (14) of the Rules.

This project requires a FCC Class II change to add new mode of operation for NB-IoT Inband and Guardband. The following configurations are being supported:

- LTE NB-Iot Inband: 5, 10, 15, and 20 MHz, QPSK Modulation
- LTE NB-IoT Guardband: 10, 15, and 20 MHz, QPSK Modulation

1.3 EUT Details

The EUT is an LTE Base transceiver station RRH 850 MHz with 4 power amplifiers.

The BTS performs the full RAN function of LTE system (evolved UTRA). This is sometimes referred to as collapsed RAN, where equivalent functions of former 3G BTS and 3G RNC are all integrated into BTS. BTS is connected directly to the core network via S1 interface, and to mobile stations via Air interface (Uu). In addition, BTS's are optionally connected directly to each other via X2 interface for handover purposes.

1.3.1 Specifications

Specification Items	Description
Radio Access Technology	E-UTRA
Duplex Mode	NB-IoT
Modulation Type(s)	QPSK, 16QAM, 64QAM, 256QAM
Operation Frequency Range	869-894MHz
Channel Bandwidths	5, 10, 15 and 20MHz
Tx/Rx	4T4R / 2T2R
MIMO	Yes
Deployment Environment	Outdoor
Supply Voltage	120V AC
Max RF Output Power	2X60 W and 4X40 W MIMO

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	RF Power Output	Yes
2.1047	Modulation Characteristics	Yes
2.1049	(a) Occupied Bandwidth (b) Out-of-Band Emissions	Yes
2.1051	Conducted Out-of-Band Emissions Spurious Emissions at Antenna Terminals	Yes
2.1053, 22.917	Field Strength of Spurious Radiation	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 22.
- FCC KDB 971168 D01 Power Measurement License Digital Systems v03r01 April 9, 2018.
- FCC KDB 662911 D01 Multiple Transmitter Output v02r01 Oct 2013.
- ANSI C63.26, American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
- 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.

1.5.2 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

1.5.3 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, (*e.g.*, ANSI C63.4, CISPR 11, 14, 22, *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

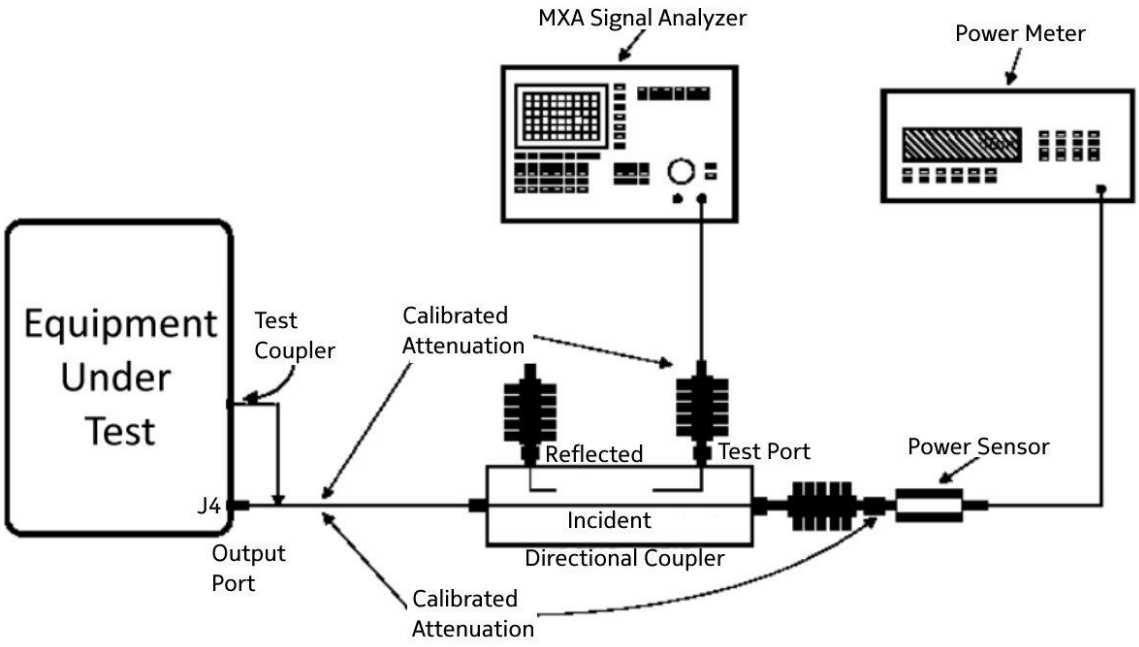
Antenna Port Test	Signal Bandwidth	Frequency Range	Expanded Uncertainty (k=2), Amplitude
Occupied Bandwidth, Edge of Band, Conducted Spurious Emissions	10 Hz 100 Hz 10 kHz to 1 MHz 1MHz	9 kHz to 20 MHz 20 MHz to 1 GHz 1 GHz to 10 GHz 10 GHz to 40 GHz:	1.78 dB
RF Power	10 Hz to 20 MHz	50 MHz to 18 GHz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

1.6 Executive Summary

Requirement	Description	Result
47 CFR FCC Parts 2 and 22		
2.1046	RF Power Output Peak to Average Power Ratio	COMPLIES
2.1047	Modulation Characteristics	COMPLIES
2.1049	(a) Occupied Bandwidth (b) Edge of Band Emissions	COMPLIES
2.1051	Spurious Emissions at Antenna Terminals	COMPLIES
2.1053, 22.917	Field Strength of Spurious Radiation	COMPLIES

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 output is bolded in each case.

Channel RF Power Guardband (40W)

Channel Power - GB 40W Test Model 1.1 Modulation QPSK							
TX Port	Signal BW 10MHz			Signal BW 15MHz		Signal BW 20MHz	
	Channel Frequency (MHz)			Channel Frequency (MHz)		Channel Frequency (MHz)	
	874	881.5	889	876.5	886.5	879	884
	Channel Power (dBm)			Channel Power (dBm)		Channel Power (dBm)	
1	46.01	46.2	46.07	46.07	46.02	45.95	46.01
2	46.22	46.2	46.16	46.19	46.06	46.15	46.12
3	**46.37**	**46.25**	**46.19**	**46.43**	**46.31**	**46.30**	**46.26**
4	46.13	46.08	45.97	46.03	45.95	46.03	45.94

Channel RF Power Guardband (60W)

Channel Power - GB 60W Test Model 1.1 Modulation QPSK							
TX Port	Signal BW 10MHz			Signal BW 15MHz		Signal BW 20MHz	
	Channel Frequency (MHz)			Channel Frequency (MHz)		Channel Frequency (MHz)	
	874	881.5	889	876.5	886.5	879	884
	Channel Power (dBm)			Channel Power (dBm)		Channel Power (dBm)	
1	47.60	47.55	47.47	47.52	47.56	47.48	47.46
3	**47.76**	**47.73**	**47.58**	**47.70**	**47.56**	**47.72**	**47.73**

Channel RF Power Inband (40W)

Channel Power - IB 40W Test Model 1.1 Modulation QPSK										
TX Port	Signal BW 5MHz			Signal BW 10MHz			Signal BW 15MHz		Signal BW 20MHz	
	Channel Frequency (MHz)			Channel Frequency (MHz)			Channel Frequency (MHz)		Channel Frequency (MHz)	
	871.5	881.5	891.5	874	881.5	889	876.5	886.5	879	884
	Channel Power (dBm)			Channel Power (dBm)			Channel Power (dBm)		Channel Power (dBm)	
1	45.93	46.04	45.79	46.05	46.16	46.12	46.10	46.14	46.21	46.13
2	46.22	46.12	45.99	46.27	46.21	**46.15**	46.35	46.29	46.29	46.10
3	**46.27**	**46.33**	**46.02**	**46.37**	**46.41**	46.14	**46.42**	**46.36**	**46.36**	**46.33**
4	46.00	46.08	45.82	46.17	46.09	46.12	46.15	46.06	46.13	46.07

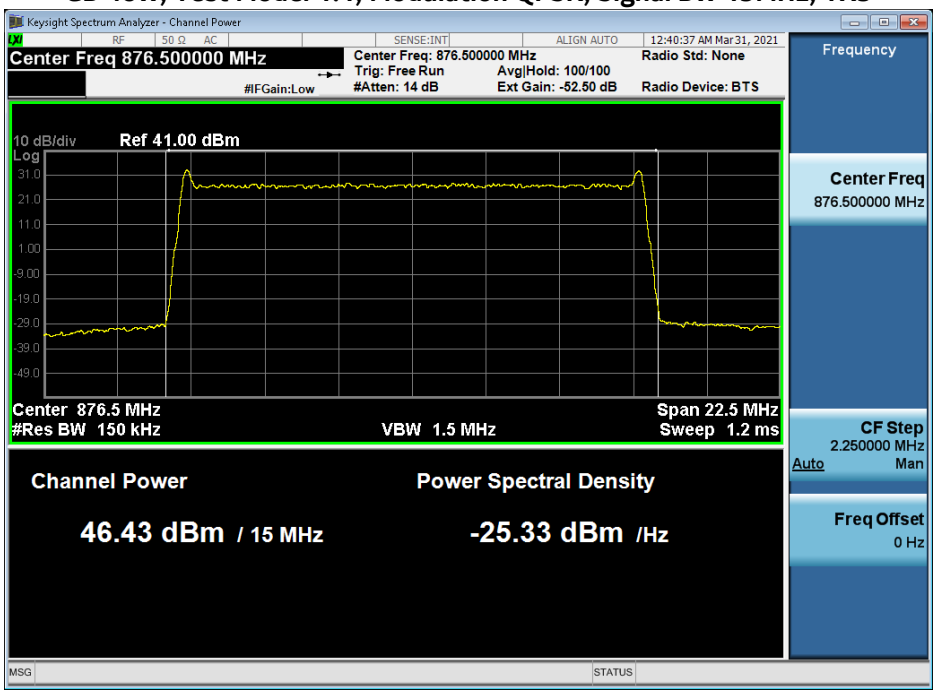
Channel RF Power Inband (60W)

Channel Power - IB 60W Test Model 1.1 Modulation QPSK										
TX Port	Signal BW 5MHz			Signal BW 10MHz			Signal BW 15MHz		Signal BW 20MHz	
	Channel Frequency (MHz)			Channel Frequency (MHz)			Channel Frequency (MHz)		Channel Frequency (MHz)	
	871.5	881.5	891.5	874	881.5	889	876.5	886.5	879	884
	Channel Power (dBm)			Channel Power (dBm)			Channel Power (dBm)		Channel Power (dBm)	
1	47.18	47.36	47.05	47.03	47.23	47.14	47.42	47.50	47.45	47.47
3	**47.43**	**47.51**	**47.17**	**47.33**	**47.41**	**47.21**	**47.63**	**47.53**	**47.76**	**47.50**

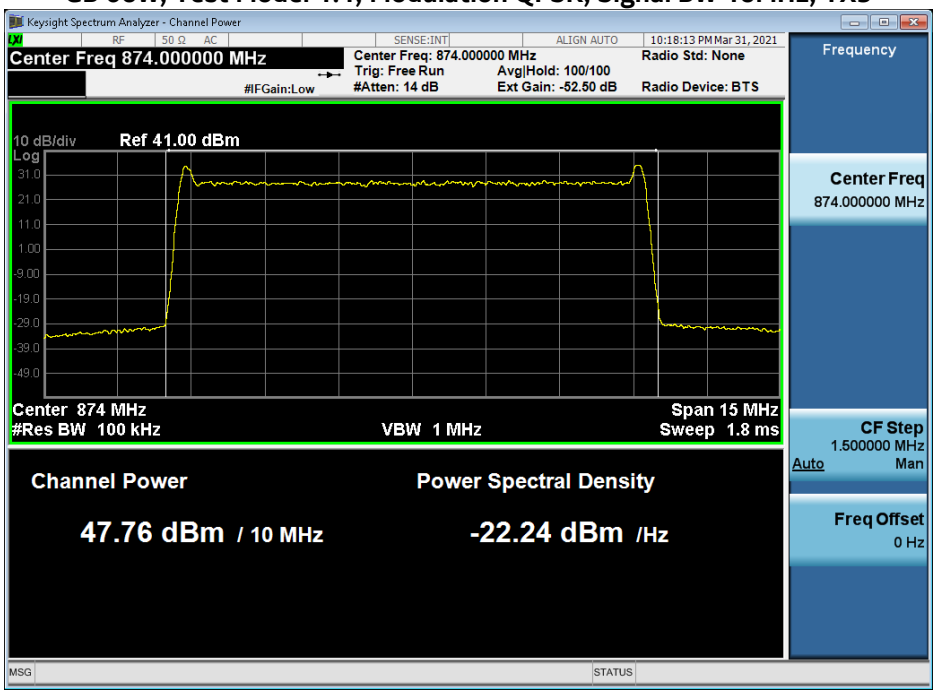
2.1.1 Channel RF Power – Plots (Guardband)

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.

GB 40W, Test Model 1.1, Modulation QPSK, Signal BW 15MHz, TX3



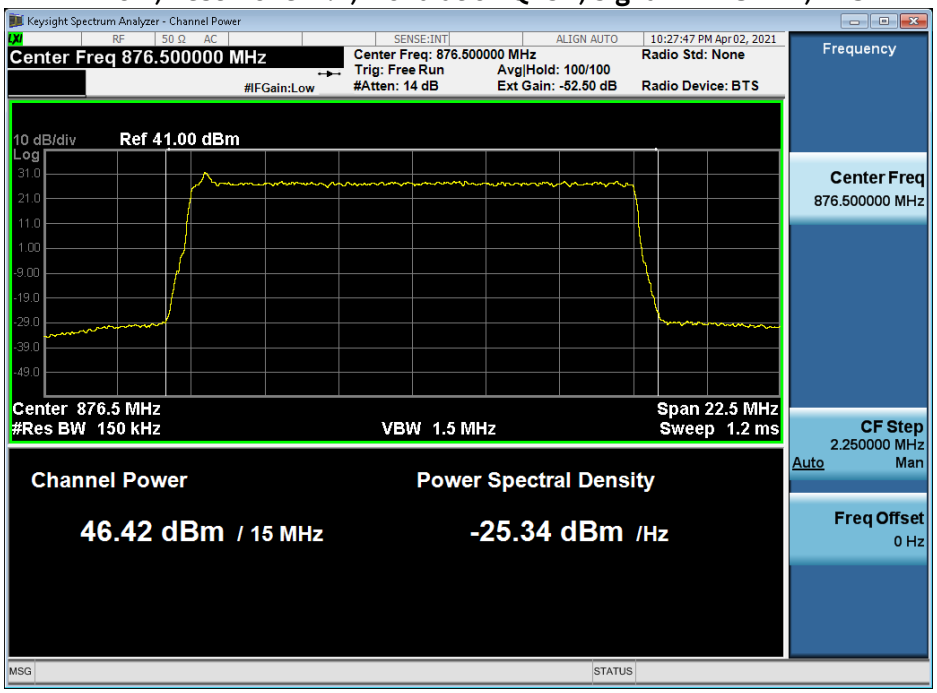
GB 60W, Test Model 1.1, Modulation QPSK, Signal BW 10MHz, TX3



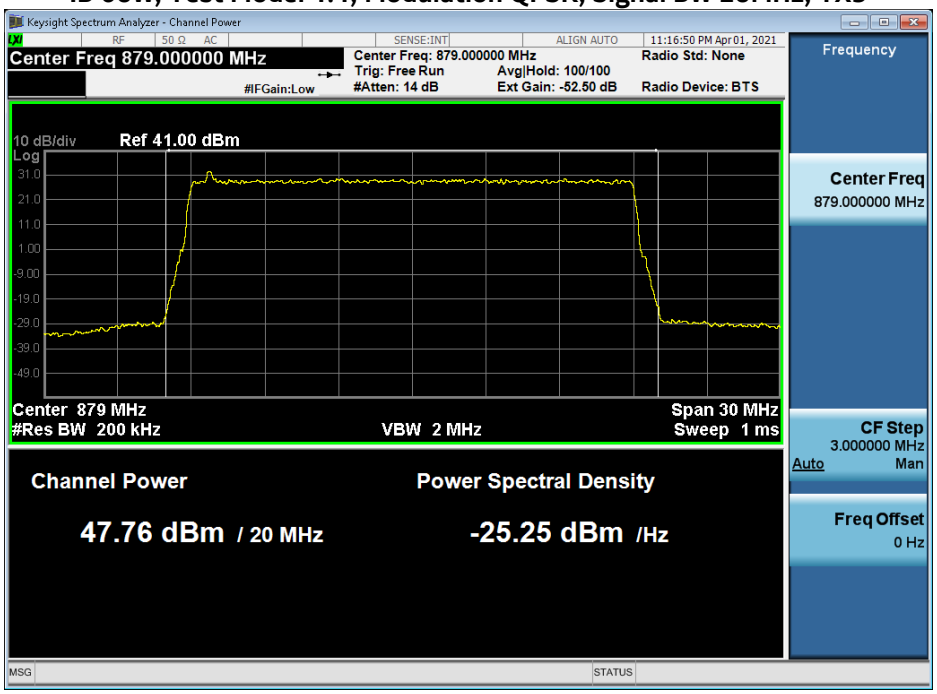
2.1.2 Channel RF Power – Plots (Inband)

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.

IB 40W, Test Model 1.1, Modulation QPSK, Signal BW 15MHz, TX3



IB 60W, Test Model 1.1, Modulation QPSK, Signal BW 20MHz, TX3

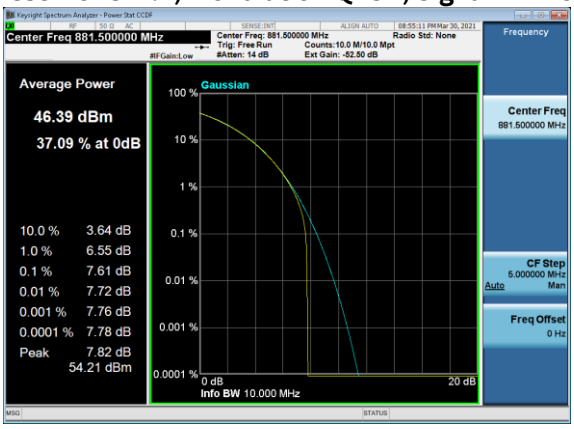


2.1.3 Peak-to-Average Power Ratio (PAPR) – Plots (Guardband)

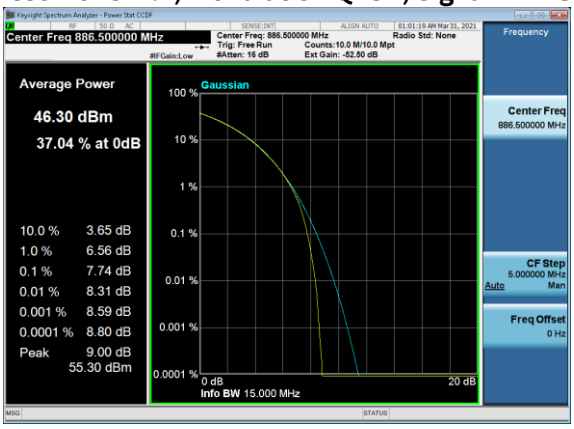
The Peak-to-Average Power Ratio (PAPR) was evaluated per KDB 971168 for 5, 10, 15 and 20MHz bandwidths. The PAPR values of all carriers measured are below 13dB.

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.

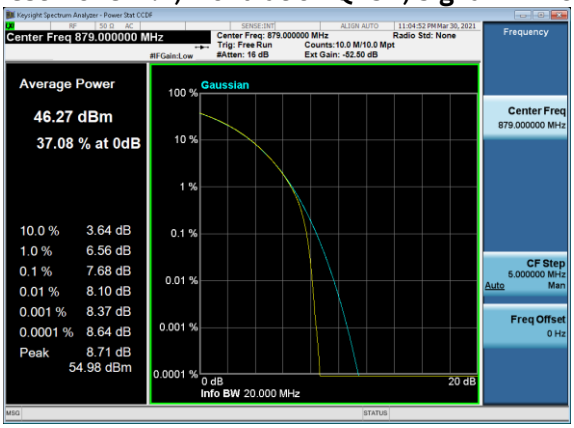
GB 40W, Test Model 1.1, Modulation QPSK, Signal BW 10MHz, TX3



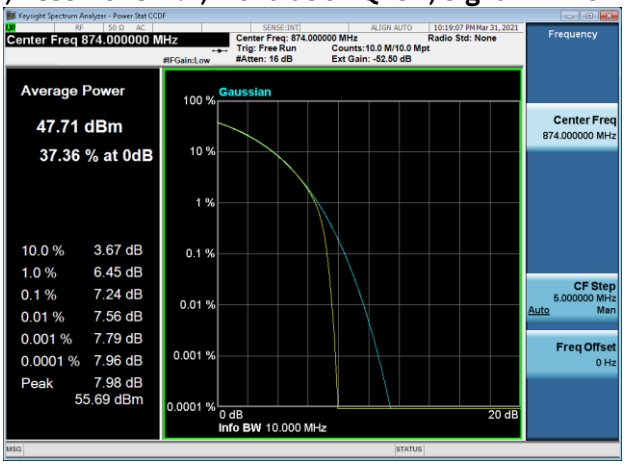
GB 40W, Test Model 1.1, Modulation QPSK, Signal BW 15MHz, TX3



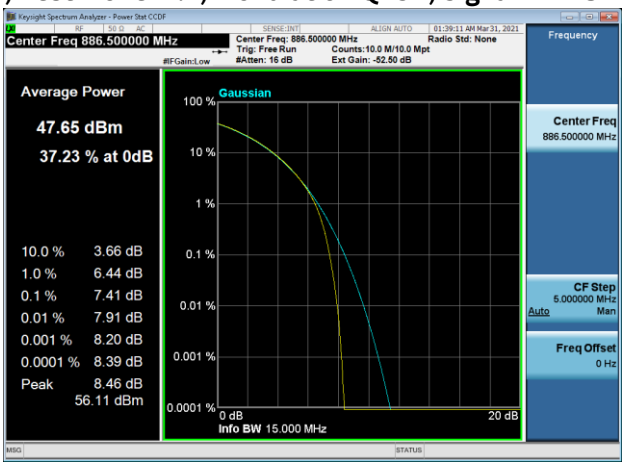
GB 40W, Test Model 1.1, Modulation QPSK, Signal BW 20MHz, TX3



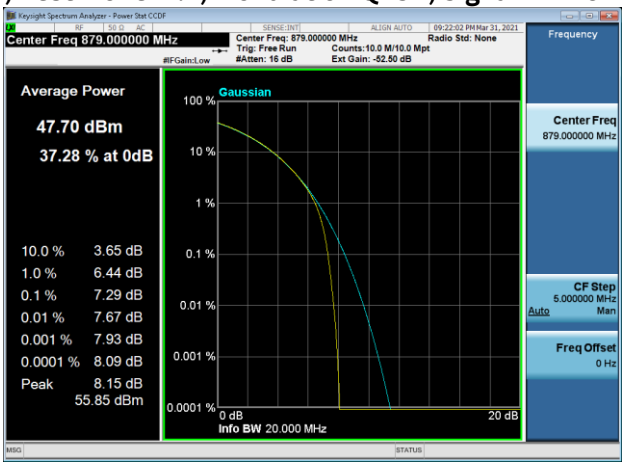
GB 60W, Test Model 1.1, Modulation QPSK, Signal BW 10MHz, TX3



GB 60W, Test Model 1.1, Modulation QPSK, Signal BW 15MHz, TX3



GB 60W, Test Model 1.1, Modulation QPSK, Signal BW 20MHz, TX3

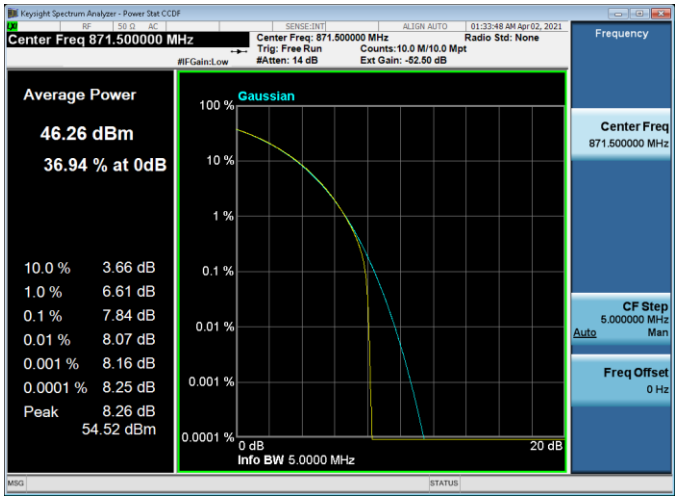


2.1.4 Peak-to-Average Power Ratio (PAPR) – Plots (Inband)

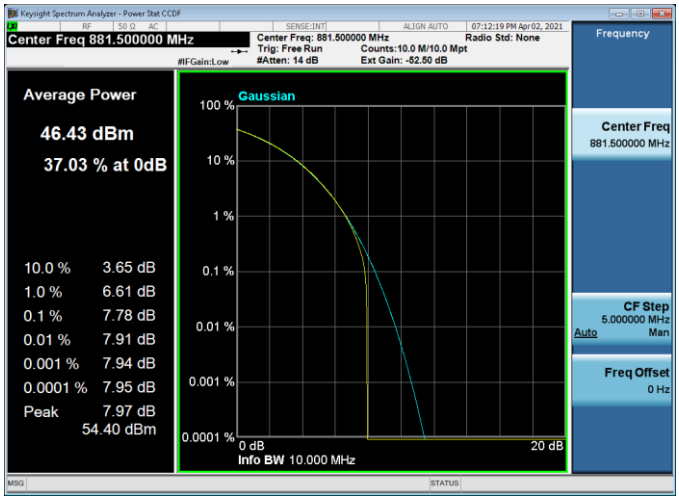
The Peak-to-Average Power Ratio (PAPR) was evaluated per KDB 971168 for 5, 10, 15 and 20MHz bandwidths. The PAPR values of all carriers measured are below 13dB.

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.

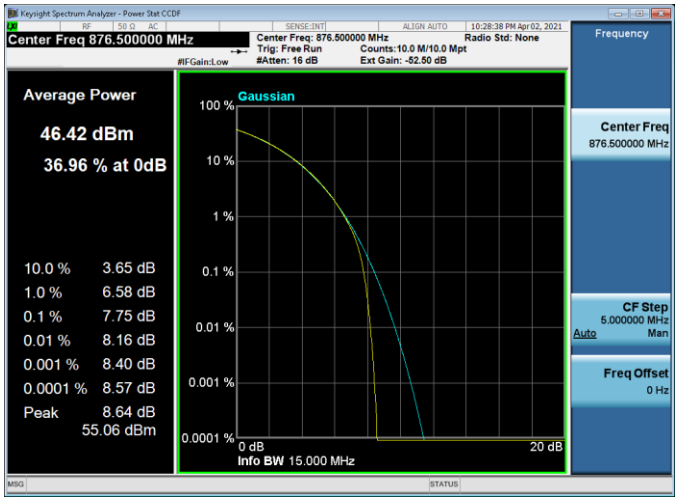
IB 40W, Test Model 1.1, Modulation QPSK, Signal BW 5MHz, TX3



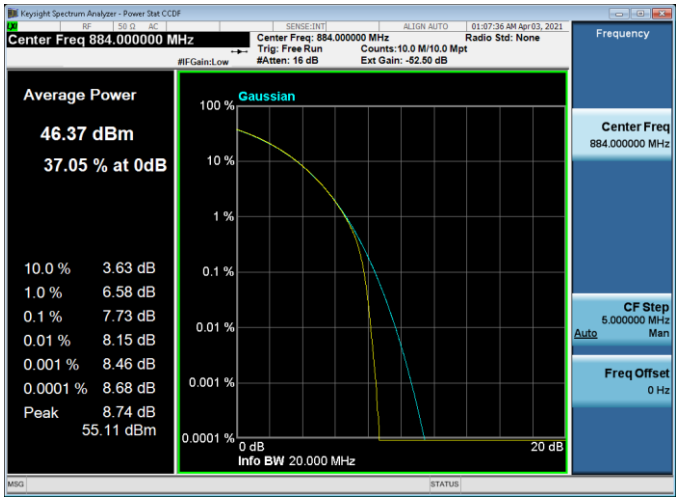
IB 40W, Test Model 1.1, Modulation QPSK, Signal BW 10MHz, TX3



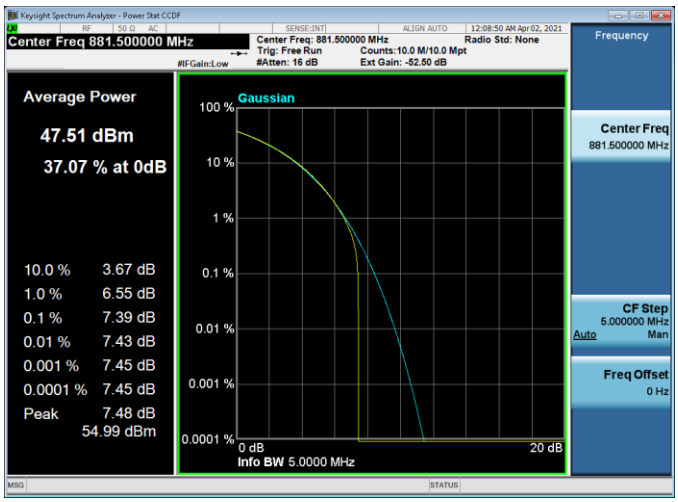
IB 40W, Test Model 1.1, Modulation QPSK, Signal BW 15MHz, TX3



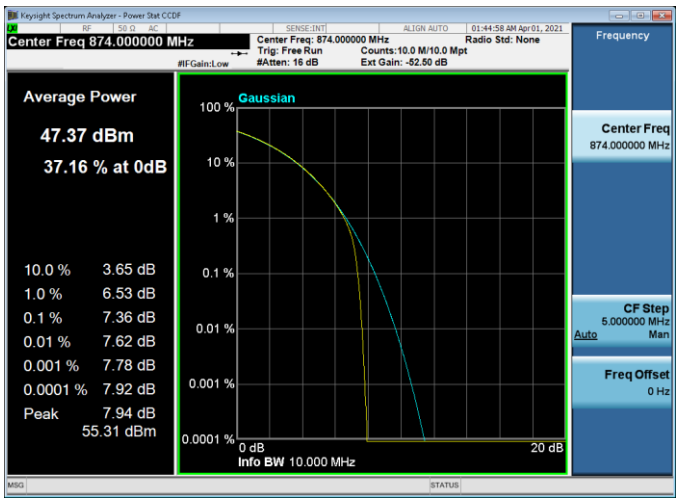
IB 40W, Test Model 1.1, Modulation QPSK, Signal BW 20MHz, TX3



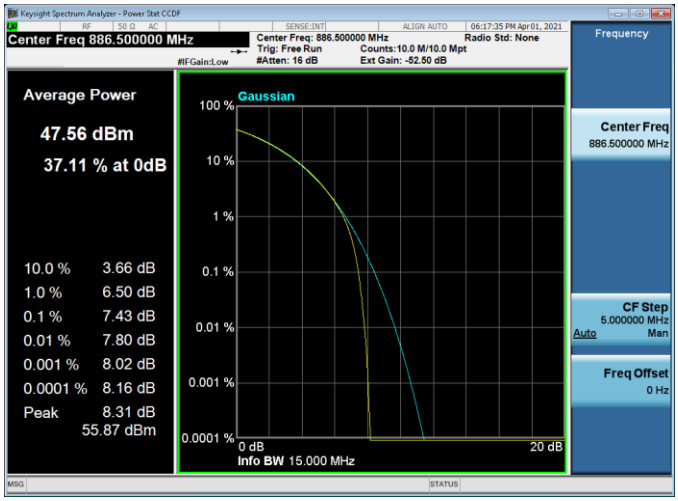
IB 60W, Test Model 1.1, Modulation QPSK, Signal BW 5MHz, TX3



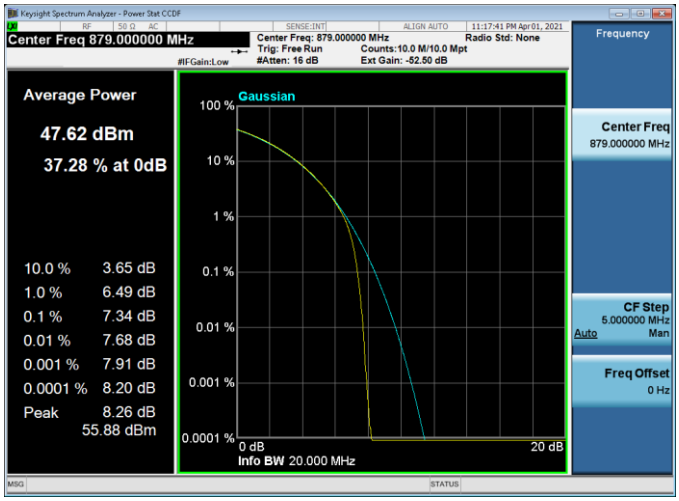
IB 60W, Test Model 1.1, Modulation QPSK, Signal BW 10MHz, TX3



IB 60W, Test Model 1.1, Modulation QPSK, Signal BW 15MHz, TX3



IB 60W, Test Model 1.1, Modulation QPSK, Signal BW 20MHz, TX3



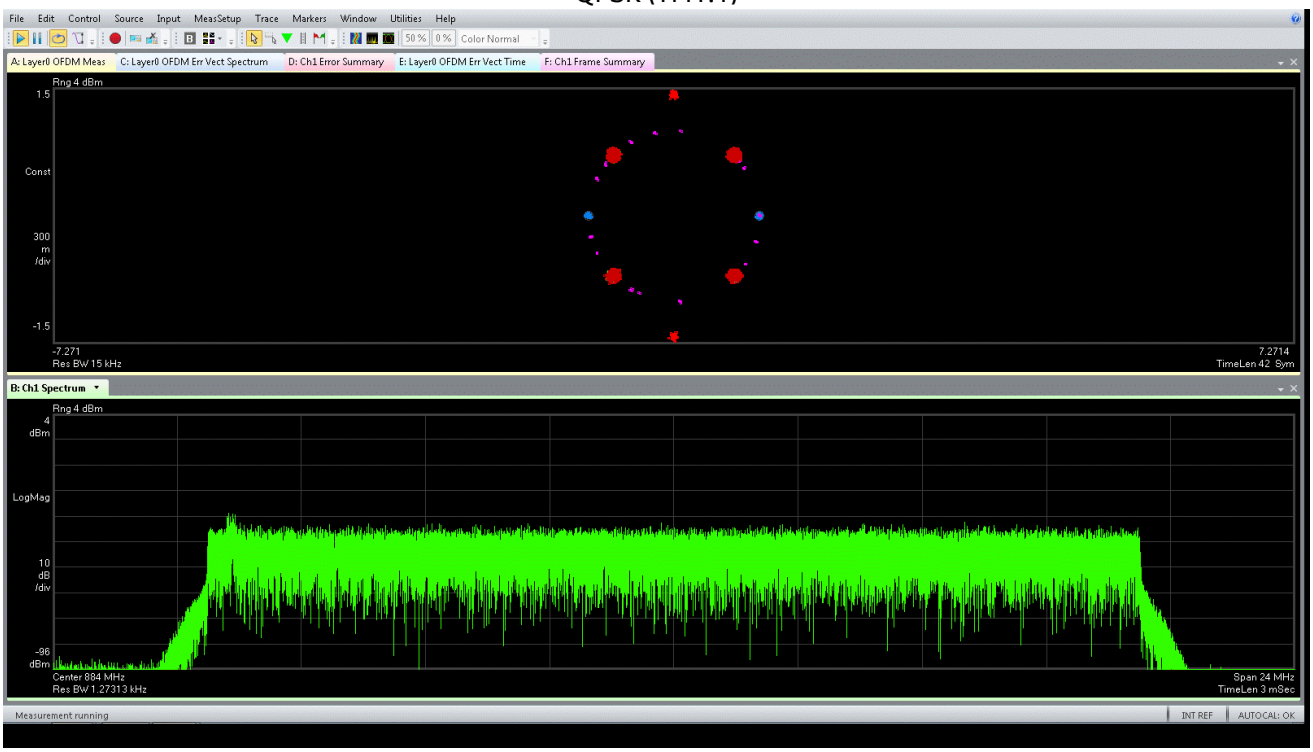
3. FCC Section 2.1047 - Modulation Characteristics

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.

QPSK (TM1.1)



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 (Guardband)

Test Model	Modulation	TX Port	Signal BW (MHz)	Channel Frequency (MHz)	Power (W)	Occupied BW (MHz)
1.1	QPSK	3	10	874	40	9.4097
1.1	QPSK	3	10	881.5	40	9.4167
1.1	QPSK	3	10	889	40	9.4155
1.1	QPSK	3	15	876.5	40	14.030
1.1	QPSK	3	15	886.5	40	14.023
1.1	QPSK	3	20	879	40	18.462
1.1	QPSK	3	20	884	40	18.448
1.1	QPSK	3	10	874	60	9.4156
1.1	QPSK	3	10	881.5	60	9.4167
1.1	QPSK	3	10	889	60	9.4140
1.1	QPSK	3	15	876.5	60	14.027
1.1	QPSK	3	15	886.5	60	14.018
1.1	QPSK	3	20	879	60	18.453
1.1	QPSK	3	20	884	60	18.453

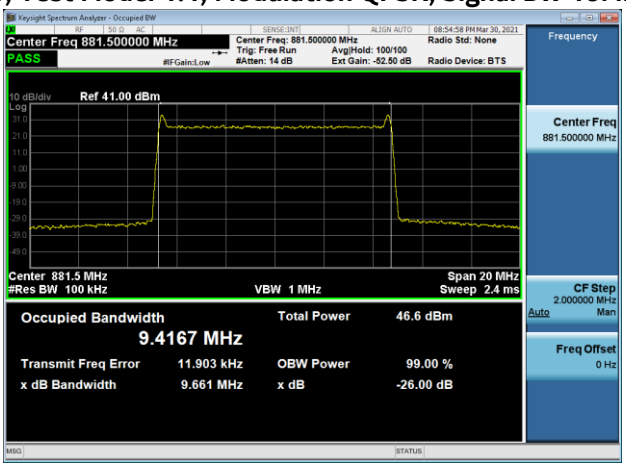
Tabular Data – Occupied Bandwidth (Inband)

Test Model	Modulation	TX Port	Signal BW (MHz)	Channel Frequency (MHz)	Power (W)	Occupied BW (MHz)
1.1	QPSK	3	5	871.5	40	4.4727
1.1	QPSK	3	5	881.5	40	4.4755
1.1	QPSK	3	5	891.5	40	4.4658
1.1	QPSK	3	10	874	40	8.9308
1.1	QPSK	3	10	881.5	40	8.9374
1.1	QPSK	3	10	889	40	8.9221
1.1	QPSK	3	15	876.5	40	13.387
1.1	QPSK	3	15	886.5	40	13.391
1.1	QPSK	3	20	879	40	17.850
1.1	QPSK	3	20	884	40	17.842
1.1	QPSK	3	5	871.5	60	4.4730
1.1	QPSK	3	5	881.5	60	4.4736
1.1	QPSK	3	5	891.5	60	4.4682
1.1	QPSK	3	10	874	60	8.9343
1.1	QPSK	3	10	881.5	60	8.9356
1.1	QPSK	3	10	889	60	8.9219
1.1	QPSK	3	15	876.5	60	13.381
1.1	QPSK	3	15	886.5	60	13.389
1.1	QPSK	3	20	879	60	17.849
1.1	QPSK	3	20	884	60	17.832

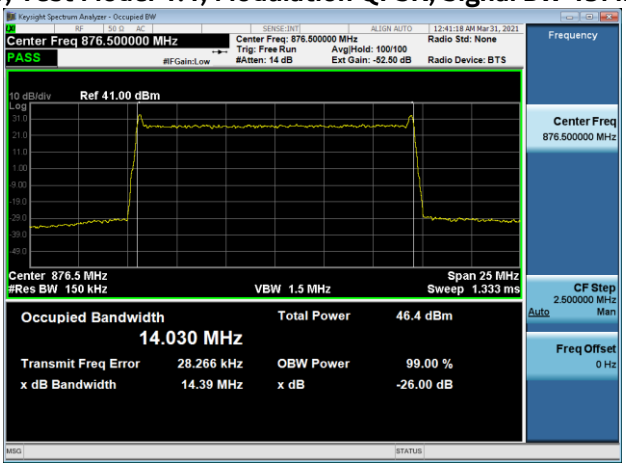
4.1.1 Occupied Bandwidth – Plots (Guardband)

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.

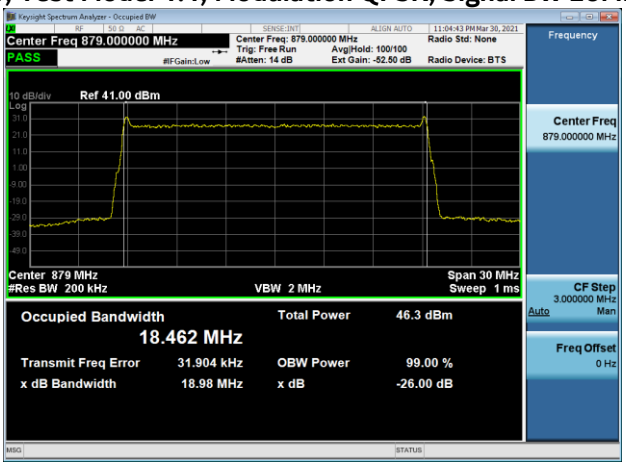
GB 40W, Test Model 1.1, Modulation QPSK, Signal BW 10MHz, TX3



GB 40W, Test Model 1.1, Modulation QPSK, Signal BW 15MHz, TX3

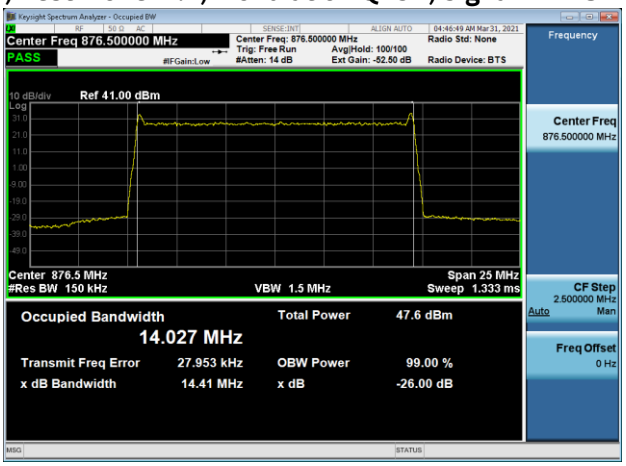


GB 40W, Test Model 1.1, Modulation QPSK, Signal BW 20MHz, TX3

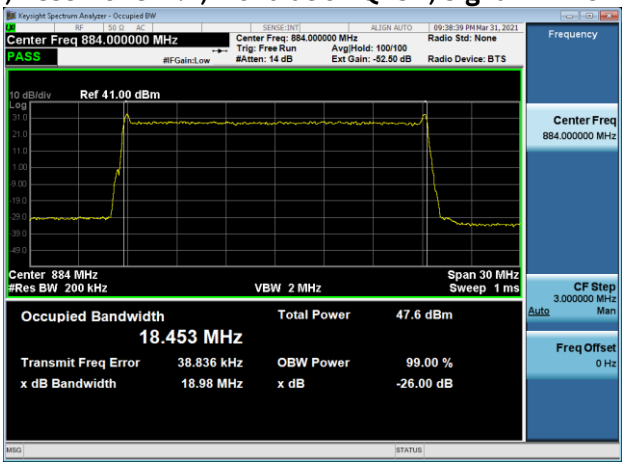


GB 60W, Test Model 1.1, Modulation QPSK, Signal BW 10MHz, TX3

GB 60W, Test Model 1.1, Modulation QPSK, Signal BW 15MHz, TX3



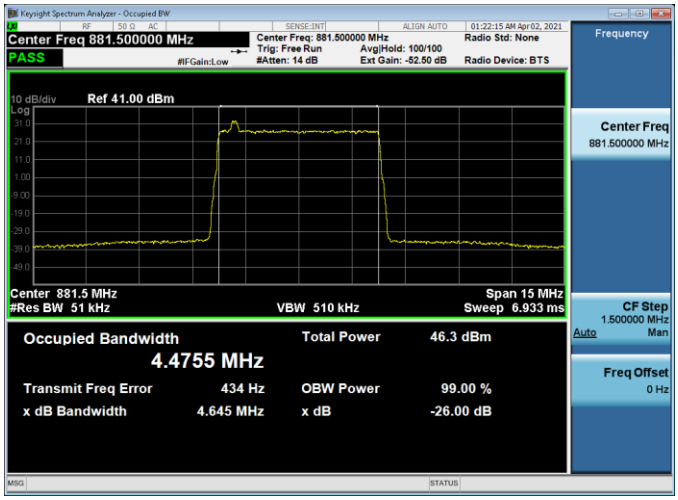
GB 60W, Test Model 1.1, Modulation QPSK, Signal BW 20MHz, TX3



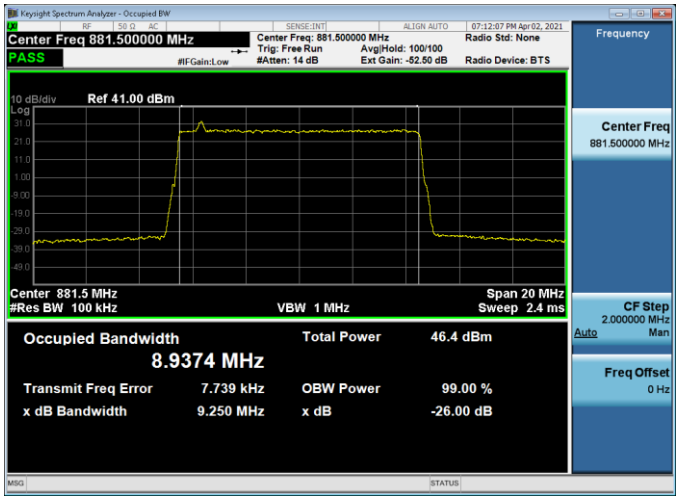
4.1.2 Occupied Bandwidth – Plots (Inband)

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.

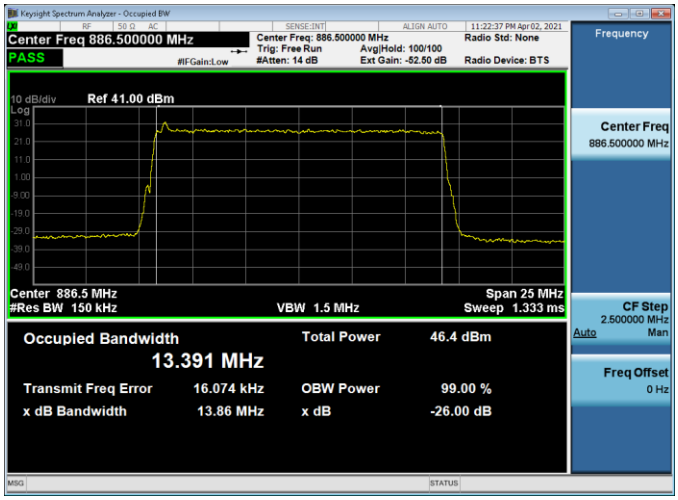
IB 40W, Test Model 1.1, Modulation QPSK, Signal BW 5MHz, TX3



IB 40W, Test Model 1.1, Modulation QPSK, Signal BW 10MHz, TX3



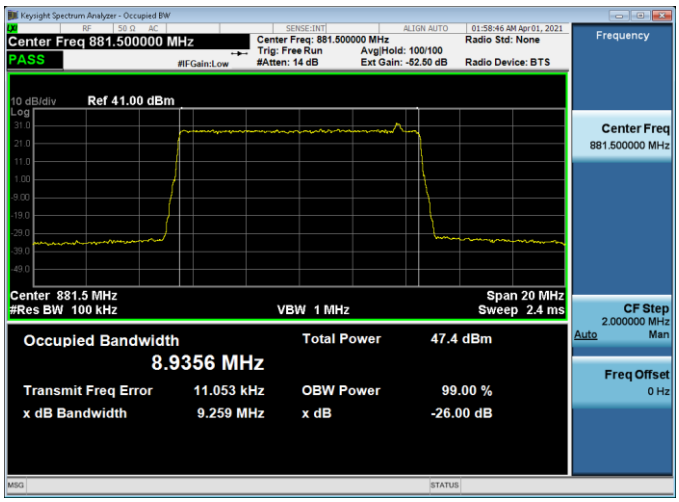
IB 40W, Test Model 1.1, Modulation QPSK, Signal BW 15MHz, TX3



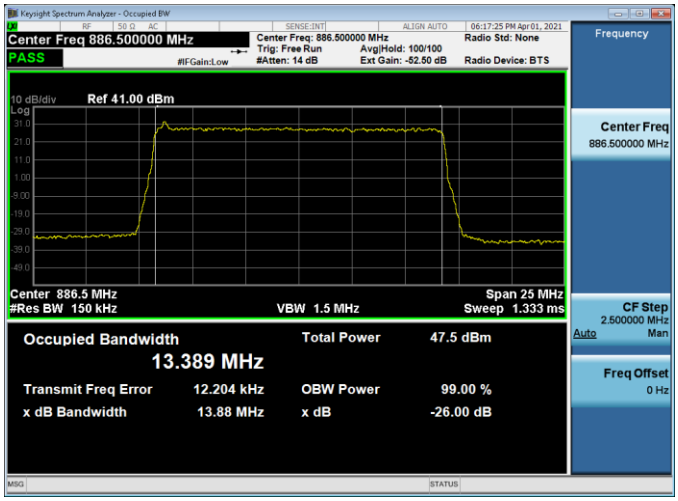
IB 40W, Test Model 1.1, Modulation QPSK, Signal BW 20MHz, TX3

IB 60W, Test Model 1.1, Modulation QPSK, Signal BW 5MHz, TX3

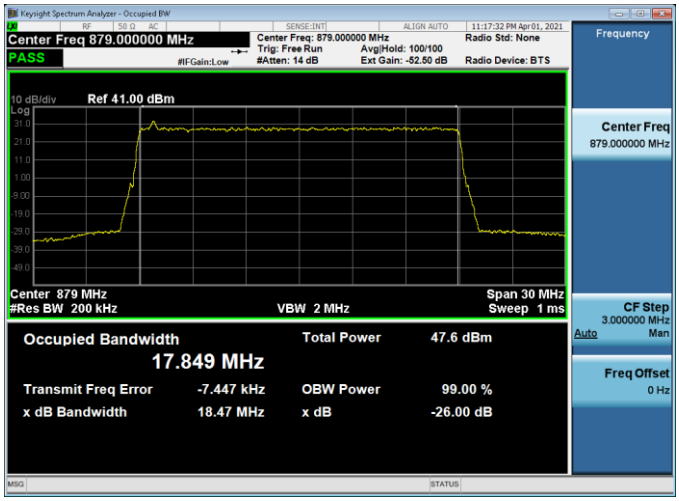
IB 60W, Test Model 1.1, Modulation QPSK, Signal BW 10MHz, TX3



IB 60W, Test Model 1.1, Modulation QPSK, Signal BW 15MHz, TX3



IB 60W, Test Model 1.1, Modulation QPSK, Signal BW 20MHz, TX3



4.2 Edge of band Emissions

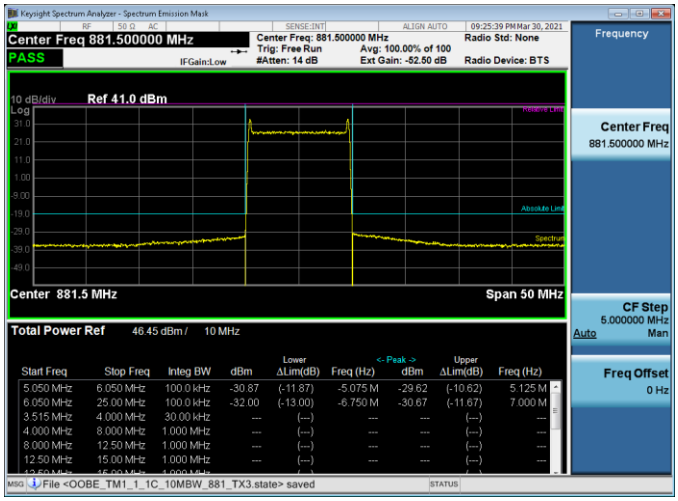
The Edge of Band emissions of the EUT at the external antenna connector (EAC) were measured using a Keysight MXA Signal Analyzer. The RF power level was continuously measured using a RF broadband power meter. The RF output from the EAC port to signal analyzer was reduced (to an amplitude usable by the 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.

4.2.1 Edge of Band Emissions – Plots (Guardband)

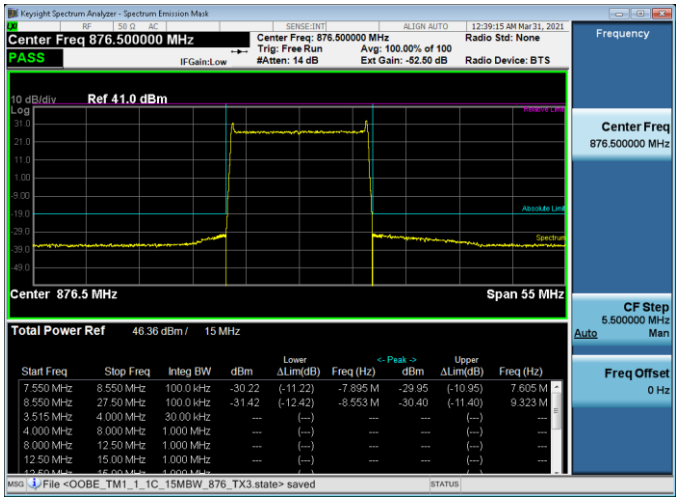
All of the measurements met the requirements of Part 2.1049.

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.

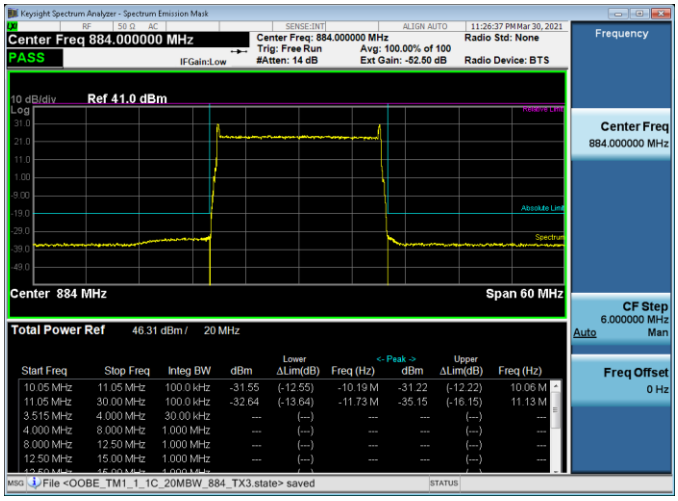
GB 40W, Test Model 1.1, Modulation QPSK, Signal BW 5MHz, TX3



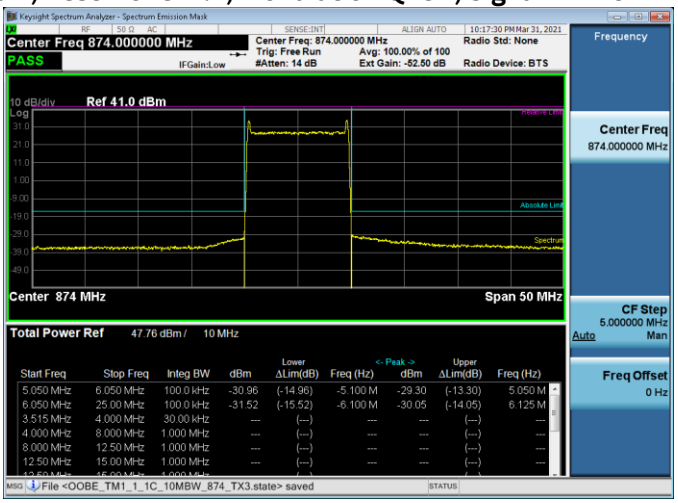
GB 40W, Test Model 1.1, Modulation QPSK, Signal BW 10MHz, TX3



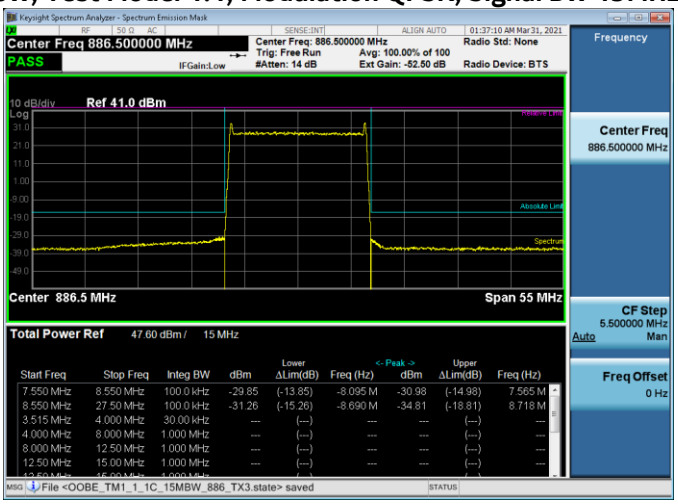
GB 40W, Test Model 1.1, Modulation QPSK, Signal BW 15MHz, TX3



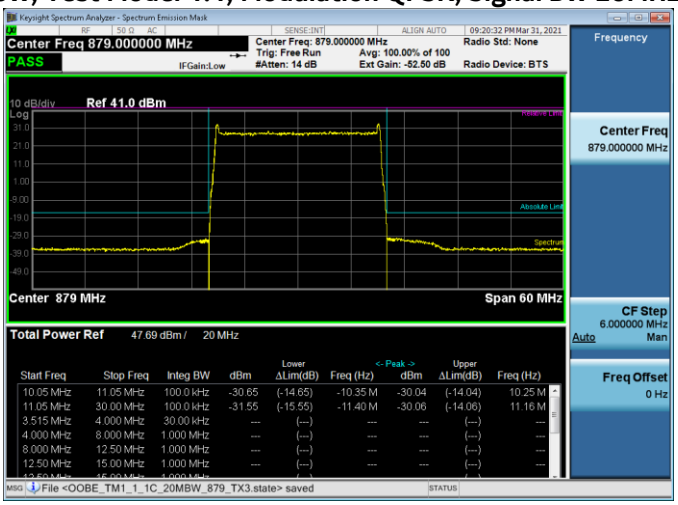
GB 60W, Test Model 1.1, Modulation QPSK, Signal BW 10MHz, TX3



GB 60W, Test Model 1.1, Modulation QPSK, Signal BW 15MHz, TX3



GB 60W, Test Model 1.1, Modulation QPSK, Signal BW 20MHz, TX3

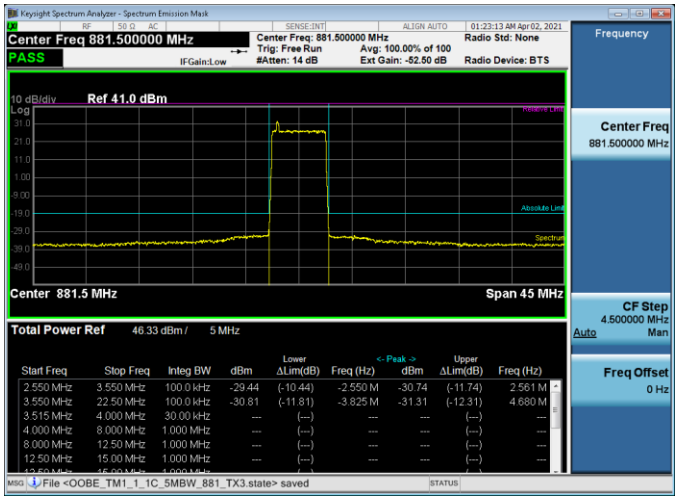


4.2.2 Edge of Band Emissions – Plots (Inband)

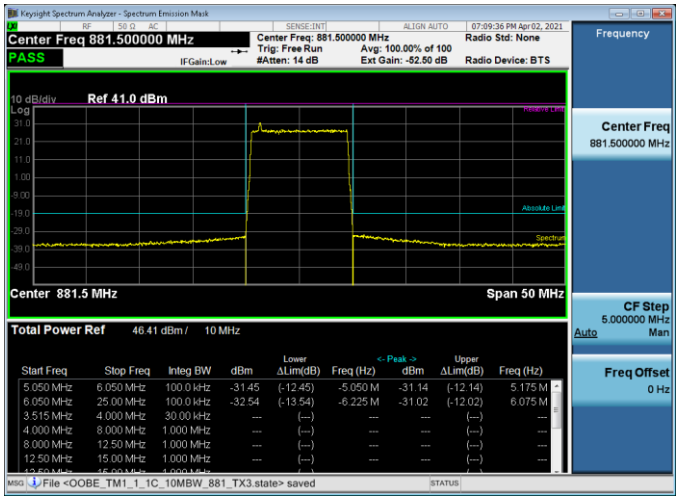
All of the measurements met the requirements of Part 2.1049.

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.

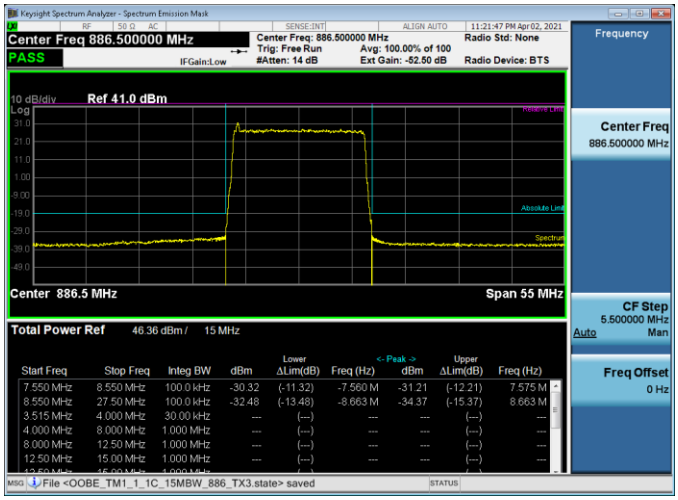
IB 40W, Test Model 1.1, Modulation QPSK, Signal BW 5MHz, TX3



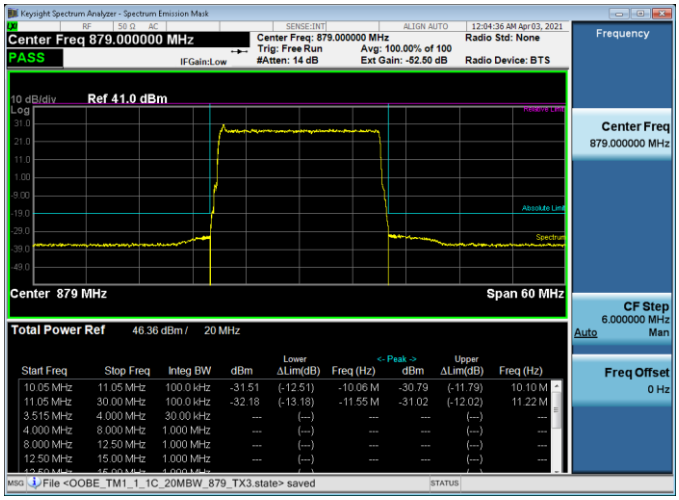
IB 40W, Test Model 1.1, Modulation QPSK, Signal BW 10MHz, TX3



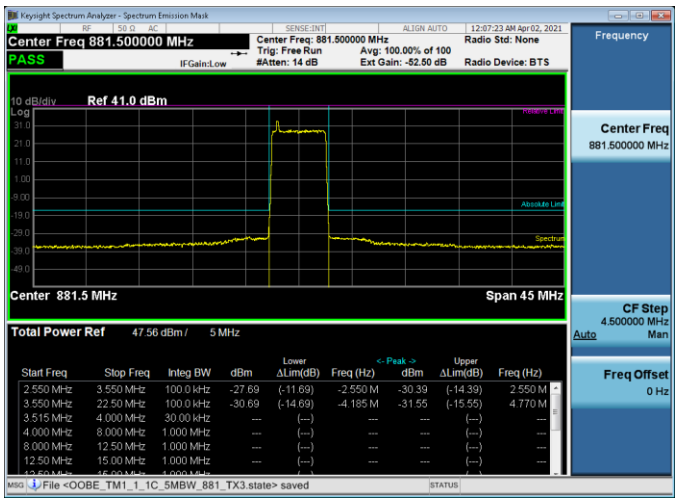
IB 40W, Test Model 1.1, Modulation QPSK, Signal BW 15MHz, TX3



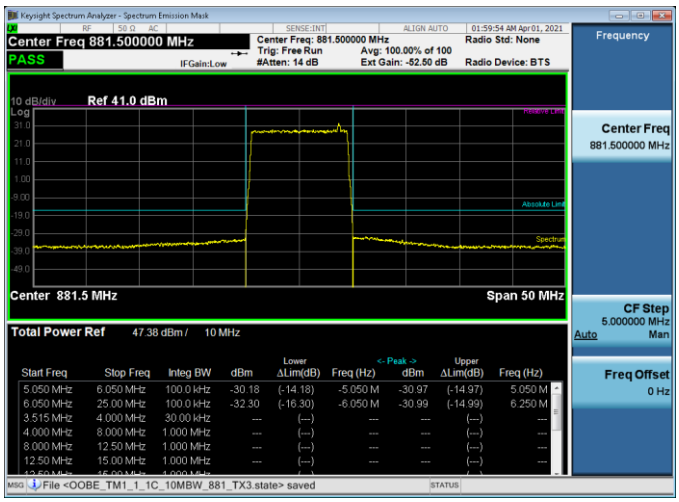
IB 40W, Test Model 1.1, Modulation QPSK, Signal BW 20MHz, TX3



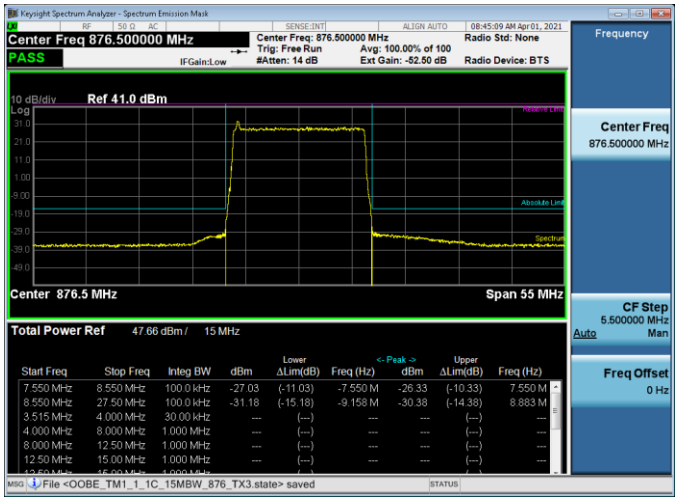
IB 60W, Test Model 1.1, Modulation QPSK, Signal BW 5MHz, TX3



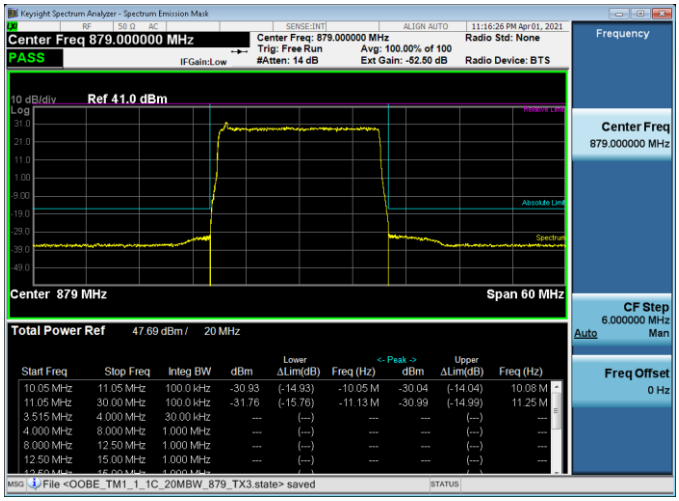
IB 60W, Test Model 1.1, Modulation QPSK, Signal BW 10MHz, TX3



IB 60W, Test Model 1.1, Modulation QPSK, Signal BW 15MHz, TX3



IB 60W, Test Model 1.1, Modulation QPSK, Signal BW 20MHz, TX3



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 9kHz to beyond the 10th harmonic of the specific transmit band. For this band of operation, the measurements were performed up to 1.4 GHz. 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.

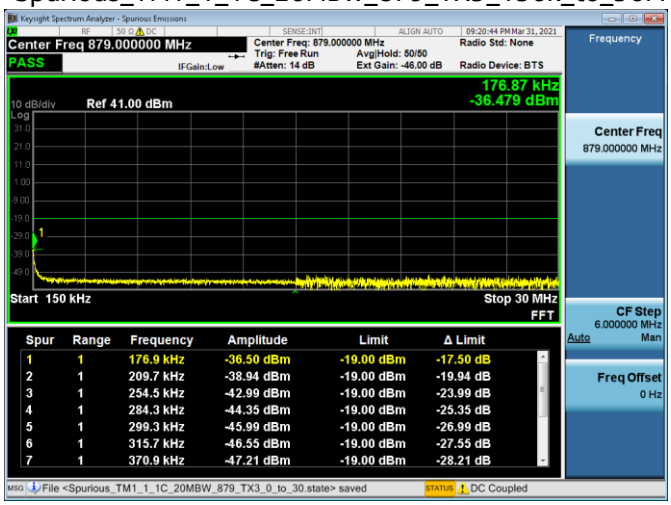
The required emission limitation is specified as appropriate in 22.917. The measured spurious emission levels were plotted for the frequency range as specified in 2.1057. There were no reportable emissions. Data below documents performance up to 10 GHz.

5.1.1 Spurious Emissions at Tx Port – Plots (Guardband)

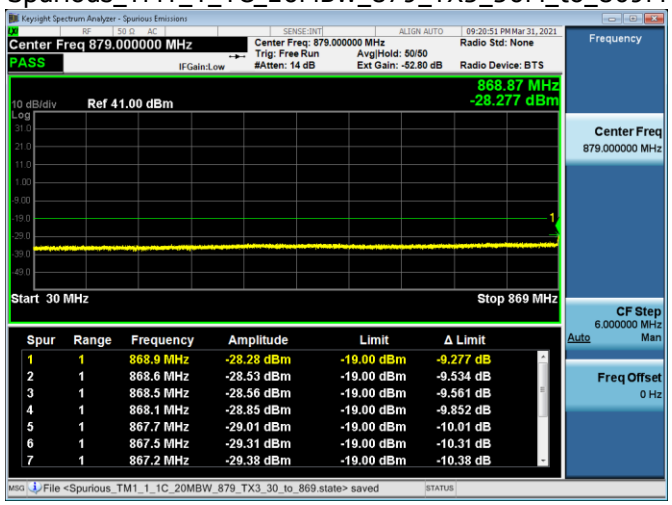
NOTE: Only a sample of the plots are used in this report. The full suite of raw data resides at the MH, New Jersey location.

Spurious_TM1_1_1C_20MBW_879_TX3_9k_to_150k

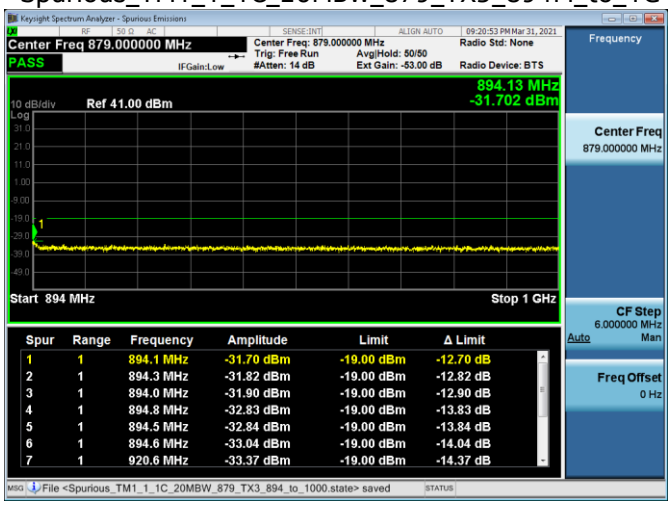
Spurious_TM1_1_1C_20MBW_879_TX3_150k_to_30M



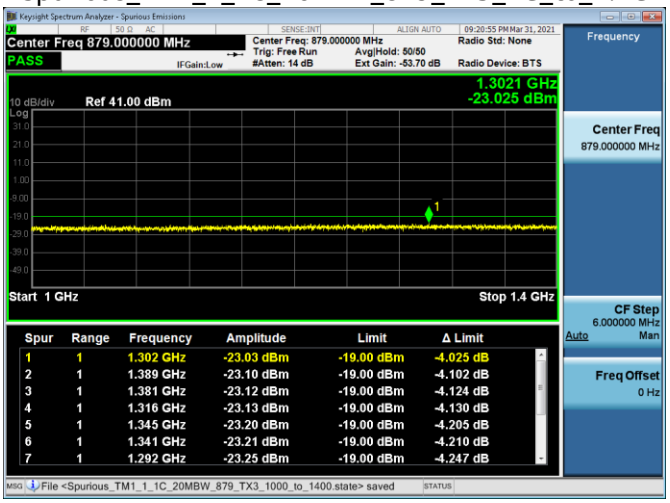
Spurious_TM1_1_1C_20MBW_879_TX3_30M_to_869M



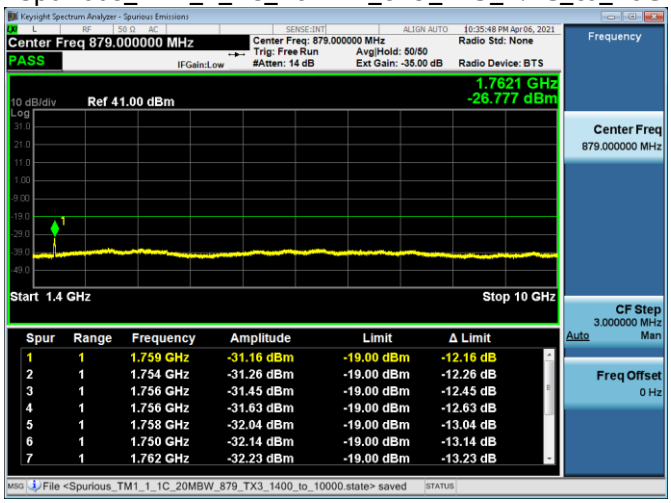
Spurious_TM1_1_1C_20MBW_879_TX3_894M_to_1G



Spurious_TM1_1_1C_20MBW_879_TX3_1G_to_1.4G



Spurious_TM1_1_1C_20MBW_879_TX3_1.4G_to_10G

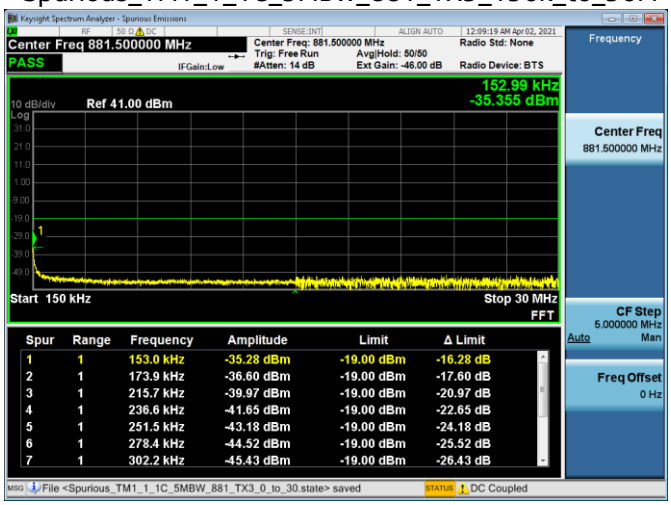


5.1.2 Spurious Emissions at Tx Port – Plots (Inband)

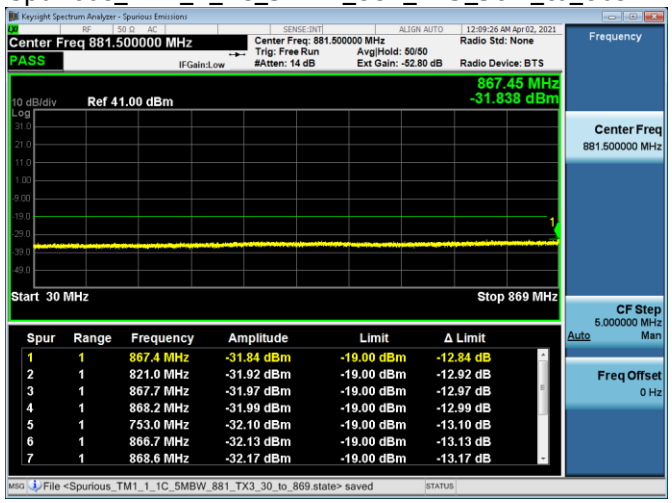
NOTE: Only a sample of the plots are used in this report. The full suite of raw data resides at the MH, New Jersey location.

Spurious_TM1_1_1C_5MBW_881_TX3_9k_to_150k

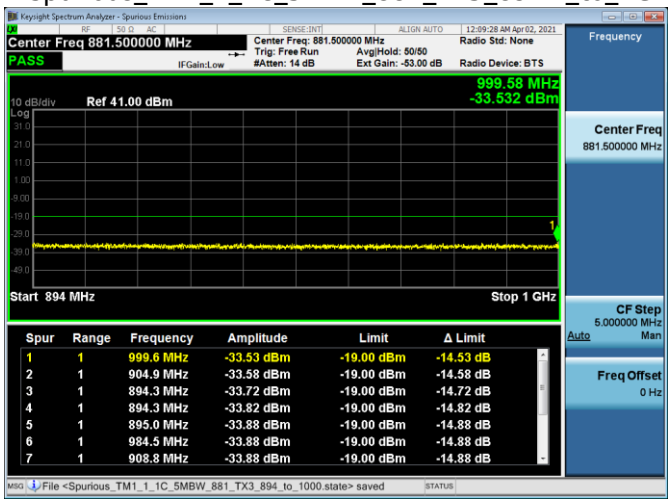
Spurious_TM1_1_1C_5MBW_881_TX3_150k_to_30M



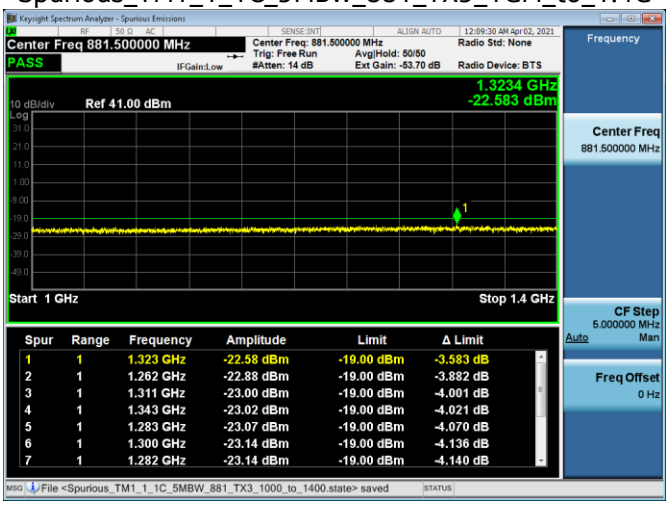
Spurious_TM1_1_1C_5MBW_881_TX3_30M_to_869Mk



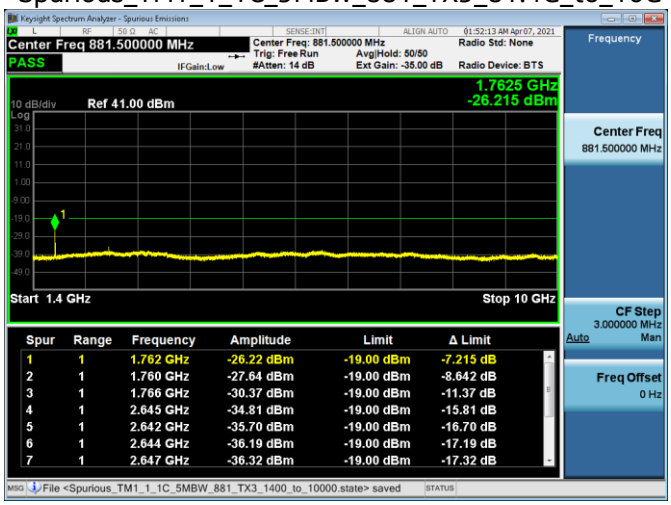
Spurious_TM1_1_1C_5MBW_881_TX3_894M_to_1G



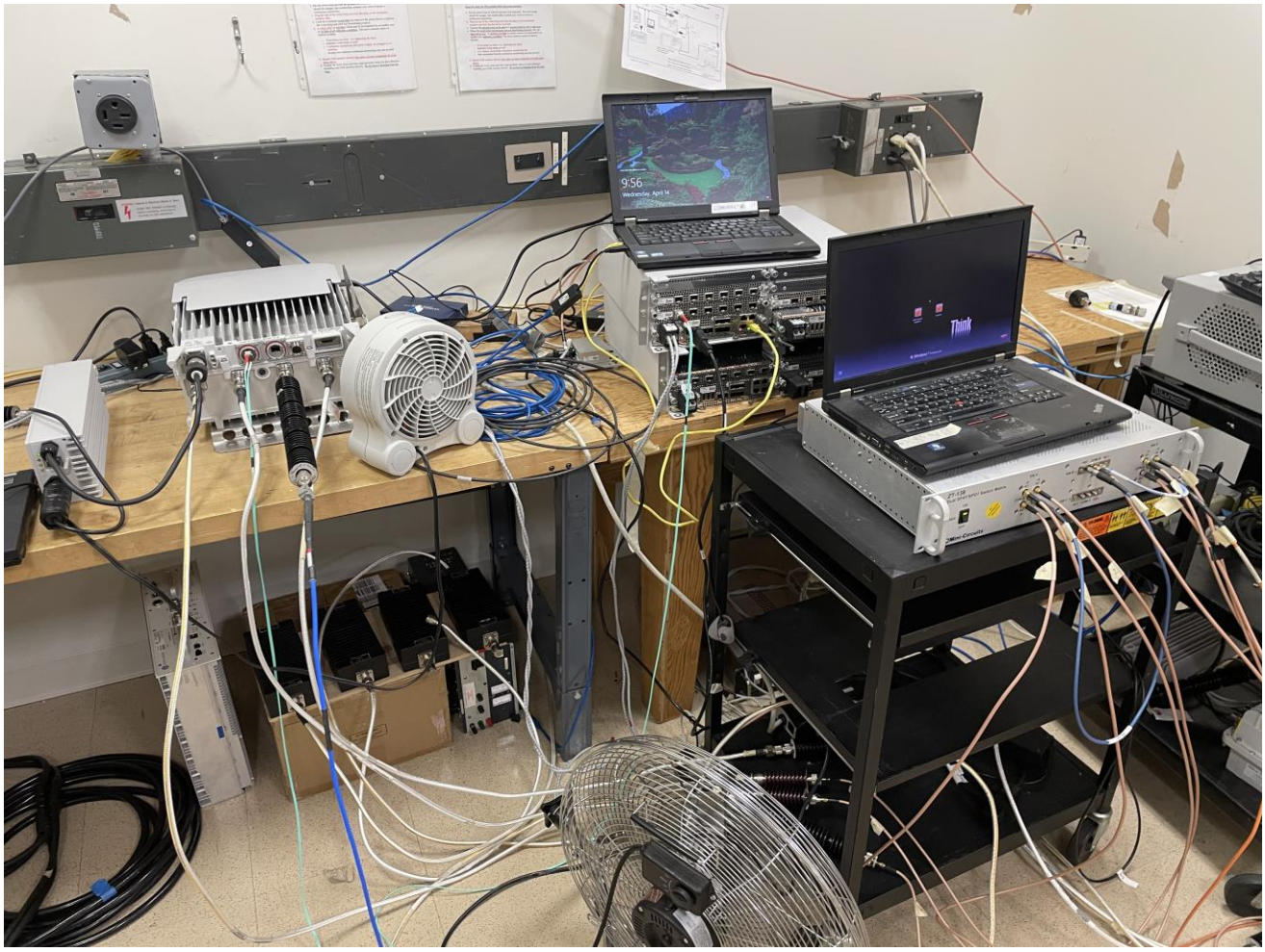
Spurious_TM1_1_1C_5MBW_881_TX3_1GM_to_1.4G



Spurious_TM1_1_1C_5MBW_881_TX3_81.4G_to_10G



Photographs



Test Equipment

Asset ID	Manufacturer	Type	Description	Model	Serial	Calibration Date	Calibration Due
E1218	KeySight Technologies	EMI Receiver	MXE EMI Receiver 26.5GHz	N9038A	MY54130037	2020-08-28	2022-08-28
E896	Network Analyzer	Agilent Technologies	N5230C	MY49000897	A	2021-03-03	2023-03-03
E1022	Weinschel	Attenuator	10dB DC-18GHz 25W	46-10-34-LIM	BN3118	CNR-V	CNR-V
E1043	Weinschel	Attenuator	30dB 50W DC-8.5GHz	24-30-43		CNR-V	CNR-V
E1344	Macom	Attenuator	3 dB, DC - 4 GHz, 2W	2082-6171-03	N/A	CNR-V	CNR-V
E1155	Weinschel	Attenuator	10dB 25W 0.05- 26GHz	74-10-12	1068	CNR-V	CNR-V
E1154	Weinschel	Attenuator	30dB 25W 0.05GHz-26GHz	74-30-12	1065	CNR-V	CNR-V
E1250	Weinschel	Attenuator	3dB Attenuator 100W	24-3-43	BB9072	CNR-V	CNR-V
E1251	Weinschel	Attenuator	0dB 150W DC-18GHz	66-30-33	BV1667	CNR-V	CNR-V
E1397	Trilithic	Filter, High Pass		4HC1350/9000-1-LK	200802162	CNR-V	CNR-V

CNR-V: Calibration Not Required; Must Be Verified

6. FCC Section 2.1053 - 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, 18 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.

6.2 Field Strength of Spurious Emissions - Limits

Sections 2.1053 and 22.917 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, 4th edition, IT&T Corp.

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

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

Where:
E = Field Intensity in Volts/meter P = Transmitted Power in Watts
R = Measurement distance in meters = 3 m

The Part 22 Limit is 82.23 dBµV/m at 3m and 91.77 dBµV/m at 1m
The Part 22 non-report level is 62.23 dBµV/m at 3m.

The calculated emission levels were found by:

Measured level (dBµV) + Cable Loss(dB)+Antenna Factor(dB) = Field Strength (dBµV/m)

RESULTS:

For compliance with 47CFR Parts 2 and 22, the field strength of any spurious radiation, measured at 3m, is required to be less than 82.23 dBµV/meter (82.23 @ 3m). Emissions equal to or less than 62.23 dBµV/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 10 GHz). No reportable spurious emissions were detected.

7. NVLAP Certificate of Accreditation

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

ilac-MRA

Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 100275-0

Nokia, Global Product Compliance Lab
Murray Hill, NJ

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Electromagnetic Compatibility & Telecommunications

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. 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).

2020-09-25 through 2021-09-30
Effective Dates

DEPARTMENT OF COMMERCE * UNITED STATES OF AMERICA *

For the National Voluntary Laboratory Accreditation Program