NOKIA Bell Labs

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TESTING
NVLAP LAB CODE: 100275-0

Title 47 Code of Federal Regulations Test Report

Regulation:
Title 47 CFR FCC Part 96

Client:
NOKIA SOLUTIONS AND NETWORKS, OY

Product Evaluated:
AWHQU AirScale Micro 4T4R n48 40W CBRS 20W

Report Number:
TR-2024-0038-FCC96

Date Issued:
June 19, 2024

Table of Contents

Revisions

Date	Revision	Section	Change
6/19/2024	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):	AWHQU AirScale Micro 4T4R n48 40W CBRS 20W
Serial Number:	Refer to Section 1.3.2
FCC ID:	2AD8UAWHQU01
Hardware Version:	Refer to Section 1.3.2
Software Version:	SBTS24R1
Frequency Range:	3550-3700 MHz
GPCL Project Number:	2024-0038
Manufacturer:	NOKIA SOLUTIONS AND NETWORKS, OY KARAKAARI 7, FI-02610 ESPOO FINLAND
Applicant:	NOKIA SOLUTIONS AND NETWORKS, OY 3201 Olympus Blvd Dallas, Texas 75019 Lee Klindenborg
Test Requirement(s):	Title 47 CFR Part96
Test Standards:	• Title 47 CFR Parts 2 and 96 • KDB 940660 D01 Certification And Test Procedures For Citizens Broadband Radio Service Devices Authorized Under Part 96, v03, Oct 29, 2020 • 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):	7/12/2023 – 6/5/2024
Test Performed By:	Nokia Global Product Compliance Laboratory 600-700 Mountain Ave. P.O. Box 636 Murray Hill, NJ 07974-0636 Test Site Number: US5302
Product Engineer(s):	Ron Remy
Lead Engineer:	Steve Gordon
Test Engineer (s):	Jaideep Yadav, Chris Polanco, Norberto Batista
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 **AWHQU AirScale Micro 4T4R n48 40W CBRS 20W**, hereinafter referred to as the Equipment Under Test (EUT).

1.2 Purpose and Scope

This document is to provide the testing data required for qualifying the EUT in compliance with FCC Part 96 measured in accordance with the procedures set out in Section 2.1033 (c) (14) of the Rules.

The AWHQU is an LTE-TDD (Long Term Evolution-Time Division Duplex) and 5G-NR transceiver which operates in Band 48 Citizens Broadband Radio Service (CBRS) spectrum (3550-3700 MHz) and it was previously certified under FCC ID: 2AD8UAWHQU01.

This Class II change will lower the LTE 10 MHz carrier power to a level compliant with the Power Spectral Density limit of 37 dBm/MHz. The 5G power on the Grant is increased since the power level did not reflect the correct maximum power for the 10 MHz signal during the initial certification. The power of the 10 MHz signal is well below the maximum power previously demonstrated for the product (343.6 W).

It supports the external antennas with a minimum gain of 4 dBi and a maximum gain of 18dBi.

1.3 EUT Details

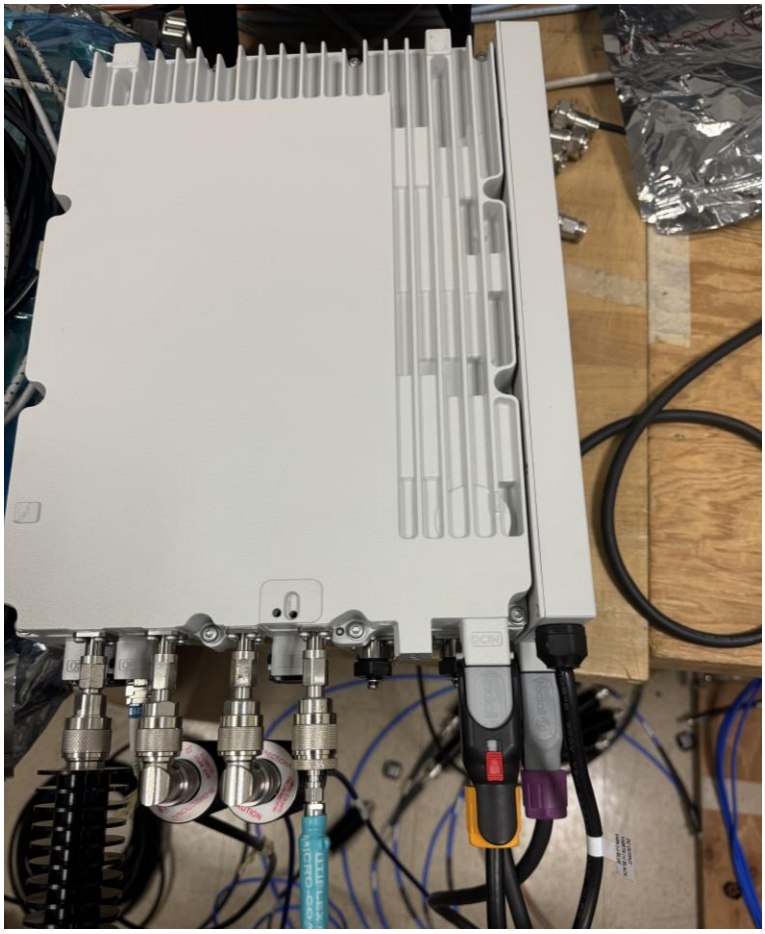
1.3.1 Specifications

Specification Items	Description
Product Type	AWHQU AirScale Micro 4T4R n48 40W CBRS 20W
Radio Type	Intentional Transceiver
CBSD Category	Category B CBSD Device
Power Type	DC: -48V
Modulation	QPSK, 16QAM, 64QAM and 256QAM
Operating Frequency Range	CBRS (Tx/Rx: 3550-3700 MHz)
Channel Bandwidth	LTE: 10 MHz 5G-NG: 10 MHz
Max Conducted Power (Rated)	Up to 4x5W (37.0 dBm)
Antenna Gain	Between 4 & 18 dBi Max
Operating Mode	4T4R

1.3.2 Photographs

RE Unit

Radio Test Unit



1.4 Test Requirements

Each required measurement is listed below:

47 CFR FCC Sections	Description of Tests	Test Required
2.1046, 96.41 (b) 96.41(g)	RF Power Output (b) Power Limits, EIRP, PSD (g) Peak-to-Average Power Ratio	Yes
2.1047, 96.41(a)	Modulation Characteristics	Yes
2.1049, 96.41(e)(2)(3)	(a) Occupied Bandwidth (b) Out-of-Band Emissions	Yes
2.1051, 96.41(e)	Spurious Emissions at Antenna Terminals	Yes
2.1053, 96.41(e)(2)(3)	Field Strength of Spurious Radiation	Yes
2.1055, 96.41(e)(2)(3)	Measurement of Frequency Stability	No*

*Previously Tested and Passed; Refer to GPCL Project 2023-0004.

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 96.
- KDB 940660 D01 Certification And Test Procedures For Citizens Broadband Radio Service Devices Authorized Under Part 96, v03, Oct 29, 2020
- 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, 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

1.7 Executive Summary

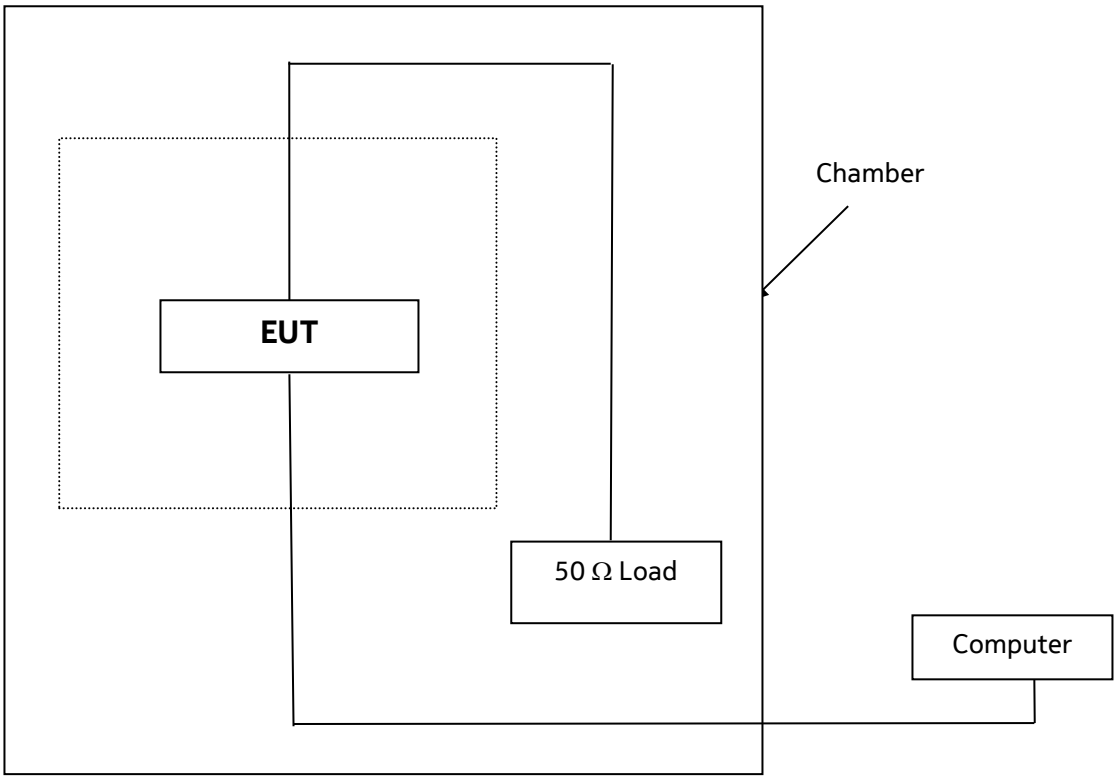
Requirement 47 CFR FCC Parts 2 and 96	Description of Tests	Result
2.1046, 96.41 (b) 96.41(g)	RF Power Output (b) Power Limits, EIRP, PSD (g) Peak-to-Average Power Ratio	COMPLIES
2.1047, 96.41(a)	Modulation Characteristics	COMPLIES
2.1049, 96.41(e)(2)(3)	(a) Occupied Bandwidth (b) Out-of-Band Emissions	COMPLIES
2.1051, 96.41(e)	Spurious Emissions at Antenna Terminals	COMPLIES
2.1053, 96.41(e)	Field Strength of Spurious Radiation	COMPLIES
2.1055	Measurement of 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 Radiated Measurement



2. FCC Section 2.1046 - RF Power Output and Power Spectral Density

2.1 RF Power Output

2.1.1 Limits

The FCC Part 96.41 requirement for Category B CBSD is that the Output Power of the EUT shall not exceed 47 dBm/10MHz EIRP.

2.1.2 Results

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.

The maximum RF conducted output power and EIRP for each configuration/operation mode using the minimum and maximum antenna gain are tabulated below and the results are all below FCC Part 96.41 maximum EIRP limit for Category B CBSD. Additional antenna types used with the product require conducted power to be reduced below maximum demonstrated for 4 dBi gain antenna by the difference in gain of that antenna minus 4 dBi. The results have demonstrated the compliance with FCC RF EIRP power output requirement.

Maximum Effective Isotropic Radiated Power (EIRP) 47 dBm/10MHz Compliance

Technology	Signal BW (MHz)	** Power Level (dBm)	TM	Modulation	Channel Frequency (MHz)	4 Port Max Total Power* (dBm)/ BW	Max Total Power Adjusted (dBm/10MHz)	Antenna Gain (dBi)	Total Product EIRP (dBm/10MHz)	EIRP Compliance
LTE	10	**Low/23.1**	3.2	QPSK/16QAM	3625	28.19	28.19	18	46.19	Pass
LTE	10	**High/36.5**	3.1a	256QAM	3695	42.13	42.13	4	**46.13**	Pass
5G-NR	10	**Low/22.8**	3.1	64QAM	3555	28.27	28.27	18	46.27	Pass
5G-NR	10	**High/36.4**	3.1	64QAM	3555	42.27	42.27	4	**46.27**	Pass

The conducted RF output power results measured for all configurations and operation modes supported are presented in the following sections. *Value from tables 2.1 – 2.4.

****Settings for all channels above cannot exceed the listed power.**

2.1.2.1 LTE, 10 MHz

Table 2.1 RF Power Output Results – Low

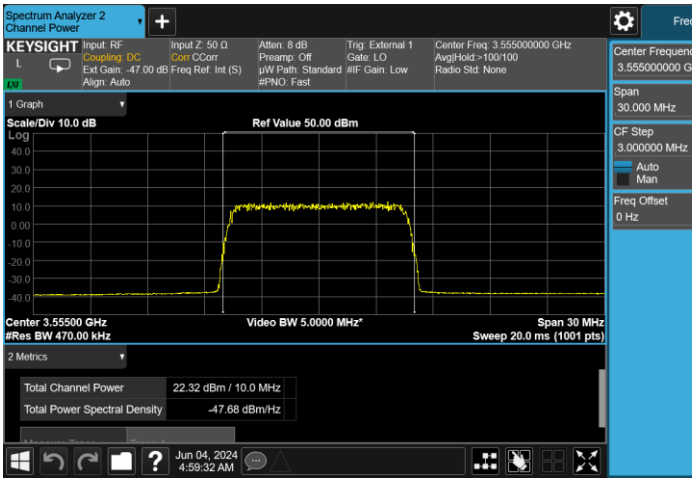
Channel Power - Signal BW 10MHz LTE					
Test Model 3.1 Modulation 64 QAM Channel Frequency 3555MHz **Power Setting – 22.7 dBm**		Test Model 3.2 Modulation QPSK/16QAM Channel Frequency 3625MHz **Power Setting – 23.1 dBm**		Test Model 3.1a Modulation 256QAM Channel Frequency 3695MHz **Power Setting – 22.8 dBm**	
TX Port	(dBm)	TX Port	(dBm)	TX Port	(dBm)
1	22.24	1	22.23	1	22.28
2	**22.32**	2	22.20	2	22.28
3	22.23	3	22.20	3	22.27
4	22.12	4	22.03	4	22.06
Total Power (dBm)	28.25	Total Power (dBm)	28.19	Total Power (dBm)	28.24
Total Power (W)	0.67	Total Power (W)	0.66	Total Power (W)	0.67

Table 2.2 RF Power Output Results – High

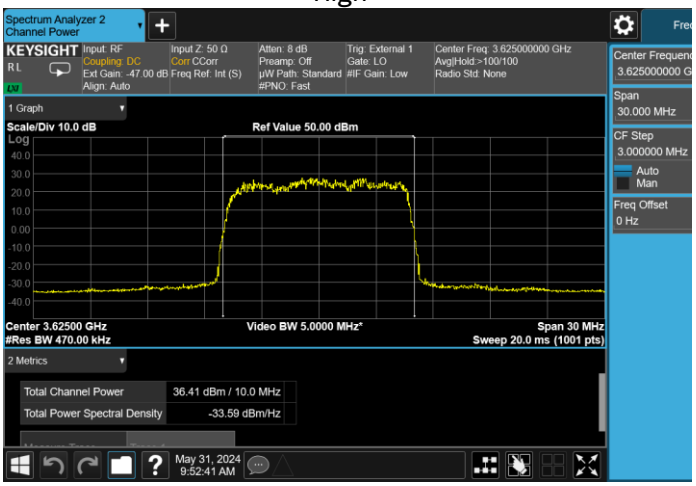
Channel Power - Signal BW 10MHz LTE					
Test Model 3.1 Modulation 64 QAM Channel Frequency 3555MHz **Power Setting – 36.2 dBm**		Test Model 3.2 Modulation QPSK/16QAM Channel Frequency 3625MHz **Power Setting – 36.6 dBm**		Test Model 3.1a Modulation 256QAM Channel Frequency 3695MHz **Power Setting – 36.5 dBm**	
TX Port	(dBm)	TX Port	(dBm)	TX Port	(dBm)
1	36.16	1	**36.41**	1	36.17
2	36.24	2	36.38	2	36.17
3	36.14	3	36.38	3	36.18
4	36.04	4	36.23	4	35.92
Total Power (dBm)	42.17	Total Power (dBm)	42.37	Total Power (dBm)	42.13
Total Power (W)	16.47	Total Power (W)	17.26	Total Power (W)	16.34

Maximum RF Conducted Output Power Plots

Low



High



2.1.2.2 5G-NR, 10 MHz

Table 2.3 RF Power Output Results – Low

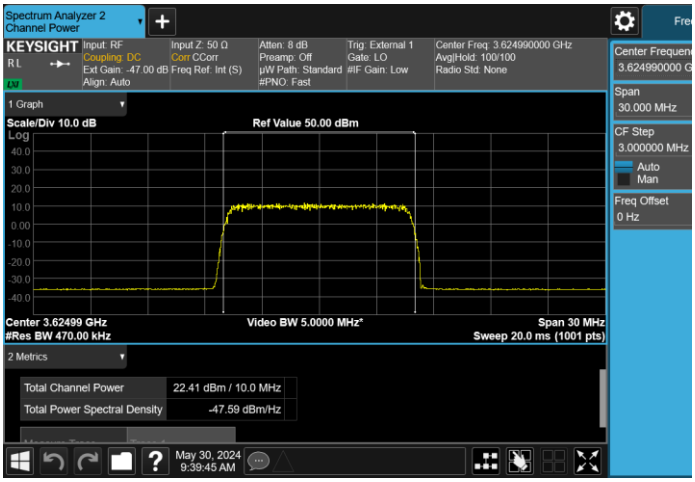
Channel Power - Signal BW 10MHz 5G-NR					
Test Model 3.1 Modulation 64 QAM Channel Frequency 3555MHz **Power Setting – 22.8 dBm**		Test Model1.1 Modulation QPSK Channel Frequency 3624.99MHz **Power Setting – 23.2 dBm**		Test Model 3.1a Modulation 256QAM Channel Frequency 3694MHz **Power Setting – 22.9 dBm**	
TX Port	(dBm)	TX Port	(dBm)	TX Port	(dBm)
1	22.27	1	**22.41**	1	22.33
2	22.33	2	22.37	2	22.32
3	22.24	3	22.37	3	22.31
4	22.14	4	22.21	4	22.08
Total Power (dBm)	28.27	Total Power (dBm)	28.36	Total Power (dBm)	28.28
Total Power (W)	0.67	Total Power (W)	0.69	Total Power (W)	0.67

Table 2.4 RF Power Output Results – High

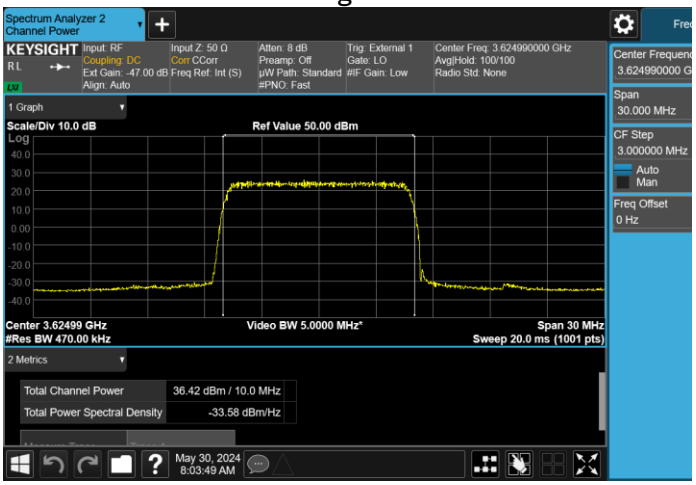
Channel Power - Signal BW 10MHz 5G-NR					
Test Model 3.1 Modulation 64 QAM Channel Frequency 3555MHz **Power Setting – 36.4 dBm**		Test Model 1.1 Modulation QPSK Channel Frequency 3624.99MHz **Power Setting – 36.8 dBm**		Test Model 3.1a Modulation 256QAM Channel Frequency 3694.995MHz **Power Setting – 36.6 dBm**	
TX Port	(dBm)	TX Port	(dBm)	TX Port	(dBm)
1	36.27	1	**36.42**	1	36.31
2	36.35	2	36.40	2	36.32
3	36.25	3	36.40	3	36.33
4	36.14	4	36.24	4	36.06
Total Power (dBm)	42.27	Total Power (dBm)	42.39	Total Power (dBm)	42.28
Total Power (W)	16.88	Total Power (W)	17.32	Total Power (W)	16.89

Maximum RF Conducted Output Power Plots

Low



High



2.2 Power Spectral Density

2.2.1 Limits

The FCC Part 96.41 requirement for Category B CBSD is that the Power Spectral Density (PSD) of the EUT shall not exceed 37 dBm/MHz.

2.2.2 Results

The peak average PSD of the EUT was measured per ANSI C63.26 methods and procedures and with the PSD Measurement feature of the MXA Analyzer. The PSD was measured when the product was set to each power setting for the bandwidths being measured at the antenna transmitting terminals. The signal bandwidths, modulations and transmit channels identified in Table below were evaluated. The measured power spectral density level was documented in the table below.

The Maximum Average PSD Values are bolded in each Table.

Table 2.5 LTE Power Spectral Density Results

Technology	Signal BW (MHz)	Power Level (dBm)	TM	Modulation	Channel Frequency (MHz)	TX	Peak PSD (1Port) dBm/1MHz	Peak PSD (4Port) dBm/1MHz	Antenna Gain	Total PSD dBm/1MHz	PSD Compliance
LTE	10	Low	1.1	QPSK	3555	1	12.97	19.01	18	37.01	Pass
LTE	10	Low	1.1	QPSK	3555	2	**13.07**				
LTE	10	Low	1.1	QPSK	3555	3	12.96				
LTE	10	Low	1.1	QPSK	3555	4	12.96				
LTE	10	Low	1.1	QPSK	3625	1	12.90	18.87	18	36.87	Pass
LTE	10	Low	1.1	QPSK	3625	2	12.90				
LTE	10	Low	1.1	QPSK	3625	3	12.87				
LTE	10	Low	1.1	QPSK	3625	4	12.71				
LTE	10	Low	1.1	QPSK	3695	1	12.96	18.91	18	36.91	Pass
LTE	10	Low	1.1	QPSK	3695	2	12.94				
LTE	10	Low	1.1	QPSK	3695	3	12.96				
LTE	10	Low	1.1	QPSK	3695	4	12.70				
LTE	10	High	1.1	QPSK	3555	1	26.88	32.90	4	36.90	Pass
LTE	10	High	1.1	QPSK	3555	2	27.00				
LTE	10	High	1.1	QPSK	3555	3	26.87				
LTE	10	High	1.1	QPSK	3555	4	26.77				
LTE	10	High	1.1	QPSK	3625	1	27.00	32.95	4	36.95	Pass
LTE	10	High	1.1	QPSK	3625	2	26.97				
LTE	10	High	1.1	QPSK	3625	3	26.94				
LTE	10	High	1.1	QPSK	3625	4	26.79				
LTE	10	High	1.1	QPSK	3695	1	26.98	32.98	4	36.98	Pass
LTE	10	High	1.1	QPSK	3695	2	**27.03**				
LTE	10	High	1.1	QPSK	3695	3	**27.03**				
LTE	10	High	1.1	QPSK	3695	4	26.80				

Tolerance Level : ±1dB

Table 2.6 5G-NR Power Spectral Density Results

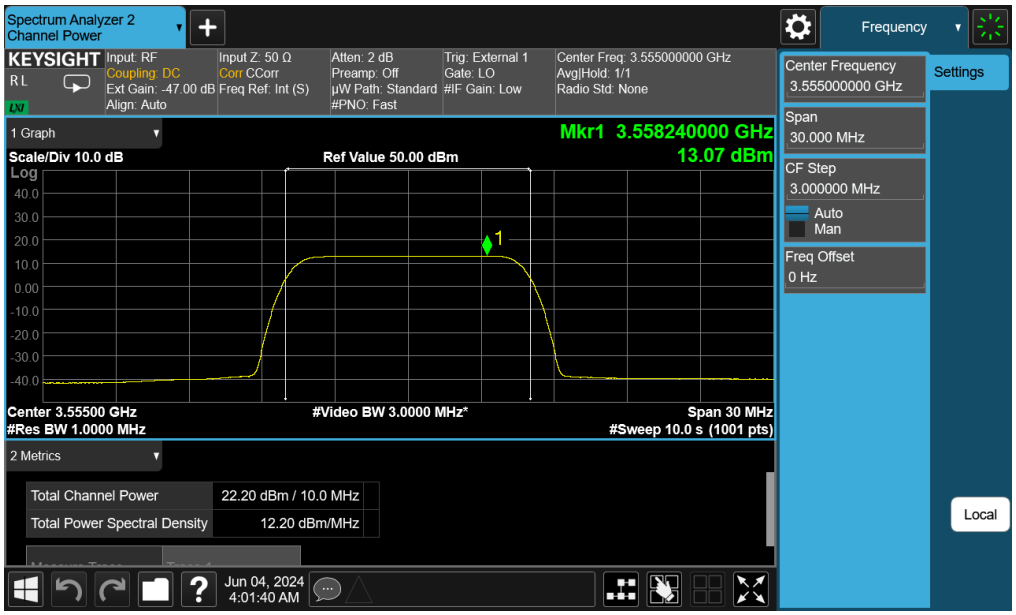
Technology	Signal BW (MHz)	Power Level (dBm)	TM	Modulation	Channel Frequency (MHz)	TX	Peak PSD (1Port) dBm/1MHz	Peak PSD (4Port) dBm/1MHz	Antenna Gain	Total PSD dBm/1MHz	PSD Compliance
5G-NR	10	Low	1.1	QPSK	3555	1	12.91	18.90	18	36.90	Pass
5G-NR	10	Low	1.1	QPSK	3555	2	**12.99**				
5G-NR	10	Low	1.1	QPSK	3555	3	12.86				
5G-NR	10	Low	1.1	QPSK	3555	4	12.77				
5G-NR	10	Low	1.1	QPSK	3624.99	1	12.98	18.94	18	36.94	Pass
5G-NR	10	Low	1.1	QPSK	3624.99	2	12.96				
5G-NR	10	Low	1.1	QPSK	3624.99	3	12.94				
5G-NR	10	Low	1.1	QPSK	3624.99	4	12.78				
5G-NR	10	Low	1.1	QPSK	3694	1	12.91	18.90	18	36.90	Pass
5G-NR	10	Low	1.1	QPSK	3694	2	12.94				
5G-NR	10	Low	1.1	QPSK	3694	3	12.93				
5G-NR	10	Low	1.1	QPSK	3694	4	12.72				
5G-NR	10	High	1.1	QPSK	3555	1	26.88	32.90	4	36.90	Pass
5G-NR	10	High	1.1	QPSK	3555	2	26.98				
5G-NR	10	High	1.1	QPSK	3555	3	26.87				
5G-NR	10	High	1.1	QPSK	3555	4	26.78				
5G-NR	10	High	1.1	QPSK	3624.99	1	**27.00**	32.96	4	36.96	Pass
5G-NR	10	High	1.1	QPSK	3624.99	2	26.98				
5G-NR	10	High	1.1	QPSK	3624.99	3	26.96				
5G-NR	10	High	1.1	QPSK	3624.99	4	26.81				
5G-NR	10	High	1.1	QPSK	3694.995	1	26.90	32.91	4	36.91	Pass
5G-NR	10	High	1.1	QPSK	3694.995	2	26.96				
5G-NR	10	High	1.1	QPSK	3694.995	3	26.97				
5G-NR	10	High	1.1	QPSK	3694.995	4	26.74				

2.2.3 Maximum Conducted PSD Plots

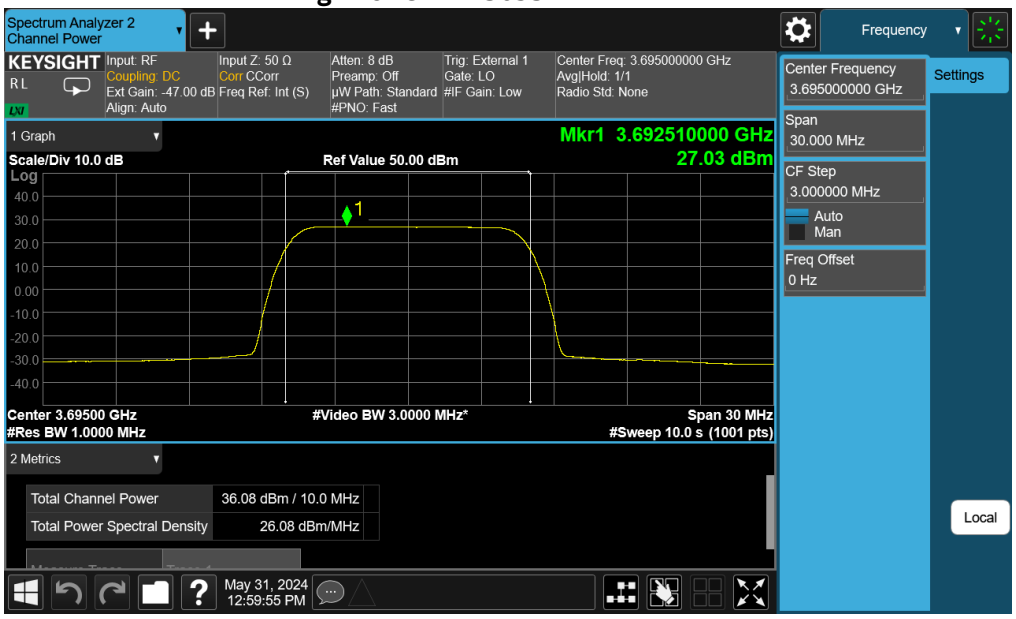
NOTE: Only a sample of the plots are used in this report. The full suite of raw data resides at the MH, New Jersey location.

2.2.3.1 LTE, 10 MHz

Low Power 3555MHz TX2

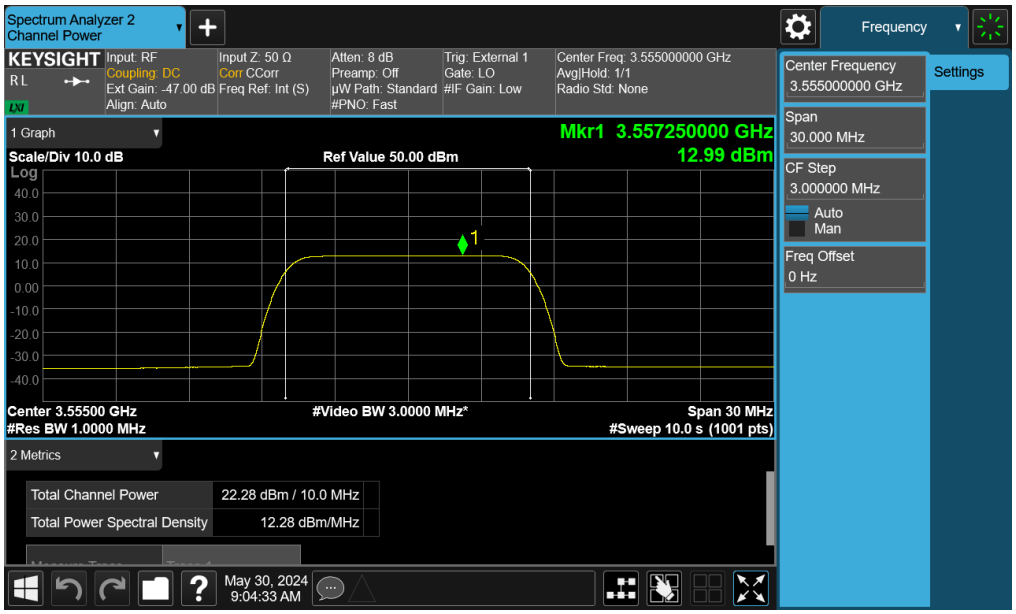


High Power 3695MHz TX2

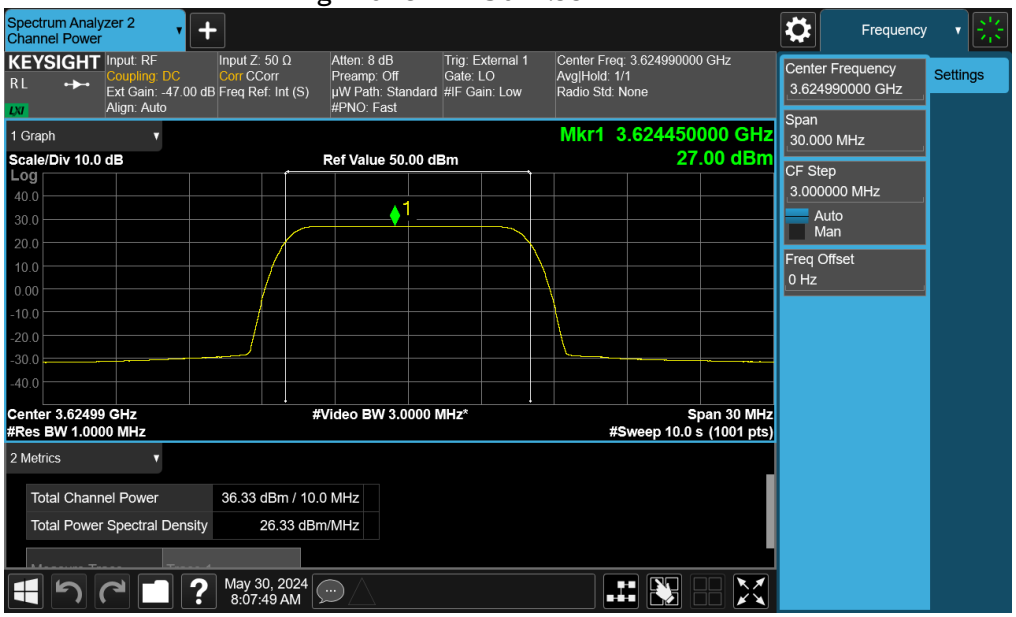


2.2.3.2 5G-NR, 10 MHz

Low Power 3555MHz TX2



High Power 3624.99MHz TX1



2.3 Peak-to-Average Power Ratio (PAPR)

The Peak-to-Average Power Ratio (PAPR) of the EUT was measured per KDB 971168 D01 using the Power Complementary Cumulative Distribution Function (CCDF) feature of the MXA Analyzer. The PAPR measurements are tabulated in Table 2.16.

The FCC requirement for PAPR is that the transmitter's peak-to-average power ratio (PAPR) shall not exceed 13 dB for more than 0.1% of the time using a signal corresponding to the highest PAPR during periods of continuous transmission. The maximum PAPR value for each measured configuration is given in Table 2.16.

2.3.1 Peak-to-Average Power Ratio Result

The maximum Peak-to-Average Power Ratio (PAPR) of the EUT measured at its antenna transmitting terminals was measured to be 8.11dB maximum, which is in full compliance with the requirement to not exceed 13 dB as specified by the FCC. The representative data sets exact values are listed in Table 2.16 below.

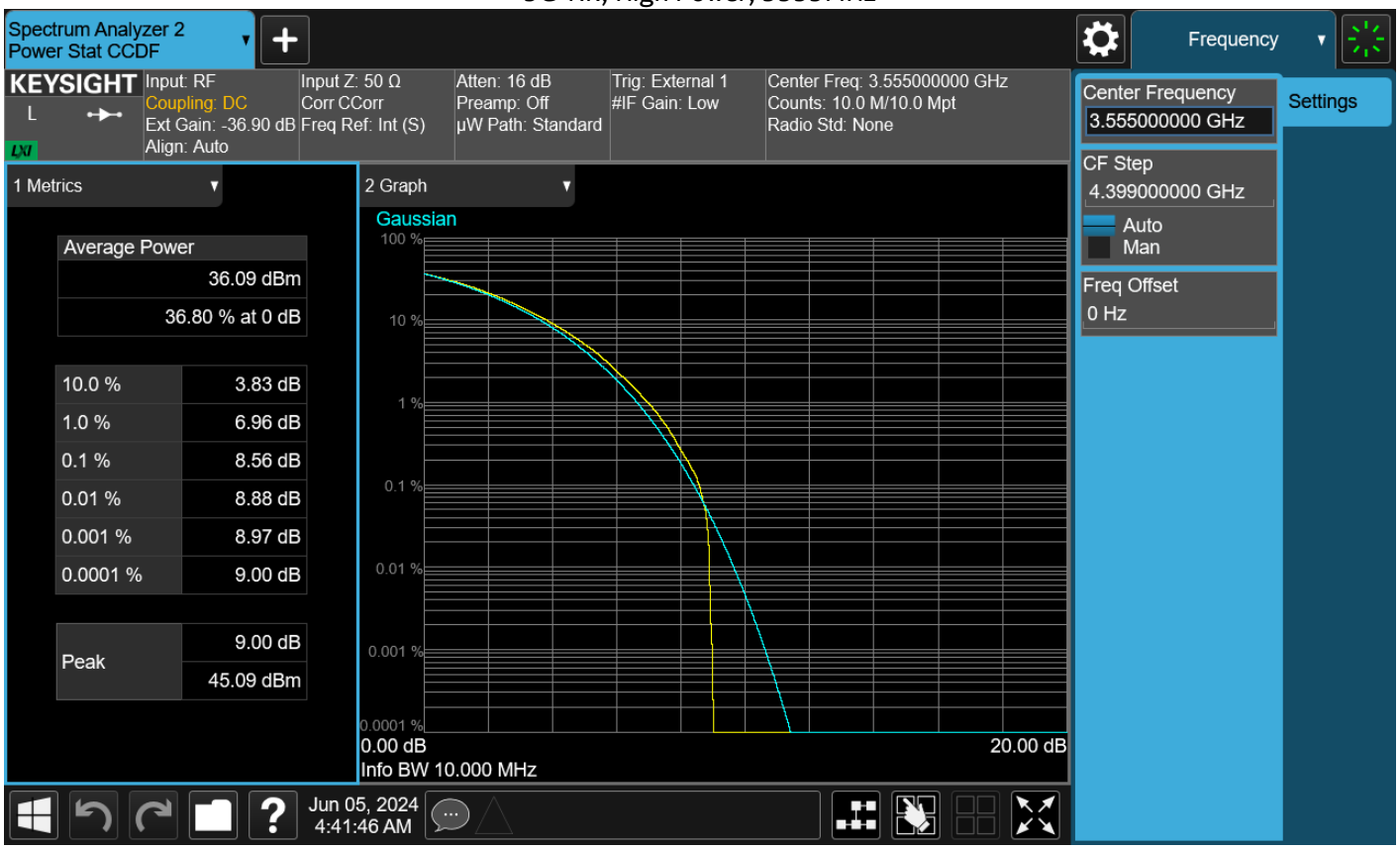
Table 2.21 Peak to Average Power Ratio

Technology	Signal BW (MHz)	Power Level (dBm)	TM	Modulation	Channel Frequency (MHz)	TX	PAR at 0.1% Limit - 13 dB
LTE	10	High	3.1	64QAM	3555	1	8.21
LTE	10	High	3.2	QPSK/16QAM	3625	1	8.10
LTE	10	High	3.1a	256QAM	3695	1	8.17
5G-NR	10	High	3.1	64QAM	3555	1	**8.56**
5G-NR	10	High	1.1	QPSK	3624.99	1	8.29
5G-NR	10	High	3.1a	256QAM	3694.995	1	8.44

2.3.2 Peak-to-Average Power Ratio Plot

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

5G-NR, High Power, 3555MHz



3. FCC Section 2.1047 - Modulation Characteristics

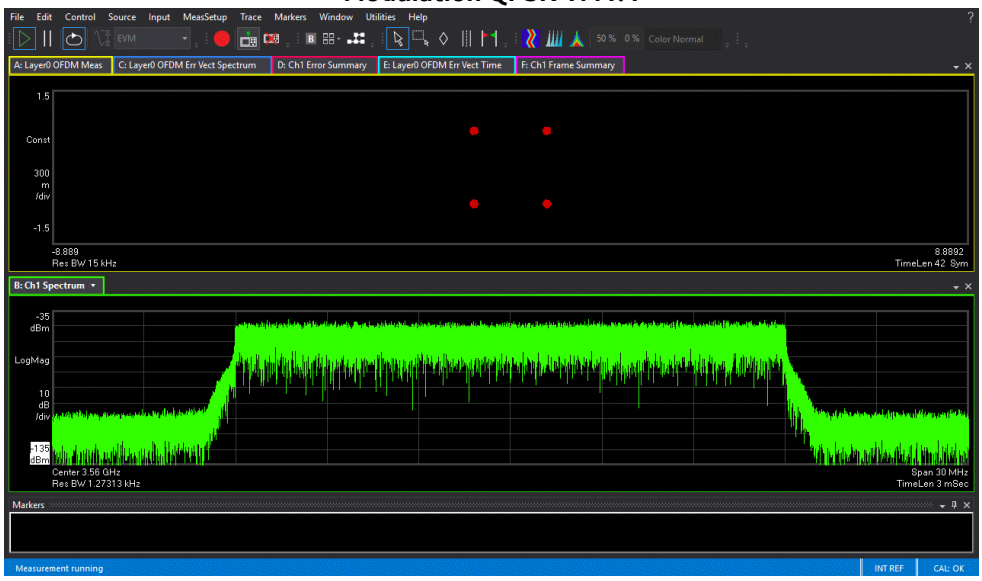
3.1 Modulation Characteristics

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

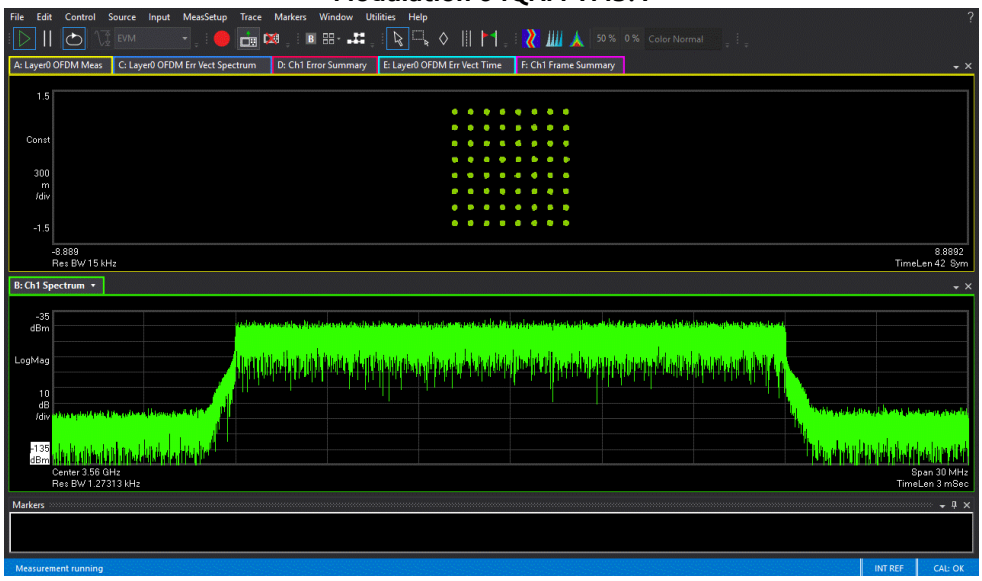
3.1.1 Modulation Characteristics – Plots

LTE

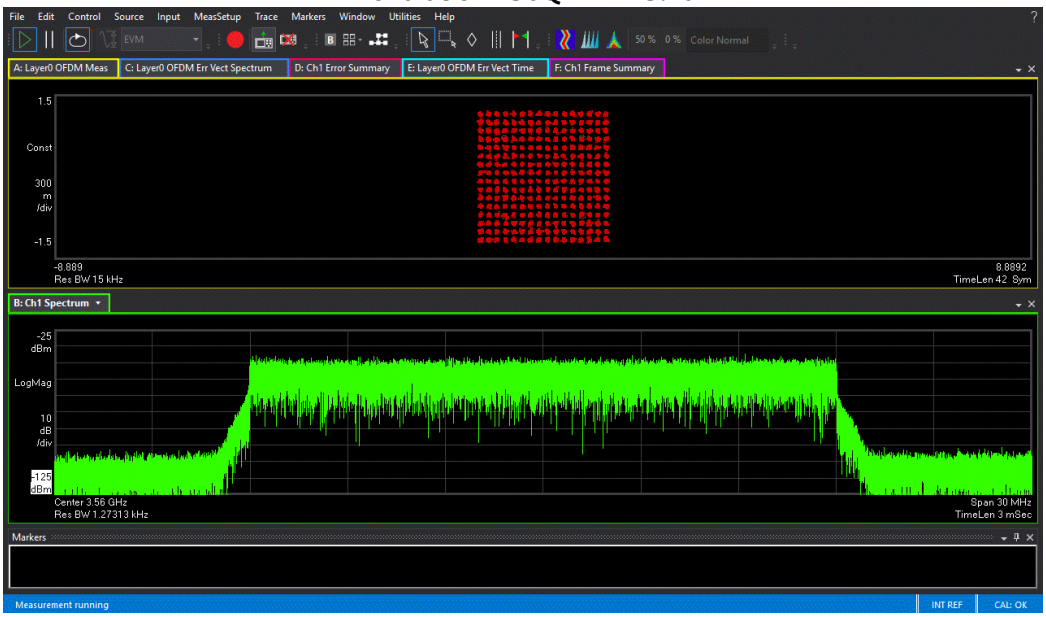
Modulation QPSK TM1.1



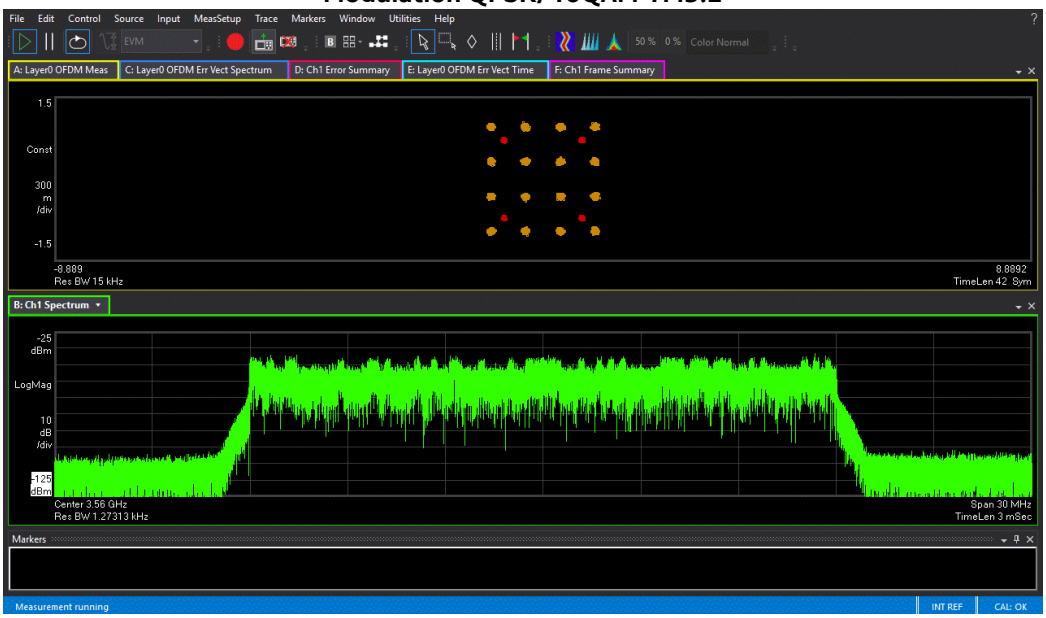
Modulation 64QAM TM3.1



Modulation 256QAM TM3.1a

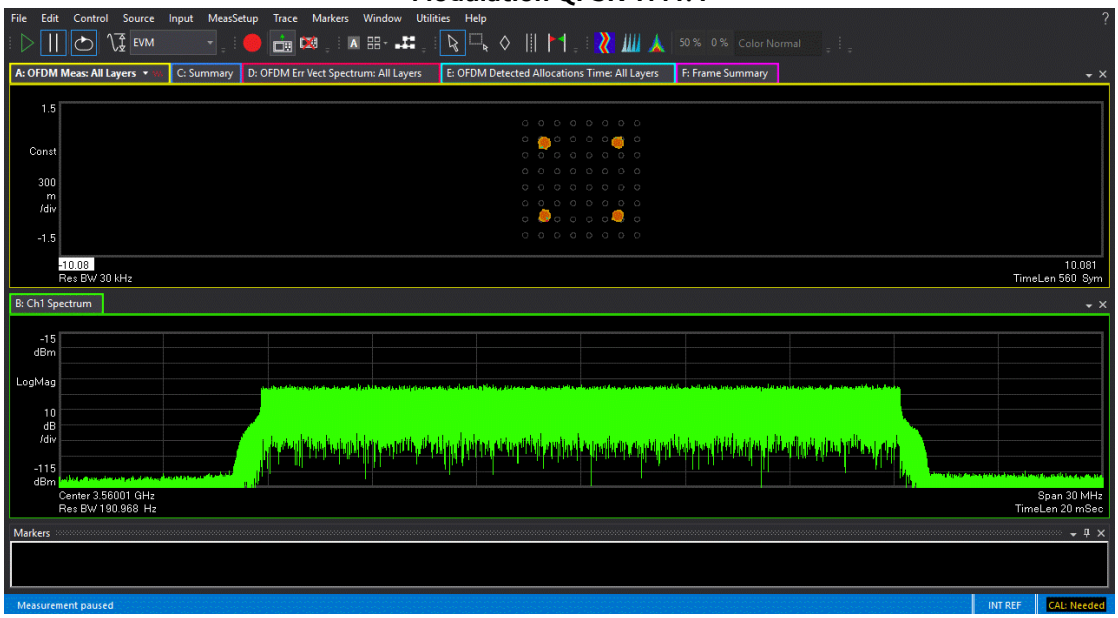


Modulation QPSK/16QAM TM3.2

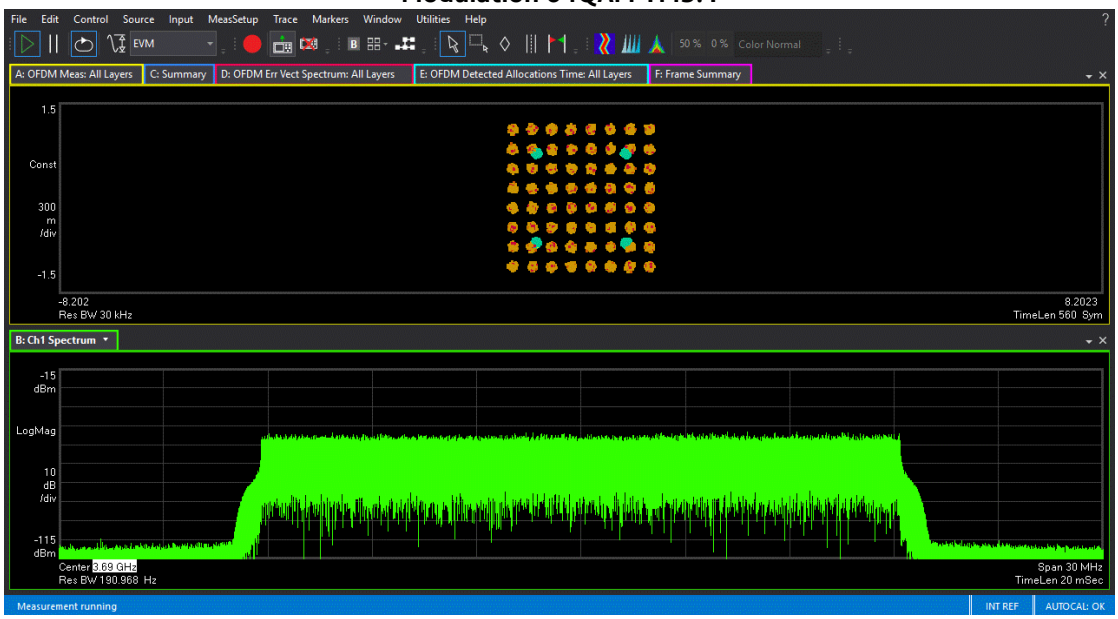


5G-NR

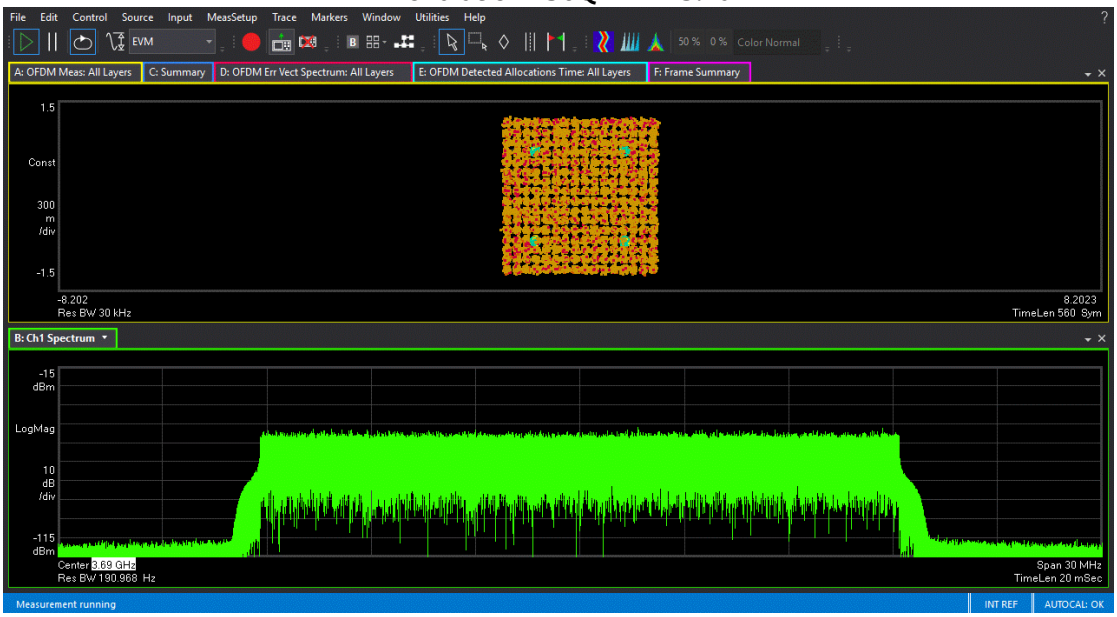
Modulation QPSK TM1.1



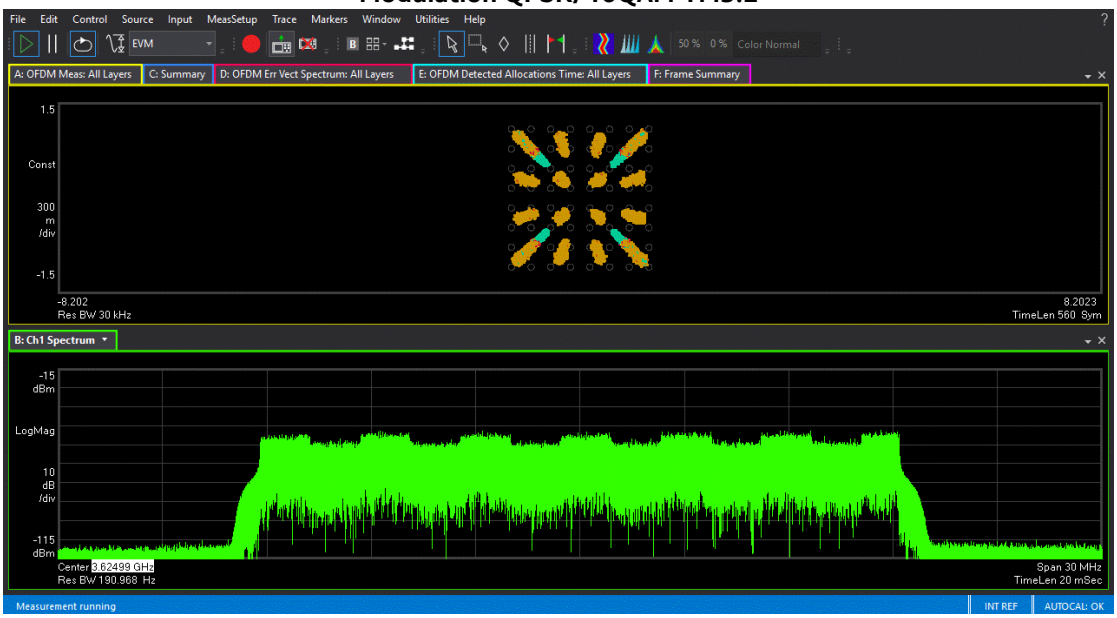
Modulation 64QAM TM3.1



Modulation 256QAM TM3.1a



Modulation QPSK/16QAM TM3.2



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.

Part 96.41e(3) specified that the fundamental emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

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

4.1.1 Occupied Bandwidth – Result

4.1.1.1 99% Occupied Bandwidth Result

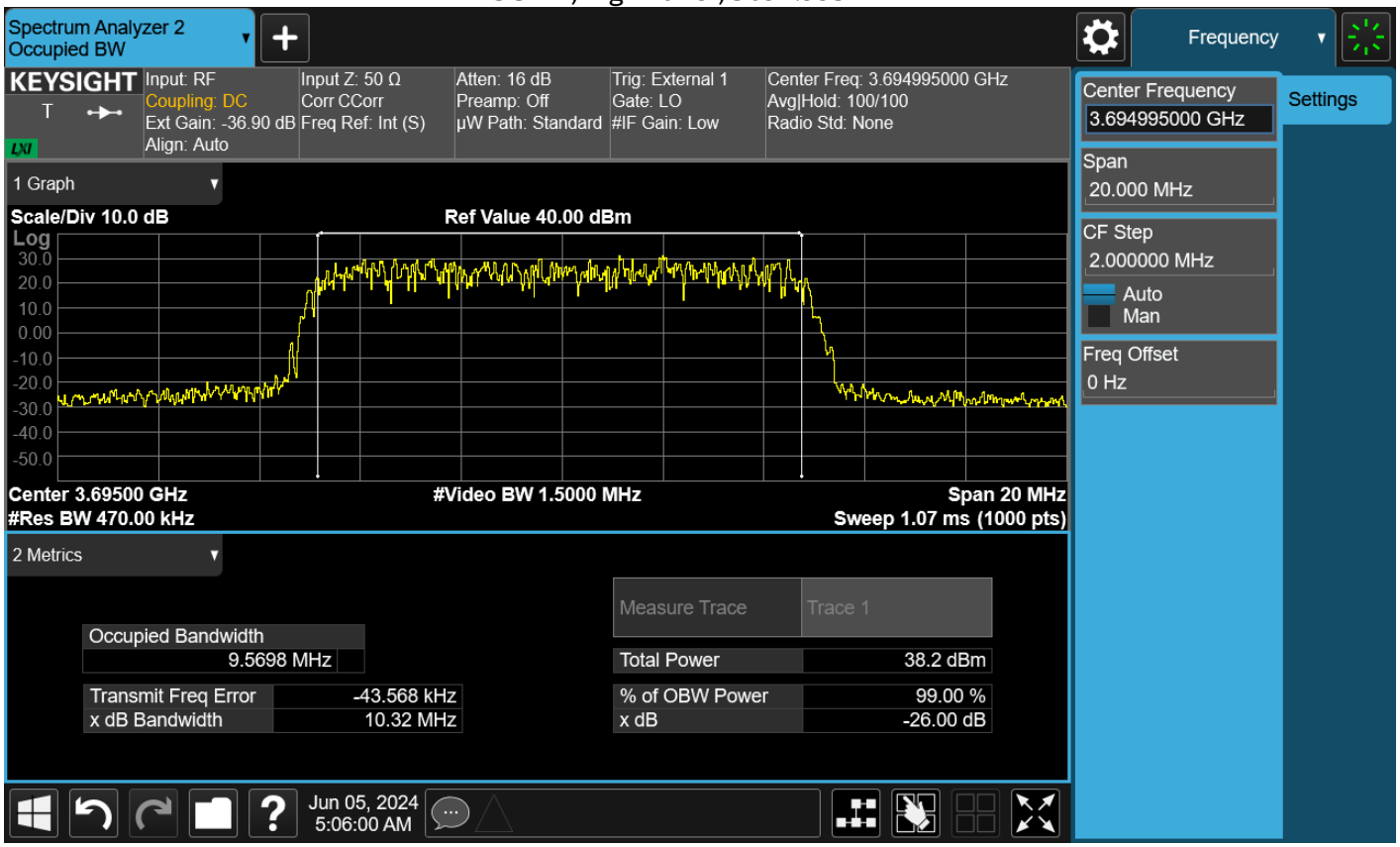
99% Occupied Bandwidth

Technology	Signal BW (MHz)	Power Level (dBm)	TM	Modulation	Channel Frequency (MHz)	TX	99% Occupied BW (MHz)
LTE	10	High	3.1	64QAM	3555	1	9.1018
LTE	10	High	3.2	QPSK/16QAM	3625	1	9.2678
LTE	10	High	3.1a	256QAM	3695	1	9.1429
5G-NR	10	High	3.1	64QAM	3555	1	9.3577
5G-NR	10	High	1.1	QPSK	3624.99	1	9.3606
5G-NR	10	High	3.1a	256QAM	3694.995	1	**9.5698**

4.1.2 Occupied Bandwidth – Plots

NOTE: Only the plots which give the widest bandwidth for each configuration evaluated are used in this report. The full suite of raw data resides at the MH, New Jersey location.

5G-NR, High Power, 3694.995 MHz



4.2 Edge of band Emissions

47CFR 96.41 (e)(1) (i) (2) and KDB 940660 D01 Section 3.2 (b)(6) specified that the limits for the emissions outside the fundamental are as follows.

- within 0 MHz to 10 MHz above and below the assigned channel $\leqslant$ −13 dBm/MHz,
- greater than 10 MHz above and below the assigned channel $\leqslant$ −25 dBm/MHz,
- any emission below 3530 MHz and above 3720 MHz $\leqslant$ −40 dBm/MHz.

47CFR 96.41 (e)(3) and KDB 940660 D01 Section 3.2 (b)(6) specified stated that (i) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's authorized frequency channel, a resolution bandwidth of no less than one percent of the fundamental emission bandwidth may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full reference bandwidth (*i.e.,* 1 MHz or 1 percent of emission bandwidth, as specified). The fundamental emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. (ii) When measuring unwanted emissions to demonstrate compliance with the limits, the CBSD and End User Device nominal carrier frequency/channel shall be adjusted as close to the licensee's authorized frequency block edges, both upper and lower, as the design permits. (iii) Compliance with emission limits shall be demonstrated using either average (RMS)-detected or peak-detected power measurement techniques.

KDB 940660 D01 Section 3.2 (b)(6) specified that measurements must be performed for low, mid, and high channels. It is acceptable to apply the procedures in Section 5.7 of ANSI C63.26-2015. When antenna-port conducted measurements are performed to demonstrate compliance to the applicable unwanted emission limits (Section 2.1051), a separate radiated measurement is required to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation (Section 2.1053). The Section 96.41(e) limits generally also apply to radiated unwanted 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 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.

OOBE mask limit was created using the following sample calculation:
Limits:

Within 0-1MHz: -13dBm/1%EBW
Within 1-10MHz: -13dBm/MHz
Within >10: -25dBm/MHz

For 10MHz Carriers with 4 ports, the limits at one port:

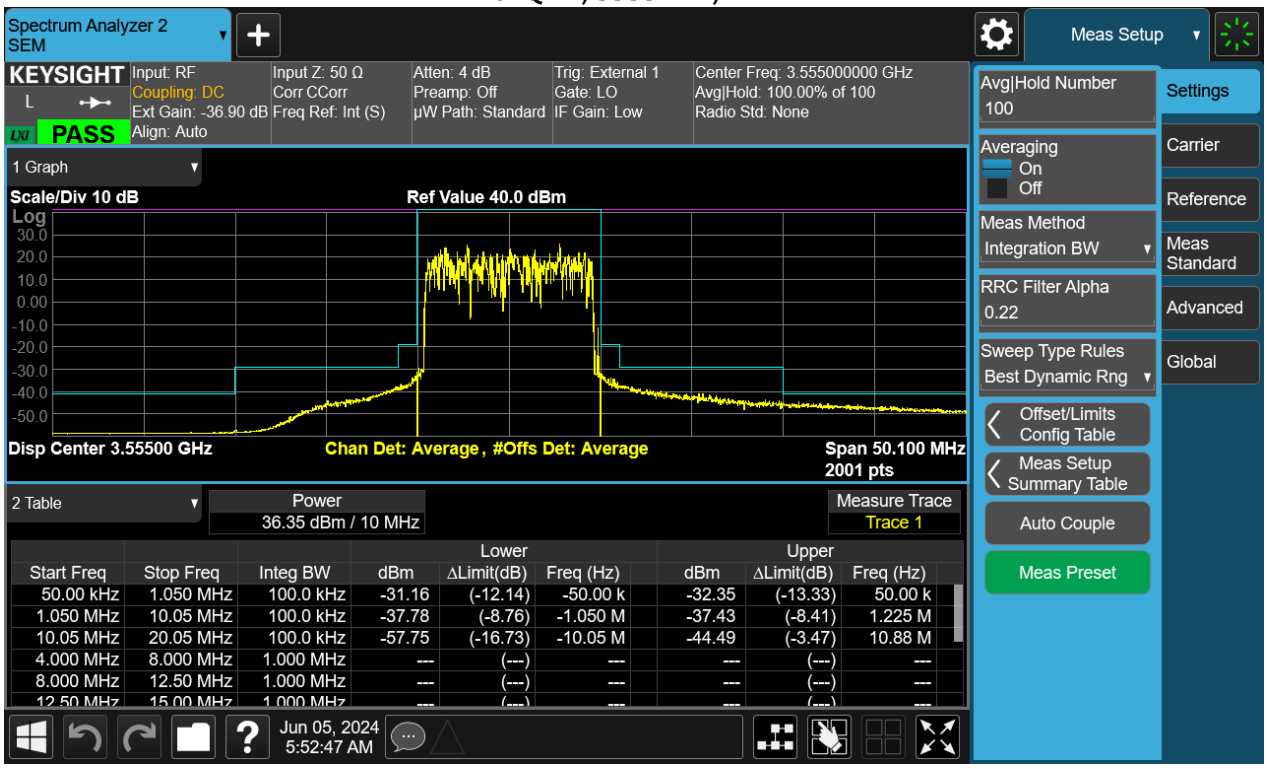
Within 0-1MHz: -13dBm/1%EBW=> -19dBm/100kHz
Within 1-10MHz: -13dBm/MHz => -29dBm/100kHz
Within >10: -25dBm/MHz => -41dBm/100kHz

4.2.1 Edge of Band Emissions - Plots.

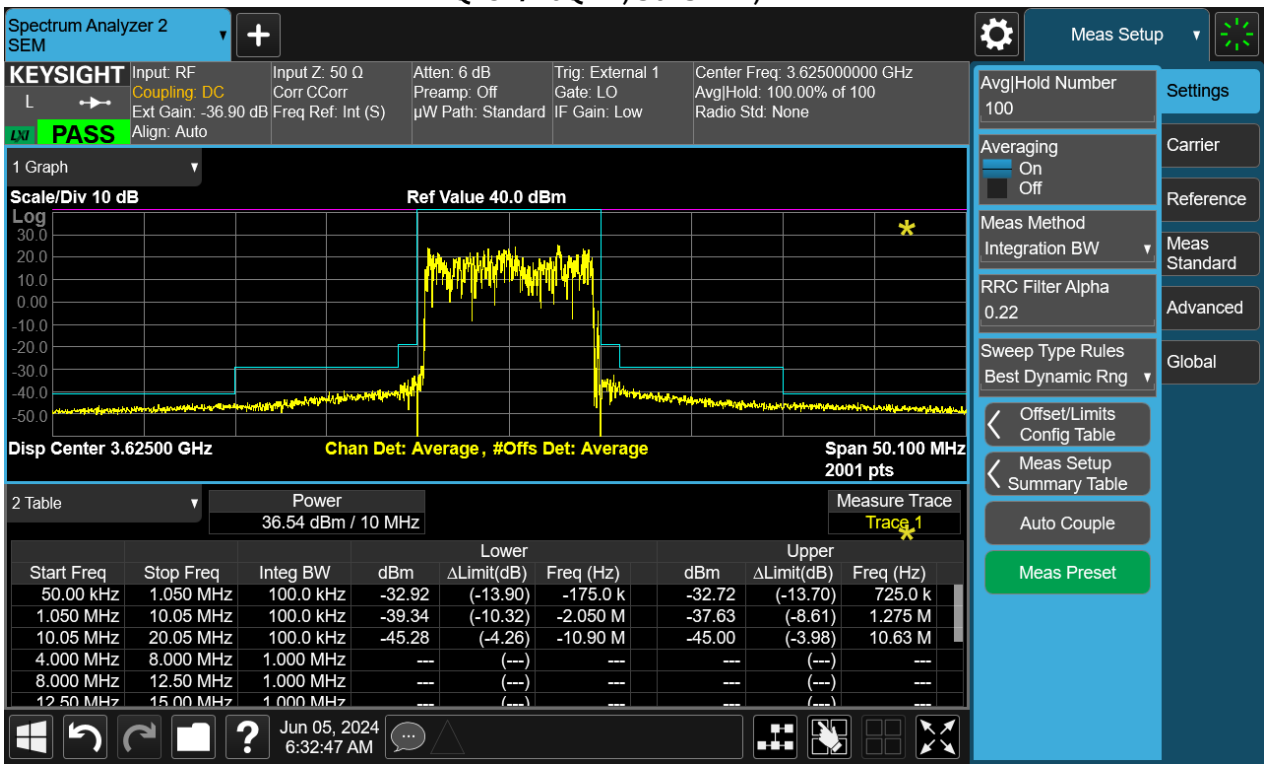
All of the measurements met the requirements of Part 96.41(e)(1) and KDB 940660 D01 Section 3.2 (b)(6) when measured per Part 2.1049.

4.2.1.1 LTE, 10MHz, High Power

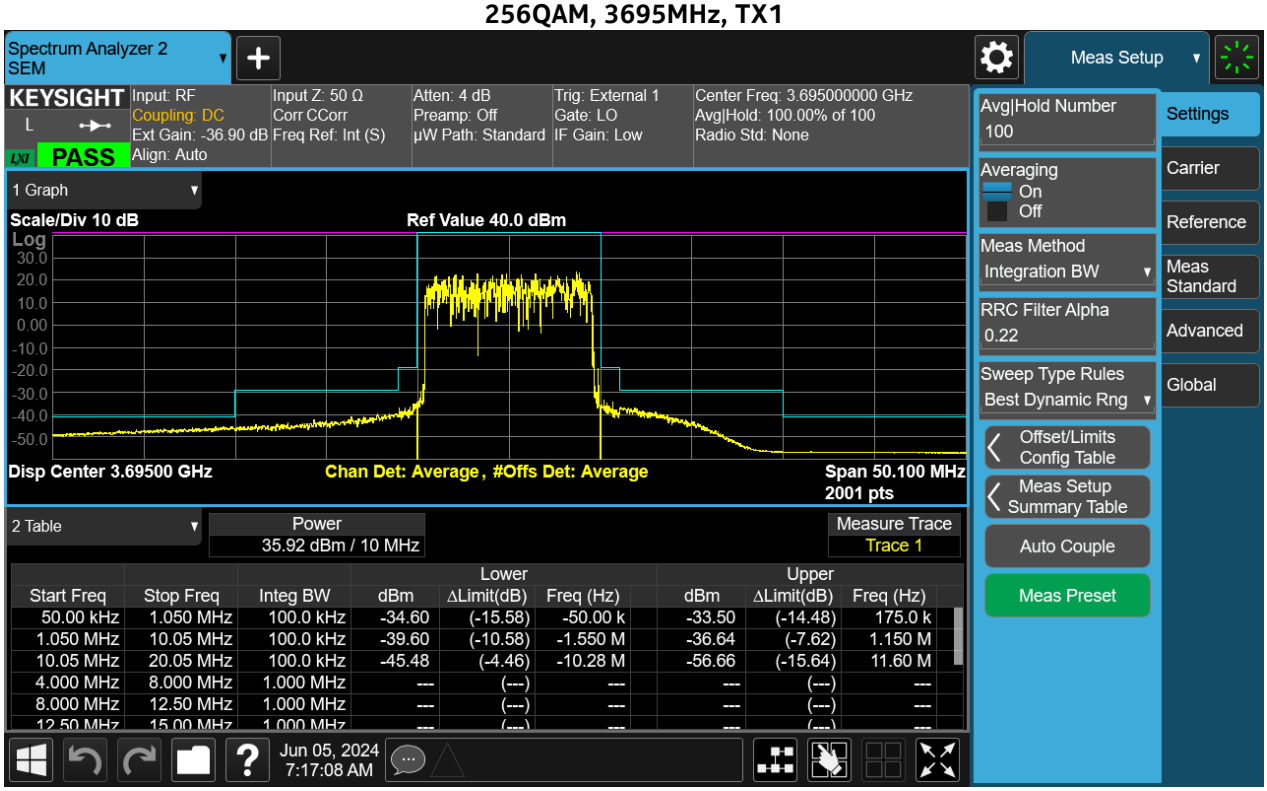
64QAM, 3555MHz, TX1



QPSK/16QAM, 3625MHz, TX1

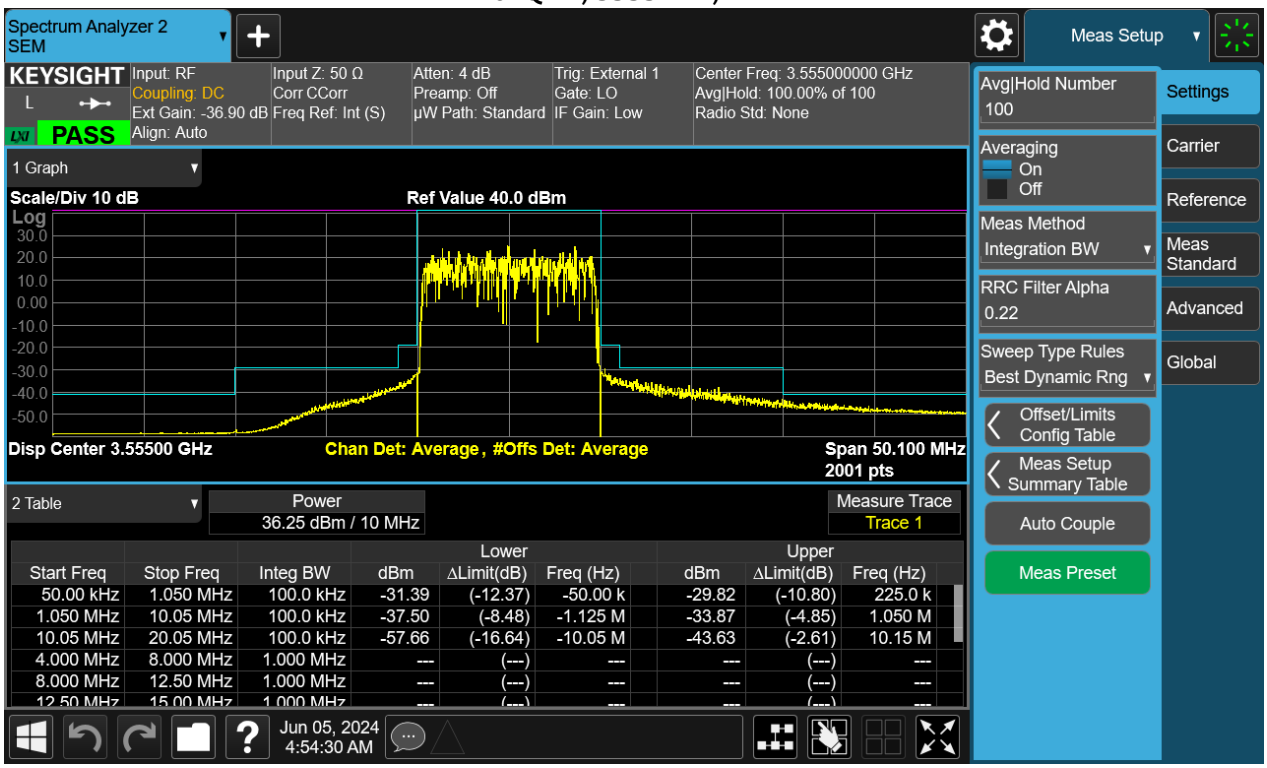


256QAM, 3695MHz, TX1

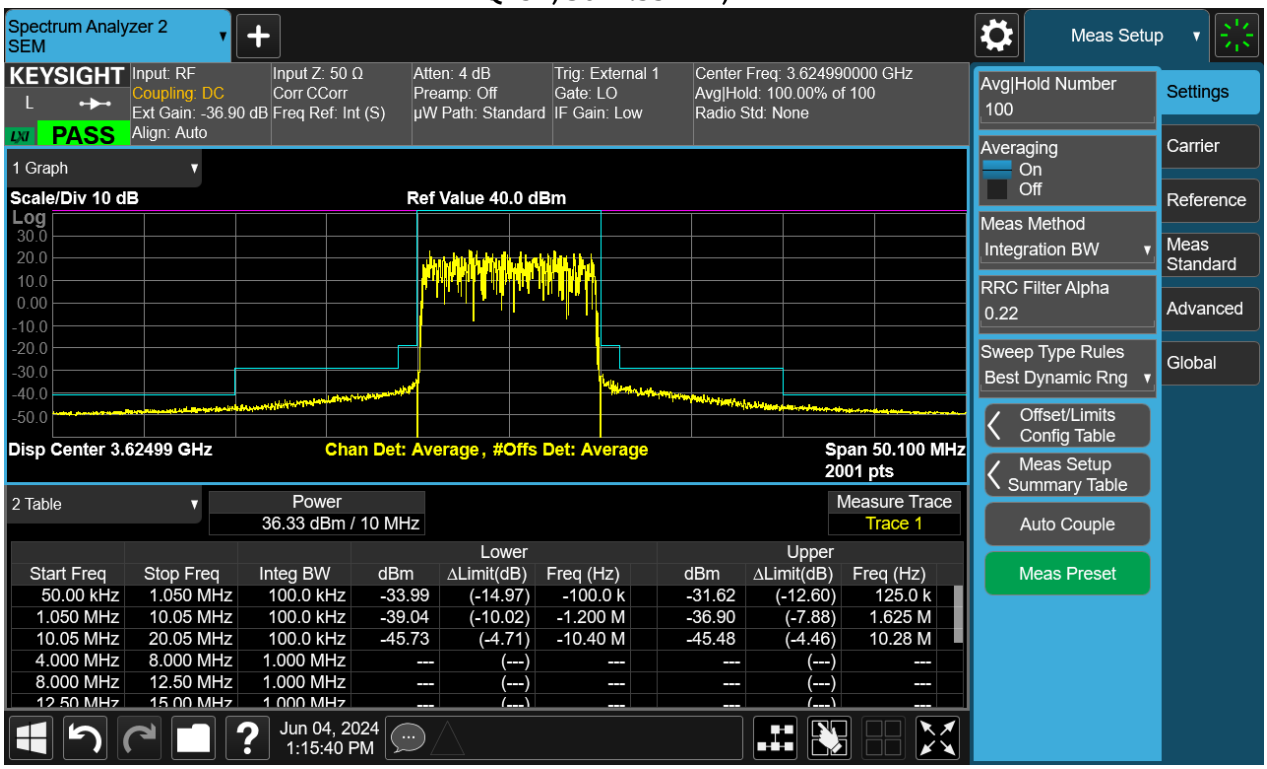


4.2.1.3 5G-NR, 10MHz, High Power

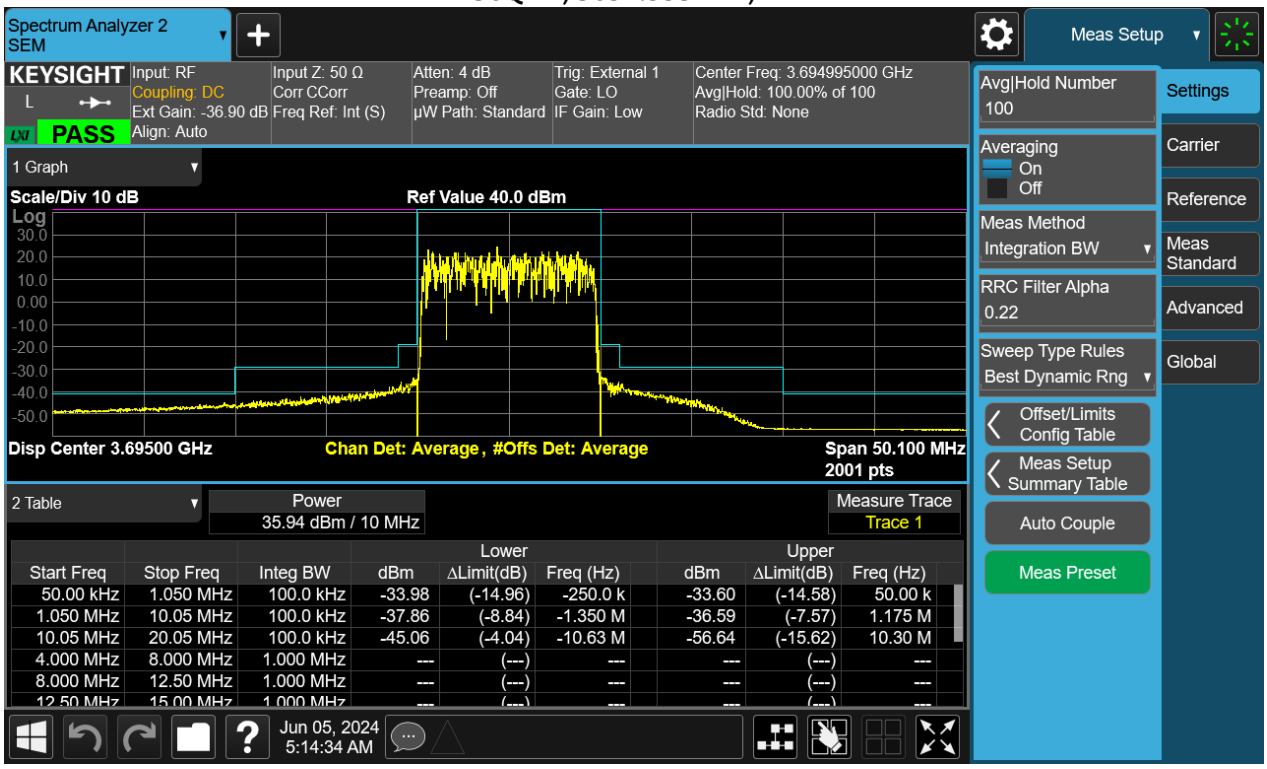
64QAM, 3555MHz, TX1



QPSK, 3624.99MHz, TX1



256QAM, 3694.995MHz, TX1



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

This test measures the emissions of spurious signals which may come from harmonic, parasitic, intermodulation and frequency conversion products and are outside the necessary bandwidth but excludes Edge-of-Band emissions.

5.1 Section 2.1051 Spurious Emissions at Antenna Terminals

Spurious Emissions at the antenna terminals were investigated per 47CFR Section 2.1057(a)(1) over the frequency range of 9 kHz to 37 GHz which is beyond the 10th harmonic of the carrier frequency. A test coupler and/or attenuator which incorporates a low intermod broadband RF attenuator was used to reduce the transceiver's amplitude to a level usable by the spectrum analyzer.

The spurious measurements were made using a PC based automated test system which controls either a MXA Signal Analyzer or a Rohde & Schwarz ESU-40 Test Receiver/ Spectrum Analyzer. These measurements are performed in compliance with ANSI C63.26 and our ISO17025 process. The measurement meets the ANSI C63.26 requirements in paragraphs 5.2.4.4.1 and 5.7 which requires that the number of points in the sweep be > 2 × Span/RBW.

The required emission limitation specified in **47CFR 96.41 (e)** was applied to these tests. Based upon the criterion given in Section 96 of the Code, the required emission limit for emissions outside a licensee's frequency block is:

47CFR 96.41 (e)(2) Additional protection levels. Notwithstanding paragraph (d)(1) of this section, the conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed −40dBm/MHz. In order to account for the spectral adding of identical signals from the primary and diversity ports, per KDB 662911 D01 Multiple Transmitter Output v01r01, the level needs be adjusted by 10LOG(n) where n= number of outputs.

The adjustment for n=4 → 10LOG (4) = 6.02 dB

Therefore, the limit for emissions >20 MHz outside a licensee's frequency block when measured with a RBW of 1 MHz is:

-40 dBm – 6.02 dB = -46.02 dBm for 4x MIMO

5.2 Spurious Emissions at Antenna Terminals Results

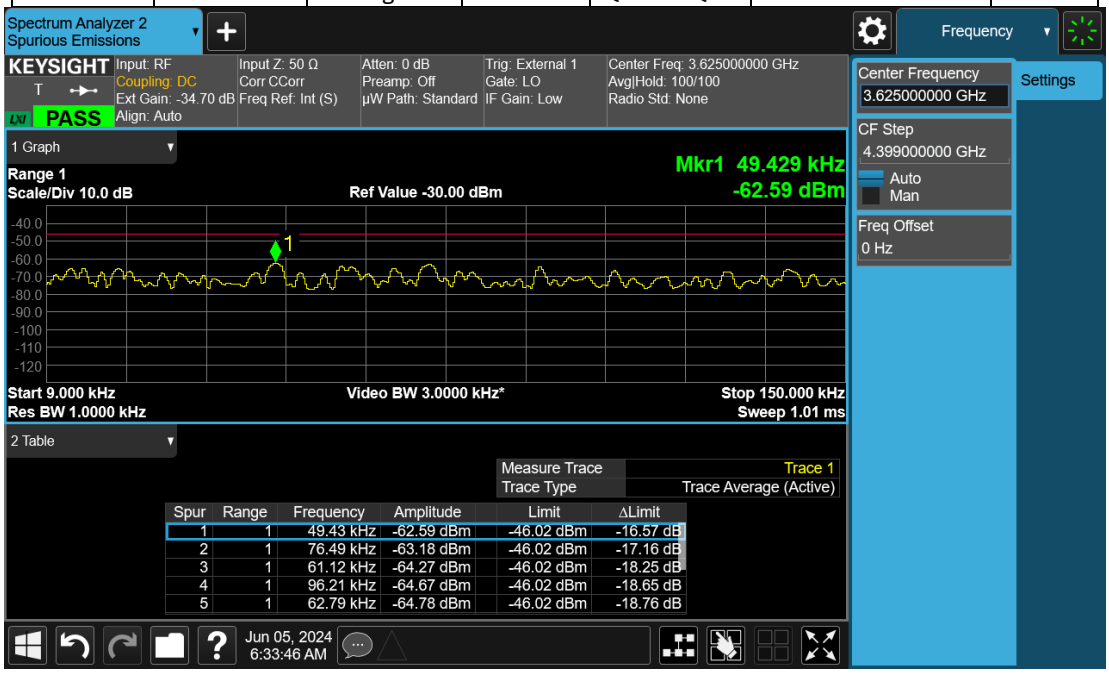
NOTE: Only plots with lowest margin in each frequency range are used in this report. The full suite of raw data resides at the MH, New Jersey location.

Tabular Data – Spurious Emissions at Antenna Terminals

Technology	Signal BW (MHz)	Power Level (dBm)	TM	Modulation	Channel Frequency (MHz)	TX	Conducted Spurious Emissions Results
LTE	10	High	3.1	64QAM	3555	1	Pass
LTE	10	High	3.2	QPSK/16QAM	3625	1	Pass
LTE	10	High	3.1a	256QAM	3695	1	Pass
5G-NR	10	High	3.1	64QAM	3555	1	Pass
5G-NR	10	High	1.1	QPSK	3624.99	1	Pass
5G-NR	10	High	3.1a	256QAM	3694.995	1	Pass

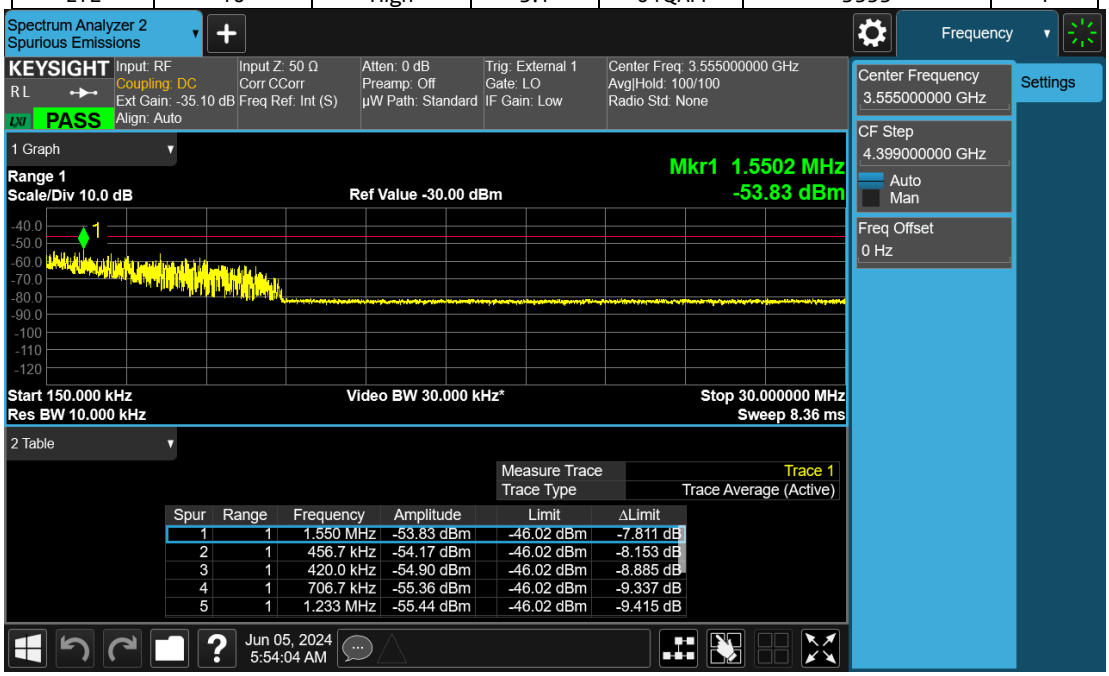
9KHz – 150kHz

Technology	Signal BW (MHz)	Power Level (dBm)	TM	Modulation	Channel Frequency (MHz)	TX
LTE	10	High	3.2	QPSK/16QAM	3625	1



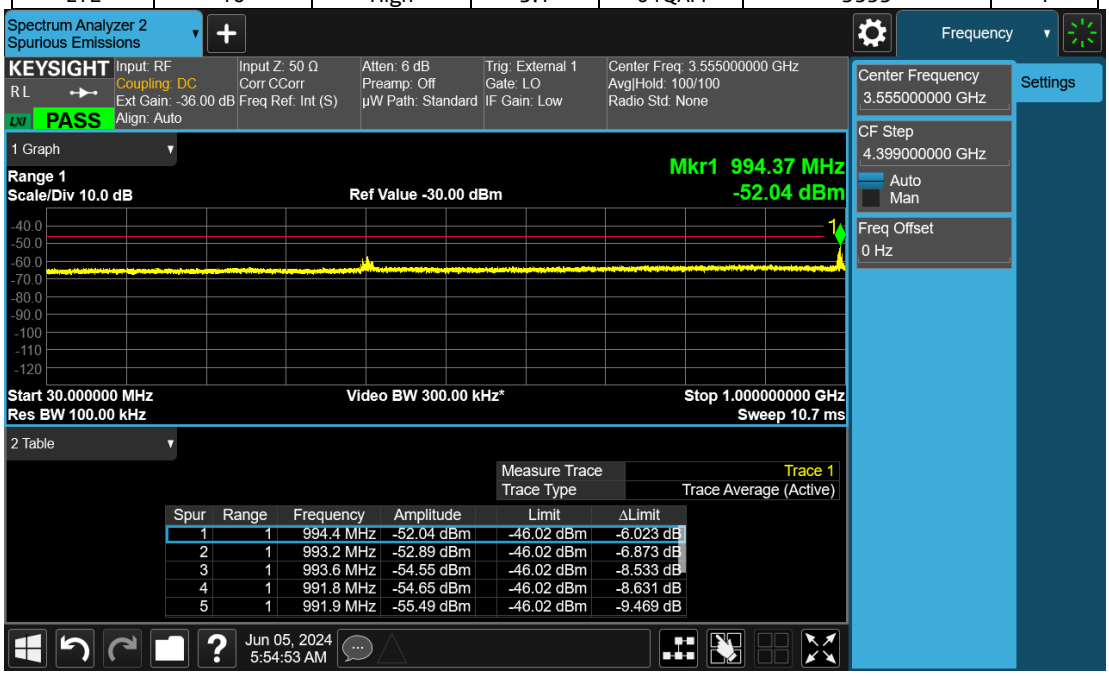
150kHz – 30MHz

Technology	Signal BW (MHz)	Power Level (dBm)	TM	Modulation	Channel Frequency (MHz)	TX
LTE	10	High	3.1	64QAM	3555	1



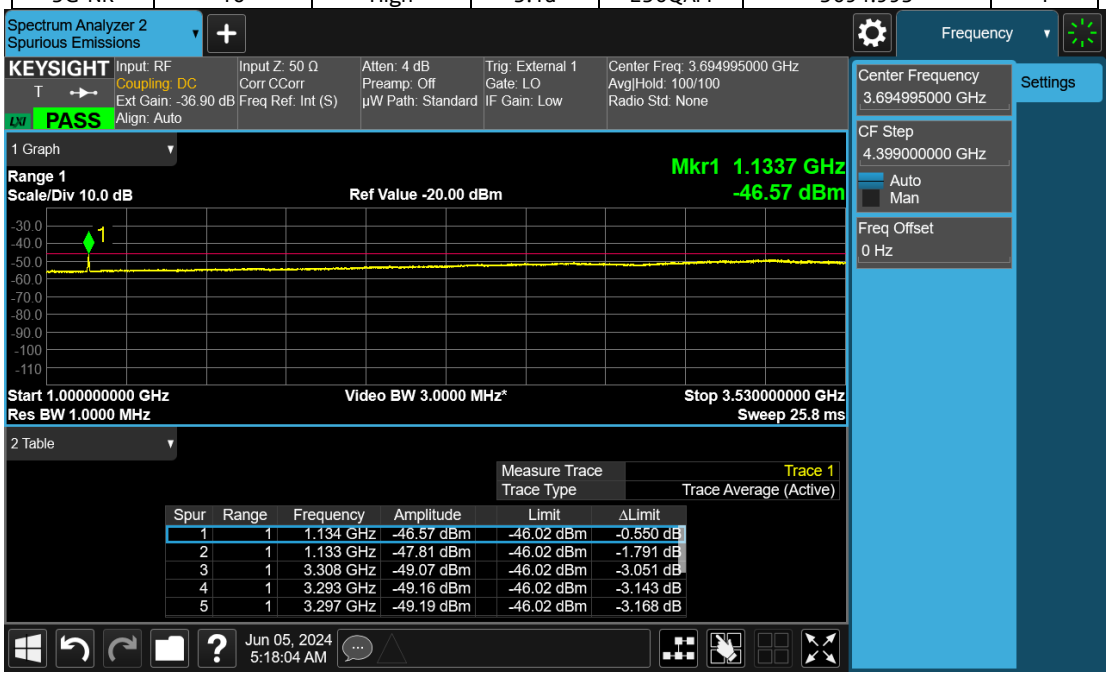
30MHz – 1GHz

Technology	Signal BW (MHz)	Power Level (dBm)	TM	Modulation	Channel Frequency (MHz)	TX
LTE	10	High	3.1	64QAM	3555	1



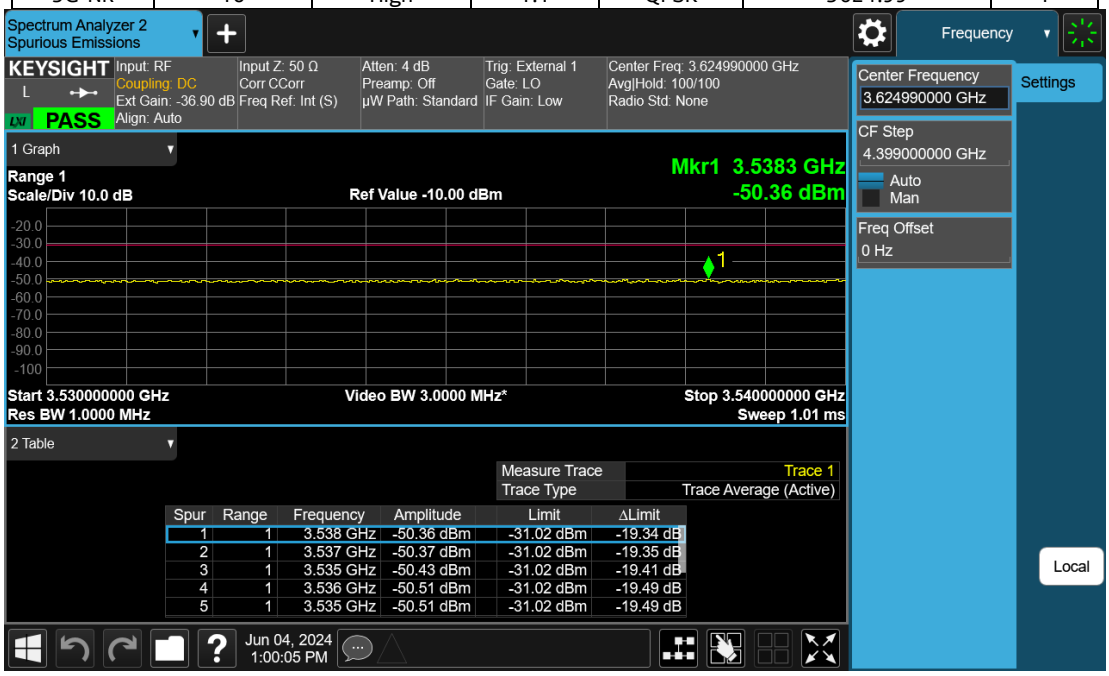
1GHz – 3.53GHz

Technology	Signal BW (MHz)	Power Level (dBm)	TM	Modulation	Channel Frequency (MHz)	TX
5G-NR	10	High	3.1a	256QAM	3694.995	1



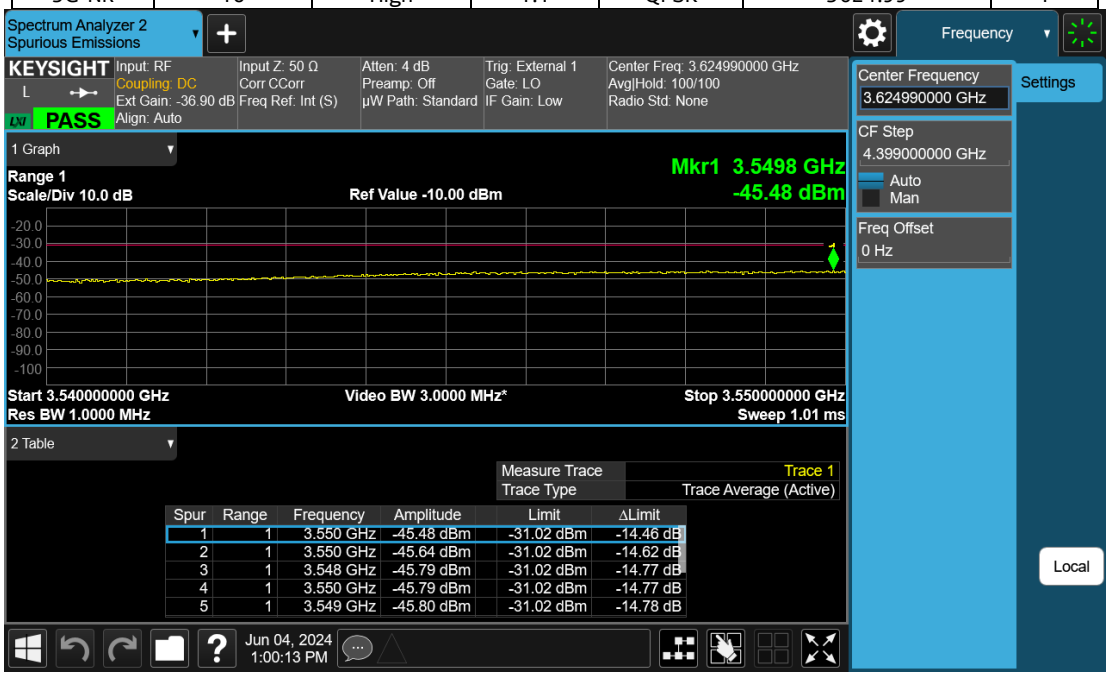
3.53GHz – 3.54GHz

Technology	Signal BW (MHz)	Power Level (dBm)	TM	Modulation	Channel Frequency (MHz)	TX
5G-NR	10	High	1.1	QPSK	3624.99	1



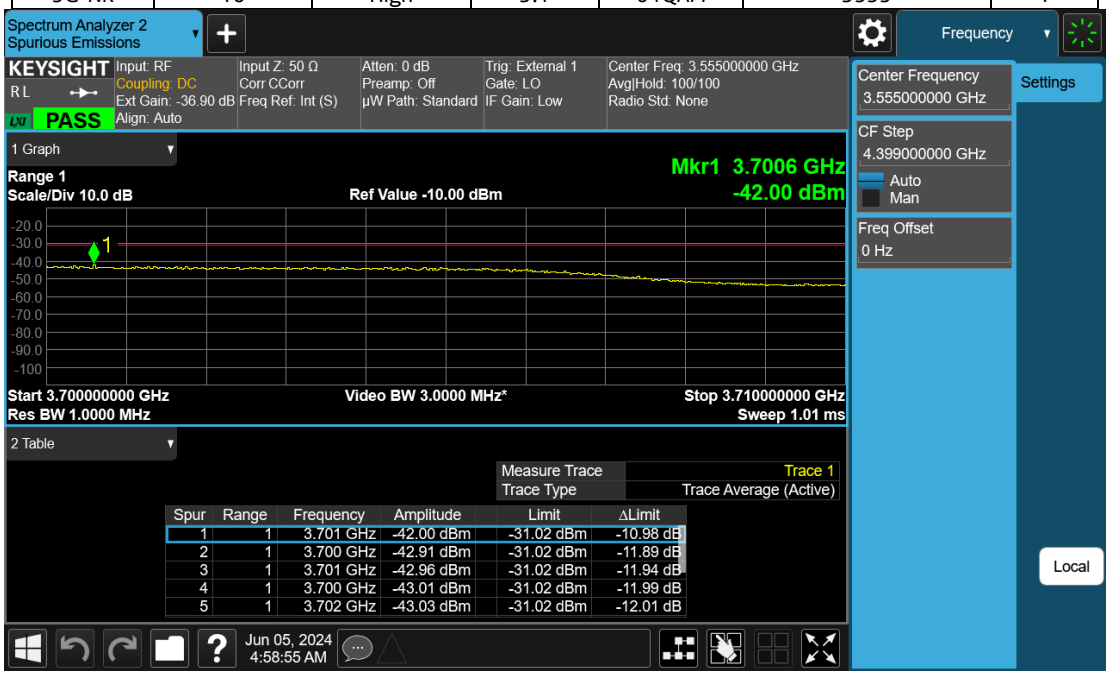
3.54GHz – 3.55GHz

Technology	Signal BW (MHz)	Power Level (dBm)	TM	Modulation	Channel Frequency (MHz)	TX
5G-NR	10	High	1.1	QPSK	3624.99	1



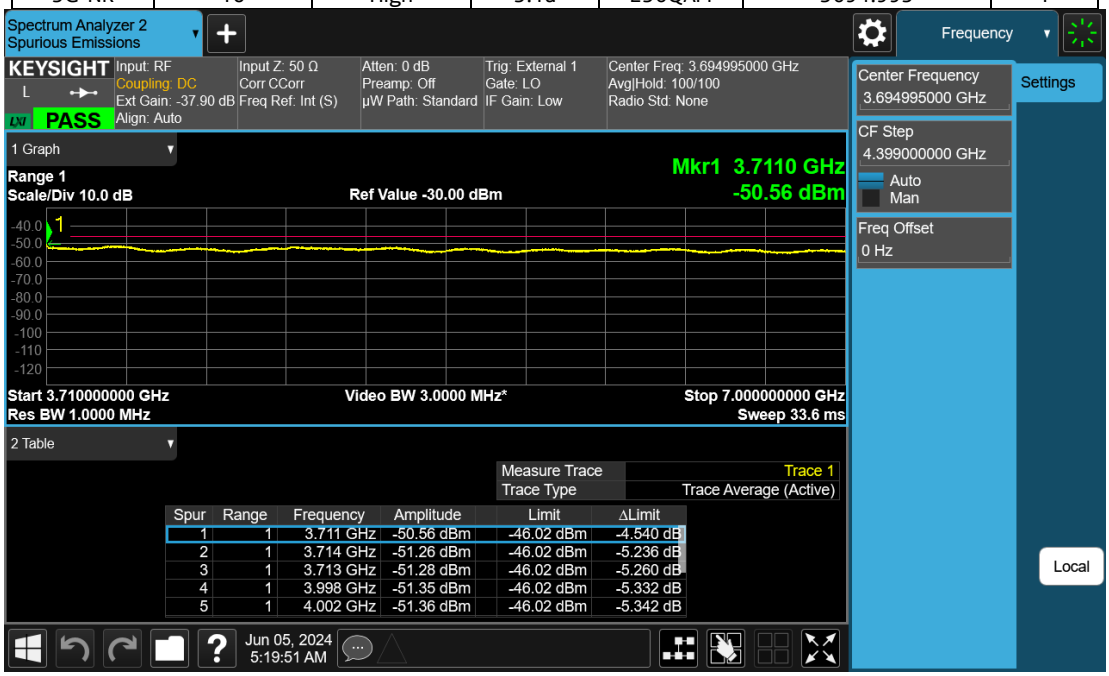
3.70GHz – 3.71GHz

Technology	Signal BW (MHz)	Power Level (dBm)	TM	Modulation	Channel Frequency (MHz)	TX
5G-NR	10	High	3.1	64QAM	3555	1



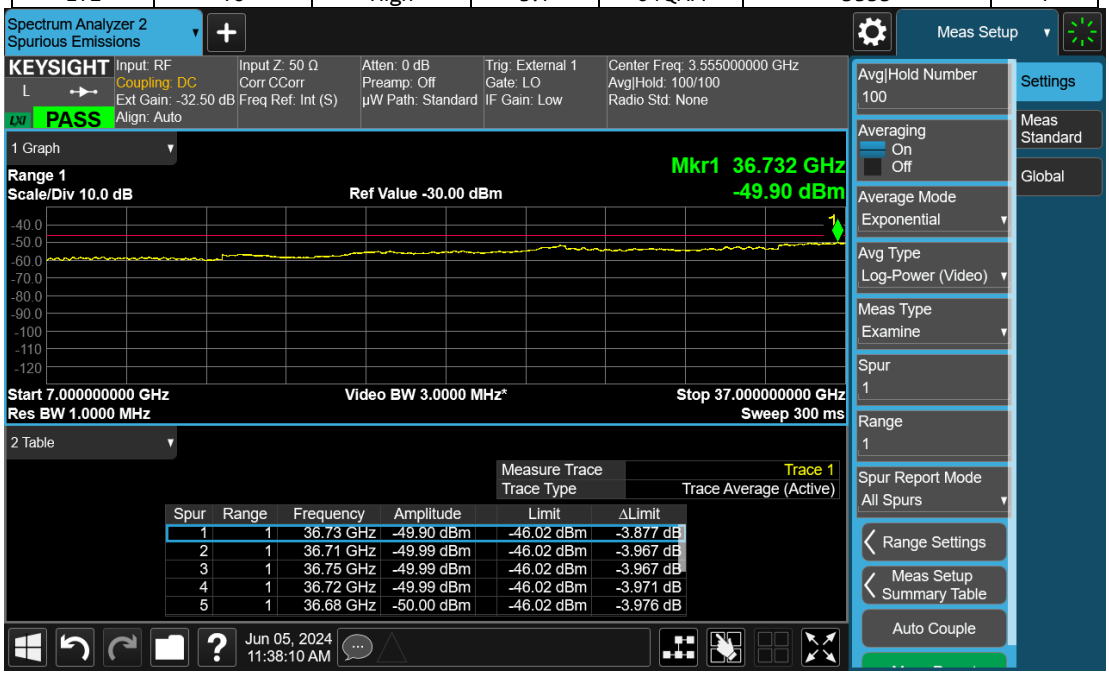
3.71GHz – 7GHz

Technology	Signal BW (MHz)	Power Level (dBm)	TM	Modulation	Channel Frequency (MHz)	TX
5G-NR	10	High	3.1a	256QAM	3694.995	1



7GHz – 37GHz

Technology	Signal BW (MHz)	Power Level (dBm)	TM	Modulation	Channel Frequency (MHz)	TX
LTE	10	High	3.1	64QAM	3555	1



6. Section 2.1053 - Measurement Required: Field Strength of Spurious Radiation

The field strength measurements of radiated spurious emissions were made in a FCC registered 3-meter semi-anechoic chamber AR-6, (FCC Registration Number: 395774) **NVLAP** Lab Code: 100275-0 and IC (Filing Number: 6933F-5) which is maintained by Nokia Bell Labs in Murray Hill, New Jersey.

6.1 Spurious Radiation and Radiated Emissions Requirements.

This product meets Parts 2,15 and 96 requirements. FCC Part 15 Class B require emissions to be below 54.5 dBuV/m at 3m.

47CFR 96.41 (e)(1) (i) and KDB 940660 D01 Section 3.2 (b)(6) specified that the limits for the emissions outside the fundamental are as follows.

- within 0 MHz to 10 MHz above and below the assigned channel $\leqslant$ −13 dBm/MHz,
- greater than 10 MHz above and below the assigned channel $\leqslant$ −25 dBm/MHz,
- any emission below 3530 MHz and above 3720 MHz $\leqslant$ −40 dBm/MHz.

Title 47CFR section 2.1053 contains the requirements for the levels of spurious radiation as a function of the EIRP of the unmodulated carrier. The reference level for the unmodulated carrier is calculated as the field produced by an isotropic radiator excited by the transmitter output power according to the following relation taken from Reference Data for Radio Engineers, page 27-7, 6th edition, IT&T Corp.

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

Where: E = Field Intensity in Volts/ meter R = Distance in meters = 3 m
P = Emission Power in Watts

Hence,

$$E\ (dB\mu V/m) = EIRP\ (dBm) - 20 \log d\ (m) + 104.77.$$

For EIRP = -13dBm/MHz, E = 82.2 dBµV/m,
For EIRP = -25dBm/MHz, E = 70.2 dBµV/m,
For EIRP = -40dBm/MHz, E = 55.2 dBµV/m.

The field strength of radiated spurious emissions measured was determined by

$$E\ (dB\mu V/m) = V_{meas}\ (dB\mu V) + \text{Cable Loss (dB)} + \text{Antenna Factor (dBi/m)}.$$

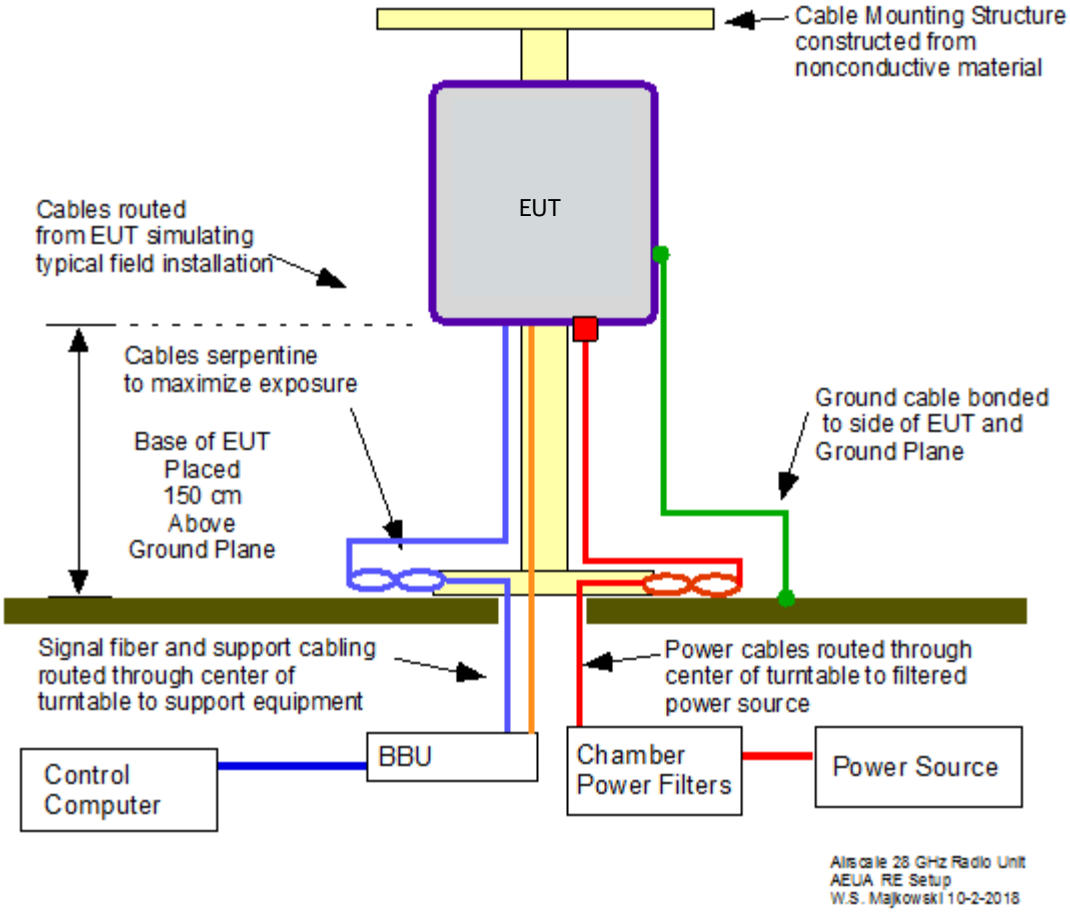
Field strength measurements of radiated spurious emissions were made in the 3m semi-anechoic chamber, AR-6 as detailed above. The recommendations of ANSI C63.4 and ANSI C63.26 were followed for EUT testing setup, cabling, and measurement approach and procedures. All the measurement equipment used, including antennas, was calibrated in accordance with ISO 9001 process. The EUT setup diagram is given in the Figure 4.5.

Below 18GHz, FCC Part 15 Class B limit up to 54.5 dBuV/m AVE was used which is worse than FCC Part 96 limit. Above 18GHz, the limit 55.2 dBuV/m AVE was used.

6.2 Field Strength of Spurious Radiation Results:

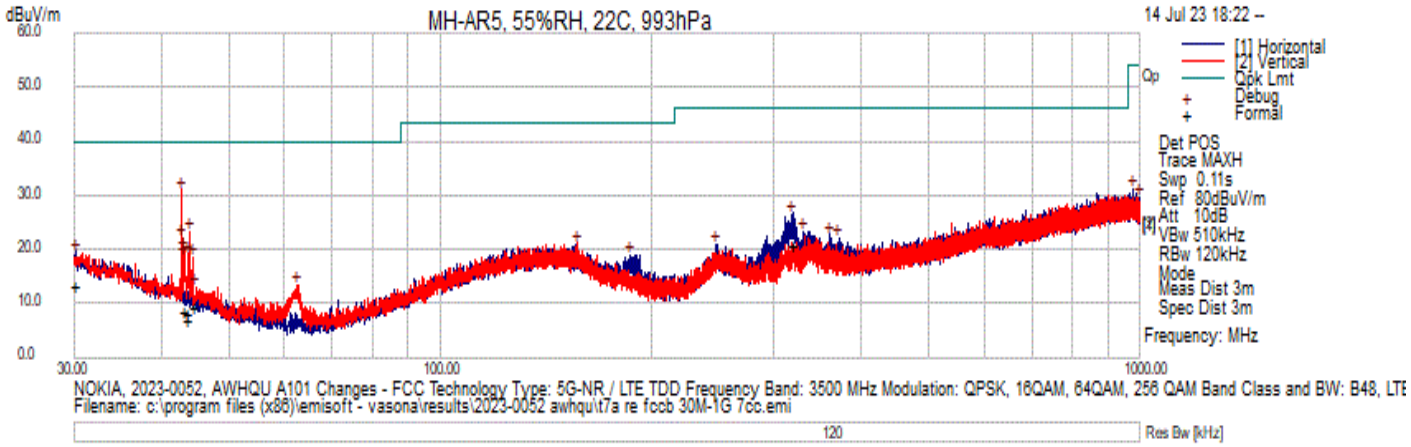
This product meets Part 96 Requirements. For the Title 47CFR section 96.41(e) and 2.1053 test, the field strength of any spurious radiation, measured at 3m, is required to be less than 55.2dBµV/meter. Emissions equal to or less than 35.2 dBµV/meter are not reportable and may be verified using field strength measurements with broadband antennas.

Radiated Emission Setup



6.3 Transmitter Measurements of Radiated Spurious Emissions Plots

Radiated Emissions - 30MHz – 1GHz



Test Information

Results Title	Radiated E 3m 30MHz-1GHz
File Name	t7bre fccb 30M-1G 7cc.emi
Test Laboratory	MH-AR5, 55%RH, 22C, 993hPa
Test Engineer	BB
Test Software	Vasona by EMISoft, version 6.061
Equipment	NOKIA
EUT Details	2023-0052, AWHQU A101 Changes - FCC Technology Type: 5G-NR / LTE TDD Frequency Band: 3500 MHz Modulation: QPSK, 16QAM, 64QAM, 256 QAM Band Class and BW: B48, LTE: 10, 20 MHz 5G-NR: 10, 20, 30, and 40 MHz Power Level: 4 X 5 W, MIMO, 5G Carrier 3555MHz, LTE 36665MHz, SN EB2313R0212, 7cc NR10 3555MHz, 3564.99MHz, 3775.01MHz, LTE10 3665MHz, 3685MHz, 3695MHz, 3.1, (37dbm)
Configuration	FCC PART 15-B RE30MHz-1GHzG 3 METER OFFSET BORE DISTANCE, MXE E1608, PRE AMP E1252, ANTENNA E601, LPF E980, AR5 CABLE SET, RBW PREVIEW 12OKHz / FORMALS 1MHZ, VBW 3MHz.
Date	2023-07-14 18:22:53

Formal Data

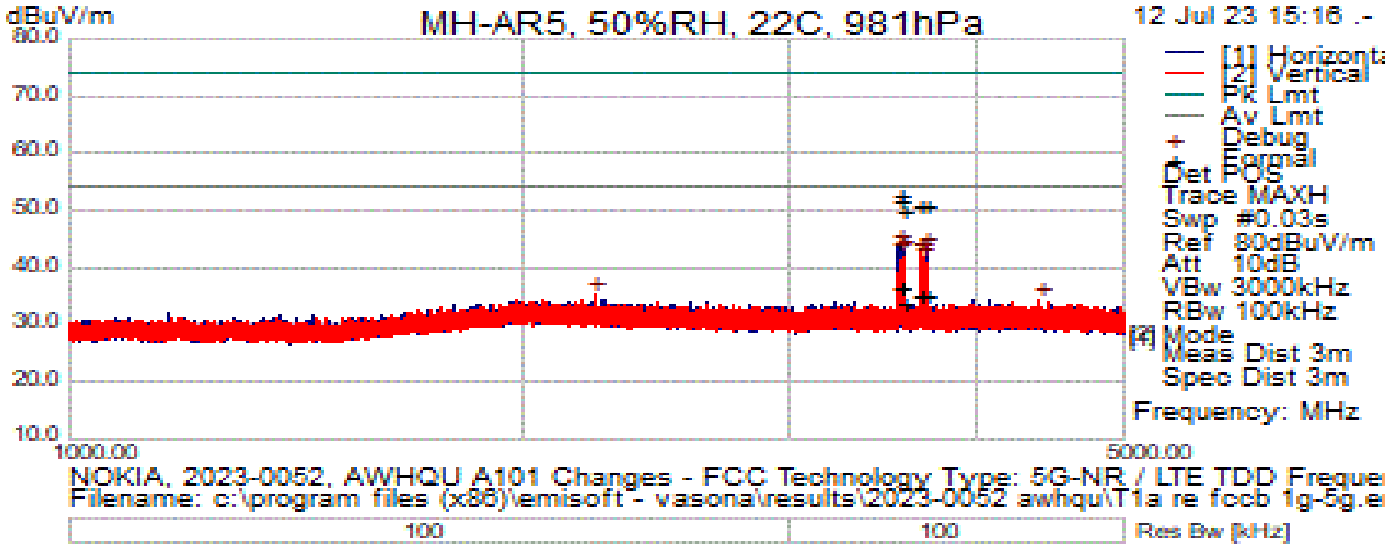
Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
319.425	31.73	1.81	-12.81	20.72	QuasiMax	H	109	301	46.00	-25.28	Pass	
30.226333	21.50	0.65	-8.88	13.27	QuasiMax	H	204	5	40.00	-26.73	Pass	
44.824	24.76	0.73	-16.35	9.14	QuasiMax	V	105	125	40.00	-30.86	Pass	
43.252	23.41	0.72	-15.62	8.51	QuasiMax	V	126	129	40.00	-31.49	Pass	
43.693	23.42	0.72	-15.83	8.32	QuasiMax	V	143	121	40.00	-31.68	Pass	
43.663	21.99	0.72	-15.81	6.89	QuasiMax	V	114	318	40.00	-33.11	Pass	

Preview Data

Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
42.771667	45.65	0.72	-15.39	30.97	Debug	V	100	135	40.00	-9.03	Pass	
43.935667	38.50	0.72	-15.94	23.28	Debug	V	100	135	40.00	-16.72	Pass	
42.901	36.86	0.72	-15.45	22.12	Debug	V	100	135	40.00	-17.88	Pass	
318.801333	37.67	1.81	-12.82	26.65	Debug	H	100	315	46.00	-19.35	Pass	
43.159667	34.59	0.72	-15.58	19.73	Debug	V	100	135	40.00	-20.27	Pass	
30.226333	27.72	0.65	-8.88	19.50	Debug	H	350	225	40.00	-20.50	Pass	
43.806333	34.24	0.72	-15.88	19.08	Debug	V	100	135	40.00	-20.92	Pass	
44.453	34.04	0.72	-16.18	18.59	Debug	V	100	135	40.00	-21.41	Pass	
42.998	33.35	0.72	-15.50	18.56	Debug	V	100	135	40.00	-21.44	Pass	
157.361	29.92	1.30	-10.04	21.18	Debug	V	200	135	43.50	-22.32	Pass	
331.023333	34.15	1.84	-12.67	23.31	Debug	H	100	270	46.00	-22.69	Pass	
977.560667	30.41	3.43	-2.56	31.28	Debug	H	100	45	54.00	-22.72	Pass	
360.511333	32.82	1.91	-12.05	22.68	Debug	H	150	0	46.00	-23.32	Pass	
371.084333	31.69	1.93	-11.58	22.04	Debug	H	100	315	46.00	-23.96	Pass	
997.251667	28.99	3.18	-2.47	29.69	Debug	H	150	270	54.00	-24.31	Pass	
187.334	31.51	1.42	-13.98	18.95	Debug	H	250	225	43.50	-24.55	Pass	
248.444	29.60	1.63	-10.25	20.98	Debug	H	150	90	46.00	-25.02	Pass	
62.527333	33.57	0.83	-21.06	13.33	Debug	V	100	90	40.00	-26.67	Pass	
44.808667	28.65	0.73	-16.34	13.04	Debug	V	100	90	40.00	-26.96	Pass	

Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in formal data.

Radiated Emissions - 1GHz – 5GHz



Test Information

Results Title	Radiated E 3m 1-5GHz
File Name	T1a re fccb 1g-5g.emi
Test Laboratory	MH-AR5, 50%RH, 22C, 981hPa
Test Engineer	BB
Test Software	Vasona by EMISoft, version 6.061
Equipment	NOKIA
EUT Details	2023-0052, AWHQU A101 Changes - FCC Technology Type: 5G-NR / LTE TDD Frequency Band: 3500 MHz Modulation: QPSK, 16QAM, 64QAM, 256 QAM Band Class and BW: B48, LTE: 10, 20 MHz 5G-NR: 10, 20, 30, and 40 MHz Power Level: 4 X 5 W, MIMO, 5G Carrier 3555MHz, LTE 36665MHz, SN EB2313R0212, 7cc NR10 3555MHz, 3564.99MHz, 3775.01MHz, LTE10 3665MHz, 3685MHz, 3695MHz, 3.1, (37dbm)
Configuration	2023-0052 RE FCC PART 15 B 1G-5G 3METER DISTANCE, ESW E1511, PRE AMP E1356, ANTENNA E1073, 6dB PAD E891, AR5 CABLE SET, RBW 12OKHz VBW 3MHz
Date	2023-07-12 15:27:19

Formal Data

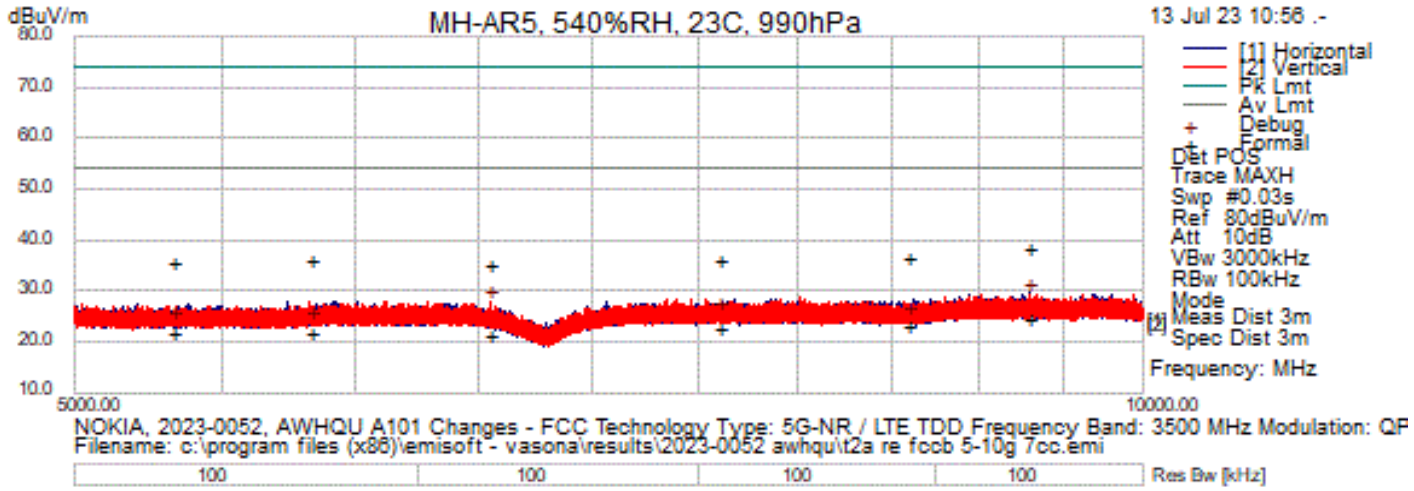
Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
3551.771	38.15	1.34	-2.81	36.68	AvgMax	H	207	29	54.00	-17.32	Pass	Carrier Exempt
3550.944	37.85	1.34	-2.81	36.38	AvgMax	H	207	29	54.00	-17.62	Pass	Carrier Exempt
3696.910	36.39	1.23	-2.39	35.23	AvgMax	H	100	310	54.00	-18.77	Pass	Carrier Exempt
3663.544	36.22	1.25	-2.48	34.99	AvgMax	V	187	295	54.00	-19.01	Pass	Carrier Exempt
3567.540	35.47	1.33	-2.76	34.04	AvgMax	H	149	105	54.00	-19.96	Pass	Carrier Exempt
3551.771	54.24	1.34	-2.81	52.78	PeakMax	H	207	29	74.00	-21.22	Pass	Carrier Exempt
3550.944	53.34	1.34	-2.81	51.87	PeakMax	H	207	29	74.00	-22.13	Pass	Carrier Exempt
3663.544	52.15	1.25	-2.48	50.92	PeakMax	V	187	295	74.00	-23.08	Pass	Carrier Exempt
3696.910	51.92	1.23	-2.39	50.76	PeakMax	H	100	310	74.00	-23.24	Pass	Carrier Exempt
3567.540	51.22	1.33	-2.76	49.79	PeakMax	H	149	105	74.00	-24.21	Pass	Carrier Exempt

Preview Data

Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
3551.200	45.30	1.34	-2.81	43.83	Debug	H	200	220	54.00	-10.17	Pass	
3697.000	44.66	1.23	-2.39	43.50	Debug	H	100	308	54.00	-10.50	Pass	
3578.466667	44.32	1.32	-2.73	42.91	Debug	H	200	220	54.00	-11.09	Pass	
3562.066667	44.01	1.33	-2.78	42.56	Debug	H	200	220	54.00	-11.44	Pass	
3668.733333	43.75	1.25	-2.47	42.53	Debug	V	200	242	54.00	-11.47	Pass	
3671.733333	43.35	1.25	-2.46	42.14	Debug	H	200	44	54.00	-11.86	Pass	
3681.133333	42.72	1.24	-2.43	41.53	Debug	H	200	44	54.00	-12.47	Pass	
2229.933333	37.59	2.25	-4.41	35.43	Debug	V	100	352	54.00	-18.57	Pass	
4399.133333	35.10	0.75	-1.56	34.28	Debug	V	300	0	54.00	-19.72	Pass	

Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in formal data.

Radiated Emissions - 5GHz – 10GHz



Test Information

Results Title	Radiated E 3m 5-10GHz
File Name	t2a re fccb 5-10g 7cc.emi
Test Laboratory	MH-AR5, 54%RH, 23C, 990hPa
Test Engineer	CP
Test Software	Vasona by EMISoft, version 6.061
Equipment	NOKIA
EUT Details	2023-0052, AWHQU A101 Changes - FCC Technology Type: 5G-NR / LTE TDD Frequency Band: 3500 MHz Modulation: QPSK, 16QAM, 64QAM, 256 QAM Band Class and BW: B48, LTE: 10, 20 MHz 5G-NR: 10, 20, 30, and 40 MHz Power Level: 4 X 5 W, MIMO, 5G Carrier 3555MHz, LTE 36665MHz, SN EB2313R0212, 7cc NR10 3555MHz, 3564.99MHz, 3775.01MHz, LTE10 3665MHz, 3685MHz, 3695MHz, 3.1, (37dbm)
Configuration	FCC PART 15-B RE5G-10G 3METER DISTANCE, ESW E1511, PRE AMP E1356, ANTENNA E1073, HPF E1479, AR5 CABLE SET, RBW PREVIEW 12OKHz / FORMALS 1MHZ, VBW 3MHz.
Date	2023-07-13 10:56:32

Formal Data

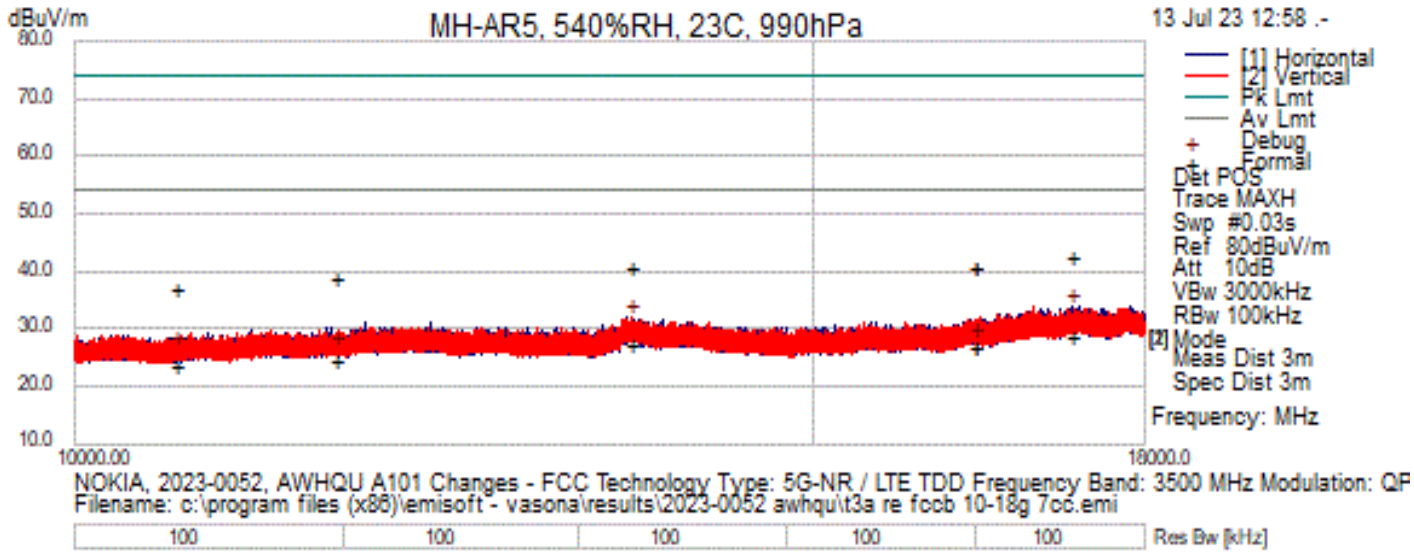
Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
9291.875	29.90	-7.07	1.65	24.48	AvgMax	H	155	340	54.00	-29.52	Pass	
8594.586	28.78	-7.16	1.44	23.06	AvgMax	V	189	47	54.00	-30.94	Pass	
7604.894	27.88	-6.53	1.36	22.71	AvgMax	V	100	158	54.00	-31.29	Pass	
5833.768	27.27	-5.45	-0.03	21.79	AvgMax	V	376	33	54.00	-32.21	Pass	
5332.929	27.66	-5.13	-0.84	21.69	AvgMax	V	187	167	54.00	-32.31	Pass	
6555.791667	26.13	-5.59	0.71	21.26	AvgMax	V	239	1	54.00	-32.74	Pass	
9291.875	43.96	-7.07	1.65	38.54	PeakMax	H	155	340	74.00	-35.46	Pass	
8594.586	42.12	-7.16	1.44	36.41	PeakMax	V	189	47	74.00	-37.59	Pass	
7604.894	41.49	-6.53	1.36	36.32	PeakMax	V	100	158	74.00	-37.68	Pass	
5833.768	41.80	-5.45	-0.03	36.32	PeakMax	V	376	33	74.00	-37.68	Pass	
5332.929	41.58	-5.13	-0.84	35.61	PeakMax	V	187	167	74.00	-38.39	Pass	
6555.791667	40.19	-5.59	0.71	35.31	PeakMax	V	239	1	74.00	-38.69	Pass	

Preview Data

Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
9291.875	34.97	-7.07	1.65	29.55	Debug	H	300	220	54.00	-24.45	Pass	
6555.791667	32.86	-5.59	0.71	27.98	Debug	V	300	88	54.00	-26.02	Pass	
8594.586	30.46	-7.16	1.44	24.74	Debug	V	100	353	54.00	-29.26	Pass	
7604.894	30.93	-6.53	1.36	25.76	Debug	V	100	353	54.00	-28.24	Pass	
5833.768	29.45	-5.45	-0.03	23.97	Debug	V	100	353	54.00	-30.03	Pass	
5332.929	30.00	-5.13	-0.84	24.03	Debug	V	100	353	54.00	-29.97	Pass	

Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in formal data.

Radiated Emissions - 10GHz – 18GHz



Test Information

Results Title	Radiated E 3m 10-18GHz
File Name	t3a re fccb 10-18g 7cc.emi
Test Laboratory	MH-AR5, 54%RH, 23C, 990hPa
Test Engineer	CP
Test Software	Vasona by EMISoft, version 6.061
Equipment	NOKIA
EUT Details	2023-0052, AWHQU A101 Changes - FCC Technology Type: 5G-NR / LTE TDD Frequency Band: 3500 MHz Modulation: QPSK, 16QAM, 64QAM, 256 QAM Band Class and BW: B48, LTE: 10, 20 MHz 5G-NR: 10, 20, 30, and 40 MHz Power Level: 4 X 5 W, MIMO, 5G Carrier 3555MHz, LTE 36665MHz, SN EB2313R0212, 7cc NR10 3555MHz, 3564.99MHz, 3775.01MHz, LTE10 3665MHz, 3685MHz, 3695MHz, 3.1, (37dbm)
Configuration	FCC PART 15-B RE10G-18G 3METER DISTANCE, ESW E1511, PRE AMP E1356, ANTENNA E1073, HPF E1479, AR5 CABLE SET, RBW PREVIEW 12OKHz / FORMALS 1MHZ, VBW 3MHz.
Date	2023-07-13 13:11:16

Formal Data

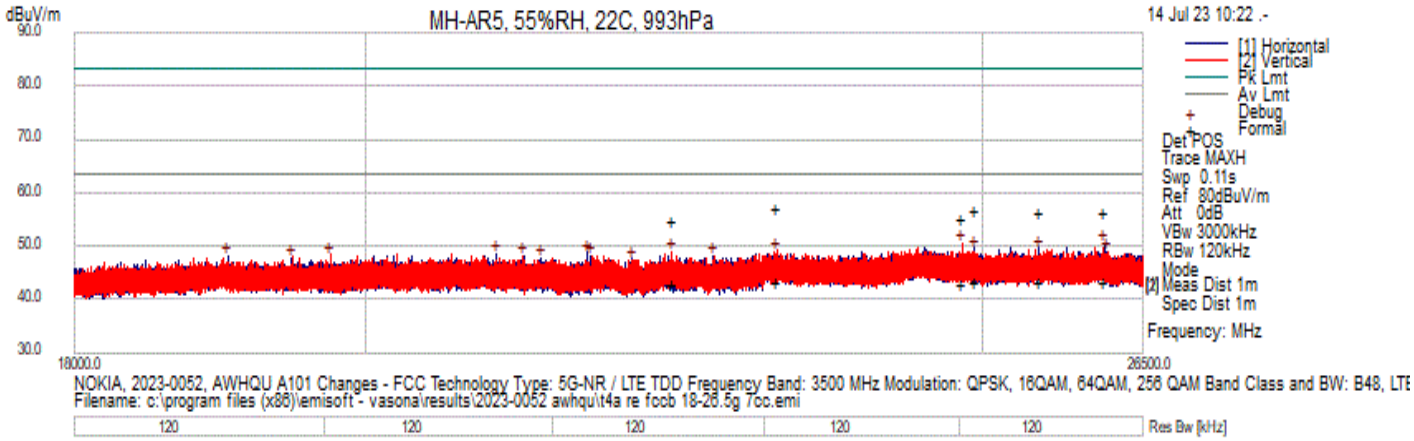
Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
17308.960	28.60	-10.08	10.02	28.53	AvgMax	H	328	118	54.00	-25.47	Pass	
13589.760	29.29	-8.71	6.77	27.34	AvgMax	V	215	121	54.00	-26.66	Pass	
16408.432	28.79	-9.56	7.70	26.93	AvgMax	V	194	47	54.00	-27.07	Pass	
16408.432	28.77	-9.56	7.70	26.91	AvgMax	V	281	211	54.00	-27.09	Pass	
11548.930	28.58	-8.31	4.39	24.65	AvgMax	V	371	264	54.00	-29.35	Pass	
10577.390	28.50	-7.85	2.91	23.56	AvgMax	V	241	15	54.00	-30.44	Pass	
17308.960	42.64	-10.08	10.02	42.58	PeakMax	H	328	118	74.00	-31.42	Pass	
13589.760	42.88	-8.71	6.77	40.93	PeakMax	V	215	121	74.00	-33.07	Pass	
16408.432	42.50	-9.56	7.70	40.64	PeakMax	V	194	47	74.00	-33.36	Pass	
16408.432	42.48	-9.56	7.70	40.62	PeakMax	V	281	211	74.00	-33.38	Pass	
11548.930	42.64	-8.31	4.39	38.72	PeakMax	V	371	264	74.00	-35.28	Pass	
10577.390	42.10	-7.85	2.91	37.16	PeakMax	V	241	15	74.00	-36.84	Pass	

Preview Data

Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
17308.960	33.93	-10.08	10.02	33.87	Debug	H	300	220	54.00	-20.13	Pass	
13589.760	33.95	-8.71	6.77	32.00	Debug	V	300	154	54.00	-22.00	Pass	
16408.432	29.86	-9.56	7.70	28.00	Debug	V	99	353	54.00	-26.00	Pass	
16408.432	29.86	-9.56	7.70	28.00	Debug	V	99	353	54.00	-26.00	Pass	
11548.930	30.72	-8.31	4.39	26.80	Debug	V	99	353	54.00	-27.20	Pass	
10577.390	31.73	-7.85	2.91	26.79	Debug	V	99	353	54.00	-27.21	Pass	

Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in formal data.

Radiated Emissions - 18GHz – 26.5GHz



Test Information

Results Title	Radiated E 1m 18-26.5GHz
File Name	t4a re fccb 18-26.5g 7cc.emi
Test Laboratory	MH-AR5, 55%RH, 22C, 993hPa
Test Engineer	CP
Test Software	Vasona by EMISoft, version 6.061
Equipment	NOKIA
EUT Details	2023-0052, AWHQU A101 Changes - FCC Technology Type: 5G-NR / LTE TDD Frequency Band: 3500 MHz Modulation: QPSK, 16QAM, 64QAM, 256 QAM Band Class and BW: B48, LTE: 10, 20 MHz 5G-NR: 10, 20, 30, and 40 MHz Power Level: 4 X 5 W, MIMO, 5G Carrier 3555MHz, LTE 36665MHz, SN EB2313R0212, 7cc NR10 3555MHz, 3564.99MHz, 3775.01MHz, LTE10 3665MHz, 3685MHz, 3695MHz, 3.1, (37dbm)
Configuration	FCC PART 15-B RE18G-26.5G 1 METER DISTANCE, MXE E1608, PRE AMP E1601, ANTENNA E1526, HPF E1213, E1528/E1529 CABLE SET, RBW PREVIEW 12OKHz / FORMALS 1MHZ, VBW 3MHz.
Date	2023-07-14 10:22:35

Formal Data

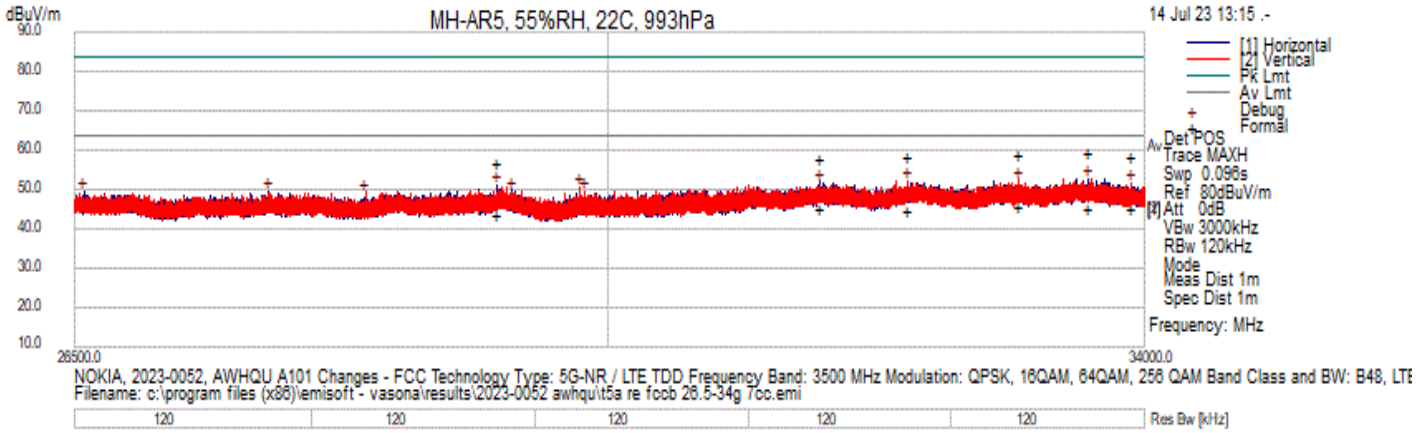
Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
23207.892	32.47	12.83	-1.92	43.38	AvgMax	V	125	308	63.50	-20.12	Pass	
24926.026	31.45	13.08	-1.29	43.24	AvgMax	H	118	273	63.50	-20.26	Pass	
26127.416	32.00	13.27	-2.05	43.22	AvgMax	H	142	285	63.50	-20.28	Pass	
25510.996	31.42	13.25	-1.47	43.20	AvgMax	H	134	11	63.50	-20.30	Pass	
24816.319	31.05	13.05	-1.03	43.07	AvgMax	V	112	359	63.50	-20.43	Pass	
22343.329	33.17	12.60	-3.08	42.69	AvgMax	V	165	5	63.50	-20.81	Pass	
23207.892	46.32	12.83	-1.92	57.23	PeakMax	V	125	308	83.50	-26.27	Pass	
24926.026	44.94	13.08	-1.29	56.73	PeakMax	H	118	273	83.50	-26.77	Pass	
26127.416	45.23	13.27	-2.05	56.44	PeakMax	H	142	285	83.50	-27.06	Pass	
25510.996	44.47	13.25	-1.47	56.26	PeakMax	H	134	11	83.50	-27.24	Pass	
24816.319	43.35	13.05	-1.03	55.37	PeakMax	V	112	359	83.50	-28.13	Pass	
22343.329	45.35	12.60	-3.08	54.87	PeakMax	V	165	5	83.50	-28.63	Pass	

Preview Data

Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
26127.416	39.37	13.27	-2.05	50.58	Debug	H	150	330	63.50	-12.92	Pass	
24816.319	38.53	13.05	-1.03	50.54	Debug	V	150	88	63.50	-12.96	Pass	
24926.026	37.80	13.08	-1.29	49.60	Debug	H	150	308	63.50	-13.90	Pass	
25510.996	37.69	13.25	-1.47	49.48	Debug	H	100	0	63.50	-14.02	Pass	
23207.892	38.23	12.83	-1.92	49.14	Debug	V	200	242	63.50	-14.36	Pass	
22343.329	39.50	12.60	-3.08	49.02	Debug	V	150	220	63.50	-14.48	Pass	
26149.799	37.74	13.26	-2.04	48.96	Debug	H	200	176	63.50	-14.54	Pass	
21676.760	40.28	12.40	-4.01	48.67	Debug	H	200	308	63.50	-14.83	Pass	
20973.073	40.94	12.13	-4.49	48.59	Debug	H	200	88	63.50	-14.91	Pass	
19748.280	42.31	11.68	-5.68	48.31	Debug	V	200	154	63.50	-15.19	Pass	
21169.027	40.38	12.20	-4.40	48.18	Debug	V	150	330	63.50	-15.32	Pass	
19028.783	42.42	11.39	-5.65	48.17	Debug	H	100	110	63.50	-15.33	Pass	
21696.480	39.70	12.41	-3.98	48.12	Debug	H	100	0	63.50	-15.38	Pass	
22678.173	37.97	12.68	-2.56	48.09	Debug	H	150	110	63.50	-15.41	Pass	
19477.017	42.35	11.56	-5.96	47.95	Debug	V	150	264	63.50	-15.55	Pass	
21310.127	39.85	12.26	-4.35	47.75	Debug	H	150	308	63.50	-15.75	Pass	
22027.243	38.44	12.54	-3.49	47.49	Debug	H	200	88	63.50	-16.01	Pass	

Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in formal data.

Radiated Emissions - 26.5 GHz – 34 GHz



Test Information

Results Title	Radiated E 1m 26.5-34GHz
File Name	t5a re fccb 26.5-34g 7cc.emi
Test Laboratory	MH-AR5, 55%RH, 22C, 993hPa
Test Engineer	CP
Test Software	Vasona by EMISoft, version 6.061
Equipment	NOKIA
EUT Details	2023-0052, AWHQU A101 Changes - FCC Technology Type: 5G-NR / LTE TDD Frequency Band: 3500 MHz Modulation: QPSK, 16QAM, 64QAM, 256 QAM Band Class and BW: B48, LTE: 10, 20 MHz 5G-NR: 10, 20, 30, and 40 MHz Power Level: 4 X 5 W, MIMO, 5G Carrier 3555MHz, LTE 36665MHz, SN EB2313R0212, 7cc NR10 3555MHz, 3564.99MHz, 3775.01MHz, LTE10 3665MHz, 3685MHz, 3695MHz, 3.1, (37dbm)
Configuration	FCC PART 15-B RE26.5G-34G 1 METER DISTANCE, MXE E1608, PRE AMP E1601, ANTENNA E1526, HPF E1213, E1528/E1529 CABLE SET, RBW PREVIEW 12OKHz / FORMALS 1MHZ, VBW 3MHz.
Date	2023-07-14 13:17:09

Formal Data

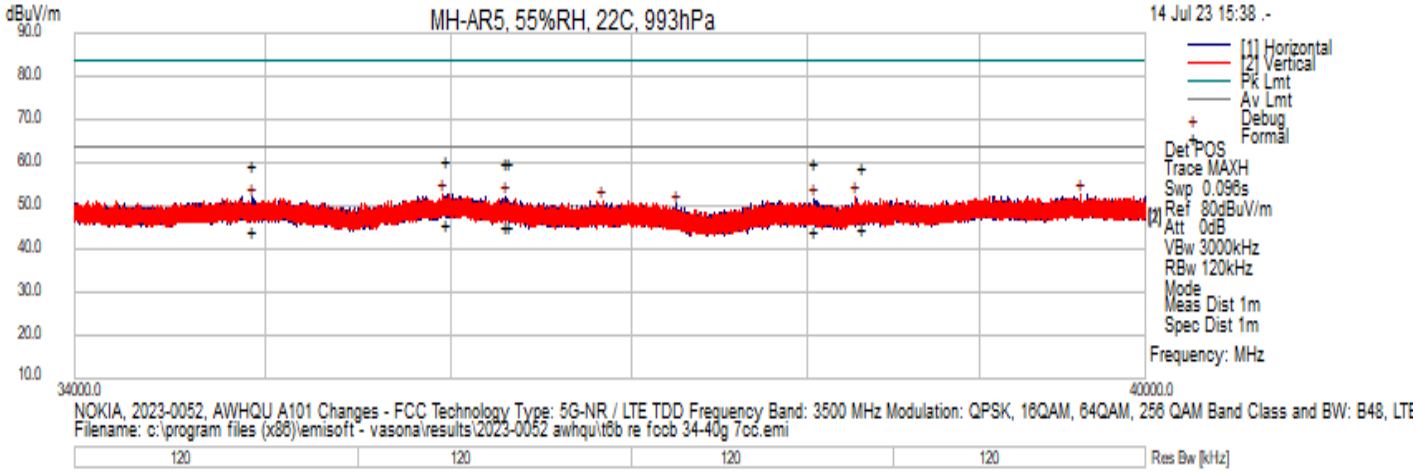
Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
33018.150	30.09	14.79	0.56	45.44	AvgMax	V	115	82	63.50	-18.06	Pass	
33556.100	28.85	14.81	1.70	45.35	AvgMax	H	114	61	63.50	-18.15	Pass	
33893.450	29.70	14.84	0.71	45.24	AvgMax	V	193	131	63.50	-18.26	Pass	
31522.300	31.06	14.51	-0.67	44.90	AvgMax	H	113	261	63.50	-18.60	Pass	
32171.500	30.18	14.53	-0.04	44.66	AvgMax	V	100	315	63.50	-18.84	Pass	
29241.550	31.27	13.69	-1.30	43.66	AvgMax	H	133	37	63.50	-19.84	Pass	
33556.100	42.85	14.81	1.70	59.35	PeakMax	H	114	61	83.50	-24.15	Pass	
33018.150	43.37	14.79	0.56	58.72	PeakMax	V	115	82	83.50	-24.78	Pass	
33893.450	42.90	14.84	0.71	58.45	PeakMax	V	193	131	83.50	-25.05	Pass	
32171.500	43.82	14.53	-0.04	58.31	PeakMax	V	100	315	83.50	-25.19	Pass	
31522.300	43.95	14.51	-0.67	57.79	PeakMax	H	113	261	83.50	-25.71	Pass	
29241.550	44.52	13.69	-1.30	56.91	PeakMax	H	133	37	83.50	-26.59	Pass	

Preview Data

Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
33556.100	36.24	14.81	1.70	52.75	Debug	H	150	352	63.50	-10.75	Pass	
33018.150	37.13	14.79	0.56	52.48	Debug	V	125	99	63.50	-11.02	Pass	
32171.500	37.66	14.53	-0.04	52.15	Debug	V	150	187	63.50	-11.35	Pass	
31522.300	37.97	14.51	-0.67	51.81	Debug	H	150	286	63.50	-11.69	Pass	
33893.450	35.99	14.84	0.71	51.53	Debug	V	125	154	63.50	-11.97	Pass	
29241.550	38.83	13.69	-1.30	51.22	Debug	H	100	341	63.50	-12.28	Pass	
29811.400	38.69	13.95	-2.19	50.45	Debug	V	175	22	63.50	-13.05	Pass	
29344.100	37.69	13.72	-1.56	49.84	Debug	H	175	77	63.50	-13.66	Pass	
29841.700	37.71	13.97	-2.21	49.47	Debug	V	125	176	63.50	-14.03	Pass	
27727.850	38.25	13.37	-2.18	49.45	Debug	H	150	231	63.50	-14.05	Pass	
26559.900	38.10	13.24	-1.96	49.37	Debug	H	200	88	63.50	-14.13	Pass	
28360.100	37.94	13.51	-2.16	49.29	Debug	V	200	88	63.50	-14.21	Pass	

Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in formal data.

Radiated Emissions - 34 GHz – 40 GHz



Test Information

Results Title	Radiated E 1m 34-40GHz
File Name	t6b re fccb 34-40g 7cc.emi
Test Laboratory	MH-AR5, 55%RH, 22C, 993hPa
Test Engineer	CP
Test Software	Vasona by EMISoft, version 6.061
Equipment	NOKIA
EUT Details	2023-0052, AWHQU A101 Changes - FCC Technology Type: 5G-NR / LTE TDD Frequency Band: 3500 MHz Modulation: QPSK, 16QAM, 64QAM, 256 QAM Band Class and BW: B48, LTE: 10, 20 MHz 5G-NR: 10, 20, 30, and 40 MHz Power Level: 4 X 5 W, MIMO, 5G Carrier 3555MHz, LTE 36665MHz, SN EB2313R0212, 7cc NR10 3555MHz, 3564.99MHz, 3775.01MHz, LTE10 3665MHz, 3685MHz, 3695MHz, 3.1, (37dbm)
Configuration	FCC PART 15-B RE34G-40G 1 METER DISTANCE, MXE E1608, PRE AMP E1601, ANTENNA E1526, HPF E1213, E1528/E1529 CABLE SET, RBW PREVIEW 12OKHz / FORMALS 1MHZ, VBW 3MHz.
Date	2023-07-14 15:38:46

Formal Data

Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
35974.640	28.57	15.11	2.15	45.84	AvgMax	V	103	217	63.50	-17.66	Pass	
36301.492	29.50	15.18	0.57	45.24	AvgMax	H	169	125	63.50	-18.26	Pass	
36318.965	29.41	15.18	0.47	45.06	AvgMax	V	100	8	63.50	-18.44	Pass	
38313.938	29.97	16.13	-1.30	44.80	AvgMax	V	139	54	63.50	-18.70	Pass	
38042.021	28.45	15.97	-0.36	44.06	AvgMax	H	184	209	63.50	-19.44	Pass	
34930.202	27.86	14.96	1.19	44.02	AvgMax	H	100	223	63.50	-19.48	Pass	
35974.640	43.41	15.11	2.15	60.68	PeakMax	V	103	217	83.50	-22.82	Pass	
38042.021	44.54	15.97	-0.36	60.16	PeakMax	H	184	209	83.50	-23.34	Pass	
36318.965	44.18	15.18	0.47	59.83	PeakMax	V	100	8	83.50	-23.67	Pass	
36301.492	44.07	15.18	0.57	59.81	PeakMax	H	169	125	83.50	-23.69	Pass	
34930.202	43.10	14.96	1.19	59.25	PeakMax	H	100	223	83.50	-24.25	Pass	
38313.938	44.23	16.13	-1.30	59.06	PeakMax	V	139	54	83.50	-24.44	Pass	

Preview Data

Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
35955.450	35.66	15.10	2.05	52.81	Debug	V	150	308	63.50	-10.69	Pass	
39605.100	36.89	16.77	-0.89	52.77	Debug	V	175	308	63.50	-10.73	Pass	
38274.700	37.22	16.10	-1.16	52.16	Debug	V	175	154	63.50	-11.34	Pass	
36299.450	36.37	15.18	0.58	52.12	Debug	H	200	352	63.50	-11.38	Pass	
34930.900	35.64	14.96	1.19	51.80	Debug	H	175	220	63.50	-11.70	Pass	
38036.850	35.97	15.97	-0.34	51.59	Debug	H	200	0	63.50	-11.91	Pass	
36838.550	35.98	15.42	-0.30	51.10	Debug	V	125	330	63.50	-12.40	Pass	
37249.500	35.69	15.54	-1.03	50.20	Debug	H	150	275	63.50	-13.30	Pass	

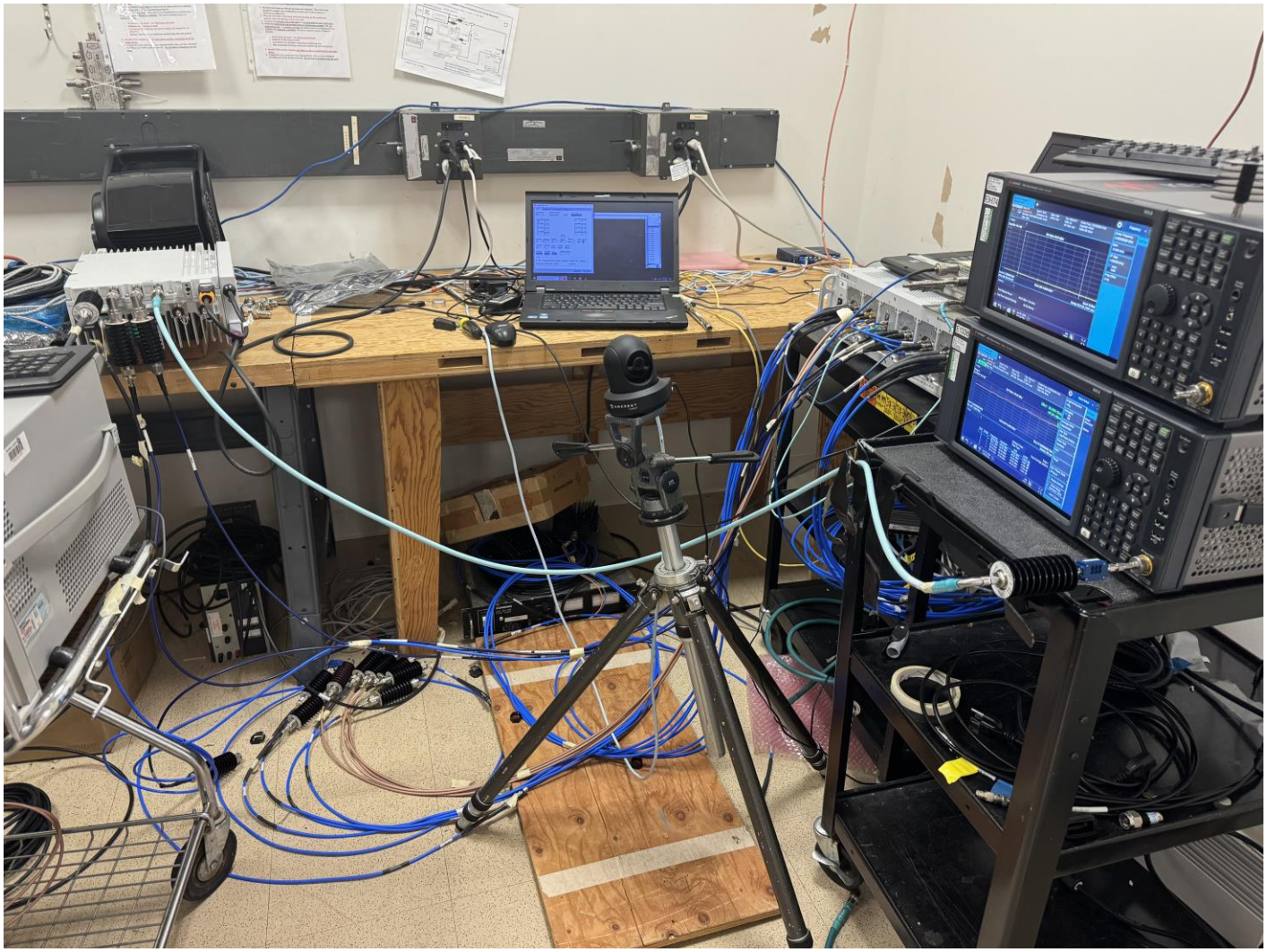
Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in formal data.

7. FCC Section 2.1055 - Measurement of Frequency Stability

Frequency Stability was previously tested and passed under GPCL Project 2023-0004.

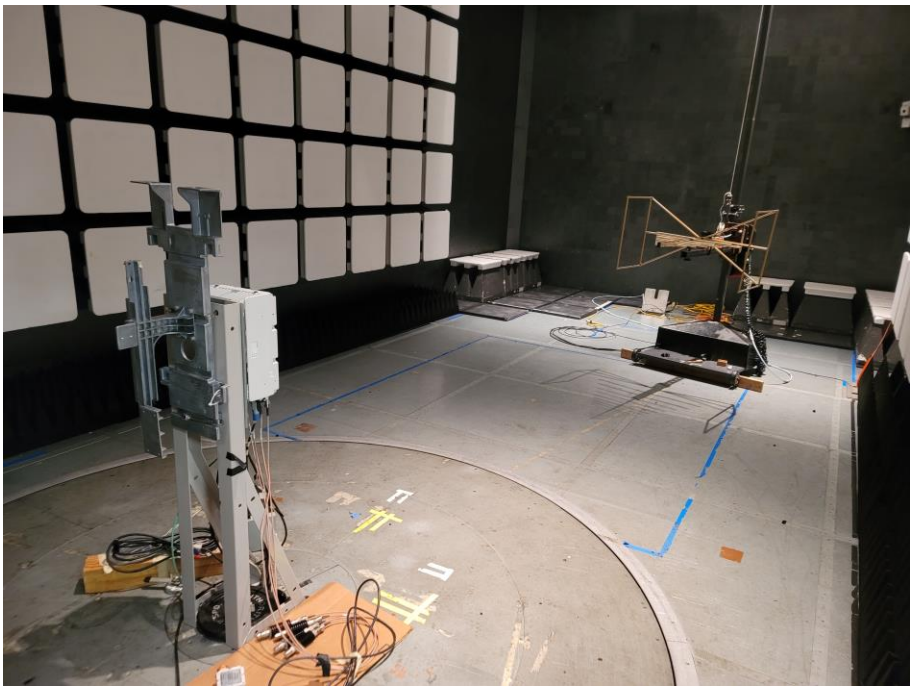
Photographs

Radio Test

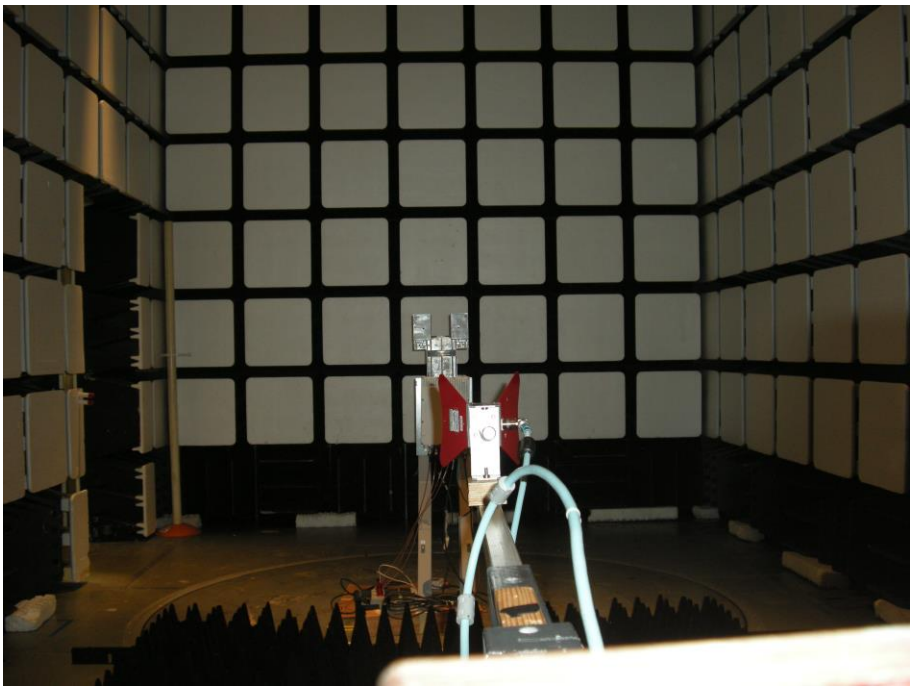


Radiated Emission Test

30MHz – 1GHz



1GHz – 18GHz



Test Equipment

Radio Test Equipment

Asset ID	Manufacturer	Type	Description	Model	Serial	Calibration Date	Calibration Due
E896	Agilent Technologies	Analyzer, Network Analyzer	10 MHz - 40 GHz, PNA-L Microwave Network Analyzer	N5230C	MY49000897	2023-02-08	2025-02-08
E1154	Weinschel	Attenuator	30dB 25W 0.05GHz-26GHz	74-30-12	1065	CNR-V	CNR-V
E1338	KeySight Technologies	Analyzer, MXA Signal Analyzer	20 Hz-44 GHz (Analysis Bandwidth 125 MHz)	N9020B	MY57430927	2023-05-06	2025-05-06
E1587		Filter, High Pass Filter	6 - 24 GHz	11HS-6G/24G-K11	20-02	CNR-V	CNR-V
Customer Provide Equipment							
	MCE/Weinschel	Attenuator	6dB 25W	6530-6-34LIM	3N3225	CNR-V	CNR-V
	Aeroflex Weinschel	Attenuator	20dB 50W	24-20-12 LIM	CE5783	CNR-V	CNR-V
	Micro Coax Utiflex	RF Cable		MFR-64639-228872-001	UF142A-000400-200-2G0	CNR-V	CNR-V
	Mini Circuit	Modular Test System		ZTM-53	11701-250030	CNR-V	CNR-V
	Agilent Technologies	Variable Attenuator	DC-18GHz	8495B	11761A	CNR-V	CNR-V
	Agilent Technologies	Variable Attenuator	DC-18GHz	8494B	11761A	CNR-V	CNR-V

CNR-V: Calibration Not Required, Must Be Verified
Test Date: 5/30/24 – 6/5/24

Radiated Emission Test Equipment

Asset ID	Manufacturer	Type	Description	Model	Serial	Calibration Date	Calibration Due
E1601	A.H. Systems Inc.	Pre-Amplifier	18 - 42 GHz	PAM-1842	102	2022-12-12	2024-12-12
E1526	ETS Lindgren	Horn Antenna	Double Ridged Horn 10-40 GHz	3116C	0227821	2022-07-08	2024-07-08
E1073	ETS Lindgren	Horn Antenna	Double-Ridged Waveguide Horn 1-18 GHz	3117	00135198	2023-06-06	2025-06-06
E1356	Hewlett Packard	Pre-Amplifier	Pre-Amplifier 1-26.5GHz	8449B	3008A01353	2022-11-23	2024-11-23
E1608	KeySight Technologies	EMI Receiver	MXE EMI Receiver, 3 Hz - 44 GHz	N9038B	MY61380146	2022-11-29	2024-11-29
E1213	RLC Electronics Inc	Filter, High Pass	10 - 30 GHz, 2W, 5dB	F-19414	1444001	CNR-V	CNR-V
E1479	Reactel, Inc.	Filter, High Pass	DC - 4.3 GHz	11HS-X4.3 GS11	SN20-01	CNR-V	CNR-V
E1511	Rohde & Schwarz	Test Receiver	EMI Test Receiver 2 Hz - 44 GHz	ESW44	101965	2021-04-07	2023-08-07
E891	Weinschel	Attenuator	DC - 18 GHz, 6 dB, 5W	2-6	BX3432	2022-12-06	2024-12-06
E601	A.H. Systems Inc.	Bilogical Antenna	25 - 2000 MHz	SAS-521-2	408	2022-06-16	2024-06-16
E1529	Micro-Coax	Cable	1-40 GHz, 2.92 (m)+2.92 (m), 237 inch., armor, 90 degree bent	UFB142A-0-2370-2002G0	SFC235841	N/A	N/A
E1528	Micro-Coax	Cable	1-40 GHz, 2.92 (m)+2.92 (m), 36 inch., armor, 90 degree bent	UFB142A-Q-0360-2002GO	SFC235840	N/A	N/A
E1252	Sonoma Instrument Co.	Amplifier	Amplifier 9KHz-1GHz gain 32dB	310N	185704	2022-11-30	2024-11-30
E980	Trilithic	Filter, Low Pass	PCS	10LC1790-3-AA	PCS-LPF-12	CNR	CNR

CNR: Calibration Not Required.
CNR-V: Calibration Not Required; Must be Verified.
Test Date: 7/12/23 - 7/14/23

8. NVLAP Certificate of Accreditation

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

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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).

2022-09-28 through 2023-09-30
Effective Dates

DEPARTMENT OF COMMERCE • UNITED STATES OF AMERICA •

For the National Voluntary Laboratory Accreditation Program

United States Department of Commerce
National Institute of Standards and Technology

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Certificate of Accreditation to ISO/IEC 17025:2017

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2023-09-07 through 2024-09-30
Effective Dates

For the National Voluntary Laboratory Accreditation Program