

## DATA REFERENCE REPORT PART 24

**Applicant Name:**

Apple Inc.  
One Apple Park Way  
Cupertino, CA 95014  
United States

**Date of Testing:**

5/30/2022 - 9/16/2022

**Test Site/Location:**

Element Washington DC LLC, Morgan Hill, CA,  
USA

**Test Report Serial No.:**

1C2205090029-02.BCG

**FCC ID:**

BCGA2437

**Applicant Name:**

Apple Inc.

**Reference Model:**

A2764

**Variant Model:**

A2437 (A2766)

**EUT Type:**

Tablet Device

**FCC Classification:**

PCS Licensed Transmitter (PCB)

**FCC Rule Part:**

24

**Test Procedure(s):**

ANSI C63.26-2015, TIA-603-E-2016, KDB 971168 D01 v03r01


This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.



RJ Ortanez  
Executive Vice President




FCC ID: BCGA2437	 <b>PART 24 DATA REFERENCE REPORT</b>	Approved by: Technical Manager
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## 1.0 INTRODUCTION

### 1.1 Scope

Per manufacturer declaration, there are two tablet device models, A2764 and A2437 (A2766), with high degree of similarity, reference model FCC ID: BCGA2764 and variant model **FCC ID: BCGA2437**. The reference models support mmWave operations, while the variant models have the mmWave components/antennas removed. Both models share the same material, form factor, circuit design, and components, including antennas and their locations. The reference and variant models use the same power tables and have same tune-up tolerances.

Per FCC approved Data Referencing Test Plan, testing was done fully on the reference model FCC ID: BCGA2764, while radiated and conducted spot-check verification has been performed on variant model FCC ID: BCGA2437. Spot-check measurements were conducted, all measurements were investigated and found to be within acceptable tolerance.

Equipment Class	Reference Model FCC ID	Reference Report	Report Title
PCB	BCGA2764	1C2205090028-02.BCG	RF Part 24 Test Report

Table 1-1. Reference Model Details


Reference model FCC ID: BCGA2764 test report has been included in Appendix A

### 1.2 Element Washington DC LLC Test Location

These measurement tests were conducted at the Element Washington DC LLC facility located at 18855 Adams Court, Morgan Hill, CA 95037. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014 and KDB 414788 D01 v01r01.

### 1.3 Test Facility / Accreditations

- Element Washington DC LLC is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.02 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- Element Washington DC LLC TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISSED Standards (RSS).
- Element Washington DC LLC facility is a registered (22831) test laboratory with the site description on file with ISSED.

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## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Apple Tablet Device FCC ID:BCGA2437**. The test data contained in this report pertains only to the emissions due to the EUT's licensed transmitters that operate under the provisions of Part 24.

**Test Device Serial No.:** WMY9M2Q405, KYXYR43WW7, XTJMX4C4RT, DLX2184008F1M9L1L

### 2.2 Device Capabilities

This device contains the following capabilities:

850/1700/1900 WCDMA/HSPA, Multi-band LTE, Multi-band 5G NR (FR1), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII, 802.11a/ax WIFI 6E, Bluetooth (1x, EDR, LE1M, LE2M, HDR4, HDR8), NB UNII (1x, HDR4, HDR8), WPT

This device supports BT Beamforming

This device supports simultaneous transmission operations, which allows for multiple transmitters to transmit simultaneously on the same antenna. The table below shows all configurations possible.


Antenna	Simultaneous Tx Config	WiFi 2.4GHz	Bluetooth	NB UNII	WiFi 5GHz	WiFi 6GHz	LTE / FR1 NR
		802.11 b/g/n/ax	BDR, EDR, HDR4/8, LE1/2M	BDR, HDR4/8	802.11 a/n/ac/ax	802.11 a/ax	Ultra High Band
2a	Config 1	✓	✗	✗	✗	✗	✓
2a	Config 2	✗	✓	✗	✗	✗	✓
4a	Config 3	✓	✗	✓	✗	✗	✗
4a	Config 4	✗	✓	✗	✓	✗	✗

**Table 2-1. Simultaneous Transmission Configurations**

✓ = Support; ✗ = Not Support

#### Note:

1. All the above simultaneous transmission configurations have been tested and the worst case configuration was found to be Bluetooth and LTE B48. Results can be found on RF Bluetooth and RF Part 96 Test Reports.
2. Wi-Fi 2.4GHz and Bluetooth 2.4 GHz can transmit simultaneously on separate antennas. Specific 2.4 GHz Wi-Fi antenna that can only transmit simultaneously with 2.4 GHz Bluetooth antenna is listed in the SAR test report. For BT (2.4 GHz) in connected mode and Wi-Fi (2.4 GHz) – Wi-Fi max power will not exceed minimum of (13.5dBm, SAR max cap, Reg max cap) power. For BT (2.4 GHz) in disconnected mode and Wi-Fi (2.4 GHz) – BT will be using iPA only and Wi-Fi max power will not exceed minimum of (SAR max cap, Reg max cap) power.

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## 2.3 Antenna Description

Following antenna gains provided by manufacturer were used for testing.


Band	Antenna Gain [dBi]			
	Antenna 4b	Antenna 1	Antenna 3	Antenna 2b
WCDMA 1900	-1.0	1.8	0.7	-0.1
LTE Band 25/2				
NR Band n25/n2				

**Table 2-2. Highest Antenna Gain**

## 2.4 Test Support Equipment

1	Apple MacBook Pro	Model:	A2141	S/N:	C02DV7VKMD6T
	w/AC/DC Adapter	Model:	A2166	S/N:	N/A
2	Apple USB-C Cable	Model:	Spartan	S/N:	000MKTR02U
3	USB-C Cable	Model:	A246	S/N:	N/A
	w/ AC Adapter	Model:	A2305	S/N:	N/A
4	Apple Pencil	Model:	N/A	S/N:	GQXGSXBJKM9
5	DC Power Supply	Model:	KPS3010D	S/N:	N/A

**Table 2-3. Test Support Equipment**

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## 2.5 Test Configuration

The EUT was tested per the guidance of ANSI C63.26 2015, TIA-603-E-2016 and KDB 971168 D01 v03r01. See Section 7.0 of this test report for a description of the radiated emissions tests.

For emissions from 1GHz – 18GHz, low, mid, and high channels were tested with highest power and worst case configuration.

The EUT was manipulated through three orthogonal planes of X-orientation (flatbed), Y-orientation (landscape), and Z-orientation (portrait) during the testing. Only the worst case emissions were reported in this test report.

Per FCC Approved Data Referencing Test Plan, Antennas 4b,1, 3 and 2b spot-check measurements have been conducted and reported. Spot-check Test Plan can be referred to below Table 2-4.

Technology	Test Case	Antenna / Modes	FCC ID: BCGA2437	
			Mode	Channel
<b>WCDMA, LTE, FR1 Single Carrier &amp; IntraBand ULCA</b>	Radiated Spurious Emissions (>1GHz)	Max. conducted Power Antenna	LTE Band 5, 2, 7 Max BW, 1RB (QPSK-highest power)	Mid
	Radiated Spurious Emissions (<1GHz)		LTE Band 5, 2, 7 Max BW, 1RB (QPSK-highest power)	Mid
	Conducted Power EIRP	All possible Antenna Configurations	LTE Band 5, 2, 7 Max BW, 1RB (QPSK-highest power)	Mid

**Table 2-4. FCC Approved Spot-Check Test Plan**


Output powers were measured and confirmed to be consistent between Reference and Variant models prior to testing.

## 2.6 Software and Firmware

The test was conducted with firmware version 20A8359 installed on the EUT.

## 2.7 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

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## 3.0 DESCRIPTION OF TESTS

### 3.1 Measurement Procedure

The measurement procedures described in the document titled "Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards" (ANSI C63.26-2015/TIA-603-E-2016) and "Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems" (KDB 971168 D01 v03r01) were used in the measurement of the EUT.

### 3.2 Radiated Spurious Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. For measurements below 1GHz, the absorbers are removed. A raised turntable is used for radiated measurement. The turn table is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm tall test table made of Styrodur is placed on top of the turn table. A Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

The equipment under test was transmitting while connected to its integral antenna and is placed on a turntable 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer.

For radiated spurious emissions measurements and calculations, conversion method is used per the formulas in KDB 971168 Section 5.8.4. Field Strength (EIRP) is calculated using the following formulas:

$$E_{[dB\mu V/m]} = \text{Measured amplitude level}_{[dBm]} + 107 + \text{Cable Loss}_{[dB]} + \text{Antenna Factor}_{[dB/m]}$$

And


$$\text{EIRP}_{[dBm]} = E_{[dB\mu V/m]} + 20\log D - 104.8;$$

Where D is the measurement distance in meters.

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014.

Per KDB 414788 D01 v01r01, radiated emission test sites other than open-field test sites (e.g., shielded anechoic chambers), may be employed for emission measurements below 30MHz if characterized so that the measurements correspond to those obtained at an open-field test site. To determine test site equivalency, a reference sample transmitting at 149kHz was measured on an open field test site (asphalt with no ground plane) and then measured in the 3m semi-anechoic chamber. A calibrated 60cm loop antenna was used while the reference device was rotated through the X, Y and Z axis in order to capture the worst case level. A maximum deviation of 2.77dB at 149kHz was measured when comparing the 3 meter semi-anechoic chamber to the open field site.

Radiated spurious emission levels are investigated with the receive antenna horizontally and vertically polarized per ANSI C63.26-2015 and TIA-603-E-2016.

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## 4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.23-2012. All measurement uncertainty values are shown with a coverage factor of  $k = 2$  to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty ( $\pm$ dB)
Conducted Bench Top Measurements	1.77
Radiated Disturbance (<30MHz)	4.38
Radiated Disturbance (30MHz-1GHz)	4.75
Radiated Disturbance (1-18GHz)	5.20
Radiated Disturbance (>18GHz)	4.72

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## 5.0 TEST EQUIPMENT CALIBRATION DATA


Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	6/10/2022	Annual	6/10/2023	MY49430244
ATM	180-442A-KF	20dB Nominal Gain Horn Antenna	1/19/2022	Annual	1/19/2023	T058701-02
ETS-Lindgren	3142E	Biconilog Antenna (26-6000MHz)	10/21/2021	Annual	10/21/2022	208204
ETS-Lindgren	3117	Double Ridged Guide Horn Antenna (1-18GHz)	10/25/2021	Annual	10/25/2022	227597
ETS-Lindgren	SU-241	Table Top Temperature Chamber	10/6/2021	Annual	10/6/2022	92009574
Keysight Technology	N9040B	UXA Signal Analyzer	2/8/2022	Annual	2/8/2023	MY57212015
Rohde & Schwarz	TS-PR8	Pre-Amplifier (30MHz-6GHz)	1/6/2022	Annual	1/6/2023	102328
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	10/11/2021	Annual	10/11/2022	161616
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	11/4/2021	Annual	11/4/2022	151888
Rohde & Schwarz	ESW26	EMI Test Receiver	5/19/2022	Annual	5/19/2023	101299
Rohde & Schwarz	ESW44	EMI Test Receiver	12/2/2021	Annual	12/2/2022	101570
Rohde & Schwarz	FSV40	Signal Analyzer (10Hz-40GHz)	3/4/2022	Annual	3/4/2023	101619
Rohde & Schwarz	FSVA3044	Signal Analyzer (up to 44 GHz)	5/12/2022	Annual	5/12/2023	101098
Rohde & Schwarz	HFH2-Z2	Loop Antenna	4/3/2022	Annual	4/3/2023	100546
Rohde & Schwarz	TC-TA18	Cross-Polarized Antenna 400MHz-18GHz	1/25/2022	Annual	1/25/2023	101063
Rohde & Schwarz	TS-PR18	Pre-Amplifier (1GHz-18GHz)	1/6/2022	Annual	1/6/2023	101639
Rohde & Schwarz	TS-PR1840	Pre-Amplifier (18GHz-40GHz)	4/18/2022	Annual	4/18/2023	100050

**Table 5-1. Test Equipment**

### Notes:

1. For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

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## 6.0 SAMPLE CALCULATIONS

### Spurious Radiated Emission

#### **Example: Spurious emission at 3700.40 MHz**

The receive spectrum analyzer reading at 3 meters with the EUT on the turntable was  $-81.0$  dBm. The gain of the substituted antenna is  $8.1$  dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of  $-81.0$  dBm on the spectrum analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is  $2.0$  dB at  $3700.40$  MHz. So  $6.1$  dB is added to the signal generator reading of  $-30.9$  dBm yielding  $-24.80$  dBm. The fundamental EIRP was  $25.50$  dBm so this harmonic was  $25.50$  dBm  $- (-24.80) = 50.3$  dBc.

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## 7.0 TEST RESULTS (SPOT-CHECK DATA)

### 7.1 Summary

Company Name: Apple Inc.  
 FCC ID: BCGA2437  
 FCC Classification: PCS Licensed Transmitter (PCB)  
 Mode(s): WCDMA/LTE/NR

Technology	Test Configurations					Reference Model	Variant Model	Delta
	Test Description	Modulation	BW / RB Config	Channel	Measurement Frequency [MHz]	FCC ID: BCGA2764	FCC ID: BCGA2437	
						Average [dBm]	Average [dBm]	Average [dB]
LTE-B2	Radiated Spurious Emissions	QPSK	20MHz / 1/50 RB	M	3760.0	-59.93	-60.80	0.87
LTE-B2	Conducted Powers	QPSK	20MHz / 1/99 RB	M	1880.0	25.26	25.58	0.32
WCDMA B2	Conducted Powers	QPSK	5MHz	M	1880.0	25.62	25.36	0.26
NR Band n2	Conducted Powers	QPSK	20MHz / 1/0 RB	M	1880.0	25.51	25.39	0.12


Table 7-1. Worst Case Antenna 4b Spot-Check Results

Technology	Test Configurations					Reference Model	Variant Model	Delta
	Test Description	Modulation	BW / RB Config	Channel	Measurement Frequency [MHz]	FCC ID: BCGA2764	FCC ID: BCGA2437	
						Average [dBm]	Average [dBm]	Average [dB]
LTE-B2	Conducted Powers	QPSK	20MHz / 1/99 RB	M	1880.0	22.29	22.51	0.16
WCDMA B2	Conducted Powers	QPSK	5MHz	M	1880.0	22.35	22.47	0.12
NR Band n2	Conducted Powers	QPSK	20MHz / 1/0 RB	M	1880.0	22.21	22.34	0.13

Table 7-2. Worst Case Antenna 1 Spot-Check Results

Technology	Test Configurations					Reference Model	Variant Model	Delta
	Test Description	Modulation	BW / RB Config	Channel	Measurement Frequency [MHz]	FCC ID: BCGA2764	FCC ID: BCGA2437	
						Average [dBm]	Average [dBm]	Average [dB]
LTE-B2	Conducted Powers	QPSK	20MHz / 1/99 RB	M	1880.0	25.08	25.13	0.05
WCDMA B2	Conducted Powers	QPSK	5MHz	M	1880.0	25.07	24.98	0.09
NR Band n2	Conducted Powers	QPSK	20MHz / 1/50 RB	M	1880.0	24.90	25.13	0.23

Table 7-3. Worst Case Antenna 3 Spot-Check Results

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Technology	Test Configurations					Reference Model	Variant Model	Delta
	Test Description	Modulation	BW / RB Config	Channel	Measurement Frequency [MHz]	FCC ID: BCGA2764	FCC ID: BCGA2437	
						Average [dBm]	Average [dBm]	Average [dB]
LTE-B2	Conducted Powers	QPSK	20MHz / 1/99 RB	M	1880.0	22.19	22.25	0.06
WCDMA B2	Conducted Powers	QPSK	5MHz	M	1880.0	22.52	22.66	0.14
NR Band n2	Conducted Powers	QPSK	20MHz / 1/0 RB	M	1880.0	22.70	22.62	0.08

**Table 7-4. Worst Case Antenna 2b Spot-Check Results**

Spot-checks were conducted, all measurements were investigated and found to be within acceptable tolerance in accordance with FCC Approved Data Referencing Test Plan.

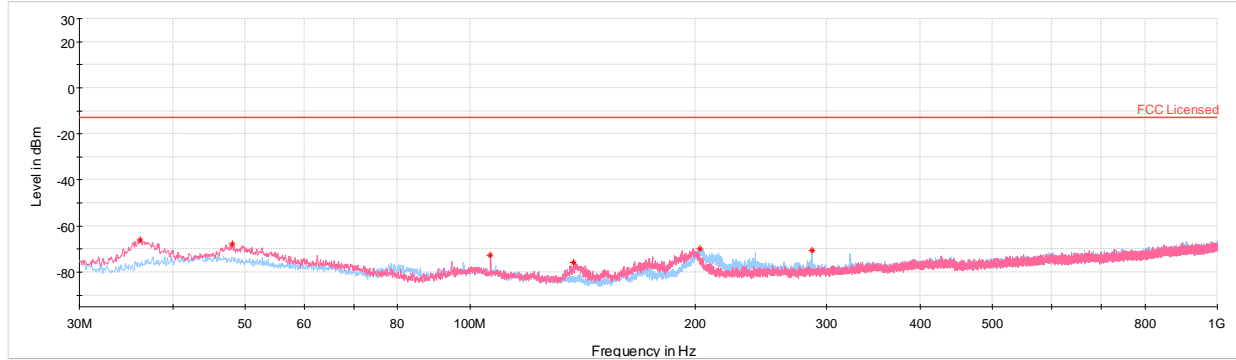
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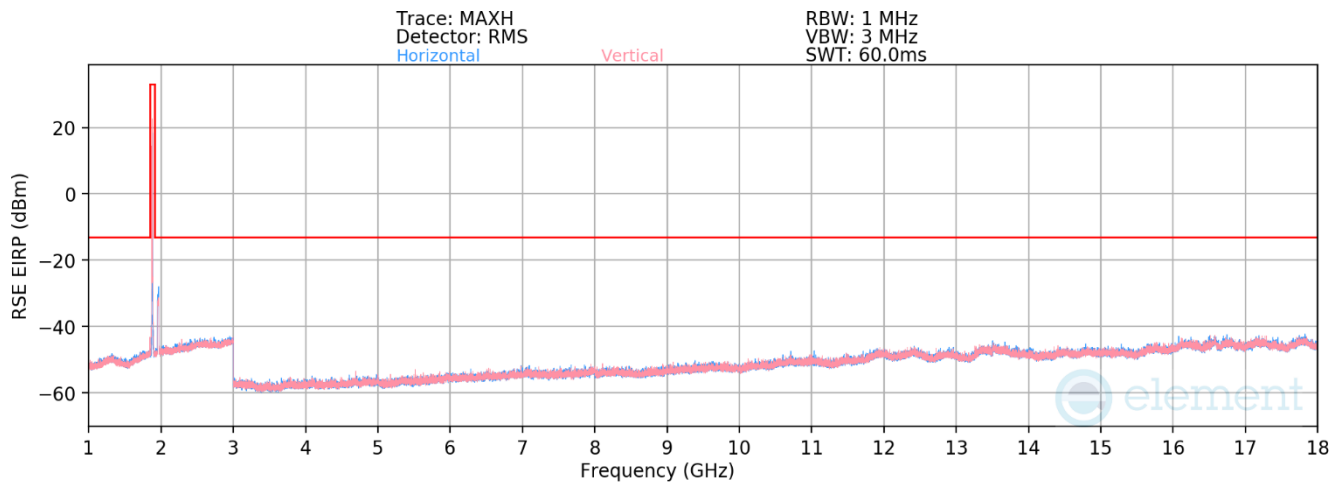
## 7.2 Antenna 4b Radiated Spurious Emissions

§2.1053, 24.238(a)

### LTE-B2



**Plot 7-1. Antenna 4b Radiated Spurious Plot below 1GHz (LTE Band 2)**




**Plot 7-2. Antenna 4b Radiated Spurious Emission above 1GHz (LTE Band 2)**

Bandwidth (MHz):	20
Frequency (MHz):	1880.0
RB / Offset:	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3760.0	H	-	-	-79.61	5.38	32.77	-62.48	-13.00	-49.48
5640.0	H	-	-	-80.15	7.61	34.46	-60.80	-13.00	-47.80
7520.0	H	-	-	-82.63	10.47	34.84	-60.41	-13.00	-47.41

**Table 7-5. Antenna 4b Radiated Spurious Data (LTE Band 2 – Mid Channel)**

FCC ID: BCGA2437	 PART 24 DATA REFERENCE REPORT	Approved by: Technical Manager
Test Report S/N: 1C2205090029-02.BCG	Test Dates: 5/30/2022 - 9/16/2022	EUT Type: Tablet Device
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## 7.3 Antenna 4b – EIRP

### LTE-B2

Bandwidth	Mod.	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
20 MHz	QPSK	1880.0	-1.00	1 / 99	25.58	24.58	0.287	33.01	-8.43

Table 7-6. Antenna 4b EIRP Data (LTE Band 2)

### WCDMA Band 2


Frequency [MHz]	Mode	Conducted Power [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1880.00	WCDMA1900	25.36	-1.00	24.36	0.273	33.01	-8.65

Table 7-7. Antenna 4b EIRP Data (WCDMA Band 2)

### NR Band n2

Bandwidth	Mod.	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
20 MHz	QPSK	1880.0	-1.00	1 / 0	25.39	24.39	0.275	33.01	-8.62

Table 7-8. Antenna 4b EIRP Data (NR Band n2)

FCC ID: BCGA2437	 PART 24 DATA REFERENCE REPORT	Approved by: Technical Manager
Test Report S/N: 1C2205090029-02.BCG	Test Dates: 5/30/2022 - 9/16/2022	EUT Type: Tablet Device
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## 7.4 Antenna 1 –EIRP

### LTE-B2

Bandwidth	Mod.	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
20 MHz	QPSK	1880.0	1.80	1 / 99	22.51	24.31	0.270	33.01	-8.70

Table 7-9. Antenna 1 EIRP Data (LTE Band 2)

### WCDMA Band 2


Frequency [MHz]	Mode	Conducted Power [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1880.00	WCDMA1900	22.47	1.80	24.27	0.267	33.01	-8.74

Table 7-10. Antenna 1 EIRP Data (WCDMA Band 2)

### NR Band n2

Bandwidth	Mod.	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
20 MHz	QPSK	1880.0	1.80	1 / 0	22.34	24.14	0.259	33.01	-8.87

Table 7-11. Antenna 1 EIRP Data (NR Band n2)

FCC ID: BCGA2437	 PART 24 DATA REFERENCE REPORT	Approved by: Technical Manager
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## 7.5 Antenna 3 – EIRP

### LTE-B2

Bandwidth	Mod.	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
20 MHz	QPSK	1880.0	0.70	1 / 99	25.13	25.83	0.383	33.01	-7.18

Table 7-12. Antenna 3 EIRP Data (LTE Band 2)

### WCDMA Band 2


Frequency [MHz]	Mode	Conducted Power [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1880.00	WCDMA1900	24.98	0.70	25.68	0.370	33.01	-7.33

Table 7-13. Antenna 3 EIRP Data (WCDMA Band 2)

### NR Band n2

Bandwidth	Mod.	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
20 MHz	QPSK	1880.0	0.70	1 / 0	25.13	25.83	0.383	33.01	-7.18

Table 7-14. Antenna 3 EIRP Data (NR Band n2)

FCC ID: BCGA2437	 PART 24 DATA REFERENCE REPORT	Approved by: Technical Manager
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## 7.6 Antenna 2b – EIRP

### LTE-B2

Bandwidth	Mod.	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
20 MHz	QPSK	1880.0	-0.10	1 / 99	22.25	22.15	0.164	33.01	-10.86

Table 7-15. Antenna 2b EIRP Data (LTE Band 7)

### WCDMA Band 2


Frequency [MHz]	Mode	Conducted Power [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1880.00	WCDMA1900	22.66	-0.10	22.56	0.180	33.01	-10.45

Table 7-16. Antenna 2b EIRP Data (WCDMA Band 7)

### NR Band n2

Bandwidth	Mod.	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
20 MHz	QPSK	1880.0	-0.10	1 / 0	22.62	22.52	0.179	33.01	-10.49


Table 7-17. Antenna 2b EIRP Data (NR Band n2)

FCC ID: BCGA2437	 PART 24 DATA REFERENCE REPORT	Approved by: Technical Manager
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## 8.0 CONCLUSION

The spot-check data measured for variant model **FCC ID: BCGA2437** is in tolerance with reference model FCC ID: BCGA2764 per FCC Approved Data Referencing Test Plan.


<b>FCC ID:</b> BCGA2437	 <b>PART 24 DATA REFERENCE REPORT</b>	<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1C2205090029-02.BCG	<b>Test Dates:</b> 5/30/2022 - 9/16/2022	<b>EUT Type:</b> Tablet Device
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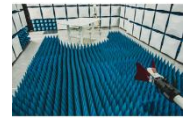
## 9.0 APPENDIX A: REFERENCE MODEL TEST REPORT

Attached is the test report (1C2205090028-02.BCG) from reference model FCC ID: BCGA2764, which includes referenced data results.

<b>FCC ID:</b> BCGA2437	 <b>PART 24 DATA REFERENCE REPORT</b>	<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1C2205090029-02.BCG	<b>Test Dates:</b> 5/30/2022 - 9/16/2022	<b>EUT Type:</b> Tablet Device
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## PART 24 MEASUREMENT REPORT

**Applicant Name:**

Apple Inc.  
One Apple Park Way  
Cupertino, CA 95014  
United States

**Date of Testing:**

5/30/2022 - 9/16/2022

**Test Site/Location:**

Element Washington DC LLC, Morgan Hill, CA, USA

**Test Report Serial No.:**

1C2205090028-02.BCG

**FCC ID:**

BCGA2764

**Applicant Name:**

Apple Inc.

**Application Type:**

Certification

**Model:**

A2764

**EUT Type:**

Tablet Device

**FCC Classification:**

PCS Licensed Transmitter (PCB)

**FCC Rule Part:**

24

**Test Procedure(s):**

ANSI C63.26-2015, TIA-603-E-2016, KDB 971168 D01  
v03r01

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

RJ Ortanez  
Executive Vice President




<b>FCC ID:</b> BCGA2764	<b>PART 24 MEASUREMENT REPORT</b>	<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1C2205090028-02.BCG	<b>Test Dates:</b> 5/30/2022 - 9/16/2022	<b>EUT Type:</b> Tablet Device
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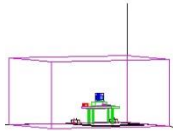
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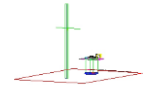
<b>FCC ID:</b> BCGA2764		<b>PART 24 MEASUREMENT REPORT</b>	<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1C2205090028-02.BCG	<b>Test Dates:</b> 5/30/2022 - 9/16/2022	<b>EUT Type:</b> Tablet Device	Page 2 of 210

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## PART 24 MEASUREMENT REPORT



Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	OBW [MHz]	PAR at 0.1% [dB]	EIRP		Emission Designator
						Max. Power [W]	Max. Power [dBm]	
WCMA1900	5 MHz	Spread Spectrum	1852.4 - 1907.6	4.1620	2.83	0.378	25.77	4M16F9W
LTE Band 2	1.4 MHz	QPSK	1850.7 - 1909.3	1.1083	4.98	0.378	25.78	1M11G7W
		16QAM	1850.7 - 1909.3	1.1184	5.82	0.298	24.74	1M12D7W
		64QAM	1850.7 - 1909.3	1.1122	6.42	0.243	23.86	1M11D7W
		256QAM	1850.7 - 1909.3	1.1126	6.73	0.121	20.82	1M11D7W
	3 MHz	QPSK	1851.5 - 1908.5	2.7349	4.64	0.389	25.90	2M73G7W
		16QAM	1851.5 - 1908.5	2.7374	5.70	0.310	24.92	2M74D7W
		64QAM	1851.5 - 1908.5	2.7265	6.50	0.239	23.78	2M73D7W
		256QAM	1851.5 - 1908.5	2.7322	6.72	0.123	20.91	2M73D7W
	5 MHz	QPSK	1852.5 - 1902.5	4.5467	4.87	0.385	25.86	4M55G7W
		16QAM	1852.5 - 1902.5	4.5537	5.86	0.313	24.95	4M55D7W
		64QAM	1852.5 - 1902.5	4.5551	6.45	0.248	23.94	4M56D7W
		256QAM	1852.5 - 1902.5	4.5518	6.80	0.125	20.96	4M55D7W
	10MHz	QPSK	1855 - 1905	9.0620	4.97	0.374	25.73	9M06G7W
		16QAM	1855 - 1905	9.0502	5.86	0.294	24.69	9M05D7W
		64QAM	1855 - 1905	9.0549	6.46	0.248	23.95	9M05D7W
		256QAM	1855 - 1905	9.0417	6.66	0.126	21.02	9M04D7W
	15 MHz	QPSK	1857.5 - 1902.5	13.5678	4.97	0.385	25.86	13M6G7W
		16QAM	1857.5 - 1902.5	13.5745	5.90	0.318	25.03	13M6D7W
		64QAM	1857.5 - 1902.5	13.5224	6.47	0.247	23.93	13M5D7W
		256QAM	1857.5 - 1902.5	13.5867	6.67	0.130	21.13	13M6D7W
	20 MHz	QPSK	1860 - 1900	18.0545	4.89	0.381	25.81	18M1G7W
		16QAM	1860 - 1900	18.0638	5.84	0.284	24.53	18M1D7W
		64QAM	1860 - 1900	18.0452	6.45	0.241	23.82	18M0D7W
		256QAM	1860 - 1900	18.0256	6.67	0.120	20.80	18M0D7W
LTE Band 25	1.4 MHz	QPSK	1850.7 - 1914.3	1.1083	4.97	0.389	25.90	1M11G7W
		16QAM	1850.7 - 1914.3	1.1184	5.87	0.286	24.56	1M12D7W
		64QAM	1850.7 - 1914.3	1.1122	6.50	0.238	23.77	1M11D7W
		256QAM	1850.7 - 1914.3	1.1126	6.84	0.124	20.92	1M11D7W
	3 MHz	QPSK	1851.5 - 1913.5	2.7349	4.67	0.389	25.90	2M73G7W
		16QAM	1851.5 - 1913.5	2.7374	5.73	0.301	24.78	2M74D7W
		64QAM	1851.5 - 1913.5	2.7265	6.57	0.244	23.88	2M73D7W
		256QAM	1851.5 - 1913.5	2.7322	6.76	0.247	23.92	2M73D7W
	5 MHz	QPSK	1852.5 - 1912.5	4.5467	4.89	0.389	25.90	4M55G7W
		16QAM	1852.5 - 1912.5	4.5537	5.91	0.296	24.72	4M55D7W
		64QAM	1852.5 - 1912.5	4.5551	6.50	0.232	23.65	4M56D7W
		256QAM	1852.5 - 1912.5	4.5518	6.80	0.119	20.75	4M55D7W
	10 MHz	QPSK	1855 - 1910	9.0620	4.98	0.389	25.90	9M06G7W
		16QAM	1855 - 1910	9.0502	5.89	0.332	25.21	9M05D7W
		64QAM	1855 - 1910	9.0549	6.51	0.266	24.25	9M05D7W
		256QAM	1855 - 1910	9.0417	6.72	0.134	21.27	9M04D7W
	15 MHz	QPSK	1857.5 - 1907.5	13.5678	4.97	0.389	25.90	13M6G7W
		16QAM	1857.5 - 1907.5	13.5745	5.92	0.321	25.06	13M6D7W
		64QAM	1857.5 - 1907.5	13.5224	6.47	0.258	24.12	13M5D7W
		256QAM	1857.5 - 1907.5	13.5867	6.72	0.129	21.09	13M6D7W
	20 MHz	QPSK	1860 - 1905	18.0545	4.88	0.389	25.90	18M1G7W
		16QAM	1860 - 1905	18.0638	5.85	0.316	25.00	18M1D7W
		64QAM	1860 - 1905	18.0452	6.46	0.246	23.91	18M0D7W
		256QAM	1860 - 1905	18.0256	6.75	0.125	20.96	18M0D7W

### EUT Overview


FCC ID: BCGA2764	 <b>PART 24 MEASUREMENT REPORT</b>		Approved by: Technical Manager
Test Report S/N: 1C2205090028-02.BCG	Test Dates: 5/30/2022 - 9/16/2022	EUT Type: Tablet Device	Page 3 of 210

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Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	OBW [MHz]	PAR at 0.1% [dB]	EIRP		Emission Designator
						Max. Power [W]	Max. Power [dBm]	
NR Band n2	5 MHz	$\pi/2$ BPSK	1852.5 - 1907.5	4.5951	4.03	0.384	25.84	4M60G7W
		QPSK	1852.5 - 1907.5	4.5345	5.38	0.382	25.82	4M53G7W
		16QAM	1852.5 - 1907.5	4.5436	6.34	0.308	24.89	4M54D7W
		64QAM	1852.5 - 1907.5	4.5353	6.56	0.243	23.86	4M54D7W
		256QAM	1852.5 - 1907.5	4.5280	6.54	0.121	20.82	4M53D7W
	10 MHz	$\pi/2$ BPSK	1855 - 1905	9.0156	4.24	0.382	25.82	9M02G7W
		QPSK	1855 - 1905	9.3831	5.50	0.394	25.96	9M38G7W
		16QAM	1855 - 1905	9.3720	6.45	0.311	24.93	9M37D7W
		64QAM	1855 - 1905	9.3514	6.62	0.244	23.88	9M35D7W
		256QAM	1855 - 1905	9.3348	6.65	0.121	20.82	9M33D7W
	15 MHz	$\pi/2$ BPSK	1857.5 - 1902.5	13.5482	4.21	0.378	25.78	13M5G7W
		QPSK	1857.5 - 1902.5	14.2390	5.49	0.383	25.83	14M2G7W
		16QAM	1857.5 - 1902.5	14.2255	6.34	0.321	25.07	14M2D7W
		64QAM	1857.5 - 1902.5	14.1711	6.54	0.245	23.89	14M2D7W
		256QAM	1857.5 - 1902.5	14.2408	6.68	0.123	20.91	14M2D7W
	20 MHz	$\pi/2$ BPSK	1860 - 1900	17.9916	4.25	0.387	25.88	18M0G7W
		QPSK	1860 - 1900	19.0259	5.48	0.381	25.81	19M0G7W
		16QAM	1860 - 1900	19.1158	6.23	0.305	24.85	19M1D7W
		64QAM	1860 - 1900	19.1035	6.60	0.245	23.89	19M1D7W
		256QAM	1860 - 1900	19.0840	6.61	0.123	20.91	19M1D7W
NR Band n25	5 MHz	$\pi/2$ BPSK	1852.5 - 1912.5	4.5951	3.96	0.382	25.82	4M60G7W
		QPSK	1852.5 - 1912.5	4.5345	5.30	0.386	25.87	4M53G7W
		16QAM	1852.5 - 1912.5	4.5436	6.25	0.313	24.96	4M54D7W
		64QAM	1852.5 - 1912.5	4.5353	6.54	0.248	23.95	4M54D7W
		256QAM	1852.5 - 1912.5	4.5280	6.64	0.124	20.93	4M53D7W
	10 MHz	$\pi/2$ BPSK	1855 - 1910	9.0156	4.24	0.381	25.81	9M02G7W
		QPSK	1855 - 1910	9.3831	5.44	0.382	25.82	9M38G7W
		16QAM	1855 - 1910	9.3720	6.37	0.310	24.91	9M37D7W
		64QAM	1855 - 1910	9.3514	6.53	0.242	23.84	9M35D7W
		256QAM	1855 - 1910	9.3348	6.79	0.121	20.82	9M33D7W
	15 MHz	$\pi/2$ BPSK	1857.5 - 1907.5	13.5482	4.17	0.384	25.84	13M5G7W
		QPSK	1857.5 - 1907.5	14.2390	5.39	0.375	25.74	14M2G7W
		16QAM	1857.5 - 1907.5	14.2255	6.28	0.308	24.88	14M2D7W
		64QAM	1857.5 - 1907.5	14.1711	6.35	0.246	23.91	14M2D7W
		256QAM	1857.5 - 1907.5	14.2408	6.84	0.120	20.80	14M2D7W
	20 MHz	$\pi/2$ BPSK	1860 - 1905	17.9916	4.14	0.389	25.90	18M0G7W
		QPSK	1860 - 1905	19.0259	5.37	0.379	25.79	19M0G7W
		16QAM	1860 - 1905	19.1158	6.25	0.309	24.90	19M1D7W
		64QAM	1860 - 1905	19.1035	6.40	0.245	23.89	19M1D7W
		256QAM	1860 - 1905	19.0840	6.55	0.124	20.92	19M1D7W
	25 MHz	$\pi/2$ BPSK	1862.5 - 1902.5	23.1090	4.18	0.386	25.87	23M1G7W
		QPSK	1862.5 - 1902.5	23.9182	5.41	0.386	25.87	23M9G7W
		16QAM	1862.5 - 1902.5	23.9099	6.33	0.305	24.85	23M9D7W
		64QAM	1862.5 - 1902.5	23.8955	6.55	0.242	23.83	23M9D7W
		256QAM	1862.5 - 1902.5	23.8532	6.54	0.123	20.89	23M9D7W
	30 MHz	$\pi/2$ BPSK	1865 - 1900	28.7462	4.16	0.385	25.85	28M7G7W
		QPSK	1865 - 1900	28.8503	5.56	0.382	25.82	28M9G7W
		16QAM	1865 - 1900	28.7904	6.36	0.304	24.83	28M8D7W
		64QAM	1865 - 1900	28.8186	6.64	0.245	23.89	28M8D7W
		256QAM	1865 - 1900	28.8329	6.69	0.120	20.78	28M8D7W
	40 MHz	$\pi/2$ BPSK	1870 - 1895	38.9426	4.42	0.388	25.89	38M9G7W
		QPSK	1870 - 1895	38.7899	5.76	0.385	25.86	38M8G7W
		16QAM	1870 - 1895	38.8428	6.39	0.307	24.87	38M8D7W
		64QAM	1870 - 1895	38.8860	6.63	0.243	23.86	38M9D7W
		256QAM	1870 - 1895	38.8198	6.69	0.121	20.84	38M8D7W

### EUT Overview

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## 1.0 INTRODUCTION

### 1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.


### 1.2 Element Washington DC LLC Test Location

These measurement tests were conducted at the Element Washington DC LLC facility located at 18855 Adams Court, Morgan Hill, CA 95037. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014 and KDB 414788 D01 v01r01.

### 1.3 Test Facility / Accreditations

Measurements were performed at Element Washington DC LLC located in Morgan Hill, CA 95037, U.S.A.

- Element Washington DC LLC is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.02 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- Element Washington DC LLC TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).
- Element Washington DC LLC facility is a registered (22831) test laboratory with the site description on file with ISED.

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## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Apple Tablet Device FCC ID:BCGA2764**. The test data contained in this report pertains only to the emissions due to the EUT's licensed transmitters that operate under the provisions of Part 24.

**Test Device Serial No.:** DLX2184009B1M9L1M, KRRF2YPXDHM, H4QHFXRX21, CC6D2QF1Q5

### 2.2 Device Capabilities

This device contains the following capabilities:

850/1700/1900 WCDMA/HSPA, Multi-band LTE, Multi-band 5G NR (FR1, FR2), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII, 802.11a/ax WIFI 6E, Bluetooth (1x, EDR, LE1M, LE2M, HDR4, HDR8), NB UNII (1x, HDR4, HDR8), WPT

This device supports BT Beamforming

This device supports simultaneous transmission operations, which allows for multiple transmitters to transmit simultaneously on the same antenna. The table below shows all configurations possible.

Antenna	Simultaneous Tx Config	WiFi 2.4GHz	Bluetooth	NB UNII	WiFi 5GHz	WiFi 6GHz	LTE / FR1 NR
		802.11 b/g/n/ax	BDR, EDR, HDR4/8, LE1/2M	BDR, HDR4/8	802.11 a/n/ac/ax	802.11 a/ax	Ultra High Band
2a	Config 1	✓	✗	✗	✗	✗	✓
2a	Config 2	✗	✓	✗	✗	✗	✓
4a	Config 3	✓	✗	✓	✗	✗	✗
4a	Config 4	✗	✓	✗	✓	✗	✗


**Table 2-1. Simultaneous Transmission Configurations**

✓ = Support; ✗ = Not Support

#### **Note:**

All the above simultaneous transmission configurations have been tested and the worst case configuration was found to be Config 2 and reported in RF Bluetooth and FCC Part 96 test reports.

Wi-Fi 2.4GHz and Bluetooth 2.4 GHz can transmit simultaneously on separate antennas. Specific 2.4 GHz Wi-Fi antenna that can only transmit simultaneously with 2.4 GHz Bluetooth antenna is listed in the SAR test report. For BT (2.4 GHz) in connected mode and Wi-Fi (2.4 GHz) – Wi-Fi max power will not exceed minimum of (13.5dBm, SAR max cap, Reg max cap) power. For BT (2.4 GHz) in disconnected mode and Wi-Fi (2.4 GHz) – BT will be using iPA only and Wi-Fi max power will not exceed minimum of (SAR max cap, Reg max cap) power.

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## 2.3 Antenna Description

Following antenna gains provided by manufacturer were used for testing.


Band	Antenna Gain [dBi]			
	Antenna 4b	Antenna 1	Antenna 3	Antenna 2b
WCDMA1900	-1.0	1.8	0.7	-0.1
LTE Band 25/2				
NR Band n25/n2				

**Table 2-2. Highest Antenna Gain**

## 2.4 Test Support Equipment

1	Apple MacBook Pro w/AC/DC Adapter	Model: A2141 Model: A2166	S/N: C02DV7VKMD6T S/N: N/A
2	Apple USB-C Cable	Model: Spartan	S/N: 000MKTR02U
3	USB-C Cable w/ AC Adapter	Model: A246 Model: A2305	S/N: N/A S/N: N/A
4	Apple Pencil	Model: N/A	S/N: GQXGSXBJKM9
5	DC Power Supply	Model: KPS3010D	S/N: N/A

**Table 2-3. Test Support Equipment**

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## 2.5 Test Configuration

The EUT was tested per the guidance of ANSI C63.26-2015, TIA-603-E-2016 and KDB 971168 D01 v03r01. See Section 7.0 of this test report for a description of the radiated and antenna conducted emissions tests.

For emissions from 1GHz – 18GHz, low, mid, and high channels were tested with highest power and worst case configuration. The emissions below 1GHz and above 18GHz were tested with the highest transmitting power and the worst case channel.


The EUT was manipulated through three orthogonal planes of X-orientation (flatbed), Y-orientation (landscape), and Z-orientation (portrait) during the testing. Only the worst case emissions were reported in this test report.

## 2.6 Software and Firmware

The test was conducted with firmware version 20A8359 installed on the EUT.

## 2.7 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

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## 3.0 DESCRIPTION OF TESTS

### 3.1 Evaluation Procedure

The measurement procedures described in the document titled "Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards" (ANSI C63.26-2015/TIA-603-E-2016) and "Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems" (KDB 971168 D01 v03r01) were used in the measurement of the EUT.

Deviation from Measurement Procedure.....None

### 3.2 Radiated Spurious Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. For measurements below 1GHz, the absorbers are removed. A raised turntable is used for radiated measurement. The turn table is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm tall test table made of Styrodur is placed on top of the turn table. A Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

The equipment under test was transmitting while connected to its integral antenna and is placed on a turntable 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer.

For radiated spurious emissions measurements and calculations, conversion method is used per the formulas in KDB 971168 Section 5.8.4. Field Strength (EIRP) is calculated using the following formulas:

$$E_{[dB\mu V/m]} = \text{Measured amplitude level}_{[dBm]} + 107 + \text{Cable Loss}_{[dB]} + \text{Antenna Factor}_{[dB/m]}$$


And

$$\text{EIRP}_{[dBm]} = E_{[dB\mu V/m]} + 20\log D - 104.8; \text{ where } D \text{ is the measurement distance in meters.}$$

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014.

Per KDB 414788 D01 v01r01, radiated emission test sites other than open-field test sites (e.g., shielded anechoic chambers), may be employed for emission measurements below 30MHz if characterized so that the measurements correspond to those obtained at an open-field test site. To determine test site equivalency, a reference sample transmitting at 149kHz was measured on an open field test site (asphalt with no ground plane) and then measured in the 3m semi-anechoic chamber. A calibrated 60cm loop antenna was used while the reference device was rotated through the X, Y and Z axis in order to capture the worst case level. A maximum deviation of 2.77dB at 149kHz was measured when comparing the 3 meter semi-anechoic chamber to the open field site.

Radiated spurious emission levels are investigated with the receive antenna horizontally and vertically polarized per ANSI C63.26-2015 and TIA-603-E-2016.


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## 4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.23-2012. All measurement uncertainty values are shown with a coverage factor of  $k = 2$  to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty ( $\pm$ dB)
Conducted Bench Top Measurements	1.77
Radiated Disturbance (<30MHz)	4.38
Radiated Disturbance (30MHz-1GHz)	4.75
Radiated Disturbance (1-18GHz)	5.20
Radiated Disturbance (>18GHz)	4.72

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## 5.0 TEST EQUIPMENT CALIBRATION DATA


Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	6/10/2022	Annual	6/10/2023	MY49430244
Agilent Technologies	N9020A	MXA Signal Analyzer	4/26/2022	Annual	4/26/2023	MY56470202
ATM	180-442A-KF	20dB Nominal Gain Horn Antenna	1/19/2022	Annual	1/19/2023	T058701-02
ETS-Lindgren	3142E	Biconilog Antenna (26-6000MHz)	10/21/2021	Annual	10/21/2022	208204
ETS-Lindgren	3117	Double Ridged Guide Horn Antenna (1-18GHz)	10/25/2021	Annual	10/25/2022	227597
ETS-Lindgren	SU-241	Table Top Temperature Chamber	10/6/2021	Annual	10/6/2022	92009574
Keysight Technology	N9040B	UXA Signal Analyzer	2/8/2022	Annual	2/8/2023	MY57212015
Rohde & Schwarz	TS-PR8	Pre-Amplifier (30MHz-6GHz)	1/6/2022	Annual	1/6/2023	102328
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	10/11/2021	Annual	10/11/2022	161616
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	11/4/2021	Annual	11/4/2022	151888
Rohde & Schwarz	ESW26	EMI Test Receiver	5/19/2022	Annual	5/19/2023	101299
Rohde & Schwarz	ESW44	EMI Test Receiver	12/2/2021	Annual	12/2/2022	101570
Rohde & Schwarz	FSV40	Signal Analyzer (10Hz-40GHz)	3/4/2022	Annual	3/4/2023	101619
Rohde & Schwarz	FSVA3044	Signal Analyzer (up to 44 GHz)	5/12/2022	Annual	5/12/2023	101098
Rohde & Schwarz	HFH2-Z2	Loop Antenna	4/3/2022	Annual	4/3/2023	100546
Rohde & Schwarz	TC-TA18	Cross-Polarized Antenna 400MHz-18GHz	1/25/2022	Annual	1/25/2023	101063
Rohde & Schwarz	TS-PR18	Pre-Amplifier (1GHz-18GHz)	1/6/2022	Annual	1/6/2023	101639
Rohde & Schwarz	TS-PR1840	Pre-Amplifier (18GHz-40GHz)	4/18/2022	Annual	4/18/2023	100050

**Table 5-1. Test Equipment**

### Notes:

1. For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.
2. Equipment with a calibration date of "N/A" shown in this list was not used to make direct calibrated measurements.

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## 6.0 SAMPLE CALCULATIONS

### Emission Designator

#### WCDMA Emission Designator

**Emission Designator = 4M16F9W**

WCDMA BW = 4.16 MHz

F = Frequency Modulation

9 = Composite Digital Info

W = Combination (Audio/Data)

#### $\pi/2$ BPSK / QPSK Modulation

**Emission Designator = 8M62G7W**

BW = 8.62 MHz

G = Phase Modulation

7 = Quantized/Digital Info

W = Combination of Any

#### QAM Modulation

**Emission Designator = 8M45D7W**

BW = 8.45 MHz

D = Amplitude/Angle Modulated


7 = Quantized/Digital Info

W = Combination of Any

### Spurious Radiated Emission

#### **Example: Spurious emission at 3700.40 MHz**

The receive spectrum analyzer reading at 3 meters with the EUT on the turntable was  $-81.0$  dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of  $-81.0$  dBm on the spectrum analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 3700.40 MHz. So 6.1 dB is added to the signal generator reading of  $-30.9$  dBm yielding  $-24.80$  dBm. The fundamental EIRP was 25.50 dBm so this harmonic was  $25.50$  dBm  $- (-24.80) = 50.3$  dBc.

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## 7.0 TEST RESULTS

### 7.1 Summary


Company Name: Apple Inc.  
 FCC ID: BCGA2764  
 FCC Classification: PCS Licensed Transmitter (PCB)  
 Mode(s): WCDMA/LTE/NR

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Occupied Bandwidth	2.1049	N/A	N/A	Section 7.2
	Conducted Band Edge / Spurious Emissions	2.1051, 24.238(a)	-13 dBm at Band Edge and for all out-of-band emissions	PASS	Sections 7.3, 7.4
	Peak-Average Ratio	24.232(d)	< 13 dB	PASS	Section 7.5
	Transmitter Conducted Output Power	2.1046	N/A	N/A	See RF Exposure Report
	Frequency Stability	2.1055, 24.235	Fundamental emissions stay within authorized frequency block over the temperature and voltage range as tested	PASS	Section 7.8
	Effective Radiated Power / Equivalent Isotropic Radiated Power	24.232(c)	< 2 Watts max. EIRP	PASS	Section 7.6
RADIATED	Radiated Spurious Emissions	2.1053, 24.238(a)	-13 dBm for all out-of-band emissions	PASS	Section 7.7

**Table 7-1. Summary of Test Results**

#### Notes:

1. All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2. The analyzer plots were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
3. All antenna conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
4. All conducted emissions measurements are performed with automated test software to capture the corresponding plots necessary to show compliance. The measurement software utilized is Element EMC Software Tool v1.1.

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## 7.2 Occupied Bandwidth

**\$2.1049**

### Test Overview

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. All modes of operation were investigated and the worst case configuration results are reported in this section. All ports were tested and only the worst case data were reported.

### Test Procedure Used

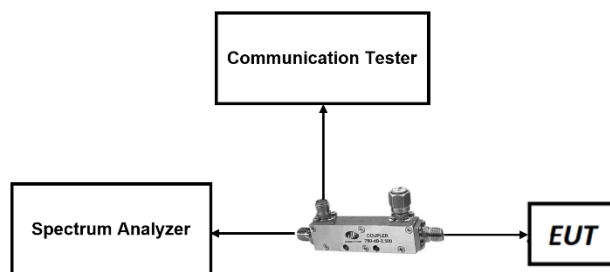
KDB 971168 D01 v03r01 – Section 4.2

### Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW  $\geq 3 \times$  RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

### Test Setup


The EUT and measurement equipment were set up as shown in the diagram below.



**Figure 7-1. Test Instrument & Measurement Setup**

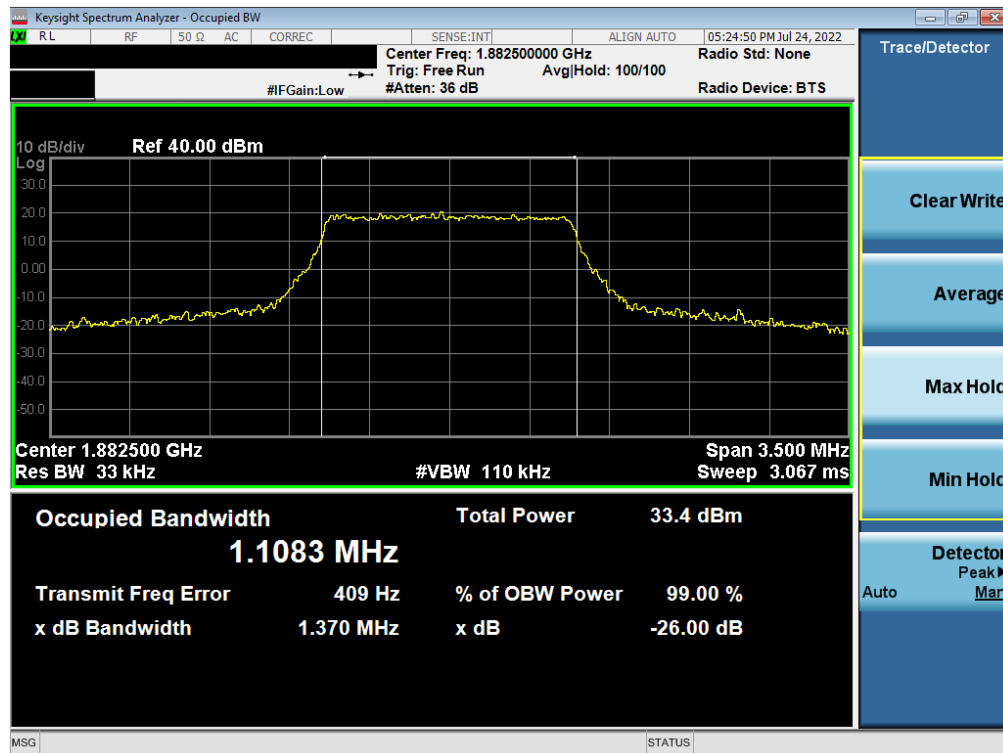
### Test Notes

None.

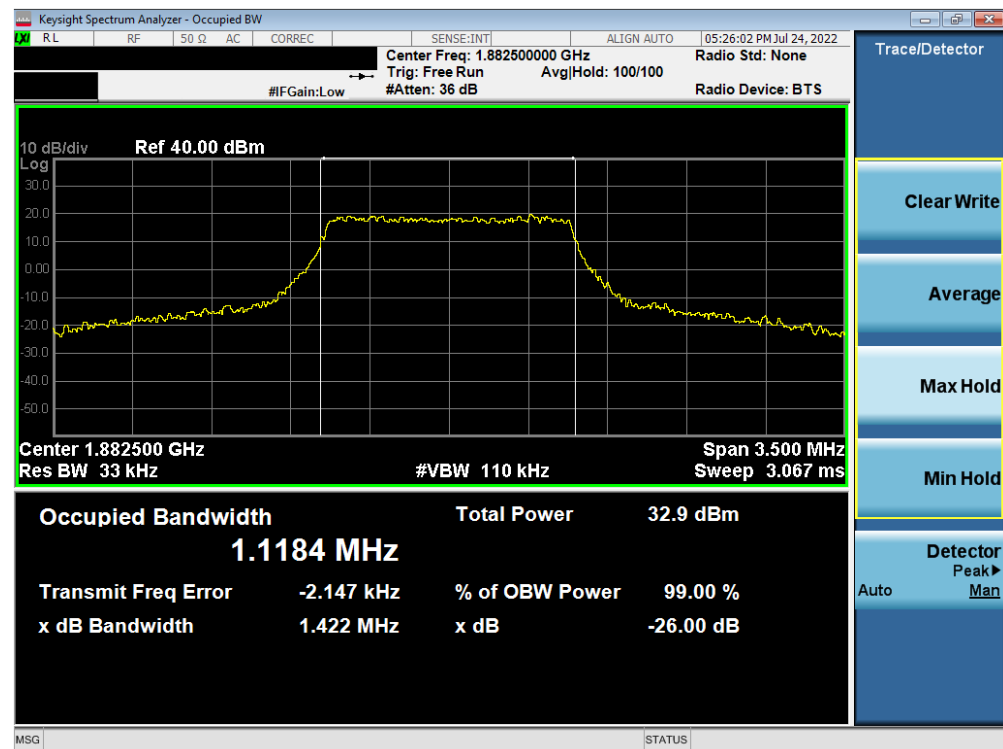
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## LTE Band 25/2



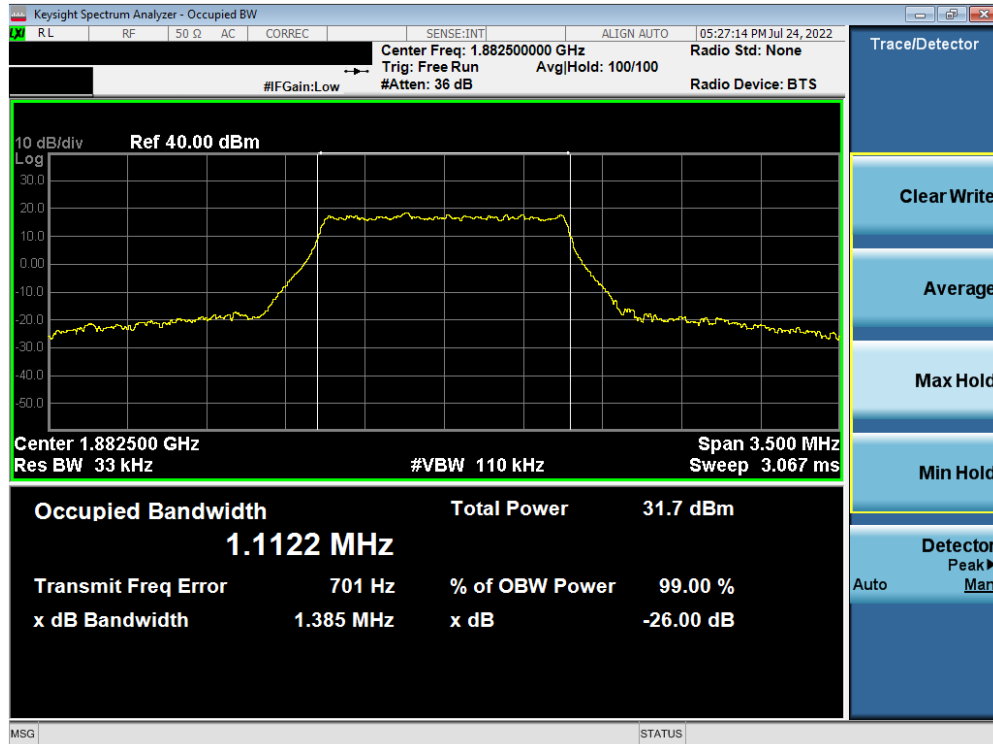
Plot 7-1. Occupied Bandwidth Plot (LTE Band 25/2 - 1.4MHz QPSK - Full RB Configuration)



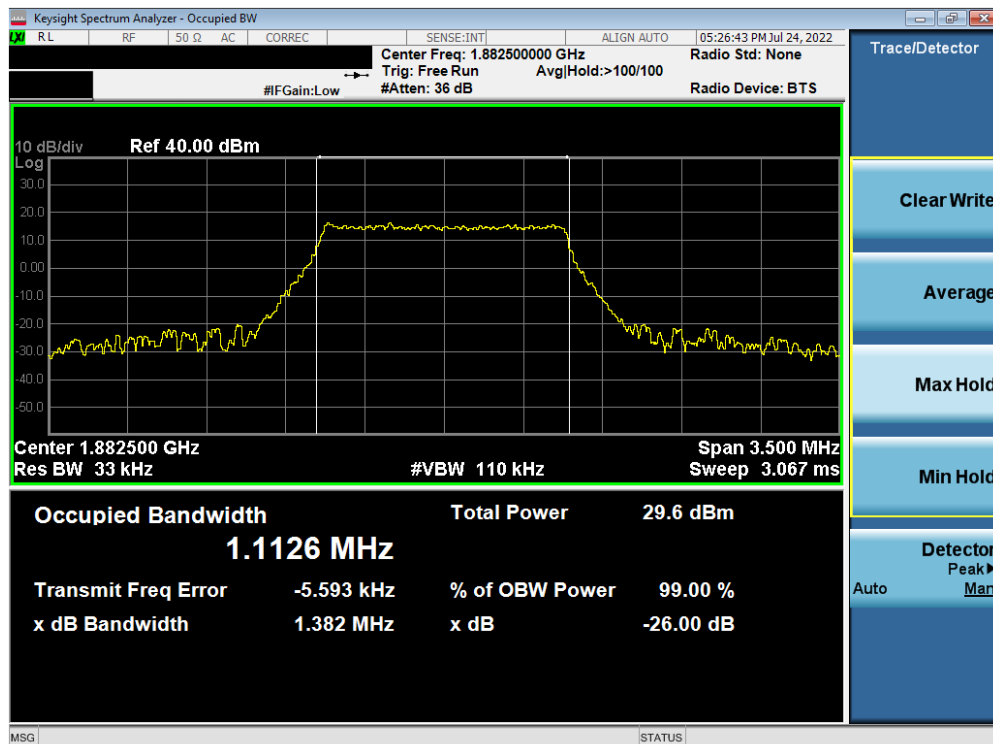
Plot 7-2. Occupied Bandwidth Plot (LTE Band 25/2 - 1.4MHz 16-QAM - Full RB Configuration)

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Plot 7-3. Occupied Bandwidth Plot (LTE Band 25/2 - 1.4MHz 64-QAM - Full RB Configuration)

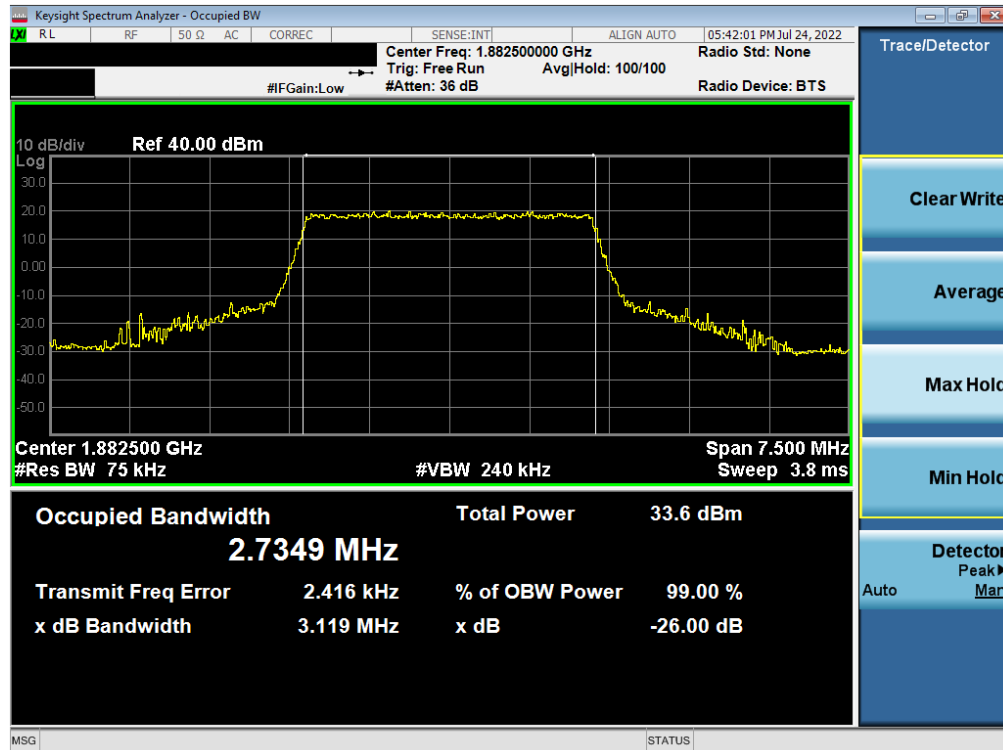


Plot 7-4. Occupied Bandwidth Plot (LTE Band 25/2 - 1.4MHz 256-QAM - Full RB Configuration)

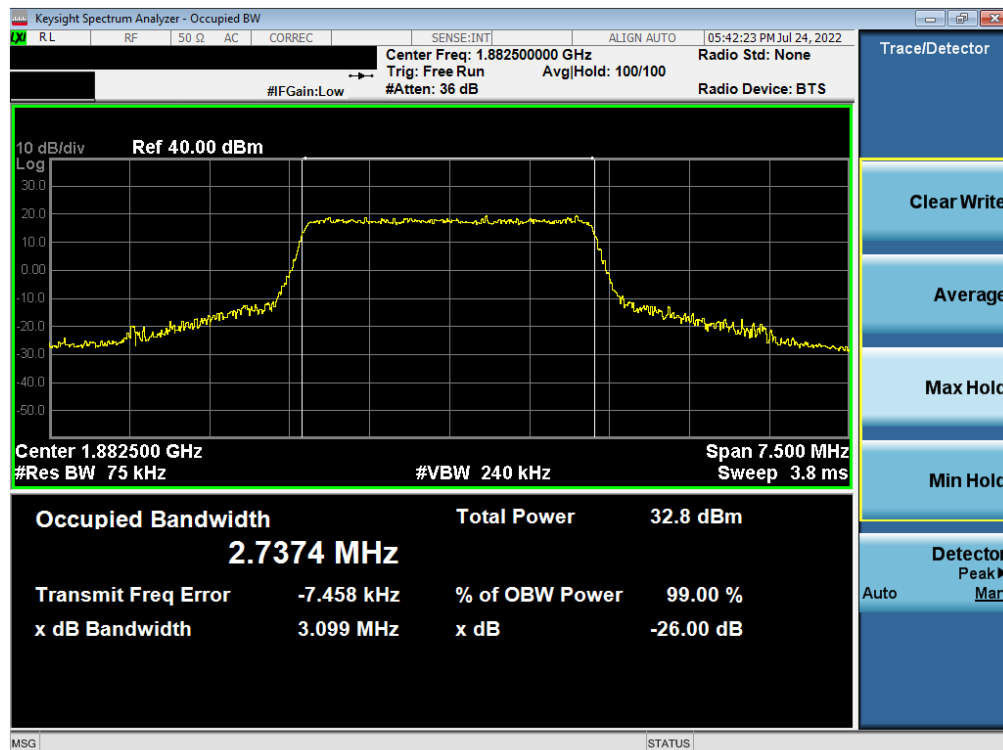
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Plot 7-5. Occupied Bandwidth Plot (LTE Band 25/2 - 3MHz QPSK - Full RB Configuration)

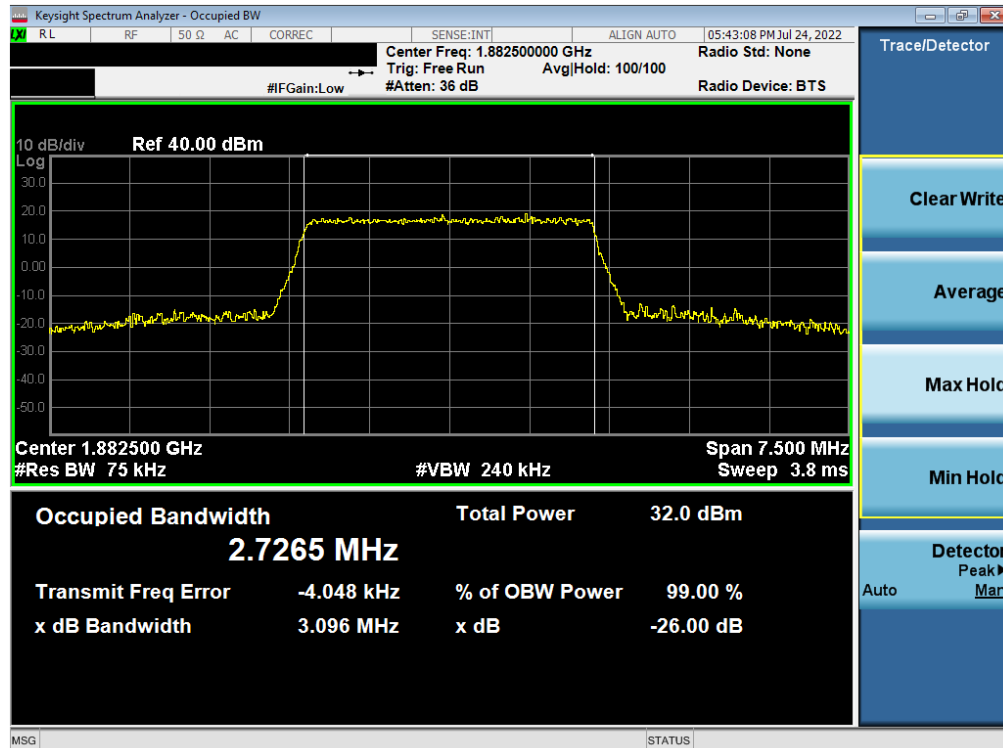


Plot 7-6. Occupied Bandwidth Plot (LTE Band 25/2 - 3MHz 16-QAM - Full RB Configuration)

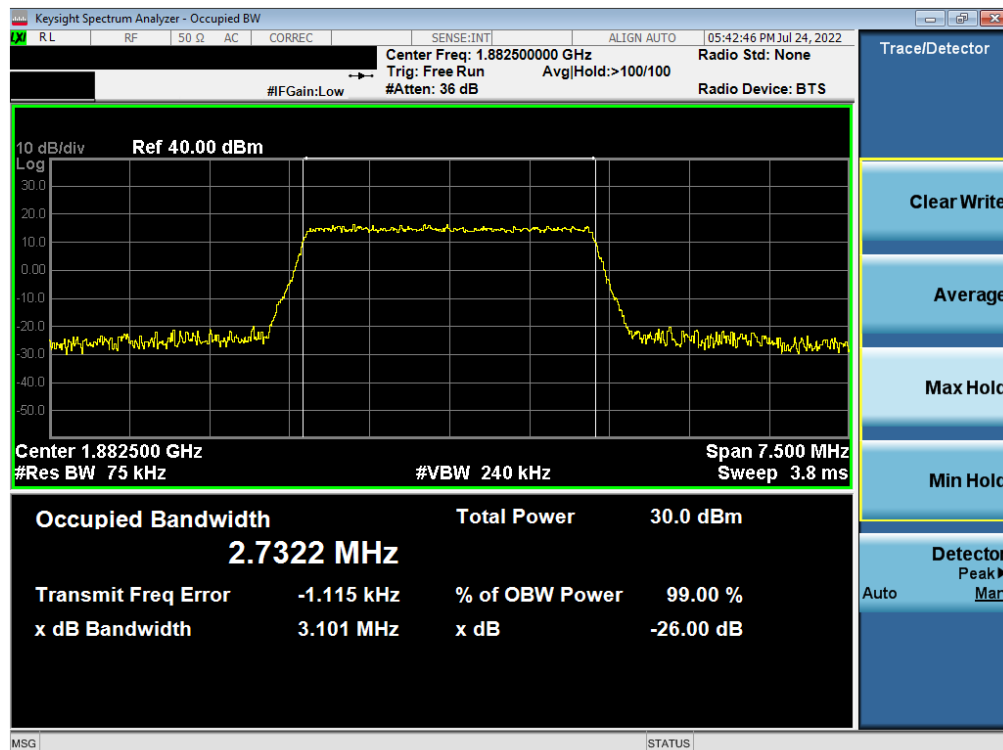
FCC ID: BCGA2764	element	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1C2205090028-02.BCG	Test Dates: 5/30/2022 - 9/16/2022	EUT Type: Tablet Device	Page 17 of 210

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Plot 7-7. Occupied Bandwidth Plot (LTE Band 25/2 - 3MHz 64-QAM - Full RB Configuration)

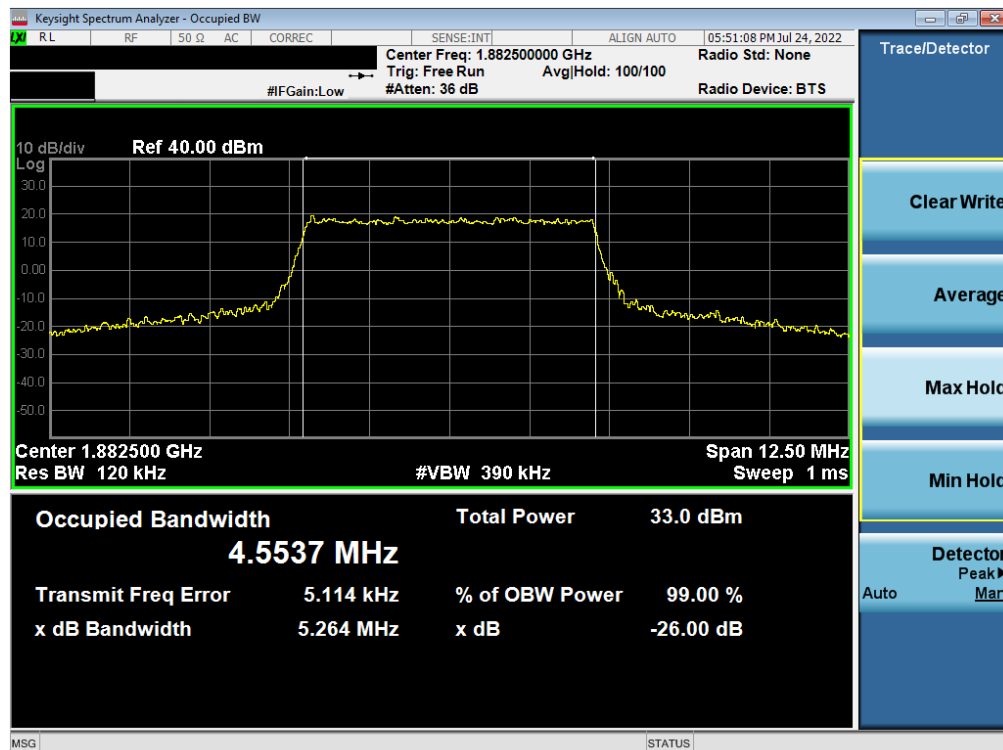


Plot 7-8. Occupied Bandwidth Plot (LTE Band 25/2 - 3MHz 256-QAM - Full RB Configuration)


FCC ID: BCGA2764	 <b>PART 24 MEASUREMENT REPORT</b>		Approved by: Technical Manager
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Plot 7-9. Occupied Bandwidth Plot (LTE Band 25/2 - 5MHz QPSK - Full RB Configuration)



Plot 7-10. Occupied Bandwidth Plot (LTE Band 25/2 - 5MHz 16-QAM - Full RB Configuration)

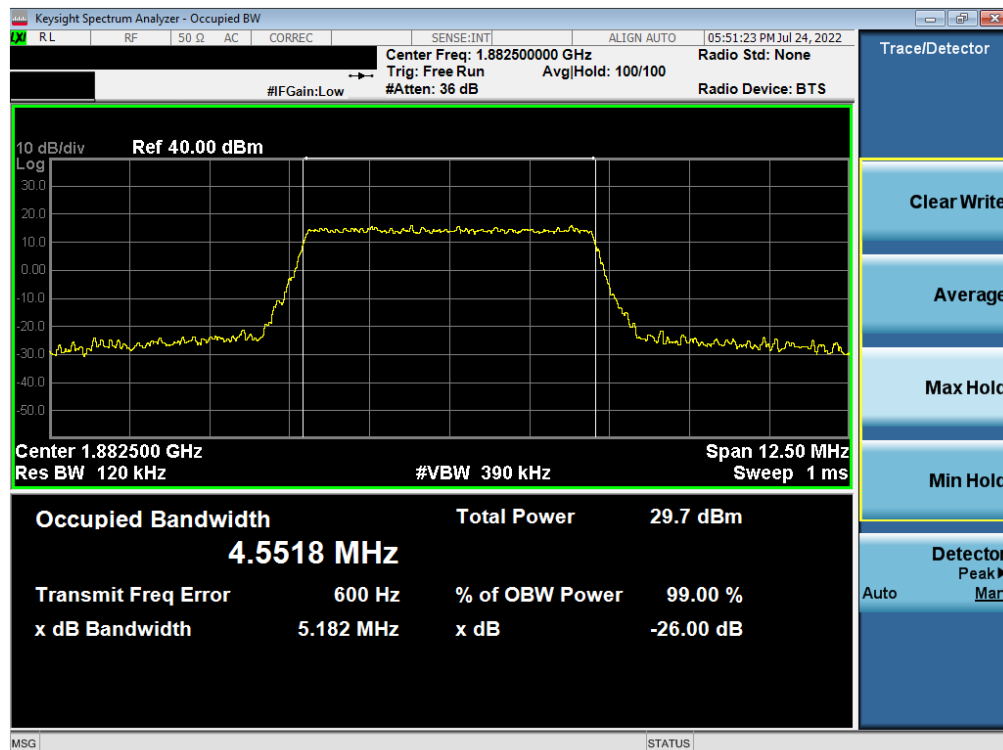
FCC ID: BCGA2764	 <b>PART 24 MEASUREMENT REPORT</b>		Approved by: Technical Manager
Test Report S/N: 1C2205090028-02.BCG	Test Dates: 5/30/2022 - 9/16/2022	EUT Type: Tablet Device	Page 19 of 210

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Plot 7-11. Occupied Bandwidth Plot (LTE Band 25/2 - 5MHz 64-QAM - Full RB Configuration)

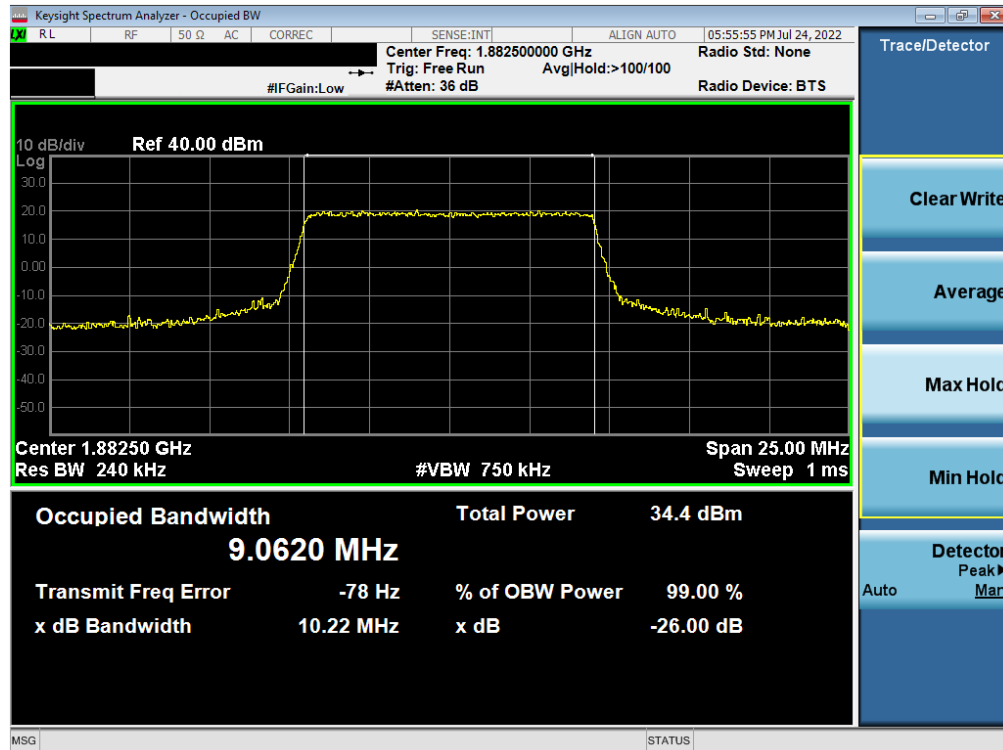


Plot 7-12. Occupied Bandwidth Plot (LTE Band 25/2 - 5MHz 256-QAM - Full RB Configuration)

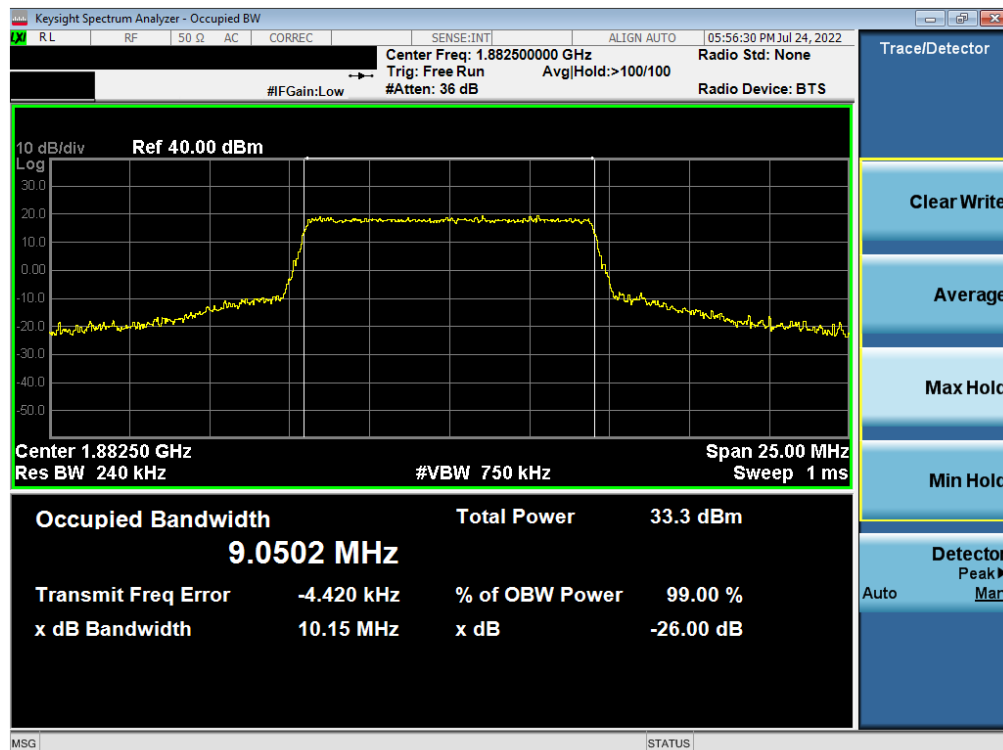
FCC ID: BCGA2764	 <b>PART 24 MEASUREMENT REPORT</b>		Approved by: Technical Manager
Test Report S/N: 1C2205090028-02.BCG	Test Dates: 5/30/2022 - 9/16/2022	EUT Type: Tablet Device	Page 20 of 210

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Plot 7-13. Occupied Bandwidth Plot (LTE Band 25/2 - 10MHz QPSK - Full RB Configuration)



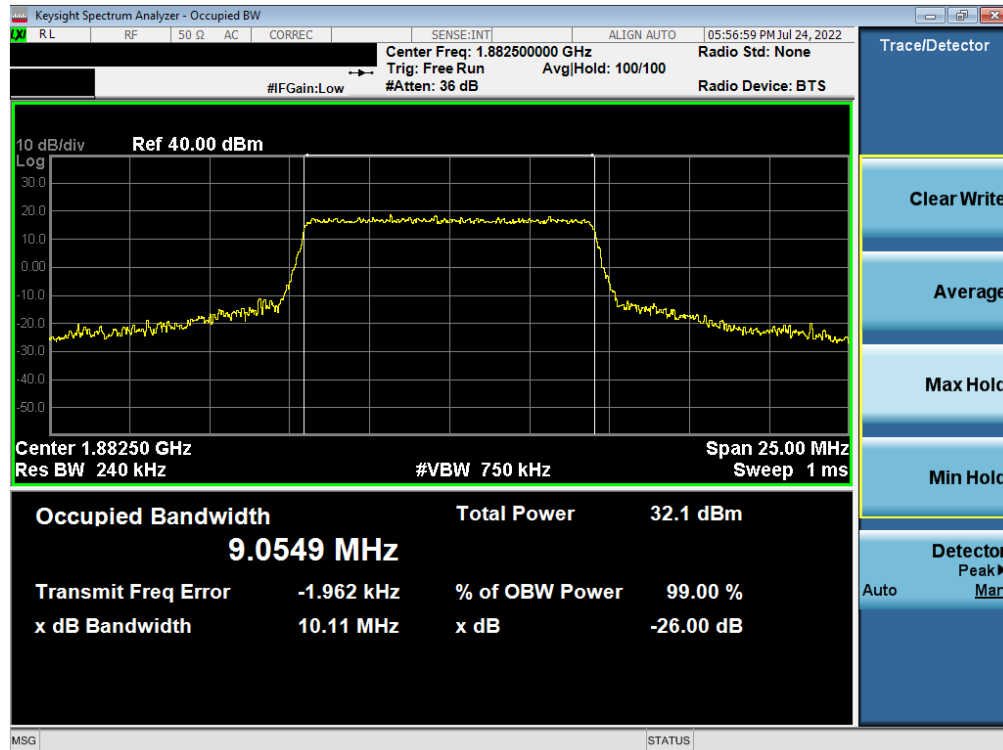
Plot 7-14. Occupied Bandwidth Plot (LTE Band 25/2 - 10MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2764	 <b>PART 24 MEASUREMENT REPORT</b>		Approved by: Technical Manager
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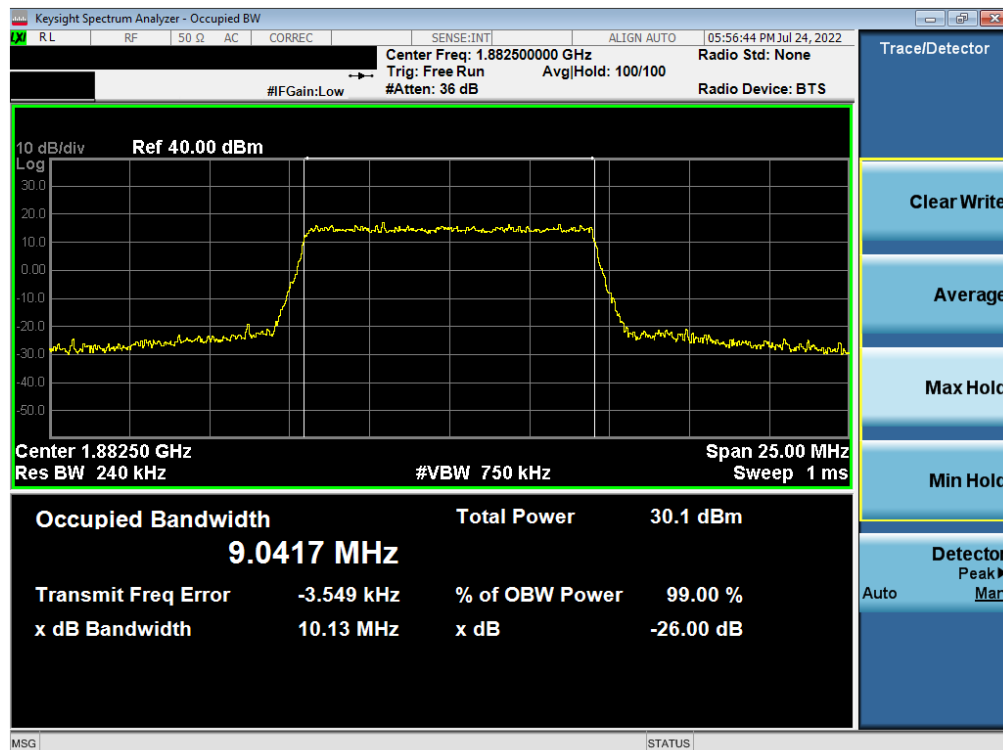
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Plot 7-15. Occupied Bandwidth Plot (LTE Band 25/2 - 10MHz 64-QAM - Full RB Configuration)



Plot 7-16. Occupied Bandwidth Plot (LTE Band 25/2 - 10MHz 256-QAM - Full RB Configuration)

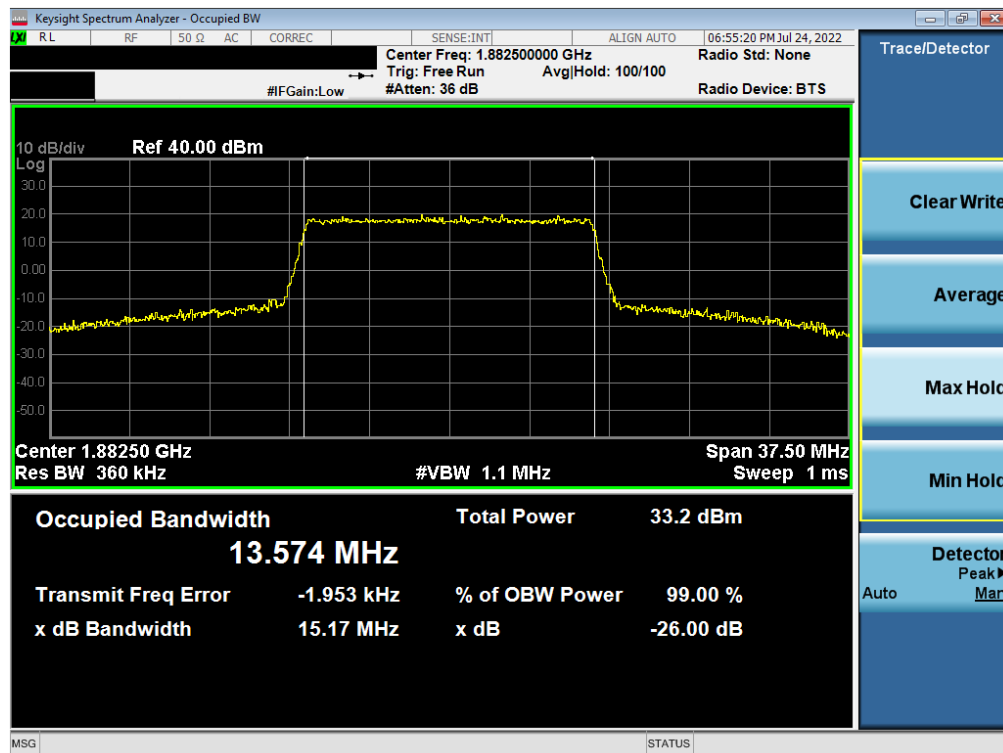
FCC ID: BCGA2764	 <b>PART 24 MEASUREMENT REPORT</b>		Approved by: Technical Manager
Test Report S/N: 1C2205090028-02.BCG	Test Dates: 5/30/2022 - 9/16/2022	EUT Type: Tablet Device	Page 22 of 210

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Plot 7-17. Occupied Bandwidth Plot (LTE Band 25/2 - 15MHz QPSK - Full RB Configuration)

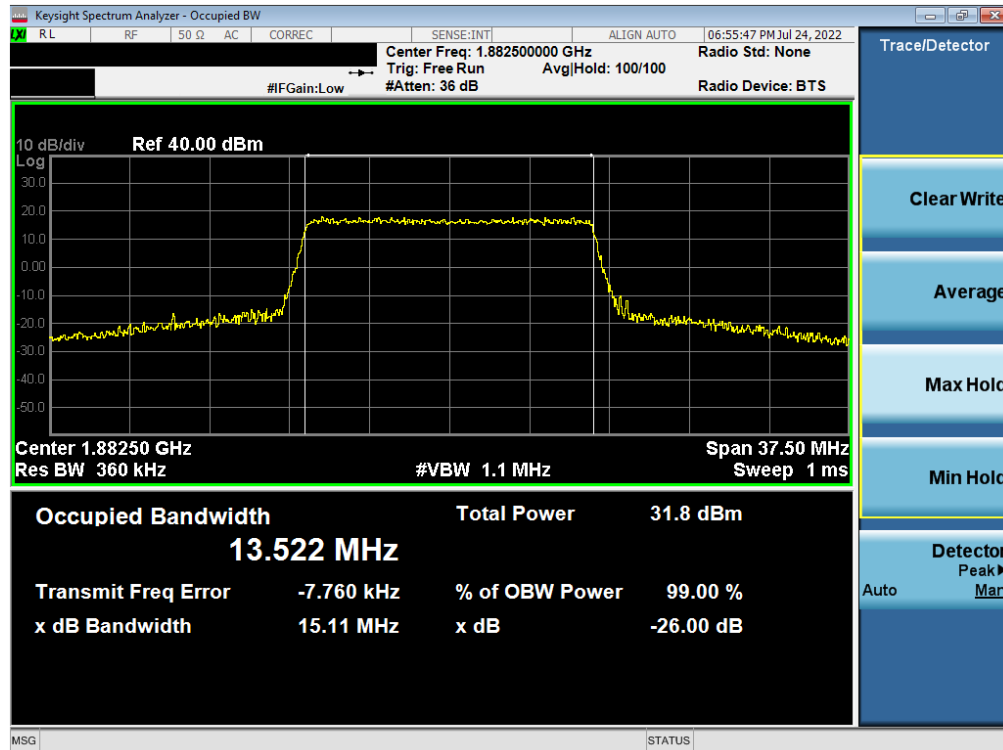


Plot 7-18. Occupied Bandwidth Plot (LTE Band 25/2 - 15MHz 16-QAM - Full RB Configuration)

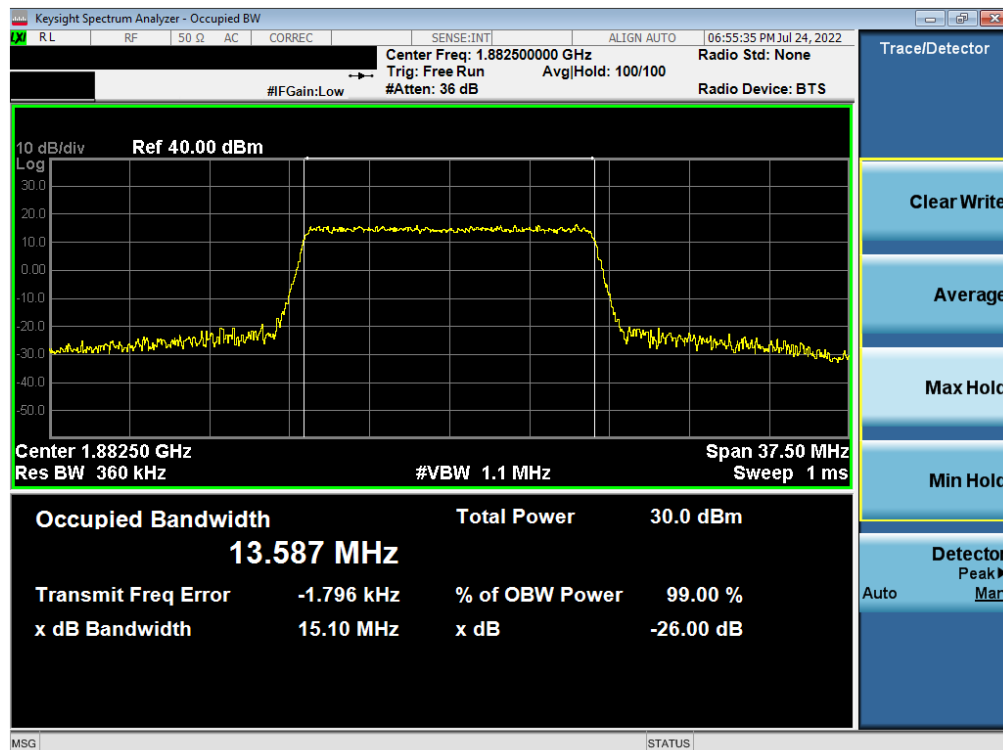
FCC ID: BCGA2764	 PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090028-02.BCG	Test Dates: 5/30/2022 - 9/16/2022	EUT Type: Tablet Device	Page 23 of 210

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Plot 7-19. Occupied Bandwidth Plot (LTE Band 25/2 - 15MHz 64-QAM - Full RB Configuration)

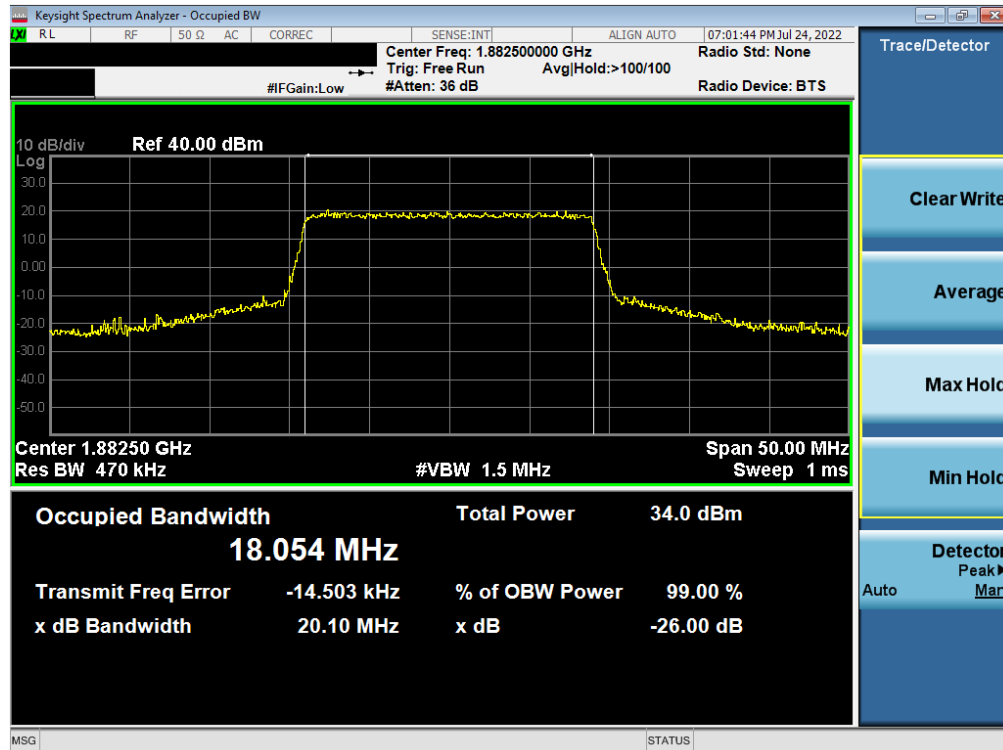


Plot 7-20. Occupied Bandwidth Plot (LTE Band 25/2 - 15MHz 256-QAM - Full RB Configuration)

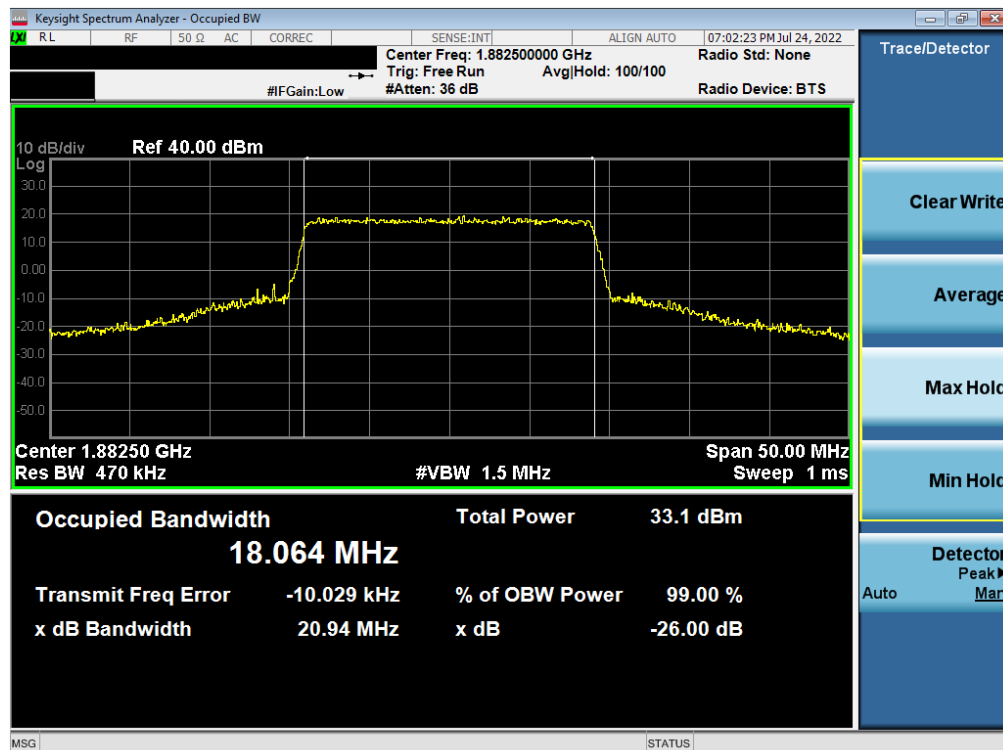
FCC ID: BCGA2764	 <b>PART 24 MEASUREMENT REPORT</b>		Approved by: Technical Manager
Test Report S/N: 1C2205090028-02.BCG	Test Dates: 5/30/2022 - 9/16/2022	EUT Type: Tablet Device	Page 24 of 210

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Plot 7-21. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz QPSK - Full RB Configuration)

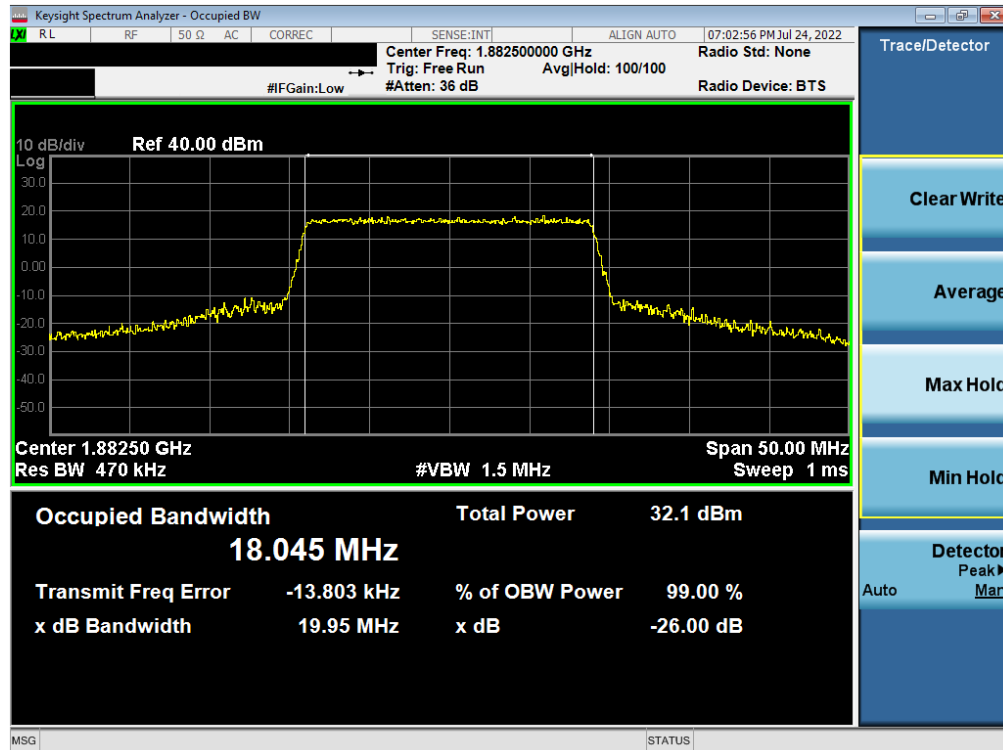


Plot 7-22. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz 16-QAM - Full RB Configuration)

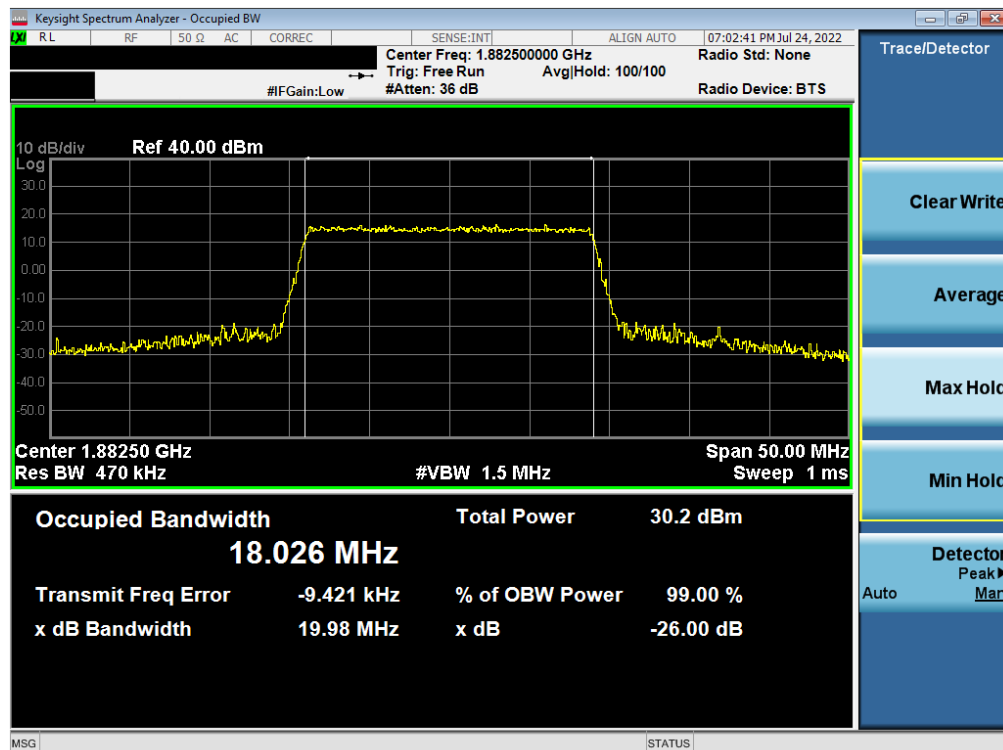
FCC ID: BCGA2764	 <b>PART 24 MEASUREMENT REPORT</b>		Approved by: Technical Manager
Test Report S/N: 1C2205090028-02.BCG	Test Dates: 5/30/2022 - 9/16/2022	EUT Type: Tablet Device	Page 25 of 210

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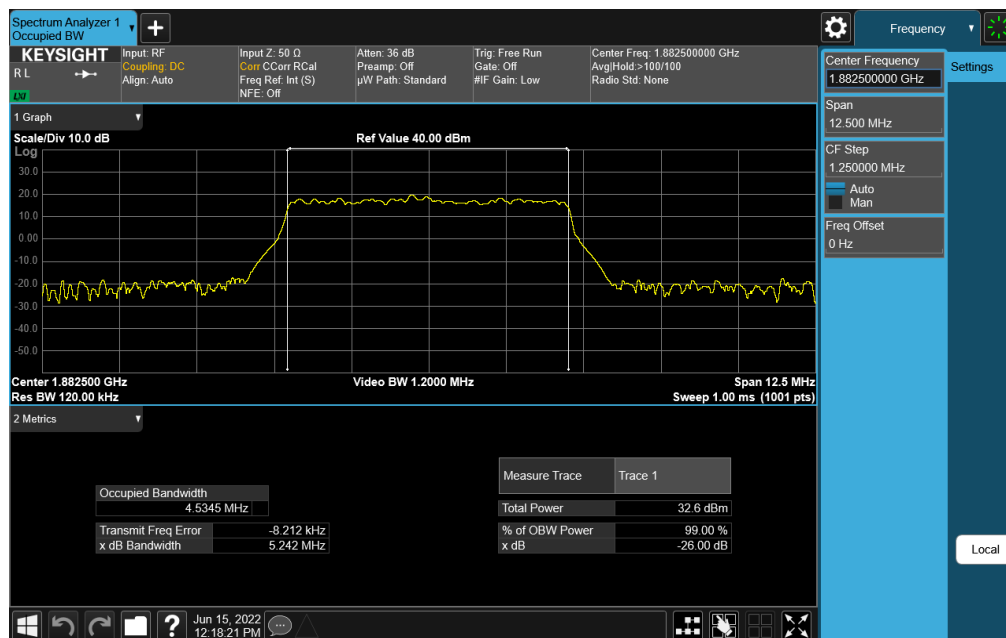
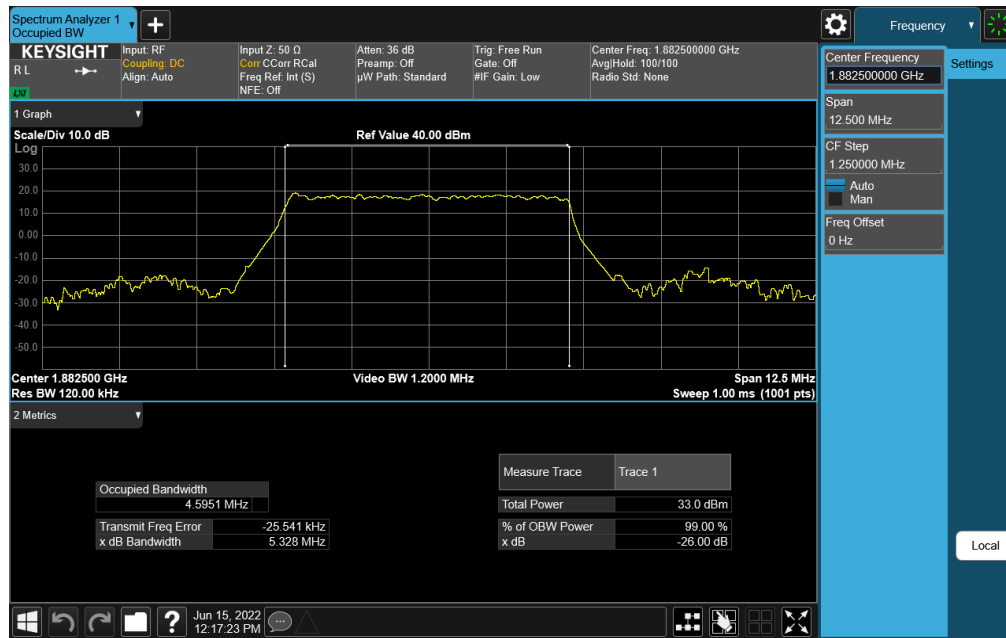
Plot 7-23. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz 64-QAM - Full RB Configuration)

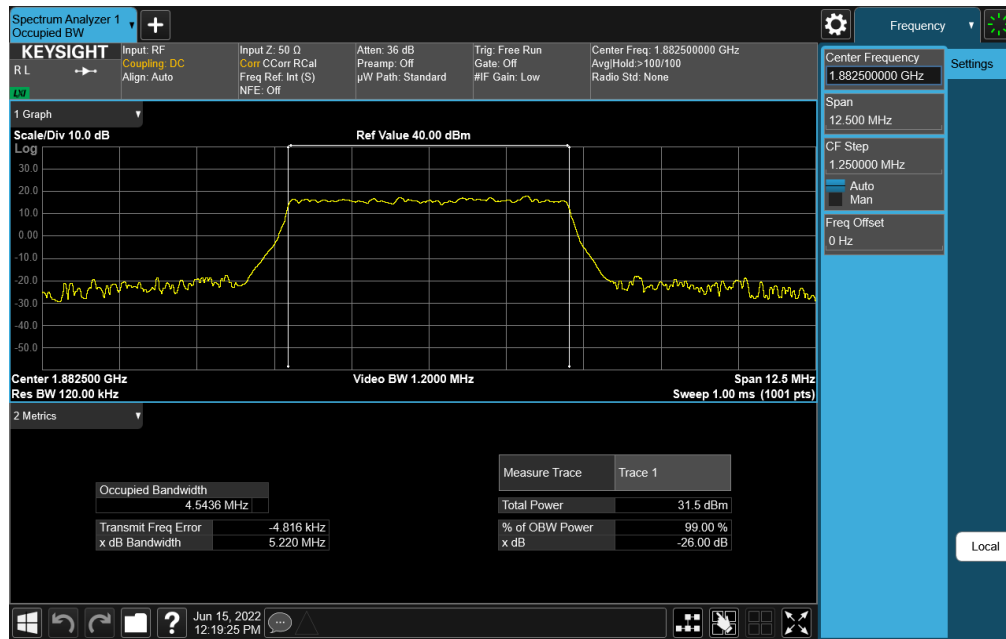


Plot 7-24. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz 256-QAM - Full RB Configuration)

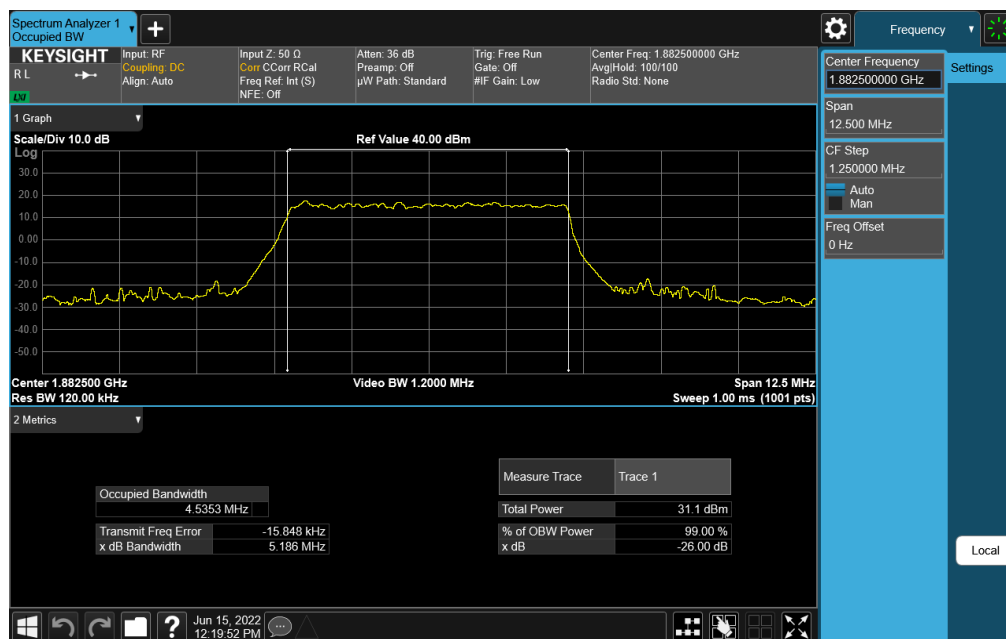
FCC ID: BCGA2764	<b>PART 24 MEASUREMENT REPORT</b>		Approved by: Technical Manager
Test Report S/N: 1C2205090028-02.BCG	Test Dates: 5/30/2022 - 9/16/2022	EUT Type: Tablet Device	Page 26 of 210

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**Plot 7-27. Occupied Bandwidth Plot (NR Band n25/n2 - 5.0MHz DFT-s-OFDM 16QAM - Full RB)**

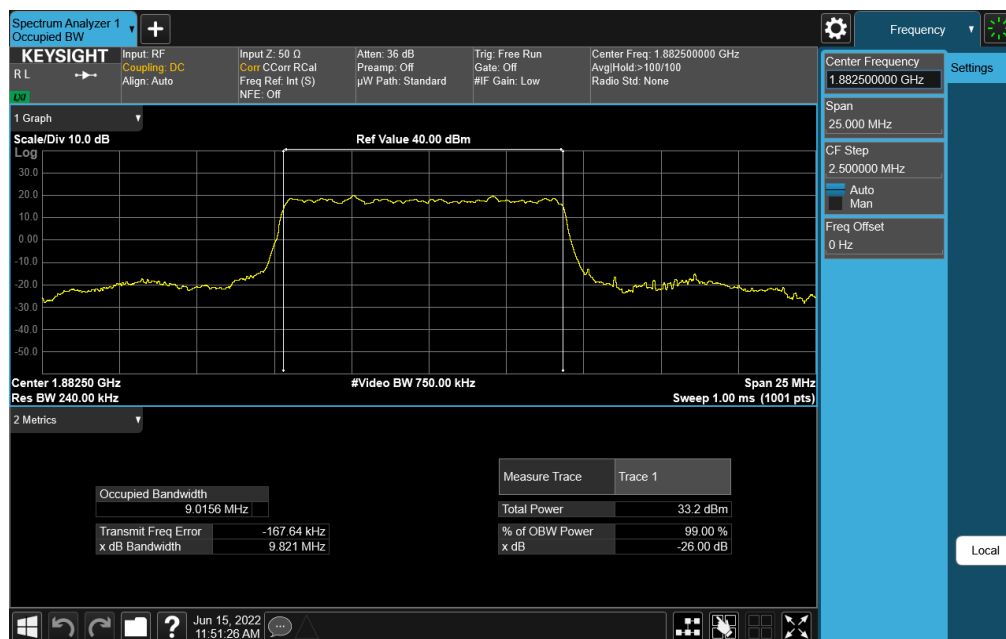


**Plot 7-28. Occupied Bandwidth Plot (NR Band n25/n2 - 5.0MHz DFT-s-OFDM 64QAM - Full RB)**


FCC ID: BCGA2764	 <b>PART 24 MEASUREMENT REPORT</b>		<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1C2205090028-02.BCG	<b>Test Dates:</b> 5/30/2022 - 9/16/2022	<b>EUT Type:</b> Tablet Device	Page 28 of 210



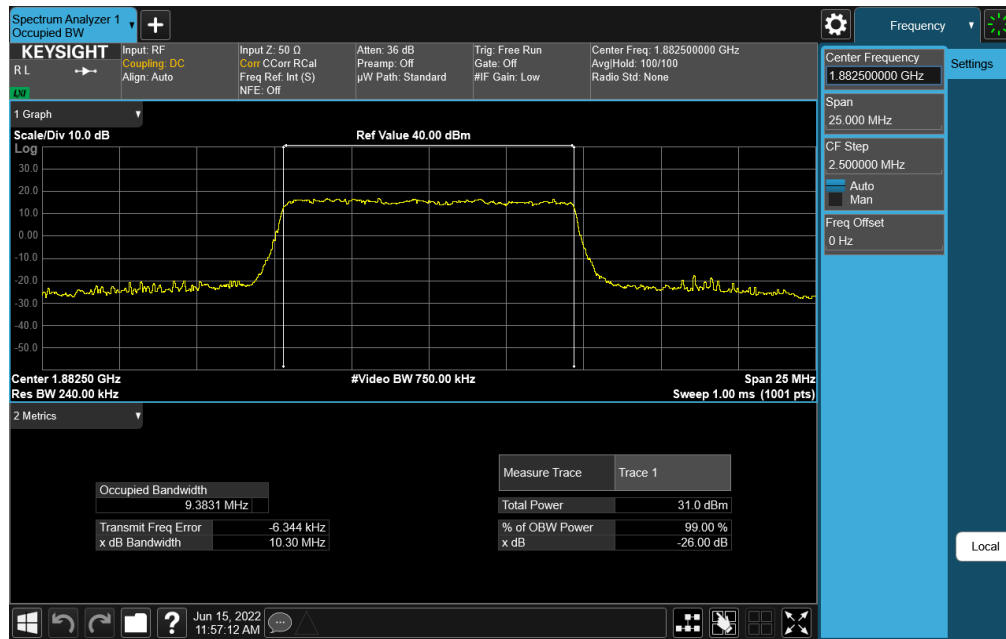
**Plot 7-29. Occupied Bandwidth Plot (NR Band n25/n2 - 5.0MHz CP-OFDM 256QAM - Full RB)**



**Plot 7-30. Occupied Bandwidth Plot (NR Band n25/n2 - 10.0MHz DFT-s-OFDM  $\pi/2$  BPSK - Full RB)**

FCC ID: BCGA2764	 <b>PART 24 MEASUREMENT REPORT</b>		<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1C2205090028-02.BCG	<b>Test Dates:</b> 5/30/2022 - 9/16/2022	<b>EUT Type:</b> Tablet Device	Page 29 of 210






Plot 7-31. Occupied Bandwidth Plot (NR Band n25/n2 - 10.0MHz CP-OFDM QPSK - Full RB)

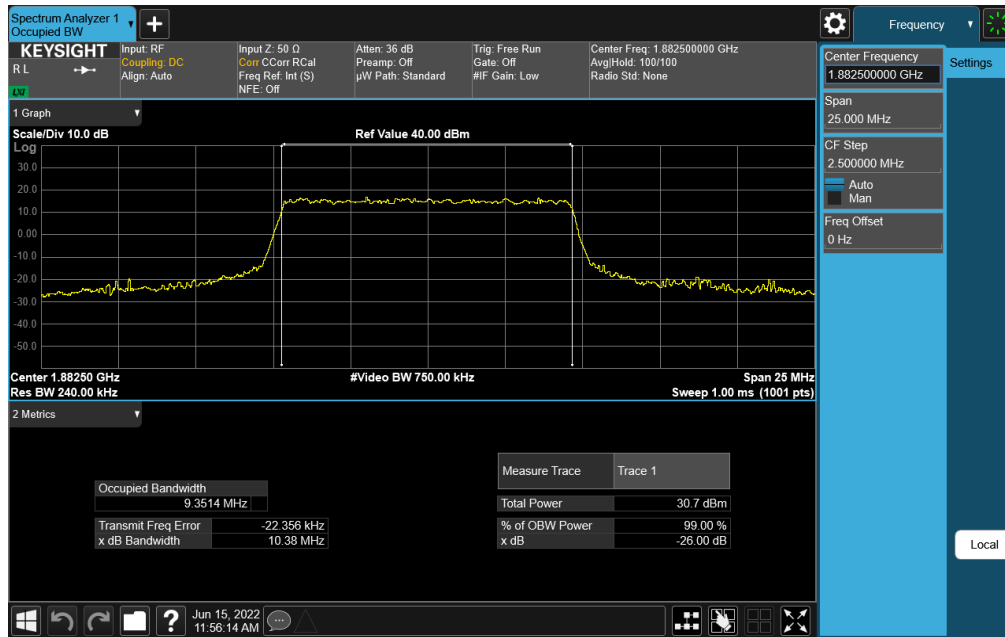


Plot 7-32. Occupied Bandwidth Plot (NR Band n25/n2 - 10.0MHz CP-OFDM 16QAM - Full RB)

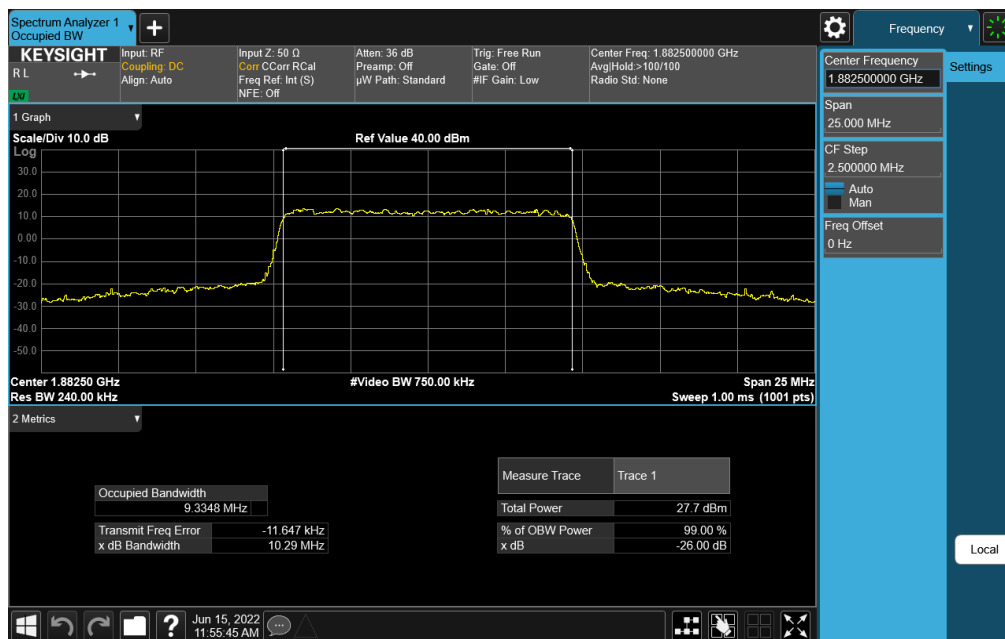
FCC ID: BCGA2764	 <b>PART 24 MEASUREMENT REPORT</b>		Approved by: Technical Manager
Test Report S/N: 1C2205090028-02.BCG	Test Dates: 5/30/2022 - 9/16/2022	EUT Type: Tablet Device	Page 30 of 210

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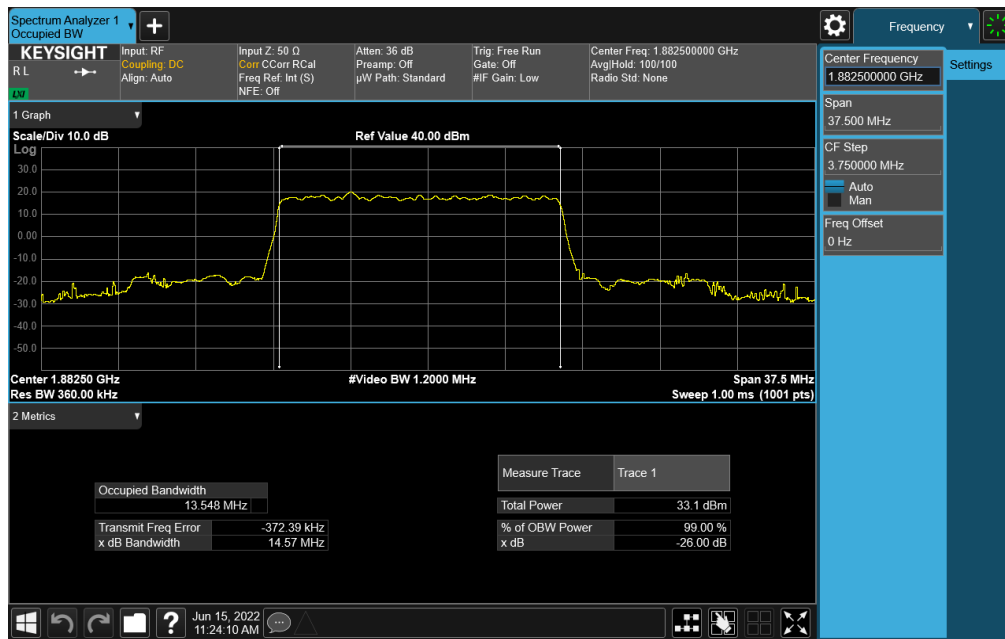


**Plot 7-33. Occupied Bandwidth Plot (NR Band n25/n2 - 10.0MHz CP-OFDM 64QAM - Full RB)**

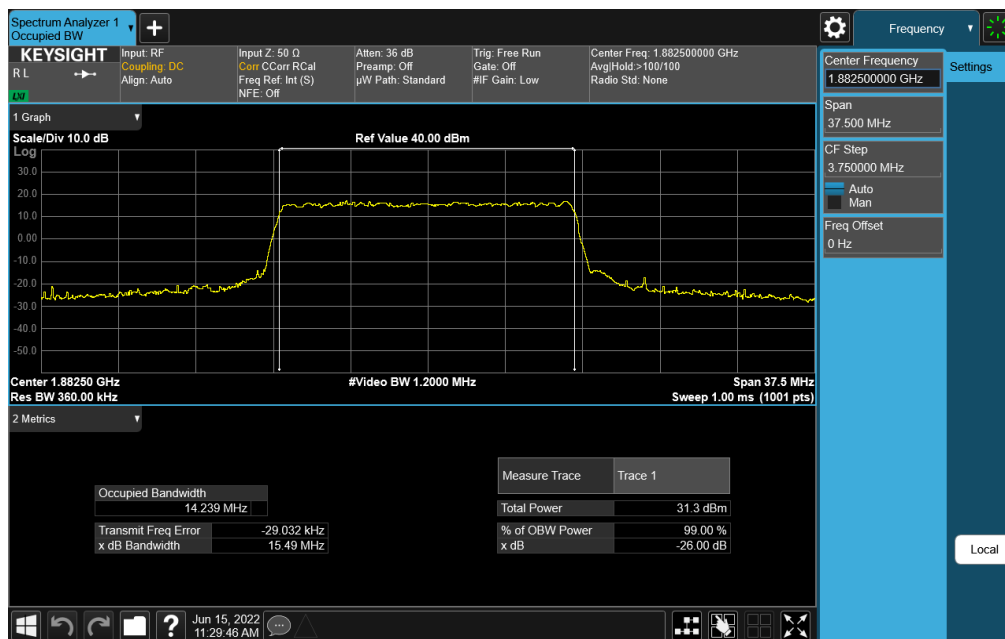


**Plot 7-34. Occupied Bandwidth Plot (NR Band n25/n2 - 10.0MHz CP-OFDM 256QAM - Full RB)**


FCC ID: BCGA2764	 <b>PART 24 MEASUREMENT REPORT</b>		<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1C2205090028-02.BCG	<b>Test Dates:</b> 5/30/2022 - 9/16/2022	<b>EUT Type:</b> Tablet Device	Page 31 of 210



Plot 7-35. Occupied Bandwidth Plot (NR Band n25/n2 - 15.0MHz DFT-s-OFDM  $\pi/2$  BPSK - Full RB)

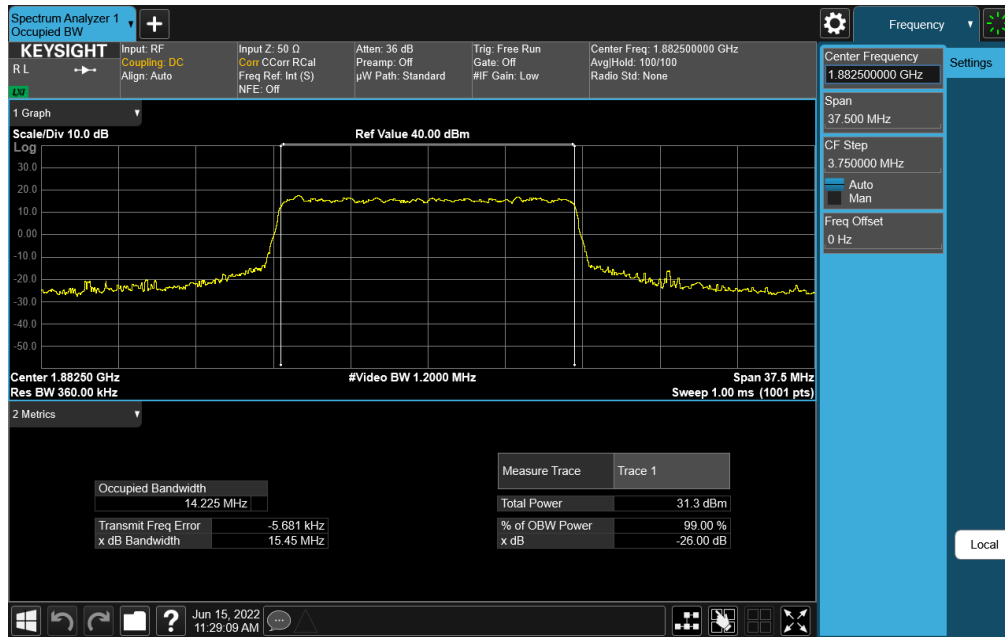


Plot 7-36. Occupied Bandwidth Plot (NR Band n25/n2 - 15.0MHz CP-OFDM QPSK - Full RB)

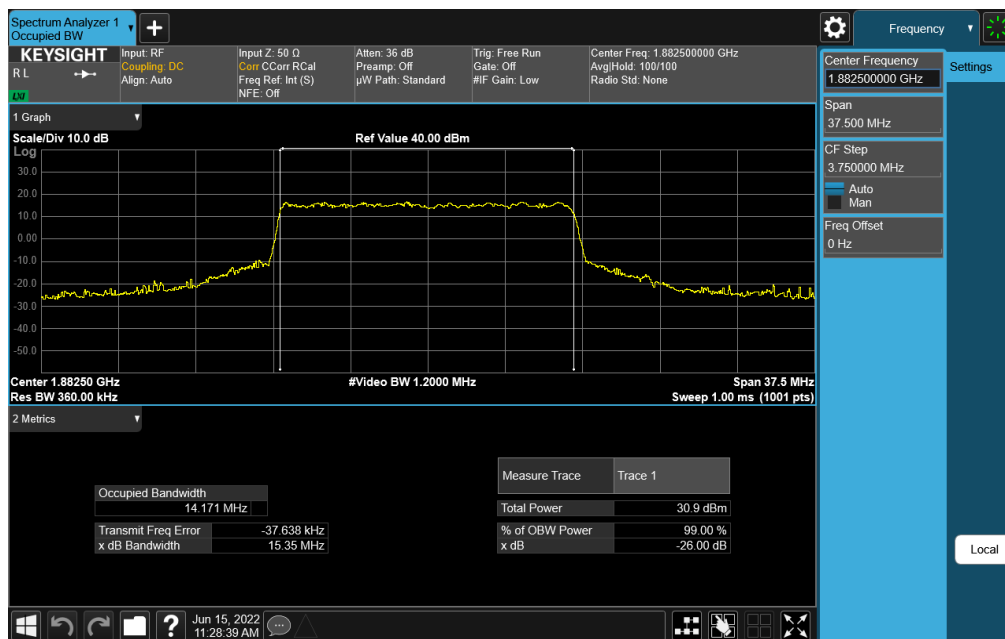
FCC ID: BCGA2764		PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1C2205090028-02.BCG	Test Dates: 5/30/2022 - 9/16/2022	EUT Type: Tablet Device	Page 32 of 210

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Plot 7-37. Occupied Bandwidth Plot (NR Band n25/n2 - 15.0MHz CP-OFDM 16QAM - Full RB)

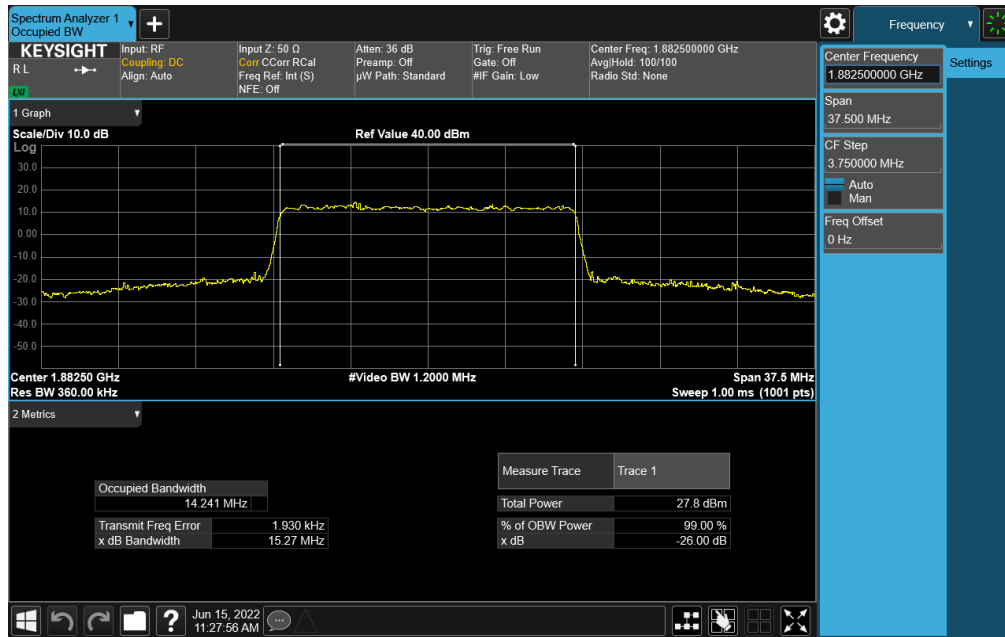


Plot 7-38. Occupied Bandwidth Plot (NR Band n25/n2 - 15.0MHz CP-OFDM 64QAM - Full RB)

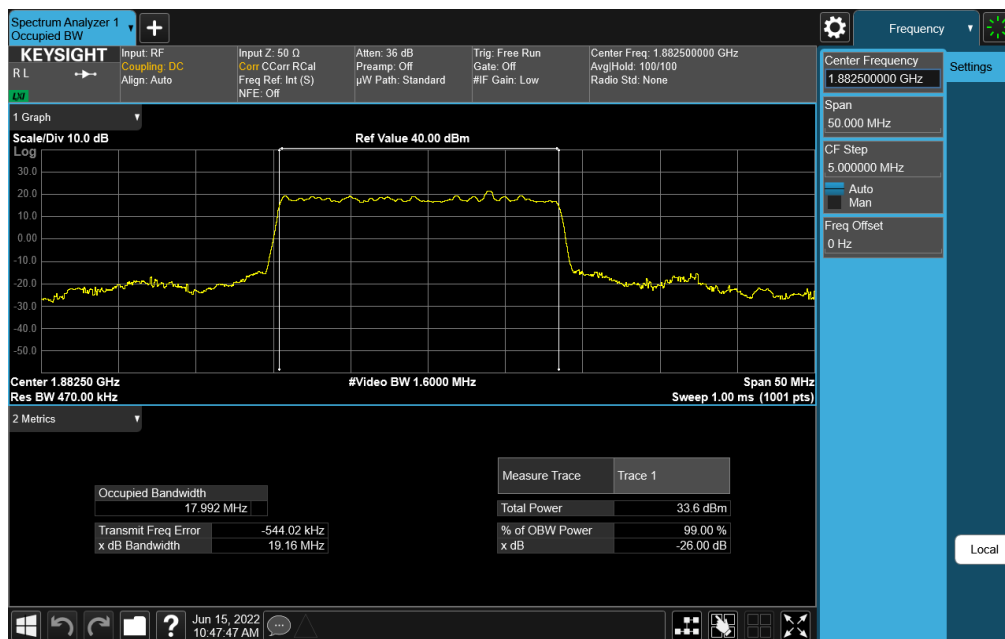
FCC ID: BCGA2764	 <b>PART 24 MEASUREMENT REPORT</b>		Approved by: Technical Manager
Test Report S/N: 1C2205090028-02.BCG	Test Dates: 5/30/2022 - 9/16/2022	EUT Type: Tablet Device	Page 33 of 210

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Plot 7-39. Occupied Bandwidth Plot (NR Band n25/n2 - 15.0MHz CP-OFDM 256QAM - Full RB)

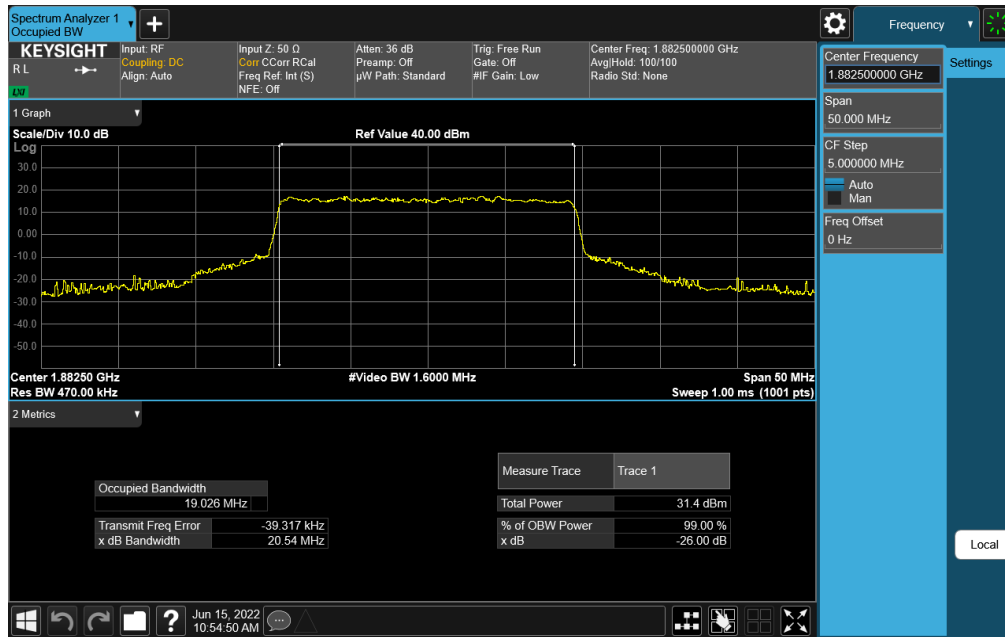


Plot 7-40. Occupied Bandwidth Plot (NR Band n25/n2 - 20.0MHz DFT-s-OFDM  $\pi/2$  BPSK - Full RB)

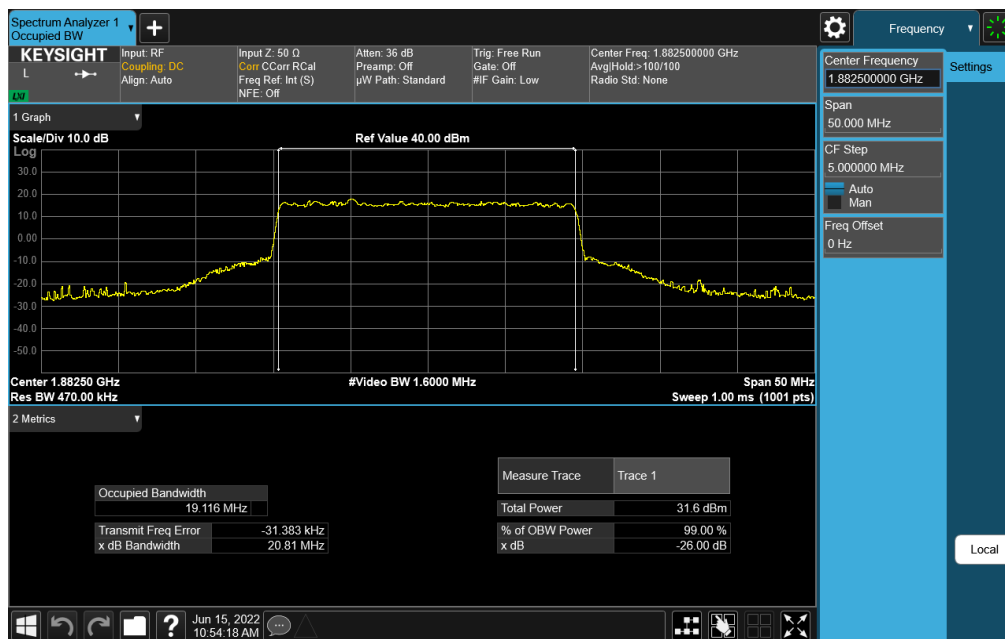
FCC ID: BCGA2764	 <b>PART 24 MEASUREMENT REPORT</b>		Approved by: Technical Manager
Test Report S/N: 1C2205090028-02.BCG	Test Dates: 5/30/2022 - 9/16/2022	EUT Type: Tablet Device	Page 34 of 210

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Plot 7-41. Occupied Bandwidth Plot (NR Band n25/n2 - 20.0MHz CP-OFDM QPSK - Full RB)

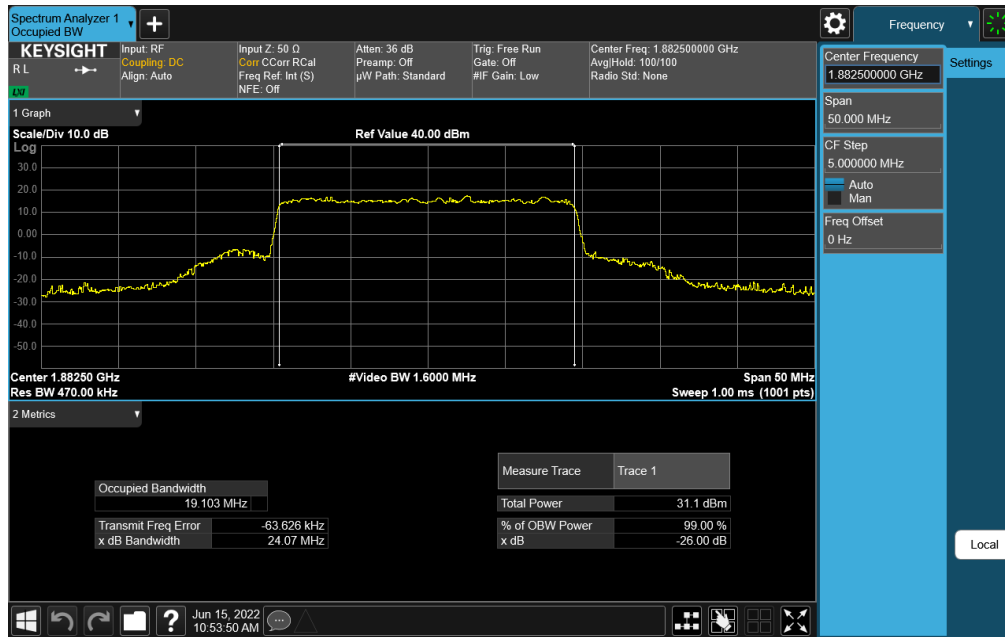


Plot 7-42. Occupied Bandwidth Plot (NR Band n25/n2 - 20.0MHz CP-OFDM 16QAM - Full RB)

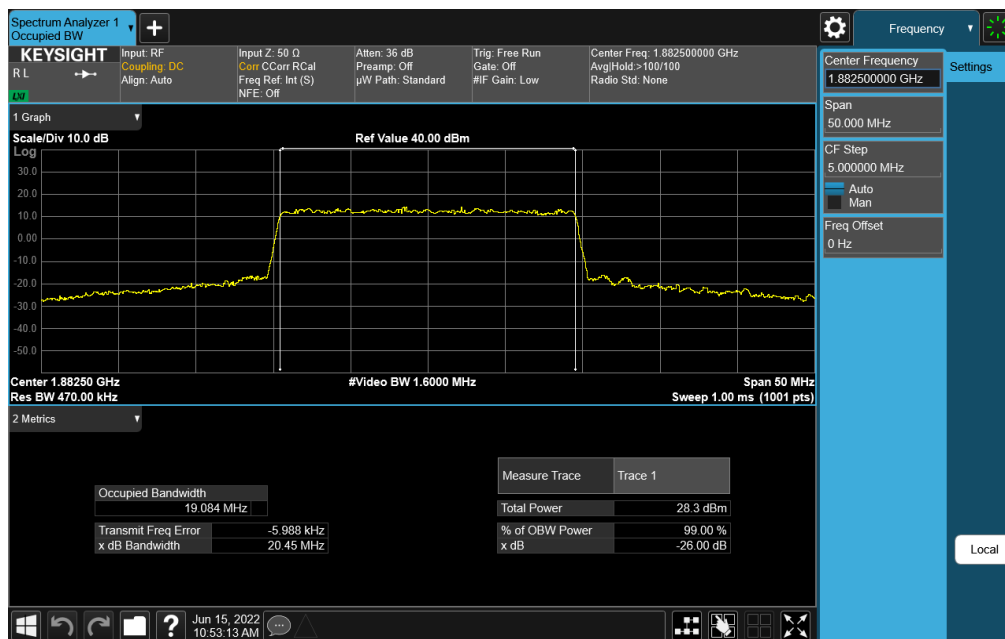
FCC ID: BCGA2764	<b>PART 24 MEASUREMENT REPORT</b>		Approved by: Technical Manager
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Plot 7-43. Occupied Bandwidth Plot (NR Band n25/n2 - 20.0MHz CP-OFDM 64QAM - Full RB)

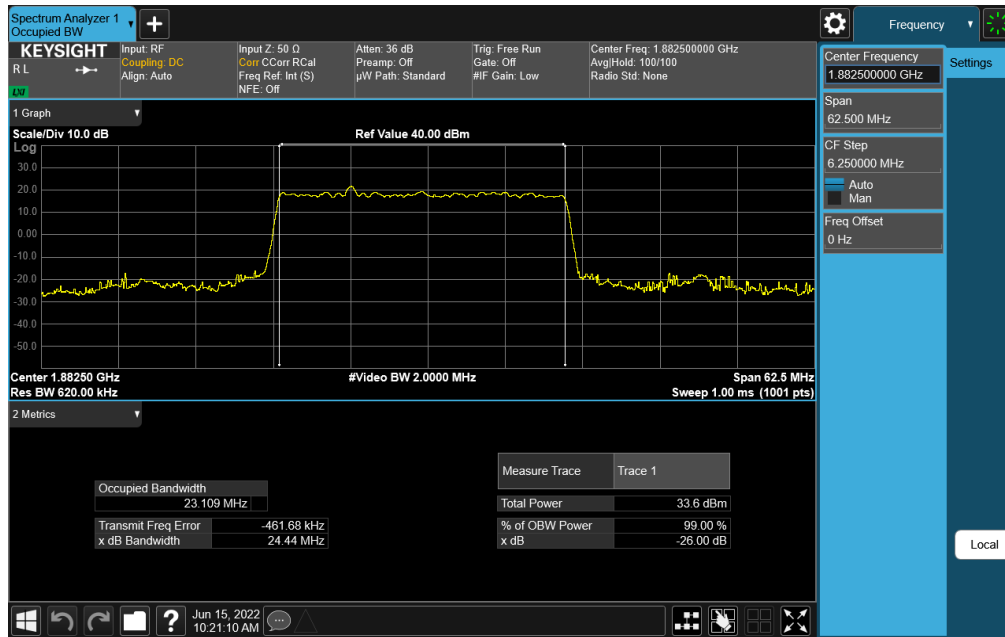


Plot 7-44. Occupied Bandwidth Plot (NR Band n25/n2 - 20.0MHz CP-OFDM 256QAM - Full RB)

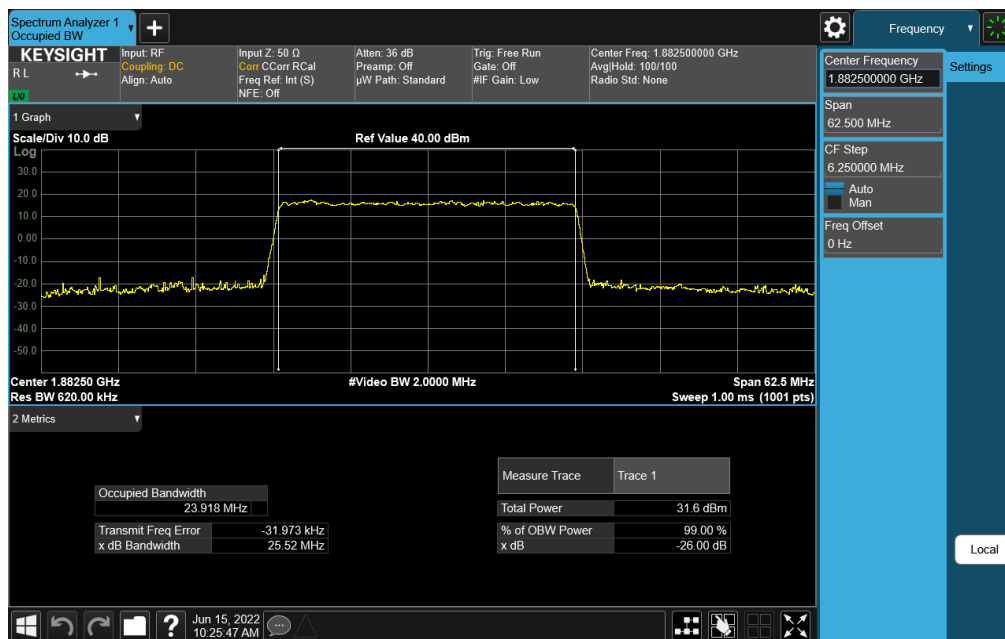
FCC ID: BCGA2764	<b>PART 24 MEASUREMENT REPORT</b>		Approved by: Technical Manager
Test Report S/N: 1C2205090028-02.BCG	Test Dates: 5/30/2022 - 9/16/2022	EUT Type: Tablet Device	Page 36 of 210

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Plot 7-45. Occupied Bandwidth Plot (NR Band n25 - 25.0MHz DFT-s-OFDM  $\pi/2$  BPSK - Full RB)



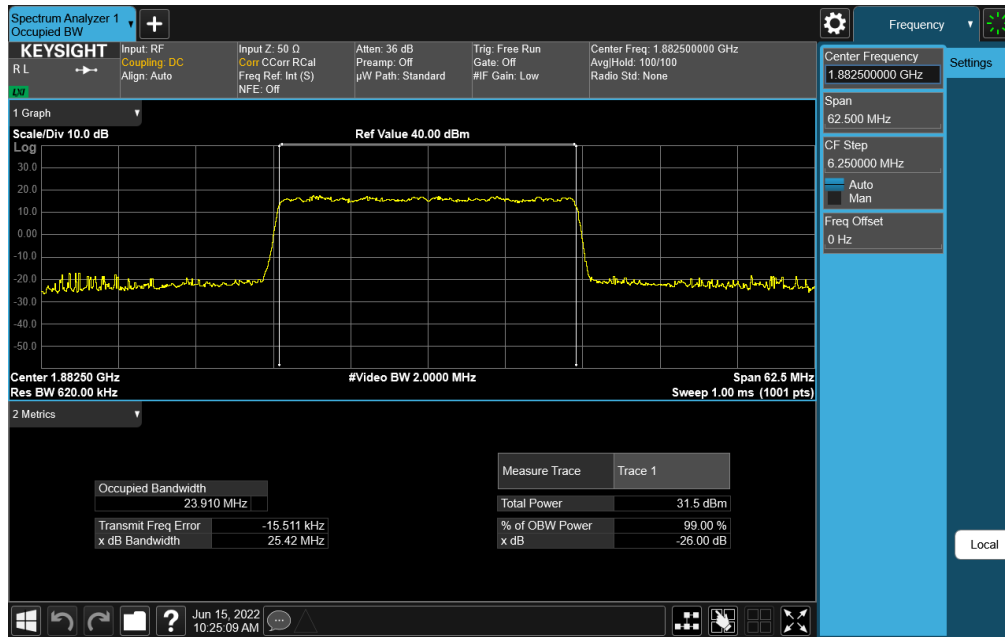
Plot 7-46. Occupied Bandwidth Plot (NR Band n25 - 25.0MHz CP-OFDM QPSK - Full RB)

FCC ID: BCGA2764	 <b>PART 24 MEASUREMENT REPORT</b>		Approved by: Technical Manager
Test Report S/N: 1C2205090028-02.BCG	Test Dates: 5/30/2022 - 9/16/2022	EUT Type: Tablet Device	Page 37 of 210

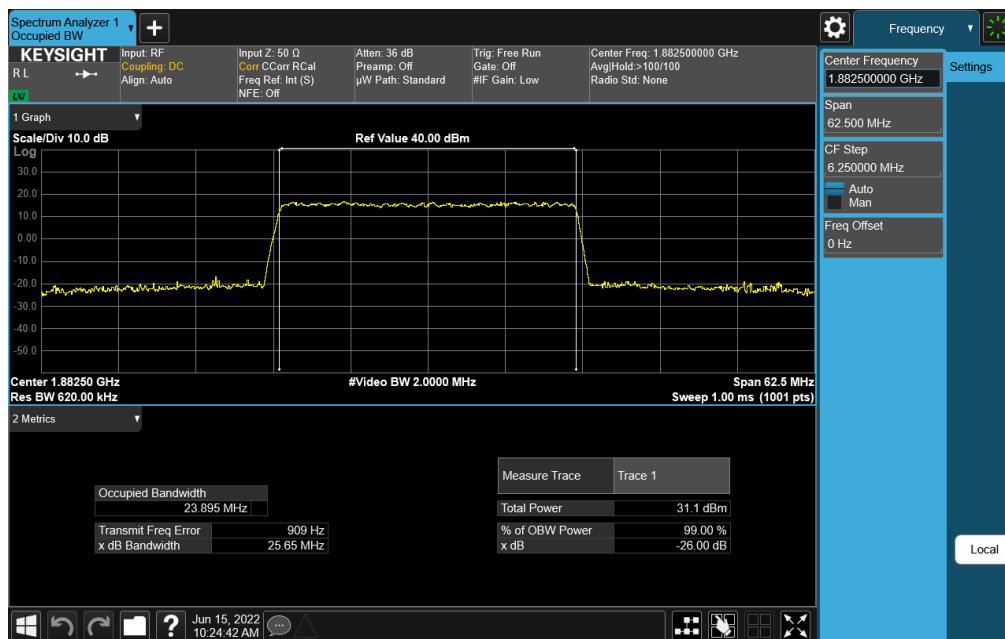
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Plot 7-47. Occupied Bandwidth Plot (NR Band n25 - 25.0MHz CP-OFDM 16QAM - Full RB)

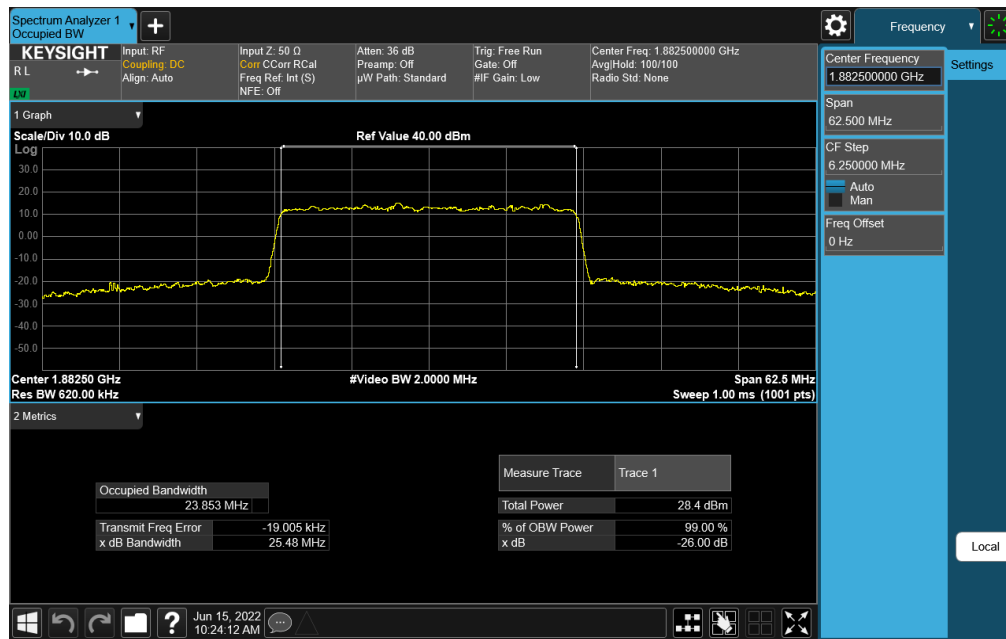


Plot 7-48. Occupied Bandwidth Plot (NR Band n25 - 25.0MHz CP-OFDM 64QAM - Full RB)

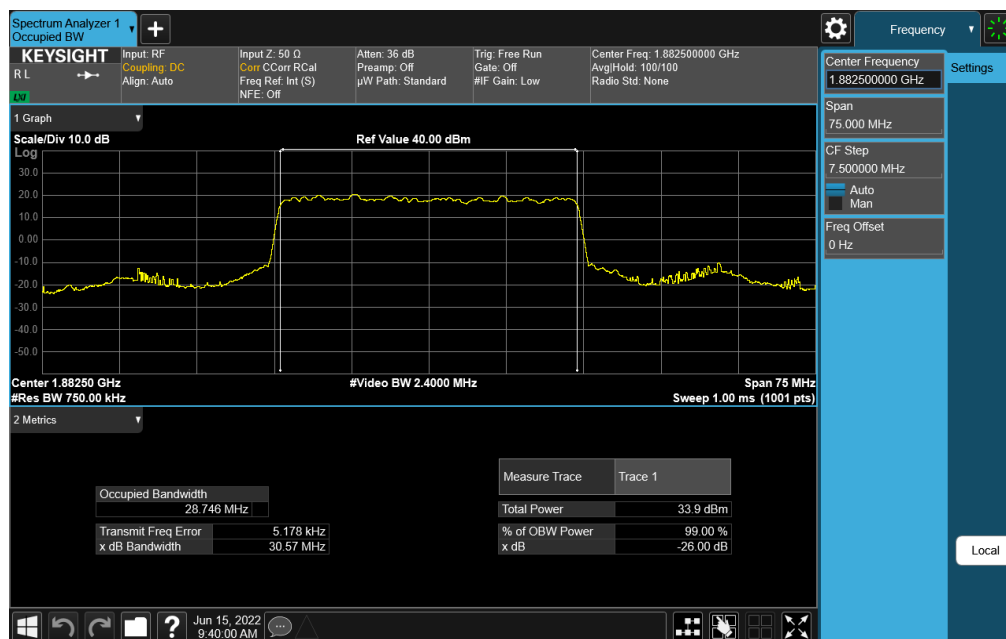
FCC ID: BCGA2764	 <b>PART 24 MEASUREMENT REPORT</b>		Approved by: Technical Manager
Test Report S/N: 1C2205090028-02.BCG	Test Dates: 5/30/2022 - 9/16/2022	EUT Type: Tablet Device	Page 38 of 210

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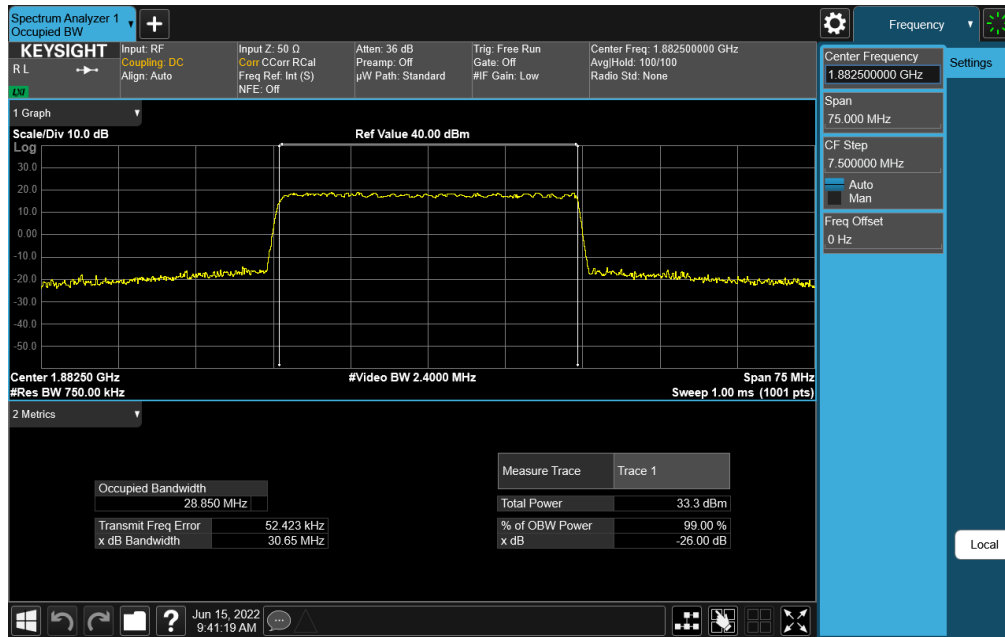


**Plot 7-49. Occupied Bandwidth Plot (NR Band n25 - 25.0MHz CP-OFDM 256QAM - Full RB)**

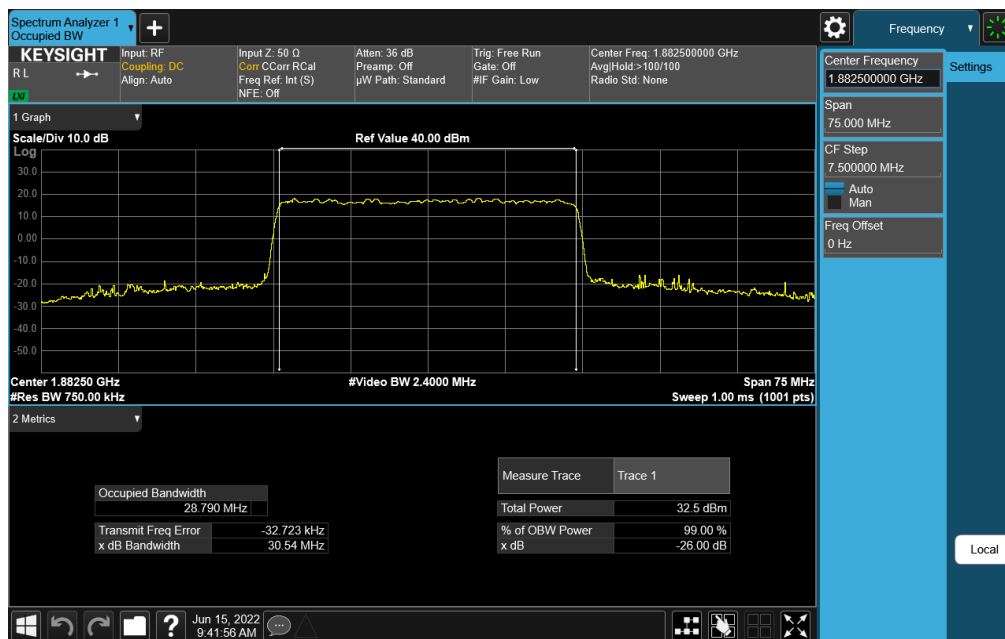


**Plot 7-50. Occupied Bandwidth Plot (NR Band n25 - 30.0MHz DFT-s-OFDM  $\pi/2$  BPSK - Full RB)**


FCC ID: BCGA2764	 <b>PART 24 MEASUREMENT REPORT</b>		<b>Approved by:</b> Technical Manager
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Plot 7-51. Occupied Bandwidth Plot (NR Band n25 - 30.0MHz DFT-s-OFDM QPSK - Full RB)

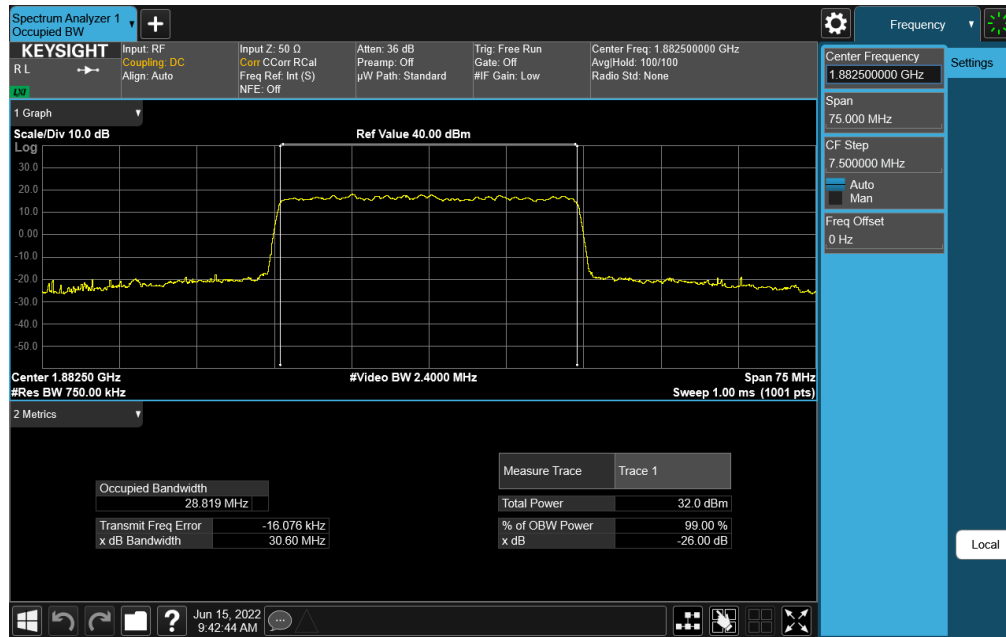


Plot 7-52. Occupied Bandwidth Plot (NR Band n25 - 30.0MHz DFT-s-OFDM 16QAM - Full RB)

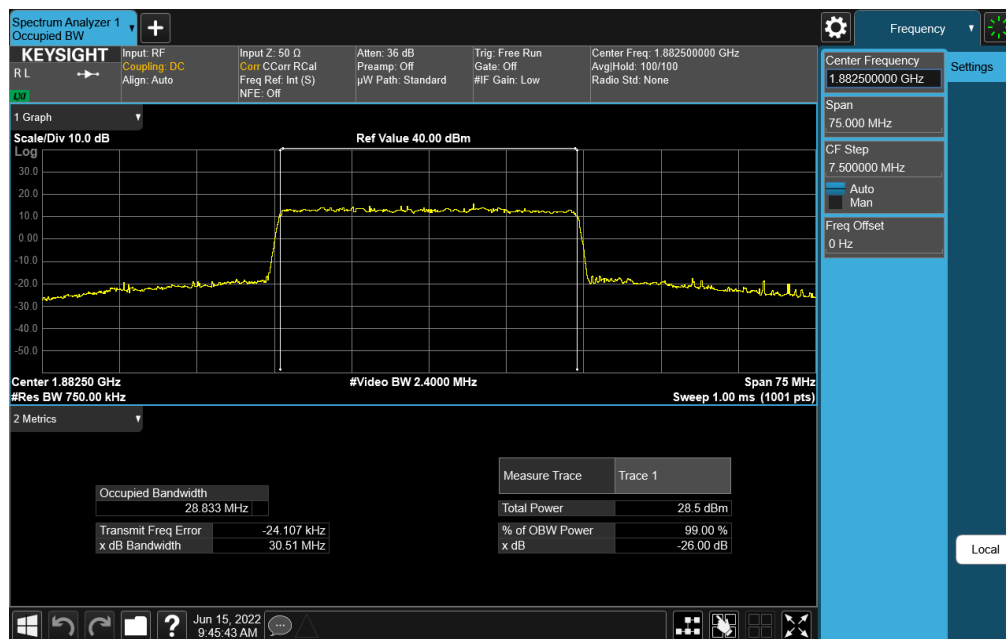
FCC ID: BCGA2764	 <b>PART 24 MEASUREMENT REPORT</b>		Approved by: Technical Manager
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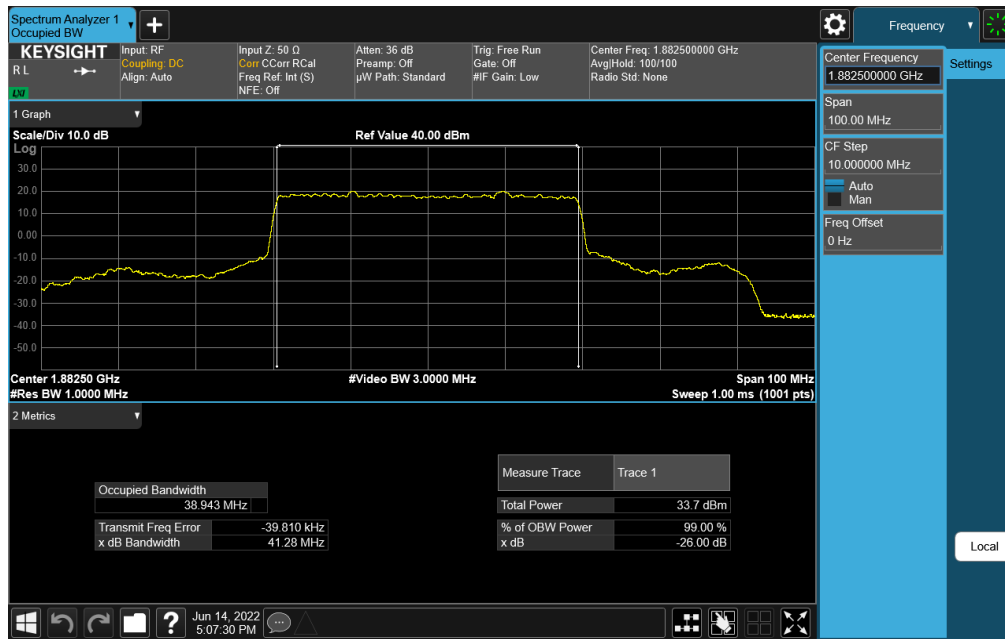


**Plot 7-53. Occupied Bandwidth Plot (NR Band n25 - 30.0MHz DFT-s-OFDM 64QAM - Full RB)**

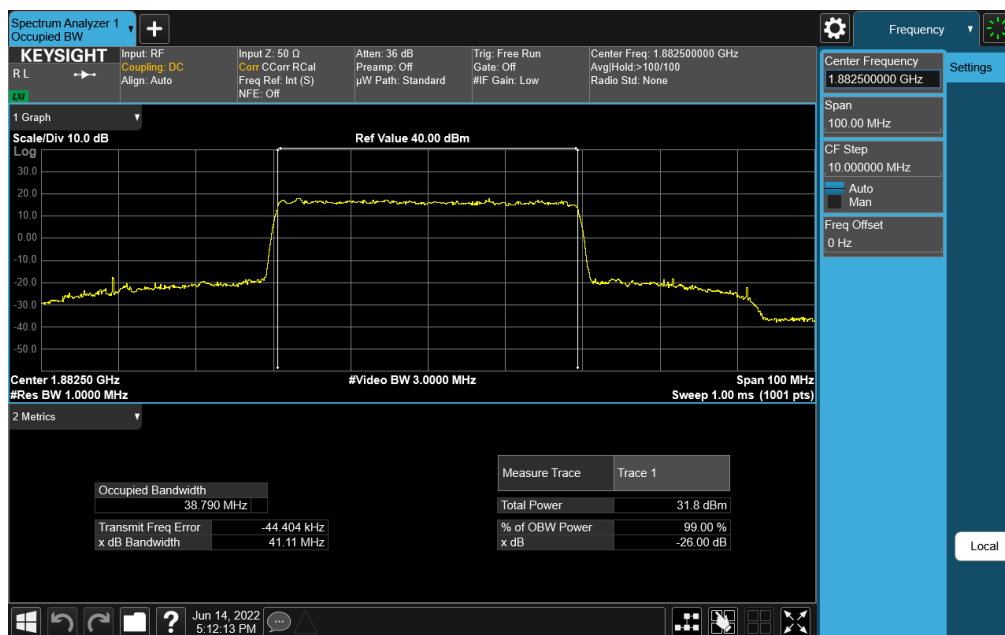


**Plot 7-54. Occupied Bandwidth Plot (NR Band n25 - 30.0MHz CP-OFDM 256QAM - Full RB)**


FCC ID: BCGA2764	 <b>PART 24 MEASUREMENT REPORT</b>		<b>Approved by:</b> Technical Manager
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Plot 7-55. Occupied Bandwidth Plot (NR Band n25 - 40.0MHz DFT-s-OFDM  $\pi/2$  BPSK - Full RB)

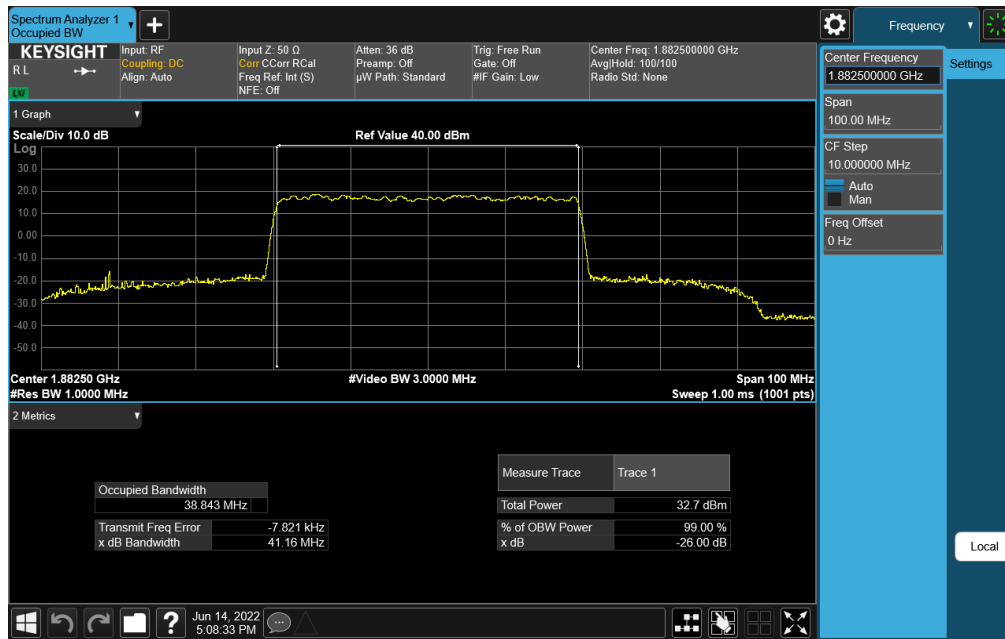


Plot 7-56. Occupied Bandwidth Plot (NR Band n25 - 40.0MHz CP-OFDM QPSK - Full RB)

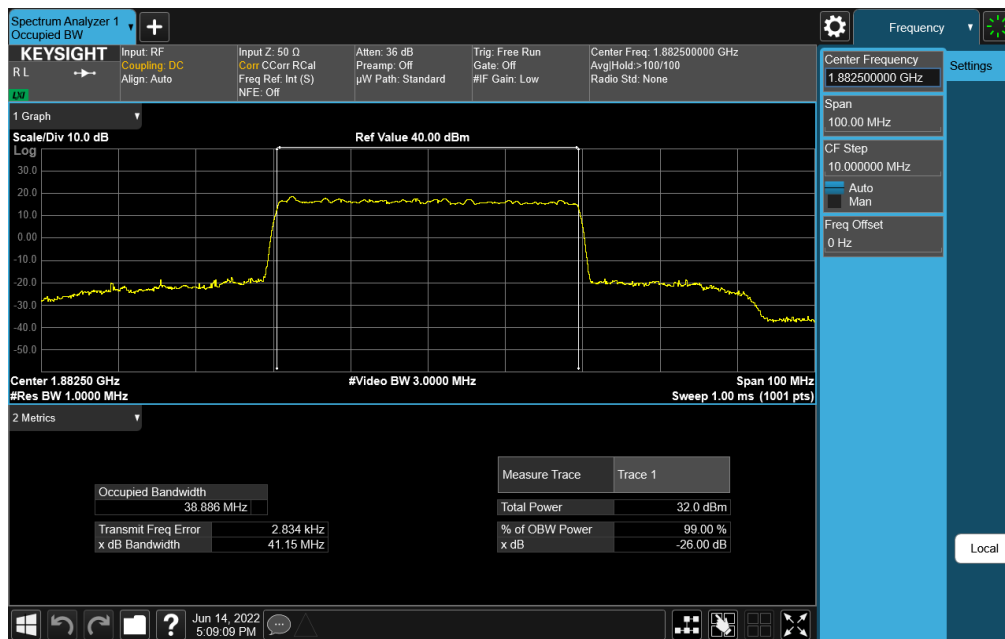
FCC ID: BCGA2764	 <b>PART 24 MEASUREMENT REPORT</b>		Approved by: Technical Manager
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Plot 7-57. Occupied Bandwidth Plot (NR Band n25 - 40.0MHz DFT-s-OFDM 16QAM - Full RB)

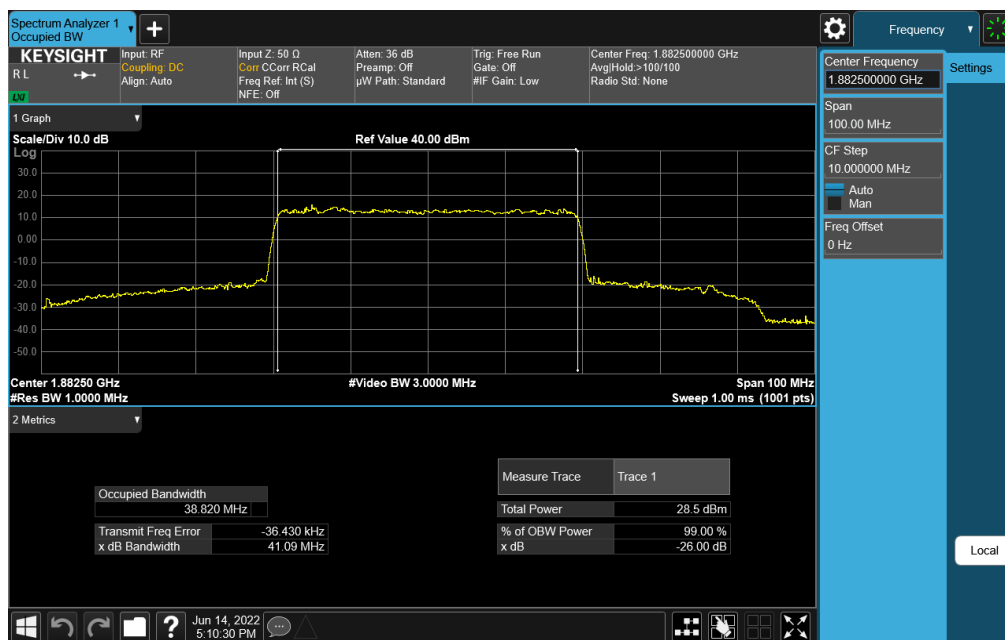


Plot 7-58. Occupied Bandwidth Plot (NR Band n25 - 40.0MHz DFT-s-OFDM 64QAM - Full RB)


FCC ID: BCGA2764	<b>PART 24 MEASUREMENT REPORT</b>		Approved by: Technical Manager
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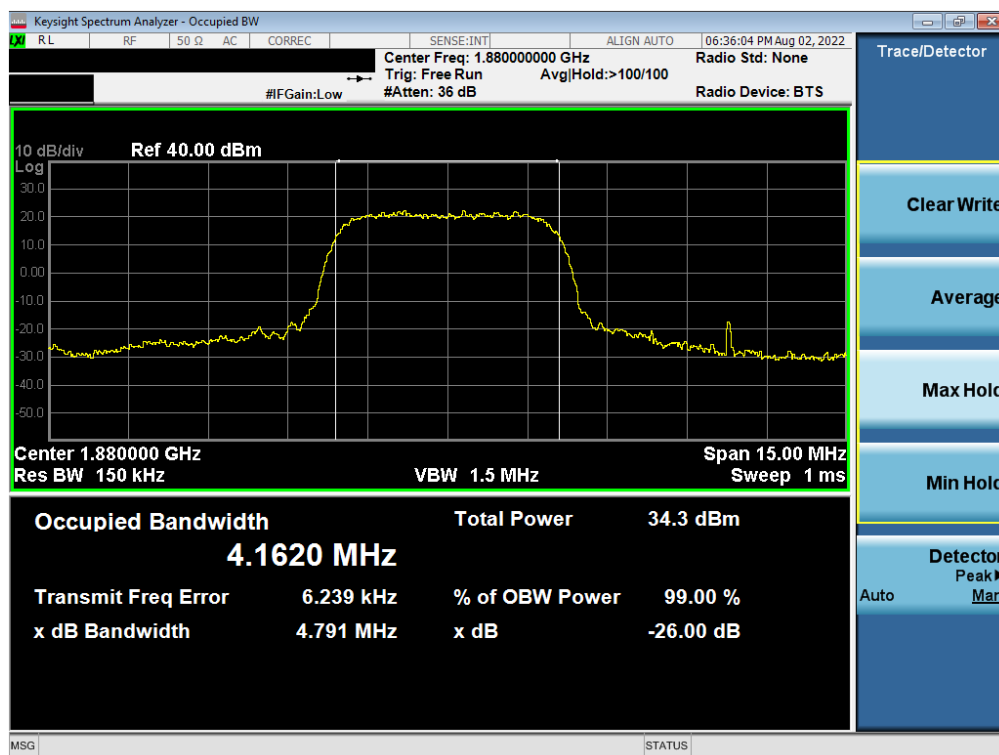
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**Plot 7-59. Occupied Bandwidth Plot (NR Band n25 - 40.0MHz CP-OFDM 256QAM - Full RB)**

FCC ID: BCGA2764	 <b>PART 24 MEASUREMENT REPORT</b>		<b>Approved by:</b> Technical Manager
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Plot 7-60. Occupied Bandwidth Plot (WCDMA, Ch. 9400)

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### 7.3 Spurious and Harmonic Emissions at Antenna Terminal

§2.1051, §24.238(a)

#### Test Overview

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section. All ports were tested and only the worst case data were reported.

***The minimum permissible attenuation level of any spurious emission is  $43 + 10 \log_{10}(P_{\text{Watts}})$ , where  $P$  is the transmitter power in Watts.***

#### Test Procedure Used

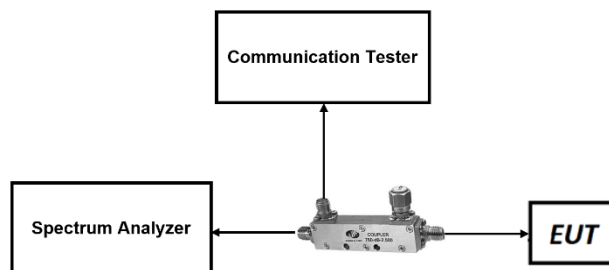
KDB 971168 D01 v03r01 – Section 6.0

#### Test Settings


1. Start frequency was set to 30MHz and stop frequency was set to 20GHz (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

#### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.




**Figure 7-2. Test Instrument & Measurement Setup**

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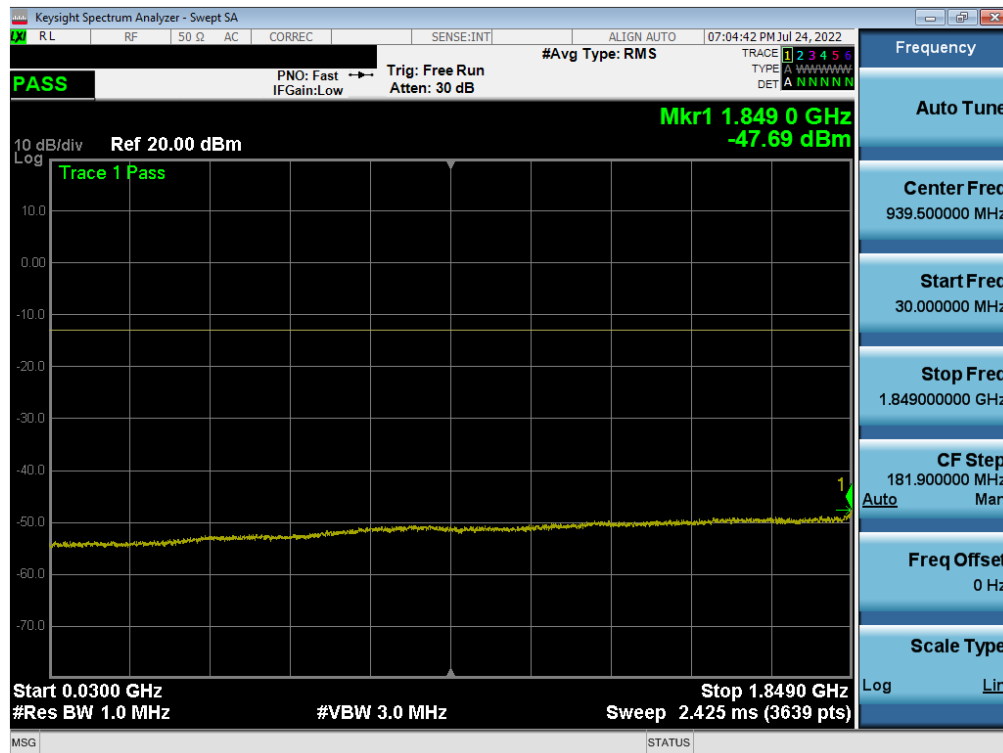
## **Test Notes**

1. Per Part 24, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth 100 kHz or greater for measurements below 1GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The 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 emission are attenuated at least 26 dB below the transmitter power.
2. For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.
3. NR Band n25 overlaps the entire frequency range of NR Band n2. Therefore, the conducted spurious emissions data of NR band n25 provided in this report covers NR Band n2.

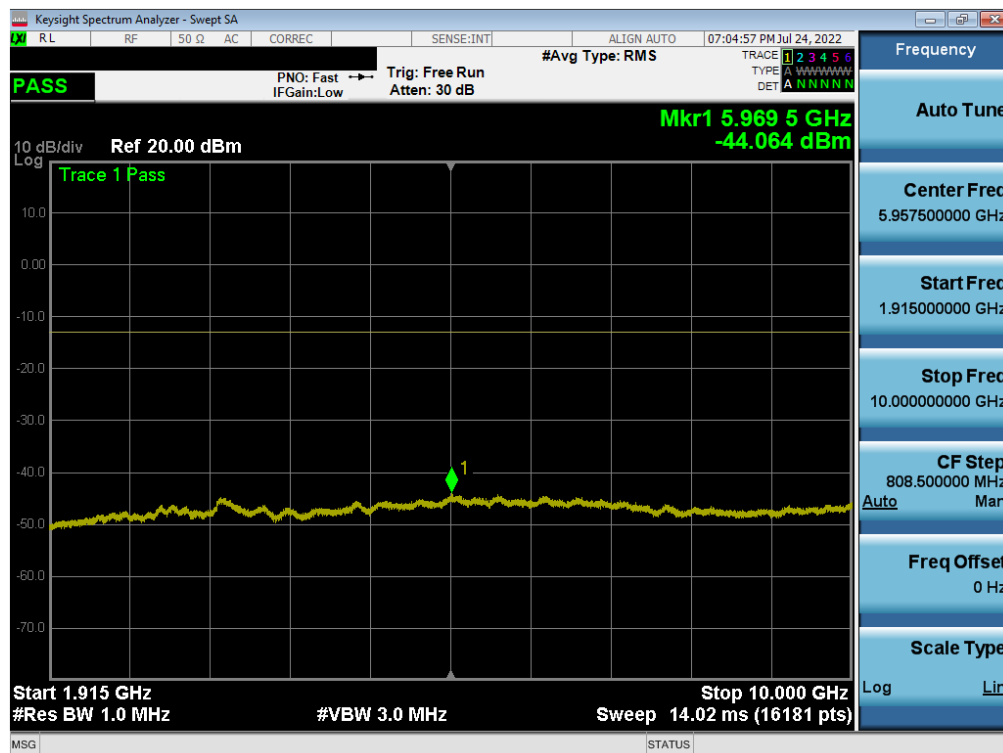
<b>FCC ID:</b> BCGA2764	 <b>PART 24 MEASUREMENT REPORT</b>		<b>Approved by:</b> Technical Manager
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## LTE Band 25/2



Plot 7-61. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

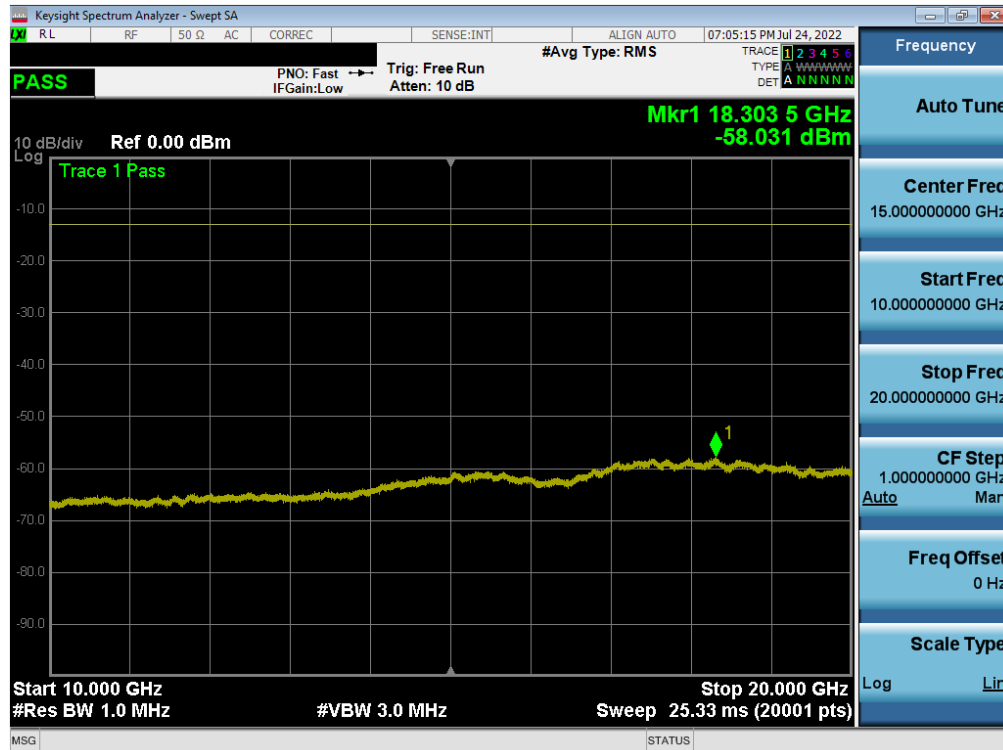


Plot 7-62. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

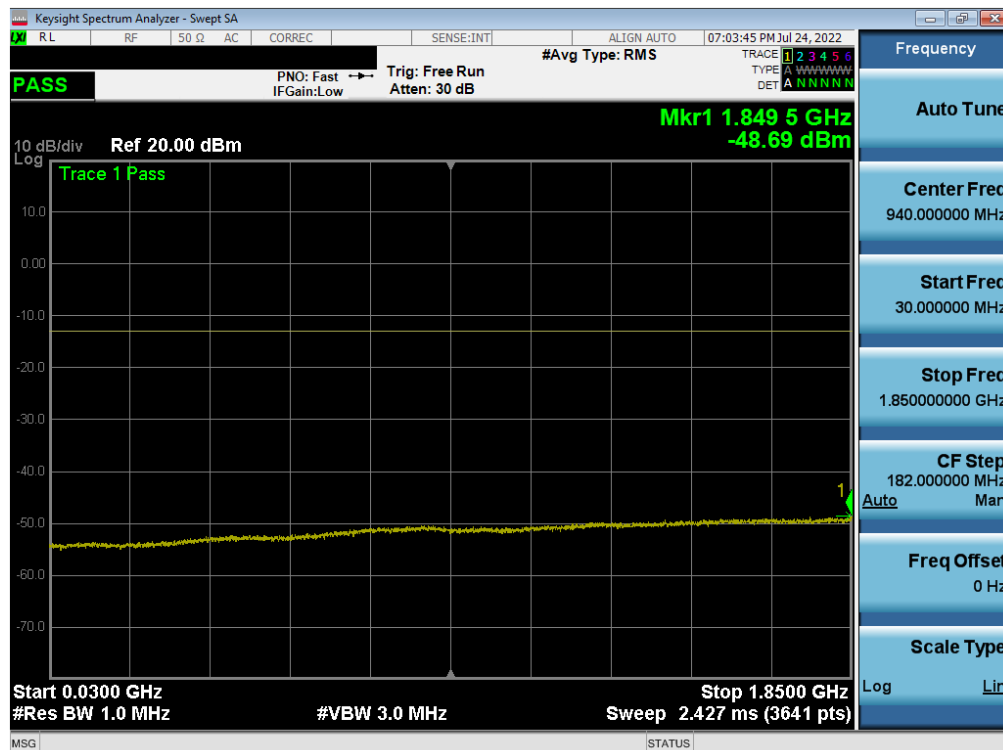
FCC ID: BCGA2764	 <b>PART 24 MEASUREMENT REPORT</b>		Approved by: Technical Manager
Test Report S/N: 1C2205090028-02.BCG	Test Dates: 5/30/2022 - 9/16/2022	EUT Type: Tablet Device	Page 48 of 210

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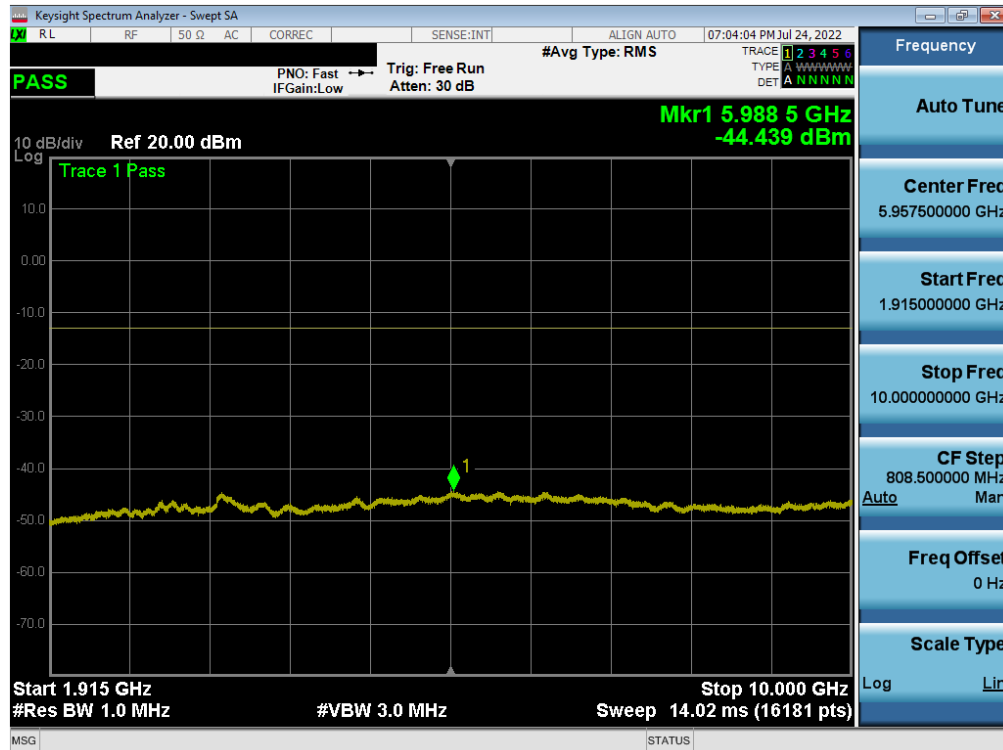


Plot 7-63. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

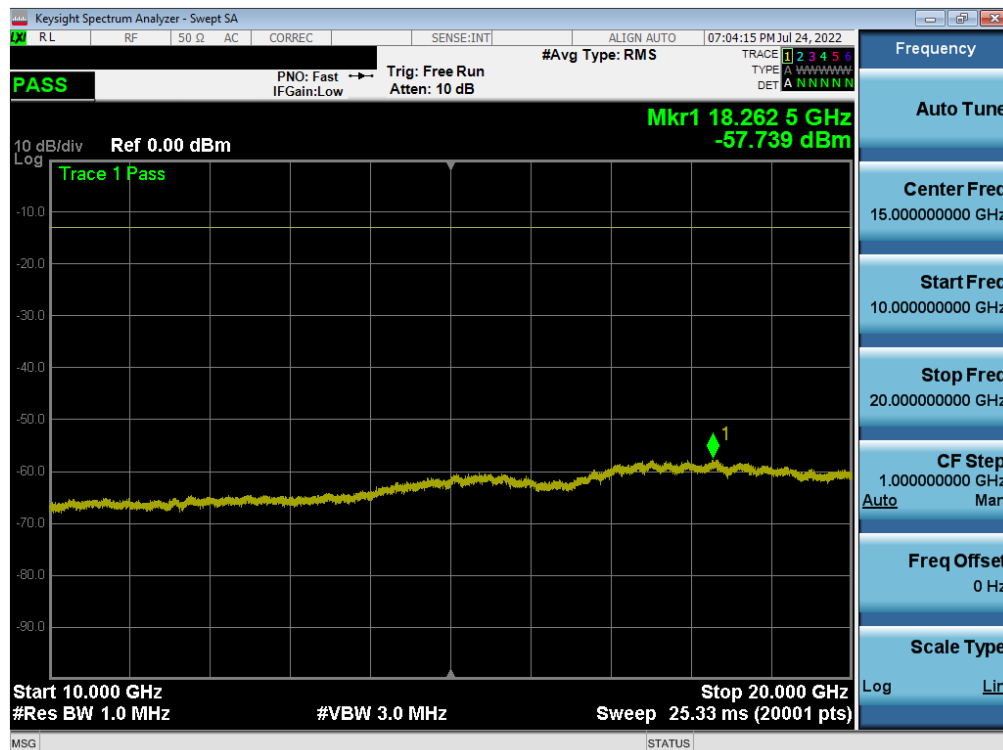


Plot 7-64. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCGA2764	element	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
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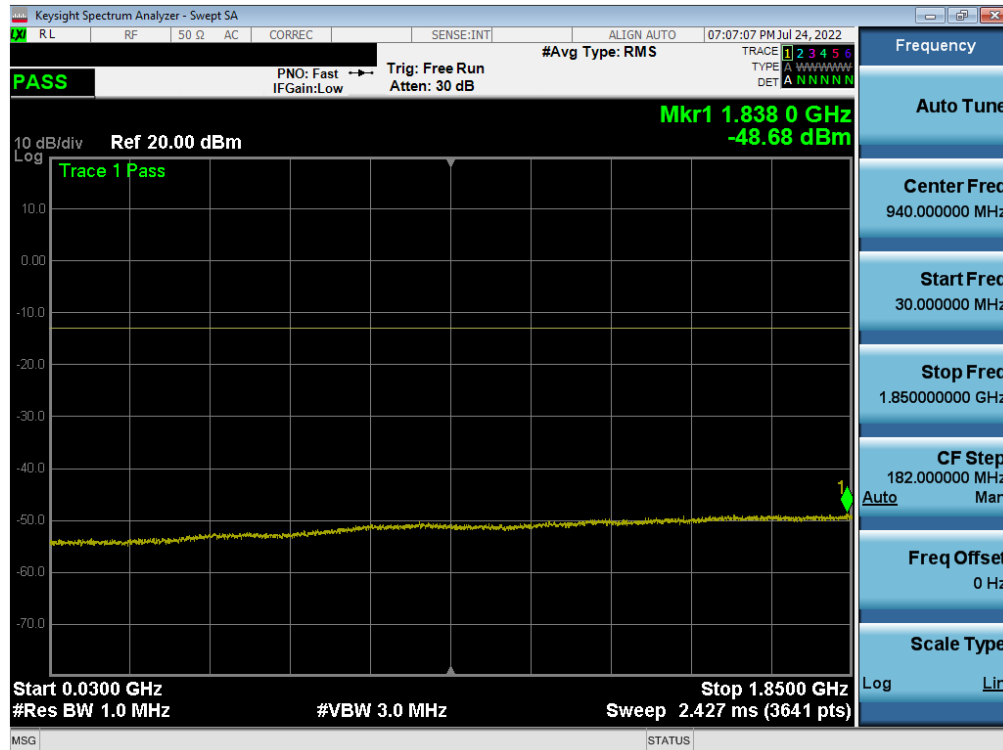


Plot 7-65. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

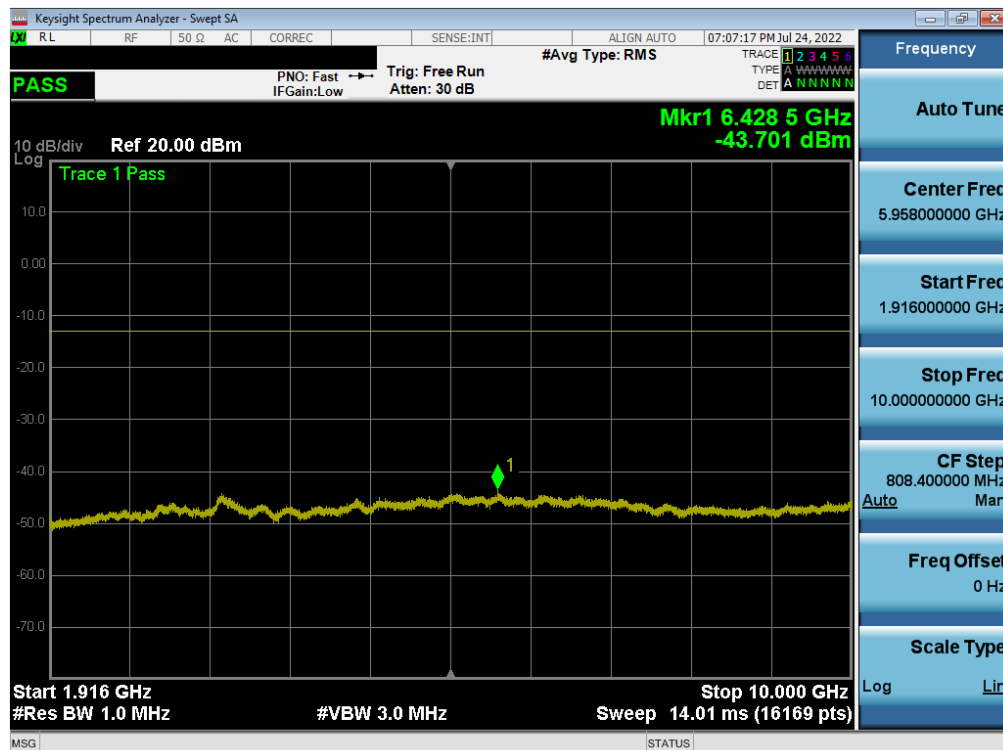


Plot 7-66. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCGA2764	element	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
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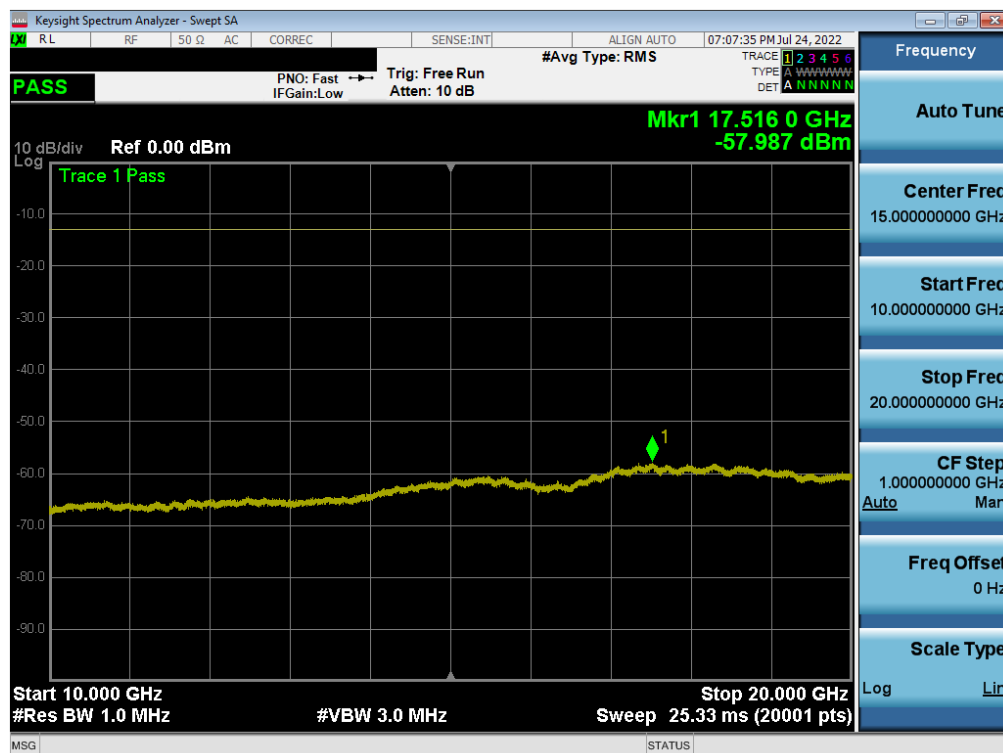


Plot 7-67. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-68. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

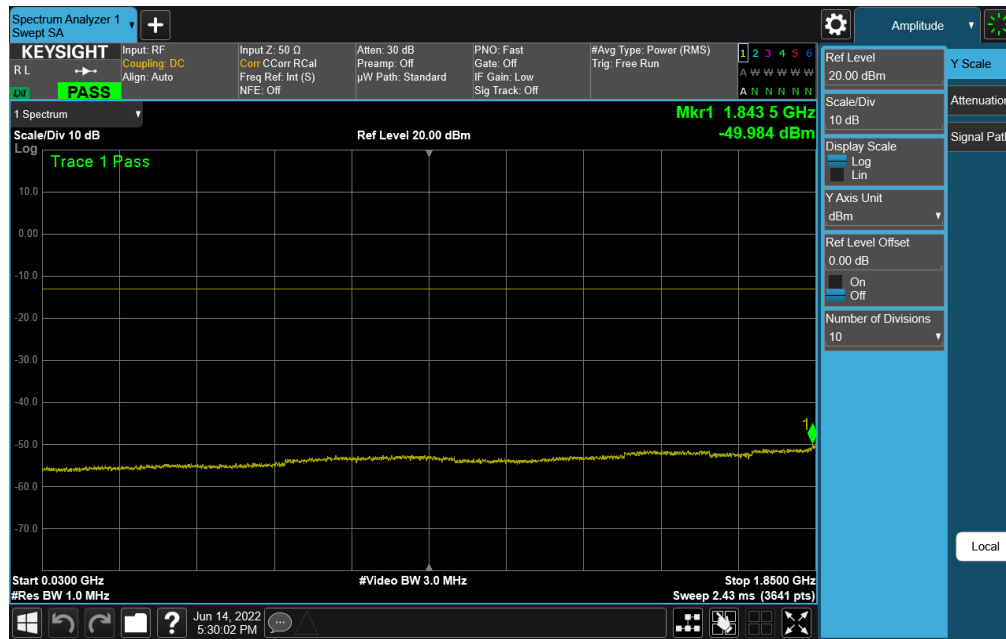
FCC ID: BCGA2764	element	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
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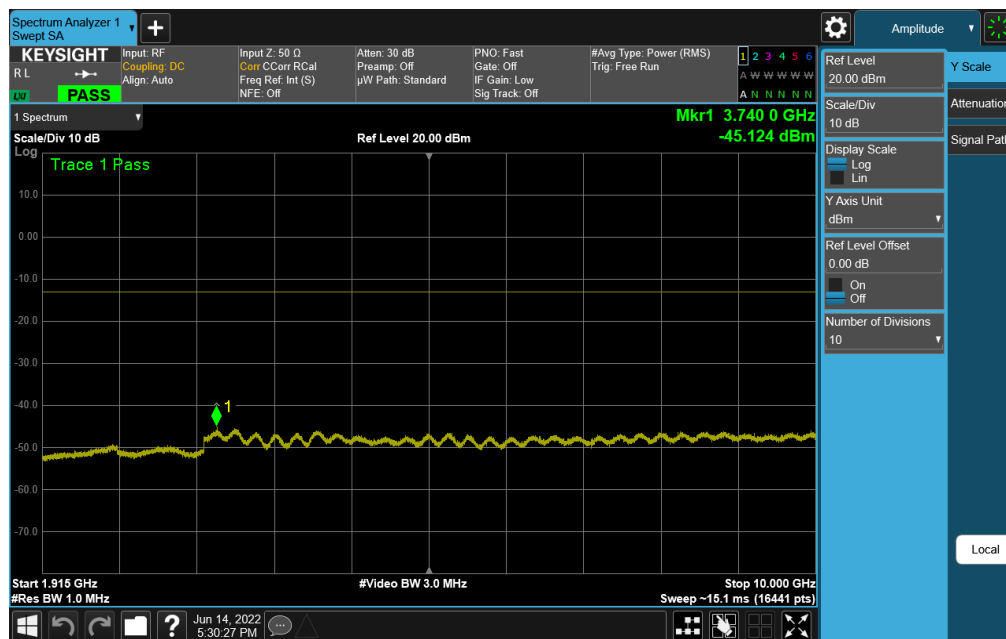
Plot 7-69. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: BCGA2764	<b>PART 24 MEASUREMENT REPORT</b>		Approved by: Technical Manager
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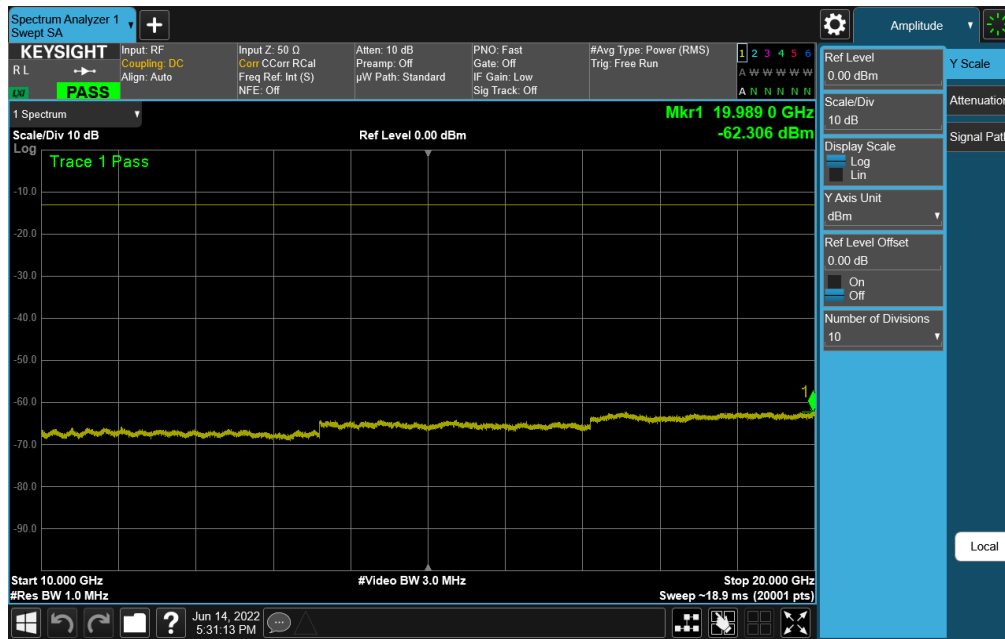
Plot 7-70. Conducted Spurious Plot (NR Band n25/n2 - 40.0MHz - RB Size 1, RB Offset 0 - Low Channel)



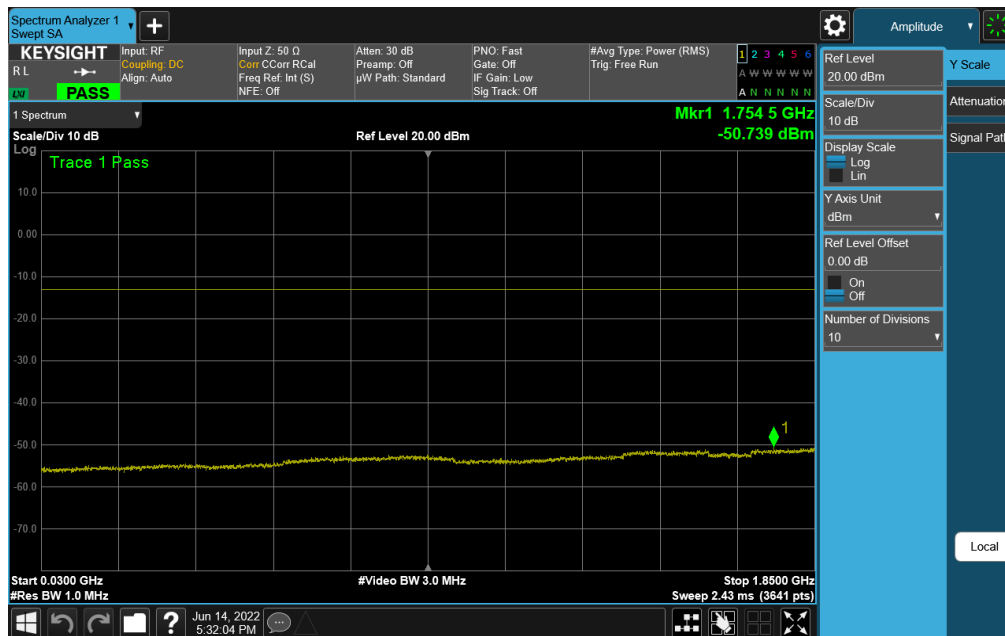
Plot 7-71. Conducted Spurious Plot (NR Band n25/n2 - 40.0MHz - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: BCGA2764	 <b>PART 24 MEASUREMENT REPORT</b>		Approved by: Technical Manager
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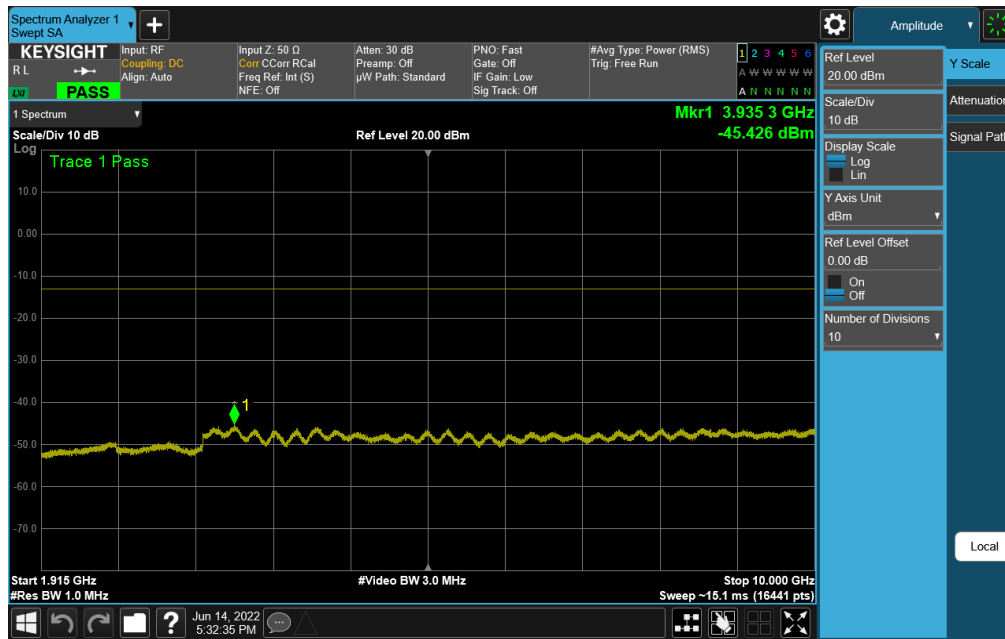


Plot 7-72. Conducted Spurious Plot (NR Band n25/n2 - 40.0MHz - RB Size 1, RB Offset 0 - Low Channel)

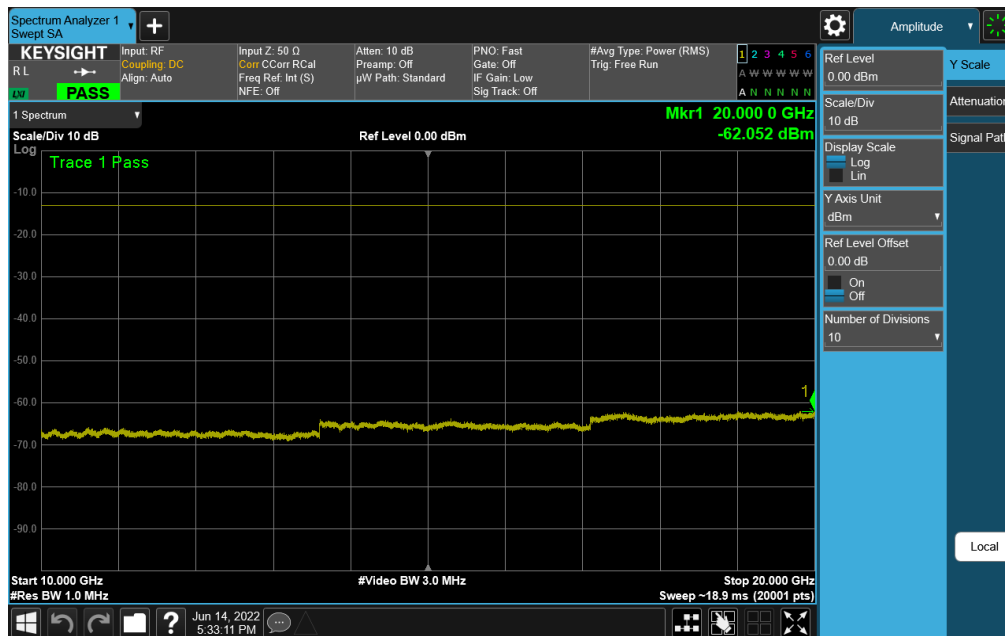


Plot 7-73. Conducted Spurious Plot (NR Band n25/n2 - 40.0MHz - RB Size 1, RB Offset 0 - Mid Channel)


FCC ID: BCGA2764	<p>element</p> <p>PART 24 MEASUREMENT REPORT</p>		Approved by: Technical Manager
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Plot 7-74. Conducted Spurious Plot (NR Band n25/n2 - 40.0MHz - RB Size 1, RB Offset 0 - Mid Channel)



Plot 7-75. Conducted Spurious Plot (NR Band n25/n2 - 40.0MHz - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCGA2764	 <b>PART 24 MEASUREMENT REPORT</b>		Approved by: Technical Manager
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