

# TEST REPORT



## CTK Co., Ltd.

(Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si,  
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REPORT No.:  
CTK-2022-02665  
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### 1. Applicant

- Name : Samsung Electronics Co Ltd
- Address : 19 Chapin Rd, Building D. Pine Brook, New Jersey, United States
- Date of Receipt : 2022-10-04

### 2. Manufacturer

- Name : Samsung Electronics Co Ltd

### 3. Use of Report : For FCC Certification

### 4. Test sample / Model : RRU (RF4440d) / RF4440d-13A

### 5. Date(s) of test : 2022-10-05 to 2022-10-17

### 6. Test Standard (Method) used : FCC 47 CFR Part 2, 22

### 7. Testing Environment : Temperature: (25 ± 1) °C, Humidity: (45 ± 2) % R.H.

### 8. Test Results : Refer to 10 pages to 292 pages

### 9. Location of Test : Permanent Testing Lab On Site Testing (Address : 5, Dongbu-ro 221beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Republic of Korea)

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.  
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Approval	Tested by: Bong-jun Jang  (Signature)	Technical Manager: Young-taek Lee  (Signature)
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Remark. This report is not related to KOLAS accreditation and relevant regulation.

2022-10-18

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## REPORT REVISION HISTORY

Date	Revision	Page No
2022-10-18	Issued (CTK-2022-02665)	all

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# 1. General Information

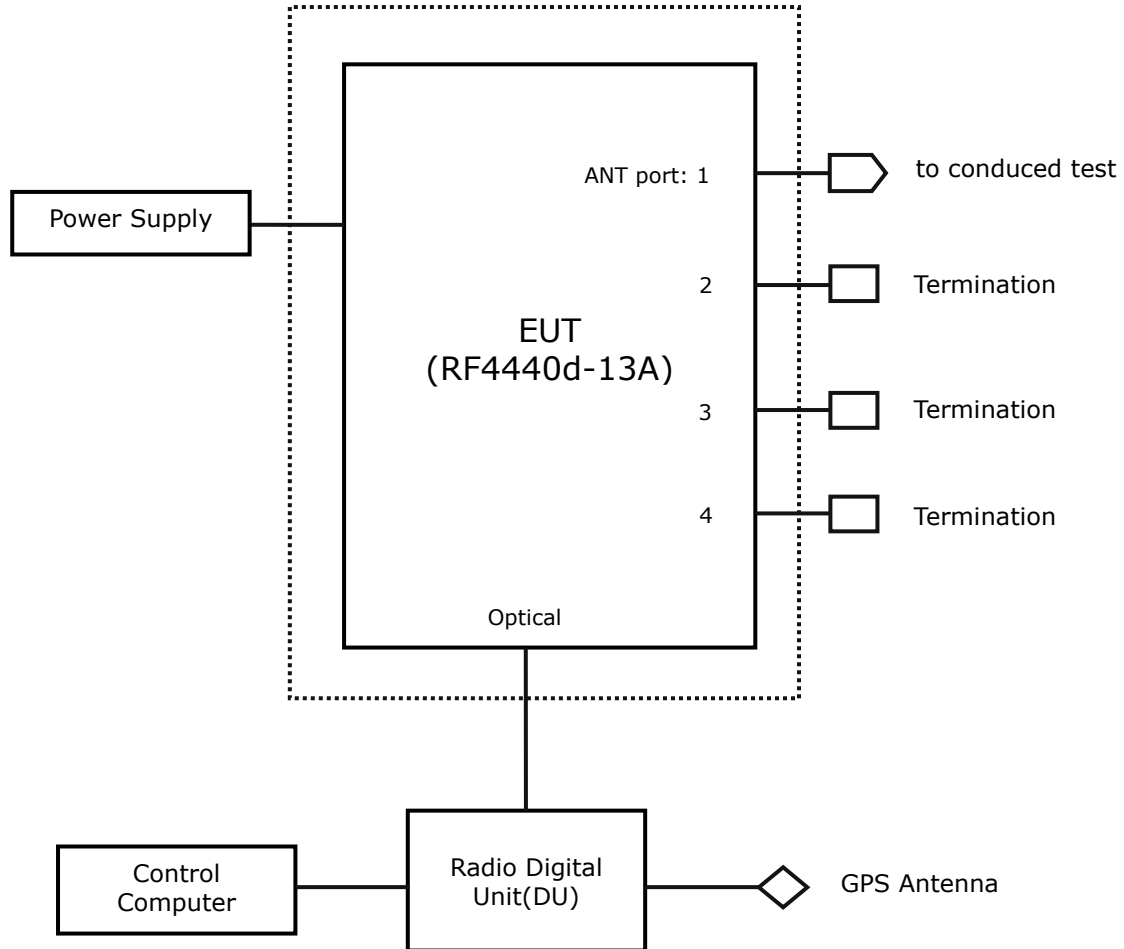
## 1.1 Client Information


<b>Company</b>	Samsung Electronics Co., Ltd.
<b>Contact Point</b>	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Republic of Korea
<b>Contact Person</b>	Name : Kim, Jong-in E-mail : jered.kim@samsung.com Tel : +82-31-279-3096

## 1.2 Product Information

<b>FCC ID</b>	A3LRF4440D-13A		
<b>Product Description</b>	RRU (RF4440d)		
<b>Model name</b>	RF4440d-13A		
<b>Power Supply</b>	-48 Vdc		
<b>Device Capabilities</b>	LTE, 5G NR		
<b>Operating Frequency</b>	Band	Tx(Downlink)	Rx(Uplink)
	LTE Band 5	869 MHz to 894 MHz	824 MHz to 849 MHz
	LTE Band 13	746 MHz to 756 MHz	777 MHz to 787 MHz
	5G NR n5	869 MHz to 894 MHz	824 MHz to 849 MHz
<b>Supported Configurations</b>	Single carrier, Multi carrier		
<b>Channel Bandwidth</b>	LTE Band 5	Single carrier	20 MHz
		Multi carrier	5 MHz + 20 MHz
	5G NR n5	Single carrier	20 MHz
		Multi carrier	5 MHz + 20 MHz
<b>Antenna ports</b>	4Tx/4Rx		
<b>RF Output Power</b>	LTE Band 5	[Single Carrier] Bandwidth 20 MHz: 40 W/path(Total 4 path: 160 W) [Multi Carrier] Bandwidth 5 MHz+20 MHz: 40 W/path(Total 4 path: 160 W)	
	5G NR n5	[Single Carrier] Bandwidth 20 MHz: 40 W/path(Total 4 path: 160 W) [Multi Carrier] Bandwidth 5 MHz+20 MHz: 40 W/path(Total 4 path: 160 W)	
<b>Modulation Type</b>	QPSK, 16QAM, 64QAM, 256QAM		
<b>FCC Rule</b>	Part 2 : FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS Part 22 : PUBLIC MOBILE SERVICES KDB 662911 D01 Multiple Transmitter Output v02r01 KDB 971168 D01 v03r01 ANSI C63.26-2015		

### 1.3 Configurations



 <b>CTK Co., Ltd.</b> <small>The Power Leader of Global Equipment Calibration</small>	<b>CTK Co., Ltd.</b> (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, 449-100, Korea Tel: +82-31-339-9970 Fax: +82-31-624-9501	<b>REPORT No.:</b> <b>CTK-2022-02665</b> Page (6) / (293) Pages	
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## 2. Facility and Accreditations

### 2.1 Laboratory Accreditations and Listings

Country	Agency	Registration Number
USA	FCC	805871
CANADA	ISED	8737A
KOREA	NRRA	KR0025

### 2.2 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.

### 3. Test Specifications

#### 3.1 Standards

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 2, Part 22.

Section	Test Items	Test Condition	Results
§2.1046 §22.913	RF output power	Conducted	Compliant
§22.913	Peak-to-average power ratio		Compliant
§2.1049	Occupied bandwidth		Compliant
§2.1051 §22.917	Spurious Emissions at Antenna Terminals		Compliant
§2.1051 §22.917	Band edge Emissions at Antenna Terminals		Compliant
§2.1055(a)(1) §2.1055(d)	Frequency Stability		Compliant
§2.1053 §22.917	Radiated Spurious emission	Radiated	Compliant

#### 3.2 Mode of operation during the test

The EUT is operated in a manner representative of the typical of the equipments. During at testing, system components were manipulated within the confines of typical usage to maximize each emission. All modulation(QPSK, 16QAM, 64QAM, 256QAM) modes were tests.



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Frequency range		
Band	Tx(Downlink)	Rx(Uplink)
LTE Band 5	869 MHz to 894 MHz	824 MHz to 849 MHz
5G NR n5	869 MHz to 894 MHz	824 MHz to 849 MHz

Operating Configurations	
Supported configurations	Single carrier, Multi carrier

Single carrier rated total output power as a sum of all carriers					
Bandwidth	Positions	Frequency [MHz]	Rated Power[W] (per a path)	Output ports	Total Power(sum)[W]
20 MHz	Lowest	879	40	4 TX	160
	Middle	881.5			
	Highest	884			

Multi carrier rated total output power as a sum of all carriers						
Bandwidth	Bandwidth positions		1 <sup>st</sup> Component Carrier_CC0	2 <sup>nd</sup> Component Carrier_CC1	Output port	Total Power(sum)[W]
5 MHz + 20 MHz	Middle	Bandwidth	5 MHz	20 MHz	-	-
		Frequency	871.5 MHz	884 MHz	-	-
		Rated Power[W] (per a path)	40		4 TX	160





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### 3.3 Maximum Measurement Uncertainty

The value of the measurement uncertainty for the measurement of each parameter.  
Coverage factor  $k = 2$ , Confidence levels of 95 %

Description	Uncertainty
Conducted RF output power	1.5 dB
Occupied bandwidth	0.1 MHz
Spurious emission at antenna terminals	3.0 dB
Radiated spurious emissions ( $f \leq 1$ GHz)	4.0 dB
Radiated spurious emissions ( $f > 1$ GHz)	5.0 dB
Frequency stability	0.1 kHz

### 3.4 Standards Environmental Test conditions

Temperature	+ 15 °C to + 35 °C
Relative humidity	30 % to 60 %
Air pressure	860 mbar to 1 060 mbar

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## 4. RF output power

### Test Requirements :

#### § 2.1046 Measurements required : RF power output

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in §2.1033(c)(8). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

(b) For single sideband, independent sideband, and single channel, controlled carrier radiotelephone transmitters the procedure specified in paragraph (a) of this section shall be employed and, in addition, the transmitter shall be modulated during the test as follows. In all tests, the input level of the modulating signal shall be such as to develop rated peak envelope power or carrier power, as appropriate, for the transmitter.

(c) For measurements conducted pursuant to paragraphs (a) and (b) of this section, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

#### § 22.913 Effective radiated power limits.

Licenses in the Cellular Radiotelephone Service are subject to the effective radiated power (ERP) limits and other requirements in this Section. See also § 22.169.

(a) Maximum ERP. The ERP of transmitters in the Cellular Radiotelephone Service must not exceed the limits in this section.

(1) Except as described in paragraphs (a)(2), (3), and (4) of this section, the ERP of base stations and repeaters must not exceed -

- (i) 500 watts per emission; or
- (ii) 400 watts/MHz (PSD) per sector.

(2) Except as described in paragraphs (a)(3) and (4) of this section, for systems operating in areas more than 72 kilometers (45 miles) from international borders that:

- (i) Are located in counties with population densities of 100 persons or fewer per square mile, based upon the most recently available population statistics from the Bureau of the Census; or
- (ii) Extend coverage into Unserved Area on a secondary basis (see § 22.949), the ERP of base transmitters and repeaters must not exceed -
  - (A) 1000 watts per emission; or
  - (B) 800 watts/MHz (PSD) per sector.

(3) Provided that they also comply with paragraphs (b) and (c) of this section, licensees are permitted to operate their base transmitters and repeaters with an ERP greater than 400 watts/MHz (PSD) per sector, up to a maximum ERP of 1000 watts/MHz (PSD) per sector unless they meet the conditions in paragraph (a)(4) of this section.

(4) Provided that they also comply with paragraphs (b) and (c) of this section, licensees of systems operating in areas more than 72 kilometers (45 miles) from international borders that:

- (i) Are located in counties with population densities of 100 persons or fewer per square mile, based upon the most recently available population statistics from the Bureau of the Census; or
- (ii) Extend coverage into Unserved Area on a secondary basis (see § 22.949), are permitted to operate base transmitters and repeaters with an ERP greater than 800 watts/MHz (PSD) per sector, up to a maximum of 2000 watts/MHz (PSD) per sector.

(5) The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

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**Test Procedures :**

The measurement is performed in according with Section 5.2.4.4.1 of ANSI C63.26.

- a) Set span to 2 x to 3 x the OBW.
- b) Set RBW=1% to 5% of the OBW.
- c) Set VBW  $\geq$  3 x RBW.
- d) Set number of measurement points in sweep  $\geq$  2 x span / RBW.
- e) Sweep time:
  - 1) Set = auto-couple, or
  - 2) Set  $\geq$  [10 x (number of points in sweep) x (transmission period)] for single sweep (automation-compatible) measurement. Transmission period is the on and off time of the transmitter.
- f) Detector = power averaging (rms).
- g) If the EUT can be configured to transmit continuously, then set the trigger to free run.
- h) If the EUT cannot be configured to transmit continuously, then use a sweep trigger with the level set to enable triggering only on full power bursts and configure the EUT to transmit at full power for the entire duration of each sweep. Verify that the sweep time is less than or equal to the transmission burst duration. Time gating can also be used under similar constraints (i.e., configured such that measurement data is collected only during active full-power transmissions).
- i) Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. To accurately determine the average power over multiple symbols, it can be necessary to increase the number of traces to be averaged above 100 or, if using a manually configured sweep time, increase the sweep time.
- j) Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band or channel power measurement function, with the band/channel limits set equal to the OBW band edges. If the instrument does not have a band or channel power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

Note 1 : The conducted emission level is measured at each antenna port and then summed mathematically to determine the total emission level from the device.

Note 2: Maximum ERP is sufficient level to pass the limit.

Note 3 : Sum data is in a tolerance of specification provided from manufacturer.

**► LTE**

Maximum output power for one port :

- Single carrier  
Bandwidth 20 MHz : **45.99 dBm (39.72 W)**
- Multi carrier  
Bandwidth 5 MHz + 20 MHz : **45.90 dBm (38.91 W)**

Maximum output sum power :

- Single carrier  
Bandwidth 20 MHz : **51.90 dBm (154.74 W)**
- Multi carrier  
Bandwidth 5 MHz + 20 MHz : **51.76 dBm (149.99 W)**

**► 5G NR**

Maximum output power for one port :

- Single carrier  
Bandwidth 20 MHz : **46.08 dBm (40.55 W)**
- Multi carrier  
Bandwidth 5 MHz + 20 MHz : **45.80 dBm (38.02 W)**

Maximum output sum power :

- Single carrier  
Bandwidth 20 MHz : **52.01 dBm (158.86 W)**
- Multi carrier  
Bandwidth 5 MHz + 20 MHz : **51.71 dBm (148.16 W)**



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**Test Results : RF output power**

**Test Data : Single carrier**

**[LTE\_Bandwidth 20 MHz]  
Low Channel**

Antenna port	Output Power [dBm]			
	Modulation Type			
	QPSK	16QAM	64QAM	256QAM
1	45.50	45.62	45.65	45.59
2	45.76	45.89	45.93	45.99
3	45.78	45.92	45.94	45.94
4	45.83	45.90	45.93	45.97

Antenna port	Total Output Power							
	Modulation Type							
	QPSK		16QAM		64QAM		256QAM	
	[dBm]	[W]	[dBm]	[W]	[dBm]	[W]	[dBm]	[W]
1-4	51.74	149.31	51.85	153.31	51.88	154.34	51.90	154.74

**Middle Channel**

Antenna port	Output Power [dBm]			
	Modulation Type			
	QPSK	16QAM	64QAM	256QAM
1	45.51	45.56	45.49	45.47
2	45.83	45.87	45.86	45.91
3	45.77	45.83	45.89	45.94
4	45.87	45.82	45.80	45.91

Antenna port	Total Output Power							
	Modulation Type							
	QPSK		16QAM		64QAM		256QAM	
	[dBm]	[W]	[dBm]	[W]	[dBm]	[W]	[dBm]	[W]
1 - 4	51.77	150.24	51.79	151.09	51.78	150.78	51.83	152.49

**High Channel**

Antenna port	Output Power [dBm]			
	Modulation Type			
	QPSK	16QAM	64QAM	256QAM
1	45.55	45.51	45.49	45.55
2	45.87	45.89	45.90	45.89
3	45.79	45.90	45.94	45.95
4	45.86	45.83	45.87	45.84

Antenna port	Total Output Power							
	Modulation Type							
	QPSK		16QAM		64QAM		256QAM	
	[dBm]	[W]	[dBm]	[W]	[dBm]	[W]	[dBm]	[W]
1 - 4	51.79	151.01	51.81	151.57	51.82	152.21	51.83	152.43



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**[5G NR\_Bandwidth 20 MHz]  
Low Channel**

Antenna port	Output Power [dBm]			
	Modulation Type			
	QPSK	16QAM	64QAM	256QAM
1	45.76	45.69	45.64	45.74
2	46.10	46.01	45.98	46.03
3	46.01	45.96	45.93	45.96
4	46.08	46.00	45.95	46.02

Antenna port	Total Output Power							
	Modulation Type							
	QPSK		16QAM		64QAM		256QAM	
	[dBm]	[W]	[dBm]	[W]	[dBm]	[W]	[dBm]	[W]
1 - 4	52.01	158.86	51.94	156.23	51.90	154.80	51.96	157.02

**Middle Channel**

Antenna port	Output Power [dBm]			
	Modulation Type			
	QPSK	16QAM	64QAM	256QAM
1	45.66	45.60	45.62	45.61
2	45.97	45.95	45.93	45.94
3	45.93	45.94	45.90	45.92
4	45.98	45.99	45.97	45.96

Antenna port	Total Output Power							
	Modulation Type							
	QPSK		16QAM		64QAM		256QAM	
	[dBm]	[W]	[dBm]	[W]	[dBm]	[W]	[dBm]	[W]
1 - 4	51.91	155.15	51.89	154.65	51.88	154.09	51.88	154.19

**High Channel**

Antenna port	Output Power [dBm]			
	Modulation Type			
	QPSK	16QAM	64QAM	256QAM
1	45.55	45.61	45.58	45.60
2	45.91	45.85	45.85	45.91
3	45.90	45.93	45.89	45.92
4	45.90	45.93	45.91	45.86

Antenna port	Total Output Power							
	Modulation Type							
	QPSK		16QAM		64QAM		256QAM	
	[dBm]	[W]	[dBm]	[W]	[dBm]	[W]	[dBm]	[W]
1 - 4	51.84	152.70	51.85	153.20	51.83	152.41	51.85	152.93



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**Test Data : Multi carrier**

**[LTE\_Bandwidth 5MHz + 20 MHz]**

**Middle Channel**

Antenna port	Output Power [dBm]			
	Modulation Type			
	QPSK	16QAM	64QAM	256QAM
1	45.50	45.41	45.39	45.46
2	45.77	45.63	45.65	45.68
3	45.90	45.83	45.78	45.78
4	45.78	45.69	45.66	45.64

Antenna port	Total Output Power							
	Modulation Type							
	QPSK		16QAM		64QAM		256QAM	
	[dBm]	[W]	[dBm]	[W]	[dBm]	[W]	[dBm]	[W]
1-4	51.76	149.99	51.66	146.66	51.64	145.98	51.66	146.63

**[5G NR\_Bandwidth 5 MHz + 20 MHz]**

**Middle Channel**

Antenna port	Output Power [dBm]			
	Modulation Type			
	QPSK	16QAM	64QAM	256QAM
1	45.42	45.38	45.39	45.47
2	45.69	45.65	45.66	45.72
3	45.80	45.77	45.80	45.76
4	45.79	45.71	45.71	45.79

Antenna port	Total Output Power							
	Modulation Type							
	QPSK		16QAM		64QAM		256QAM	
	[dBm]	[W]	[dBm]	[W]	[dBm]	[W]	[dBm]	[W]
1 - 4	51.70	147.85	51.65	146.24	51.66	146.66	51.71	148.16



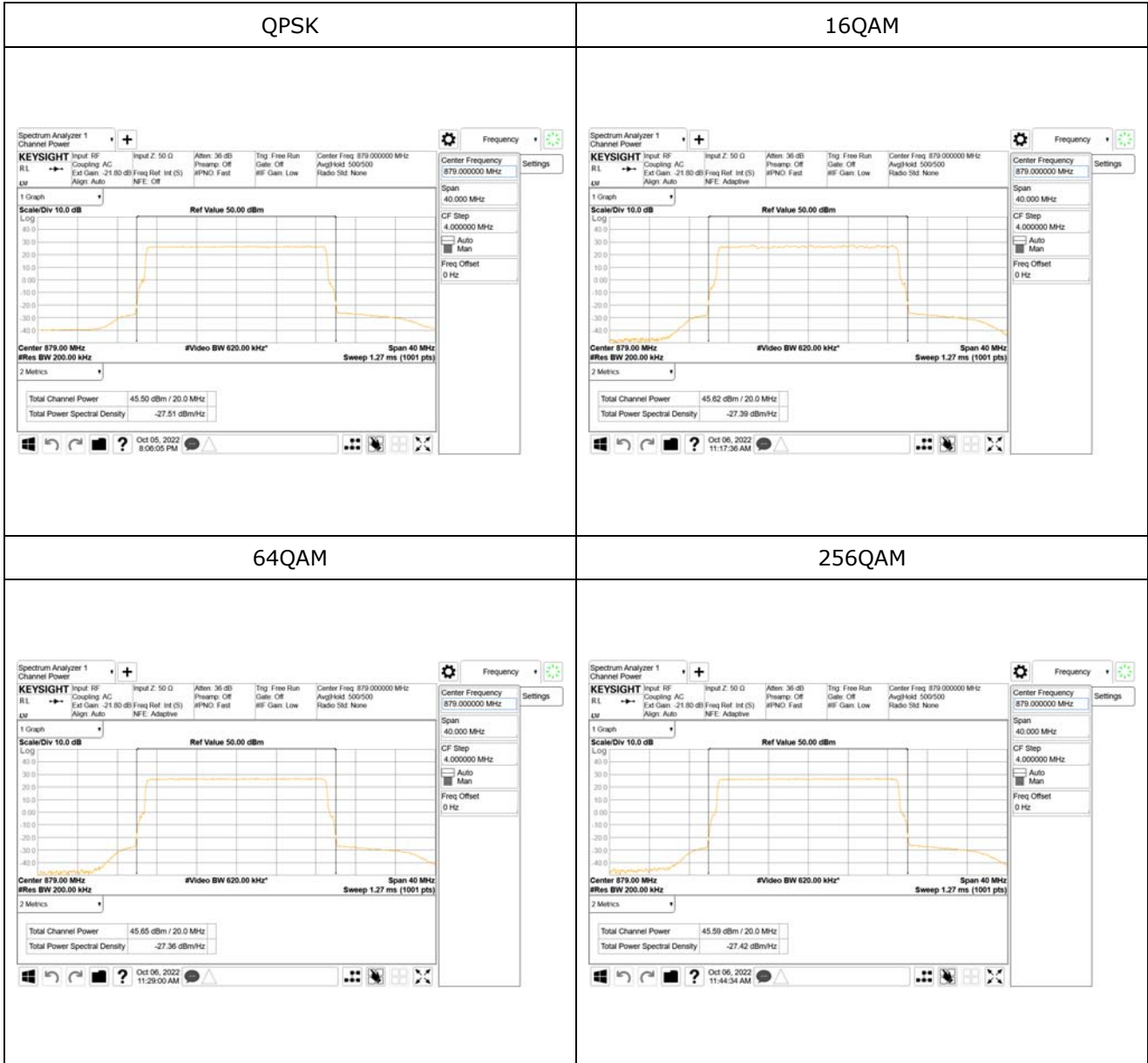
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### Test Plot at Output Power

### LTE, Single carrier 20 MHz, Low Channel ANT 1





**ANT 2**

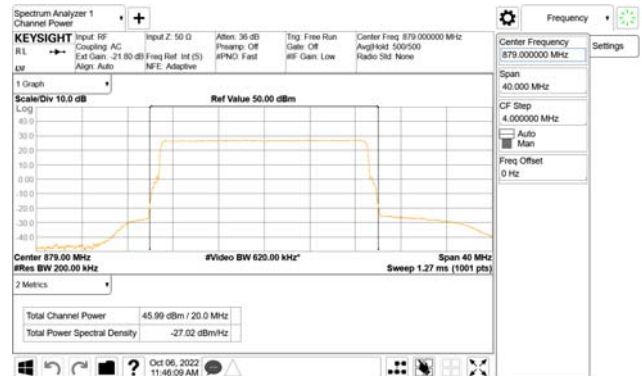
**QPSK**

**16QAM**



**64QAM**

**256QAM**







**ANT 3**

**QPSK**

**16QAM**



**64QAM**

**256QAM**





**ANT 4**

**QPSK**

**16QAM**



**64QAM**

**256QAM**





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**LTE, Single carrier 20 MHz, Middle Channel  
ANT 1**

QPSK

16QAM



64QAM

256QAM





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### ANT 2

#### QPSK

#### 16QAM



#### 64QAM

#### 256QAM





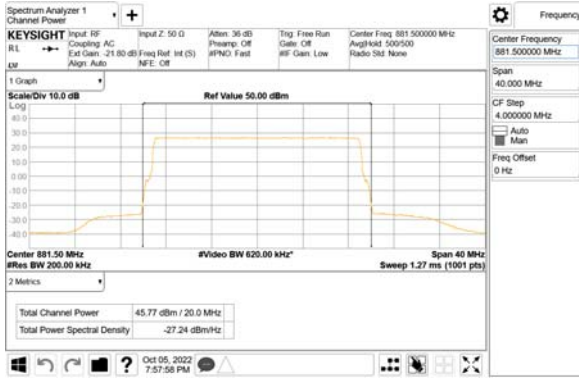
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### ANT 3

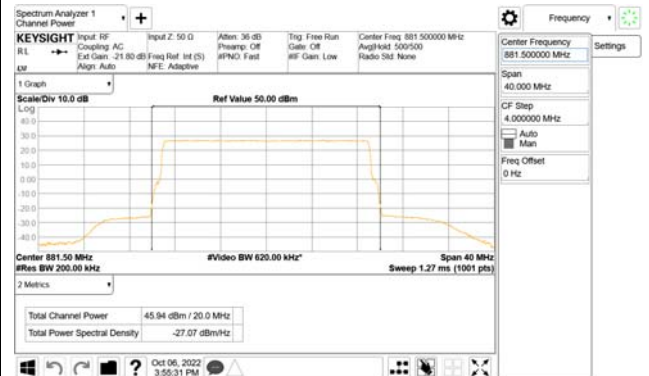
#### QPSK

#### 16QAM



#### 64QAM

#### 256QAM





**ANT 4**

**QPSK**

**16QAM**



**64QAM**

**256QAM**





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**LTE, Single carrier 20 MHz, High Channel**  
**ANT 1**

**QPSK**

**16QAM**



**64QAM**

**256QAM**



**ANT 2**

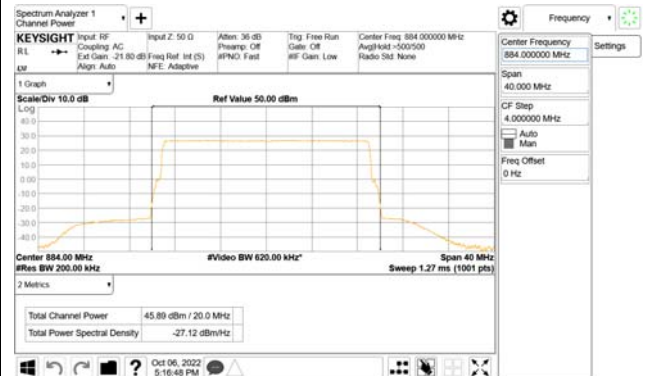
**QPSK**

**16QAM**



**64QAM**

**256QAM**







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### ANT 3

#### QPSK

#### 16QAM



#### 64QAM

#### 256QAM





**ANT 4**

**QPSK**

**16QAM**



**64QAM**

**256QAM**





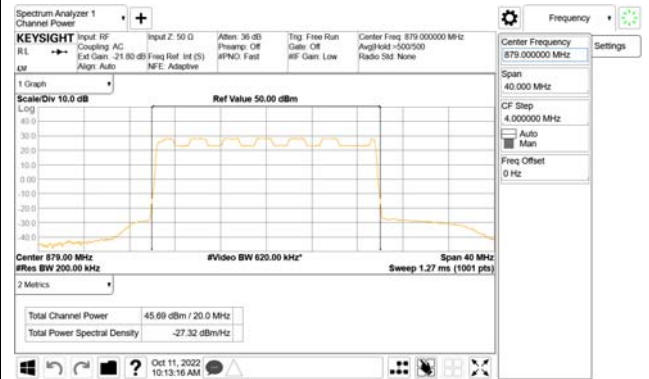
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**5G NR, Single carrier 20 MHz, Low Channel  
ANT 1**

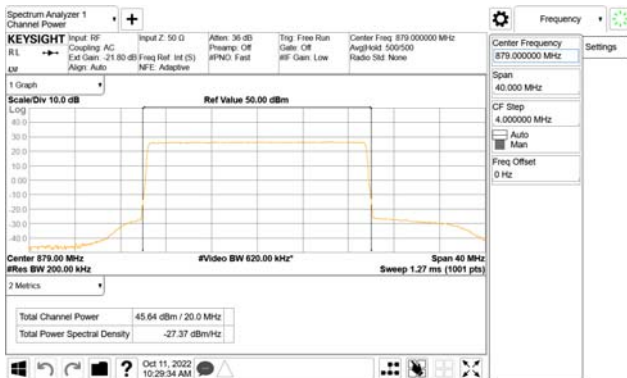
QPSK

16QAM



64QAM

256QAM





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### ANT 2

#### QPSK

#### 16QAM



#### 64QAM

#### 256QAM





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### ANT 3

#### QPSK

#### 16QAM



#### 64QAM

#### 256QAM





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### ANT 4

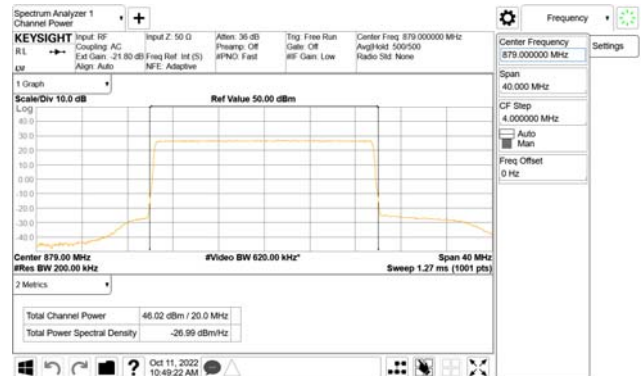
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#### 16QAM



#### 64QAM

#### 256QAM

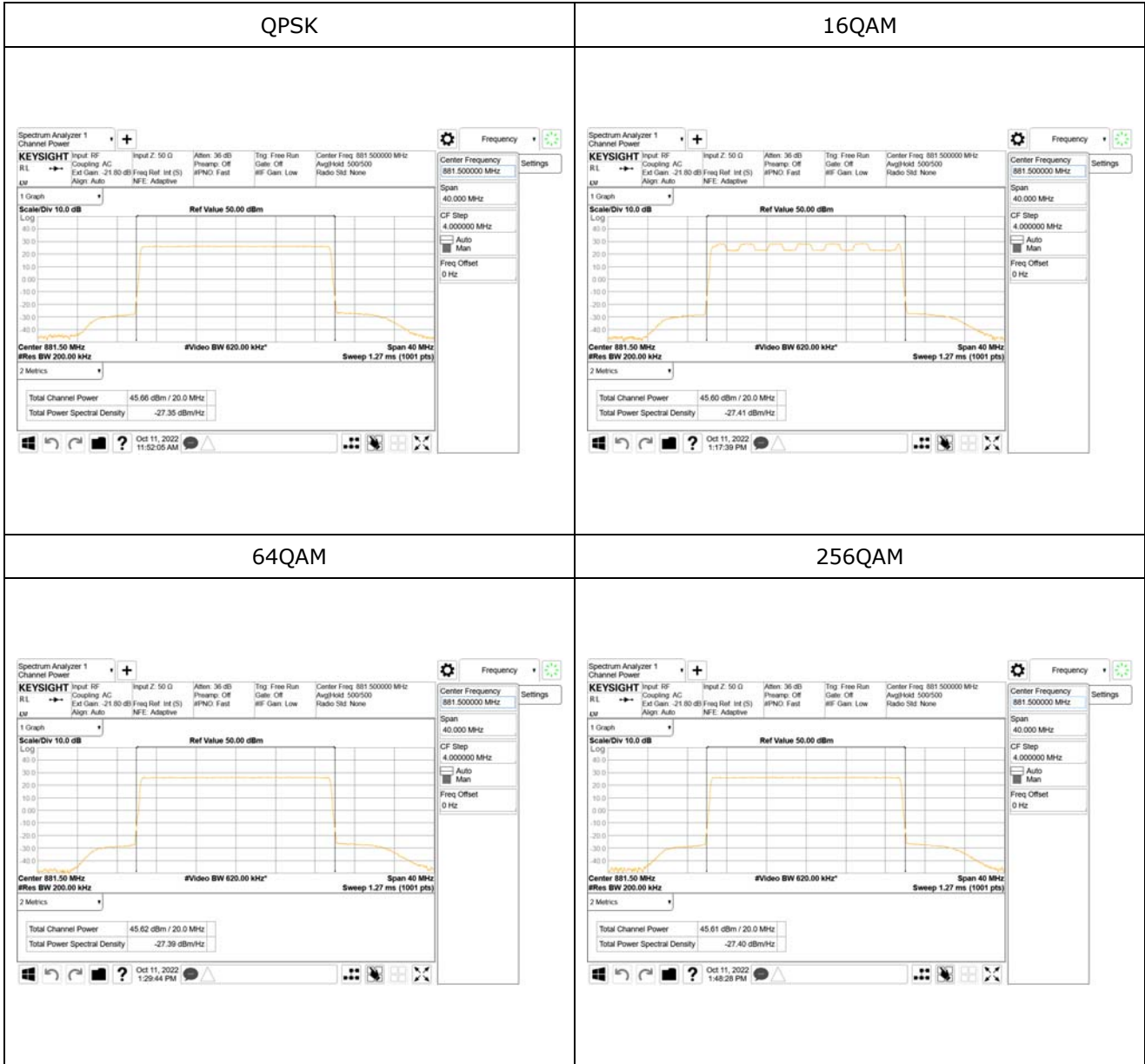




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**5G NR, Single carrier 20 MHz, Middle Channel  
ANT 1**





**ANT 2**

**QPSK**

**16QAM**



**64QAM**

**256QAM**







**ANT 3**

**QPSK**

**16QAM**



**64QAM**

**256QAM**





**ANT 4**

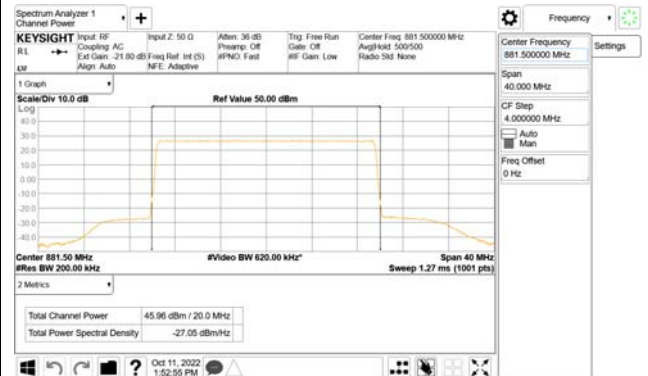
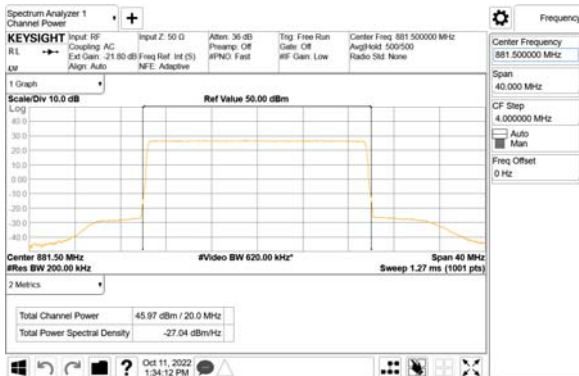
**QPSK**

**16QAM**



**64QAM**

**256QAM**





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REPORT No.:  
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**5G NR, Single carrier 20 MHz, High Channel  
ANT 1**

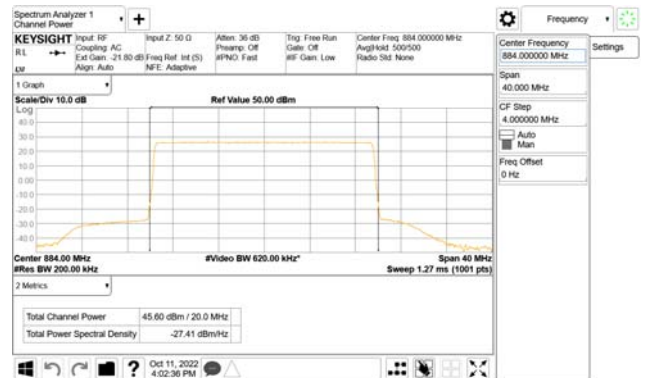
QPSK

16QAM



64QAM

256QAM





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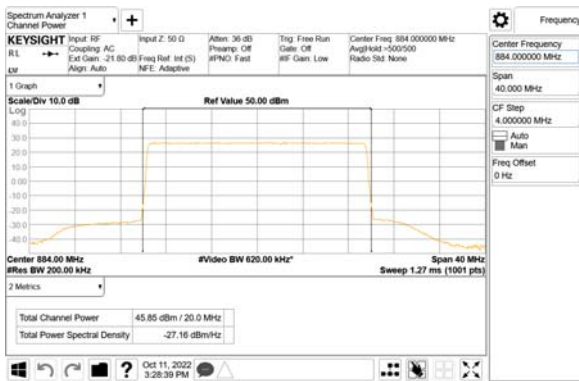
#### QPSK

#### 16QAM



#### 64QAM

#### 256QAM





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### ANT 3

#### QPSK

#### 16QAM



#### 64QAM

#### 256QAM





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### ANT 4

#### QPSK

#### 16QAM



#### 64QAM

#### 256QAM





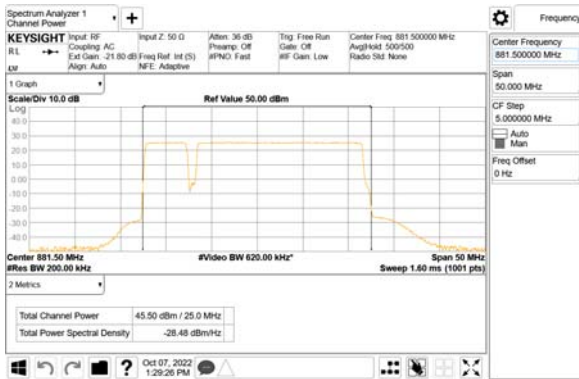
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REPORT No.:  
CTK-2022-02665  
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**LTE, Multi carrier 5 MHz + 20 MHz, Middle Channel  
ANT 1**

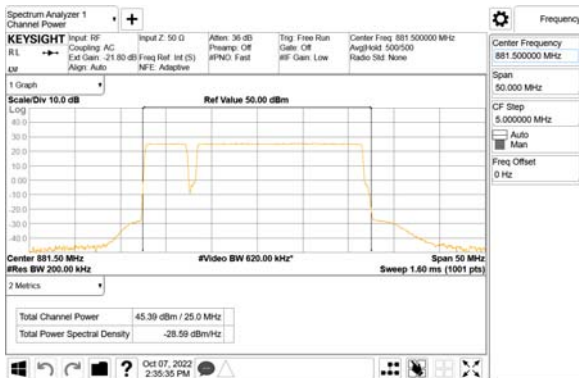
QPSK

16QAM



64QAM

256QAM





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### ANT 2

#### QPSK

#### 16QAM



#### 64QAM

#### 256QAM







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### ANT 3

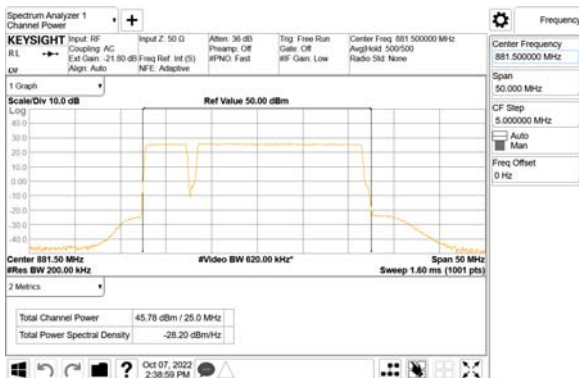
#### QPSK

#### 16QAM



#### 64QAM

#### 256QAM





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### ANT 4

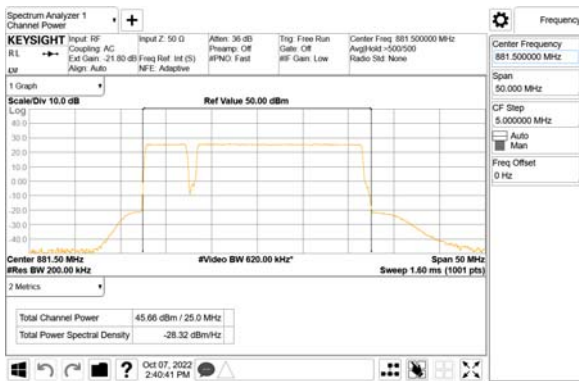
#### QPSK

#### 16QAM



#### 64QAM

#### 256QAM





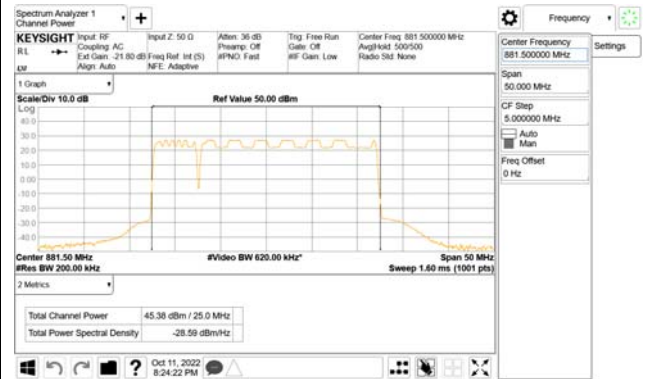
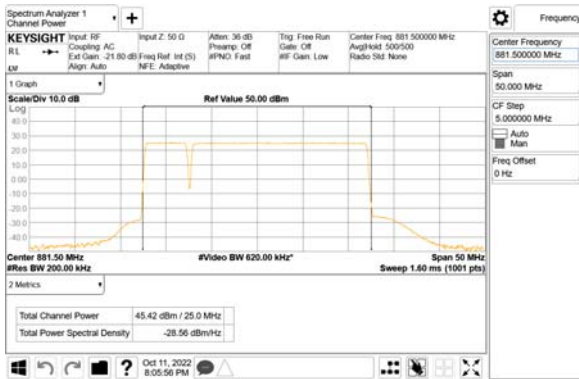
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**5G NR, Multi carrier 5 MHz + 20 MHz, Middle Channel  
ANT 1**

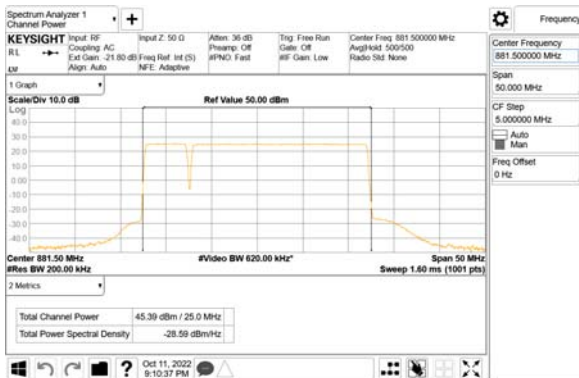
QPSK

16QAM



64QAM

256QAM



**ANT 2**

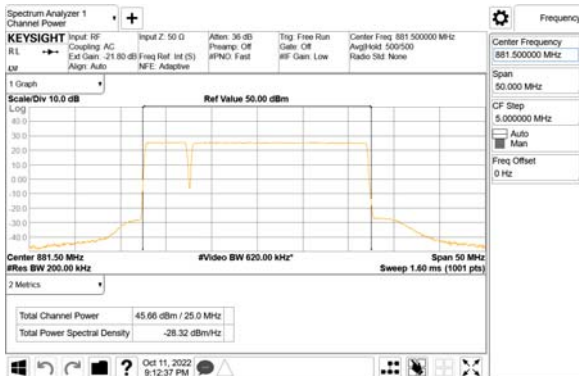
**QPSK**

**16QAM**



**64QAM**

**256QAM**





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### ANT 3

#### QPSK

#### 16QAM



#### 64QAM

#### 256QAM





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### ANT 4

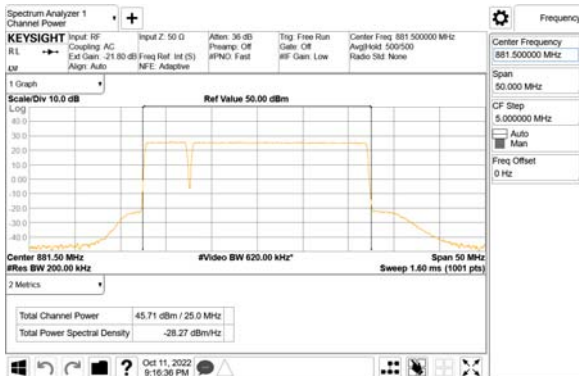
#### QPSK


#### 16QAM



#### 64QAM

#### 256QAM



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## 5. Peak-to-average power ratio

### Test Requirements :

#### § 22.913 Effective radiated power limits.

- (d) Power measurement. Measurement of the ERP of Cellular base transmitters and repeaters must be made using an average power measurement technique. The peak-to-average ratio (PAR) of the transmission must not exceed 13 dB.

### Test Procedures :

The measurement is performed in according with Section 5.2.3.4 of ANSI C63.26.

- a) Set resolution/measurement bandwidth  $\geq$  OBW or specified reference bandwidth
- b) Set the number of counts to a value that stabilizes the measured CCDF curve.
- c) Set the measurement interval as follows:
  - 1) For continuous transmissions, set to the greater of  $[10 \times (\text{number of points in sweep}) \times (\text{transmission symbol period})]$  or 1 ms.
  - 2) For burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize. Set the measurement interval to a time that is less than or equal to the burst duration.
  - 3) If there are several carriers in a single antenna port, the peak power shall be determined for each individual carrier (by disabling the other carriers while measuring the required carrier) and the total peak power calculated from the sum of the individual carrier peak powers.
- d) Record the maximum PAPR level associated with a probability of 0.1 %.
- e) The peak power level is calculated from the sum of the PAPR value from step d) to the measured average power.



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**Test Results : Peak-to-average power ratio**

**Test Data : Single carrier**

**[LTE\_Bandwidth 20 MHz]**

Channel	port	PAPR [dB]				0.1 % PAPR Limit [dB]
		Modulation Type				
		QPSK	16QAM	64QAM	256QAM	
Low	1	8.37	8.40	8.30	8.46	< 13
	2	8.44	8.37	8.33	8.42	
	3	7.74	7.71	7.68	7.69	
	4	7.74	7.70	7.70	7.73	
Middle	1	8.40	8.39	8.32	8.40	
	2	8.42	8.40	8.31	8.37	
	3	7.65	7.66	7.63	7.63	
	4	7.66	7.66	7.64	7.66	
High	1	8.34	8.39	8.32	8.33	
	2	8.41	8.40	8.33	8.34	
	3	7.64	7.63	7.63	7.62	
	4	7.64	7.65	7.62	7.62	

**[5G NR\_Bandwidth 20 MHz]**

Channel	port	PAPR [dB]				0.1 % PAPR Limit [dB]
		Modulation Type				
		QPSK	16QAM	64QAM	256QAM	
Low	1	8.31	8.37	8.41	8.34	< 13
	2	8.34	8.35	8.38	8.33	
	3	7.74	7.73	7.76	7.71	
	4	7.76	7.74	7.74	7.74	
Middle	1	8.29	8.34	8.40	8.34	
	2	8.30	8.33	8.40	8.32	
	3	7.64	7.65	7.67	7.64	
	4	7.65	7.64	7.68	7.65	
High	1	8.29	8.33	8.37	8.35	
	2	8.29	8.33	8.37	8.36	
	3	7.61	7.63	7.64	7.62	
	4	7.62	7.63	7.64	7.62	

**Test Data : Multi carrier**

**[LTE\_Bandwidth 5 MHz + 20 MHz]**

Channel	port	PAPR [dB]				0.1 % PAPR Limit [dB]
		Modulation Type				
		QPSK	16QAM	64QAM	256QAM	
Middle	1	8.40	8.43	8.43	8.34	< 13
	2	8.38	8.43	8.41	8.42	
	3	8.04	8.06	8.03	8.09	
	4	8.01	8.06	8.06	8.07	

**[5G NR\_Bandwidth 5 MHz + 20 MHz]**

Channel	port	PAPR [dB]				0.1 % PAPR Limit [dB]
		Modulation Type				
		QPSK	16QAM	64QAM	256QAM	
Middle	1	8.37	8.37	8.39	8.39	< 13
	2	8.44	8.42	8.35	8.41	
	3	8.09	8.04	8.03	8.07	
	4	8.05	8.04	8.02	8.12	





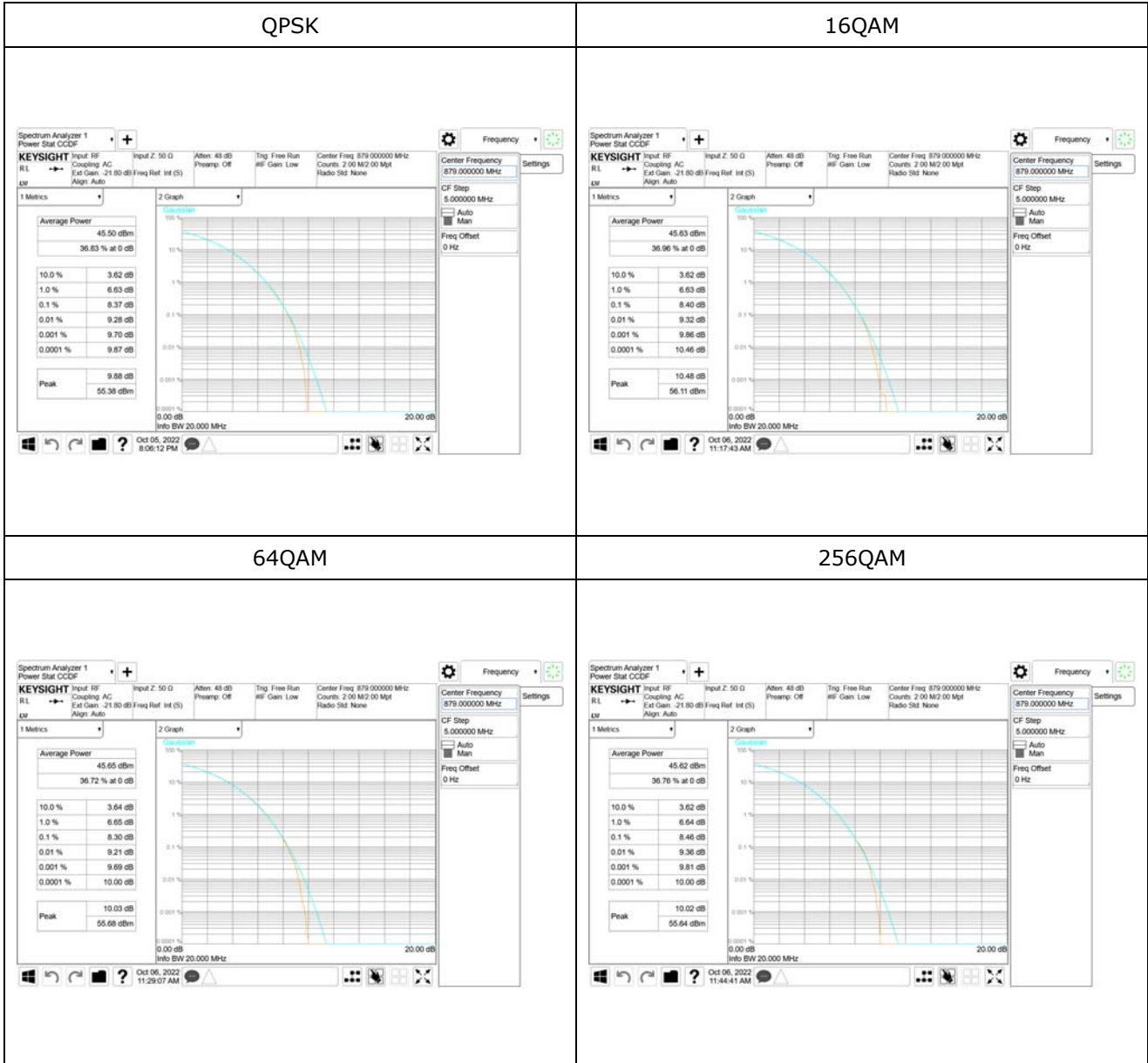
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CTK-2022-02665  
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**Test Plot at Peak-to-Average Ratio**

**LTE, Single carrier 20 MHz, Low Channel  
ANT 1**





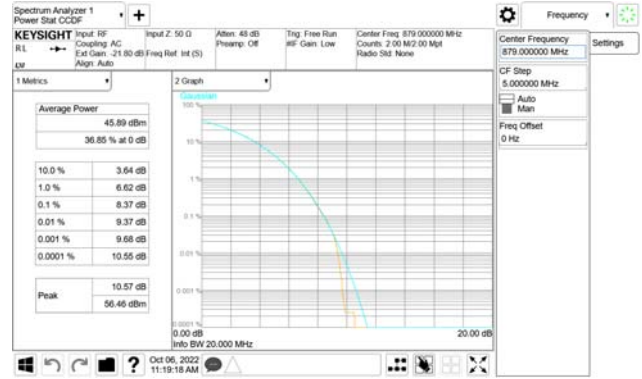
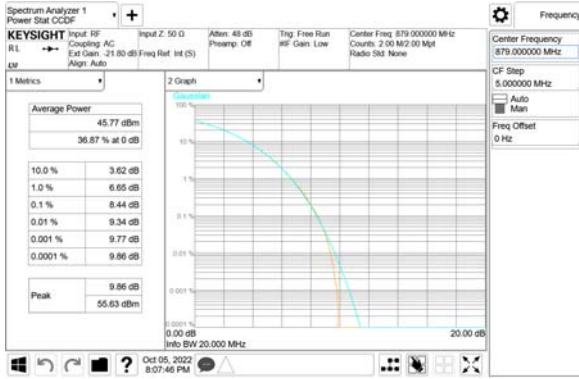
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**ANT 2**

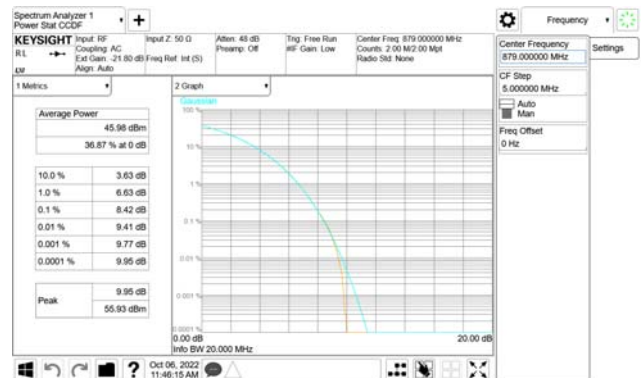
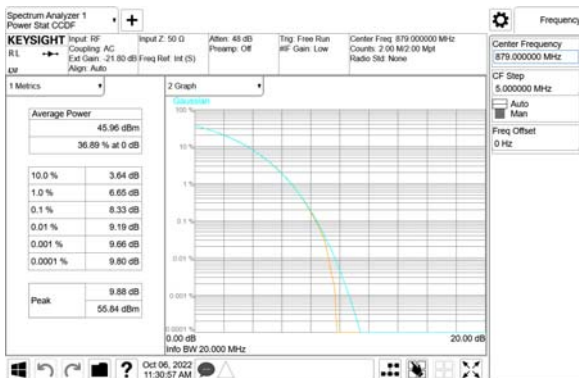
**QPSK**

**16QAM**



**64QAM**

**256QAM**



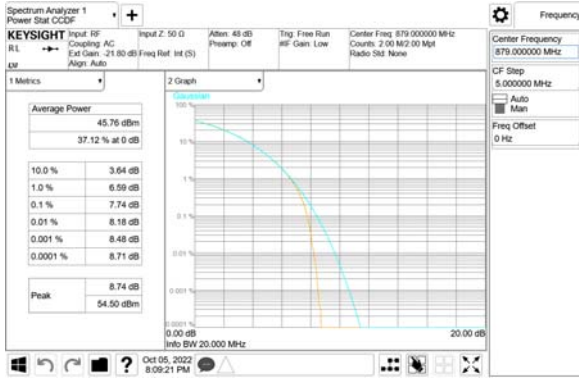


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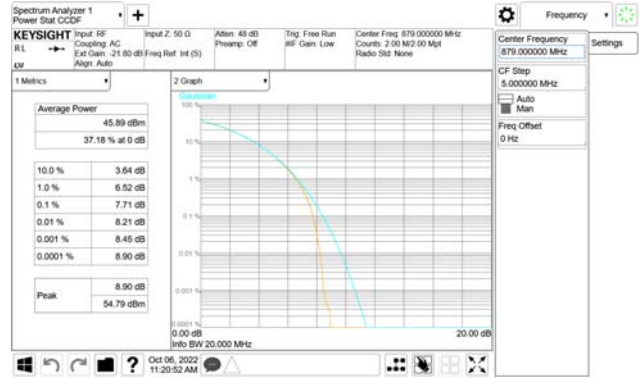
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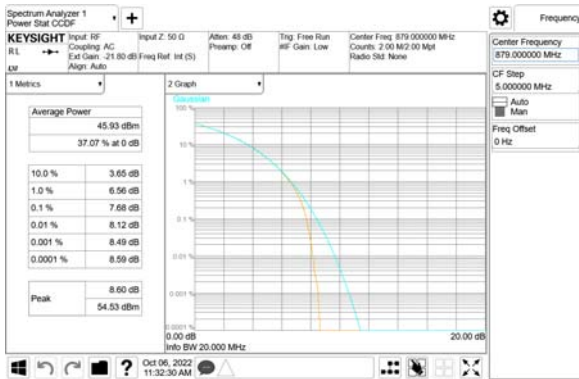
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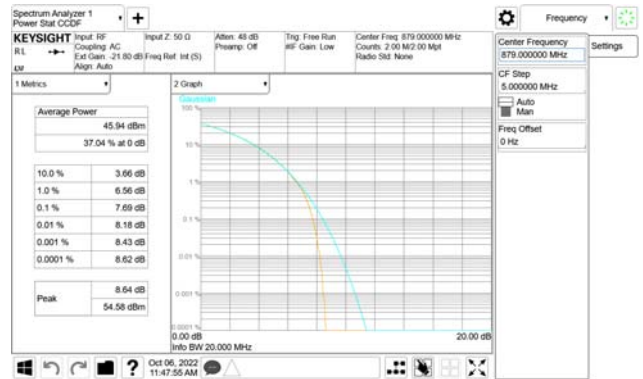
**16QAM**



**64QAM**

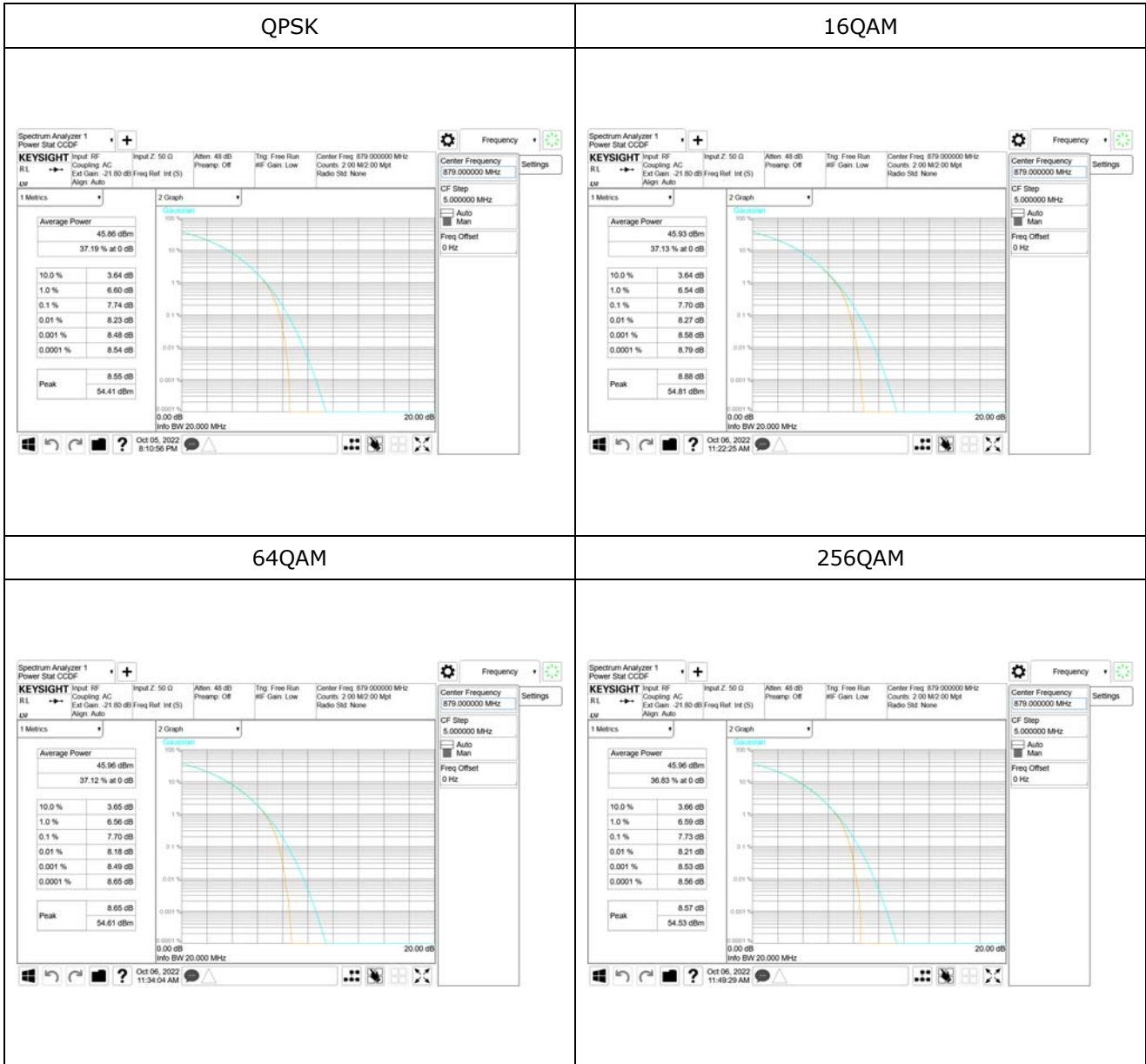


**256QAM**





**ANT 4**

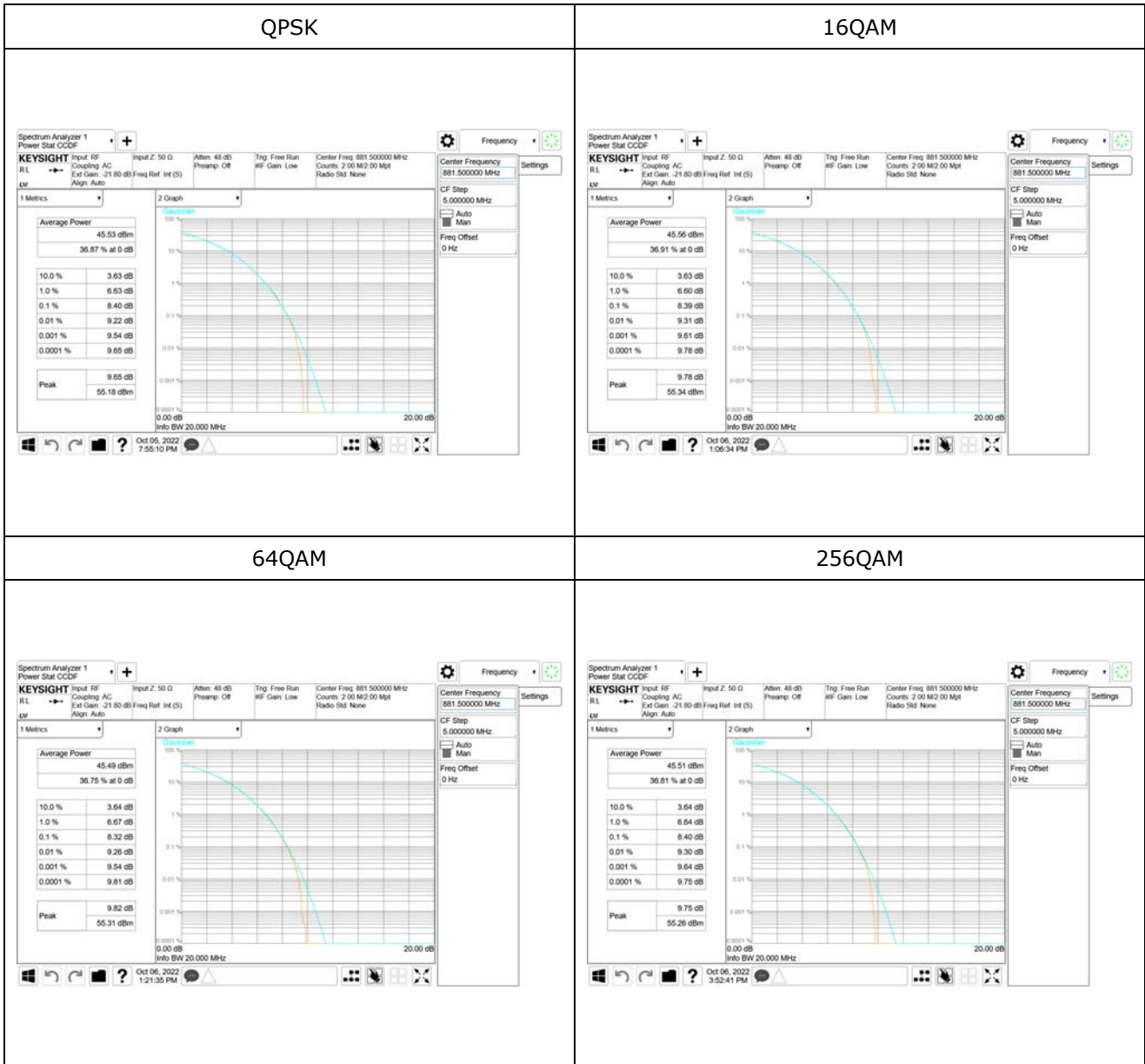




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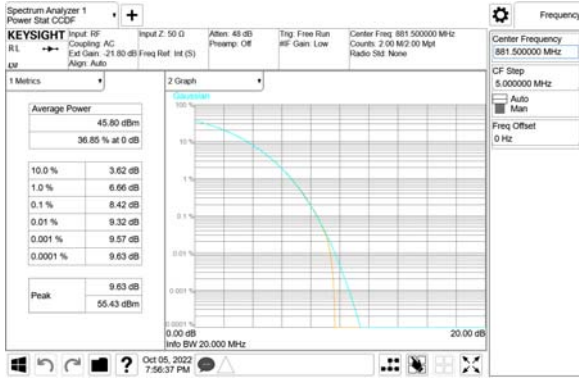
**LTE, Single carrier 20 MHz, Middle Channel  
 ANT 1**



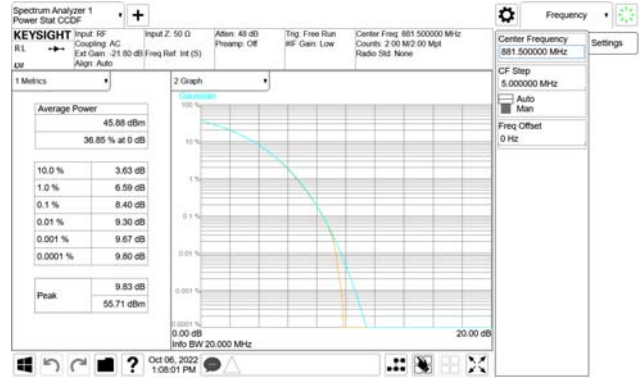


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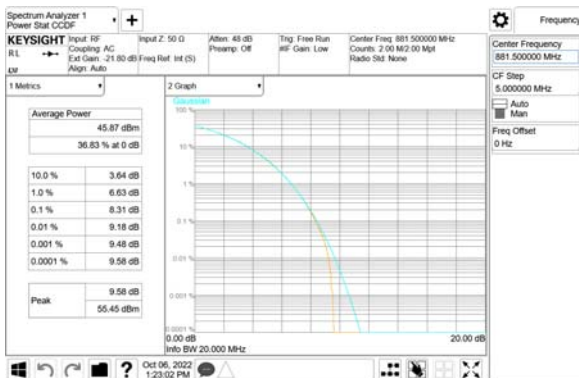
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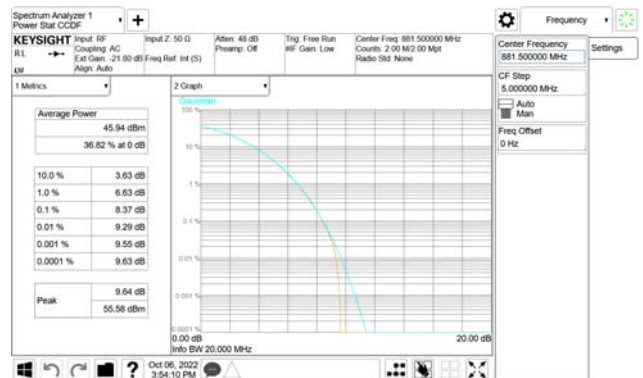
**16QAM**



**64QAM**



**256QAM**



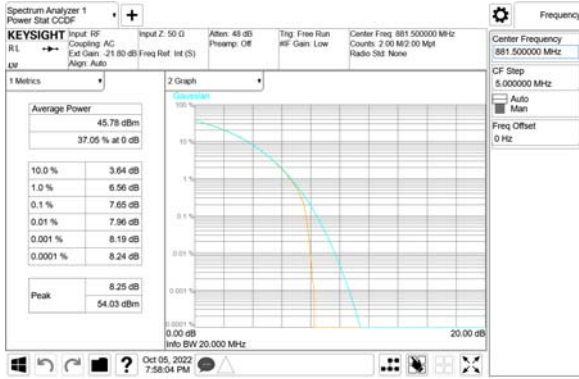


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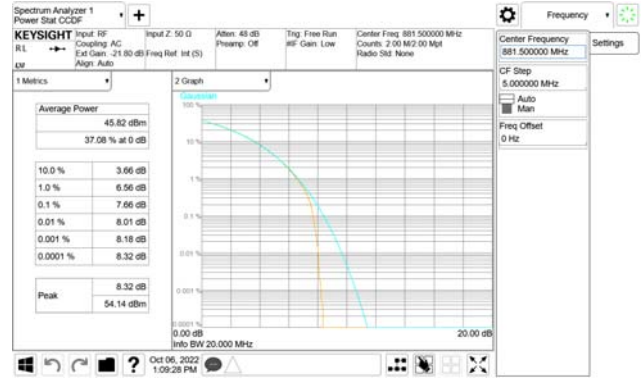
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### ANT 3

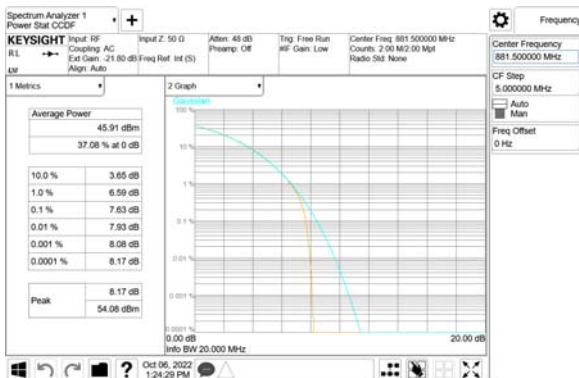
#### QPSK



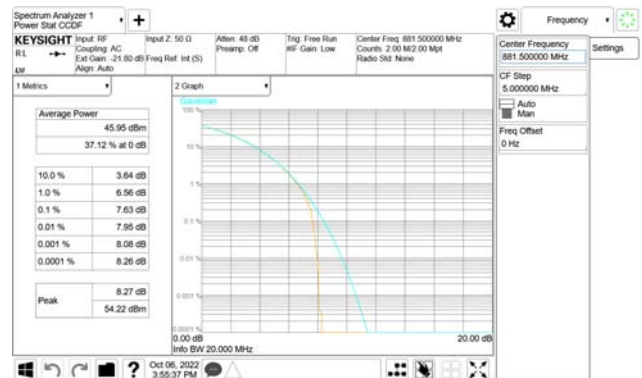
#### 16QAM



#### 64QAM



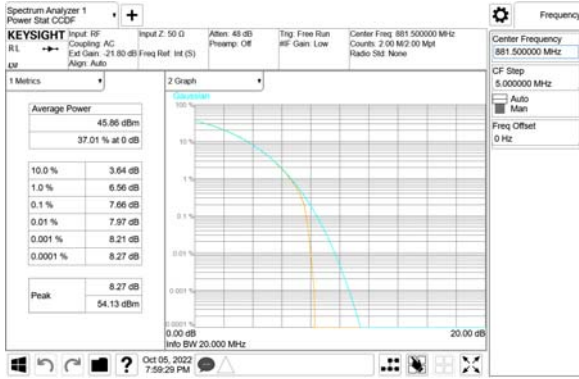
#### 256QAM



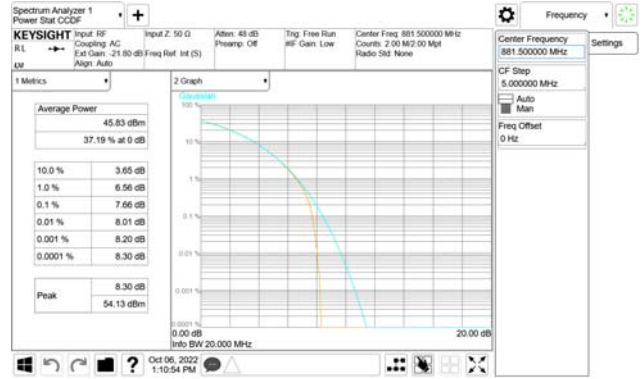


**ANT 4**

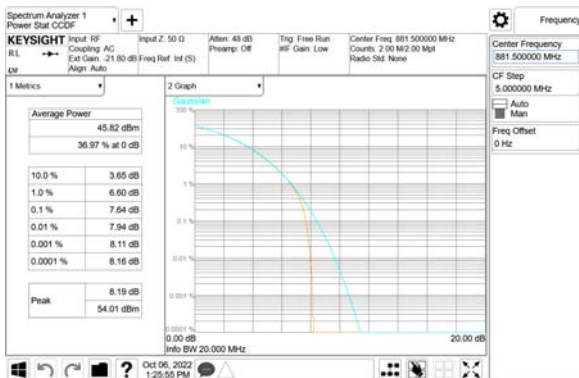
**QPSK**



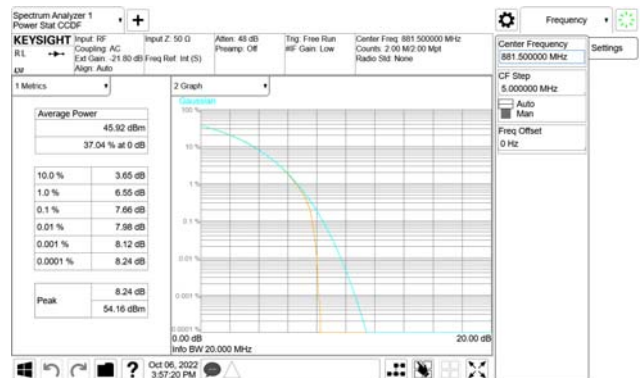
**16QAM**



**64QAM**



**256QAM**



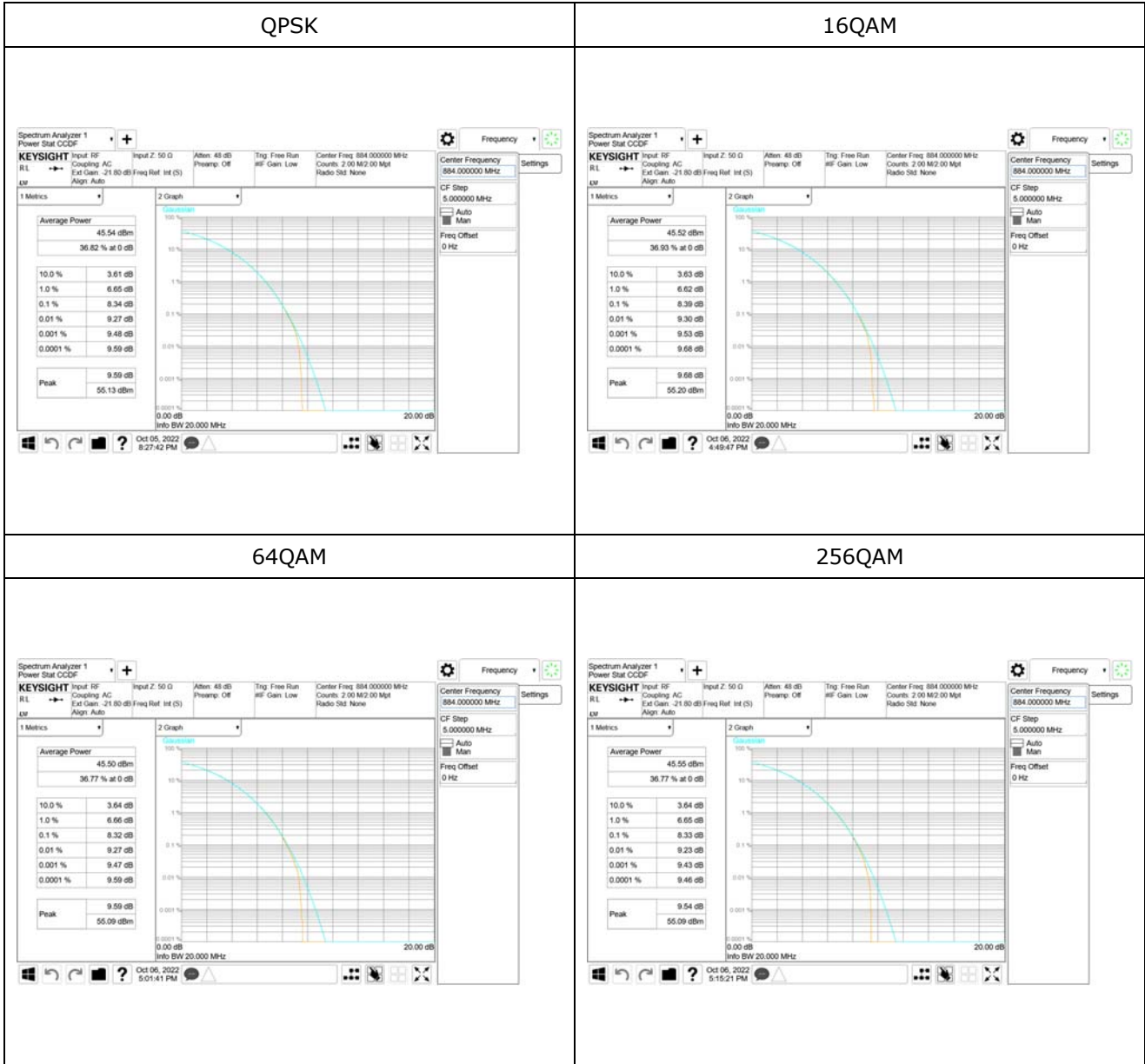




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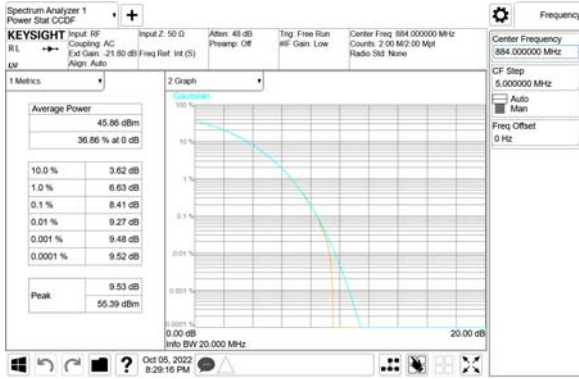
**LTE, Single carrier 20 MHz, High Channel  
 ANT 1**



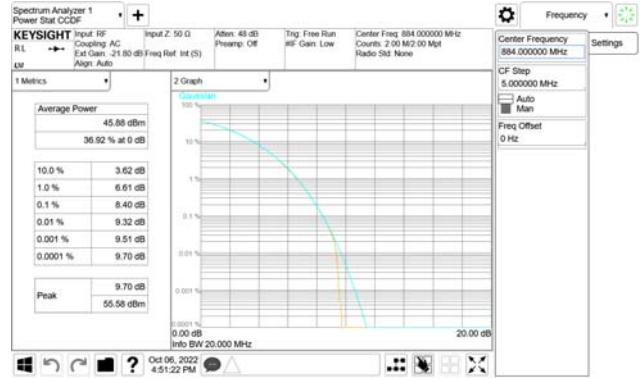


**ANT 2**

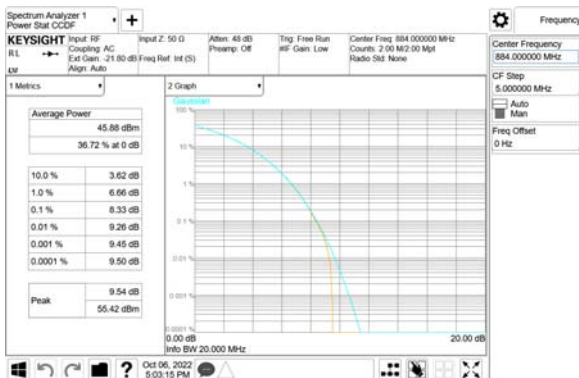
**QPSK**



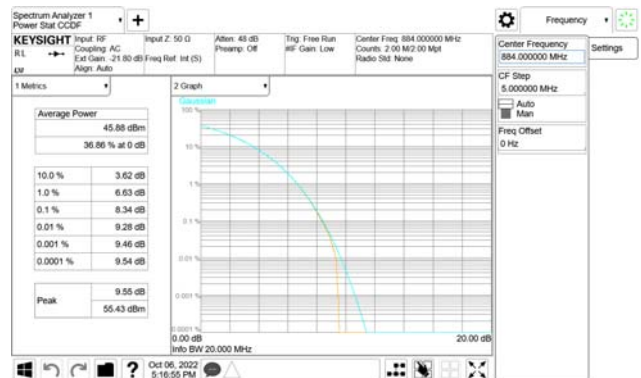
**16QAM**



**64QAM**



**256QAM**

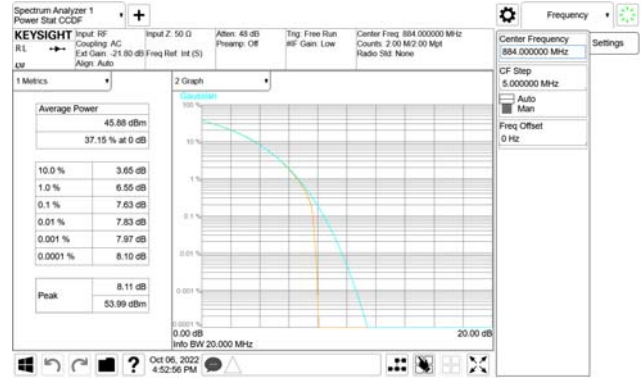
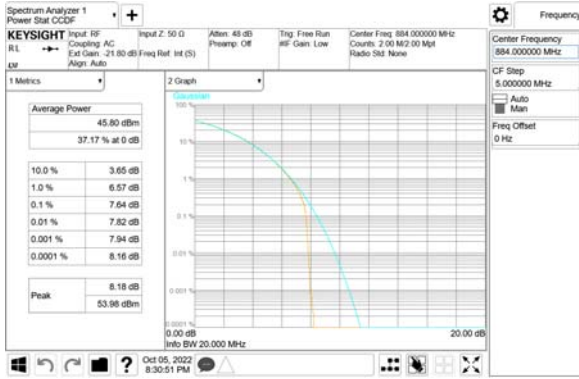




**ANT 3**

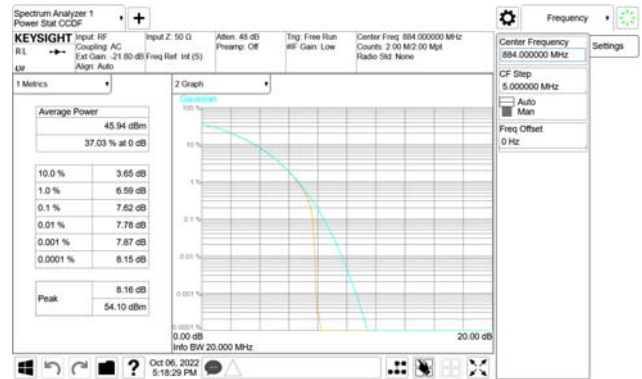
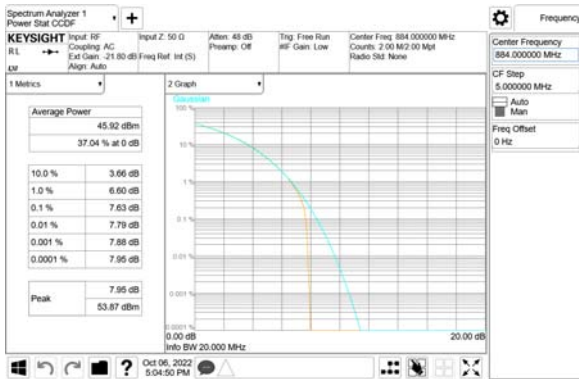
**QPSK**

**16QAM**



**64QAM**

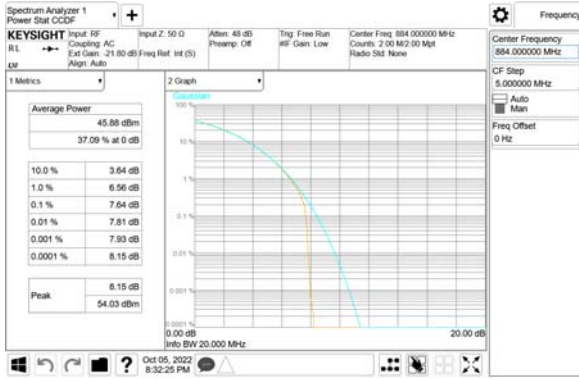
**256QAM**



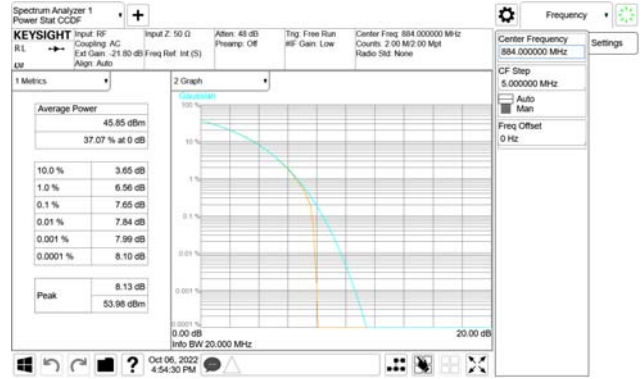


**ANT 4**

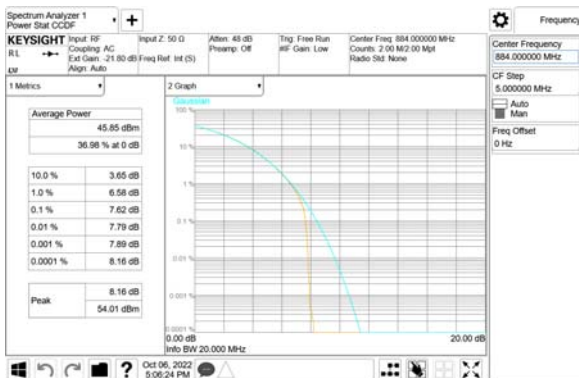
**QPSK**



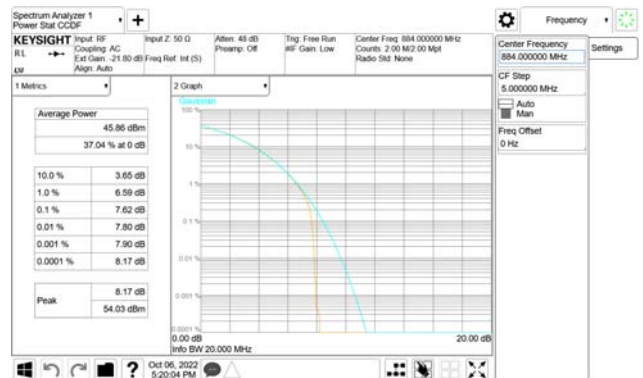
**16QAM**



**64QAM**



**256QAM**

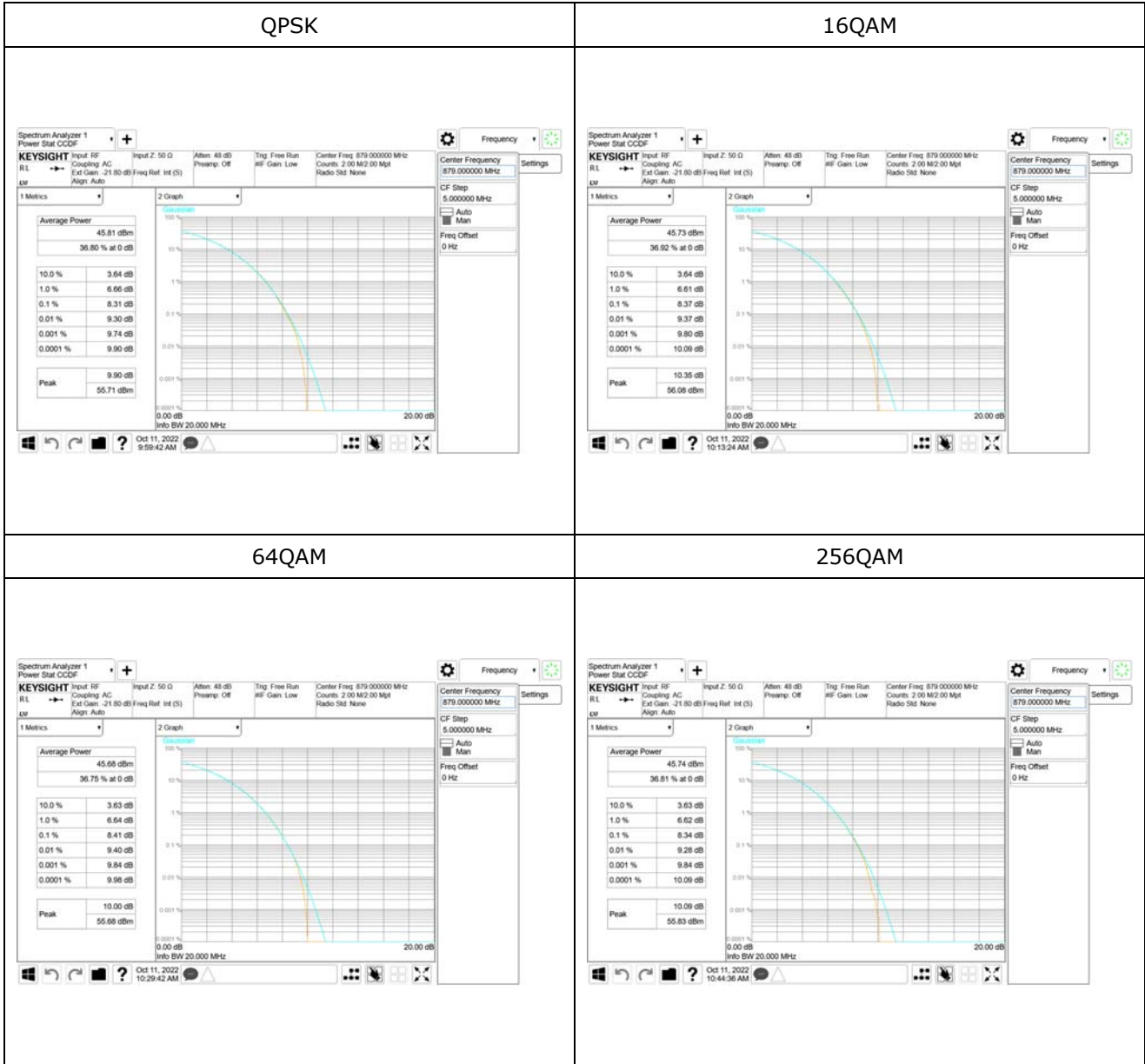




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**5G NR, Single carrier 20 MHz, Low Channel  
 ANT 1**



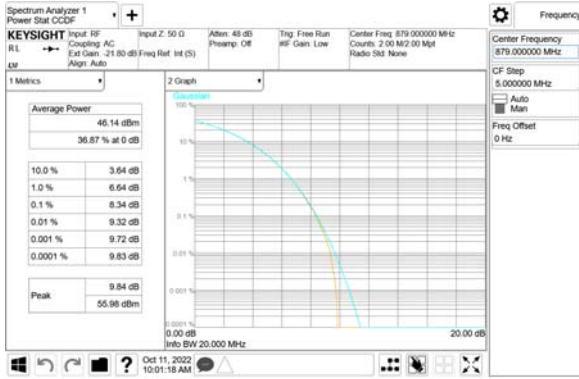


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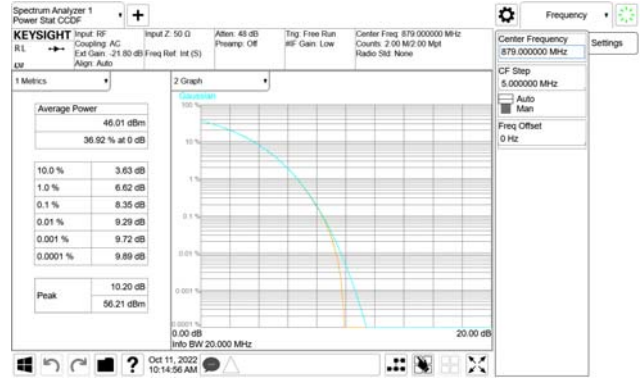
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### ANT 2

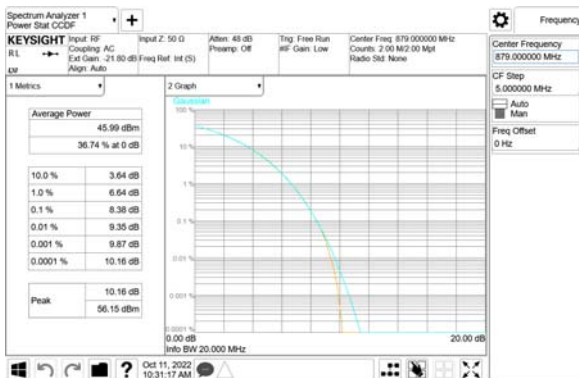
#### QPSK



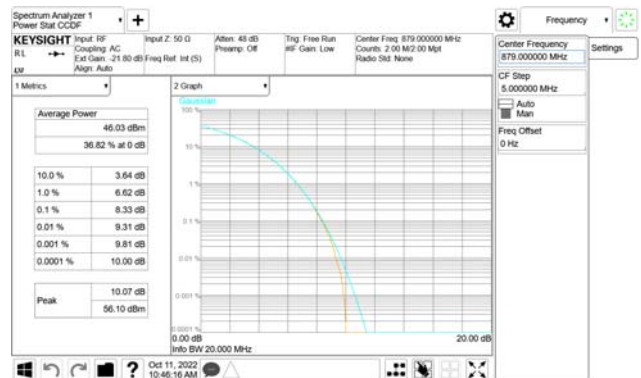
#### 16QAM



#### 64QAM



#### 256QAM



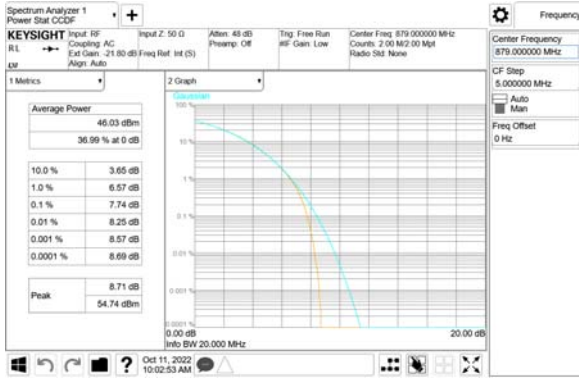


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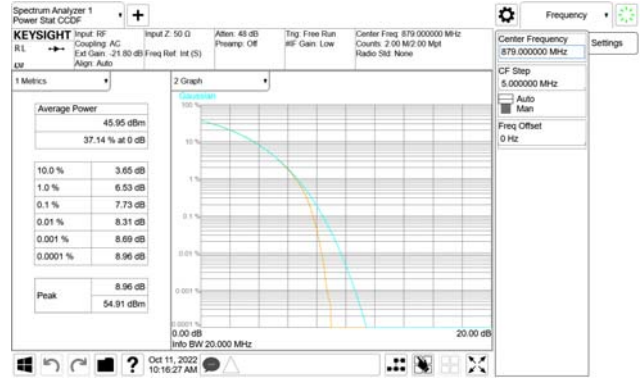
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**ANT 3**

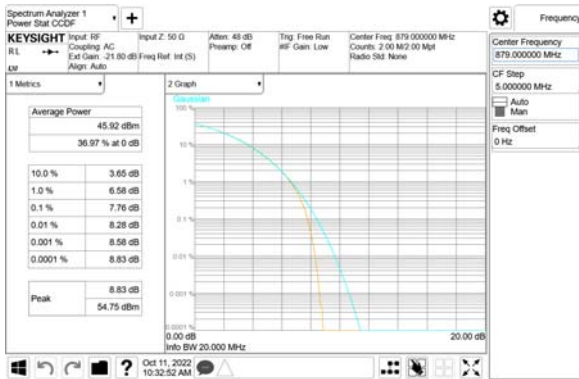
**QPSK**



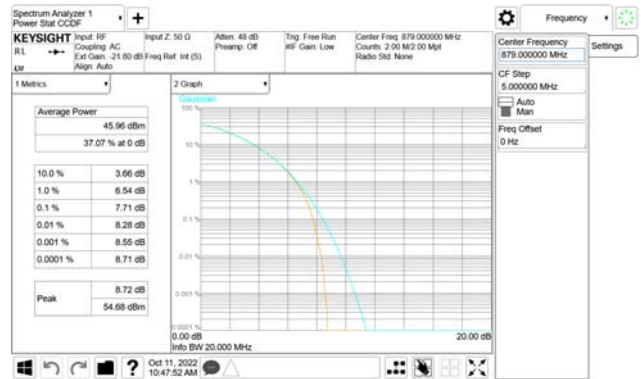
**16QAM**



**64QAM**



**256QAM**



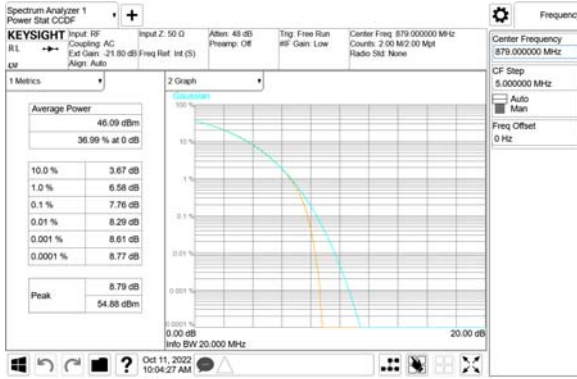


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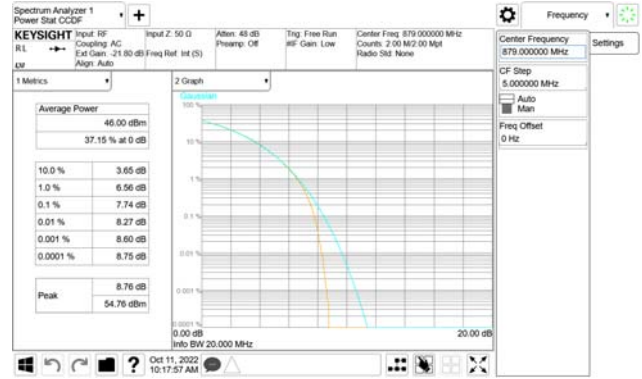
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### ANT 4

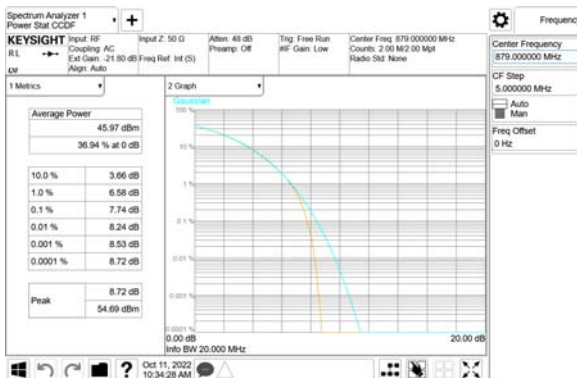
#### QPSK



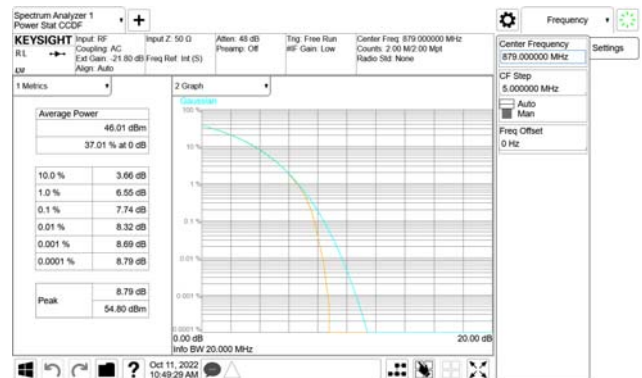
#### 16QAM



#### 64QAM



#### 256QAM



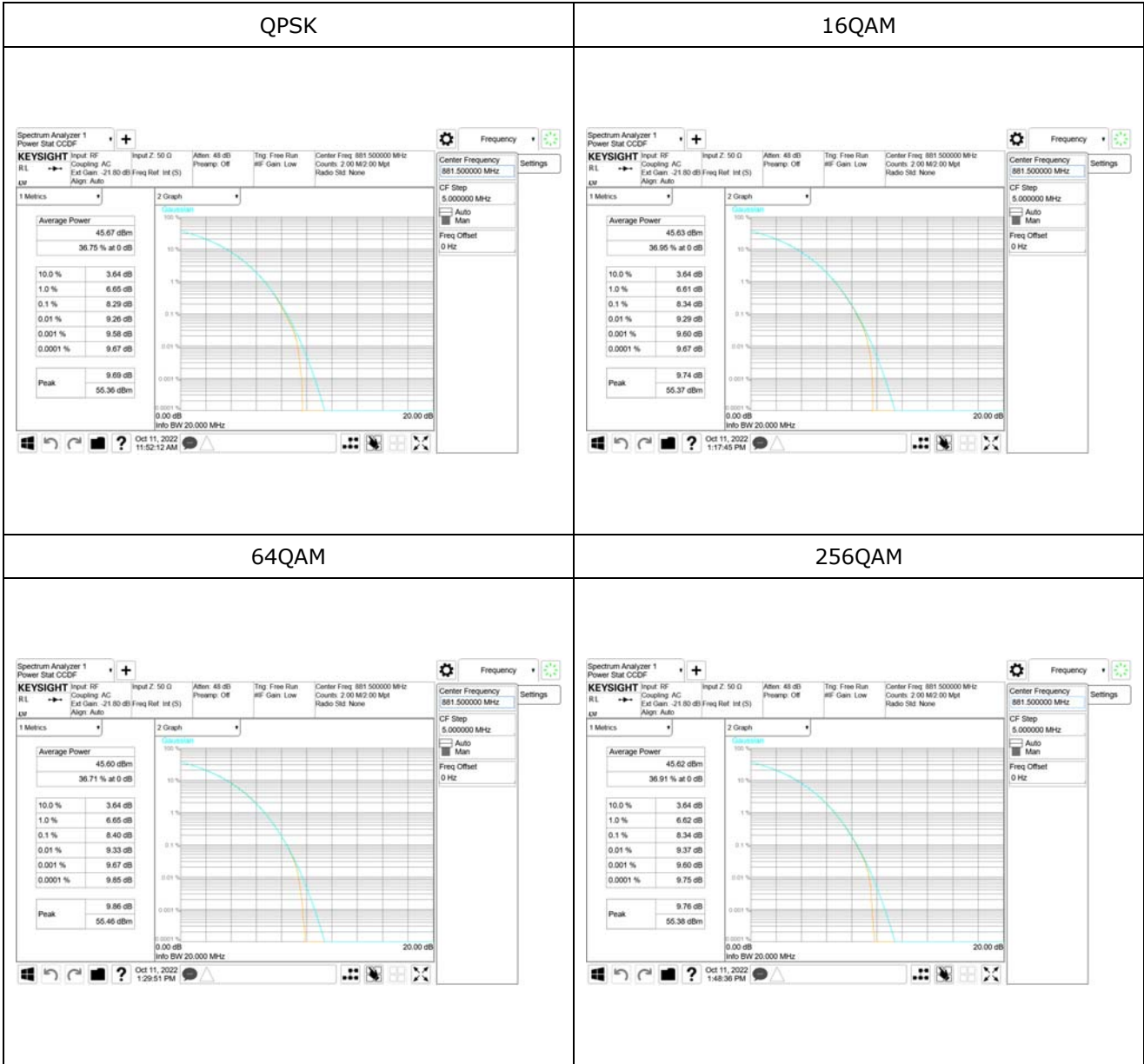




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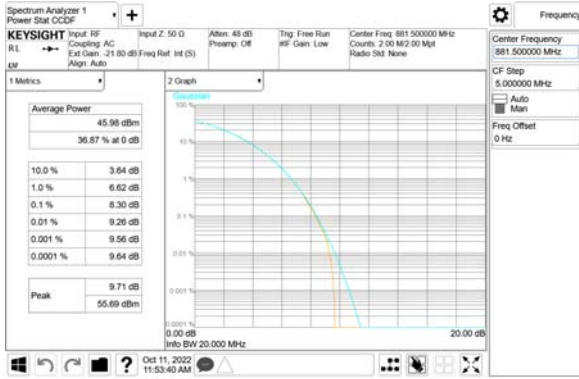
**5G NR, Single carrier 20 MHz, Middle Channel  
 ANT 1**



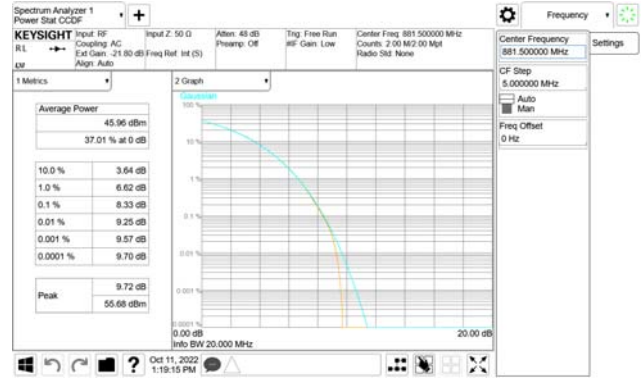


**ANT 2**

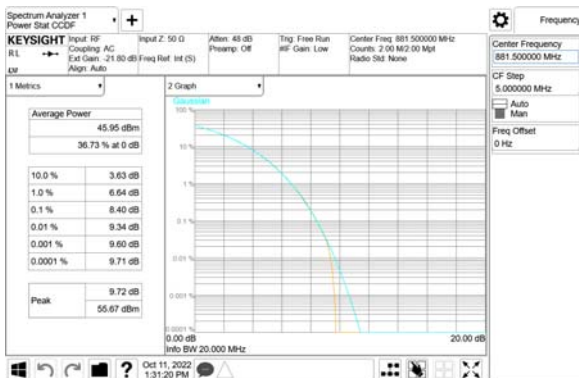
**QPSK**



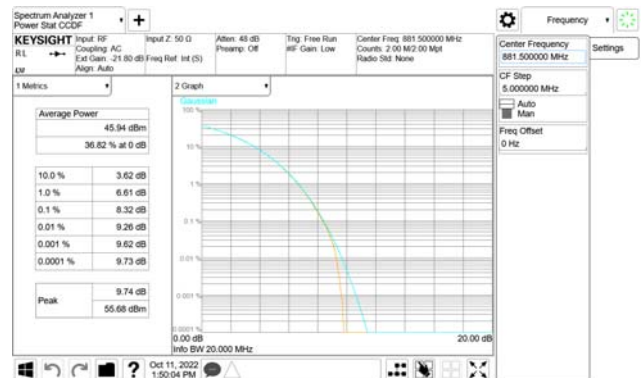
**16QAM**



**64QAM**



**256QAM**



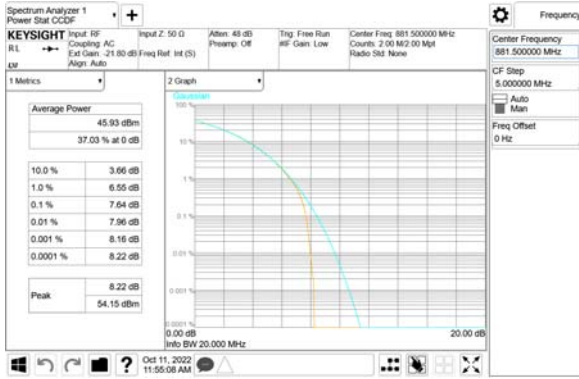


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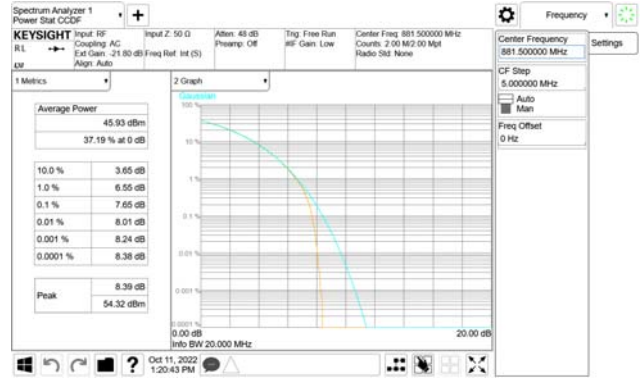
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### ANT 3

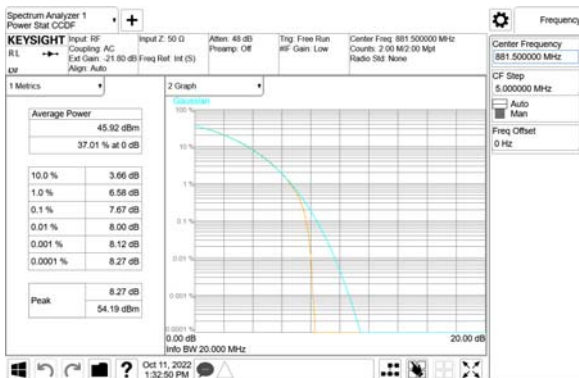
#### QPSK



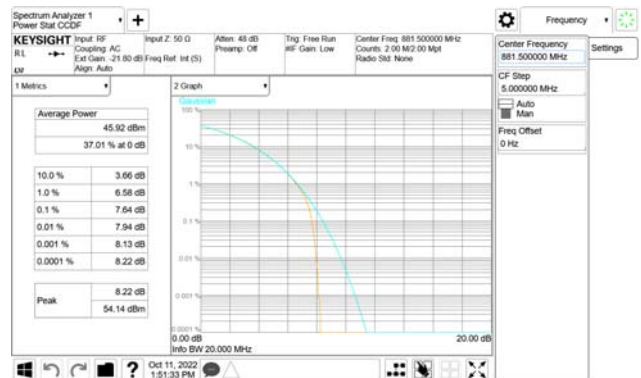
#### 16QAM



#### 64QAM



#### 256QAM



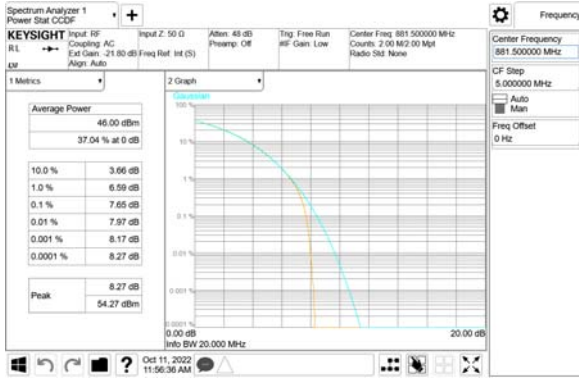


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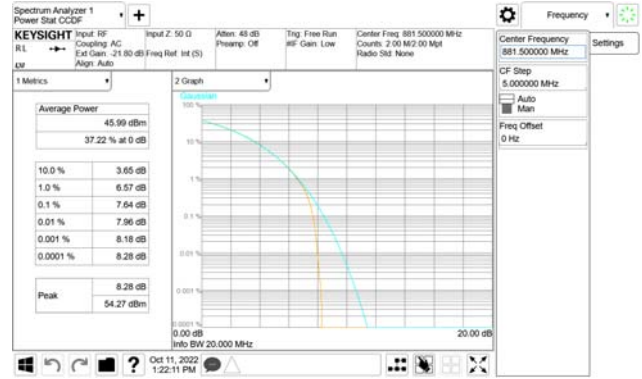
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### ANT 4

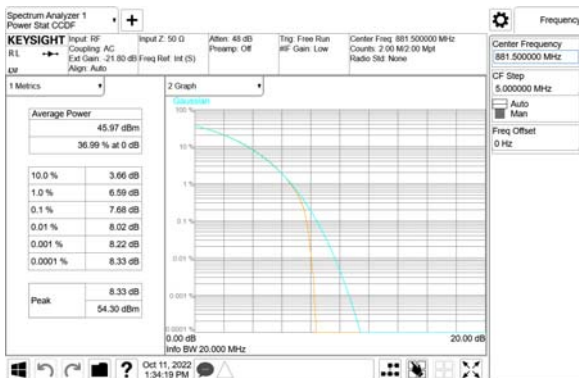
#### QPSK



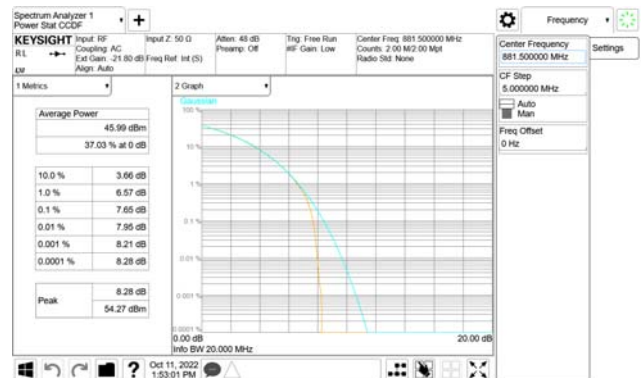
#### 16QAM



#### 64QAM



#### 256QAM





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**5G NR, Single carrier 20 MHz, High Channel  
 ANT 1**

