

TEST REPORT

FCC Sub6 n26(Part22) Test for SM-S931U
Certification

APPLICANT
SAMSUNG Electronics Co., Ltd.

REPORT NO.
HCT-RF-2410-FC033

DATE OF ISSUE
October 24, 2024

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TEST REPORT

REPORT NO.

HCT-RF-2410-FC033

DATE OF ISSUE

October 24, 2024

Additional Model

SM-S931U1

Applicant**SAMSUNG Electronics Co., Ltd.**

129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

Product Name

Mobile Phone

Model Name

SM-S931U

Date of Test

August 26, 2024 ~ October 23, 2024

FCC ID

A3LSMS931U

Location of Test

☒ Permanent Testing Lab ☐ On Site Testing

(Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Republic of Korea)

FCC Classification:

PCS Licensed Transmitter Held to Ear (PCE)

Test Standard Used

FCC Rule Part: § 22

Test Results

PASS

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	October 24, 2024	Initial Release

Notice

Content

The measurements shown in this report were made in accordance with the procedures specified in CFR47 section § 2.947. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998, 21 U.S. C. 853(a)

The results shown in this test report only apply to the sample(s), as received, provided by the applicant, unless otherwise stated.

The test results have only been applied with the test methods required by the standard(s).

The laboratory is not accredited for the test results marked *.

Information provided by the applicant is marked **.

Test results provided by external providers are marked ***.

When confirmation of authenticity of this test report is required, please contact www.hct.co.kr

The test results in this test report are not associated with the ((KS Q) ISO/IEC 17025) accreditation by KOLAS (Korea Laboratory Accreditation Scheme) / A2LA (American Association for Laboratory Accreditation) that are under the ILAC (International Laboratory Accreditation Cooperation) Mutual Recognition Agreement (MRA).

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MEASUREMENT REPORT

1. GENERAL INFORMATION

Applicant Name:	SAMSUNG Electronics Co., Ltd.
Address:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
FCC ID:	A3LSMS931U
Application Type:	Certification
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part(s):	§ 22
EUT Type:	Mobile phone
Model(s):	SM-S931U
Additional Model(s)	SM-S931U1
SCS(kHz):	15
Bandwidth(MHz):	5, 10, 15, 20
Waveform:	CP-OFDM, DFT-S-OFDM
Modulation:	DFT-S-OFDM: PI/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-OFDM: QPSK, 16QAM, 64QAM, 256QAM
Tx Frequency:	826.5 MHz – 846.5 MHz (Sub6 n26 (5 MHz)) 829.0 MHz – 844.0 MHz (Sub6 n26 (10 MHz)) 831.5 MHz – 841.5 MHz (Sub6 n26 (15 MHz)) 834.0 MHz – 839.0 MHz (Sub6 n26 (20 MHz))
Date(s) of Tests:	August 26, 2024 ~ October 23, 2024
Serial number:	Radiated : R3CX80BGBQR Conducted : R3CX70H9JQN

1.1. MAXIMUM OUTPUT POWER

Main 1 ANT

Mode (MHz)	Tx Frequency (MHz)	Emission Designator	Modulation	ERP	
				Max. Power (W)	Max. Power (dBm)
Sub6 n26 (5)	826.5 – 846.5	4M63G7D	PI/2 BPSK	0.041	16.08
		4M56G7D	QPSK	0.039	15.94
		4M54W7D	16QAM	0.031	14.94
		4M52W7D	64QAM	0.023	13.56
		4M61W7D	256QAM	0.012	10.88
Sub6 n26 (10)	829.0 – 844.0	8M98G7D	PI/2 BPSK	0.040	15.99
		8M96G7D	QPSK	0.040	15.97
		8M99W7D	16QAM	0.032	15.00
		8M97W7D	64QAM	0.023	13.57
		8M96W7D	256QAM	0.012	10.88
Sub6 n26 (15)	831.5 – 841.5	13M5G7D	PI/2 BPSK	0.040	15.97
		13M5G7D	QPSK	0.039	15.96
		13M5W7D	16QAM	0.030	14.84
		13M5W7D	64QAM	0.023	13.57
		13M5W7D	256QAM	0.012	10.91
Sub6 n26 (20)	834.0 – 839.0	17M9G7D	PI/2 BPSK	0.040	15.98
		18M0G7D	QPSK	0.039	15.93
		18M0W7D	16QAM	0.031	14.89
		17M9W7D	64QAM	0.023	13.60
		18M0W7D	256QAM	0.012	10.93

Sub 1 ANT

Mode (MHz)	Tx Frequency (MHz)	Emission Designator	Modulation	ERP	
				Max. Power (W)	Max. Power (dBm)
Sub6 n26 (5)	826.5 – 846.5	4M53G7D	PI/2 BPSK	0.061	17.86
		4M50G7D	QPSK	0.059	17.73
		4M52W7D	16QAM	0.046	16.61
		4M55W7D	64QAM	0.034	15.31
		4M53W7D	256QAM	0.018	12.64
Sub6 n26 (10)	829.0 – 844.0	8M96G7D	PI/2 BPSK	0.058	17.64
		9M02G7D	QPSK	0.057	17.54
		9M03W7D	16QAM	0.045	16.51
		8M96W7D	64QAM	0.033	15.18
		8M97W7D	256QAM	0.018	12.51
Sub6 n26 (15)	831.5 – 841.5	13M5G7D	PI/2 BPSK	0.060	17.81
		13M5G7D	QPSK	0.059	17.71
		13M5W7D	16QAM	0.046	16.61
		13M5W7D	64QAM	0.034	15.31
		13M5W7D	256QAM	0.019	12.73
Sub6 n26 (20)	834.0 – 839.0	17M9G7D	PI/2 BPSK	0.061	17.83
		18M0G7D	QPSK	0.059	17.69
		17M9W7D	16QAM	0.047	16.69
		17M9W7D	64QAM	0.033	15.20
		17M9W7D	256QAM	0.018	12.62

2. INTRODUCTION

2.1. DESCRIPTION OF EUT

The EUT was a Mobile Phone with GSM/GPRS/EGPRS/UMTS and LTE, Sub 6, mmWave. It also supports IEEE 802.11 a/b/g/n/ac/ax/be (20/40/80/160/320 MHz), Bluetooth(iPA, ePA), BT LE(iPA, ePA), NFC, WPT, WIFI 6E.

2.2. MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

2.3. TEST FACILITY

The Fully-anechoic chamber and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Republic of Korea

3. DESCRIPTION OF TESTS

3.1 TEST PROCEDURE

Test Description	Test Procedure Used
Occupied Bandwidth	- KDB 971168 D01 v03r01 – Section 4.3 - ANSI C63.26-2015 – Section 5.4.4
Band Edge	- KDB 971168 D01 v03r01 – Section 6.0 - ANSI C63.26-2015 – Section 5.7
Spurious and Harmonic Emissions at Antenna Terminal	- KDB 971168 D01 v03r01 – Section 6.0 - ANSI C63.26-2015 – Section 5.7
Peak- to- Average Ratio	- KDB 971168 D01 v03r01 – Section 5.7 - ANSI C63.26-2015 – Section 5.2.3.4
Conducted Output Power	- N/A (See SAR Report)
Frequency stability	- ANSI C63.26-2015 – Section 5.6
Effective Radiated Power/ Effective Isotropic Radiated Power	- KDB 971168 D01 v03r01 – Section 5.2 & 5.8 - ANSI/TIA-603-E-2016 – Section 2.2.17
Radiated Spurious and Harmonic Emissions	- KDB 971168 D01 v03r01 – Section 6.2 - ANSI/TIA-603-E-2016 – Section 2.2.12

3.2 RADIATED POWER

Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

The equipment under test is placed on a non-conductive table 3-meters away from the receive antenna in accordance with ANSI/TIA-603-E-2016 Clause 2.2.17.

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5 % of the expected OBW, not to exceed 1 MHz
3. VBW $\geq$ 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points > 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

Test Note

1. The turntable is rotated through 360 degrees, and the receiving antenna scans in order to determine the level of the maximized emission.
2. A half wave dipole is then substituted in place of the EUT. For emissions above 1 GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated.

The power is calculated by the following formula;

$$P_d \text{ (dBm)} = P_g \text{ (dBm)} - \text{cable loss (dB)} + \text{antenna gain (dB)}$$

Where: P_d is the dipole equivalent power and P_g is the generator output power into the substitution antenna.

3. The maximum value is calculated by adding the forward power to the calibrated source plus its appropriate gain value.

These steps are repeated with the receiving antenna in both vertical and horizontal polarization. the difference between the gain of the horn and an isotropic antenna are taken into consideration

4. The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
5. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

3.3 RADIATED SPURIOUS EMISSIONS

Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA-603-E-2016.

Test Settings

1. RBW = 100 kHz for emissions below 1 GHz and 1 MHz for emissions above 1 GHz
2. VBW $\geq 3 \times$ RBW
3. Span = 1.5 times the OBW
4. No. of sweep points $> 2 \times$ span / RBW
5. Detector = Peak
6. Trace mode = Max Hold
7. The trace was allowed to stabilize
8. Test channel : Low/ Middle/ High
9. Frequency range : We are performed all frequency to 10th harmonics from 9 kHz.

Test Note

1. Measurements value show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
2. The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the test data
3. For spurious emissions above 1 GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated. The spurious emissions is calculated by the following formula;

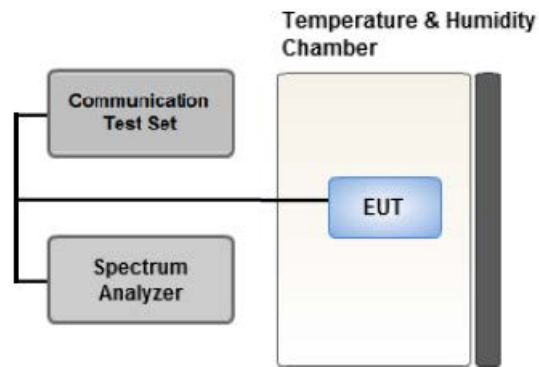
$$\text{Result}_{(\text{dBm})} = P_g_{(\text{dBm})} - \text{cable loss}_{(\text{dB})} + \text{antenna gain}_{(\text{dBi})}$$

Where: P_g is the generator output power into the substitution antenna.

If the fundamental frequency is below 1 GHz, RF output power has been converted to EIRP.

$$\text{EIRP}_{(\text{dBm})} = \text{ERP}_{(\text{dBm})} + 2.15$$

3.4 PEAK- TO- AVERAGE RATIO



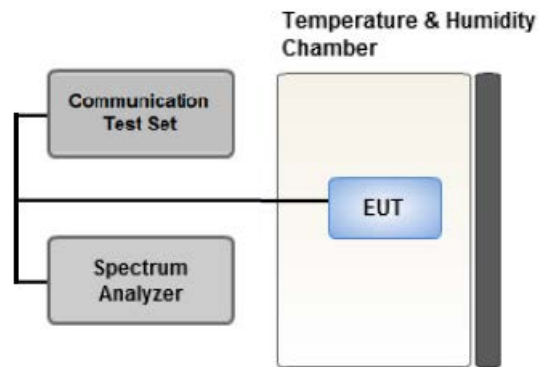
Test setup

① CCDF Procedure for PAPR

Test Settings

1. Set resolution/measurement bandwidth $\geq$ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Set the measurement interval as follows:
 - .- for continuous transmissions, set to 1 ms,
 - .- or 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 and set the measurement interval to a time that is less than or equal to the burst duration.
4. Record the maximum PAPR level associated with a probability of 0.1 %.

3.5 OCCUPIED BANDWIDTH.



Test setup

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

The EUT makes a call to the communication simulator.

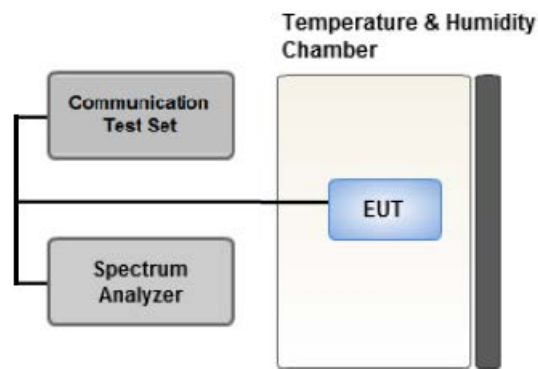
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99 % occupied bandwidth and the 26 dB 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 x 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

3.6 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL



Test setup

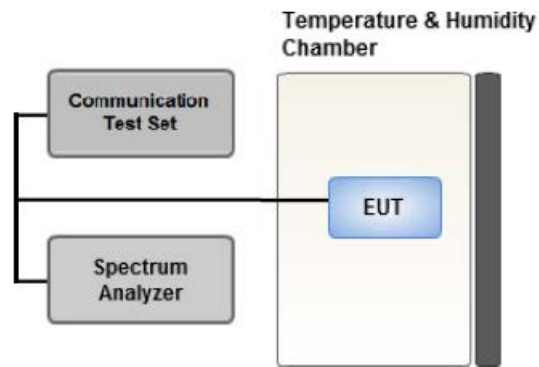
Test Overview

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 its maximum duty cycle, 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.

Test Settings

1. RBW = 1 MHz
2. VBW $\geq$ 3 MHz
3. Detector = RMS
4. Trace Mode = trace average
5. Sweep time = auto
6. Number of points in sweep $\geq$ 2 x Span / RBW

3.7 BAND EDGE



Test setup

Test Overview

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 its maximum duty cycle, 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.

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW > 1 % of the emission bandwidth
4. VBW > 3 x RBW
5. Detector = RMS
6. Number of sweep points $\geq 2 \times \text{Span/RBW}$
7. Trace mode = trace average
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Notes

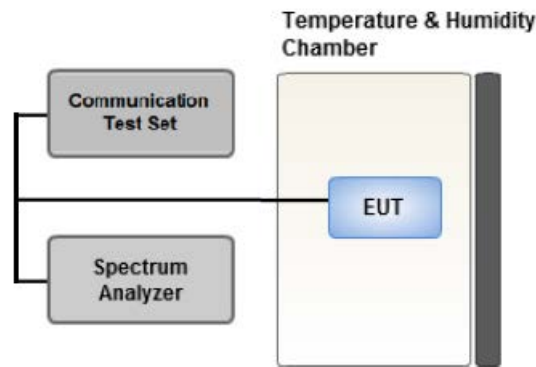
According to FCC 22.917, 24.238, 27.53 specified that power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

All measurements were done at 2 channels (low and high operational frequency range.)

The band edge measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

Where $\text{Margin} < 1$ dB the emission level is either corrected by $10 \log(1 \text{ MHz} / \text{RB})$ or the emission is integrated over a 1 MHz bandwidth to determine the final result. When using the integration method the integration window is either centered on the emission or, for emissions at the band edge, centered by an offset of 500 kHz from the block edge so that the integration window is the 1 MHz adjacent to the block edge.

3.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE



Test setup

Test Overview

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.26-2015.

The frequency stability of the transmitter is measured by:

1. Temperature:

The temperature is varied from -30 °C to +50 °C in 10 °C increments using an environmental chamber.

2. Primary Supply Voltage:

- .- Unless otherwise specified, vary primary supply voltage from 85 % to 115 % of the nominal value for other than hand carried battery equipment.
- .- For hand carried, battery powered equipment, reduce the primary ac or dc supply voltage to the battery operating end point, which shall be specified by the manufacturer.

Test Settings

1. The carrier frequency of the transmitter is measured at room temperature (20 °C to provide a reference).
2. The equipment is turned on in a “standby” condition for fifteen minutes before applying power to the transmitter.
Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10 °C intervals ranging from -30 °C to +50 °C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

3.9 WORST CASE(RADIATED TEST)

- Waveform : All Waveform of operation were investigated and the worst case configuration results are reported.
(Worst case: DFT-S-OFDM)
- The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
- All modes of operation were investigated and the worst case configuration results are reported.
Mode: SA Only
Mode : Stand alone, Stand alone + External accessories (Earphone, AC adapter, etc)
Worst case : Stand alone
- All simultaneous transmission scenarios of operation were investigated, and the test results showed no additional significant emissions relative to the least restrictive limit were observed.
Therefore, only the worst case(stand-alone) results were reported.
- All RB sizes, offsets of operation were investigated and the worst case configuration results are reported.
Please refer to the table below.
- In the case of radiated spurious emissions, all bandwidth of operation was investigated and the worst case bandwidth results are reported. (Worst case : 5 MHz)
- SM-S931U & additional models were tested and the worst case results are reported.
(Worst case : SM-S931U)

[Main 1 ANT Worst case]

Test Description	Modulation	RB size	RB offset	Axis
Effective Radiated Power	PI/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM	See Section 8.1		Z
Radiated Spurious and Harmonic Emissions	PI/2 BPSK	See Section 8.2		Z

[Sub 1 ANT Worst case]

Test Description	Modulation	RB size	RB offset	Axis
Effective Radiated Power	PI/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM	See Section 9.1		X
Radiated Spurious and Harmonic Emissions	PI/2 BPSK	See Section 9.2		X

3.10 WORST CASE(CONDUCTED TEST)

- Waveform : All Waveform of operation were investigated and the worst case configuration results are reported.
(Worst case: DFT-S-OFDM)
- Modulation : All Modulation of operation were investigated and the worst case configuration results are reported.
(Worst case: PI/2 BPSK)
- All modes of operation were investigated and the worst case configuration results are reported.
Mode: SA Only
- All RB sizes, offsets of operation were investigated and the worst case configuration results are reported.
Please refer to the table below..
- SM-S931U & additional models were tested and the worst case results are reported.
(Worst case : SM-S931U)

[Worst case]

Test Description	Modulation	Bandwidth (MHz)	Frequency	RB size	RB offset
Occupied Bandwidth	Pi2/BPSK QPSK, 16QAM, 64QAM, 256QAM	5, 10, 15, 20	Mid	Full RB	0
Peak-To-Average Ratio	Pi2/BPSK QPSK, 16QAM, 64QAM, 256QAM	5, 10, 15, 20	Mid	Full RB	0
Band-edge	Pi2/BPSK	5	Low	1	0
			High	1	24
		10	Low	1	0
			High	1	49
		15	Low	1	0
			High	1	74
		20	Low	1	0
			High	1	99
Band-edge	Pi2/BPSK	5, 10, 15, 20	Low, High	Full RB	0
			Low, Mid, High	1	1
Spurious and Harmonic Emissions at Antenna Terminal	Pi2/BPSK	5, 10, 15, 20	Low, Mid, High	1	1

4. LIST OF TEST EQUIPMENT

Equipment	Model	Manufacture	Serial No.	Due to Calibration	Calibration Interval
Precision Dipole Antenna	UHAP	Schwarzbeck	01273	03/10/2026	Biennial
Precision Dipole Antenna	UHAP	Schwarzbeck	01274	03/10/2026	Biennial
Horn Antenna(1~18 GHz)	BBHA 9120D	Schwarzbeck	02289	02/14/2026	Biennial
Horn Antenna(1~18 GHz)	BBHA 9120D	Schwarzbeck	9120D-1299	04/27/2025	Biennial
Horn Antenna(15~40 GHz)	BBHA 9170	Schwarzbeck	BBHA9170342	09/20/2026	Biennial
Horn Antenna(15~40 GHz)	BBHA 9170	Schwarzbeck	BBHA9170124	03/28/2025	Biennial
Loop Antenna(9 kHz~30 MHz)	FMZB1513	Rohde & Schwarz	1513-175	01/16/2025	Biennial
Bilog Antenna	VULB9160	Schwarzbeck	3150	03/09/2025	Biennial
Hybrid Antenna	VULB9160	Schwarzbeck	760	02/24/2025	Biennial
RF Switching System	FBSR-06B (1G HPF + LNA)	T&M SYSTEM	F3L1	05/14/2025	Annual
RF Switching System	FBSR-06B (3G HPF + LNA)	T&M SYSTEM	F3L2	05/14/2025	Annual
RF Switching System	FBSR-06B (6G HPF + LNA)	T&M SYSTEM	F3L3	05/14/2025	Annual
RF Switching System	FBSR-06B (LNA)	T&M SYSTEM	F3L4	05/14/2025	Annual
Power Amplifier	CBL18265035	CERNEX	22966	11/17/2024	Annual
Power Amplifier	CBL26405040	CERNEX	25956	02/26/2025	Annual
DC Power Supply	E3632A	Hewlett Packard	MY40004427	08/22/2025	Annual
Power Splitter(DC~26.5 GHz)	11667B	Hewlett Packard	11275	02/29/2025	Annual
Chamber	SU-642	ESPEC	93008124	02/19/2025	Annual
Signal Analyzer(10 Hz~26.5 GHz)	N9020A	Agilent	MY51110063	04/04/2025	Annual
ATTENUATOR(20 dB)	8493C	Hewlett Packard	17280	04/17/2025	Annual
Spectrum Analyzer(10 Hz~40 GHz)	FSV40	REOHDE & SCHWARZ	101436	02/13/2025	Annual
Base Station	8960 (E5515C)	Agilent	MY48360800	08/05/2025	Annual
Wideband Radio Communication Tester	MT8821C	Anritsu Corp.	6262287701	05/16/2025	Annual
Wideband Radio Communication Tester	MT8000A	Anritsu Corp.	6262302511	05/14/2025	Annual
Signal Analyzer(5 Hz~40.0 GHz)	N9030B	KEYSIGHT	MY55480167	05/17/2025	Annual
4-Way Divider	ZC4PD-K1844+	Mini-Circuits	942907	09/10/2025	Annual
FCC LTE Mobile Conducted RF Automation Test Software	-	HCT CO., LTD.,	-	-	-

Note:

- Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.
- Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2017).

5. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4:2014.

All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95 % level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty ($\pm$ dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.98 (Confidence level about 95 %, $k=2$)
Radiated Disturbance (9 kHz ~ 30 MHz)	4.36 (Confidence level about 95 %, $k=2$)
Radiated Disturbance (30 MHz ~ 1 GHz)	5.70 (Confidence level about 95 %, $k=2$)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.52 (Confidence level about 95 %, $k=2$)
Radiated Disturbance (18 GHz ~ 40 GHz)	5.66 (Confidence level about 95 %, $k=2$)
Radiated Disturbance (Above 40 GHz)	5.58 (Confidence level about 95 %, $k=2$)

6. SUMMARY OF TEST RESULTS

6.1 Test Condition: Conducted Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Occupied Bandwidth	§ 2.1049	N/A	PASS
Band Edge / Spurious and Harmonic Emissions at Antenna Terminal.	§ 2.1051, § 22.917(a)	< 43 + 10log10 (P[Watts]) at Band Edge and for all out-of-band emissions	PASS
Conducted Output Power	§ 2.1046	N/A	<u>See Note1</u>
Peak- to- Average Ratio	§ 22.913(d)	< 13 dB	PASS
Frequency stability / variation of ambient temperature	§ 2.1055, § 22.355	< 2.5 ppm	PASS

Note:

1. See SAR Report
2. Conducted test were tested using 5G Wireless Tester.

6.2 Test Condition: Radiated Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Effective Radiated Power	§ 22.913(a)(5)	< 7 Watts max. ERP	PASS
Radiated Spurious and Harmonic Emissions	§ 2.1053, § 22.917(a)	< 43 + 10log10 (P[Watts]) for all out-of band emissions	PASS

Note:

1. Radiated tests were tested using 5G Wireless Tester.

7. SAMPLE CALCULATION

7.1 ERP Sample Calculation

Ch./ Freq.		Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain (dBd)	C.L	Pol.	ERP	
channel	Freq.(MHz)						W	dBm
128	824.20	-21.37	38.40	-10.61	0.95	H	0.483	26.84

$$\text{ERP} = \text{Substitute LEVEL(dBm)} + \text{Ant. Gain} - \text{CL(Cable Loss)}$$

- 1) The EUT mounted on a non-conductive turntable is 2.5 meter above test site ground level.
- 2) During the test, the turn table is rotated until the maximum signal is found.
- 3) Record the field strength meter's level.
- 4) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.
- 5) Increase the signal generator output till the field strength meter's level is equal to the item (3).
- 6) The signal generator output level with Ant. Gain and cable loss are the rating of effective radiated power.

7.2 EIRP Sample Calculation

Ch./ Freq.		Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain (dBi)	C.L	Pol.	EIRP	
channel	Freq.(MHz)						W	dBm
20175	1,732.50	-15.75	18.45	9.90	1.76	H	0.456	26.59

$$\text{EIRP} = \text{Substitute LEVEL(dBm)} + \text{Ant. Gain} - \text{CL(Cable Loss)}$$

- 1) The EUT mounted on a non-conductive turntable is 2.5 meter above test site ground level.
- 2) During the test, the turn table is rotated until the maximum signal is found.
- 3) Record the field strength meter's level.
- 4) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.
- 5) Increase the signal generator output till the field strength meter's level is equal to the item (3).
- 6) The signal generator output level with Ant. Gain and cable loss are the rating of equivalent isotropic radiated power.

7.3. Emission Designator

GSM Emission Designator

Emission Designator = 249KGXW
GSM BW = 249 kHz
G = Phase Modulation
X = Cases not otherwise covered
W = Combination (Audio/Data)

EDGE Emission Designator

Emission Designator = 249KG7W
GSM BW = 249 kHz
G = Phase Modulation
7 = Quantized/Digital Info
W = Combination (Audio/Data)

WCDMA Emission Designator

Emission Designator = 4M17F9W
WCDMA BW = 4.17 MHz
F = Frequency Modulation
9 = Composite Digital Info
W = Combination (Audio/Data)

QPSK Modulation

Emission Designator = 4M48G7D
LTE BW = 4.48 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data transmission; telemetry; telecommand

QAM Modulation

Emission Designator = 4M48W7D
LTE BW = 4.48 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data transmission; telemetry; telecommand

8. TEST DATA (Main 1 ANT)

8.1 EFFECTIVE RADIATED POWER

Freq (MHz)	Mod/ Bandwidth [SCS (kHz)]	Modulation	Measured	Substitute	Ant. Gain (dBd)	C.L	Pol	Limit	ERP		RB	
			Level (dBm)	Level (dBm)				W	W	dBm	Size	Offset
826.5	Sub6 n26 5 MHz [15 kHz]	PI/2 BPSK	-33.88	26.95	-9.90	1.44	V	< 7.00	0.036	15.61	1	1
		QPSK	-33.96	26.87	-9.90	1.44	V		0.036	15.53		
		16-QAM	-34.96	25.87	-9.90	1.44	V		0.028	14.53		
		64-QAM	-36.40	24.43	-9.90	1.44	V		0.020	13.09		
		256-QAM	-39.02	21.81	-9.90	1.44	V		0.011	10.47		
836.5		PI/2 BPSK	-34.46	26.99	-9.90	1.45	V		0.037	15.64	1	1
		QPSK	-34.55	26.90	-9.90	1.45	V		0.036	15.55		
		16-QAM	-35.57	25.88	-9.90	1.45	V		0.028	14.53		
		64-QAM	-36.89	24.56	-9.90	1.45	V		0.021	13.21		
		256-QAM	-39.51	21.94	-9.90	1.45	V		0.012	10.59		
1846.5		PI/2 BPSK	-33.04	27.43	-9.90	1.45	H		0.041	16.08	1	1
		QPSK	-33.18	27.29	-9.90	1.45	H		0.039	15.94		
		16-QAM	-34.18	26.29	-9.90	1.45	H		0.031	14.94		
		64-QAM	-35.56	24.91	-9.90	1.45	H		0.023	13.56		
		256-QAM	-38.24	22.23	-9.90	1.45	H		0.012	10.88		

Freq (MHz)	Mod/ Bandwidth [SCS (kHz)]	Modulation	Measured	Substitute	Ant. Gain (dBd)	C.L	Pol	Limit	ERP		RB	
			Level (dBm)	Level (dBm)				W	W	dBm	Size	Offset
829.0	Sub6 n26 10 MHz [15 kHz]	PI/2 BPSK	-33.85	26.92	-9.90	1.44	V	< 7.00	0.036	15.58	1	1
		QPSK	-33.96	26.81	-9.90	1.44	V		0.035	15.47		
		16-QAM	-35.09	25.68	-9.90	1.44	V		0.027	14.34		
		64-QAM	-36.51	24.26	-9.90	1.44	V		0.020	12.92		
		256-QAM	-39.13	21.64	-9.90	1.44	V		0.011	10.30		
836.5		PI/2 BPSK	-34.41	27.04	-9.90	1.45	V		0.037	15.69	1	1
		QPSK	-34.59	26.86	-9.90	1.45	V		0.036	15.51		
		16-QAM	-35.67	25.78	-9.90	1.45	V		0.028	14.43		
		64-QAM	-36.93	24.52	-9.90	1.45	V		0.021	13.17		
		256-QAM	-39.65	21.80	-9.90	1.45	V		0.011	10.45		
844.0		PI/2 BPSK	-33.00	27.34	-9.90	1.45	H		0.040	15.99	1	1
		QPSK	-33.02	27.32	-9.90	1.45	H		0.040	15.97		
		16-QAM	-33.99	26.35	-9.90	1.45	H		0.032	15.00		
		64-QAM	-35.42	24.92	-9.90	1.45	H		0.023	13.57		
		256-QAM	-38.11	22.23	-9.90	1.45	H		0.012	10.88		

Freq (MHz)	Mod/ Bandwidth [SCS (kHz)]	Modulation	Measured	Substitute	Ant. Gain (dBd)	C.L	Pol	Limit	ERP		RB	
			Level (dBm)	Level (dBm)				W	W	dBm	Size	Offset
831.5	Sub6 n26 15 MHz [15 kHz]	PI/2 BPSK	-33.99	26.99	-9.90	1.45	V	< 7.00	0.037	15.64	1	1
		QPSK	-34.03	26.95	-9.90	1.45	V		0.036	15.60		
		16-QAM	-35.08	25.90	-9.90	1.45	V		0.029	14.55		
		64-QAM	-36.42	24.56	-9.90	1.45	V		0.021	13.21		
		256-QAM	-39.04	21.94	-9.90	1.45	V		0.012	10.59		
836.5		PI/2 BPSK	-34.22	27.23	-9.90	1.45	V		0.039	15.88	1	1
		QPSK	-34.44	27.01	-9.90	1.45	V		0.037	15.66		
		16-QAM	-35.54	25.91	-9.90	1.45	V		0.029	14.56		
		64-QAM	-36.85	24.60	-9.90	1.45	V		0.021	13.25		
		256-QAM	-39.27	22.18	-9.90	1.45	V		0.012	10.83		
841.5		PI/2 BPSK	-33.05	27.32	-9.90	1.45	H	0.040	15.97	1	39	
		QPSK	-33.06	27.31	-9.90	1.45	H	0.039	15.96			
		16-QAM	-34.18	26.19	-9.90	1.45	H	0.031	14.84			
		64-QAM	-35.45	24.92	-9.90	1.45	H	0.023	13.57			
		256-QAM	-38.11	22.26	-9.90	1.45	H	0.012	10.91			

Freq (MHz)	Mod/ Bandwidth [SCS (kHz)]	Modulation	Measured	Substitute	Ant. Gain (dBd)	C.L	Pol	Limit	ERP		RB	
			Level (dBm)	Level (dBm)				W	W	dBm	Size	Offset
834.0	Sub6 n26 20 MHz [15 kHz]	PI/2 BPSK	-34.00	27.32	-9.90	1.45	V	< 7.00	0.040	15.97	1	1
		QPSK	-34.04	27.28	-9.90	1.45	V		0.039	15.93		
		16-QAM	-35.08	26.24	-9.90	1.45	V		0.031	14.89		
		64-QAM	-36.51	24.81	-9.90	1.45	V		0.022	13.46		
		256-QAM	-39.04	22.28	-9.90	1.45	V		0.012	10.93		
836.5		PI/2 BPSK	-34.20	27.25	-9.90	1.45	V		0.039	15.90	1	1
		QPSK	-34.22	27.23	-9.90	1.45	V		0.039	15.88		
		16-QAM	-35.30	26.15	-9.90	1.45	V		0.030	14.80		
		64-QAM	-36.50	24.95	-9.90	1.45	V		0.023	13.60		
		256-QAM	-39.18	22.27	-9.90	1.45	V		0.012	10.92		
839.0		PI/2 BPSK	-33.04	27.33	-9.90	1.45	H	0.040	15.98	1	53	
		QPSK	-33.18	27.19	-9.90	1.45	H	0.038	15.84			
		16-QAM	-34.14	26.23	-9.90	1.45	H	0.031	14.88			
		64-QAM	-35.52	24.85	-9.90	1.45	H	0.022	13.50			
		256-QAM	-38.12	22.25	-9.90	1.45	H	0.012	10.90			

8.2 RADIATED SPURIOUS EMISSIONS

NR Band:	<u>N26</u>
Bandwidth:	<u>5 MHz</u>
Modulation:	<u>PI/2 BPSK</u>
Distance:	<u>3 meters</u>
SCS:	<u>15 kHz</u>

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit (dBm)	RB	
									Size	Offset
165300 (826.5)	1 653.00	-55.05	9.49	-63.96	2.02	V	-56.49	-13.00	1	1
	2 479.50	-59.68	10.74	-63.37	2.55	V	-55.18	-13.00		
	3 306.00	-60.53	11.61	-62.70	2.97	V	-54.06	-13.00		
167300 (836.5)	1 673.00	-57.59	9.69	-66.97	2.05	V	-59.33	-13.00	1	1
	2 509.50	-59.54	10.55	-64.27	2.51	V	-56.23	-13.00		
	3 346.00	-57.79	11.53	-60.31	2.96	V	-51.74	-13.00		
169300 (846.5)	1 693.00	-58.27	9.91	-67.06	2.07	V	-59.22	-13.00	1	1
	2 539.50	-59.39	10.62	-64.02	2.53	V	-55.93	-13.00		
	3 386.00	-60.14	11.50	-62.17	2.99	V	-53.66	-13.00		

8.3 PEAK-TO-AVERAGE RATIO

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (dB)
Sub6 n26	5 MHz	836.5	BPSK	25	0	3.92
			QPSK			4.92
			16-QAM			5.66
			64-QAM			5.88
			256-QAM			6.29
	10 MHz		BPSK	50		4.31
			QPSK			5.00
			16-QAM			5.55
			64-QAM			6.00
			256-QAM			6.64
	15 MHz		BPSK	75		3.68
			QPSK			4.79
			16-QAM			5.66
			64-QAM			5.94
			256-QAM			6.39
	20 MHz		BPSK	100		4.33
			QPSK			4.78
			16-QAM			5.75
			64-QAM			6.02
			256-QAM			6.56

Note:

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 70~ 89.

8.4 OCCUPIED BANDWIDTH

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
Sub6 n26	5 MHz	836.5	BPSK	25	0	4.6246
			QPSK			4.5594
			16-QAM			4.5419
			64-QAM			4.5238
			256-QAM			4.6124
	10 MHz		BPSK	50		8.9782
			QPSK			8.9631
			16-QAM			8.9921
			64-QAM			8.9693
			256-QAM			8.9559
	15 MHz		BPSK	75		13.445
			QPSK			13.505
			16-QAM			13.484
			64-QAM			13.491
			256-QAM			13.499
	20 MHz		BPSK	100		17.934
			QPSK			17.963
			16-QAM			17.962
			64-QAM			17.931
			256-QAM			17.997

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 50 ~ 69.

8.5 CONDUCTED SPURIOUS EMISSIONS

Band	Band Width (MHz)	Frequency (MHz)	Frequency of Maximum Harmonic (GHz)	Factor (dB)	Measurement Maximum Data (dBm)	Result (dBm)	Limit (dBm)
Sub6 n26	5	826.5	8.8445	30.815	-74.771	-43.956	-13.00
		836.5	3.7643	30.200	-73.846	-43.646	
		846.5	7.9950	30.815	-74.286	-43.471	
	10	829.0	4.0639	30.200	-74.277	-44.077	
		836.5	8.2662	30.815	-74.641	-43.826	
		844.0	8.5573	30.815	-74.221	-43.406	
	15	831.5	5.7573	30.815	-73.992	-43.177	
		836.5	6.0314	30.815	-74.906	-44.091	
		841.5	8.2916	30.815	-74.239	-43.424	
	20	834.0	8.2737	30.815	-74.062	-43.247	
		836.5	6.0275	30.815	-74.933	-44.118	
		839.0	9.1810	30.815	-74.812	-43.997	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 114 ~ 125.
2. Result (dBm) = Measurement Maximum Data (dBm) + Factor (dB)
3. Factor(dB) = Cable Loss + Ext. Attenuator + Power Splitter

Frequency Range (GHz)	Factor [dB]
0.03 – 1	27.494
1 – 5	30.200
5 – 10	30.815
10 – 15	31.340
15 – 20	31.713
Above 20	32.355

8.6 BAND EDGE

- Plots of the EUT's Band Edge are shown Page 90 ~ 113.

8.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

- ▣ BandWidth: 5 MHz
- ▣ Voltage(100 %): 3.880 VDC
- ▣ Batt. Endpoint: 3.300 VDC
- ▣ Deviation Limit: ± 0.000 25 % or 2.5 ppm

Test. Frequency	Voltage	Temp.	Frequency	Frequency Error	Deviation	ppm
(MHz)	(%)	(°C)	(Hz)	(Hz)	(%)	
836.5	100 %	+20(Ref)	836 499 995	0.0	0.000 000	0.000
	100 %	-30	836 499 990	-5.4	-0.000 001	-0.006
	100 %	-20	836 499 989	-5.8	-0.000 001	-0.007
	100 %	-10	836 499 990	-4.6	-0.000 001	-0.006
	100 %	0	836 499 989	-6.0	-0.000 001	-0.007
	100 %	+10	836 499 990	-5.0	-0.000 001	-0.006
	100 %	+30	836 499 991	-4.2	-0.000 001	-0.005
	100 %	+40	836 499 990	-5.3	-0.000 001	-0.006
	100 %	+50	836 499 991	-4.2	-0.000 001	-0.005
	Batt. Endpoint	+20	836 499 990	-5.4	-0.000 001	-0.006

- ▣ BandWidth: 10 MHz
- ▣ Voltage(100 %): 3.880 VDC
- ▣ Batt. Endpoint: 3.300 VDC
- ▣ Deviation Limit: ± 0.000 25 % or 2.5 ppm

Test. Frequency	Voltage	Temp.	Frequency	Frequency Error	Deviation	ppm
(MHz)	(%)	(°C)	(Hz)	(Hz)	(%)	
836.5	100 %	+20(Ref)	836 500 001	0.0	0.000 000	0.000
	100 %	-30	836 500 003	2.3	0.000 000	0.003
	100 %	-20	836 500 003	2.0	0.000 000	0.002
	100 %	-10	836 500 002	1.6	0.000 000	0.002
	100 %	0	836 500 002	1.4	0.000 000	0.002
	100 %	+10	836 500 002	1.1	0.000 000	0.001
	100 %	+30	836 500 002	1.6	0.000 000	0.002
	100 %	+40	836 500 001	0.9	0.000 000	0.001
	100 %	+50	836 500 005	4.1	0.000 000	0.005
	Batt. Endpoint	+20	836 500 004	4.0	0.000 000	0.005

BandWidth:	<u>15 MHz</u>
Voltage(100 %):	<u>3.880 VDC</u>
Batt. Endpoint:	<u>3.300 VDC</u>
Deviation Limit:	<u>± 0.000 25 % or 2.5 ppm</u>

Test. Frequency	Voltage	Temp.	Frequency	Frequency Error	Deviation	ppm
(MHz)	(%)	(°C)	(Hz)	(Hz)	(%)	
836.5	100 %	+20(Ref)	836 500 000	0.0	0.000 000	0.000
	100 %	-30	836 500 001	1.0	0.000 000	0.001
	100 %	-20	836 500 000	0.4	0.000 000	0.001
	100 %	-10	836 500 001	0.7	0.000 000	0.001
	100 %	0	836 500 001	1.0	0.000 000	0.001
	100 %	+10	836 500 001	1.1	0.000 000	0.001
	100 %	+30	836 500 001	1.3	0.000 000	0.002
	100 %	+40	836 500 002	1.6	0.000 000	0.002
	100 %	+50	836 500 002	1.8	0.000 000	0.002
	Batt. Endpoint	+20	836 500 000	0.0	0.000 000	0.000

BandWidth:	<u>20 MHz</u>
Voltage(100 %):	<u>3.880 VDC</u>
Batt. Endpoint:	<u>3.300 VDC</u>
Deviation Limit:	<u>± 0.000 25 % or 2.5 ppm</u>

Test. Frequency	Voltage	Temp.	Frequency	Frequency Error	Deviation	ppm
(MHz)	(%)	(°C)	(Hz)	(Hz)	(%)	
836.5	100 %	+20(Ref)	836 499 998	0.0	0.000 000	0.000
	100 %	-30	836 499 998	0.1	0.000 000	0.000
	100 %	-20	836 499 998	0.0	0.000 000	0.000
	100 %	-10	836 499 998	-0.3	0.000 000	0.000
	100 %	0	836 499 998	-0.7	0.000 000	-0.001
	100 %	+10	836 499 999	0.9	0.000 000	0.001
	100 %	+30	836 499 998	-0.6	0.000 000	-0.001
	100 %	+40	836 499 998	-0.8	0.000 000	-0.001
	100 %	+50	836 499 997	-1.0	0.000 000	-0.001
	Batt. Endpoint	+20	836 499 997	-1.3	0.000 000	-0.002

9. TEST DATA (Sub 1 ANT)

9.1 EFFECTIVE RADIATED POWER

Freq (MHz)	Mod/ Bandwidth [SCS (kHz)]	Modulation	Measured	Substitute	Ant. Gain (dBd)	C.L	Pol	Limit	ERP		RB	
			Level (dBm)	Level (dBm)				W	W	dBm	Size	Offset
826.5	Sub6 n26 5 MHz [15 kHz]	PI/2 BPSK	-32.14	28.03	-9.90	1.44	H	< 7.00	0.047	16.69	1	23
		QPSK	-32.19	27.98	-9.90	1.44	H		0.046	16.64		
		16-QAM	-33.16	27.01	-9.90	1.44	H		0.037	15.67		
		64-QAM	-34.51	25.66	-9.90	1.44	H		0.027	14.32		
		256-QAM	-37.18	22.99	-9.90	1.44	H		0.015	11.65		
836.5		PI/2 BPSK	-31.42	28.80	-9.90	1.45	H		0.056	17.45	1	23
		QPSK	-31.70	28.52	-9.90	1.45	H		0.052	17.17		
		16-QAM	-32.69	27.53	-9.90	1.45	H		0.042	16.18		
		64-QAM	-34.00	26.22	-9.90	1.45	H		0.031	14.87		
		256-QAM	-36.69	23.53	-9.90	1.45	H		0.017	12.18		
1846.5		PI/2 BPSK	-31.26	29.21	-9.90	1.45	H		0.061	17.86	1	12
		QPSK	-31.39	29.08	-9.90	1.45	H		0.059	17.73		
		16-QAM	-32.51	27.96	-9.90	1.45	H		0.046	16.61		
		64-QAM	-33.81	26.66	-9.90	1.45	H		0.034	15.31		
		256-QAM	-36.48	23.99	-9.90	1.45	H		0.018	12.64		

Freq (MHz)	Mod/ Bandwidth [SCS (kHz)]	Modulation	Measured	Substitute	Ant. Gain (dBd)	C.L	Pol	Limit	ERP		RB	
			Level (dBm)	Level (dBm)				W	W	dBm	Size	Offset
829.0	Sub6 n26 10 MHz [15 kHz]	PI/2 BPSK	-31.80	28.34	-9.90	1.44	H	< 7.00	0.050	17.00	1	50
		QPSK	-31.84	28.30	-9.90	1.44	H		0.050	16.96		
		16-QAM	-32.98	27.16	-9.90	1.44	H		0.038	15.82		
		64-QAM	-34.31	25.83	-9.90	1.44	H		0.028	14.49		
		256-QAM	-36.99	23.15	-9.90	1.44	H		0.015	11.81		
836.5		PI/2 BPSK	-31.50	28.72	-9.90	1.45	H		0.055	17.37	1	50
		QPSK	-31.54	28.68	-9.90	1.45	H		0.054	17.33		
		16-QAM	-32.61	27.61	-9.90	1.45	H		0.042	16.26		
		64-QAM	-33.85	26.37	-9.90	1.45	H		0.032	15.02		
		256-QAM	-36.53	23.69	-9.90	1.45	H		0.017	12.34		
844.0		PI/2 BPSK	-31.35	28.99	-9.90	1.45	H		0.058	17.64	1	26
		QPSK	-31.45	28.89	-9.90	1.45	H		0.057	17.54		
		16-QAM	-32.48	27.86	-9.90	1.45	H		0.045	16.51		
		64-QAM	-33.81	26.53	-9.90	1.45	H		0.033	15.18		
		256-QAM	-36.48	23.86	-9.90	1.45	H		0.018	12.51		

Freq (MHz)	Mod/ Bandwidth [SCS (kHz)]	Modulation	Measured	Substitute	Ant. Gain (dBd)	C.L	Pol	Limit	ERP		RB	
			Level (dBm)	Level (dBm)				W	W	dBm	Size	Offset
831.5	Sub6 n26 15 MHz [15 kHz]	PI/2 BPSK	-31.48	28.72	-9.90	1.45	H	< 7.00	0.055	17.37	1	77
		QPSK	-31.50	28.70	-9.90	1.45	H		0.054	17.35		
		16-QAM	-32.62	27.58	-9.90	1.45	H		0.042	16.23		
		64-QAM	-33.91	26.29	-9.90	1.45	H		0.031	14.94		
		256-QAM	-36.53	23.67	-9.90	1.45	H		0.017	12.32		
836.5		PI/2 BPSK	-31.16	29.06	-9.90	1.45	H		0.059	17.71	1	77
		QPSK	-31.22	29.00	-9.90	1.45	H		0.058	17.65		
		16-QAM	-32.27	27.95	-9.90	1.45	H		0.046	16.60		
		64-QAM	-33.74	26.48	-9.90	1.45	H		0.033	15.13		
		256-QAM	-36.30	23.92	-9.90	1.45	H		0.018	12.57		
841.5		PI/2 BPSK	-31.31	29.16	-9.90	1.45	H	0.060	17.81	1	77	
		QPSK	-31.41	29.06	-9.90	1.45	H	0.059	17.71			
		16-QAM	-32.51	27.96	-9.90	1.45	H	0.046	16.61			
		64-QAM	-33.81	26.66	-9.90	1.45	H	0.034	15.31			
		256-QAM	-36.39	24.08	-9.90	1.45	H	0.019	12.73			

Freq (MHz)	Mod/ Bandwidth [SCS (kHz)]	Modulation	Measured	Substitute	Ant. Gain (dBd)	C.L	Pol	Limit	ERP		RB	
			Level (dBm)	Level (dBm)				W	W	dBm	Size	Offset
834.0	Sub6 n26 20 MHz [15 kHz]	PI/2 BPSK	-31.14	29.18	-9.90	1.45	H	< 7.00	0.061	17.83	1	104
		QPSK	-31.28	29.04	-9.90	1.45	H		0.059	17.69		
		16-QAM	-32.28	28.04	-9.90	1.45	H		0.047	16.69		
		64-QAM	-33.77	26.55	-9.90	1.45	H		0.033	15.20		
		256-QAM	-36.35	23.97	-9.90	1.45	H		0.018	12.62		
836.5		PI/2 BPSK	-31.25	28.97	-9.90	1.45	H		0.058	17.62	1	104
		QPSK	-31.26	28.96	-9.90	1.45	H		0.058	17.61		
		16-QAM	-32.37	27.85	-9.90	1.45	H		0.045	16.50		
		64-QAM	-33.74	26.48	-9.90	1.45	H		0.033	15.13		
		256-QAM	-36.40	23.82	-9.90	1.45	H		0.018	12.47		
839.0		PI/2 BPSK	-31.34	29.00	-9.90	1.45	H	0.058	17.65	1	104	
		QPSK	-31.46	28.88	-9.90	1.45	H	0.057	17.53			
		16-QAM	-32.56	27.78	-9.90	1.45	H	0.044	16.43			
		64-QAM	-33.85	26.49	-9.90	1.45	H	0.033	15.14			
		256-QAM	-36.48	23.86	-9.90	1.45	H	0.018	12.51			

9.2 RADIATED SPURIOUS EMISSIONS

NR Band:	<u>N26</u>
Bandwidth:	<u>5 MHz</u>
Modulation:	<u>PI/2 BPSK</u>
Distance:	<u>3 meters</u>
SCS:	<u>15 kHz</u>

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit (dBm)	RB	
									Size	Offset
165300 (826.5)	1 653.00	-58.07	9.49	-66.98	2.02	H	-59.51	-13.00	1	23
	2 479.50	-57.90	10.74	-61.59	2.55	H	-53.40	-13.00		
	3 306.00	-59.63	11.61	-61.80	2.97	H	-53.16	-13.00		
167300 (836.5)	1 673.00	-58.07	9.69	-67.45	2.05	H	-59.81	-13.00	1	23
	2 509.50	-58.26	10.55	-62.99	2.51	H	-54.95	-13.00		
	3 346.00	-60.27	11.53	-62.79	2.96	H	-54.22	-13.00		
169300 (846.5)	1 693.00	-57.82	9.91	-66.61	2.07	H	-58.77	-13.00	1	12
	2 539.50	-59.17	10.62	-63.80	2.53	H	-55.71	-13.00		
	3 386.00	-58.12	11.50	-60.15	2.99	H	-51.64	-13.00		

9.3 PEAK-TO-AVERAGE RATIO

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (dB)
Sub6 n26	5 MHz	836.5	BPSK	25	0	3.94
			QPSK			4.70
			16-QAM			5.61
			64-QAM			5.77
			256-QAM			6.49
	10 MHz		BPSK	50		3.78
			QPSK			4.69
			16-QAM			5.49
			64-QAM			5.78
			256-QAM			6.50
	15 MHz		BPSK	75		4.04
			QPSK			4.75
			16-QAM			5.46
			64-QAM			5.86
			256-QAM			6.46
	20 MHz		BPSK	100		3.89
			QPSK			4.83
			16-QAM			5.59
			64-QAM			5.92
			256-QAM			6.44

Note:

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 147 ~ 166.

9.4 OCCUPIED BANDWIDTH

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
Sub6 n26	5 MHz	836.5	BPSK	25	0	4.5335
			QPSK			4.5008
			16-QAM			4.5151
			64-QAM			4.5511
			256-QAM			4.5282
	10 MHz		BPSK	50		8.9635
			QPSK			9.0213
			16-QAM			9.0295
			64-QAM			8.9583
			256-QAM			8.9698
	15 MHz		BPSK	75		13.474
			QPSK			13.486
			16-QAM			13.481
			64-QAM			13.460
			256-QAM			13.478
	20 MHz		BPSK	100		17.924
			QPSK			17.945
			16-QAM			17.930
			64-QAM			17.891
			256-QAM			17.881

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 127 ~ 146.

9.5 CONDUCTED SPURIOUS EMISSIONS

Band	Band Width (MHz)	Frequency (MHz)	Frequency of Maximum Harmonic (GHz)	Factor (dB)	Measurement Maximum Data (dBm)	Result (dBm)	Limit (dBm)
Sub6 n26	5	826.5	4.9786	30.200	-73.719	-43.519	-13.00
		836.5	8.6231	30.815	-74.174	-43.359	
		846.5	9.9875	30.815	-74.297	-43.482	
	10	829.0	9.3779	30.815	-74.205	-43.390	
		836.5	4.0654	30.200	-74.736	-44.536	
		844.0	8.8380	30.815	-74.362	-43.547	
	15	831.5	9.1346	30.815	-74.841	-44.026	
		836.5	8.8515	30.815	-74.104	-43.289	
		841.5	4.0554	30.200	-74.468	-44.268	
	20	834.0	8.0374	30.815	-74.254	-43.439	
		836.5	3.7653	30.200	-74.274	-44.074	
		839.0	9.4008	30.815	-73.995	-43.180	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 191 ~ 202.
2. Result (dBm) = Measurement Maximum Data (dBm) + Factor (dB)
3. Factor(dB) = Cable Loss + Ext. Attenuator + Power Splitter

Frequency Range (GHz)	Factor [dB]
0.03 – 1	27.494
1 – 5	30.200
5 – 10	30.815
10 – 15	31.340
15 – 20	31.713
Above 20	32.355

9.6 BAND EDGE

- Plots of the EUT's Band Edge are shown Page 167 ~ 190.

9.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

- ▣ BandWidth: 5 MHz
- ▣ Voltage(100 %): 3.880 VDC
- ▣ Batt. Endpoint: 3.300 VDC
- ▣ Deviation Limit: ± 0.000 25 % or 2.5 ppm

Test. Frequency	Voltage	Temp.	Frequency	Frequency Error	Deviation	ppm
(MHz)	(%)	(°C)	(Hz)	(Hz)	(%)	
836.5	100 %	+20(Ref)	836 499 997	0.0	0.000 000	0.000
	100 %	-30	836 499 994	-3.4	0.000 000	-0.004
	100 %	-20	836 499 995	-2.2	0.000 000	-0.003
	100 %	-10	836 499 994	-3.3	0.000 000	-0.004
	100 %	0	836 499 994	-3.6	0.000 000	-0.004
	100 %	+10	836 499 994	-3.6	0.000 000	-0.004
	100 %	+30	836 499 994	-3.6	0.000 000	-0.004
	100 %	+40	836 499 994	-3.5	0.000 000	-0.004
	100 %	+50	836 499 993	-4.8	-0.000 001	-0.006
	Batt. Endpoint	+20	836 499 993	-4.6	-0.000 001	-0.005

▣ BandWidth:	<u>10 MHz</u>
▣ Voltage(100 %):	<u>3.880 VDC</u>
▣ Batt. Endpoint:	<u>3.300 VDC</u>
▣ Deviation Limit:	<u>± 0.000 25 % or 2.5 ppm</u>

Test. Frequency	Voltage	Temp.	Frequency	Frequency Error	Deviation	ppm
(MHz)	(%)	(°C)	(Hz)	(Hz)	(%)	
836.5	100 %	+20(Ref)	836 500 003	0.0	0.000 000	0.000
	100 %	-30	836 500 006	2.2	0.000 000	0.003
	100 %	-20	836 500 006	2.7	0.000 000	0.003
	100 %	-10	836 500 005	1.4	0.000 000	0.002
	100 %	0	836 500 005	1.6	0.000 000	0.002
	100 %	+10	836 500 005	1.6	0.000 000	0.002
	100 %	+30	836 500 006	2.4	0.000 000	0.003
	100 %	+40	836 500 007	3.3	0.000 000	0.004
	100 %	+50	836 500 007	3.6	0.000 000	0.004
	Batt. Endpoint	+20	836 500 005	1.8	0.000 000	0.002

BandWidth:	<u>15 MHz</u>
Voltage(100 %):	<u>3.880 VDC</u>
Batt. Endpoint:	<u>3.300 VDC</u>
Deviation Limit:	<u>± 0.000 25 % or 2.5 ppm</u>

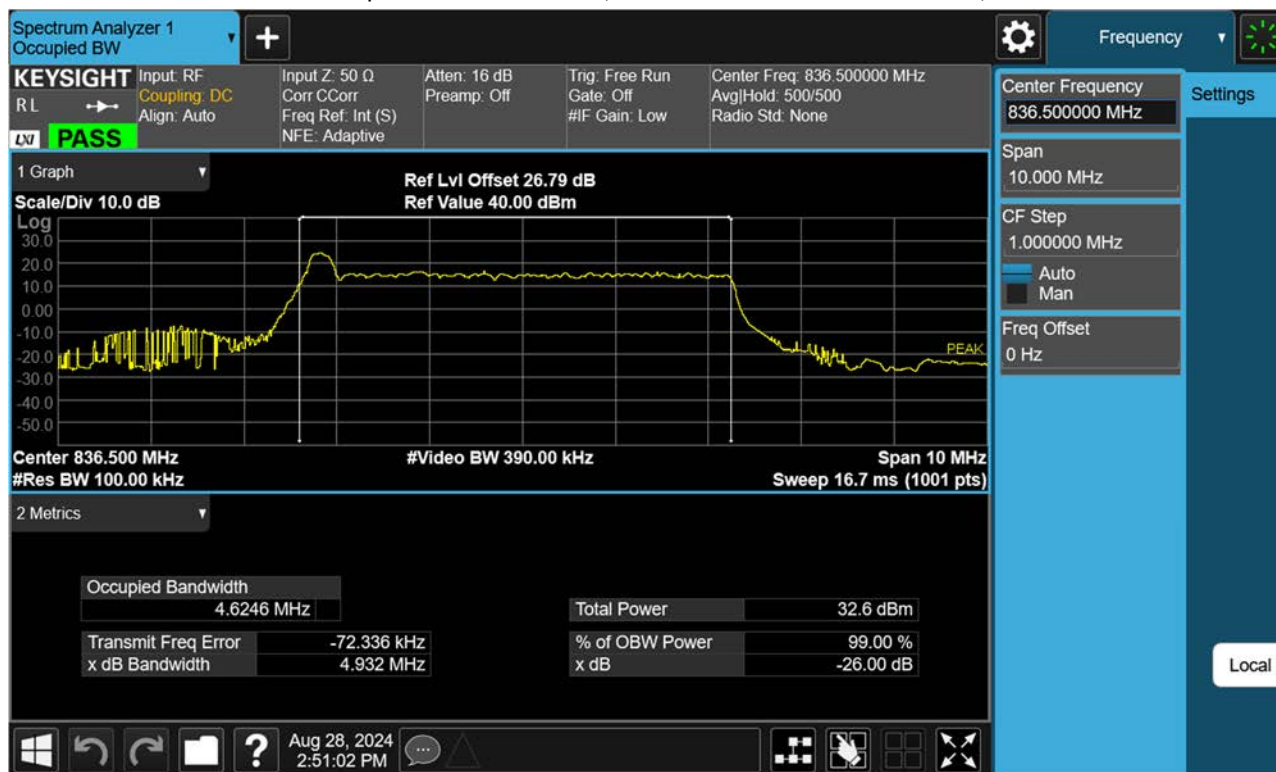
Test. Frequency	Voltage	Temp.	Frequency	Frequency Error	Deviation	ppm
(MHz)	(%)	(°C)	(Hz)	(Hz)	(%)	
836.5	100 %	+20(Ref)	836 500 000	0.0	0.000 000	0.000
	100 %	-30	836 500 001	0.2	0.000 000	0.000
	100 %	-20	836 500 001	0.2	0.000 000	0.000
	100 %	-10	836 500 001	0.3	0.000 000	0.000
	100 %	0	836 500 001	0.4	0.000 000	0.001
	100 %	+10	836 500 001	0.5	0.000 000	0.001
	100 %	+30	836 500 001	0.8	0.000 000	0.001
	100 %	+40	836 500 001	0.8	0.000 000	0.001
	100 %	+50	836 500 001	0.3	0.000 000	0.000
	Batt. Endpoint	+20	836 500 000	-0.5	0.000 000	-0.001

- ▣ BandWidth: 20 MHz
- ▣ Voltage(100 %): 3.880 VDC
- ▣ Batt. Endpoint: 3.300 VDC
- ▣ Deviation Limit: ± 0.000 25 % or 2.5 ppm

Test. Frequency	Voltage	Temp.	Frequency	Frequency Error	Deviation	ppm
(MHz)	(%)	(°C)	(Hz)	(Hz)	(%)	
836.5	100 %	+20(Ref)	836 499 998	0.0	0.000 000	0.000
	100 %	-30	836 499 996	-1.9	0.000 000	-0.002
	100 %	-20	836 499 997	-0.8	0.000 000	-0.001
	100 %	-10	836 499 997	-1.0	0.000 000	-0.001
	100 %	0	836 499 996	-1.4	0.000 000	-0.002
	100 %	+10	836 499 996	-1.4	0.000 000	-0.002
	100 %	+30	836 499 996	-1.6	0.000 000	-0.002
	100 %	+40	836 499 998	0.3	0.000 000	0.000
	100 %	+50	836 499 997	-0.4	0.000 000	0.000
	Batt. Endpoint	+20	836 499 997	-0.6	0.000 000	-0.001

10. TEST PLOTS(Main 1 ANT)

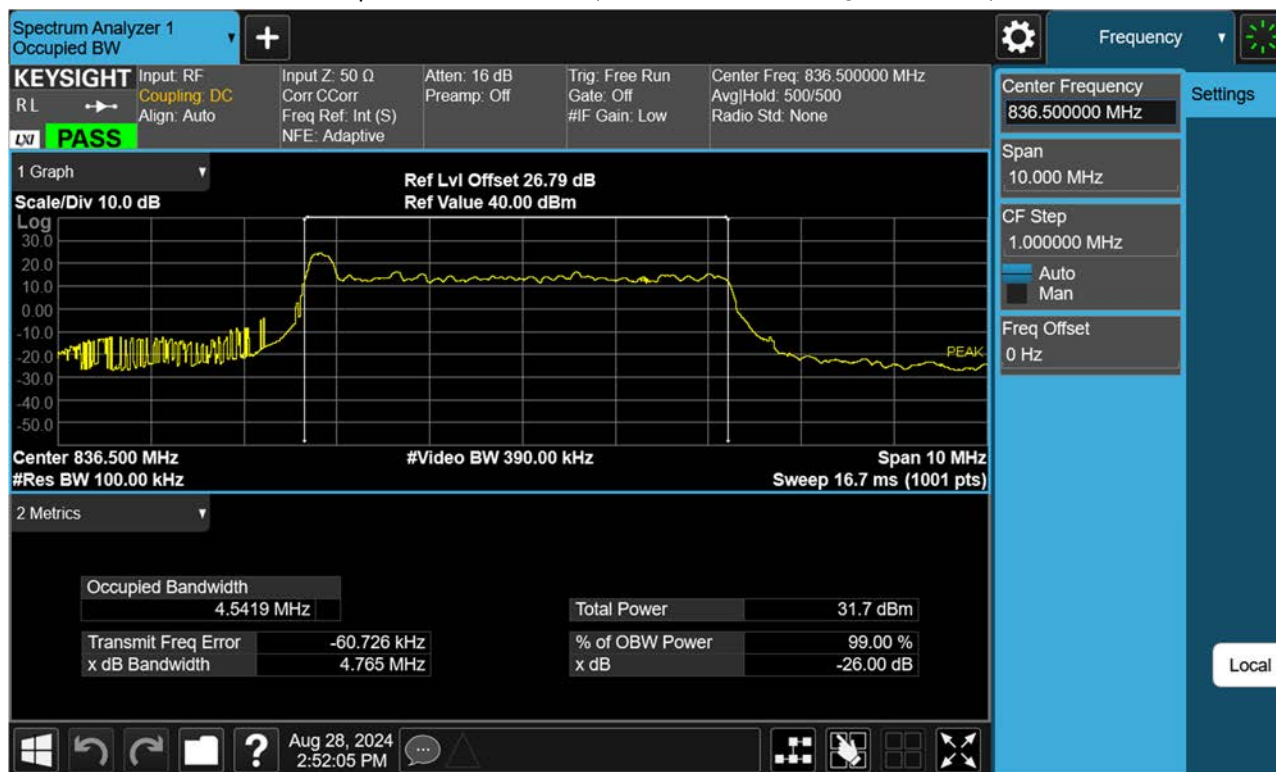
Occupied Bandwidth Plot (5 M BW Ch.167300 BPSK_RB 25_0)



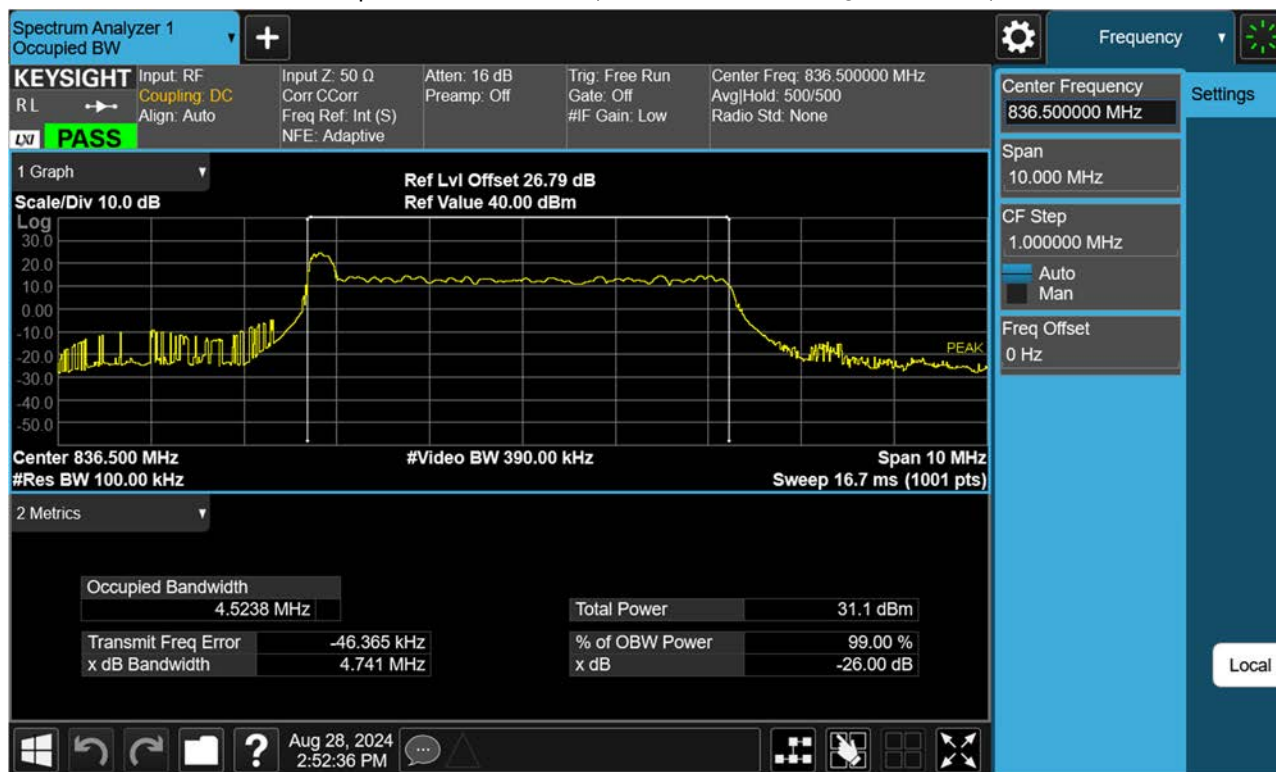
Occupied Bandwidth Plot (5 M BW Ch.167300 QPSK_RB 25_0)



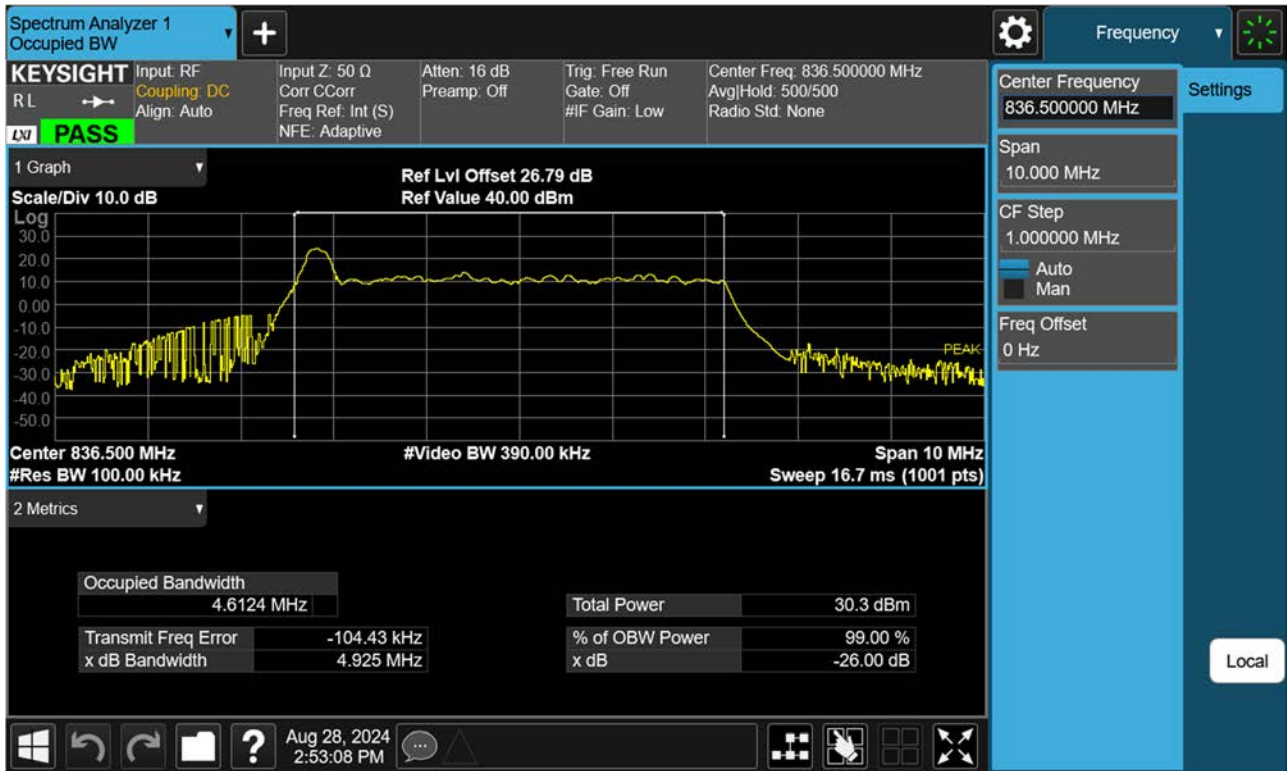
Occupied Bandwidth Plot (5 M BW Ch.167300 16QAM_RB 25_0)



Occupied Bandwidth Plot (5 M BW Ch.167300 64QAM_RB 25_0)



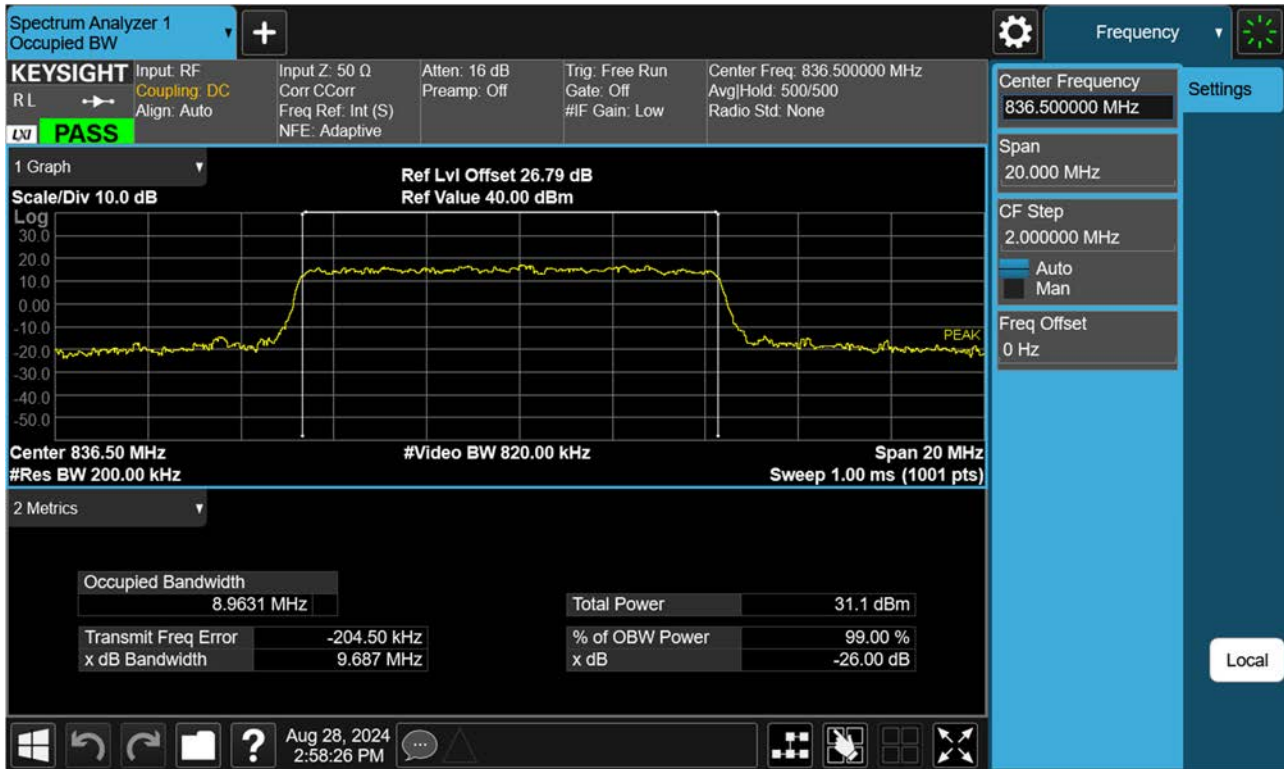
Occupied Bandwidth Plot (5 M BW Ch.167300 256QAM_RB 25_0)



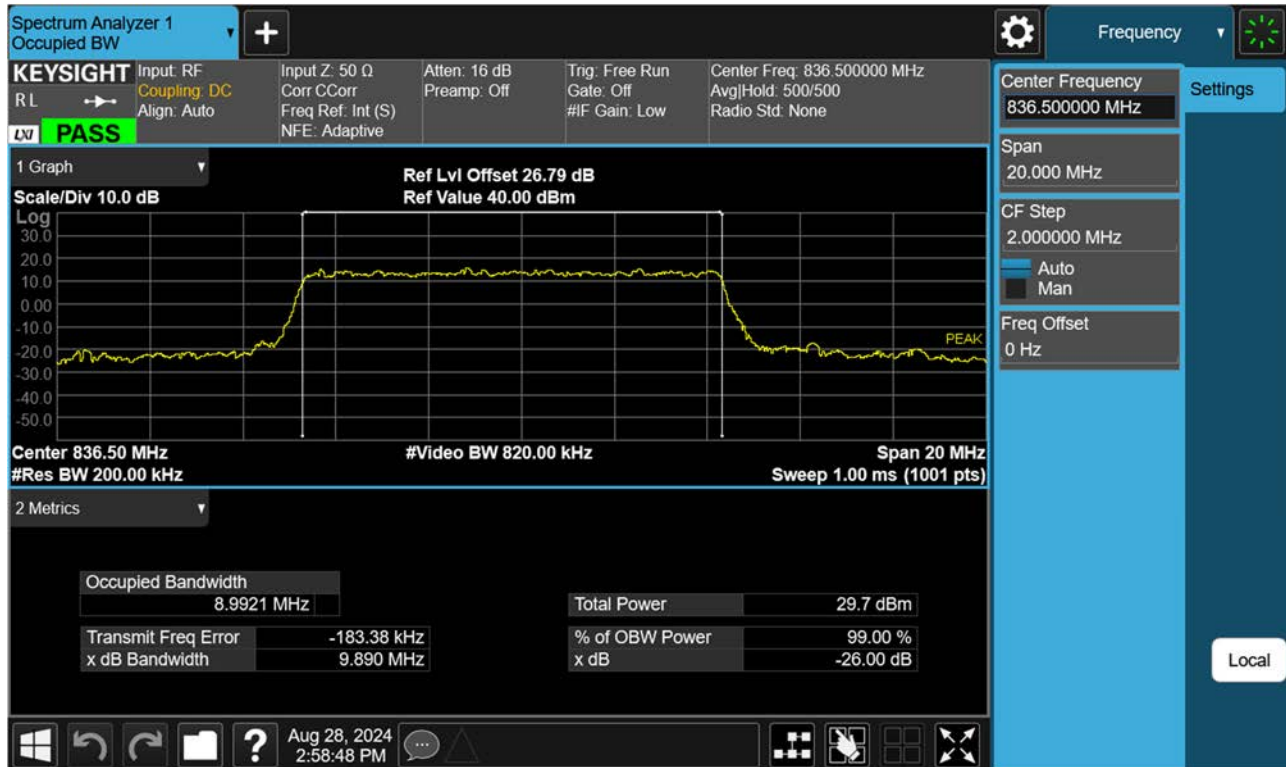
Occupied Bandwidth Plot (10 M BW Ch.167300 BPSK_RB 50_0)



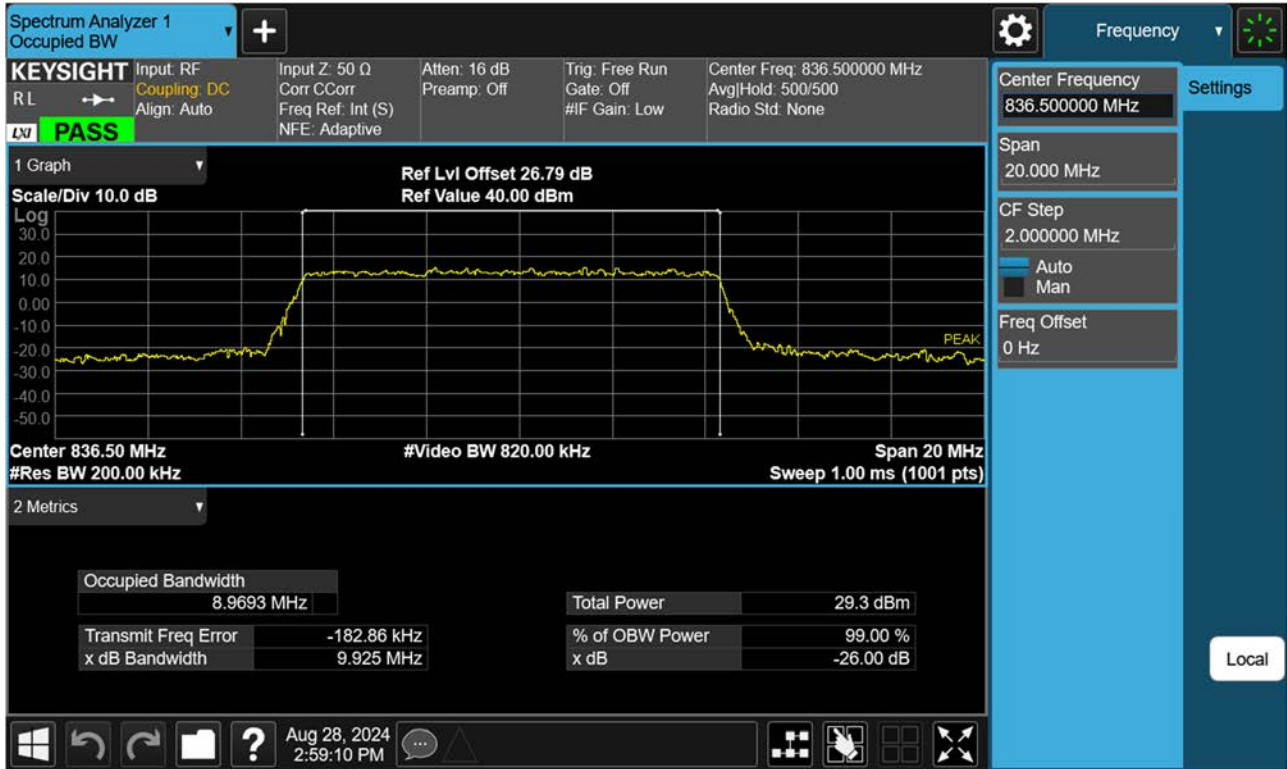
Occupied Bandwidth Plot (10 M BW Ch.167300 QPSK_RB 50_0)



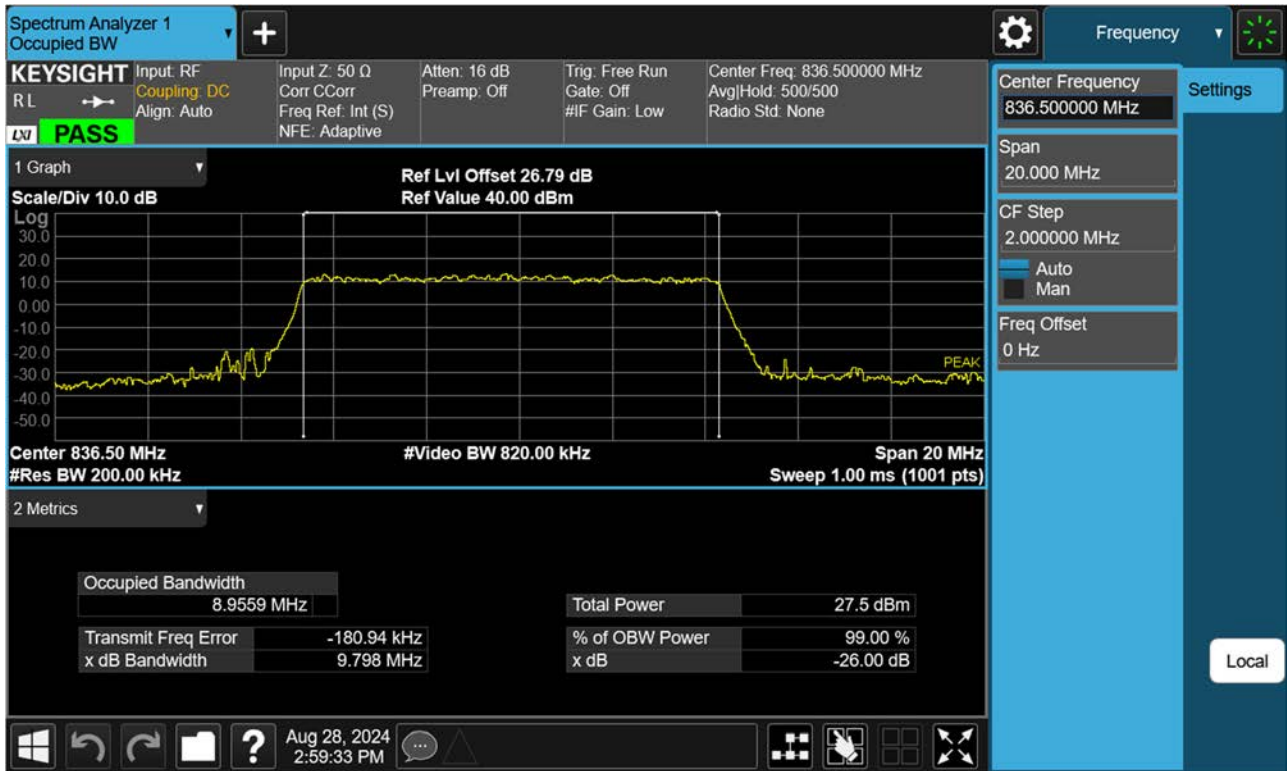
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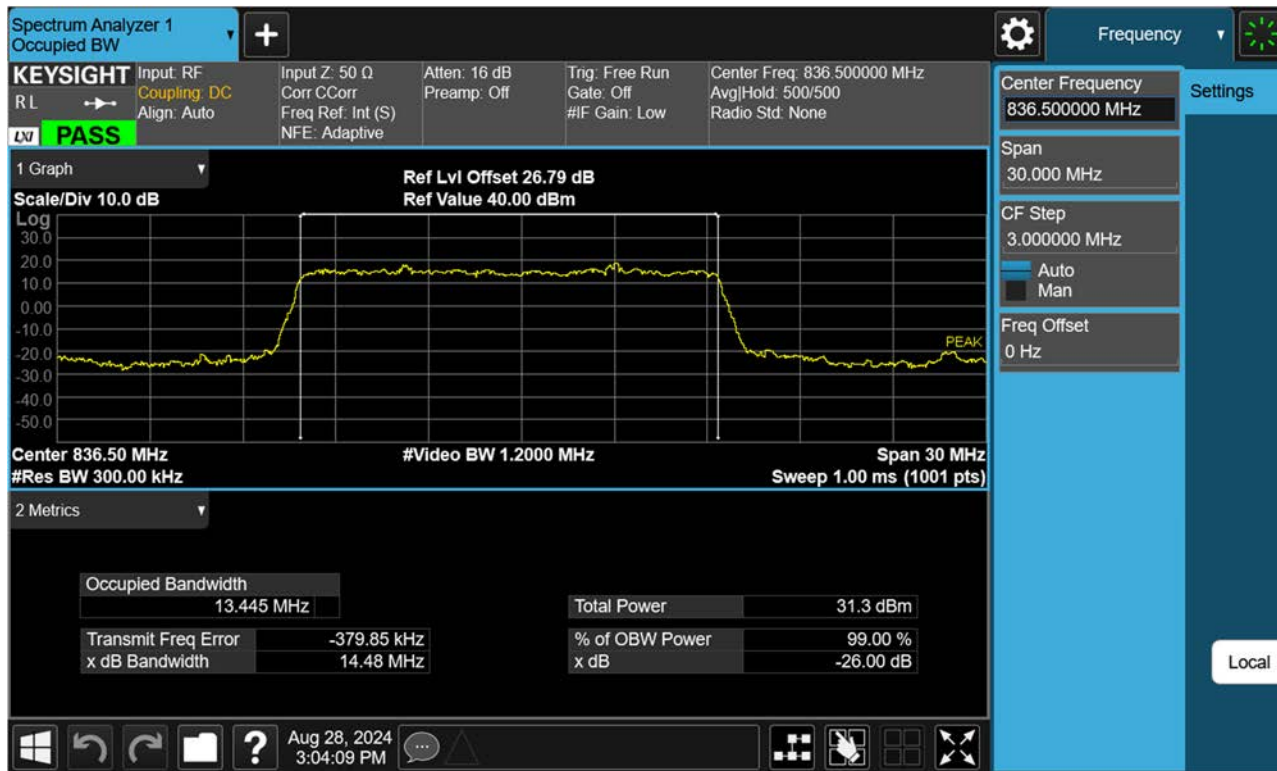
Occupied Bandwidth Plot (10 M BW Ch.167300 64QAM_RB 50_0)



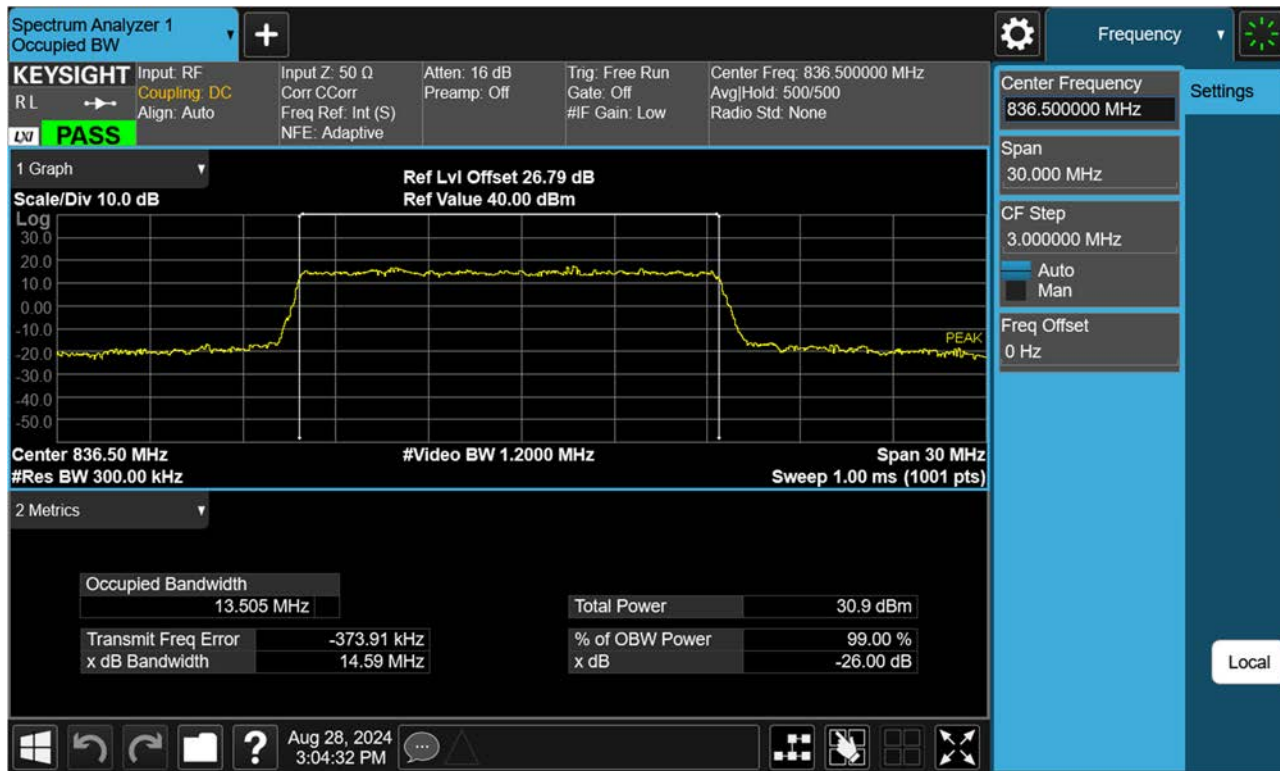
Occupied Bandwidth Plot (10 M BW Ch.167300 256QAM_RB 50_0)



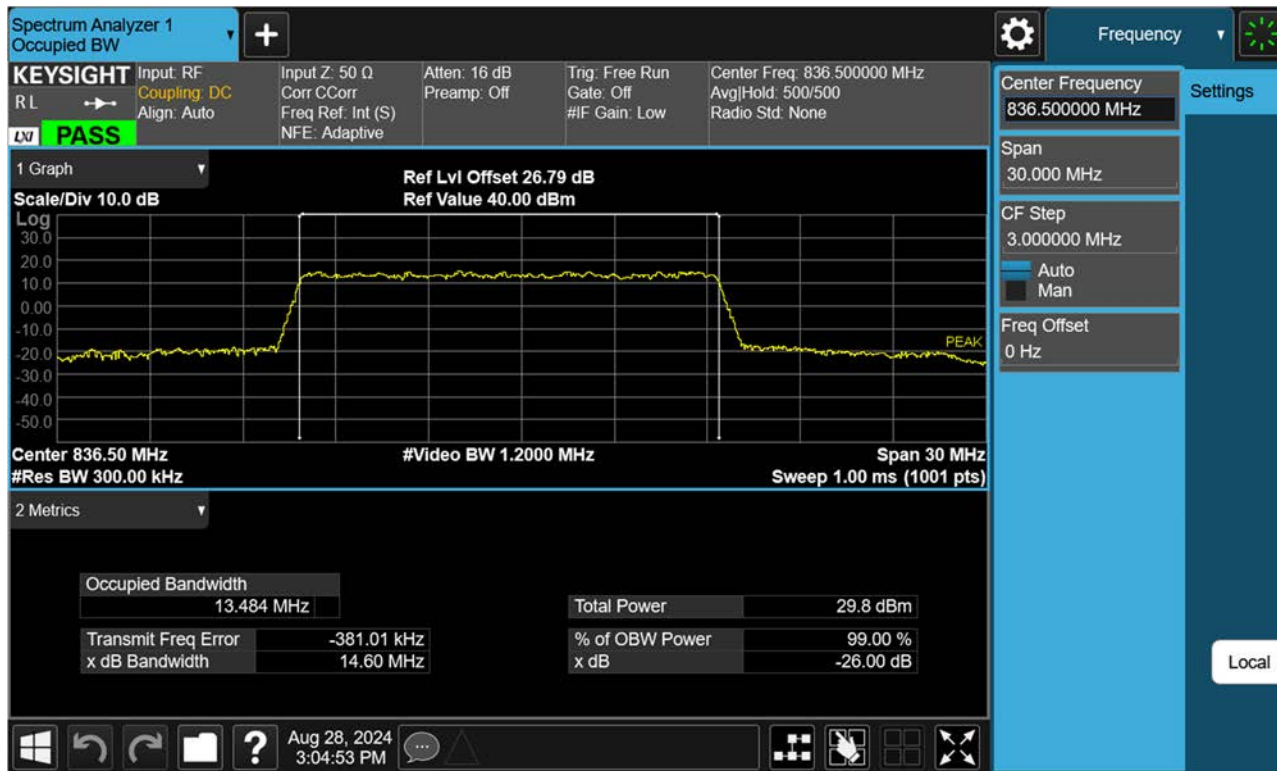
Occupied Bandwidth Plot (15 M BW Ch.167300 BPSK RB 75_0)



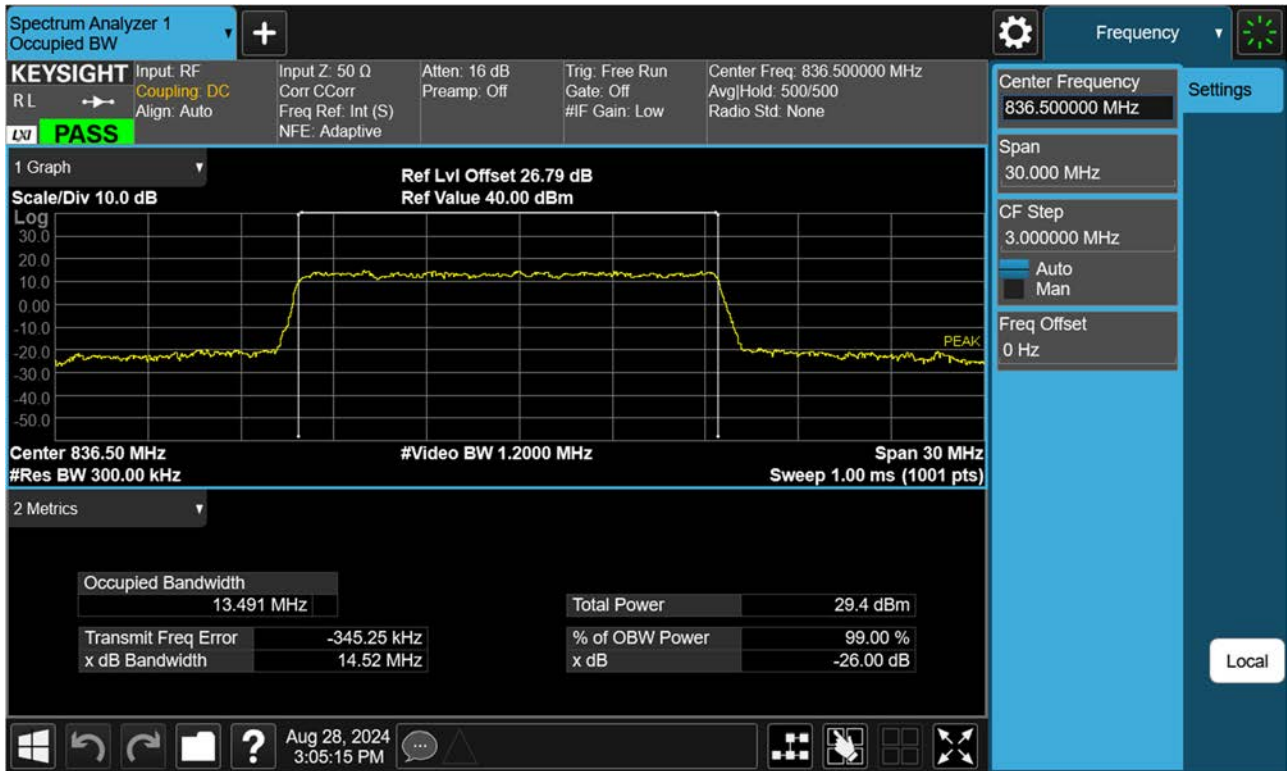
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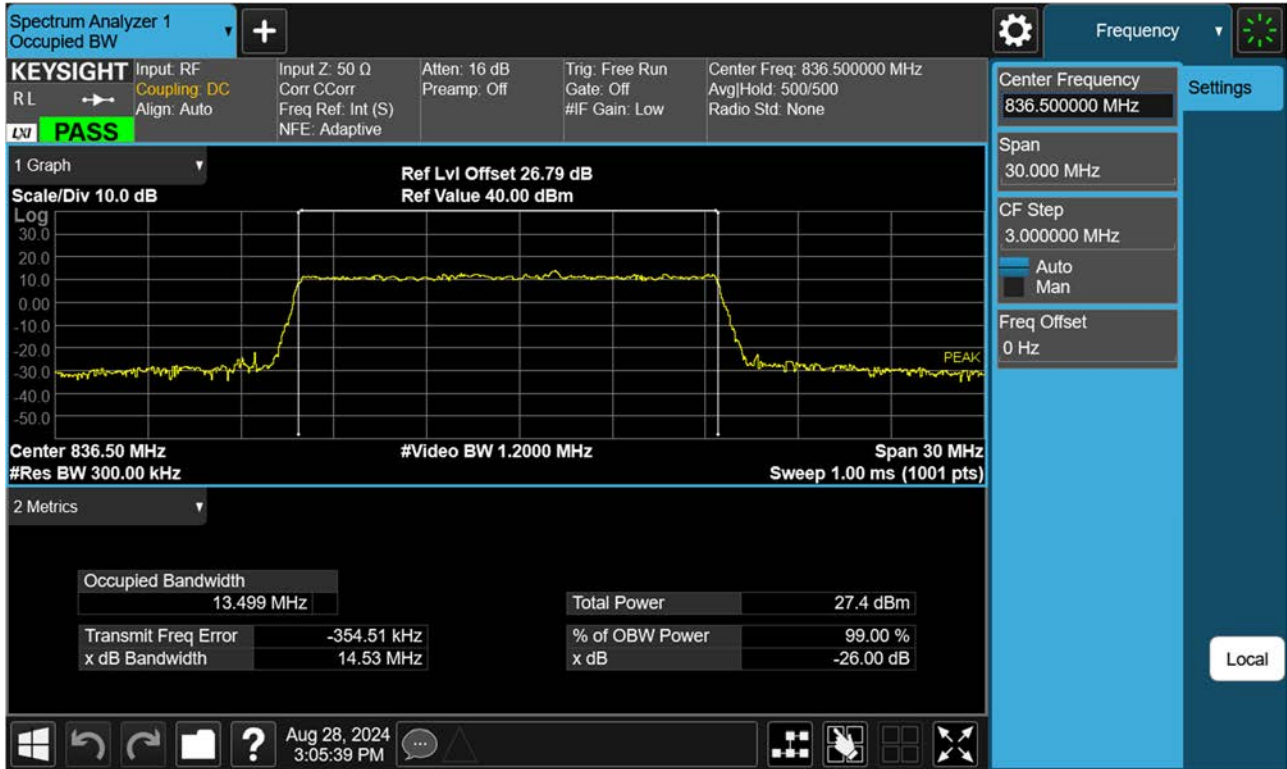
Occupied Bandwidth Plot (15 M BW Ch.167300 16QAM RB 75_0)



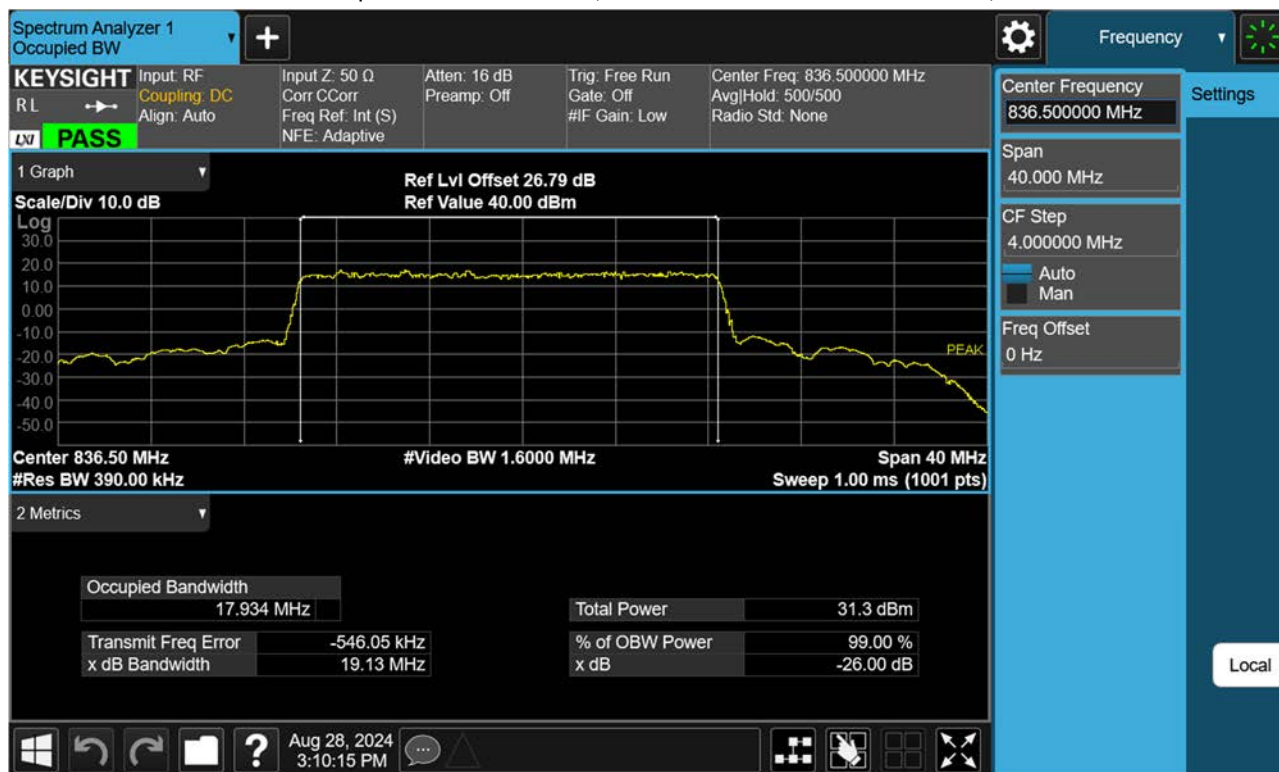
Occupied Bandwidth Plot (15 M BW Ch.167300 64QAM RB 75_0)



Occupied Bandwidth Plot (15 M BW Ch.167300 256QAM RB 75_0)



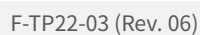
Occupied Bandwidth Plot (20 M BW Ch.167300 BPSK RB 100_0)



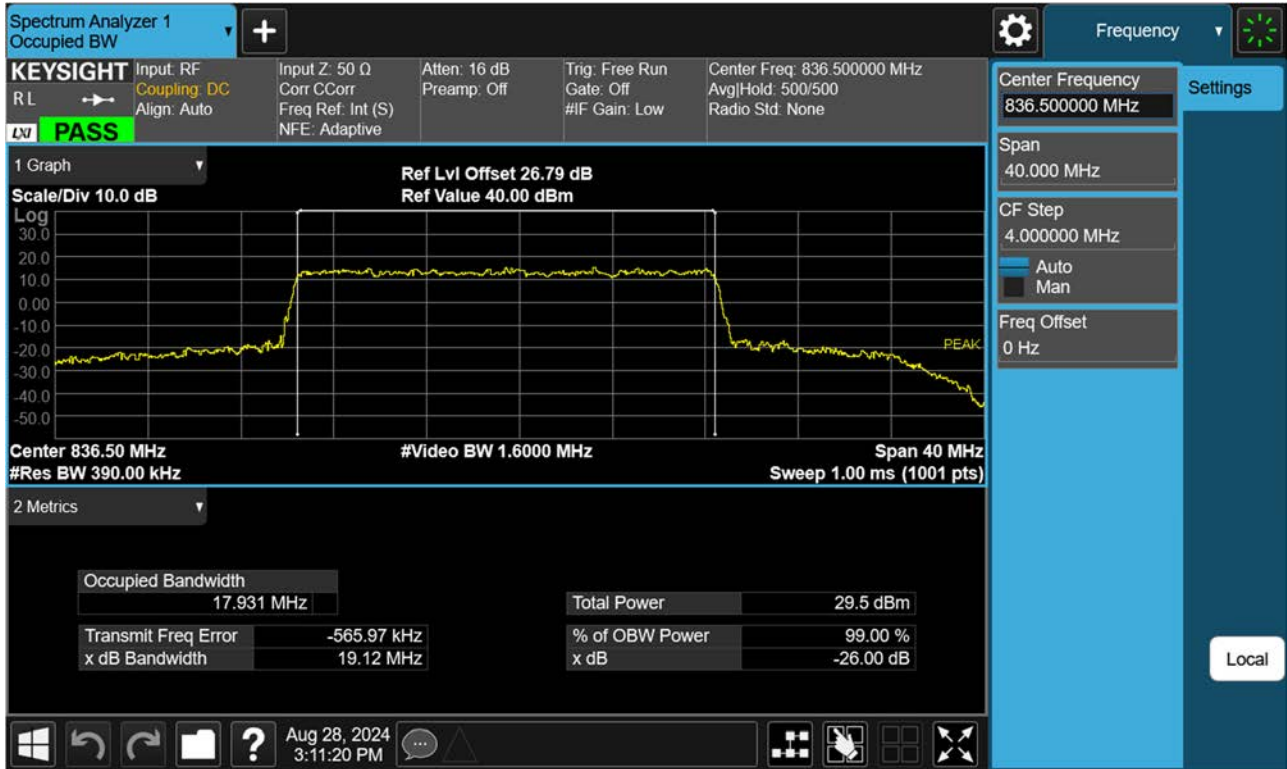
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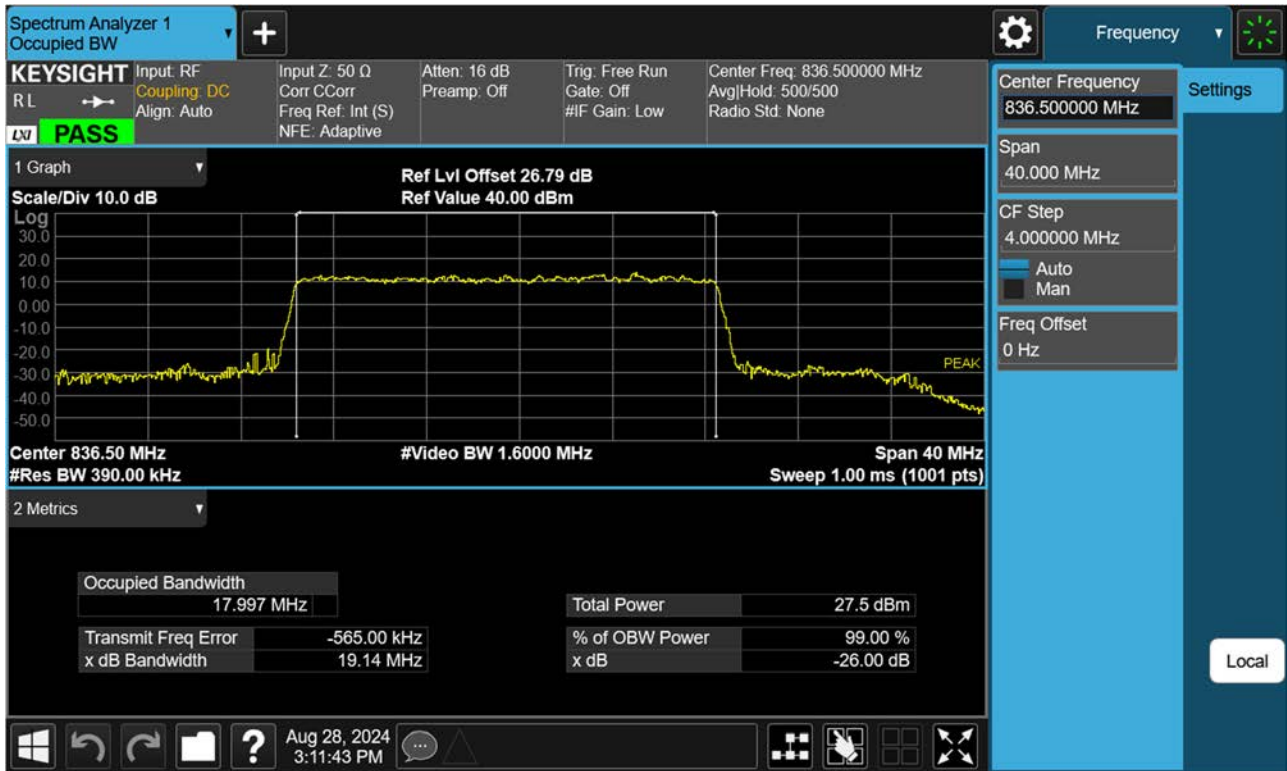
Occupied Bandwidth Plot (20 M BW Ch.167300 16QAM RB 100_0)



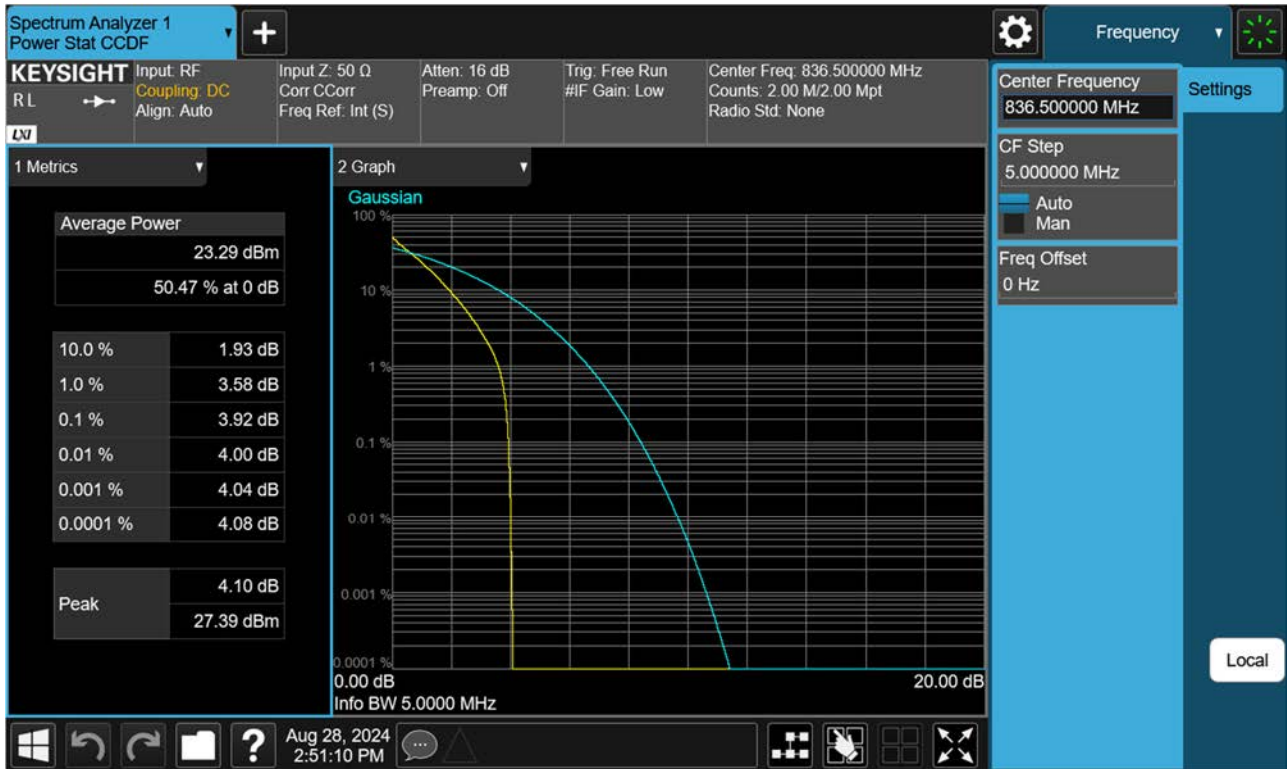
Occupied Bandwidth Plot (20 M BW Ch.167300 64QAM RB 100_0)



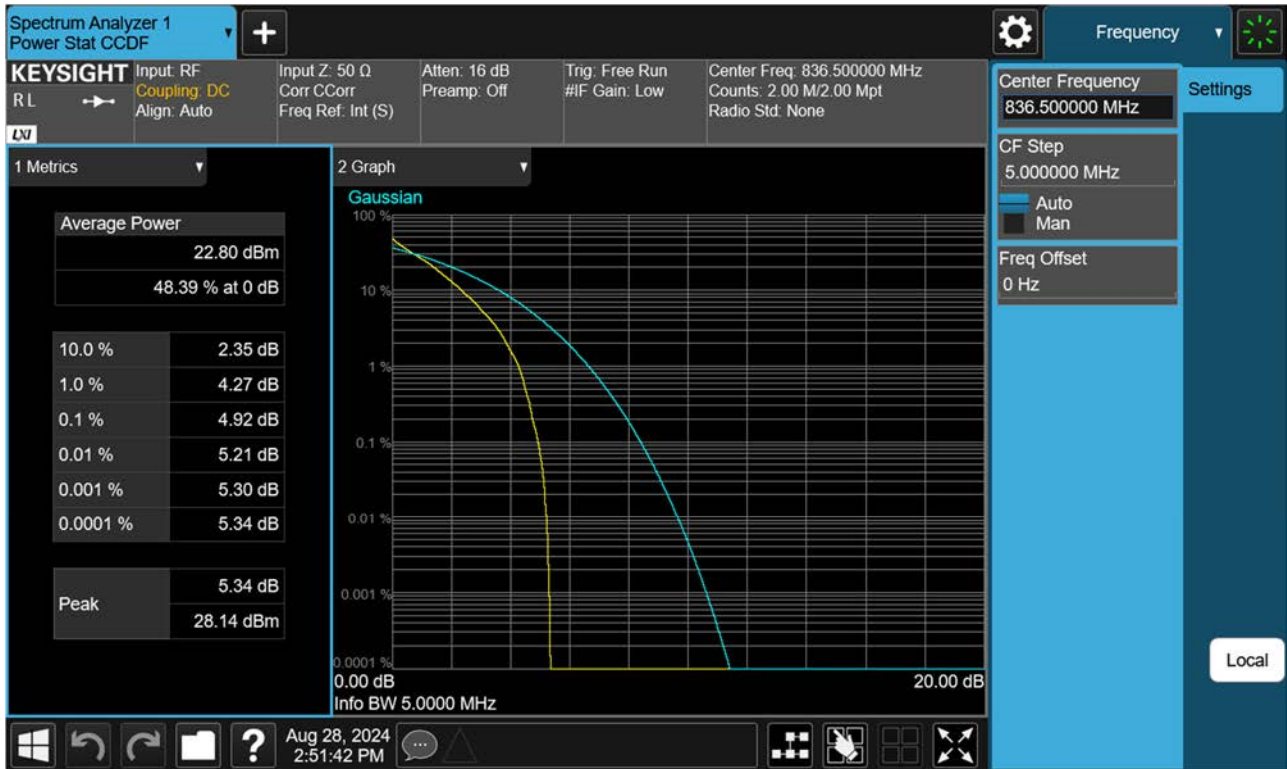
Occupied Bandwidth Plot (20 M BW Ch.167300 256QAM RB 100_0)



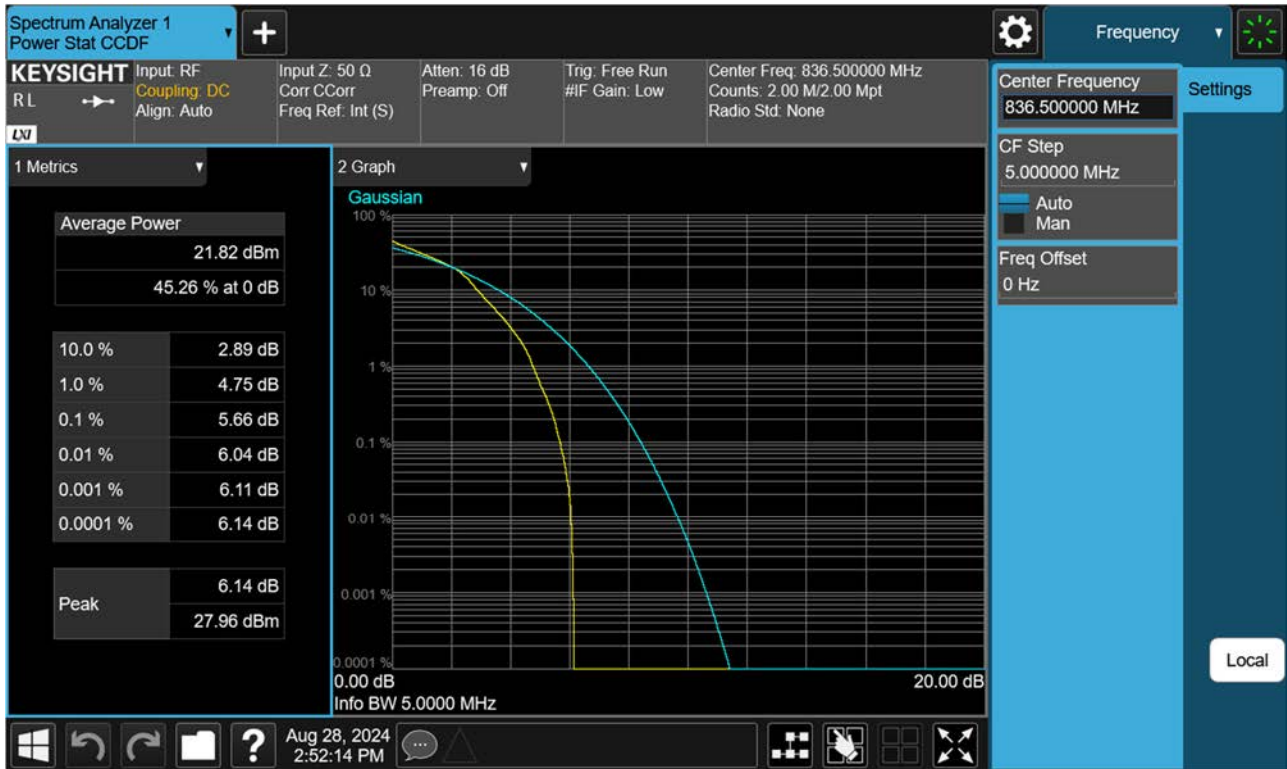
PAR Plot (5 M BW Ch.167300 BPSK_RB 25_0)



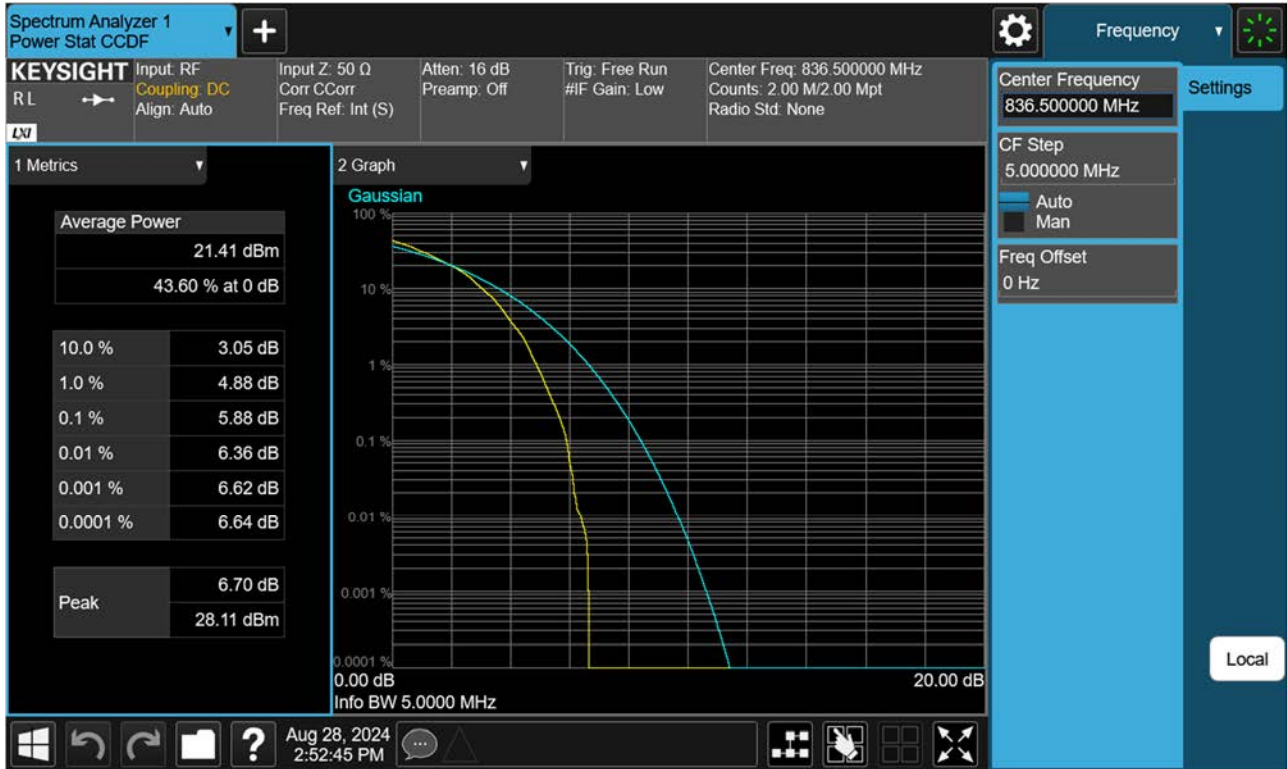
PAR Plot (5 M BW Ch.167300 QPSK_RB 25_0)



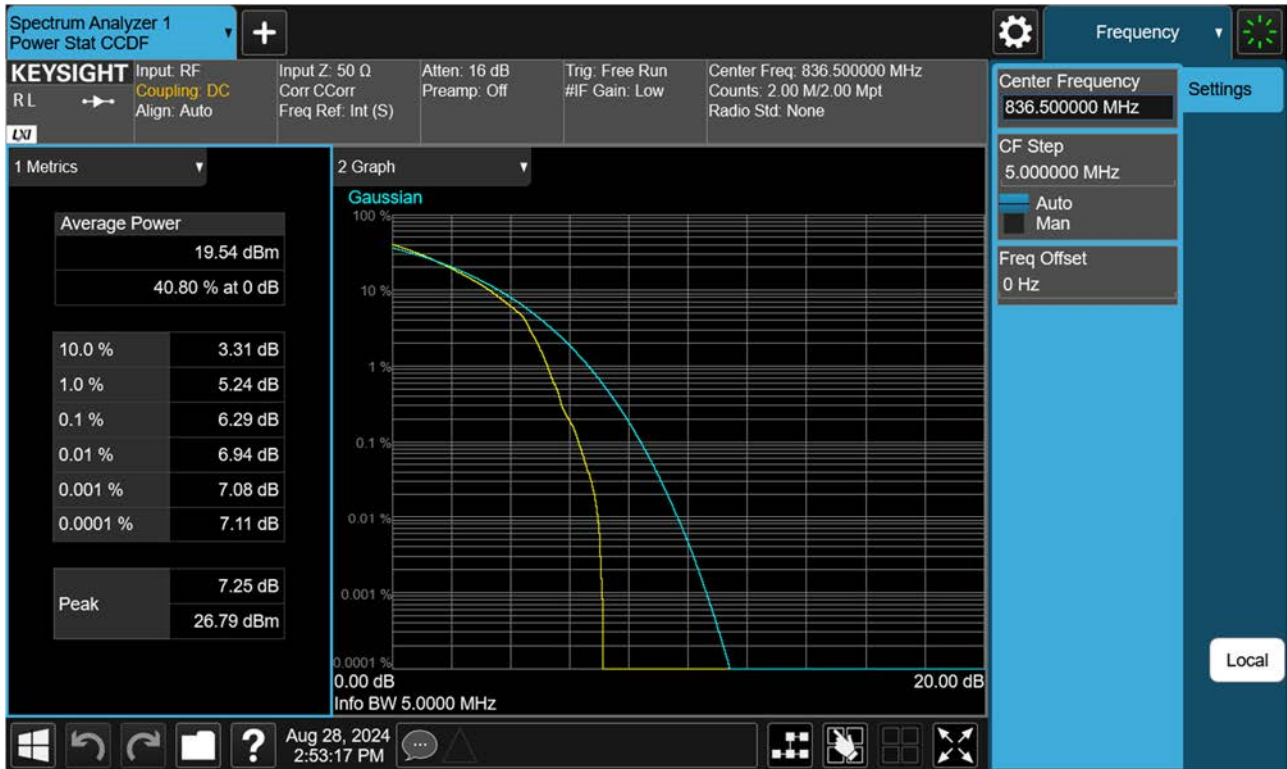
PAR Plot (5 M BW Ch.167300 16QAM_RB 25_0)



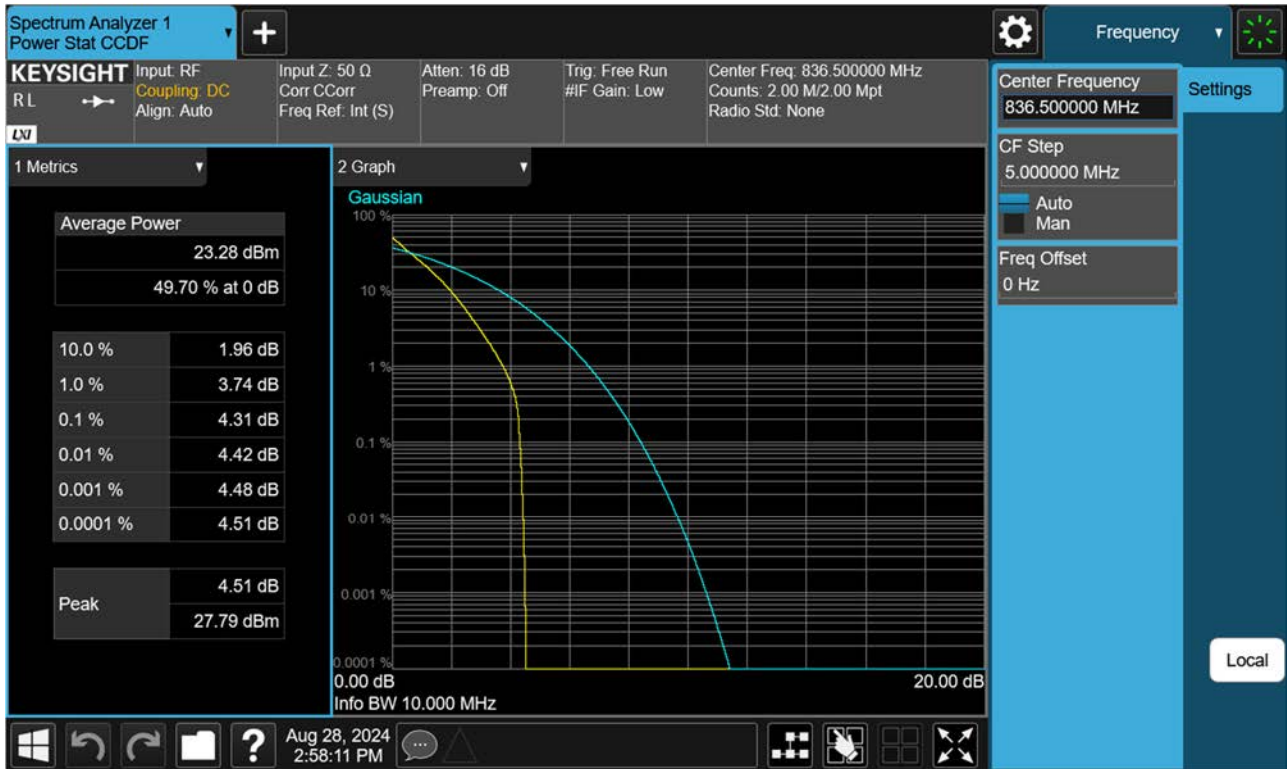
PAR Plot (5 M BW Ch.167300 64QAM_RB 25_0)



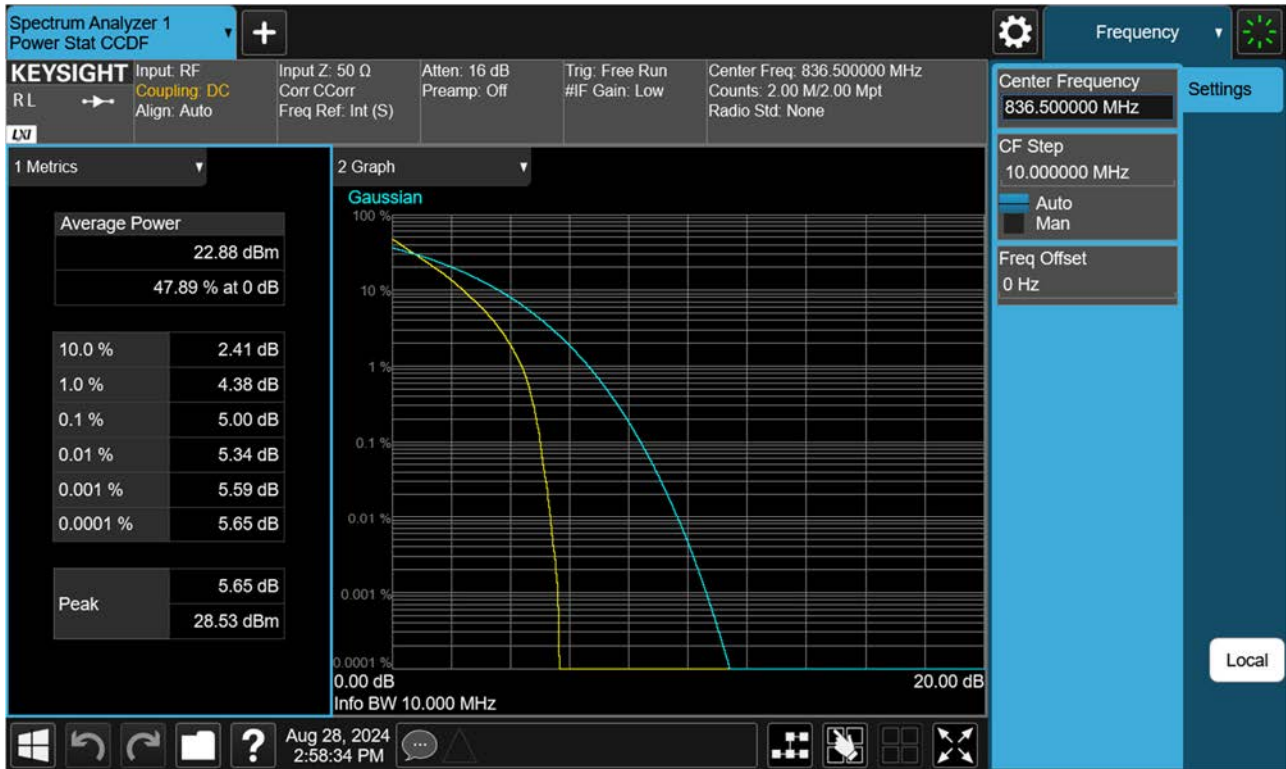
PAR Plot (5 M BW Ch.167300 256QAM_RB 25_0)



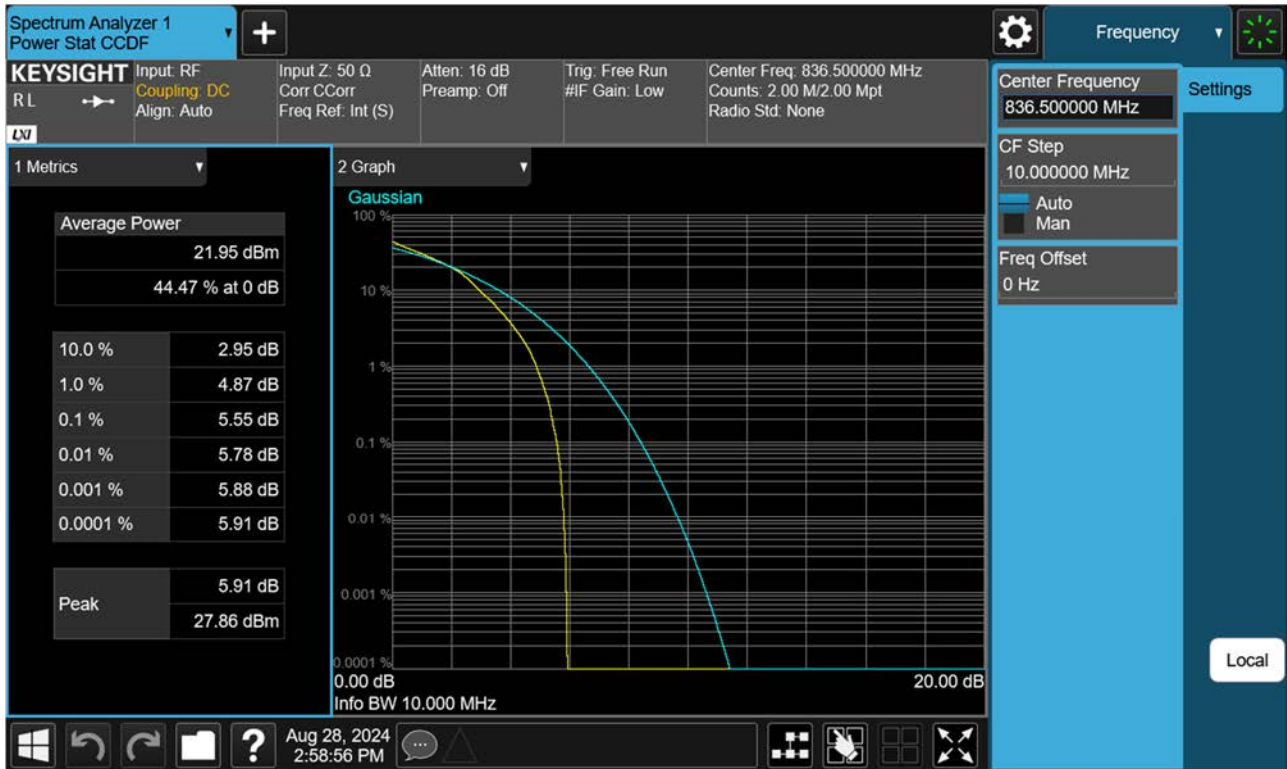
PAR Plot (10 M BW Ch.167300 BPSK_RB 50_0)



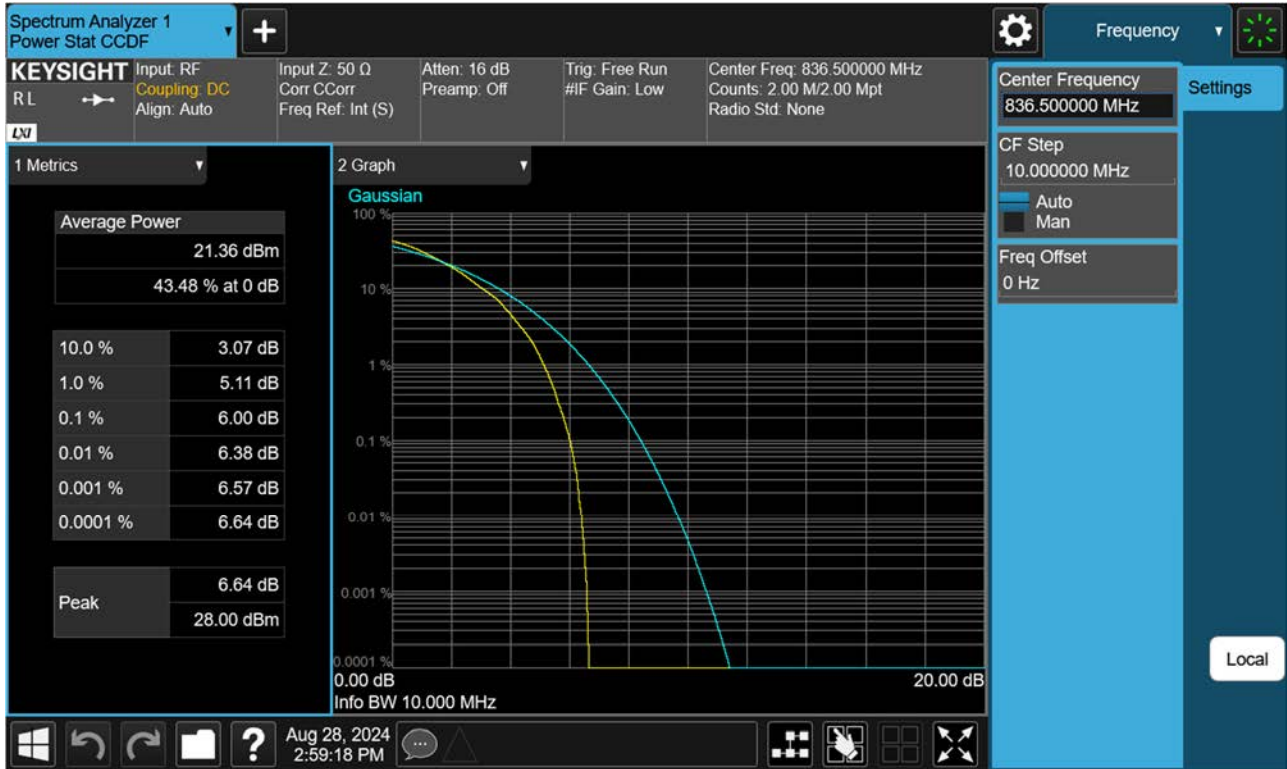
PAR Plot (10 M BW Ch.167300 QPSK_RB 50_0)



PAR Plot (10 M BW Ch.167300 16QAM_RB 50_0)



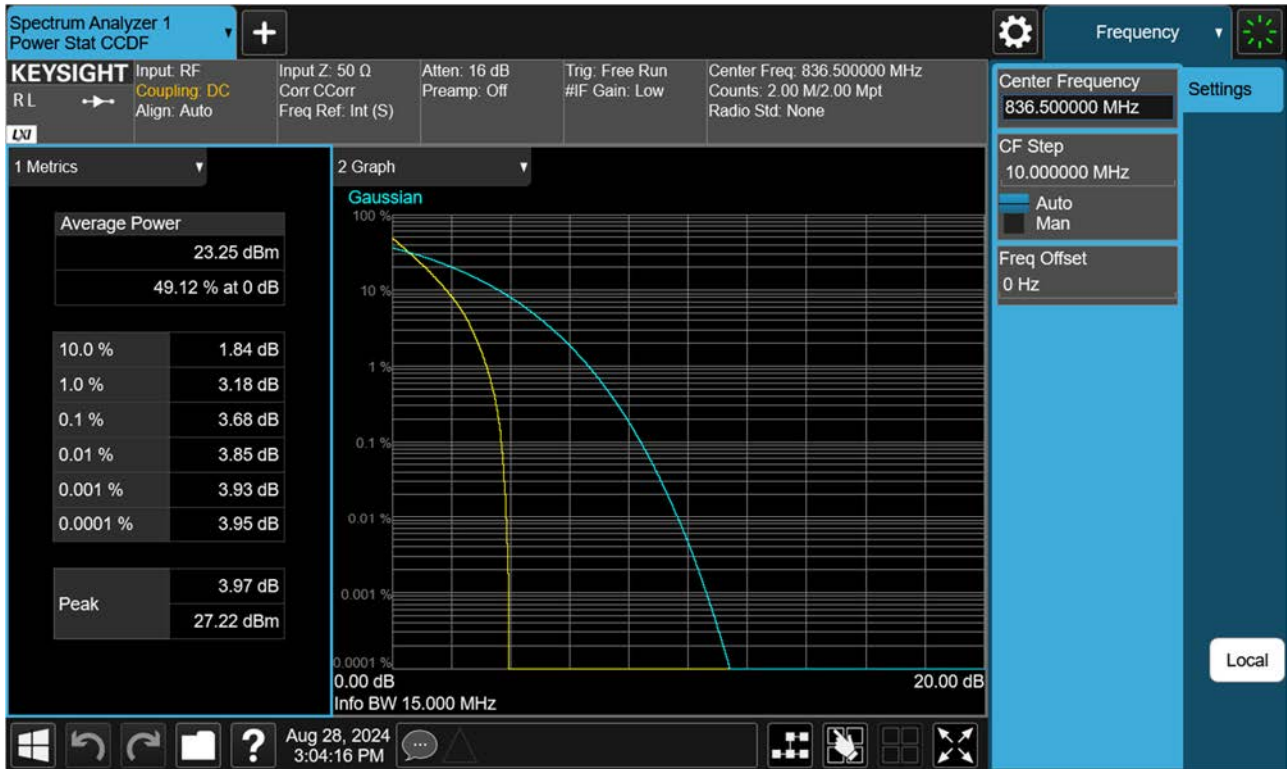
PAR Plot (10 M BW Ch.167300 64QAM_RB 50_0)



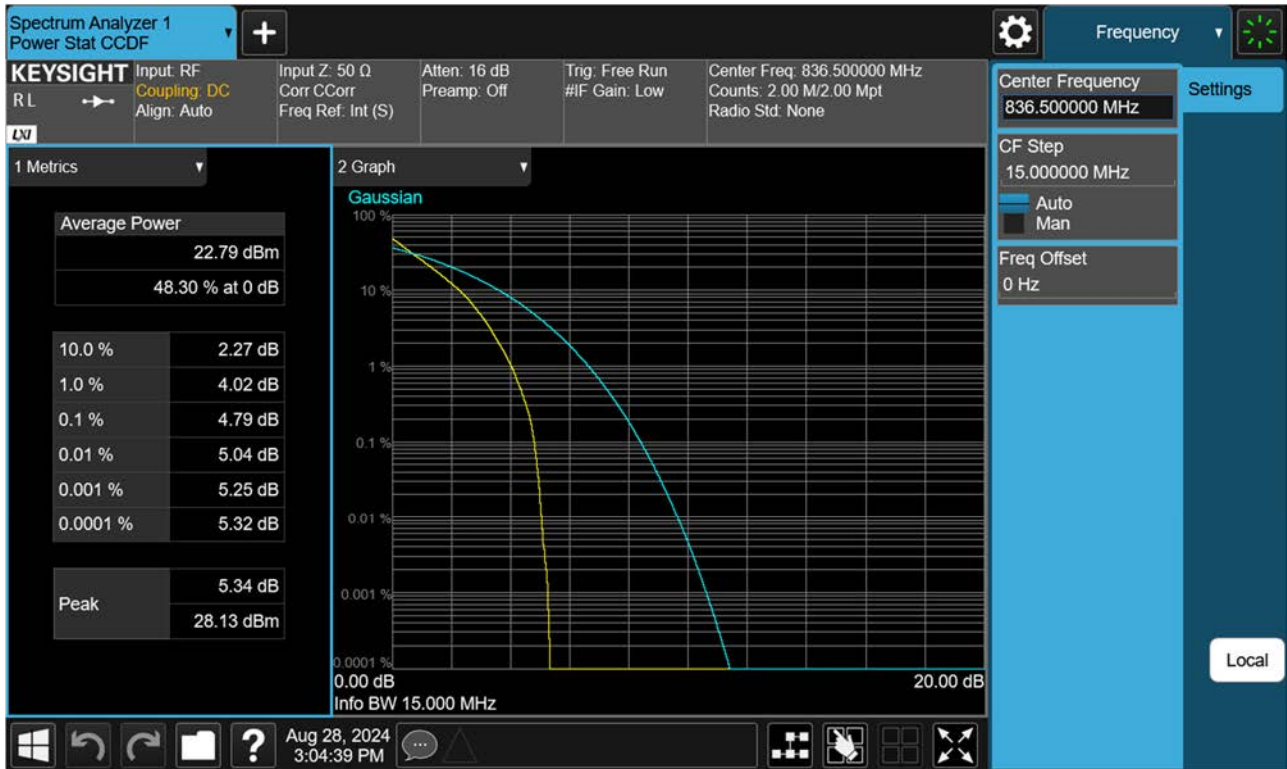
PAR Plot (10 M BW Ch.167300 256QAM_RB 50_0)



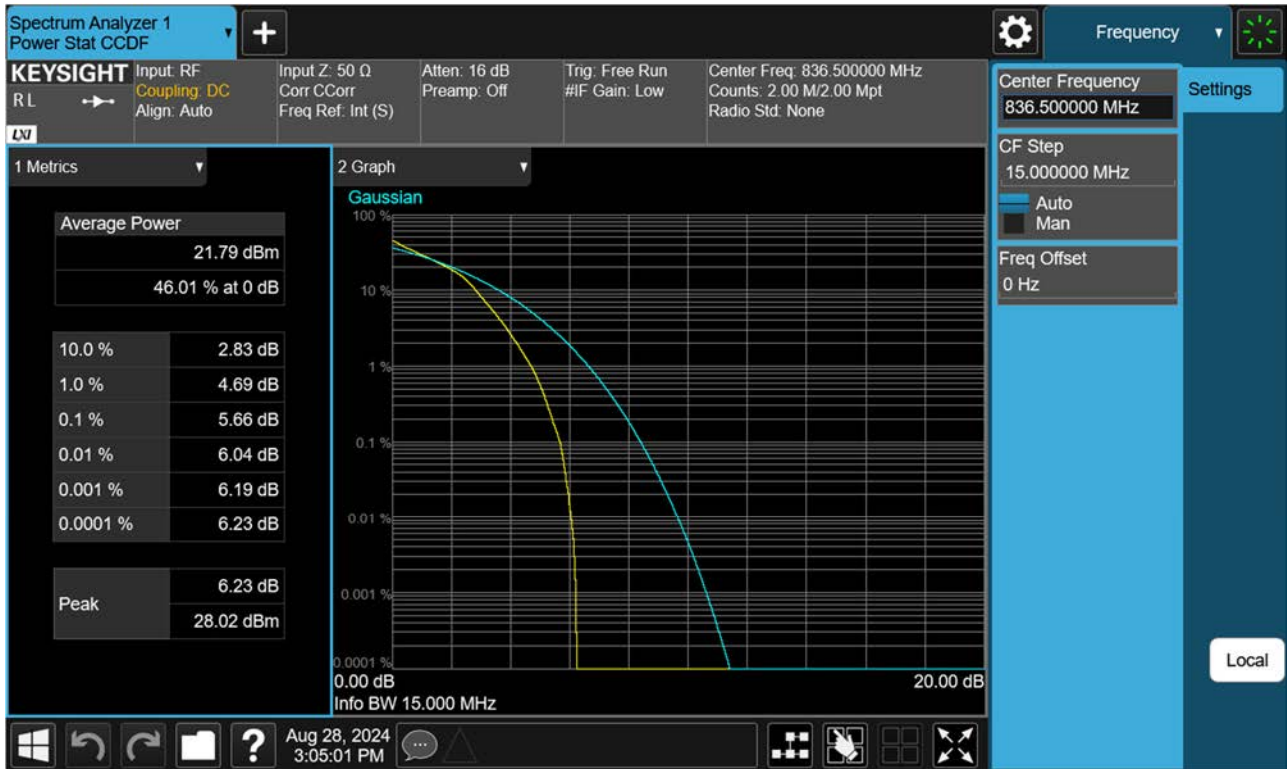
PAR Plot (15 M BW Ch.167300 BPSK RB 75_0)



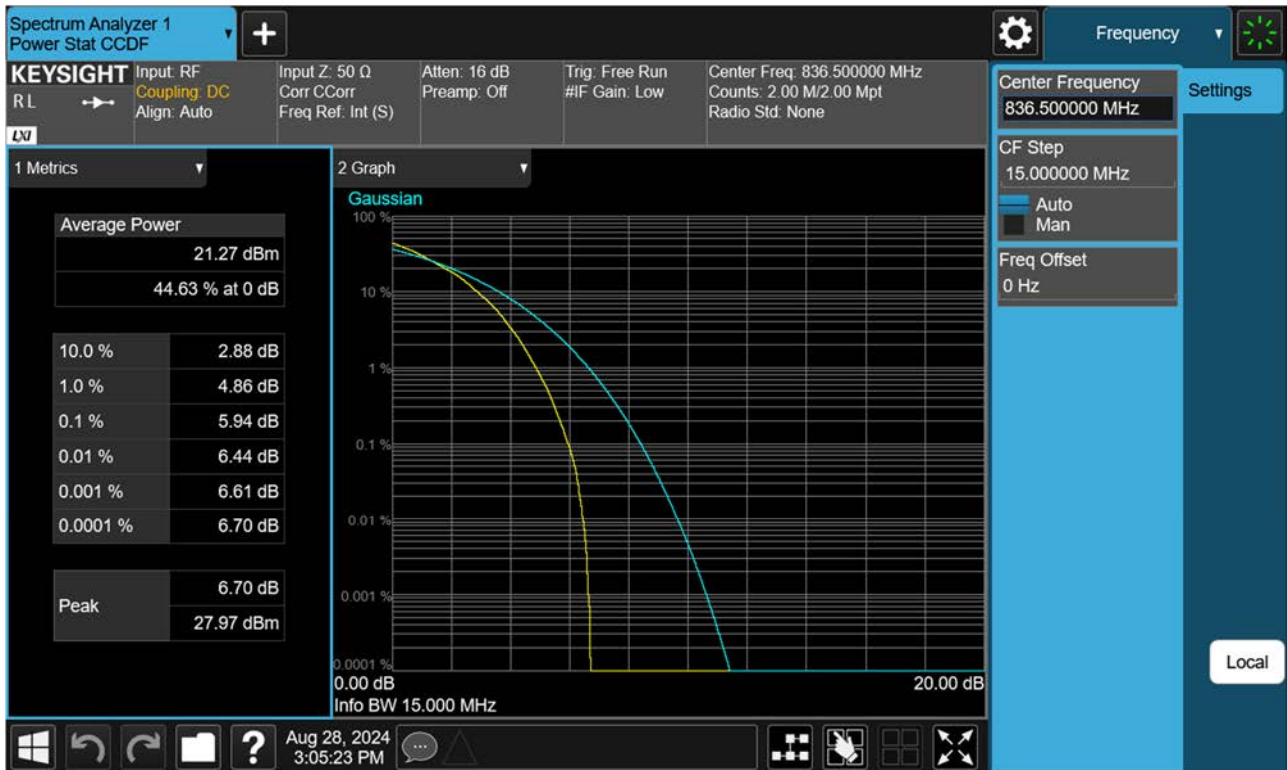
PAR Plot (15 M BW Ch.167300 QPSK RB 75_0)



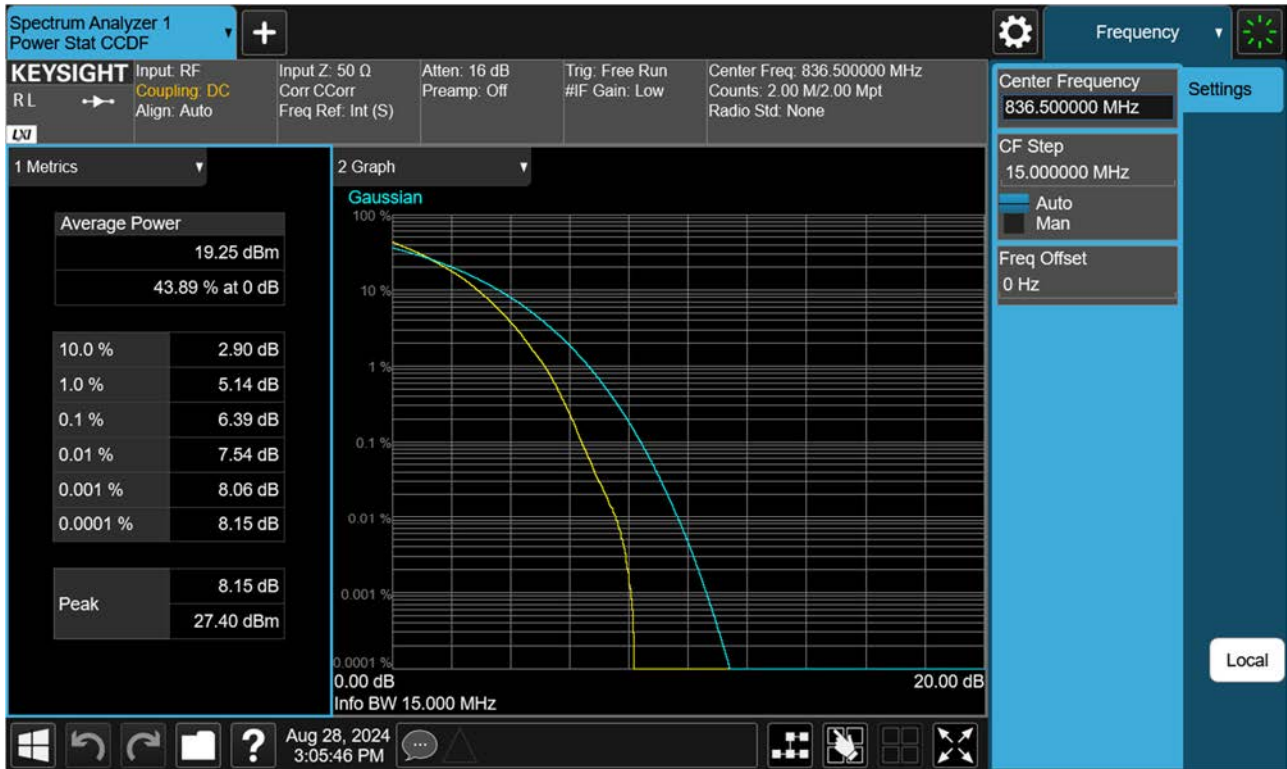
PAR Plot (15 M BW Ch.167300 16QAM RB 75_0)



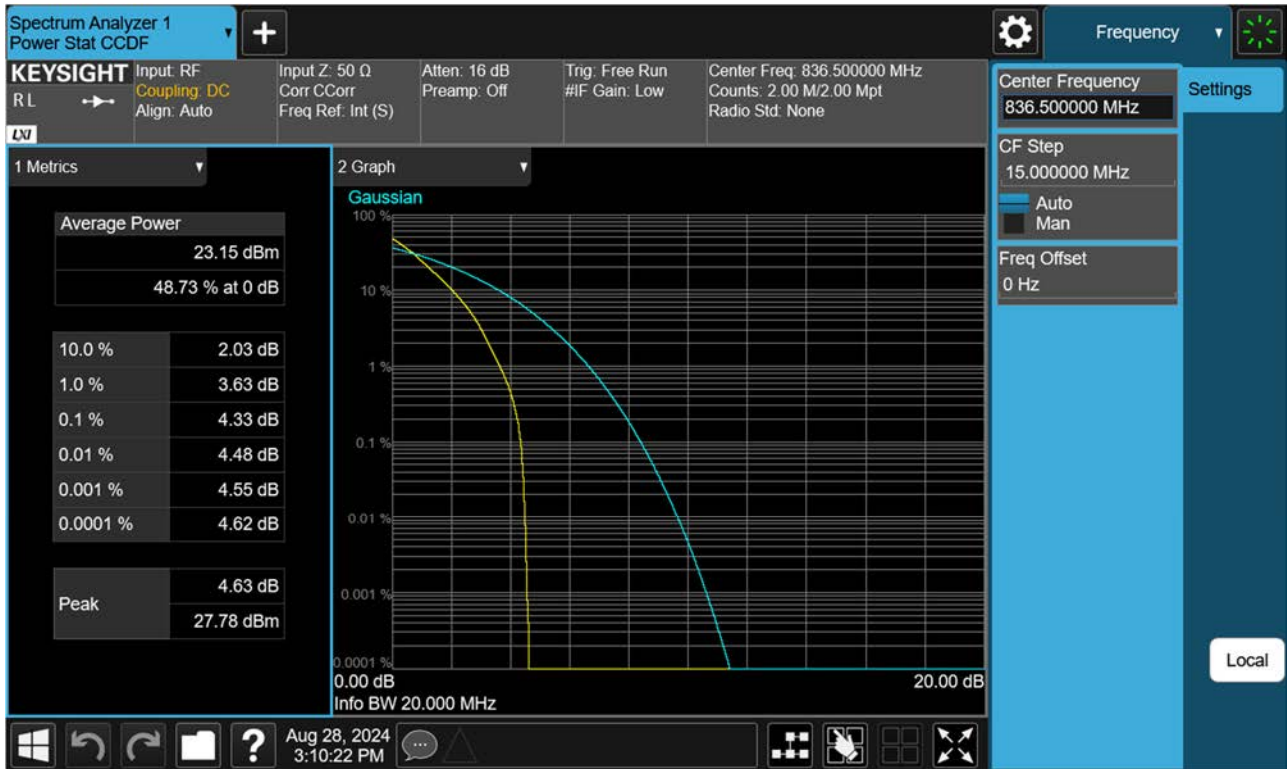
PAR Plot (15 M BW Ch.167300 64QAM RB 75_0)



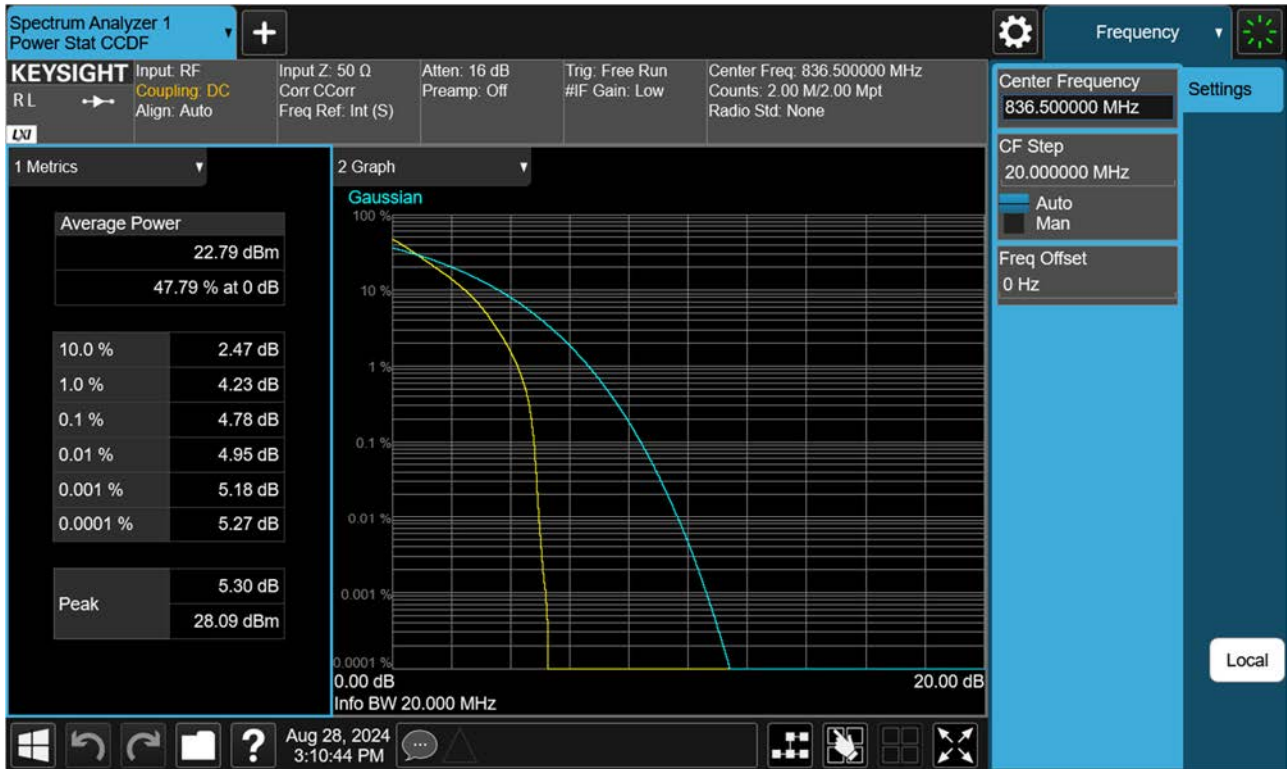
PAR Plot (15 M BW Ch.167300 256QAM RB 75_0)



PAR Plot (20 M BW Ch.167300 BPSK RB 100_0)



PAR Plot (20 M BW Ch.167300 QPSK RB 100_0)



PAR Plot (20 M BW Ch.167300 16QAM RB 100_0)



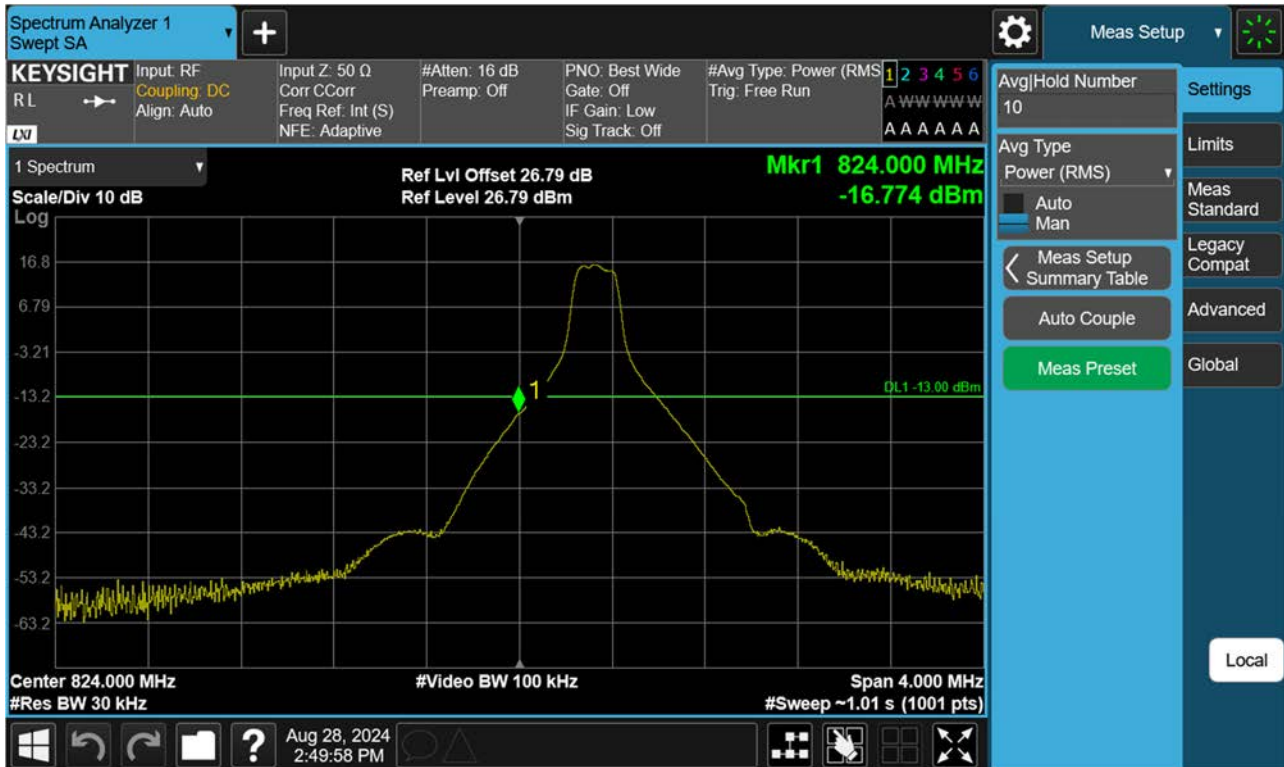
PAR Plot (20 M BW Ch.167300 64QAM RB 100_0)



PAR Plot (20 M BW Ch.167300 256QAM RB 100_0)



Lower Band Edge Plot (5 M BW Ch.165300 BPSK_RB 1_Offset 0)



Lower Band Edge Plot (5 M BW Ch.165300 BPSK_RB 25_Offset 0)



Lower Extended Band Edge Plot (5 M BW Ch.165300 BPSK_RB 25_0)



Lower Band Edge Plot (10 M BW Ch.165800 BPSK_RB 1_Offset 0)



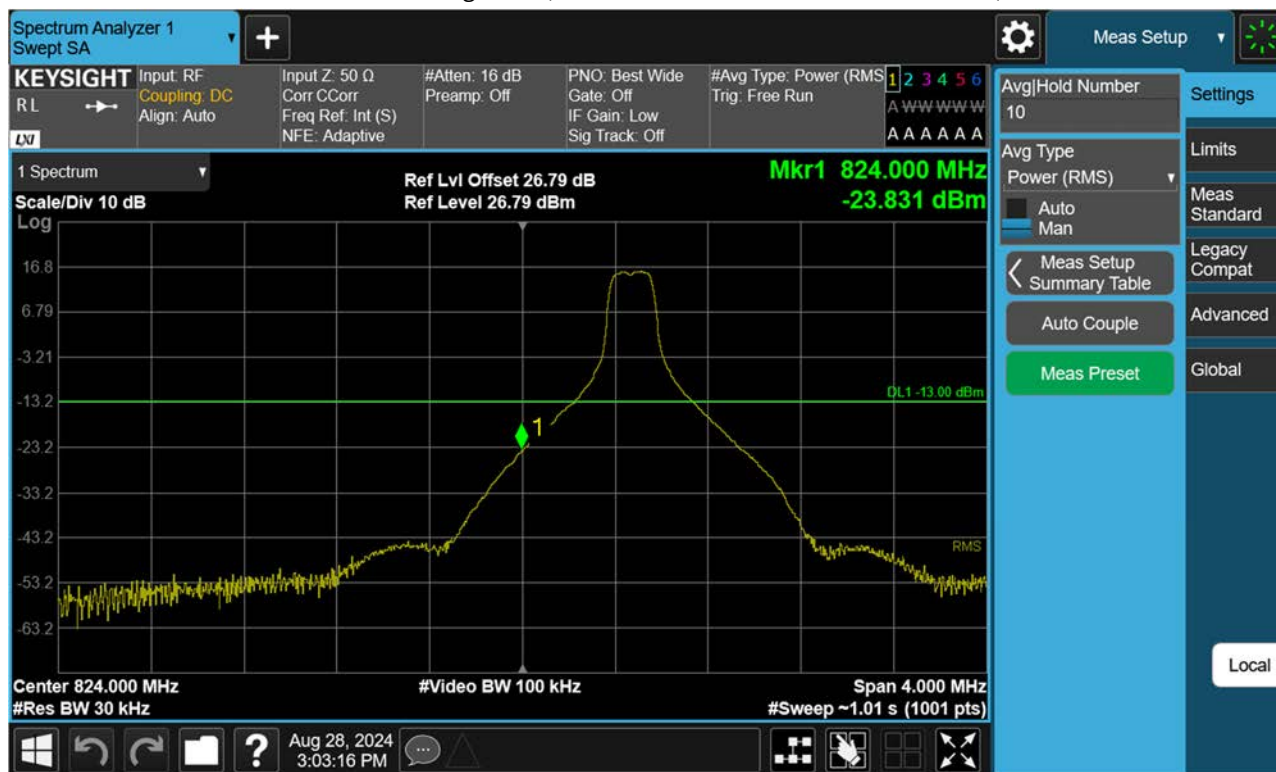
Lower Band Edge Plot (10 M BW Ch.165800 BPSK_RB 50_Offset 0)



Lower Extended Band Edge Plot (10 M BW Ch.165800 BPSK_RB 50_0)



Lower Band Edge Plot (15 M BW Ch.166300 BPSK_RB 1_Offset 0)



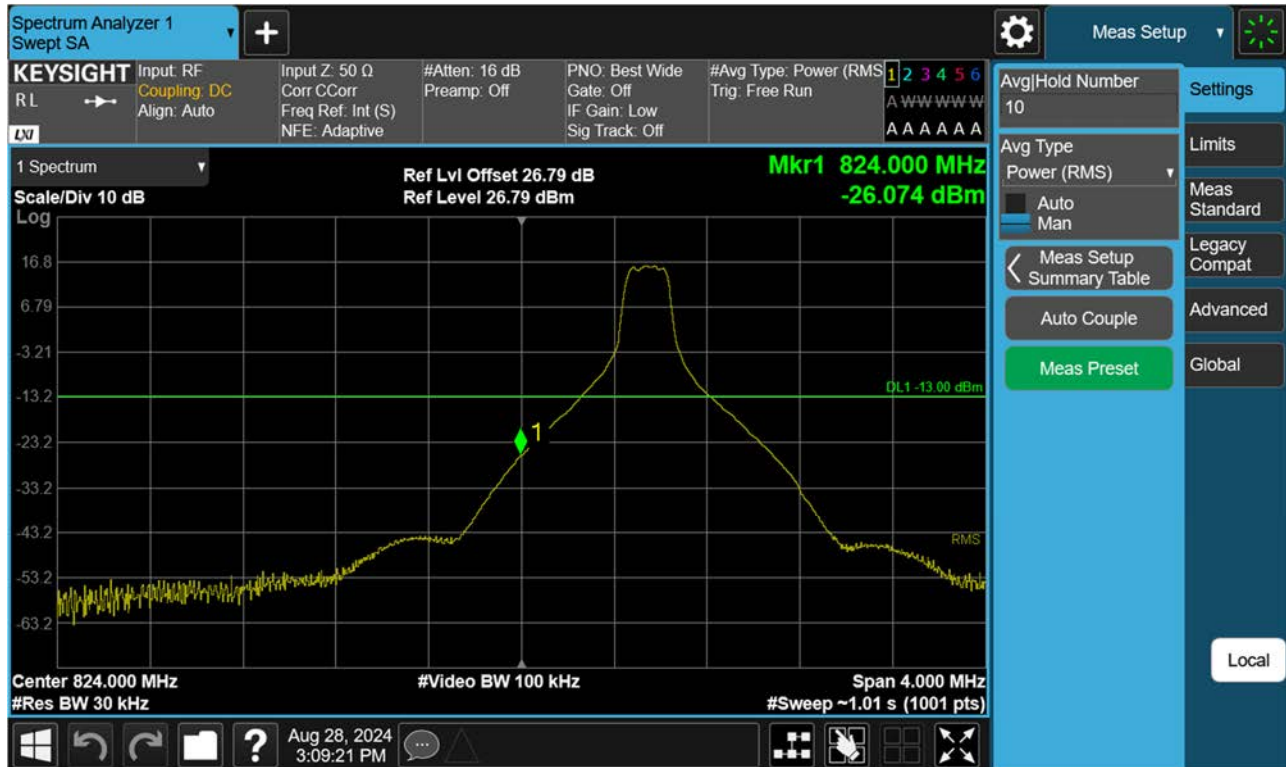
Lower Band Edge Plot (15 M BW Ch.166300 BPSK_RB 75_Offset 0)



Lower Extended Band Edge Plot (15 M BW Ch.166300 BPSK_RB 75_0)



Lower Band Edge Plot (20 M BW Ch.166800 BPSK_RB 1_Offset 0)



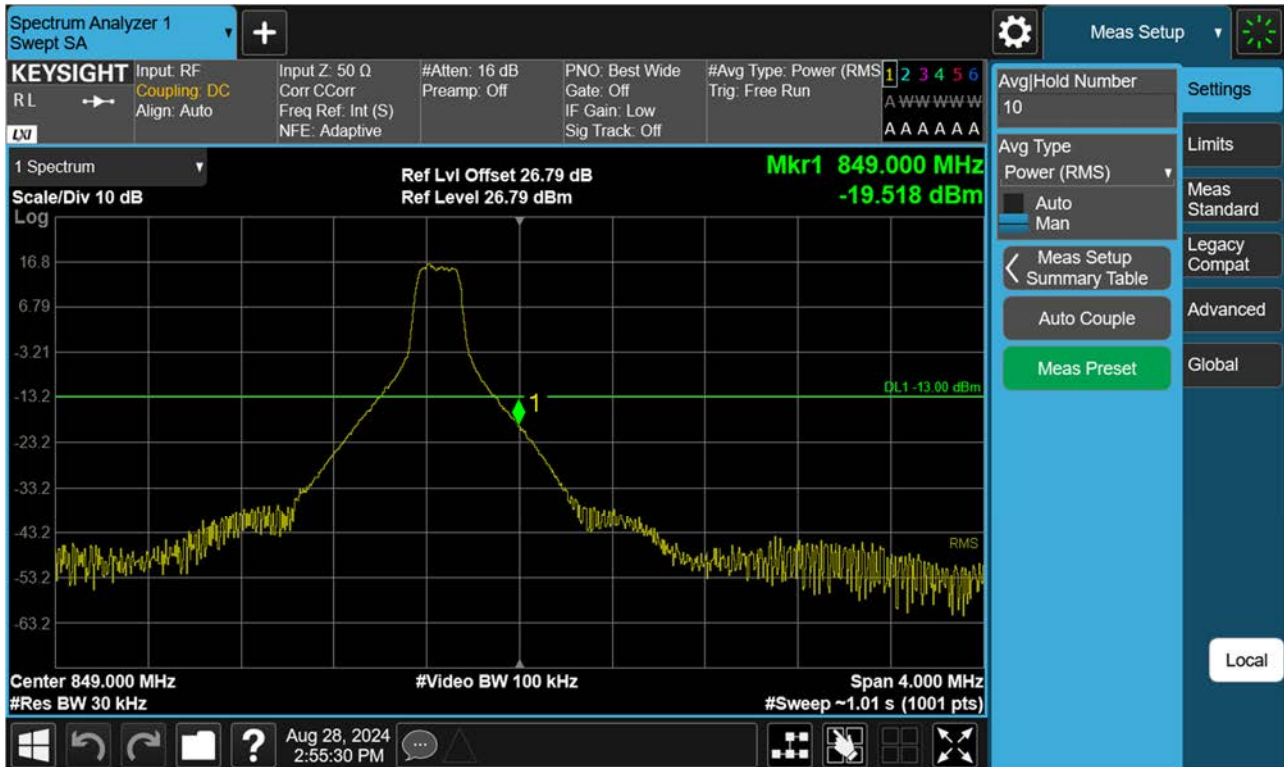
Lower Band Edge Plot (20 M BW Ch.166800 BPSK_RB 100_Offset 0)



Lower Extended Band Edge Plot (20 M BW Ch.166800 BPSK_RB 100_0)



Upper Band Edge Plot (5 M BW Ch.169300 BPSK_RB 1_Offset 24)



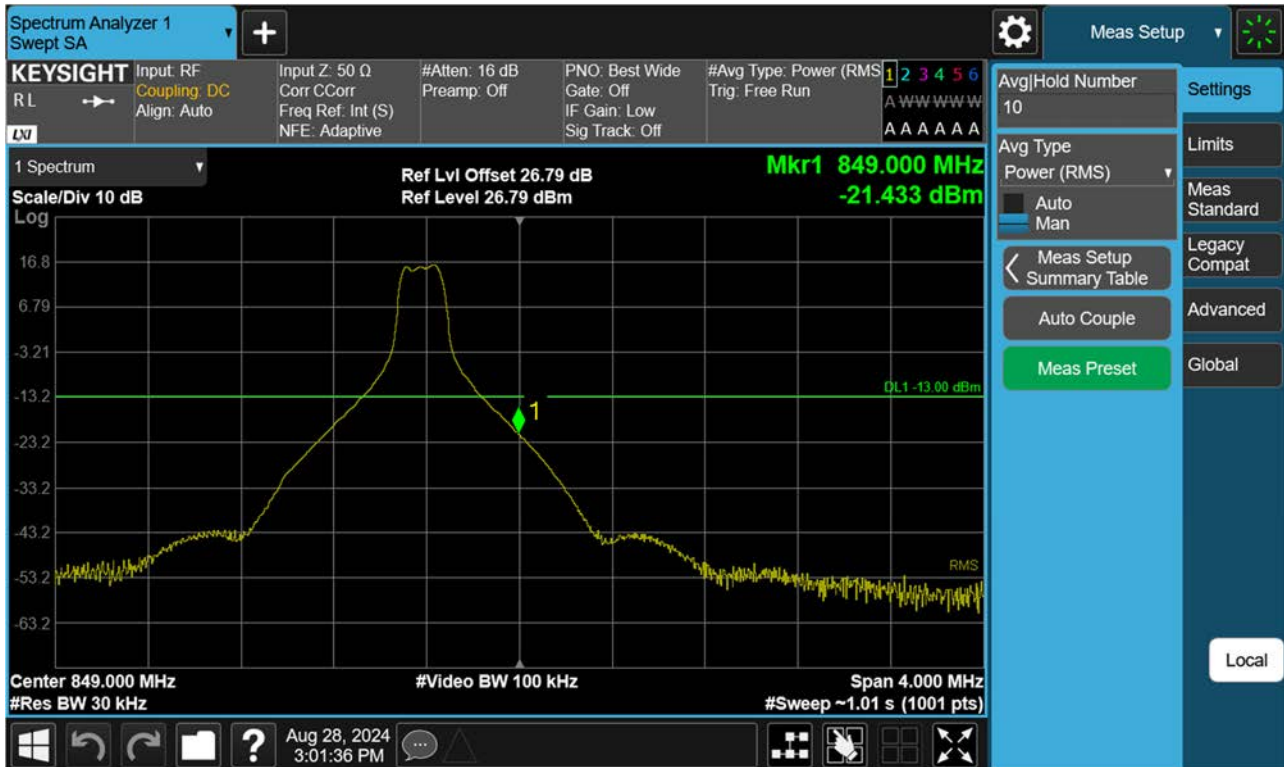
Upper Band Edge Plot (5 M BW Ch.169300 BPSK_RB 25_Offset 0)



Upper Extended Band Edge Plot (5 M BW Ch.169300 BPSK_RB 25_0)



Upper Band Edge Plot (10 M BW Ch.168800 BPSK_RB 1_Offset 49)



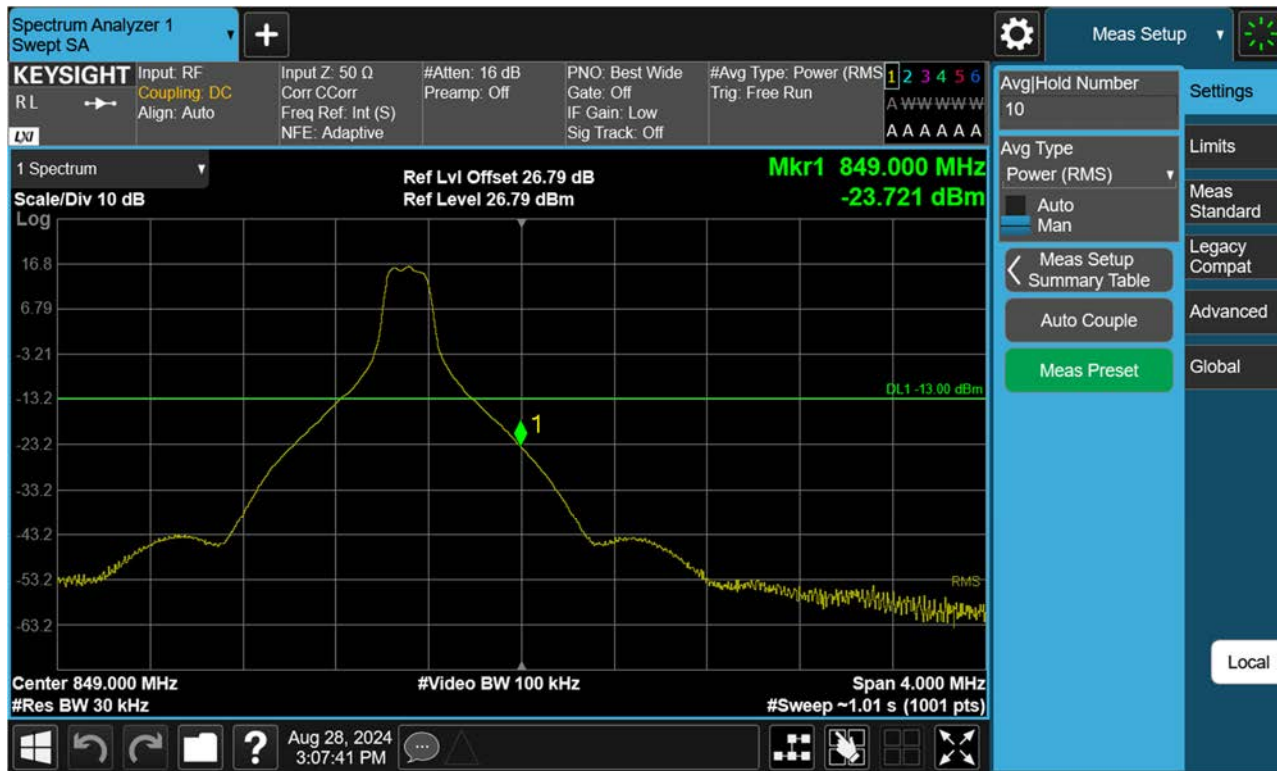
Upper Band Edge Plot (10 M BW Ch.168800 BPSK_RB 50_Offset 0)



Upper Extended Band Edge Plot (10 M BW Ch.168800 BPSK_RB 50_0)



Upper Band Edge Plot (15 M BW Ch.168300 BPSK_RB 1_Offset 74)



Upper Band Edge Plot (15 M BW Ch.168300 BPSK_RB 75_Offset 0)



Upper Extended Band Edge Plot (15 M BW Ch.168300 BPSK_RB 75_0)

