

FCC Sub6 REPORT

Certification

Applicant Name:
SAMSUNG Electronics Co., Ltd.

Date of Issue:
June 15, 2021

Address:
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Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

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Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA

Report No.: HCT-RF-2105-FC010-R1

FCC ID: A3LSMG990U

APPLICANT: SAMSUNG Electronics Co., Ltd.

Model(s): SM-G990U
 Additional Model(s): SM-G990U1/DS, SM-G990U1
 EUT Type: Mobile Phone
 FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)
 FCC Rule Part(s): §27, §2

Mode (MHz)	Tx Frequency (MHz)	Emission Designator	Modulation	EIRP	
				Max. Power (W)	Max. Power (dBm)
Sub6 n66 (5)	1712.5 – 1777.5	4M51G7D	PI/2 BPSK	0.170	22.30
		4M50G7D	QPSK	0.166	22.19
		4M51W7D	16QAM	0.138	21.39
		4M49W7D	64QAM	0.087	19.41
		4M49W7D	256QAM	0.056	17.51
Sub6 n66 (10)	1715.0 – 1775.0	8M97G7D	PI/2 BPSK	0.162	22.09
		8M95G7D	QPSK	0.160	22.05
		8M94W7D	16QAM	0.130	21.14
		8M97W7D	64QAM	0.083	19.21
		8M97W7D	256QAM	0.054	17.33
Sub6 n66 (15)	1717.5 – 1772.5	13M5G7D	PI/2 BPSK	0.167	22.24
		13M5G7D	QPSK	0.164	22.15
		13M5W7D	16QAM	0.136	21.35
		13M5W7D	64QAM	0.087	19.38
		13M5W7D	256QAM	0.055	17.39
Sub6 n66 (20)	1720.0 – 1770.0	17M9G7D	PI/2 BPSK	0.164	22.15
		17M9G7D	QPSK	0.163	22.14
		17M9W7D	16QAM	0.134	21.26
		17M9W7D	64QAM	0.089	19.49
		17M8W7D	256QAM	0.056	17.45
Sub6 n66 (30)	1725.0 – 1765.0	28M6G7D	PI/2 BPSK	0.178	22.50
		28M7G7D	QPSK	0.172	22.35
		28M6W7D	16QAM	0.147	21.68
		28M5W7D	64QAM	0.093	19.70
		28M6W7D	256QAM	0.058	17.62
Sub6 n66 (40)	1730.0 – 1760.0	38M5G7D	PI/2 BPSK	0.168	22.25
		38M5G7D	QPSK	0.164	22.16
		38M6W7D	16QAM	0.136	21.34
		38M5W7D	64QAM	0.092	19.63
		38M6W7D	256QAM	0.055	17.43

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)

Report No.: HCT-RF-2105-FC010-R1

REVIEWED BY



Report prepared by : Jung Ki Lim
Engineer of Telecommunication Testing Center

Report approved by : Jong Seok Lee
Manager of Telecommunication Testing Center

This test results were applied only to the test methods required by the standard.

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

The above Test Report is the accredited test result by (KS Q) ISO/IEC 17025 and KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA. (HCT Accreditation No.: KT197)

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Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2105-FC010	May 26, 2021	- First Approval Report
HCT-RF-2105-FC010-R1	June 15, 2021	- Revised the Additional model(s). (SM-G990U1 added)

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.

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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:	A3LSMG990U
Application Type:	Certification
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part(s):	§27, §2
EUT Type:	Mobile Phone
Model(s):	SM-G990U
Additional Model(s):	SM-G990U1/DS, SM-G990U1
SCS(kHz):	15
Bandwidth(MHz):	5, 10, 15, 20, 30, 40
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:	1712.5 MHz – 1777.5 MHz (Sub6 n66(5 MHz)) 1715.0 MHz – 1775.0 MHz (Sub6 n66(10 MHz)) 1717.5 MHz – 1772.5 MHz (Sub6 n66(15 MHz)) 1720.0 MHz – 1770.0 MHz (Sub6 n66(20 MHz)) 1725.0 MHz – 1765.0 MHz (Sub6 n66(30 MHz)) 1730.0 MHz – 1760.0 MHz (Sub6 n66(40 MHz))
Date(s) of Tests:	April 13, 2021 ~ May 25, 2021
Serial number:	Radiated: R3CR315YMXB Conducted: R3CR3117F6L

2. INTRODUCTION

2.1. DESCRIPTION OF EUT

The EUT was a Mobile Phone with GSM/GPRS/EGPRS/UMTS, CDMA(BC0, 1, 10) and LTE, Sub6.

It also supports IEEE 802.11 a/b/g/n/ac/ax (HT20/40/80), Bluetooth, BT LE, NFC, WPT, mmWave(n260/261).

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, 17383, Rep. 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
Conducted Output Power	- N/A (See SAR Report)
Peak- to- Average Ratio	- KDB 971168 D01 v03r01 – Section 5.7 - ANSI C63.26-2015 – Section 5.2.3.4 - ANSI C63.26-2015 – Section 5.2.6(only GSM)
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 1MHz
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 1GHz, 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;

$$P_{d(dBm)} = P_{g(dBm)} - \text{cable loss (dB)} + \text{antenna gain (dB)}$$

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 = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
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 1GHz, 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;

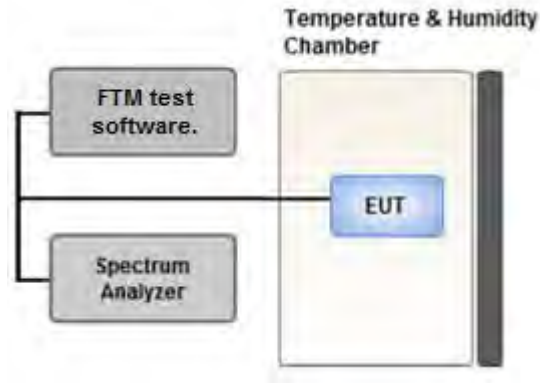
$$\text{Result}_{(\text{dBm})} = P_{g(\text{dBm})} - \text{cable loss}_{(\text{dB})} + \text{antenna gain}_{(\text{dBi})}$$

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

If the fundamental frequency is below 1GHz, 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%.

② Alternate Procedure for PAPR

Use one of the procedures presented in 5.2(ANSI C63.26-2015) to measure the total peak power and record as P_{Pk} .

Use one of the applicable procedures presented 5.2(ANSI C63.26-2015) to measure the total average power and record as P_{Avg} . Determine the P.A.R. from:

$$P.A.R_{(dB)} = P_{Pk (dBm)} - P_{Avg (dBm)} \quad (P_{Avg} = \text{Average Power} + \text{Duty cycle Factor})$$

Test Settings(Peak Power)

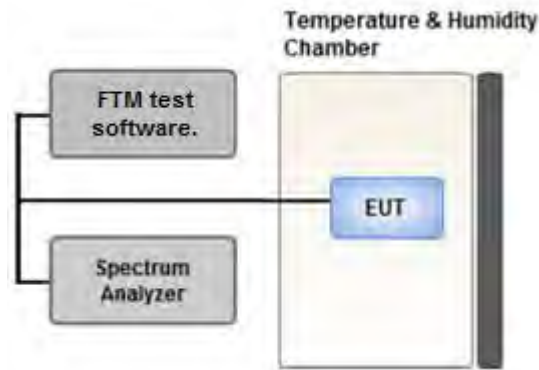
The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW $\geq 3 \times$ RBW.

1. Set the RBW \geq OBW.
2. Set VBW $\geq 3 \times$ RBW.
3. Set span $\geq 2 \times$ OBW.
4. Sweep time $\geq 10 \times$ (number of points in sweep) \times (transmission symbol period).
5. Detector = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the peak amplitude level.

Test Settings(Average Power)

1. Set span to $2 \times$ to $3 \times$ the OBW.
2. Set RBW \geq OBW.
3. Set VBW $\geq 3 \times$ RBW.
4. Set number of measurement points in sweep $\geq 2 \times$ span / RBW.
5. Sweep time:
Set $\geq [10 \times (\text{number of points in sweep}) \times (\text{transmission period})]$ for single sweep (automation-compatible) measurement. The transmission period is the (on + off) time.
6. Detector = power averaging (rms).
7. Set sweep trigger to "free run."
8. 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 the on and off period of the transmitter, 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.)
9. Use the peak marker function to determine the maximum amplitude level.
10. Add $[10 \log (1/\text{duty cycle})]$ to the measured maximum power level to compute the average power during continuous transmission. For example, add $[10 \log (1/0.25)] = 6 \text{ dB}$ if the duty cycle is a constant 25%.

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.

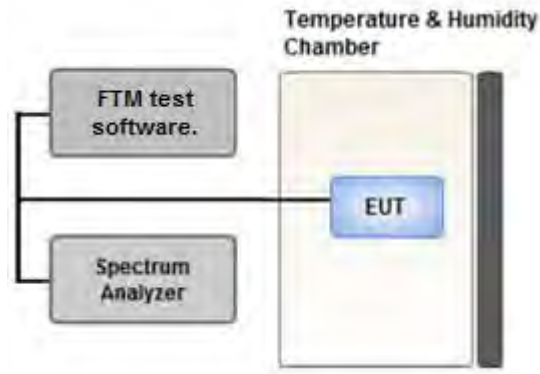
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

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 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW \geq 3 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.

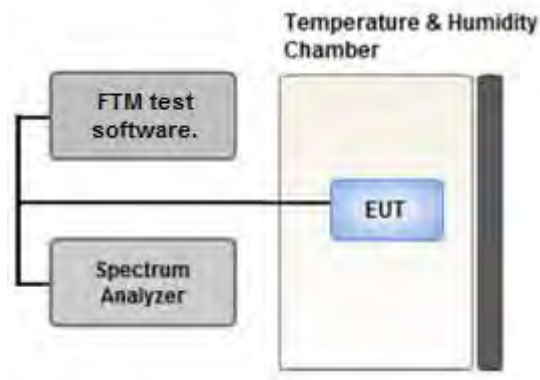
All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

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

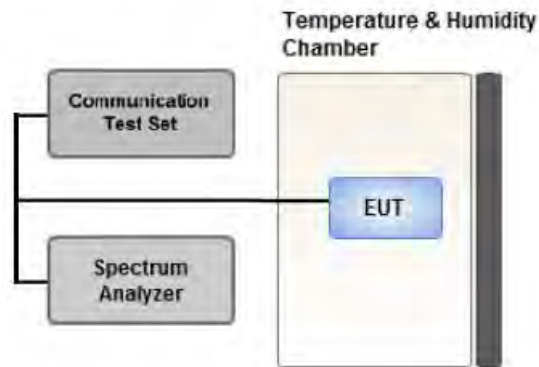
Test Notes

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.

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 $+50^{\circ}\text{C}$ 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 $+50^{\circ}\text{C}$. 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, NSA
Worst case: NSA
- Radiated Spurious emissions are measured while operating in EN-DC mode with Sub 6 NR carrier as well as an LTE carrier (anchor).
All EN-DC mode of operation were investigated and the worst case configuration results are reported.
(Worst case: 12A-n66A)
- All RB sizes, offsets of operation were investigated and the worst case configuration results are reported.
Please refer to the table below.
- SM-G990U & additional models were tested and the worst case results are reported.
(Worst case : SM-G990U)

[Worst case]

Test Description	Modulation	RB size	RB offset	Axis
Effective Isotropic Radiated Power	PI/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM	1	1	Z
Radiated Spurious and Harmonic Emissions	QPSK	1	1	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, NSA

Worst case: NSA

- All RB sizes, offsets of operation were investigated and the worst case configuration results are reported.

Please refer to the table below.

- SM-G990U & additional models were tested and the worst case results are reported.

(Worst case : SM-G990U)

[Worst case]

Test Description	Modulation	Bandwidth (MHz)	Frequency	RB size	RB offset
Occupied Bandwidth, Peak-To-Average Ratio	PI/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM	5, 10, 15, 20, 30, 40	Mid	Full RB	0
Band Edge	PI/2 BPSK	5	Low	1	0
			High	1	24
		10	Low	1	0
			High	1	51
		15	Low	1	0
			High	1	78
		20	Low	1	0
			High	1	105
		30	Low	1	0
			High	1	159
		40	Low	1	0
			High	1	215
				5, 10, 15, 20, 30, 40	Low, High
Spurious and Harmonic Emissions at Antenna Terminal	PI/2 BPSK	5, 10, 15, 20, 30, 40	Low, Mid, High	1	1

4. LIST OF TEST EQUIPMENT

Manufacture	Model/ Equipment	Serial Number	Calibration Date	Calibration Interval	Calibration Due
Schwarzbeck	UHAP / Precision Dipole Antenna	01273	05/30/2020	Biennial	05/30/2022
Schwarzbeck	UHAP / Precision Dipole Antenna	01274	05/30/2020	Biennial	05/30/2022
Schwarzbeck	BBHA 9120D/ Horn Antenna(1~18GHz)	02289	05/08/2020	Biennial	05/08/2022
Schwarzbeck	BBHA 9120D/ Horn Antenna(1~18GHz)	9120D-1299	05/04/2020	Biennial	05/04/2022
Schwarzbeck	BBHA 9170/ Horn Antenna(15~40GHz)	BBHA9170342	10/13/2020	Biennial	10/13/2022
Schwarzbeck	BBHA 9170/ Horn Antenna(15~40GHz)	BBHA9170124	02/11/2020	Biennial	02/11/2022
Rohde & Schwarz	FMZB1513/ Loop Antenna(9kHz~30MHz)	1513-175	05/18/2020	Biennial	05/18/2022
Schwarzbeck	VULB9160/ Bilog Antenna	3150	03/03/2021	Biennial	03/03/2023
Schwarzbeck	VULB9160/ Hybrid Antenna	760	02/22/2021	Biennial	02/22/2023
ESPEC	SU-642 / Chamber	93008124	03/15/2021	Annual	03/15/2022
Agilent	N9020A/Signal Analyzer(10Hz~26.5GHz)	MY50200093	11/17/2020	Annual	11/17/2021
Hewlett Packard	8493C/ATTENUATOR(20dB)	17280	06/04/2020	Annual	06/04/2021
REOHDE & SCHWARZ	FSV40/Spectrum Analyzer(10Hz~40GHz)	101436	03/02/2021	Annual	03/02/2022
Agilent	8960 (E5515C)/ Base Station	MY48360800	08/26/2020	Annual	08/26/2021
Wainwright Instruments	WHKX10-900-1000-15000-40SS/ High Pass Filter	5	07/13/2020	Annual	07/13/2021
Wainwright Instruments	WHKX10-2700-3000-18000-40SS/ High Pass Filter	145	09/03/2020	Annual	09/03/2021
Hewlett Packard	11667B / Power Splitter(DC~26.5 GHz)	11275	04/07/2021	Annual	04/07/2022
CERNEX	LOW NOISE AMP (100MHz ~ 18GHz)	26822	06/04/2020	Annual	06/04/2021
CERNEX	CBL18265035 / Power Amplifier	22966	12/04/2020	Annual	12/04/2021
CERNEX	CBL26405040 / Power Amplifier	25956	03/23/2021	Annual	03/23/2022
Hewlett Packard	E3632A/DC Power Supply	MY40004427	09/16/2020	Annual	09/16/2021
Anritsu Corp.	MT8821C/Wideband Radio Communication Tester	6262116770	07/22/2020	Annual	07/22/2021
Anritsu Corp.	MT8820C/Wideband Radio Communication Tester	6201026545	01/07/2021	Annual	01/07/2022
REOHDE & SCHWARZ	SMB100A/ SIGNAL GENERATOR (100kHz~40GHz)	177633	07/13/2020	Annual	07/13/2021
KEYSIGHT	N9030B / Signal Analyzer(5Hz~40.0GHz)	MY55480167	06/04/2020	Annual	06/04/2021
HCT CO., LTD.,	FCC LTE Mobile Conducted RF Automation Test Software	-	-	-	-

Note:

1. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.
2. 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)	1.82
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70
Radiated Disturbance (18 GHz ~ 40 GHz)	5.05

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, §27.53(h)	< 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	§27.50(d)(5)	< 13 dB	PASS
Frequency stability / variation of ambient temperature	§2.1055, §27.54	Emission must remain in band	PASS

Note:

1. See SAR Report
2. All conducted tests were tested using 5G Wireless Tester.

6.2 Test Condition : Radiated Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Equivalent Isotropic Radiated Power	§27.50(d)(4)	< 1 Watts max. EIRP	PASS
Radiated Spurious and Harmonic Emissions	§2.1053, §27.53(h)	< 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

ERP = Substitute LEVEL(dBm) + Ant. Gain – 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
349000	1,732.50	-15.75	18.45	9.90	1.76	H	0.456	26.59

EIRP = Substitute LEVEL(dBm) + Ant. Gain – 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)

PSK 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

8.1 EQUIVALENT ISOTROPIC RADIATED POWER

Freq (MHz)	Mod/ Bandwidth [SCS (kHz)]	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1712.5	Sub6 n66/ 5 MHz [15 kHz]	PI/2 BPSK	-18.14	13.76	9.76	1.87	V	< 1.00	0.146	21.65
		QPSK	-18.25	13.65	9.76	1.87	V		0.143	21.54
		16-QAM	-19.09	12.81	9.76	1.87	V		0.117	20.70
		64-QAM	-21.06	10.84	9.76	1.87	V		0.075	18.73
		256-QAM	-23.26	8.64	9.76	1.87	V		0.045	16.53
1745.0		PI/2 BPSK	-17.79	14.03	9.97	1.88	V		0.163	22.13
		QPSK	-17.81	14.01	9.97	1.88	V		0.162	22.11
		16-QAM	-18.67	13.15	9.97	1.88	V		0.133	21.25
		64-QAM	-20.63	11.19	9.97	1.88	V		0.085	19.29
		256-QAM	-22.42	9.40	9.97	1.88	V		0.056	17.50
1777.5	PI/2 BPSK	-17.68	14.10	10.12	1.92	V	0.170	22.30		
	QPSK	-17.79	13.99	10.12	1.92	V	0.166	22.19		
	16-QAM	-18.59	13.19	10.12	1.92	V	0.138	21.39		
	64-QAM	-20.57	11.21	10.12	1.92	V	0.087	19.41		
	256-QAM	-22.47	9.31	10.12	1.92	V	0.056	17.51		

Freq (MHz)	Mod/ Bandwidth [SCS (kHz)]	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1715.0	Sub6 n66/ 10 MHz [15 kHz]	PI/2 BPSK	-18.70	13.17	9.79	1.87	V	< 1.00	0.129	21.09
		QPSK	-18.80	13.07	9.79	1.87	V		0.126	20.99
		16-QAM	-19.56	12.31	9.79	1.87	V		0.105	20.23
		64-QAM	-21.57	10.30	9.79	1.87	V		0.066	18.22
		256-QAM	-23.32	8.55	9.79	1.87	V		0.044	16.47
1745.0		PI/2 BPSK	-17.83	13.99	9.97	1.88	V		0.162	22.09
		QPSK	-17.87	13.95	9.97	1.88	V		0.160	22.05
		16-QAM	-18.78	13.04	9.97	1.88	V		0.130	21.14
		64-QAM	-20.71	11.11	9.97	1.88	V		0.083	19.21
		256-QAM	-22.59	9.23	9.97	1.88	V		0.054	17.33
1775.0	PI/2 BPSK	-17.97	13.82	10.10	1.92	V	0.159	22.01		
	QPSK	-18.08	13.71	10.10	1.92	V	0.155	21.90		
	16-QAM	-18.86	12.93	10.10	1.92	V	0.129	21.12		
	64-QAM	-20.90	10.89	10.10	1.92	V	0.081	19.08		
	256-QAM	-22.71	9.08	10.10	1.92	V	0.053	17.27		

Freq (MHz)	Mod/ Bandwidth [SCS (kHz)]	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1717.5	Sub6 n66/ 15 MHz [15 kHz]	PI/2 BPSK	-18.27	13.57	9.82	1.87	V	< 1.00	0.142	21.52
		QPSK	-18.35	13.49	9.82	1.87	V		0.139	21.44
		16-QAM	-19.06	12.78	9.82	1.87	V		0.118	20.73
		64-QAM	-21.00	10.84	9.82	1.87	V		0.076	18.79
		256-QAM	-23.35	8.49	9.82	1.87	V		0.044	16.44
1745.0		PI/2 BPSK	-17.68	14.14	9.97	1.88	V		0.167	22.24
		QPSK	-17.77	14.05	9.97	1.88	V		0.164	22.15
		16-QAM	-18.61	13.21	9.97	1.88	V		0.135	21.31
		64-QAM	-20.57	11.25	9.97	1.88	V		0.086	19.35
		256-QAM	-22.56	9.26	9.97	1.88	V		0.054	17.36
1772.5	PI/2 BPSK	-17.83	13.97	10.08	1.91	V	0.164	22.14		
	QPSK	-17.85	13.95	10.08	1.91	V	0.163	22.12		
	16-QAM	-18.62	13.18	10.08	1.91	V	0.136	21.35		
	64-QAM	-20.59	11.21	10.08	1.91	V	0.087	19.38		
	256-QAM	-22.58	9.22	10.08	1.91	V	0.055	17.39		

Freq (MHz)	Mod/ Bandwidth [SCS (kHz)]	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1720.0	Sub6 n66/ 20 MHz [15 kHz]	PI/2 BPSK	-18.25	13.58	9.82	1.87	V	< 1.00	0.142	21.53
		QPSK	-18.26	13.57	9.82	1.87	V		0.142	21.52
		16-QAM	-19.05	12.78	9.82	1.87	V		0.118	20.73
		64-QAM	-21.01	10.82	9.82	1.87	V		0.075	18.77
		256-QAM	-23.27	8.56	9.82	1.87	V		0.045	16.51
1745.0		PI/2 BPSK	-17.77	14.05	9.97	1.88	V		0.164	22.15
		QPSK	-17.78	14.04	9.97	1.88	V		0.163	22.14
		16-QAM	-18.66	13.16	9.97	1.88	V		0.134	21.26
		64-QAM	-20.43	11.39	9.97	1.88	V		0.089	19.49
		256-QAM	-22.47	9.35	9.97	1.88	V		0.056	17.45
1770.0	PI/2 BPSK	-17.96	13.91	10.08	1.91	V	0.161	22.08		
	QPSK	-17.97	13.90	10.08	1.91	V	0.161	22.07		
	16-QAM	-18.82	13.05	10.08	1.91	V	0.132	21.22		
	64-QAM	-20.56	11.31	10.08	1.91	V	0.089	19.48		
	256-QAM	-22.61	9.26	10.08	1.91	V	0.055	17.43		

Freq (MHz)	Mod/ Bandwidth [SCS (kHz)]	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1725.0	Sub6 n66/ 30 MHz [15 kHz]	PI/2 BPSK	-17.98	13.88	9.85	1.87	V	< 1.00	0.153	21.86
		QPSK	-18.51	13.35	9.85	1.87	V		0.136	21.33
		16-QAM	-19.30	12.56	9.85	1.87	V		0.113	20.54
		64-QAM	-21.35	10.51	9.85	1.87	V		0.071	18.49
		256-QAM	-23.07	8.79	9.85	1.87	V		0.048	16.77
1745.0		PI/2 BPSK	-17.63	14.19	9.97	1.88	V		0.169	22.29
		QPSK	-17.88	13.94	9.97	1.88	V		0.160	22.04
		16-QAM	-18.64	13.18	9.97	1.88	V		0.134	21.28
		64-QAM	-20.63	11.19	9.97	1.88	V		0.085	19.29
		256-QAM	-22.38	9.44	9.97	1.88	V		0.057	17.54
1765.0	PI/2 BPSK	-17.50	14.34	10.06	1.90	V	0.178	22.50		
	QPSK	-17.65	14.19	10.06	1.90	V	0.172	22.35		
	16-QAM	-18.32	13.52	10.06	1.90	V	0.147	21.68		
	64-QAM	-20.30	11.54	10.06	1.90	V	0.093	19.70		
	256-QAM	-22.38	9.46	10.06	1.90	V	0.058	17.62		

Freq (MHz)	Mod/ Bandwidth [SCS (kHz)]	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
									W	W
1730.0	Sub6 n66/ 40 MHz [15 kHz]	PI/2 BPSK	-18.91	12.98	9.88	1.87	V	< 1.00	0.126	20.99
		QPSK	-19.03	12.86	9.88	1.87	V		0.122	20.87
		16-QAM	-19.69	12.20	9.88	1.87	V		0.105	20.21
		64-QAM	-21.43	10.46	9.88	1.87	V		0.070	18.47
		256-QAM	-23.39	8.50	9.88	1.87	V		0.045	16.51
1745.0		PI/2 BPSK	-18.24	13.58	9.97	1.88	V		0.147	21.68
		QPSK	-18.31	13.51	9.97	1.88	V		0.145	21.61
		16-QAM	-19.05	12.77	9.97	1.88	V		0.122	20.87
		64-QAM	-20.87	10.95	9.97	1.88	V		0.080	19.05
		256-QAM	-22.71	9.11	9.97	1.88	V		0.053	17.21
1760.0	PI/2 BPSK	-17.71	14.10	10.04	1.89	V	0.168	22.25		
	QPSK	-17.80	14.01	10.04	1.89	V	0.164	22.16		
	16-QAM	-18.62	13.19	10.04	1.89	V	0.136	21.34		
	64-QAM	-20.33	11.48	10.04	1.89	V	0.092	19.63		
	256-QAM	-22.53	9.28	10.04	1.89	V	0.055	17.43		

8.2 RADIATED SPURIOUS EMISSIONS

- ▣ NR Band: N66
- ▣ LTE Band(Anchor): B12
- ▣ Bandwidth: 30 MHz
- ▣ Modulation: PI/2 BPSK
- ▣ Distance: 3 meters
- ▣ SCS: 15 kHz

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit (dBm)
345000 (1725.0)	3 450.00	-58.64	11.30	-67.24	2.70	V	-58.64	-13.00
	5 175.00	-60.66	11.45	-68.73	3.38	V	-60.66	-13.00
	6 900.00	-62.12	11.10	-69.28	3.94	V	-62.12	-13.00
	8 625.00	-61.30	10.95	-67.80	4.45	V	-61.30	-13.00
	10 350.00	-63.45	11.80	-70.32	4.93	V	-63.45	-13.00
349000 (1745.0)	3 490.00	-59.45	11.46	-68.17	2.74	V	-59.45	-13.00
	5 235.00	-57.70	11.57	-65.88	3.39	H	-57.70	-13.00
	6 980.00	-61.99	11.16	-69.19	3.96	V	-61.99	-13.00
	8 725.00	-60.44	11.10	-67.06	4.49	V	-60.44	-13.00
	10 470.00	-62.68	11.80	-69.51	4.97	V	-62.68	-13.00
353000 (1765.0)	3 530.00	-57.98	11.62	-66.84	2.76	V	-57.98	-13.00
	5 295.00	-58.93	11.69	-67.22	3.41	V	-58.93	-13.00
	7 060.00	-61.06	11.16	-68.23	3.99	V	-61.06	-13.00
	8 825.00	-60.97	11.05	-67.52	4.51	V	-60.97	-13.00
	10 590.00	-62.22	11.70	-68.98	4.94	V	-62.22	-13.00

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit (dBm)
23095 (707.5)	1,415.00	-54.96	7.61	-62.75	1.69	H	-56.83	-13.00
	2,122.50	-57.02	8.98	-64.08	2.09	H	-57.19	-13.00
	2,830.00	-57.72	10.52	-62.69	2.43	H	-54.60	-13.00

8.3 PEAK-TO-AVERAGE RATIO

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (dB)
Sub6 n66	5 MHz	1745.0	BPSK	25	0	3.83
			QPSK			5.33
			16-QAM			6.14
			64-QAM			6.52
			256-QAM			6.45
	10 MHz		BPSK	50		3.89
			QPSK			5.36
			16-QAM			6.27
			64-QAM			6.60
			256-QAM			6.53
	15 MHz		BPSK	75		4.05
			QPSK			5.36
			16-QAM			6.29
			64-QAM			6.42
			256-QAM			6.73
	20 MHz		BPSK	100		3.88
			QPSK			5.27
			16-QAM			6.17
			64-QAM			6.40
			256-QAM			6.59

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (dB)
Sub6 n66	30 MHz	1745.0	BPSK	160	0	3.91
			QPSK			5.42
			16-QAM			6.32
			64-QAM			6.50
			256-QAM			6.67
	40 MHz		BPSK	216		4.16
			QPSK			5.29
			16-QAM			6.17
			64-QAM			6.48
			256-QAM			6.62

Note:

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 73 ~ 102.

8.4 OCCUPIED BANDWIDTH

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
Sub6 n66	5 MHz	1745.0	BPSK	25	0	4.5059
			QPSK			4.5002
			16-QAM			4.5048
			64-QAM			4.4871
			256-QAM			4.4924
	10 MHz		BPSK	50		8.9648
			QPSK			8.9515
			16-QAM			8.9392
			64-QAM			8.9668
			256-QAM			8.9674
	15 MHz		BPSK	75		13.458
			QPSK			13.445
			16-QAM			13.473
			64-QAM			13.476
			256-QAM			13.488
	20 MHz		BPSK	100		17.865
			QPSK			17.909
			16-QAM			17.887
			64-QAM			17.900
			256-QAM			17.832

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
Sub6 n66	30 MHz	1745.0	BPSK	160	0	28.612
			QPSK			28.708
			16-QAM			28.599
			64-QAM			28.509
			256-QAM			28.618
	40 MHz		BPSK	216		38.465
			QPSK			38.518
			16-QAM			38.551
			64-QAM			38.458
			256-QAM			38.564

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 43~ 72.

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 n66	5	1712.5	3.8480	31.103	-65.497	-34.394	-13.00
		1745.0	3.8216	31.103	-65.354	-34.251	
		1777.5	3.8630	31.103	-65.587	-34.484	
	10	1715.0	3.8311	31.103	-65.377	-34.274	
		1745.0	3.8834	31.103	-65.303	-34.200	
		1775.0	3.8485	31.103	-65.394	-34.291	
	15	1717.5	3.9063	31.103	-65.657	-34.554	
		1745.0	3.8375	31.103	-65.392	-34.289	
		1772.5	3.9009	31.103	-65.272	-34.169	
	20	1720.0	3.8460	31.103	-65.521	-34.418	
		1745.0	3.8699	31.103	-65.458	-34.355	
		1770.0	3.8994	31.103	-65.370	-34.267	
	30	1725.0	3.8595	31.103	-65.187	-34.084	
		1745.0	3.8670	31.103	-65.367	-34.264	
		1765.0	3.8954	31.103	-65.513	-34.410	
	40	1730.0	3.1167	31.103	-72.979	-41.876	
		1745.0	3.7488	31.103	-72.117	-41.014	
		1760.0	9.8724	31.715	-72.537	-40.822	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 139 ~ 174.
2. Result (dBm) = Measurement Maximum Data (dBm) + Factor (dB)
3. Factor(dB) = Cable Loss + Attenuator

Frequency Range (GHz)	Factor [dB]
0.03 – 1	27.511
1 – 5	31.103
5 – 10	31.715
10 – 15	32.240
15 – 20	32.613
Above 20(26.5)	33.255

8.6 BAND EDGE

- Plots of the EUT's Band Edge are shown Page 103 ~ 138.

8.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

- ▣ BandWidth: 5 MHz
- ▣ Voltage(100%): 3.880 VDC
- ▣ Batt. Endpoint: 3.650 VDC
- ▣ LIMIT: Emission must remain in band

Test. Frequency (MHz)	Voltage (%)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
1712.5	100%	+20(Ref)	1712 500 009	0.0	0.000 000	0.000
	100%	-30	1712 500 024	14.8	0.000 001	0.009
	100%	-20	1712 500 023	13.4	0.000 001	0.008
	100%	-10	1712 500 025	15.4	0.000 001	0.009
	100%	0	1712 500 016	7.1	0.000 000	0.004
	100%	+10	1712 500 013	3.4	0.000 000	0.002
	100%	+30	1712 500 015	5.5	0.000 000	0.003
	100%	+40	1712 500 019	9.4	0.000 001	0.005
	100%	+50	1712 500 018	8.9	0.000 001	0.005
	Batt. Endpoint	+20	1712 500 022	12.3	0.000 001	0.007
1777.5	100%	+20(Ref)	1777 500 009	0.0	0.000 000	0.000
	100%	-30	1777 500 018	9.3	0.000 001	0.005
	100%	-20	1777 500 022	13.3	0.000 001	0.008
	100%	-10	1777 500 019	10.1	0.000 001	0.006
	100%	0	1777 500 019	10.3	0.000 001	0.006
	100%	+10	1777 500 016	7.3	0.000 000	0.004
	100%	+30	1777 500 020	11.4	0.000 001	0.006
	100%	+40	1777 500 024	14.9	0.000 001	0.008
	100%	+50	1777 500 025	15.8	0.000 001	0.009
	Batt. Endpoint	+20	1777 500 016	6.6	0.000 000	0.004

- ▣ BandWidth: 10 MHz
- ▣ Voltage(100%): 3.880 VDC
- ▣ Batt. Endpoint: 3.650 VDC
- ▣ LIMIT: Emission must remain in band

Test. Frequency (MHz)	Voltage (%)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
1715.0	100%	+20(Ref)	1715 000 015	0.0	0.000 000	0.000
	100%	-30	1715 000 027	11.5	0.000 001	0.007
	100%	-20	1715 000 030	14.1	0.000 001	0.008
	100%	-10	1715 000 032	16.8	0.000 001	0.010
	100%	0	1715 000 024	8.3	0.000 000	0.005
	100%	+10	1715 000 021	5.1	0.000 000	0.003
	100%	+30	1715 000 031	15.9	0.000 001	0.009
	100%	+40	1715 000 020	4.5	0.000 000	0.003
	100%	+50	1715 000 023	7.5	0.000 000	0.004
	Batt. Endpoint	+20	1715 000 019	3.1	0.000 000	0.002
1775.0	100%	+20(Ref)	1775 000 007	0.0	0.000 000	0.000
	100%	-30	1775 000 019	12.6	0.000 001	0.007
	100%	-20	1775 000 021	14.7	0.000 001	0.008
	100%	-10	1775 000 015	8.7	0.000 000	0.005
	100%	0	1775 000 015	8.6	0.000 000	0.005
	100%	+10	1775 000 017	10.5	0.000 001	0.006
	100%	+30	1775 000 020	13.2	0.000 001	0.007
	100%	+40	1775 000 023	16.7	0.000 001	0.009
	100%	+50	1775 000 014	6.8	0.000 000	0.004
	Batt. Endpoint	+20	1775 000 012	5.5	0.000 000	0.003

- ▣ BandWidth: 15 MHz
- ▣ Voltage(100%): 3.880 VDC
- ▣ Batt. Endpoint: 3.650 VDC
- ▣ LIMIT: Emission must remain in band

Test. Frequency (MHz)	Voltage (%)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
1717.5	100%	+20(Ref)	1717 500 010	0.0	0.000 000	0.000
	100%	-30	1717 500 016	5.6	0.000 000	0.003
	100%	-20	1717 500 022	11.7	0.000 001	0.007
	100%	-10	1717 500 020	9.5	0.000 001	0.006
	100%	0	1717 500 017	6.9	0.000 000	0.004
	100%	+10	1717 500 025	15.1	0.000 001	0.009
	100%	+30	1717 500 018	7.6	0.000 000	0.004
	100%	+40	1717 500 026	15.6	0.000 001	0.009
	100%	+50	1717 500 027	16.6	0.000 001	0.010
	Batt. Endpoint	+20	1717 500 024	13.9	0.000 001	0.008
1772.5	100%	+20(Ref)	1772 500 011	0.0	0.000 000	0.000
	100%	-30	1772 500 020	9.7	0.000 001	0.005
	100%	-20	1772 500 016	5.9	0.000 000	0.003
	100%	-10	1772 500 017	6.7	0.000 000	0.004
	100%	0	1772 500 016	5.7	0.000 000	0.003
	100%	+10	1772 500 016	5.4	0.000 000	0.003
	100%	+30	1772 500 017	6.6	0.000 000	0.004
	100%	+40	1772 500 020	9.3	0.000 001	0.005
	100%	+50	1772 500 021	10.7	0.000 001	0.006
	Batt. Endpoint	+20	1772 500 023	12.3	0.000 001	0.007

- ▣ BandWidth: 20 MHz
- ▣ Voltage(100%): 3.880 VDC
- ▣ Batt. Endpoint: 3.650 VDC
- ▣ LIMIT: Emission must remain in band

Test. Frequency (MHz)	Voltage (%)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
1720.0	100%	+20(Ref)	1720 000 006	0.0	0.000 000	0.000
	100%	-30	1720 000 010	4.1	0.000 000	0.002
	100%	-20	1720 000 019	13.3	0.000 001	0.008
	100%	-10	1720 000 010	3.6	0.000 000	0.002
	100%	0	1720 000 020	14.1	0.000 001	0.008
	100%	+10	1720 000 018	11.5	0.000 001	0.007
	100%	+30	1720 000 012	6.3	0.000 000	0.004
	100%	+40	1720 000 021	14.5	0.000 001	0.008
	100%	+50	1720 000 011	5.1	0.000 000	0.003
	Batt. Endpoint	+20	1720 000 022	16.2	0.000 001	0.009
1770.0	100%	+20(Ref)	1770 000 011	0.0	0.000 000	0.000
	100%	-30	1770 000 016	5.4	0.000 000	0.003
	100%	-20	1770 000 015	3.6	0.000 000	0.002
	100%	-10	1770 000 020	9.6	0.000 001	0.005
	100%	0	1770 000 015	4.3	0.000 000	0.002
	100%	+10	1770 000 027	15.8	0.000 001	0.009
	100%	+30	1770 000 025	13.8	0.000 001	0.008
	100%	+40	1770 000 022	11.5	0.000 001	0.006
	100%	+50	1770 000 018	6.7	0.000 000	0.004
	Batt. Endpoint	+20	1770 000 016	5.6	0.000 000	0.003

- ▣ BandWidth: 30 MHz
- ▣ Voltage(100%): 3.880 VDC
- ▣ Batt. Endpoint: 3.650 VDC
- ▣ LIMIT: Emission must remain in band

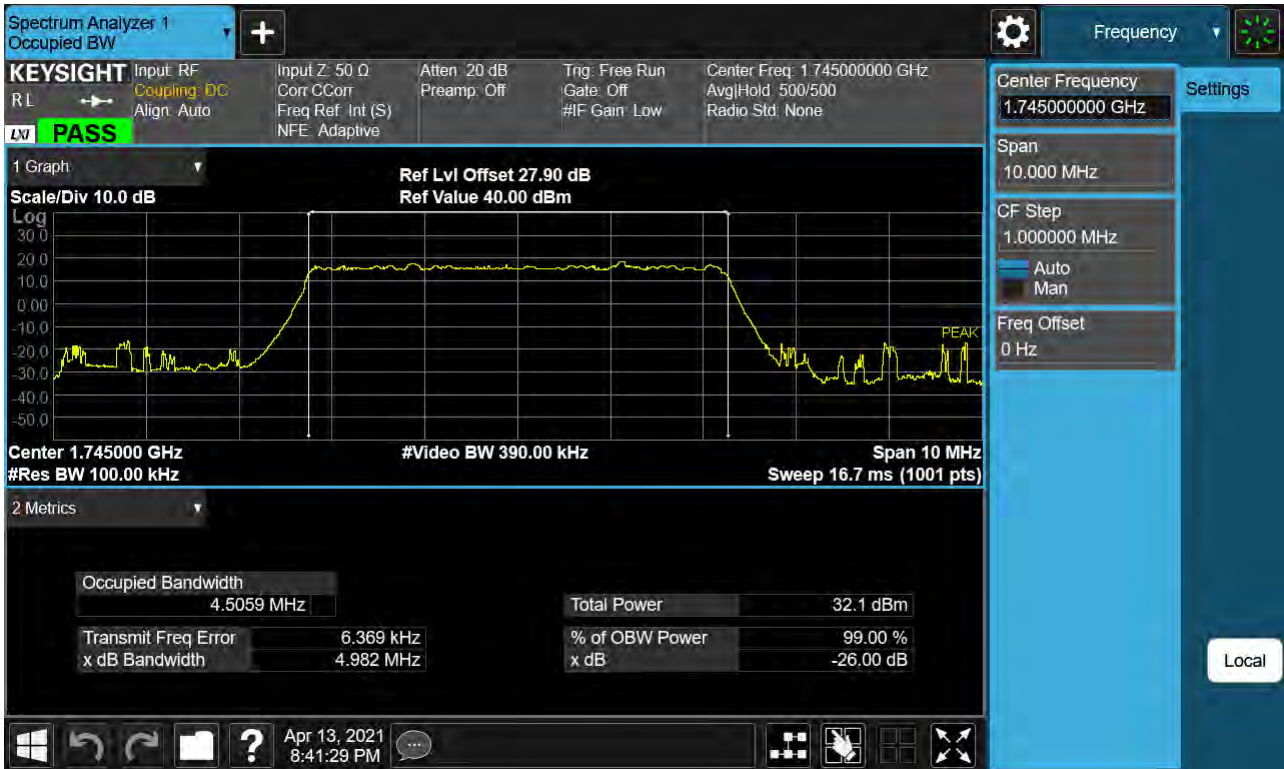
Test. Frequency (MHz)	Voltage (%)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
1725.0	100%	+20(Ref)	1725 000 003	0.0	0.000 000	0.000
	100%	-30	1725 000 014	10.9	0.000 001	0.006
	100%	-20	1725 000 008	4.8	0.000 000	0.003
	100%	-10	1725 000 010	6.5	0.000 000	0.004
	100%	0	1725 000 009	5.8	0.000 000	0.003
	100%	+10	1725 000 015	11.7	0.000 001	0.007
	100%	+30	1725 000 012	9.3	0.000 001	0.005
	100%	+40	1725 000 013	10.2	0.000 001	0.006
	100%	+50	1725 000 014	10.9	0.000 001	0.006
	Batt. Endpoint	+20	1725 000 013	10.4	0.000 001	0.006
1765.0	100%	+20(Ref)	1765 000 008	0.0	0.000 000	0.000
	100%	-30	1765 000 011	3.4	0.000 000	0.002
	100%	-20	1765 000 014	6.5	0.000 000	0.004
	100%	-10	1765 000 016	7.8	0.000 000	0.004
	100%	0	1765 000 020	12.4	0.000 001	0.007
	100%	+10	1765 000 020	12.3	0.000 001	0.007
	100%	+30	1765 000 022	14.4	0.000 001	0.008
	100%	+40	1765 000 016	8.0	0.000 000	0.005
	100%	+50	1765 000 012	4.4	0.000 000	0.002
	Batt. Endpoint	+20	1765 000 015	6.7	0.000 000	0.004

- ▣ BandWidth: 40 MHz
- ▣ Voltage(100%): 3.880 VDC
- ▣ Batt. Endpoint: 3.650 VDC
- ▣ LIMIT: Emission must remain in band

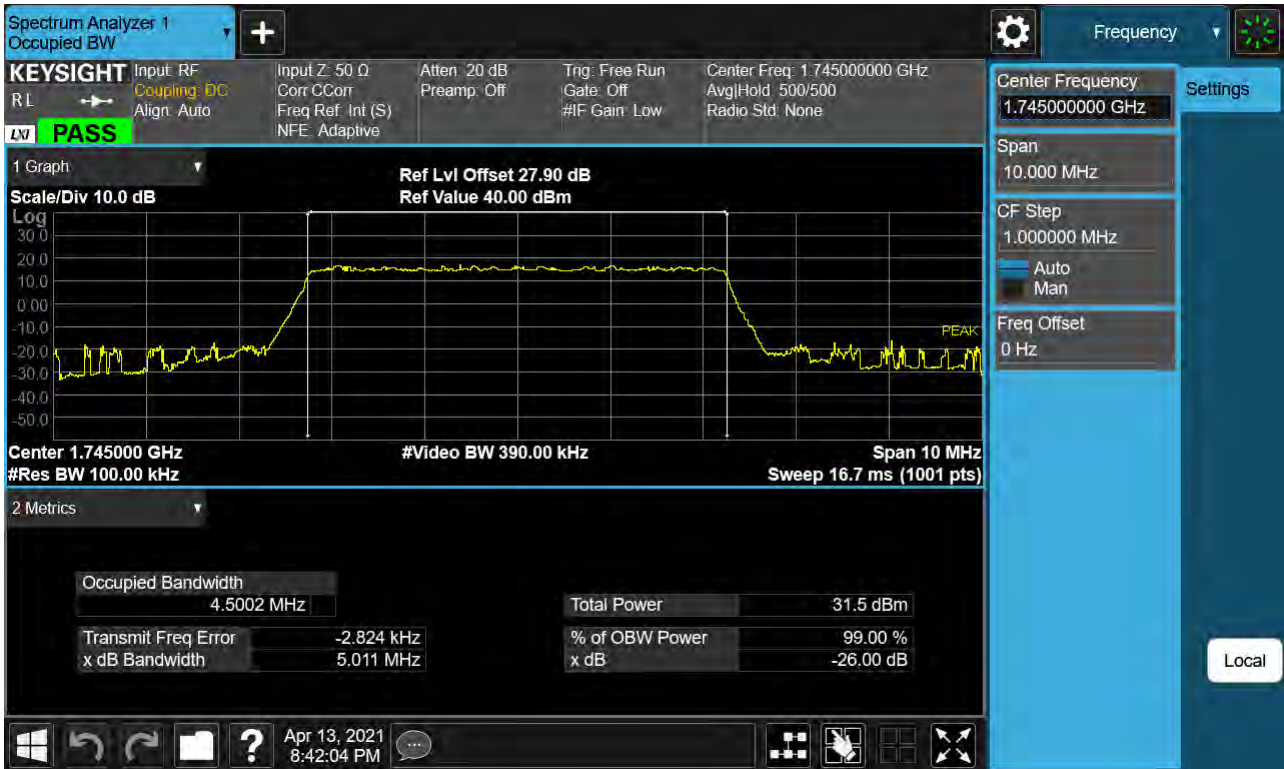
Test. Frequency (MHz)	Voltage (%)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
1730.0	100%	+20(Ref)	1730 000 017	0.0	0.000 000	0.000
	100%	-30	1730 000 020	3.4	0.000 000	0.002
	100%	-20	1730 000 022	5.1	0.000 000	0.003
	100%	-10	1730 000 024	7.7	0.000 000	0.004
	100%	0	1730 000 023	6.7	0.000 000	0.004
	100%	+10	1730 000 021	4.6	0.000 000	0.003
	100%	+30	1730 000 033	16.3	0.000 001	0.009
	100%	+40	1730 000 020	3.1	0.000 000	0.002
	100%	+50	1730 000 025	8.6	0.000 000	0.005
	Batt. Endpoint	+20	1730 000 023	6.0	0.000 000	0.003
1760.0	100%	+20(Ref)	1760 000 006	0.0	0.000 000	0.000
	100%	-30	1760 000 022	16.2	0.000 001	0.009
	100%	-20	1760 000 017	10.7	0.000 001	0.006
	100%	-10	1760 000 023	16.6	0.000 001	0.009
	100%	0	1760 000 013	6.3	0.000 000	0.004
	100%	+10	1760 000 017	10.4	0.000 001	0.006
	100%	+30	1760 000 021	14.8	0.000 001	0.008
	100%	+40	1760 000 017	11.0	0.000 001	0.006
	100%	+50	1760 000 010	4.0	0.000 000	0.002
	Batt. Endpoint	+20	1760 000 022	15.3	0.000 001	0.009

9. TEST PLOTS

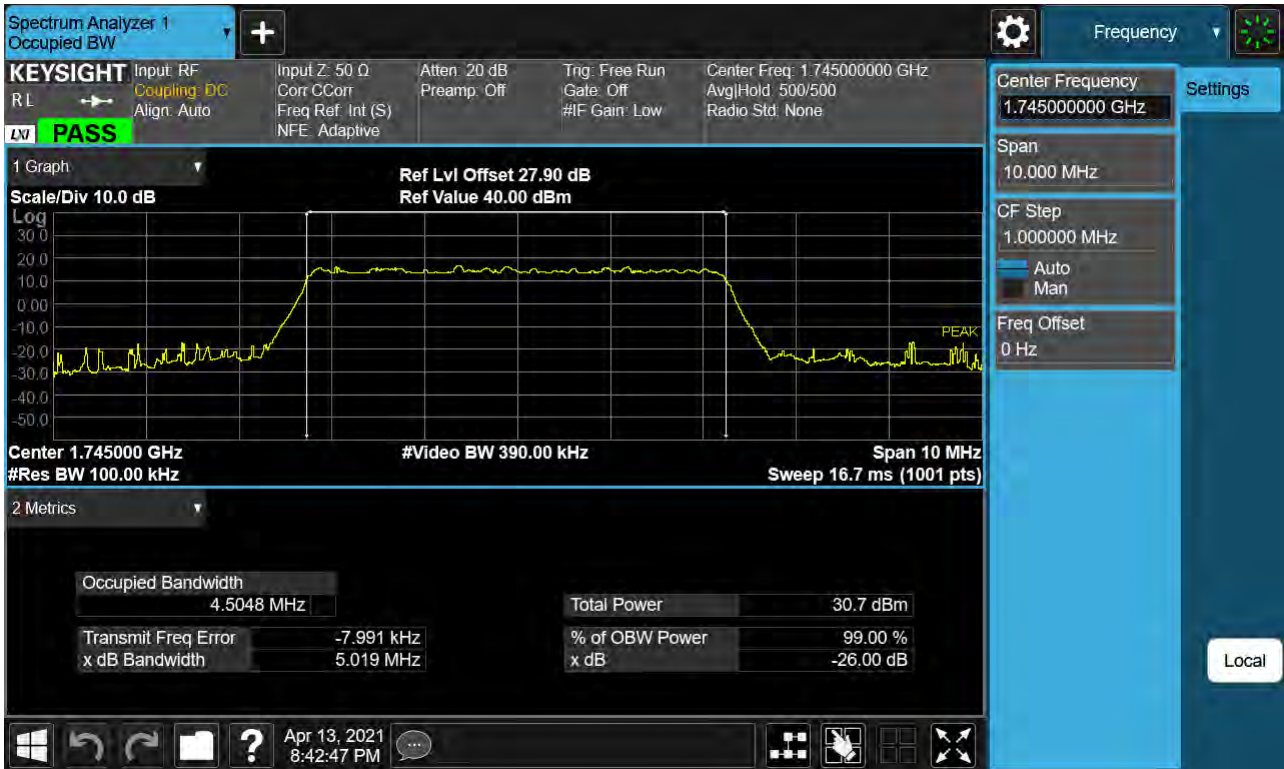
Sub6 n66. Occupied Bandwidth Plot (5M BW Ch.349000 BPSK RB 25)



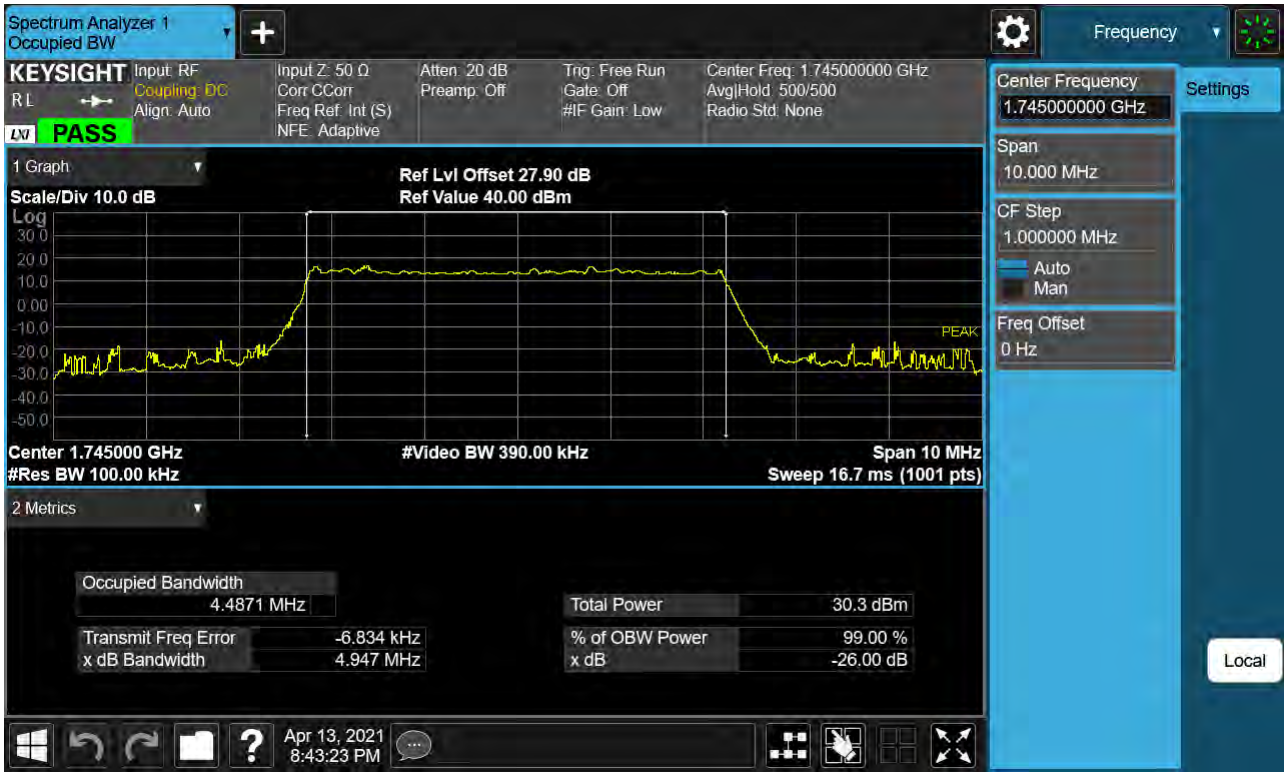
Sub6 n66. Occupied Bandwidth Plot (5M BW Ch.349000 QPSK RB 25)



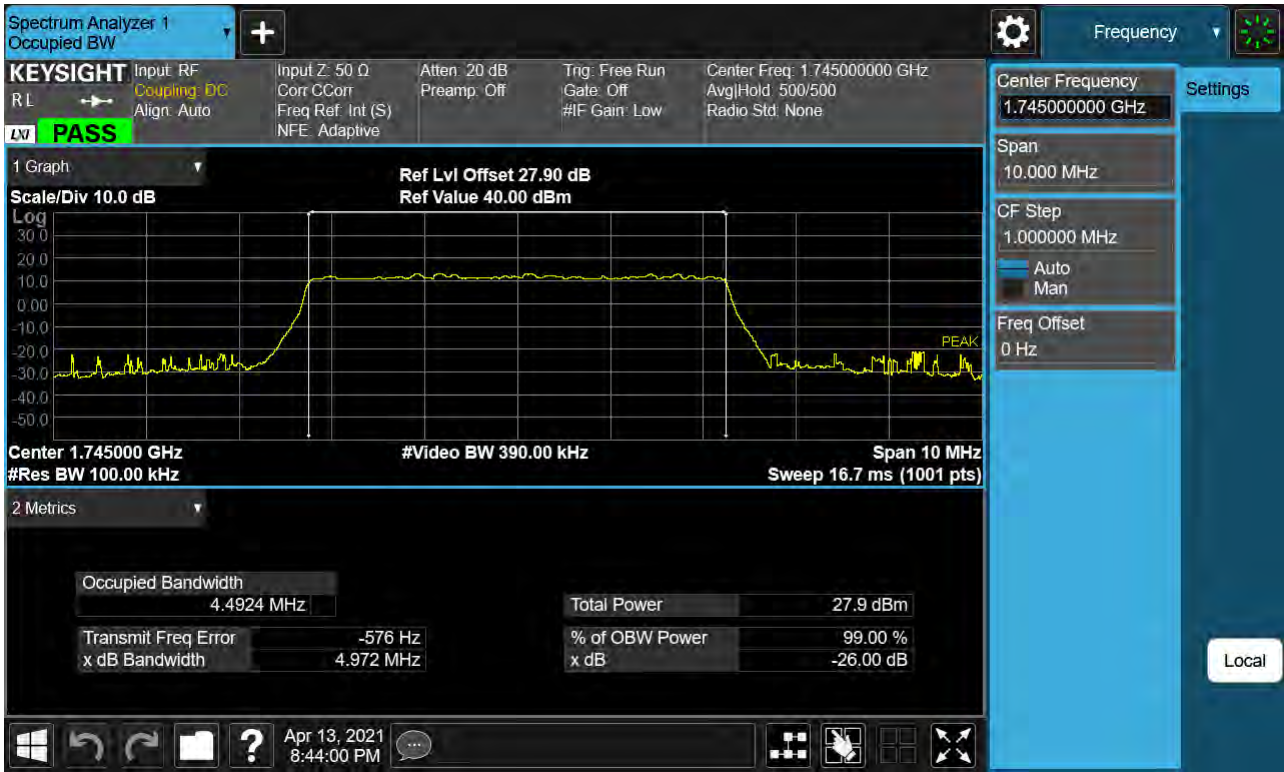
Sub6 n66. Occupied Bandwidth Plot (5M BW Ch.349000 16QAM RB 25)



Sub6 n66. Occupied Bandwidth Plot (5M BW Ch.349000 64QAM RB 25)



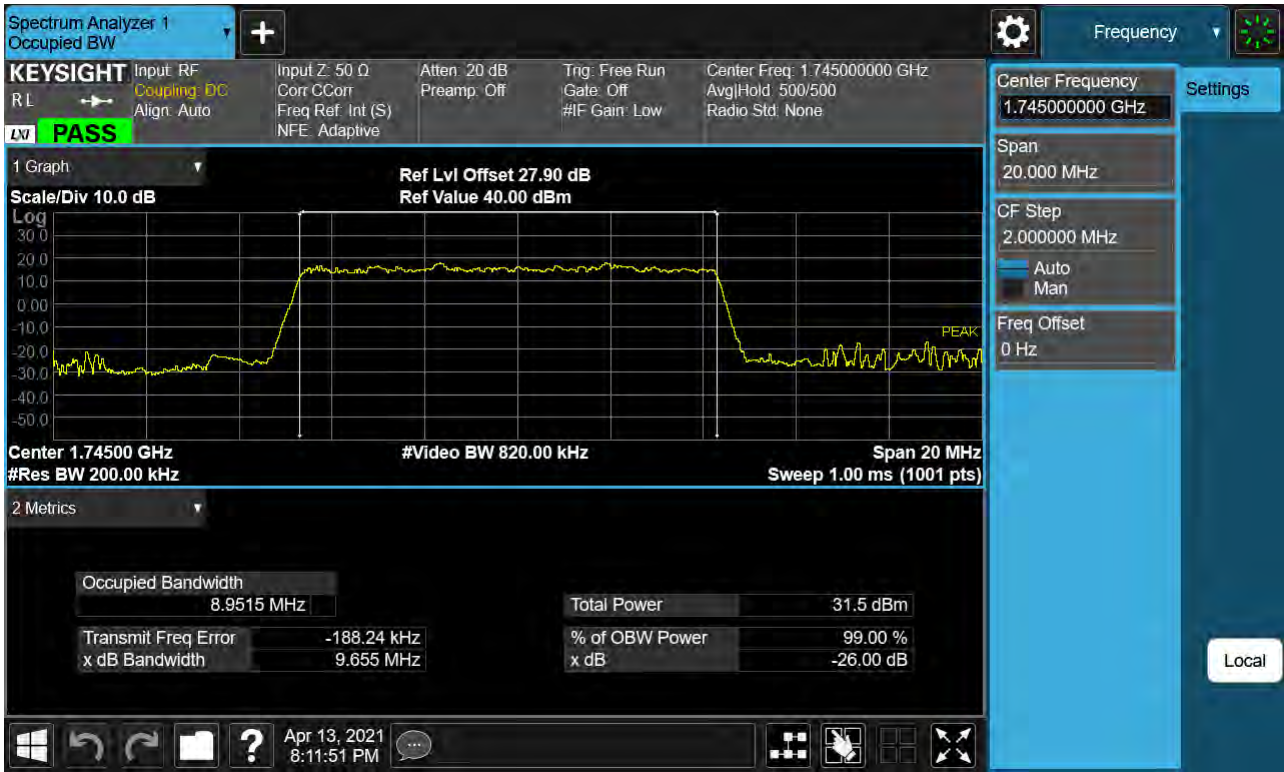
Sub6 n66. Occupied Bandwidth Plot (5M BW Ch.349000 256QAM RB 25)



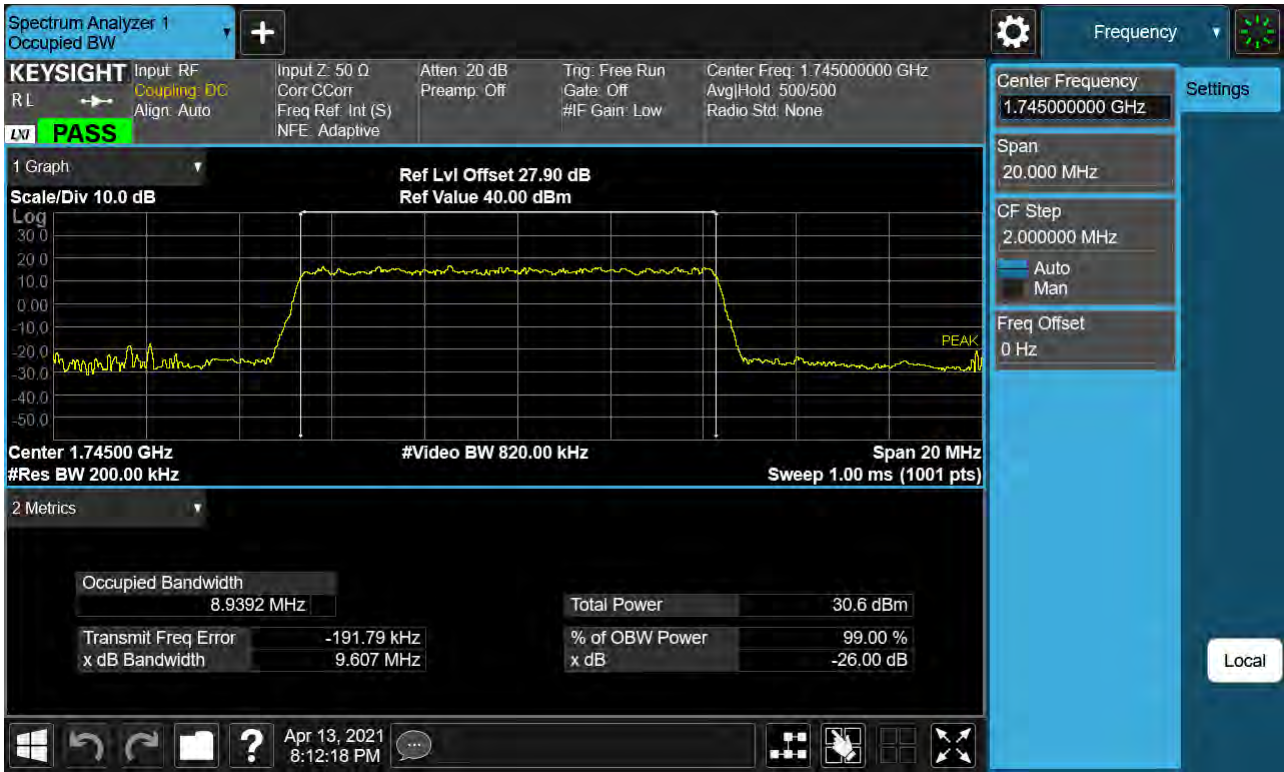
Sub6 n66. Occupied Bandwidth Plot (10M BW Ch.349000 BPSK RB 50)



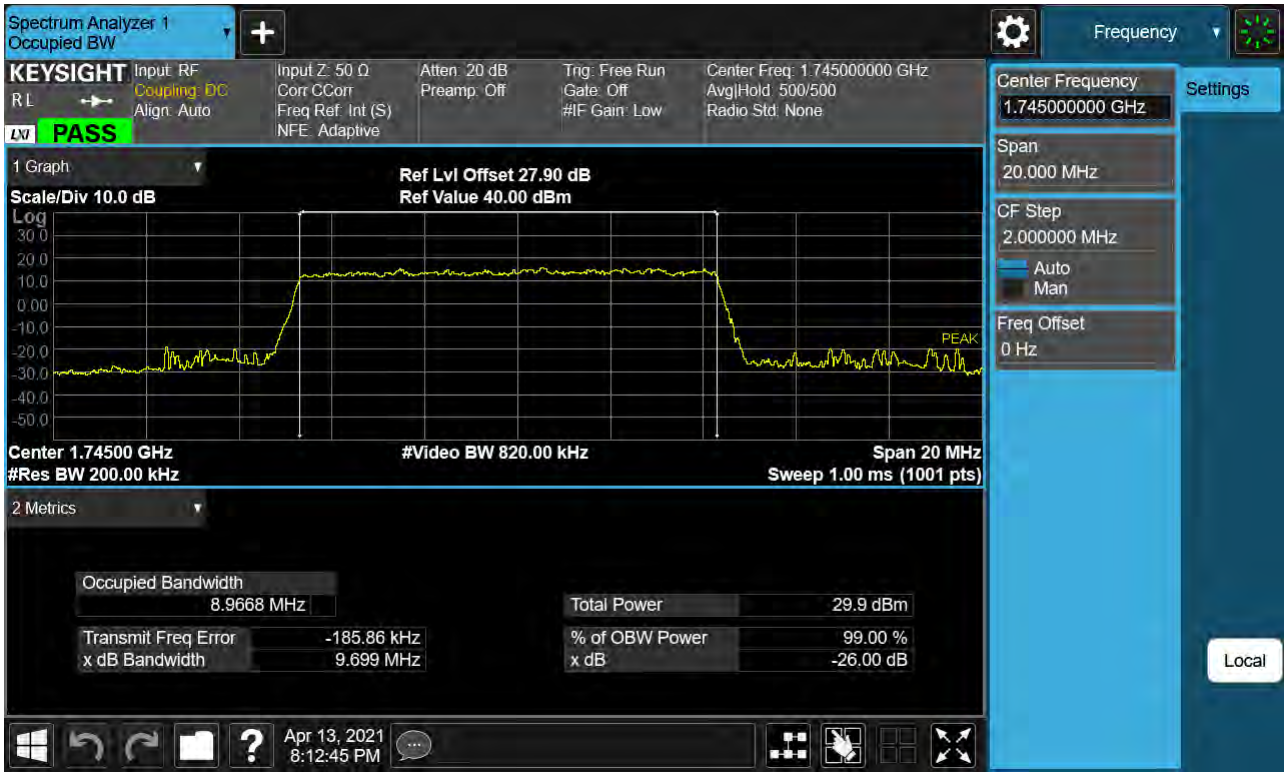
Sub6 n66. Occupied Bandwidth Plot (10M BW Ch.349000 QPSK RB 50)



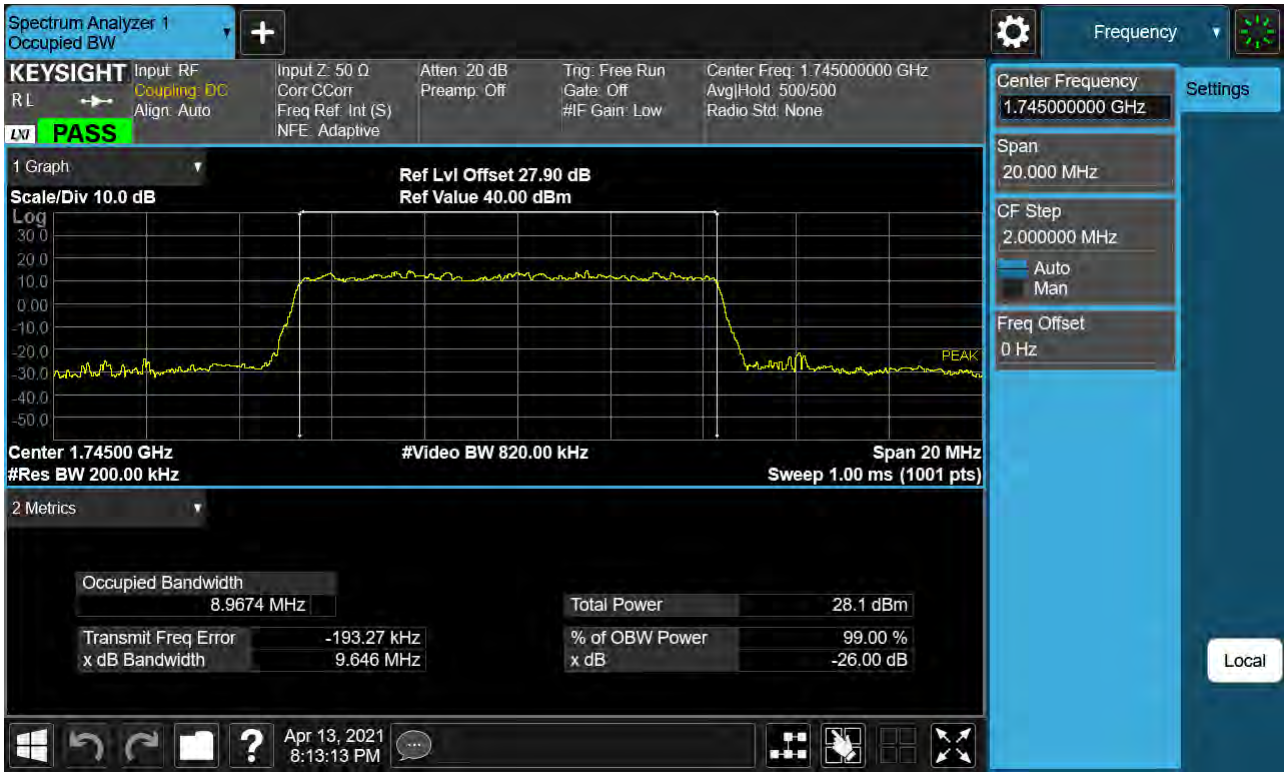
Sub6 n66. Occupied Bandwidth Plot (10M BW Ch.349000 16QAM RB 50)



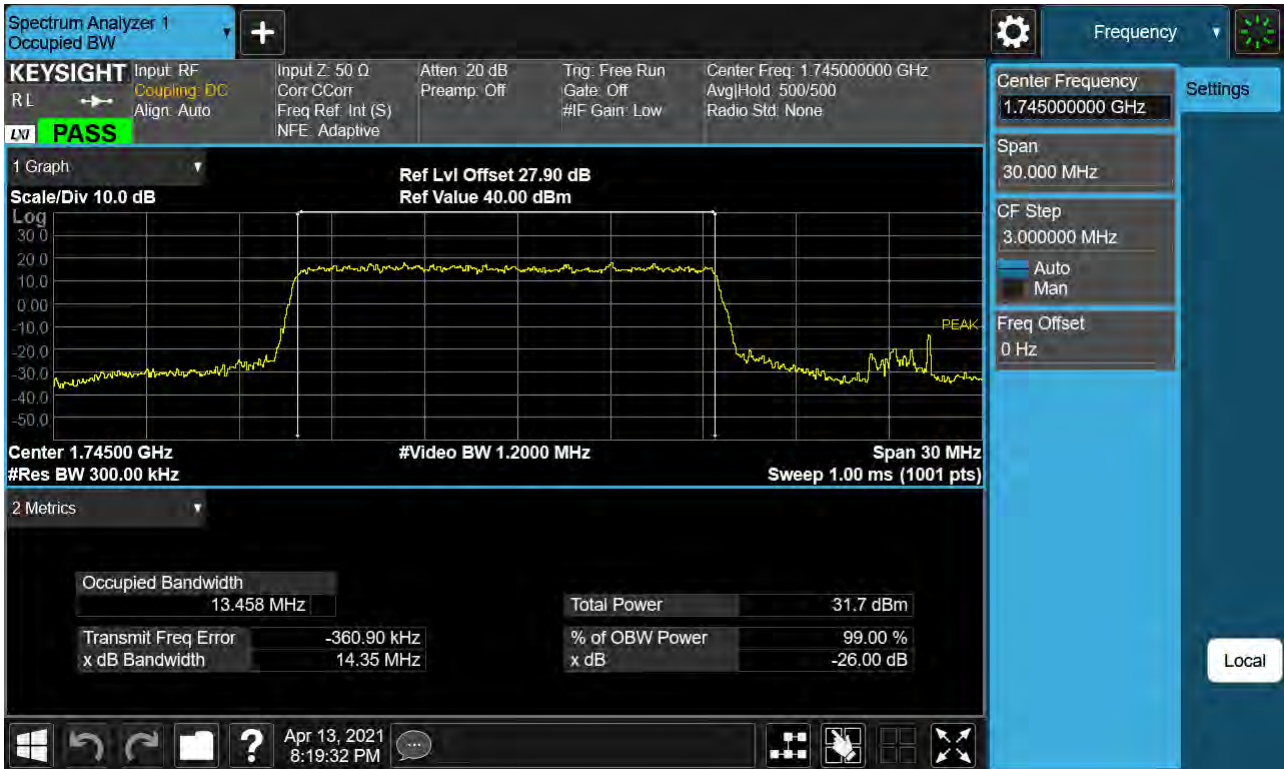
Sub6 n66. Occupied Bandwidth Plot (10M BW Ch.349000 64QAM RB 50)



Sub6 n66. Occupied Bandwidth Plot (10M BW Ch.349000 256QAM RB 50)



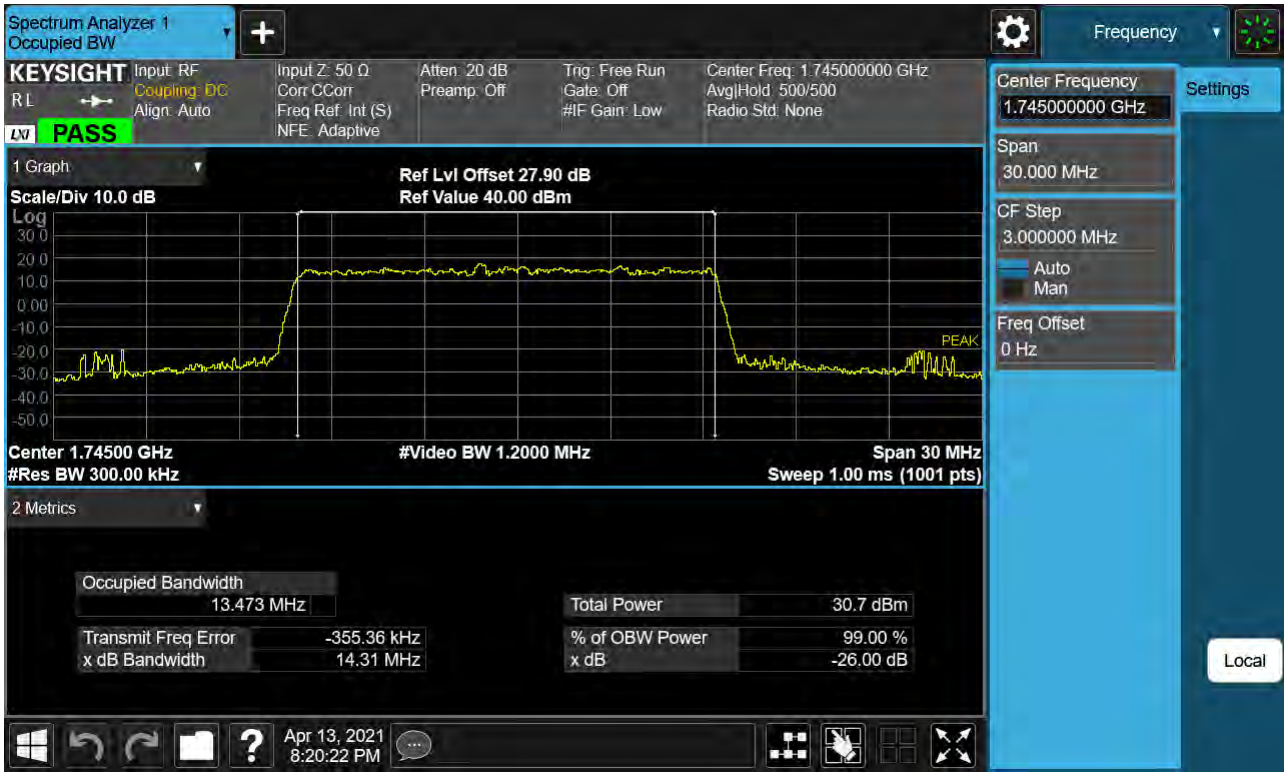
Sub6 n66. Occupied Bandwidth Plot (15M BW Ch.349000 BPSK RB 75)



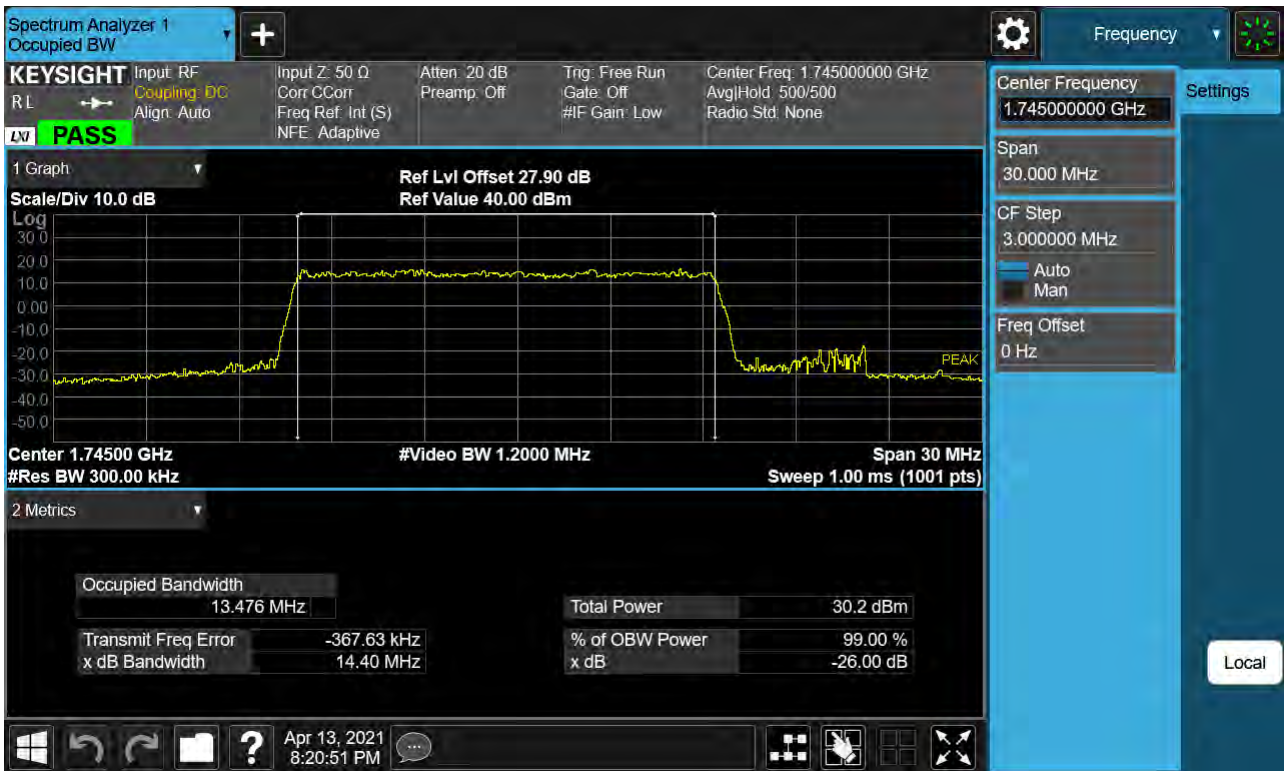
Sub6 n66. Occupied Bandwidth Plot (15M BW Ch.349000 QPSK RB 75)



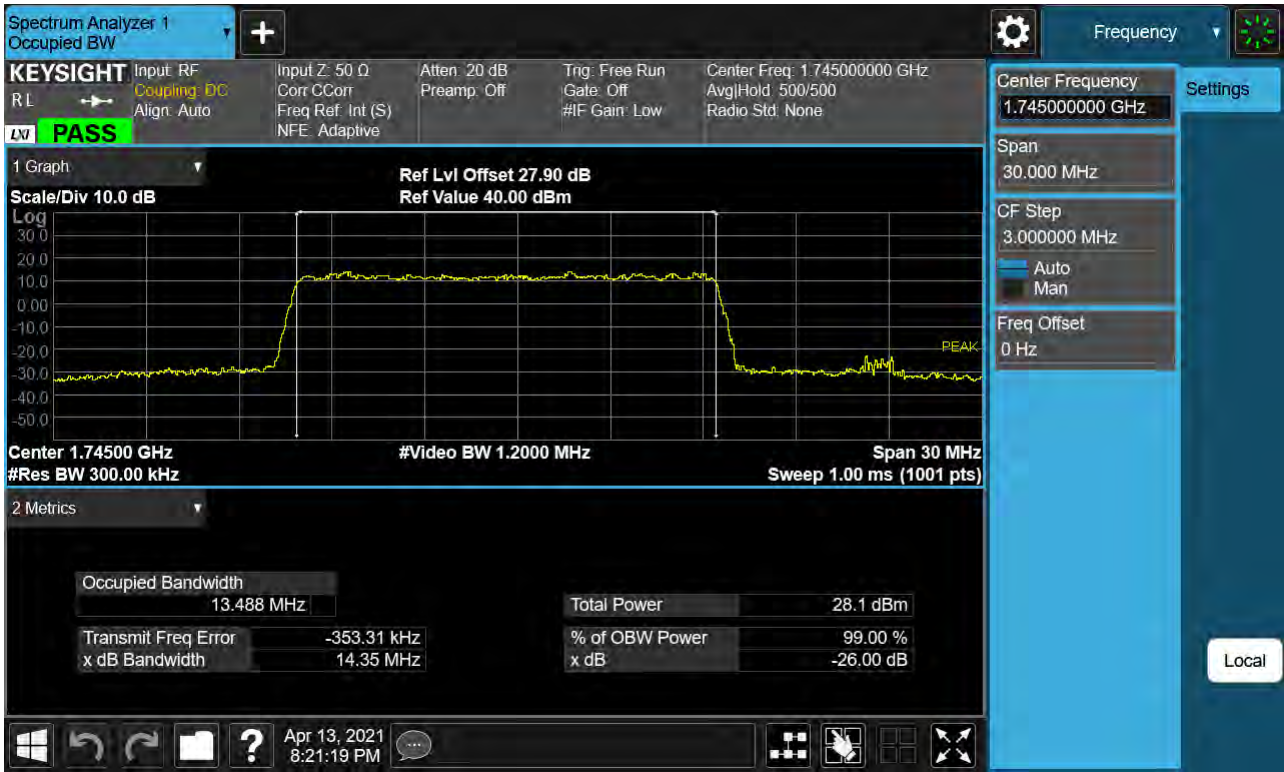
Sub6 n66. Occupied Bandwidth Plot (15M BW Ch.349000 16QAM RB 75)



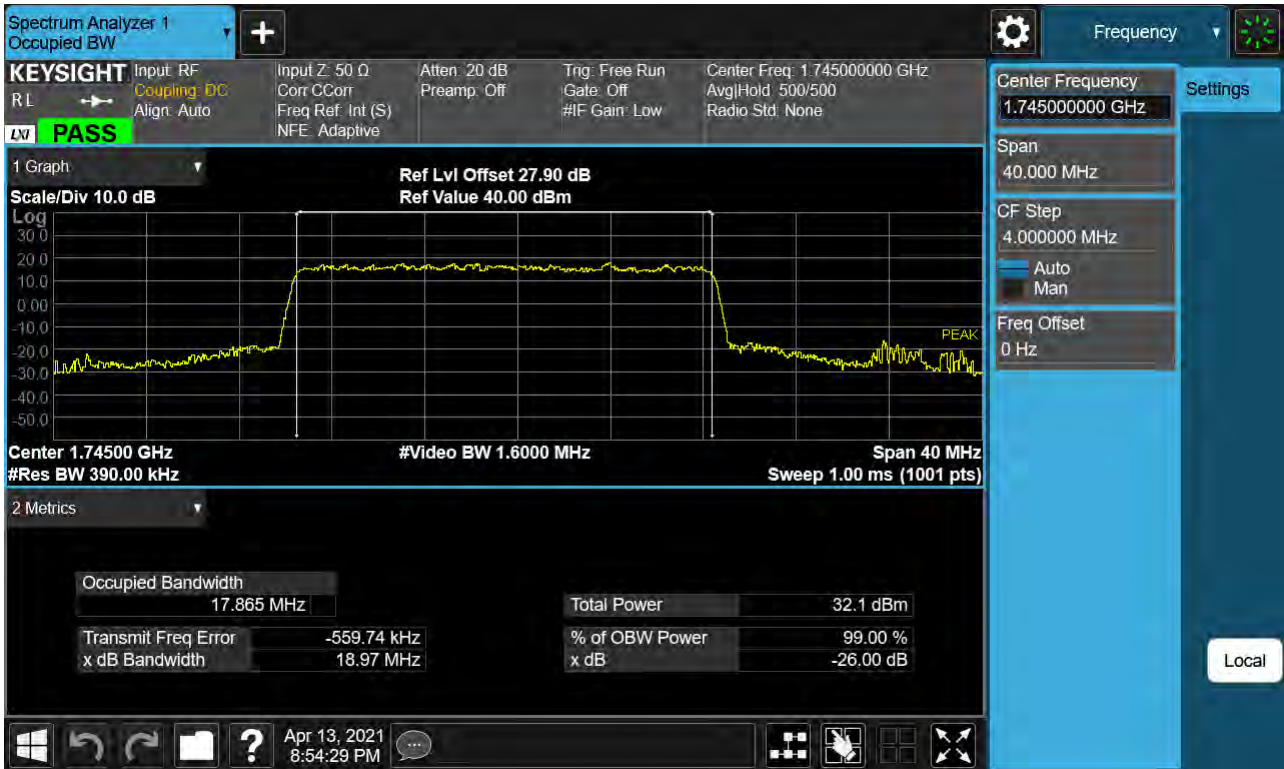
Sub6 n66. Occupied Bandwidth Plot (15M BW Ch.349000 64QAM RB 75)



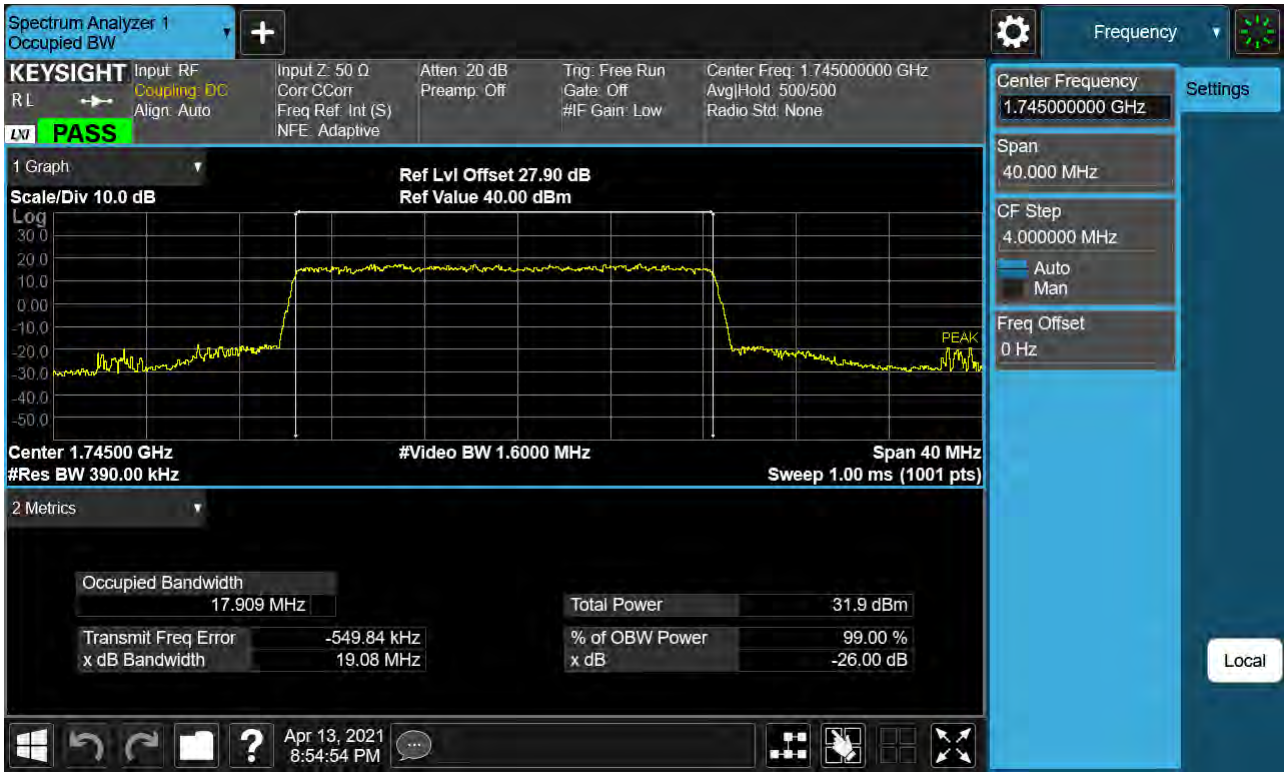
Sub6 n66. Occupied Bandwidth Plot (15M BW Ch.349000 256QAM RB 75)



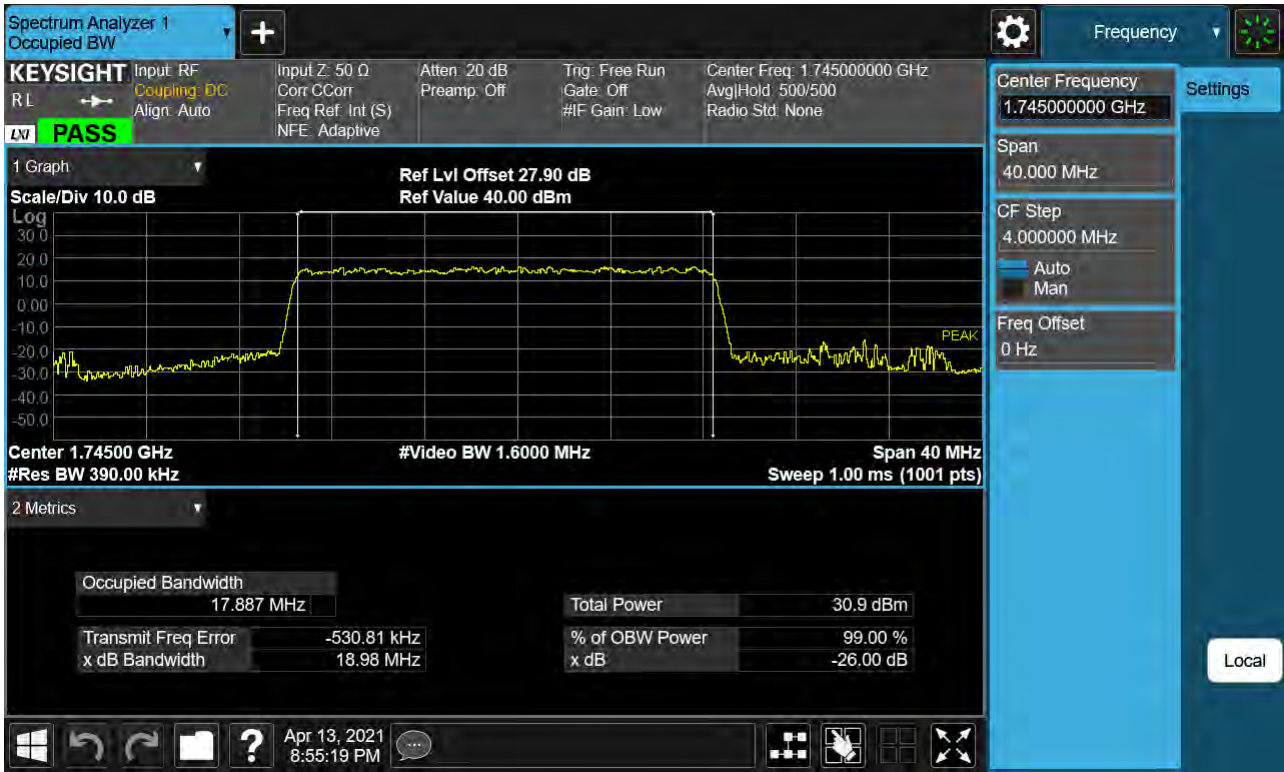
Sub6 n66. Occupied Bandwidth Plot (20M BW Ch.349000 BPSK RB 100)



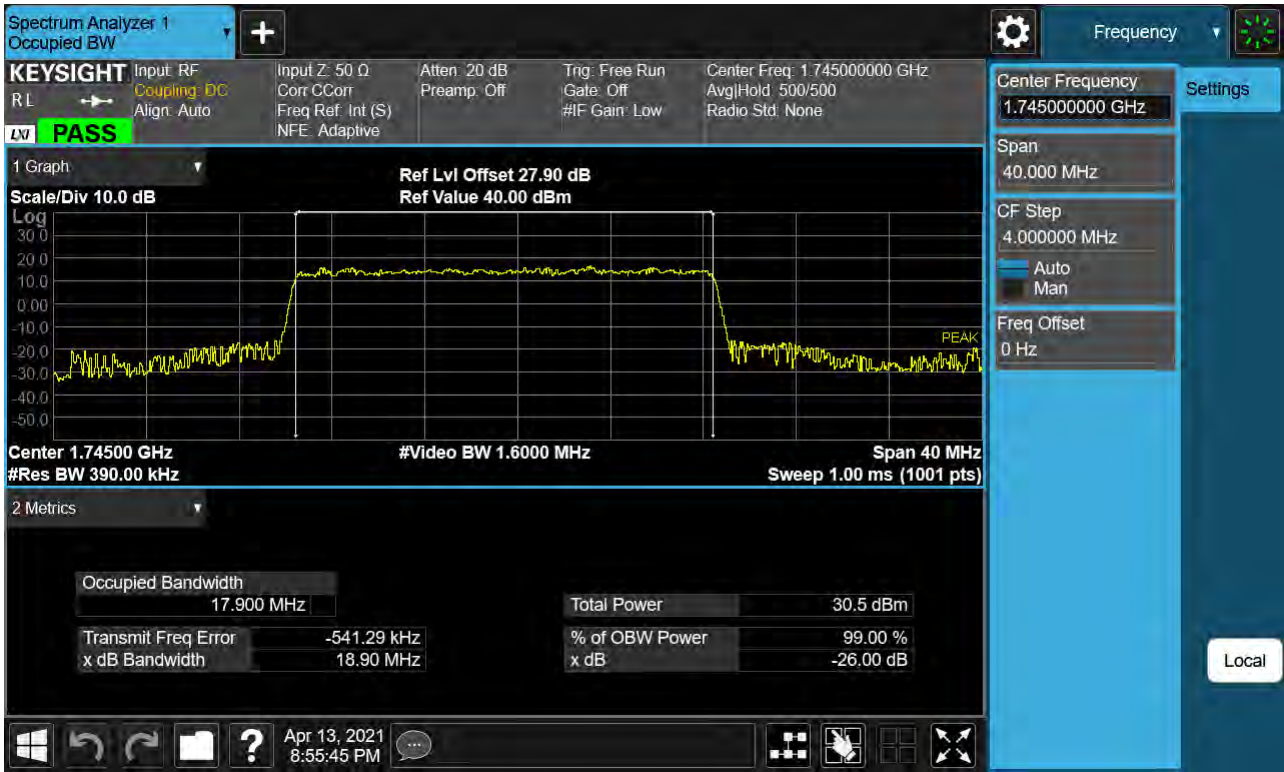
Sub6 n66. Occupied Bandwidth Plot (20M BW Ch.349000 QPSK RB 100)



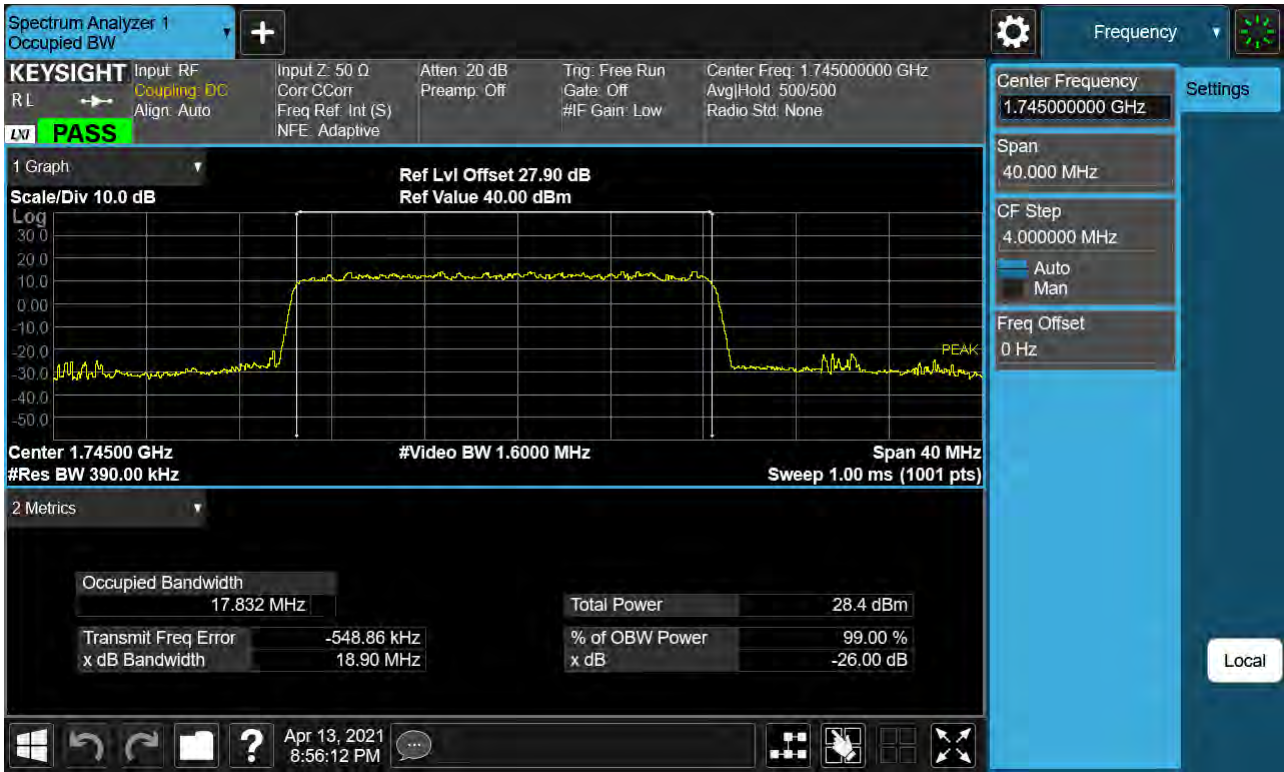
Sub6 n66. Occupied Bandwidth Plot (20M BW Ch.349000 16QAM RB 100)



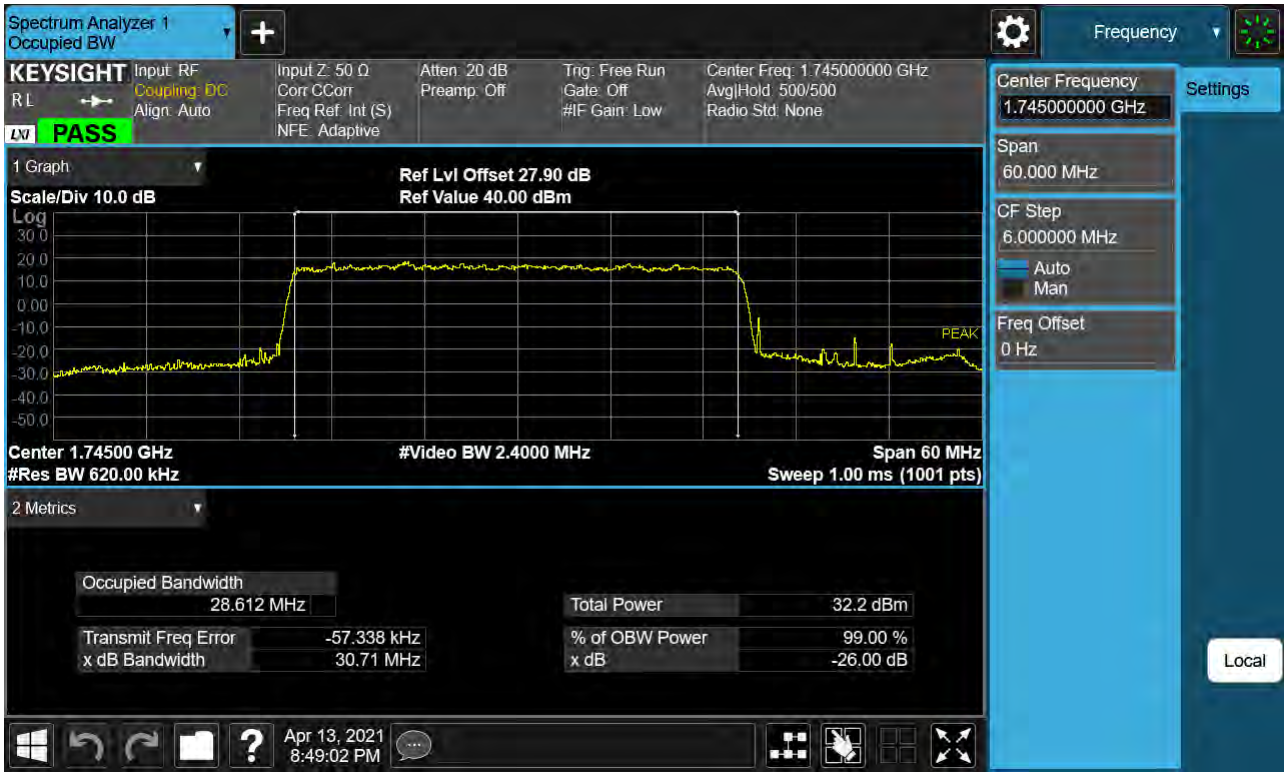
Sub6 n66. Occupied Bandwidth Plot (20M BW Ch.349000 64QAM RB 100)



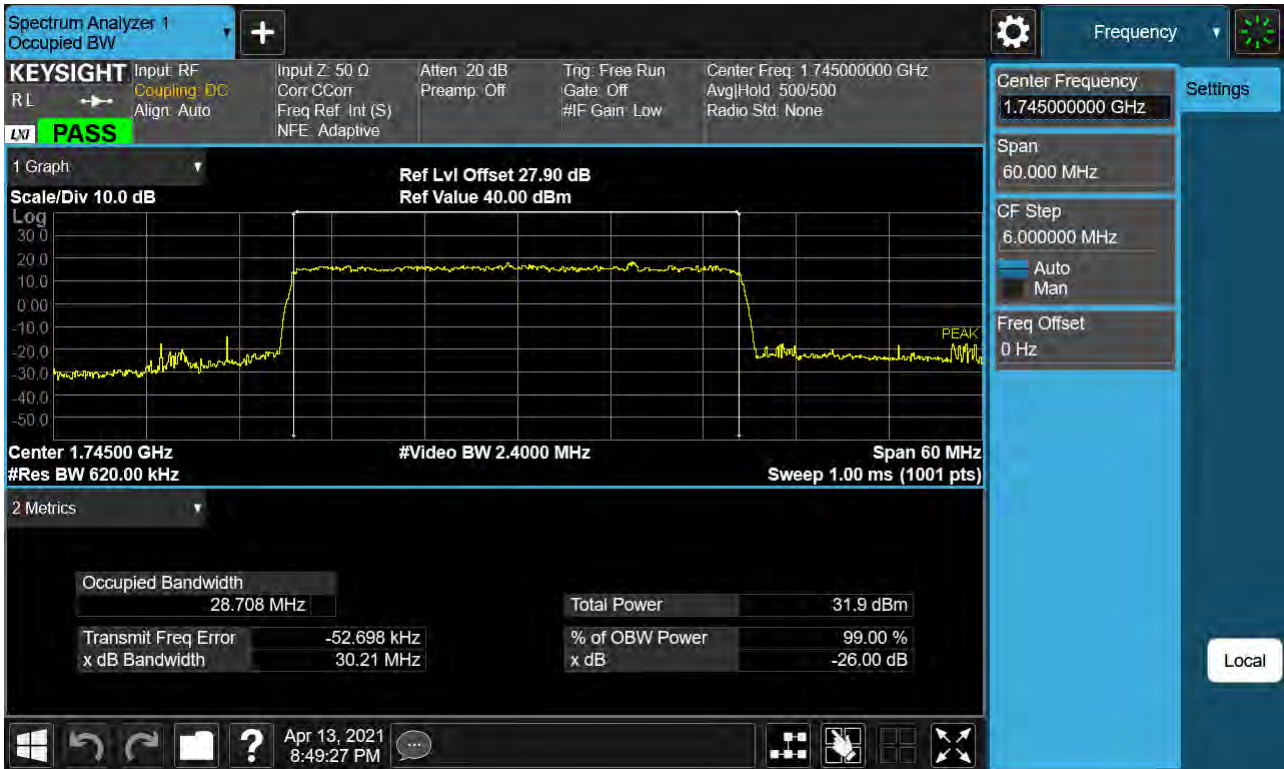
Sub6 n66. Occupied Bandwidth Plot (20M BW Ch.349000 256QAM RB 100)



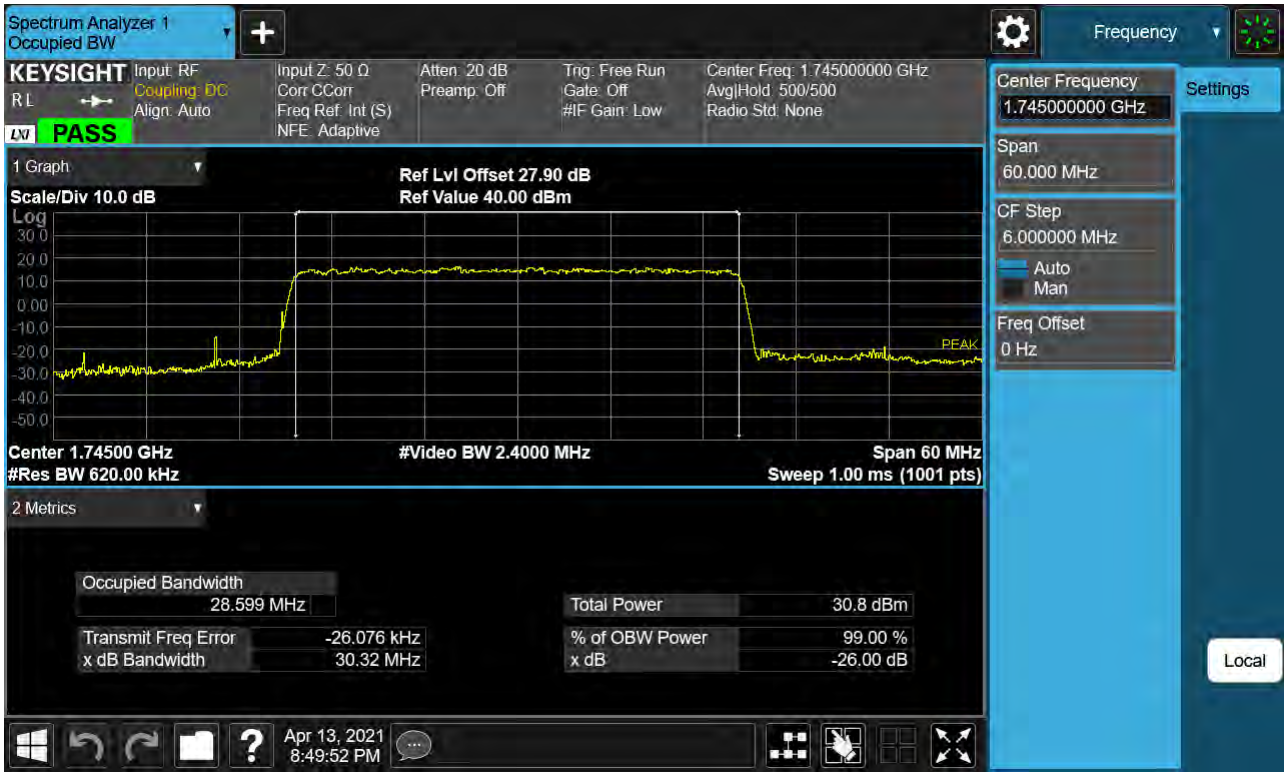
Sub6 n66. Occupied Bandwidth Plot (30M BW Ch.349000 BPSK RB 160)



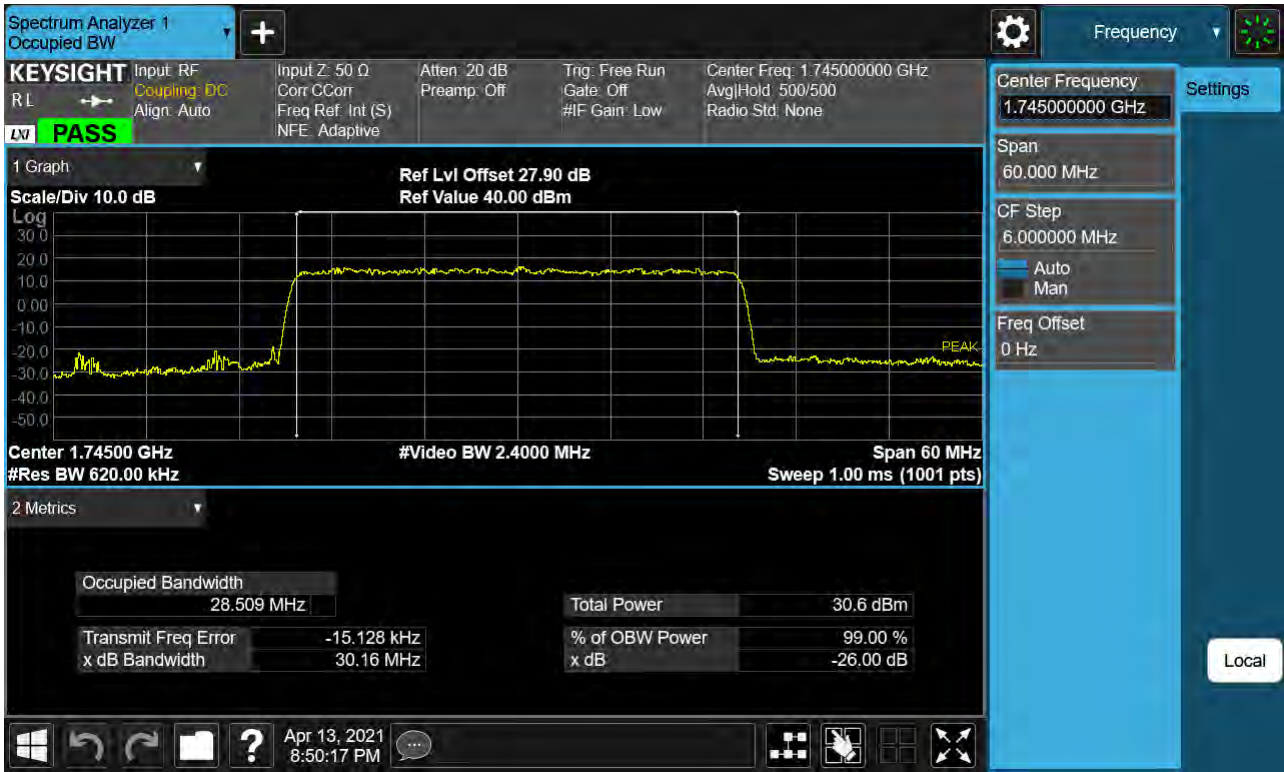
Sub6 n66. Occupied Bandwidth Plot (30M BW Ch.349000 QPSK RB 160)



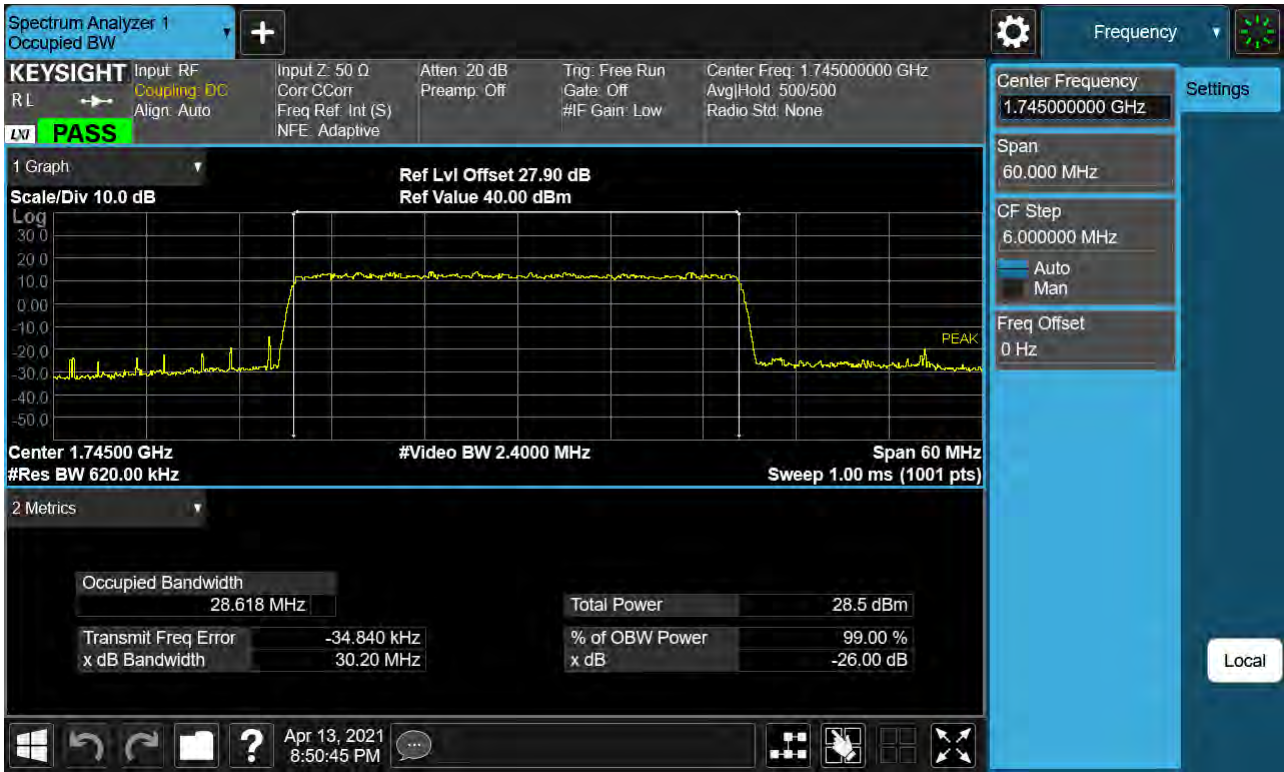
Sub6 n66. Occupied Bandwidth Plot (30M BW Ch.349000 16QAM RB 160)



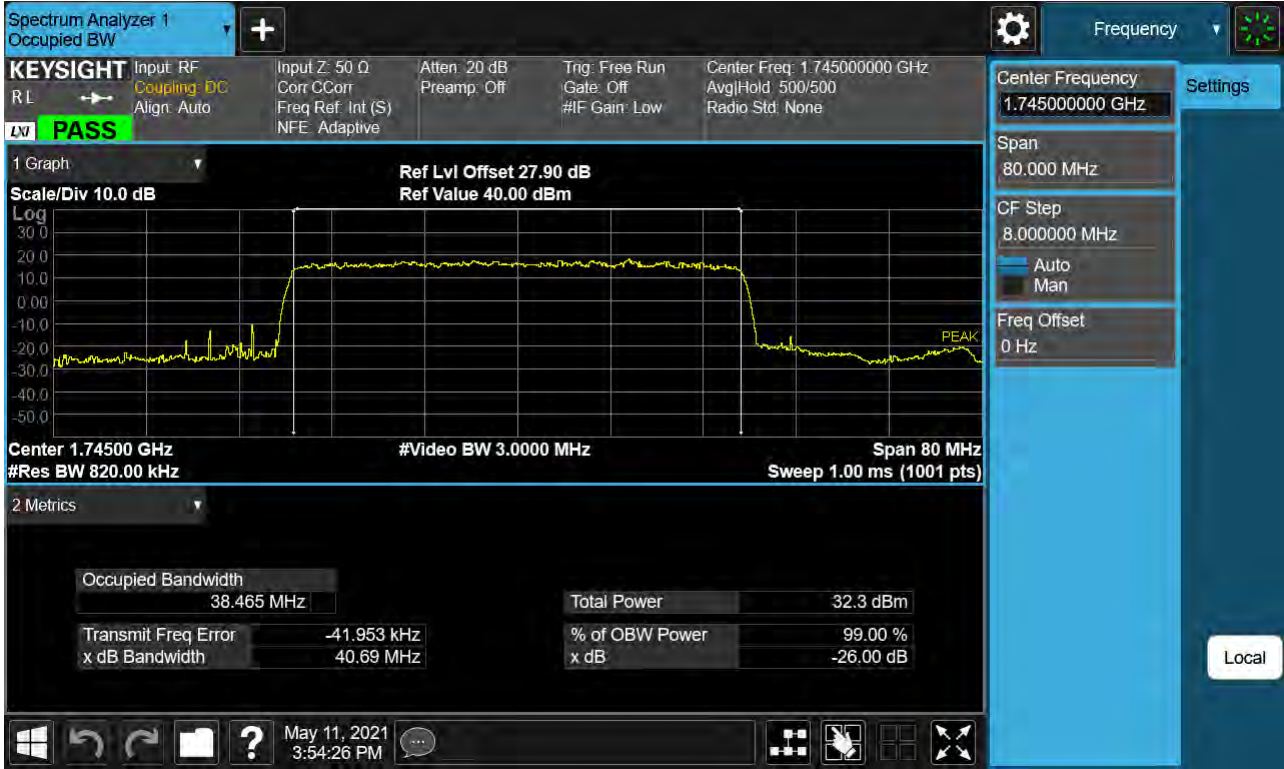
Sub6 n66. Occupied Bandwidth Plot (30M BW Ch.349000 64QAM RB 160)



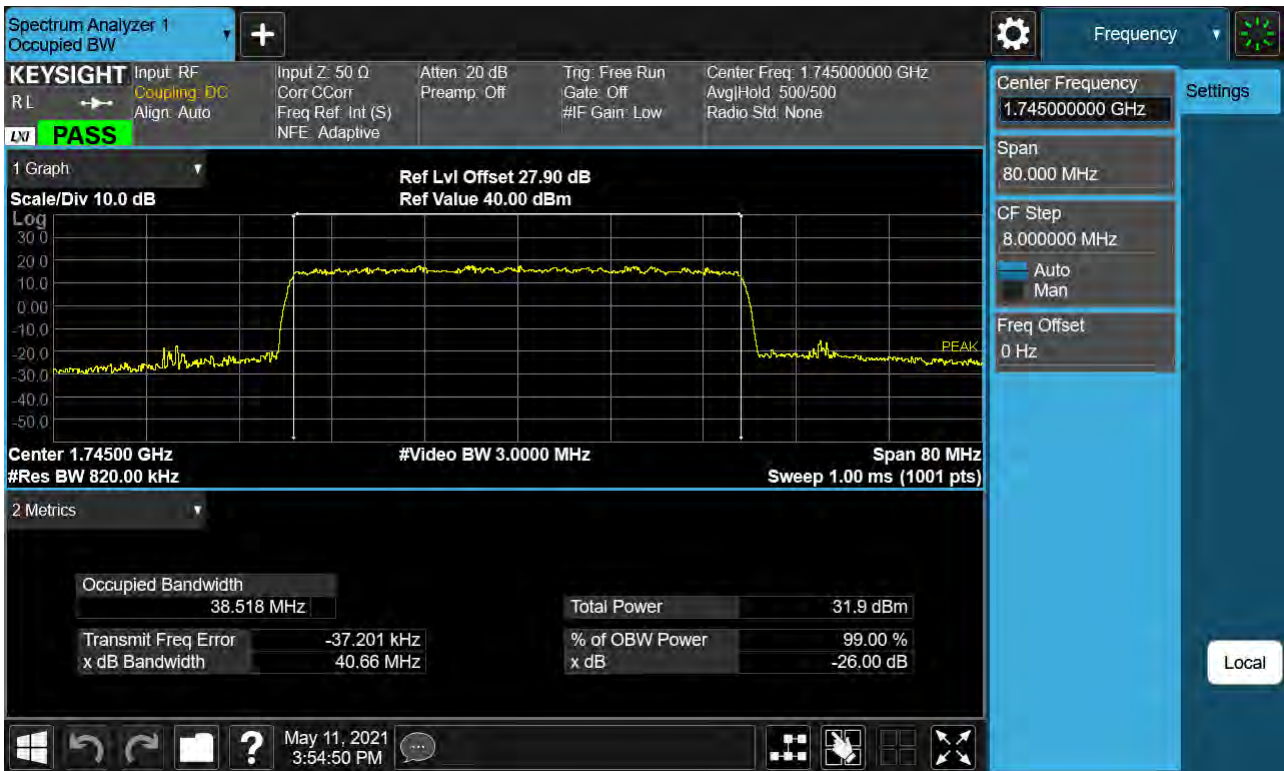
Sub6 n66. Occupied Bandwidth Plot (30M BW Ch.349000 256QAM RB 160)



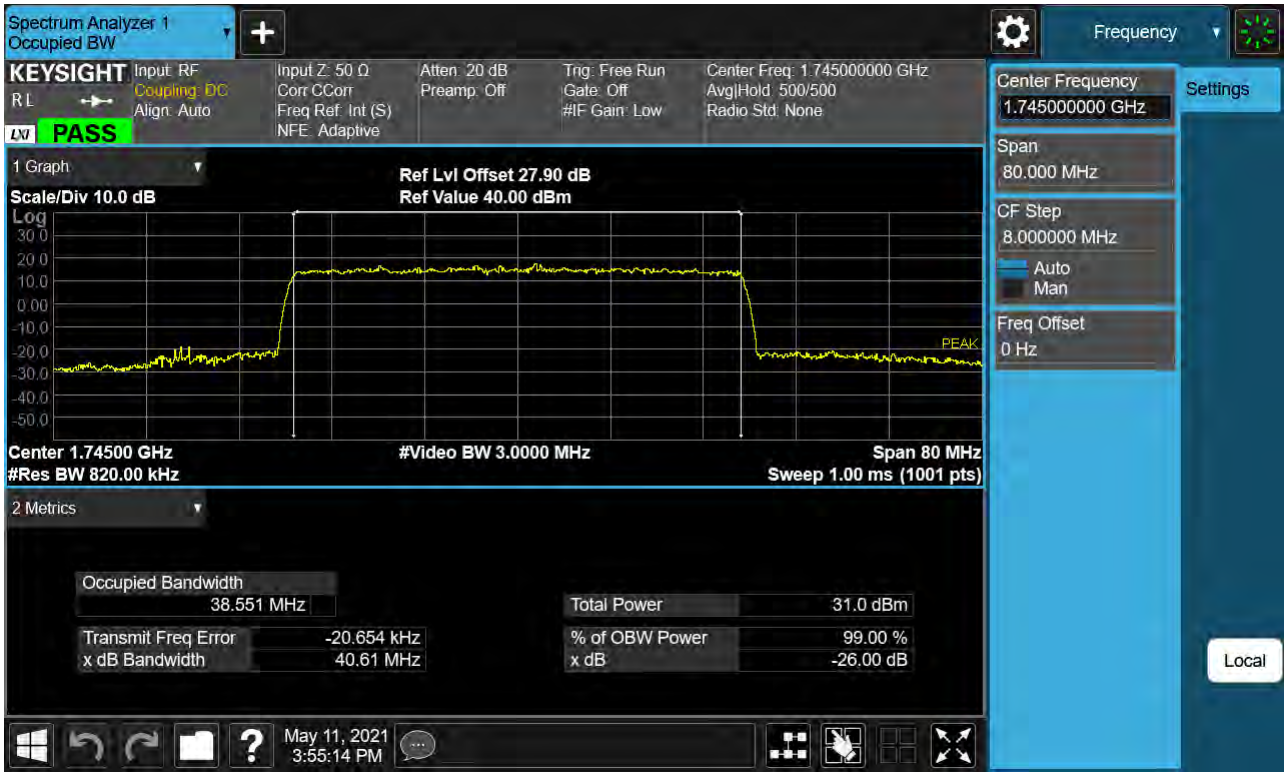
Sub6 n66. Occupied Bandwidth Plot (40M BW Ch.349000 BPSK RB 216)



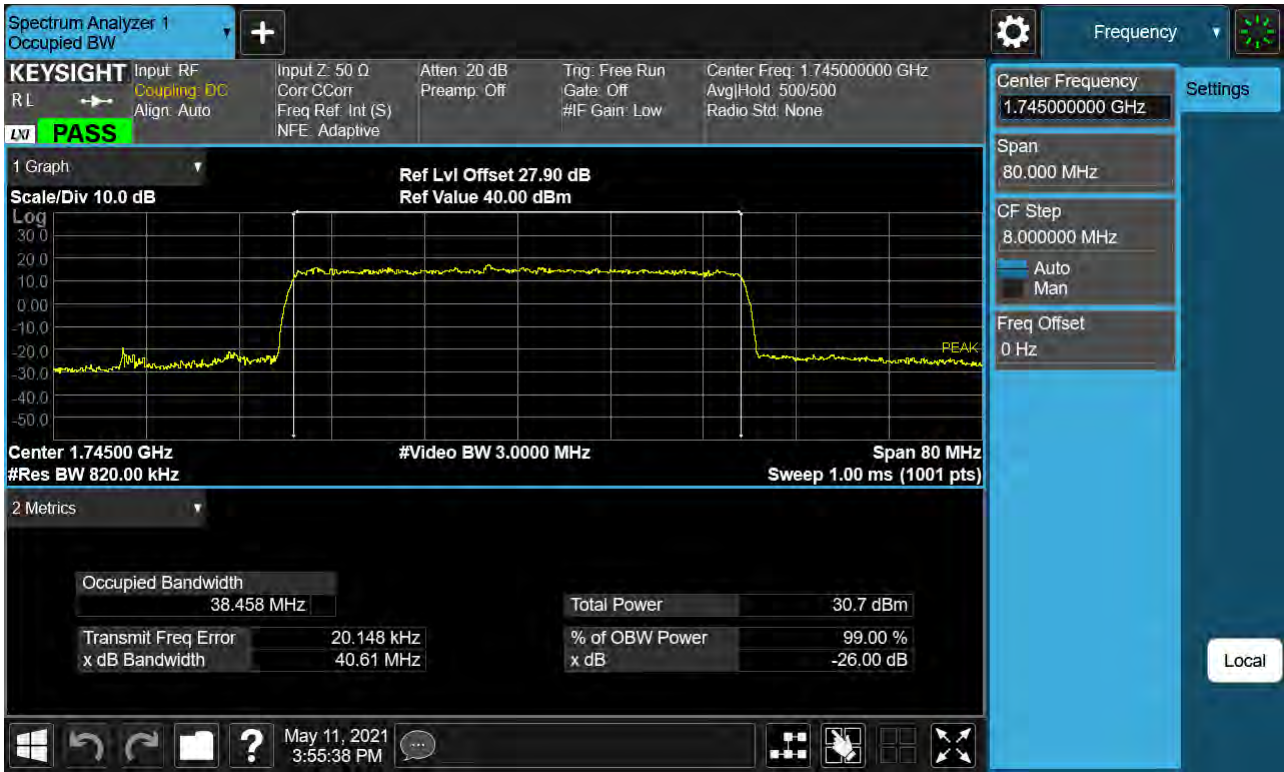
Sub6 n66. Occupied Bandwidth Plot (40M BW Ch.349000 QPSK RB 216)



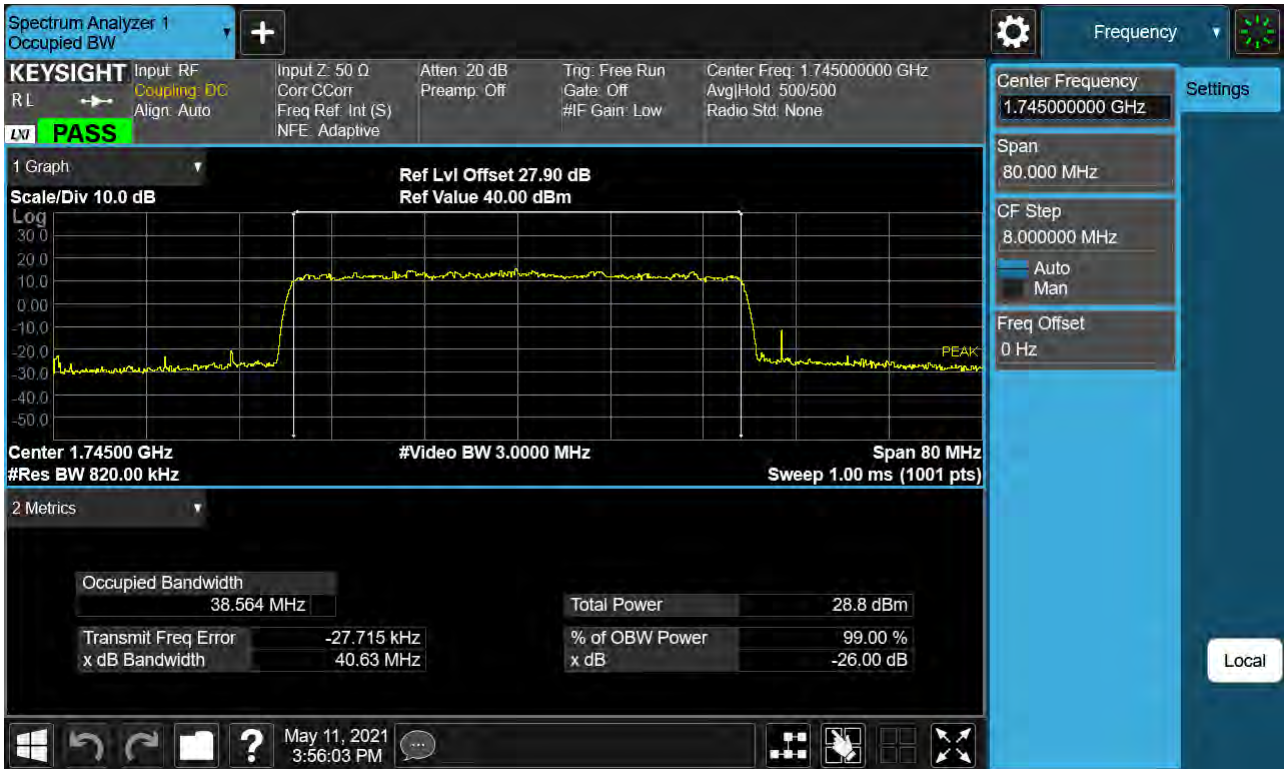
Sub6 n66. Occupied Bandwidth Plot (40M BW Ch.349000 16QAM RB 216)



Sub6 n66. Occupied Bandwidth Plot (40M BW Ch.349000 64QAM RB 216)



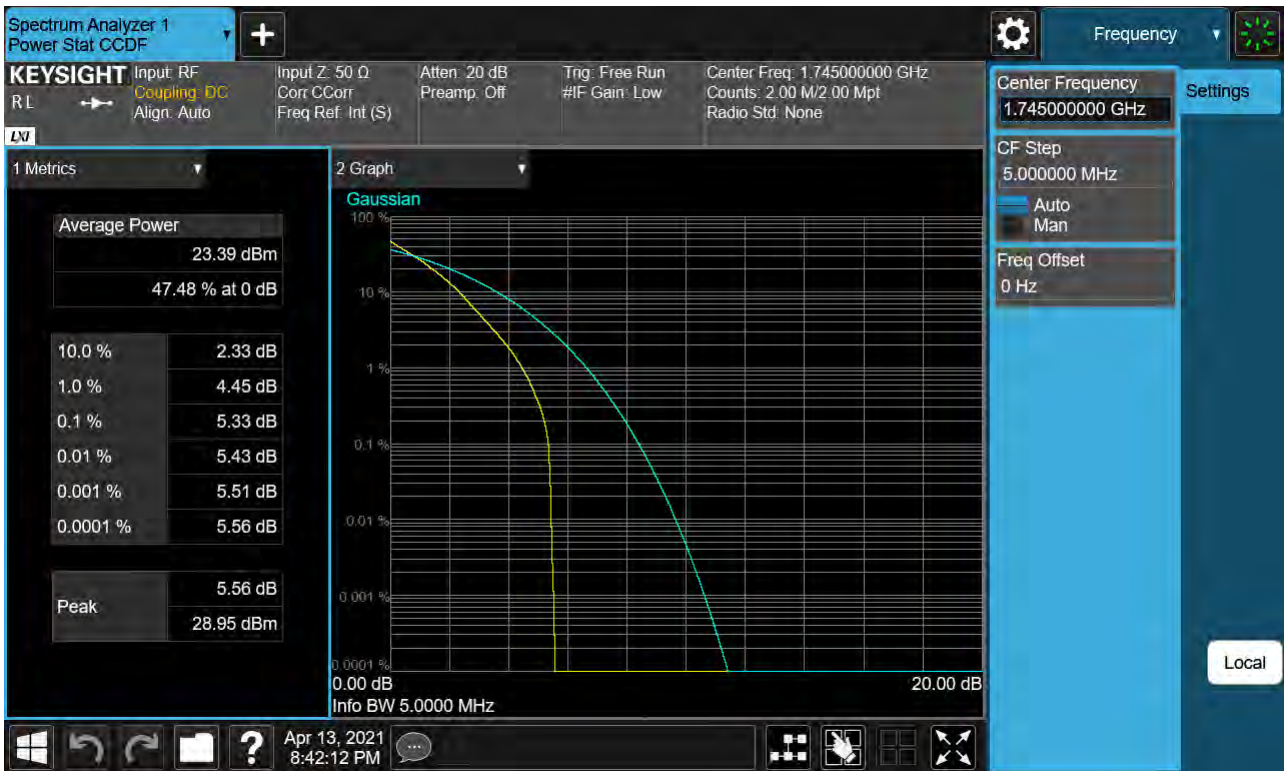
Sub6 n66. Occupied Bandwidth Plot (40M BW Ch.349000 256QAM RB 216)



Sub6 n66. PAR Plot (5M BW_Ch.349000_ BPSK_RB25_0)



Sub6 n66. PAR Plot (5M BW_Ch.349000_QPSK_RB25_0)



Sub6 n66. PAR Plot (5M BW_Ch.349000_16QAM_RB25_0)



Sub6 n66. PAR Plot (5M BW_Ch.349000_64QAM_RB25_0)



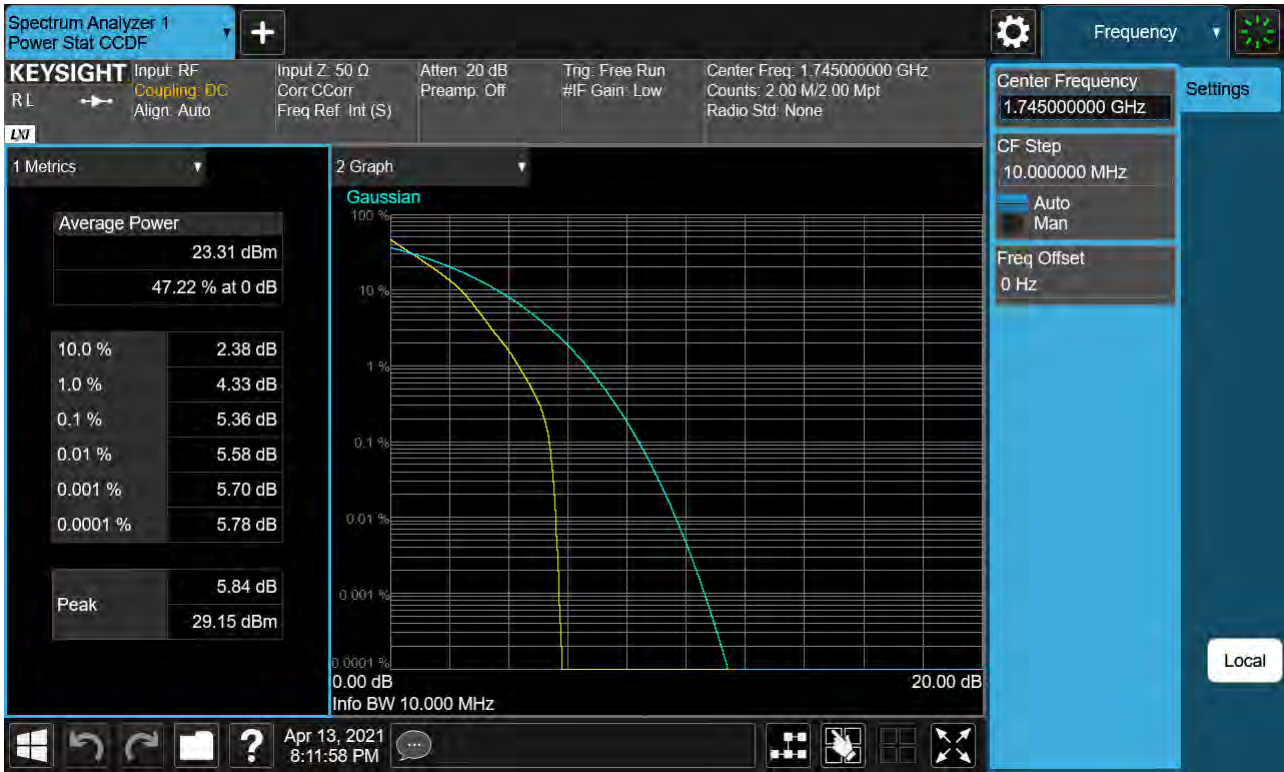
Sub6 n66. PAR Plot (5M BW_Ch.349000_256QAM_RB25_0)



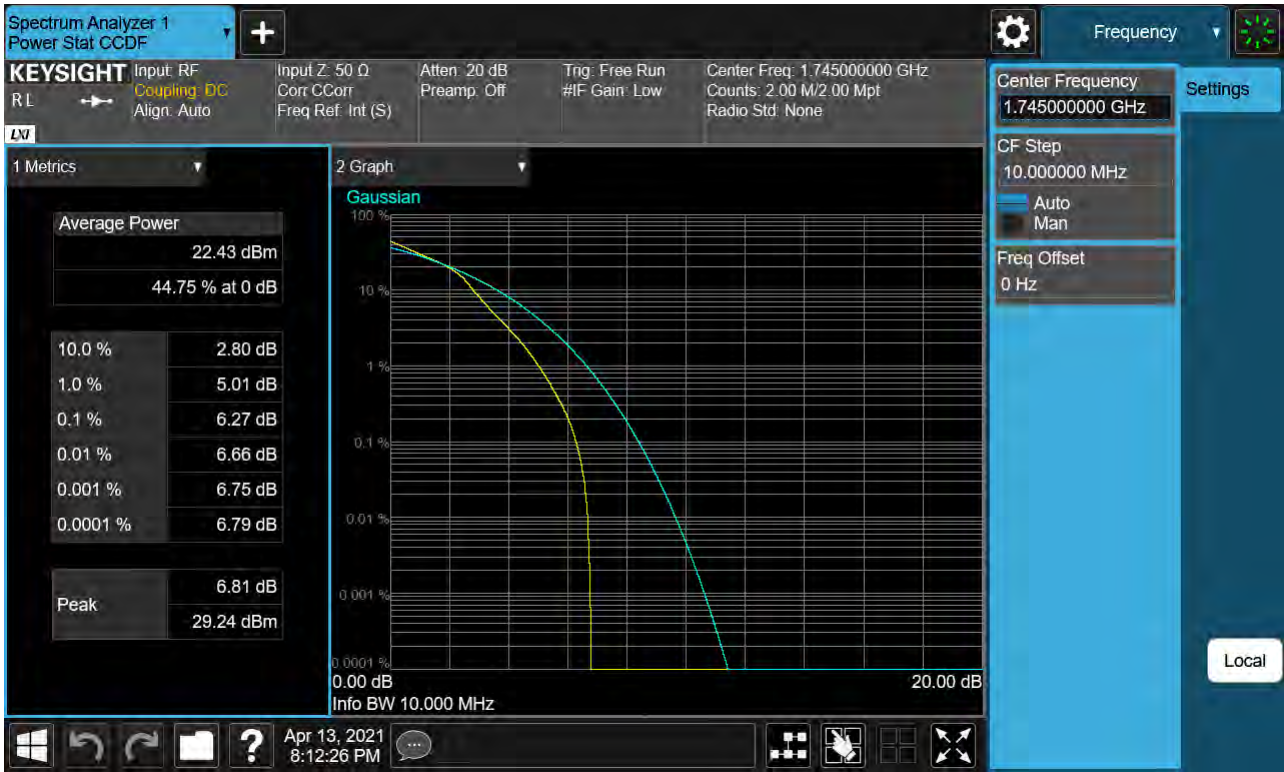
Sub6 n66. PAR Plot (10M BW_Ch.349000_ BPSK_RB50_0)



Sub6 n66. PAR Plot (10M BW_Ch.349000_QPSK_RB50_0)



Sub6 n66. PAR Plot (10M BW_Ch.349000_16QAM_RB50_0)



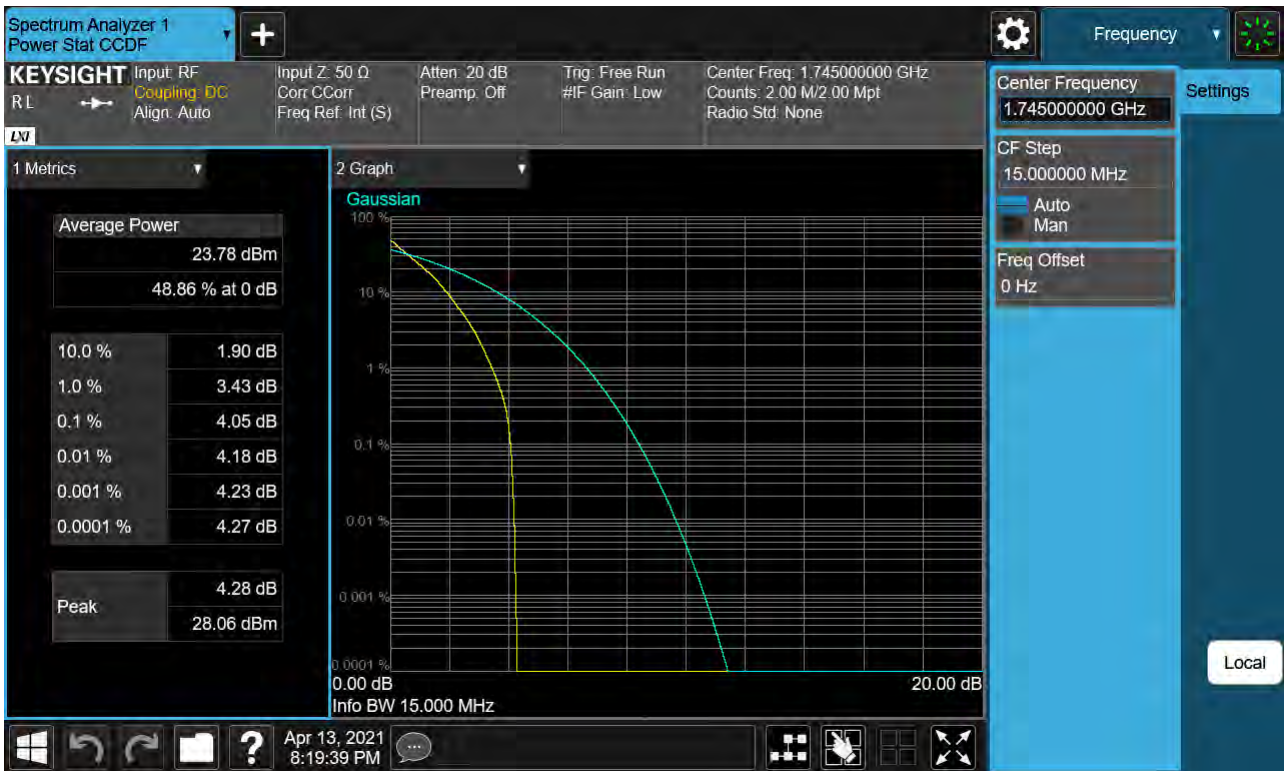
Sub6 n66. PAR Plot (10M BW_Ch.349000_64QAM_RB50_0)



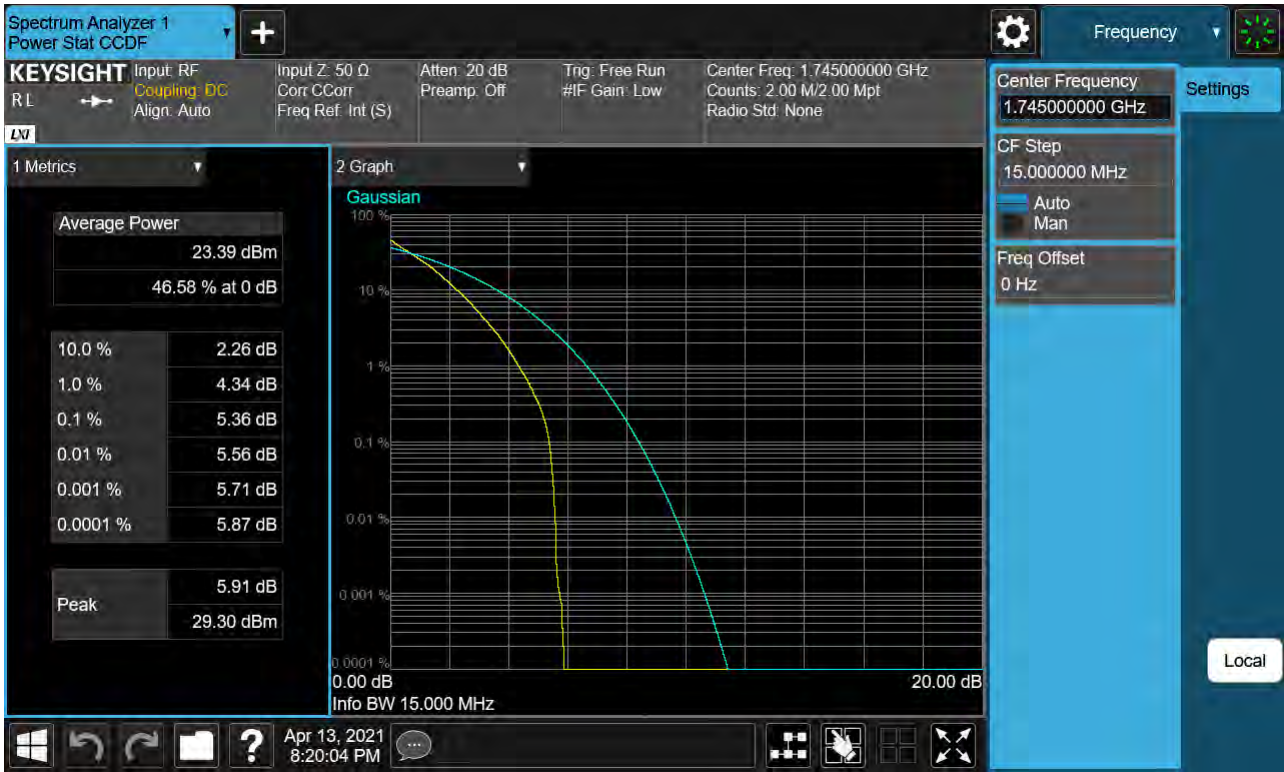
Sub6 n66. PAR Plot (10M BW_Ch.349000_256QAM_RB50_0)



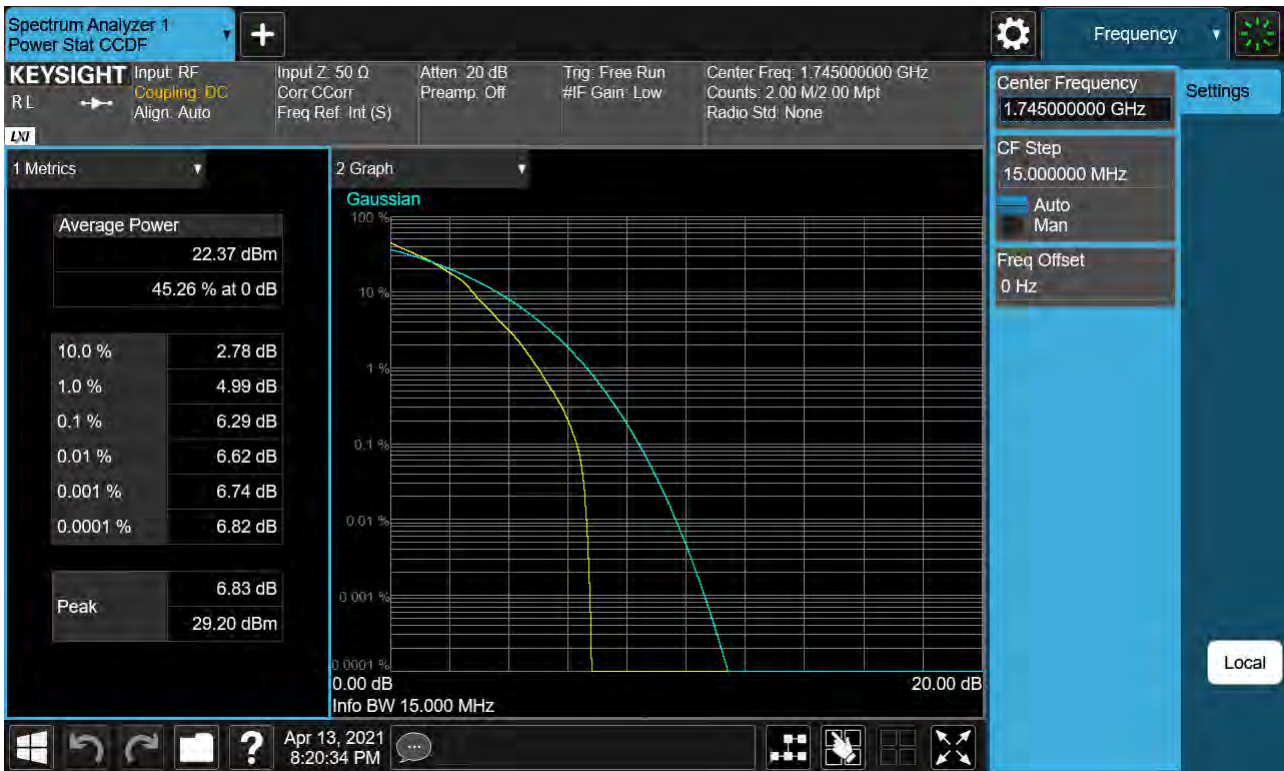
Sub6 n66. PAR Plot (15M BW_Ch.349000_ BPSK_RB75_0)



Sub6 n66. PAR Plot (15M BW_Ch.349000_QPSK_RB75_0)



Sub6 n66. PAR Plot (15M BW_Ch.349000_16QAM_RB75_0)



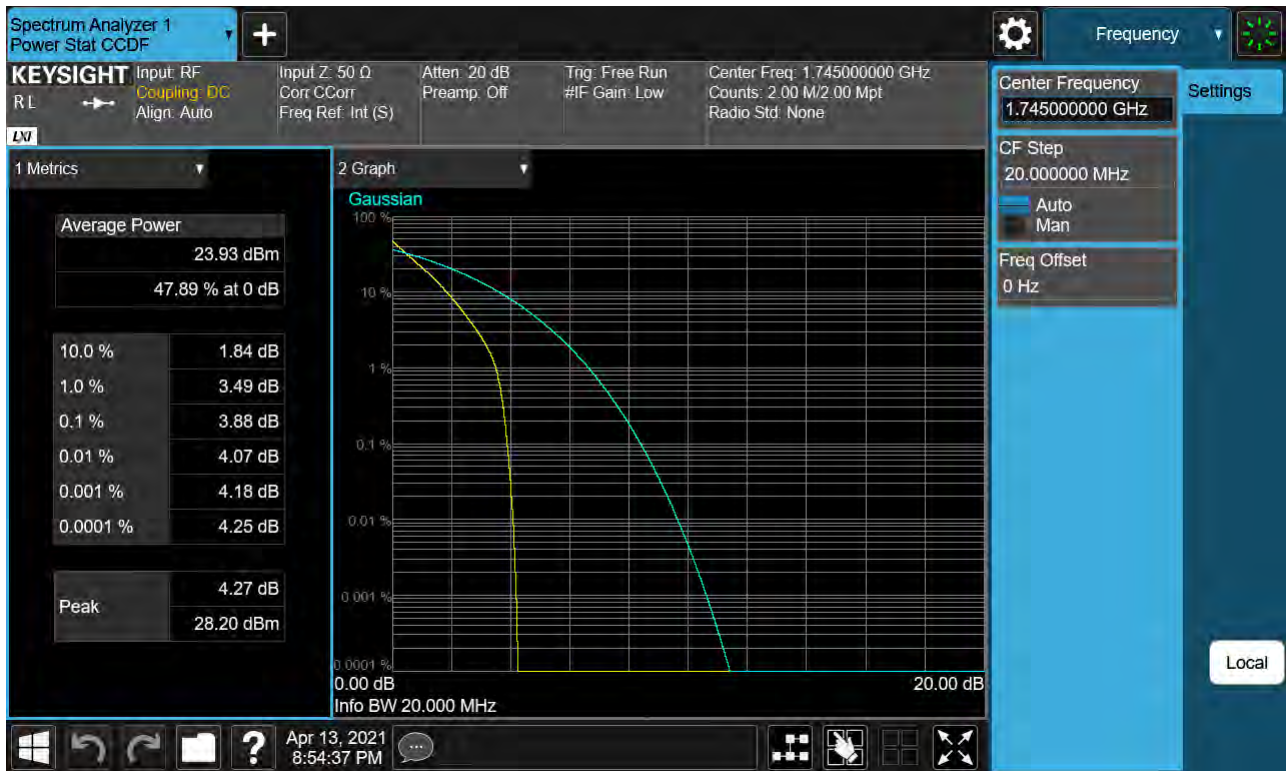
Sub6 n66. PAR Plot (15M BW_Ch.349000_64QAM_RB75_0)



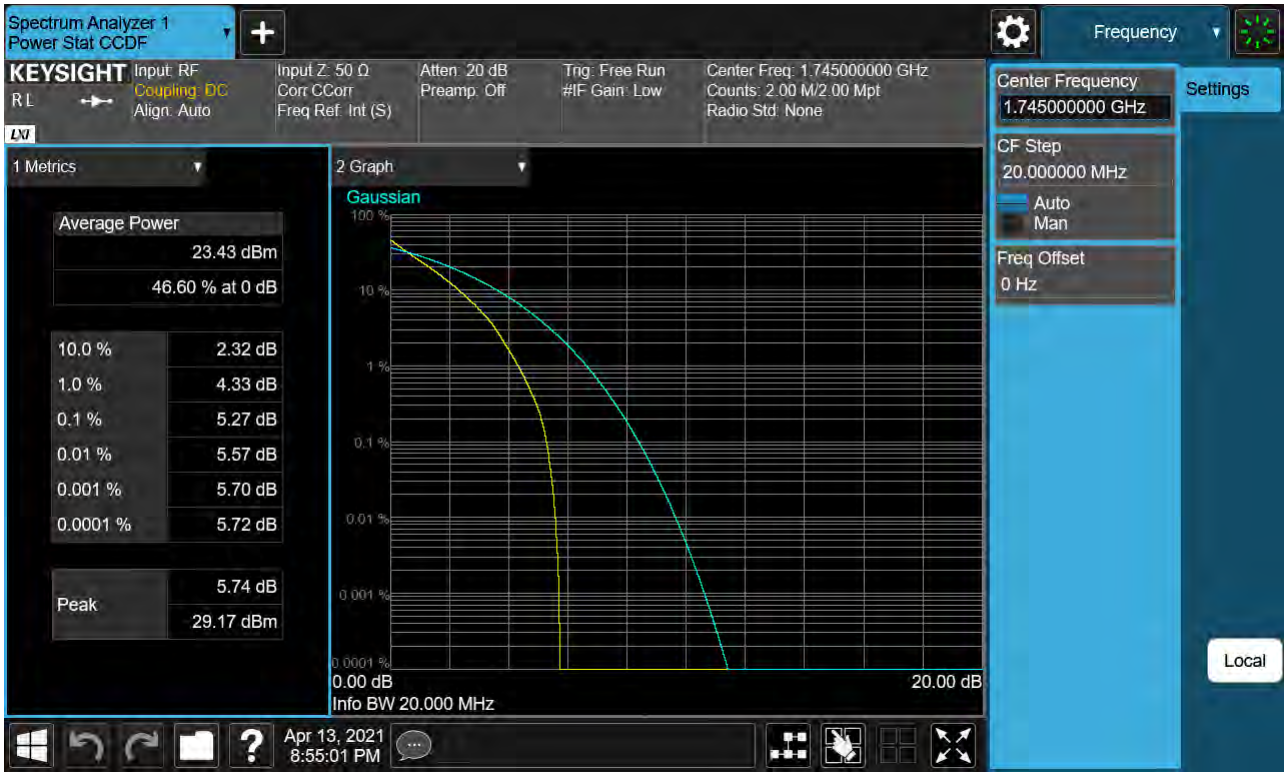
Sub6 n66. PAR Plot (15M BW_Ch.349000_256QAM_RB75_0)



Sub6 n66. PAR Plot (20M BW_Ch.349000_ BPSK_RB100_0)



Sub6 n66. PAR Plot (20M BW_Ch.349000_QPSK_RB100_0)



Sub6 n66. PAR Plot (20M BW_Ch.349000_16QAM_RB100_0)



Sub6 n66. PAR Plot (20M BW_Ch.349000_64QAM_RB100_0)



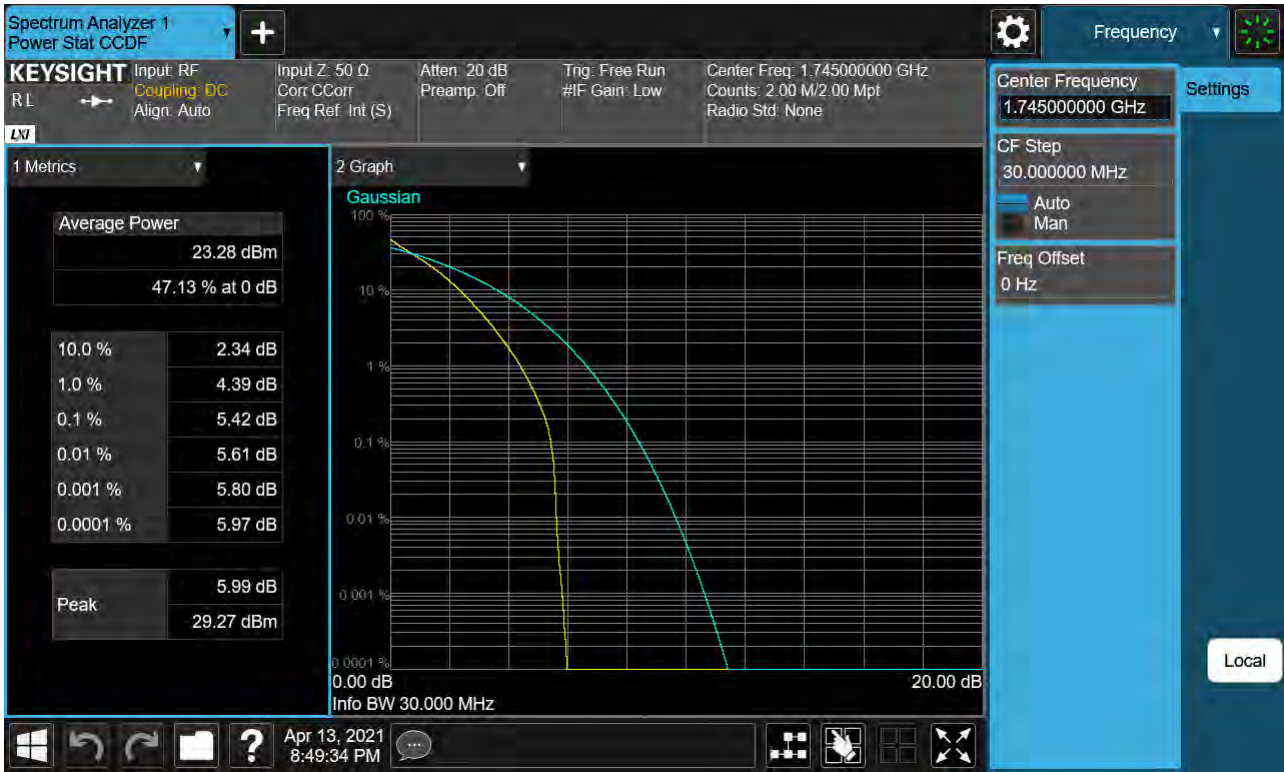
Sub6 n66. PAR Plot (20M BW_Ch.349000_256QAM_RB100_0)



Sub6 n66. PAR Plot (30M BW_Ch.349000_ BPSK_RB160_0)



Sub6 n66. PAR Plot (30M BW_Ch.349000_QPSK_RB160_0)



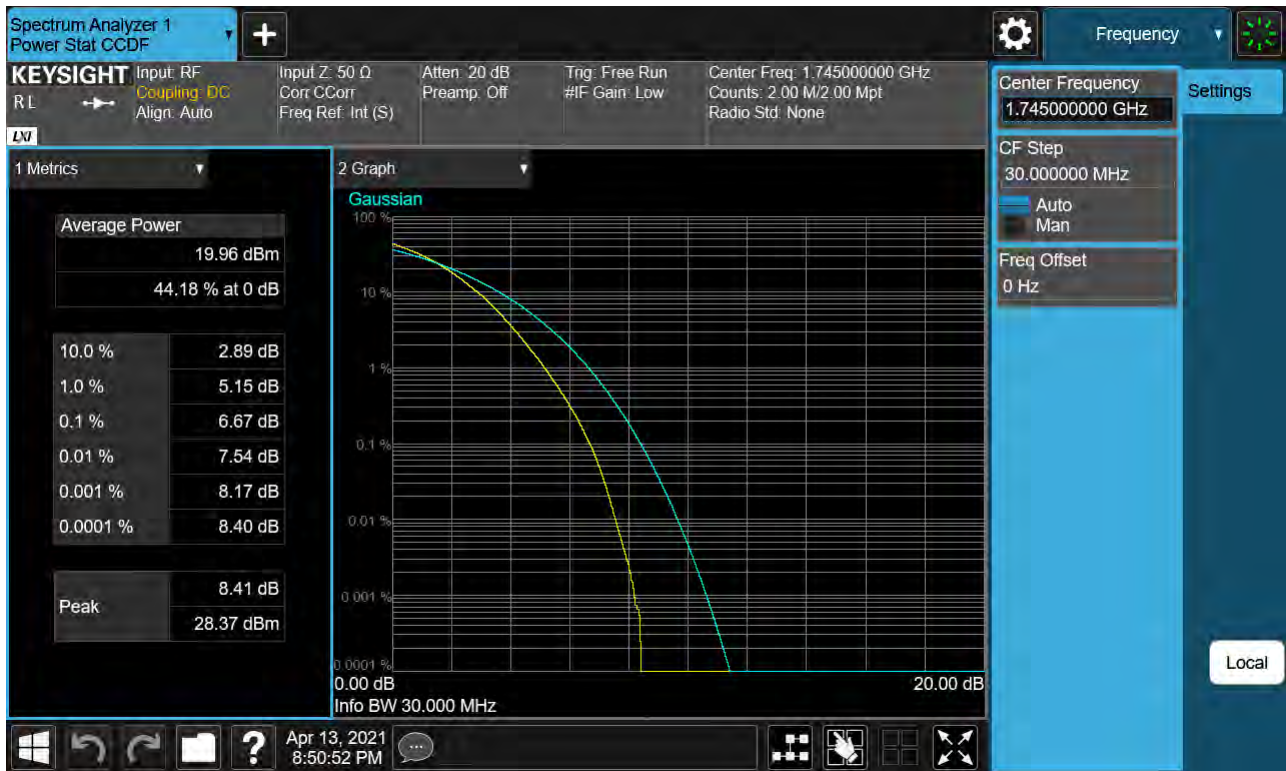
Sub6 n66. PAR Plot (30M BW_Ch.349000_16QAM_RB160_0)



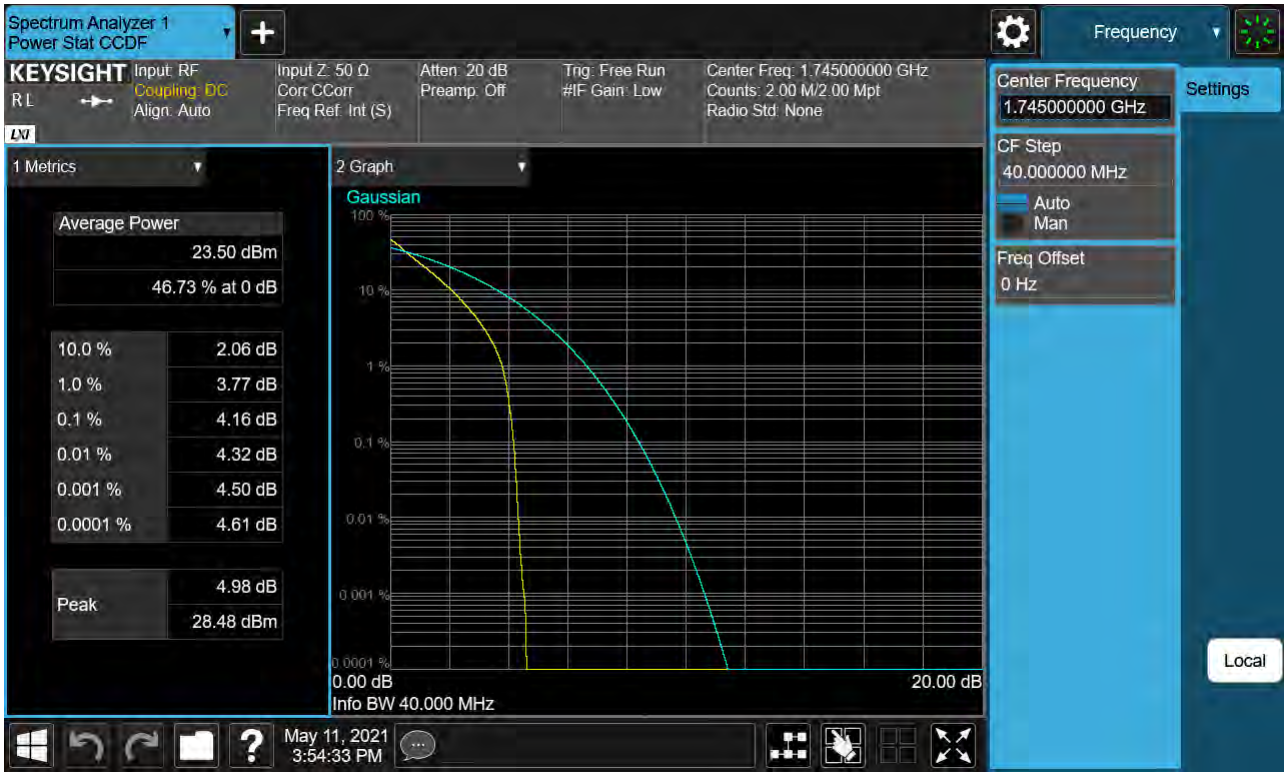
Sub6 n66. PAR Plot (30M BW_Ch.349000_64QAM_RB160_0)



Sub6 n66. PAR Plot (30M BW_Ch.349000_256QAM_RB160_0)



Sub6 n66. PAR Plot (40M BW_Ch.349000_ BPSK_RB216_0)



Sub6 n66. PAR Plot (40M BW_Ch.349000_QPSK_RB216_0)



Sub6 n66. PAR Plot (40M BW_Ch.349000_16QAM_RB216_0)



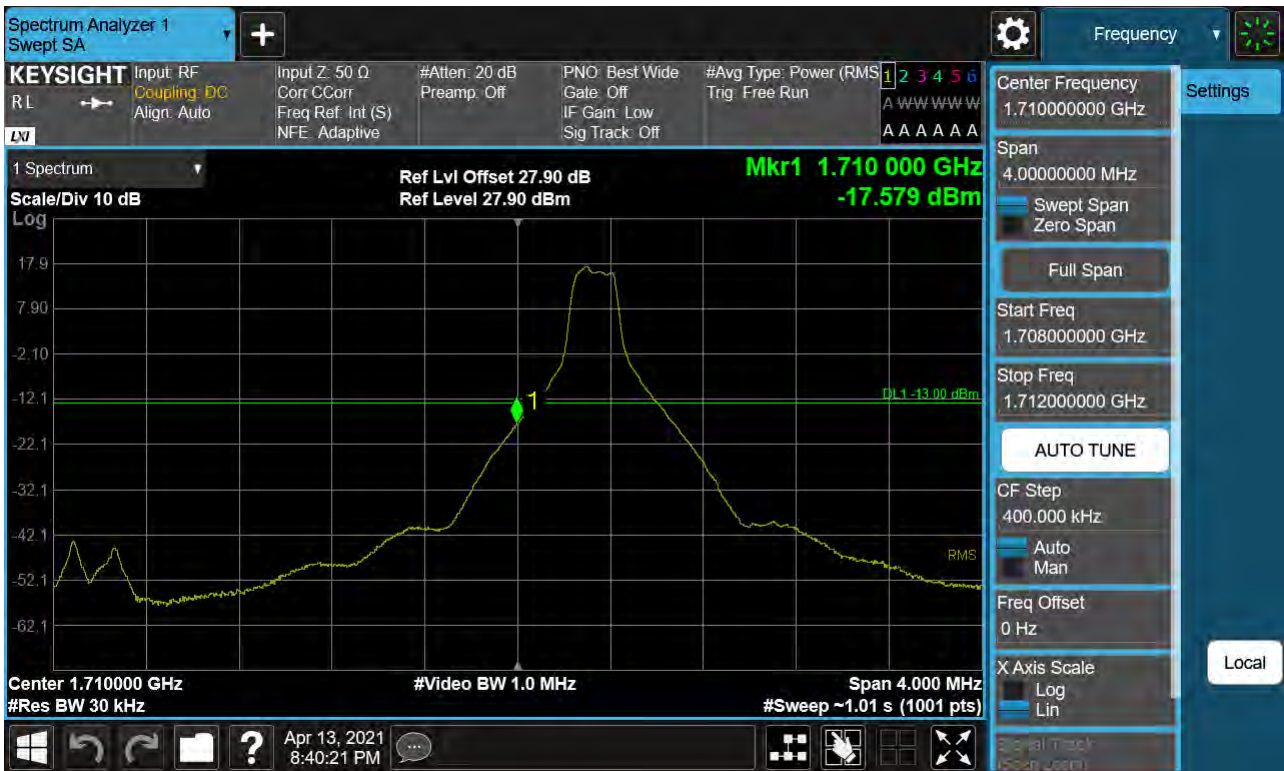
Sub6 n66. PAR Plot (40M BW_Ch.349000_64QAM_RB216_0)



Sub6 n66. PAR Plot (40M BW_Ch.349000_256QAM_RB216_0)



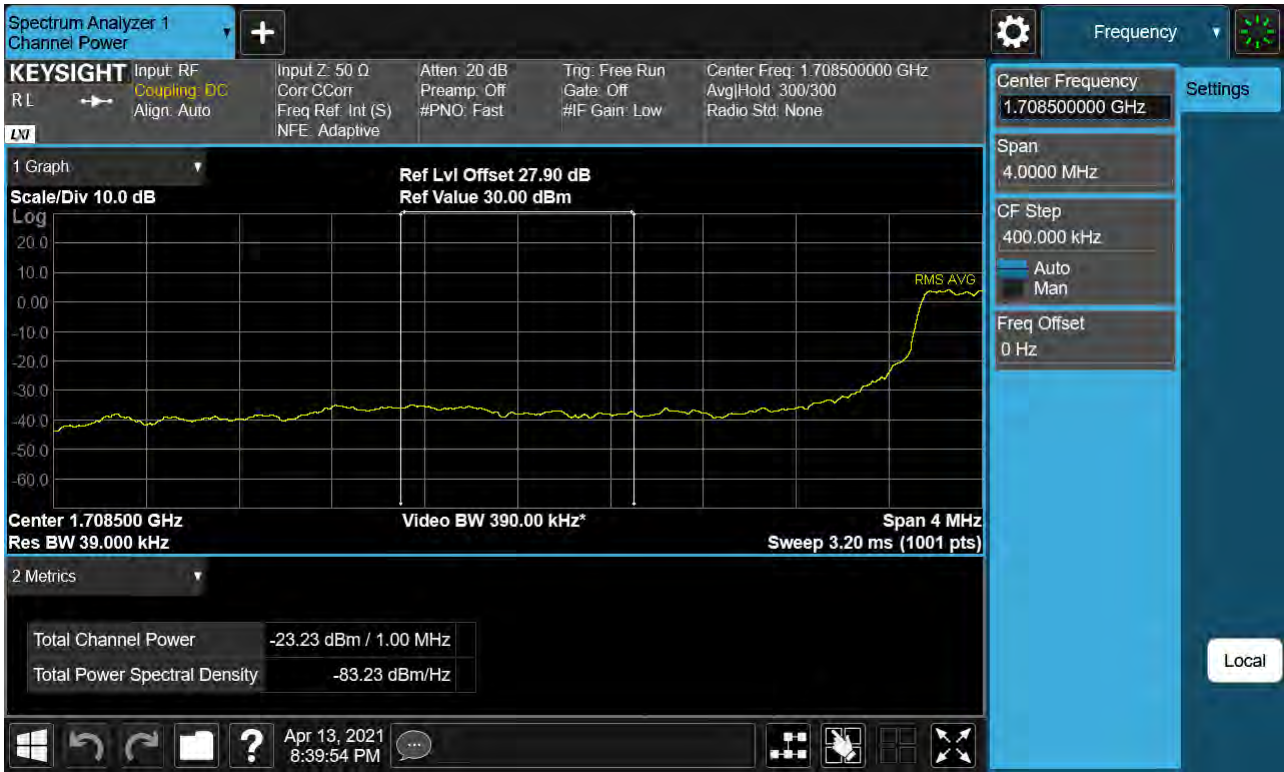
Sub6 n66. Lower Band Edge Plot (5M BW Ch.342500 BPSK RB 1, Offset 0) -1



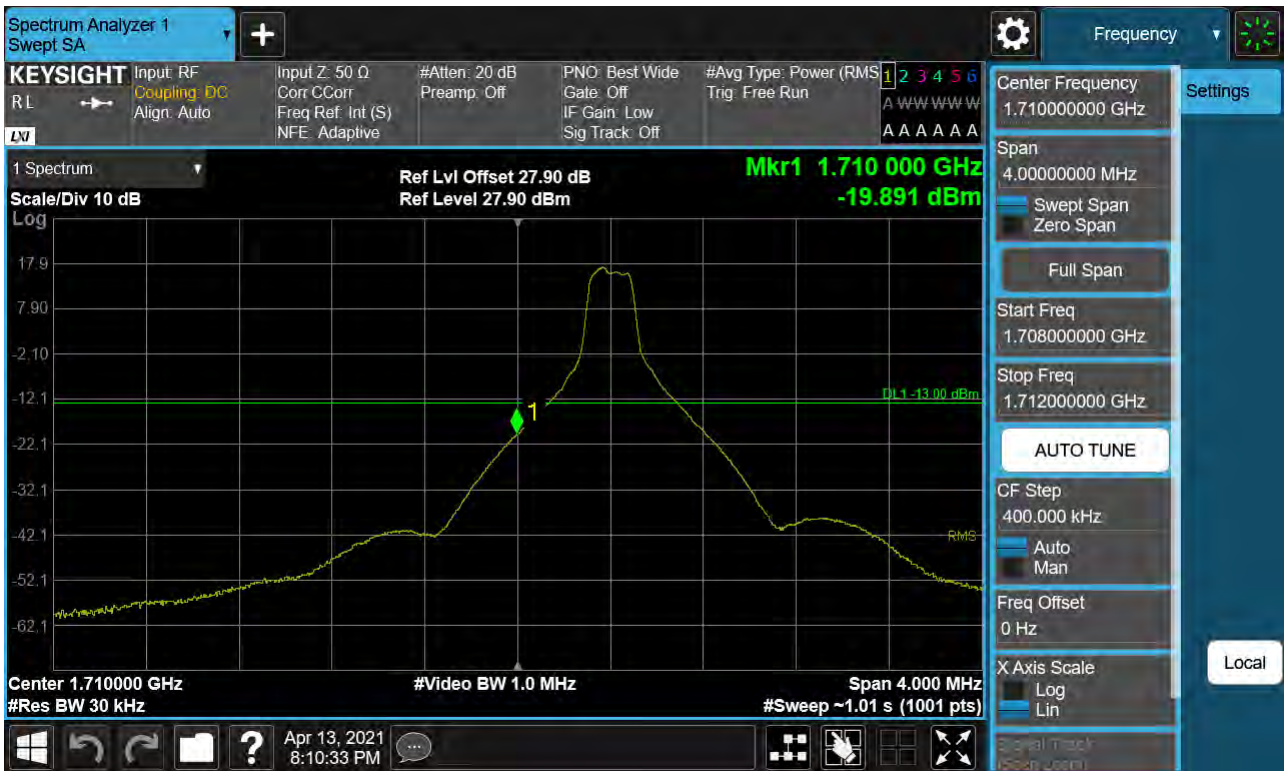
Sub6 n66. Lower Band Edge Plot (5M BW Ch.342500 BPSK RB 25_0) -2



Sub6 n66. Lower Extended Band Edge Plot (5M BW Ch.342500 BPSK_RB25_0) -3



Sub6 n66. Lower Band Edge Plot (10M BW Ch.343000 BPSK RB 1, Offset 0) -1



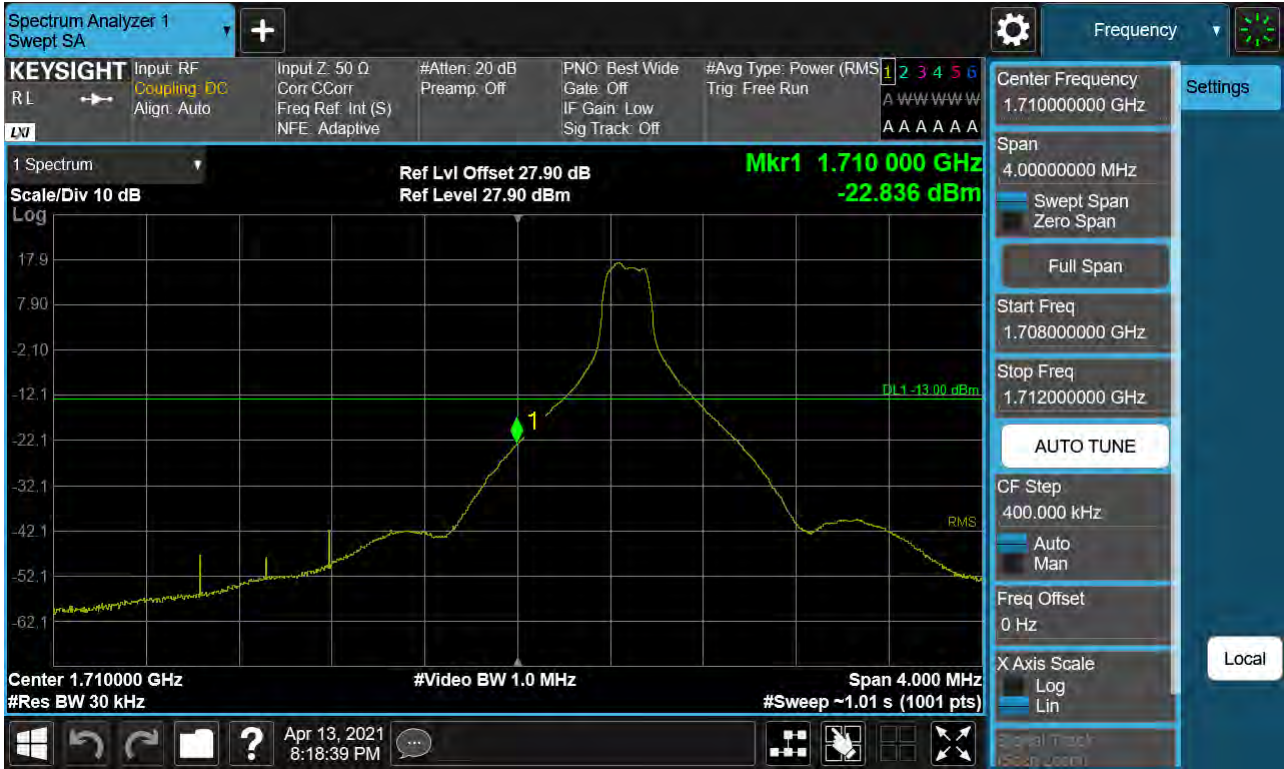
Sub6 n66. Lower Band Edge Plot (10M BW Ch.343000 BPSK RB 50_0) -2



Sub6 n66. Lower Extended Band Edge Plot (10M BW Ch.343000 BPSK_RB50_0) -3



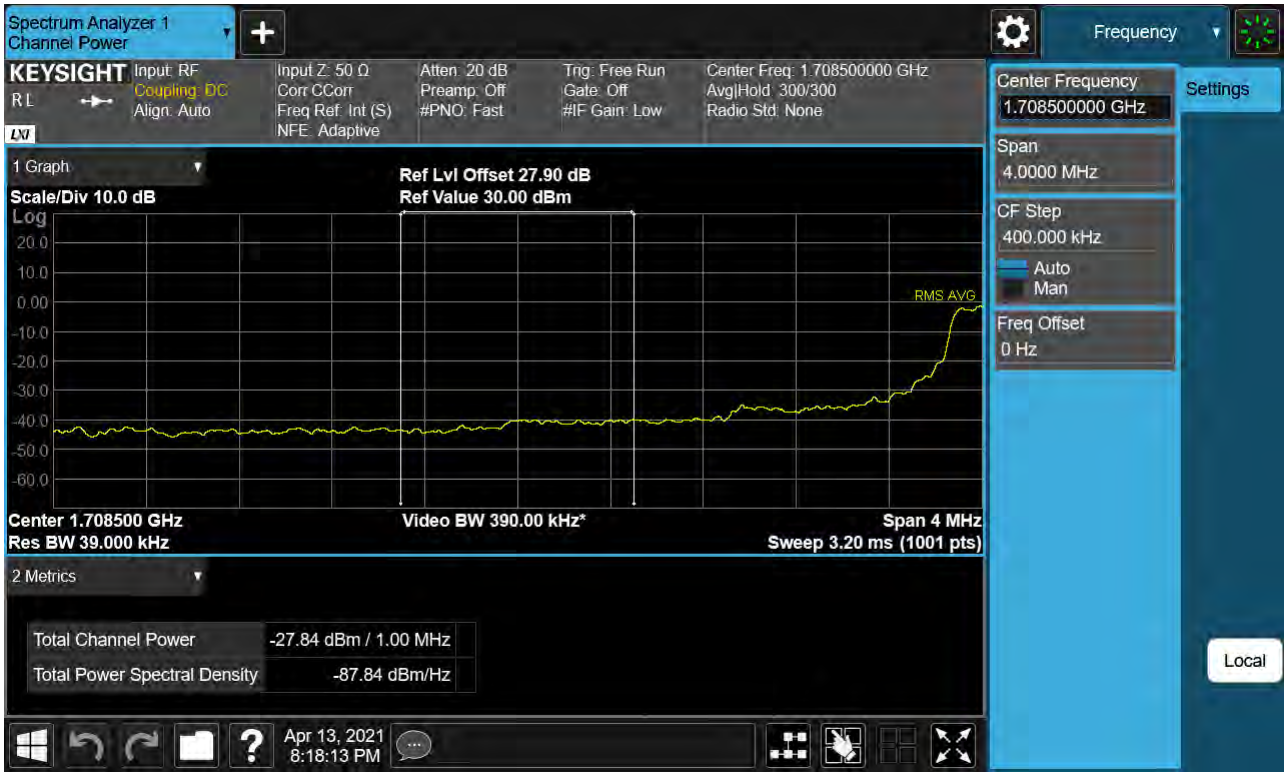
Sub6 n66. Lower Band Edge Plot (15M BW Ch.343500 BPSK RB 1, Offset 0) -1



Sub6 n66. Lower Band Edge Plot (15M BW Ch.343500 BPSK RB 75_0) -2



Sub6 n66. Lower Extended Band Edge Plot (15M BW Ch.343500 BPSK_RB75_0) -3



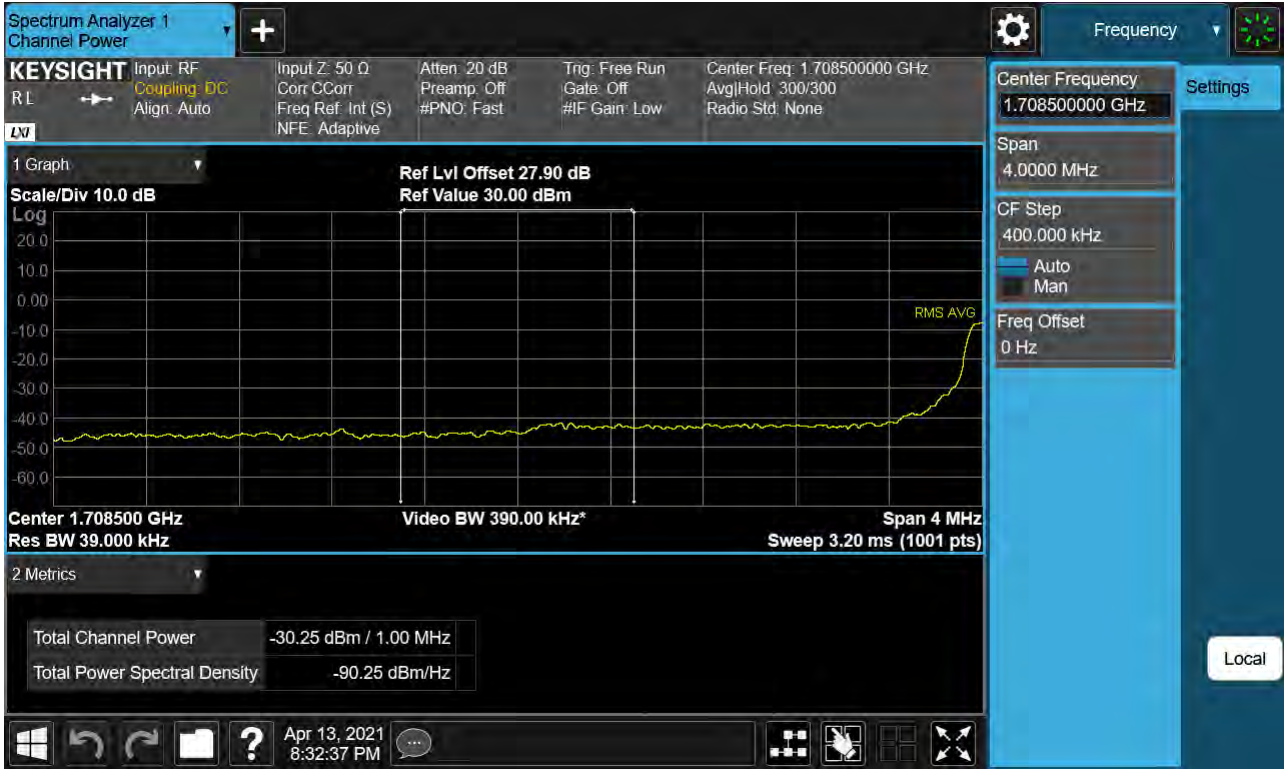
Sub6 n66. Lower Band Edge Plot (20M BW Ch.344000 BPSK RB 1, Offset 0) -1



Sub6 n66. Lower Band Edge Plot (20M BW Ch.344000 BPSK RB 100_0) -2



Sub6 n66. Lower Extended Band Edge Plot (20M BW Ch.344000 BPSK_RB100_0) -3



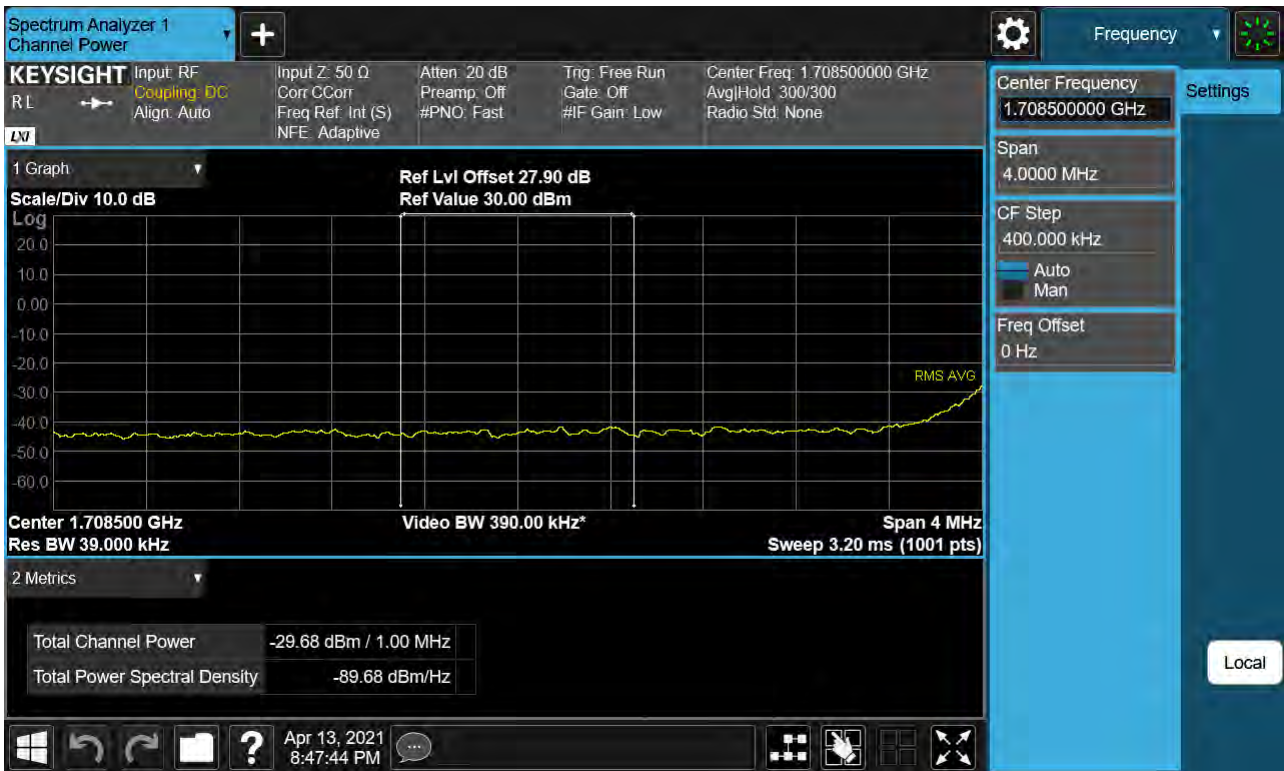
Sub6 n66. Lower Band Edge Plot (30M BW Ch.345000 BPSK RB 1, Offset 0) -1



Sub6 n66. Lower Band Edge Plot (30M BW Ch.345000 BPSK RB 160_0) -2



Sub6 n66. Lower Extended Band Edge Plot (30M BW Ch.345000 BPSK_RB160_0) -3



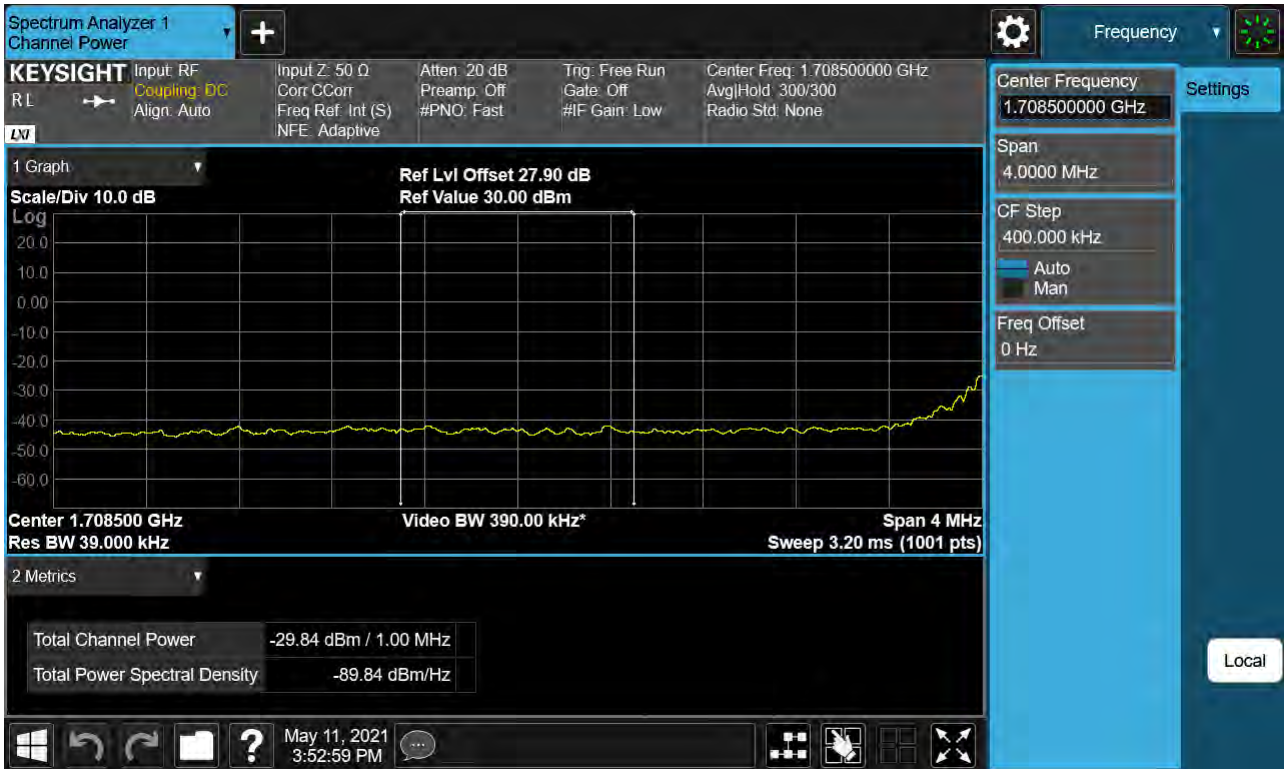
Sub6 n66. Lower Band Edge Plot (40M BW Ch.346000 BPSK RB 1, Offset 0) -1



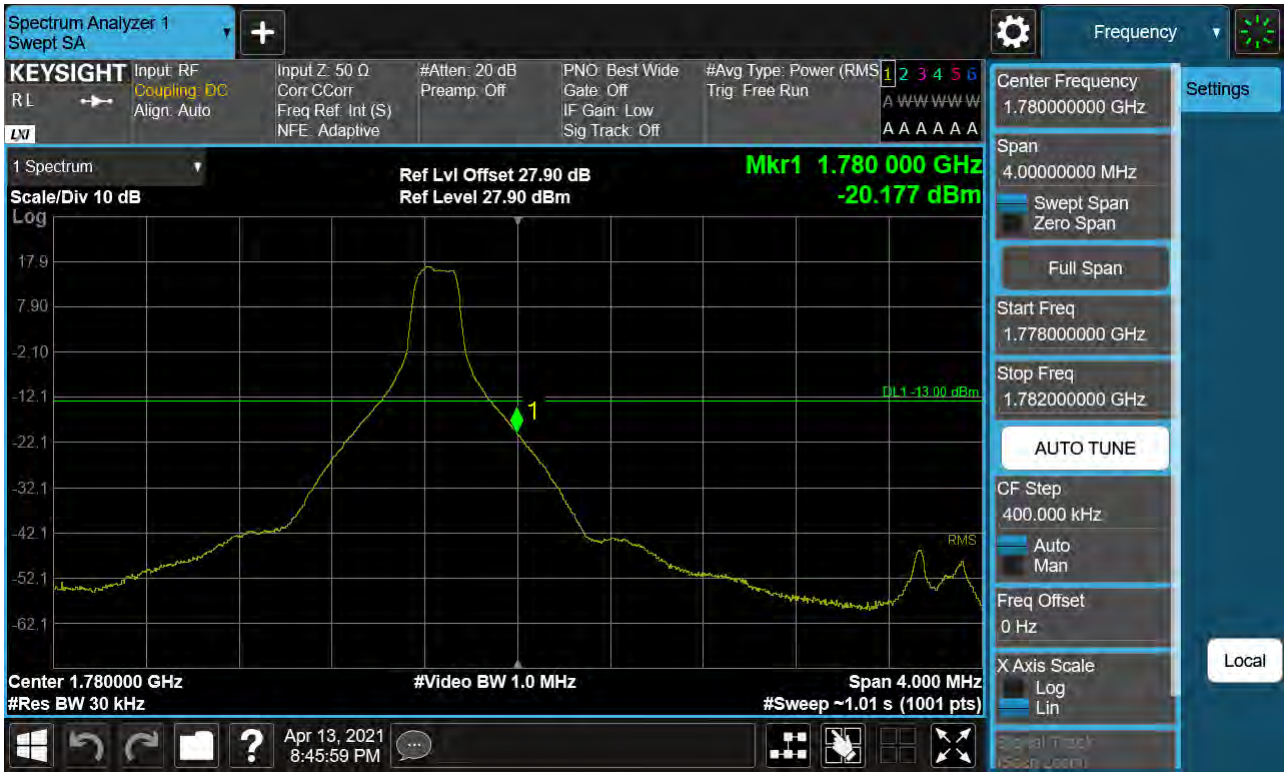
Sub6 n66. Lower Band Edge Plot (40M BW Ch.346000 BPSK RB 216_0) -2



Sub6 n66. Lower Extended Band Edge Plot (40M BW Ch.346000 BPSK_RB216_0) -3



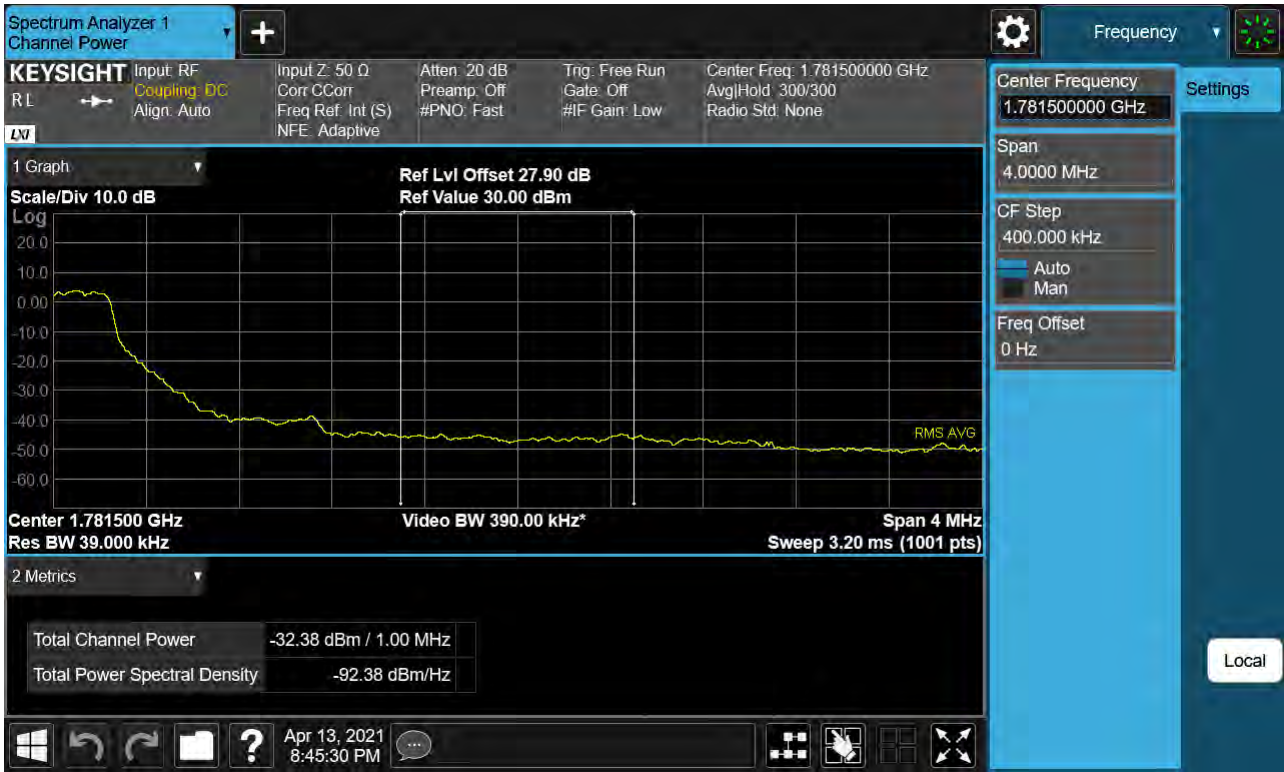
Sub6 n66. Upper Band Edge Plot (5M BW Ch.355500 BPSK_RB1_Offset 24) -1



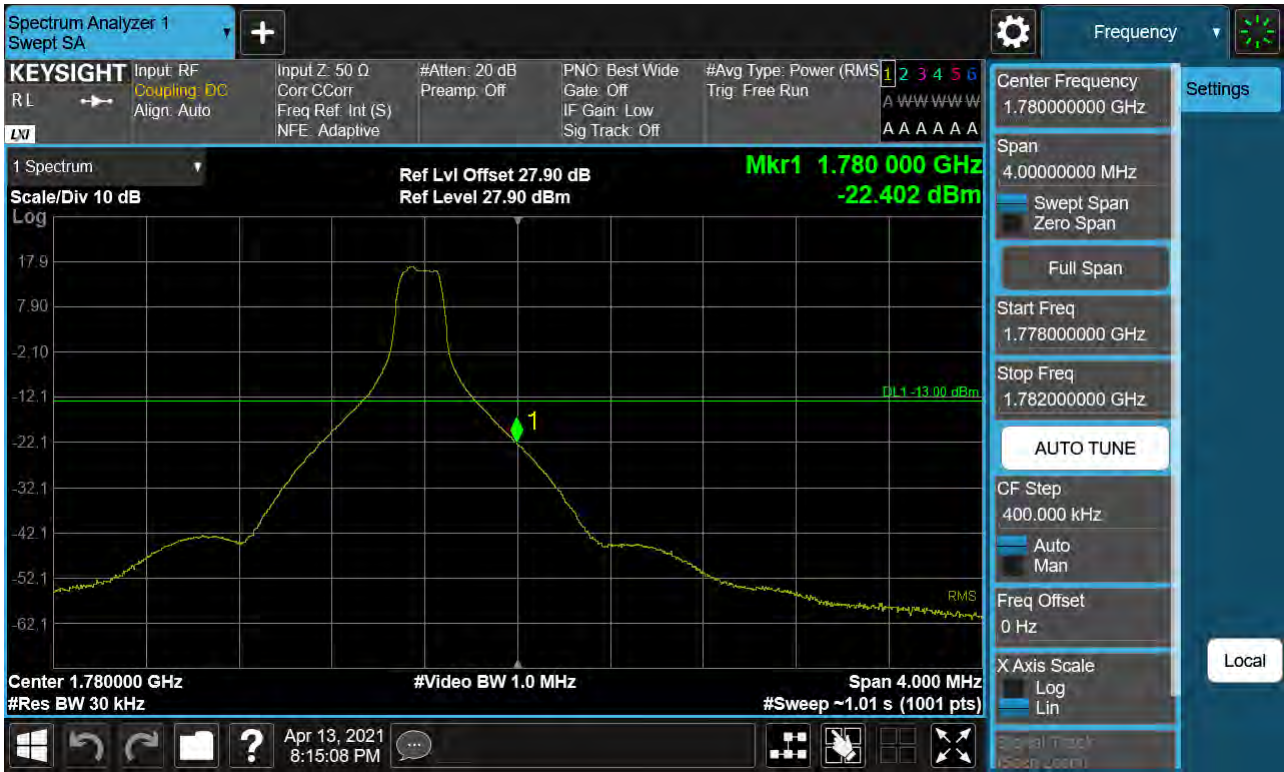
Sub6 n66. Upper Band Edge Plot (5M BW Ch.355500 BPSK_RB25_0) -2



Sub6 n66. Upper Extended Band Edge Plot (5M BW Ch.355500 BPSK_RB25_0) -3



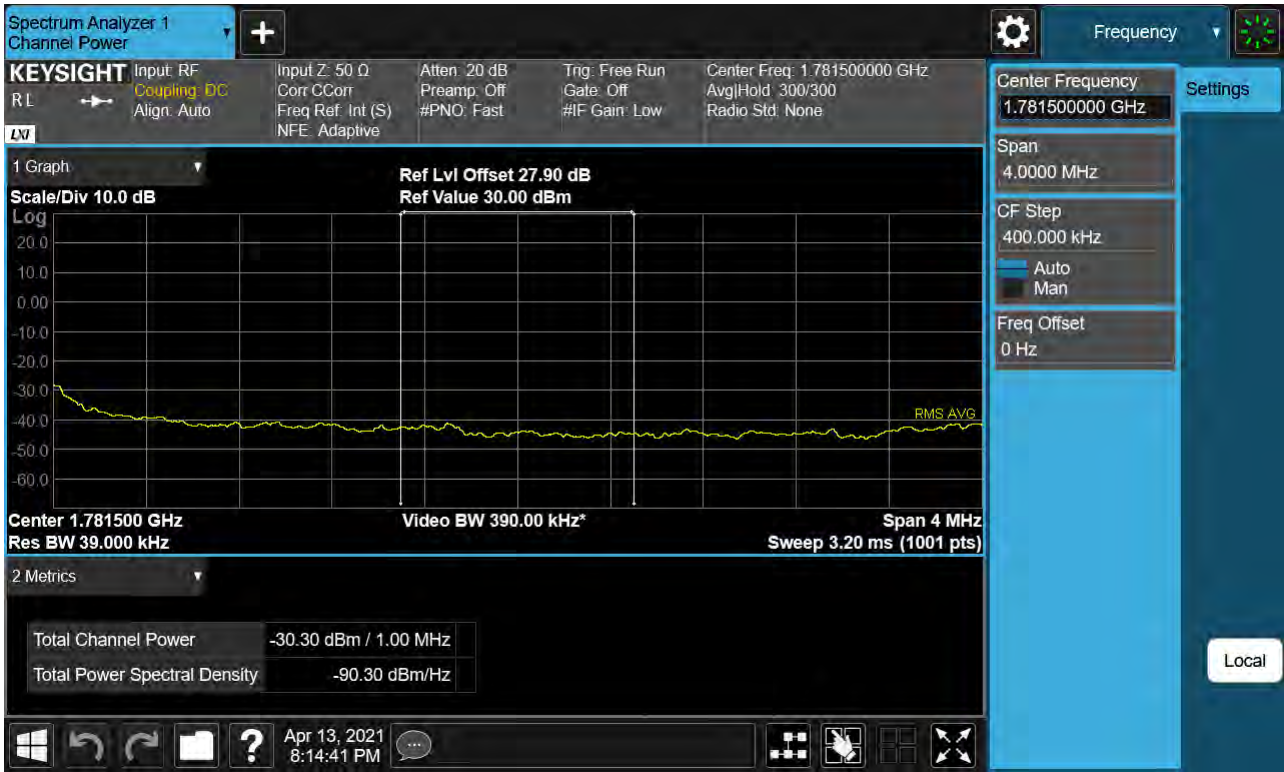
Sub6 n66. Upper Band Edge Plot (10M BW Ch.355000 BPSK_RB1_Offset 51) -1



Sub6 n66. Upper Band Edge Plot (10M BW Ch.355000 BPSK_RB50_0) -2



Sub6 n66. Upper Extended Band Edge Plot (10M BW Ch.355000 BPSK_RB50_0) -3



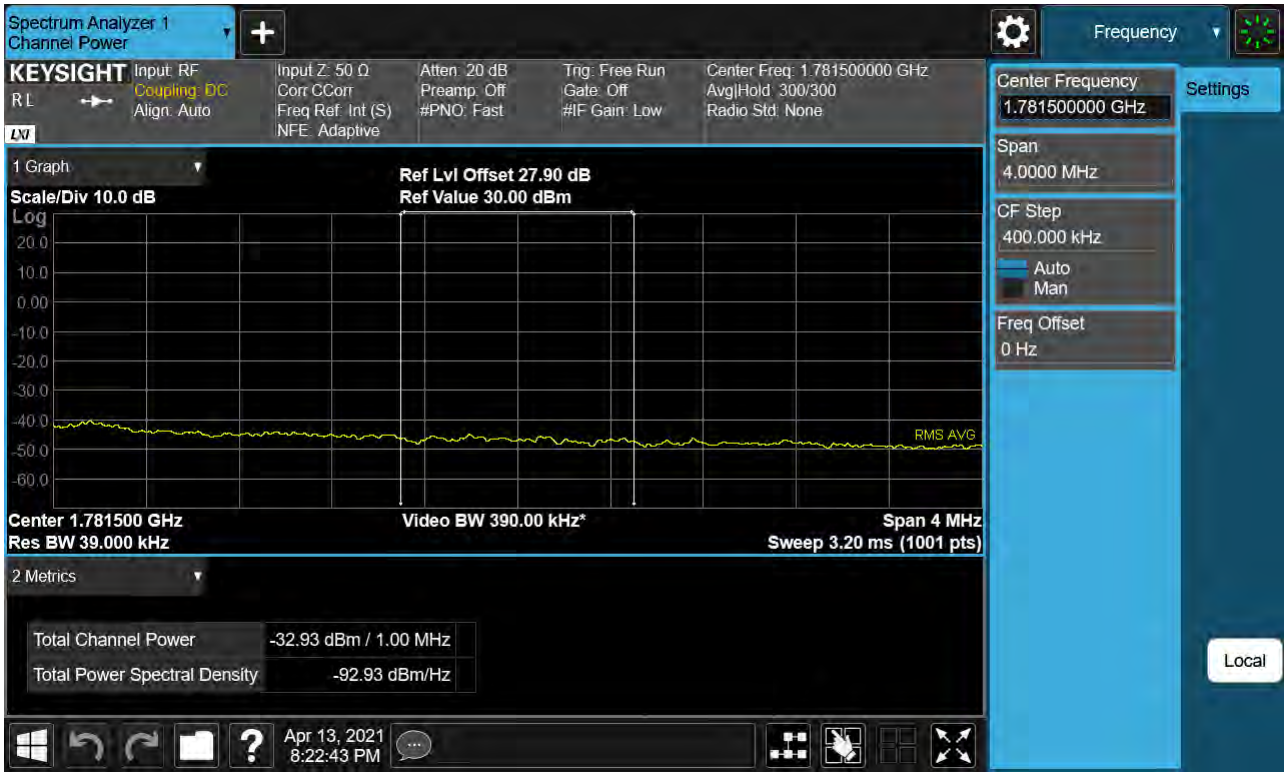
Sub6 n66. Upper Band Edge Plot (15M BW Ch.354500 BPSK_RB1_Offset 78) -1



Sub6 n66. Upper Band Edge Plot (15M BW Ch.354500 BPSK_RB75_0) -2



Sub6 n66. Upper Extended Band Edge Plot (15M BW Ch.354500 BPSK_RB75_0) -3



Sub6 n66. Upper Band Edge Plot (20M BW Ch.354000 BPSK_RB1_Offset 105) -1



Sub6 n66. Upper Band Edge Plot (20M BW Ch.354000 BPSK_RB100_0) -2



Sub6 n66. Upper Extended Band Edge Plot (20M BW Ch.354000 BPSK_RB100_0) -3



Sub6 n66. Upper Band Edge Plot (30M BW Ch.353000 BPSK_RB1_Offset 159) -1



Sub6 n66. Upper Band Edge Plot (30M BW Ch.353000 BPSK_RB160_0) -2



Sub6 n66. Upper Extended Band Edge Plot (30M BW Ch.353000 BPSK_RB160_0) -3



Sub6 n66. Upper Band Edge Plot (40M BW Ch.352000 BPSK_RB1_Offset 215) -1



Sub6 n66. Upper Band Edge Plot (40M BW Ch.352000 BPSK_RB216_0) -2



Sub6 n66. Upper Extended Band Edge Plot (40M BW Ch.352000 BPSK_RB216_0) -3



Sub6 n66. Conducted Spurious Plot_1 (342500ch_5MHz_BPSK_RB 1_1)



Sub6 n66. Conducted Spurious Plot_2 (342500ch_5MHz_BPSK_RB 1_1)

