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FCC Sub6 REPORT

Certification

Applicant Name:
SAMSUNG Electronics Co., Ltd.

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

Date of Issue:
February 19, 2021
Location:
HCT CO., LTD.,
74, Seoicheon-ro 578beon-gil, Majang-myeon,
Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA
Report No.: HCT-RF-2102-FC027-R1

FCC ID: **A3LSMA326U**

APPLICANT: **SAMSUNG Electronics Co., Ltd.**

Model(s):	SM-A326U
Additional Model(s):	SM-A326U1/DS, SM-S326DL
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	4M49G7D	PI/2 BPSK	0.185	22.67
		4M51G7D	QPSK	0.183	22.62
		4M51W7D	16QAM	0.140	21.46
		4M49W7D	64QAM	0.099	19.98
		4M50W7D	256QAM	0.071	18.53
Sub6 n66 (10)	1715.0 – 1775.0	8M97G7D	PI/2 BPSK	0.179	22.54
		9M00G7D	QPSK	0.175	22.43
		8M98W7D	16QAM	0.132	21.20
		8M96W7D	64QAM	0.095	19.78
		8M98W7D	256QAM	0.069	18.40
Sub6 n66 (15)	1717.5 – 1772.5	13M4G7D	PI/2 BPSK	0.179	22.54
		13M5G7D	QPSK	0.175	22.42
		13M5W7D	16QAM	0.135	21.32
		13M5W7D	64QAM	0.095	19.79
		13M5W7D	256QAM	0.069	18.40
Sub6 n66 (20)	1720.0 – 1770.0	18M0G7D	PI/2 BPSK	0.186	22.69
		17M9G7D	QPSK	0.185	22.67
		17M9W7D	16QAM	0.139	21.45
		17M9W7D	64QAM	0.101	20.06
		18M0W7D	256QAM	0.072	18.57
Sub6 n66 (25)	1722.5 – 1767.5	22M9G7D	PI/2 BPSK	0.178	22.50
		22M9G7D	QPSK	0.174	22.40
		22M9W7D	16QAM	0.132	21.22
		23M0W7D	64QAM	0.095	19.77
		22M9W7D	256QAM	0.069	18.37
Sub6 n66 (30)	1725.0 – 1765.0	28M7G7D	PI/2 BPSK	0.182	22.60
		28M6G7D	QPSK	0.180	22.55
		28M7W7D	16QAM	0.142	21.51
		28M6W7D	64QAM	0.101	20.03
		28M6W7D	256QAM	0.071	18.52
Sub6 n66 (40)	1730.0 – 1760.0	38M6G7D	PI/2 BPSK	0.173	22.39
		38M7G7D	QPSK	0.170	22.32
		38M6W7D	16QAM	0.129	21.12
		38M6W7D	64QAM	0.092	19.66
		37M7W7D	256QAM	0.067	18.28

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)

REVIEWED BY

Report prepared by : Jae Ryang Do
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)

* The report shall not be reproduced except in full(only partly) without approval of the laboratory.

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2102-FC027	February 10, 2021	- First Approval Report
HCT-RF-2102-FC027-R1	February 19, 2021	- Revised the E.I.R.P

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:	A3LSMA326U
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-A326U
Additional Model(s):	SM-A326U1/DS, SM-S326DL
SCS(kHz):	15
Bandwidth(MHz):	5, 10, 15, 20, 25, 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)) 1722.5 MHz – 1767.5 MHz (Sub6 n66(25 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:	January 04, 2021 ~ February 05, 2021
Serial number:	Radiated: R3CNC01KD7D Conducted: 4C1B22D9E41C7ECE

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 (HT20/40/80), Bluetooth, BT LE, NFC.

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 ≥ 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;

   $$P_{d(dBm)} = Pg_{(dBm)} – \text{cable loss}_{(dB)} + \text{antenna gain}_{(dB)}$$

   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 ≥ 3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points > 2 x 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 10^{th} 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;

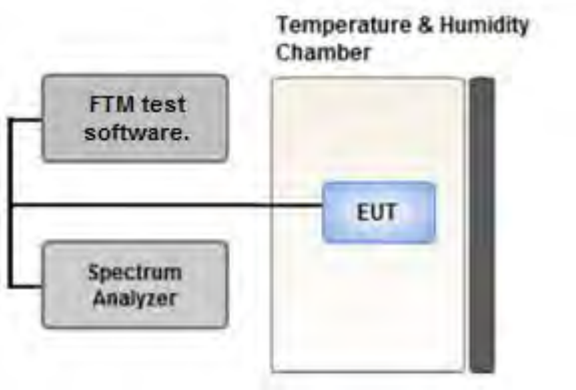
$$Result_{(dBm)} = Pg_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dBi)}$$

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.

$$EIRP_{(dBm)} = ERP_{(dBm)} + 2.15$$

3.4 PEAK- TO- AVERAGE RATIO



Test setup

① **CCDF Procedure for PAPR**

Test Settings

1. Set resolution/measurement bandwidth ≥ 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:

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

Test Settings(Peak Power)

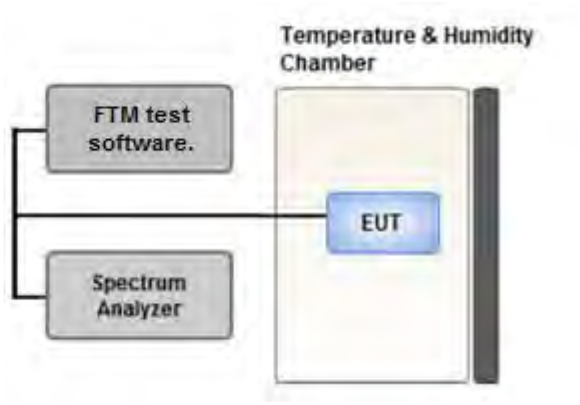
The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW ≥ 3 × RBW.

1. Set the RBW ≥ OBW.
2. Set VBW ≥ 3 × RBW.
3. Set span ≥ 2 × OBW.
4. Sweep time ≥ 10 × (number of points in sweep) × (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 × to 3 × the OBW.
2. Set RBW ≥ OBW.
3. Set VBW ≥ 3 × RBW.
4. Set number of measurement points in sweep ≥ 2 × span / RBW.
5. Sweep time:
   Set ≥ [10 × (number of points in sweep) × (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/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 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.

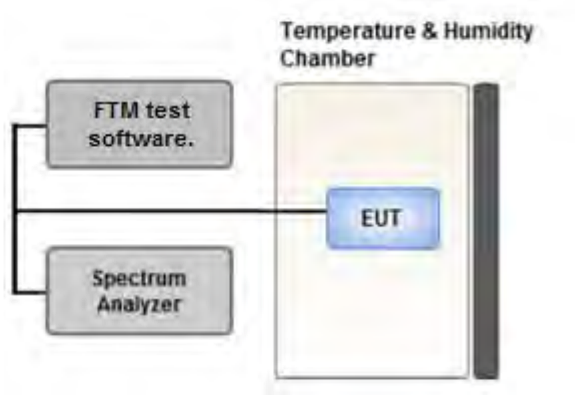
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

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 ≥ 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.

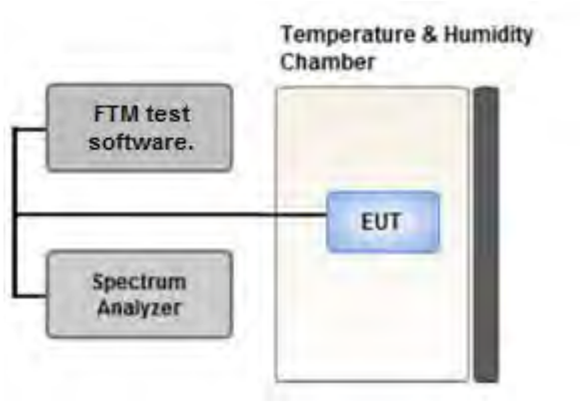
All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

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 ≥ 3 MHz
3. Detector = RMS
4. Trace Mode = trace average
5. Sweep time = auto
6. Number of points in sweep ≥ 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 ≥ 2 x Span/RBW
7. Trace mode = trace average
8. Sweep time = auto couple
9. The trace was allowed to stabilize

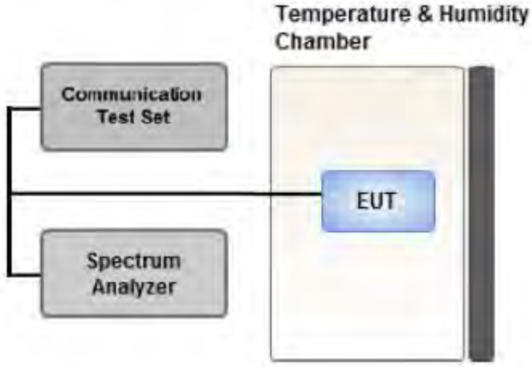
Test Notes

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°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.

(In the case of radiated spurious emissions, only the B.W result that confirmed the maximum radiated power was reported.)

- 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: 5A-n66A(BW 20MHz))
- All RB sizes, offsets of operation were investigated and the worst case configuration results are reported.
  Please refer to the table below.
- SM-A326U & additional models were tested and the worst case results are reported.

(Worst case : SM-A326U)

[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	Z

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 RB sizes, offsets of operation were investigated and the worst case configuration results are reported.
  Please refer to the table below.
- SM-A326U & additional models were tested and the worst case results are reported.
(Worst case : SM-A326U)

[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, 25, 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
		25	Low	1	0
			High	1	132
		30	Low	1	0
			High	1	159
		40	Low	1	0
			High	1	215
		5, 10, 15, 20, 25, 30, 40	Low, High	Full RB	0
Spurious and Harmonic Emissions at Antenna Terminal	PI/2 BPSK	5, 10, 15, 20, 25, 30, 40	Low, Mid, High	1	1

4. LIST OF TEST EQUIPMENT

Manufacture	Model/ Equipment	Serial Number	Calibration Date	Calibration Interval	Calibration Due
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
Wainwright Instruments	WHNX6-4740-6000-26500-40CC/ High Pass Filter	11	09/03/2020	Annual	09/03/2021
Hewlett Packard	11667B / Power Splitter(DC~26.5 GHz)	11275	04/27/2020	Annual	04/27/2021
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	03/23/2020	Annual	03/23/2021
Hewlett Packard	E3632A/DC Power Supply	MY40004427	09/16/2020	Annual	09/16/2021
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
ESPEC	SU-642 / Chamber	93008124	03/18/2020	Annual	03/18/2021
Schwarzbeck	BBHA 9120D/ Horn Antenna(1~18GHz)	02289	05/08/2020	Biennial	05/08/2022
Schwarzbeck	BBHA 9120D/ Horn Antenna(1~18GHz)	9120D-1299	05/10/2019	Biennial	05/10/2021
Schwarzbeck	BBHA 9170/ Horn Antenna(15~40GHz)	BBHA9170342	04/29/2019	Biennial	04/29/2021
Schwarzbeck	BBHA 9170/ Horn Antenna(15~40GHz)	BBHA9170124	02/11/2020	Biennial	02/11/2022
Agilent	N9020A/Signal Analyzer(10Hz~26.5GHz)	MY51110063	04/27/2020	Annual	04/27/2021
Hewlett Packard	8493C/ATTENUATOR(20dB)	17280	06/04/2020	Annual	06/04/2021
REOHDE & SCHWARZ	FSV40/Spectrum Analyzer(10Hz~40GHz)	101436	03/16/2020	Annual	03/16/2021
Rohde & Schwarz	FMZB1513/ Loop Antenna(9kHz~30MHz)	1513-175	05/18/2020	Biennial	05/18/2022
Schwarzbeck	VULB9160/ Bilog Antenna	3150	03/12/2019	Biennial	03/12/2021
Schwarzbeck	VULB9160/ Hybrid Antenna	760	03/22/2019	Biennial	03/22/2021
Anritsu Corp.	MT8821C/Wideband Radio Communication Tester	6262116770	07/22/2020	Annual	07/22/2021
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
KEYSIGHT	E7515B / 5G Wireless Tester	MY60101126	05/28/2020	Annual	05/28/2021
Mini-Circuits	ZC4PD-K1844+ / 4-Way Divider	942907	09/14/2020	Annual	09/14/2021
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. Espectially, 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 (±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	**See Note1**
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. Radiateded tests were tested using FTM test software.

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	-18.86	13.04	9.76	1.87	V	< 1.00	0.124	20.93
		QPSK	-18.90	13.00	9.76	1.87	V		0.123	20.89
		16-QAM	-20.00	11.90	9.76	1.87	V		0.095	19.79
		64-QAM	-21.49	10.41	9.76	1.87	V		0.068	18.30
		256-QAM	-23.00	8.90	9.76	1.87	V		0.048	16.79
1745.0		PI/2 BPSK	-17.25	14.57	9.97	1.88	V		0.185	22.67
		QPSK	-17.30	14.52	9.97	1.88	V		0.183	22.62
		16-QAM	-18.46	13.36	9.97	1.88	V		0.140	21.46
		64-QAM	-19.94	11.88	9.97	1.88	V		0.099	19.98
		256-QAM	-21.39	10.43	9.97	1.88	V		0.071	18.53
1777.5		PI/2 BPSK	-17.65	14.13	10.12	1.92	V		0.171	22.33
		QPSK	-17.68	14.10	10.12	1.92	V		0.170	22.30
		16-QAM	-18.80	12.98	10.12	1.92	V		0.131	21.18
		64-QAM	-20.33	11.45	10.12	1.92	V		0.092	19.65
		256-QAM	-21.77	10.01	10.12	1.92	V		0.066	18.21

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	-18.90	12.97	9.79	1.87	V	< 1.00	0.123	20.89
		QPSK	-19.01	12.86	9.79	1.87	V		0.120	20.78
		16-QAM	-20.23	11.64	9.79	1.87	V		0.090	19.56
		64-QAM	-21.65	10.22	9.79	1.87	V		0.065	18.14
		256-QAM	-23.11	8.76	9.79	1.87	V		0.047	16.68
1745.0		PI/2 BPSK	-17.38	14.44	9.97	1.88	V		0.179	22.54
		QPSK	-17.49	14.33	9.97	1.88	V		0.175	22.43
		16-QAM	-18.72	13.10	9.97	1.88	V		0.132	21.20
		64-QAM	-20.14	11.68	9.97	1.88	V		0.095	19.78
		256-QAM	-21.52	10.30	9.97	1.88	V		0.069	18.40
1775.0		PI/2 BPSK	-17.88	13.91	10.10	1.92	V		0.162	22.10
		QPSK	-17.97	13.82	10.10	1.92	V		0.159	22.01
		16-QAM	-19.21	12.58	10.10	1.92	V		0.119	20.77
		64-QAM	-20.62	11.17	10.10	1.92	V		0.086	19.36
		256-QAM	-22.01	9.78	10.10	1.92	V		0.063	17.97

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	-18.81	13.03	9.82	1.87	V	< 1.00	0.125	20.98
		QPSK	-18.84	13.00	9.82	1.87	V		0.124	20.95
		16-QAM	-19.92	11.92	9.82	1.87	V		0.097	19.87
		64-QAM	-21.47	10.37	9.82	1.87	V		0.068	18.32
		256-QAM	-22.84	9.00	9.82	1.87	V		0.050	16.95
1745.0		PI/2 BPSK	-17.38	14.44	9.97	1.88	V		0.179	22.54
		QPSK	-17.50	14.32	9.97	1.88	V		0.174	22.42
		16-QAM	-18.60	13.22	9.97	1.88	V		0.135	21.32
		64-QAM	-20.13	11.69	9.97	1.88	V		0.095	19.79
		256-QAM	-21.52	10.30	9.97	1.88	V		0.069	18.40
1772.5		PI/2 BPSK	-17.47	14.33	10.08	1.91	V		0.178	22.50
		QPSK	-17.55	14.25	10.08	1.91	V		0.175	22.42
		16-QAM	-18.70	13.10	10.08	1.91	V		0.134	21.27
		64-QAM	-20.18	11.62	10.08	1.91	V		0.095	19.79
		256-QAM	-21.60	10.20	10.08	1.91	V		0.069	18.37

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	-18.74	13.09	9.82	1.87	V	< 1.00	0.127	21.04
		QPSK	-18.78	13.05	9.82	1.87	V		0.126	21.00
		16-QAM	-19.95	11.88	9.82	1.87	V		0.096	19.83
		64-QAM	-21.36	10.47	9.82	1.87	V		0.070	18.42
		256-QAM	-22.83	9.00	9.82	1.87	V		0.050	16.95
1745.0		PI/2 BPSK	-17.23	14.59	9.97	1.88	V		0.186	22.69
		QPSK	-17.25	14.57	9.97	1.88	V		0.185	22.67
		16-QAM	-18.47	13.35	9.97	1.88	V		0.139	21.45
		64-QAM	-19.86	11.96	9.97	1.88	V		0.101	20.06
		256-QAM	-21.35	10.47	9.97	1.88	V		0.072	18.57
1770.0		PI/2 BPSK	-17.61	14.26	10.08	1.91	V		0.175	22.43
		QPSK	-17.64	14.23	10.08	1.91	V		0.174	22.40
		16-QAM	-18.88	12.99	10.08	1.91	V		0.130	21.16
		64-QAM	-20.25	11.62	10.08	1.91	V		0.095	19.79
		256-QAM	-21.80	10.07	10.08	1.91	V		0.067	18.24

Freq (MHz)	Mod/ Bandwidth [SCS (kHz)]	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1722.5	Sub6 n66/ 25 MHz [15 kHz]	PI/2 BPSK	-18.75	13.08	9.82	1.87	V	< 1.00	0.127	21.03
		QPSK	-18.84	12.99	9.82	1.87	V		0.124	20.94
		16-QAM	-20.07	11.76	9.82	1.87	V		0.094	19.71
		64-QAM	-21.55	10.28	9.82	1.87	V		0.067	18.23
		256-QAM	-22.88	8.95	9.82	1.87	V		0.049	16.90
1745.0		PI/2 BPSK	-17.43	14.39	9.97	1.88	V		0.177	22.49
		QPSK	-17.52	14.30	9.97	1.88	V		0.174	22.40
		16-QAM	-18.70	13.12	9.97	1.88	V		0.132	21.22
		64-QAM	-20.15	11.67	9.97	1.88	V		0.095	19.77
		256-QAM	-21.55	10.27	9.97	1.88	V		0.069	18.37
1767.5		PI/2 BPSK	-17.50	14.38	10.02	1.90	V		0.178	22.50
		QPSK	-17.66	14.22	10.02	1.90	V		0.171	22.34
		16-QAM	-18.80	13.08	10.02	1.90	V		0.132	21.20
		64-QAM	-20.32	11.56	10.02	1.90	V		0.093	19.68
		256-QAM	-21.65	10.23	10.02	1.90	V		0.068	18.35

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	-18.97	12.89	9.85	1.87	V	< 1.00	0.122	20.87
		QPSK	-19.00	12.86	9.85	1.87	V		0.121	20.84
		16-QAM	-20.09	11.77	9.85	1.87	V		0.094	19.75
		64-QAM	-21.56	10.30	9.85	1.87	V		0.067	18.28
		256-QAM	-23.03	8.83	9.85	1.87	V		0.048	16.81
1745.0		PI/2 BPSK	-17.87	13.95	9.97	1.88	V		0.160	22.05
		QPSK	-17.89	13.93	9.97	1.88	V		0.159	22.03
		16-QAM	-19.00	12.82	9.97	1.88	V		0.123	20.92
		64-QAM	-20.48	11.34	9.97	1.88	V		0.088	19.44
		256-QAM	-21.94	9.88	9.97	1.88	V		0.063	17.98
1765.0		PI/2 BPSK	-17.40	14.44	10.06	1.90	V		0.182	22.60
		QPSK	-17.45	14.39	10.06	1.90	V		0.180	22.55
		16-QAM	-18.49	13.35	10.06	1.90	V		0.142	21.51
		64-QAM	-19.97	11.87	10.06	1.90	V		0.101	20.03
		256-QAM	-21.48	10.36	10.06	1.90	V		0.071	18.52

Freq (MHz)	Mod/ Bandwidth [SCS (kHz)]	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1730.0	Sub6 n66/ 40 MHz [15 kHz]	PI/2 BPSK	-19.12	12.77	9.88	1.87	V	< 1.00	0.120	20.78
		QPSK	-19.22	12.67	9.88	1.87	V		0.117	20.68
		16-QAM	-20.37	11.52	9.88	1.87	V		0.090	19.53
		64-QAM	-21.84	10.05	9.88	1.87	V		0.064	18.06
		256-QAM	-23.23	8.66	9.88	1.87	V		0.046	16.67
1745.0		PI/2 BPSK	-18.12	13.70	9.97	1.88	V		0.151	21.80
		QPSK	-18.17	13.65	9.97	1.88	V		0.149	21.75
		16-QAM	-19.37	12.45	9.97	1.88	V		0.113	20.55
		64-QAM	-20.83	10.99	9.97	1.88	V		0.081	19.09
		256-QAM	-22.17	9.65	9.97	1.88	V		0.059	17.75
1760.0		PI/2 BPSK	-17.57	14.24	10.04	1.89	V		0.173	22.39
		QPSK	-17.64	14.17	10.04	1.89	V		0.170	22.32
		16-QAM	-18.84	12.97	10.04	1.89	V		0.129	21.12
		64-QAM	-20.30	11.51	10.04	1.89	V		0.092	19.66
		256-QAM	-21.68	10.13	10.04	1.89	V		0.067	18.28

8.2 RADIATED SPURIOUS EMISSIONS

- NR Band: N66
- LTE Band(Anchor): B5
- Bandwidth: 20 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)
344000 (1720.0)	3 440.00	-58.56	11.30	-65.65	2.71	H	-57.06	-13.00
	5 160.00	-59.99	11.42	-60.43	3.36	V	-52.37	-13.00
	6 880.00	-60.78	11.14	-55.03	3.93	H	-47.82	-13.00
349000 (1745.0)	3 490.00	-58.24	11.46	-64.97	2.74	H	-56.25	-13.00
	5 235.00	-59.73	11.57	-60.61	3.39	V	-52.43	-13.00
	6 980.00	-61.13	11.16	-54.80	3.96	H	-47.60	-13.00
354000 (1770.0)	3 540.00	-58.07	11.66	-64.75	2.76	H	-55.85	-13.00
	5 310.00	-58.96	11.72	-59.71	3.42	H	-51.41	-13.00
	7 080.00	-61.08	11.08	-52.92	4.00	H	-45.84	-13.00

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit (dBm)
20525 (836.5)	1,673.00	-58.21	9.52	-69.74	1.84	V	-62.06	-13.00
	2,509.50	-59.49	10.28	-68.20	2.30	V	-60.22	-13.00
	3,346.00	-60.81	11.28	-68.07	2.67	H	-59.46	-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	4.00
			QPSK			5.08
			16-QAM			5.82
			64-QAM			6.14
			256-QAM			6.62
	10 MHz		BPSK	52		4.19
			QPSK			5.20
			16-QAM			6.05
			64-QAM			6.27
			256-QAM			6.50
	15 MHz		BPSK	79		4.15
			QPSK			5.17
			16-QAM			5.91
			64-QAM			6.30
			256-QAM			6.61
	20 MHz		BPSK	106		4.12
			QPSK			5.16
			16-QAM			5.92
			64-QAM			6.20
			256-QAM			6.49

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (dB)
Sub6 n66	25 MHz	1745.0	BPSK	133	0	4.43
			QPSK			5.23
			16-QAM			5.96
			64-QAM			6.15
			256-QAM			6.52
	30 MHz		BPSK	160		4.12
			QPSK			5.22
			16-QAM			5.93
			64-QAM			6.24
			256-QAM			6.55
	40 MHz		BPSK	216		4.69
			QPSK			5.28
			16-QAM			6.01
			64-QAM			6.35
			256-QAM			6.57

Note:

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 81 ~ 115.

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	4.4849
			QPSK			4.5049
			16-QAM			4.5113
			64-QAM			4.4859
			256-QAM			4.4953
	10 MHz		BPSK	52		8.9661
			QPSK			8.9982
			16-QAM			8.9825
			64-QAM			8.9600
			256-QAM			8.9782
	15 MHz		BPSK	79		13.438
			QPSK			13.450
			16-QAM			13.464
			64-QAM			13.518
			256-QAM			13.456
	20 MHz		BPSK	106		17.950
			QPSK			17.897
			16-QAM			17.862
			64-QAM			17.937
			256-QAM			17.967

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
Sub6 n66	25 MHz	1745.0	BPSK	133	0	22.916
			QPSK			22.870
			16-QAM			22.906
			64-QAM			22.997
			256-QAM			22.941
	30 MHz		BPSK	160		28.659
			QPSK			28.561
			16-QAM			28.650
			64-QAM			28.569
			256-QAM			28.580
	40 MHz		BPSK	216		38.641
			QPSK			38.651
			16-QAM			38.619
			64-QAM			38.622
			256-QAM			38.709

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 46~ 80.

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	3.7658	30.981	-72.537	-41.556	-13.00
		1745.0	6.0364	31.591	-72.891	-41.300	
		1777.5	8.8490	31.591	-72.092	-40.501	
	10	1715.0	7.9881	31.591	-72.227	-40.636	
		1745.0	3.2314	30.981	-71.927	-40.946	
		1775.0	6.9661	31.591	-72.760	-41.169	
	15	1717.5	8.0329	31.591	-72.694	-41.103	
		1745.0	4.0554	30.981	-73.155	-42.174	
		1772.5	7.9856	31.591	-72.540	-40.949	
	20	1720.0	3.1760	30.981	-72.233	-41.252	
		1745.0	3.7762	30.981	-72.110	-41.129	
		1770.0	8.8440	31.591	-71.549	-39.958	
	25	1722.5	8.2976	31.591	-71.683	-40.092	
		1745.0	8.0065	31.591	-71.053	-39.462	
		1767.5	3.2239	30.981	-71.922	-40.941	
	30	1725.0	3.7847	30.981	-72.257	-41.276	
		1745.0	3.7897	30.981	-72.398	-41.417	
		1765.0	3.8266	30.981	-69.888	-38.907	
	40	1730.0	3.7668	30.981	-72.181	-41.200	
		1745.0	7.9920	31.591	-71.025	-39.434	
		1760.0	5.4582	31.591	-72.441	-40.850	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 158 ~ 199.

2. Result (dBm) = Measurement Maximum Data (dBm) + Factor (dB)

3. Factor(dB) = Cable Loss + Attenuator

Frequency Range (GHz)	Factor [dB]
0.03 – 1	28.493
1 – 5	30.981
5 – 10	31.591
10 – 15	32.116
15 – 20	32.489
Above 20(26.5)	33.131

8.6 BAND EDGE

- Plots of the EUT's Band Edge are shown Page 116 ~ 157.

8.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

- BandWidth: 5 MHz
- Voltage(100%): 3.860 VDC
- Batt. Endpoint: 3.400 VDC
- LIMIT: Emission must remain in band

Test. Frequncy (MHz)	Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
1712.5	100%	+20(Ref)	1712 500 013	0.0	0.000 000	0.000
	100%	-30	1712 500 027	14.2	0.000 001	0.008
	100%	-20	1712 500 020	7.5	0.000 000	0.004
	100%	-10	1712 500 022	9.3	0.000 001	0.005
	100%	0	1712 500 023	10.3	0.000 001	0.006
	100%	+10	1712 500 027	14.1	0.000 001	0.008
	100%	+30	1712 500 021	8.3	0.000 000	0.005
	100%	+40	1712 500 019	6.2	0.000 000	0.004
	100%	+50	1712 500 028	15.8	0.000 001	0.009
	Batt. Endpoint	+20	1712 500 024	11.6	0.000 001	0.007
1777.5	100%	+20(Ref)	1777 500 009	0.0	0.000 000	0.000
	100%	-30	1777 500 015	6.4	0.000 000	0.004
	100%	-20	1777 500 021	12.2	0.000 001	0.007
	100%	-10	1777 500 017	8.5	0.000 000	0.005
	100%	0	1777 500 023	14.5	0.000 001	0.008
	100%	+10	1777 500 017	8.3	0.000 000	0.005
	100%	+30	1777 500 019	10.5	0.000 001	0.006
	100%	+40	1777 500 012	3.4	0.000 000	0.002
	100%	+50	1777 500 023	14.2	0.000 001	0.008
	Batt. Endpoint	+20	1777 500 023	14.6	0.000 001	0.008

▣ BandWidth: 10 MHz

▣ Voltage(100%): 3.860 VDC

▣ Batt. Endpoint: 3.400 VDC

▣ LIMIT: Emission must remain in band

Test. Frequncy (MHz)	Voltage (%)	Temp. (℃)	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 000 021	5.6	0.000 000	0.003
	100%	-20	1715 000 028	12.1	0.000 001	0.007
	100%	-10	1715 000 023	7.4	0.000 000	0.004
	100%	0	1715 000 023	7.8	0.000 000	0.005
	100%	+10	1715 000 020	5.0	0.000 000	0.003
	100%	+30	1715 000 028	12.4	0.000 001	0.007
	100%	+40	1715 000 019	3.7	0.000 000	0.002
	100%	+50	1715 000 022	6.9	0.000 000	0.004
	Batt. Endpoint	+20	1715 000 020	5.0	0.000 000	0.003
1775.0	100%	+20(Ref)	1775 000 009	0.0	0.000 000	0.000
	100%	-30	1775 000 012	3.5	0.000 000	0.002
	100%	-20	1775 000 017	8.1	0.000 000	0.005
	100%	-10	1775 000 022	13.6	0.000 001	0.008
	100%	0	1775 000 012	3.4	0.000 000	0.002
	100%	+10	1775 000 022	13.6	0.000 001	0.008
	100%	+30	1775 000 023	14.0	0.000 001	0.008
	100%	+40	1775 000 025	16.5	0.000 001	0.009
	100%	+50	1775 000 017	7.8	0.000 000	0.004
	Batt. Endpoint	+20	1775 000 024	15.5	0.000 001	0.009

▣ BandWidth: 15 MHz

▣ Voltage(100%): 3.860 VDC

▣ Batt. Endpoint: 3.400 VDC

▣ LIMIT: Emission must remain in band

Test. Frequncy (MHz)	Voltage (%)	Temp. (℃)	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 500 019	8.6	0.000 000	0.005
	100%	-20	1717 500 020	10.4	0.000 001	0.006
	100%	-10	1717 500 015	5.3	0.000 000	0.003
	100%	0	1717 500 014	4.2	0.000 000	0.002
	100%	+10	1717 500 021	10.7	0.000 001	0.006
	100%	+30	1717 500 026	15.7	0.000 001	0.009
	100%	+40	1717 500 025	15.1	0.000 001	0.009
	100%	+50	1717 500 021	10.9	0.000 001	0.006
	Batt. Endpoint	+20	1717 500 017	6.6	0.000 000	0.004
1772.5	100%	+20(Ref)	1772 500 014	0.0	0.000 000	0.000
	100%	-30	1772 500 019	5.2	0.000 000	0.003
	100%	-20	1772 500 028	14.0	0.000 001	0.008
	100%	-10	1772 500 022	8.4	0.000 000	0.005
	100%	0	1772 500 027	13.5	0.000 001	0.008
	100%	+10	1772 500 028	14.4	0.000 001	0.008
	100%	+30	1772 500 026	12.4	0.000 001	0.007
	100%	+40	1772 500 030	16.7	0.000 001	0.009
	100%	+50	1772 500 028	14.3	0.000 001	0.008
	Batt. Endpoint	+20	1772 500 022	8.4	0.000 000	0.005

▣ BandWidth: 20 MHz

▣ Voltage(100%): 3.860 VDC

▣ Batt. Endpoint: 3.400 VDC

▣ LIMIT: Emission must remain in band

Test. Frequncy (MHz)	Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
1720.0	100%	+20(Ref)	1720 000 003	0.0	0.000 000	0.000
	100%	-30	1720 000 017	13.5	0.000 001	0.008
	100%	-20	1720 000 020	16.9	0.000 001	0.010
	100%	-10	1720 000 013	10.1	0.000 001	0.006
	100%	0	1720 000 007	3.5	0.000 000	0.002
	100%	+10	1720 000 010	7.2	0.000 000	0.004
	100%	+30	1720 000 011	7.4	0.000 000	0.004
	100%	+40	1720 000 011	7.2	0.000 000	0.004
	100%	+50	1720 000 012	8.8	0.000 001	0.005
	Batt. Endpoint	+20	1720 000 018	14.4	0.000 001	0.008
1770.0	100%	+20(Ref)	1770 000 016	0.0	0.000 000	0.000
	100%	-30	1770 000 028	11.6	0.000 001	0.007
	100%	-20	1770 000 020	4.4	0.000 000	0.002
	100%	-10	1770 000 028	12.0	0.000 001	0.007
	100%	0	1770 000 030	14.2	0.000 001	0.008
	100%	+10	1770 000 020	3.6	0.000 000	0.002
	100%	+30	1770 000 025	9.1	0.000 001	0.005
	100%	+40	1770 000 028	11.9	0.000 001	0.007
	100%	+50	1770 000 020	4.1	0.000 000	0.002
	Batt. Endpoint	+20	1770 000 026	9.8	0.000 001	0.006

▣ BandWidth: 25 MHz

▣ Voltage(100%): 3.860 VDC

▣ Batt. Endpoint: 3.400 VDC

▣ LIMIT: Emission must remain in band

Test. Frequncy (MHz)	Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
1730.0	100%	+20(Ref)	1730 000 013	0.0	0.000 000	0.000
	100%	-30	1730 000 020	6.5	0.000 000	0.004
	100%	-20	1730 000 027	13.4	0.000 001	0.008
	100%	-10	1730 000 026	12.8	0.000 001	0.007
	100%	0	1730 000 027	13.3	0.000 001	0.008
	100%	+10	1730 000 027	13.5	0.000 001	0.008
	100%	+30	1730 000 021	7.1	0.000 000	0.004
	100%	+40	1730 000 024	11.0	0.000 001	0.006
	100%	+50	1730 000 023	9.1	0.000 001	0.005
	Batt. Endpoint	+20	1730 000 029	15.3	0.000 001	0.009
1767.5	100%	+20(Ref)	1767 500 009	0.0	0.000 000	0.000
	100%	-30	1767 500 021	11.5	0.000 001	0.006
	100%	-20	1767 500 016	6.9	0.000 000	0.004
	100%	-10	1767 500 013	3.3	0.000 000	0.002
	100%	0	1767 500 021	11.9	0.000 001	0.007
	100%	+10	1767 500 017	7.4	0.000 000	0.004
	100%	+30	1767 500 013	3.1	0.000 000	0.002
	100%	+40	1767 500 019	9.2	0.000 001	0.005
	100%	+50	1767 500 026	16.7	0.000 001	0.009
	Batt. Endpoint	+20	1767 500 014	4.2	0.000 000	0.002

▣ BandWidth: 30 MHz

▣ Voltage(100%): 3.860 VDC

▣ Batt. Endpoint: 3.400 VDC

▣ LIMIT: Emission must remain in band

Test. Frequncy (MHz)	Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
1725.0	100%	+20(Ref)	1725 000 004	0.0	0.000 000	0.000
	100%	-30	1725 000 014	9.9	0.000 001	0.006
	100%	-20	1725 000 013	9.1	0.000 001	0.005
	100%	-10	1725 000 009	5.4	0.000 000	0.003
	100%	0	1725 000 008	4.1	0.000 000	0.002
	100%	+10	1725 000 007	3.4	0.000 000	0.002
	100%	+30	1725 000 015	11.4	0.000 001	0.007
	100%	+40	1725 000 019	15.4	0.000 001	0.009
	100%	+50	1725 000 018	14.6	0.000 001	0.008
	Batt. Endpoint	+20	1725 000 017	12.9	0.000 001	0.007
1765.0	100%	+20(Ref)	1765 000 005	0.0	0.000 000	0.000
	100%	-30	1765 000 013	8.0	0.000 000	0.005
	100%	-20	1765 000 022	16.8	0.000 001	0.010
	100%	-10	1765 000 012	6.5	0.000 000	0.004
	100%	0	1765 000 010	4.9	0.000 000	0.003
	100%	+10	1765 000 016	10.8	0.000 001	0.006
	100%	+30	1765 000 011	5.8	0.000 000	0.003
	100%	+40	1765 000 018	12.6	0.000 001	0.007
	100%	+50	1765 000 011	5.5	0.000 000	0.003
	Batt. Endpoint	+20	1765 000 020	14.8	0.000 001	0.008

▣ BandWidth: 40 MHz

▣ Voltage(100%): 3.860 VDC

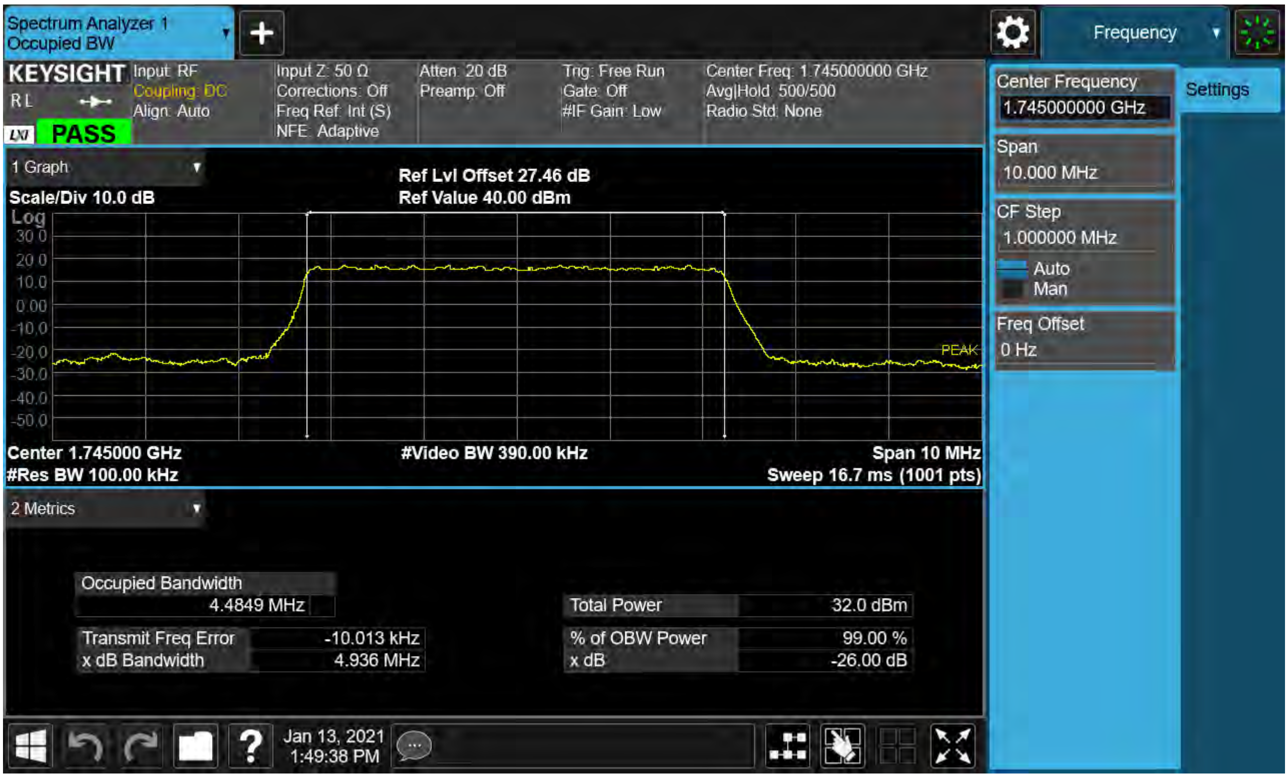
▣ Batt. Endpoint: 3.400 VDC

▣ LIMIT: Emission must remain in band

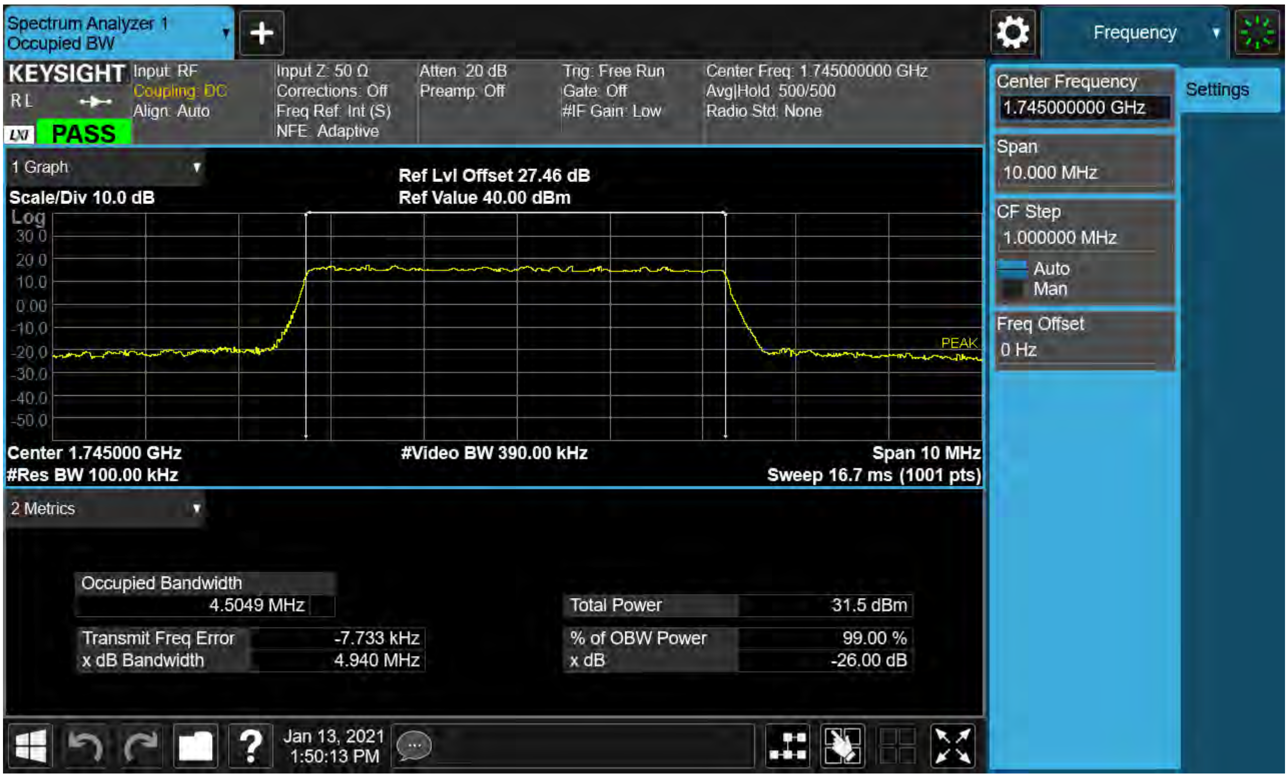
Test. Frequncy (MHz)	Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
1730.0	100%	+20(Ref)	1730 000 015	0.0	0.000 000	0.000
	100%	-30	1730 000 028	12.2	0.000 001	0.007
	100%	-20	1730 000 032	16.7	0.000 001	0.010
	100%	-10	1730 000 028	12.3	0.000 001	0.007
	100%	0	1730 000 027	11.4	0.000 001	0.007
	100%	+10	1730 000 024	8.6	0.000 000	0.005
	100%	+30	1730 000 030	14.3	0.000 001	0.008
	100%	+40	1730 000 030	15.0	0.000 001	0.009
	100%	+50	1730 000 025	9.6	0.000 001	0.006
	Batt. Endpoint	+20	1730 000 020	5.0	0.000 000	0.003
1760.0	100%	+20(Ref)	1760 000 012	0.0	0.000 000	0.000
	100%	-30	1760 000 016	4.8	0.000 000	0.003
	100%	-20	1760 000 016	4.3	0.000 000	0.002
	100%	-10	1760 000 019	7.7	0.000 000	0.004
	100%	0	1760 000 025	13.6	0.000 001	0.008
	100%	+10	1760 000 027	15.0	0.000 001	0.009
	100%	+30	1760 000 022	10.8	0.000 001	0.006
	100%	+40	1760 000 022	10.3	0.000 001	0.006
	100%	+50	1760 000 024	12.7	0.000 001	0.007
	Batt. Endpoint	+20	1760 000 026	14.2	0.000 001	0.008

9. TEST PLOTS

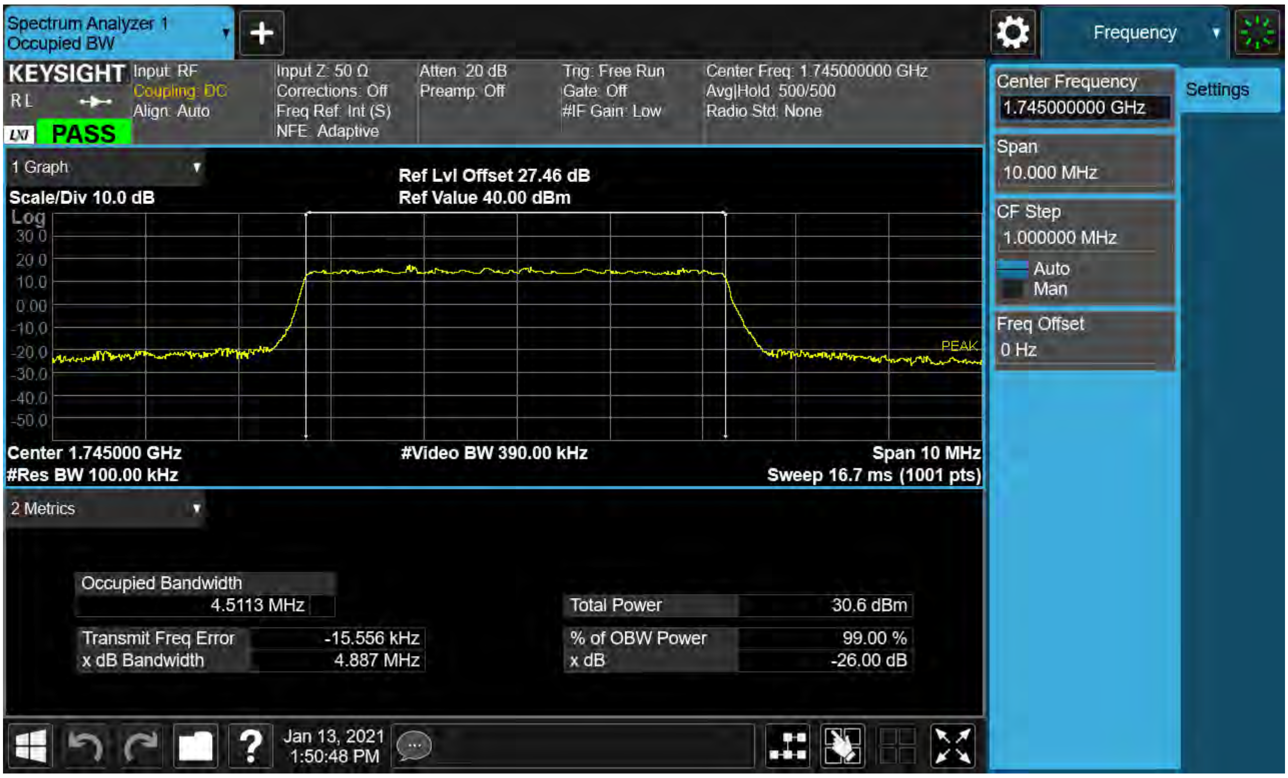
Sub6 n66. Occupied Bandwidth Plot (5M BW Ch.349000 BPSK RB 25)



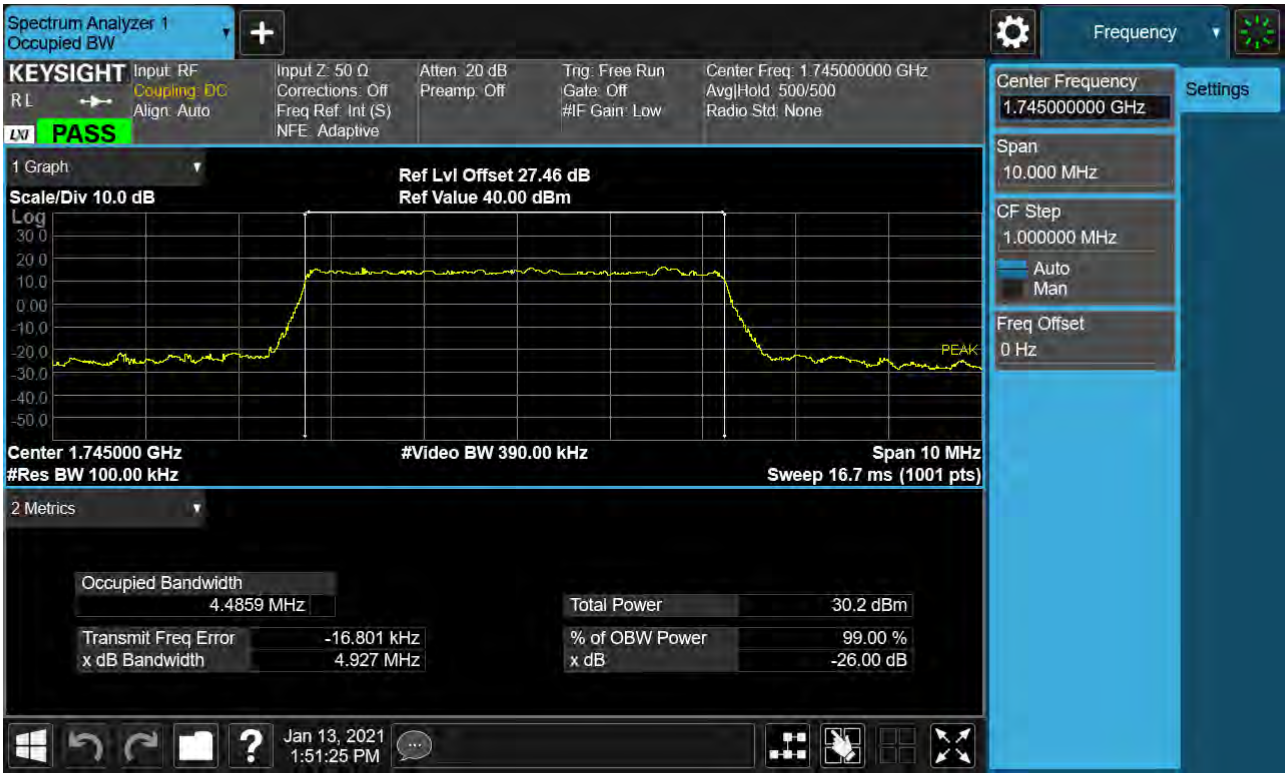
Sub6 n66. Occupied Bandwidth Plot (5M BW Ch.349000 QPSK RB 25)



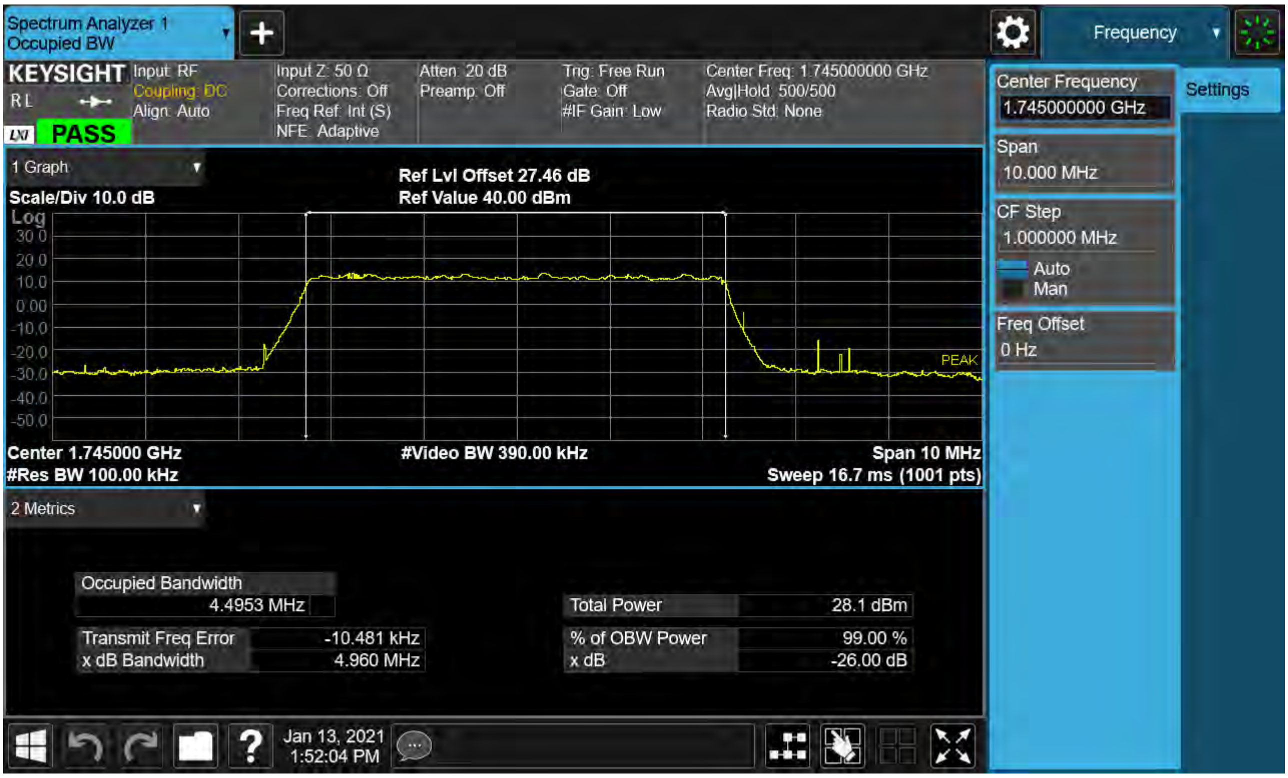
Sub6 n66. Occupied Bandwidth Plot (5M BW Ch.349000 16QAM RB 25)



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

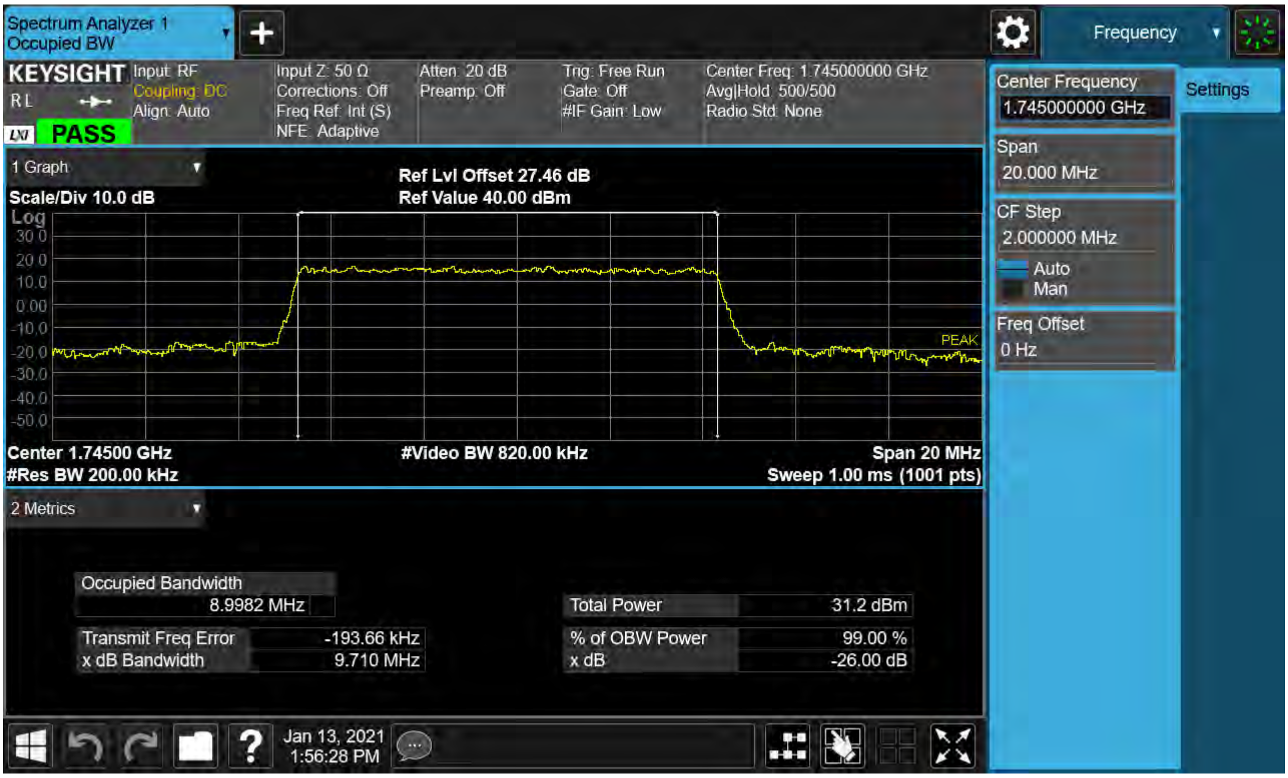


Sub6 n66. Occupied Bandwidth Plot (5M BW Ch.349000 256QAM RB 25)



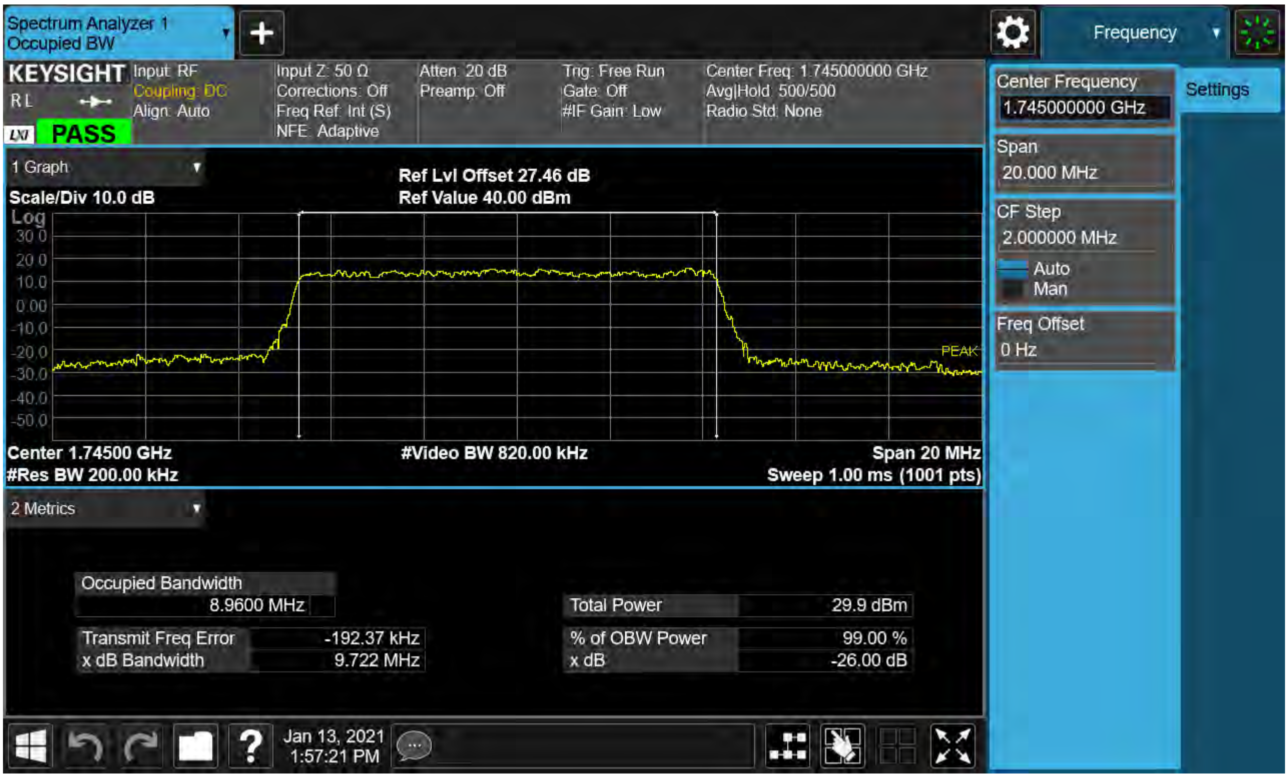
Sub6 n66. Occupied Bandwidth Plot (10M BW Ch.349000 BPSK RB 52)

Sub6 n66. Occupied Bandwidth Plot (10M BW Ch.349000 QPSK RB 52)



Sub6 n66. Occupied Bandwidth Plot (10M BW Ch.349000 16QAM RB 52)

Sub6 n66. Occupied Bandwidth Plot (10M BW Ch.349000 64QAM RB 52)



Sub6 n66. Occupied Bandwidth Plot (10M BW Ch.349000 256QAM RB 52)

Sub6 n66. Occupied Bandwidth Plot (15M BW Ch.349000 BPSK RB 79)

Sub6 n66. Occupied Bandwidth Plot (15M BW Ch.349000 QPSK RB 79)

Sub6 n66. Occupied Bandwidth Plot (15M BW Ch.349000 16QAM RB 79)

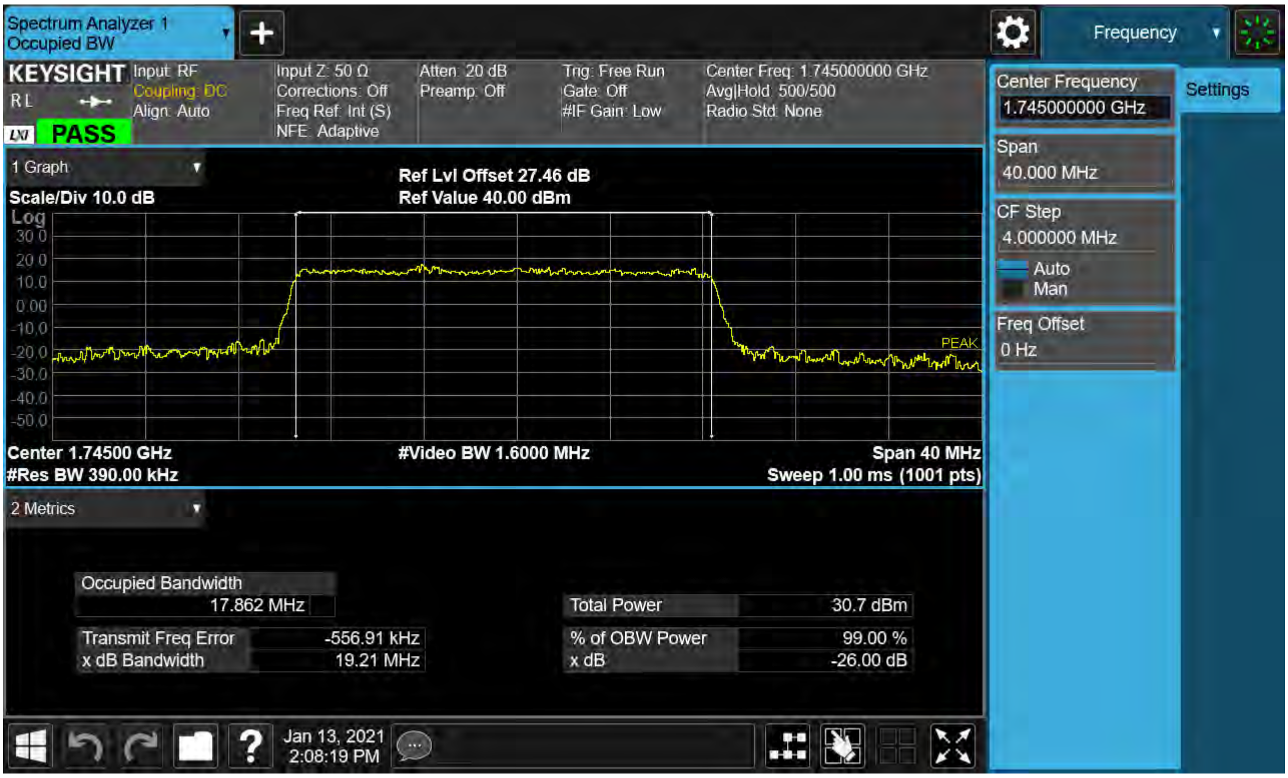
Sub6 n66. Occupied Bandwidth Plot (15M BW Ch.349000 64QAM RB 79)

Sub6 n66. Occupied Bandwidth Plot (15M BW Ch.349000 256QAM RB 79)

Sub6 n66. Occupied Bandwidth Plot (20M BW Ch.349000 BPSK RB 106)

Sub6 n66. Occupied Bandw idth Plot (20M BW Ch.349000 QPSK RB 106)

Sub6 n66. Occupied Bandwidth Plot (20M BW Ch.349000 16QAM RB 106)



Sub6 n66. Occupied Bandwidth Plot (20M BW Ch.349000 64QAM RB 106)

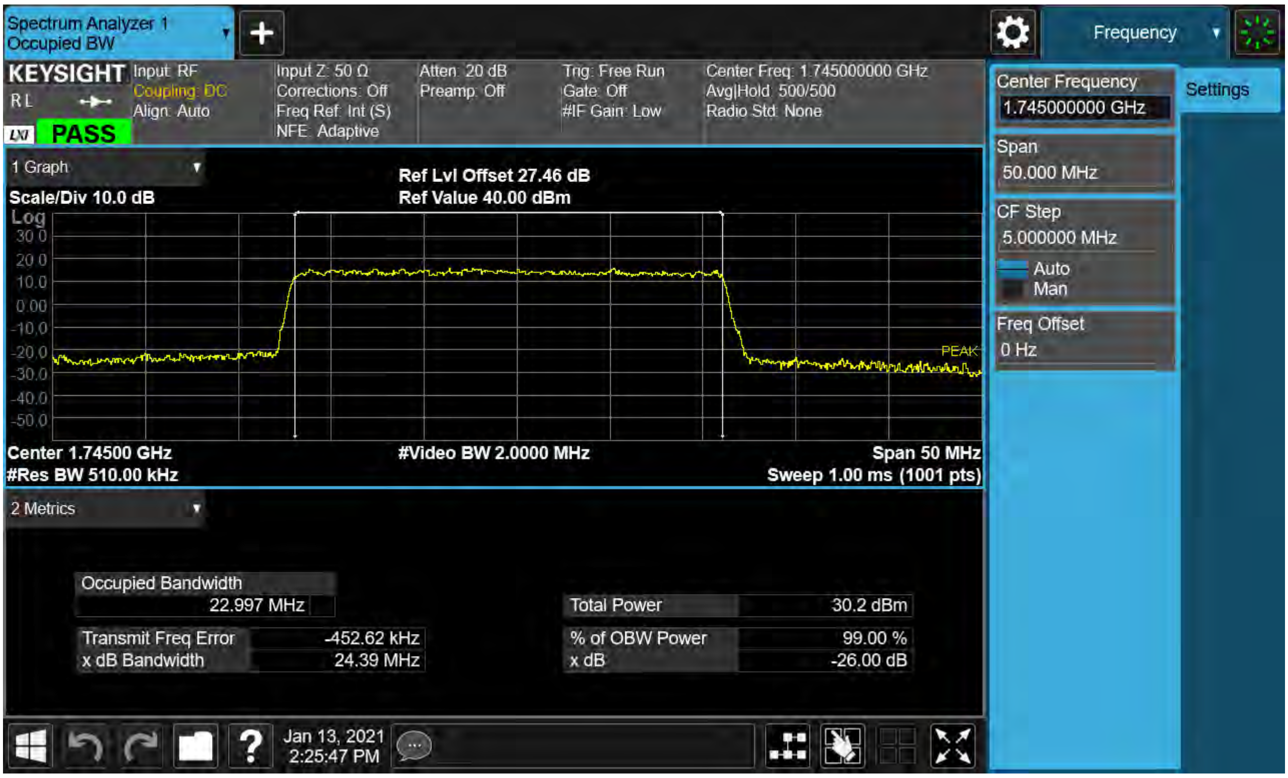
Sub6 n66. Occupied Bandwidth Plot (20M BW Ch.349000 256QAM RB 106)

Sub6 n66. Occupied Bandwidth Plot (25M BW Ch.349000 BPSK RB 133)

Sub6 n66. Occupied Bandw idth Plot (25M BW Ch.349000 QPSK RB 133)

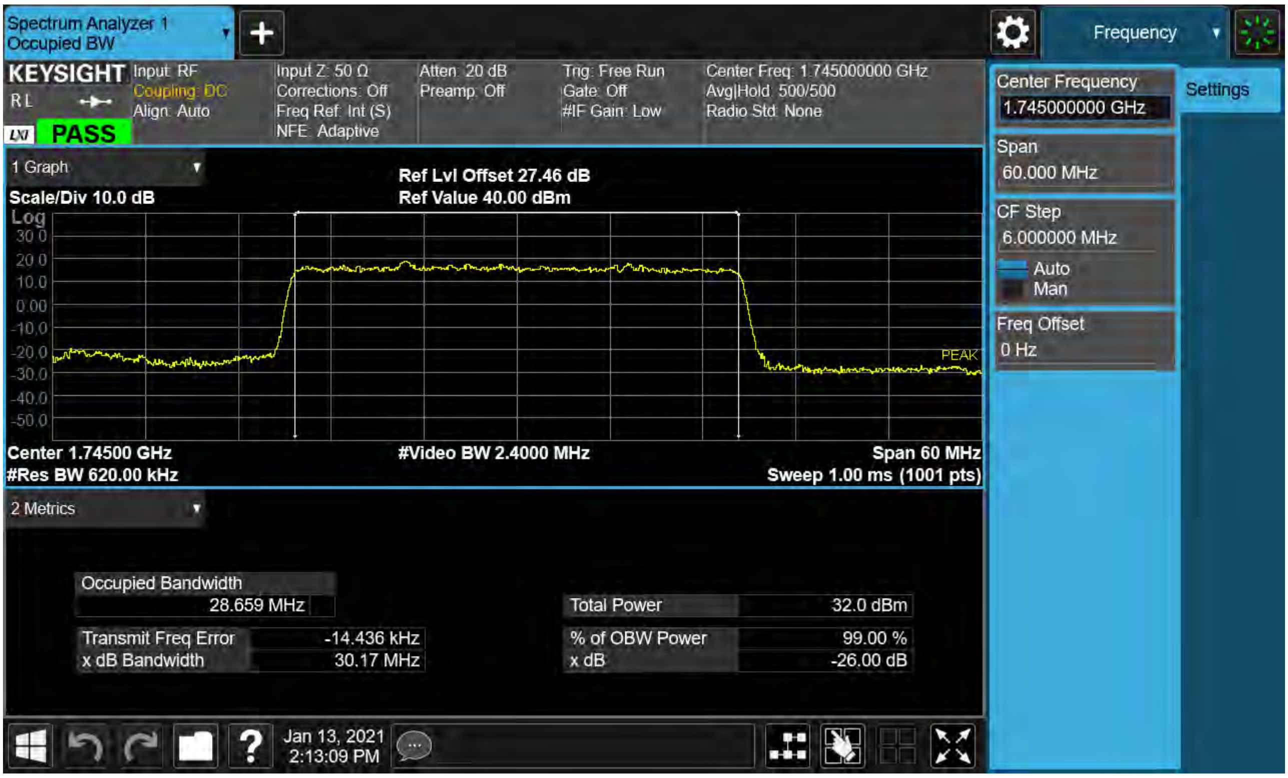
Sub6 n66. Occupied Bandwidth Plot (25M BW Ch.349000 16QAM RB 133)

Sub6 n66. Occupied Bandwidth Plot (25M BW Ch.349000 64QAM RB 133)



Sub6 n66. Occupied Bandwidth Plot (25M BW Ch.349000 256QAM RB 133)

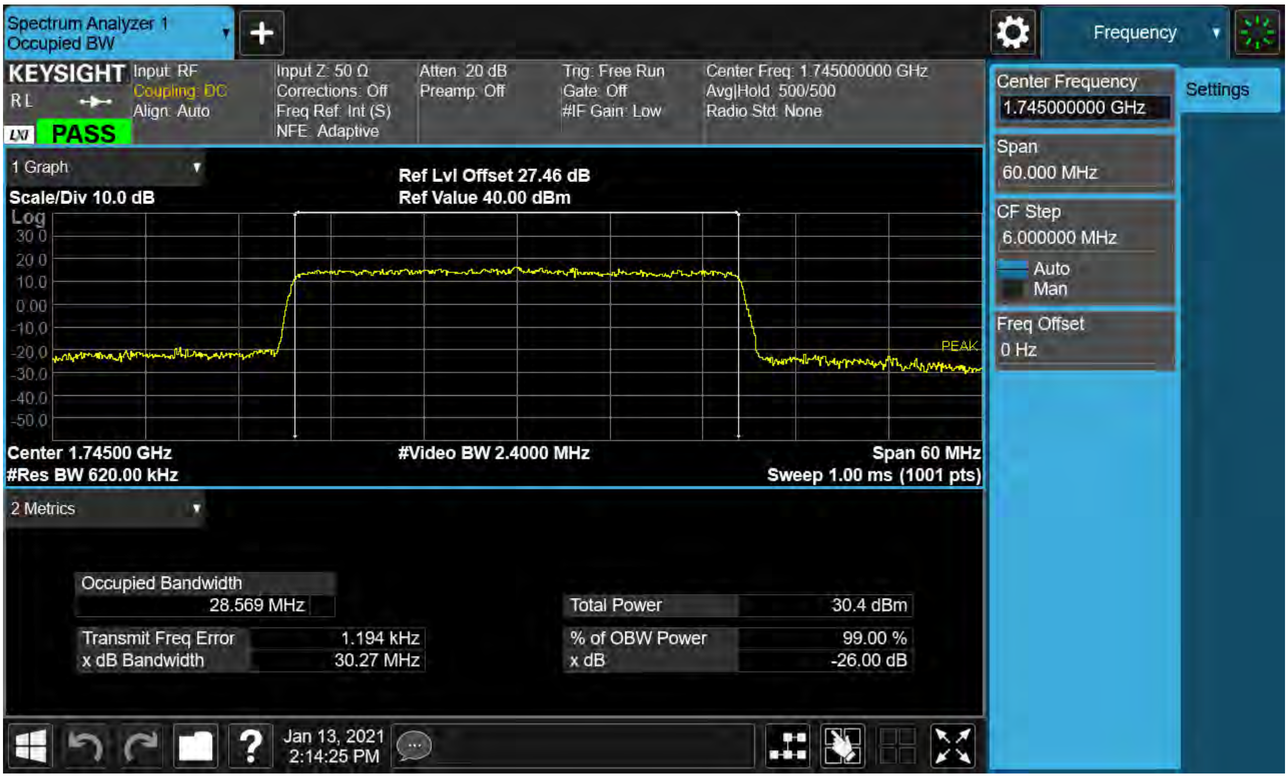
Sub6 n66. Occupied Bandwidth Plot (30M BW Ch.349000 BPSK RB 160)



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)

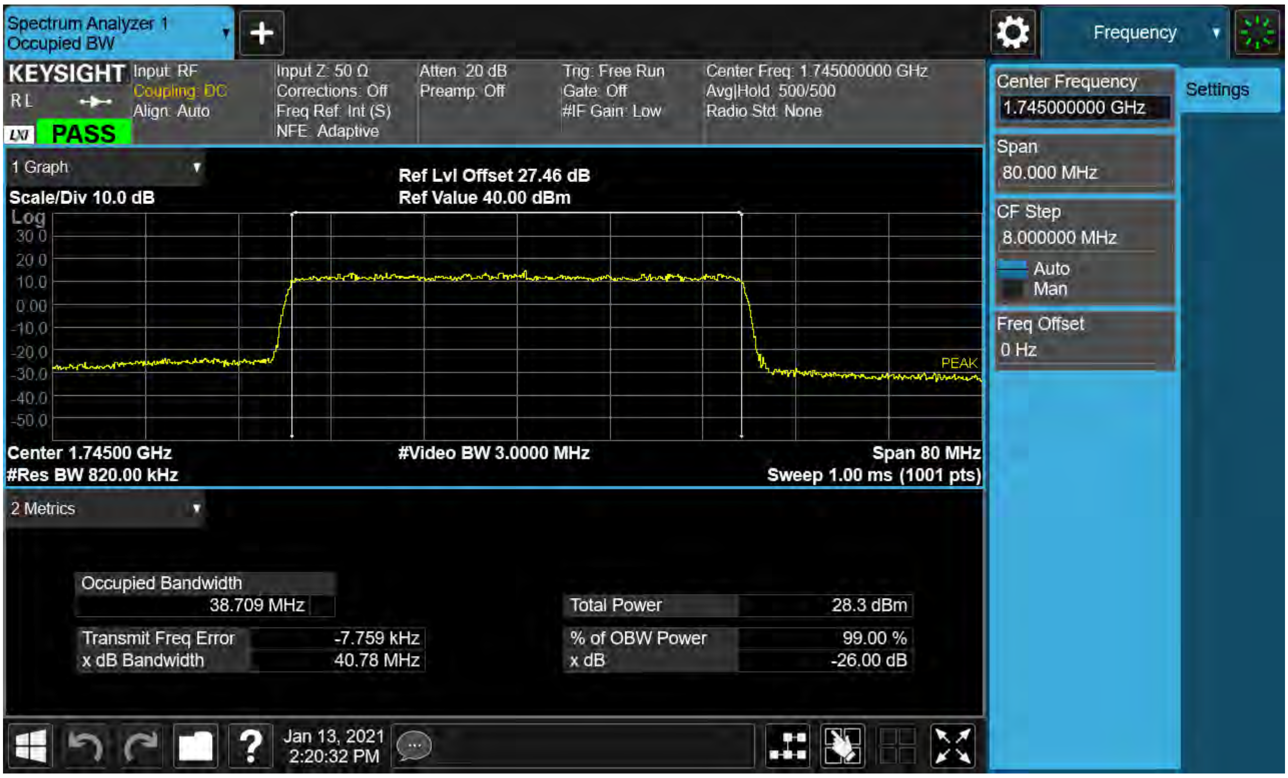
Sub6 n66. Occupied Bandwidth Plot (40M BW Ch.349000 BPSK RB 216)

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

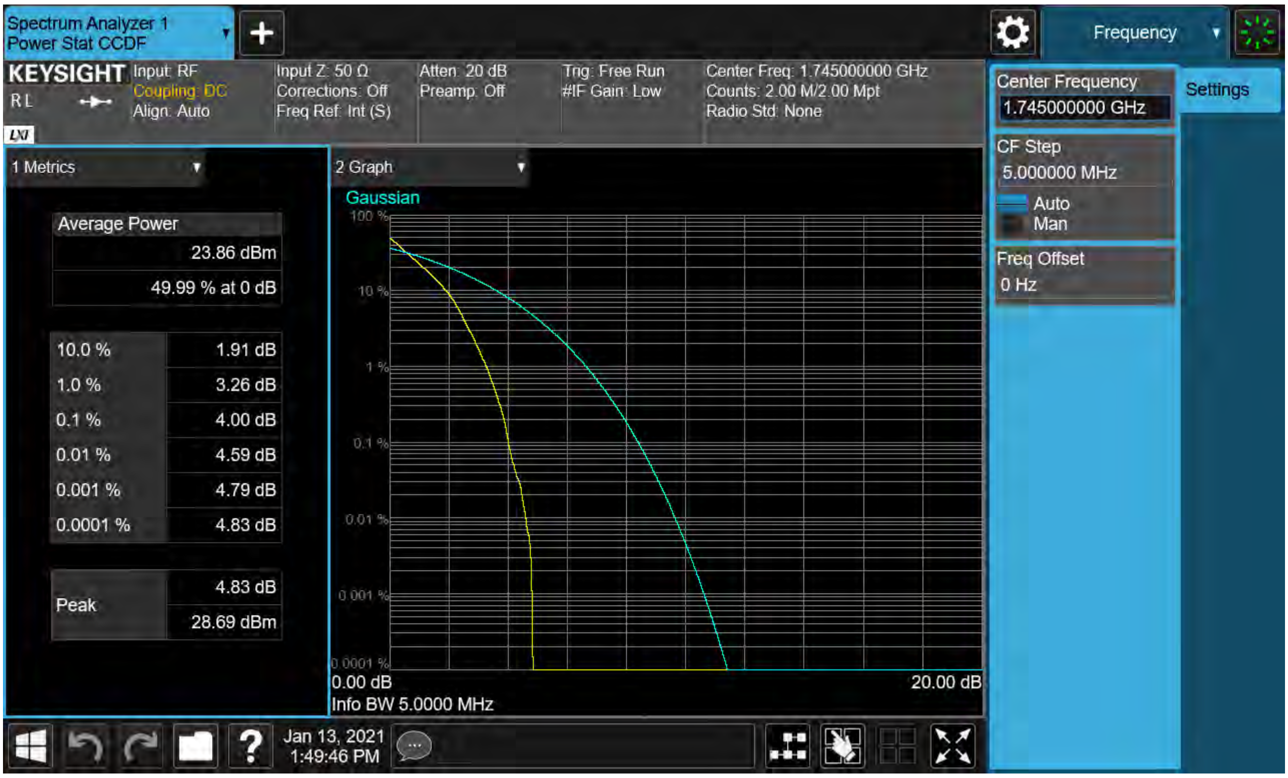
Sub6 n66. Occupied Bandwidth Plot (40M BW Ch.349000 16QAM RB 216)

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

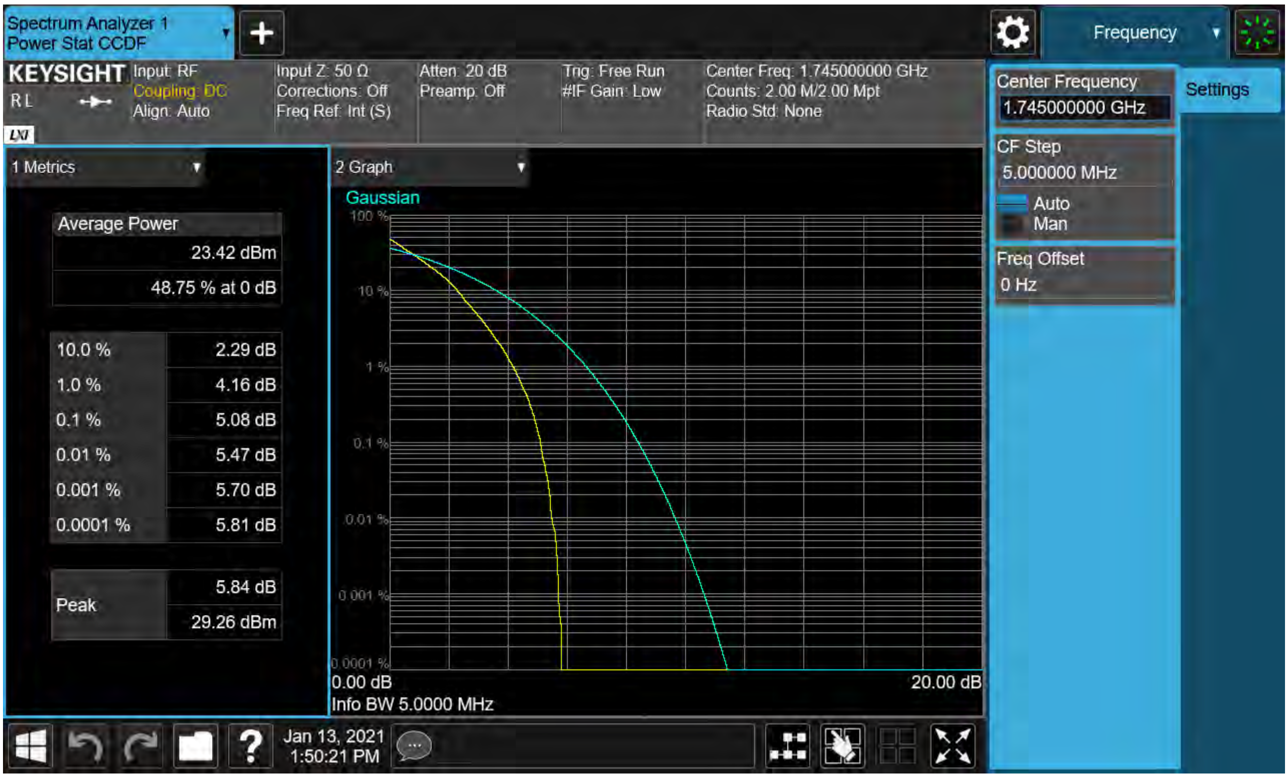
Sub6 n66. Occupied Bandwidth Plot (40M BW Ch.349000 256QAM RB 216)



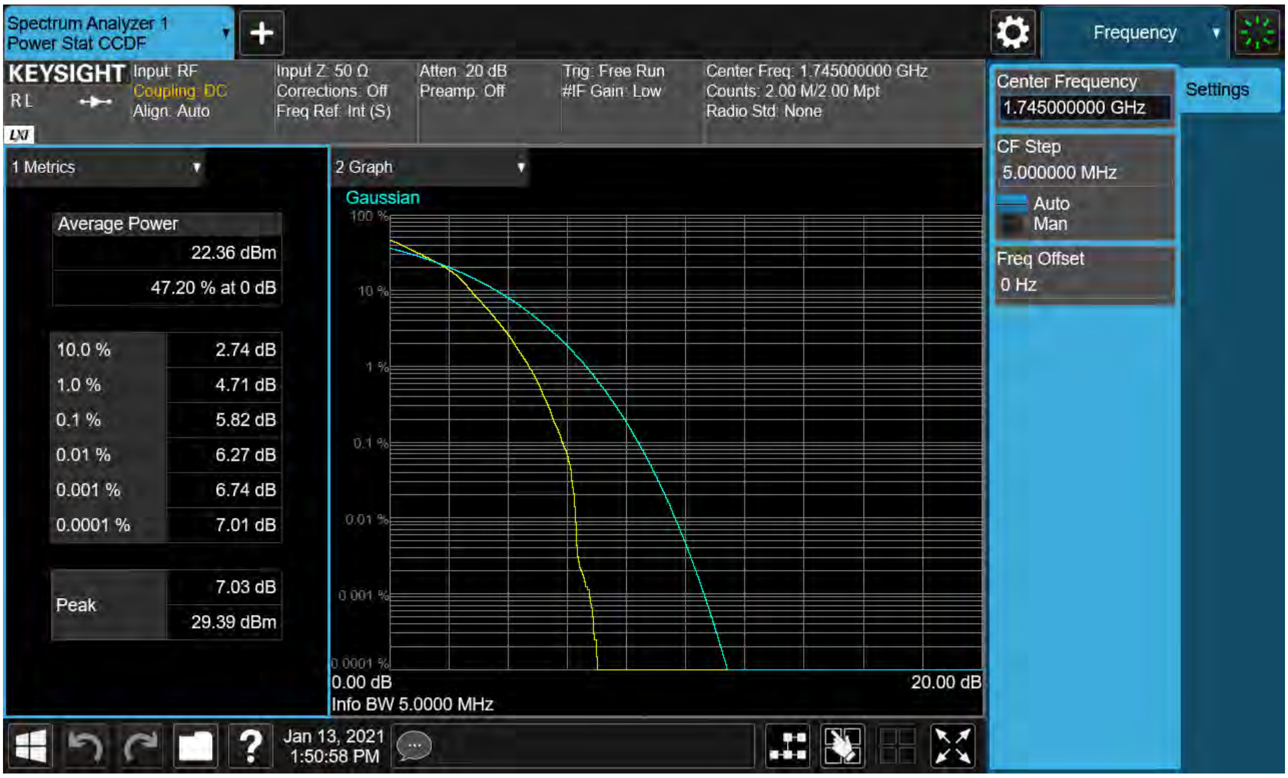
Sub6 n66. PAR Plot (5M BW_Ch.349000_ BPSK_RB25_0)



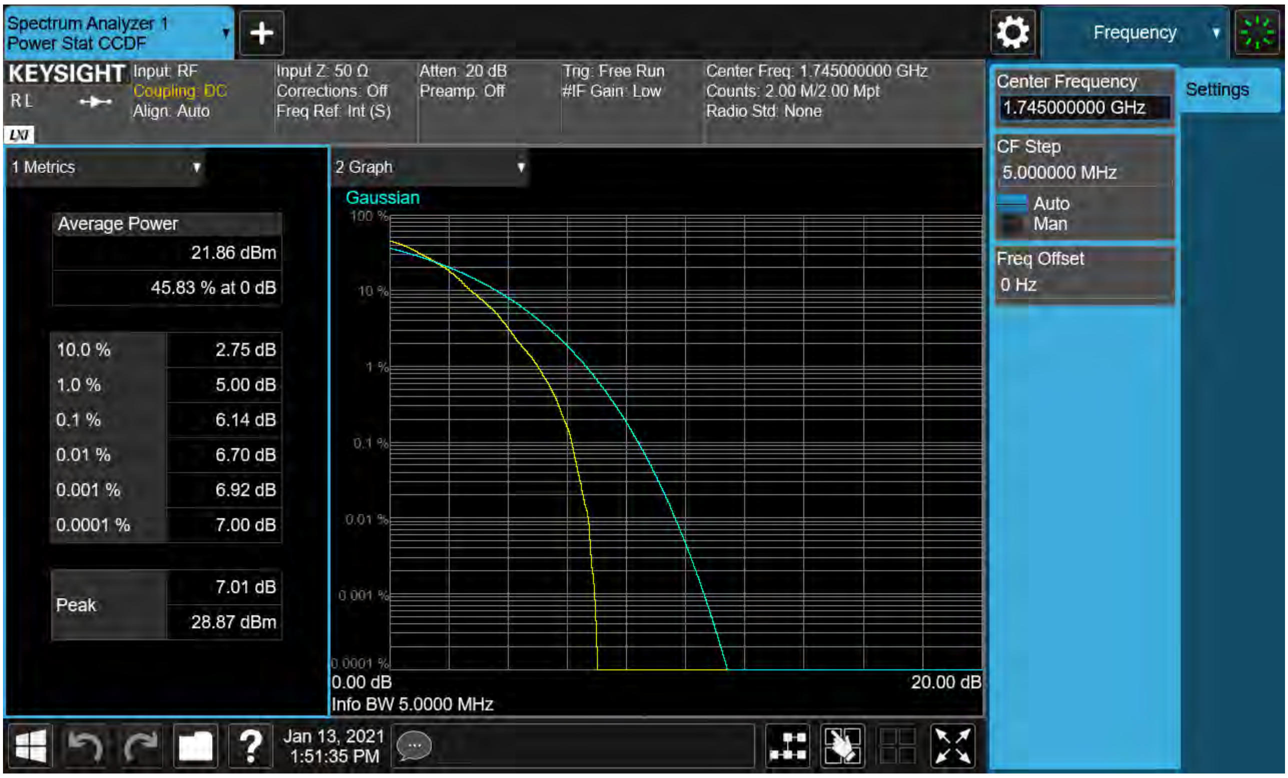
Sub6 n66. PAR Plot (5M BW_Ch.349000_QPSK_RB25_0)



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



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

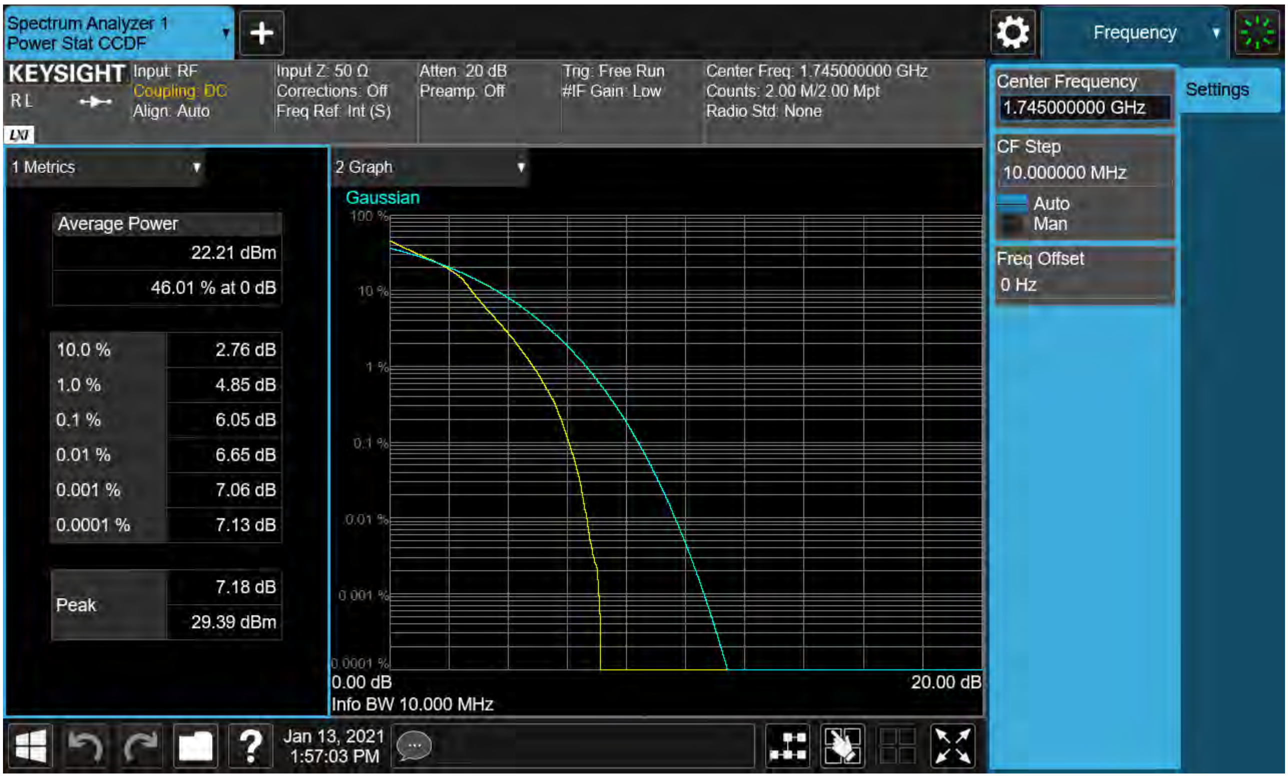


Sub6 n66. PAR Plot (5M BW_Ch.349000_256QAM_RB25_0)

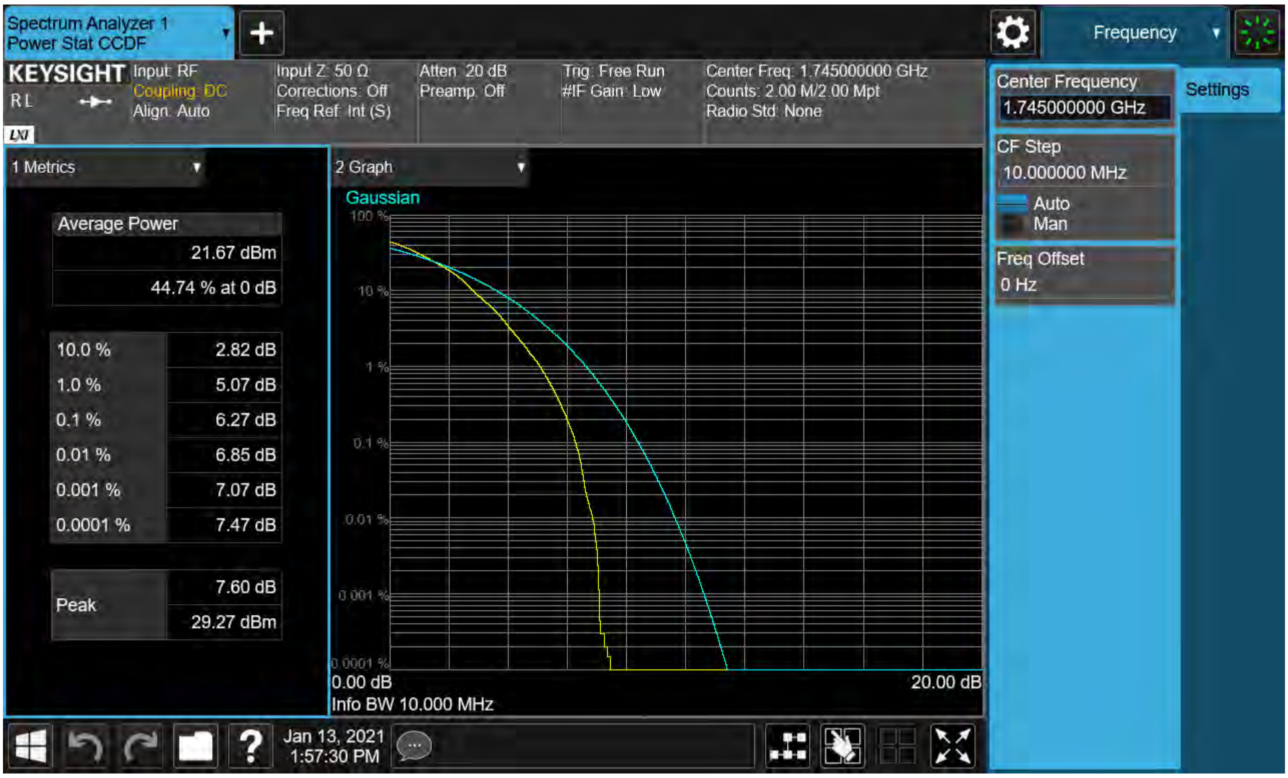
Sub6 n66. PAR Plot (10M BW_Ch.349000_ BPSK_RB52_0)

Sub6 n66. PAR Plot (10M BW_Ch.349000_QPSK_RB52_0)

Sub6 n66. PAR Plot (10M BW_Ch.349000_16QAM_RB52_0)



Sub6 n66. PAR Plot (10M BW_Ch.349000_64QAM_RB52_0)



Sub6 n66. PAR Plot (10M BW_Ch.349000_256QAM_RB52_0)

Sub6 n66. PAR Plot (15M BW_Ch.349000_ BPSK_RB79_0)

Sub6 n66. PAR Plot (15M BW_Ch.349000_QPSK_RB79_0)

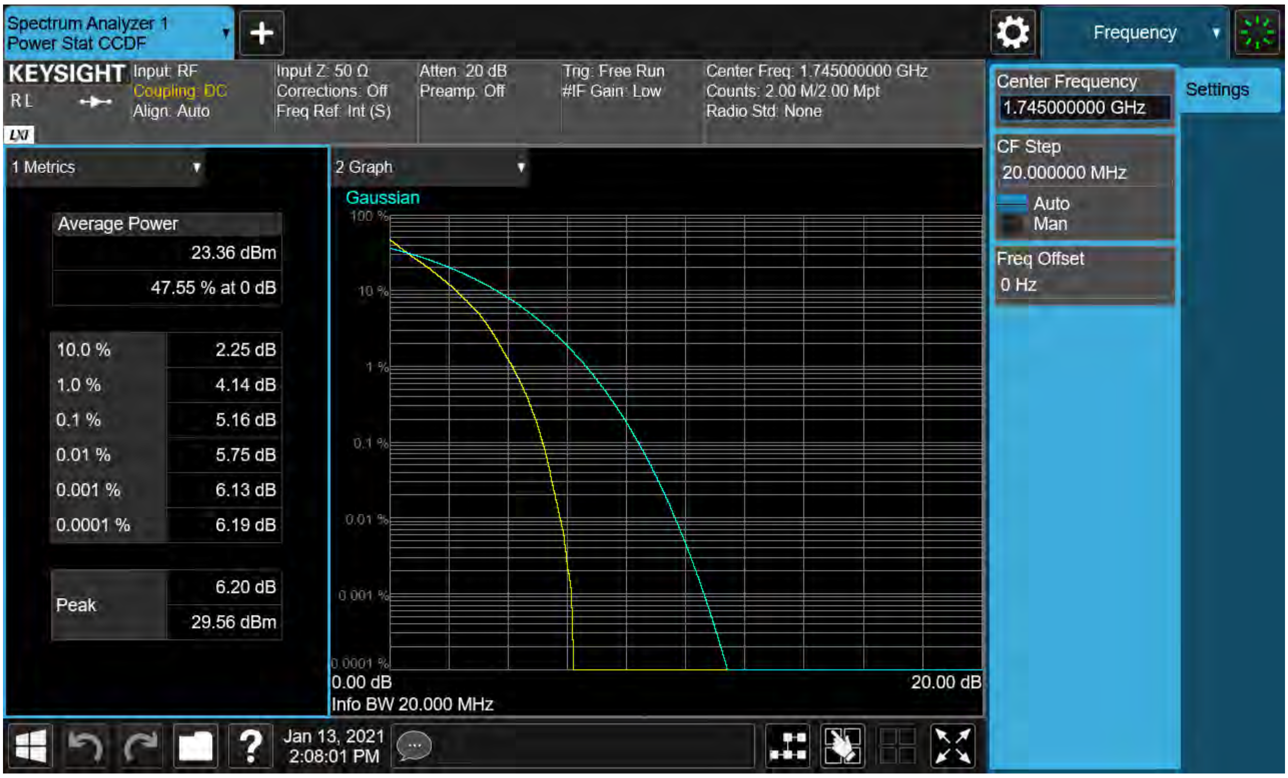
Sub6 n66. PAR Plot (15M BW_Ch.349000_16QAM_RB79_0)

Sub6 n66. PAR Plot (15M BW_Ch.349000_64QAM_RB79_0)

Sub6 n66. PAR Plot (15M BW_Ch.349000_256QAM_RB79_0)

Sub6 n66. PAR Plot (20M BW_Ch.349000_ BPSK_RB106_0)

Sub6 n66. PAR Plot (20M BW_Ch.349000_QPSK_RB106_0)

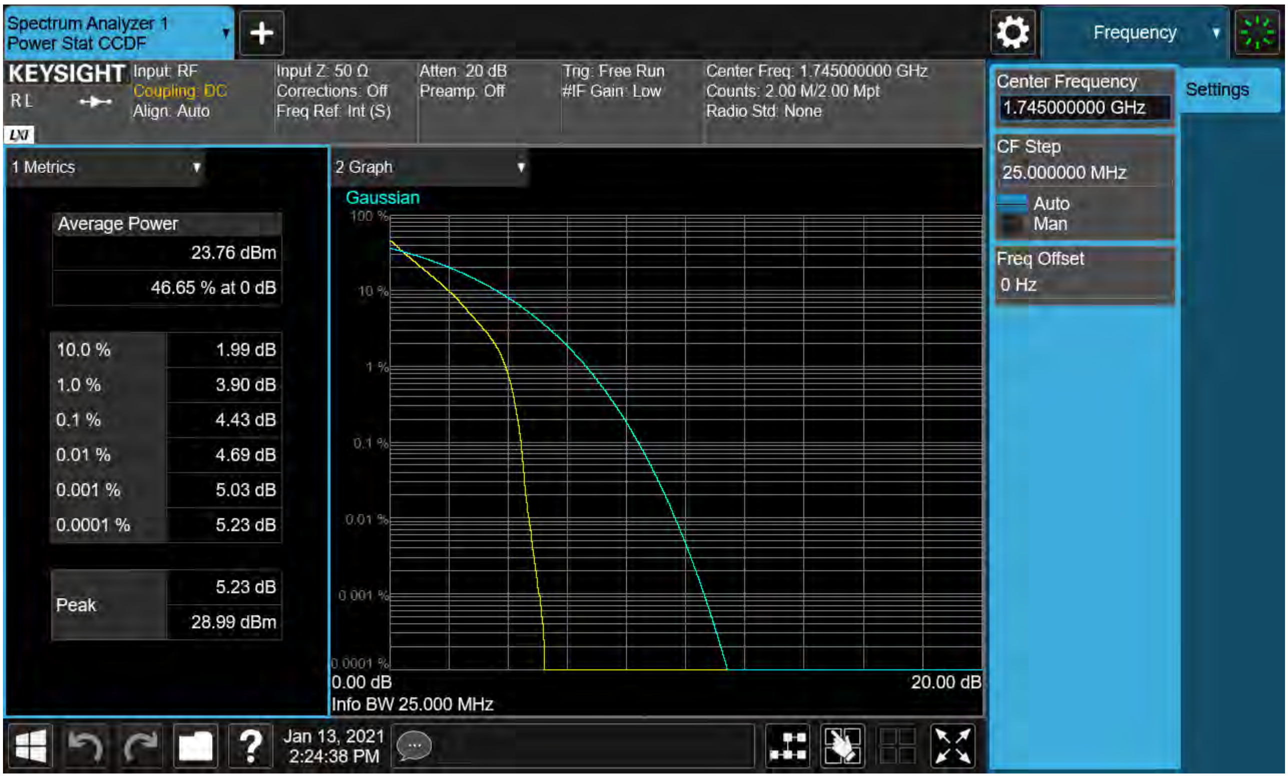


Sub6 n66. PAR Plot (20M BW_Ch.349000_16QAM_RB106_0)

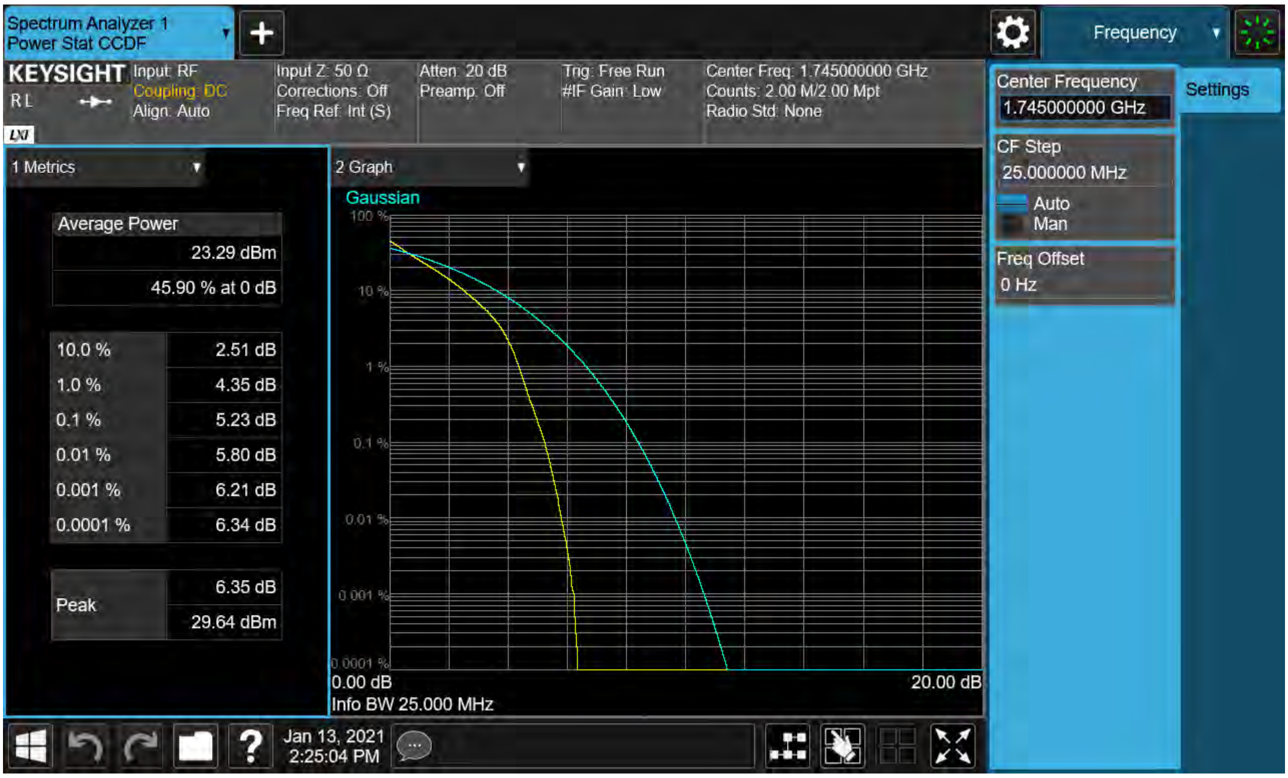
Sub6 n66. PAR Plot (20M BW_Ch.349000_64QAM_RB106_0)

Sub6 n66. PAR Plot (20M BW_Ch.349000_256QAM_RB106_0)

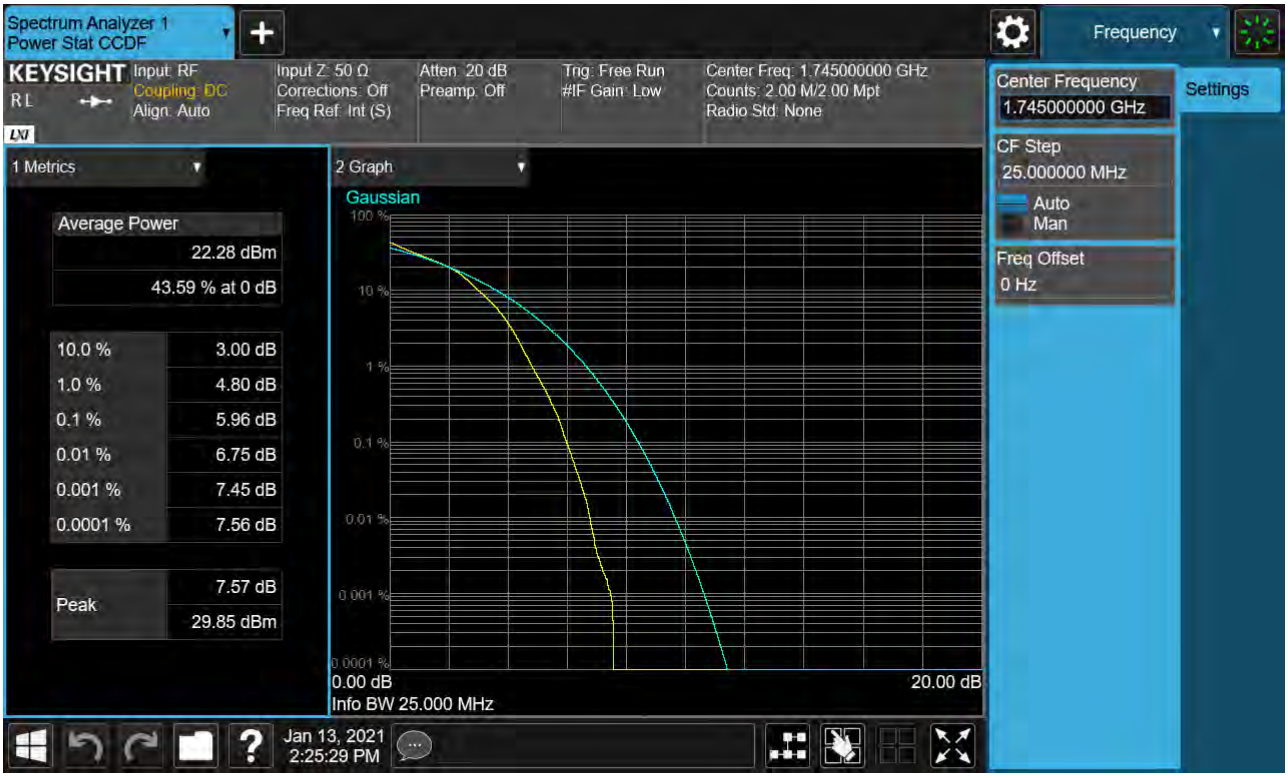
Sub6 n66. PAR Plot (25M BW_Ch.349000_ BPSK_RB133_0)



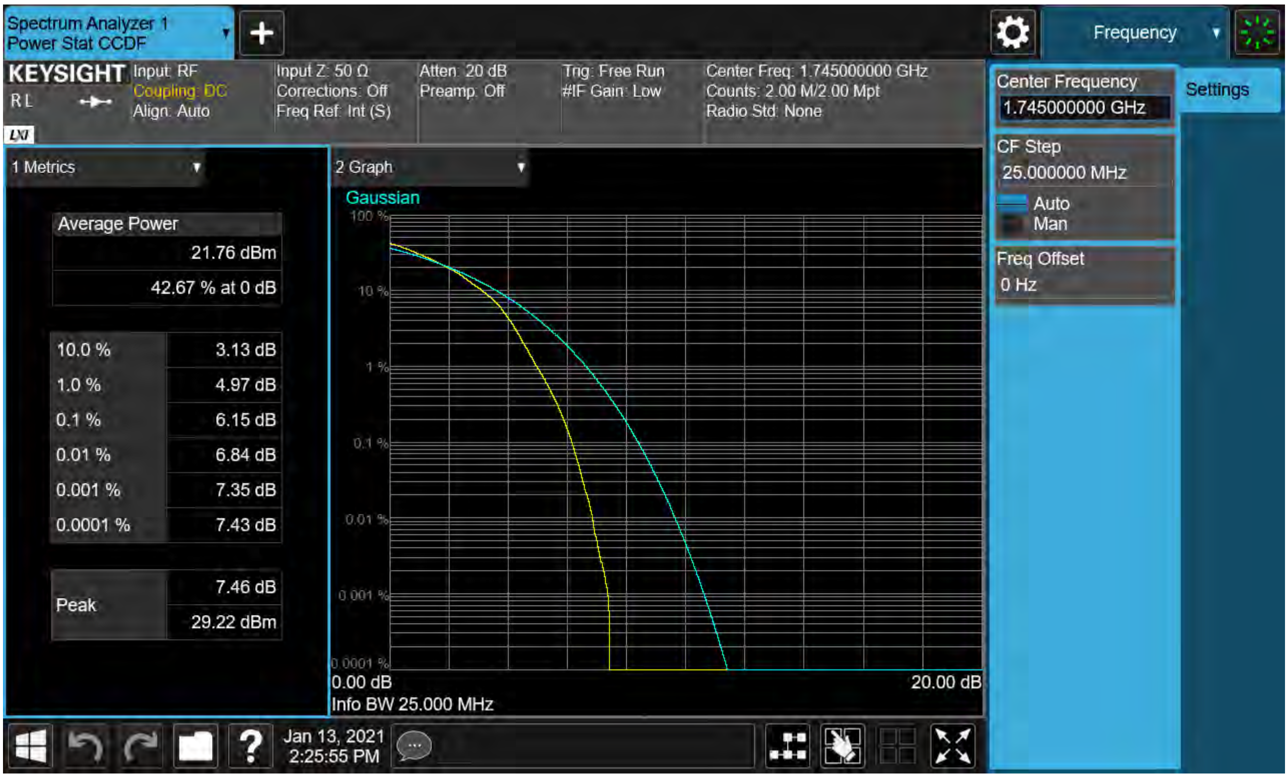
Sub6 n66. PAR Plot (25M BW_Ch.349000_QPSK_RB133_0)



Sub6 n66. PAR Plot (25M BW_Ch.349000_16QAM_RB133_0)

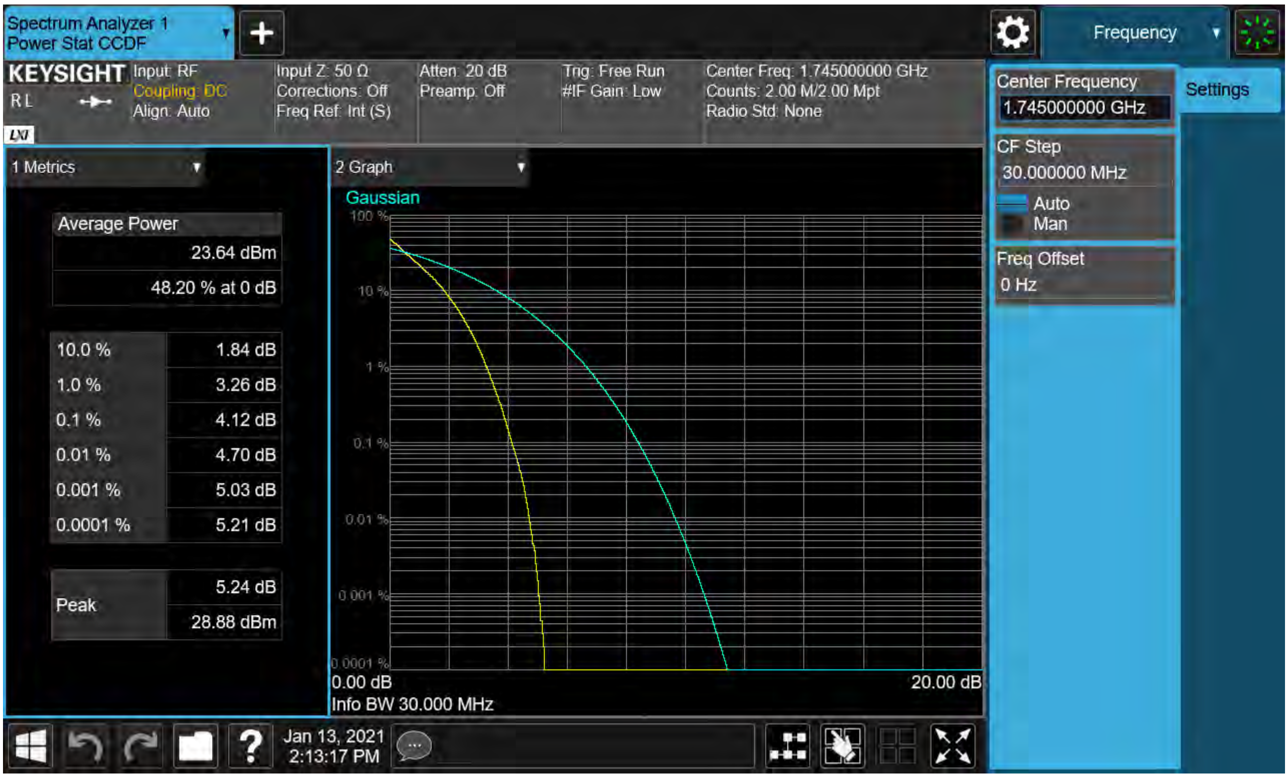


Sub6 n66. PAR Plot (25M BW_Ch.349000_64QAM_RB133_0)

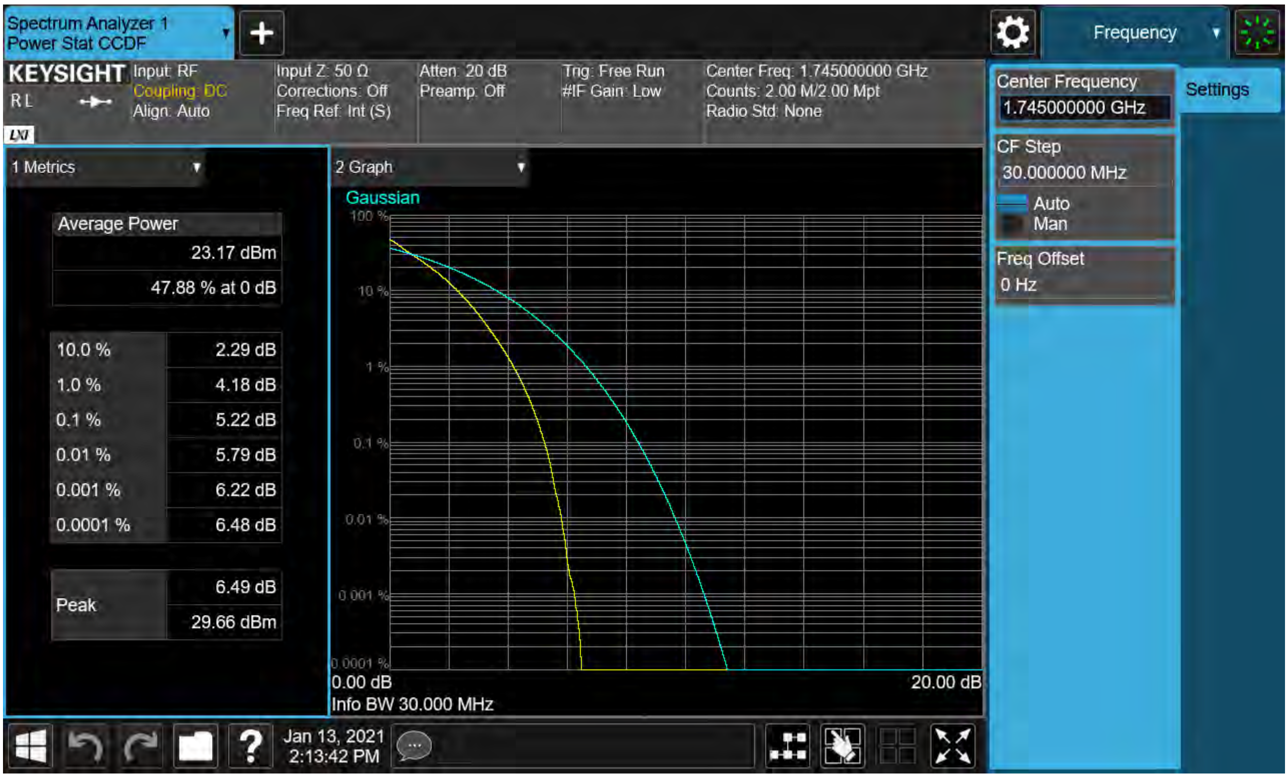


Sub6 n66. PAR Plot (25M BW_Ch.349000_256QAM_RB133_0)

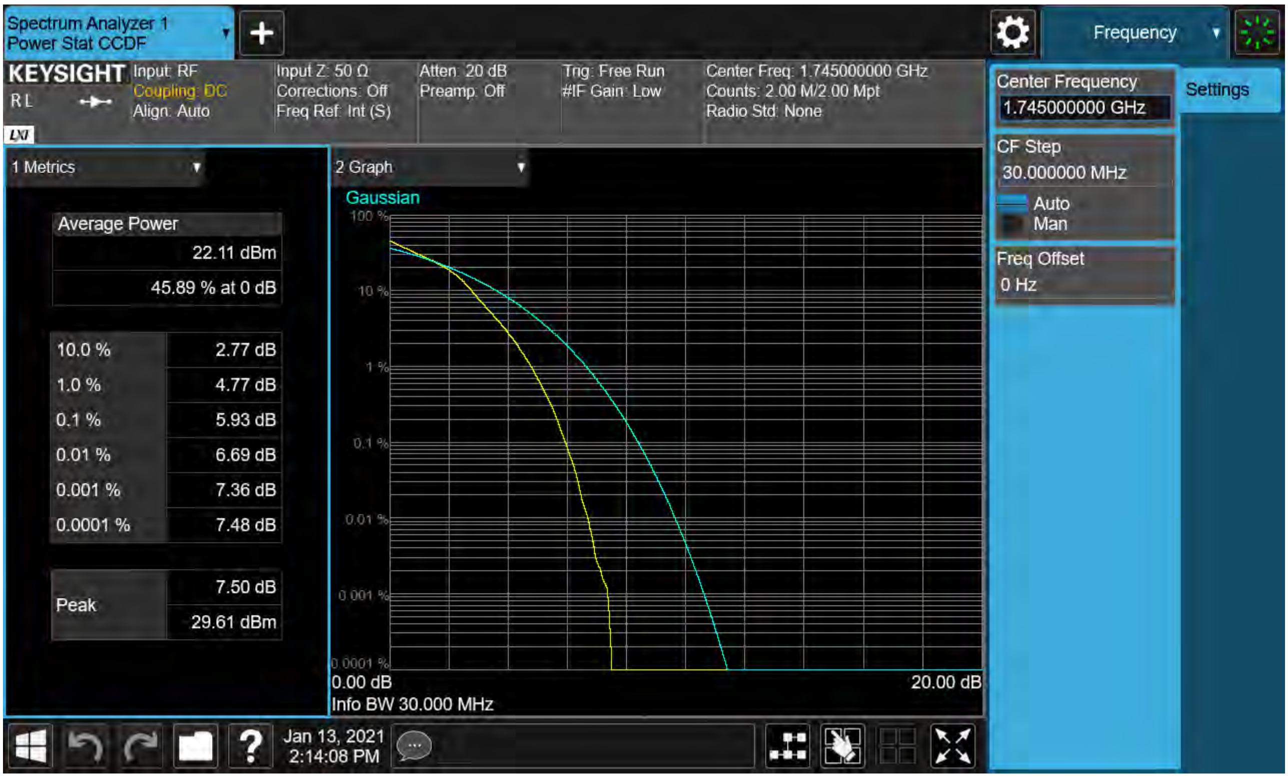
Sub6 n66. PAR Plot (30M BW_Ch.349000_ BPSK_RB160_0)



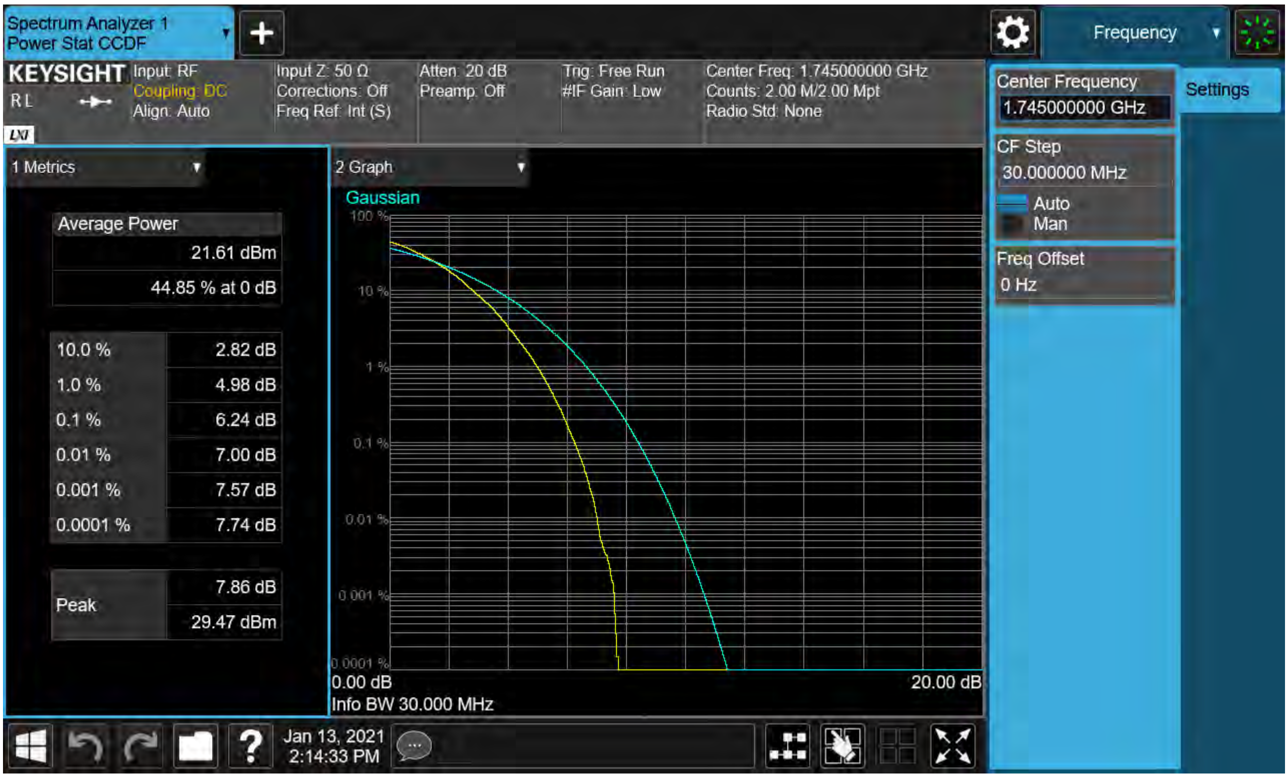
Sub6 n66. PAR Plot (30M BW_Ch.349000_QPSK_RB160_0)



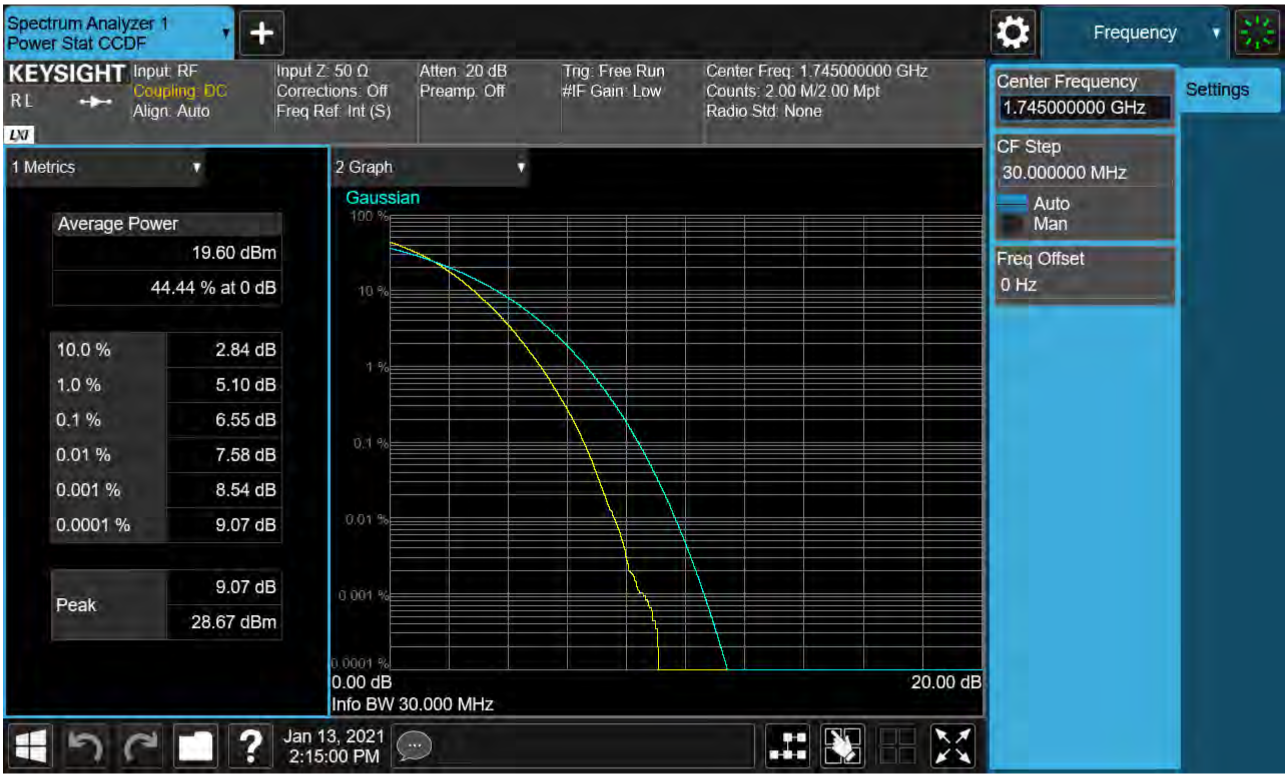
Sub6 n66. PAR Plot (30M BW_Ch.349000_16QAM_RB160_0)



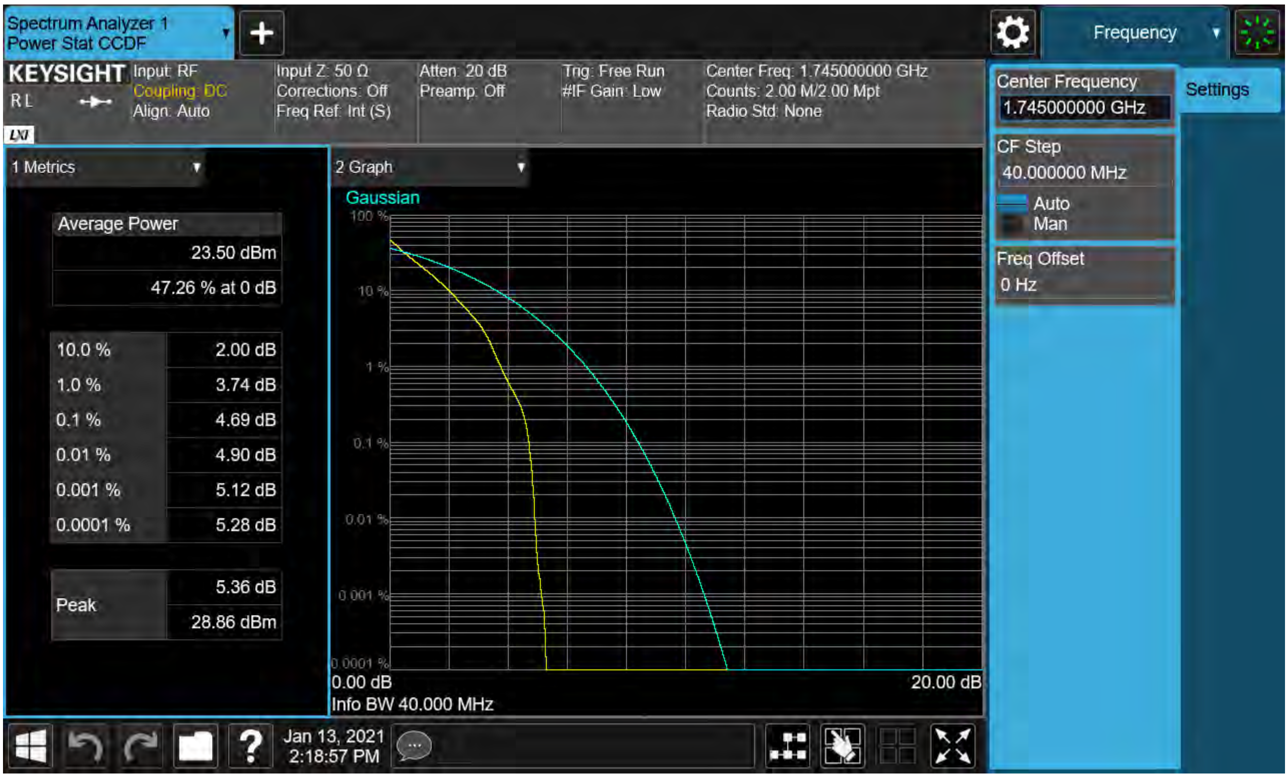
Sub6 n66. PAR Plot (30M BW_Ch.349000_64QAM_RB160_0)



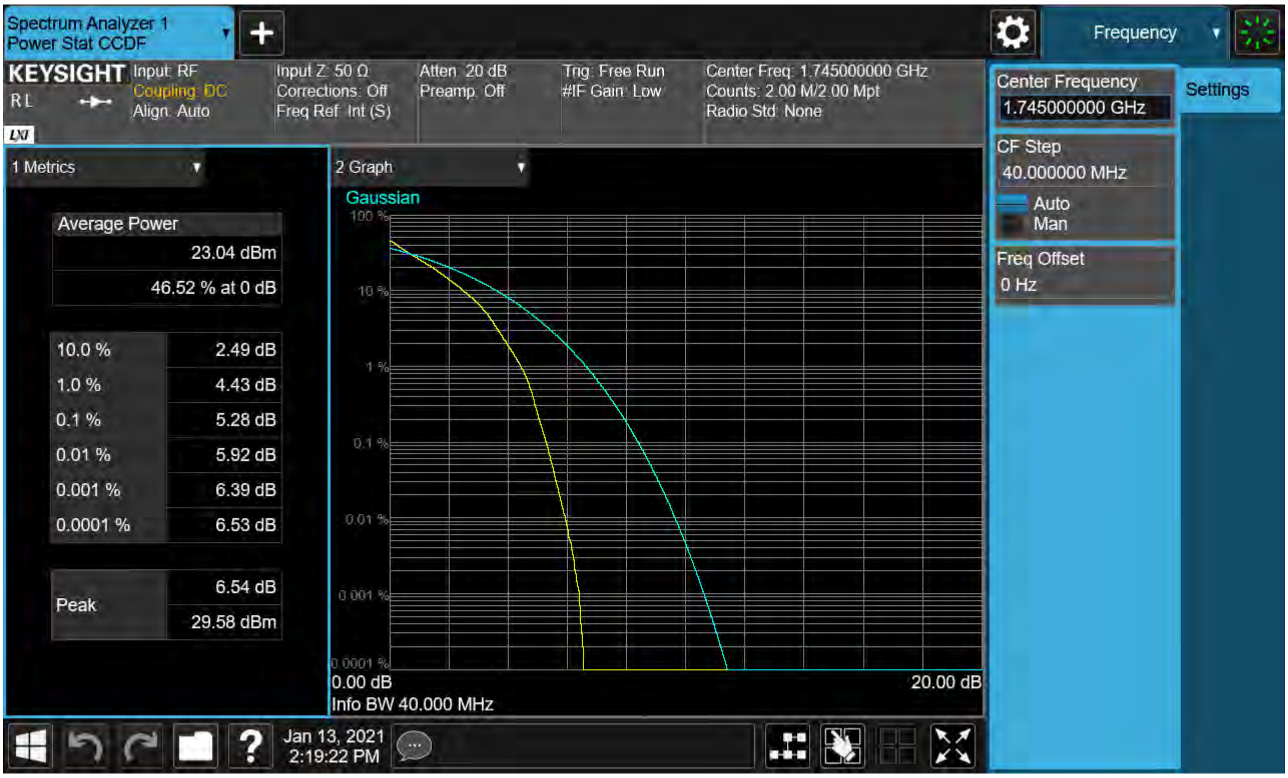
Sub6 n66. PAR Plot (30M BW_Ch.349000_256QAM_RB160_0)



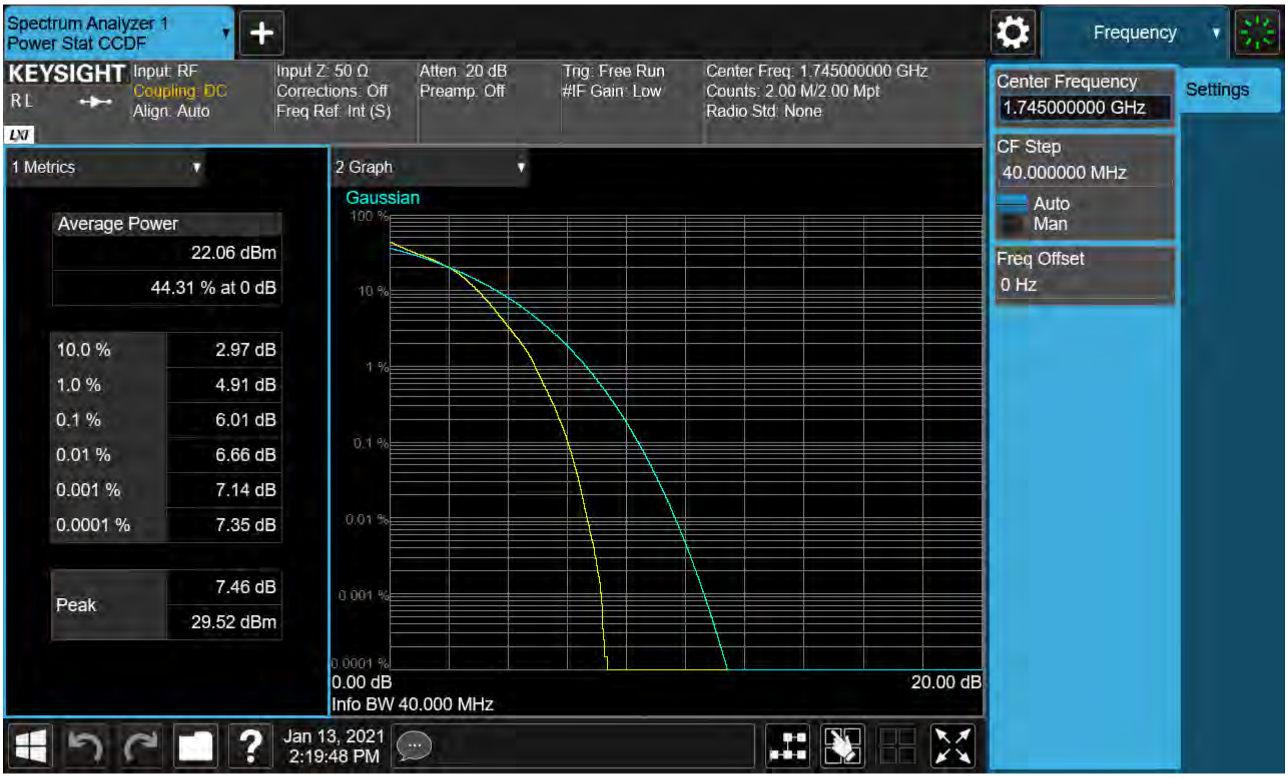
Sub6 n66. PAR Plot (40M BW_Ch.349000_ BPSK_RB216_0)



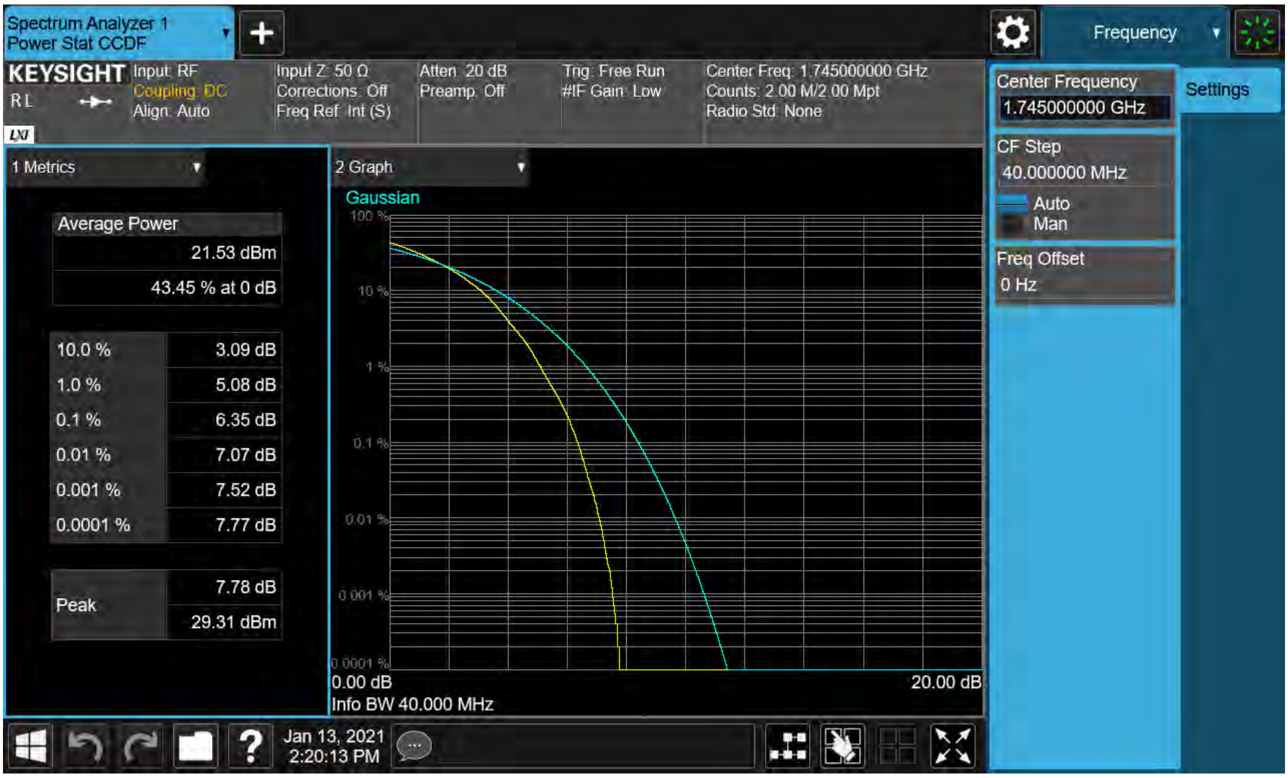
Sub6 n66. PAR Plot (40M BW_Ch.349000_QPSK_RB216_0)



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

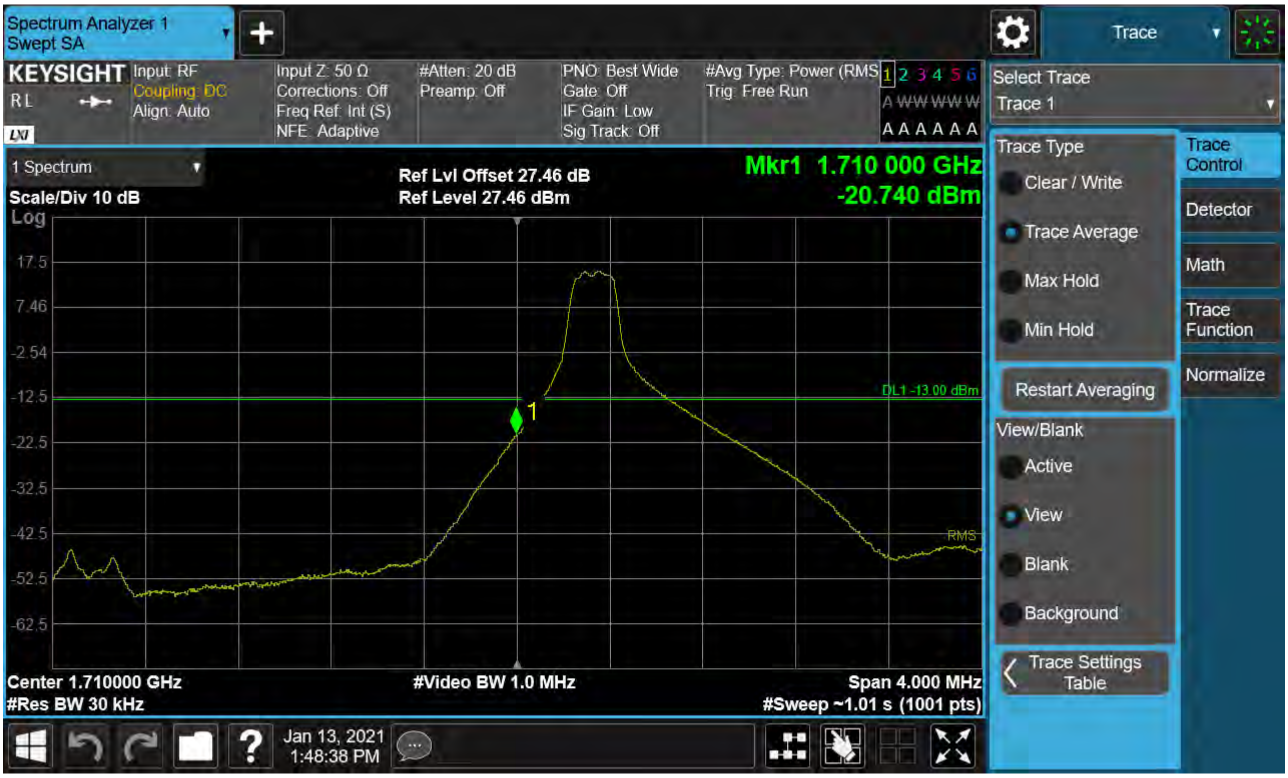


Sub6 n66. PAR Plot (40M BW_Ch.349000_64QAM_RB216_0)



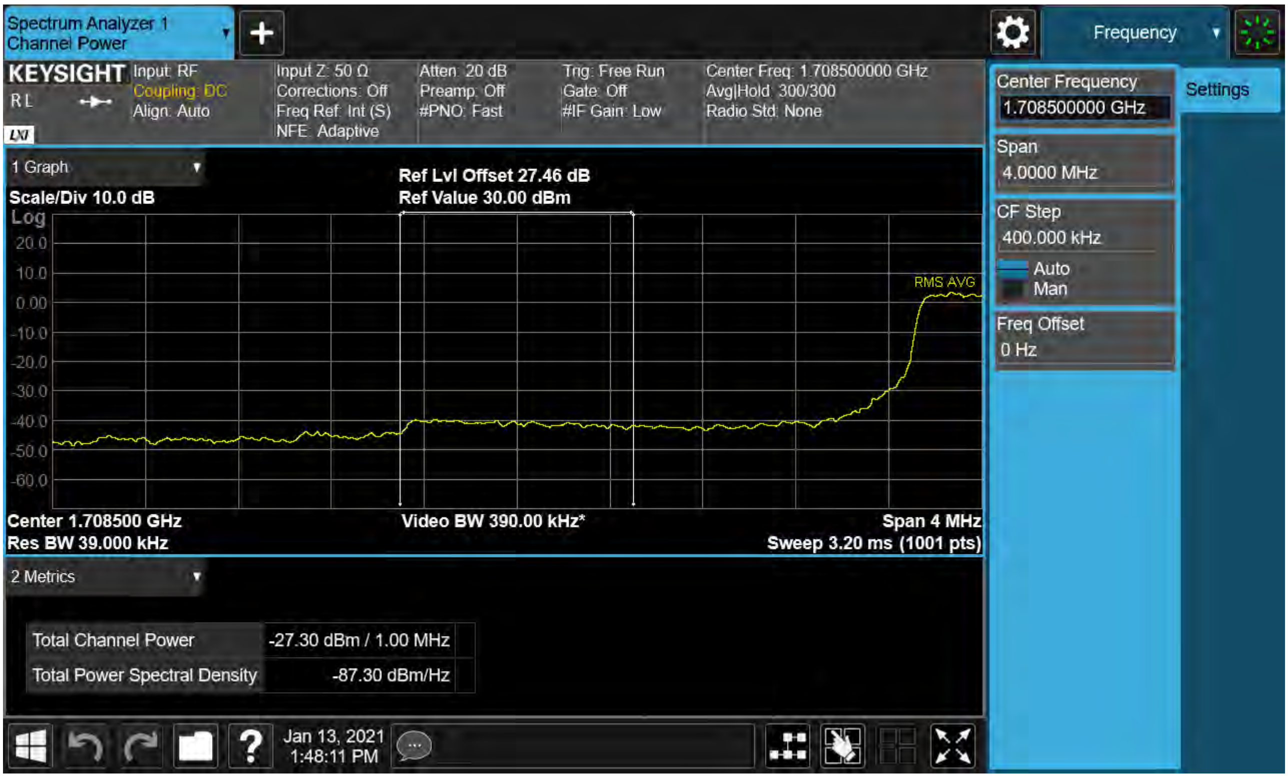
Sub6 n66. PAR Plot (40M BW_Ch.349000_256QAM_RB216_0)

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

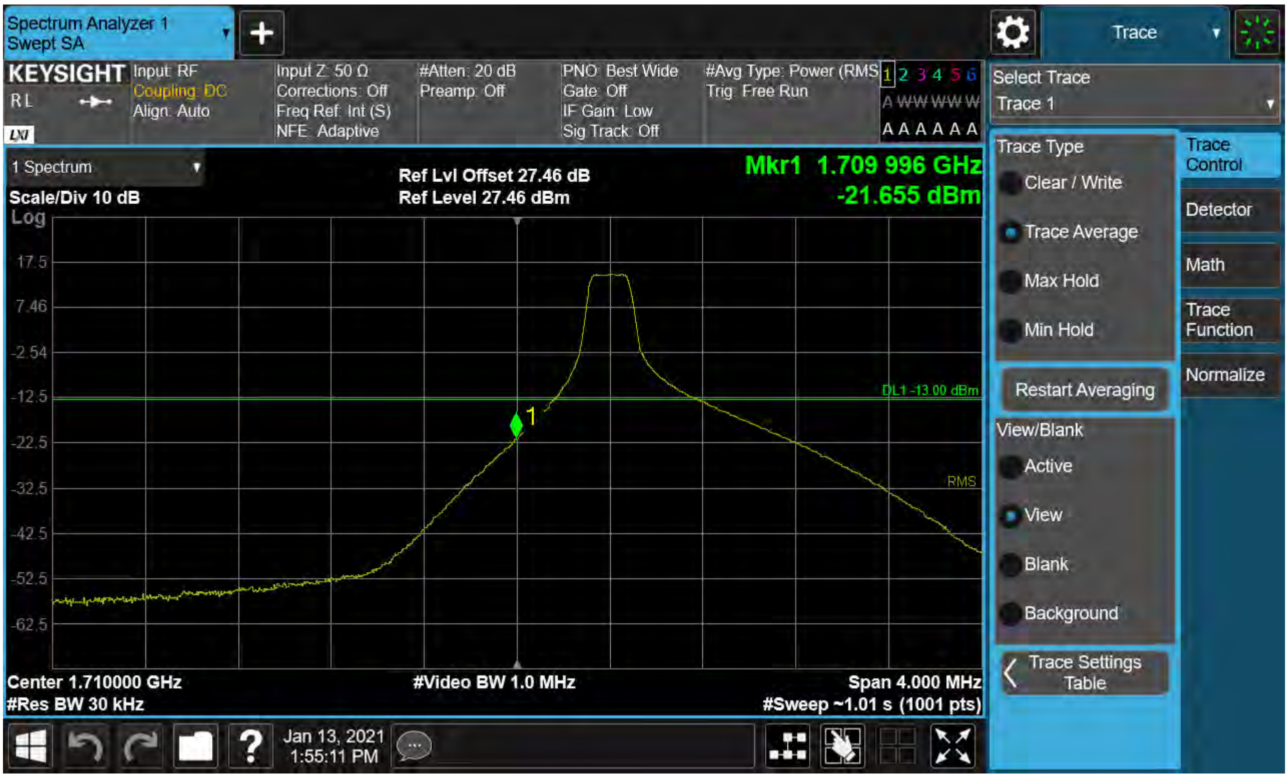


Sub6 n66. Lower Band Edge Plot (5M BW Ch.342500 BPSK RB 25_0) -2

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

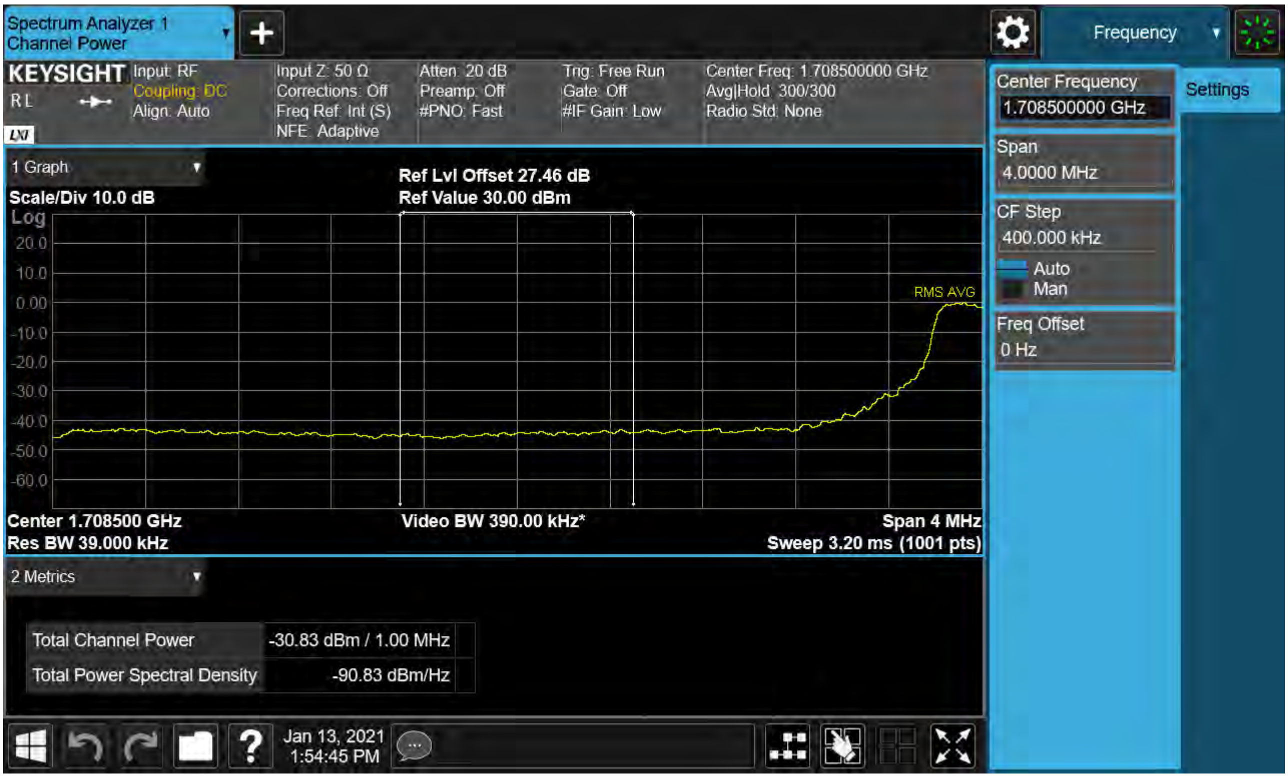


Sub6 n66. Lower Band Edge Plot (10M BW Ch.343000 BPSK RB 1, Offset 0) -1

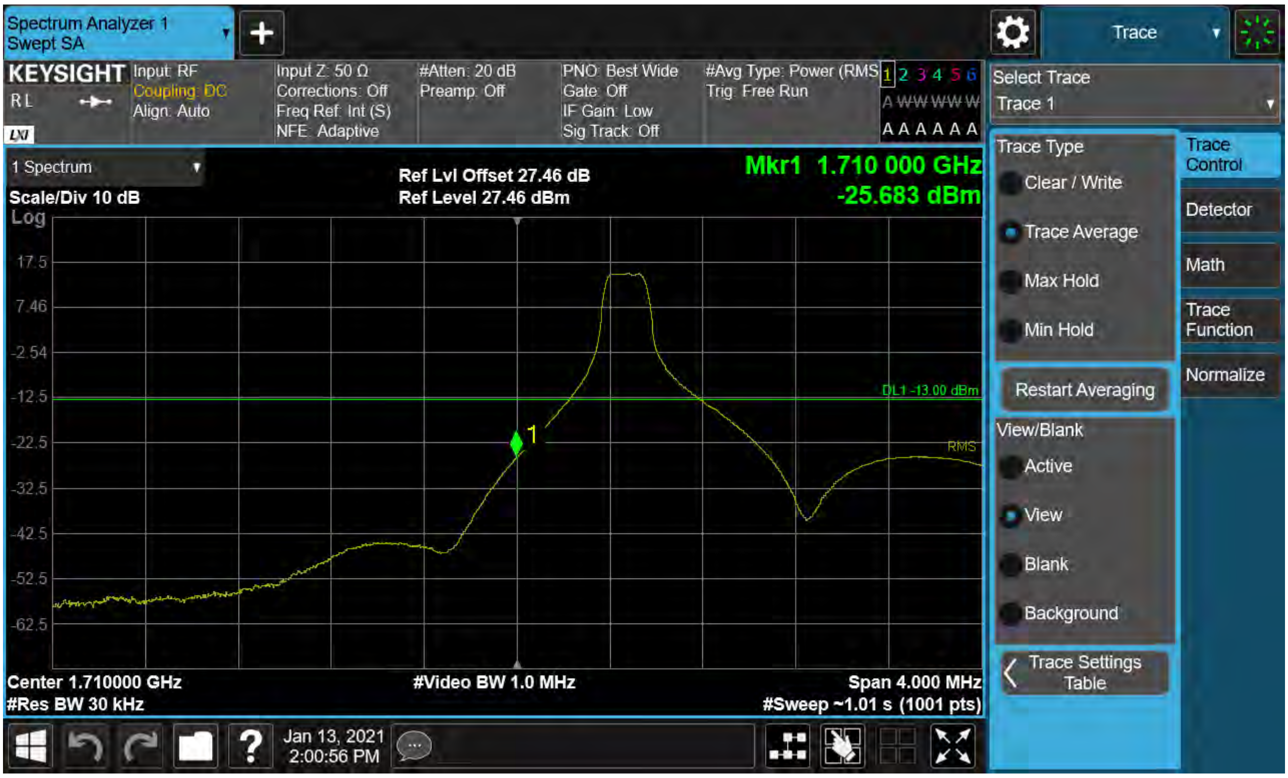


Sub6 n66. Lower Band Edge Plot (10M BW Ch.343000 BPSK RB 52_0) -2

Sub6 n66. Lower Extended Band Edge Plot (10M BW Ch.343000 BPSK_RB52_0) -3

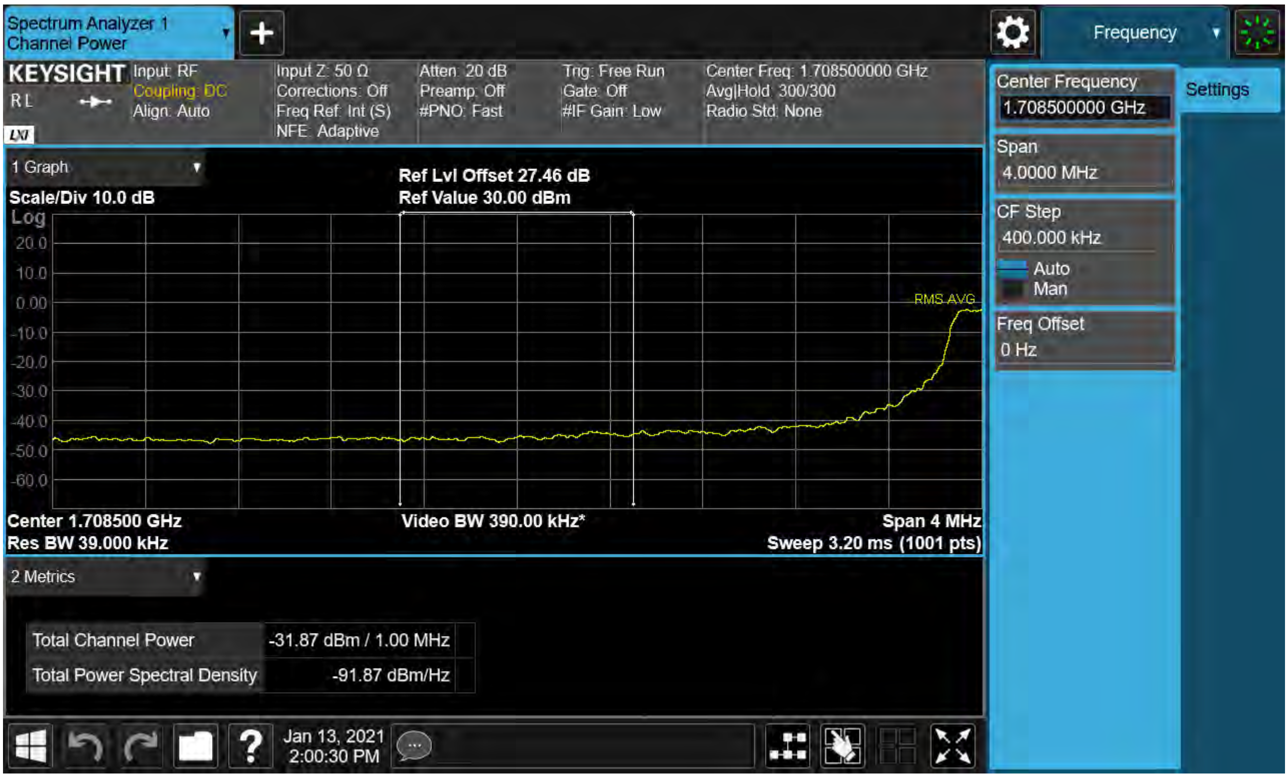


Sub6 n66. Lower Band Edge Plot (15M BW Ch.343500 BPSK RB 1, Offset 0) -1

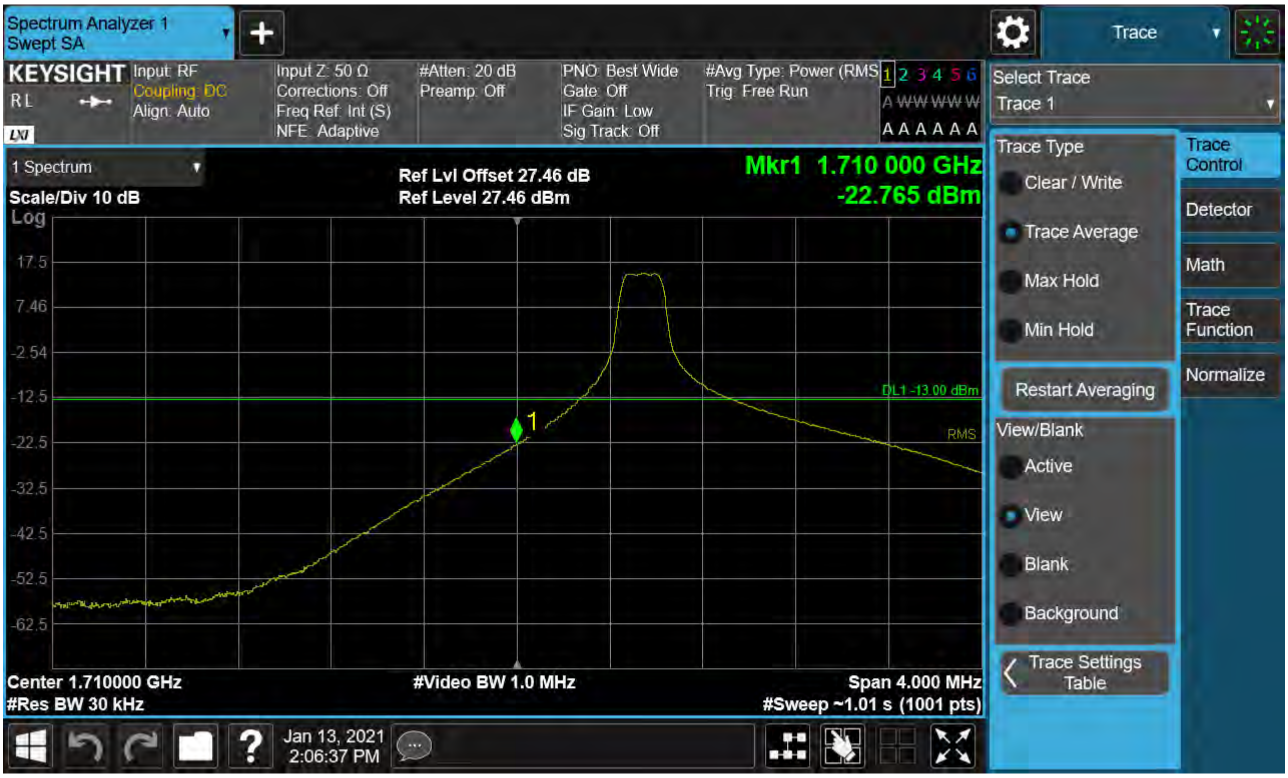


Sub6 n66. Lower Band Edge Plot (15M BW Ch.343500 BPSK RB 79_0) -2

Sub6 n66. Lower Extended Band Edge Plot (15M BW Ch.343500 BPSK_RB79_0) -3

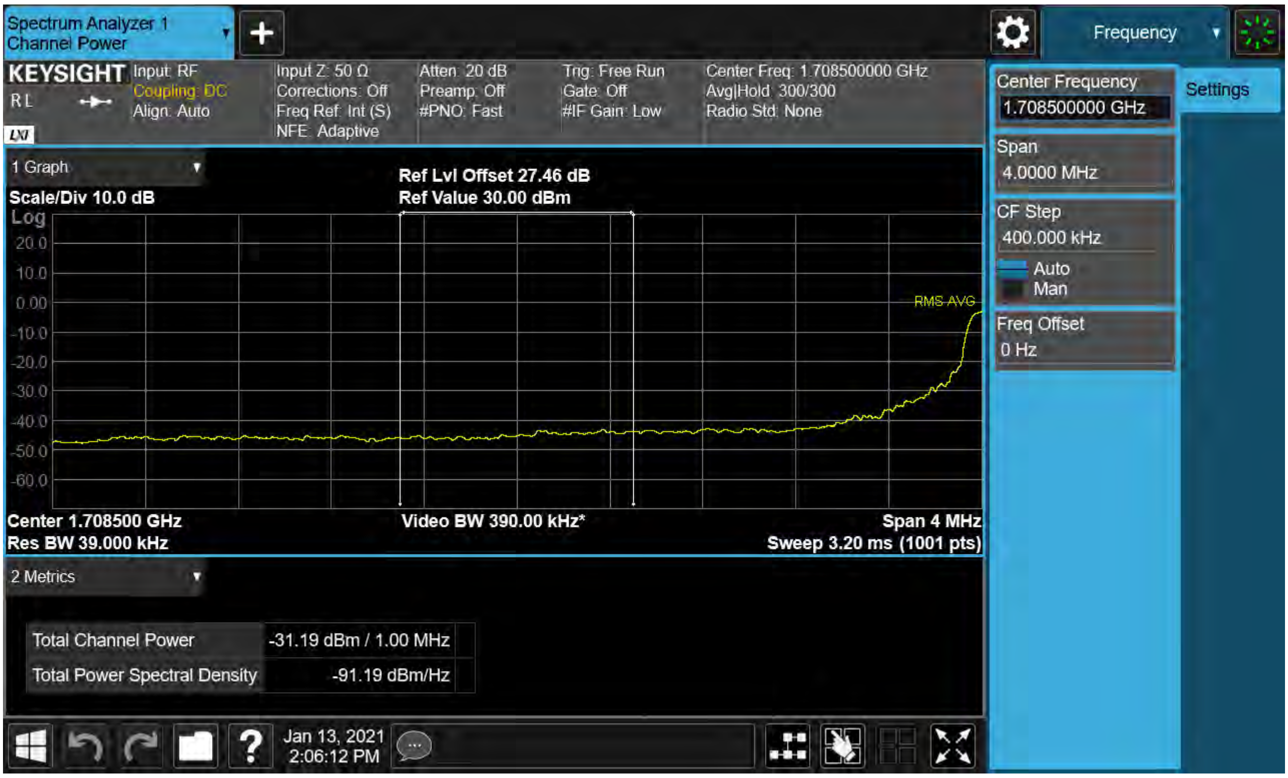


Sub6 n66. Lower Band Edge Plot (20M BW Ch.344000 BPSK RB 1, Offset 0) -1



Sub6 n66. Lower Band Edge Plot (20M BW Ch.344000 BPSK RB 106_0) -2

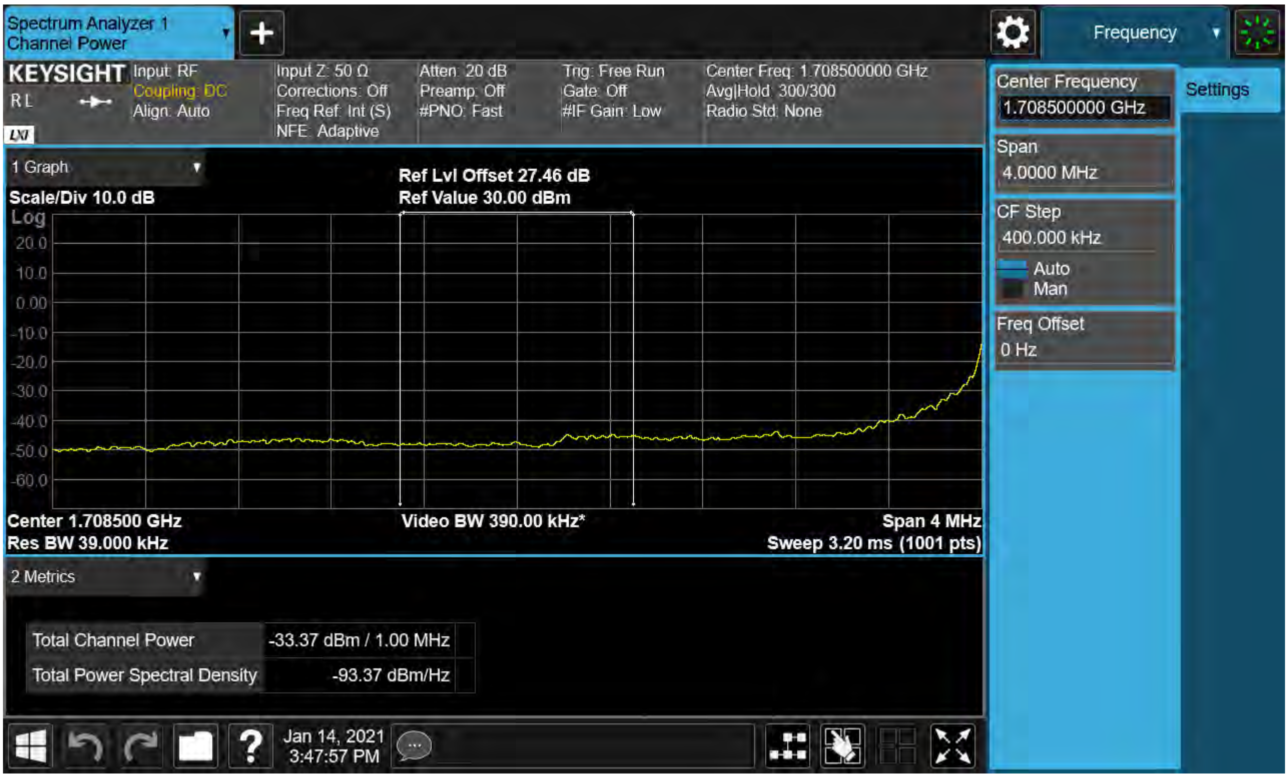
Sub6 n66. Lower Extended Band Edge Plot (20M BW Ch.344000 BPSK_RB106_0) -3



Sub6 n66. Lower Band Edge Plot (25M BW Ch.344500 BPSK RB 1, Offset 0) -1

Sub6 n66. Lower Band Edge Plot (25M BW Ch.344500 BPSK RB 133_0) -2

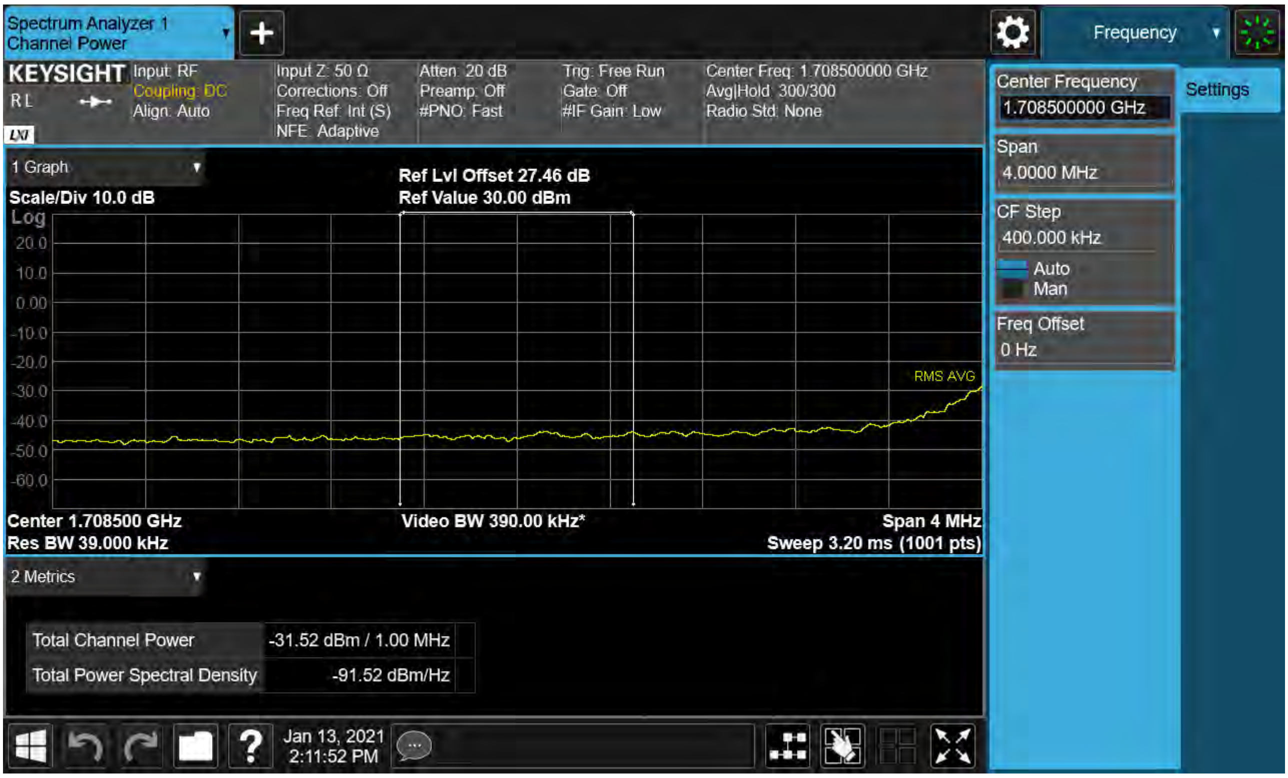
Sub6 n66. Lower Extended Band Edge Plot (25M BW Ch.344500 BPSK_RB133_0) -3



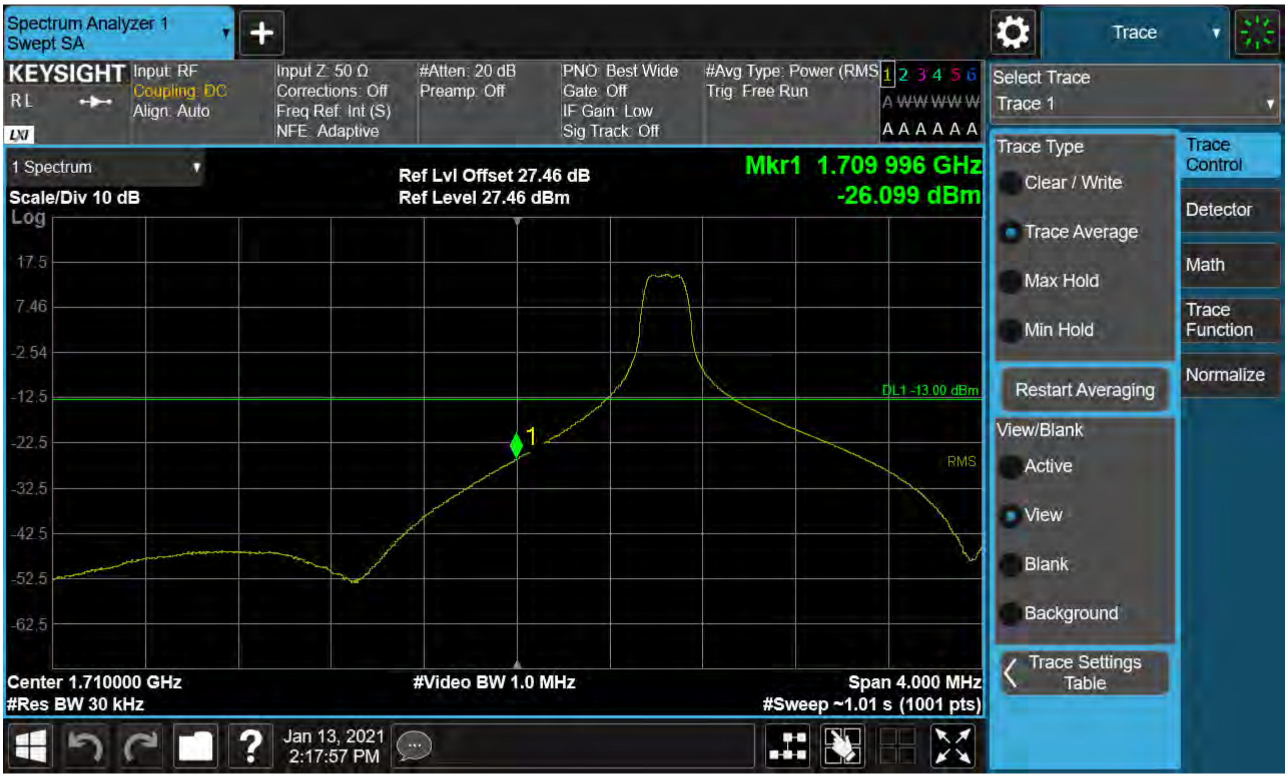
Sub6 n66. Lower Band Edge Plot (30M BW Ch.345000 BPSK RB 1, Offset 0) -1

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

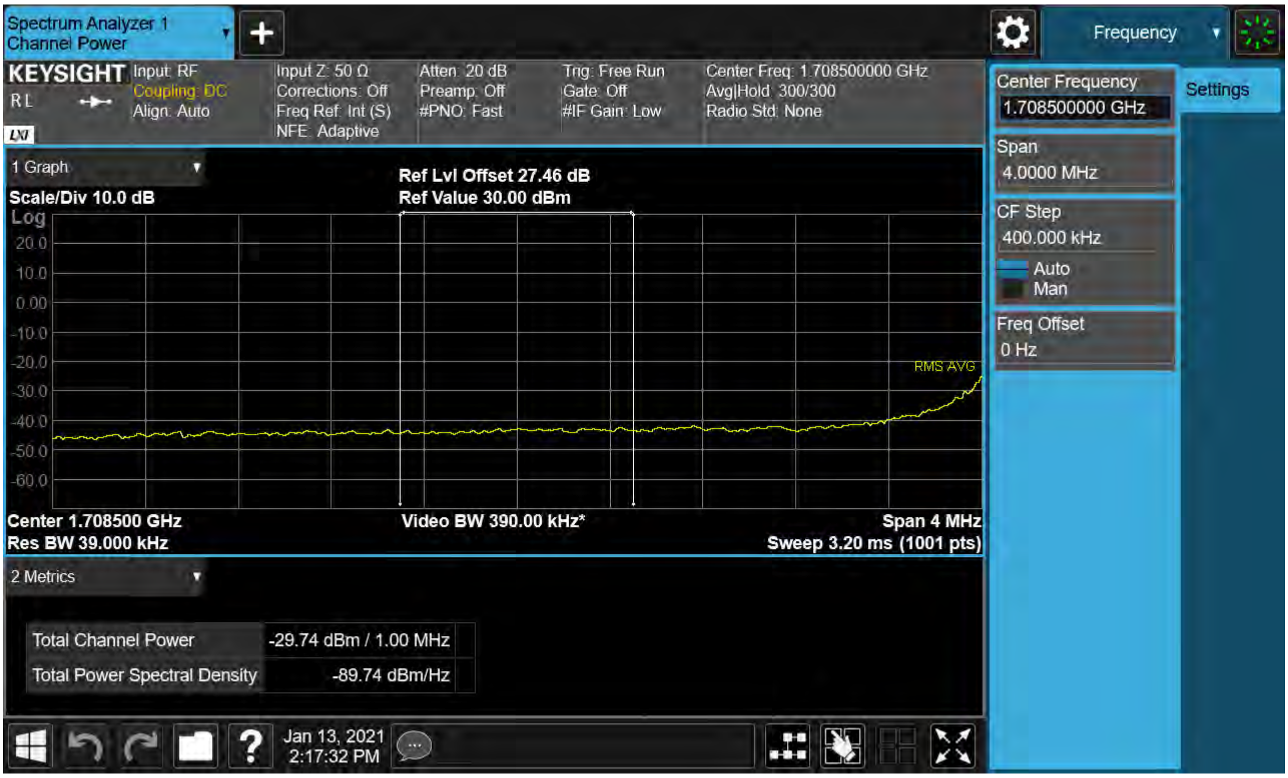


Sub6 n66. Lower Band Edge Plot (40M BW Ch.346000 BPSK RB 1, Offset 0) -1

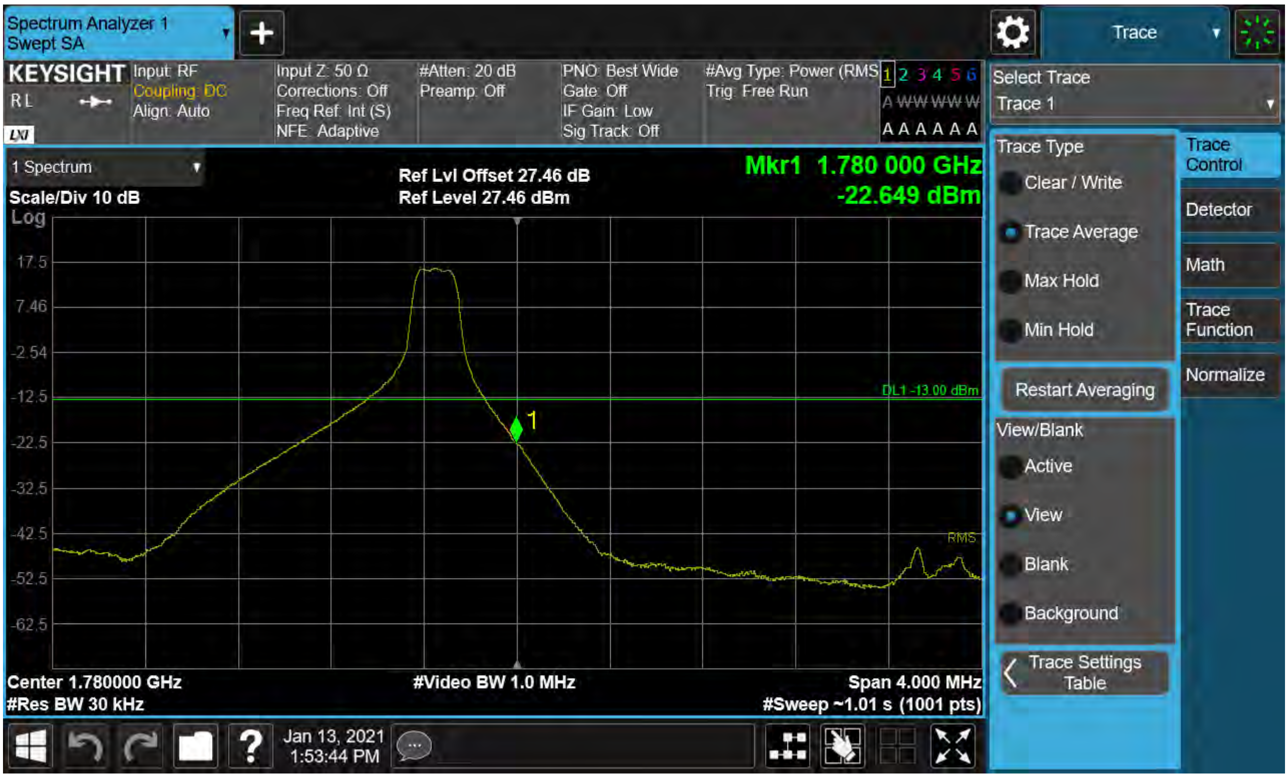


Sub6 n66. Lower Band Edge Plot (40M BW Ch.346000 BPSK RB 216_0) -2

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

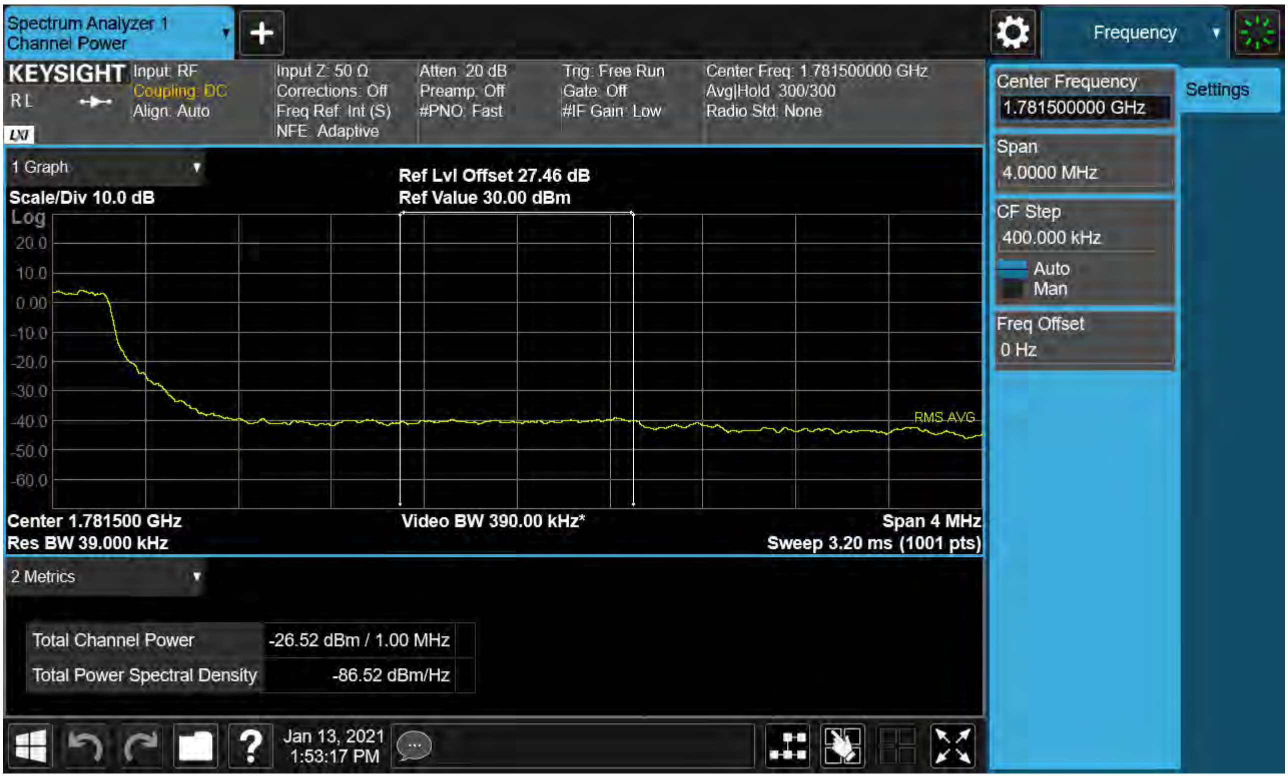


Sub6 n66. Upper Band Edge Plot (5M BW Ch.355500 BPSK_RB1_Offset 24) -1

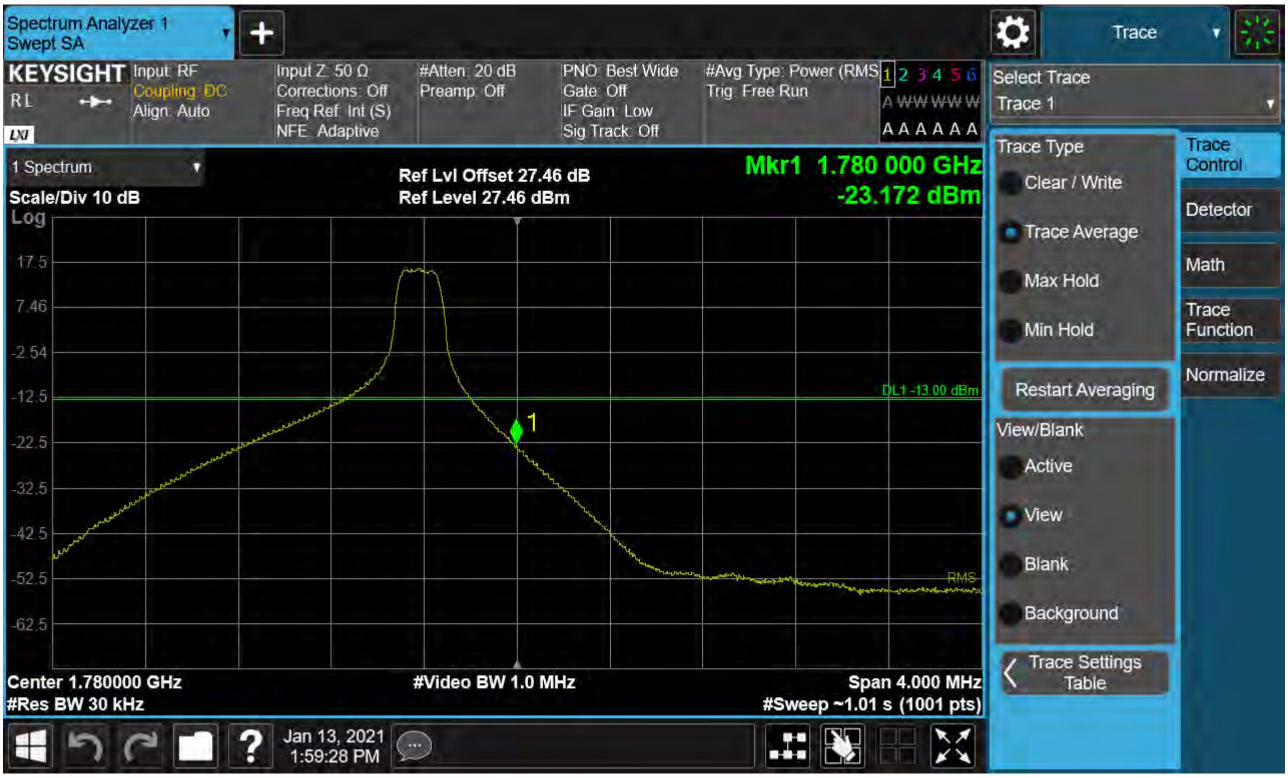


Sub6 n66. Upper Band Edge Plot (5M BW Ch.355500 BPSK_RB25_0) -2

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

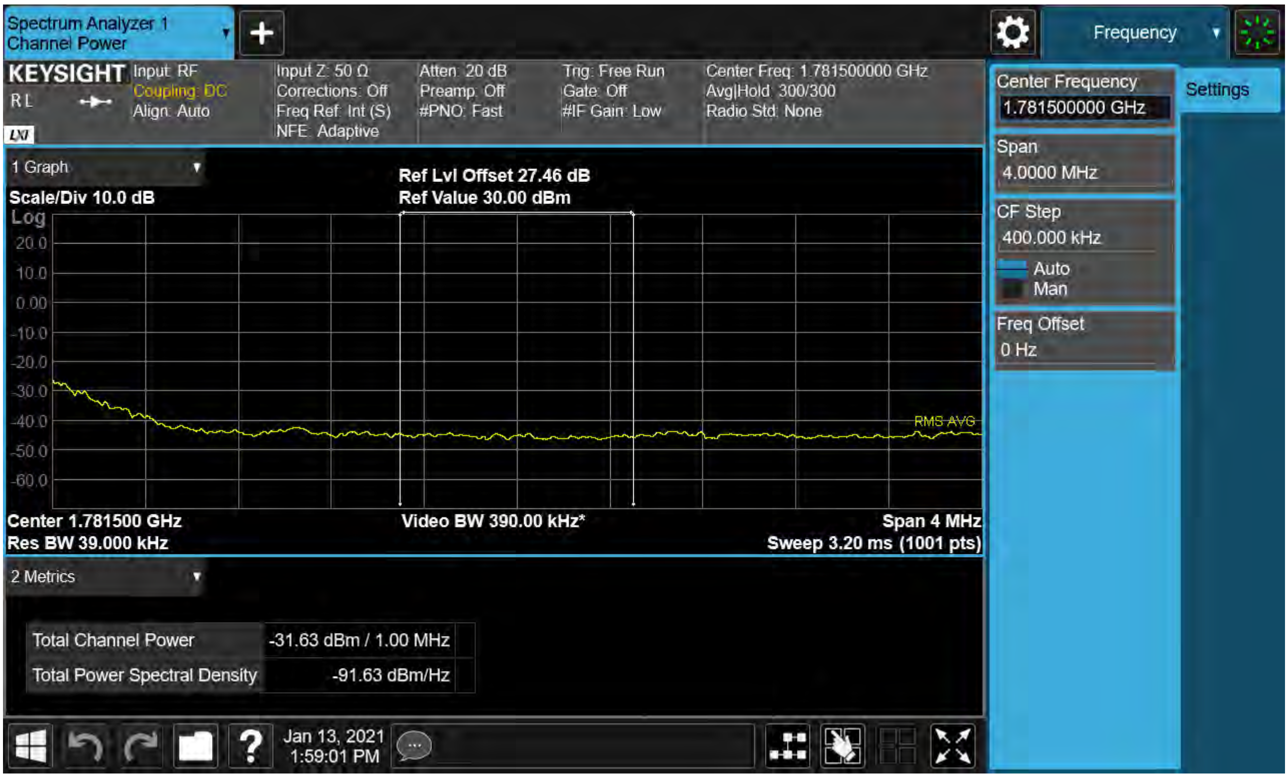


Sub6 n66. Upper Band Edge Plot (10M BW Ch.355000 BPSK_RB1_Offset 51) -1



Sub6 n66. Upper Band Edge Plot (10M BW Ch.355000 BPSK_RB52_0) -2

Sub6 n66. Upper Extended Band Edge Plot (10M BW Ch.355000 BPSK_RB52_0) -3

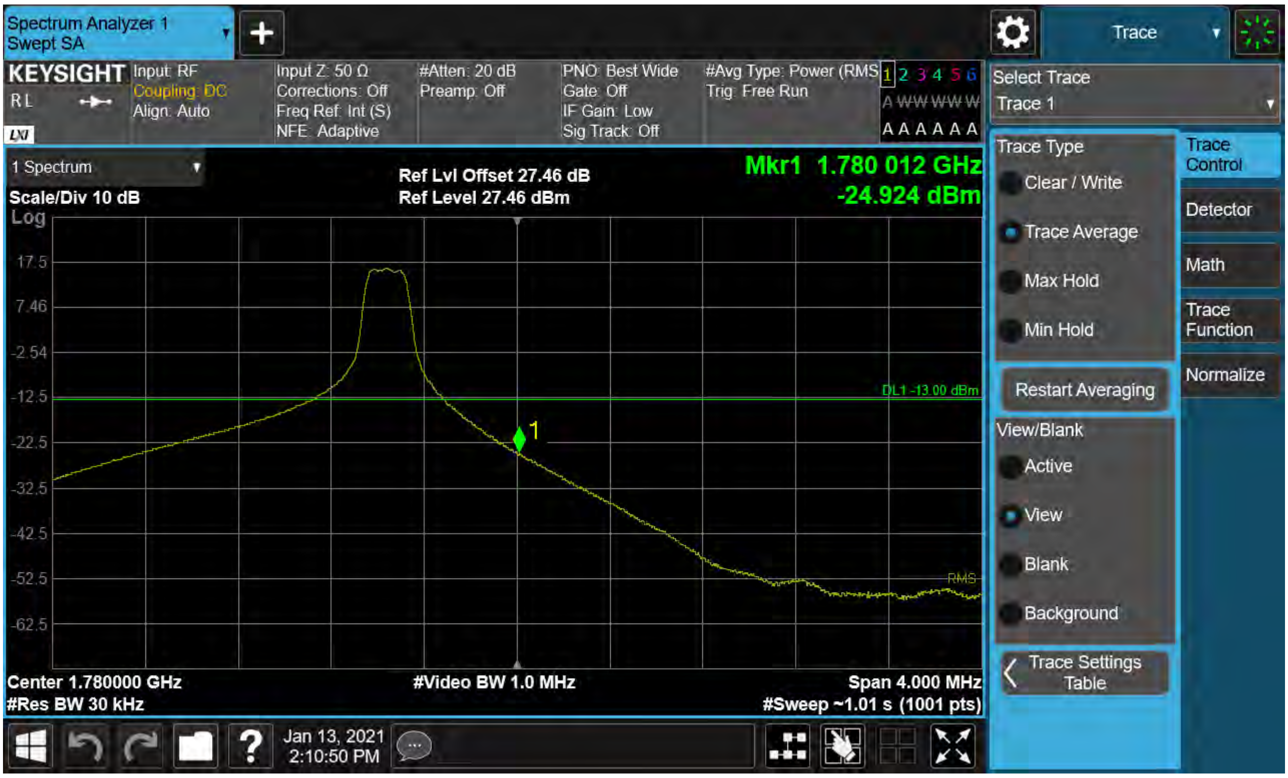


Sub6 n66. Upper Band Edge Plot (15M BW Ch.354500 BPSK_RB1_Offset 78) -1

Sub6 n66. Upper Band Edge Plot (15M BW Ch.354500 BPSK_RB79_0) -2

Sub6 n66. Upper Extended Band Edge Plot (15M BW Ch.354500 BPSK_RB79_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_RB106_0) -2

Sub6 n66. Upper Extended Band Edge Plot (20M BW Ch.354000 BPSK_RB106_0) -3