74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA
TEL: +82-31-645-6300 FAX: +82-31-645-6401

FCC Sub6 REPORT

Class II Permissive Change

Applicant Name:
SAMSUNG Electronics Co., Ltd.

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

Date of Issue:
July 21, 2022

Location:
HCT CO., LTD.,
74, Seoicheon-ro 578beon-gil, Majang-myeon,
Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA

Report No.: HCT-RF-2206-FC039-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: Citizens Band End User Devices (CBE)
FCC Rule Part(s): §96, §2

Mode (MHz)	Tx Frequency (MHz)	Emission Designator	Modulation	EIRP	
				Max. Power (W)	Max. Power (dBm/10MHz)
Sub6 n48 (20)	3560.01 – 3690.00	18M0G7D	PI/2 BPSK	0.157	21.95
		17M9G7D	QPSK	0.155	21.91
		17M8W7D	16QAM	0.126	20.99
		18M0W7D	64QAM	0.078	18.92
		18M0W7D	256QAM	0.055	17.41
Sub6 n48 (40)	3570.00 – 3679.98	35M9G7D	PI/2 BPSK	0.156	21.93
		35M9G7D	QPSK	0.155	21.90
		35M9W7D	16QAM	0.125	20.97
		35M9W7D	64QAM	0.079	18.96
		35M8W7D	256QAM	0.054	17.33

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 : Jung Ki Lim **Engineer of Telecommunication Testing Center**	**Report approved by : Se Wook Park** **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-2206-FC039	July 05, 2022	- First Approval Report
HCT-RF-2206-FC039-R1	July 21, 2022	- Updated the list of test equipment

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

Table of Contents

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:	Class II Permissive Change
FCC Classification:	Citizens Band End User Devices (CBE)
FCC Rule Part(s):	§96, §2
EUT Type:	Mobile Phone
Model(s):	SM-G990U
Additional Model(s):	SM-G990U1/DS, SM-G990U1
SCS(kHz):	30
Bandwidth(MHz):	20, 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:	3560.01 – 3690.00 : (Sub6 n48(20 MHz)) 3570.00 – 3679.98 : (Sub6 n48(40 MHz))
Date(s) of Tests:	May 03, 2021 ~ June 07, 2021
Serial number:	Radiated: R3CR315YMXB Conducted: R3CR3117FEE

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 - KDB 940660 D01 v01
Channel Edge	- KDB 971168 D01 v03r01 – Section 6.0 - ANSI C63.26-2015 – Section 5.7 - KDB 940660 D01 v01
Spurious and Harmonic Emissions at Antenna Terminal	- KDB 971168 D01 v03r01 – Section 6.0 - ANSI C63.26-2015 – Section 5.7 - KDB 940660 D01 v01
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 - KDB 940660 D01 v01
Frequency stability	- ANSI C63.26-2015 – Section 5.6 - KDB 940660 D01 v01
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 - KDB 940660 D01 v01
Radiated Spurious and Harmonic Emissions	- KDB 971168 D01 v03r01 – Section 6.2 - ANSI/TIA-603-E-2016 – Section 2.2.12 - KDB 940660 D01 v01

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 set equal to 10MHz.
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 NormalHz 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 = RMS
6. Trace mode = Average
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;

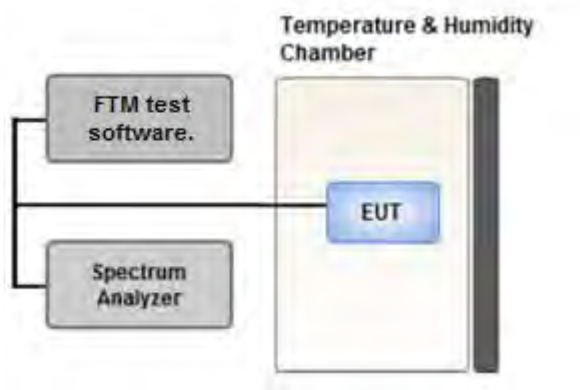
$$Result_{(dBm)} = Pg_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dBi)}$$

   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:

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

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.

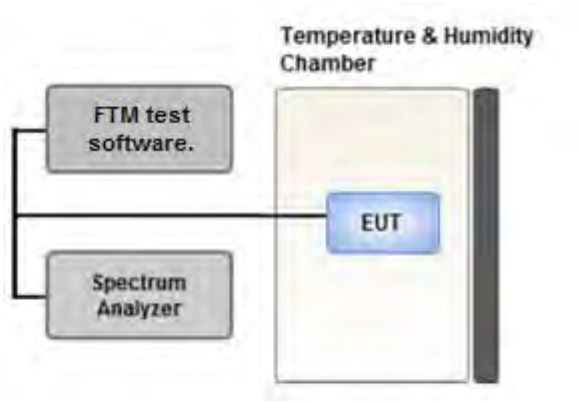
1. Set the RBW ≥ OBW.
2. Set VBW ≥ 3 × RBW.
3. Set span ≥ 2 × OBW.
4. Sweep time ≥ 10 × (number of points in sweep) × (transmission symbol period).
5. Detector = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the peak amplitude level.

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.

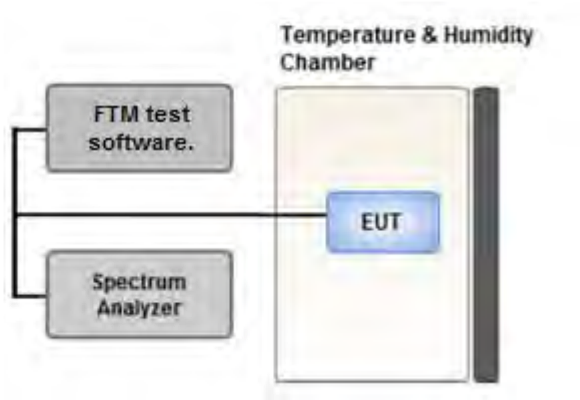
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

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 = Average
5. Sweep time = auto
6. Number of points in sweep ≥ 2 x Span / RBW

Test Notes

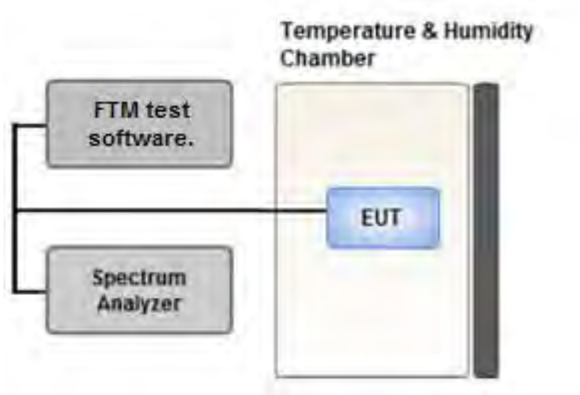
1. Factor(dB) = Cable Loss + Ext. Attenuator

- Result(dBm) = Reading + Factor

2. Factor(dB)

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	33.255

3.7 CHANNEL EDGE



Test setup

Test Settings

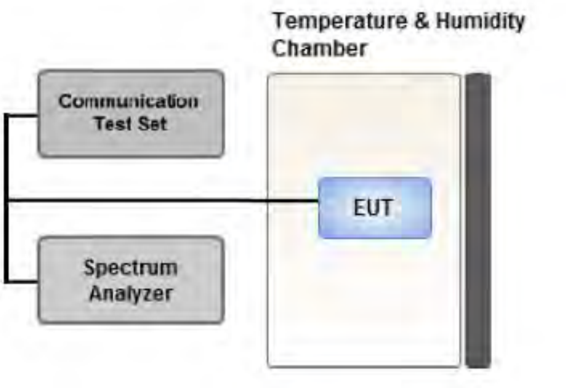
1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. Within 1MHz of the channel edge the RBW should be 2% of EBW, then 1 MHz after that.
4. VBW > 3 x RBW
5. 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

The conducted power of any emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed −13 dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any emission shall not exceed −25 dBm/MHz.

The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/Mhz

3.8 Adjacent Channel Leakage Ratio



Test setup

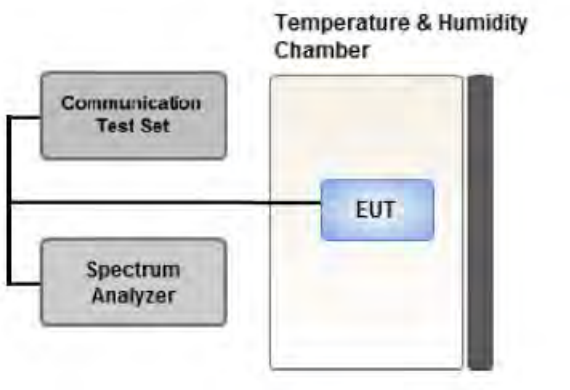
Test Settings

1. Use ACP measurement function of Spectrum analyzer to measure adjacent channel leakage ratio
2. Integ BW = Assigned channel bandwidth
5. Detector = RMS
6. Number of sweep points ≥ 2 x Span/RBW
7. Trace mode = trace average
8. Sweep time = 1s
9. The trace was allowed to stabilize

Test Notes

the Adjacent Channel Leakage Ratio for End User Devices shall be at least 30 dB.

3.9 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.

3.10 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 : Stand alone, Stand alone + External accessories (Earphone, AC adapter, etc)

  Worst case : Stand alone
- All modes of operation were investigated and the worst case configuration results are reported.
  Mode: SA only
- We were performed the RSE test in condition of co-location.
  Mode : Stand alone, Simultaneous transmission scenarios
  Worst case : Stand alone
- 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	PI/2 BPSK	1	1	Y

3.11 WORST CASE(CONDUCTED TEST)

- Waveform : All Waveform of operation were investigated and the worst case configuration results are reported.
  (Worst case: DFT-S-OFDM)
- Modulation : All Modulation of operation were investigated and the worst case configuration results are reported.
  (Worst case: PI/2 BPSK)
- All modes of operation were investigated and the worst case configuration results are reported.
  Mode: SA only
- All RB sizes, offsets of operation were investigated and the worst case configuration results are reported.
  Please refer to the table below.
- SM-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 Radio	PI/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM	20, 40	Mid	Full RB	0
Channel Edge	PI/2 BPSK	20	Low	1	0
			High	1	50
		40	Low	1	0
			High	1	105
		20, 40	Low, Mid, High	Full RB	0
Spurious and Harmonic Emissions at Antenna Terminal	PI/2 BPSK	20, 40	Low, Mid, High	1	1

4. LIST OF TEST EQUIPMENT

4.1 Calibration date within the test period

Equipment	Model	Manufacture	Serial No.	Due to Calibration	Calibration Interval
Precision Dipole Antenna	UHAP	Schwarzbeck	01273	05/30/2022	Biennial
Precision Dipole Antenna	UHAP	Schwarzbeck	01274	05/30/2022	Biennial
Horn Antenna(1~18 GHz)	BBHA 9120D	Schwarzbeck	02289	05/28/2022	Biennial
Horn Antenna(1~18 GHz)	BBHA 9120D	Schwarzbeck	9120D-1299	05/04/2023	Biennial
Horn Antenna(15~40 GHz)	BBHA 9170	Schwarzbeck	BBHA9170342	10/13/2022	Biennial
Horn Antenna(15~40 GHz)	BBHA 9170	Schwarzbeck	BBHA9170124	04/12/2023	Biennial
Loop Antenna(9 kHz~30 MHz)	FMZB1513	Rohde & Schwarz	1513-175	06/04/2023	Biennial
Bilog Antenna	VULB9160	Schwarzbeck	3150	03/03/2023	Biennial
Hybrid Antenna	VULB9160	Schwarzbeck	760	02/22/2023	Biennial
High Pass Filter	WHKX10-900-1000-15000-40SS	Wainwright Instruments	15	08/10/2021	Annual
High Pass Filter	WHKX10-2700-3000-18000-40SS	Wainwright Instruments	145	09/03/2021	Annual
High Pass Filter	WHNX6-4740-6000-26500-40CC	Wainwright Instruments	11	09/03/2021	Annual
LOW NOISE AMP (100 MHz ~ 18 GHz)	CBLU1183540B-01	CERNEX	26822	06/04/2021	Annual
Power Amplifier	CBL18265035	CERNEX	22966	12/04/2021	Annual
Power Amplifier	CBL26405040	CERNEX	25956	03/23/2022	Annual
DC Power Supply	E3632A	Hewlett Packard	MY40004427	09/16/2021	Annual
Power Splitter(DC~26.5 GHz)	11667B	Hewlett Packard	11275	04/07/2022	Annual
Chamber	SU-642	ESPEC	93008124	03/15/2022	Annual
Signal Analyzer(10Hz~26.5GHz)	N9020A	Agilent	MY51110063	04/22/2022	Annual
ATTENUATOR(20 dB)	8493C	Hewlett Packard	17280	06/01/2022	Annual
Spectrum Analyzer(10 Hz~40 GHz)	FSV40	REOHDE & SCHWARZ	101436	03/02/2022	Annual
Base Station	8960 (E5515C)	Agilent	MY48360800	08/16/2021	Annual
Wideband Radio Communication Tester	MT8821C	Anritsu Corp.	6262287700	05/25/2022	Annual
Wideband Radio Communication Tester	MT8000A	Anritsu Corp.	6262302511	05/26/2022	Annual
SIGNAL GENERATOR (100kHz~40GHz)	SMB100A	REOHDE & SCHWARZ	177633	07/13/2021	Annual
Signal Analyzer(5Hz~40.0GHz)	N9030B	KEYSIGHT	MY55480167	06/02/2022	Annual
4-Way Divider	ZC4PD-K1844+	Mini-Circuits	942907	09/14/2021	Annual
FCC LTE Mobile Conducted RF Automation Test Software	-	HCT CO., LTD.,	-	-	-

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).

4.2 Date of Latest Calibration

Equipment	Model	Manufacture	Serial No.	Due to Calibration	Calibration Interval
Precision Dipole Antenna	UHAP	Schwarzbeck	01273	03/27/2024	Biennial
Precision Dipole Antenna	UHAP	Schwarzbeck	01274	03/27/2024	Biennial
Horn Antenna(1~18 GHz)	BBHA 9120D	Schwarzbeck	02289	03/21/2024	Biennial
Horn Antenna(1~18 GHz)	BBHA 9120D	Schwarzbeck	9120D-1299	05/04/2023	Biennial
Horn Antenna(15~40 GHz)	BBHA 9170	Schwarzbeck	BBHA9170342	10/13/2022	Biennial
Horn Antenna(15~40 GHz)	BBHA 9170	Schwarzbeck	BBHA9170124	04/12/2023	Biennial
Loop Antenna(9 kHz~30 MHz)	FMZB1513	Rohde & Schwarz	1513-175	06/04/2023	Biennial
Bilog Antenna	VULB9160	Schwarzbeck	3150	03/03/2023	Biennial
Hybrid Antenna	VULB9160	Schwarzbeck	760	02/22/2023	Biennial
High Pass Filter	WHKX10-900-1000-15000-40SS	Wainwright Instruments	15	05/18/2023	Annual
High Pass Filter	WHKX10-2700-3000-18000-40SS	Wainwright Instruments	145	05/18/2023	Annual
High Pass Filter	WHNX6-4740-6000-26500-40CC	Wainwright Instruments	11	05/18/2023	Annual
LOW NOISE AMP (100 MHz ~ 18 GHz)	CBLU1183540B-01	CERNEX	26822	05/18/2023	Annual
Power Amplifier	CBL18265035	CERNEX	22966	12/02/2022	Annual
Power Amplifier	CBL26405040	CERNEX	25956	03/11/2023	Annual
DC Power Supply	E3632A	Hewlett Packard	MY40004427	09/15/2022	Annual
Power Splitter(DC~26.5 GHz)	11667B	Hewlett Packard	11275	03/11/2023	Annual
Chamber	SU-642	ESPEC	93008124	03/04/2023	Annual
Signal Analyzer(10 Hz~26.5 GHz)	N9020A	Agilent	MY51110063	04/19/2023	Annual
ATTENUATOR(20 dB)	8493C	Hewlett Packard	17280	05/18/2023	Annual
Spectrum Analyzer(10 Hz~40 GHz)	FSV40	REOHDE & SCHWARZ	101436	02/25/2023	Annual
Base Station	8960 (E5515C)	Agilent	MY48360800	08/18/2022	Annual
Wideband Radio Communication Tester	MT8821C	Anritsu Corp.	6262287700	05/19/2023	Annual
Wideband Radio Communication Tester	MT8000A	Anritsu Corp.	6262302511	05/18/2023	Annual
SIGNAL GENERATOR (100 kHz~40 GHz)	SMB100A	REOHDE & SCHWARZ	177633	07/05/2022	Annual
Signal Analyzer(5 Hz~40.0 GHz)	N9030B	KEYSIGHT	MY55480167	05/30/2023	Annual
4-Way Divider	ZC4PD-K1844+	Mini-Circuits	942907	09/27/2022	Annual
FCC LTE Mobile Conducted RF Automation Test Software	-	HCT CO., LTD.,	-	-	-

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)	2.00 (Confidence level about 95 %, *k*=2)
Radiated Disturbance (9 kHz ~ 30 MHz)	4.40 (Confidence level about 95 %, *k*=2)
Radiated Disturbance (30 MHz ~ 1 GHz)	5.74 (Confidence level about 95 %, *k*=2)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.51 (Confidence level about 95 %, *k*=2)
Radiated Disturbance (18 GHz ~ 40 GHz)	5.92 (Confidence level about 95 %, *k*=2)
Radiated Disturbance (Above 40 GHz)	5.48 (Confidence level about 95 %, *k*=2)

6. SUMMARY OF TEST RESULTS

6.1 Test Condition : Conducted Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Occupied Bandwidth	§2.1049	N/A	PASS
Band Edge / Spurious and Harmonic Emissions at Antenna Terminal.	§2.1051, §96.41(e)	■ -13 dBm/Mhz at frequencies within 0-10MHz of channel edge ■ -25 dBm/MHz at frequencies greater than 10MHz above and below channel edge ■ -40 dBm/MHz at frequencies below 3530 MHz and above 3720 MHz	PASS
Adjacent Channel Leakage Ratio	§96.41(e)	At least 30 dB.	PASS
Conducted Output Power	§2.1046	N/A	See Note1
Peak- to- Average Ratio	§96.41(g)	< 13 dB	PASS
Frequency stability / variation of ambient temperature	§2.1055,	Emission must remain in band	PASS

Note:

1. See SAR Report

2. 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	§96.41(b)	23 dBm/10MHz	PASS
Radiated Spurious and Harmonic Emissions	§2.1053, §96.41(e)	-40 dBm/MHz	PASS

Note:

1. Radiateded 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
55990	2595.0	-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)

QPSK Modulation

Emission Designator = 4M48G7D

LTE BW = 4.48 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

QAM Modulation

Emission Designator = 4M48W7D

LTE BW = 4.48 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

8. TEST DATA

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	EIRP	Limit
								dBm/10MHz	
3560.01	Sub6 n48/ 20 MHz [30 kHz]	PI/2 BPSK	-24.21	12.19	11.74	2.77	H	21.16	23.0
		QPSK	-24.22	12.18	11.74	2.77	H	21.15	
		16-QAM	-25.14	11.26	11.74	2.77	H	20.23	
		64-QAM	-27.12	9.28	11.74	2.77	H	18.25	
		256-QAM	-28.75	7.65	11.74	2.77	H	16.62	
3624.99		PI/2 BPSK	-23.58	12.88	11.85	2.78	H	21.95	
		QPSK	-23.62	12.84	11.85	2.78	H	21.91	
		16-QAM	-24.54	11.92	11.85	2.78	H	20.99	
		64-QAM	-26.61	9.85	11.85	2.78	H	18.92	
		256-QAM	-28.12	8.34	11.85	2.78	H	17.41	
3690.00		PI/2 BPSK	-23.99	12.58	11.72	2.82	H	21.48	
		QPSK	-24.07	12.50	11.72	2.82	H	21.40	
		16-QAM	-24.89	11.68	11.72	2.82	H	20.58	
		64-QAM	-27.02	9.55	11.72	2.82	H	18.45	
		256-QAM	-28.62	7.95	11.72	2.82	H	16.85	

Freq (MHz)	Mod/ Bandwidth [SCS (kHz)]	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	EIRP	Limit
								dBm/10MHz	
3570.00	Sub6 n48/ 40 MHz [30 kHz]	PI/2 BPSK	-24.13	12.20	11.78	2.77	H	21.21	23.0
		QPSK	-24.14	12.19	11.78	2.77	H	21.20	
		16-QAM	-24.92	11.41	11.78	2.77	H	20.42	
		64-QAM	-27.02	9.31	11.78	2.77	H	18.32	
		256-QAM	-28.61	7.72	11.78	2.77	H	16.73	
3624.99		PI/2 BPSK	-23.68	12.78	11.85	2.78	H	21.85	
		QPSK	-23.69	12.77	11.85	2.78	H	21.84	
		16-QAM	-24.67	11.79	11.85	2.78	H	20.86	
		64-QAM	-26.57	9.89	11.85	2.78	H	18.96	
		256-QAM	-28.22	8.24	11.85	2.78	H	17.31	
3679.98		PI/2 BPSK	-23.72	13.00	11.74	2.81	H	21.93	
		QPSK	-23.75	12.97	11.74	2.81	H	21.90	
		16-QAM	-24.68	12.04	11.74	2.81	H	20.97	
		64-QAM	-26.73	9.99	11.74	2.81	H	18.92	
		256-QAM	-28.32	8.40	11.74	2.81	H	17.33	

8.2 RADIATED SPURIOUS EMISSIONS

- NR Band: N48
- Bandwidth: 20 MHz
- Modulation: PI/2 BPSK
- Distance: 1 meters
- SCS: 30 kHz

Freq (MHz)	Measured Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit (dBm)
637334 (3560.01)	7 120.02	-62.18	10.92	-54.52	4.01	V	-47.61	-40.00
	10 680.03	-61.75	11.70	-51.02	5.02	V	-44.34	-40.00
	14 240.04	-59.20	13.08	-52.16	5.83	V	-44.91	-40.00
641666 (3624.99)	7 249.98	-61.18	10.50	-53.56	4.07	V	-47.13	-40.00
	10 874.97	-63.12	11.85	-52.47	5.11	V	-45.73	-40.00
	14 499.96	-59.10	13.40	-52.43	5.90	V	-44.93	-40.00
646000 (3690.00)	7 380.00	-62.14	11.08	-54.97	4.07	V	-47.96	-40.00
	11 070.00	-62.69	12.24	-52.15	5.13	V	-45.04	-40.00
	14 760.00	-60.06	13.72	-54.55	5.89	V	-46.72	-40.00

▣ NR Band: N48

▣ Bandwidth: 40 MHz

▣ Modulation: PI/2 BPSK

▣ Distance: 1 meters

▣ SCS: 30 kHz

Freq (MHz)	Measured Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit (dBm)
638000 (3570.00)	7 140.00	-62.15	10.84	-54.75	4.03	H	-47.94	-40.00
	10 710.00	-62.46	11.70	-51.51	4.92	H	-44.73	-40.00
	14 280.00	-59.35	13.16	-51.92	5.75	H	-44.51	-40.00
641666 (3624.99)	7 249.98	-62.46	10.50	-54.84	4.07	H	-48.41	-40.00
	10 874.97	-62.49	11.85	-51.84	5.11	H	-45.10	-40.00
	14 499.96	-60.26	13.40	-53.59	5.90	H	-46.09	-40.00
645332 (3679.98)	7 359.96	-60.64	10.96	-53.10	4.09	H	-46.23	-40.00
	11 039.94	-62.67	12.20	-51.46	5.04	H	-44.30	-40.00
	14 719.92	-59.59	13.58	-53.43	6.02	H	-45.87	-40.00

8.3 PEAK-TO-AVERAGE RATIO

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (dB)
Sub6 n48	20 MHz	3624.99	BPSK	50	0	4.48
			QPSK			5.27
			16-QAM			6.22
			64-QAM			6.69
			256-QAM			6.71
	40 MHz		BPSK	100		4.18
			QPSK			5.40
			16-QAM			6.12
			64-QAM			6.60
			256-QAM			6.53

Note:

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 49 ~ 58.

8.4 OCCUPIED BANDWIDTH

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
Sub6 n48	20 MHz	3624.99	BPSK	50	0	17.969
			QPSK			17.932
			16-QAM			17.830
			64-QAM			17.953
			256-QAM			17.963
	40 MHz		BPSK	100		35.879
			QPSK			35.921
			16-QAM			35.882
			64-QAM			35.907
			256-QAM			35.775

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 39 ~ 48.

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 n48	20	3560.01	8.0000	31.715	-77.445	-45.730	-40.00
		3624.99	9.7164	31.715	-78.175	-46.460	
		3690.00	7.1855	31.715	-78.160	-46.445	
	40	3570.00	3.7712	31.103	-77.571	-46.468	
		3624.99	6.0693	31.715	-77.091	-45.376	
		3679.98	8.0140	31.715	-78.108	-46.393	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 87 ~ 98.
2. Factor(dB) = Cable Loss + Ext. Attenuator + Power Splitter
   - Result(dBm) = Reading + Factor
3. Factor(dB)

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	33.255

8.6 CHANNEL EDGE

BW (MHz)	RB (Size/ Offset)	Freq. (MHz)	Outside of the authorized band (dBm)							
			Lower Side(MHz)				Upper Side(MHz)			
			Below 3530 MHz	-[B]MHz ~ 3530 MHz	-1 MHz ~ -[B]MHz	0 MHz ~ -1 MHz	0 MHz ~ +1 MHz	1 MHz ~ +[B]MHz	+[B]MHz ~ 3720 MHz	Above 3720 MHz
20	50/0	3560.01	-53.41	-42.71	-39.62	-38.02	-45.14	-42.31	-51.45	—
		3624.99	—	-52.99	-42.07	-38.05	-48.16	-48.83	-51.97	—
		3690.00	—	-52.09	-43.45	-39.17	-48.02	-49.91	-50.13	-50.38
40	100/0	3570.00	-51.15	-49.05	-45.76	-45.38	-50.34	-50.82	-52.50	—
		3624.99	—	-53.49	-43.32	-40.30	-53.29	-51.25	-51.11	—
		3679.98	—	-51.47	-50.48	-47.60	-53.77	-50.89	-49.71	-50.46
Limit (dBm)			-40.00	-25.00	-13.00	-13.00	-13.00	-13.00	-25.00	-40.00

Note:

1. C.E = Channel Edge
2. Plots of the EUT's Channel Edge are shown Page 65 ~ 86
3. Duty Cycle factor already applied on the factor.
   - Duty Cycle Factor(dB) = 6.99
   - Factor(dB) = Duty Cycle factor + Cable Loss + Ext. Attenuator + Power Splitter
   - Result(dBm) = Reading + Factor

BW (MHz)	RB (Size/ Offset)	Freq. (MHz)	**Outside of the authorized band (dBm)**							
			Lower Side(MHz)				Upper Side(MHz)			
			Below 3530 MHz	-[B]MHz ~ 3530 MHz	-1 MHz ~ -[B]MHz	0 MHz ~ -1 MHz	0 MHz ~ +1 MHz	1 MHz ~ +[B]MHz	+[B]MHz ~ 3720 MHz	Above 3720 MHz
20	Lower Side: 1/0 Upper Side: 1/50	3560.01	-52.06	-47.63	-30.51	-26.14	-28.17	-31.37	-51.31	—
		3624.99	—	-51.77	-30.41	-26.77	-28.64	-32.03	-51.86	—
		3690.00	—	-52.03	-32.66	-29.33	-27.86	-32.37	-50.52	-50.29
40	Lower Side: 1/0 Upper Side: 1/105	3570.00	-52.91	-49.48	-33.36	-29.81	-31.54	-33.46	-52.51	—
		3624.99	—	-53.38	-33.07	-29.53	-31.97	-34.39	-51.08	—
		3679.98	—	-51.50	-33.34	-30.80	-32.63	-34.76	-50.53	-50.38
Limit (dBm)			-40.00	-25.00	-13.00	-13.00	-13.00	-13.00	-25.00	-40.00

Note:

1. C.E = Channel Edge

2. Plots of the EUT's Channel Edge are shown Page 65 ~ 86

3. Duty Cycle factor already applied on the factor.

- Duty Cycle Factor(dB) = 6.99
- Factor(dB) = Duty Cycle factor + Cable Loss + Ext. Attenuator
- Result(dBm) = Reading + Factor

8.7 Adjacent Channel Leakage Ratio(ACLR)

Band Width	RB (Size/ Offset)	Frequency (MHz)	Adjacent Channel Leakage Ratio(dB)	
			Lower Side	Upper Side
20 MHz	50/0	3560.01	49.05	51.66
		3624.99	50.61	56.22
		3690.00	51.12	55.54
40 MHz	100/0	3570.00	37.20	48.16
		3624.99	39.77	55.17
		3679.98	38.43	46.92
Limit (dB)			ACLR > 30dB	ACLR > 30dB

Note:

1. Duty Cycle factor already applied on the factor.
   - Factor(dB) = Duty Cycle factor + Cable Loss + Ext. Attenuator
   - Result(dBm) = Reading + Factor
   - Duty Cycle Factor(dB) = 6.990
2. Plots of the EUT's Adjacent Channel Leakage Ratio(ACLR) are shown Page 59 ~ 64.

8.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

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

Test. Frequncy (MHz)	Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
3560.010	100%	+20(Ref)	3560 010 008	0.0	0.000 000	0.000
	100%	-30	3560 010 021	12.7	0.000 000	0.004
	100%	-20	3560 010 020	12.0	0.000 000	0.003
	100%	-10	3560 010 015	6.2	0.000 000	0.002
	100%	0	3560 010 019	10.1	0.000 000	0.003
	100%	+10	3560 010 012	3.3	0.000 000	0.001
	100%	+30	3560 010 018	10.1	0.000 000	0.003
	100%	+40	3560 010 016	7.5	0.000 000	0.002
	100%	+50	3560 010 021	12.2	0.000 000	0.003
	Batt. Endpoint	+20	3560 010 012	4.1	0.000 000	0.001
3690.000	100%	+20(Ref)	3690 000 011	0.0	0.000 000	0.000
	100%	-30	3690 000 027	15.7	0.000 000	0.004
	100%	-20	3690 000 018	6.7	0.000 000	0.002
	100%	-10	3690 000 016	4.4	0.000 000	0.001
	100%	0	3690 000 017	5.6	0.000 000	0.002
	100%	+10	3690 000 026	14.8	0.000 000	0.004
	100%	+30	3690 000 022	10.2	0.000 000	0.003
	100%	+40	3690 000 027	15.5	0.000 000	0.004
	100%	+50	3690 000 016	4.5	0.000 000	0.001
	Batt. Endpoint	+20	3690 000 018	6.6	0.000 000	0.002

▣ BandWidth: 40 MHz

▣ Voltage(100%): 3.880 VDC

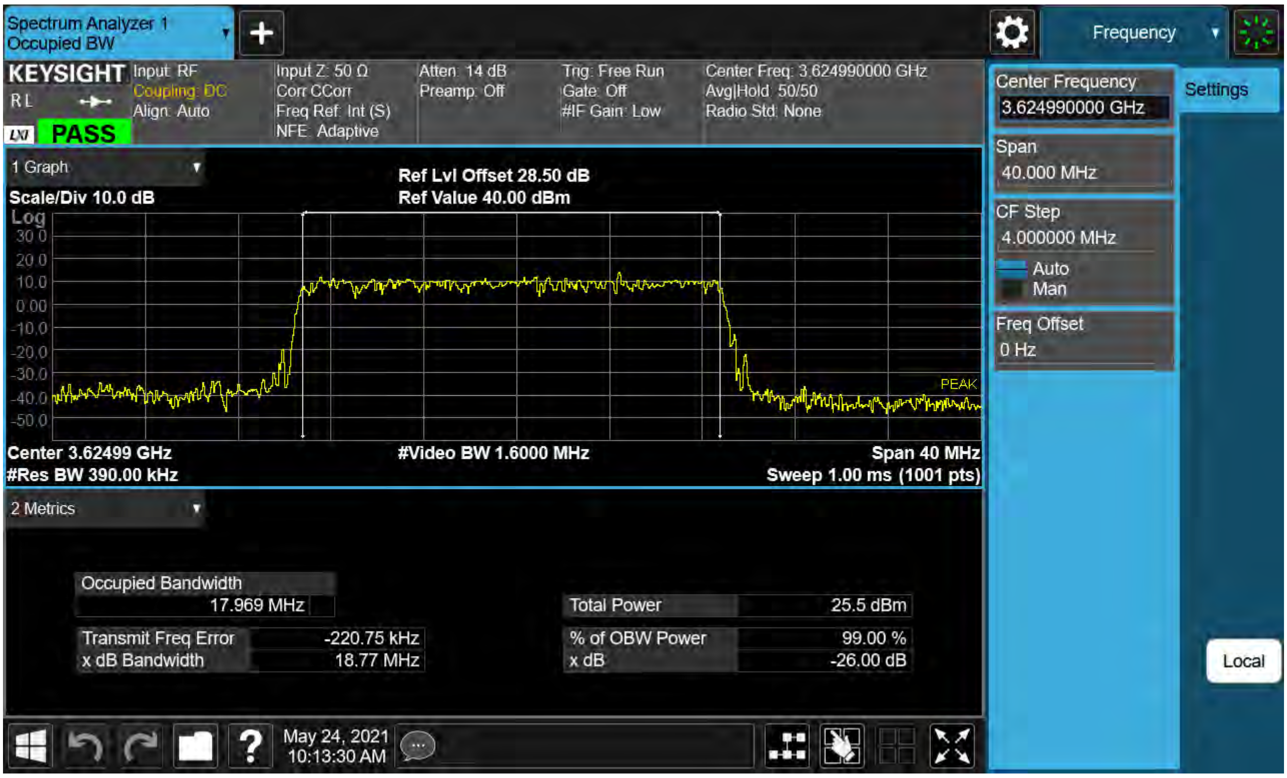
▣ Batt. Endpoint: 3.650 VDC

▣ LIMIT: Emission must remain in band

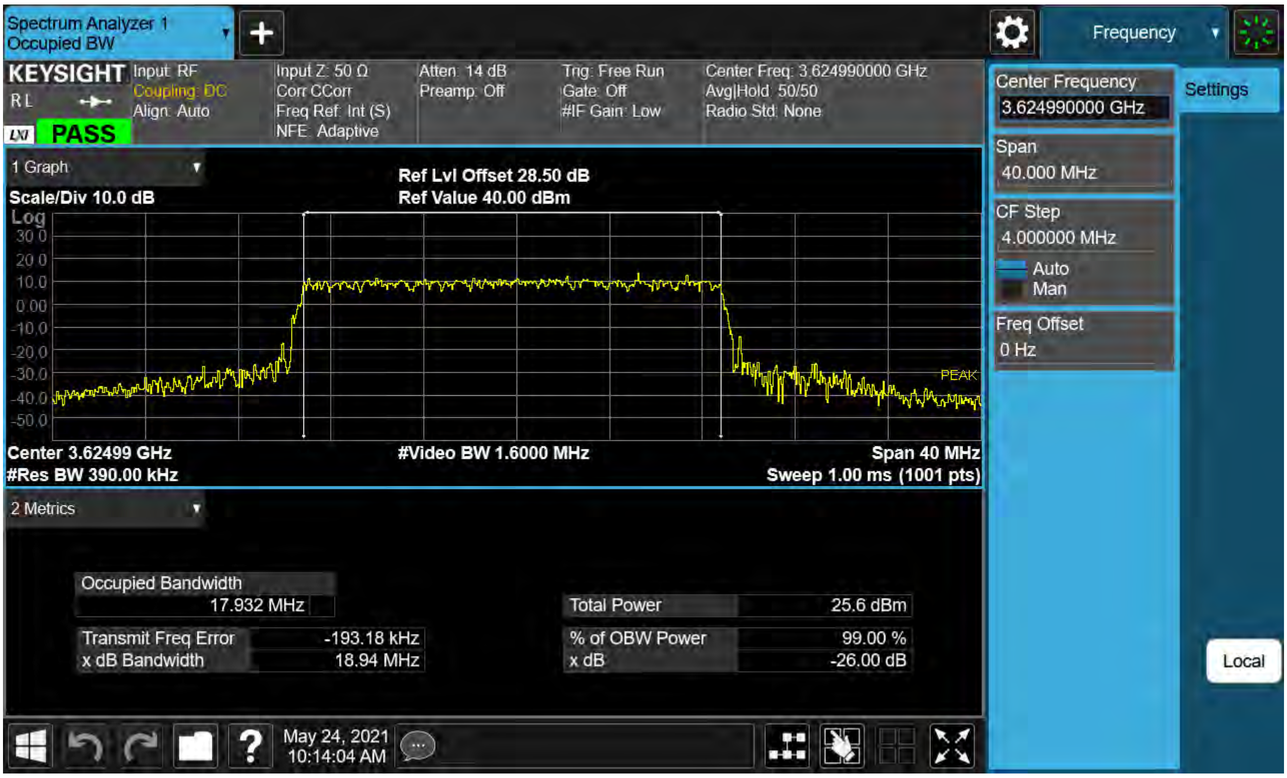
Test. Frequncy (MHz)	Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
3570.000	100%	+20(Ref)	3570 000 009	0.0	0.000 000	0.000
	100%	-30	3570 000 022	12.9	0.000 000	0.004
	100%	-20	3570 000 019	10.9	0.000 000	0.003
	100%	-10	3570 000 015	6.1	0.000 000	0.002
	100%	0	3570 000 016	7.4	0.000 000	0.002
	100%	+10	3570 000 014	5.5	0.000 000	0.002
	100%	+30	3570 000 021	12.7	0.000 000	0.004
	100%	+40	3570 000 023	14.1	0.000 000	0.004
	100%	+50	3570 000 013	4.4	0.000 000	0.001
	Batt. Endpoint	+20	3570 000 013	4.6	0.000 000	0.001
3679.980	100%	+20(Ref)	3679 980 009	0.0	0.000 000	0.000
	100%	-30	3679 980 017	7.5	0.000 000	0.002
	100%	-20	3679 980 021	12.0	0.000 000	0.003
	100%	-10	3679 980 021	12.1	0.000 000	0.003
	100%	0	3679 980 022	12.9	0.000 000	0.004
	100%	+10	3679 980 025	15.9	0.000 000	0.004
	100%	+30	3679 980 023	13.6	0.000 000	0.004
	100%	+40	3679 980 017	8.0	0.000 000	0.002
	100%	+50	3679 980 014	5.3	0.000 000	0.001
	Batt. Endpoint	+20	3679 980 023	14.1	0.000 000	0.004

9. TEST PLOTS

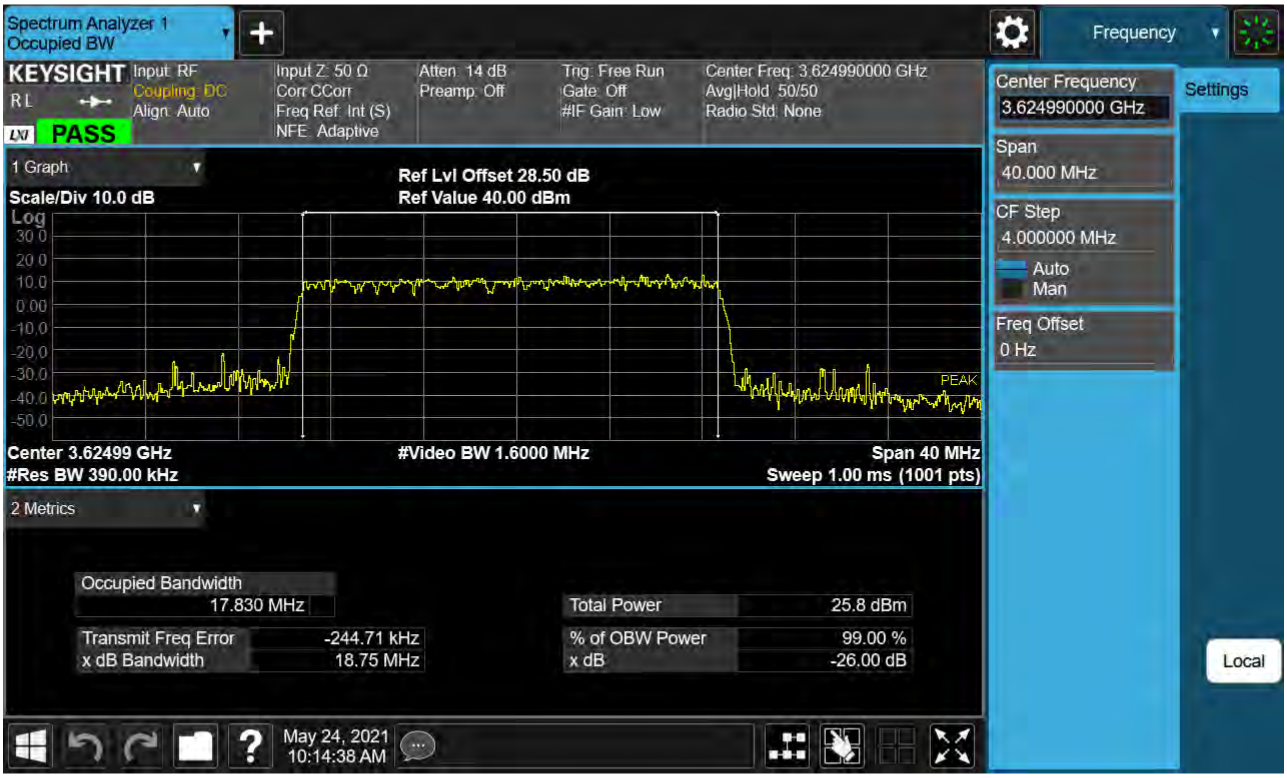
Sub6 n48. Occupied Bandwidth Plot (20 MHz Ch. 641666 BPSK RB 50)



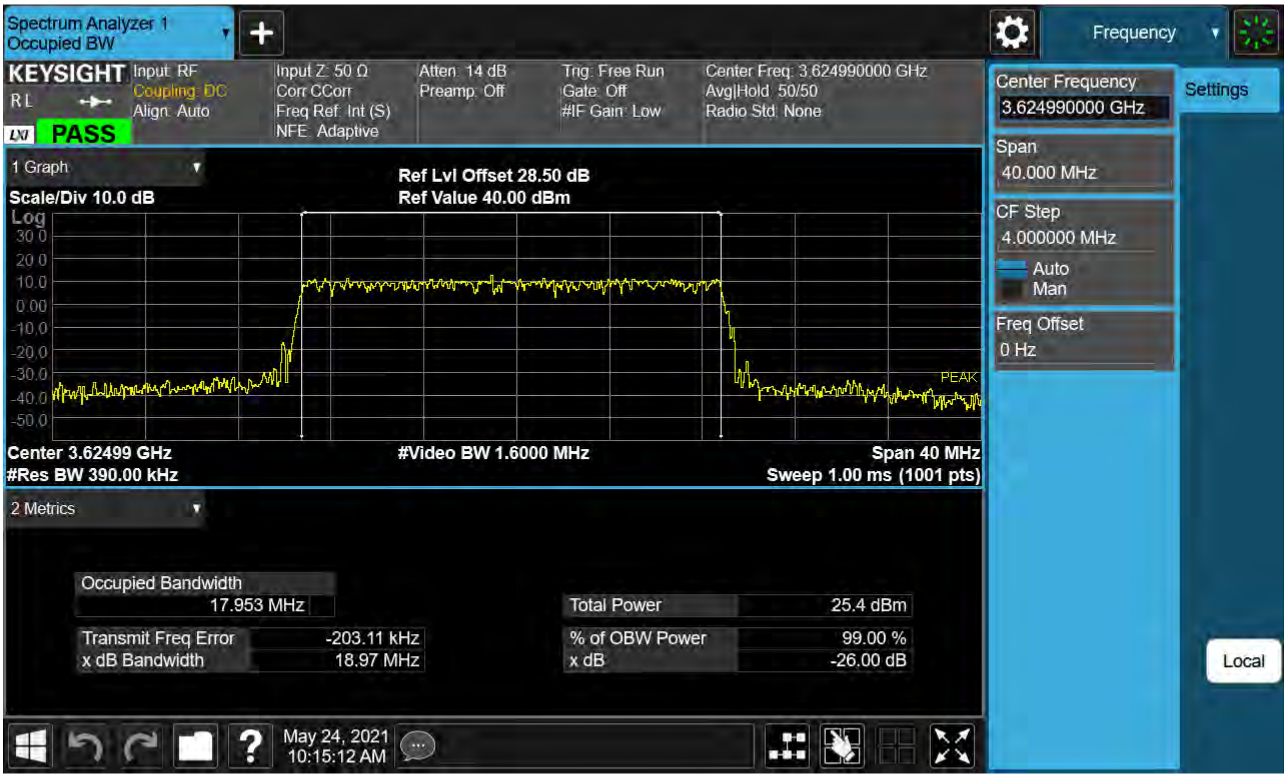
Sub6 n48. Occupied Bandwidth Plot (20 MHz Ch. 641666 QPSK RB 50)



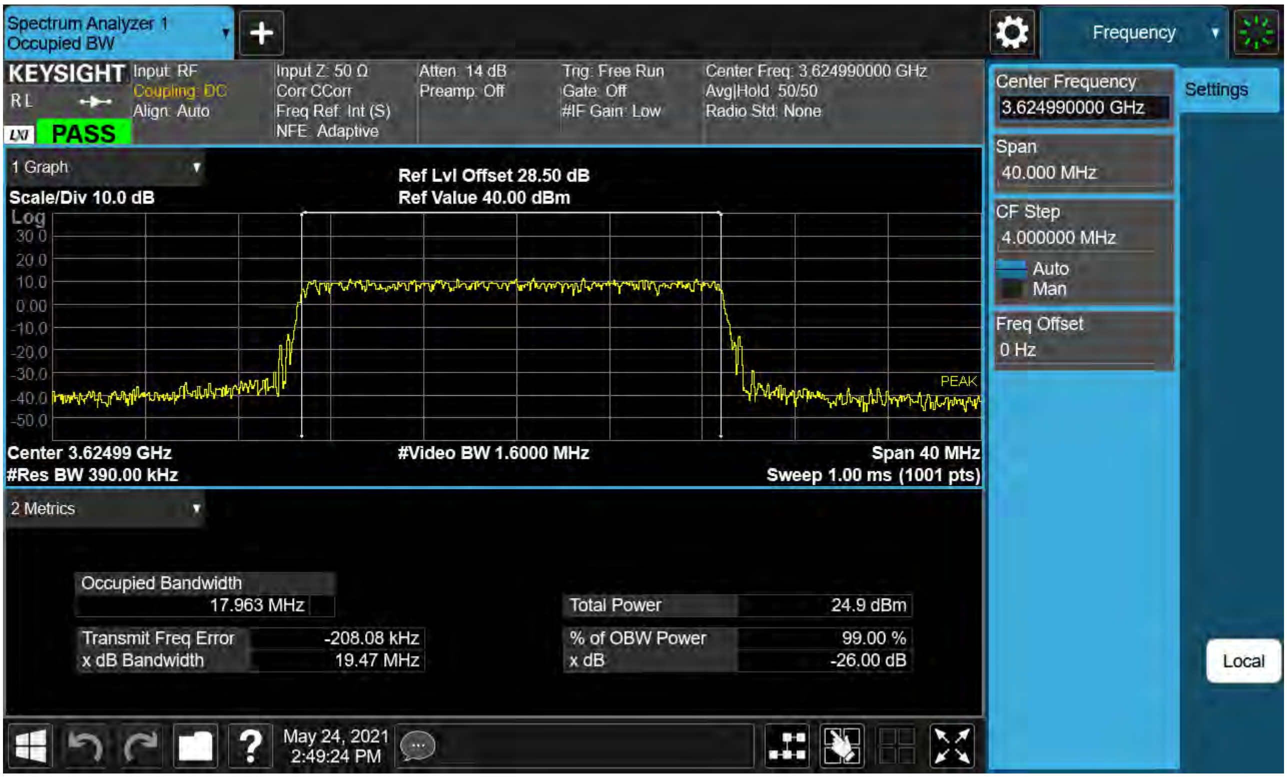
Sub6 n48. Occupied Bandwidth Plot (20 MHz Ch.641666 16-QAM RB 50)



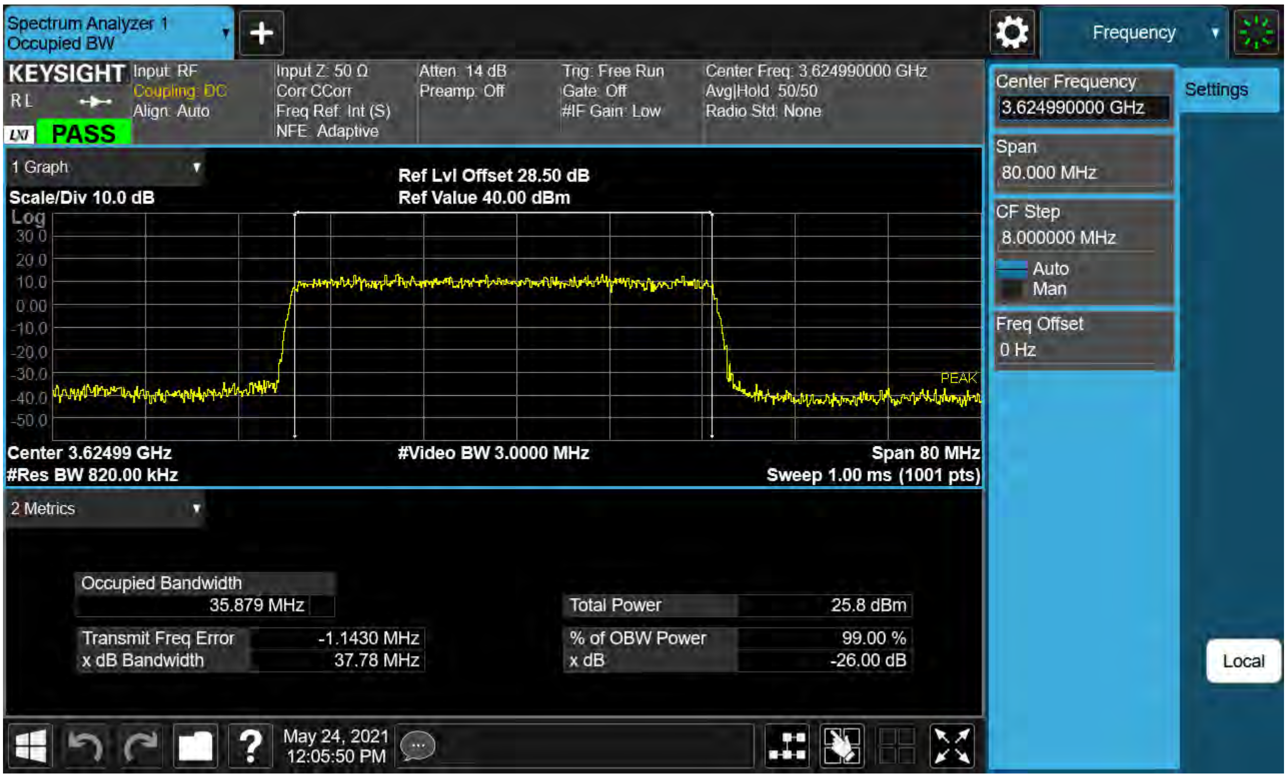
Sub6 n48. Occupied Bandwidth Plot (20 MHz Ch.641666 64-QAM RB 50)



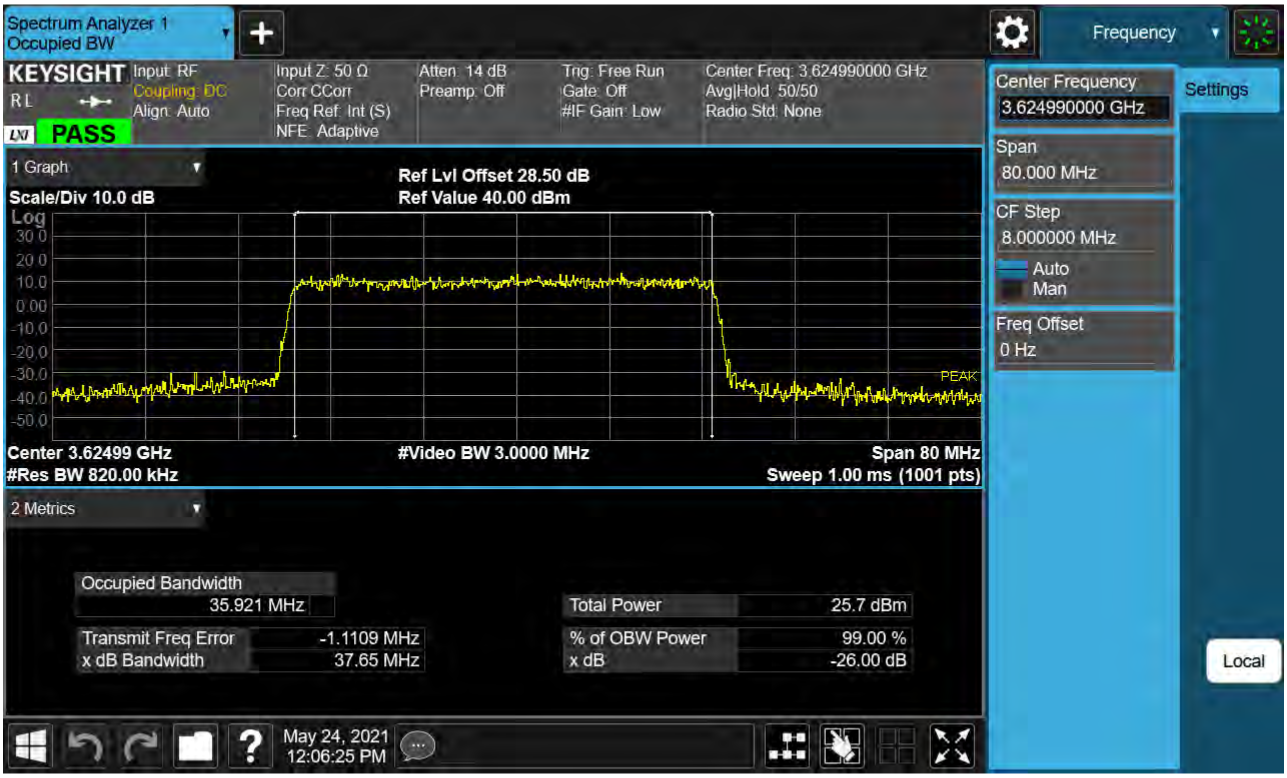
Sub6 n48. Occupied Bandwidth Plot (20 MHz Ch.641666 256-QAM RB 50)



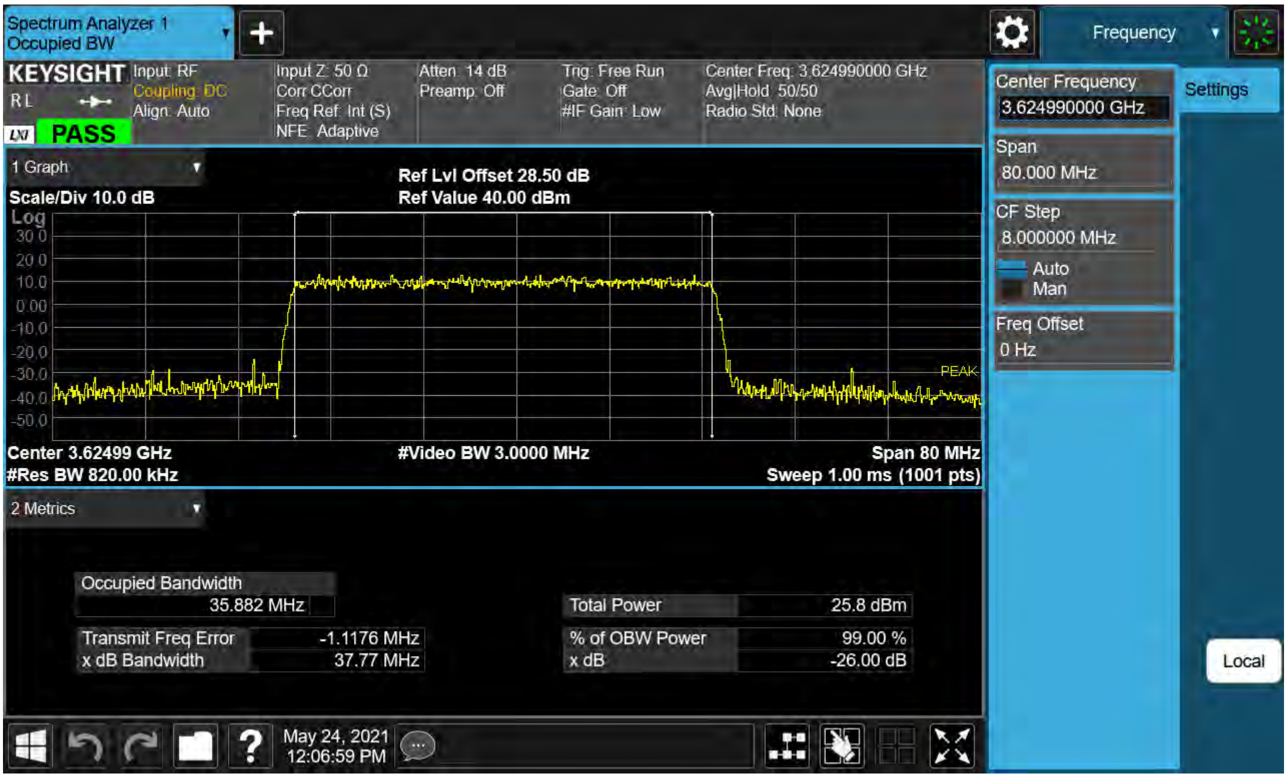
Sub6 n48. Occupied Bandwidth Plot (40 MHz Ch. 641666 BPSK RB 100)



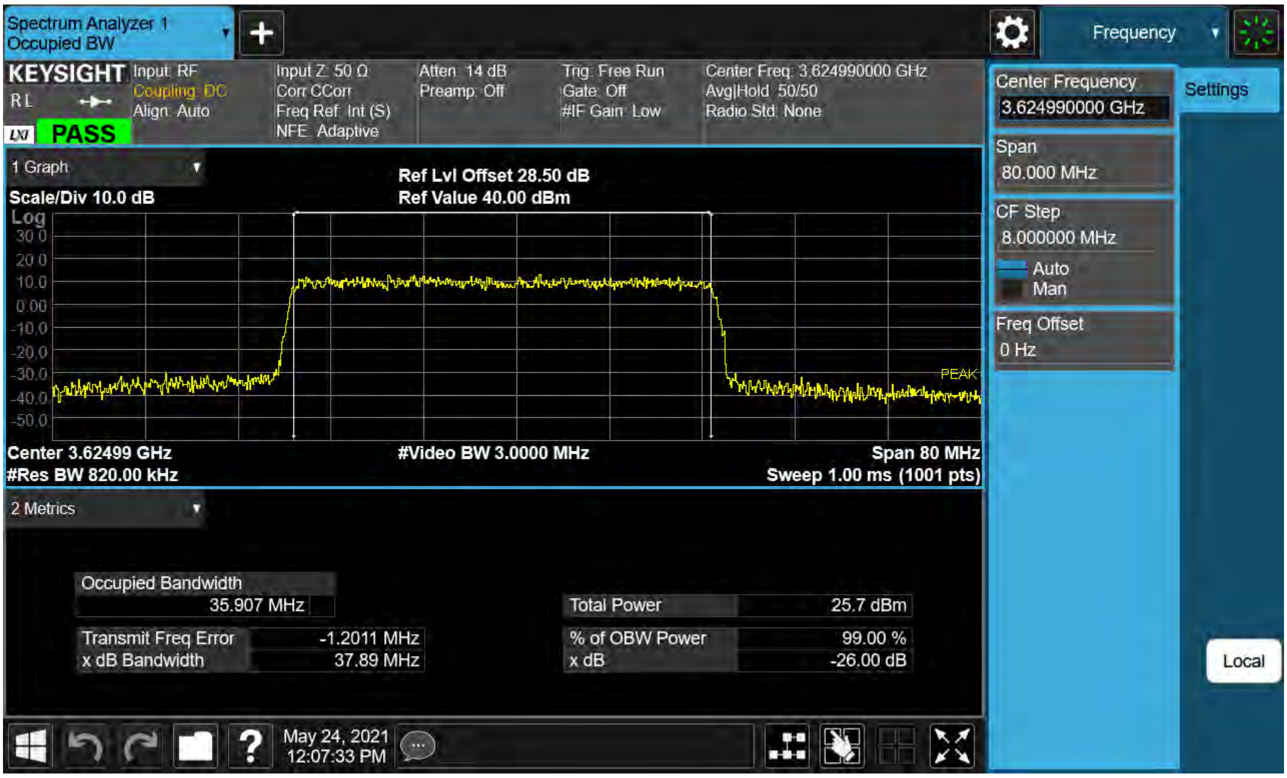
Sub6 n48. Occupied Bandwidth Plot (40 MHz Ch. 641666 QPSK RB 100)



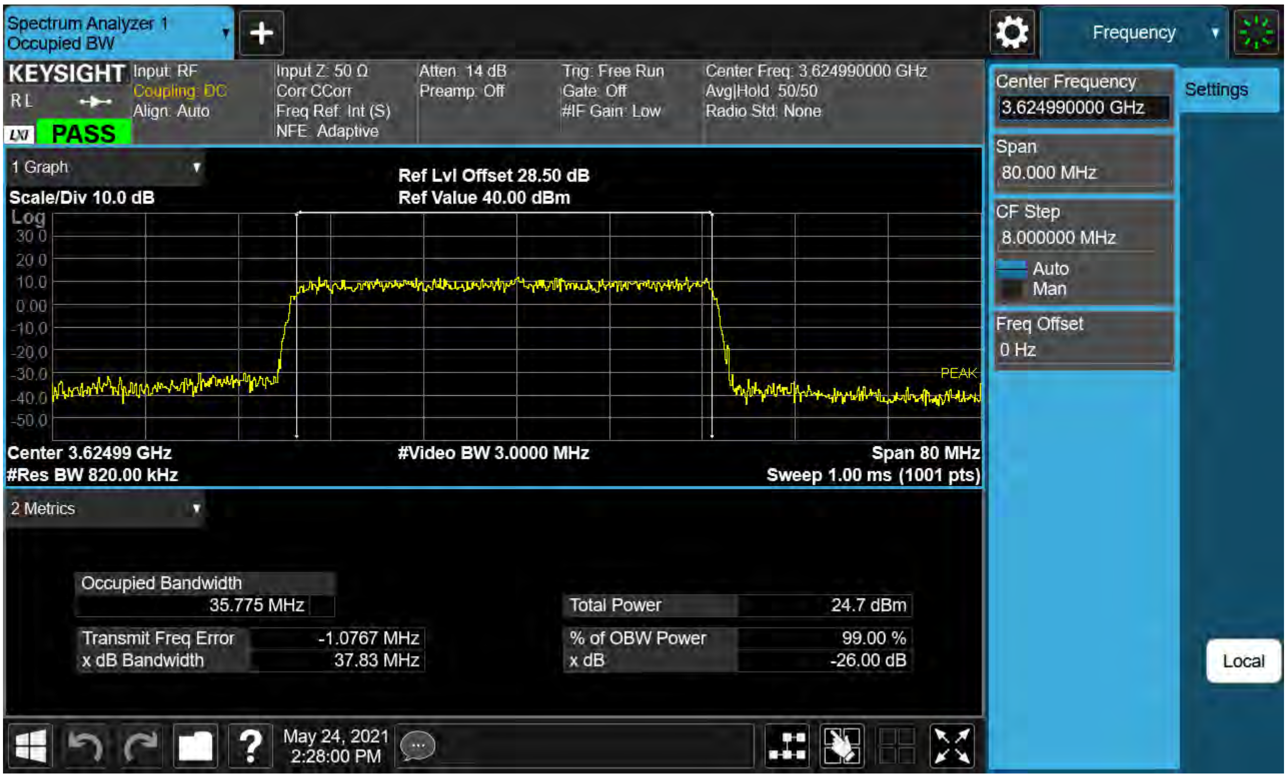
Sub6 n48. Occupied Bandwidth Plot (40 MHz Ch.641666 16-QAM RB 100)



Sub6 n48. Occupied Bandwidth Plot (40 MHz Ch.641666 64-QAM RB 100)



Sub6 n48. Occupied Bandwidth Plot (40 MHz Ch.641666 256-QAM RB 100)



Sub6 n48. PAR Plot (20 MHz Ch. 641666 BPSK RB 50)

Sub6 n48. PAR Plot (20 MHz Ch. 641666 QPSK RB 50)

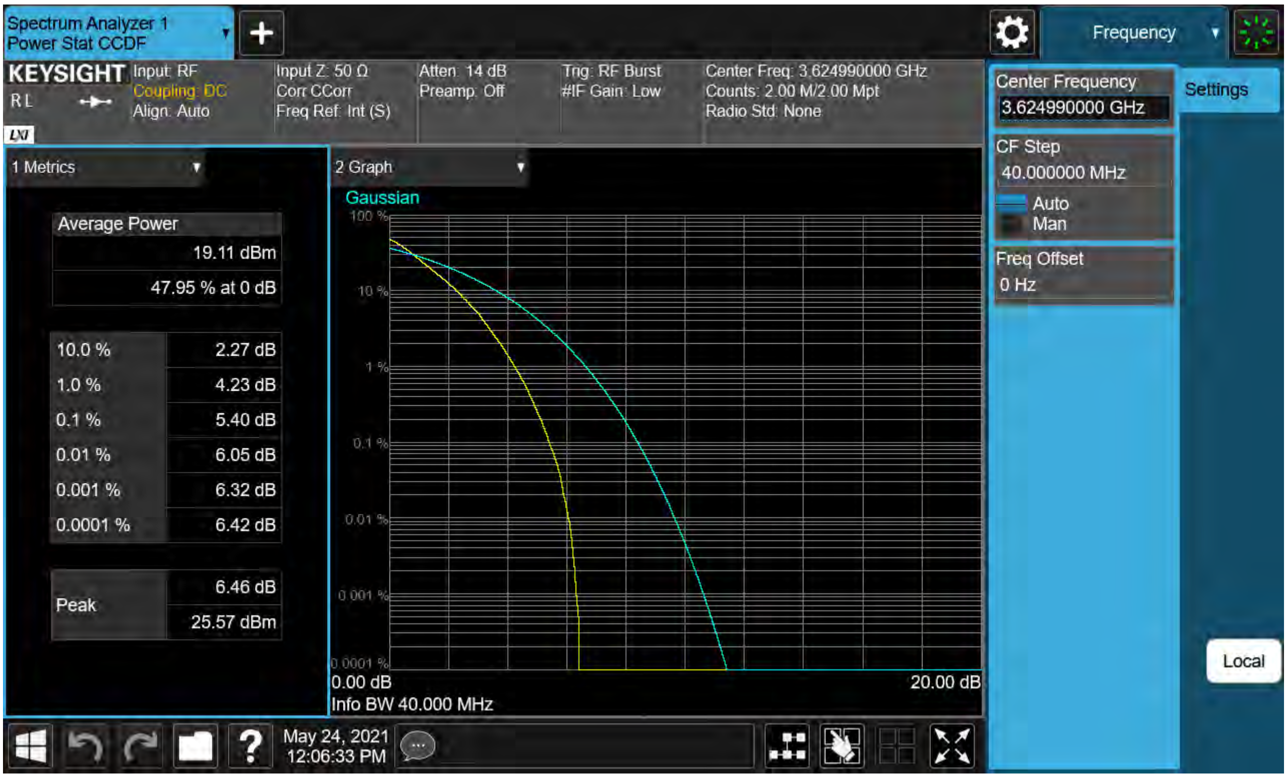
Sub6 n48. PAR Plot (20 MHz Ch.641666 16-QAM RB 50)

Sub6 n48. PAR Plot (20 MHz Ch.641666 64-QAM RB 50)

Sub6 n48. PAR Plot (20 MHz Ch.641666 256-QAM RB 50)

Sub6 n48. PAR Plot (40 MHz Ch. 641666 BPSK RB 100)

Sub6 n48. PAR Plot (40 MHz Ch. 641666 QPSK RB 100)

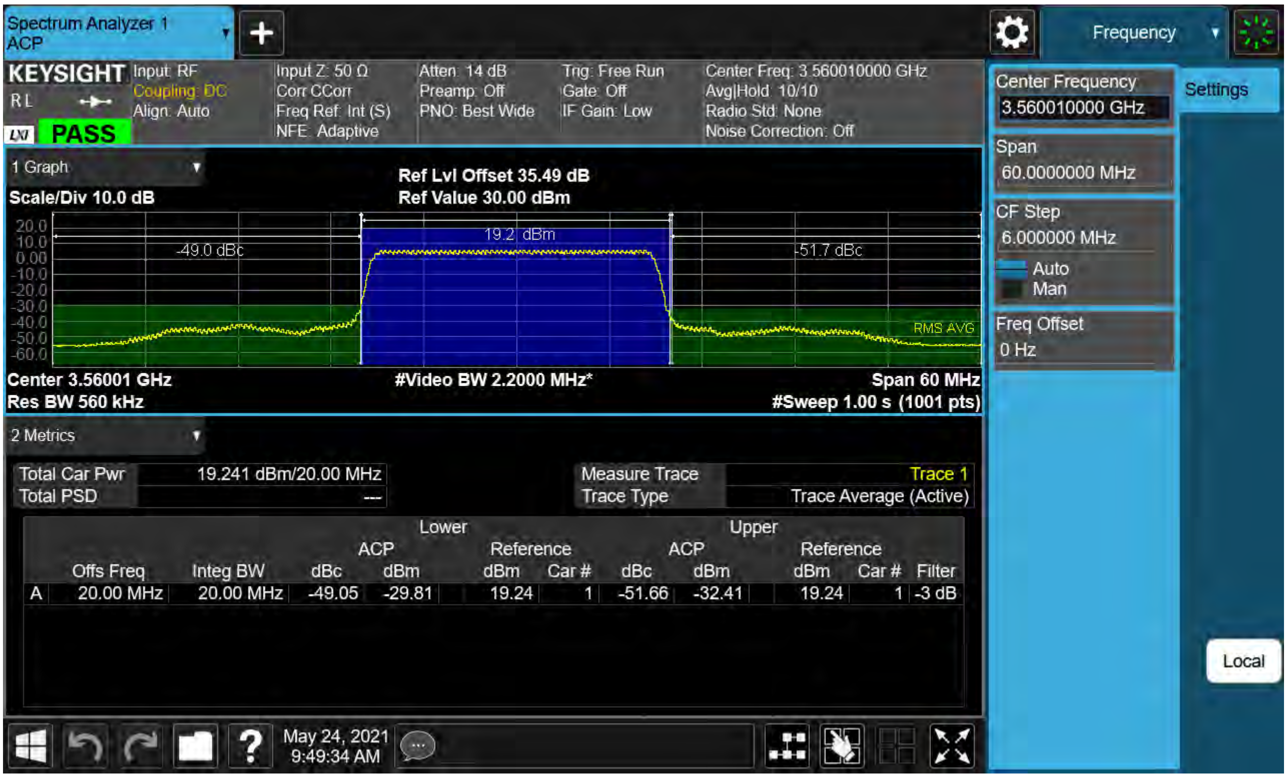


Sub6 n48. PAR Plot (40 MHz Ch.641666 16-QAM RB 100)

Sub6 n48. PAR Plot (40 MHz Ch.641666 64-QAM RB 100)

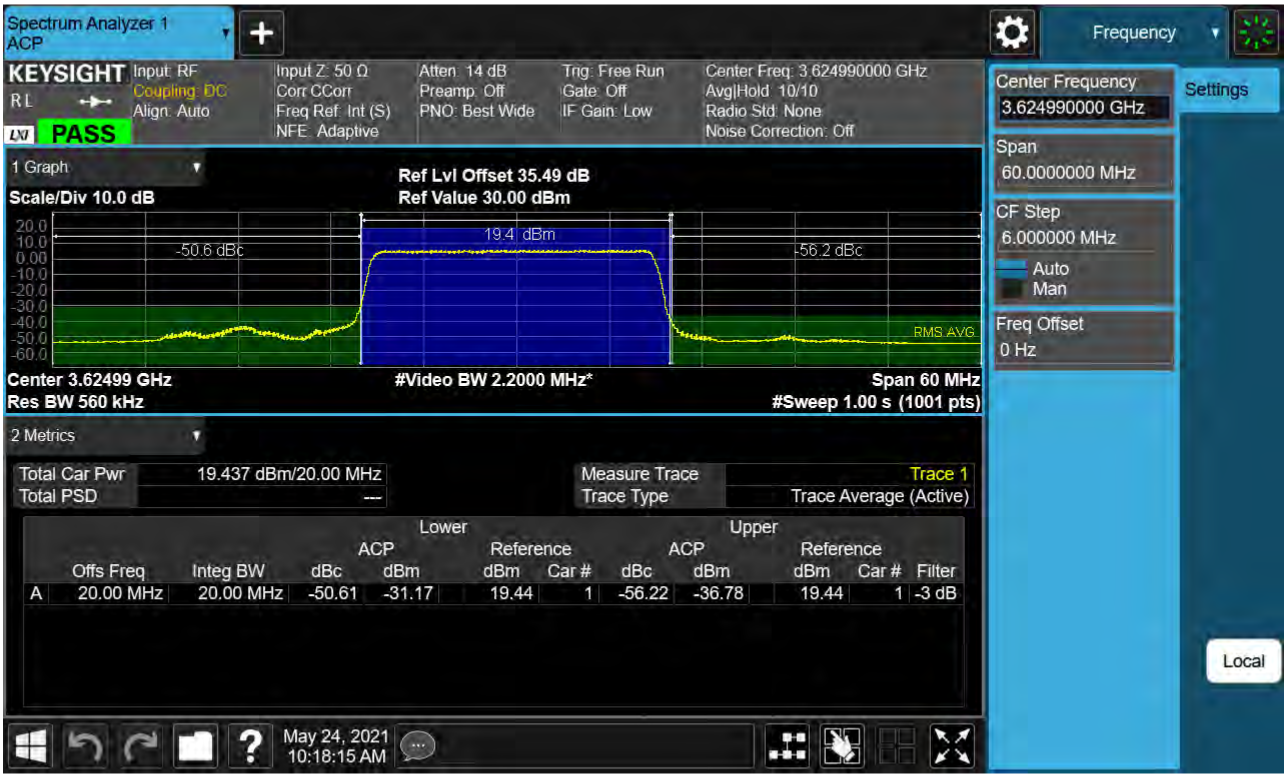
Sub6 n48. PAR Plot (40 MHz Ch.641666 256-QAM RB 100)

Sub6 n48. Adjacent Channel Leakage Ratio(ACLR) Plot (20 MHz Ch.637334 BPSK RB 50, Offset 0)

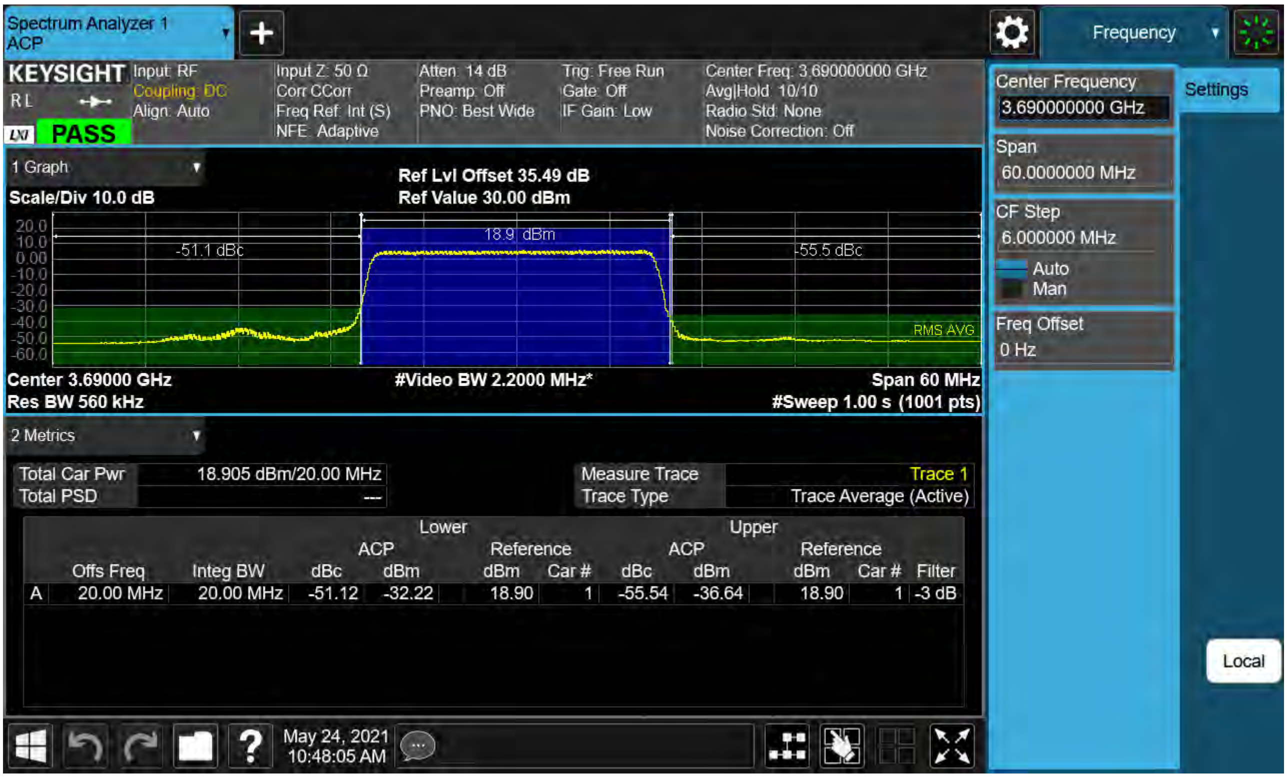


	Offs Freq	Integ BW	Lower ACP dBc	Lower ACP dBm	Lower Reference dBm	Lower Car #	Upper ACP dBc	Upper ACP dBm	Upper Reference dBm	Upper Car #	Filter
A	20.00 MHz	20.00 MHz	-49.05	-29.81	19.24	1	-51.66	-32.41	19.24	1	-3 dB

Sub6 n48. Adjacent Channel Leakage Ratio(ACLR) Plot (20 MHz Ch.641666 BPSK RB 50, Offset 0)

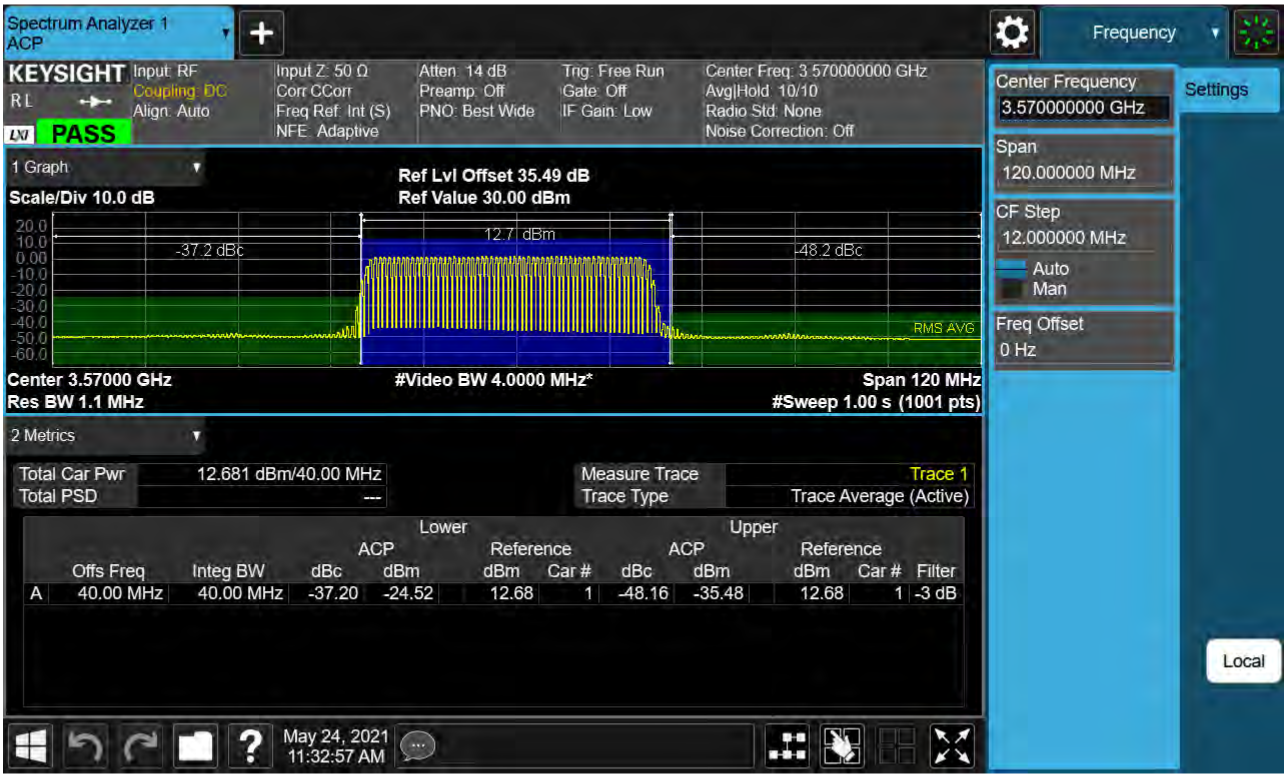


Sub6 n48. Adjacent Channel Leakage Ratio(ACLR) Plot (20 MHz Ch.646000 BPSK RB 50, Offset 0)



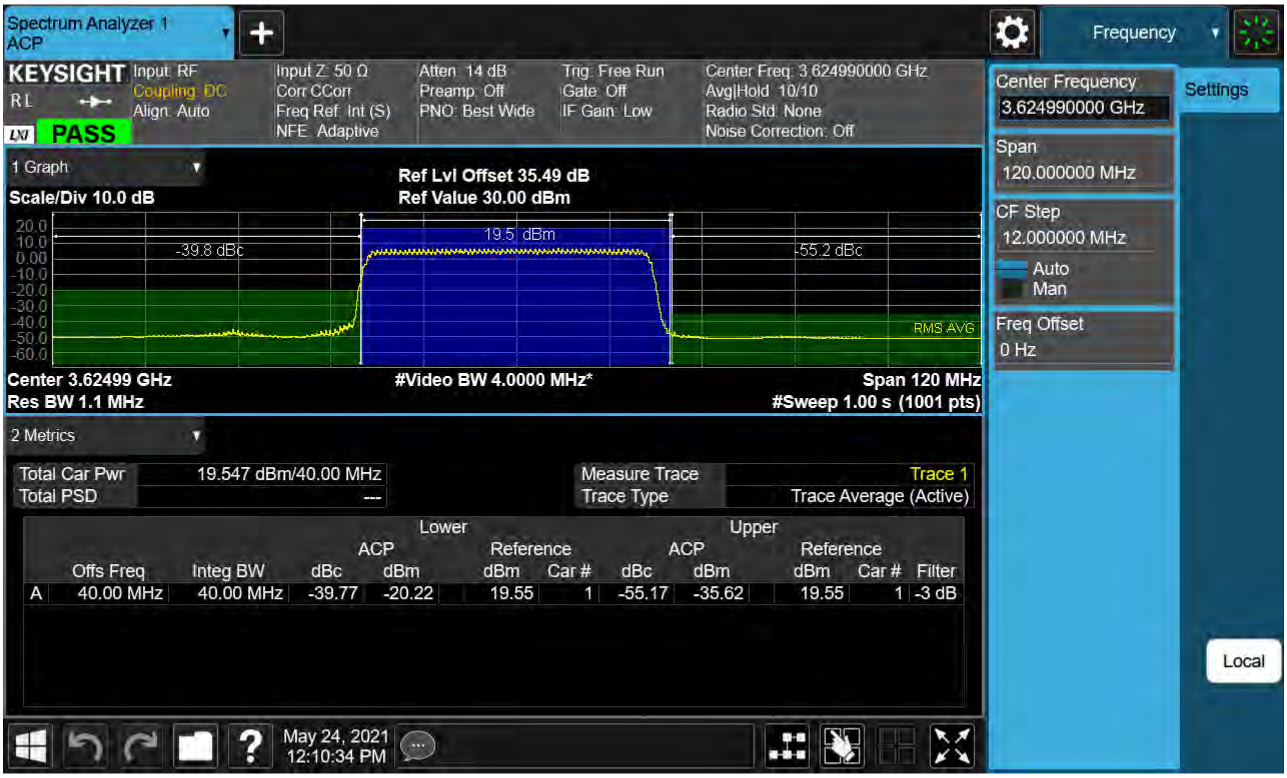
			Lower				Upper				
			ACP		Reference		ACP		Reference		
	Offs Freq	Integ BW	dBc	dBm	dBm	Car #	dBc	dBm	dBm	Car #	Filter
A	20.00 MHz	20.00 MHz	-51.12	-32.22	18.90	1	-55.54	-36.64	18.90	1	-3 dB

Sub6 n48. Adjacent Channel Leakage Ratio(ACLR) Plot (40 MHz Ch.638000 BPSK RB 100, Offset 0)



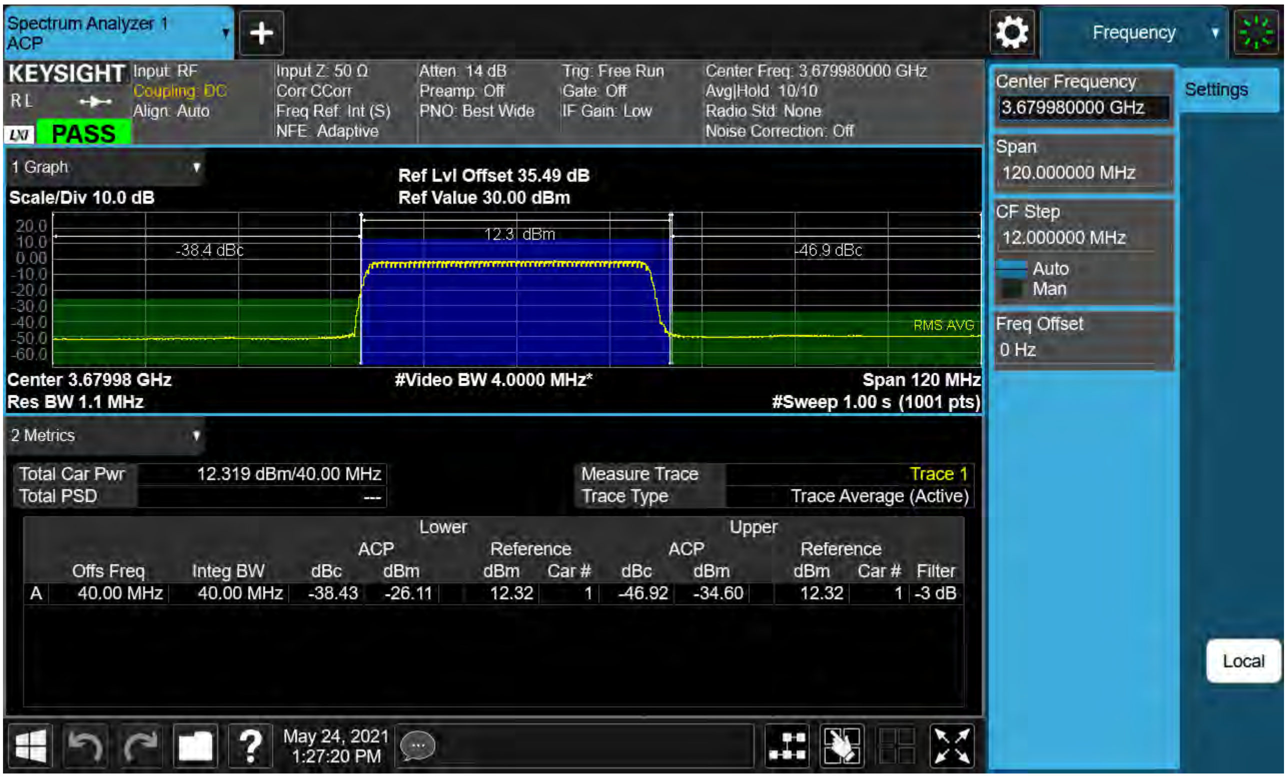
	Offs Freq	Integ BW	Lower ACP dBc	Lower ACP dBm	Lower Reference dBm	Lower Car #	Upper ACP dBc	Upper ACP dBm	Upper Reference dBm	Upper Car #	Filter
A	40.00 MHz	40.00 MHz	-37.20	-24.52	12.68	1	-48.16	-35.48	12.68	1	-3 dB

Sub6 n48. Adjacent Channel Leakage Ratio(ACLR) Plot (40 MHz Ch.641666 BPSK RB 100, Offset 0)



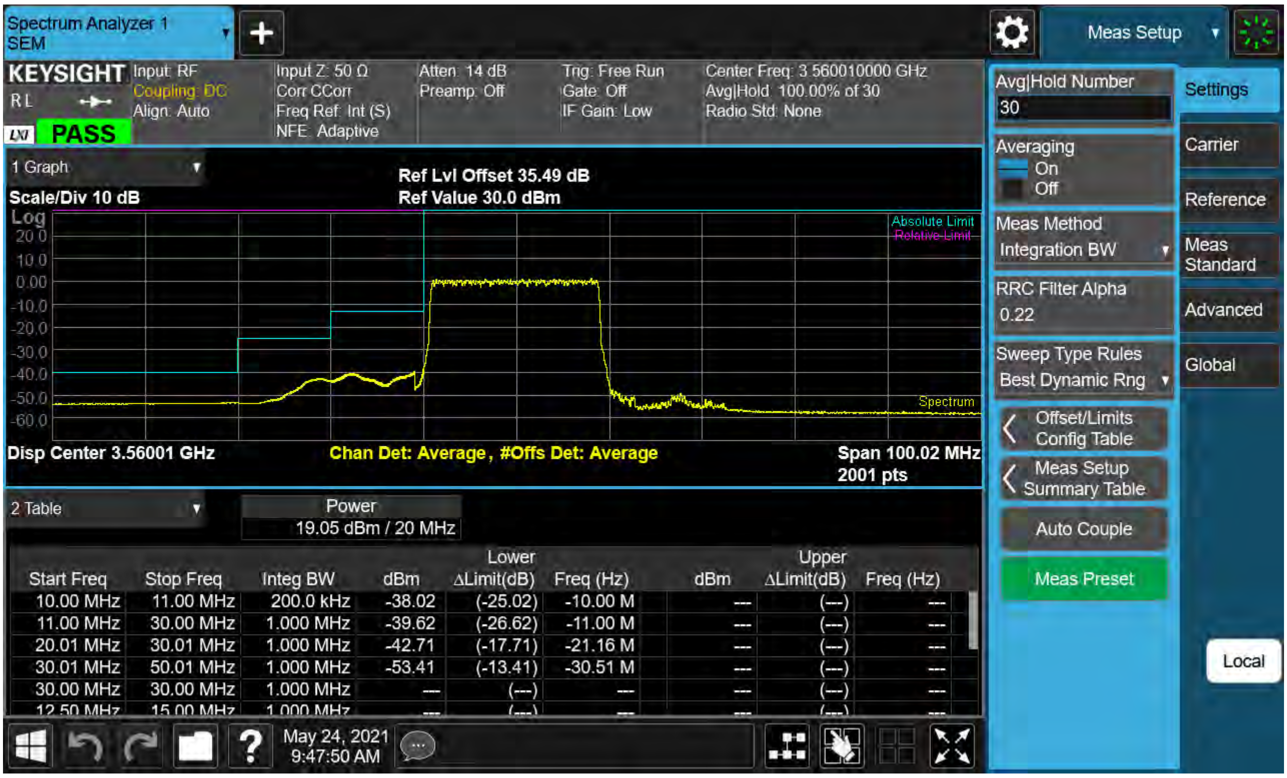
			Lower					Upper				
			ACP		Reference		ACP		Reference		
	Offs Freq	Integ BW	dBc	dBm	dBm	Car #	dBc	dBm	dBm	Car #	Filter
A	40.00 MHz	40.00 MHz	-39.77	-20.22	19.55	1	-55.17	-35.62	19.55	1	-3 dB

Sub6 n48. Adjacent Channel Leakage Ratio(ACLR) Plot (40 MHz Ch.645332 BPSK RB 100, Offset 0)



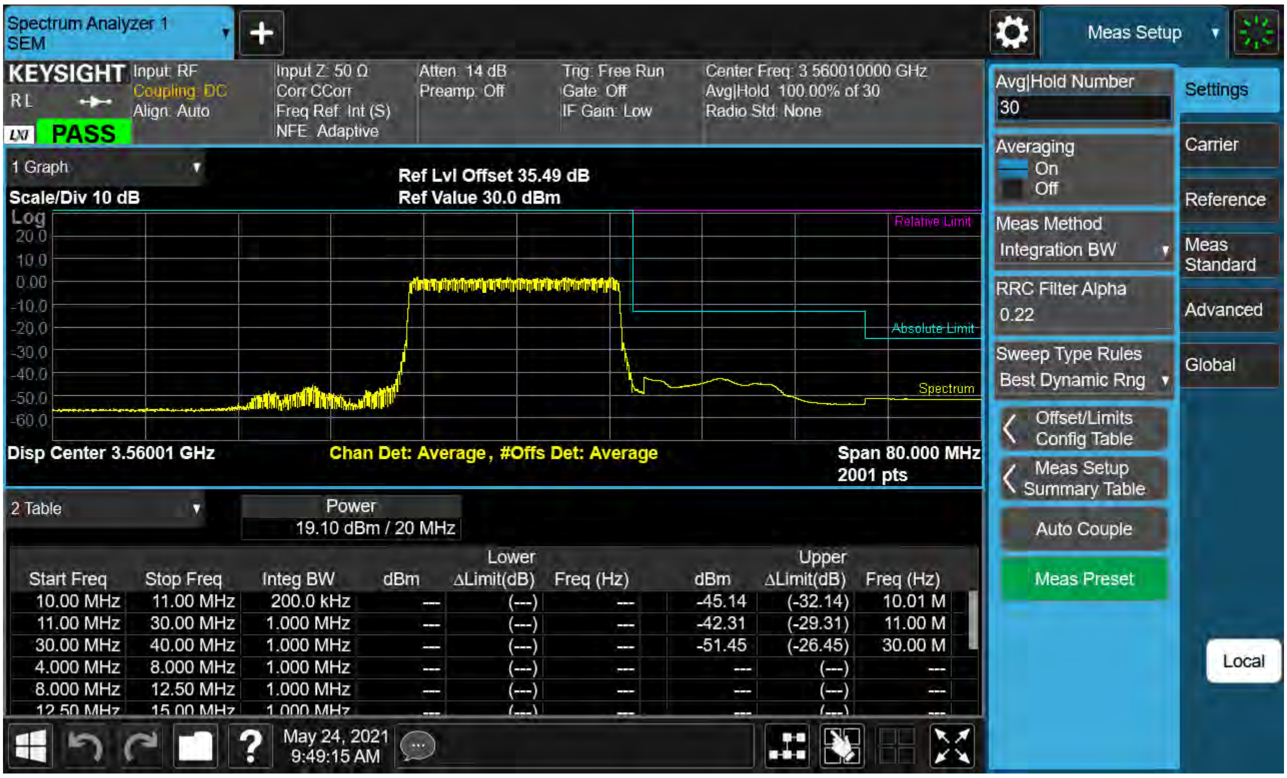
	Offs Freq	Integ BW	Lower ACP dBc	Lower ACP dBm	Lower Reference dBm	Lower Reference Car #	Upper ACP dBc	Upper ACP dBm	Upper Reference dBm	Upper Reference Car #	Filter
A	40.00 MHz	40.00 MHz	-38.43	-26.11	12.32	1	-46.92	-34.60	12.32	1	-3 dB

Sub6 n48. 20M BandEdge(Lower)_Low_ 3560.01MHz_BPSK_FullRB



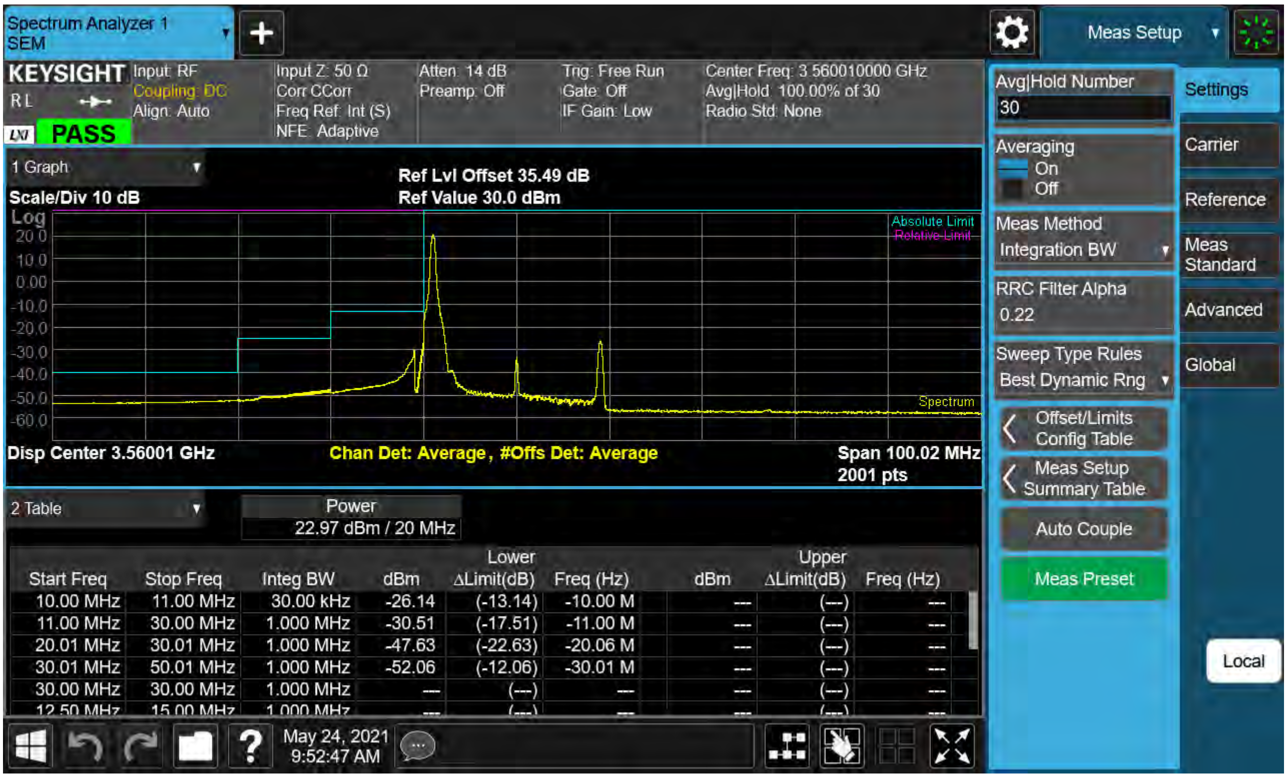
Start Freq	Stop Freq	Integ BW	Lower dBm	Lower ΔLimit(dB)	Lower Freq (Hz)	Upper dBm	Upper ΔLimit(dB)	Upper Freq (Hz)
10.00 MHz	11.00 MHz	200.0 kHz	-38.02	(-25.02)	-10.00 M	---	(---)	---
11.00 MHz	30.00 MHz	1.000 MHz	-39.62	(-26.62)	-11.00 M	---	(---)	---
20.01 MHz	30.01 MHz	1.000 MHz	-42.71	(-17.71)	-21.16 M	---	(---)	---
30.01 MHz	50.01 MHz	1.000 MHz	-53.41	(-13.41)	-30.51 M	---	(---)	---
30.00 MHz	30.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

Sub6 n48. 20M_BandEdge(Upper)_Low_ 3560.01MHz_BPSK_FullRB



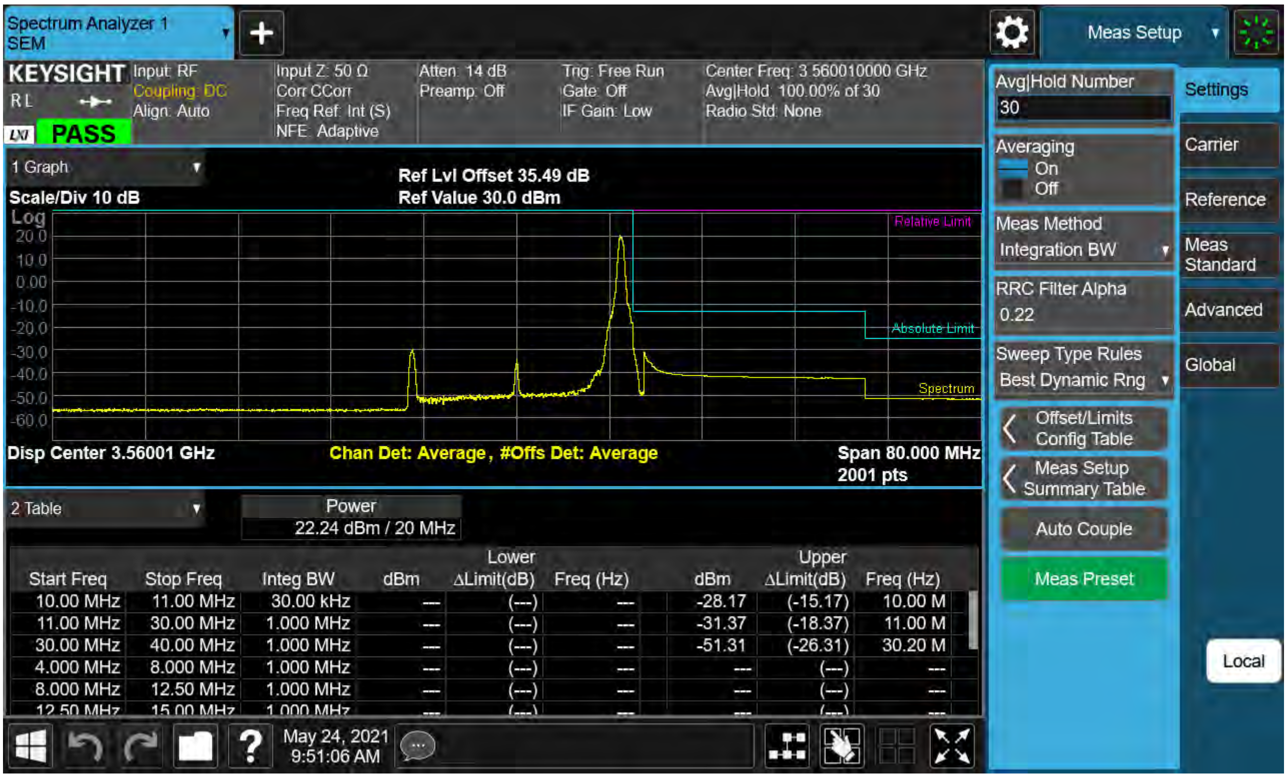
Start Freq	Stop Freq	Integ BW	Lower dBm	Lower ΔLimit(dB)	Lower Freq (Hz)	Upper dBm	Upper ΔLimit(dB)	Upper Freq (Hz)
10.00 MHz	11.00 MHz	200.0 kHz	---	(---)	---	-45.14	(-32.14)	10.01 M
11.00 MHz	30.00 MHz	1.000 MHz	---	(---)	---	-42.31	(-29.31)	11.00 M
30.00 MHz	40.00 MHz	1.000 MHz	---	(---)	---	-51.45	(-26.45)	30.00 M
4.000 MHz	8.000 MHz	1.000 MHz	---	(---)	---	---	(---)	---
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

Sub6 n48. 20M_BandEdge(Lower)_Low_ 3560.01MHz_BPSK_1RB



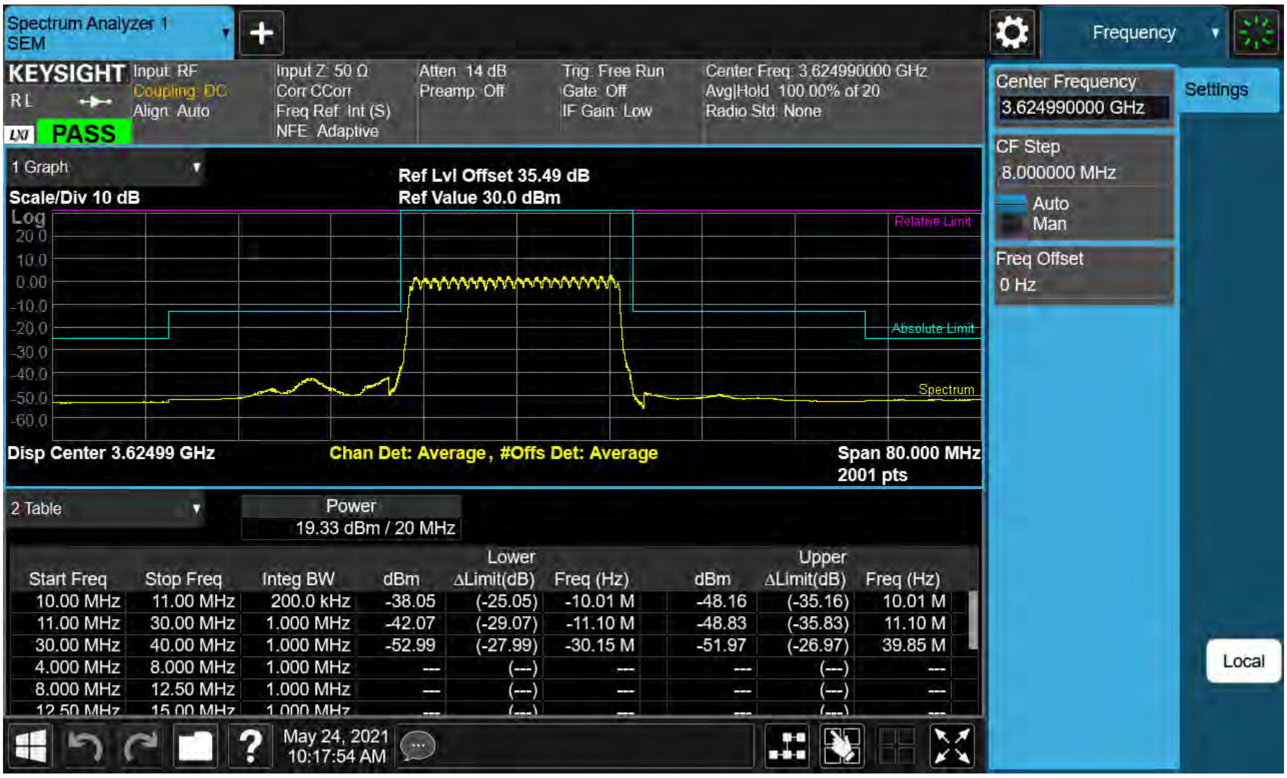
			Lower			Upper		
Start Freq	Stop Freq	Integ BW	dBm	ΔLimit(dB)	Freq (Hz)	dBm	ΔLimit(dB)	Freq (Hz)
10.00 MHz	11.00 MHz	30.00 kHz	-26.14	(-13.14)	-10.00 M	---	(---)	---
11.00 MHz	30.00 MHz	1.000 MHz	-30.51	(-17.51)	-11.00 M	---	(---)	---
20.01 MHz	30.01 MHz	1.000 MHz	-47.63	(-22.63)	-20.06 M	---	(---)	---
30.01 MHz	50.01 MHz	1.000 MHz	-52.06	(-12.06)	-30.01 M	---	(---)	---
30.00 MHz	30.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

Sub6 n48. 20M_BandEdge(Upper)_Low_ 3560.01MHz_BPSK_1RB



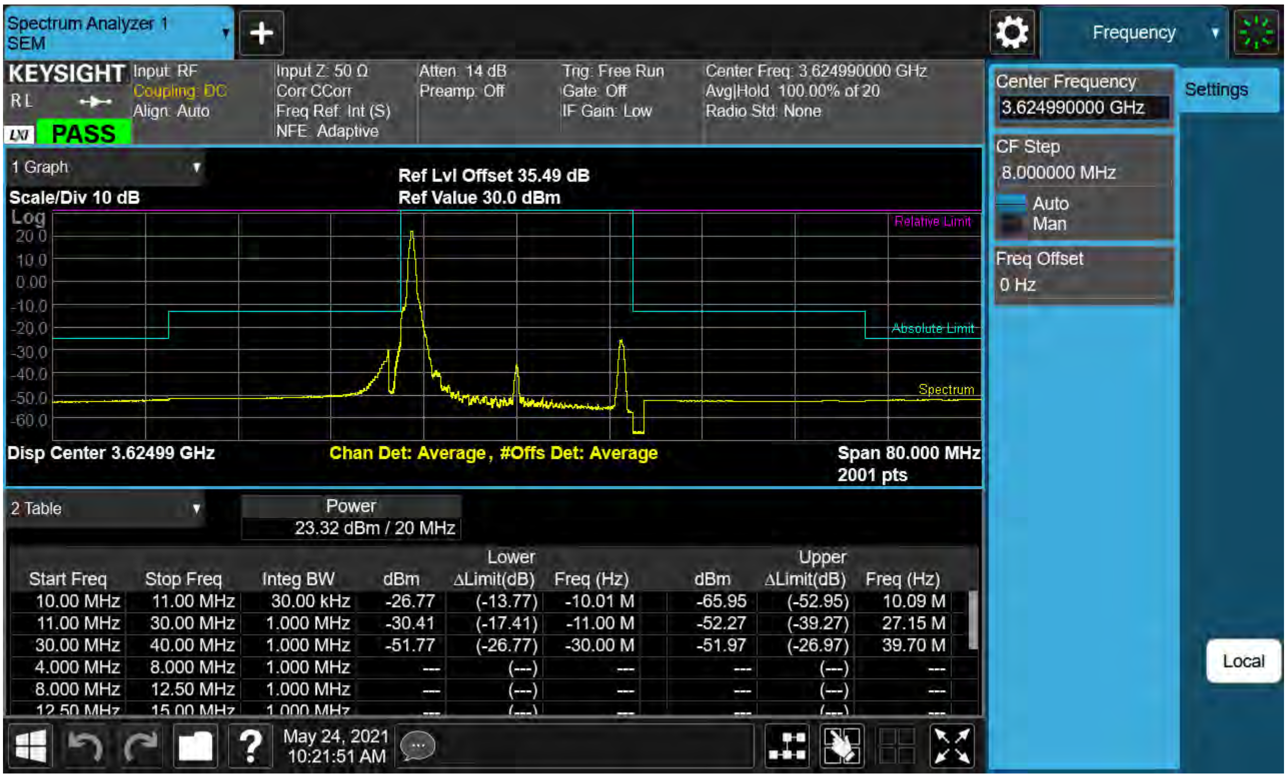
Start Freq	Stop Freq	Integ BW	Lower dBm	Lower ΔLimit(dB)	Lower Freq (Hz)	Upper dBm	Upper ΔLimit(dB)	Upper Freq (Hz)
10.00 MHz	11.00 MHz	30.00 kHz	---	(---)	---	-28.17	(-15.17)	10.00 M
11.00 MHz	30.00 MHz	1.000 MHz	---	(---)	---	-31.37	(-18.37)	11.00 M
30.00 MHz	40.00 MHz	1.000 MHz	---	(---)	---	-51.31	(-26.31)	30.20 M
4.000 MHz	8.000 MHz	1.000 MHz	---	(---)	---	---	(---)	---
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

Sub6 n48. 20M_BandEdge(Center)_Mid_3624.99MHz_BPSK_FullRB

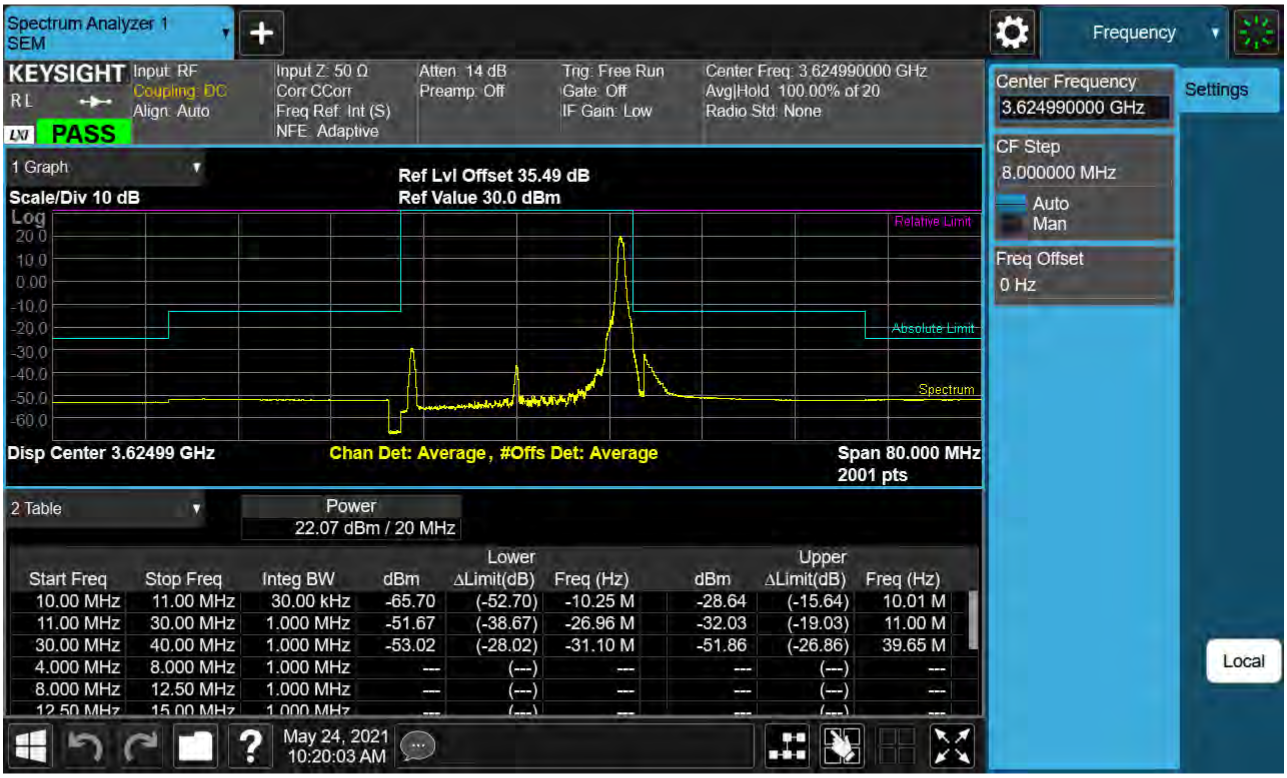


Start Freq	Stop Freq	Integ BW	Lower dBm	Lower ΔLimit(dB)	Lower Freq (Hz)	Upper dBm	Upper ΔLimit(dB)	Upper Freq (Hz)
10.00 MHz	11.00 MHz	200.0 kHz	-38.05	(-25.05)	-10.01 M	-48.16	(-35.16)	10.01 M
11.00 MHz	30.00 MHz	1.000 MHz	-42.07	(-29.07)	-11.10 M	-48.83	(-35.83)	11.10 M
30.00 MHz	40.00 MHz	1.000 MHz	-52.99	(-27.99)	-30.15 M	-51.97	(-26.97)	39.85 M
4.000 MHz	8.000 MHz	1.000 MHz	---	(---)	---	---	(---)	---
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

Sub6 n48. 20M_BandEdge(Lower)_Mid_3624.99MHz_BPSK_1RB

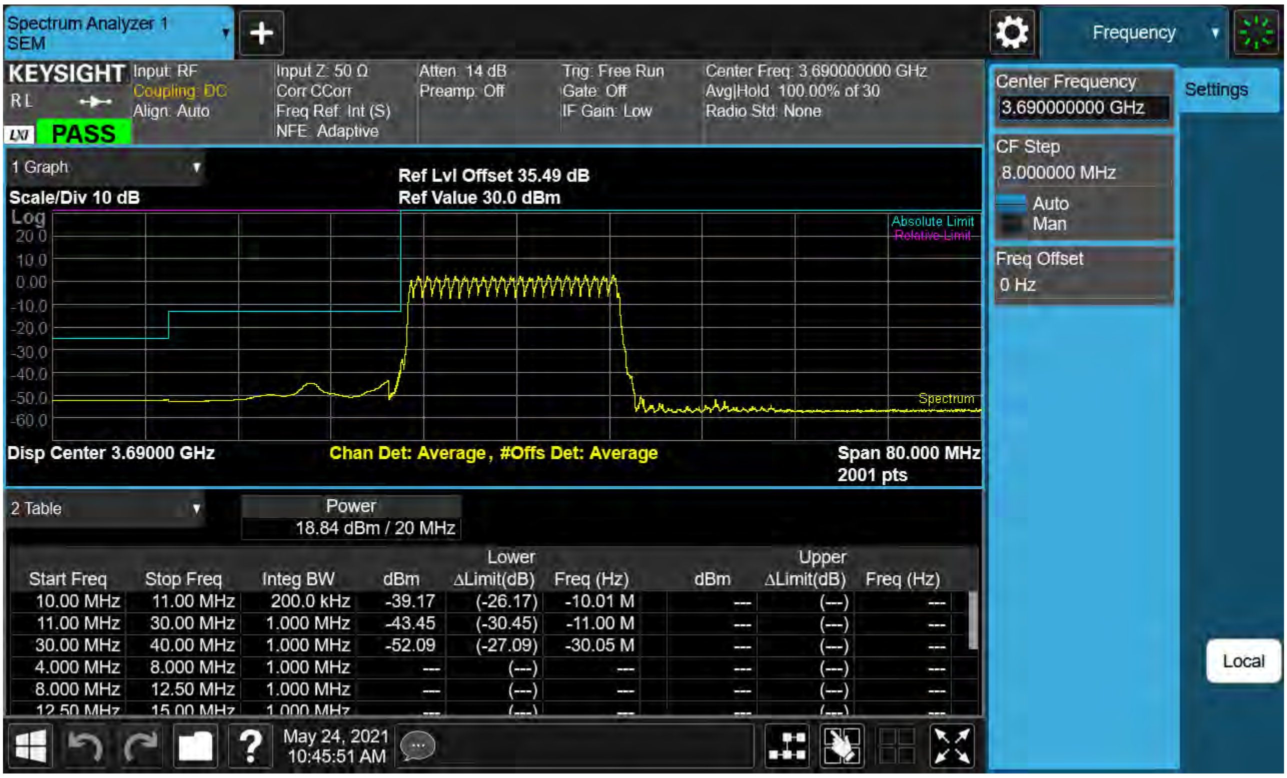


Sub6 n48. 20M_BandEdge(Upper)_Mid_3624.99MHz_BPSK_1RB

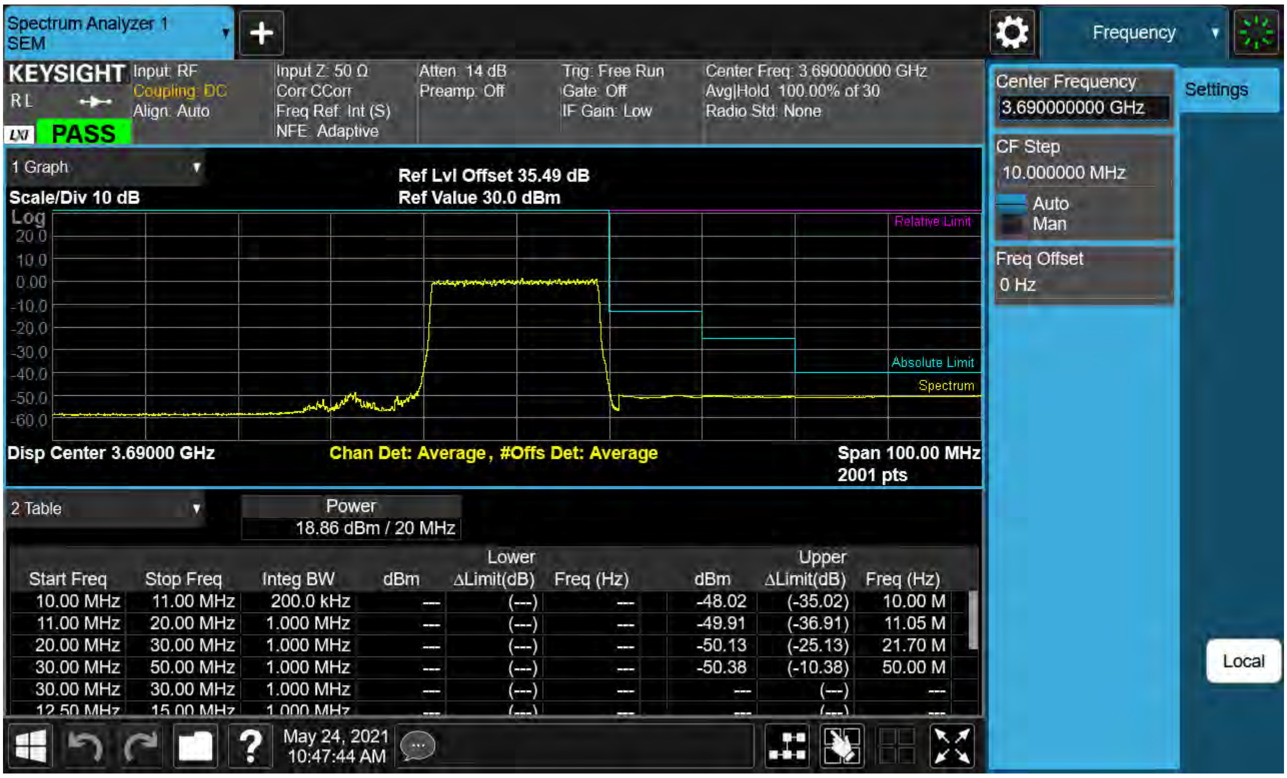


			Lower			Upper		
Start Freq	Stop Freq	Integ BW	dBm	ΔLimit(dB)	Freq (Hz)	dBm	ΔLimit(dB)	Freq (Hz)
10.00 MHz	11.00 MHz	30.00 kHz	-65.70	(-52.70)	-10.25 M	-28.64	(-15.64)	10.01 M
11.00 MHz	30.00 MHz	1.000 MHz	-51.67	(-38.67)	-26.96 M	-32.03	(-19.03)	11.00 M
30.00 MHz	40.00 MHz	1.000 MHz	-53.02	(-28.02)	-31.10 M	-51.86	(-26.86)	39.65 M
4.000 MHz	8.000 MHz	1.000 MHz	---	(---)	---	---	(---)	---
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

Sub6 n48. 20M_BandEdge(Lower)_High_ 3690.00MHz_BPSK_FullRB

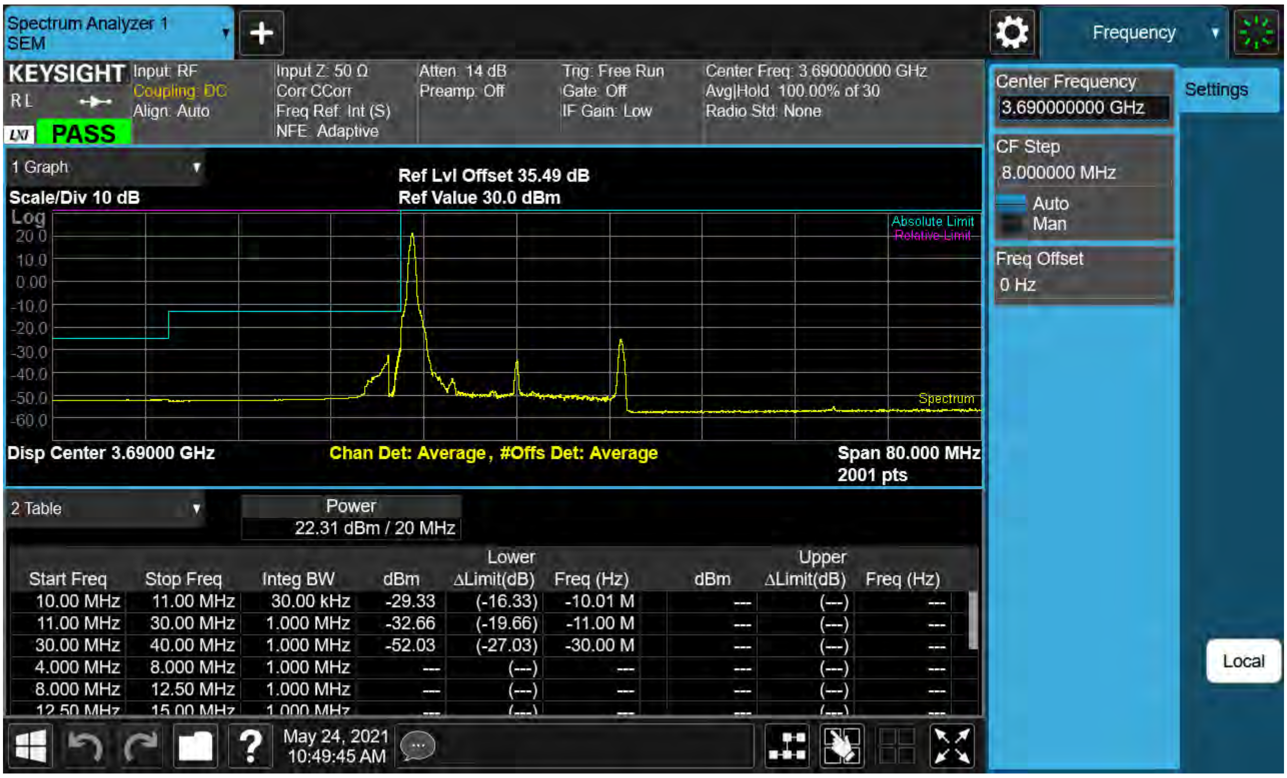


Sub6 n48. 20M_BandEdge(Upper)_High_ 3690.00MHz_BPSK_FullRB



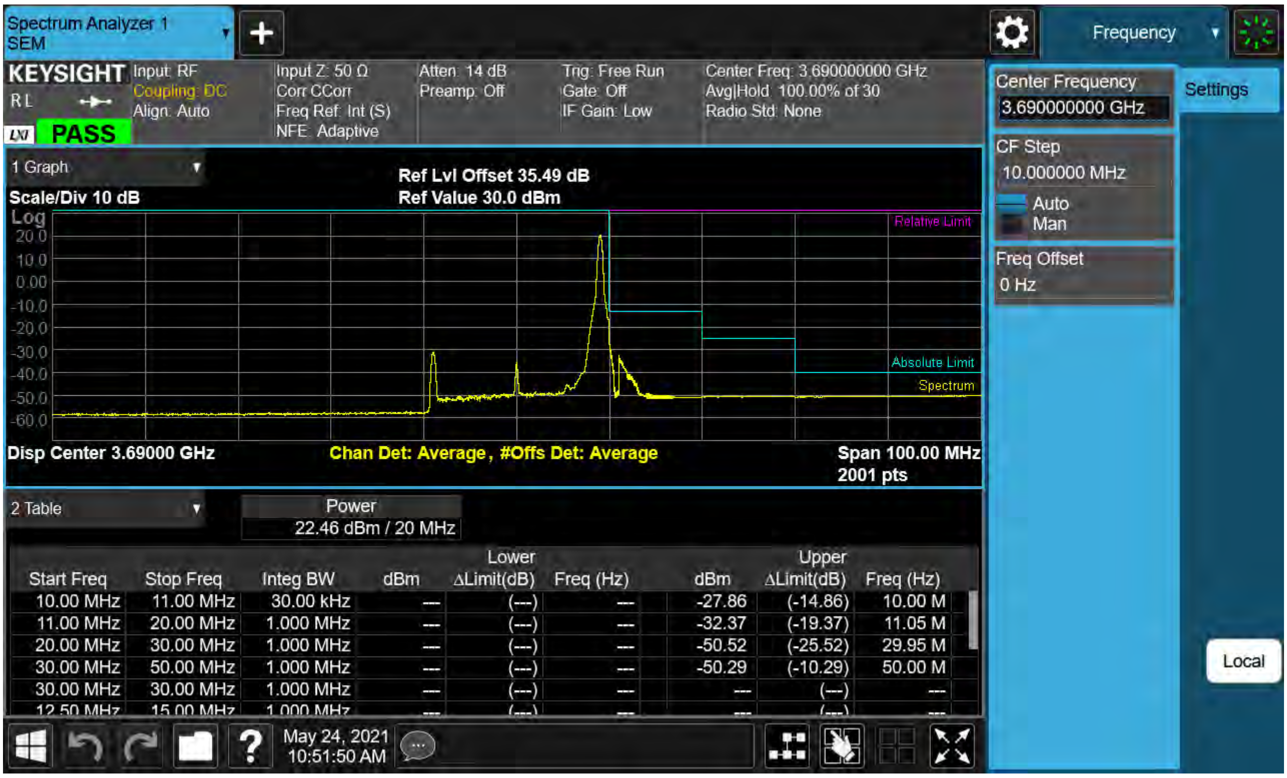
			Lower			Upper		
Start Freq	Stop Freq	Integ BW	dBm	ΔLimit(dB)	Freq (Hz)	dBm	ΔLimit(dB)	Freq (Hz)
10.00 MHz	11.00 MHz	200.0 kHz	---	(---)	---	-48.02	(-35.02)	10.00 M
11.00 MHz	20.00 MHz	1.000 MHz	---	(---)	---	-49.91	(-36.91)	11.05 M
20.00 MHz	30.00 MHz	1.000 MHz	---	(---)	---	-50.13	(-25.13)	21.70 M
30.00 MHz	50.00 MHz	1.000 MHz	---	(---)	---	-50.38	(-10.38)	50.00 M
30.00 MHz	30.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

Sub6 n48. 20M_BandEdge(Lower)_High_ 3690.00MHz_BPSK_1RB

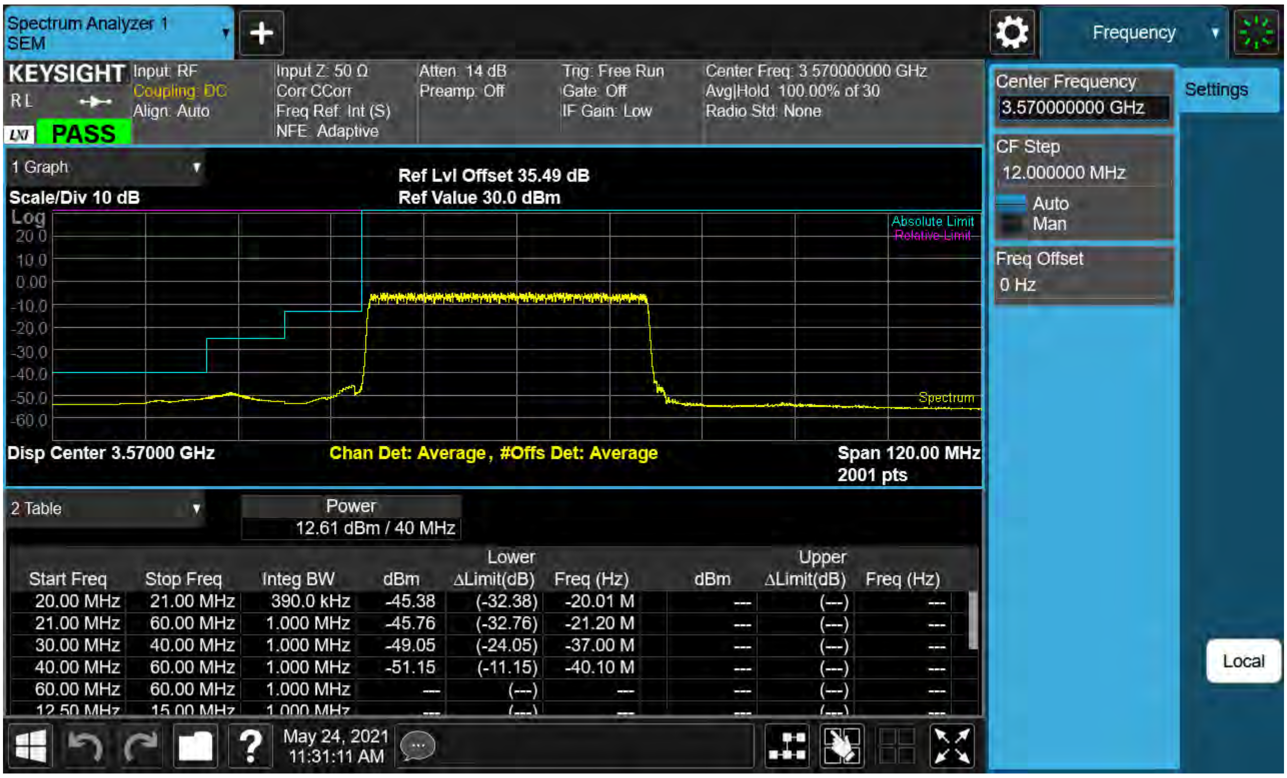


Start Freq	Stop Freq	Integ BW	Lower dBm	Lower ΔLimit(dB)	Lower Freq (Hz)	Upper dBm	Upper ΔLimit(dB)	Upper Freq (Hz)
10.00 MHz	11.00 MHz	30.00 kHz	-29.33	(-16.33)	-10.01 M	---	(---)	---
11.00 MHz	30.00 MHz	1.000 MHz	-32.66	(-19.66)	-11.00 M	---	(---)	---
30.00 MHz	40.00 MHz	1.000 MHz	-52.03	(-27.03)	-30.00 M	---	(---)	---
4.000 MHz	8.000 MHz	1.000 MHz	---	(---)	---	---	(---)	---
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

Sub6 n48. 20M_BandEdge(Upper)_High_ 3690.00MHz_BPSK_1RB

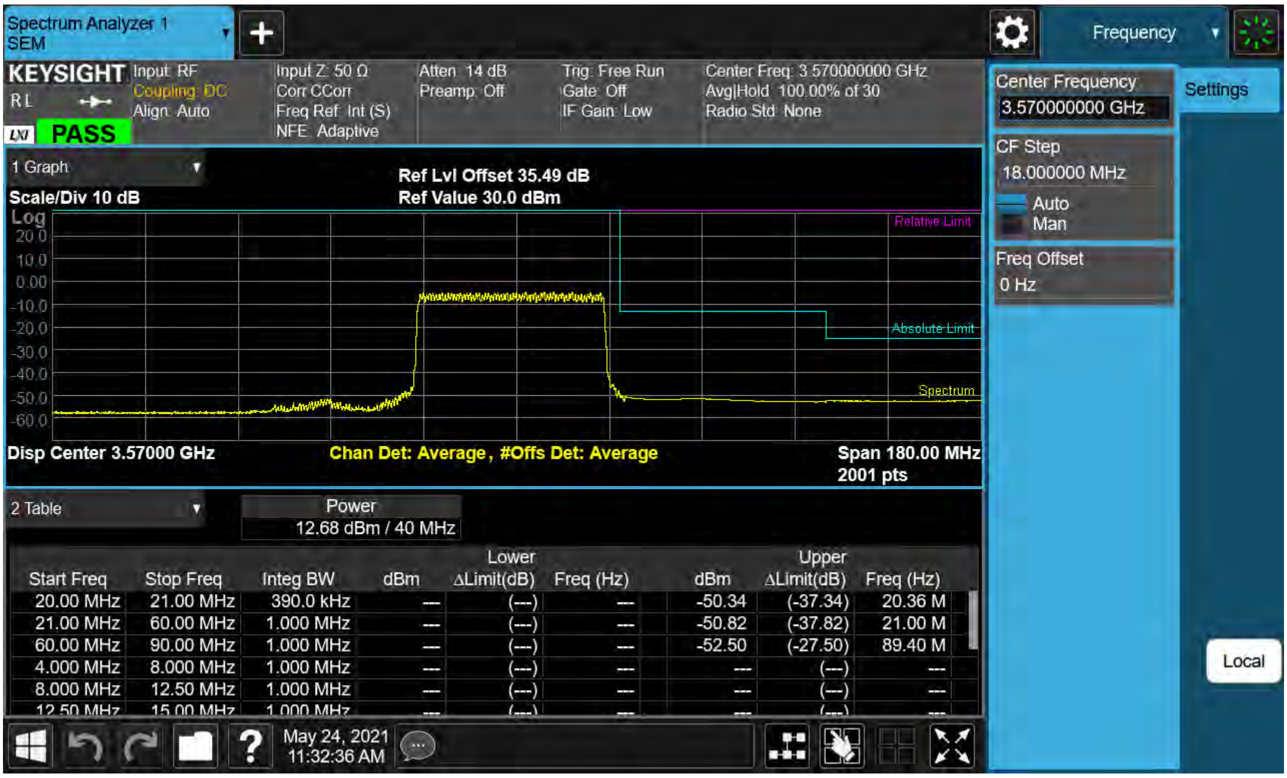


Sub6 n48. 40M BandEdge(Lower)_Low_ 3570.00MHz_BPSK_FullRB



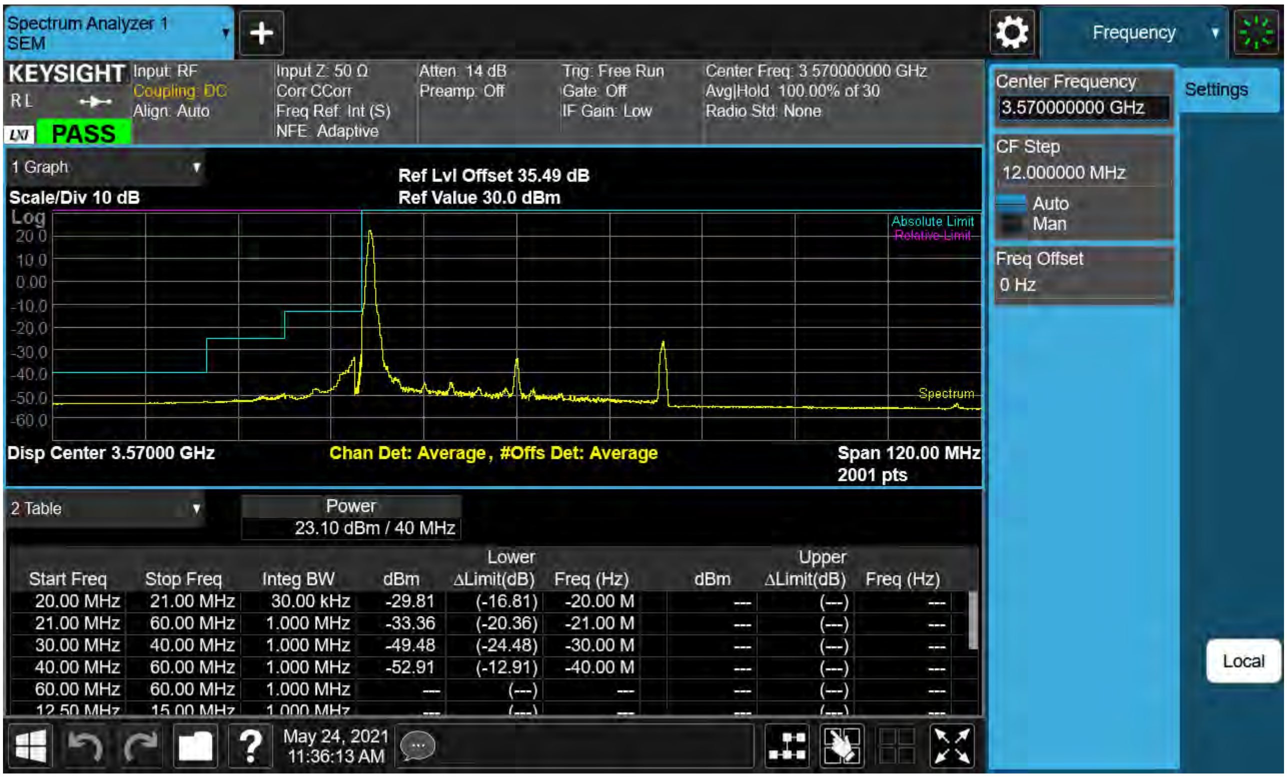
Start Freq	Stop Freq	Integ BW	Lower dBm	Lower ΔLimit(dB)	Lower Freq (Hz)	Upper dBm	Upper ΔLimit(dB)	Upper Freq (Hz)
20.00 MHz	21.00 MHz	390.0 kHz	-45.38	(-32.38)	-20.01 M	---	(---)	---
21.00 MHz	60.00 MHz	1.000 MHz	-45.76	(-32.76)	-21.20 M	---	(---)	---
30.00 MHz	40.00 MHz	1.000 MHz	-49.05	(-24.05)	-37.00 M	---	(---)	---
40.00 MHz	60.00 MHz	1.000 MHz	-51.15	(-11.15)	-40.10 M	---	(---)	---
60.00 MHz	60.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

Sub6 n48. 40M_BandEdge(Upper)_Low_ 3570.00MHz_BPSK_FullRB



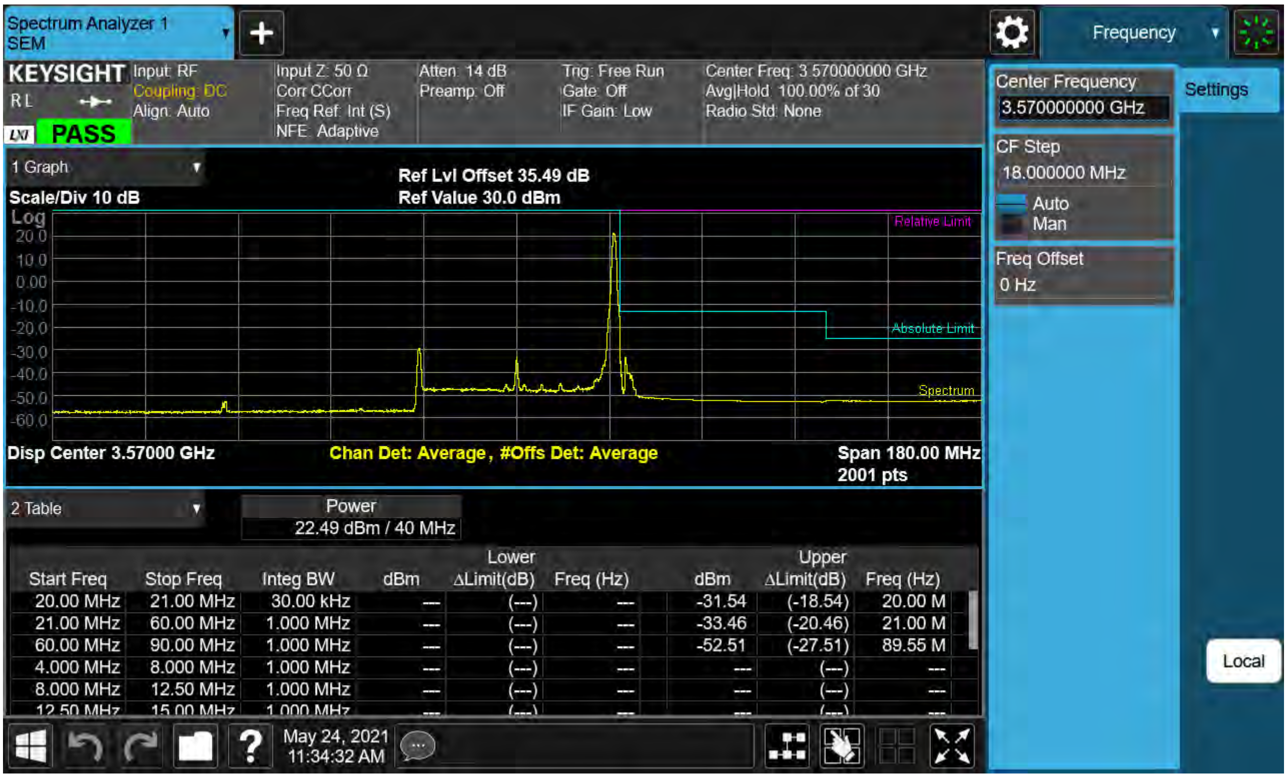
			Lower			Upper		
Start Freq	Stop Freq	Integ BW	dBm	ΔLimit(dB)	Freq (Hz)	dBm	ΔLimit(dB)	Freq (Hz)
20.00 MHz	21.00 MHz	390.0 kHz	---	(---)	---	-50.34	(-37.34)	20.36 M
21.00 MHz	60.00 MHz	1.000 MHz	---	(---)	---	-50.82	(-37.82)	21.00 M
60.00 MHz	90.00 MHz	1.000 MHz	---	(---)	---	-52.50	(-27.50)	89.40 M
4.000 MHz	8.000 MHz	1.000 MHz	---	(---)	---	---	(---)	---
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

Sub6 n48. 40M_BandEdge(Lower)_Low_ 3570.00MHz_BPSK_1RB



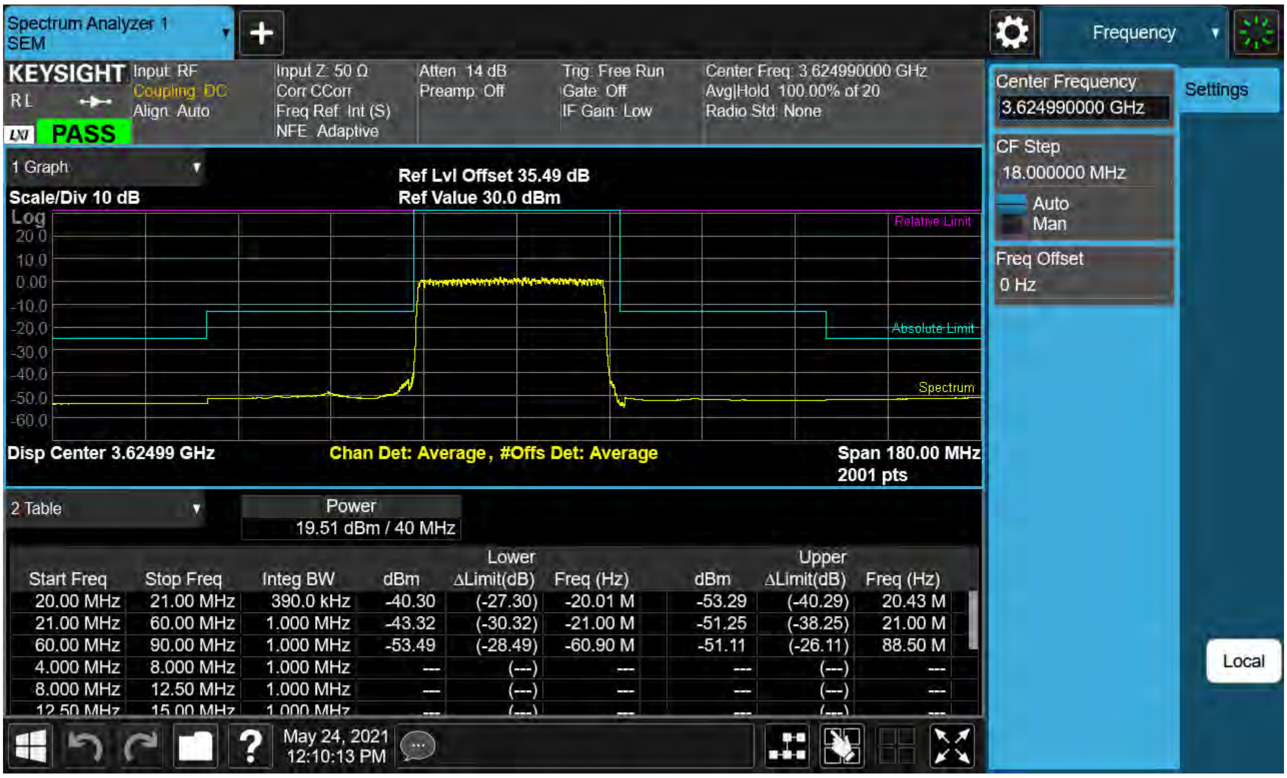
Start Freq	Stop Freq	Integ BW	Lower dBm	Lower ΔLimit(dB)	Lower Freq (Hz)	Upper dBm	Upper ΔLimit(dB)	Upper Freq (Hz)
20.00 MHz	21.00 MHz	30.00 kHz	-29.81	(-16.81)	-20.00 M	---	(---)	---
21.00 MHz	60.00 MHz	1.000 MHz	-33.36	(-20.36)	-21.00 M	---	(---)	---
30.00 MHz	40.00 MHz	1.000 MHz	-49.48	(-24.48)	-30.00 M	---	(---)	---
40.00 MHz	60.00 MHz	1.000 MHz	-52.91	(-12.91)	-40.00 M	---	(---)	---
60.00 MHz	60.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

Sub6 n48. 40M_BandEdge(Upper)_Low_ 3570.00MHz_BPSK_1RB



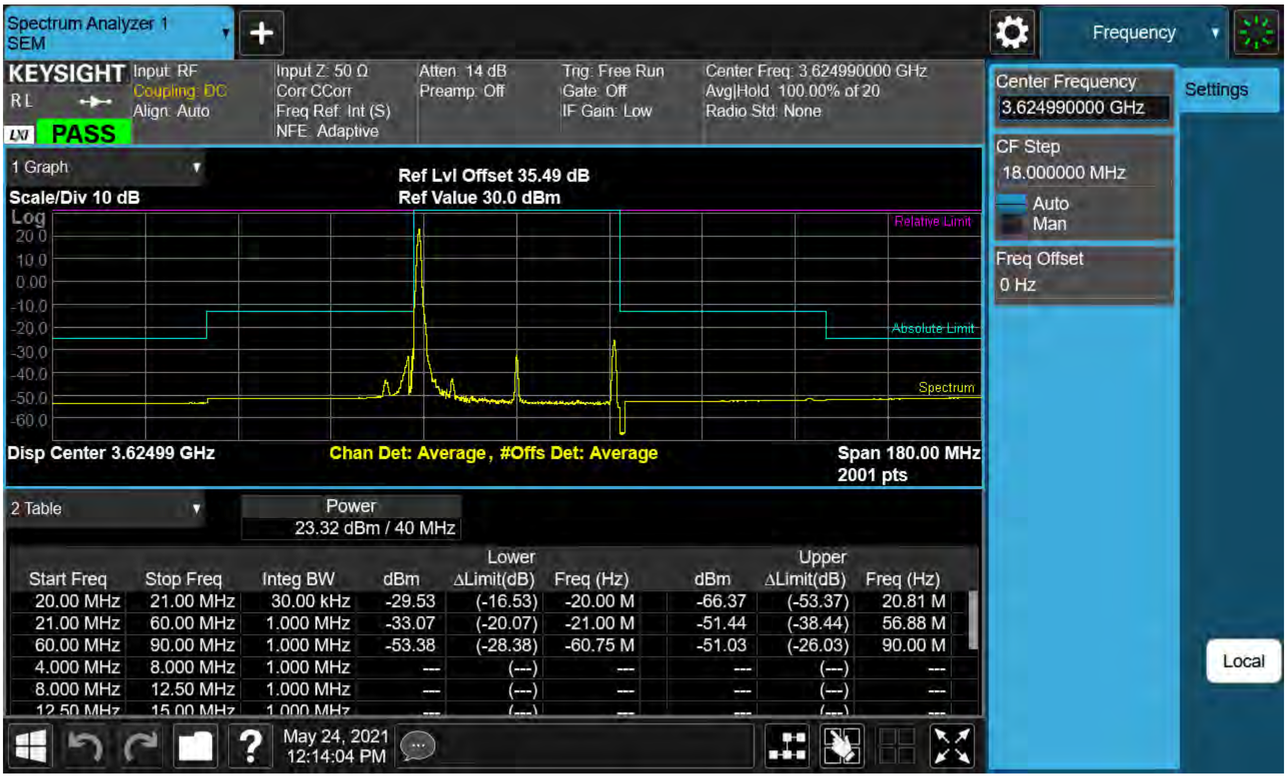
Start Freq	Stop Freq	Integ BW	Lower dBm	Lower ΔLimit(dB)	Lower Freq (Hz)	Upper dBm	Upper ΔLimit(dB)	Upper Freq (Hz)
20.00 MHz	21.00 MHz	30.00 kHz	---	(---)	---	-31.54	(-18.54)	20.00 M
21.00 MHz	60.00 MHz	1.000 MHz	---	(---)	---	-33.46	(-20.46)	21.00 M
60.00 MHz	90.00 MHz	1.000 MHz	---	(---)	---	-52.51	(-27.51)	89.55 M
4.000 MHz	8.000 MHz	1.000 MHz	---	(---)	---	---	(---)	---
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

Sub6 n48. 40M_BandEdge(Center)_Mid_3624.99MHz_BPSK_FullRB



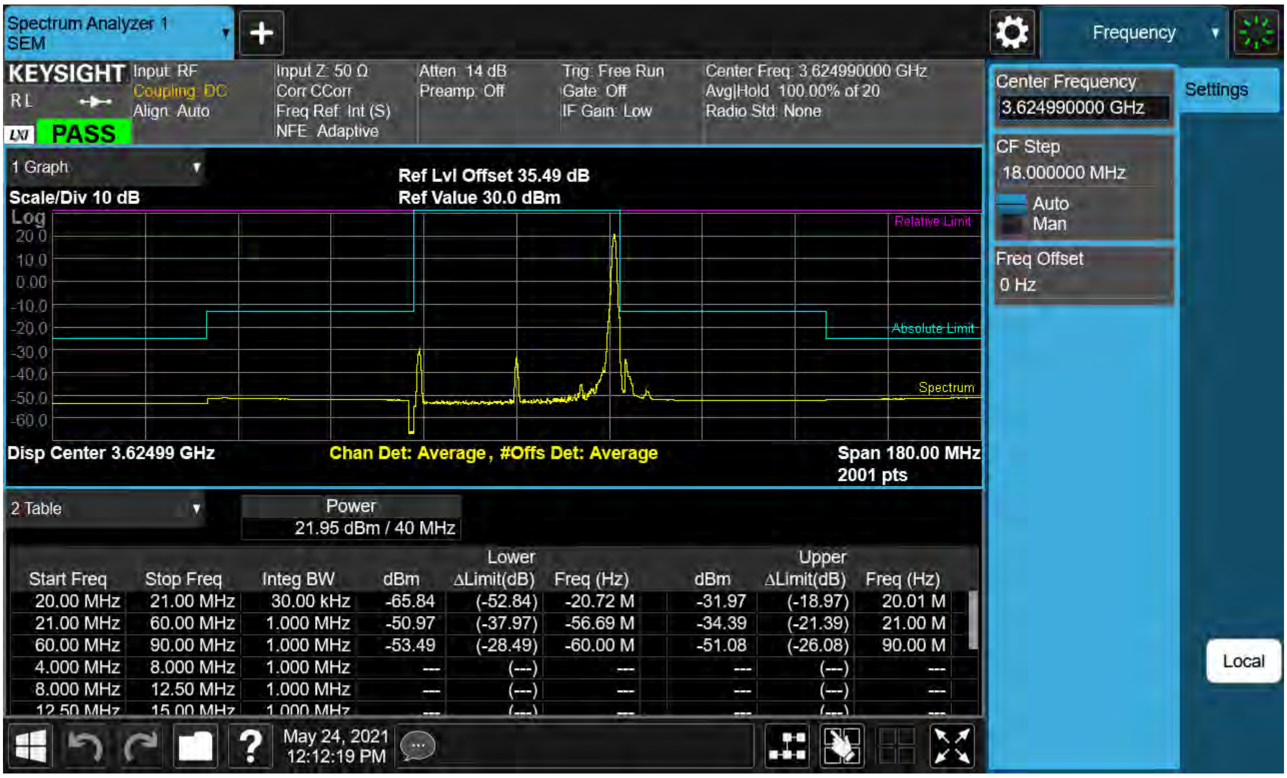
Start Freq	Stop Freq	Integ BW	Lower dBm	Lower ΔLimit(dB)	Lower Freq (Hz)	Upper dBm	Upper ΔLimit(dB)	Upper Freq (Hz)
20.00 MHz	21.00 MHz	390.0 kHz	-40.30	(-27.30)	-20.01 M	-53.29	(-40.29)	20.43 M
21.00 MHz	60.00 MHz	1.000 MHz	-43.32	(-30.32)	-21.00 M	-51.25	(-38.25)	21.00 M
60.00 MHz	90.00 MHz	1.000 MHz	-53.49	(-28.49)	-60.90 M	-51.11	(-26.11)	88.50 M
4.000 MHz	8.000 MHz	1.000 MHz	---	(---)	---	---	(---)	---
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

Sub6 n48. 40M_BandEdge(Lower)_Mid_3624.99MHz_BPSK_1RB

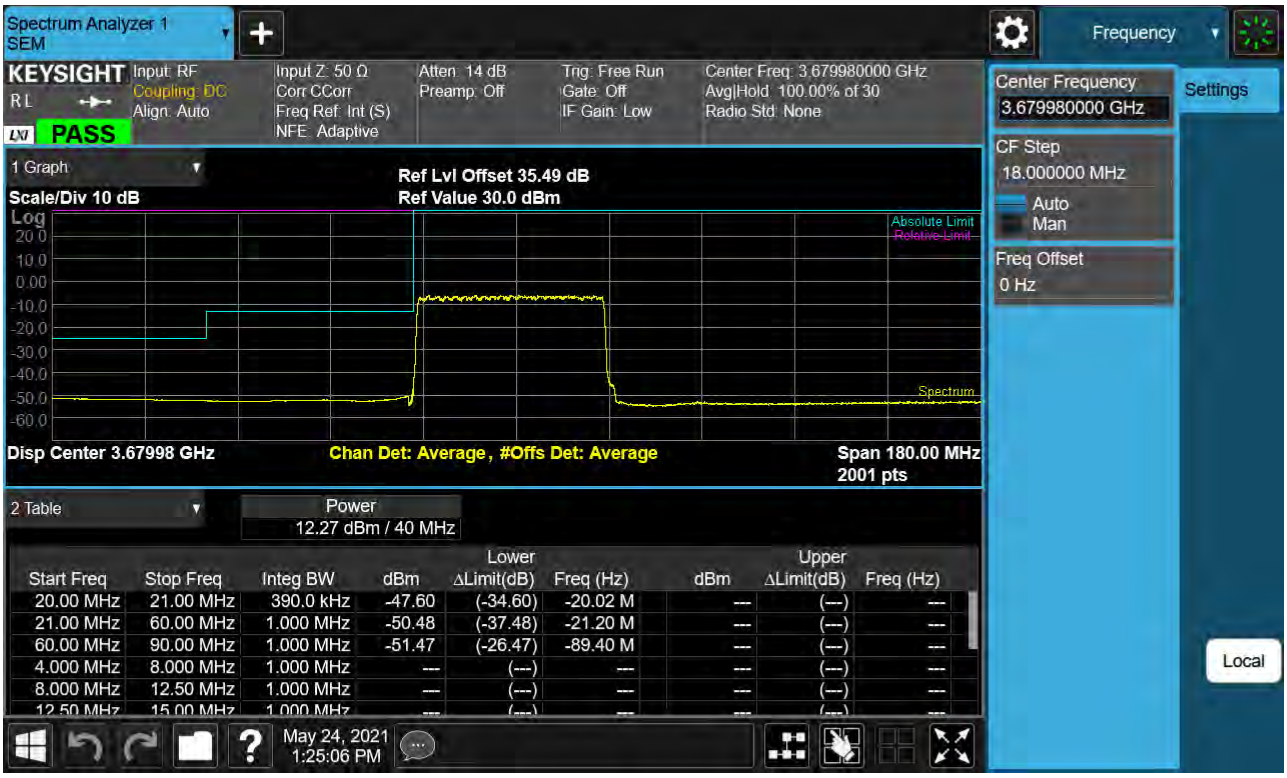


			Lower			Upper		
Start Freq	Stop Freq	Integ BW	dBm	ΔLimit(dB)	Freq (Hz)	dBm	ΔLimit(dB)	Freq (Hz)
20.00 MHz	21.00 MHz	30.00 kHz	-29.53	(-16.53)	-20.00 M	-66.37	(-53.37)	20.81 M
21.00 MHz	60.00 MHz	1.000 MHz	-33.07	(-20.07)	-21.00 M	-51.44	(-38.44)	56.88 M
60.00 MHz	90.00 MHz	1.000 MHz	-53.38	(-28.38)	-60.75 M	-51.03	(-26.03)	90.00 M
4.000 MHz	8.000 MHz	1.000 MHz	---	(---)	---	---	(---)	---
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

Sub6 n48. 40M_BandEdge(Upper)_Mid_3624.99MHz_BPSK_1RB

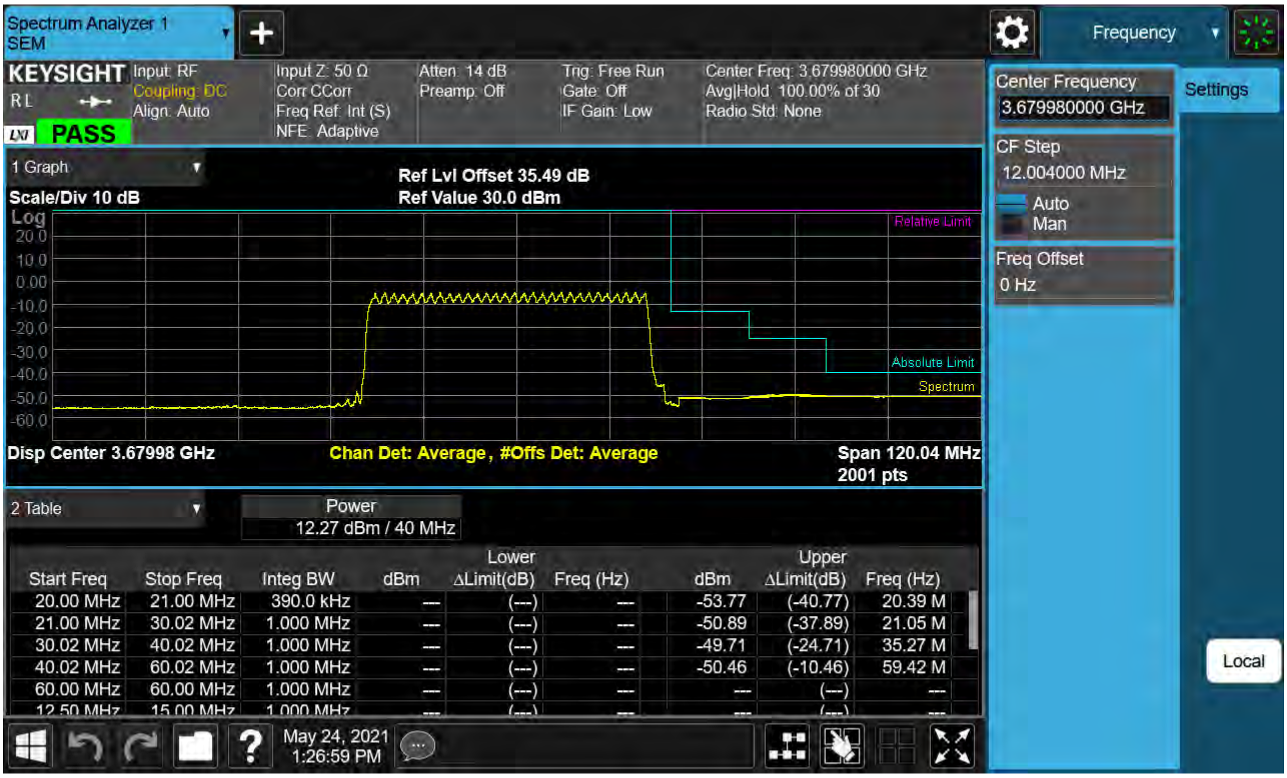


Sub6 n48. 40M_BandEdge(Lower)_High_ 3679.98MHz_BPSK_FullRB

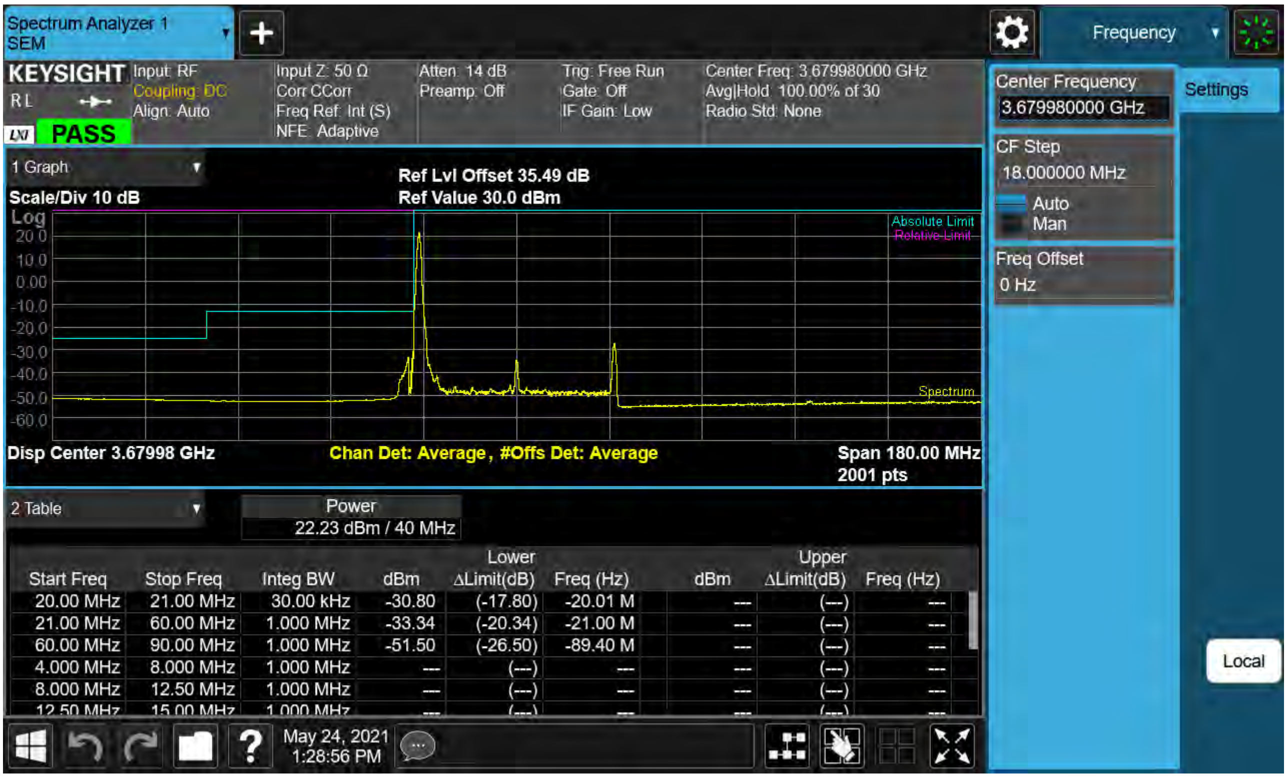


			Lower			Upper		
Start Freq	Stop Freq	Integ BW	dBm	ΔLimit(dB)	Freq (Hz)	dBm	ΔLimit(dB)	Freq (Hz)
20.00 MHz	21.00 MHz	390.0 kHz	-47.60	(-34.60)	-20.02 M	---	(---)	---
21.00 MHz	60.00 MHz	1.000 MHz	-50.48	(-37.48)	-21.20 M	---	(---)	---
60.00 MHz	90.00 MHz	1.000 MHz	-51.47	(-26.47)	-89.40 M	---	(---)	---
4.000 MHz	8.000 MHz	1.000 MHz	---	(---)	---	---	(---)	---
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

Sub6 n48. 40M_BandEdge(Upper)_High_ 3679.98MHz_BPSK_FullRB

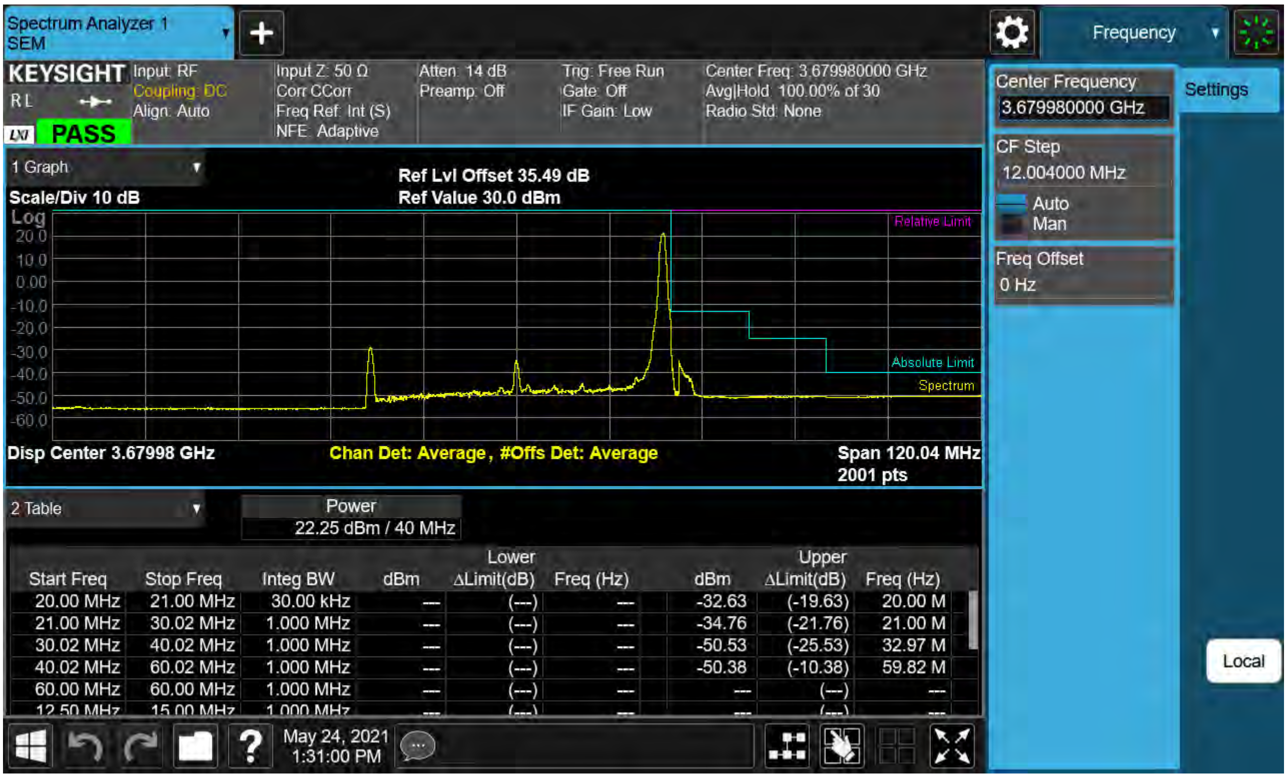


Sub6 n48. 40M_BandEdge(Lower)_High_ 3679.98MHz_BPSK_1RB



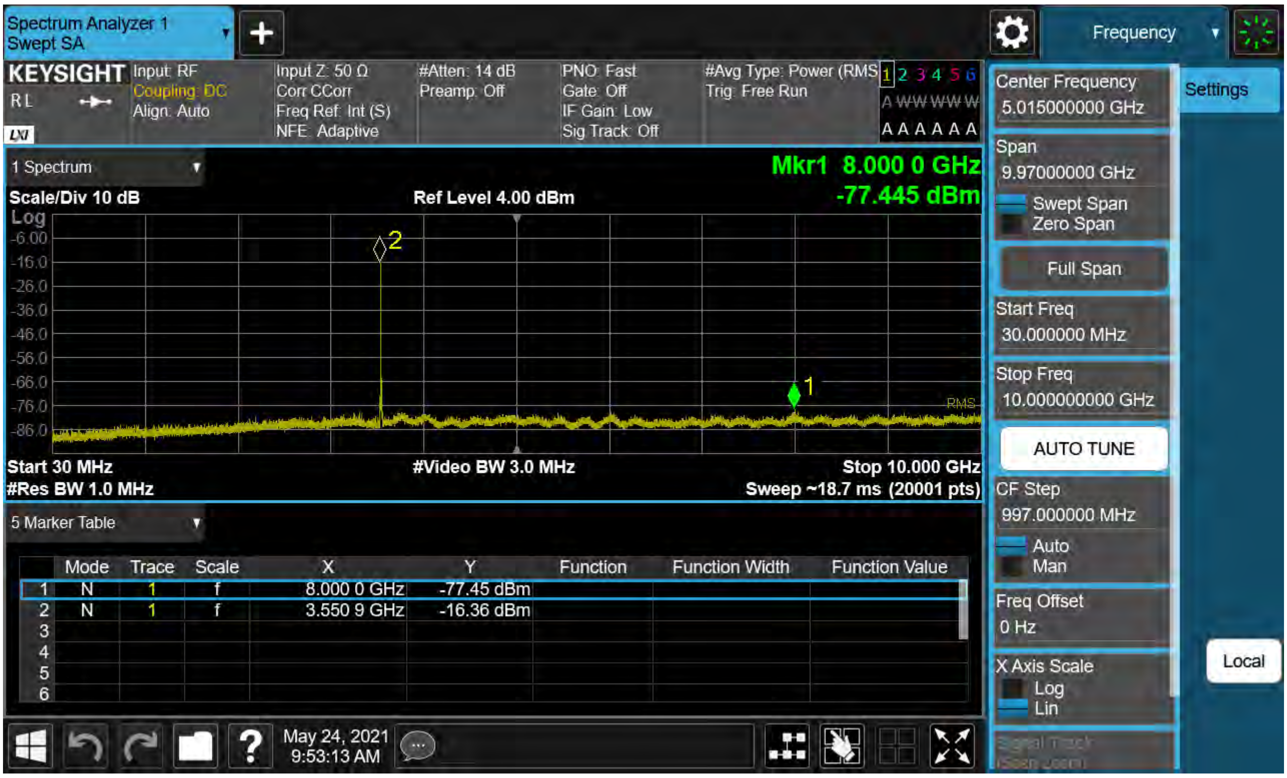
Start Freq	Stop Freq	Integ BW	Lower dBm	Lower ΔLimit(dB)	Lower Freq (Hz)	Upper dBm	Upper ΔLimit(dB)	Upper Freq (Hz)
20.00 MHz	21.00 MHz	30.00 kHz	-30.80	(-17.80)	-20.01 M	---	(---)	---
21.00 MHz	60.00 MHz	1.000 MHz	-33.34	(-20.34)	-21.00 M	---	(---)	---
60.00 MHz	90.00 MHz	1.000 MHz	-51.50	(-26.50)	-89.40 M	---	(---)	---
4.000 MHz	8.000 MHz	1.000 MHz	---	(---)	---	---	(---)	---
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

Sub6 n48. 40M_BandEdge(Upper)_High_ 3679.98MHz_BPSK_1RB

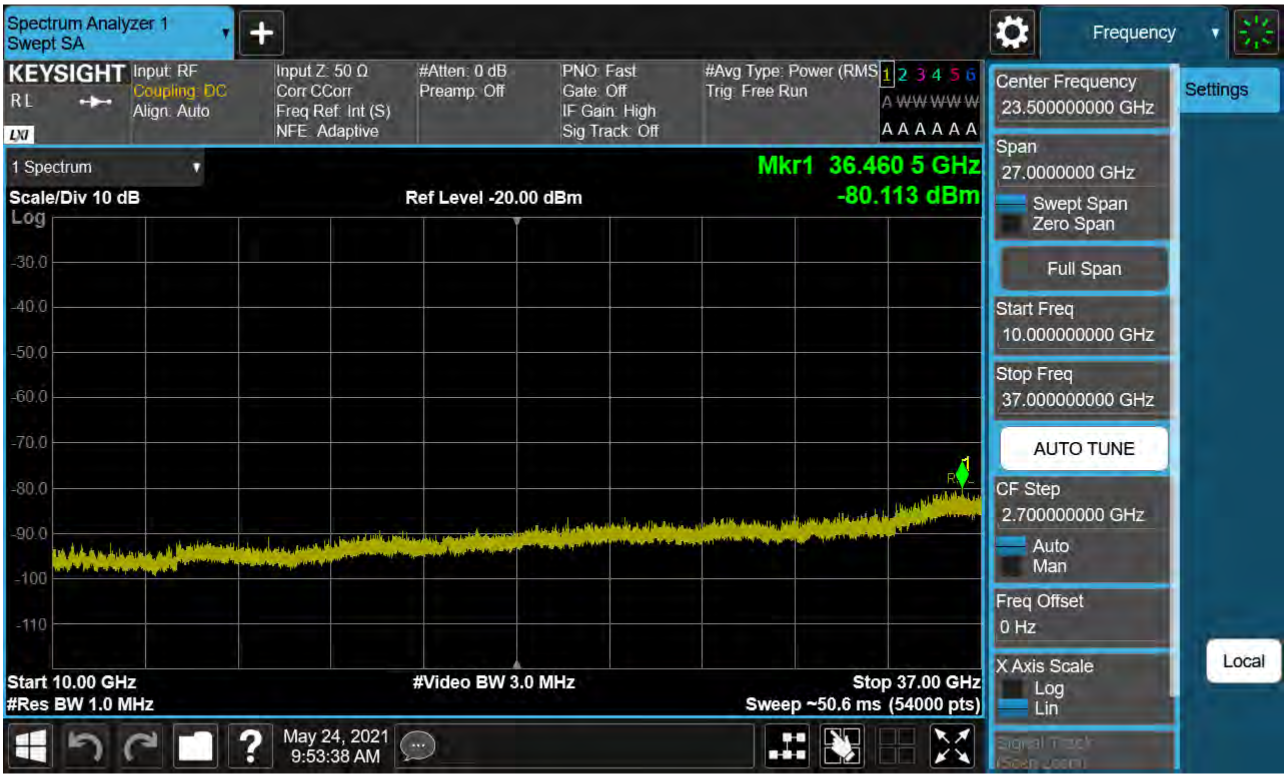


			Lower			Upper		
Start Freq	Stop Freq	Integ BW	dBm	ΔLimit(dB)	Freq (Hz)	dBm	ΔLimit(dB)	Freq (Hz)
20.00 MHz	21.00 MHz	30.00 kHz	---	(---)	---	-32.63	(-19.63)	20.00 M
21.00 MHz	30.02 MHz	1.000 MHz	---	(---)	---	-34.76	(-21.76)	21.00 M
30.02 MHz	40.02 MHz	1.000 MHz	---	(---)	---	-50.53	(-25.53)	32.97 M
40.02 MHz	60.02 MHz	1.000 MHz	---	(---)	---	-50.38	(-10.38)	59.82 M
60.00 MHz	60.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

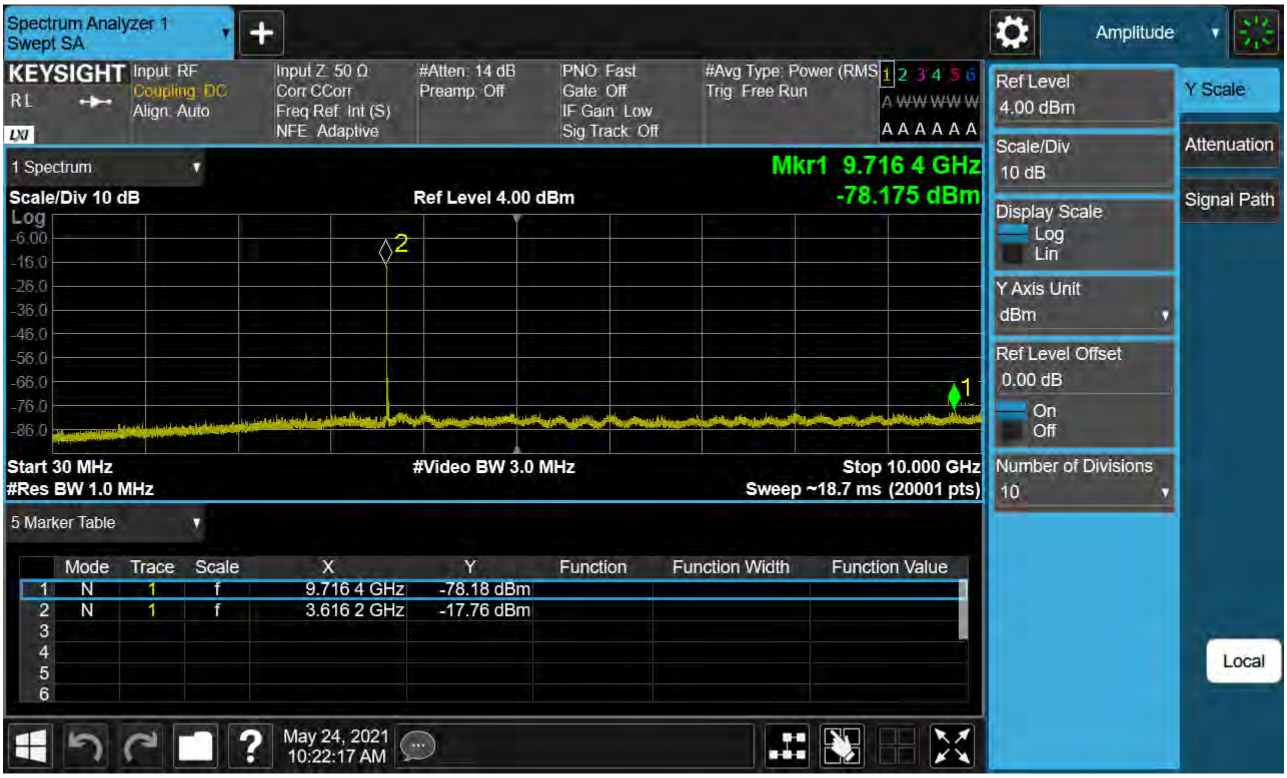
Sub6 n48. Conducted Spurious Plot 1 (20 MHz Ch. 637334 BPSK RB 1, Offset 0)



Sub6 n48. Conducted Spurious Plot 2 (20 MHz Ch. 637334 BPSK RB 1, Offset 0)

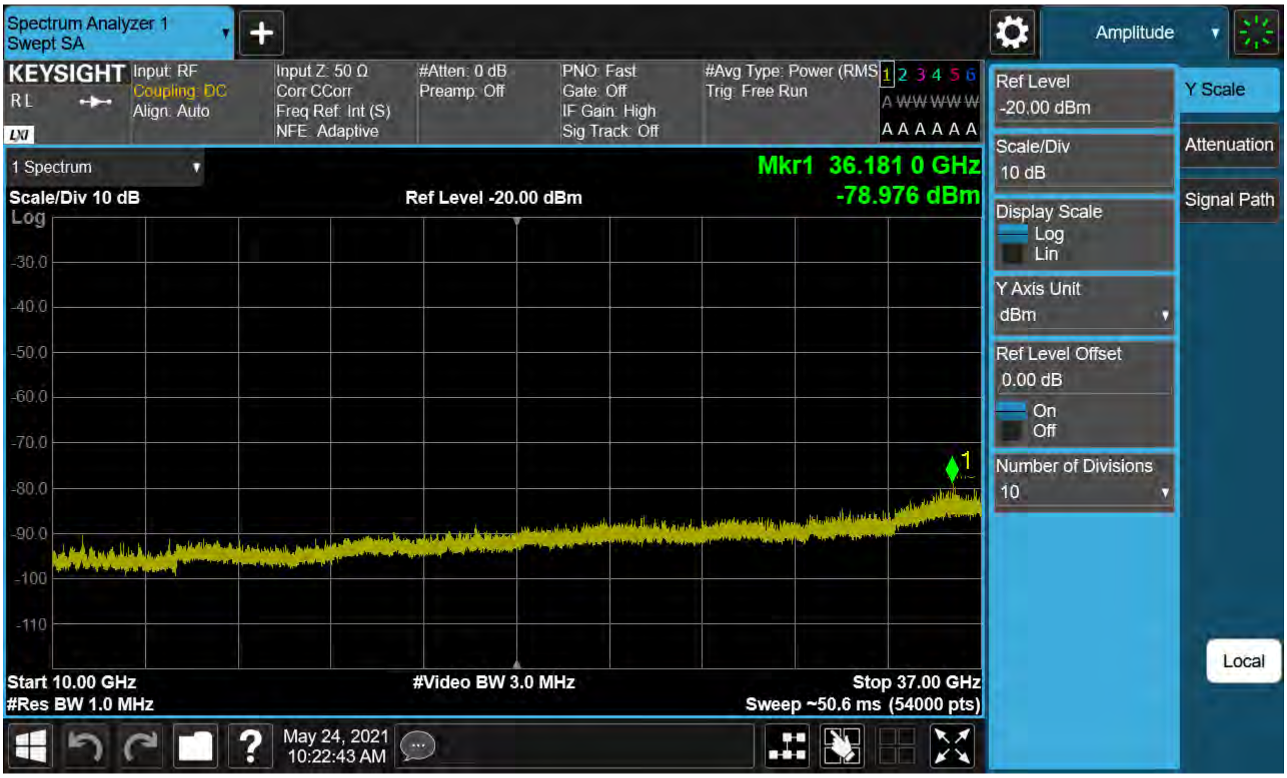


Sub6 n48. Conducted Spurious Plot 1 (20 MHz Ch. 641666 BPSK RB 1, Offset 0)

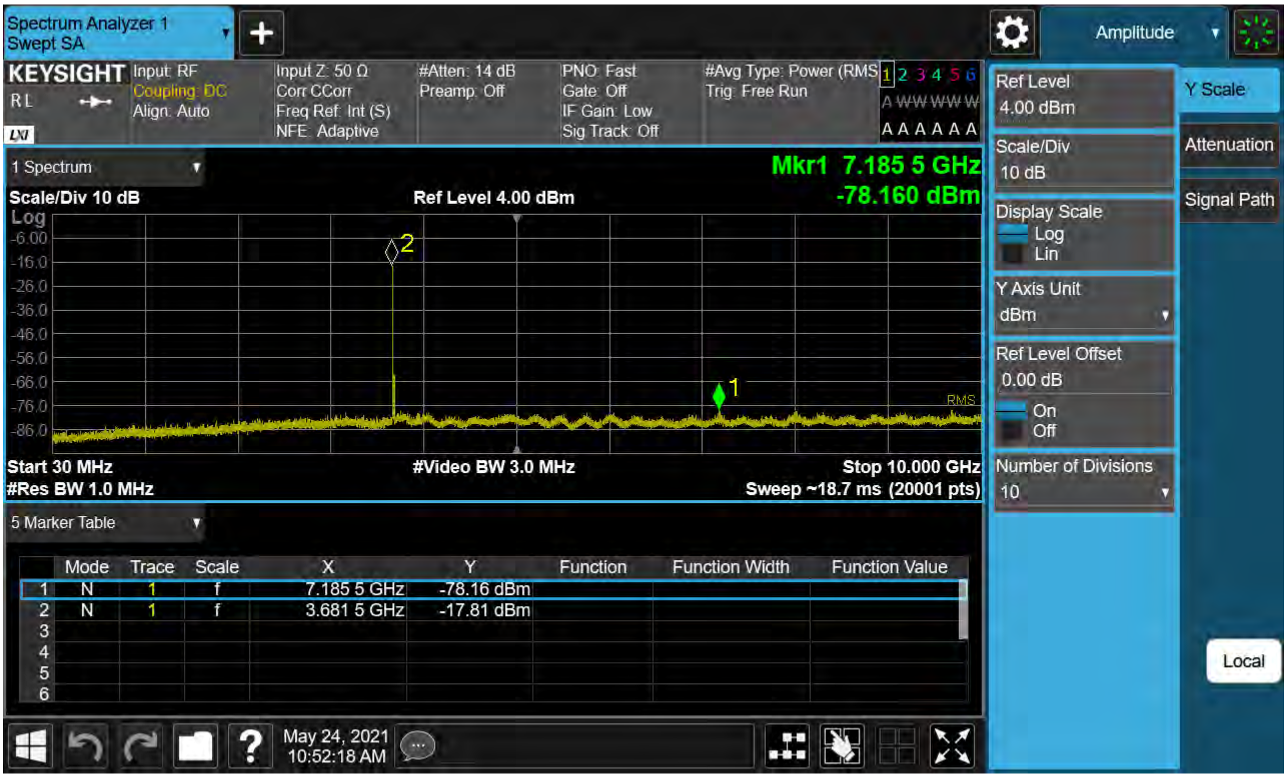


	Mode	Trace	Scale	X	Y	Function	Function Width	Function Value
1	N	1	f	9.716 4 GHz	-78.18 dBm			
2	N	1	f	3.616 2 GHz	-17.76 dBm			
3								
4								
5								
6								

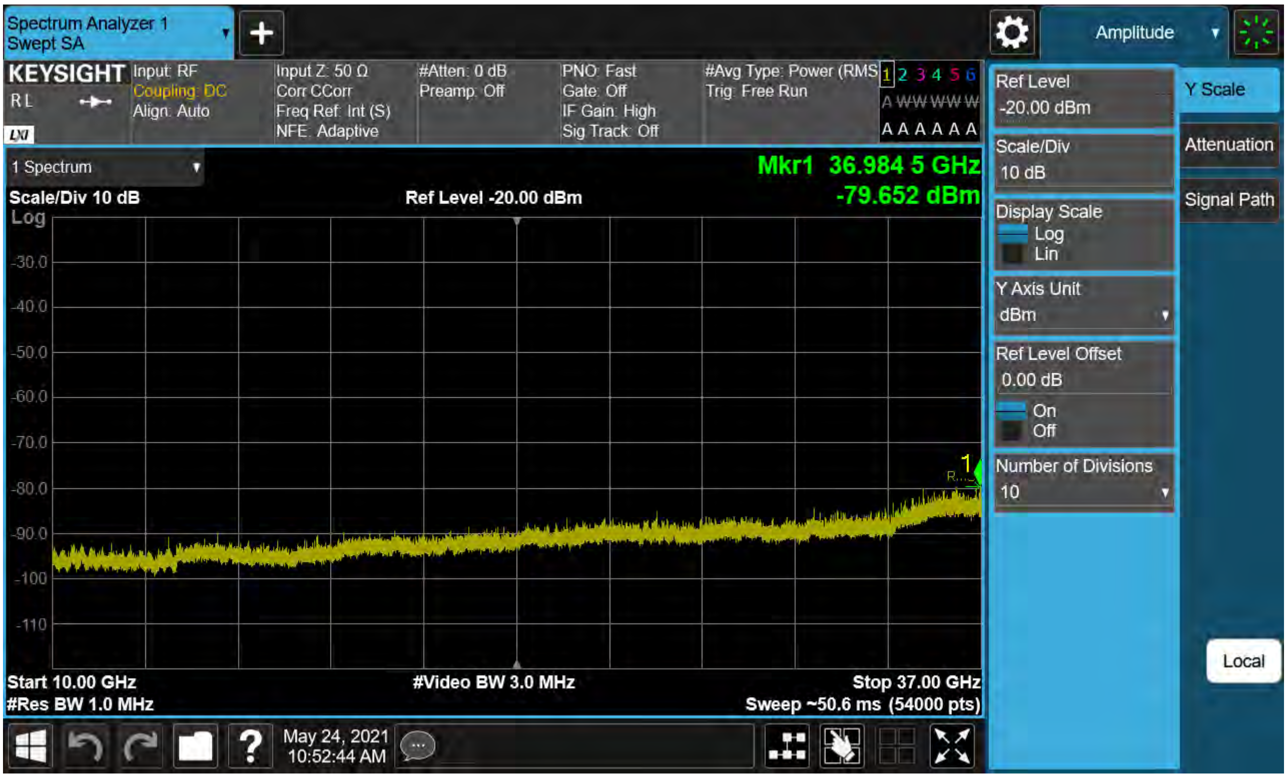
Sub6 n48. Conducted Spurious Plot 2 (20 MHz Ch. 641666 BPSK RB 1, Offset 0)



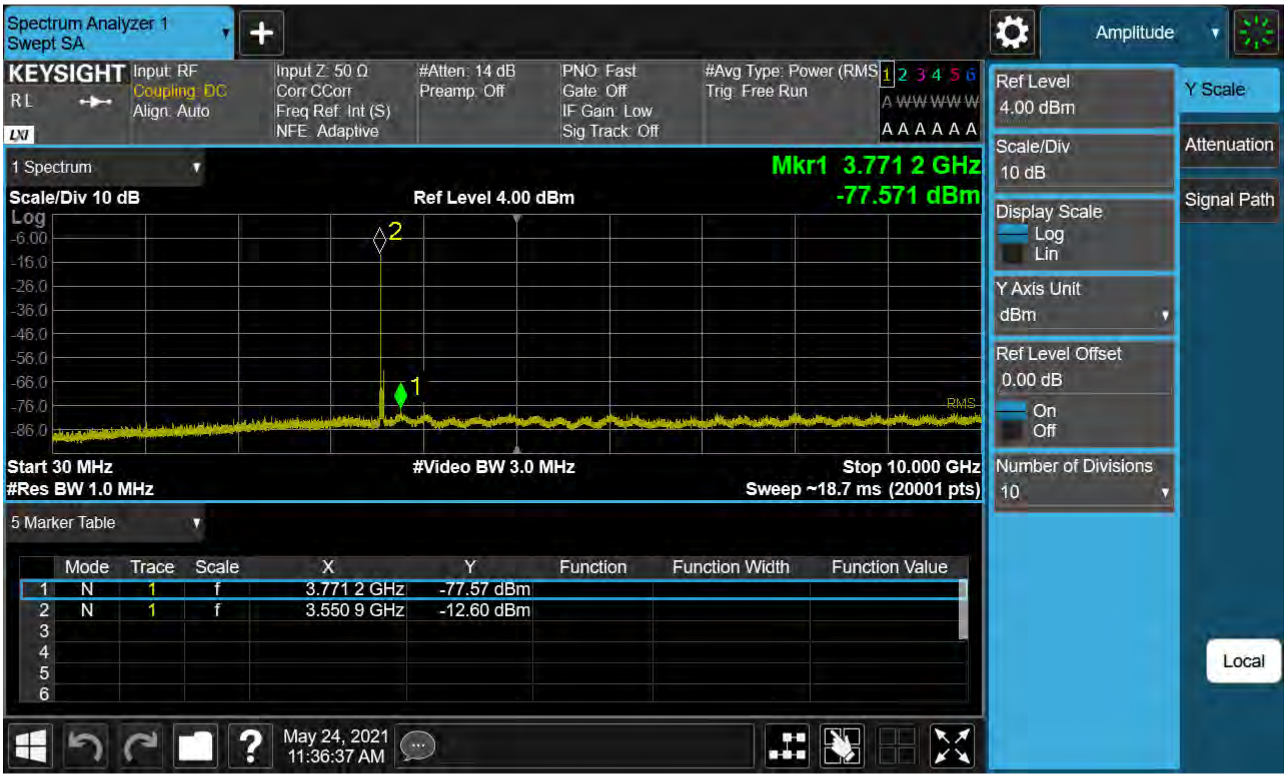
Sub6 n48. Conducted Spurious Plot 1 (20 MHz Ch. 646000 BPSK RB 1, Offset 0)



Sub6 n48. Conducted Spurious Plot 2 (20 MHz Ch. 646000 BPSK RB 1, Offset 0)



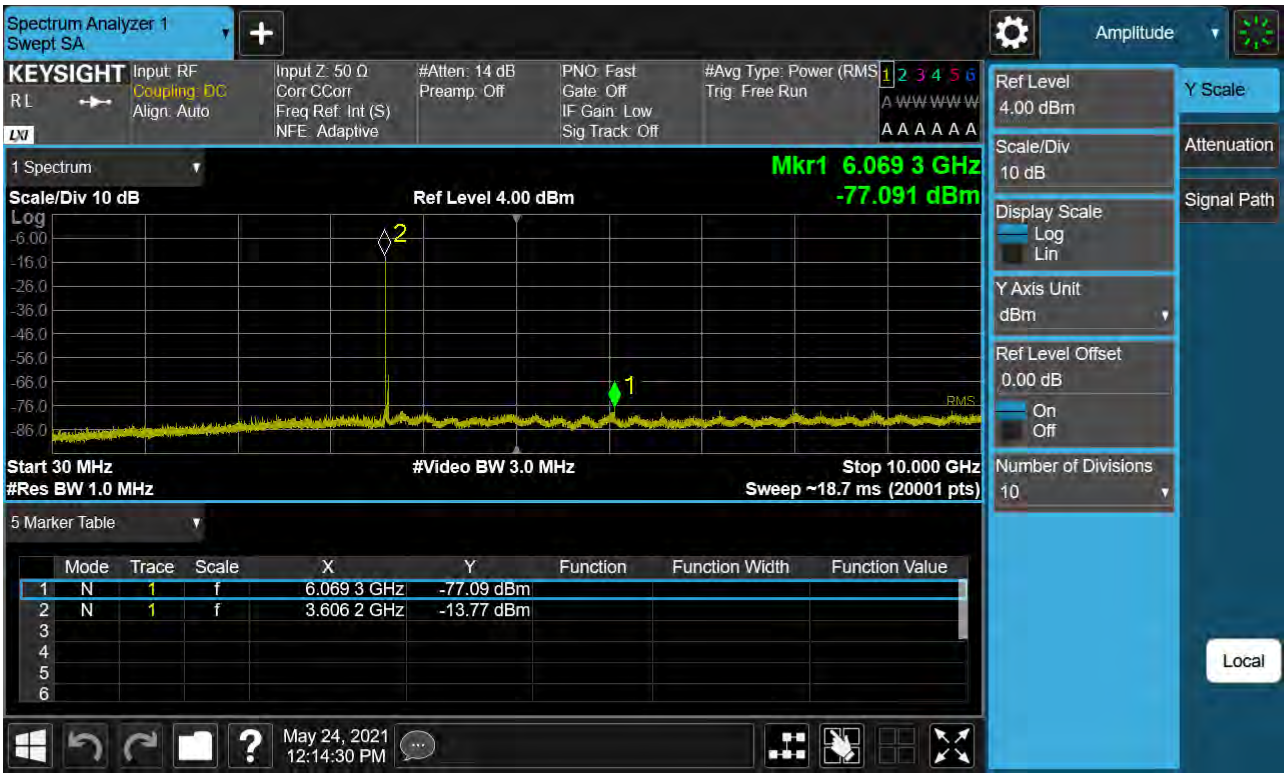
Sub6 n48. Conducted Spurious Plot 1 (40 MHz Ch. 638000 BPSK RB 1, Offset 0)



	Mode	Trace	Scale	X	Y	Function	Function Width	Function Value
1	N	1	f	3.771 2 GHz	-77.57 dBm			
2	N	1	f	3.550 9 GHz	-12.60 dBm			
3								
4								
5								
6								

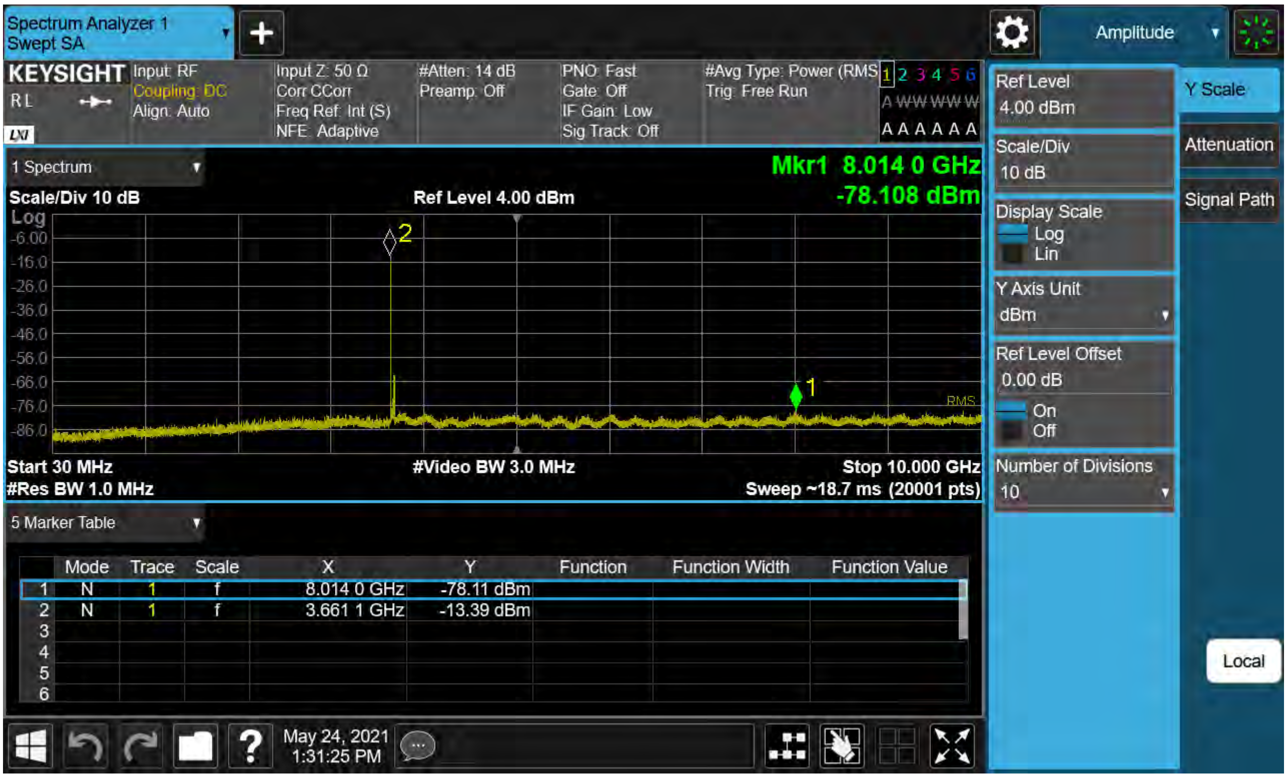
Sub6 n48. Conducted Spurious Plot 2 (40 MHz Ch. 638000 BPSK RB 1, Offset 0)

Sub6 n48. Conducted Spurious Plot 1 (40 MHz Ch. 641666 BPSK RB 1, Offset 0)

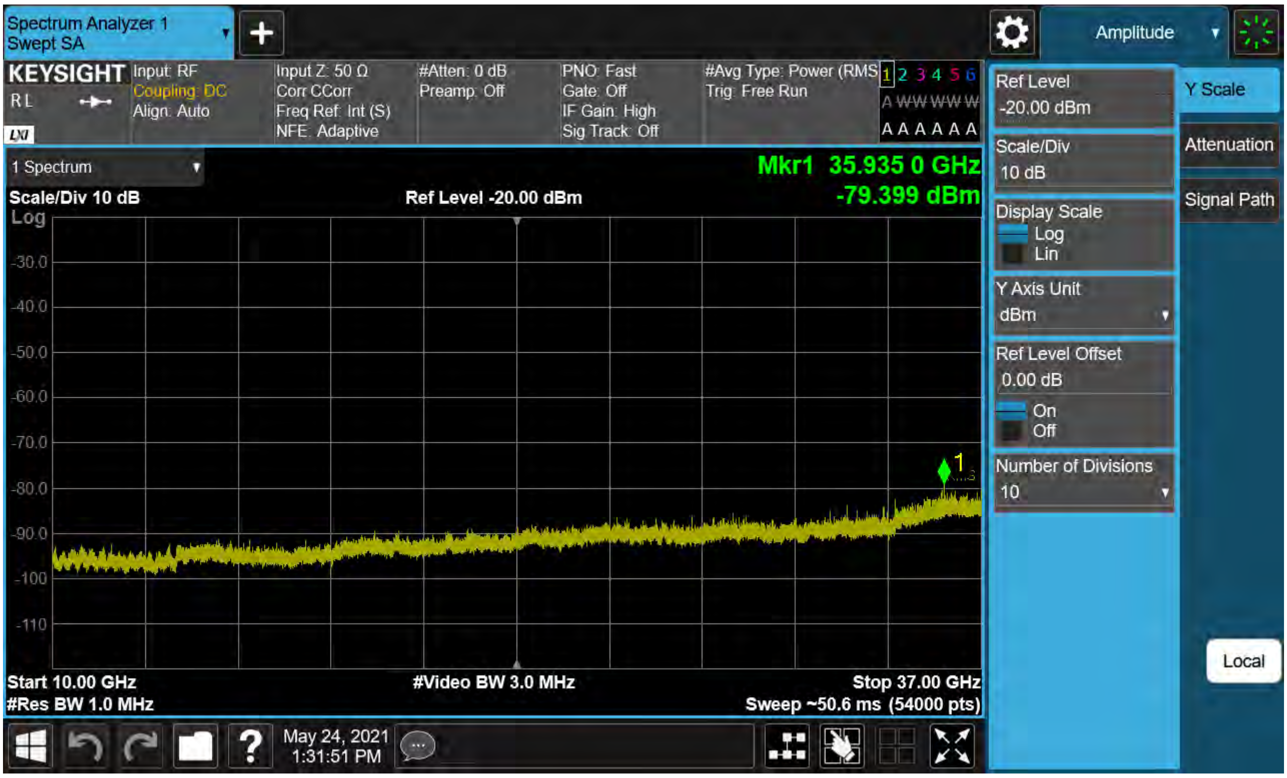


Sub6 n48. Conducted Spurious Plot 2 (40 MHz Ch. 641666 BPSK RB 1, Offset 0)

Sub6 n48. Conducted Spurious Plot 1 (40 MHz Ch. 645332 BPSK RB 1, Offset 0)



Sub6 n48. Conducted Spurious Plot 2 (40 MHz Ch. 645332 BPSK RB 1, Offset 0)



10. ANNEX A_ TEST SETUP PHOTO

Please refer to test setup photo file no. as follows;

No.	Description
1	HCT-RF-2206-FC039-P