74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA
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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:
June 15, 2021
Location:
HCT CO., LTD.,
74, Seoicheon-ro 578beon-gil, Majang-myeon,
Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA
Report No.: HCT-RF-2105-FC005-R1

FCC ID: **A3LSMG990U**

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

Model(s):	SM-G990U
Additional Model(s):	SM-G990U1/DS, SM-G990U1
EUT Type:	Mobile Phone
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part(s):	§24, §2

Mode (MHz)	Tx Frequency (MHz)	Emission Designator	Modulation	EIRP	
				Max. Power (W)	Max. Power (dBm)
Sub6 n25(2) (5)	1852.5 - 1912.5	4M50G7D	PI/2 BPSK	0.158	21.98
		4M50G7D	QPSK	0.157	21.97
		4M50W7D	16QAM	0.129	21.10
		4M50W7D	64QAM	0.084	19.26
		4M50W7D	256QAM	0.054	17.33
Sub6 n25(2) (10)	1855.0 - 1910.0	8M96G7D	PI/2 BPSK	0.164	22.15
		8M95G7D	QPSK	0.161	22.06
		8M94W7D	16QAM	0.135	21.31
		8M96W7D	64QAM	0.087	19.38
		8M97W7D	256QAM	0.055	17.43
Sub6 n25(2) (15)	1857.5 - 1907.5	13M5G7D	PI/2 BPSK	0.154	21.87
		13M5G7D	QPSK	0.151	21.80
		13M5W7D	16QAM	0.126	21.00
		13M5W7D	64QAM	0.082	19.16
		13M5W7D	256QAM	0.052	17.19
Sub6 n25(2) (20)	1860.0 - 1905.0	17M9G7D	PI/2 BPSK	0.150	21.77
		17M9G7D	QPSK	0.152	21.82
		17M9W7D	16QAM	0.121	20.84
		17M9W7D	64QAM	0.077	18.89
		17M8W7D	256QAM	0.050	17.03
Sub6 n25(2) (30)	1865.0 – 1900.0	28M6G7D	PI/2 BPSK	0.151	21.79
		28M8G7D	QPSK	0.149	21.74
		28M6W7D	16QAM	0.125	20.97
		28M5W7D	64QAM	0.085	19.27
		28M7W7D	256QAM	0.052	17.15
Sub6 n25(2) (40)	1870.0 – 1895.0	38M5G7D	PI/2 BPSK	0.145	21.62
		38M6G7D	QPSK	0.143	21.54
		38M6W7D	16QAM	0.119	20.75
		38M5W7D	64QAM	0.080	19.04
		38M6W7D	256QAM	0.048	16.82

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 : 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-2105-FC005	May 26, 2021	- First Approval Report
HCT-RF-2105-FC005-R1	June 15, 2021	- Revised the Additional model(s). (SM-G990U1 added)

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

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:	Certification
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part(s):	§24, §2
EUT Type:	Mobile Phone
Model(s):	SM-G990U
Additional Model(s):	SM-G990U1/DS, SM-G990U1
SCS(kHz):	15
Bandwidth(MHz):	5, 10, 15, 20, 30, 40
Waveform:	CP-OFDM, DFT-S-OFDM
Modulation:	DFT-S-OFDM: PI/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-OFDM: QPSK, 16QAM, 64QAM, 256QAM
Tx Frequency:	1852.5 MHz – 1912.5 MHz (Sub6 n25(2) (5 MHz)) 1855.0 MHz – 1910.0 MHz (Sub6 n25(2) (10 MHz)) 1857.5 MHz – 1907.5 MHz (Sub6 n25(2) (15 MHz)) 1860.0 MHz – 1905.0 MHz (Sub6 n25(2) (20 MHz)) 1865.0 MHz – 1900.0 MHz (Sub6 n25(2) (30 MHz)) 1870.0 MHz – 1895.0 MHz (Sub6 n25(2) (40 MHz))
Date(s) of Tests:	April 13, 2021 ~ May 25, 2021
Serial number:	Radiated: R3CR315YMXB Conducted: R3CR3117F6L

2. INTRODUCTION

2.1. DESCRIPTION OF EUT

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

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

2.2. MEASURING INSTRUMENT CALIBRATION

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

2.3. TEST FACILITY

The Fully-anechoic chamber and conducted measurement facility used to collect the radiated data are located at the **74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA.**

3. DESCRIPTION OF TESTS

3.1 TEST PROCEDURE

Test Description	Test Procedure Used
Occupied Bandwidth	- KDB 971168 D01 v03r01 – Section 4.3 - ANSI C63.26-2015 – Section 5.4.4
Band Edge	- KDB 971168 D01 v03r01 – Section 6.0 - ANSI C63.26-2015 – Section 5.7
Spurious and Harmonic Emissions at Antenna Terminal	- KDB 971168 D01 v03r01 – Section 6.0 - ANSI C63.26-2015 – Section 5.7
Conducted Output Power	- N/A (See SAR Report)
Peak- to- Average Ratio	- KDB 971168 D01 v03r01 – Section 5.7 - ANSI C63.26-2015 – Section 5.2.3.4 - ANSI C63.26-2015 – Section 5.2.6(only GSM)
Frequency stability	- ANSI C63.26-2015 – Section 5.6
Effective Radiated Power/ Effective Isotropic Radiated Power	- KDB 971168 D01 v03r01 – Section 5.2 & 5.8 - ANSI/TIA-603-E-2016 – Section 2.2.17
Radiated Spurious and Harmonic Emissions	- KDB 971168 D01 v03r01 – Section 6.2 - ANSI/TIA-603-E-2016 – Section 2.2.12

3.2 RADIATED POWER

Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

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

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW ≥ 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;

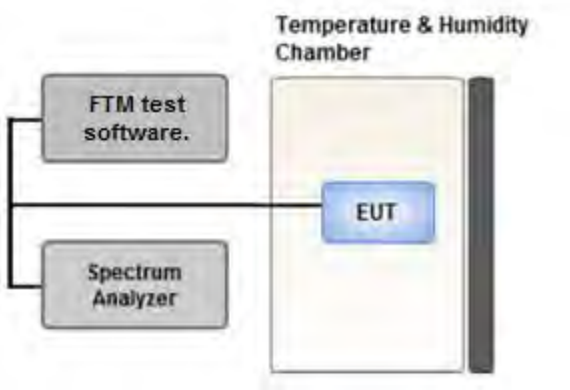
$$Result_{(dBm)} = Pg_{(dBm)} – cable\ loss_{(dB)} + antenna\ gain_{(dBi)}$$

   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)

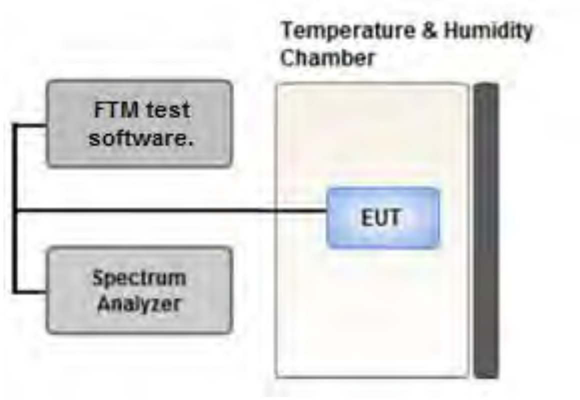
The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW ≥ 3 × RBW.

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.

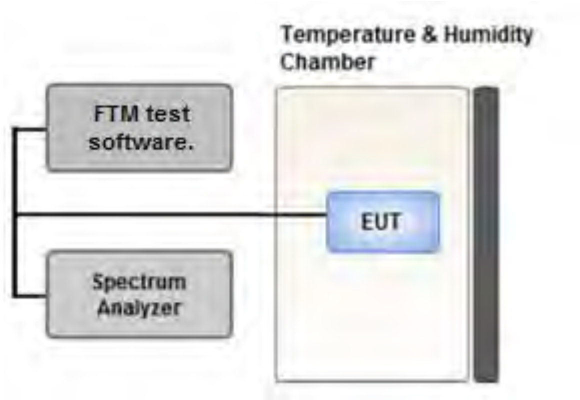
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

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

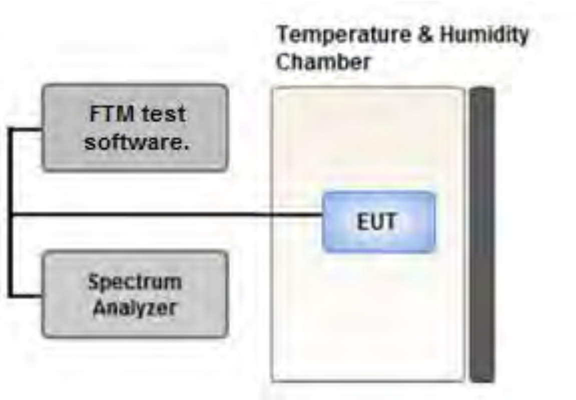
Test Overview

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 = Average
5. Sweep time = auto
6. Number of points in sweep ≥ 2 * 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

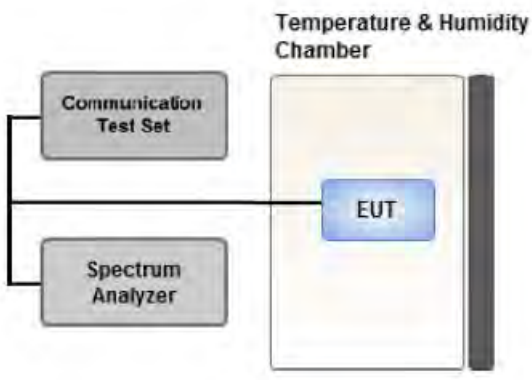
Test Notes

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)
- BAND 25 (1850 – 1915 MHz) overlaps the entire frequency range of BAND 2 (1850 - 1910 MHz) and they have the same Tune-up power. Therefore, test data provided in this report covers BAND 2 as well as BAND 25.
- The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
- All modes of operation were investigated and the worst case configuration results are reported.
  Mode: SA, NSA
  Worst case: NSA
- Radiated Spurious emissions are measured while operating in EN-DC mode with Sub 6 NR carrier as well as an LTE carrier (anchor).
  All EN-DC mode of operation were investigated and the worst case configuration results are reported.
  (Worst case: 12A-n25A(BW 10MHz))
- 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	Y
Radiated Spurious and Harmonic Emissions	QPSK	1	1	X

3.10 WORST CASE(CONDUCTED TEST)

- Waveform : All Waveform of operation were investigated and the worst case configuration results are reported.
  (Worst case: DFT-S-OFDM)
- Modulation : All Modulation of operation were investigated and the worst case configuration results are reported.
  (Worst case: PI/2 BPSK)
- BAND 25 (1850 – 1915 MHz) overlaps the entire frequency range of BAND 2 (1850 - 1910 MHz) and they have the same Tune-up power. Therefore, test data provided in this report covers BAND 2 as well as BAND 25.
- All modes of operation were investigated and the worst case configuration results are reported.
  Mode: SA, NSA
  Worst case: NSA
- All RB sizes, offsets of operation were investigated and the worst case configuration results are reported.
  Please refer to the table below.
- SM-G990U & additional models were tested and the worst case results are reported. (Worst case : SM-G990U)

[Worst case]

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

4. LIST OF TEST EQUIPMENT

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

Note:

1. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.
2. 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, §24.238(a)	< 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	§24.232(d)	< 13 dB	PASS
Frequency stability / variation of ambient temperature	§24.235	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	§24.232(c)	< 2 Watts max. EIRP	PASS
Radiated Spurious and Harmonic Emissions	§2.1053, §24.238(a)	< 43 + 10log10 (P[Watts]) for all out-of band emissions	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
20175	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)

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	Limit	EIRP	
								W	W	dBm
1852.5	Sub6 n25(2)/ 5 MHz [15 kHz]	PI/2 BPSK	-19.30	12.57	10.10	1.93	H	< 2.00	0.119	20.74
		QPSK	-19.42	12.45	10.10	1.93	H		0.115	20.62
		16-QAM	-20.31	11.56	10.10	1.93	H		0.094	19.73
		64-QAM	-21.95	9.92	10.10	1.93	H		0.064	18.09
		256-QAM	-23.92	7.95	10.10	1.93	H		0.041	16.12
1882.5		PI/2 BPSK	-18.62	13.24	9.98	1.97	H		0.133	21.25
		QPSK	-18.70	13.16	9.98	1.97	H		0.131	21.17
		16-QAM	-19.44	12.42	9.98	1.97	H		0.110	20.43
		64-QAM	-21.39	10.47	9.98	1.97	H		0.071	18.48
		256-QAM	-23.35	8.51	9.98	1.97	H		0.045	16.52
1912.5		PI/2 BPSK	-18.28	14.08	9.88	1.98	H		0.158	21.98
		QPSK	-18.29	14.07	9.88	1.98	H		0.157	21.97
		16-QAM	-19.16	13.20	9.88	1.98	H		0.129	21.10
		64-QAM	-21.00	11.36	9.88	1.98	H		0.084	19.26
		256-QAM	-22.93	9.43	9.88	1.98	H		0.054	17.33

Freq (MHz)	Mod/ Bandwidth [SCS (kHz)]	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1855.0	Sub6 n25(2)/ 10 MHz [15 kHz]	PI/2 BPSK	-19.38	12.61	10.08	1.94	H	< 2.00	0.119	20.76
		QPSK	-19.42	12.57	10.08	1.94	H		0.118	20.72
		16-QAM	-20.26	11.73	10.08	1.94	H		0.097	19.88
		64-QAM	-22.00	9.99	10.08	1.94	H		0.065	18.14
		256-QAM	-24.05	7.94	10.08	1.94	H		0.041	16.09
1882.5		PI/2 BPSK	-18.73	13.13	9.98	1.97	H		0.130	21.14
		QPSK	-18.77	13.09	9.98	1.97	H		0.129	21.10
		16-QAM	-19.50	12.36	9.98	1.97	H		0.109	20.37
		64-QAM	-21.37	10.49	9.98	1.97	H		0.071	18.50
		256-QAM	-23.38	8.48	9.98	1.97	H		0.045	16.49
1910.0		PI/2 BPSK	-18.11	14.23	9.89	1.98	H		0.164	22.15
		QPSK	-18.20	14.14	9.89	1.98	H		0.161	22.06
		16-QAM	-18.95	13.39	9.89	1.98	H		0.135	21.31
		64-QAM	-20.88	11.46	9.89	1.98	H		0.087	19.38
		256-QAM	-22.83	9.51	9.89	1.98	H		0.055	17.43

Freq (MHz)	Mod/ Bandwidth [SCS (kHz)]	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1857.5	Sub6 n25(2)/ 15 MHz [15 kHz]	PI/2 BPSK	-19.25	12.85	10.06	1.94	H	< 2.00	0.125	20.97
		QPSK	-19.27	12.83	10.06	1.94	H		0.124	20.95
		16-QAM	-20.15	11.95	10.06	1.94	H		0.102	20.07
		64-QAM	-21.84	10.26	10.06	1.94	H		0.069	18.38
		256-QAM	-23.95	8.15	10.06	1.94	H		0.042	16.27
1882.5		PI/2 BPSK	-18.70	13.16	9.98	1.97	H		0.131	21.17
		QPSK	-18.75	13.11	9.98	1.97	H		0.129	21.12
		16-QAM	-19.58	12.28	9.98	1.97	H		0.107	20.29
		64-QAM	-21.40	10.46	9.98	1.97	H		0.070	18.47
		256-QAM	-23.37	8.49	9.98	1.97	H		0.045	16.50
1907.5		PI/2 BPSK	-18.38	13.94	9.90	1.97	H		0.154	21.87
		QPSK	-18.45	13.87	9.90	1.97	H		0.151	21.80
		16-QAM	-19.25	13.07	9.90	1.97	H		0.126	21.00
		64-QAM	-21.09	11.23	9.90	1.97	H		0.082	19.16
		256-QAM	-23.06	9.26	9.90	1.97	H		0.052	17.19

Freq (MHz)	Mod/ Bandwidth [SCS (kHz)]	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1860.0	Sub6 n25(2)/ 20 MHz [15 kHz]	PI/2 BPSK	-19.31	12.79	10.06	1.94	H	< 2.00	0.123	20.91
		QPSK	-19.33	12.77	10.06	1.94	H		0.123	20.89
		16-QAM	-20.20	11.90	10.06	1.94	H		0.100	20.02
		64-QAM	-21.93	10.17	10.06	1.94	H		0.067	18.29
		256-QAM	-23.99	8.11	10.06	1.94	H		0.042	16.23
1882.5		PI/2 BPSK	-18.95	13.13	9.98	1.97	H		0.130	21.14
		QPSK	-19.01	13.07	9.98	1.97	H		0.128	21.08
		16-QAM	-19.73	12.35	9.98	1.97	H		0.109	20.36
		64-QAM	-21.58	10.50	9.98	1.97	H		0.071	18.51
		256-QAM	-23.50	8.58	9.98	1.97	H		0.046	16.59
1905.0		PI/2 BPSK	-18.47	13.85	9.89	1.98	H		0.150	21.77
		QPSK	-18.42	13.90	9.89	1.98	H		0.152	21.82
		16-QAM	-19.40	12.92	9.89	1.98	H		0.121	20.84
		64-QAM	-21.35	10.97	9.89	1.98	H		0.077	18.89
		256-QAM	-23.21	9.11	9.89	1.98	H		0.050	17.03

Freq (MHz)	Mod/ Bandwidth [SCS (kHz)]	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1865.0	Sub6 n25(2)/ 30 MHz [15 kHz]	PI/2 BPSK	-19.88	12.23	10.04	1.95	H	< 2.00	0.108	20.32
		QPSK	-19.98	12.13	10.04	1.95	H		0.105	20.22
		16-QAM	-20.92	11.19	10.04	1.95	H		0.085	19.28
		64-QAM	-22.63	9.48	10.04	1.95	H		0.057	17.57
		256-QAM	-24.82	7.29	10.04	1.95	H		0.035	15.38
1882.5		PI/2 BPSK	-19.04	13.04	9.98	1.97	H		0.127	21.05
		QPSK	-19.19	12.89	9.98	1.97	H		0.123	20.90
		16-QAM	-19.89	12.19	9.98	1.97	H		0.105	20.20
		64-QAM	-21.68	10.40	9.98	1.97	H		0.069	18.41
		256-QAM	-23.80	8.28	9.98	1.97	H		0.043	16.29
1900.0		PI/2 BPSK	-18.74	13.86	9.90	1.97	H		0.151	21.79
		QPSK	-18.79	13.81	9.90	1.97	H		0.149	21.74
		16-QAM	-19.56	13.04	9.90	1.97	H		0.125	20.97
		64-QAM	-21.26	11.34	9.90	1.97	H		0.085	19.27
		256-QAM	-23.38	9.22	9.90	1.97	H		0.052	17.15

Freq (MHz)	Mod/ Bandwidth [SCS (kHz)]	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1870.0	Sub6 n25(2)/ 40 MHz [15 kHz]	PI/2 BPSK	-19.97	12.16	10.02	1.96	H	< 2.00	0.105	20.22
		QPSK	-20.16	11.97	10.02	1.96	H		0.101	20.03
		16-QAM	-20.91	11.22	10.02	1.96	H		0.085	19.28
		64-QAM	-22.57	9.56	10.02	1.96	H		0.058	17.62
		256-QAM	-24.76	7.37	10.02	1.96	H		0.035	15.43
1882.5		PI/2 BPSK	-19.59	12.49	9.98	1.97	H		0.112	20.50
		QPSK	-19.63	12.45	9.98	1.97	H		0.111	20.46
		16-QAM	-20.37	11.71	9.98	1.97	H		0.094	19.72
		64-QAM	-21.97	10.11	9.98	1.97	H		0.065	18.12
		256-QAM	-24.23	7.85	9.98	1.97	H		0.039	15.86
1895.0		PI/2 BPSK	-18.81	13.67	9.92	1.97	H		0.145	21.62
		QPSK	-18.89	13.59	9.92	1.97	H		0.143	21.54
		16-QAM	-19.68	12.80	9.92	1.97	H		0.119	20.75
		64-QAM	-21.39	11.09	9.92	1.97	H		0.080	19.04
		256-QAM	-23.61	8.87	9.92	1.97	H		0.048	16.82

8.2 RADIATED SPURIOUS EMISSIONS

- ▣ NR Band: N25(2)
- ▣ LTE Band(Anchor): B12
- ▣ Bandwidth: 10 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)
371000 (1855.0)	3 710.00	-57.26	11.70	-60.21	2.82	H	-51.33	-13.00
	5 565.00	-59.42	12.07	-56.36	3.51	H	-47.80	-13.00
	7 420.00	-62.97	11.28	-50.54	4.11	H	-43.37	-13.00
	9 275.00	-61.74	11.30	-48.85	4.67	H	-42.22	-13.00
	11 130.00	-63.84	12.30	-47.25	5.02	H	-39.97	-13.00
376500 (1882.5)	3 765.00	-58.98	11.61	-61.87	2.86	H	-53.11	-13.00
	5 647.50	-60.95	12.00	-57.64	3.55	H	-49.19	-13.00
	7 530.00	-62.49	11.56	-50.56	4.15	H	-43.15	-13.00
	9 412.50	-60.98	11.20	-47.87	4.66	H	-41.33	-13.00
	11 295.00	-63.28	12.11	-46.62	5.16	H	-39.66	-13.00
382000 (1910.0)	3 820.00	-58.75	11.32	-60.86	2.88	H	-52.42	-13.00
	5 730.00	-59.23	11.74	-55.18	3.57	H	-47.01	-13.00
	7 640.00	-61.60	11.60	-49.91	4.19	H	-42.50	-13.00
	9 550.00	-60.00	11.32	-46.90	4.75	H	-40.33	-13.00
	11 460.00	-62.20	12.30	-45.24	5.17	H	-38.11	-13.00

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit (dBm)
23095 (707.5)	1,415.00	-54.75	7.61	-62.54	1.69	H	-56.62	-13.00
	2,122.50	-56.83	8.98	-63.89	2.09	H	-57.00	-13.00
	2,830.00	-57.46	10.52	-62.43	2.43	H	-54.34	-13.00

8.3 PEAK-TO-AVERAGE RATIO

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (dB)
Sub6 n25(2)	5 MHz	1882.5	BPSK	25	0	3.99
			QPSK			5.68
			16-QAM			6.32
			64-QAM			6.65
			256-QAM			6.57
	10 MHz		BPSK	50		4.07
			QPSK			5.52
			16-QAM			6.41
			64-QAM			6.76
			256-QAM			6.52
	15 MHz		BPSK	75		4.11
			QPSK			5.55
			16-QAM			6.41
			64-QAM			6.56
			256-QAM			6.72
	20 MHz		BPSK	100		4.10
			QPSK			5.49
			16-QAM			6.35
			64-QAM			6.57
			256-QAM			6.65

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (dB)
Sub6 n25(2)	30 MHz	1882.5	BPSK	160	0	4.15
			QPSK			5.62
			16-QAM			6.59
			64-QAM			6.76
			256-QAM			6.81
	40 MHz		BPSK	216		4.37
			QPSK			5.73
			16-QAM			6.54
			64-QAM			6.83
			256-QAM			6.84

Note:

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

8.4 OCCUPIED BANDWIDTH

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
Sub6 n25(2)	5 MHz	1882.5	BPSK	25	0	4.5017
			QPSK			4.4997
			16-QAM			4.4956
			64-QAM			4.5007
			256-QAM			4.4971
	10 MHz		BPSK	50		8.9635
			QPSK			8.9466
			16-QAM			8.9407
			64-QAM			8.9625
			256-QAM			8.9685
	15 MHz		BPSK	75		13.458
			QPSK			13.448
			16-QAM			13.480
			64-QAM			13.474
			256-QAM			13.505
	20 MHz		BPSK	100		17.861
			QPSK			17.927
			16-QAM			17.886
			64-QAM			17.872
			256-QAM			17.834

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
Sub6 n25(2)	30 MHz	1882.5	BPSK	160	0	28.563
			QPSK			28.773
			16-QAM			28.615
			64-QAM			28.534
			256-QAM			28.666
	40 MHz		BPSK	216		38.477
			QPSK			38.597
			16-QAM			38.555
			64-QAM			38.481
			256-QAM			38.571

Note:

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

8.5 CONDUCTED SPURIOUS EMISSIONS

Band	Band Width (MHz)	Frequency (MHz)	Frequency of Maximum Harmonic (GHz)	Factor (dB)	Measurement Maximum Data (dBm)	Result (dBm)	Limit (dBm)
Sub6 n25(2)	5	1852.5	3.8814	31.103	-65.621	-34.518	-13.00
		1882.5	3.8166	31.103	-65.258	-34.155	
		1912.5	3.8655	31.103	-65.441	-34.338	
	10	1855.0	3.8390	31.103	-65.222	-34.119	
		1882.5	3.8964	31.103	-65.402	-34.299	
		1910.0	3.8131	31.103	-65.490	-34.387	
	15	1857.5	3.8460	31.103	-65.449	-34.346	
		1882.5	3.8181	31.103	-65.160	-34.057	
		1907.5	3.8346	31.103	-65.093	-33.990	
	20	1860.0	3.8999	31.103	-65.249	-34.146	
		1882.5	3.8480	31.103	-65.518	-34.415	
		1905.0	3.8435	31.103	-65.395	-34.292	
	30	1865.0	3.1790	31.103	-72.192	-41.089	
		1882.5	8.0105	31.715	-71.697	-39.982	
		1900.0	8.2503	31.715	-72.148	-40.433	
	40	1870.0	5.2014	31.715	-72.929	-41.214	
		1882.5	3.8017	31.103	-72.884	-41.781	
		1895.0	8.0314	31.715	-71.861	-40.146	

Note:

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

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

8.6 BAND EDGE

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

8.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

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

Test. Frequncy (MHz)	Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
1852.5	100%	+20(Ref)	1852 500 005	0.0	0.000 000	0.000
	100%	-30	1852 500 014	8.5	0.000 000	0.005
	100%	-20	1852 500 012	7.3	0.000 000	0.004
	100%	-10	1852 500 013	7.9	0.000 000	0.004
	100%	0	1852 500 010	4.6	0.000 000	0.002
	100%	+10	1852 500 021	15.6	0.000 001	0.008
	100%	+30	1852 500 016	10.8	0.000 001	0.006
	100%	+40	1852 500 013	8.0	0.000 000	0.004
	100%	+50	1852 500 019	13.8	0.000 001	0.007
	Batt. Endpoint	+20	1852 500 010	5.2	0.000 000	0.003
1912.5	100%	+20(Ref)	1912 500 007	0.0	0.000 000	0.000
	100%	-30	1912 500 012	5.0	0.000 000	0.003
	100%	-20	1912 500 018	11.2	0.000 001	0.006
	100%	-10	1912 500 017	10.6	0.000 001	0.006
	100%	0	1912 500 017	10.7	0.000 001	0.006
	100%	+10	1912 500 012	5.2	0.000 000	0.003
	100%	+30	1912 500 013	6.2	0.000 000	0.003
	100%	+40	1912 500 017	10.7	0.000 001	0.006
	100%	+50	1912 500 023	15.9	0.000 001	0.008
	Batt. Endpoint	+20	1912 500 016	9.1	0.000 000	0.005

▣ BandWidth: 10 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
1855.0	100%	+20(Ref)	1855 000 010	0.0	0.000 000	0.000
	100%	-30	1855 000 017	7.1	0.000 000	0.004
	100%	-20	1855 000 023	12.3	0.000 001	0.007
	100%	-10	1855 000 023	12.3	0.000 001	0.007
	100%	0	1855 000 017	6.3	0.000 000	0.003
	100%	+10	1855 000 022	11.4	0.000 001	0.006
	100%	+30	1855 000 020	9.9	0.000 001	0.005
	100%	+40	1855 000 023	13.2	0.000 001	0.007
	100%	+50	1855 000 016	6.0	0.000 000	0.003
	Batt. Endpoint	+20	1855 000 026	15.9	0.000 001	0.009
1910.0	100%	+20(Ref)	1910 000 011	0.0	0.000 000	0.000
	100%	-30	1910 000 026	14.3	0.000 001	0.007
	100%	-20	1910 000 014	3.0	0.000 000	0.002
	100%	-10	1910 000 026	14.4	0.000 001	0.008
	100%	0	1910 000 016	5.0	0.000 000	0.003
	100%	+10	1910 000 020	8.9	0.000 000	0.005
	100%	+30	1910 000 022	11.1	0.000 001	0.006
	100%	+40	1910 000 017	5.9	0.000 000	0.003
	100%	+50	1910 000 019	7.8	0.000 000	0.004
	Batt. Endpoint	+20	1910 000 021	9.4	0.000 000	0.005

▣ BandWidth: 15 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
1857.5	100%	+20(Ref)	1857 500 006	0.0	0.000 000	0.000
	100%	-30	1857 500 011	4.6	0.000 000	0.002
	100%	-20	1857 500 011	5.1	0.000 000	0.003
	100%	-10	1857 500 016	10.5	0.000 001	0.006
	100%	0	1857 500 010	4.5	0.000 000	0.002
	100%	+10	1857 500 011	4.7	0.000 000	0.003
	100%	+30	1857 500 020	13.6	0.000 001	0.007
	100%	+40	1857 500 021	14.9	0.000 001	0.008
	100%	+50	1857 500 022	15.7	0.000 001	0.008
	Batt. Endpoint	+20	1857 500 012	6.0	0.000 000	0.003
1907.5	100%	+20(Ref)	1907 500 015	0.0	0.000 000	0.000
	100%	-30	1907 500 028	13.5	0.000 001	0.007
	100%	-20	1907 500 027	12.3	0.000 001	0.006
	100%	-10	1907 500 023	7.7	0.000 000	0.004
	100%	0	1907 500 031	16.2	0.000 001	0.008
	100%	+10	1907 500 022	6.9	0.000 000	0.004
	100%	+30	1907 500 022	7.0	0.000 000	0.004
	100%	+40	1907 500 022	6.8	0.000 000	0.004
	100%	+50	1907 500 025	10.3	0.000 001	0.005
	Batt. Endpoint	+20	1907 500 030	14.7	0.000 001	0.008

▣ 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
1860.0	100%	+20(Ref)	1860 000 006	0.0	0.000 000	0.000
	100%	-30	1860 000 011	4.7	0.000 000	0.003
	100%	-20	1860 000 017	11.0	0.000 001	0.006
	100%	-10	1860 000 013	6.5	0.000 000	0.003
	100%	0	1860 000 013	7.1	0.000 000	0.004
	100%	+10	1860 000 010	3.9	0.000 000	0.002
	100%	+30	1860 000 010	4.0	0.000 000	0.002
	100%	+40	1860 000 016	9.4	0.000 001	0.005
	100%	+50	1860 000 015	8.7	0.000 000	0.005
	Batt. Endpoint	+20	1860 000 018	12.1	0.000 001	0.006
1905.0	100%	+20(Ref)	1905 000 003	0.0	0.000 000	0.000
	100%	-30	1905 000 020	16.5	0.000 001	0.009
	100%	-20	1905 000 009	5.2	0.000 000	0.003
	100%	-10	1905 000 012	8.0	0.000 000	0.004
	100%	0	1905 000 016	12.9	0.000 001	0.007
	100%	+10	1905 000 012	8.4	0.000 000	0.004
	100%	+30	1905 000 020	16.4	0.000 001	0.009
	100%	+40	1905 000 015	11.4	0.000 001	0.006
	100%	+50	1905 000 013	10.0	0.000 001	0.005
	Batt. Endpoint	+20	1905 000 009	5.8	0.000 000	0.003

▣ BandWidth: 30 MHz

▣ Voltage(100%): 3.880 VDC

▣ Batt. Endpoint: 3.650 VDC

▣ LIMIT: Emission must remain in band

Test. Frequncy (MHz)	Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
1865.0	100%	+20(Ref)	1865 000 016	0.0	0.000 000	0.000
	100%	-30	1865 000 027	10.4	0.000 001	0.006
	100%	-20	1865 000 023	6.4	0.000 000	0.003
	100%	-10	1865 000 031	14.4	0.000 001	0.008
	100%	0	1865 000 019	3.1	0.000 000	0.002
	100%	+10	1865 000 020	3.9	0.000 000	0.002
	100%	+30	1865 000 025	9.2	0.000 000	0.005
	100%	+40	1865 000 030	13.5	0.000 001	0.007
	100%	+50	1865 000 031	14.4	0.000 001	0.008
	Batt. Endpoint	+20	1865 000 022	6.1	0.000 000	0.003
1900.0	100%	+20(Ref)	1900 000 003	0.0	0.000 000	0.000
	100%	-30	1900 000 015	11.7	0.000 001	0.006
	100%	-20	1900 000 020	16.6	0.000 001	0.009
	100%	-10	1900 000 013	9.5	0.000 000	0.005
	100%	0	1900 000 008	4.3	0.000 000	0.002
	100%	+10	1900 000 008	4.7	0.000 000	0.002
	100%	+30	1900 000 020	16.6	0.000 001	0.009
	100%	+40	1900 000 007	3.5	0.000 000	0.002
	100%	+50	1900 000 011	7.9	0.000 000	0.004
	Batt. Endpoint	+20	1900 000 012	8.8	0.000 000	0.005

▣ BandWidth: 40 MHz

▣ Voltage(100%): 3.880 VDC

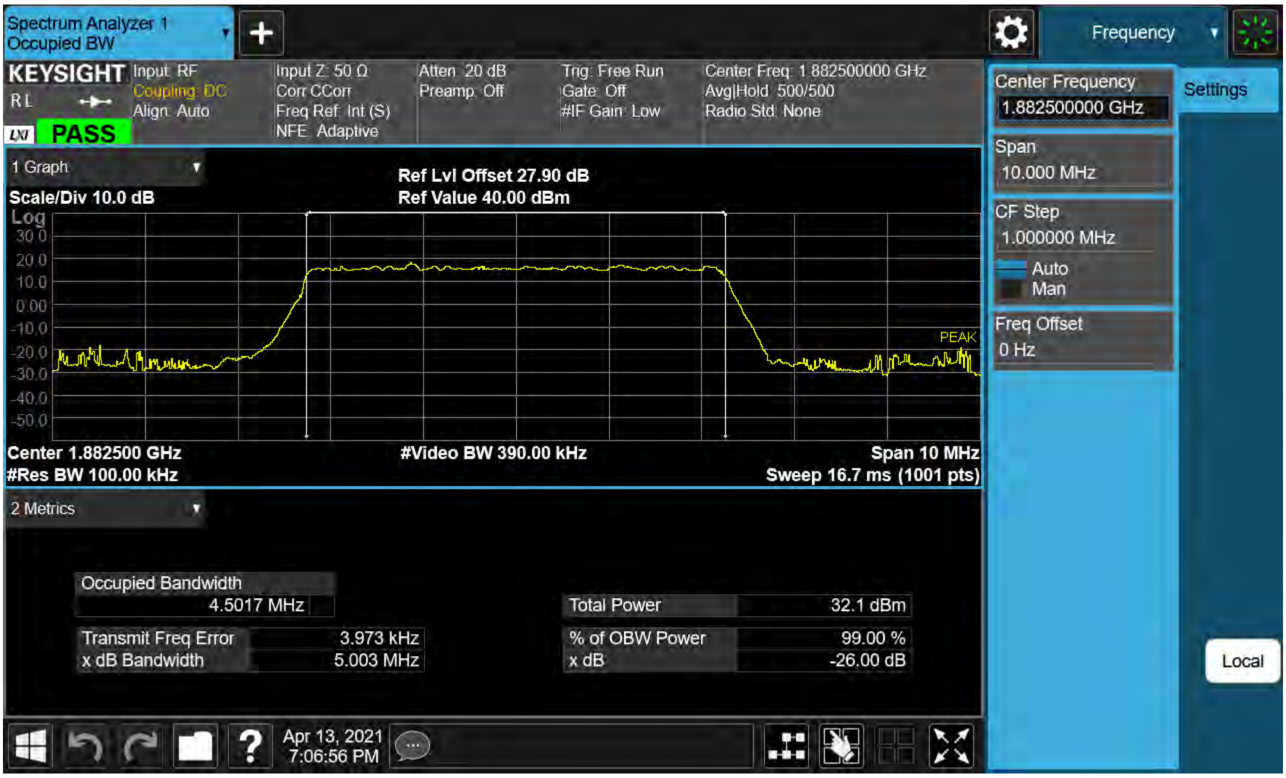
▣ Batt. Endpoint: 3.650 VDC

▣ LIMIT: Emission must remain in band

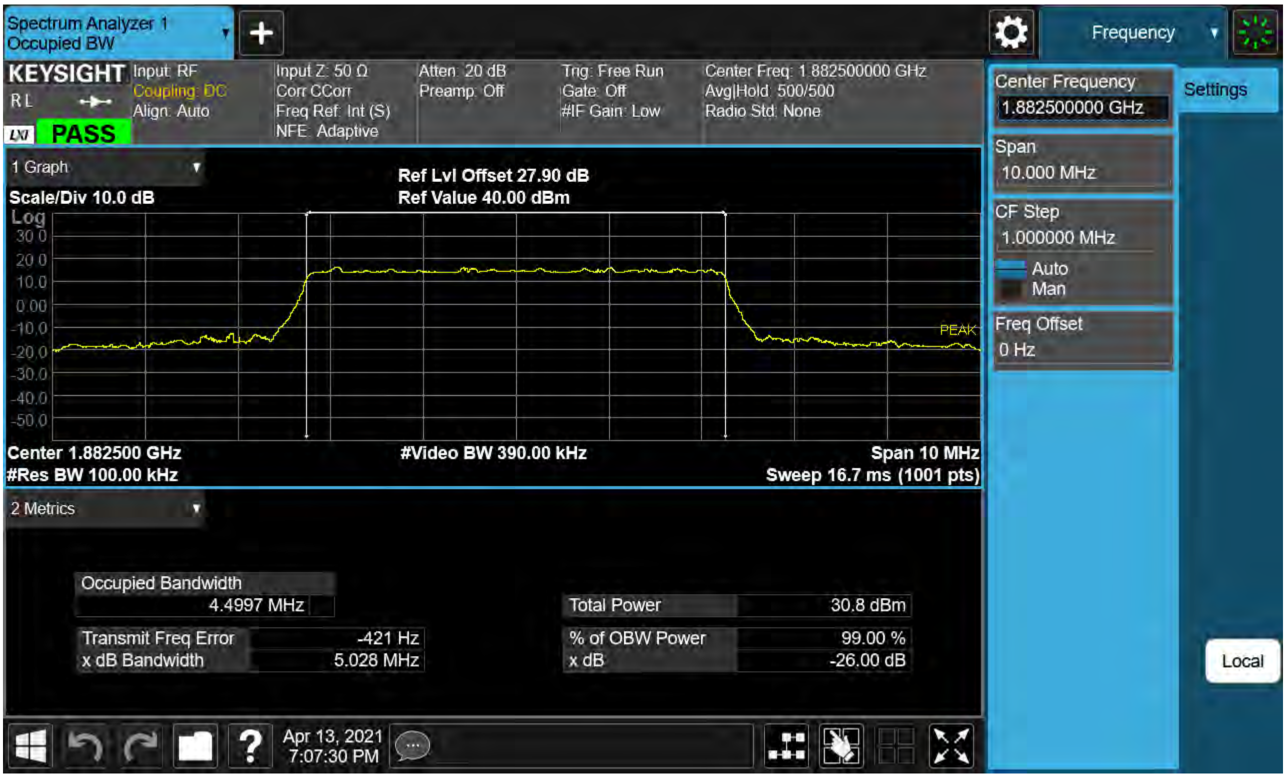
Test. Frequncy (MHz)	Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
1870.0	100%	+20(Ref)	1870 000 004	0.0	0.000 000	0.000
	100%	-30	1870 000 016	12.6	0.000 001	0.007
	100%	-20	1870 000 017	13.2	0.000 001	0.007
	100%	-10	1870 000 015	11.6	0.000 001	0.006
	100%	0	1870 000 013	9.8	0.000 001	0.005
	100%	+10	1870 000 007	3.8	0.000 000	0.002
	100%	+30	1870 000 008	4.5	0.000 000	0.002
	100%	+40	1870 000 008	4.8	0.000 000	0.003
	100%	+50	1870 000 014	10.5	0.000 001	0.006
	Batt. Endpoint	+20	1870 000 013	9.9	0.000 001	0.005
1895.0	100%	+20(Ref)	1895 000 015	0.0	0.000 000	0.000
	100%	-30	1895 000 022	7.1	0.000 000	0.004
	100%	-20	1895 000 023	8.5	0.000 000	0.004
	100%	-10	1895 000 023	7.7	0.000 000	0.004
	100%	0	1895 000 027	12.1	0.000 001	0.006
	100%	+10	1895 000 021	6.5	0.000 000	0.003
	100%	+30	1895 000 024	9.0	0.000 000	0.005
	100%	+40	1895 000 026	11.5	0.000 001	0.006
	100%	+50	1895 000 024	9.6	0.000 001	0.005
	Batt. Endpoint	+20	1895 000 025	10.4	0.000 001	0.005

9. TEST PLOTS

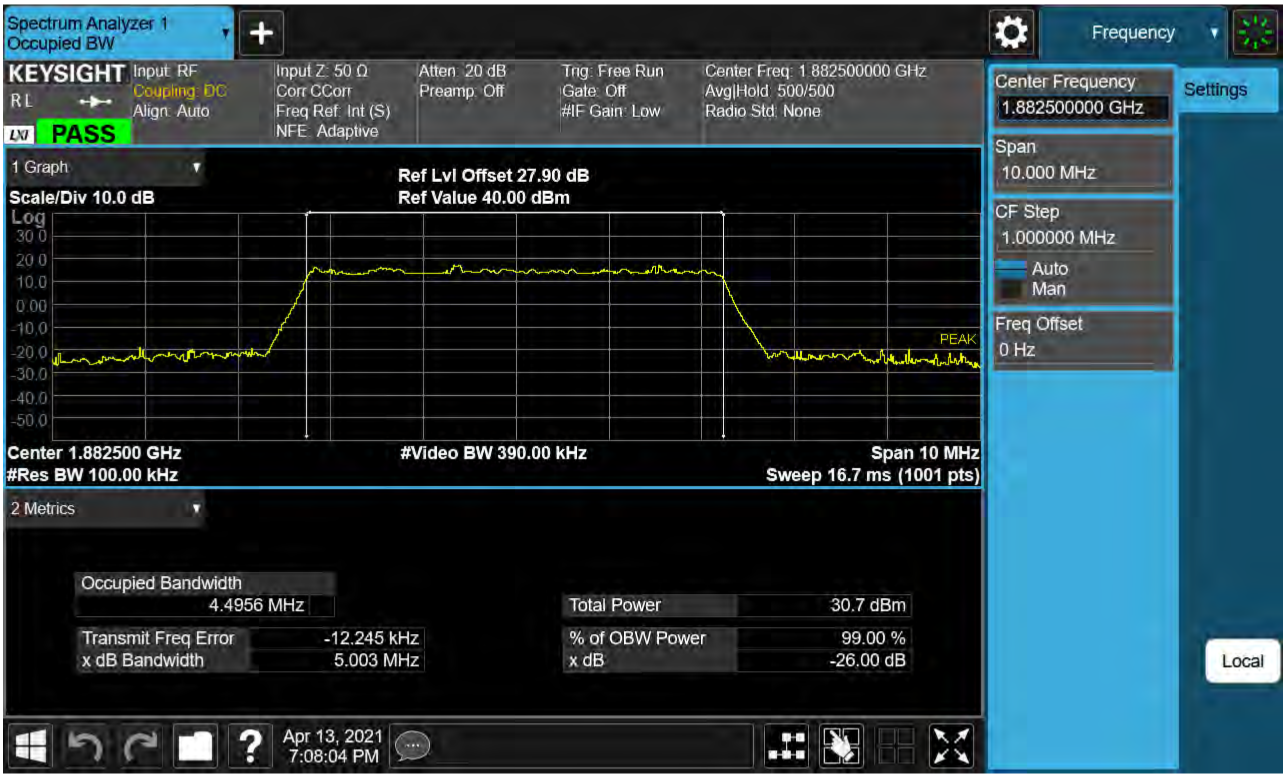
Sub6 n25(2). Occupied Bandwidth Plot (5M BW Ch.376500 BPSK_ Full RB _0)



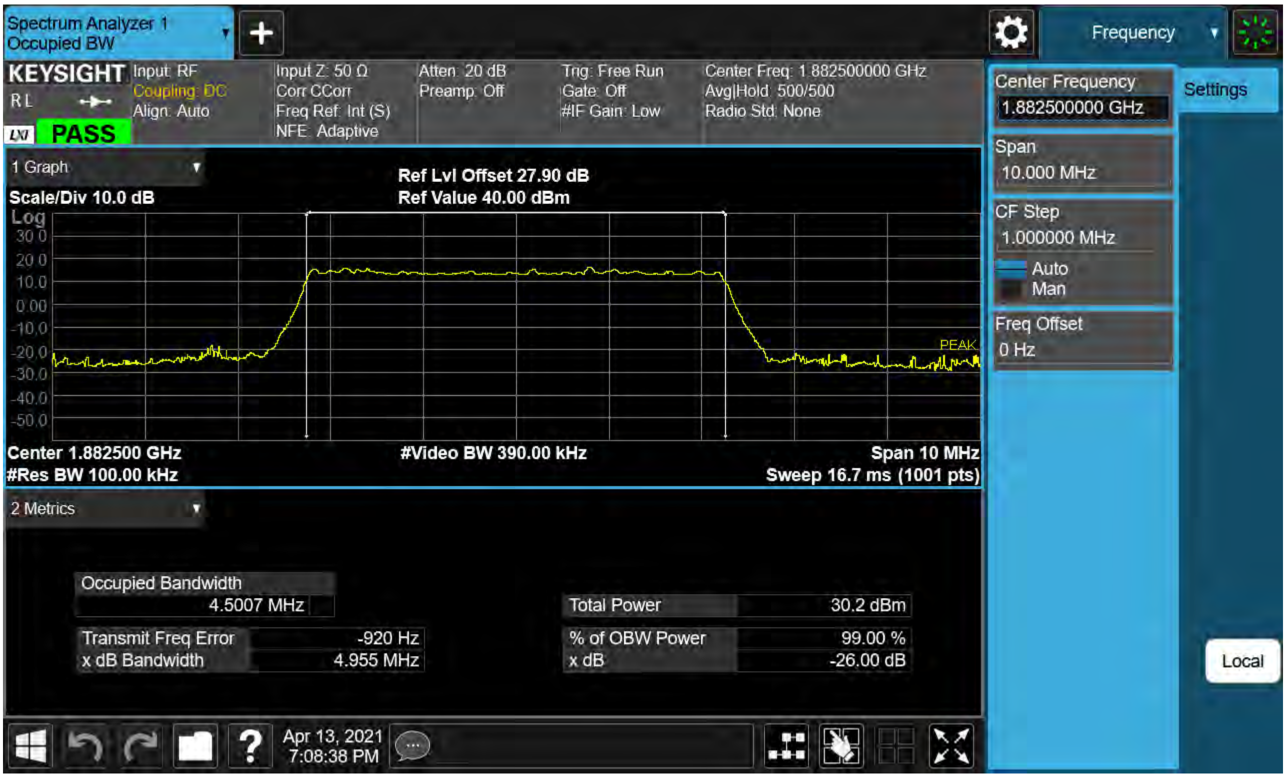
Sub6 n25(2). Occupied Bandwidth Plot (5M BW Ch.376500 QPSK_ Full RB _0)



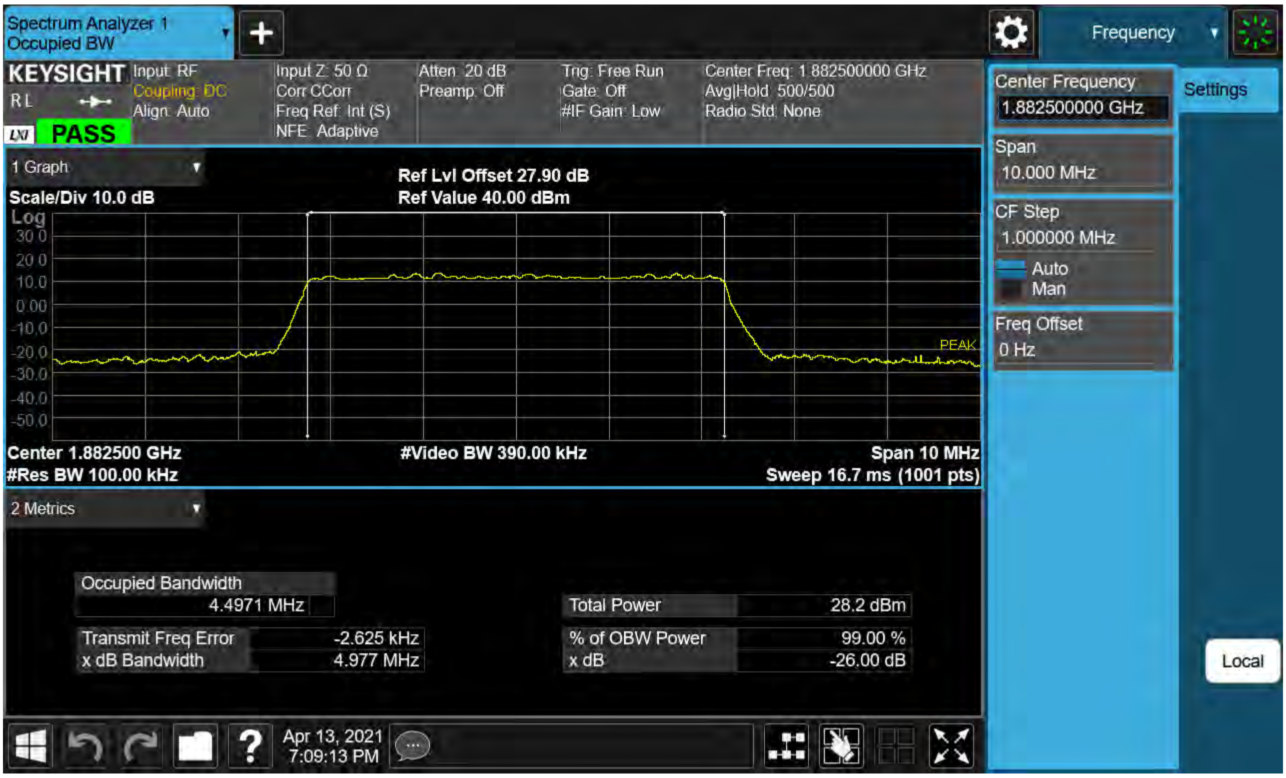
Sub6 n25(2). Occupied Bandwidth Plot (5M BW Ch.376500 16QAM _ Full RB _0)



Sub6 n25(2). Occupied Bandwidth Plot (5M BW Ch.376500 64QAM_ Full RB _0)

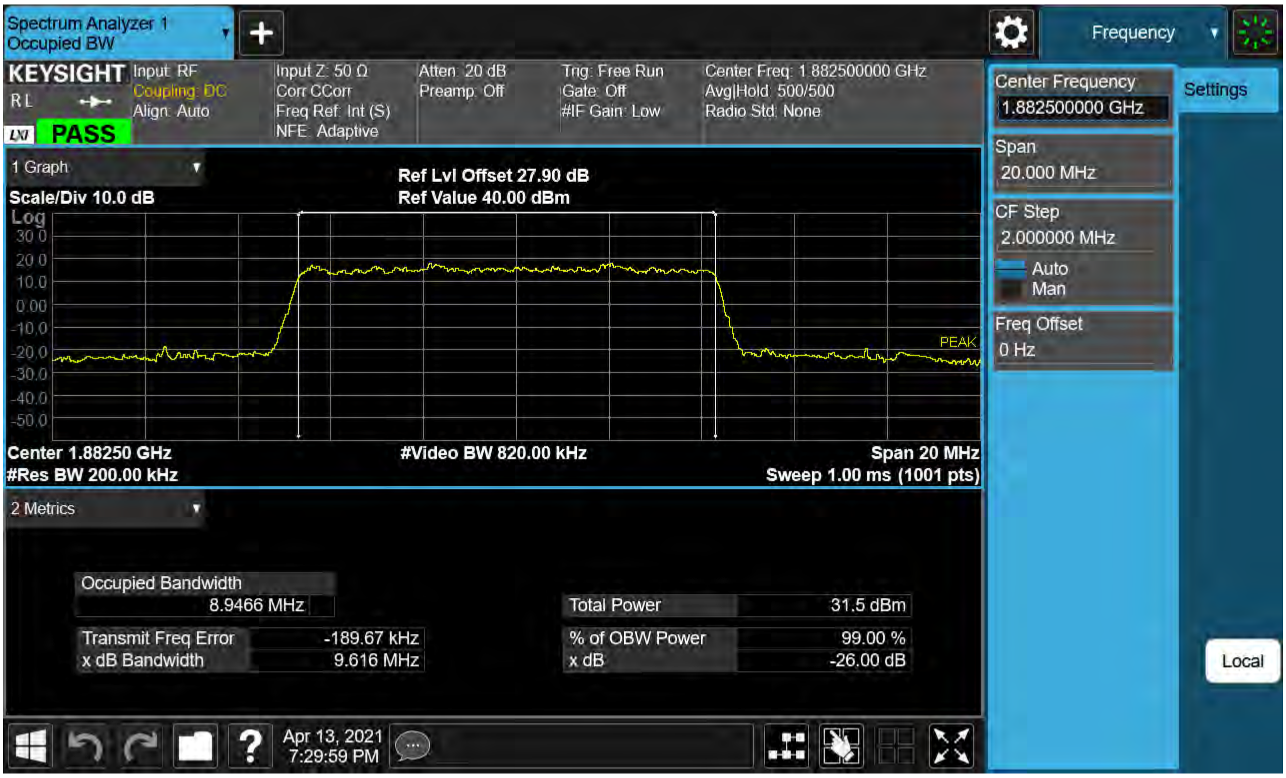


Sub6 n25(2). Occupied Bandwidth Plot (5M BW Ch.376500 256QAM_ Full RB _0)

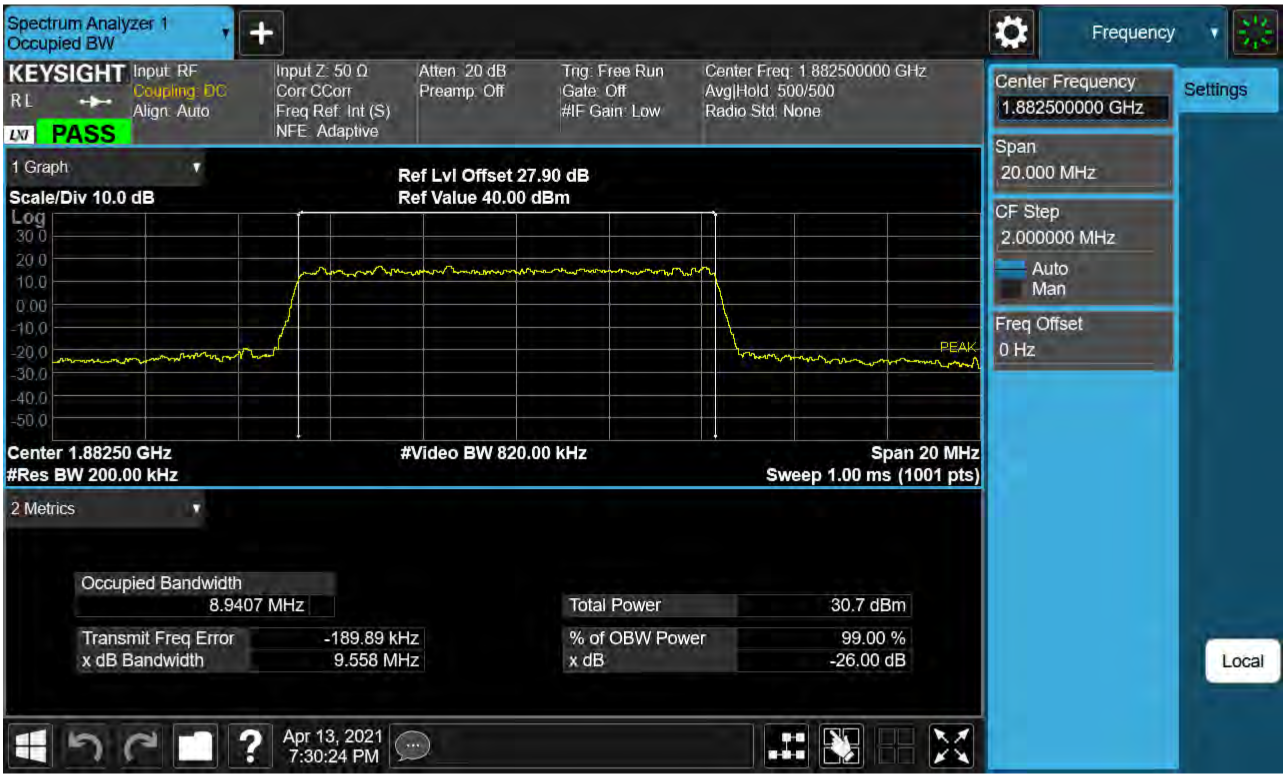


Sub6 n25(2). Occupied Bandwidth Plot (10M BW Ch.376500 BPSK _ Full RB _0)

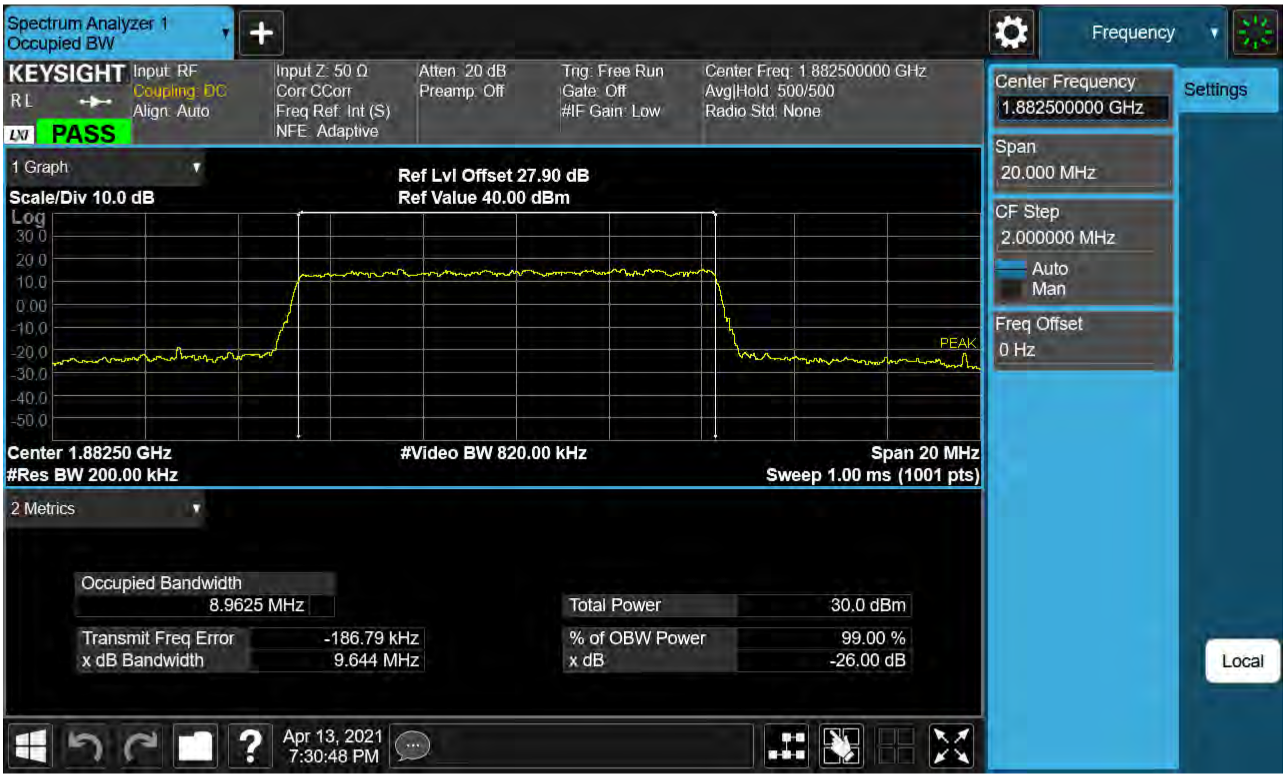
Sub6 n25(2). Occupied Bandwidth Plot (10M BW Ch.376500 QPSK _ Full RB _0)



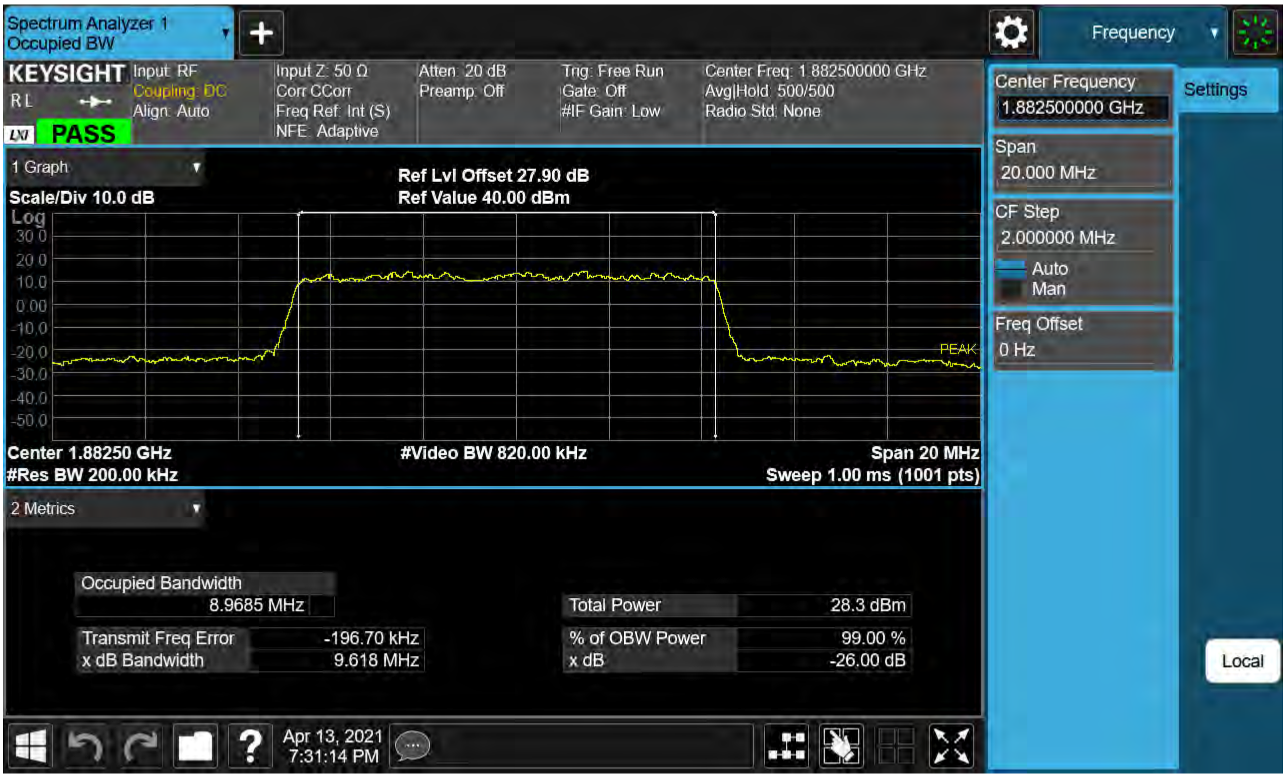
Sub6 n25(2). Occupied Bandwidth Plot (10M BW Ch.376500 16QAM _ Full RB _0)



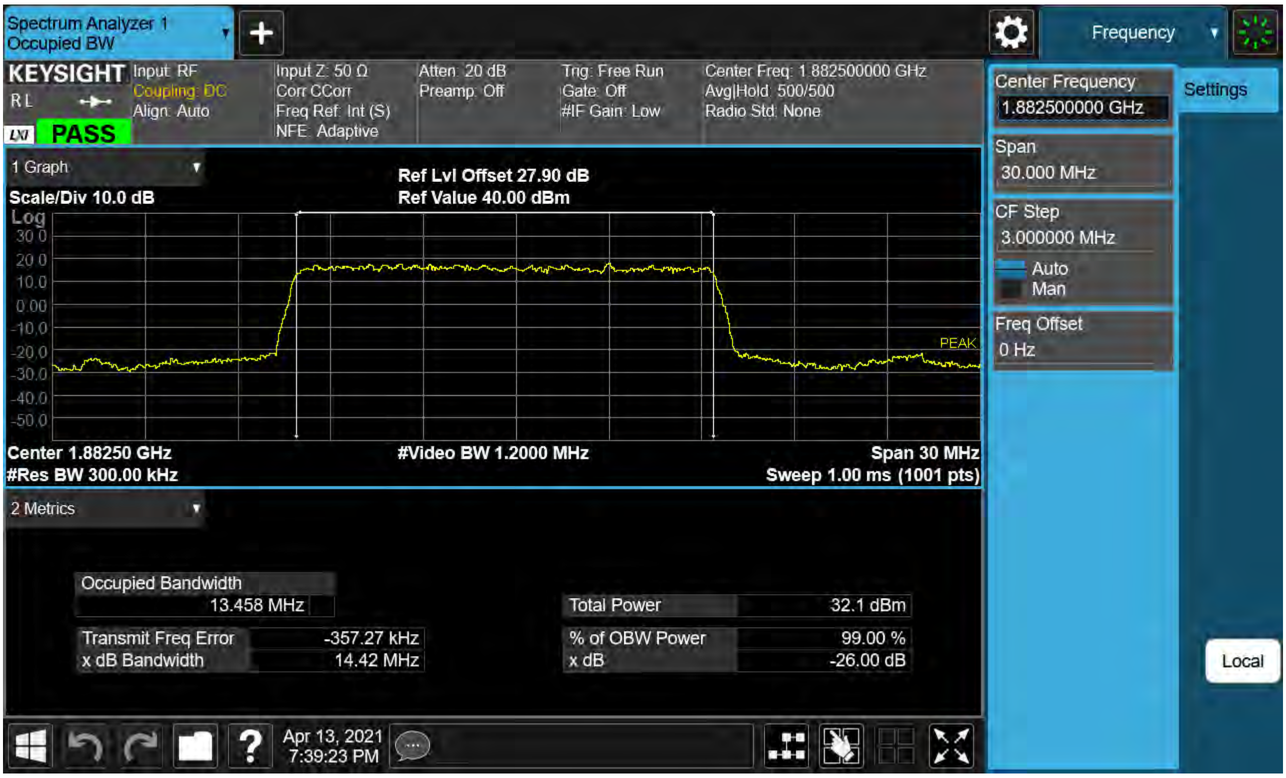
Sub6 n25(2). Occupied Bandwidth Plot (10M BW Ch.376500 64QAM _ Full RB _0)



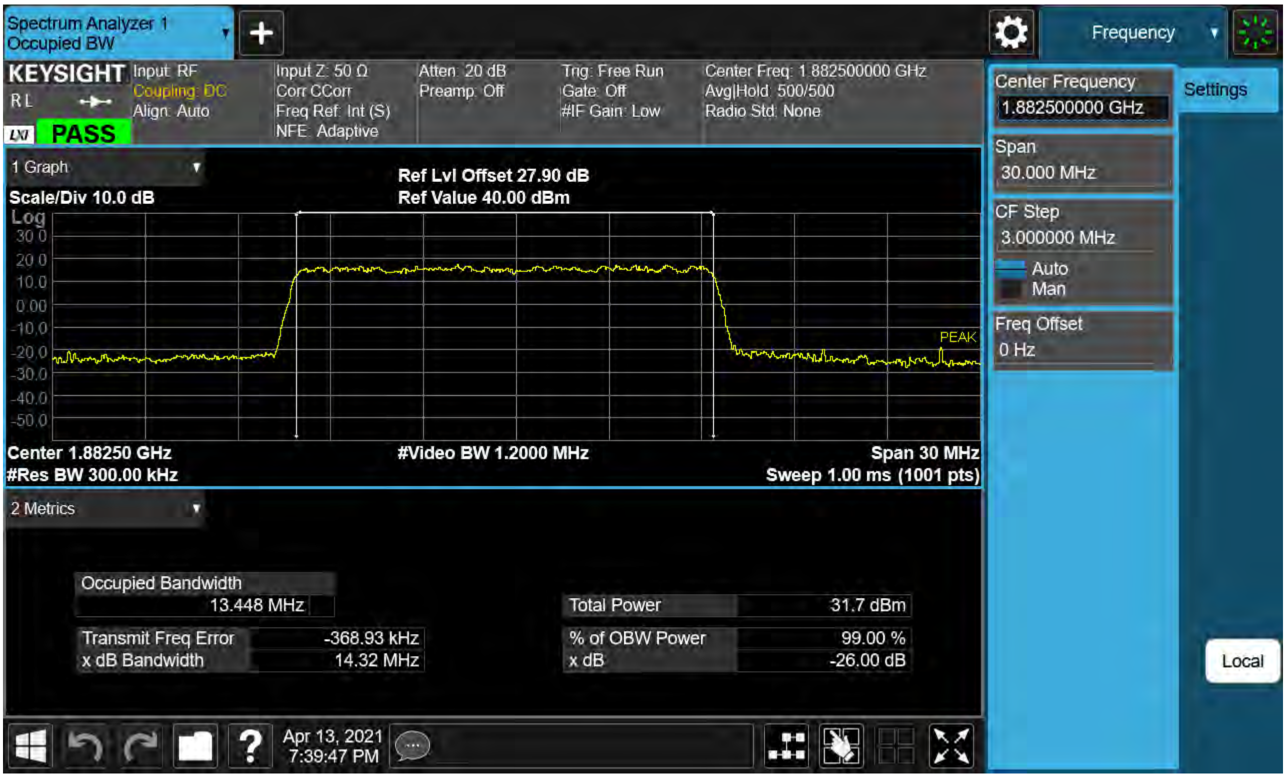
Sub6 n25(2). Occupied Bandwidth Plot (10M BW Ch.376500 256QAM _ Full RB _0)



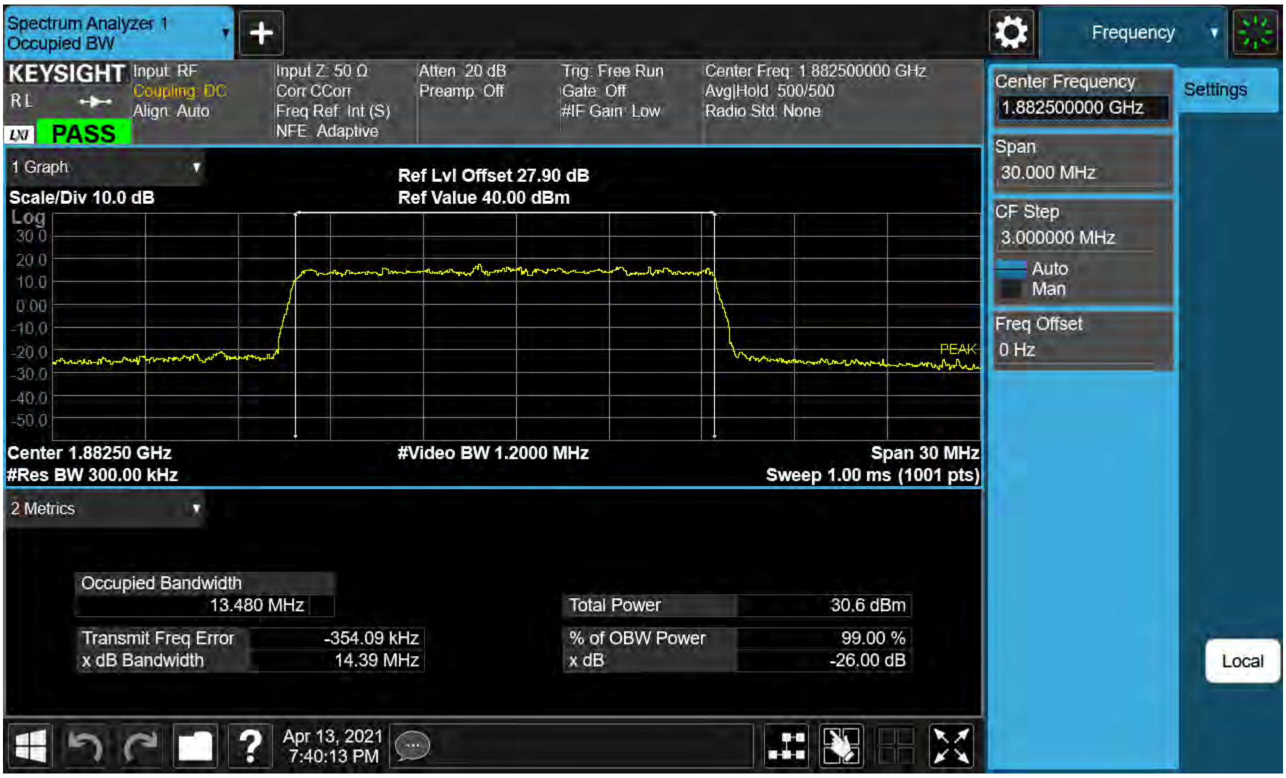
Sub6 n25(2). Occupied Bandwidth Plot (15M BW Ch.376500 BPSK_ Full RB _0)



Sub6 n25(2). Occupied Bandwidth Plot (15M BW Ch.376500 QPSK _ Full RB _0)

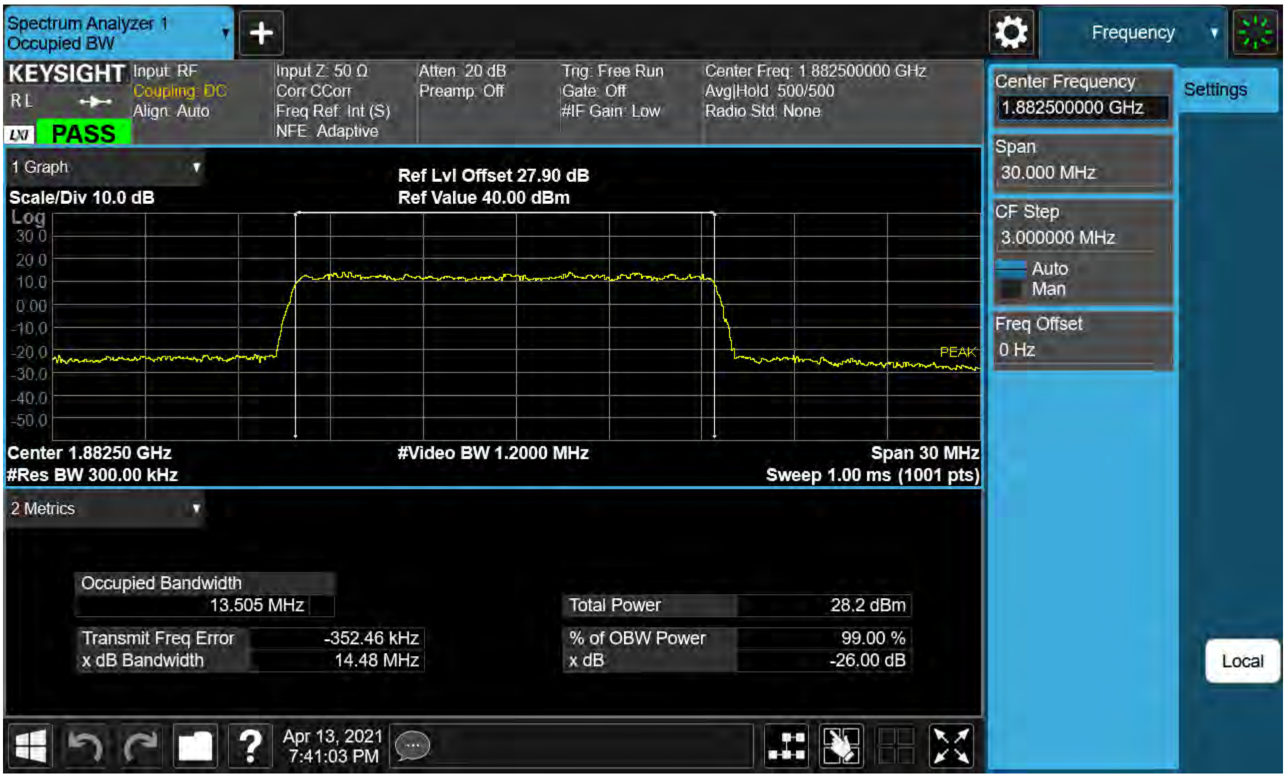


Sub6 n25(2). Occupied Bandwidth Plot (15M BW Ch.376500 16QAM _ Full RB _0)

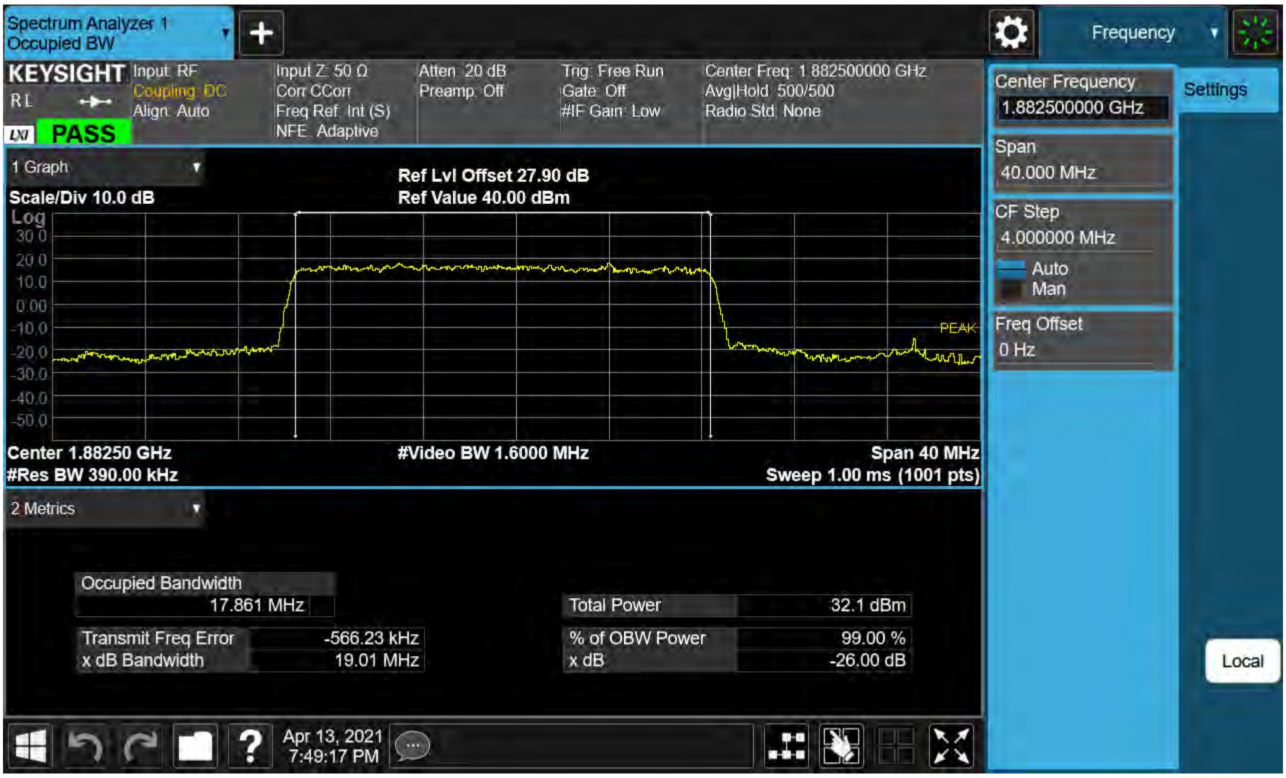


Sub6 n25(2). Occupied Bandwidth Plot (15M BW Ch.376500 64QAM _ Full RB _0)

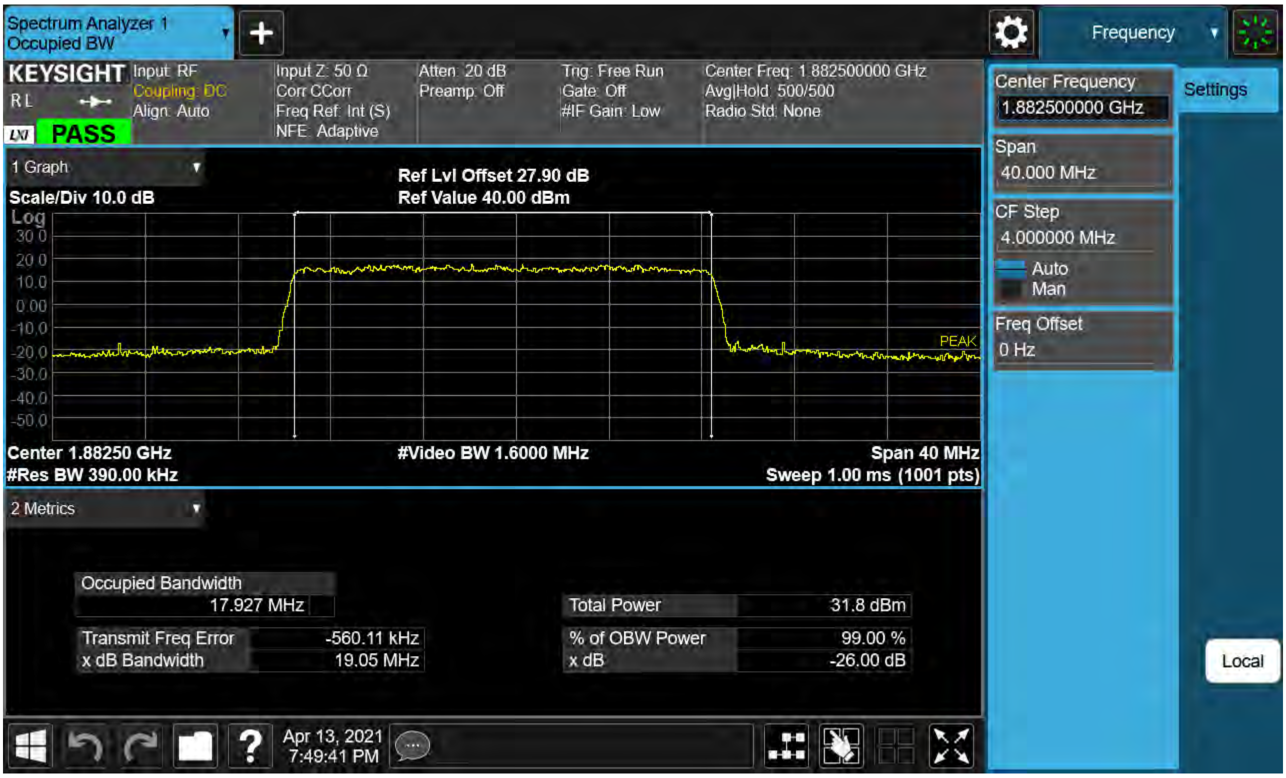
Sub6 n25(2). Occupied Bandwidth Plot (15M BW Ch.376500 256QAM _ Full RB _0



Sub6 n25(2). Occupied Bandwidth Plot (20M BW Ch.376500 BPSK _ Full RB _0)

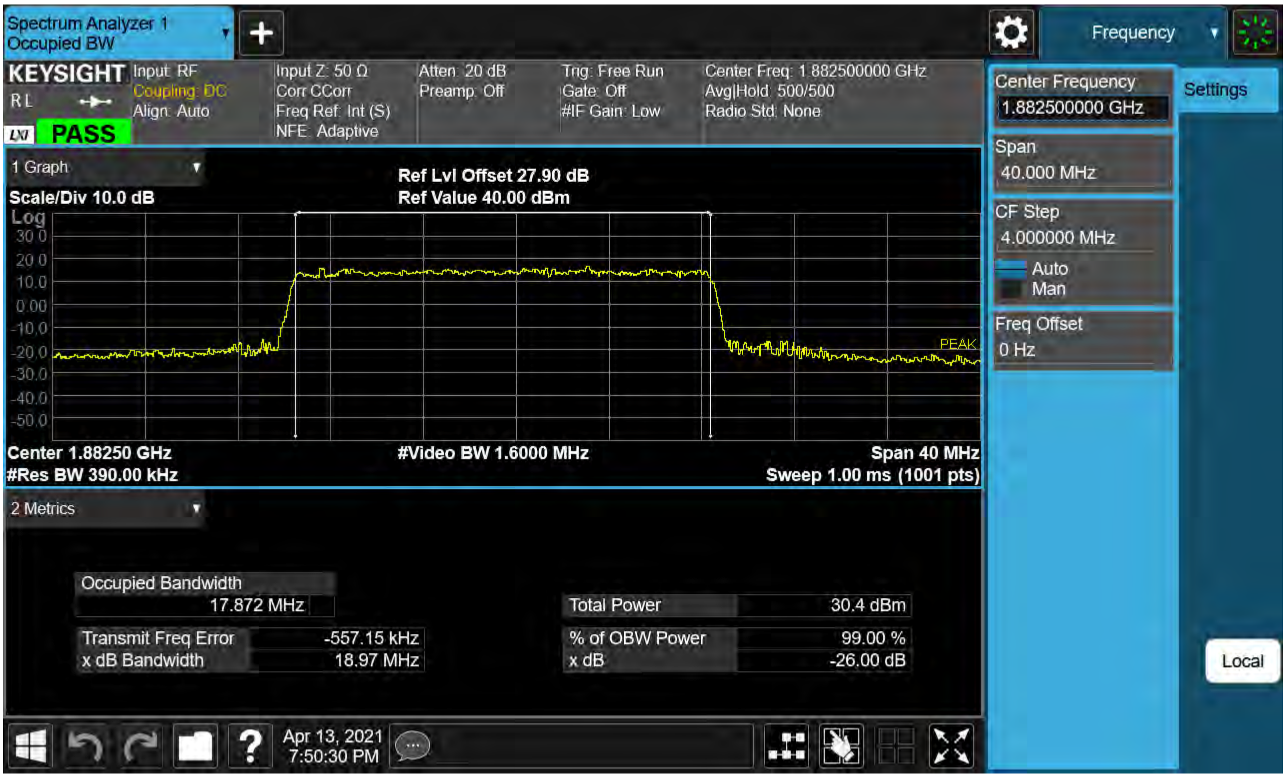


Sub6 n25(2). Occupied Bandwidth Plot (20M BW Ch.376500 QPSK _ Full RB _0)

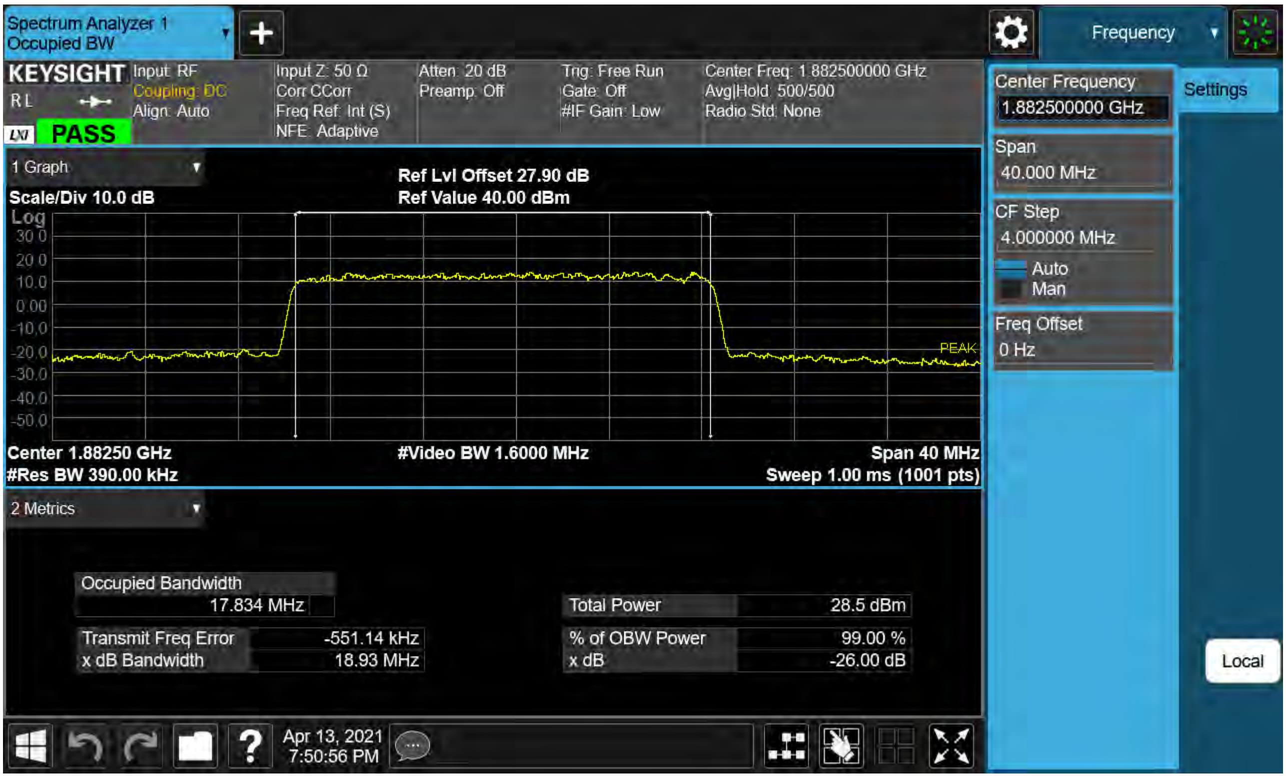


Sub6 n25(2). Occupied Bandwidth Plot (20M BW Ch.376500 16QAM _ Full RB _0)

Sub6 n25(2). Occupied Bandwidth Plot (20M BW Ch.376500 64QAM _ Full RB _0)



Sub6 n25(2). Occupied Bandwidth Plot (20M BW Ch.376500 256QAM _ Full RB _0)

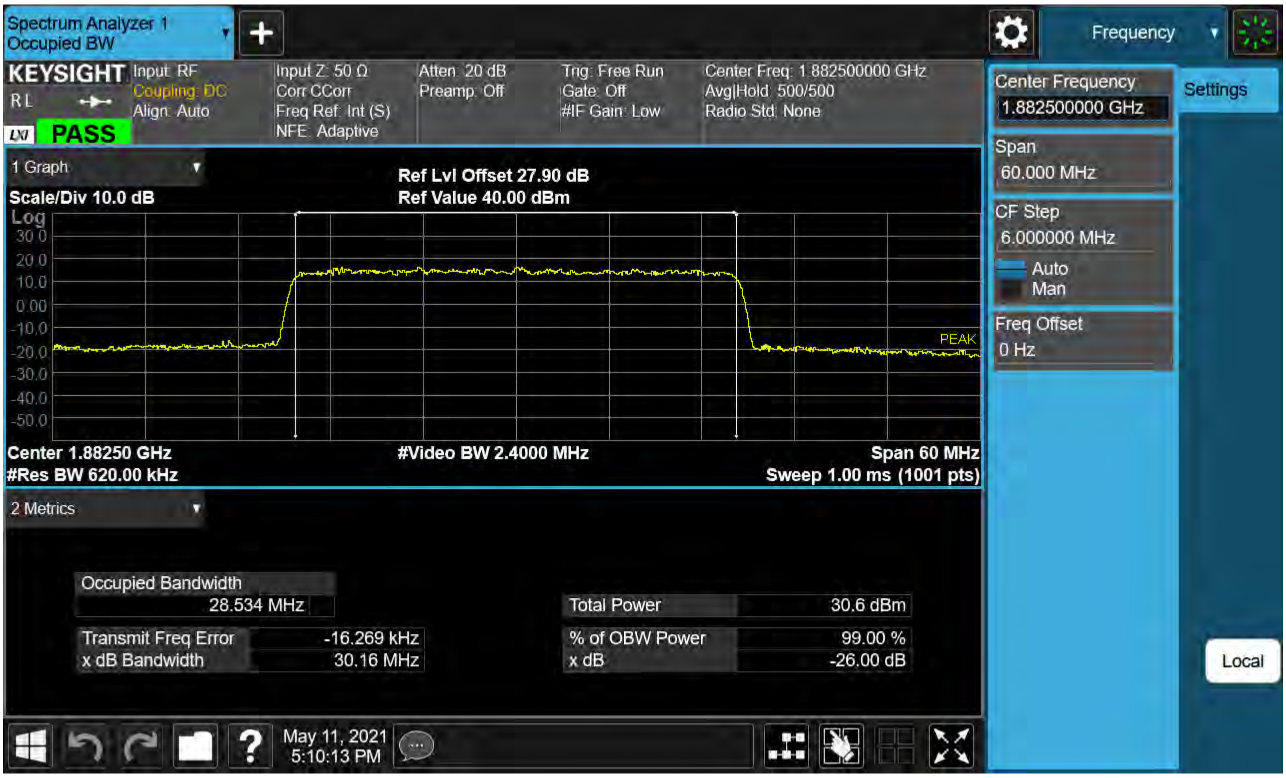


Sub6 n25(2). Occupied Bandwidth Plot (30M BW Ch.376500 BPSK_ Full RB _0)

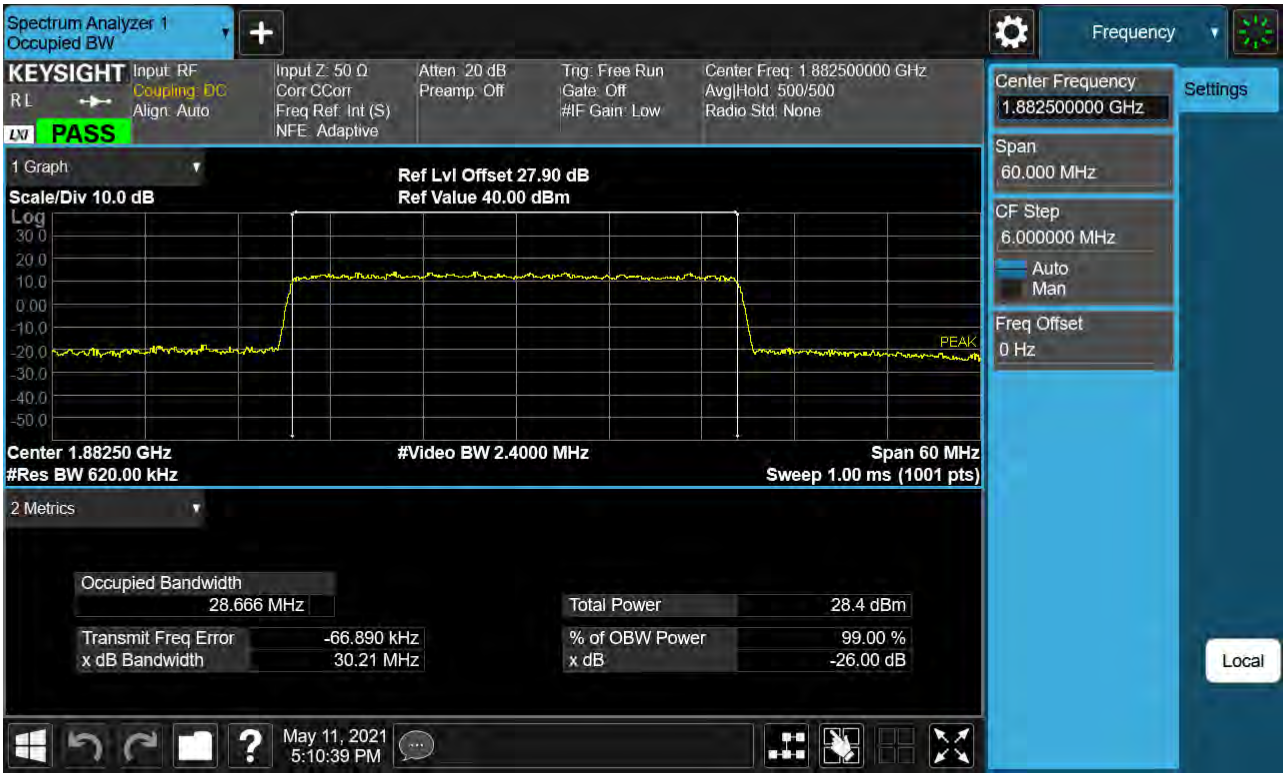
Sub6 n25(2). Occupied Bandwidth Plot (30M BW Ch.376500 QPSK_ Full RB _0)

Sub6 n25(2). Occupied Bandwidth Plot (30M BW Ch.376500 16QAM _ Full RB _0)

Sub6 n25(2). Occupied Bandwidth Plot (30M BW Ch.376500 64QAM_ Full RB _0)



Sub6 n25(2). Occupied Bandwidth Plot (30M BW Ch.376500 256QAM_ Full RB _0)



Sub6 n25(2). Occupied Bandwidth Plot (40M BW Ch.376500 BPSK_ Full RB _0)

Sub6 n25(2). Occupied Bandwidth Plot (40M BW Ch.376500 QPSK_ Full RB _0)

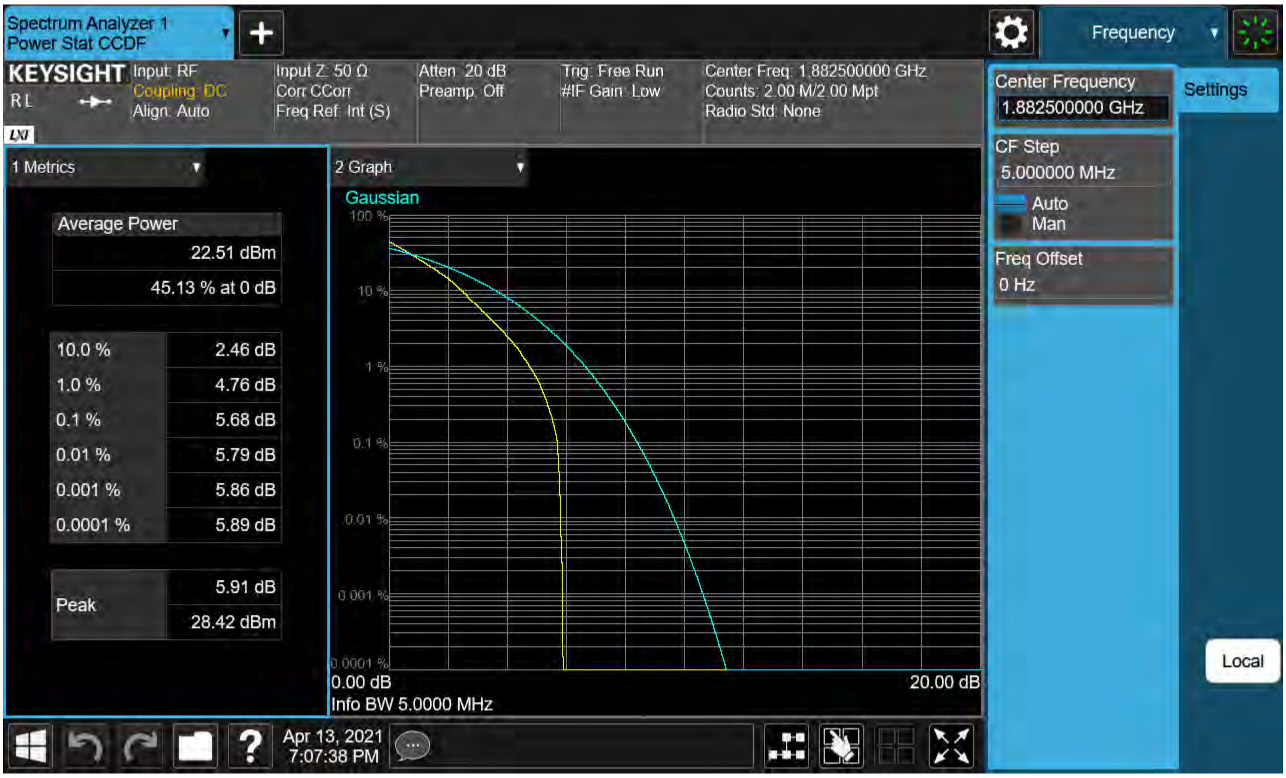
Sub6 n25(2). Occupied Bandwidth Plot (40M BW Ch.376500 16QAM_ Full RB _0)

Sub6 n25(2). Occupied Bandwidth Plot (40M BW Ch.376500 64QAM_ Full RB _0)

Sub6 n25(2). Occupied Bandwidth Plot (40M BW Ch.376500 256QAM_ Full RB _0)

Sub6 n25(2). PAR Plot (5M BW Ch.376500 BPSK_ Full RB _0)

Sub6 n25(2). PAR Plot (5M BW Ch.376500 QPSK _ Full RB _0)



Sub6 n25(2). PAR Plot (5M BW Ch.376500 16QAM_ Full RB _0)

Sub6 n25(2). PAR Plot (5M BW Ch.376500 64QAM_ Full RB _0)

Sub6 n25(2). PAR Plot (5M BW Ch.376500 256QAM_ Full RB _0)

Sub6 n25(2). PAR Plot (10M BW Ch.376500 BPSK _ Full RB _0)

Sub6 n25(2). PAR Plot (10M BW Ch.376500 QPSK _ Full RB _0)

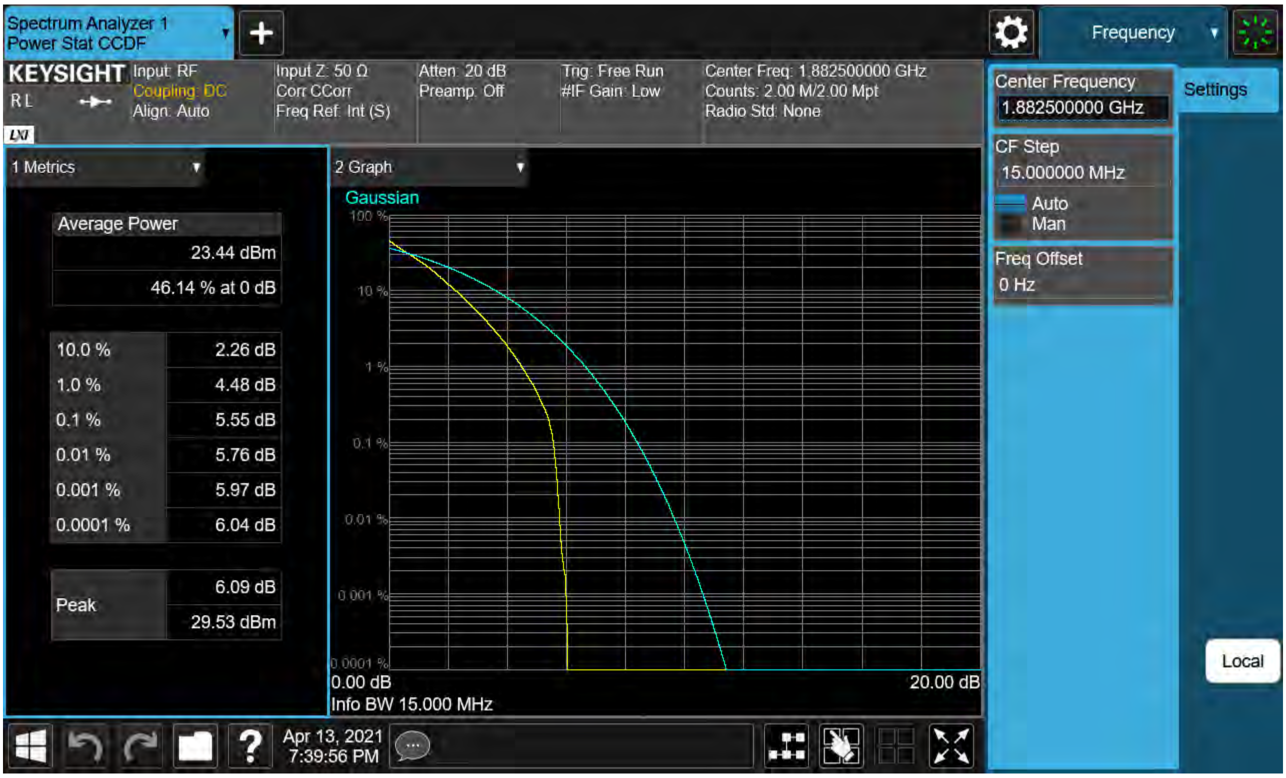
Sub6 n25(2). PAR Plot (10M BW Ch.376500 16QAM _ Full RB _0)

Sub6 n25(2). PAR Plot (10M BW Ch.376500 64QAM _ Full RB _0)

Sub6 n25(2). PAR Plot (10M BW Ch.376500 256QAM _ Full RB _0)

Sub6 n25(2). PAR Plot (15M BW Ch.376500 BPSK _ Full RB _0)

Sub6 n25(2). PAR Plot (15M BW Ch.376500 QPSK _ Full RB _0)



Sub6 n25(2). PAR Plot (15M BW Ch.376500 16QAM _ Full RB _0)

Sub6 n25(2). PAR Plot (15M BW Ch.376500 64QAM _ Full RB _0)

Sub6 n25(2). PAR Plot (15M BW Ch.376500 256QAM _ Full RB _0)

Sub6 n25(2). PAR Plot (20M BW Ch.376500 BPSK _ Full RB _0)

Sub6 n25(2). PAR Plot (20M BW Ch.376500 QPSK _ Full RB _0)

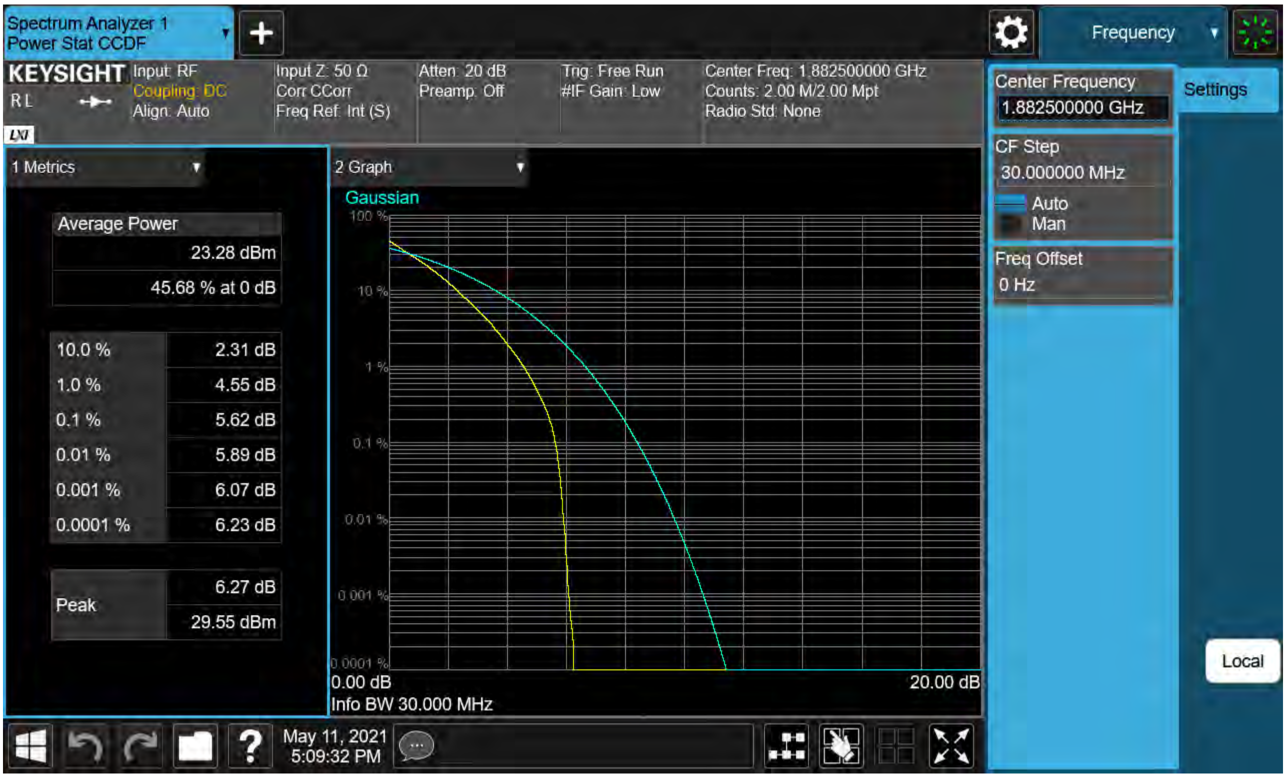
Sub6 n25(2). PAR Plot (20M BW Ch.376500 16QAM _ Full RB _0)

Sub6 n25(2). PAR Plot (20M BW Ch.376500 64QAM _ Full RB _0)

Sub6 n25(2). PAR Plot (20M BW Ch.376500 256QAM _ Full RB _0)

Sub6 n25(2). PAR Plot (30M BW Ch.376500 BPSK_ Full RB _0)

Sub6 n25(2). PAR Plot (30M BW Ch.376500 QPSK_ Full RB _0)

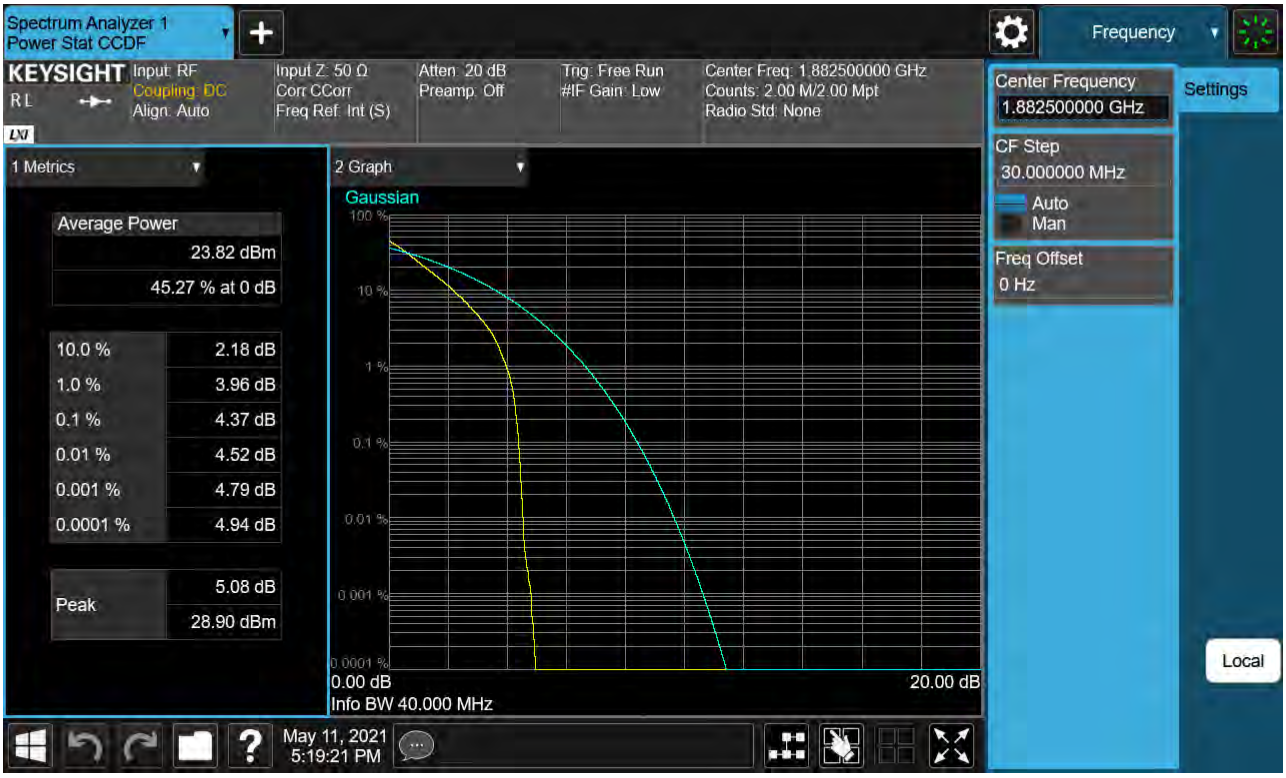


Sub6 n25(2). PAR Plot (30M BW Ch.376500 16QAM_ Full RB _0)

Sub6 n25(2). PAR Plot (30M BW Ch.376500 64QAM_ Full RB _0)

Sub6 n25(2). PAR Plot (30M BW Ch.376500 256QAM_ Full RB _0)

Sub6 n25(2). PAR Plot (40M BW Ch.376500 BPSK_ Full RB _0)



Sub6 n25(2). PAR Plot (40M BW Ch.376500 QPSK_ Full RB _0)

Sub6 n25(2). PAR Plot (40M BW Ch.376500 16QAM_ Full RB _0)

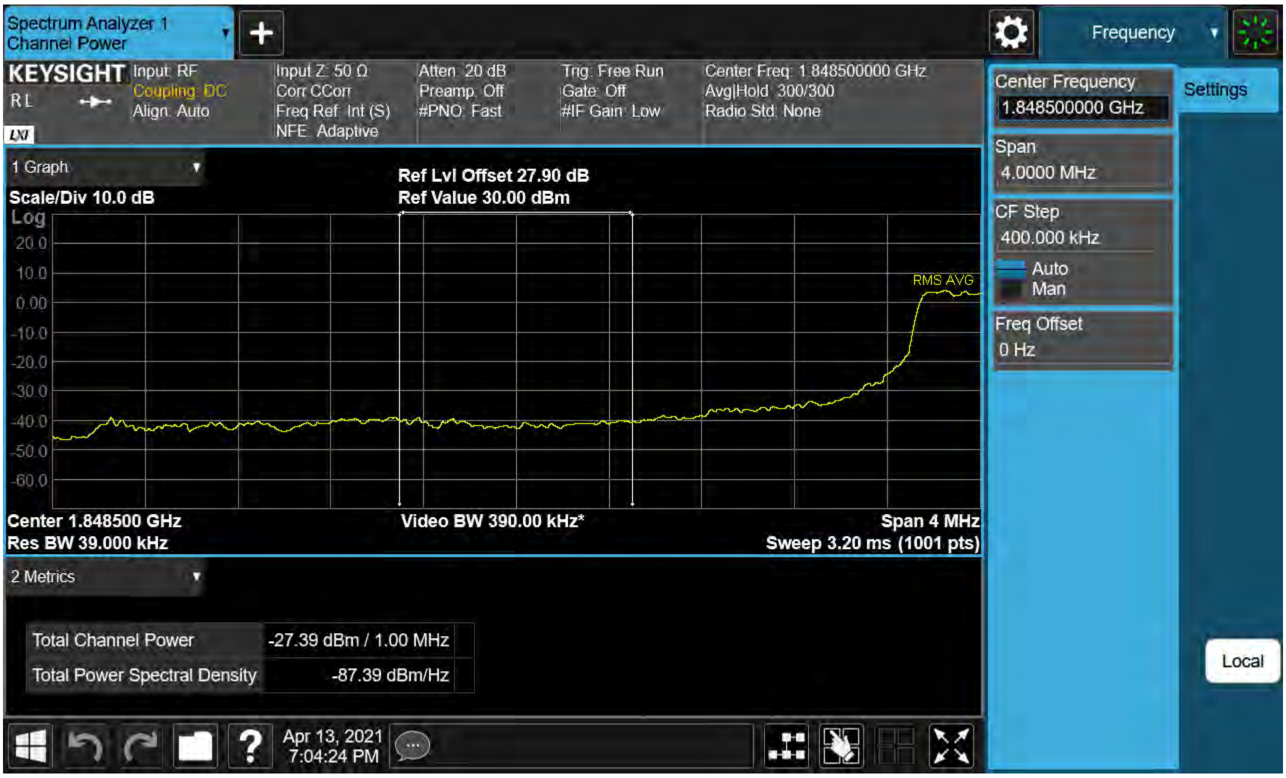
Sub6 n25(2). PAR Plot (40M BW Ch.376500 64QAM_ Full RB _0)

Sub6 n25(2). PAR Plot (40M BW Ch.376500 256QAM_ Full RB _0)

Sub6 n25(2). Lower Band Edge Plot (5M BW Ch.370500 BPSK_RB1_Offset 0)

Sub6 n25(2). Lower Band Edge Plot (5M BW Ch.370500 BPSK_RB25_Offset 0) -1

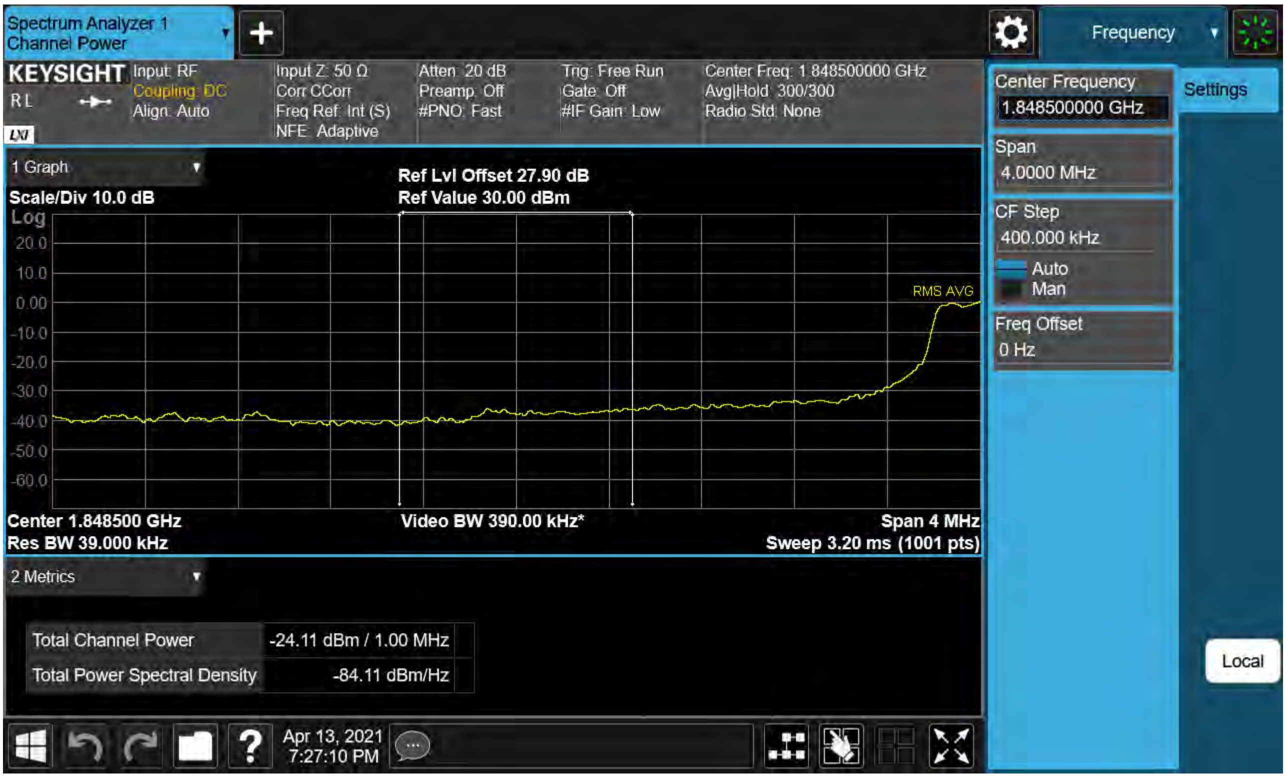
Sub6 n25(2). Lower Extended Band Edge Plot (5M BW Ch.370500 BPSK_RB25_0) -2



Sub6 n25(2). Lower Band Edge Plot (10M BW Ch.371000 BPSK_RB1_Offset 0)

Sub6 n25(2). Lower Band Edge Plot (10M BW Ch.371000 BPSK_RB50_Offset 0) -1

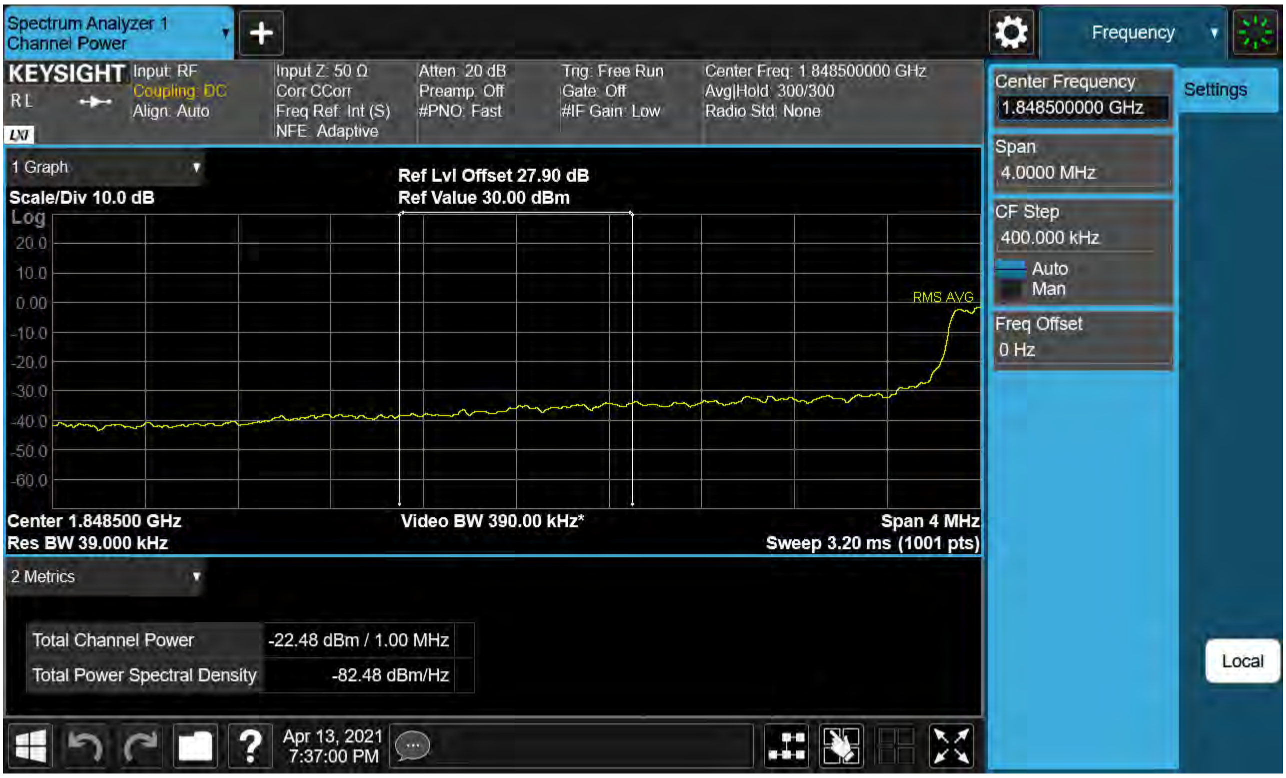
Sub6 n25(2). Lower Extended Band Edge Plot (10M BW Ch.371000 BPSK_RB50_0) -2



Sub6 n25(2). Lower Band Edge Plot (15M BW Ch.371500 BPSK_RB1_Offset 0)

Sub6 n25(2). Lower Band Edge Plot (15M BW Ch.371500 BPSK_RB75_Offset 0) -1

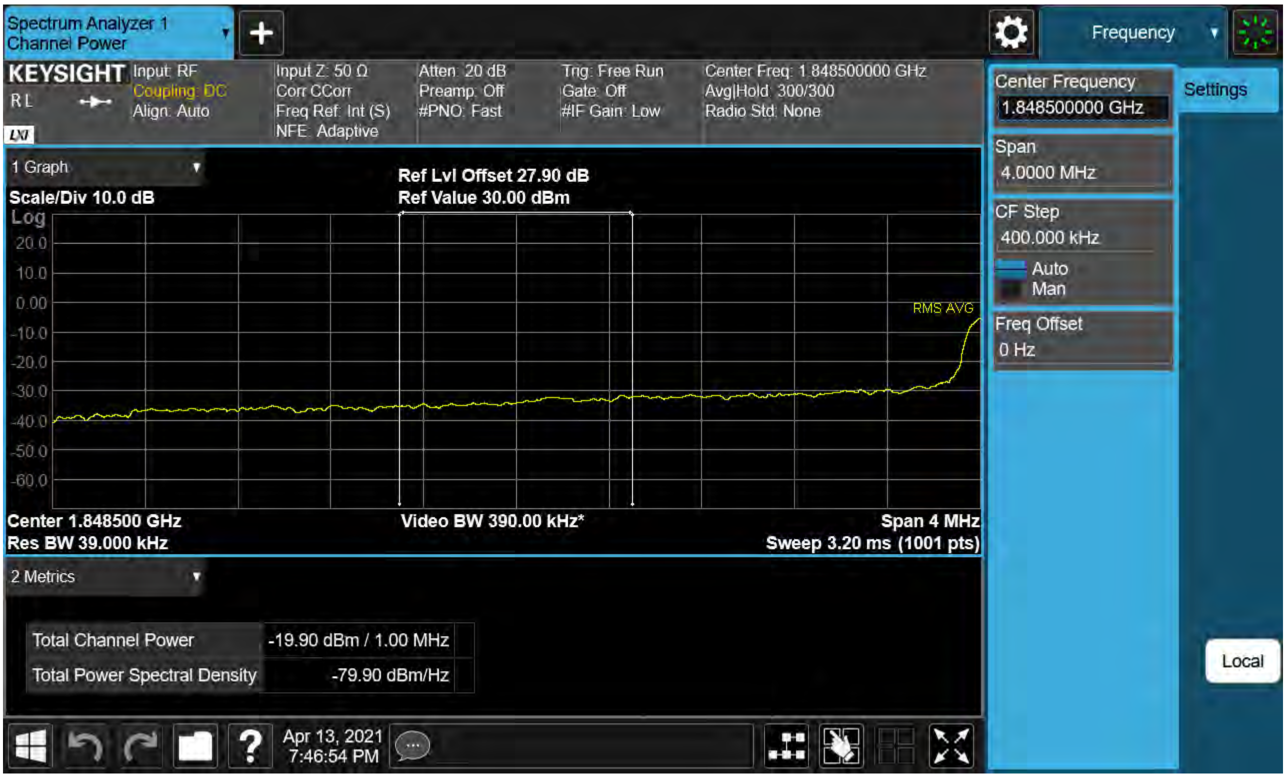
Sub6 n25(2). Lower Extended Band Edge Plot (15M BW Ch.371500 BPSK_RB75_0) -2



Sub6 n25(2). Lower Band Edge Plot (20M BW Ch.372000 BPSK_RB1_Offset 0)

Sub6 n25(2). Lower Band Edge Plot (20M BW Ch.372000 BPSK_RB100_Offset 0) -1

Sub6 n25(2). Lower Extended Band Edge Plot (20M BW Ch.372000 BPSK_RB100_0) -2



Sub6 n25(2). Lower Band Edge Plot (30M BW Ch.373000 BPSK_RB1_Offset 0)

Sub6 n25(2). Lower Band Edge Plot (30M BW Ch.373000 BPSK_RB160_Offset 0) -1

Sub6 n25(2). Lower Extended Band Edge Plot (30M BW Ch.373000 BPSK_RB160_0) -2

Sub6 n25(2). Lower Band Edge Plot (40M BW Ch.374000 BPSK_RB1_Offset 0)

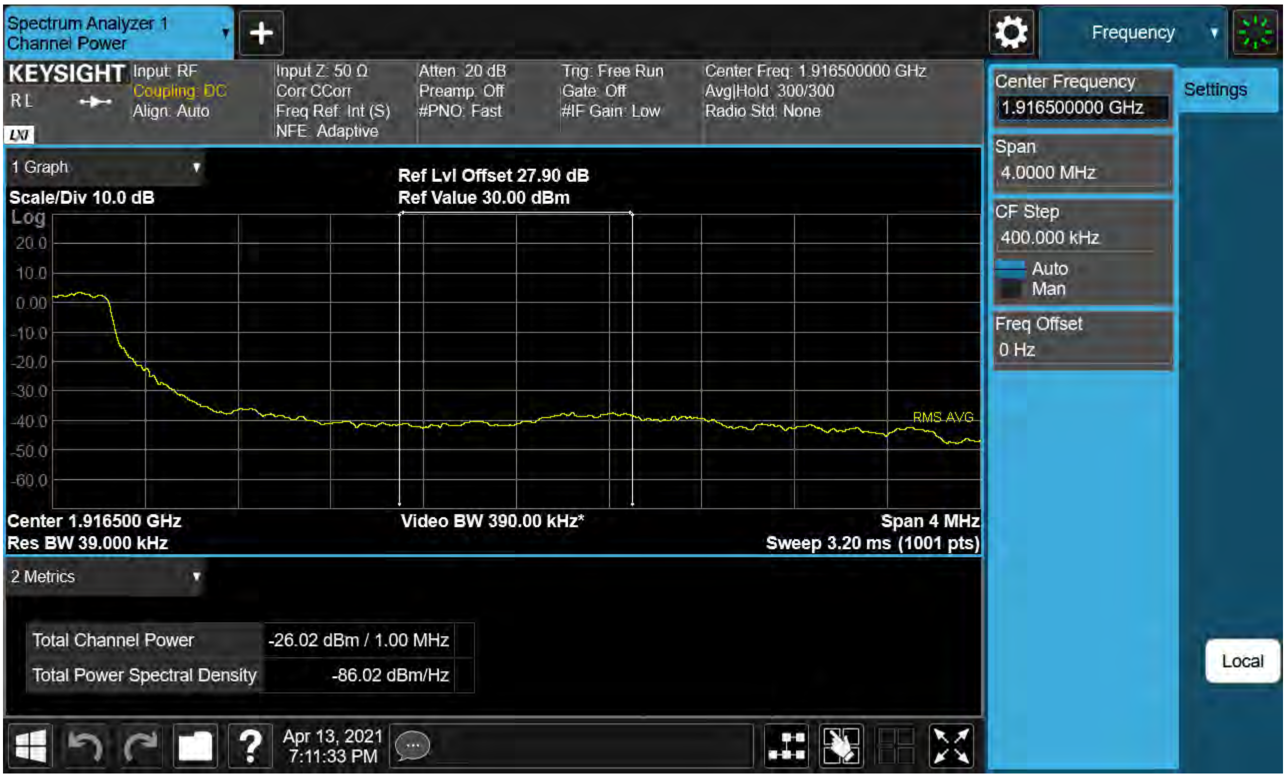
Sub6 n25(2). Lower Band Edge Plot (40M BW Ch.374000 BPSK_RB216_Offset 0) -1

Sub6 n25(2). Lower Extended Band Edge Plot (40M BW Ch.374000 BPSK_RB216_0) -2

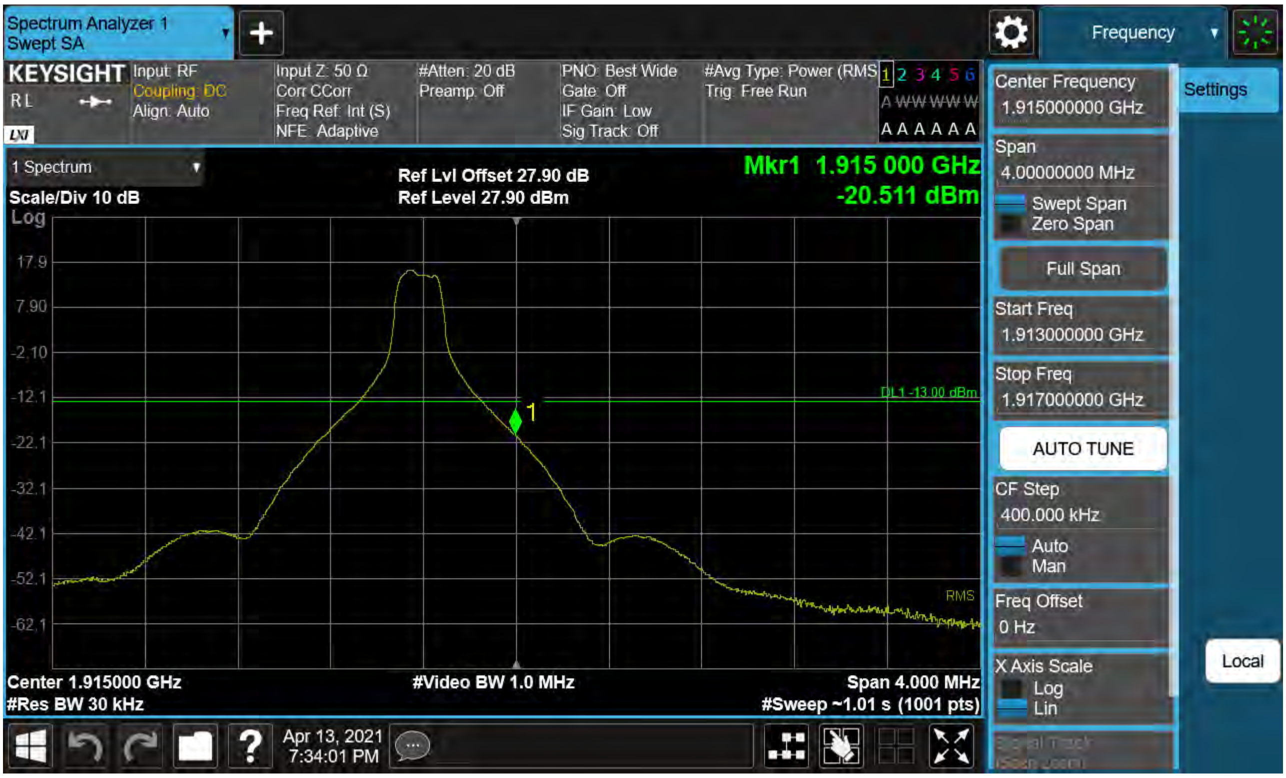
Sub6 n25(2). Upper Band Edge Plot (5M BW Ch.382500 BPSK_RB1_Offset 24)

Sub6 n25(2). Upper Band Edge Plot (5M BW Ch.382500 BPSK_RB25_Offset 0) -1

Sub6 n25(2). Upper Extended Band Edge Plot (5M BW Ch.382500 BPSK_RB25_0) -2

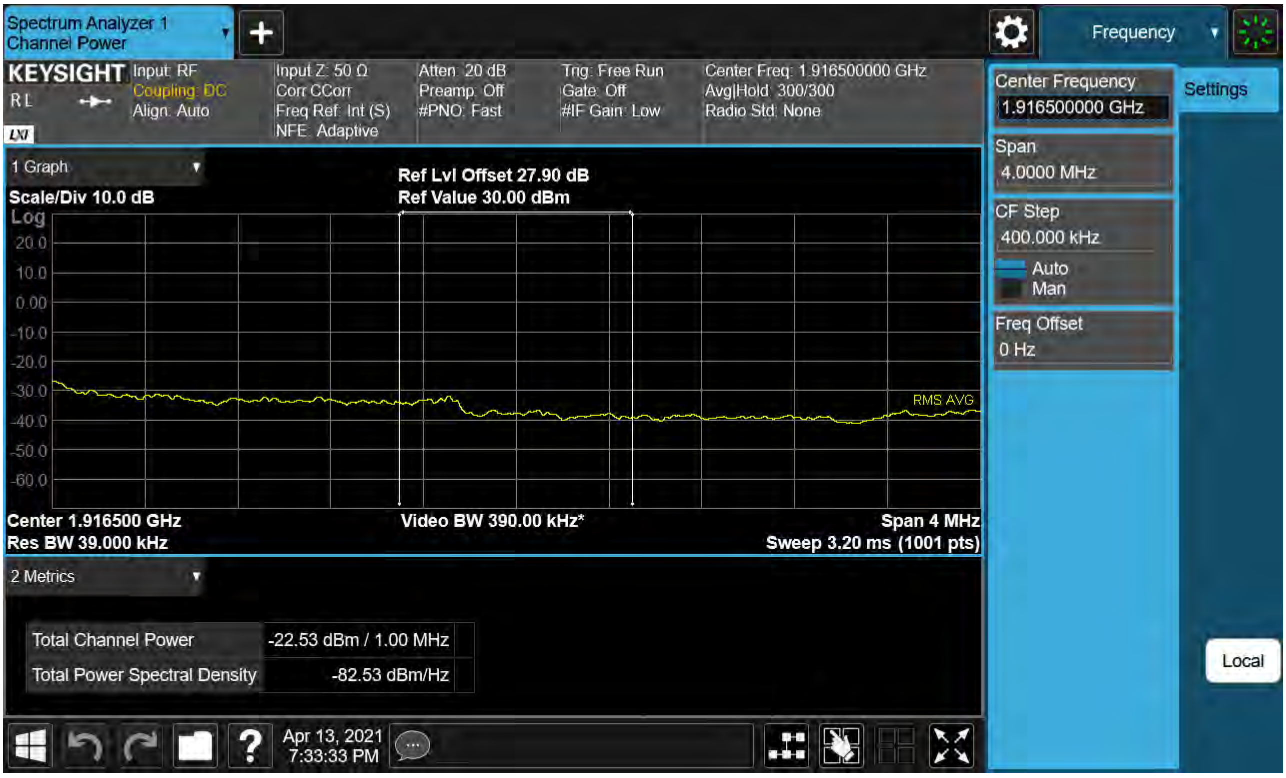


Sub6 n25(2). Upper Band Edge Plot (10M BW Ch.382000 BPSK_RB1_Offset 49)



Sub6 n25(2). Upper Band Edge Plot (10M BW Ch.382000 BPSK_RB50_Offset 0) -1

Sub6 n25(2). Upper Extended Band Edge Plot (10M BW Ch.382000 BPSK_RB50_0) -2



Sub6 n25(2). Upper Band Edge Plot (15M BW Ch.381500 BPSK_RB1_Offset 74)

Sub6 n25(2). Upper Band Edge Plot (15M BW Ch.381500 BPSK_RB75_Offset 0) -1

Sub6 n25(2). Upper Extended Band Edge Plot (15M BW Ch.381500 BPSK_RB75_0) -2

Sub6 n25(2). Upper Band Edge Plot (20M BW Ch.381000 BPSK_RB1_Offset 99)

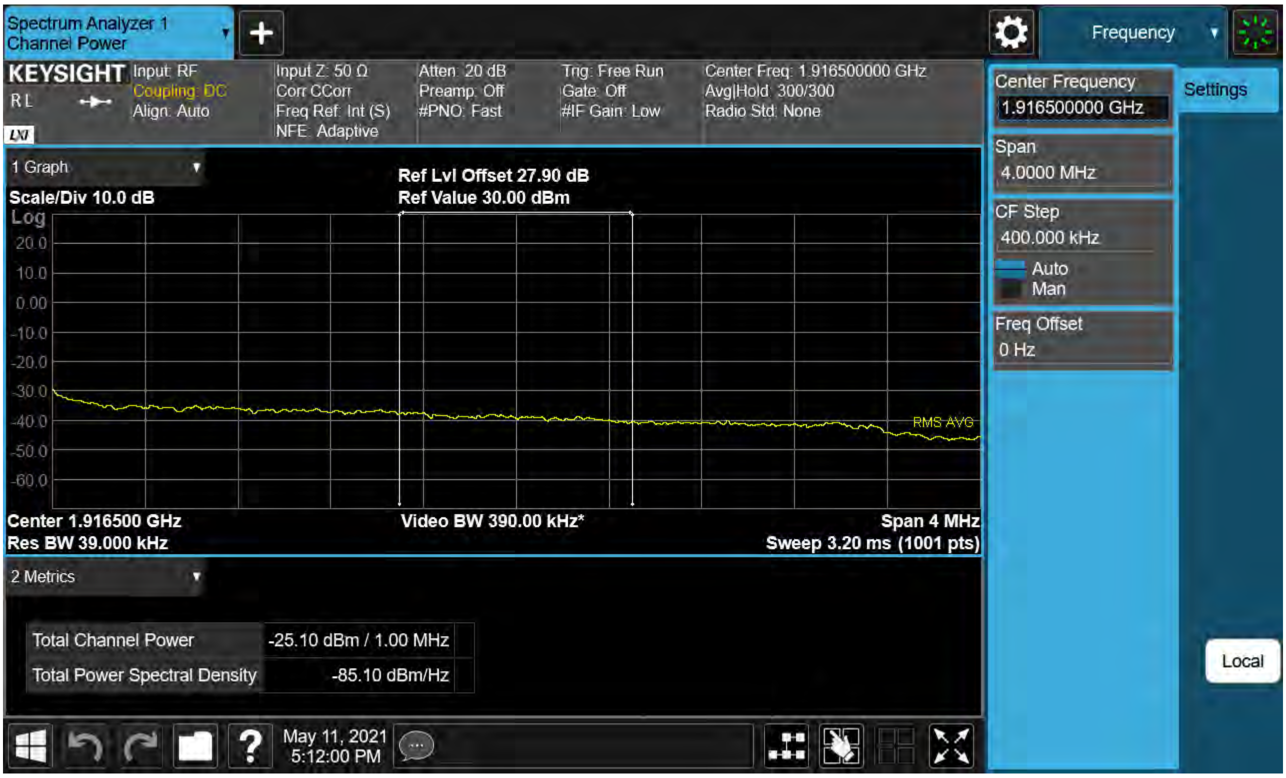
Sub6 n25(2). Upper Band Edge Plot (20M BW Ch.381000 BPSK_RB100_Offset 0) -1

Sub6 n25(2). Upper Extended Band Edge Plot (20M BW Ch.381000 BPSK_RB100_0) -2

Sub6 n25(2). Upper Band Edge Plot (30M BW Ch.380000 BPSK_RB1_Offset 159)

Sub6 n25(2). Upper Band Edge Plot (30M BW Ch.380000 BPSK_RB160_Offset 0) -1

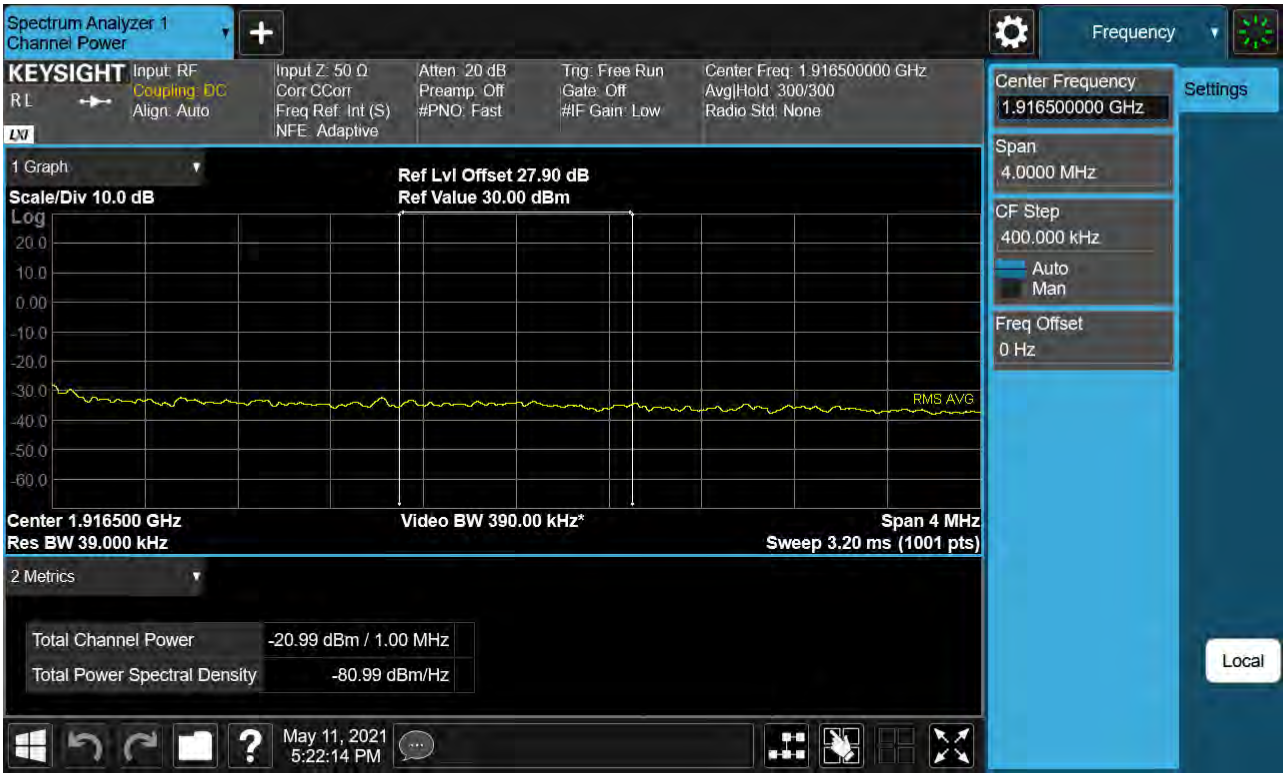
Sub6 n25(2). Upper Extended Band Edge Plot (30M BW Ch.380000 BPSK_RB160_0) -2



Sub6 n25(2). Upper Band Edge Plot (40M BW Ch.379000 BPSK_RB1_Offset 215)

Sub6 n25(2). Upper Band Edge Plot (40M BW Ch.379000 BPSK_RB216_Offset 0) -1

Sub6 n25(2). Upper Extended Band Edge Plot (40M BW Ch.379000 BPSK_RB216_0) -2



Sub6 n25(2). Conducted Spurious_1 (370500ch_5MHz_BPSK_RB 1_1)

Sub6 n25(2). Conducted Spurious_2 (370500ch_5MHz_BPSK_RB 1_1)