HCT CO.,LTD.
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 LTE 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:
November 04, 2021

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

Report No.: HCT-RF-2110-FC039-R1

FCC ID: **A3LSMN980F1**

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

According to the Evaluation report, all of the data contained herein is reused from the reference FCC ID : A3LSMN981B1 report.

Model(s):	SM-N980F/DS
Additional Model(s):	SM-N980F
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)
LTE – Band25 (1.4)	1850.7 - 1914.3	1M10G7D	QPSK	0.138	21.39
		1M10W7D	16QAM	0.115	20.60
		1M10W7D	64QAM	0.090	19.53
		1M09W7D	256QAM	0.044	16.45
LTE – Band25 (3)	1851.5 - 1913.5	2M72G7D	QPSK	0.139	21.43
		2M71W7D	16QAM	0.117	20.68
		2M72W7D	64QAM	0.091	19.59
		2M71W7D	256QAM	0.045	16.50
LTE – Band25 (5)	1852.5 - 1912.5	4M54G7D	QPSK	0.142	21.51
		4M52W7D	16QAM	0.117	20.70
		4M52W7D	64QAM	0.092	19.64
		4M55W7D	256QAM	0.046	16.60
LTE – Band25 (10)	1855.0 - 1910.0	9M01G7D	QPSK	0.129	21.11
		9M03W7D	16QAM	0.108	20.32
		9M00W7D	64QAM	0.084	19.24
		8M99W7D	256QAM	0.042	16.20
LTE – Band25 (15)	1857.5 - 1907.5	13M5G7D	QPSK	0.126	21.00
		13M5W7D	16QAM	0.104	20.17
		13M5W7D	64QAM	0.082	19.12
		13M5W7D	256QAM	0.040	16.02
LTE – Band25 (20)	1860.0 - 1905.0	18M0G7D	QPSK	0.119	20.76
		17M9W7D	16QAM	0.098	19.93
		18M0W7D	64QAM	0.078	18.91
		18M0W7D	256QAM	0.039	15.88

The measurements shown in this report were made in accordance with the procedures specified in CFR47 section §2.947. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.
HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a)

REVIEWED BY

Report prepared by : Jae Ryang Do
Engineer of Telecommunication Testing Center

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

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

This laboratory is not accredited for the test results marked *.
The above Test Report is the accredited test result by (KS Q) ISO/IEC 17025 and KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA. (HCT Accreditation No.: KT197)

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

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2110-FC039	October 29, 2021	- First Approval Report
HCT-RF-2110-FC039-R1	November 04, 2021	- Revised the 16 page.

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:	A3LSMN980F1
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-N980F/DS
Additional Model(s):	SM-N980F
Tx Frequency:	1850.7 MHz – 1914.3 MHz (LTE – Band25 (1.4 MHz)) 1851.5 MHz – 1913.5 MHz (LTE – Band25 (3 MHz)) 1852.5 MHz – 1912.5 MHz (LTE – Band25 (5 MHz)) 1855.0 MHz – 1910.0 MHz (LTE – Band25 (10 MHz)) 1857.5 MHz – 1907.5 MHz (LTE – Band25 (15 MHz)) 1860.0 MHz – 1905.0 MHz (LTE – Band25 (20 MHz))
Date(s) of Tests:	October 04, 2021 ~ October 28, 2021
Serial number:	Radiated: R3CR90LSAZJ Conducted: R3CR90LSB3M

2. INTRODUCTION

2.1. DESCRIPTION OF EUT

The EUT was a Mobile Phone with GSM/GPRS/EGPRS/UMTS and LTE.

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

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 1 MHz
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 1 GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated.

   The power is calculated by the following formula;

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

   Where: P_d is the dipole equivalent power and P_g is the generator output power into the substitution antenna.
3. The maximum value is calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps are repeated with the receiving antenna in both vertical and horizontal polarization. the difference between the gain of the horn and an isotropic antenna are taken into consideration
4. The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
5. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

3.3 RADIATED SPURIOUS EMISSIONS

Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

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

Test Settings

1. RBW = 100 kHz for emissions below 1 GHz and 1 MHz for emissions above 1 GHz
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 dat
3. For spurious emissions above 1 GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated.
   The spurious emissions is calculated by the following formula;

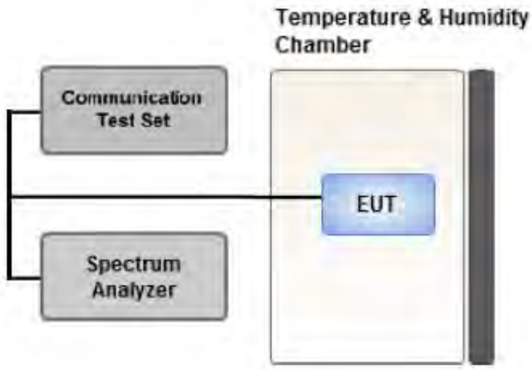
   $$\text{Result}_{(dBm)} = P\,g_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dBi)}$$

   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.

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

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:

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

Test Settings(Peak Power)

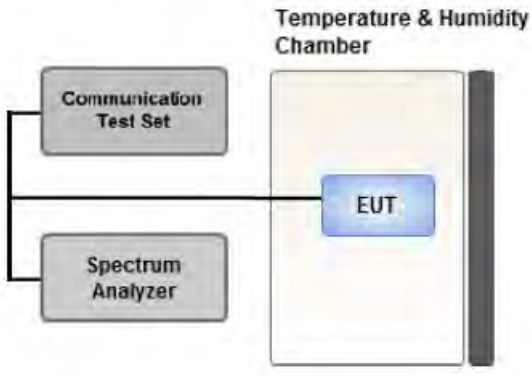
The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW ≥ 3 × RBW.

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 x log (1/duty cycle)] to the measured maximum power level to compute the average power during continuous transmission. For example, add [10 x 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.

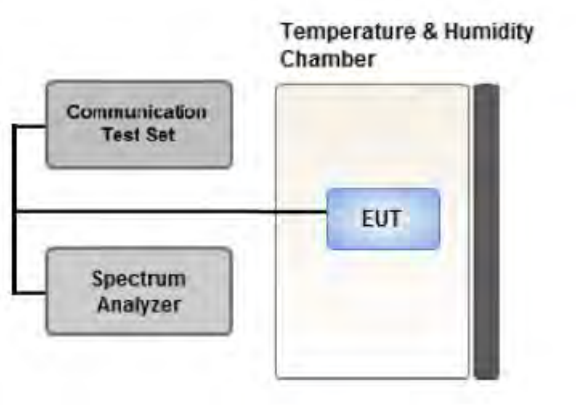
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

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

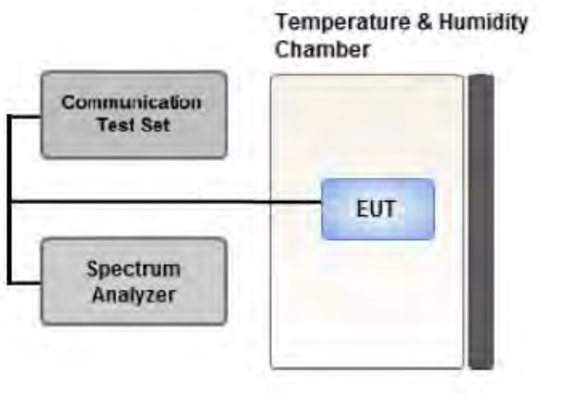
Test Overview

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

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

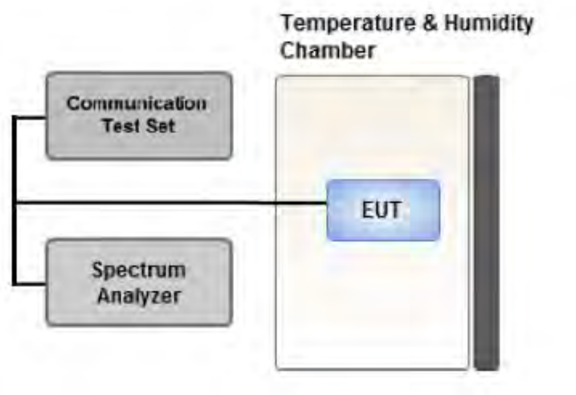
Test Notes

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 x 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)

- The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
- All modes of operation were investigated and the worst case configuration results are reported.
- In the case of radiated spurious emissions, all bandwidth of operation were investigated and the worst case bandwidth results are reported. (Worst case : 5 MHz)
- The worst case is reported with the EUT positioning, modulations, and paging service configurations shown in the test data.
- Please refer to the table below.
- 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

- SM-N980F/DS & additional models were tested and the worst case results are reported.

(Worst case : SM-N980F/DS)

[Worst case]

Test Description	Modulation	RB size	RB offset	Axis
Effective Isotropic Radiated Power	QPSK, 16QAM, 64QAM, 256QAM	1	0	Z
Radiated Spurious and Harmonic Emissions	QPSK	1	0	X

3.10 WORST CASE(CONDUCTED TEST)

[Worst case]

<table>
<tr><th>Test Description</th><th>Modulation</th><th>Bandwidth (MHz)</th><th>Frequency</th><th>RB size</th><th>RB offset</th></tr>
<tr><td>Occupied Bandwidth</td><td>QPSK, 16QAM, 64QAM, 256QAM</td><td>1.4, 3, 5, 10, 15, 20</td><td>Mid</td><td>Full RB</td><td>0</td></tr>
<tr><td>Peak-To-Average Ratio</td><td>QPSK, 16QAM, 64QAM, 256QAM</td><td>1.4, 3, 5, 10, 15, 20</td><td>Mid</td><td>Full RB</td><td>0</td></tr>
<tr><td rowspan="13">Band Edge</td><td rowspan="13">QPSK</td><td rowspan="2">1.4</td><td>Low</td><td>1</td><td>0</td></tr>
<tr><td>High</td><td>1</td><td>5</td></tr>
<tr><td rowspan="2">3</td><td>Low</td><td>1</td><td>0</td></tr>
<tr><td>High</td><td>1</td><td>14</td></tr>
<tr><td rowspan="2">5</td><td>Low</td><td>1</td><td>0</td></tr>
<tr><td>High</td><td>1</td><td>24</td></tr>
<tr><td rowspan="2">10</td><td>Low</td><td>1</td><td>0</td></tr>
<tr><td>High</td><td>1</td><td>49</td></tr>
<tr><td rowspan="2">15</td><td>Low</td><td>1</td><td>0</td></tr>
<tr><td>High</td><td>1</td><td>74</td></tr>
<tr><td rowspan="2">20</td><td>Low</td><td>1</td><td>0</td></tr>
<tr><td>High</td><td>1</td><td>99</td></tr>
<tr><td>1.4, 3, 5, 10, 15, 20</td><td>Low, High</td><td>Full RB</td><td>0</td></tr>
<tr><td>Spurious and Harmonic Emissions at Antenna Terminal</td><td>QPSK</td><td>1.4, 3, 5, 10, 15, 20</td><td>Low, Mid, High</td><td>1</td><td>0</td></tr>
</table>

- All modes of operation were investigated and the worst case configuration results are reported.
- SM-N980F/DS & additional models were tested and the worst case results are reported.

(Worst case : SM-N980F/DS)

4. LIST OF TEST EQUIPMENT

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(1~18GHz)	BBHA 9120D	Schwarzbeck	02289	05/08/2022	Biennial
Horn Antenna(1~18GHz)	BBHA 9120D	Schwarzbeck	9120D-1299	05/04/2022	Biennial
Horn Antenna(15~40GHz)	BBHA 9170	Schwarzbeck	BBHA9170342	10/13/2022	Biennial
Horn Antenna(15~40GHz)	BBHA 9170	Schwarzbeck	BBHA9170124	02/11/2022	Biennial
Loop Antenna(9kHz~30 MHz)	FMZB1513	Rohde & Schwarz	1513-175	05/18/2022	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	06/15/2022	Annual
High Pass Filter	WHKX10-2700-3000-18000-40SS	Wainwright Instruments	145	06/15/2022	Annual
High Pass Filter	WHNX6-4740-6000-26500-40CC	Wainwright Instruments	11	06/15/2022	Annual
LOW NOISE AMP (100 MHz ~ 18GHz)	CBLU1183540B-01	CERNEX	26822	06/15/2022	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	09/15/2022	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(20dB)	8493C	Hewlett Packard	17280	06/01/2022	Annual
Spectrum Analyzer(10Hz~40GHz)	FSV40	REOHDE & SCHWARZ	101436	03/02/2022	Annual
Base Station	8960 (E5515C)	Agilent	MY48360800	08/18/2022	Annual
Wideband Radio Communication Tester	MT8821C	Anritsu Corp.	6262116770	07/12/2022	Annual
Wideband Radio Communication Tester	MT8820C	Anritsu Corp.	6201026545	01/07/2022	Annual
SIGNAL GENERATOR (100kHz~40GHz)	SMB100A	REOHDE & SCHWARZ	177633	07/05/2022	Annual
Signal Analyzer(5Hz~40.0GHz)	N9030B	KEYSIGHT	MY55480167	06/02/2022	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)	1.82 (Confidence level about 95 %, *k*=2)
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40 (Confidence level about 95 %, *k*=2)
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80 (Confidence level about 95 %, *k*=2)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70 (Confidence level about 95 %, *k*=2)
Radiated Disturbance (18 GHz ~ 40 GHz)	5.05 (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, §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

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

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	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1850.7	LTE B25 1.4 MHz	QPSK	-20.28	13.44	10.10	2.15	V	< 2.00	0.138	21.39
		16-QAM	-21.07	12.65	10.10	2.15	V		0.115	20.60
		64-QAM	-22.14	11.58	10.10	2.15	V		0.090	19.53
		256-QAM	-25.22	8.50	10.10	2.15	V		0.044	16.45
1882.5		QPSK	-21.44	11.75	9.98	2.25	V		0.089	19.48
		16-QAM	-22.15	11.04	9.98	2.25	V		0.075	18.77
		64-QAM	-23.23	9.96	9.98	2.25	V		0.059	17.69
		256-QAM	-26.31	6.88	9.98	2.25	V		0.029	14.61
1914.3		QPSK	-21.28	12.70	9.87	2.17	V		0.110	20.41
		16-QAM	-22.06	11.92	9.87	2.17	V		0.092	19.63
		64-QAM	-23.16	10.82	9.87	2.17	V		0.071	18.53
		256-QAM	-26.14	7.84	9.87	2.17	V		0.036	15.55

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1851.5	LTE B25 3 MHz	QPSK	-20.24	13.48	10.10	2.15	V	< 2.00	0.139	21.43
		16-QAM	-20.99	12.73	10.10	2.15	V		0.117	20.68
		64-QAM	-22.08	11.64	10.10	2.15	V		0.091	19.59
		256-QAM	-25.17	8.55	10.10	2.15	V		0.045	16.50
1882.5		QPSK	-21.31	11.88	9.98	2.25	V		0.091	19.61
		16-QAM	-21.99	11.20	9.98	2.25	V		0.078	18.93
		64-QAM	-23.07	10.12	9.98	2.25	V		0.061	17.85
		256-QAM	-26.20	6.99	9.98	2.25	V		0.030	14.72
1913.5		QPSK	-21.25	12.54	9.88	2.17	V		0.106	20.25
		16-QAM	-21.99	11.80	9.88	2.17	V		0.089	19.51
		64-QAM	-23.05	10.74	9.88	2.17	V		0.070	18.45
		256-QAM	-26.10	7.69	9.88	2.17	V		0.035	15.40

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit W	EIRP W	EIRP dBm
1852.5	LTE B25 5 MHz	QPSK	-20.16	13.56	10.10	2.15	V	< 2.00	0.142	21.51
		16-QAM	-20.97	12.75	10.10	2.15	V		0.117	20.70
		64-QAM	-22.03	11.69	10.10	2.15	V		0.092	19.64
		256-QAM	-25.07	8.65	10.10	2.15	V		0.046	16.60
1882.5		QPSK	-21.29	11.90	9.98	2.25	V		0.092	19.63
		16-QAM	-22.07	11.12	9.98	2.25	V		0.077	18.85
		64-QAM	-23.11	10.08	9.98	2.25	V		0.060	17.81
		256-QAM	-26.19	7.00	9.98	2.25	V		0.030	14.73
1912.5		QPSK	-20.97	12.82	9.88	2.17	V		0.113	20.53
		16-QAM	-21.80	11.99	9.88	2.17	V		0.093	19.70
		64-QAM	-22.88	10.91	9.88	2.17	V		0.073	18.62
		256-QAM	-25.85	7.94	9.88	2.17	V		0.037	15.65

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit W	EIRP W	EIRP dBm
1855.0	LTE B25 10 MHz	QPSK	-20.21	13.20	10.08	2.17	V	< 2.00	0.129	21.11
		16-QAM	-21.00	12.41	10.08	2.17	V		0.108	20.32
		64-QAM	-22.08	11.33	10.08	2.17	V		0.084	19.24
		256-QAM	-25.12	8.29	10.08	2.17	V		0.042	16.20
1882.5		QPSK	-21.30	11.89	9.98	2.25	V		0.092	19.62
		16-QAM	-22.03	11.16	9.98	2.25	V		0.077	18.89
		64-QAM	-23.10	10.09	9.98	2.25	V		0.061	17.82
		256-QAM	-26.23	6.96	9.98	2.25	V		0.029	14.69
1910.0		QPSK	-21.07	12.71	9.89	2.17	V		0.110	20.43
		16-QAM	-21.83	11.95	9.89	2.17	V		0.093	19.67
		64-QAM	-22.83	10.95	9.89	2.17	V		0.074	18.67
		256-QAM	-26.03	7.75	9.89	2.17	V		0.035	15.47

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1857.5	LTE B25 15 MHz	QPSK	-20.14	13.11	10.06	2.17	V	< 2.00	0.126	21.00
		16-QAM	-20.97	12.28	10.06	2.17	V		0.104	20.17
		64-QAM	-22.02	11.23	10.06	2.17	V		0.082	19.12
		256-QAM	-25.12	8.13	10.06	2.17	V		0.040	16.02
1882.5		QPSK	-21.32	11.87	9.98	2.25	V		0.091	19.60
		16-QAM	-22.12	11.07	9.98	2.25	V		0.076	18.80
		64-QAM	-23.12	10.07	9.98	2.25	V		0.060	17.80
		256-QAM	-26.17	7.02	9.98	2.25	V		0.030	14.75
1907.5		QPSK	-20.64	13.13	9.90	2.17	V		0.122	20.86
		16-QAM	-21.51	12.26	9.90	2.17	V		0.100	19.99
		64-QAM	-22.50	11.27	9.90	2.17	V		0.079	19.00
		256-QAM	-25.51	8.26	9.90	2.17	V		0.040	15.99

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1860.0	LTE B25 20 MHz	QPSK	-20.20	12.89	10.06	2.19	V	< 2.00	0.119	20.76
		16-QAM	-21.03	12.06	10.06	2.19	V		0.098	19.93
		64-QAM	-22.05	11.04	10.06	2.19	V		0.078	18.91
		256-QAM	-25.08	8.01	10.06	2.19	V		0.039	15.88
1882.5		QPSK	-21.27	11.92	9.98	2.25	V		0.092	19.65
		16-QAM	-22.13	11.06	9.98	2.25	V		0.076	18.79
		64-QAM	-23.10	10.09	9.98	2.25	V		0.061	17.82
		256-QAM	-26.14	7.05	9.98	2.25	V		0.030	14.78
1905.0		QPSK	-20.83	12.88	9.89	2.19	V		0.114	20.59
		16-QAM	-21.67	12.04	9.89	2.19	V		0.094	19.75
		64-QAM	-22.67	11.04	9.89	2.19	V		0.075	18.75
		256-QAM	-25.74	7.97	9.89	2.19	V		0.037	15.68

8.2 RADIATED SPURIOUS EMISSIONS

- ▣ OPERATING FREQUENCY: 1852.5 MHz
- ▣ MEASURED OUTPUT POWER: 21.51 dBm = 0.142 W
- ▣ MOD: LTE B25
- ▣ MODULATION SIGNAL: 5 MHz QPSK
- ▣ DISTANCE: 3 meters
- ▣ LIMIT: 43 + 10 log10 (W) = 34.51 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
26065 (1852.5)	3 705.00	-59.19	11.70	-60.03	3.12	H	-51.45	72.96
	5 557.50	-61.55	12.08	-56.33	3.88	H	-48.13	69.64
	7 410.00	-63.91	11.24	-48.95	4.41	V	-42.12	63.63
26365 (1882.5)	3 765.00	-60.56	11.61	-60.56	3.16	V	-52.10	73.61
	5 647.50	-61.69	12.00	-55.84	3.94	H	-47.78	69.29
	7 530.00	-63.60	11.56	-49.79	4.54	V	-42.77	64.28
26665 (1912.5)	3 825.00	-60.85	11.30	-60.30	3.19	V	-52.19	73.70
	5 737.50	-61.92	11.72	-55.25	3.89	H	-47.42	68.92
	7 650.00	-64.46	11.60	-50.93	4.61	V	-43.94	65.44

8.3 PEAK-TO-AVERAGE RATIO

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (dB)
25	1.4 MHz	1882.5	QPSK	6	0	6.15
			16-QAM	6	0	6.53
			64-QAM	6	0	6.65
			256-QAM	6	0	6.72
	3 MHz		QPSK	15	0	6.13
			16-QAM	15	0	6.54
			64-QAM	15	0	6.59
			256-QAM	15	0	6.64
	5 MHz		QPSK	25	0	5.95
			16-QAM	25	0	6.47
			64-QAM	25	0	6.55
			256-QAM	25	0	6.60
	10 MHz		QPSK	50	0	6.00
			16-QAM	50	0	6.41
			64-QAM	50	0	6.51
			256-QAM	50	0	6.63
	15 MHz		QPSK	75	0	5.94
			16-QAM	75	0	6.53
			64-QAM	75	0	6.51
			256-QAM	75	0	6.63
	20 MHz		QPSK	100	0	5.96
			16-QAM	100	0	6.45
			64-QAM	100	0	6.52
			256-QAM	100	0	6.71

Note:

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 109 ~ 132.

8.4 OCCUPIED BANDWIDTH

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
25	1.4 MHz	1882.5	QPSK	6	0	1.0998
			16-QAM	6	0	1.0984
			64-QAM	6	0	1.0952
			256-QAM	6	0	1.0930
	3 MHz		QPSK	15	0	2.7222
			16-QAM	15	0	2.7118
			64-QAM	15	0	2.7154
			256-QAM	15	0	2.7106
	5 MHz		QPSK	25	0	4.5362
			16-QAM	25	0	4.5231
			64-QAM	25	0	4.5218
			256-QAM	25	0	4.5452
	10 MHz		QPSK	50	0	9.0143
			16-QAM	50	0	9.0342
			64-QAM	50	0	9.0010
			256-QAM	50	0	8.9873
	15 MHz		QPSK	75	0	13.472
			16-QAM	75	0	13.490
			64-QAM	75	0	13.473
			256-QAM	75	0	13.477
	20 MHz		QPSK	100	0	17.952
			16-QAM	100	0	17.940
			64-QAM	100	0	17.964
			256-QAM	100	0	17.970

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 85 ~ 108.

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)
25	1.4	3.6790	3.6905	27.976	-77.394	-49.418	-13.00
		3.6790	3.6905	27.976	-76.958	-48.982	
		3.6780	3.6895	27.976	-77.464	-49.488	
	3	3.6815	3.7134	27.976	-77.613	-49.637	
		3.7114	3.7079	27.976	-77.337	-49.361	
		3.6885	3.7309	27.976	-77.195	-49.219	
	5	3.7194	3.7164	27.976	-77.354	-49.378	
		3.7114	3.6955	27.976	-77.222	-49.246	
		3.6850	3.6915	27.976	-77.196	-49.220	
	10	3.7189	3.6691	27.976	-77.331	-49.355	
		3.7044	3.6820	27.976	-77.259	-49.283	
		3.6785	3.7184	27.976	-76.488	-48.512	
	15	3.6910	3.7074	27.976	-77.127	-49.151	
		3.7039	3.7024	27.976	-77.343	-49.367	
		3.7044	3.7024	27.976	-77.365	-49.389	
	20	3.7169	3.6985	27.976	-77.167	-49.191	
		3.7124	3.7109	27.976	-77.173	-49.197	
		3.7005	3.6915	27.976	-77.306	-49.330	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 133 ~ 168.
2. Conducted Spurious Emissions was Tested QPSK Modulation, Resource Block Size 1 and Resource Block Offset 0
3. Result (dBm) = Measurement Maximum Data (dBm) + Factor (dB)
4. Factor(dB) = Cable Loss + Ext. Attenuator + Power Splitter

Frequency Range (GHz)	Factor [dB]
0.03 – 1	25.270
1 – 5	27.976
5 – 10	28.591
10 – 15	29.116
15 – 20	29.489
Above 20(26.5)	30.131

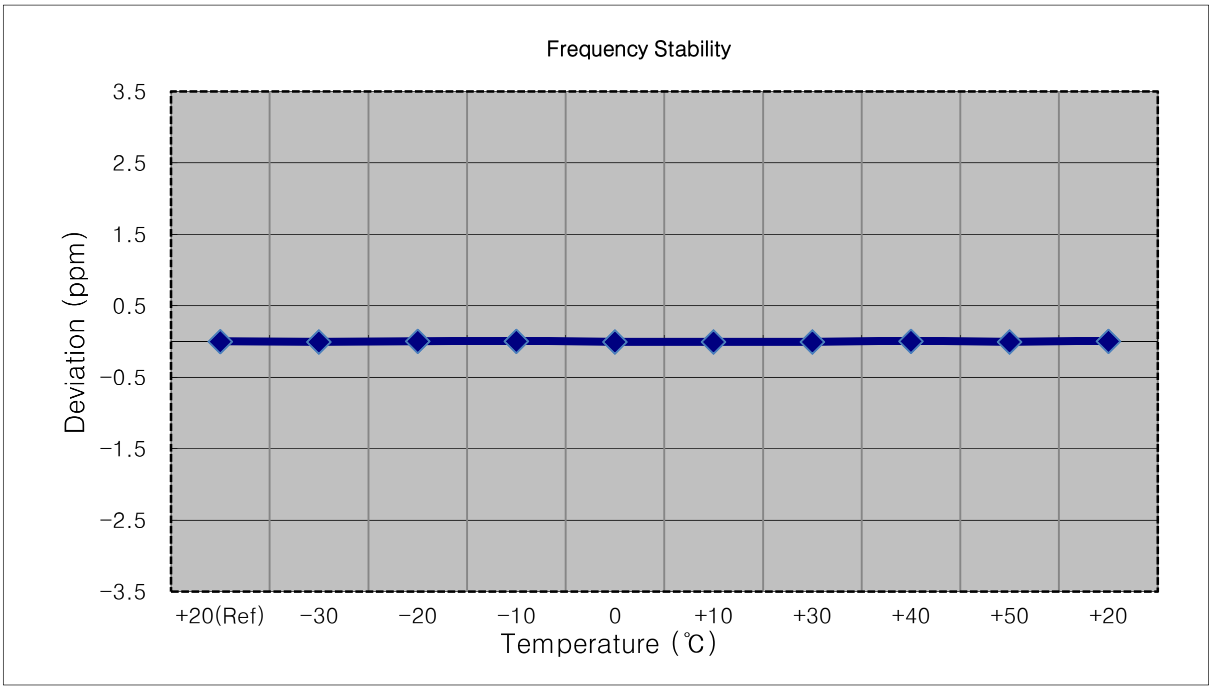
8.6 BAND EDGE

- Plots of the EUT's Band Edge are shown Page 49 ~ 84.

8.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

- ▣ MODE: LTE B25
- ▣ OPERATING FREQUENCY: 1850,700,000 Hz
- ▣ CHANNEL: 26047 (1.4 MHz)
- ▣ REFERENCE VOLTAGE: 3.88 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	1850 700 007	0.0	0.000 000	0.000
100 %		-30	1850 699 999	-7.7	0.000 000	-0.004
100 %		-20	1850 700 013	6.6	0.000 000	0.004
100 %		-10	1850 700 014	7.2	0.000 000	0.004
100 %		0	1850 700 000	-6.5	0.000 000	-0.004
100 %		+10	1850 699 999	-7.7	0.000 000	-0.004
100 %		+30	1850 700 000	-7.0	0.000 000	-0.004
100 %		+40	1850 700 014	7.1	0.000 000	0.004
100 %		+50	1850 699 998	-8.4	0.000 000	-0.005
Batt. Endpoint	3.400	+20	1850 700 014	7.2	0.000 000	0.004



▣ MODE: LTE B25

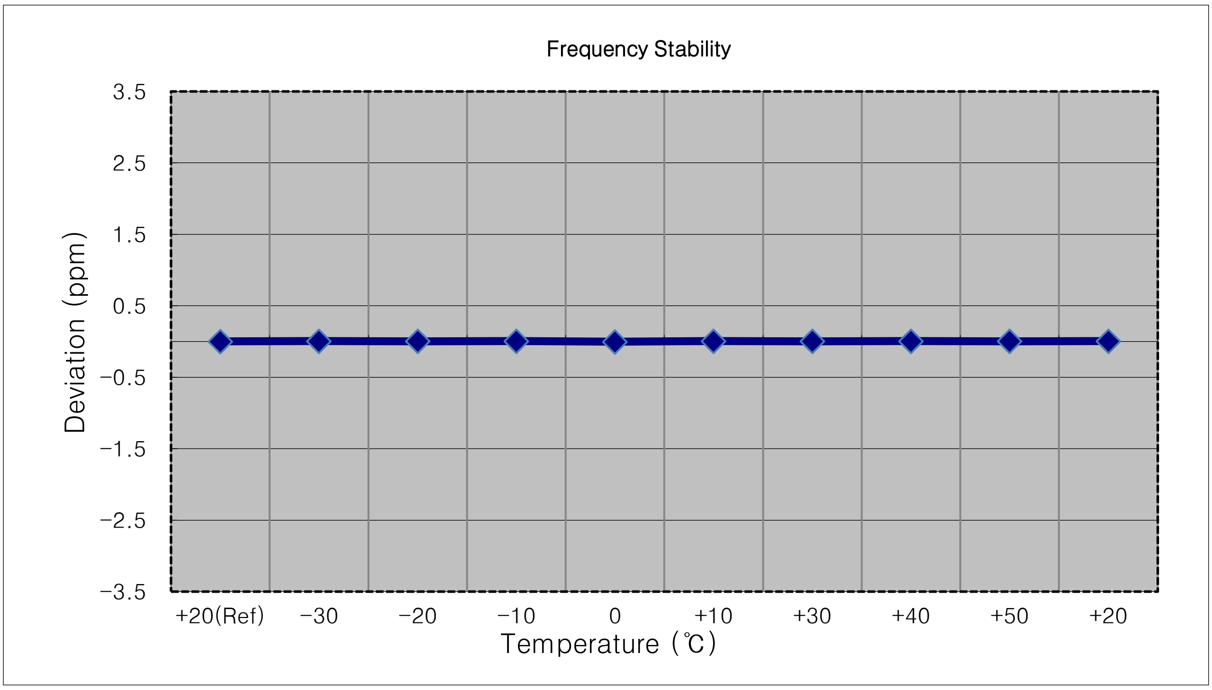
▣ OPERATING FREQUENCY: 1851,500,000 Hz

▣ CHANNEL: 26055 (3 MHz)

▣ REFERENCE VOLTAGE: 3.88 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	1851 500 007	0.0	0.000 000	0.000
100 %		-30	1851 500 016	9.0	0.000 000	0.005
100 %		-20	1851 500 014	6.4	0.000 000	0.003
100 %		-10	1851 500 015	7.9	0.000 000	0.004
100 %		0	1851 500 001	-6.4	0.000 000	-0.003
100 %		+10	1851 500 015	7.1	0.000 000	0.004
100 %		+30	1851 500 014	6.8	0.000 000	0.004
100 %		+40	1851 500 015	7.2	0.000 000	0.004
100 %		+50	1851 500 014	6.4	0.000 000	0.003
Batt. Endpoint	3.400	+20	1851 500 015	7.6	0.000 000	0.004



▣ MODE: LTE B25

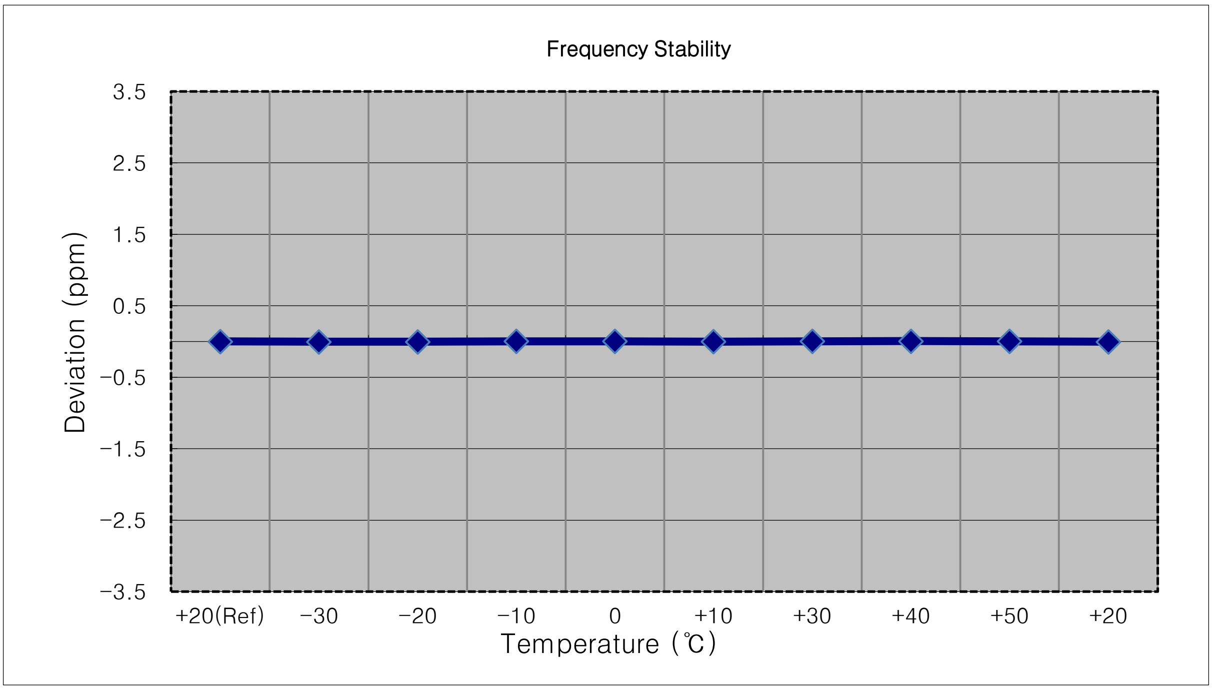
▣ OPERATING FREQUENCY: 1852,500,000 Hz

▣ CHANNEL: 26065 (5 MHz)

▣ REFERENCE VOLTAGE: 3.88 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	1852 500 006	0.0	0.000 000	0.000
100 %		-30	1852 499 999	-6.9	0.000 000	-0.004
100 %		-20	1852 499 999	-6.9	0.000 000	-0.004
100 %		-10	1852 500 012	6.3	0.000 000	0.003
100 %		0	1852 500 012	5.8	0.000 000	0.003
100 %		+10	1852 500 001	-5.4	0.000 000	-0.003
100 %		+30	1852 500 013	6.7	0.000 000	0.004
100 %		+40	1852 500 013	7.4	0.000 000	0.004
100 %		+50	1852 500 012	6.3	0.000 000	0.003
Batt. Endpoint	3.400	+20	1852 499 999	-6.6	0.000 000	-0.004



▣ MODE: LTE B25

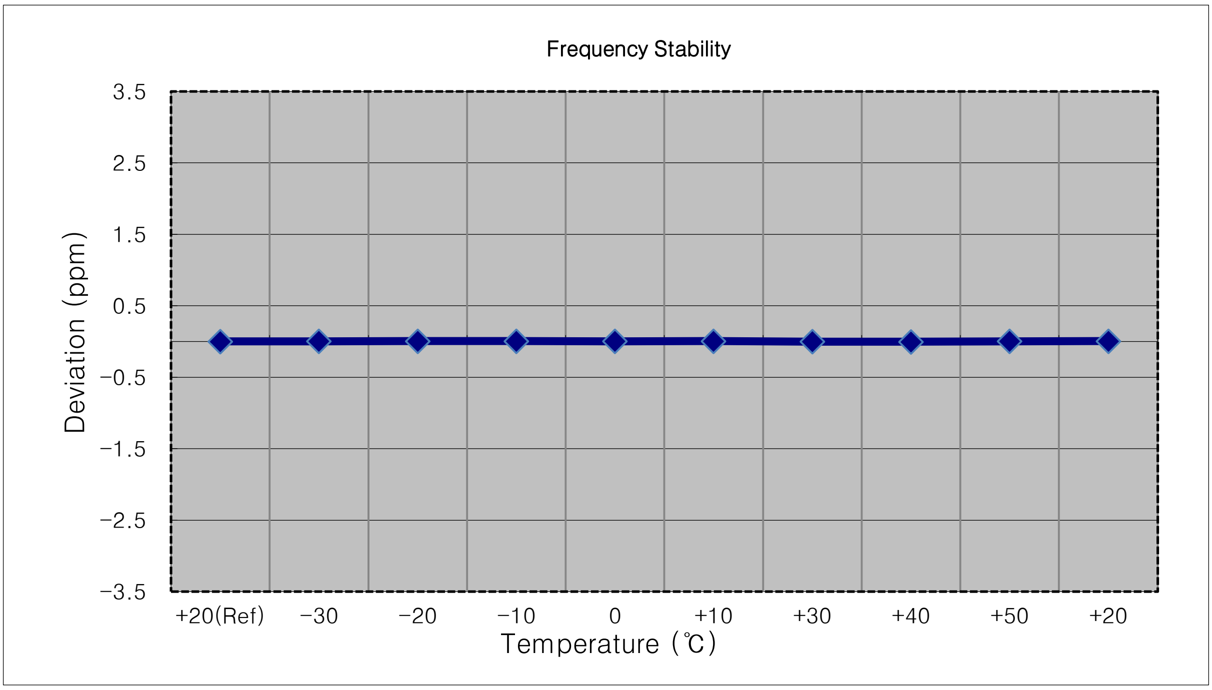
▣ OPERATING FREQUENCY: 1855,000,000 Hz

▣ CHANNEL: 26090 (10 MHz)

▣ REFERENCE VOLTAGE: 3.88 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	1855 000 007	0.0	0.000 000	0.000
100 %		-30	1855 000 013	6.4	0.000 000	0.003
100 %		-20	1855 000 015	7.5	0.000 000	0.004
100 %		-10	1855 000 014	7.0	0.000 000	0.004
100 %		0	1855 000 014	6.8	0.000 000	0.004
100 %		+10	1855 000 015	7.5	0.000 000	0.004
100 %		+30	1855 000 002	-5.3	0.000 000	-0.003
100 %		+40	1855 000 001	-5.6	0.000 000	-0.003
100 %		+50	1855 000 013	6.0	0.000 000	0.003
Batt. Endpoint	3.400	+20	1855 000 015	7.8	0.000 000	0.004



▣ MODE: LTE B25

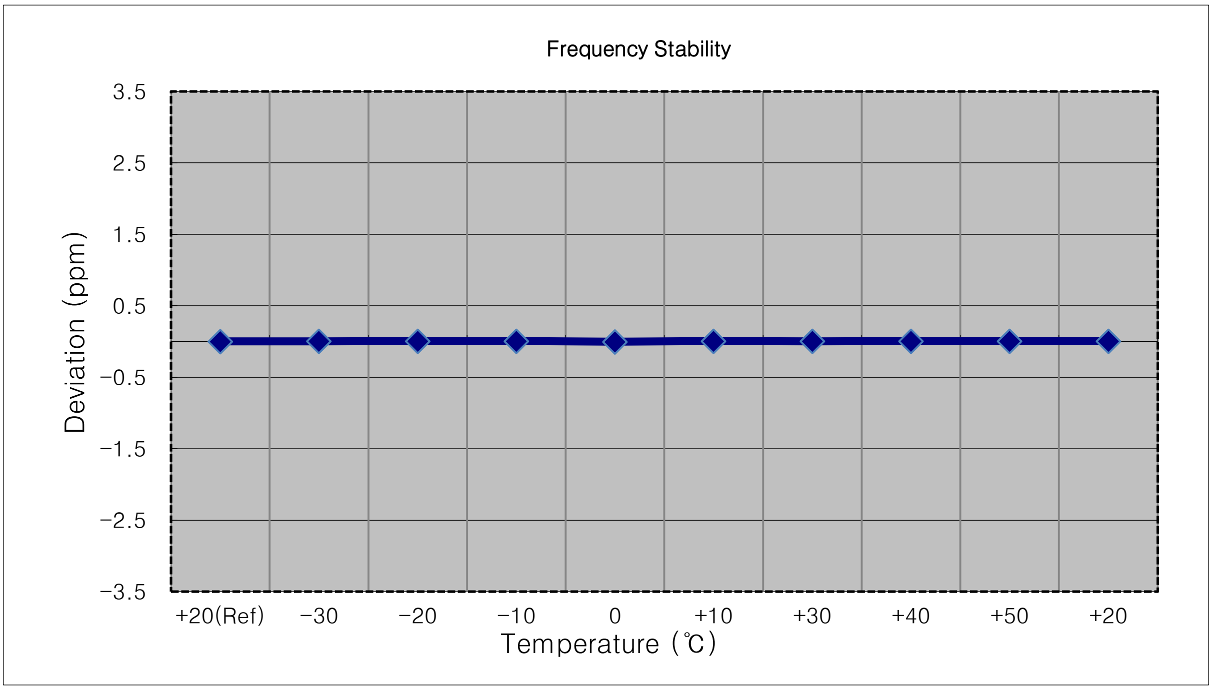
▣ OPERATING FREQUENCY: 1857,500,000 Hz

▣ CHANNEL: 26115 (15 MHz)

▣ REFERENCE VOLTAGE: 3.88 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	1857 500 007	0.0	0.000 000	0.000
100 %		-30	1857 500 014	6.4	0.000 000	0.003
100 %		-20	1857 500 015	7.7	0.000 000	0.004
100 %		-10	1857 500 016	8.6	0.000 000	0.005
100 %		0	1857 500 002	-5.7	0.000 000	-0.003
100 %		+10	1857 500 015	7.3	0.000 000	0.004
100 %		+30	1857 500 014	6.7	0.000 000	0.004
100 %		+40	1857 500 015	7.4	0.000 000	0.004
100 %		+50	1857 500 015	8.0	0.000 000	0.004
Batt. Endpoint	3.400	+20	1857 500 015	8.0	0.000 000	0.004



▣ MODE: LTE B25

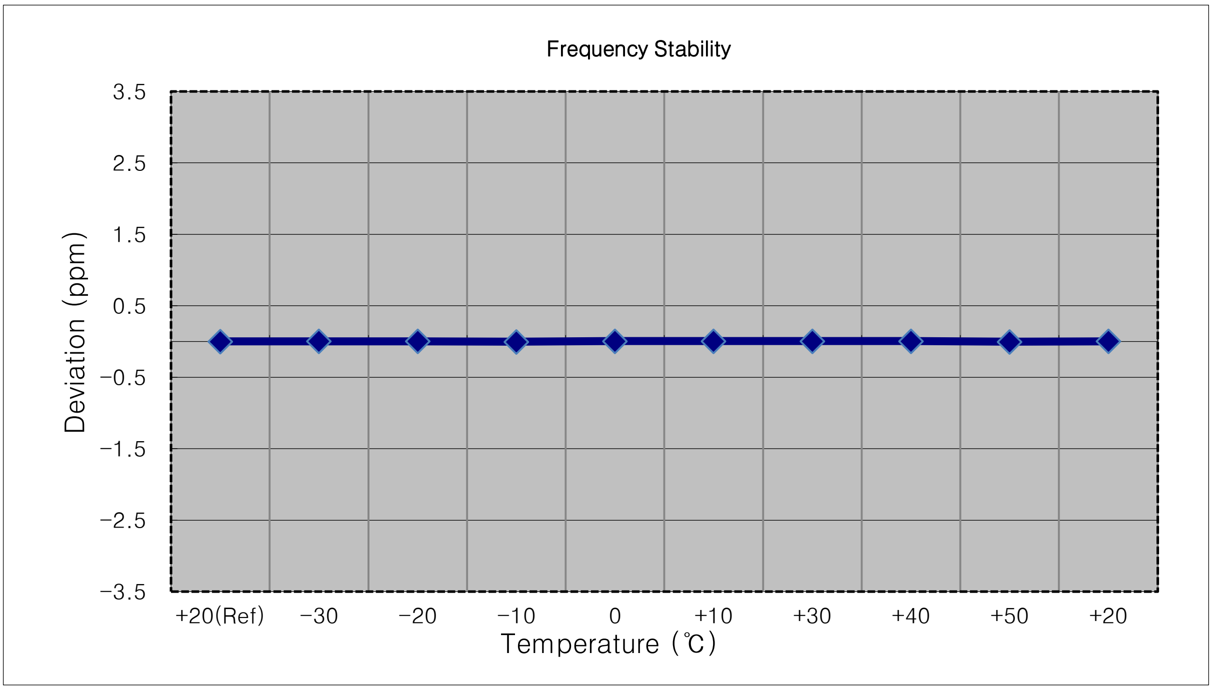
▣ OPERATING FREQUENCY: 1860,000,000 Hz

▣ CHANNEL: 26140 (20 MHz)

▣ REFERENCE VOLTAGE: 3.88 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	1860 000 006	0.0	0.000 000	0.000
100 %		-30	1860 000 012	6.3	0.000 000	0.003
100 %		-20	1860 000 012	6.5	0.000 000	0.003
100 %		-10	1859 999 999	-6.6	0.000 000	-0.004
100 %		0	1860 000 013	7.4	0.000 000	0.004
100 %		+10	1860 000 013	6.9	0.000 000	0.004
100 %		+30	1860 000 013	7.2	0.000 000	0.004
100 %		+40	1860 000 013	7.3	0.000 000	0.004
100 %		+50	1859 999 999	-6.6	0.000 000	-0.004
Batt. Endpoint	3.400	+20	1860 000 013	6.6	0.000 000	0.004



▣ MODE: LTE B25

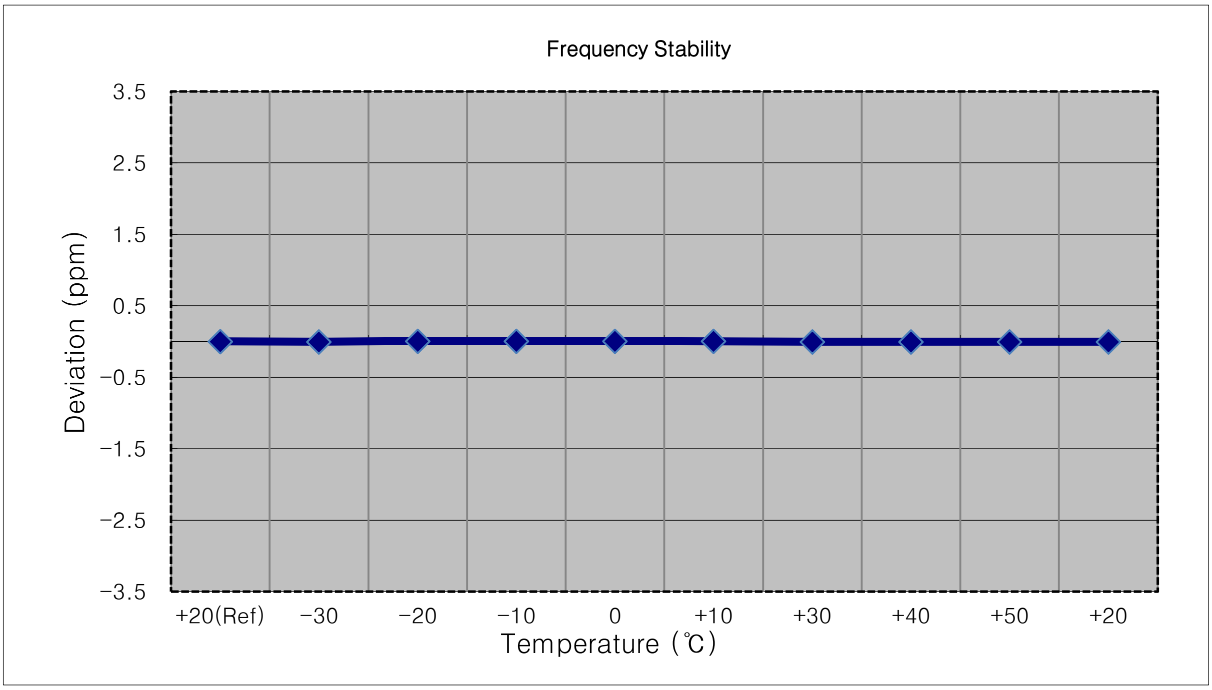
▣ OPERATING FREQUENCY: 1882,500,000 Hz

▣ CHANNEL: 26365 (1.4 MHz)

▣ REFERENCE VOLTAGE: 3.88 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	1882 500 007	0.0	0.000 000	0.000
100 %		-30	1882 500 000	-6.9	0.000 000	-0.004
100 %		-20	1882 500 014	7.2	0.000 000	0.004
100 %		-10	1882 500 015	7.8	0.000 000	0.004
100 %		0	1882 500 015	7.7	0.000 000	0.004
100 %		+10	1882 500 013	6.5	0.000 000	0.003
100 %		+30	1882 500 001	-6.0	0.000 000	-0.003
100 %		+40	1882 500 000	-7.1	0.000 000	-0.004
100 %		+50	1882 500 000	-7.4	0.000 000	-0.004
Batt. Endpoint	3.400	+20	1882 499 999	-8.1	0.000 000	-0.004



▣ MODE: LTE B25

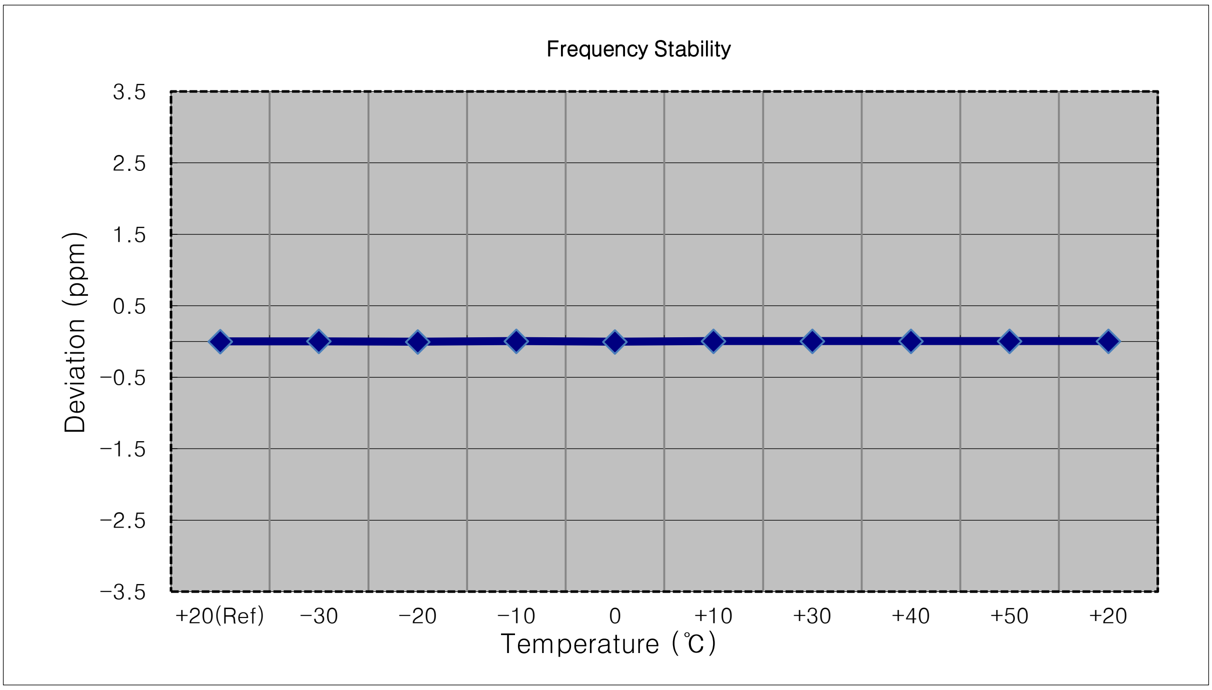
▣ OPERATING FREQUENCY: 1882,500,000 Hz

▣ CHANNEL: 26365 (3 MHz)

▣ REFERENCE VOLTAGE: 3.88 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	1882 500 009	0.0	0.000 000	0.000
100 %		-30	1882 500 015	6.5	0.000 000	0.003
100 %		-20	1882 500 000	-8.2	0.000 000	-0.004
100 %		-10	1882 500 017	8.1	0.000 000	0.004
100 %		0	1882 499 999	-9.2	0.000 000	-0.005
100 %		+10	1882 500 016	7.0	0.000 000	0.004
100 %		+30	1882 500 017	8.7	0.000 000	0.005
100 %		+40	1882 500 017	8.2	0.000 000	0.004
100 %		+50	1882 500 016	7.7	0.000 000	0.004
Batt. Endpoint	3.400	+20	1882 500 018	9.1	0.000 000	0.005



▣ MODE: LTE B25

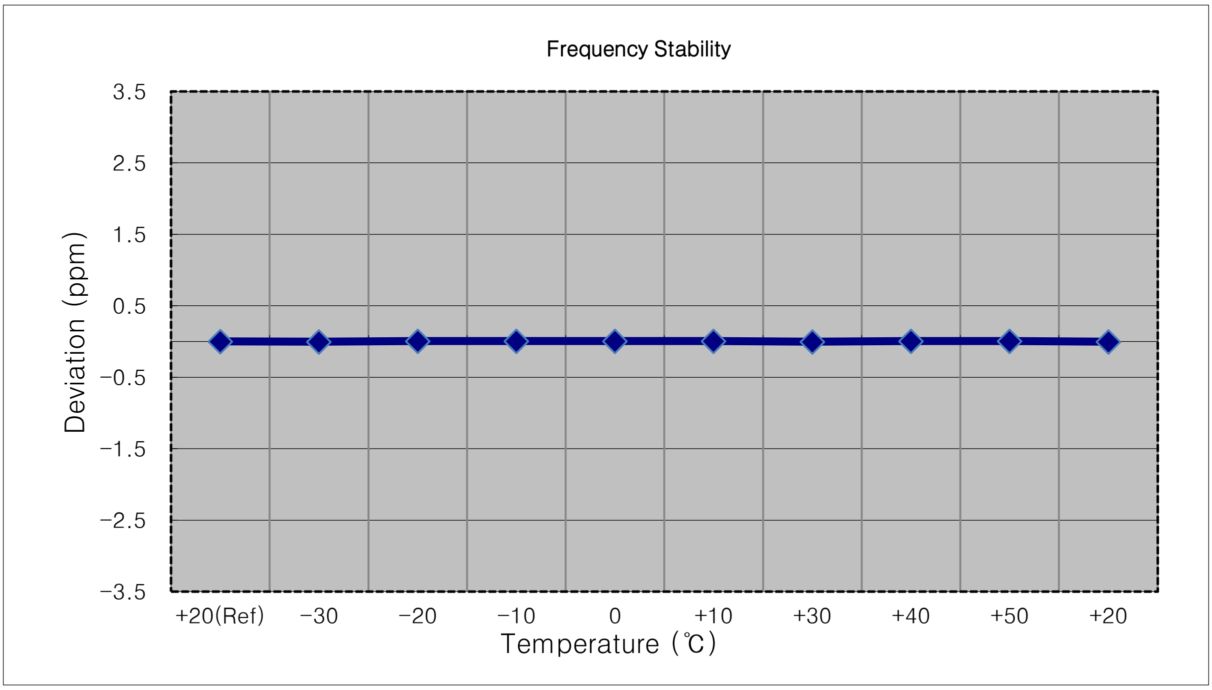
▣ OPERATING FREQUENCY: 1882,500,000 Hz

▣ CHANNEL: 26365 (5 MHz)

▣ REFERENCE VOLTAGE: 3.88 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	1882 499 990	0.0	0.000 000	0.000
100 %		-30	1882 499 984	-6.5	0.000 000	-0.003
100 %		-20	1882 499 999	8.5	0.000 000	0.005
100 %		-10	1882 500 000	9.5	0.000 001	0.005
100 %		0	1882 500 000	9.7	0.000 001	0.005
100 %		+10	1882 499 999	9.0	0.000 000	0.005
100 %		+30	1882 499 982	-8.1	0.000 000	-0.004
100 %		+40	1882 499 998	8.1	0.000 000	0.004
100 %		+50	1882 499 999	8.7	0.000 000	0.005
Batt. Endpoint	3.400	+20	1882 499 984	-6.1	0.000 000	-0.003



▣ MODE: LTE B25

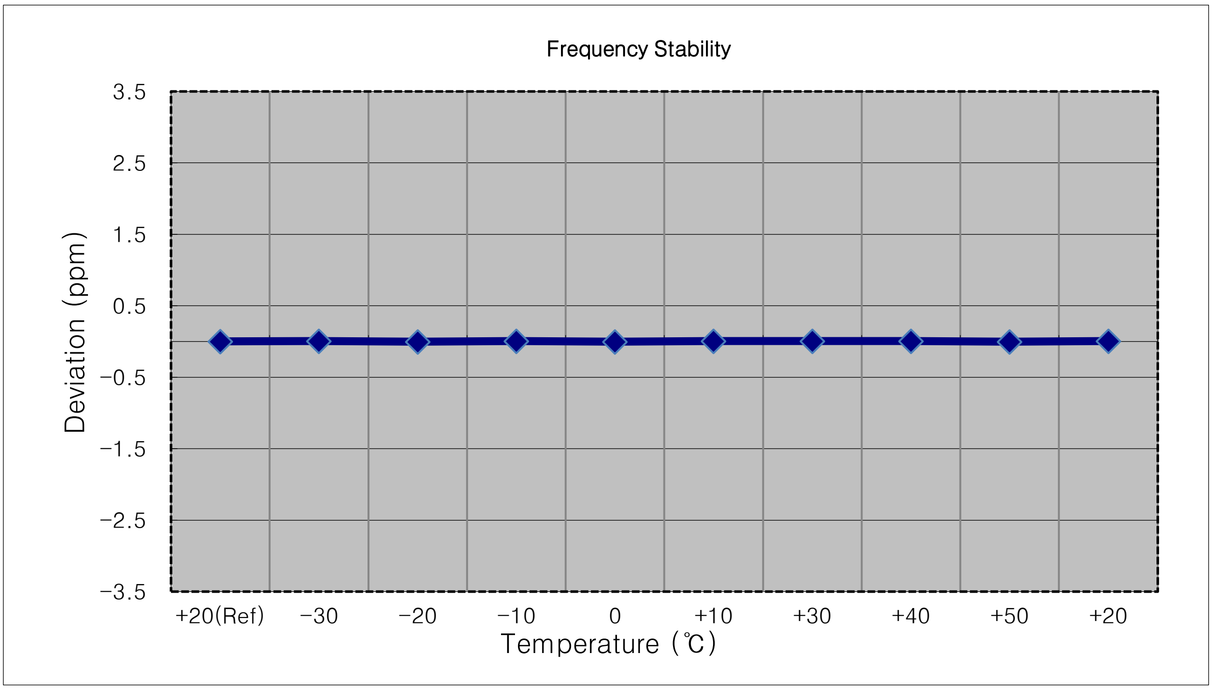
▣ OPERATING FREQUENCY: 1882,500,000 Hz

▣ CHANNEL: 26365 (10 MHz)

▣ REFERENCE VOLTAGE: 3.88 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	1882 500 009	0.0	0.000 000	0.000
100 %		-30	1882 500 016	7.8	0.000 000	0.004
100 %		-20	1882 500 001	-7.4	0.000 000	-0.004
100 %		-10	1882 500 018	9.0	0.000 000	0.005
100 %		0	1882 500 001	-7.7	0.000 000	-0.004
100 %		+10	1882 500 017	8.8	0.000 000	0.005
100 %		+30	1882 500 016	7.7	0.000 000	0.004
100 %		+40	1882 500 016	7.6	0.000 000	0.004
100 %		+50	1882 500 001	-7.4	0.000 000	-0.004
Batt. Endpoint	3.400	+20	1882 500 018	9.6	0.000 001	0.005



▣ MODE: LTE B25

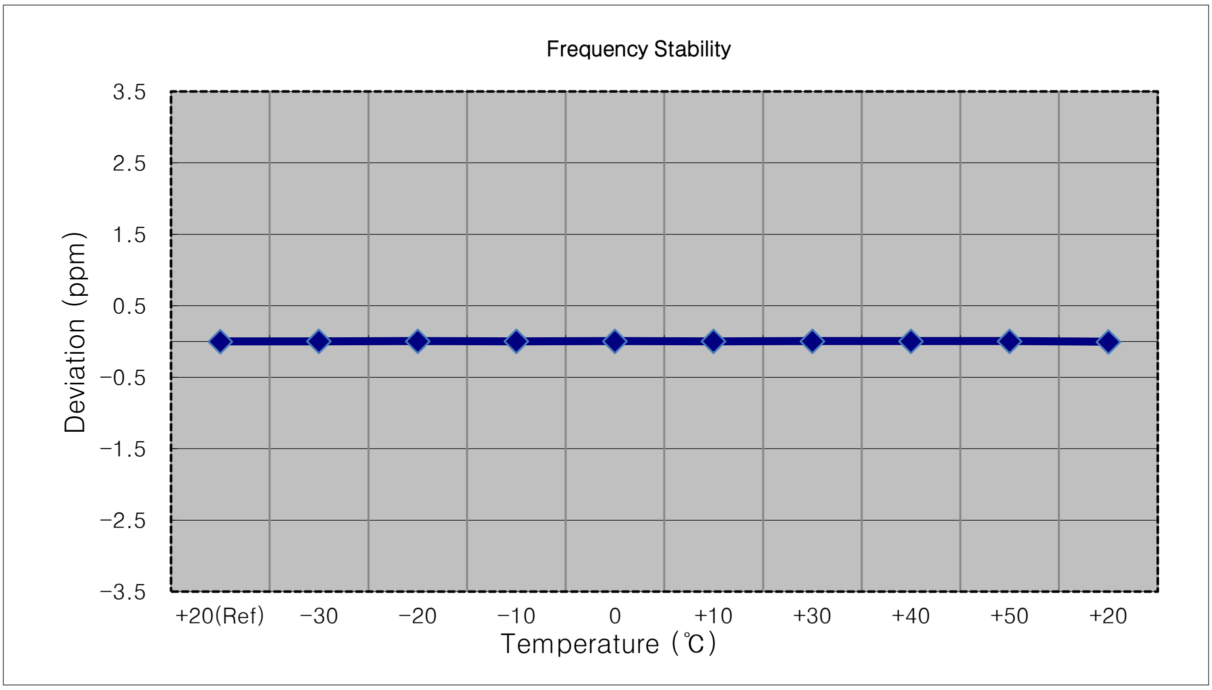
▣ OPERATING FREQUENCY: 1882,500,000 Hz

▣ CHANNEL: 26365 (15 MHz)

▣ REFERENCE VOLTAGE: 3.88 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	1882 500 008	0.0	0.000 000	0.000
100 %		-30	1882 500 014	6.1	0.000 000	0.003
100 %		-20	1882 500 015	7.4	0.000 000	0.004
100 %		-10	1882 500 014	5.6	0.000 000	0.003
100 %		0	1882 500 016	8.4	0.000 000	0.004
100 %		+10	1882 500 014	6.3	0.000 000	0.003
100 %		+30	1882 500 016	7.8	0.000 000	0.004
100 %		+40	1882 500 015	7.5	0.000 000	0.004
100 %		+50	1882 500 015	7.4	0.000 000	0.004
Batt. Endpoint	3.400	+20	1882 500 001	-6.5	0.000 000	-0.003



▣ MODE: LTE B25

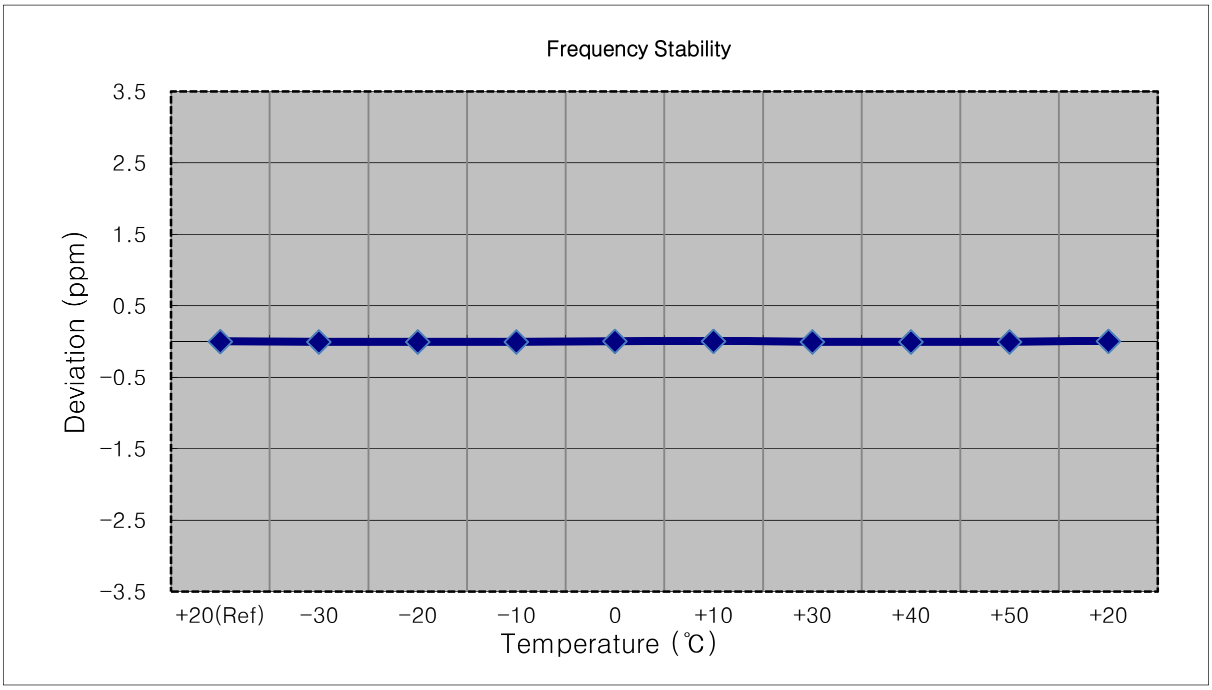
▣ OPERATING FREQUENCY: 1882,500,000 Hz

▣ CHANNEL: 26365 (20 MHz)

▣ REFERENCE VOLTAGE: 3.88 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	1882 500 007	0.0	0.000 000	0.000
100 %		-30	1882 500 001	-5.8	0.000 000	-0.003
100 %		-20	1882 499 999	-7.6	0.000 000	-0.004
100 %		-10	1882 500 000	-6.9	0.000 000	-0.004
100 %		0	1882 500 014	6.7	0.000 000	0.004
100 %		+10	1882 500 014	7.3	0.000 000	0.004
100 %		+30	1882 500 000	-7.2	0.000 000	-0.004
100 %		+40	1882 500 001	-6.3	0.000 000	-0.003
100 %		+50	1882 500 000	-7.4	0.000 000	-0.004
Batt. Endpoint	3.400	+20	1882 500 015	8.3	0.000 000	0.004



▣ MODE: LTE B25

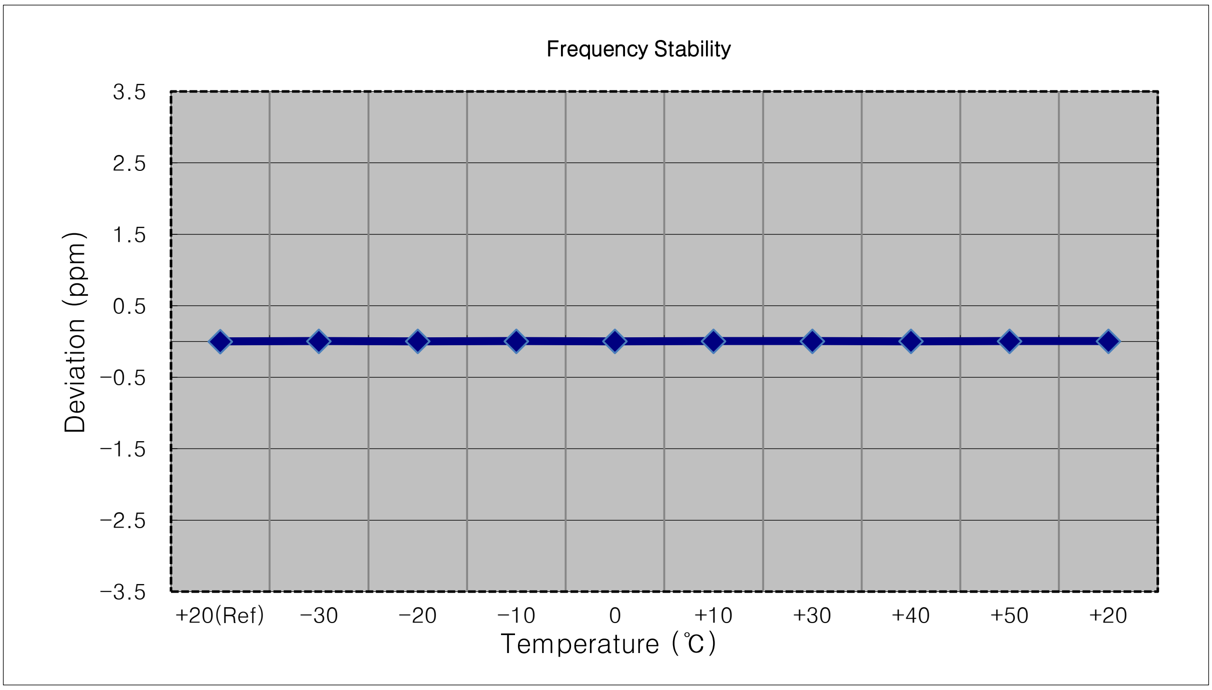
▣ OPERATING FREQUENCY: 1914,300,000 Hz

▣ CHANNEL: 26683 (1.4 MHz)

▣ REFERENCE VOLTAGE: 3.88 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	1914 299 993	0.0	0.000 000	0.000
100 %		-30	1914 300 001	8.1	0.000 000	0.004
100 %		-20	1914 299 999	5.6	0.000 000	0.003
100 %		-10	1914 300 002	9.2	0.000 000	0.005
100 %		0	1914 299 999	5.5	0.000 000	0.003
100 %		+10	1914 300 001	7.7	0.000 000	0.004
100 %		+30	1914 300 001	8.0	0.000 000	0.004
100 %		+40	1914 300 000	6.4	0.000 000	0.003
100 %		+50	1914 300 002	8.5	0.000 000	0.004
Batt. Endpoint	3.400	+20	1914 300 001	7.5	0.000 000	0.004



▣ MODE: LTE B25

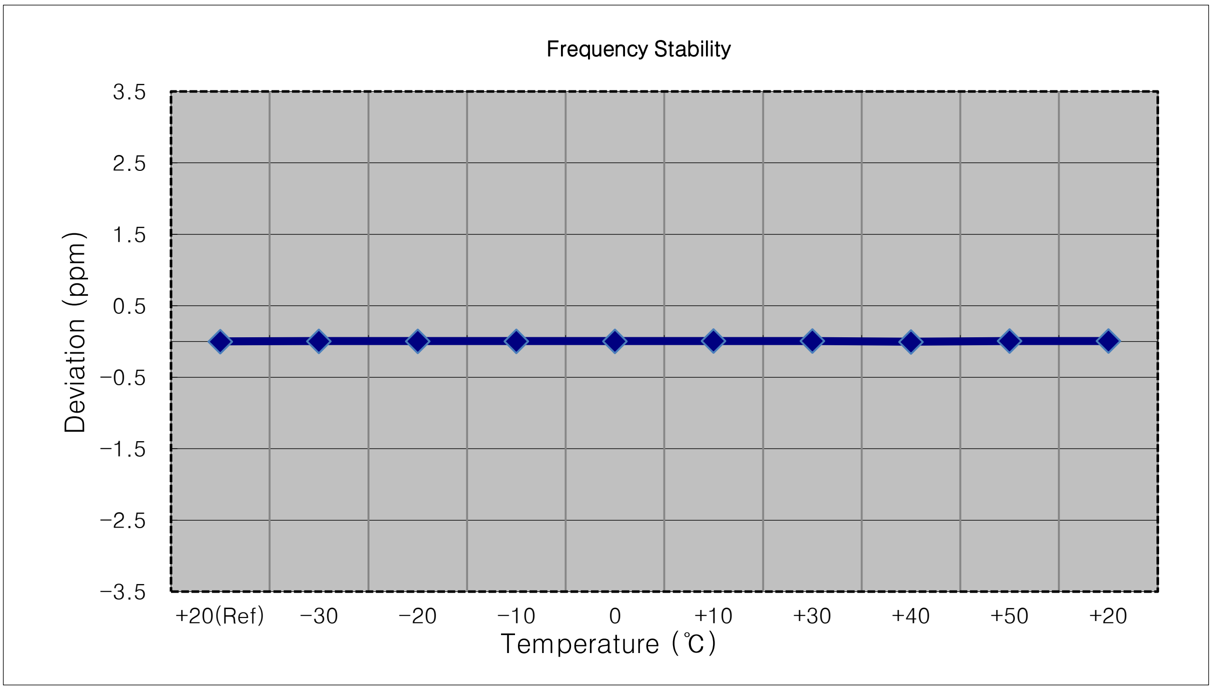
▣ OPERATING FREQUENCY: 1913,500,000 Hz

▣ CHANNEL: 26675 (3 MHz)

▣ REFERENCE VOLTAGE: 3.88 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	1913 500 008	0.0	0.000 000	0.000
100 %		-30	1913 500 019	10.8	0.000 001	0.006
100 %		-20	1913 500 016	8.0	0.000 000	0.004
100 %		-10	1913 500 017	8.8	0.000 000	0.005
100 %		0	1913 500 017	8.7	0.000 000	0.005
100 %		+10	1913 500 021	12.3	0.000 001	0.006
100 %		+30	1913 500 021	12.2	0.000 001	0.006
100 %		+40	1913 500 001	-7.8	0.000 000	-0.004
100 %		+50	1913 500 021	12.7	0.000 001	0.007
Batt. Endpoint	3.400	+20	1913 500 022	13.7	0.000 001	0.007



▣ MODE: LTE B25

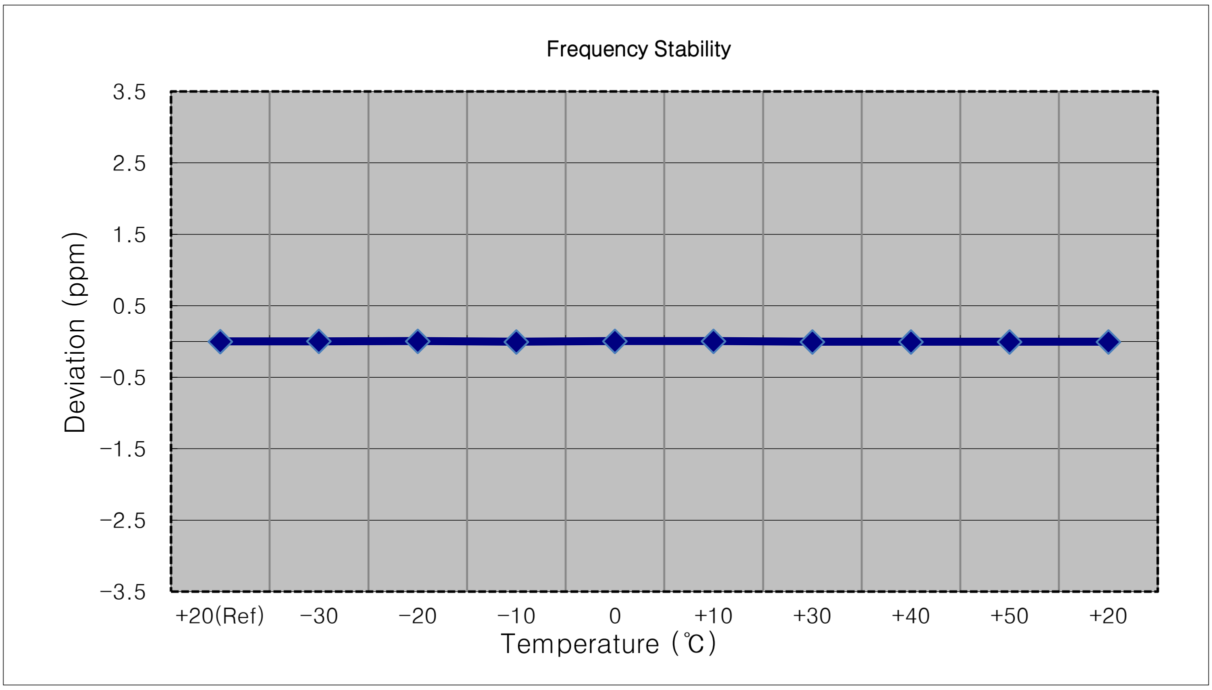
▣ OPERATING FREQUENCY: 1912,500,000 Hz

▣ CHANNEL: 26665 (5 MHz)

▣ REFERENCE VOLTAGE: 3.88 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	1912 500 011	0.0	0.000 000	0.000
100 %		-30	1912 500 017	6.2	0.000 000	0.003
100 %		-20	1912 500 019	7.9	0.000 000	0.004
100 %		-10	1912 500 003	-7.9	0.000 000	-0.004
100 %		0	1912 500 022	10.7	0.000 001	0.006
100 %		+10	1912 500 020	9.6	0.000 001	0.005
100 %		+30	1912 500 002	-9.1	0.000 000	-0.005
100 %		+40	1912 500 003	-8.1	0.000 000	-0.004
100 %		+50	1912 500 004	-6.8	0.000 000	-0.004
Batt. Endpoint	3.400	+20	1912 500 003	-8.1	0.000 000	-0.004



▣ MODE: LTE B25

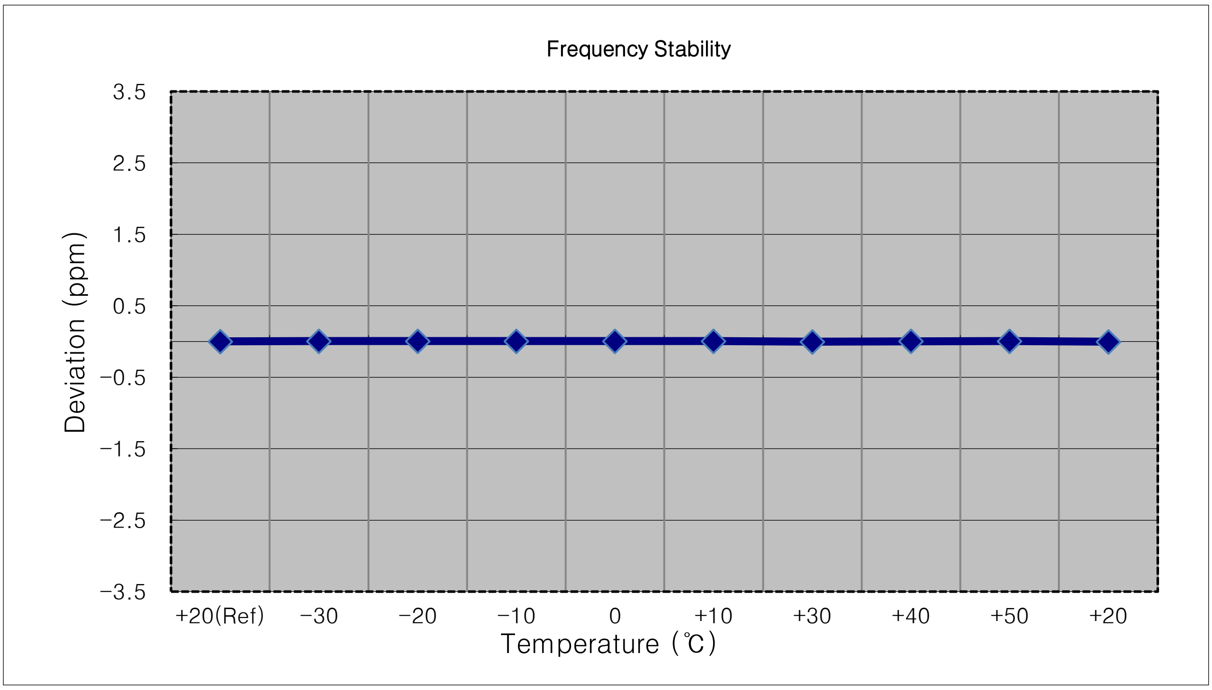
▣ OPERATING FREQUENCY: 1910,000,000 Hz

▣ CHANNEL: 26640 (10 MHz)

▣ REFERENCE VOLTAGE: 3.88 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	1910 000 007	0.0	0.000 000	0.000
100 %		-30	1910 000 015	8.0	0.000 000	0.004
100 %		-20	1910 000 015	7.9	0.000 000	0.004
100 %		-10	1910 000 016	8.8	0.000 000	0.005
100 %		0	1910 000 014	7.4	0.000 000	0.004
100 %		+10	1910 000 015	8.6	0.000 000	0.005
100 %		+30	1910 000 000	-6.5	0.000 000	-0.003
100 %		+40	1910 000 014	7.0	0.000 000	0.004
100 %		+50	1910 000 015	7.9	0.000 000	0.004
Batt. Endpoint	3.400	+20	1910 000 000	-6.5	0.000 000	-0.003



▣ MODE: LTE B25

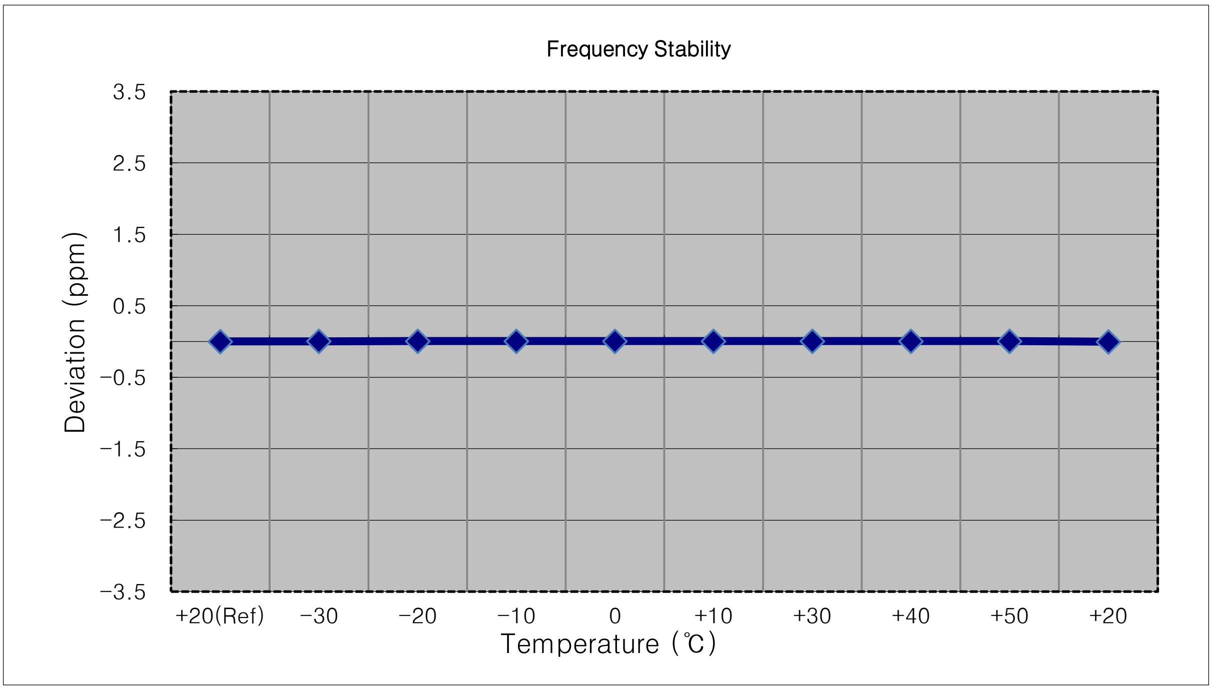
▣ OPERATING FREQUENCY: 1907,500,000 Hz

▣ CHANNEL: 26615 (15 MHz)

▣ REFERENCE VOLTAGE: 3.88 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	1907 499 993	0.0	0.000 000	0.000
100 %		-30	1907 500 000	7.0	0.000 000	0.004
100 %		-20	1907 500 001	8.2	0.000 000	0.004
100 %		-10	1907 500 001	8.4	0.000 000	0.004
100 %		0	1907 500 002	9.4	0.000 000	0.005
100 %		+10	1907 500 000	7.3	0.000 000	0.004
100 %		+30	1907 500 000	7.3	0.000 000	0.004
100 %		+40	1907 500 001	8.2	0.000 000	0.004
100 %		+50	1907 500 000	7.3	0.000 000	0.004
Batt. Endpoint	3.400	+20	1907 499 985	-7.8	0.000 000	-0.004



▣ MODE: LTE B25

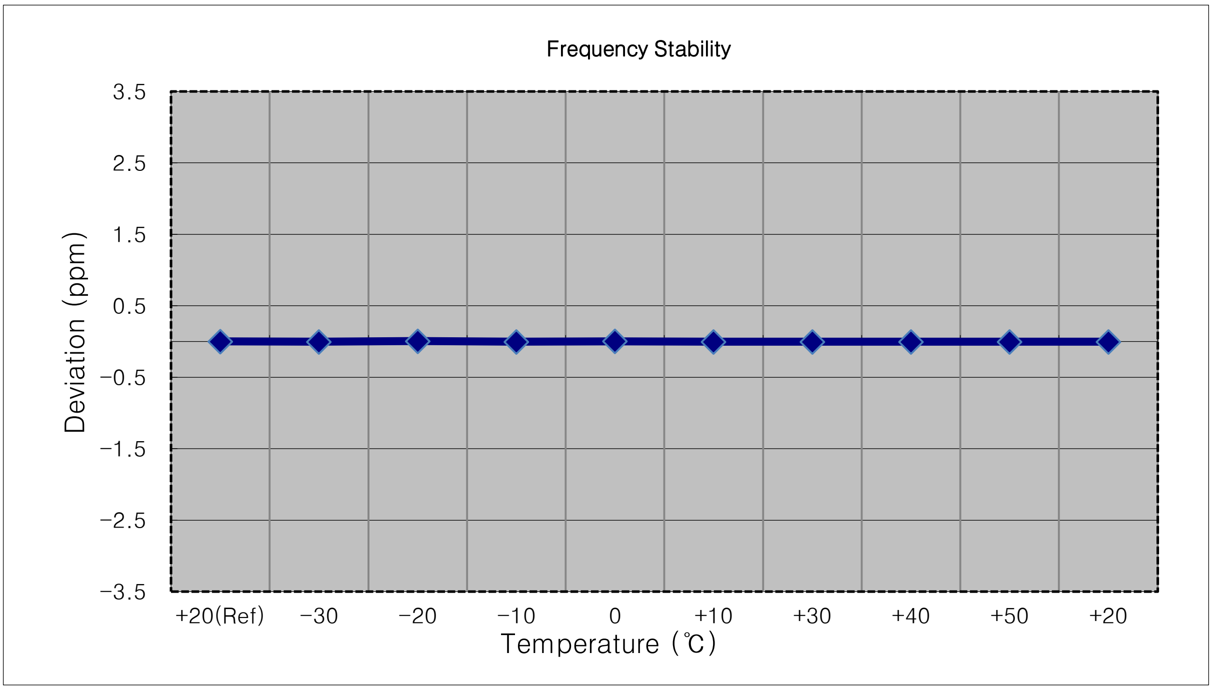
▣ OPERATING FREQUENCY: 1905,000,000 Hz

▣ CHANNEL: 26590 (20 MHz)

▣ REFERENCE VOLTAGE: 3.88 VDC

▣ DEVIATION LIMIT: Emission must remain in band

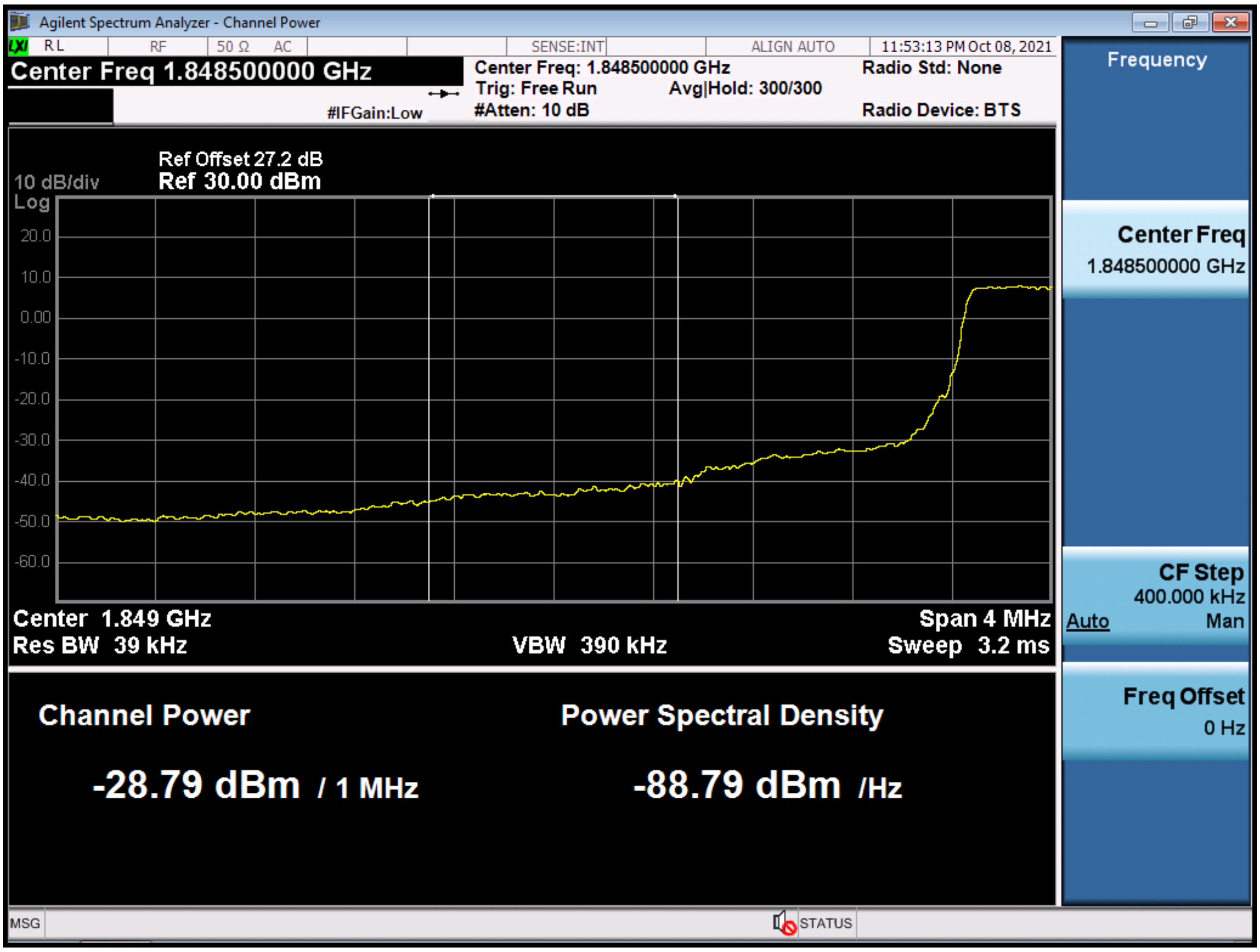
Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	1905 000 009	0.0	0.000 000	0.000
100 %		-30	1905 000 002	-7.1	0.000 000	-0.004
100 %		-20	1905 000 017	7.7	0.000 000	0.004
100 %		-10	1905 000 000	-9.5	0.000 000	-0.005
100 %		0	1905 000 016	6.7	0.000 000	0.004
100 %		+10	1905 000 002	-7.2	0.000 000	-0.004
100 %		+30	1905 000 003	-6.2	0.000 000	-0.003
100 %		+40	1905 000 001	-8.1	0.000 000	-0.004
100 %		+50	1905 000 002	-7.5	0.000 000	-0.004
Batt. Endpoint	3.400	+20	1905 000 003	-6.4	0.000 000	-0.003



9. TEST PLOTS

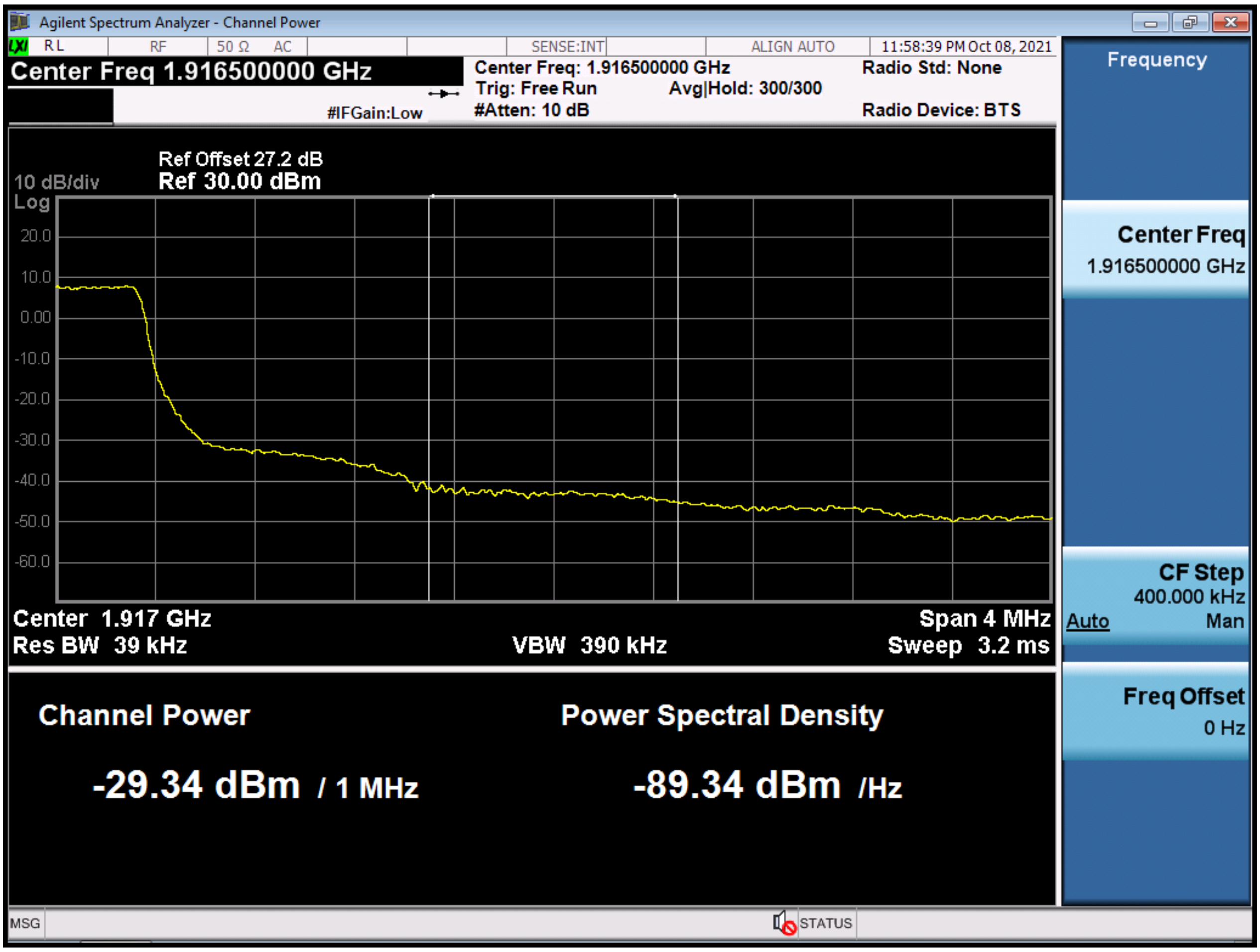
BW1.4 M_BandEdge_Lowest Channel_QPSK_FullRB(1)

BW1.4 M_BandEdge_Lowest Channel_QPSK_FullRB(2)

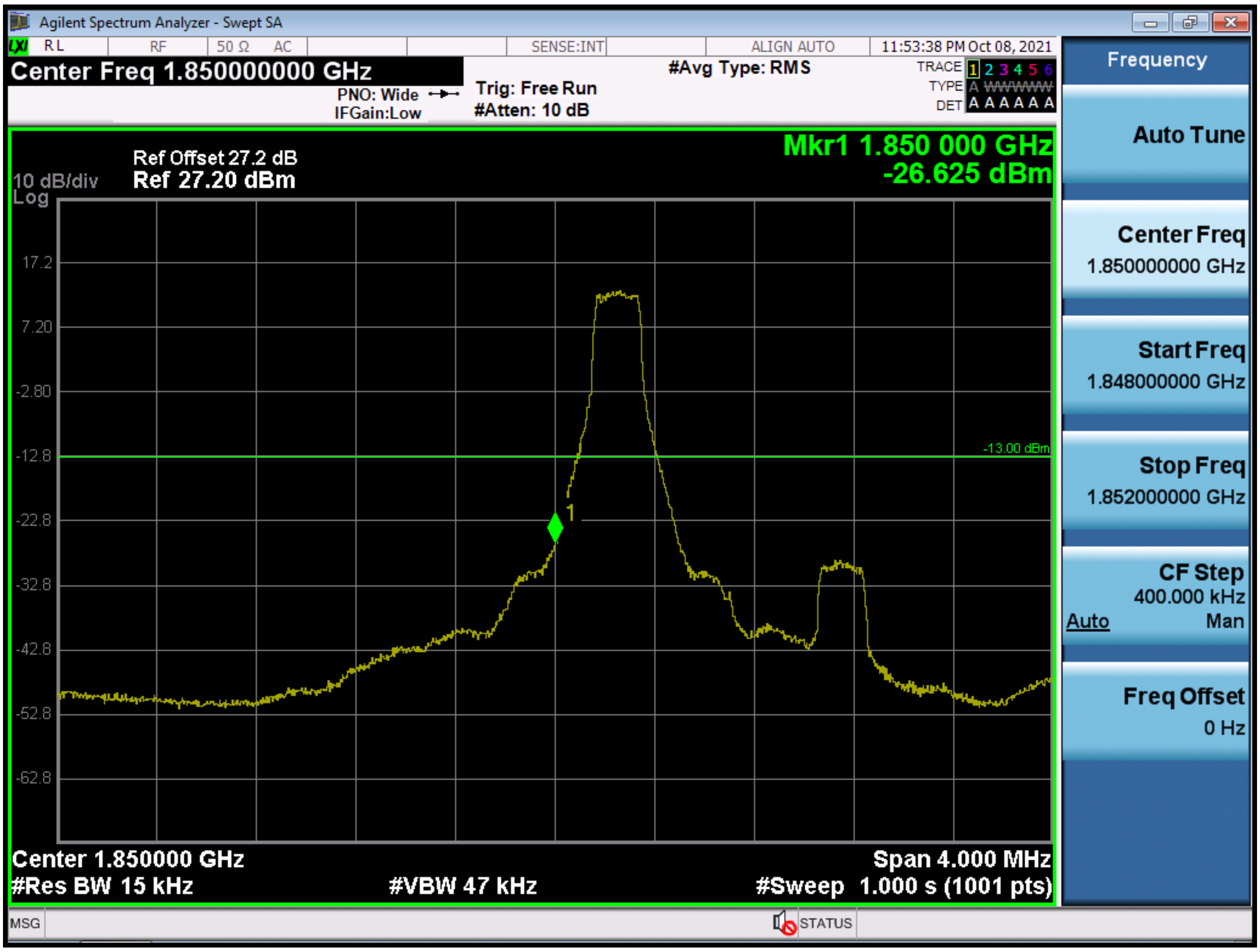


BW1.4 M_BandEdge_Highest Channel_QPSK_FullRB(1)

BW1.4 M_BandEdge_Highest Channel_QPSK_FullRB(2)



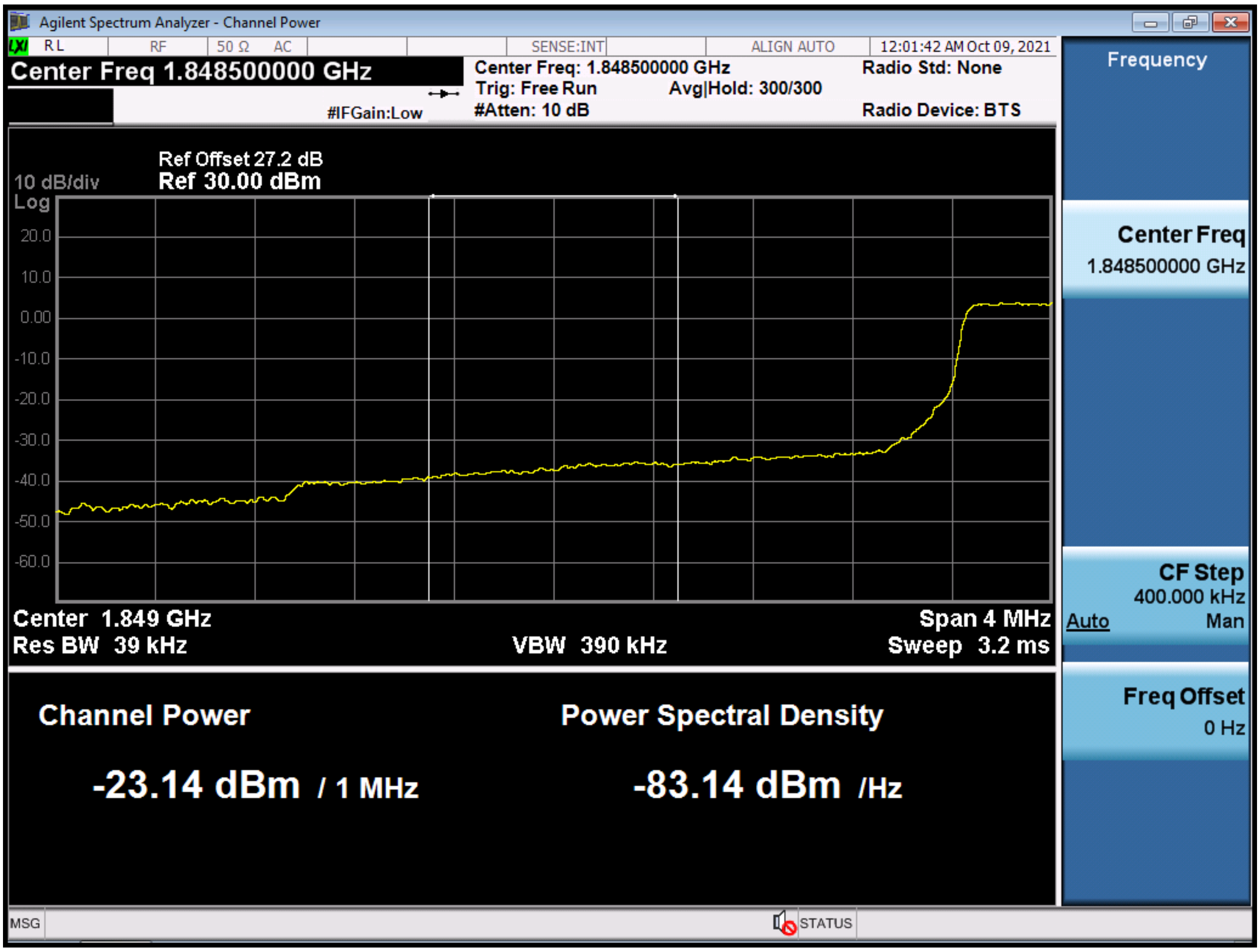
BW1.4 M_BandEdge_Lowest Channel_QPSK_1RB



BW1.4 M_BandEdge_Highest Channel_QPSK_1RB

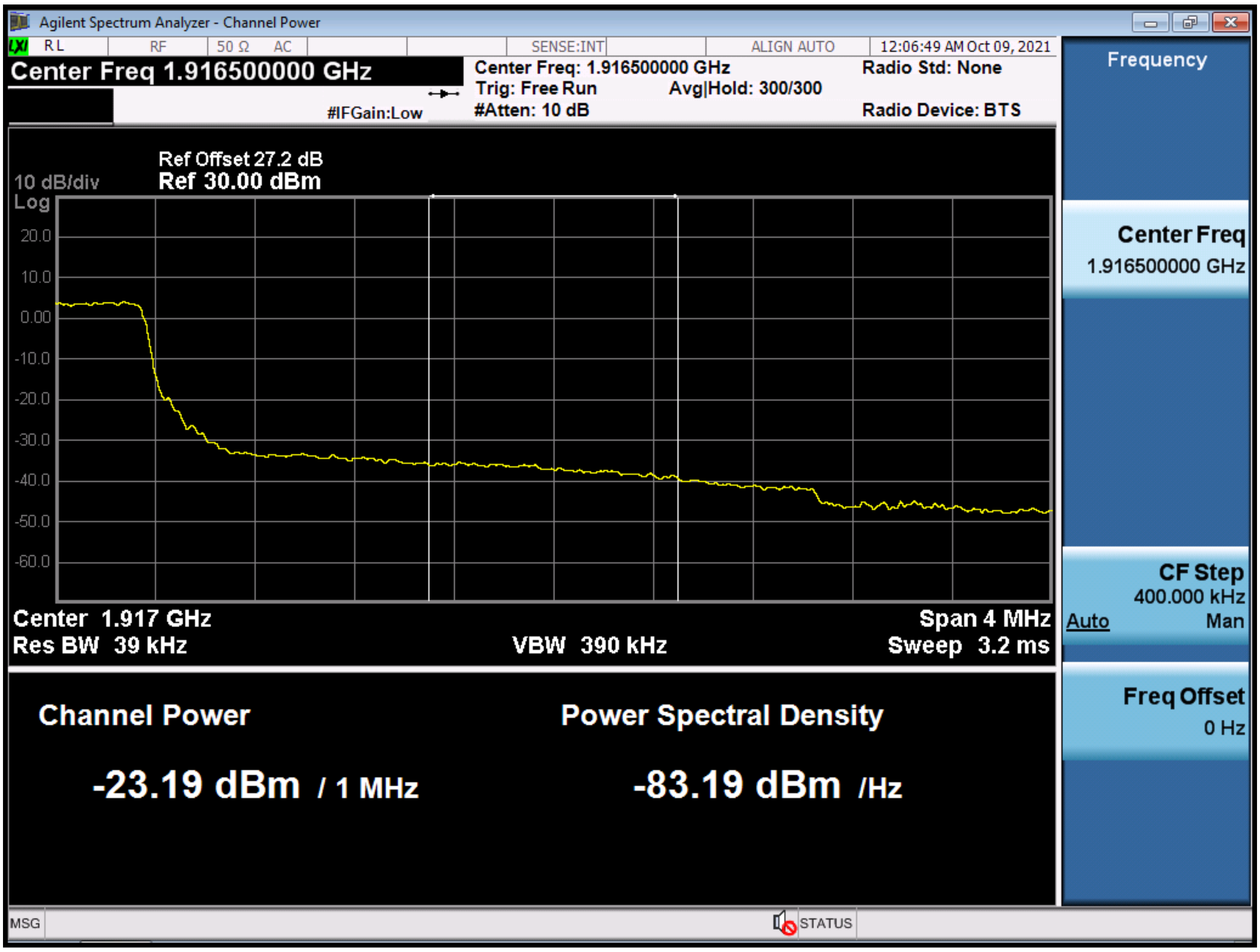
BW3 M_BandEdge_Lowest Channel_QPSK_FullRB(1)

BW3 M_BandEdge_Lowest Channel_QPSK_FullRB(2)

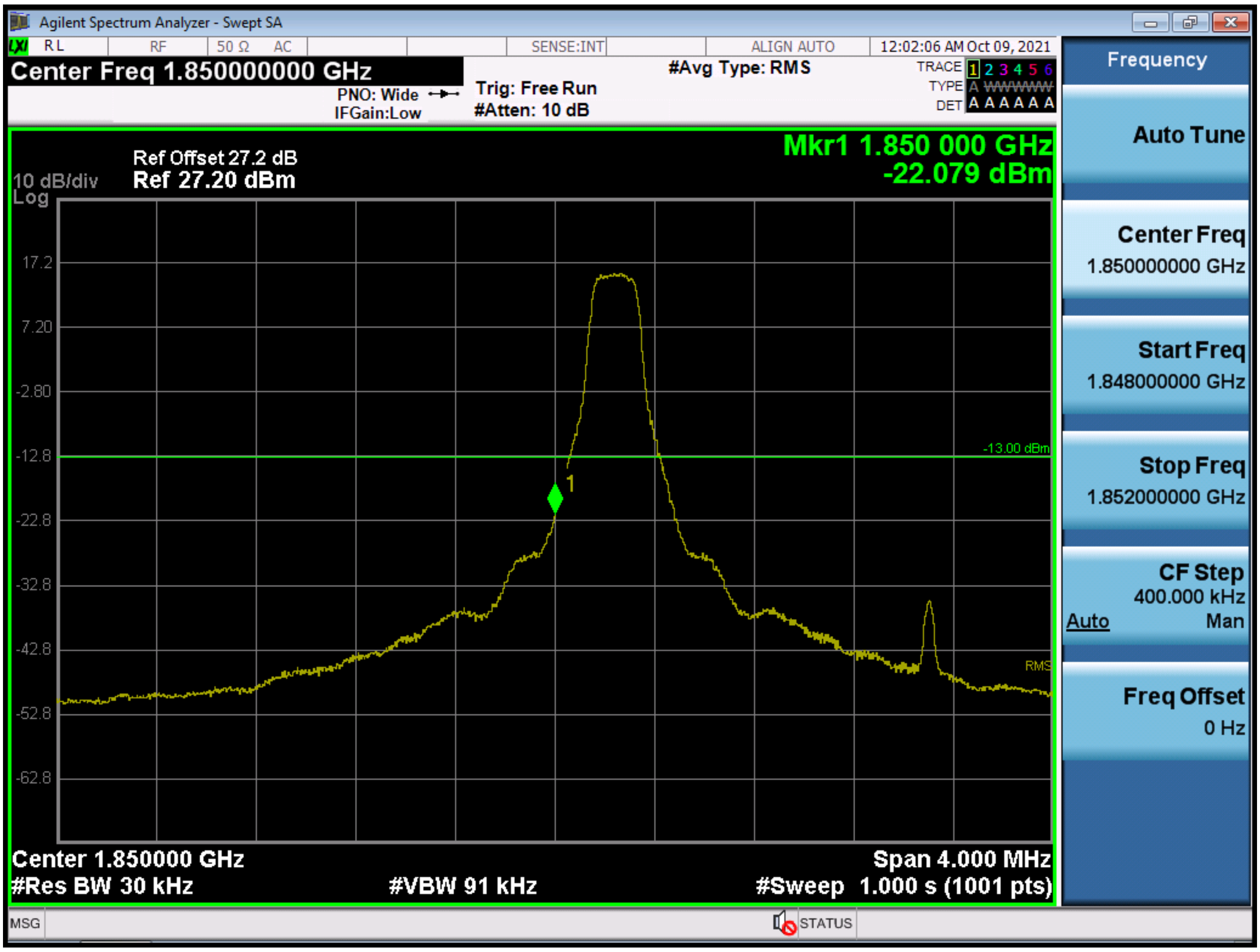


BW3 M_BandEdge_Highest Channel_QPSK_FullRB(1)

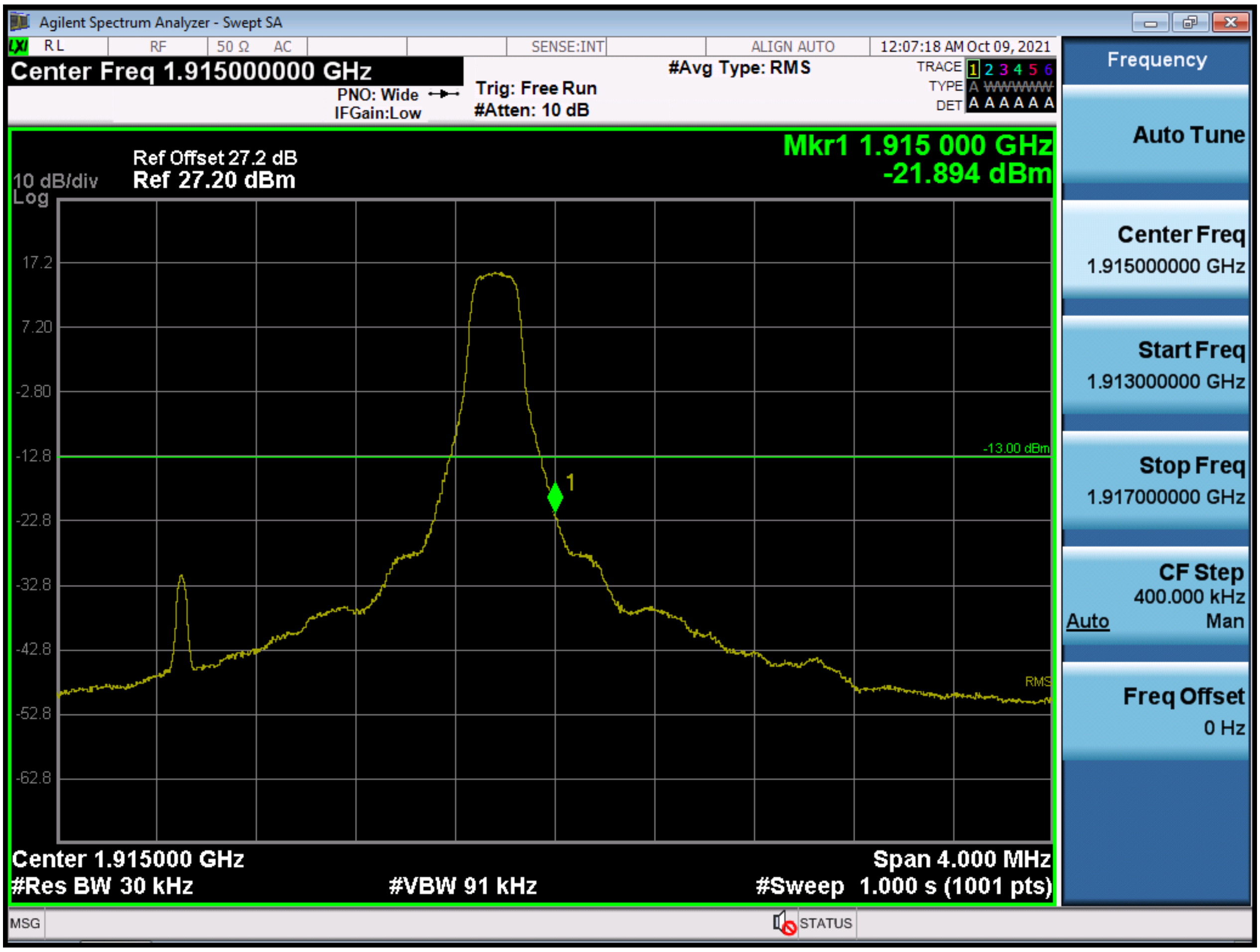
BW3 M_BandEdge_Highest Channel_QPSK_FullRB(2)



BW3 M_BandEdge_Lowest Channel_QPSK_1RB

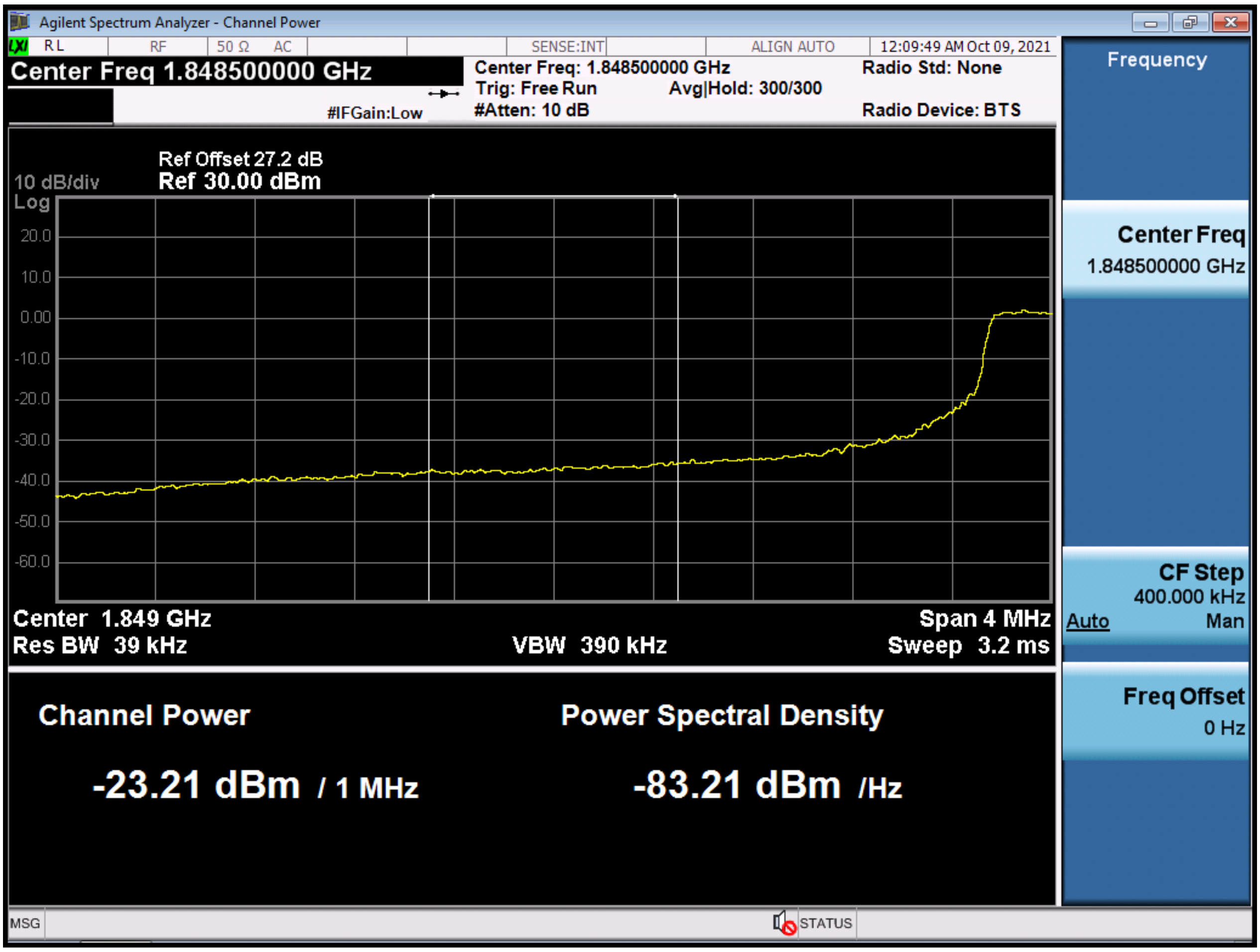


BW3 M_BandEdge_Highest Channel_QPSK_1RB



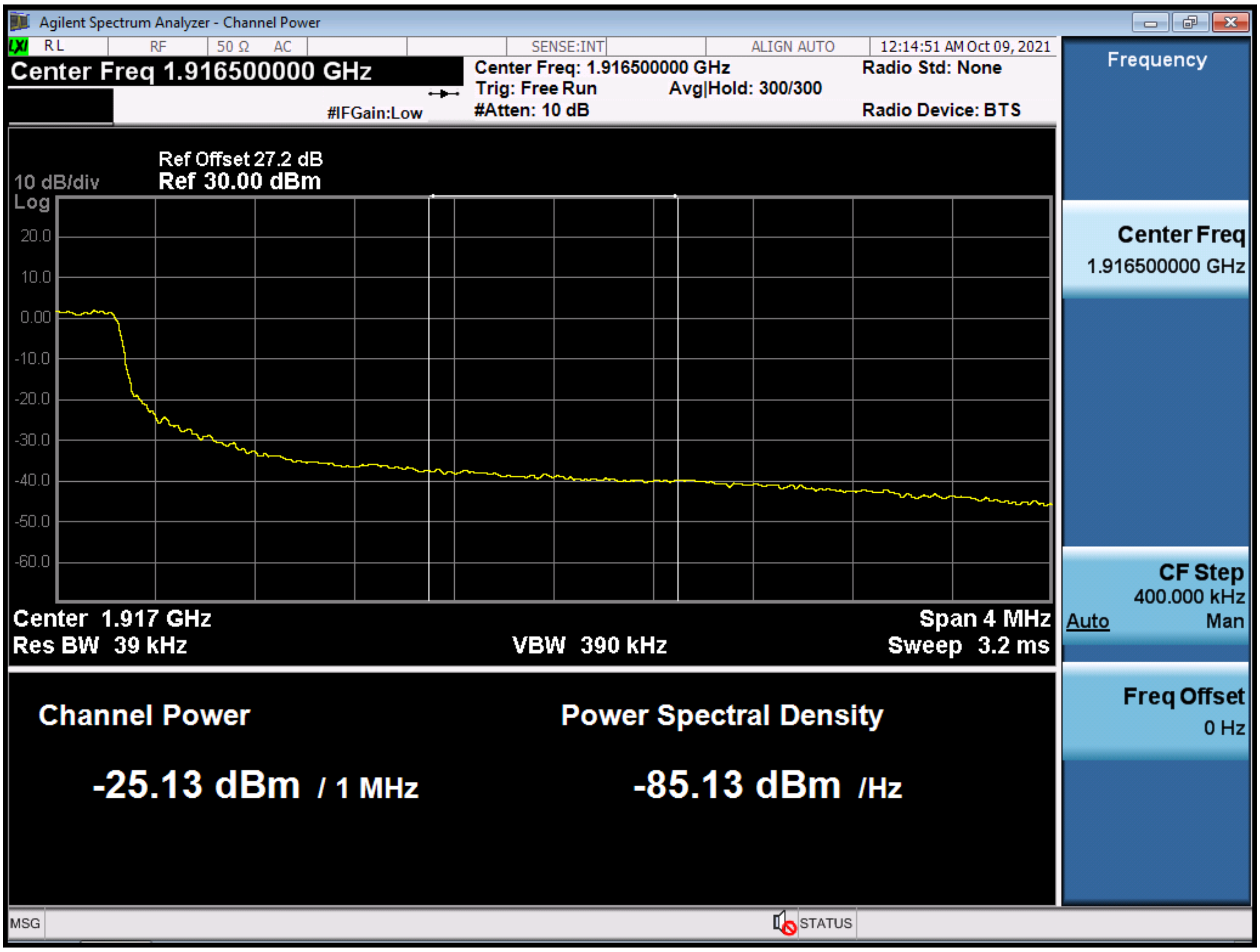
BW5 M_BandEdge_Lowest Channel_QPSK_FullRB(1)

BW5 M_BandEdge_Lowest Channel_QPSK_FullRB(2)



BW5 M_BandEdge_Highest Channel_QPSK_FullRB(1)

BW5 M_BandEdge_Highest Channel_QPSK_FullRB(2)



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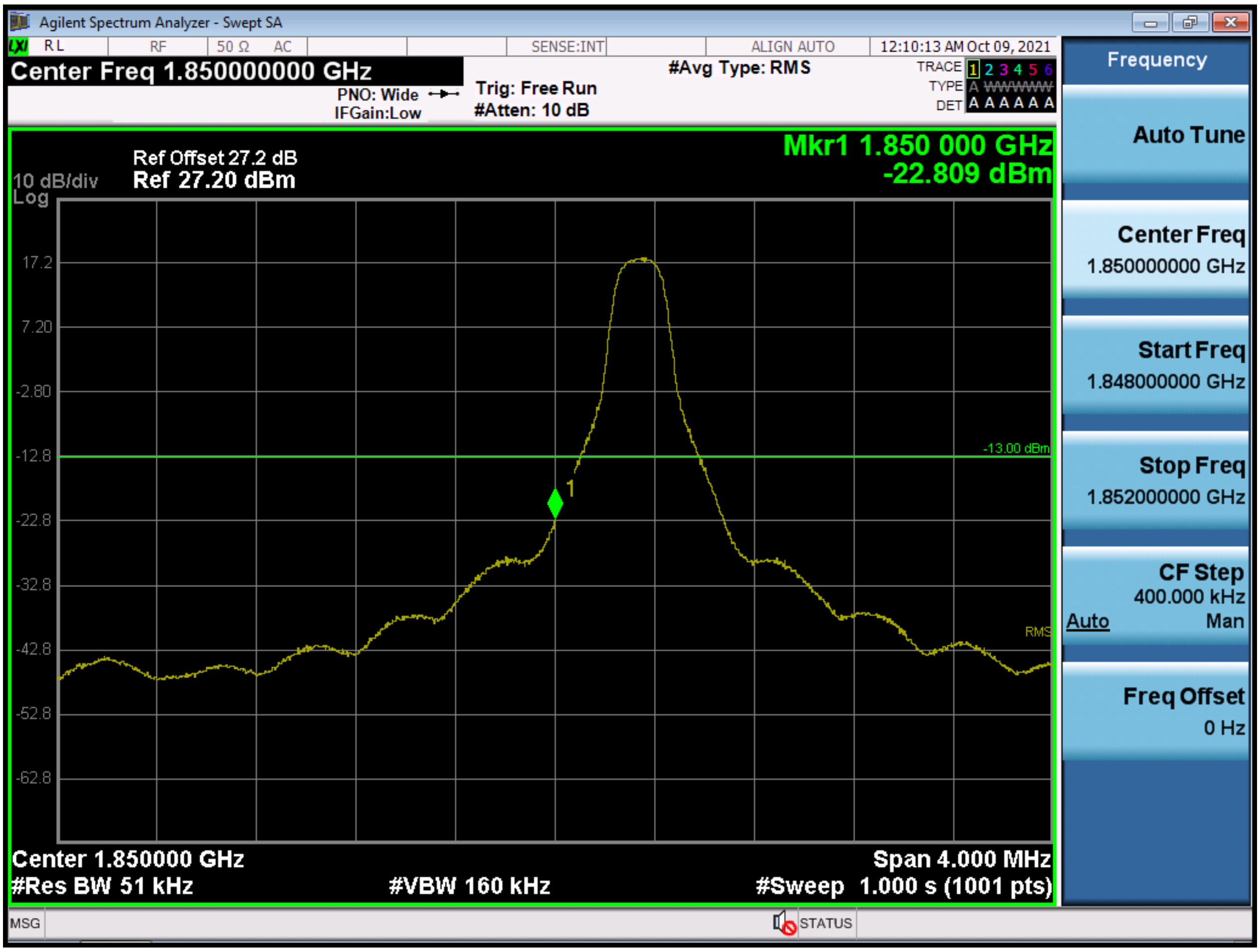


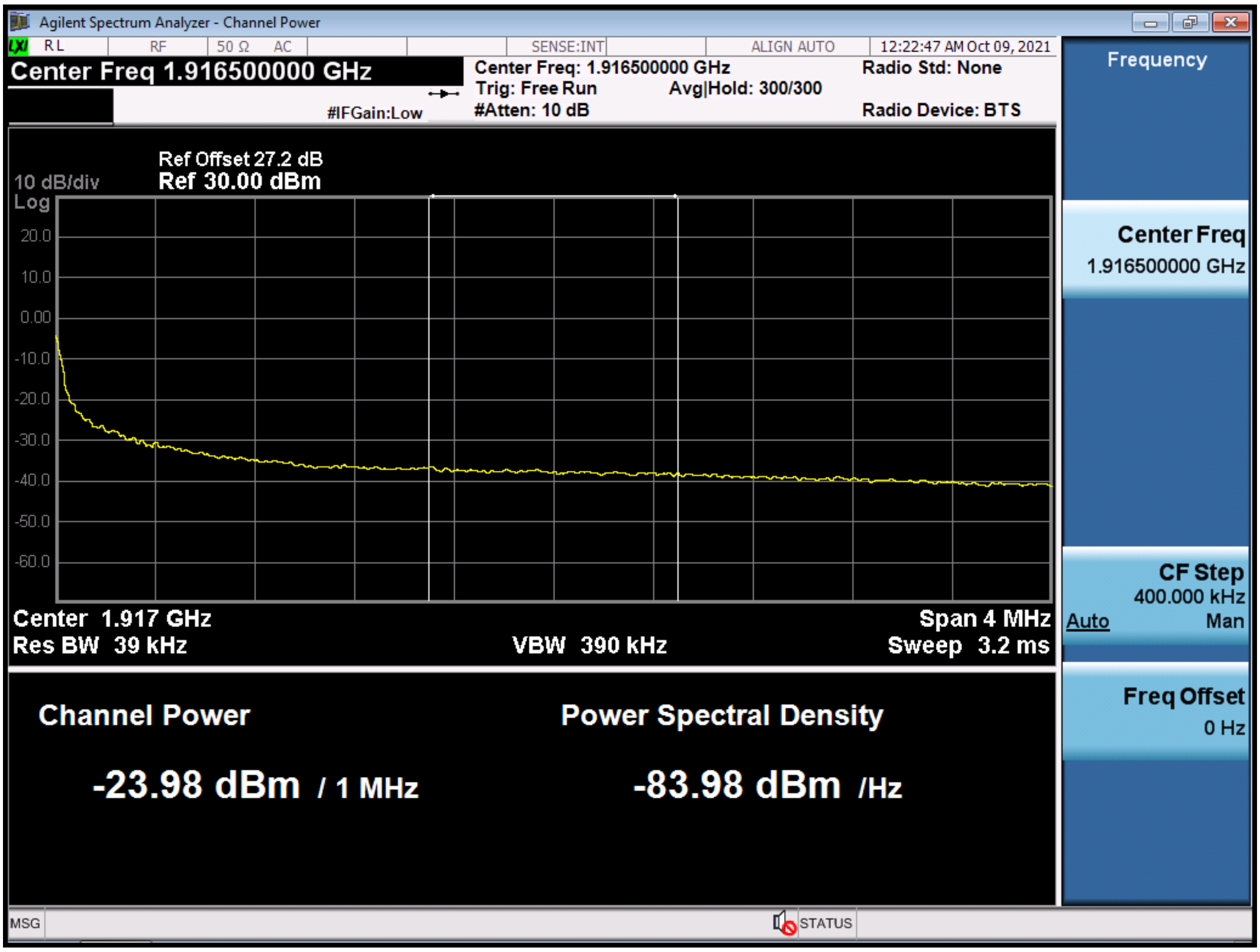
BW5 M_BandEdge_Highest Channel_QPSK_1RB

BW10 M_BandEdge_Lowest Channel_QPSK_FullRB(1)

BW10 M_BandEdge_Lowest Channel_QPSK_FullRB(2)

BW10 M_BandEdge_Highest Channel_QPSK_FullRB(1)

BW10 M_BandEdge_Highest Channel_QPSK_FullRB(2)



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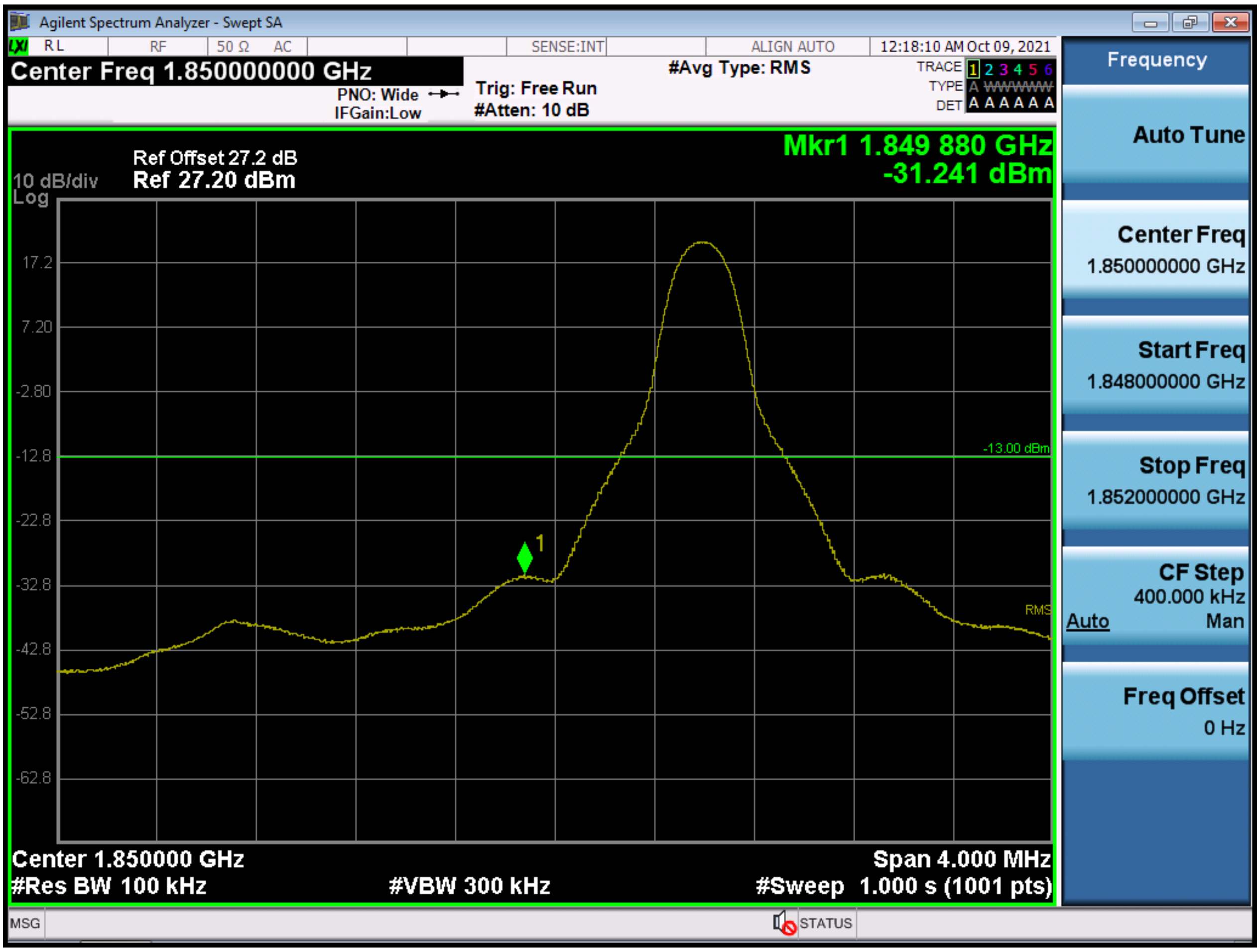
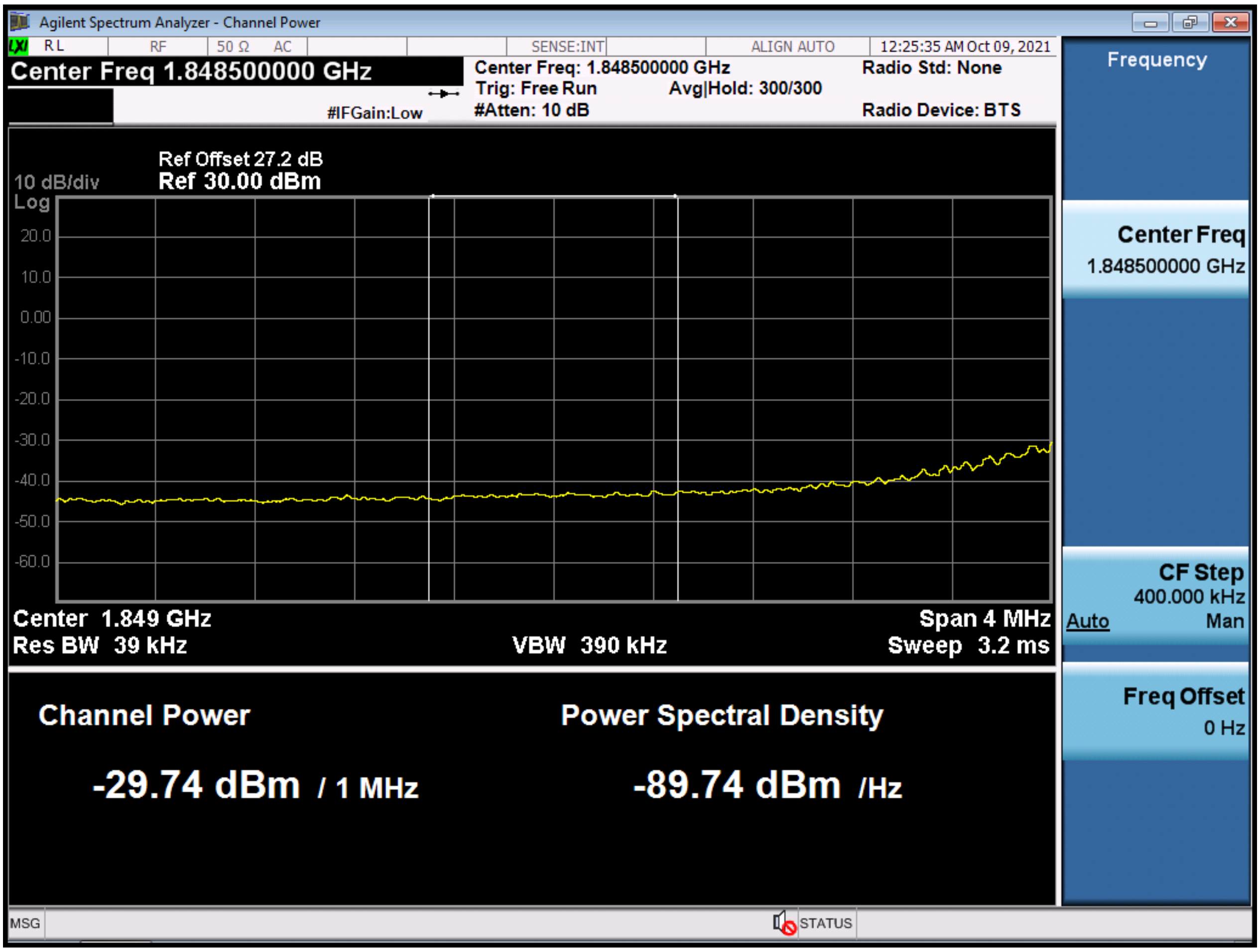


BW10 M_BandEdge_Highest Channel_QPSK_1RB

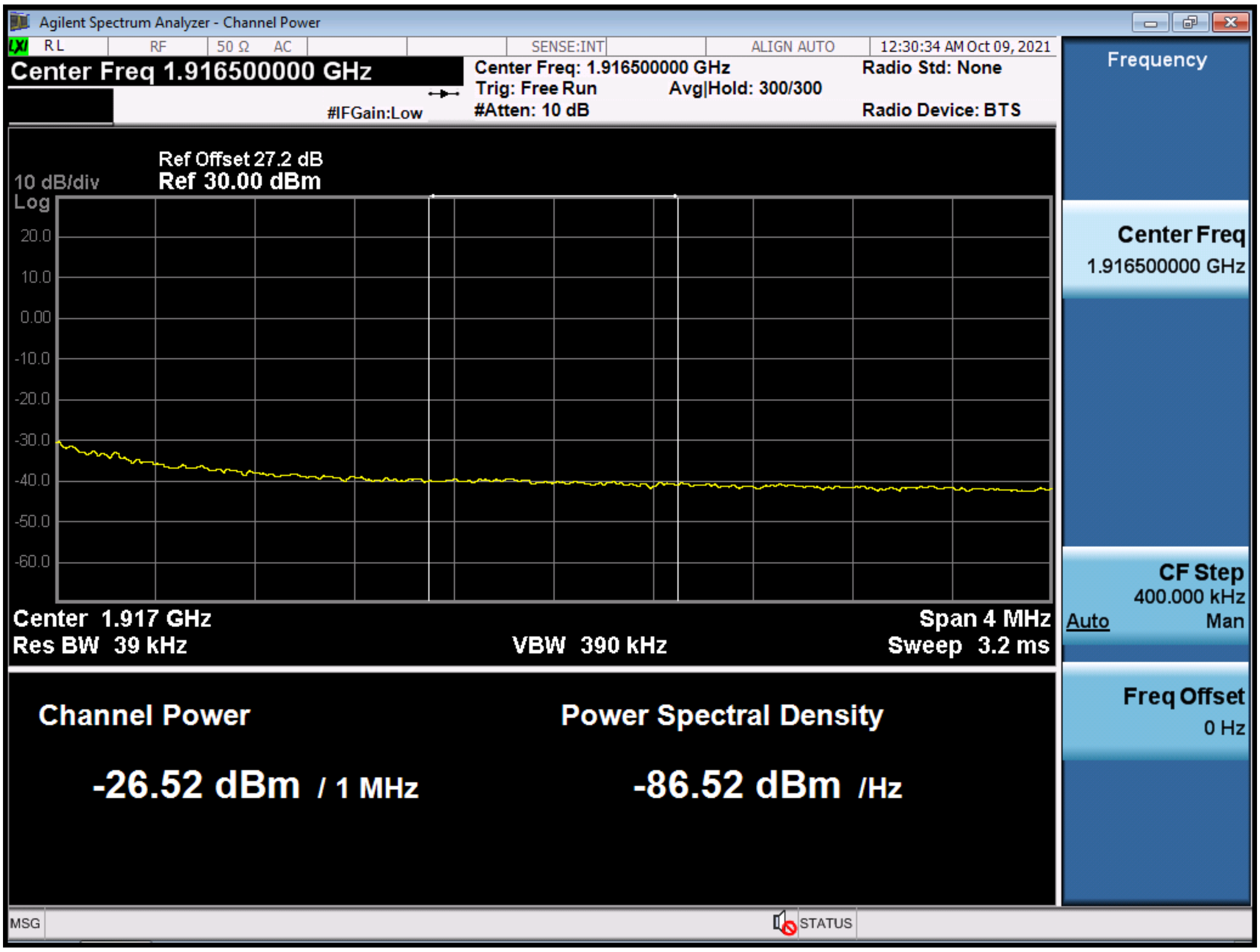
BW15 M_BandEdge_Lowest Channel_QPSK_FullRB(1)

BW15 M_BandEdge_Lowest Channel_QPSK_FullRB(2)



BW15 M_BandEdge_Highest Channel_QPSK_FullRB(1)

BW15 M_BandEdge_Highest Channel_QPSK_FullRB(2)

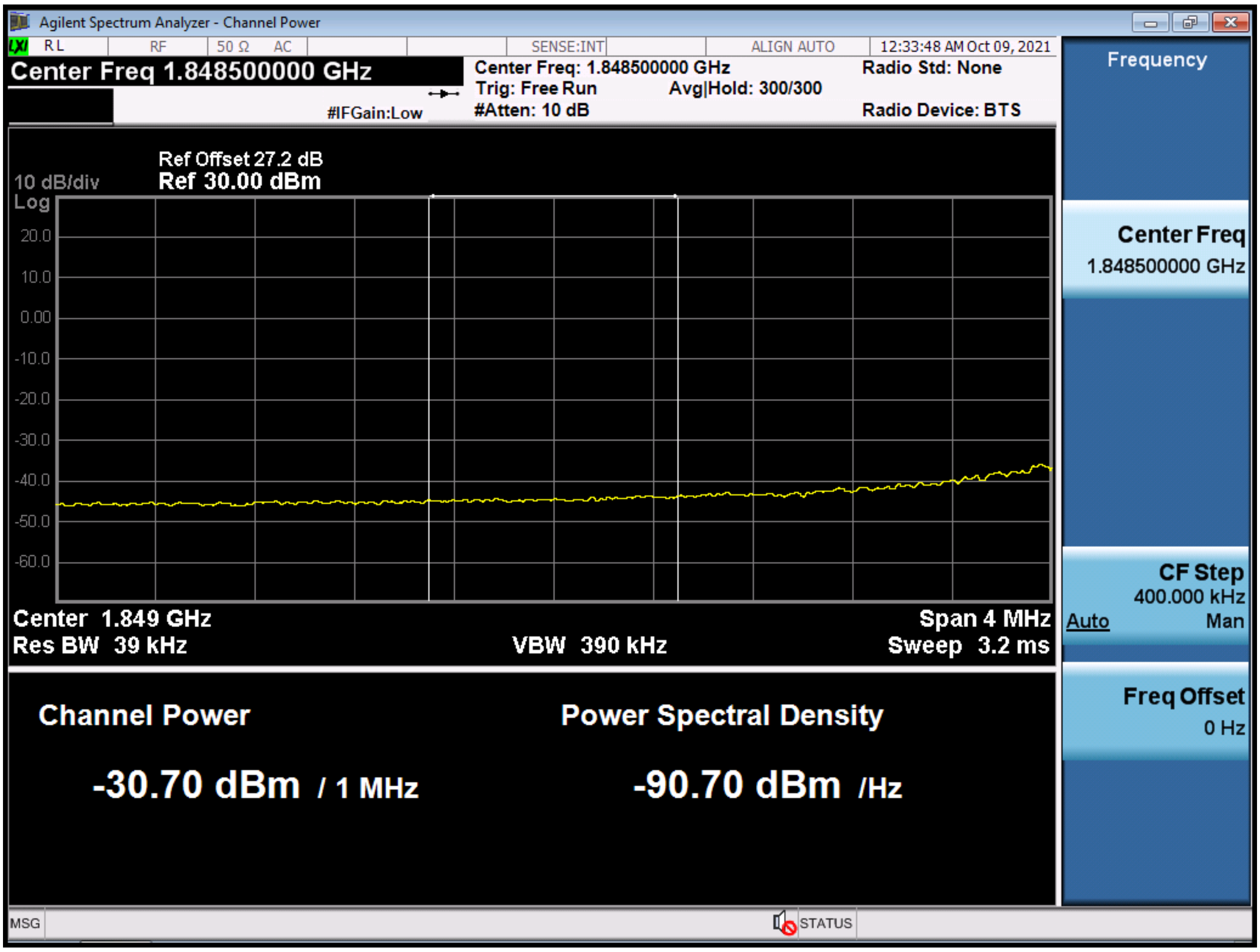


BW15 M_BandEdge_Lowest Channel_QPSK_1RB

BW15 M_BandEdge_Highest Channel_QPSK_1RB

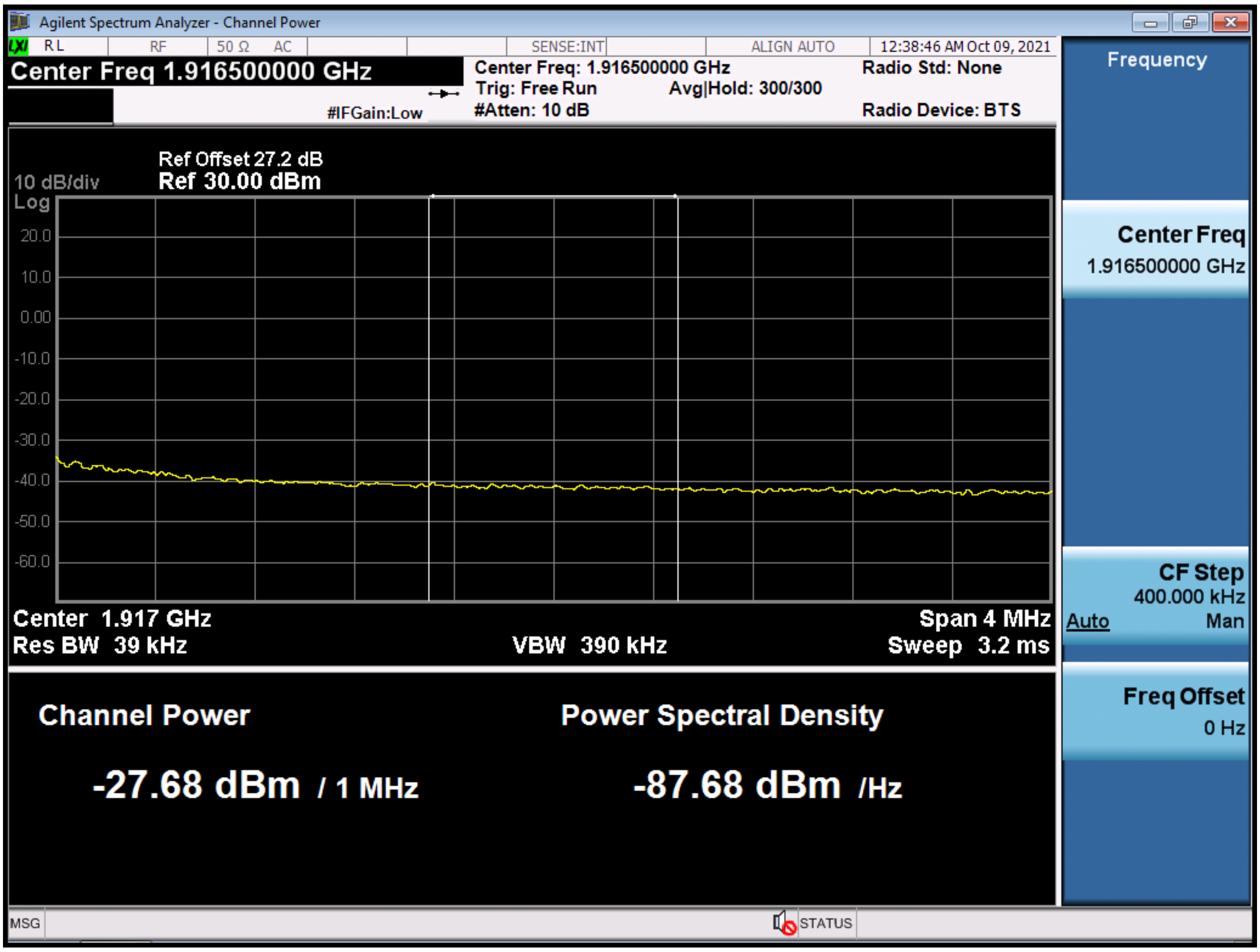
BW20 M_BandEdge_Lowest Channel_QPSK_FullRB(1)

BW20 M_BandEdge_Lowest Channel_QPSK_FullRB(2)

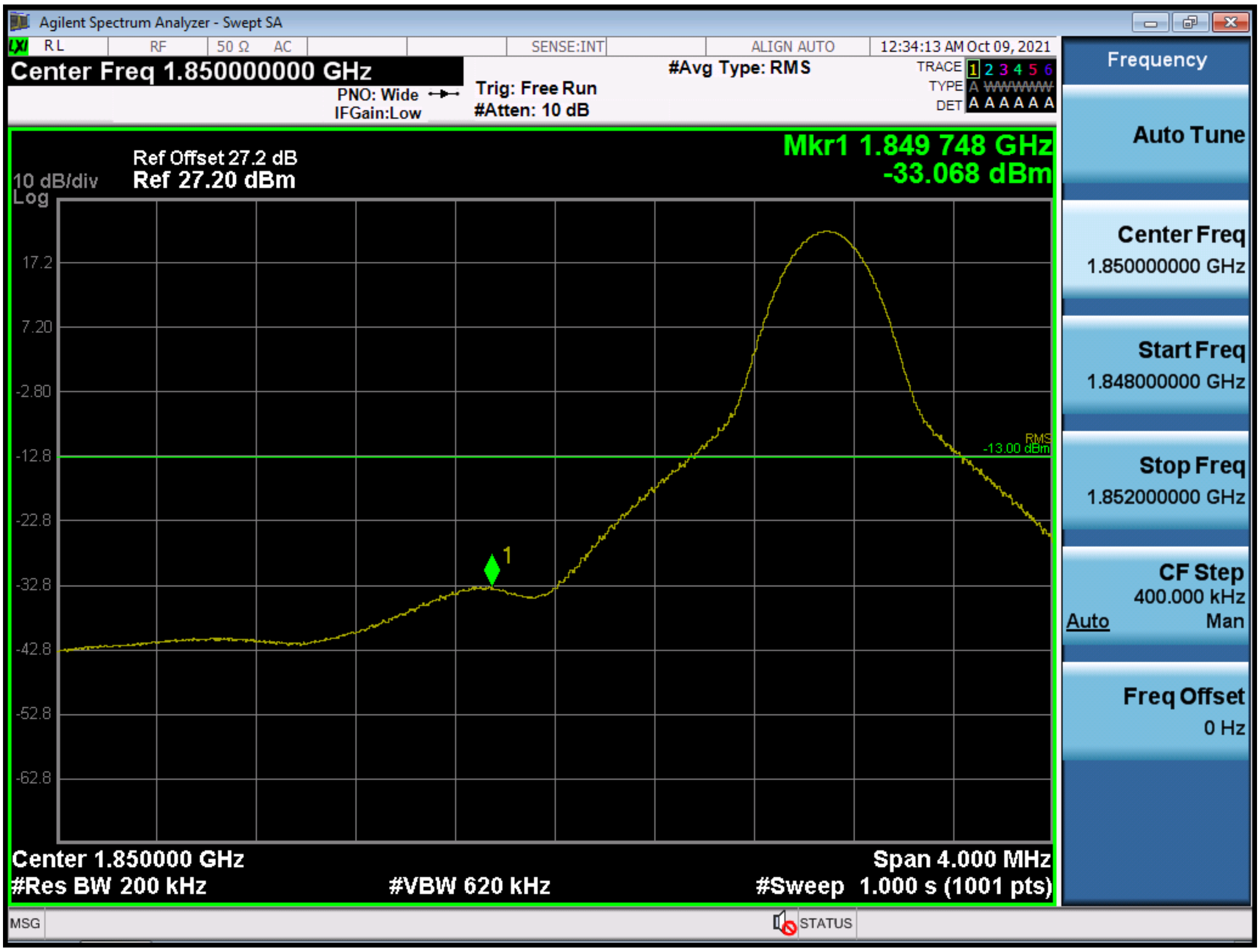


BW20 M_BandEdge_Highest Channel_QPSK_FullRB(1)

BW20 M_BandEdge_Highest Channel_QPSK_FullRB(2)

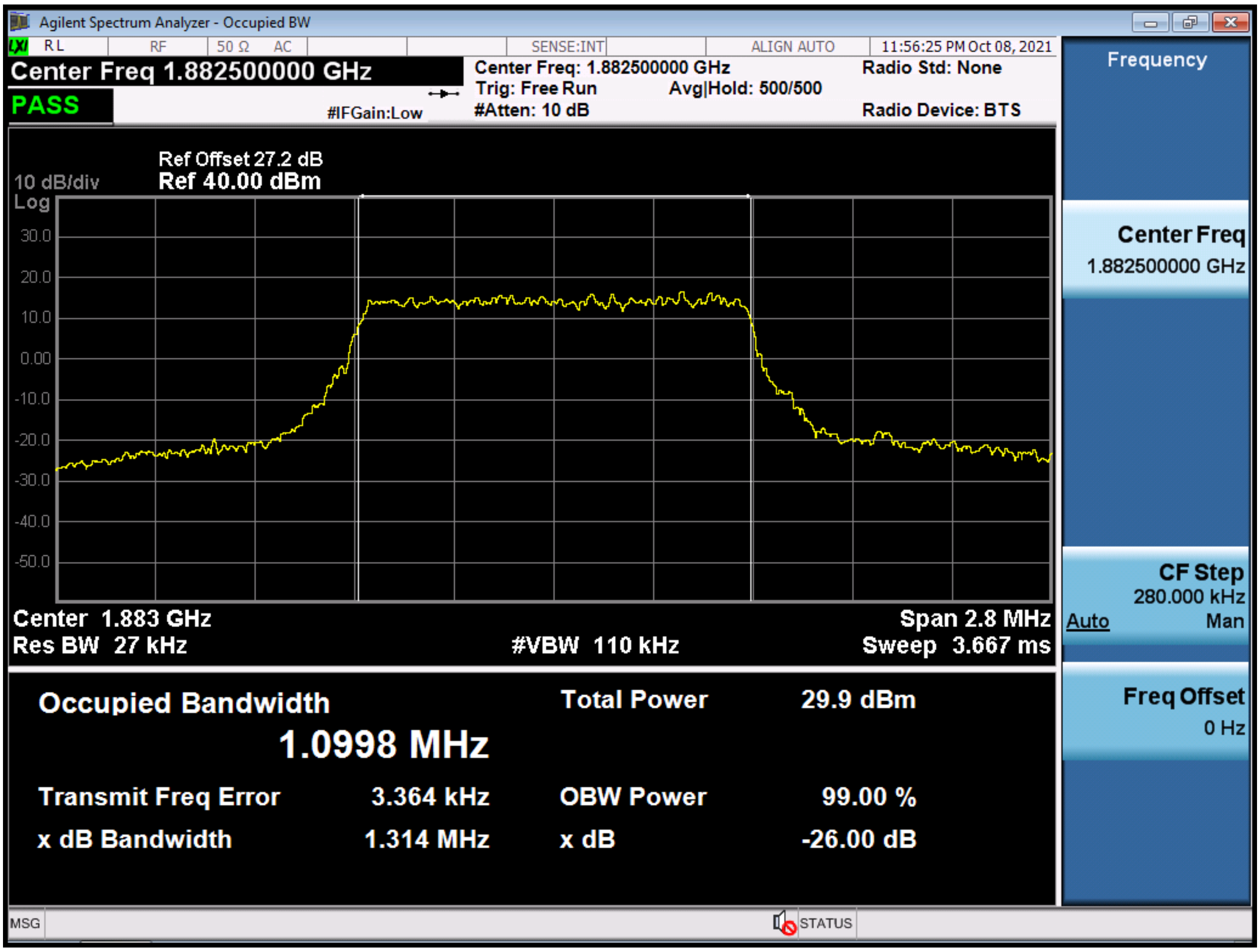


BW20 M_BandEdge_Lowest Channel_QPSK_1RB

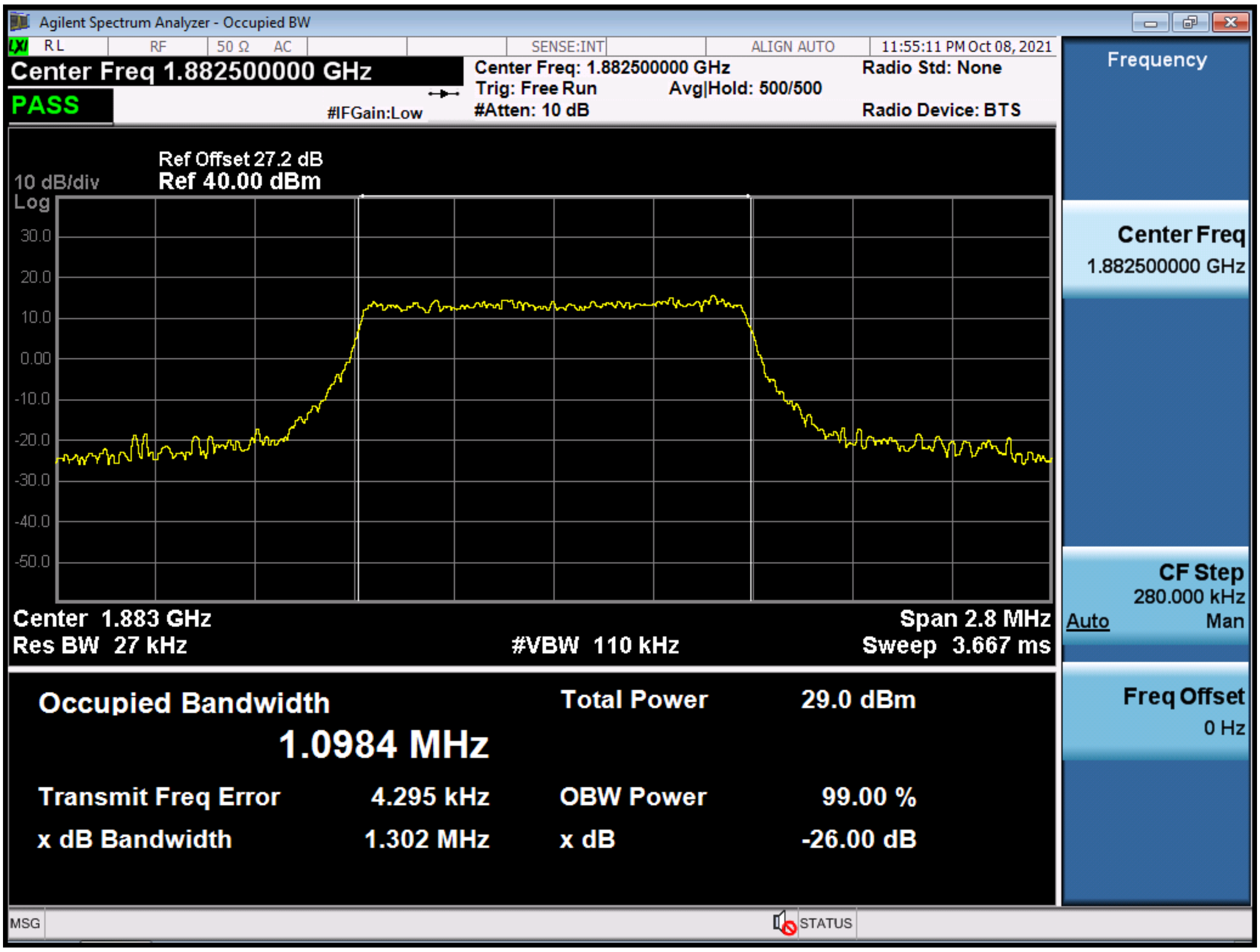


BW20 M_BandEdge_Highest Channel_QPSK_1RB

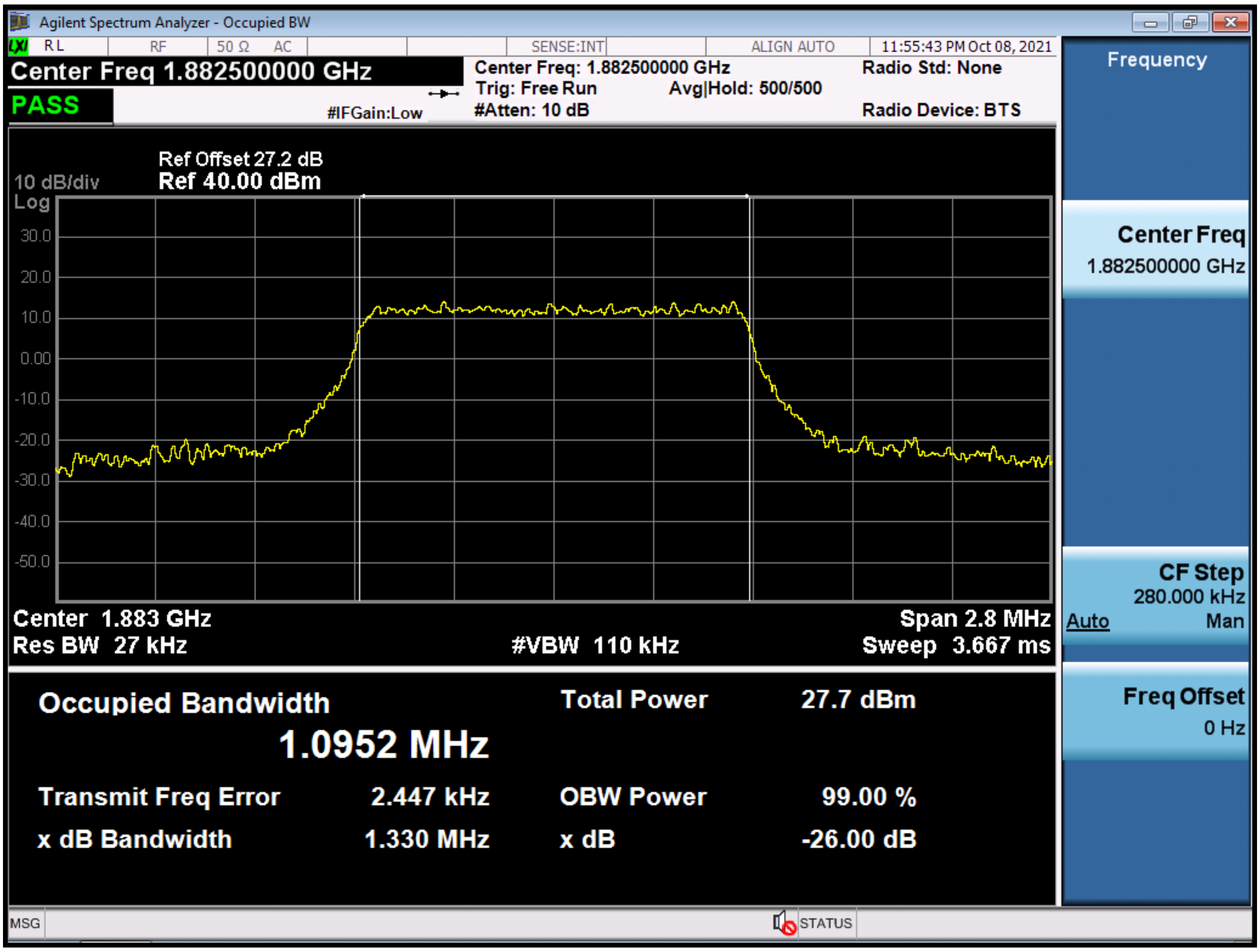
BW1.4 M_OBW_Middle Channel_QPSK_FullRB



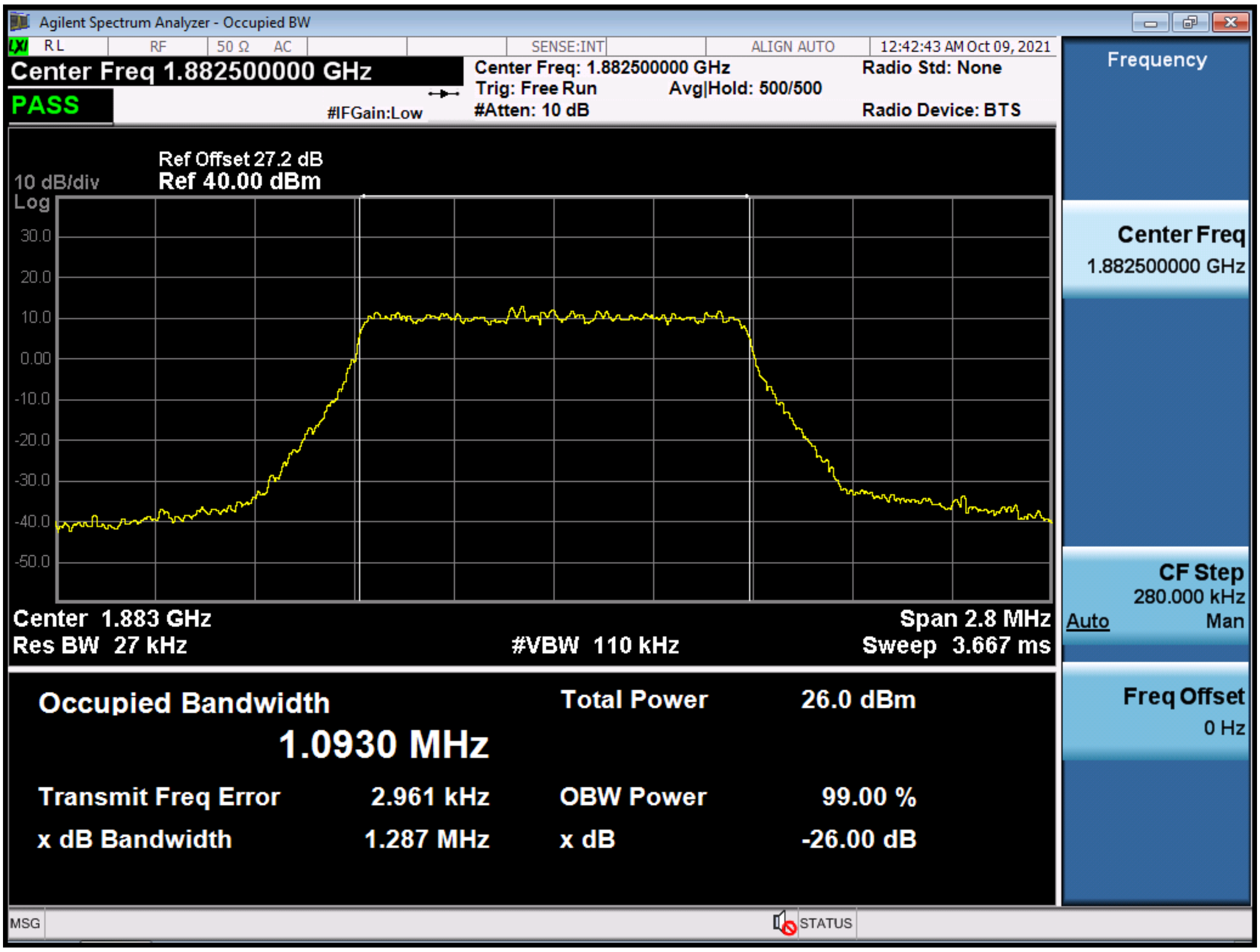
BW1.4 M_OBW_Middle Channel_16QAM_FullRB



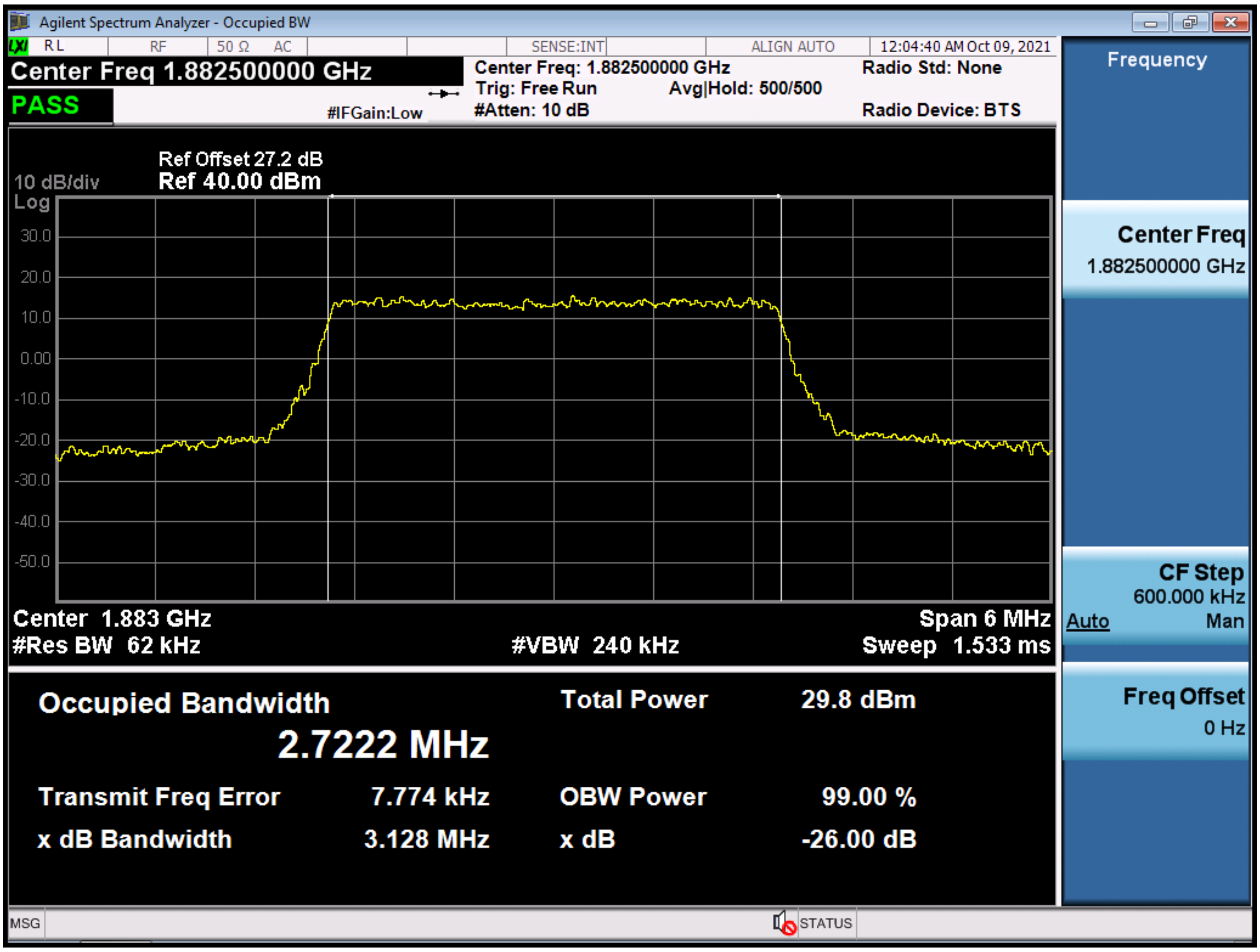
BW1.4 M_OBW_Middle Channel_64QAM_FullRB



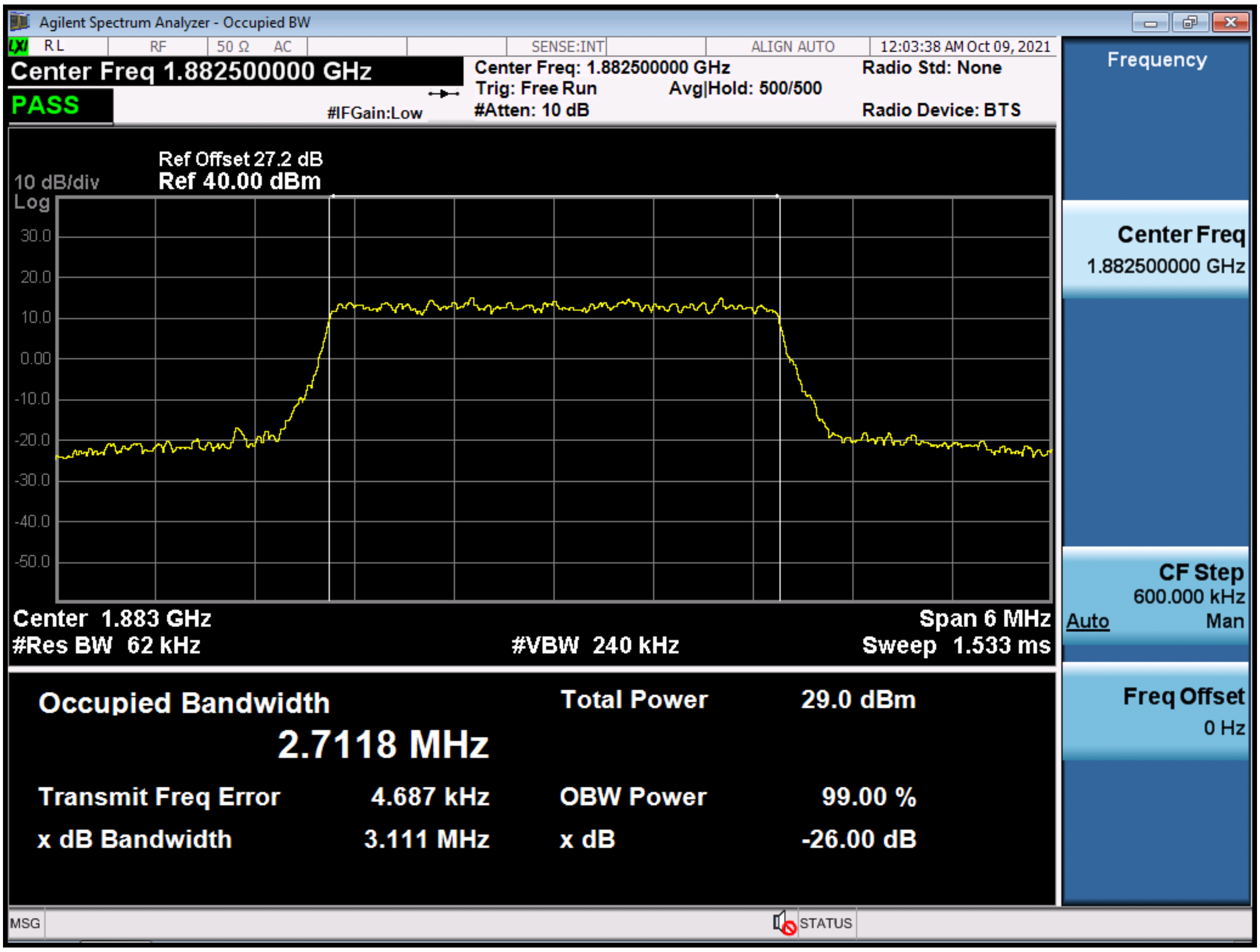
BW1.4 M_OBW_Middle Channel_256QAM_FullRB



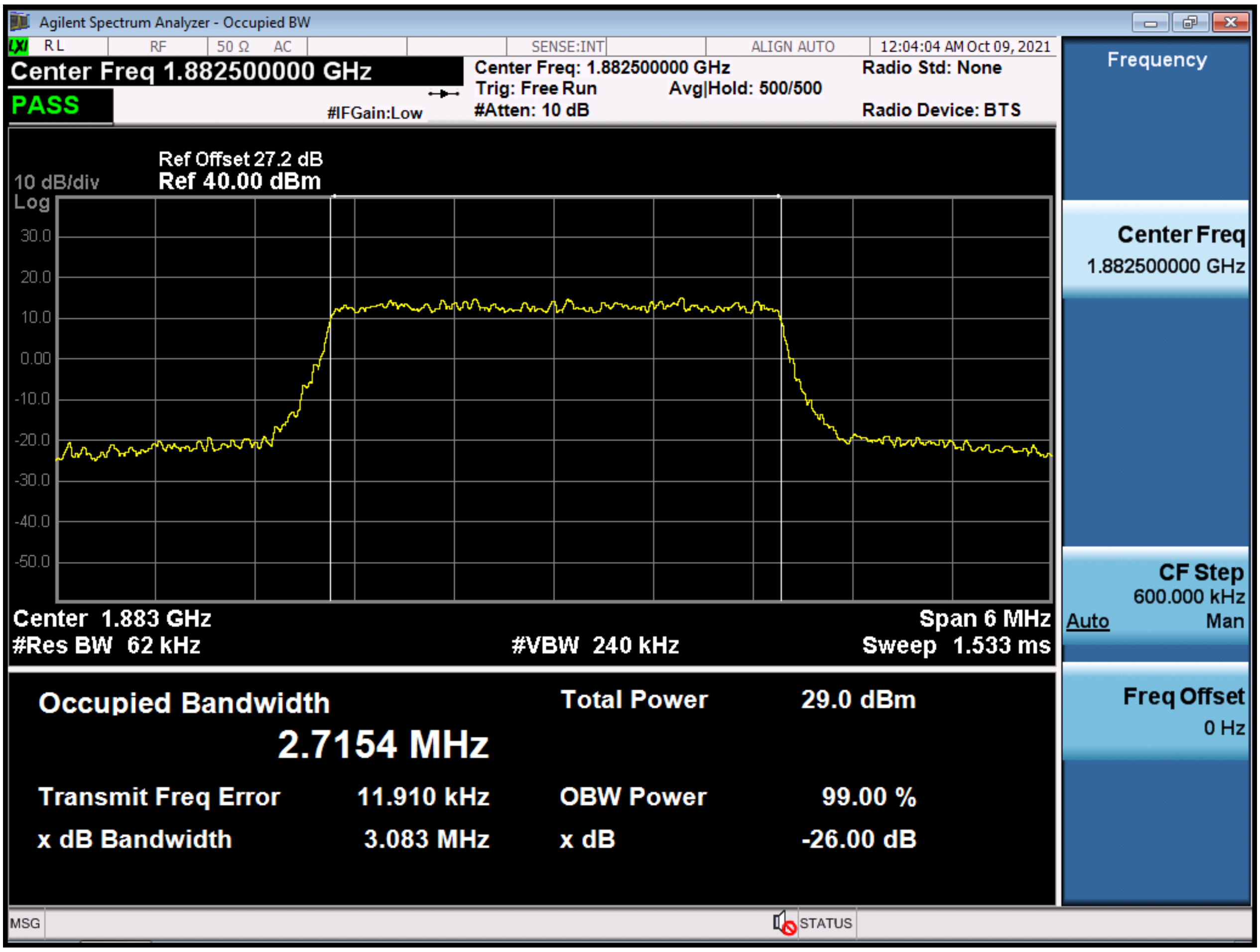
BW3 M_OBW_Middle Channel_QPSK_FullRB



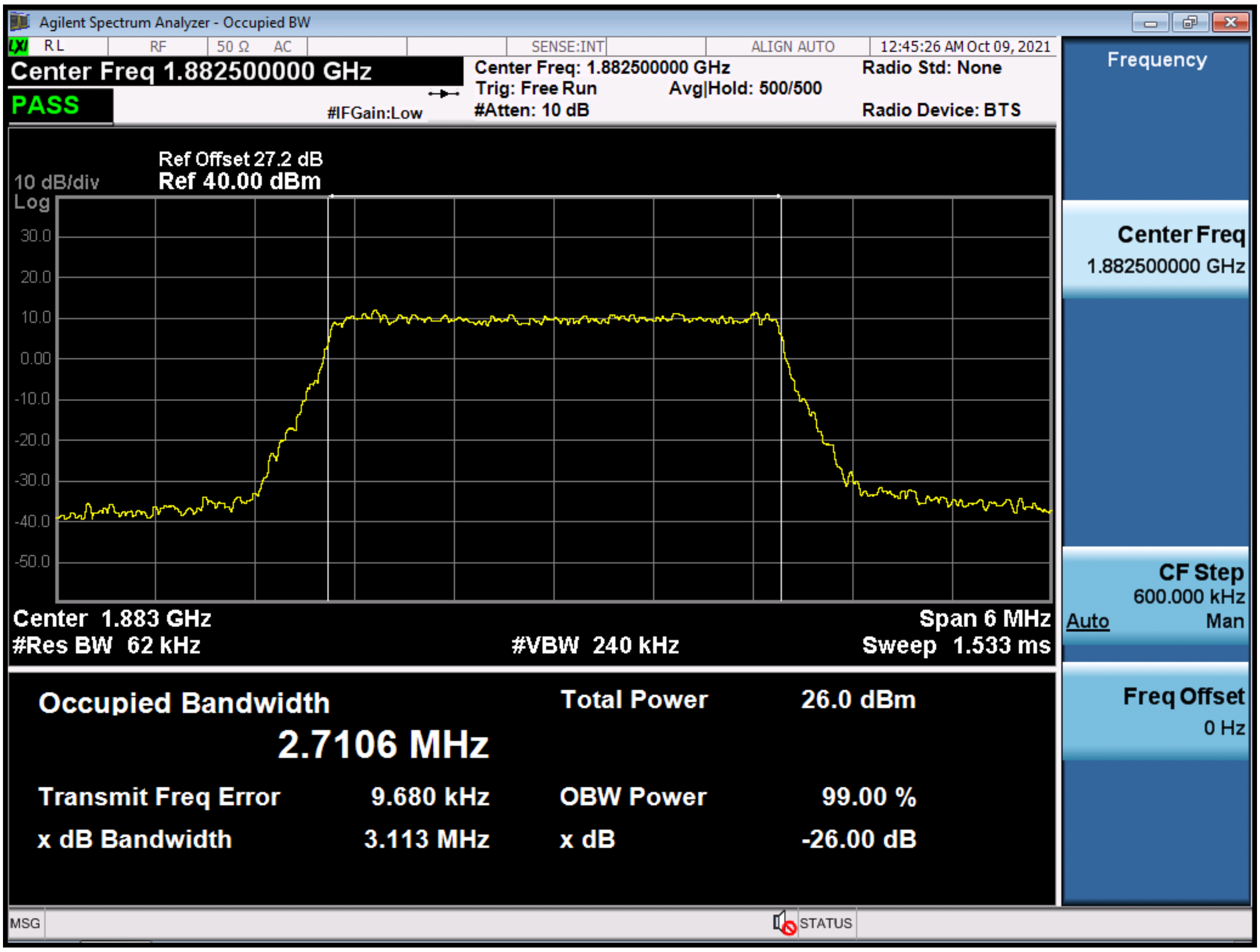
BW3 M_OBW_Middle Channel_16QAM_FullRB



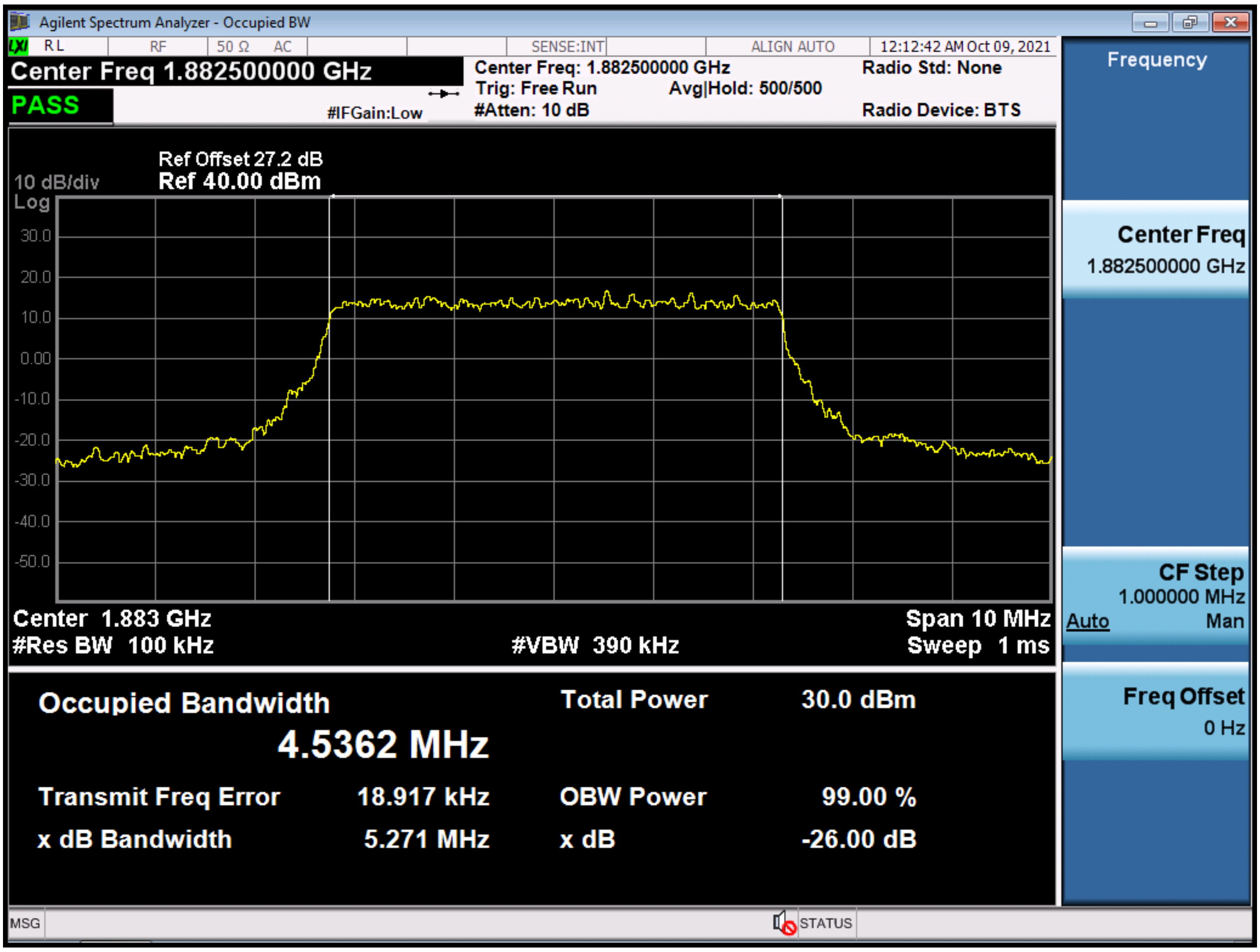
BW3 M_OBW_Middle Channel_64QAM_FullRB



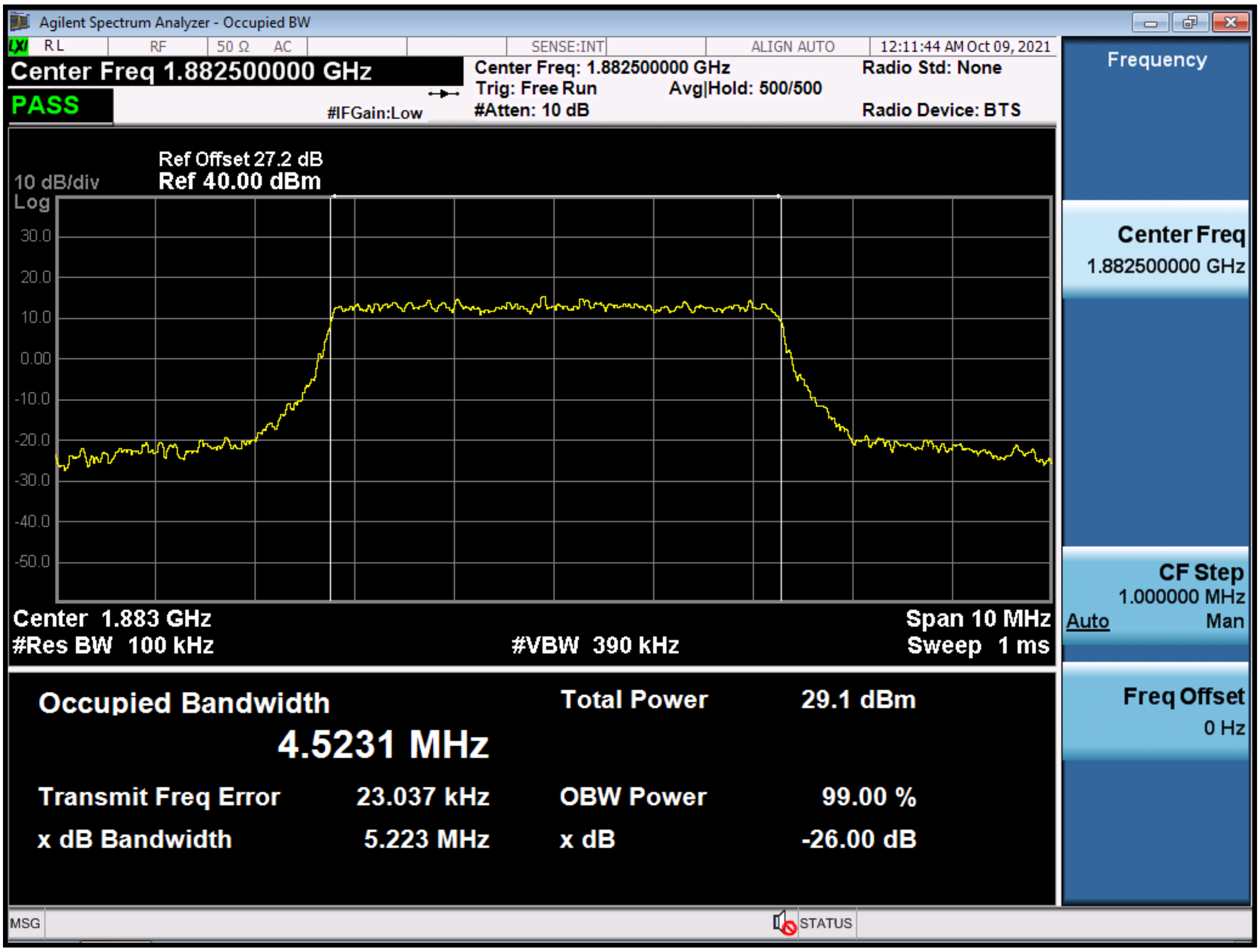
BW3 M_OBW_Middle Channel_256QAM_FullRB



BW5 M_OBW_Middle Channel_QPSK_FullRB



BW5 M_OBW_Middle Channel_16QAM_FullRB



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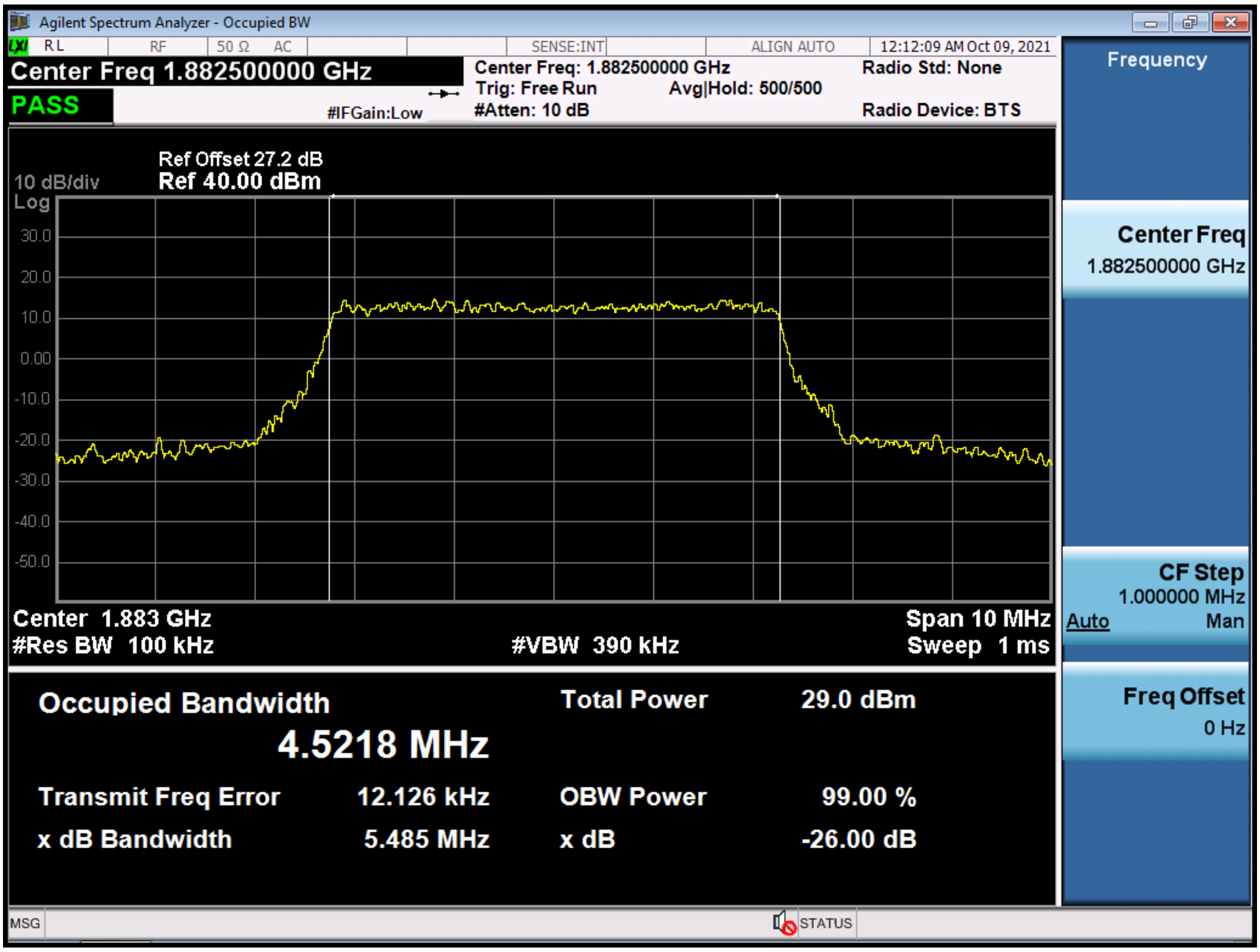

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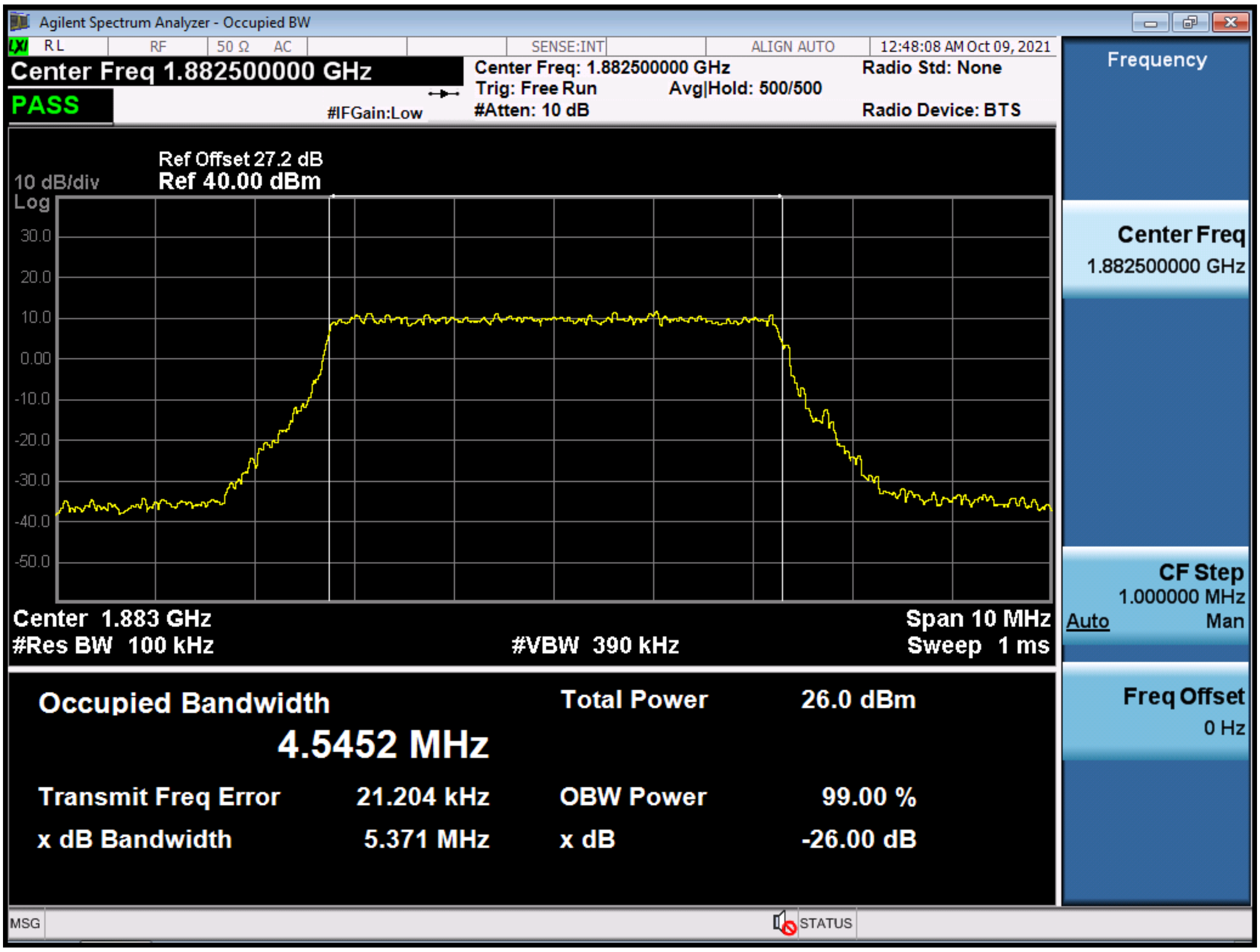
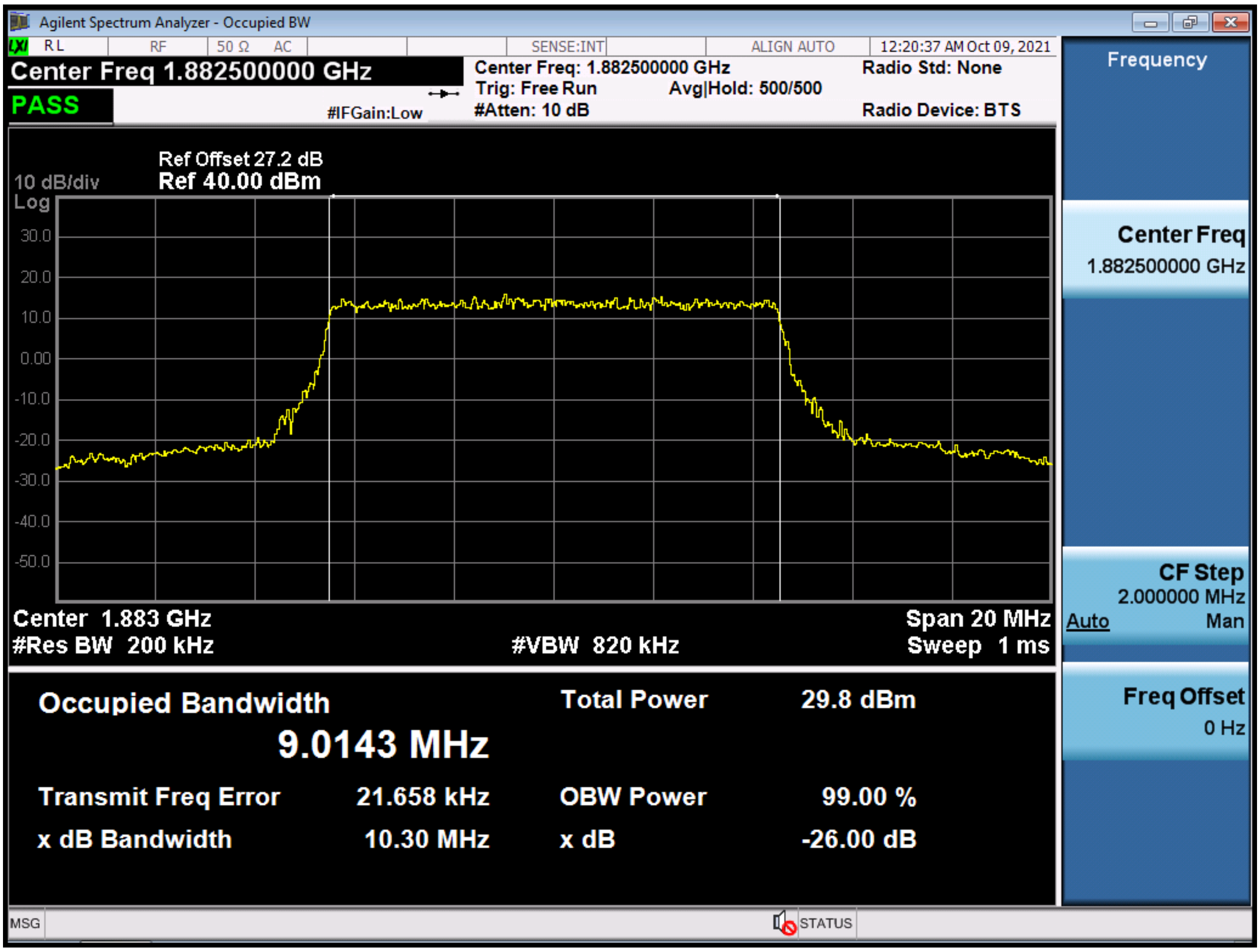


BW10 M_OBW_Middle Channel_QPSK_FullRB



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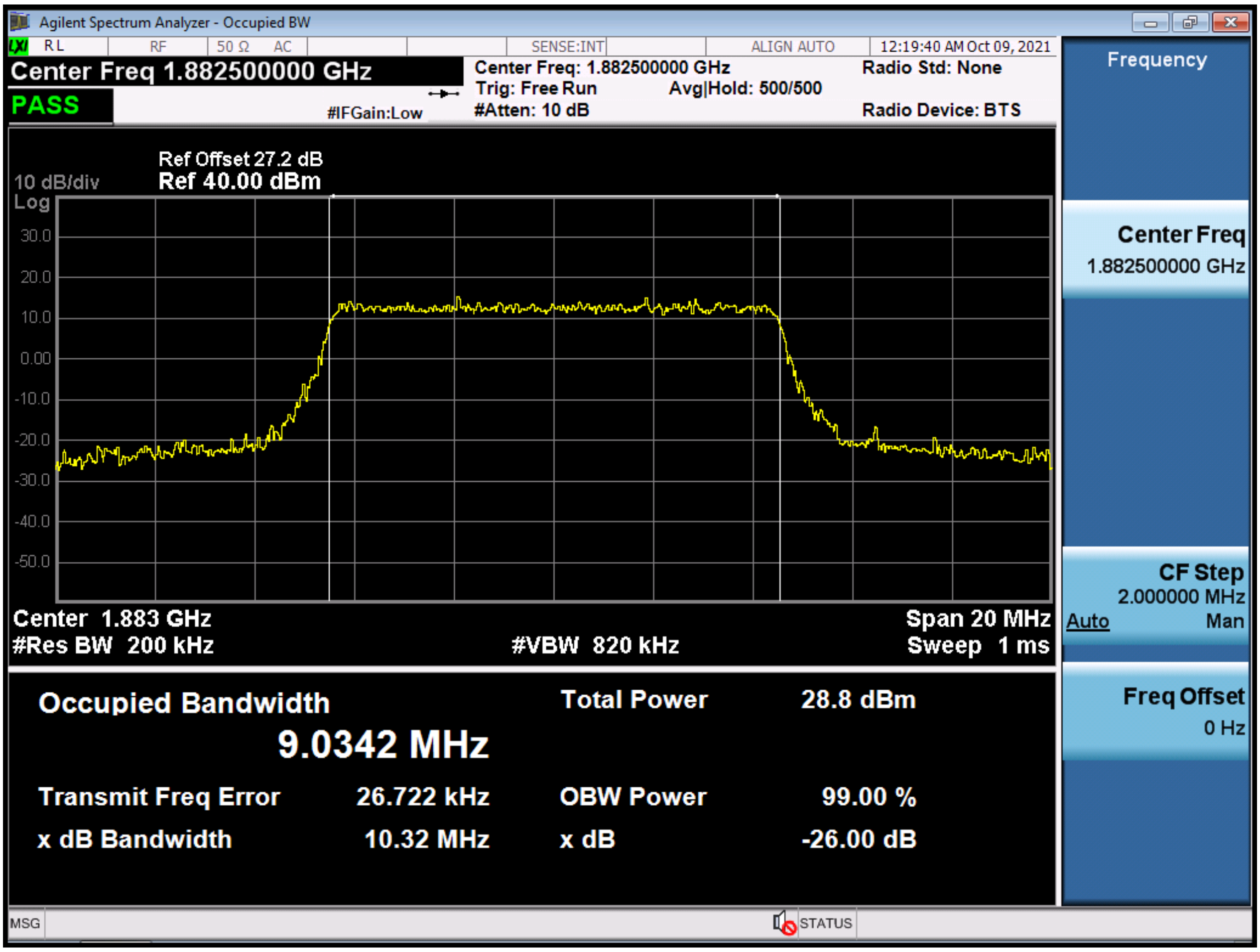

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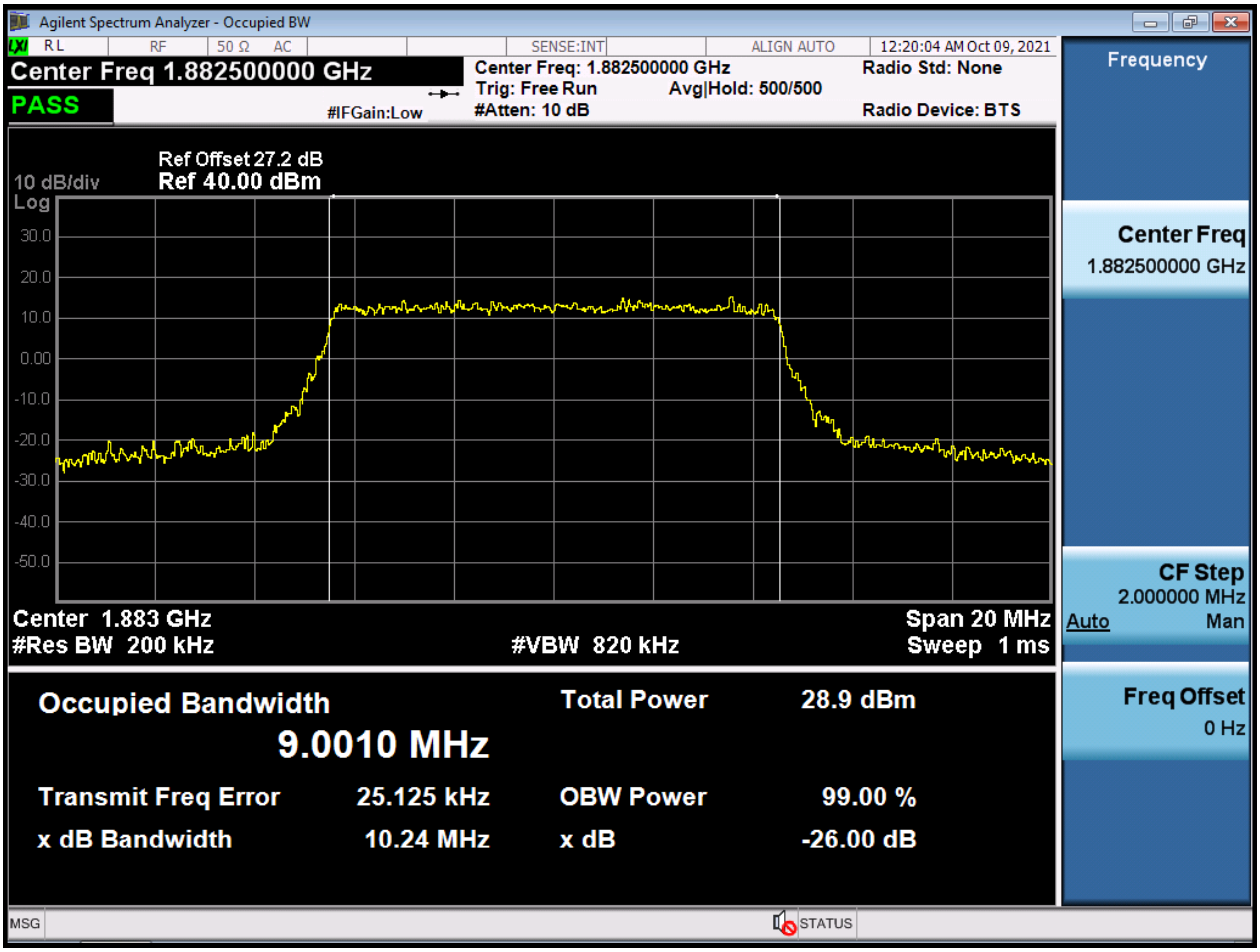

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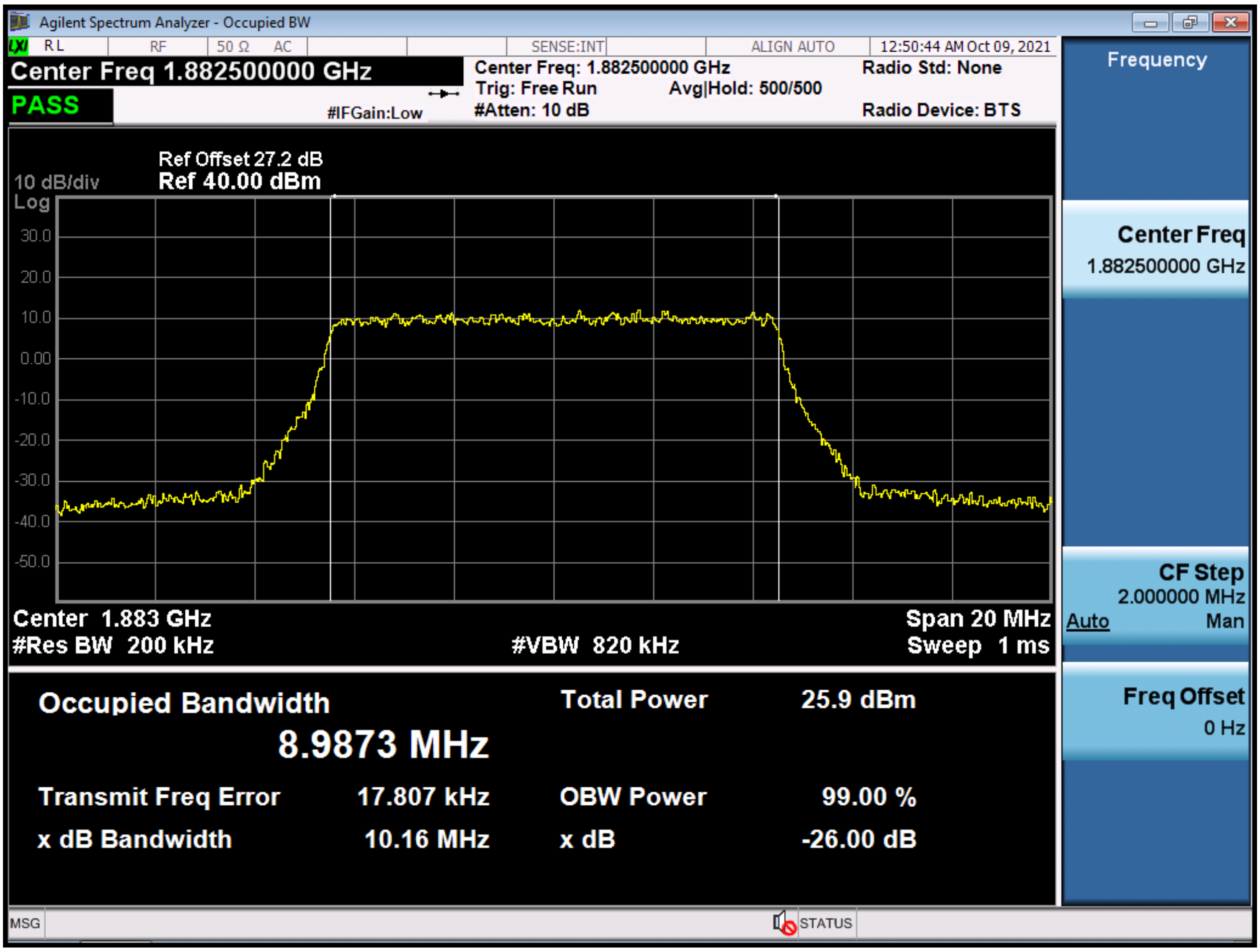
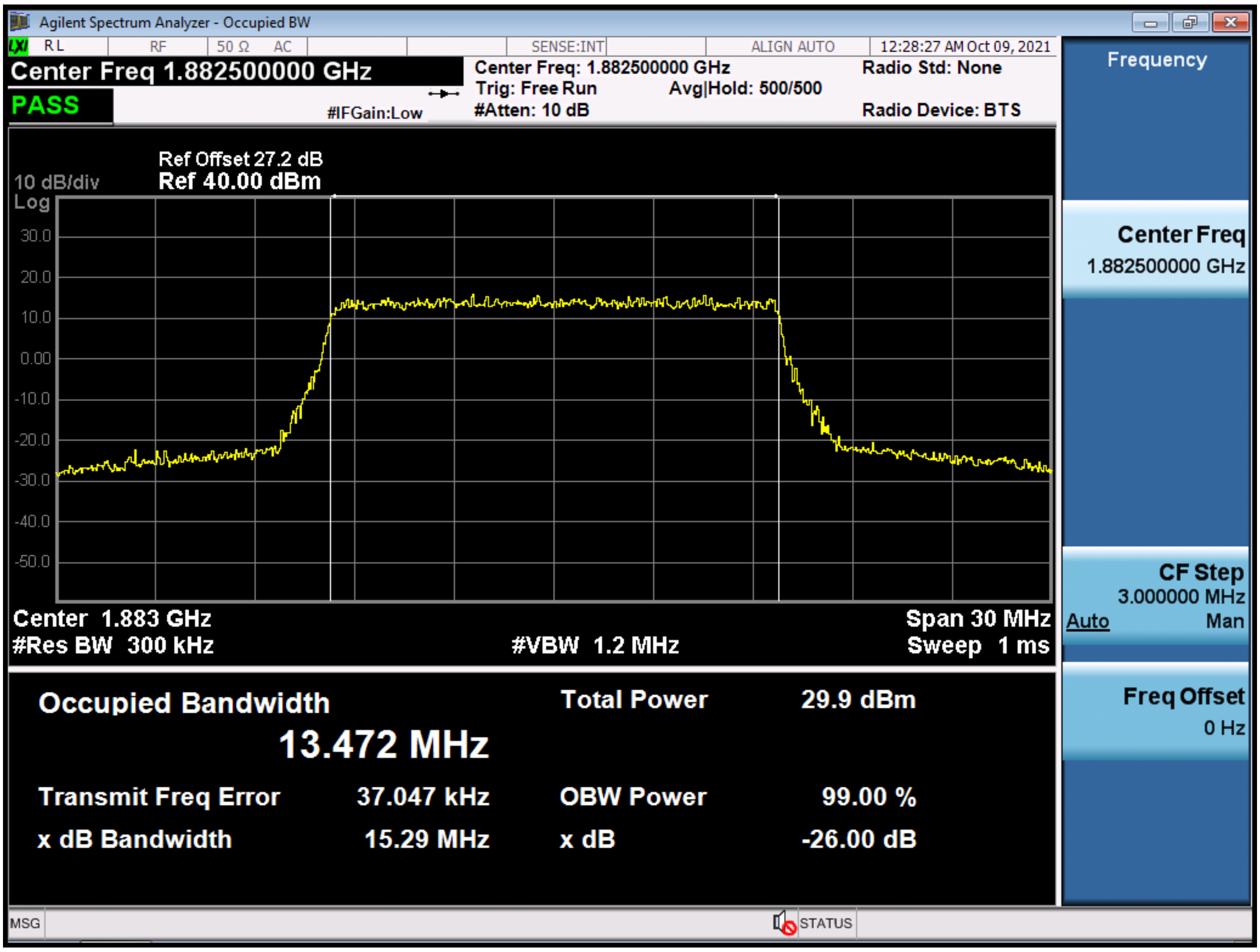


BW15 M_OBW_Middle Channel_QPSK_FullRB



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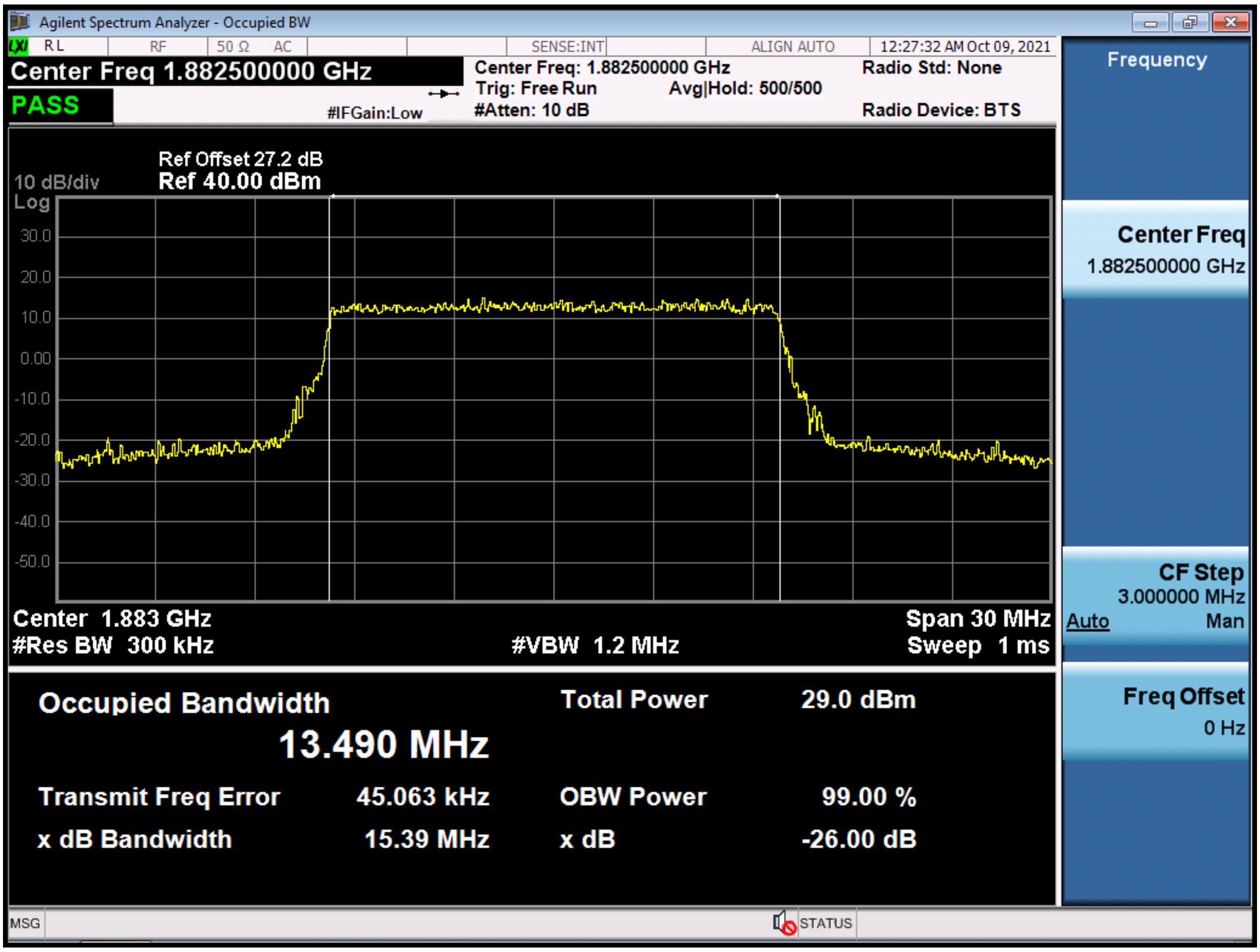

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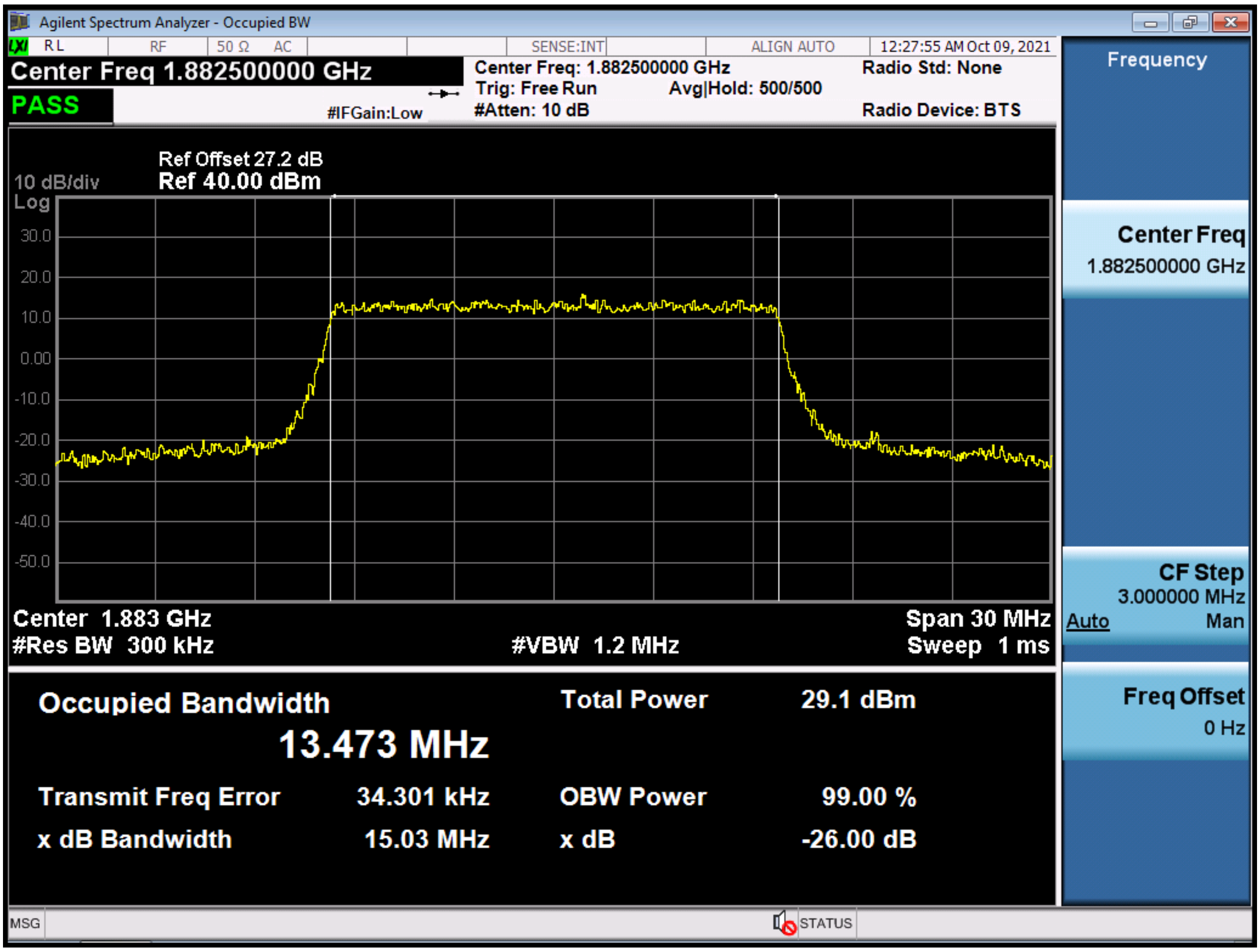

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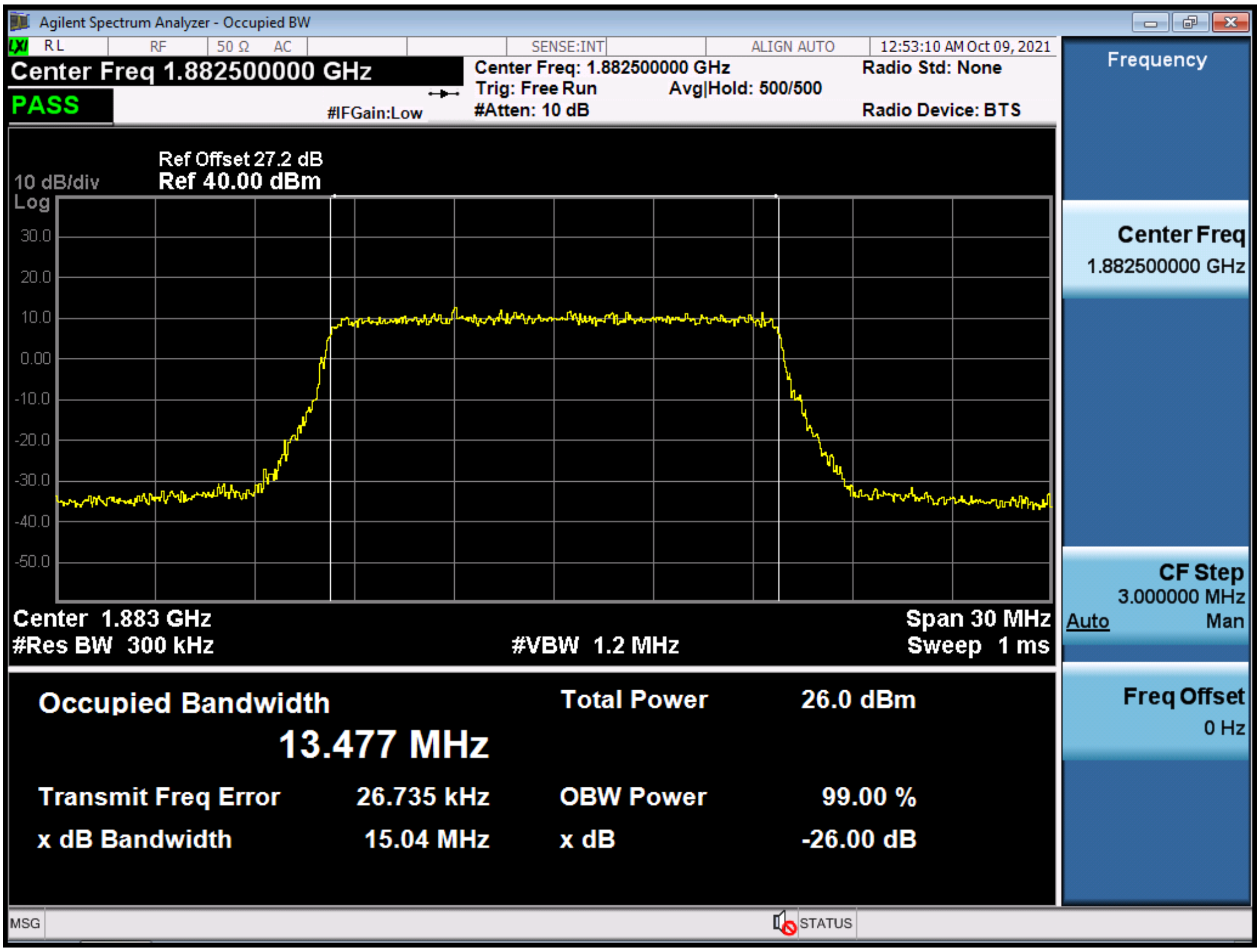
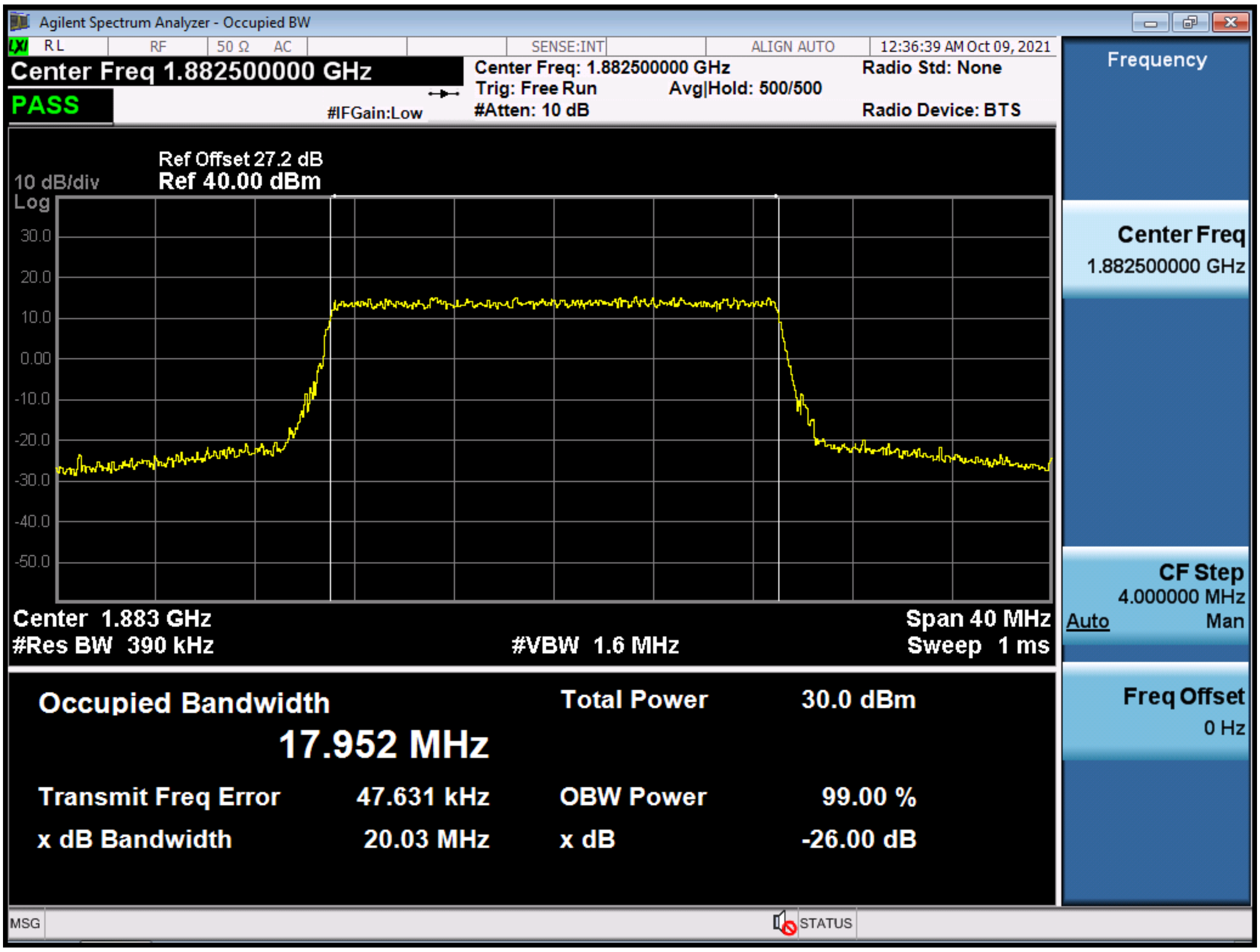
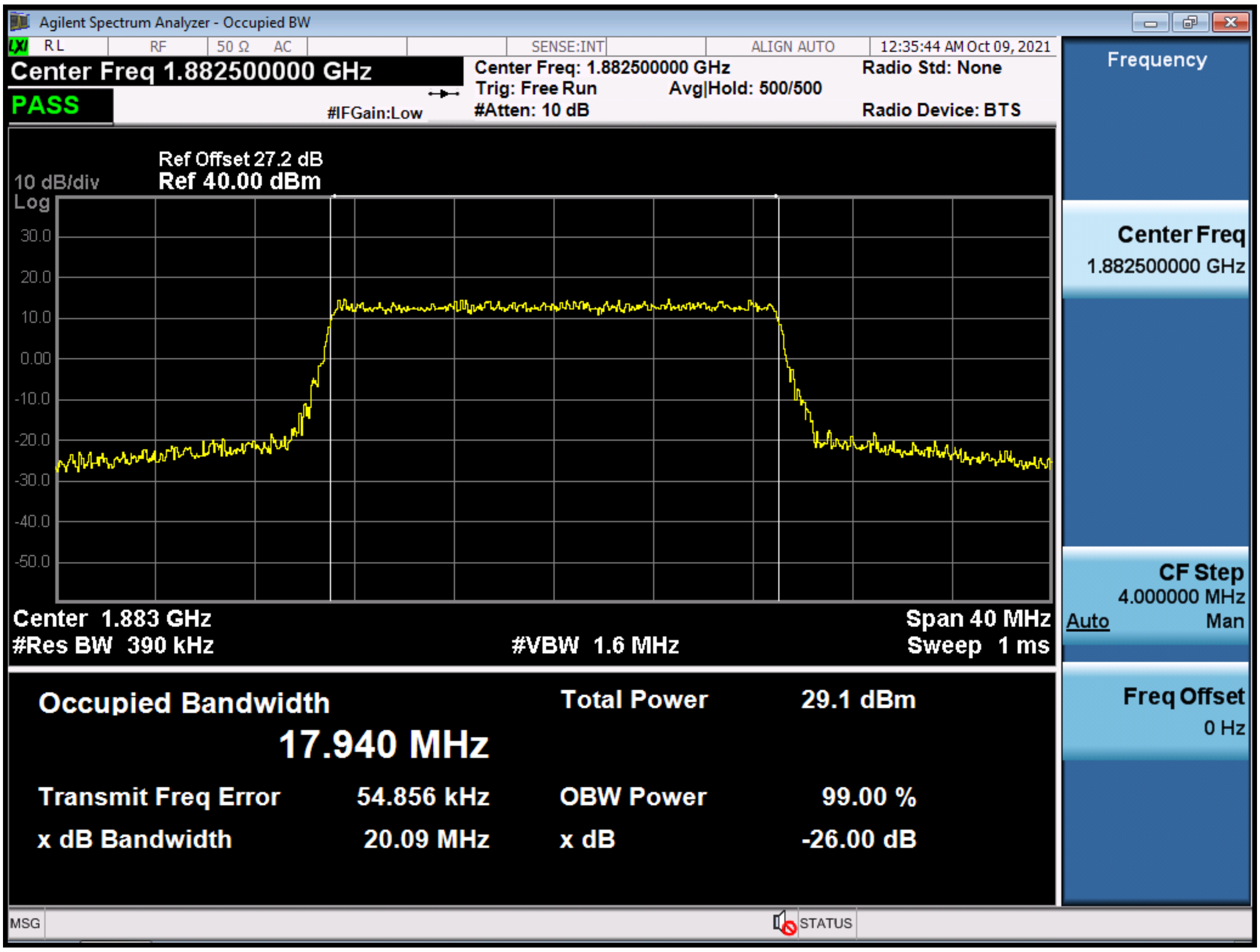


BW20 M_OBW_Middle Channel_QPSK_FullRB



BW20 M_OBW_Middle Channel_16QAM_FullRB



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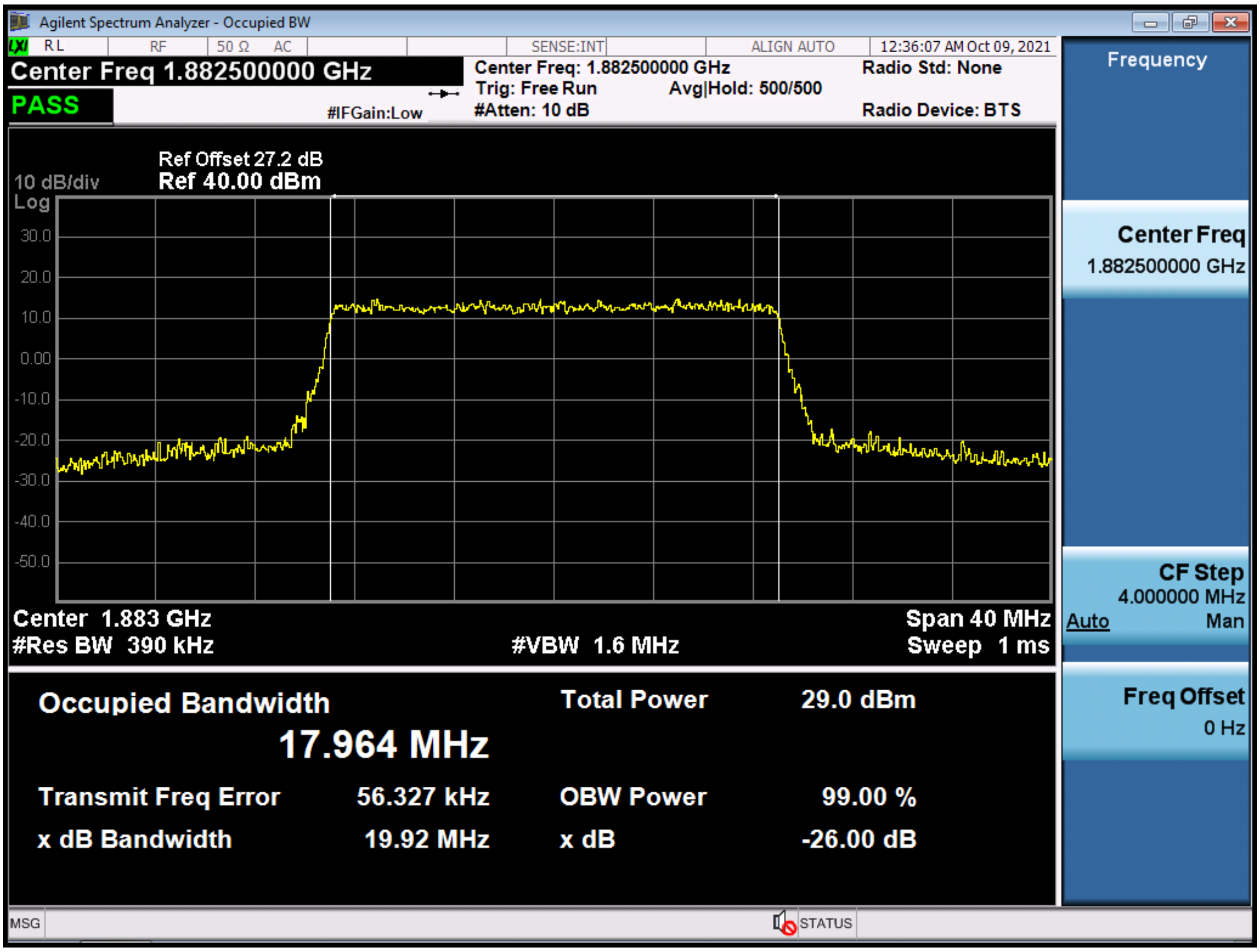

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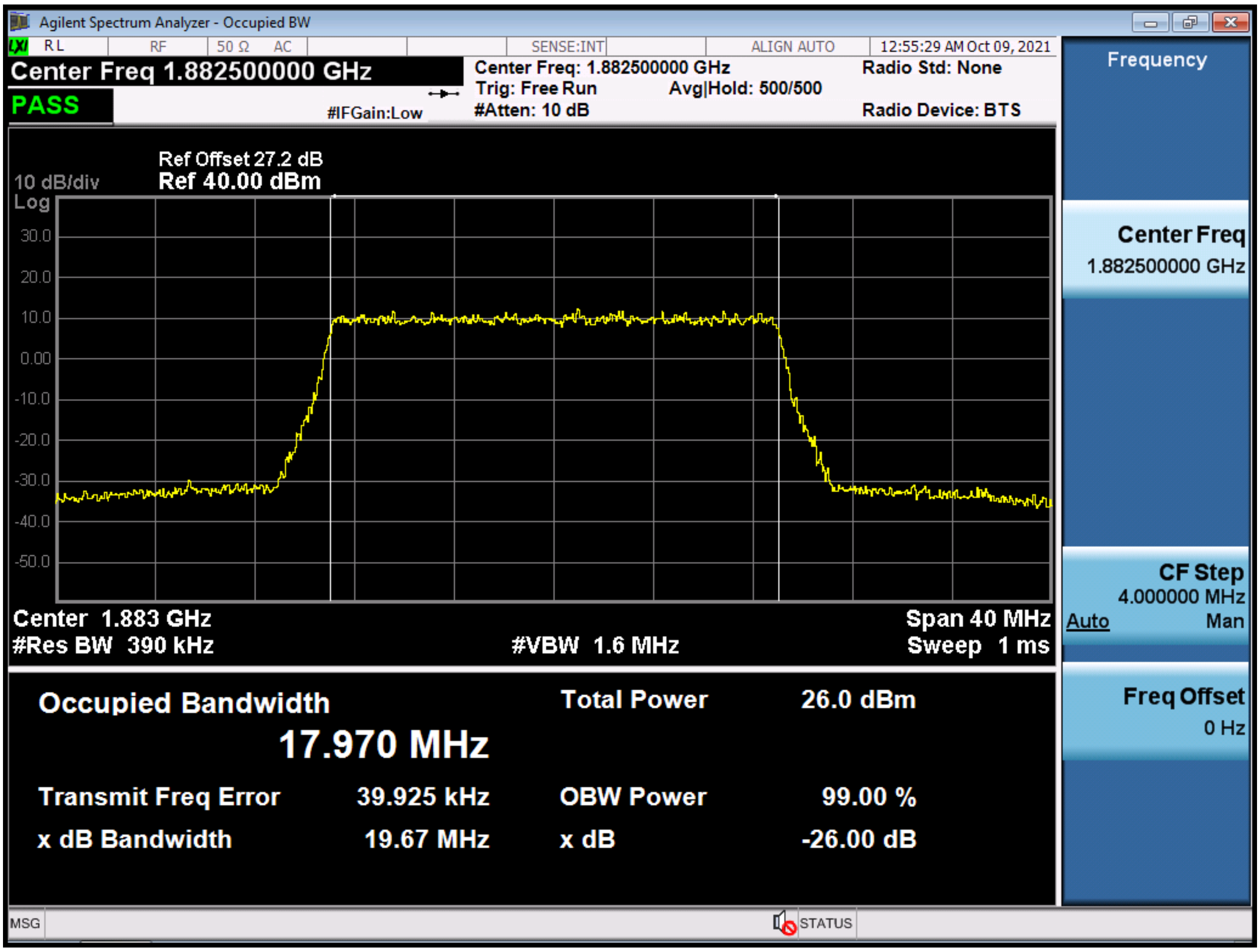
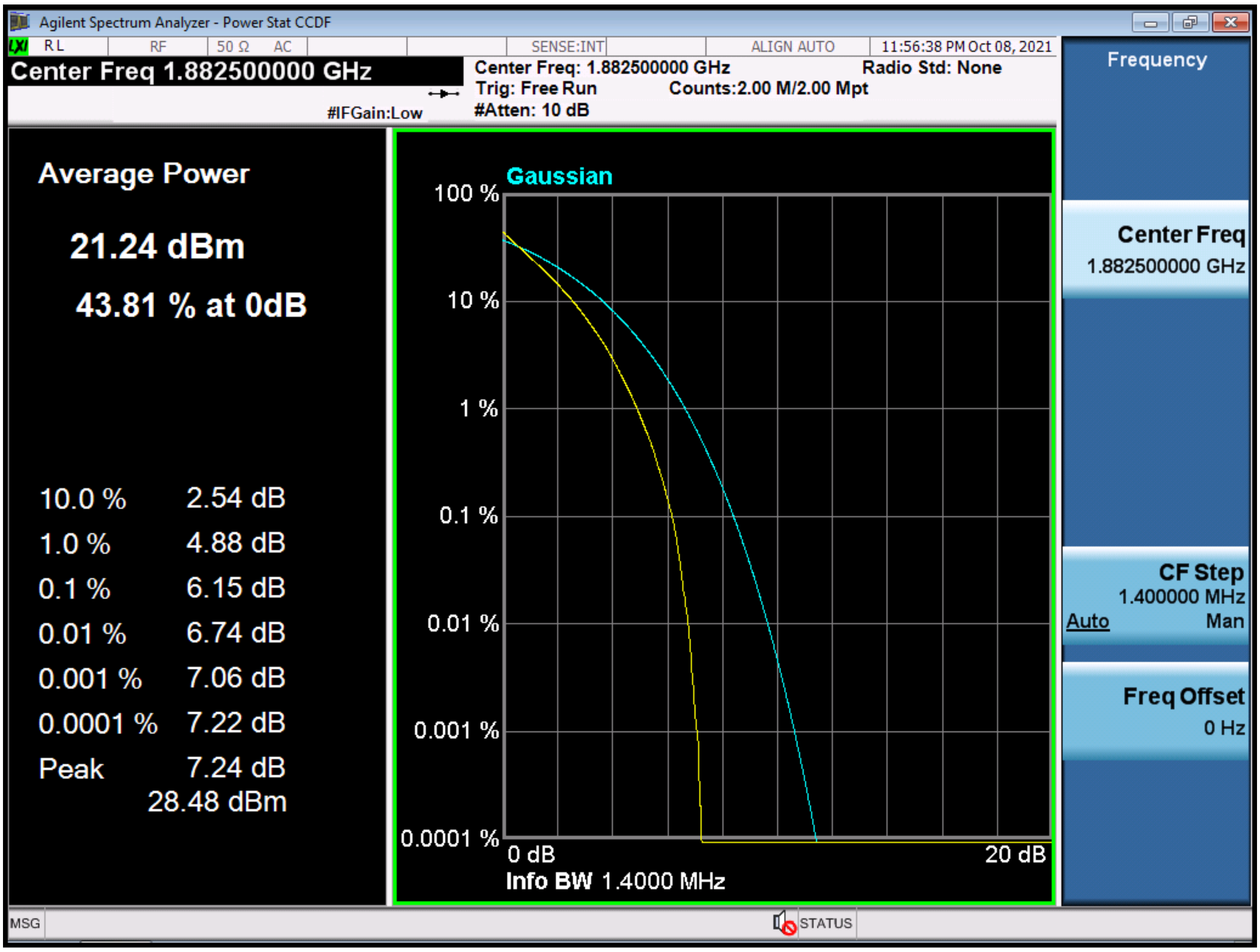


BW1.4 M_PAR_Middle Channel_QPSK_FullRB



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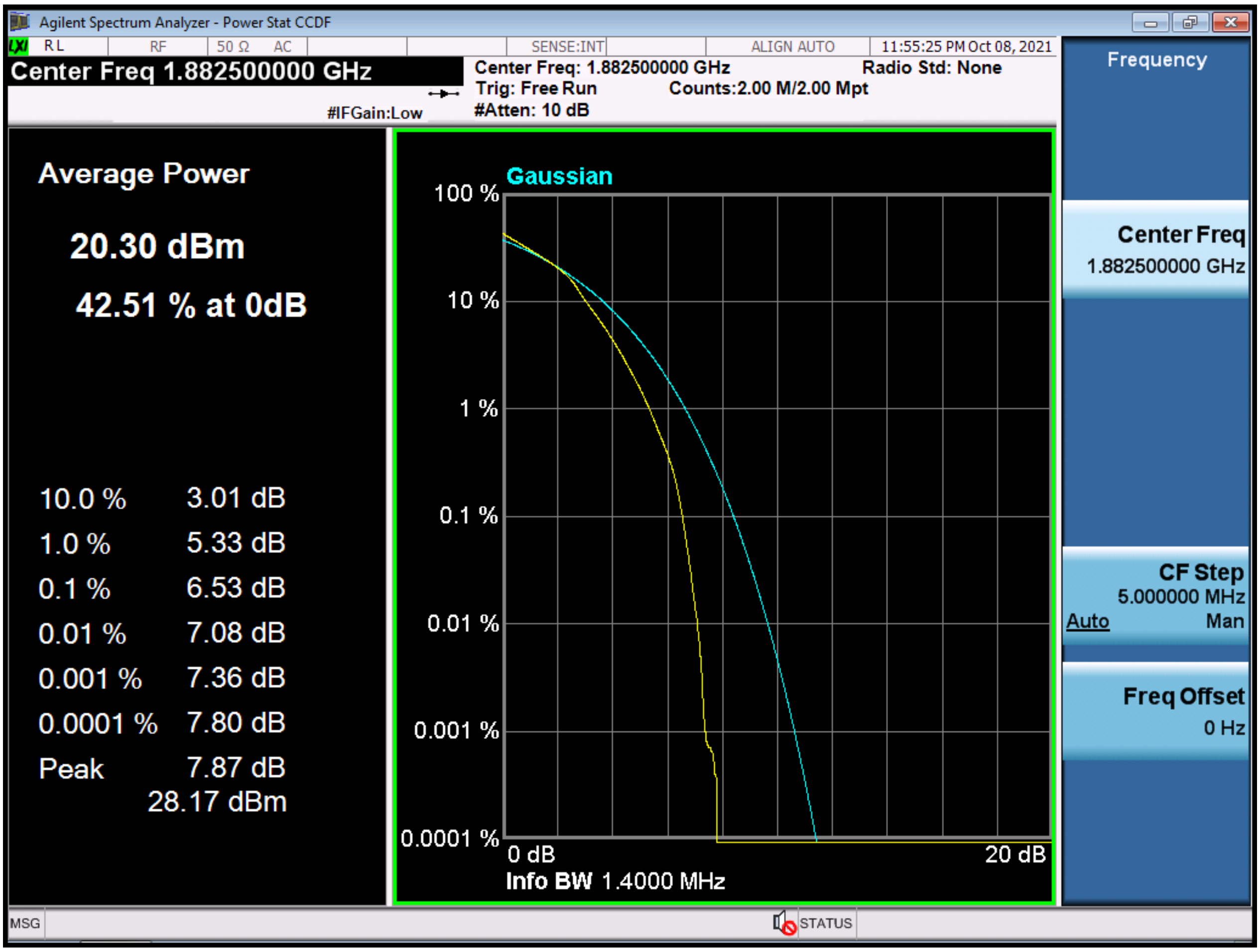

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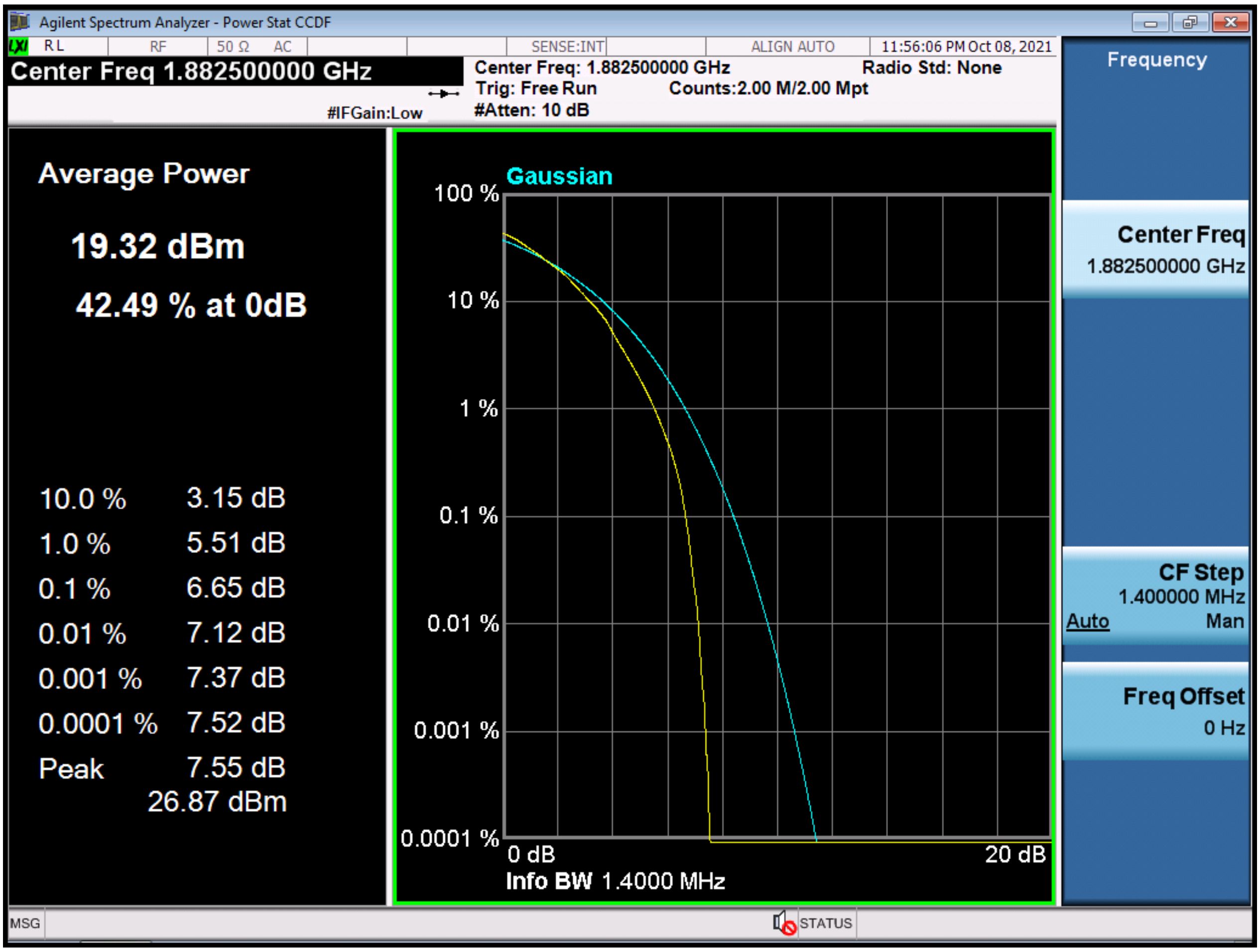

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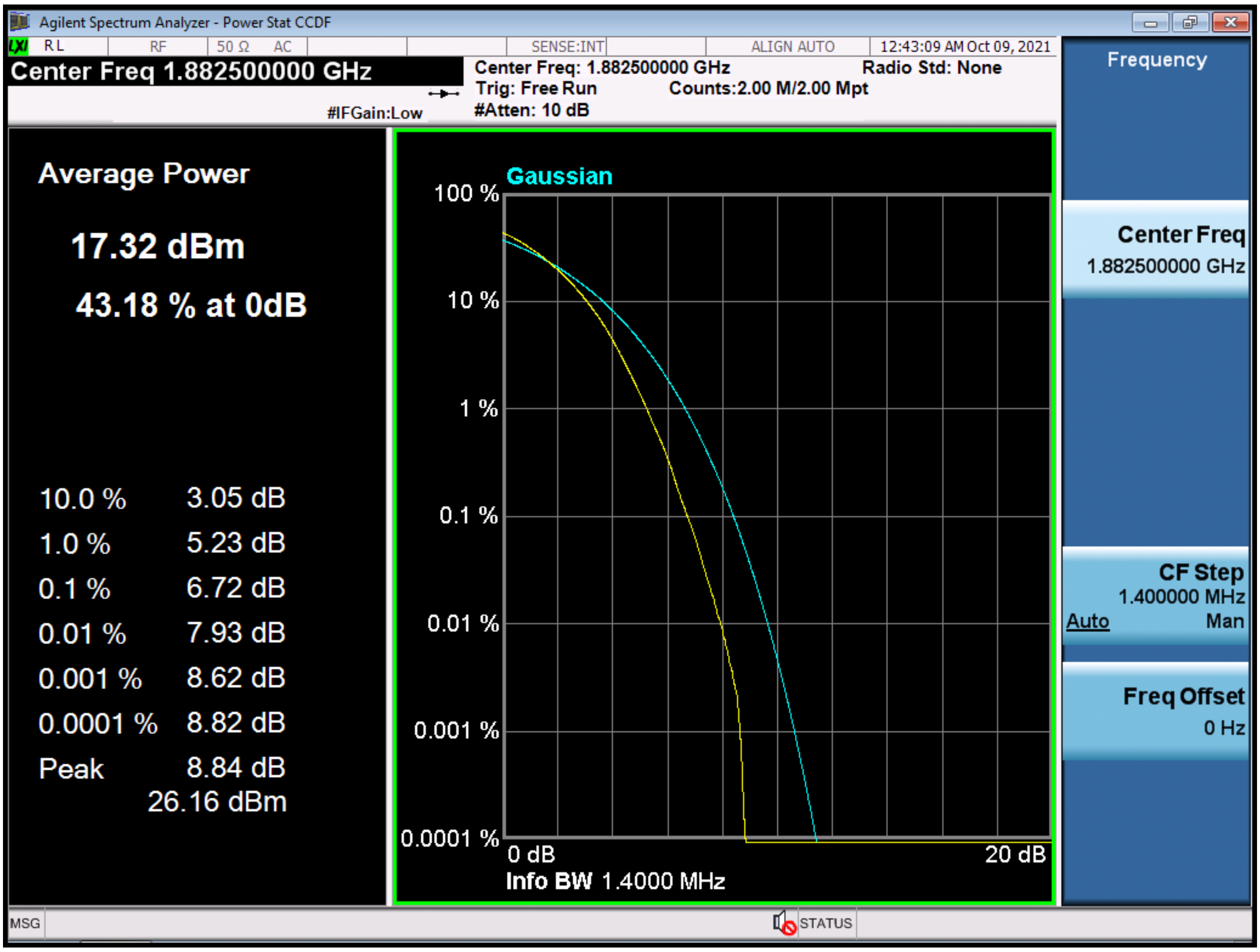
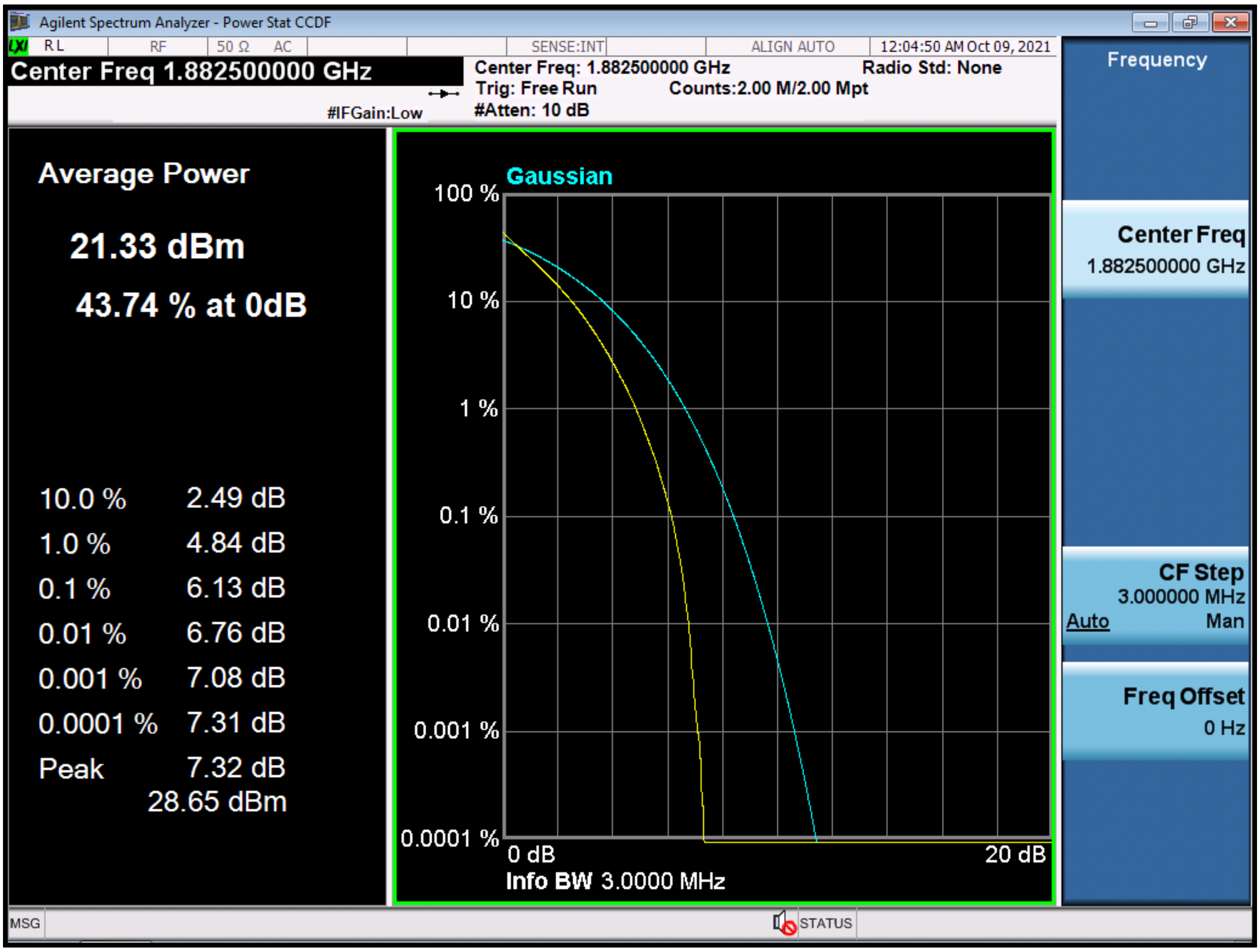


BW3 M_PAR_Middle Channel_QPSK_FullRB



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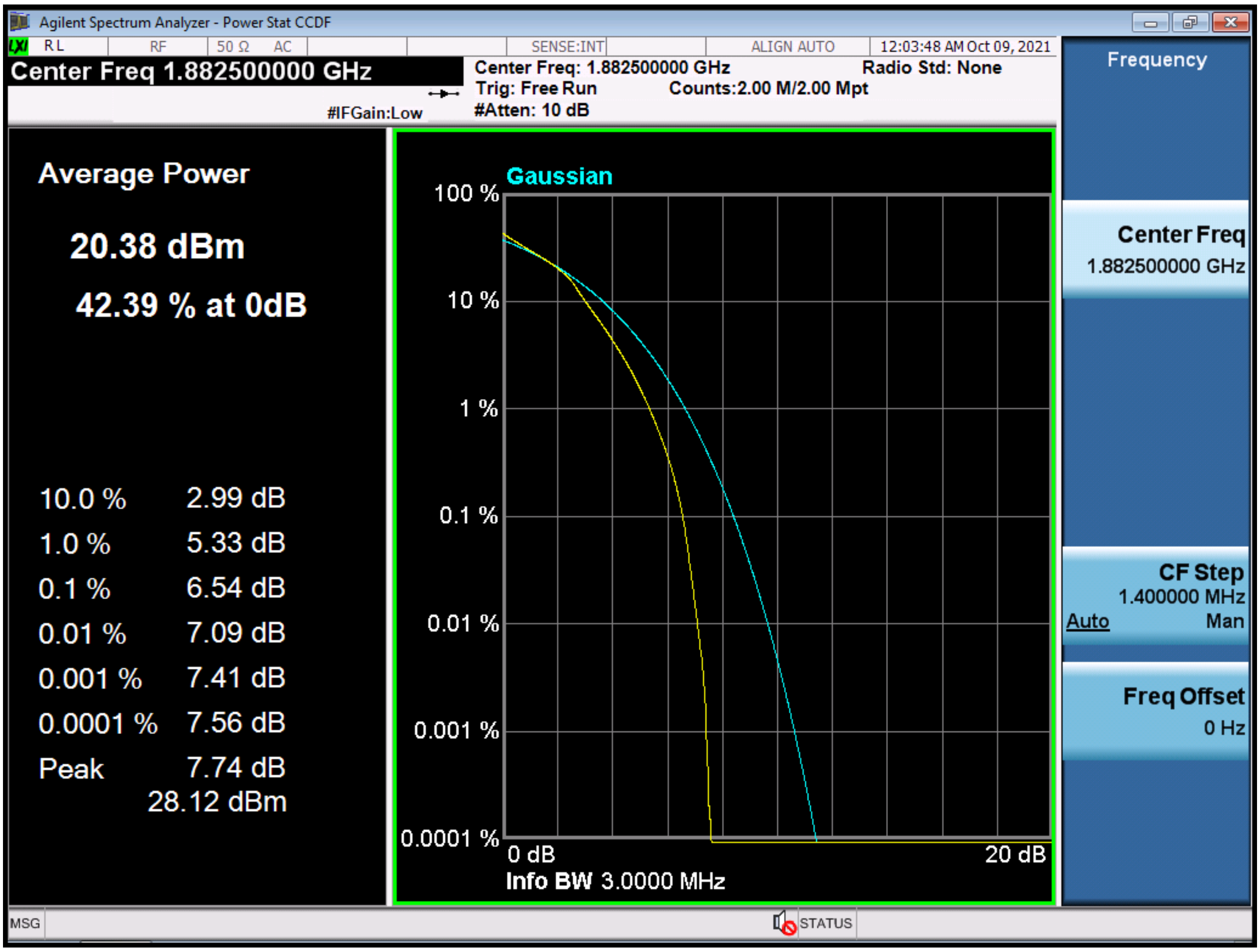

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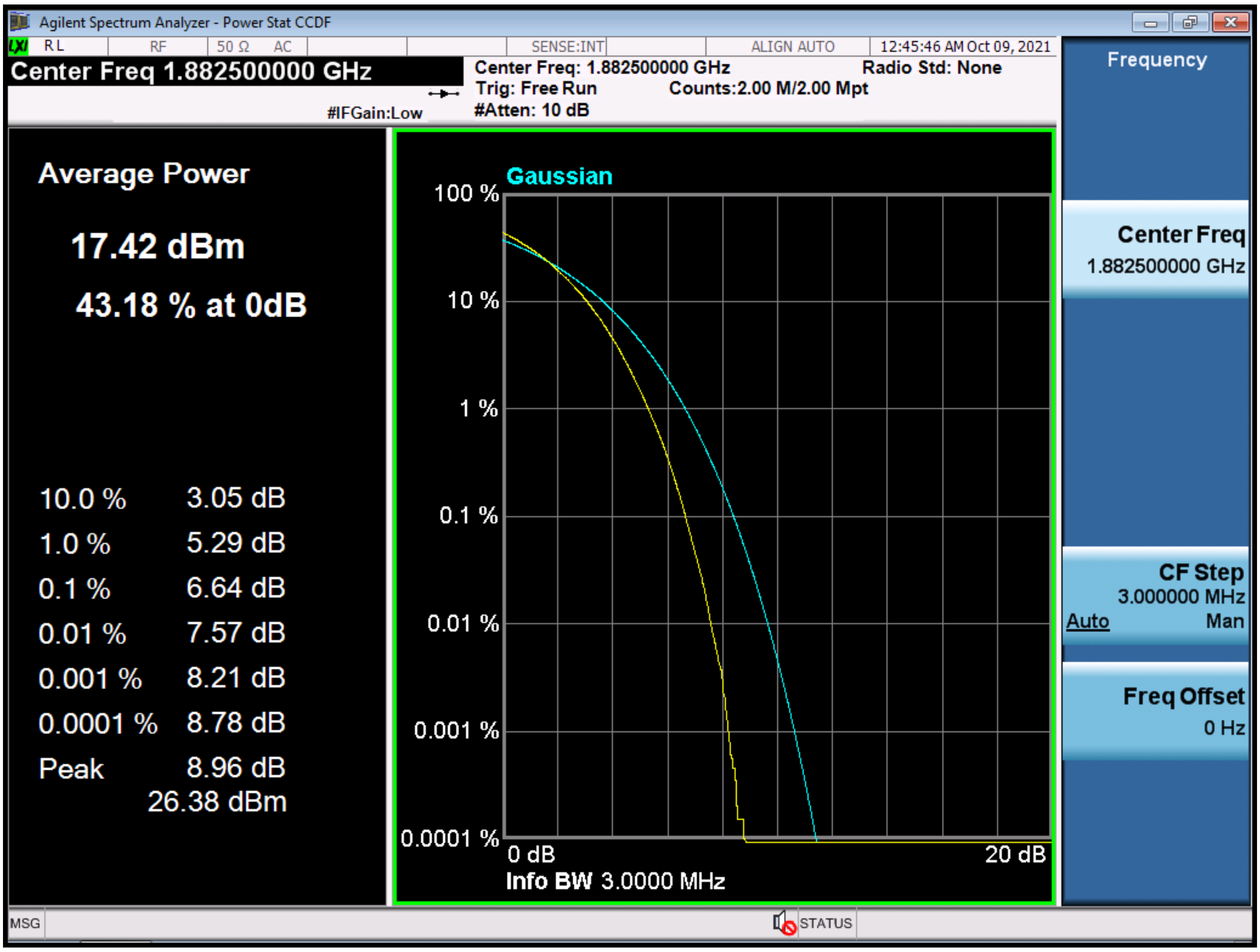
BW3 M_PAR_Middle Channel_256QAM_FullRB



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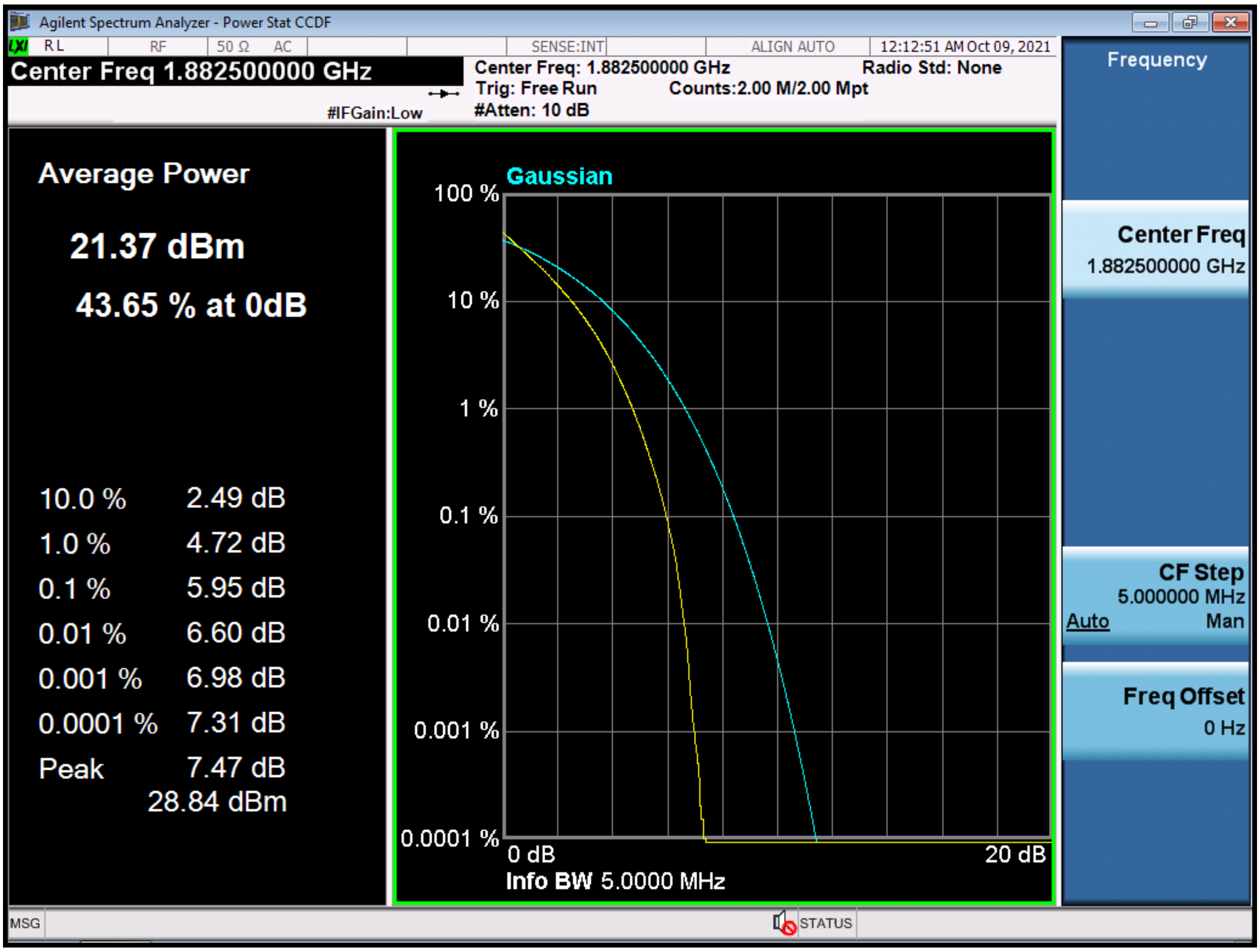

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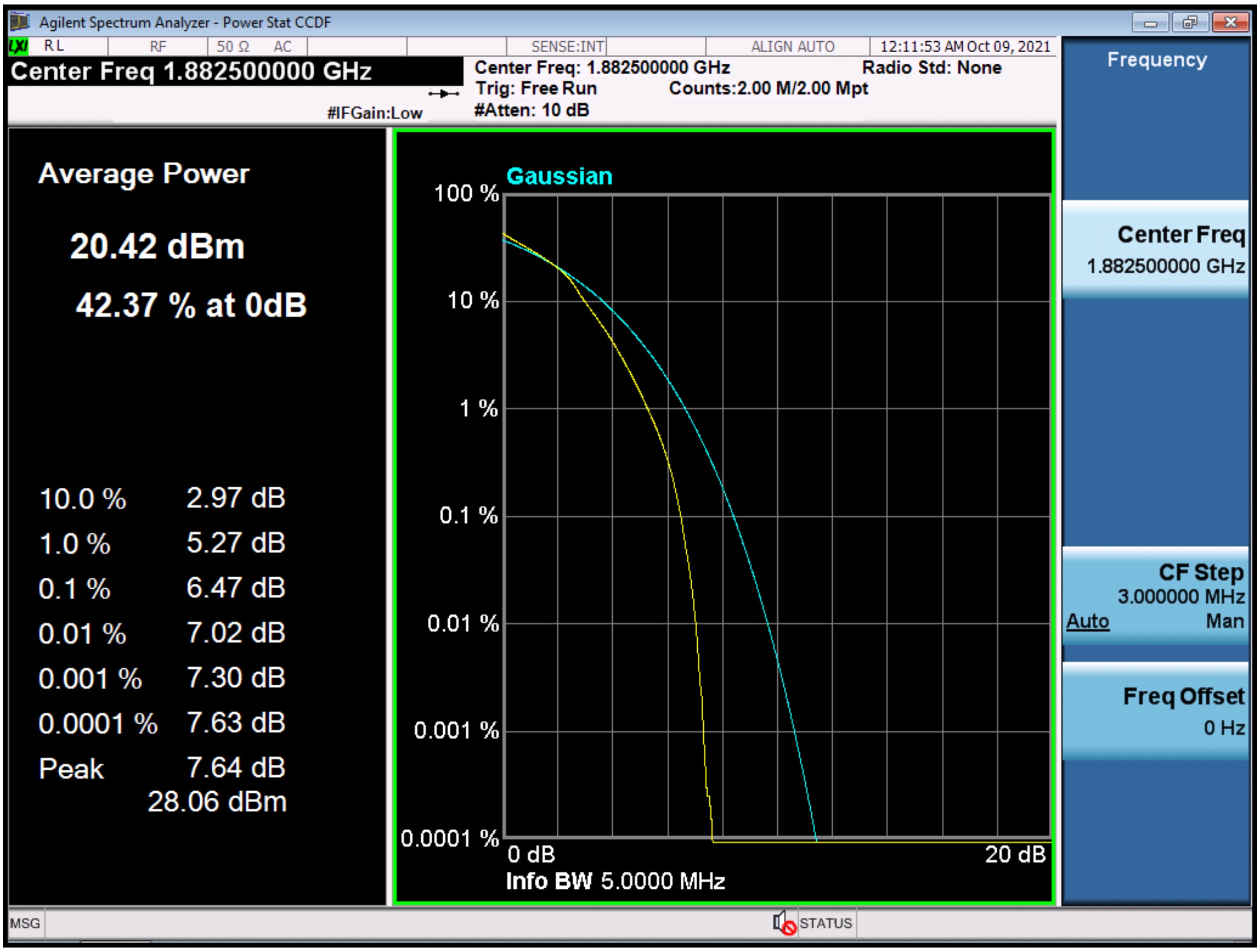

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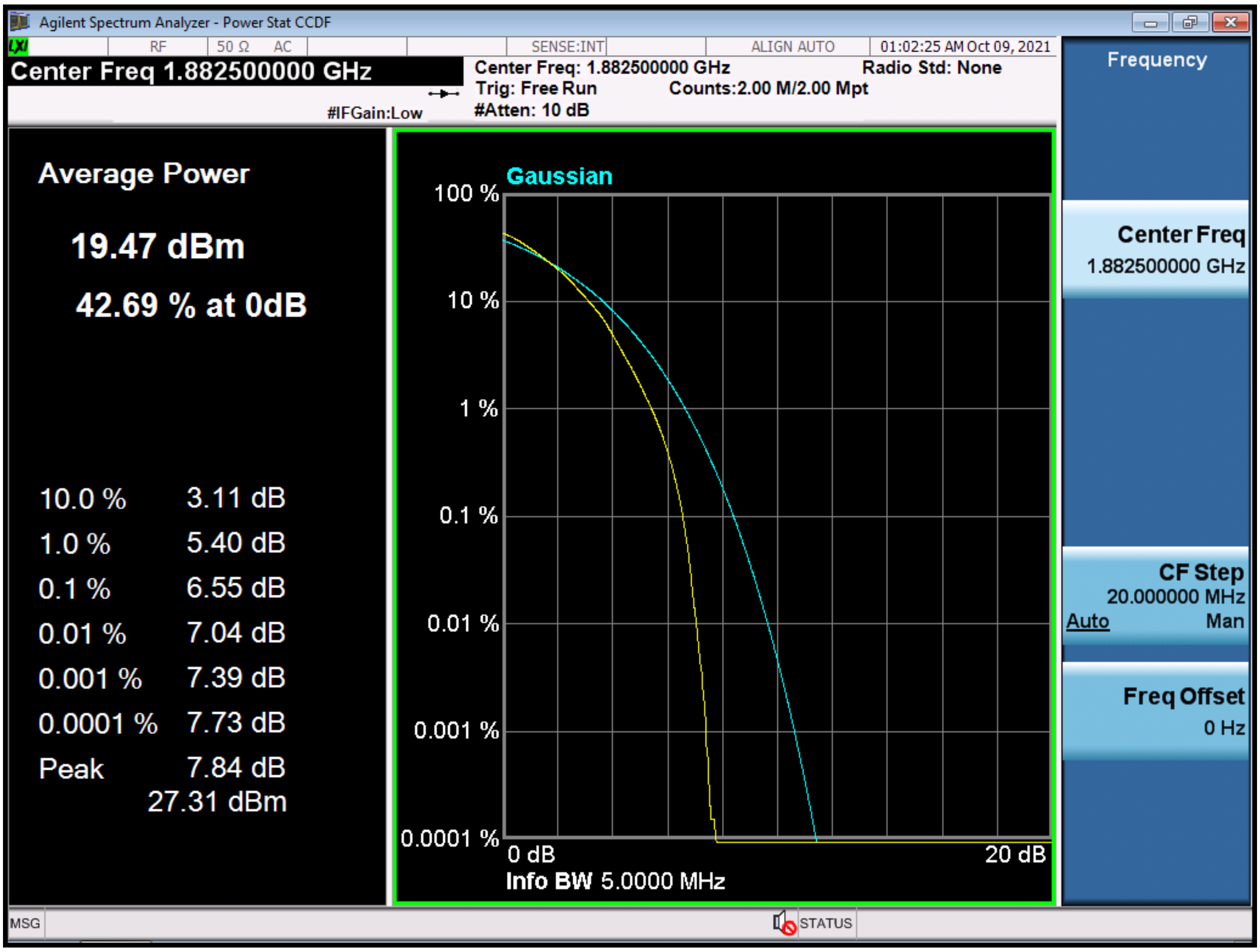

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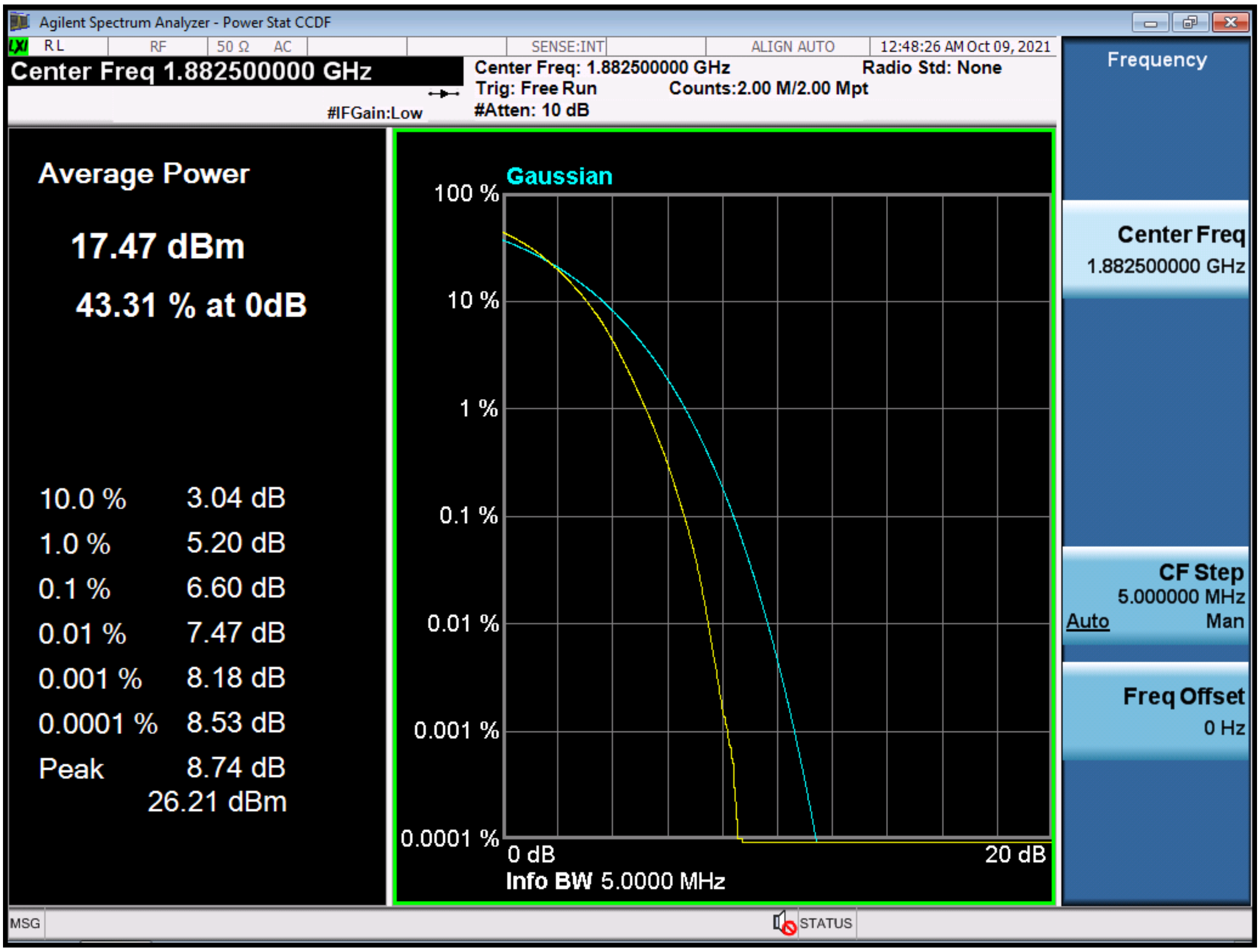
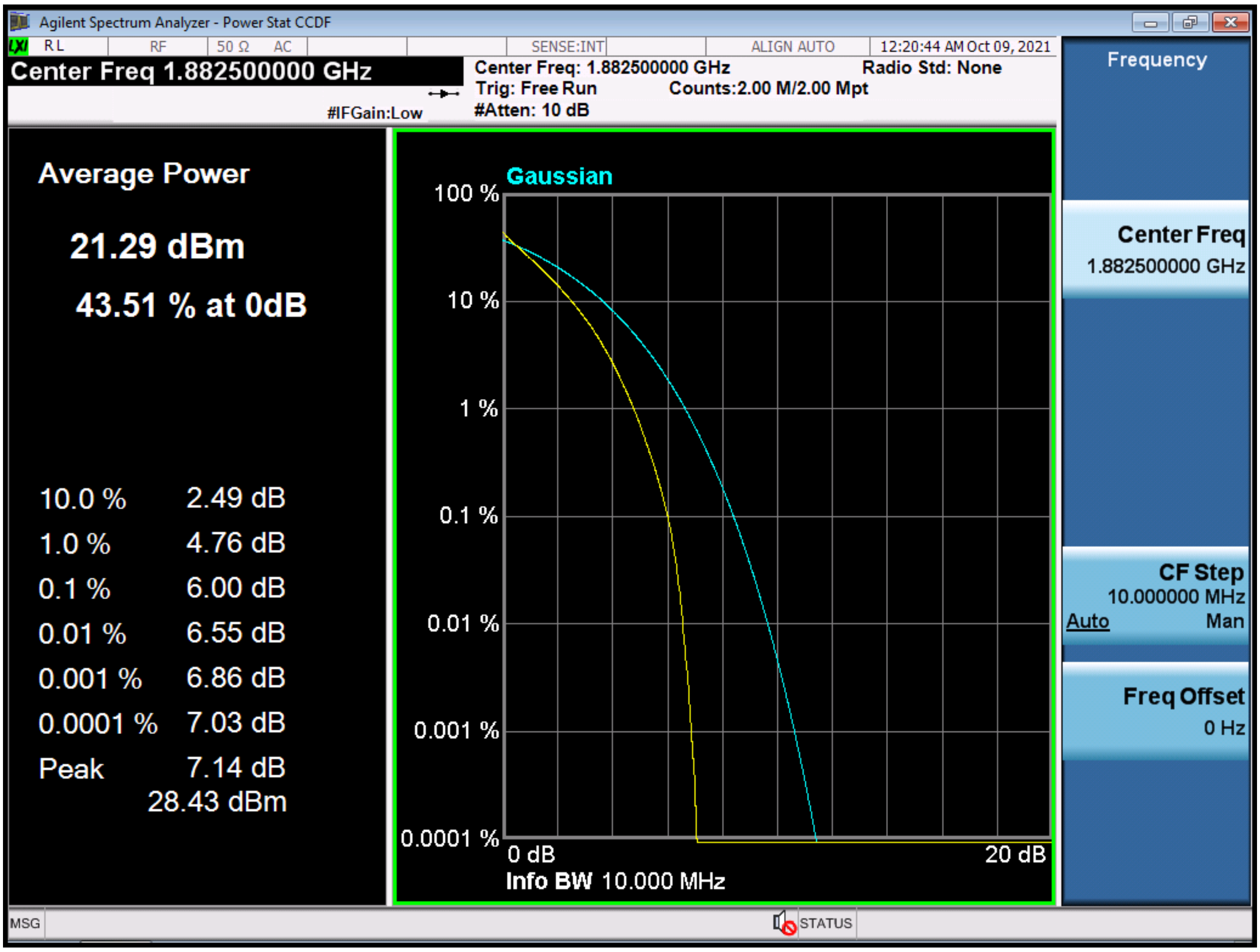


BW10 M_PAR_Middle Channelz_QPSK_FullRB



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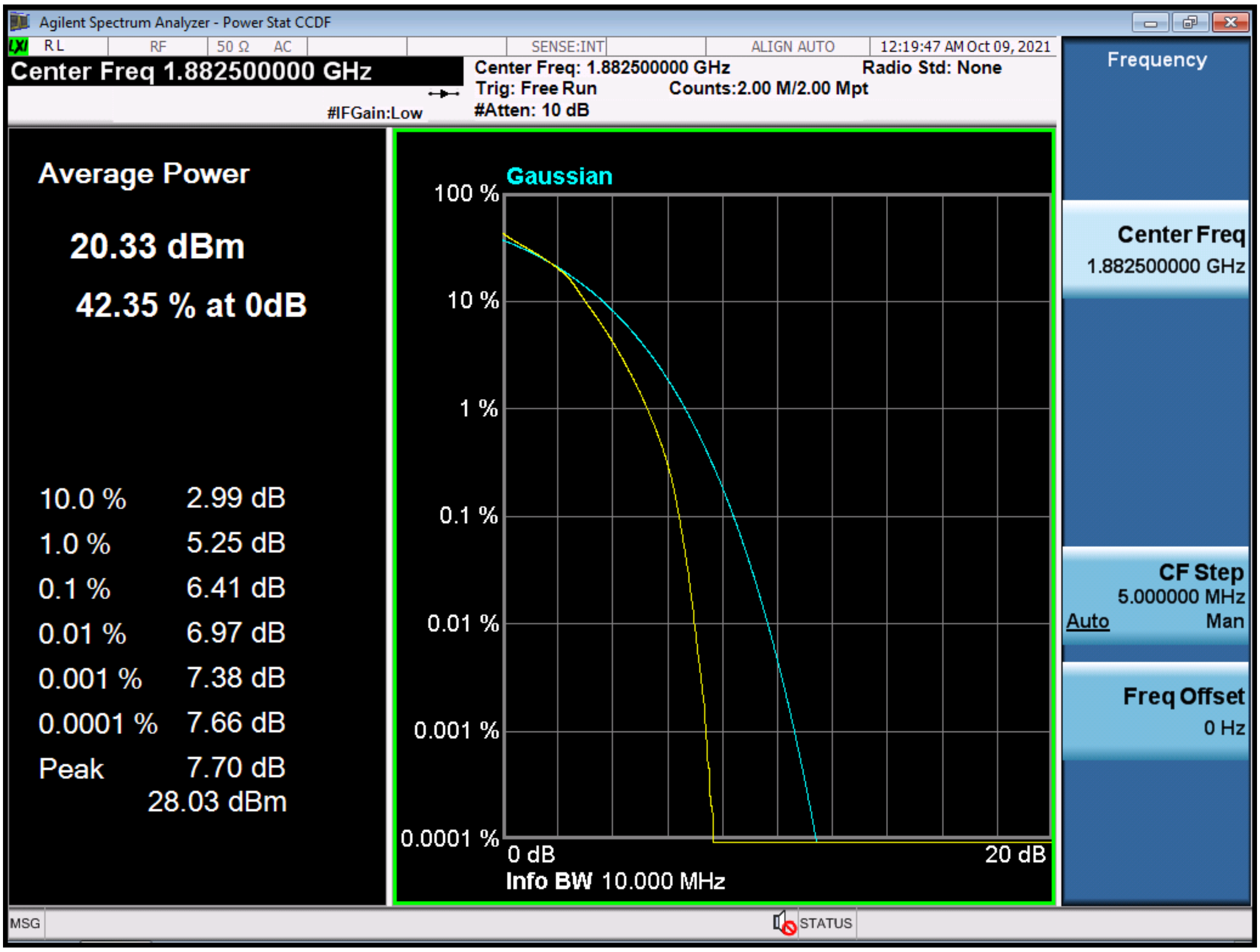

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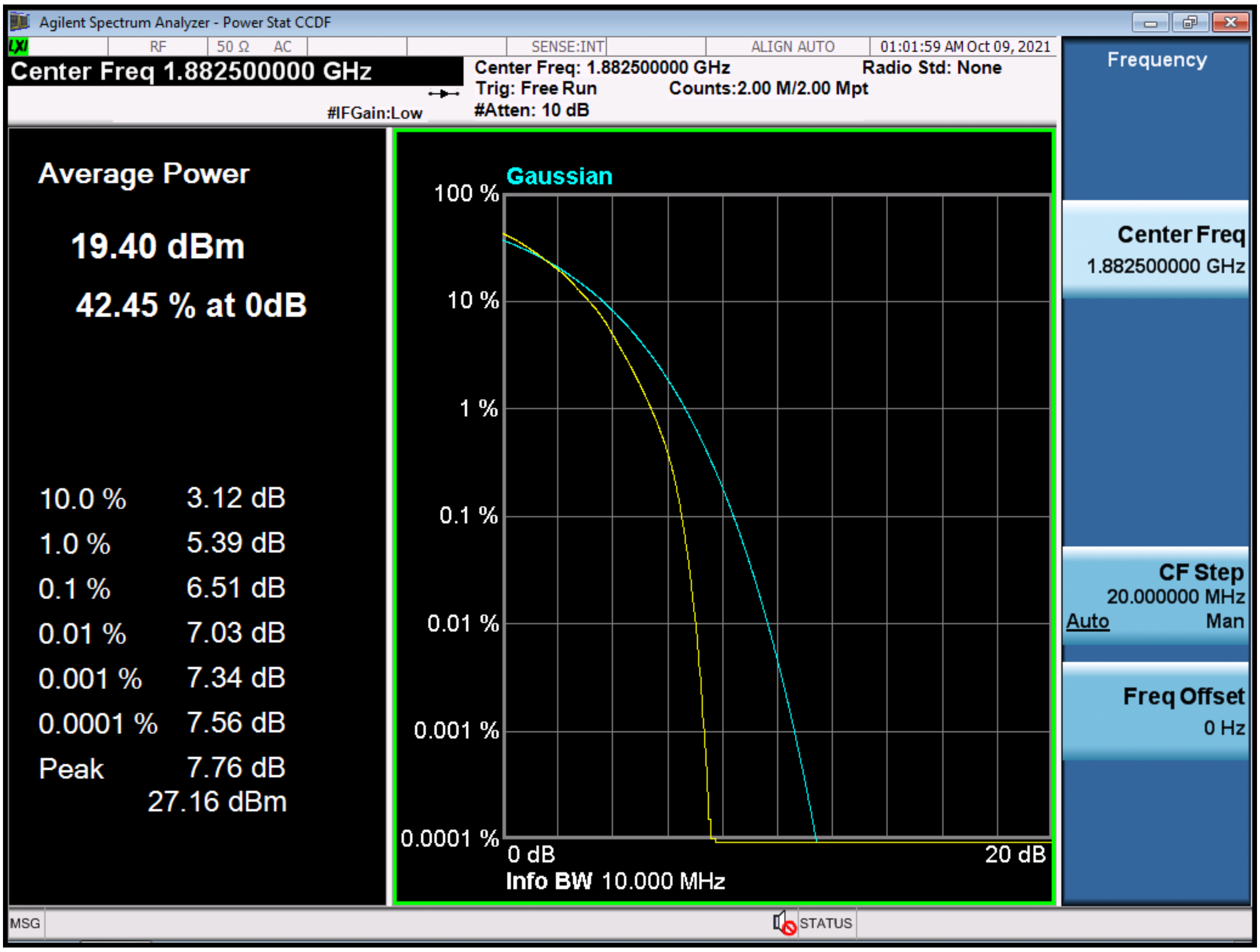

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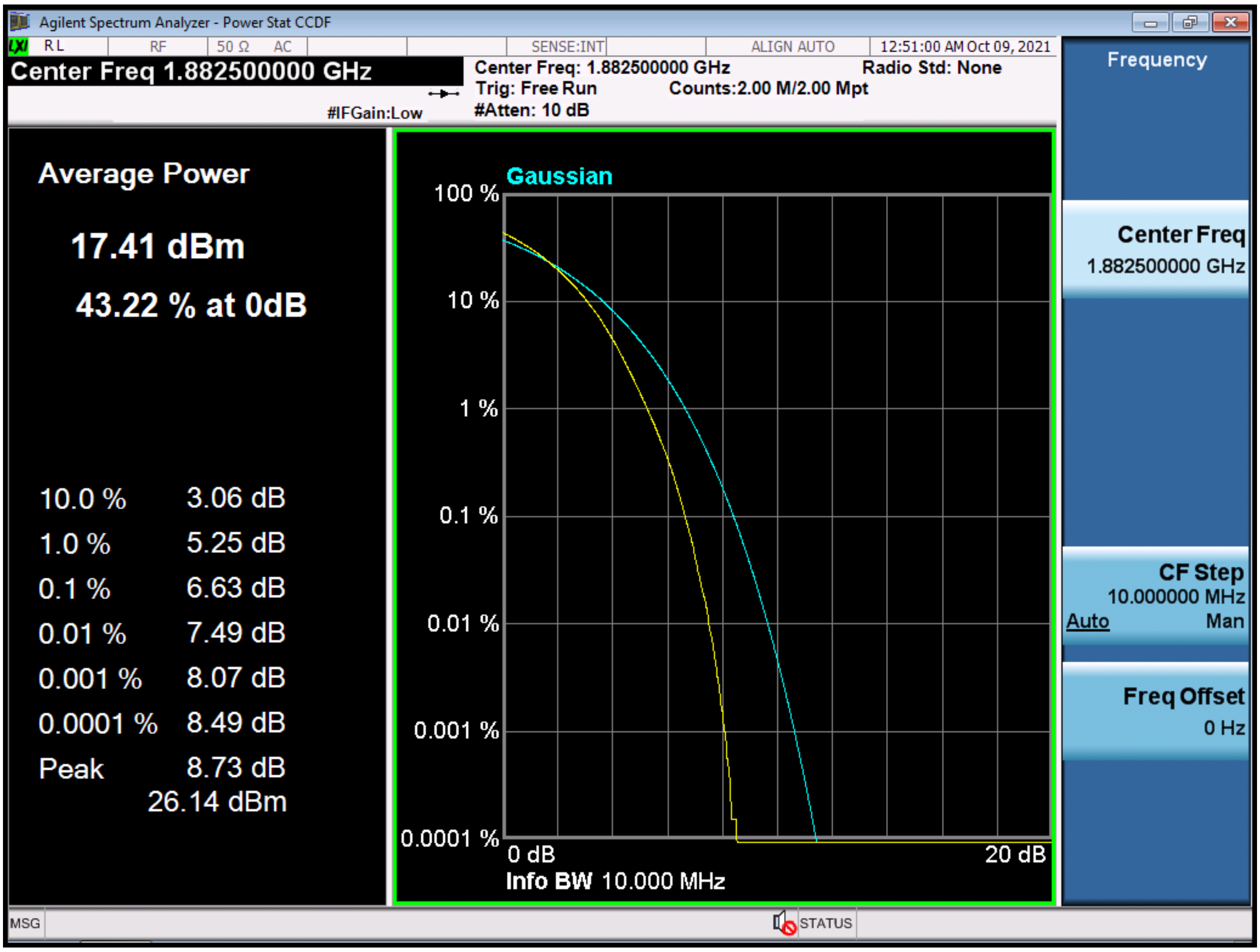

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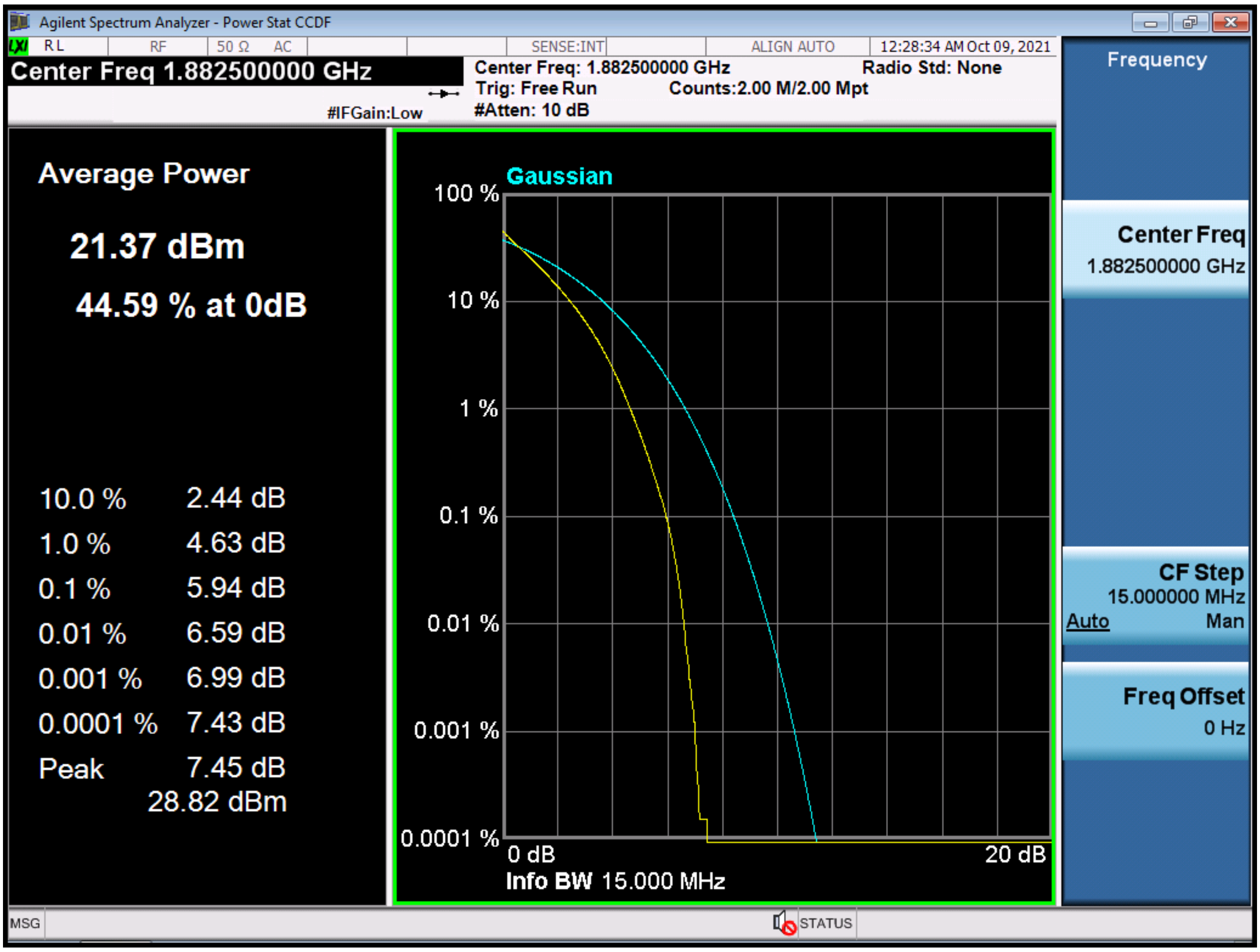

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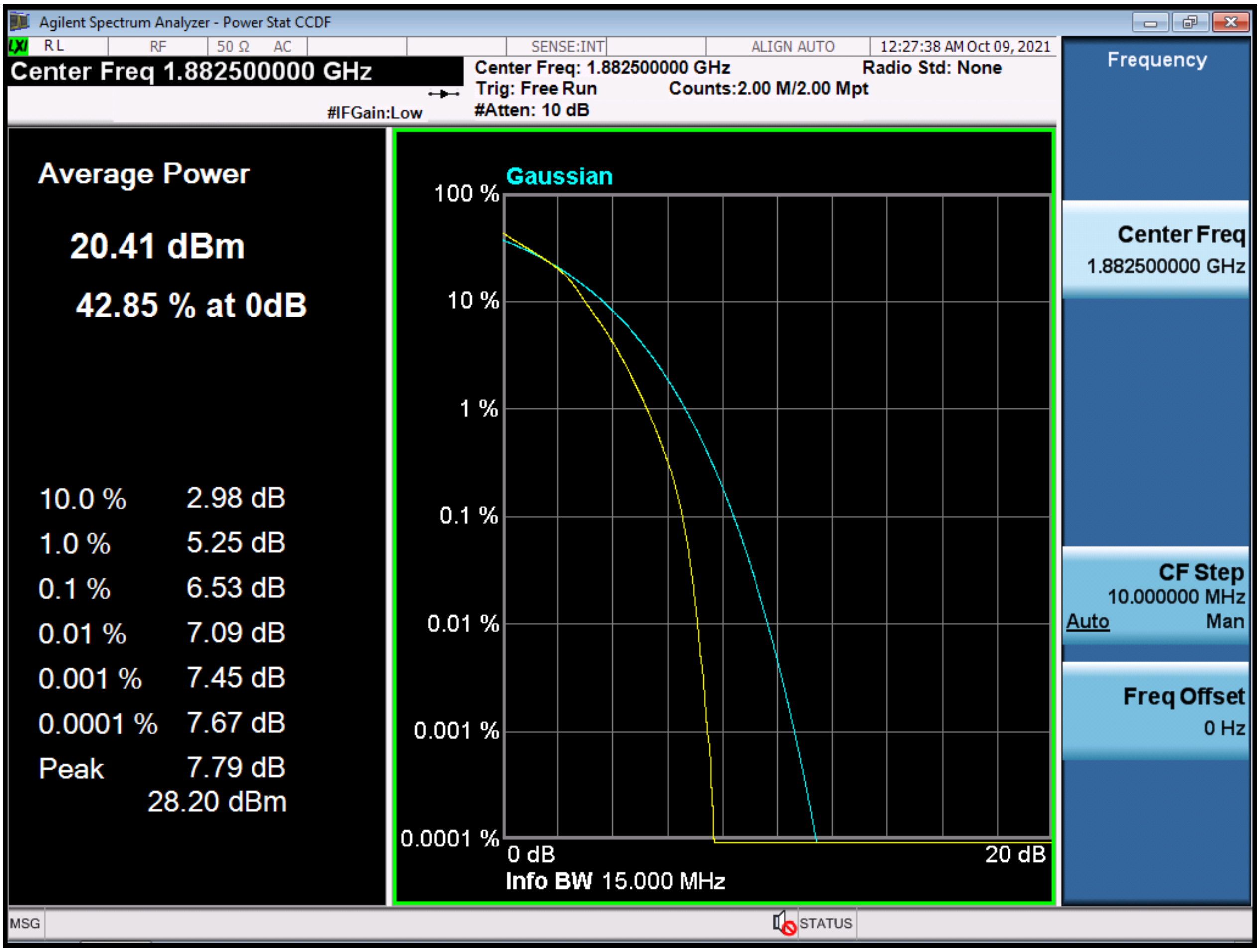

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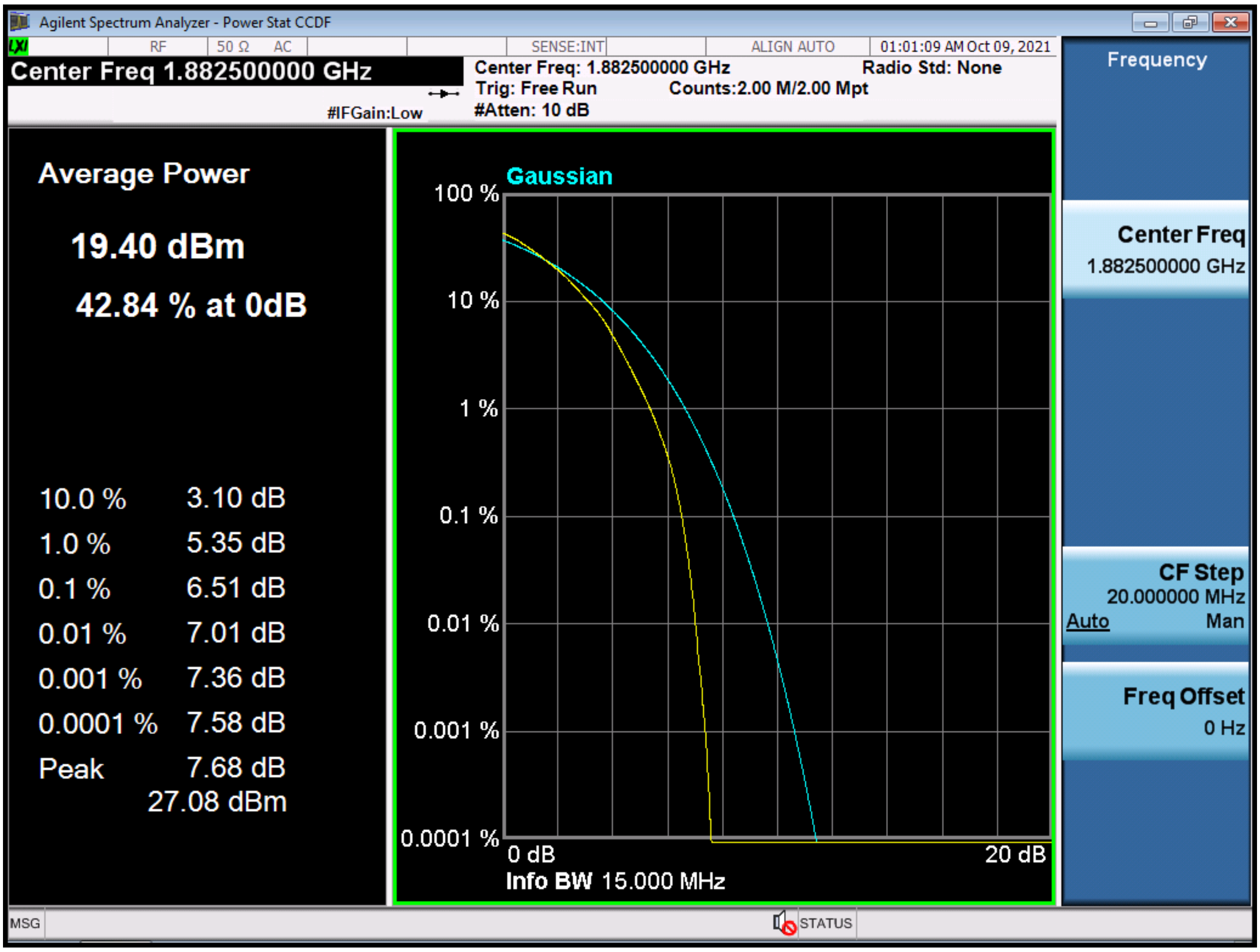

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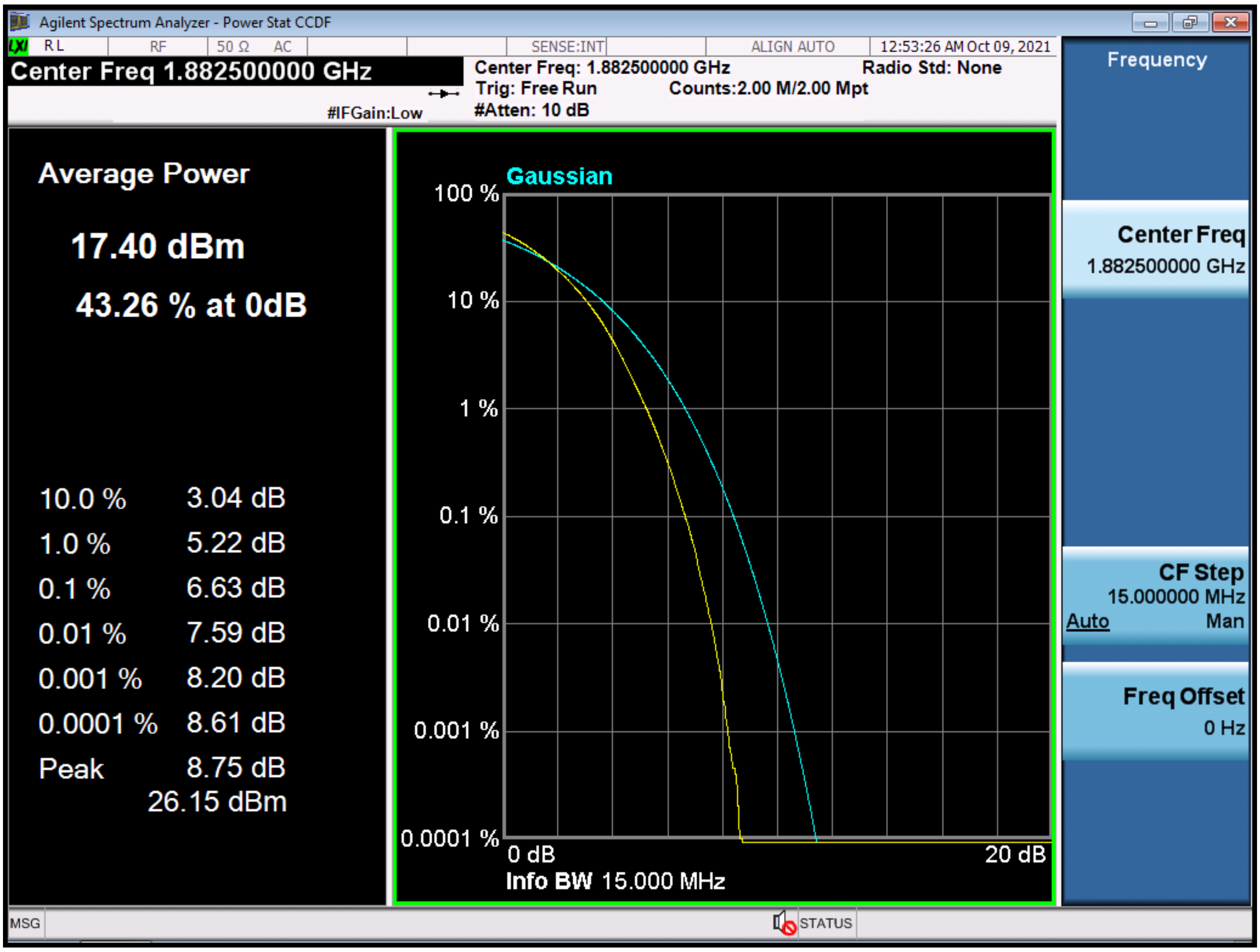
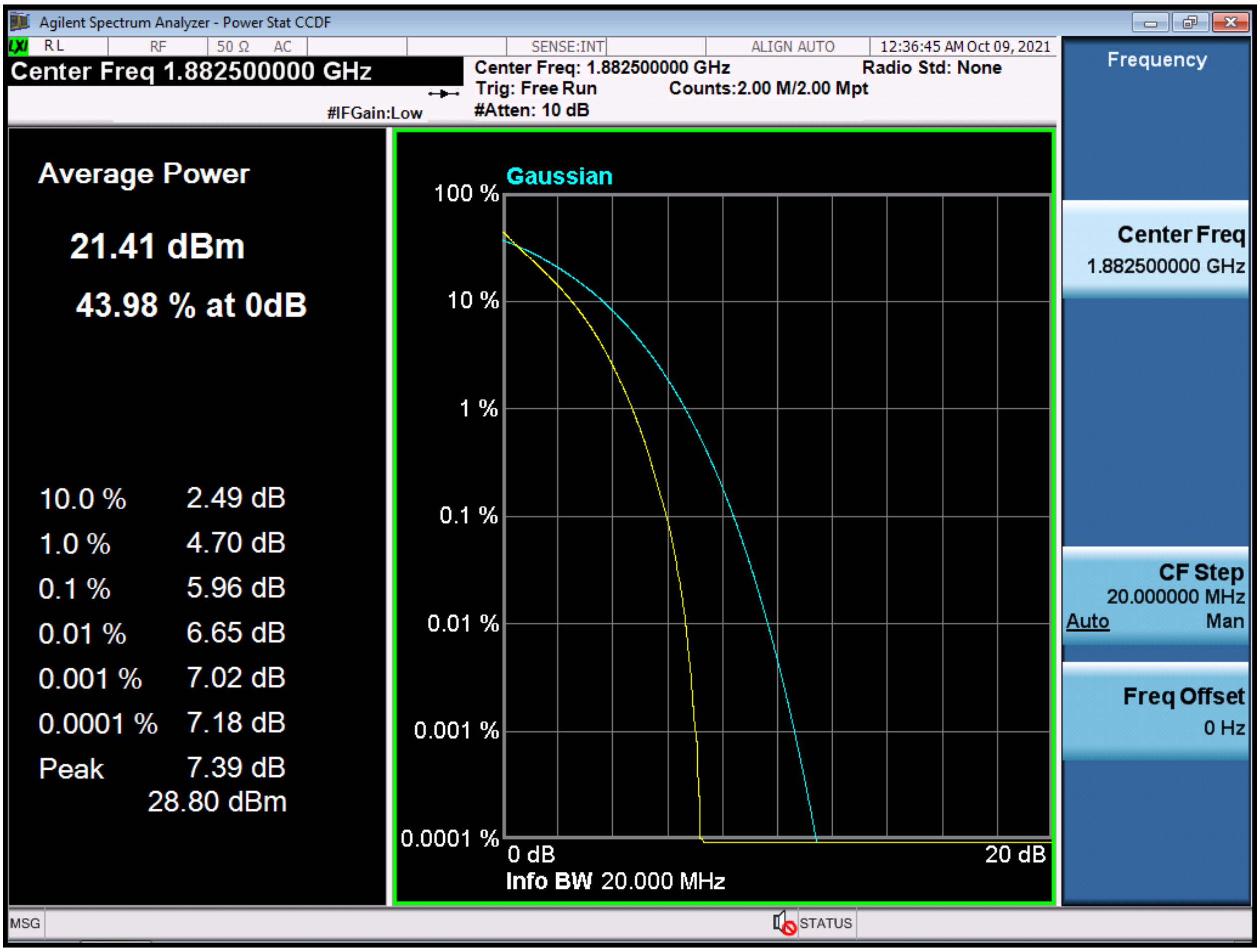


BW20 M_PAR_Middle Channel_QPSK_FullRB



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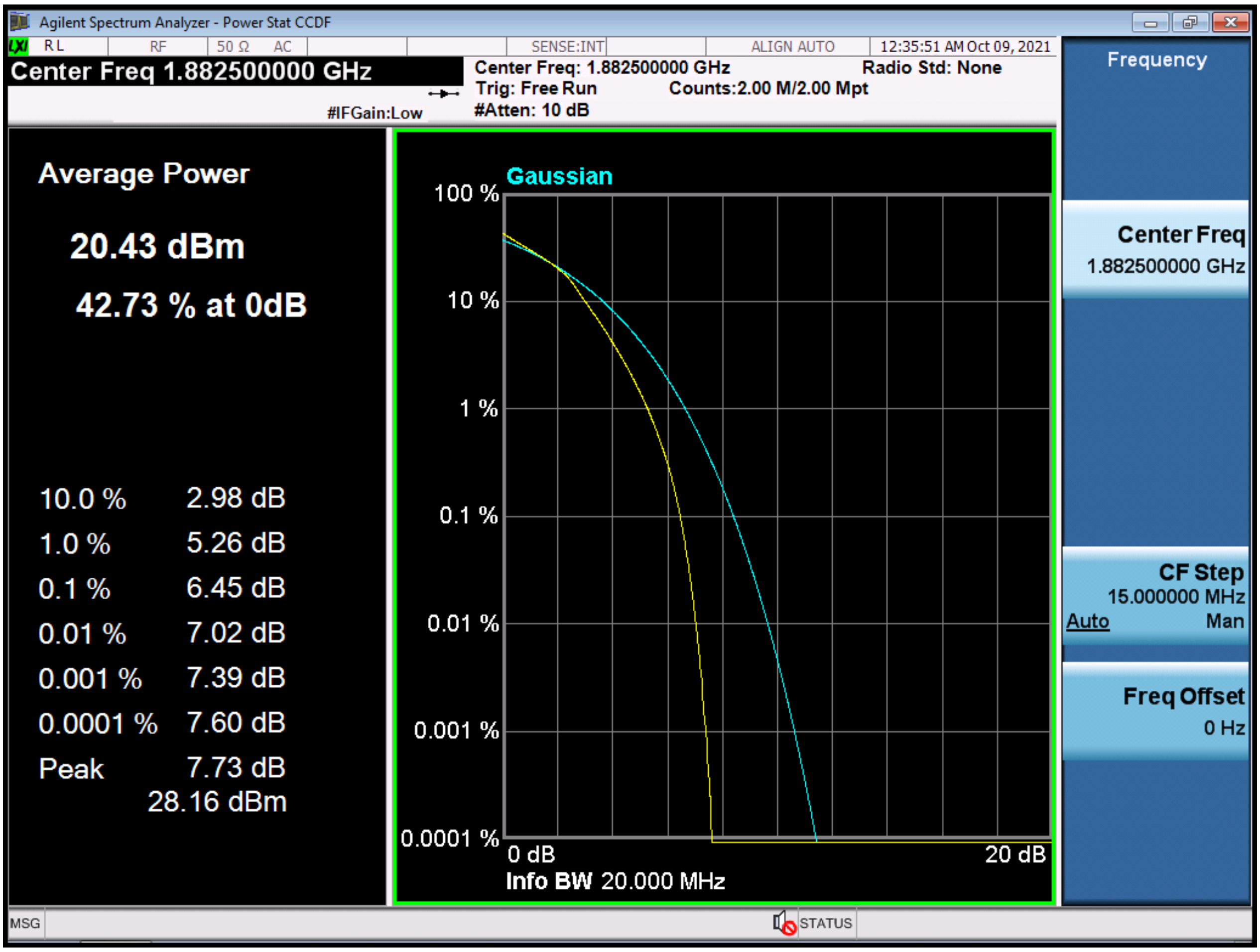

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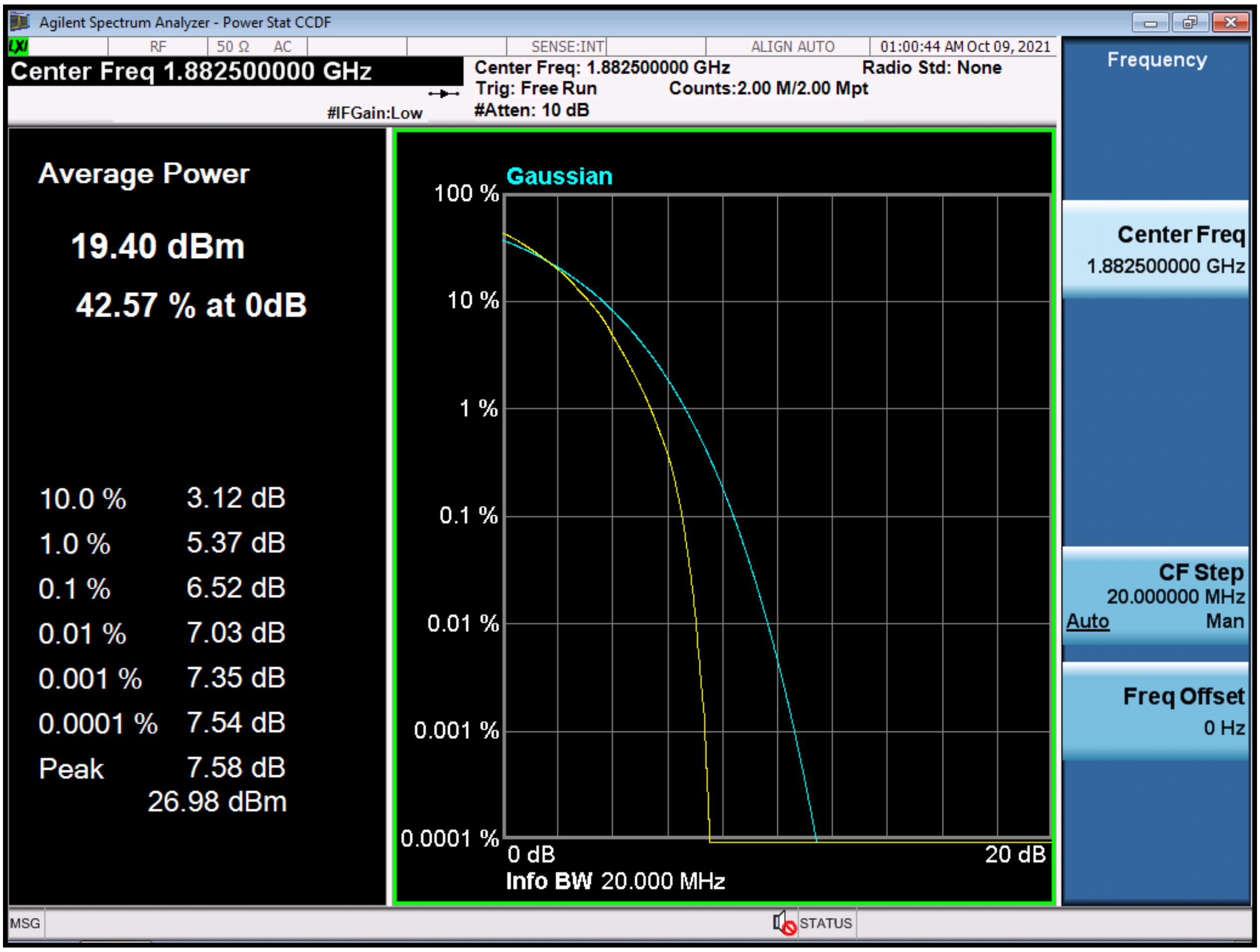
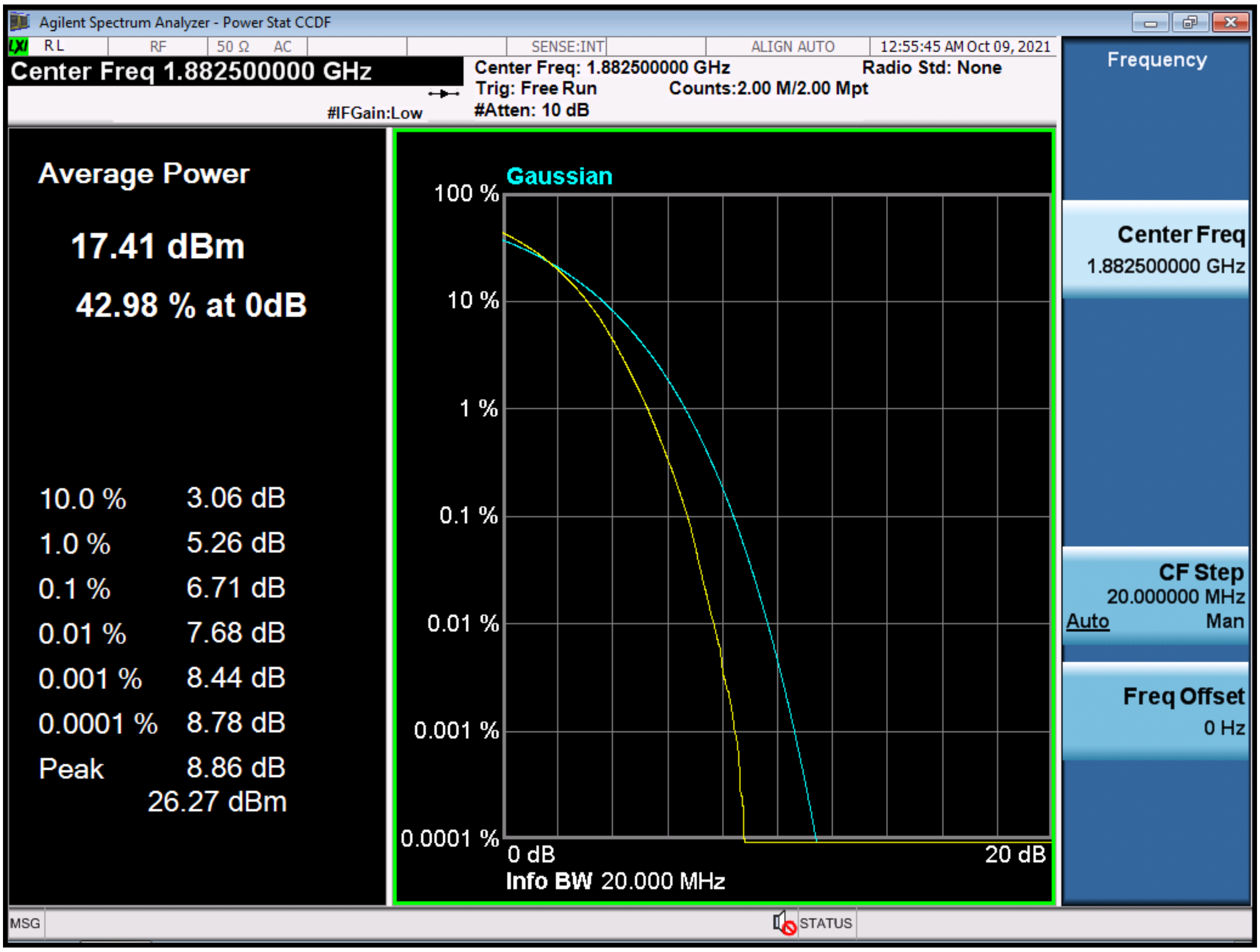
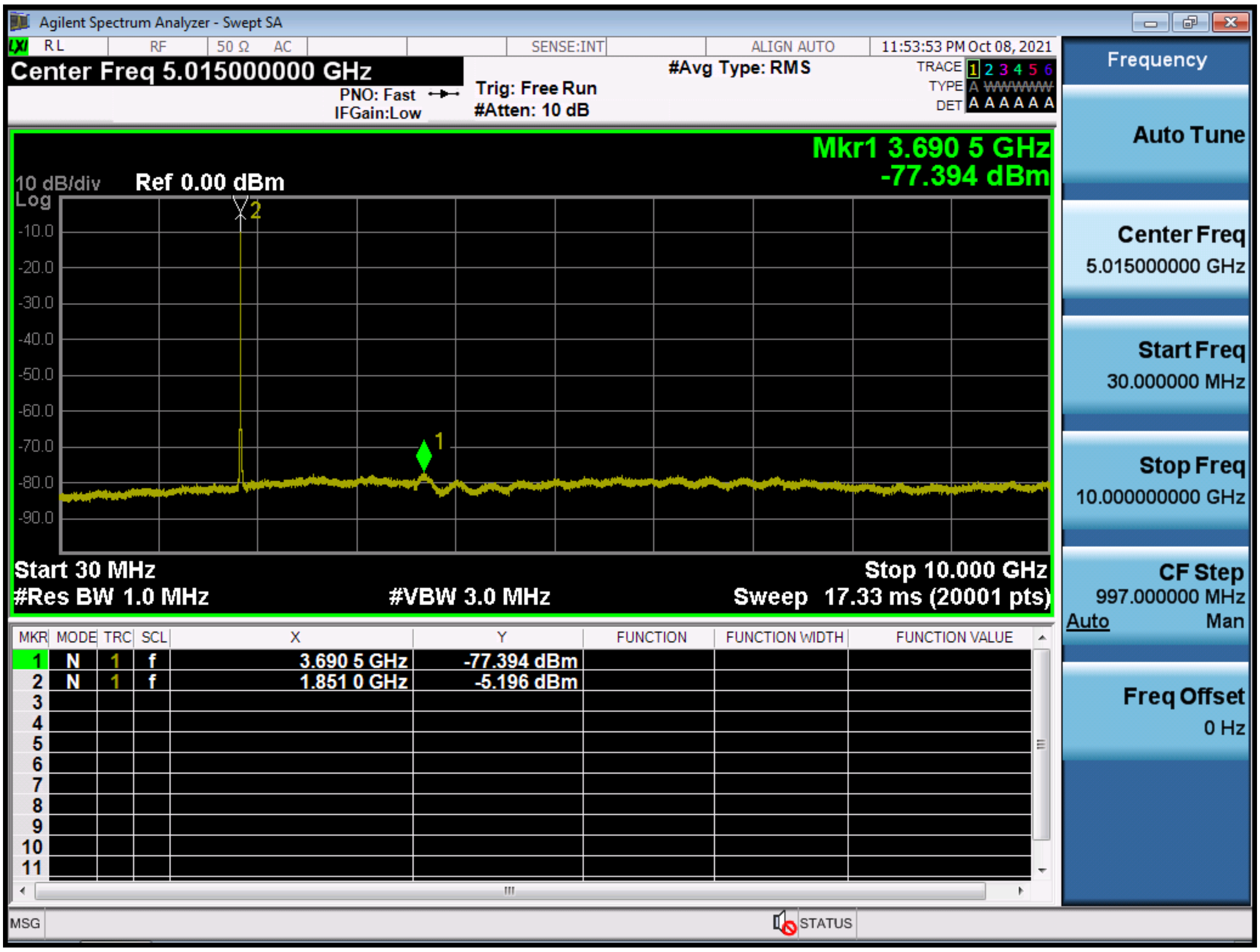


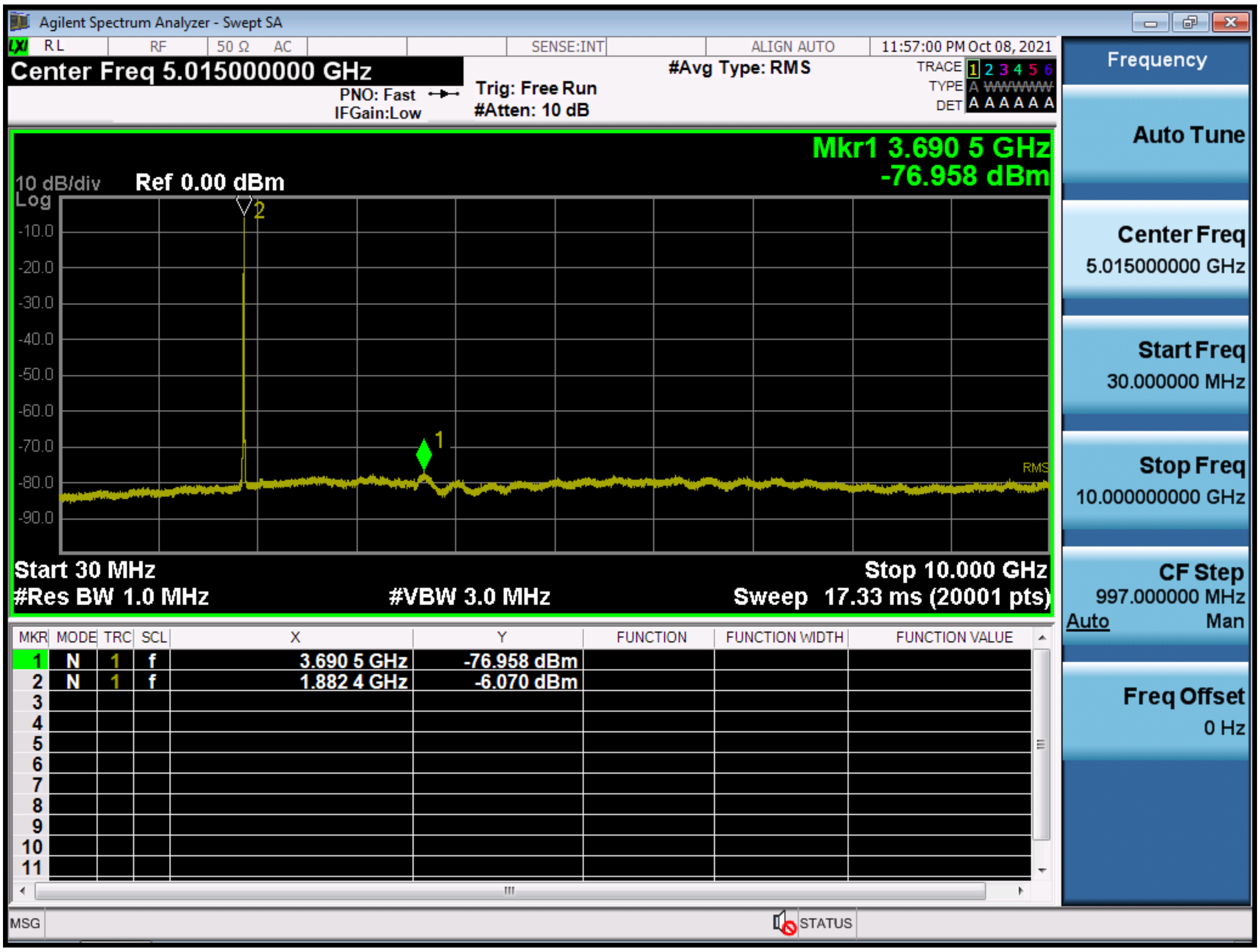
BW20 M_PAR_Middle Channel_256QAM_FullRB



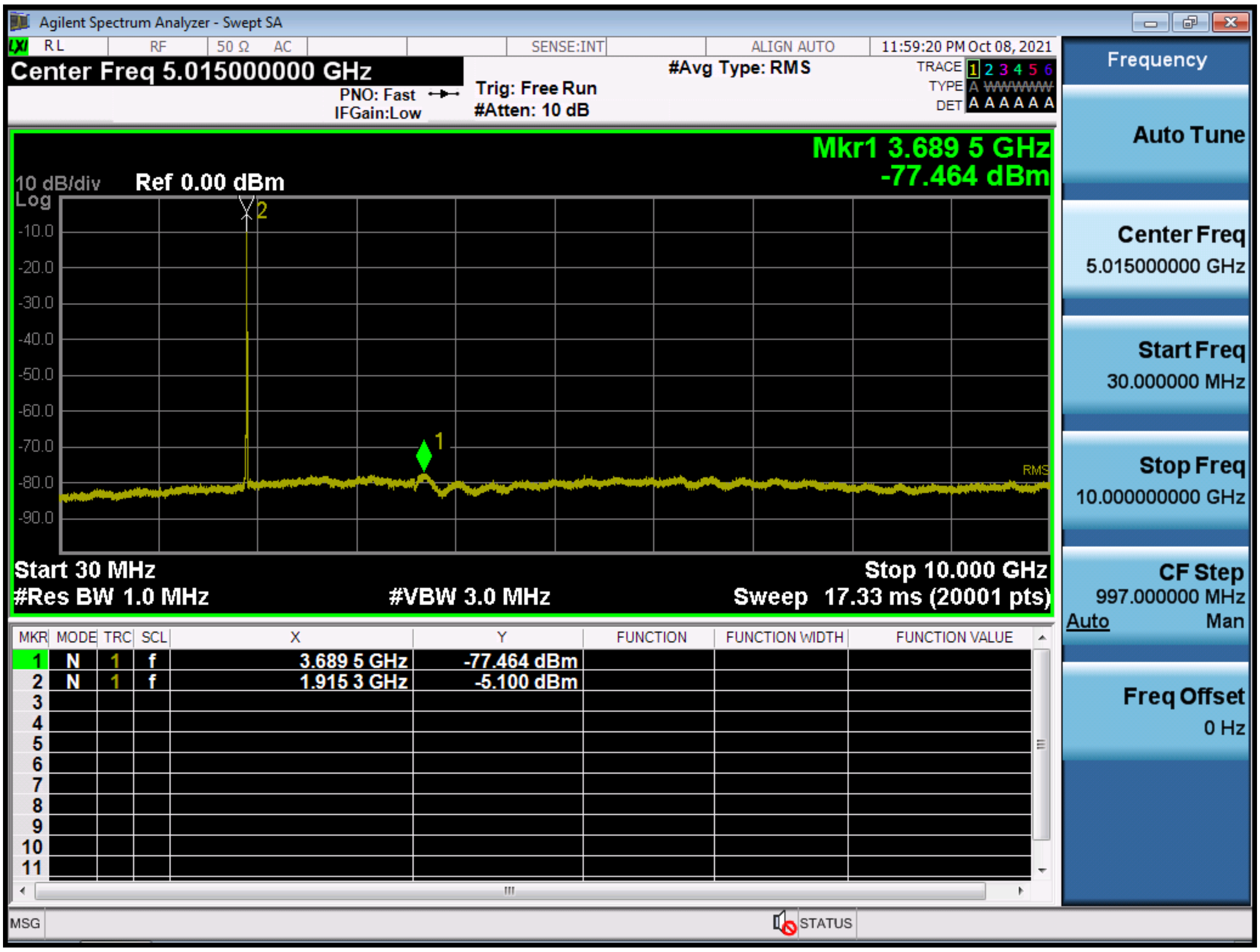
BW1.4 M_CSE(30 M-10 G)_Lowest Channel_QPSK_1RB



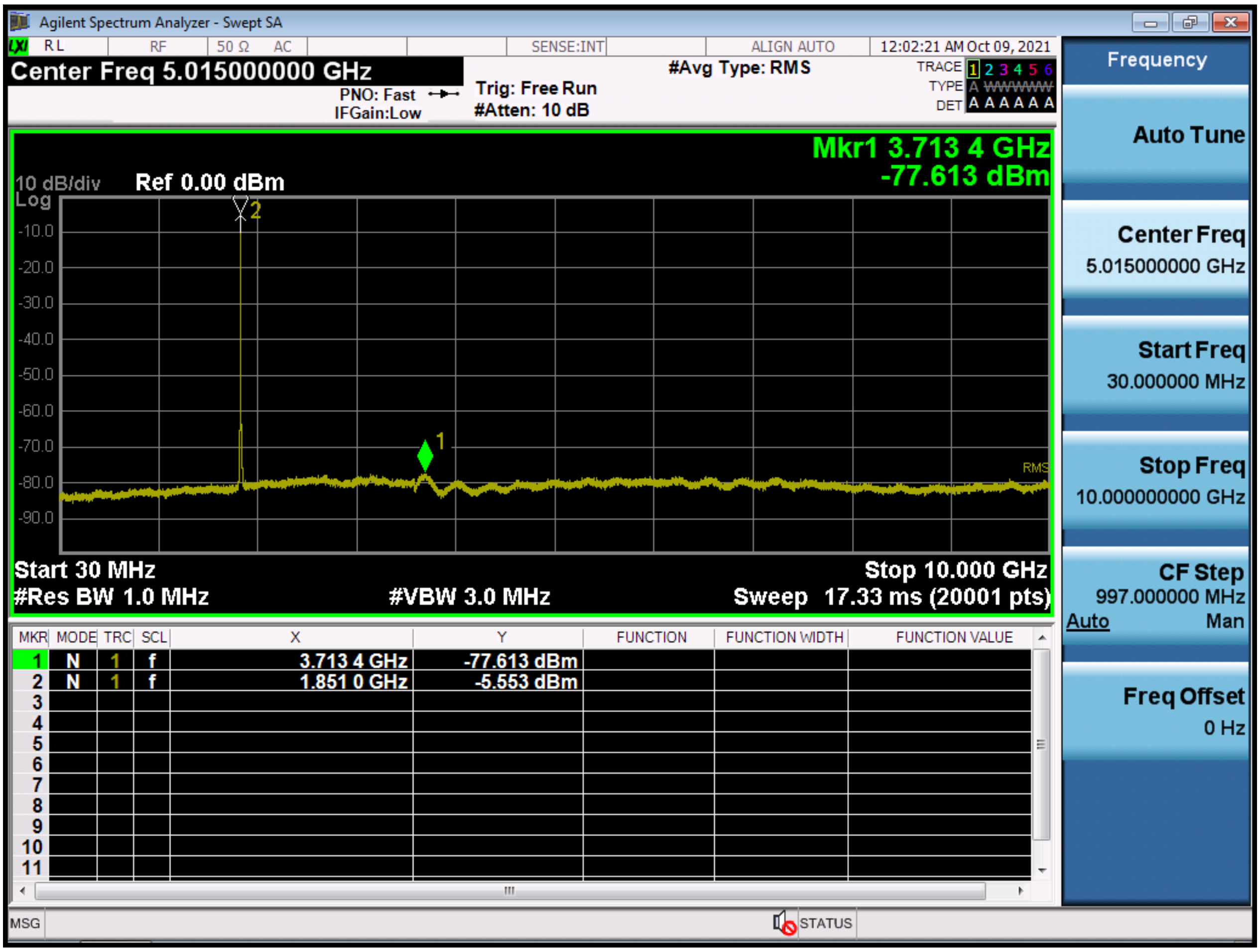
BW1.4 M_CSE(30 M-10 G)_Middle Channel_QPSK_1RB



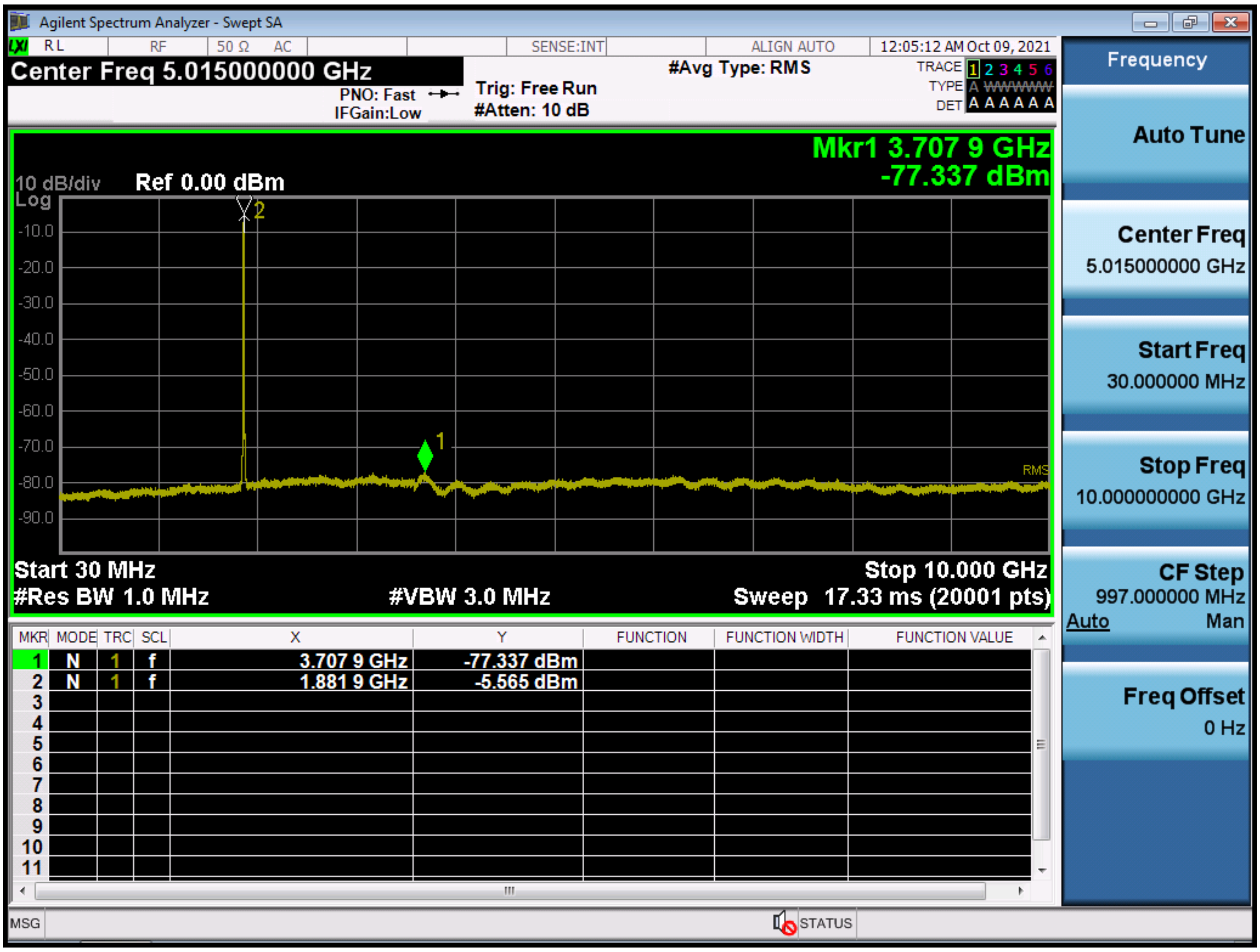
BW1.4 M_CSE(30 M-10 G)_Highest Channel_QPSK_1RB



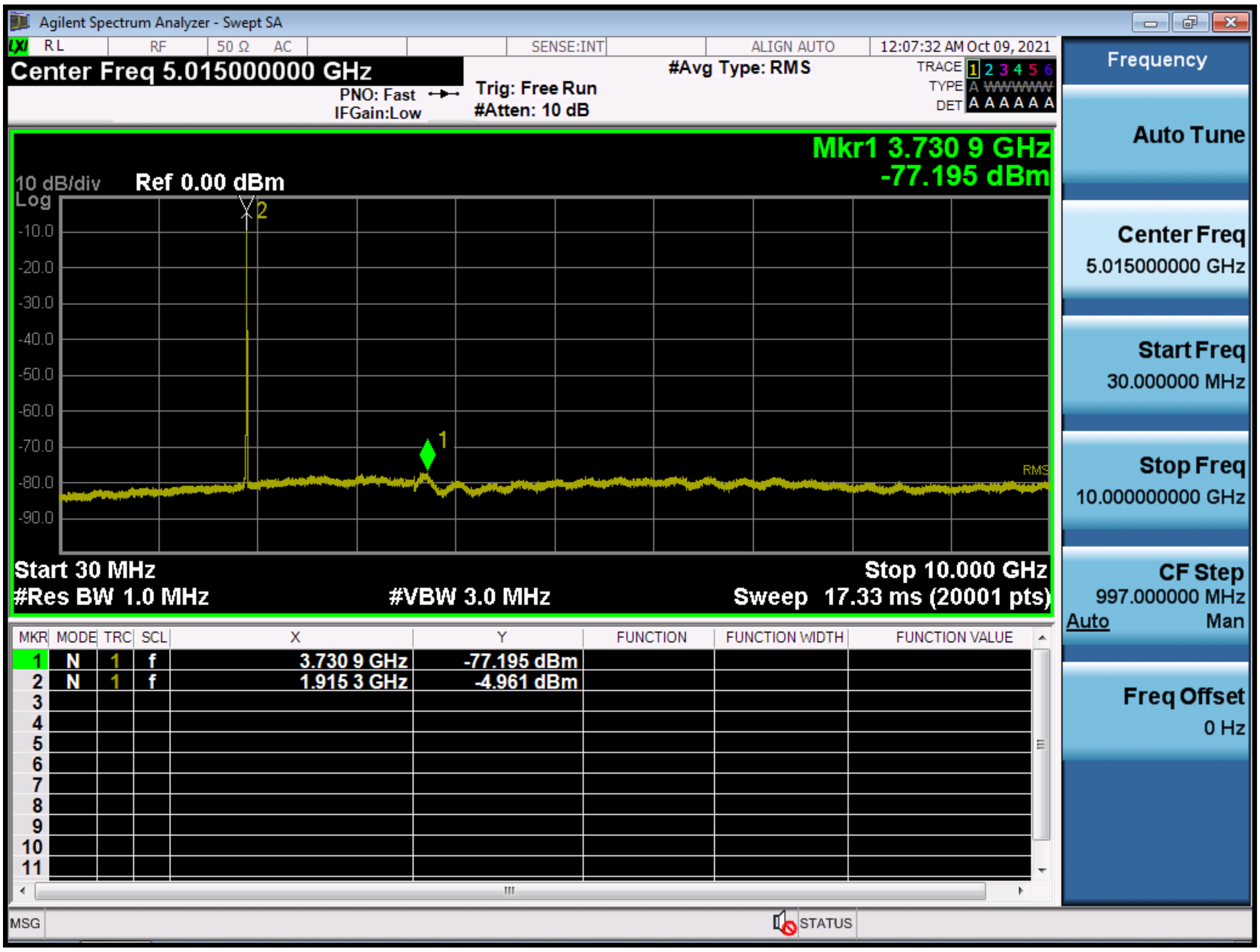
BW3 M_CSE(30 M-10 G)_Lowest Channel_QPSK_1RB



BW3 M_CSE(30 M-10 G)_Middle Channel_QPSK_1RB

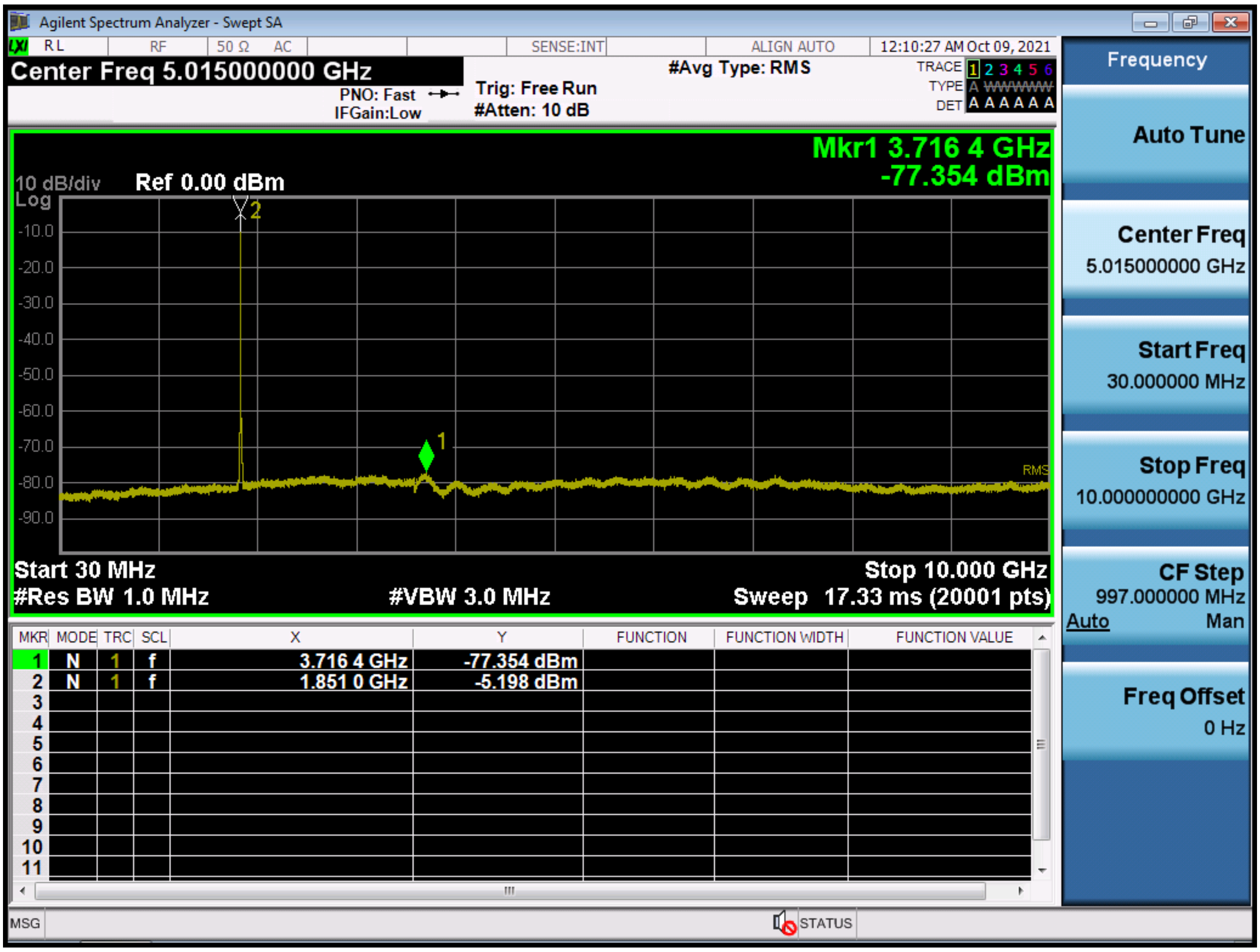


BW3 M_CSE(30 M-10 G)_Highest Channel_QPSK_1RB



MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	3.730 9 GHz	-77.195 dBm			
2	N	1	f	1.915 3 GHz	-4.961 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								

BW5 M_CSE(30 M-10 G)_Lowest Channel_QPSK_1RB



MKR	MODE	TRC	SCL	X	Y
1	N	1	f	3.716 4 GHz	-77.354 dBm
2	N	1	f	1.851 0 GHz	-5.198 dBm

BW5 M_CSE(30 M-10 G)_Middle Channel_QPSK_1RB