

# FCC LTE REPORT

## Certification

**Applicant Name:**

SAMSUNG Electronics Co., Ltd.

**Date of Issue:**

December 11, 2020

**Address:**

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

**Location:**

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

**Report No.:** HCT-RF-2012-FC021

**FCC ID:** A3LSMA326B

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

Model(s): SM-A326B/DS  
 Additional Model(s): SM-A326B  
 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 – Band2 (1.4)	1850.7 - 1909.3	1M10G7D	QPSK	0.174	22.41
		1M09W7D	16QAM	0.146	21.64
		1M10W7D	64QAM	0.114	20.58
LTE – Band2 (3)	1851.5 - 1908.5	2M70G7D	QPSK	0.174	22.40
		2M69W7D	16QAM	0.146	21.65
		2M70W7D	64QAM	0.114	20.57
LTE – Band2 (5)	1852.5 - 1907.5	4M51G7D	QPSK	0.175	22.42
		4M49W7D	16QAM	0.146	21.63
		4M50W7D	64QAM	0.114	20.55
LTE – Band2 (10)	1855.0 - 1905.0	8M96G7D	QPSK	0.177	22.48
		8M98W7D	16QAM	0.147	21.67
		8M98W7D	64QAM	0.114	20.56
LTE – Band2 (15)	1857.5 - 1902.5	13M4G7D	QPSK	0.175	22.43
		13M5W7D	16QAM	0.147	21.66
		13M4W7D	64QAM	0.114	20.55
LTE – Band2 (20)	1860.0 - 1900.0	17M9G7D	QPSK	0.171	22.33
		17M9W7D	16QAM	0.143	21.55
		17M9W7D	64QAM	0.111	20.47

The measurements shown in this report were made in accordance with the procedures specified in CFR47 section §2.947. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a)

Report No.: HCT-RF-2012-FC021

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REVIEWED BY



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

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Report approved by : Kwon Jeong  
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-2012-FC021	December 11, 2020	- First Approval Report

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

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# MEASUREMENT REPORT

## 1. GENERAL INFORMATION

<b>Applicant Name:</b>	SAMSUNG Electronics Co., Ltd.
<b>Address:</b>	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
<b>FCC ID:</b>	A3LSMA326B
<b>Application Type:</b>	Certification
<b>FCC Classification:</b>	PCS Licensed Transmitter Held to Ear (PCE)
<b>FCC Rule Part(s):</b>	§24, §2
<b>EUT Type:</b>	Mobile Phone
<b>Model(s):</b>	SM-A326B/DS
<b>Additional Model(s):</b>	SM-A326B
<b>Tx Frequency:</b>	1850.7 MHz – 1909.3 MHz (LTE – Band2 (1.4 MHz)) 1851.5 MHz – 1908.5 MHz (LTE – Band2 (3 MHz)) 1852.5 MHz – 1907.5 MHz (LTE – Band2 (5 MHz)) 1855.0 MHz – 1905.0 MHz (LTE – Band2 (10 MHz)) 1857.5 MHz – 1902.5 MHz (LTE – Band2 (15 MHz)) 1860.0 MHz – 1900.0 MHz (LTE – Band2 (20 MHz))
<b>Date(s) of Tests:</b>	November 24, 2020 ~ December 04, 2020

## **2. INTRODUCTION**

### **2.1. DESCRIPTION OF EUT**

The EUT was a Mobile Phone with GSM/GPRS/EGPRS/UMTS and LTE, Sub6.

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

### **2.2. MEASURING INSTRUMENT CALIBRATION**

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

### **2.3. TEST FACILITY**

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

### 3. DESCRIPTION OF TESTS

#### 3.1 TEST PROCEDURE

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

## 3.2 RADIATED POWER

### Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

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

### Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW  $\geq 3 \times$  RBW
4. Span = 1.5 times the OBW
5. No. of sweep points  $> 2 \times$  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;

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

Where:  $P_d$  is the dipole equivalent power and  $P_g$  is the generator output power into the substitution antenna.

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



### 3.3 RADIATED SPURIOUS EMISSIONS

#### Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

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

#### Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW  $\geq 3 \times$  RBW
3. Span = 1.5 times the OBW
4. No. of sweep points  $> 2 \times$  span / RBW
5. Detector = Peak
6. Trace mode = Max Hold
7. The trace was allowed to stabilize
8. Test channel : Low/ Middle/ High
9. Frequency range : We are performed all frequency to 10<sup>th</sup> harmonics from 9 kHz.

#### Test Note

1. Measurements value show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin  $> 20$  dB from the applicable limit) and considered that's already beyond the background noise floor.
2. The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the test data
3. For spurious emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated.

The spurious emissions is calculated by the following formula;

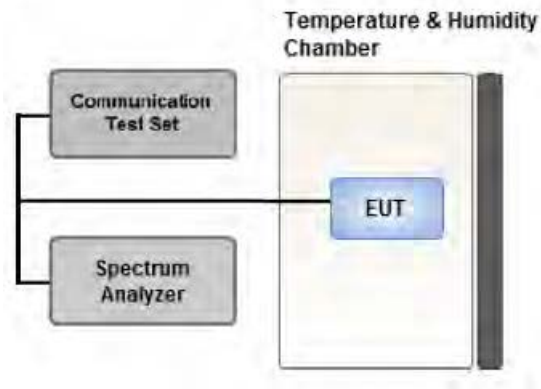
$$\text{Result}_{(\text{dBm})} = P_{g(\text{dBm})} - \text{cable loss}_{(\text{dB})} + \text{antenna gain}_{(\text{dBi})}$$

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

If the fundalmatal frequency is below 1GHz, RF output power has been converted to EIRP.

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

### 3.4 PEAK- TO- AVERAGE RATIO



Test setup

#### ① CCDF Procedure for PAPR

##### Test Settings

1. Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Set the measurement interval as follows:
  - .- for continuous transmissions, set to 1 ms,
  - .- or burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.
4. Record the maximum PAPR level associated with a probability of 0.1%.

**② Alternate Procedure for PAPR**

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

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

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

**Test Settings(Peak Power)**

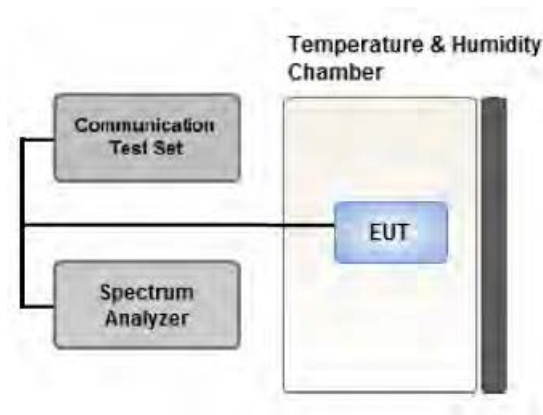
The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW  $\geq 3 \times$  RBW.

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

**Test Settings(Average Power)**

1. Set span to  $2 \times$  to  $3 \times$  the OBW.
2. Set RBW  $\geq$  OBW.
3. Set VBW  $\geq 3 \times$  RBW.
4. Set number of measurement points in sweep  $\geq 2 \times$  span / RBW.
5. Sweep time:  
Set  $\geq [10 \times (\text{number of points in sweep}) \times (\text{transmission period})]$  for single sweep (automation-compatible) measurement. The transmission period is the (on + off) time.
6. Detector = power averaging (rms).
7. Set sweep trigger to "free run."
8. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. (To accurately determine the average power over the on and off period of the transmitter, it can be necessary to increase the number of traces to be averaged above 100 or, if using a manually configured sweep time, increase the sweep time.)
9. Use the peak marker function to determine the maximum amplitude level.
10. Add  $[10 \log (1/\text{duty cycle})]$  to the measured maximum power level to compute the average power during continuous transmission. For example, add  $[10 \log (1/0.25)] = 6$  dB if the duty cycle is a constant 25%.

### 3.5 OCCUPIED BANDWIDTH.



**Test setup**

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

The EUT makes a call to the communication simulator.

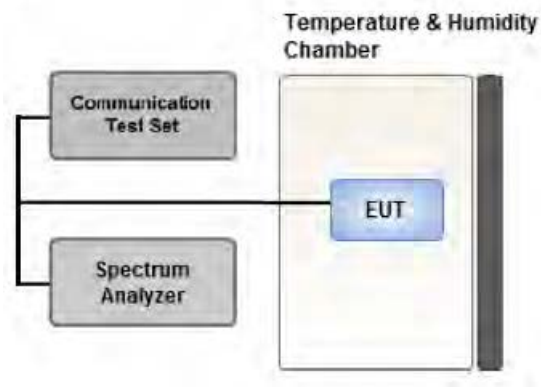
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth

#### **Test Settings**

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW  $\geq$  3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

### 3.6 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL



**Test setup**

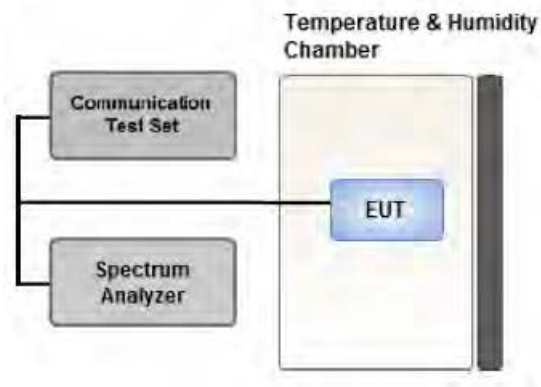
#### **Test Overview**

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

#### **Test Settings**

1. RBW = 1 MHz
2. VBW  $\geq$  3 MHz
3. Detector = RMS
4. Trace Mode = Average
5. Sweep time = auto
6. Number of points in sweep  $\geq$  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  $\geq 2 \times \text{Span}/\text{RBW}$
7. Trace mode = trace average
8. Sweep time = auto couple
9. The trace was allowed to stabilize

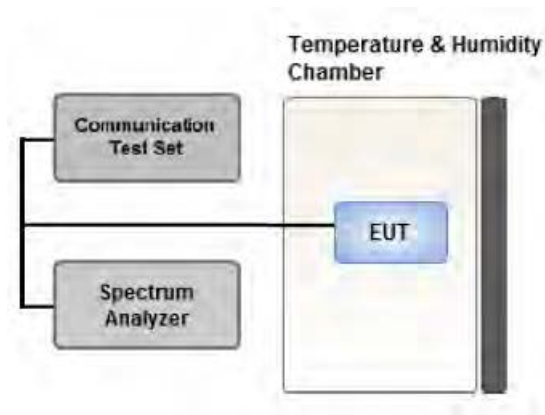
#### Test Notes

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)

- The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
- All modes of operation were investigated and the worst case configuration results are reported.  
(In the case of radiated spurious emissions, only the B.W result that confirmed the maximum radiated power was reported.)
- 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.
- SM-A326B/DS & additional models were tested and the worst case results are reported.  
(Worst case : SM-A326B/DS)

[ Worst case ]

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



**3.10 WORST CASE(CONDUCTED TEST)**

[ Worst case ]

Test Description	Modulation	Bandwidth (MHz)	Frequency	RB size	RB offset		
Occupied Bandwidth	QPSK, 16QAM, 64QAM	1.4, 3, 5, 10, 15, 20	Mid	Full RB	0		
Peak-To-Average Ratio	QPSK, 16QAM, 64QAM	1.4, 3, 5, 10, 15, 20	Mid	Full RB	0		
Band Edge	QPSK	1.4	Low	1	0		
			High	1	5		
		3	Low	1	0		
			High	1	14		
		5	Low	1	0		
			High	1	24		
		10	Low	1	0		
			High	1	49		
		15	Low	1	0		
			High	1	74		
		20	Low	1	0		
			High	1	99		
				1.4, 3, 5, 10, 15, 20	Low, High	Full RB	0
		Spurious and Harmonic Emissions at Antenna Terminal	QPSK	1.4, 3, 5, 10, 15, 20	Low, Mid, High	1	0

- Worst case : Of all modulation, We have tested modulation of the high Conducted Output Power.

Conducted Output Power value can be confirmed on the SAR report.

- All modes of operation were investigated and the worst case configuration results are reported.

- SM-A326B/DS & additional models were tested and the worst case results are reported.

(Worst case : SM-A326B/DS)

#### 4. LIST OF TEST EQUIPMENT

Manufacture	Model/ Equipment	Serial Number	Calibration Date	Calibrati on Interval	Calibration Due
T&M SYSTEM	FBSR-02B(WHK1.2/15G-10EF)/H.P.F	-	03/09/2020	Annual	03/09/2021
T&M SYSTEM	FBSR-02B(WHK3.3/18G-10EF)/H.P.F	-	03/09/2020	Annual	03/09/2021
Hewlett Packard	11667B / Power Splitter(DC~26.5 GHz)	11275	04/27/2020	Annual	04/27/2021
Hewlett Packard	E3632A/DC Power Supply	MY40004427	09/16/2020	Annual	09/16/2021
Schwarzbeck	UHAP/ Dipole Antenna	557	03/29/2019	Biennial	03/29/2021
Schwarzbeck	UHAP/ Dipole Antenna	558	03/29/2019	Biennial	03/29/2021
ESPEC	SU-642 / Chamber	93008124	03/18/2020	Annual	03/18/2021
Schwarzbeck	BBHA 9120D/ Horn Antenna(1~18GHz)	147	08/29/2019	Biennial	08/29/2021
Schwarzbeck	BBHA 9120D/ Horn Antenna(1~18GHz)	9120D-1298	09/25/2019	Biennial	09/25/2021
Schwarzbeck	BBHA 9170/ Horn Antenna(15~40GHz)	BBHA9170342	04/29/2019	Biennial	04/29/2021
Schwarzbeck	BBHA 9170/ Horn Antenna(15~40GHz)	BBHA9170124	02/11/2020	Biennial	02/11/2022
Agilent	N9020A/Signal Analyzer(10Hz~26.5GHz)	MY51110063	04/27/2020	Annual	04/27/2021
Hewlett Packard	8493C/ATTENUATOR(20dB)	17280	06/04/2020	Annual	06/04/2021
REOHDE & SCHWARZ	FSV40/Spectrum Analyzer(10Hz~40GHz)	100931	10/14/2020	Annual	10/14/2021
Agilent	8960 (E5515C)/ Base Station	MY48360800	08/26/2020	Annual	08/26/2021
Schwarzbeck	FMZB1513/ Loop Antenna(9kHz~30MHz)	1513-175	04/26/2019	Biennial	04/26/2021
Schwarzbeck	VULB9160/ Bilog Antenna	3150	03/12/2019	Biennial	03/12/2021
Schwarzbeck	VULB9160/ Hybrid Antenna	760	03/22/2019	Biennial	03/22/2021
Anritsu Corp.	MT8821C/Wideband Radio Communication Tester	6262116770	07/22/2020	Annual	07/22/2021
Anritsu Corp.	MT8820C/Wideband Radio Communication Tester	6201026545	01/22/2020	Annual	01/22/2021
REOHDE & SCHWARZ	SMB100A/ SIGNAL GENERATOR (100kHz~40GHz)	177633	07/13/2020	Annual	07/13/2021
KEYSIGHT	N9030B / Signal Analyzer(5Hz~40.0GHz)	MY55480167	06/04/2020	Annual	06/04/2021
HCT CO., LTD.,	FCC LTE Mobile Conducted RF Automation Test Software	-	-	-	-

**Note:**

- Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.
- Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2017).
- Model : FSV40/Spectrum  
- Use date of equipment : September 23, 2020 ~ October 12, 2020, October 14, 2020 ~

## 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  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty ( $\pm$ dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70
Radiated Disturbance (18 GHz ~ 40 GHz)	5.05

## 6. SUMMARY OF TEST RESULTS

### 6.1 Test Condition : Conducted Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Occupied Bandwidth	§2.1049	N/A	PASS
Band Edge / Spurious and Harmonic Emissions at Antenna Terminal.	§2.1051, §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	<u>See Note1</u>
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. The same samples were used for SAR and EMC

### 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
1850.7	LTE B2/ 1.4 MHz	QPSK	-19.66	14.42	10.10	2.11	V	< 2.00	0.174	22.41
		16-QAM	-20.43	13.65	10.10	2.11	V		0.146	21.64
		64-QAM	-21.49	12.59	10.10	2.11	H		0.114	20.58
1880.0		QPSK	-21.34	13.21	10.15	2.15	V		0.132	21.21
		16-QAM	-22.09	12.46	10.15	2.15	V		0.111	20.46
		64-QAM	-23.16	11.39	10.15	2.15	H		0.087	19.39
1909.3		QPSK	-21.98	12.56	10.23	2.15	V		0.116	20.64
		16-QAM	-22.78	11.76	10.23	2.15	V		0.096	19.84
		64-QAM	-23.80	10.74	10.23	2.15	H		0.076	18.82

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
									W	W
1851.5	LTE B2/ 3 MHz	QPSK	-19.67	14.41	10.10	2.11	V	< 2.00	0.174	22.40
		16-QAM	-20.42	13.66	10.10	2.11	V		0.146	21.65
		64-QAM	-21.50	12.58	10.10	2.11	H		0.114	20.57
1880.0		QPSK	-21.26	13.29	10.15	2.15	V		0.135	21.29
		16-QAM	-22.02	12.53	10.15	2.15	V		0.113	20.53
		64-QAM	-23.11	11.44	10.15	2.15	H		0.088	19.44
1908.5		QPSK	-21.82	12.72	10.23	2.15	V		0.120	20.80
		16-QAM	-22.62	11.92	10.23	2.15	V		0.100	20.00
		64-QAM	-23.66	10.88	10.23	2.15	H		0.079	18.96

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1852.5	LTE B2/ 5 MHz	QPSK	-19.65	14.43	10.10	2.11	V	< 2.00	0.175	22.42
		16-QAM	-20.44	13.64	10.10	2.11	V		0.146	21.63
		64-QAM	-21.52	12.56	10.10	2.11	H		0.114	20.55
1880.0		QPSK	-21.06	13.49	10.15	2.15	V		0.141	21.49
		16-QAM	-21.85	12.70	10.15	2.15	V		0.118	20.70
		64-QAM	-22.93	11.62	10.15	2.15	H		0.092	19.62
1907.5		QPSK	-21.71	12.83	10.23	2.15	V		0.123	20.91
		16-QAM	-22.53	12.01	10.23	2.15	V		0.102	20.09
		64-QAM	-23.57	10.97	10.23	2.15	H		0.080	19.05

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1855.0	LTE B2/ 10 MHz	QPSK	-19.67	14.48	10.12	2.12	V	< 2.00	0.177	22.48
		16-QAM	-20.48	13.67	10.12	2.12	V		0.147	21.67
		64-QAM	-21.59	12.56	10.12	2.12	H		0.114	20.56
1880.0		QPSK	-20.81	13.74	10.15	2.15	V		0.149	21.74
		16-QAM	-21.58	12.97	10.15	2.15	V		0.125	20.97
		64-QAM	-22.70	11.85	10.15	2.15	H		0.097	19.85
1905.0		QPSK	-21.67	12.99	10.22	2.15	V		0.128	21.06
		16-QAM	-22.47	12.19	10.22	2.15	V		0.106	20.26
		64-QAM	-23.51	11.15	10.22	2.15	H		0.084	19.22



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 B2/ 15 MHz	QPSK	-19.79	14.42	10.13	2.12	V	< 2.00	0.175	22.43
		16-QAM	-20.56	13.65	10.13	2.12	V		0.147	21.66
		64-QAM	-21.67	12.54	10.13	2.12	H		0.114	20.55
1880.0		QPSK	-21.05	13.50	10.15	2.15	V		0.141	21.50
		16-QAM	-21.81	12.74	10.15	2.15	V		0.119	20.74
		64-QAM	-22.89	11.66	10.15	2.15	H		0.092	19.66
1902.5		QPSK	-21.39	13.40	10.20	2.15	V		0.140	21.45
		16-QAM	-22.19	12.60	10.20	2.15	V		0.116	20.65
		64-QAM	-23.23	11.56	10.20	2.15	H		0.091	19.61

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 B2/ 20 MHz	QPSK	-19.89	14.32	10.13	2.12	V	< 2.00	0.171	22.33
		16-QAM	-20.67	13.54	10.13	2.12	V		0.143	21.55
		64-QAM	-21.75	12.46	10.13	2.12	H		0.111	20.47
1880.0		QPSK	-20.89	13.66	10.15	2.15	V		0.147	21.66
		16-QAM	-21.66	12.89	10.15	2.15	V		0.123	20.89
		64-QAM	-22.77	11.78	10.15	2.15	H		0.095	19.78
1900.0		QPSK	-21.46	13.33	10.20	2.15	V		0.137	21.38
		16-QAM	-22.26	12.53	10.20	2.15	V		0.114	20.58
		64-QAM	-23.34	11.45	10.20	2.15	H		0.089	19.50

### 8.2 RADIATED SPURIOUS EMISSIONS

- ▣ OPERATING FREQUENCY: 1855.0 MHz
- ▣ MEASURED OUTPUT POWER: 22.48 dBm = 0.177 W
- ▣ MODE: LTE B2
- ▣ MODULATION SIGNAL: 10 MHz QPSK
- ▣ DISTANCE: 3 meters
- ▣ LIMIT:  $43 + 10 \log_{10} (W) =$  35.48 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
18650 (1855.0)	3 710.00	-50.92	12.43	-55.15	3.08	H	-45.80	68.27
	5 565.00	-51.61	13.18	-49.71	3.83	V	-40.36	62.84
	7 420.00	-50.95	11.15	-40.41	4.43	V	-33.69	56.16
18900 (1880.0)	3 760.00	-50.24	12.48	-54.11	3.10	H	-44.73	67.20
	5 640.00	-52.20	13.30	-50.03	3.85	H	-40.58	63.06
	7 520.00	-52.31	11.30	-41.74	4.46	V	-34.90	57.38
19150 (1905.0)	3 810.00	-50.84	12.40	-55.19	3.13	V	-45.92	68.39
	5 715.00	-52.65	13.37	-49.87	3.88	H	-40.39	62.86
	7 620.00	-52.38	11.60	-42.17	4.48	V	-35.05	57.52

**8.3 PEAK-TO-AVERAGE RATIO**

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data ( dB )
2	1.4 MHz	1880.0	QPSK	6	0	5.53
			16-QAM	6	0	6.24
			64-QAM	6	0	6.48
	3 MHz		QPSK	15	0	5.62
			16-QAM	15	0	6.24
			64-QAM	15	0	6.49
	5 MHz		QPSK	25	0	5.53
			16-QAM	25	0	6.20
			64-QAM	25	0	6.47
	10 MHz		QPSK	50	0	5.59
			16-QAM	50	0	6.22
			64-QAM	50	0	6.44
	15 MHz		QPSK	75	0	5.50
			16-QAM	75	0	6.18
			64-QAM	75	0	6.48
20 MHz	QPSK	100	0	5.45		
	16-QAM	100	0	6.18		
	64-QAM	100	0	6.43		

**Note:**

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 67 ~ 84.

**8.4 OCCUPIED BANDWIDTH**

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data ( MHz )
2	1.4 MHz	1880.0	QPSK	6	0	1.0959
			16-QAM	6	0	1.0925
			64-QAM	6	0	1.0964
	3 MHz		QPSK	15	0	2.6965
			16-QAM	15	0	2.6913
			64-QAM	15	0	2.7000
	5 MHz		QPSK	25	0	4.5139
			16-QAM	25	0	4.4859
			64-QAM	25	0	4.4979
	10 MHz		QPSK	50	0	8.9615
			16-QAM	50	0	8.9755
			64-QAM	50	0	8.9842
	15 MHz		QPSK	75	0	13.425
			16-QAM	75	0	13.460
			64-QAM	75	0	13.421
	20 MHz		QPSK	100	0	17.926
			16-QAM	100	0	17.868
			64-QAM	100	0	17.883

**Note:**

1. Plots of the EUT's Occupied Bandwidth are shown Page 49 ~ 66.

**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)
2	1.4	1850.7	3.7044	27.976	-77.279	-49.303	-13.00
		1880.0	3.6990	27.976	-77.026	-49.050	
		1909.3	3.6800	27.976	-77.148	-49.172	
	3	1851.5	3.7119	27.976	-77.143	-49.167	
		1880.0	3.6890	27.976	-77.179	-49.203	
		1908.5	3.7124	27.976	-77.390	-49.414	
	5	1852.5	3.7054	27.976	-77.466	-49.490	
		1880.0	3.6750	27.976	-77.117	-49.141	
		1907.5	3.7134	27.976	-77.205	-49.229	
	10	1855.0	3.6945	27.976	-77.289	-49.313	
		1880.0	3.6940	27.976	-77.220	-49.244	
		1905.0	3.7034	27.976	-77.036	-49.060	
	15	1857.5	3.6750	27.976	-77.159	-49.183	
		1880.0	3.7000	27.976	-77.111	-49.135	
		1902.5	3.6840	27.976	-77.367	-49.391	
	20	1860.0	3.6960	27.976	-77.072	-49.096	
		1880.0	3.6785	27.976	-77.187	-49.211	
		1900.0	3.6885	27.976	-76.897	-48.921	

**Note:**

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 121 ~ 156.
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 + 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	30.131

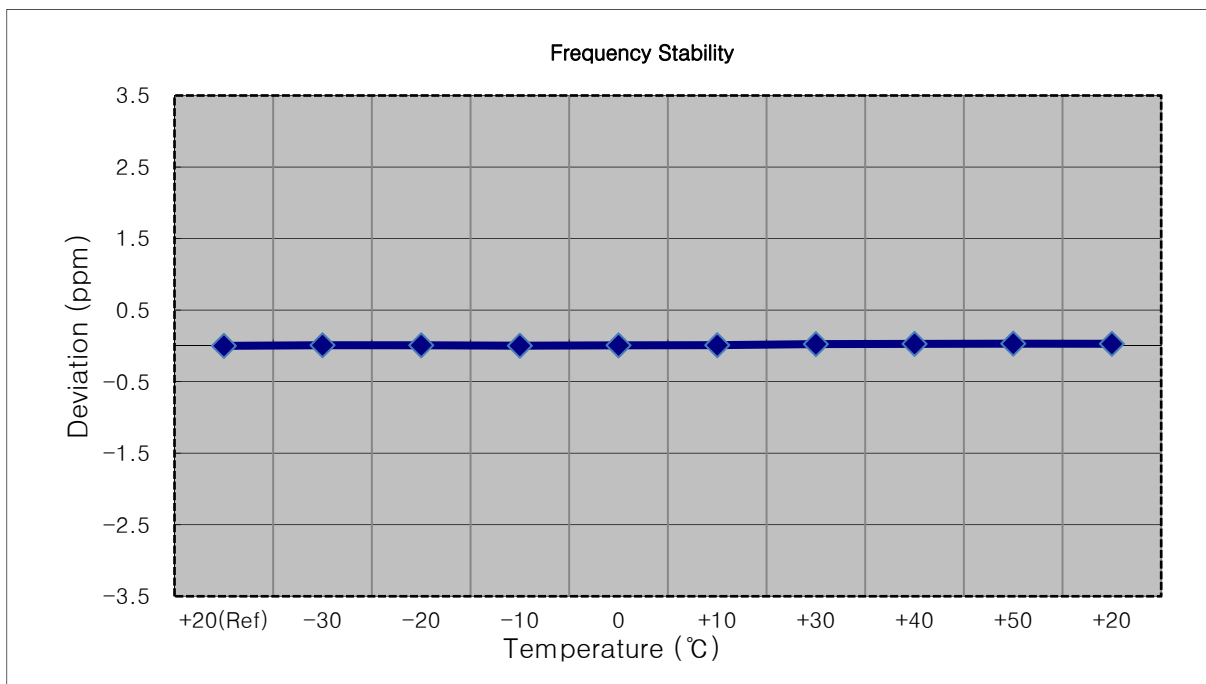
**8.6 BAND EDGE**

- Plots of the EUT's Band Edge are shown Page 85 ~ 120.

**8.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE**

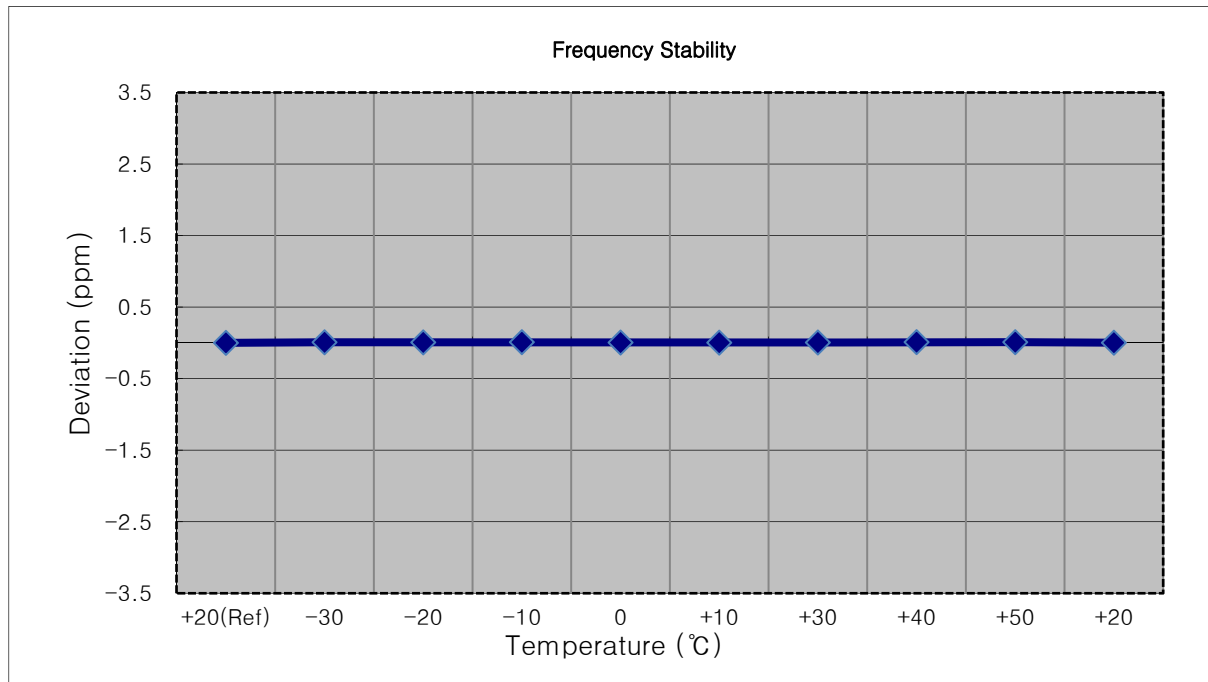
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1850,700,000 Hz
- ▣ CHANNEL: 18607 (1.4 MHz)
- ▣ REFERENCE VOLTAGE: 3.86 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.860	+20(Ref)	1850 700 006	0.0	0.000 000	0.000
100%		-30	1850 700 023	16.6	0.000 001	0.009
100%		-20	1850 700 021	15.1	0.000 001	0.008
100%		-10	1850 700 010	4.0	0.000 000	0.002
100%		0	1850 700 020	14.2	0.000 001	0.008
100%		+10	1850 700 023	17.2	0.000 001	0.009
100%		+30	1850 700 051	44.9	0.000 002	0.024
100%		+40	1850 700 058	51.6	0.000 003	0.028
100%		+50	1850 700 064	57.6	0.000 003	0.031
Batt. Endpoint		3.400	+20	1850 700 060	54.0	0.000 003



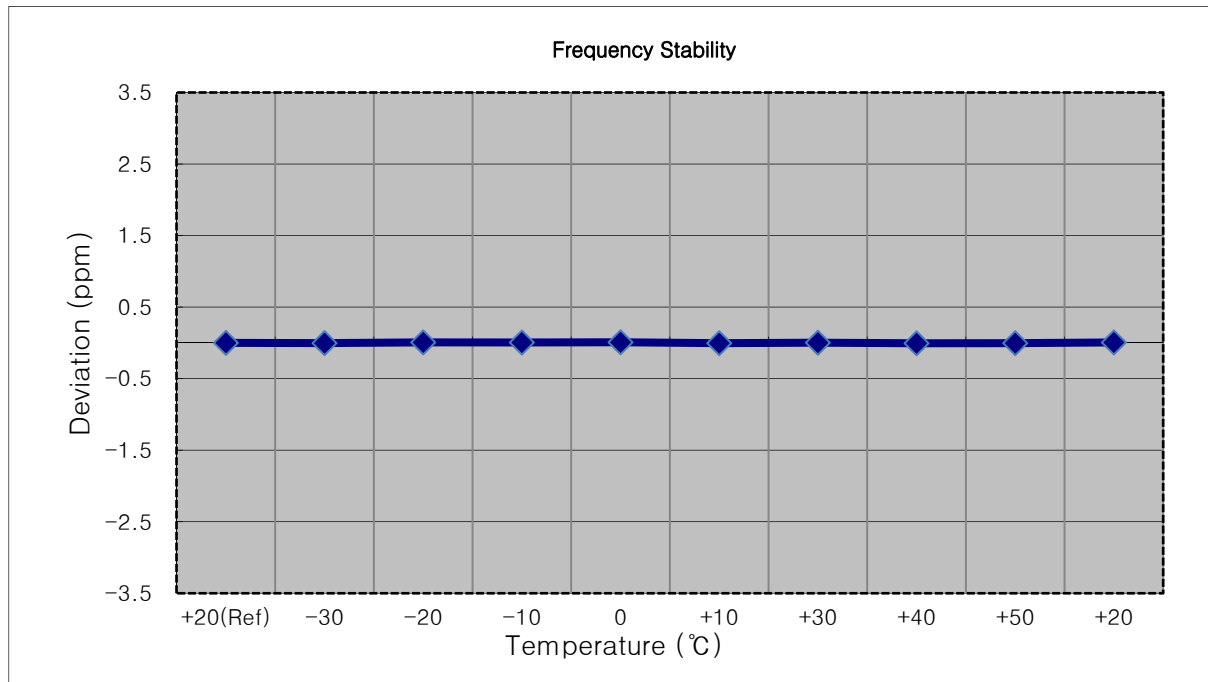
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1851,500,000 Hz
- ▣ CHANNEL: 18615 (3 MHz)
- ▣ REFERENCE VOLTAGE: 3.86 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.860	+20(Ref)	1851 500 016	0.0	0.000 000	0.000
100%		-30	1851 500 031	14.7	0.000 001	0.008
100%		-20	1851 500 029	13.0	0.000 001	0.007
100%		-10	1851 500 034	18.1	0.000 001	0.010
100%		0	1851 500 025	8.9	0.000 000	0.005
100%		+10	1851 500 021	5.2	0.000 000	0.003
100%		+30	1851 500 026	9.3	0.000 001	0.005
100%		+40	1851 500 035	18.9	0.000 001	0.010
100%		+50	1851 500 034	18.0	0.000 001	0.010
Batt. Endpoint	3.400	+20	1851 500 020	4.0	0.000 000	0.002



- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1852.500.000 Hz
- ▣ CHANNEL: 18625 (5 MHz)
- ▣ REFERENCE VOLTAGE: 3.86 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

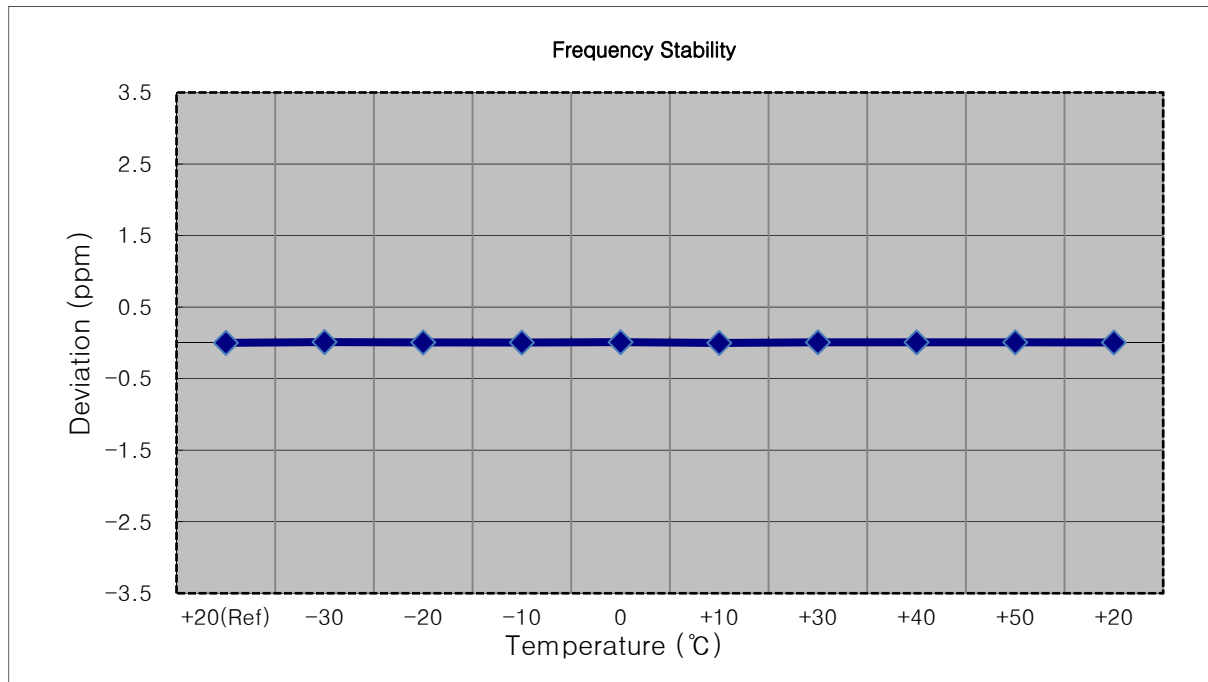
Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.860	+20(Ref)	1852 500 017	0.0	0.000 000	0.000
100%		-30	1852 500 010	-6.8	0.000 000	-0.004
100%		-20	1852 500 030	12.5	0.000 001	0.007
100%		-10	1852 500 027	9.9	0.000 001	0.005
100%		0	1852 500 032	15.2	0.000 001	0.008
100%		+10	1852 500 009	-8.2	0.000 000	-0.004
100%		+30	1852 500 021	4.2	0.000 000	0.002
100%		+40	1852 500 006	-10.8	-0.000 001	-0.006
100%		+50	1852 500 009	-7.7	0.000 000	-0.004
Batt. Endpoint		3.400	+20	1852 500 029	11.6	0.000 001





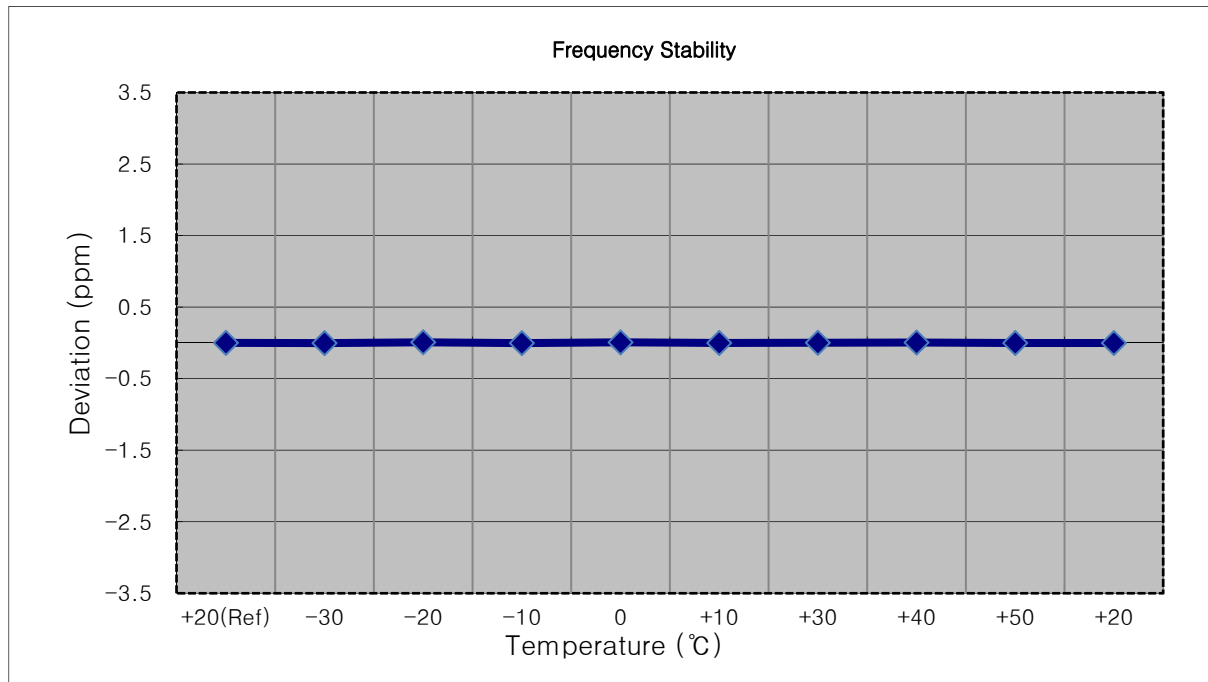
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1855,000,000 Hz
- ▣ CHANNEL: 18650 (10 MHz)
- ▣ REFERENCE VOLTAGE: 3.86 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.860	+20(Ref)	1855 000 009	0.0	0.000 000	0.000
100%		-30	1855 000 029	20.5	0.000 001	0.011
100%		-20	1855 000 020	11.2	0.000 001	0.006
100%		-10	1855 000 018	8.8	0.000 000	0.005
100%		0	1855 000 027	17.9	0.000 001	0.010
100%		+10	1855 000 006	-2.7	0.000 000	-0.001
100%		+30	1855 000 023	14.4	0.000 001	0.008
100%		+40	1855 000 023	14.4	0.000 001	0.008
100%		+50	1855 000 022	13.5	0.000 001	0.007
Batt. Endpoint	3.400	+20	1855 000 018	9.4	0.000 001	0.005



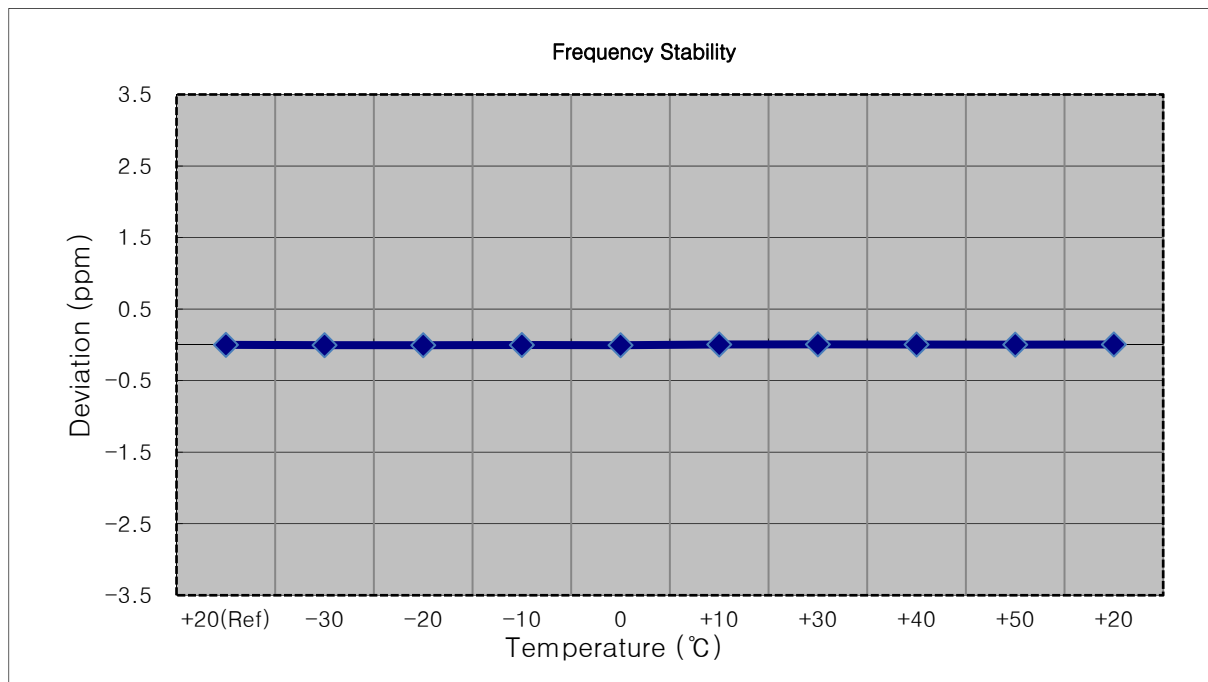
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1857.500.000 Hz
- ▣ CHANNEL: 18675 (15 MHz)
- ▣ REFERENCE VOLTAGE: 3.86 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.860	+20(Ref)	1857 499 992	0.0	0.000 000	0.000
100%		-30	1857 499 985	-6.6	0.000 000	-0.004
100%		-20	1857 500 007	14.9	0.000 001	0.008
100%		-10	1857 499 986	-6.4	0.000 000	-0.003
100%		0	1857 500 005	13.2	0.000 001	0.007
100%		+10	1857 499 989	-2.9	0.000 000	-0.002
100%		+30	1857 499 995	2.8	0.000 000	0.002
100%		+40	1857 500 000	8.1	0.000 000	0.004
100%		+50	1857 499 987	-4.7	0.000 000	-0.003
Batt. Endpoint		3.400	+20	1857 499 988	-4.3	0.000 000



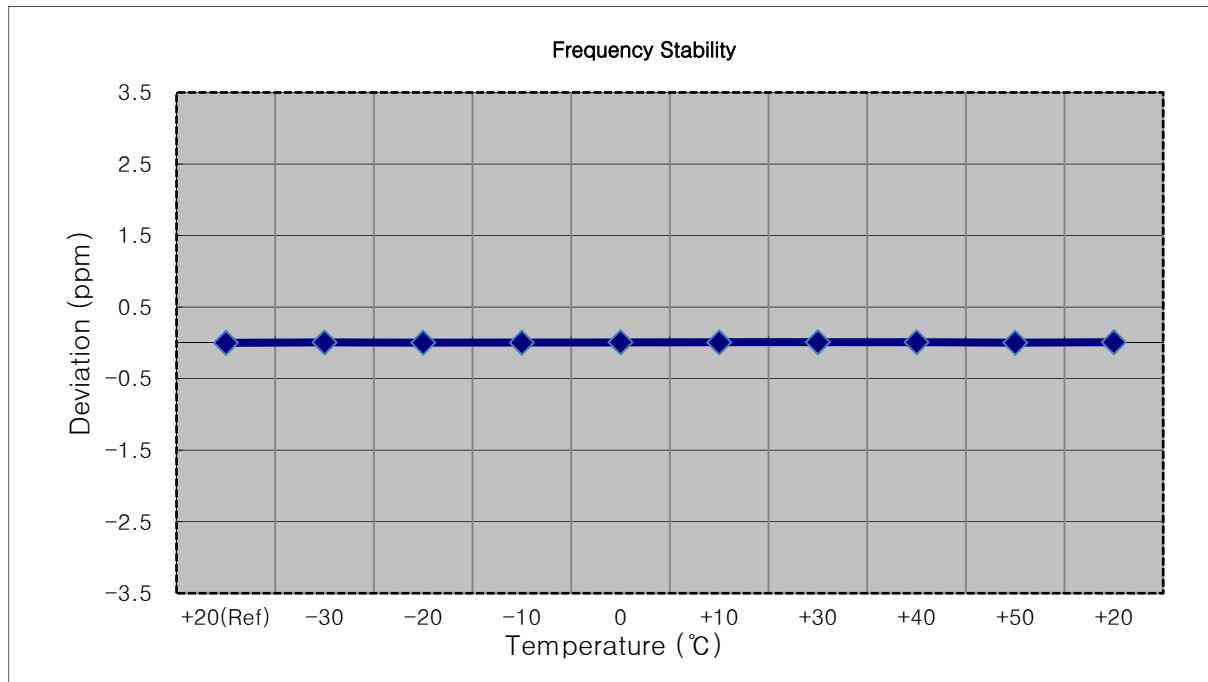
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1860,000,000 Hz
- ▣ CHANNEL: 18700 (20 MHz)
- ▣ REFERENCE VOLTAGE: 3.86 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.860	+20(Ref)	1860 000 015	0.0	0.000 000	0.000
100%		-30	1860 000 007	-8.0	0.000 000	-0.004
100%		-20	1860 000 005	-9.8	-0.000 001	-0.005
100%		-10	1860 000 011	-4.3	0.000 000	-0.002
100%		0	1860 000 006	-9.1	0.000 000	-0.005
100%		+10	1860 000 025	10.0	0.000 001	0.005
100%		+30	1860 000 028	12.8	0.000 001	0.007
100%		+40	1860 000 024	8.9	0.000 000	0.005
100%		+50	1860 000 020	5.2	0.000 000	0.003
Batt. Endpoint	3.400	+20	1860 000 024	9.2	0.000 000	0.005



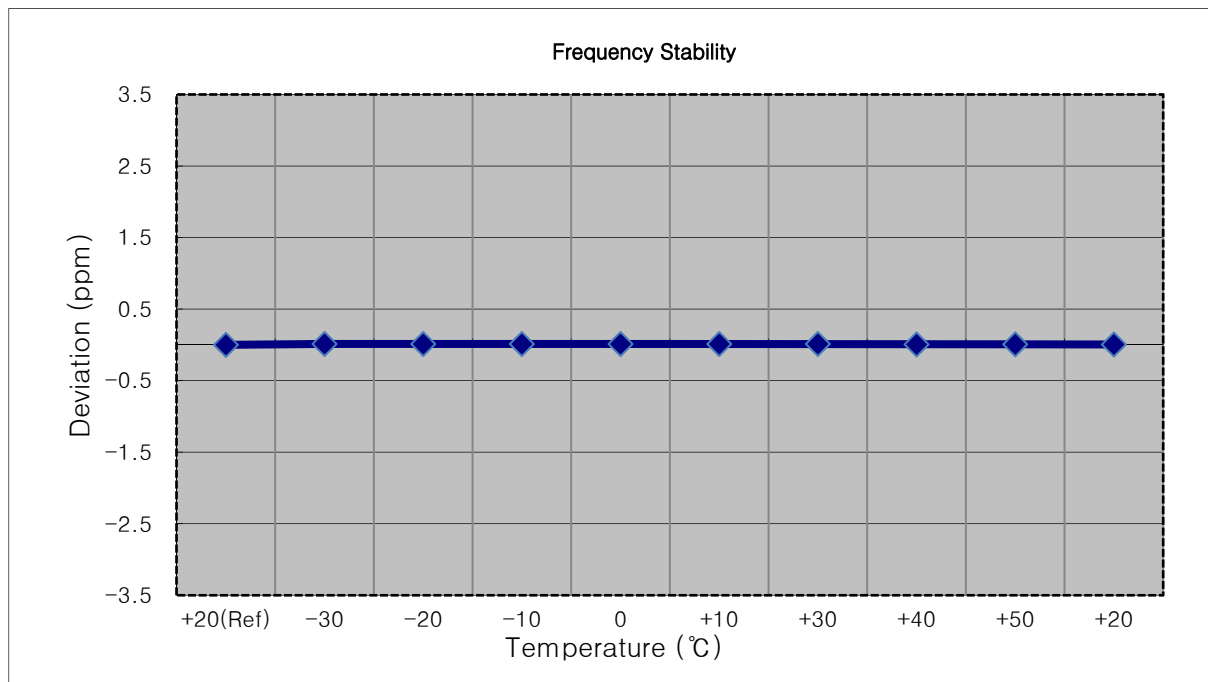
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1880,000,000 Hz
- ▣ CHANNEL: 18900 (1.4 MHz)
- ▣ REFERENCE VOLTAGE: 3.86 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.860	+20(Ref)	1880 000 006	0.0	0.000 000	0.000
100%		-30	1880 000 019	13.2	0.000 001	0.007
100%		-20	1880 000 011	5.3	0.000 000	0.003
100%		-10	1880 000 012	6.1	0.000 000	0.003
100%		0	1880 000 022	15.9	0.000 001	0.008
100%		+10	1880 000 019	13.2	0.000 001	0.007
100%		+30	1880 000 024	17.7	0.000 001	0.009
100%		+40	1880 000 025	18.4	0.000 001	0.010
100%		+50	1880 000 010	3.6	0.000 000	0.002
Batt. Endpoint	3.400	+20	1880 000 023	16.7	0.000 001	0.009



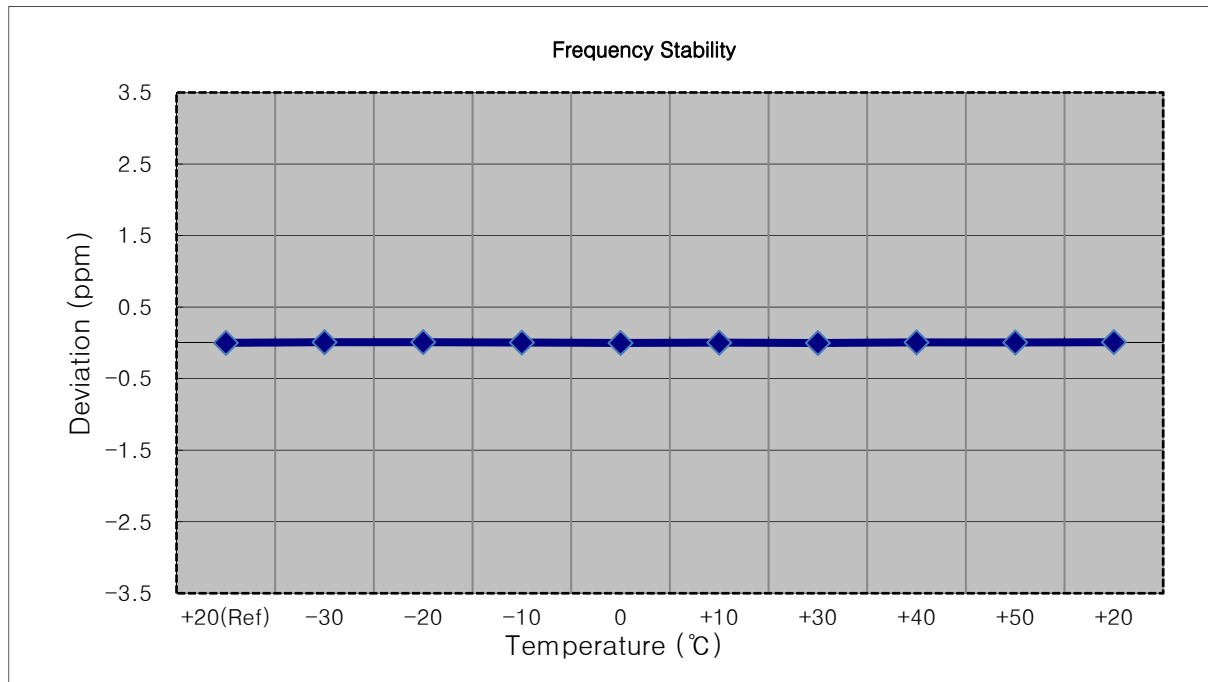
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1880,000,000 Hz
- ▣ CHANNEL: 18900 (3 MHz)
- ▣ REFERENCE VOLTAGE: 3.86 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.860	+20(Ref)	1880 000 021	0.0	0.000 000	0.000
100%		-30	1880 000 045	23.8	0.000 001	0.013
100%		-20	1880 000 043	21.7	0.000 001	0.012
100%		-10	1880 000 043	22.1	0.000 001	0.012
100%		0	1880 000 044	22.8	0.000 001	0.012
100%		+10	1880 000 043	22.0	0.000 001	0.012
100%		+30	1880 000 045	23.9	0.000 001	0.013
100%		+40	1880 000 033	11.2	0.000 001	0.006
100%		+50	1880 000 036	14.5	0.000 001	0.008
Batt. Endpoint	3.400	+20	1880 000 030	9.1	0.000 000	0.005



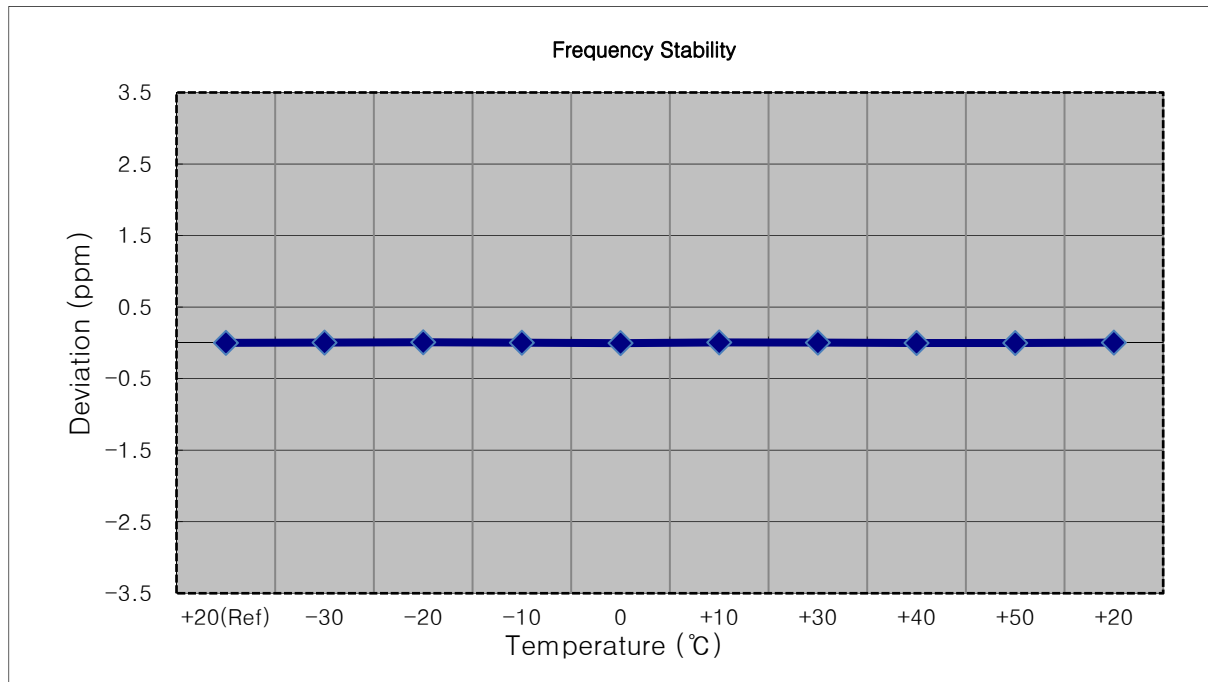
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1880,000,000 Hz
- ▣ CHANNEL: 18900 (5 MHz)
- ▣ REFERENCE VOLTAGE: 3.86 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.860	+20(Ref)	1879 999 992	0.0	0.000 000	0.000
100%		-30	1880 000 009	16.4	0.000 001	0.009
100%		-20	1880 000 010	17.5	0.000 001	0.009
100%		-10	1880 000 000	7.7	0.000 000	0.004
100%		0	1879 999 990	-2.7	0.000 000	-0.001
100%		+10	1879 999 998	6.0	0.000 000	0.003
100%		+30	1879 999 988	-4.1	0.000 000	-0.002
100%		+40	1880 000 005	12.5	0.000 001	0.007
100%		+50	1880 000 002	10.0	0.000 001	0.005
Batt. Endpoint	3.400	+20	1880 000 010	17.5	0.000 001	0.009



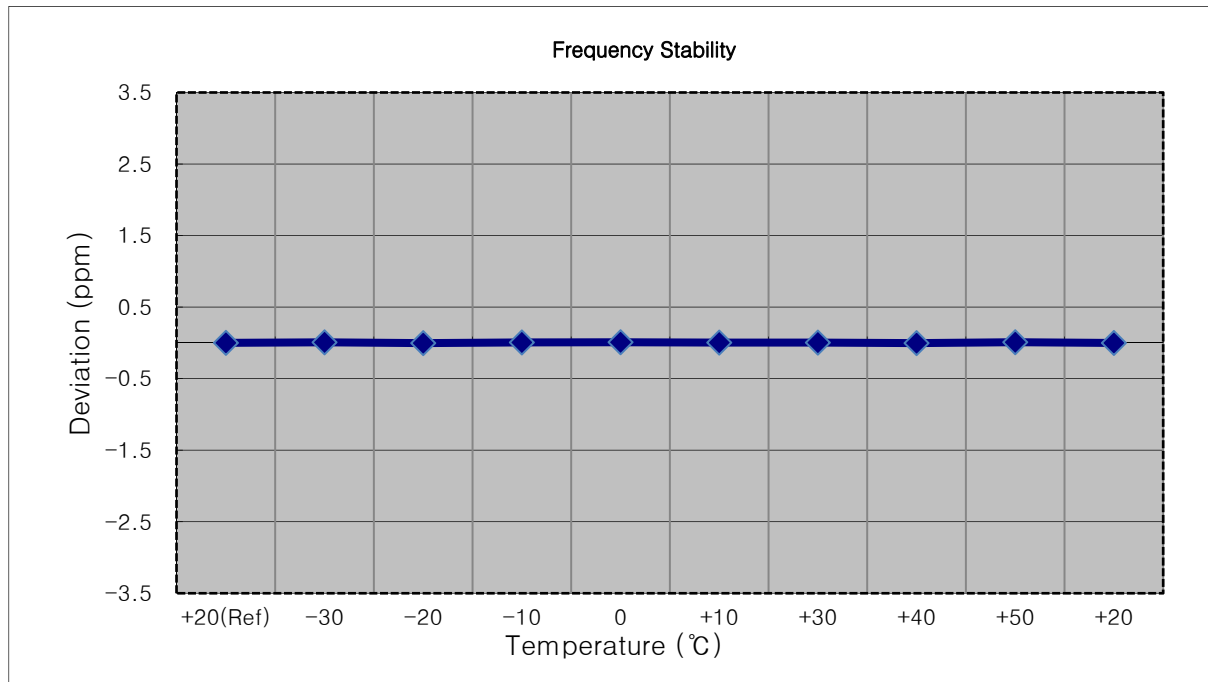
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1880,000,000 Hz
- ▣ CHANNEL: 18900 (10 MHz)
- ▣ REFERENCE VOLTAGE: 3.86 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.860	+20(Ref)	1880 000 005	0.0	0.000 000	0.000
100%		-30	1880 000 011	6.7	0.000 000	0.004
100%		-20	1880 000 021	16.0	0.000 001	0.009
100%		-10	1880 000 009	4.4	0.000 000	0.002
100%		0	1879 999 997	-7.6	0.000 000	-0.004
100%		+10	1880 000 015	10.5	0.000 001	0.006
100%		+30	1880 000 012	6.9	0.000 000	0.004
100%		+40	1880 000 001	-3.9	0.000 000	-0.002
100%		+50	1880 000 000	-4.8	0.000 000	-0.003
Batt. Endpoint		3.400	+20	1880 000 011	6.8	0.000 000



- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1880,000,000 Hz
- ▣ CHANNEL: 18900 (15 MHz)
- ▣ REFERENCE VOLTAGE: 3.86 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

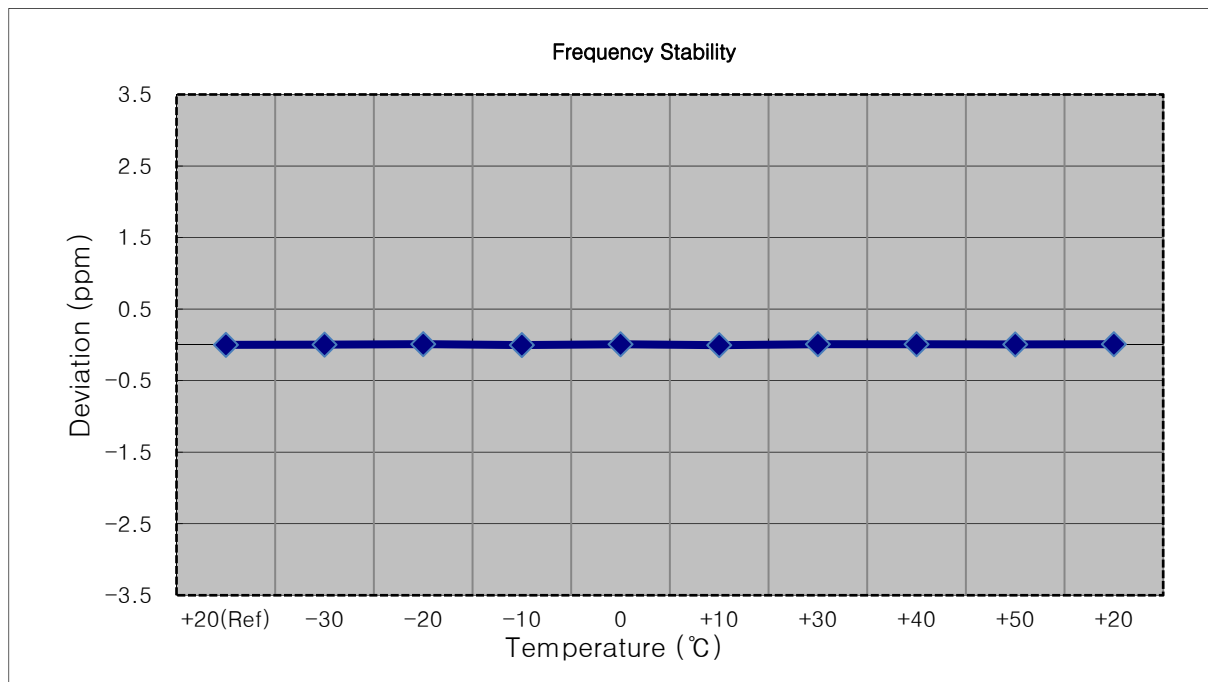
Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.860	+20(Ref)	1879 999 995	0.0	0.000 000	0.000
100%		-30	1880 000 009	14.0	0.000 001	0.007
100%		-20	1879 999 988	-6.6	0.000 000	-0.004
100%		-10	1880 000 005	10.7	0.000 001	0.006
100%		0	1880 000 011	16.4	0.000 001	0.009
100%		+10	1880 000 001	6.5	0.000 000	0.003
100%		+30	1880 000 001	6.4	0.000 000	0.003
100%		+40	1879 999 988	-6.7	0.000 000	-0.004
100%		+50	1880 000 011	16.3	0.000 001	0.009
Batt. Endpoint	3.400	+20	1879 999 992	-3.0	0.000 000	-0.002





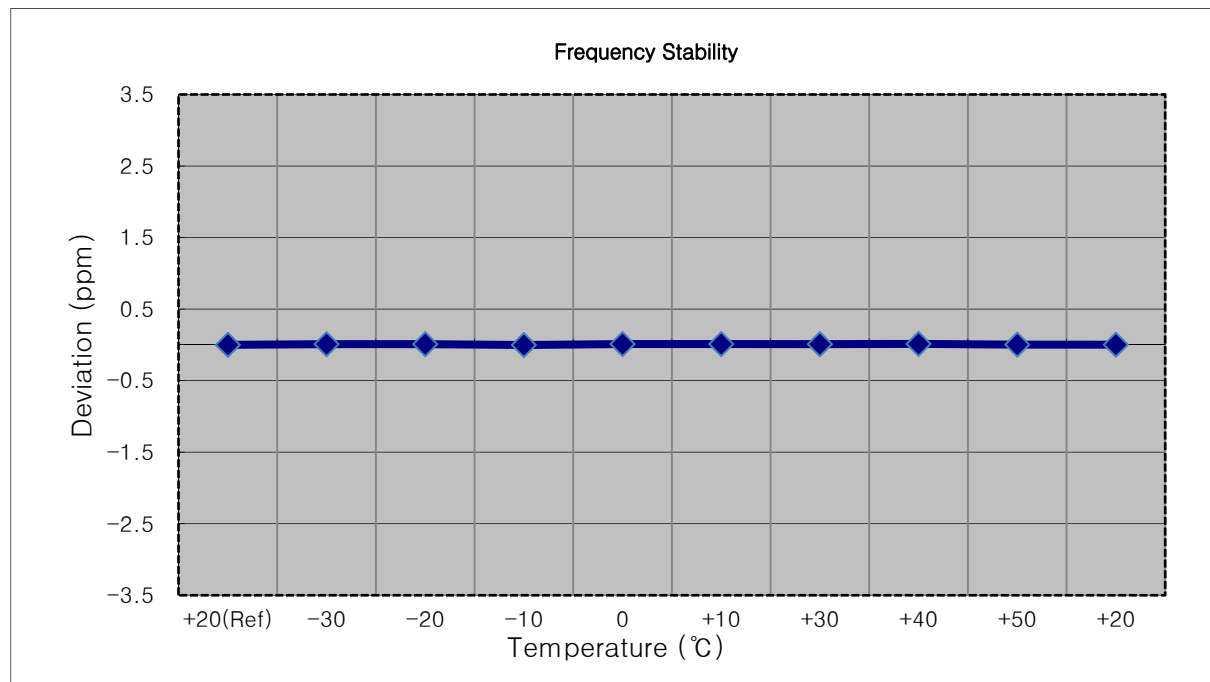
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1880,000,000 Hz
- ▣ CHANNEL: 18900 (20 MHz)
- ▣ REFERENCE VOLTAGE: 3.86 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.860	+20(Ref)	1880 000 007	0.0	0.000 000	0.000
100%		-30	1880 000 012	5.1	0.000 000	0.003
100%		-20	1880 000 025	18.3	0.000 001	0.010
100%		-10	1880 000 002	-5.4	0.000 000	-0.003
100%		0	1880 000 023	16.0	0.000 001	0.009
100%		+10	1879 999 999	-8.1	0.000 000	-0.004
100%		+30	1880 000 024	17.4	0.000 001	0.009
100%		+40	1880 000 023	15.5	0.000 001	0.008
100%		+50	1880 000 018	11.4	0.000 001	0.006
Batt. Endpoint		3.400	+20	1880 000 024	17.3	0.000 001



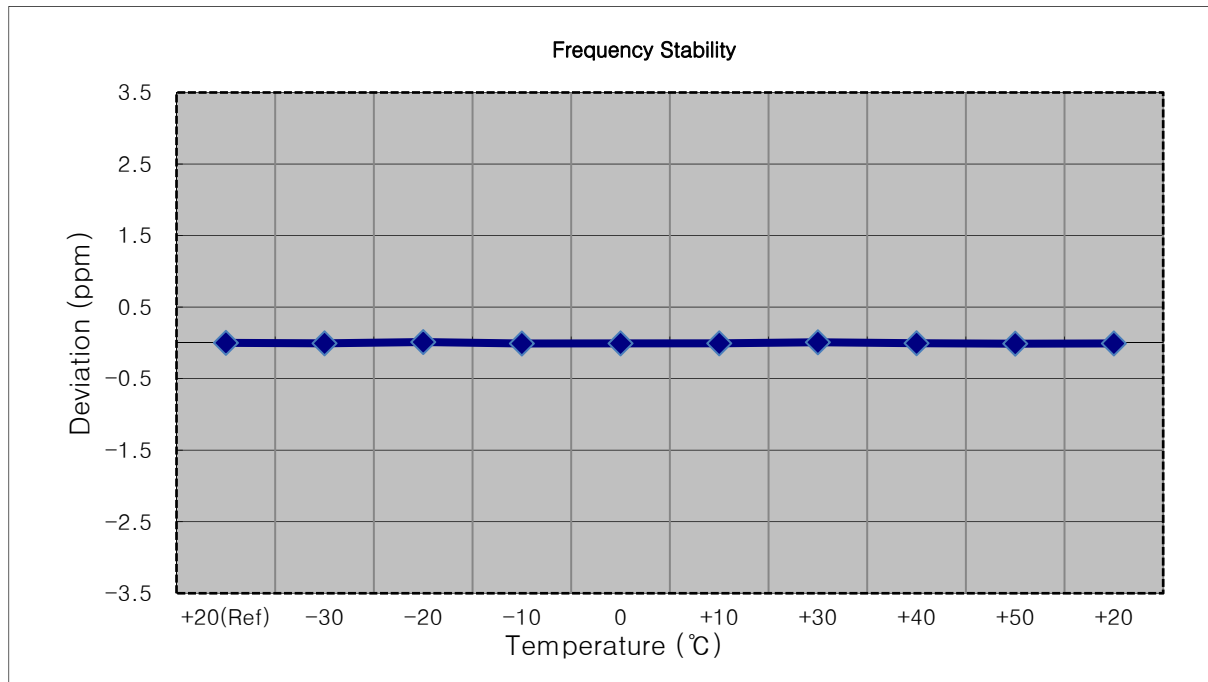
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1909,300,000 Hz
- ▣ CHANNEL: 19193 (1.4 MHz)
- ▣ REFERENCE VOLTAGE: 3.86 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.860	+20(Ref)	1909 300 009	0.0	0.000 000	0.000
100%		-30	1909 300 028	18.5	0.000 001	0.010
100%		-20	1909 300 028	18.5	0.000 001	0.010
100%		-10	1909 300 005	-4.1	0.000 000	-0.002
100%		0	1909 300 031	21.2	0.000 001	0.011
100%		+10	1909 300 031	21.6	0.000 001	0.011
100%		+30	1909 300 028	18.7	0.000 001	0.010
100%		+40	1909 300 035	25.7	0.000 001	0.013
100%		+50	1909 300 015	5.3	0.000 000	0.003
Batt. Endpoint	3.400	+20	1909 300 014	4.5	0.000 000	0.002



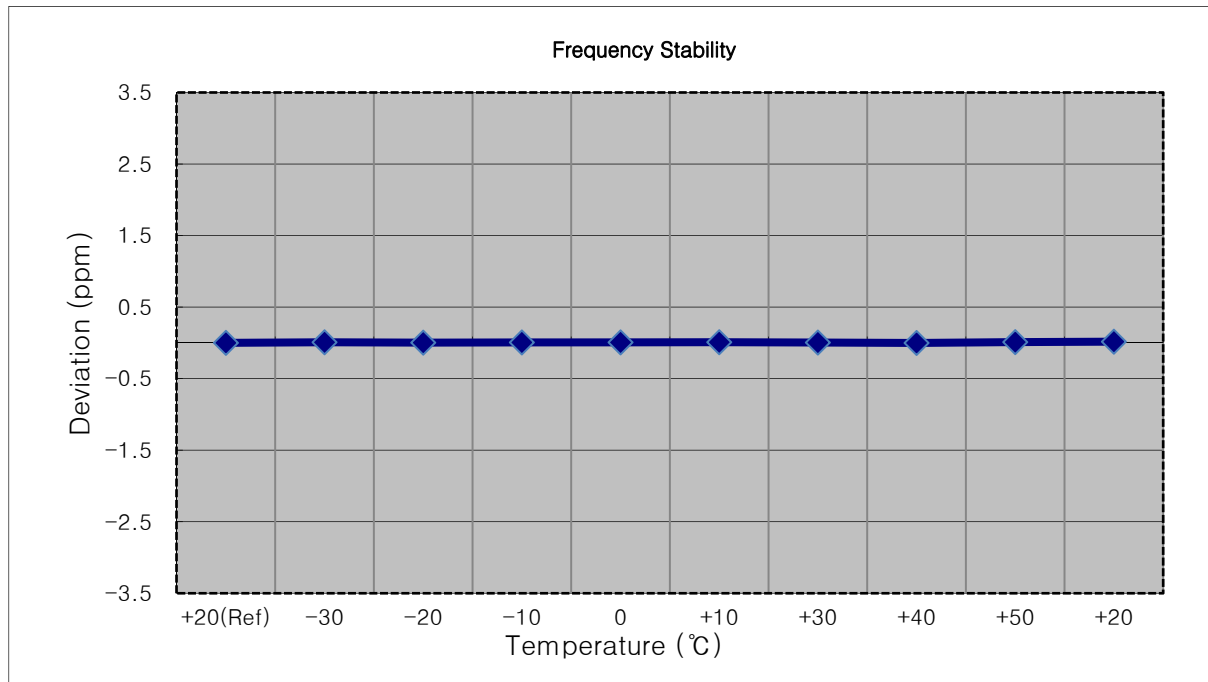
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1908,500,000 Hz
- ▣ CHANNEL: 19185 (3 MHz)
- ▣ REFERENCE VOLTAGE: 3.86 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.860	+20(Ref)	1908 500 012	0.0	0.000 000	0.000
100%		-30	1908 500 000	-12.2	-0.000 001	-0.006
100%		-20	1908 500 034	22.0	0.000 001	0.012
100%		-10	1908 499 996	-16.5	-0.000 001	-0.009
100%		0	1908 499 998	-14.9	-0.000 001	-0.008
100%		+10	1908 499 999	-13.1	-0.000 001	-0.007
100%		+30	1908 500 027	15.0	0.000 001	0.008
100%		+40	1908 500 003	-9.6	-0.000 001	-0.005
100%		+50	1908 499 990	-22.1	-0.000 001	-0.012
Batt. Endpoint		3.400	+20	1908 499 997	-15.3	-0.000 001



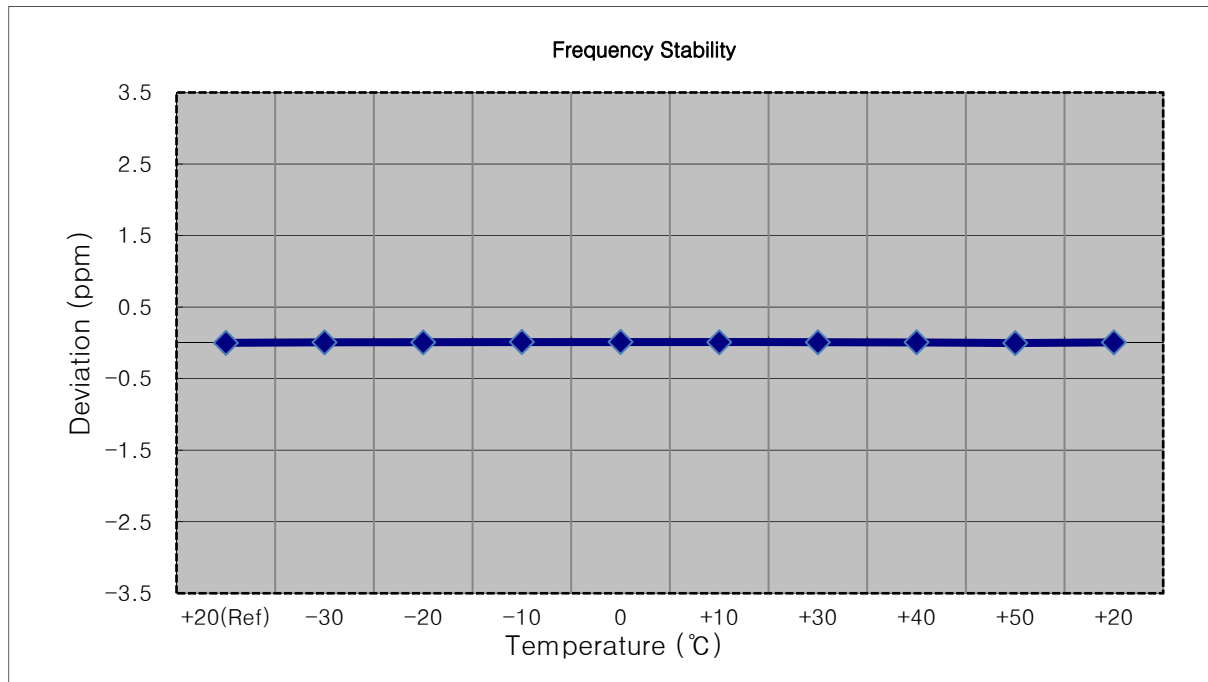
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1907.500.000 Hz
- ▣ CHANNEL: 19175 (5 MHz)
- ▣ REFERENCE VOLTAGE: 3.86 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.860	+20(Ref)	1907 499 992	0.0	0.000 000	0.000
100%		-30	1907 500 008	15.5	0.000 001	0.008
100%		-20	1907 499 998	5.4	0.000 000	0.003
100%		-10	1907 500 004	11.7	0.000 001	0.006
100%		0	1907 500 005	12.9	0.000 001	0.007
100%		+10	1907 500 009	17.0	0.000 001	0.009
100%		+30	1907 500 001	9.1	0.000 000	0.005
100%		+40	1907 499 989	-2.9	0.000 000	-0.002
100%		+50	1907 500 013	20.5	0.000 001	0.011
Batt. Endpoint	3.400	+20	1907 500 024	31.4	0.000 002	0.016



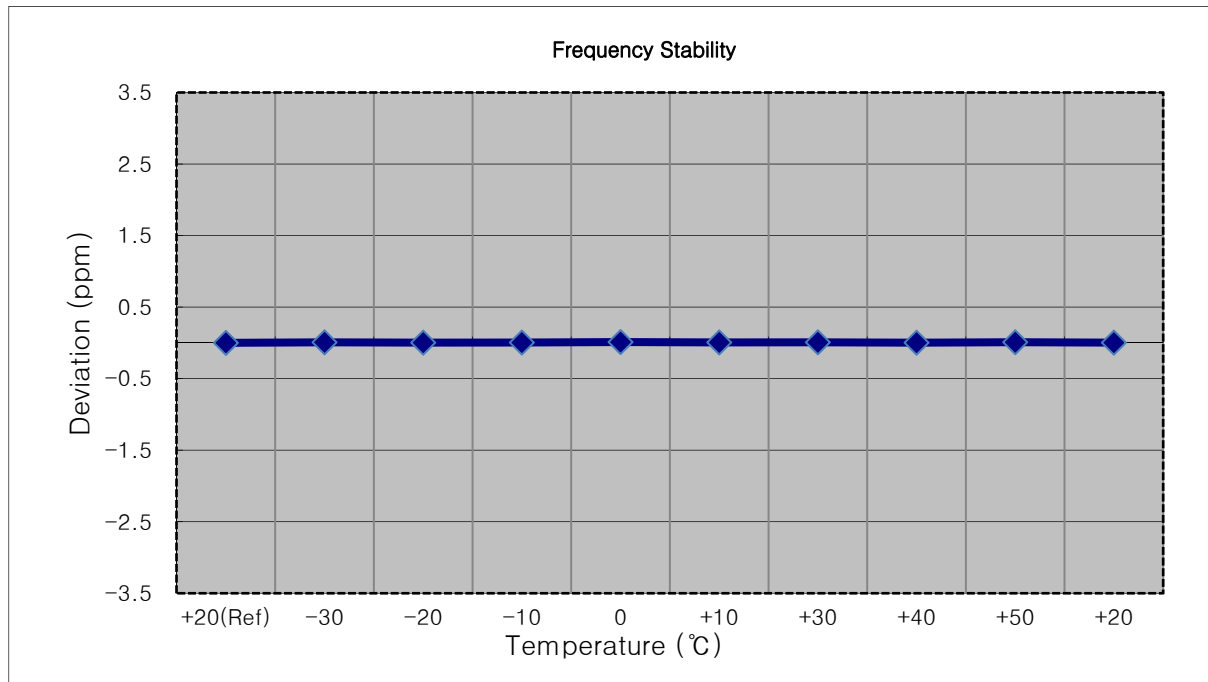
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1905,000,000 Hz
- ▣ CHANNEL: 19150 (10 MHz)
- ▣ REFERENCE VOLTAGE: 3.86 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.860	+20(Ref)	1905 000 020	0.0	0.000 000	0.000
100%		-30	1905 000 035	14.8	0.000 001	0.008
100%		-20	1905 000 033	12.6	0.000 001	0.007
100%		-10	1905 000 045	24.7	0.000 001	0.013
100%		0	1905 000 046	25.8	0.000 001	0.014
100%		+10	1905 000 037	16.9	0.000 001	0.009
100%		+30	1905 000 035	14.9	0.000 001	0.008
100%		+40	1905 000 035	15.2	0.000 001	0.008
100%		+50	1905 000 015	1905 000 015	-5.2	0.000 000
Batt. Endpoint	3.400	+20	1905 000 032	12.3	0.000 001	0.006



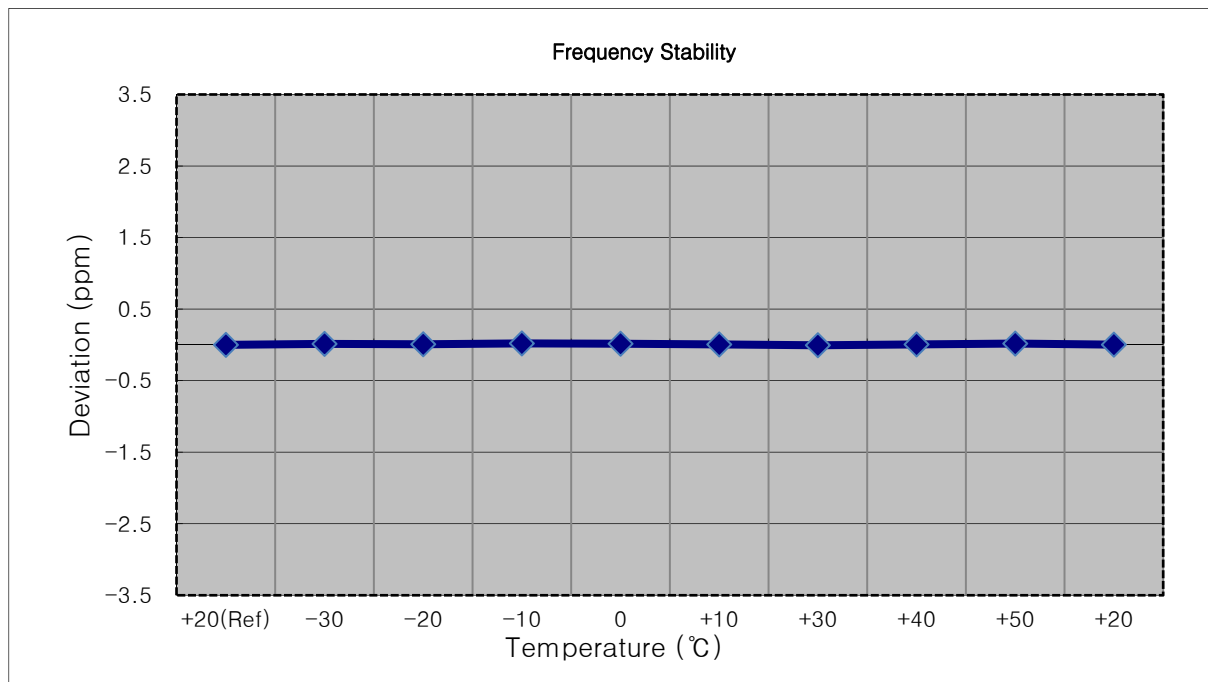
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1902.500.000 Hz
- ▣ CHANNEL: 19125 (15 MHz)
- ▣ REFERENCE VOLTAGE: 3.86 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.860	+20(Ref)	1902 500 014	0.0	0.000 000	0.000
100%		-30	1902 500 029	14.6	0.000 001	0.008
100%		-20	1902 500 020	5.5	0.000 000	0.003
100%		-10	1902 500 022	7.9	0.000 000	0.004
100%		0	1902 500 036	21.5	0.000 001	0.011
100%		+10	1902 500 026	11.4	0.000 001	0.006
100%		+30	1902 500 028	13.6	0.000 001	0.007
100%		+40	1902 500 019	4.7	0.000 000	0.002
100%		+50	1902 500 031	16.5	0.000 001	0.009
Batt. Endpoint	3.400	+20	1902 500 019	5.1	0.000 000	0.003



- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1900,000,000 Hz
- ▣ CHANNEL: 19100 (20 MHz)
- ▣ REFERENCE VOLTAGE: 3.86 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

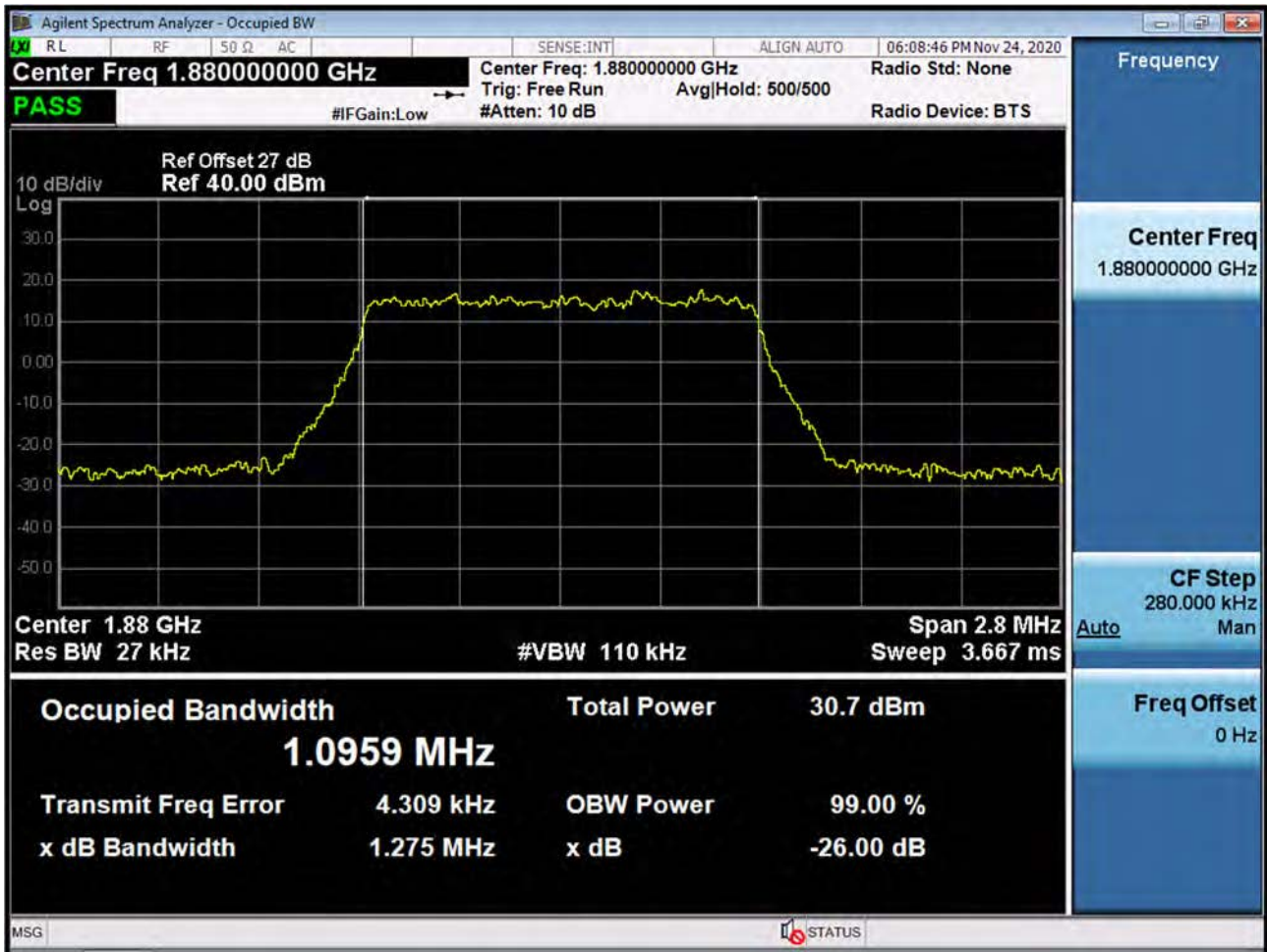
Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.860	+20(Ref)	1900 000 018	0.0	0.000 000	0.000
100%		-30	1900 000 044	26.1	0.000 001	0.014
100%		-20	1900 000 032	14.9	0.000 001	0.008
100%		-10	1900 000 056	38.4	0.000 002	0.020
100%		0	1900 000 047	29.2	0.000 002	0.015
100%		+10	1900 000 029	11.5	0.000 001	0.006
100%		+30	1900 000 007	-10.2	-0.000 001	-0.005
100%		+40	1900 000 029	11.3	0.000 001	0.006
100%		+50	1900 000 051	33.5	0.000 002	0.018
Batt. Endpoint	3.400	+20	1900 000 023	5.5	0.000 000	0.003



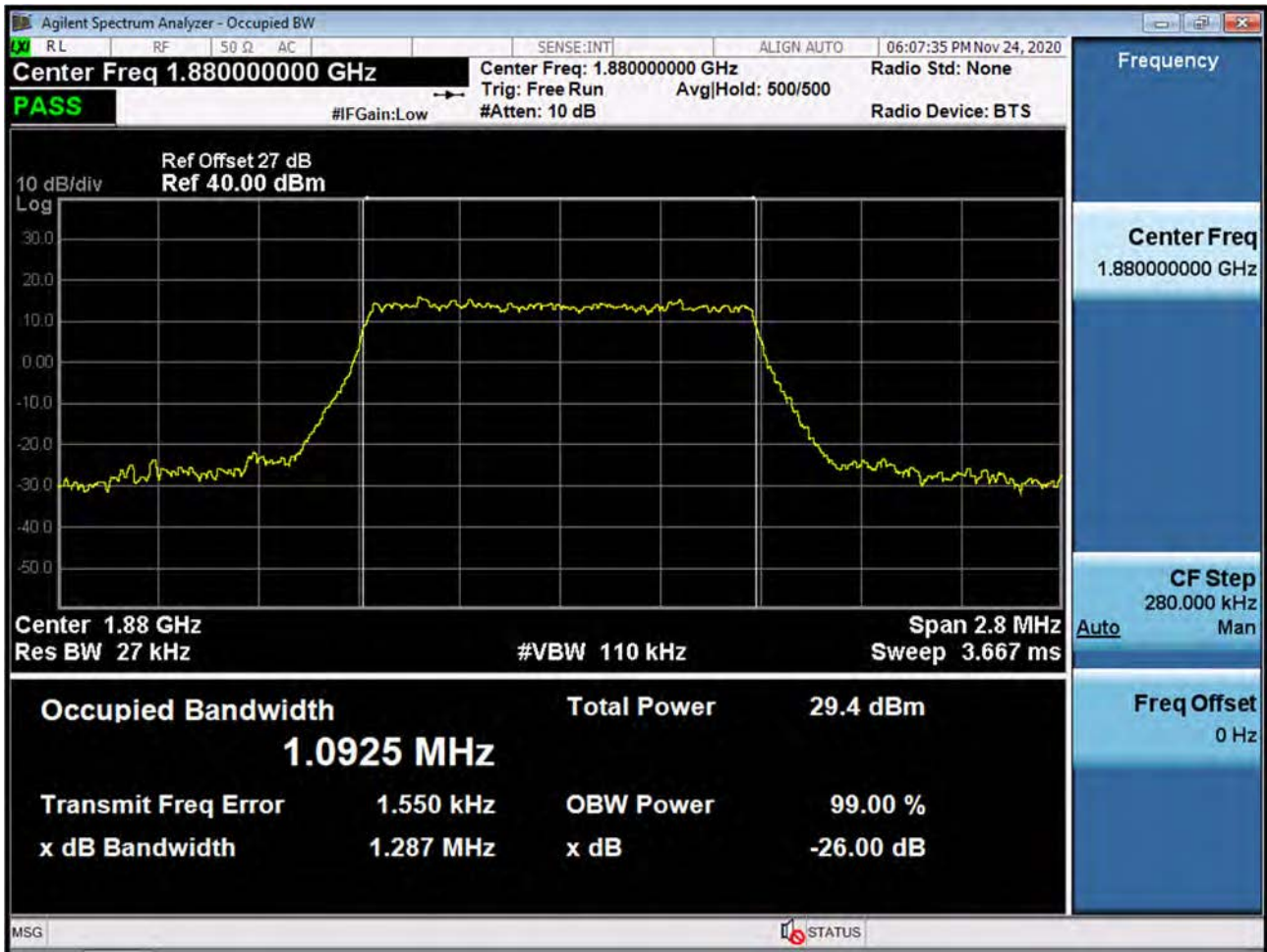
## 9. TEST PLOTS



BAND 2. Occupied Bandwidth Plot (1.4M BW Ch.18900 QPSK RB 6\_0)

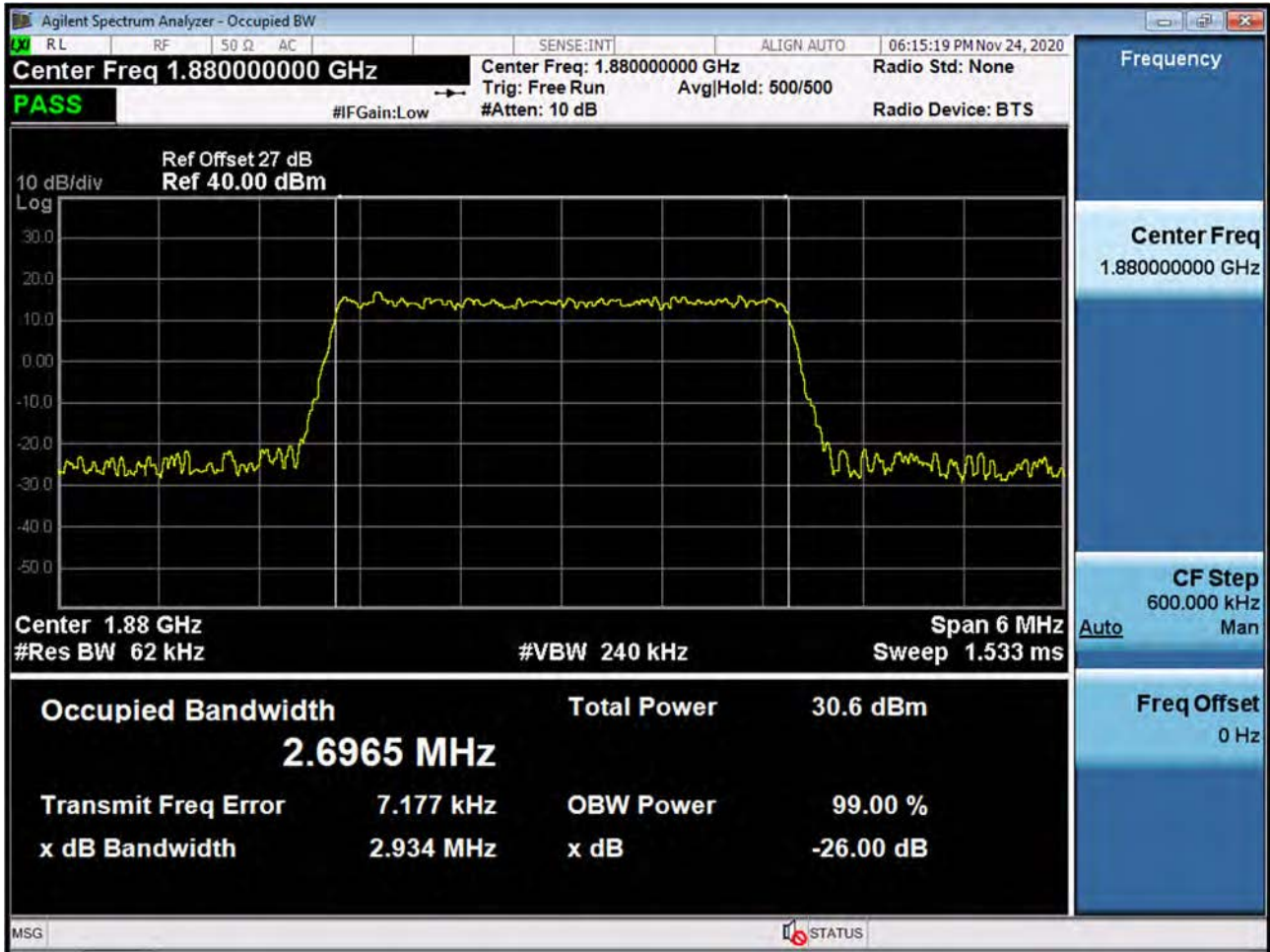


BAND 2. Occupied Bandwidth Plot (1.4M BW Ch.18900 16QAM RB 6\_0)

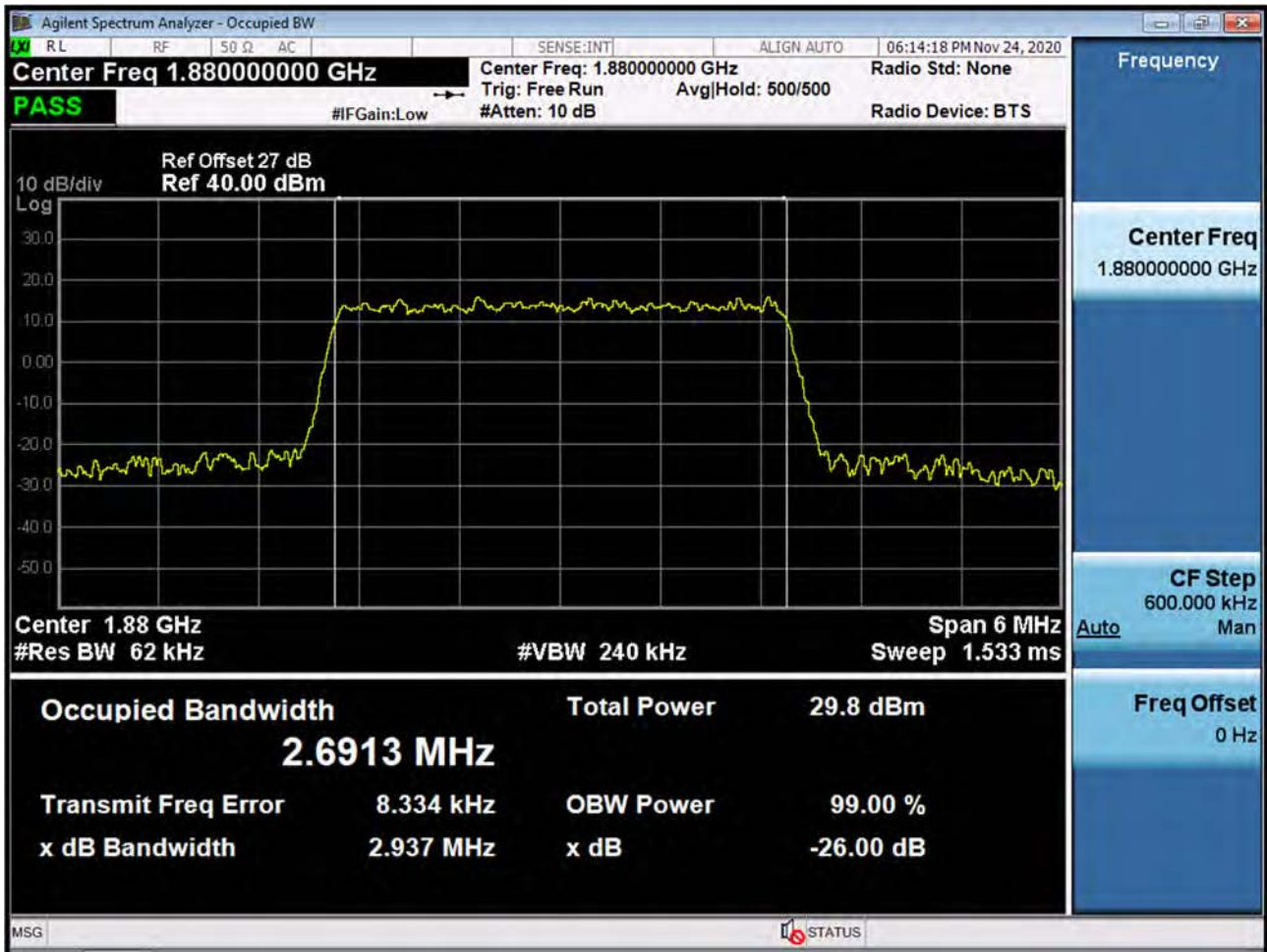




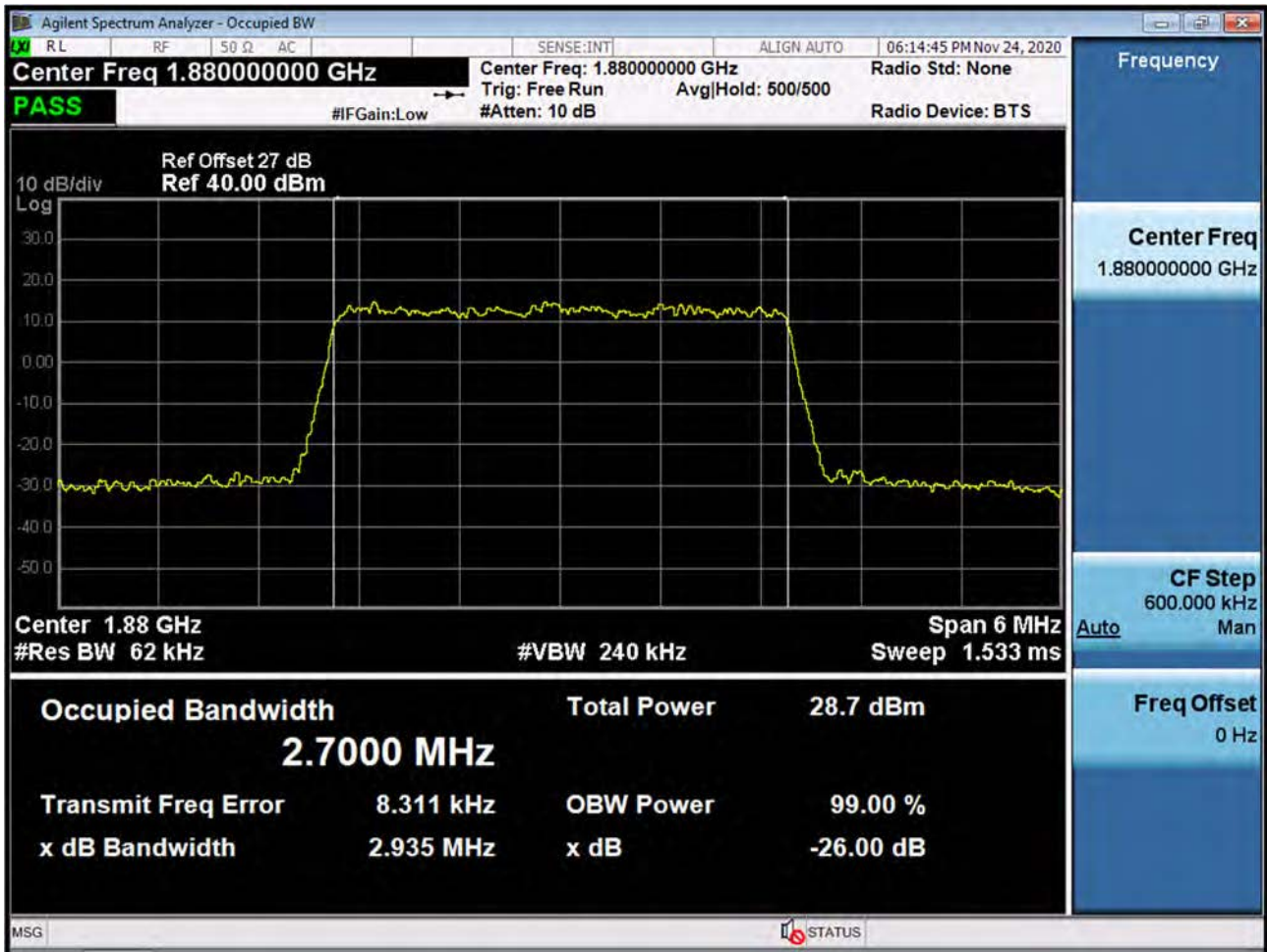
BAND 2. Occupied Bandwidth Plot (3M BW Ch.18900 QPSK RB 15\_0)



BAND 2. Occupied Bandwidth Plot (3M BW Ch.18900 16QAM RB 15\_0)

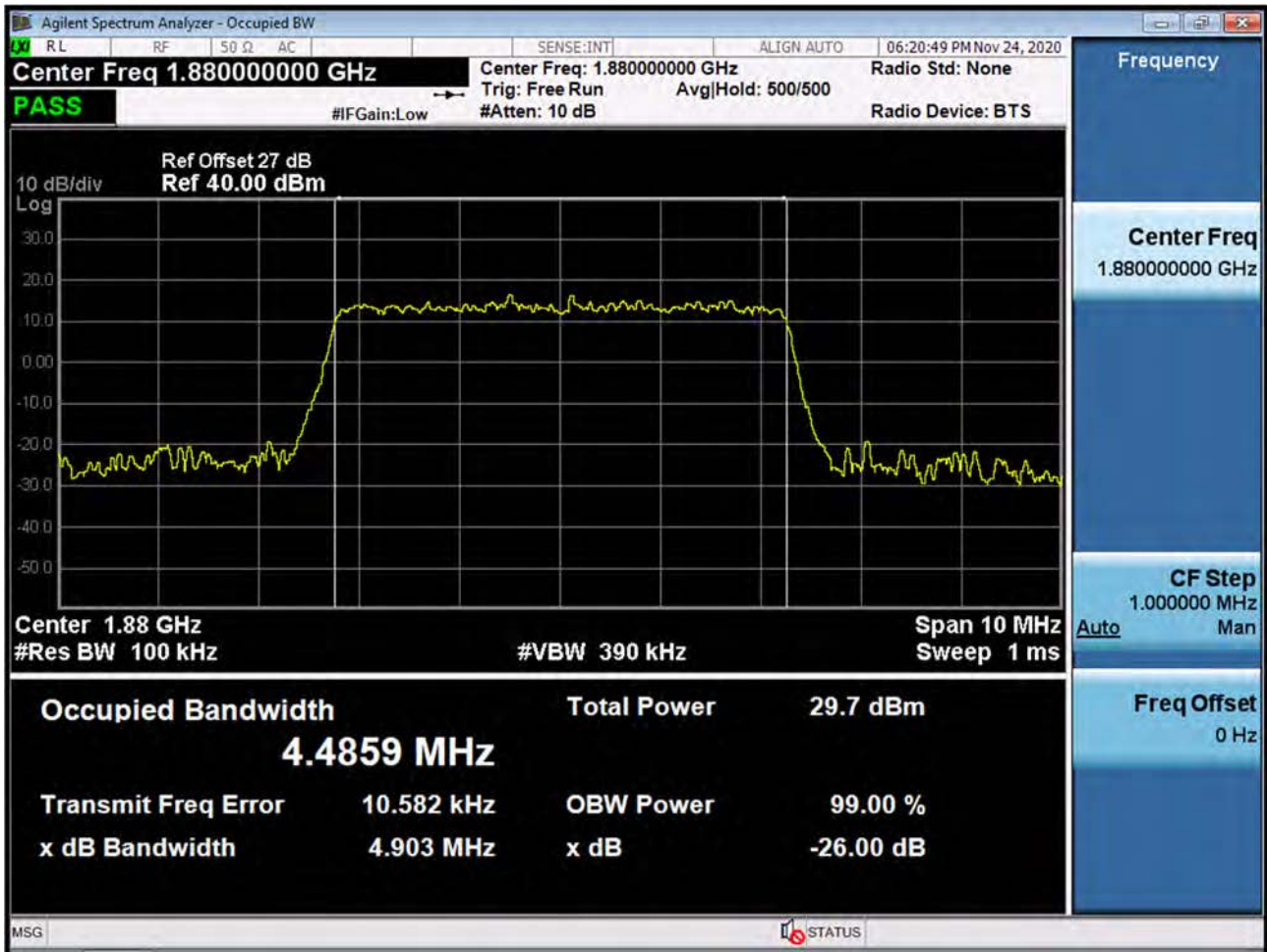


BAND 2. Occupied Bandwidth Plot (3M BW Ch.18900 64QAM RB 15\_0)



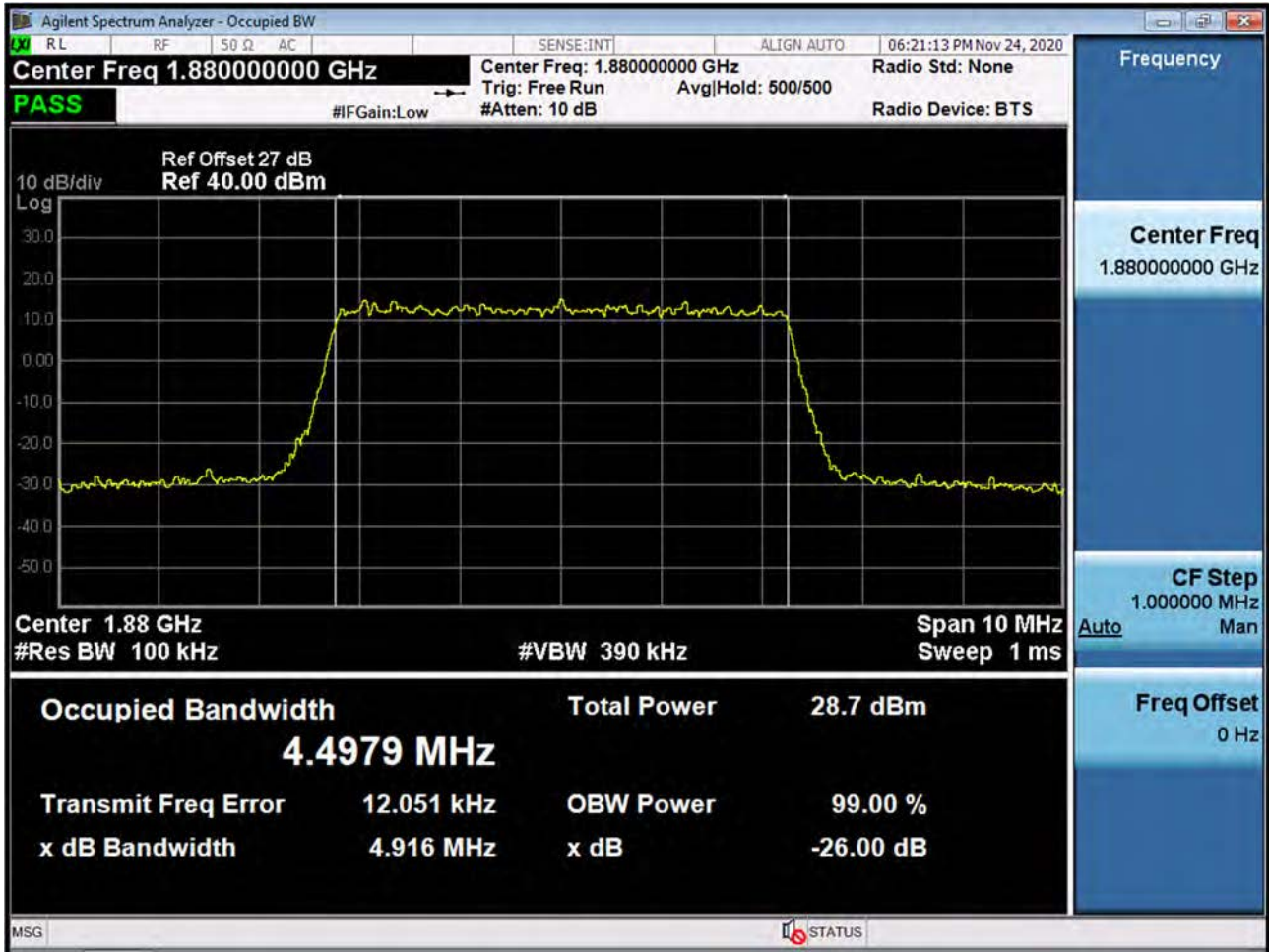


BAND 2. Occupied Bandwidth Plot (5M BW Ch.18900 16QAM RB 25\_0)

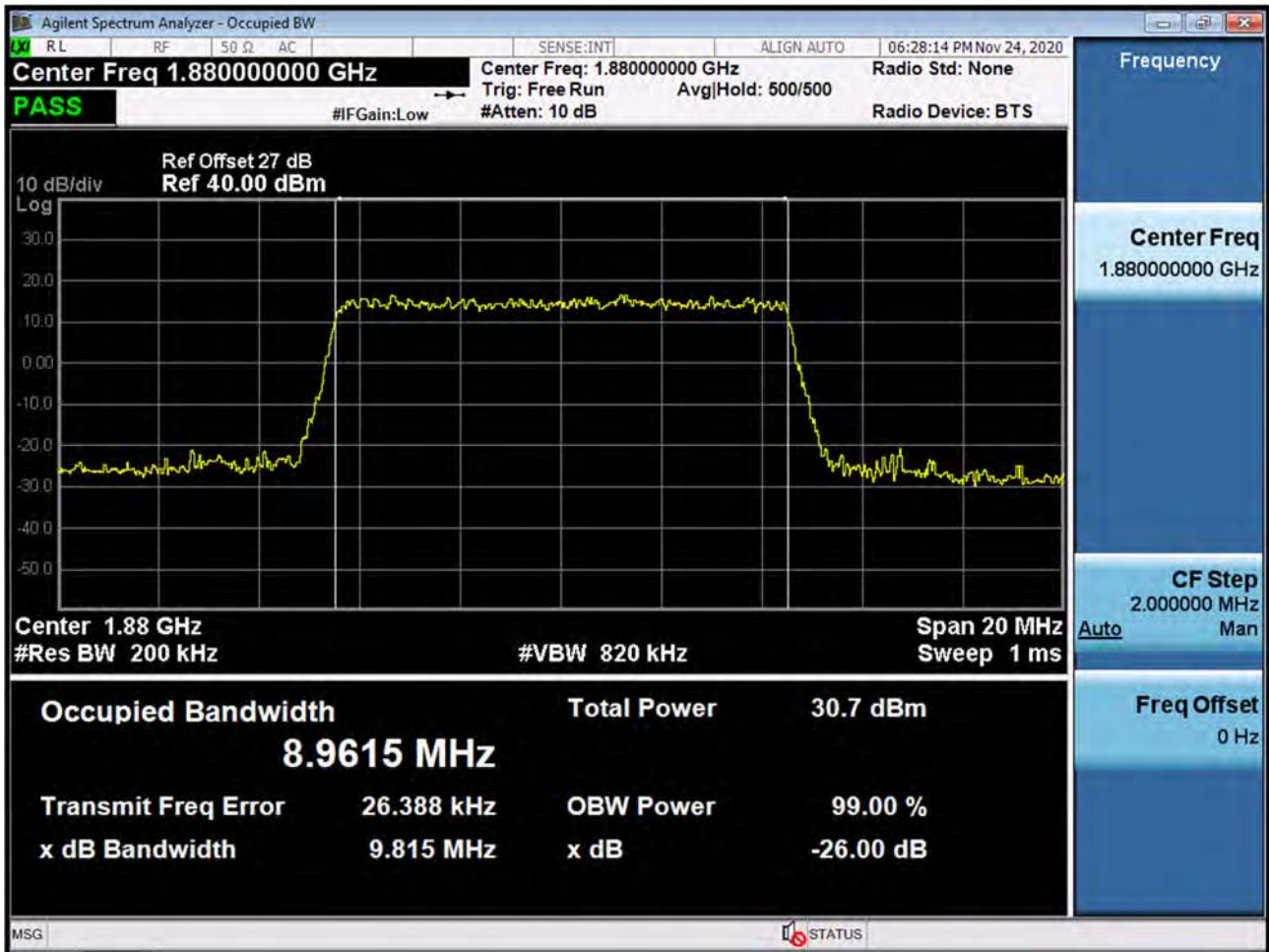




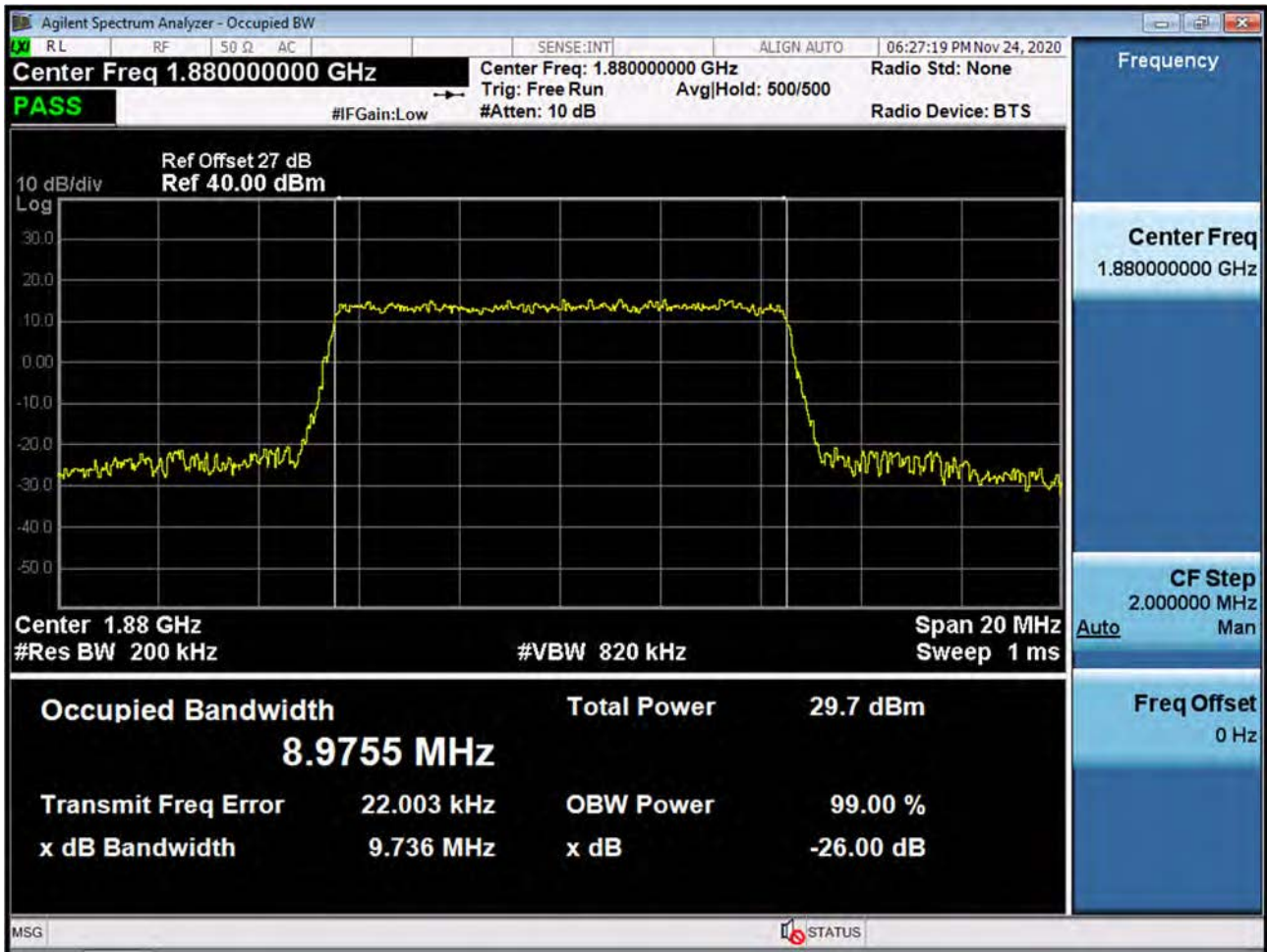
BAND 2. Occupied Bandwidth Plot (5M BW Ch.18900 64QAM RB 25\_0)



BAND 2. Occupied Bandwidth Plot (10M BW Ch.18900 QPSK RB 50\_0)

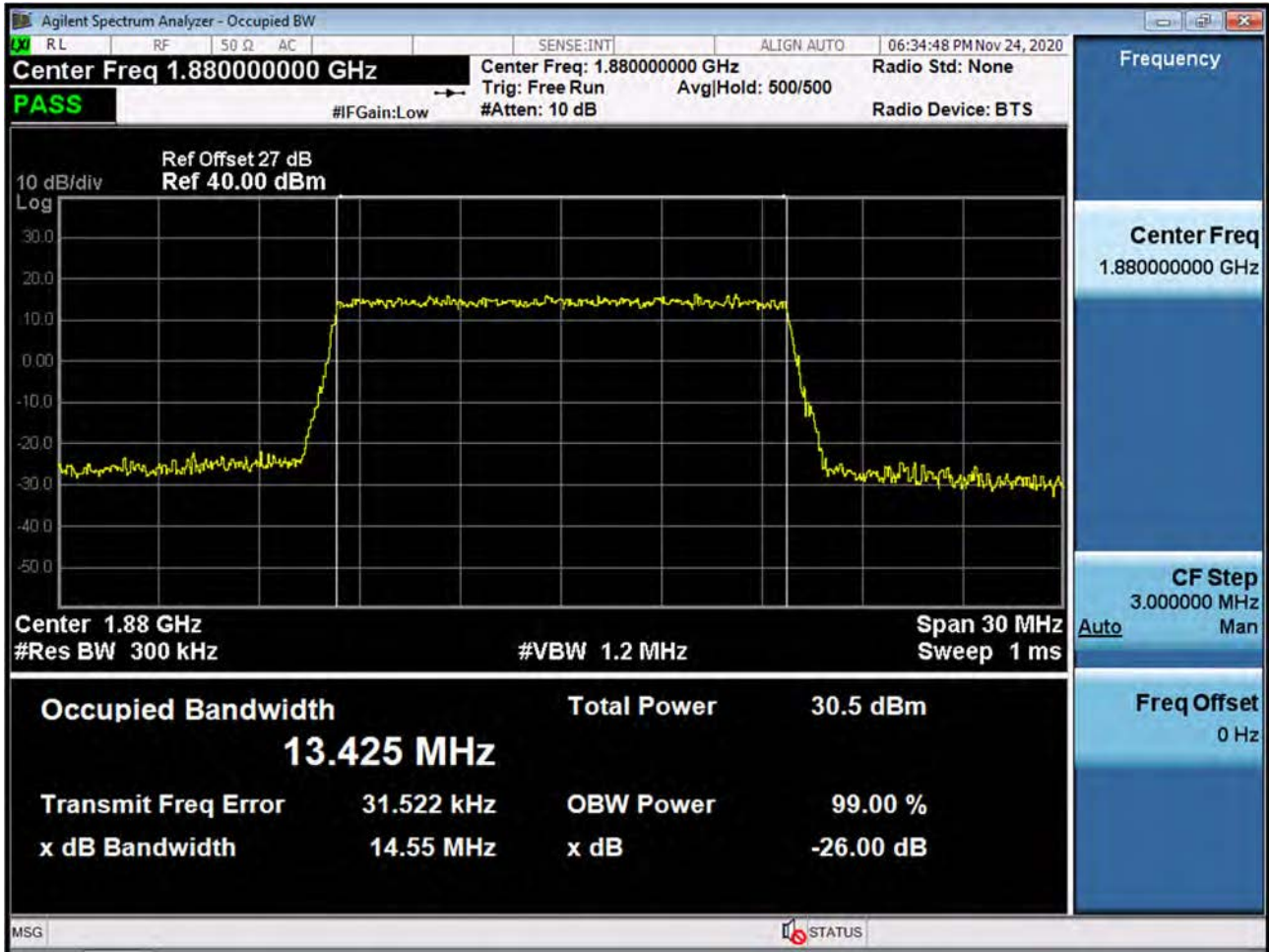


BAND 2. Occupied Bandwidth Plot (10M BW Ch.18900 16QAM RB 50\_0)

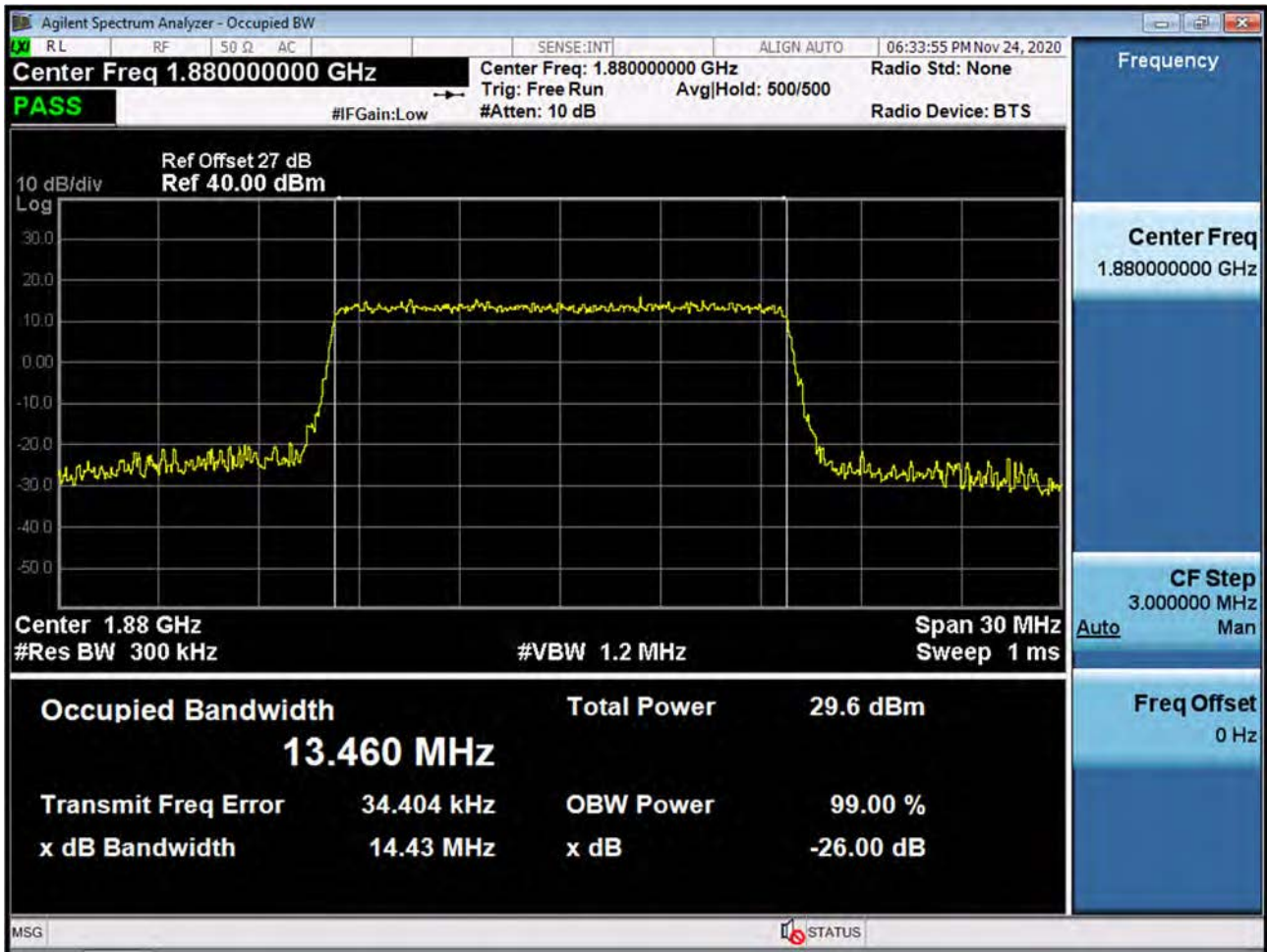




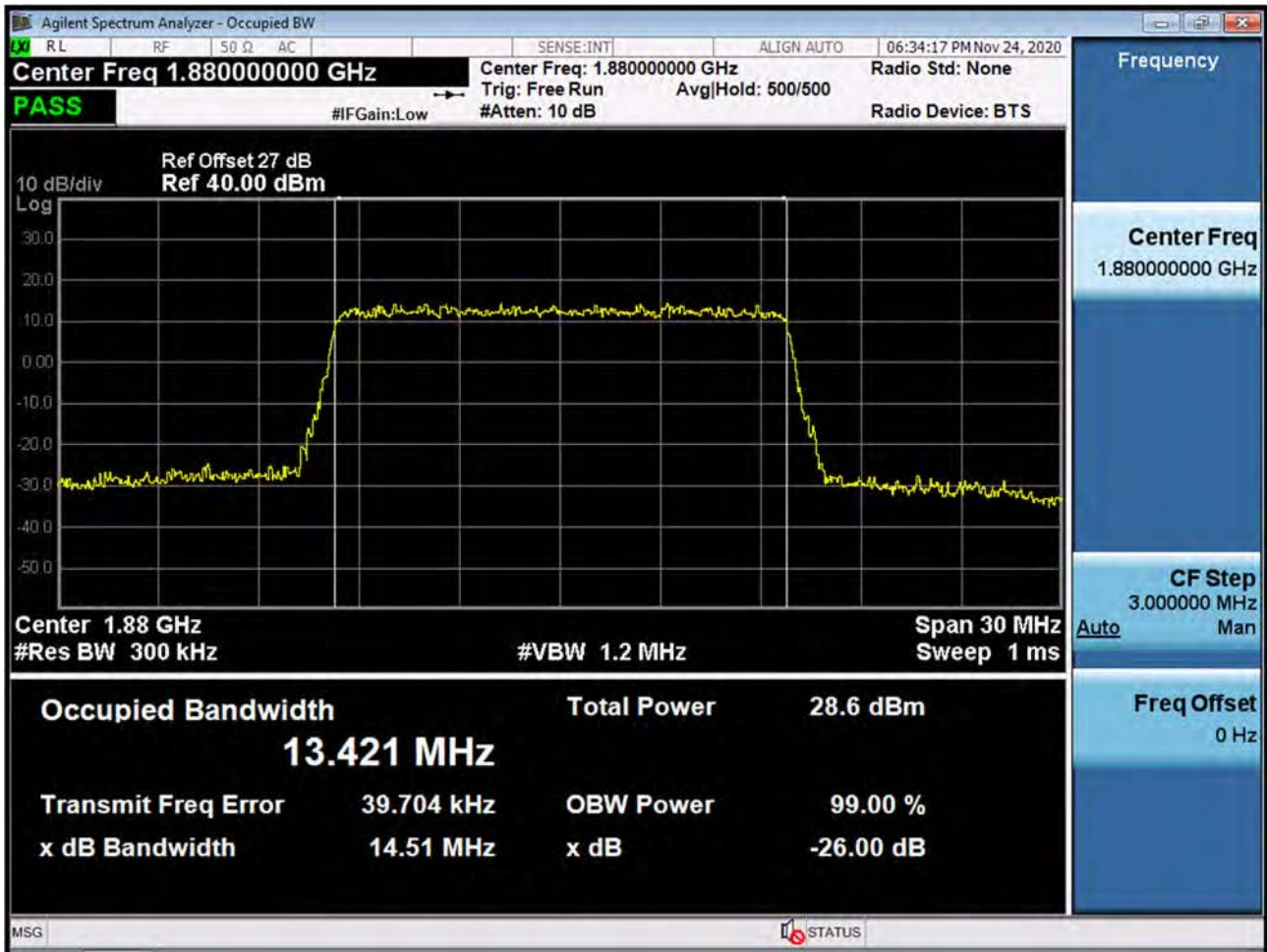
BAND 2. Occupied Bandwidth Plot (15M BW Ch.18900 QPSK RB 75\_0)



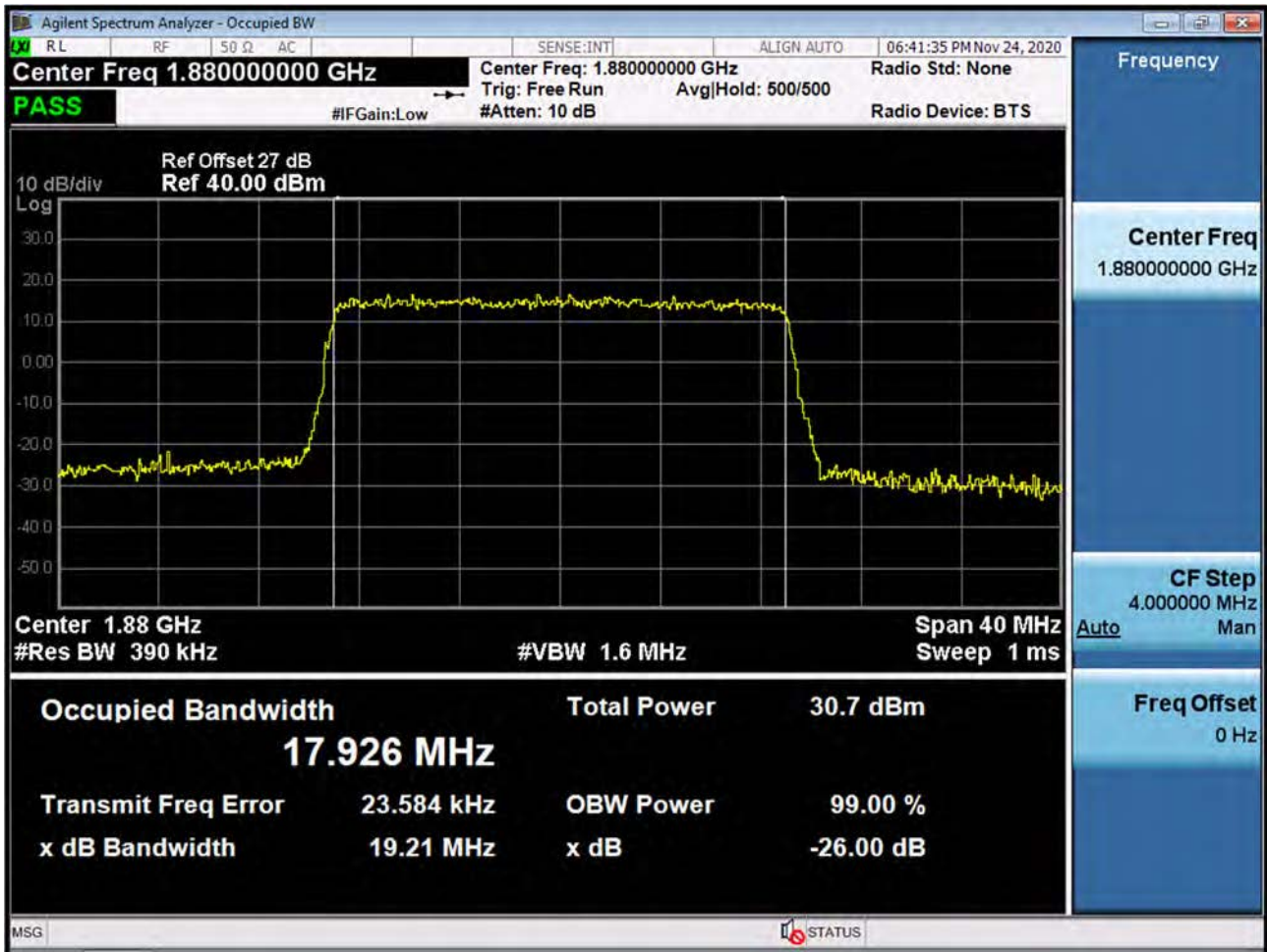
BAND 2. Occupied Bandwidth Plot (15M BW Ch.18900 16QAM RB 75\_0)



BAND 2. Occupied Bandwidth Plot (15M BW Ch.18900 64QAM RB 75\_0)

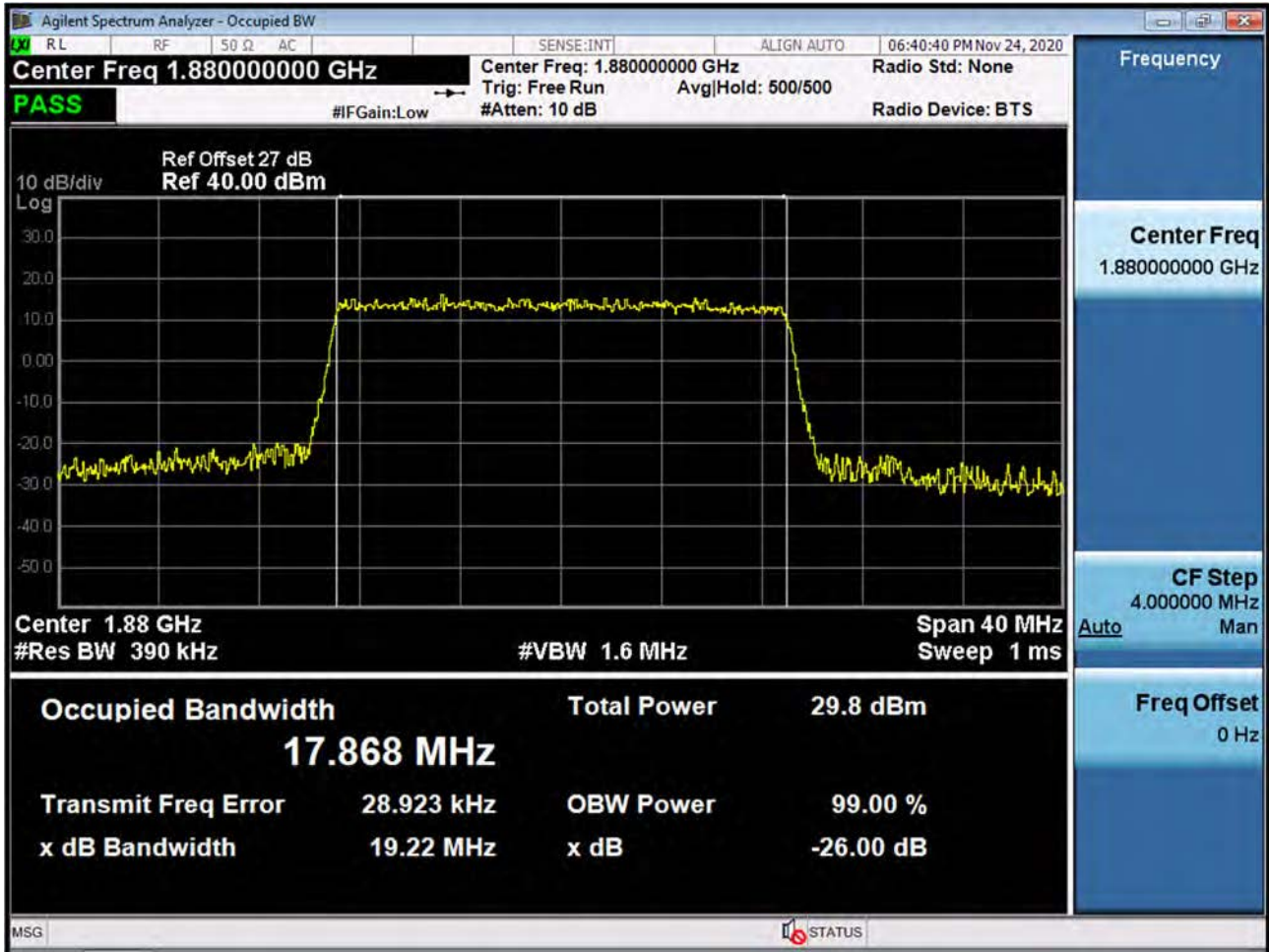


BAND 2. Occupied Bandwidth Plot (20M BW Ch.18900 QPSK RB 100\_0)

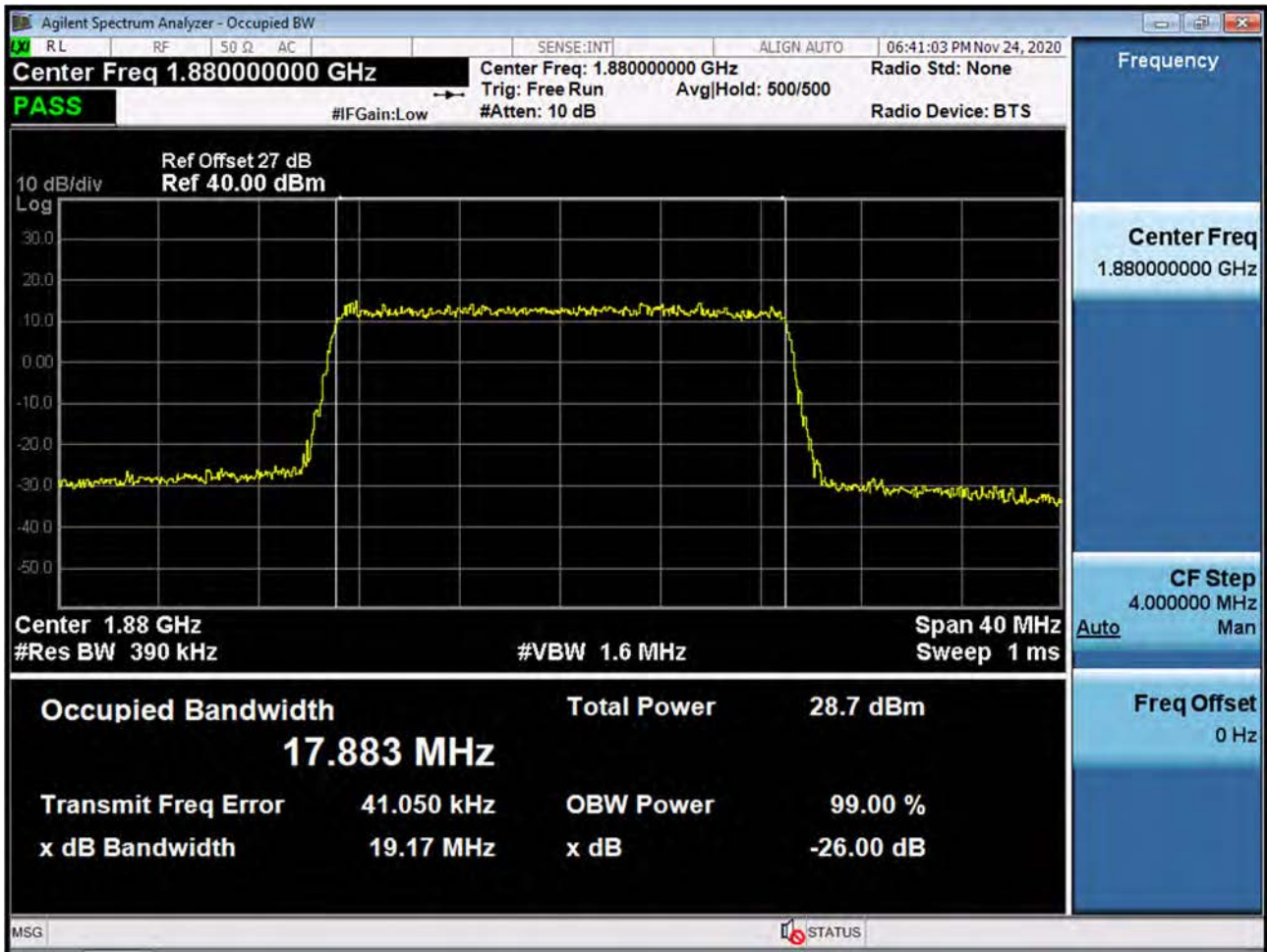




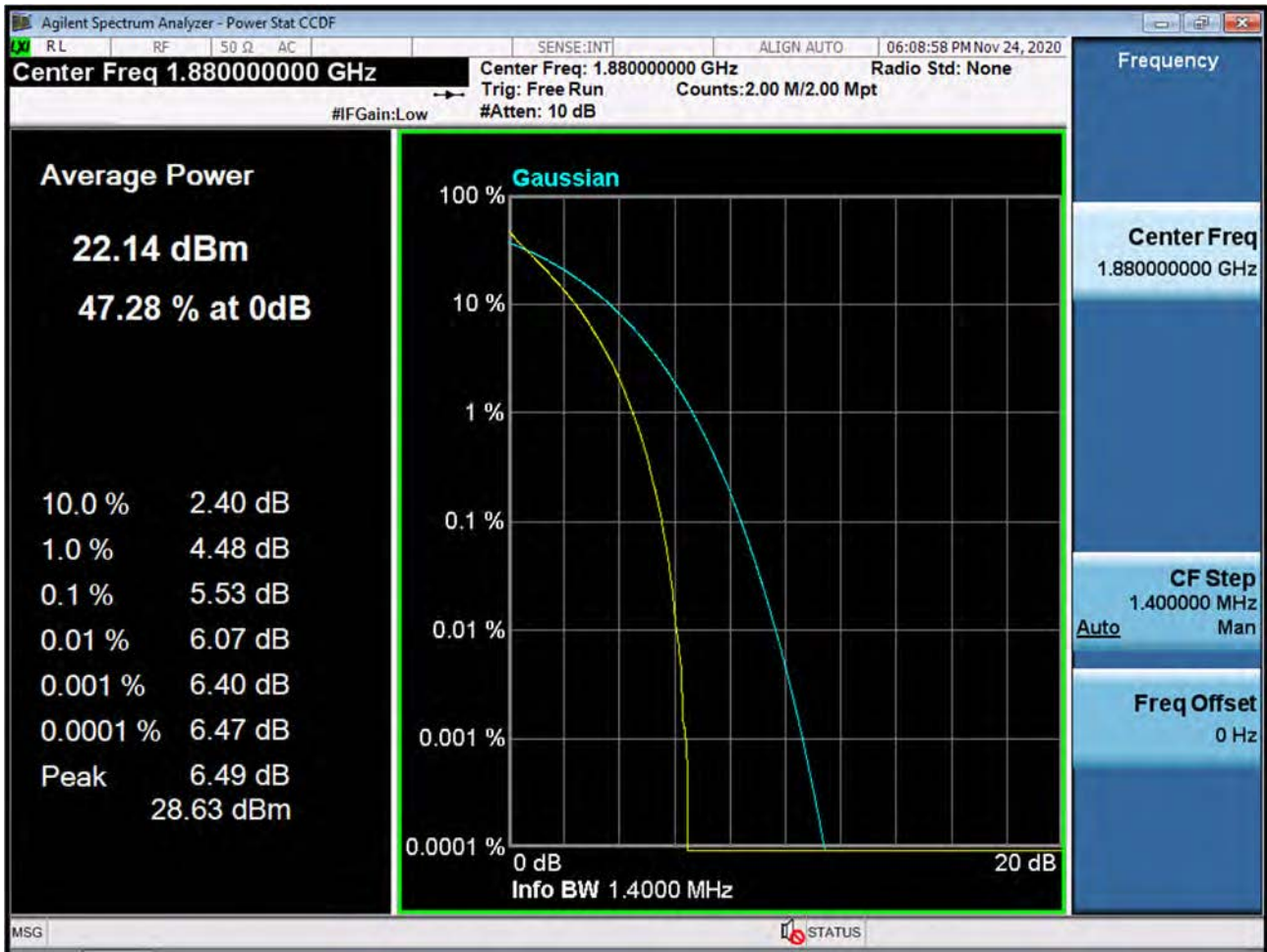
BAND 2. Occupied Bandwidth Plot (20M BW Ch.18900 16QAM RB 100\_0)



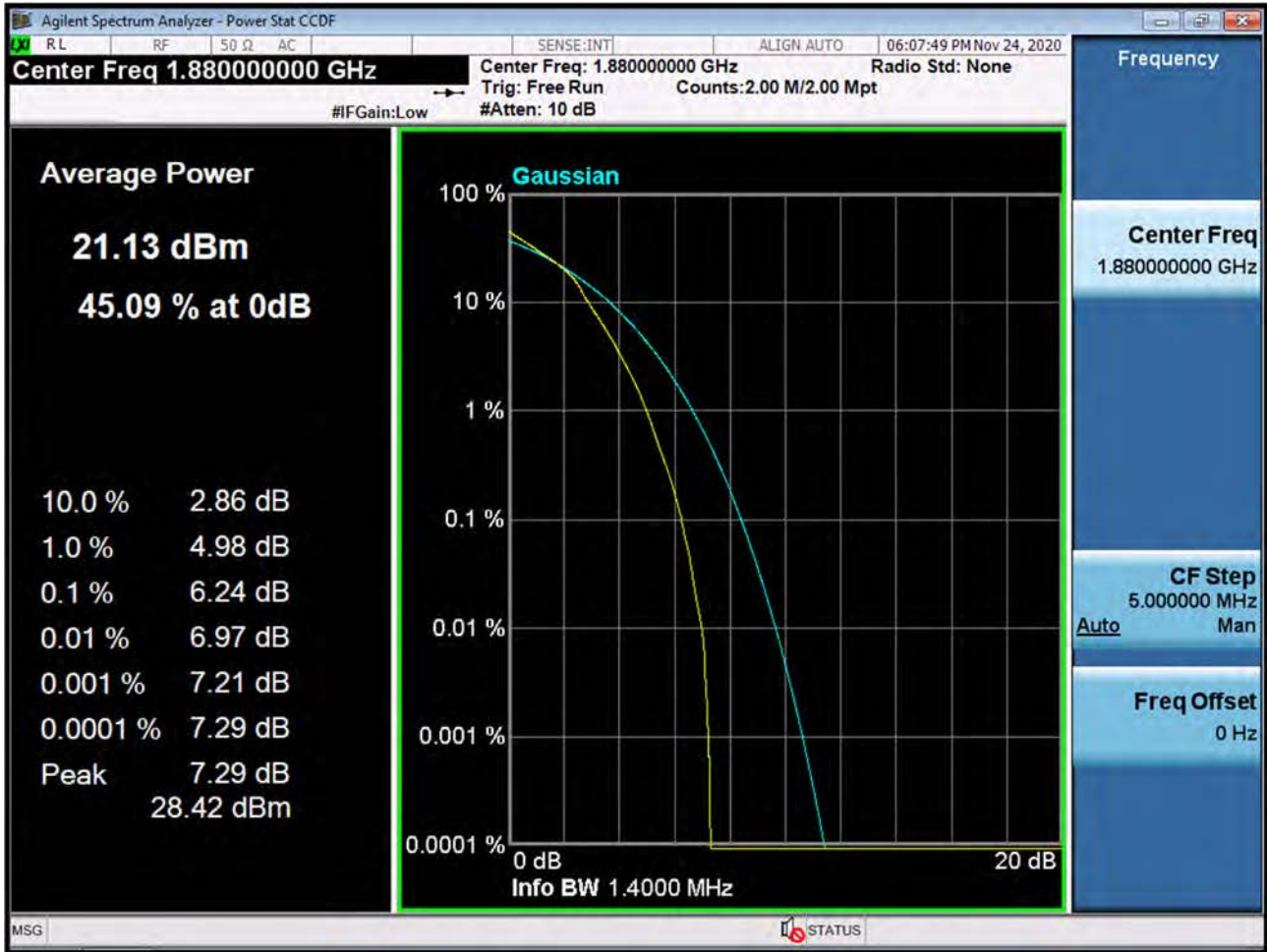
BAND 2. Occupied Bandwidth Plot (20M BW Ch.18900 64QAM RB 100\_0)



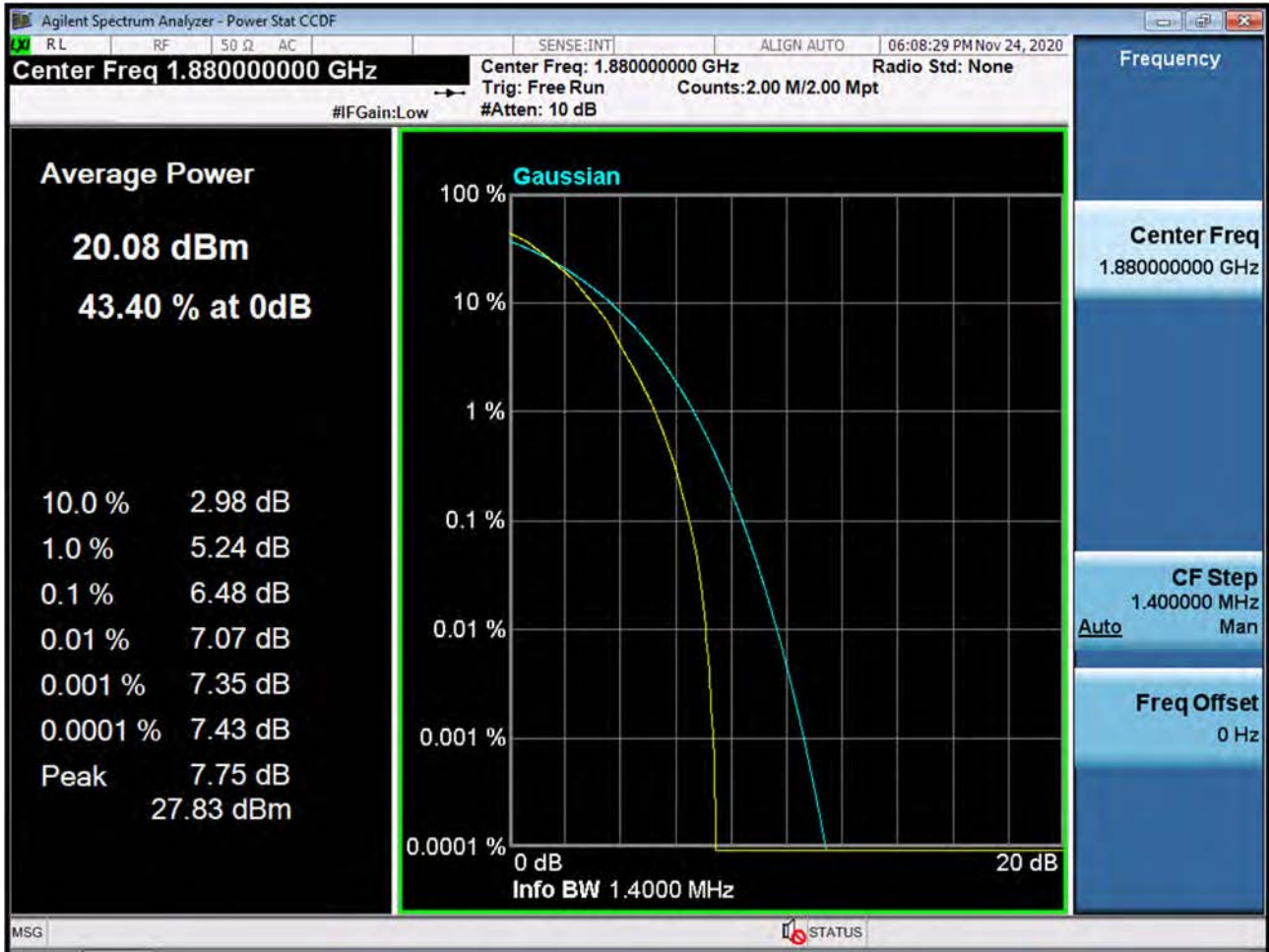
BAND 2. PAR Plot (1.4M BW Ch.18900 QPSK RB 6\_0)



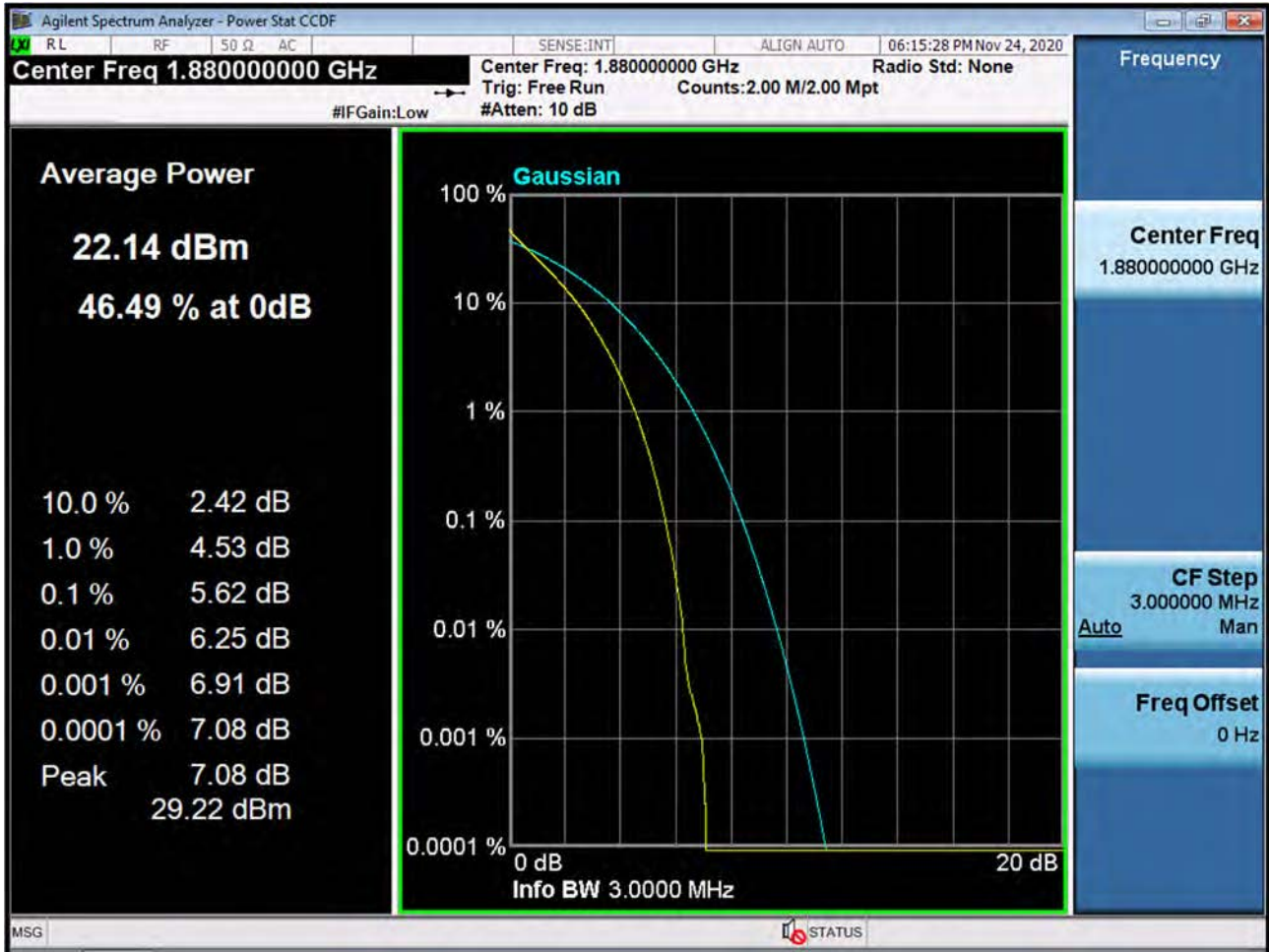
BAND 2. PAR Plot (1.4M BW Ch.18900 16QAM RB 6\_0)



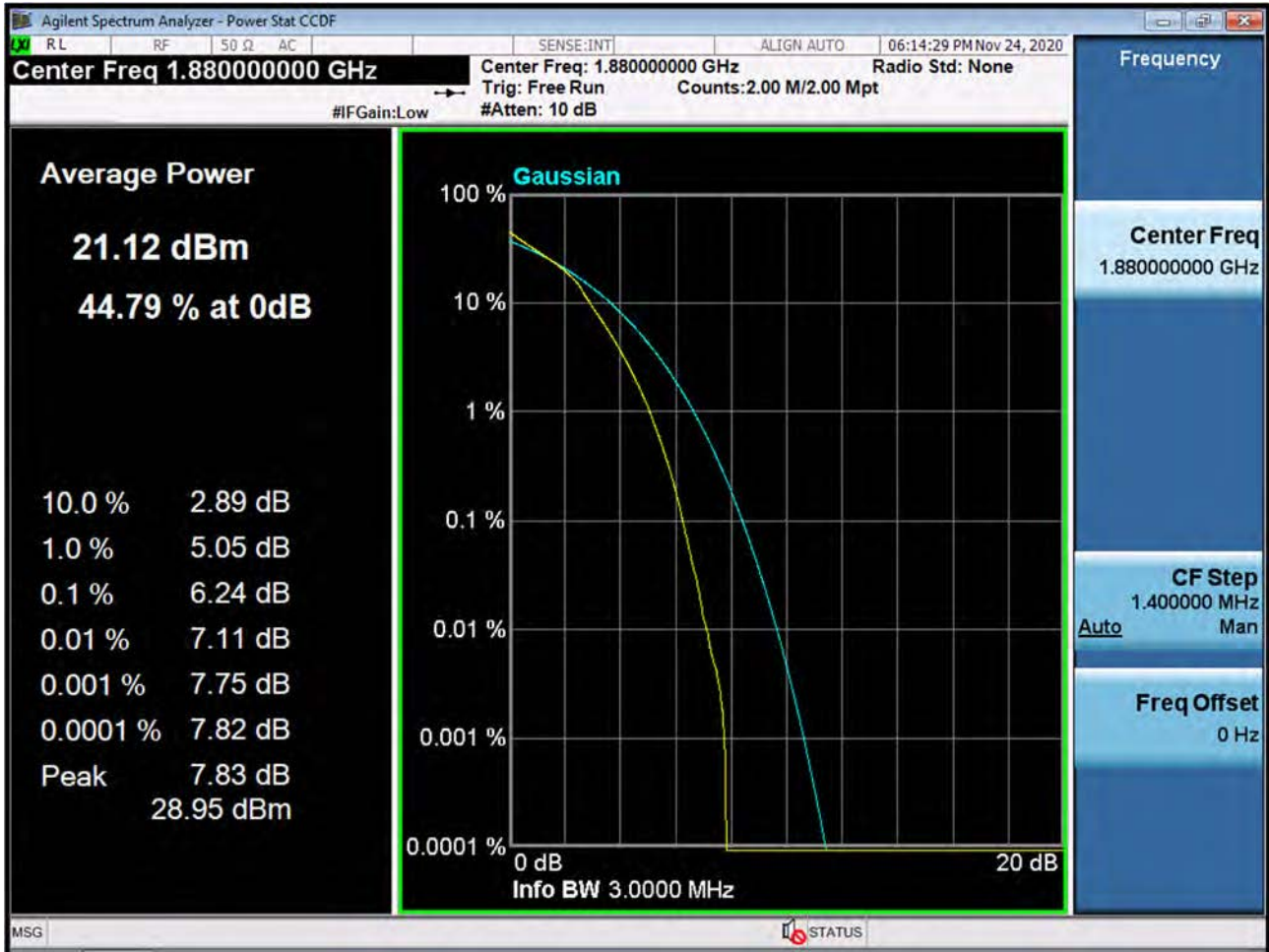
BAND 2. PAR Plot (1.4M BW Ch.18900 64QAM RB 6\_0)



BAND 2. PAR Plot (3M BW Ch.18900 QPSK RB 15\_0)



BAND 2. PAR Plot (3M BW Ch.18900 16QAM RB 15\_0)

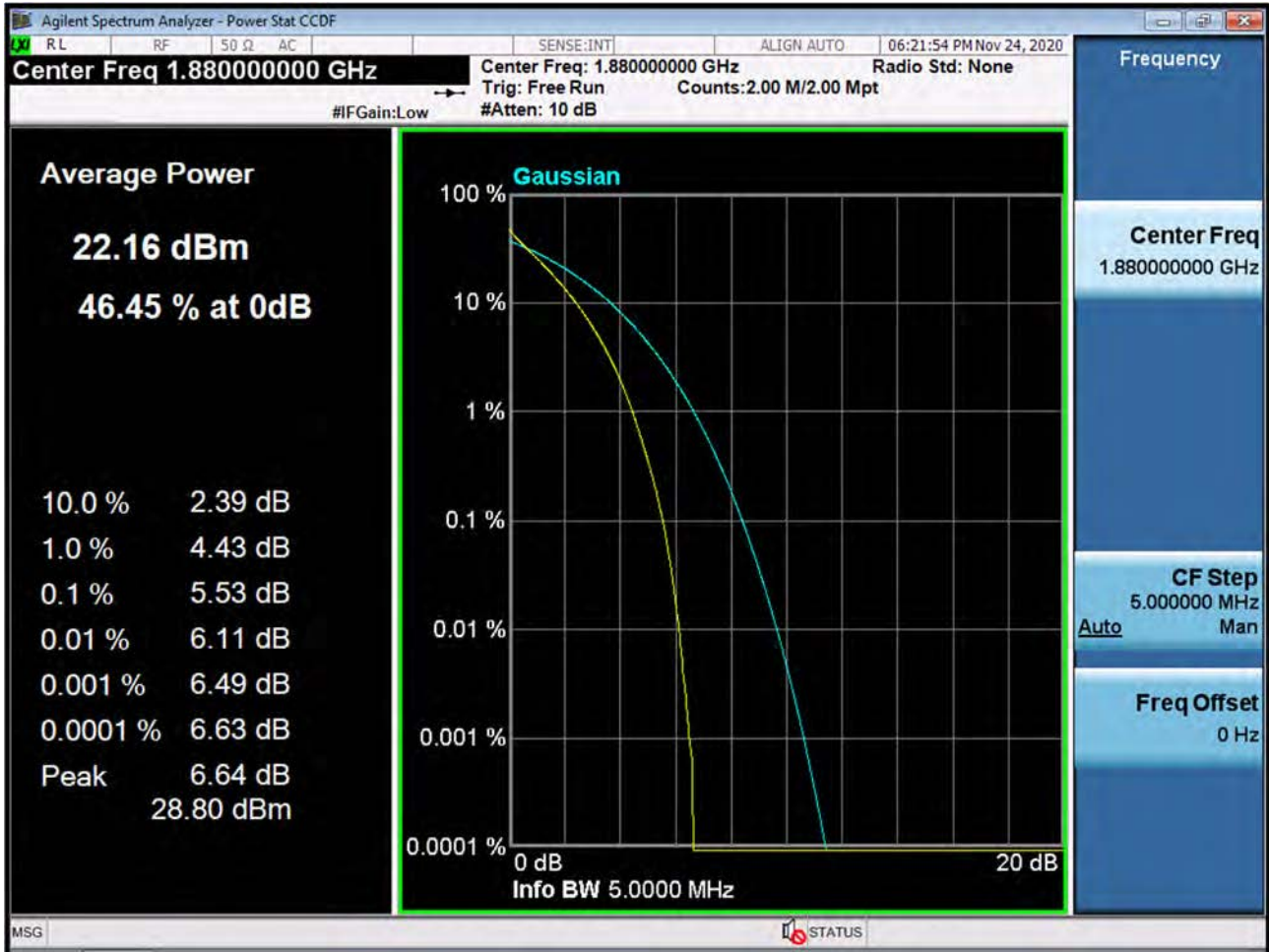


BAND 2. PAR Plot (3M BW Ch.18900 64QAM RB 15\_0)

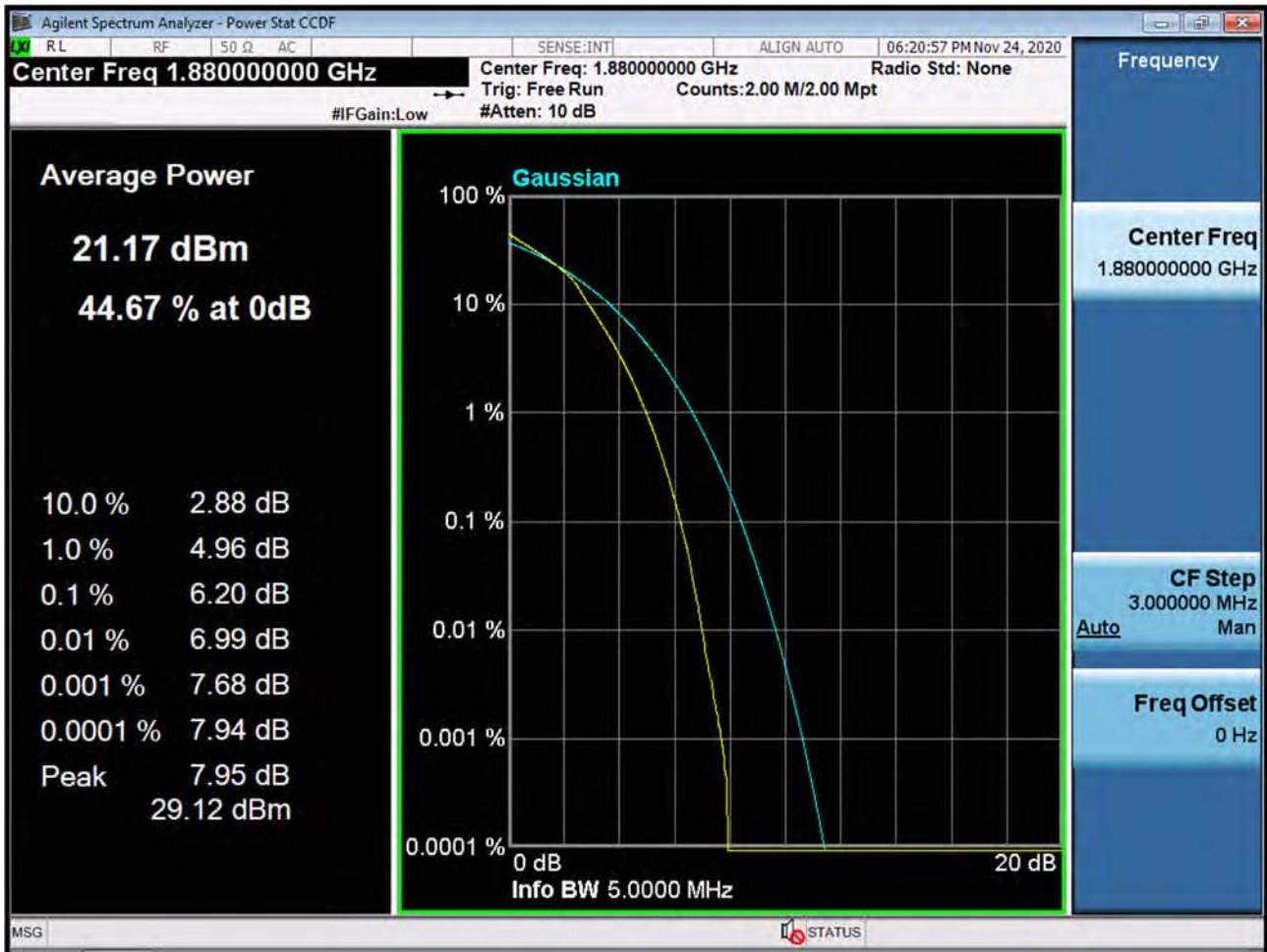




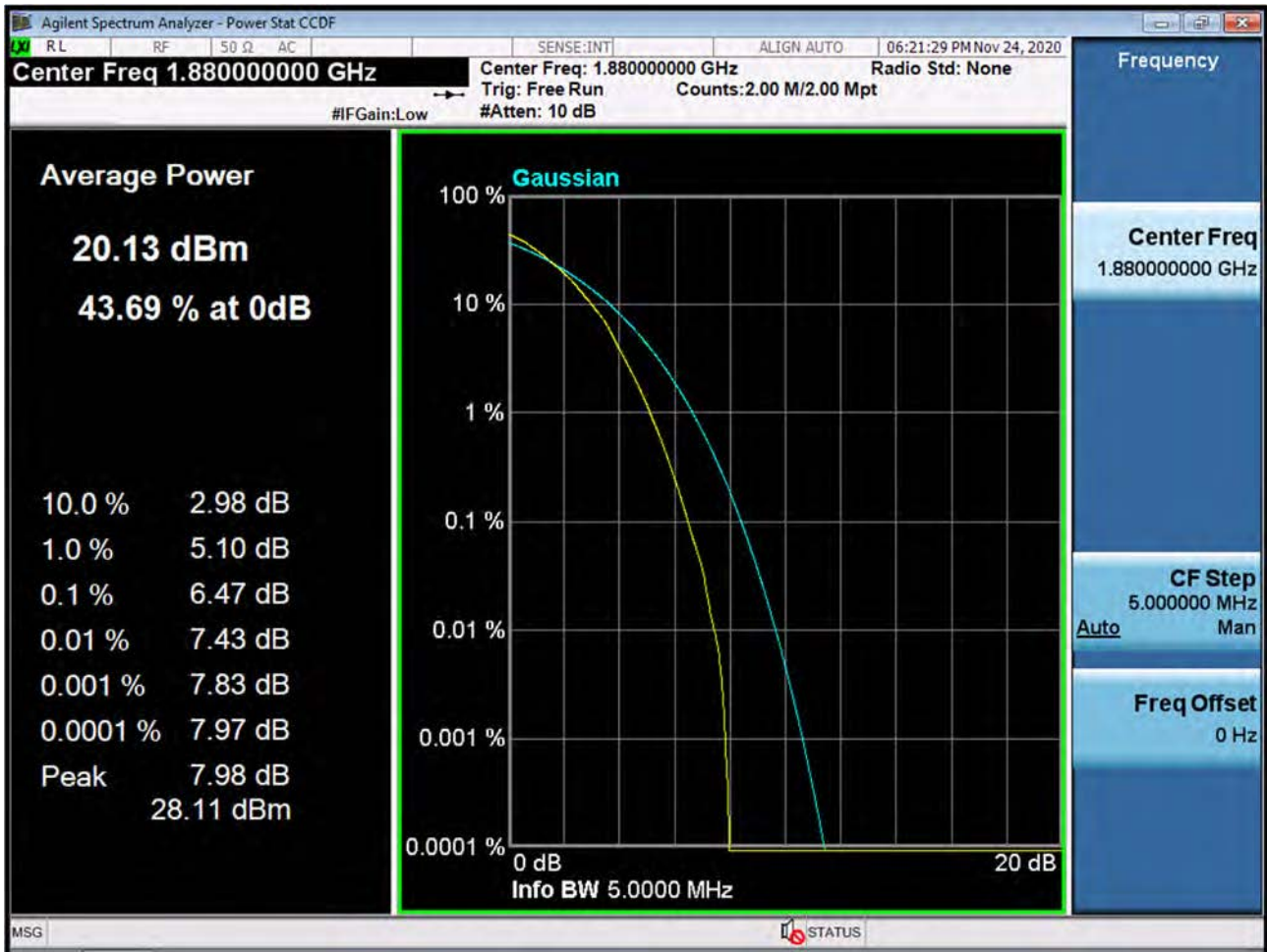
BAND 2. PAR Plot (5M BW Ch.18900 QPSK RB 25\_0)



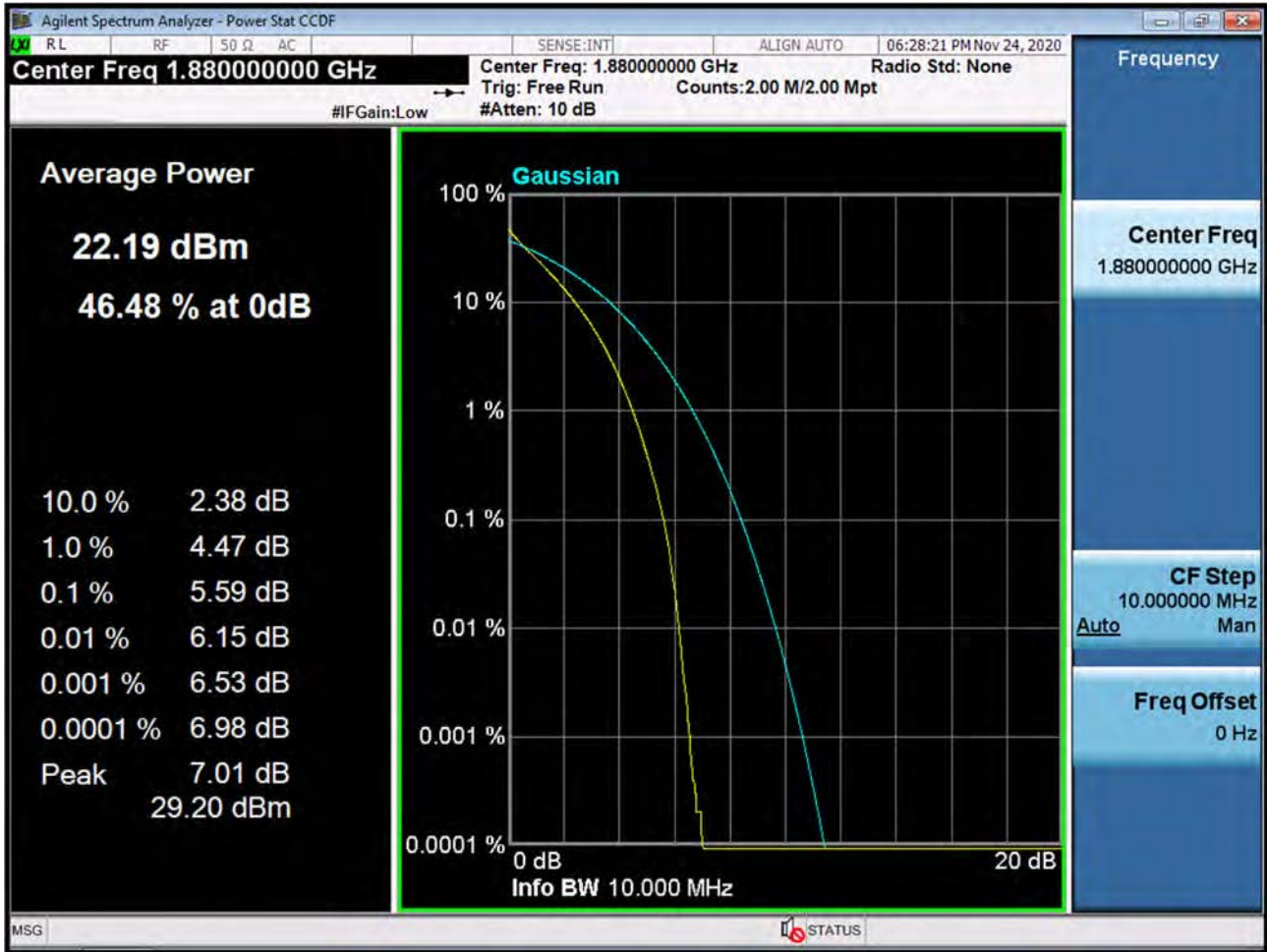
BAND 2. PAR Plot (5M BW Ch.18900 16QAM RB 25\_0)



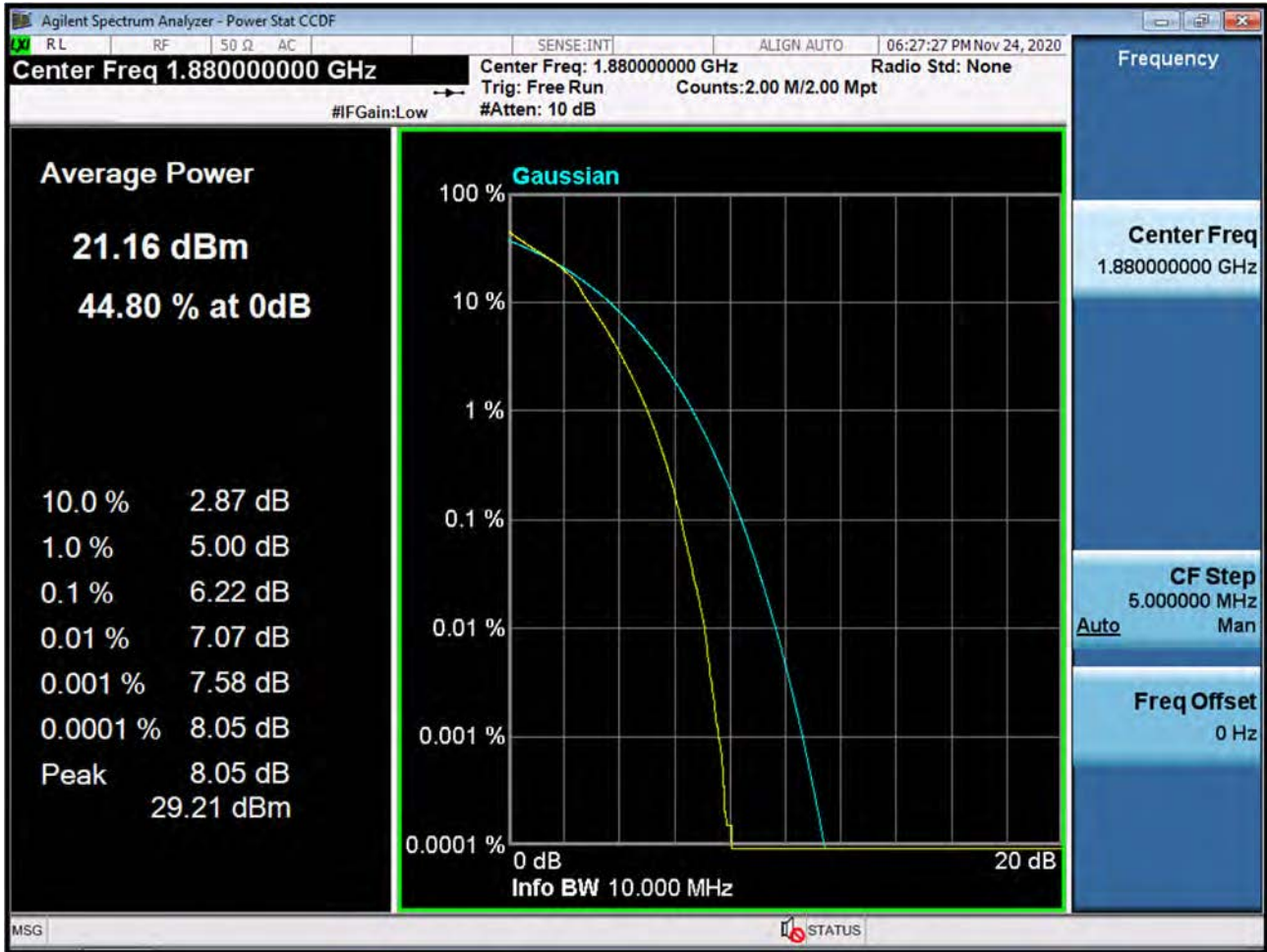
BAND 2. PAR Plot (5M BW Ch.18900 64QAM RB 25\_0)



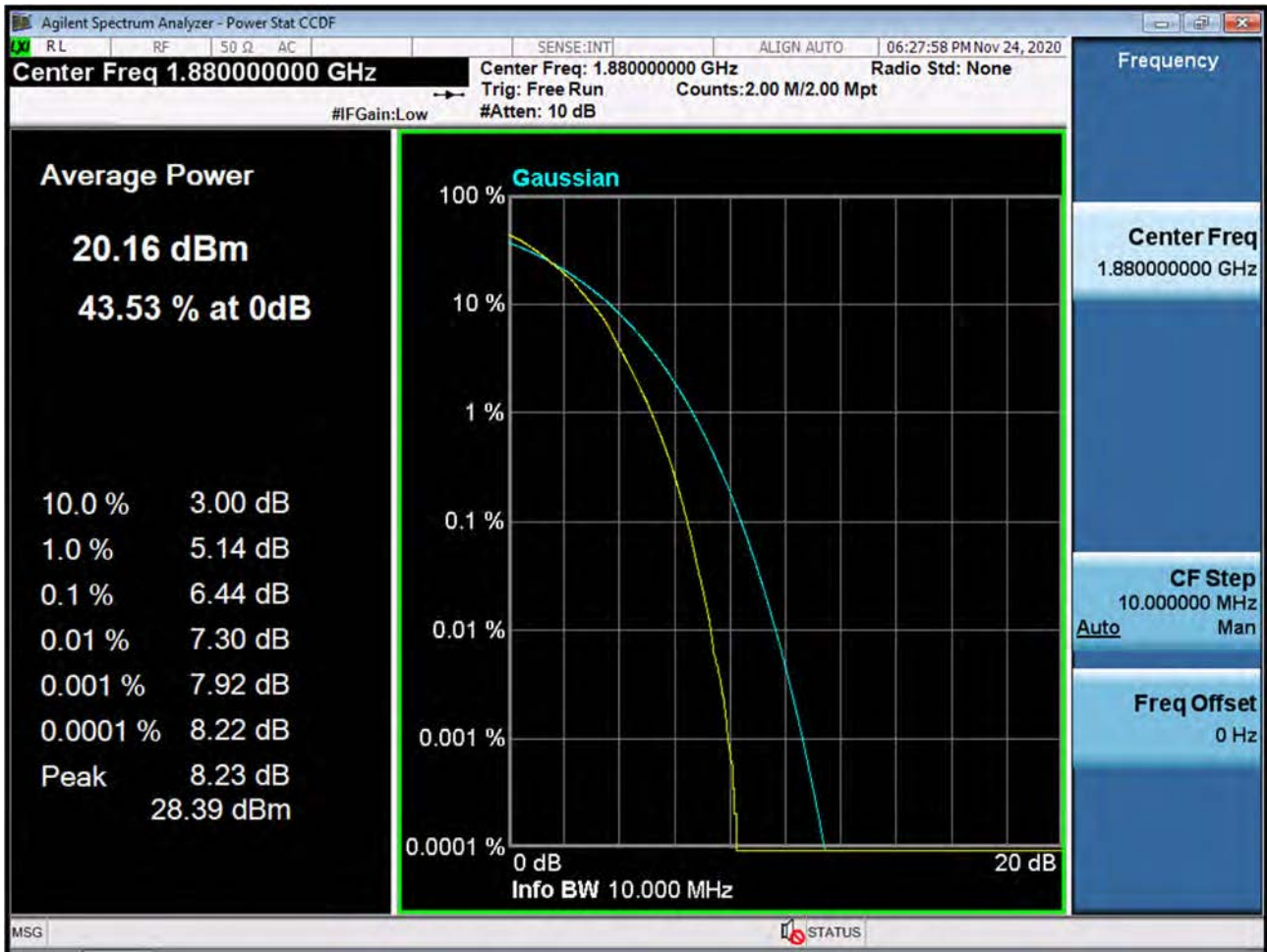
BAND 2. PAR Plot (10M BW Ch.18900 QPSK RB 50\_0)



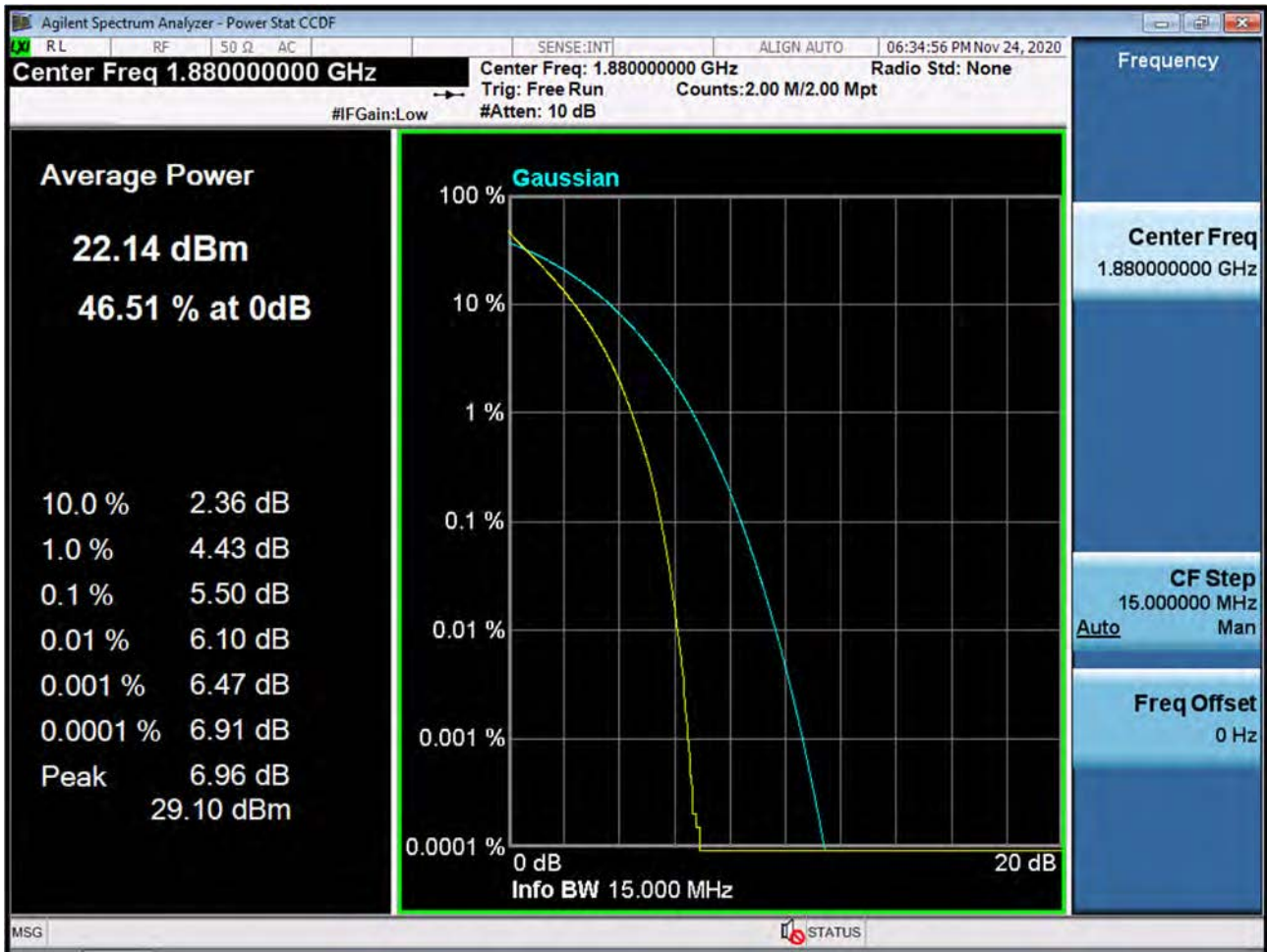
BAND 2. PAR Plot (10M BW Ch.18900 16QAM RB 50\_0)



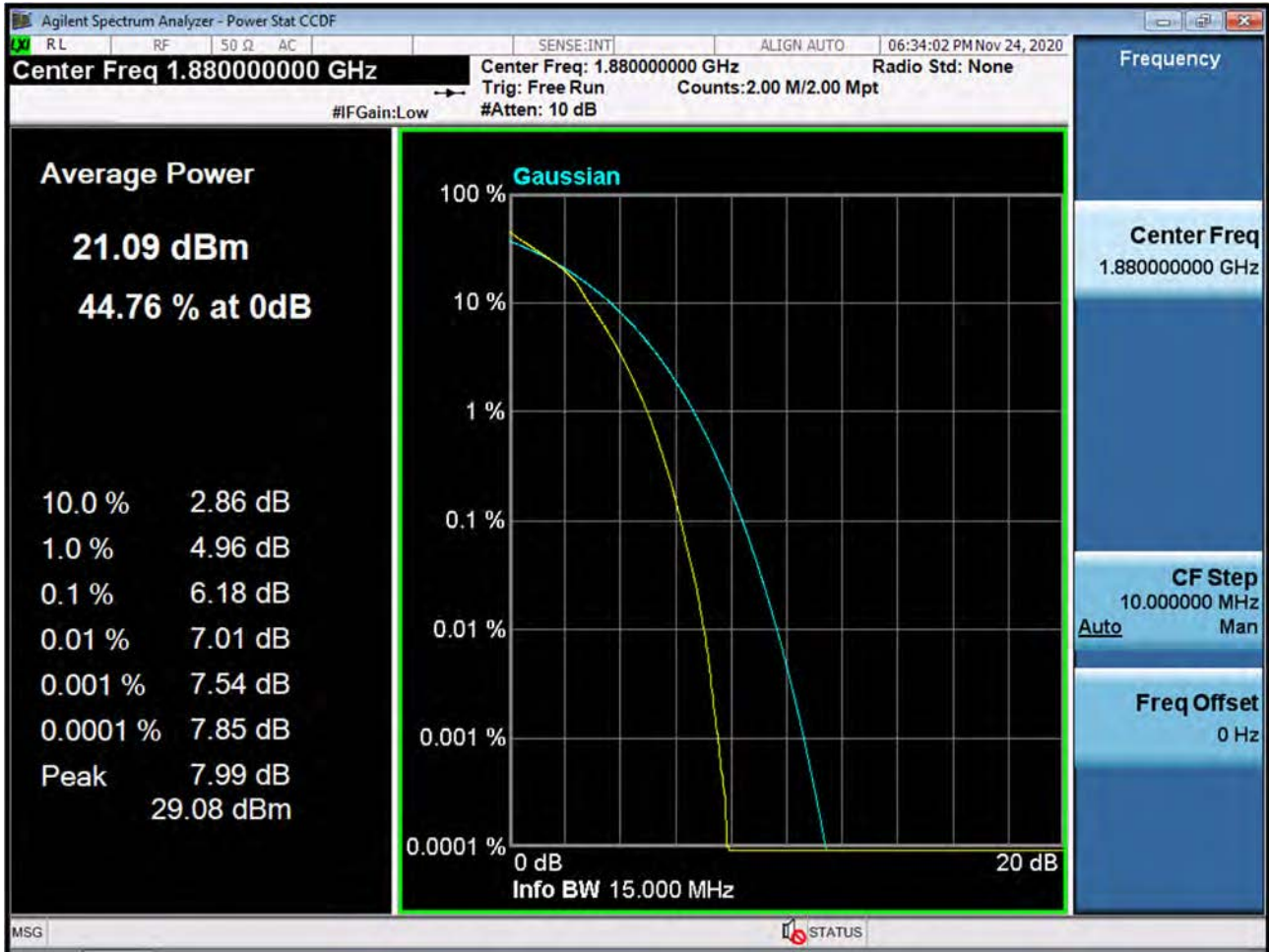
BAND 2. PAR Plot (10M BW Ch.18900 64QAM RB 50\_0)



BAND 2. PAR Plot (15M BW Ch.18900 QPSK RB 75\_0)

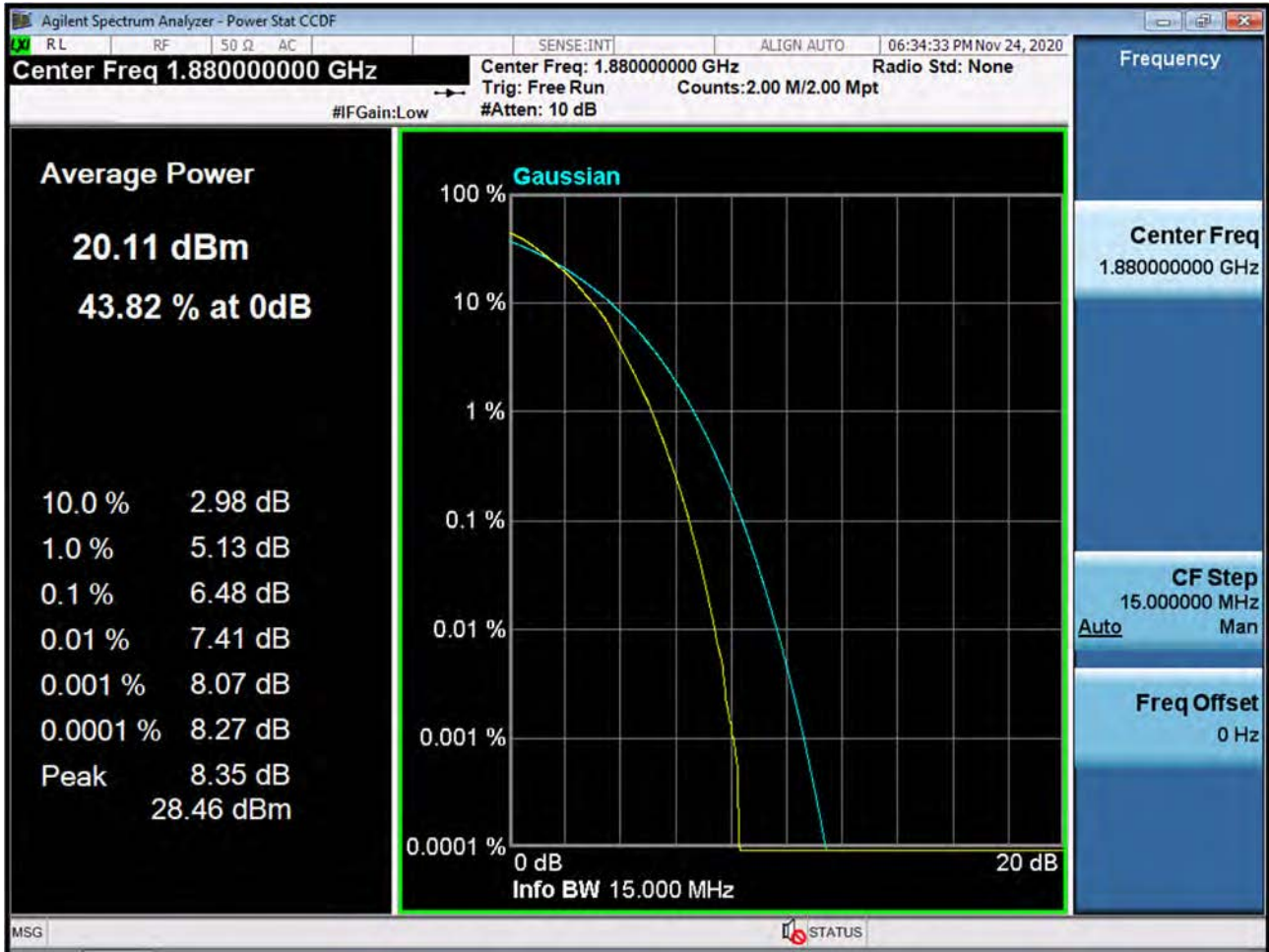


BAND 2. PAR Plot (15M BW Ch.18900 16QAM RB 75\_0)

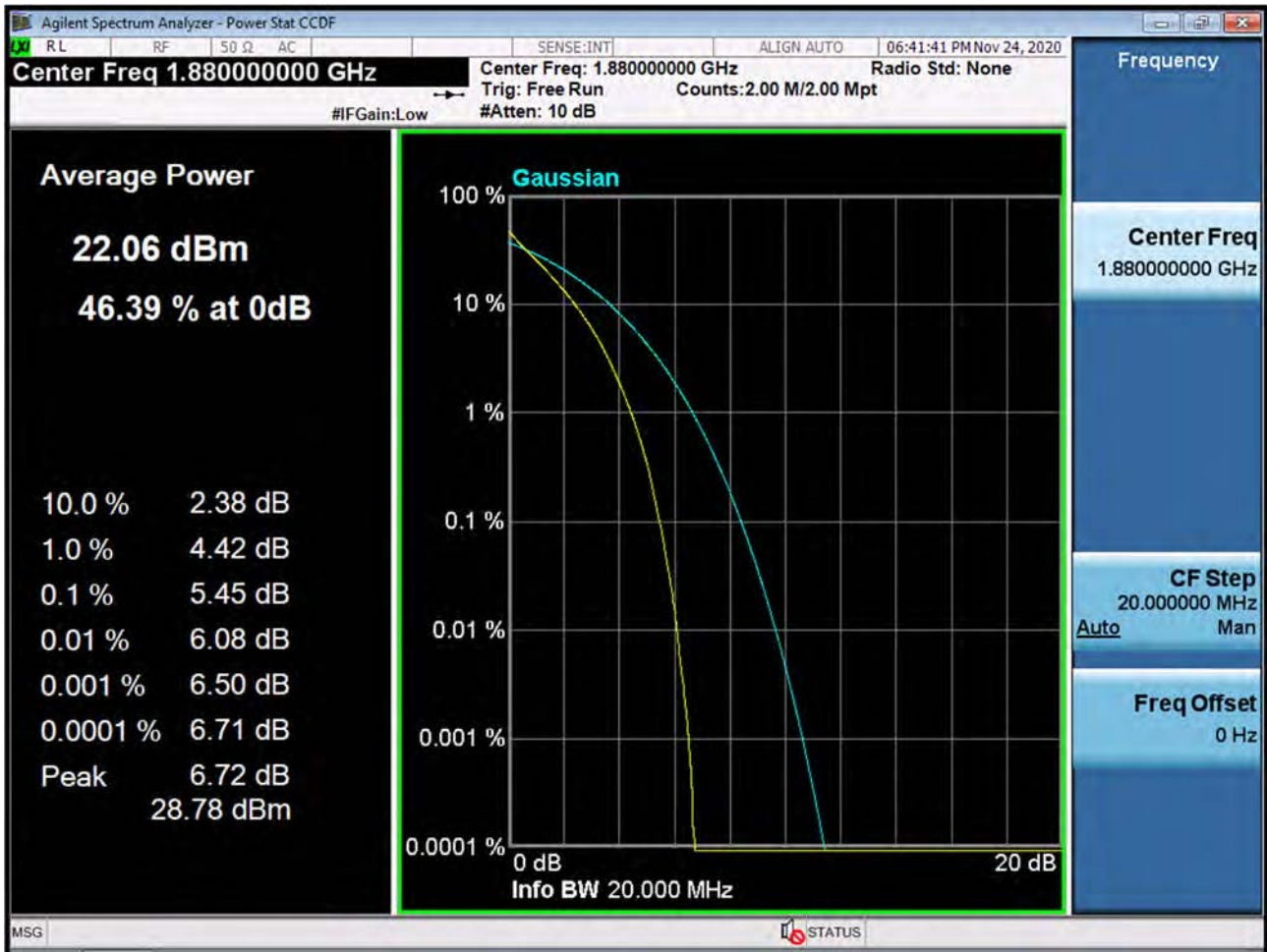




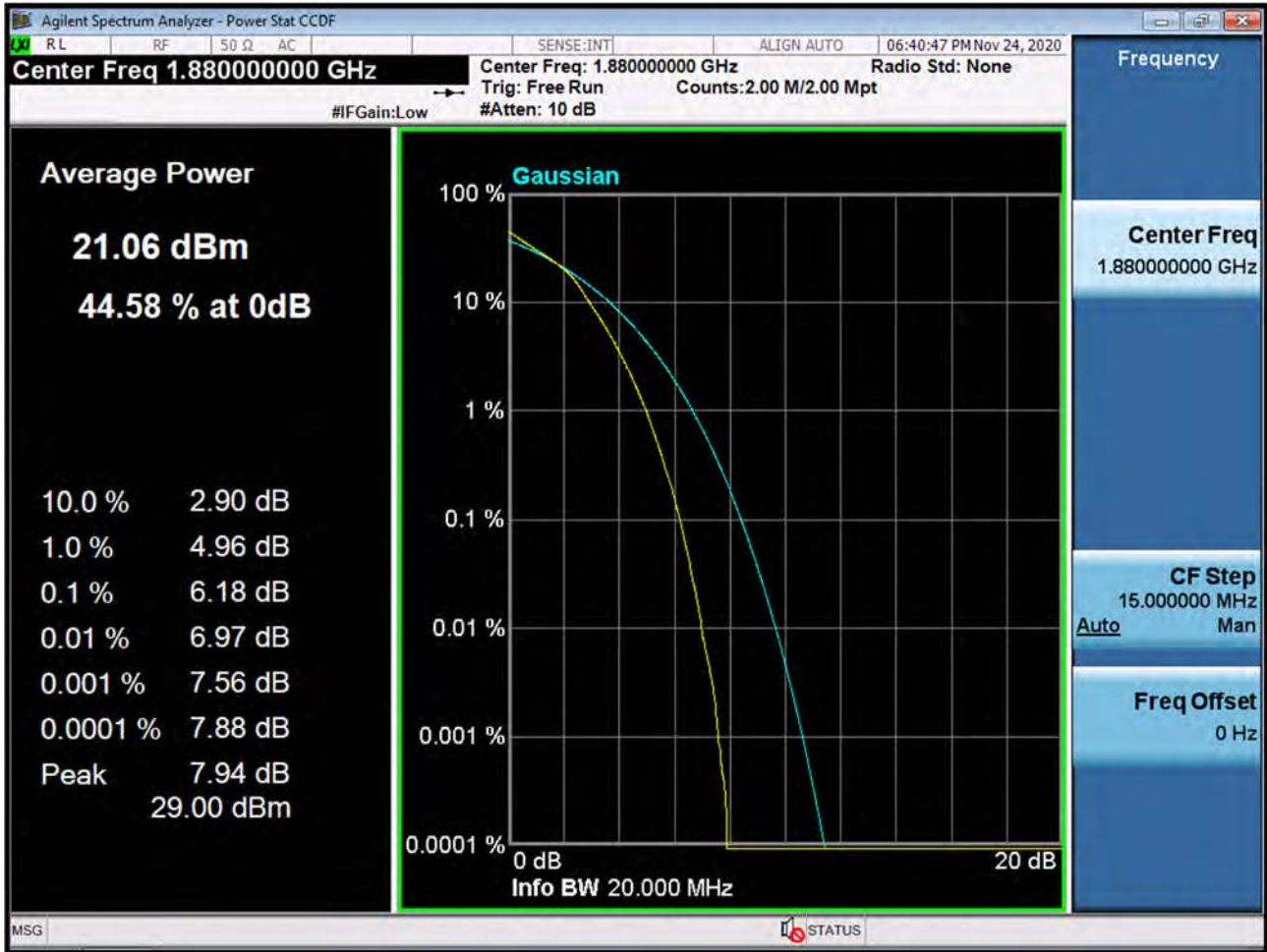
BAND 2. PAR Plot (15M BW Ch.18900 64QAM RB 75\_0)



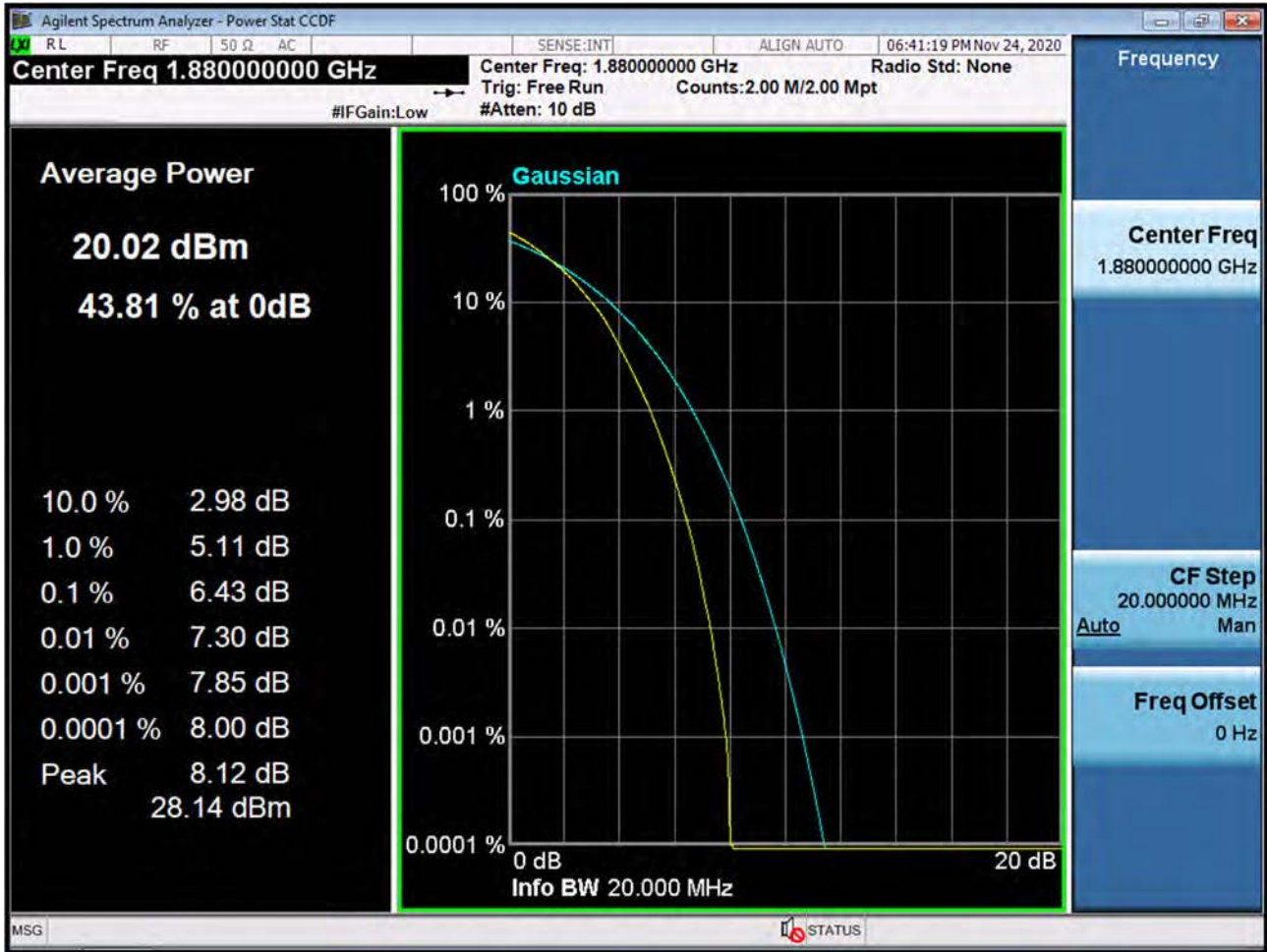
BAND 2. PAR Plot (20M BW Ch.18900 QPSK RB 100\_0)



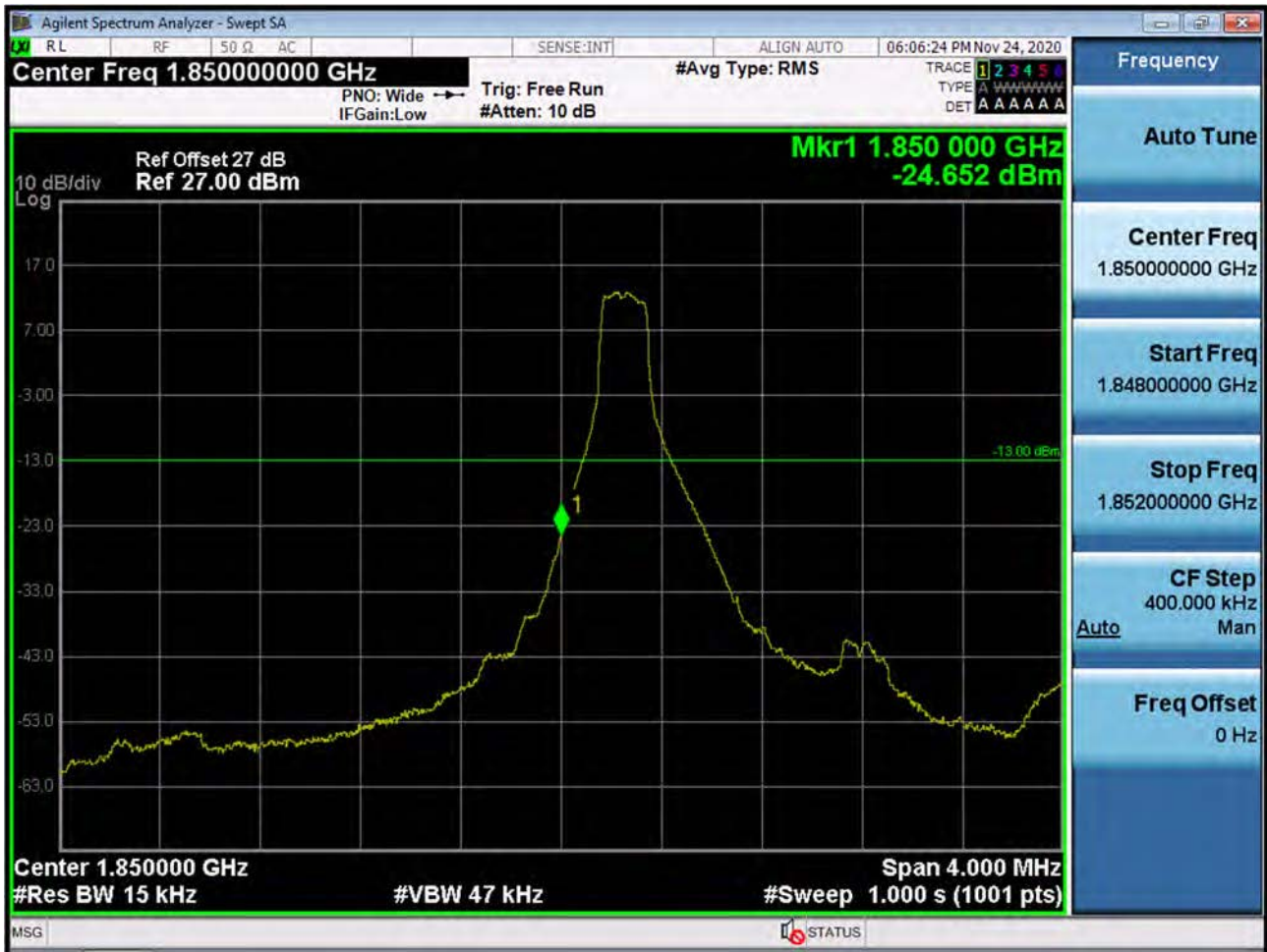
BAND 2. PAR Plot (20M BW Ch.18900 16QAM RB 100\_0)



BAND 2. PAR Plot (20M BW Ch.18900 64QAM RB 100\_0)



BAND 2. Lower Band Edge Plot (1.4M BW Ch.18607 QPSK\_RB1\_Offset 0) -1



BAND 2. Lower Band Edge Plot (1.4M BW Ch.18607 QPSK\_RB6\_Offset 0) -2



BAND 2. Lower Extended Band Edge Plot (1.4M BW Ch.18607 QPSK\_RB6\_0) -3



BAND 2. Lower Band Edge Plot (3M BW Ch.18615 QPSK\_RB1\_Offset 0) -1

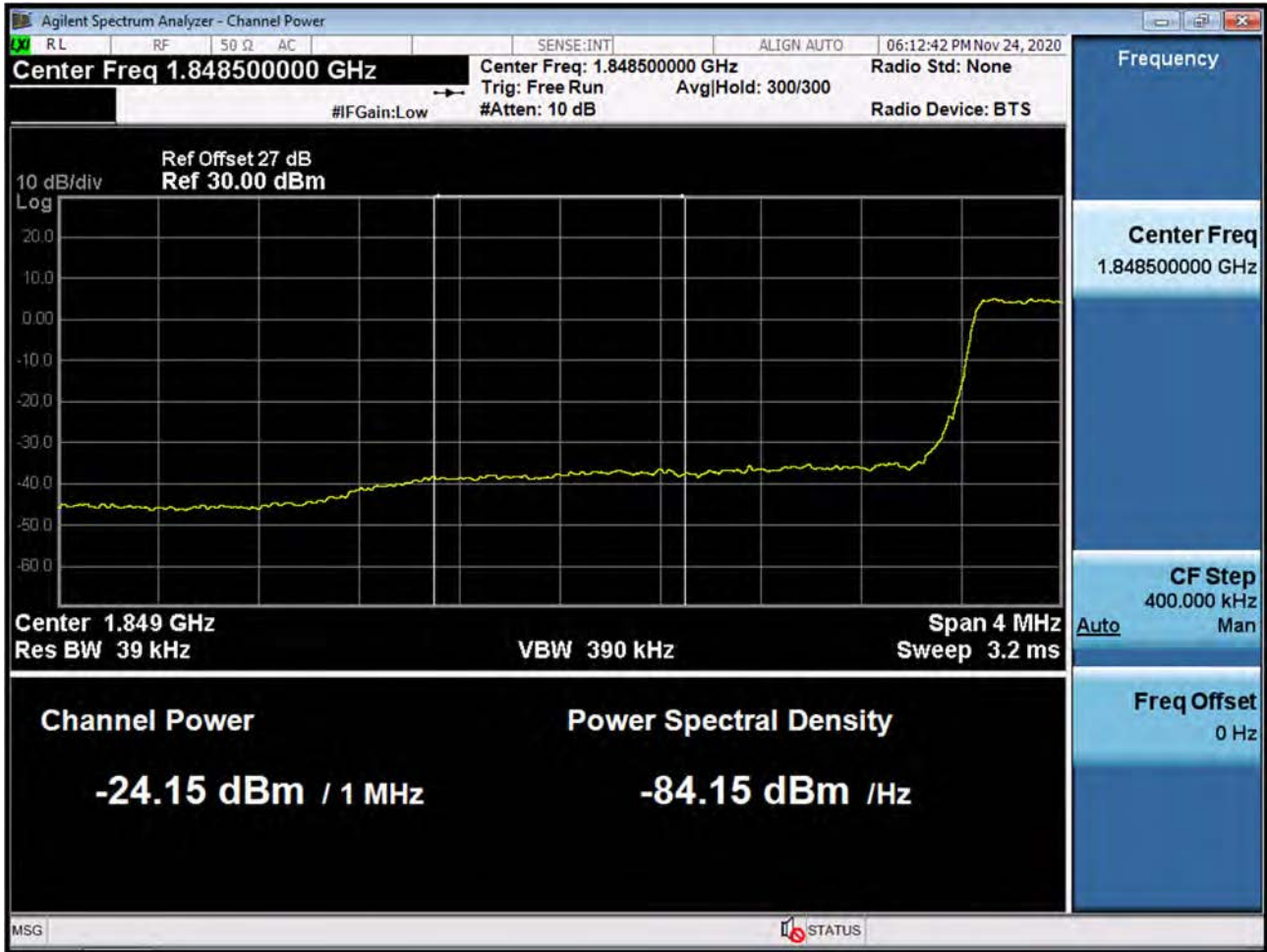




BAND 2. Lower Band Edge Plot (3M BW Ch.18615 QPSK\_RB15\_Offset 0) -2



BAND 2. Lower Extended Band Edge Plot (3M BW Ch.18615 QPSK\_RB15\_0) -3

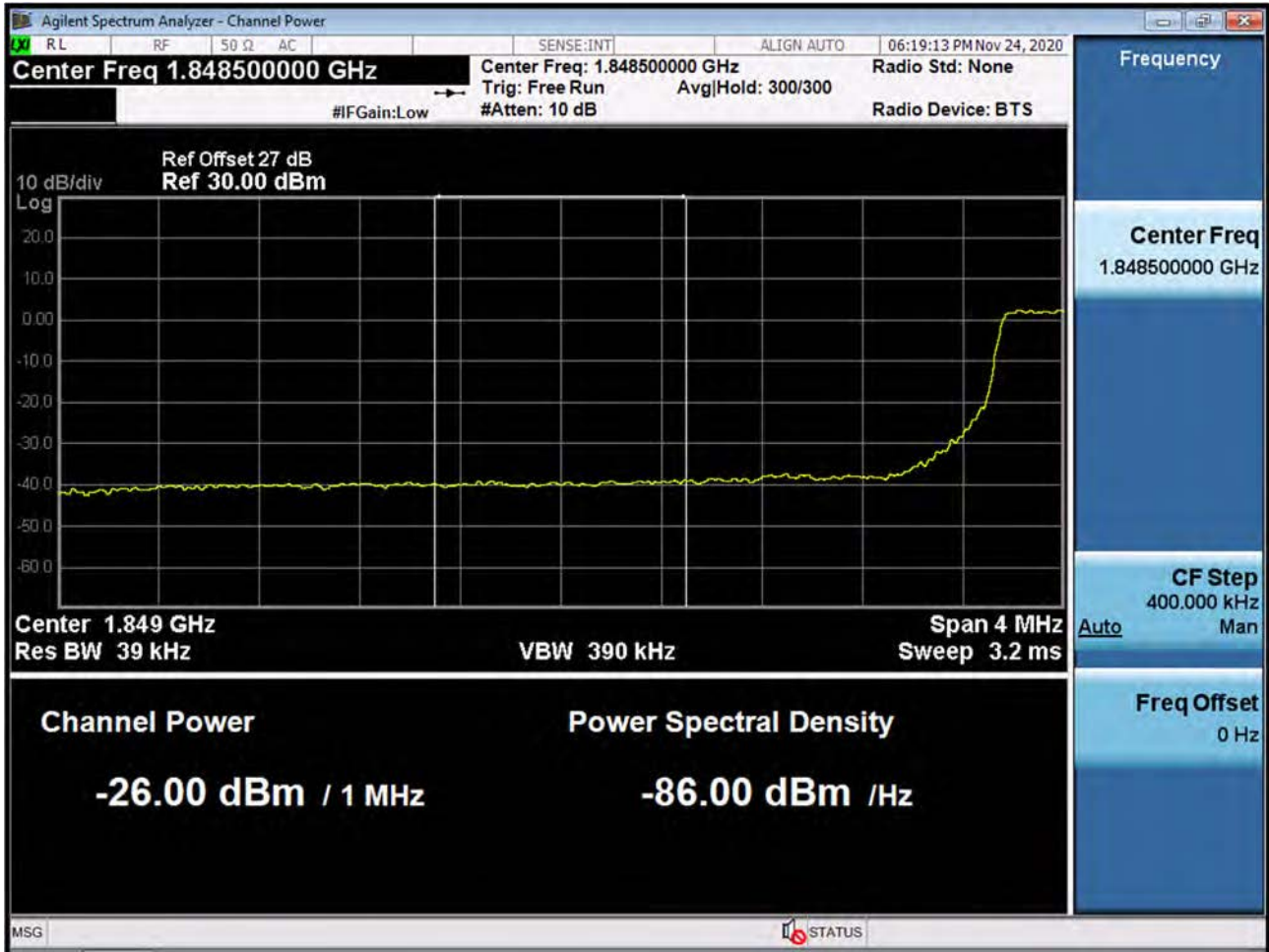




BAND 2. Lower Band Edge Plot (5M BW Ch.18625 QPSK\_RB25\_Offset 0) -2



BAND 2. Lower Extended Band Edge Plot (5M BW Ch.18625 QPSK\_RB25\_0) -3



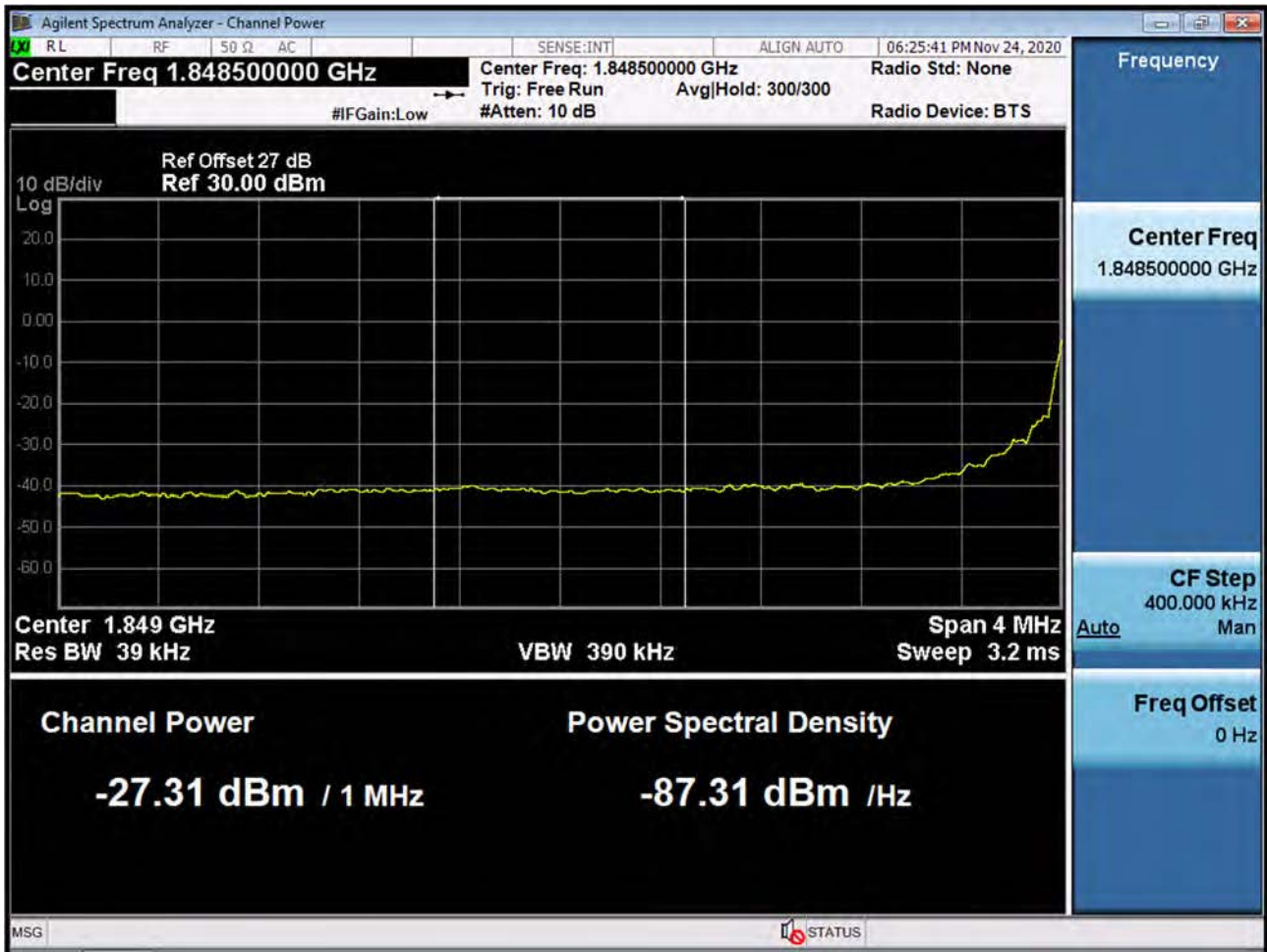
BAND 2. Lower Band Edge Plot (10M BW Ch.18650 QPSK\_RB1\_Offset 0) -1



BAND 2. Lower Band Edge Plot (10M BW Ch.18650 QPSK\_RB50\_Offset 0) -2

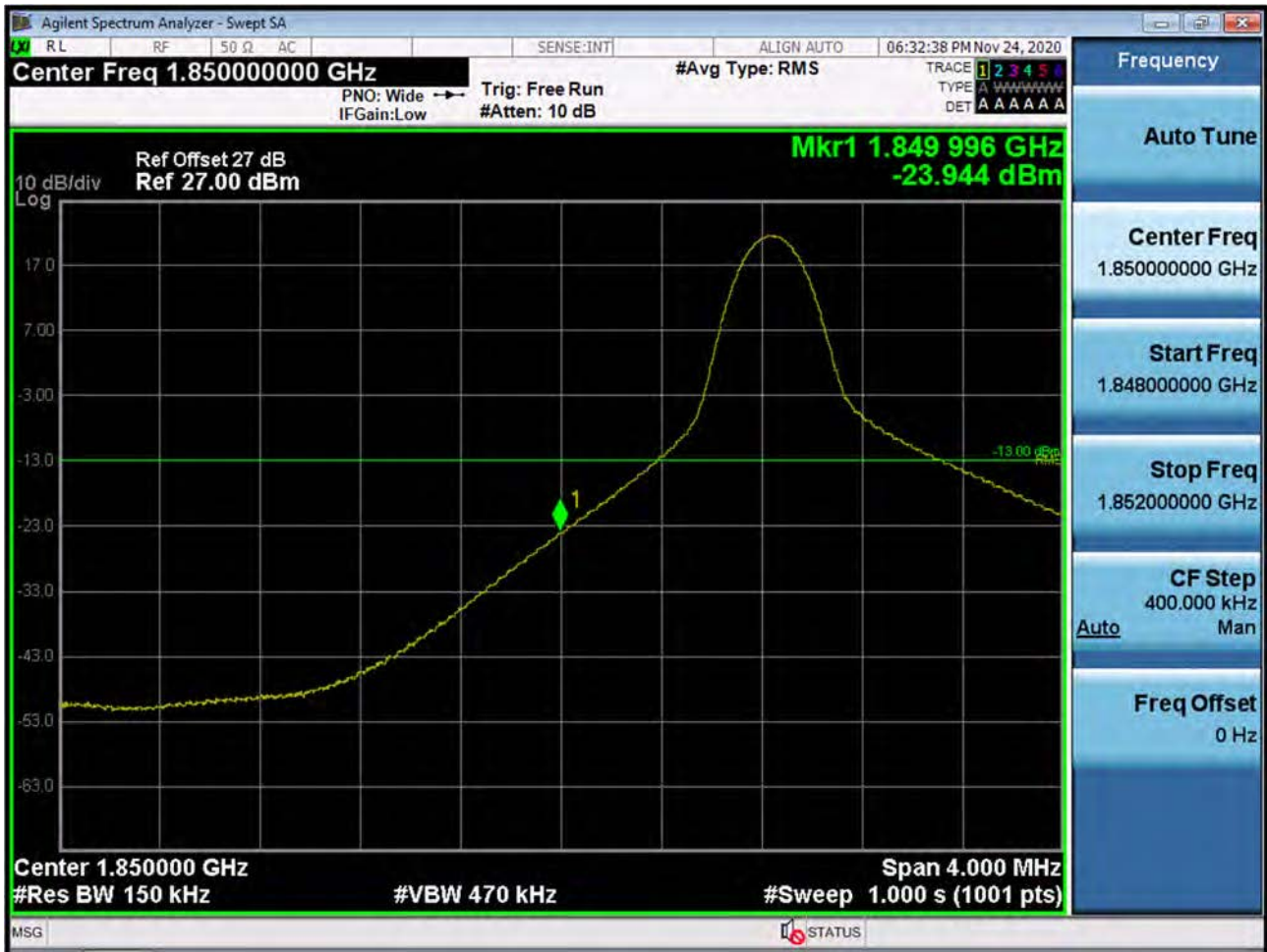


BAND 2. Lower Extended Band Edge Plot (10M BW Ch.18650 QPSK\_RB50\_0) -3





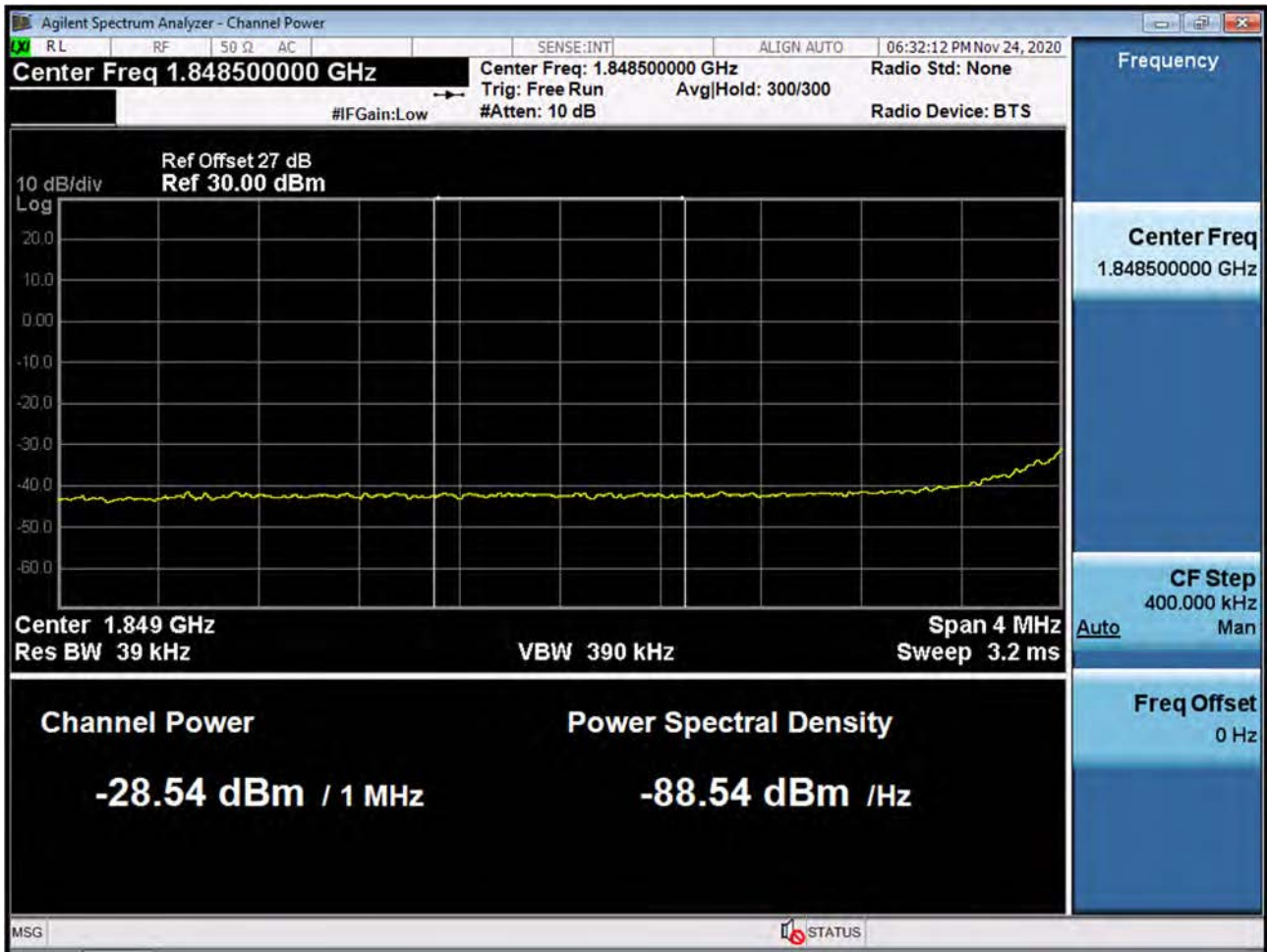
BAND 2. Lower Band Edge Plot (15M BW Ch.18675 QPSK\_RB75\_Offset 0) -1



BAND 2. Lower Band Edge Plot (15M BW Ch.18675 QPSK\_RB75\_Offset 0) -2



BAND 2. Lower Extended Band Edge Plot (15M BW Ch.18675 QPSK\_RB75\_0) -3



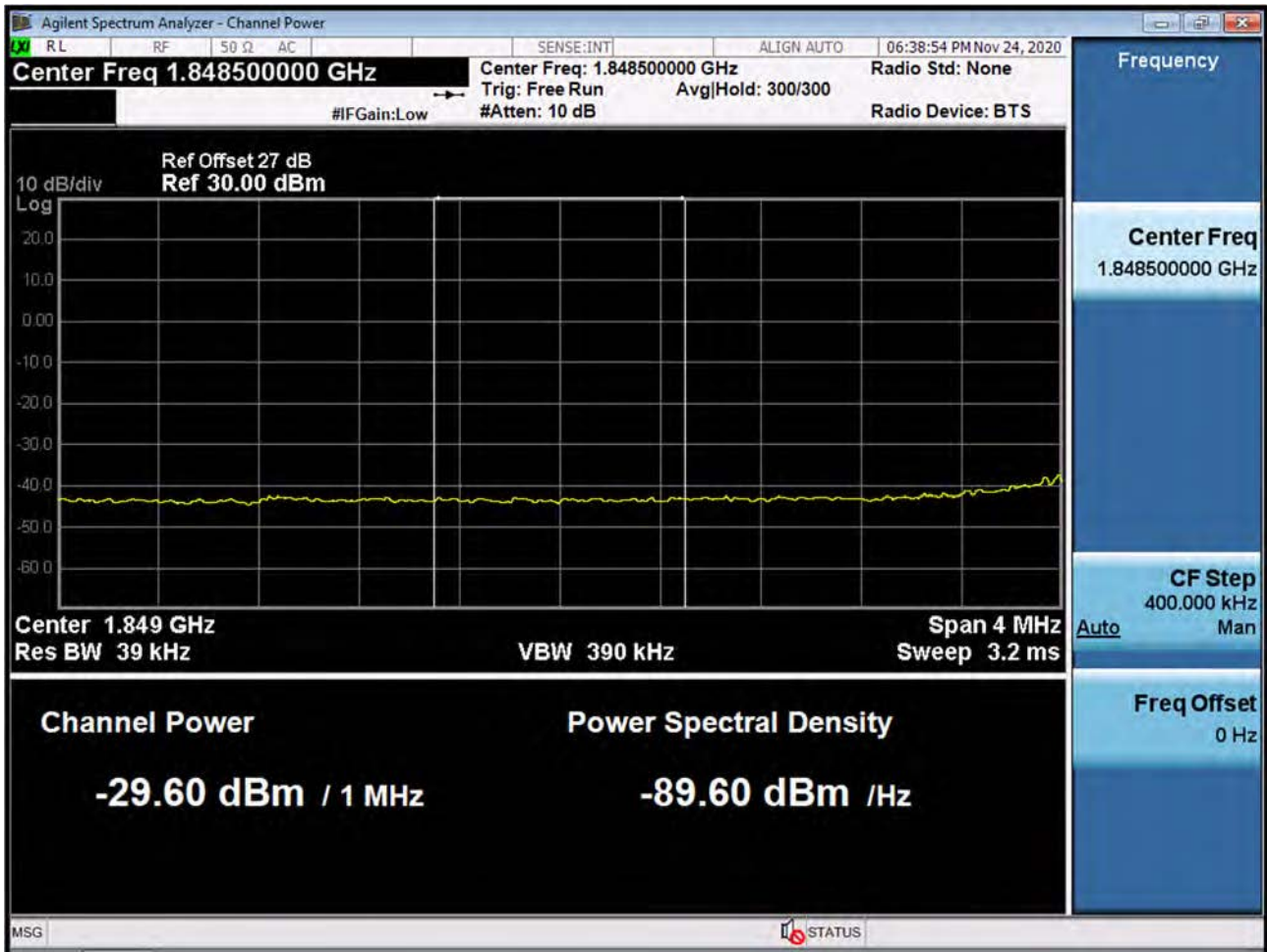
BAND 2. Lower Band Edge Plot (20M BW Ch.18700 QPSK\_RB1\_Offset 0) -1



BAND 2. Lower Band Edge Plot (20M BW Ch.18700 QPSK\_RB100\_Offset 0) -2



BAND 2. Lower Extended Band Edge Plot (20M BW Ch.18700 QPSK\_RB100\_0) -3



BAND 2. Upper Band Edge Plot (1.4M BW Ch.19193 QPSK\_RB1\_Offset 5) -1



BAND 2. Upper Band Edge Plot (1.4M BW Ch.19193 QPSK\_RB6\_Offset 0) -2





BAND 2. Upper Extended Band Edge Plot (1.4M BW Ch.19193 QPSK\_RB6\_0) -3

