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# 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:**
February 28, 2019

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

**Report No.:** HCT-RF-1902-FC034-R1

| | |
|---|---|
| **FCC ID:** | **A3LSMT515** |
| **APPLICANT:** | **SAMSUNG Electronics Co., Ltd.** |

**Model(s):** SM-T515
**Additional Model(s):** SM-T515N, SM-T517
**EUT Type:** Tablet
**FCC Classification:** PCS Licensed Transmitter (PCB)
**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 | 1M09G7D | QPSK | 0.214 | 23.30 |
| | | 1M10W7D | 16QAM | 0.154 | 21.87 |
| LTE – Band2 (3) | 1851.5 - 1908.5 | 2M71G7D | QPSK | 0.216 | 23.35 |
| | | 2M71W7D | 16QAM | 0.167 | 22.22 |
| LTE – Band2 (5) | 1852.5 - 1907.5 | 4M52G7D | QPSK | 0.228 | 23.58 |
| | | 4M52W7D | 16QAM | 0.177 | 22.47 |
| LTE – Band2 (10) | 1855.0 - 1905.0 | 8M99G7D | QPSK | 0.213 | 23.28 |
| | | 9M01W7D | 16QAM | 0.162 | 22.08 |
| LTE – Band2 (15) | 1857.5 - 1902.5 | 13M5G7D | QPSK | 0.195 | 22.91 |
| | | 13M5W7D | 16QAM | 0.148 | 21.71 |
| LTE – Band2 (20) | 1860.0 - 1900.0 | 18M0G7D | QPSK | 0.207 | 23.16 |
| | | 17M9W7D | 16QAM | 0.156 | 21.93 |

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

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

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# Version

| TEST REPORT NO. | DATE | DESCRIPTION |
|---|---|---|
| HCT-RF-1902-FC034 | February 22, 2019 | - First Approval Report |
| HCT-RF-1902-FC034-R1 | February 28, 2019 | - Modified Equipment Class |
| | | |
| | | |

# Table of Contents

1. GENERAL INFORMATION ..... 4
2. INTRODUCTION ..... 5
2.1. DESCRIPTION OF EUT ..... 5
2.2. MEASURING INSTRUMENT CALIBRATION ..... 5
2.3. TEST FACILITY ..... 5
3. DESCRIPTION OF TESTS ..... 6
3.1 TEST PROCEDURE ..... 6
3.2 RADIATED POWER ..... 7
3.3 RADIATED SPURIOUS EMISSIONS ..... 8
3.4 PEAK- TO- AVERAGE RATIO ..... 9
3.5 OCCUPIED BANDWIDTH. ..... 11
3.6 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL ..... 12
3.7 BAND EDGE ..... 13
3.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE ..... 14
3.8 WORST CASE(RADIATED TEST) ..... 15
3.9 WORST CASE(CONDUCTED TEST) ..... 16
4. LIST OF TEST EQUIPMENT ..... 17
5. MEASUREMENT UNCERTAINTY ..... 18
6. SUMMARY OF TEST RESULTS ..... 19
7. SAMPLE CALCULATION ..... 20
8. TEST DATA ..... 22
8.1 EQUIVALENT ISOTROPIC RADIATED POWER ..... 22
8.2 RADIATED SPURIOUS EMISSIONS ..... 25
8.3 PEAK-TO-AVERAGE RATIO ..... 31
8.4 OCCUPIED BANDWIDTH ..... 32
8.5 CONDUCTED SPURIOUS EMISSIONS ..... 33
8.6 BAND EDGE ..... 33
8.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE ..... 34
9. TEST PLOTS ..... 52
10. APPENDIX A_ TEST SETUP PHOTO ..... 149

# 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:** | A3LSMT515 |
| **Application Type:** | Certification |
| **FCC Classification:** | PCS Licensed Transmitter (PCB) |
| **FCC Rule Part(s):** | §24, §2 |
| **EUT Type:** | Tablet |
| **Additional Model(s):** | SM-T515 |
| **Model(s):** | SM-T515N, SM-T517 |
| **Tx Frequency:** | 1850.7 MHz – 1909.3 MHz (LTE – Band2 (1.4 MHz))<br>1851.5 MHz – 1908.5 MHz (LTE – Band2 (3 MHz))<br>1852.5 MHz – 1907.5 MHz (LTE – Band2 (5 MHz))<br>1855.0 MHz – 1905.0 MHz (LTE – Band2 (10 MHz))<br>1857.5 MHz – 1902.5 MHz (LTE – Band2 (15 MHz))<br>1860.0 MHz – 1900.0 MHz (LTE – Band2 (20 MHz)) |
| **Date(s) of Tests:** | February 02, 2019 ~ February 18, 2019 |

# 2. INTRODUCTION

### 2.1. DESCRIPTION OF EUT

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

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

### 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<br>- ANSI C63.26-2015 – Section 5.4.4 |
| Band Edge | - KDB 971168 D01 v03r01 – Section 6.0<br>- ANSI C63.26-2015 – Section 5.7 |
| Spurious and Harmonic Emissions at Antenna Terminal | - KDB 971168 D01 v03r01 – Section 6.0<br>- 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<br>- ANSI C63.26-2015 – Section 5.2.3.4<br>- ANSI C63.26-2015 – Section 5.2.6(only GSM) |
| Frequency stability | - ANSI C63.26-2015 – Section 5.6 |
| Effective Radiated Power/<br>Effective Isotropic Radiated Power | - KDB 971168 D01 v03r01 – Section 5.2 & 5.8<br>- ANSI C63.26-2015 – Section 5.2<br>- ANSI/TIA-603-E-2016 – Section 2.2.17 |
| Radiated Spurious and Harmonic Emissions | - KDB 971168 D01 v03r01 – Section 6.2<br>- ANSI/TIA-603-E-2016 – Section 2.2.12 |

## 3.2 RADIATED POWER

**Test Overview**

Radiated tests are performed in the Fully-anechoic chamber.

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

**Test Settings**

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW ≥ 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points > 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

**Test Note**

1. The turntable is rotated through 360 degrees, and the receiving antenna scans in order to determine the level of the maximized emission.
2. A half wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated.

   The power is calculated by the following formula;

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

   Where: $P_d$ is the dipole equivalent power and $P_g$ is the generator output power into the substitution antenna.
3. The maximum value is calculated by adding the forward power to the calibrated source plus its appropriate gain value.

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

### 3.3 RADIATED SPURIOUS EMISSIONS

**Test Overview**

Radiated tests are performed in the Fully-anechoic chamber.

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

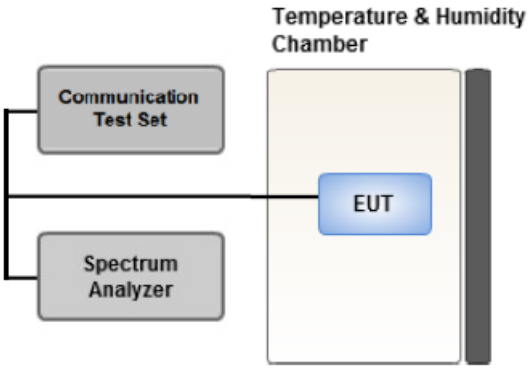
**Test Settings**

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

**Test Note**

1. Measurements value show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
2. The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
   The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the test data

### 3.4 PEAK- TO- AVERAGE RATIO




**Test setup**

① **CCDF Procedure for PAPR**

**Test Settings**

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

**② Alternate Procedure for PAPR**

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

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

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

**Test Settings(Peak Power)**

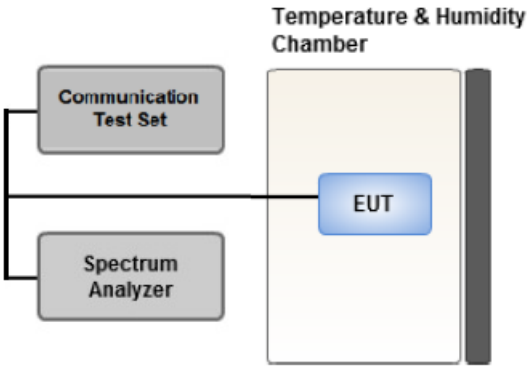
The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW ≥ 3 × RBW.

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

**Test Settings(Average Power)**

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

### 3.5 OCCUPIED BANDWIDTH.




**Test setup**

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

The EUT makes a call to the communication simulator.

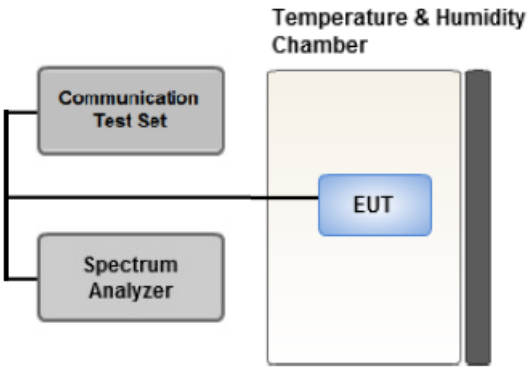
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

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

**Test Settings**

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

### 3.6 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL




**Test setup**

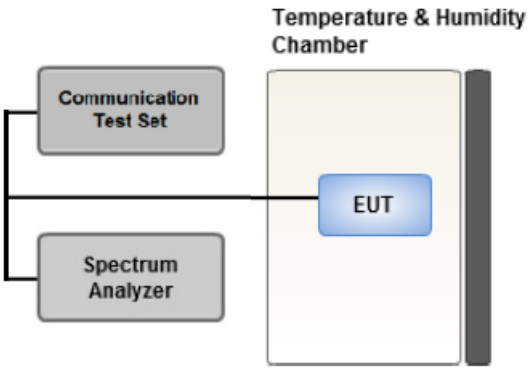
**Test Overview**

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

**Test Settings**

1. RBW = 1 MHz
2. VBW ≥ 3 MHz
3. Detector = Peak
4. Trace Mode = max hold
5. Sweep time = auto
6. Number of points in sweep ≥ 2 * Span / RBW

### 3.7 BAND EDGE




**Test setup**

**Test Overview**

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

**Test Settings**

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW > 1% of the emission bandwidth
4. VBW > 3 x RBW
5. Detector = RMS
6. Number of sweep points ≥ 2 x Span/RBW
7. Trace mode = trace average
8. Sweep time = auto couple
9. The trace was allowed to stabilize

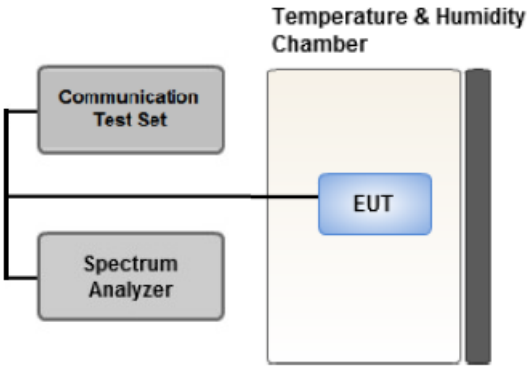
**Test Notes**

According to FCC 22.917, 24.238, 27.53 specified that power of any emission outside of The authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

All measurements were done at 2 channels(low and high operational frequency range.)

The band edge measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

### 3.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE




**Test setup**

**Test Overview**

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.26-2015.

The frequency stability of the transmitter is measured by:

1. Temperature:
   The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.
2. Primary Supply Voltage:
   .- Unless otherwise specified, vary primary supply voltage from 85% to 115% of the nominal value for other than hand carried battery equipment.
   .- For hand carried, battery powered equipment, reduce the primary ac or dc supply voltage to the battery operating end point, which shall be specified by the manufacturer.

**Test Settings**

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a “standby” condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

### 3.8 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.
- The worst case is reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the test data.
- Please refer to the table below.

[ Worst case ]

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

**Note:**

- SM-T515 & additional models were tested and the worst case results are reported.

(Worst case : SM-T515)

### 3.9 WORST CASE(CONDUCTED TEST)

[ Worst case ]

| Test Description | Modulation | Bandwidth (MHz) | Frequency | RB size | RB offset |
|---|---|---|---|---|---|
| Occupied Bandwidth | QPSK, 16QAM | 1.4, 3, 5, 10, 15, 20 | Low, Mid, High | 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 |
| Channel Edge | * QPSK | 1.4, 3, 5, 10, 15, 20 | Low, Mid, 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.

**Note:**

- SM-T515 & additional models were tested and the worst case results are reported.

(Worst case : SM-T515)

# 4. LIST OF TEST EQUIPMENT

| Manufacture | Model/ Equipment | Serial Number | Calibration Date | Calibration Interval | Calibration Due |
|---|---|---|---|---|---|
| REOHDE & SCHWARZ | SCU 18 / AMPLIFIER | 10094 | 04/17/2018 | Annual | 04/17/2019 |
| Wainwright | WHK1.2/15G-10EF/H.P.F | 4 | 04/04/2018 | Annual | 04/04/2019 |
| Wainwright | WHK3.3/18G-10EF/H.P.F | 2 | 04/04/2018 | Annual | 04/04/2019 |
| Hewlett Packard | 11667B / Power Splitter(DC~26.5 GHz) | 5001 | 06/07/2018 | Annual | 06/07/2019 |
| Agilent | E3632A/DC Power Supply | KR75303243 | 05/09/2018 | Annual | 05/09/2019 |
| Schwarzbeck | UHAP/ Dipole Antenna | 557 | 03/31/2017 | Biennial | 03/31/2019 |
| Schwarzbeck | UHAP/ Dipole Antenna | 558 | 03/31/2017 | Biennial | 03/31/2019 |
| ESPEC | SU-642 / Chamber | 93000718 | 08/07/2018 | Annual | 08/07/2019 |
| Schwarzbeck | BBHA 9120D/ Horn Antenna(1~18GHz) | 147 | 09/14/2018 | Annual | 09/14/2019 |
| Schwarzbeck | BBHA 9120D/ Horn Antenna(1~18GHz) | 9120D-1298 | 10/04/2018 | Annual | 10/04/2019 |
| Schwarzbeck | BBHA 9170/ Horn Antenna(15~40GHz) | BBHA9170342 | 04/25/2017 | Biennial | 04/25/2019 |
| Schwarzbeck | BBHA 9170/ Horn Antenna(15~40GHz) | BBHA9170124 | 04/25/2017 | Biennial | 04/25/2019 |
| Agilent | N9020A/Signal Analyzer(10Hz~26.5GHz) | MY52090906 | 06/08/2018 | Annual | 06/08/2019 |
| Hewlett Packard | 8493C/ATTENUATOR(20dB) | 17280 | 06/21/2018 | Annual | 06/21/2019 |
| REOHDE & SCHWARZ | FSV40/Spectrum Analyzer(10Hz~40GHz) | 100931 | 10/22/2018 | Annual | 10/22/2019 |
| Agilent | 8960 (E5515C)/ Base Station | MY48360800 | 09/27/2018 | Annual | 09/27/2019 |
| Schwarzbeck | FMZB1513/ Loop Antenna(9kHz~30MHz) | 1513-175 | 08/23/2018 | Biennial | 08/23/2020 |
| Schwarzbeck | VULB9160/ Bilog Antenna | 9160-3368 | 08/09/2018 | Biennial | 08/09/2020 |
| Schwarzbeck | VULB9160/ Hybrid Antenna | 760 | 04/06/2017 | Biennial | 04/06/2019 |
| Anritsu Corp. | MT8821C/Wideband Radio Communication Tester | 6201502997 | 08/13/2018 | Annual | 08/13/2019 |
| Anritsu Corp. | MT8820C/Wideband Radio Communication Tester | 6201026545 | 01/30/2019 | Annual | 01/30/2020 |
| REOHDE & SCHWARZ | SMB100A/ SIGNAL GENERATOR (100kHz~40GHz) | 177633 | 07/19/2018 | Annual | 07/19/2019 |
| REOHDE & SCHWARZ | ESU40 / EMI TEST RECEIVER | 100524 | 07/27/2018 | Annual | 07/27/2019 |
| HCT CO., LTD., | FCC LTE Mobile Conducted RF Automation Test Software | - | - | - | - |

**Note:**

1. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

# 5. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4:2014.

All measurement uncertainty values are shown with a coverage factor of $k$ = 2 to indicate a 95 % level of confidence. The measurement data shown herein meets or exceeds the $U_{CISPR}$ measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

| Parameter | Expanded Uncertainty (±dB) |
|---|---|
| Conducted Disturbance (150 kHz ~ 30 MHz) | 1.82 |
| Radiated Disturbance (9 kHz ~ 30 MHz) | 3.40 |
| Radiated Disturbance (30 MHz ~ 1 GHz) | 4.80 |
| Radiated Disturbance (1 GHz ~ 18 GHz) | 5.70 |
| Radiated Disturbance (18 GHz ~ 40 GHz) | 5.71 |

# 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

**16QAM 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 B2/ 1.4 MHz | QPSK | -18.34 | 13.70 | 10.27 | 1.34 | H | < 2.00 | 0.183 | 22.63 |
| | | 16-QAM | -19.78 | 12.26 | 10.27 | 1.34 | H | | 0.131 | 21.19 |
| 1880.0 | | QPSK | -18.16 | 13.97 | 10.29 | 1.36 | H | | 0.195 | 22.90 |
| | | 16-QAM | -19.61 | 12.52 | 10.29 | 1.36 | H | | 0.140 | 21.45 |
| 1909.3 | | QPSK | -18.17 | 14.36 | 10.31 | 1.37 | H | | 0.214 | 23.30 |
| | | 16-QAM | -19.60 | 12.93 | 10.31 | 1.37 | H | | 0.154 | 21.87 |

| 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 B2/ 3 MHz | QPSK | -18.36 | 13.68 | 10.27 | 1.34 | H | < 2.00 | 0.182 | 22.61 |
| | | 16-QAM | -19.68 | 12.36 | 10.27 | 1.34 | H | | 0.135 | 21.29 |
| 1880.0 | | QPSK | -18.10 | 14.03 | 10.29 | 1.36 | H | | 0.198 | 22.96 |
| | | 16-QAM | -19.29 | 12.84 | 10.29 | 1.36 | H | | 0.150 | 21.77 |
| 1908.5 | | QPSK | -18.12 | 14.41 | 10.31 | 1.37 | H | | 0.216 | 23.35 |
| | | 16-QAM | -19.25 | 13.28 | 10.31 | 1.37 | H | | 0.167 | 22.22 |

| 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 | -18.27 | 13.77 | 10.27 | 1.34 | H | < 2.00 | 0.186 | 22.70 |
| | | 16-QAM | -19.48 | 12.56 | 10.27 | 1.34 | H | | 0.141 | 21.49 |
| 1880.0 | | QPSK | -18.12 | 14.01 | 10.29 | 1.36 | H | | 0.197 | 22.94 |
| | | 16-QAM | -19.34 | 12.79 | 10.29 | 1.36 | H | | 0.149 | 21.72 |
| 1907.5 | | QPSK | -17.89 | 14.64 | 10.31 | 1.37 | H | | 0.228 | 23.58 |
| | | 16-QAM | -19.00 | 13.53 | 10.31 | 1.37 | H | | 0.177 | 22.47 |

| 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 | -18.32 | 13.68 | 10.28 | 1.34 | H | < 2.00 | 0.183 | 22.61 |
| | | 16-QAM | -19.56 | 12.44 | 10.28 | 1.34 | H | | 0.137 | 21.37 |
| 1880.0 | | QPSK | -18.30 | 13.83 | 10.29 | 1.36 | H | | 0.189 | 22.76 |
| | | 16-QAM | -19.52 | 12.61 | 10.29 | 1.36 | H | | 0.143 | 21.54 |
| 1905.0 | | QPSK | -18.08 | 14.34 | 10.31 | 1.37 | H | | 0.213 | 23.28 |
| | | 16-QAM | -19.28 | 13.14 | 10.31 | 1.37 | H | | 0.162 | 22.08 |

| 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 | -18.37 | 13.59 | 10.28 | 1.34 | H | < 2.00 | 0.179 | 22.53 |
| | | 16-QAM | -19.60 | 12.36 | 10.28 | 1.34 | H | | 0.135 | 21.30 |
| 1880.0 | | QPSK | -18.15 | 13.98 | 10.29 | 1.36 | H | | 0.195 | 22.91 |
| | | 16-QAM | -19.35 | 12.78 | 10.29 | 1.36 | H | | 0.148 | 21.71 |
| 1902.5 | | QPSK | -18.52 | 13.79 | 10.31 | 1.36 | H | | 0.188 | 22.74 |
| | | 16-QAM | -19.75 | 12.56 | 10.31 | 1.36 | H | | 0.142 | 21.51 |

| 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 | -18.33 | 13.63 | 10.28 | 1.34 | H | < 2.00 | 0.181 | 22.57 |
| | | 16-QAM | -19.62 | 12.34 | 10.28 | 1.34 | H | | 0.134 | 21.28 |
| 1880.0 | | QPSK | -18.11 | 14.02 | 10.29 | 1.36 | H | | 0.197 | 22.95 |
| | | 16-QAM | -19.39 | 12.74 | 10.29 | 1.36 | H | | 0.147 | 21.67 |
| 1900.0 | | QPSK | -18.10 | 14.21 | 10.31 | 1.36 | H | | 0.207 | 23.16 |
| | | 16-QAM | -19.33 | 12.98 | 10.31 | 1.36 | H | | 0.156 | 21.93 |

## 8.2 RADIATED SPURIOUS EMISSIONS

▣ OPERATING FREQUENTY: 1909.3 MHz

▣ MEASURED OUTPUT POWER: 23.30 dBm = 0.214 W

▣ MOD: LTE B2

▣ MODULATION SIGNAL: 1.4 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 $log_{10}$ (W) = 36.30 dBc

| Ch | Freq (MHz) | Measured Level (dBm) | Ant. Gain (dBi) | Substitute Level (dBm) | C.L | Pol | Result (dBm) | dBc |
|---|---|---|---|---|---|---|---|---|
| 18607 (1850.7) | 3,701.40 | -56.89 | 12.51 | -63.69 | 1.98 | H | -53.16 | 76.46 |
| | 5,552.10 | -56.71 | 13.62 | -57.99 | 2.72 | V | -47.09 | 70.39 |
| | 7,402.80 | -57.40 | 11.50 | -52.39 | 2.92 | H | -43.81 | 67.11 |
| 18900 (1880.0) | 3,760.00 | -57.15 | 12.40 | -63.59 | 2.00 | V | -53.19 | 76.49 |
| | 5,640.00 | -57.44 | 13.78 | -58.27 | 2.70 | V | -47.19 | 70.49 |
| | 7,520.00 | -58.13 | 11.57 | -52.92 | 2.93 | V | -44.28 | 67.58 |
| 19193 (1909.3) | 3,818.60 | -56.95 | 12.52 | -63.19 | 2.05 | V | -52.72 | 76.01 |
| | 5,727.90 | -57.29 | 13.69 | -57.24 | 2.72 | H | -46.27 | 69.57 |
| | 7,637.20 | -56.42 | 11.99 | -51.62 | 2.93 | V | -42.56 | 65.86 |

▣ OPERATING FREQUENTY: 1908.50 MHz

▣ MEASURED OUTPUT POWER: 23.35 dBm = 0.216 W

▣ MOD: LTE B2

▣ MODULATION SIGNAL: 3 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 $log_{10}$ (W) = 36.35 dBc

| Ch | Freq (MHz) | Measured Level (dBm) | Ant. Gain (dBi) | Substitute Level (dBm) | C.L | Pol | Result (dBm) | dBc |
|---|---|---|---|---|---|---|---|---|
| 18615 (1851.5) | 3,703.00 | -55.55 | 12.51 | -62.35 | 1.98 | H | -51.82 | 75.17 |
| | 5,554.50 | -57.49 | 13.63 | -58.75 | 2.72 | H | -47.84 | 71.19 |
| | 7,406.00 | -56.87 | 11.50 | -51.72 | 2.93 | H | -43.15 | 66.50 |
| 18900 (1880.0) | 3,760.00 | -56.97 | 12.40 | -63.41 | 2.00 | V | -53.01 | 76.36 |
| | 5,640.00 | -57.69 | 13.78 | -58.52 | 2.70 | V | -47.44 | 70.79 |
| | 7,520.00 | -58.25 | 11.57 | -53.04 | 2.93 | H | -44.40 | 67.75 |
| 19185 (1908.5) | 3,817.00 | -57.09 | 12.52 | -63.33 | 2.05 | H | -52.86 | 76.20 |
| | 5,725.50 | -55.64 | 13.70 | -55.46 | 2.72 | H | -44.49 | 67.83 |
| | 7,634.00 | -57.87 | 11.97 | -53.06 | 2.96 | V | -44.05 | 67.39 |

▣ OPERATING FREQUENTY: 1907.50 MHz

▣ MEASURED OUTPUT POWER: 23.58 dBm = 0.228 W

▣ MOD: LTE B2

▣ MODULATION SIGNAL: 5 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 $log_{10}$ (W) = 36.58 dBc

| Ch | Freq (MHz) | Measured Level (dBm) | Ant. Gain (dBi) | Substitute Level (dBm) | C.L | Pol | Result (dBm) | dBc |
|---|---|---|---|---|---|---|---|---|
| 18625 (1852.5) | 3,705.00 | -56.43 | 12.50 | -63.06 | 2.00 | H | -52.55 | 76.13 |
| | 5,557.50 | -57.15 | 13.64 | -58.39 | 2.71 | H | -47.46 | 71.04 |
| | 7,410.00 | -57.45 | 11.50 | -52.16 | 2.93 | V | -43.59 | 67.17 |
| 18900 (1880.0) | 3,760.00 | -58.07 | 12.40 | -64.51 | 2.00 | H | -54.11 | 77.69 |
| | 5,640.00 | -58.08 | 13.78 | -58.91 | 2.70 | V | -47.83 | 71.41 |
| | 7,520.00 | -58.35 | 11.57 | -53.14 | 2.93 | H | -44.50 | 68.08 |
| 19175 (1907.5) | 3,815.00 | -56.70 | 12.52 | -63.07 | 2.06 | V | -52.60 | 76.18 |
| | 5,722.50 | -58.27 | 13.70 | -57.96 | 2.72 | H | -46.98 | 70.56 |
| | 7,630.00 | -57.70 | 11.95 | -52.89 | 2.98 | H | -43.92 | 67.49 |

▣ OPERATING FREQUENTY: 1905.00 MHz

▣ MEASURED OUTPUT POWER: 23.28 dBm = 0.213 W

▣ MOD: LTE B2

▣ MODULATION SIGNAL: 10 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 $log_{10}$ (W) = 36.28 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 | -55.35 | 12.49 | -61.81 | 2.01 | H | -51.33 | 74.61 |
| | 5,565.00 | -56.74 | 13.65 | -58.02 | 2.71 | H | -47.08 | 70.36 |
| | 7,420.00 | -58.08 | 11.51 | -52.70 | 2.94 | H | -44.13 | 67.42 |
| 18900 (1880.0) | 3,760.00 | -56.49 | 12.40 | -62.93 | 2.00 | H | -52.53 | 75.81 |
| | 5,640.00 | -57.80 | 13.78 | -58.63 | 2.70 | H | -47.55 | 70.83 |
| | 7,520.00 | -58.49 | 11.57 | -53.28 | 2.93 | H | -44.64 | 67.93 |
| 19150 (1905.0) | 3,810.00 | -57.37 | 12.52 | -63.87 | 2.06 | H | -53.41 | 76.69 |
| | 5,715.00 | -57.61 | 13.70 | -57.43 | 2.72 | V | -46.45 | 69.73 |
| | 7,620.00 | -56.76 | 11.90 | -51.96 | 2.94 | H | -43.00 | 66.28 |

▣ OPERATING FREQUENTY: 1880.00 MHz

▣ MEASURED OUTPUT POWER: 22.91 dBm = 0.195 W

▣ MOD: LTE B2

▣ MODULATION SIGNAL: 15 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 $lo_{g10}$ (W) = 35.91dBc

| Ch | Freq (MHz) | Measured Level (dBm) | Ant. Gain (dBi) | Substitute Level (dBm) | C.L | Pol | Result (dBm) | dBc |
|---|---|---|---|---|---|---|---|---|
| 18675 (1857.5) | 3,715.00 | -57.65 | 12.49 | -64.30 | 2.02 | V | -53.83 | 76.74 |
| | 5,572.50 | -58.04 | 13.66 | -59.36 | 2.71 | V | -48.41 | 71.32 |
| | 7,430.00 | -57.01 | 11.51 | -51.79 | 2.94 | V | -43.22 | 66.13 |
| 18900 (1880.0) | 3,760.00 | -57.95 | 12.40 | -64.39 | 2.00 | H | -53.99 | 76.90 |
| | 5,640.00 | -57.94 | 13.78 | -58.77 | 2.70 | V | -47.69 | 70.60 |
| | 7,520.00 | -57.72 | 11.57 | -52.51 | 2.93 | H | -43.87 | 66.78 |
| 19125 (1902.5) | 3,805.00 | -57.32 | 12.52 | -63.56 | 2.09 | H | -53.13 | 76.05 |
| | 5,707.50 | -57.19 | 13.70 | -57.14 | 2.72 | H | -46.16 | 69.07 |
| | 7,610.00 | -58.19 | 11.87 | -53.17 | 3.00 | H | -44.30 | 67.21 |

▣ OPERATING FREQUENTY: 1900.00 MHz

▣ MEASURED OUTPUT POWER: 23.16 dBm = 0.207 W

▣ MOD: LTE B2

▣ MODULATION SIGNAL: 20 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 $log_{10}$ (W) = 36.16 dBc

| Ch | Freq (MHz) | Measured Level (dBm) | Ant. Gain (dBi) | Substitute Level (dBm) | C.L | Pol | Result (dBm) | dBc |
|---|---|---|---|---|---|---|---|---|
| 18700 (1860.0) | 3,720.00 | -57.88 | 12.48 | -64.72 | 2.03 | V | -54.27 | 77.43 |
| | 5,580.00 | -56.82 | 13.69 | -57.88 | 2.69 | V | -46.88 | 70.04 |
| | 7,440.00 | -57.80 | 11.52 | -52.71 | 2.89 | H | -44.08 | 67.24 |
| 18900 (1880.0) | 3,760.00 | -57.95 | 12.40 | -64.39 | 2.00 | V | -53.99 | 77.15 |
| | 5,640.00 | -57.68 | 13.78 | -58.51 | 2.70 | V | -47.43 | 70.59 |
| | 7,520.00 | -58.30 | 11.57 | -53.09 | 2.93 | V | -44.45 | 67.61 |
| 19100 (1900.0) | 3,800.00 | -57.78 | 12.52 | -63.77 | 2.12 | H | -53.37 | 76.53 |
| | 5,700.00 | -57.85 | 13.71 | -58.18 | 2.74 | H | -47.21 | 70.37 |
| | 7,600.00 | -57.67 | 11.85 | -52.40 | 2.90 | H | -43.45 | 66.61 |

### 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 | 5.46 |
| | | | 16-QAM | 6 | 0 | 6.06 |
| | 3 MHz | | QPSK | 15 | 0 | 5.51 |
| | | | 16-QAM | 15 | 0 | 6.17 |
| | 5 MHz | | QPSK | 25 | 0 | 5.46 |
| | | | 16-QAM | 25 | 0 | 6.17 |
| | 10 MHz | | QPSK | 50 | 0 | 5.50 |
| | | | 16-QAM | 50 | 0 | 6.10 |
| | 15 MHz | | QPSK | 75 | 0 | 5.44 |
| | | | 16-QAM | 75 | 0 | 6.09 |
| | 20 MHz | | QPSK | 100 | 0 | 5.42 |
| | | | 16-QAM | 100 | 0 | 6.15 |

**Note:**

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 65 ~ 76.

### 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 | 1.0934 |
| | | | 16-QAM | 6 | 0 | 1.0998 |
| | 3 MHz | | QPSK | 15 | 0 | 2.7118 |
| | | | 16-QAM | 15 | 0 | 2.7071 |
| | 5 MHz | | QPSK | 25 | 0 | 4.5225 |
| | | | 16-QAM | 25 | 0 | 4.5165 |
| | 10 MHz | | QPSK | 50 | 0 | 8.9924 |
| | | | 16-QAM | 50 | 0 | 9.0116 |
| | 15 MHz | | QPSK | 75 | 0 | 13.490 |
| | | | 16-QAM | 75 | 0 | 13.492 |
| | 20 MHz | | QPSK | 100 | 0 | 17.959 |
| | | | 16-QAM | 100 | 0 | 17.936 |

**Note:**

1. Plots of the EUT's Occupied Bandwidth are shown Page 53 ~ 64.

### 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 | 3.7015 | 27.976 | -76.053 | -48.077 | -13.00 |
| | | 1880.0 | 3.6950 | 27.976 | -77.182 | -49.206 | |
| | | 1909.3 | 3.6725 | 27.976 | -77.162 | -49.186 | |
| | 3 | 1851.5 | 3.7010 | 27.976 | -75.726 | -47.750 | |
| | | 1880.0 | 3.7074 | 27.976 | -77.350 | -49.374 | |
| | | 1908.5 | 3.6960 | 27.976 | -78.183 | -50.207 | |
| | 5 | 1852.5 | 3.7015 | 27.976 | -76.065 | -48.089 | |
| | | 1880.0 | 3.7010 | 27.976 | -77.187 | -49.211 | |
| | | 1907.5 | 3.7229 | 27.976 | -76.891 | -48.915 | |
| | 10 | 1855.0 | 3.7020 | 27.976 | -76.097 | -48.121 | |
| | | 1880.0 | 3.6960 | 27.976 | -77.230 | -49.254 | |
| | | 1905.0 | 3.7034 | 27.976 | -76.794 | -48.818 | |
| | 15 | 1857.5 | 3.7024 | 27.976 | -76.987 | -49.011 | |
| | | 1880.0 | 3.7473 | 27.976 | -77.368 | -49.392 | |
| | | 1902.5 | 3.6671 | 27.976 | -76.948 | -48.972 | |
| | 20 | 1860.0 | 3.7029 | 27.976 | -75.918 | -47.942 | |
| | | 1880.0 | 3.6890 | 27.976 | -77.231 | -49.255 | |
| | | 1900.0 | 3.6975 | 27.976 | -77.222 | -49.246 | |

**Note:**

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 113 ~ 148.
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 77 ~ 112.

## 8.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

▣ MODE: LTE B2

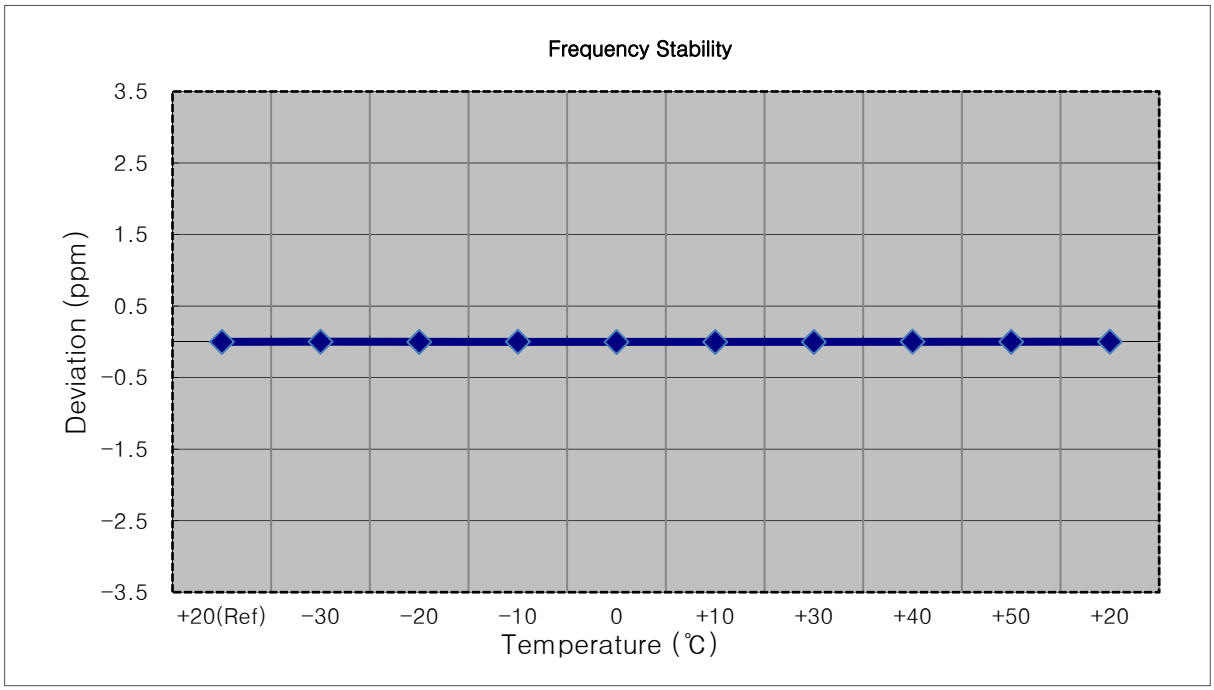
▣ OPERATING FREQUENCY: 1850,700,000 Hz

▣ CHANNEL: 18607 (1.4 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%) | Power (VDC) | Temp. (℃) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm |
|---|---|---|---|---|---|---|
| 100% | 3.850 | +20(Ref) | 1850 699 996 | 0.0 | 0.000 000 | 0.000 |
| 100% | | -30 | 1850 699 999 | 3.5 | 0.000 000 | 0.002 |
| 100% | | -20 | 1850 699 994 | -1.8 | 0.000 000 | -0.001 |
| 100% | | -10 | 1850 699 999 | 3.5 | 0.000 000 | 0.002 |
| 100% | | 0 | 1850 699 992 | -4.1 | 0.000 000 | -0.002 |
| 100% | | +10 | 1850 699 993 | -2.6 | 0.000 000 | -0.001 |
| 100% | | +30 | 1850 699 992 | -3.4 | 0.000 000 | -0.002 |
| 100% | | +40 | 1850 700 001 | 5.4 | 0.000 000 | 0.003 |
| 100% | | +50 | 1850 699 999 | 3.0 | 0.000 000 | 0.002 |
| Batt. Endpoint | 3.400 | +20 | 1850 700 000 | 4.1 | 0.000 000 | 0.002 |



▣ MODE: LTE B2

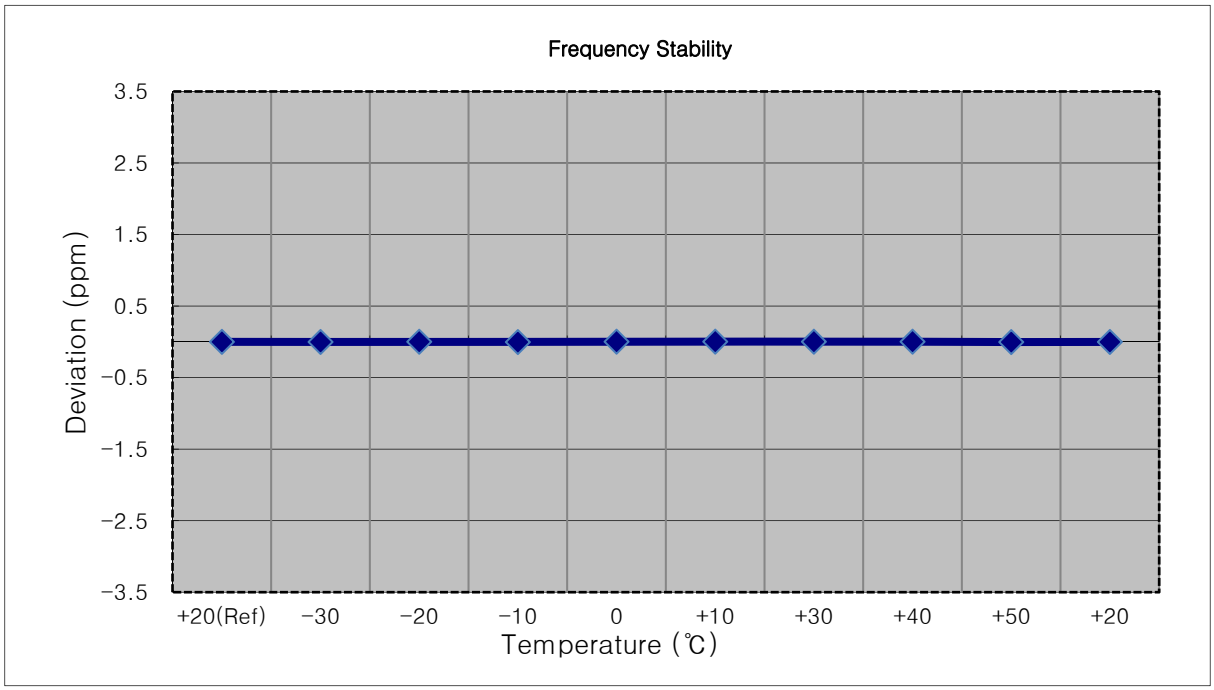
▣ OPERATING FREQUENCY: 1851,500,000 Hz

▣ CHANNEL: 18615 (3 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%) | Power (VDC) | Temp. (℃) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm |
|---|---|---|---|---|---|---|
| 100% | 3.850 | +20(Ref) | 1851 500 003 | 0.0 | 0.000 000 | 0.000 |
| 100% | | -30 | 1851 500 000 | -3.0 | 0.000 000 | -0.002 |
| 100% | | -20 | 1851 500 005 | 2.5 | 0.000 000 | 0.001 |
| 100% | | -10 | 1851 499 998 | -5.3 | 0.000 000 | -0.003 |
| 100% | | 0 | 1851 500 007 | 3.7 | 0.000 000 | 0.002 |
| 100% | | +10 | 1851 500 008 | 5.0 | 0.000 000 | 0.003 |
| 100% | | +30 | 1851 500 007 | 3.8 | 0.000 000 | 0.002 |
| 100% | | +40 | 1851 500 006 | 3.6 | 0.000 000 | 0.002 |
| 100% | | +50 | 1851 499 997 | -5.4 | 0.000 000 | -0.003 |
| Batt. Endpoint | 3.400 | +20 | 1851 500 000 | -3.1 | 0.000 000 | -0.002 |



▣ MODE: LTE B2

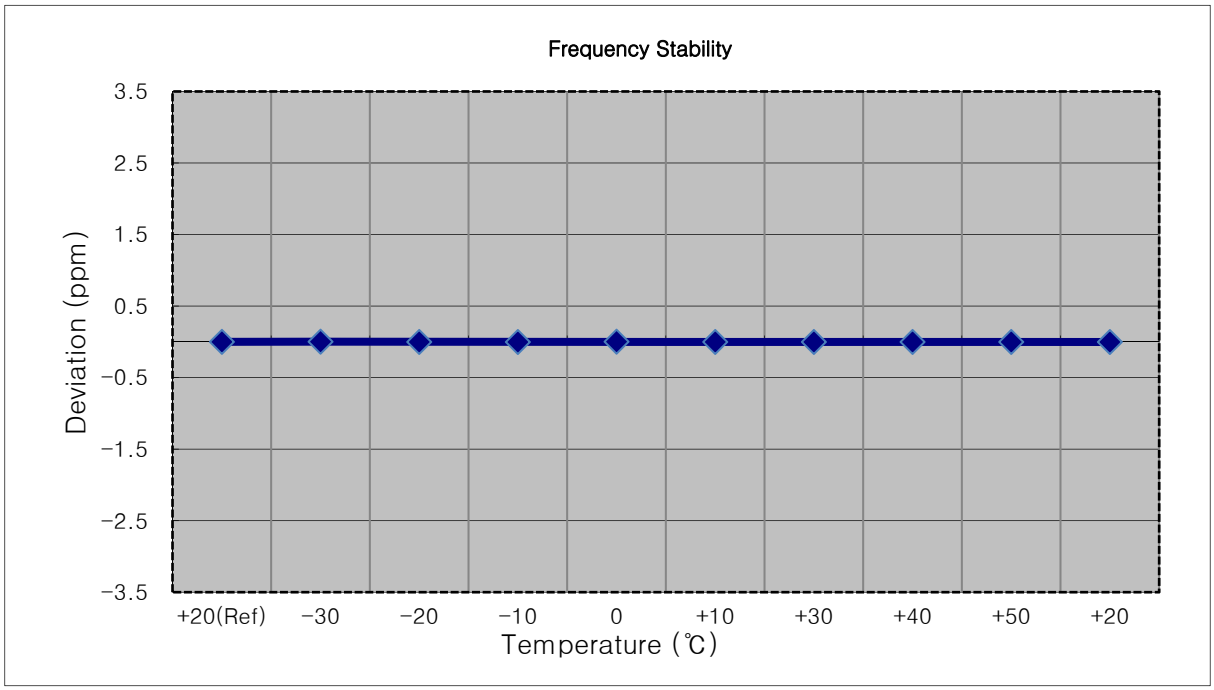
▣ OPERATING FREQUENCY: 1852,500,000 Hz

▣ CHANNEL: 18625 (5 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%) | Power (VDC) | Temp. (℃) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm |
|---|---|---|---|---|---|---|
| 100% | 3.850 | +20(Ref) | 1852 499 996 | 0.0 | 0.000 000 | 0.000 |
| 100% | | -30 | 1852 500 000 | 3.6 | 0.000 000 | 0.002 |
| 100% | | -20 | 1852 499 993 | -2.6 | 0.000 000 | -0.001 |
| 100% | | -10 | 1852 499 992 | -4.3 | 0.000 000 | -0.002 |
| 100% | | 0 | 1852 500 000 | 3.8 | 0.000 000 | 0.002 |
| 100% | | +10 | 1852 499 993 | -3.4 | 0.000 000 | -0.002 |
| 100% | | +30 | 1852 499 994 | -2.2 | 0.000 000 | -0.001 |
| 100% | | +40 | 1852 499 993 | -3.3 | 0.000 000 | -0.002 |
| 100% | | +50 | 1852 499 993 | -2.8 | 0.000 000 | -0.002 |
| Batt. Endpoint | 3.400 | +20 | 1852 499 992 | -3.8 | 0.000 000 | -0.002 |



▣ MODE: LTE B2

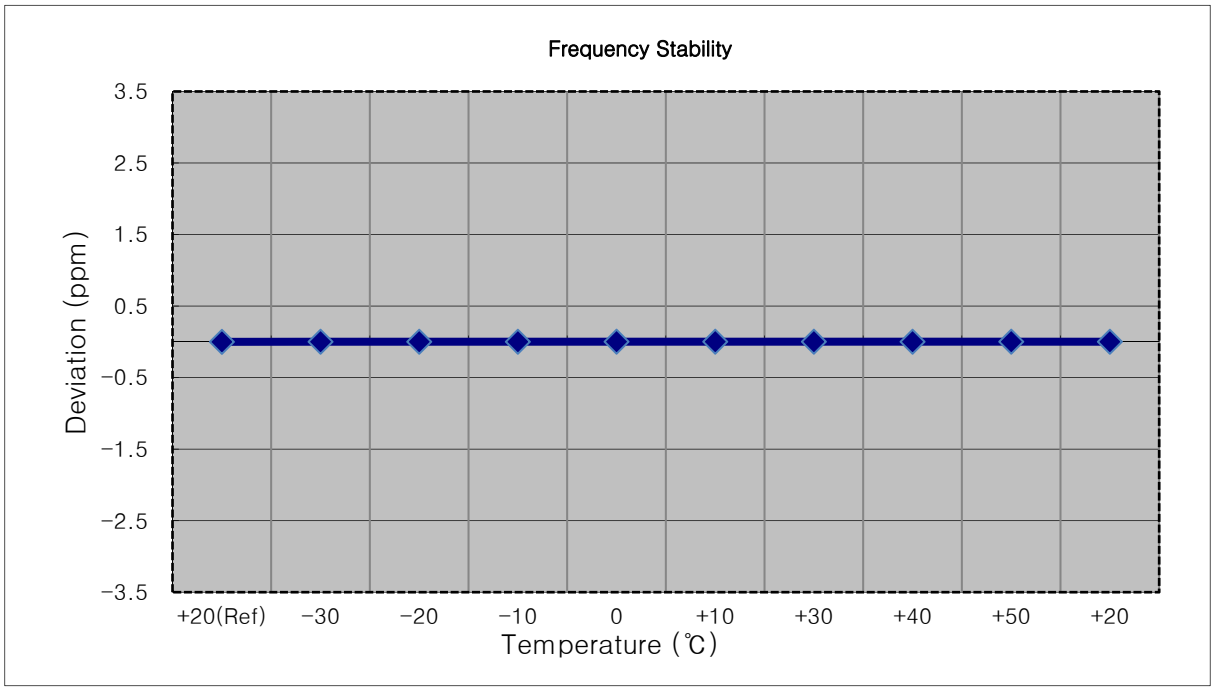
▣ OPERATING FREQUENCY: 1855,000,000 Hz

▣ CHANNEL: 18650 (10 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%) | Power (VDC) | Temp. (℃) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm |
|---|---|---|---|---|---|---|
| 100% | 3.850 | +20(Ref) | 1855 000 003 | 0.0 | 0.000 000 | 0.000 |
| 100% | | -30 | 1855 000 006 | 3.0 | 0.000 000 | 0.002 |
| 100% | | -20 | 1855 000 006 | 2.9 | 0.000 000 | 0.002 |
| 100% | | -10 | 1855 000 007 | 3.2 | 0.000 000 | 0.002 |
| 100% | | 0 | 1855 000 007 | 4.0 | 0.000 000 | 0.002 |
| 100% | | +10 | 1855 000 008 | 4.4 | 0.000 000 | 0.002 |
| 100% | | +30 | 1855 000 007 | 3.6 | 0.000 000 | 0.002 |
| 100% | | +40 | 1855 000 006 | 2.9 | 0.000 000 | 0.002 |
| 100% | | +50 | 1855 000 007 | 3.9 | 0.000 000 | 0.002 |
| Batt. Endpoint | 3.400 | +20 | 1855 000 007 | 3.4 | 0.000 000 | 0.002 |



▣ MODE: LTE B2

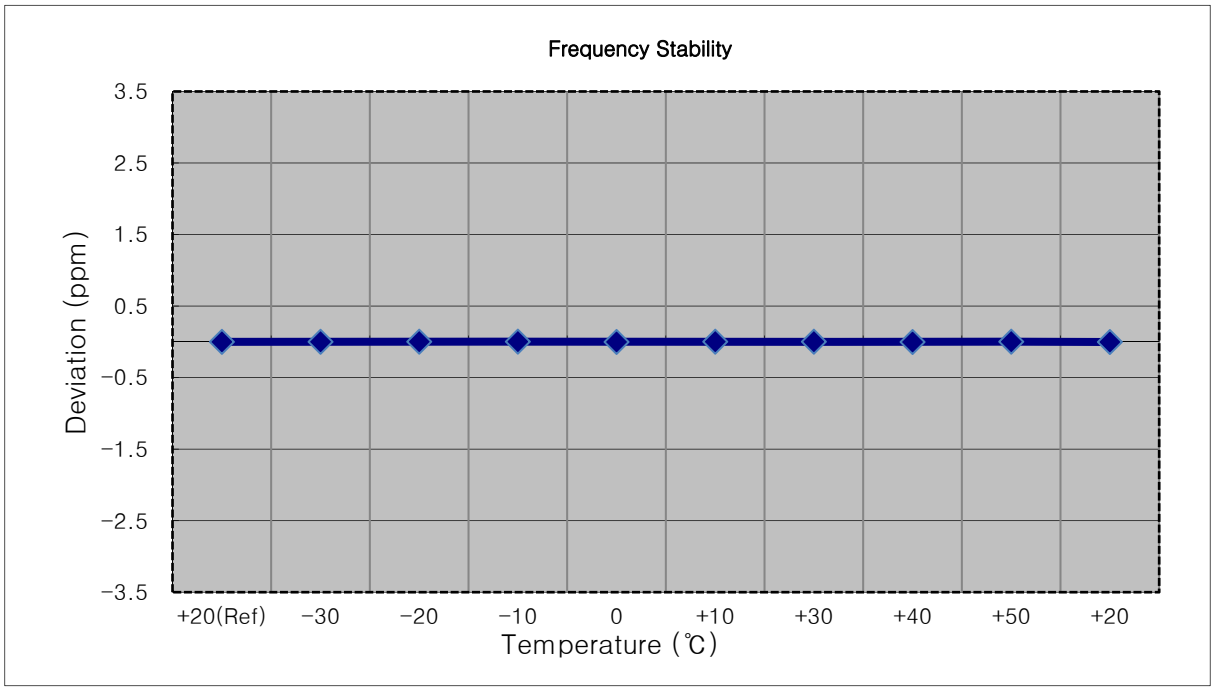
▣ OPERATING FREQUENCY: 1857,500,000 Hz

▣ CHANNEL: 18675 (15 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%) | Power (VDC) | Temp. (℃) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm |
|---|---|---|---|---|---|---|
| 100% | 3.850 | +20(Ref) | 1857 499 996 | 0.0 | 0.000 000 | 0.000 |
| 100% | | -30 | 1857 499 998 | 1.7 | 0.000 000 | 0.001 |
| 100% | | -20 | 1857 500 000 | 4.2 | 0.000 000 | 0.002 |
| 100% | | -10 | 1857 500 001 | 5.1 | 0.000 000 | 0.003 |
| 100% | | 0 | 1857 499 993 | -2.7 | 0.000 000 | -0.001 |
| 100% | | +10 | 1857 500 000 | 3.6 | 0.000 000 | 0.002 |
| 100% | | +30 | 1857 500 000 | 4.2 | 0.000 000 | 0.002 |
| 100% | | +40 | 1857 499 992 | -3.7 | 0.000 000 | -0.002 |
| 100% | | +50 | 1857 500 000 | 3.9 | 0.000 000 | 0.002 |
| Batt. Endpoint | 3.400 | +20 | 1857 499 991 | -4.6 | 0.000 000 | -0.002 |



▣ MODE: LTE B2

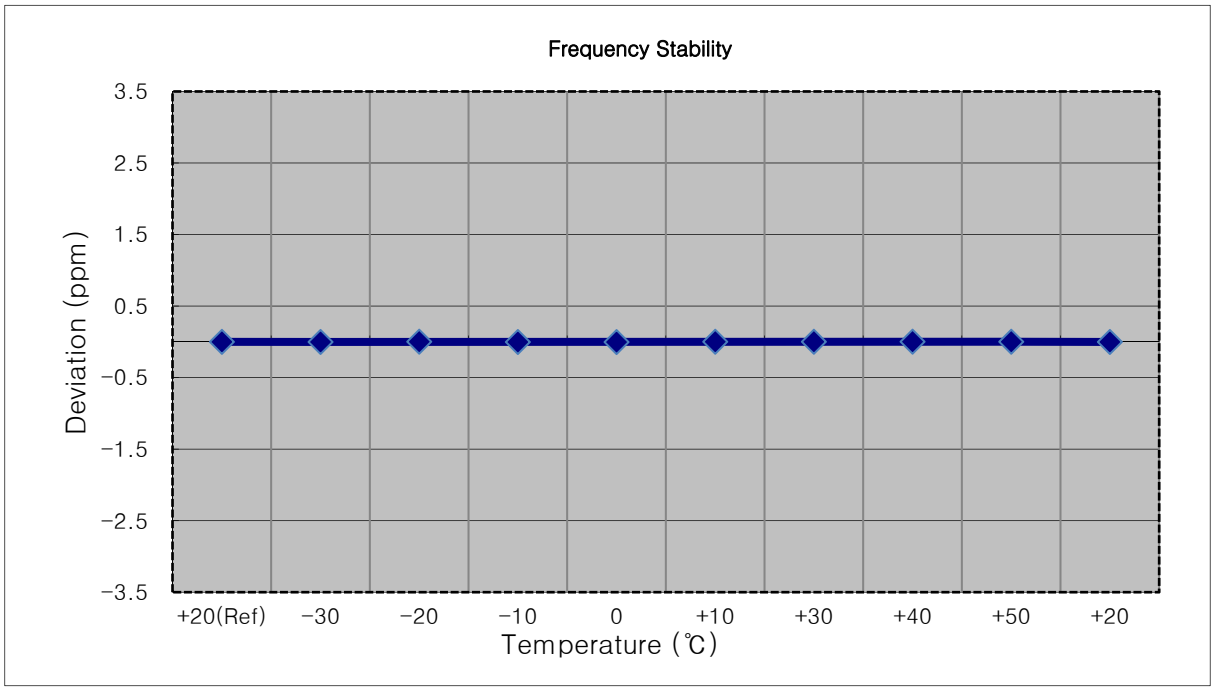
▣ OPERATING FREQUENCY: 1860,000,000 Hz

▣ CHANNEL: 18700 (20 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%) | Power (VDC) | Temp. (℃) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm |
|---|---|---|---|---|---|---|
| 100% | 3.850 | +20(Ref) | 1860 000 003 | 0.0 | 0.000 000 | 0.000 |
| 100% | | -30 | 1860 000 000 | -3.1 | 0.000 000 | -0.002 |
| 100% | | -20 | 1860 000 007 | 4.4 | 0.000 000 | 0.002 |
| 100% | | -10 | 1859 999 999 | -3.9 | 0.000 000 | -0.002 |
| 100% | | 0 | 1859 999 997 | -6.1 | 0.000 000 | -0.003 |
| 100% | | +10 | 1860 000 005 | 2.2 | 0.000 000 | 0.001 |
| 100% | | +30 | 1860 000 006 | 2.8 | 0.000 000 | 0.002 |
| 100% | | +40 | 1860 000 007 | 3.6 | 0.000 000 | 0.002 |
| 100% | | +50 | 1860 000 006 | 2.6 | 0.000 000 | 0.001 |
| Batt. Endpoint | 3.400 | +20 | 1860 000 001 | -2.5 | 0.000 000 | -0.001 |



▣ MODE: LTE B2

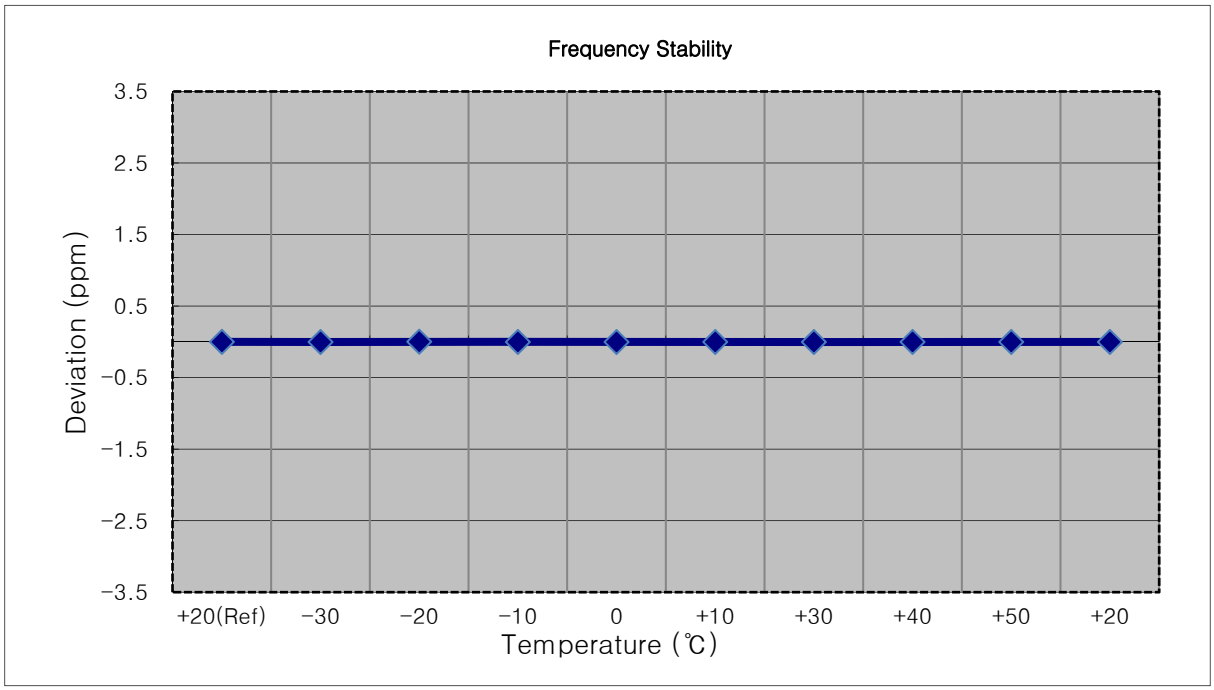
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 18900 (1.4 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%) | Power (VDC) | Temp. (℃) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm |
|---|---|---|---|---|---|---|
| 100% | 3.850 | +20(Ref) | 1879 999 997 | 0.0 | 0.000 000 | 0.000 |
| 100% | | -30 | 1879 999 993 | -4.2 | 0.000 000 | -0.002 |
| 100% | | -20 | 1880 000 002 | 4.5 | 0.000 000 | 0.002 |
| 100% | | -10 | 1879 999 994 | -3.1 | 0.000 000 | -0.002 |
| 100% | | 0 | 1879 999 993 | -4.2 | 0.000 000 | -0.002 |
| 100% | | +10 | 1879 999 995 | -2.8 | 0.000 000 | -0.001 |
| 100% | | +30 | 1879 999 993 | -4.1 | 0.000 000 | -0.002 |
| 100% | | +40 | 1879 999 994 | -3.5 | 0.000 000 | -0.002 |
| 100% | | +50 | 1879 999 994 | -3.1 | 0.000 000 | -0.002 |
| Batt. Endpoint | 3.400 | +20 | 1879 999 995 | -2.7 | 0.000 000 | -0.001 |



▣ MODE: LTE B2

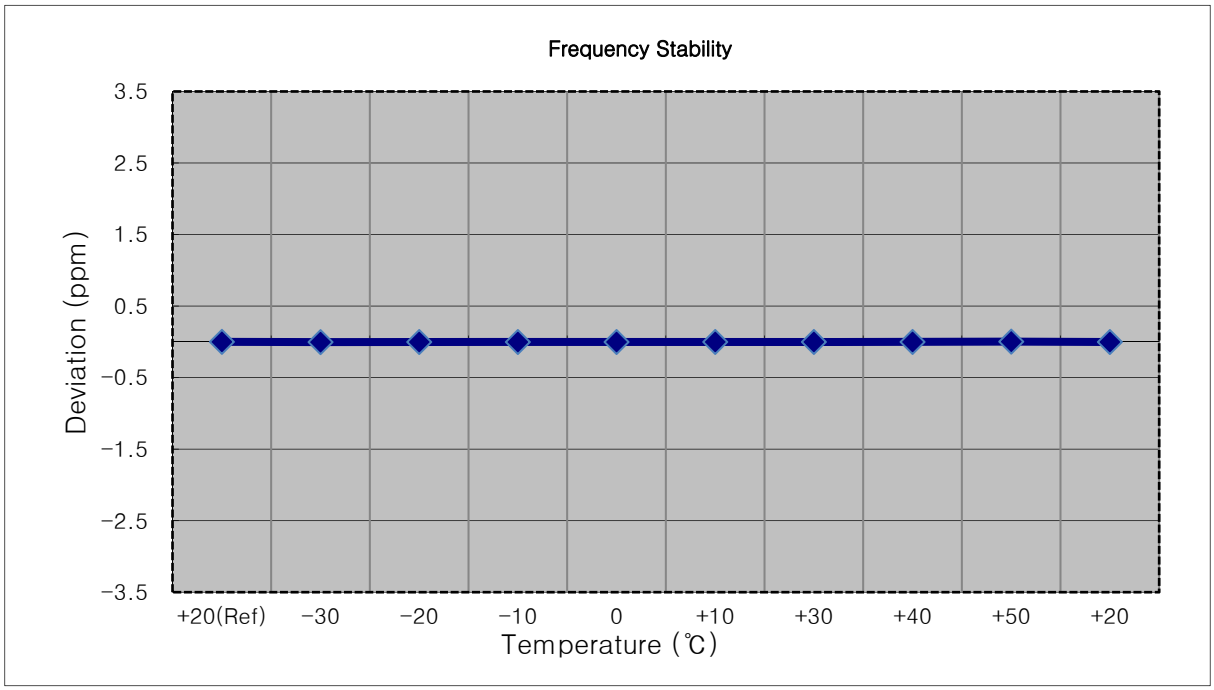
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 18900 (3 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%) | Power (VDC) | Temp. (℃) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm |
|---|---|---|---|---|---|---|
| 100% | 3.850 | +20(Ref) | 1879 999 995 | 0.0 | 0.000 000 | 0.000 |
| 100% | | -30 | 1879 999 988 | -6.7 | 0.000 000 | -0.004 |
| 100% | | -20 | 1879 999 991 | -3.6 | 0.000 000 | -0.002 |
| 100% | | -10 | 1879 999 990 | -4.3 | 0.000 000 | -0.002 |
| 100% | | 0 | 1879 999 991 | -3.6 | 0.000 000 | -0.002 |
| 100% | | +10 | 1879 999 992 | -2.6 | 0.000 000 | -0.001 |
| 100% | | +30 | 1879 999 992 | -2.7 | 0.000 000 | -0.001 |
| 100% | | +40 | 1879 999 991 | -3.2 | 0.000 000 | -0.002 |
| 100% | | +50 | 1880 000 000 | 5.8 | 0.000 000 | 0.003 |
| Batt. Endpoint | 3.400 | +20 | 1879 999 991 | -3.6 | 0.000 000 | -0.002 |



▣ MODE: LTE B2

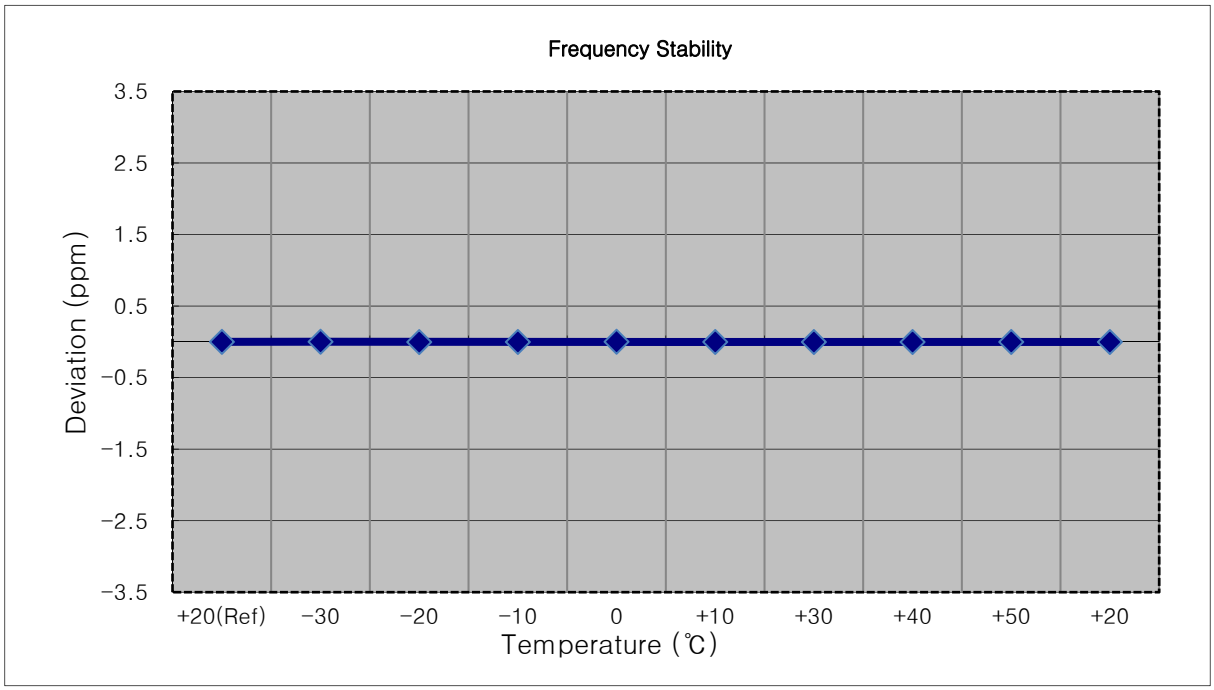
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 18900 (5 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%) | Power (VDC) | Temp. (℃) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm |
|---|---|---|---|---|---|---|
| 100% | 3.850 | +20(Ref) | 1879 999 996 | 0.0 | 0.000 000 | 0.000 |
| 100% | | -30 | 1879 999 998 | 2.6 | 0.000 000 | 0.001 |
| 100% | | -20 | 1879 999 990 | -5.5 | 0.000 000 | -0.003 |
| 100% | | -10 | 1879 999 992 | -3.5 | 0.000 000 | -0.002 |
| 100% | | 0 | 1879 999 998 | 2.9 | 0.000 000 | 0.002 |
| 100% | | +10 | 1879 999 993 | -3.0 | 0.000 000 | -0.002 |
| 100% | | +30 | 1879 999 992 | -3.8 | 0.000 000 | -0.002 |
| 100% | | +40 | 1879 999 992 | -3.6 | 0.000 000 | -0.002 |
| 100% | | +50 | 1879 999 993 | -3.0 | 0.000 000 | -0.002 |
| Batt. Endpoint | 3.400 | +20 | 1879 999 992 | -3.9 | 0.000 000 | -0.002 |



▣ MODE: LTE B2

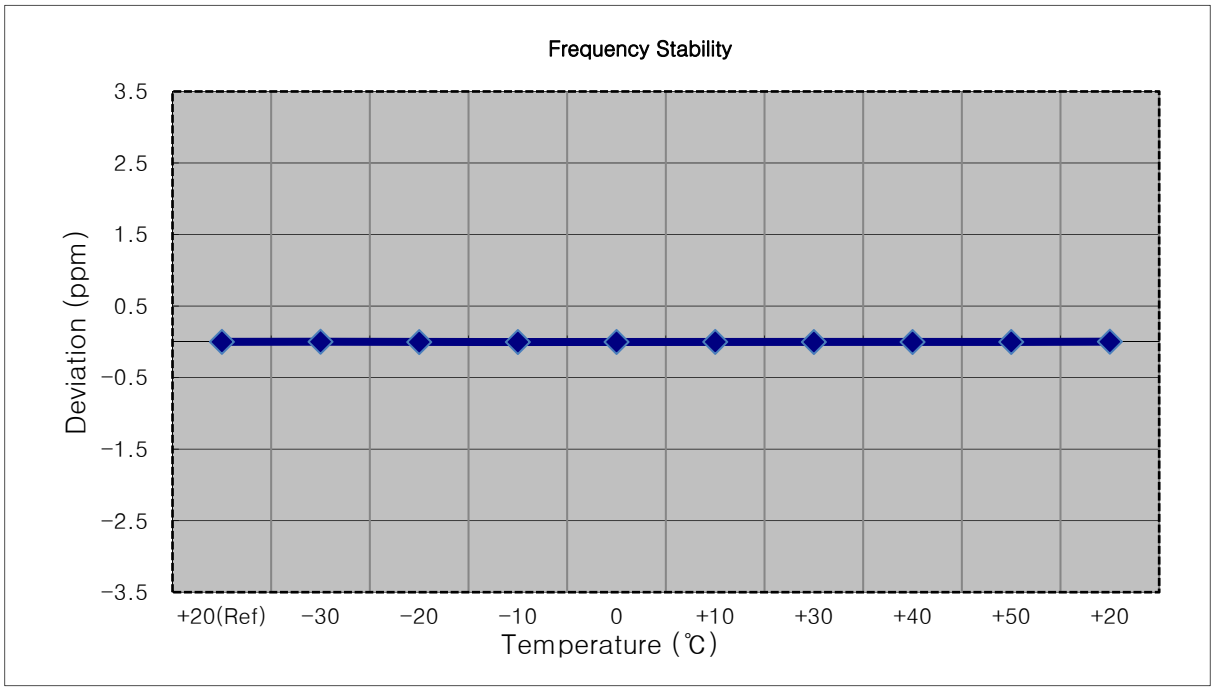
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 18900 (10 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%) | Power (VDC) | Temp. (℃) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm |
|---|---|---|---|---|---|---|
| 100% | 3.850 | +20(Ref) | 1879 999 995 | 0.0 | 0.000 000 | 0.000 |
| 100% | | -30 | 1879 999 997 | 2.3 | 0.000 000 | 0.001 |
| 100% | | -20 | 1879 999 990 | -5.5 | 0.000 000 | -0.003 |
| 100% | | -10 | 1879 999 991 | -4.3 | 0.000 000 | -0.002 |
| 100% | | 0 | 1879 999 992 | -3.2 | 0.000 000 | -0.002 |
| 100% | | +10 | 1879 999 993 | -1.8 | 0.000 000 | -0.001 |
| 100% | | +30 | 1879 999 991 | -4.2 | 0.000 000 | -0.002 |
| 100% | | +40 | 1879 999 991 | -3.9 | 0.000 000 | -0.002 |
| 100% | | +50 | 1879 999 992 | -3.1 | 0.000 000 | -0.002 |
| Batt. Endpoint | 3.400 | +20 | 1879 999 999 | 4.2 | 0.000 000 | 0.002 |



▣ MODE: LTE B2

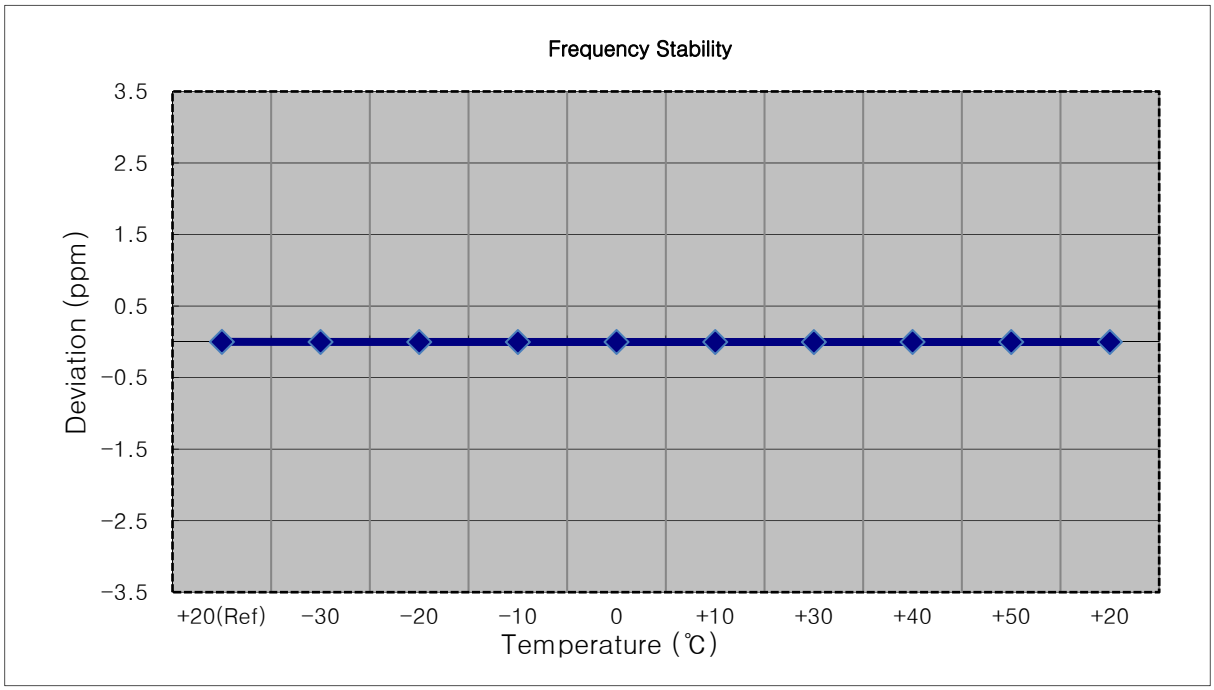
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 18900 (15 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%) | Power (VDC) | Temp. (℃) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm |
|---|---|---|---|---|---|---|
| 100% | 3.850 | +20(Ref) | 1879 999 994 | 0.0 | 0.000 000 | 0.000 |
| 100% | | -30 | 1879 999 991 | -3.4 | 0.000 000 | -0.002 |
| 100% | | -20 | 1879 999 990 | -4.7 | 0.000 000 | -0.003 |
| 100% | | -10 | 1879 999 990 | -4.4 | 0.000 000 | -0.002 |
| 100% | | 0 | 1879 999 991 | -3.2 | 0.000 000 | -0.002 |
| 100% | | +10 | 1879 999 990 | -4.3 | 0.000 000 | -0.002 |
| 100% | | +30 | 1879 999 989 | -5.9 | 0.000 000 | -0.003 |
| 100% | | +40 | 1879 999 992 | -2.8 | 0.000 000 | -0.001 |
| 100% | | +50 | 1879 999 990 | -4.3 | 0.000 000 | -0.002 |
| Batt. Endpoint | 3.400 | +20 | 1879 999 991 | -3.7 | 0.000 000 | -0.002 |



▣ MODE: LTE B2

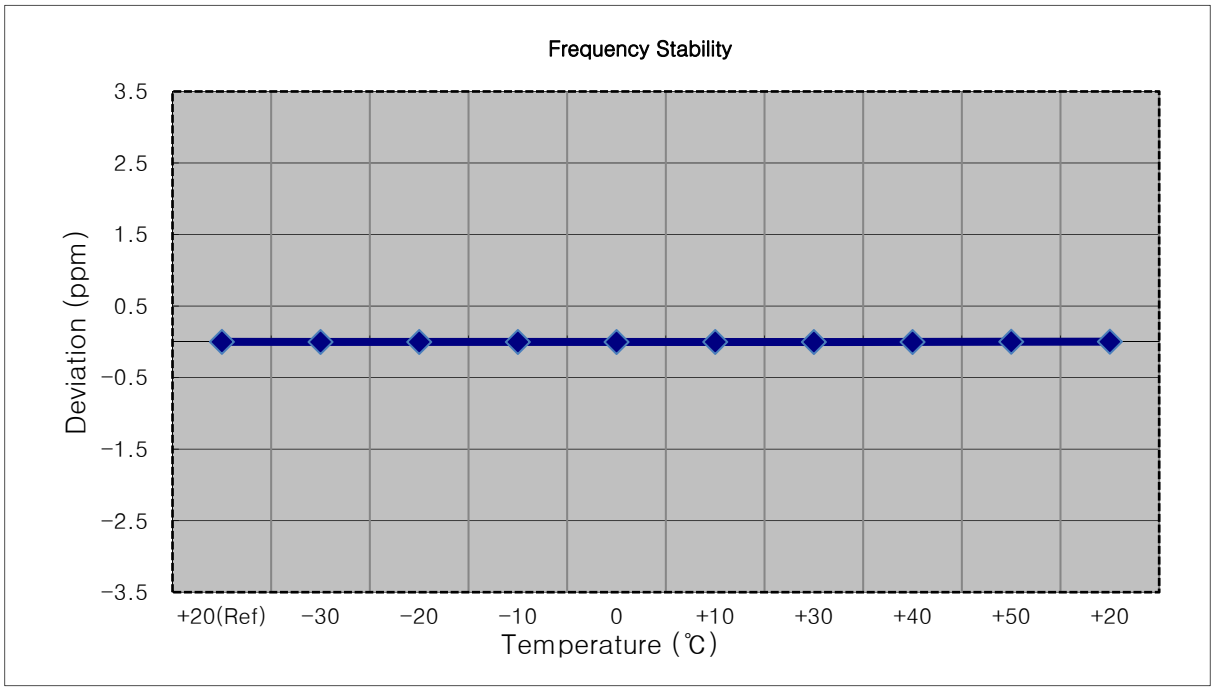
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 18900 (20 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%) | Power (VDC) | Temp. (℃) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm |
|---|---|---|---|---|---|---|
| 100% | 3.850 | +20(Ref) | 1879 999 997 | 0.0 | 0.000 000 | 0.000 |
| 100% | | -30 | 1879 999 994 | -2.8 | 0.000 000 | -0.001 |
| 100% | | -20 | 1879 999 994 | -3.1 | 0.000 000 | -0.002 |
| 100% | | -10 | 1879 999 994 | -3.4 | 0.000 000 | -0.002 |
| 100% | | 0 | 1879 999 992 | -4.7 | 0.000 000 | -0.003 |
| 100% | | +10 | 1879 999 994 | -3.5 | 0.000 000 | -0.002 |
| 100% | | +30 | 1879 999 993 | -4.1 | 0.000 000 | -0.002 |
| 100% | | +40 | 1879 999 993 | -4.0 | 0.000 000 | -0.002 |
| 100% | | +50 | 1880 000 000 | 2.6 | 0.000 000 | 0.001 |
| Batt. Endpoint | 3.400 | +20 | 1880 000 001 | 4.3 | 0.000 000 | 0.002 |



▣ MODE: LTE B2

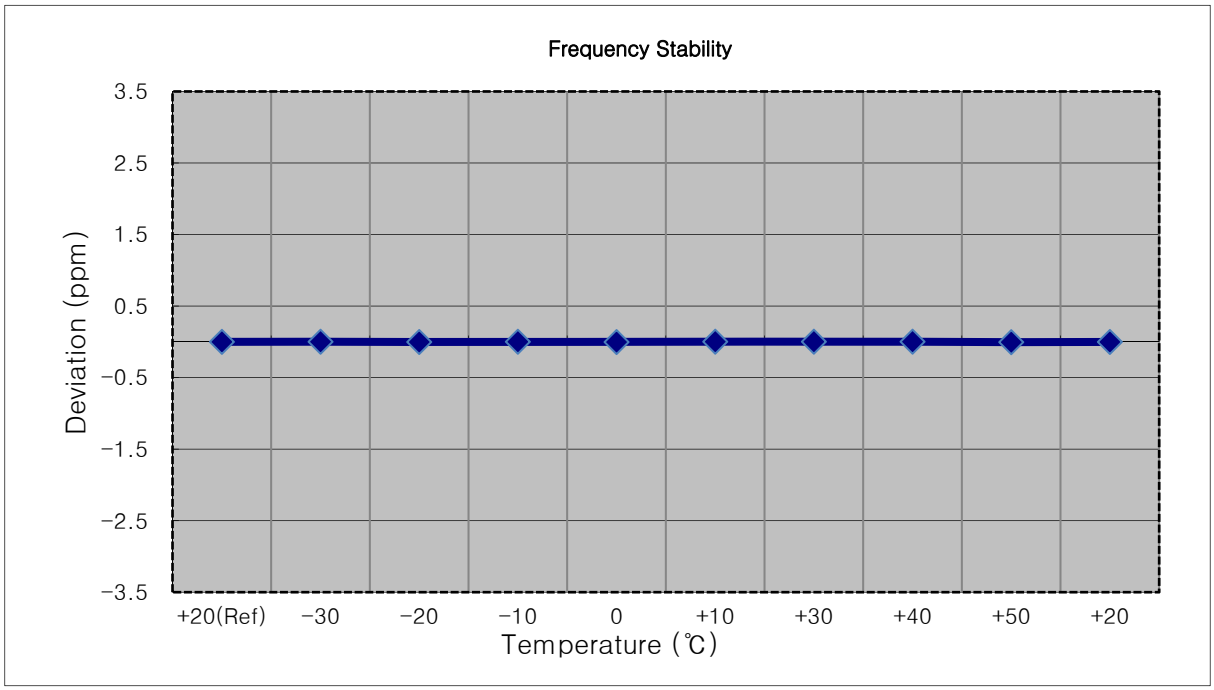
▣ OPERATING FREQUENCY: 1909,300,000 Hz

▣ CHANNEL: 19193 (1.4 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%) | Power (VDC) | Temp. (℃) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm |
|---|---|---|---|---|---|---|
| 100% | 3.850 | +20(Ref) | 1909 299 995 | 0.0 | 0.000 000 | 0.000 |
| 100% | | -30 | 1909 299 998 | 3.0 | 0.000 000 | 0.002 |
| 100% | | -20 | 1909 299 990 | -5.0 | 0.000 000 | -0.003 |
| 100% | | -10 | 1909 299 998 | 2.6 | 0.000 000 | 0.001 |
| 100% | | 0 | 1909 299 989 | -6.0 | 0.000 000 | -0.003 |
| 100% | | +10 | 1909 299 999 | 4.1 | 0.000 000 | 0.002 |
| 100% | | +30 | 1909 300 000 | 4.4 | 0.000 000 | 0.002 |
| 100% | | +40 | 1909 300 000 | 4.8 | 0.000 000 | 0.003 |
| 100% | | +50 | 1909 299 987 | -8.2 | 0.000 000 | -0.004 |
| Batt. Endpoint | 3.400 | +20 | 1909 299 992 | -3.3 | 0.000 000 | -0.002 |



▣ MODE: LTE B2

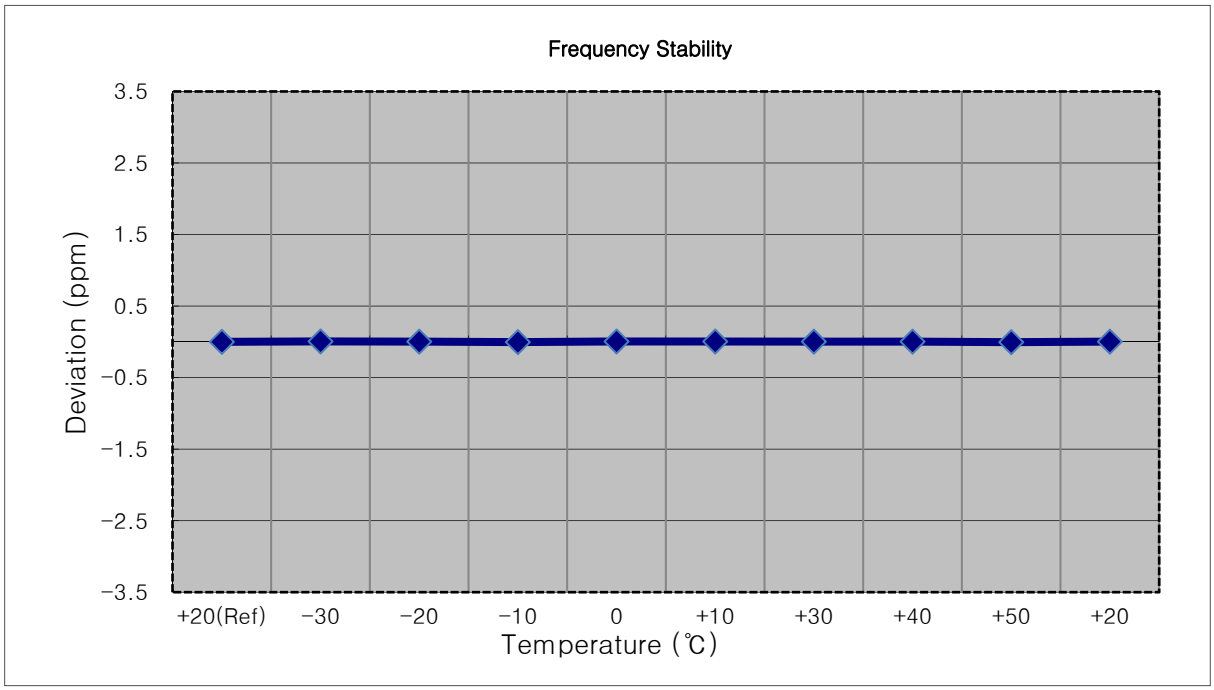
▣ OPERATING FREQUENCY: 1908,500,000 Hz

▣ CHANNEL: 19185 (3 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%) | Power (VDC) | Temp. (℃) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm |
|---|---|---|---|---|---|---|
| 100% | 3.850 | +20(Ref) | 1908 499 992 | 0.0 | 0.000 000 | 0.000 |
| 100% | | -30 | 1908 500 003 | 10.8 | 0.000 001 | 0.006 |
| 100% | | -20 | 1908 499 997 | 5.2 | 0.000 000 | 0.003 |
| 100% | | -10 | 1908 499 985 | -7.4 | 0.000 000 | -0.004 |
| 100% | | 0 | 1908 500 002 | 9.5 | 0.000 000 | 0.005 |
| 100% | | +10 | 1908 500 000 | 8.1 | 0.000 000 | 0.004 |
| 100% | | +30 | 1908 499 998 | 5.4 | 0.000 000 | 0.003 |
| 100% | | +40 | 1908 499 998 | 5.8 | 0.000 000 | 0.003 |
| 100% | | +50 | 1908 499 984 | -8.6 | 0.000 000 | -0.005 |
| Batt. Endpoint | 3.400 | +20 | 1908 499 998 | 6.2 | 0.000 000 | 0.003 |



▣ MODE: LTE B2

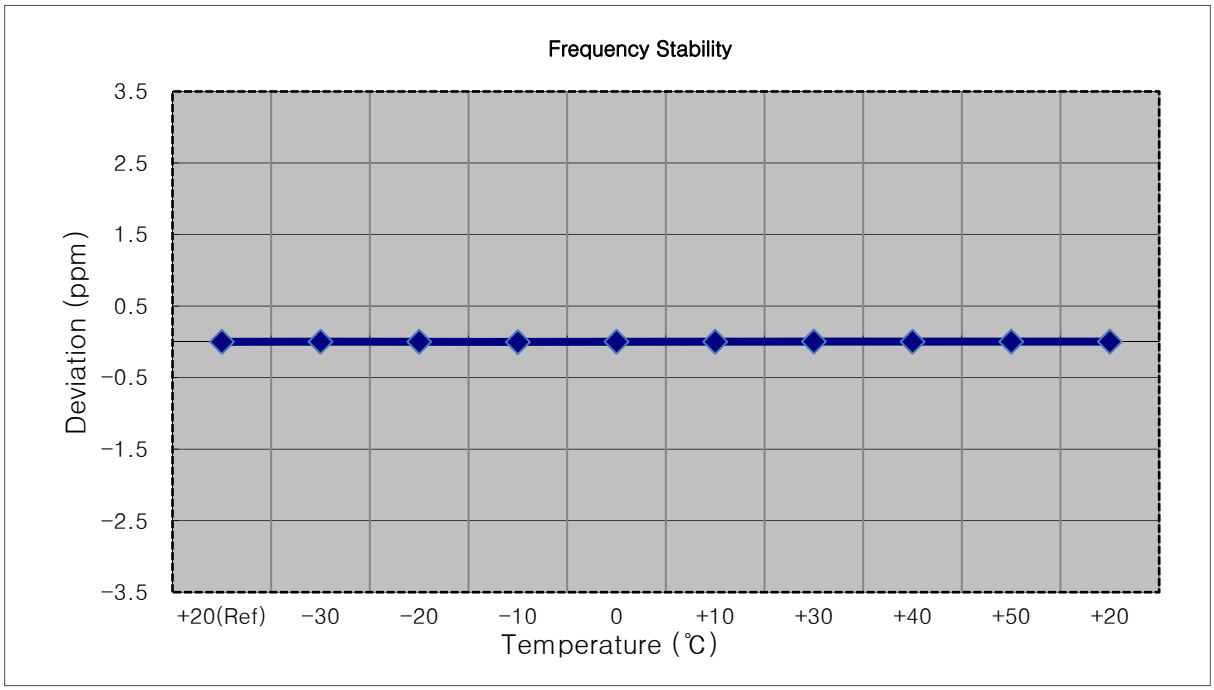
▣ OPERATING FREQUENCY: 1907,500,000 Hz

▣ CHANNEL: 19175 (5 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%) | Power (VDC) | Temp. (℃) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm |
|---|---|---|---|---|---|---|
| 100% | 3.850 | +20(Ref) | 1907 499 997 | 0.0 | 0.000 000 | 0.000 |
| 100% | | -30 | 1907 500 001 | 4.3 | 0.000 000 | 0.002 |
| 100% | | -20 | 1907 500 001 | 3.5 | 0.000 000 | 0.002 |
| 100% | | -10 | 1907 499 991 | -6.1 | 0.000 000 | -0.003 |
| 100% | | 0 | 1907 500 001 | 4.1 | 0.000 000 | 0.002 |
| 100% | | +10 | 1907 500 000 | 2.5 | 0.000 000 | 0.001 |
| 100% | | +30 | 1907 500 004 | 6.5 | 0.000 000 | 0.003 |
| 100% | | +40 | 1907 500 001 | 3.6 | 0.000 000 | 0.002 |
| 100% | | +50 | 1907 500 002 | 5.2 | 0.000 000 | 0.003 |
| Batt. Endpoint | 3.400 | +20 | 1907 500 002 | 5.3 | 0.000 000 | 0.003 |



▣ MODE: LTE B2

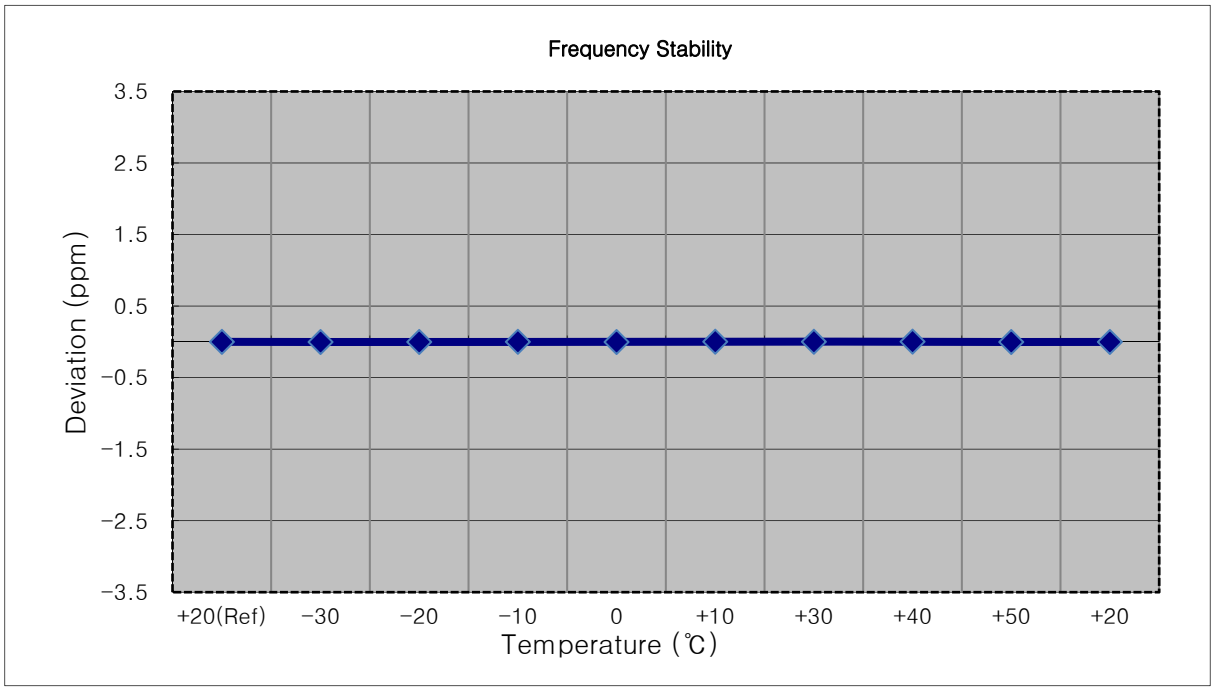
▣ OPERATING FREQUENCY: 1905,000,000 Hz

▣ CHANNEL: 19150 (10 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%) | Power (VDC) | Temp. (℃) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm |
|---|---|---|---|---|---|---|
| 100% | 3.850 | +20(Ref) | 1904 999 996 | 0.0 | 0.000 000 | 0.000 |
| 100% | | -30 | 1904 999 991 | -4.6 | 0.000 000 | -0.002 |
| 100% | | -20 | 1904 999 993 | -3.4 | 0.000 000 | -0.002 |
| 100% | | -10 | 1904 999 998 | 2.0 | 0.000 000 | 0.001 |
| 100% | | 0 | 1904 999 992 | -3.9 | 0.000 000 | -0.002 |
| 100% | | +10 | 1905 000 000 | 3.5 | 0.000 000 | 0.002 |
| 100% | | +30 | 1904 999 998 | 2.3 | 0.000 000 | 0.001 |
| 100% | | +40 | 1905 000 002 | 5.5 | 0.000 000 | 0.003 |
| 100% | | +50 | 1904 999 991 | -4.6 | 0.000 000 | -0.002 |
| Batt. Endpoint | 3.400 | +20 | 1904 999 993 | -2.8 | 0.000 000 | -0.001 |



▣ MODE: LTE B2

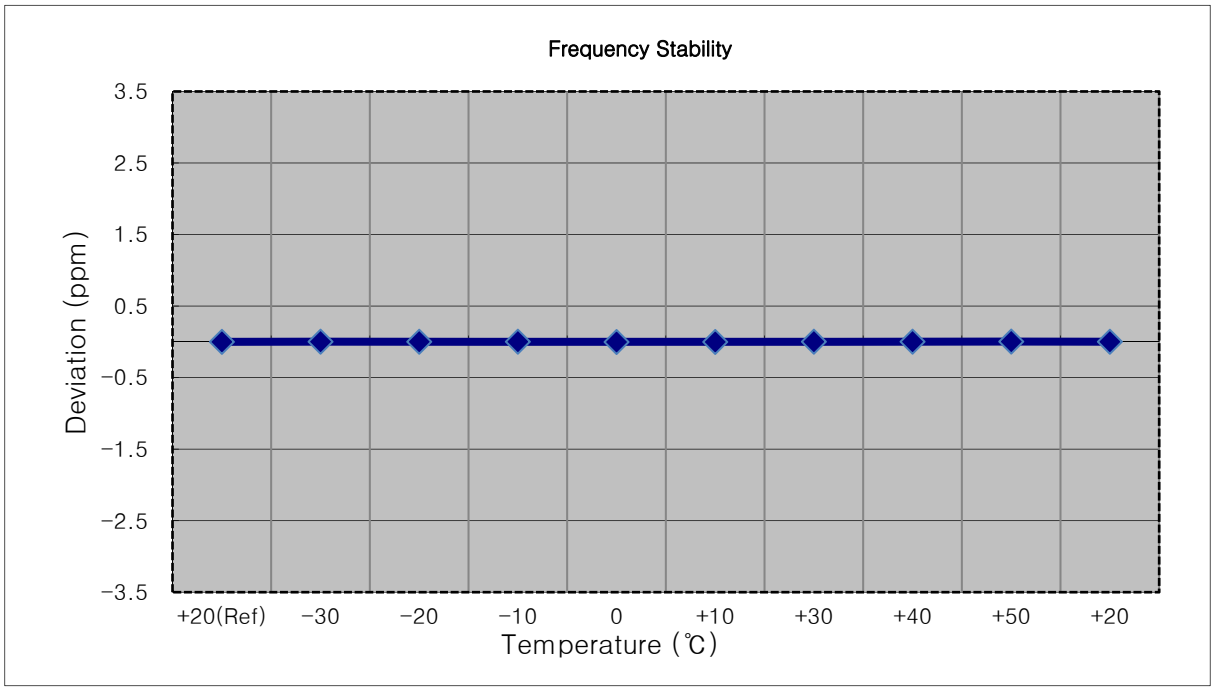
▣ OPERATING FREQUENCY: 1902,500,000 Hz

▣ CHANNEL: 19125 (15 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%) | Power (VDC) | Temp. (℃) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm |
|---|---|---|---|---|---|---|
| 100% | 3.850 | +20(Ref) | 1902 499 997 | 0.0 | 0.000 000 | 0.000 |
| 100% | | -30 | 1902 500 002 | 4.4 | 0.000 000 | 0.002 |
| 100% | | -20 | 1902 500 001 | 3.4 | 0.000 000 | 0.002 |
| 100% | | -10 | 1902 500 002 | 4.9 | 0.000 000 | 0.003 |
| 100% | | 0 | 1902 499 993 | -4.7 | 0.000 000 | -0.002 |
| 100% | | +10 | 1902 499 994 | -3.0 | 0.000 000 | -0.002 |
| 100% | | +30 | 1902 500 001 | 3.9 | 0.000 000 | 0.002 |
| 100% | | +40 | 1902 500 002 | 4.6 | 0.000 000 | 0.002 |
| 100% | | +50 | 1902 500 005 | 7.1 | 0.000 000 | 0.004 |
| Batt. Endpoint | 3.400 | +20 | 1902 500 000 | 2.8 | 0.000 000 | 0.001 |



▣ MODE: LTE B2

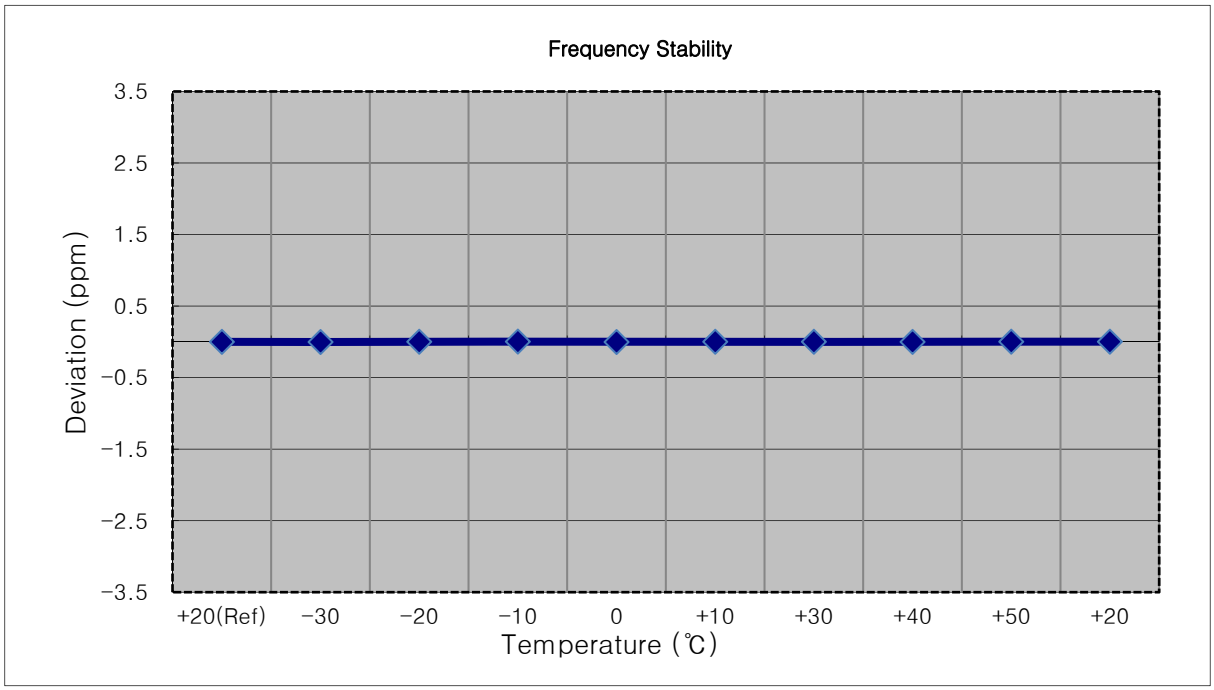
▣ OPERATING FREQUENCY: 1900,000,000 Hz

▣ CHANNEL: 19100 (20 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

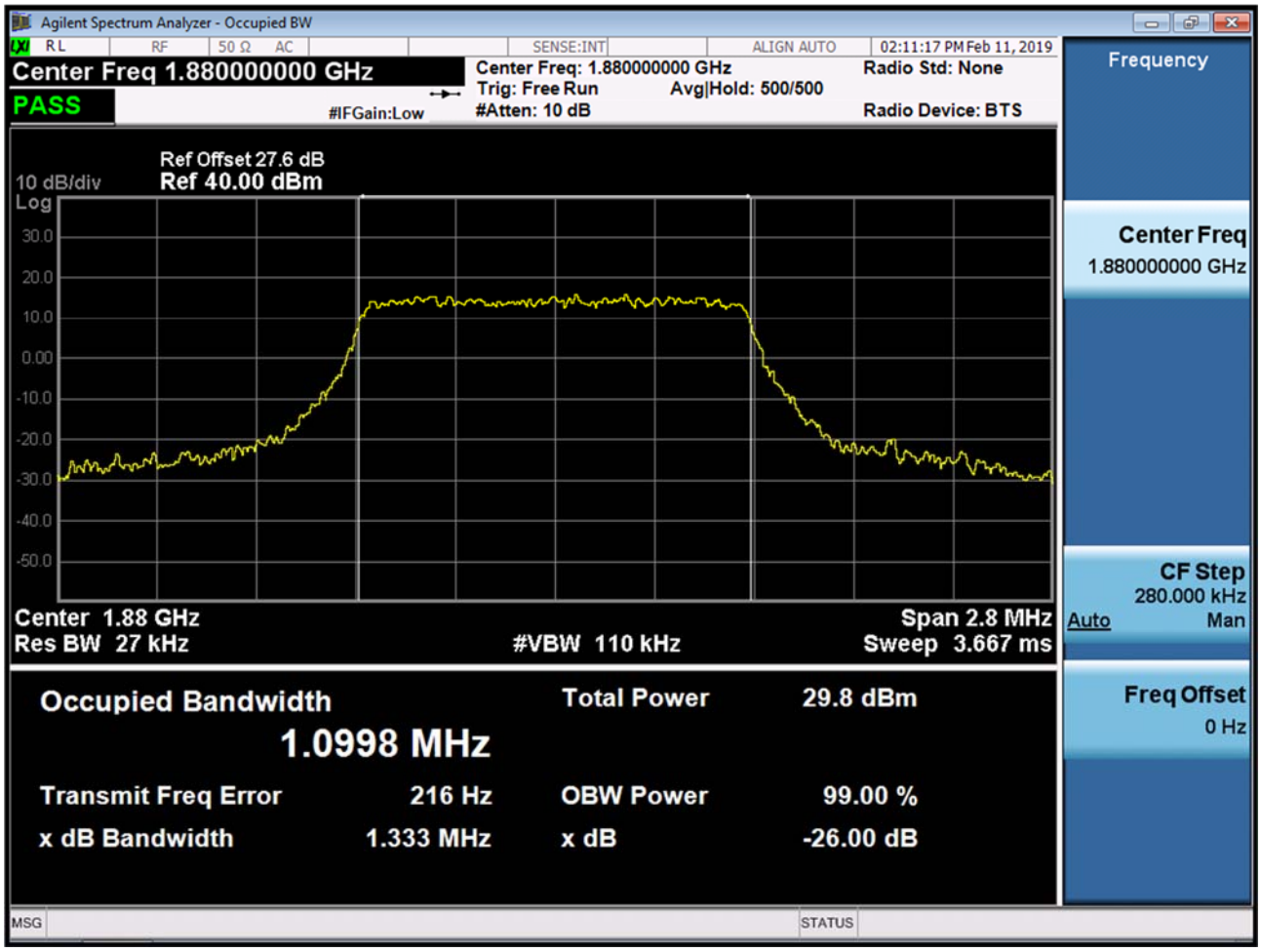
| Voltage (%) | Power (VDC) | Temp. (℃) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm |
|---|---|---|---|---|---|---|
| 100% | 3.850 | +20(Ref) | 1900 000 004 | 0.0 | 0.000 000 | 0.000 |
| 100% | | -30 | 1900 000 000 | -4.2 | 0.000 000 | -0.002 |
| 100% | | -20 | 1900 000 008 | 3.4 | 0.000 000 | 0.002 |
| 100% | | -10 | 1900 000 011 | 6.7 | 0.000 000 | 0.004 |
| 100% | | 0 | 1900 000 001 | -3.8 | 0.000 000 | -0.002 |
| 100% | | +10 | 1900 000 007 | 2.2 | 0.000 000 | 0.001 |
| 100% | | +30 | 1900 000 007 | 2.3 | 0.000 000 | 0.001 |
| 100% | | +40 | 1900 000 003 | -1.6 | 0.000 000 | -0.001 |
| 100% | | +50 | 1900 000 009 | 4.2 | 0.000 000 | 0.002 |
| Batt. Endpoint | 3.400 | +20 | 1900 000 008 | 3.7 | 0.000 000 | 0.002 |



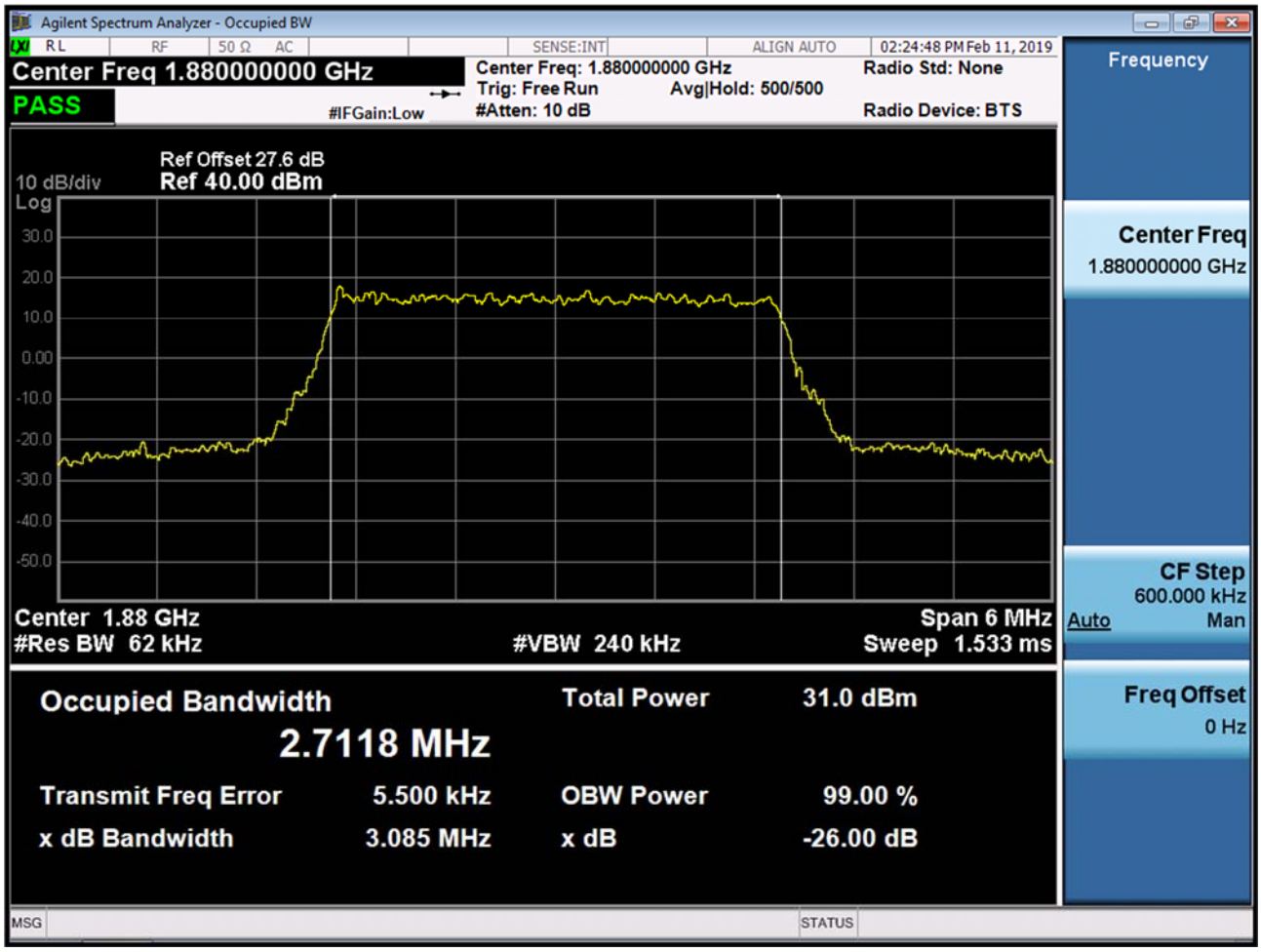
# 9. TEST PLOTS

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

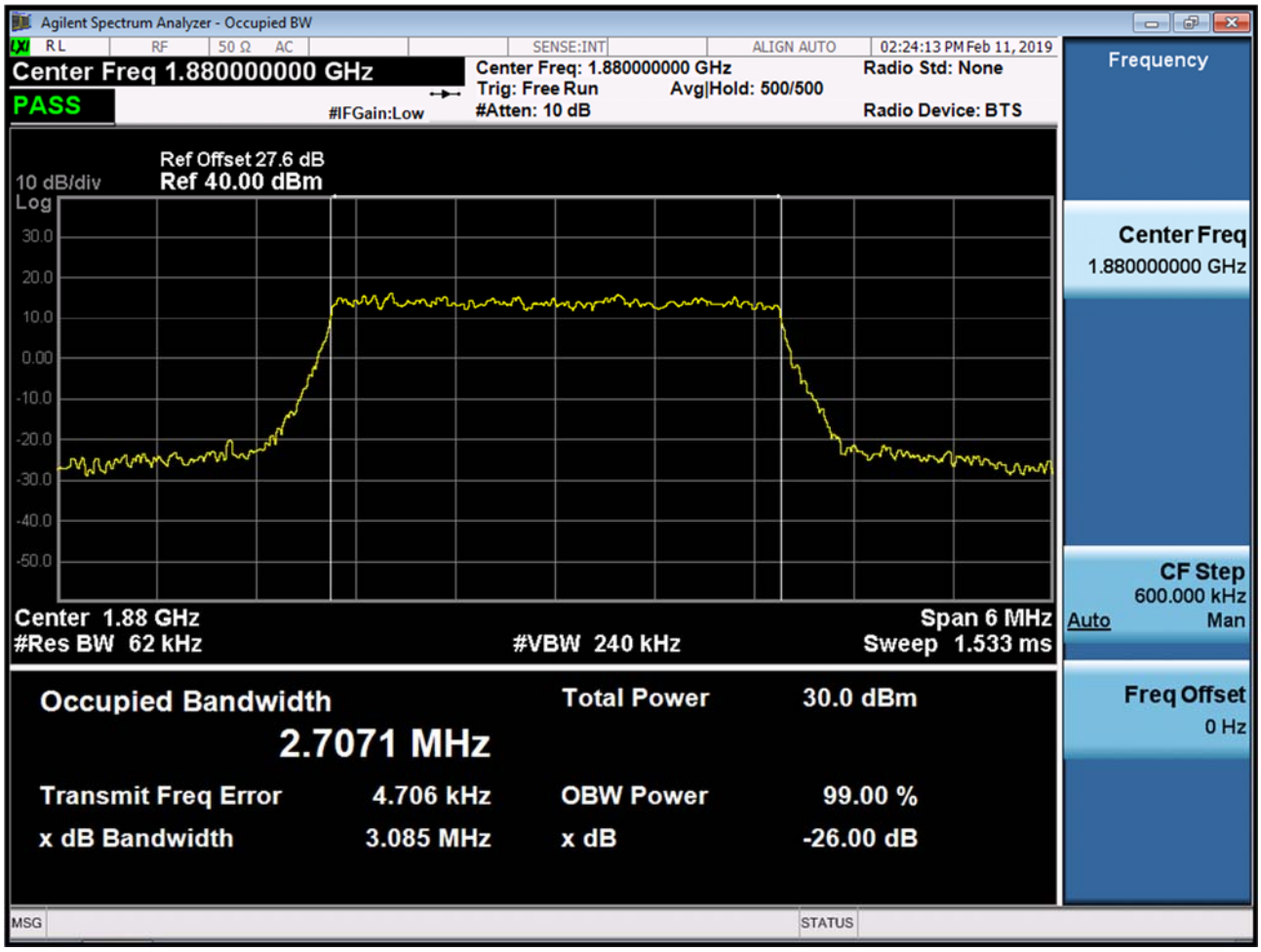
BAND 2. Occupied Bandwidth Plot (1.4M BW Ch.18900 16QAM RB 6_0)



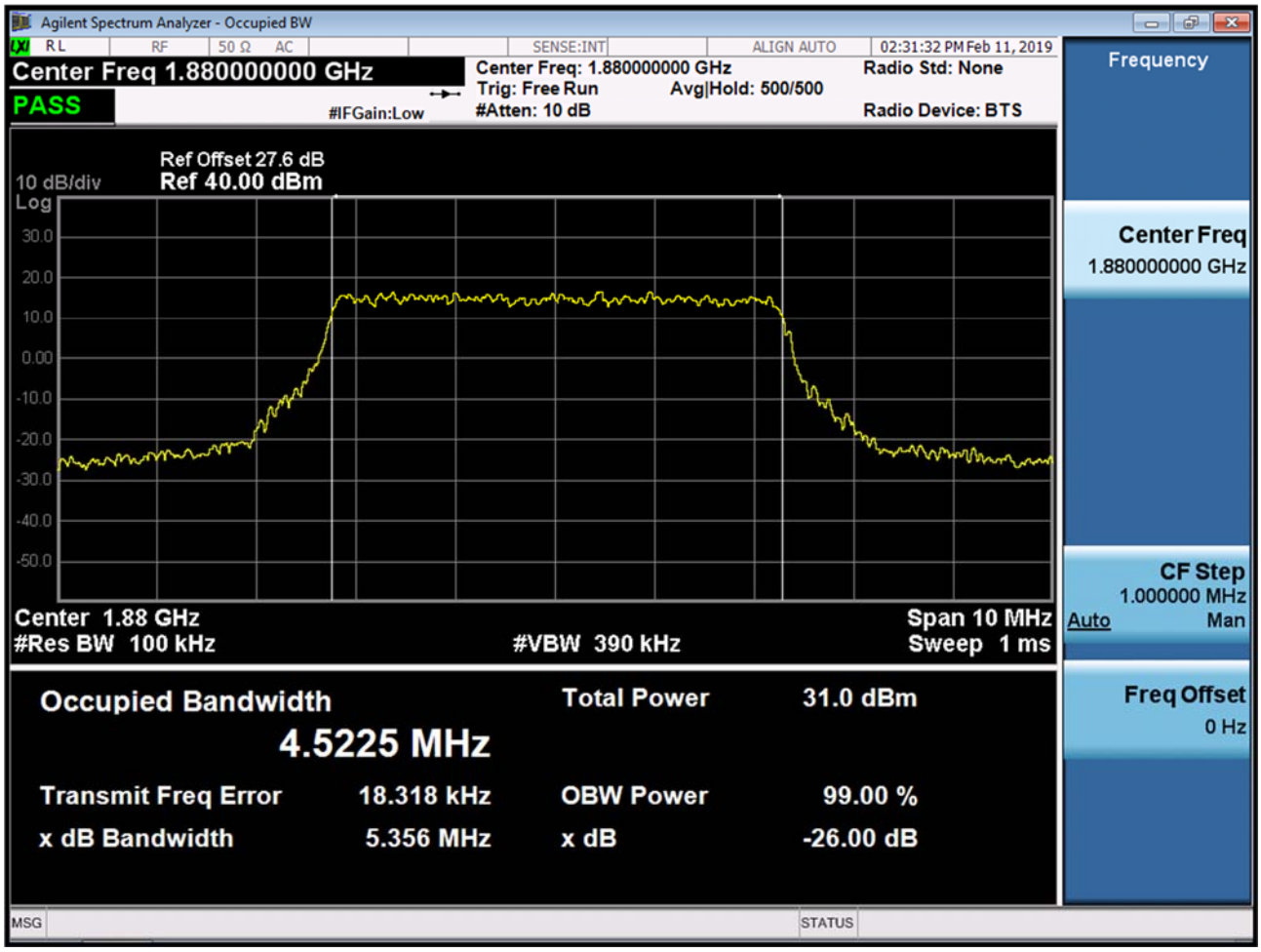
BAND 2. Occupied Bandwidth Plot (3M BW Ch.18900 QPSK RB 15_0)



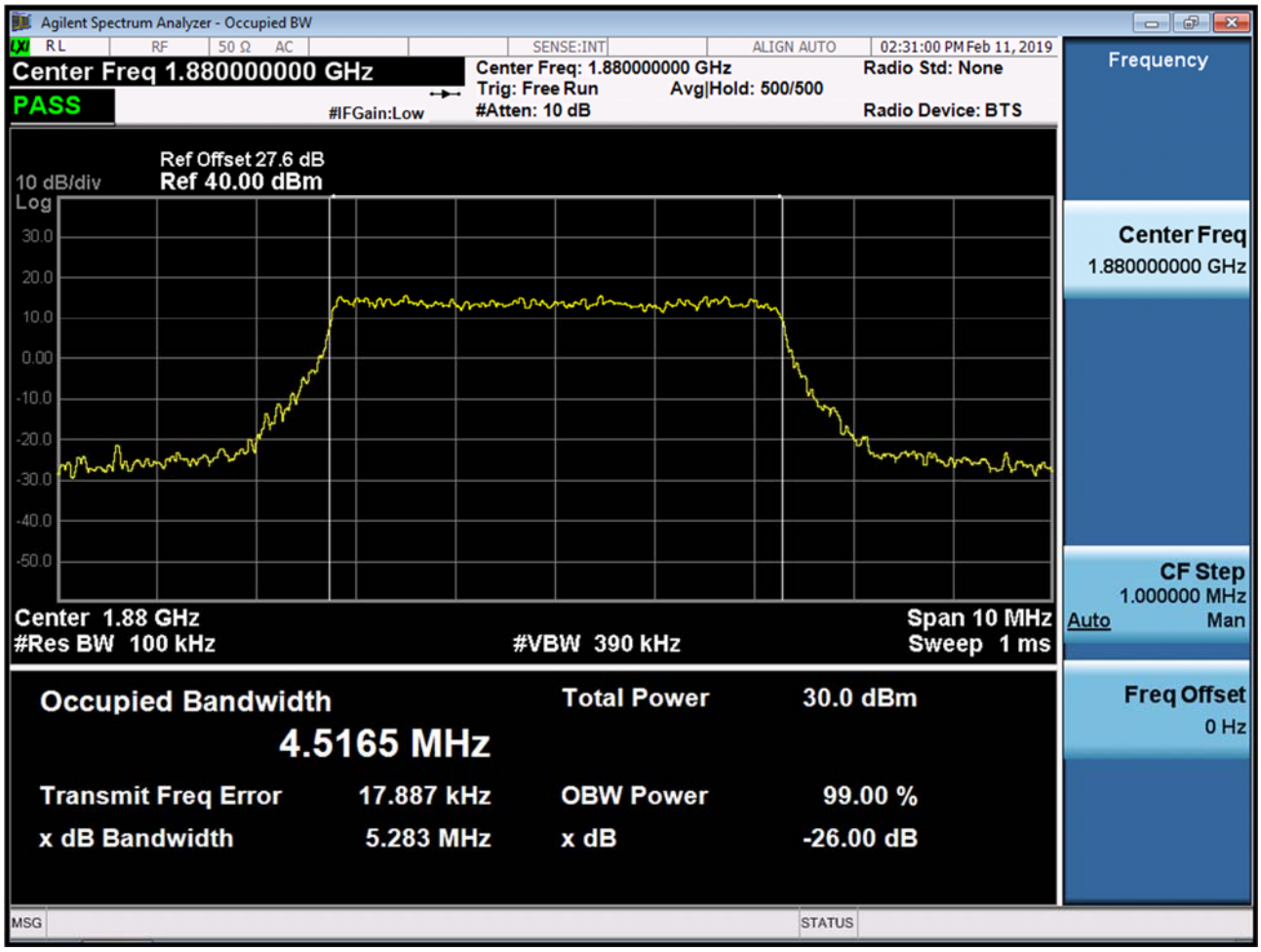
BAND 2. Occupied Bandwidth Plot (3M BW Ch.18900 16QAM RB 15_0)



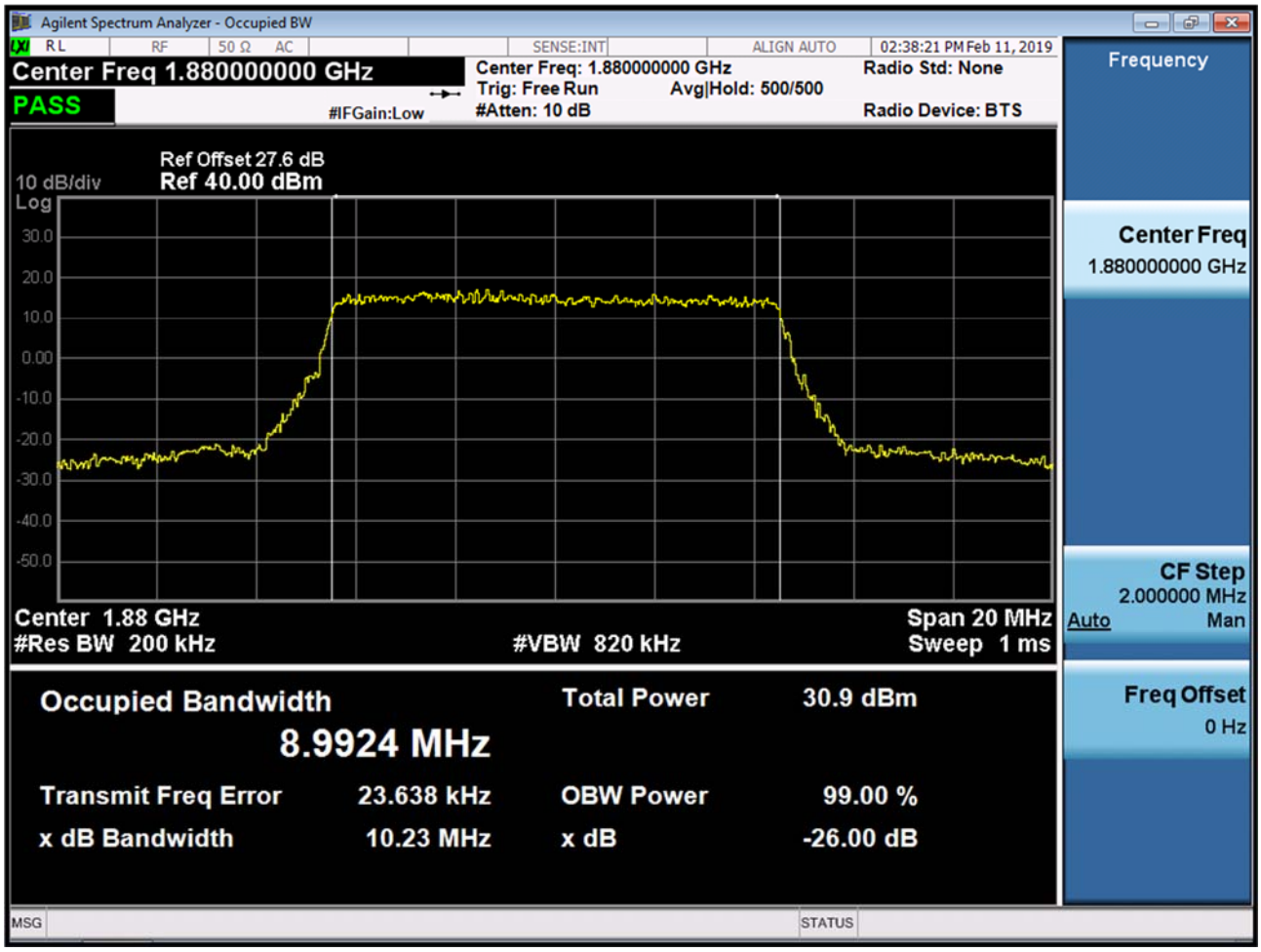
BAND 2. Occupied Bandwidth Plot (5M BW Ch.18900 QPSK RB 25_0)



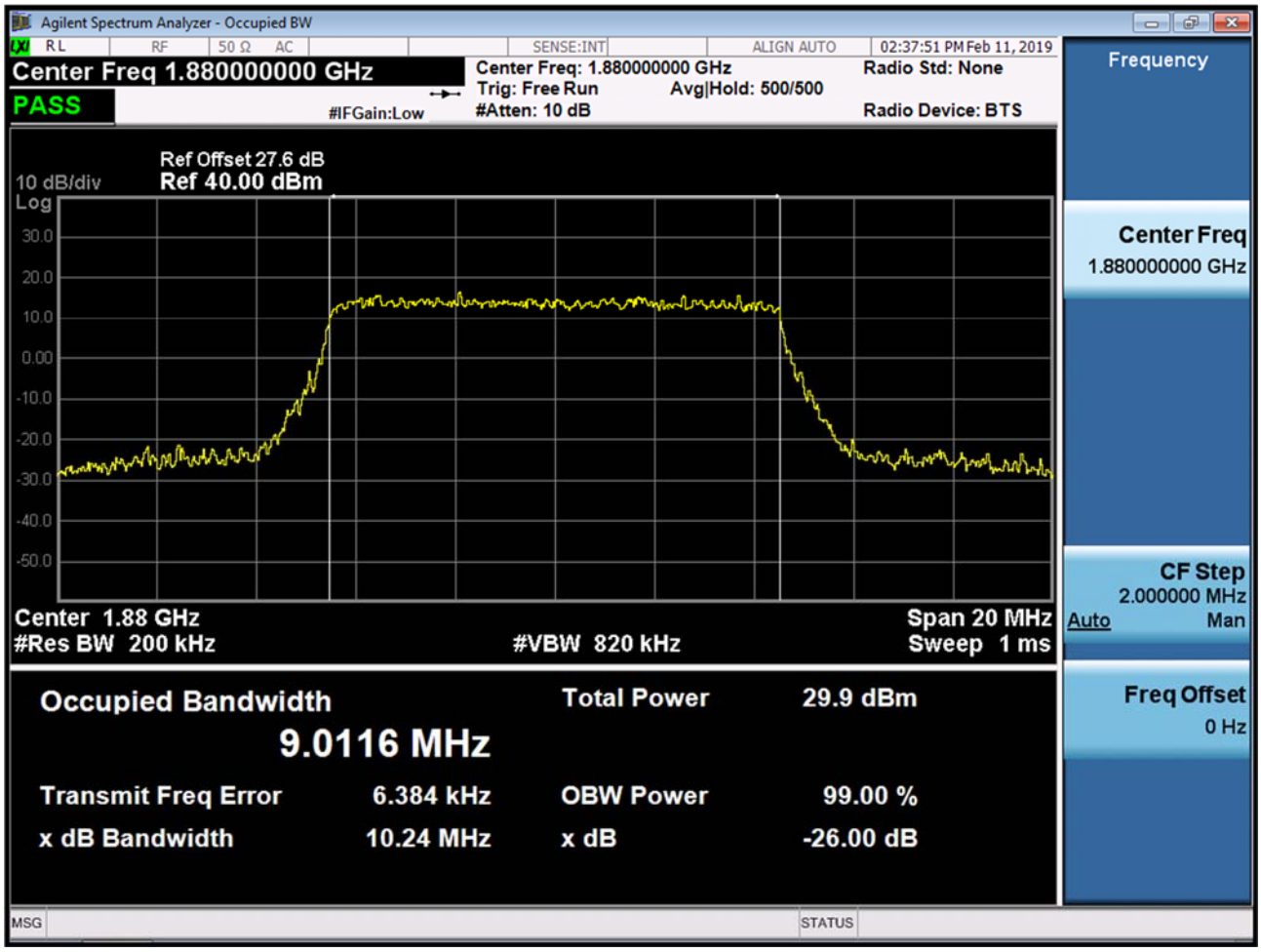
BAND 2. Occupied Bandwidth Plot (5M BW Ch.18900 16QAM RB 25_0)



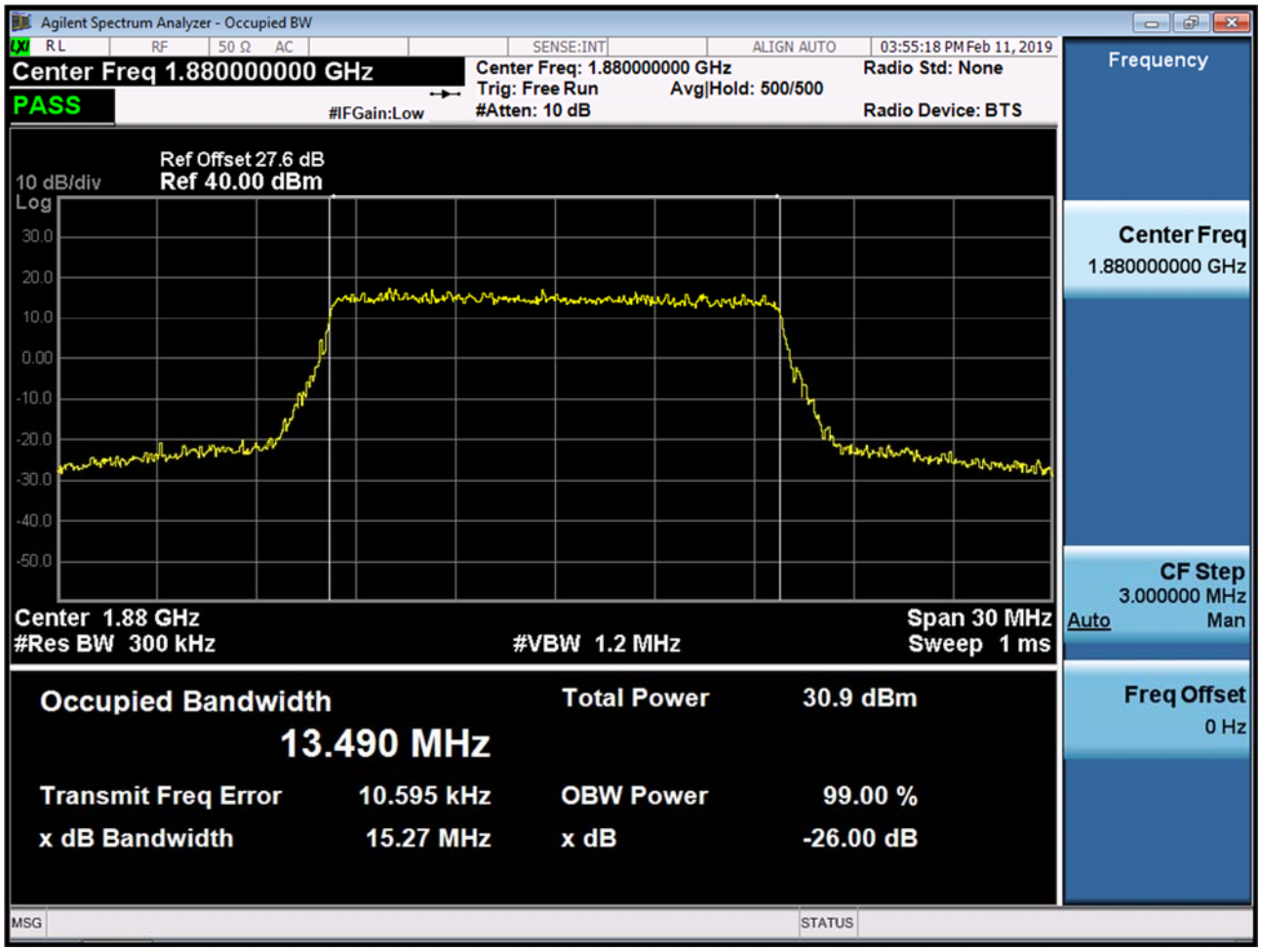
BAND 2. Occupied Bandwidth Plot (10M BW Ch.18900 QPSK RB 50_0)



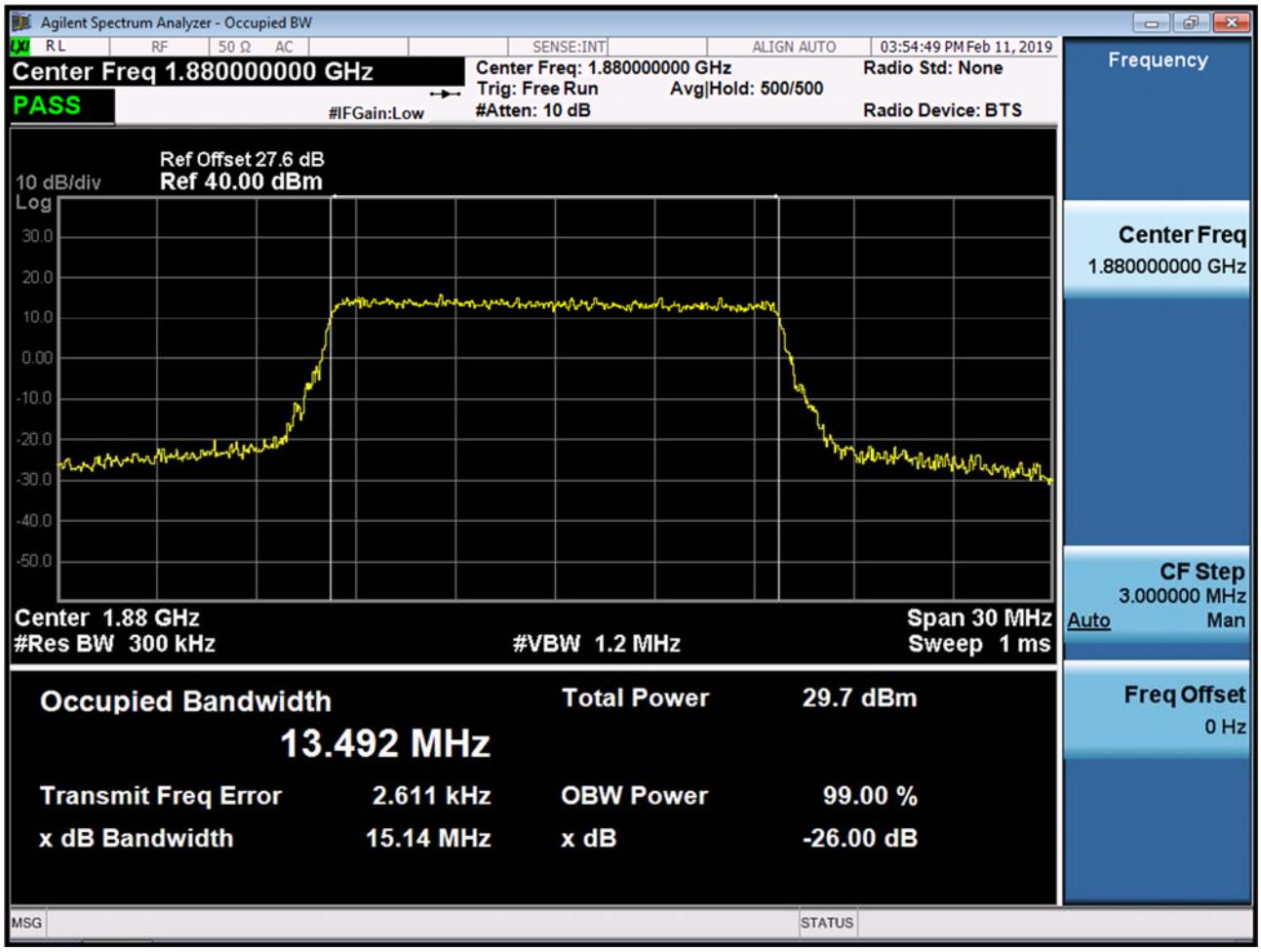
BAND 2. Occupied Bandwidth Plot (10M BW Ch.18900 16QAM RB 50_0)



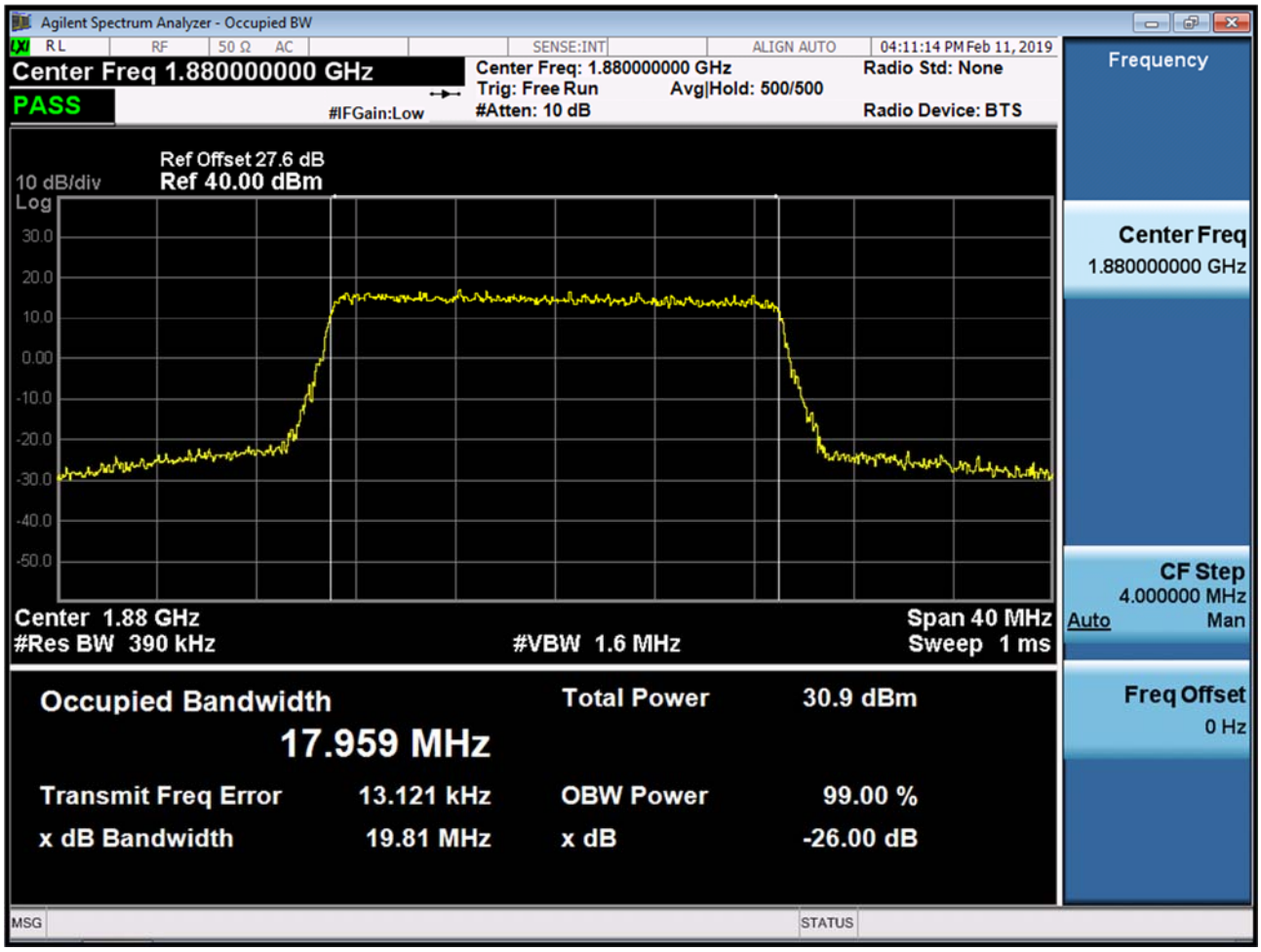
BAND 2. Occupied Bandwidth Plot (15M BW Ch.18900 QPSK RB 75_0)



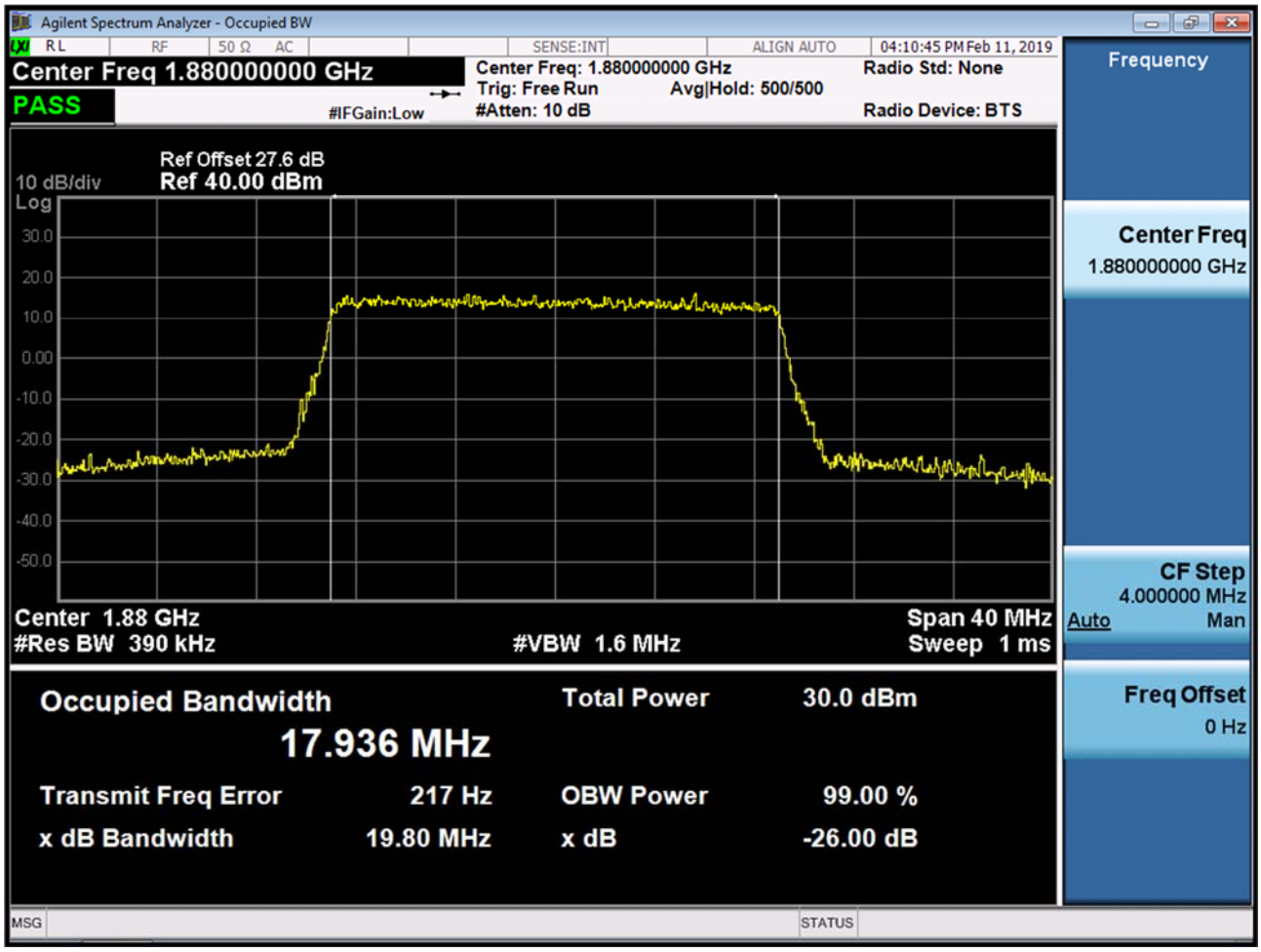
BAND 2. Occupied Bandwidth Plot (15M BW Ch.18900 16QAM RB 75_0)



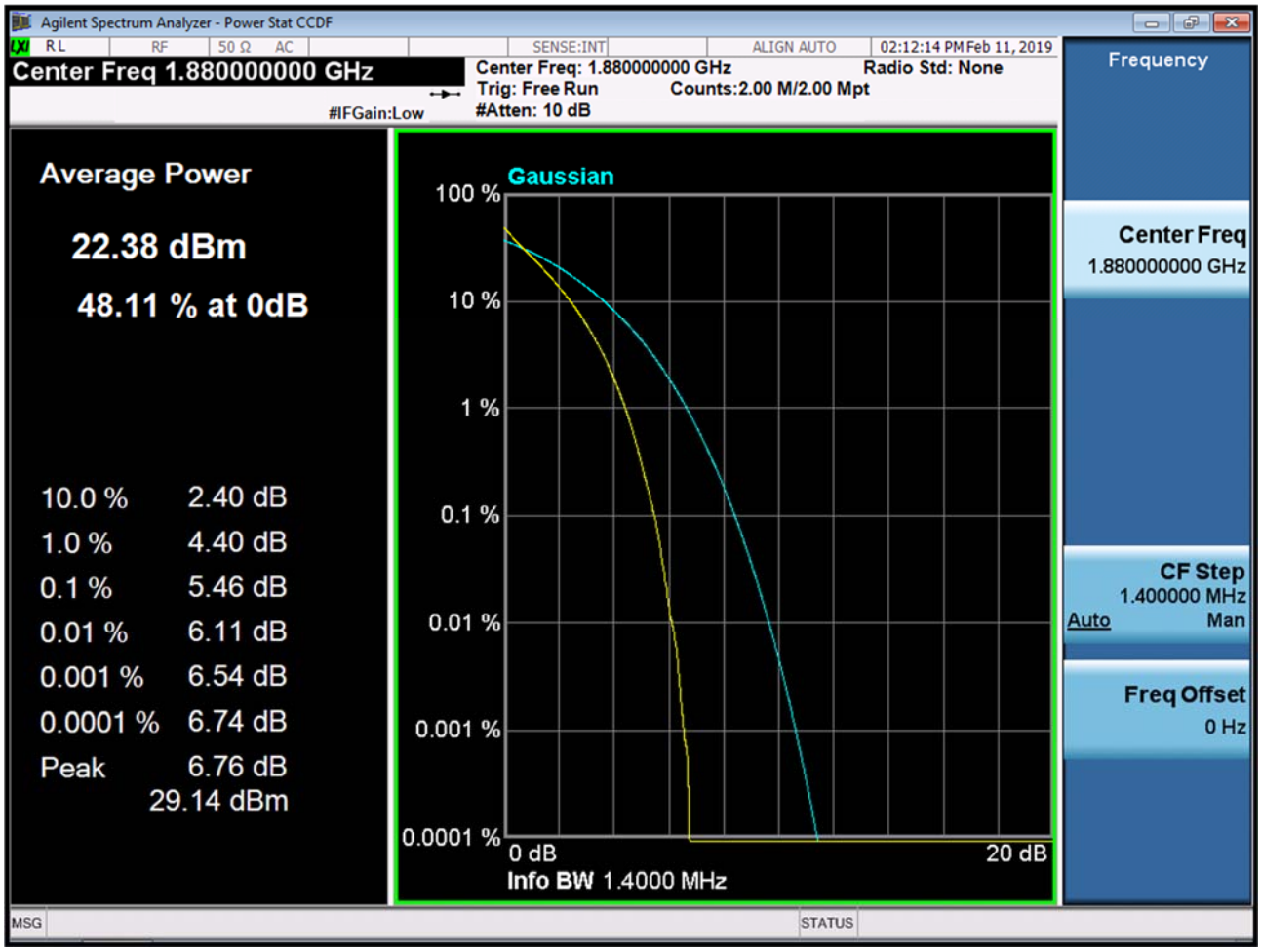
BAND 2. Occupied Bandwidth Plot (20M BW Ch.18900 QPSK RB 100_0)



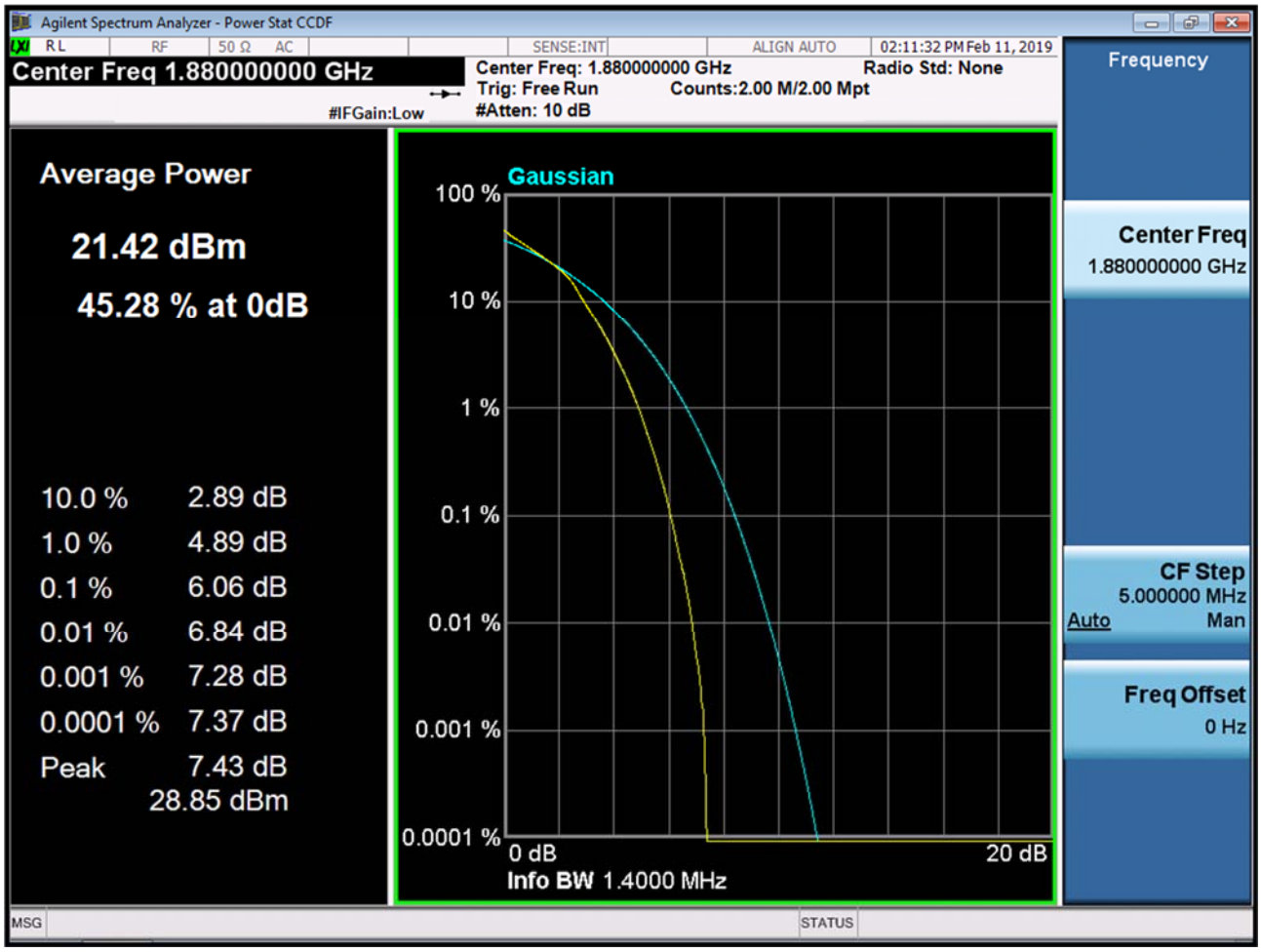
BAND 2. Occupied Bandwidth Plot (20M BW Ch.18900 16QAM RB 100_0)



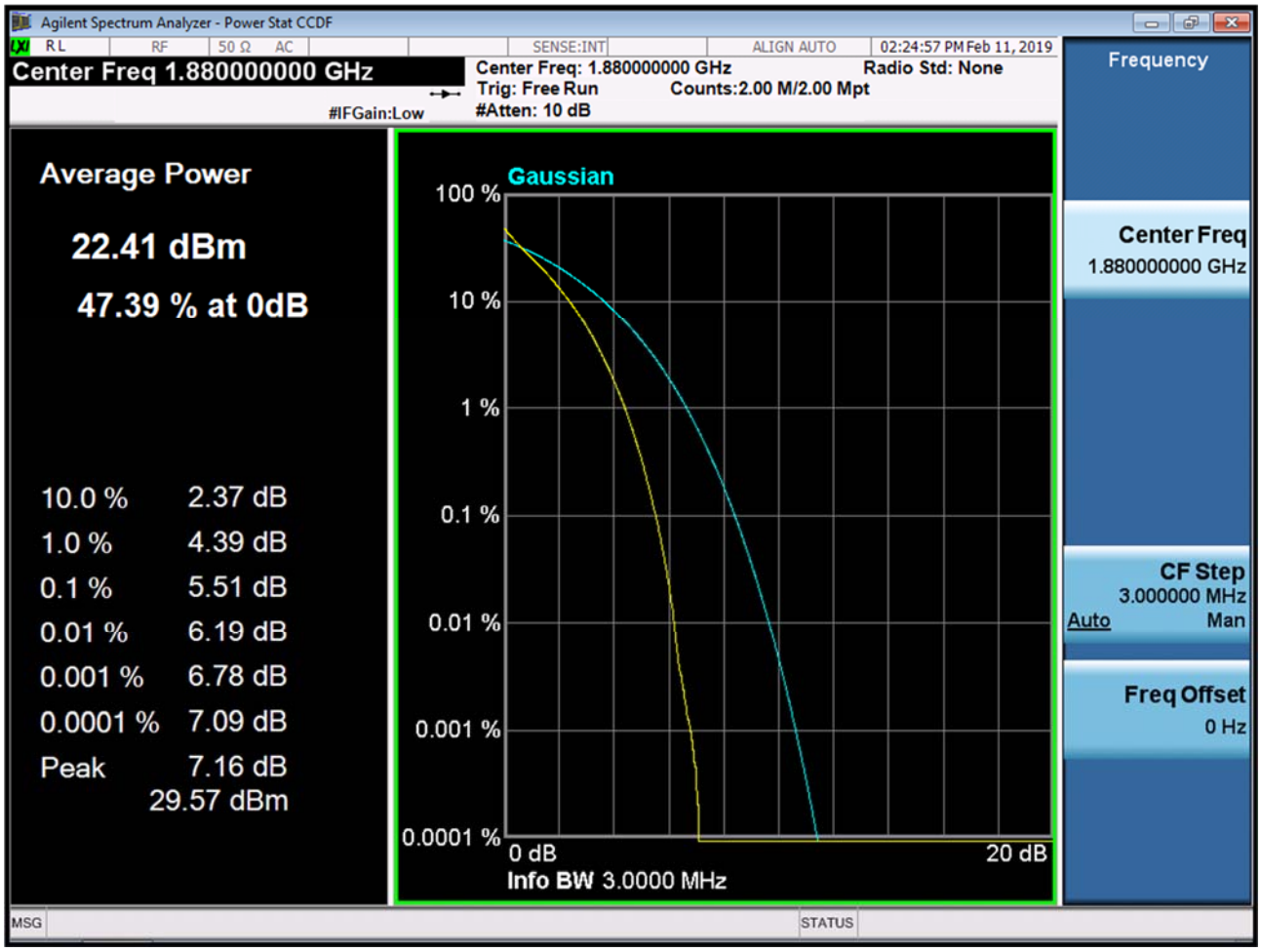
BAND 2. PAR Plot (1.4M BW Ch.18900 QPSK RB 6_0)



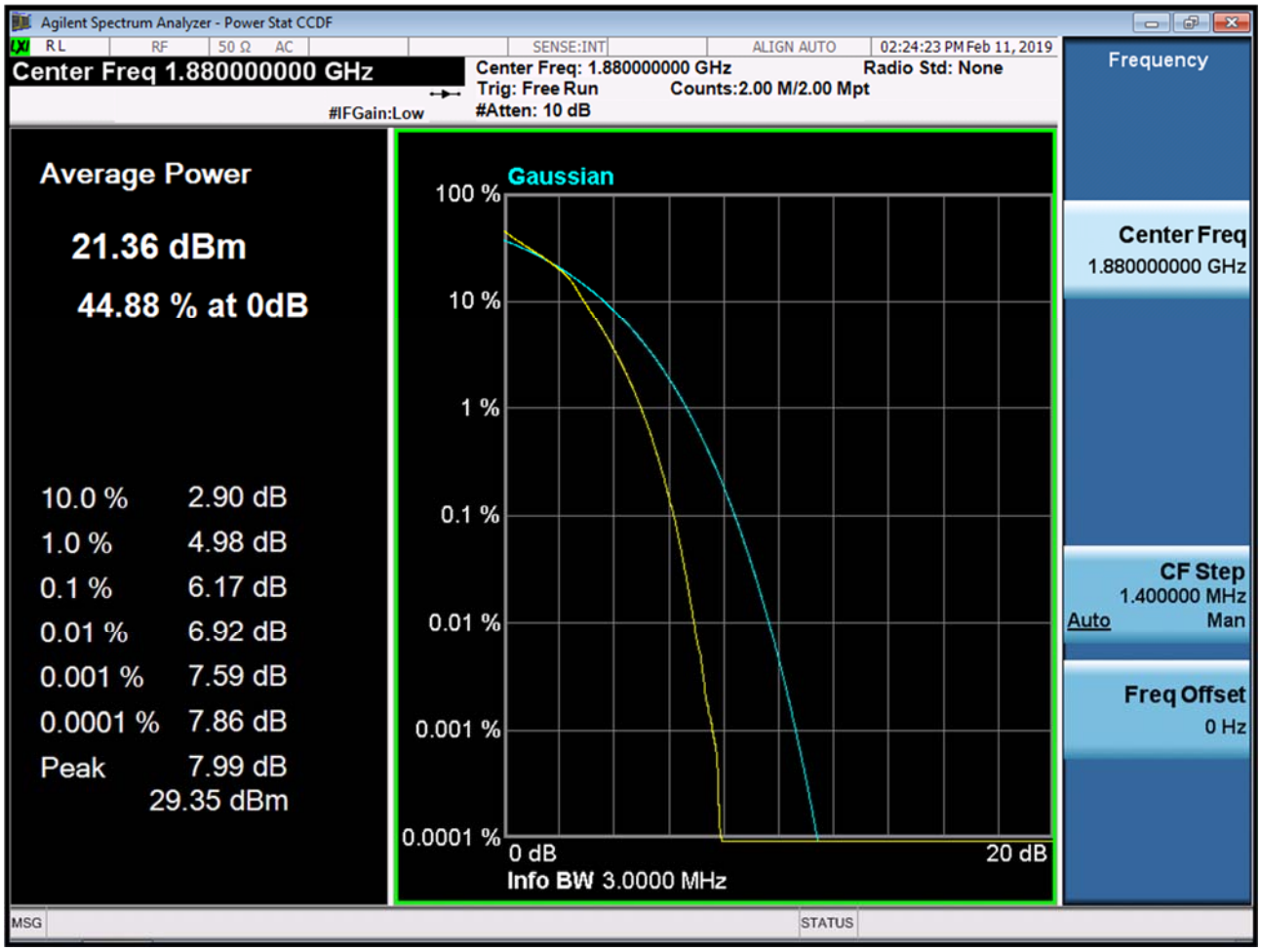
BAND 2. PAR Plot (1.4M BW Ch.18900 16QAM RB 6_0)



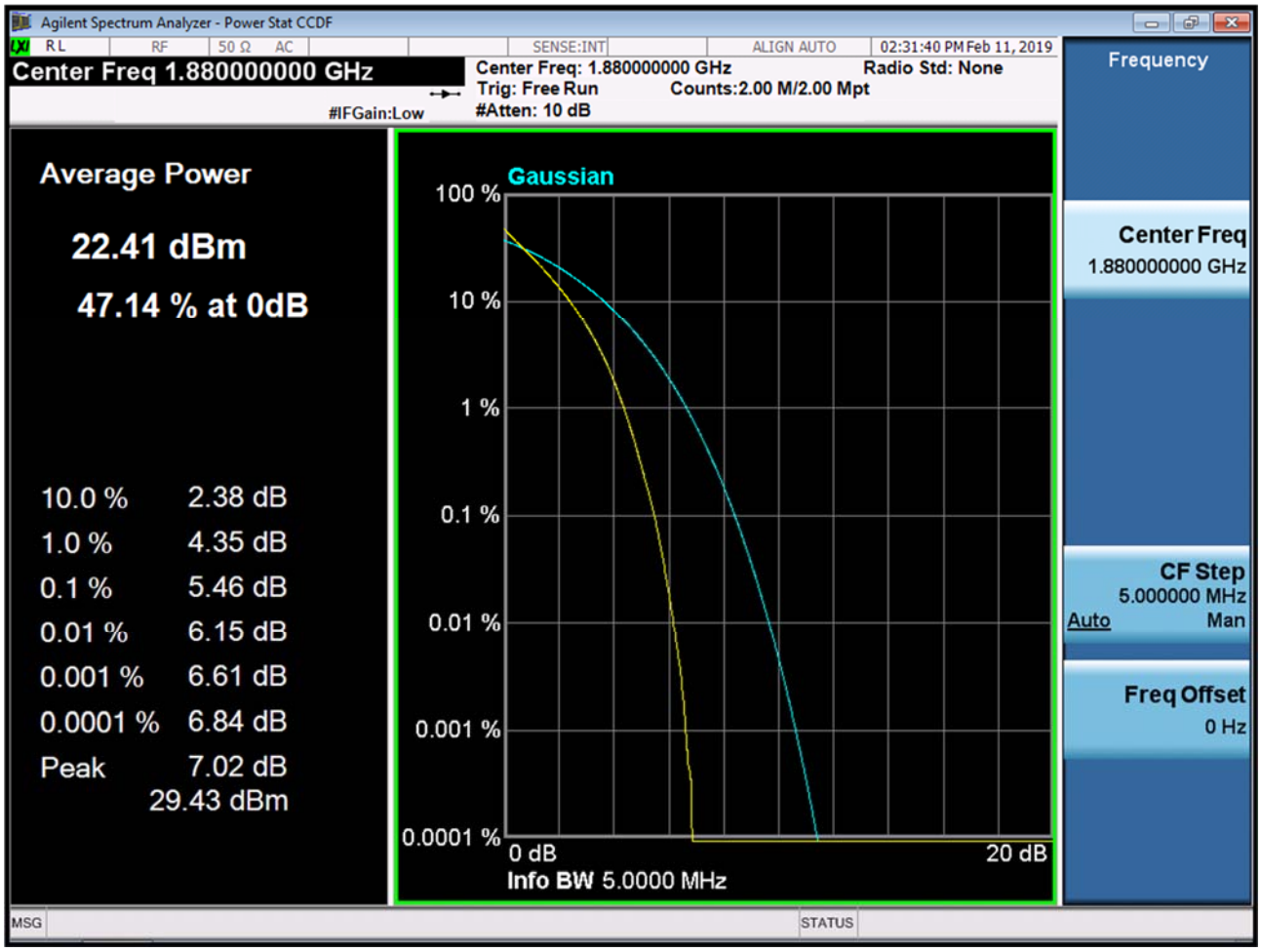
BAND 2. PAR Plot (3M BW Ch.18900 QPSK RB 15_0)



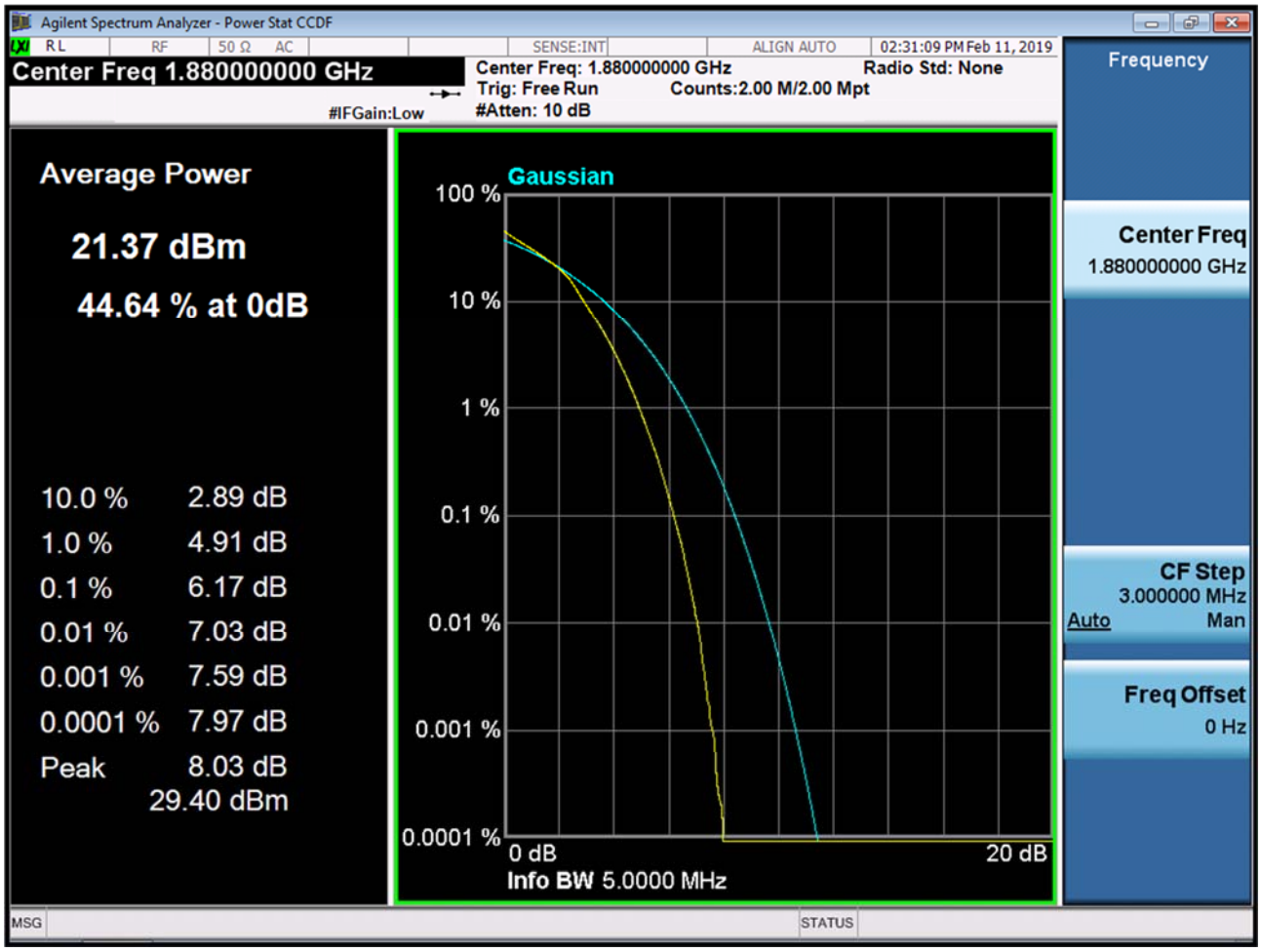
BAND 2. PAR Plot (3M BW Ch.18900 16QAM RB 15_0)



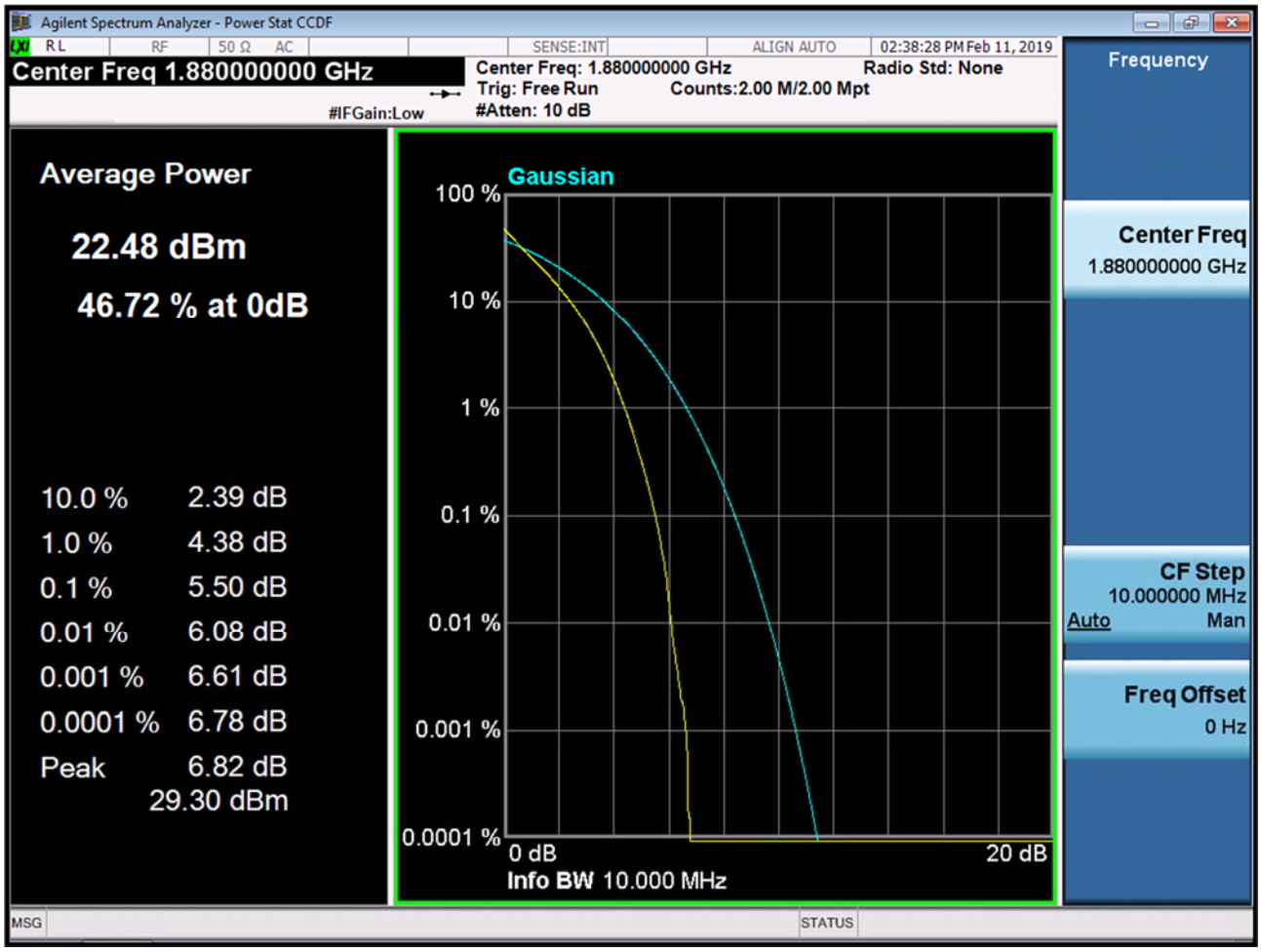
BAND 2. PAR Plot (5M BW Ch.18900 QPSK RB 25_0)



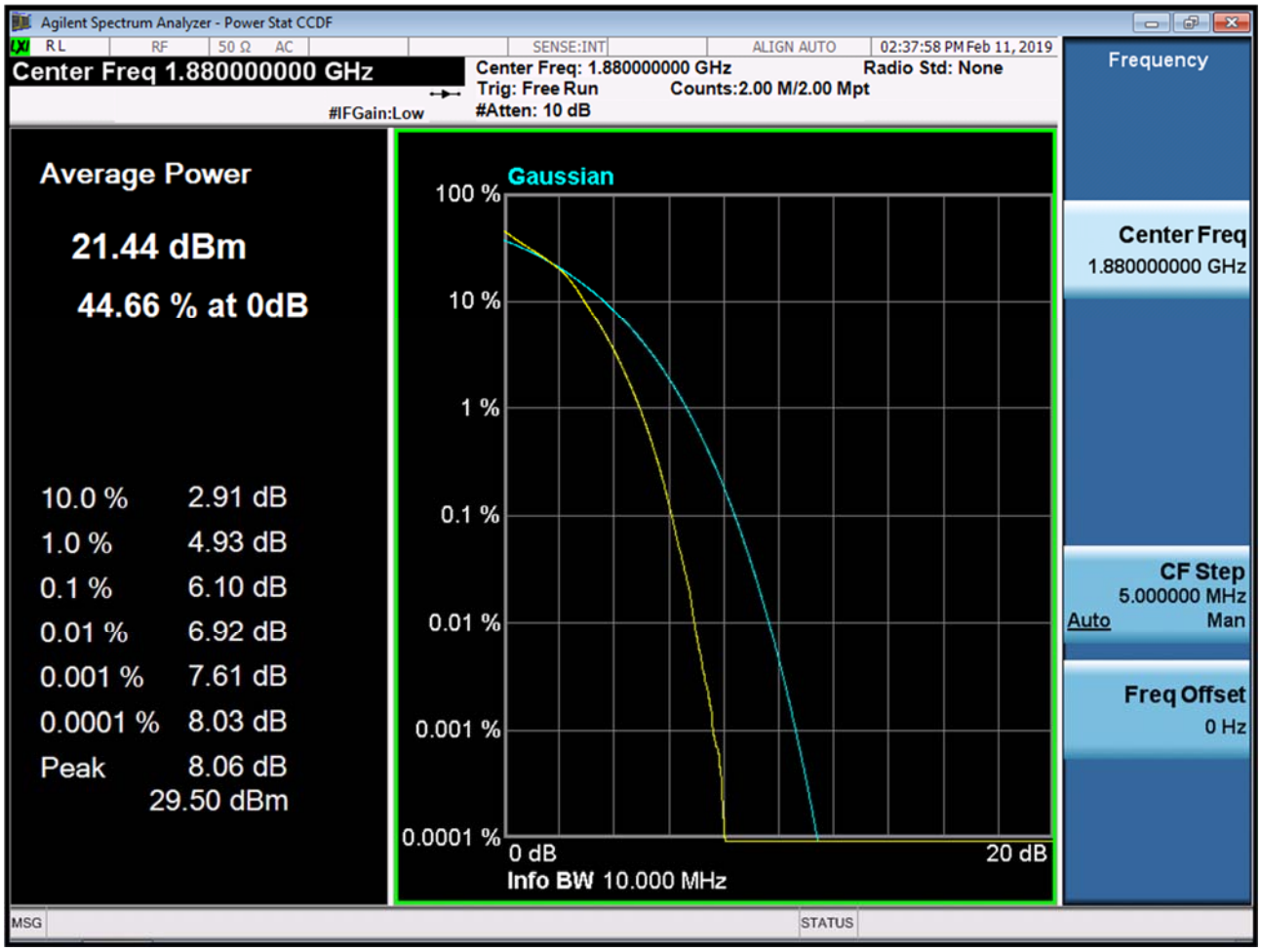
BAND 2. PAR Plot (5M BW Ch.18900 16QAM RB 25_0)



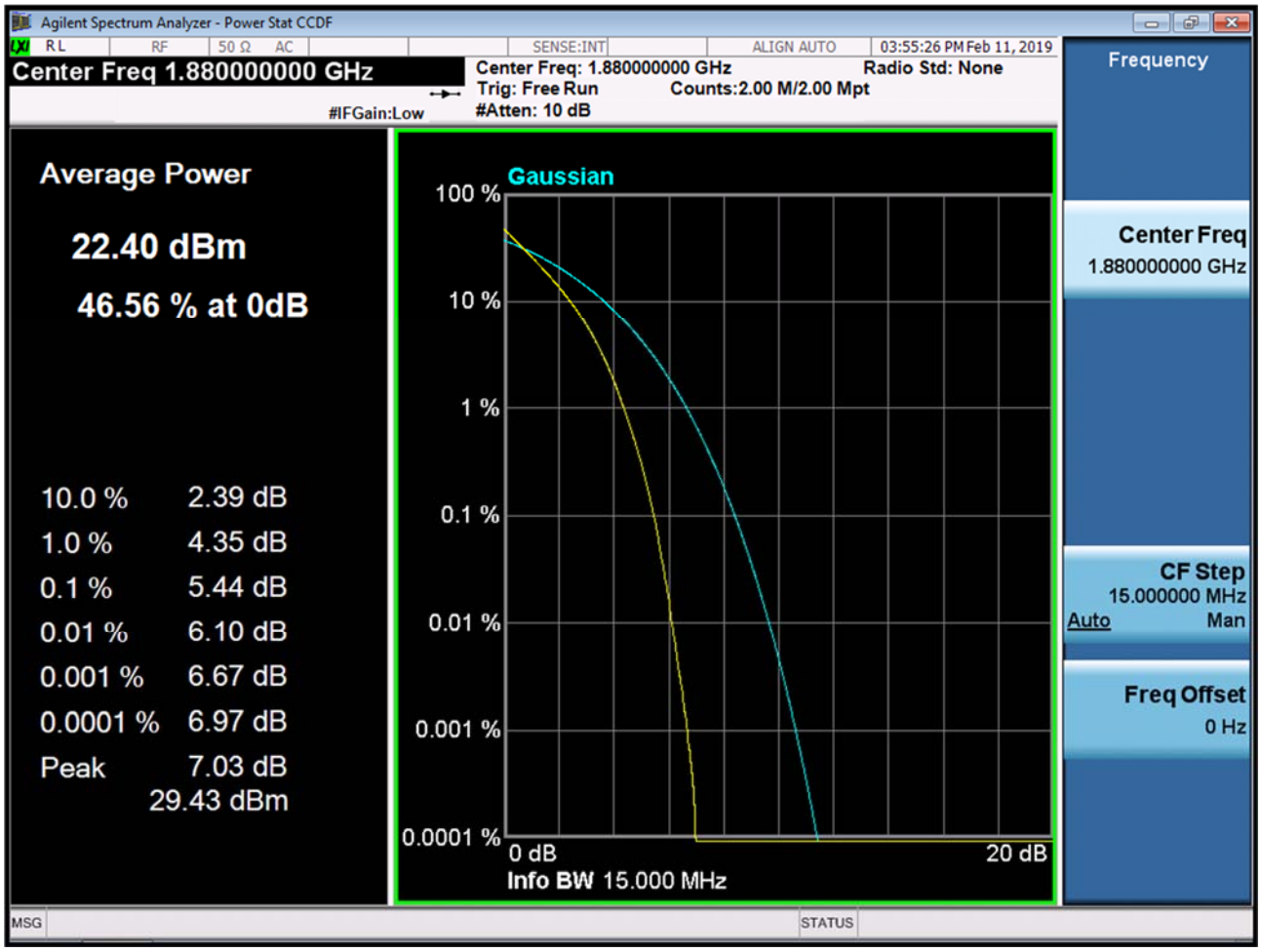
BAND 2. PAR Plot (10M BW Ch.18900 QPSK RB 50_0)



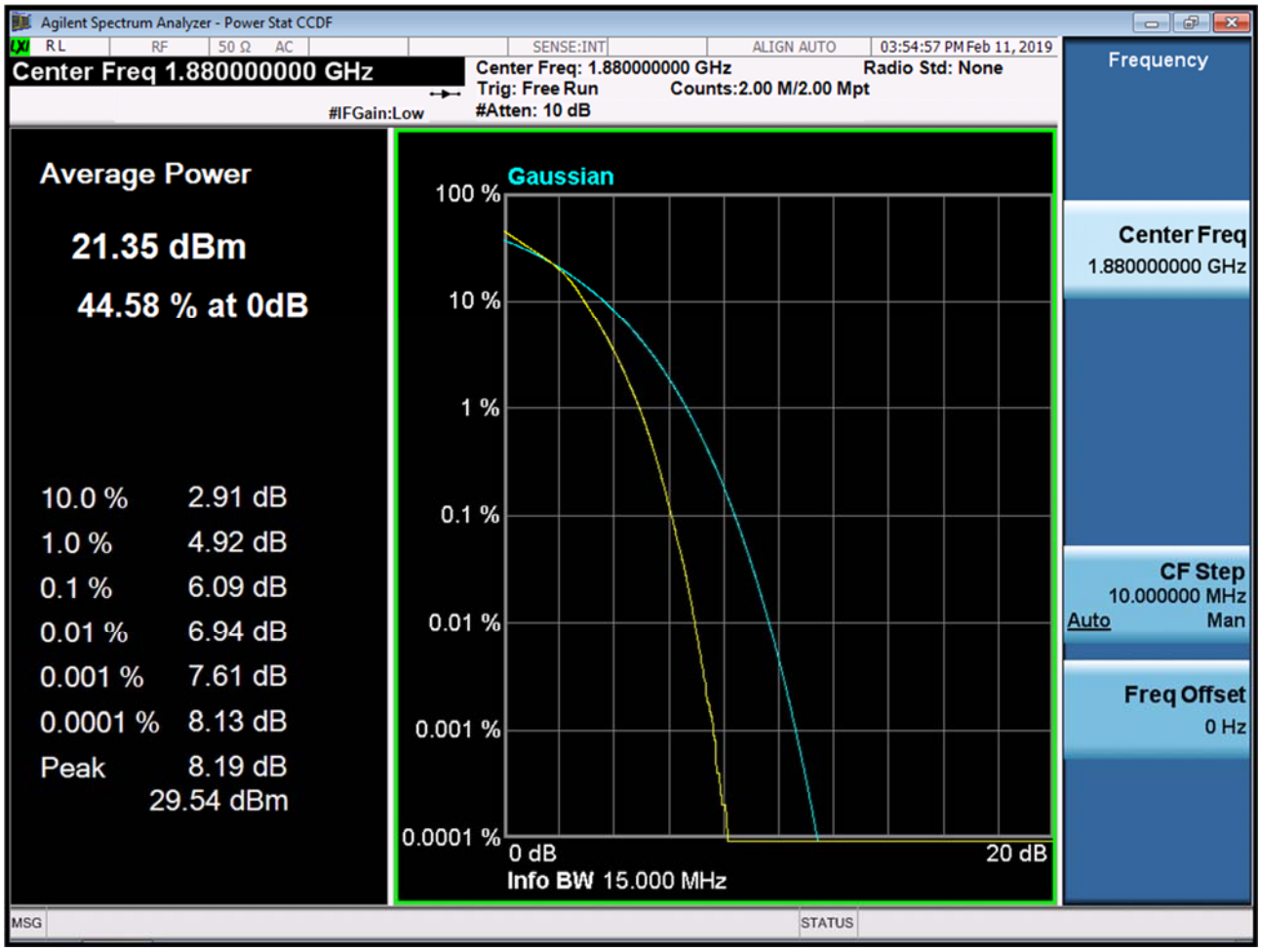
BAND 2. PAR Plot (10M BW Ch.18900 16QAM RB 50_0)



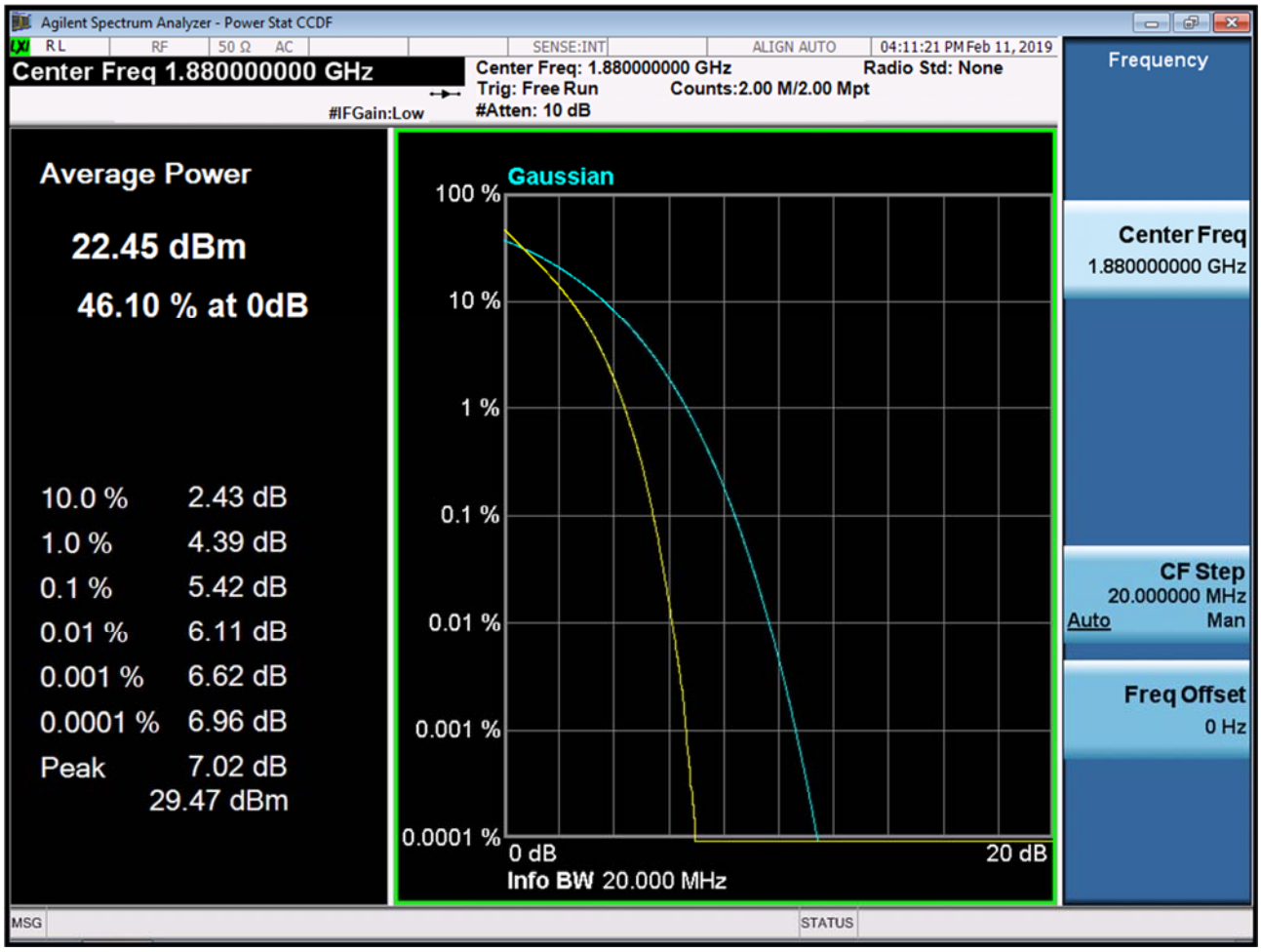
BAND 2. PAR Plot (15M BW Ch.18900 QPSK RB 75_0)



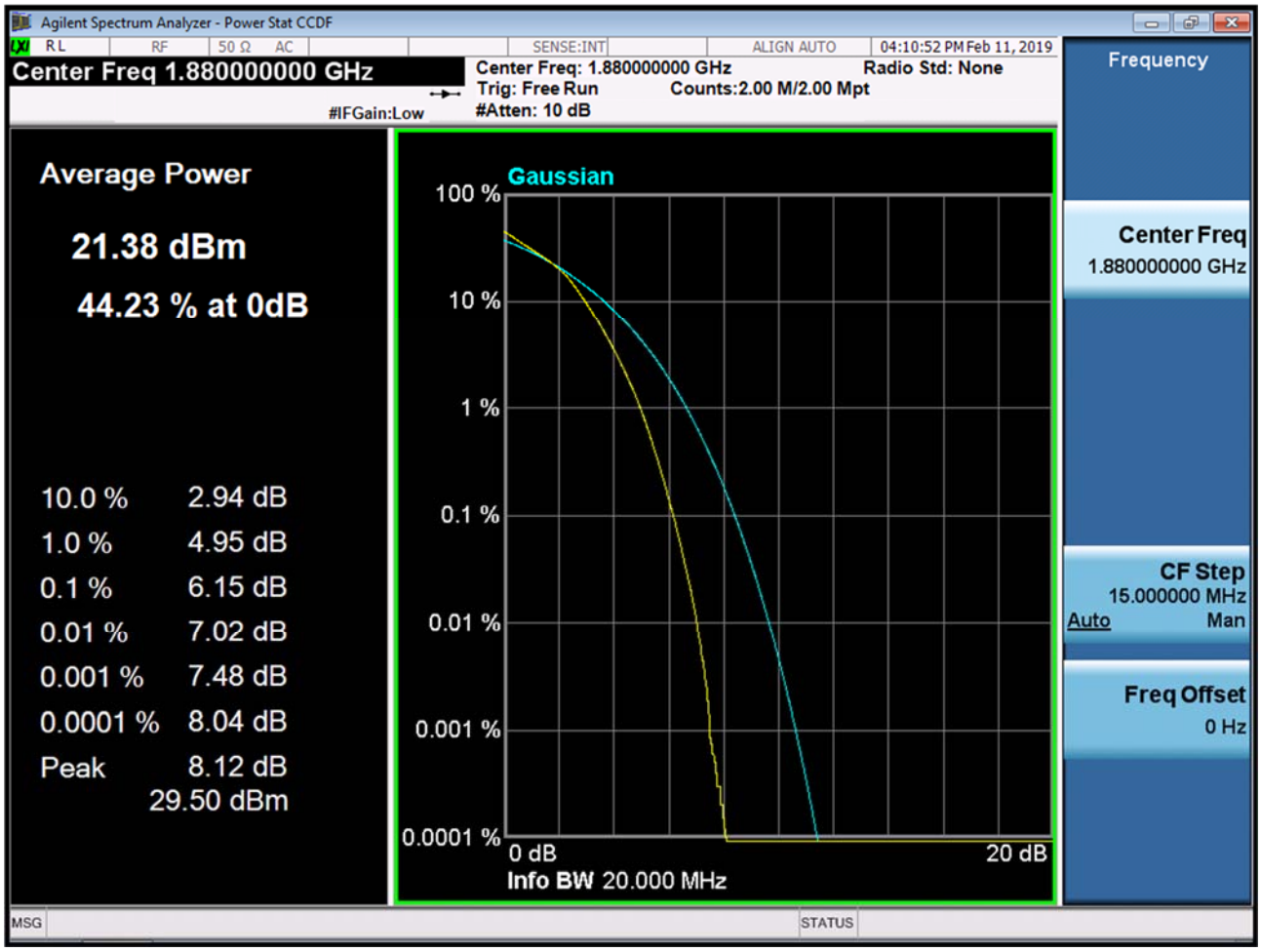
BAND 2. PAR Plot (15M BW Ch.18900 16QAM RB 75_0)



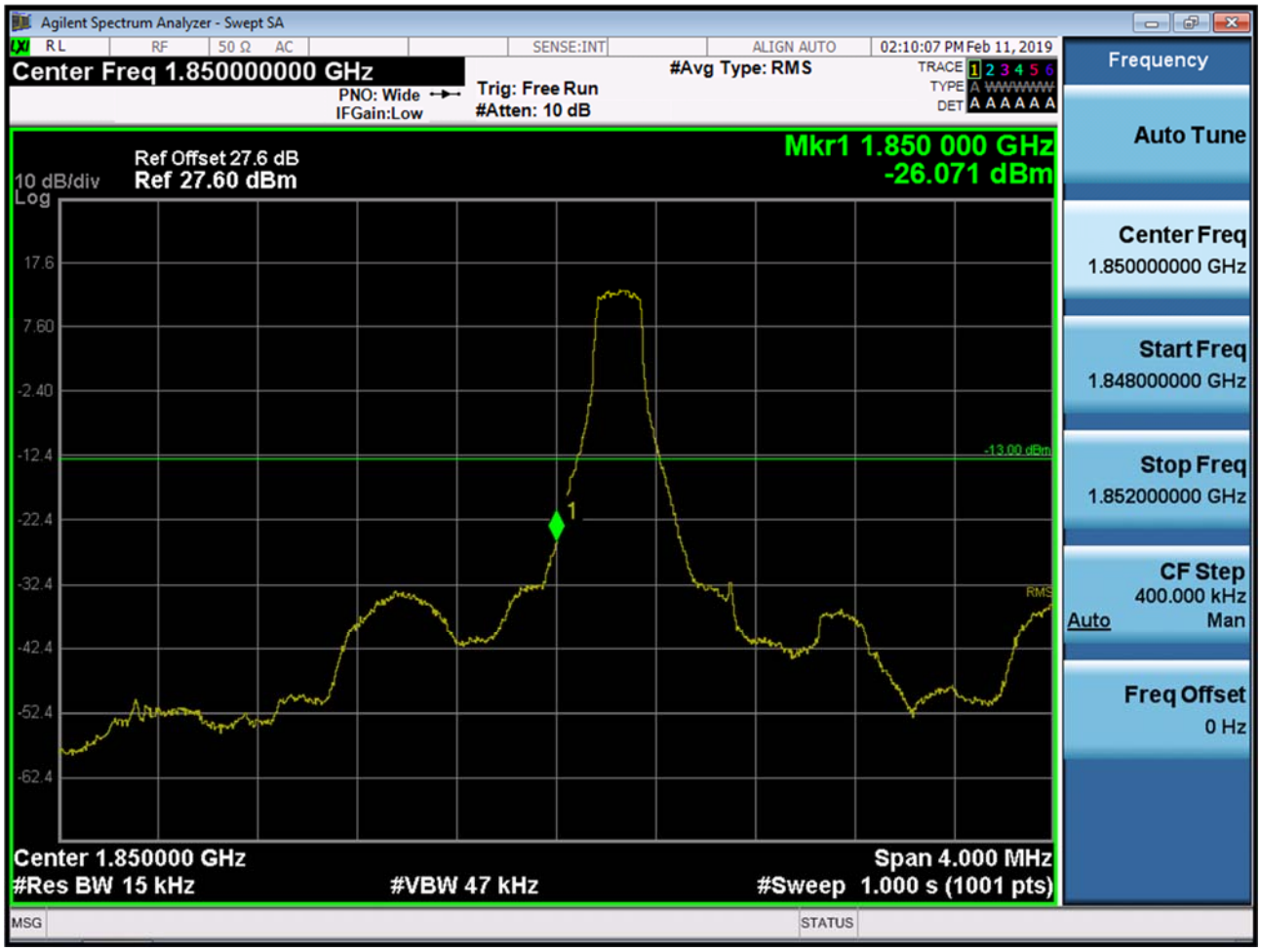
BAND 2. PAR Plot (20M BW Ch.18900 QPSK RB 100_0)



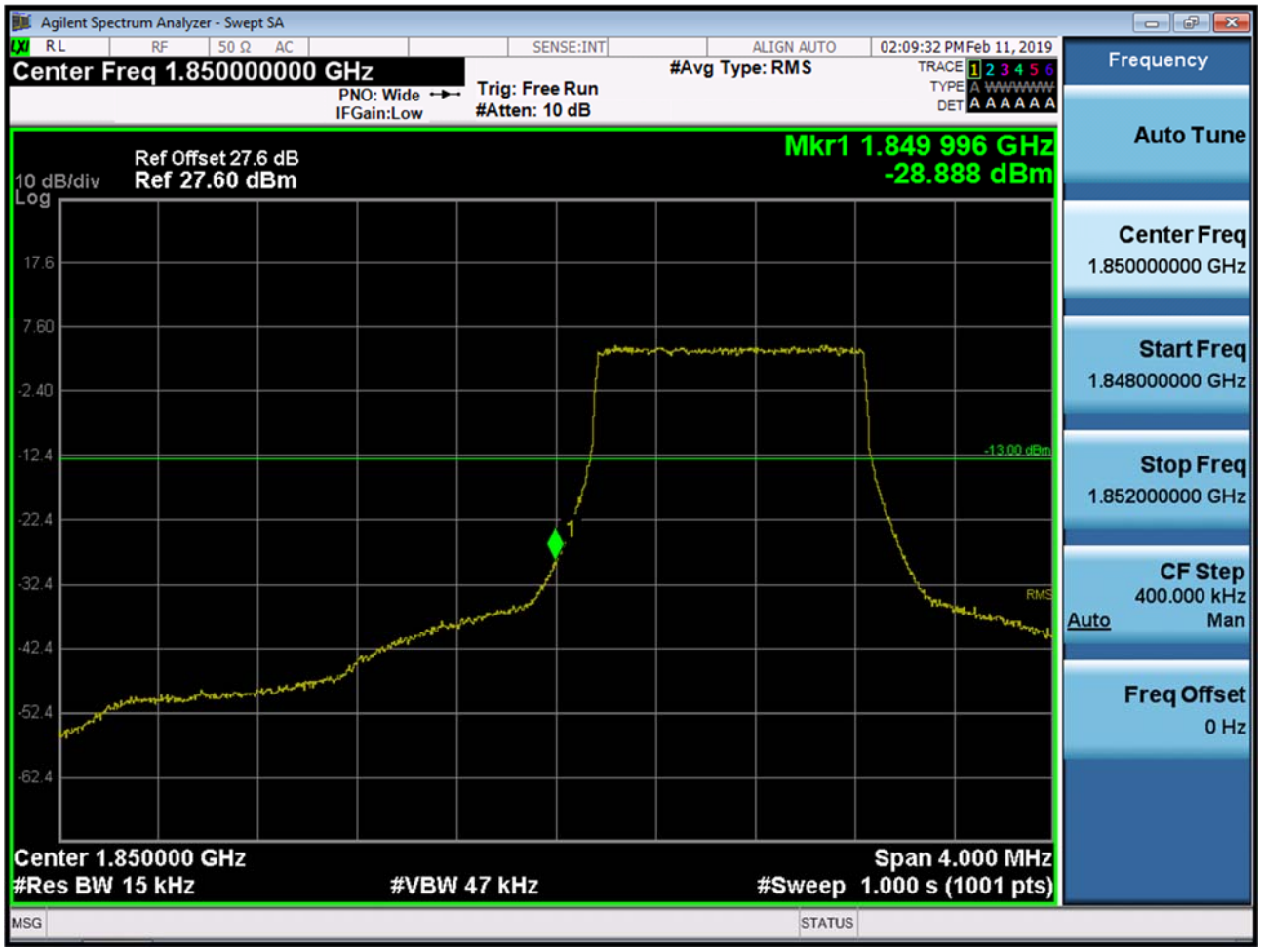
BAND 2. PAR Plot (20M BW Ch.18900 16QAM RB 100_0)



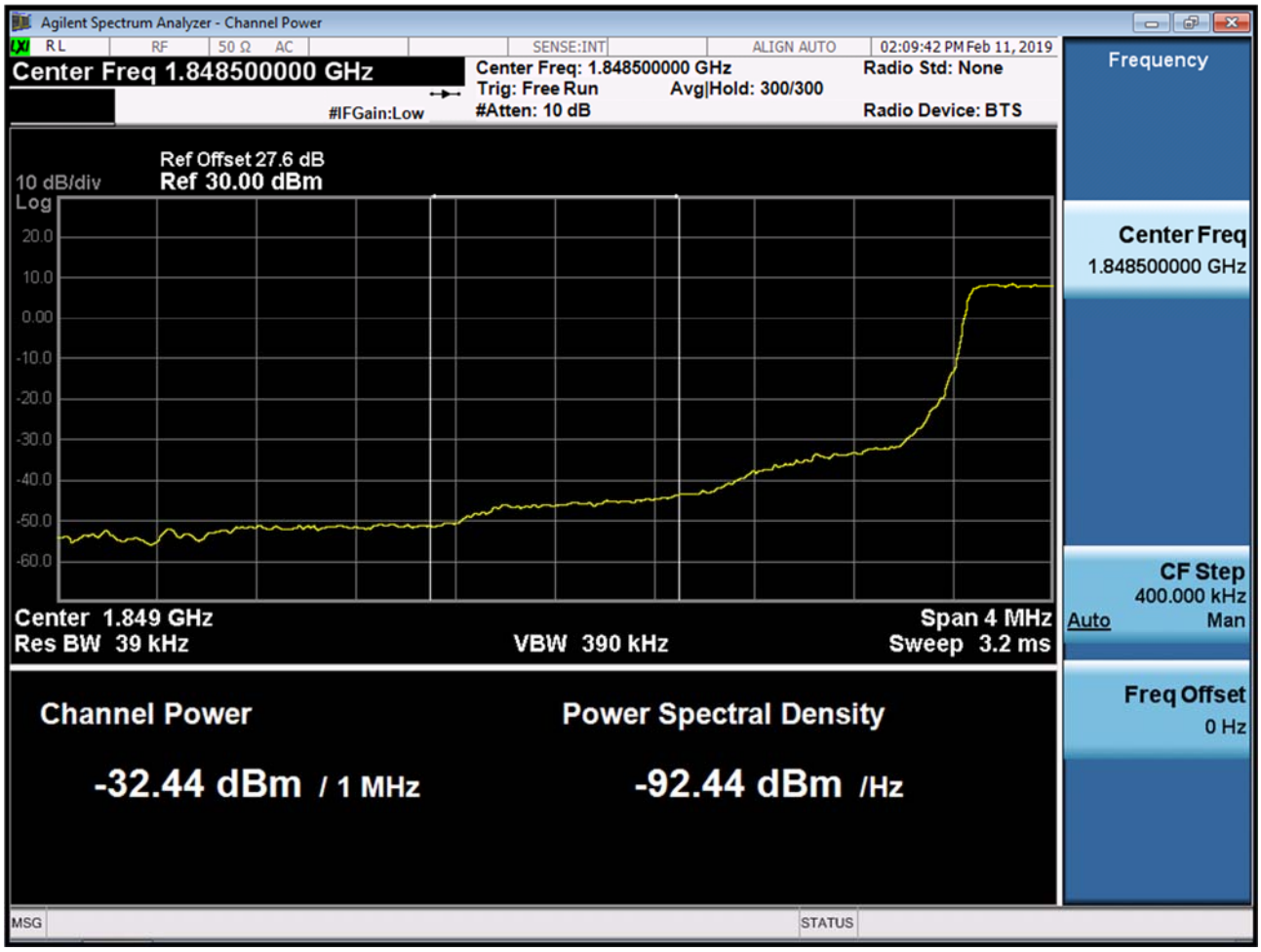
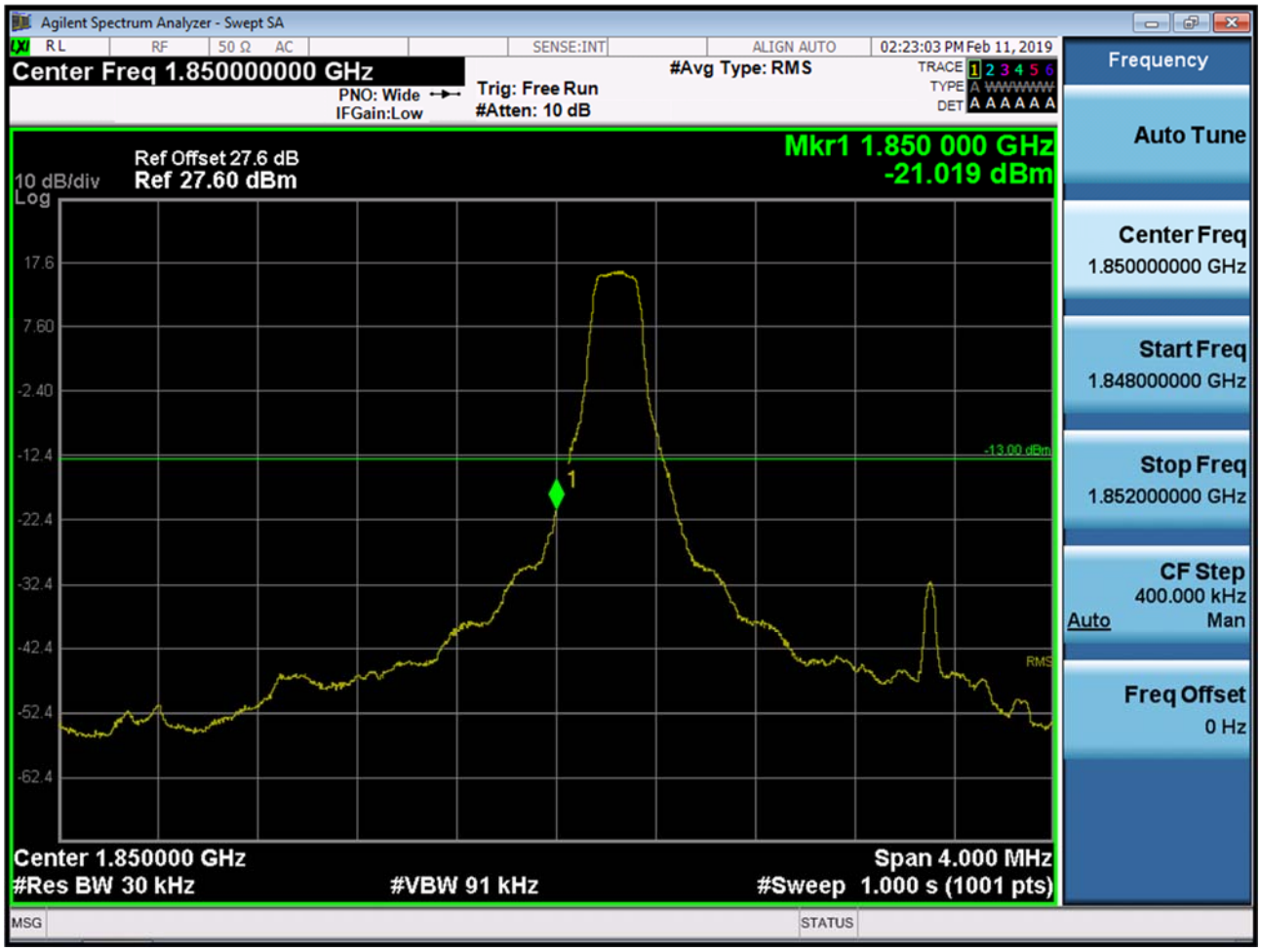
BAND 2. Lower Band Edge Plot (1.4M BW Ch.18607 QPSK_RB1_Offset 0) -1



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