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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:
December 21, 2023

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

Report No.: HCT-RF-2312-FC016

FCC ID:	**A3LSMM156B**
APPLICANT:	**SAMSUNG Electronics Co., Ltd.**

Model(s): SM-M156B/DSN
EUT Type: Mobile phone
FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part(s): §24

Main 2 Ant

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	0.213	23.29
		1M09W7D	16QAM	0.181	22.57
		1M10W7D	64QAM	0.141	21.49
		1M09W7D	256QAM	0.072	18.57
LTE – Band2 (3)	1851.5 - 1908.5	2M71G7D	QPSK	0.215	23.32
		2M69W7D	16QAM	0.181	22.58
		2M70W7D	64QAM	0.141	21.50
		2M70W7D	256QAM	0.072	18.55
LTE – Band2 (5)	1852.5 - 1907.5	4M51G7D	QPSK	0.218	23.38
		4M50W7D	16QAM	0.185	22.68
		4M51W7D	64QAM	0.144	21.58
		4M52W7D	256QAM	0.073	18.64
LTE – Band2 (10)	1855.0 - 1905.0	8M98G7D	QPSK	0.229	23.60
		8M98W7D	16QAM	0.194	22.87
		8M97W7D	64QAM	0.152	21.82
		8M99W7D	256QAM	0.077	18.87
LTE – Band2 (15)	1857.5 - 1902.5	13M5G7D	QPSK	0.226	23.55
		13M5W7D	16QAM	0.194	22.87
		13M4W7D	64QAM	0.150	21.77
		13M5W7D	256QAM	0.076	18.80
LTE – Band2 (20)	1860.0 - 1900.0	18M0G7D	QPSK	0.226	23.54
		17M9W7D	16QAM	0.192	22.84
		17M9W7D	64QAM	0.149	21.72
		17M9W7D	256QAM	0.075	18.76

Main 3 Ant

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	0.090	19.53
		1M10W7D	16QAM	0.076	18.83
		1M10W7D	64QAM	0.058	17.67
		1M09W7D	256QAM	0.030	14.76
LTE – Band2 (3)	1851.5 - 1908.5	2M70G7D	QPSK	0.089	19.47
		2M70W7D	16QAM	0.076	18.78
		2M70W7D	64QAM	0.058	17.61
		2M70W7D	256QAM	0.030	14.70
LTE – Band2 (5)	1852.5 - 1907.5	4M52G7D	QPSK	0.090	19.52
		4M49W7D	16QAM	0.076	18.83
		4M50W7D	64QAM	0.058	17.66
		4M50W7D	256QAM	0.030	14.72
LTE – Band2 (10)	1855.0 - 1905.0	9M00G7D	QPSK	0.094	19.72
		8M97W7D	16QAM	0.080	19.04
		9M00W7D	64QAM	0.061	17.87
		9M00W7D	256QAM	0.031	14.93
LTE – Band2 (15)	1857.5 - 1902.5	13M5G7D	QPSK	0.095	19.78
		13M5W7D	16QAM	0.081	19.09
		13M5W7D	64QAM	0.062	17.92
		13M5W7D	256QAM	0.031	14.92
LTE – Band2 (20)	1860.0 - 1900.0	18M0G7D	QPSK	0.095	19.80
		17M9W7D	16QAM	0.081	19.11
		18M0W7D	64QAM	0.062	17.92
		18M0W7D	256QAM	0.031	14.96

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

REVIEWED BY

Report prepared by : Seok Hyun Kim
Engineer of Telecommunication Testing Center

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

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.
This test results were applied only to the test methods required by the standard.

Test Report Statement:
The above Test Report is not related to the accredited test result by (KS Q) ISO/IEC 17025 and KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA.

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2312-FC016	December 21, 2023	- First Approval Report

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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:	A3LSMM156B
Application Type:	Certification
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part(s):	§24
EUT Type:	Mobile phone
Model(s):	SM-M156B/DSN
Tx Frequency:	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))
Date(s) of Tests:	December 06, 2023 ~ December 18, 2023
Serial number:	Radiated: R3CWB0E8S8B(Main 2 Ant), R3CWB0E8BEY(Main 3 Ant) Conducted: R3CWB0E8ATM(Main 2 Ant), R3CWA0QSYXJ(Main 3 Ant)

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 (20/40/80 MHz), Bluetooth, BT LE, NFC, iPA.

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
Frequency stability	- ANSI C63.26-2015 – Section 5.6
Effective Radiated Power/ Effective Isotropic Radiated Power	- KDB 971168 D01 v03r01 – Section 5.2 & 5.8 - ANSI/TIA-603-E-2016 – Section 2.2.17
Radiated Spurious and Harmonic Emissions	- KDB 971168 D01 v03r01 – Section 6.2 - ANSI/TIA-603-E-2016 – Section 2.2.12

3.2 RADIATED POWER

Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

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

Test Settings

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

Test Note

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

   The power is calculated by the following formula;

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

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

Test Note

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

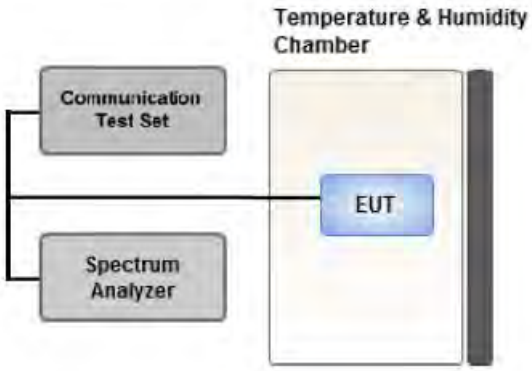
$$\text{Result}_{(dBm)} = \text{Pg}_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dBi)}$$

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

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

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

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

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

Test Settings(Peak Power)

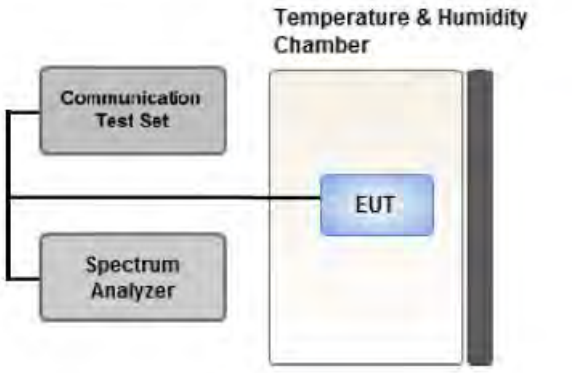
The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW ≥ 3 × RBW.

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

Test Settings(Average Power)

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

3.5 OCCUPIED BANDWIDTH.



Test setup

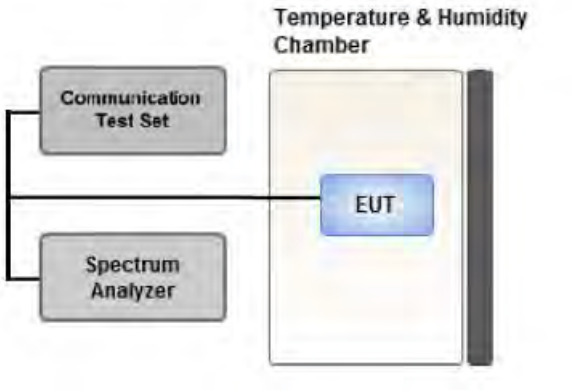
The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

The EUT makes a call to the communication simulator.
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth

Test Settings

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

3.6 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL



Test setup

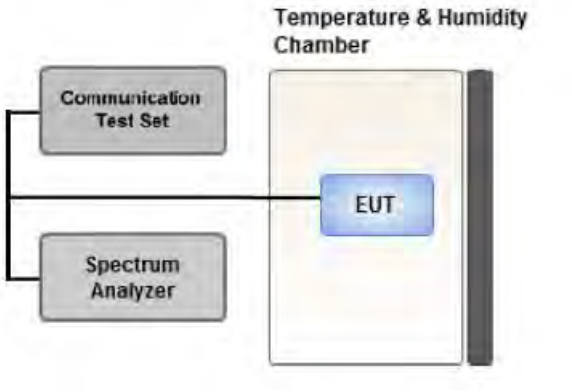
Test Overview

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

Test Settings

1. RBW = 1 MHz
2. VBW ≥ 3 MHz
3. Detector = RMS
4. Trace Mode = Average
5. Sweep time = auto
6. Number of points in sweep ≥ 2 * 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

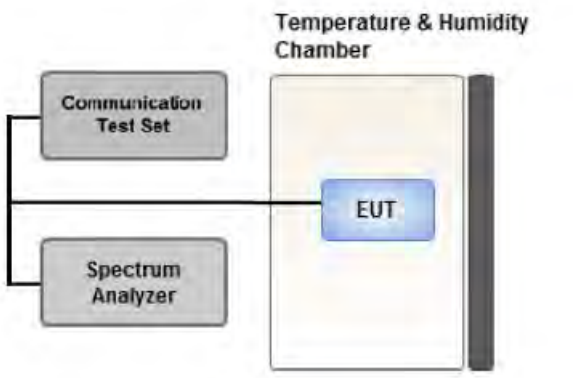
1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW > 1 % of the emission bandwidth
4. VBW > 3 x RBW
5. Detector = RMS
6. Number of sweep points ≥ 2 x Span/RBW
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.

Where Margin < 1 dB the emission level is either corrected by 10 log(1 MHz/ RB) or the emission is integrated over a 1 MHz bandwidth to determine the final result. When using the integration method the integration window is either centered on the emission or, for emissions at the band edge, centered by an offset of 500 kHz from the block edge so that the integration window is the 1 MHz adjacent to the block edge.

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.
  Mode : Stand alone, Stand alone + External accessories (Earphone, AC adapter, etc.)
  Worst case : Stand alone
- We were performed the RSE test in condition of co-location.
  Mode : Stand alone, Simultaneous transmission scenarios
  Worst case : Stand alone
- In the case of radiated spurious emissions, all bandwidth of operation was investigated and the worst case bandwidth results are reported.
  (Worst case :10 MHz(Main 2 Ant), 20 MHz(Main 3 Ant))
- 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.

[Main 2 Ant Worst case]

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

[Main 3 Ant Worst case]

Test Description	Modulation	Bandwidth (MHz)	Frequency	RB size	RB offset	Axis
Effective isotropic Radiated Power	QPSK, 16QAM, 64QAM, 256QAM	1.4	Low	1	5	X
			Mid, High	1	0	
		3	Low	1	13	
			Mid, High	1	0	
		5	Low	1	24	
			Mid, High	1	0	
		10	Low	1	49	
			Mid, High	1	0	
		15	Low	1	74	
			Mid, High	1	0	
		20	Low	1	99	
			Mid, High	1	0	
Radiated Spurious and Harmonic Emissions	QPSK	20	Low	1	99	Y
			Mid, High	1	0	

3.10 WORST CASE(CONDUCTED TEST)

[Worst case]

Test Description	Modulation	Bandwidth (MHz)	Frequency	RB size	RB offset
Occupied Bandwidth	QPSK, 16QAM, 64QAM, 256QAM	1.4, 3, 5, 10, 15, 20	Mid	Full RB	0
Peak-To-Average Ratio	QPSK, 16QAM, 64QAM, 256QAM	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

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

4. LIST OF TEST EQUIPMENT

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
RF Switching System	FBSR-02B(1.2G HPF+LNA)	T&M SYSTEM	F1L1	01/19/2024	Annual
RF Switching System	FBSR-02B(3.3G HPF+LNA)	T&M SYSTEM	F1L2	01/19/2024	Annual
Power Splitter(DC ~ 26.5 GHz)	11667B	Hewlett Packard	5001	04/19/2024	Annual
DC Power Supply	E3632A	Agilent	MY40010147	06/23/2024	Annual
Dipole Antenna	UHAP	Schwarzbeck	557	03/09/2025	Biennial
Dipole Antenna	UHAP	Schwarzbeck	558	03/09/2025	Biennial
Chamber	SU-642	ESPEC	93008124	02/22/2024	Annual
Horn Antenna(1 ~ 18 GHz)	BBHA 9120D	Schwarzbeck	147	08/17/2025	Biennial
Horn Antenna(1 ~ 18 GHz)	BBHA 9120D	Schwarzbeck	9120D-1298	09/11/2025	Biennial
Horn Antenna(15 ~ 40 GHz)	BBHA 9170	Schwarzbeck	BBHA9170342	09/29/2024	Biennial
Horn Antenna(15 ~ 40 GHz)	BBHA 9170	Schwarzbeck	BBHA9170124	03/28/2025	Biennial
Signal Analyzer(10 Hz ~ 26.5 GHz)	N9020A	Agilent	MY52090906	04/20/2024	Annual
ATTENUATOR(20 dB)	8493C	Hewlett Packard	17280	04/19/2024	Annual
Spectrum Analyzer(10 Hz ~ 40 GHz)	FSV40	REOHDE & SCHWARZ	100931	08/17/2024	Annual
Base Station	8960 (E5515C)	Agilent	MY48360800	08/10/2024	Annual
Loop Antenna(9 kHz ~ 30 MHz)	FMZB1513	Schwarzbeck	1513-333	03/17/2024	Biennial
Trilog Broadband Antenna	VULB9168	Schwarzbeck	895	08/16/2024	Biennial
Trilog Broadband Antenna	VULB9168	Schwarzbeck	1135	03/21/2024	Biennial
Wideband Radio Communication Tester	MT8821C	Anritsu Corp.	6262094331	11/17/2024	Annual
Wideband Radio Communication Tester	MT8820C	Anritsu Corp.	6201026545	01/05/2024	Annual
SIGNAL GENERATOR (100 kHz ~ 40 GHz)	SMB100A	REOHDE & SCHWARZ	177633	06/22/2024	Annual
Signal Analyzer(5 Hz ~ 40.0 GHz)	N9030B	KEYSIGHT	MY55480167	05/24/2024	Annual
FCC LTE Mobile Conducted RF Automation Test Software	-	HCT CO., LTD.,	-	-	-

Note:

1. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.
2. Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2017).

5. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4:2014. All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95 % level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (±dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.90 (Confidence level about 95 %, k=2)
Radiated Disturbance (9 kHz ~ 30 MHz)	4.14 (Confidence level about 95 %, k=2)
Radiated Disturbance (30 MHz ~ 1 GHz)	5.16 (Confidence level about 95 %, k=2)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.57 (Confidence level about 95 %, k=2)
Radiated Disturbance (18 GHz ~ 40 GHz)	5.76 (Confidence level about 95 %, k=2)
Radiated Disturbance (Above 40 GHz)	5.52 (Confidence level about 95 %, k=2)

6. SUMMARY OF TEST RESULTS

6.1 Test Condition: Conducted Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Occupied Bandwidth	§2.1049	N/A	PASS
Band Edge / Spurious and Harmonic Emissions at Antenna Terminal.	§2.1051, §24.238(a)	< 43 + 10log10 (P[Watts]) at Band Edge and for all out-of-band emissions	PASS
Conducted Output Power	§2.1046	N/A	**See Note1**
Peak- to- Average Ratio	§24.232(d)	< 13 dB	PASS
Frequency stability / variation of ambient temperature	§24.235	Emission must remain in band	PASS

Note:

1. See SAR Report

6.2 Test Condition: Radiated Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Equivalent Isotropic Radiated Power	§24.232(c)	< 2 Watts max. EIRP	PASS
Radiated Spurious and Harmonic Emissions	§2.1053, §24.238(a)	< 43 + 10log10 (P[Watts]) for all out-of band emissions	PASS

7. SAMPLE CALCULATION

7.1 ERP Sample Calculation

Ch./ Freq.		Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain (dBd)	C.L	Pol.	ERP	
channel	Freq.(MHz)						W	dBm
128	824.20	-21.37	38.40	-10.61	0.95	H	0.483	26.84

ERP = Substitute LEVEL(dBm) + Ant. Gain – CL(Cable Loss)

1) The EUT mounted on a non-conductive turntable is 2.5 meter above test site ground level.

2) During the test, the turn table is rotated until the maximum signal is found.

3) Record the field strength meter's level.

4) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.

5) Increase the signal generator output till the field strength meter's level is equal to the item (3).

6) The signal generator output level with Ant. Gain and cable loss are the rating of effective radiated power.

7.2 EIRP Sample Calculation

Ch./ Freq.		Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain (dBi)	C.L	Pol.	EIRP	
channel	Freq.(MHz)						W	dBm
20175	1,732.50	-15.75	18.45	9.90	1.76	H	0.456	26.59

EIRP = Substitute LEVEL(dBm) + Ant. Gain – CL(Cable Loss)

1) The EUT mounted on a non-conductive turntable is 2.5 meter above test site ground level.

2) During the test, the turn table is rotated until the maximum signal is found.

3) Record the field strength meter's level.

4) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.

5) Increase the signal generator output till the field strength meter's level is equal to the item (3).

6) The signal generator output level with Ant. Gain and cable loss are the rating of equivalent isotropic radiated power.

7.3. Emission Designator

GSM Emission Designator

Emission Designator = 249KGXW

GSM BW = 249 kHz

G = Phase Modulation

X = Cases not otherwise covered

W = Combination (Audio/Data)

EDGE Emission Designator

Emission Designator = 249KG7W

GSM BW = 249 kHz

G = Phase Modulation

7 = Quantized/Digital Info

W = Combination (Audio/Data)

WCDMA Emission Designator

Emission Designator = 4M17F9W

WCDMA BW = 4.17 MHz

F = Frequency Modulation

9 = Composite Digital Info

W = Combination (Audio/Data)

QPSK Modulation

Emission Designator = 4M48G7D

LTE BW = 4.48 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

QAM Modulation

Emission Designator = 4M48W7D

LTE BW = 4.48 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

8. TEST DATA(Main 2 Ant)

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	-19.00	14.89	10.31	2.30	V	< 2.00	0.195	22.90
		16-QAM	-19.71	14.18	10.31	2.30	V		0.166	22.19
		64-QAM	-20.78	13.11	10.31	2.30	V		0.129	21.12
		256-QAM	-23.63	10.26	10.31	2.30	V		0.067	18.27
1880.0		QPSK	-19.43	15.27	10.35	2.33	V		0.213	23.29
		16-QAM	-20.15	14.55	10.35	2.33	V		0.181	22.57
		64-QAM	-21.23	13.47	10.35	2.33	V		0.141	21.49
		256-QAM	-24.15	10.55	10.35	2.33	V		0.072	18.57
1909.3		QPSK	-20.54	13.50	10.40	2.29	V		0.145	21.61
		16-QAM	-21.24	12.80	10.40	2.29	V		0.123	20.91
		64-QAM	-22.36	11.68	10.40	2.29	V		0.095	19.79
		256-QAM	-25.24	8.80	10.40	2.29	V		0.049	16.91

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	-18.98	14.91	10.31	2.30	V	< 2.00	0.196	22.92
		16-QAM	-19.71	14.18	10.31	2.30	V		0.166	22.19
		64-QAM	-20.79	13.10	10.31	2.30	V		0.129	21.11
		256-QAM	-23.68	10.21	10.31	2.30	V		0.066	18.22
1880.0		QPSK	-19.40	15.30	10.35	2.33	V		0.215	23.32
		16-QAM	-20.14	14.56	10.35	2.33	V		0.181	22.58
		64-QAM	-21.22	13.48	10.35	2.33	V		0.141	21.50
		256-QAM	-24.17	10.53	10.35	2.33	V		0.072	18.55
1908.5		QPSK	-20.32	13.72	10.40	2.29	V		0.152	21.83
		16-QAM	-21.05	12.99	10.40	2.29	V		0.129	21.10
		64-QAM	-22.17	11.87	10.40	2.29	V		0.100	19.98
		256-QAM	-25.07	8.97	10.40	2.29	V		0.051	17.08

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	-18.95	14.94	10.31	2.30	V	< 2.00	0.197	22.95
		16-QAM	-19.67	14.22	10.31	2.30	V		0.167	22.23
		64-QAM	-20.76	13.13	10.31	2.30	V		0.130	21.14
		256-QAM	-23.63	10.26	10.31	2.30	V		0.067	18.27
1880.0		QPSK	-19.34	15.36	10.35	2.33	V		0.218	23.38
		16-QAM	-20.04	14.66	10.35	2.33	V		0.185	22.68
		64-QAM	-21.14	13.56	10.35	2.33	V		0.144	21.58
		256-QAM	-24.08	10.62	10.35	2.33	V		0.073	18.64
1907.5		QPSK	-20.17	13.87	10.40	2.29	V		0.158	21.98
		16-QAM	-20.86	13.18	10.40	2.29	V		0.135	21.29
		64-QAM	-21.99	12.05	10.40	2.29	V		0.104	20.16
		256-QAM	-24.90	9.14	10.40	2.29	V		0.053	17.25

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	-18.93	14.98	10.32	2.25	V	< 2.00	0.202	23.05
		16-QAM	-19.61	14.30	10.32	2.25	V		0.173	22.37
		64-QAM	-20.72	13.19	10.32	2.25	V		0.134	21.26
		256-QAM	-23.59	10.32	10.32	2.25	V		0.069	18.39
1880.0		QPSK	-19.12	15.58	10.35	2.33	V		0.229	23.60
		16-QAM	-19.85	14.85	10.35	2.33	V		0.194	22.87
		64-QAM	-20.90	13.80	10.35	2.33	V		0.152	21.82
		256-QAM	-23.85	10.85	10.35	2.33	V		0.077	18.87
1905.0		QPSK	-20.16	13.99	10.39	2.30	V		0.162	22.09
		16-QAM	-20.91	13.24	10.39	2.30	V		0.136	21.34
		64-QAM	-21.99	12.16	10.39	2.30	V		0.106	20.26
		256-QAM	-24.96	9.19	10.39	2.30	V		0.054	17.29

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	-18.94	15.06	10.32	2.26	V	< 2.00	0.205	23.12
		16-QAM	-19.61	14.39	10.32	2.26	V		0.176	22.45
		64-QAM	-20.71	13.29	10.32	2.26	V		0.136	21.35
		256-QAM	-23.63	10.37	10.32	2.26	V		0.070	18.43
1880.0		QPSK	-19.17	15.53	10.35	2.33	V		0.226	23.55
		16-QAM	-19.85	14.85	10.35	2.33	V		0.194	22.87
		64-QAM	-20.95	13.75	10.35	2.33	V		0.150	21.77
		256-QAM	-23.92	10.78	10.35	2.33	V		0.076	18.80
1902.5		QPSK	-20.07	14.20	10.38	2.30	V		0.169	22.28
		16-QAM	-20.77	13.50	10.38	2.30	V		0.144	21.58
		64-QAM	-21.88	12.39	10.38	2.30	V		0.111	20.47
		256-QAM	-24.82	9.45	10.38	2.30	V		0.057	17.53

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	-18.92	15.08	10.32	2.26	V	< 2.00	0.206	23.14
		16-QAM	-19.67	14.33	10.32	2.26	V		0.173	22.39
		64-QAM	-20.76	13.24	10.32	2.26	V		0.135	21.30
		256-QAM	-23.70	10.30	10.32	2.26	V		0.069	18.36
1880.0		QPSK	-19.18	15.52	10.35	2.33	V		0.226	23.54
		16-QAM	-19.88	14.82	10.35	2.33	V		0.192	22.84
		64-QAM	-21.00	13.70	10.35	2.33	V		0.149	21.72
		256-QAM	-23.96	10.74	10.35	2.33	V		0.075	18.76
1900.0		QPSK	-19.72	14.55	10.38	2.30	V		0.183	22.63
		16-QAM	-20.42	13.85	10.38	2.30	V		0.156	21.93
		64-QAM	-21.56	12.71	10.38	2.30	V		0.120	20.79
		256-QAM	-24.50	9.77	10.38	2.30	V		0.061	17.85

8.2 RADIATED SPURIOUS EMISSIONS

▣ OPERATING FREQUENCY: 1880.0 MHz

▣ MEASURED OUTPUT POWER: 23.60 dBm = 0.229 W

▣ MODE: LTE B2

▣ MODULATION SIGNAL: 10 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 log10 (W) = 36.60 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	-52.85	12.28	-57.91	3.15	V	-48.78	72.38
	5 565.00	-51.86	13.05	-50.12	3.93	V	-40.99	64.59
	7 420.00	-36.87	10.78	-26.64	4.68	H	-20.54	44.14
	9 275.00	-47.84	10.44	-31.13	5.32	H	-26.01	49.61
	11 130.00	-55.12	11.14	-36.81	5.84	V	-31.51	55.11
18900 (1880.0)	3 760.00	-55.16	12.22	-59.79	3.27	H	-50.84	74.44
	5 640.00	-48.70	13.12	-46.43	4.07	H	-37.38	60.98
	7 520.00	-37.45	10.82	-26.64	4.71	H	-20.53	44.13
	9 400.00	-50.11	10.40	-33.81	5.35	H	-28.76	52.36
19150 (1905.0)	3 810.00	-52.36	12.15	-57.41	3.23	H	-48.49	72.09
	5 715.00	-50.20	13.08	-47.60	4.16	V	-38.68	62.28
	7 620.00	-39.00	11.14	-28.65	4.75	H	-22.26	45.86
	9 525.00	-50.35	10.80	-34.33	5.36	H	-28.89	52.49

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	5.02
			16-QAM	6	0	5.81
			64-QAM	6	0	6.35
			256-QAM	6	0	6.96
	3 MHz		QPSK	15	0	5.15
			16-QAM	15	0	5.90
			64-QAM	15	0	6.26
			256-QAM	15	0	7.01
	5 MHz		QPSK	25	0	5.14
			16-QAM	25	0	5.87
			64-QAM	25	0	6.47
			256-QAM	25	0	7.03
	10 MHz		QPSK	50	0	5.20
			16-QAM	50	0	5.94
			64-QAM	50	0	6.48
			256-QAM	50	0	7.01
	15 MHz		QPSK	75	0	5.06
			16-QAM	75	0	5.83
			64-QAM	75	0	6.33
			256-QAM	75	0	7.02
	20 MHz		QPSK	100	0	5.03
			16-QAM	100	0	5.78
			64-QAM	100	0	6.55
			256-QAM	100	0	7.02

Note:

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 140 ~ 163.

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	1.0931
			16-QAM	6	0	1.0928
			64-QAM	6	0	1.0984
			256-QAM	6	0	1.0931
	3 MHz		QPSK	15	0	2.7065
			16-QAM	15	0	2.6929
			64-QAM	15	0	2.7039
			256-QAM	15	0	2.6982
	5 MHz		QPSK	25	0	4.5079
			16-QAM	25	0	4.5043
			64-QAM	25	0	4.5082
			256-QAM	25	0	4.5194
	10 MHz		QPSK	50	0	8.9822
			16-QAM	50	0	8.9828
			64-QAM	50	0	8.9737
			256-QAM	50	0	8.9868
	15 MHz		QPSK	75	0	13.448
			16-QAM	75	0	13.468
			64-QAM	75	0	13.441
			256-QAM	75	0	13.469
	20 MHz		QPSK	100	0	18.037
			16-QAM	100	0	17.914
			64-QAM	100	0	17.910
			256-QAM	100	0	17.898

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 116 ~ 139.

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	3.7054	27.976	-67.665	-39.689	-13.00
		1880.0	3.6830	27.976	-67.290	-39.314	
		1909.3	3.1706	27.976	-67.549	-39.573	
	3	1851.5	3.7034	27.976	-67.279	-39.303	
		1880.0	3.7054	27.976	-66.874	-38.898	
		1908.5	3.6915	27.976	-67.020	-39.044	
	5	1852.5	3.7184	27.976	-67.631	-39.655	
		1880.0	3.7054	27.976	-67.289	-39.313	
		1907.5	3.7144	27.976	-67.086	-39.110	
	10	1855.0	3.7184	27.976	-67.296	-39.320	
		1880.0	3.1676	27.976	-67.198	-39.222	
		1905.0	3.7079	27.976	-67.102	-39.126	
	15	1857.5	3.7044	27.976	-67.343	-39.367	
		1880.0	3.1686	27.976	-67.252	-39.276	
		1902.5	3.6820	27.976	-66.853	-38.877	
	20	1860.0	3.1865	27.976	-66.968	-38.992	
		1880.0	3.7094	27.976	-67.284	-39.308	
		1900.0	3.6835	27.976	-67.333	-39.357	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 164 ~ 199.
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(26.5)	30.131

8.6 BAND EDGE

- Plots of the EUT's Band Edge are shown Page 80 ~ 115.

8.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

▣ MODE: LTE B2

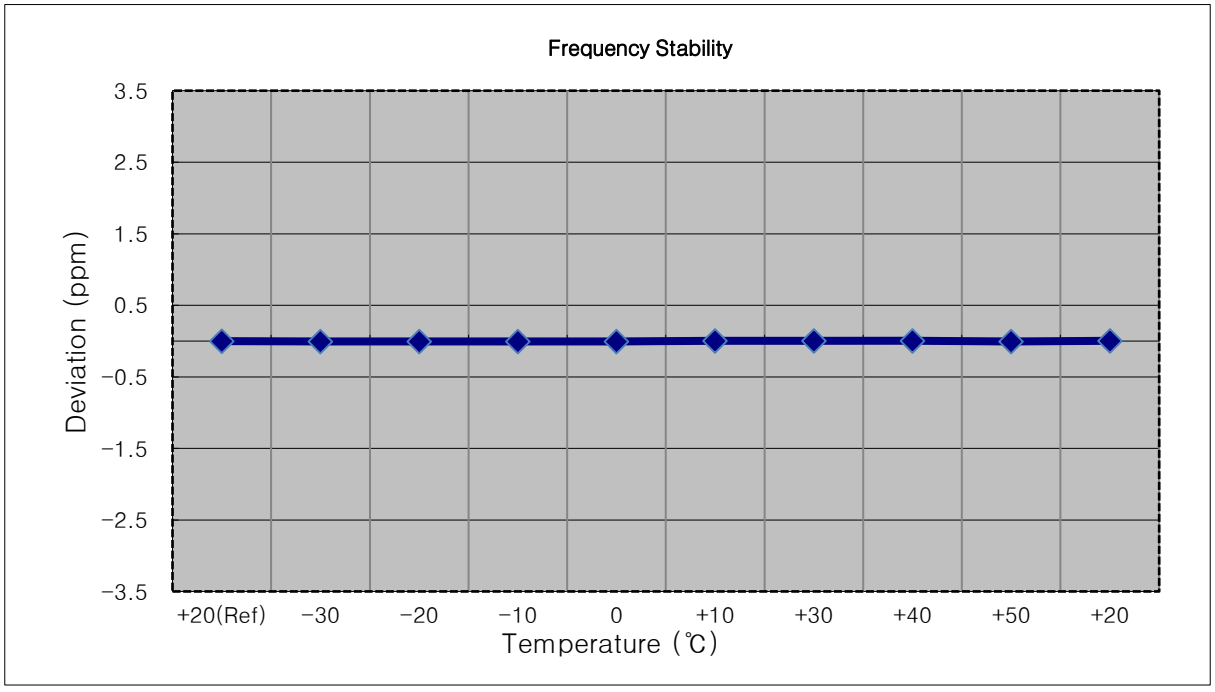
▣ OPERATING FREQUENCY: 1850,700,000 Hz

▣ CHANNEL: 18607 (1.4 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1850 700 009	0.0	0.000 000	0.000
100 %		-30	1850 700 002	-7.5	0.000 000	-0.004
100 %		-20	1850 700 003	-6.5	0.000 000	-0.004
100 %		-10	1850 700 003	-6.1	0.000 000	-0.003
100 %		0	1850 700 002	-7.5	0.000 000	-0.004
100 %		+10	1850 700 017	8.3	0.000 000	0.004
100 %		+30	1850 700 016	6.7	0.000 000	0.004
100 %		+40	1850 700 017	8.4	0.000 000	0.005
100 %		+50	1850 699 998	-10.7	-0.000 001	-0.006
Batt. Endpoint	3.400	+20	1850 700 017	8.2	0.000 000	0.004



▣ MODE: LTE B2

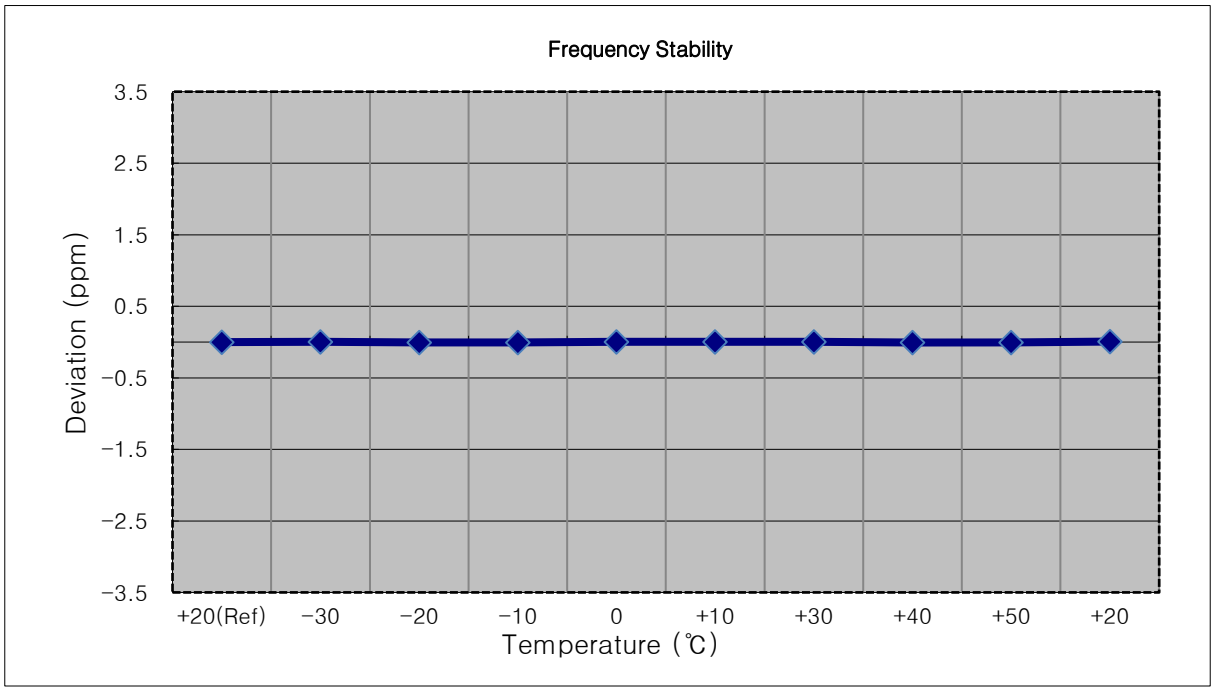
▣ OPERATING FREQUENCY: 1851,500,000 Hz

▣ CHANNEL: 18615 (3 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1851 499 990	0.0	0.000 000	0.000
100 %		-30	1851 499 996	6.4	0.000 000	0.003
100 %		-20	1851 499 981	-9.0	0.000 000	-0.005
100 %		-10	1851 499 982	-7.7	0.000 000	-0.004
100 %		0	1851 499 998	7.7	0.000 000	0.004
100 %		+10	1851 499 999	9.2	0.000 000	0.005
100 %		+30	1851 499 994	4.3	0.000 000	0.002
100 %		+40	1851 499 978	-12.1	-0.000 001	-0.007
100 %		+50	1851 499 981	-9.3	-0.000 001	-0.005
Batt. Endpoint	3.400	+20	1851 500 002	12.5	0.000 001	0.007



▣ MODE: LTE B2

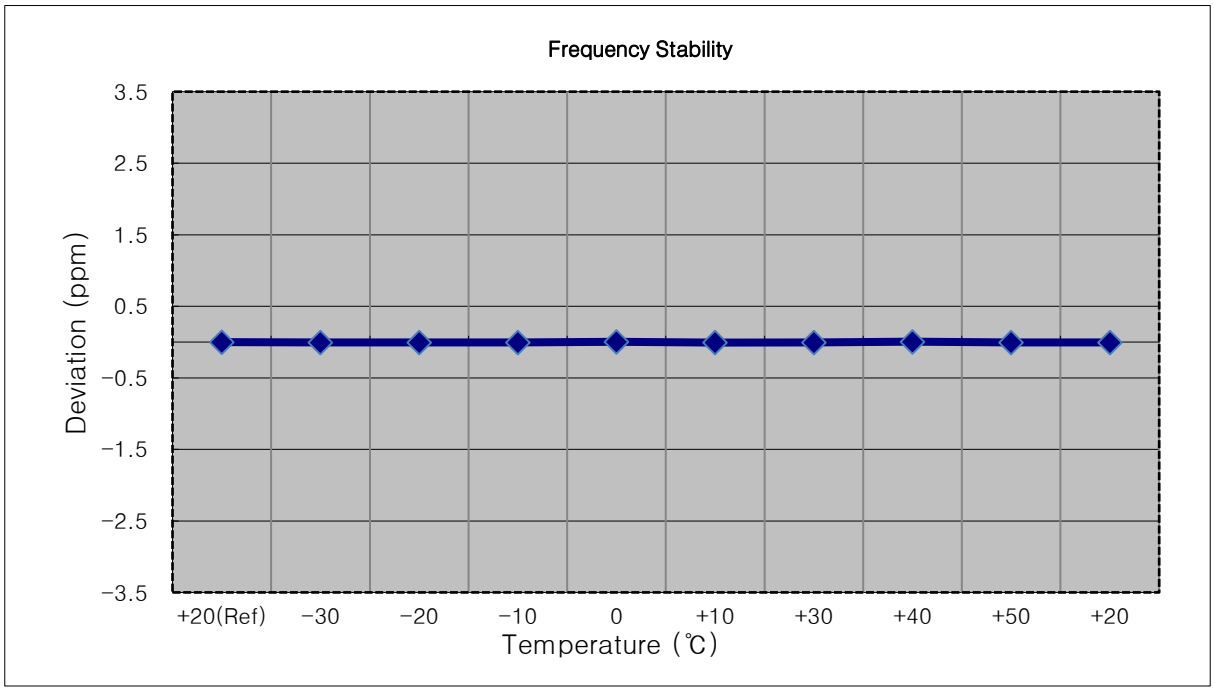
▣ OPERATING FREQUENCY: 1852,500,000 Hz

▣ CHANNEL: 18625 (5 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1852 500 013	0.0	0.000 000	0.000
100 %		-30	1852 500 006	-6.7	0.000 000	-0.004
100 %		-20	1852 500 001	-12.5	-0.000 001	-0.007
100 %		-10	1852 500 002	-11.6	-0.000 001	-0.006
100 %		0	1852 500 017	4.0	0.000 000	0.002
100 %		+10	1852 500 000	-13.6	-0.000 001	-0.007
100 %		+30	1852 500 001	-12.5	-0.000 001	-0.007
100 %		+40	1852 500 024	10.5	0.000 001	0.006
100 %		+50	1852 500 004	-9.1	0.000 000	-0.005
Batt. Endpoint	3.400	+20	1852 500 001	-12.2	-0.000 001	-0.007



▣ MODE: LTE B2

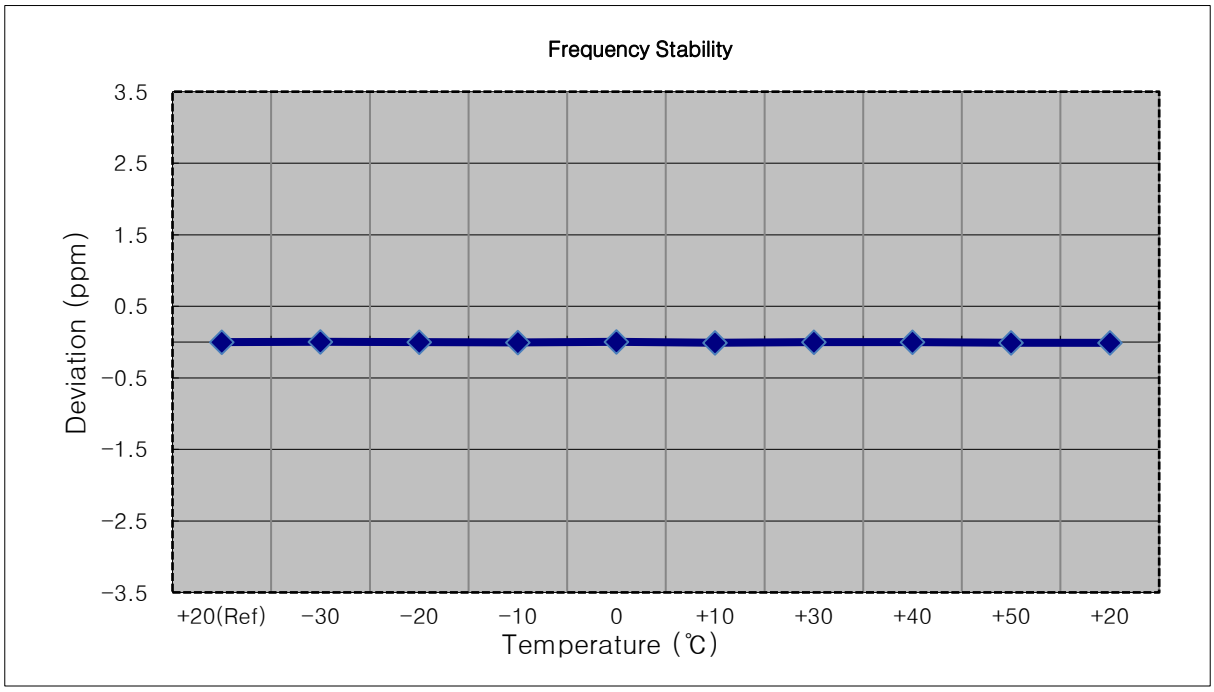
▣ OPERATING FREQUENCY: 1855,000,000 Hz

▣ CHANNEL: 18650 (10 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1854 999 998	0.0	0.000 000	0.000
100 %		-30	1855 000 002	4.1	0.000 000	0.002
100 %		-20	1854 999 996	-1.7	0.000 000	-0.001
100 %		-10	1854 999 985	-12.8	-0.000 001	-0.007
100 %		0	1855 000 004	6.0	0.000 000	0.003
100 %		+10	1854 999 981	-17.1	-0.000 001	-0.009
100 %		+30	1855 000 000	1.7	0.000 000	0.001
100 %		+40	1854 999 996	-1.6	0.000 000	-0.001
100 %		+50	1854 999 983	-14.9	-0.000 001	-0.008
Batt. Endpoint	3.400	+20	1854 999 978	-20.3	-0.000 001	-0.011



▣ MODE: LTE B2

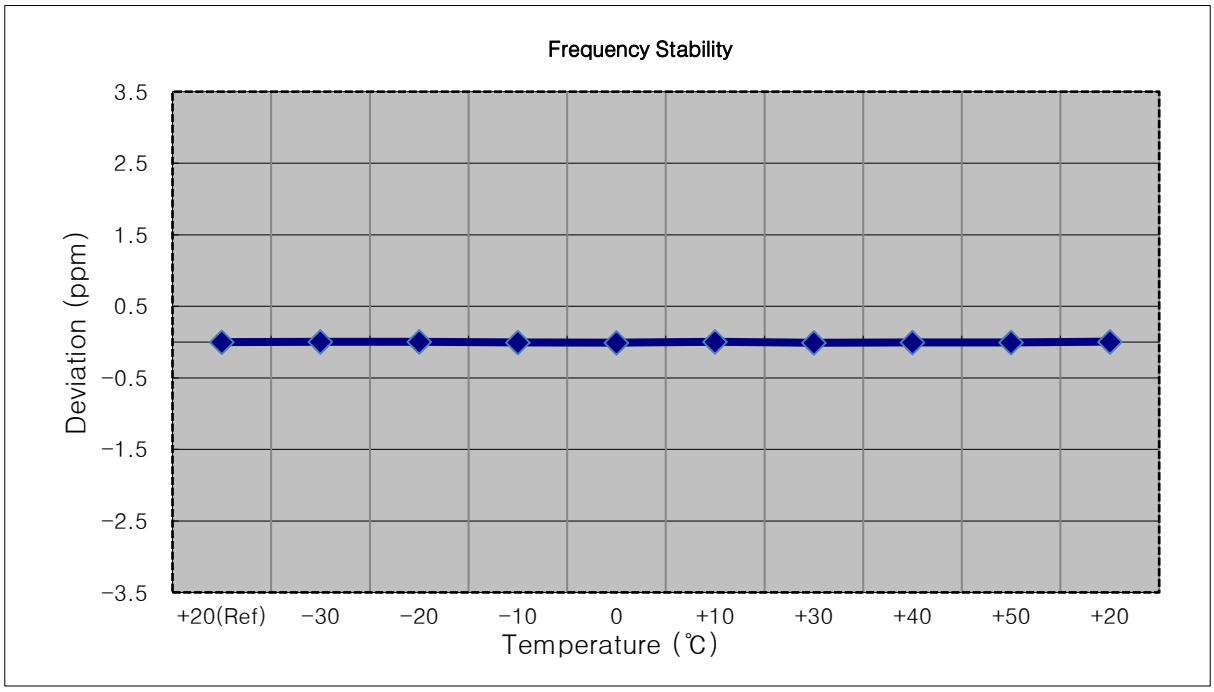
▣ OPERATING FREQUENCY: 1857,500,000 Hz

▣ CHANNEL: 18675 (15 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1857 499 991	0.0	0.000 000	0.000
100 %		-30	1857 499 994	3.2	0.000 000	0.002
100 %		-20	1857 499 997	5.9	0.000 000	0.003
100 %		-10	1857 499 978	-13.3	-0.000 001	-0.007
100 %		0	1857 499 976	-15.4	-0.000 001	-0.008
100 %		+10	1857 499 998	6.8	0.000 000	0.004
100 %		+30	1857 499 976	-15.0	-0.000 001	-0.008
100 %		+40	1857 499 980	-10.6	-0.000 001	-0.006
100 %		+50	1857 499 981	-9.5	-0.000 001	-0.005
Batt. Endpoint	3.400	+20	1857 500 002	10.8	0.000 001	0.006



▣ MODE: LTE B2

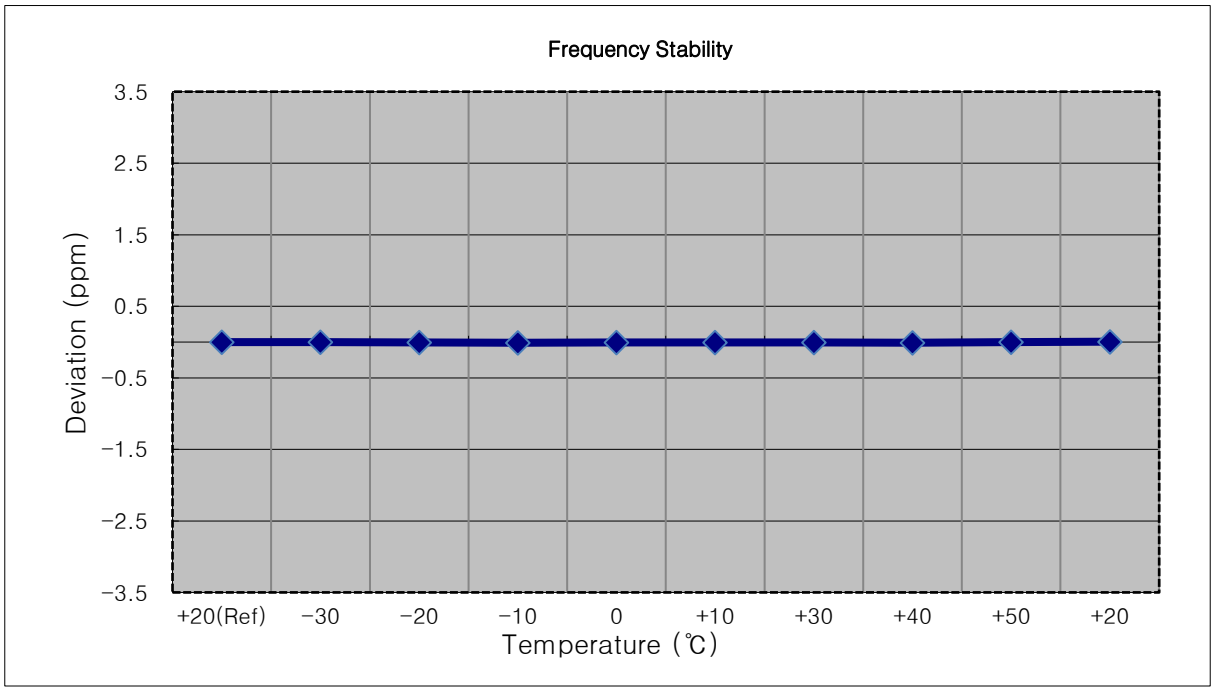
▣ OPERATING FREQUENCY: 1860,000,000 Hz

▣ CHANNEL: 18700 (20 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1860 000 005	0.0	0.000 000	0.000
100 %		-30	1860 000 003	-1.3	0.000 000	-0.001
100 %		-20	1859 999 997	-7.3	0.000 000	-0.004
100 %		-10	1859 999 989	-15.7	-0.000 001	-0.008
100 %		0	1859 999 997	-7.3	0.000 000	-0.004
100 %		+10	1859 999 993	-11.8	-0.000 001	-0.006
100 %		+30	1859 999 993	-11.8	-0.000 001	-0.006
100 %		+40	1859 999 988	-17.2	-0.000 001	-0.009
100 %		+50	1860 000 003	-1.5	0.000 000	-0.001
Batt. Endpoint	3.400	+20	1860 000 014	9.7	0.000 001	0.005



▣ MODE: LTE B2

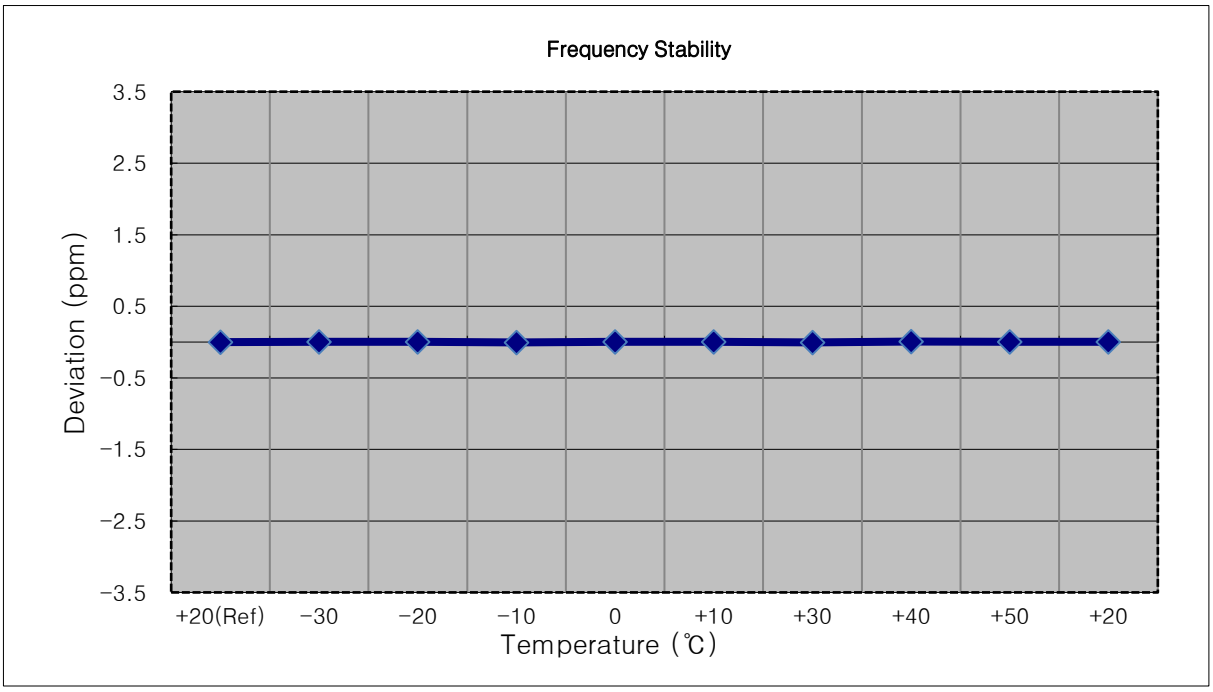
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 18900 (1.4 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1880 000 011	0.0	0.000 000	0.000
100 %		-30	1880 000 020	8.8	0.000 000	0.005
100 %		-20	1880 000 021	10.2	0.000 001	0.005
100 %		-10	1880 000 003	-7.8	0.000 000	-0.004
100 %		0	1880 000 021	10.2	0.000 001	0.005
100 %		+10	1880 000 021	9.5	0.000 001	0.005
100 %		+30	1880 000 002	-9.5	-0.000 001	-0.005
100 %		+40	1880 000 024	13.3	0.000 001	0.007
100 %		+50	1880 000 019	8.0	0.000 000	0.004
Batt. Endpoint	3.400	+20	1880 000 021	10.1	0.000 001	0.005



▣ MODE: LTE B2

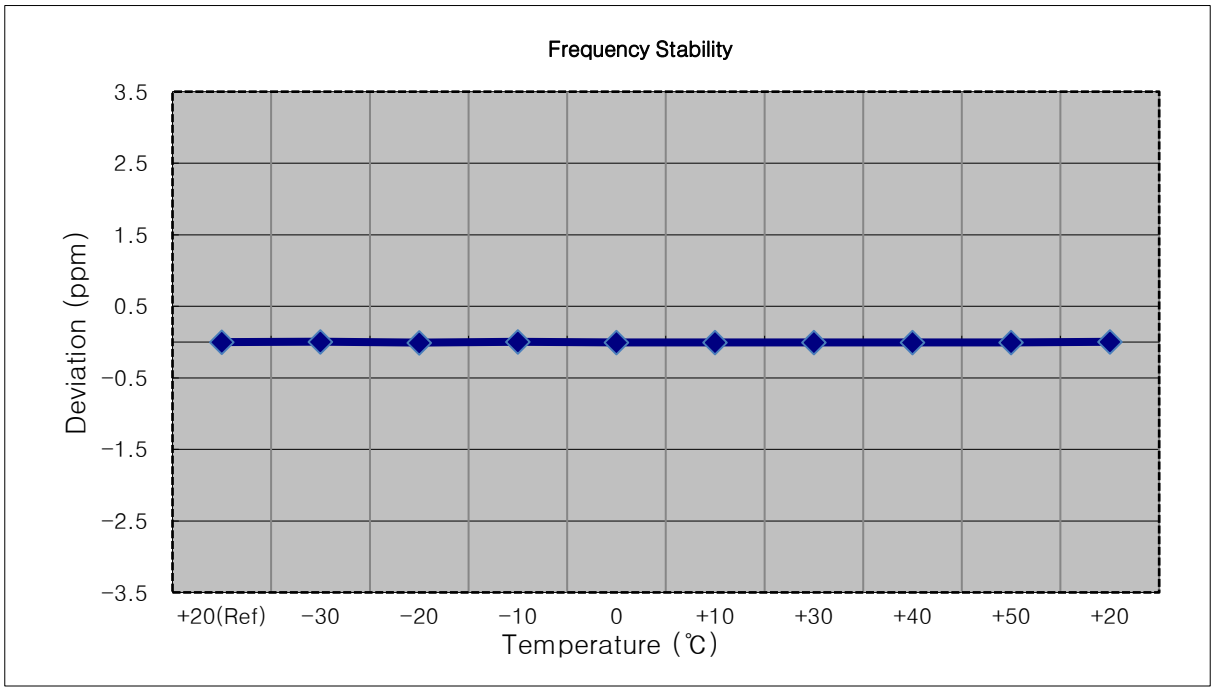
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 18900 (3 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1880 000 009	0.0	0.000 000	0.000
100 %		-30	1880 000 018	9.5	0.000 001	0.005
100 %		-20	1879 999 995	-14.2	-0.000 001	-0.008
100 %		-10	1880 000 015	6.5	0.000 000	0.003
100 %		0	1879 999 996	-13.0	-0.000 001	-0.007
100 %		+10	1879 999 996	-13.0	-0.000 001	-0.007
100 %		+30	1879 999 995	-13.5	-0.000 001	-0.007
100 %		+40	1879 999 997	-11.6	-0.000 001	-0.006
100 %		+50	1880 000 002	-6.8	0.000 000	-0.004
Batt. Endpoint	3.400	+20	1880 000 017	8.1	0.000 000	0.004



▣ MODE: LTE B2

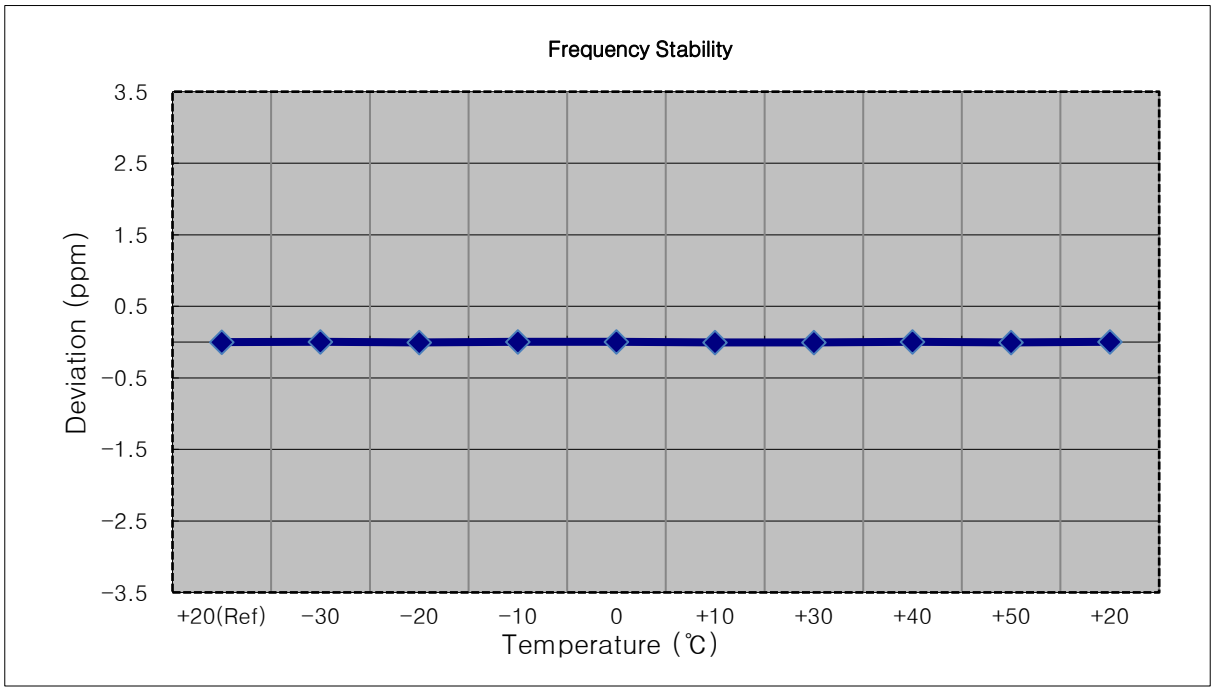
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 18900 (5 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1879 999 990	0.0	0.000 000	0.000
100 %		-30	1879 999 997	7.0	0.000 000	0.004
100 %		-20	1879 999 983	-7.4	0.000 000	-0.004
100 %		-10	1879 999 994	4.1	0.000 000	0.002
100 %		0	1879 999 996	6.2	0.000 000	0.003
100 %		+10	1879 999 983	-7.2	0.000 000	-0.004
100 %		+30	1879 999 983	-7.0	0.000 000	-0.004
100 %		+40	1879 999 997	6.7	0.000 000	0.004
100 %		+50	1879 999 980	-9.9	-0.000 001	-0.005
Batt. Endpoint	3.400	+20	1879 999 994	3.8	0.000 000	0.002



▣ MODE: LTE B2

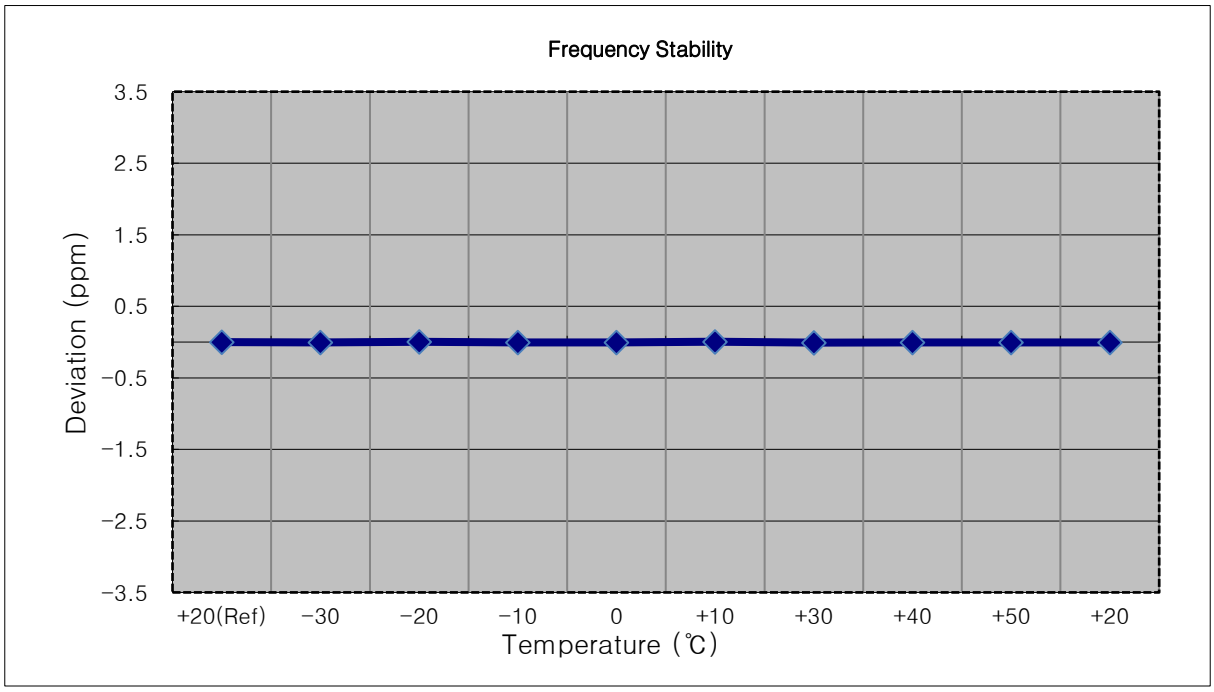
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 18900 (10 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1879 999 992	0.0	0.000 000	0.000
100 %		-30	1879 999 982	-10.5	-0.000 001	-0.006
100 %		-20	1879 999 997	5.4	0.000 000	0.003
100 %		-10	1879 999 982	-9.8	-0.000 001	-0.005
100 %		0	1879 999 978	-14.0	-0.000 001	-0.007
100 %		+10	1880 000 001	9.2	0.000 000	0.005
100 %		+30	1879 999 977	-14.8	-0.000 001	-0.008
100 %		+40	1879 999 982	-10.2	-0.000 001	-0.005
100 %		+50	1879 999 984	-7.8	0.000 000	-0.004
Batt. Endpoint	3.400	+20	1879 999 985	-7.2	0.000 000	-0.004



▣ MODE: LTE B2

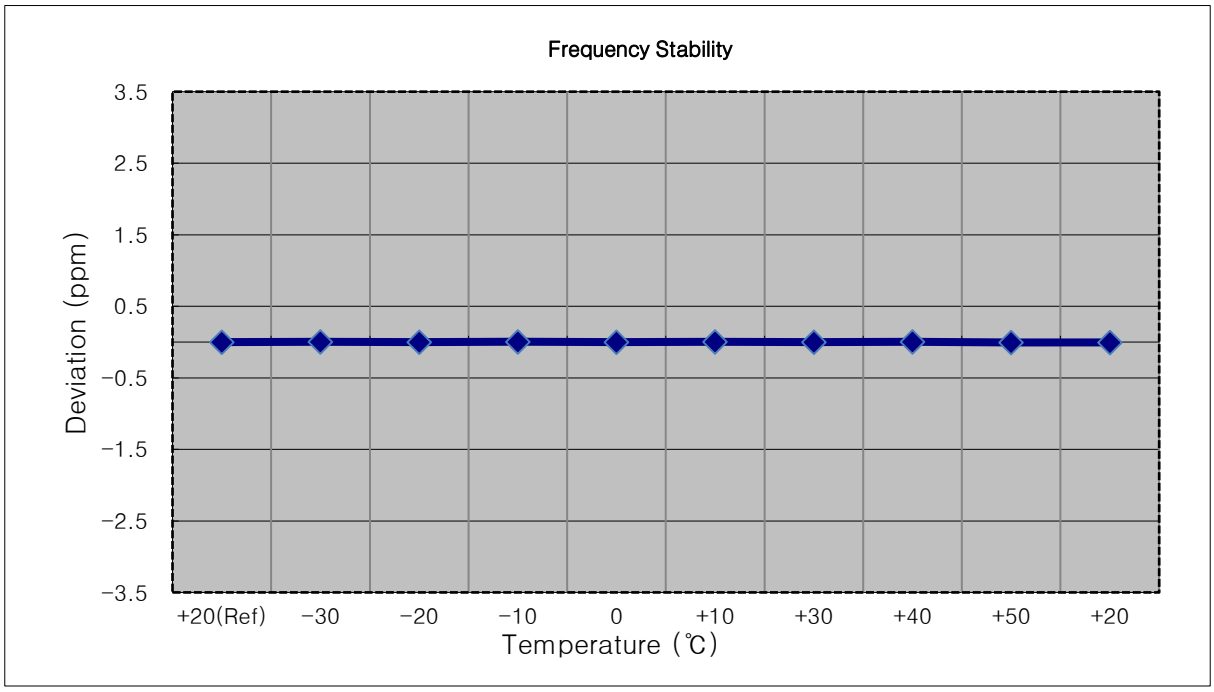
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 18900 (15 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1880 000 007	0.0	0.000 000	0.000
100 %		-30	1880 000 015	7.3	0.000 000	0.004
100 %		-20	1880 000 003	-4.4	0.000 000	-0.002
100 %		-10	1880 000 017	9.3	0.000 000	0.005
100 %		0	1880 000 002	-4.9	0.000 000	-0.003
100 %		+10	1880 000 016	8.4	0.000 000	0.004
100 %		+30	1880 000 002	-5.1	0.000 000	-0.003
100 %		+40	1880 000 012	4.5	0.000 000	0.002
100 %		+50	1879 999 997	-10.8	-0.000 001	-0.006
Batt. Endpoint	3.400	+20	1880 000 002	-5.8	0.000 000	-0.003



▣ MODE: LTE B2

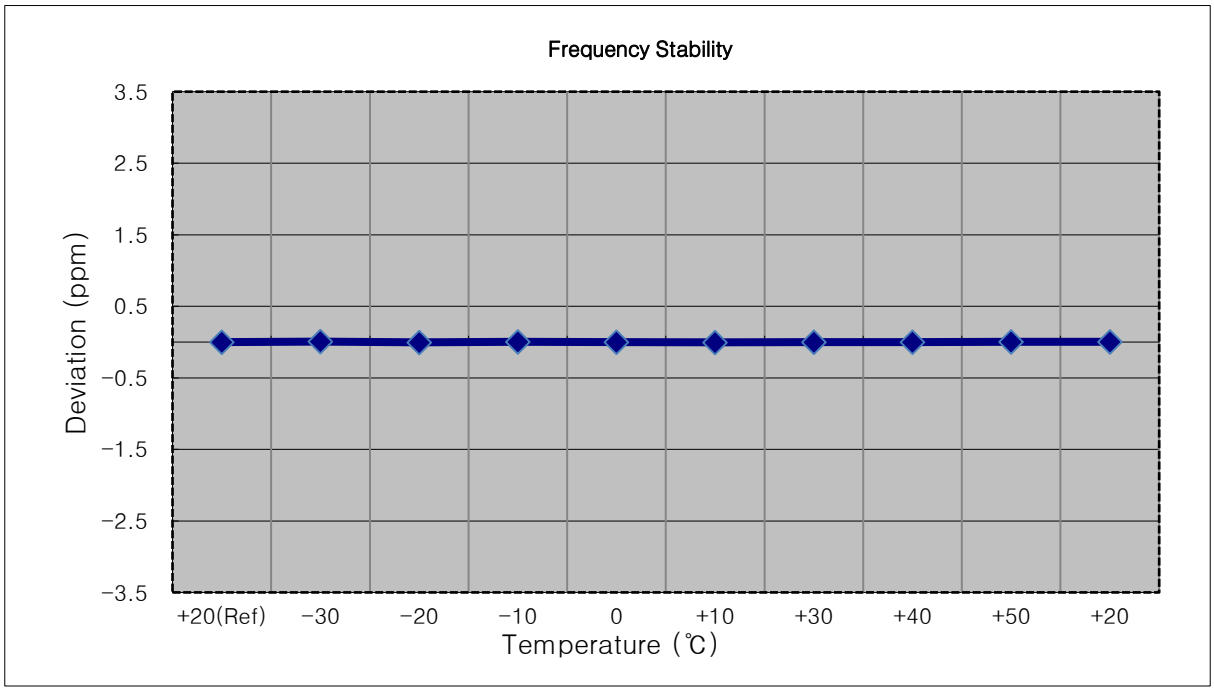
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 18900 (20 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1880 000 011	0.0	0.000 000	0.000
100 %		-30	1880 000 023	11.6	0.000 001	0.006
100 %		-20	1880 000 004	-7.1	0.000 000	-0.004
100 %		-10	1880 000 018	6.7	0.000 000	0.004
100 %		0	1880 000 008	-3.2	0.000 000	-0.002
100 %		+10	1880 000 004	-7.1	0.000 000	-0.004
100 %		+30	1880 000 007	-4.7	0.000 000	-0.002
100 %		+40	1880 000 006	-5.0	0.000 000	-0.003
100 %		+50	1880 000 022	10.6	0.000 001	0.006
Batt. Endpoint	3.400	+20	1880 000 019	7.3	0.000 000	0.004



▣ MODE: LTE B2

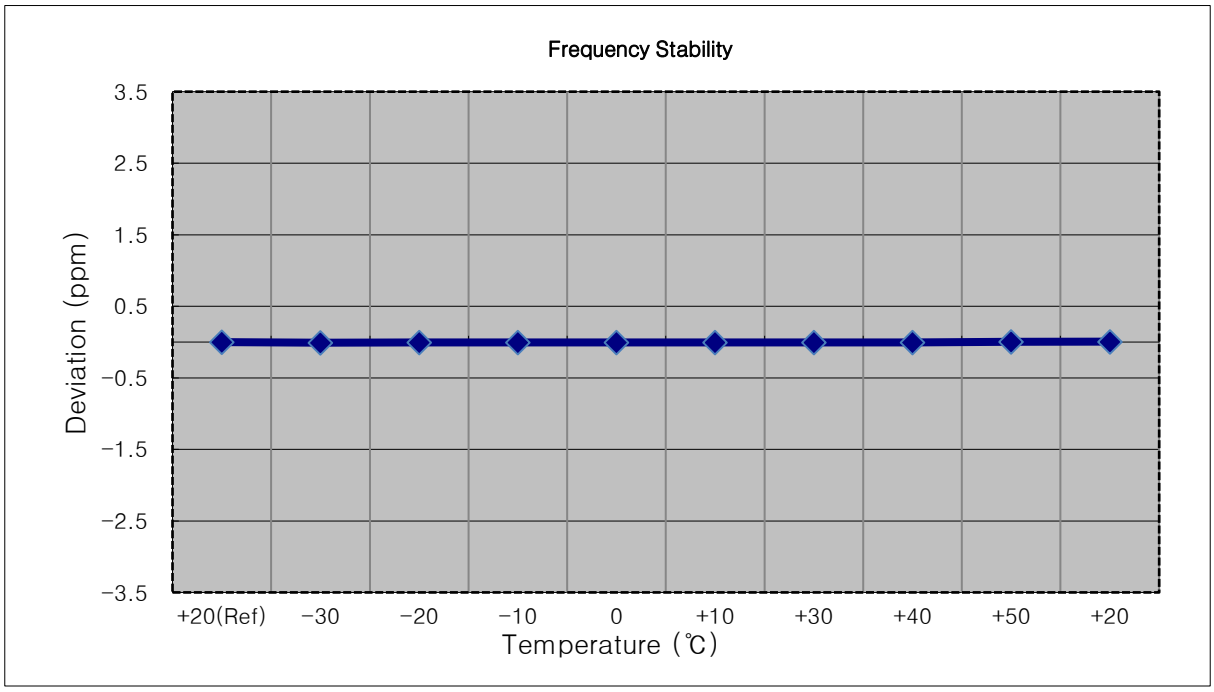
▣ OPERATING FREQUENCY: 1909,300,000 Hz

▣ CHANNEL: 19193 (1.4 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1909 300 008	0.0	0.000 000	0.000
100 %		-30	1909 299 991	-16.9	-0.000 001	-0.009
100 %		-20	1909 299 997	-11.2	-0.000 001	-0.006
100 %		-10	1909 299 997	-11.5	-0.000 001	-0.006
100 %		0	1909 299 994	-13.8	-0.000 001	-0.007
100 %		+10	1909 299 998	-10.6	-0.000 001	-0.006
100 %		+30	1909 299 996	-12.1	-0.000 001	-0.006
100 %		+40	1909 299 994	-13.8	-0.000 001	-0.007
100 %		+50	1909 300 017	9.0	0.000 000	0.005
Batt. Endpoint	3.400	+20	1909 300 019	11.1	0.000 001	0.006



▣ MODE: LTE B2

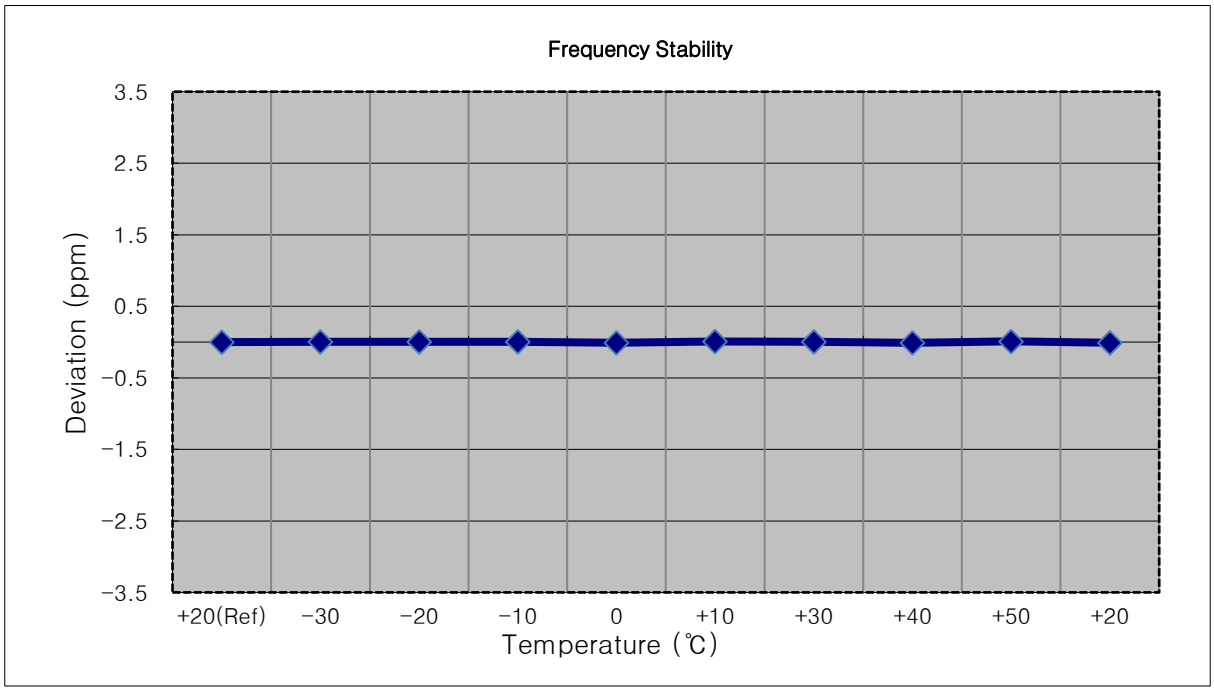
▣ OPERATING FREQUENCY: 1908,500,000 Hz

▣ CHANNEL: 19185 (3 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1908 499 981	0.0	0.000 000	0.000
100 %		-30	1908 499 990	9.2	0.000 000	0.005
100 %		-20	1908 499 991	9.6	0.000 001	0.005
100 %		-10	1908 499 991	10.5	0.000 001	0.006
100 %		0	1908 499 964	-16.9	-0.000 001	-0.009
100 %		+10	1908 499 994	12.8	0.000 001	0.007
100 %		+30	1908 499 990	9.4	0.000 000	0.005
100 %		+40	1908 499 960	-21.0	-0.000 001	-0.011
100 %		+50	1908 500 000	19.1	0.000 001	0.010
Batt. Endpoint	3.400	+20	1908 499 965	-15.5	-0.000 001	-0.008



▣ MODE: LTE B2

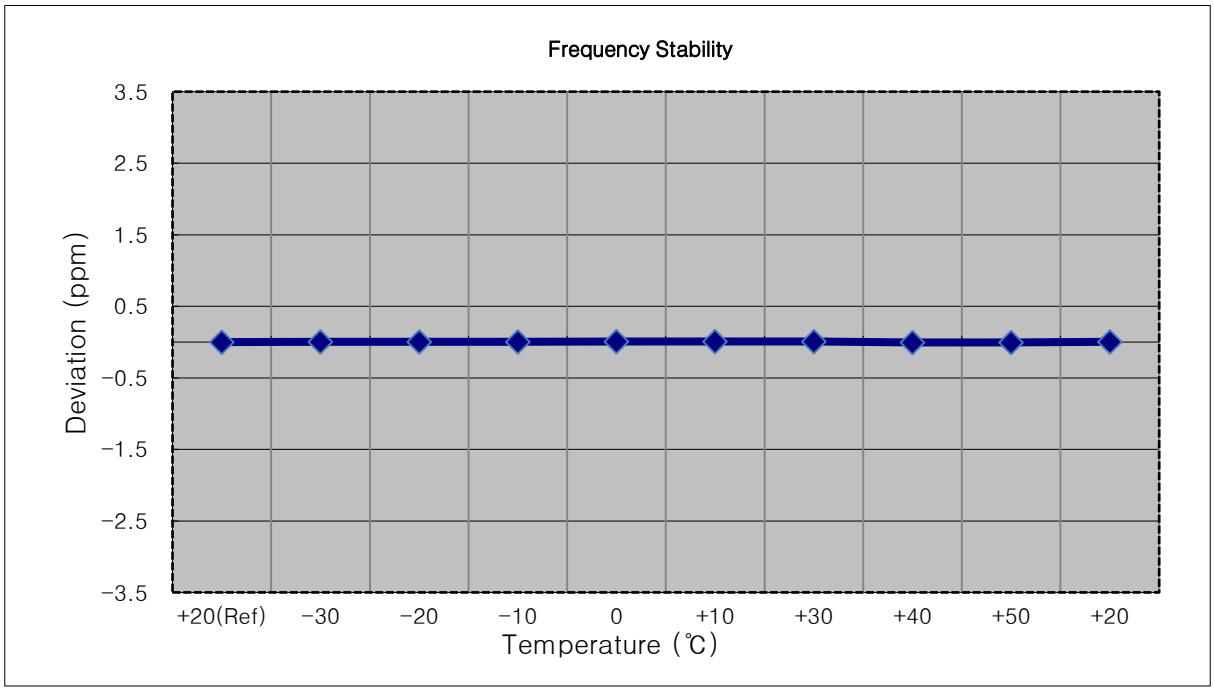
▣ OPERATING FREQUENCY: 1907,500,000 Hz

▣ CHANNEL: 19175 (5 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1907 500 009	0.0	0.000 000	0.000
100 %		-30	1907 500 018	9.8	0.000 001	0.005
100 %		-20	1907 500 019	10.1	0.000 001	0.005
100 %		-10	1907 500 019	10.1	0.000 001	0.005
100 %		0	1907 500 023	14.3	0.000 001	0.007
100 %		+10	1907 500 022	13.3	0.000 001	0.007
100 %		+30	1907 500 021	12.0	0.000 001	0.006
100 %		+40	1907 499 998	-10.5	-0.000 001	-0.006
100 %		+50	1907 500 000	-8.6	0.000 000	-0.005
Batt. Endpoint	3.400	+20	1907 500 020	11.1	0.000 001	0.006



▣ MODE: LTE B2

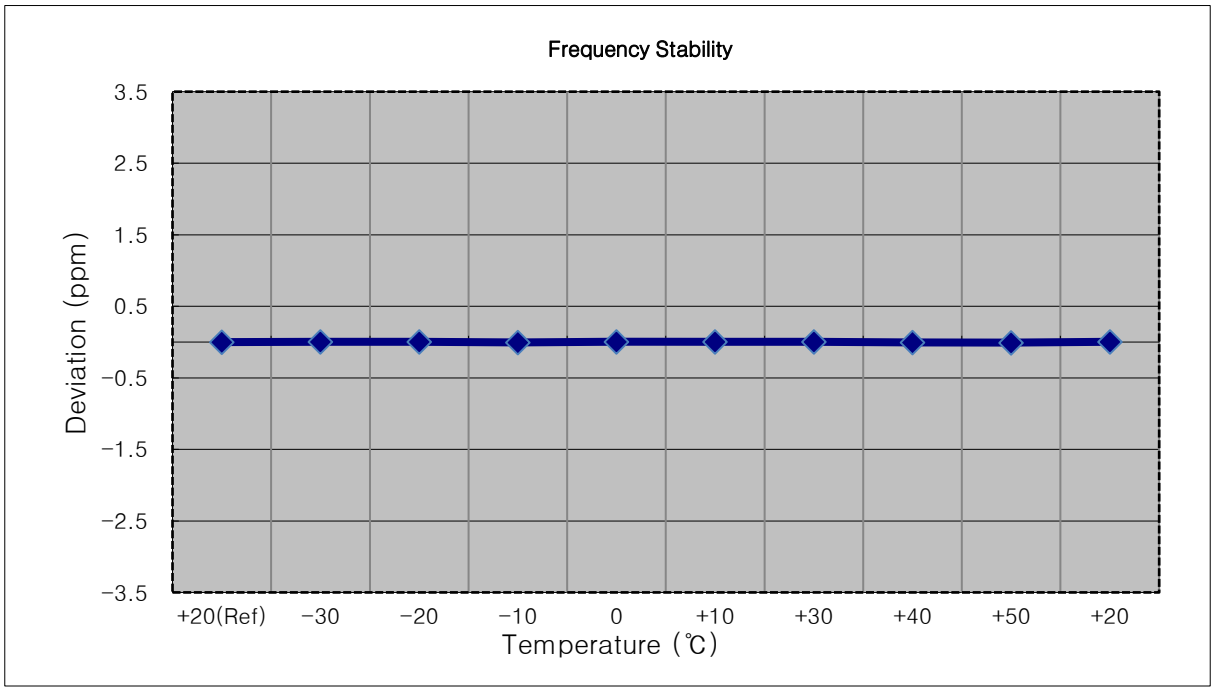
▣ OPERATING FREQUENCY: 1905,000,000 Hz

▣ CHANNEL: 19150 (10 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1904 999 986	0.0	0.000 000	0.000
100 %		-30	1904 999 993	6.8	0.000 000	0.004
100 %		-20	1904 999 991	4.4	0.000 000	0.002
100 %		-10	1904 999 974	-12.3	-0.000 001	-0.006
100 %		0	1904 999 995	9.1	0.000 000	0.005
100 %		+10	1904 999 994	8.0	0.000 000	0.004
100 %		+30	1904 999 992	6.1	0.000 000	0.003
100 %		+40	1904 999 979	-7.1	0.000 000	-0.004
100 %		+50	1904 999 972	-14.6	-0.000 001	-0.008
Batt. Endpoint	3.400	+20	1904 999 993	6.7	0.000 000	0.004



▣ MODE: LTE B2

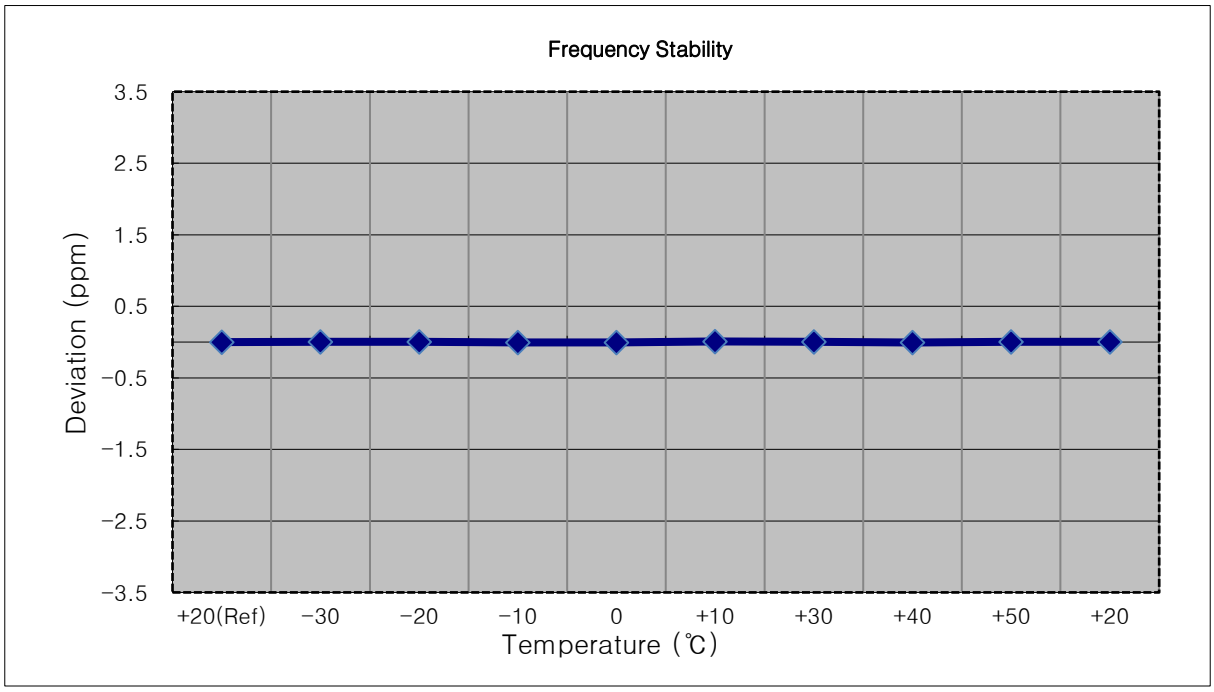
▣ OPERATING FREQUENCY: 1902,500,000 Hz

▣ CHANNEL: 19125 (15 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1902 500 010	0.0	0.000 000	0.000
100 %		-30	1902 500 020	9.7	0.000 001	0.005
100 %		-20	1902 500 016	5.6	0.000 000	0.003
100 %		-10	1902 500 004	-6.0	0.000 000	-0.003
100 %		0	1902 500 003	-7.0	0.000 000	-0.004
100 %		+10	1902 500 026	16.0	0.000 001	0.008
100 %		+30	1902 500 016	6.1	0.000 000	0.003
100 %		+40	1902 499 998	-12.4	-0.000 001	-0.007
100 %		+50	1902 500 021	10.3	0.000 001	0.005
Batt. Endpoint	3.400	+20	1902 500 016	6.0	0.000 000	0.003



▣ MODE: LTE B2

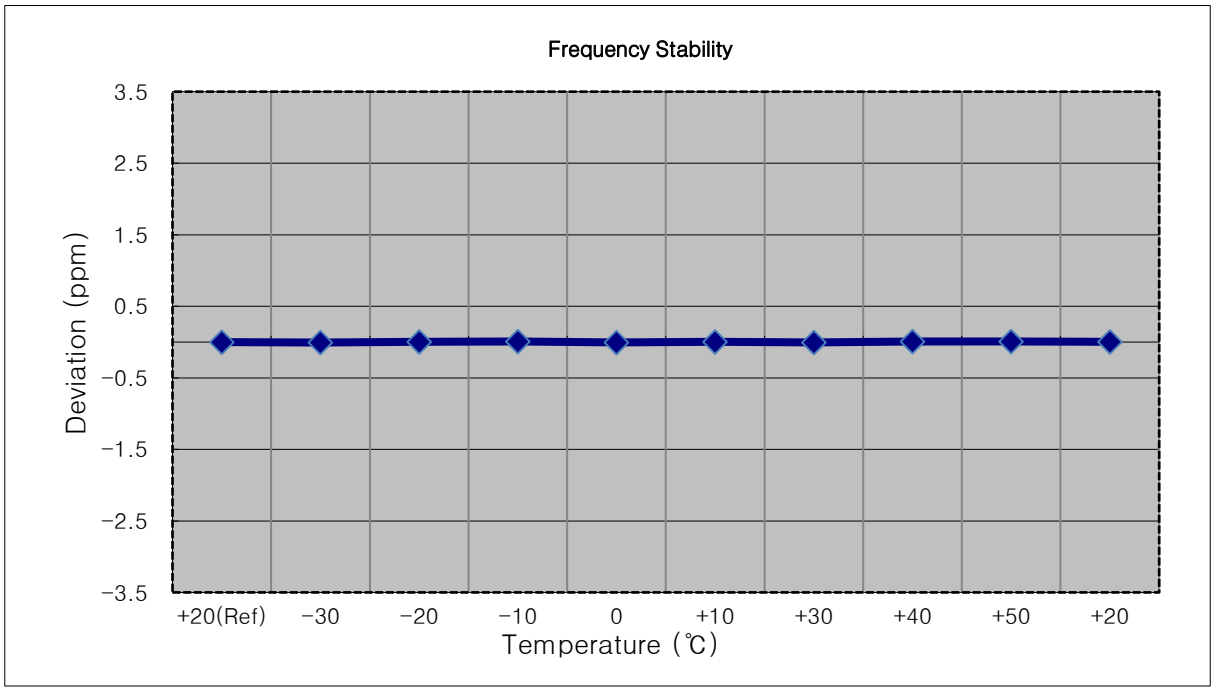
▣ OPERATING FREQUENCY: 1900,000,000 Hz

▣ CHANNEL: 19100 (20 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1900 000 010	0.0	0.000 000	0.000
100 %		-30	1899 999 997	-12.8	-0.000 001	-0.007
100 %		-20	1900 000 018	8.3	0.000 000	0.004
100 %		-10	1900 000 022	12.0	0.000 001	0.006
100 %		0	1900 000 000	-10.0	-0.000 001	-0.005
100 %		+10	1900 000 020	10.0	0.000 001	0.005
100 %		+30	1900 000 001	-9.0	0.000 000	-0.005
100 %		+40	1900 000 025	15.0	0.000 001	0.008
100 %		+50	1900 000 025	14.8	0.000 001	0.008
Batt. Endpoint	3.400	+20	1900 000 020	9.9	0.000 001	0.005



9. TEST DATA(Main 3 Ant)

9.1 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	-22.85	11.04	10.31	2.30	H	< 2.00	0.080	19.05
		16-QAM	-23.61	10.28	10.31	2.30	H		0.067	18.29
		64-QAM	-24.69	9.20	10.31	2.30	H		0.053	17.21
		256-QAM	-27.61	6.28	10.31	2.30	H		0.027	14.29
1880.0		QPSK	-23.19	11.51	10.35	2.33	H		0.090	19.53
		16-QAM	-23.89	10.81	10.35	2.33	H		0.076	18.83
		64-QAM	-25.05	9.65	10.35	2.33	H		0.059	17.67
		256-QAM	-27.96	6.74	10.35	2.33	H		0.030	14.76
1909.3		QPSK	-23.61	10.43	10.40	2.29	H		0.071	18.54
		16-QAM	-24.29	9.75	10.40	2.29	H		0.061	17.86
		64-QAM	-25.39	8.65	10.40	2.29	H		0.047	16.76
		256-QAM	-28.26	5.78	10.40	2.29	H		0.024	13.89

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	-22.88	11.01	10.31	2.30	H	< 2.00	0.080	19.02
		16-QAM	-23.63	10.26	10.31	2.30	H		0.067	18.27
		64-QAM	-24.70	9.19	10.31	2.30	H		0.053	17.20
		256-QAM	-27.64	6.25	10.31	2.30	H		0.027	14.26
1880.0		QPSK	-23.25	11.45	10.35	2.33	H		0.089	19.47
		16-QAM	-23.94	10.76	10.35	2.33	H		0.076	18.78
		64-QAM	-25.11	9.59	10.35	2.33	H		0.058	17.61
		256-QAM	-28.02	6.68	10.35	2.33	H		0.030	14.70
1908.5		QPSK	-23.35	10.69	10.40	2.29	H		0.076	18.80
		16-QAM	-24.06	9.98	10.40	2.29	H		0.064	18.09
		64-QAM	-25.21	8.83	10.40	2.29	H		0.049	16.94
		256-QAM	-28.09	5.95	10.40	2.29	H		0.026	14.06

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	-22.94	10.95	10.31	2.30	H	< 2.00	0.079	18.96
		16-QAM	-23.66	10.23	10.31	2.30	H		0.067	18.24
		64-QAM	-24.78	9.11	10.31	2.30	H		0.052	17.12
		256-QAM	-27.70	6.19	10.31	2.30	H		0.026	14.20
1880.0		QPSK	-23.20	11.50	10.35	2.33	H		0.090	19.52
		16-QAM	-23.89	10.81	10.35	2.33	H		0.076	18.83
		64-QAM	-25.06	9.64	10.35	2.33	H		0.058	17.66
		256-QAM	-28.00	6.70	10.35	2.33	H		0.030	14.72
1907.5		QPSK	-23.14	10.90	10.40	2.29	H		0.080	19.01
		16-QAM	-23.82	10.22	10.40	2.29	H		0.068	18.33
		64-QAM	-24.99	9.05	10.40	2.29	H		0.052	17.16
		256-QAM	-27.90	6.14	10.40	2.29	H		0.027	14.25

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	-22.90	11.01	10.32	2.25	H	< 2.00	0.081	19.08
		16-QAM	-23.64	10.27	10.32	2.25	H		0.068	18.34
		64-QAM	-24.72	9.19	10.32	2.25	H		0.053	17.26
		256-QAM	-27.65	6.26	10.32	2.25	H		0.027	14.33
1880.0		QPSK	-23.00	11.70	10.35	2.33	H		0.094	19.72
		16-QAM	-23.68	11.02	10.35	2.33	H		0.080	19.04
		64-QAM	-24.85	9.85	10.35	2.33	H		0.061	17.87
		256-QAM	-27.79	6.91	10.35	2.33	H		0.031	14.93
1905.0		QPSK	-23.44	10.71	10.39	2.30	H		0.076	18.81
		16-QAM	-24.14	10.01	10.39	2.30	H		0.065	18.11
		64-QAM	-25.32	8.83	10.39	2.30	H		0.049	16.93
		256-QAM	-28.26	5.89	10.39	2.30	H		0.025	13.99

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	-22.66	11.34	10.32	2.26	H	< 2.00	0.087	19.40
		16-QAM	-23.34	10.66	10.32	2.26	H		0.074	18.72
		64-QAM	-24.51	9.49	10.32	2.26	H		0.057	17.55
		256-QAM	-27.50	6.50	10.32	2.26	H		0.029	14.56
1880.0		QPSK	-22.94	11.76	10.35	2.33	H		0.095	19.78
		16-QAM	-23.63	11.07	10.35	2.33	H		0.081	19.09
		64-QAM	-24.80	9.90	10.35	2.33	H		0.062	17.92
		256-QAM	-27.80	6.90	10.35	2.33	H		0.031	14.92
1902.5		QPSK	-23.64	10.63	10.38	2.30	H		0.074	18.71
		16-QAM	-24.34	9.93	10.38	2.30	H		0.063	18.01
		64-QAM	-25.50	8.77	10.38	2.30	H		0.048	16.85
		256-QAM	-28.43	5.84	10.38	2.30	H		0.025	13.92

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	-22.65	11.35	10.32	2.26	H	< 2.00	0.087	19.41
		16-QAM	-23.30	10.70	10.32	2.26	H		0.075	18.76
		64-QAM	-24.48	9.52	10.32	2.26	H		0.057	17.58
		256-QAM	-27.48	6.52	10.32	2.26	H		0.029	14.58
1880.0		QPSK	-22.92	11.78	10.35	2.33	H		0.096	19.80
		16-QAM	-23.61	11.09	10.35	2.33	H		0.082	19.11
		64-QAM	-24.80	9.90	10.35	2.33	H		0.062	17.92
		256-QAM	-27.76	6.94	10.35	2.33	H		0.031	14.96
1900.0		QPSK	-23.36	10.91	10.38	2.30	H		0.079	18.99
		16-QAM	-24.10	10.17	10.38	2.30	H		0.067	18.25
		64-QAM	-25.21	9.06	10.38	2.30	H		0.052	17.14
		256-QAM	-28.14	6.13	10.38	2.30	H		0.026	14.21

9.2 RADIATED SPURIOUS EMISSIONS

▣ OPERATING FREQUENCY: 1880.0 MHz

▣ MEASURED OUTPUT POWER: 19.80 dBm = 0.095 W

▣ MODE: LTE B2

▣ MODULATION SIGNAL: 20 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 log10 (W) = 32.80 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	-51.50	12.28	-56.27	3.24	H	-47.23	67.03
	5 580.00	-48.80	13.07	-46.69	3.98	H	-37.60	57.40
	7 440.00	-42.74	10.78	-32.08	4.69	H	-25.99	45.79
	9 300.00	-53.07	10.42	-36.48	5.33	H	-31.39	51.19
	11 160.00	-54.58	11.20	-36.02	5.82	H	-30.64	50.44
18900 (1880.0)	3 760.00	-51.08	12.22	-55.71	3.27	V	-46.76	66.56
	5 640.00	-47.08	13.12	-44.81	4.07	H	-35.76	55.56
	7 520.00	-41.69	10.82	-30.88	4.71	H	-24.77	44.57
	9 400.00	-53.15	10.40	-36.85	5.35	V	-31.80	51.60
19100 (1900.0)	3 800.00	-51.91	12.17	-57.00	3.25	V	-48.08	67.88
	5 700.00	-48.17	13.11	-45.87	4.13	H	-36.89	56.69
	7 600.00	-36.13	11.08	-25.53	4.78	H	-19.23	39.03
	9 500.00	-50.16	10.72	-33.88	5.38	V	-28.54	48.34

9.3 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	5.82
			16-QAM	6	0	6.58
			64-QAM	6	0	6.90
			256-QAM	6	0	6.99
	3 MHz		QPSK	15	0	5.92
			16-QAM	15	0	6.55
			64-QAM	15	0	6.88
			256-QAM	15	0	6.98
	5 MHz		QPSK	25	0	5.80
			16-QAM	25	0	6.56
			64-QAM	25	0	6.84
			256-QAM	25	0	7.01
	10 MHz		QPSK	50	0	5.88
			16-QAM	50	0	6.57
			64-QAM	50	0	6.84
			256-QAM	50	0	6.98
	15 MHz		QPSK	75	0	5.79
			16-QAM	75	0	6.50
			64-QAM	75	0	6.85
			256-QAM	75	0	6.97
	20 MHz		QPSK	100	0	5.71
			16-QAM	100	0	6.50
			64-QAM	100	0	6.83
			256-QAM	100	0	7.01

Note:

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 261 ~ 284.

9.4 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	1.0978
			16-QAM	6	0	1.0945
			64-QAM	6	0	1.0961
			256-QAM	6	0	1.0941
	3 MHz		QPSK	15	0	2.7034
			16-QAM	15	0	2.7005
			64-QAM	15	0	2.7033
			256-QAM	15	0	2.6998
	5 MHz		QPSK	25	0	4.5180
			16-QAM	25	0	4.4889
			64-QAM	25	0	4.5003
			256-QAM	25	0	4.5041
	10 MHz		QPSK	50	0	8.9989
			16-QAM	50	0	8.9706
			64-QAM	50	0	8.9954
			256-QAM	50	0	8.9963
	15 MHz		QPSK	75	0	13.474
			16-QAM	75	0	13.462
			64-QAM	75	0	13.458
			256-QAM	75	0	13.510
	20 MHz		QPSK	100	0	17.983
			16-QAM	100	0	17.915
			64-QAM	100	0	17.949
			256-QAM	100	0	17.961

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 237 ~ 260.

9.5 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	3.7010	27.976	-66.661	-38.685	-13.00
		1880.0	3.6995	27.976	-66.925	-38.949	
		1909.3	3.7074	27.976	-67.362	-39.386	
	3	1851.5	3.7010	27.976	-66.424	-38.448	
		1880.0	3.6985	27.976	-67.149	-39.173	
		1908.5	3.7074	27.976	-67.103	-39.127	
	5	1852.5	3.6975	27.976	-67.196	-39.220	
		1880.0	3.7114	27.976	-66.987	-39.011	
		1907.5	3.6985	27.976	-67.115	-39.139	
	10	1855.0	3.7020	27.976	-66.438	-38.462	
		1880.0	3.6950	27.976	-67.379	-39.403	
		1905.0	3.6965	27.976	-67.284	-39.308	
	15	1857.5	3.6735	27.976	-67.239	-39.263	
		1880.0	3.6765	27.976	-67.339	-39.363	
		1902.5	3.7139	27.976	-66.789	-38.813	
	20	1860.0	3.6940	27.976	-67.317	-39.341	
		1880.0	3.7084	27.976	-67.450	-39.474	
		1900.0	3.6995	27.976	-67.055	-39.079	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 285 ~ 320
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(26.5)	30.131

9.6 BAND EDGE

- Plots of the EUT's Band Edge are shown Page 101 ~ 236.

9.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

▣ MODE: LTE B2

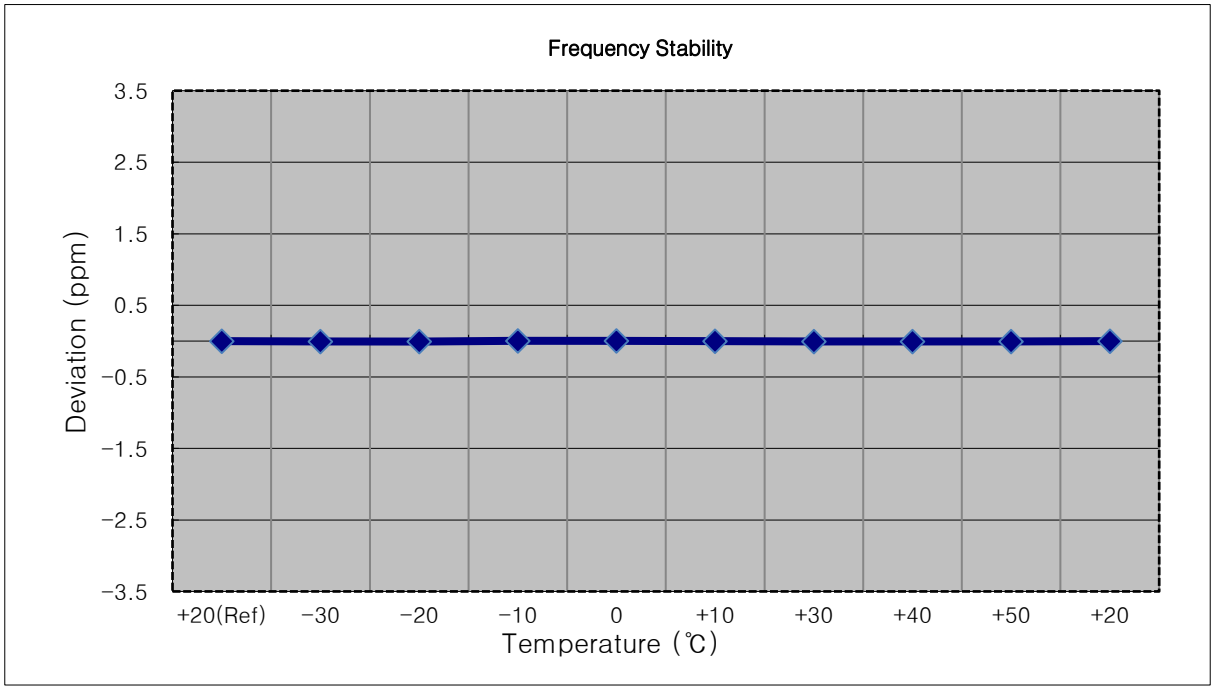
▣ OPERATING FREQUENCY: 1850,700,000 Hz

▣ CHANNEL: 18607 (1.4 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1850 699 993	0.0	0.000 000	0.000
100 %		-30	1850 699 985	-7.7	0.000 000	-0.004
100 %		-20	1850 699 981	-12.2	-0.000 001	-0.007
100 %		-10	1850 699 998	5.4	0.000 000	0.003
100 %		0	1850 699 998	5.6	0.000 000	0.003
100 %		+10	1850 699 990	-3.0	0.000 000	-0.002
100 %		+30	1850 699 983	-9.9	-0.000 001	-0.005
100 %		+40	1850 699 984	-9.0	0.000 000	-0.005
100 %		+50	1850 699 986	-7.1	0.000 000	-0.004
Batt. Endpoint	3.400	+20	1850 699 995	2.6	0.000 000	0.001



▣ MODE: LTE B2

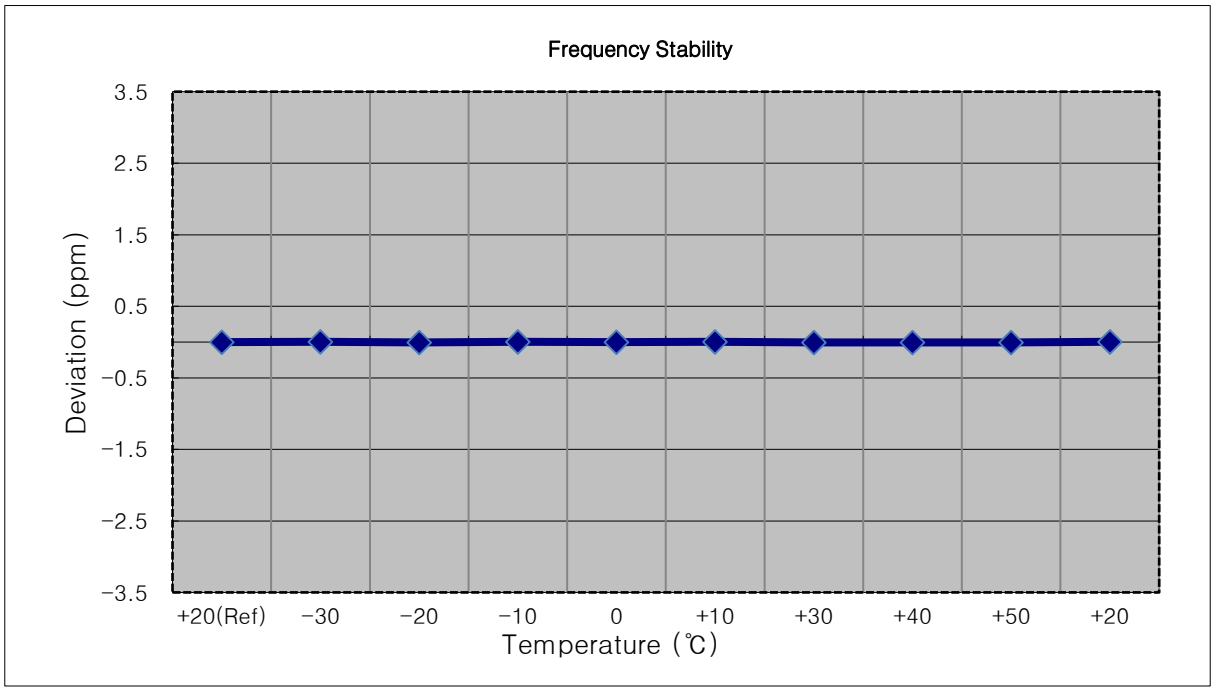
▣ OPERATING FREQUENCY: 1851,500,000 Hz

▣ CHANNEL: 18615 (3 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1851 499 989	0.0	0.000 000	0.000
100 %		-30	1851 499 996	7.5	0.000 000	0.004
100 %		-20	1851 499 983	-5.8	0.000 000	-0.003
100 %		-10	1851 499 992	3.0	0.000 000	0.002
100 %		0	1851 499 991	2.7	0.000 000	0.001
100 %		+10	1851 499 993	3.8	0.000 000	0.002
100 %		+30	1851 499 980	-8.3	0.000 000	-0.004
100 %		+40	1851 499 979	-9.7	-0.000 001	-0.005
100 %		+50	1851 499 980	-8.4	0.000 000	-0.005
Batt. Endpoint	3.400	+20	1851 499 996	7.6	0.000 000	0.004



▣ MODE: LTE B2

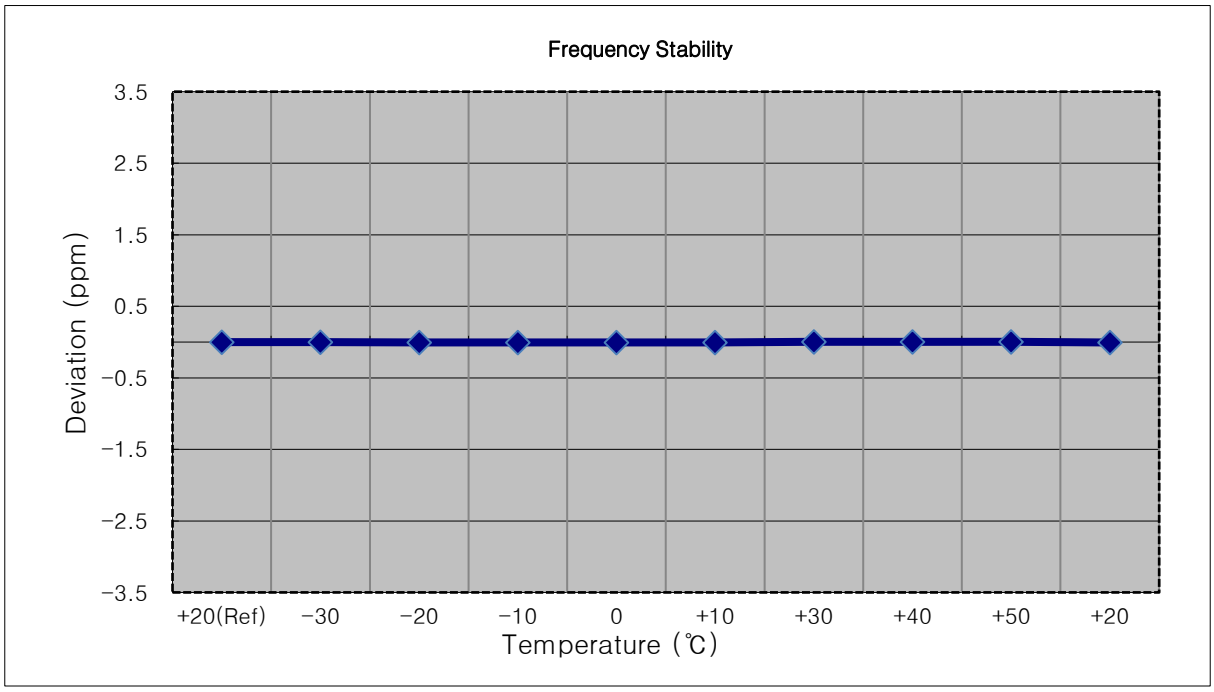
▣ OPERATING FREQUENCY: 1852,500,000 Hz

▣ CHANNEL: 18625 (5 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1852 499 997	0.0	0.000 000	0.000
100 %		-30	1852 499 994	-2.8	0.000 000	-0.002
100 %		-20	1852 499 989	-7.7	0.000 000	-0.004
100 %		-10	1852 499 991	-6.3	0.000 000	-0.003
100 %		0	1852 499 990	-6.7	0.000 000	-0.004
100 %		+10	1852 499 991	-5.6	0.000 000	-0.003
100 %		+30	1852 500 002	4.8	0.000 000	0.003
100 %		+40	1852 500 002	5.3	0.000 000	0.003
100 %		+50	1852 500 002	5.0	0.000 000	0.003
Batt. Endpoint	3.400	+20	1852 499 986	-10.8	-0.000 001	-0.006



▣ MODE: LTE B2

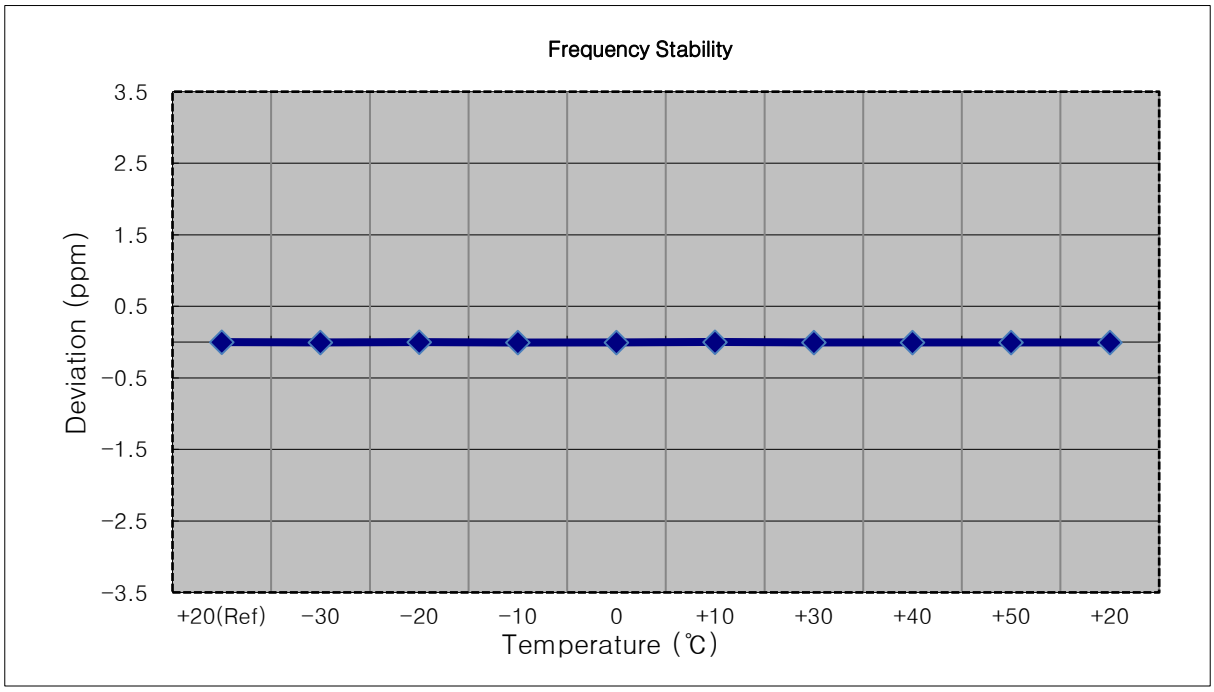
▣ OPERATING FREQUENCY: 1855,000,000 Hz

▣ CHANNEL: 18650 (10 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1854 999 990	0.0	0.000 000	0.000
100 %		-30	1854 999 981	-9.2	0.000 000	-0.005
100 %		-20	1854 999 986	-3.8	0.000 000	-0.002
100 %		-10	1854 999 978	-12.3	-0.000 001	-0.007
100 %		0	1854 999 981	-9.2	0.000 000	-0.005
100 %		+10	1854 999 993	2.5	0.000 000	0.001
100 %		+30	1854 999 981	-9.3	-0.000 001	-0.005
100 %		+40	1854 999 982	-8.1	0.000 000	-0.004
100 %		+50	1854 999 979	-11.5	-0.000 001	-0.006
Batt. Endpoint	3.400	+20	1854 999 982	-7.8	0.000 000	-0.004



▣ MODE: LTE B2

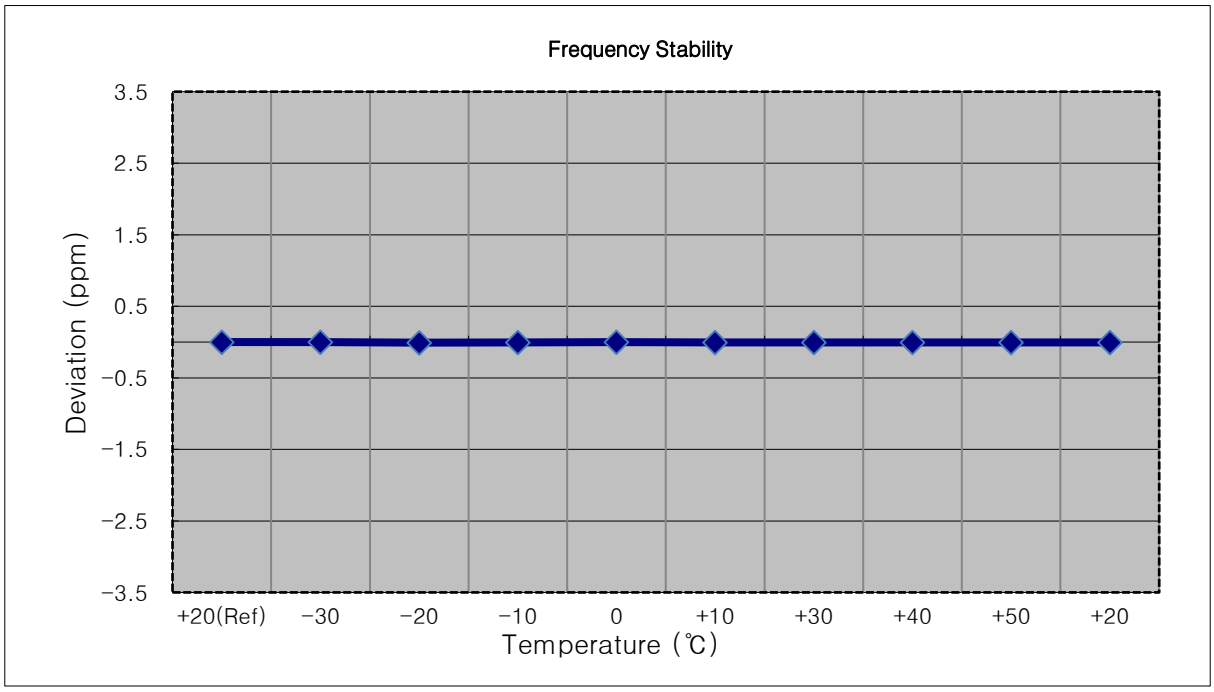
▣ OPERATING FREQUENCY: 1857,500,000 Hz

▣ CHANNEL: 18675 (15 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1857 500 002	0.0	0.000 000	0.000
100 %		-30	1857 499 998	-4.8	0.000 000	-0.003
100 %		-20	1857 499 987	-15.3	-0.000 001	-0.008
100 %		-10	1857 499 993	-9.3	-0.000 001	-0.005
100 %		0	1857 499 999	-3.7	0.000 000	-0.002
100 %		+10	1857 499 994	-8.3	0.000 000	-0.004
100 %		+30	1857 499 990	-12.1	-0.000 001	-0.007
100 %		+40	1857 499 989	-13.6	-0.000 001	-0.007
100 %		+50	1857 499 995	-7.5	0.000 000	-0.004
Batt. Endpoint	3.400	+20	1857 499 993	-9.3	-0.000 001	-0.005



▣ MODE: LTE B2

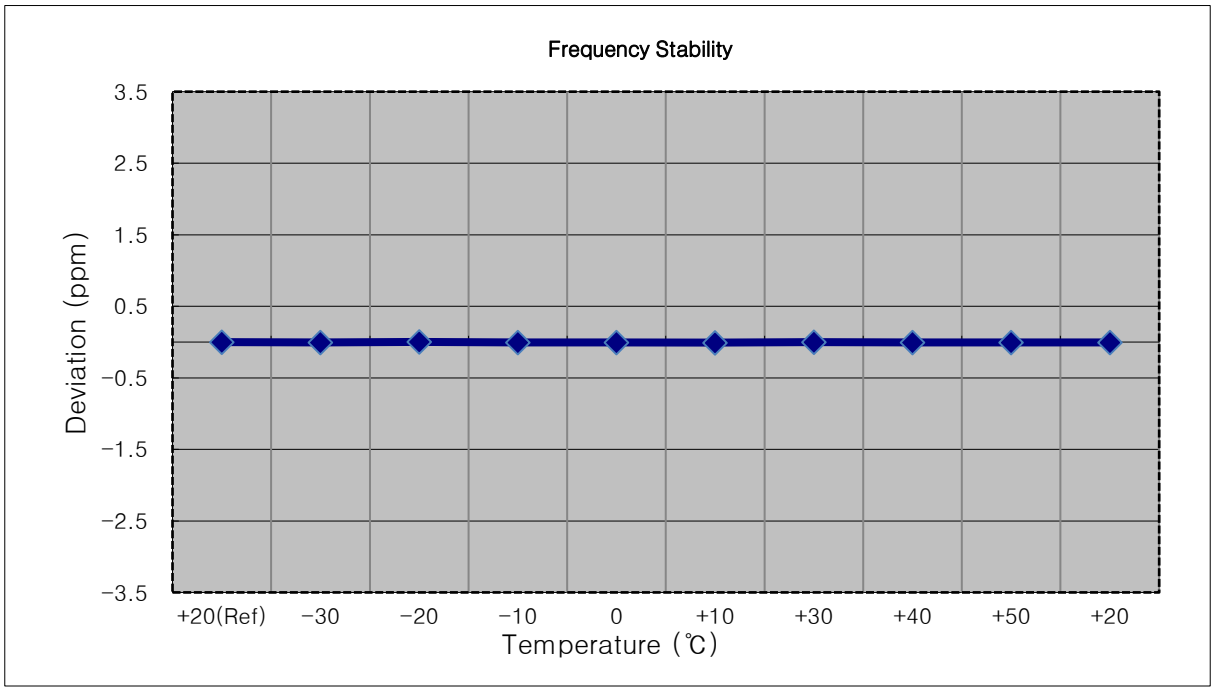
▣ OPERATING FREQUENCY: 1860,000,000 Hz

▣ CHANNEL: 18700 (20 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1859 999 994	0.0	0.000 000	0.000
100 %		-30	1859 999 980	-13.5	-0.000 001	-0.007
100 %		-20	1859 999 997	3.5	0.000 000	0.002
100 %		-10	1859 999 984	-10.0	-0.000 001	-0.005
100 %		0	1859 999 982	-12.2	-0.000 001	-0.007
100 %		+10	1859 999 980	-14.2	-0.000 001	-0.008
100 %		+30	1859 999 991	-3.0	0.000 000	-0.002
100 %		+40	1859 999 981	-12.6	-0.000 001	-0.007
100 %		+50	1859 999 982	-12.1	-0.000 001	-0.007
Batt. Endpoint	3.400	+20	1859 999 984	-10.0	-0.000 001	-0.005



▣ MODE: LTE B2

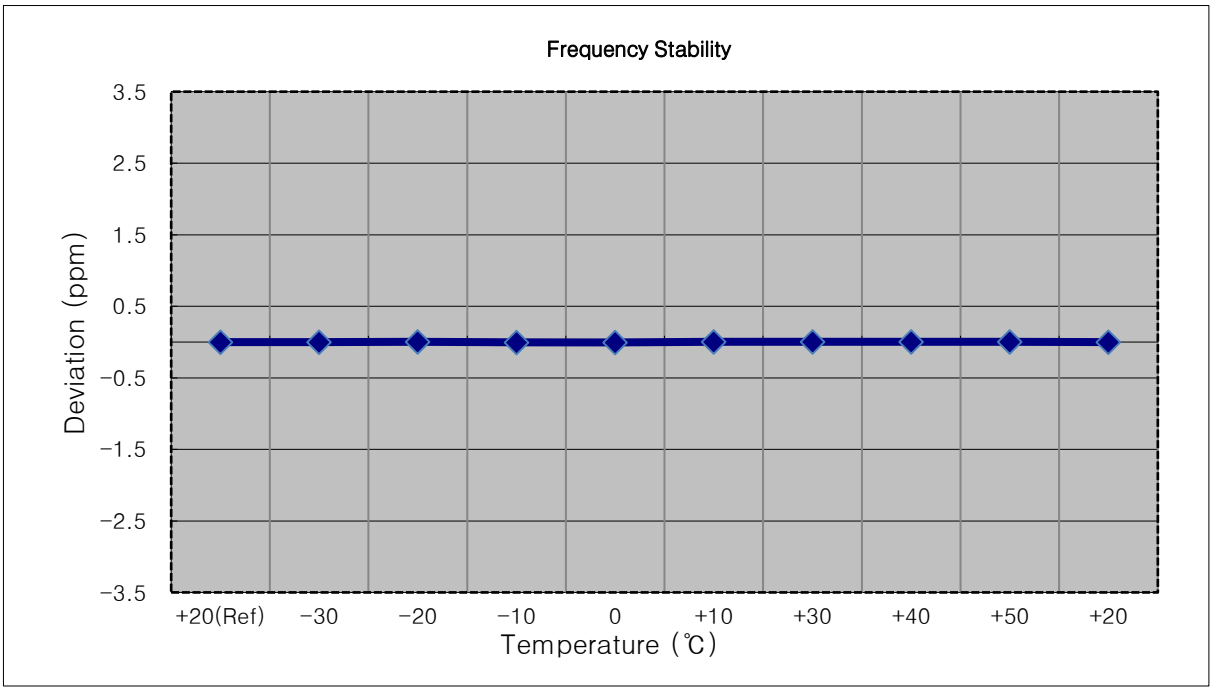
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 18900 (1.4 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1879 999 995	0.0	0.000 000	0.000
100 %		-30	1879 999 993	-2.6	0.000 000	-0.001
100 %		-20	1879 999 998	3.3	0.000 000	0.002
100 %		-10	1879 999 988	-7.2	0.000 000	-0.004
100 %		0	1879 999 988	-6.8	0.000 000	-0.004
100 %		+10	1880 000 002	6.7	0.000 000	0.004
100 %		+30	1880 000 003	7.9	0.000 000	0.004
100 %		+40	1880 000 003	7.6	0.000 000	0.004
100 %		+50	1880 000 003	7.7	0.000 000	0.004
Batt. Endpoint	3.400	+20	1879 999 991	-4.5	0.000 000	-0.002



▣ MODE: LTE B2

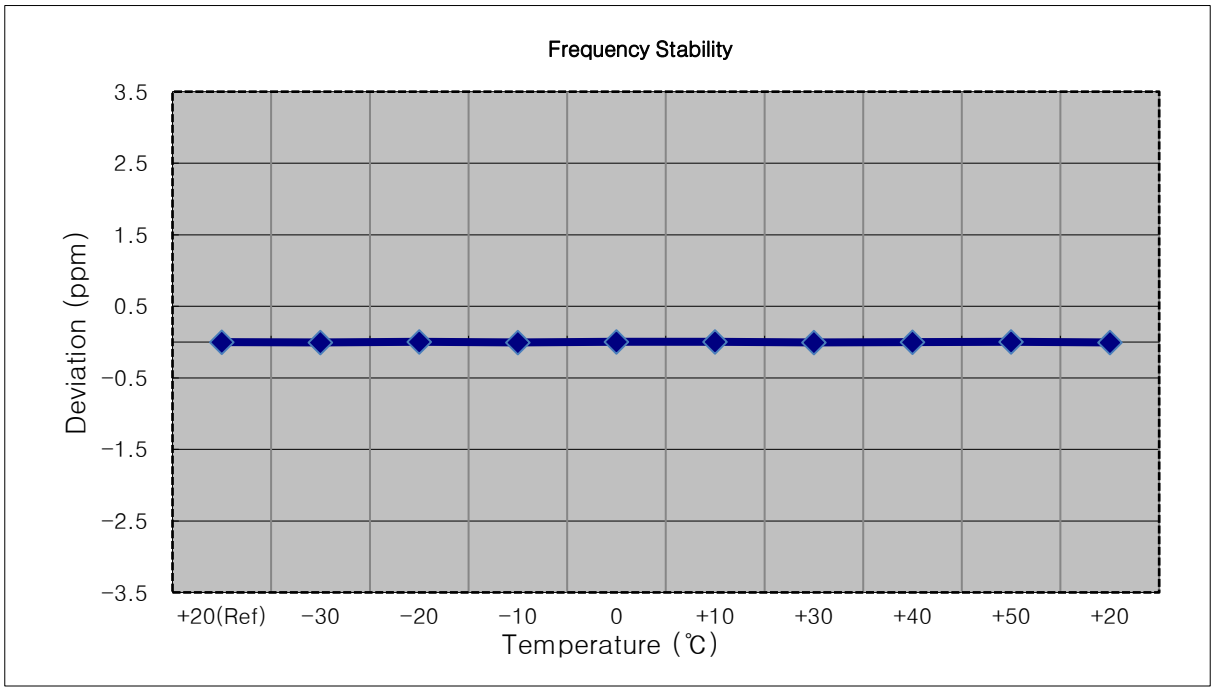
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 18900 (3 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1880 000 005	0.0	0.000 000	0.000
100 %		-30	1879 999 998	-7.8	0.000 000	-0.004
100 %		-20	1880 000 008	3.0	0.000 000	0.002
100 %		-10	1879 999 999	-6.9	0.000 000	-0.004
100 %		0	1880 000 013	8.0	0.000 000	0.004
100 %		+10	1880 000 011	5.2	0.000 000	0.003
100 %		+30	1879 999 996	-9.3	0.000 000	-0.005
100 %		+40	1880 000 000	-5.1	0.000 000	-0.003
100 %		+50	1880 000 010	4.3	0.000 000	0.002
Batt. Endpoint	3.400	+20	1879 999 995	-10.0	-0.000 001	-0.005



▣ MODE: LTE B2

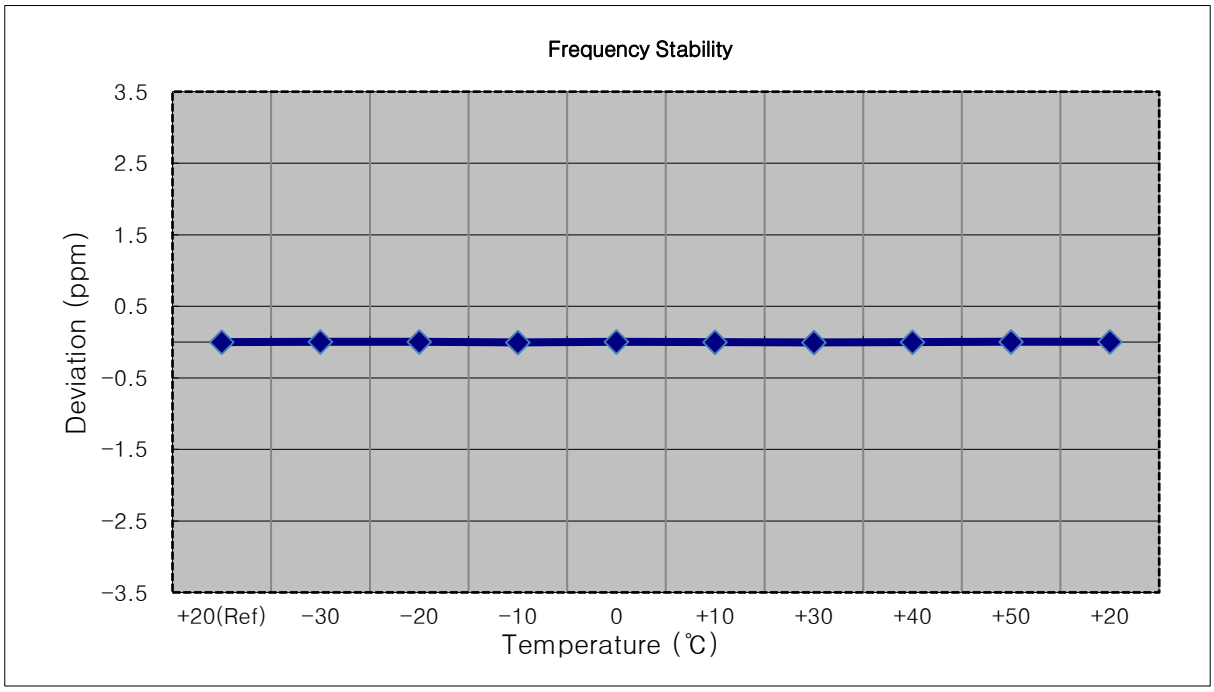
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 18900 (5 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1879 999 991	0.0	0.000 000	0.000
100 %		-30	1879 999 998	7.1	0.000 000	0.004
100 %		-20	1879 999 999	8.2	0.000 000	0.004
100 %		-10	1879 999 981	-9.5	-0.000 001	-0.005
100 %		0	1879 999 994	3.6	0.000 000	0.002
100 %		+10	1879 999 985	-5.5	0.000 000	-0.003
100 %		+30	1879 999 985	-6.1	0.000 000	-0.003
100 %		+40	1879 999 986	-4.2	0.000 000	-0.002
100 %		+50	1880 000 000	9.2	0.000 000	0.005
Batt. Endpoint	3.400	+20	1879 999 994	3.4	0.000 000	0.002



▣ MODE: LTE B2

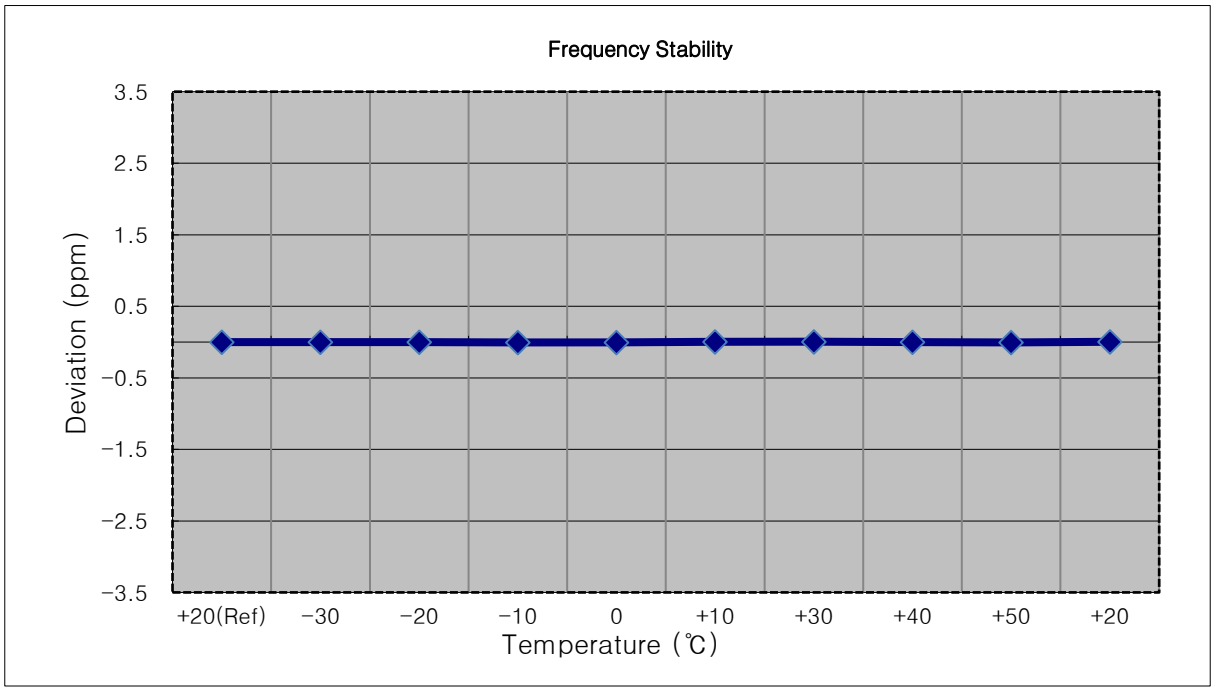
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 18900 (10 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1879 999 994	0.0	0.000 000	0.000
100 %		-30	1879 999 989	-5.4	0.000 000	-0.003
100 %		-20	1879 999 991	-3.3	0.000 000	-0.002
100 %		-10	1879 999 988	-6.2	0.000 000	-0.003
100 %		0	1879 999 986	-8.2	0.000 000	-0.004
100 %		+10	1880 000 003	9.4	0.000 001	0.005
100 %		+30	1880 000 004	9.5	0.000 001	0.005
100 %		+40	1879 999 989	-5.3	0.000 000	-0.003
100 %		+50	1879 999 987	-7.4	0.000 000	-0.004
Batt. Endpoint	3.400	+20	1879 999 999	4.7	0.000 000	0.003



▣ MODE: LTE B2

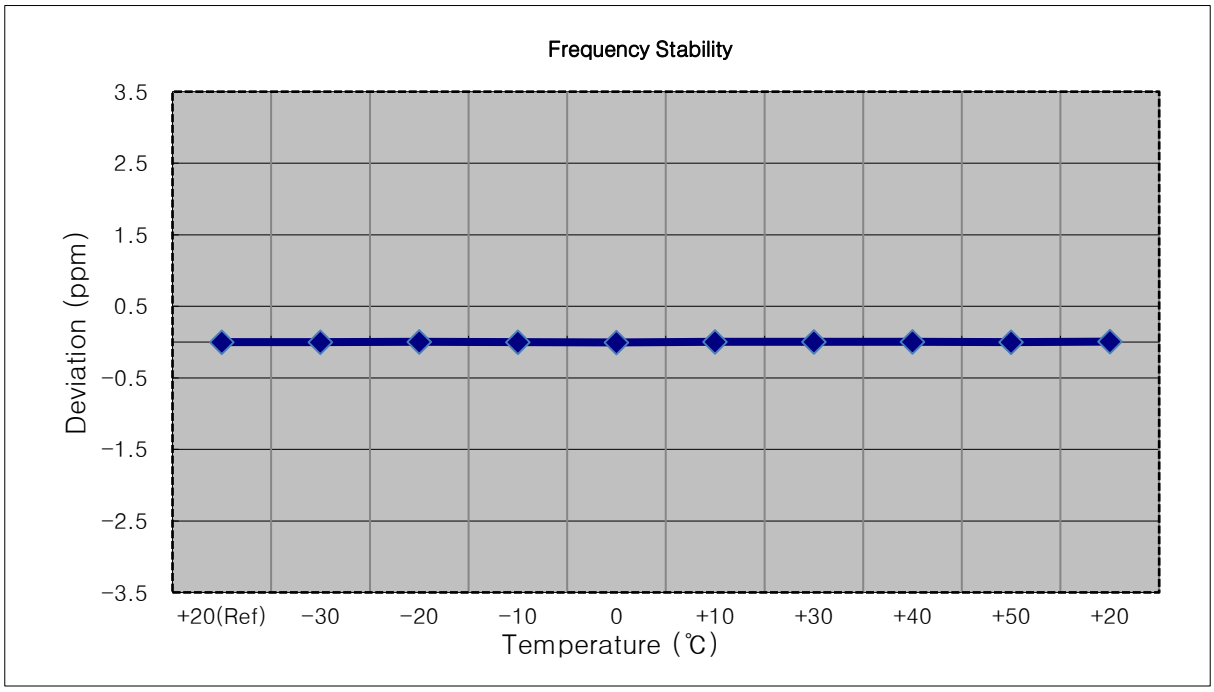
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 18900 (15 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1880 000 008	0.0	0.000 000	0.000
100 %		-30	1880 000 003	-5.3	0.000 000	-0.003
100 %		-20	1880 000 014	5.8	0.000 000	0.003
100 %		-10	1880 000 007	-1.5	0.000 000	-0.001
100 %		0	1879 999 998	-10.0	-0.000 001	-0.005
100 %		+10	1880 000 014	5.3	0.000 000	0.003
100 %		+30	1880 000 012	3.6	0.000 000	0.002
100 %		+40	1880 000 012	4.1	0.000 000	0.002
100 %		+50	1880 000 003	-5.0	0.000 000	-0.003
Batt. Endpoint	3.400	+20	1880 000 020	11.3	0.000 001	0.006



▣ MODE: LTE B2

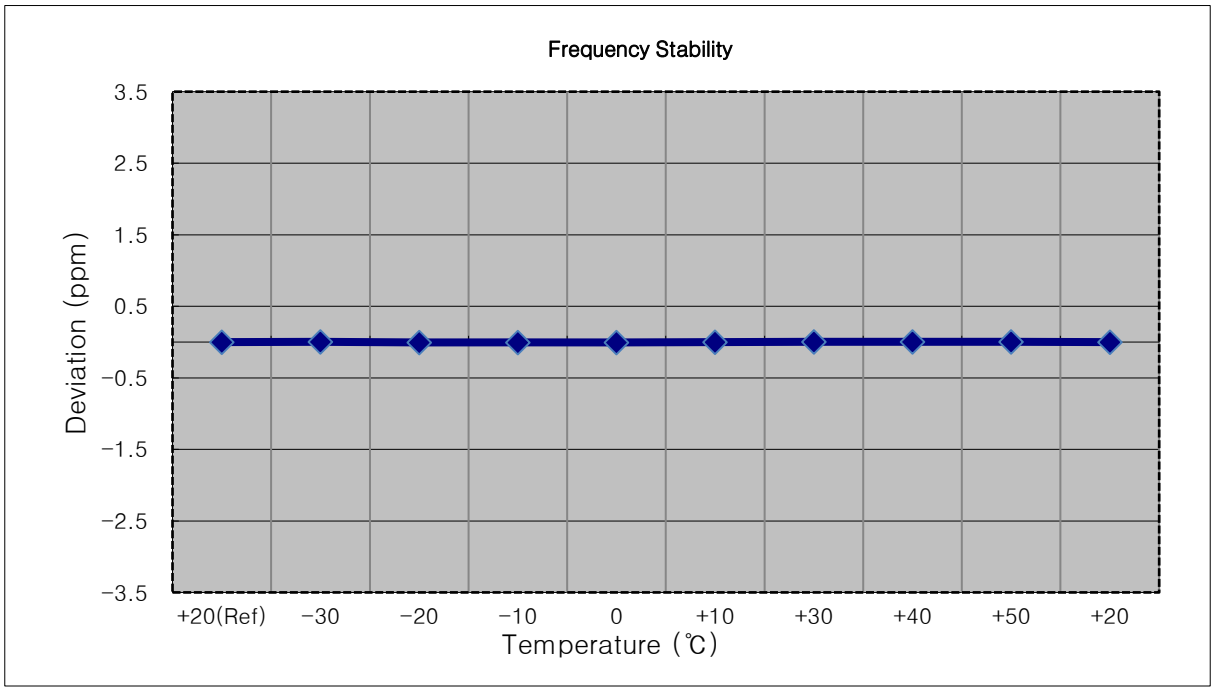
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 18900 (20 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1879 999 989	0.0	0.000 000	0.000
100 %		-30	1879 999 996	6.2	0.000 000	0.003
100 %		-20	1879 999 981	-8.0	0.000 000	-0.004
100 %		-10	1879 999 981	-8.6	0.000 000	-0.005
100 %		0	1879 999 983	-6.0	0.000 000	-0.003
100 %		+10	1879 999 986	-3.9	0.000 000	-0.002
100 %		+30	1879 999 994	4.6	0.000 000	0.002
100 %		+40	1879 999 993	3.8	0.000 000	0.002
100 %		+50	1879 999 994	4.5	0.000 000	0.002
Batt. Endpoint	3.400	+20	1879 999 986	-3.4	0.000 000	-0.002



▣ MODE: LTE B2

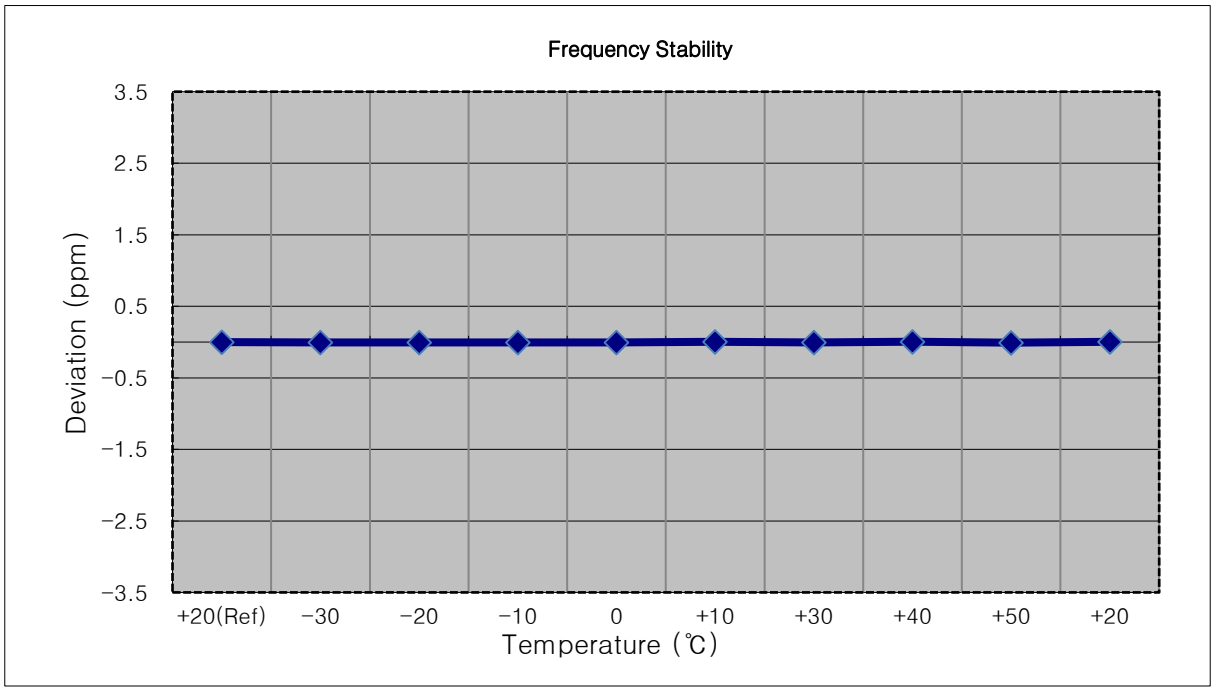
▣ OPERATING FREQUENCY: 1909,300,000 Hz

▣ CHANNEL: 19193 (1.4 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1909 300 011	0.0	0.000 000	0.000
100 %		-30	1909 300 002	-9.3	0.000 000	-0.005
100 %		-20	1909 300 003	-8.3	0.000 000	-0.004
100 %		-10	1909 299 997	-13.9	-0.000 001	-0.007
100 %		0	1909 300 004	-7.1	0.000 000	-0.004
100 %		+10	1909 300 019	7.4	0.000 000	0.004
100 %		+30	1909 300 001	-10.3	-0.000 001	-0.005
100 %		+40	1909 300 020	9.1	0.000 000	0.005
100 %		+50	1909 299 995	-16.1	-0.000 001	-0.008
Batt. Endpoint	3.400	+20	1909 300 016	5.2	0.000 000	0.003



▣ MODE: LTE B2

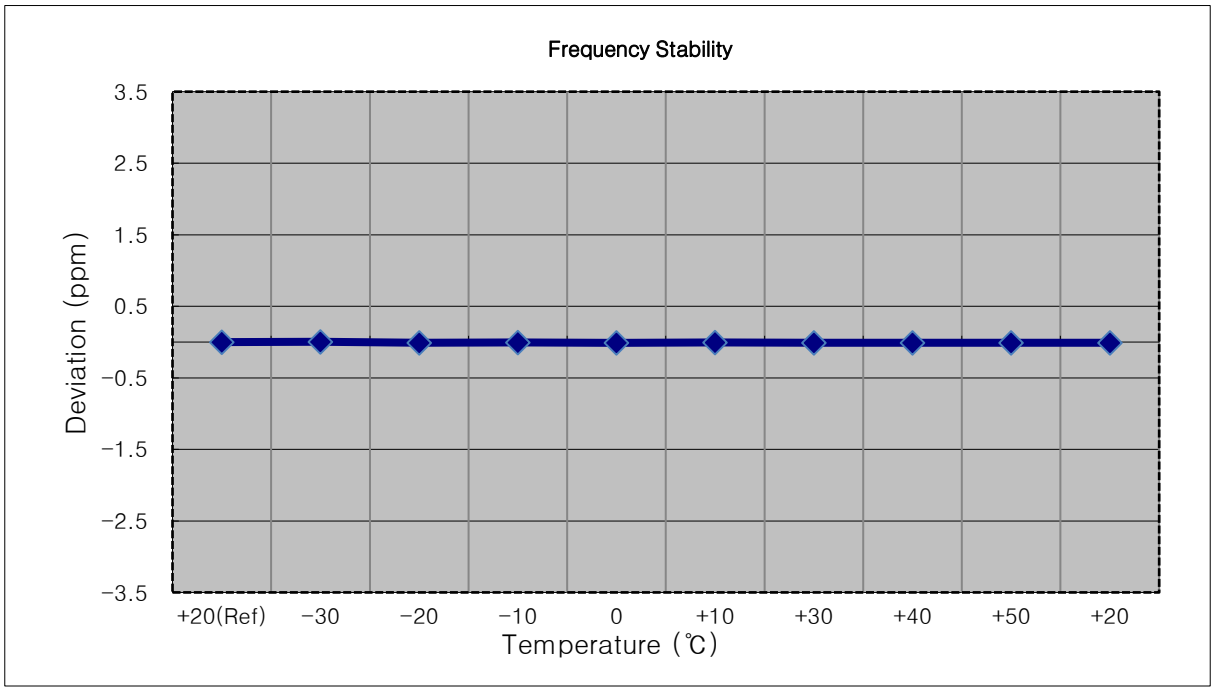
▣ OPERATING FREQUENCY: 1908,500,000 Hz

▣ CHANNEL: 19185 (3 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1908 499 981	0.0	0.000 000	0.000
100 %		-30	1908 499 988	7.8	0.000 000	0.004
100 %		-20	1908 499 960	-20.8	-0.000 001	-0.011
100 %		-10	1908 499 972	-8.1	0.000 000	-0.004
100 %		0	1908 499 959	-21.1	-0.000 001	-0.011
100 %		+10	1908 499 974	-6.9	0.000 000	-0.004
100 %		+30	1908 499 965	-15.3	-0.000 001	-0.008
100 %		+40	1908 499 963	-17.7	-0.000 001	-0.009
100 %		+50	1908 499 964	-16.2	-0.000 001	-0.008
Batt. Endpoint	3.400	+20	1908 499 965	-15.8	-0.000 001	-0.008



▣ MODE: LTE B2

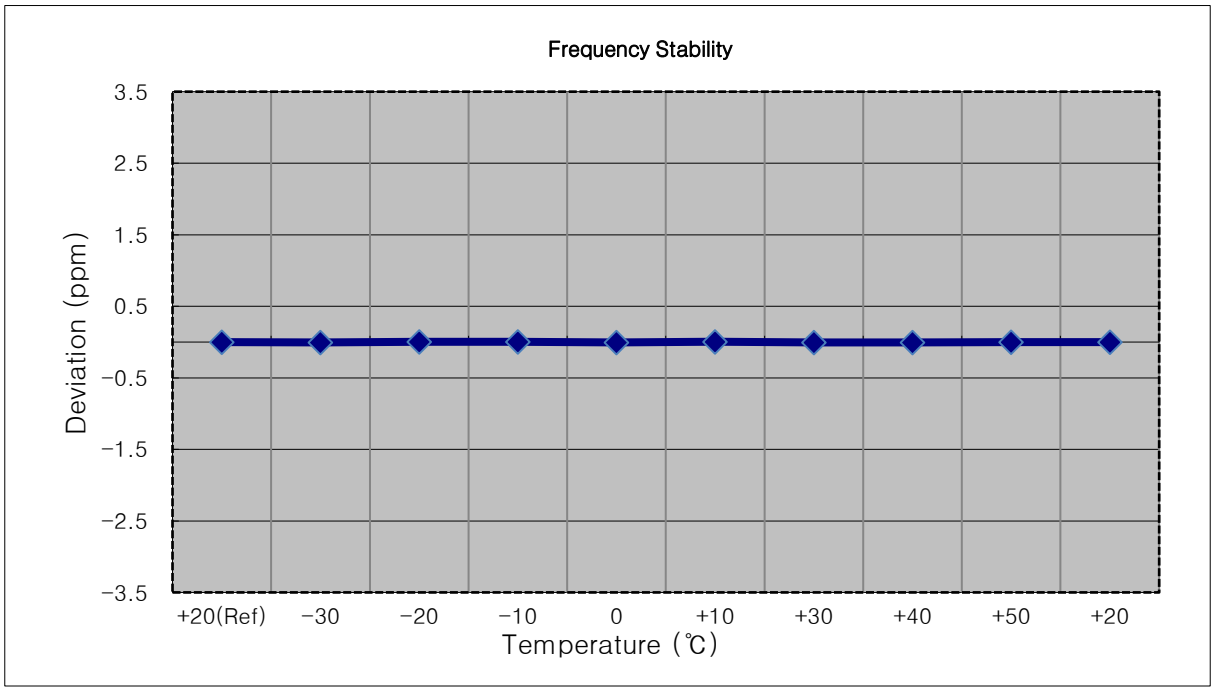
▣ OPERATING FREQUENCY: 1907,500,000 Hz

▣ CHANNEL: 19175 (5 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1907 500 003	0.0	0.000 000	0.000
100 %		-30	1907 499 994	-9.4	0.000 000	-0.005
100 %		-20	1907 500 012	8.5	0.000 000	0.004
100 %		-10	1907 500 012	8.9	0.000 000	0.005
100 %		0	1907 499 995	-8.5	0.000 000	-0.004
100 %		+10	1907 500 013	9.3	0.000 000	0.005
100 %		+30	1907 499 993	-10.1	-0.000 001	-0.005
100 %		+40	1907 499 997	-6.3	0.000 000	-0.003
100 %		+50	1907 500 000	-3.3	0.000 000	-0.002
Batt. Endpoint	3.400	+20	1907 500 005	1.8	0.000 000	0.001



▣ MODE: LTE B2

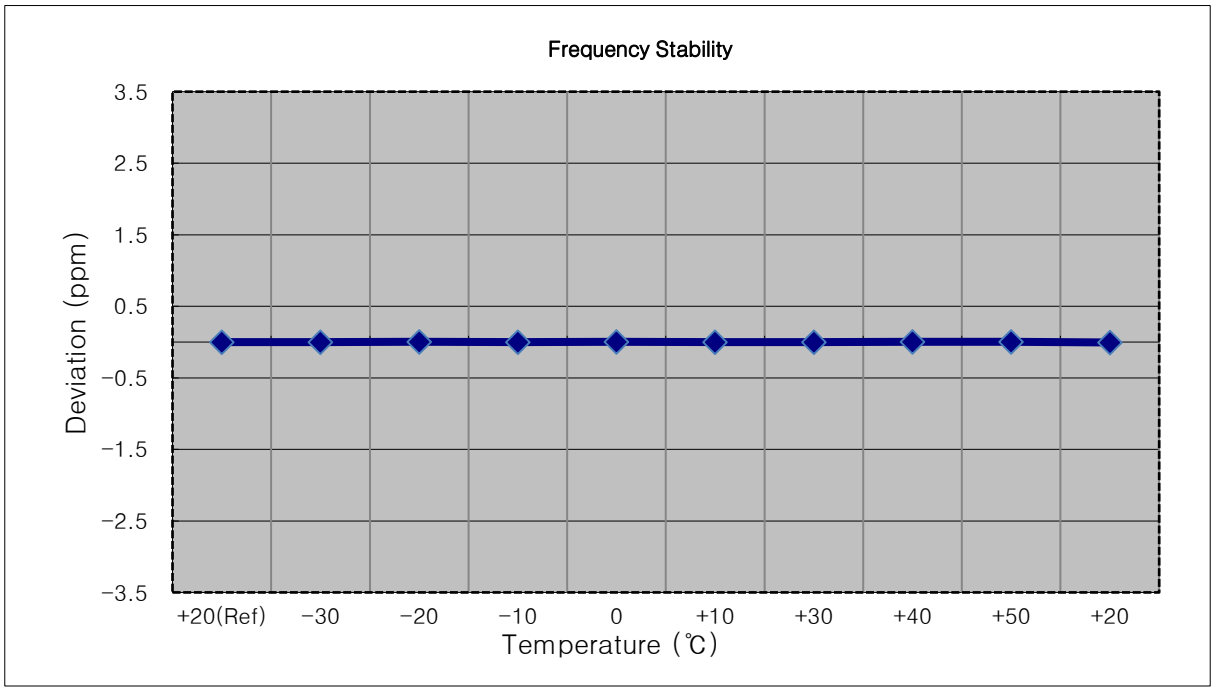
▣ OPERATING FREQUENCY: 1905,000,000 Hz

▣ CHANNEL: 19150 (10 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1905 000 011	0.0	0.000 000	0.000
100 %		-30	1905 000 007	-4.9	0.000 000	-0.003
100 %		-20	1905 000 019	7.9	0.000 000	0.004
100 %		-10	1905 000 007	-4.5	0.000 000	-0.002
100 %		0	1905 000 014	2.8	0.000 000	0.001
100 %		+10	1905 000 009	-2.0	0.000 000	-0.001
100 %		+30	1905 000 008	-3.3	0.000 000	-0.002
100 %		+40	1905 000 015	3.4	0.000 000	0.002
100 %		+50	1905 000 018	6.4	0.000 000	0.003
Batt. Endpoint	3.400	+20	1905 000 001	-10.4	-0.000 001	-0.005



▣ MODE: LTE B2

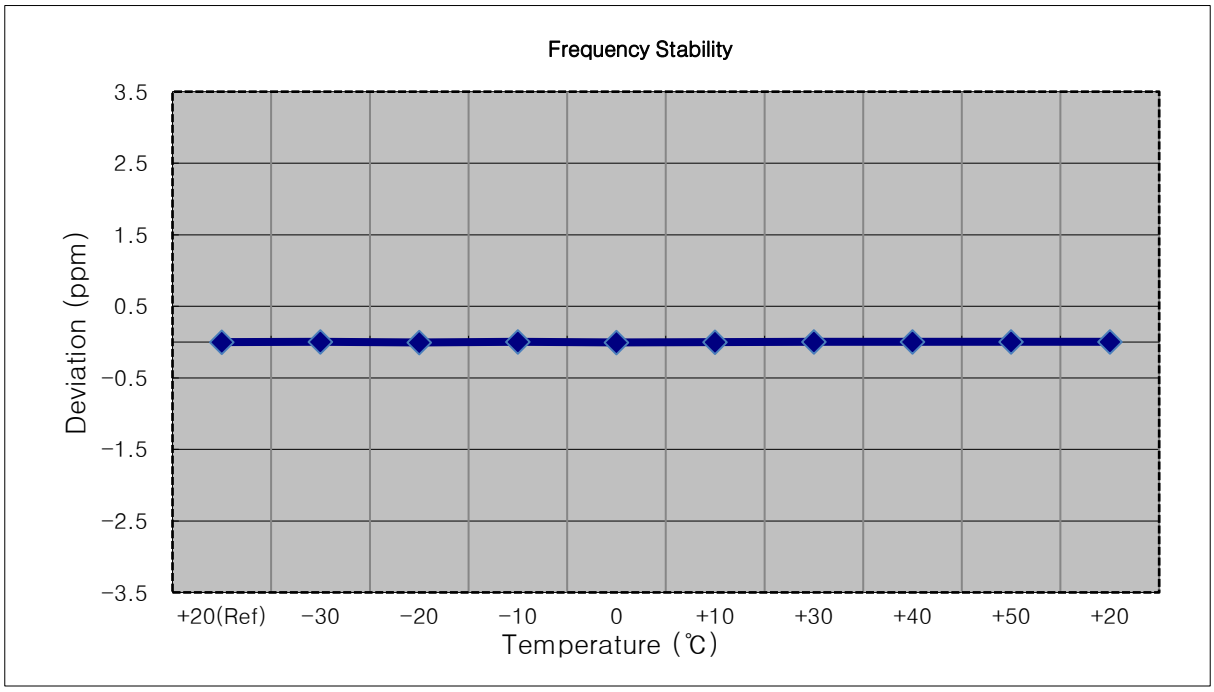
▣ OPERATING FREQUENCY: 1902,500,000 Hz

▣ CHANNEL: 19125 (15 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1902 500 008	0.0	0.000 000	0.000
100 %		-30	1902 500 012	4.7	0.000 000	0.002
100 %		-20	1902 499 997	-10.4	-0.000 001	-0.005
100 %		-10	1902 500 014	5.9	0.000 000	0.003
100 %		0	1902 499 999	-9.0	0.000 000	-0.005
100 %		+10	1902 500 003	-5.1	0.000 000	-0.003
100 %		+30	1902 500 013	5.5	0.000 000	0.003
100 %		+40	1902 500 014	6.1	0.000 000	0.003
100 %		+50	1902 500 016	8.0	0.000 000	0.004
Batt. Endpoint	3.400	+20	1902 500 011	3.0	0.000 000	0.002



▣ MODE: LTE B2

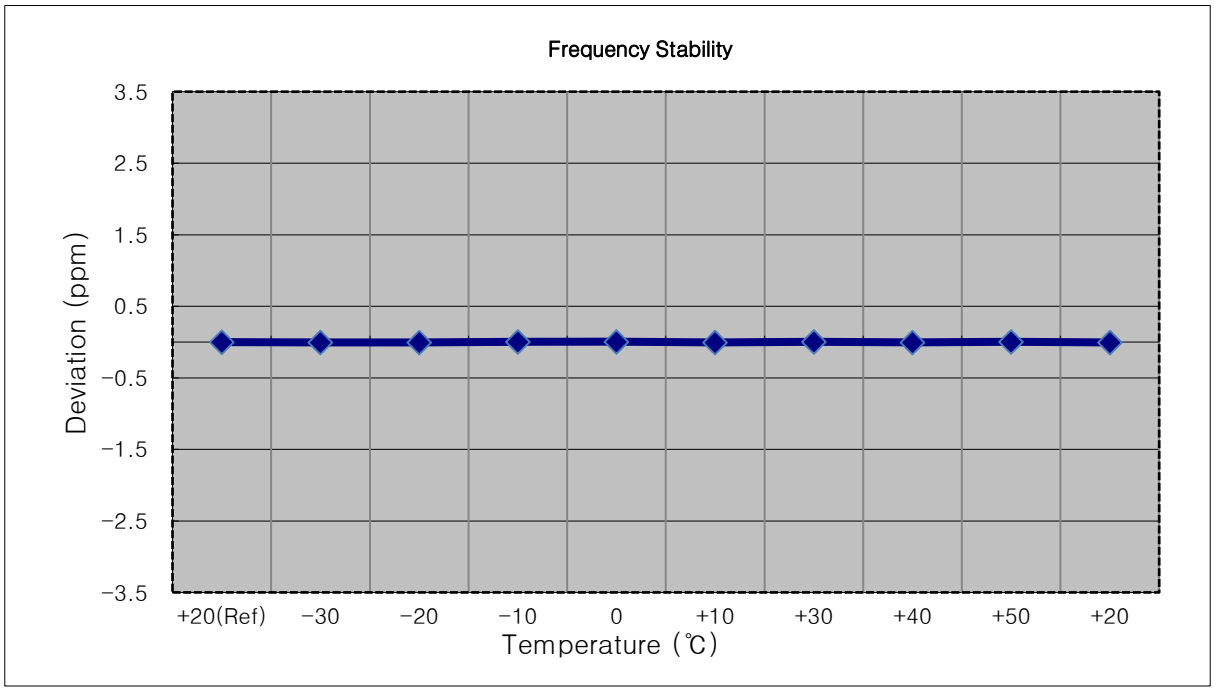
▣ OPERATING FREQUENCY: 1900,000,000 Hz

▣ CHANNEL: 19100 (20 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1900 000 004	0.0	0.000 000	0.000
100 %		-30	1899 999 998	-5.8	0.000 000	-0.003
100 %		-20	1899 999 995	-8.2	0.000 000	-0.004
100 %		-10	1900 000 012	8.8	0.000 000	0.005
100 %		0	1900 000 014	10.8	0.000 001	0.006
100 %		+10	1899 999 996	-7.4	0.000 000	-0.004
100 %		+30	1900 000 009	5.3	0.000 000	0.003
100 %		+40	1899 999 995	-8.3	0.000 000	-0.004
100 %		+50	1900 000 007	3.4	0.000 000	0.002
Batt. Endpoint	3.400	+20	1899 999 996	-7.8	0.000 000	-0.004



10. TEST DATA (Main 2 Ant , Main 3 Ant)

10.1 UPLINK CARRIER AGGREGATION

Test Note

1. All tests were evaluated for the two bands using various combinations of RB size, RB offset, modulation, and channel bandwidth.
2. All modes of operation were investigated and the worst case configuration results are reported in this section. Please refer to the table below.
3. The worst case is reported with the modulations, RB sizes and offsets.
   - 2A(Main 2 Ant)-4A(Main 3 Ant)
     (PCC - Modulation: QPSK, RB: 1, RB Offset: 0, SCC - Modulation: QPSK, RB: 1, RB Offset: 24)
   - 4A(Main 3 Ant)-2A(Main 2 Ant)
     (PCC - Modulation: QPSK, RB: 1, RB Offset: 24, SCC - Modulation: QPSK, RB: 1, RB Offset: 0)

Radiated Spurious Emissions

PCC	SCC	PCC		SCC	
		BW(MHz)	Channel	BW(MHz)	Channel
2A(Main 2 Ant)	4A(Main 3 Ant)	10	18900	5	20375
4A(Main 3 Ant)	2A(Main 2 Ant)	5	20375	10	18900

10.1.1 RADIATED SPURIOUS EMISSIONS

2A(Main 2 Ant)(PCC)-4A(Main 3 Ant)(SCC)

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit (dBm)
3 760.00	-50.56	12.22	-55.19	3.27	V	-46.24	-13.00
5 640.00	-50.91	13.12	-48.64	4.07	H	-39.59	-13.00
7 520.00	-40.68	10.82	-29.87	4.71	H	-23.76	-13.00
9 400.00	-52.79	10.40	-36.49	5.35	H	-31.44	-13.00
11 280.00	-55.05	11.29	-36.58	5.92	V	-31.21	-13.00

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit (dBm)
3 505.00	-51.25	12.34	-57.47	3.11	H	-48.24	-13.00
5 257.50	-57.41	12.99	-57.09	3.83	H	-47.93	-13.00
7 010.00	-57.36	11.26	-49.44	4.56	V	-42.74	-13.00
8 762.50	-61.03	10.83	-46.65	5.11	H	-40.93	-13.00
10 515.00	-61.22	11.23	-42.67	5.72	V	-37.16	-13.00

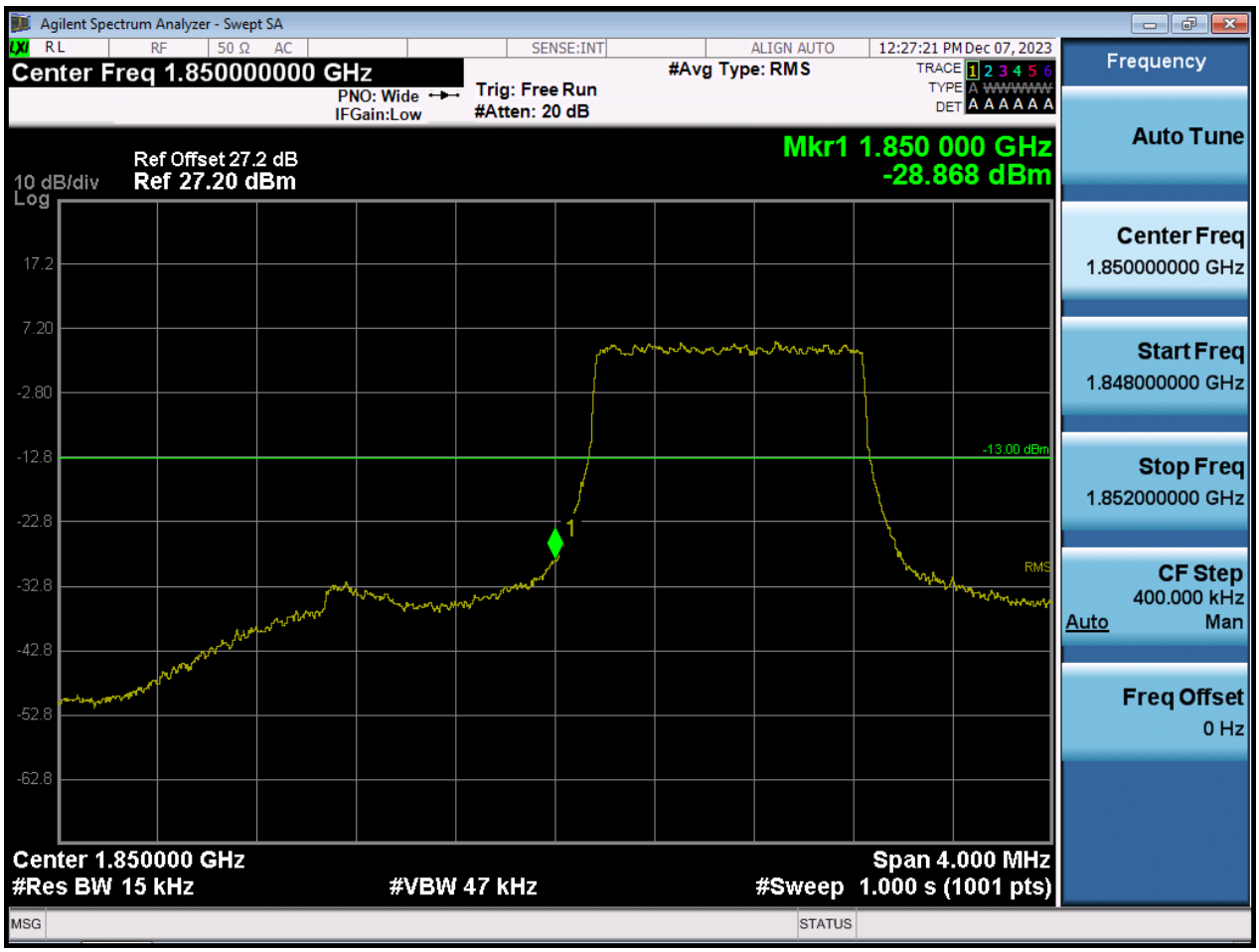
4A(Main 3 Ant)(PCC)-2A(Main 2 Ant)(SCC)

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit (dBm)
3 505.00	-50.47	12.34	-56.69	3.11	V	-47.46	-13.00
5 257.50	-56.22	12.99	-55.90	3.83	V	-46.74	-13.00
7 010.00	-57.45	11.26	-49.53	4.56	V	-42.83	-13.00
8 762.50	-58.98	10.83	-44.60	5.11	H	-38.88	-13.00
10 515.00	-59.30	11.23	-40.75	5.72	V	-35.24	-13.00

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit (dBm)
3 760.00	-50.47	12.22	-55.10	3.27	V	-46.15	-13.00
5 640.00	-51.97	13.12	-49.70	4.07	H	-40.65	-13.00
7 520.00	-38.86	10.82	-28.05	4.71	H	-21.94	-13.00
9 400.00	-52.53	10.40	-36.23	5.35	V	-31.18	-13.00
11 280.00	-53.71	11.29	-35.24	5.92	H	-29.87	-13.00

11. TEST PLOTS(Main 2 Ant)

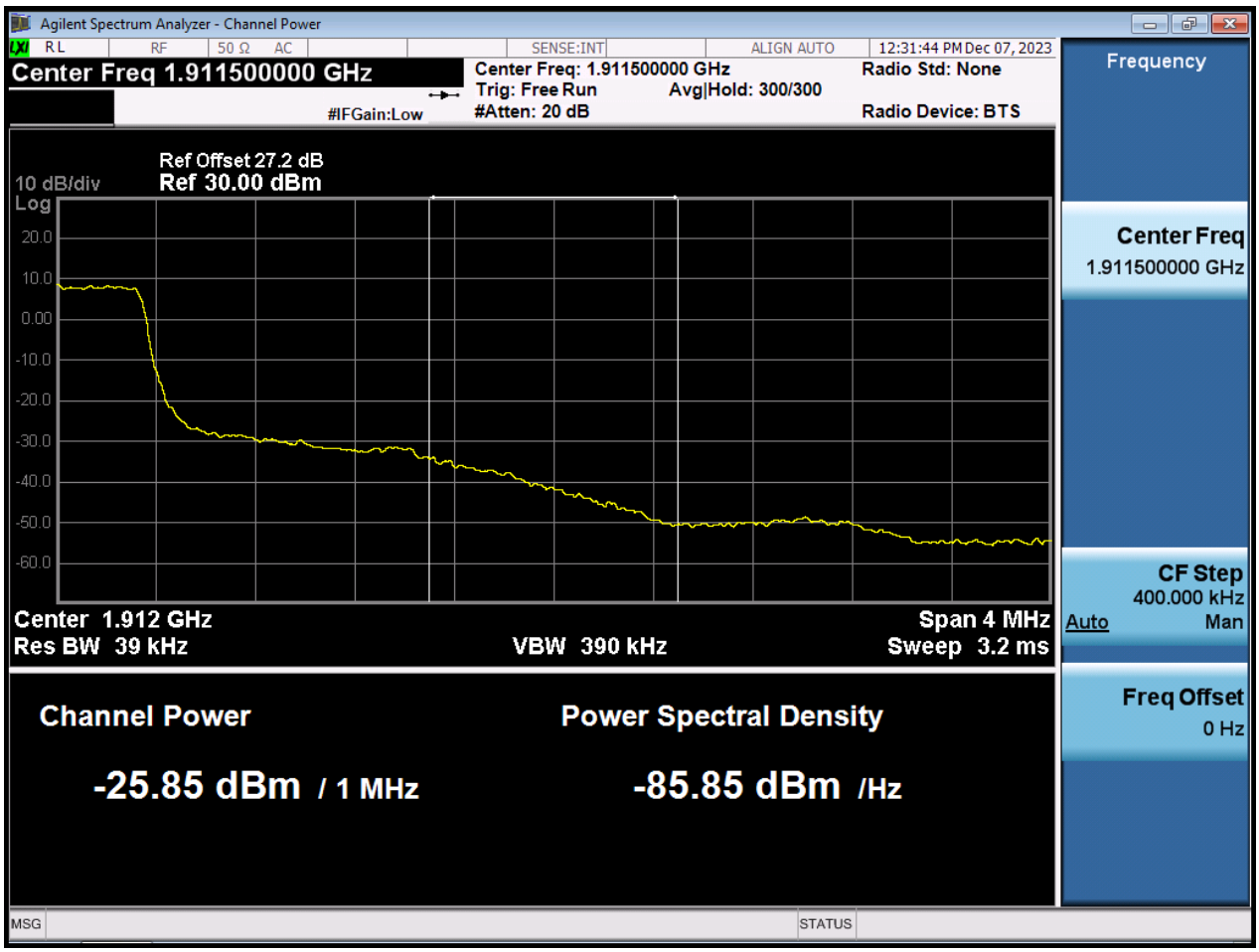
BW1.4 M_BandEdge_Lowest Channel_QPSK_FullRB(1)



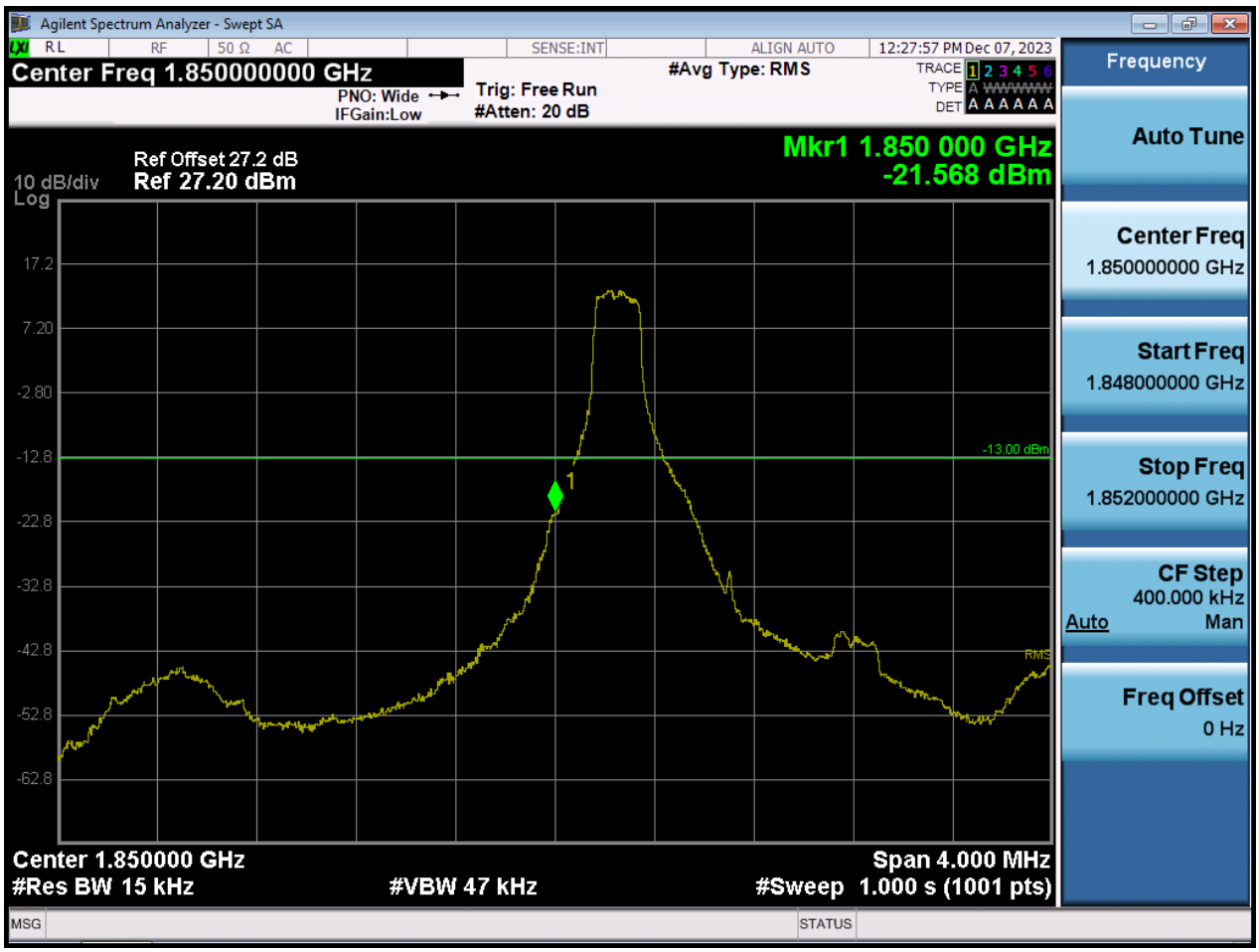
BW1.4 M_BandEdge_Lowest Channel_QPSK_FullRB(2)

BW1.4 M_BandEdge_Highest Channel_QPSK_FullRB(1)

BW1.4 M_BandEdge_Highest Channel_QPSK_FullRB(2)



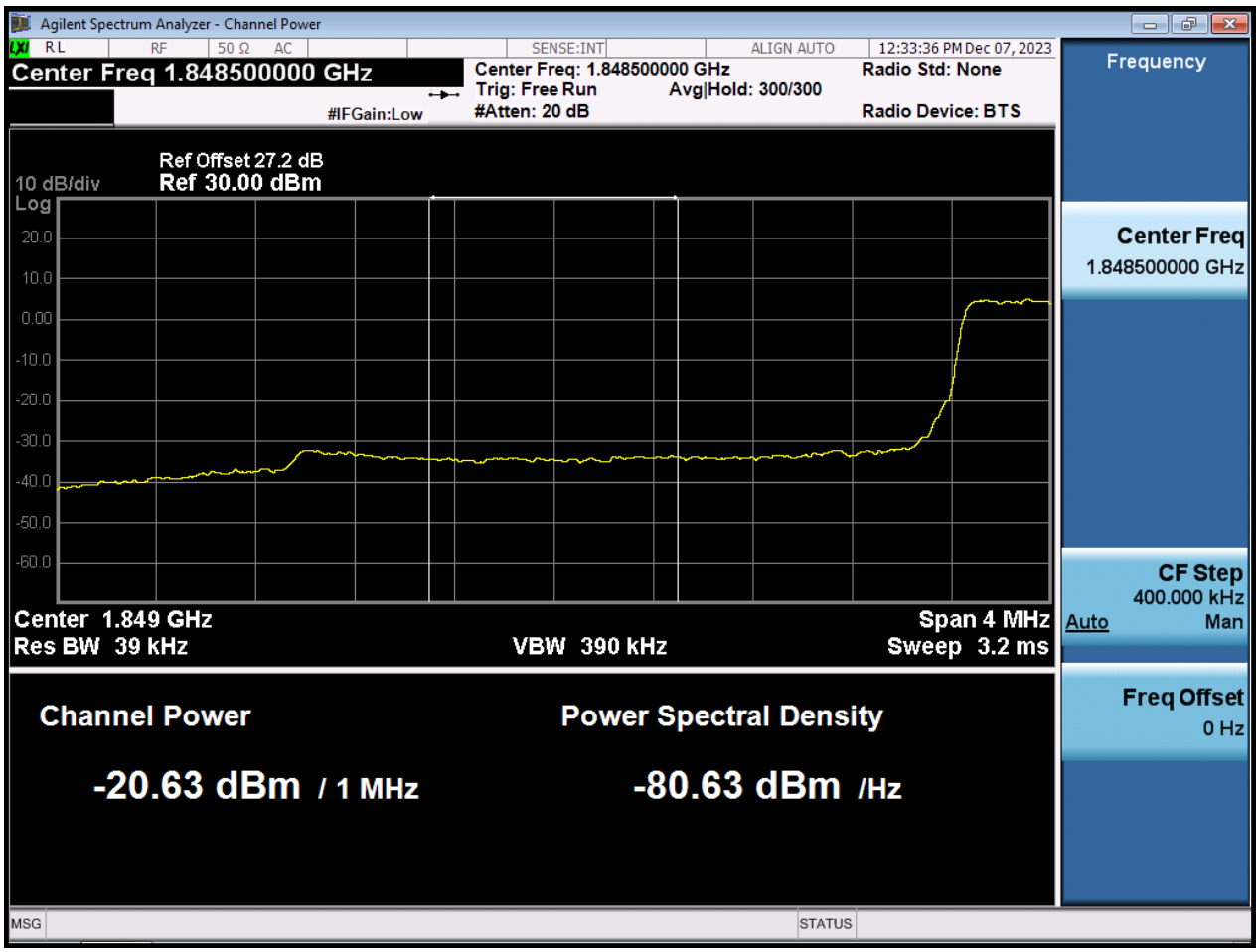
BW1.4 M_BandEdge_Lowest Channel_QPSK_1RB



BW1.4 M_BandEdge_Highest Channel_QPSK_1RB

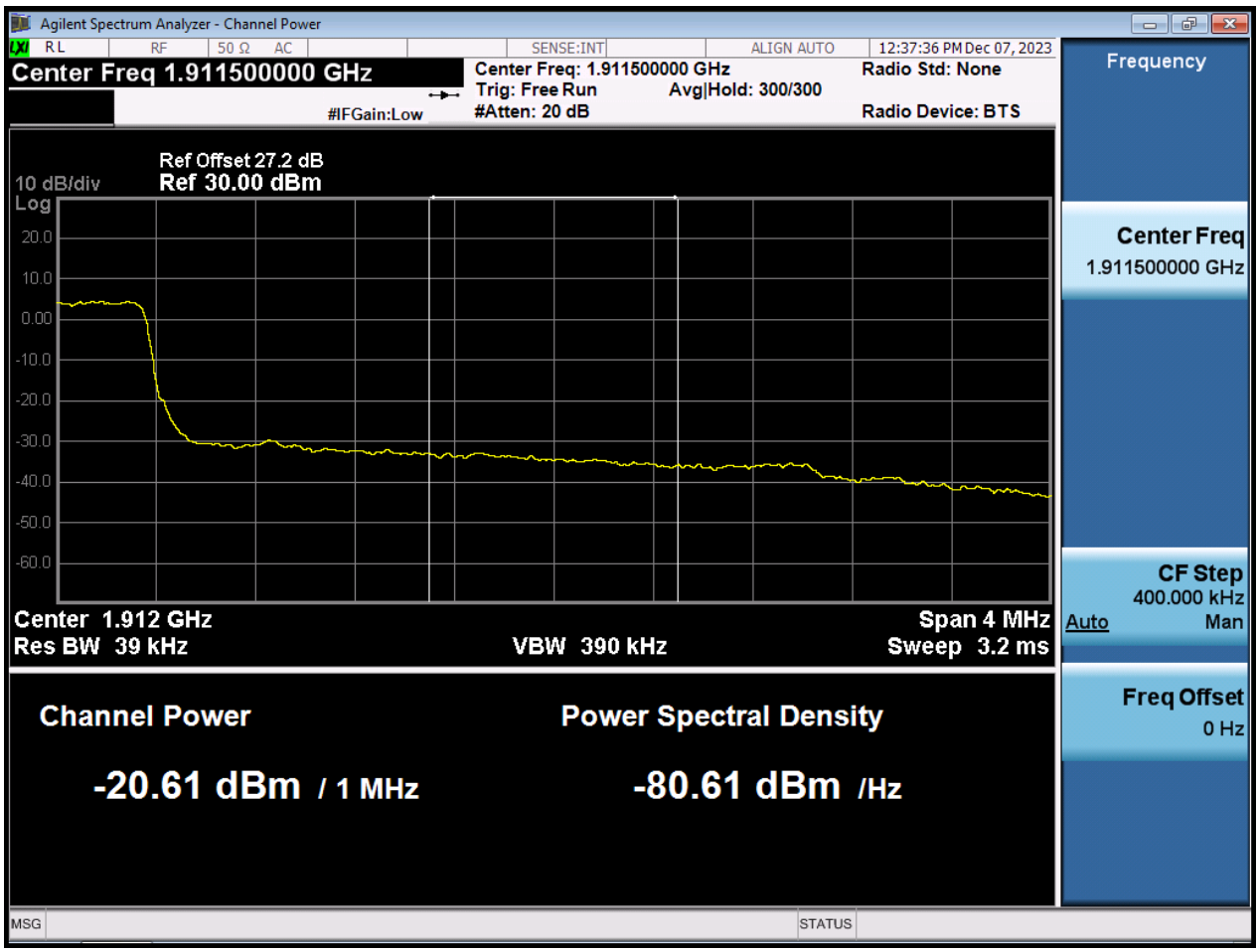
BW3 M_BandEdge_Lowest Channel_QPSK_FullRB(1)

BW3 M_BandEdge_Lowest Channel_QPSK_FullRB(2)

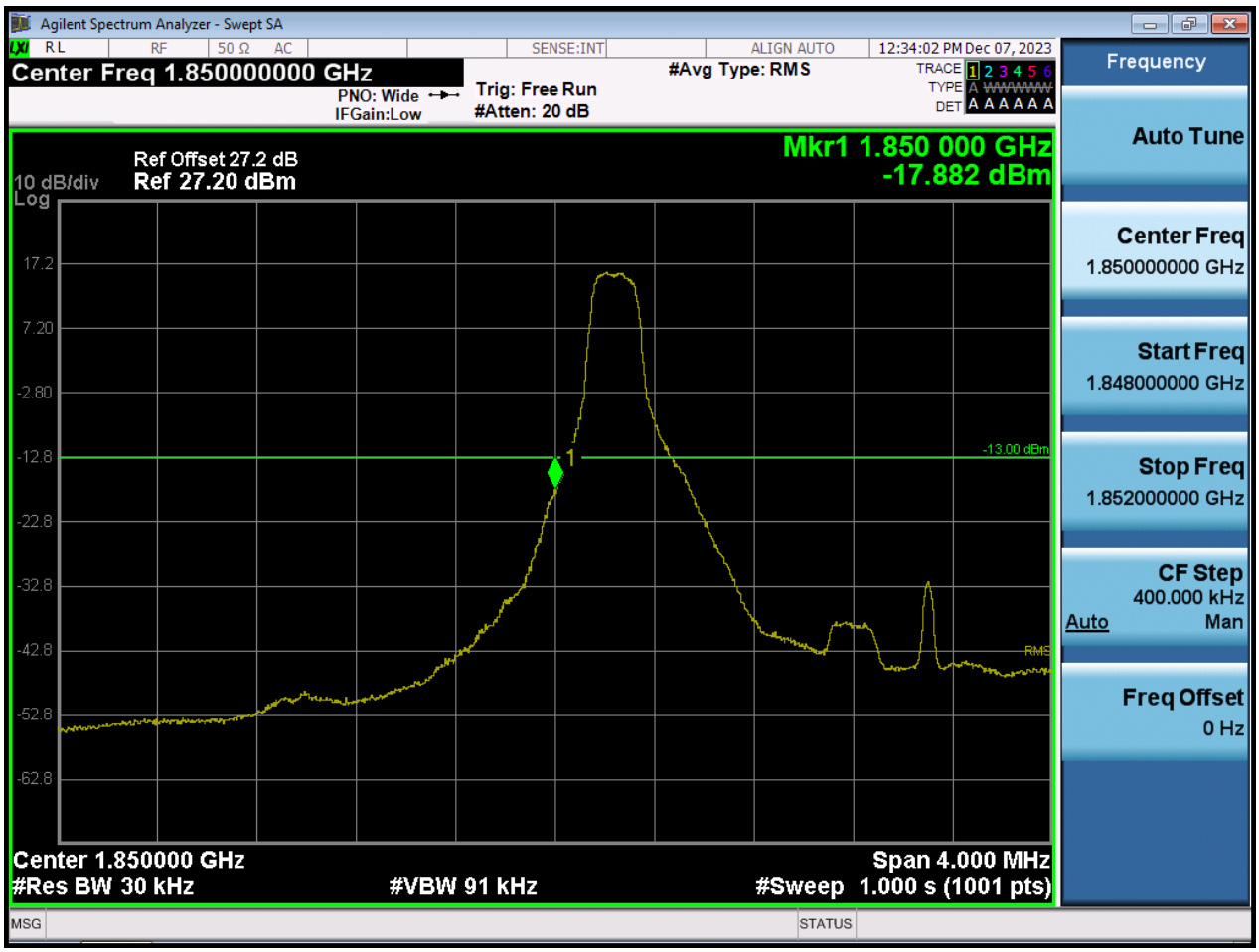


BW3 M_BandEdge_Highest Channel_QPSK_FullRB(1)

BW3 M_BandEdge_Highest Channel_QPSK_FullRB(2)



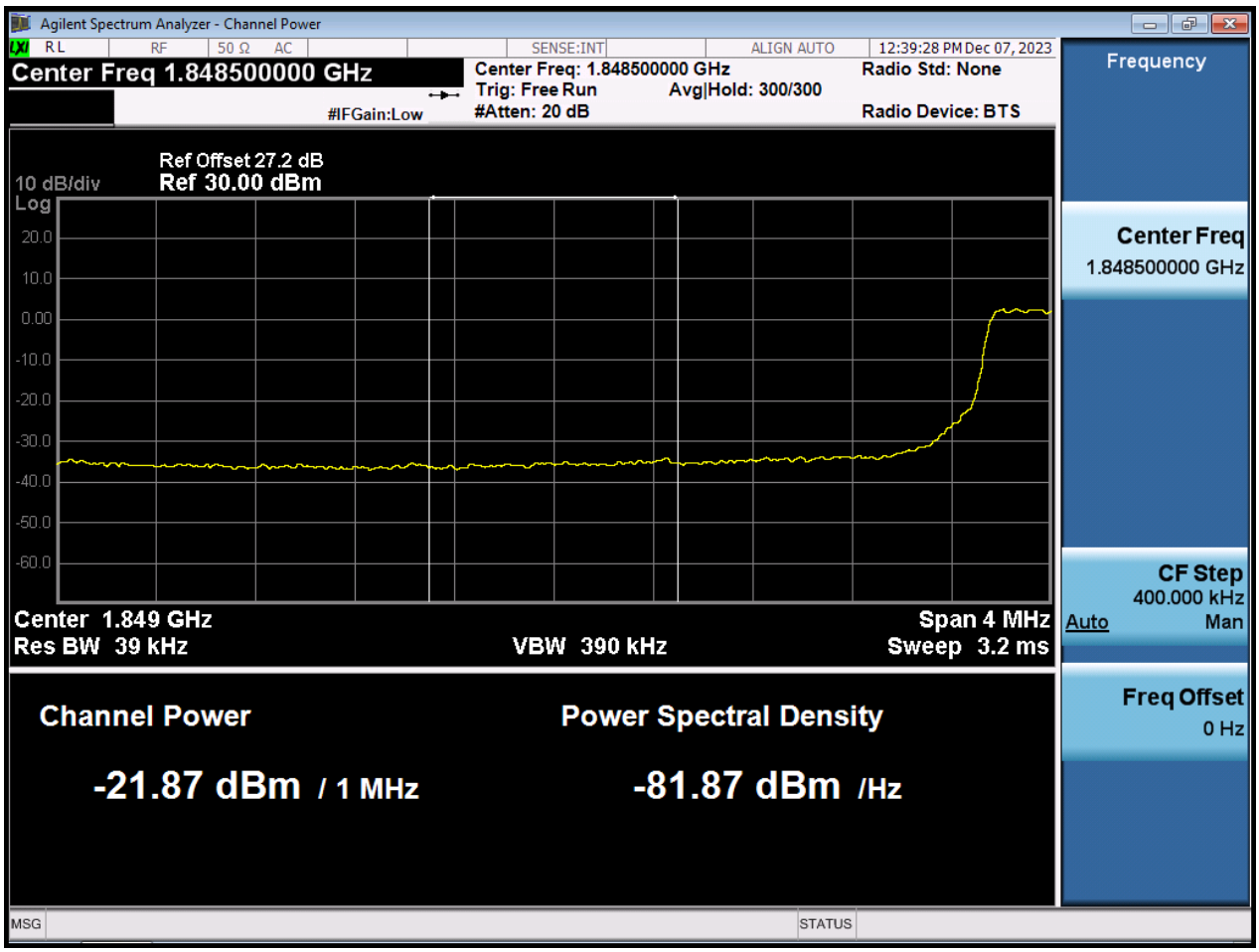
BW3 M_BandEdge_Lowest Channel_QPSK_1RB



BW3 M_BandEdge_Highest Channel_QPSK_1RB

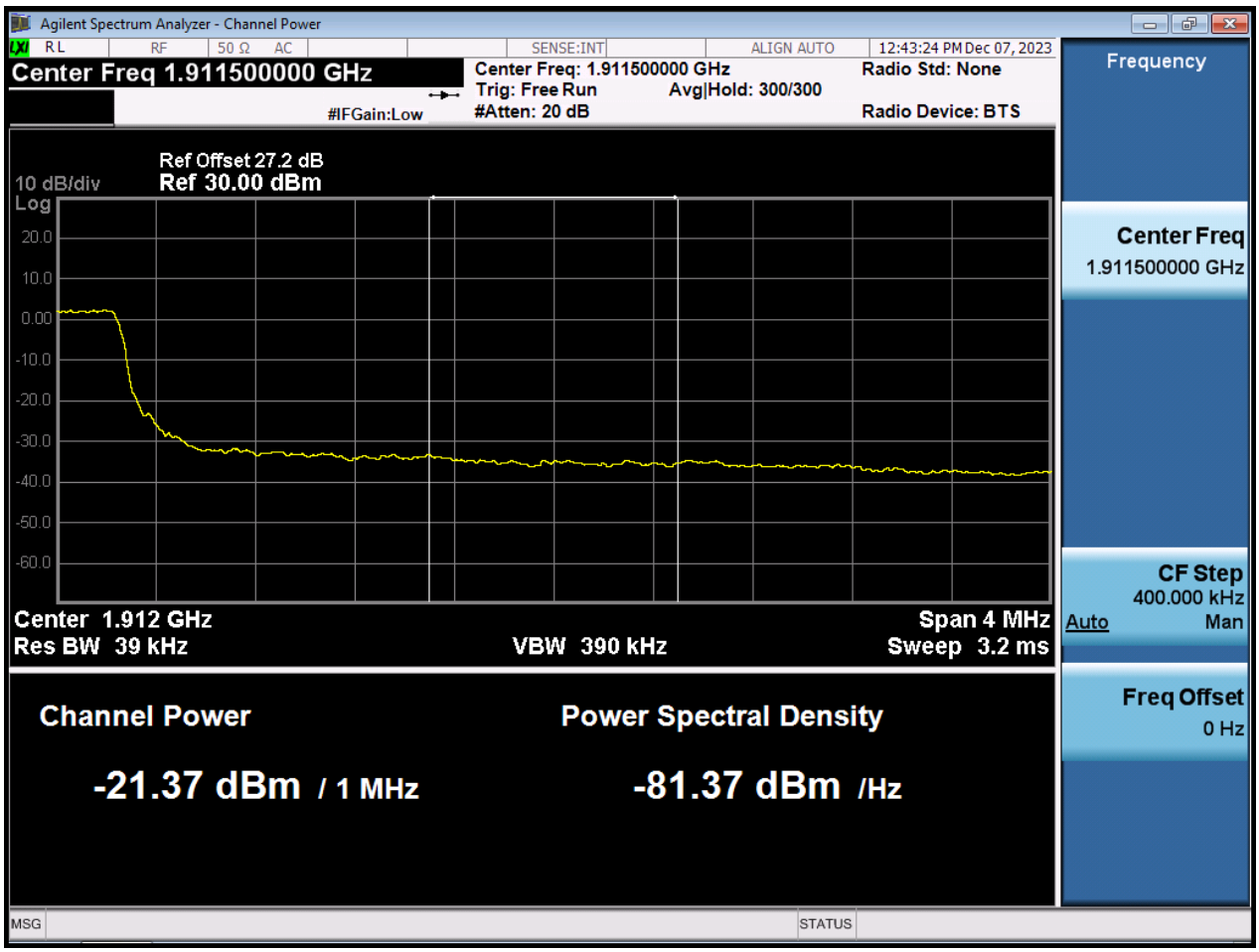
BW5 M_BandEdge_Lowest Channel_QPSK_FullRB(1)

BW5 M_BandEdge_Lowest Channel_QPSK_FullRB(2)



BW5 M_BandEdge_Highest Channel_QPSK_FullRB(1)

BW5 M_BandEdge_Highest Channel_QPSK_FullRB(2)

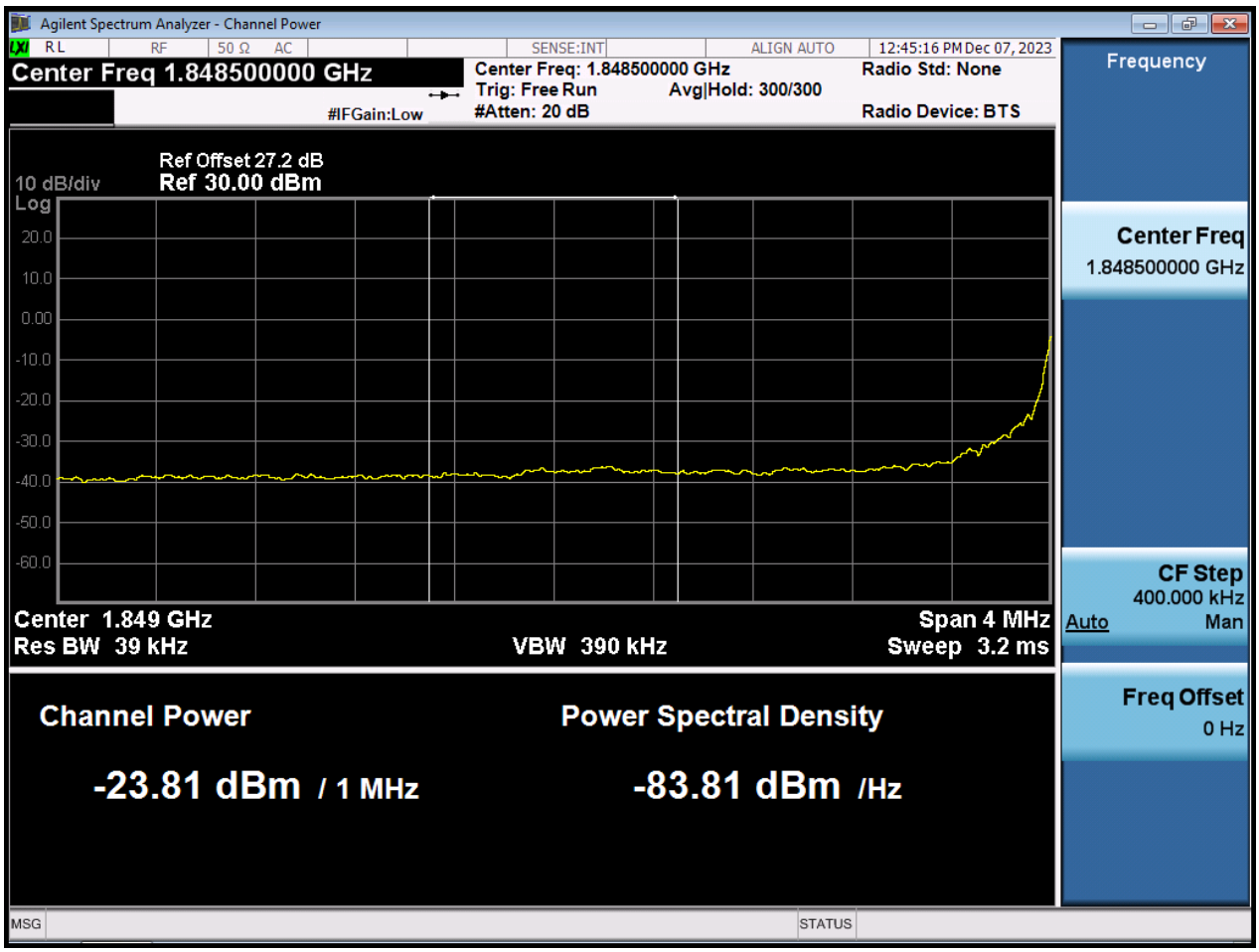


BW5 M_BandEdge_Lowest Channel_QPSK_1RB

BW5 M_BandEdge_Highest Channel_QPSK_1RB

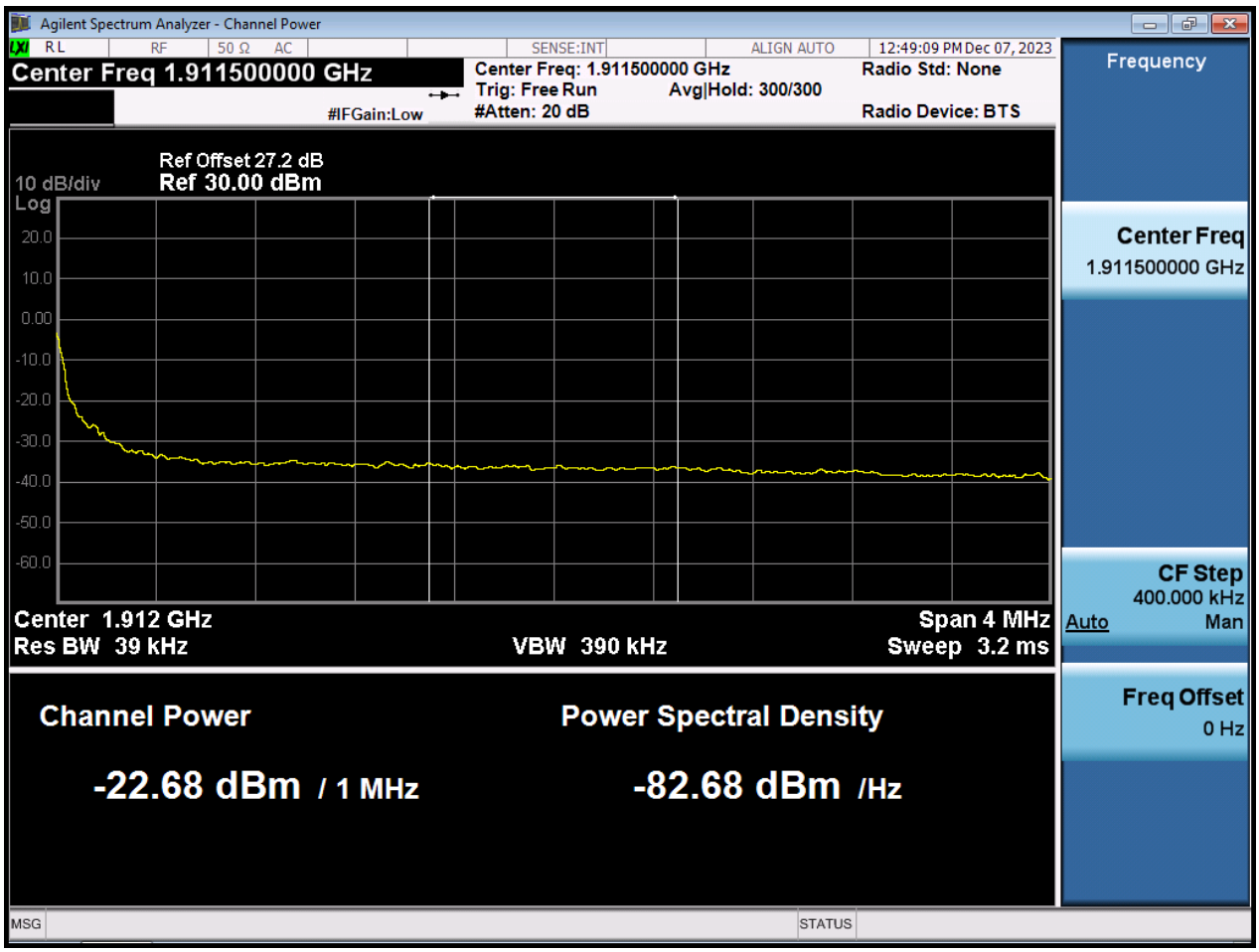
BW10 M_BandEdge_Lowest Channel_QPSK_FullRB(1)

BW10 M_BandEdge_Lowest Channel_QPSK_FullRB(2)



BW10 M_BandEdge_Highest Channel_QPSK_FullRB(1)

BW10 M_BandEdge_Highest Channel_QPSK_FullRB(2)

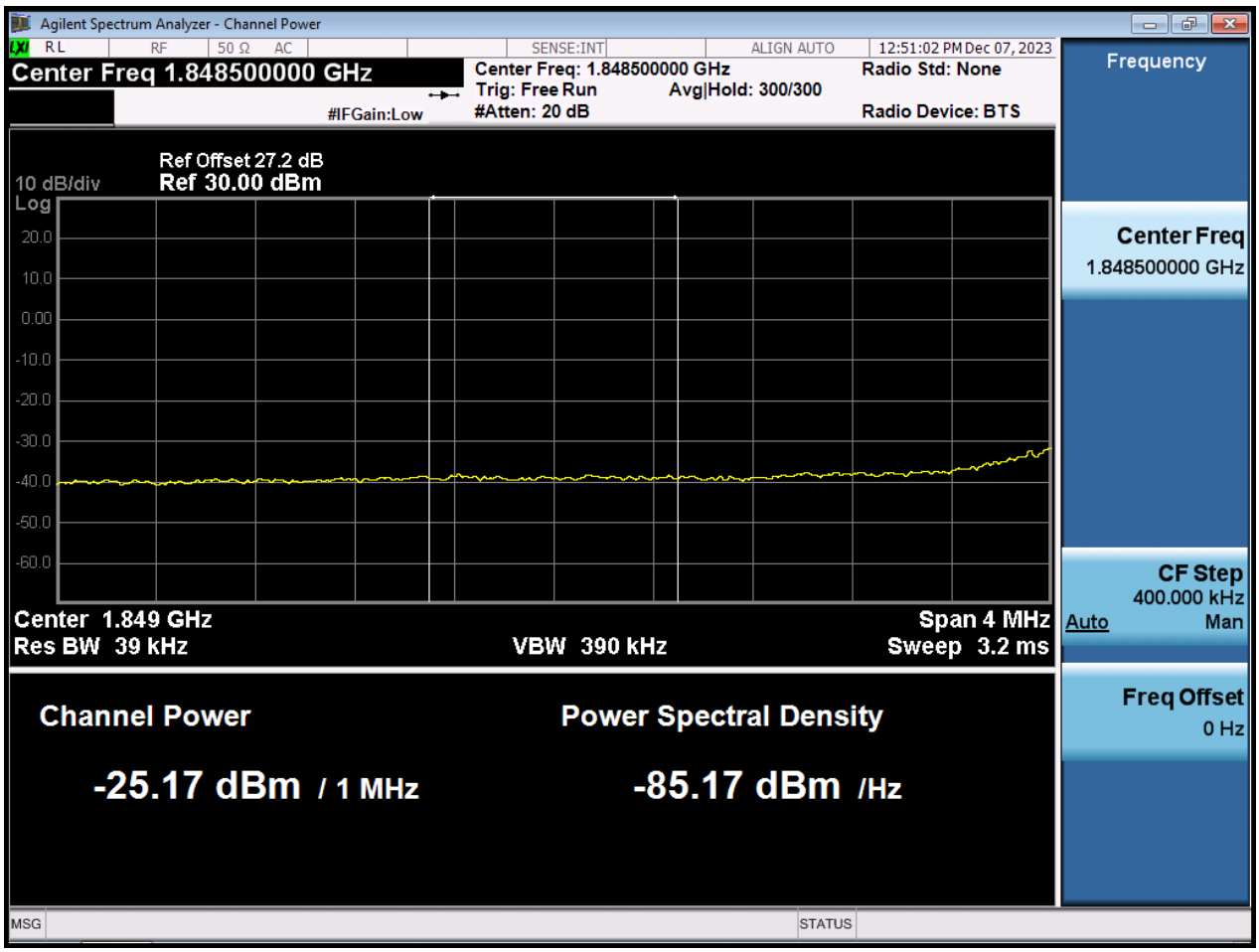


BW10 M_BandEdge_Lowest Channel_QPSK_1RB

BW10 M_BandEdge_Highest Channel_QPSK_1RB

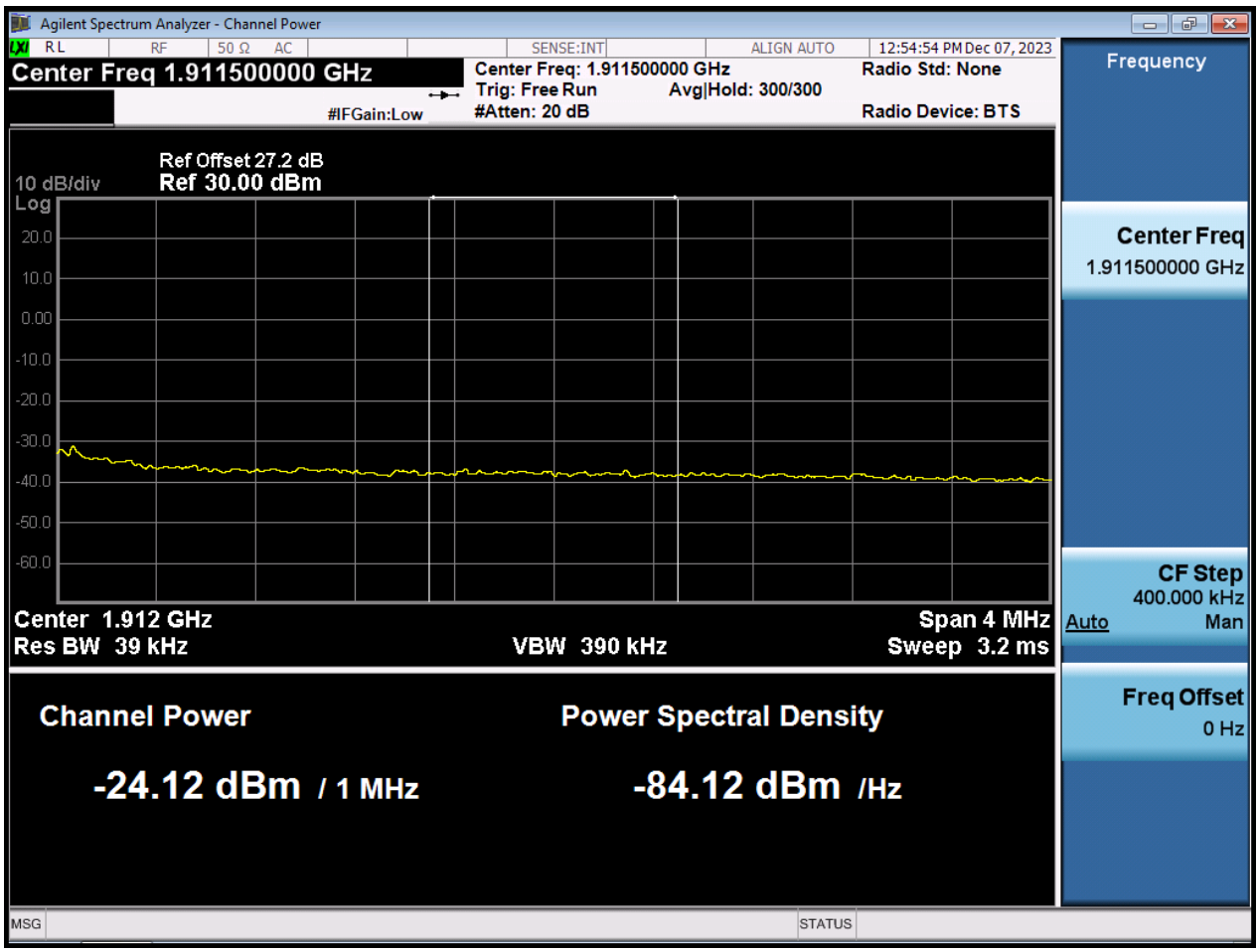
BW15 M_BandEdge_Lowest Channel_QPSK_FullRB(1)

BW15 M_BandEdge_Lowest Channel_QPSK_FullRB(2)



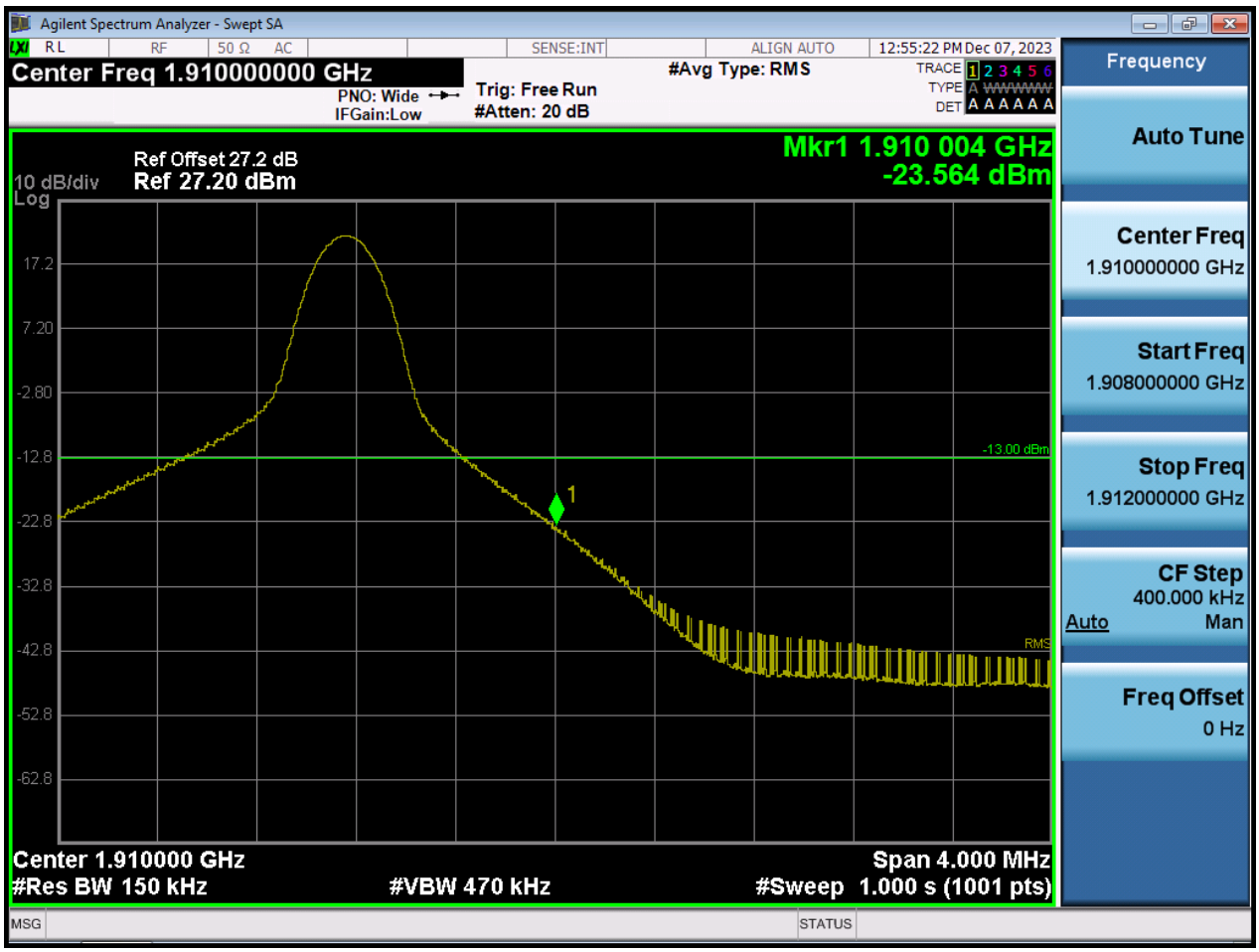
BW15 M_BandEdge_Highest Channel_QPSK_FullRB(1)

BW15 M_BandEdge_Highest Channel_QPSK_FullRB(2)



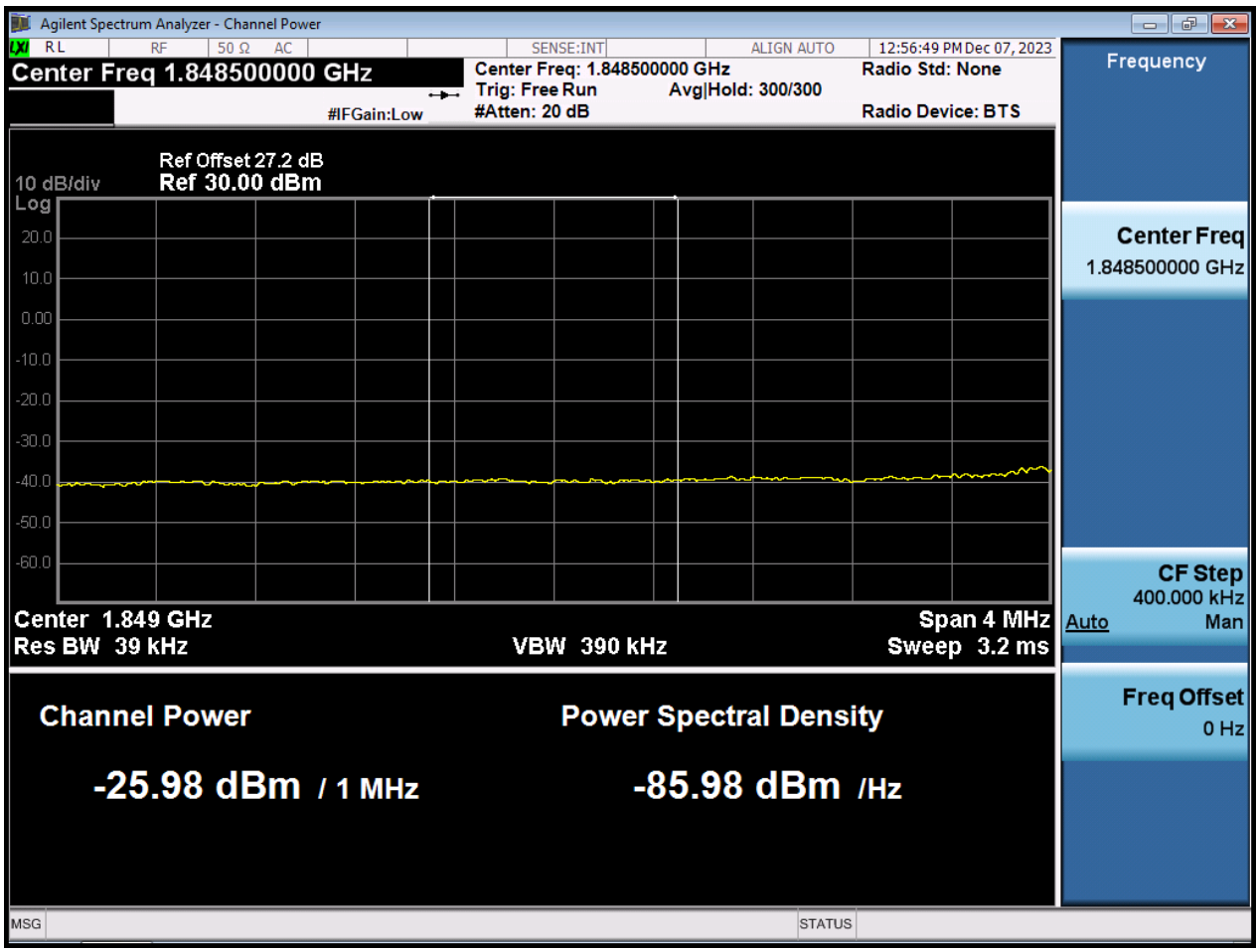
BW15 M_BandEdge_Lowest Channel_QPSK_1RB

BW15 M_BandEdge_Highest Channel_QPSK_1RB



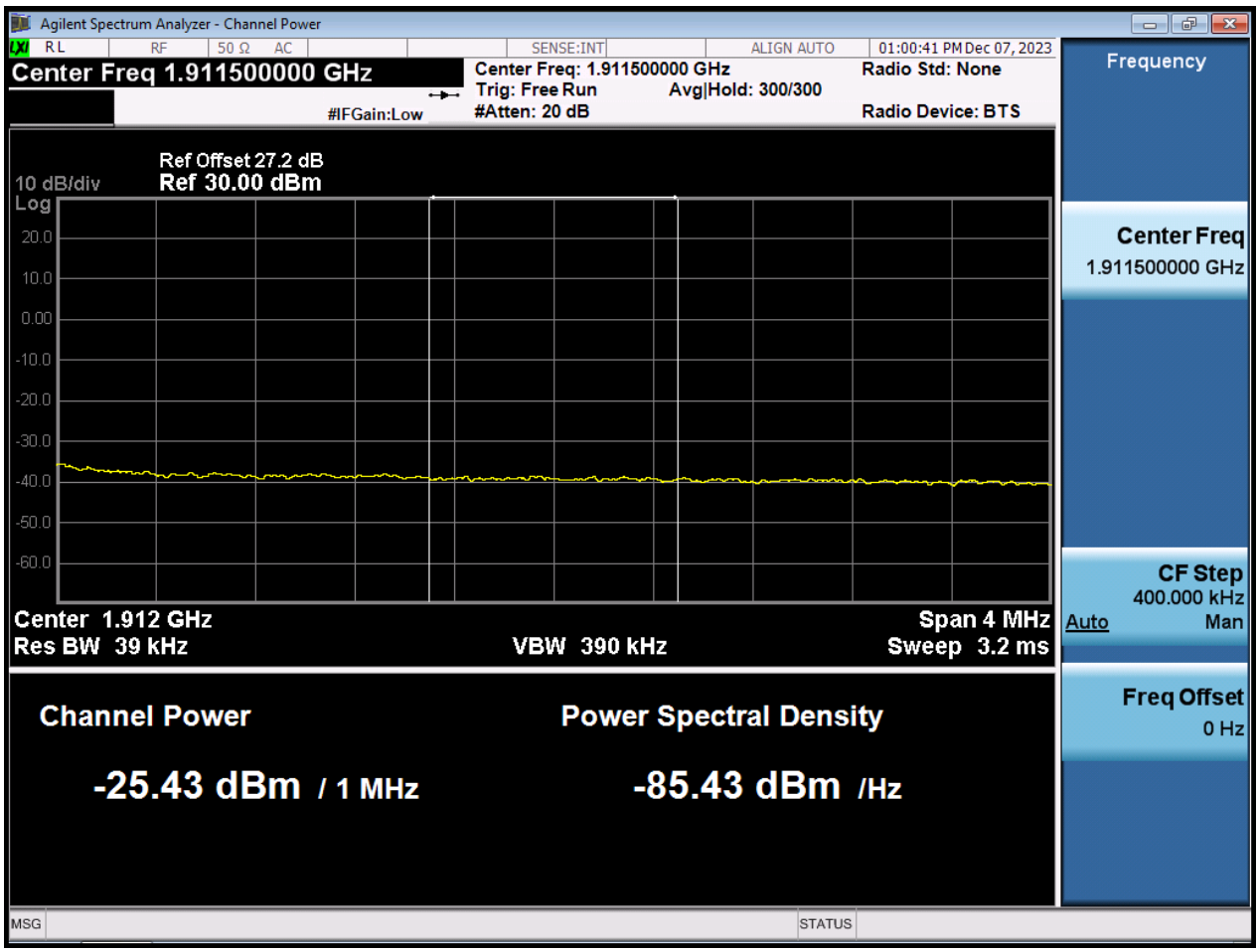
BW20 M_BandEdge_Lowest Channel_QPSK_FullRB(1)

BW20 M_BandEdge_Lowest Channel_QPSK_FullRB(2)



BW20 M_BandEdge_Highest Channel_QPSK_FullRB(1)

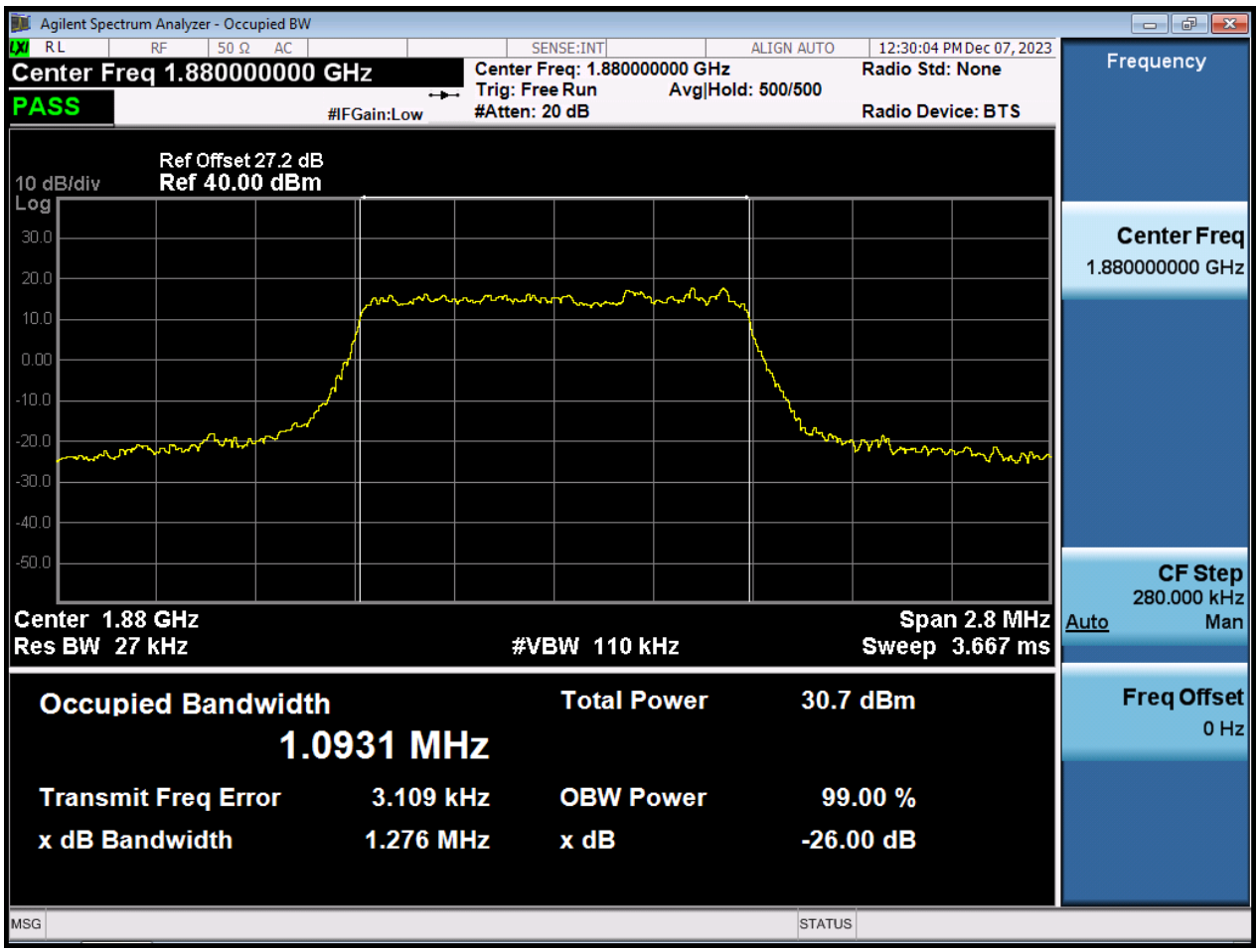
BW20 M_BandEdge_Highest Channel_QPSK_FullRB(2)



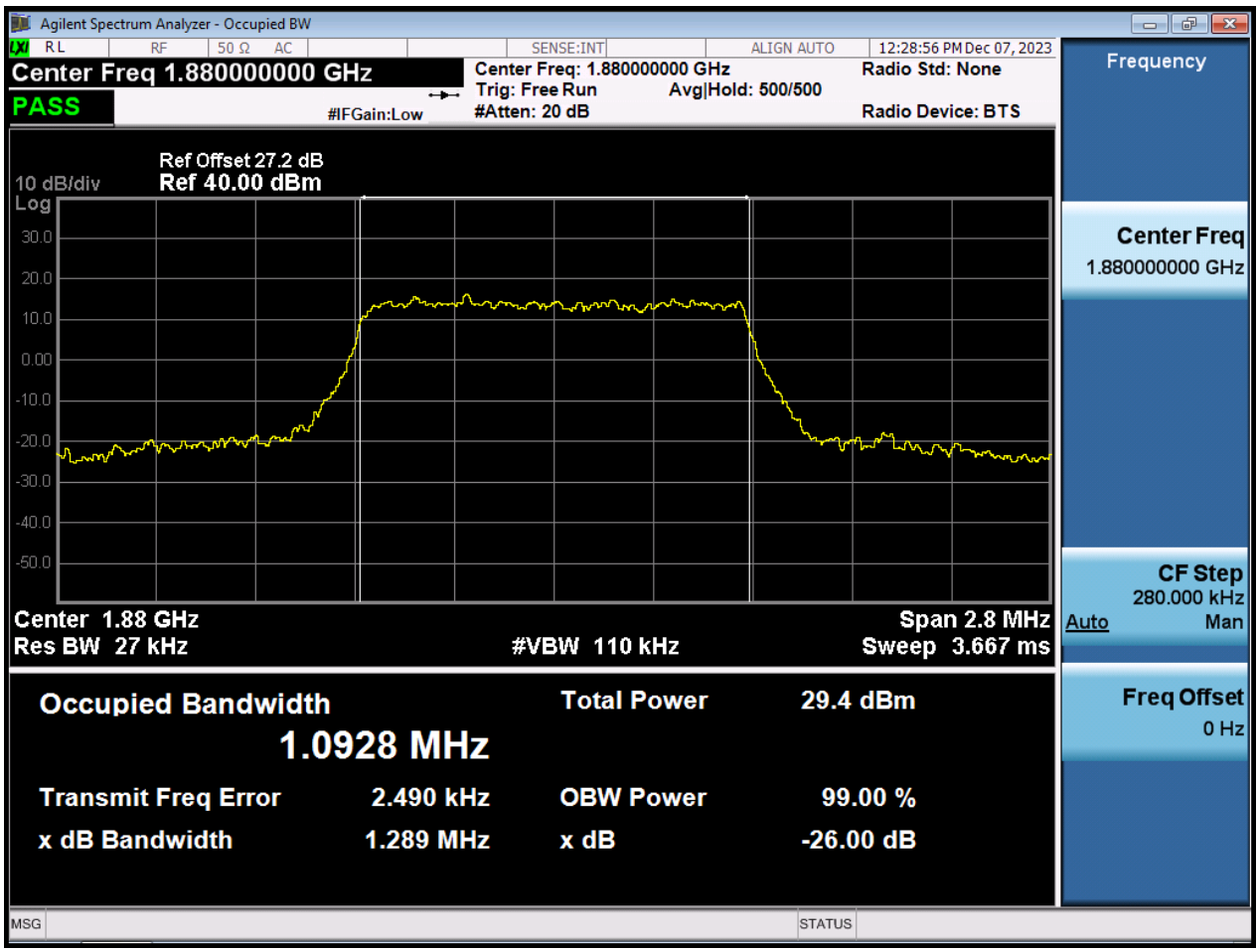
BW20 M_BandEdge_Lowest Channel_QPSK_1RB

BW20 M_BandEdge_Highest Channel_QPSK_1RB

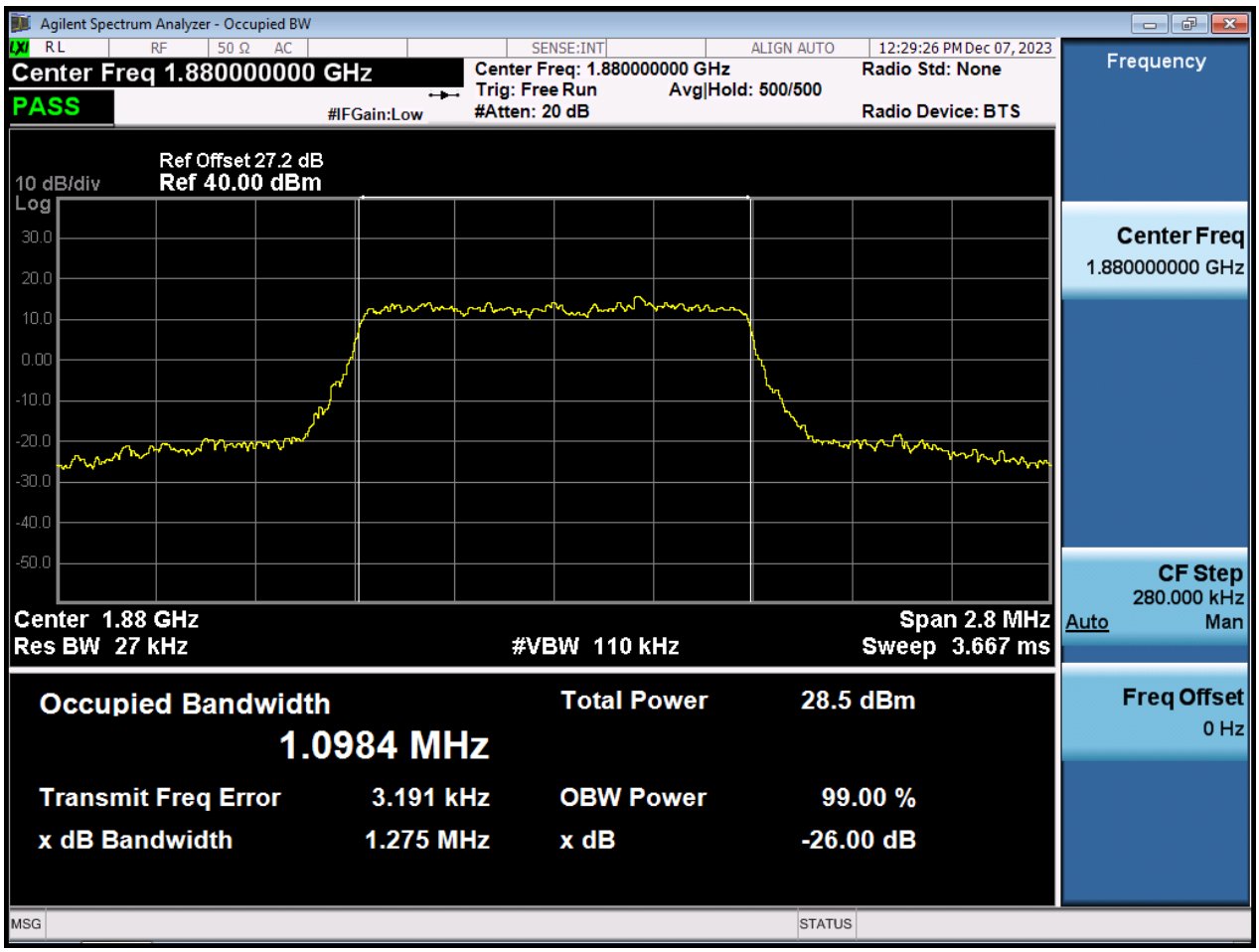
BW1.4 M_OBW_Middle Channel_QPSK_FullRB



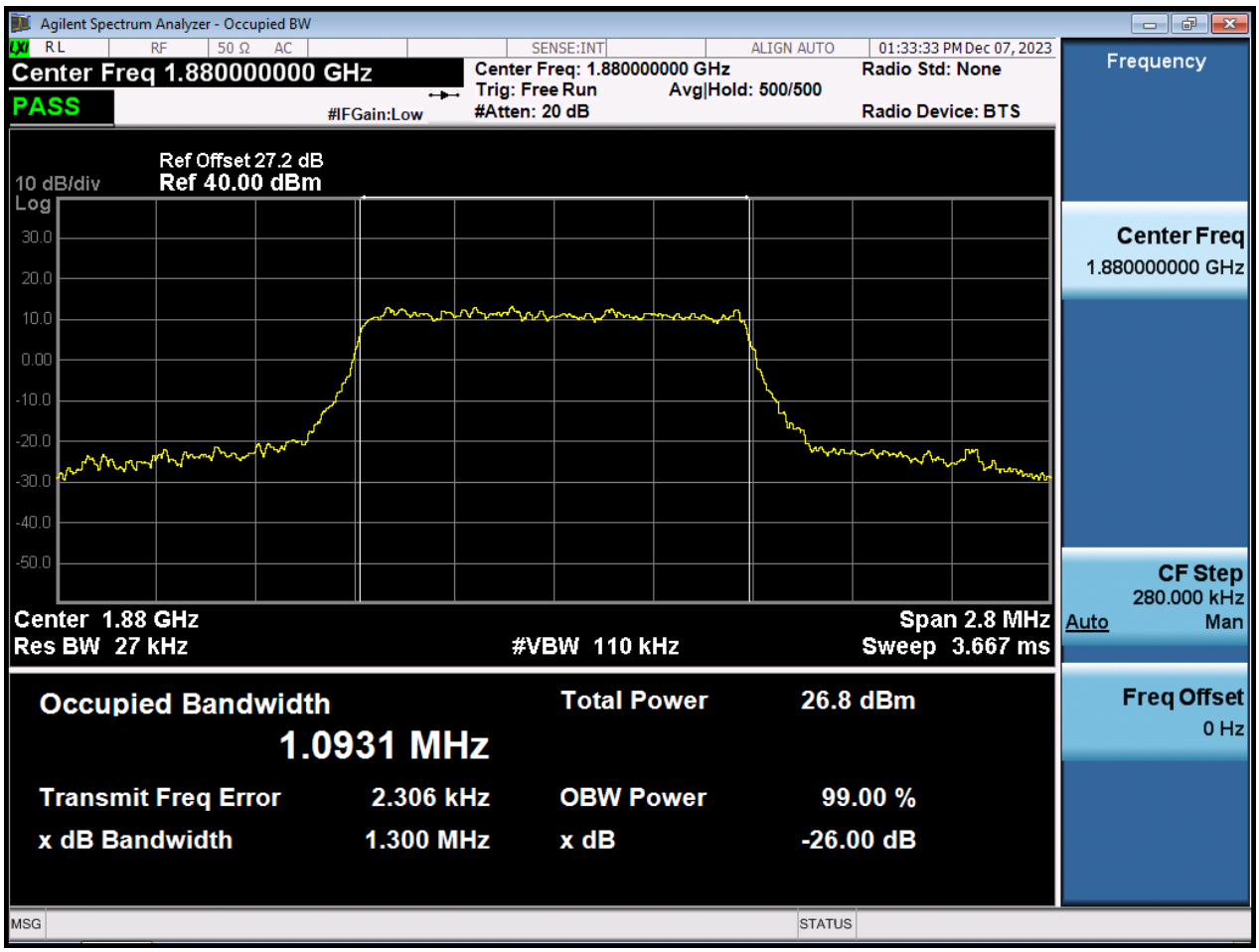
BW1.4 M_OBW_Middle Channel_16QAM_FullRB



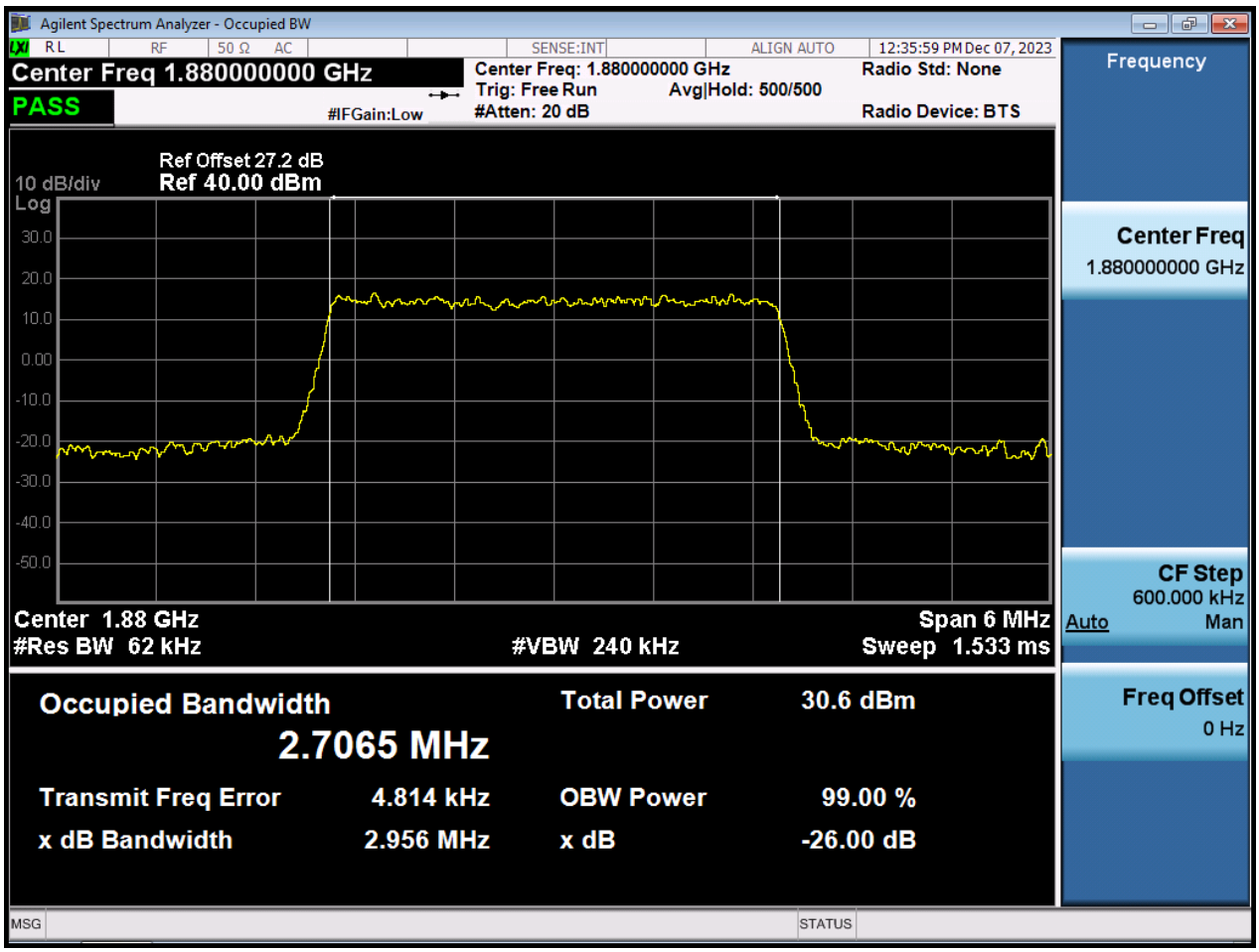
BW1.4 M_OBW_Middle Channel_64QAM_FullRB



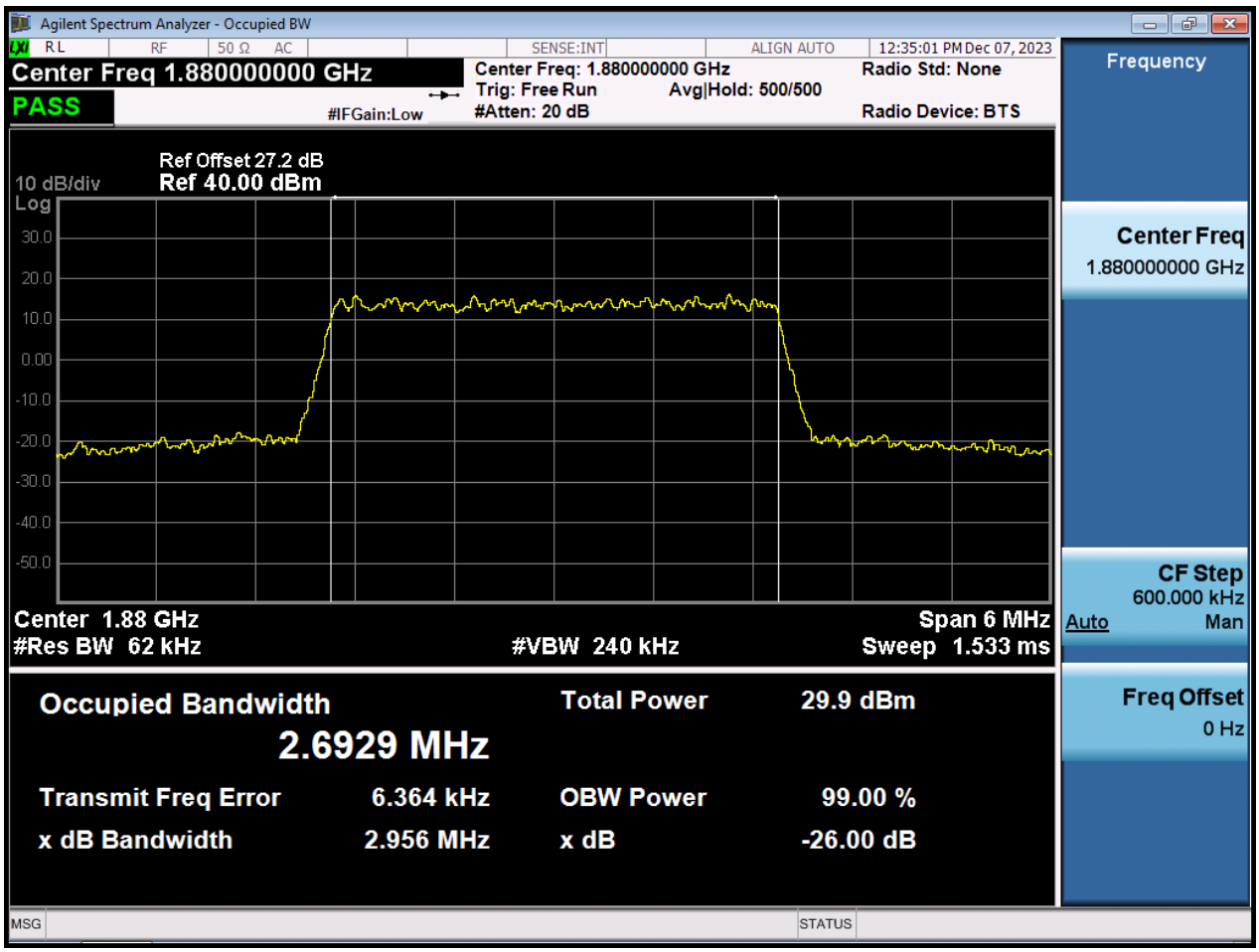
BW1.4 M_OBW_Middle Channel_256QAM_FullRB



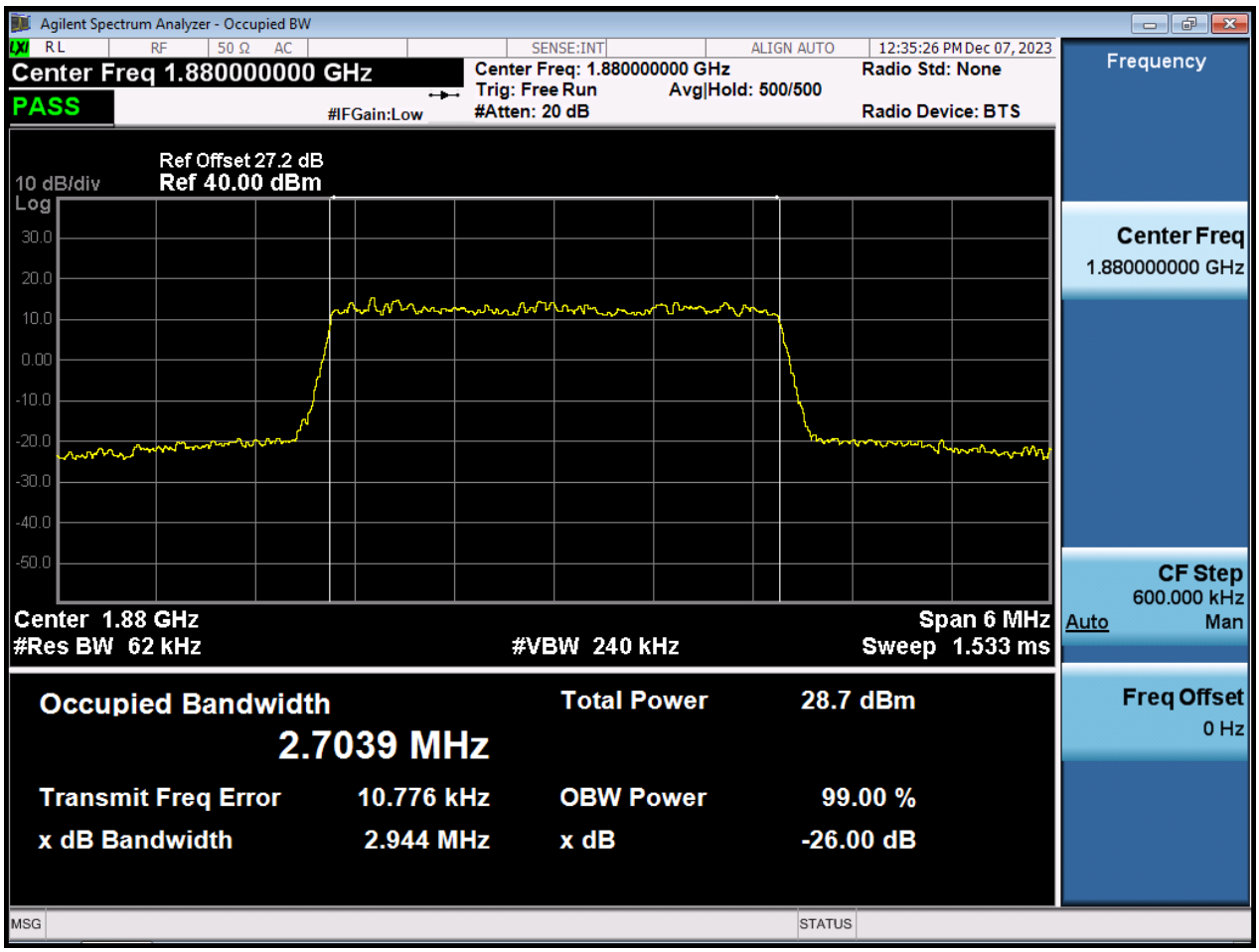
BW3 M_OBW_Middle Channel_QPSK_FullRB



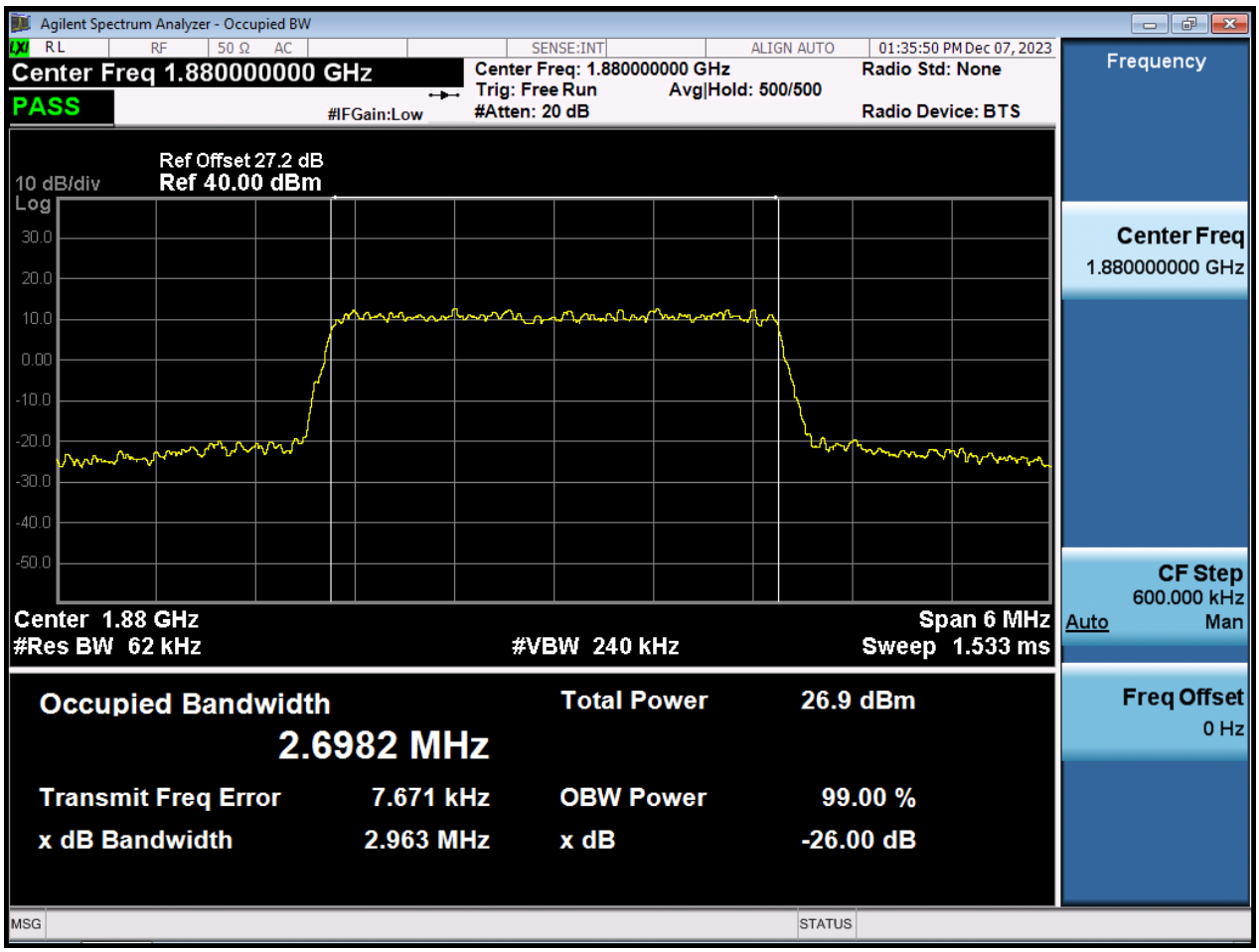
BW3 M_OBW_Middle Channel_16QAM_FullRB



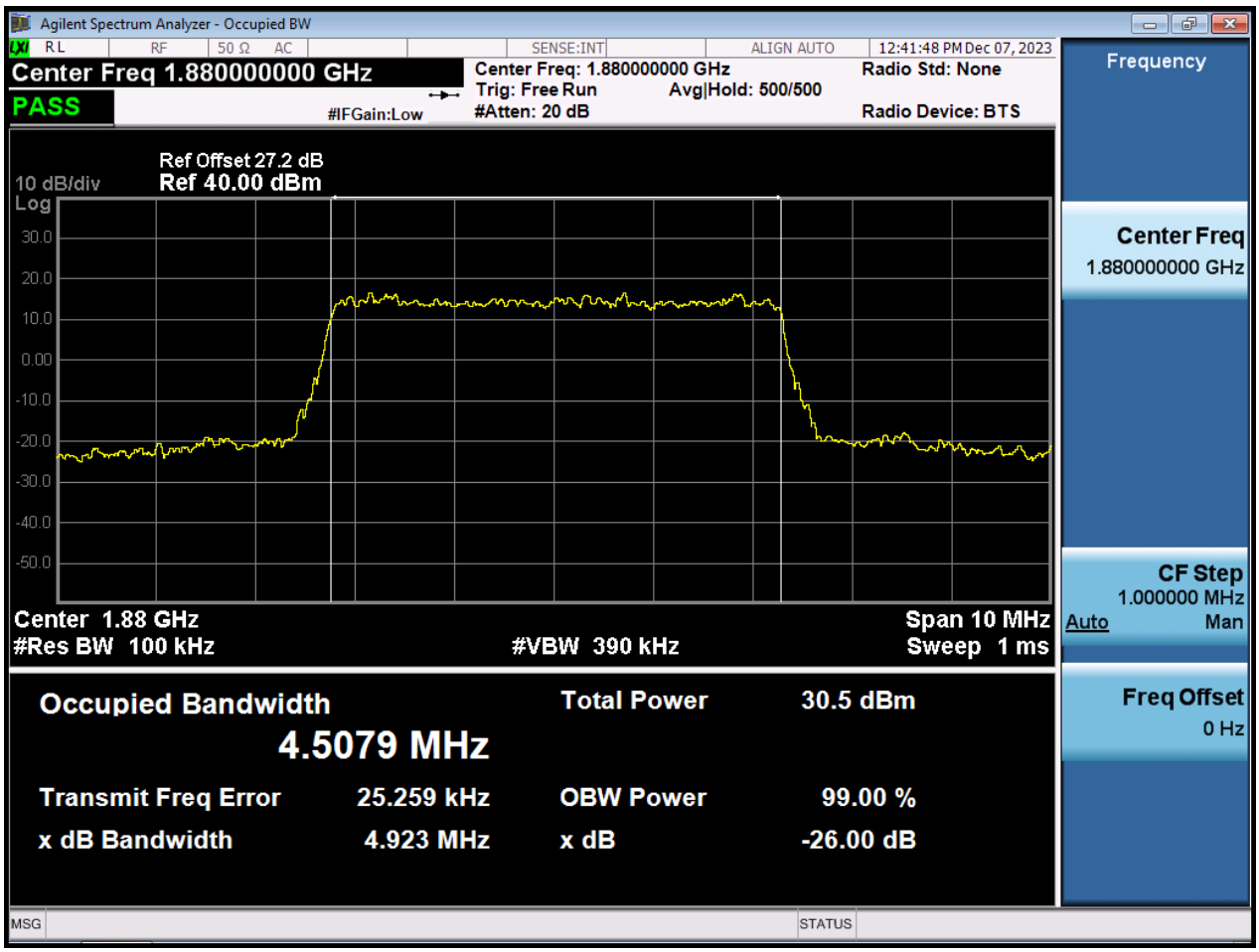
BW3 M_OBW_Middle Channel_64QAM_FullRB



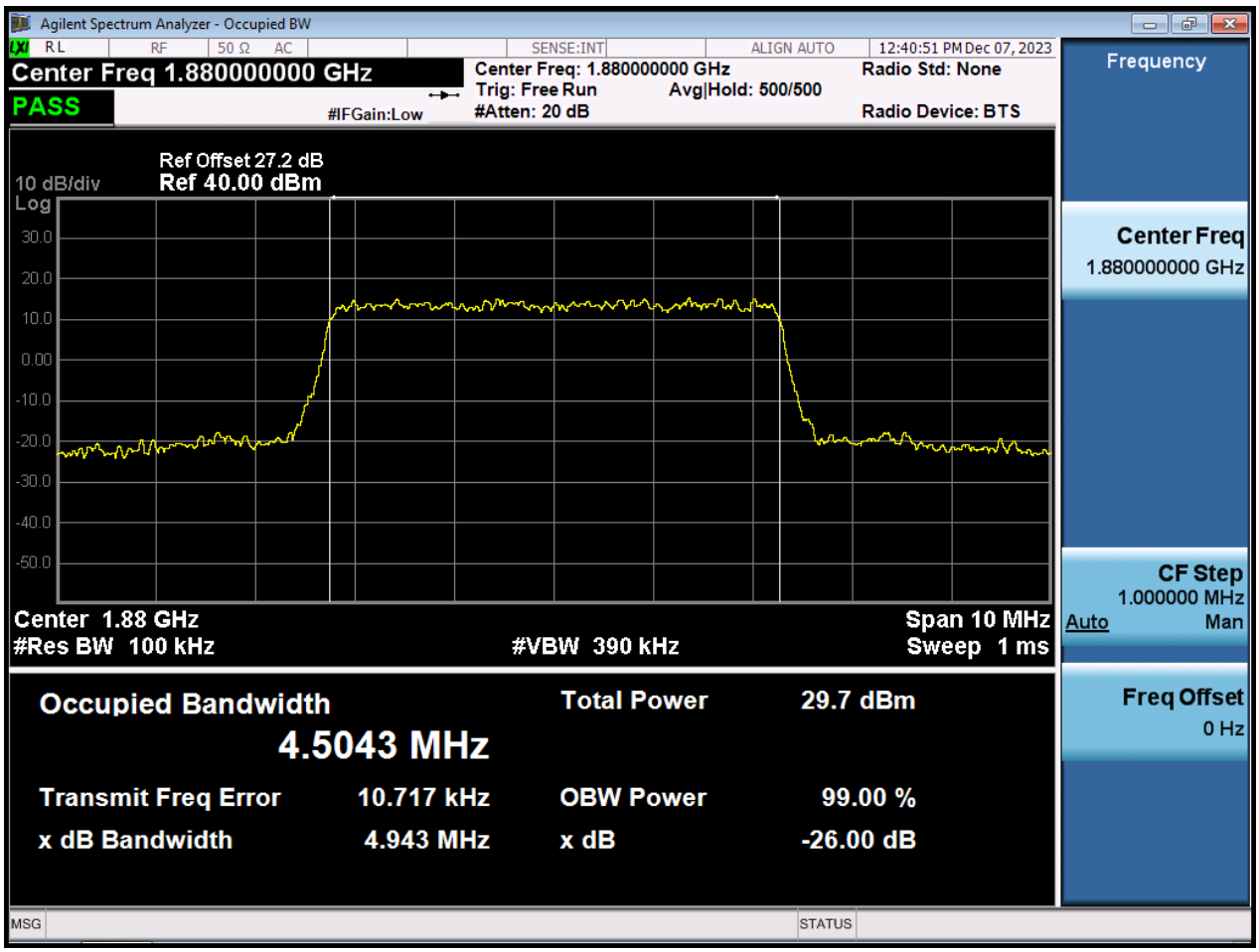
BW3 M_OBW_Middle Channel_256QAM_FullRB



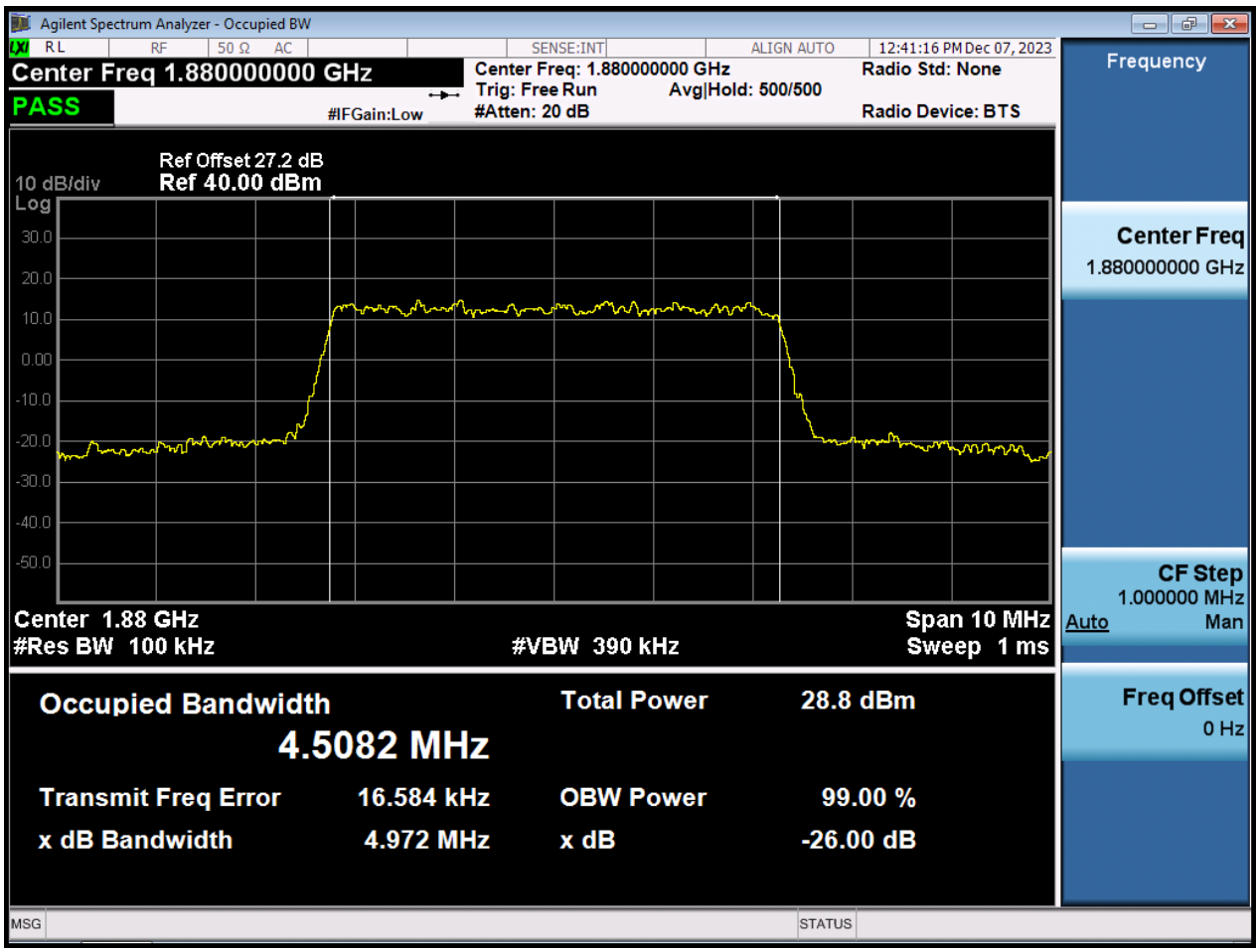
BW5 M_OBW_Middle Channel_QPSK_FullRB



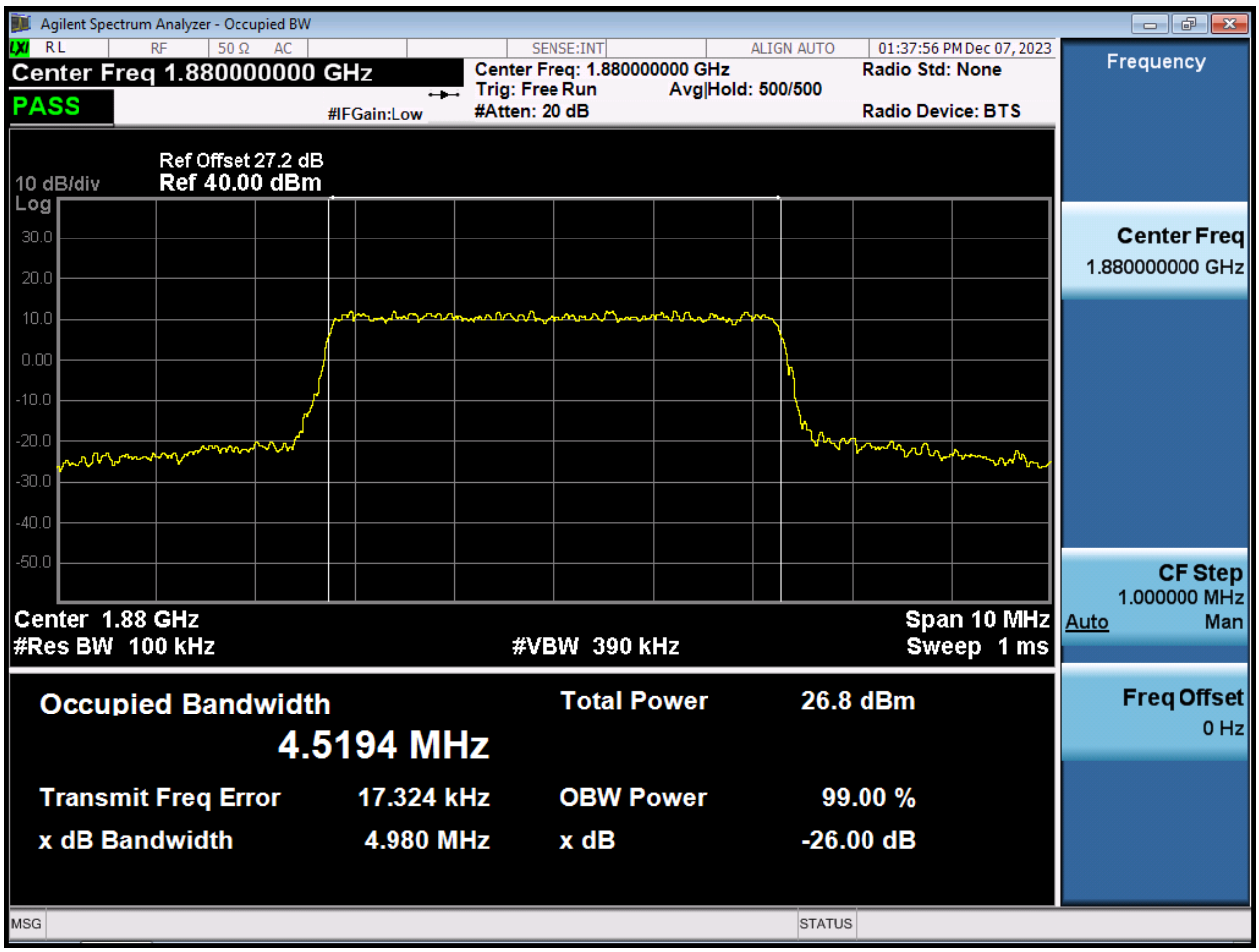
BW5 M_OBW_Middle Channel_16QAM_FullRB



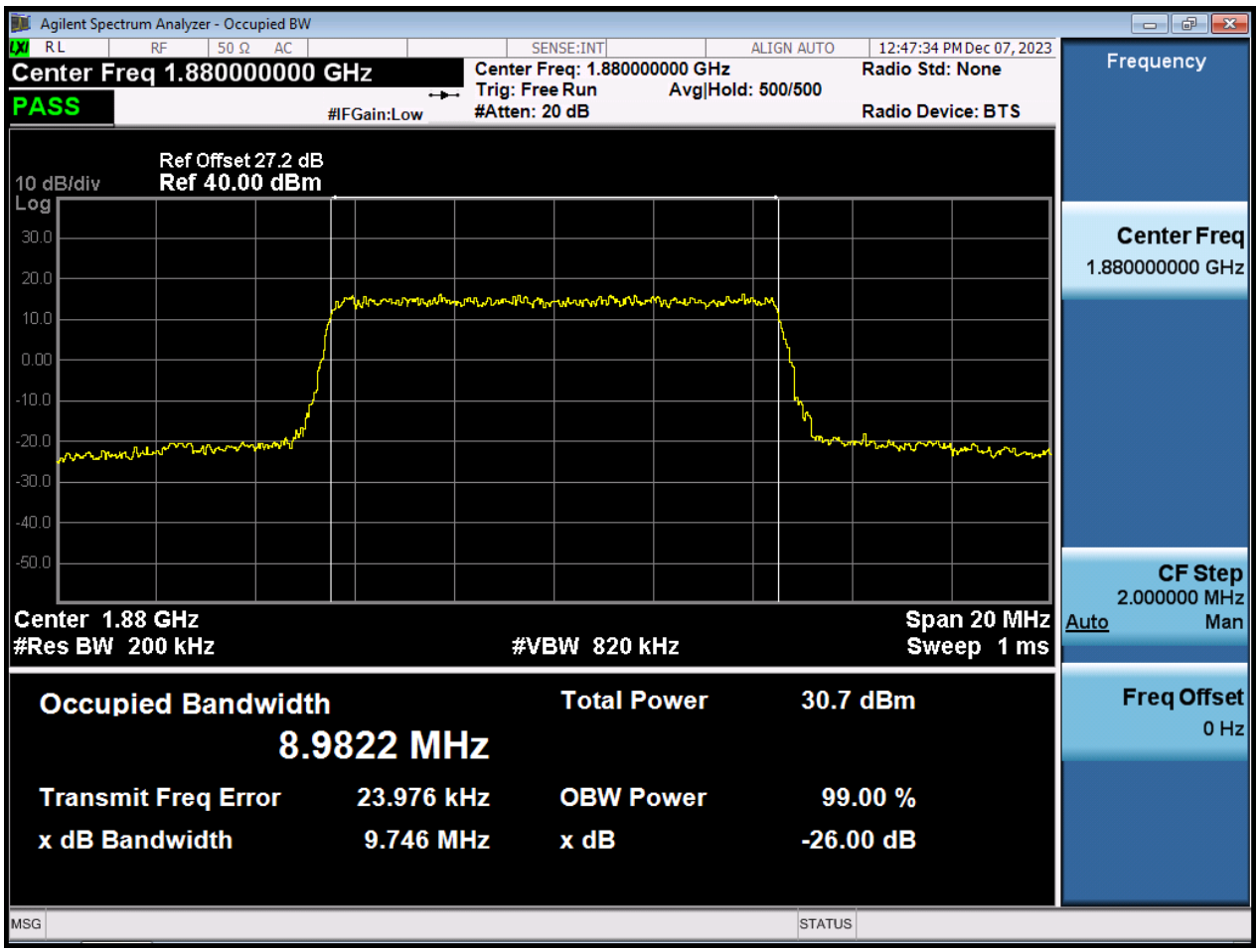
BW5 M_OBW_Middle Channel_64QAM_FullRB



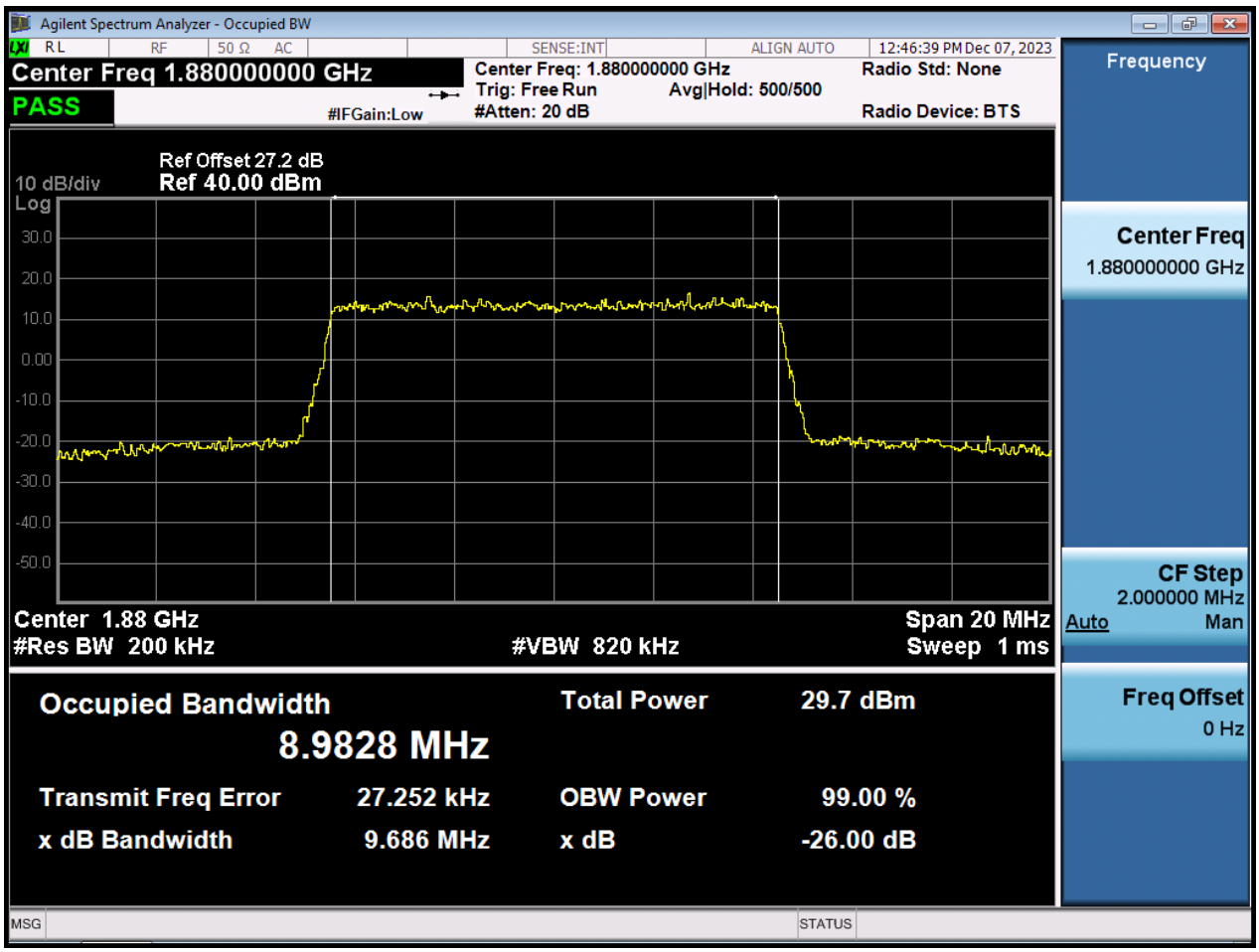
BW5 M_OBW_Middle Channel_256QAM_FullRB



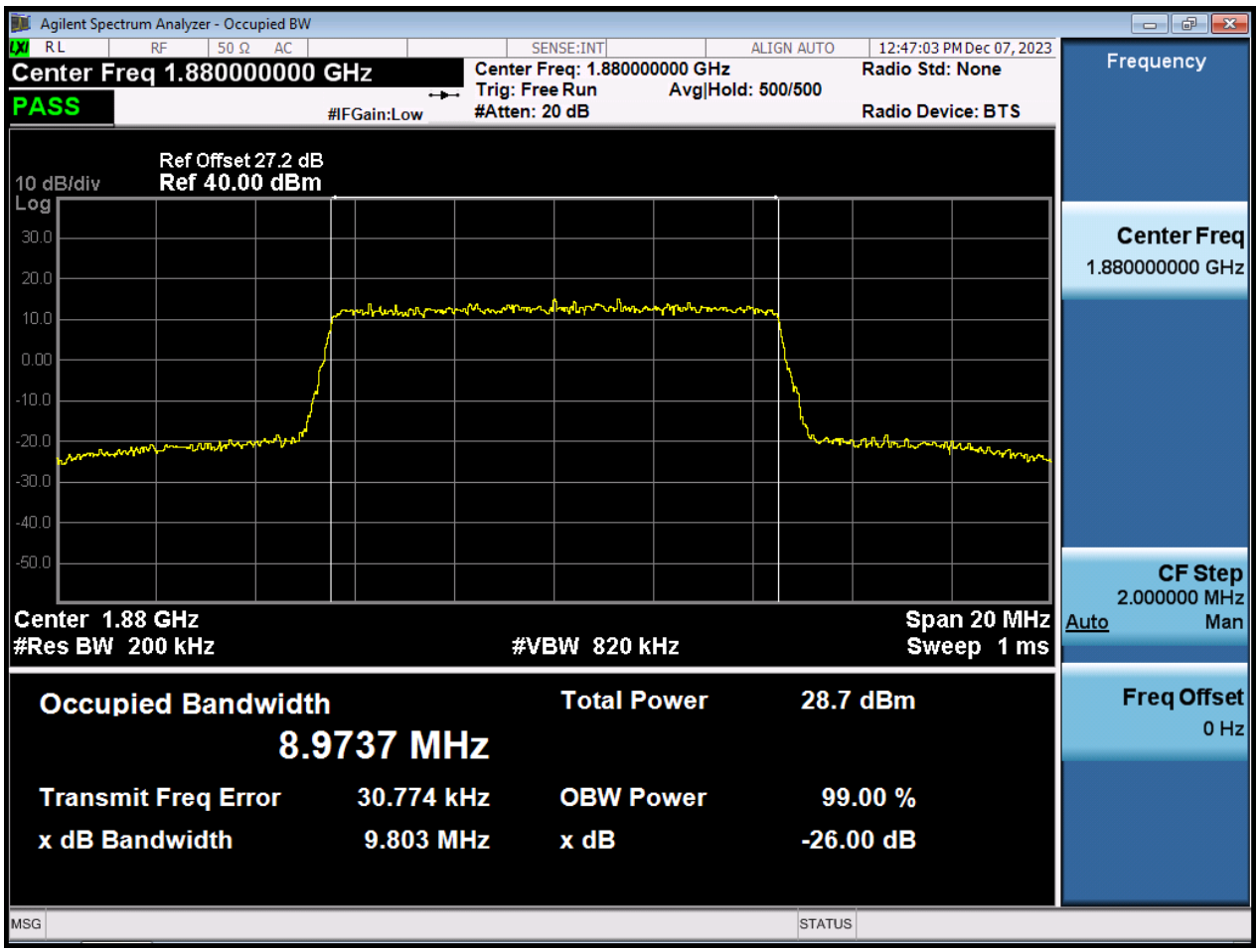
BW10 M_OBW_Middle Channel_QPSK_FullRB



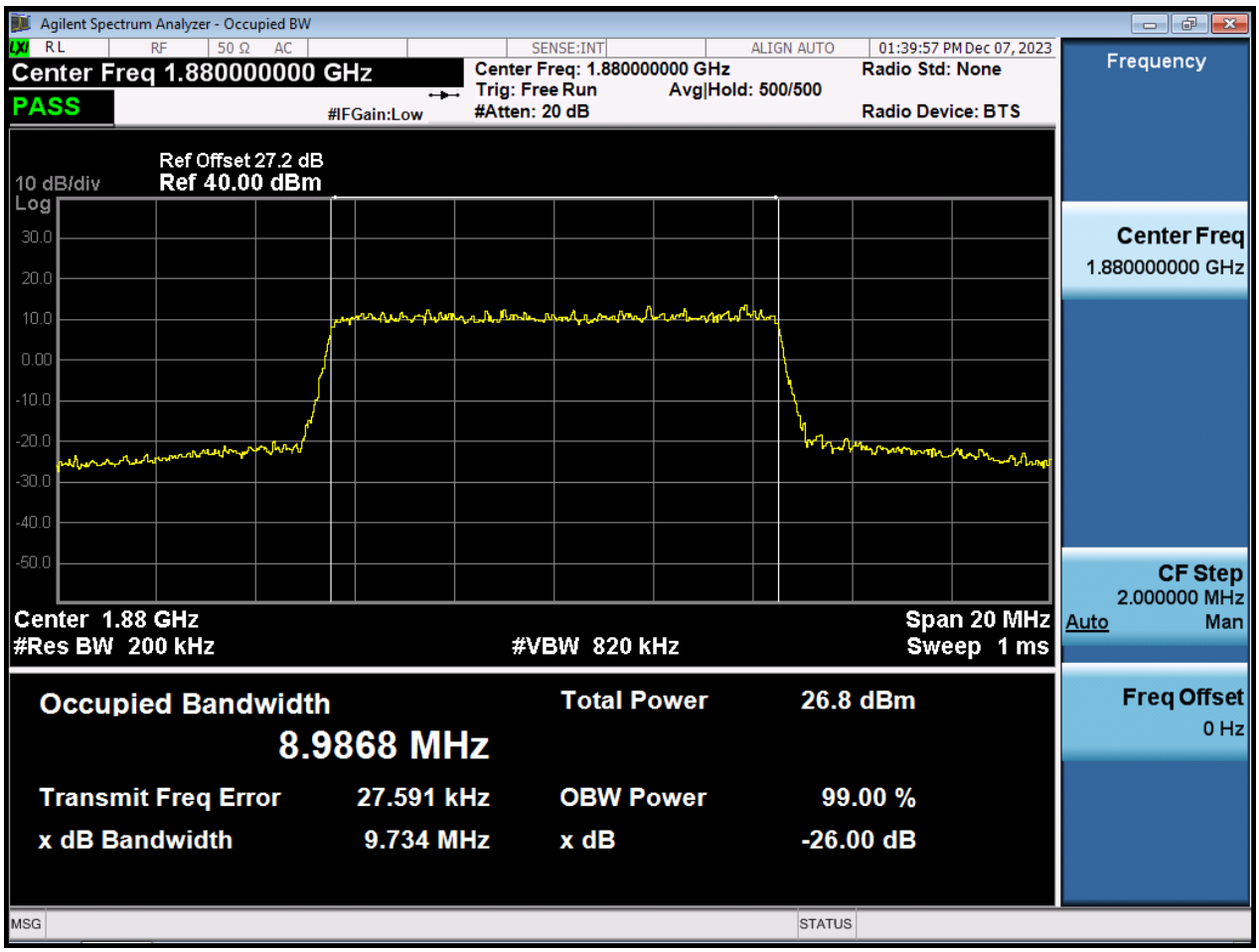
BW10 M_OBW_Middle Channel_16QAM_FullRB



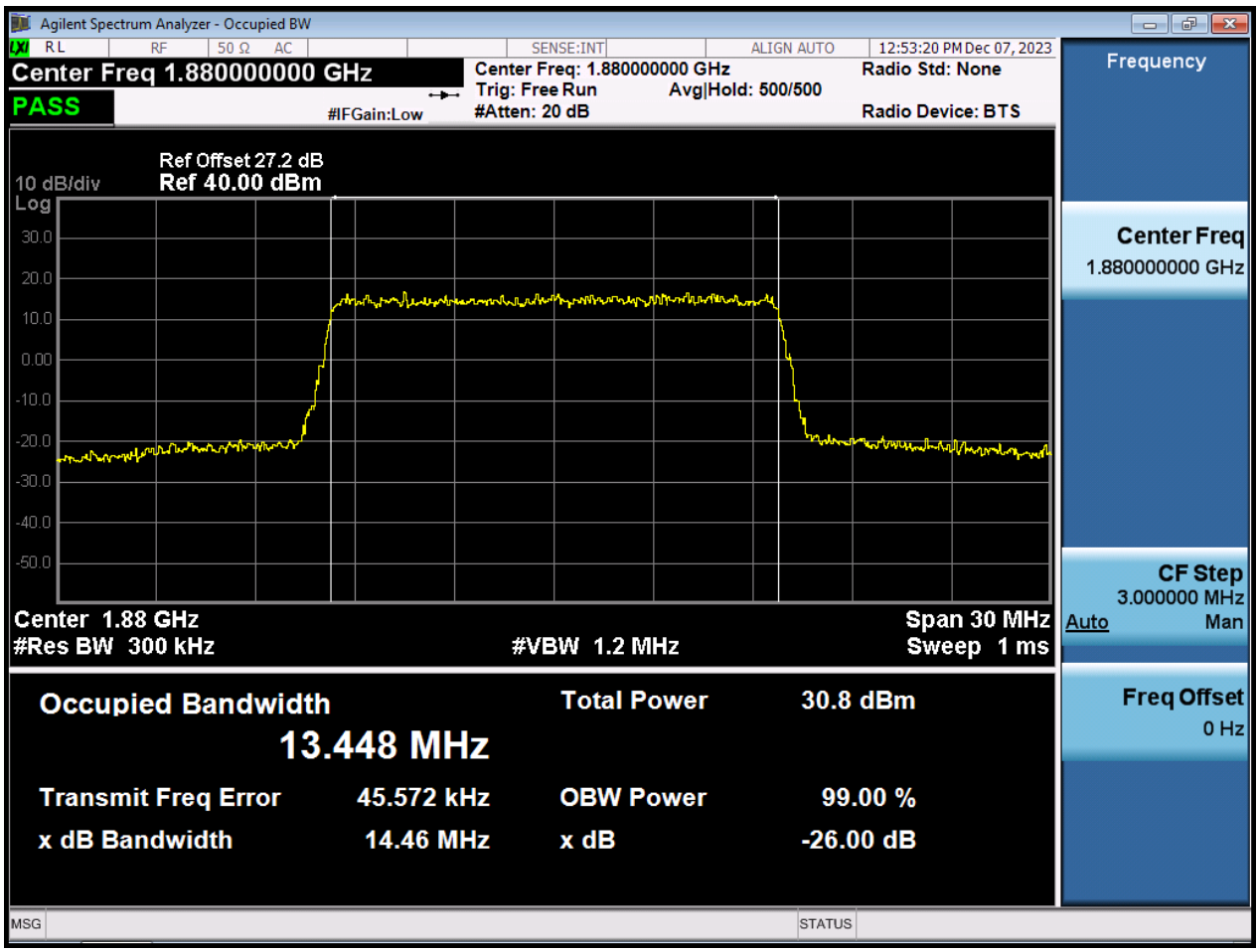
BW10 M_OBW_Middle Channel_64QAM_FullRB



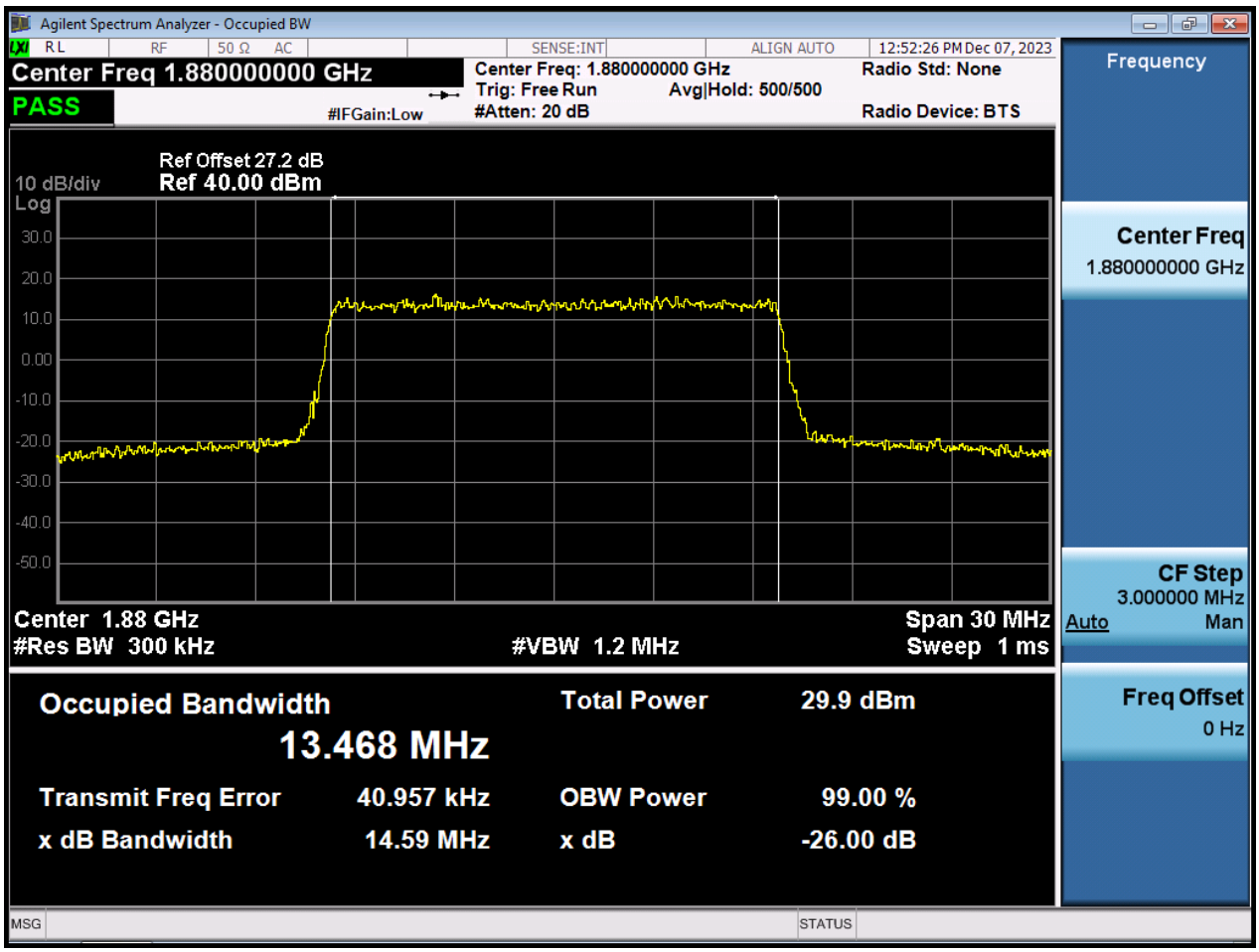
BW10 M_OBW_Middle Channel_256QAM_FullRB



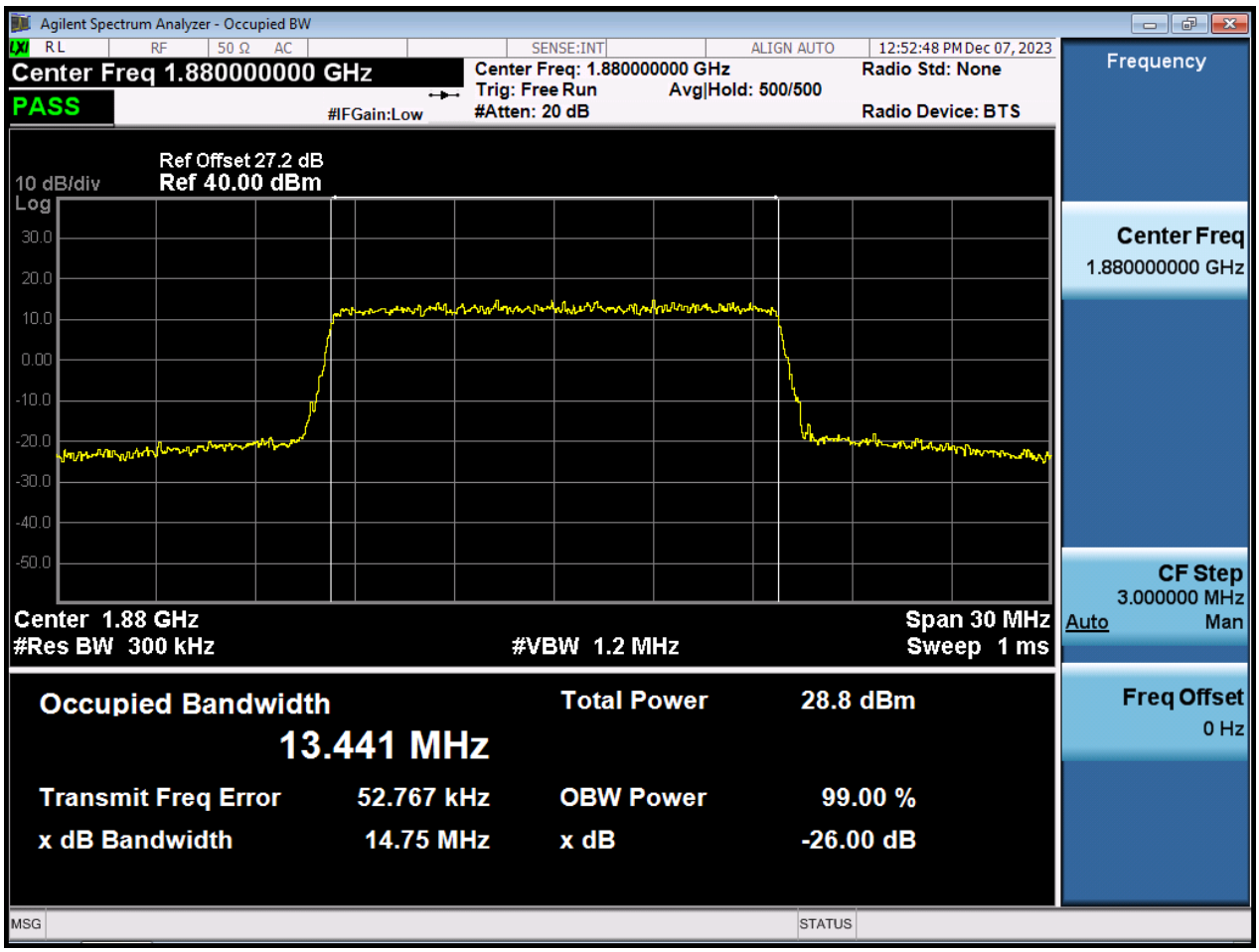
BW15 M_OBW_Middle Channel_QPSK_FullRB



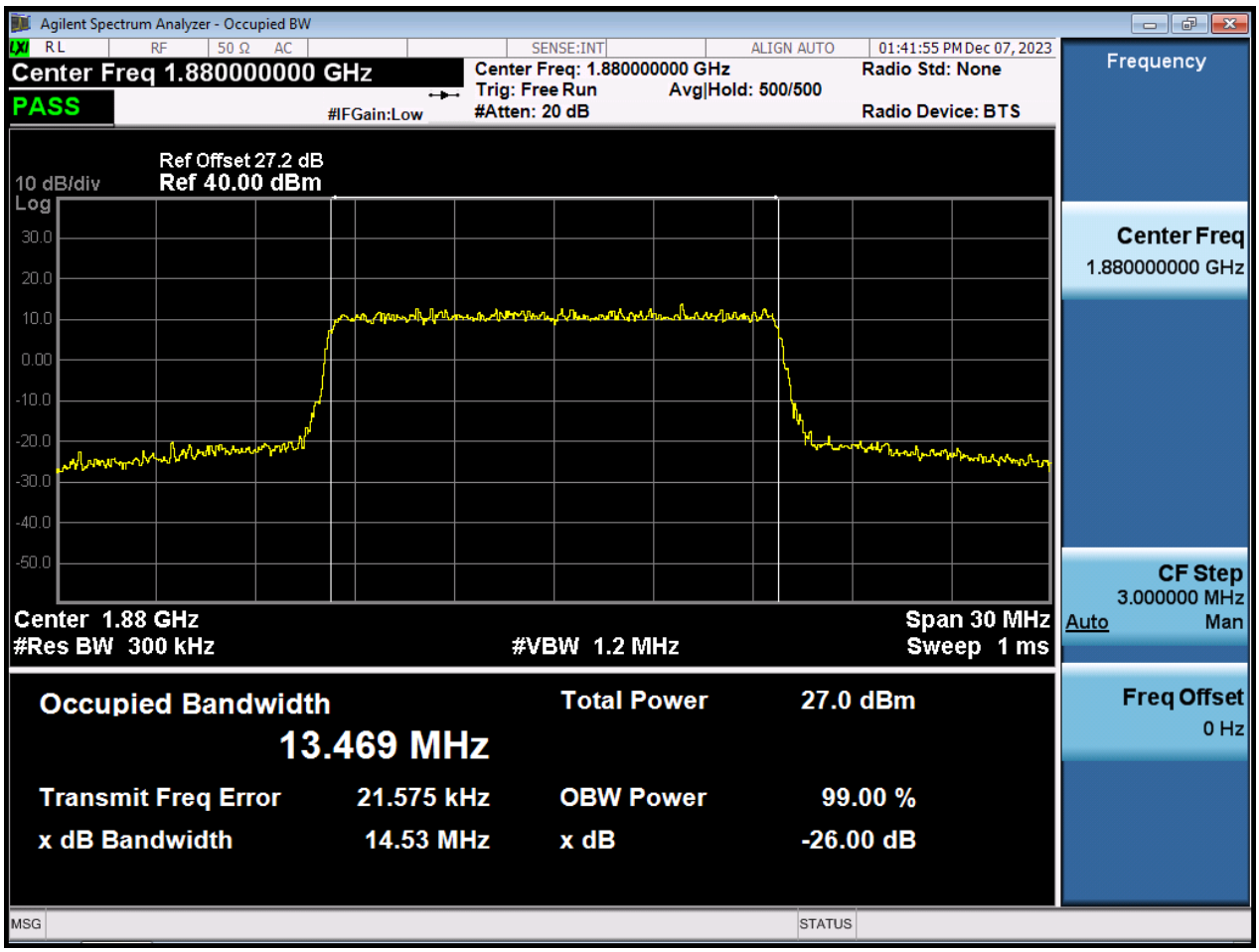
BW15 M_OBW_Middle Channel_16QAM_FullRB



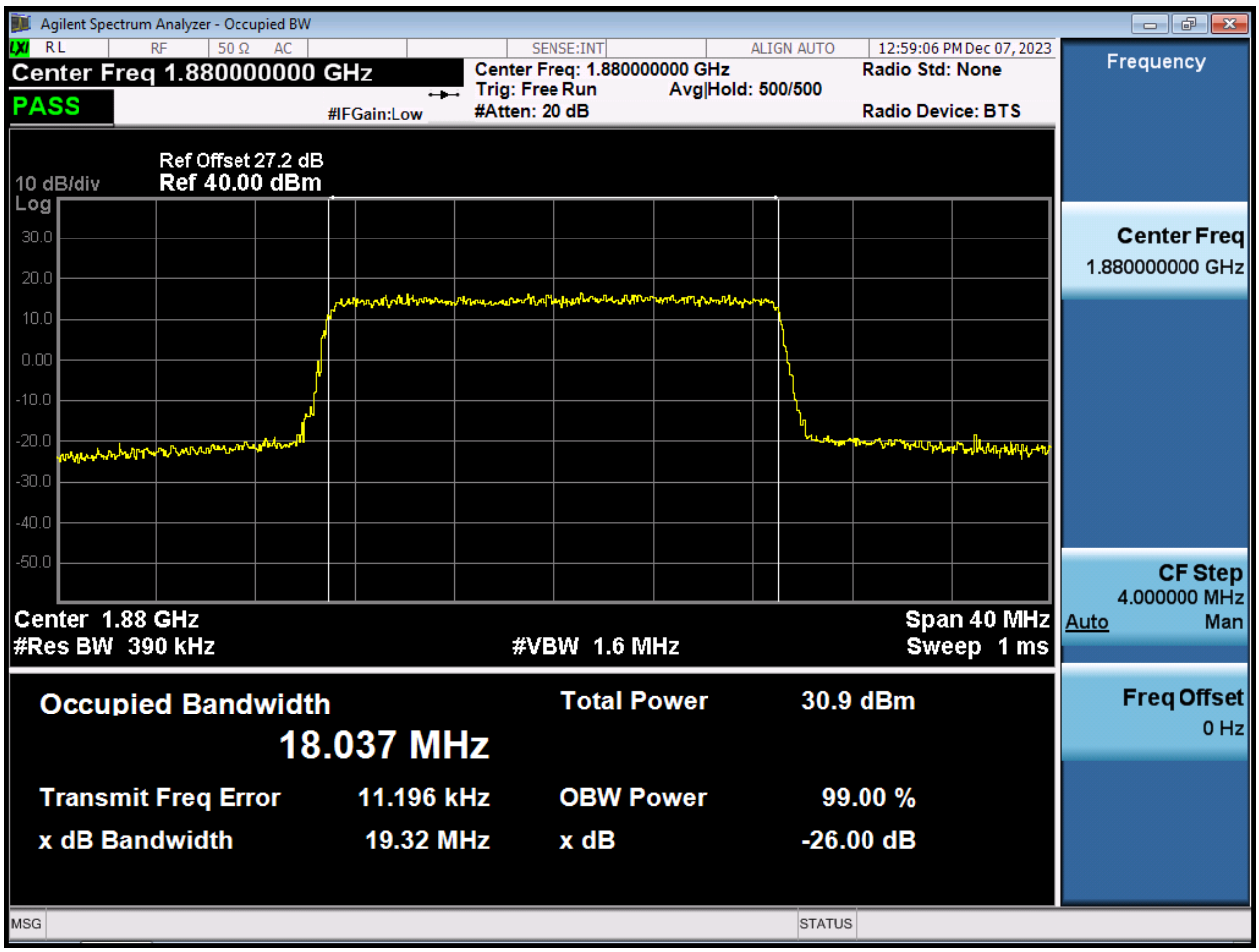
BW15 M_OBW_Middle Channel_64QAM_FullRB



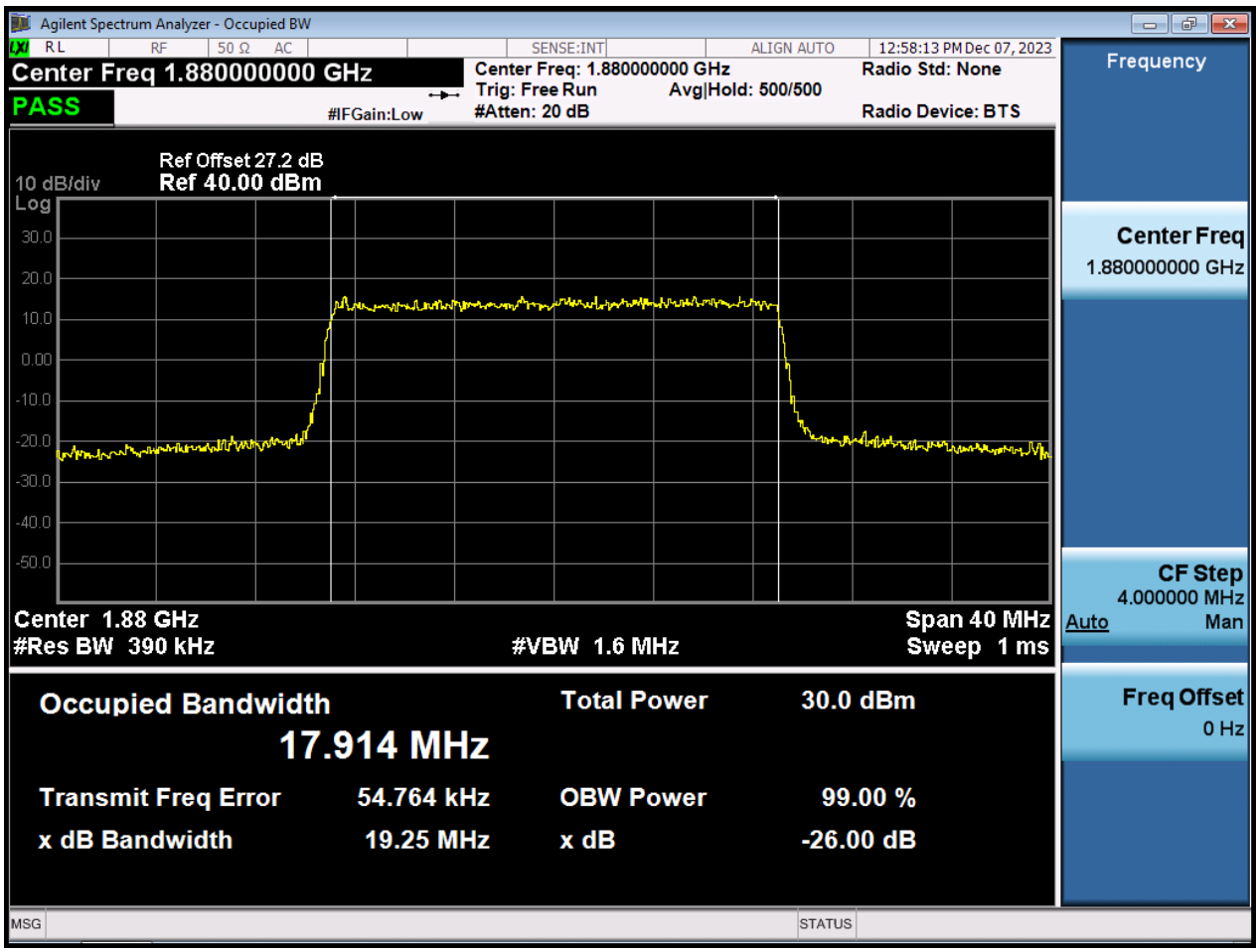
BW15 M_OBW_Middle Channel_256QAM_FullRB



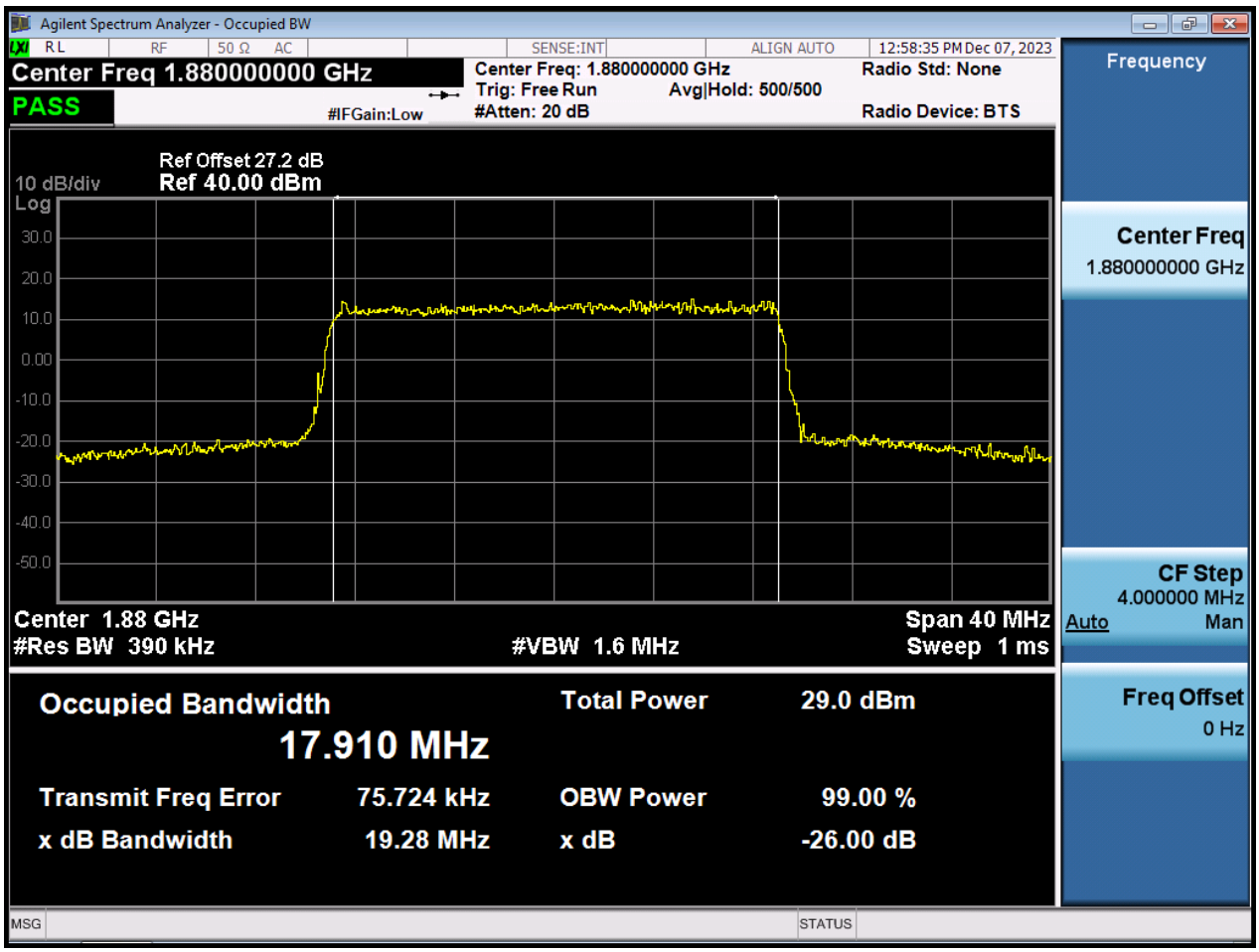
BW20 M_OBW_Middle Channel_QPSK_FullRB



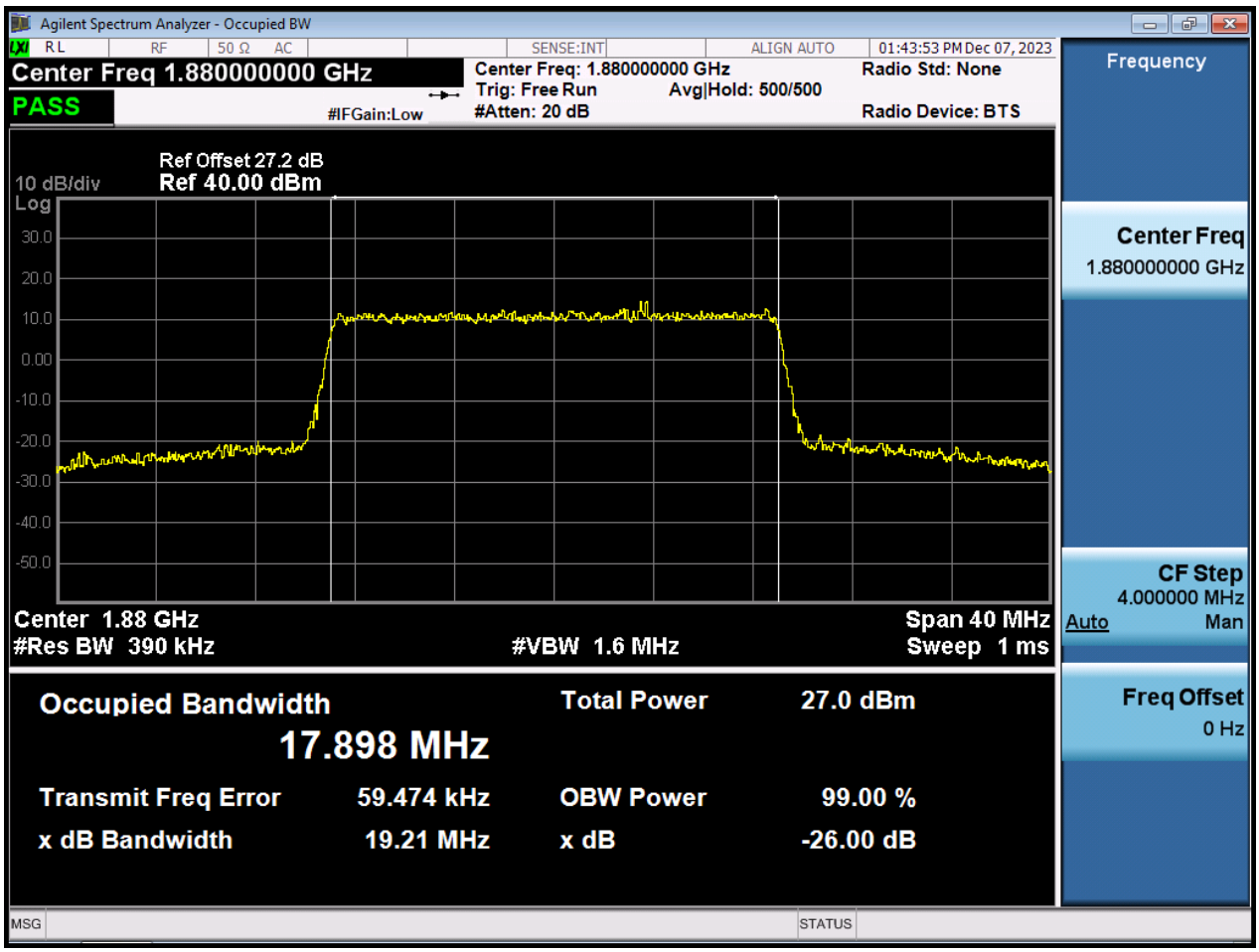
BW20 M_OBW_Middle Channel_16QAM_FullRB



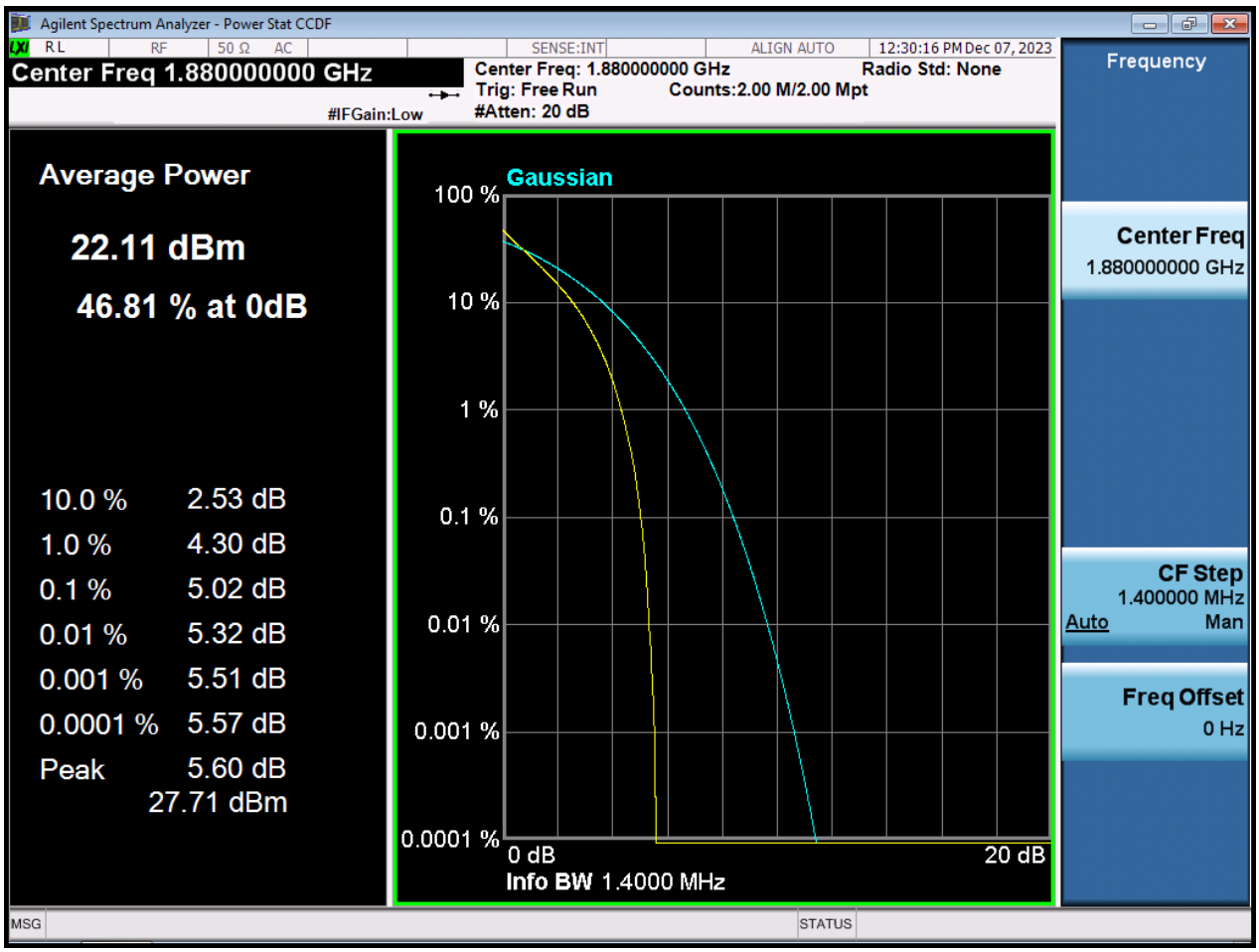
BW20 M_OBW_Middle Channel_64QAM_FullRB



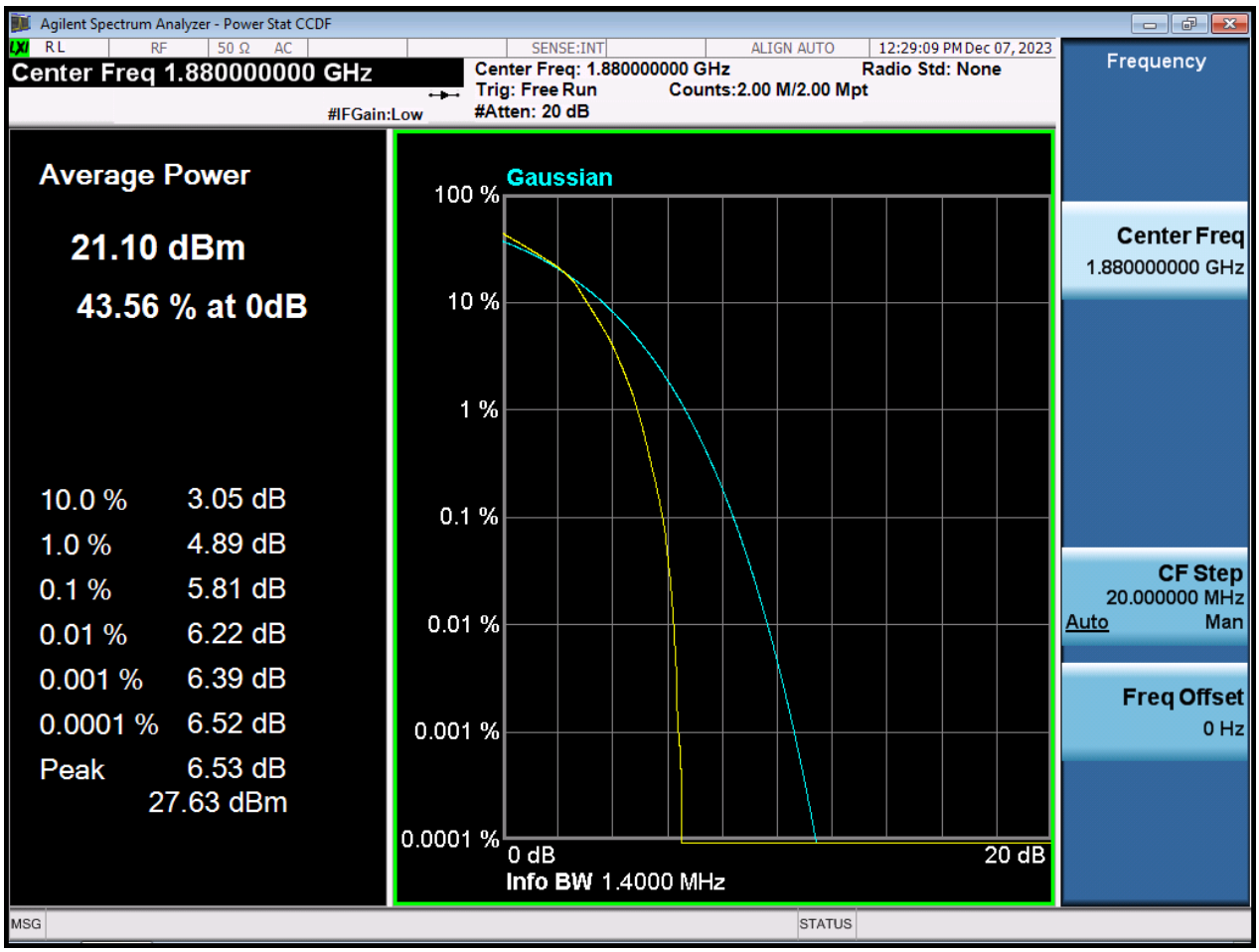
BW20 M_OBW_Middle Channel_256QAM_FullRB



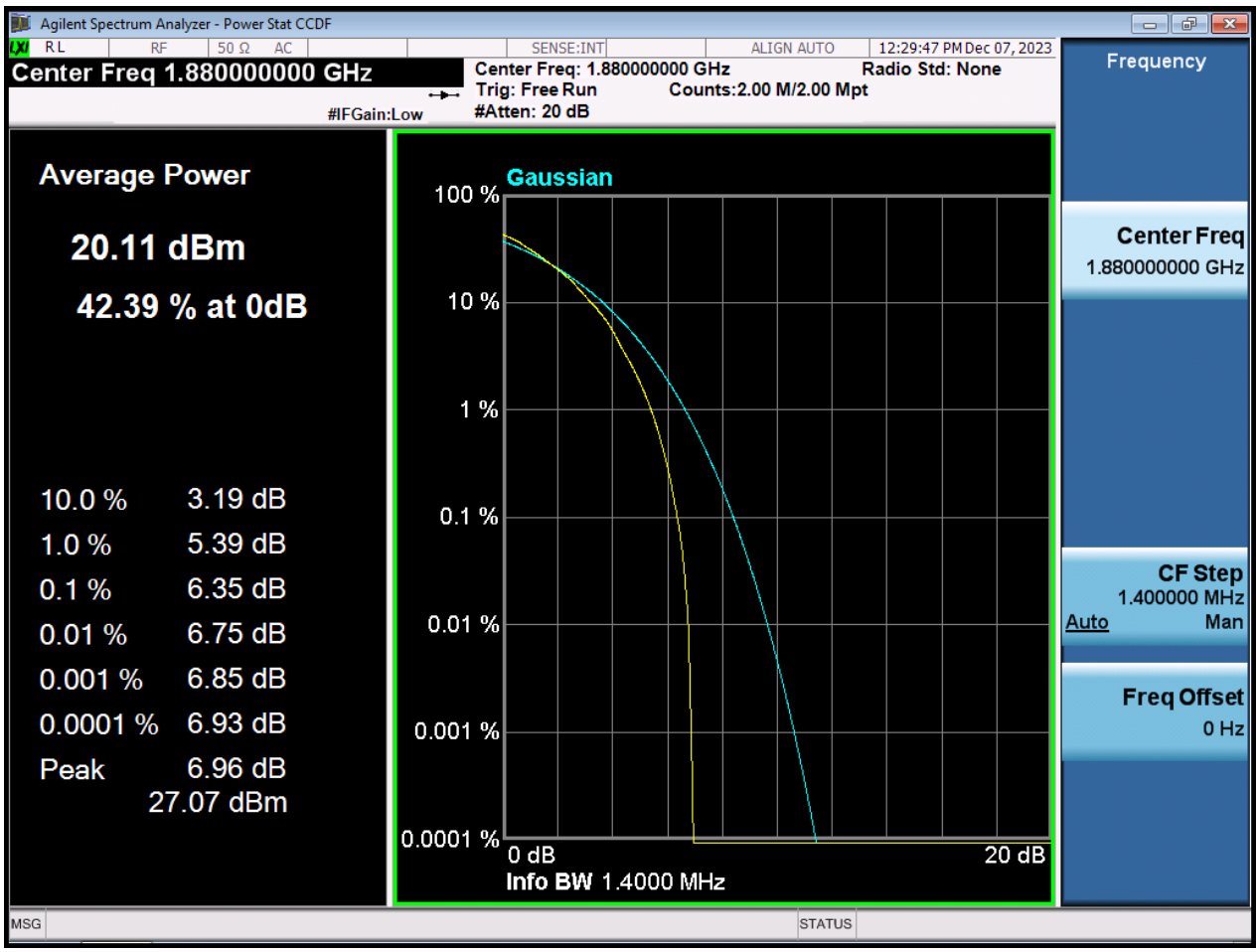
BW1.4 M_PAR_Middle Channel_QPSK_FullRB



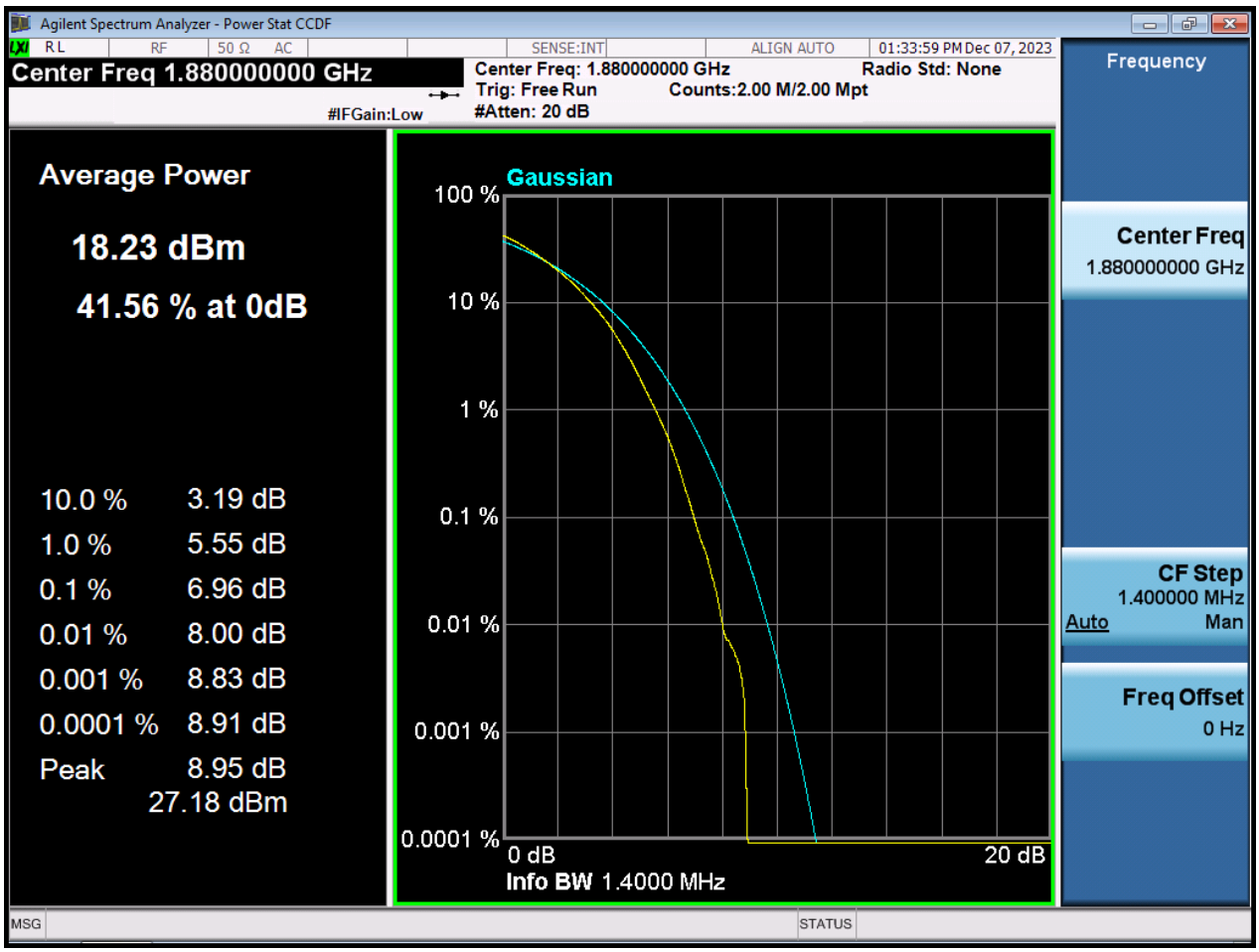
BW1.4 M_PAR_Middle Channel_16QAM_FullRB



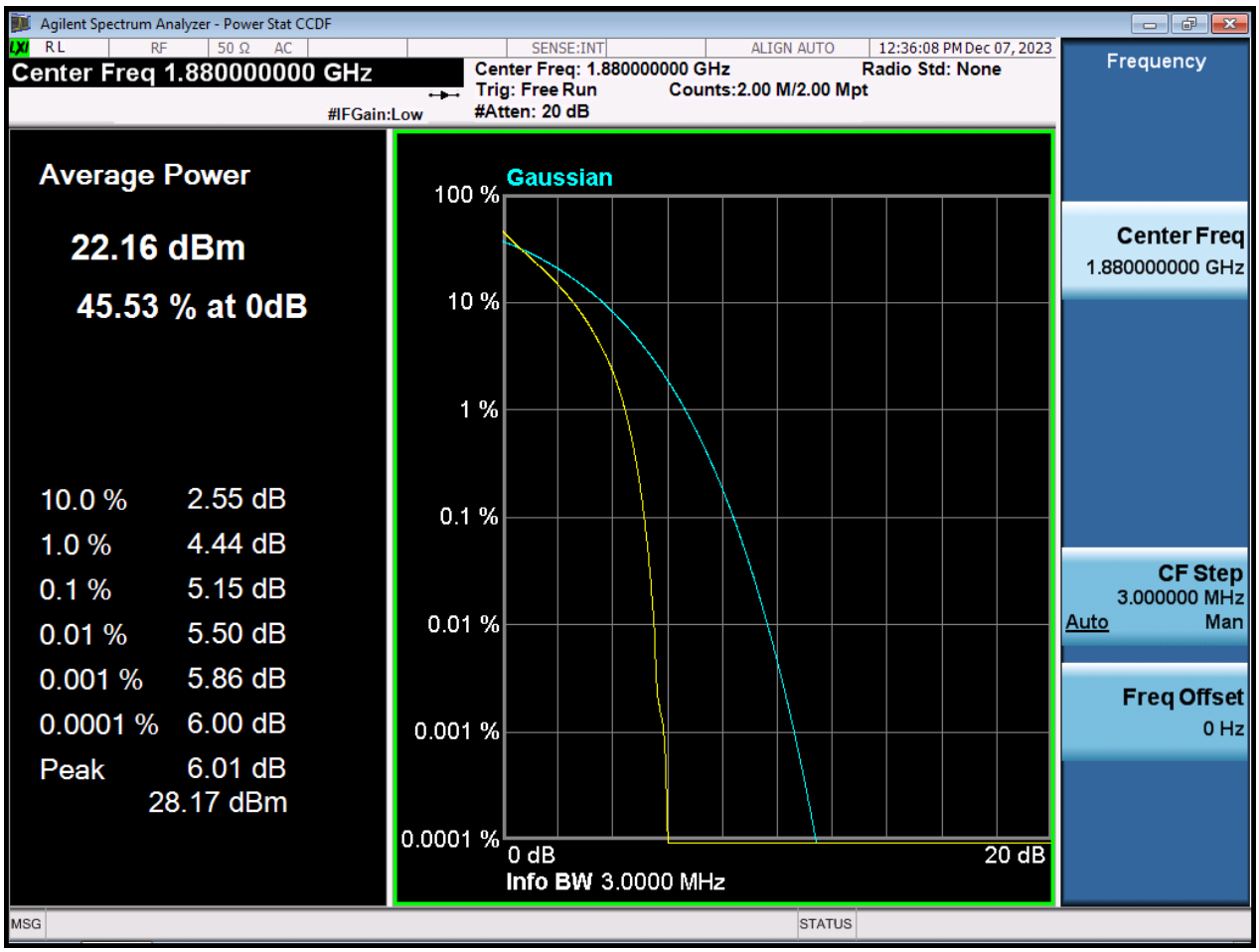
BW1.4 M_PAR_Middle Channel_64QAM_FullRB



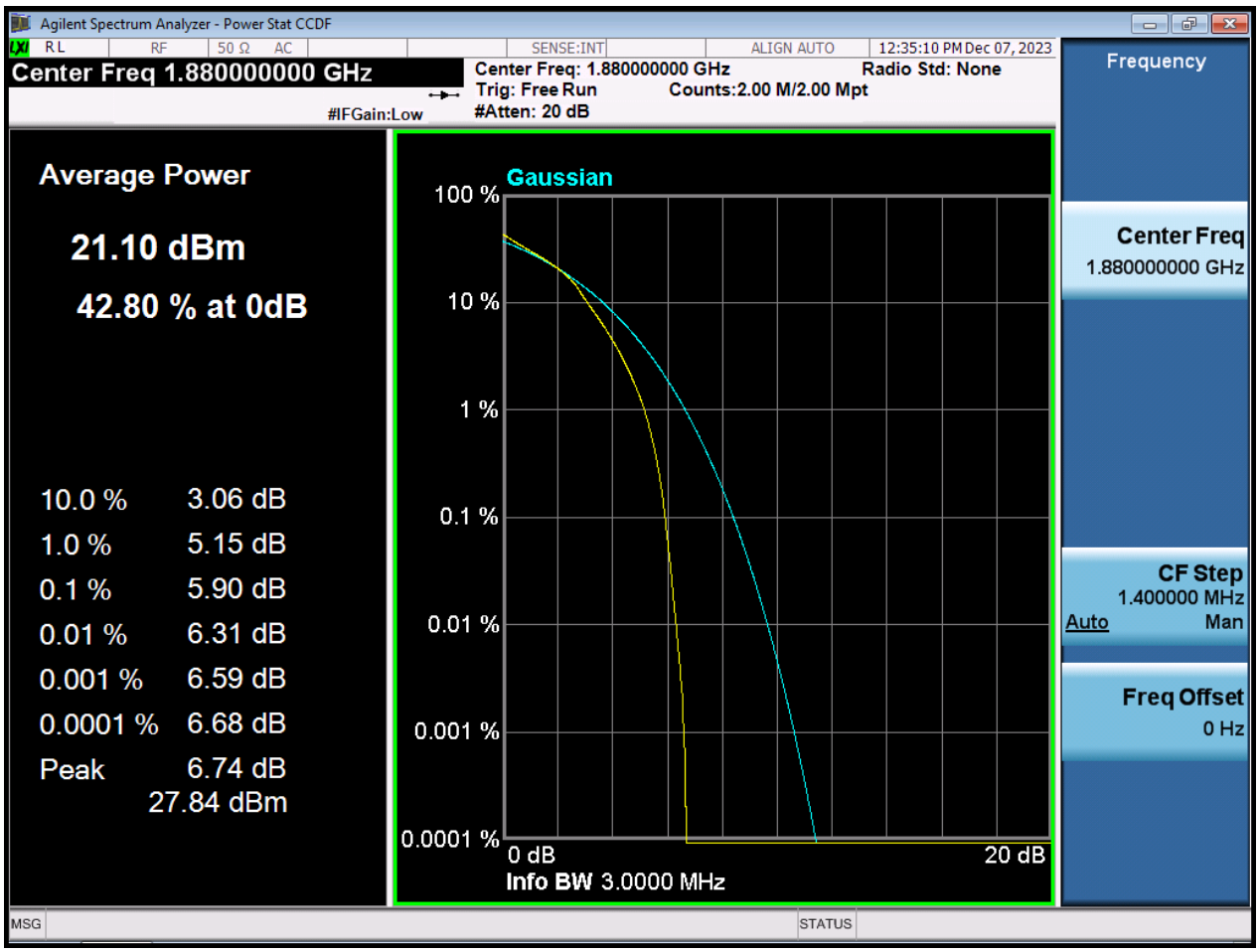
BW1.4 M_PAR_Middle Channel_256QAM_FullRB



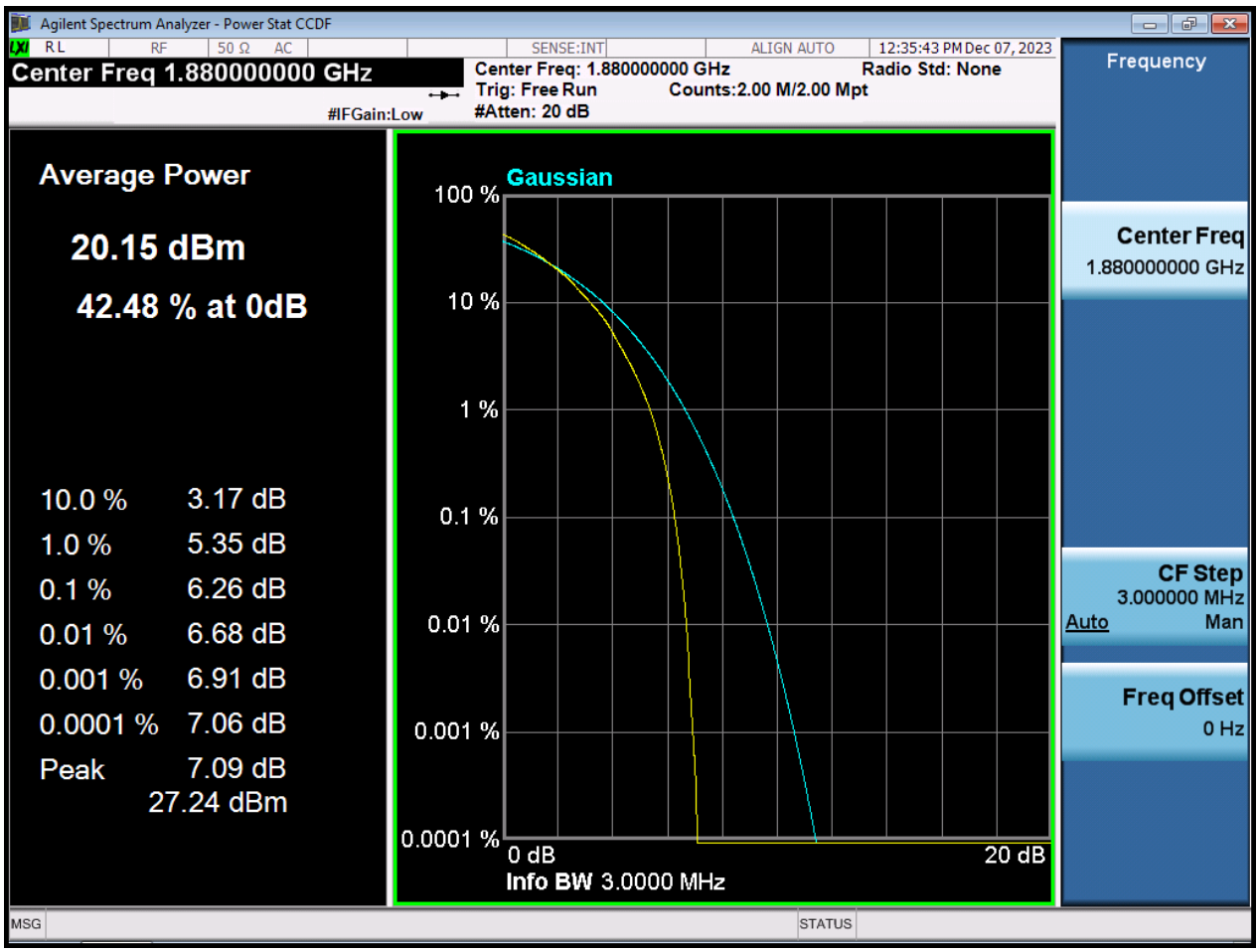
BW3 M_PAR_Middle Channel_QPSK_FullRB



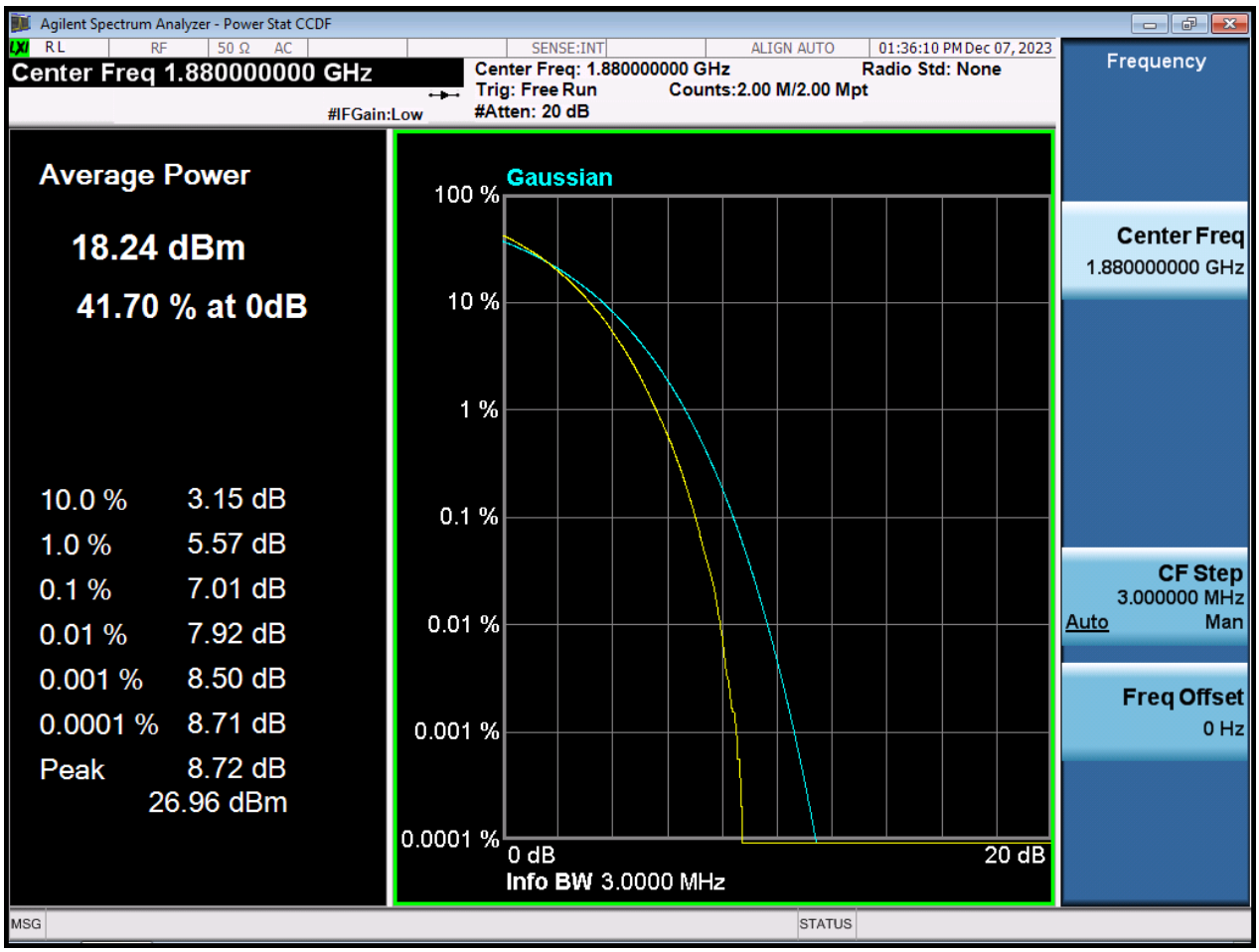
BW3 M_PAR_Middle Channel_16QAM_FullRB



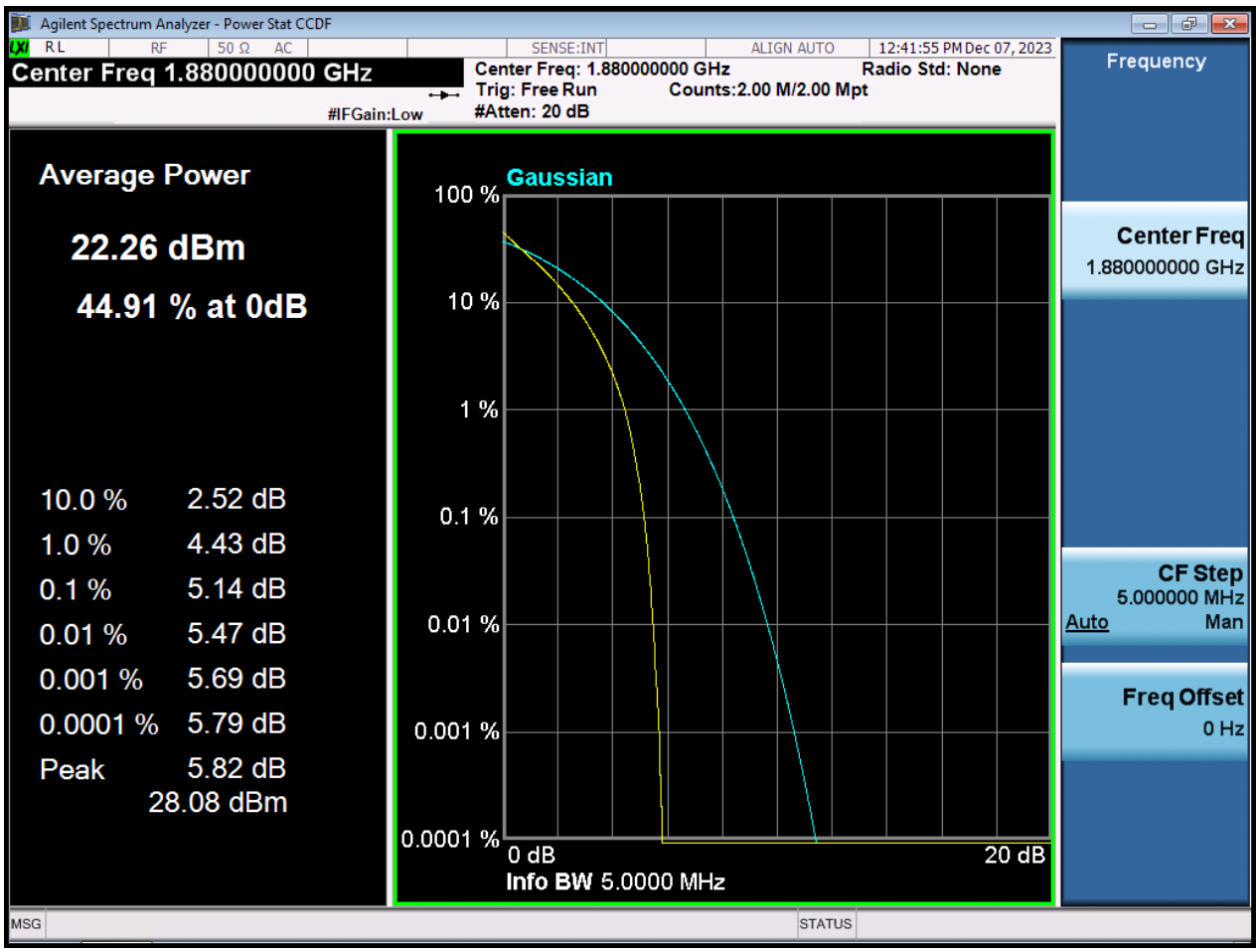
BW3 M_PAR_Middle Channel_64QAM_FullRB



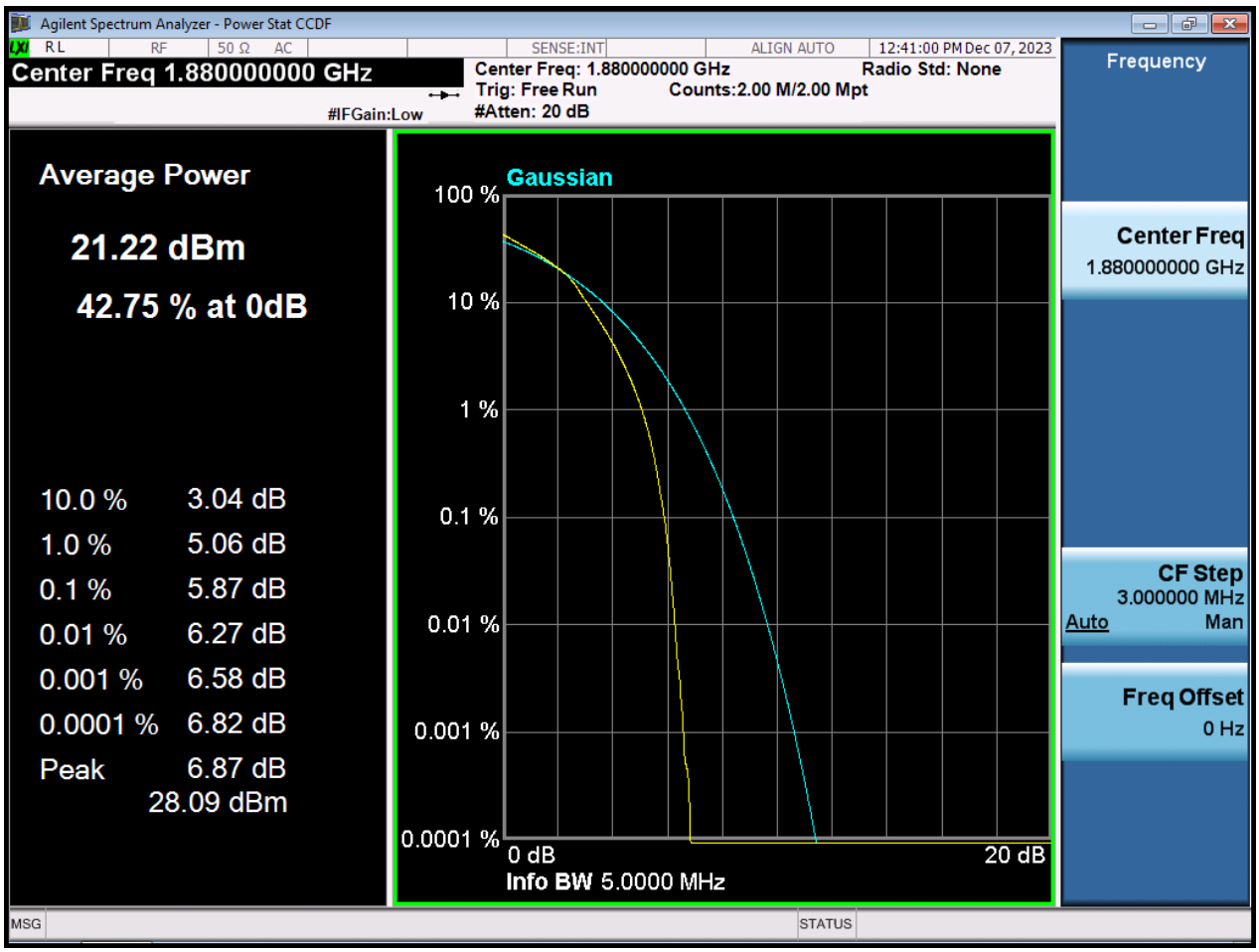
BW3 M_PAR_Middle Channel_256QAM_FullRB



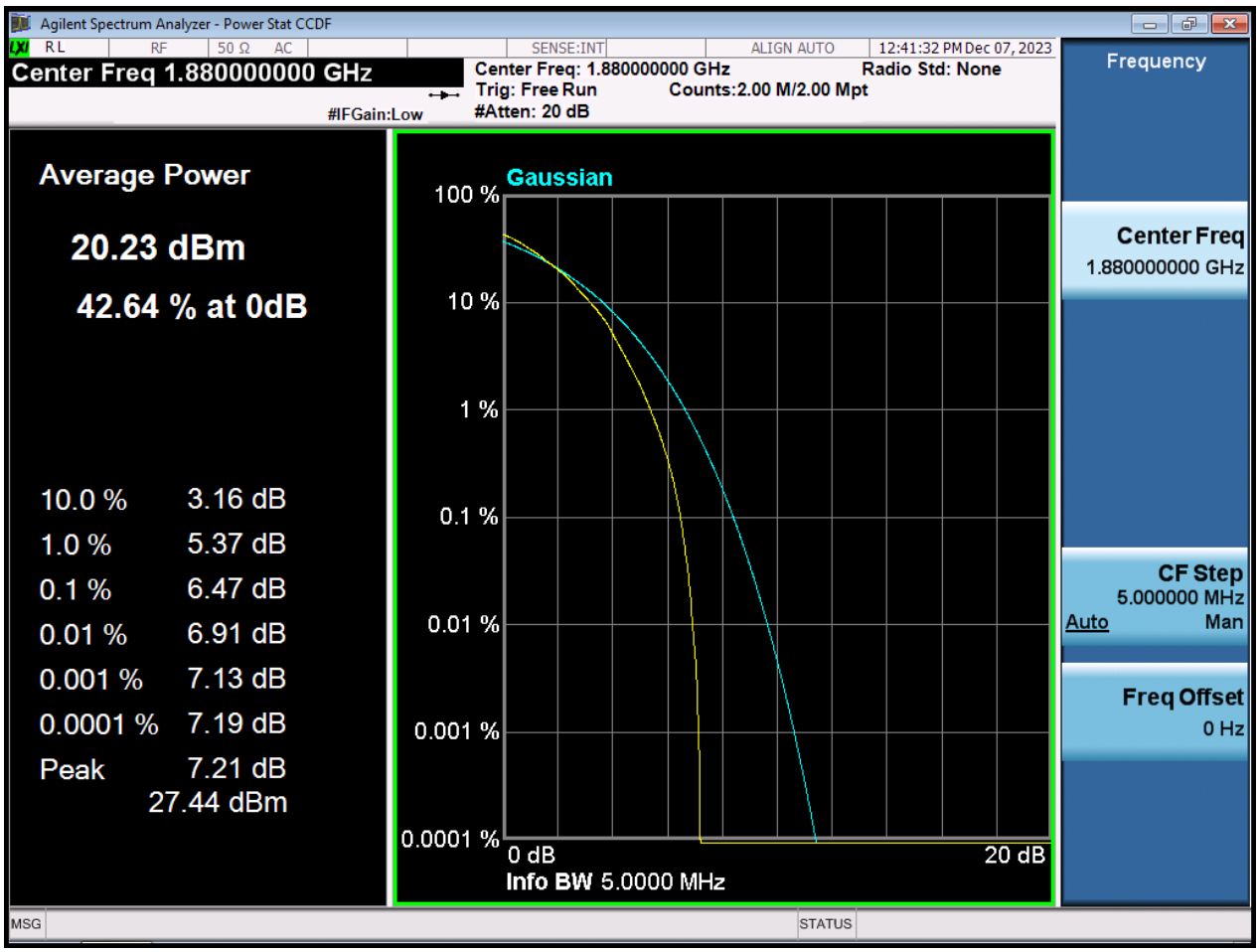
BW5 M_PAR_Middle Channel_QPSK_FullRB



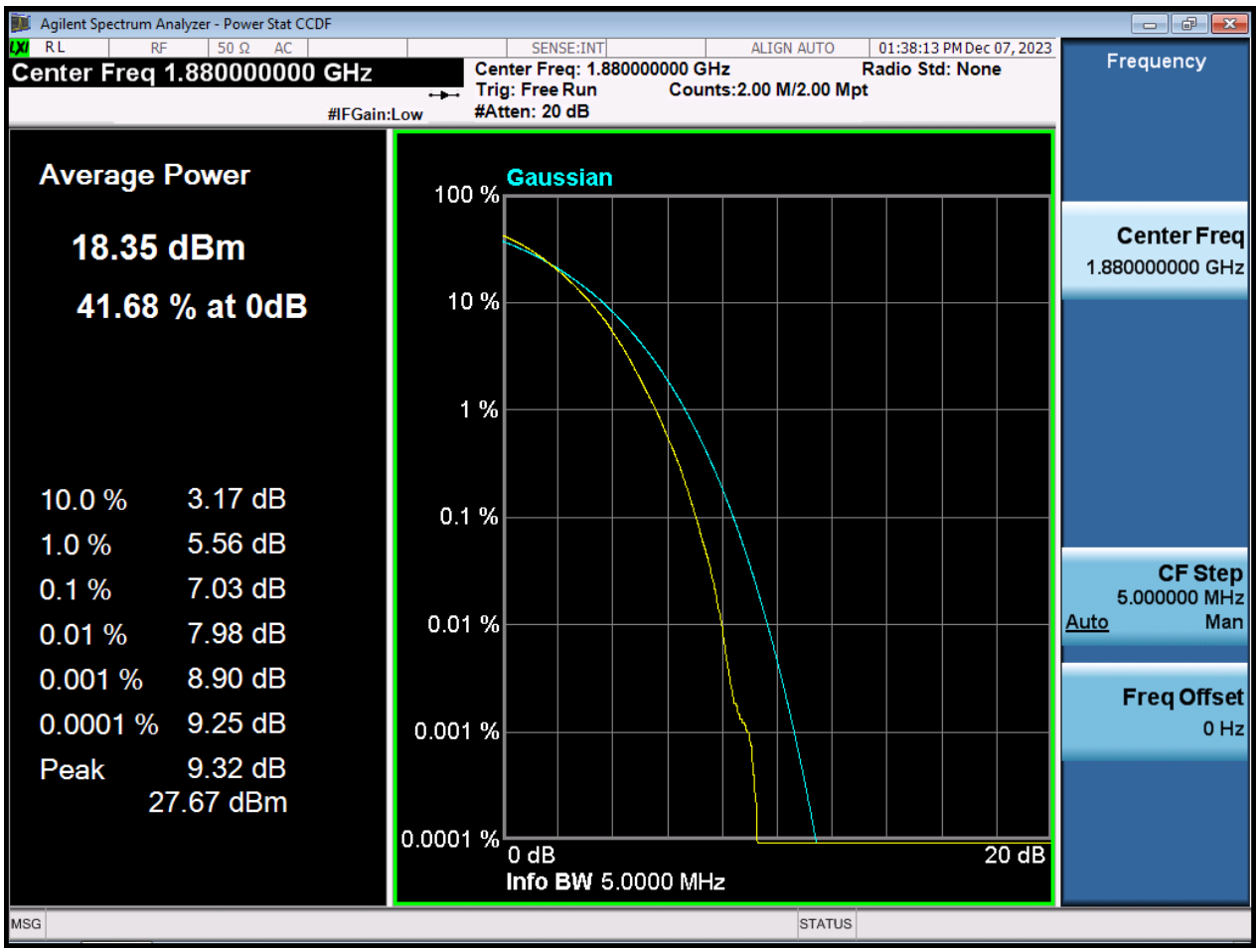
BW5 M_PAR_Middle Channel_16QAM_FullRB



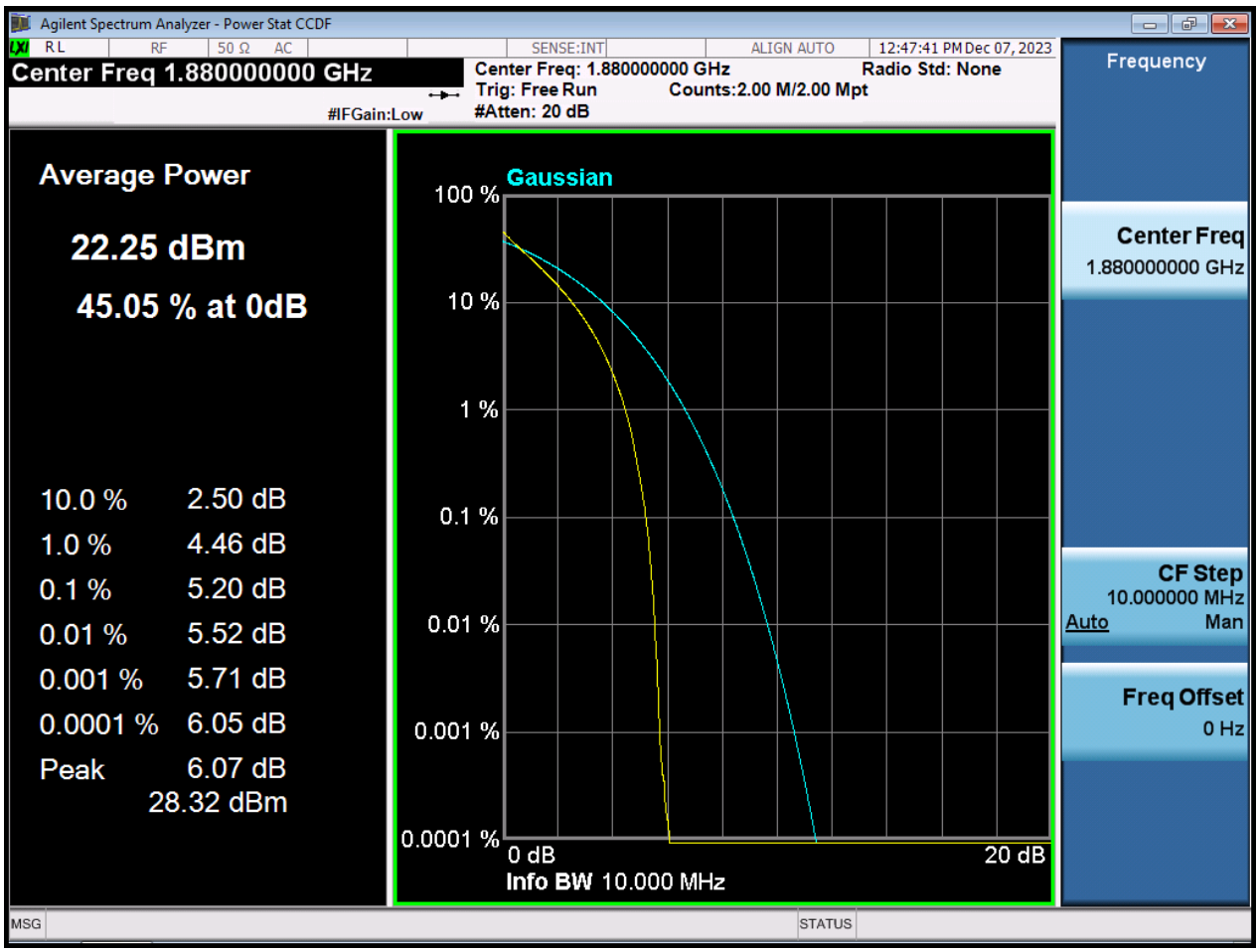
BW5 M_PAR_Middle Channel_64QAM_FullRB



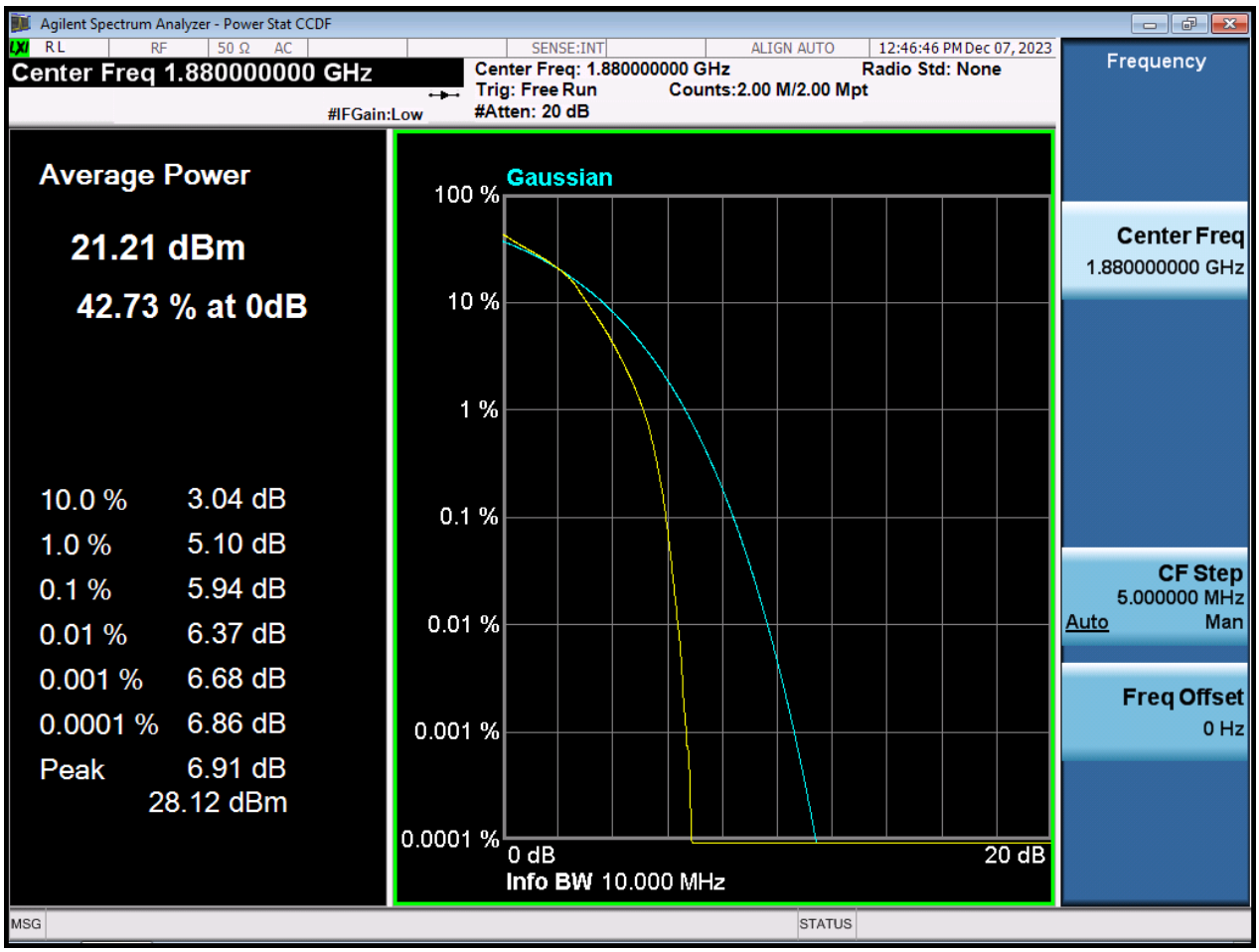
BW5 M_PAR_Middle Channel_256QAM_FullRB



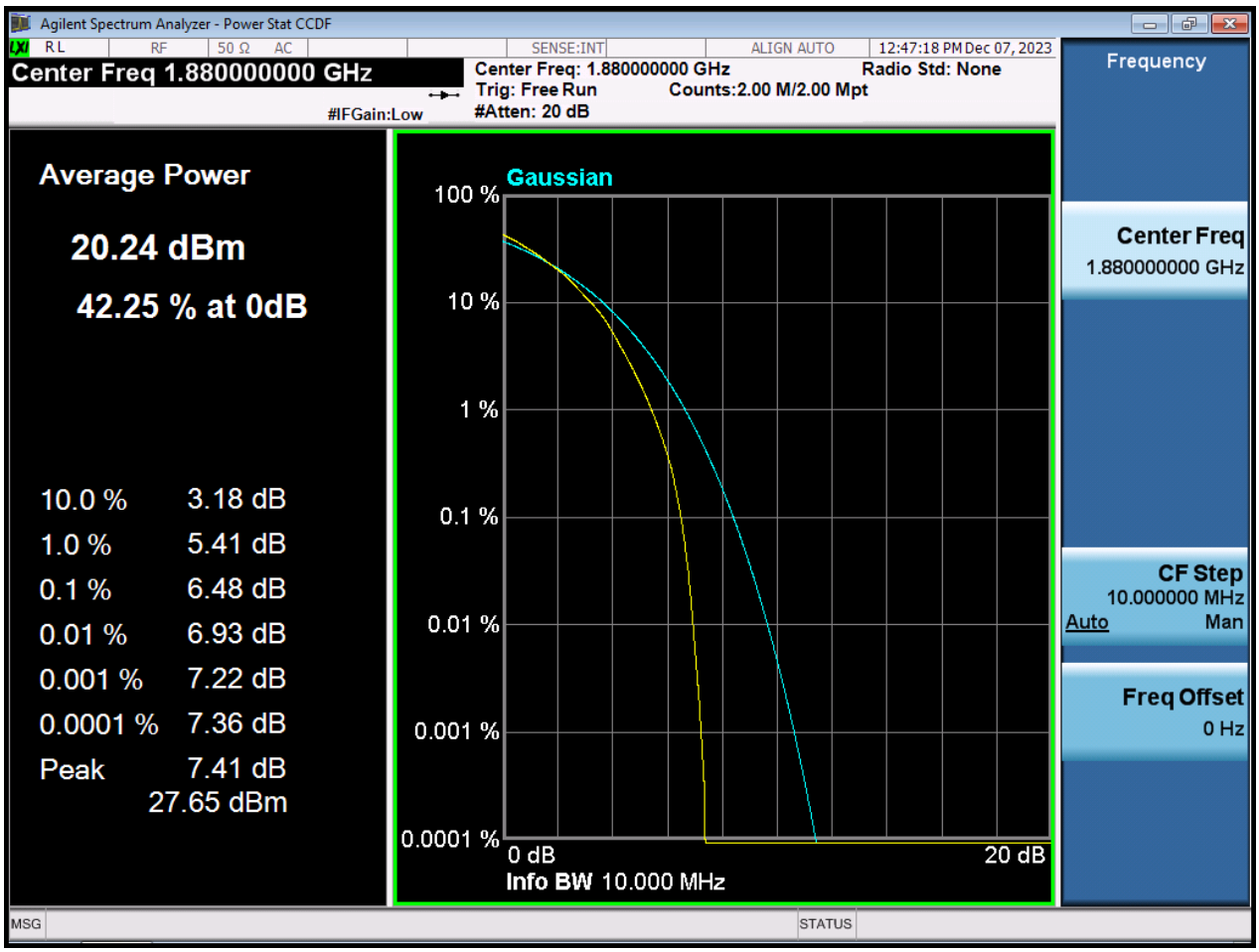
BW10 M_PAR_Middle Channelz_QPSK_FullRB



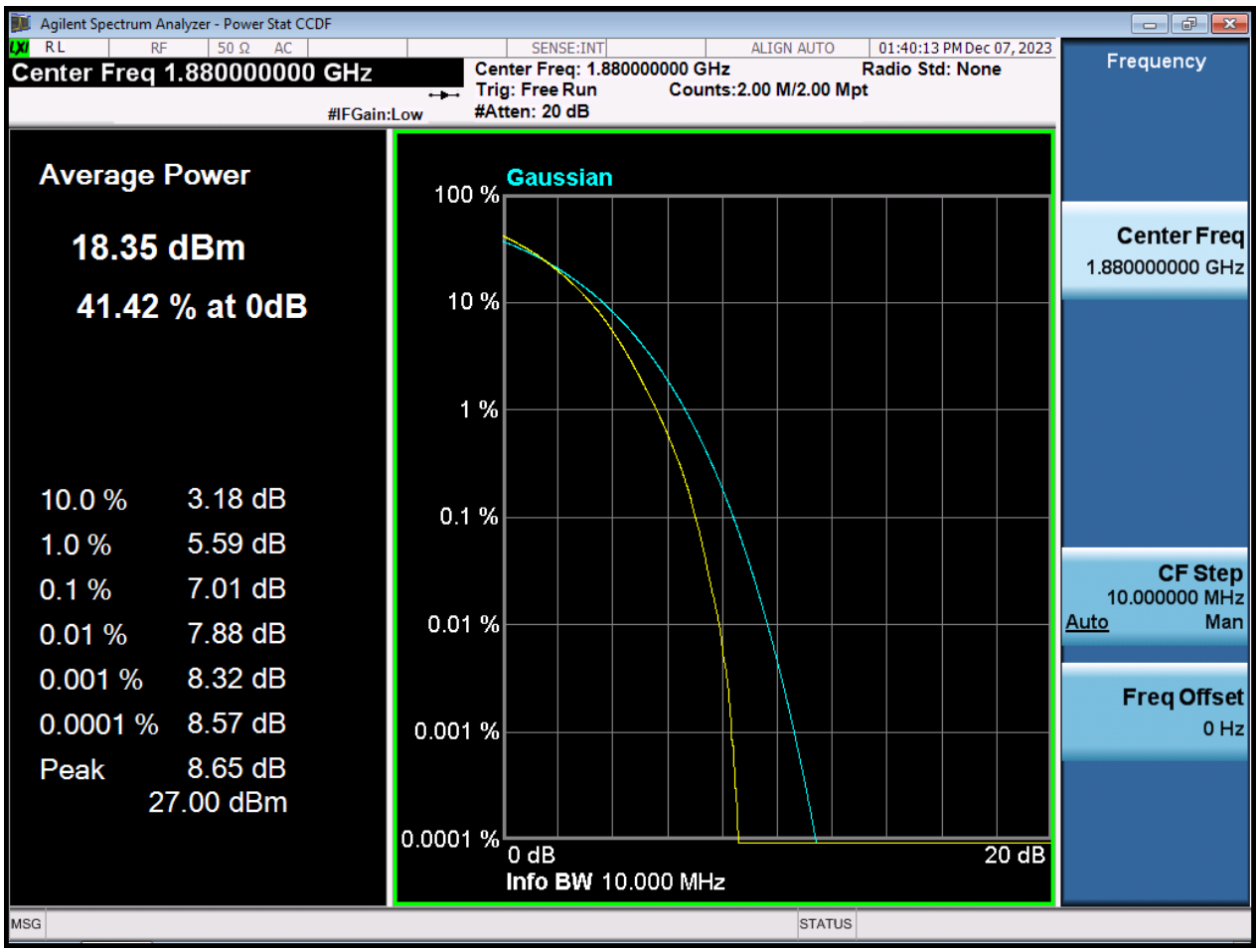
BW10 M_PAR_Middle Channel_16QAM_FullRB



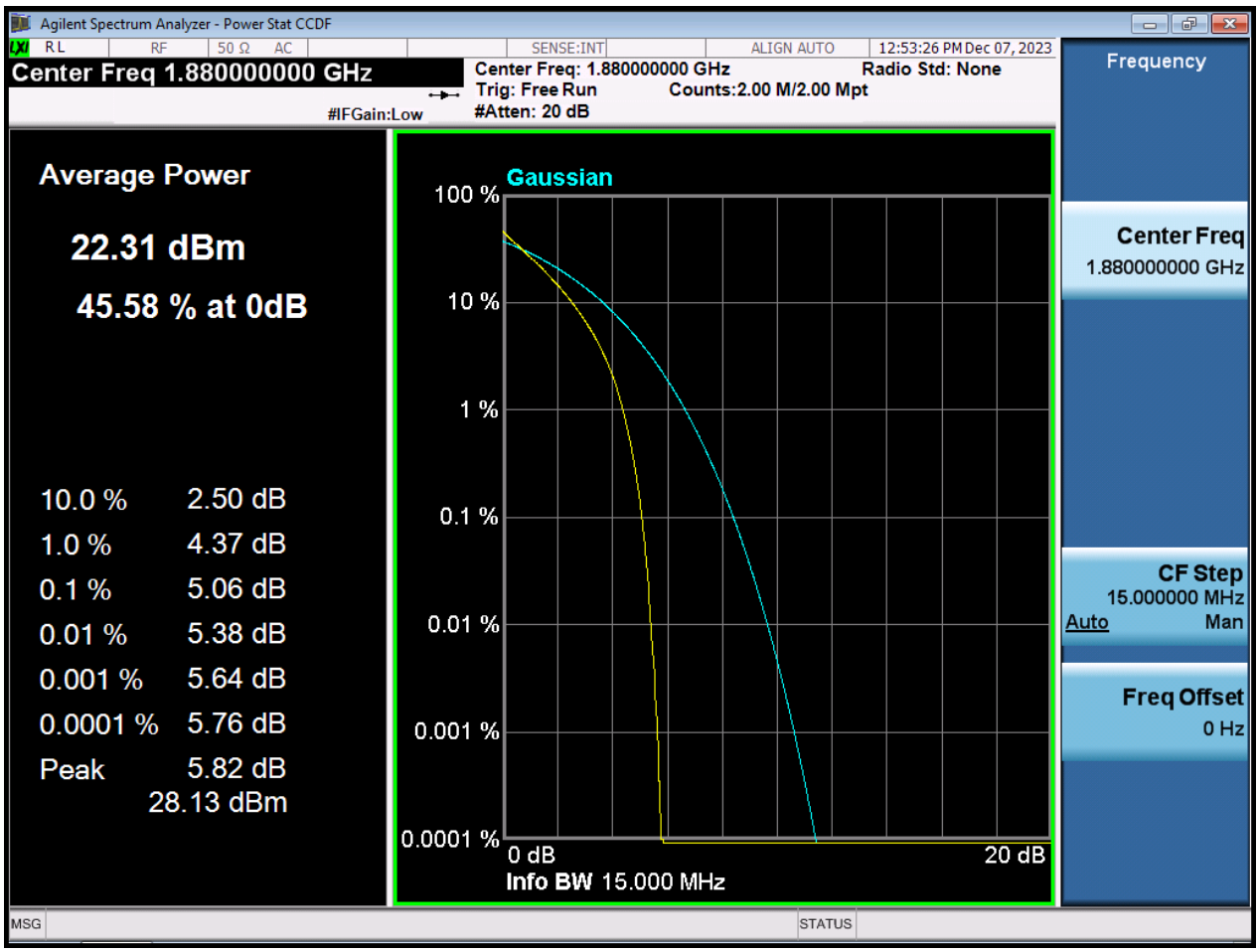
BW10 M_PAR_Middle Channel_64QAM_FullRB



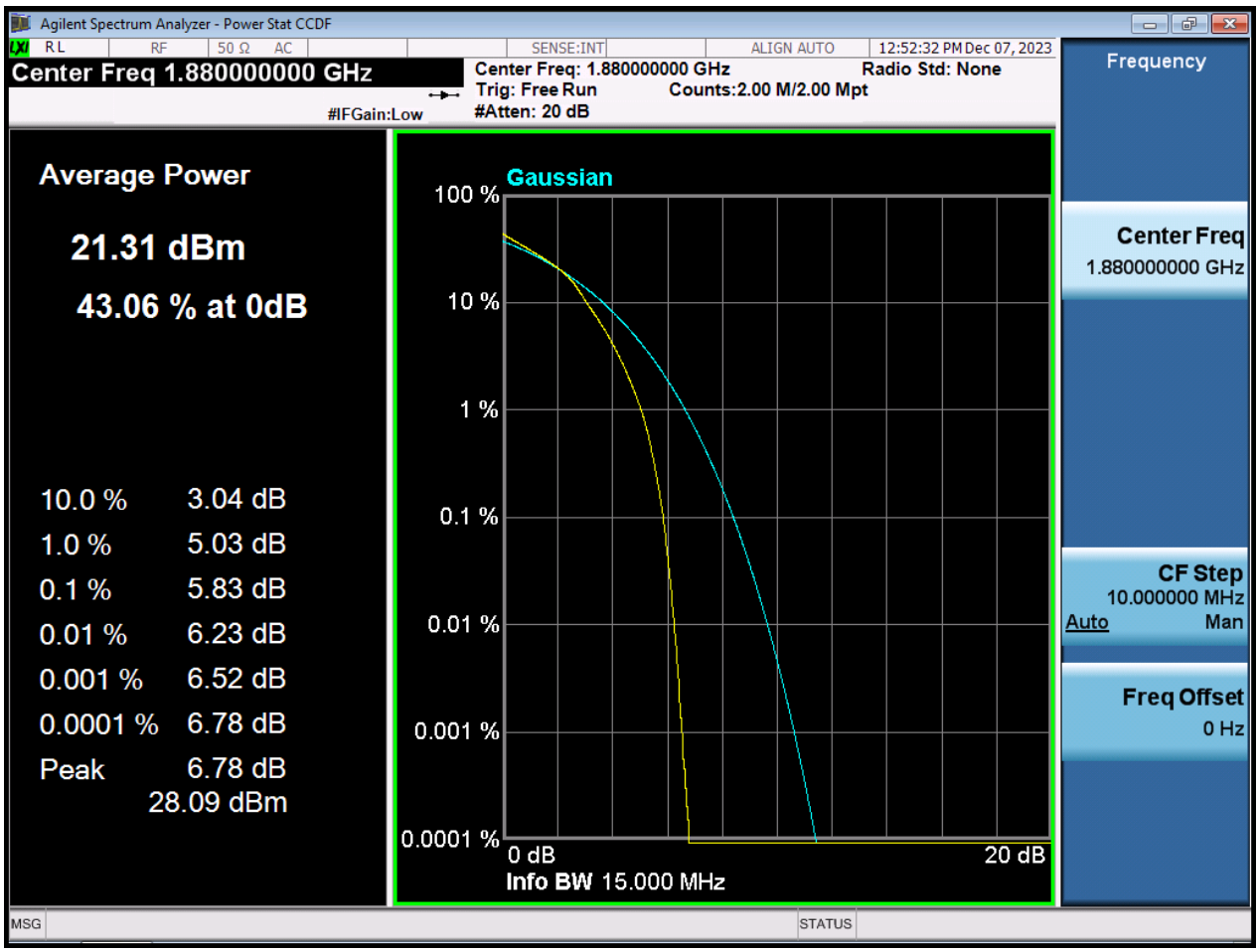
BW10 M_PAR_Middle Channel_256QAM_FullRB



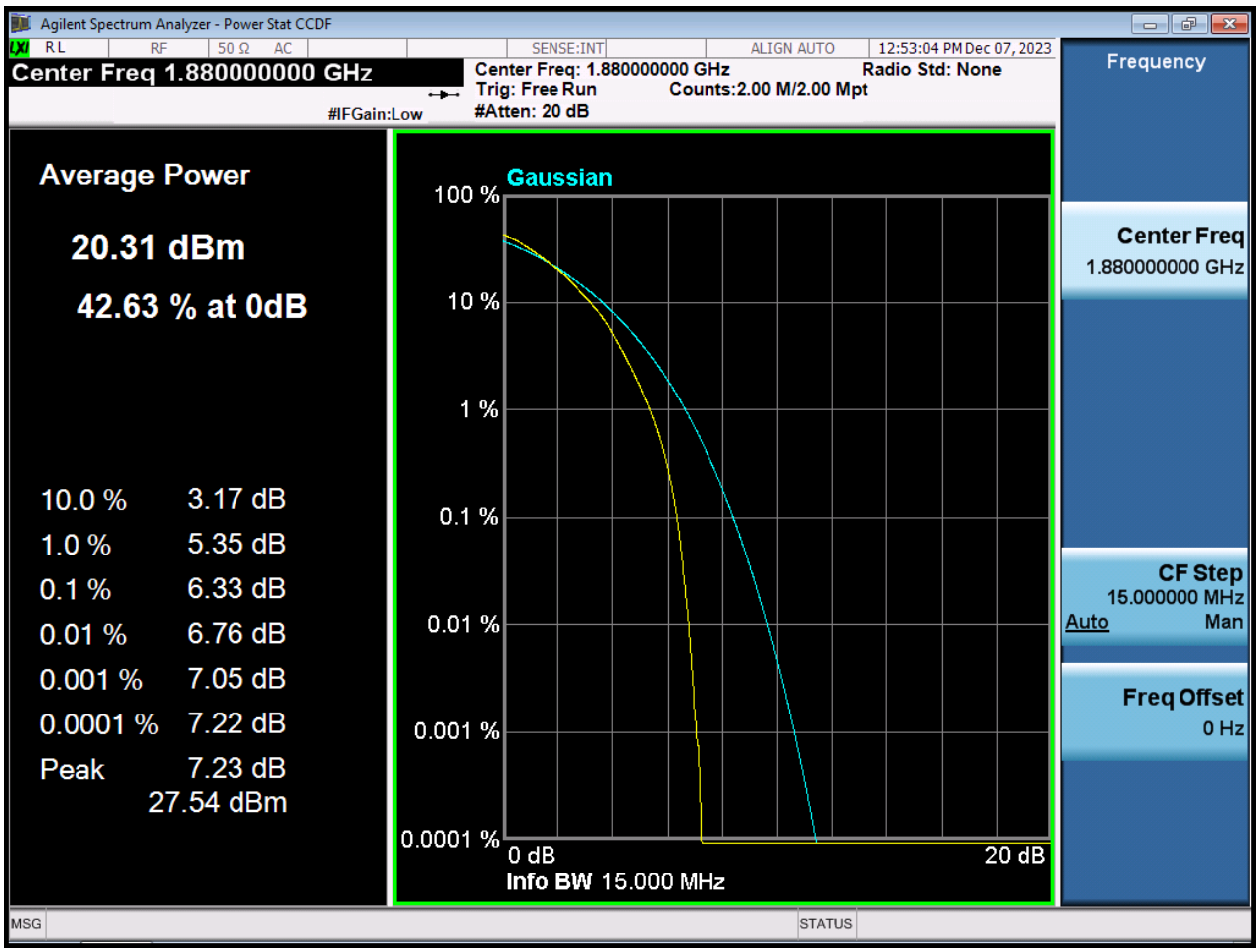
BW15 M_PAR_Middle Channel_QPSK_FullRB



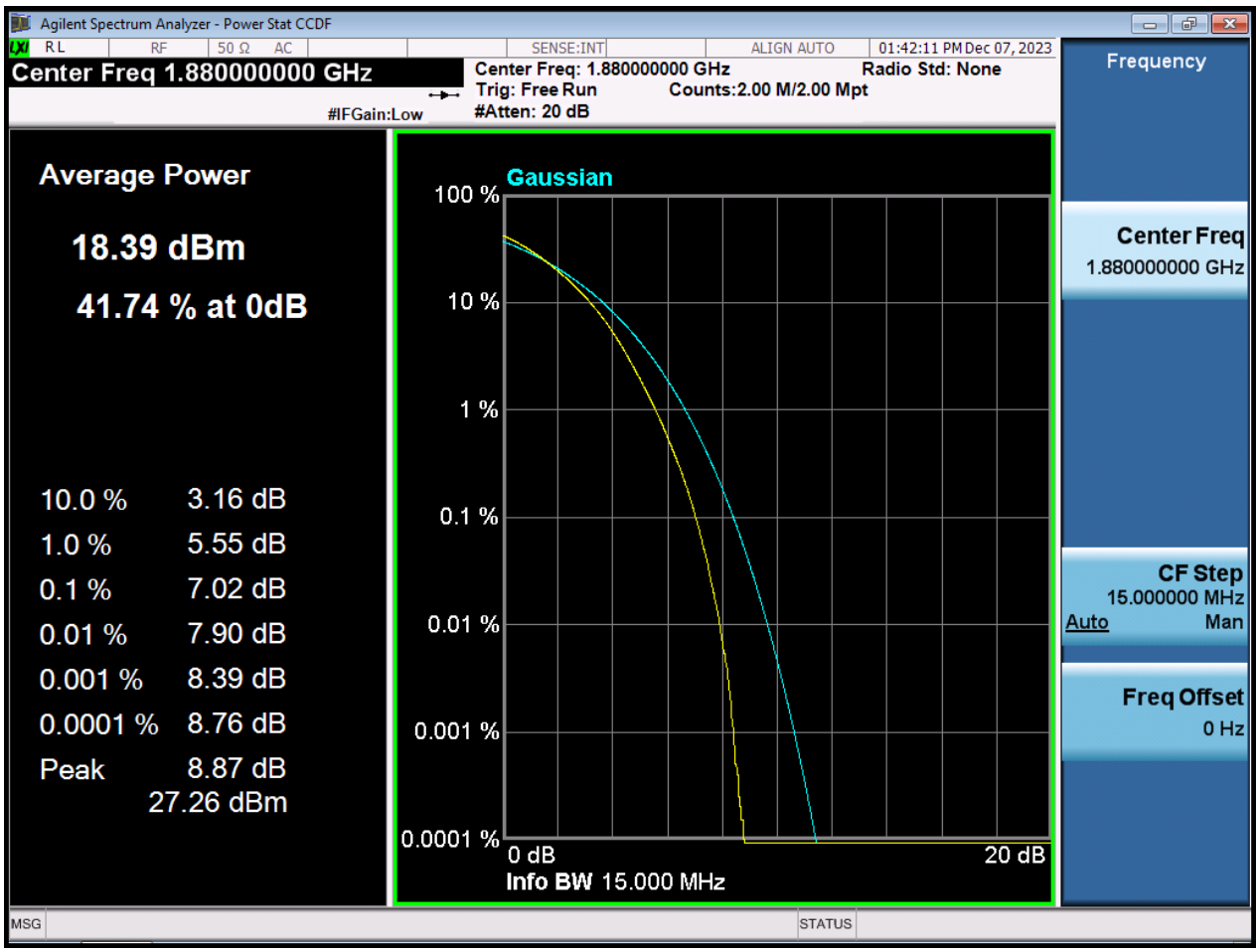
BW15 M_PAR_Middle Channel_16QAM_FullRB



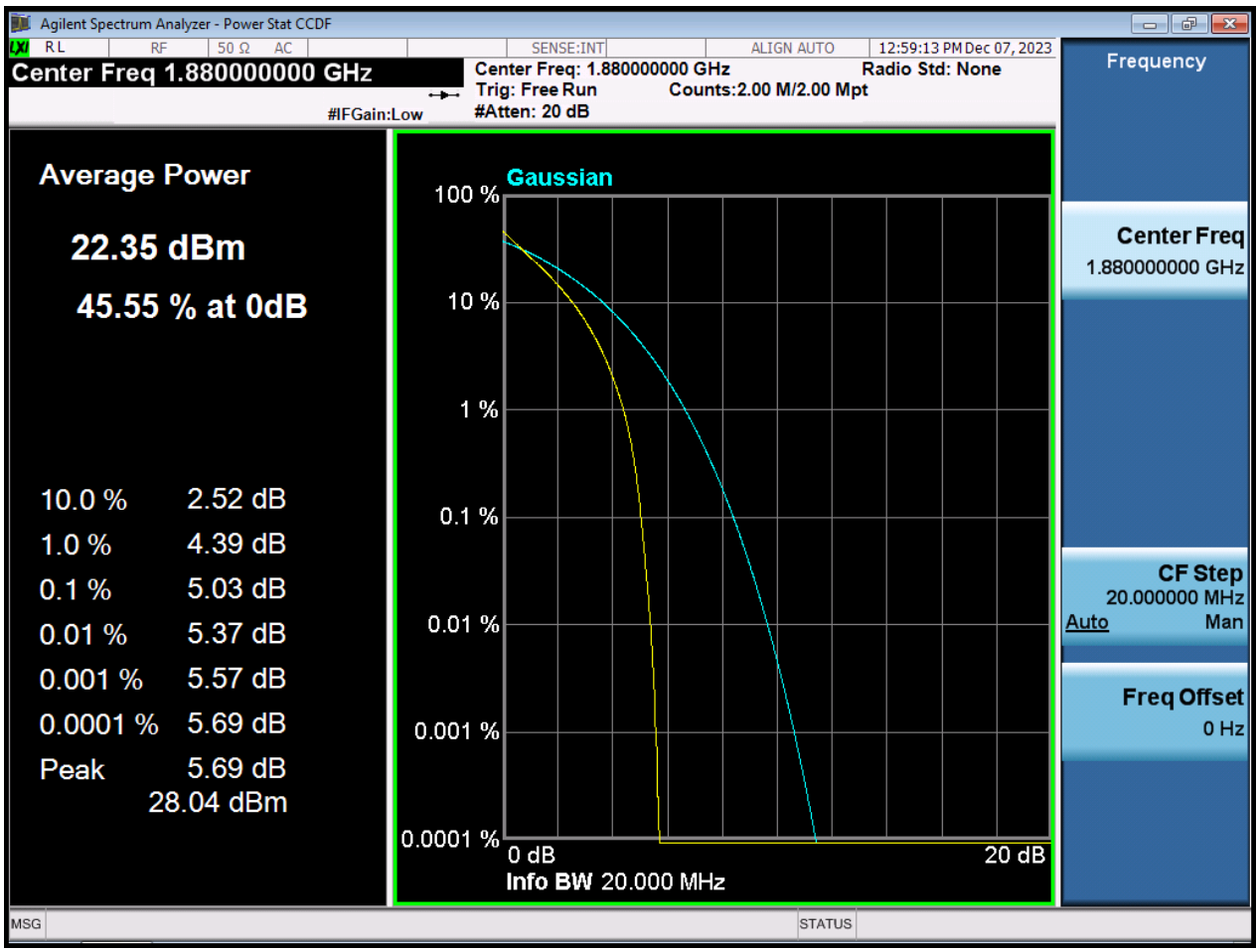
BW15 M_PAR_Middle Channel_64QAM_FullRB



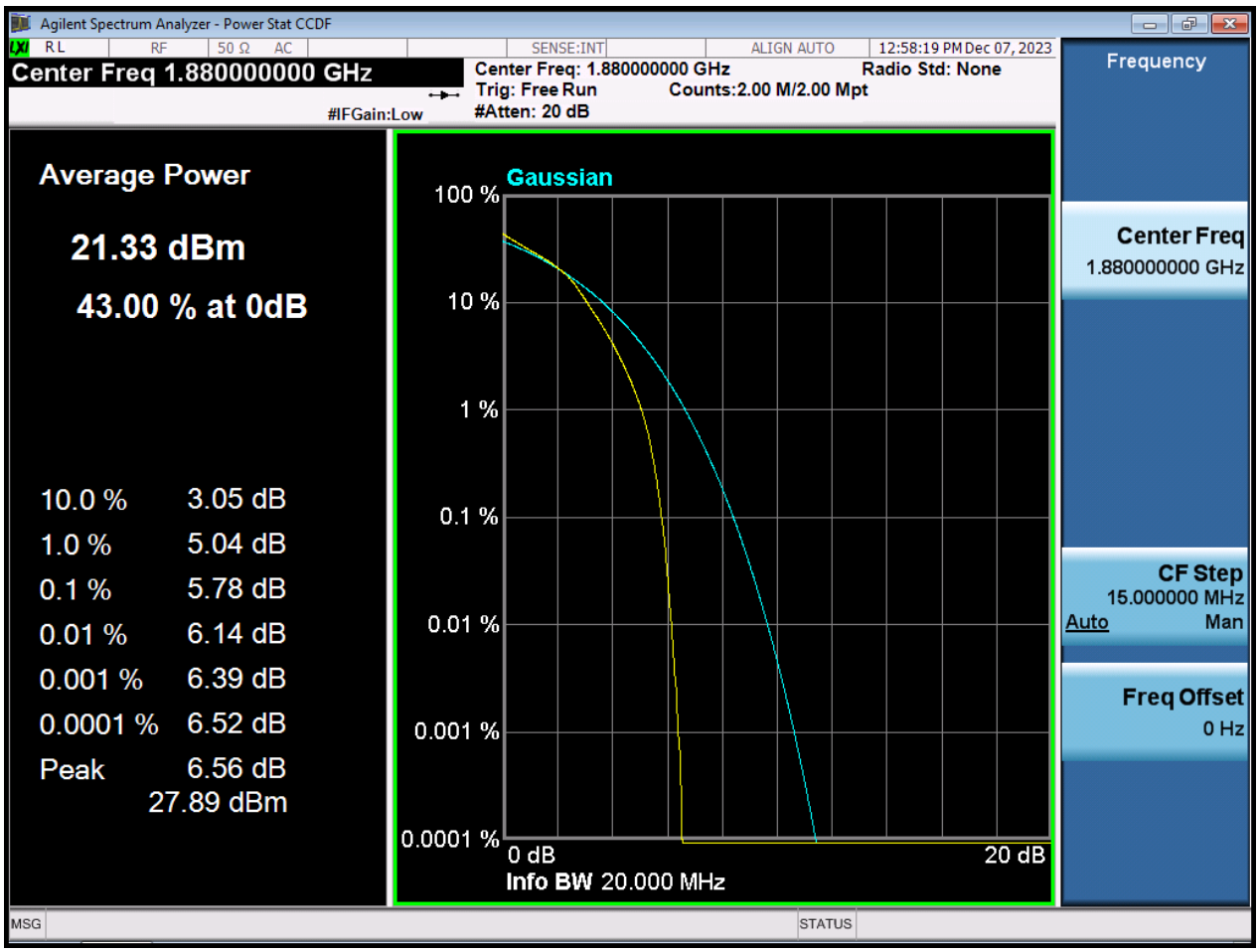
BW15 M_PAR_Middle Channel_256QAM_FullRB



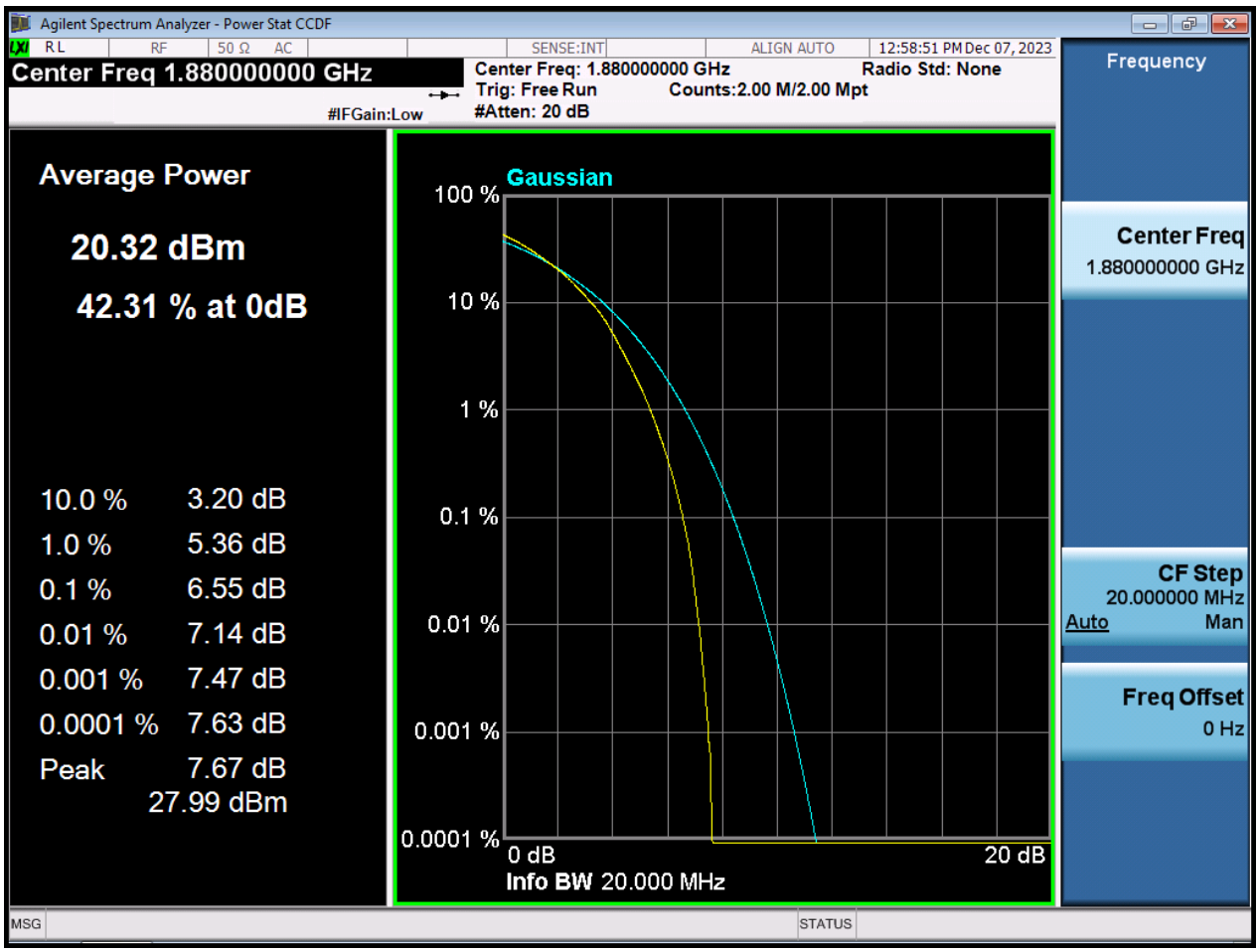
BW20 M_PAR_Middle Channel_QPSK_FullRB



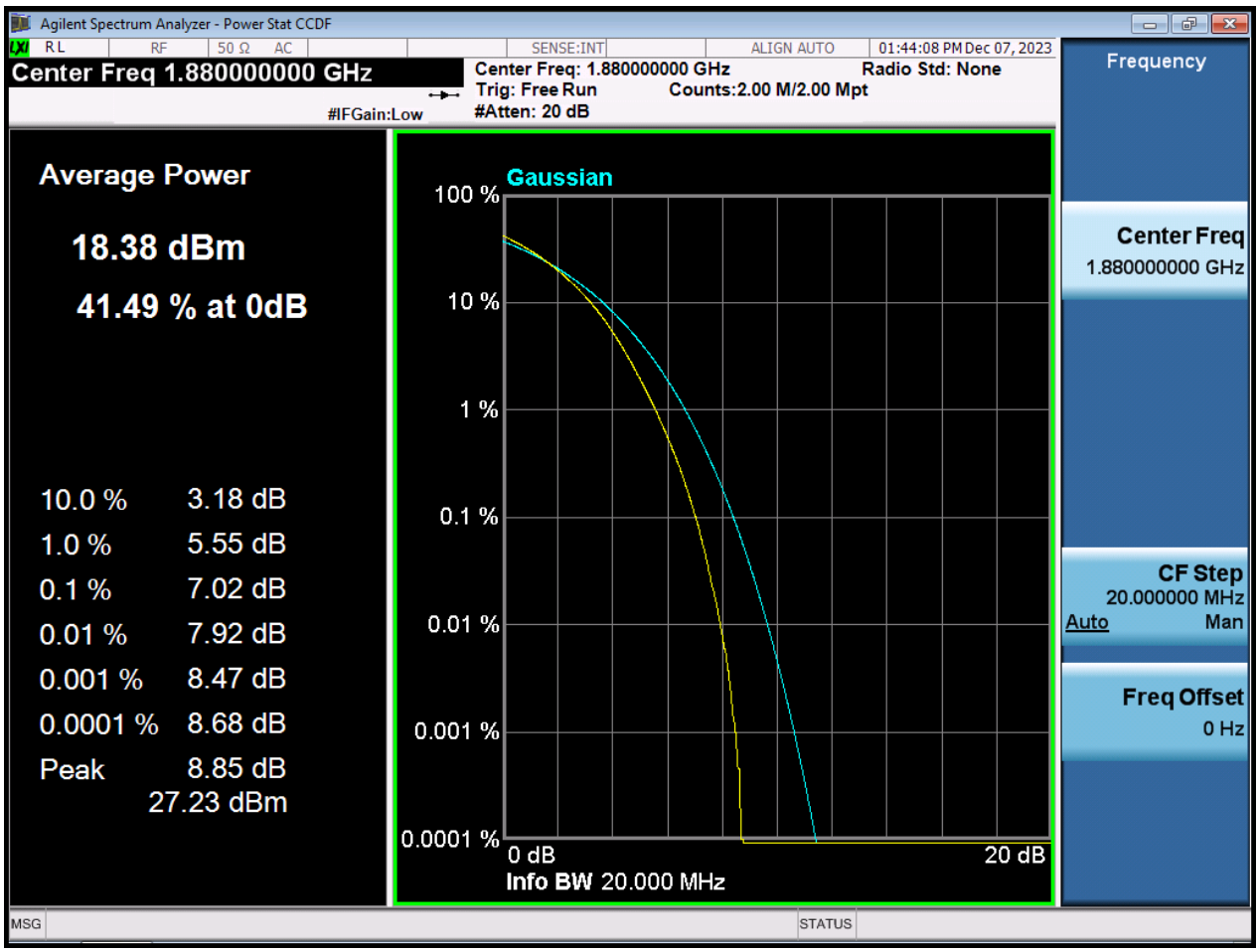
BW20 M_PAR_Middle Channel_16QAM_FullRB



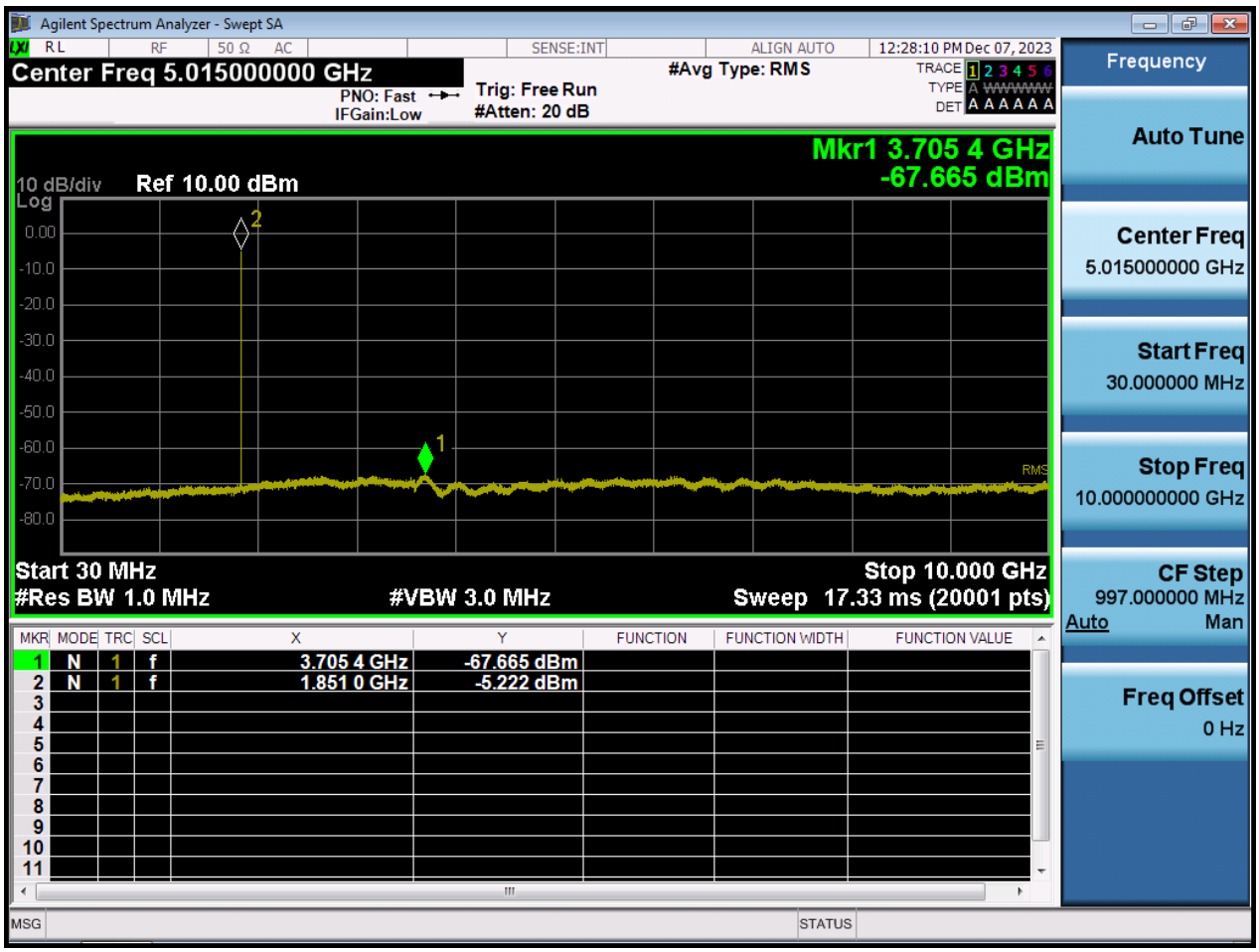
BW20 M_PAR_Middle Channel_64QAM_FullRB



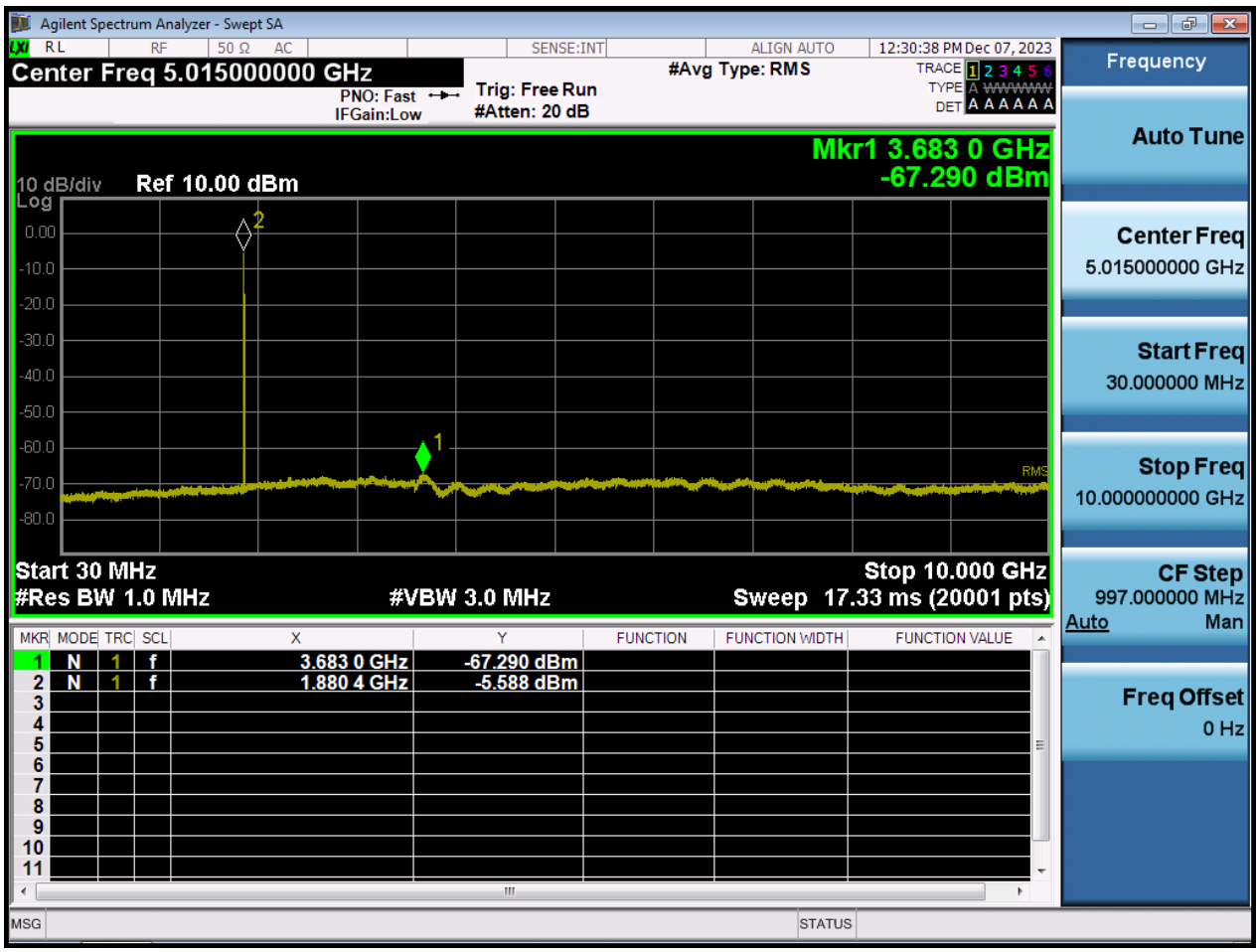
BW20 M_PAR_Middle Channel_256QAM_FullRB



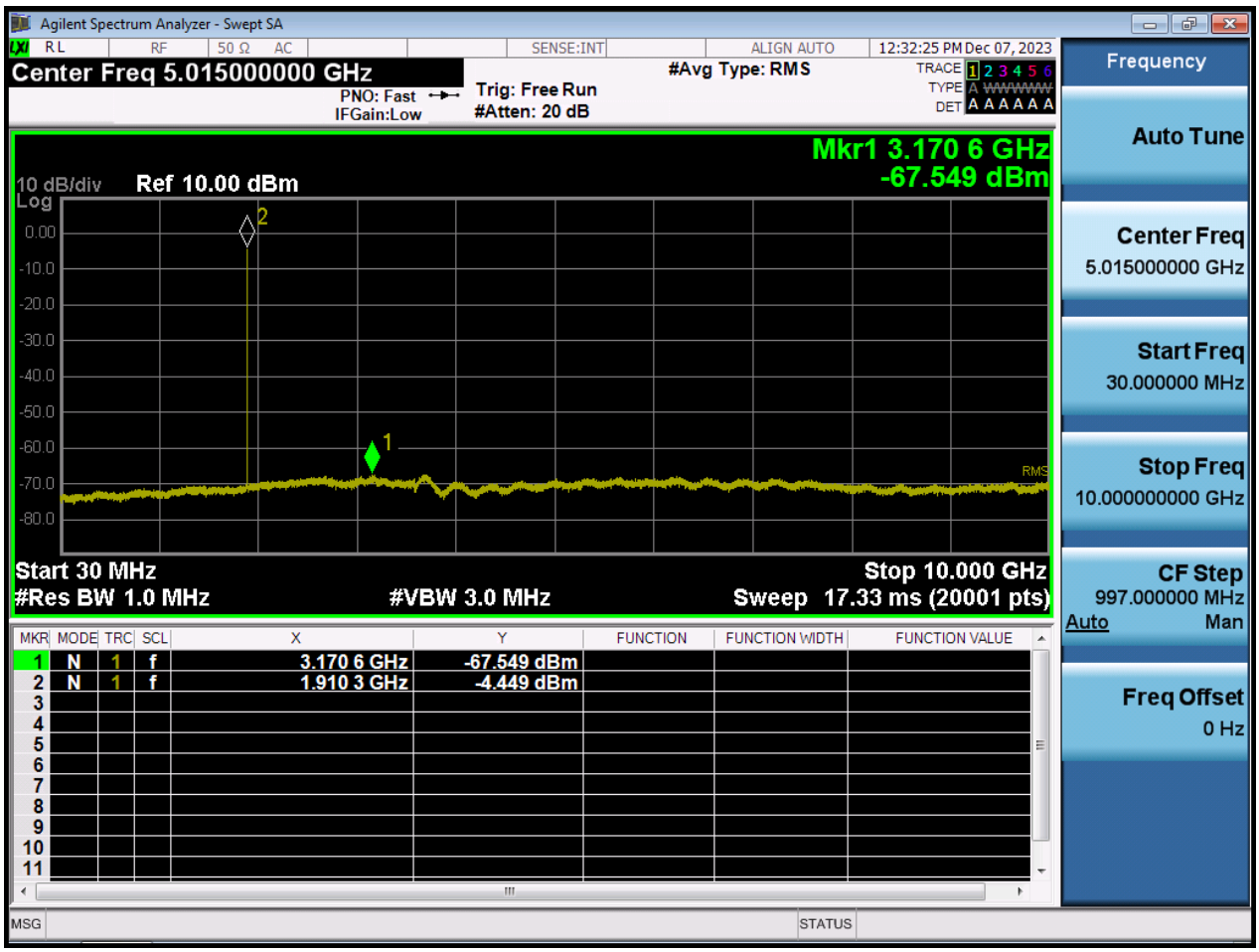
BW1.4 M_CSE(30 M-10 G)_Lowest Channel_QPSK_1RB



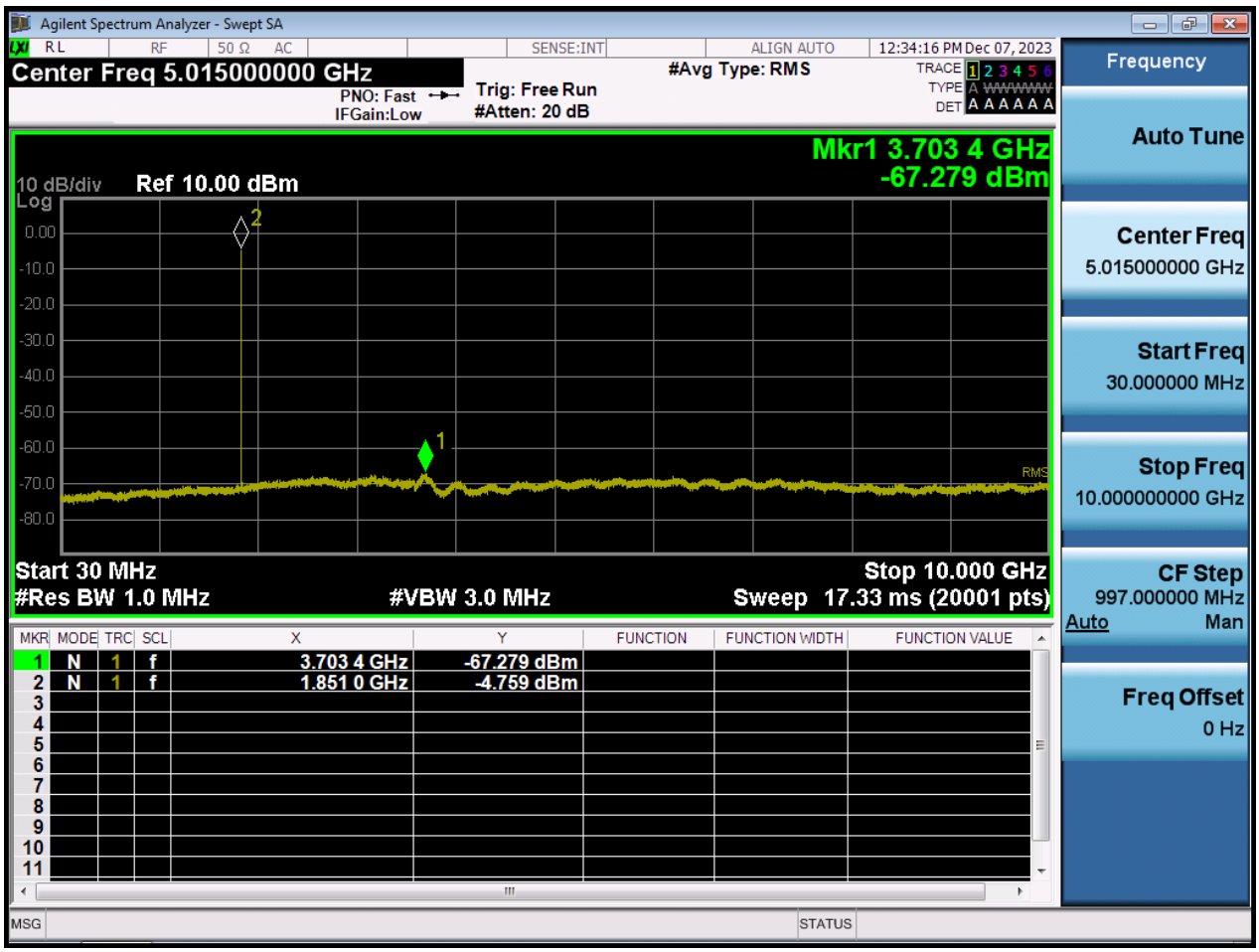
BW1.4 M_CSE(30 M-10 G)_Middle Channel_QPSK_1RB



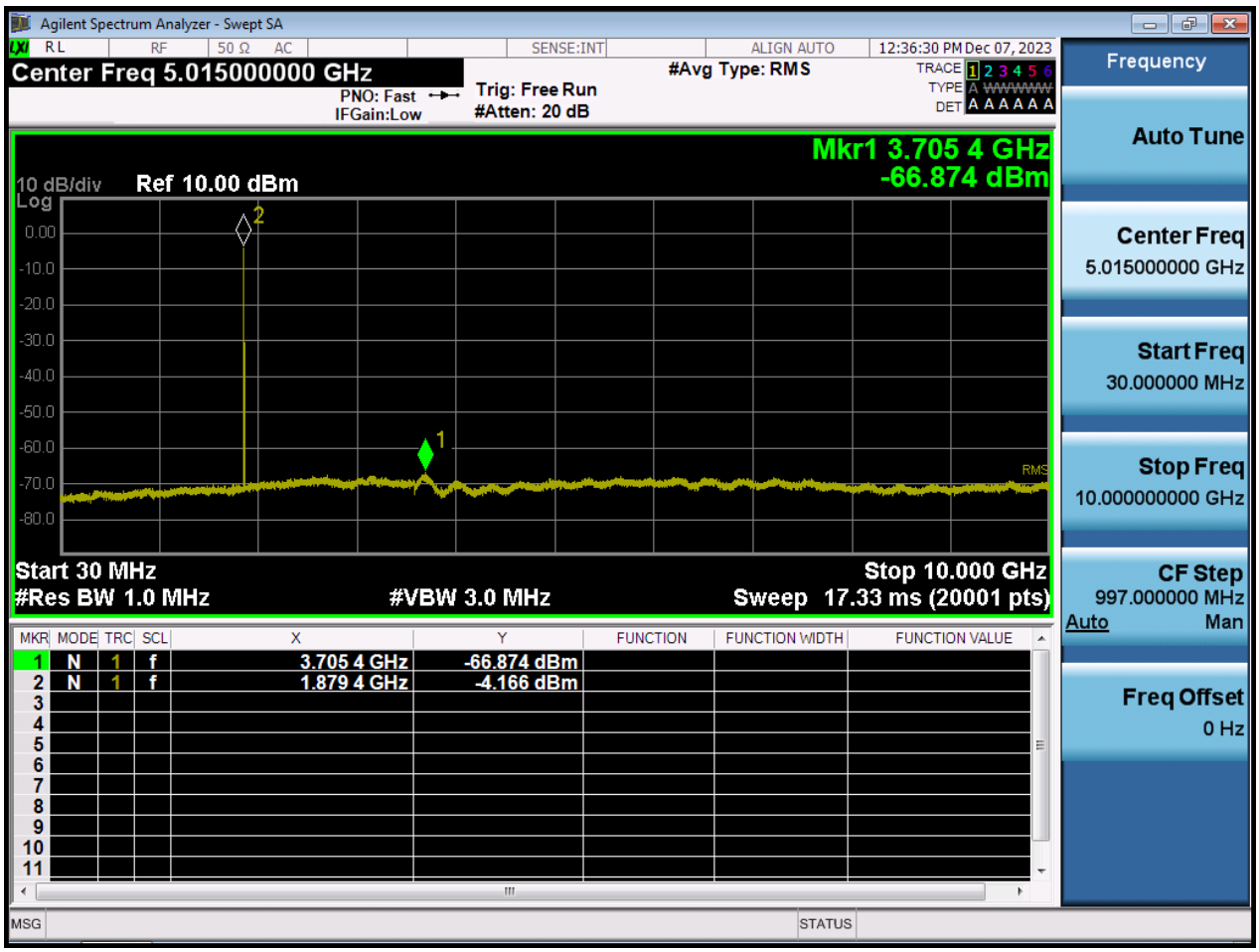
BW1.4 M_CSE(30 M-10 G)_Highest Channel_QPSK_1RB



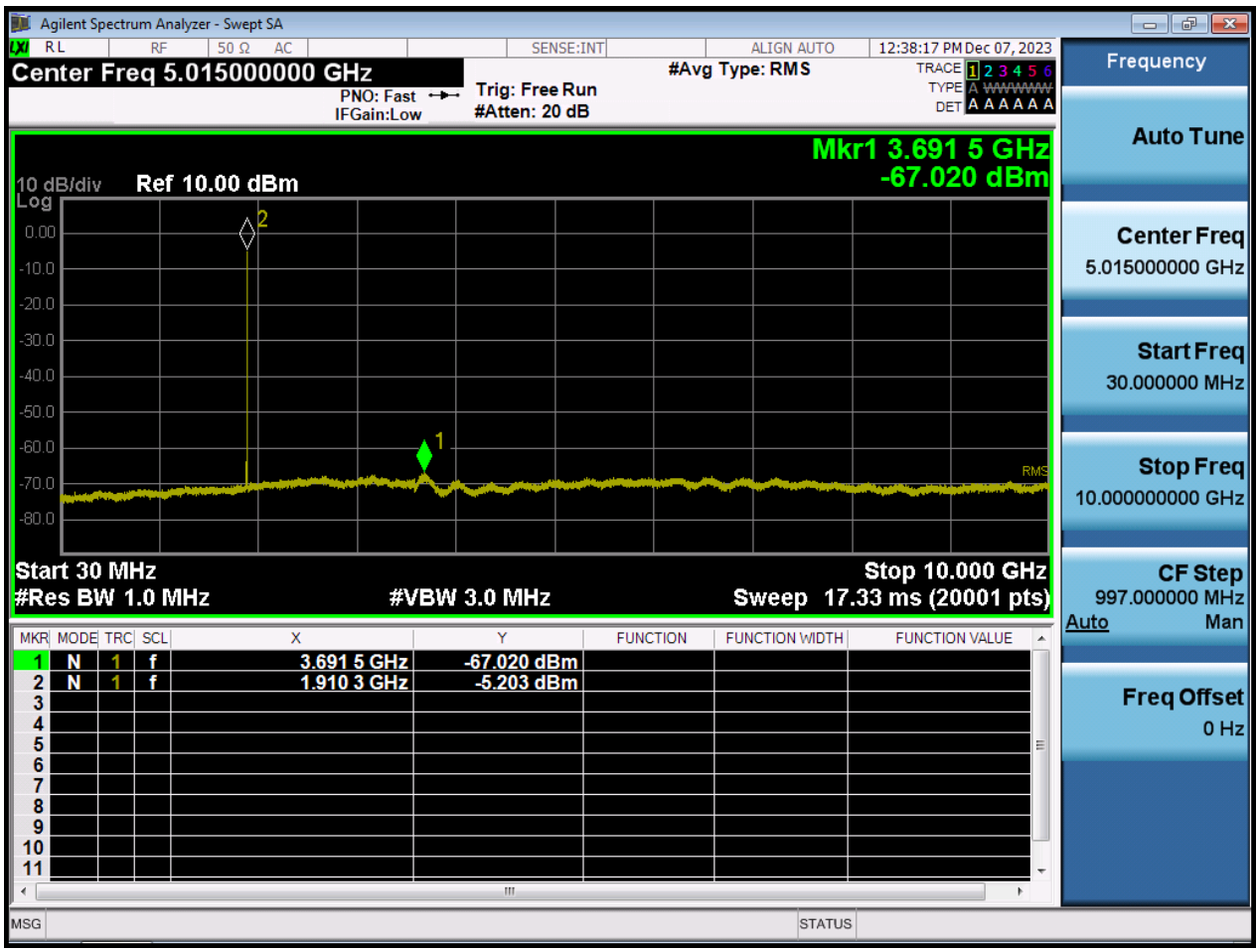
BW3 M_CSE(30 M-10 G)_Lowest Channel_QPSK_1RB



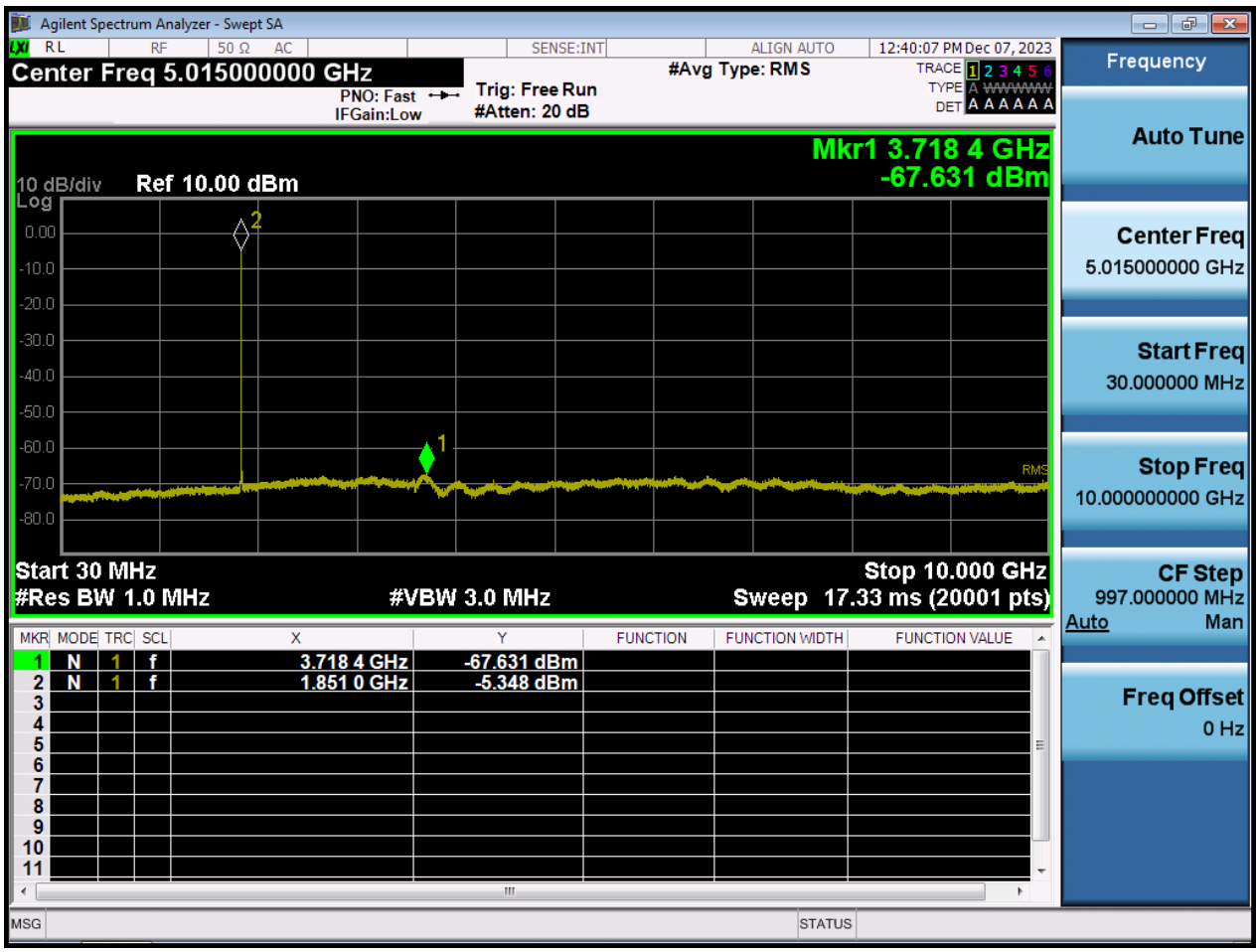
BW3 M_CSE(30 M-10 G)_Middle Channel_QPSK_1RB



BW3 M_CSE(30 M-10 G)_Highest Channel_QPSK_1RB



BW5 M_CSE(30 M-10 G)_Lowest Channel_QPSK_1RB



BW5 M_CSE(30 M-10 G)_Middle Channel_QPSK_1RB