

# FCC LTE REPORT

## Certification

**Applicant Name:**  
 SAMSUNG Electronics Co., Ltd.

**Date of Issue:**  
 April 20, 2022

**Address:**  
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 Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

**Location:**  
 HCT CO., LTD.,  
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 Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA

**Report No.:** HCT-RF-2204-FC010

**FCC ID:** A3LSMM135M

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

Model(s): SM-M135 M/DS  
 EUT Type: Mobile phone  
 FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)  
 FCC Rule Part(s): §24, §2

Mode (MHz)	Tx Frequency (MHz)	Emission Designator	Modulation	EIRP	
				Max. Power (W)	Max. Power (dBm)
LTE – Band2 (1.4)	1850.7 - 1909.3	1 M10 G7D	QPSK	0.200	23.02
		1 M10W7D	16QAM	0.147	21.68
LTE – Band2 (3)	1851.5 - 1908.5	2 M71G7D	QPSK	0.201	23.04
		2 M73W7D	16QAM	0.150	21.75
LTE – Band2 (5)	1852.5 - 1907.5	4 M52G7D	QPSK	0.200	23.02
		4 M51W7D	16QAM	0.147	21.68
LTE – Band2 (10)	1855.0 - 1905.0	9 M01G7D	QPSK	0.196	22.92
		9 M03W7D	16QAM	0.141	21.50
LTE – Band2 (15)	1857.5 - 1902.5	13 M5 G7D	QPSK	0.192	22.84
		13 M5W7D	16QAM	0.139	21.42
LTE – Band2 (20)	1860.0 - 1900.0	18 M0 G7D	QPSK	0.185	22.68
		17 M9W7D	16QAM	0.135	21.31

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

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

Report No.: HCT-RF-2204-FC010

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REVIEWED BY



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

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

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

This laboratory is not accredited for the test results marked \*.

The above Test Report is the accredited test result by (KS Q) ISO/IEC 17025 and KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA. (HCT Accreditation No.: KT197)

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## Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2204-FC010	April 20, 2022	- First Approval Report

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

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# MEASUREMENT REPORT

## 1. GENERAL INFORMATION

<b>Applicant Name:</b>	SAMSUNG Electronics Co., Ltd.
<b>Address:</b>	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
<b>FCC ID:</b>	A3LSMM135M
<b>Application Type:</b>	Certification
<b>FCC Classification:</b>	PCS Licensed Transmitter Held to Ear (PCE)
<b>FCC Rule Part(s):</b>	§24, §2
<b>EUT Type:</b>	Mobile phone
<b>Model(s):</b>	SM-M135M/DS
<b>Tx Frequency:</b>	1850.7 MHz – 1909.3 MHz (LTE – Band2 (1.4 MHz)) 1851.5 MHz – 1908.5 MHz (LTE – Band2 (3 MHz)) 1852.5 MHz – 1907.5 MHz (LTE – Band2 (5 MHz)) 1855.0 MHz – 1905.0 MHz (LTE – Band2 (10 MHz)) 1857.5 MHz – 1902.5 MHz (LTE – Band2 (15 MHz)) 1860.0 MHz – 1900.0 MHz (LTE – Band2 (20 MHz))
<b>Date(s) of Tests:</b>	March 18, 2022 ~ April 19, 2022
<b>Serial number:</b>	Radiated: R38T20052 MB Conducted: R38T200531E

## **2. INTRODUCTION**

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

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

It also supports IEEE 802.11 a/b/g/n/ac (20/40/80), Bluetooth, BT LE.

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

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

### **2.3. TEST FACILITY**

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

### 3. DESCRIPTION OF TESTS

#### 3.1 TEST PROCEDURE

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

## 3.2 RADIATED POWER

### Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

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

### Test Settings

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

$$P_d \text{ (dBm)} = P_g \text{ (dBm)} - \text{cable loss (dB)} + \text{antenna gain (dB)}$$

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

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

### 3.3 RADIATED SPURIOUS EMISSIONS

#### Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

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

#### Test Settings

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

#### Test Note

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

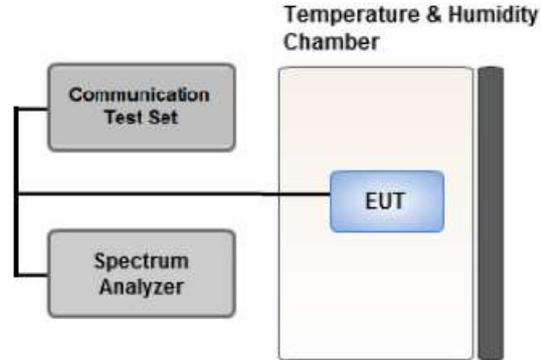
$$\text{Result}_{(\text{dBm})} = P_g_{(\text{dBm})} - \text{cable loss}_{(\text{dB})} + \text{antenna gain}_{(\text{dBi})}$$

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

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

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

### 3.4 PEAK- TO- AVERAGE RATIO



**Test setup**

#### ① CCDF Procedure for PAPR

##### **Test Settings**

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

**② Alternate Procedure for PAPR**

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

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

**Test Settings(Peak Power)**

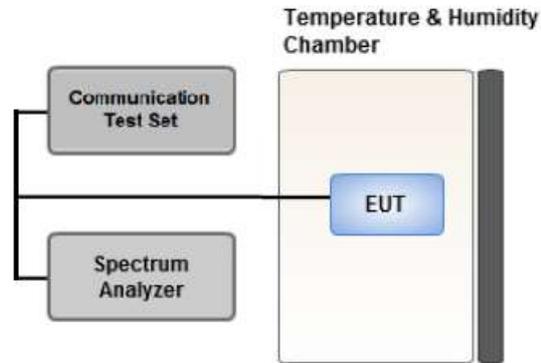
The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW  $\geq 3 \times$  RBW.

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

**Test Settings(Average Power)**

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

### 3.5 OCCUPIED BANDWIDTH.



**Test setup**

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

The EUT makes a call to the communication simulator.

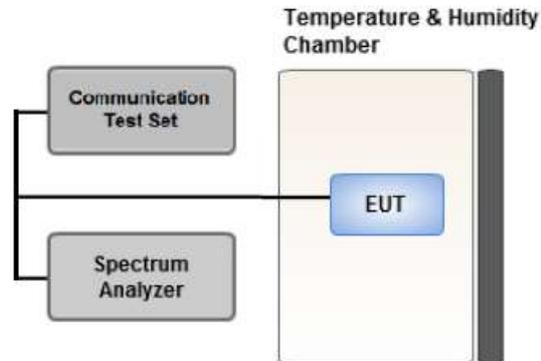
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

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

#### **Test Settings**

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99 % occupied bandwidth and the 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  $\geq$  3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5 % of the 99 % occupied bandwidth observed in Step 7

### 3.6 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL



**Test setup**

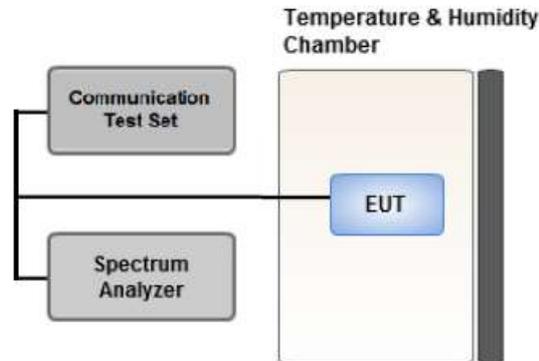
#### **Test Overview**

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

#### **Test Settings**

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

### 3.7 BAND EDGE



#### Test setup

#### Test Overview

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

#### Test Settings

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

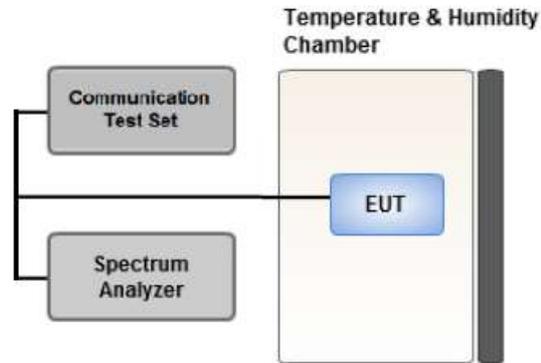
#### Test Notes

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

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

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

### 3.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE



**Test setup**

#### **Test Overview**

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

The frequency stability of the transmitter is measured by:

1. Temperature:

The temperature is varied from -30 °C to +50 °C in 10 °C increments using an environmental chamber.

2. Primary Supply Voltage:

- Unless otherwise specified, vary primary supply voltage from 85 % to 115 % of the nominal value for other than hand carried battery equipment.
- For hand carried, battery powered equipment, reduce the primary ac or dc supply voltage to the battery operating end point, which shall be specified by the manufacturer.

#### **Test Settings**

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

**3.9 WORST CASE(RADIATED TEST)**

- The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
- All modes of operation were investigated and the worst case configuration results are reported.  
 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. There has no significant emission raised.
- WWAN + UNII + BT (Worst case : Stand alone)
- In the case of radiated spurious emissions, all bandwidth of operation were investigated and the worst case bandwidth results are reported. (Worst case : 3 MHz)
- The worst case is reported with the EUT positioning, modulations, and paging service configurations shown in the test data.
- Please refer to the table below.

[ Worst case ]

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

**3.10 WORST CASE(CONDUCTED TEST)**

[ Worst case ]

Test Description	Modulation	Bandwidth (MHz)	Frequency	RB size	RB offset		
Occupied Bandwidth	QPSK, 16QAM	1.4, 3, 5, 10, 15, 20	Mid	Full RB	0		
Peak-To-Average Ratio	QPSK, 16QAM	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
H.P.F	FBSR-02B(WHK1.2/15 G-10EF)	T&M SYSTEM	-	02/18/2023	Annual
H.P.F	FBSR-02B(WHK3.3/18 G-10EF)	T&M SYSTEM	-	02/18/2023	Annual
Power Splitter(DC ~ 26.5 GHz)	11667B	Hewlett Packard	11275	03/11/2023	Annual
DC Power Supply	E3632A	Agilent	MY40010147	06/28/2022	Annual
Dipole Antenna	UHAP	Schwarzbeck	557	04/05/2023	Biennial
Dipole Antenna	UHAP	Schwarzbeck	558	04/05/2023	Biennial
Chamber	SU-642	ESPEC	93008124	03/04/2023	Annual
Horn Antenna(1 ~ 18 GHz)	BBHA 9120D	Schwarzbeck	147	08/30/2022	Biennial
Horn Antenna(1 ~ 18 GHz)	BBHA 9120D	Schwarzbeck	9120D-1298	09/15/2023	Biennial
Horn Antenna(15 ~ 40 GHz)	BBHA 9170	Schwarzbeck	BBHA9170342	10/13/2022	Biennial
Horn Antenna(15 ~ 40 GHz)	BBHA 9170	Schwarzbeck	BBHA9170124	04/12/2023	Biennial
Signal Analyzer(10 Hz ~ 26.5 GHz)	N9020A	Agilent	MY52090906	05/18/2022	Annual
ATTENUATOR(20 dB)	8493C	Hewlett Packard	17280	06/01/2022	Annual
Spectrum Analyzer(10 Hz ~ 40 GHz)	FSV40	REOHDE & SCHWARZ	100931	09/29/2022	Annual
Base Station	8960 (E5515C)	Agilent	MY48360800	08/18/2022	Annual
Loop Antenna(9 kHz ~ 30 MHz)	FMZB1513	Schwarzbeck	1513-333	03/17/2024	Biennial
Bilog Antenna	VULB9160	Schwarzbeck	3150	03/03/2023	Biennial
Hybrid Antenna	VULB9168	Schwarzbeck	760	02/22/2023	Biennial
Wideband Radio Communication Tester	MT8821C	Anritsu Corp.	6262116770	07/12/2022	Annual
Wideband Radio Communication Tester	MT8820C	Anritsu Corp.	6200863156	12/29/2022	Annual
SIGNAL GENERATOR (100 kHz ~ 40 GHz)	SMB100A	REOHDE & SCHWARZ	177633	07/05/2022	Annual
Signal Analyzer(5 Hz ~ 40.0 GHz)	N9030B	KEYSIGHT	MY55480167	06/02/2022	Annual
FCC LTE Mobile Conducted RF Automation Test Software	-	HCT CO., LTD.,	-	-	-

**Note:**

1. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.
2. 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  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty ( $\pm$ dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	2.00 (Confidence level about 95 %, $k=2$ )
Radiated Disturbance (9 kHz ~ 30 MHz)	4.40 (Confidence level about 95 %, $k=2$ )
Radiated Disturbance (30 MHz ~ 1 GHz)	5.74 (Confidence level about 95 %, $k=2$ )
Radiated Disturbance (1 GHz ~ 18 GHz)	5.51 (Confidence level about 95 %, $k=2$ )
Radiated Disturbance (18 GHz ~ 40 GHz)	5.92 (Confidence level about 95 %, $k=2$ )
Radiated Disturbance (Above 40 GHz)	5.48 (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	<u>See Note1</u>
Peak- to- Average Ratio	§24.232(d)	< 13 dB	PASS
Frequency stability / variation of ambient temperature	§24.235	Emission must remain in band	PASS

**Note:**

1. See SAR Report

### 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 = 4 M17F9W**

WCDMA BW = 4.17 MHz

F = Frequency Modulation

9 = Composite Digital Info

W = Combination (Audio/Data)

#### QPSK Modulation

**Emission Designator = 4 M48 G7D**

LTE BW = 4.48 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

#### QAM Modulation

**Emission Designator = 4 M48W7D**

LTE BW = 4.48 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

## 8. TEST DATA

### 8.1 EQUIVALENT ISOTROPIC RADIATED POWER

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain (dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1850.7	LTE B2/ 1.4 MHz	QPSK	-19.85	13.80	10.40	2.11	V	< 2.00	0.162	22.09
		16-QAM	-21.26	12.39	10.40	2.11	V		0.117	20.68
1880.0		QPSK	-19.92	14.16	10.40	2.15	V		0.174	22.41
		16-QAM	-21.21	12.87	10.40	2.15	V		0.130	21.12
1909.3		QPSK	-19.53	14.77	10.40	2.15	V		0.200	23.02
		16-QAM	-20.87	13.43	10.40	2.15	V		0.147	21.68

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	-19.90	13.75	10.40	2.11	V	< 2.00	0.160	22.04
		16-QAM	-21.24	12.41	10.40	2.11	V		0.118	20.70
1880.0		QPSK	-19.96	14.12	10.40	2.15	V		0.173	22.37
		16-QAM	-21.30	12.78	10.40	2.15	V		0.127	21.03
1908.5		QPSK	-19.51	14.79	10.40	2.15	V		0.201	23.04
		16-QAM	-20.80	13.50	10.40	2.15	V		0.150	21.75

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain (dBi)	C.L	Pol	Limit	EIRP	
									W	W
1852.5	LTE B2/ 5 MHz	QPSK	-19.84	13.81	10.40	2.11	V	< 2.00	0.162	22.10
		16-QAM	-21.21	12.44	10.40	2.11	V		0.118	20.73
1880.0		QPSK	-19.77	14.31	10.40	2.15	V		0.180	22.56
		16-QAM	-21.11	12.97	10.40	2.15	V		0.133	21.22
1907.5		QPSK	-19.53	14.77	10.40	2.15	V		0.200	23.02
		16-QAM	-20.87	13.43	10.40	2.15	V		0.147	21.68

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain (dBi)	C.L	Pol	Limit	EIRP	
									W	W
1855.0	LTE B2/ 10 MHz	QPSK	-19.85	13.92	10.40	2.12	V	< 2.00	0.166	22.21
		16-QAM	-21.29	12.48	10.40	2.12	V		0.119	20.77
1880.0		QPSK	-19.69	14.39	10.40	2.15	V		0.184	22.64
		16-QAM	-21.07	13.01	10.40	2.15	V		0.134	21.26
1905.0		QPSK	-19.56	14.67	10.40	2.15	V		0.196	22.92
		16-QAM	-20.98	13.25	10.40	2.15	V		0.141	21.50

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain (dBi)	C.L	Pol	Limit	EIRP	
									W	W
1857.5	LTE B2/ 15 MHz	QPSK	-19.87	14.03	10.40	2.12	V	< 2.00	0.170	22.31
		16-QAM	-21.23	12.67	10.40	2.12	V		0.124	20.95
1880.0		QPSK	-19.98	14.10	10.40	2.15	V		0.172	22.35
		16-QAM	-21.42	12.66	10.40	2.15	V		0.123	20.91
1902.5		QPSK	-19.57	14.59	10.40	2.15	V		0.192	22.84
		16-QAM	-20.99	13.17	10.40	2.15	V		0.139	21.42

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain (dBi)	C.L	Pol	Limit	EIRP	
									W	W
1860.0	LTE B2/ 20 MHz	QPSK	-19.89	14.01	10.40	2.12	V	< 2.00	0.169	22.29
		16-QAM	-21.26	12.64	10.40	2.12	V		0.124	20.92
1880.0		QPSK	-19.88	14.20	10.40	2.15	V		0.176	22.45
		16-QAM	-21.24	12.84	10.40	2.15	V		0.129	21.09
1900.0		QPSK	-19.73	14.43	10.40	2.15	V		0.185	22.68
		16-QAM	-21.10	13.06	10.40	2.15	V		0.135	21.31

**8.2 RADIATED SPURIOUS EMISSIONS**

- ▣ OPERATING FREQUENCY: 1880.0 MHz
- ▣ MEASURED OUTPUT POWER: 42.55 dBm = 17.972 W
- ▣ MODE: LTE B2
- ▣ MODULATION SIGNAL: 3 MHz QPSK
- ▣ DISTANCE: 3 meters
- ▣ LIMIT:  $43 + 10 \log_{10}(W) =$  55.55 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
18615 (1851.5)	3 703.00	-52.93	12.30	-57.52	3.08	V	-48.30	90.85
	5 554.50	-54.48	13.10	-52.59	3.82	V	-43.31	85.85
	7 406.00	-56.50	10.80	-46.13	4.45	H	-39.77	82.32
18900 (1880.0)	3 760.00	-53.34	12.32	-57.66	3.10	V	-48.44	90.98
	5 640.00	-55.38	13.10	-53.19	3.85	H	-43.94	86.48
	7 520.00	-55.36	10.84	-44.51	4.46	H	-38.13	80.68
19185 (1908.5)	3 817.00	-54.03	12.40	-58.72	3.14	H	-49.46	92.01
	5 725.50	-55.23	13.05	-52.37	3.88	V	-43.19	85.74
	7 634.00	-56.49	11.24	-45.71	4.48	H	-38.95	81.50

**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	5.69
			16-QAM	6	0	6.30
	3 MHz		QPSK	15	0	5.72
			16-QAM	15	0	6.37
	5 MHz		QPSK	25	0	5.60
			16-QAM	25	0	6.38
	10 MHz		QPSK	50	0	5.70
			16-QAM	50	0	6.30
	15 MHz		QPSK	75	0	5.63
			16-QAM	75	0	6.34
20 MHz	QPSK	100	0	5.60		
	16-QAM	100	0	6.35		

**Note:**

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 98 ~ 109.

**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	1.0966
			16-QAM	6	0	1.0959
	3 MHz		QPSK	15	0	2.7138
			16-QAM	15	0	2.7256
	5 MHz		QPSK	25	0	4.5211
			16-QAM	25	0	4.5087
	10 MHz		QPSK	50	0	9.0063
			16-QAM	50	0	9.0261
	15 MHz		QPSK	75	0	13.460
			16-QAM	75	0	13.468
20 MHz	QPSK	100	0	17.945		
	16-QAM	100	0	17.907		

**Note:**

1. Plots of the EUT's Occupied Bandwidth are shown Page 86 ~ 97.

**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	5.5514	28.591	-77.488	-48.897	-13.00
		1880.0	3.7184	27.976	-77.403	-49.427	
		1909.3	3.7089	27.976	-77.480	-49.504	
	3	1851.5	3.7010	27.976	-76.642	-48.666	
		1880.0	3.6900	27.976	-77.329	-49.353	
		1908.5	3.7015	27.976	-76.812	-48.836	
	5	1852.5	3.6860	27.976	-77.109	-49.133	
		1880.0	3.7563	27.976	-77.332	-49.356	
		1907.5	3.7094	27.976	-76.835	-48.859	
	10	1855.0	3.7020	27.976	-76.978	-49.002	
		1880.0	3.7518	27.976	-77.084	-49.108	
		1905.0	3.1681	27.976	-77.498	-49.522	
	15	1857.5	5.5534	28.591	-76.881	-48.290	
		1880.0	3.7473	27.976	-77.346	-49.370	
		1902.5	3.6915	27.976	-76.963	-48.987	
	20	1860.0	3.7024	27.976	-77.247	-49.271	
		1880.0	3.7428	27.976	-76.537	-48.561	
		1900.0	3.7134	27.976	-77.358	-49.382	

**Note:**

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 110 ~ 145.
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

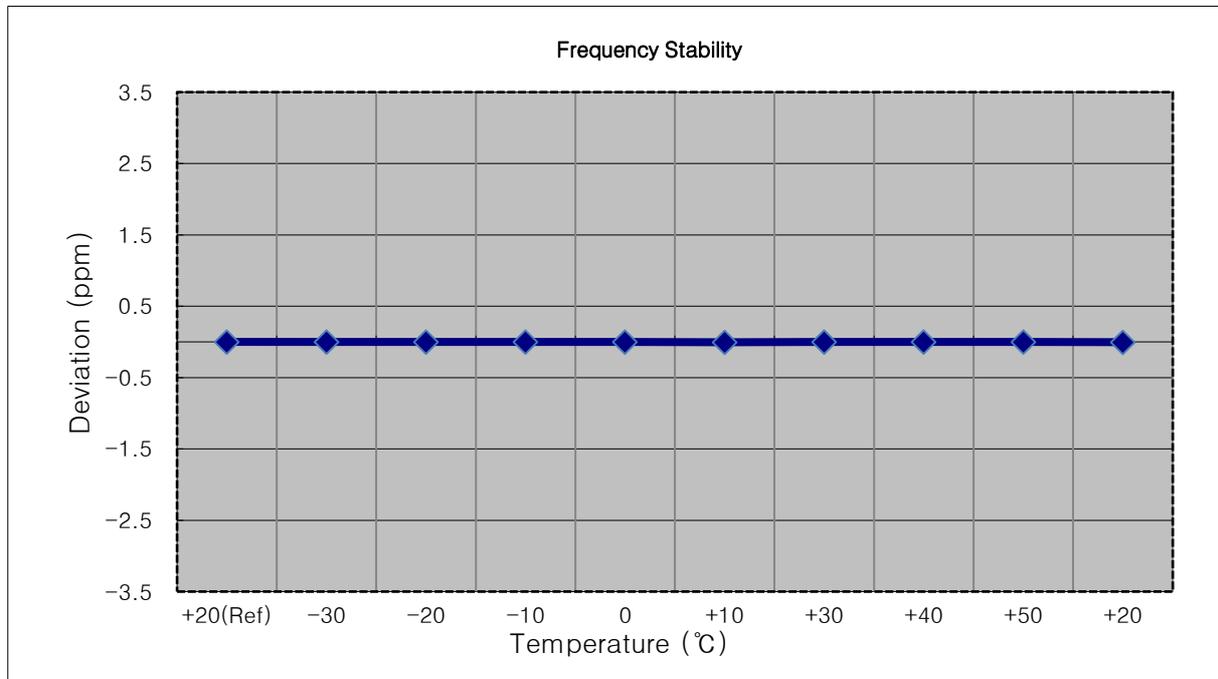
## 8.6 BAND EDGE

- Plots of the EUT's Band Edge are shown Page 50 ~ 85.

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

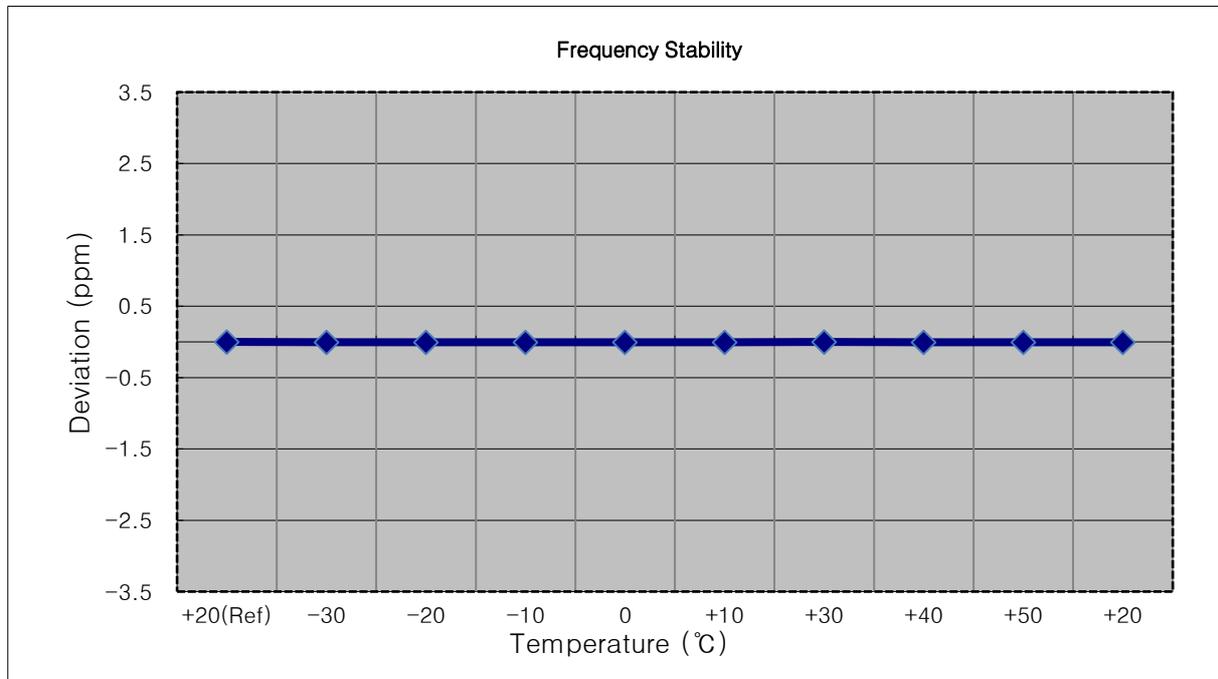
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1850,700,000 Hz
- ▣ CHANNEL: 18607 (1.4 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	1850 699 995	0.0	0.000 000	0.000
100 %		-30	1850 699 990	-4.9	0.000 000	-0.003
100 %		-20	1850 699 991	-4.0	0.000 000	-0.002
100 %		-10	1850 699 991	-4.6	0.000 000	-0.002
100 %		0	1850 699 992	-3.4	0.000 000	-0.002
100 %		+10	1850 699 990	-5.8	0.000 000	-0.003
100 %		+30	1850 699 991	-4.4	0.000 000	-0.002
100 %		+40	1850 699 992	-3.8	0.000 000	-0.002
100 %		+50	1850 699 990	-5.2	0.000 000	-0.003
Batt. Endpoint	3.400	+20	1850 699 988	-7.7	0.000 000	-0.004



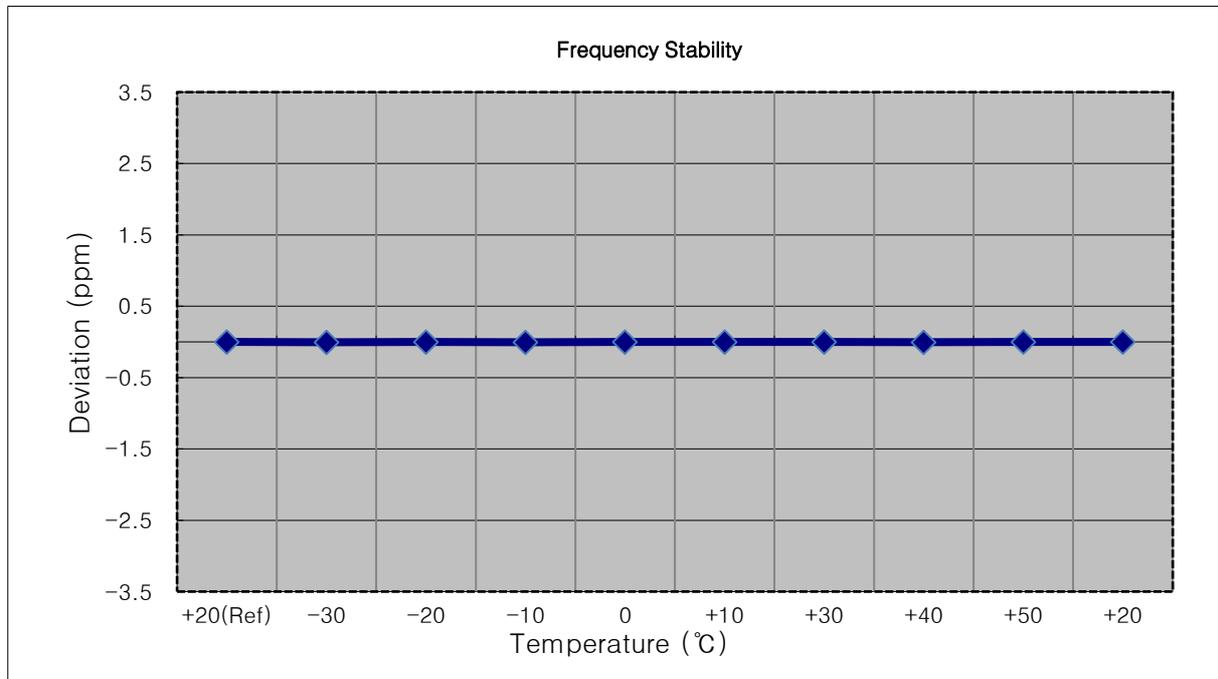
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1851,500,000 Hz
- ▣ CHANNEL: 18615 (3 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	1851 499 994	0.0	0.000 000	0.000
100 %		-30	1851 499 985	-8.4	0.000 000	-0.005
100 %		-20	1851 499 988	-5.8	0.000 000	-0.003
100 %		-10	1851 499 988	-5.7	0.000 000	-0.003
100 %		0	1851 499 988	-6.1	0.000 000	-0.003
100 %		+10	1851 499 988	-6.1	0.000 000	-0.003
100 %		+30	1851 499 989	-4.6	0.000 000	-0.002
100 %		+40	1851 499 987	-6.9	0.000 000	-0.004
100 %		+50	1851 499 987	-7.1	0.000 000	-0.004
Batt. Endpoint	3.400	+20	1851 499 986	-7.7	0.000 000	-0.004



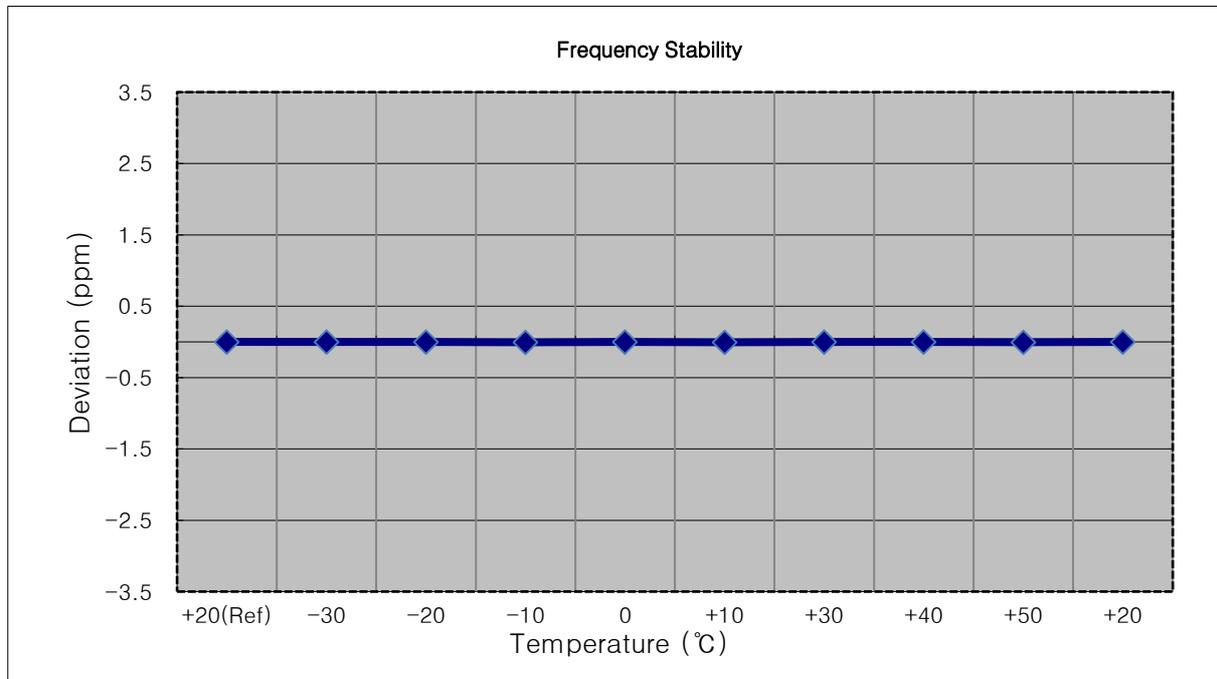
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1852,500,000 Hz
- ▣ CHANNEL: 18625 (5 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	1852 499 993	0.0	0.000 000	0.000
100 %		-30	1852 499 986	-7.2	0.000 000	-0.004
100 %		-20	1852 499 988	-4.7	0.000 000	-0.003
100 %		-10	1852 499 987	-5.8	0.000 000	-0.003
100 %		0	1852 499 988	-5.0	0.000 000	-0.003
100 %		+10	1852 499 988	-4.7	0.000 000	-0.003
100 %		+30	1852 499 989	-4.4	0.000 000	-0.002
100 %		+40	1852 499 985	-7.8	0.000 000	-0.004
100 %		+50	1852 499 988	-4.6	0.000 000	-0.002
Batt. Endpoint	3.400	+20	1852 499 990	-3.4	0.000 000	-0.002



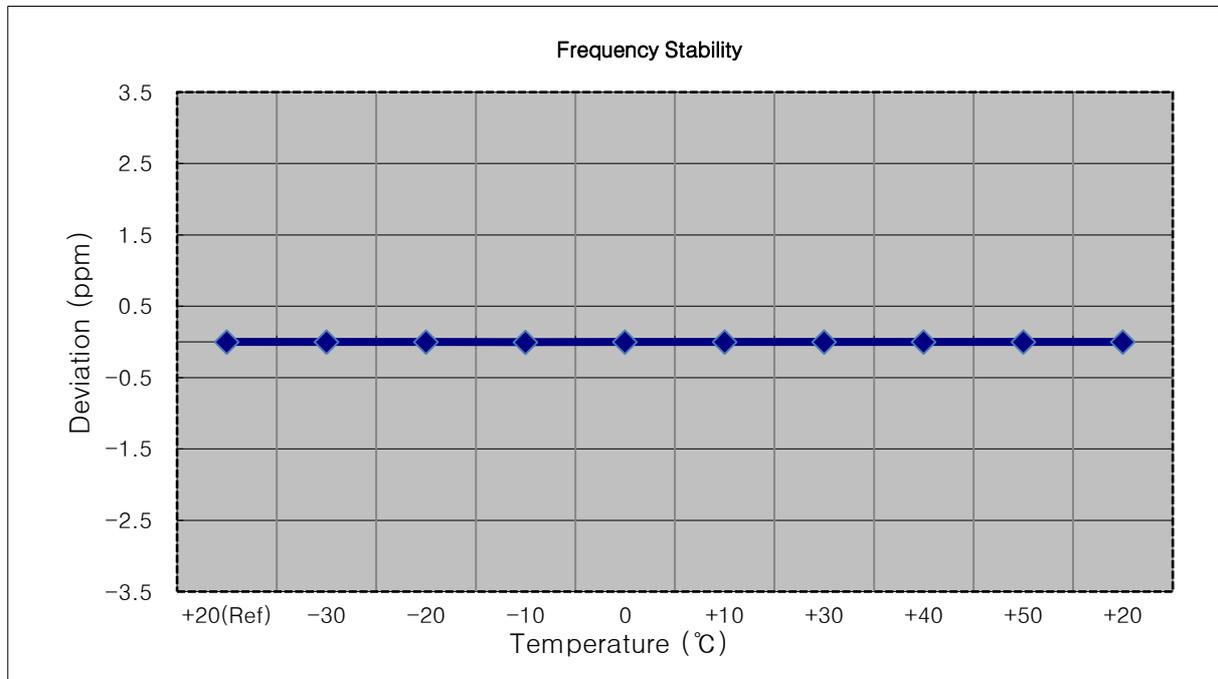
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1855,000,000 Hz
- ▣ CHANNEL: 18650 (10 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	1854 999 996	0.0	0.000 000	0.000
100 %		-30	1854 999 993	-3.1	0.000 000	-0.002
100 %		-20	1854 999 991	-4.5	0.000 000	-0.002
100 %		-10	1854 999 990	-5.7	0.000 000	-0.003
100 %		0	1854 999 992	-4.2	0.000 000	-0.002
100 %		+10	1854 999 990	-5.9	0.000 000	-0.003
100 %		+30	1854 999 990	-5.3	0.000 000	-0.003
100 %		+40	1854 999 992	-3.5	0.000 000	-0.002
100 %		+50	1854 999 989	-6.8	0.000 000	-0.004
Batt. Endpoint	3.400	+20	1854 999 992	-3.3	0.000 000	-0.002



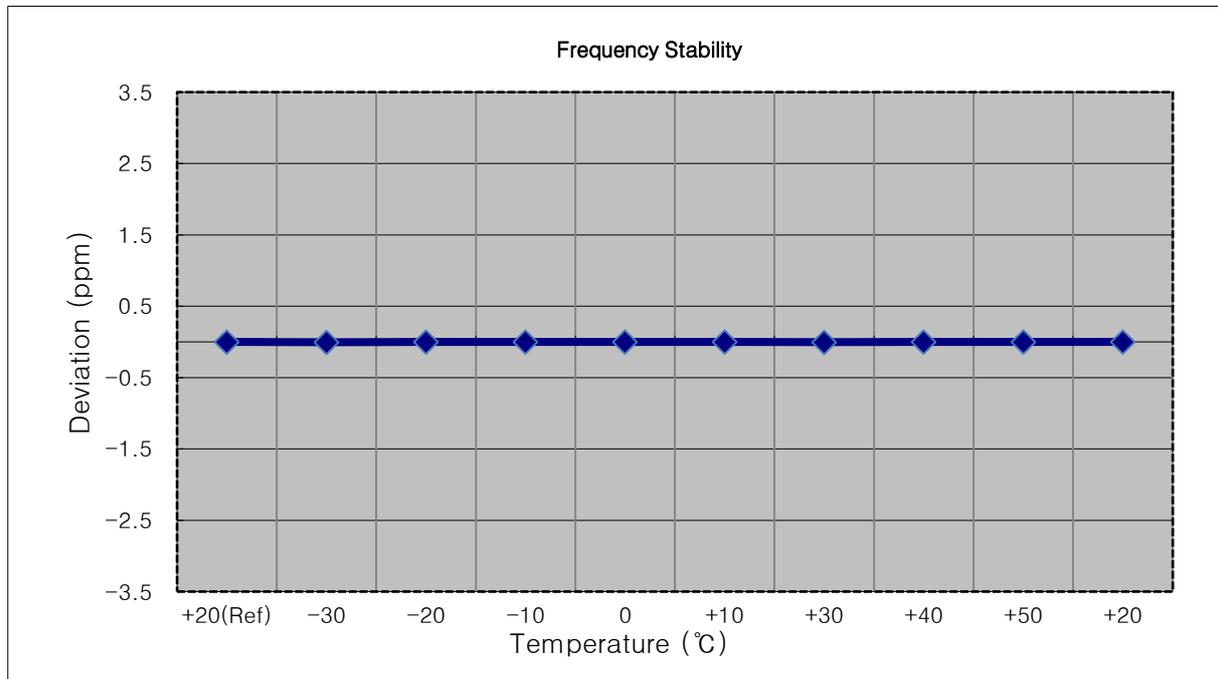
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1857,500,000 Hz
- ▣ CHANNEL: 18675 (15 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	1857 499 995	0.0	0.000 000	0.000
100 %		-30	1857 499 991	-4.3	0.000 000	-0.002
100 %		-20	1857 499 992	-3.6	0.000 000	-0.002
100 %		-10	1857 499 990	-5.6	0.000 000	-0.003
100 %		0	1857 499 990	-5.3	0.000 000	-0.003
100 %		+10	1857 499 992	-3.1	0.000 000	-0.002
100 %		+30	1857 499 991	-4.6	0.000 000	-0.002
100 %		+40	1857 499 991	-4.0	0.000 000	-0.002
100 %		+50	1857 499 991	-4.2	0.000 000	-0.002
Batt. Endpoint	3.400	+20	1857 499 991	-4.1	0.000 000	-0.002



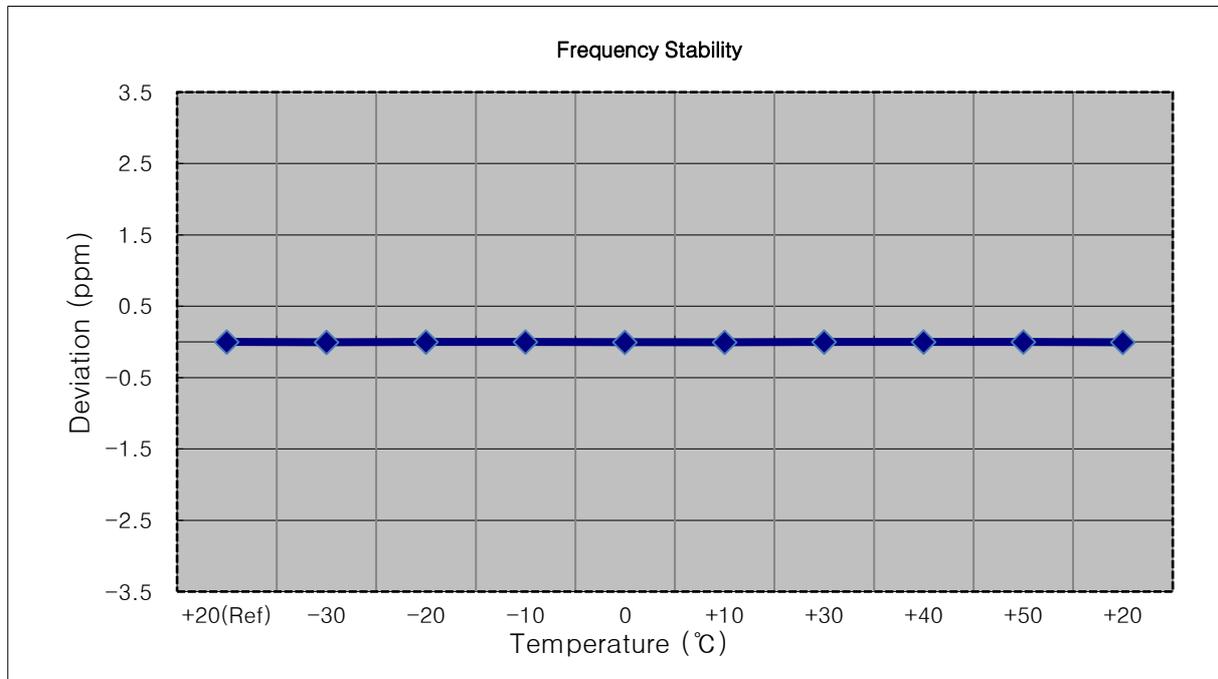
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1860,000,000 Hz
- ▣ CHANNEL: 18700 (20 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	1859 999 998	0.0	0.000 000	0.000
100 %		-30	1859 999 992	-5.9	0.000 000	-0.003
100 %		-20	1859 999 993	-4.8	0.000 000	-0.003
100 %		-10	1859 999 994	-3.7	0.000 000	-0.002
100 %		0	1859 999 994	-3.6	0.000 000	-0.002
100 %		+10	1859 999 993	-4.9	0.000 000	-0.003
100 %		+30	1859 999 991	-6.4	0.000 000	-0.003
100 %		+40	1859 999 994	-3.5	0.000 000	-0.002
100 %		+50	1859 999 994	-4.3	0.000 000	-0.002
Batt. Endpoint	3.400	+20	1859 999 994	-4.1	0.000 000	-0.002



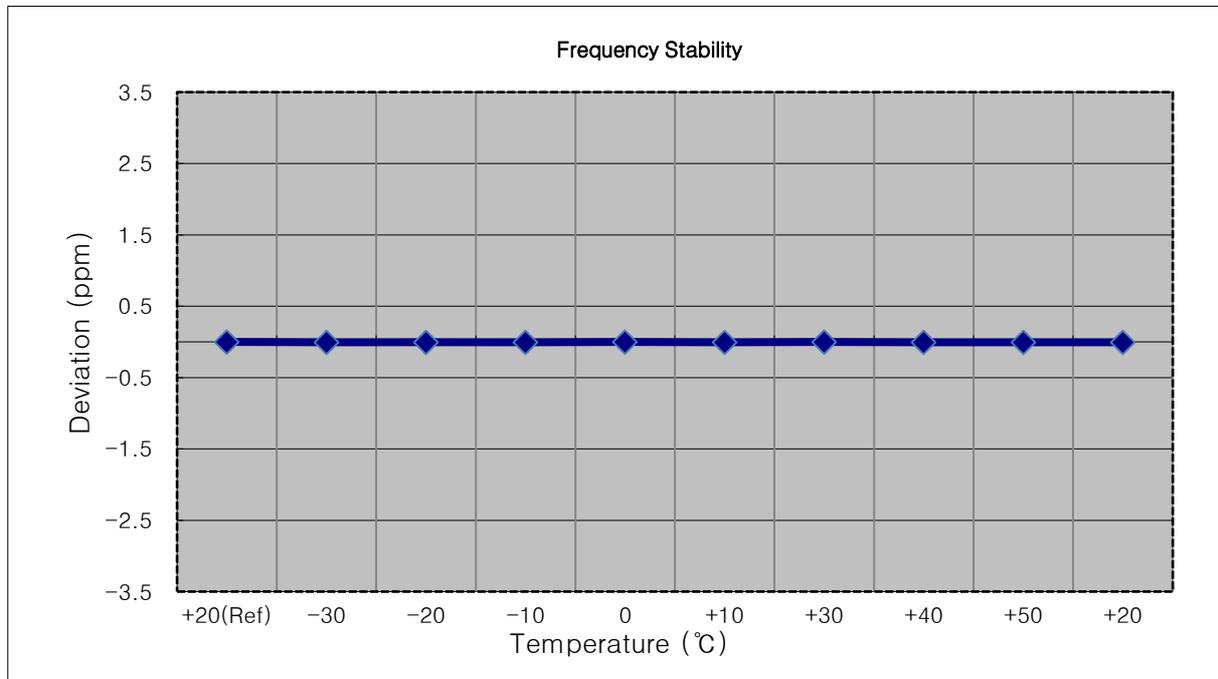
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1880,000,000 Hz
- ▣ CHANNEL: 18900 (1.4 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	1879 999 994	0.0	0.000 000	0.000
100 %		-30	1879 999 987	-7.0	0.000 000	-0.004
100 %		-20	1879 999 990	-4.6	0.000 000	-0.002
100 %		-10	1879 999 989	-5.2	0.000 000	-0.003
100 %		0	1879 999 987	-7.2	0.000 000	-0.004
100 %		+10	1879 999 988	-5.9	0.000 000	-0.003
100 %		+30	1879 999 990	-4.5	0.000 000	-0.002
100 %		+40	1879 999 991	-3.7	0.000 000	-0.002
100 %		+50	1879 999 991	-3.1	0.000 000	-0.002
Batt. Endpoint	3.400	+20	1879 999 988	-5.9	0.000 000	-0.003



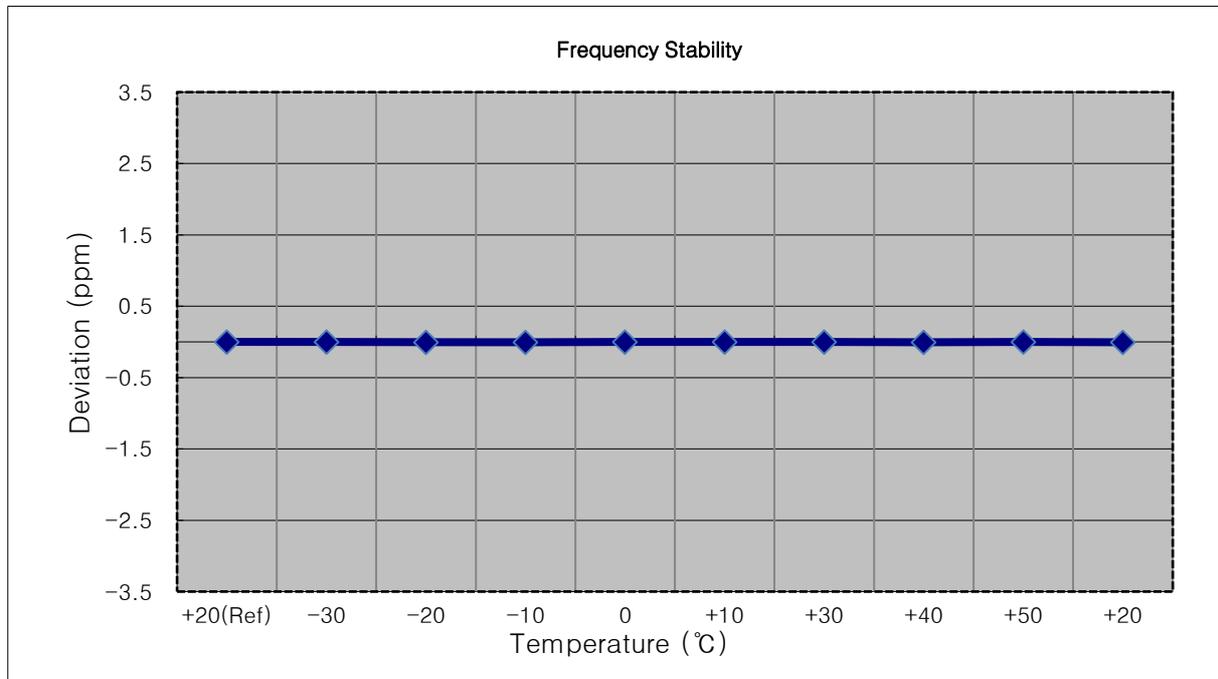
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1880,000,000 Hz
- ▣ CHANNEL: 18900 (3 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	1879 999 991	0.0	0.000 000	0.000
100 %		-30	1879 999 986	-5.7	0.000 000	-0.003
100 %		-20	1879 999 984	-7.6	0.000 000	-0.004
100 %		-10	1879 999 985	-6.5	0.000 000	-0.003
100 %		0	1879 999 987	-4.7	0.000 000	-0.003
100 %		+10	1879 999 984	-7.0	0.000 000	-0.004
100 %		+30	1879 999 986	-5.1	0.000 000	-0.003
100 %		+40	1879 999 984	-6.8	0.000 000	-0.004
100 %		+50	1879 999 985	-5.9	0.000 000	-0.003
Batt. Endpoint	3.400	+20	1879 999 984	-7.2	0.000 000	-0.004



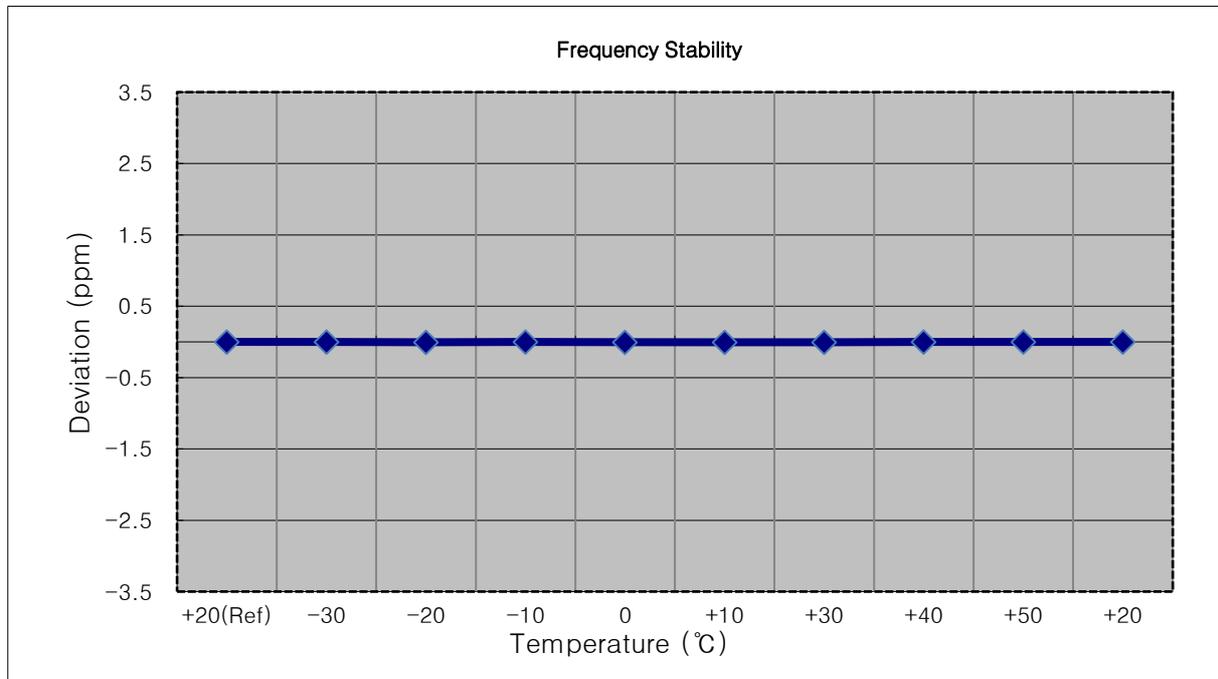
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1880,000,000 Hz
- ▣ CHANNEL: 18900 (5 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	1879 999 996	0.0	0.000 000	0.000
100 %		-30	1879 999 992	-4.4	0.000 000	-0.002
100 %		-20	1879 999 988	-7.9	0.000 000	-0.004
100 %		-10	1879 999 990	-6.0	0.000 000	-0.003
100 %		0	1879 999 991	-4.9	0.000 000	-0.003
100 %		+10	1879 999 991	-5.0	0.000 000	-0.003
100 %		+30	1879 999 993	-3.6	0.000 000	-0.002
100 %		+40	1879 999 989	-6.9	0.000 000	-0.004
100 %		+50	1879 999 992	-4.0	0.000 000	-0.002
Batt. Endpoint	3.400	+20	1879 999 990	-6.0	0.000 000	-0.003



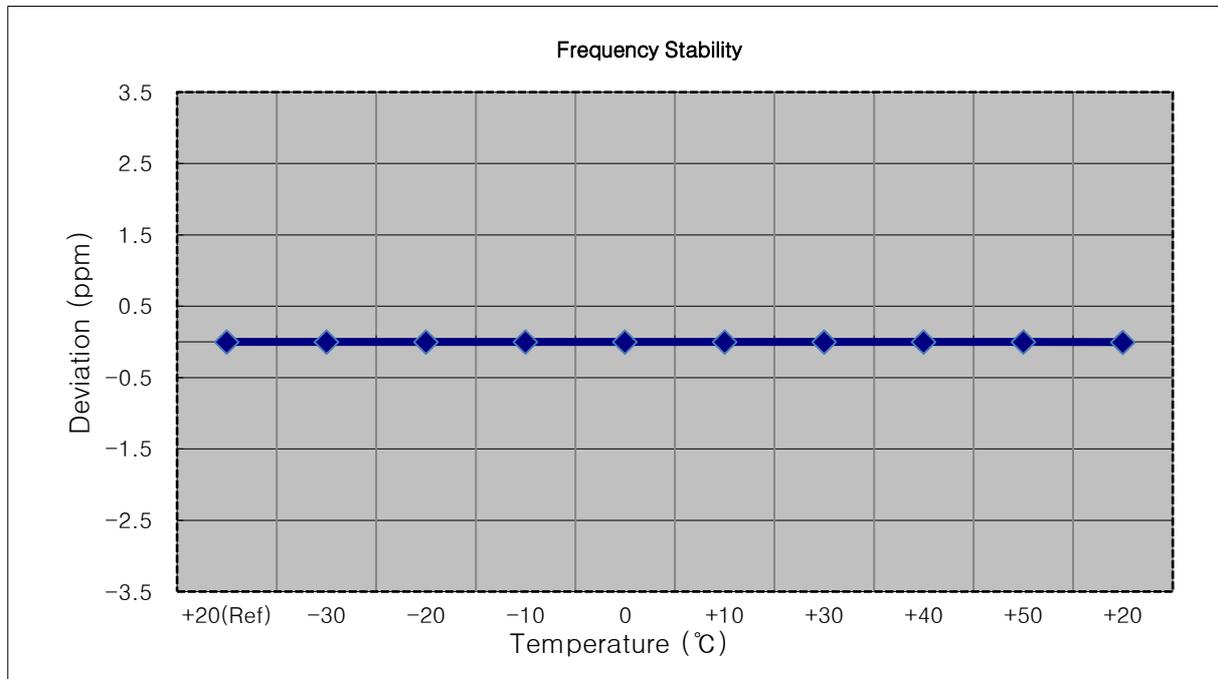
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1880,000,000 Hz
- ▣ CHANNEL: 18900 (10 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	1879 999 997	0.0	0.000 000	0.000
100 %		-30	1879 999 991	-5.4	0.000 000	-0.003
100 %		-20	1879 999 991	-5.8	0.000 000	-0.003
100 %		-10	1879 999 992	-4.6	0.000 000	-0.002
100 %		0	1879 999 989	-8.0	0.000 000	-0.004
100 %		+10	1879 999 991	-5.8	0.000 000	-0.003
100 %		+30	1879 999 990	-6.3	0.000 000	-0.003
100 %		+40	1879 999 993	-3.5	0.000 000	-0.002
100 %		+50	1879 999 992	-4.7	0.000 000	-0.003
Batt. Endpoint	3.400	+20	1879 999 991	-5.5	0.000 000	-0.003



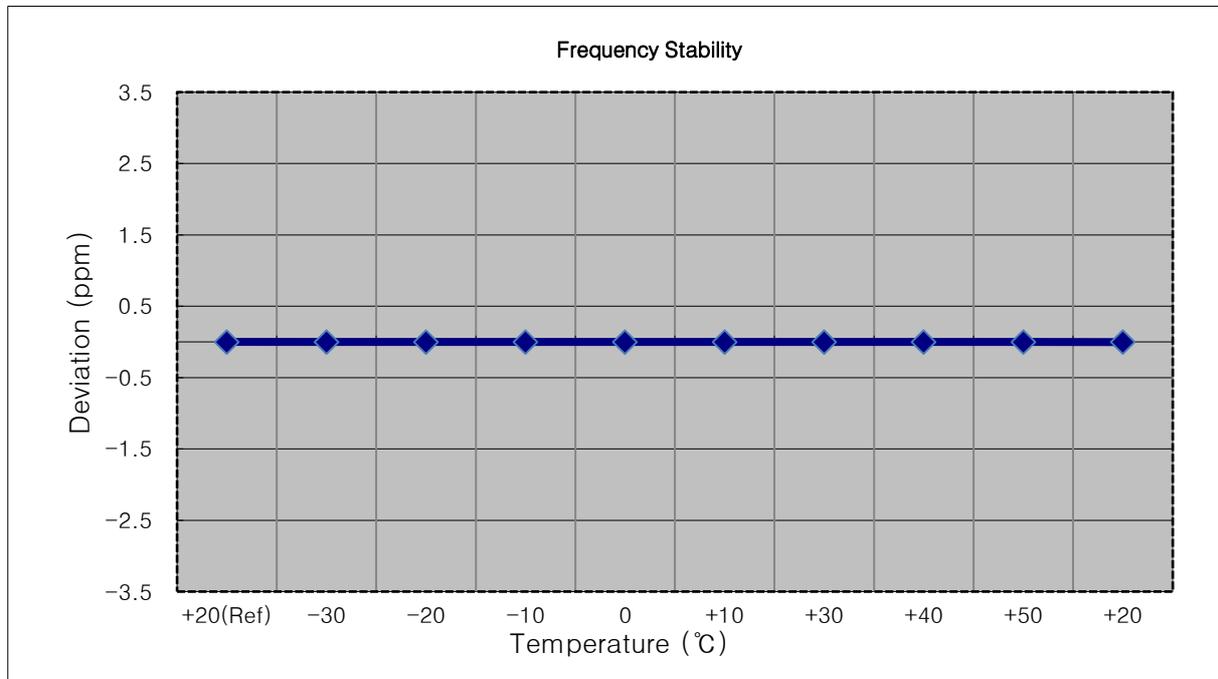
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1880,000,000 Hz
- ▣ CHANNEL: 18900 (15 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	1879 999 995	0.0	0.000 000	0.000
100 %		-30	1879 999 991	-4.1	0.000 000	-0.002
100 %		-20	1879 999 990	-4.7	0.000 000	-0.003
100 %		-10	1879 999 991	-3.7	0.000 000	-0.002
100 %		0	1879 999 991	-3.6	0.000 000	-0.002
100 %		+10	1879 999 990	-4.6	0.000 000	-0.002
100 %		+30	1879 999 989	-5.5	0.000 000	-0.003
100 %		+40	1879 999 991	-4.1	0.000 000	-0.002
100 %		+50	1879 999 990	-4.9	0.000 000	-0.003
Batt. Endpoint	3.400	+20	1879 999 989	-5.7	0.000 000	-0.003



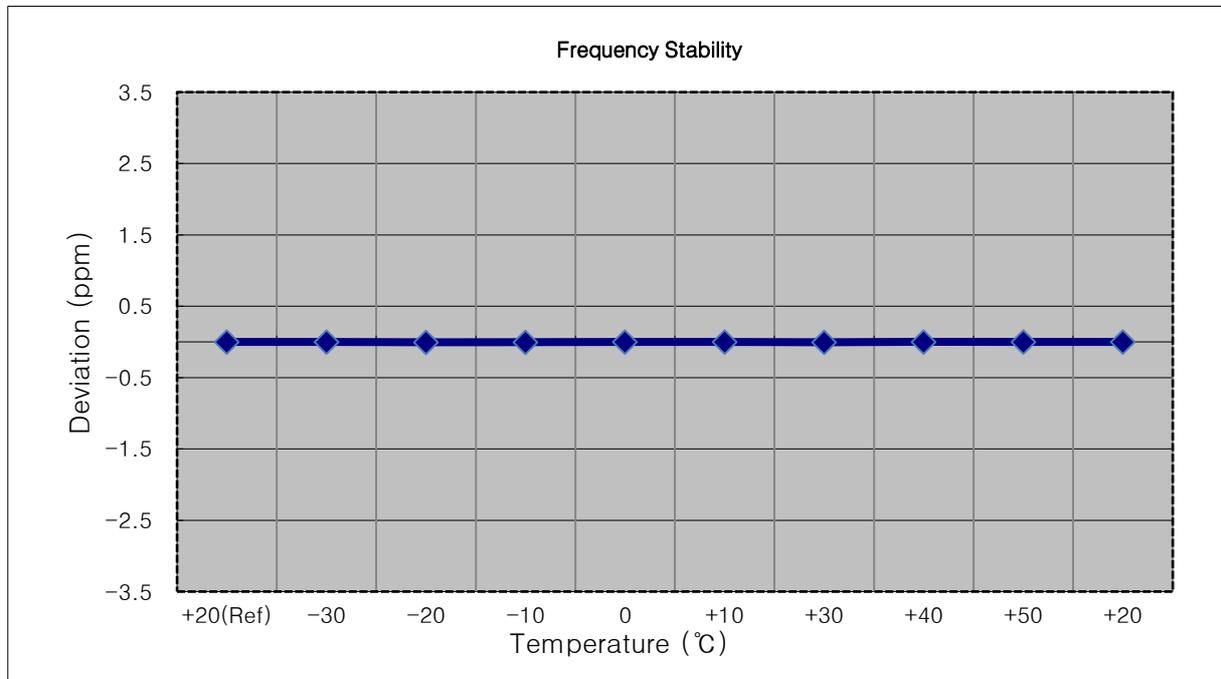
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1880,000,000 Hz
- ▣ CHANNEL: 18900 (20 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	1879 999 998	0.0	0.000 000	0.000
100 %		-30	1879 999 993	-4.2	0.000 000	-0.002
100 %		-20	1879 999 993	-4.6	0.000 000	-0.002
100 %		-10	1879 999 994	-4.1	0.000 000	-0.002
100 %		0	1879 999 992	-5.2	0.000 000	-0.003
100 %		+10	1879 999 993	-5.0	0.000 000	-0.003
100 %		+30	1879 999 996	-2.1	0.000 000	-0.001
100 %		+40	1879 999 994	-3.3	0.000 000	-0.002
100 %		+50	1879 999 992	-5.2	0.000 000	-0.003
Batt. Endpoint	3.400	+20	1879 999 992	-5.5	0.000 000	-0.003



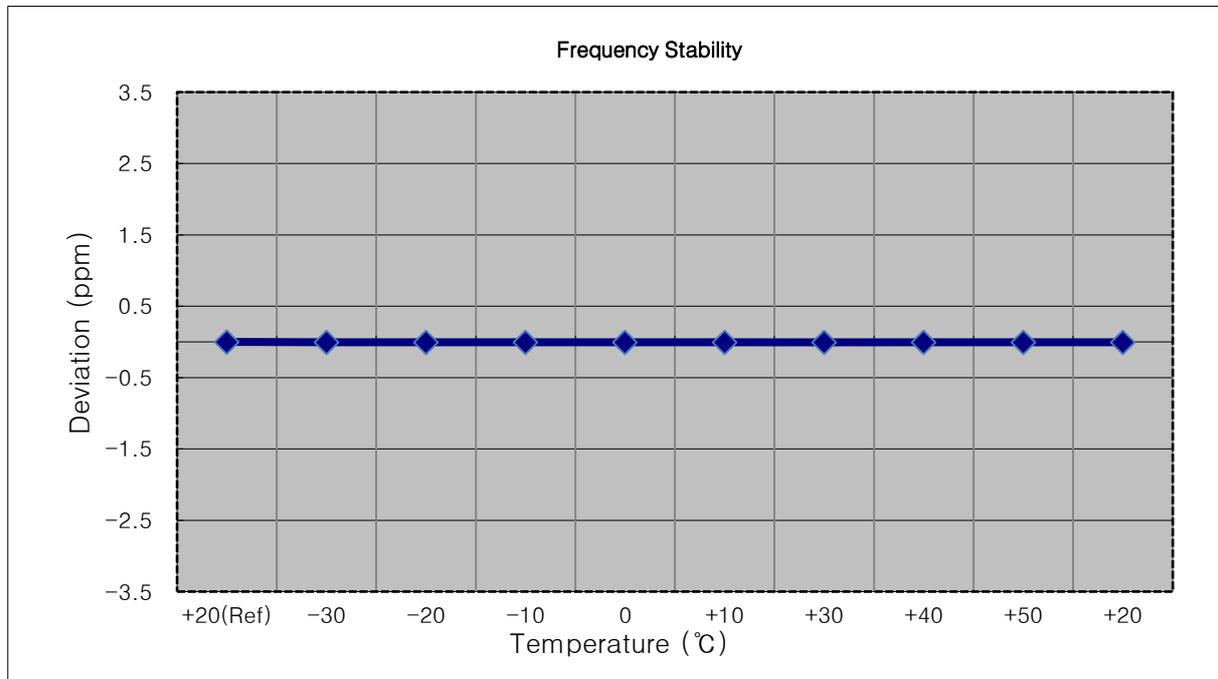
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1909,300,000 Hz
- ▣ CHANNEL: 19193 (1.4 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	1909 299 995	0.0	0.000 000	0.000
100 %		-30	1909 299 990	-4.9	0.000 000	-0.003
100 %		-20	1909 299 989	-6.3	0.000 000	-0.003
100 %		-10	1909 299 988	-7.2	0.000 000	-0.004
100 %		0	1909 299 990	-5.6	0.000 000	-0.003
100 %		+10	1909 299 990	-5.4	0.000 000	-0.003
100 %		+30	1909 299 989	-5.9	0.000 000	-0.003
100 %		+40	1909 299 997	2.3	0.000 000	0.001
100 %		+50	1909 299 990	-5.3	0.000 000	-0.003
Batt. Endpoint	3.400	+20	1909 299 989	-5.7	0.000 000	-0.003



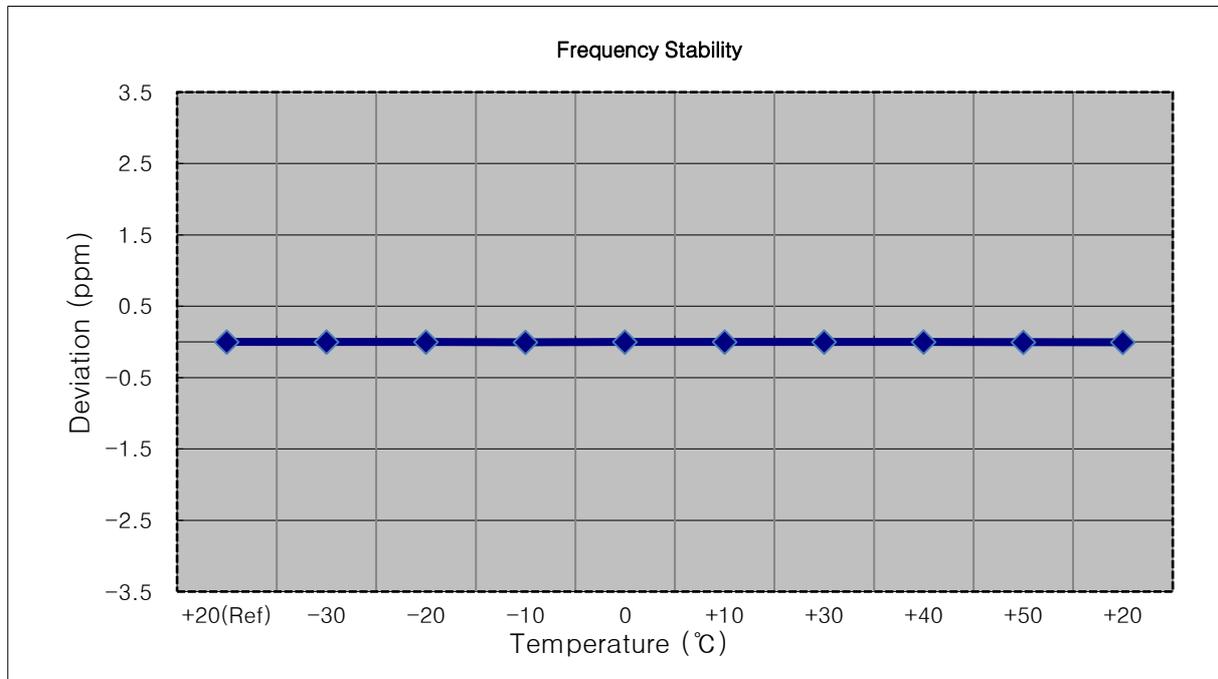
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1908,500,000 Hz
- ▣ CHANNEL: 19185 (3 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	1908 499 993	0.0	0.000 000	0.000
100 %		-30	1908 499 984	-8.7	0.000 000	-0.005
100 %		-20	1908 499 983	-9.3	0.000 000	-0.005
100 %		-10	1908 499 983	-10.2	-0.000 001	-0.005
100 %		0	1908 499 982	-10.6	-0.000 001	-0.006
100 %		+10	1908 499 984	-9.2	0.000 000	-0.005
100 %		+30	1908 499 980	-12.5	-0.000 001	-0.007
100 %		+40	1908 499 983	-10.2	-0.000 001	-0.005
100 %		+50	1908 499 982	-10.5	-0.000 001	-0.006
Batt. Endpoint	3.400	+20	1908 499 981	-11.4	-0.000 001	-0.006



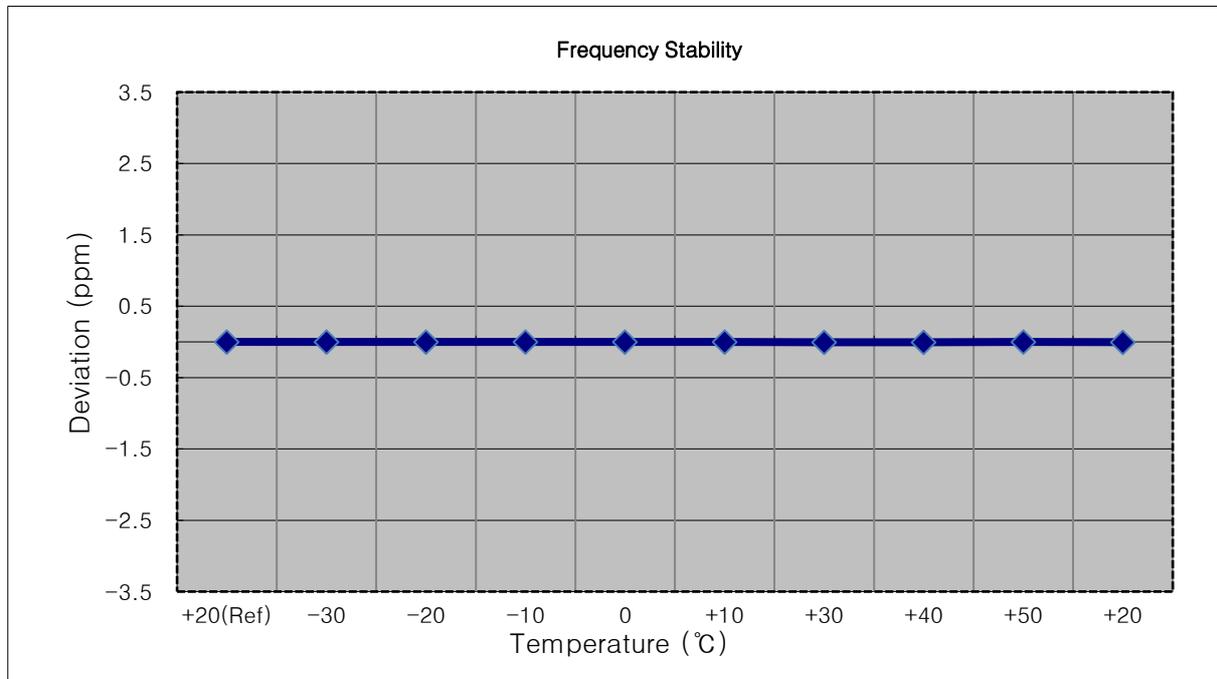
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1907,500,000 Hz
- ▣ CHANNEL: 19175 (5 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	1907 499 995	0.0	0.000 000	0.000
100 %		-30	1907 499 991	-4.6	0.000 000	-0.002
100 %		-20	1907 499 991	-4.9	0.000 000	-0.003
100 %		-10	1907 499 989	-6.3	0.000 000	-0.003
100 %		0	1907 499 990	-5.4	0.000 000	-0.003
100 %		+10	1907 499 991	-4.8	0.000 000	-0.003
100 %		+30	1907 499 990	-5.7	0.000 000	-0.003
100 %		+40	1907 499 991	-4.2	0.000 000	-0.002
100 %		+50	1907 499 989	-6.8	0.000 000	-0.004
Batt. Endpoint	3.400	+20	1907 499 989	-6.1	0.000 000	-0.003



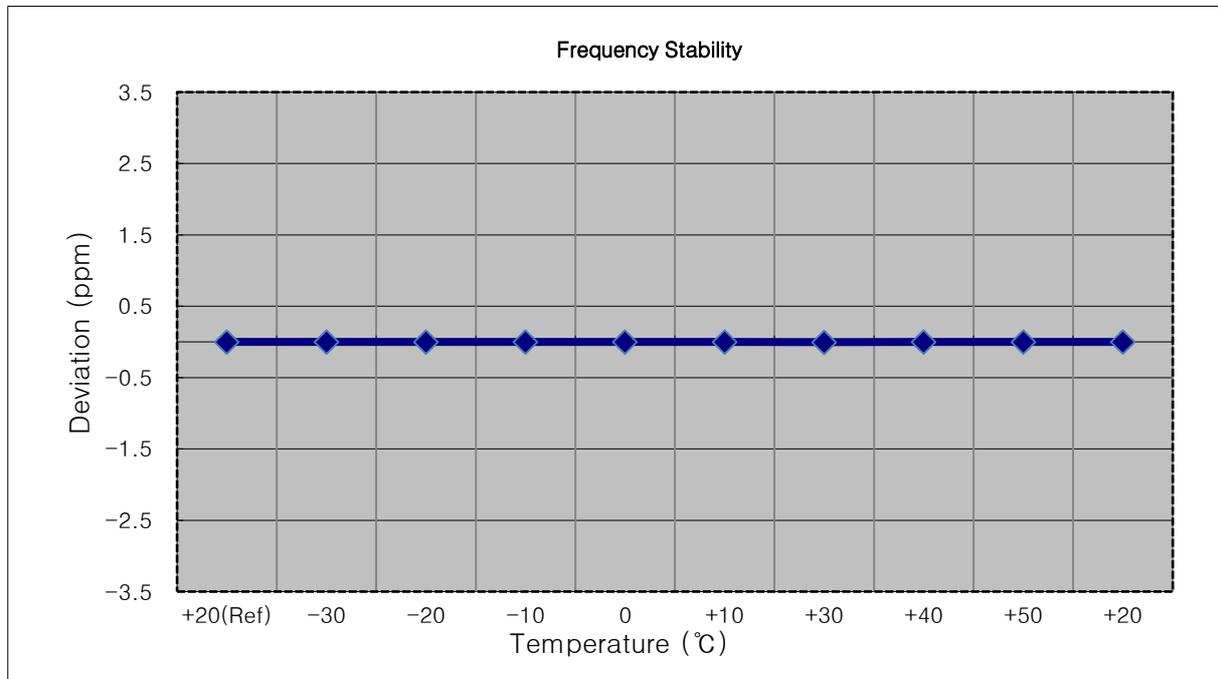
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1905,000,000 Hz
- ▣ CHANNEL: 19150 (10 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	1904 999 993	0.0	0.000 000	0.000
100 %		-30	1904 999 989	-4.3	0.000 000	-0.002
100 %		-20	1904 999 989	-4.6	0.000 000	-0.002
100 %		-10	1904 999 990	-3.3	0.000 000	-0.002
100 %		0	1904 999 990	-3.8	0.000 000	-0.002
100 %		+10	1904 999 989	-4.1	0.000 000	-0.002
100 %		+30	1904 999 987	-6.1	0.000 000	-0.003
100 %		+40	1904 999 987	-6.2	0.000 000	-0.003
100 %		+50	1904 999 989	-4.1	0.000 000	-0.002
Batt. Endpoint	3.400	+20	1904 999 987	-6.9	0.000 000	-0.004



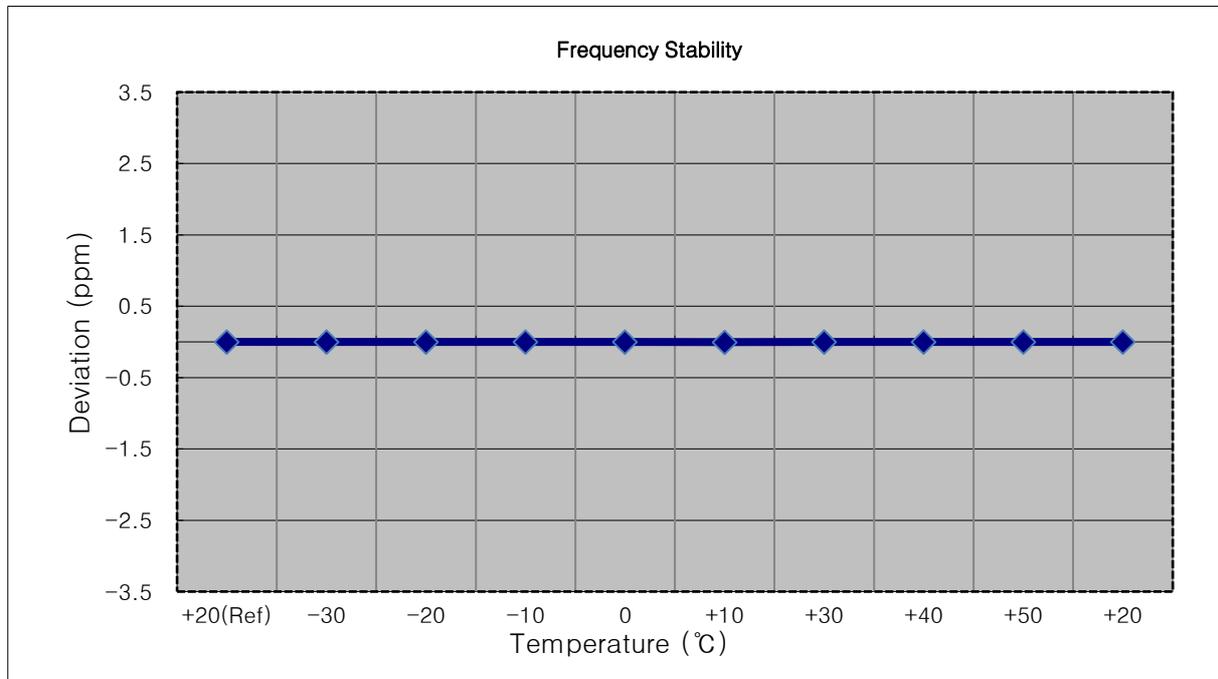
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1902,500,000 Hz
- ▣ CHANNEL: 19125 (15 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	1902 499 995	0.0	0.000 000	0.000
100 %		-30	1902 499 990	-4.8	0.000 000	-0.003
100 %		-20	1902 499 991	-4.4	0.000 000	-0.002
100 %		-10	1902 499 990	-4.8	0.000 000	-0.003
100 %		0	1902 499 991	-4.4	0.000 000	-0.002
100 %		+10	1902 499 990	-4.7	0.000 000	-0.002
100 %		+30	1902 499 988	-7.1	0.000 000	-0.004
100 %		+40	1902 499 991	-3.9	0.000 000	-0.002
100 %		+50	1902 499 990	-5.2	0.000 000	-0.003
Batt. Endpoint		3.400	+20	1902 499 992	-3.6	0.000 000



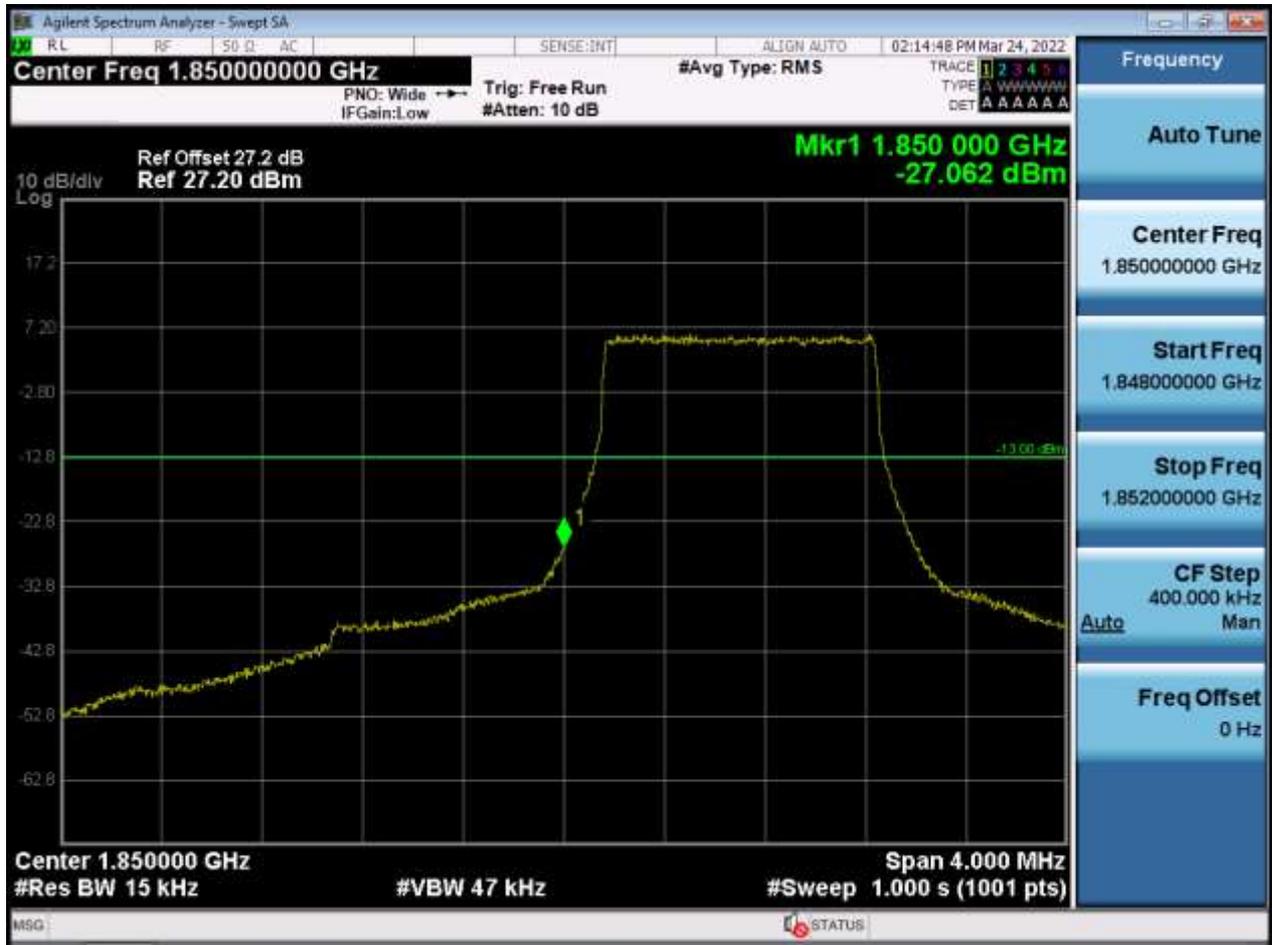
- ▣ MODE: LTE B2
- ▣ OPERATING FREQUENCY: 1900,000,000 Hz
- ▣ CHANNEL: 19100 (20 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	1899 999 995	0.0	0.000 000	0.000
100 %		-30	1899 999 990	-5.5	0.000 000	-0.003
100 %		-20	1899 999 991	-4.8	0.000 000	-0.003
100 %		-10	1899 999 990	-5.4	0.000 000	-0.003
100 %		0	1899 999 991	-4.6	0.000 000	-0.002
100 %		+10	1899 999 990	-5.9	0.000 000	-0.003
100 %		+30	1899 999 992	-3.7	0.000 000	-0.002
100 %		+40	1899 999 992	-3.8	0.000 000	-0.002
100 %		+50	1899 999 991	-4.8	0.000 000	-0.003
Batt. Endpoint	3.400	+20	1899 999 991	-4.6	0.000 000	-0.002



## 9. TEST PLOTS

BW1.4 M\_BandEdge\_Lowest Channel\_QPSK\_FullRB(1)



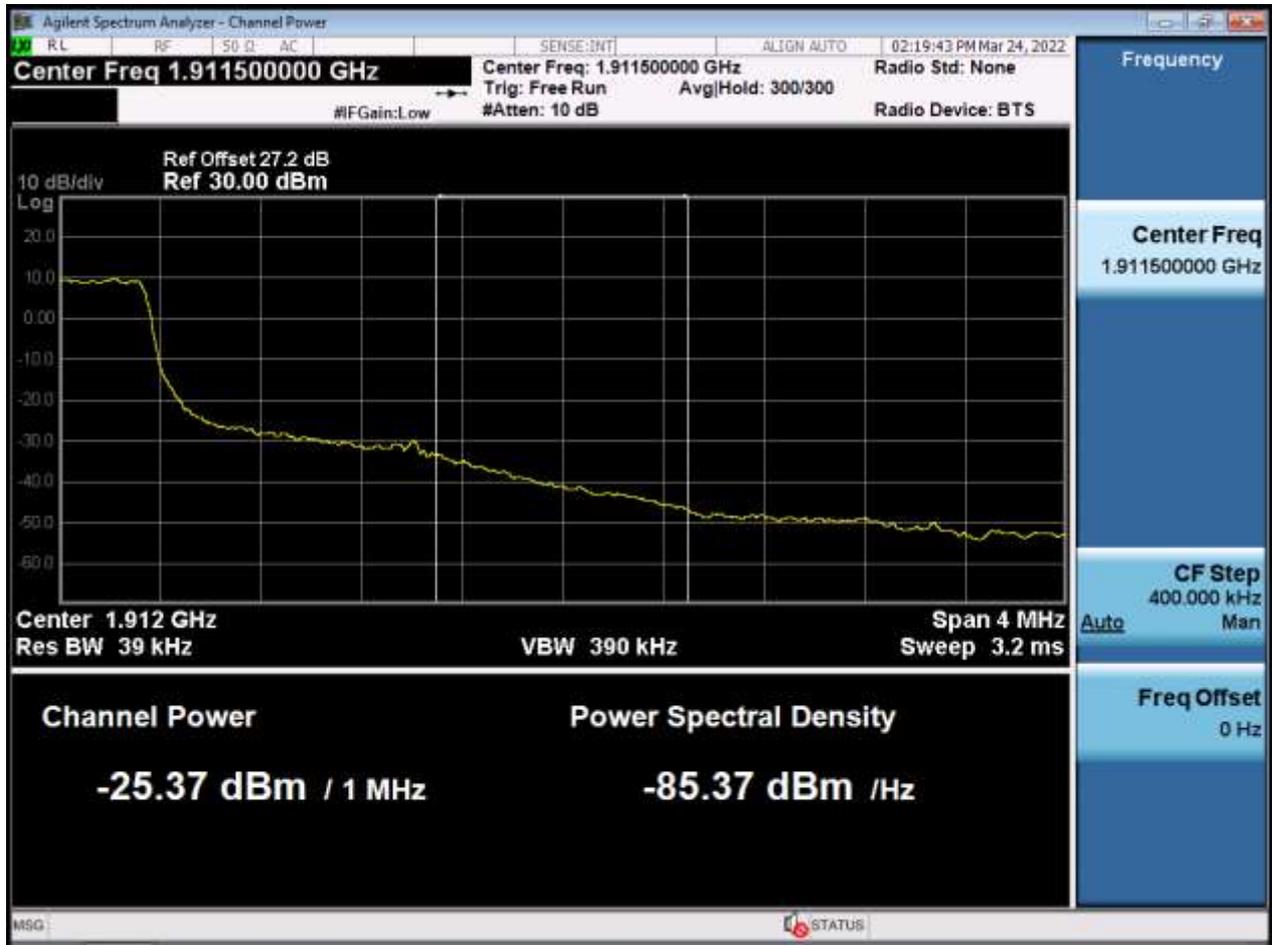
BW1.4 M\_BandEdge\_Lowest Channel\_QPSK\_FullRB(2)



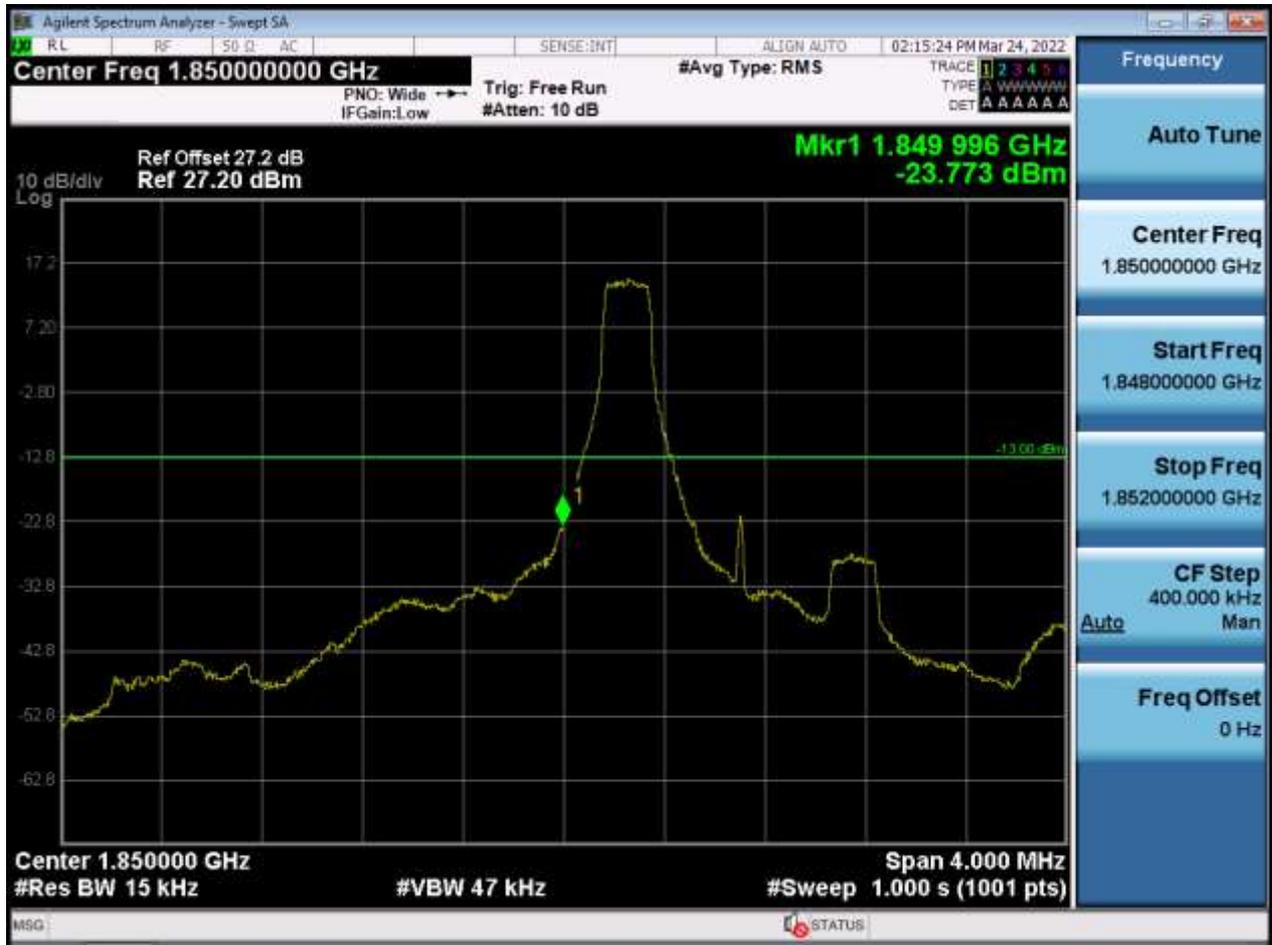
BW1.4 M\_BandEdge\_Highest Channel\_QPSK\_FullIRB(1)



BW1.4 M\_BandEdge\_Highest Channel\_QPSK\_FullIRB(2)



BW1.4 M\_BandEdge\_Lowest Channel\_QPSK\_1RB



BW1.4 M\_BandEdge\_Highest Channel\_QPSK\_1RB



BW3 M\_BandEdge\_Lowest Channel\_QPSK\_FullIRB(1)



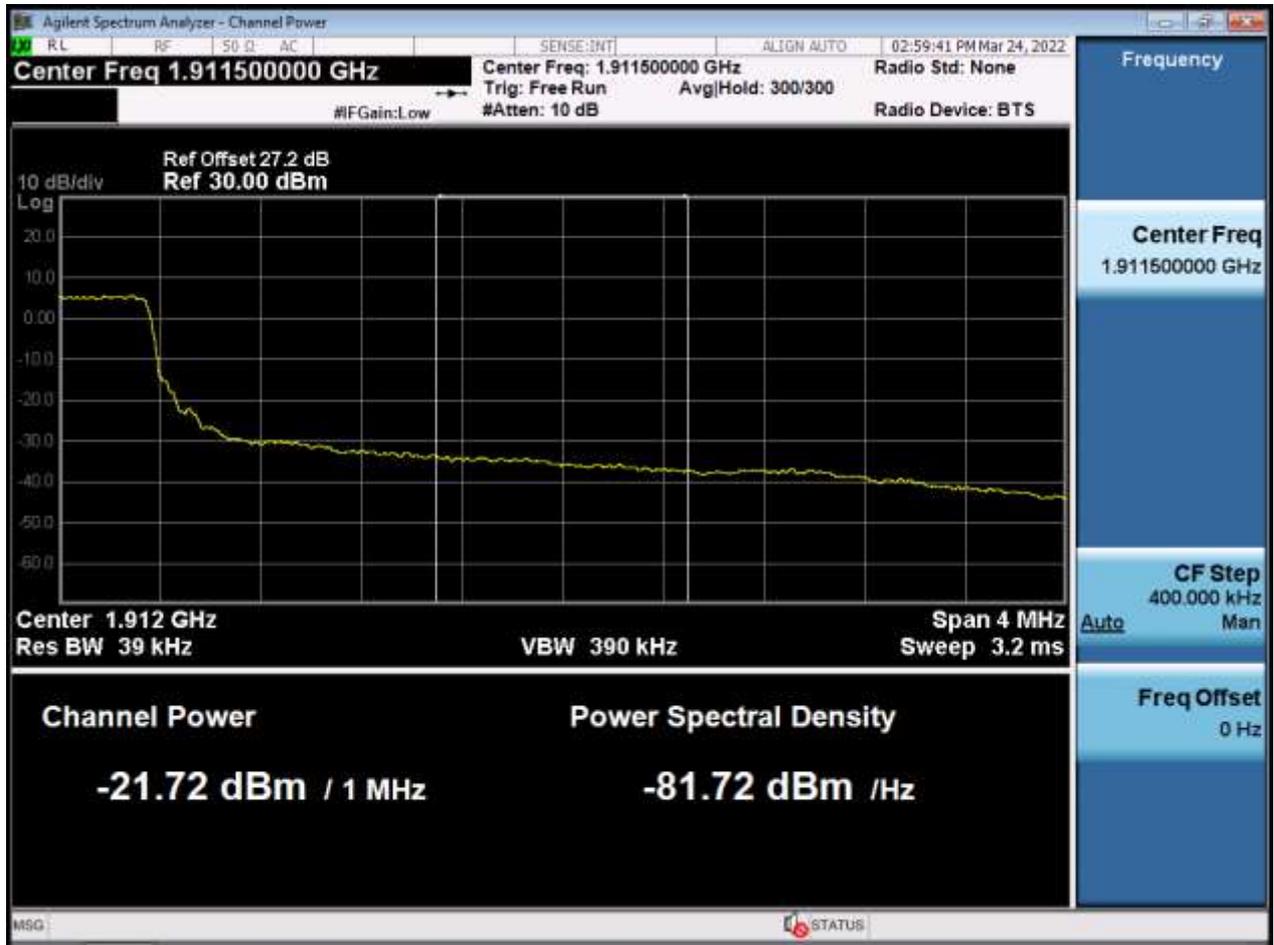
BW3 M\_BandEdge\_Lowest Channel\_QPSK\_FullIRB(2)



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\_FullIRB(1)



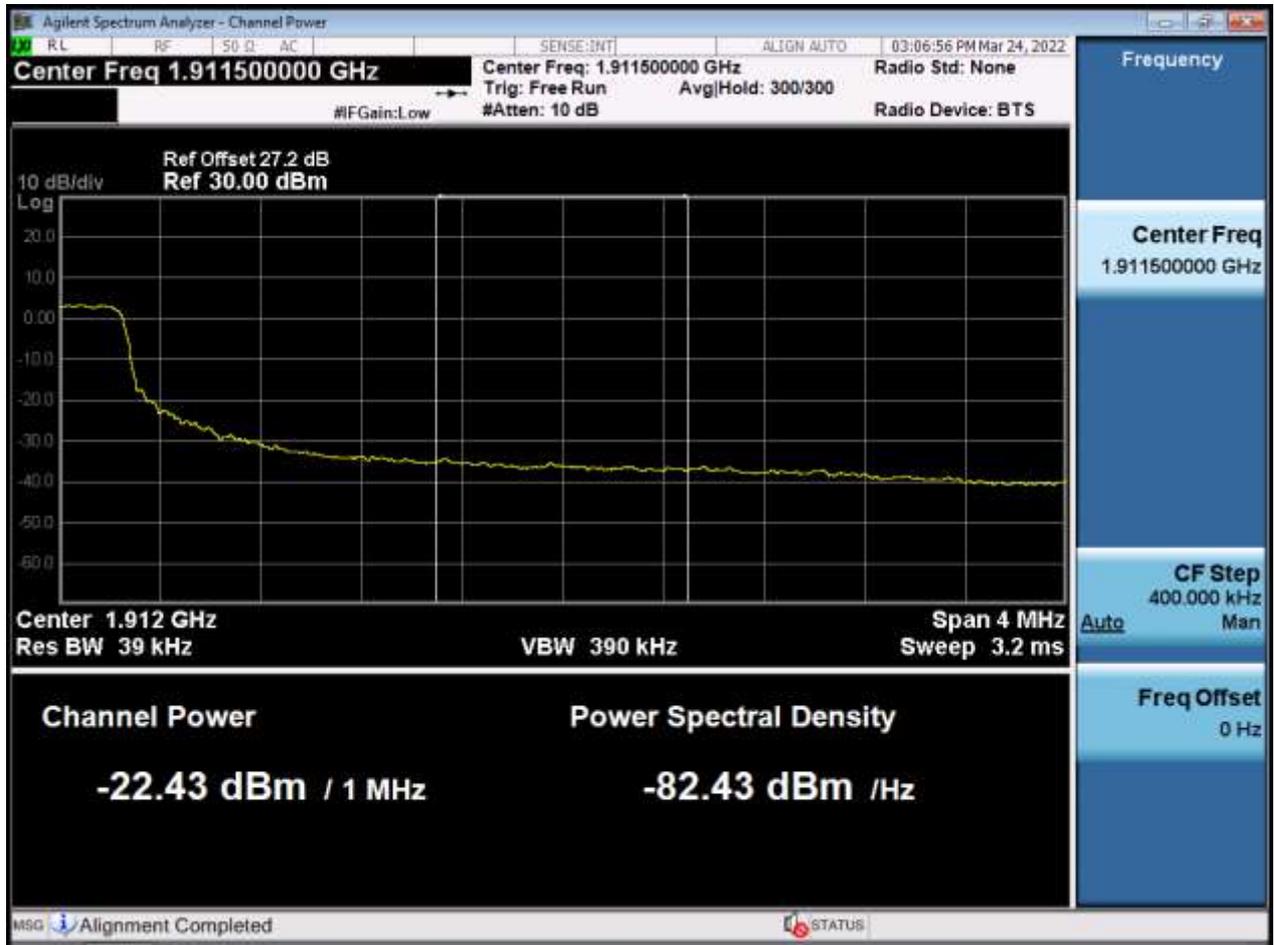
BW5 M\_BandEdge\_Lowest Channel\_QPSK\_FullIRB(2)



BW5 M\_BandEdge\_Highest Channel\_QPSK\_FullRB(1)



BW5 M\_BandEdge\_Highest Channel\_QPSK\_FullRB(2)



BW5 M\_BandEdge\_Lowest 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\_FullIRB(2)



BW15 M\_BandEdge\_Highest Channel\_QPSK\_FullRB(1)



BW15 M\_BandEdge\_Highest Channel\_QPSK\_FullRB(2)





BW15 M\_BandEdge\_Highest Channel\_QPSK\_1RB



BW20 M\_BandEdge\_Lowest Channel\_QPSK\_FullRB(1)



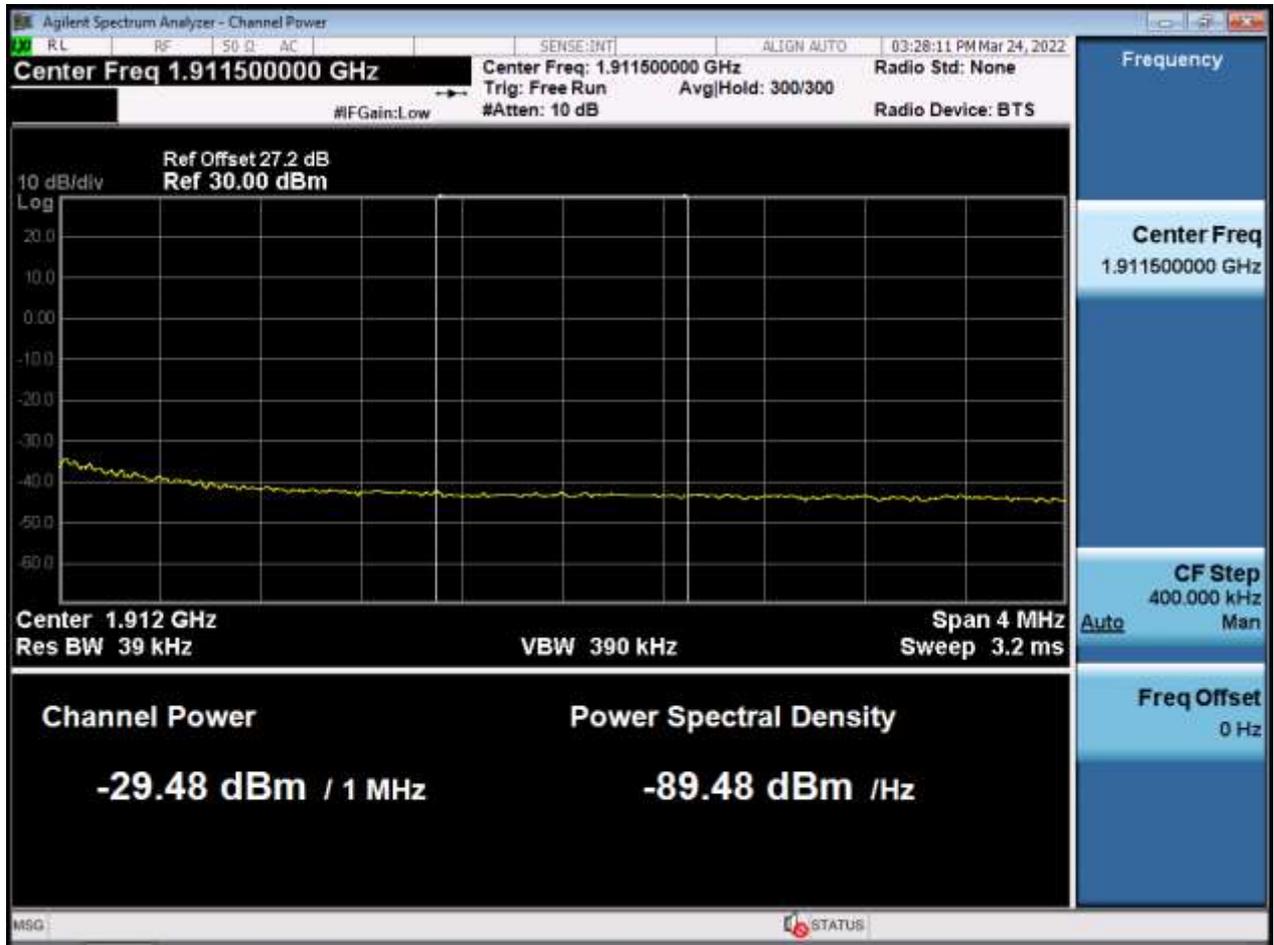
BW20 M\_BandEdge\_Lowest Channel\_QPSK\_FullIRB(2)



BW20 M\_BandEdge\_Highest Channel\_QPSK\_FullRB(1)



BW20 M\_BandEdge\_Highest Channel\_QPSK\_FullRB(2)



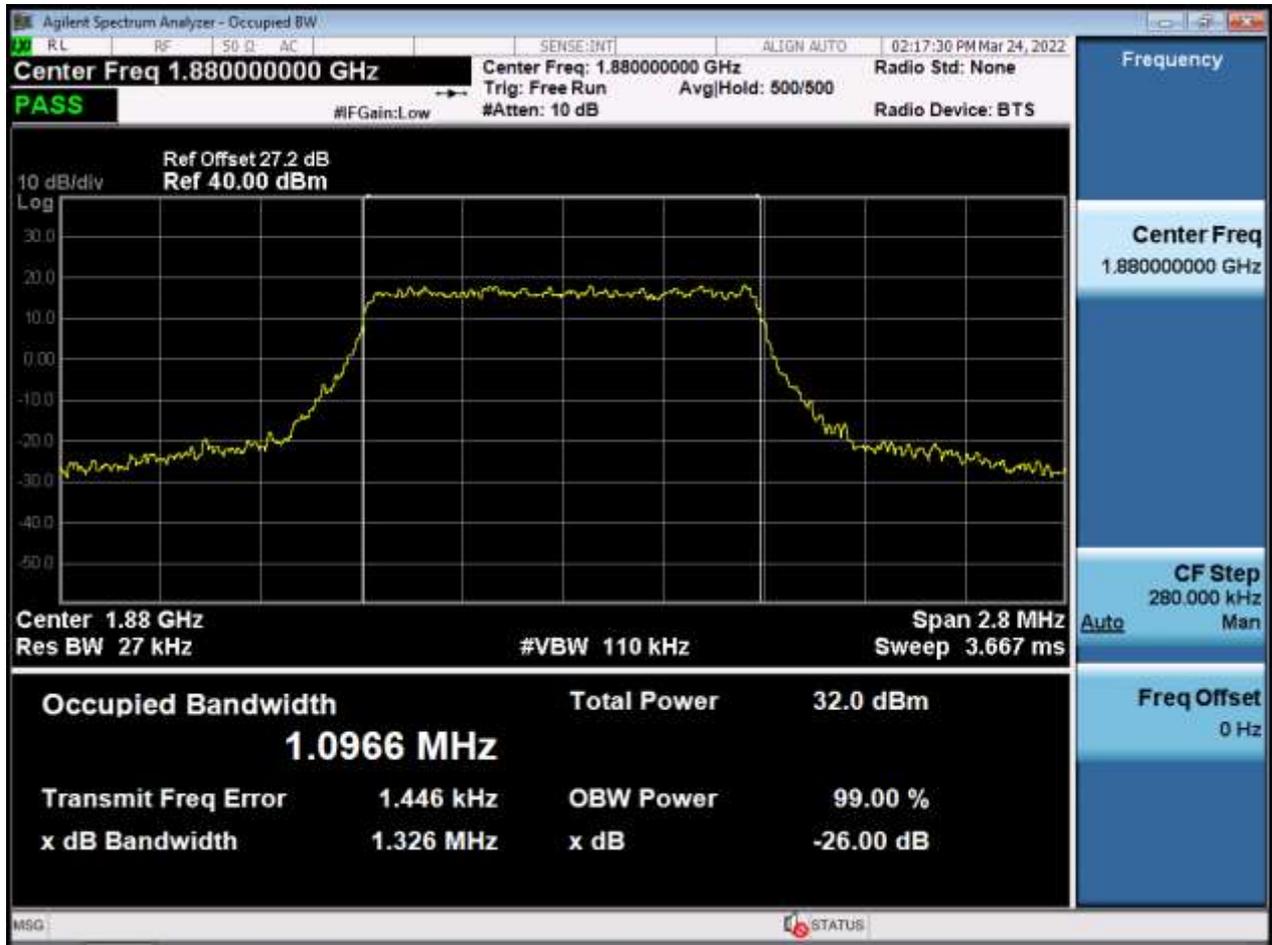
BW20 M\_BandEdge\_Lowest Channel\_QPSK\_1RB



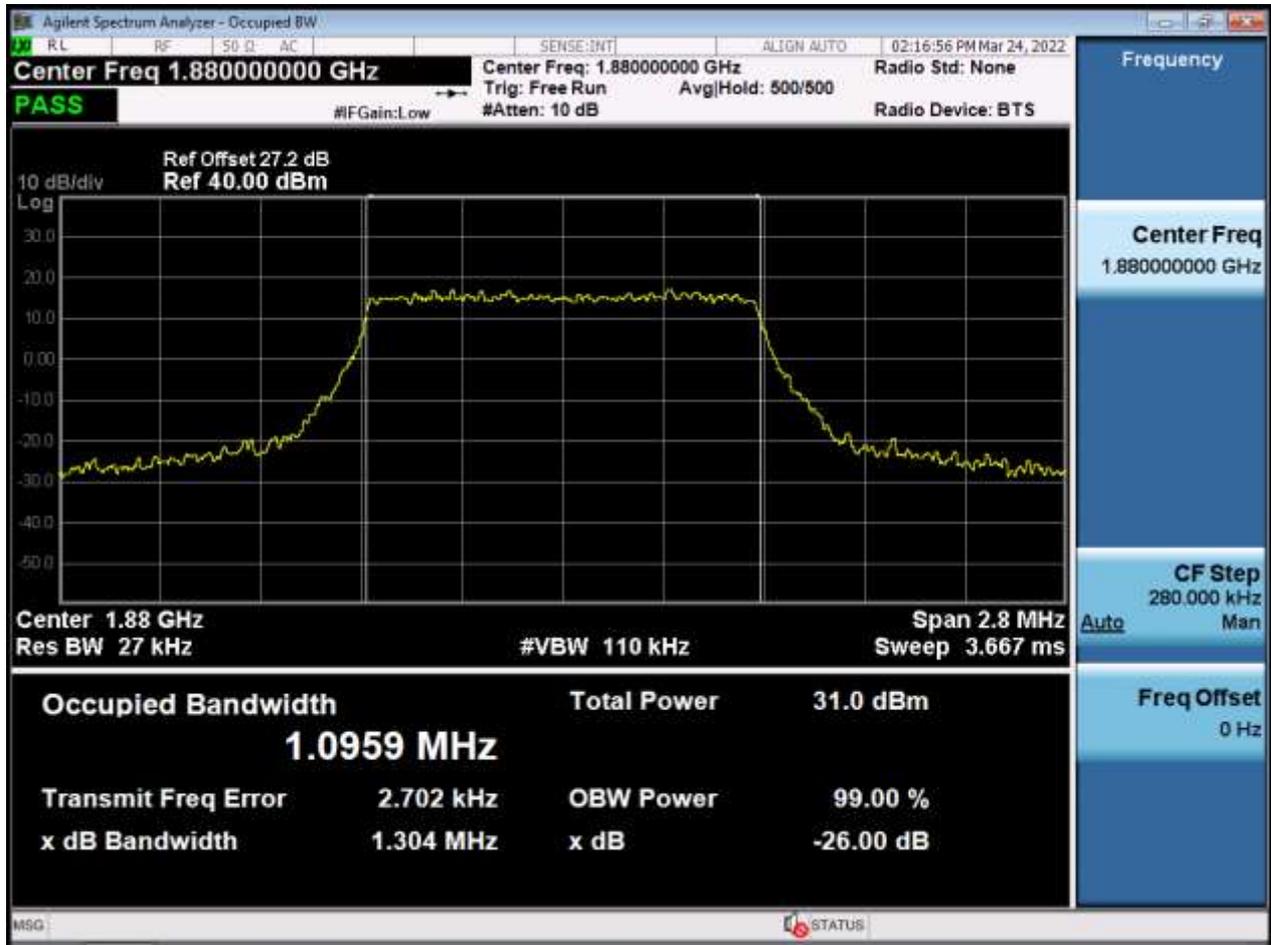
BW20 M\_BandEdge\_Highest Channel\_QPSK\_1RB



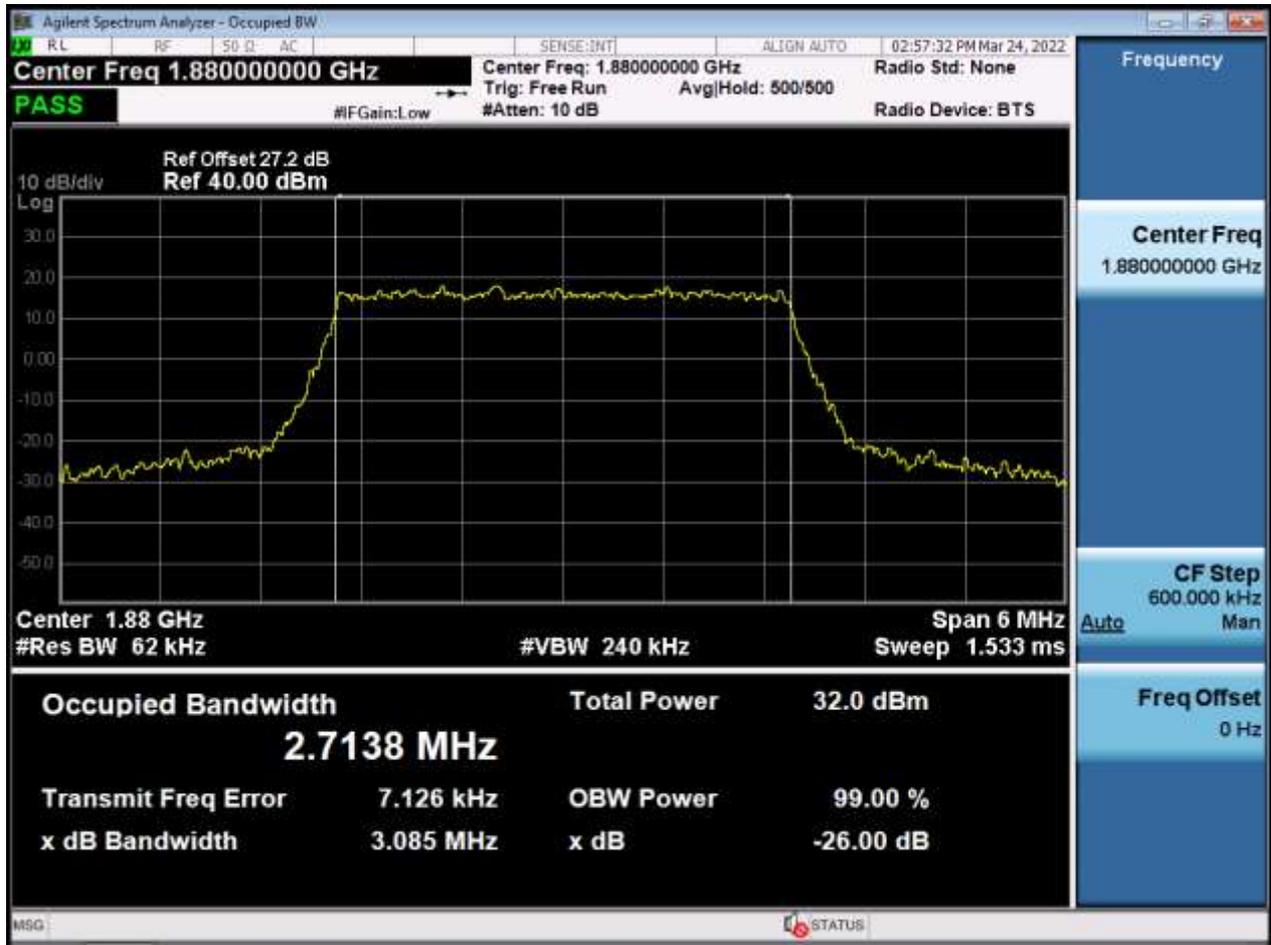
BW1.4 M\_OBW\_Middle Channel\_QPSK\_FullRB



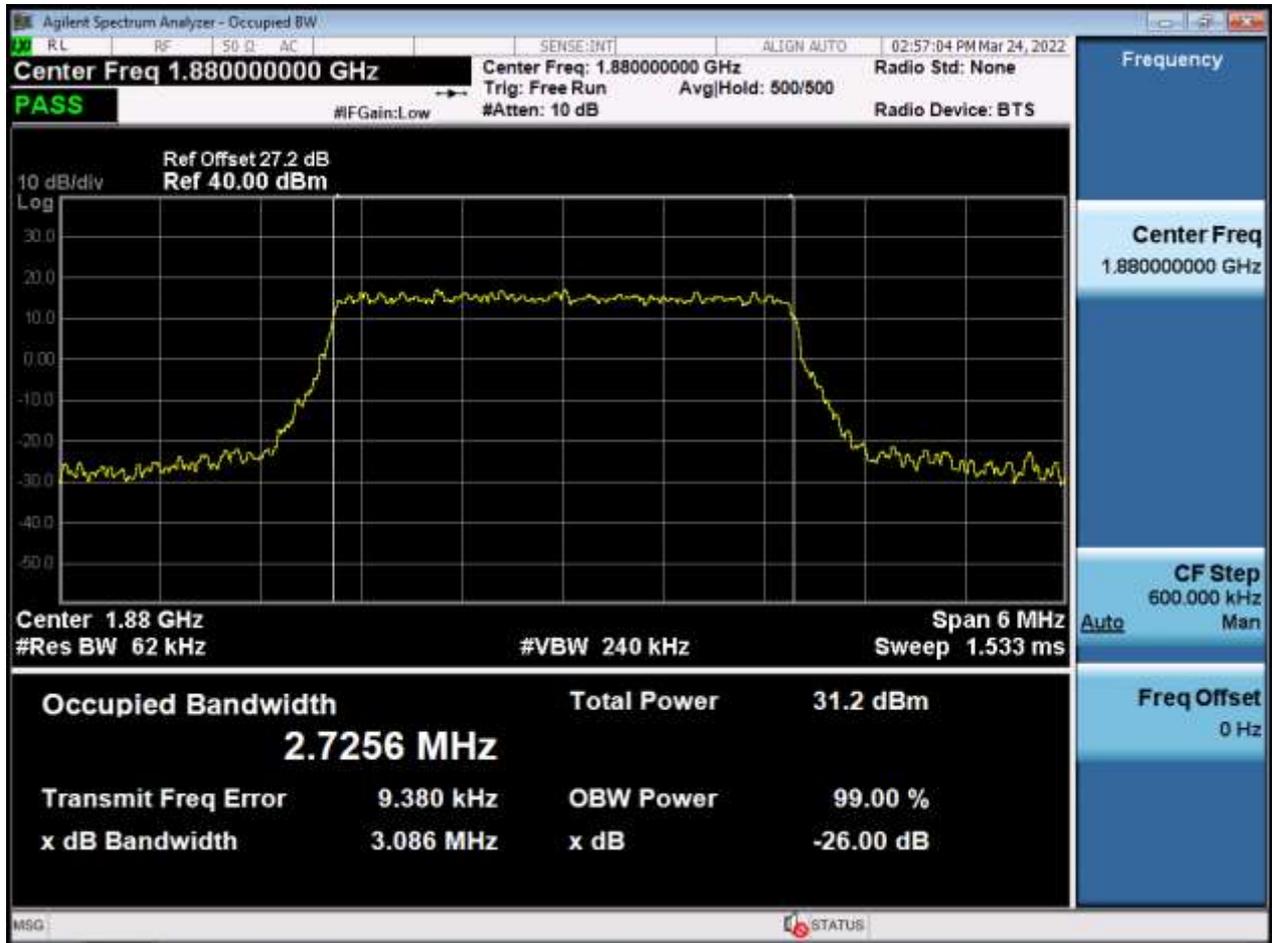
BW1.4 M\_OBW\_Middle Channel\_16QAM\_FullRB



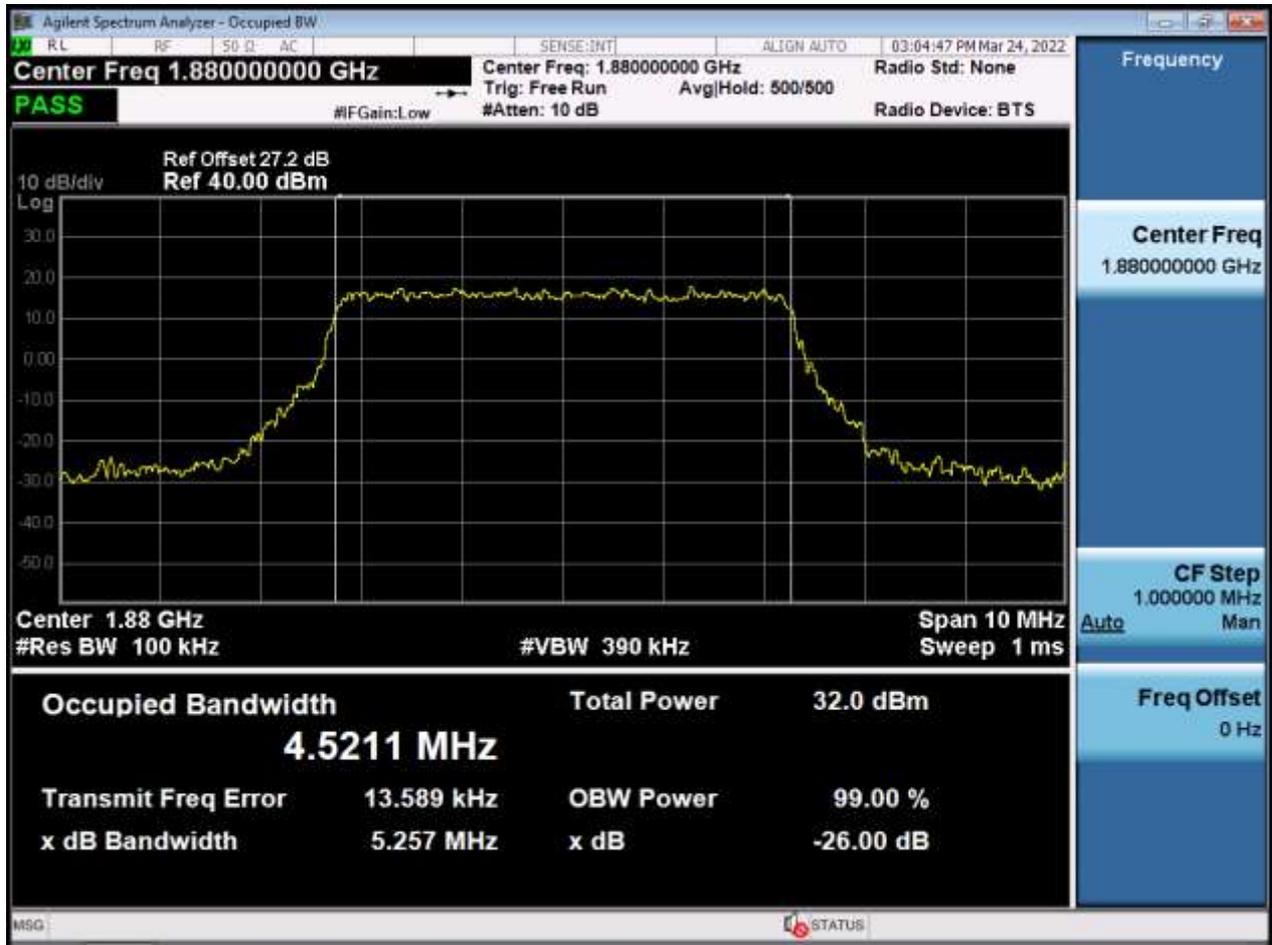
BW3 M\_OBW\_Middle Channel\_QPSK\_FullRB



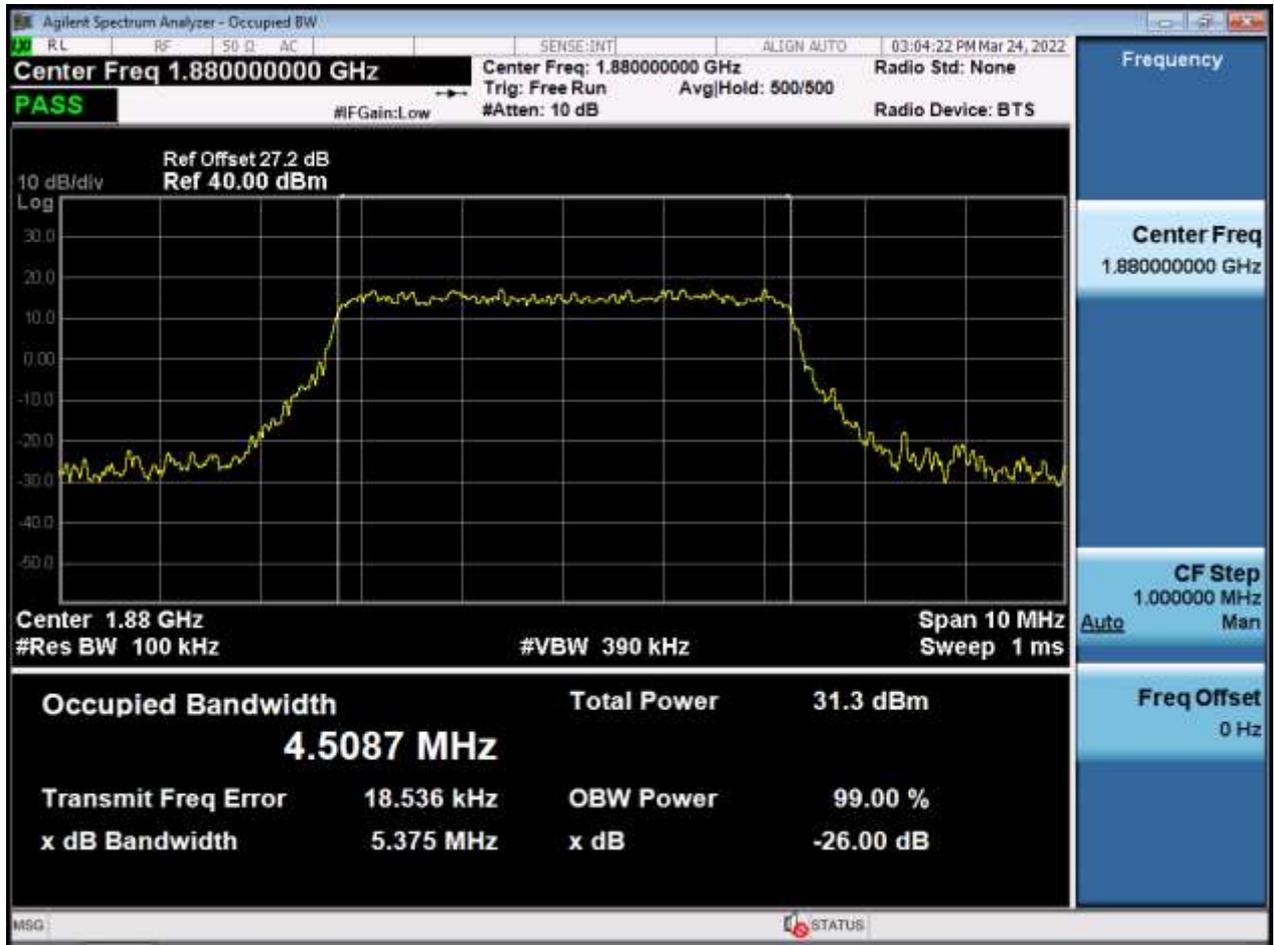
BW3 M\_OBW\_Middle Channel\_16QAM\_FullRB



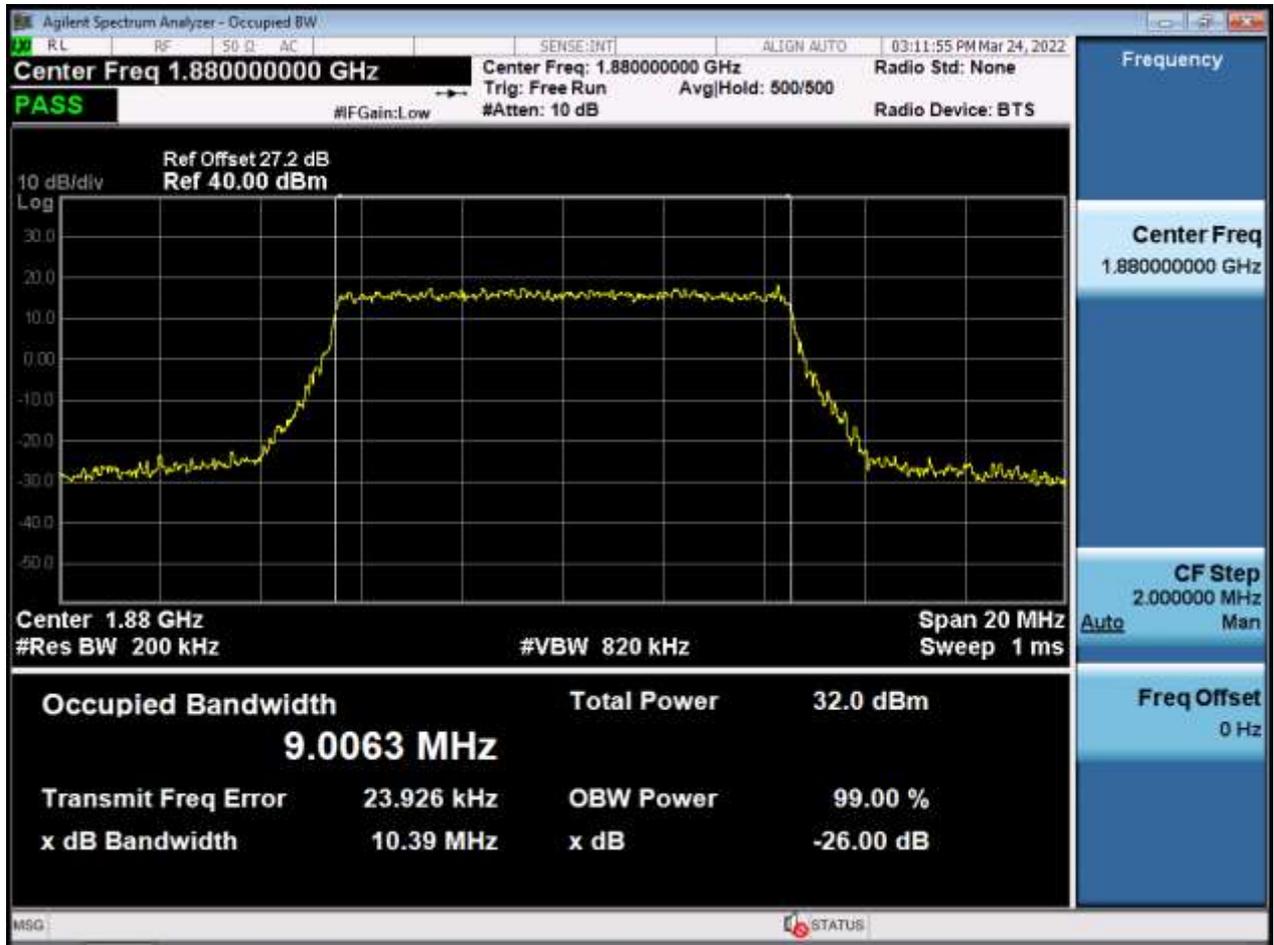
BW5 M\_OBW\_Middle Channel\_QPSK\_FullRB



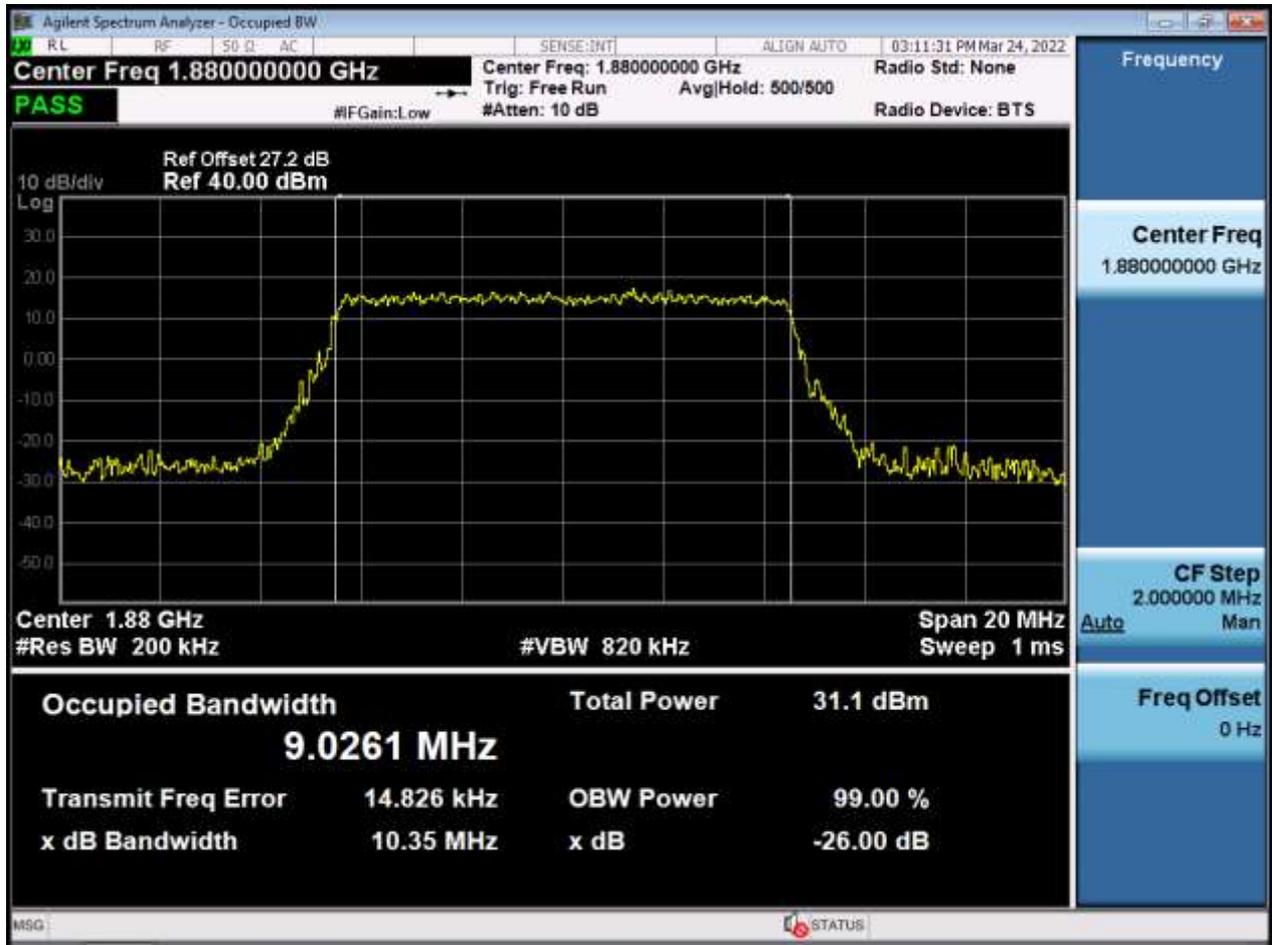
BW5 M\_OBW\_Middle Channel\_16QAM\_FullRB



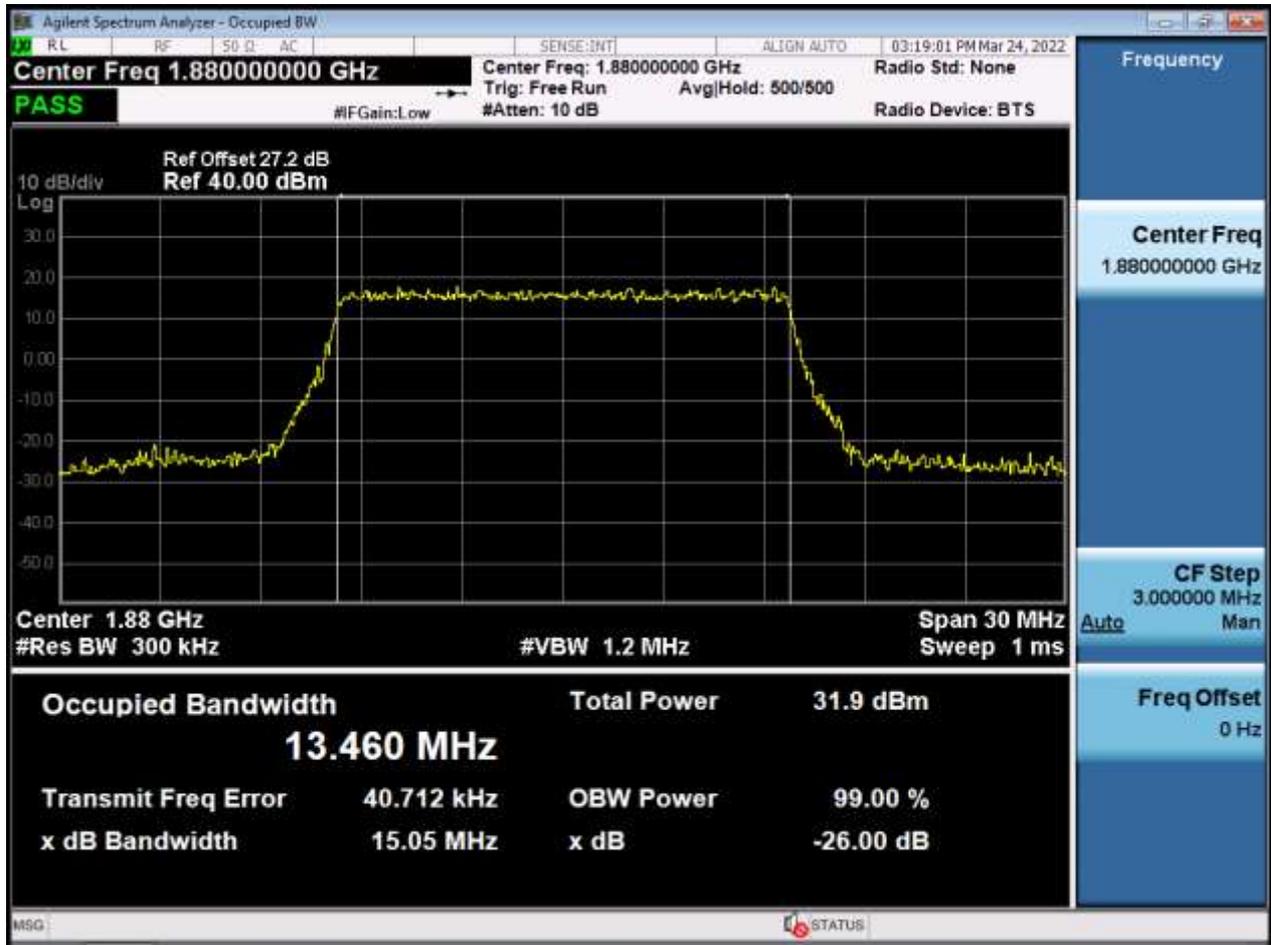
BW10 M\_OBW\_Middle Channel\_QPSK\_FullIRB



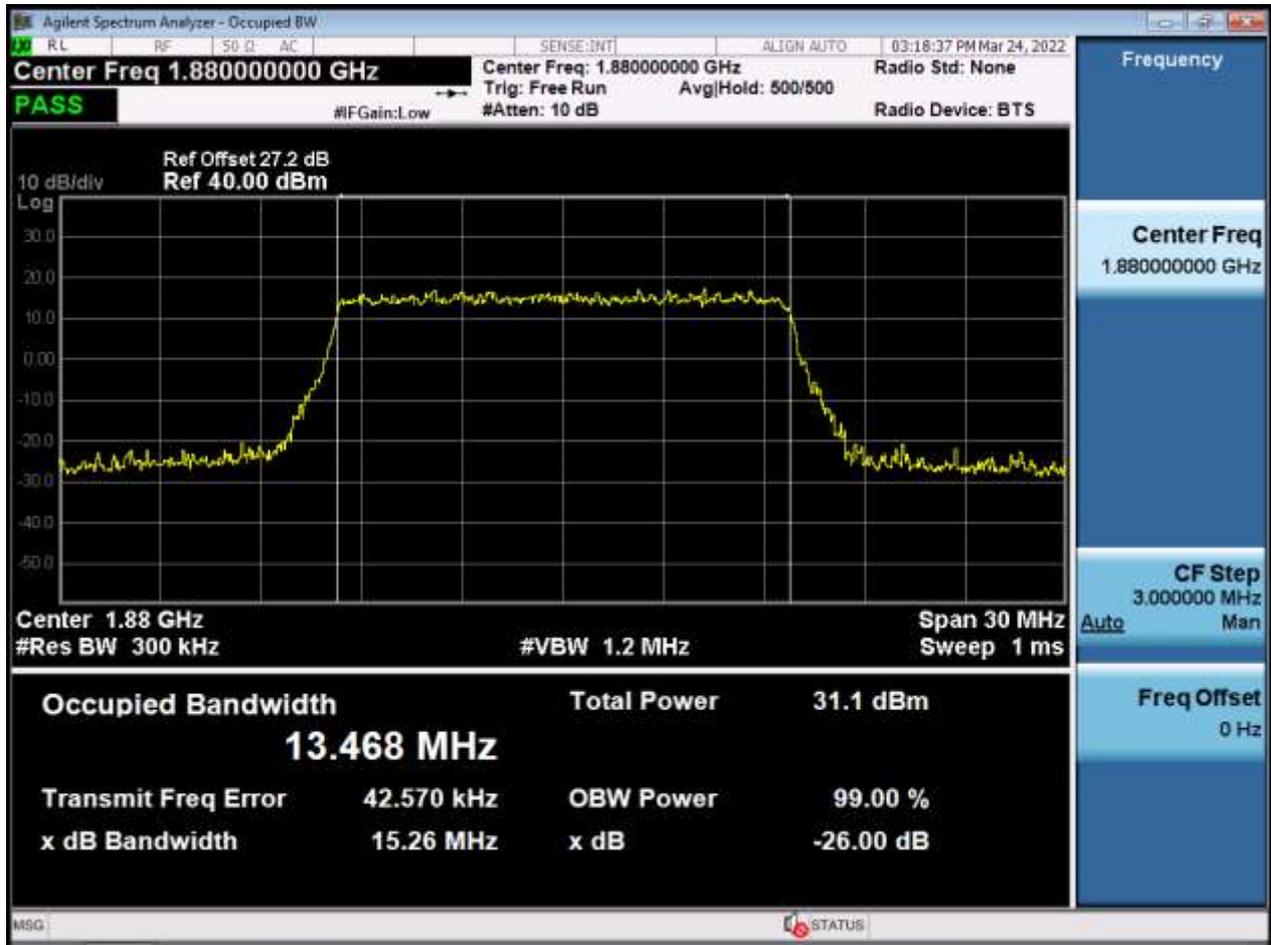
BW10 M\_OBW\_Middle Channel\_16QAM\_FullIRB



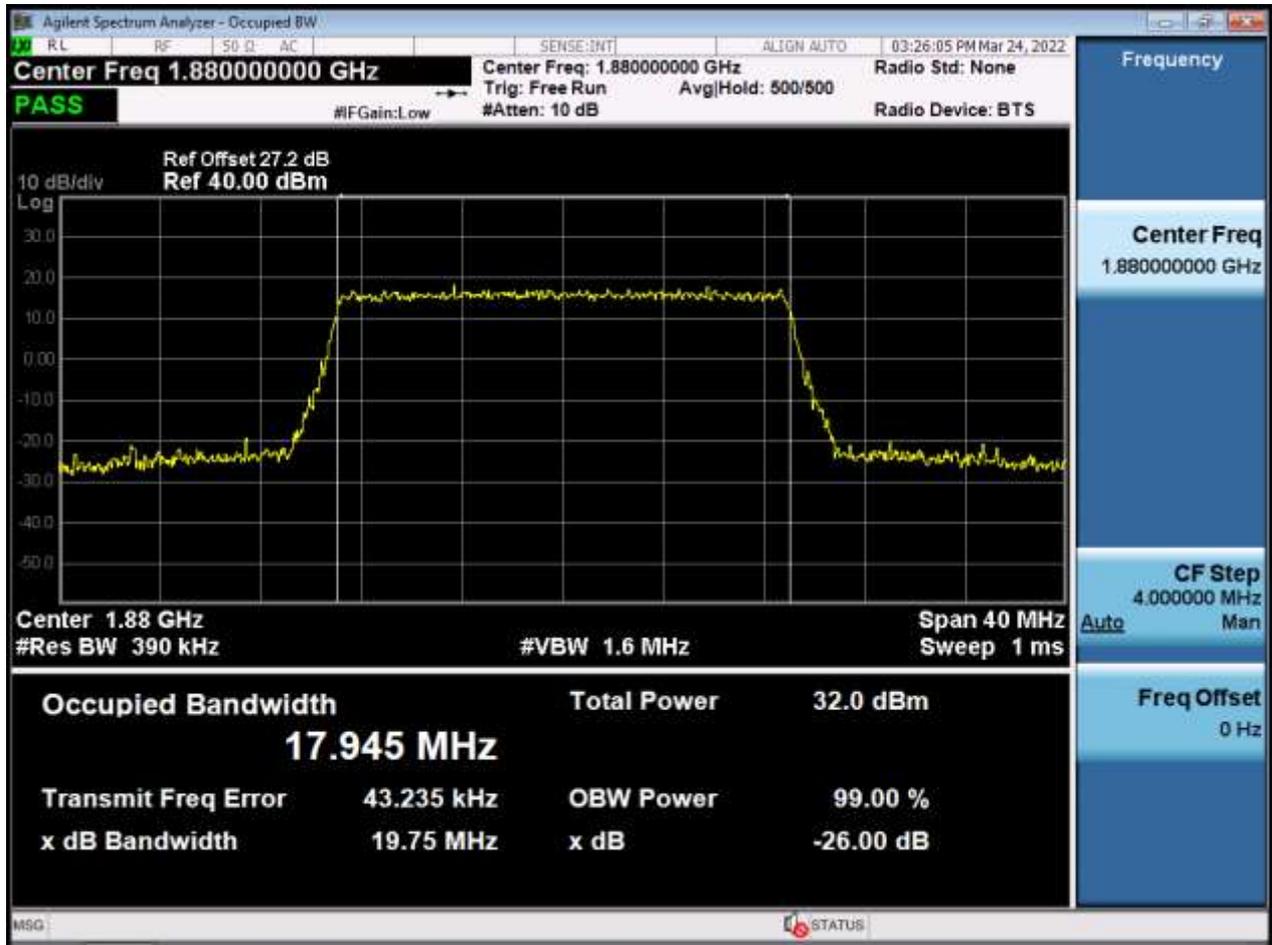
BW15 M\_OBW\_Middle Channel\_QPSK\_FullRB



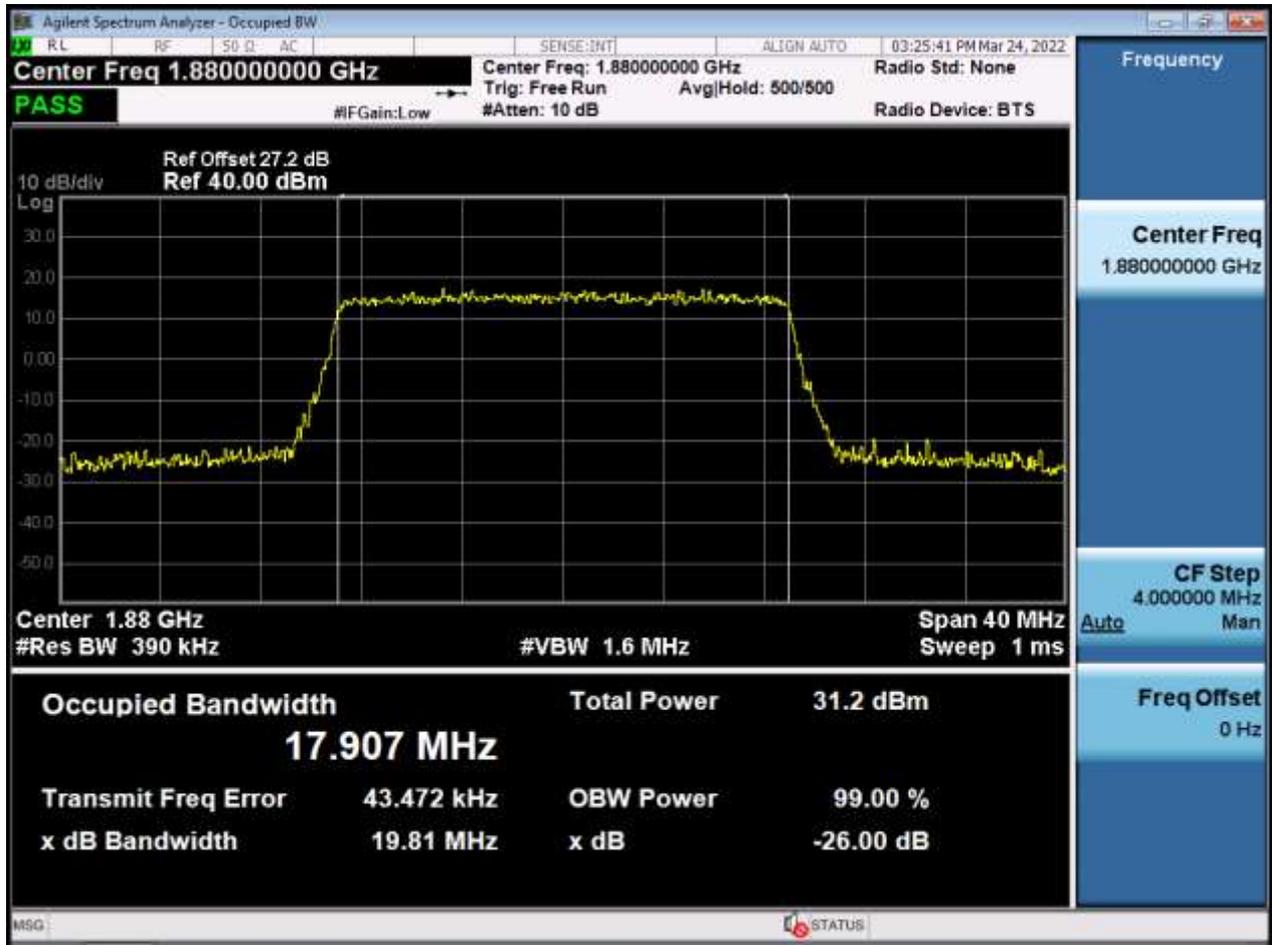
BW15 M\_OBW\_Middle Channel\_16QAM\_FullIRB



BW20 M\_OBW\_Middle Channel\_QPSK\_FullRB



BW20 M\_OBW\_Middle Channel\_16QAM\_FullIRB



BW1.4 M\_PAR\_Middle Channel\_QPSK\_FullRB



BW1.4 M\_PAR\_Middle Channel\_16QAM\_FullRB



BW3 M\_PAR\_Middle Channel\_QPSK\_FullIRB



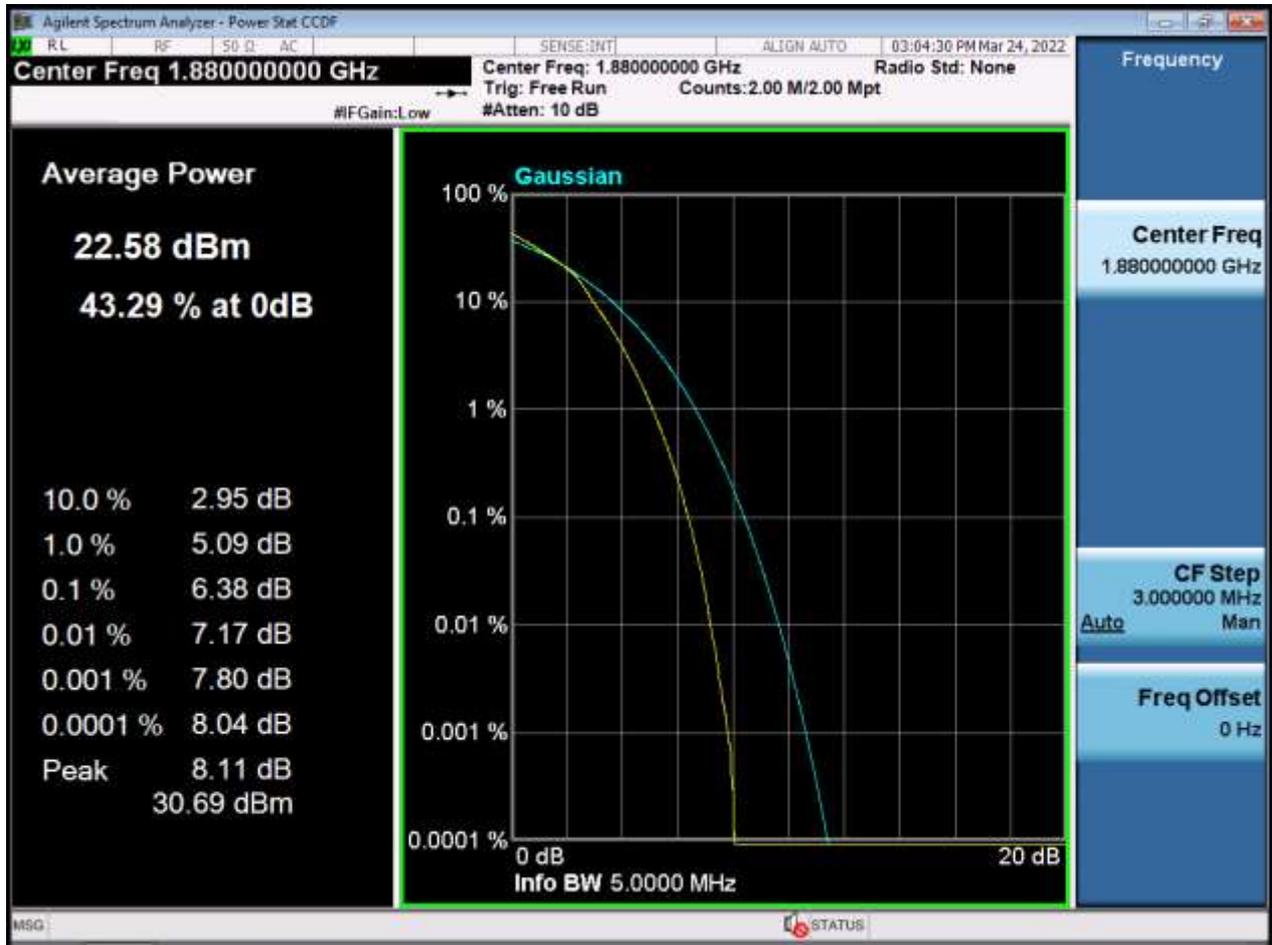
BW3 M\_PAR\_Middle Channel\_16QAM\_FuIRB



BW5 M\_PAR\_Middle Channel\_QPSK\_FullIRB



BW5 M\_PAR\_Middle Channel\_16QAM\_FuIRB



BW10 M\_PAR\_Middle Channelz\_QPSK\_FullRB



BW10 M\_PAR\_Middle Channel\_16QAM\_FullRB



BW15 M\_PAR\_Middle Channel\_QPSK\_FullRB



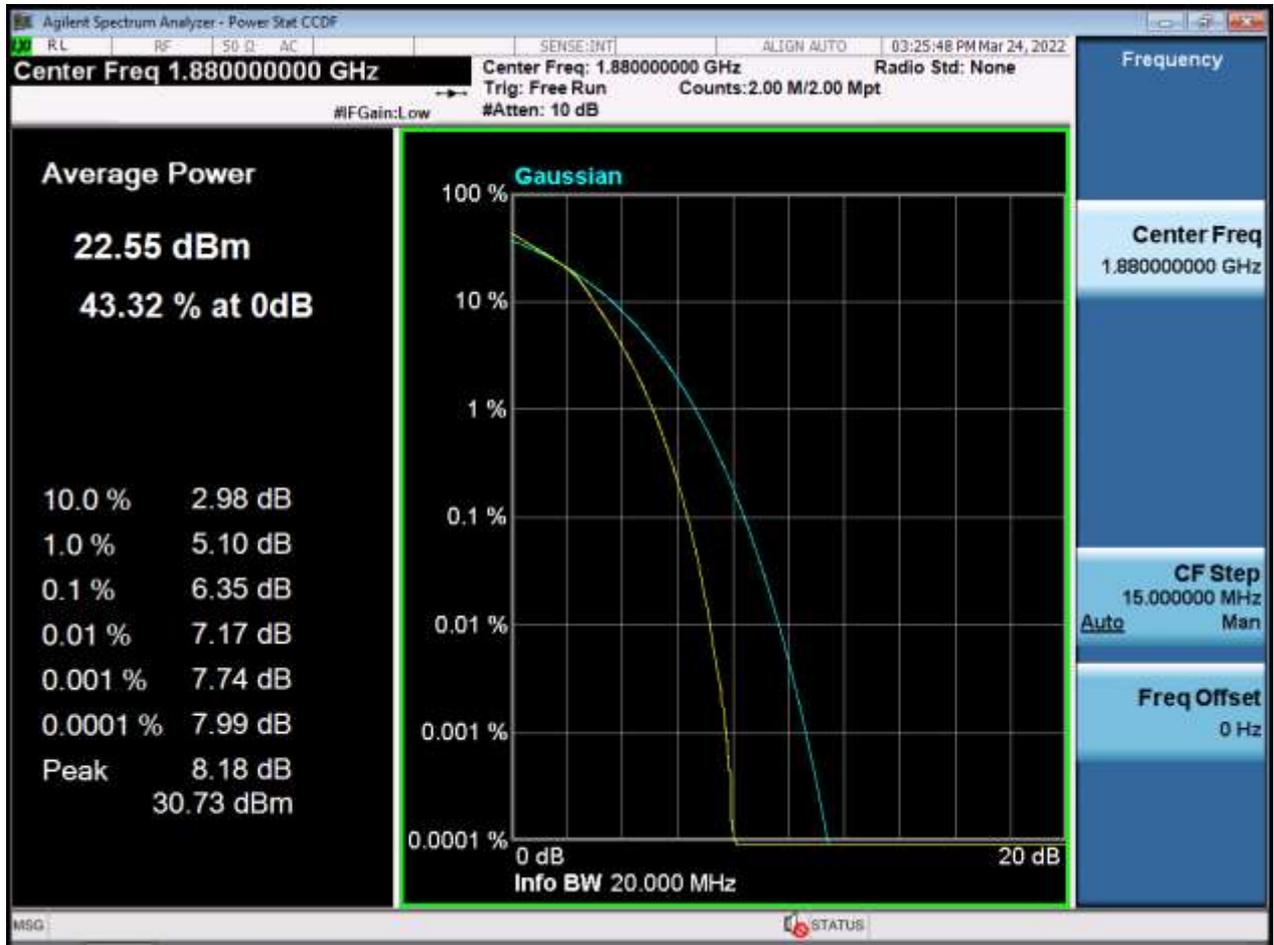
BW15 M\_PAR\_Middle Channel\_16QAM\_FullRB



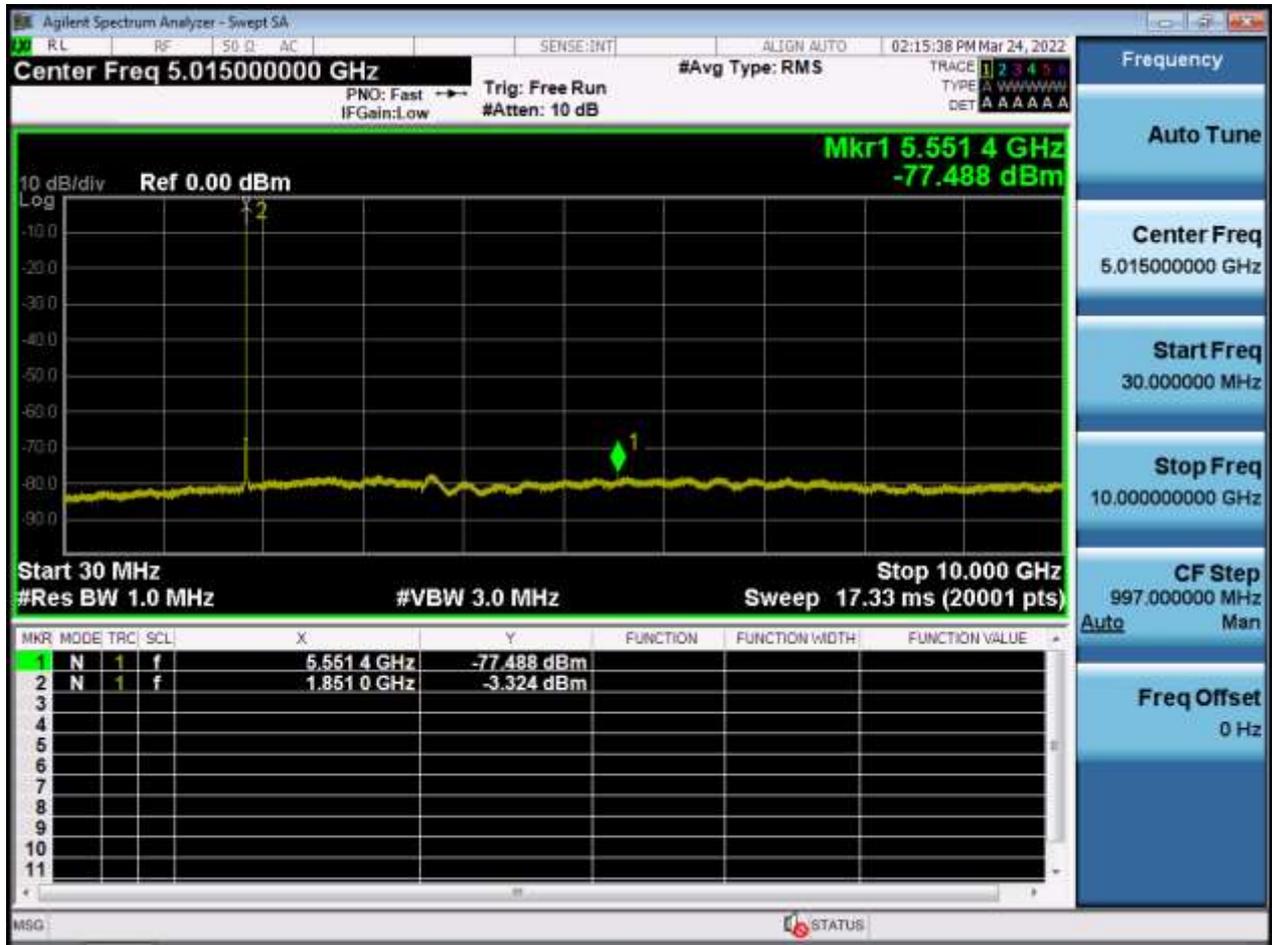
BW20 M\_PAR\_Middle Channel\_QPSK\_FullRB



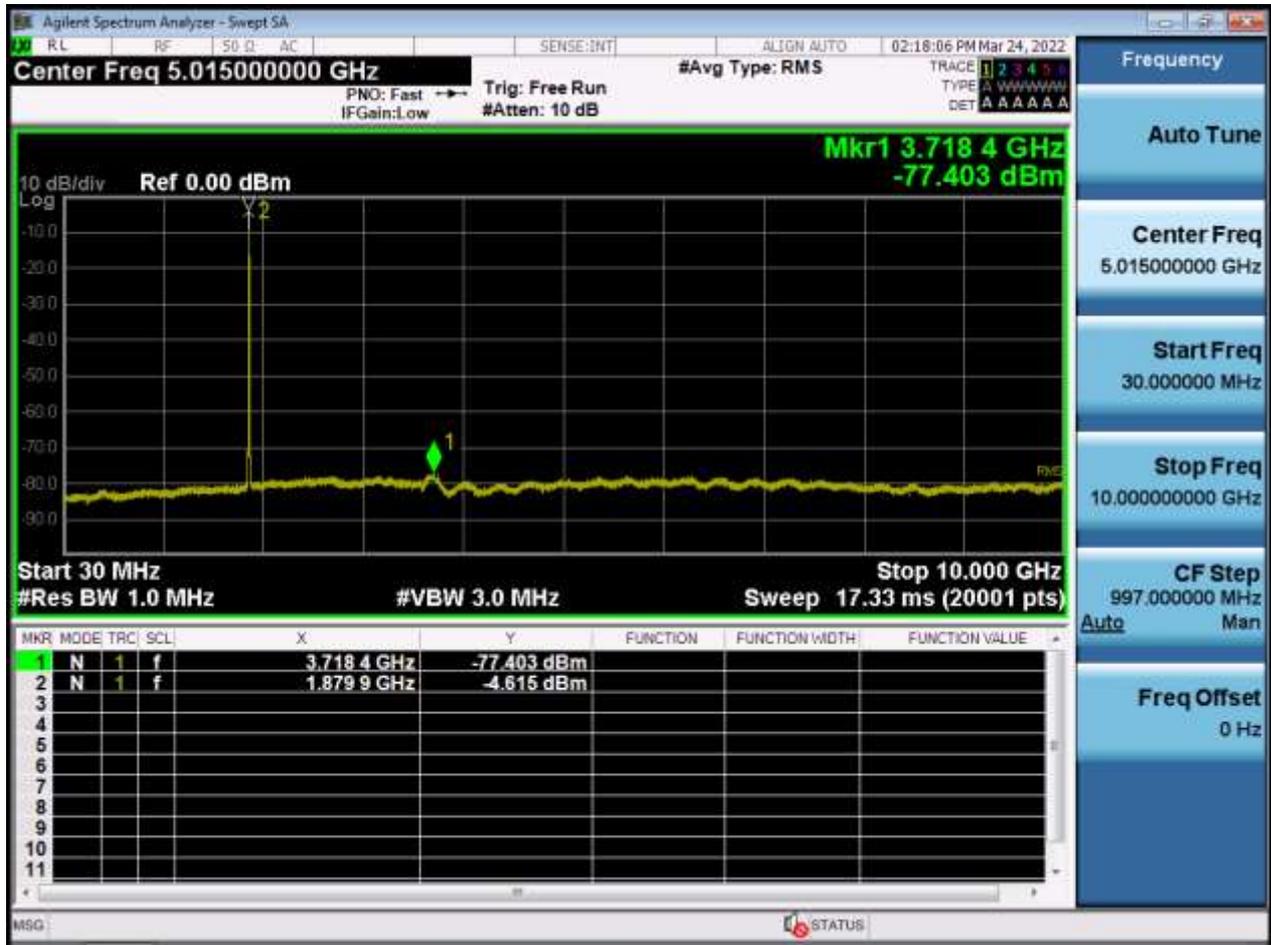
BW20 M\_PAR\_Middle Channel\_16QAM\_FullRB



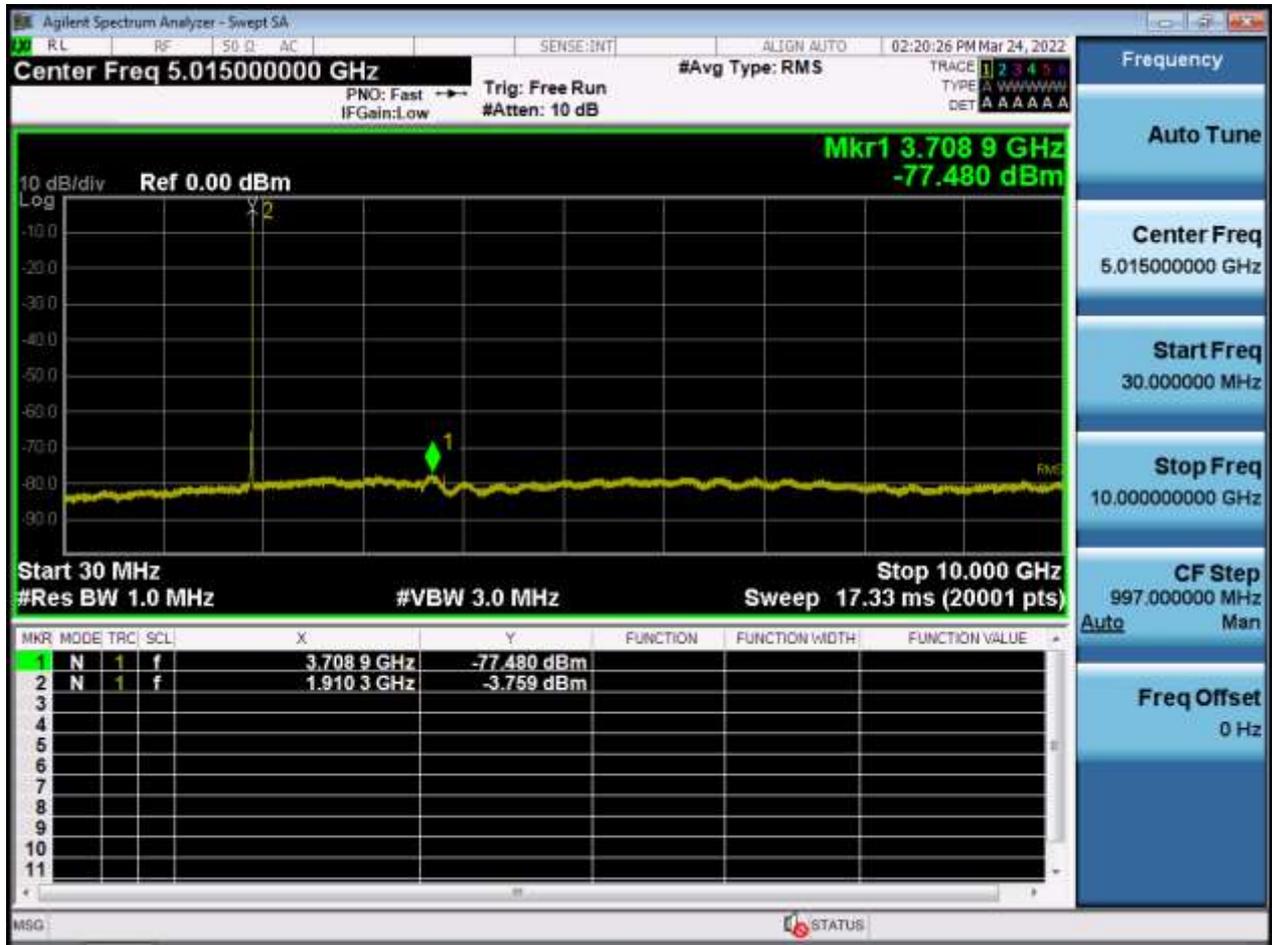
BW1.4 M\_CSE(30 M-10 G)\_Lowest Channel\_QPSK\_1RB



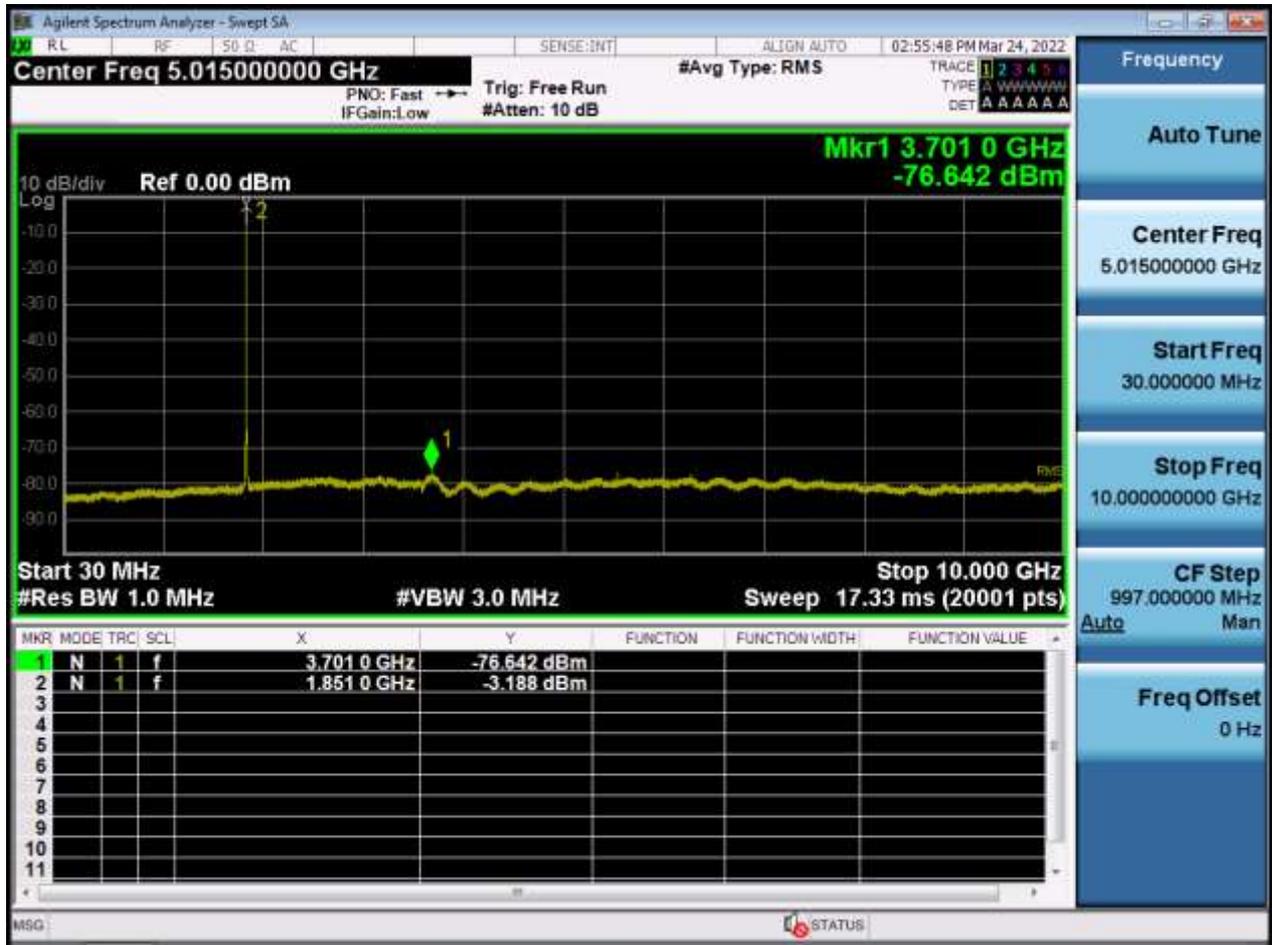
BW1.4 M\_CSE(30 M-10 G)\_Middle Channel\_QPSK\_1RB



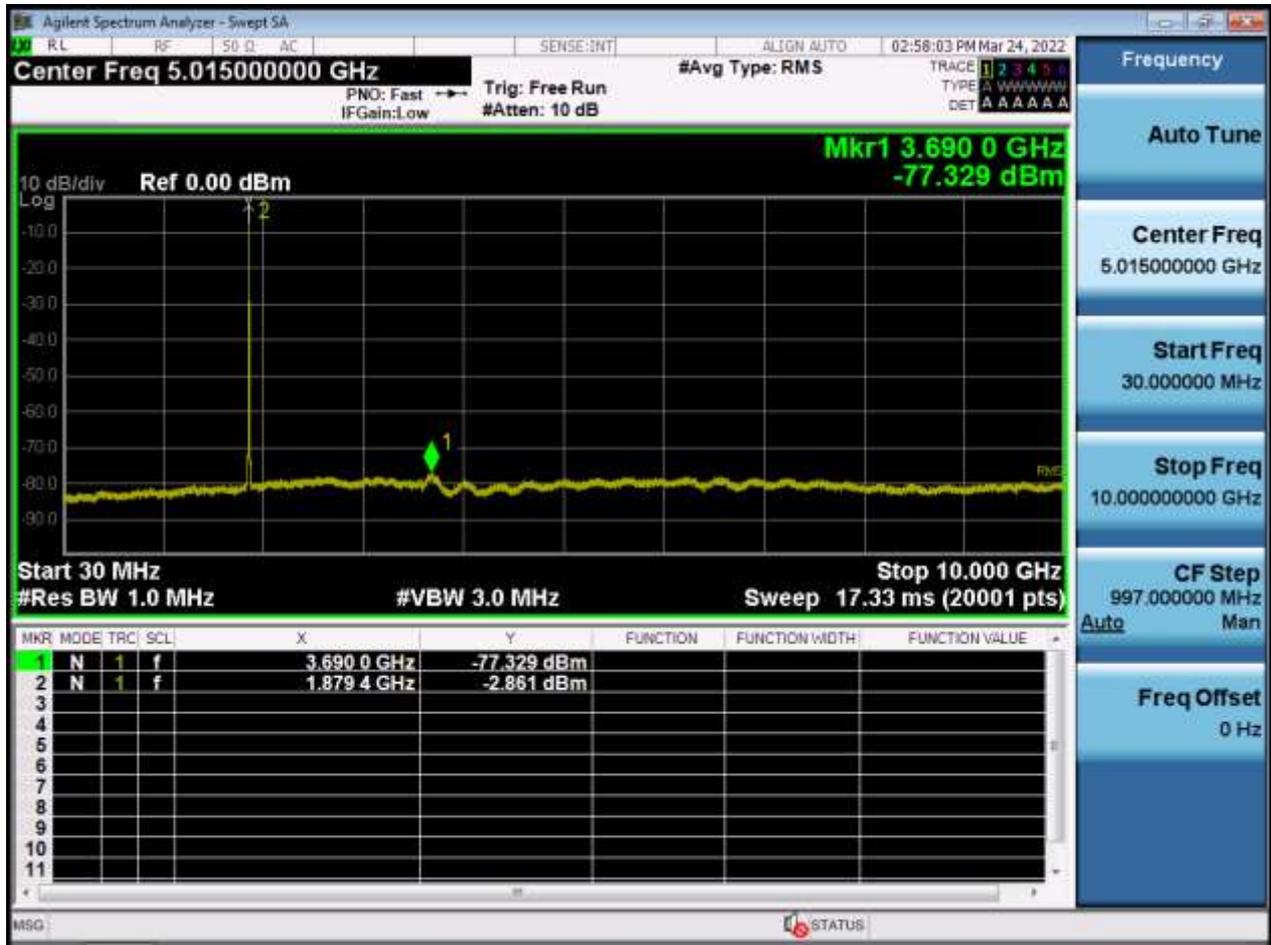
BW1.4 M\_CSE(30 M-10 G)\_Highest Channel\_QPSK\_1RB



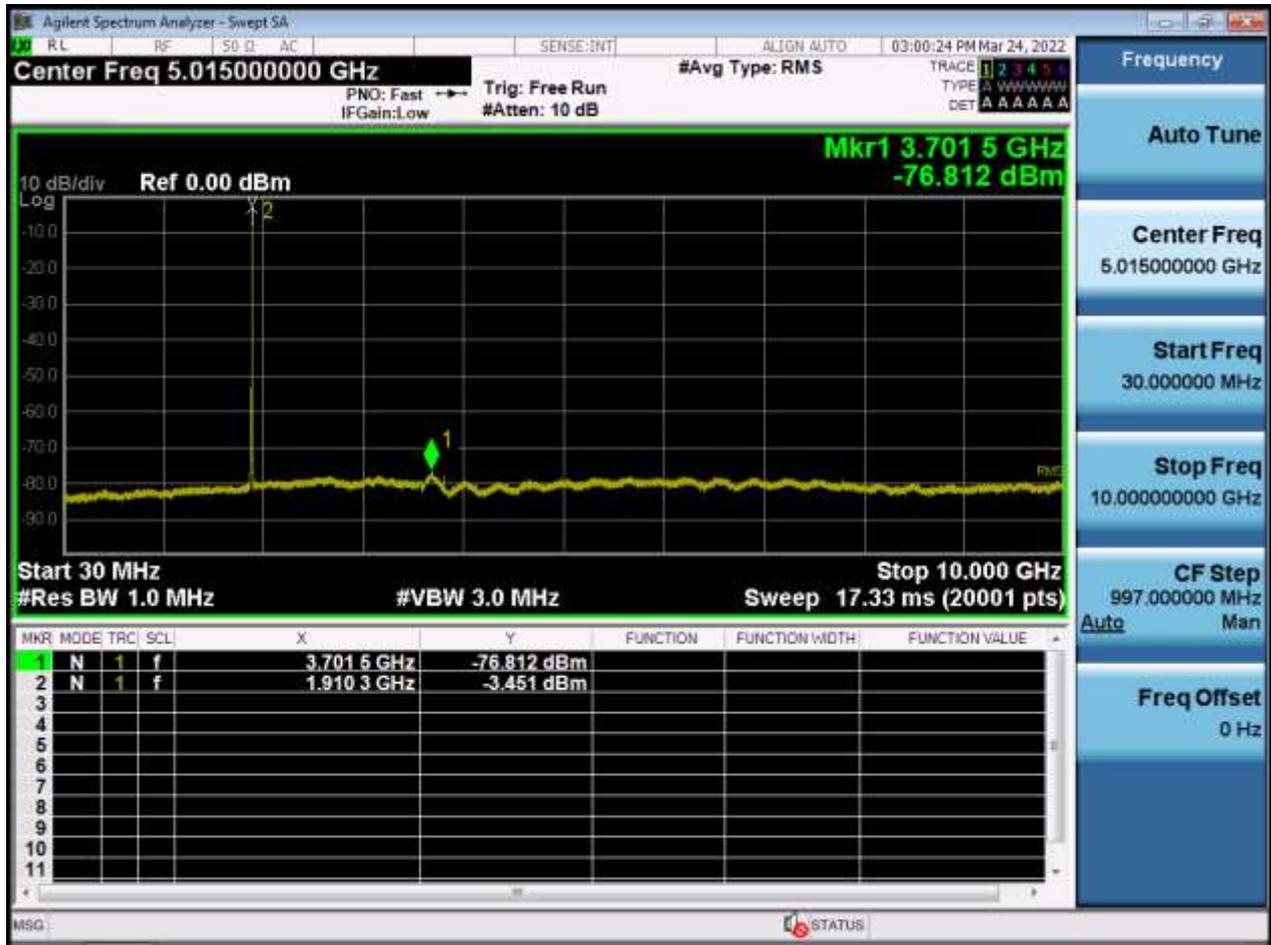
BW3 M\_CSE(30 M-10 G)\_Lowest Channel\_QPSK\_1RB



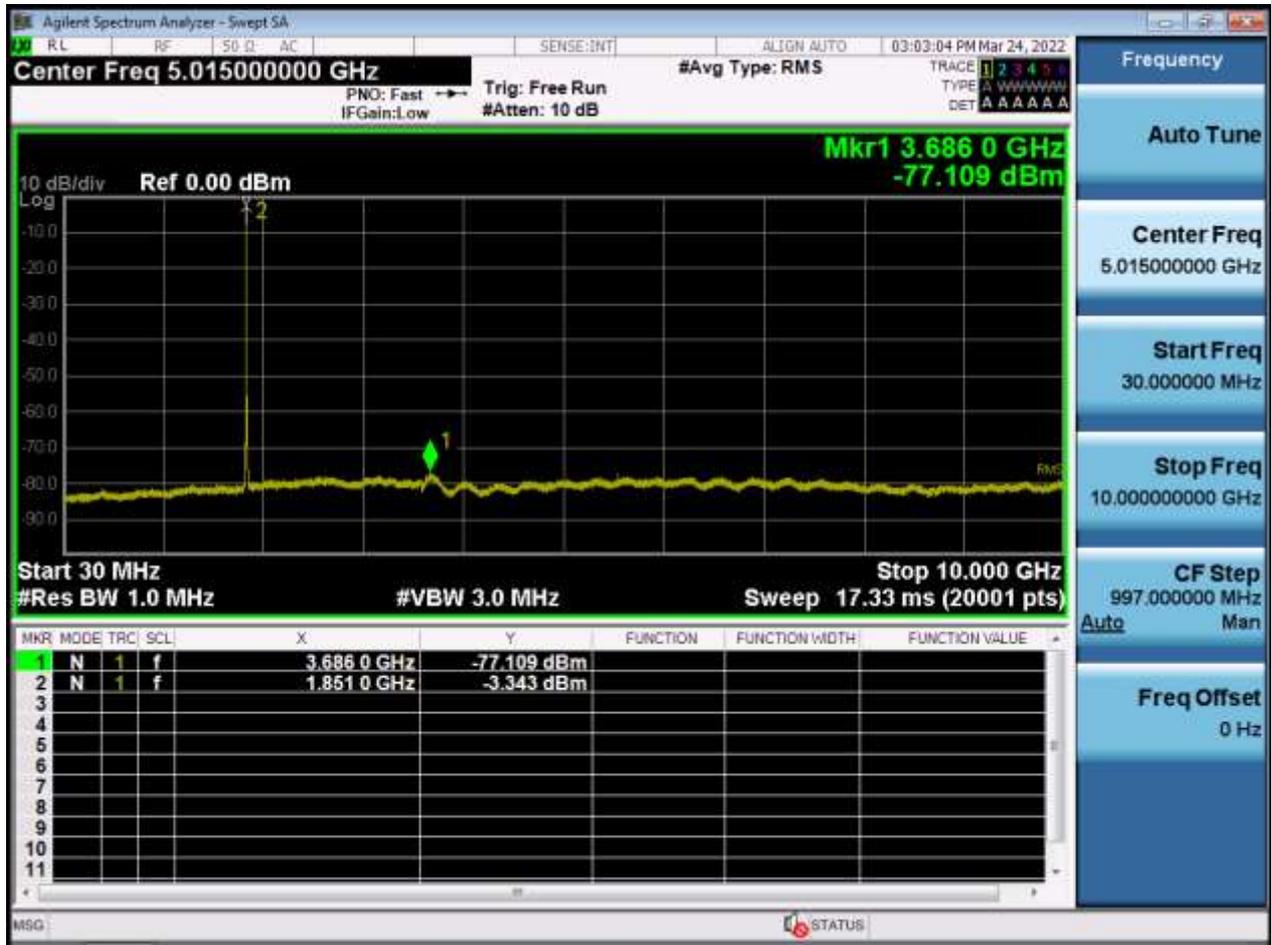
BW3 M\_CSE(30 M-10 G)\_Middle Channel\_QPSK\_1RB



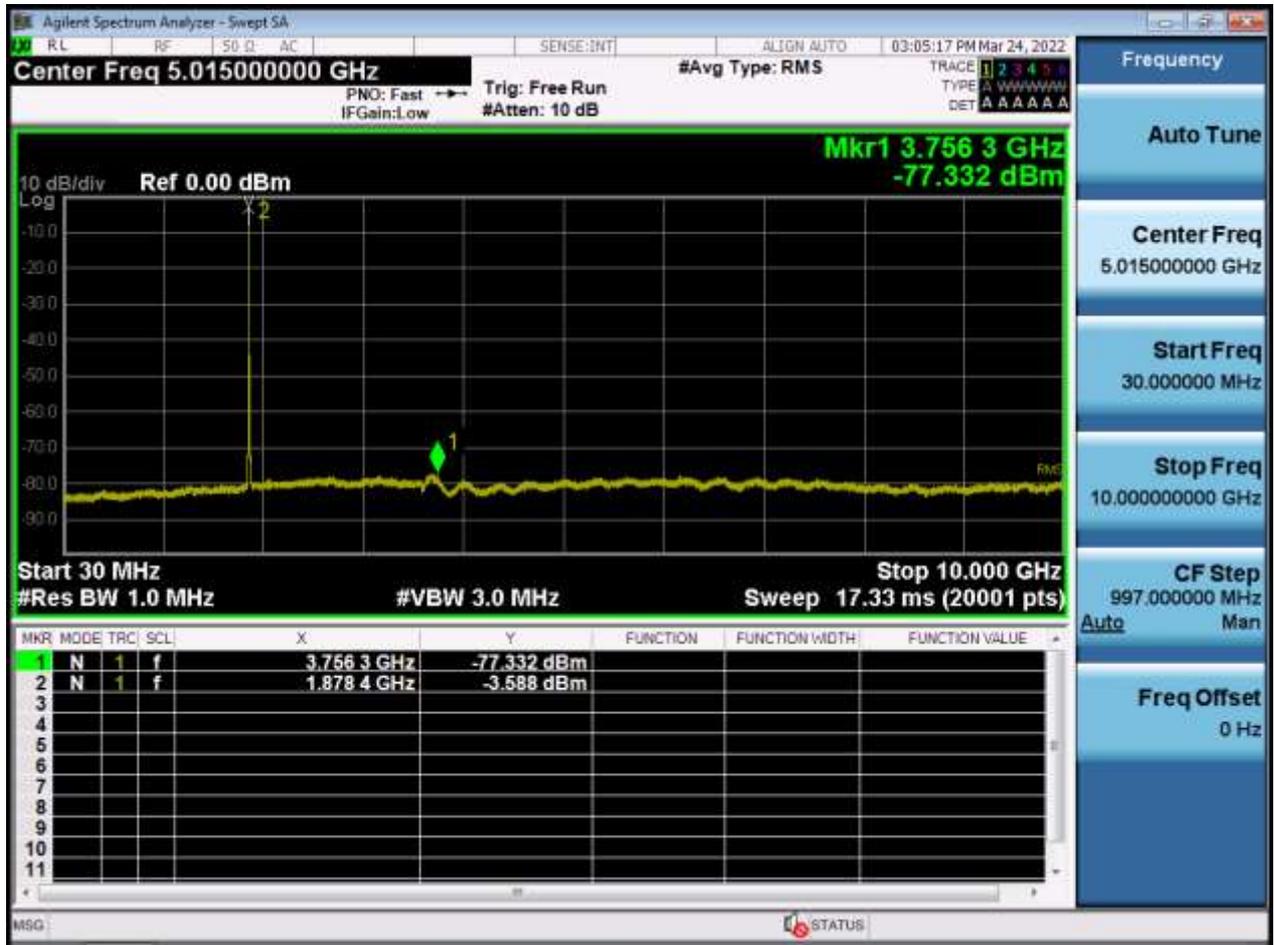
BW3 M\_CSE(30 M-10 G)\_Highest Channel\_QPSK\_1RB



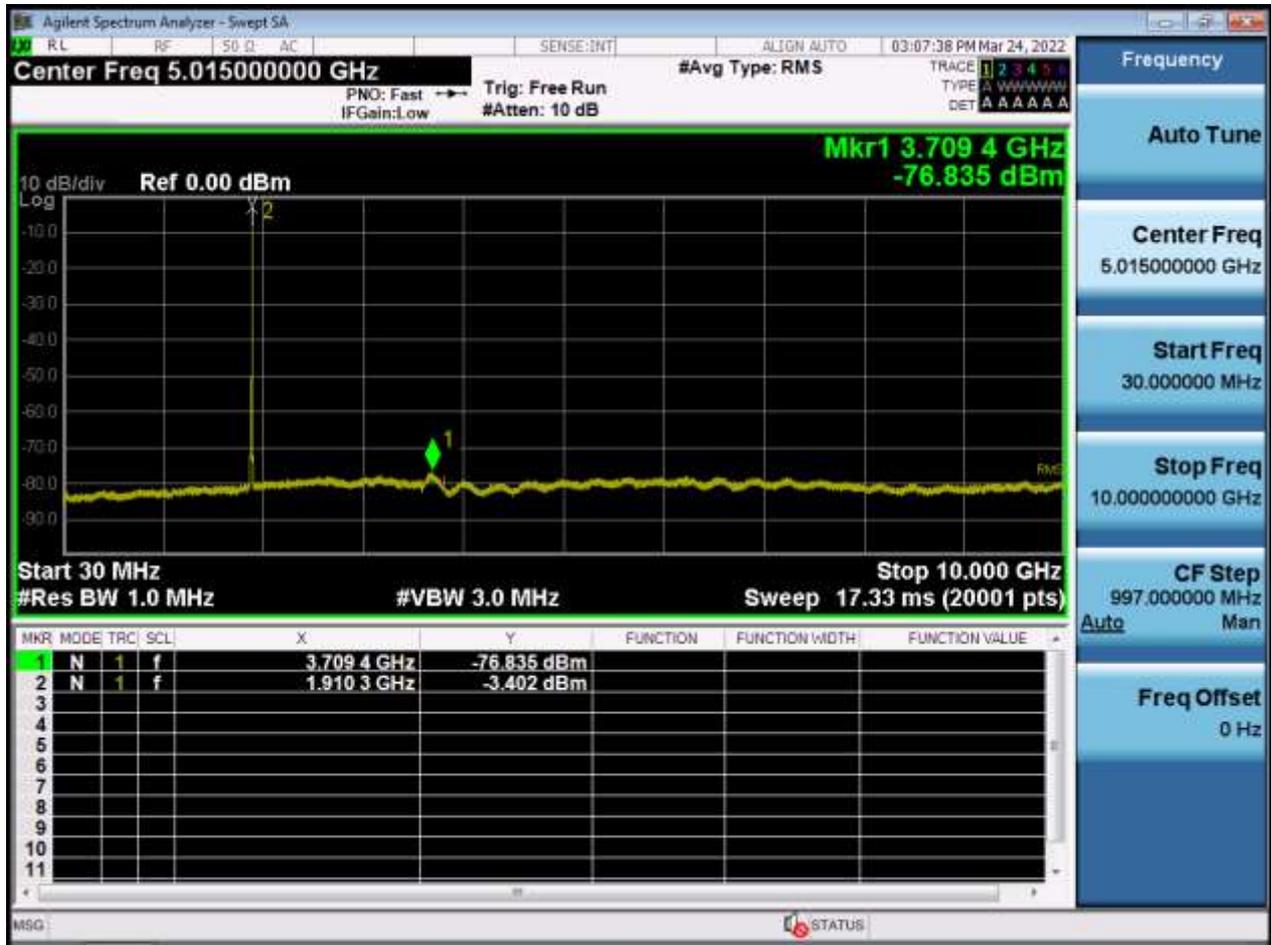
BW5 M\_CSE(30 M-10 G)\_Lowest Channel\_QPSK\_1RB



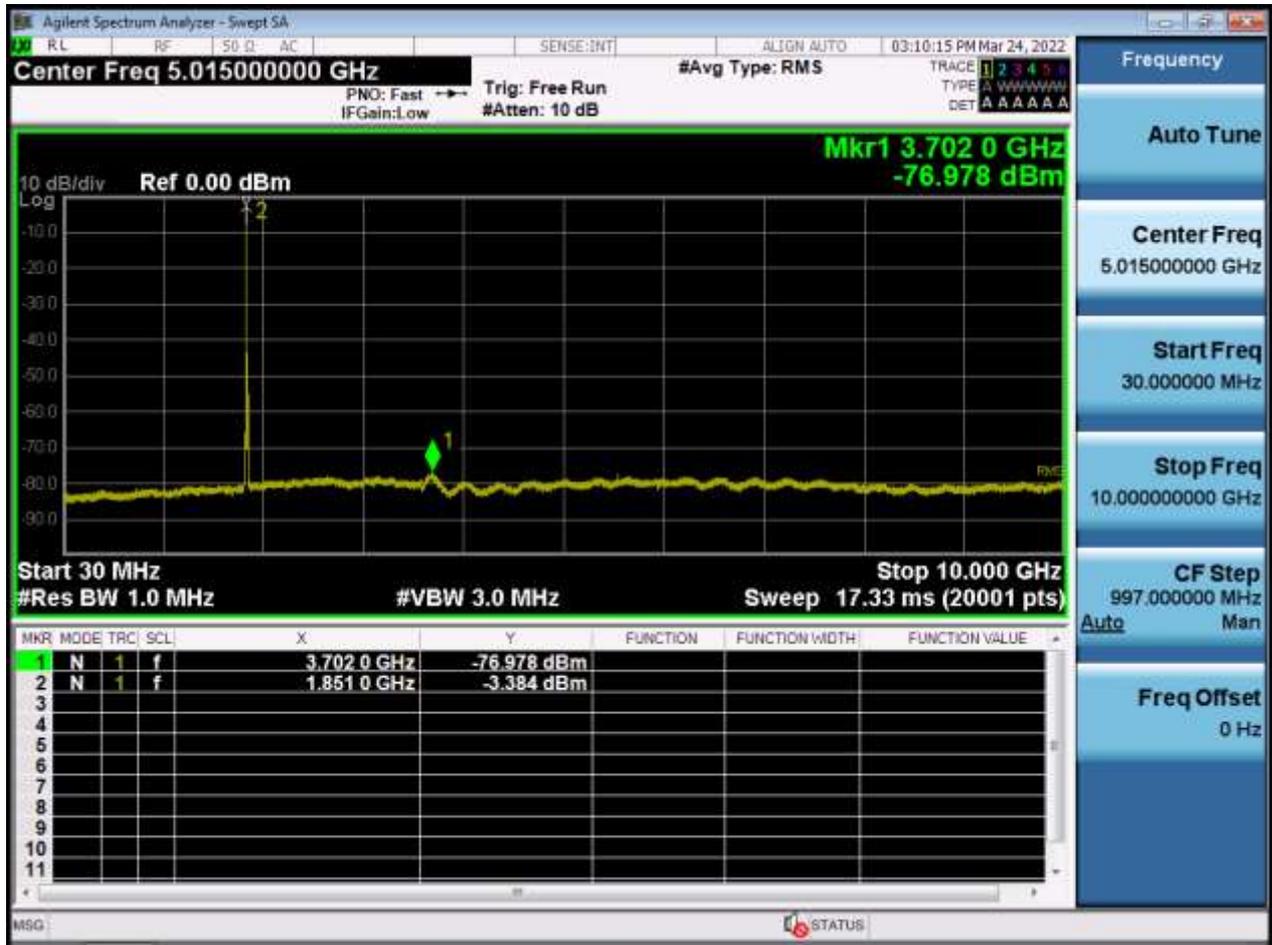
BW5 M\_CSE(30 M-10 G)\_Middle Channel\_QPSK\_1RB



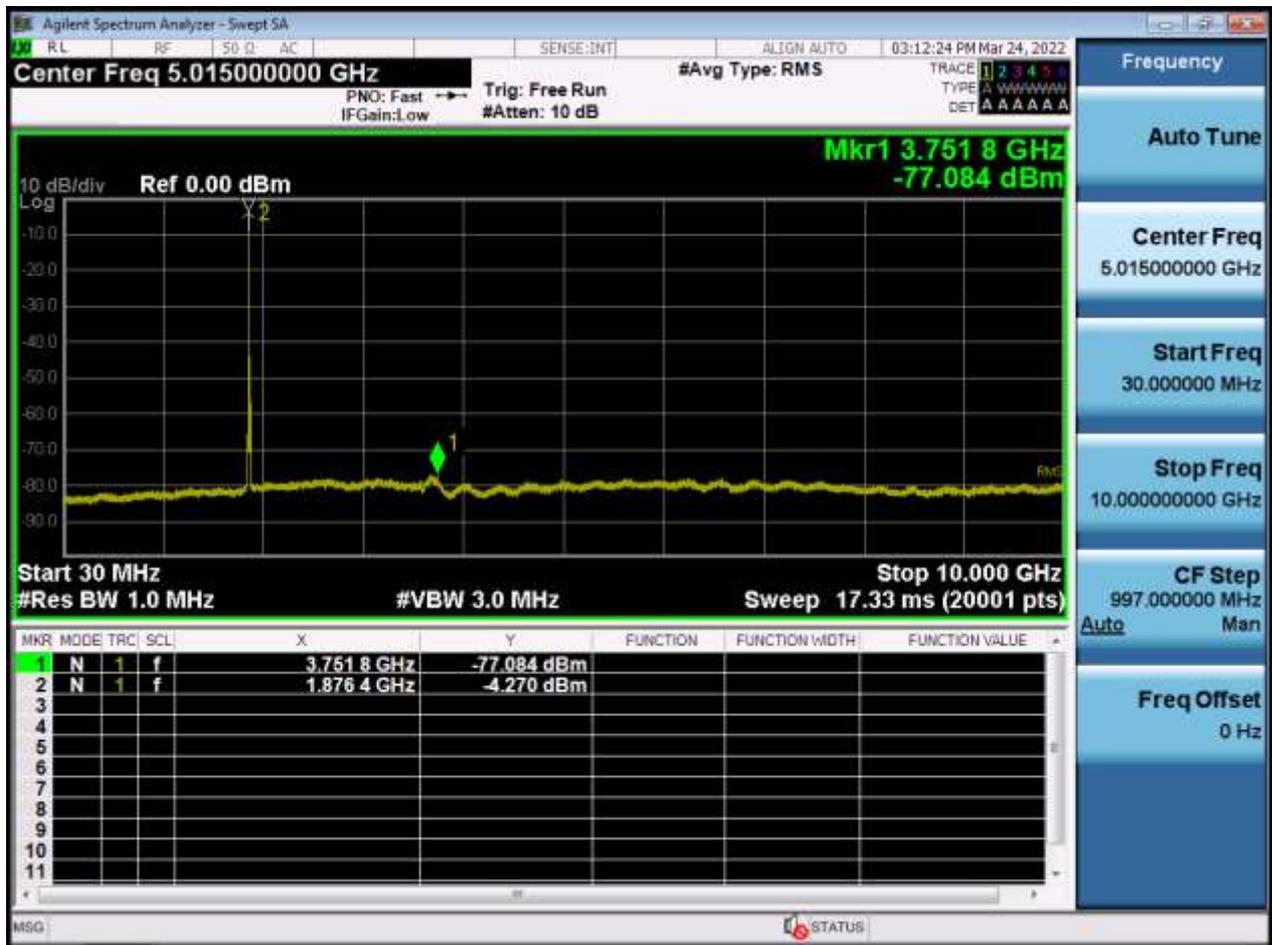
BW5 M\_CSE(30 M-10 G)\_Highest Channel\_QPSK\_1RB



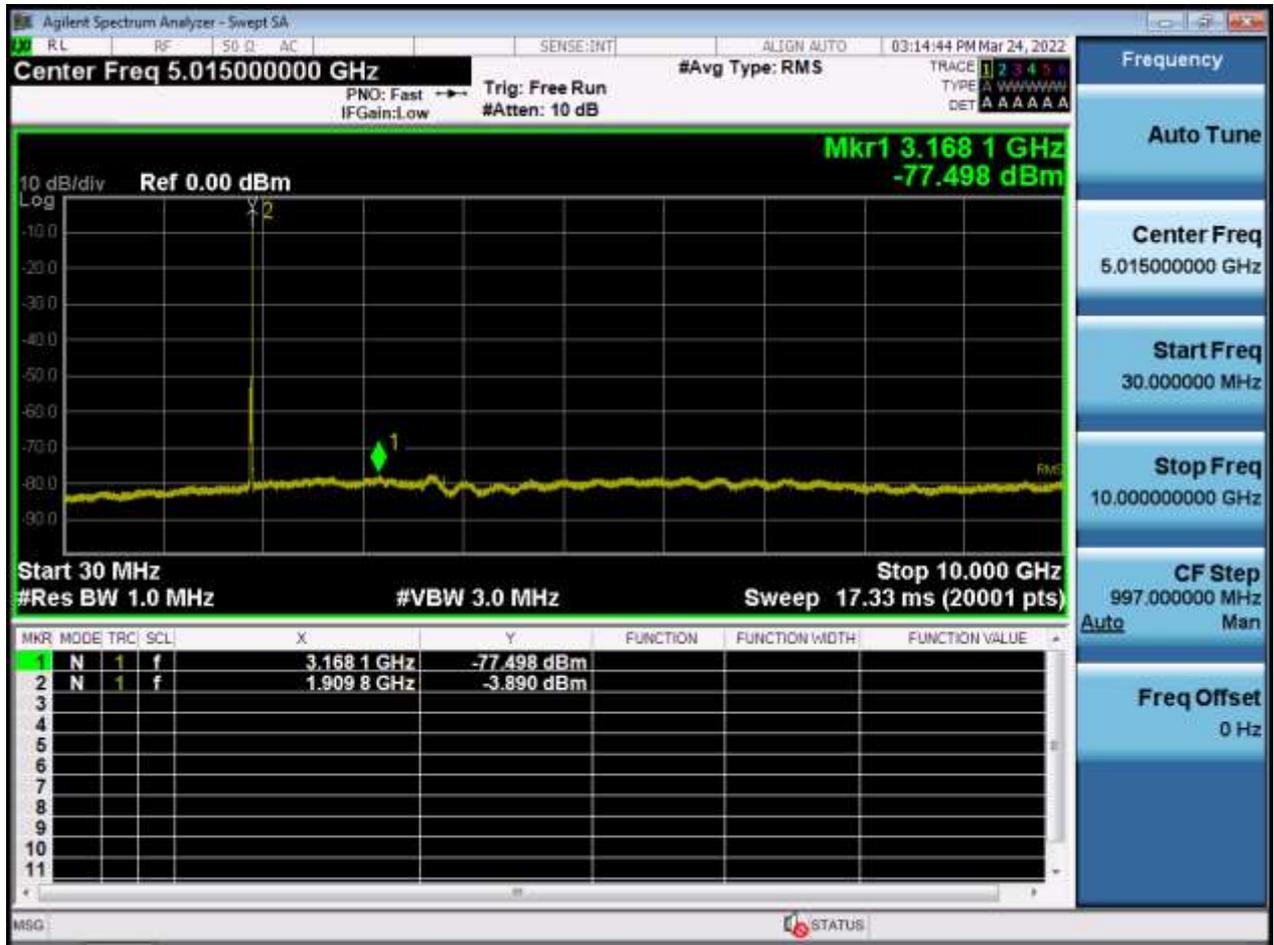
BW10 M\_CSE(30 M-10 G)\_Lowest Channel\_QPSK\_1RB



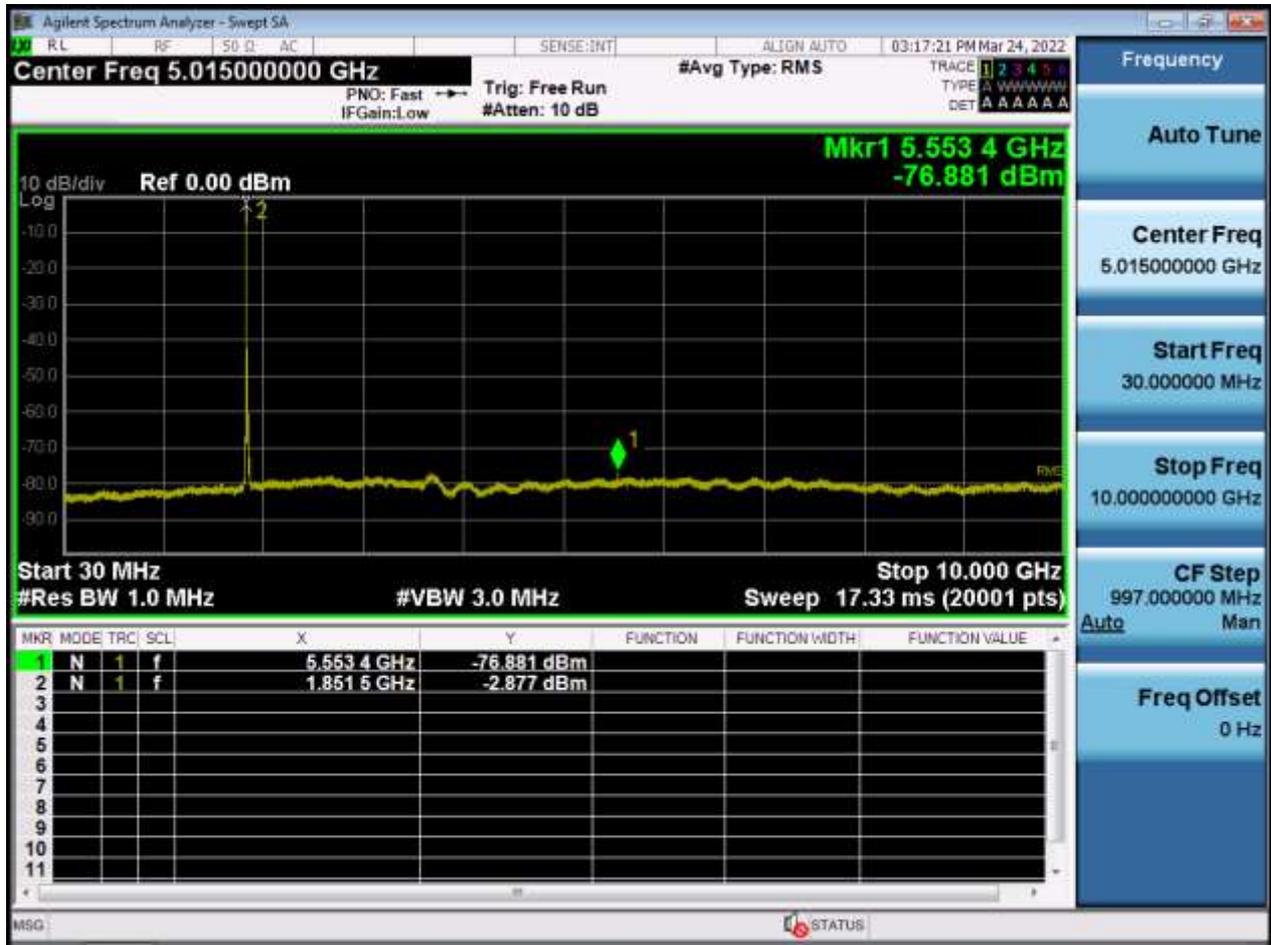
BW10 M\_CSE(30 M-10 G)\_Middle Channel\_QPSK\_1RB



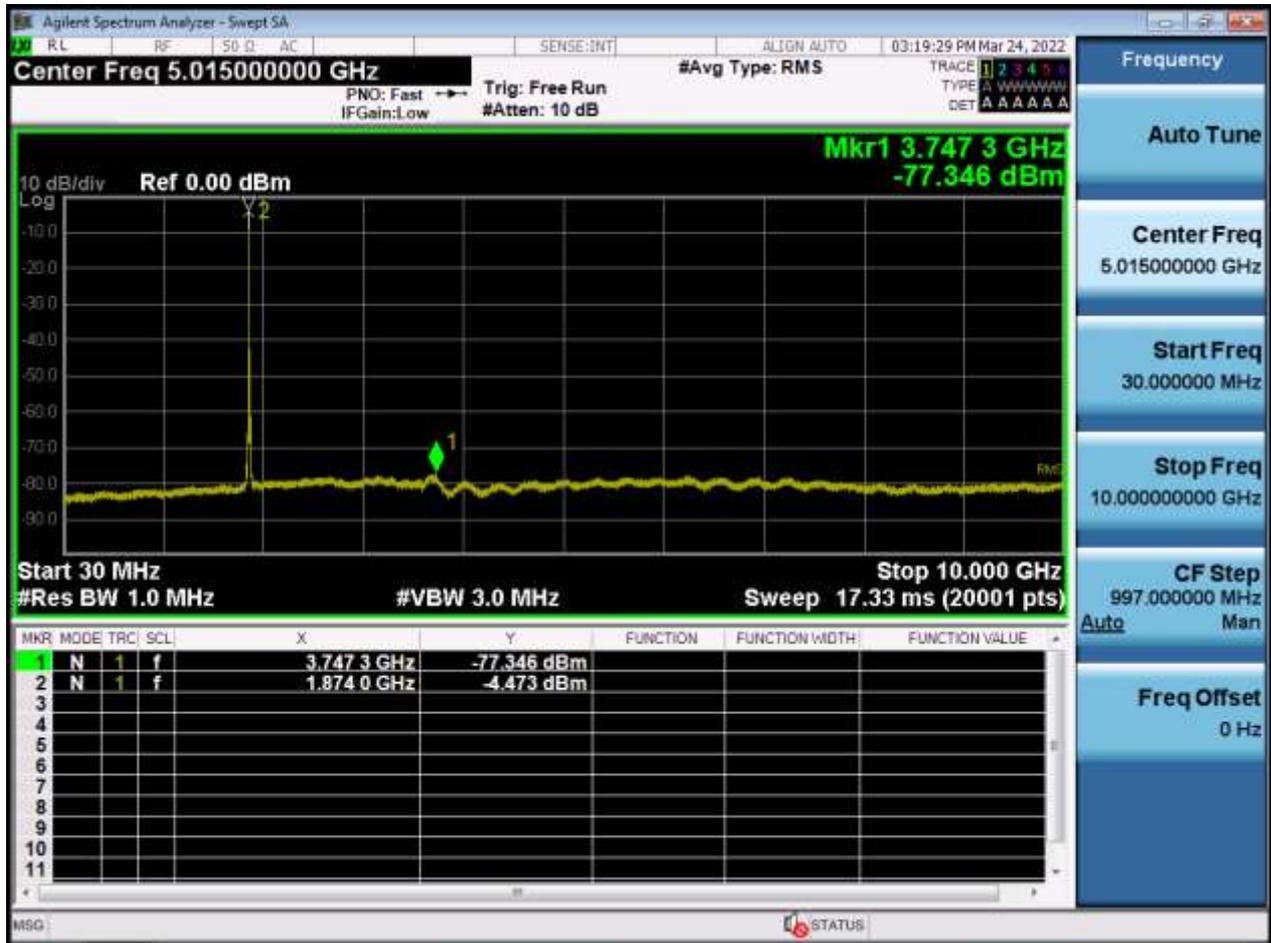
BW10 M\_CSE(30 M-10 G)\_Highest Channel\_QPSK\_1RB



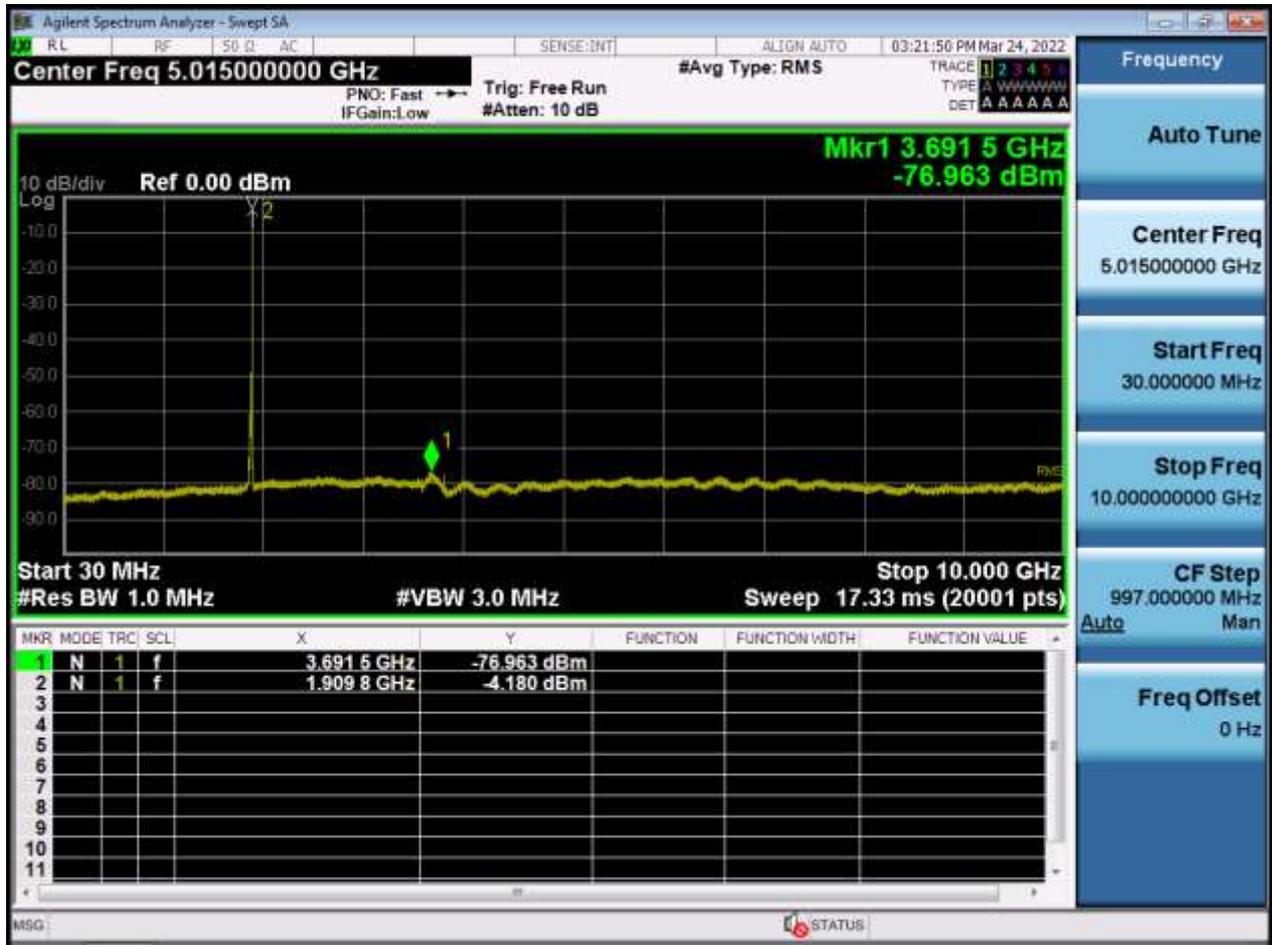
BW15 M\_CSE(30 M-10 G)\_Lowest Channel\_QPSK\_1RB



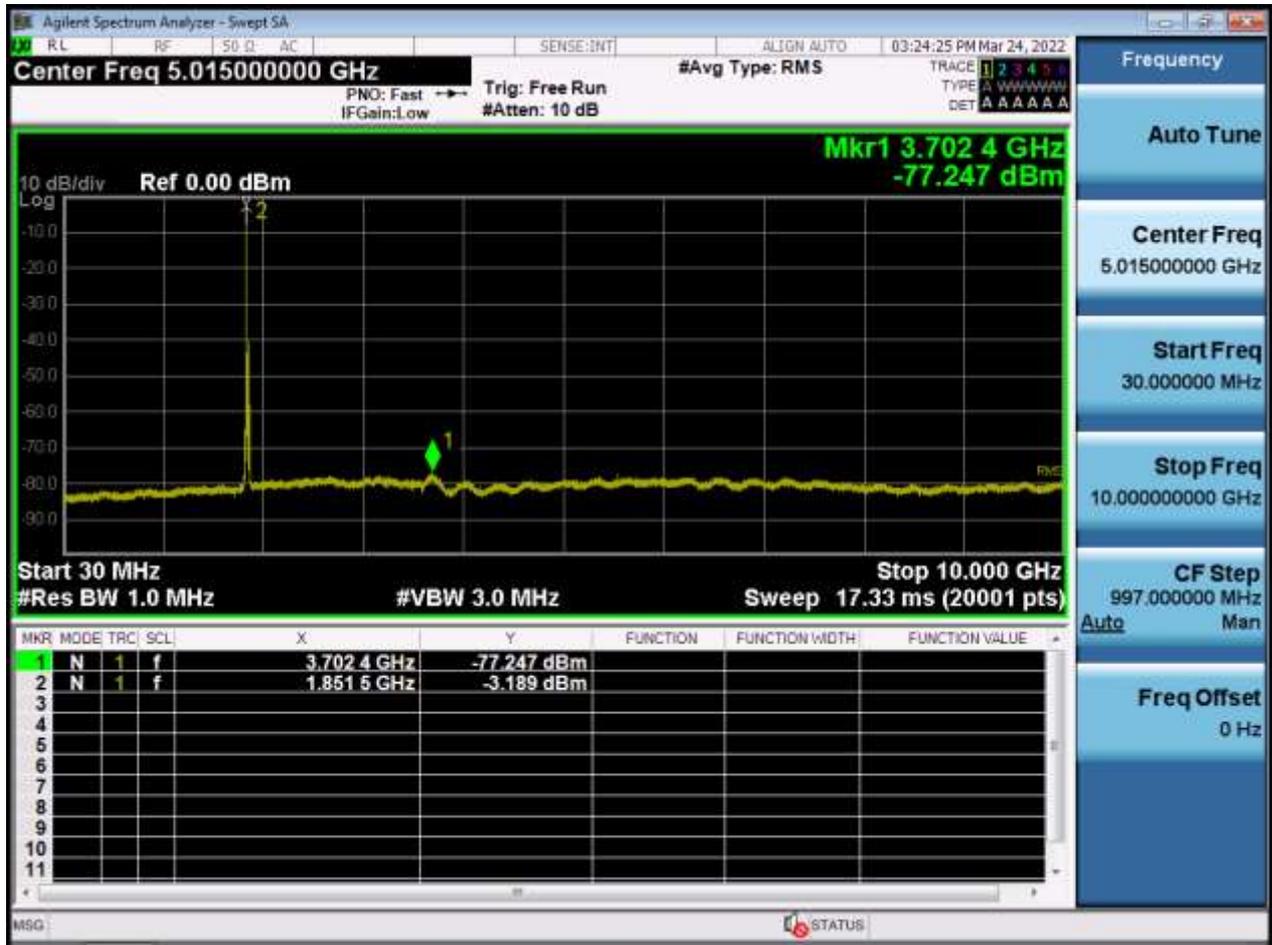
BW15 M\_CSE(30 M-10 G)\_Middle Channel\_QPSK\_1RB



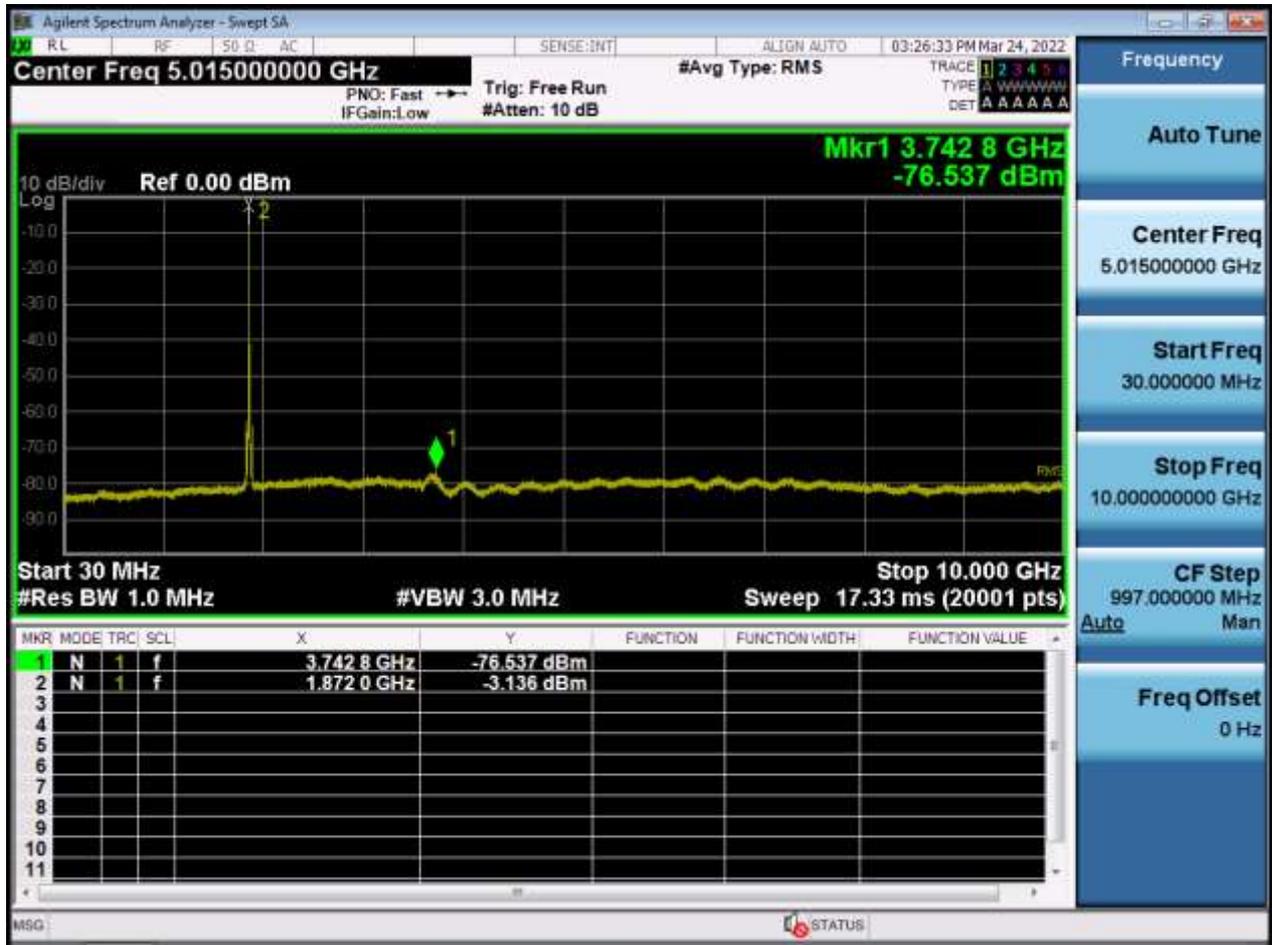
BW15 M\_CSE(30 M-10 G)\_Highest Channel\_QPSK\_1RB



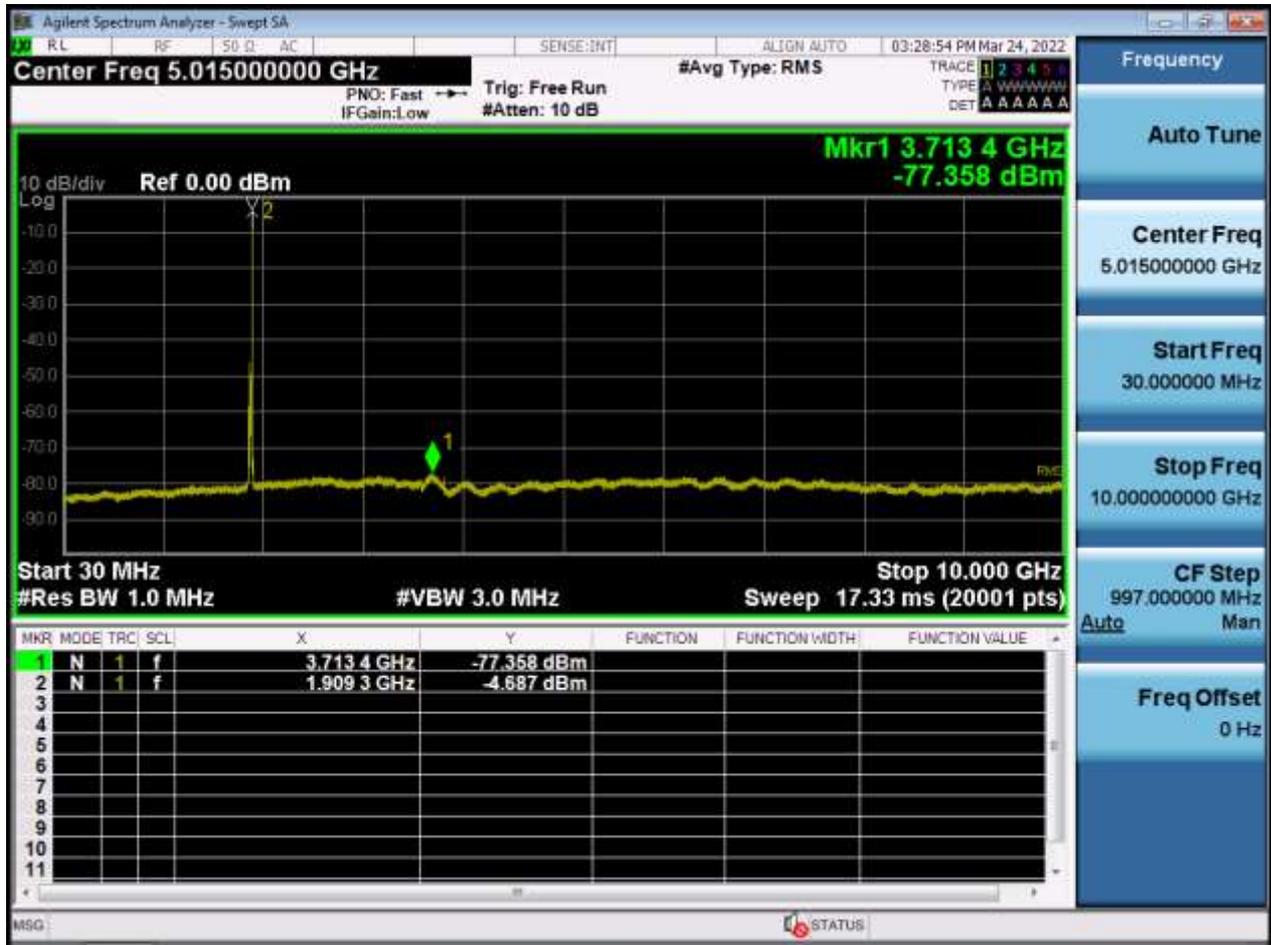
BW20 M\_CSE(30 M-10 G)\_Lowest Channel\_QPSK\_1RB



BW20 M\_CSE(30 M-10 G)\_Middle Channel\_QPSK\_1RB



BW20 M\_CSE(30 M-10 G)\_Highest Channel\_QPSK\_1RB



BW1.4 M\_CSE(10 G-26.5 G)\_Lowest Channel\_QPSK\_1RB



BW1.4 M\_CSE(10 G-26.5 G)\_Middle Channel\_QPSK\_1RB



BW1.4 M\_CSE(10 G-26.5 G)\_Highest Channel\_QPSK\_1RB



BW3 M\_CSE(10 G-26.5 G)\_Lowest Channel\_QPSK\_1RB



BW3 M\_CSE(10 G-26.5 G)\_Middle Channel\_QPSK\_1RB



BW3 M\_CSE(10 G-26.5 G)\_Highest Channel\_QPSK\_1RB



BW5 M\_CSE(10 G-26.5 G)\_Lowest Channel\_QPSK\_1RB



BW5 M\_CSE(10 G-26.5 G)\_Middle Channel\_QPSK\_1RB



BW5 M\_CSE(10 G-26.5 G)\_Highest Channel\_QPSK\_1RB



BW10 M\_CSE(10 G-26.5 G)\_Lowest Channel\_QPSK\_1RB



BW10 M\_CSE(10 G-26.5 G)\_Middle Channel\_QPSK\_1RB



BW10 M\_CSE(10 G-26.5 G)\_Highest Channel\_QPSK\_1RB



BW15 M\_CSE(10 G-26.5 G)\_Lowest Channel\_QPSK\_1RB



BW15 M\_CSE(10 G-26.5 G)\_Middle Channel\_QPSK\_1RB



BW15 M\_CSE(10 G-26.5 G)\_Highest Channel\_QPSK\_1RB



BW20 M\_CSE(10 G-26.5 G)\_Lowest Channel\_QPSK\_1RB



BW20 M\_CSE(10 G-26.5 G)\_Middle Channel\_QPSK\_1RB





**10. APPENDIX A\_ TEST SETUP PHOTO**

Please refer to test setup photo file no. as follows;

No.	Description
1	HCT-RF-2204-FC010-P