

# FCC LTE REPORT

## Certification

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

**Date of Issue:**  
January 05, 2022

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

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

**Report No.:** HCT-RF-2201-FC031

**FCC ID:** A3LSMA536V

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

Model(s): SM-A536V  
 EUT Type: Mobile phone  
 FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)  
 FCC Rule Part(s): §27, §2

Mode (MHz)	Tx Frequency (MHz)	Emission Designator	Modulation	EIRP	
				Max. Power (W)	Max. Power (dBm)
LTE – Band 7 (5)	2502.5 – 2567.5	4M53G7D	QPSK	0.126	21.00
		4M53W7D	16QAM	0.109	20.39
		4M55W7D	64QAM	0.089	19.48
		4M57W7D	256QAM	0.053	17.23
LTE – Band 7 (10)	2505.0 – 2565.0	9M01G7D	QPSK	0.130	21.15
		9M01W7D	16QAM	0.113	20.52
		9M02W7D	64QAM	0.089	19.50
		9M10W7D	256QAM	0.055	17.38
LTE – Band 7 (15)	2507.5 – 2562.5	13M5G7D	QPSK	0.132	21.19
		13M5W7D	16QAM	0.113	20.51
		13M5W7D	64QAM	0.091	19.59
		13M7W7D	256QAM	0.055	17.42
LTE – Band 7 (20)	2510.0 – 2560.0	18M0G7D	QPSK	0.130	21.14
		17M9W7D	16QAM	0.110	20.43
		17M9W7D	64QAM	0.090	19.53
		18M2W7D	256QAM	0.054	17.31

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-2201-FC031

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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-2201-FC031	January 05, 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>	A3LSMA536V
<b>Application Type:</b>	Certification
<b>FCC Classification:</b>	PCS Licensed Transmitter Held to Ear (PCE)
<b>FCC Rule Part(s):</b>	§27, §2
<b>EUT Type:</b>	Mobile phone
<b>Model(s):</b>	SM-A536V
<b>Tx Frequency:</b>	2502.5 – 2567.5 : 5 MHz 2505.0 – 2565.0 : 10 MHz 2507.5 – 2562.5 : 15 MHz 2510.0 – 2560.0 : 20 MHz
<b>Date(s) of Tests:</b>	November 29, 2021 ~ January 03, 2022
<b>Serial number:</b>	Radiated: R3CRB0Z7LTP Conducted: 5a44a2392b337ece

## **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), Bluetooth, BT LE, NFC, mmWave(n260/261).

### **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;

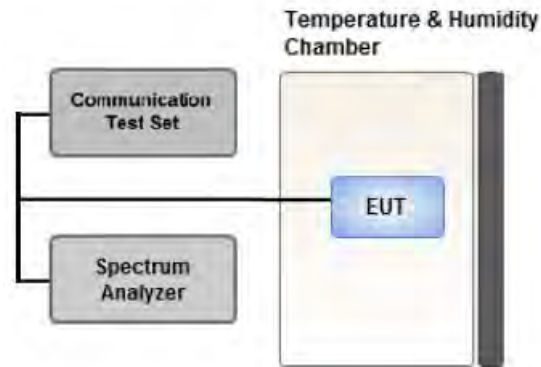
$$\text{Result}_{(dBm)} = P_g_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dBi)}$$

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

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

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

### 3.4 PEAK- TO- AVERAGE RATIO



**Test setup**

#### ① CCDF Procedure for PAPR

##### **Test Settings**

1. Set resolution/measurement bandwidth  $\geq$  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)**

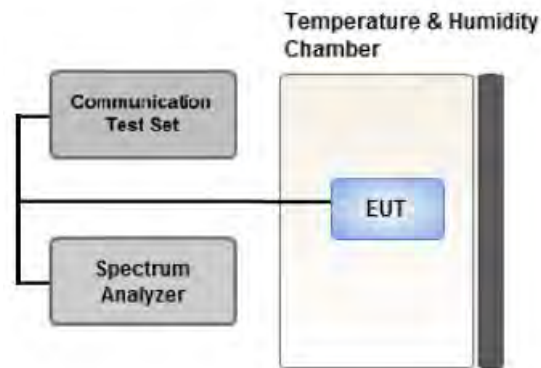
The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW  $\geq 3 \times$  RBW.

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.

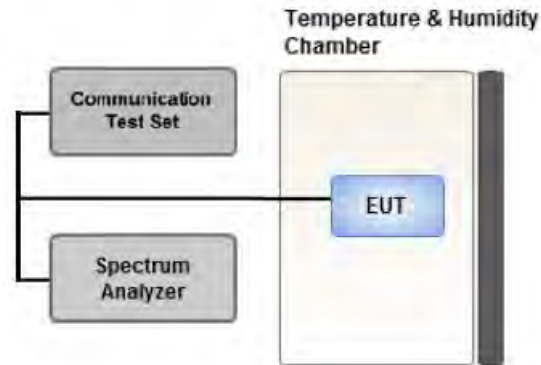
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

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**

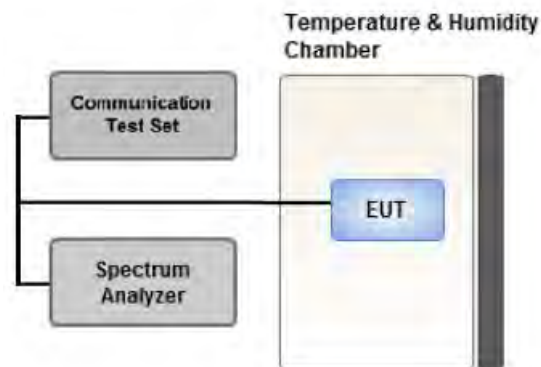
#### **Test Overview**

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 x Span / RBW

### 3.7 CHANNEL 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 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.

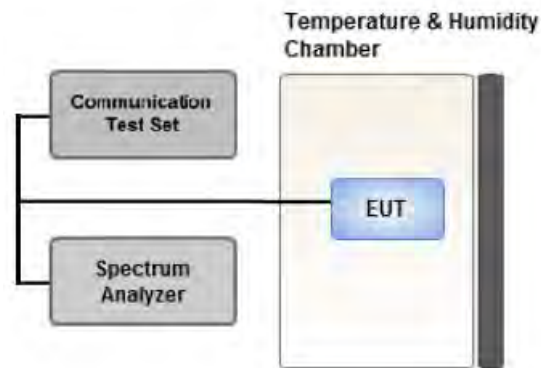
#### Test Settings

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. Within 1MHz of the channel edge the RBW should be 2% of EBW, then 1 MHz after that.
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**

1. The attenuation factor shall be not less than  $40 + 10 \log (P)$  dB on all frequencies between the channel edge and 5 megahertz from the channel edge,
2.  $43 + 10 \log (P)$  dB on all frequencies between 5 megahertz and X megahertz from the channel edge.
3.  $55 + 10 \log (P)$  dB on all frequencies more than X megahertz from the channel edge.
4. The attenuation factor shall not be less that  $43 + 10 \log (P)$  dB on all frequencies between 2490.5 MHz and 2496 MHz.
5.  $55 + 10 \log (P)$  dB at or below 2490.5 MHz.
6. X is the greater of 6MHz or the actual emission bandwidth
7. 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 + WLAN 5 GHz + BT (Worst case : Stand alone)
- 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, 64QAM, 256QAM	1	0	Z
Radiated Spurious and Harmonic Emissions	QPSK	1	0	Y

**3.10 WORST CASE(CONDUCTED TEST)**

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

[ Worst case ]

Test Description	Modulation	Bandwidth (MHz)	Frequency	RB size	RB offset
Occupied Bandwidth	QPSK, 16QAM, 64QAM, 256QAM	5, 10, 15, 20	Mid	Full RB	0
Peak-To-Average Ratio	QPSK, 16QAM, 64QAM, 256QAM	5, 10, 15, 20	Mid	Full RB	0
Band Edge	QPSK	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
		5, 10, 15, 20	Low, High	Full RB	0
Spurious and Harmonic Emissions at Antenna Terminal	QPSK	5, 10, 15, 20	Low, Mid, High	1	0

#### 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	-	03/02/2022	Annual
H.P.F	FBSR-02B(WHK3.3/18 G-10EF)	T&M SYSTEM	-	03/02/2022	Annual
Power Splitter(DC ~ 26.5 GHz)	11667B	Hewlett Packard	11275	04/07/2022	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	03/15/2022	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	02/11/2022	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	03/19/2022	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)	1.82 (Confidence level about 95 %, $k=2$ )
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40 (Confidence level about 95 %, $k=2$ )
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80 (Confidence level about 95 %, $k=2$ )
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70 (Confidence level about 95 %, $k=2$ )
Radiated Disturbance (18 GHz ~ 40 GHz)	5.05 (Confidence level about 95 %, $k=2$ )

## 6. SUMMARY OF TEST RESULTS

### 6.1 Test Condition : Conducted Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Occupied Bandwidth	§2.1049	N/A	PASS
Band Edge / Spurious and Harmonic Emissions at Antenna Terminal.	§2.1051, §27.53(m)(4)	<ul style="list-style-type: none"> <li>■ <math>&lt; 40 + 10\log_{10} (P[\text{Watts}] )</math> at Channel edges</li> <li>■ <math>&lt; 43 + 10\log_{10} (P[\text{Watts}] )</math> between 5 and X MHz from Channel edges</li> <li>■ <math>&lt; 55 + 10\log_{10} (P[\text{Watts}] )</math> beyond X MHz beyond from Channel edges</li> <li>■ <math>&lt; 43 + 10 \log (P)</math> dB on all frequencies between 2490.5 MHz and 2496 MHz</li> </ul>	PASS
Conducted Output Power	§2.1046	N/A	<u>See Note1</u>
Frequency stability / variation of ambient temperature	§2.1055, §27.54	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	§27.50(h)(2)	$< 2$ Watts max. EIRP	PASS
Radiated Spurious and Harmonic Emissions	§2.1053, §27.53(m)(4)	$< 55 + 10\log_{10} (P[\text{Watts}] )$	PASS

## 7. SAMPLE CALCULATION

### 7.1 ERP Sample Calculation

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

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

- 1) The EUT mounted on a non-conductive turntable is 2.5 meter above test site ground level.
- 2) During the test , the turn table is rotated until the maximum signal is found.
- 3) Record the field strength meter’s level.
- 4) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.
- 5) Increase the signal generator output till the field strength meter’s level is equal to the item (3).
- 6) The signal generator output level with Ant. Gain and cable loss are the rating of effective radiated power.

### 7.2 EIRP Sample Calculation

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

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

- 1) The EUT mounted on a non-conductive turntable is 2.5 meter above test site ground level.
- 2) During the test , the turn table is rotated until the maximum signal is found.
- 3) Record the field strength meter’s level.
- 4) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.
- 5) Increase the signal generator output till the field strength meter’s level is equal to the item (3).
- 6) The signal generator output level with Ant. Gain and cable loss are the rating of equivalent isotropic radiated power.

7.3. Emission Designator

**GSM Emission Designator**

**Emission Designator = 249KGXW**

GSM BW = 249 kHz

G = Phase Modulation

X = Cases not otherwise covered

W = Combination (Audio/Data)

**EDGE Emission Designator**

**Emission Designator = 249KG7W**

GSM BW = 249 kHz

G = Phase Modulation

7 = Quantized/Digital Info

W = Combination (Audio/Data)

**WCDMA Emission Designator**

**Emission Designator = 4M17F9W**

WCDMA BW = 4.17 MHz

F = Frequency Modulation

9 = Composite Digital Info

W = Combination (Audio/Data)

**QPSK Modulation**

**Emission Designator = 4M48G7D**

LTE BW = 4.48 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

**QAM Modulation**

**Emission Designator = 4M48W7D**

LTE BW = 4.48 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

## 8. TEST DATA

### 8.1 EQUIVALENT ISOTROPIC RADIATED POWER

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
2502.5	LTE B7/ 5 MHz	QPSK	-24.11	12.79	10.70	2.49	H	< 2.00	0.126	21.00
		16-QAM	-24.72	12.18	10.70	2.49	H		0.109	20.39
		64-QAM	-25.63	11.27	10.70	2.49	H		0.089	19.48
		256-QAM	-27.88	9.02	10.70	2.49	H		0.053	17.23
2535.0		QPSK	-24.87	12.25	10.70	2.51	H		0.111	20.44
		16-QAM	-25.28	11.84	10.70	2.51	H		0.101	20.03
		64-QAM	-26.34	10.78	10.70	2.51	H		0.079	18.97
		256-QAM	-28.31	8.81	10.70	2.51	H		0.050	17.00
2567.5		QPSK	-25.13	11.89	10.66	2.52	H		0.101	20.03
		16-QAM	-25.64	11.38	10.66	2.52	H		0.090	19.52
		64-QAM	-26.76	10.26	10.66	2.52	H		0.069	18.40
		256-QAM	-28.77	8.25	10.66	2.52	H		0.044	16.39

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
2505.0	LTE B7/ 10 MHz	QPSK	-24.01	12.95	10.70	2.50	H	< 2.00	0.130	21.15
		16-QAM	-24.64	12.32	10.70	2.50	H		0.113	20.52
		64-QAM	-25.66	11.30	10.70	2.50	H		0.089	19.50
		256-QAM	-27.78	9.18	10.70	2.50	H		0.055	17.38
2535.0		QPSK	-24.55	12.57	10.70	2.51	H		0.119	20.76
		16-QAM	-25.20	11.92	10.70	2.51	H		0.103	20.11
		64-QAM	-26.08	11.04	10.70	2.51	H		0.084	19.23
		256-QAM	-28.09	9.03	10.70	2.51	H		0.053	17.22
2565.0		QPSK	-24.80	12.23	10.67	2.52	H		0.109	20.38
		16-QAM	-25.37	11.66	10.67	2.52	H		0.096	19.81
		64-QAM	-26.41	10.62	10.67	2.52	H		0.075	18.77
		256-QAM	-28.40	8.63	10.67	2.52	H		0.048	16.78



Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
2507.5	LTE B7/ 15 MHz	QPSK	-24.03	12.99	10.70	2.50	H	< 2.00	0.132	21.19
		16-QAM	-24.84	12.18	10.70	2.50	H		0.109	20.38
		64-QAM	-25.66	11.36	10.70	2.50	H		0.090	19.56
		256-QAM	-27.81	9.21	10.70	2.50	H		0.055	17.41
2535.0		QPSK	-24.25	12.87	10.70	2.51	H		0.128	21.06
		16-QAM	-24.80	12.32	10.70	2.51	H		0.113	20.51
		64-QAM	-25.72	11.40	10.70	2.51	H		0.091	19.59
		256-QAM	-27.89	9.23	10.70	2.51	H		0.055	17.42
2562.5		QPSK	-24.48	12.55	10.68	2.52	H		0.118	20.71
		16-QAM	-25.06	11.97	10.68	2.52	H		0.103	20.13
		64-QAM	-26.08	10.95	10.68	2.52	H		0.082	19.11
		256-QAM	-28.29	8.74	10.68	2.52	H		0.049	16.90

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
2510.0	LTE B7/ 20 MHz	QPSK	-24.08	12.94	10.70	2.50	H	< 2.00	0.130	21.14
		16-QAM	-24.79	12.23	10.70	2.50	H		0.110	20.43
		64-QAM	-25.69	11.33	10.70	2.50	H		0.090	19.53
		256-QAM	-27.91	9.11	10.70	2.50	H		0.054	17.31
2535.0		QPSK	-24.34	12.78	10.70	2.51	H		0.125	20.97
		16-QAM	-25.01	12.11	10.70	2.51	H		0.107	20.30
		64-QAM	-26.02	11.10	10.70	2.51	H		0.085	19.29
		256-QAM	-28.04	9.08	10.70	2.51	H		0.053	17.27
2560.0		QPSK	-24.58	12.45	10.68	2.52	H		0.115	20.61
		16-QAM	-25.22	11.81	10.68	2.52	H		0.099	19.97
		64-QAM	-26.20	10.83	10.68	2.52	H		0.079	18.99
		256-QAM	-28.24	8.79	10.68	2.52	H		0.050	16.95

**8.2 RADIATED SPURIOUS EMISSIONS**

- ▣ OPERATING FREQUENCY : 2502.5 MHz
- ▣ MEASURED OUTPUT POWER: 21.00 dBm = 0.126 W
- ▣ MODE: LTE B7
- ▣ MODULATION SIGNAL: 5 MHz QPSK
- ▣ DISTANCE: 1 meters
- ▣ LIMIT:  $55 + 10 \log_{10}(W) =$  46.00 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
20775 (2502.5)	5 005.00	-37.99	12.59	-47.58	3.60	H	-38.59	59.59
	7 507.50	-41.40	10.82	-42.27	4.48	H	-35.93	56.92
	10 010.00	-53.23	11.22	-48.73	5.27	V	-42.78	63.78
	12 512.50	-54.59	13.20	-50.11	6.02	H	-42.93	63.93
21100 (2535.0)	5 070.00	-38.43	12.38	-46.29	3.65	H	-37.56	58.56
	7 605.00	-41.24	11.12	-42.45	4.49	H	-35.81	56.81
	10 140.00	-53.18	11.40	-49.43	5.29	H	-43.32	64.32
	12 675.00	-52.59	13.15	-47.18	6.03	H	-40.05	61.05
21425 (2567.5)	5 135.00	-39.79	12.27	-48.56	3.67	H	-39.96	60.95
	7 702.50	-44.47	11.40	-45.51	4.51	H	-38.62	59.62
	10 270.00	-53.93	11.50	-49.00	5.40	H	-42.90	63.90
	12 837.50	-56.16	12.82	-49.64	6.15	H	-42.97	63.97

- ▣ OPERATING FREQUENCY : 2505.0 MHz
- ▣ MEASURED OUTPUT POWER: 21.15 dBm = 0.130 W
- ▣ MODE: LTE B7
- ▣ MODULATION SIGNAL: 10 MHz QPSK
- ▣ DISTANCE: 1 meters
- ▣ LIMIT:  $55 + 10 \log_{10}(W) =$  46.15 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
20800 (2505.0)	5 010.00	-36.63	12.58	-46.38	3.59	H	-37.39	58.54
	7 515.00	-41.92	10.83	-42.63	4.47	H	-36.27	57.43
	10 020.00	-53.61	11.24	-49.14	5.27	V	-43.17	64.33
	12 525.00	-54.88	13.20	-50.58	5.94	H	-43.31	64.47
21100 (2535.0)	5 070.00	-37.87	12.38	-45.73	3.65	H	-37.00	58.00
	7 605.00	-43.57	11.12	-44.78	4.49	H	-38.14	59.14
	10 140.00	-52.30	11.40	-48.55	5.29	V	-42.44	63.44
	12 675.00	-54.73	13.15	-49.32	6.03	H	-42.19	63.19
21400 (2565.0)	5 130.00	-38.74	12.26	-47.44	3.67	H	-38.85	60.01
	7 695.00	-44.66	11.39	-45.98	4.51	H	-39.10	60.25
	10 260.00	-57.06	11.50	-52.40	5.40	V	-46.30	67.45

- ▣ OPERATING FREQUENCY : 2507.5 MHz
- ▣ MEASURED OUTPUT POWER: 21.19 dBm = 0.132 W
- ▣ MODE: LTE B7
- ▣ MODULATION SIGNAL: 15 MHz QPSK
- ▣ DISTANCE: 1 meters
- ▣ LIMIT:  $55 + 10 \log_{10}(W) =$  46.19 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
20825 (2507.5)	5 015.00	-38.67	12.57	-48.57	3.60	V	-39.59	60.78
	7 522.50	-43.80	10.84	-44.36	4.46	H	-37.98	59.17
	10 030.00	-52.75	11.26	-48.44	5.29	V	-42.47	63.66
	12 537.50	-57.84	13.20	-53.58	5.93	V	-46.31	67.50
21100 (2535.0)	5 070.00	-41.28	12.38	-49.14	3.65	H	-40.41	61.41
	7 605.00	-43.80	11.12	-45.01	4.49	H	-38.37	59.37
	10 140.00	-53.65	11.40	-49.90	5.29	H	-43.79	64.79
	12 675.00	-55.14	13.15	-49.73	6.03	H	-42.60	63.60
21375 (2562.5)	5 125.00	-40.26	12.25	-48.77	3.67	H	-40.19	61.38
	7 687.50	-43.29	11.38	-44.88	4.51	H	-38.01	59.20
	10 250.00	-55.12	11.50	-50.52	5.39	H	-44.41	65.60
	12 812.50	-56.70	12.88	-50.47	6.05	H	-43.64	64.83

- ▣ OPERATING FREQUENCY : 2510.0 MHz
- ▣ MEASURED OUTPUT POWER: 21.14 dBm = 0.130 W
- ▣ MODE: LTE B7
- ▣ MODULATION SIGNAL: 20 MHz QPSK
- ▣ DISTANCE: 1 meters
- ▣ LIMIT:  $55 + 10 \log_{10} (W) =$  46.14 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
20850 (2510.0)	5 020.00	-39.68	12.56	-49.73	3.60	V	-40.77	61.91
	7 530.00	-43.91	10.86	-44.05	4.45	V	-37.64	58.78
	10 040.00	-52.70	11.28	-48.60	5.32	V	-42.64	63.78
	12 550.00	-53.69	13.20	-49.38	5.98	H	-42.16	63.30
21100 (2535.0)	5 070.00	-39.57	12.38	-47.43	3.65	V	-38.70	59.70
	7 605.00	-41.92	11.12	-43.13	4.49	H	-36.49	57.49
	10 140.00	-54.37	11.40	-50.62	5.29	V	-44.51	65.51
	12 675.00	-56.90	13.15	-51.49	6.03	H	-44.36	65.36
21350 (2560.0)	5 120.00	-39.97	12.24	-48.28	3.67	H	-39.71	60.85
	7 680.00	-44.68	11.36	-46.43	4.50	H	-39.57	60.71
	10 240.00	-54.82	11.50	-50.26	5.37	H	-44.13	65.27
	12 800.00	-56.67	12.88	-50.46	6.03	H	-43.61	64.75

**8.3 PEAK-TO-AVERAGE RATIO**

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data ( dB )
7	5 MHz	2535.0	QPSK	25	0	5.28
			16-QAM	25	0	5.74
			64-QAM	25	0	5.73
			256-QAM	25	0	4.83
	10 MHz		QPSK	50	0	5.36
			16-QAM	50	0	5.72
			64-QAM	50	0	5.73
			256-QAM	50	0	4.88
	15 MHz		QPSK	75	0	5.24
			16-QAM	75	0	5.66
			64-QAM	75	0	5.71
			256-QAM	75	0	4.82
	20 MHz		QPSK	100	0	5.19
			16-QAM	100	0	5.69
			64-QAM	100	0	5.70
			256-QAM	100	0	4.79

**Note:**

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 63 ~ 78.

**8.4 OCCUPIED BANDWIDTH**

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data ( MHz )
7	5 MHz	2535.0	QPSK	25	0	4.5327
			16-QAM	25		4.5266
			64-QAM	25		4.5457
			256-QAM	25		4.5695
	10 MHz		QPSK	50		9.0112
			16-QAM	50		9.0104
			64-QAM	50		9.0172
			256-QAM	50		9.0984
	15 MHz		QPSK	75		13.484
			16-QAM	75		13.475
			64-QAM	75		13.458
			256-QAM	75		13.662
	20 MHz		QPSK	100		17.947
			16-QAM	100		17.891
			64-QAM	100		17.901
			256-QAM	100		18.175

**Note:**

1. Plots of the EUT's Occupied Bandwidth are shown Page 47 ~ 62.

**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)
7	5	2502.5	26.1364	30.131	-77.111	-46.980	-25.00
		2535.0	26.1304	30.131	-76.813	-46.682	
		2567.5	25.8074	30.131	-77.042	-46.911	
	10	2505.0	26.1687	30.131	-76.929	-46.798	
		2535.0	26.1759	30.131	-76.917	-46.786	
		2565.0	26.1304	30.131	-77.055	-46.924	
	15	2507.5	26.1419	30.131	-77.073	-46.942	
		2535.0	26.3905	30.131	-77.045	-46.914	
		2562.5	26.1317	30.131	-76.514	-46.383	
	20	2510.0	26.1321	30.131	-76.883	-46.752	
		2535.0	26.1411	30.131	-76.877	-46.746	
		2560.0	26.1130	30.131	-76.961	-46.830	

**Note:**

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 103 ~ 126.
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 CHANNEL EDGE**

Band Width (Modulation)	Frequency (MHz)	RB Size / Offset	C.E ~ (C.E ± 1 MHz)		2 496 MHz ~ 2 499 MHz	(C.E + 1 MHz) ~ (C.E + 5 MHz)	2 490.5 MHz ~ 2 496 MHz	(C.E + 5 MHz) ~ (C.E + X MHz)	Below 2 490.5 MHz	Above (C.E + X MHz)
			Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
5 MHz	2502.5	25 / 0	-20.91	-20.96	-17.01	-17.57	-24.01	-30.35	-39.88	-34.50
10 MHz	2505.0	50 / 0	-23.44	-23.63	-19.95	-20.99	-23.06	-25.23	-33.67	-33.66
15 MHz	2507.5	75 / 0	-25.80	-26.06	-23.61	-24.57	-25.47	-26.97	-30.07	-36.07
20 MHz	2510.0	100 / 0	-27.62	-27.84	-26.22	-26.63	-27.25	-28.37	-30.69	-37.84
Limit			-10.0		-10.0		-13.0		-25.0	

Band Width (Modulation)	Frequency (MHz)	RB Size / Offset	C.E ~ (C.E ± 1 MHz)		(C.E ± 1 MHz) ~ (C.E ± 5 MHz)	
			Lower	Upper	Lower	Upper
5 MHz (QPSK)	2535.0	25 / 0	-22.37	-22.29	-23.89	-23.24
	2567.5	25 / 0	-18.99	-19.51	-14.24	-14.82
10 MHz (QPSK)	2535.0	50 / 0	-25.64	-24.89	-25.42	-24.55
	2565.0	50 / 0	-21.38	-21.18	-17.19	-17.39
15 MHz (QPSK)	2535.0	75 / 0	-28.61	-27.65	-28.90	-27.37
	2562.5	75 / 0	-23.83	-23.60	-21.23	-20.69
20 MHz (QPSK)	2535.0	100 / 0	-31.01	-29.83	-31.04	-29.18
	2560.0	100 / 0	-25.45	-25.12	-23.44	-23.11
Limit			-10.0		-10.0	

Band Width (Modulation)	Frequency (MHz)	Resource Block Size	(C.E ± 5 MHz) ~ (C.E ± X MHz)		Above (C.E ± X MHz)	
			Lower	Upper	Lower	Upper
5 MHz (QPSK)	2535.0	25 / 0	-32.17	-32.10	-36.21	-35.88
	2567.5	25 / 0	-30.95	-31.67	-34.25	-34.96
10 MHz (QPSK)	2535.0	50 / 0	-29.38	-28.30	-36.17	-35.68
	2565.0	50 / 0	-22.16	-22.24	-35.13	-35.63
15 MHz (QPSK)	2535.0	75 / 0	-31.42	-29.97	-38.61	-37.80
	2562.5	75 / 0	-24.43	-23.72	-37.76	-39.54
20 MHz (QPSK)	2535.0	100 / 0	-32.81	-30.77	-39.68	-38.77
	2560.0	100 / 0	-25.88	-25.33	-39.43	-41.93
Limit			-13.0		-25.0	

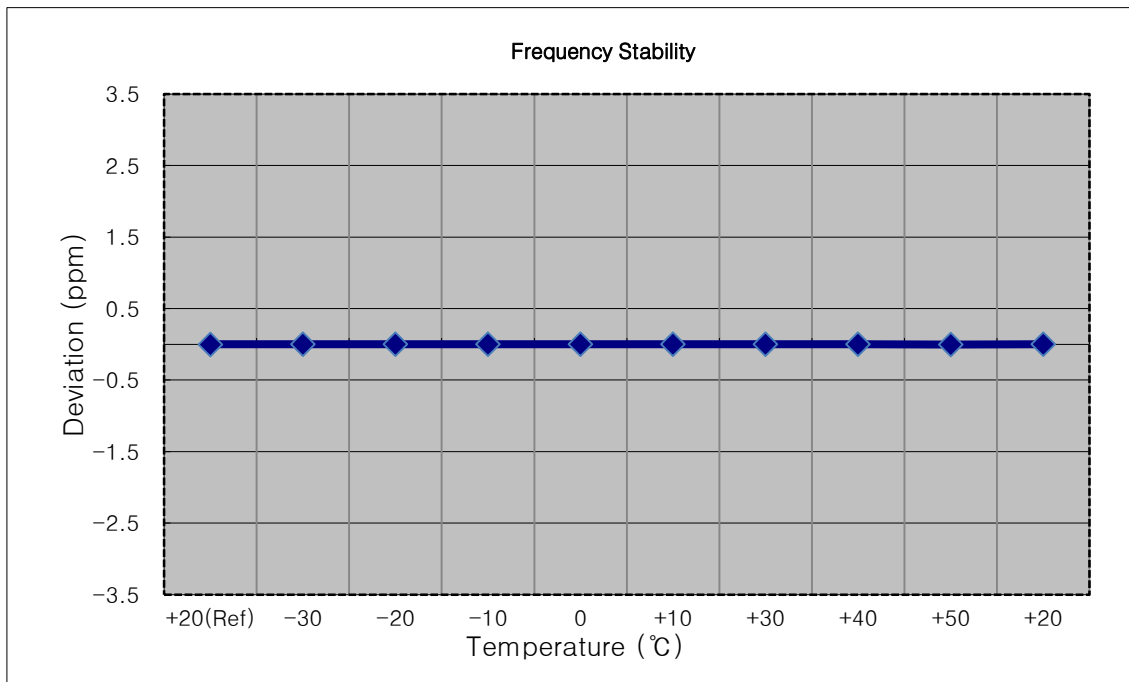
**Note:**

1. C.E = Channel Edge
2. X = X is the greater of 6 MHz or the actual emission bandwidth.
3. X = 6 MHz(5 MHz Bandwidth), 10 MHz(10 MHz Bandwidth), 15 MHz(15 MHz Bandwidth), 20 MHz(20 MHz Bandwidth)
4. Plots of the EUT's Channel Edge are shown Page 79 ~ 102.

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

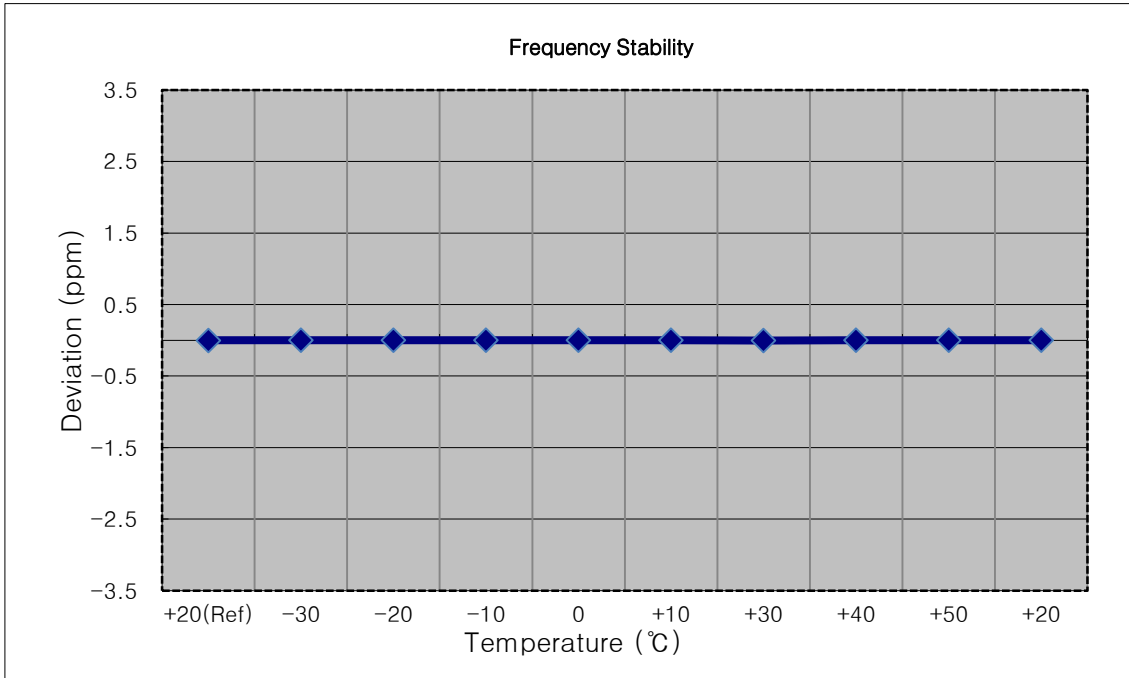
- ▣ MODE: LTE 7
- ▣ OPERATING FREQUENCY: 2,502,500,000 Hz
- ▣ CHANNEL: 20775 (5 MHz)
- ▣ REFERENCE VOLTAGE: 4.200 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	2502 500 005	0.0	0.000 000	0.000
100 %		-30	2502 500 009	3.9	0.000 000	0.002
100 %		-20	2502 500 010	4.4	0.000 000	0.002
100 %		-10	2502 500 009	3.3	0.000 000	0.001
100 %		0	2502 500 009	4.2	0.000 000	0.002
100 %		+10	2502 500 011	6.0	0.000 000	0.002
100 %		+30	2502 500 008	2.9	0.000 000	0.001
100 %		+40	2502 500 009	3.7	0.000 000	0.001
100 %		+50	2502 500 002	-3.3	0.000 000	-0.001
Batt. Endpoint		3.400	+20	2502 500 008	2.9	0.000 000



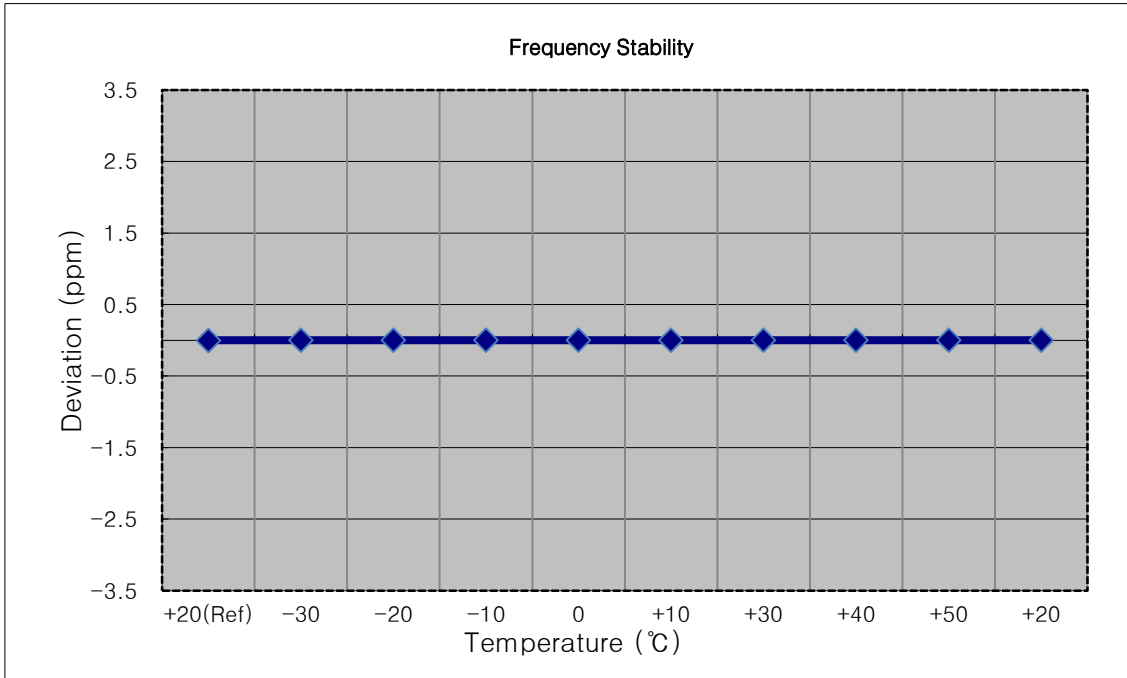
- ▣ MODE: LTE 7
- ▣ OPERATING FREQUENCY: 2,505,000,000 Hz
- ▣ CHANNEL: 20800 (10 MHz)
- ▣ REFERENCE VOLTAGE: 4.200 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	2505 000 004	0.0	0.000 000	0.000
100 %		-30	2505 000 009	4.4	0.000 000	0.002
100 %		-20	2505 000 011	6.3	0.000 000	0.003
100 %		-10	2505 000 008	3.1	0.000 000	0.001
100 %		0	2505 000 011	6.6	0.000 000	0.003
100 %		+10	2505 000 011	6.2	0.000 000	0.002
100 %		+30	2505 000 002	-2.9	0.000 000	-0.001
100 %		+40	2505 000 008	3.7	0.000 000	0.001
100 %		+50	2505 000 009	4.7	0.000 000	0.002
Batt. Endpoint		3.400	+20	2505 000 010	5.1	0.000 000



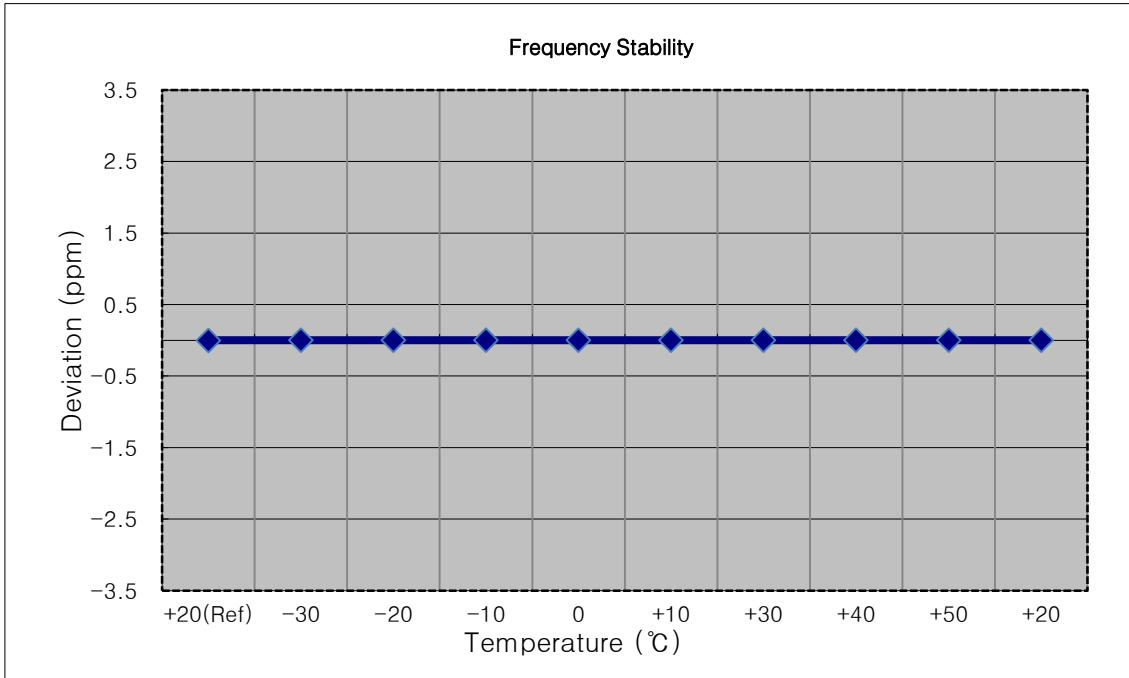
- ▣ MODE: LTE 7
- ▣ OPERATING FREQUENCY: 2,507,500,000 Hz
- ▣ CHANNEL: 20825 (15 MHz)
- ▣ REFERENCE VOLTAGE: 4.200 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	2507 500 003	0.0	0.000 000	0.000
100 %		-30	2507 500 006	3.6	0.000 000	0.001
100 %		-20	2507 500 005	2.9	0.000 000	0.001
100 %		-10	2507 500 006	3.4	0.000 000	0.001
100 %		0	2507 500 006	3.6	0.000 000	0.001
100 %		+10	2507 500 006	3.5	0.000 000	0.001
100 %		+30	2507 500 007	4.2	0.000 000	0.002
100 %		+40	2507 500 007	4.2	0.000 000	0.002
100 %		+50	2507 500 007	4.9	0.000 000	0.002
Batt. Endpoint	3.400	+20	2507 500 007	4.8	0.000 000	0.002



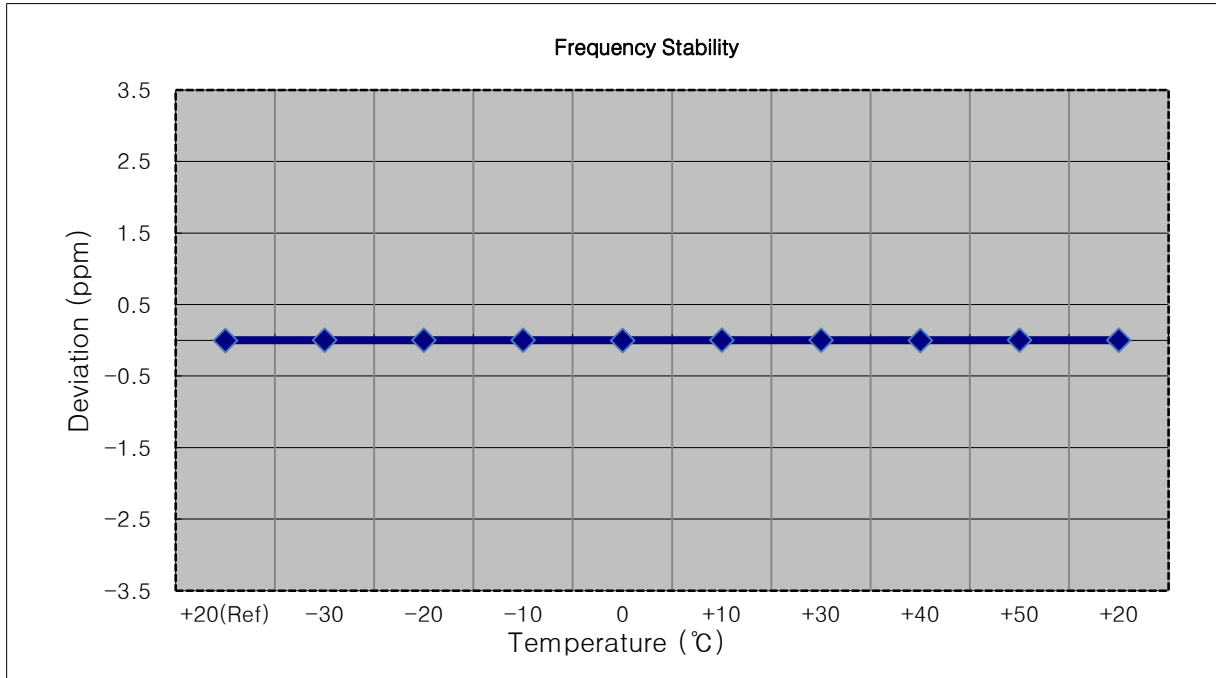
- ▣ MODE: LTE 7
- ▣ OPERATING FREQUENCY: 2,510,000,000 Hz
- ▣ CHANNEL: 20850 (20 MHz)
- ▣ REFERENCE VOLTAGE: 4.200 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	2510 000 003	0.0	0.000 000	0.000
100 %		-30	2510 000 006	3.7	0.000 000	0.001
100 %		-20	2510 000 006	3.9	0.000 000	0.002
100 %		-10	2510 000 005	2.8	0.000 000	0.001
100 %		0	2510 000 007	4.5	0.000 000	0.002
100 %		+10	2510 000 005	2.9	0.000 000	0.001
100 %		+30	2510 000 008	5.2	0.000 000	0.002
100 %		+40	2510 000 006	3.5	0.000 000	0.001
100 %		+50	2510 000 006	3.2	0.000 000	0.001
Batt. Endpoint	3.400	+20	2510 000 007	4.3	0.000 000	0.002



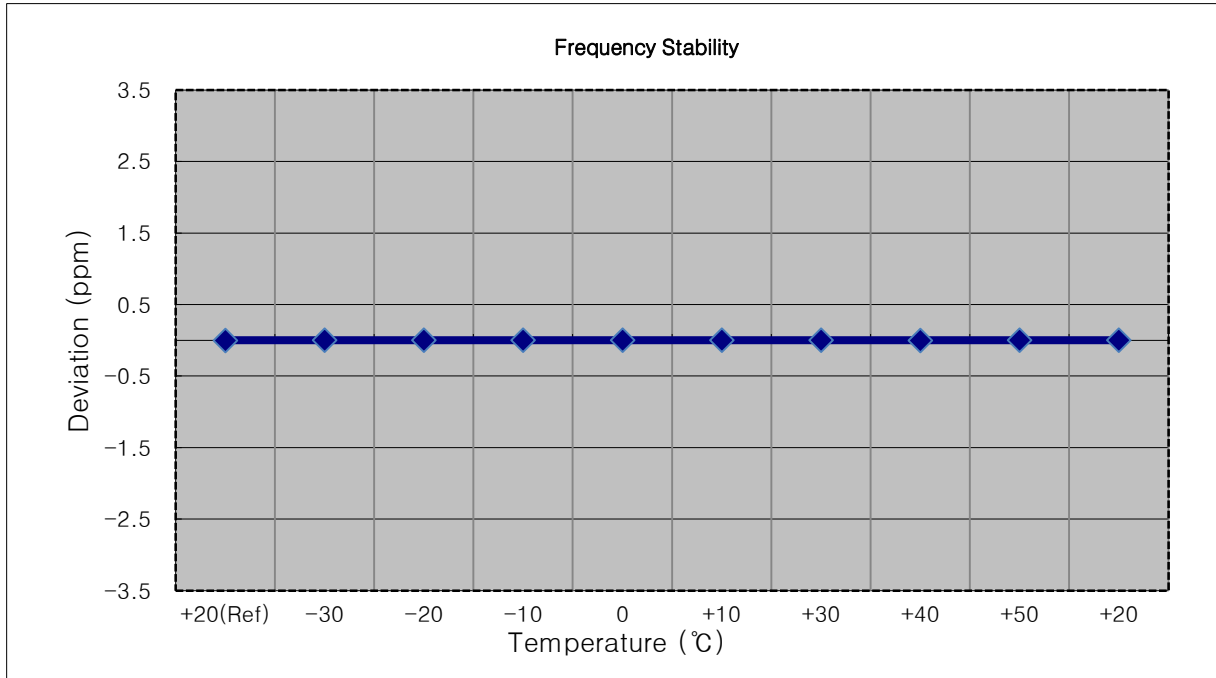
- ▣ MODE: LTE 7
- ▣ OPERATING FREQUENCY: 2,535,000,000 Hz
- ▣ CHANNEL: 21100 (5 MHz)
- ▣ REFERENCE VOLTAGE: 4.200 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	2535 000 006	0.0	0.000 000	0.000
100 %		-30	2535 000 009	3.2	0.000 000	0.001
100 %		-20	2535 000 011	5.0	0.000 000	0.002
100 %		-10	2535 000 010	4.4	0.000 000	0.002
100 %		0	2535 000 009	2.6	0.000 000	0.001
100 %		+10	2535 000 011	4.9	0.000 000	0.002
100 %		+30	2535 000 011	5.2	0.000 000	0.002
100 %		+40	2535 000 009	2.5	0.000 000	0.001
100 %		+50	2535 000 009	3.3	0.000 000	0.001
Batt. Endpoint	3.400	+20	2535 000 011	4.6	0.000 000	0.002



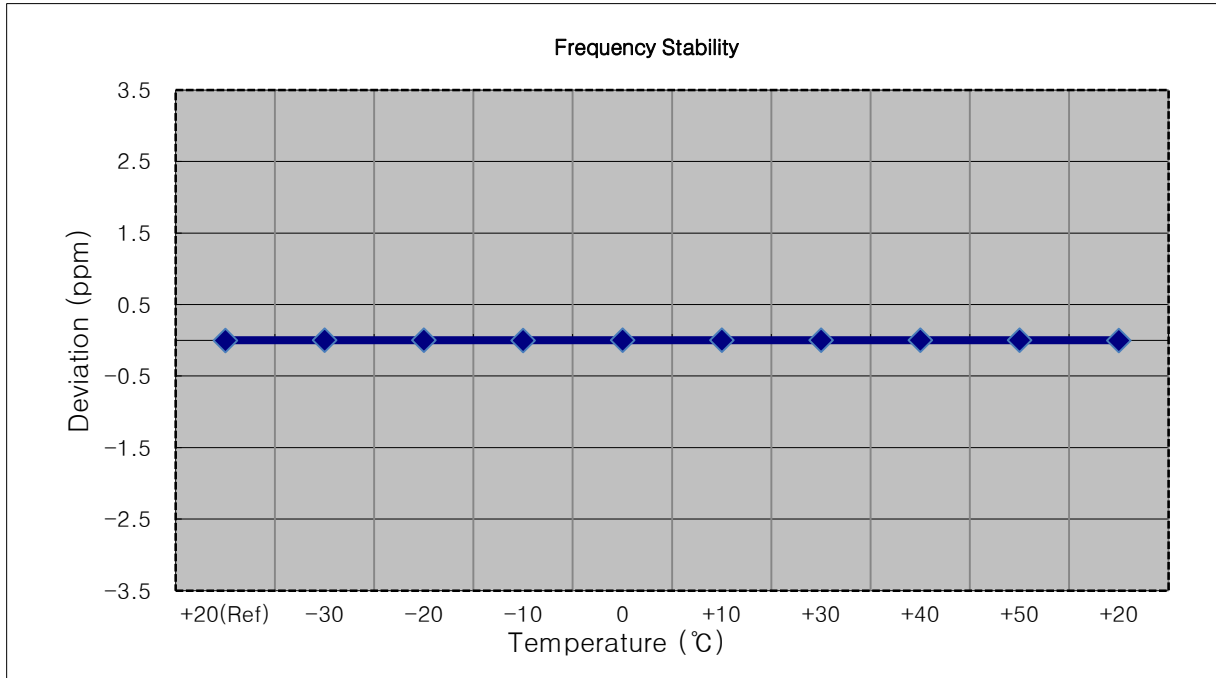
- ▣ MODE: LTE 7
- ▣ OPERATING FREQUENCY: 2,535,000,000 Hz
- ▣ CHANNEL: 21100 (10 MHz)
- ▣ REFERENCE VOLTAGE: 4.200 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	2535 000 005	0.0	0.000 000	0.000
100 %		-30	2535 000 009	4.5	0.000 000	0.002
100 %		-20	2535 000 009	3.7	0.000 000	0.001
100 %		-10	2535 000 010	4.8	0.000 000	0.002
100 %		0	2535 000 009	4.6	0.000 000	0.002
100 %		+10	2535 000 008	3.3	0.000 000	0.001
100 %		+30	2535 000 010	4.8	0.000 000	0.002
100 %		+40	2535 000 007	2.1	0.000 000	0.001
100 %		+50	2535 000 008	3.6	0.000 000	0.001
Batt. Endpoint	3.400	+20	2535 000 009	4.2	0.000 000	0.002



- ▣ MODE: LTE 7
- ▣ OPERATING FREQUENCY: 2,535,000,000 Hz
- ▣ CHANNEL: 21100 (15 MHz)
- ▣ REFERENCE VOLTAGE: 4.200 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

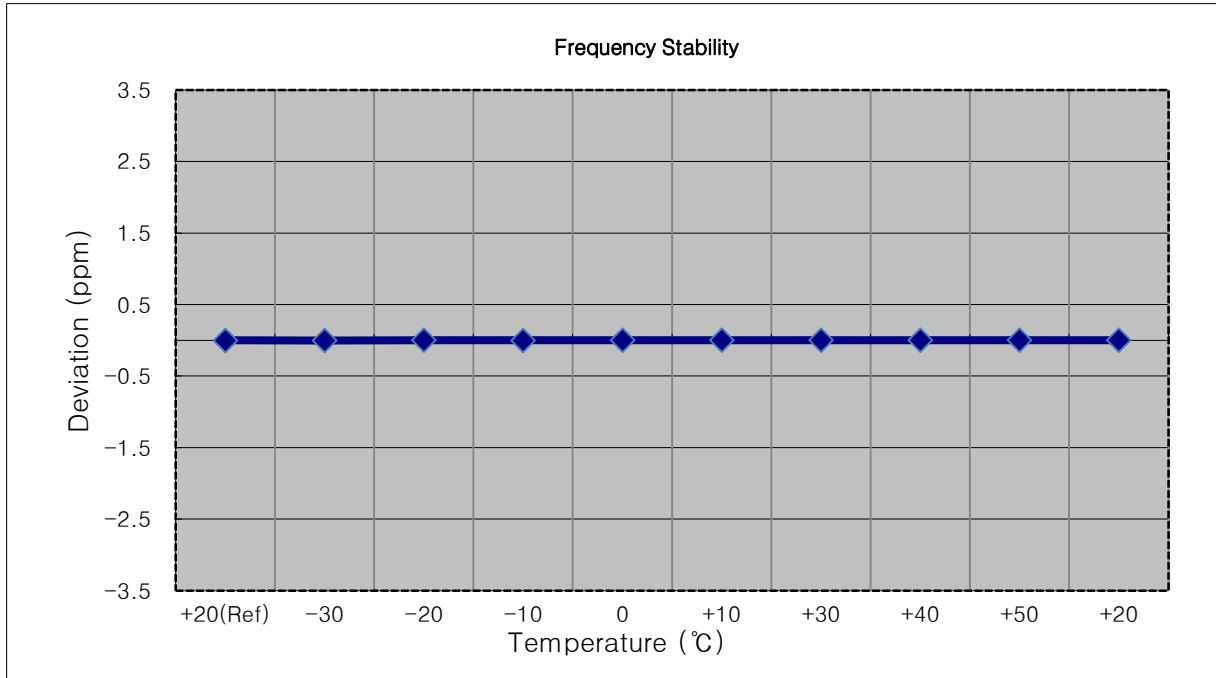
Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	2535 000 004	0.0	0.000 000	0.000
100 %		-30	2535 000 009	4.9	0.000 000	0.002
100 %		-20	2535 000 009	5.2	0.000 000	0.002
100 %		-10	2535 000 006	2.5	0.000 000	0.001
100 %		0	2535 000 009	5.4	0.000 000	0.002
100 %		+10	2535 000 007	3.4	0.000 000	0.001
100 %		+30	2535 000 008	4.7	0.000 000	0.002
100 %		+40	2535 000 008	4.3	0.000 000	0.002
100 %		+50	2535 000 008	4.2	0.000 000	0.002
Batt. Endpoint	3.400	+20	2535 000 006	2.0	0.000 000	0.001





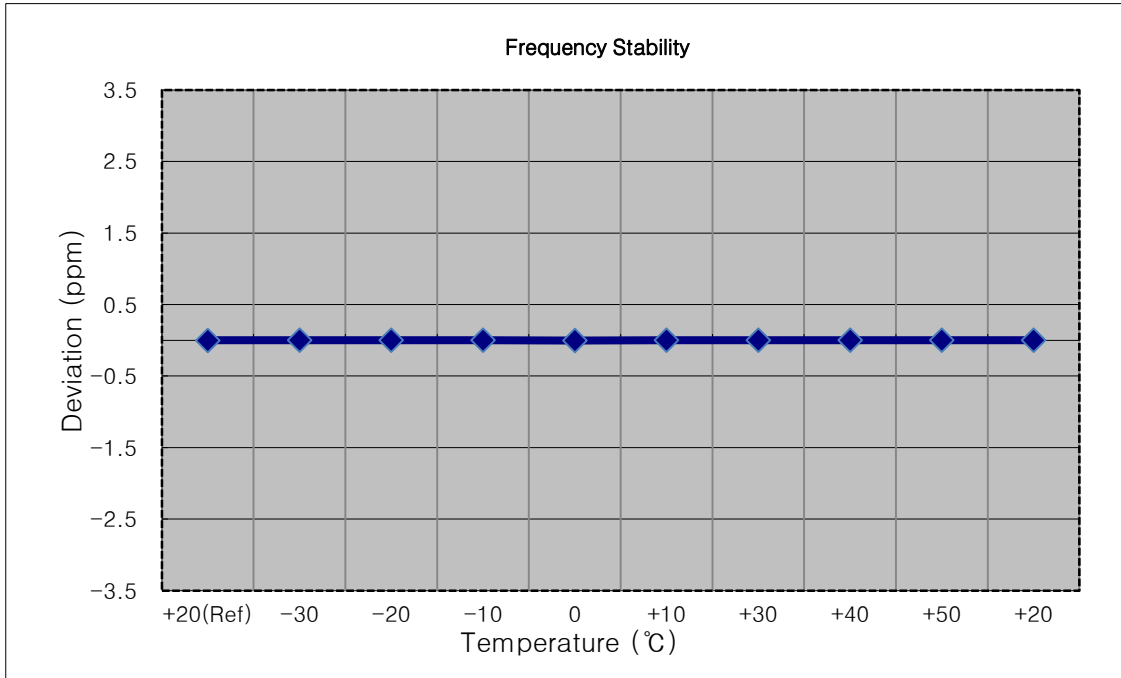
- ▣ MODE: LTE 7
- ▣ OPERATING FREQUENCY: 2,535,000,000 Hz
- ▣ CHANNEL: 21100 (20 MHz)
- ▣ REFERENCE VOLTAGE: 4.200 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	2535 000 004	0.0	0.000 000	0.000
100 %		-30	2535 000 001	-3.2	0.000 000	-0.001
100 %		-20	2535 000 009	5.5	0.000 000	0.002
100 %		-10	2535 000 006	2.2	0.000 000	0.001
100 %		0	2535 000 007	2.9	0.000 000	0.001
100 %		+10	2535 000 009	5.4	0.000 000	0.002
100 %		+30	2535 000 009	5.1	0.000 000	0.002
100 %		+40	2535 000 008	4.1	0.000 000	0.002
100 %		+50	2535 000 008	4.5	0.000 000	0.002
Batt. Endpoint	3.400	+20	2535 000 008	4.2	0.000 000	0.002



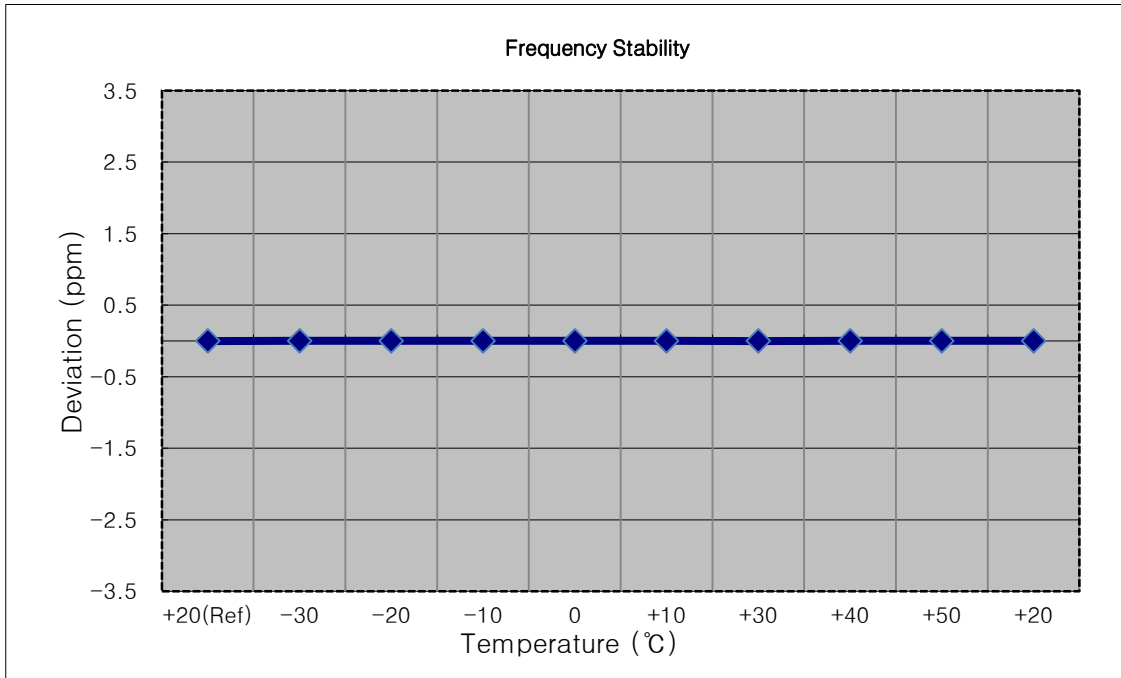
- ▣ MODE: LTE 7
- ▣ OPERATING FREQUENCY: 2,567,500,000 Hz
- ▣ CHANNEL: 21425 (5 MHz)
- ▣ REFERENCE VOLTAGE: 4.200 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	2567 500 005	0.0	0.000 000	0.000
100 %		-30	2567 500 008	2.8	0.000 000	0.001
100 %		-20	2567 500 011	5.9	0.000 000	0.002
100 %		-10	2567 500 009	3.5	0.000 000	0.001
100 %		0	2567 500 000	-5.2	0.000 000	-0.002
100 %		+10	2567 500 010	5.0	0.000 000	0.002
100 %		+30	2567 500 009	3.8	0.000 000	0.001
100 %		+40	2567 500 009	4.2	0.000 000	0.002
100 %		+50	2567 500 008	3.4	0.000 000	0.001
Batt. Endpoint	3.400	+20	2567 500 012	7.3	0.000 000	0.003



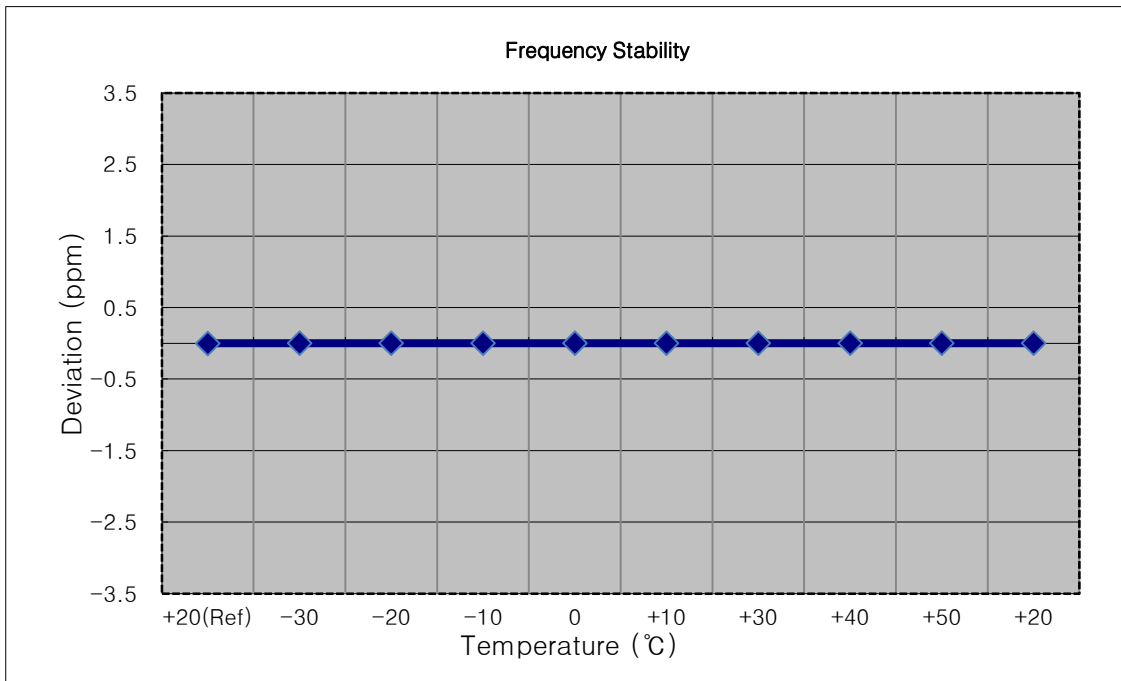
- ▣ MODE: LTE 7
- ▣ OPERATING FREQUENCY: 2,565,000,000 Hz
- ▣ CHANNEL: 21400 (10 MHz)
- ▣ REFERENCE VOLTAGE: 4.200 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	2565 000 003	0.0	0.000 000	0.000
100 %		-30	2565 000 006	3.3	0.000 000	0.001
100 %		-20	2565 000 005	2.4	0.000 000	0.001
100 %		-10	2565 000 007	4.9	0.000 000	0.002
100 %		0	2565 000 006	3.9	0.000 000	0.002
100 %		+10	2565 000 008	5.7	0.000 000	0.002
100 %		+30	2564 999 999	-3.9	0.000 000	-0.002
100 %		+40	2565 000 007	4.5	0.000 000	0.002
100 %		+50	2565 000 006	3.1	0.000 000	0.001
Batt. Endpoint	3.400	+20	2565 000 009	6.0	0.000 000	0.002



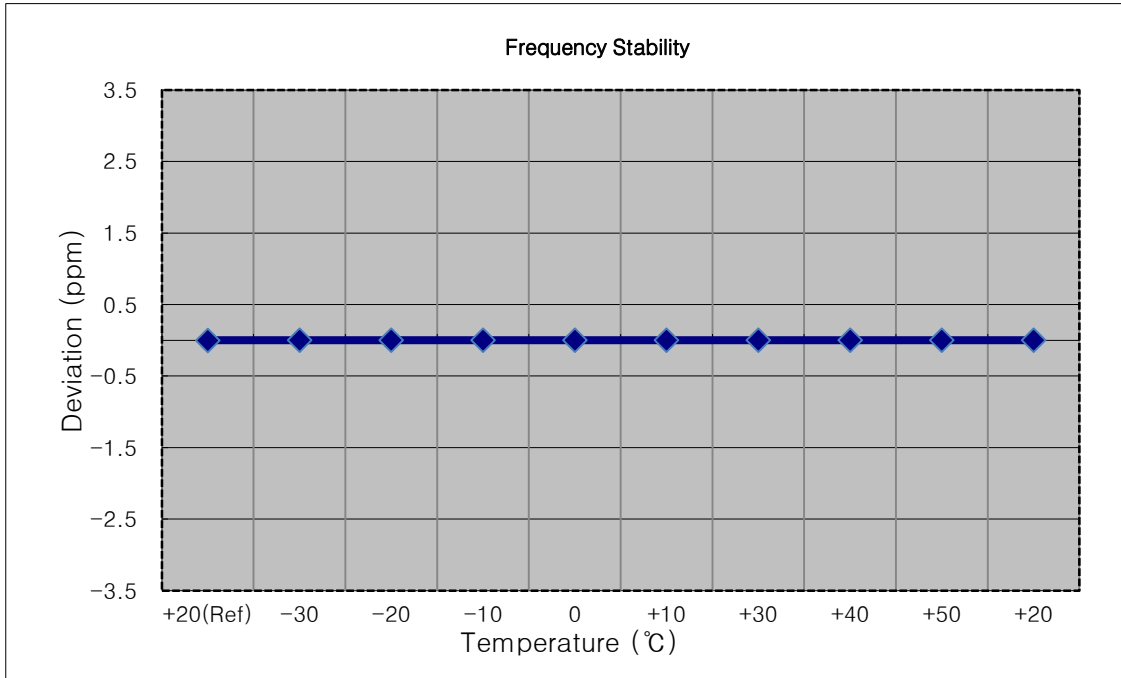
- ▣ MODE: LTE 7
- ▣ OPERATING FREQUENCY: 2,562,500,000 Hz
- ▣ CHANNEL: 21375 (15 MHz)
- ▣ REFERENCE VOLTAGE: 4.200 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	2562 500 005	0.0	0.000 000	0.000
100 %		-30	2562 500 009	4.4	0.000 000	0.002
100 %		-20	2562 500 010	5.2	0.000 000	0.002
100 %		-10	2562 500 011	6.4	0.000 000	0.002
100 %		0	2562 500 009	3.9	0.000 000	0.002
100 %		+10	2562 500 009	4.0	0.000 000	0.002
100 %		+30	2562 500 009	4.0	0.000 000	0.002
100 %		+40	2562 500 008	2.9	0.000 000	0.001
100 %		+50	2562 500 013	8.1	0.000 000	0.003
Batt. Endpoint	3.400	+20	2562 500 012	7.3	0.000 000	0.003



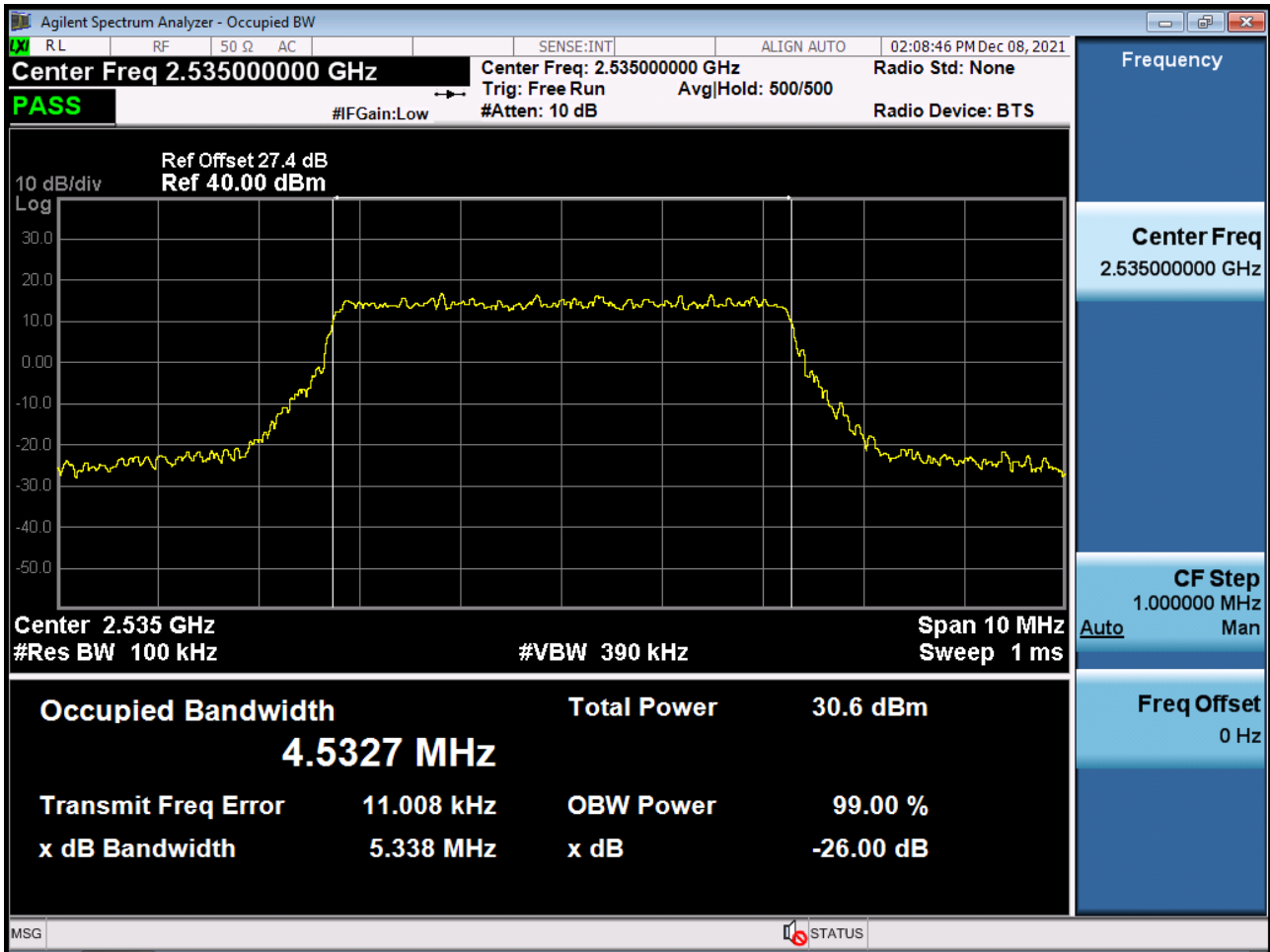
- ▣ MODE: LTE 7
- ▣ OPERATING FREQUENCY: 2,560,000,000 Hz
- ▣ CHANNEL: 21350 (20 MHz)
- ▣ REFERENCE VOLTAGE: 4.200 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	2560 000 004	0.0	0.000 000	0.000
100 %		-30	2560 000 008	3.8	0.000 000	0.001
100 %		-20	2560 000 010	6.2	0.000 000	0.002
100 %		-10	2560 000 009	5.0	0.000 000	0.002
100 %		0	2560 000 010	6.3	0.000 000	0.002
100 %		+10	2560 000 010	5.8	0.000 000	0.002
100 %		+30	2560 000 008	4.3	0.000 000	0.002
100 %		+40	2560 000 008	4.3	0.000 000	0.002
100 %		+50	2560 000 010	5.8	0.000 000	0.002
Batt. Endpoint	3.400	+20	2560 000 009	5.6	0.000 000	0.002

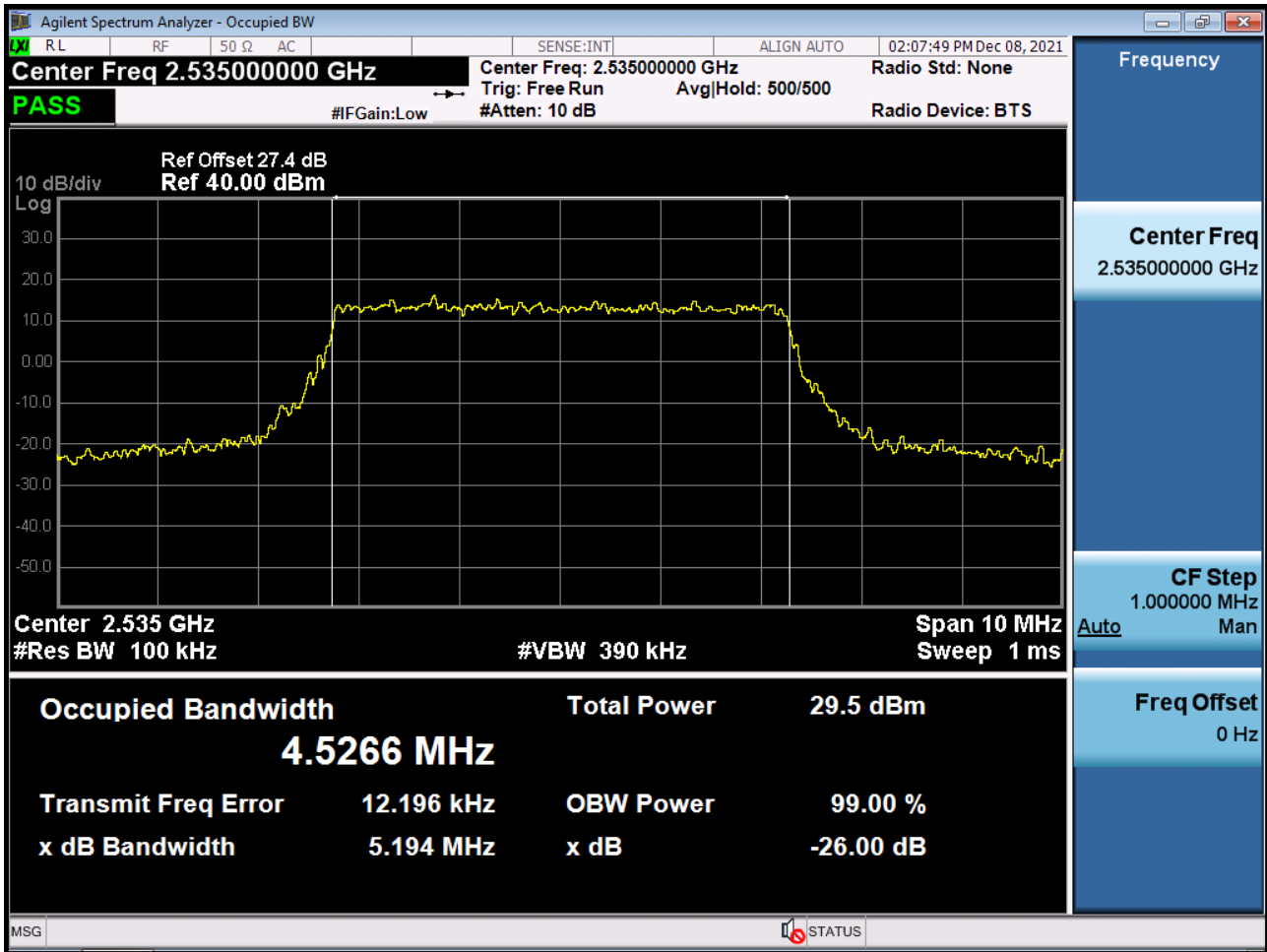


## 9. TEST PLOTS

BAND 7. Occupied Bandwidth Plot (5 MHz Ch.21100 QPSK RB 25)

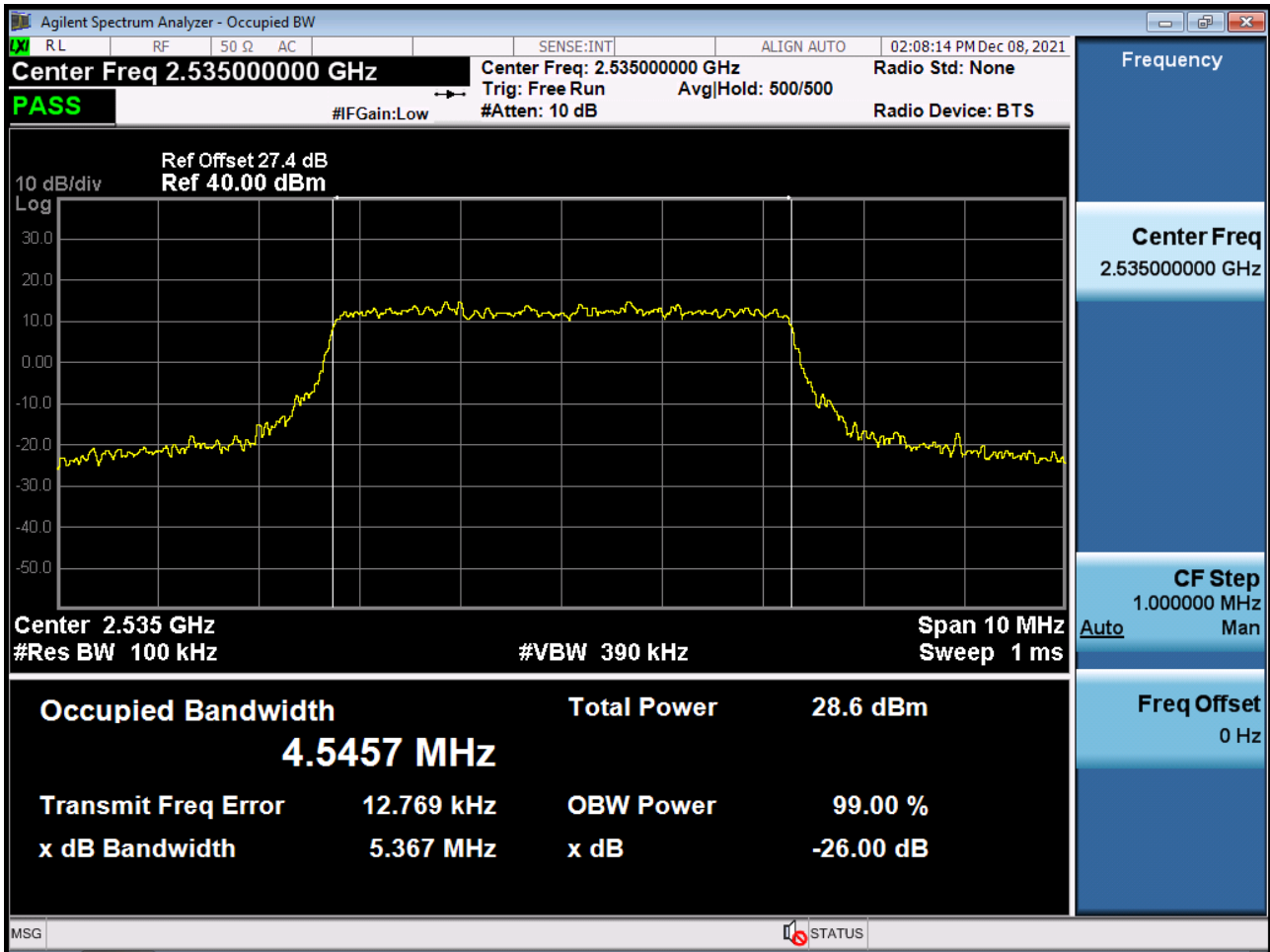


BAND 7. Occupied Bandwidth Plot (5 MHz Ch.21100 16-QAM RB 25)

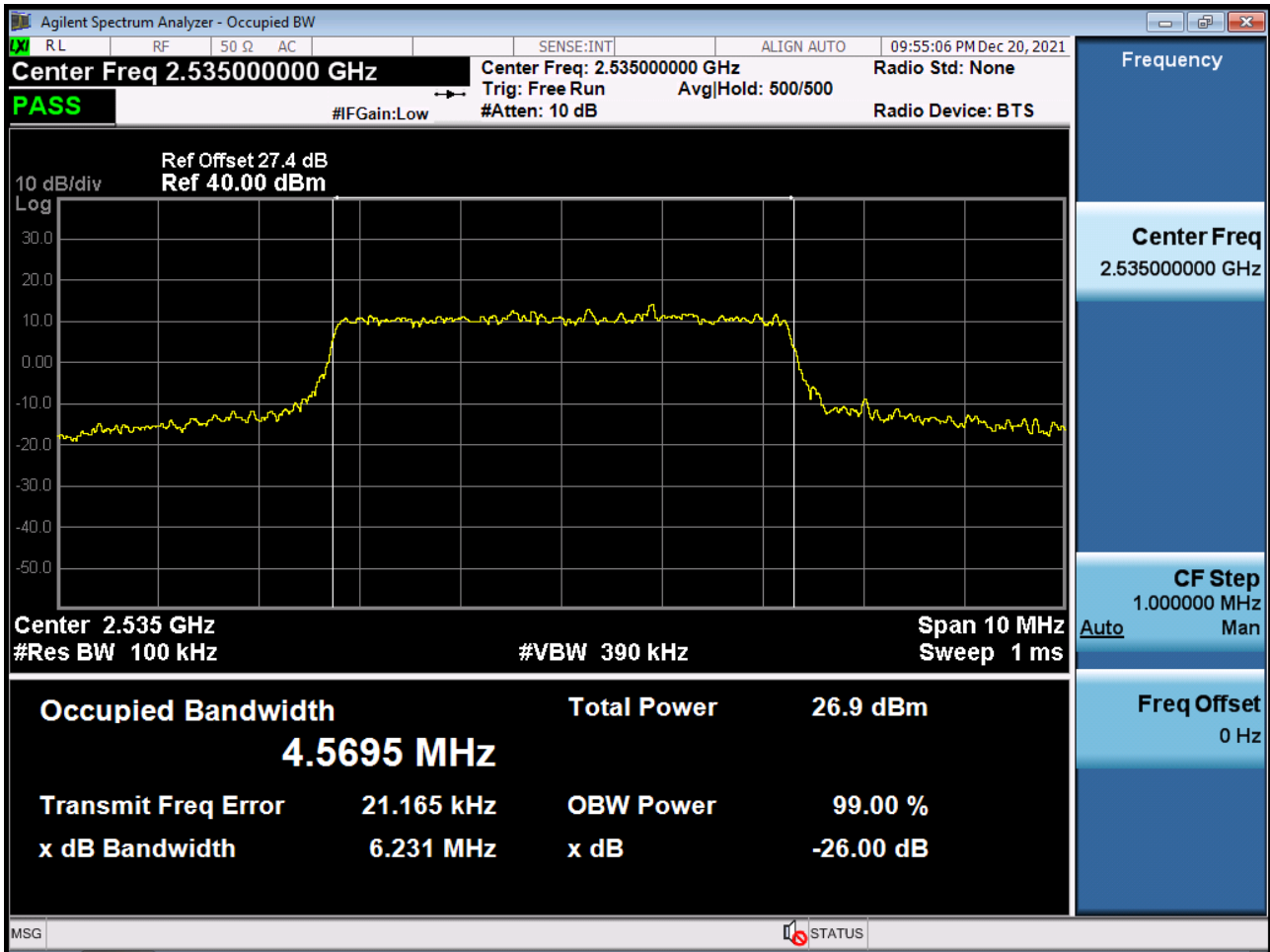




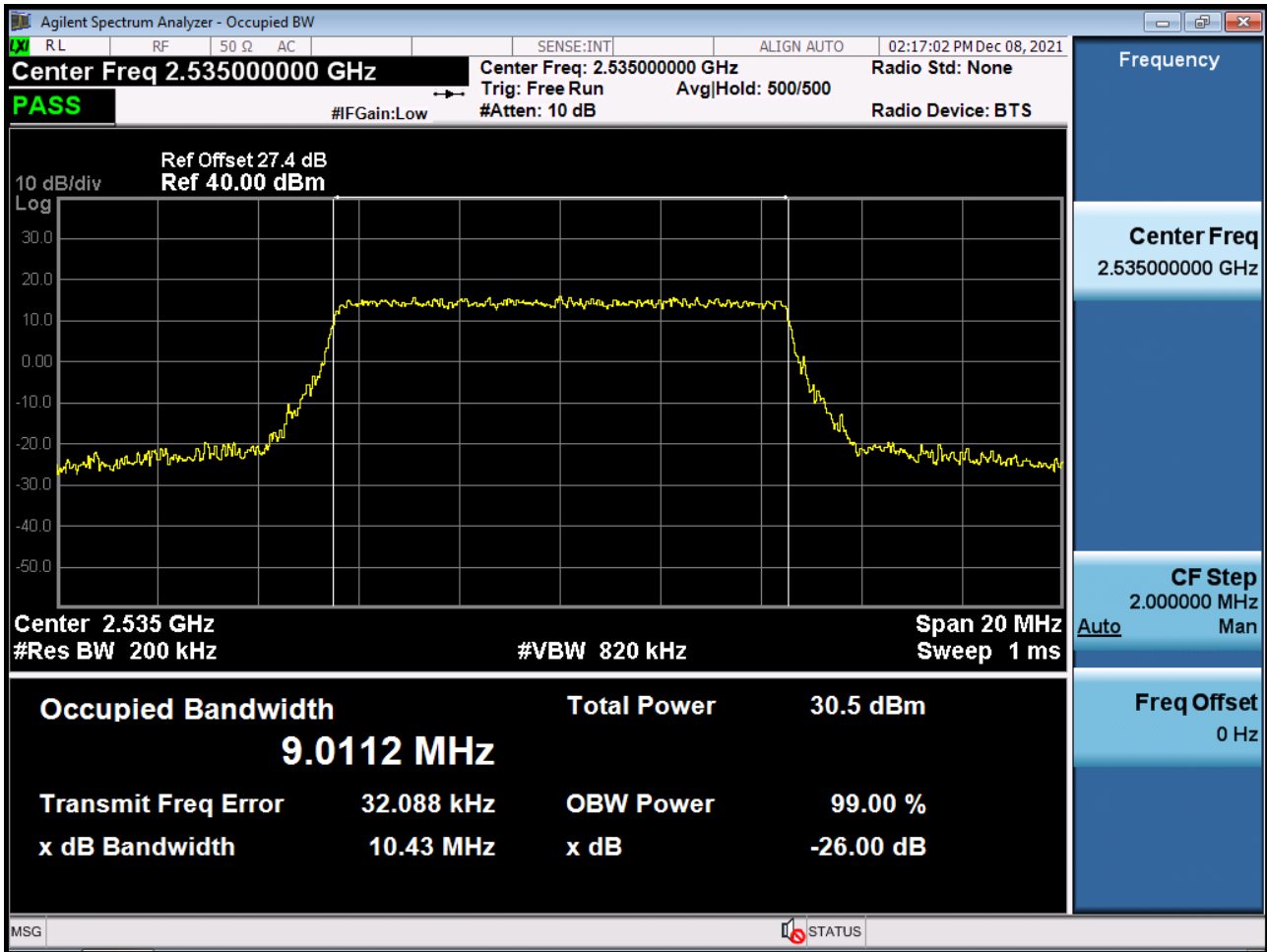
BAND 7. Occupied Bandwidth Plot (5 MHz Ch.21100 64-QAM RB 25)



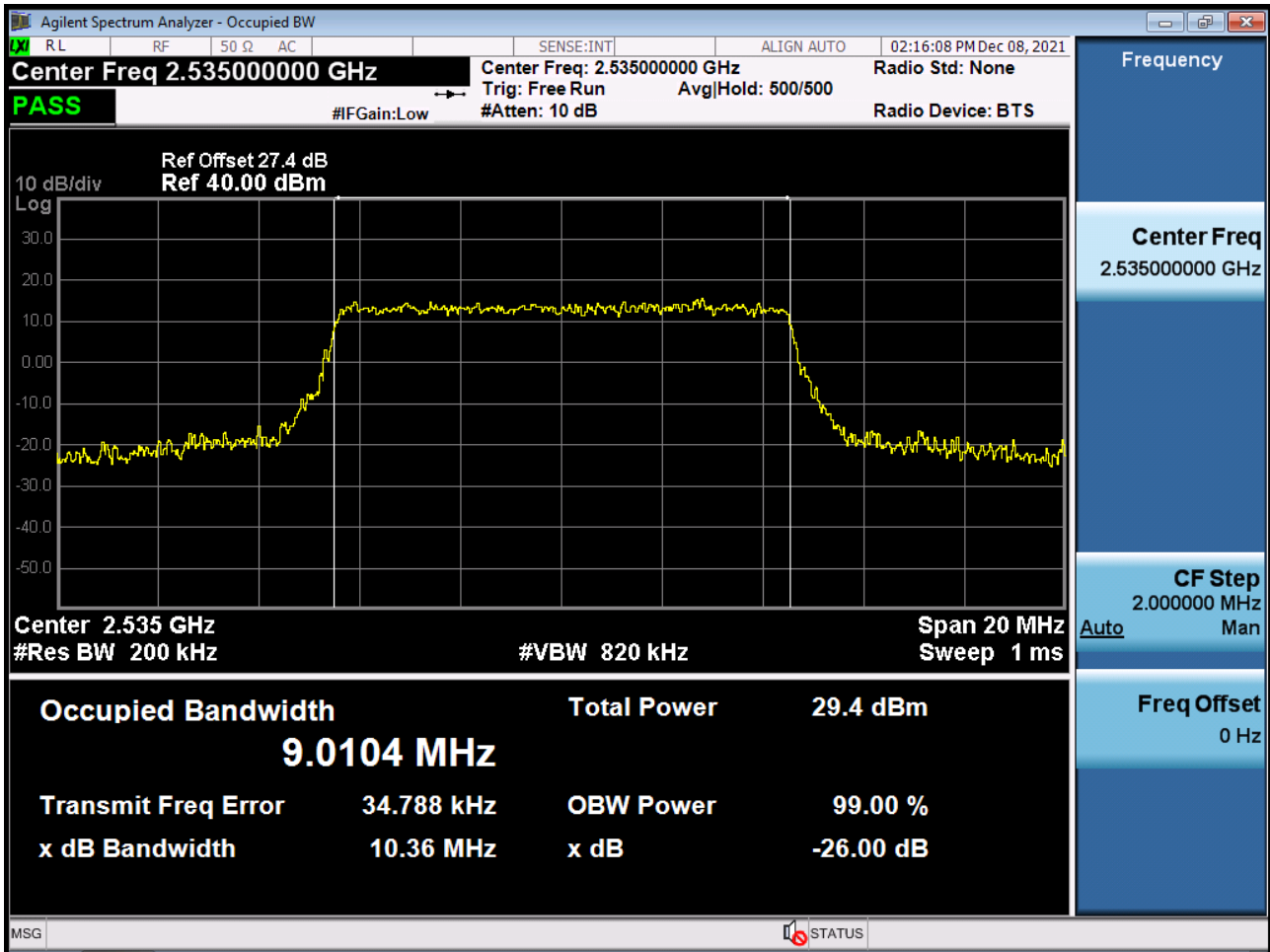
BAND 7. Occupied Bandwidth Plot (5 MHz Ch.21100 256-QAM RB 25)



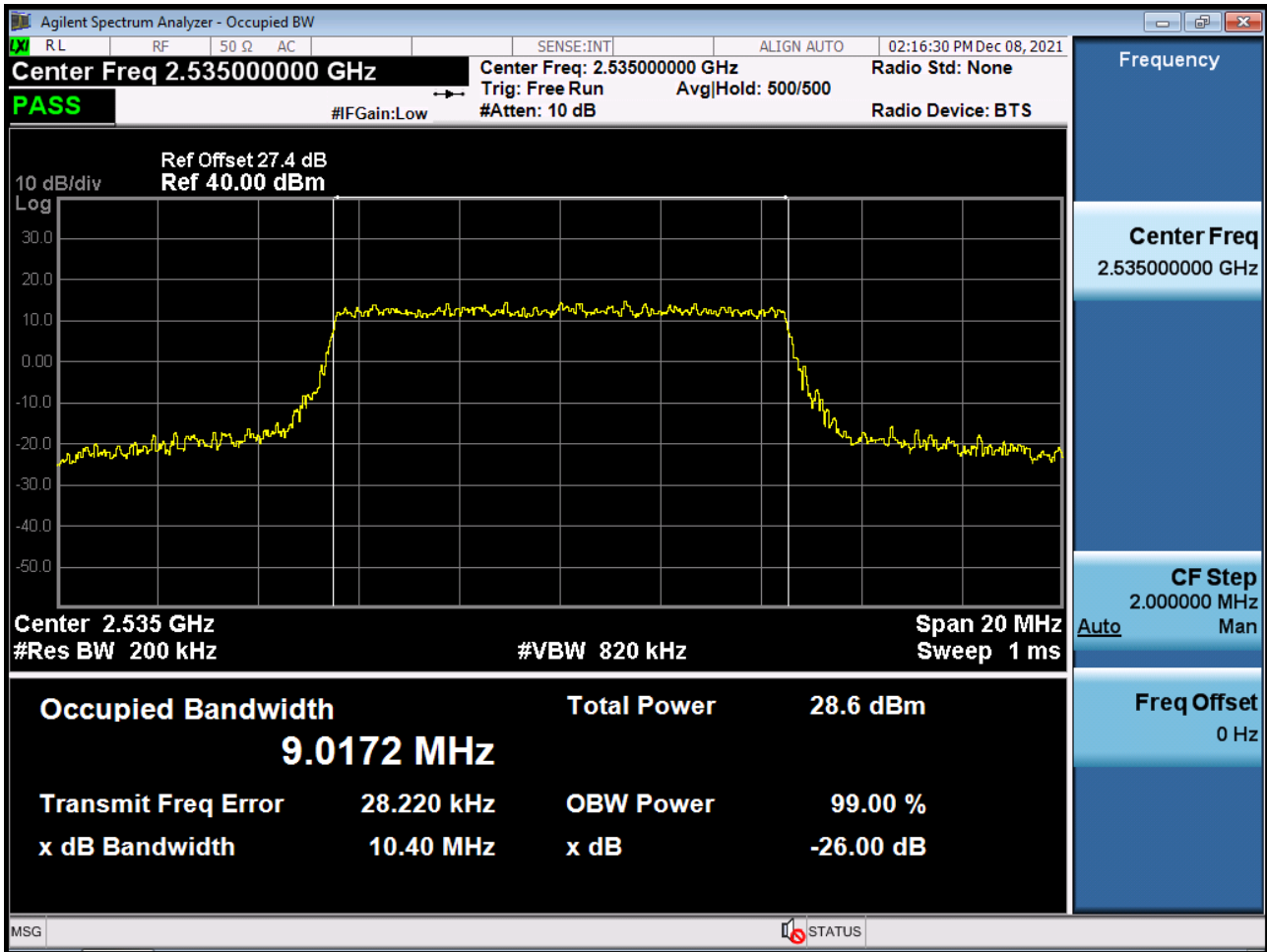
BAND 7. Occupied Bandwidth Plot (10 MHz Ch.21100 QPSK RB 50)



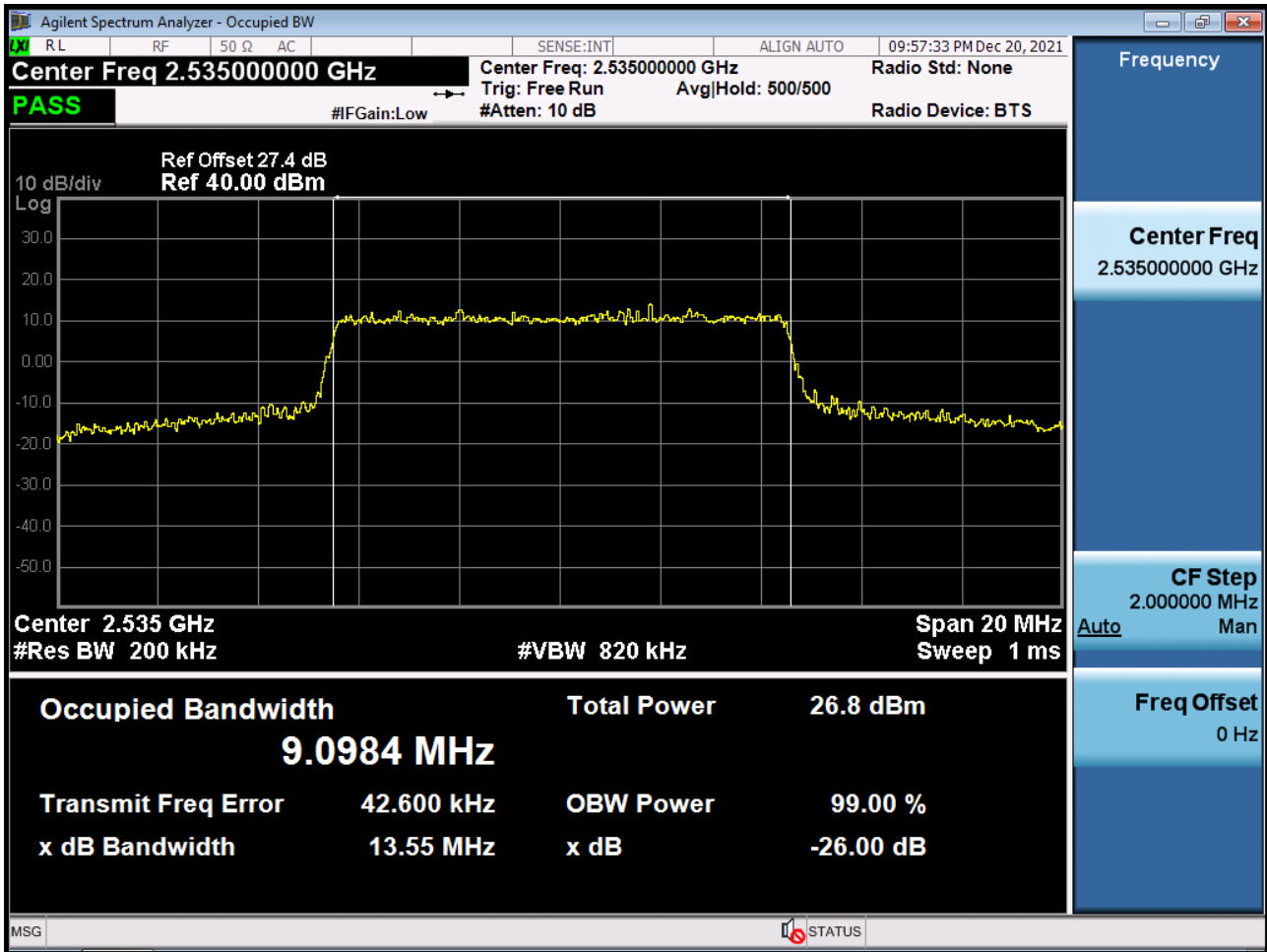
BAND 7. Occupied Bandwidth Plot (10 MHz Ch.21100 16-QAM RB 50)



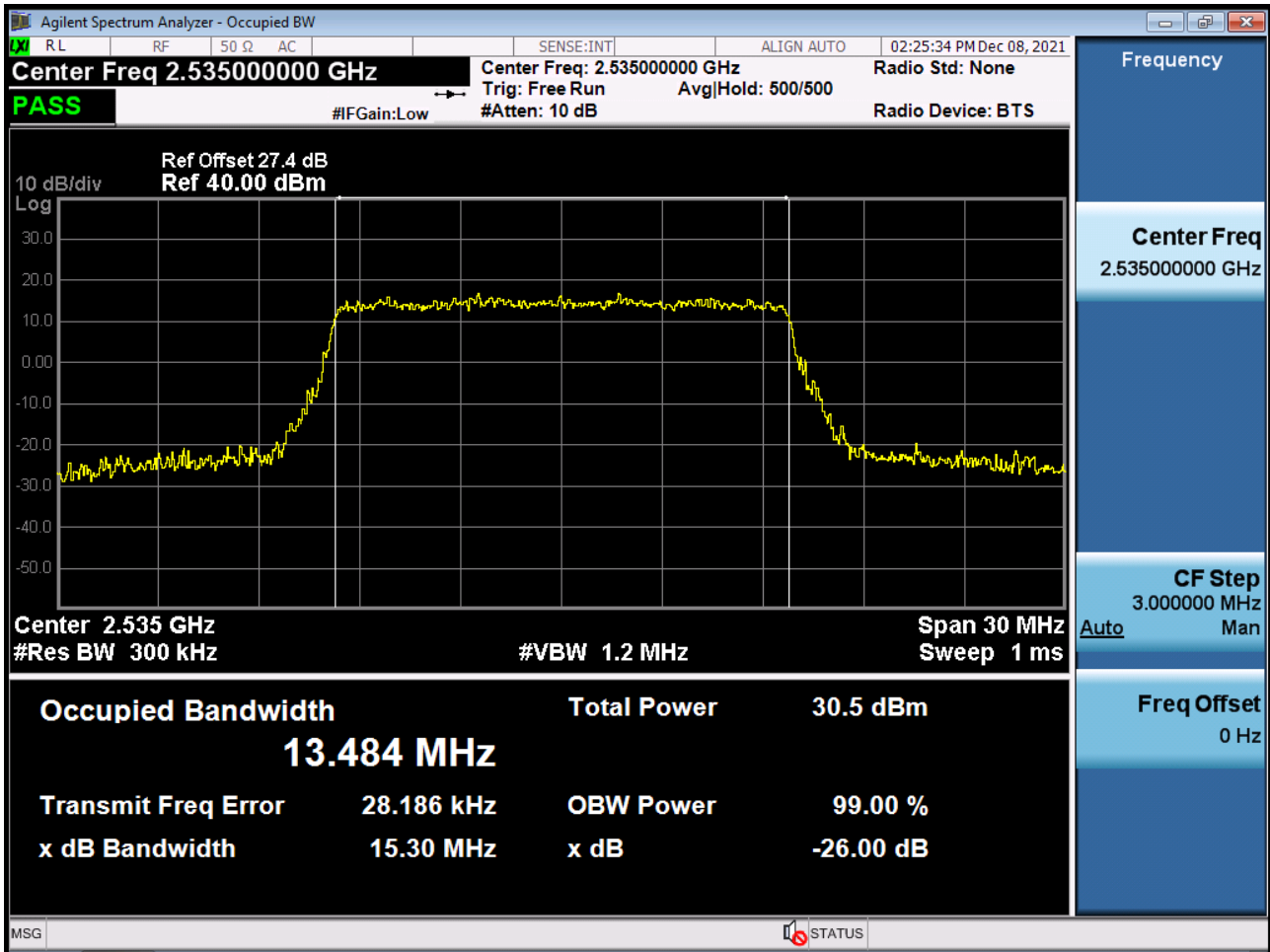
BAND 7. Occupied Bandwidth Plot (10 MHz Ch.21100 64-QAM RB 50)



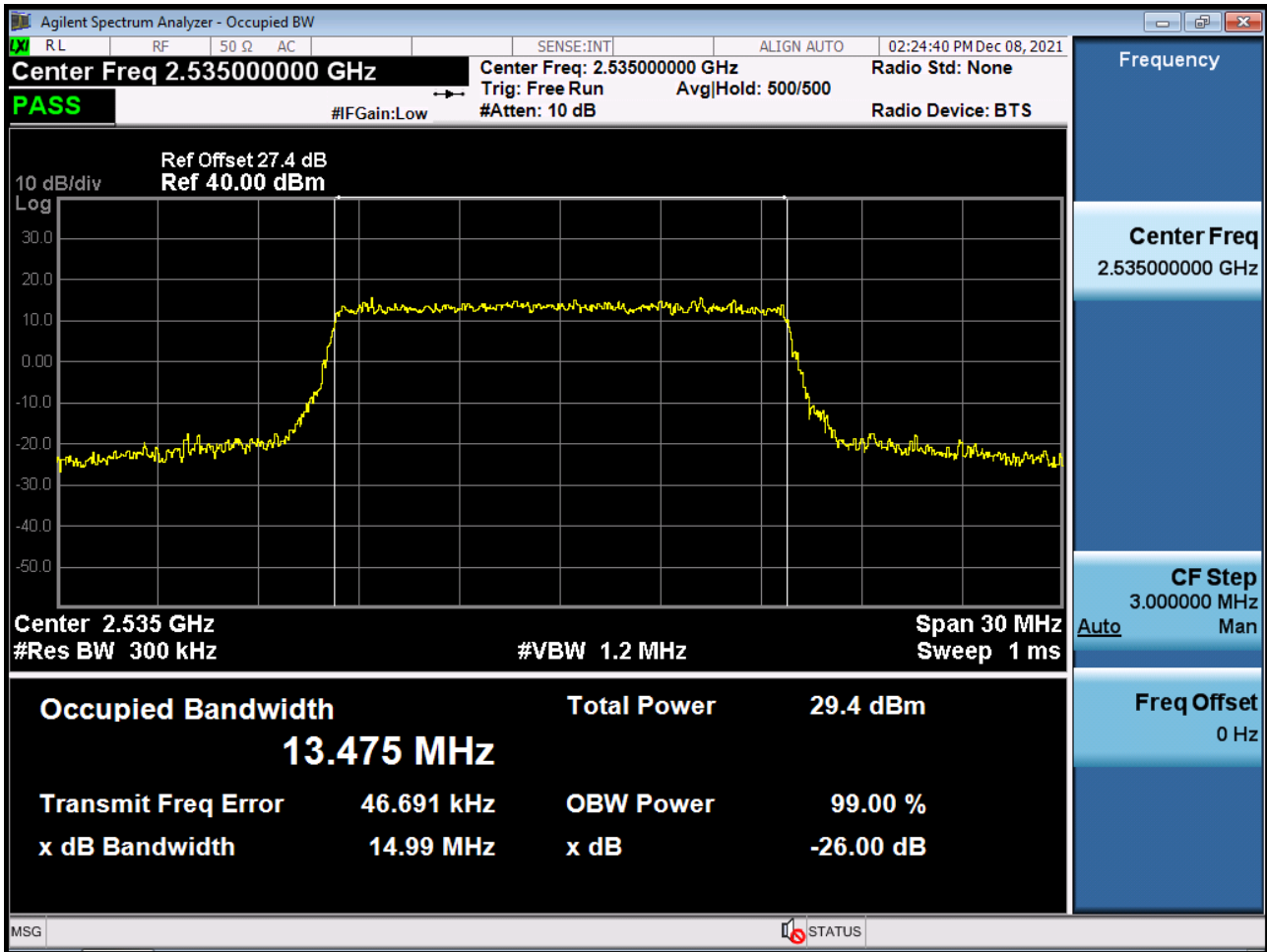
BAND 7. Occupied Bandwidth Plot (10 MHz Ch.21100 256-QAM RB 50)



BAND 7. Occupied Bandwidth Plot (15 MHz Ch.21100 QPSK RB 75)

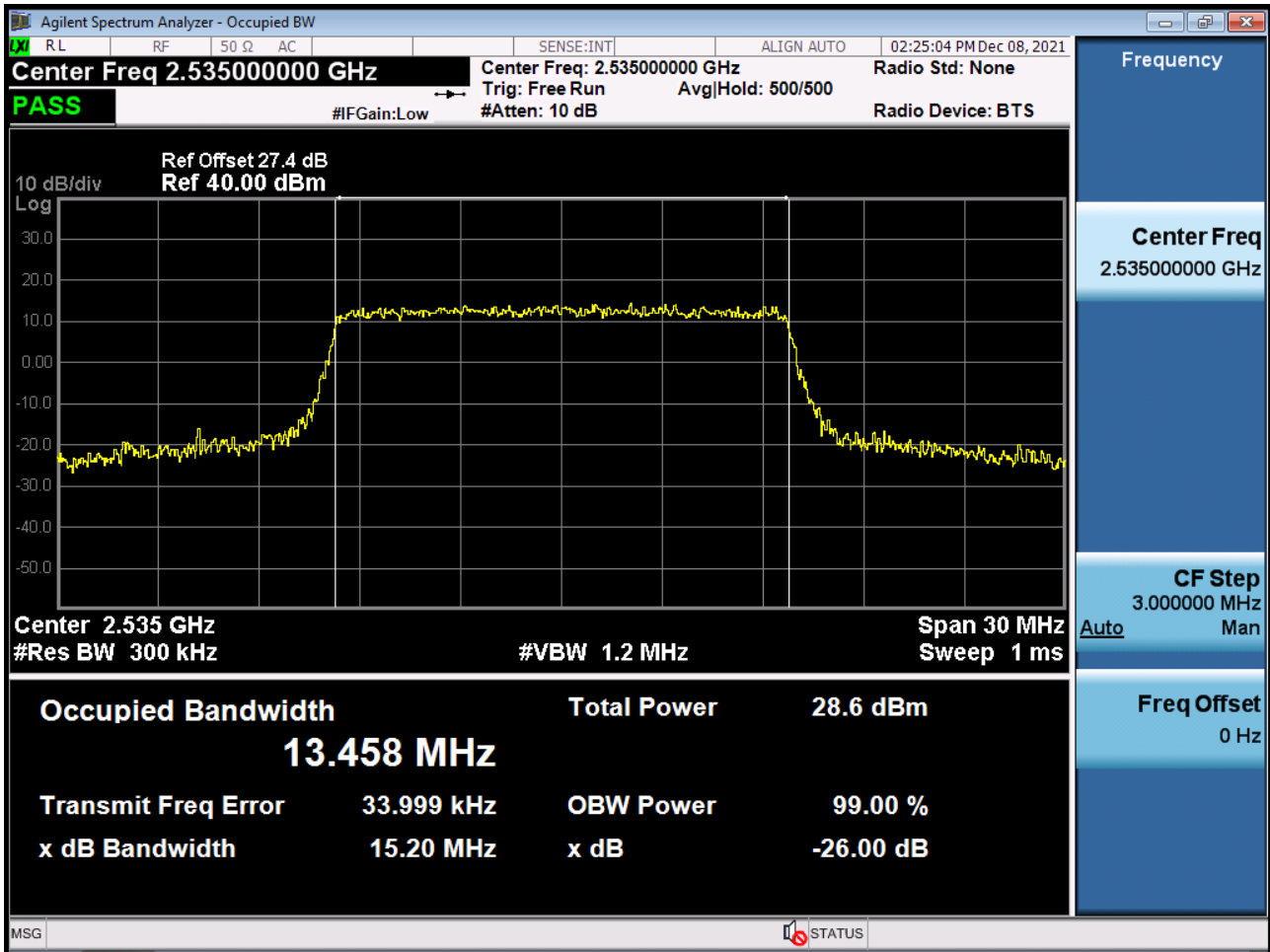


BAND 7. Occupied Bandwidth Plot (15 MHz Ch.21100 16-QAM RB 75)

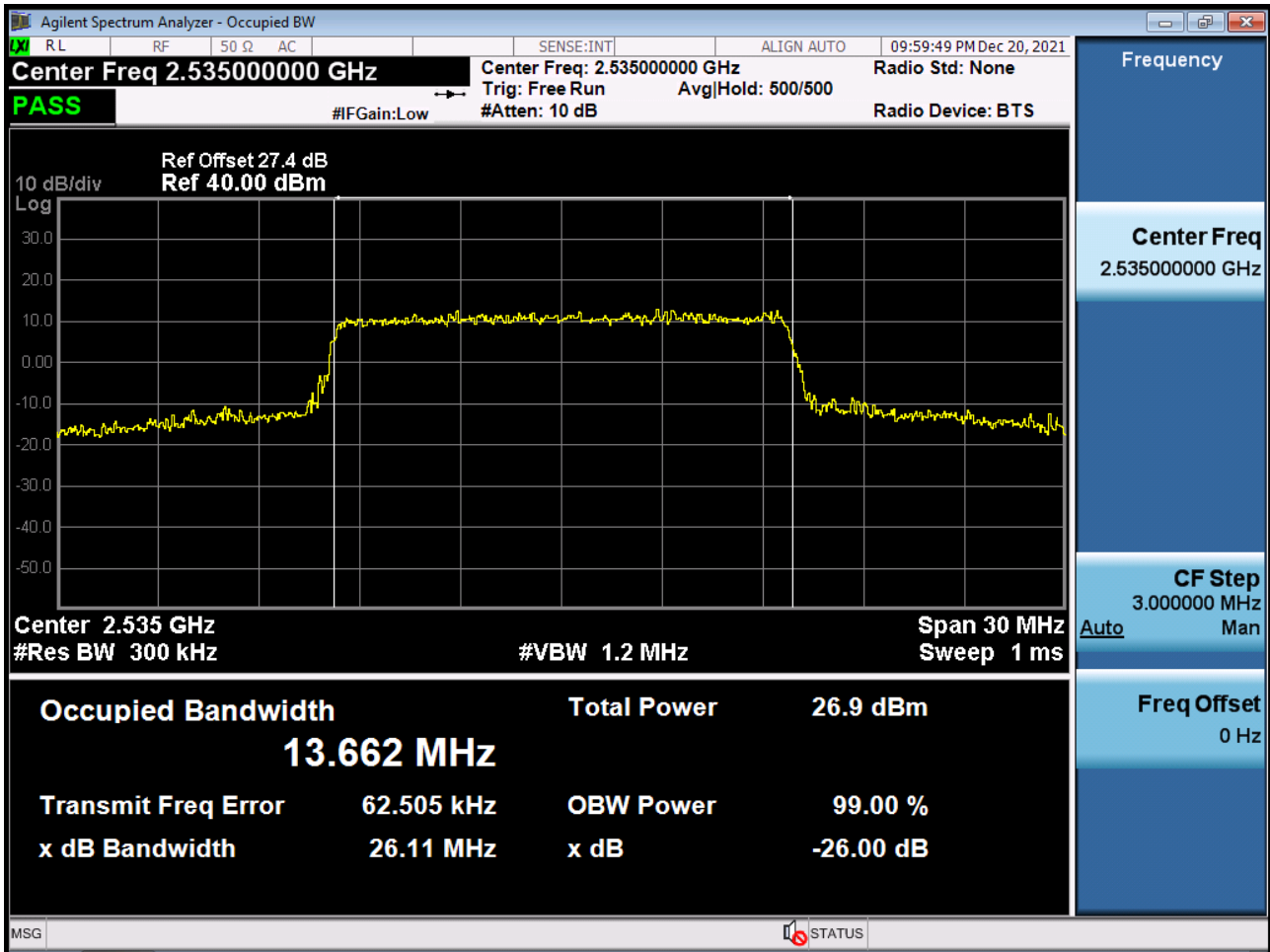




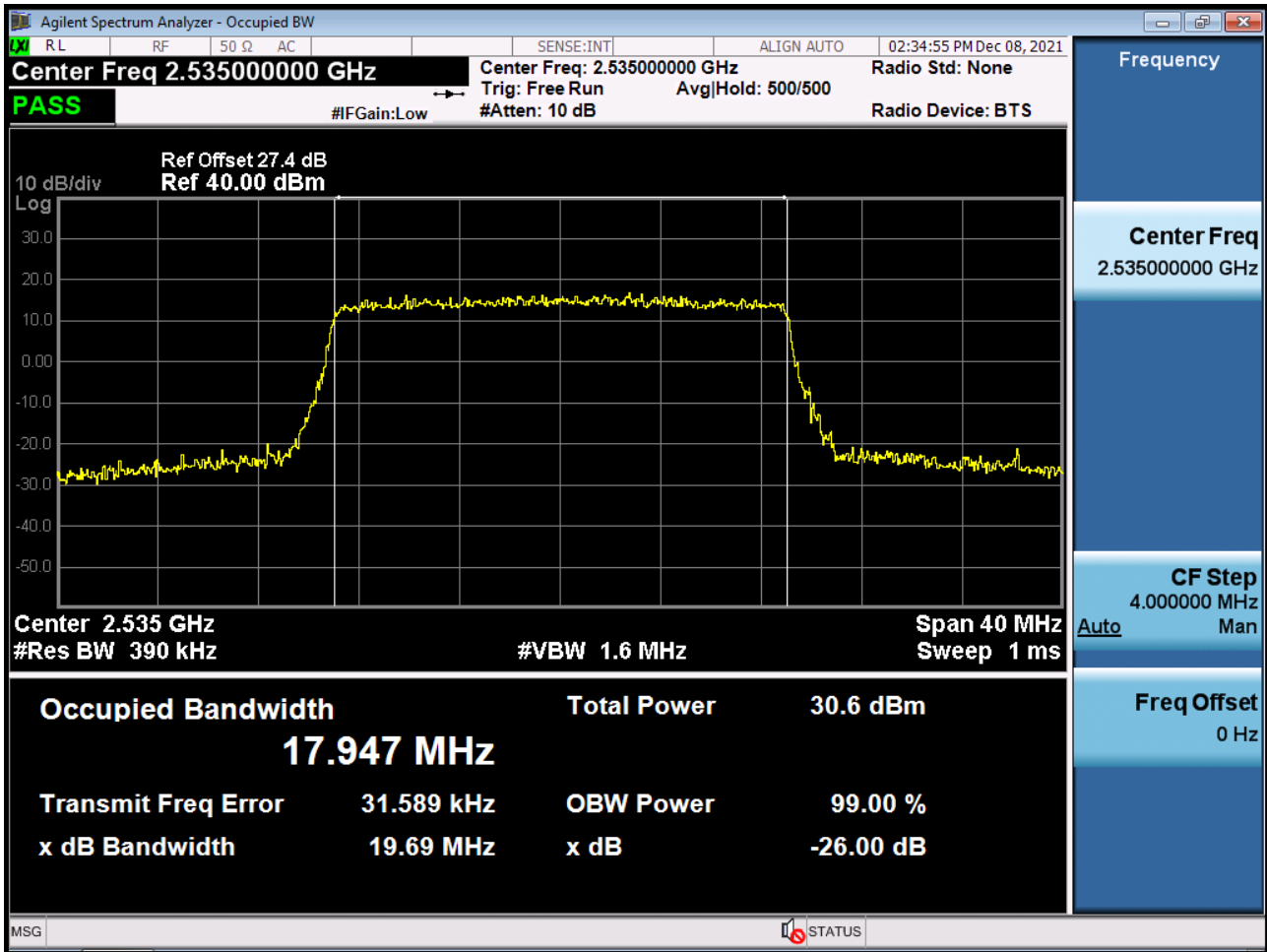
BAND 7. Occupied Bandwidth Plot (15 MHz Ch.21100 64-QAM RB 75)



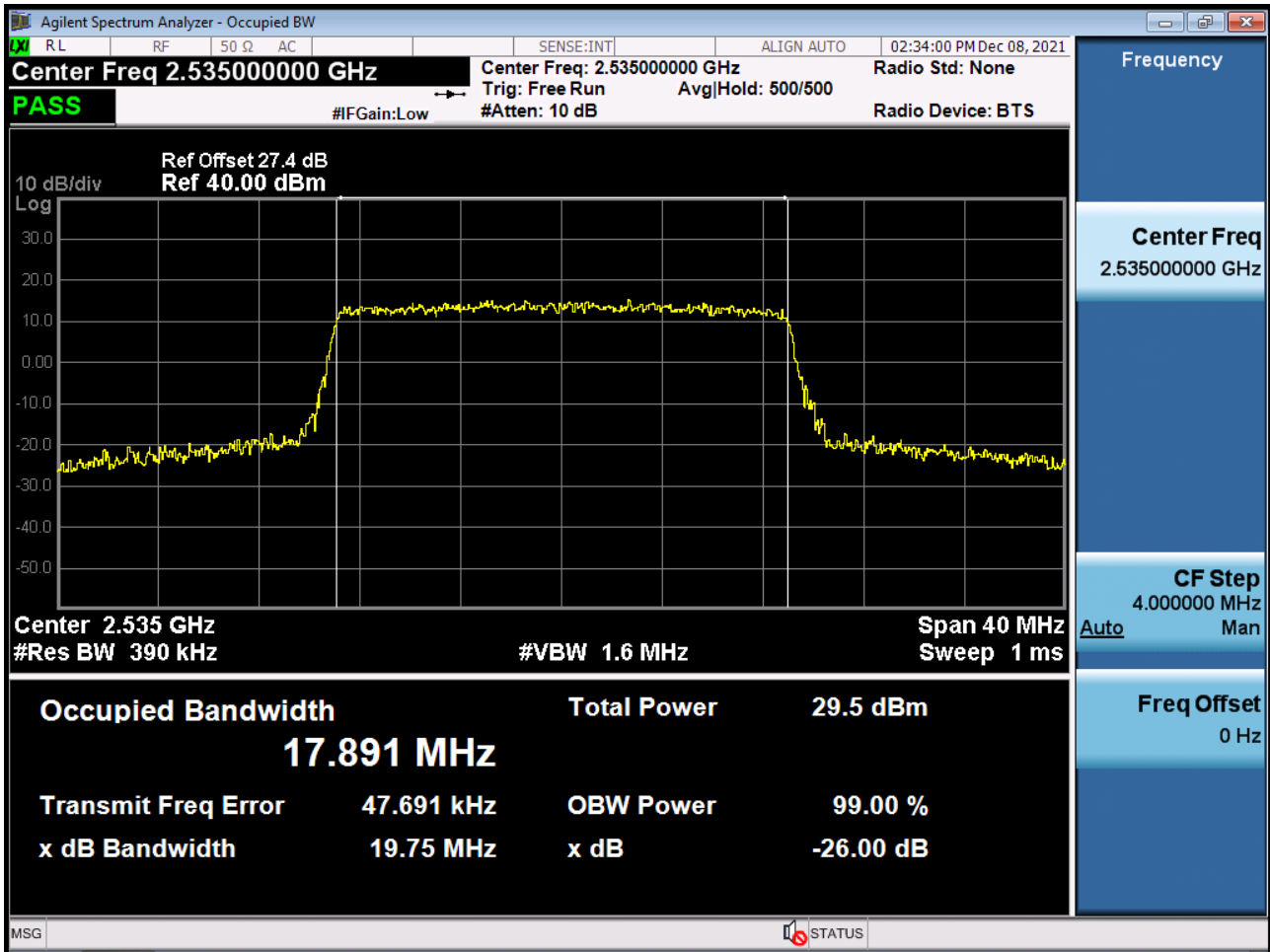
BAND 7. Occupied Bandwidth Plot (15 MHz Ch.21100 256-QAM RB 75)



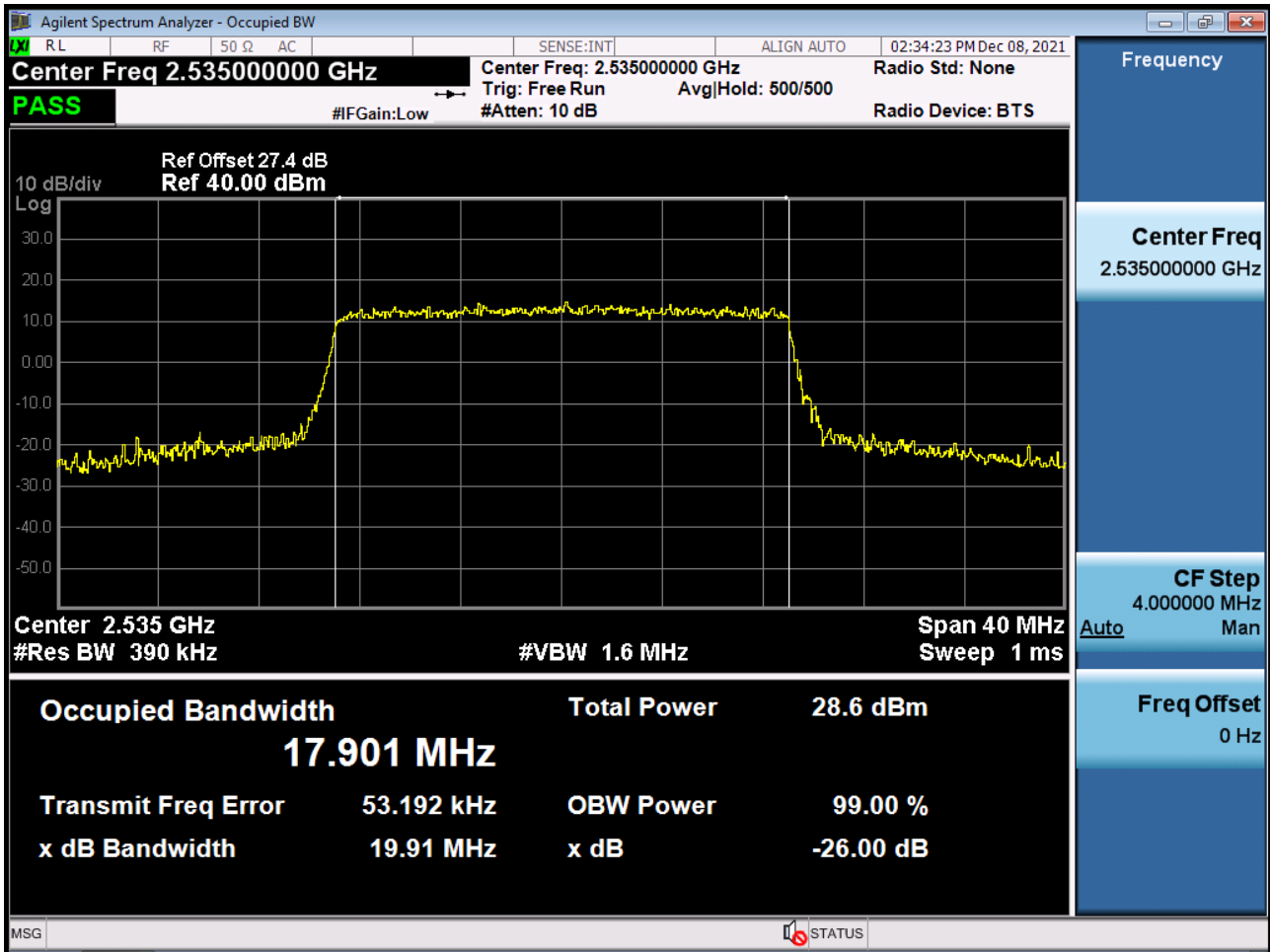
BAND 7. Occupied Bandwidth Plot (20 MHz Ch.21100 QPSK RB 100)



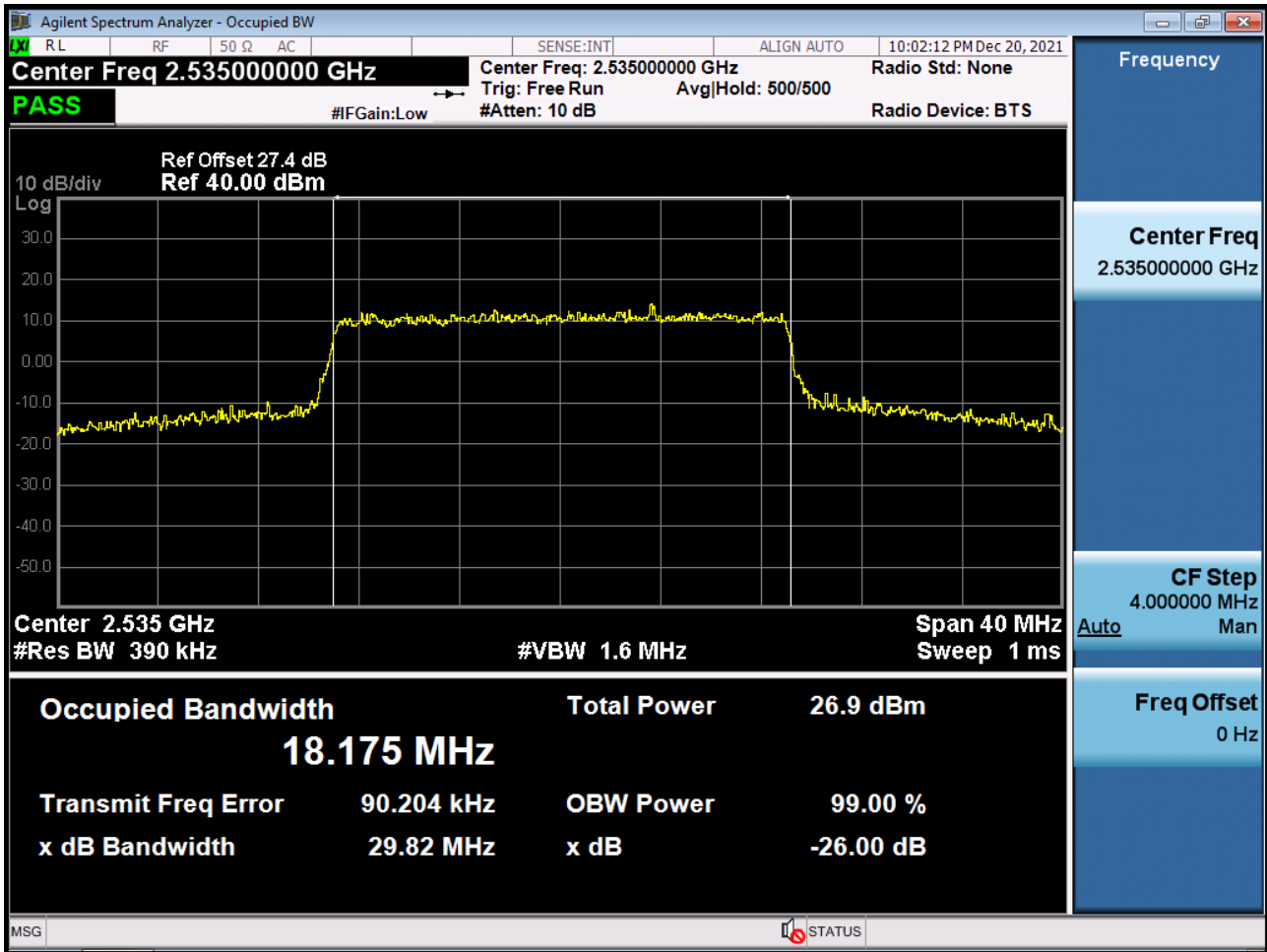
BAND 7. Occupied Bandwidth Plot (20 MHz Ch.21100 16-QAM RB 100)



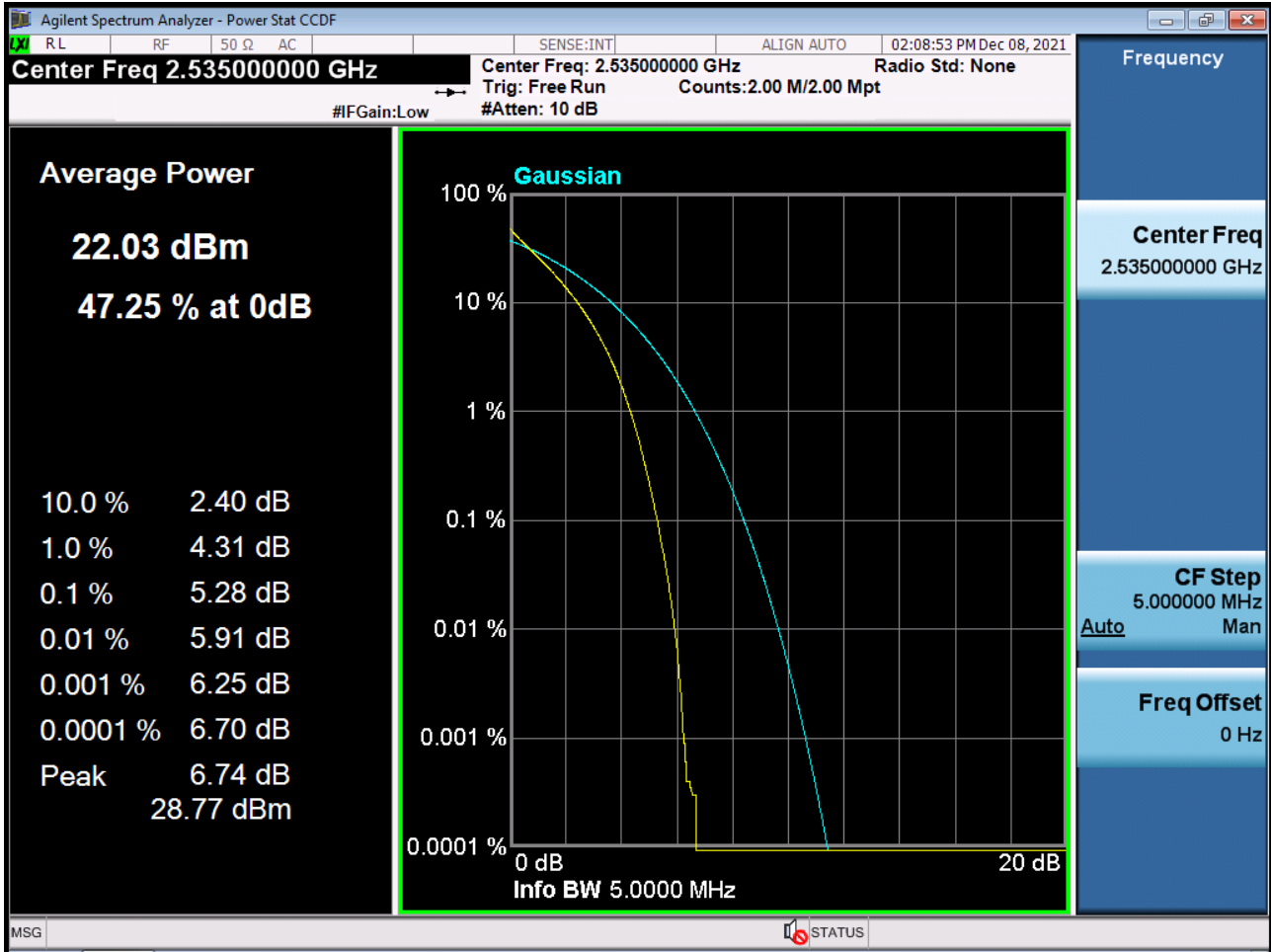
BAND 7. Occupied Bandwidth Plot (20 MHz Ch.21100 64-QAM RB 100)



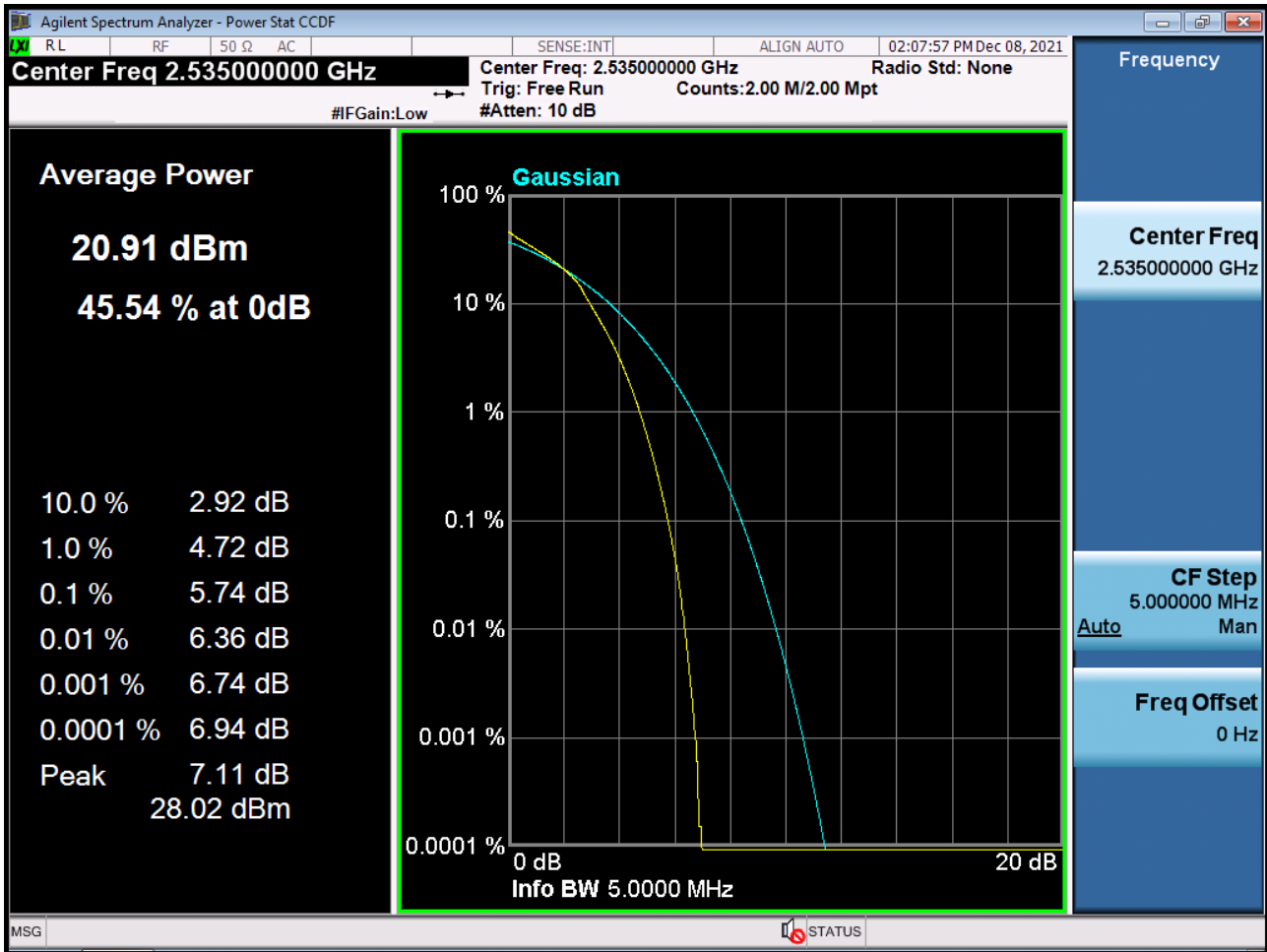
BAND 7. Occupied Bandwidth Plot (20 MHz Ch.21100 256-QAM RB 100)



BAND 7. PAR Plot (5 M BW Ch.21100 QPSK RB 25\_0)

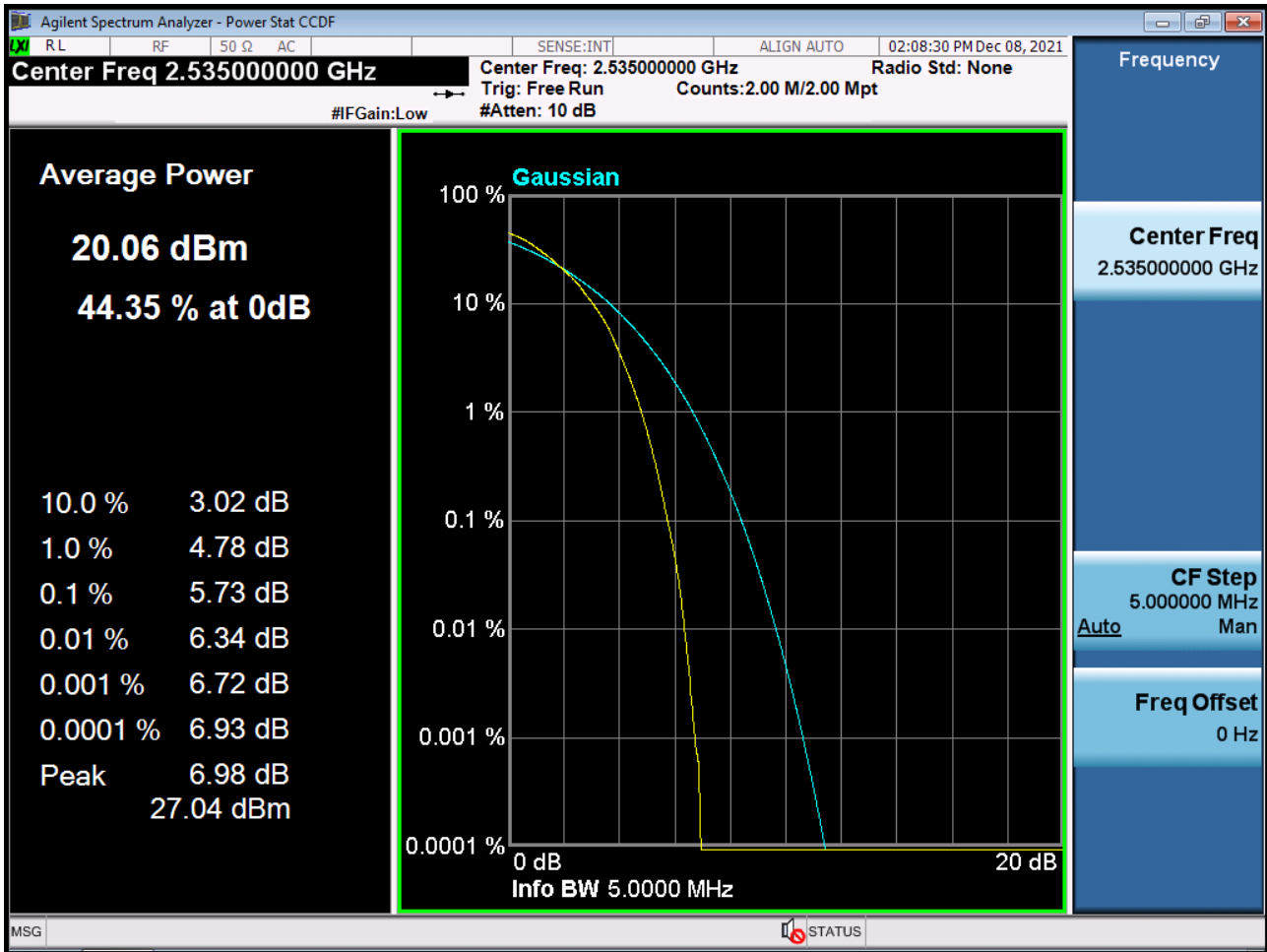


BAND 7. PAR Plot (5 M BW Ch.21100 16QAM RB 25\_0)

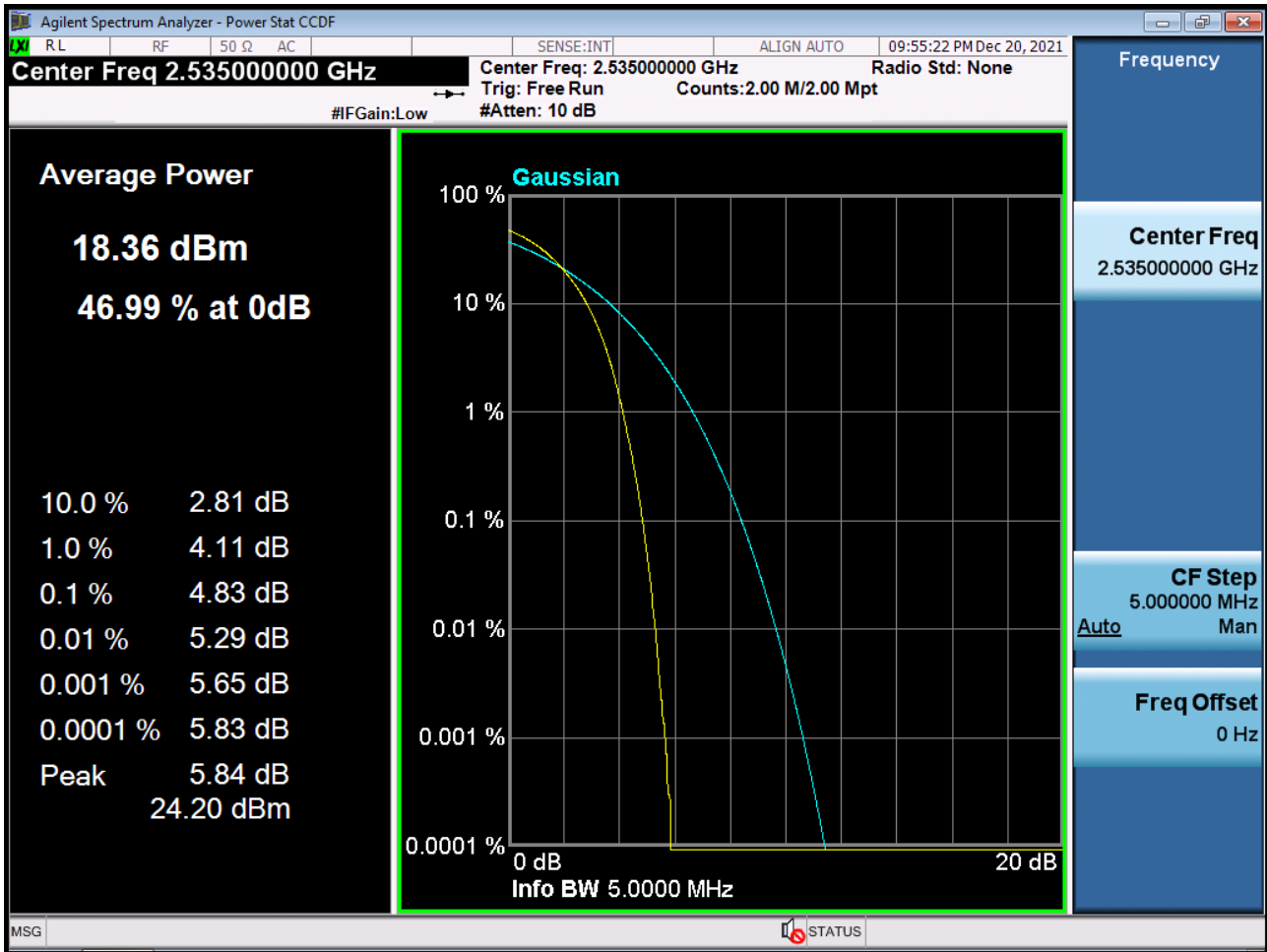




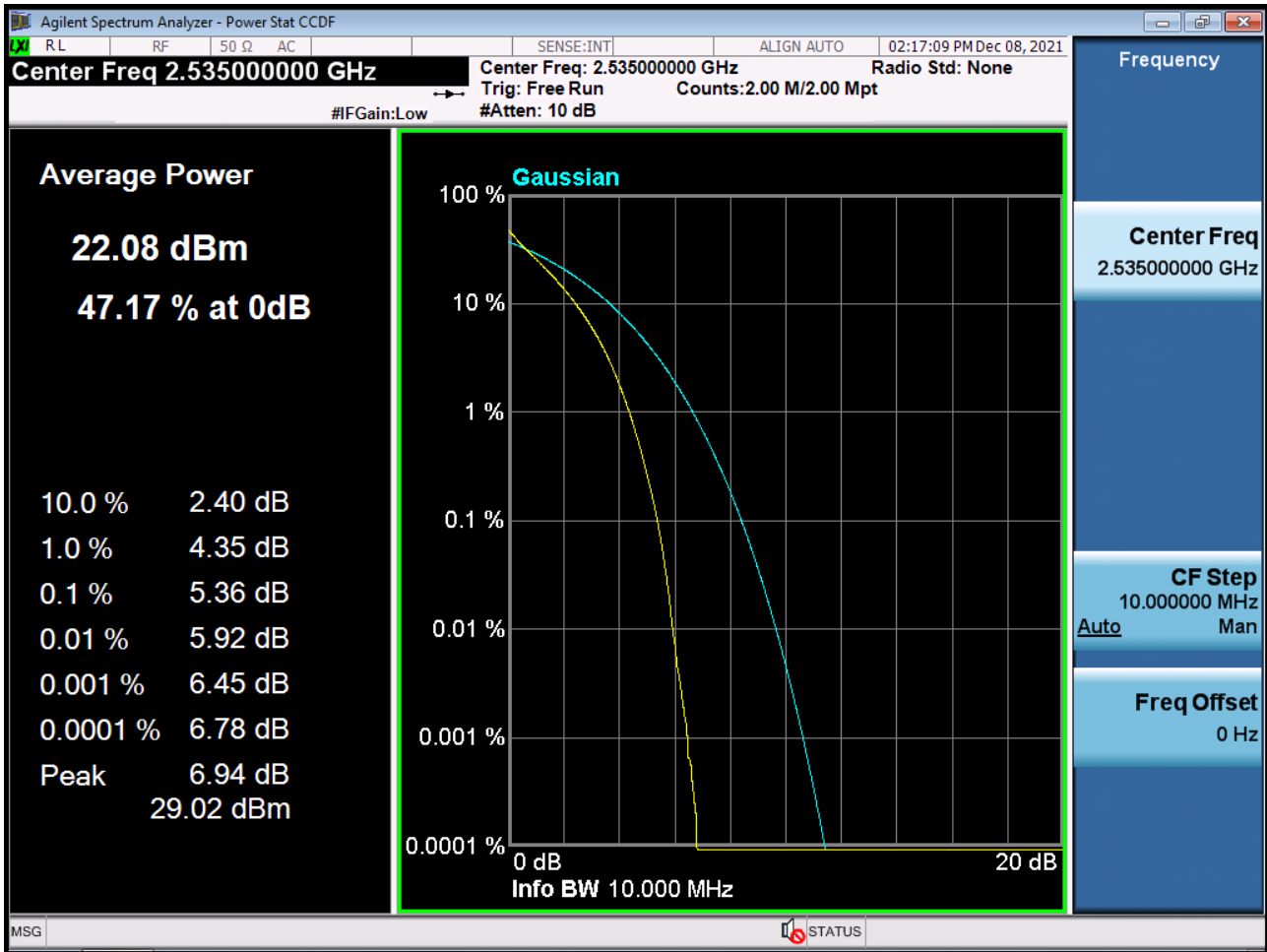
BAND 7. PAR Plot (5 M BW Ch.21100 64QAM RB 25\_0)



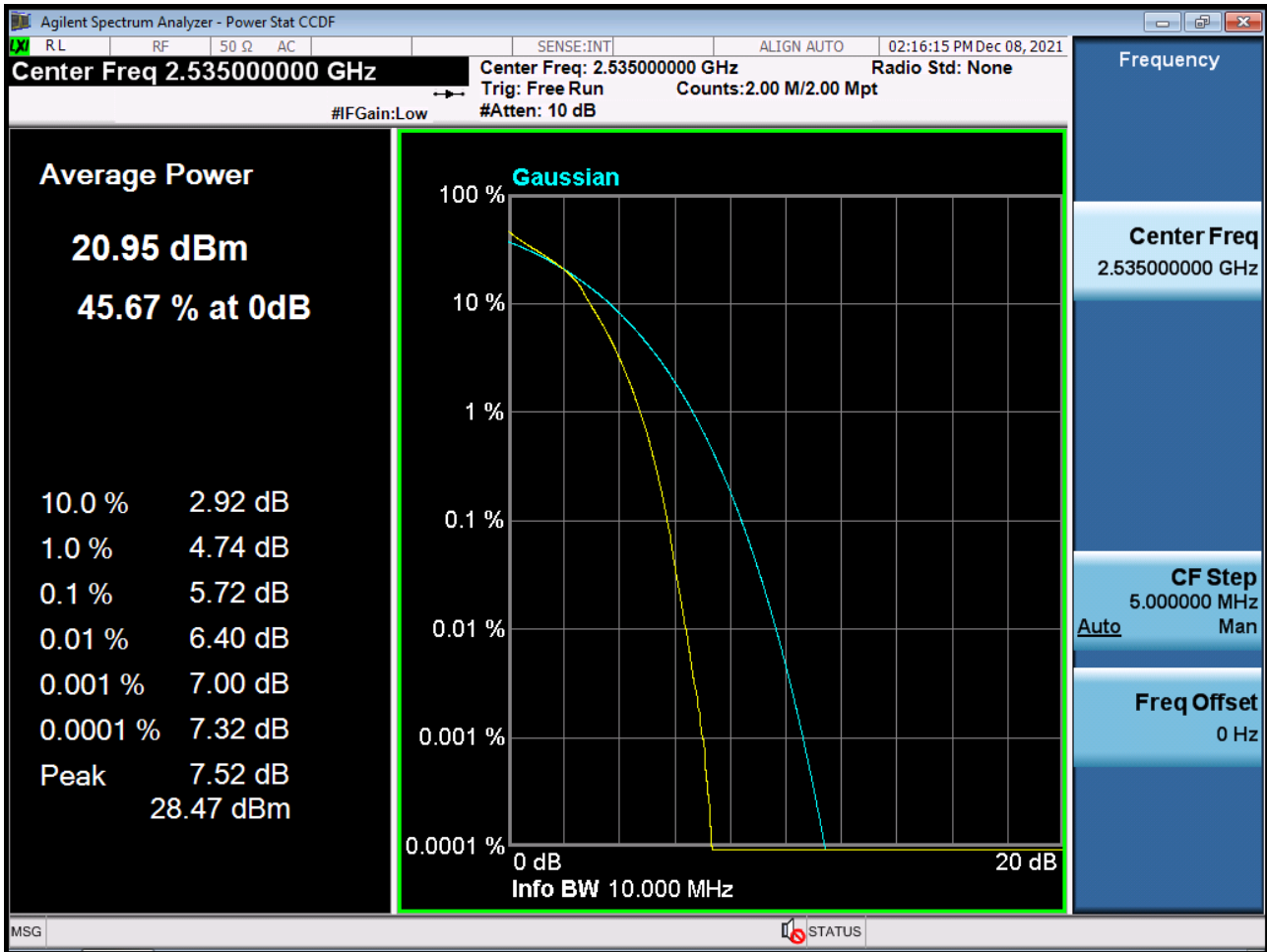
BAND 7. PAR Plot (5 M BW Ch.21100 256QAM RB 25\_0)



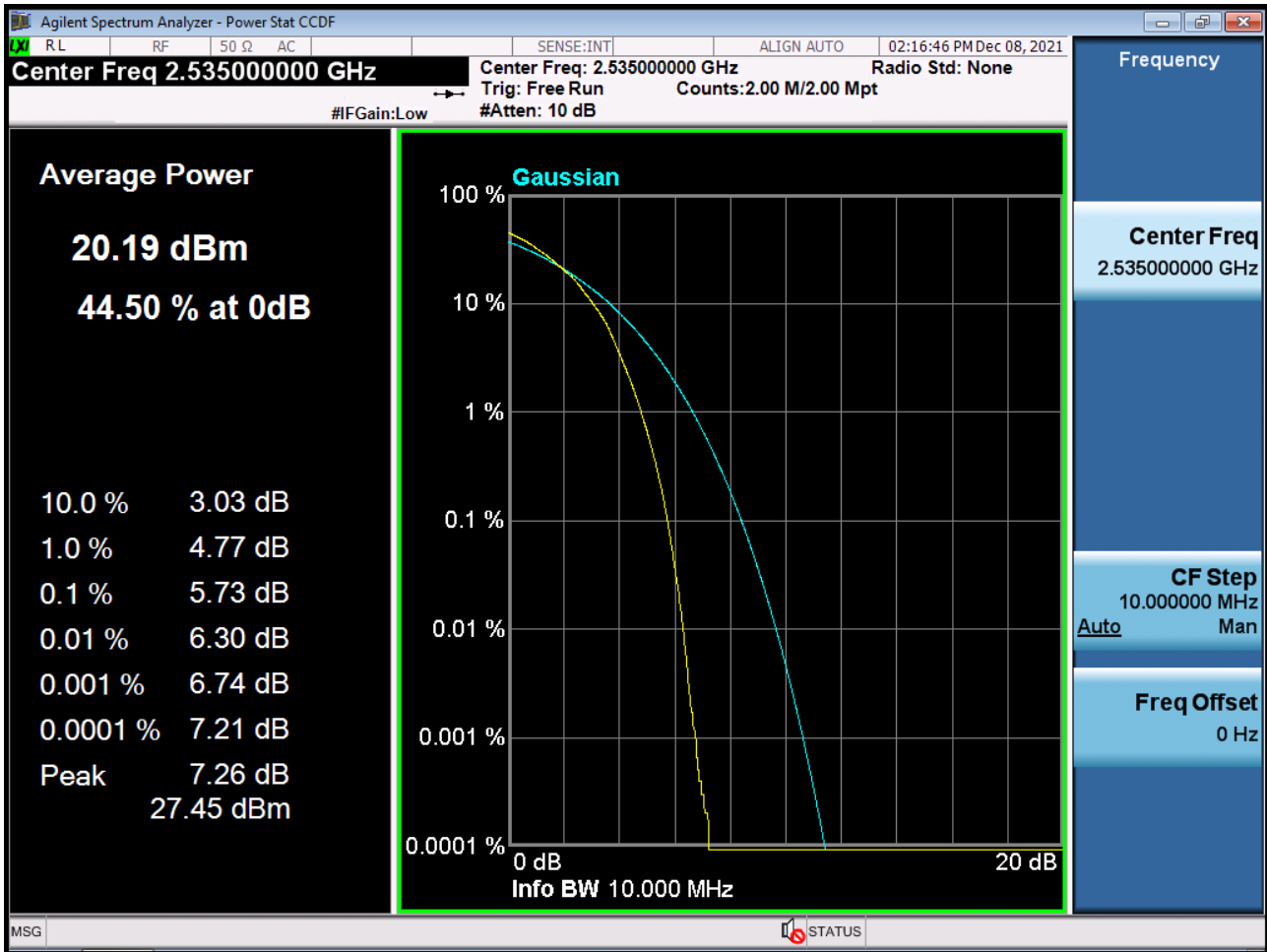
BAND 7. PAR Plot (10 M BW Ch.21100 QPSK RB 50\_0)



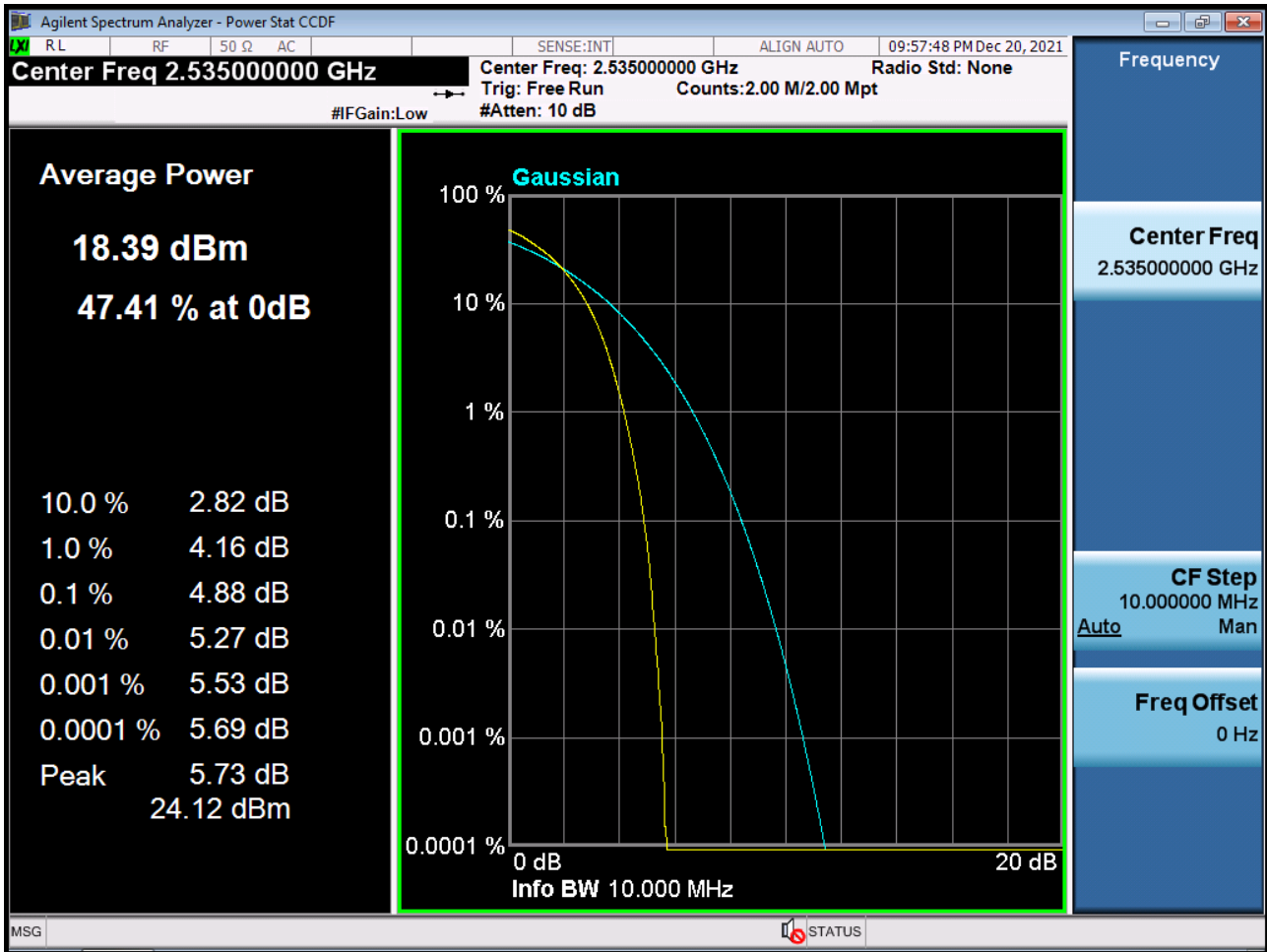
BAND 7. PAR Plot (10 M BW Ch.21100 16QAM RB 50\_0)



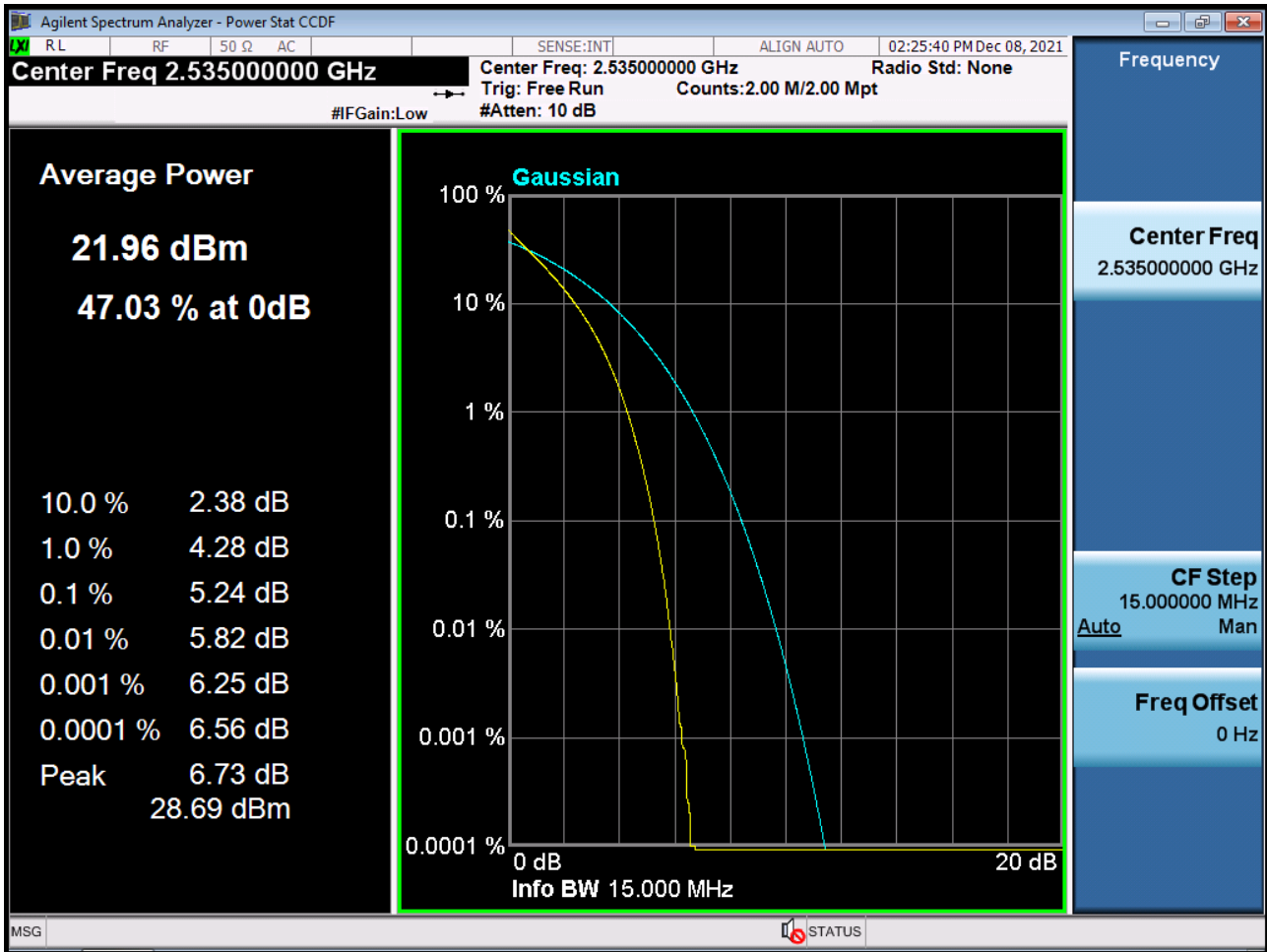
BAND 7. PAR Plot (10 M BW Ch.21100 64QAM RB 50\_0)



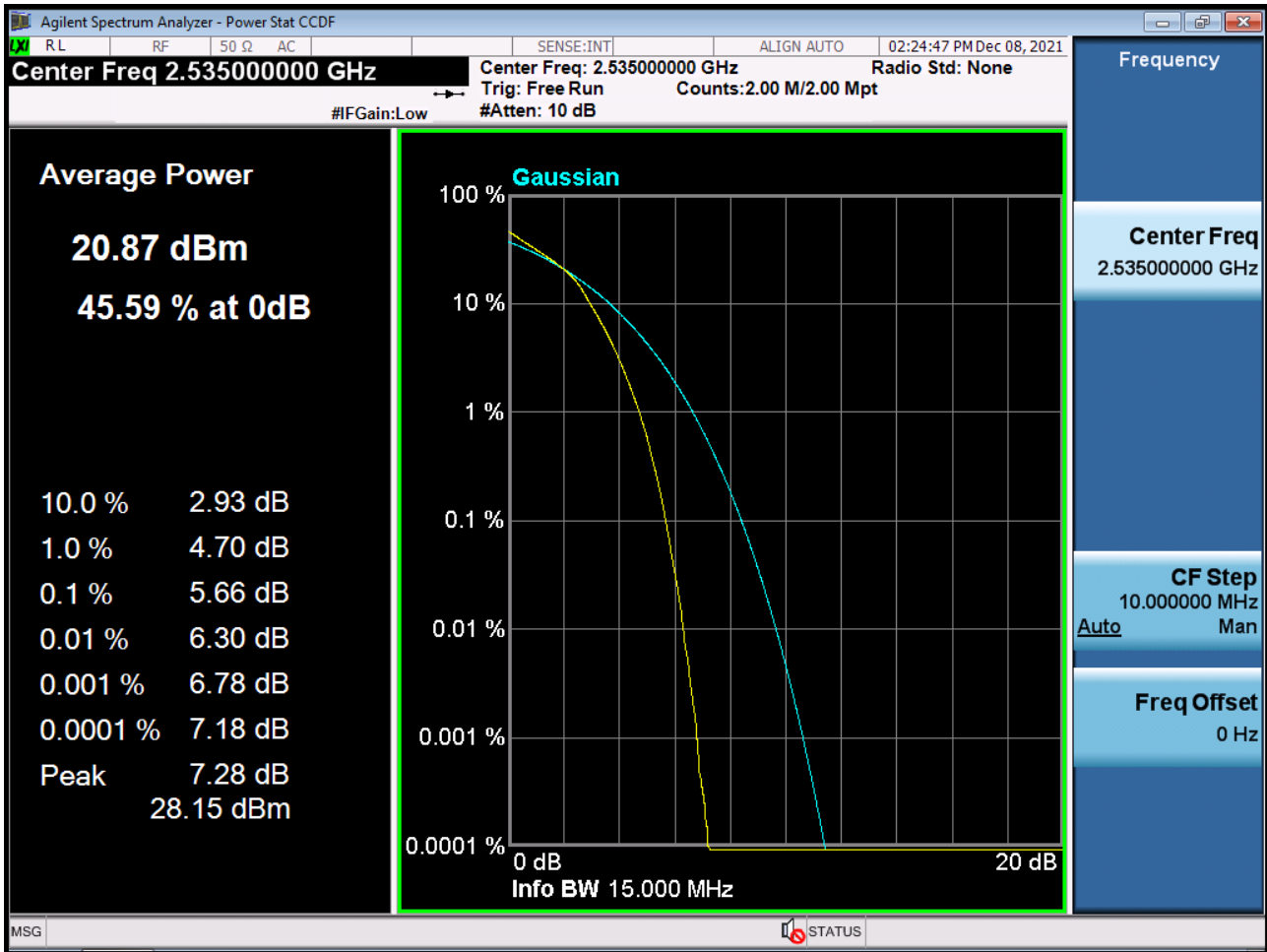
BAND 7. PAR Plot (10 M BW Ch.21100 256QAM RB 50\_0)



BAND 7. PAR Plot (15 M BW Ch.21100 QPSK RB 75\_0)

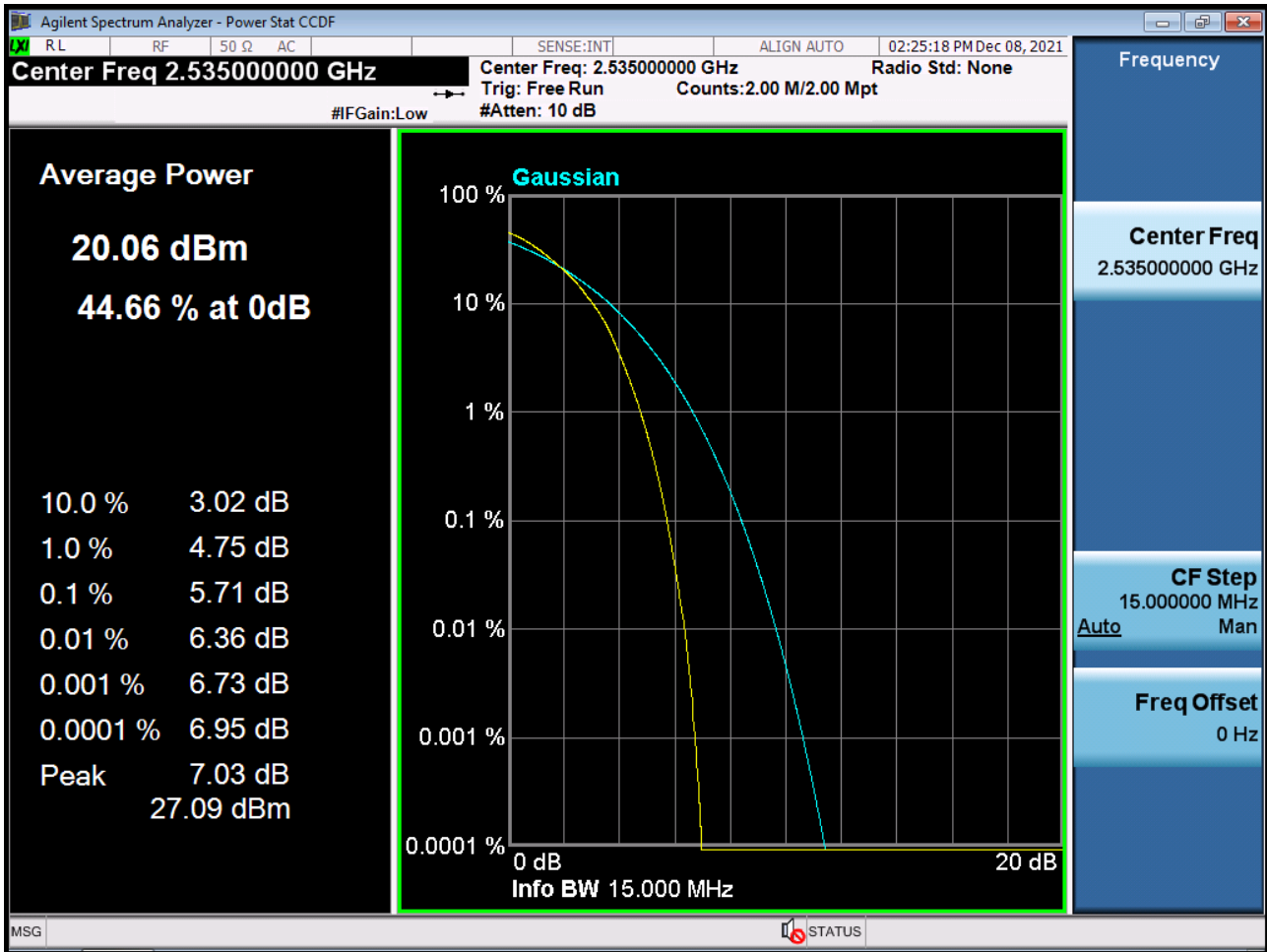


BAND 7. PAR Plot (15 M BW Ch.21100 16QAM RB 75\_0)

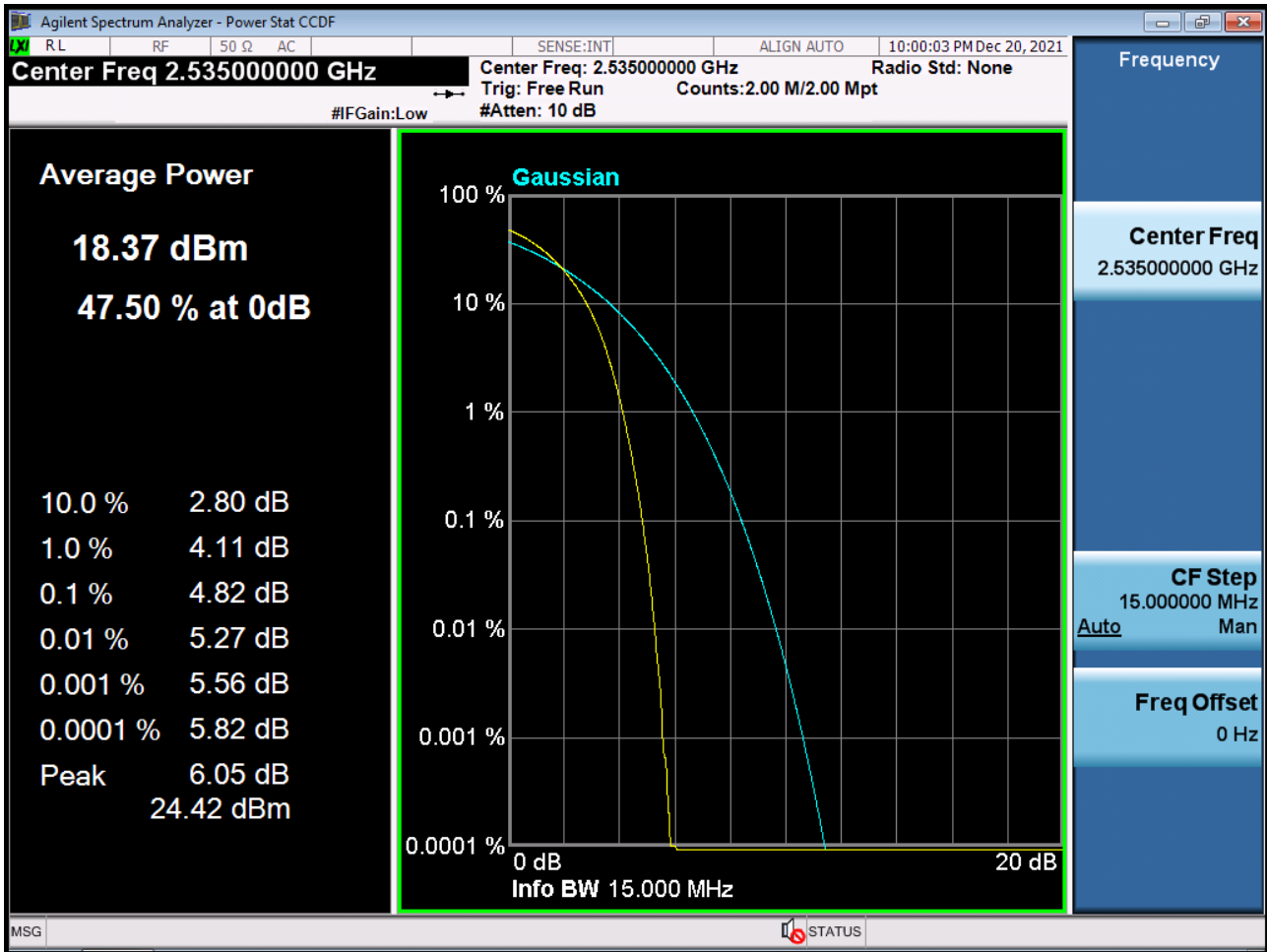




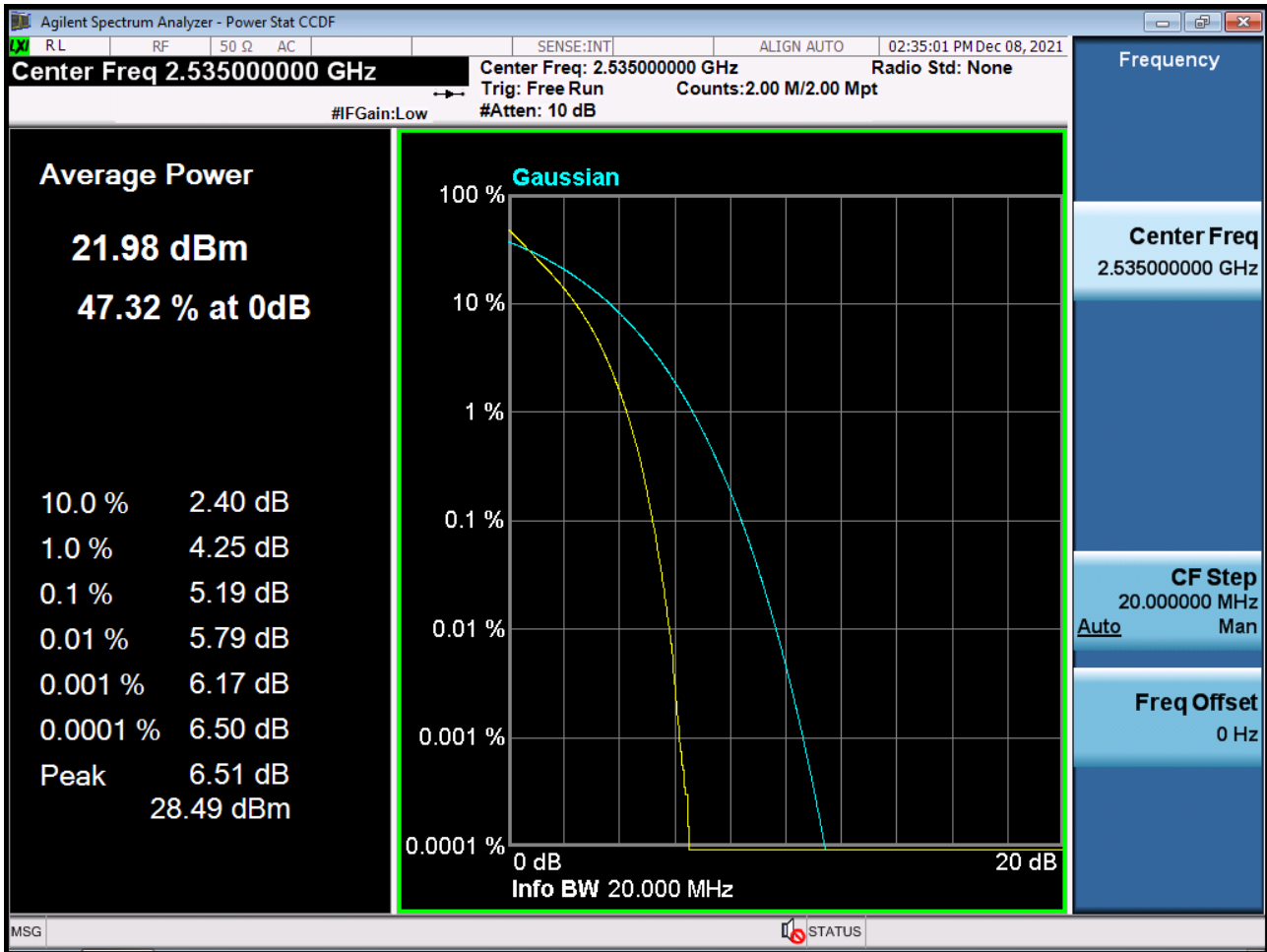
BAND 7. PAR Plot (15 M BW Ch.21100 64QAM RB 75\_0)



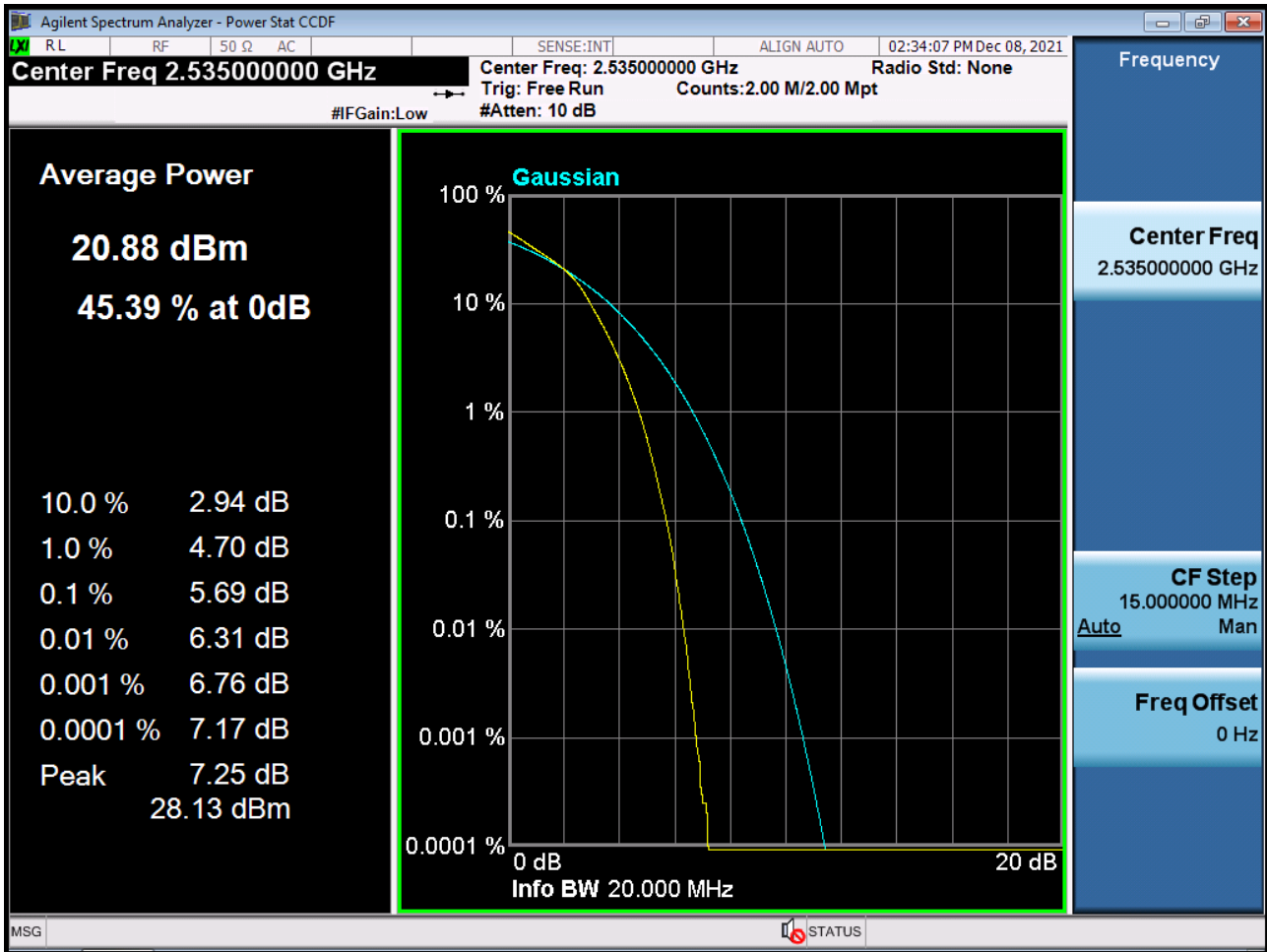
BAND 7. PAR Plot (15 M BW Ch.21100 256QAM RB 75\_0)



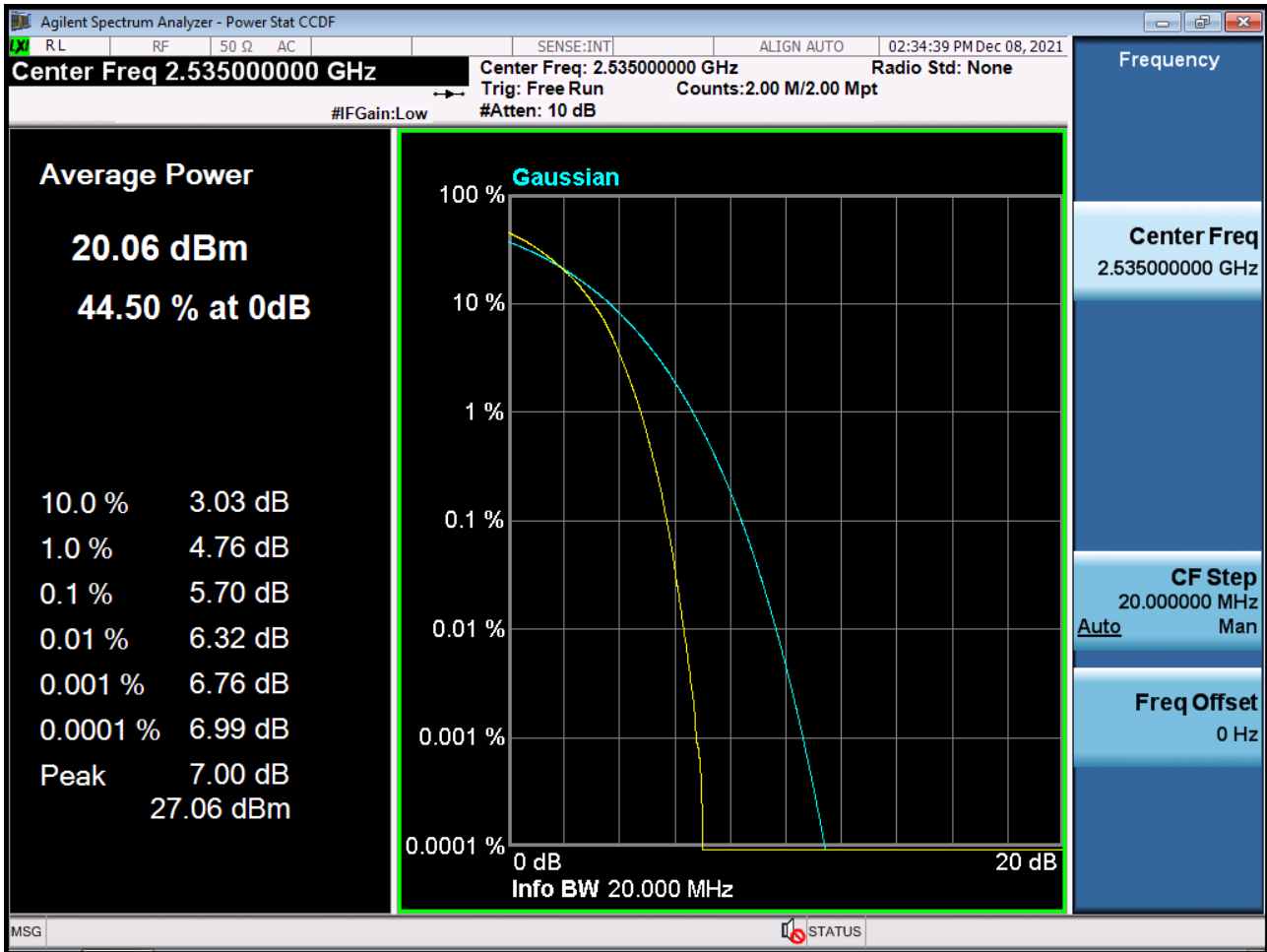
BAND 7. PAR Plot (20 M BW Ch.21100 QPSK RB 100\_0)



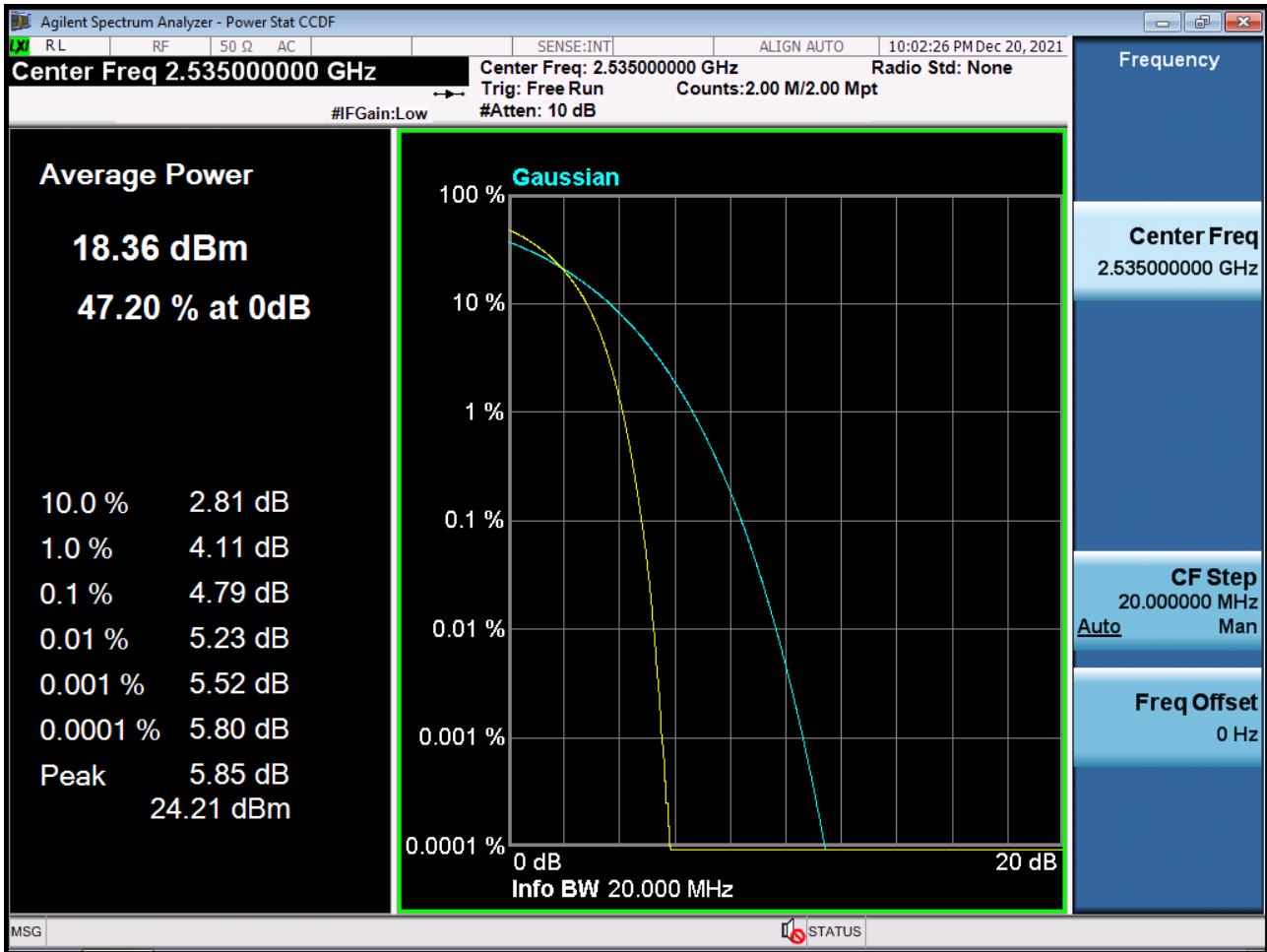
BAND 7. PAR Plot (20 M BW Ch.21100 16QAM RB 100\_0)



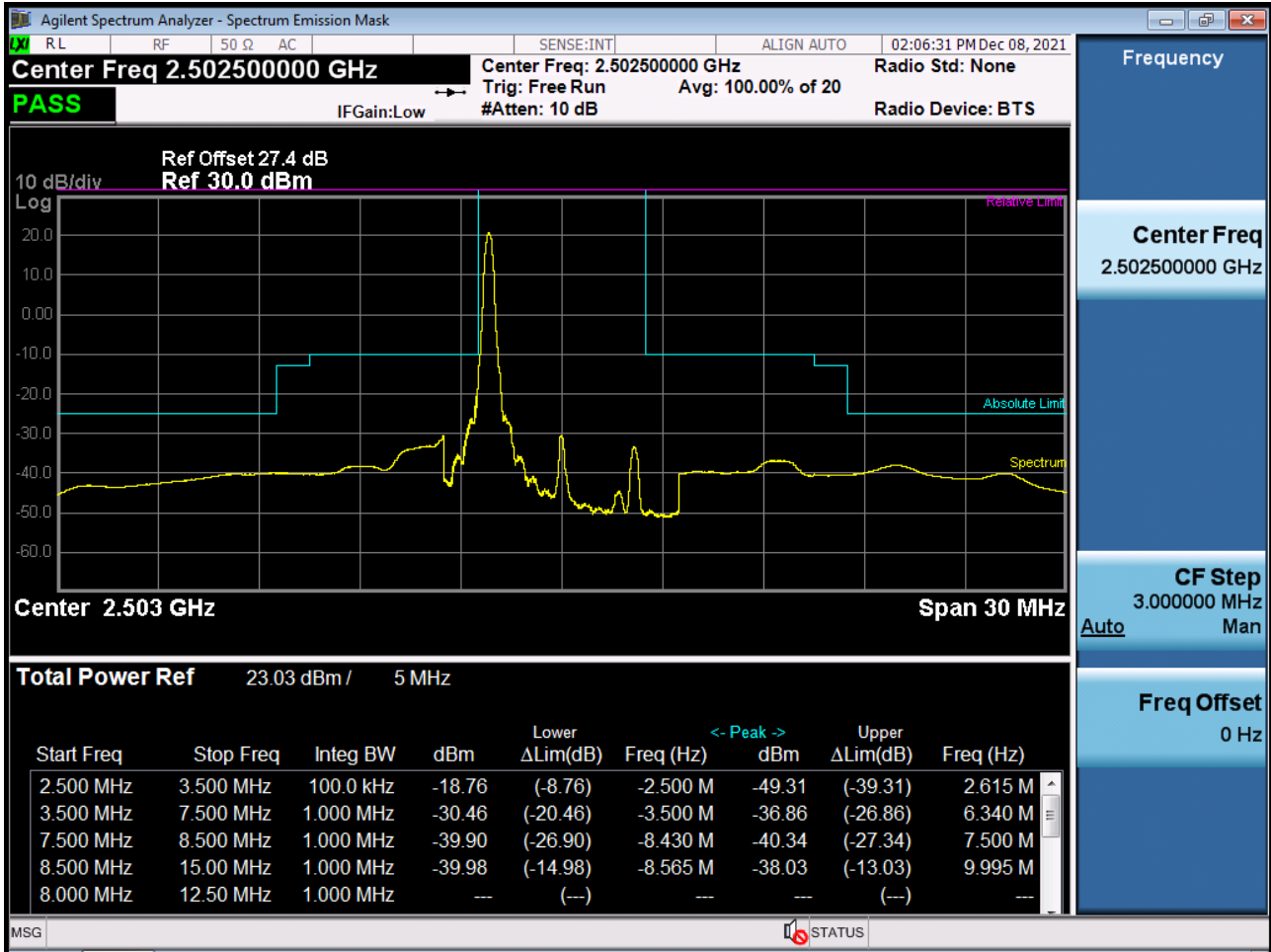
BAND 7. PAR Plot (20 M BW Ch.21100 64QAM RB 100\_0)



BAND 7. PAR Plot (20 M BW Ch.21100 256QAM RB 100\_0)



BAND 7. Low Channel Edge Plot (5 MHz Ch.20775 QPSK RB 1, Offset 0)



BAND 7. Low Channel Edge Plot (5 MHz Ch.20775 QPSK RB 25, Offset 0)

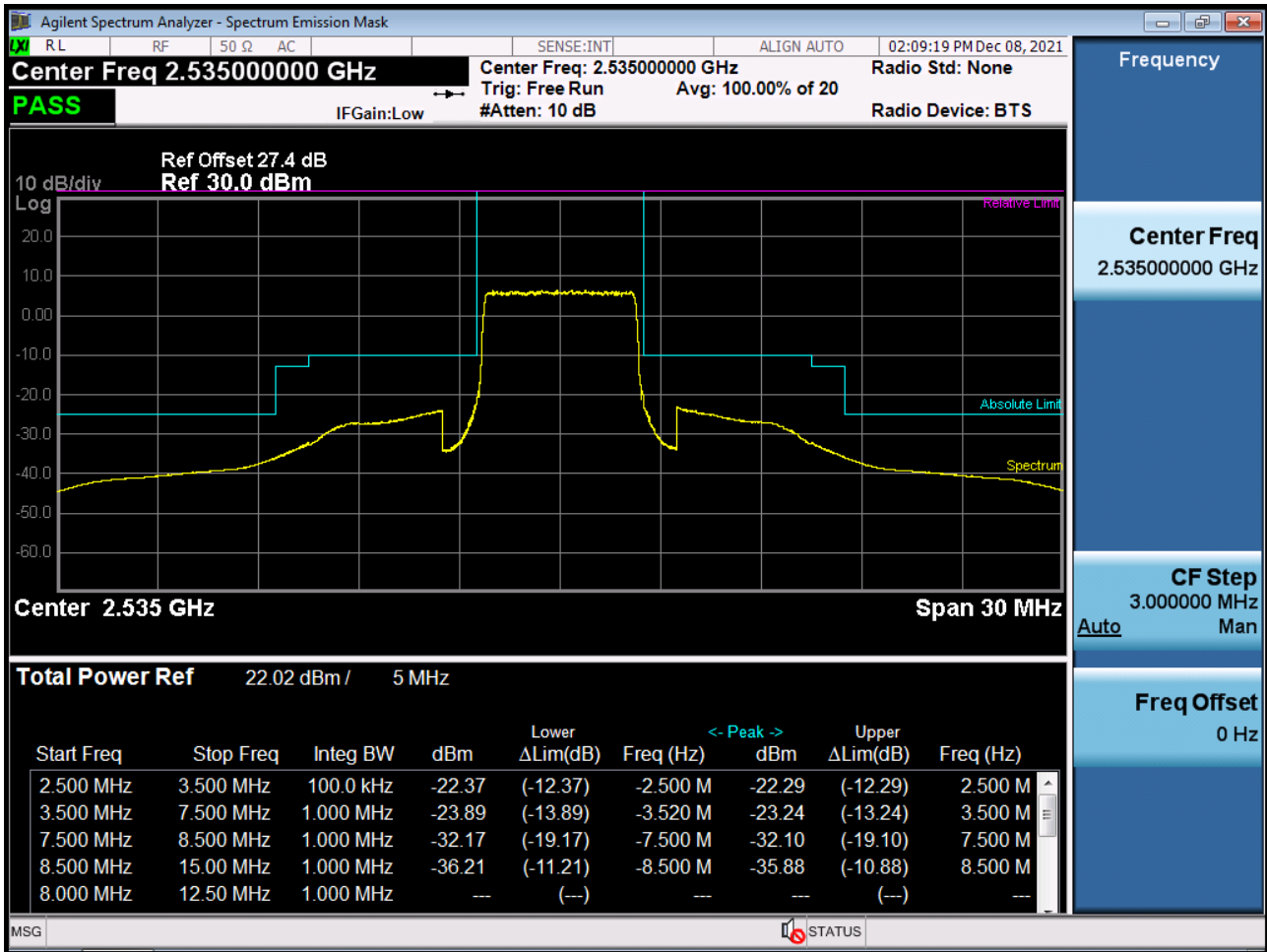




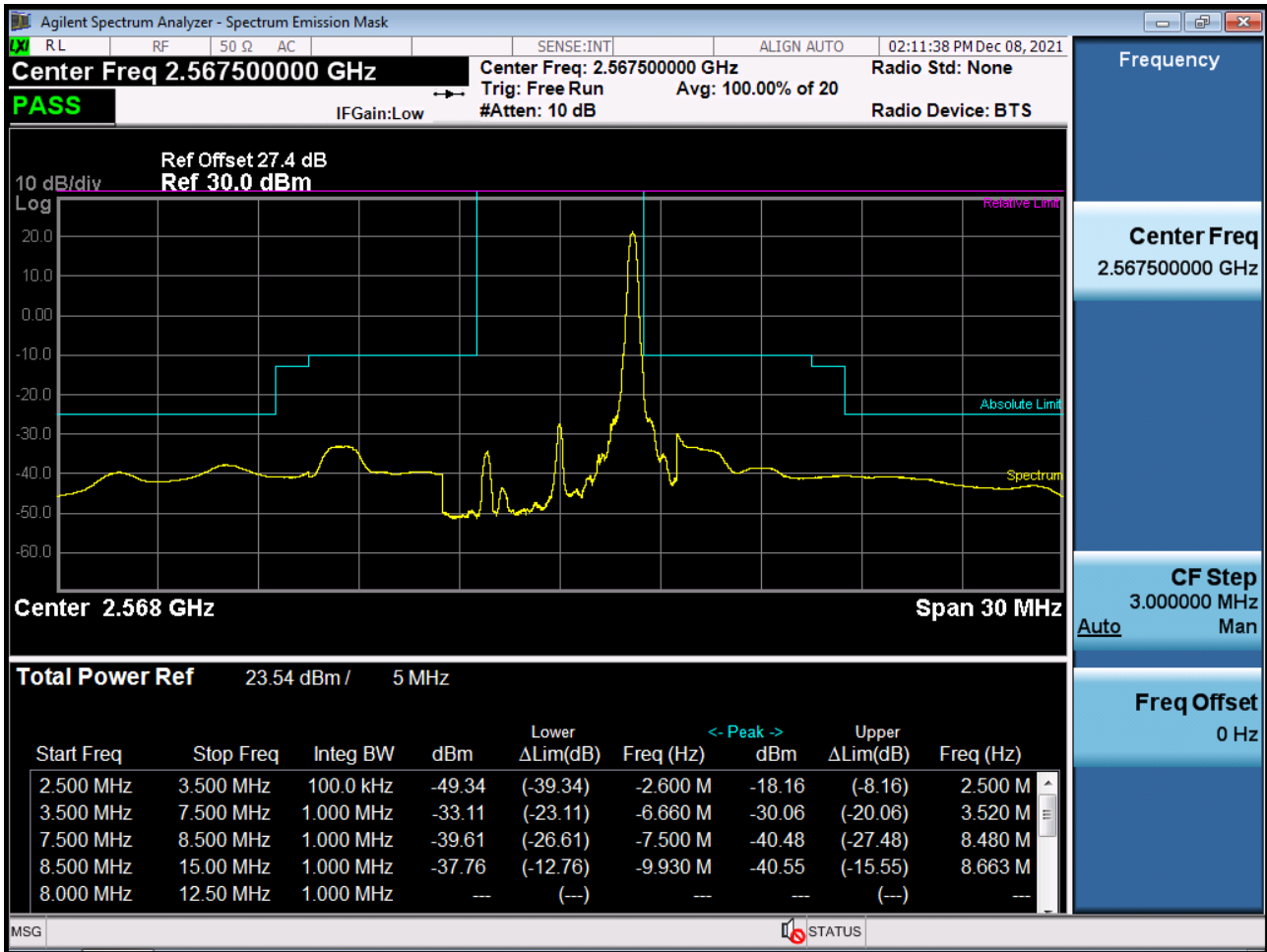
BAND 7. Low Channel Edge Plot (5 MHz Ch.20775 QPSK\_RB 1\_Offset 24)



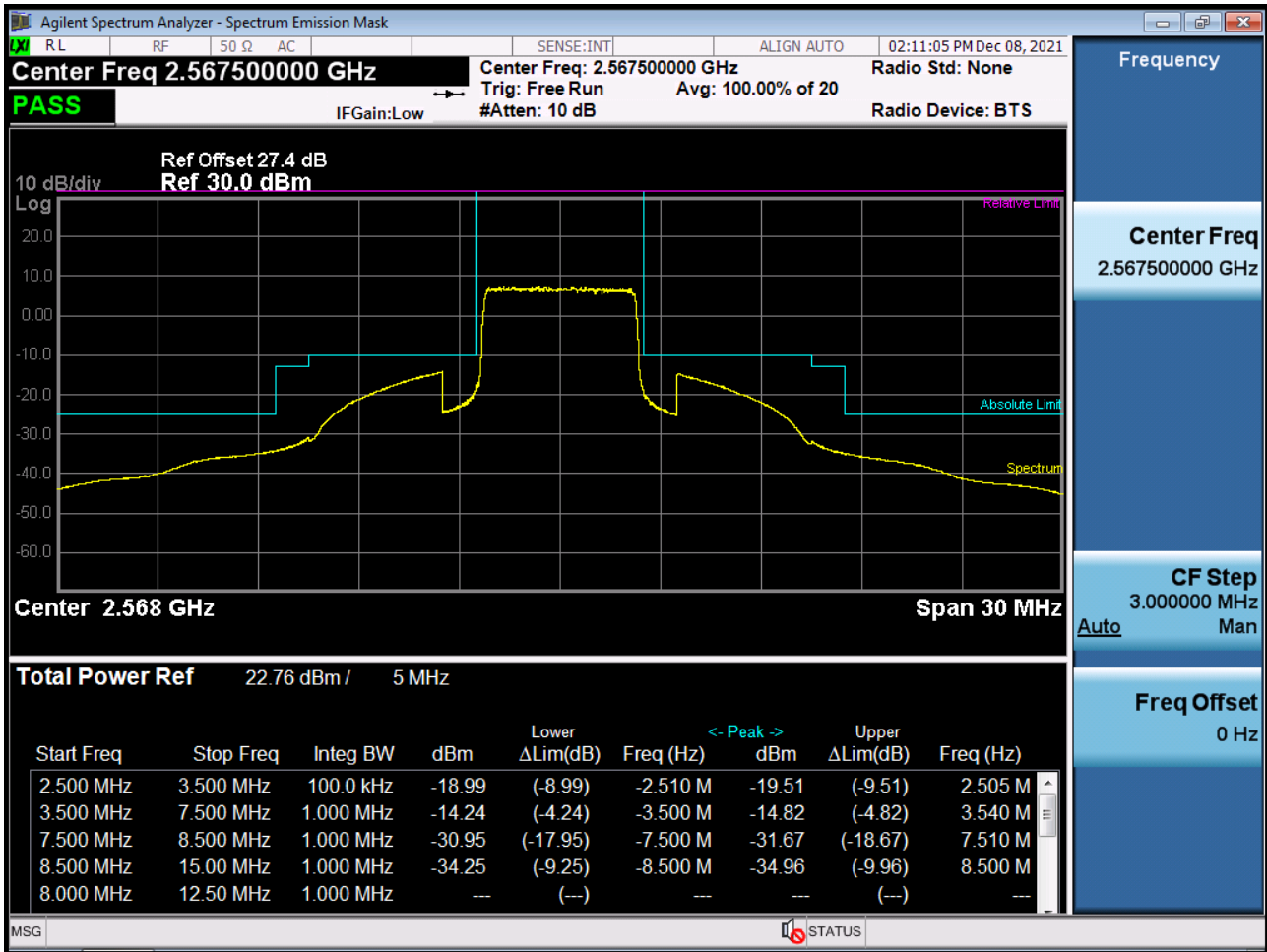
BAND 7. Mid Channel Edge Plot (5 MHz Ch.21100 QPSK RB 25)



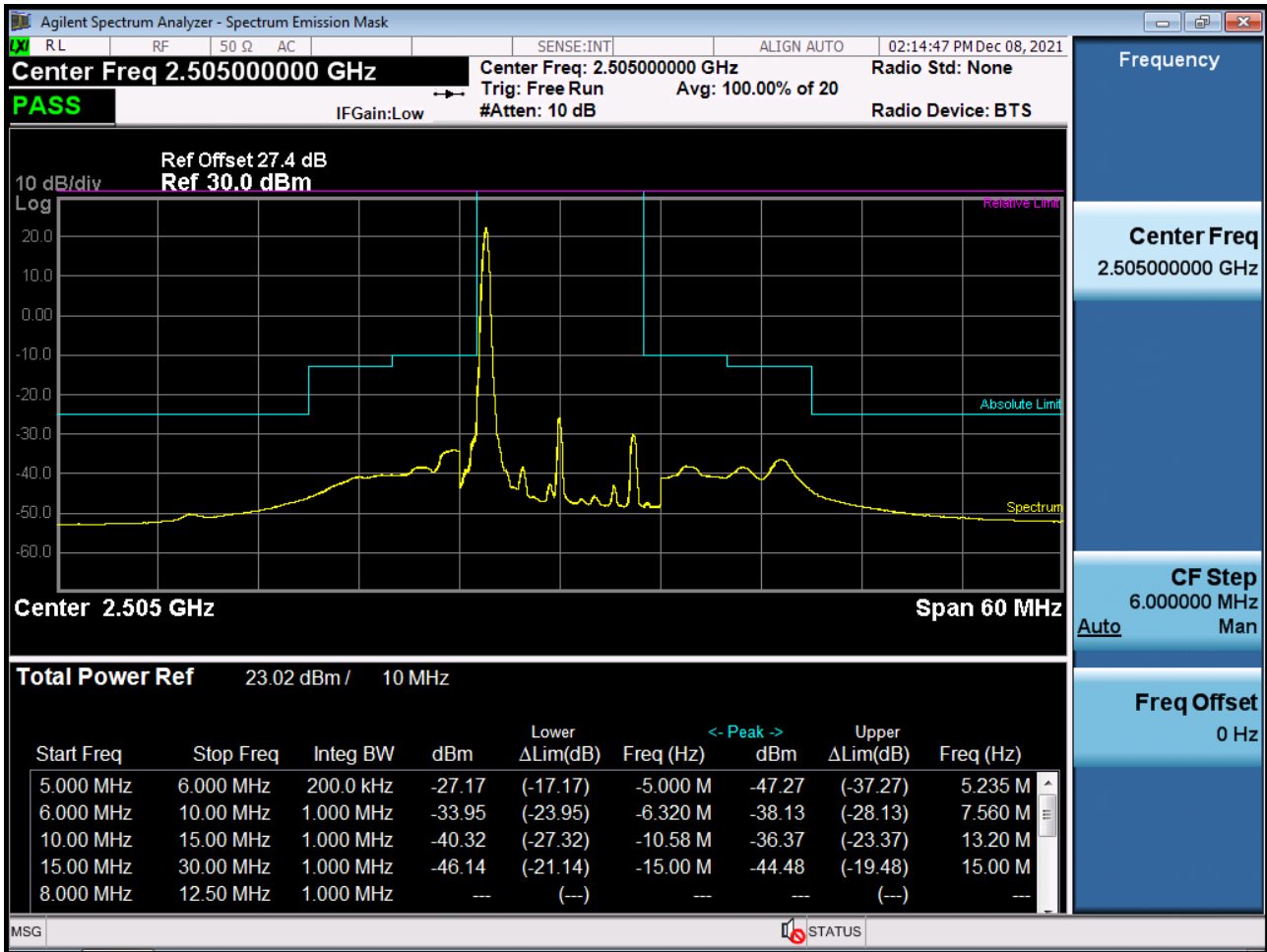
BAND 7. High Channel Edge Plot (5 MHz Ch.21425 QPSK RB 1, Offset 24)



BAND 7. High Channel Edge Plot (5 MHz Ch.21425 QPSK\_RB25\_Offset 0)



BAND 7. Low Channel Edge Plot (10 MHz Ch.20800 QPSK RB 1, Offset 0)



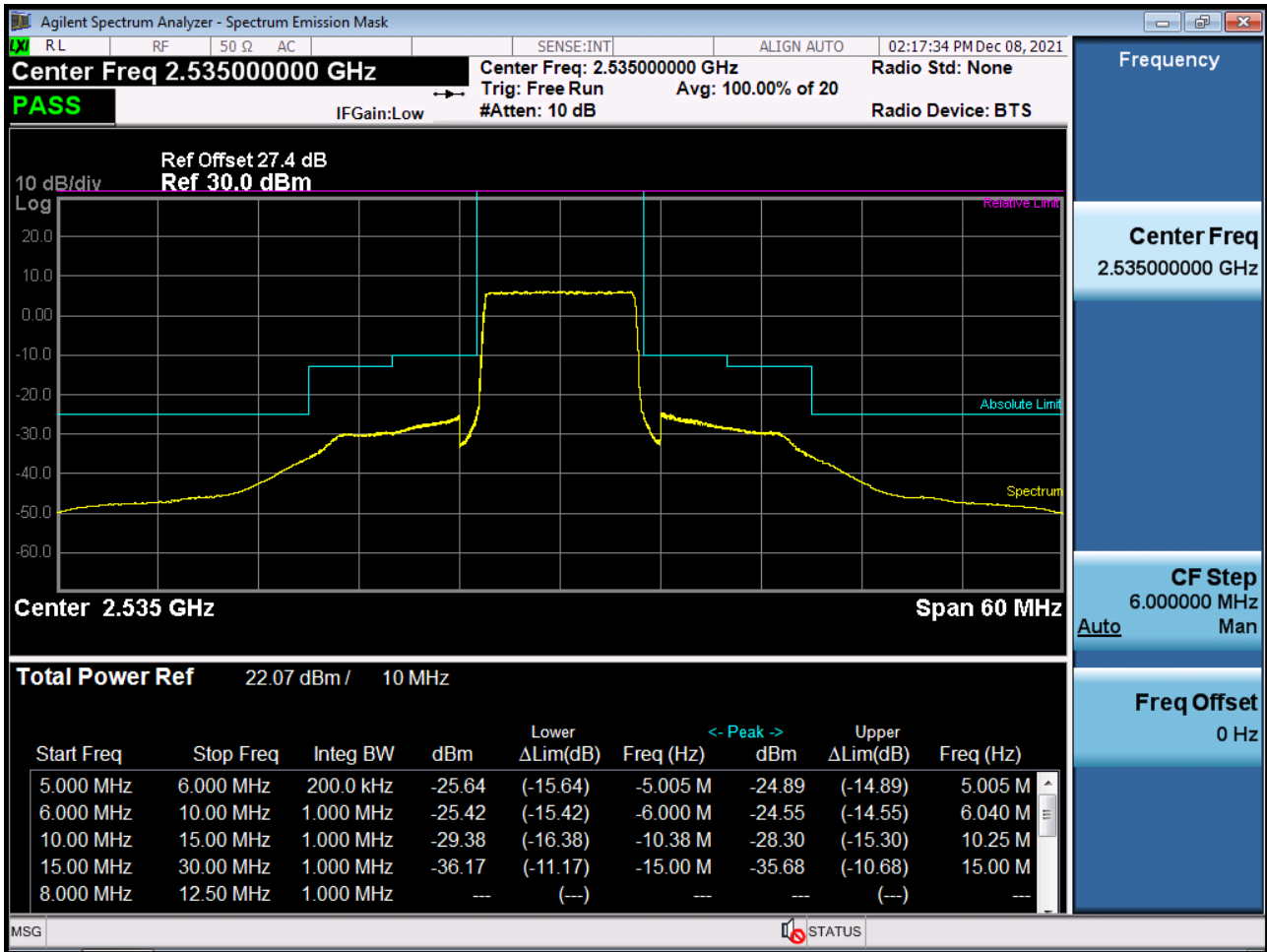
BAND 7. Low Channel Edge Plot (10 MHz Ch.20800 QPSK RB 50, Offset 0)-1



BAND 7. Low Channel Edge Plot (10 MHz Ch.20800 QPSK\_RB50\_Offset 0)-2

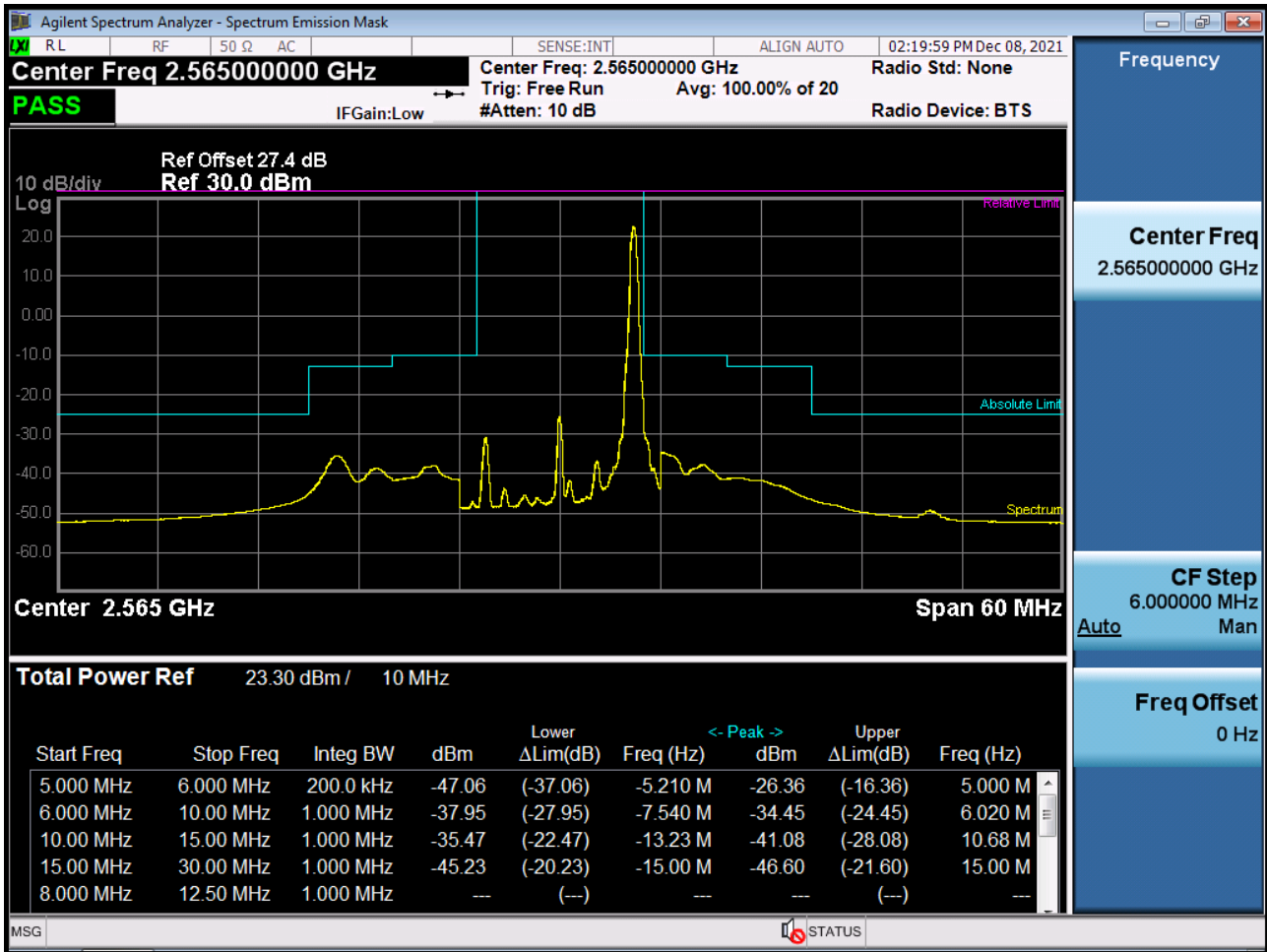


BAND 7. Mid Channel Edge Plot (10 MHz Ch.21100 QPSK RB 50)

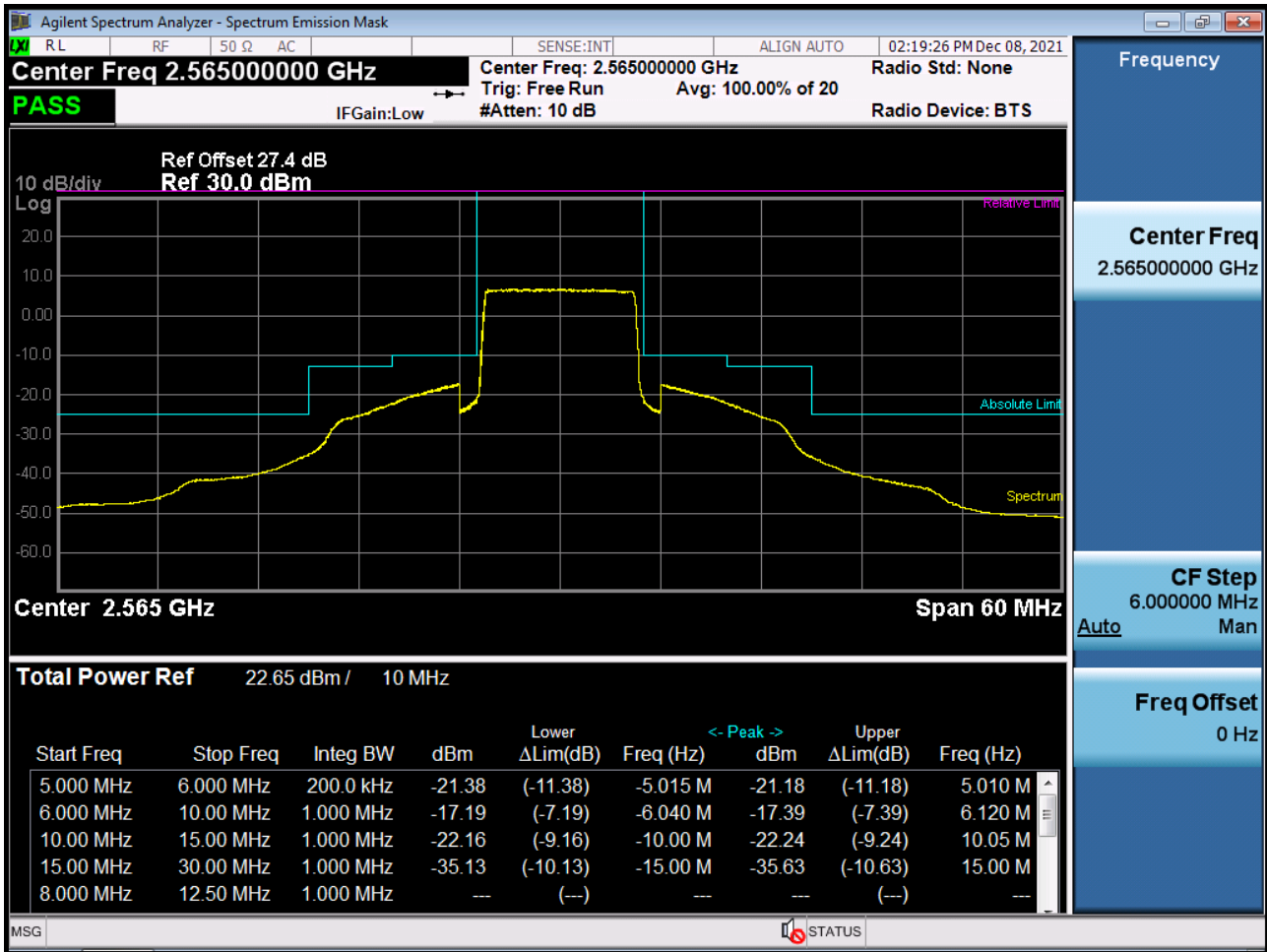




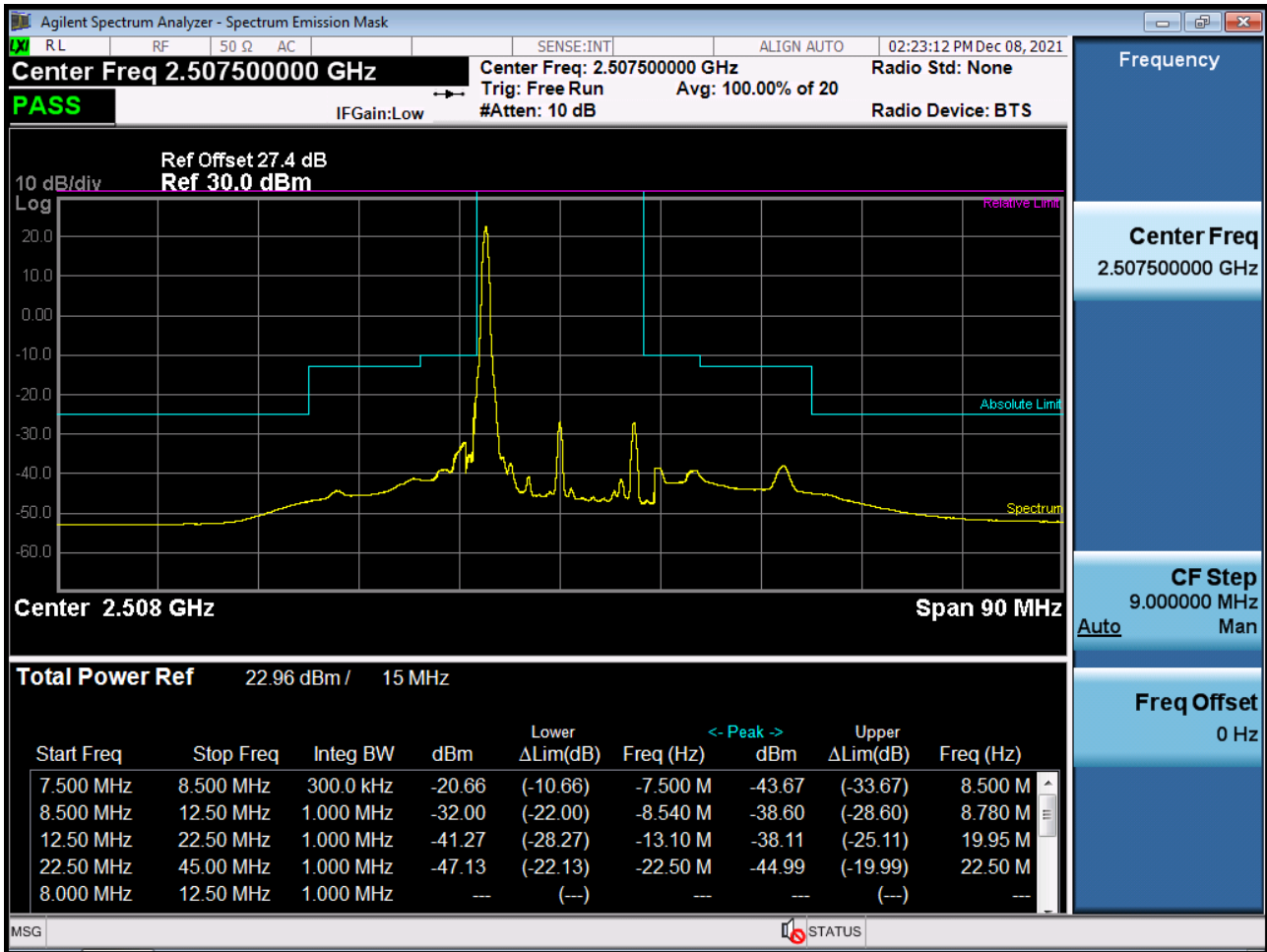
BAND 7. High Channel Edge Plot (10 MHz Ch.21400 QPSK RB 1, Offset 49)



BAND 7. High Channel Edge Plot (10 MHz Ch.21400 QPSK\_RB50\_Offset 0)



BAND 7. Low Channel Edge Plot (15 MHz Ch.20825 QPSK RB 1, Offset 0)



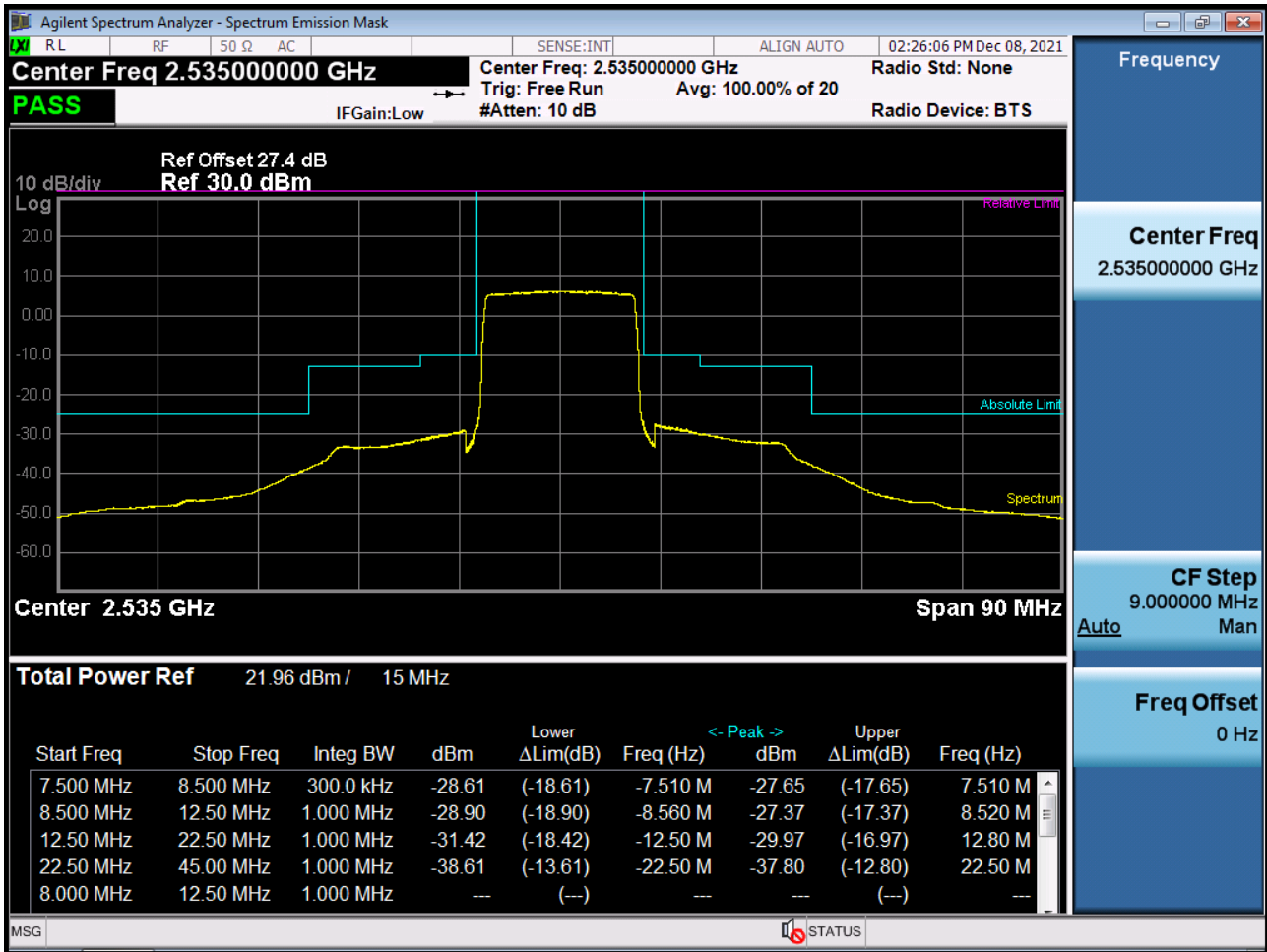
BAND 7. Low Channel Edge Plot (15 MHz Ch.20825 QPSK RB75, Offset 0)-1



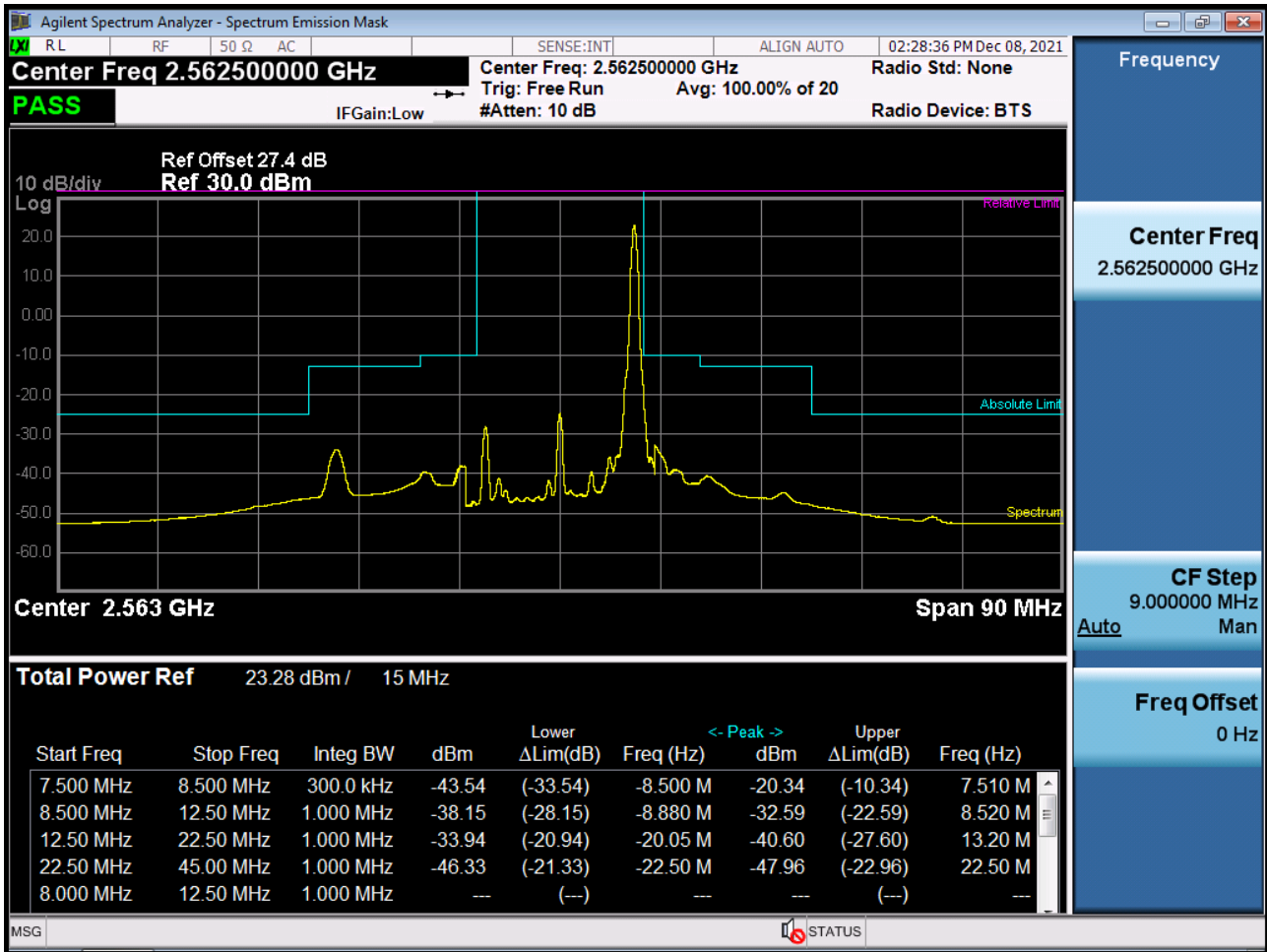
BAND 7. Low Channel Edge Plot (15 MHz Ch.20825 QPSK\_RB75\_Offset 0)-2



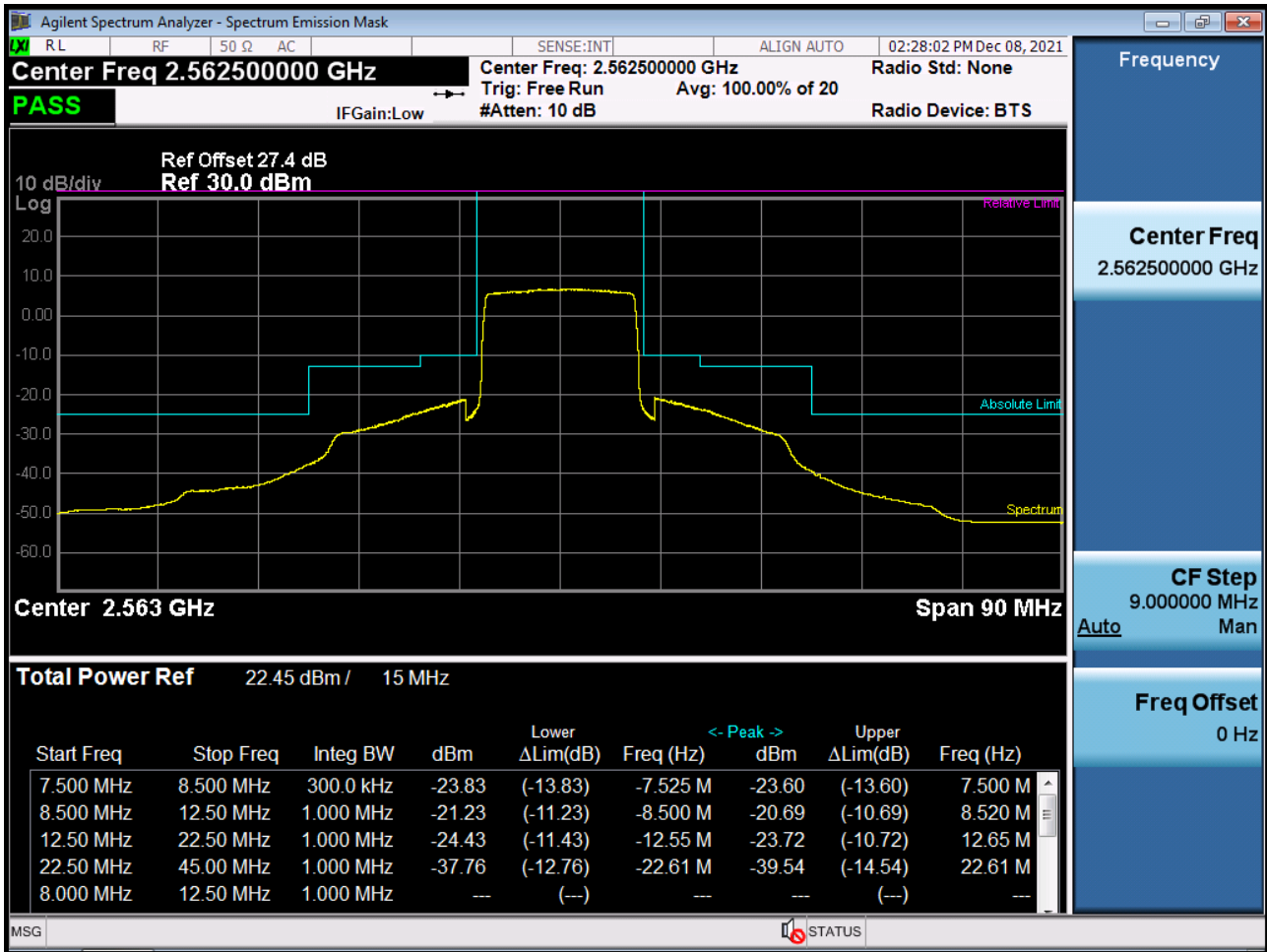
BAND 7. Mid Channel Edge Plot (15 MHz Ch.21100 QPSK RB 75, Offset 0)



BAND 7. High Channel Edge Plot (15 MHz Ch.21375 QPSK RB 1, Offset 74)

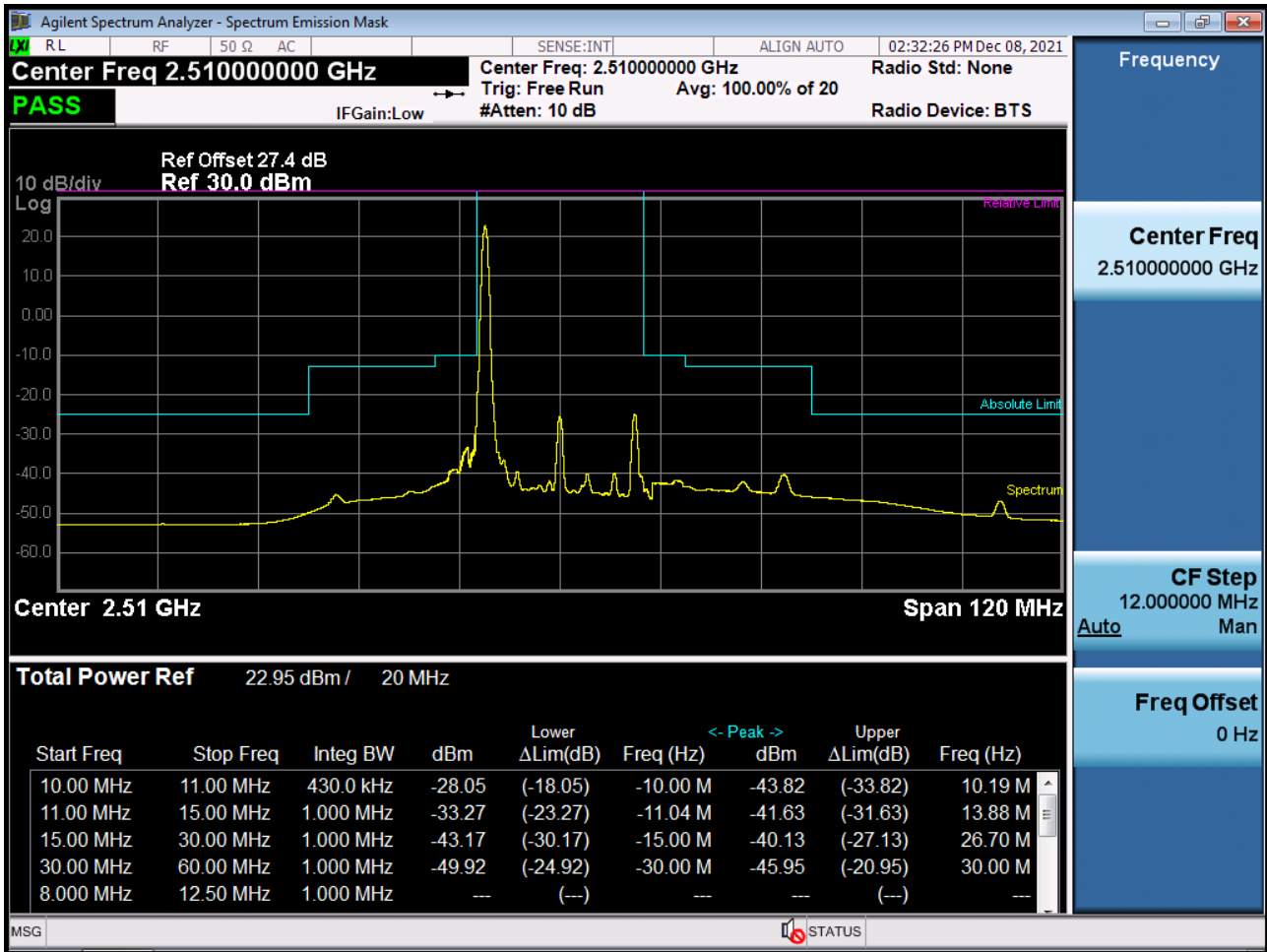


BAND 7. High Channel Edge Plot (15 MHz Ch.21375 QPSK\_RB75\_Offset 0)





BAND 7. Low Channel Edge Plot (20 MHz Ch.20850 QPSK RB 1, Offset 0)



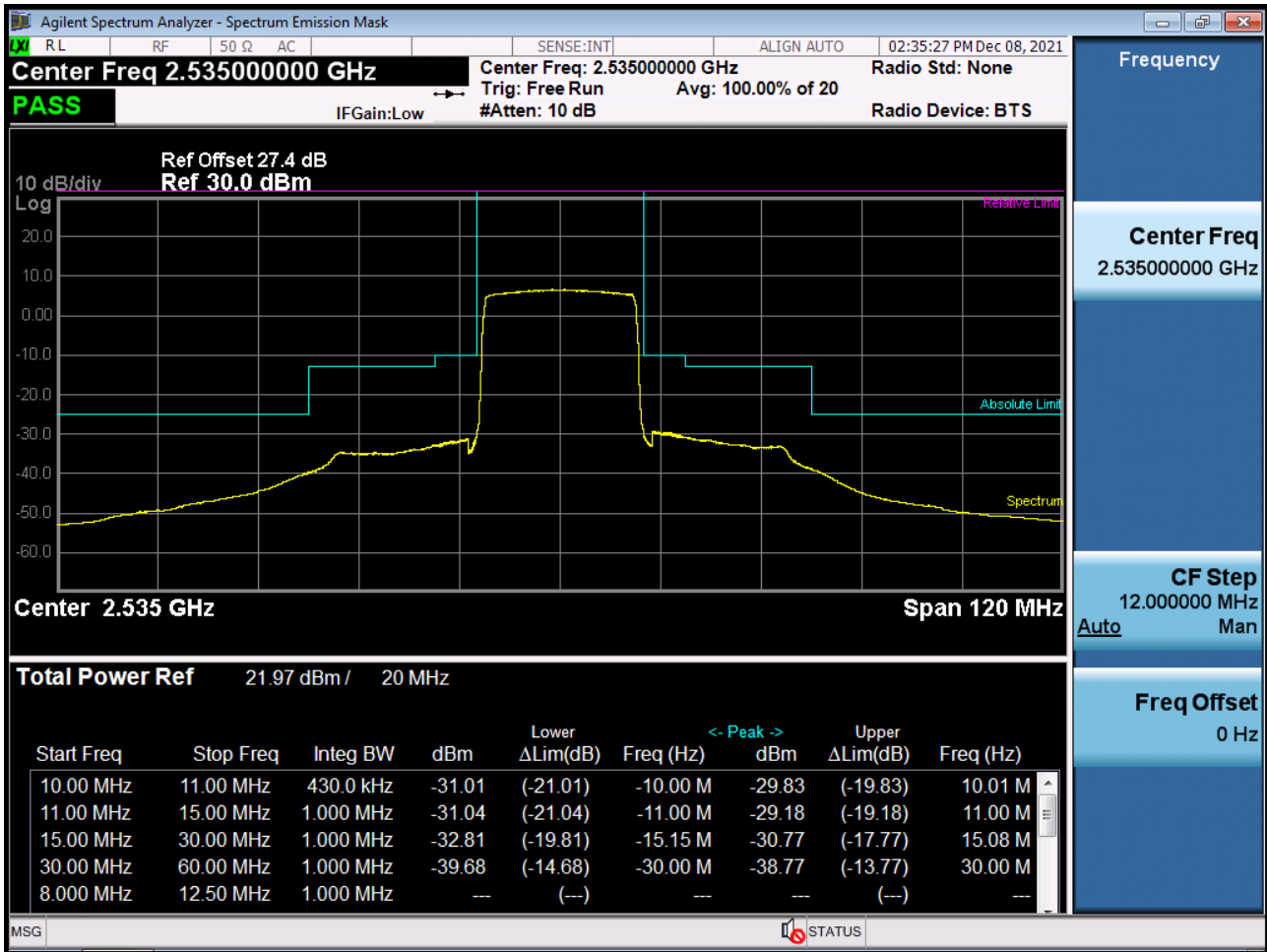
BAND 7. Low Channel Edge Plot (20 MHz Ch.20850 QPSK RB100, Offset 0)-1



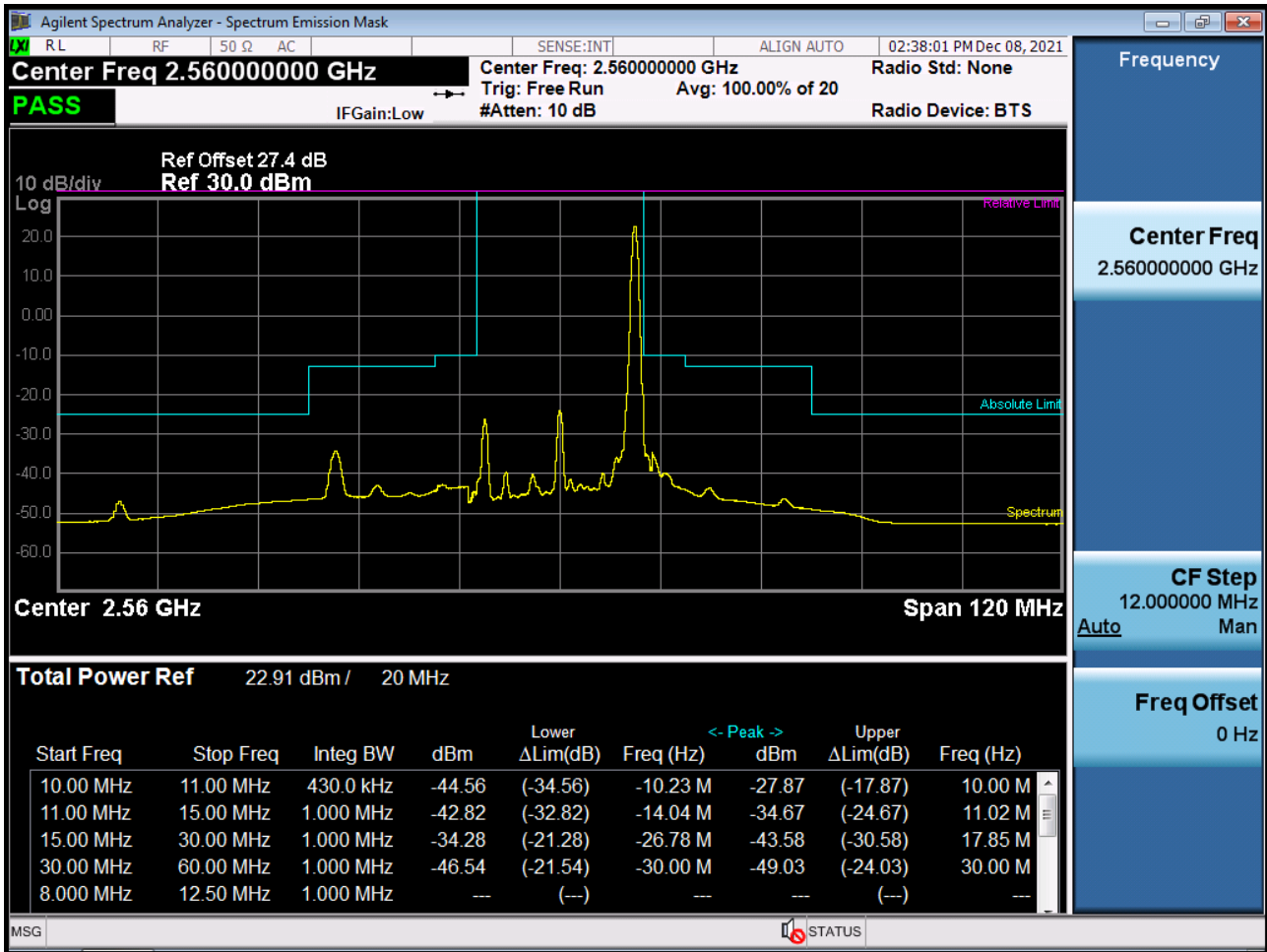
BAND 7. Low Channel Edge Plot (20 MHz Ch.20850 QPSK\_RB100\_Offset 0)-2



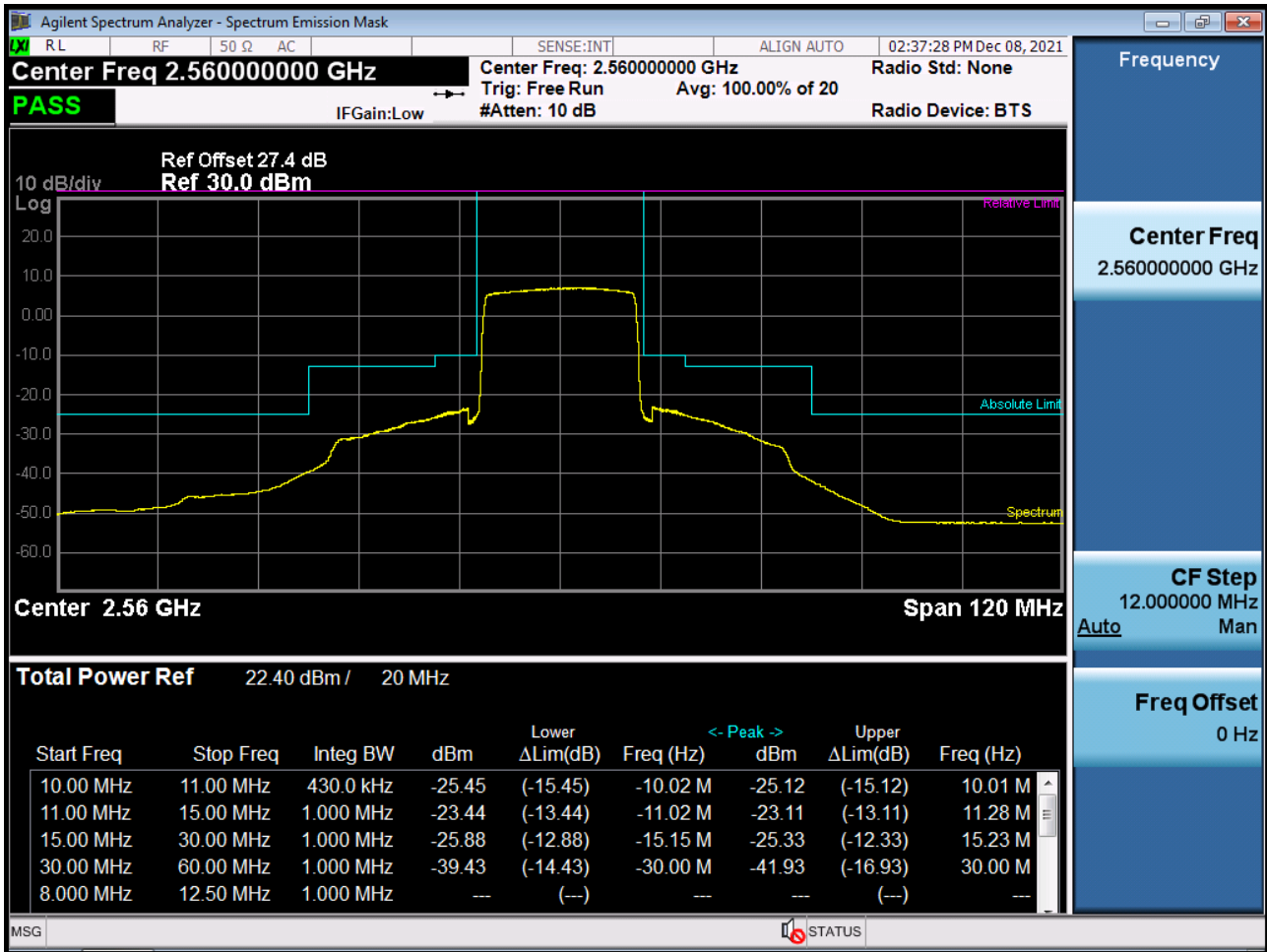
BAND 7. Mid Channel Edge Plot (20 MHz Ch.21100 QPSK RB 100, offset 0)



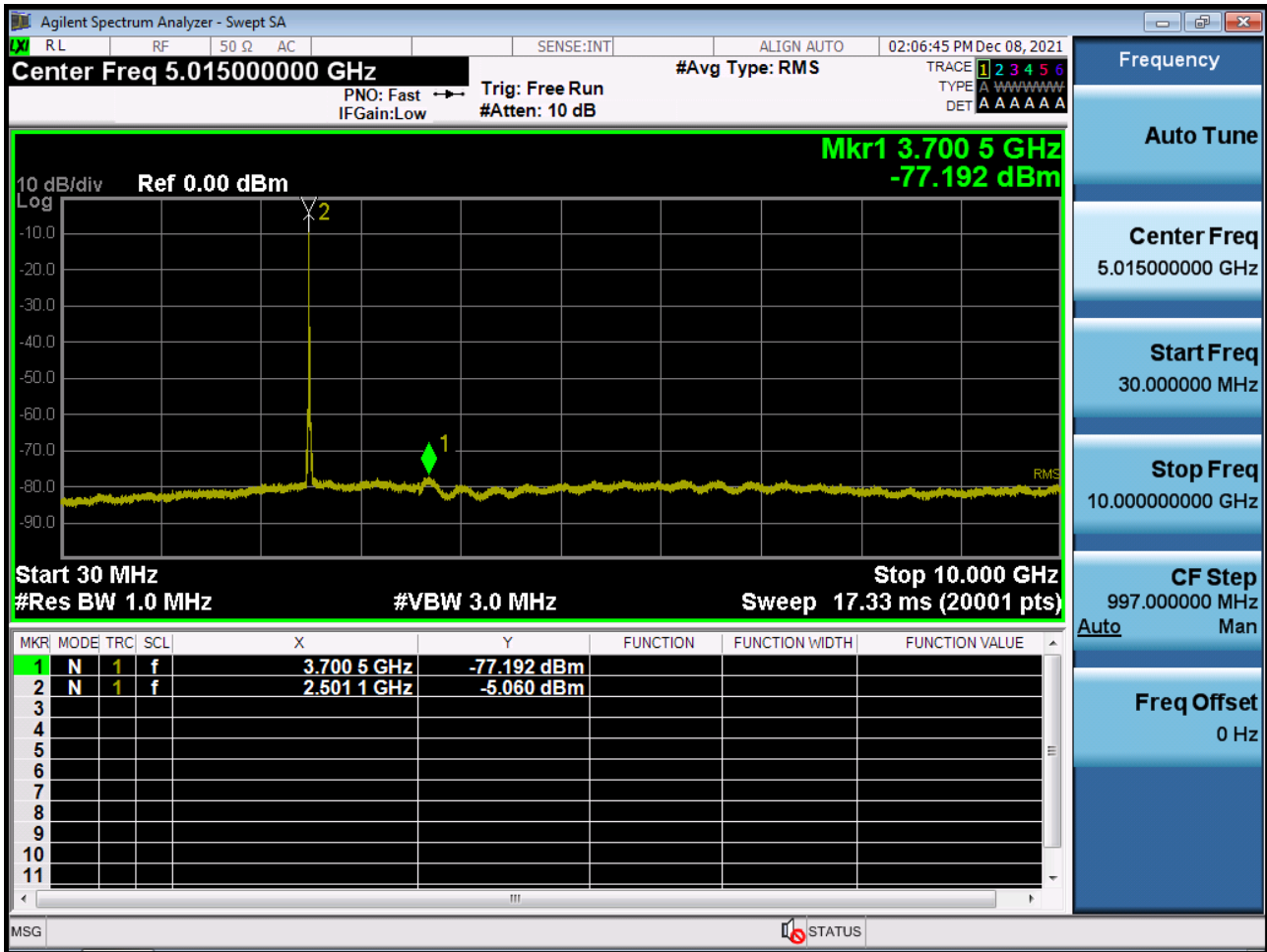
BAND 7. High Channel Edge Plot (20 MHz Ch.21350 QPSK RB 1, Offset 99)



BAND 7. High Channel Edge Plot (20 MHz Ch.21350 QPSK\_RB100\_Offset 0)



BAND 7. Conducted Spurious\_1 (20775ch\_5 MHz\_QPSK\_RB 1\_0)

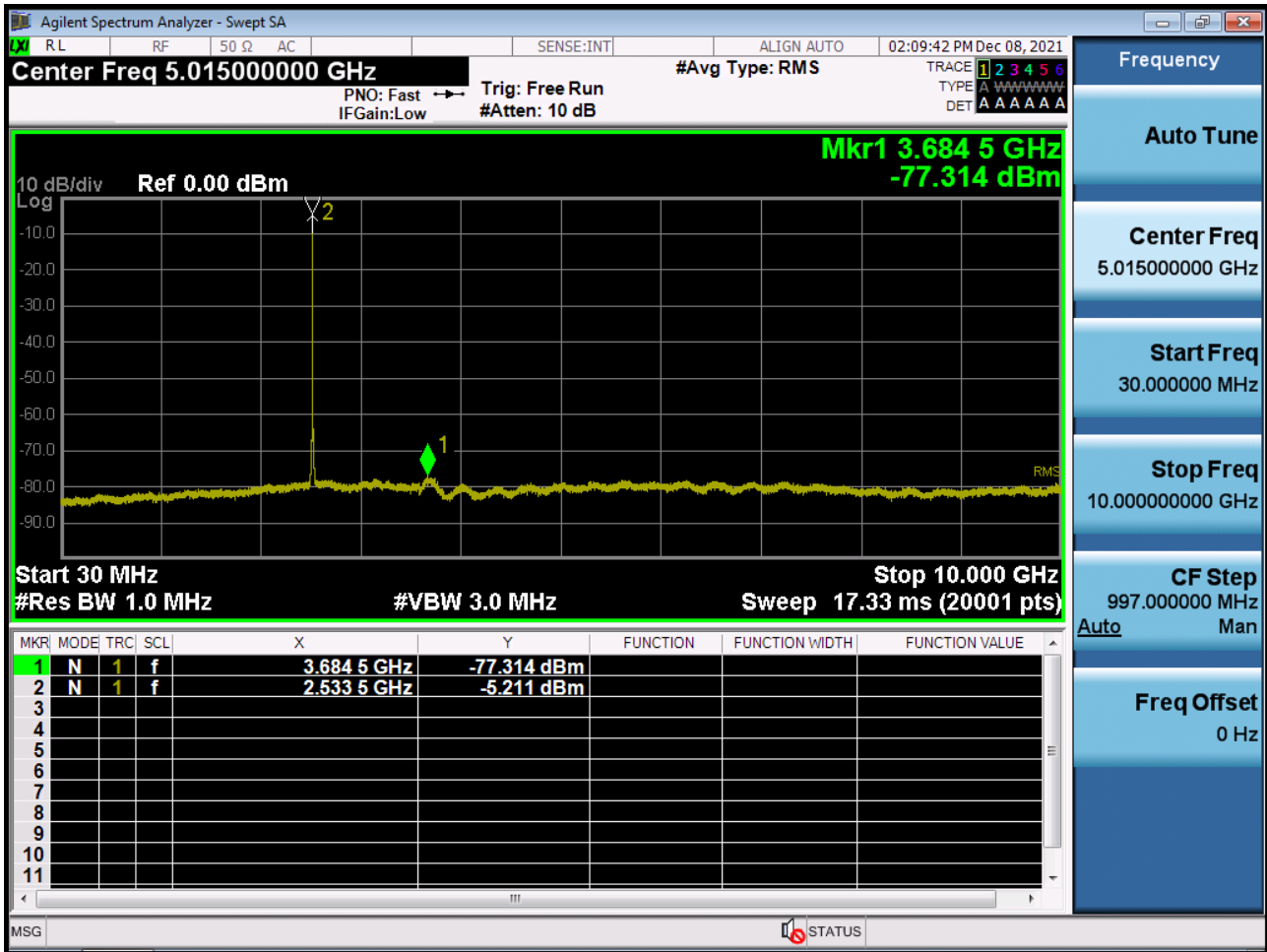


BAND 7. Conducted Spurious\_2 (20775ch\_5 MHz\_QPSK\_RB 1\_0)





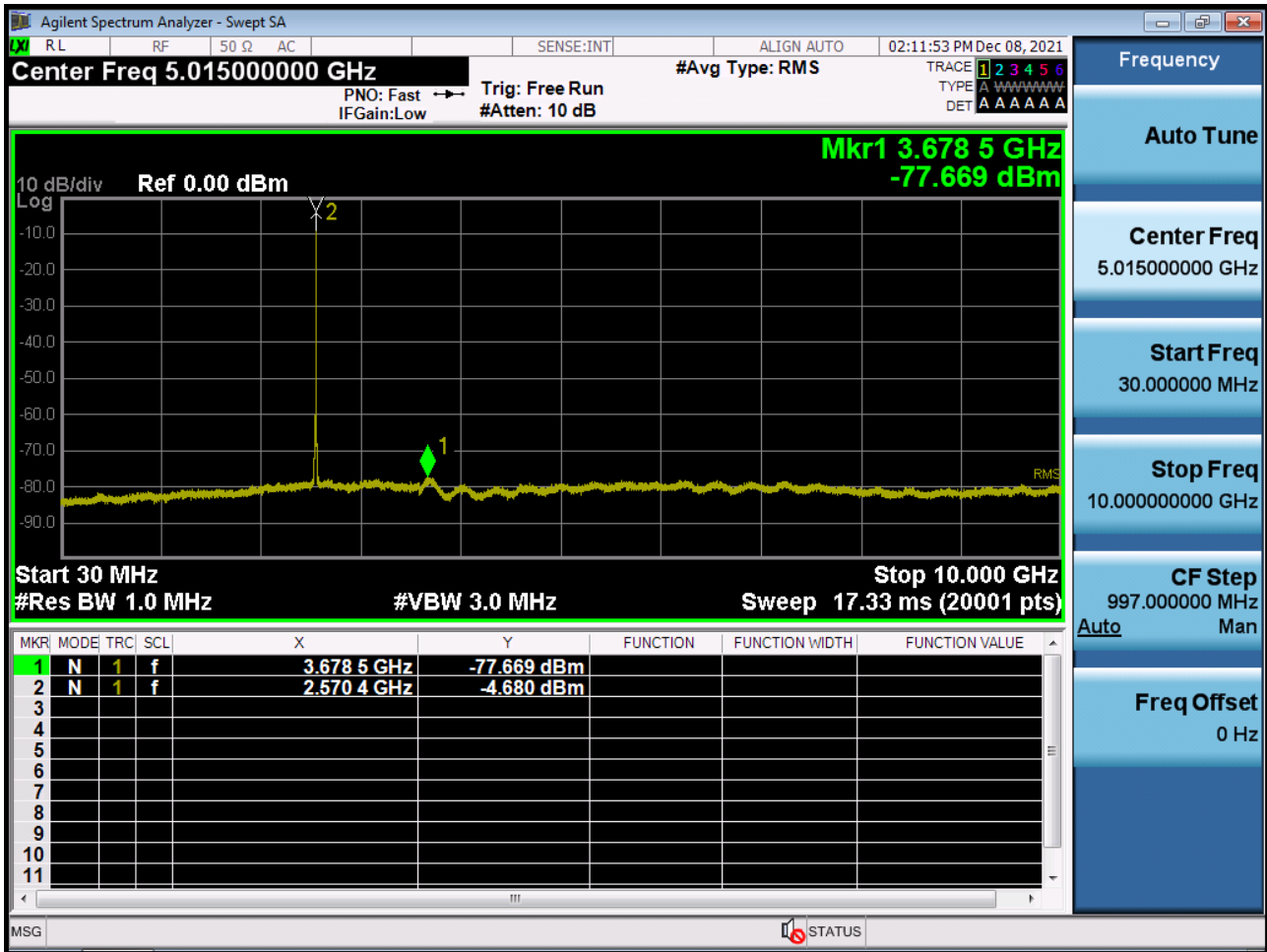
BAND 7. Conducted Spurious\_1 (21100ch\_5 MHz\_QPSK\_RB 1\_0)



BAND 7. Conducted Spurious\_2 (21100ch\_5 MHz\_QPSK\_RB 1\_0)



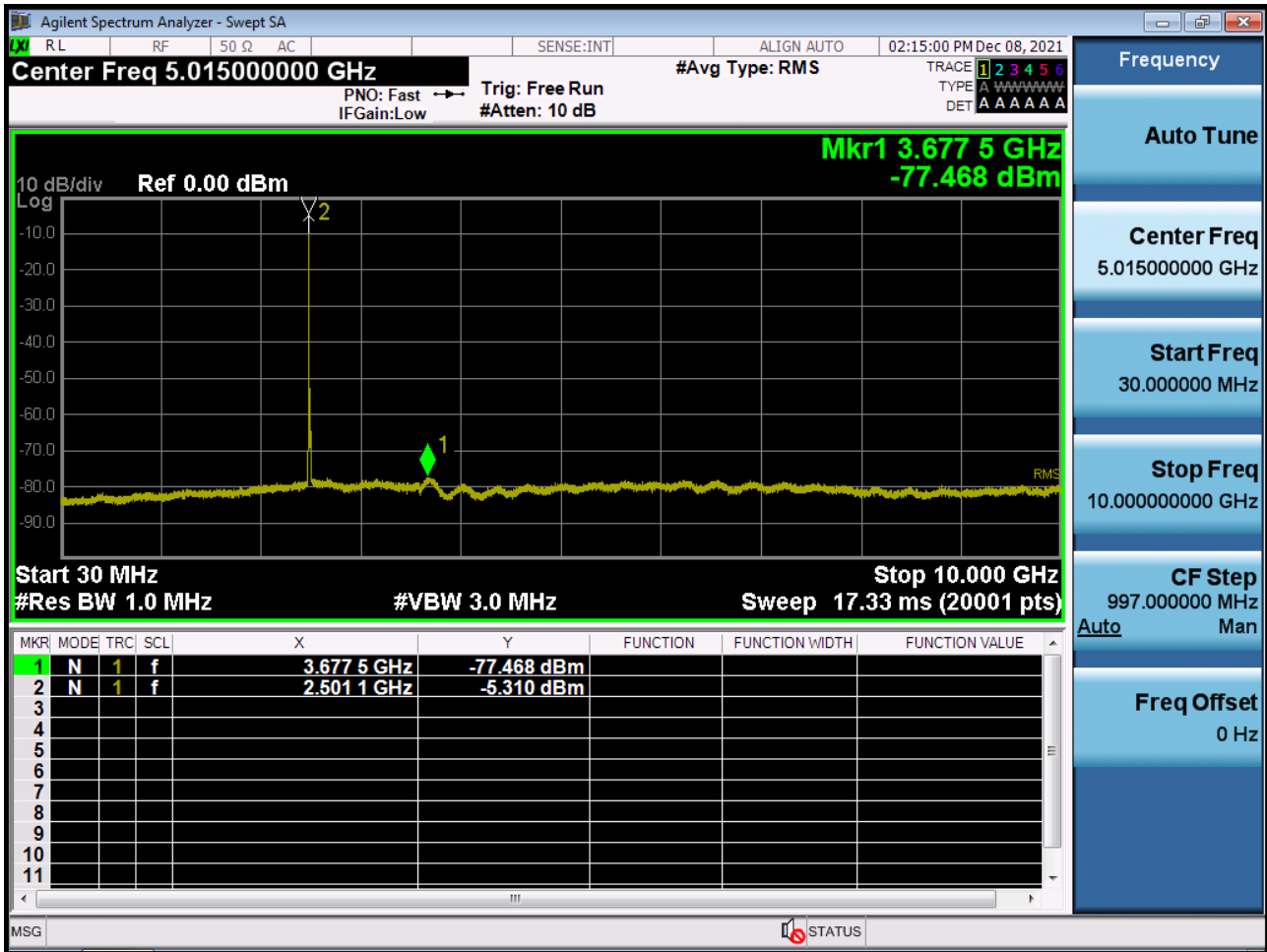
BAND 7. Conducted Spurious\_1 (21425ch\_5 MHz\_QPSK\_RB 1\_0)



BAND 7. Conducted Spurious\_2 (21425ch\_5 MHz\_QPSK\_RB 1\_0)



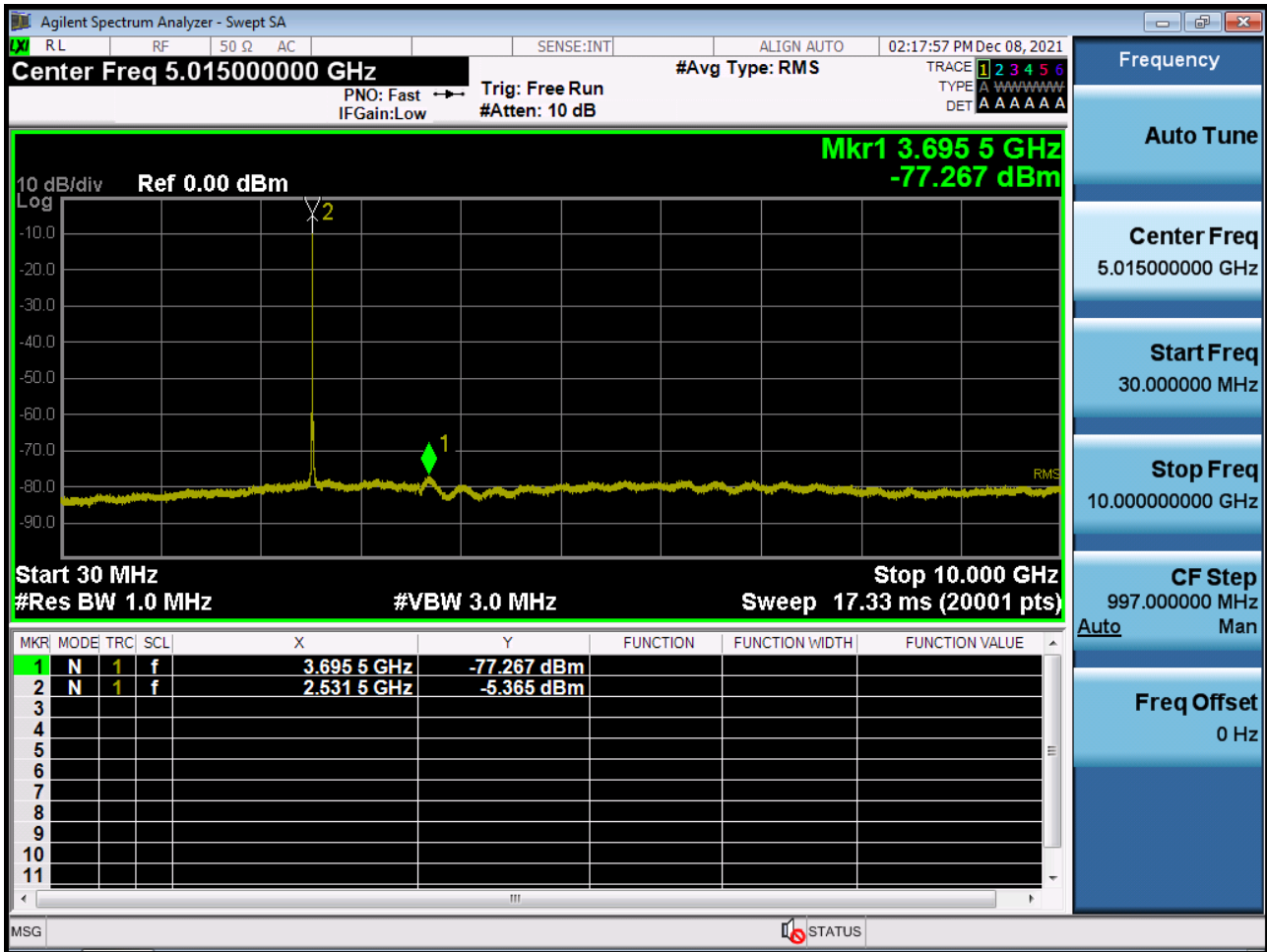
BAND 7. Conducted Spurious\_1 (20800ch\_10 MHz\_QPSK\_RB 1\_0)



BAND 7. Conducted Spurious\_2 (20800ch\_10 MHz\_QPSK\_RB 1\_0)



BAND 7. Conducted Spurious\_1 (21100ch\_10 MHz\_QPSK\_RB 1\_0)

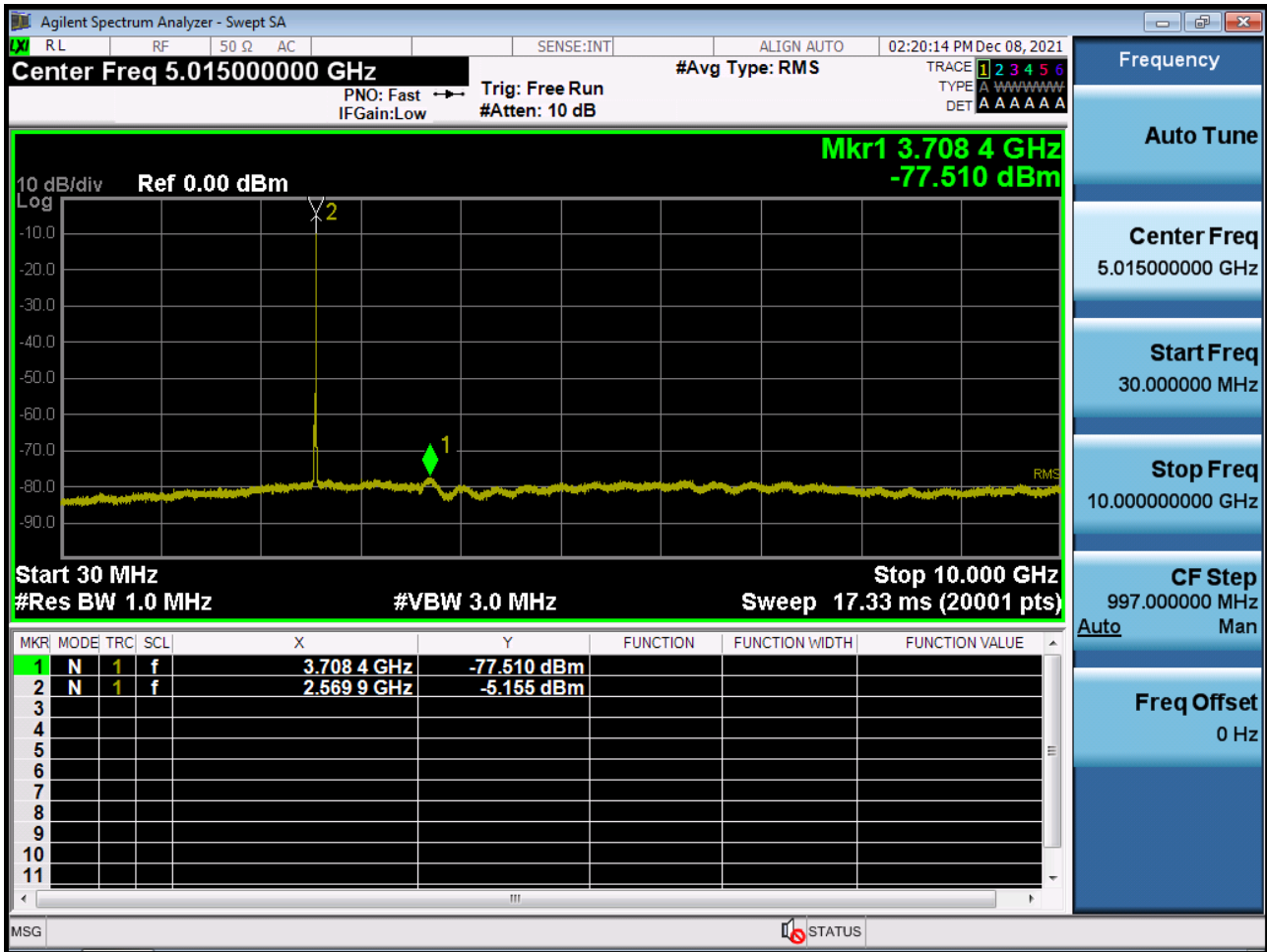


BAND 7. Conducted Spurious\_2 (21100ch\_10 MHz\_QPSK\_RB 1\_0)





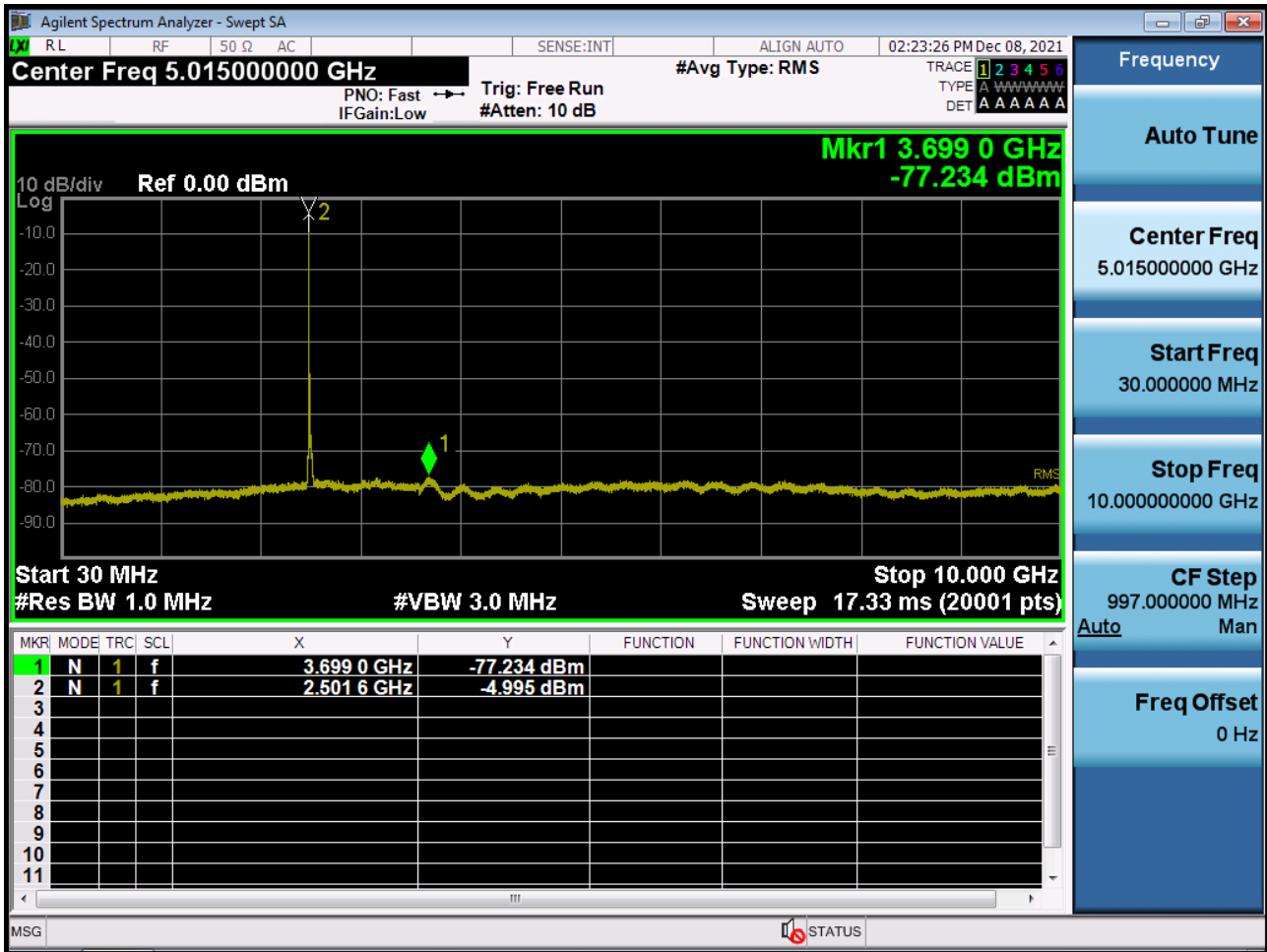
BAND 7. Conducted Spurious\_1 (21400ch\_10 MHz\_QPSK\_RB 1\_0)



BAND 7. Conducted Spurious\_2 (21400ch\_10 MHz\_QPSK\_RB 1\_0)



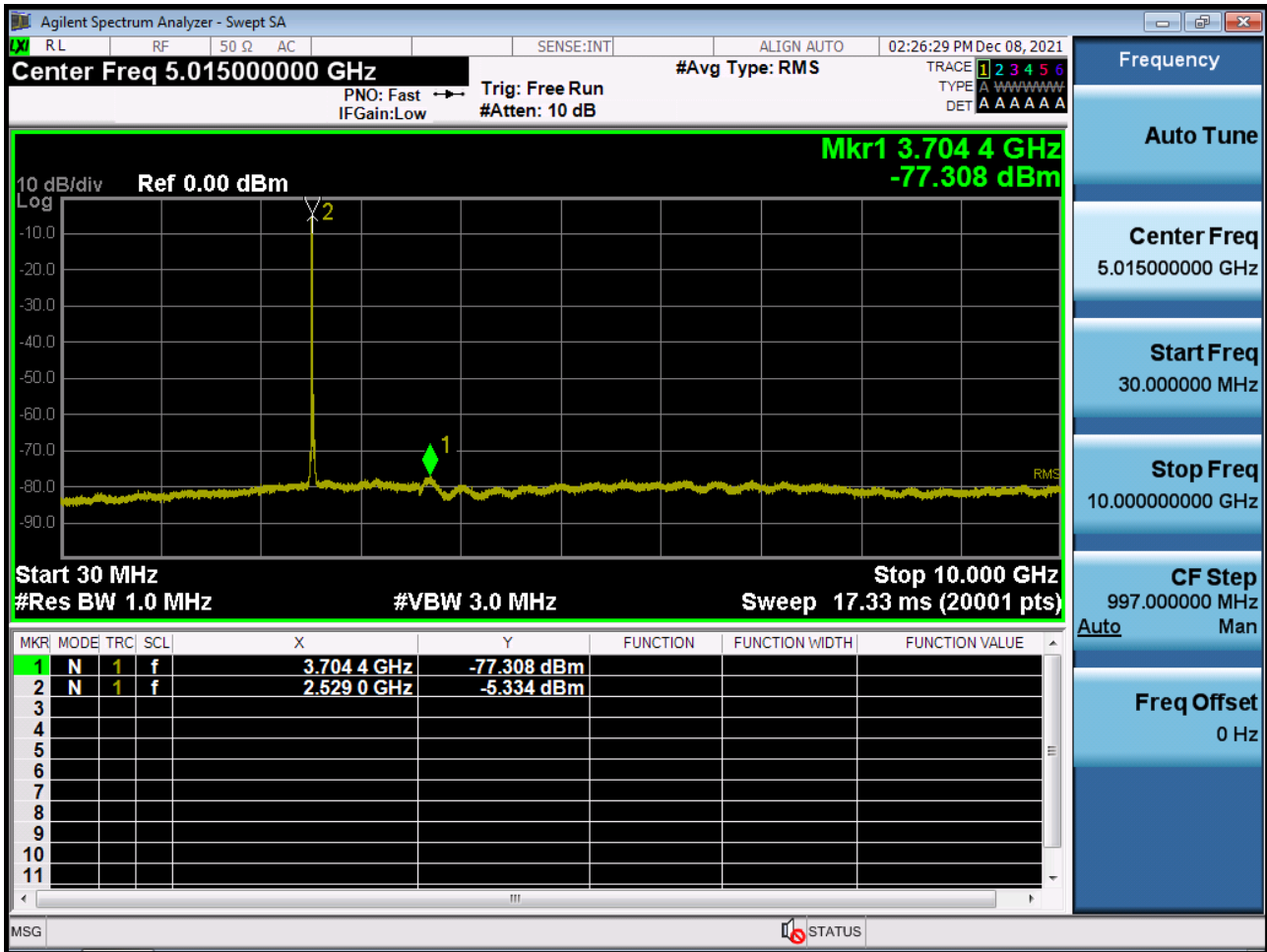
BAND 7. Conducted Spurious\_1 (20825ch\_15 MHz\_QPSK\_RB 1\_0)



BAND 7. Conducted Spurious\_2 (20825ch\_15 MHz\_QPSK\_RB 1\_0)



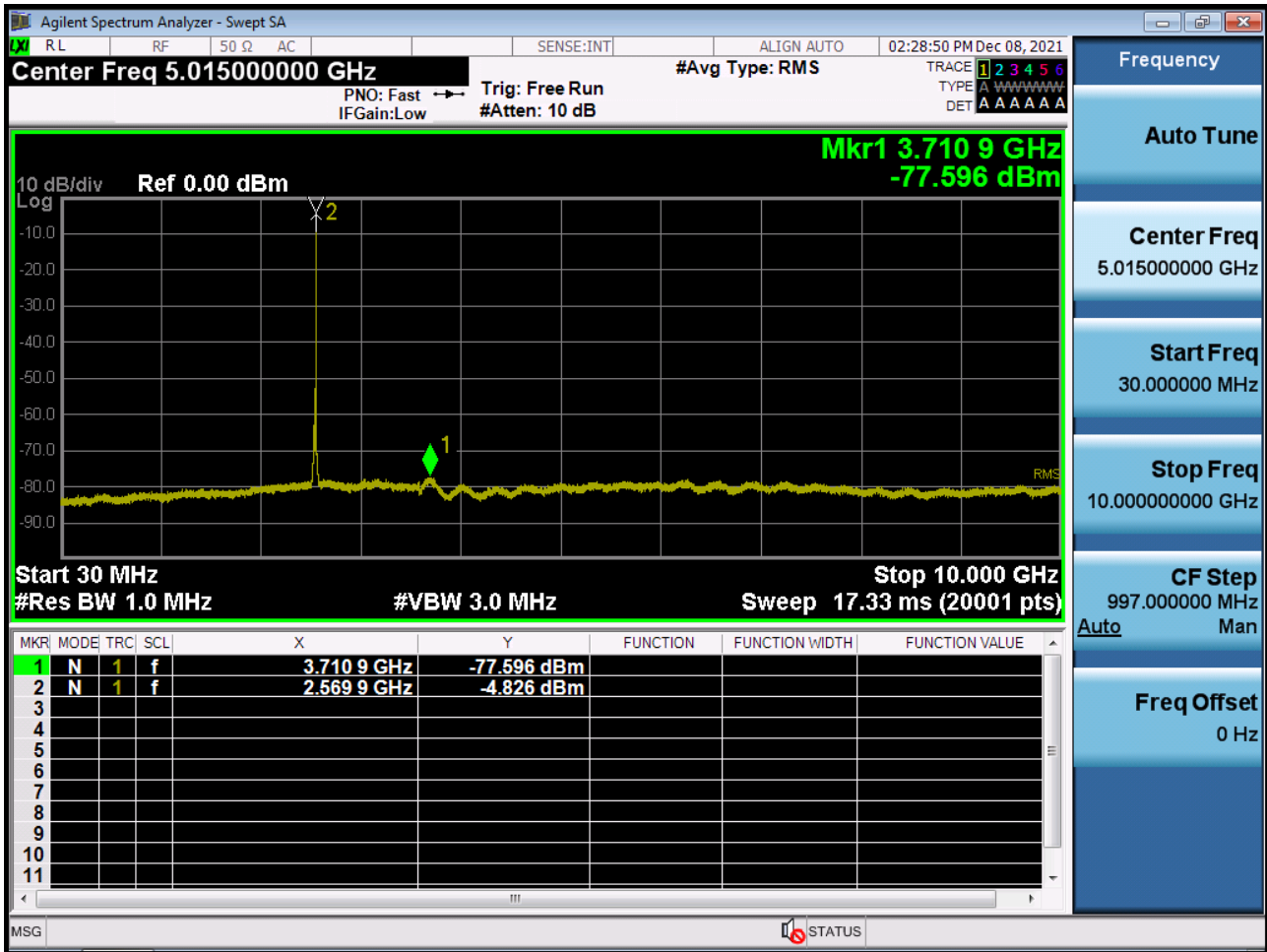
BAND 7. Conducted Spurious\_1 (21100ch\_15 MHz\_QPSK\_RB 1\_0)



BAND 7. Conducted Spurious\_2 (21100ch\_15 MHz\_QPSK\_RB 1\_0)



BAND 7. Conducted Spurious\_1 (21375ch\_15 MHz\_QPSK\_RB 1\_0)

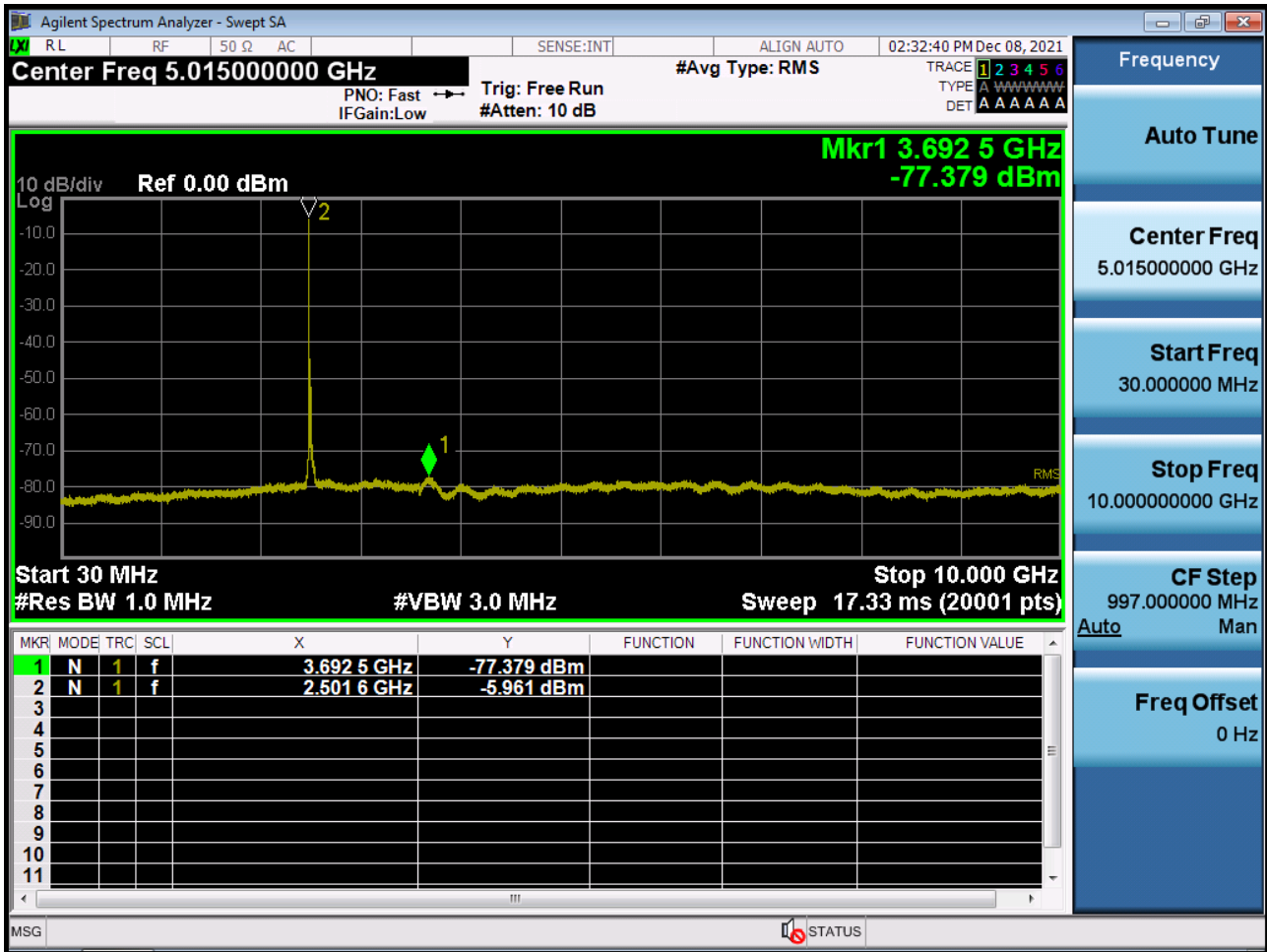


BAND 7. Conducted Spurious\_2 (21375ch\_15 MHz\_QPSK\_RB 1\_0)





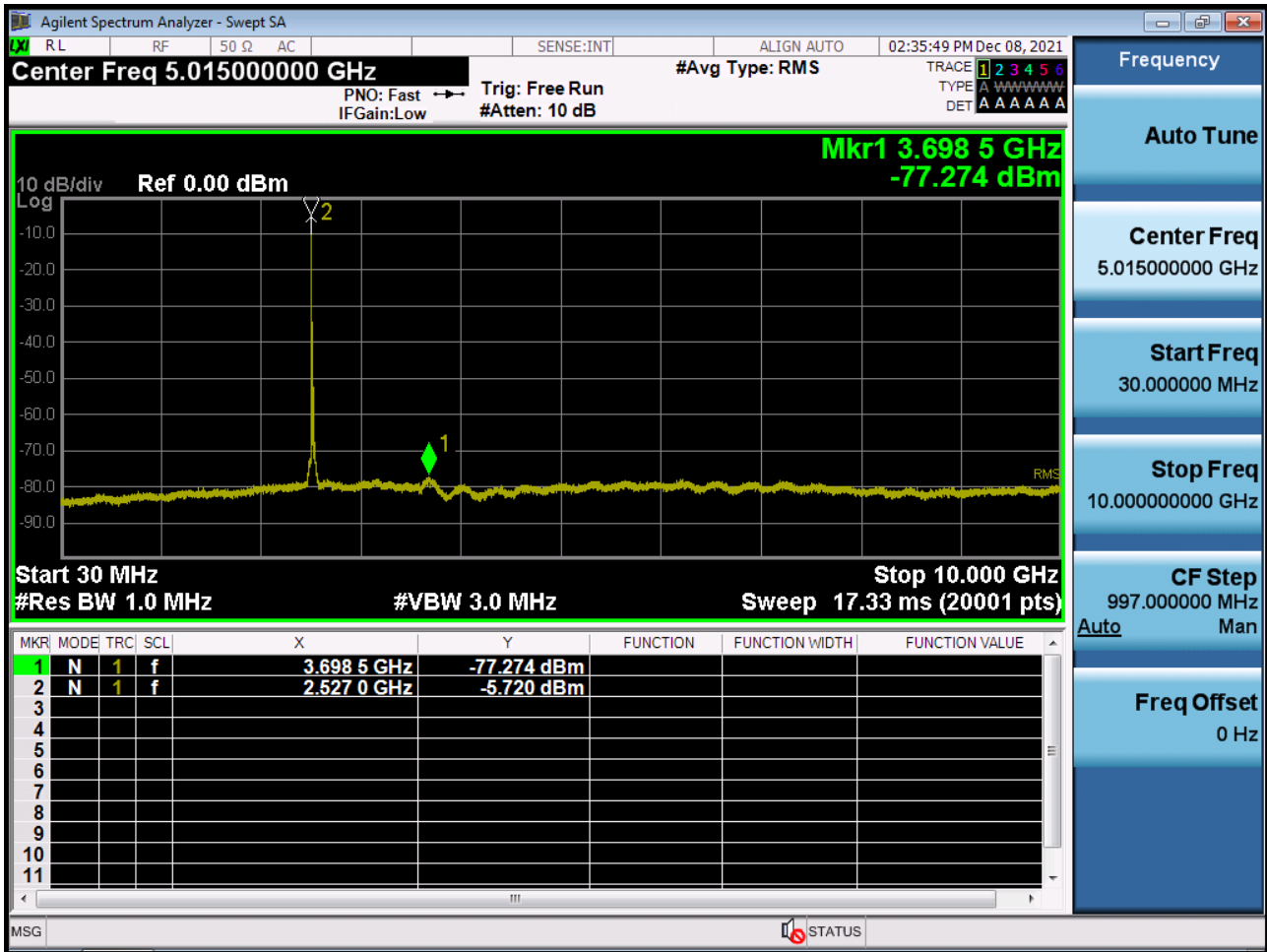
BAND 7. Conducted Spurious\_1 (20850ch\_20 MHz\_QPSK\_RB 1\_0)



BAND 7. Conducted Spurious\_2 (20850ch\_20 MHz\_QPSK\_RB 1\_0)



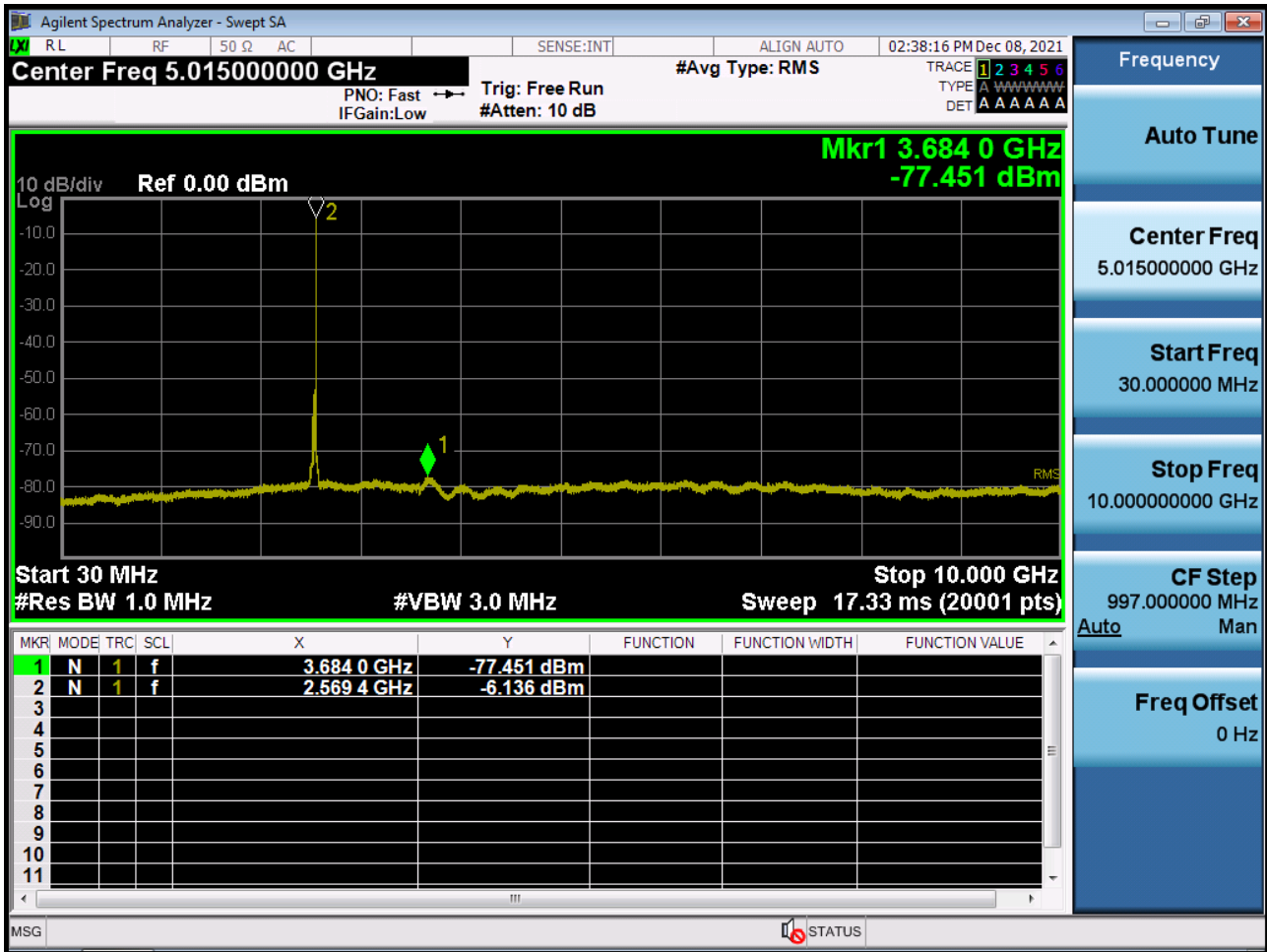
BAND 7. Conducted Spurious\_1 (21100ch\_20 MHz\_QPSK\_RB 1\_0)



BAND 7. Conducted Spurious\_2 (21100ch\_20 MHz\_QPSK\_RB 1\_0)



BAND 7. Conducted Spurious\_1 (21350ch\_20 MHz\_QPSK\_RB 1\_0)



BAND 7. Conducted Spurious\_2 (21350ch\_20 MHz\_QPSK\_RB 1\_0)



## 10. APPENDIX A\_ TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-2201-FC031-P