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FCC LTE REPORT

Certification

Applicant Name:
SAMSUNG Electronics Co., Ltd.

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

Date of Issue:
February 15, 2022

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

Report No.: HCT-RF-2202-FC012

FCC ID:	**A3LSMA736B**
APPLICANT:	**SAMSUNG Electronics Co., Ltd.**

Model(s): SM-A736B/DS
Additional Model(s): SM-A736B
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 41 (5)	2498.5 – 2687.5	4M52G7D	QPSK	0.127	21.05
		4M51W7D	16QAM	0.107	20.28
		4M51W7D	64QAM	0.084	19.25
		4M51W7D	256QAM	0.041	16.12
LTE – Band 41 (10)	2501.0 – 2685.0	8M99G7D	QPSK	0.125	20.97
		8M99W7D	16QAM	0.106	20.25
		8M99W7D	64QAM	0.083	19.17
		8M99W7D	256QAM	0.042	16.24
LTE – Band 41 (15)	2503.5 – 2682.5	13M5G7D	QPSK	0.121	20.83
		13M5W7D	16QAM	0.101	20.04
		13M5W7D	64QAM	0.078	18.92
		13M5W7D	256QAM	0.041	16.09
LTE – Band 41 (20)	2506.0 – 2680.0	18M0G7D	QPSK	0.121	20.82
		17M9W7D	16QAM	0.101	20.03
		17M9W7D	64QAM	0.079	18.96
		18M0W7D	256QAM	0.041	16.10

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

REVIEWED BY

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

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2202-FC012	February 15, 2022	- First Approval Report

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

Table of Contents

MEASUREMENT REPORT

1. GENERAL INFORMATION

Applicant Name:	SAMSUNG Electronics Co., Ltd.
Address:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
FCC ID:	A3LSMA736B
Application Type:	Certification
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part(s):	§27, §2
EUT Type:	Mobile phone
Model(s):	SM-A736B/DS
Additional Model(s):	SM-A736B
Tx Frequency:	2498.5 – 2687.5 : 5 MHz 2501.0 – 2685.0 : 10 MHz 2503.5 – 2682.5 : 15 MHz 2506.0 – 2680.0 : 20 MHz
Date(s) of Tests:	January 10, 2022 ~ February 11, 2022
Serial number:	Radiated: R3CRC05S01L Conducted: 5a1ad468e1347ece

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

2.2. MEASURING INSTRUMENT CALIBRATION

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

2.3. TEST FACILITY

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

3. DESCRIPTION OF TESTS

3.1 TEST PROCEDURE

Test Description	Test Procedure Used
Occupied Bandwidth	- KDB 971168 D01 v03r01 – Section 4.3 - ANSI C63.26-2015 – Section 5.4.4
Channel 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 Normal Hz
3. VBW ≥ 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points > 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

Test Note

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

   The power is calculated by the following formula;

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

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

3.3 RADIATED SPURIOUS EMISSIONS

Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

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

Test Settings

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

Test Note

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

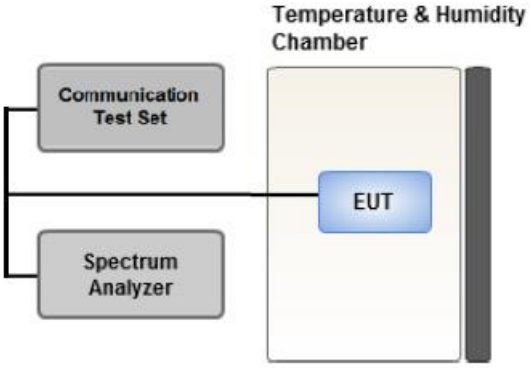
$$\text{Result}_{(dBm)} = \text{Pg}_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dBi)}$$

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

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

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

3.4 PEAK- TO- AVERAGE RATIO



Test setup

① CCDF Procedure for PAPR

Test Settings

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

② Alternate Procedure for PAPR

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

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

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

Test Settings(Peak Power)

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

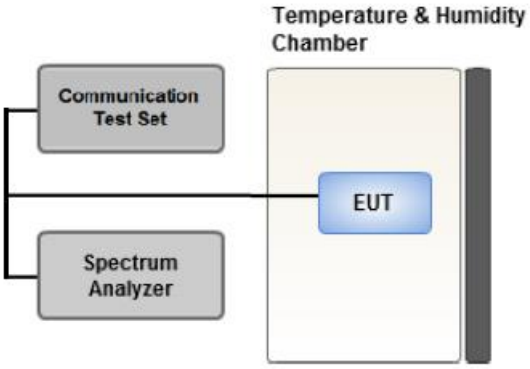
1. Set the RBW ≥ OBW.
2. Set VBW ≥ 3 × RBW.
3. Set span ≥ 2 × OBW.
4. Sweep time ≥ 10 × (number of points in sweep) × (transmission symbol period).
5. Detector = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the peak amplitude level.

Test Settings(Average Power)

1. Set span to 2 × to 3 × the OBW.
2. Set RBW ≥ OBW.
3. Set VBW ≥ 3 × RBW.
4. Set number of measurement points in sweep ≥ 2 × span / RBW.
5. Sweep time:

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

3.5 OCCUPIED BANDWIDTH.



Test setup

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

The EUT makes a call to the communication simulator.

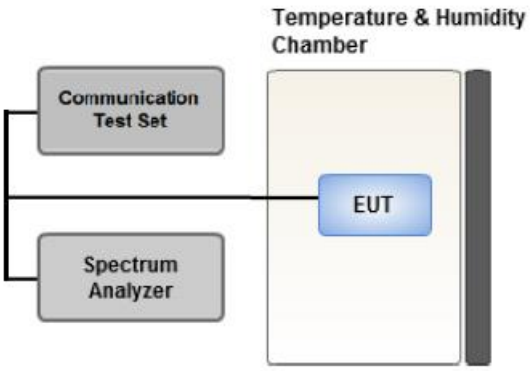
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

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

Test Settings

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

3.6 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL



Test setup

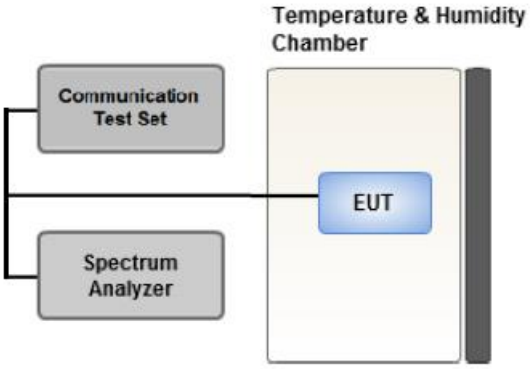
Test Overview

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

Test Settings

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

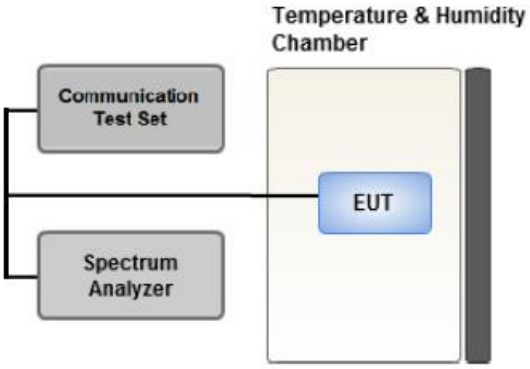
Test Settings

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. 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 ≥ 2 x Span/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, RB sizes and offsets, and channel bandwidth configurations shown in the test data.
- Please refer to the table below.
- SM-A736B/DS & additional models were tested and the worst case results are reported.

(Worst case : SM-A736B/DS)

[Worst case]

Test Description	Modulation	Bandwidth (MHz)	Frequency	RB size	RB offset	Axis
Effective Isotropic Radiated Power	QPSK, 16QAM, 64QAM, 256QAM	5	Low, Mid	1	24	Z
			High	1	13	
		10	Low Mid, High	1	25	
		15	Low Mid, High	1	38	
		20	Low, Mid	1	50	
			High	1	99	
Radiated Spurious and Harmonic Emissions	QPSK	5	Low, Mid	1	24	Y
			High	1	13	
		10	Low Mid, High	1	25	
		15	Low Mid, High	1	38	
		20	Low, Mid	1	50	
			High	1	99	

3.10 WORST CASE(CONDUCTED TEST)

- All modes of operation were investigated and the worst case configuration results are reported.
- SM-A736B/DS & additional models were tested and the worst case results are reported.

(Worst case : SM-A736B/DS)

[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 Radio	QPSK, 16QAM, 64QAM, 256QAM	5, 10, 15, 20	Mid	Full RB	0
Channel 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, Mid, 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	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	03/19/2022	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_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (±dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82 (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)	■ < 40 + 10log10 (P[Watts]) at Channel edges ■ < 43 + 10log10 (P[Watts]) between 5 and X MHz from Channel edges ■ < 55 + 10log10 (P[Watts]) beyond X MHz beyond from Channel edges ■ < 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz	PASS
Conducted Output Power	§2.1046	N/A	See Note1
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 + 10log10 (P[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
40620	2593.0	-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
2498.5	LTE B41/ 5 MHz	QPSK	-24.06	12.84	10.70	2.49	V	< 2.00	0.127	21.05
		16-QAM	-24.83	12.07	10.70	2.49	V		0.107	20.28
		64-QAM	-25.86	11.04	10.70	2.49	H		0.084	19.25
		256-QAM	-28.99	7.91	10.70	2.49	H		0.041	16.12
2593.0		QPSK	-26.81	10.51	10.62	2.53	V		0.073	18.60
		16-QAM	-27.53	9.79	10.62	2.53	V		0.061	17.88
		64-QAM	-28.72	8.60	10.62	2.53	H		0.047	16.69
		256-QAM	-31.74	5.58	10.62	2.53	H		0.023	13.67
2687.5		QPSK	-26.54	10.77	10.78	2.59	V		0.079	18.96
		16-QAM	-27.29	10.02	10.78	2.59	V		0.066	18.21
		64-QAM	-28.40	8.91	10.78	2.59	H		0.051	17.10
		256-QAM	-31.29	6.02	10.78	2.59	H		0.026	14.21

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
2501.0	LTE B41/ 10 MHz	QPSK	-24.14	12.76	10.70	2.49	V	< 2.00	0.125	20.97
		16-QAM	-24.86	12.04	10.70	2.49	V		0.106	20.25
		64-QAM	-25.94	10.96	10.70	2.49	H		0.083	19.17
		256-QAM	-28.87	8.03	10.70	2.49	H		0.042	16.24
2593.0		QPSK	-26.92	10.40	10.62	2.53	V		0.071	18.49
		16-QAM	-27.70	9.62	10.62	2.53	V		0.059	17.71
		64-QAM	-28.83	8.49	10.62	2.53	H		0.046	16.58
		256-QAM	-31.68	5.64	10.62	2.53	H		0.024	13.73
2685.0		QPSK	-26.69	10.81	10.77	2.58	V		0.079	19.00
		16-QAM	-27.43	10.07	10.77	2.58	V		0.067	18.26
		64-QAM	-28.58	8.92	10.77	2.58	H		0.051	17.11
		256-QAM	-31.40	6.10	10.77	2.58	H		0.027	14.29

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
2503.5	LTE B41/ 15 MHz	QPSK	-24.28	12.62	10.70	2.49	V	< 2.00	0.121	20.83
		16-QAM	-25.07	11.83	10.70	2.49	V		0.101	20.04
		64-QAM	-26.19	10.71	10.70	2.49	H		0.078	18.92
		256-QAM	-29.02	7.88	10.70	2.49	H		0.041	16.09
2593.0		QPSK	-26.98	10.34	10.62	2.53	V		0.070	18.43
		16-QAM	-27.88	9.44	10.62	2.53	V		0.057	17.53
		64-QAM	-28.95	8.37	10.62	2.53	H		0.044	16.46
		256-QAM	-31.72	5.60	10.62	2.53	H		0.023	13.69
2682.5		QPSK	-26.62	11.07	10.76	2.57	V		0.084	19.26
		16-QAM	-27.54	10.15	10.76	2.57	V		0.068	18.34
		64-QAM	-28.60	9.09	10.76	2.57	H		0.054	17.28
		256-QAM	-31.41	6.28	10.76	2.57	H		0.028	14.47

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
2506.0	LTE B41/ 20 MHz	QPSK	-24.34	12.62	10.70	2.50	V	< 2.00	0.121	20.82
		16-QAM	-25.13	11.83	10.70	2.50	V		0.101	20.03
		64-QAM	-26.20	10.76	10.70	2.50	H		0.079	18.96
		256-QAM	-29.06	7.90	10.70	2.50	H		0.041	16.10
2593.0		QPSK	-26.98	10.34	10.62	2.53	V		0.070	18.43
		16-QAM	-27.86	9.46	10.62	2.53	V		0.057	17.55
		64-QAM	-28.94	8.38	10.62	2.53	H		0.044	16.47
		256-QAM	-31.71	5.61	10.62	2.53	H		0.024	13.70
2680.0		QPSK	-26.85	10.84	10.76	2.57	V		0.080	19.03
		16-QAM	-27.71	9.98	10.76	2.57	V		0.066	18.17
		64-QAM	-28.84	8.85	10.76	2.57	H		0.051	17.04
		256-QAM	-31.62	6.07	10.76	2.57	H		0.027	14.26

8.2 RADIATED SPURIOUS EMISSIONS

▣ OPERATING FREQUENCY : 2593.0 MHz

▣ MEASURED OUTPUT POWER: 21.05 dBm = 0.127 W

▣ MODE: LTE B41

▣ MODULATION SIGNAL: 5 MHz QPSK

▣ DISTANCE: 1 meters

▣ LIMIT: 55 + 10 log10 (W) = 46.05 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
39675 (2498.5)	4 997.00	-49.05	12.60	-58.49	3.61	H	-49.50	70.55
	7 495.50	-49.42	10.80	-50.25	4.47	V	-43.92	64.96
	9 994.00	-58.64	11.19	-54.29	5.27	H	-48.37	69.41
40620 (2593.0)	5 186.00	-46.13	12.44	-54.65	3.70	V	-45.90	66.95
	7 779.00	-57.72	11.40	-58.55	4.54	H	-51.69	72.74
	10 372.00	-59.30	11.40	-54.25	5.45	H	-48.30	69.35
41565 (2687.5)	5 375.00	-34.91	13.00	-44.05	3.78	H	-34.83	55.88
	8 062.50	-47.21	10.80	-45.66	4.61	H	-39.47	60.52
	10 750.00	-54.01	11.20	-48.86	5.54	H	-43.20	64.25

▣ OPERATING FREQUENCY : 2593.0 MHz

▣ MEASURED OUTPUT POWER: 20.97 dBm = 0.125 W

▣ MODE: LTE B41

▣ MODULATION SIGNAL: 10 MHz QPSK

▣ DISTANCE: 1 meters

▣ LIMIT: 55 + 10 log10 (W) = 45.97 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
39700 (2501.0)	5 002.00	-52.65	12.60	-62.09	3.61	H	-53.10	74.07
	7 503.00	-52.17	10.80	-53.11	4.47	H	-46.78	67.75
	10 004.00	-59.86	11.21	-55.40	5.27	V	-49.45	70.42
40620 (2593.0)	5 186.00	-51.71	12.44	-60.23	3.70	H	-51.48	72.53
	7 779.00	-58.10	11.40	-58.93	4.54	V	-52.07	73.12
	10 372.00	-60.73	11.40	-55.68	5.45	H	-49.73	70.78
41540 (2685.0)	5 370.00	-39.23	13.00	-48.35	3.77	H	-39.12	60.09
	8 055.00	-47.75	10.80	-46.23	4.61	H	-40.03	61.00
	10 740.00	-58.54	11.22	-53.83	5.52	H	-48.13	69.10

▣ OPERATING FREQUENCY : 2593.0 MHz

▣ MEASURED OUTPUT POWER: 20.83 dBm = 0.121 W

▣ MODE: LTE B41

▣ MODULATION SIGNAL: 15 MHz QPSK

▣ DISTANCE: 1 meters

▣ LIMIT: 55 + 10 log10 (W) = 45.83 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
39725 (2503.5)	5 007.00	-51.96	12.58	-61.71	3.59	H	-52.72	73.55
	7 510.50	-52.57	10.82	-53.44	4.48	H	-47.10	67.92
	10 014.00	-60.81	11.23	-56.33	5.27	V	-50.37	71.20
40620 (2593.0)	5 186.00	-53.21	12.44	-61.73	3.70	H	-52.98	74.03
	7 779.00	-57.96	11.40	-58.79	4.54	H	-51.93	72.98
	10 372.00	-60.79	11.40	-55.74	5.45	H	-49.79	70.84
41515 (2682.5)	5 365.00	-38.11	13.00	-47.29	3.77	H	-38.06	58.88
	8 047.50	-49.83	10.80	-48.34	4.60	H	-42.14	62.97
	10 730.00	-60.30	11.24	-56.06	5.50	H	-50.32	71.15

▣ OPERATING FREQUENCY : 2593.0 MHz

▣ MEASURED OUTPUT POWER: 20.82 dBm = 0.121 W

▣ MODE: LTE B41

▣ MODULATION SIGNAL: 20 MHz QPSK

▣ DISTANCE: 1 meters

▣ LIMIT: 55 + 10 log10 (W) = 45.82 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
39750 (2506.0)	5 012.00	-51.62	12.58	-61.37	3.59	H	-52.38	73.20
	7 518.00	-53.38	10.84	-53.94	4.46	H	-47.56	68.38
	10 024.00	-61.21	11.25	-56.82	5.28	H	-50.85	71.68
40620 (2593.0)	5 186.00	-52.21	12.44	-60.73	3.70	H	-51.98	73.03
	7 779.00	-57.63	11.40	-58.46	4.54	H	-51.60	72.65
	10 372.00	-60.98	11.40	-55.93	5.45	H	-49.98	71.03
41490 (2680.0)	5 360.00	-37.65	13.00	-46.89	3.76	H	-37.65	58.48
	8 040.00	-50.64	10.80	-49.16	4.59	H	-42.95	63.77
	10 720.00	-56.93	11.26	-52.95	5.50	H	-47.19	68.01

8.3 PEAK-TO-AVERAGE RATIO

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (dB)
41	5 MHz	2593.0	QPSK	25	0	5.21
			16-QAM			6.41
			64-QAM			6.97
			256-QAM			7.17
	10 MHz		QPSK	50		5.40
			16-QAM			6.42
			64-QAM			6.73
			256-QAM			7.27
	15 MHz		QPSK	75		5.23
			16-QAM			6.08
			64-QAM			6.90
			256-QAM			7.04
	20 MHz		QPSK	100		5.26
			16-QAM			6.00
			64-QAM			6.63
			256-QAM			6.99

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)
41	5 MHz	2593.0	QPSK	25	0	4.5173
			16-QAM			4.5062
			64-QAM			4.5087
			256-QAM			4.5049
	10 MHz		QPSK	50		8.9862
			16-QAM			8.9871
			64-QAM			8.9940
			256-QAM			8.9896
	15 MHz		QPSK	75		13.452
			16-QAM			13.450
			64-QAM			13.486
			256-QAM			13.478
	20 MHz		QPSK	100		17.991
			16-QAM			17.939
			64-QAM			17.933
			256-QAM			17.948

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)
41	5	2498.5	26.2635	34.110	-76.612	-42.502	-25.00
		2593.0	26.1687	34.110	-76.242	-42.132	
		2687.5	26.1785	34.110	-76.611	-42.501	
	10	2501.0	26.1398	34.110	-76.050	-41.940	
		2593.0	26.1899	34.110	-76.610	-42.500	
		2685.0	26.1020	34.110	-76.505	-42.395	
	15	2503.5	25.9362	34.110	-76.409	-42.299	
		2593.0	26.1304	34.110	-76.060	-41.950	
		2682.5	26.1330	34.110	-76.680	-42.570	
	20	2506.0	26.1712	34.110	-76.278	-42.168	
		2593.0	26.1372	34.110	-76.426	-42.316	
		2680.0	26.1283	34.110	-76.244	-42.134	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 107 ~ 130.
2. Conducted Spurious Emissions was Tested QPSK Modulation, Resource Block Size 1 and Resource Block Offset 0
3. Duty Cycle factor already applied on the factor.
   - Duty Cycle factor(dB) = 3.979
   - Factor(dB) = Duty Cycle factor + Cable Loss + Ext. Attenuator + Power Splitter
   - Result(dBm) = Reading + Factor

Frequency Range (GHz)	Factor [dB]
0.03 – 1	29.249
1 – 5	31.955
5 – 10	32.570
10 – 15	33.095
15 – 20	33.468
Above 20	34.110

8.6 CHANNEL EDGE

Band Width	Frequency (MHz)	Modulation	RB (Size/ Offset)	2 495 MHz ~ 2 496 MHz	C.E ~ (C.E +1MHz)	2 490.5 MHz ~ 2 495 MHz	(C.E + 1 MHz) ~ (C.E + 5 MHz)	Below 2 490.5 MHz	(C.E + 5 MHz) ~ (C.E + X MHz)	Above (C.E + X MHz)
				Lower	Upper	Lower	Upper	Lower	Upper	Upper
5 MHz	2498.5	QPSK	25/0	-26.88	-27.43	-26.53	-26.94	-35.32	-34.27	-36.15
10 MHz	2501.0	QPSK	50/0	-29.76	-29.44	-30.20	-28.98	-31.41	-31.20	-38.74
15 MHz	2503.5	QPSK	75/0	-31.15	-30.02	-32.61	-30.34	-34.50	-32.11	-40.33
20 MHz	2506.0	QPSK	100/0	-31.71	-30.44	-33.74	-30.91	-35.71	-32.94	-40.70
Limit				-13.0	-10.0	-13.0	-10.0	-25.0	-13.0	-25.0

Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	C.E ~ (C.E ± 1 MHz)		(C.E ± 1 MHz) ~ (C.E ± 5 MHz)	
					Lower	Upper	Lower	Upper
5 MHz	2593.0	QPSK	25	0	-26.44	-26.96	-25.82	-27.74
	2687.5	QPSK	25	0	-27.03	-27.50	-26.71	-26.35
10 MHz	2593.0	QPSK	50	0	-29.76	-29.46	-30.13	-29.38
	2685.0	QPSK	50	0	-30.08	-29.54	-31.03	-29.14
15 MHz	2593.0	QPSK	75	0	-30.95	-30.68	-32.29	-30.76
	2682.5	QPSK	75	0	-31.05	-30.52	-33.35	-30.76
20 MHz	2593.0	QPSK	100	0	-31.44	-30.21	-32.74	-31.79
	2680.0	QPSK	100	0	-31.49	-31.19	-33.83	-31.74
Limit					-10.0		-10.0	

Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	(C.E ± 5 MHz) ~ (C.E ± X MHz)		Above (C.E ± X MHz)	
					Lower	Upper	Lower	Upper
5 MHz	2593.0	QPSK	25	0	-33.31	-34.33	-34.75	-35.48
	2687.5	QPSK	25	0	-34.52	-32.35	-36.21	-34.07
10 MHz	2593.0	QPSK	50	0	-30.94	-30.22	-38.38	-37.25
	2685.0	QPSK	50	0	-33.17	-28.89	-40.38	-36.33
15 MHz	2593.0	QPSK	75	0	-33.48	-31.35	-40.66	-38.95
	2682.5	QPSK	75	0	-35.58	-30.89	-42.97	-38.52
20 MHz	2593.0	QPSK	100	0	-34.84	-32.56	-42.07	-39.59
	2680.0	QPSK	100	0	-35.95	-32.34	-43.59	-40.27
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. RB = Resource Block
5. Duty Cycle factor already applied on the factor.
   - Factor(dB) = Duty Cycle factor + Cable Loss + Ext. Attenuator + Power Splitter
   - Result(dBm) = Reading + Factor
   - Duty Cycle Factor(dB) = 3.979
6. Plots of the EUT's Channel Edge are shown Page 79 ~ 106. (1RB & Full RB)

8.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

▣ MODE: LTE 41

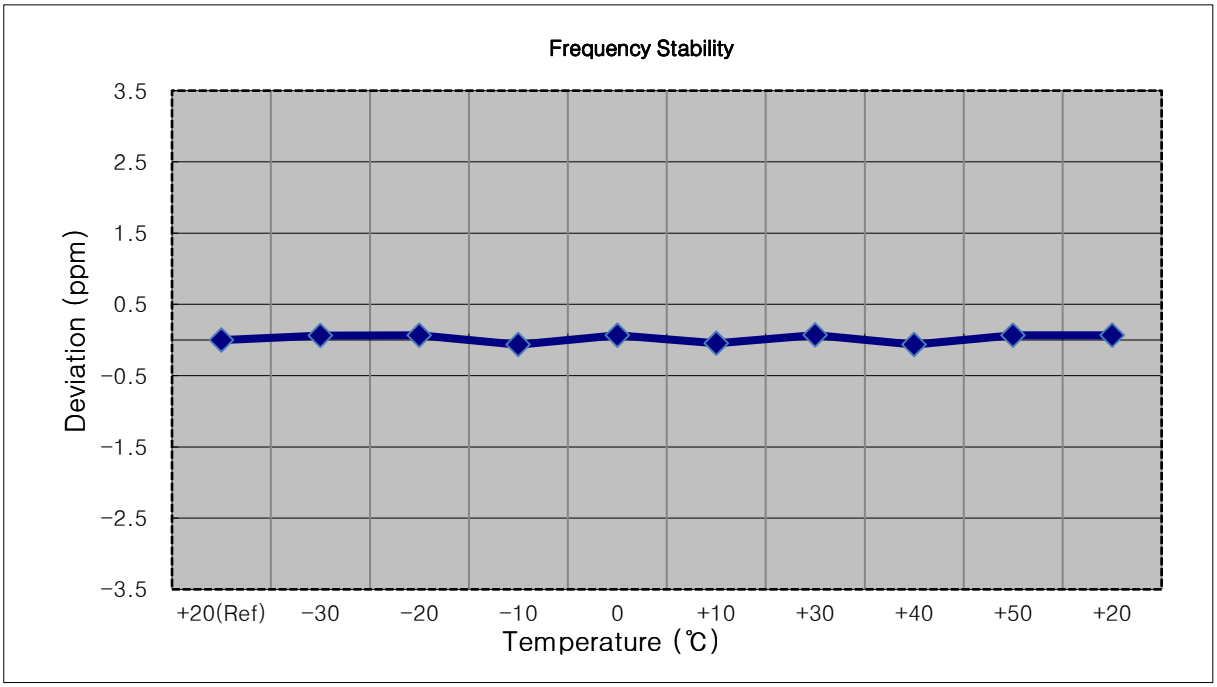
▣ OPERATING FREQUENCY: 2498,500,000 Hz

▣ BANDWIDTH: 39675 (5 MHz)

▣ REFERENCE VOLTAGE: 3.860 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.860	+20(Ref)	2498 500 149	0.0	0.000 000	0.000
100 %		-30	2498 500 299	149.6	0.000 006	0.060
100 %		-20	2498 500 312	163.4	0.000 007	0.065
100 %		-10	2498 499 985	-164.4	-0.000 007	-0.066
100 %		0	2498 500 309	159.6	0.000 006	0.064
100 %		+10	2498 500 035	-113.8	-0.000 005	-0.046
100 %		+30	2498 500 320	170.7	0.000 007	0.068
100 %		+40	2498 499 992	-157.1	-0.000 006	-0.063
100 %		+50	2498 500 316	167.2	0.000 007	0.067
Batt. Endpoint	3.550	+20	2498 500 314	165.2	0.000 007	0.066



▣ MODE: LTE 41

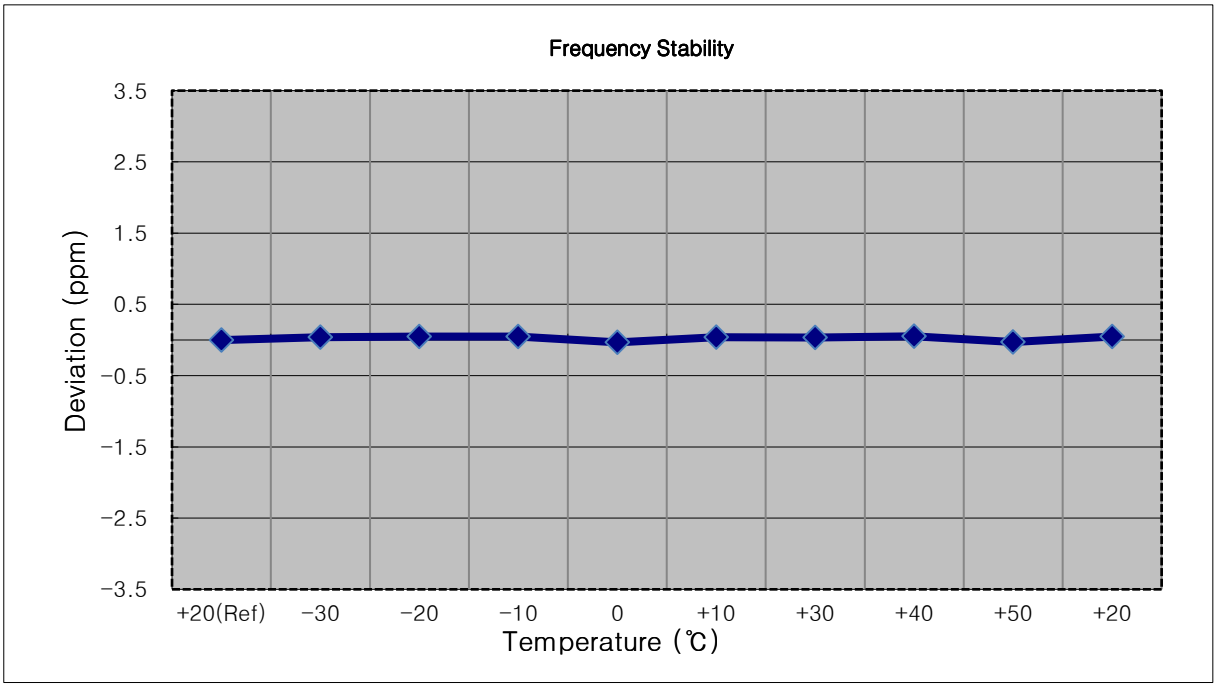
▣ OPERATING FREQUENCY: 2501,000,000 Hz

▣ BANDWIDTH: 39700 (10 MHz)

▣ REFERENCE VOLTAGE: 3.860 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.860	+20(Ref)	2501 000 077	0.0	0.000 000	0.000
100 %		-30	2501 000 177	100.6	0.000 004	0.040
100 %		-20	2501 000 201	124.5	0.000 005	0.050
100 %		-10	2501 000 195	118.3	0.000 005	0.047
100 %		0	2500 999 994	-83.3	-0.000 003	-0.033
100 %		+10	2501 000 180	102.7	0.000 004	0.041
100 %		+30	2501 000 166	89.5	0.000 004	0.036
100 %		+40	2501 000 206	129.0	0.000 005	0.052
100 %		+50	2501 000 000	-76.6	-0.000 003	-0.031
Batt. Endpoint	3.550	+20	2501 000 197	120.4	0.000 005	0.048



▣ MODE: LTE 41

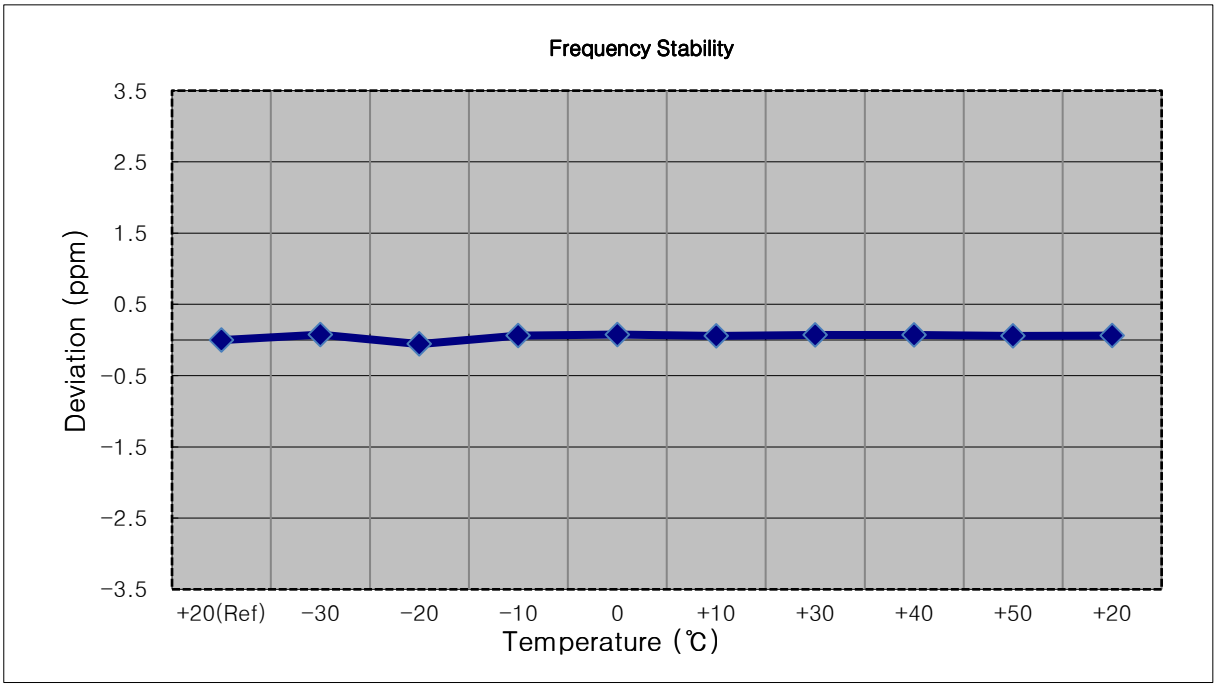
▣ OPERATING FREQUENCY: 2503,500,000 Hz

▣ BANDWIDTH: 39725 (15 MHz)

▣ REFERENCE VOLTAGE: 3.860 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.860	+20(Ref)	2503 500 181	0.0	0.000 000	0.000
100 %		-30	2503 500 366	184.5	0.000 007	0.074
100 %		-20	2503 500 037	-144.2	-0.000 006	-0.058
100 %		-10	2503 500 333	151.5	0.000 006	0.061
100 %		0	2503 500 373	191.4	0.000 008	0.076
100 %		+10	2503 500 322	141.3	0.000 006	0.056
100 %		+30	2503 500 359	177.6	0.000 007	0.071
100 %		+40	2503 500 360	178.5	0.000 007	0.071
100 %		+50	2503 500 318	137.2	0.000 005	0.055
Batt. Endpoint	3.550	+20	2503 500 333	151.9	0.000 006	0.061



▣ MODE: LTE 41

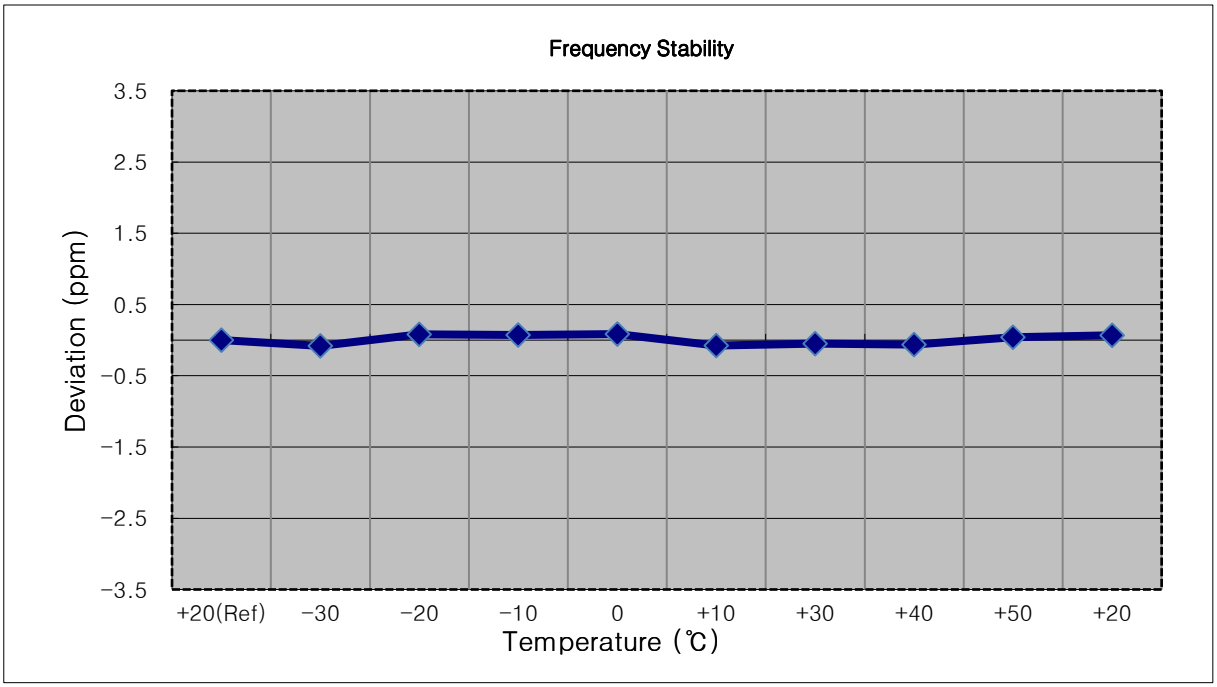
▣ OPERATING FREQUENCY: 2506,000,000 Hz

▣ BANDWIDTH: 39750 (20 MHz)

▣ REFERENCE VOLTAGE: 3.860 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.860	+20(Ref)	2505 999 827	0.0	0.000 000	0.000
100 %		-30	2505 999 624	-202.6	-0.000 008	-0.081
100 %		-20	2506 000 029	201.8	0.000 008	0.081
100 %		-10	2506 000 008	181.5	0.000 007	0.072
100 %		0	2506 000 039	212.3	0.000 008	0.085
100 %		+10	2505 999 632	-195.0	-0.000 008	-0.078
100 %		+30	2505 999 703	-123.4	-0.000 005	-0.049
100 %		+40	2505 999 671	-155.6	-0.000 006	-0.062
100 %		+50	2505 999 934	107.1	0.000 004	0.043
Batt. Endpoint	3.550	+20	2505 999 992	164.9	0.000 007	0.066



▣ MODE: LTE 41

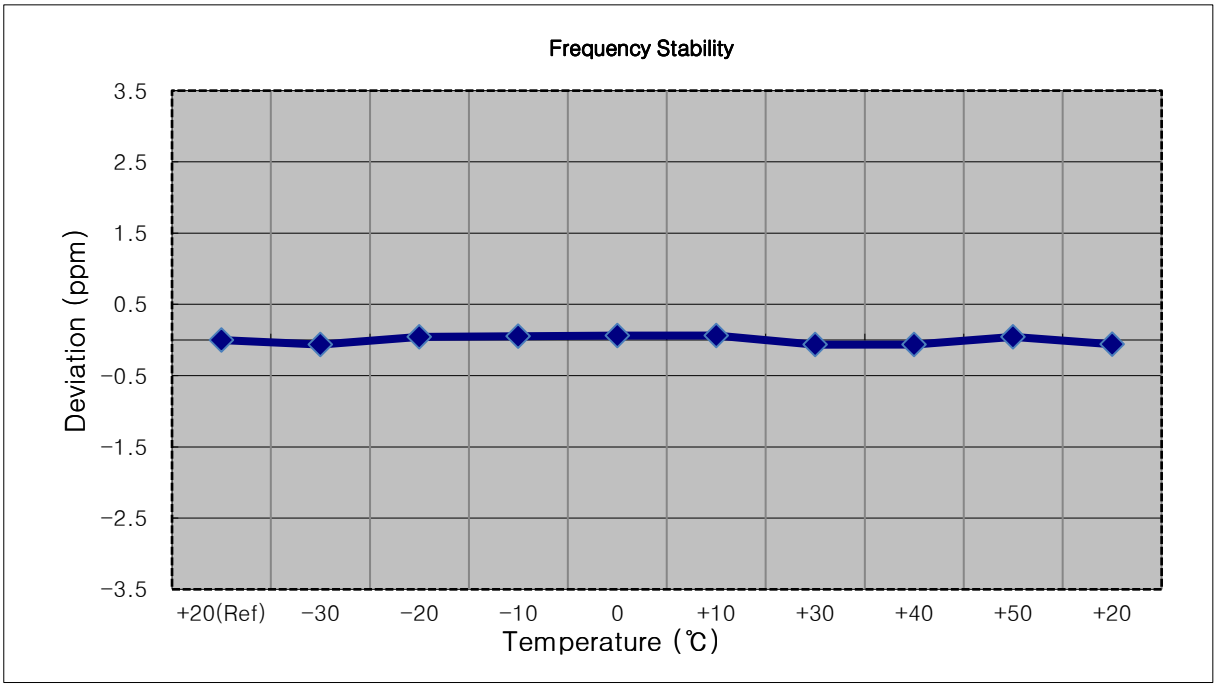
▣ OPERATING FREQUENCY: 2593,000,000 Hz

▣ BANDWIDTH: 40620 (5 MHz)

▣ REFERENCE VOLTAGE: 3.860 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.860	+20(Ref)	2592 999 850	0.0	0.000 000	0.000
100 %		-30	2592 999 680	-169.3	-0.000 007	-0.065
100 %		-20	2592 999 959	109.0	0.000 004	0.042
100 %		-10	2592 999 986	136.8	0.000 005	0.053
100 %		0	2593 000 009	159.7	0.000 006	0.062
100 %		+10	2593 000 011	161.5	0.000 006	0.062
100 %		+30	2592 999 679	-170.5	-0.000 007	-0.066
100 %		+40	2592 999 688	-161.4	-0.000 006	-0.062
100 %		+50	2592 999 959	109.3	0.000 004	0.042
Batt. Endpoint	3.550	+20	2592 999 694	-155.7	-0.000 006	-0.060



▣ MODE: LTE 41

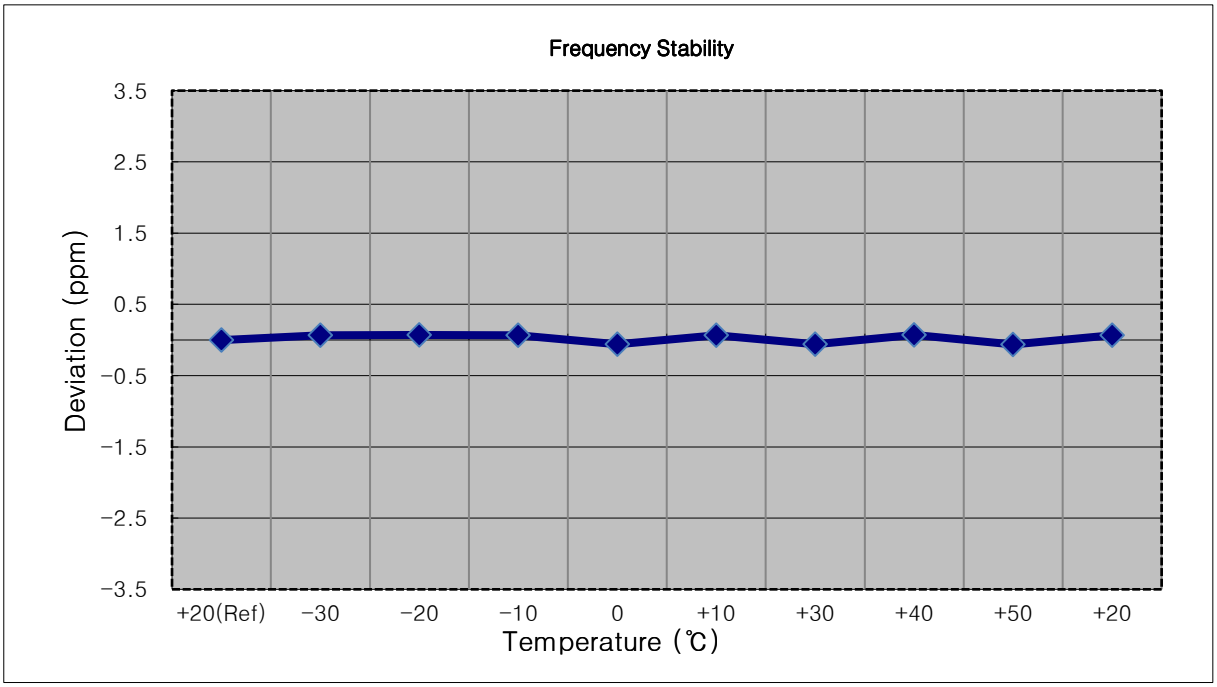
▣ OPERATING FREQUENCY: 2593,000,000 Hz

▣ BANDWIDTH: 40620 (10 MHz)

▣ REFERENCE VOLTAGE: 3.860 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.860	+20(Ref)	2593 000 174	0.0	0.000 000	0.000
100 %		-30	2593 000 348	174.7	0.000 007	0.067
100 %		-20	2593 000 352	177.9	0.000 007	0.069
100 %		-10	2593 000 349	174.9	0.000 007	0.067
100 %		0	2593 000 016	-157.8	-0.000 006	-0.061
100 %		+10	2593 000 347	173.7	0.000 007	0.067
100 %		+30	2593 000 019	-154.4	-0.000 006	-0.060
100 %		+40	2593 000 358	184.7	0.000 007	0.071
100 %		+50	2593 000 011	-162.4	-0.000 006	-0.063
Batt. Endpoint	3.550	+20	2593 000 346	172.6	0.000 007	0.067



▣ MODE: LTE 41

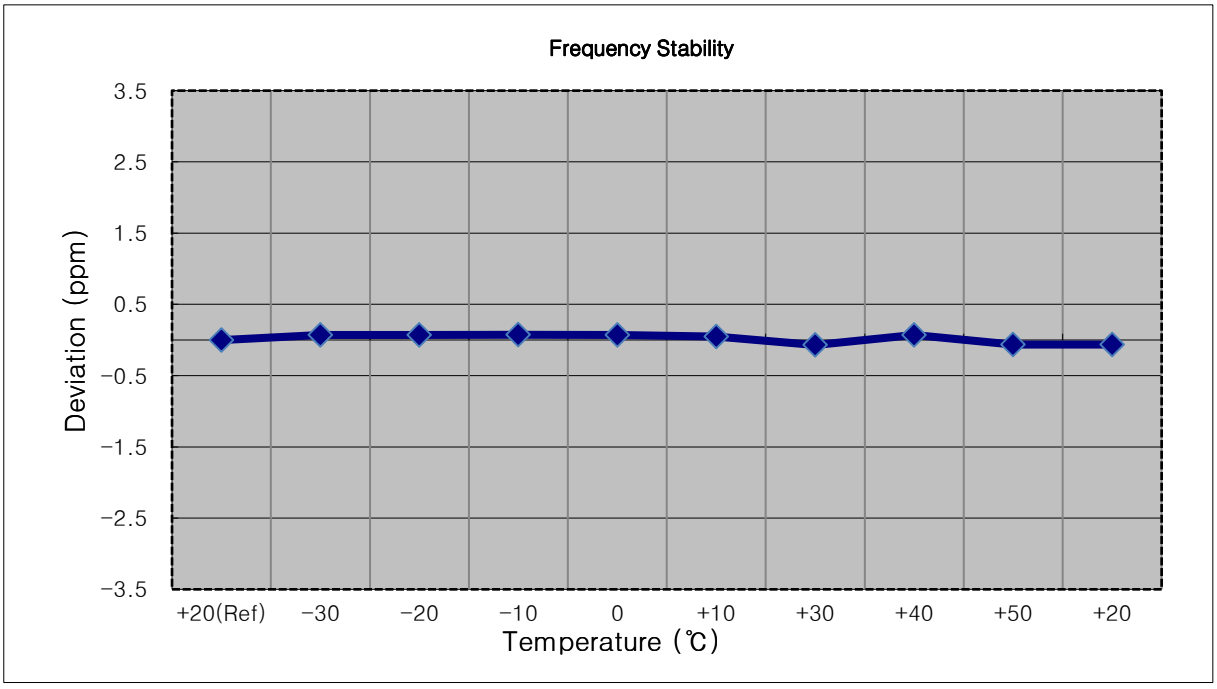
▣ OPERATING FREQUENCY: 2593,000,000 Hz

▣ BANDWIDTH: 40620 (15 MHz)

▣ REFERENCE VOLTAGE: 3.860 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.860	+20(Ref)	2593 000 183	0.0	0.000 000	0.000
100 %		-30	2593 000 362	179.3	0.000 007	0.069
100 %		-20	2593 000 366	183.2	0.000 007	0.071
100 %		-10	2593 000 372	189.5	0.000 007	0.073
100 %		0	2593 000 366	183.7	0.000 007	0.071
100 %		+10	2593 000 312	129.6	0.000 005	0.050
100 %		+30	2592 999 999	-183.4	-0.000 007	-0.071
100 %		+40	2593 000 367	184.0	0.000 007	0.071
100 %		+50	2593 000 014	-169.2	-0.000 007	-0.065
Batt. Endpoint	3.550	+20	2593 000 012	-170.7	-0.000 007	-0.066



▣ MODE: LTE 41

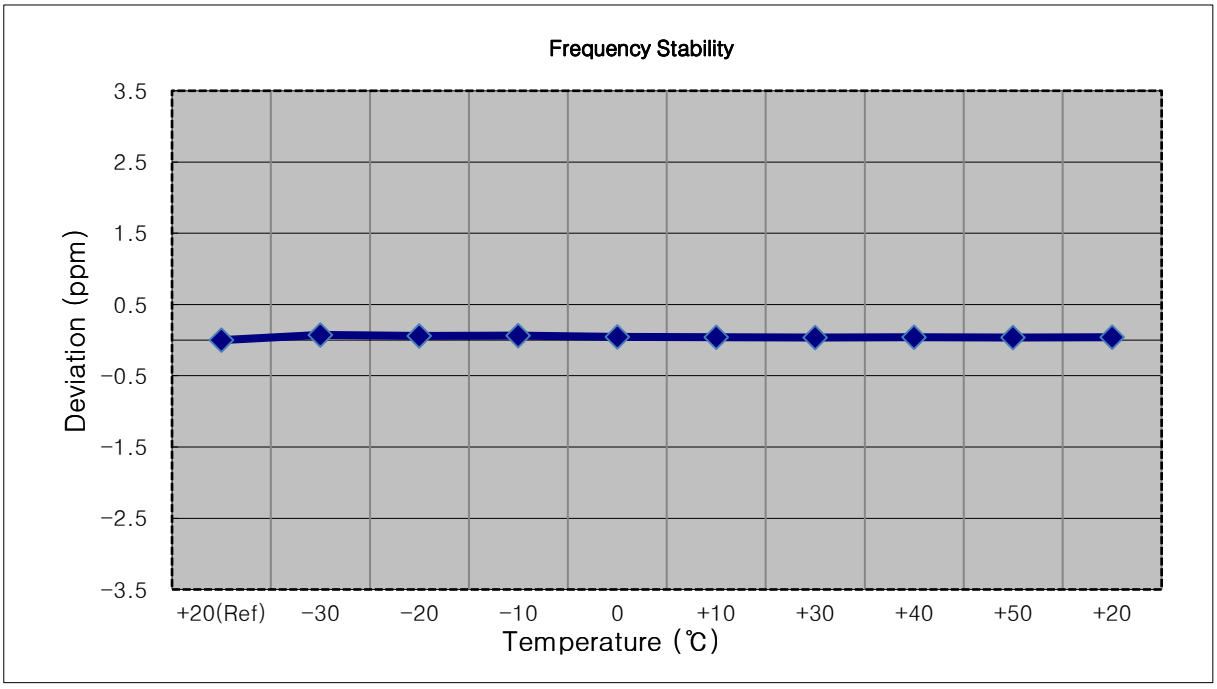
▣ OPERATING FREQUENCY: 2593,000,000 Hz

▣ BANDWIDTH: 40620 (20 MHz)

▣ REFERENCE VOLTAGE: 3.860 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.860	+20(Ref)	2593 000 170	0.0	0.000 000	0.000
100 %		-30	2593 000 359	189.2	0.000 007	0.073
100 %		-20	2593 000 327	157.5	0.000 006	0.061
100 %		-10	2593 000 334	164.2	0.000 006	0.063
100 %		0	2593 000 290	120.1	0.000 005	0.046
100 %		+10	2593 000 280	109.9	0.000 004	0.042
100 %		+30	2593 000 264	94.3	0.000 004	0.036
100 %		+40	2593 000 277	107.7	0.000 004	0.042
100 %		+50	2593 000 266	96.2	0.000 004	0.037
Batt. Endpoint	3.550	+20	2593 000 281	111.1	0.000 004	0.043



▣ MODE: LTE 41

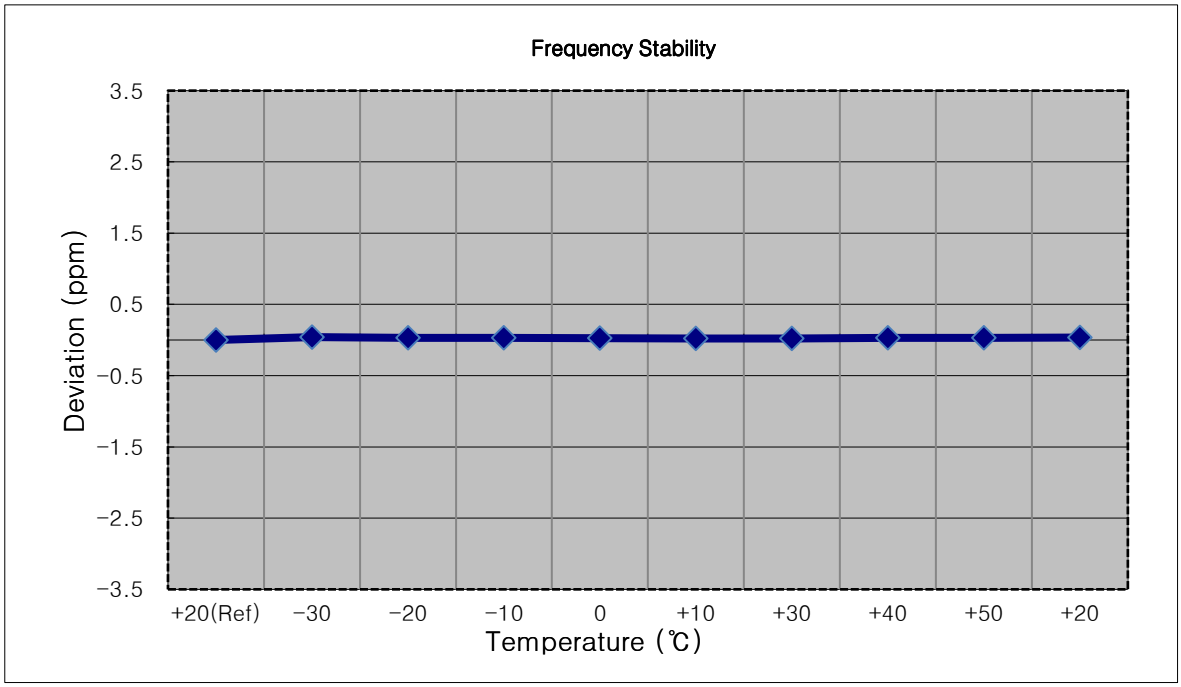
▣ OPERATING FREQUENCY: 2687,500,000 Hz

▣ BANDWIDTH: 41565 (5 MHz)

▣ REFERENCE VOLTAGE: 3.860 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.860	+20(Ref)	2687 500 086	0.0	0.000 000	0.000
100 %		-30	2687 500 196	109.7	0.000 004	0.041
100 %		-20	2687 500 162	76.2	0.000 003	0.028
100 %		-10	2687 500 163	76.3	0.000 003	0.028
100 %		0	2687 500 154	67.5	0.000 003	0.025
100 %		+10	2687 500 143	56.8	0.000 002	0.021
100 %		+30	2687 500 147	61.1	0.000 002	0.023
100 %		+40	2687 500 165	79.1	0.000 003	0.029
100 %		+50	2687 500 170	84.1	0.000 003	0.031
Batt. Endpoint	3.550	+20	2687 500 173	86.9	0.000 003	0.032



▣ MODE: LTE 41

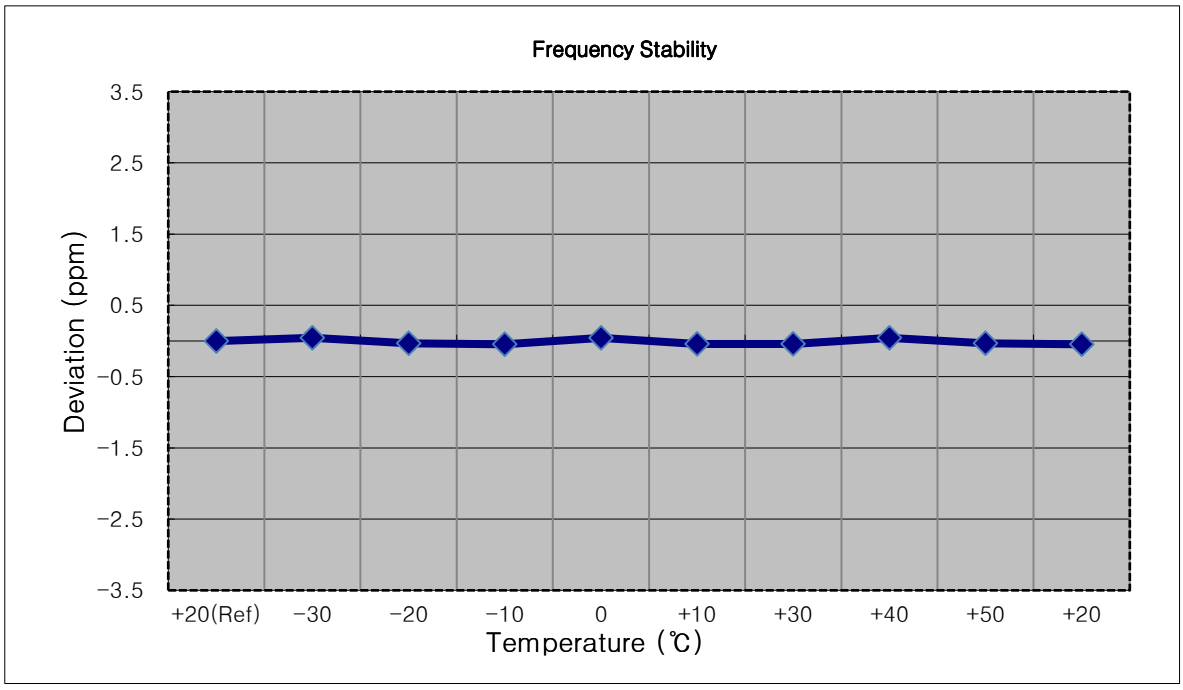
▣ OPERATING FREQUENCY: 2685,000,000 Hz

▣ BANDWIDTH: 41540 (10 MHz)

▣ REFERENCE VOLTAGE: 3.860 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.860	+20(Ref)	2685 000 108	0.0	0.000 000	0.000
100 %		-30	2685 000 228	119.8	0.000 004	0.045
100 %		-20	2685 000 022	-86.1	-0.000 003	-0.032
100 %		-10	2684 999 989	-118.9	-0.000 004	-0.044
100 %		0	2685 000 221	112.6	0.000 004	0.042
100 %		+10	2685 000 000	-108.8	-0.000 004	-0.041
100 %		+30	2685 000 000	-108.5	-0.000 004	-0.040
100 %		+40	2685 000 223	114.6	0.000 004	0.043
100 %		+50	2685 000 023	-85.4	-0.000 003	-0.032
Batt. Endpoint	3.550	+20	2684 999 983	-125.3	-0.000 005	-0.047



▣ MODE: LTE 41

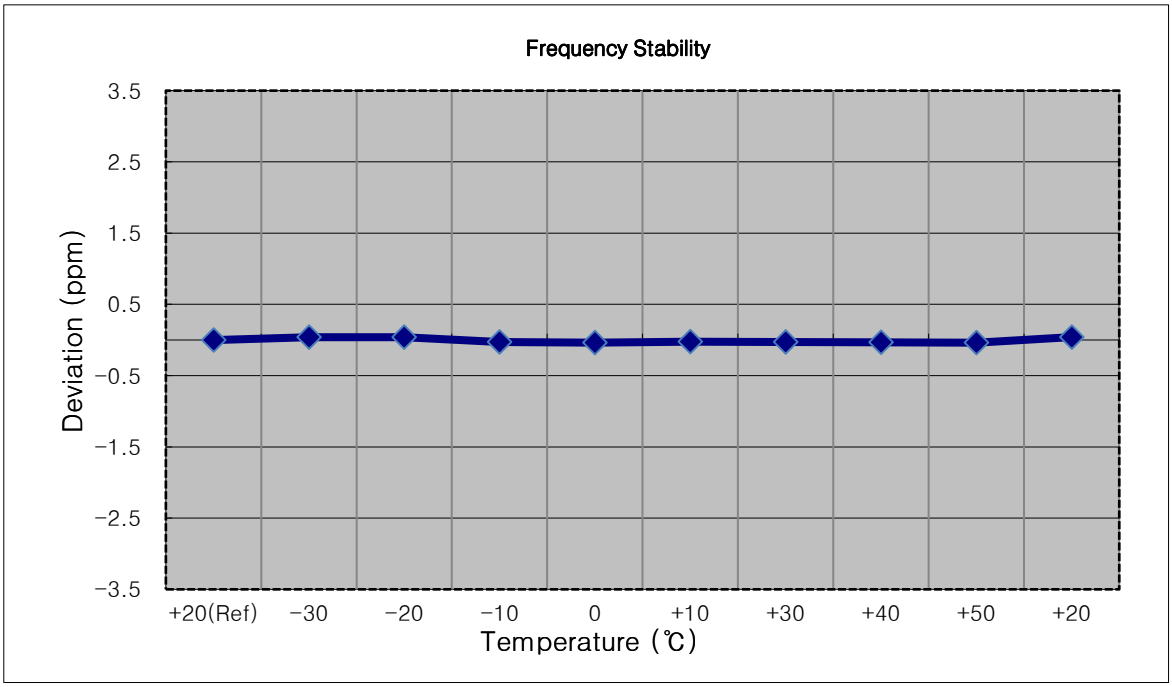
▣ OPERATING FREQUENCY: 2682,500,000 Hz

▣ BANDWIDTH: 41515 (15 MHz)

▣ REFERENCE VOLTAGE: 3.860 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.860	+20(Ref)	2682 499 896	0.0	0.000 000	0.000
100 %		-30	2682 500 003	106.6	0.000 004	0.040
100 %		-20	2682 499 999	103.0	0.000 004	0.038
100 %		-10	2682 499 821	-75.6	-0.000 003	-0.028
100 %		0	2682 499 800	-96.5	-0.000 004	-0.036
100 %		+10	2682 499 833	-63.6	-0.000 002	-0.024
100 %		+30	2682 499 817	-78.9	-0.000 003	-0.029
100 %		+40	2682 499 803	-93.2	-0.000 003	-0.035
100 %		+50	2682 499 794	-102.3	-0.000 004	-0.038
Batt. Endpoint	3.550	+20	2682 500 004	108.1	0.000 004	0.040



▣ MODE: LTE 41

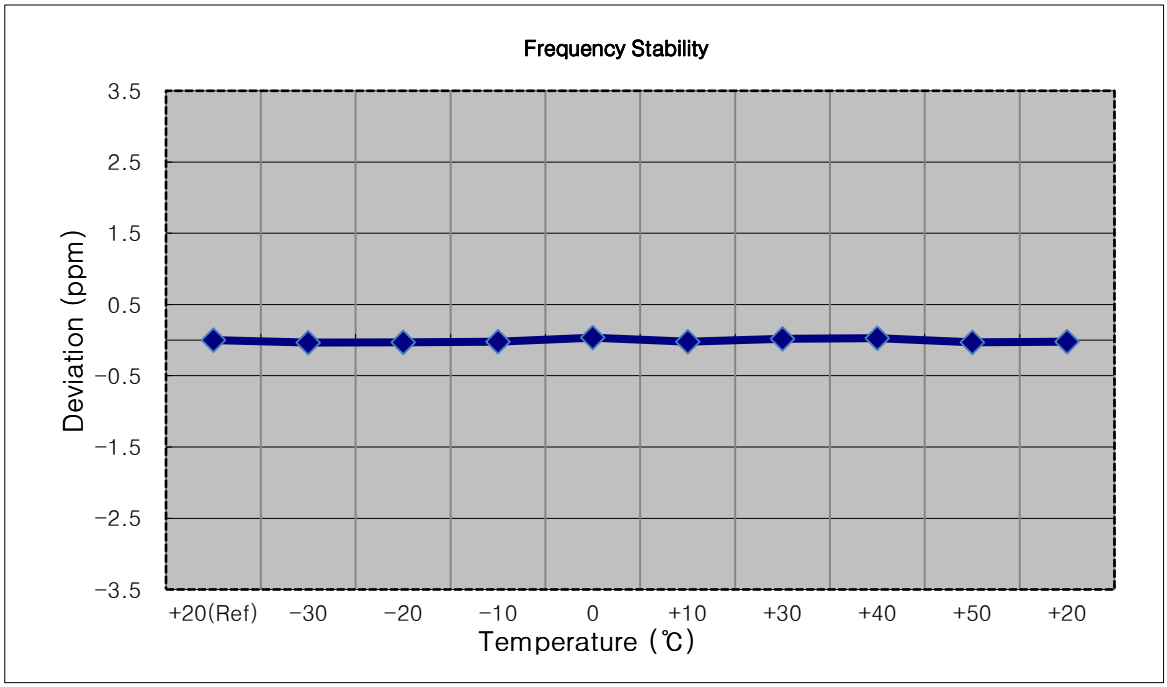
▣ OPERATING FREQUENCY: 2680,000,000 Hz

▣ BANDWIDTH: 41490 (20 MHz)

▣ REFERENCE VOLTAGE: 3.860 VDC

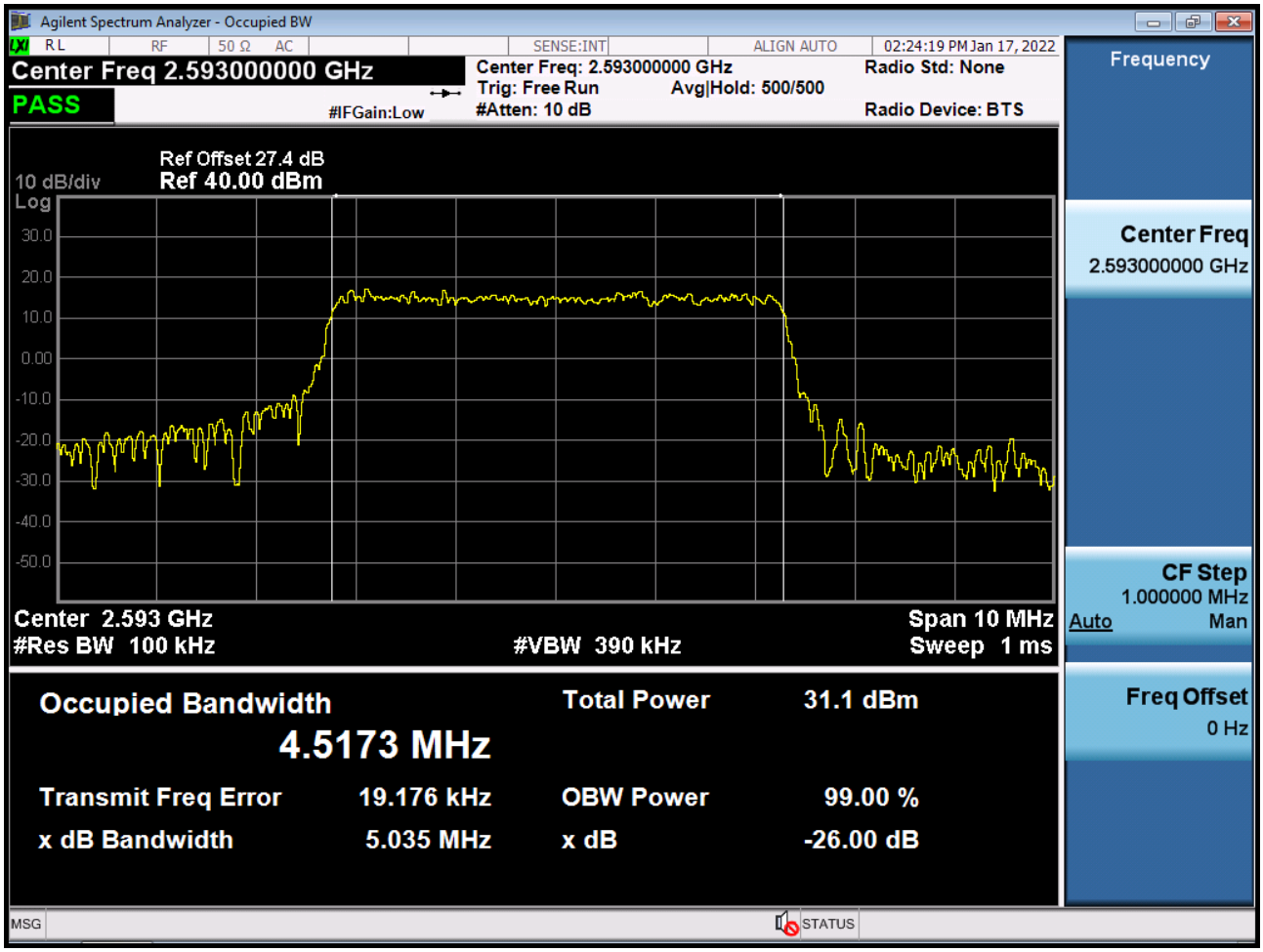
▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.860	+20(Ref)	2679 999 906	0.0	0.000 000	0.000
100 %		-30	2679 999 813	-92.6	-0.000 003	-0.035
100 %		-20	2679 999 821	-84.9	-0.000 003	-0.032
100 %		-10	2679 999 845	-61.1	-0.000 002	-0.023
100 %		0	2679 999 997	91.4	0.000 003	0.034
100 %		+10	2679 999 842	-64.4	-0.000 002	-0.024
100 %		+30	2679 999 950	43.7	0.000 002	0.016
100 %		+40	2679 999 978	72.5	0.000 003	0.027
100 %		+50	2679 999 822	-83.8	-0.000 003	-0.031
Batt. Endpoint	3.550	+20	2679 999 842	-63.9	-0.000 002	-0.024

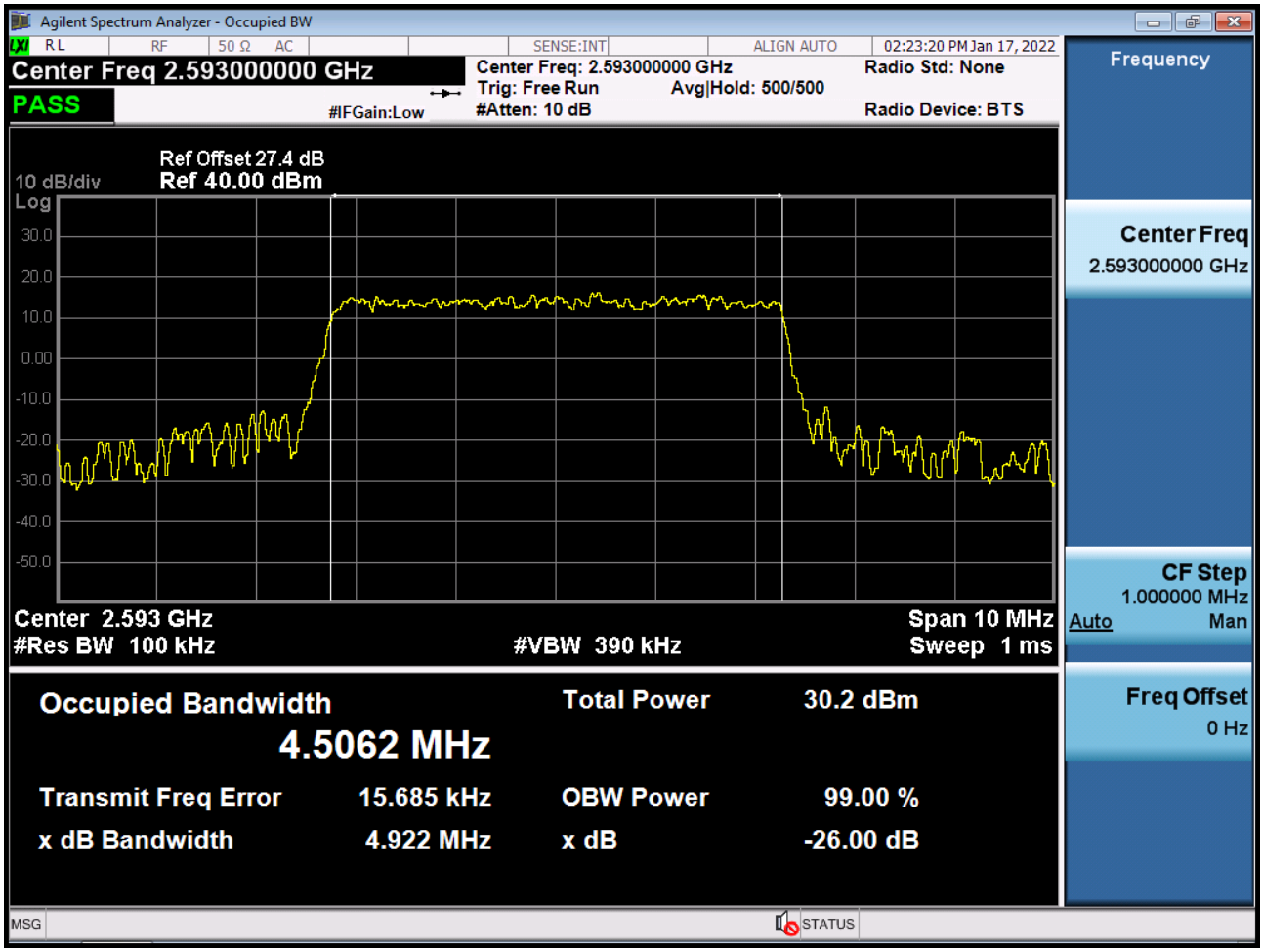


9. TEST PLOTS

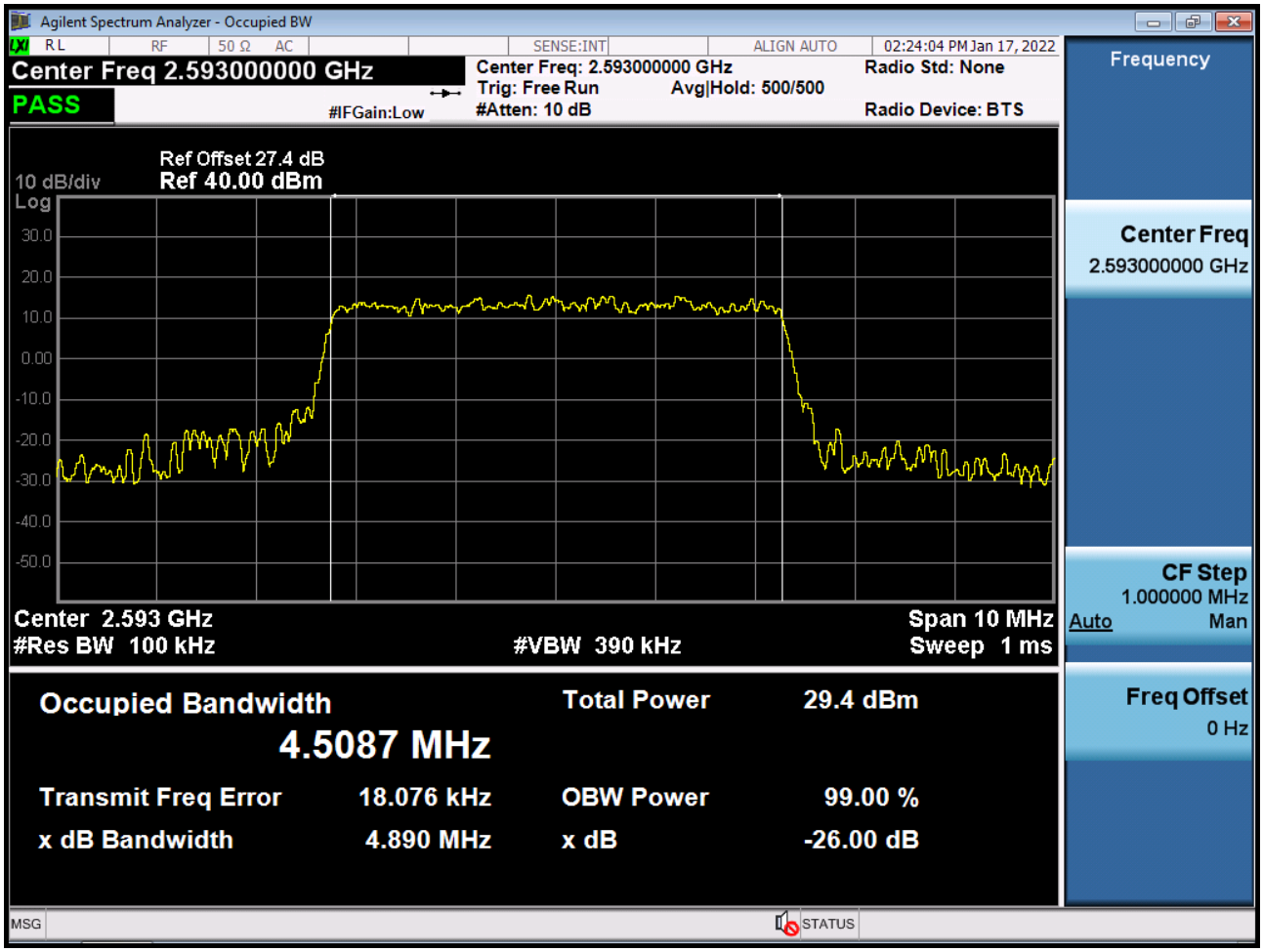
Occupied Bandwidth Plot (5 MHz Ch.40620 QPSK RB 25)



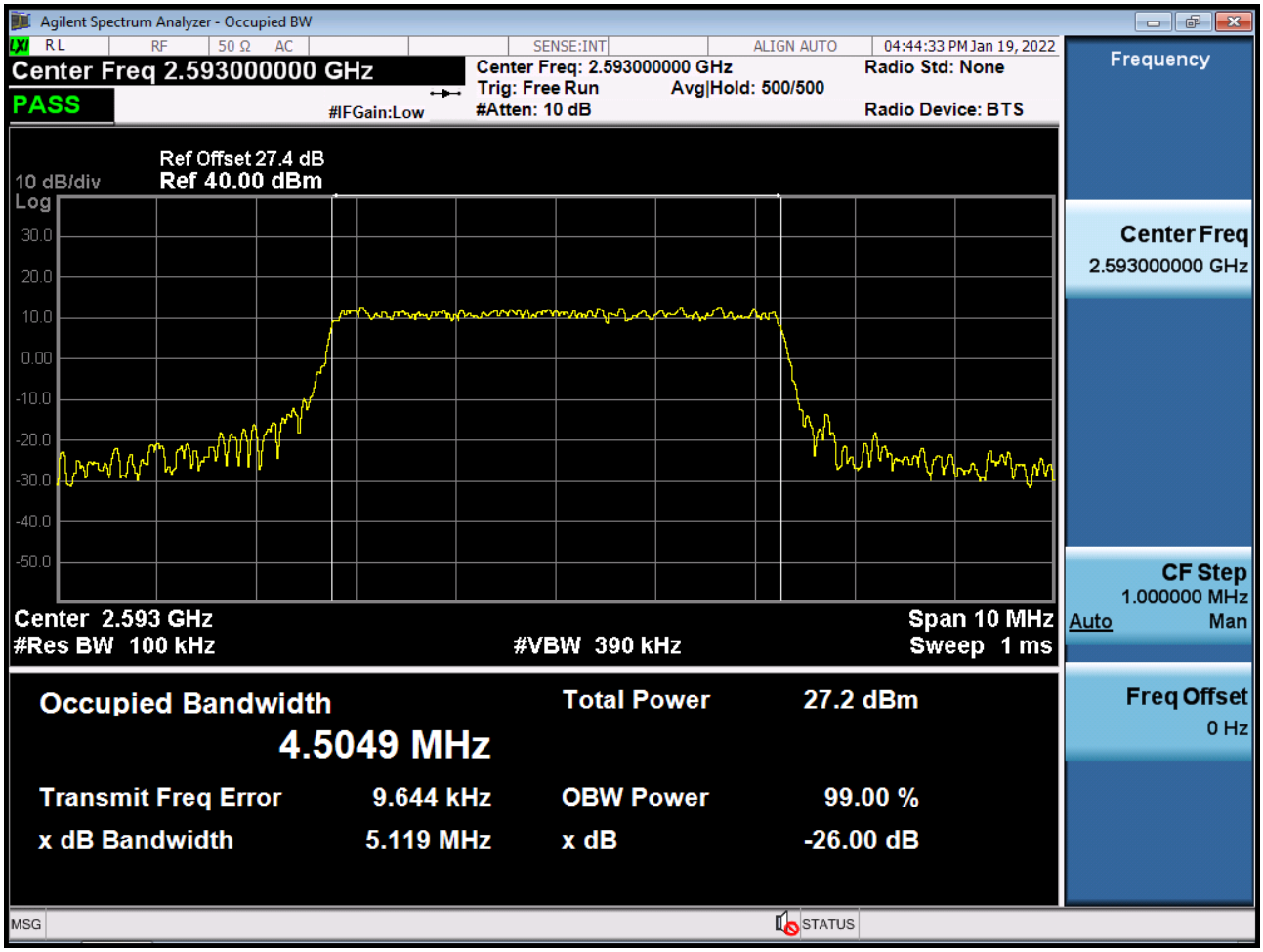
Occupied Bandwidth Plot (5 MHz Ch.40620 16-QAM RB 25)



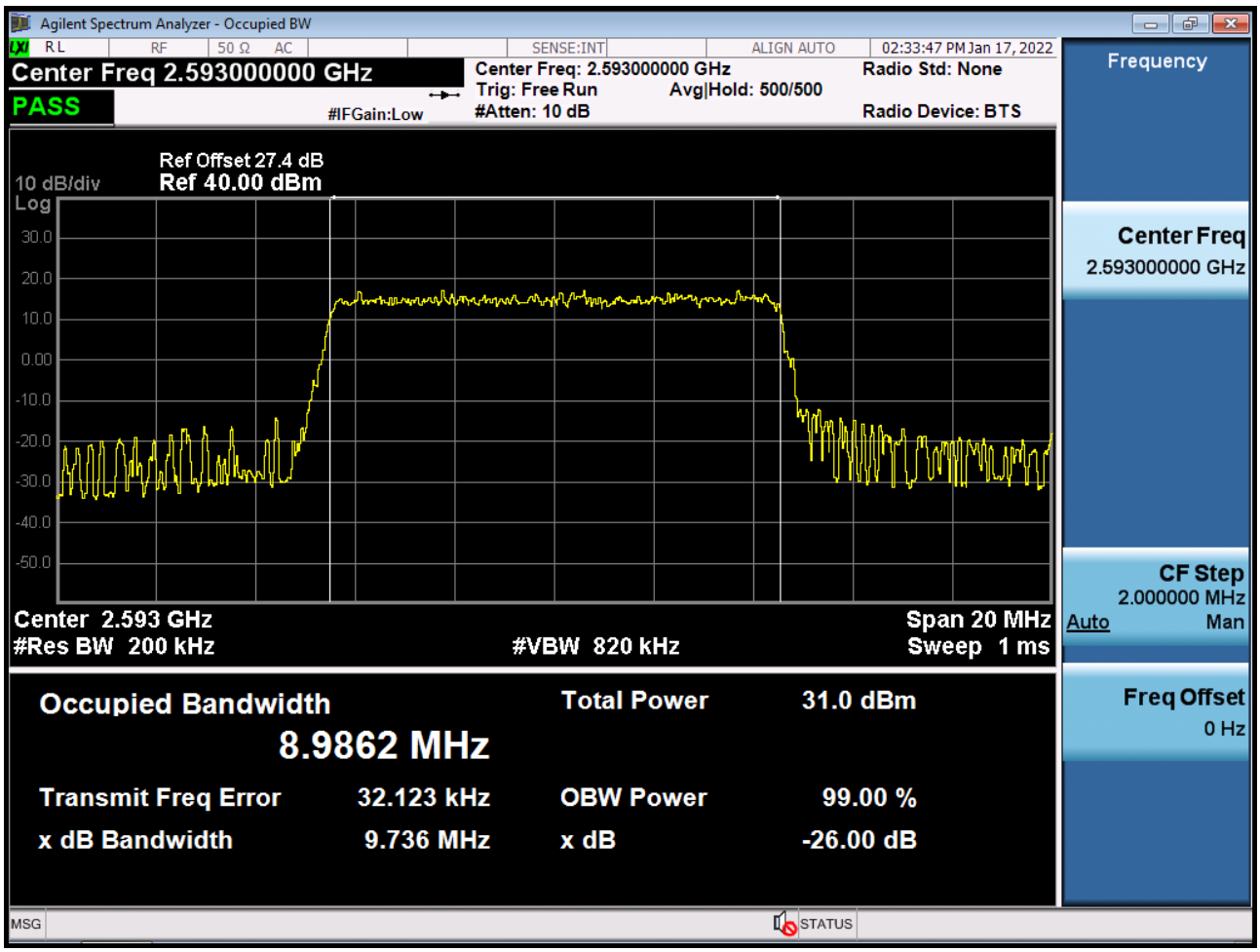
Occupied Bandwidth Plot (5 MHz Ch.40620 64-QAM RB 25)



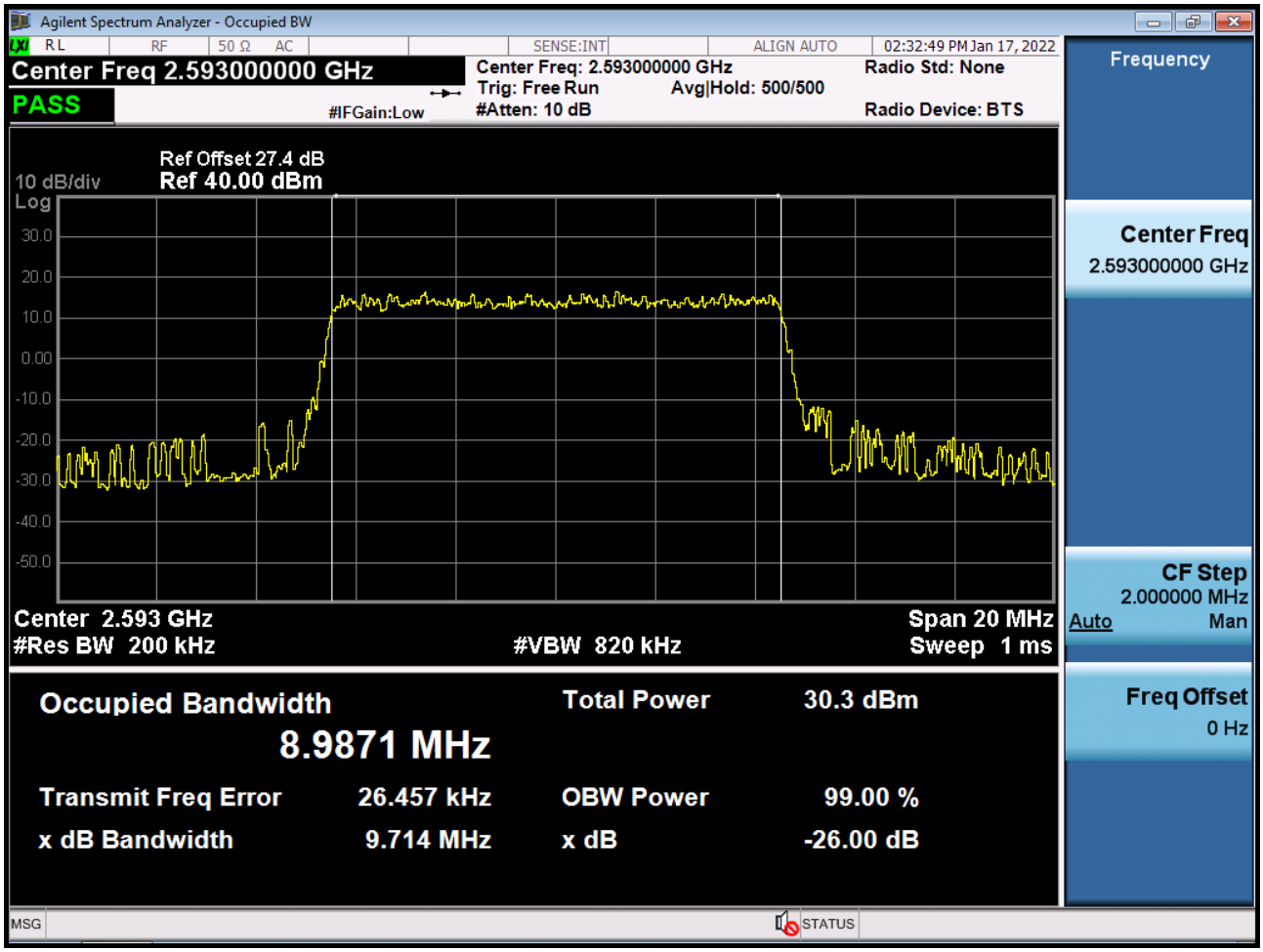
Occupied Bandwidth Plot (5 MHz Ch.40620 256-QAM RB 25)



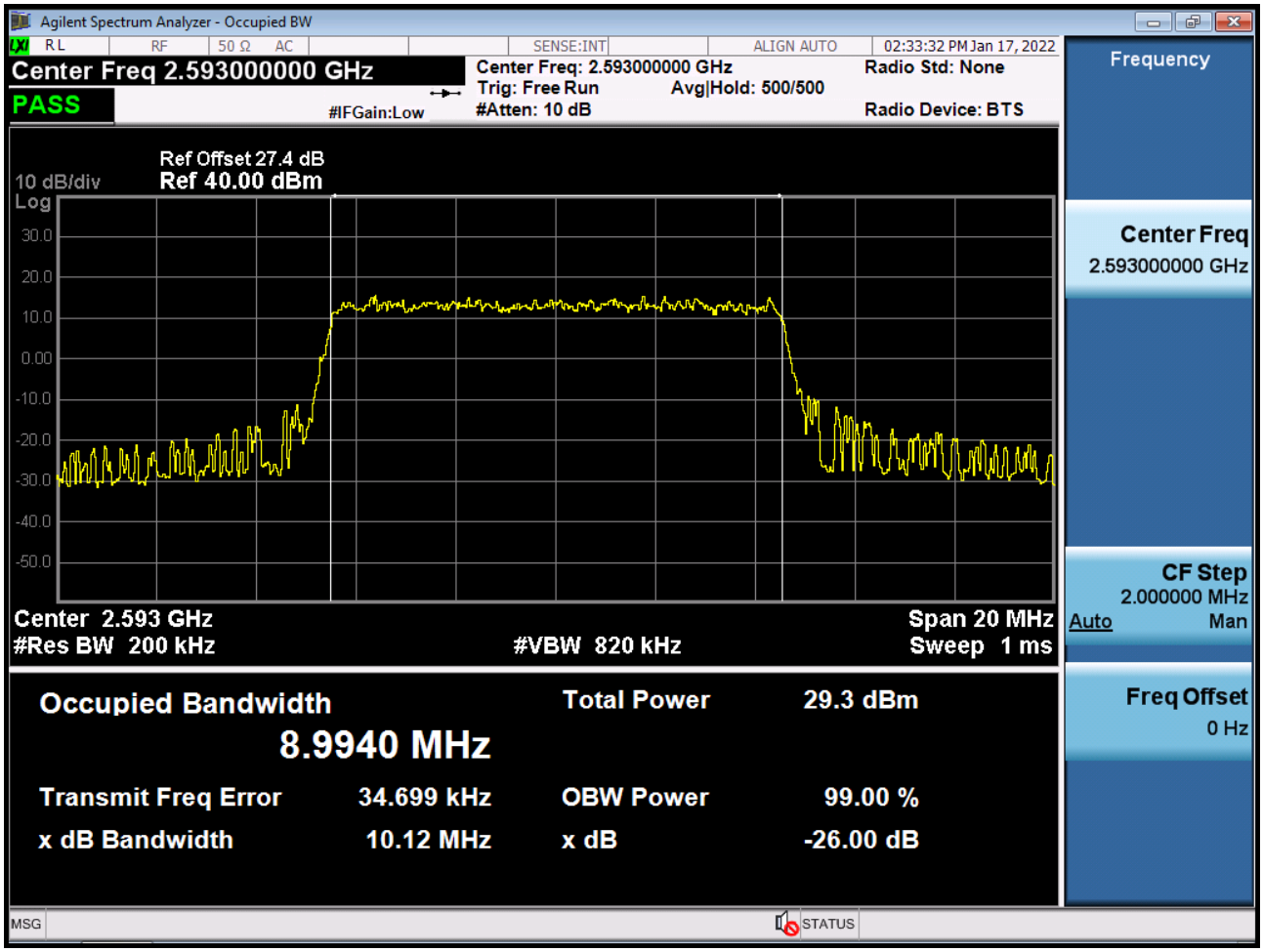
Occupied Bandwidth Plot (10 MHz Ch.40620 QPSK RB 50)



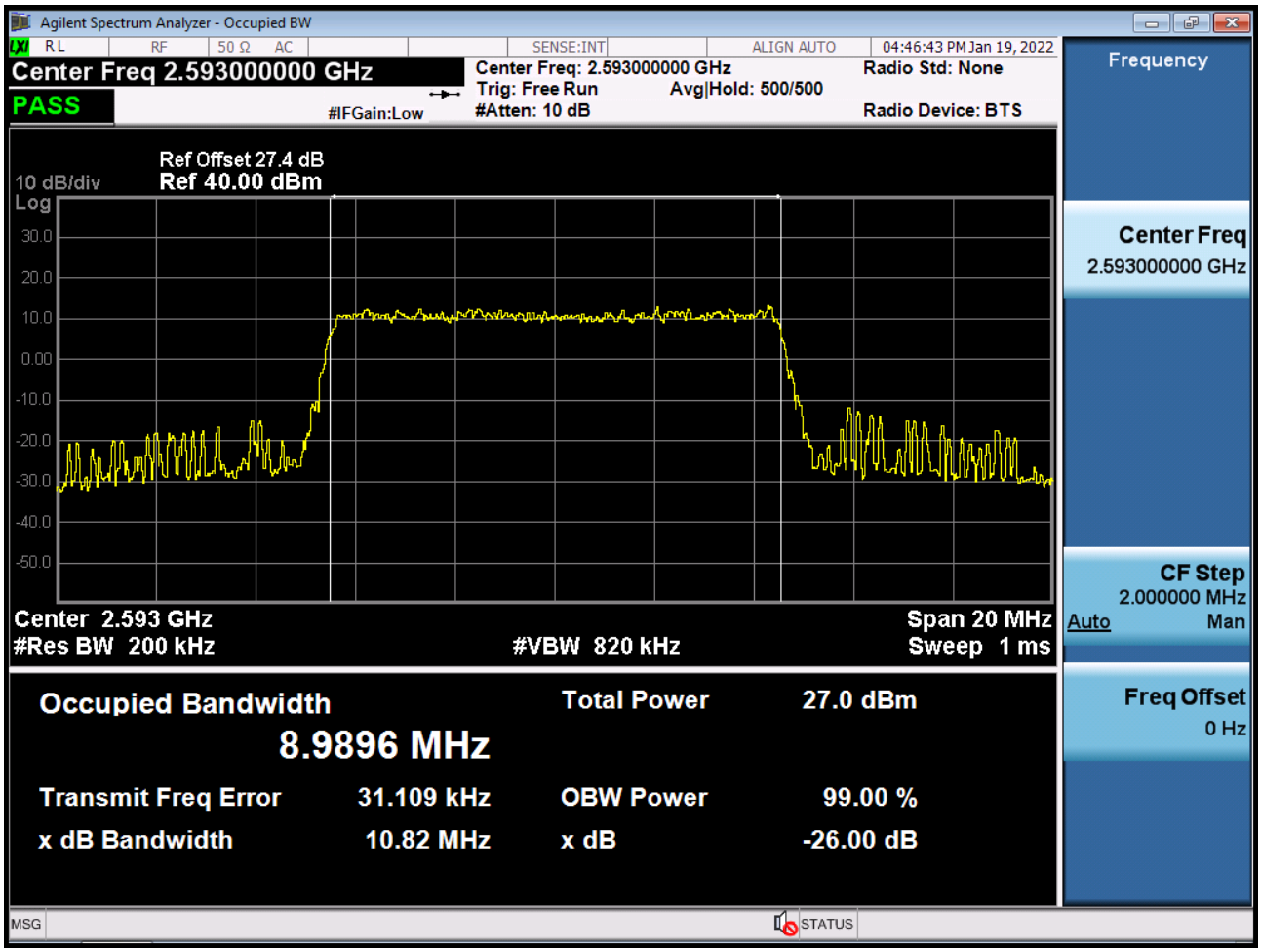
Occupied Bandwidth Plot (10 MHz Ch.40620 16-QAM RB 50)



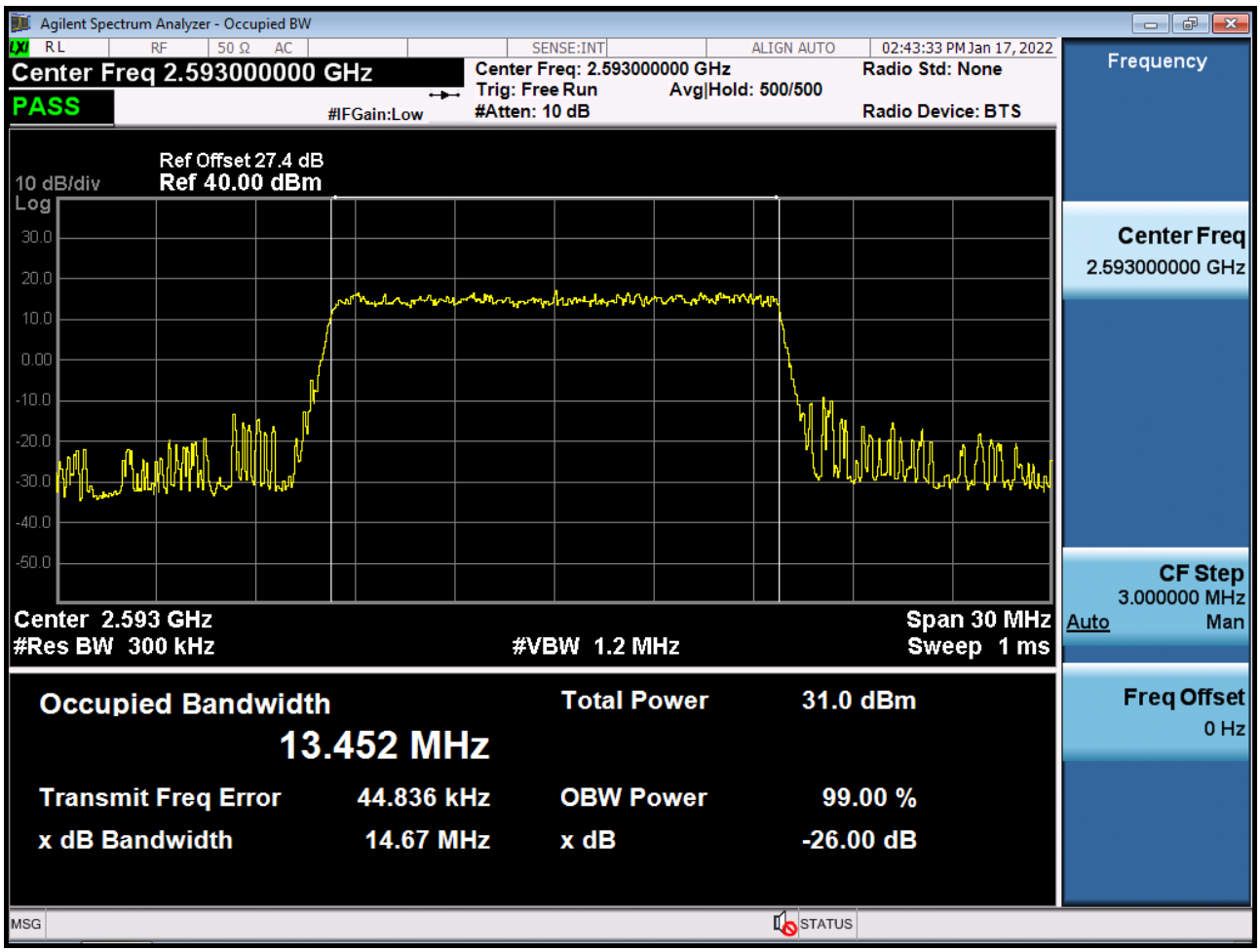
Occupied Bandwidth Plot (10 MHz Ch.40620 64-QAM RB 50)



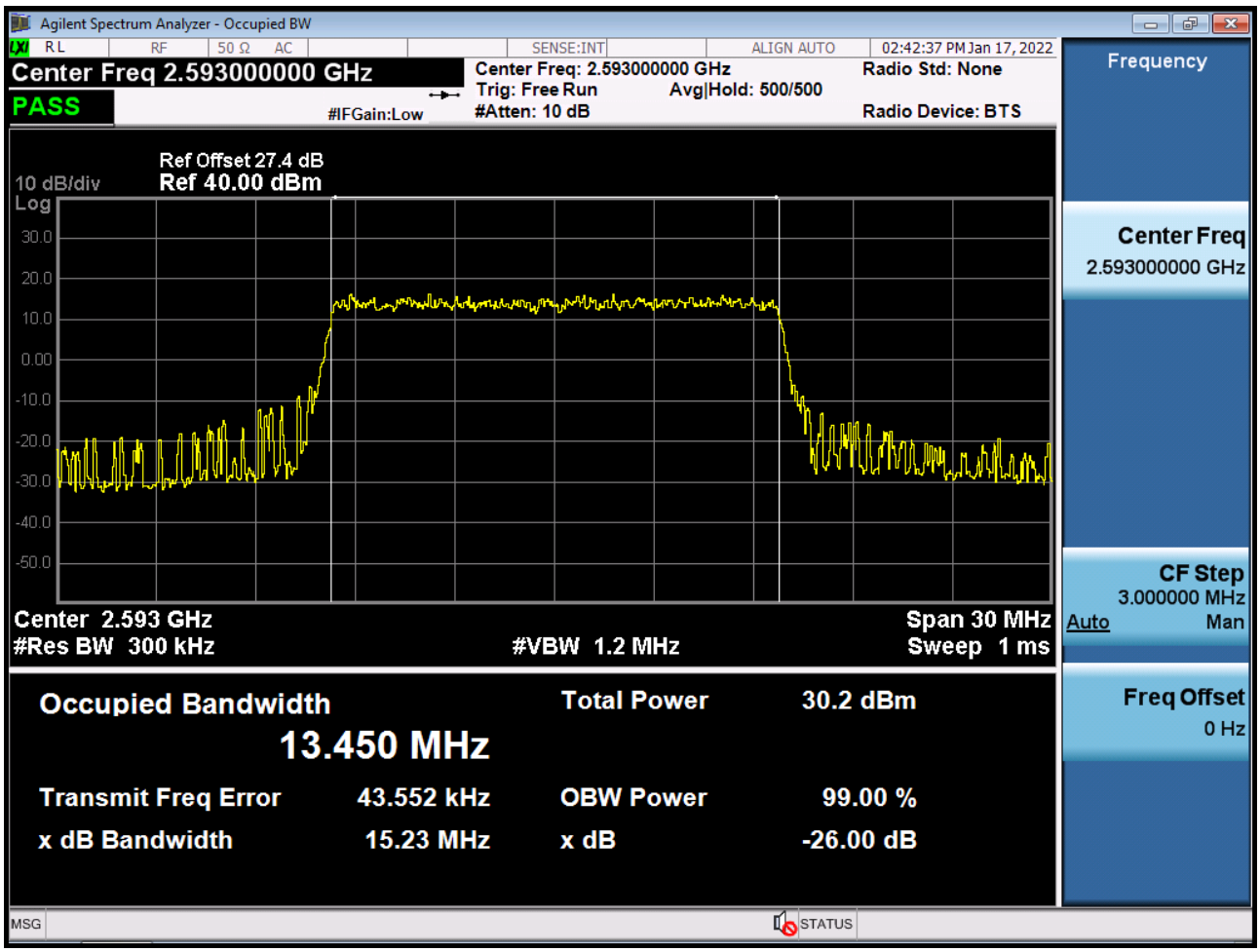
Occupied Bandwidth Plot (10 MHz Ch.40620 256-QAM RB 50)



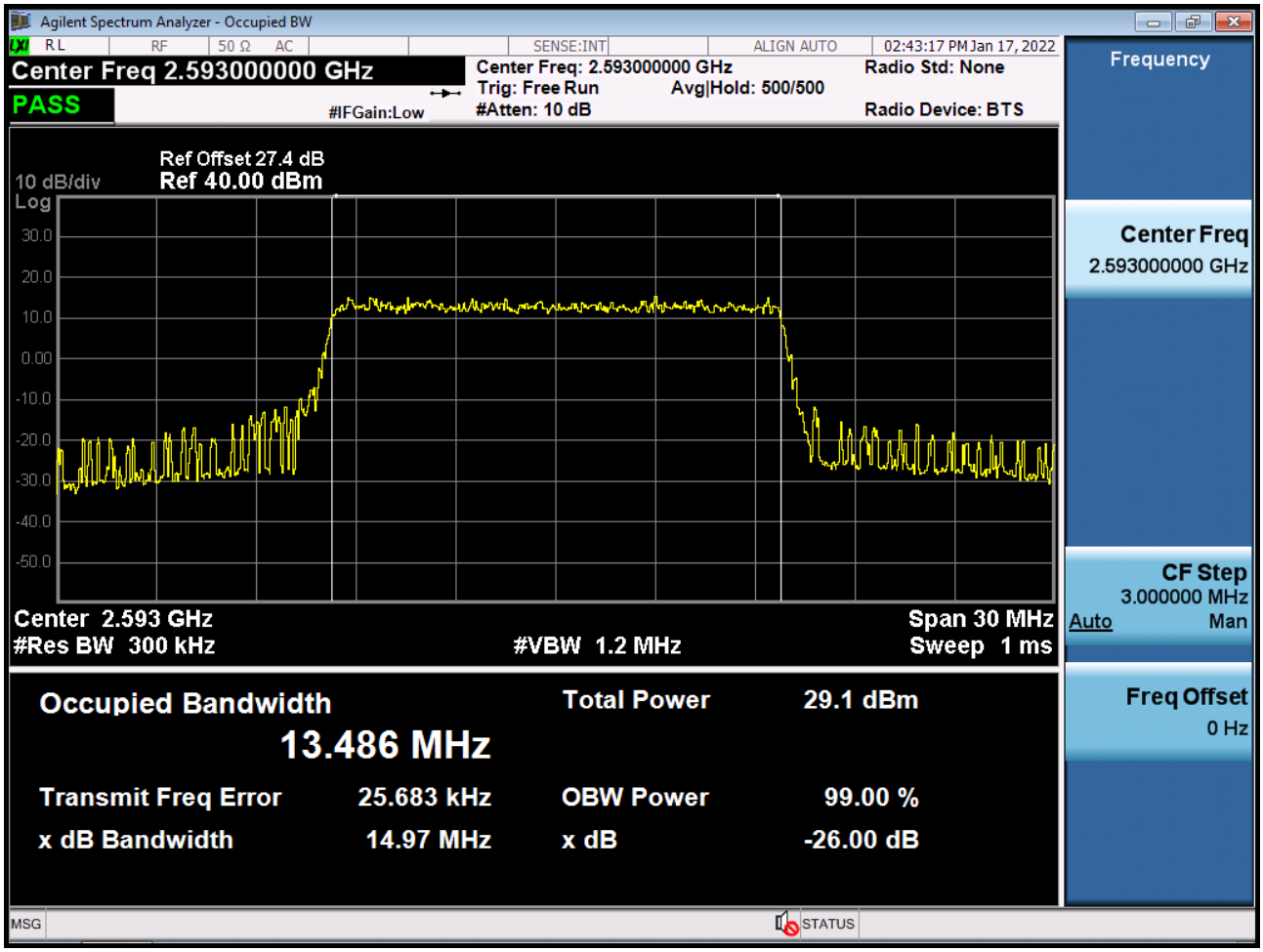
Occupied Bandwidth Plot (15 MHz Ch.40620 QPSK RB 75)



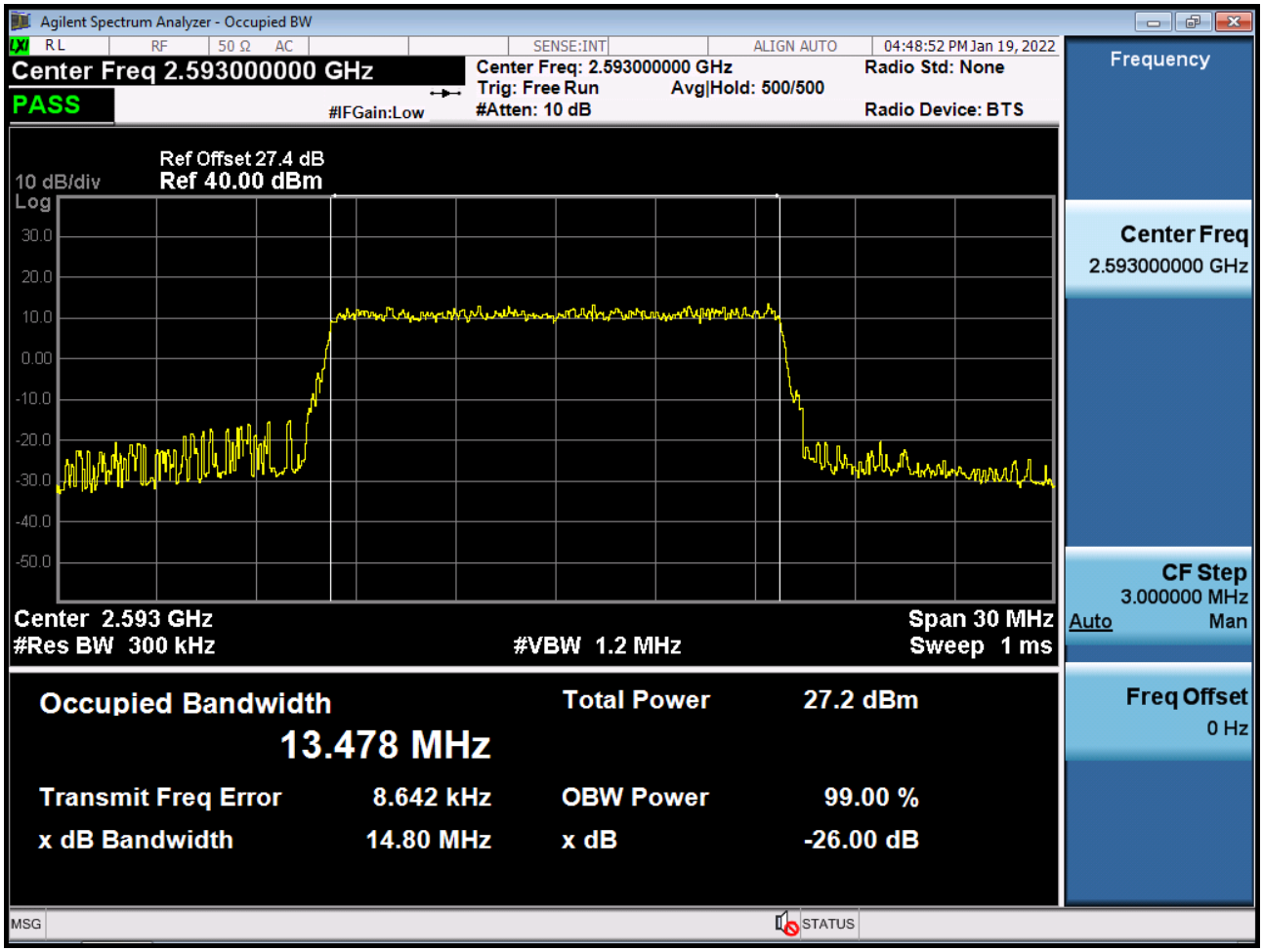
Occupied Bandwidth Plot (15 MHz Ch.40620 16-QAM RB 75)



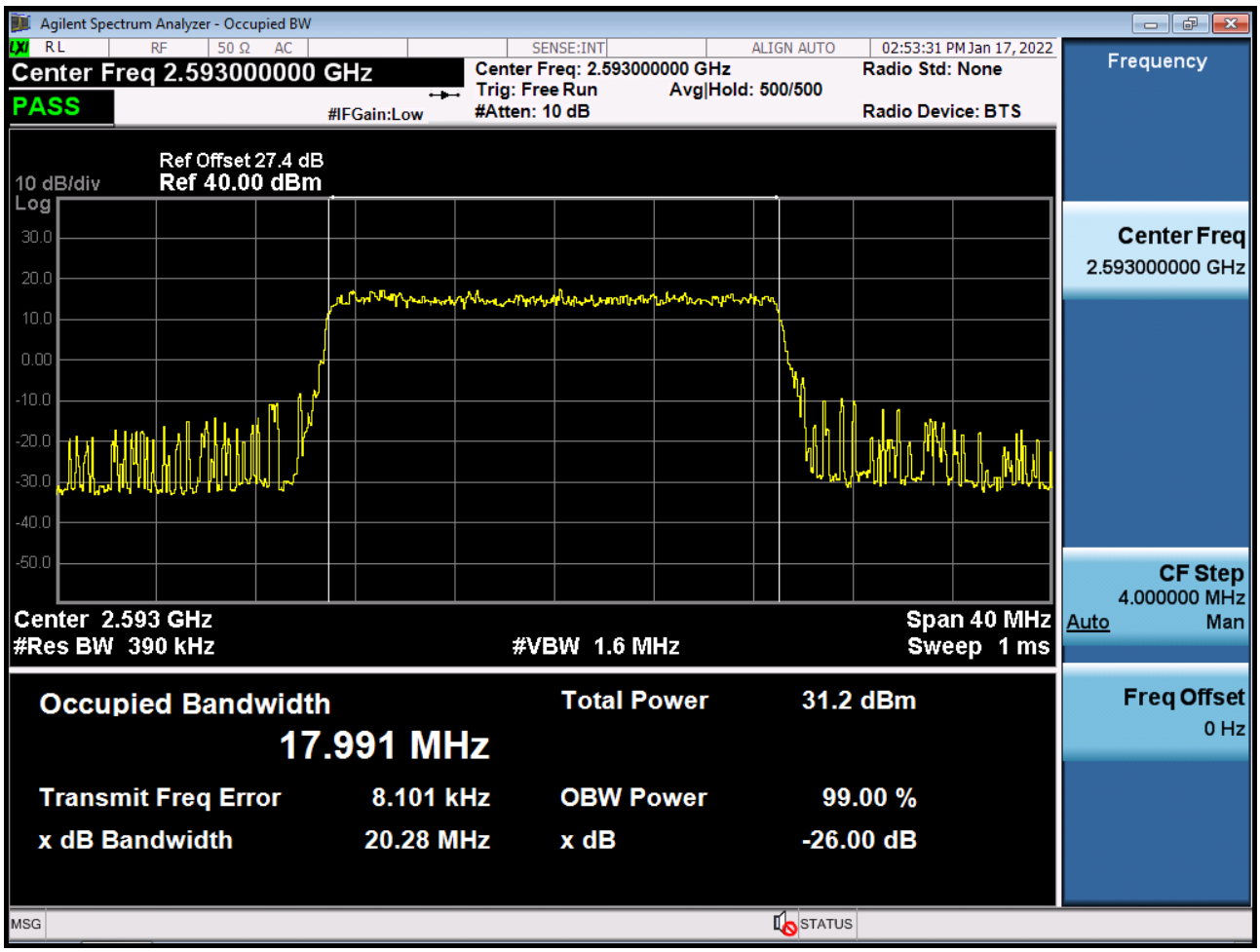
Occupied Bandwidth Plot (15 MHz Ch.40620 64-QAM RB 75)



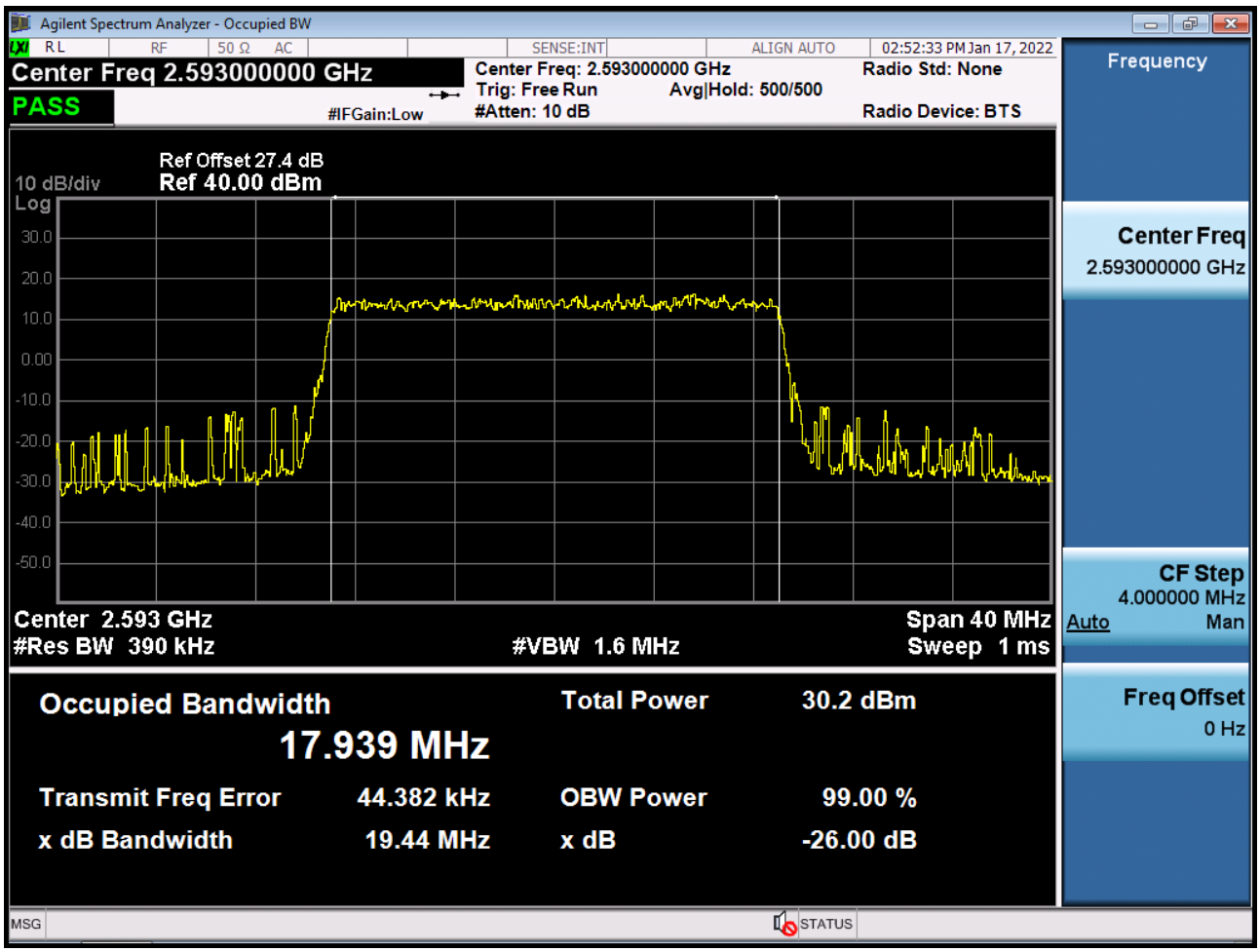
Occupied Bandwidth Plot (15 MHz Ch.40620 256-QAM RB 75)



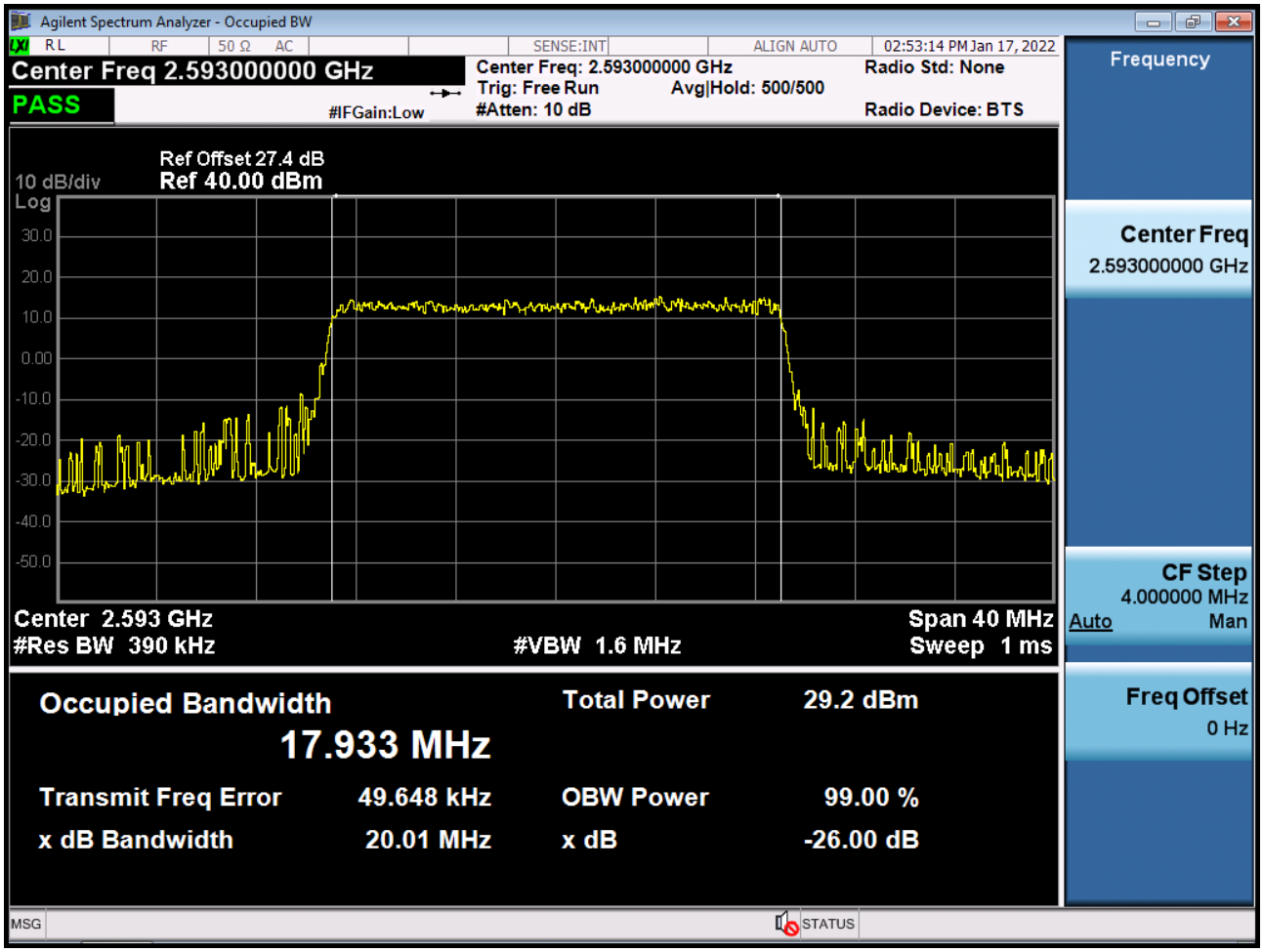
Occupied Bandwidth Plot (20 MHz Ch.40620 QPSK RB 100)



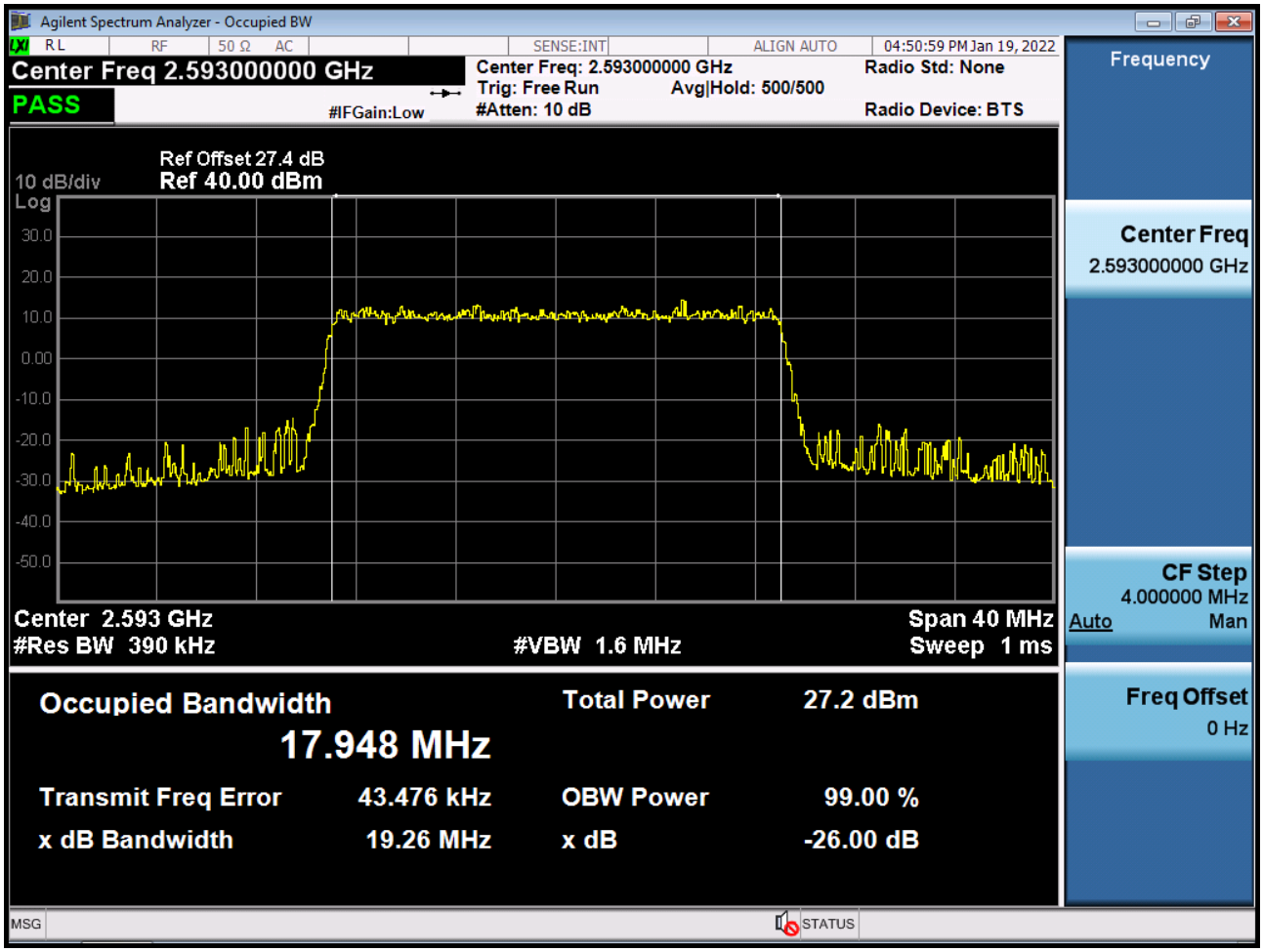
Occupied Bandwidth Plot (20 MHz Ch.40620 16-QAM RB 100)



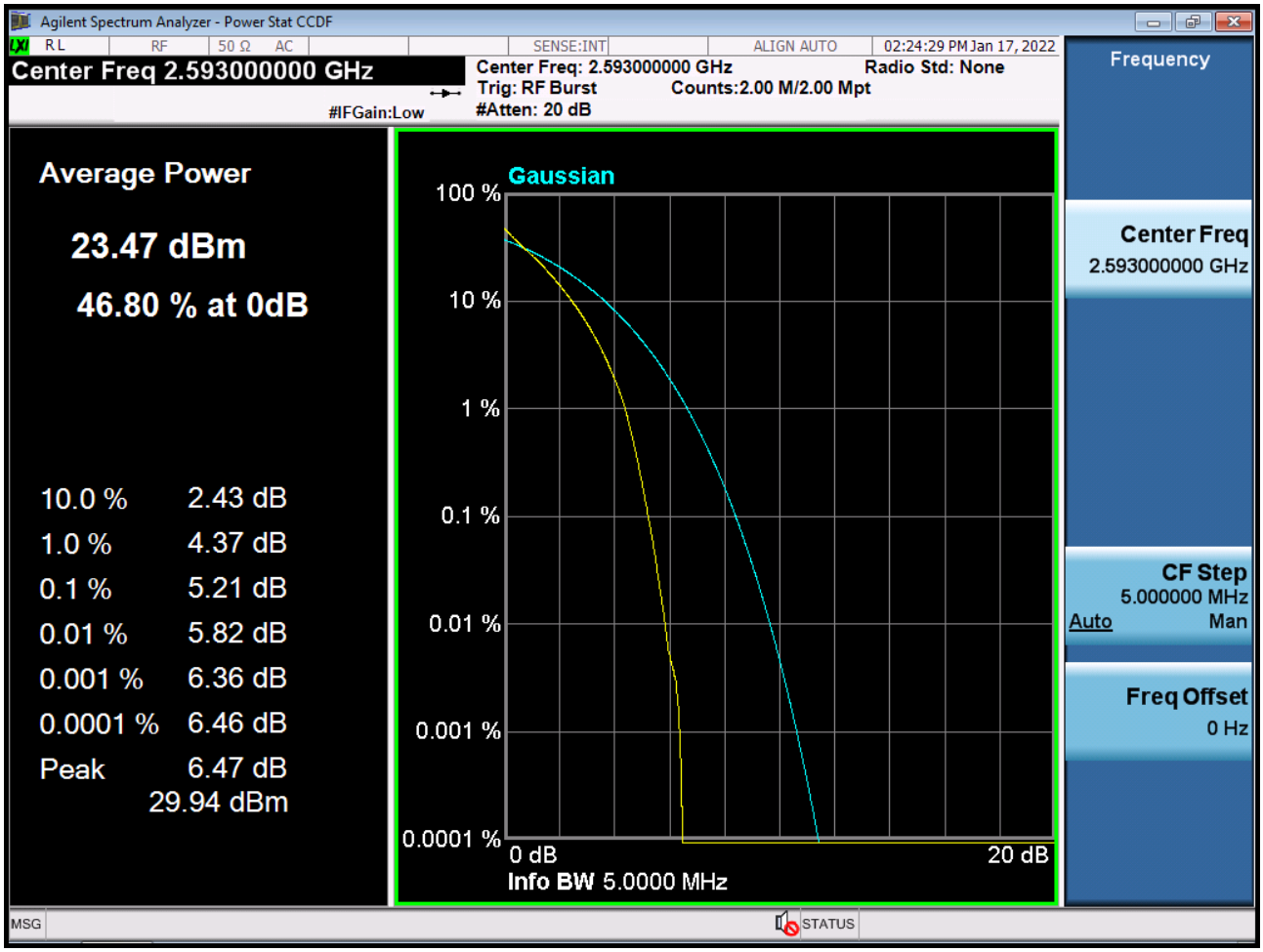
Occupied Bandwidth Plot (20 MHz Ch.40620 64-QAM RB 100)



Occupied Bandwidth Plot (20 MHz Ch.40620 256-QAM RB 100)

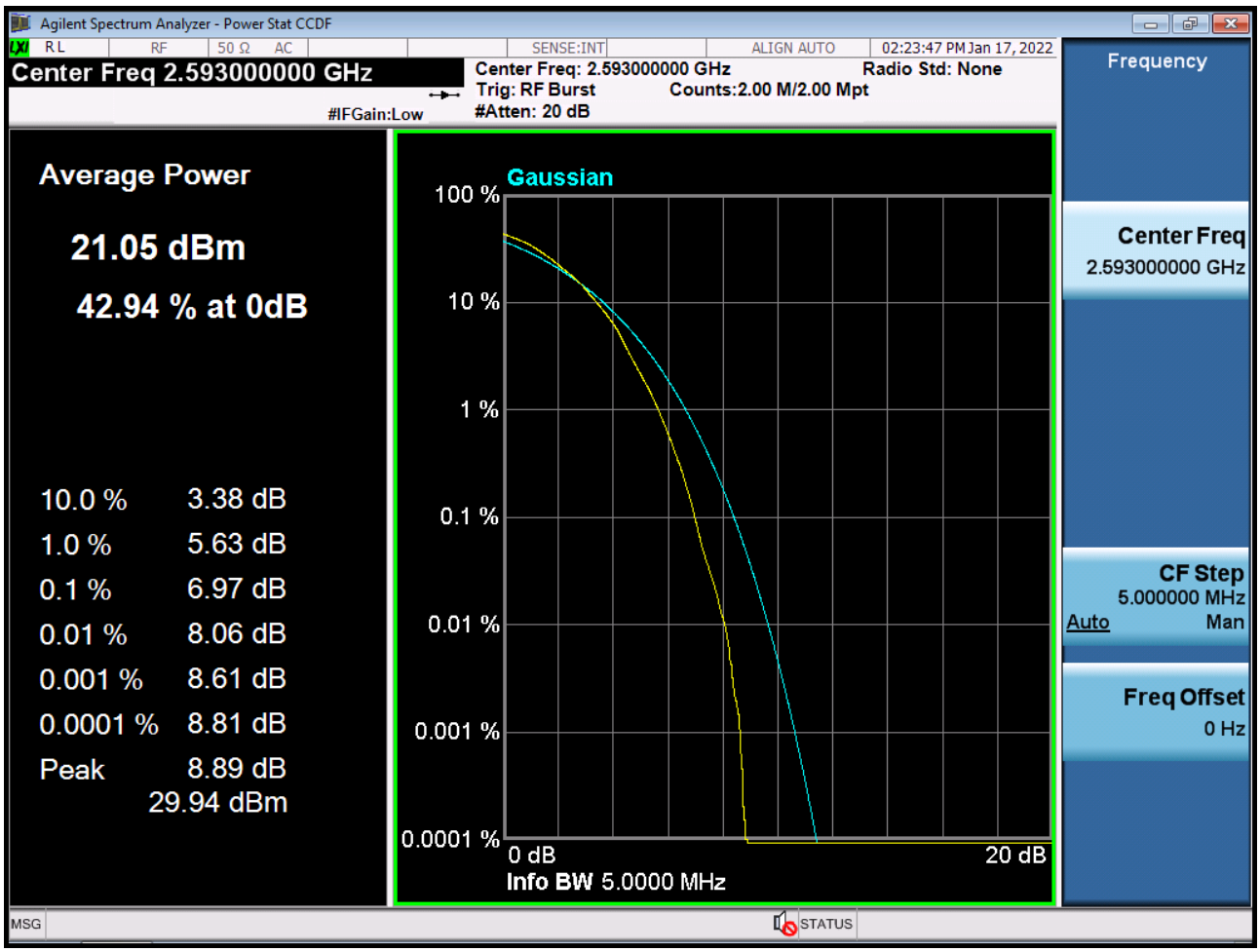


PAR Plot (5 M BW_Ch.40620_QPSK_RB25_0)

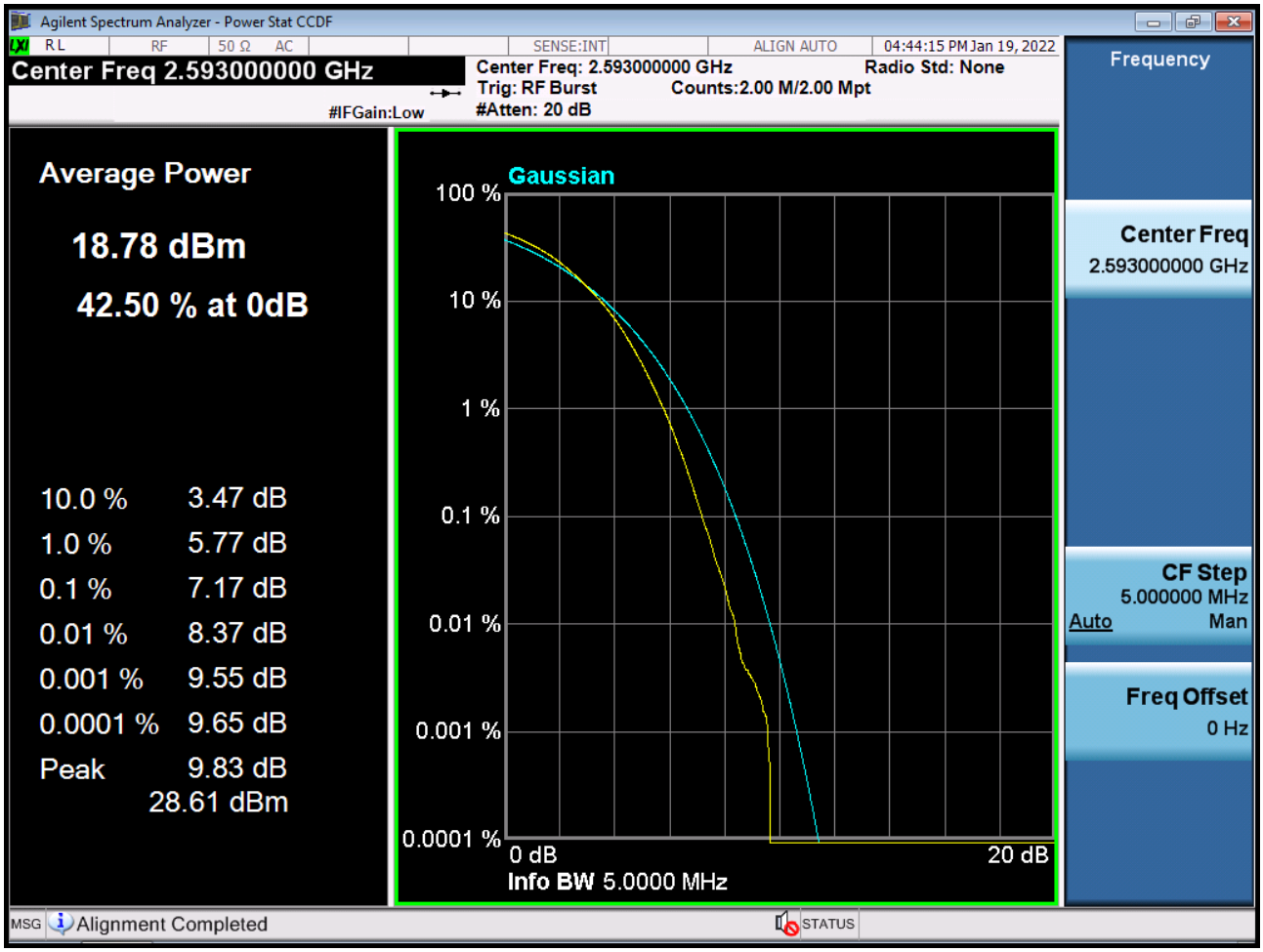


PAR Plot (5 M BW_Ch.40620_16QAM_RB25_0)

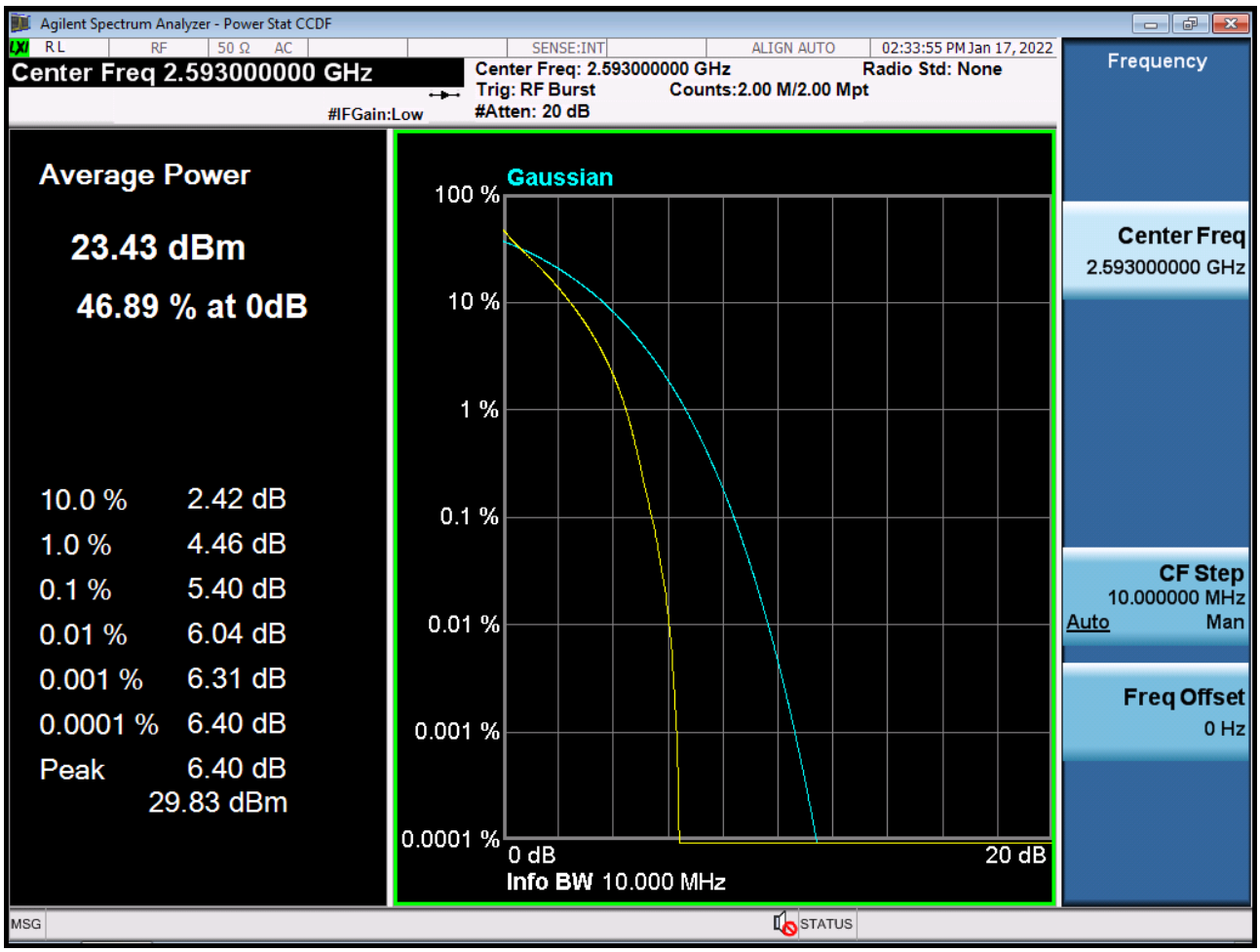
PAR Plot (5 M BW_Ch.40620_64QAM_RB25_0)



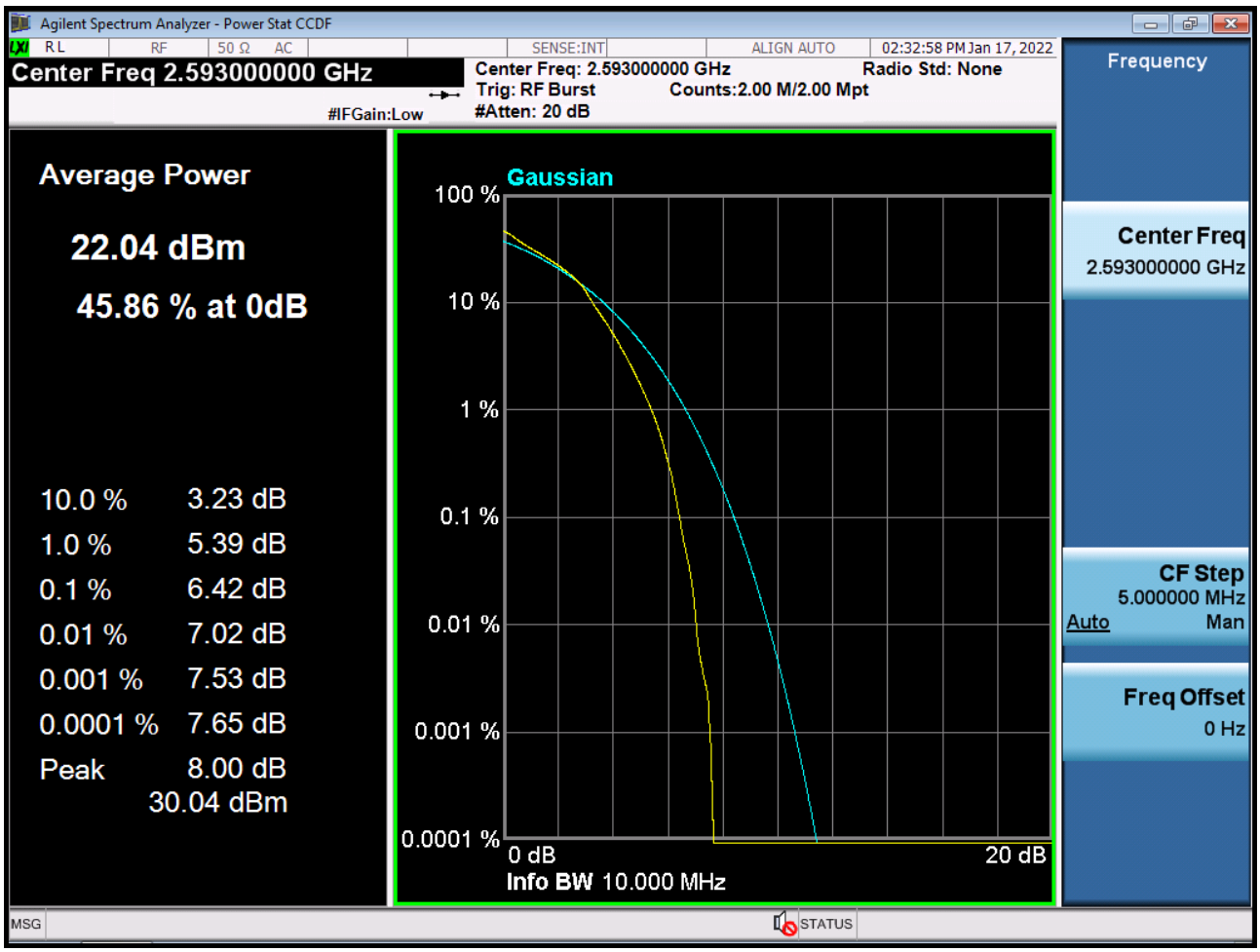
PAR Plot (5 M BW_Ch.40620_256QAM_RB25_0)



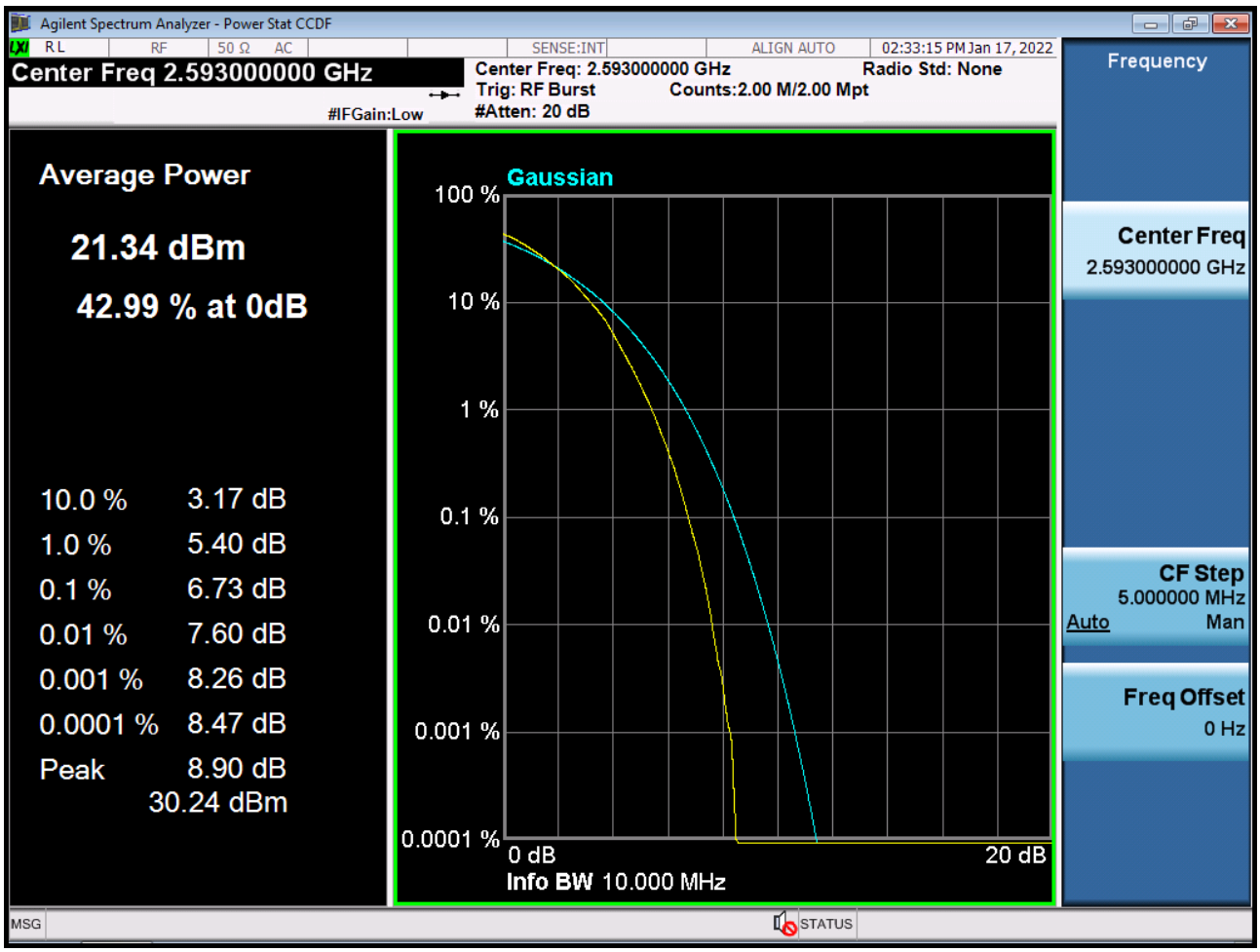
PAR Plot (10 M BW_Ch.40620_QPSK_RB50_0)



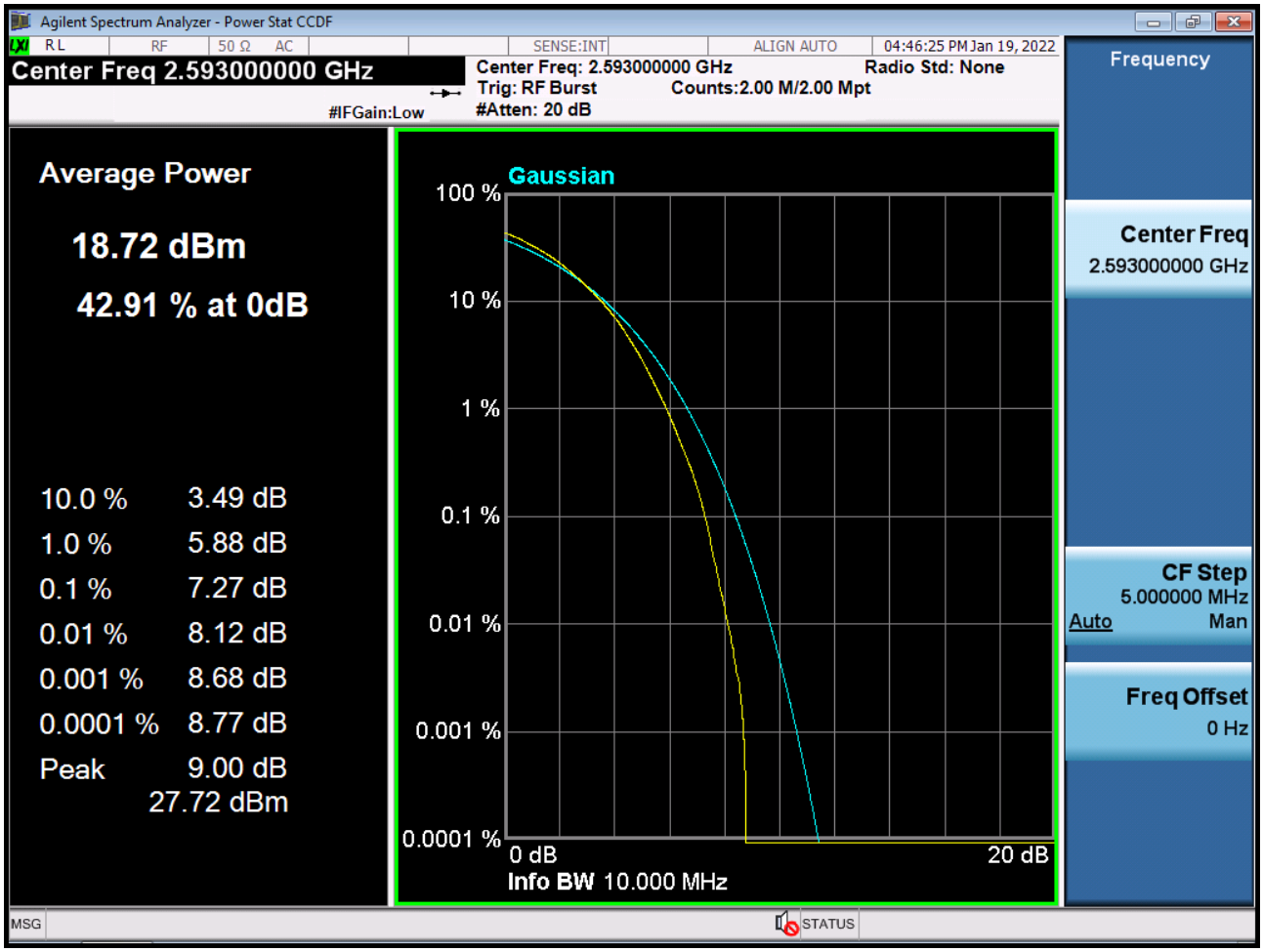
PAR Plot (10 M BW_Ch.40620_16QAM_RB50_0)



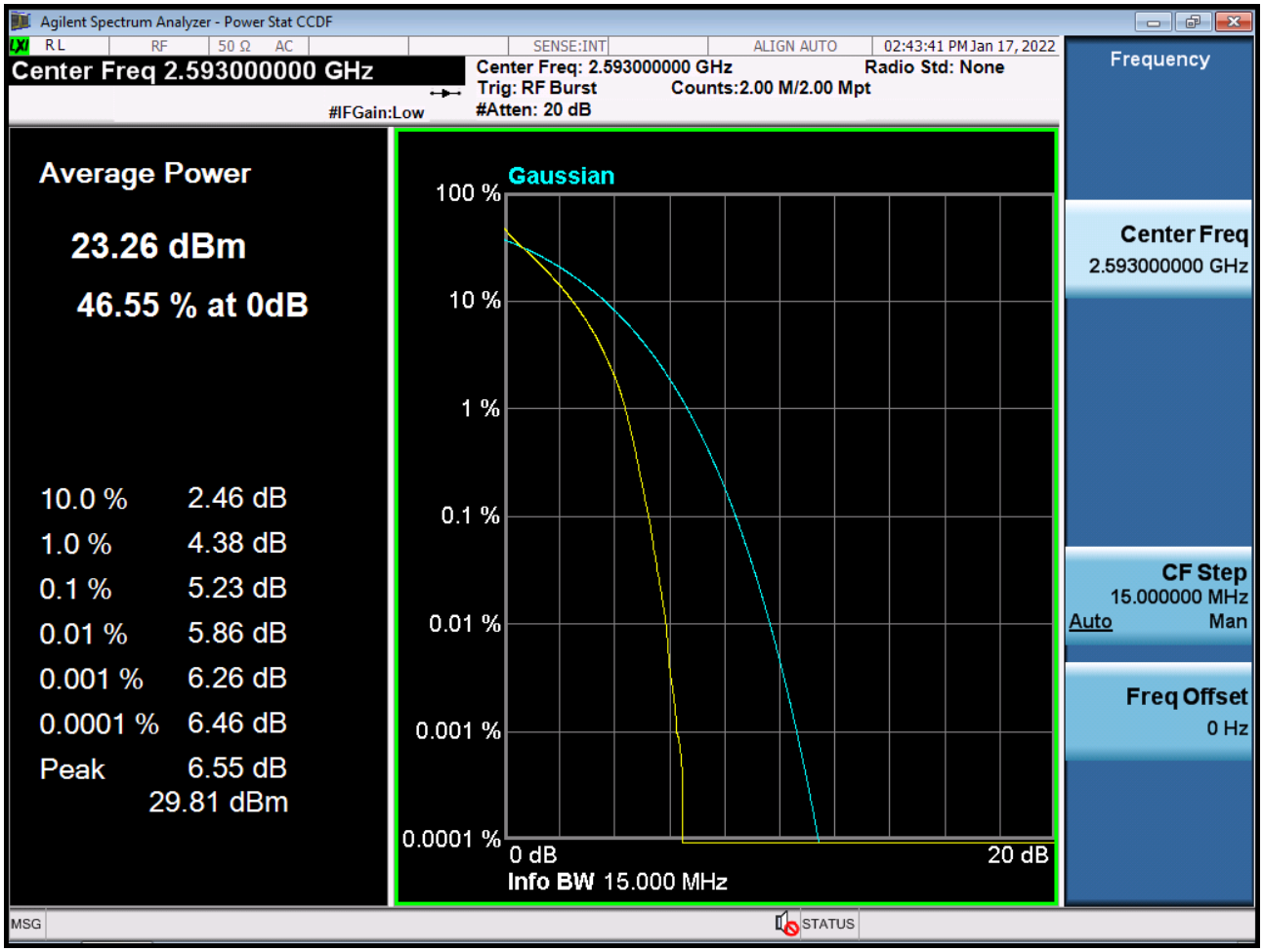
PAR Plot (10 M BW_Ch.40620_64QAM_RB50_0)



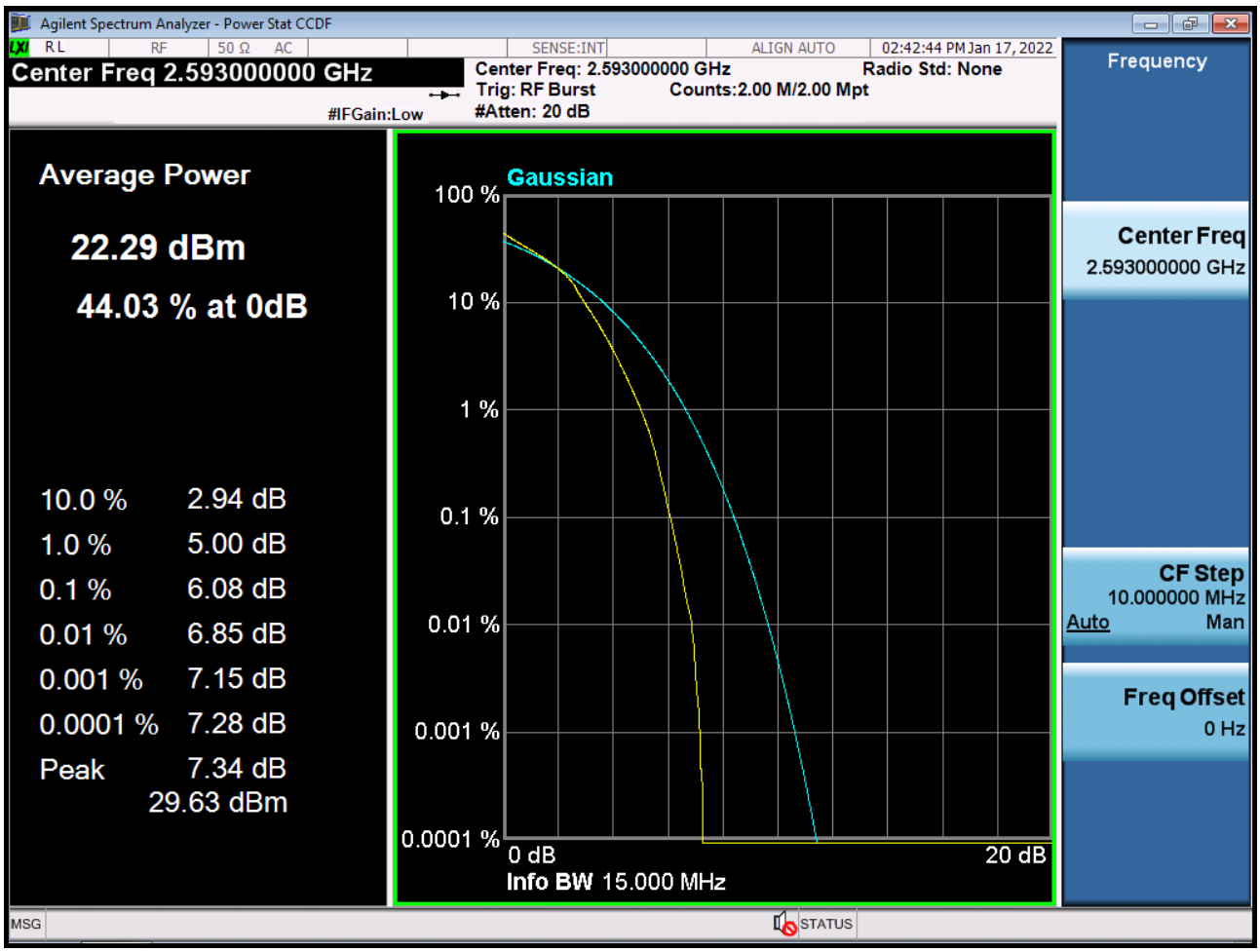
PAR Plot (10 M BW_Ch.40620_256QAM_RB50_0)



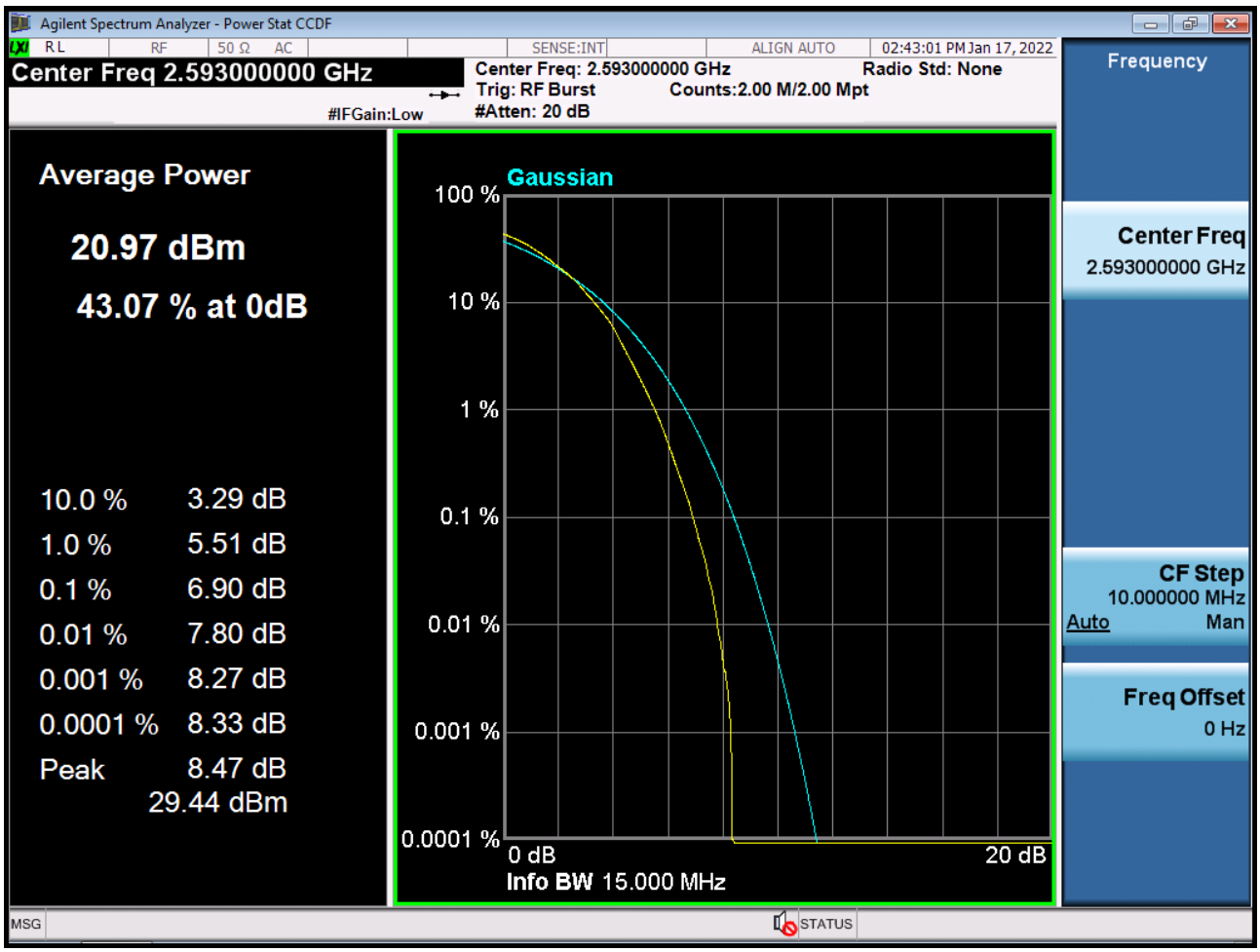
PAR Plot (15 M BW_Ch.40620_QPSK_RB75_0)



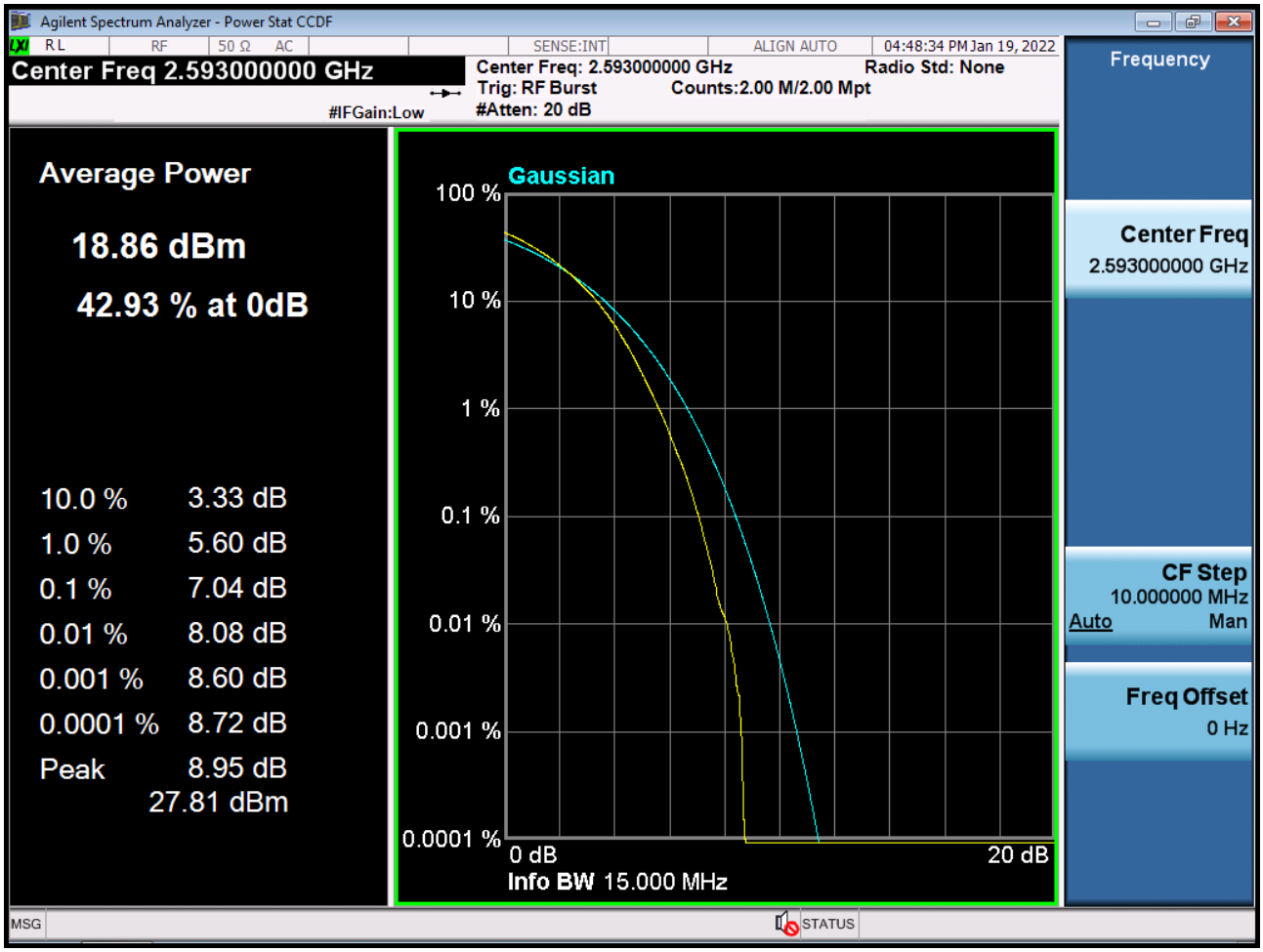
PAR Plot (15 M BW_Ch.40620_16QAM_RB75_0)



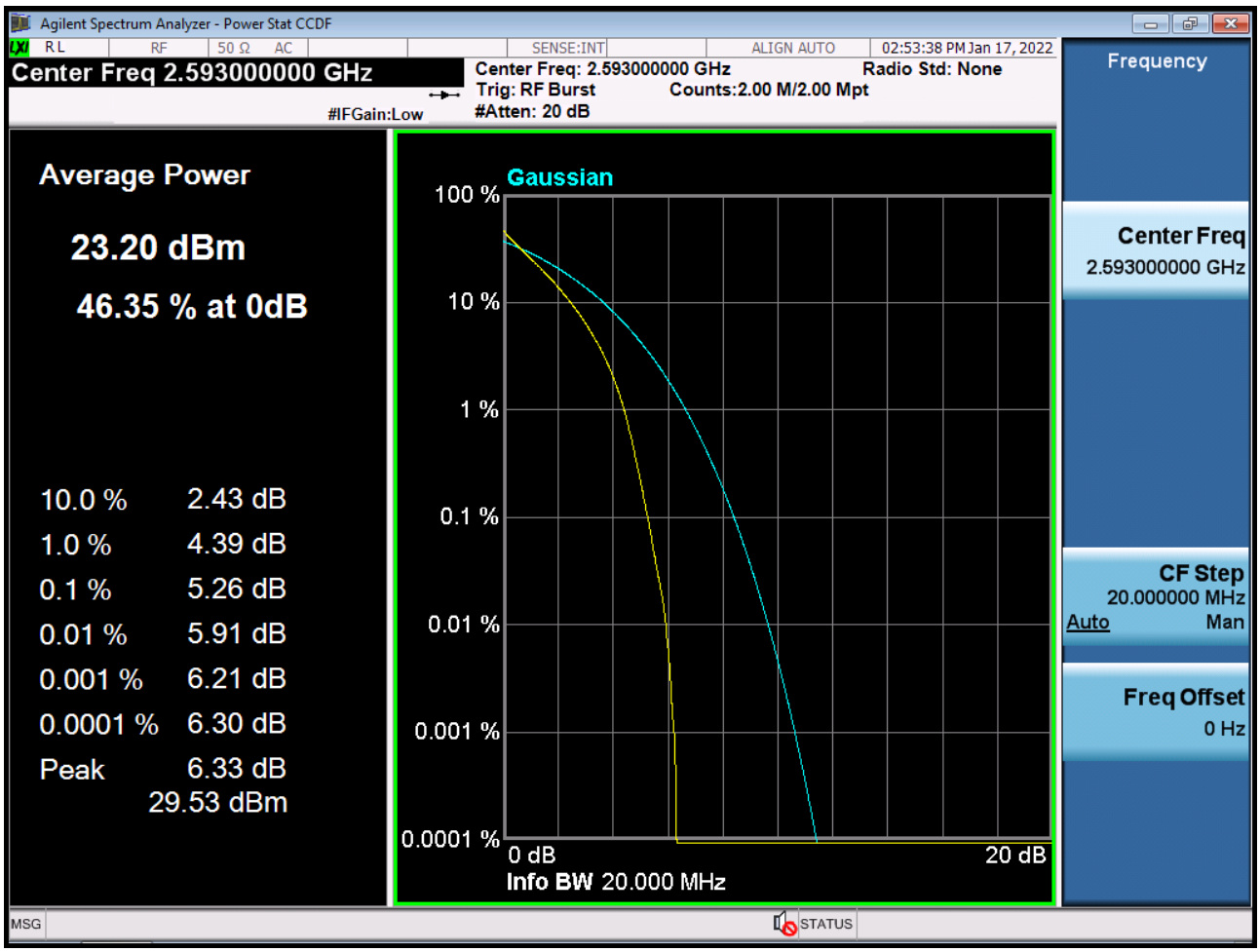
PAR Plot (15 M BW_Ch.40620_64QAM_RB75_0)



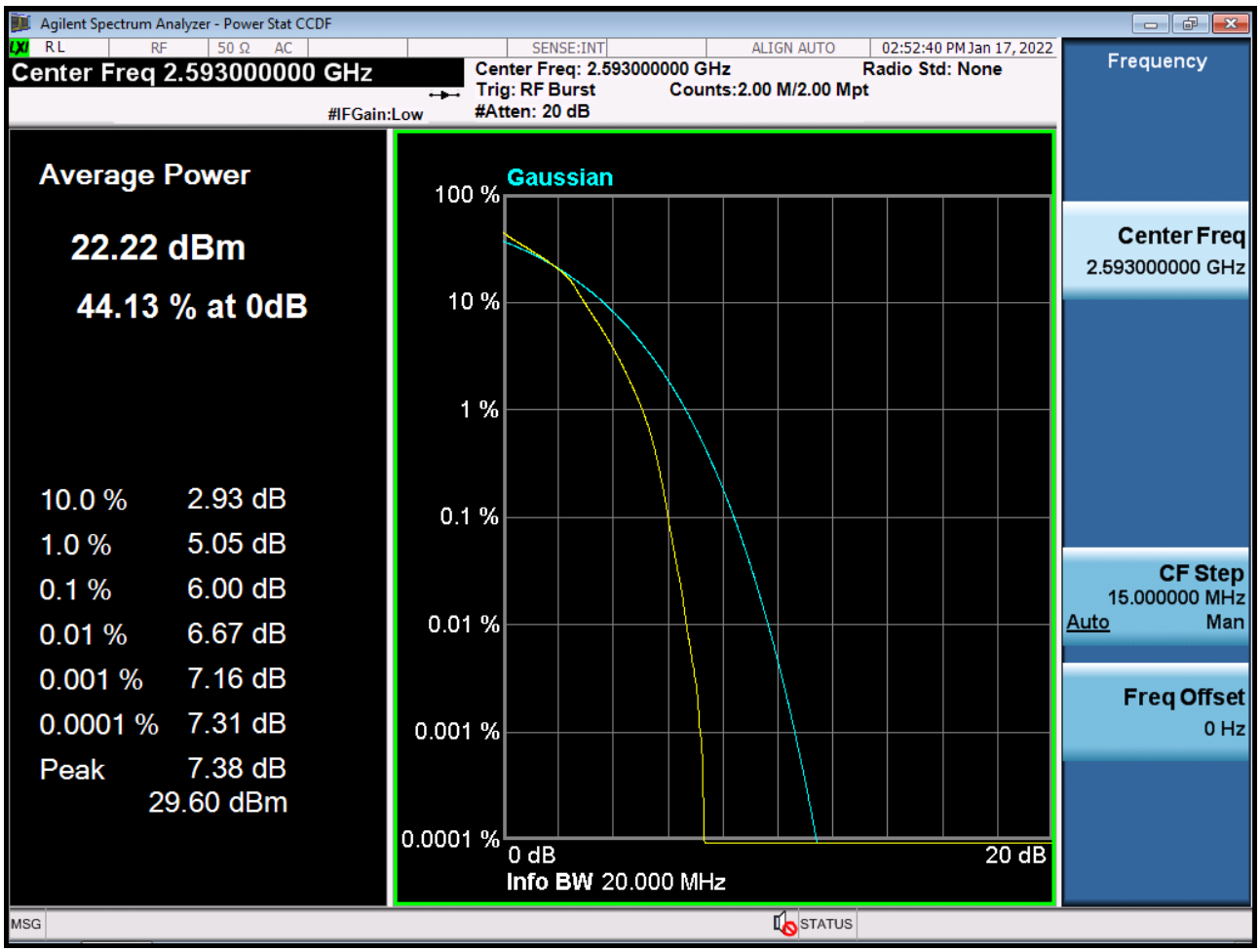
PAR Plot (15 M BW_Ch.40620_256QAM_RB75_0)



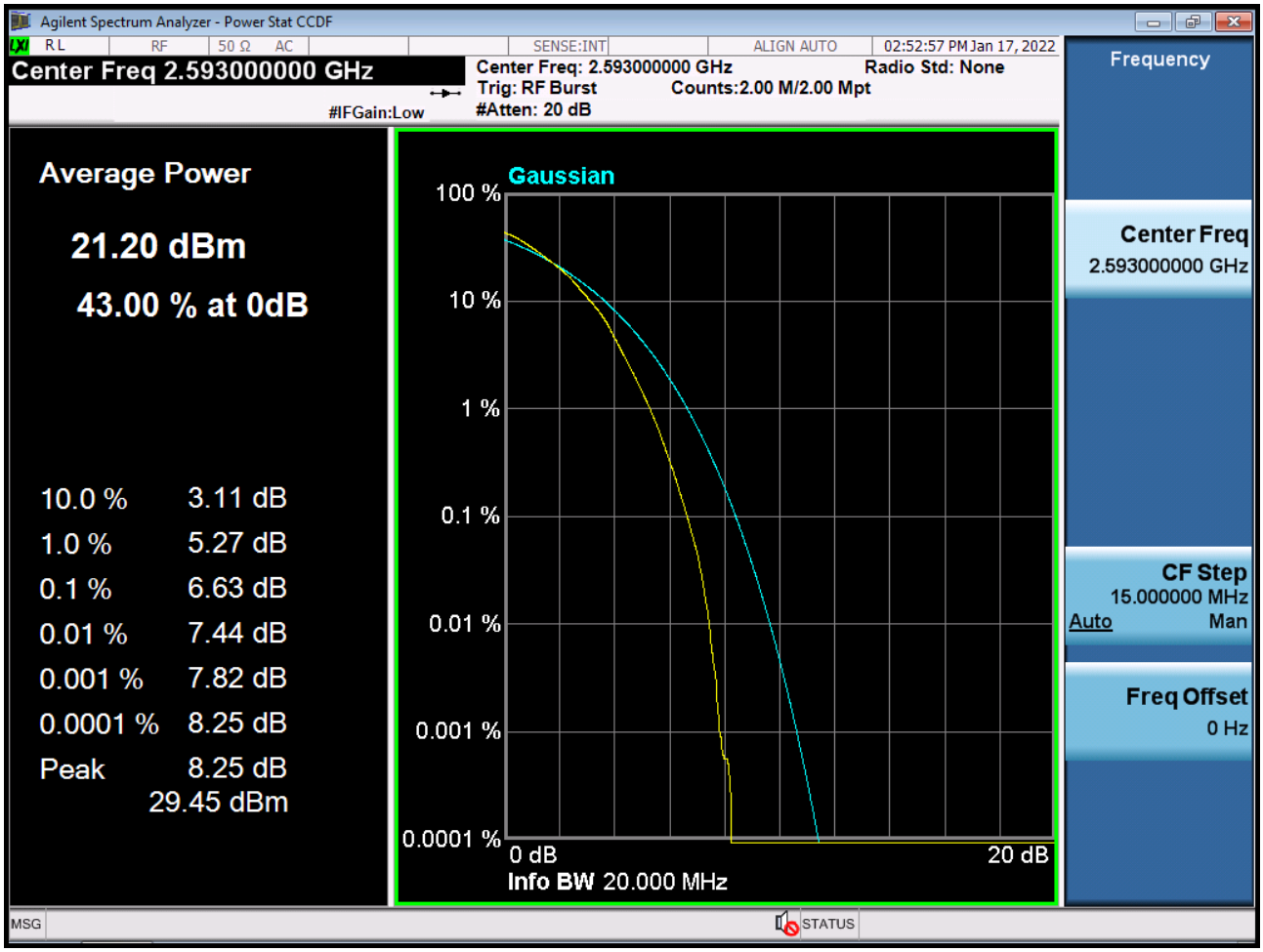
PAR Plot (20 M BW_Ch.40620_QPSK_RB100_0)



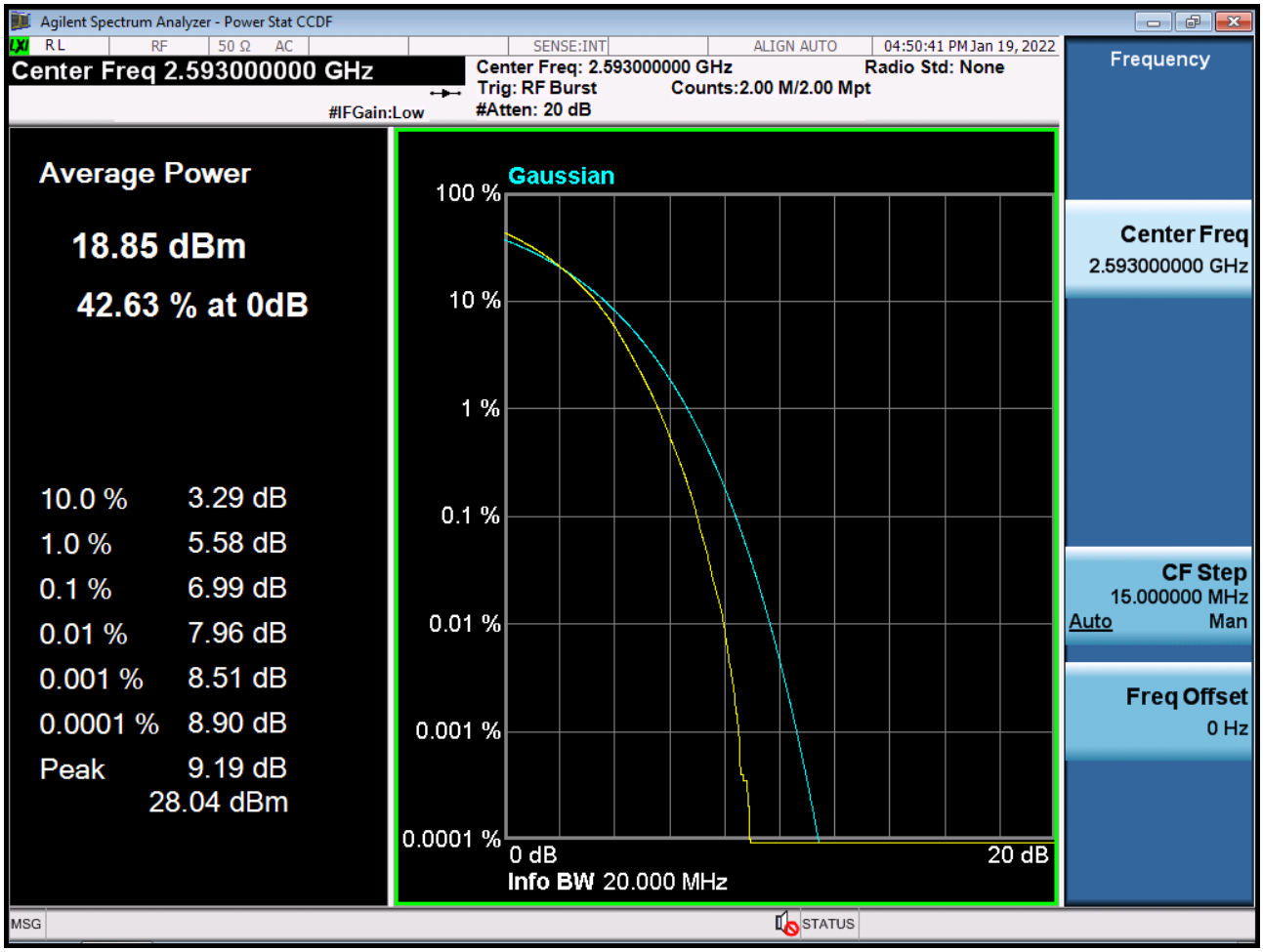
PAR Plot (20 M BW_Ch.40620_16QAM_RB100_0)



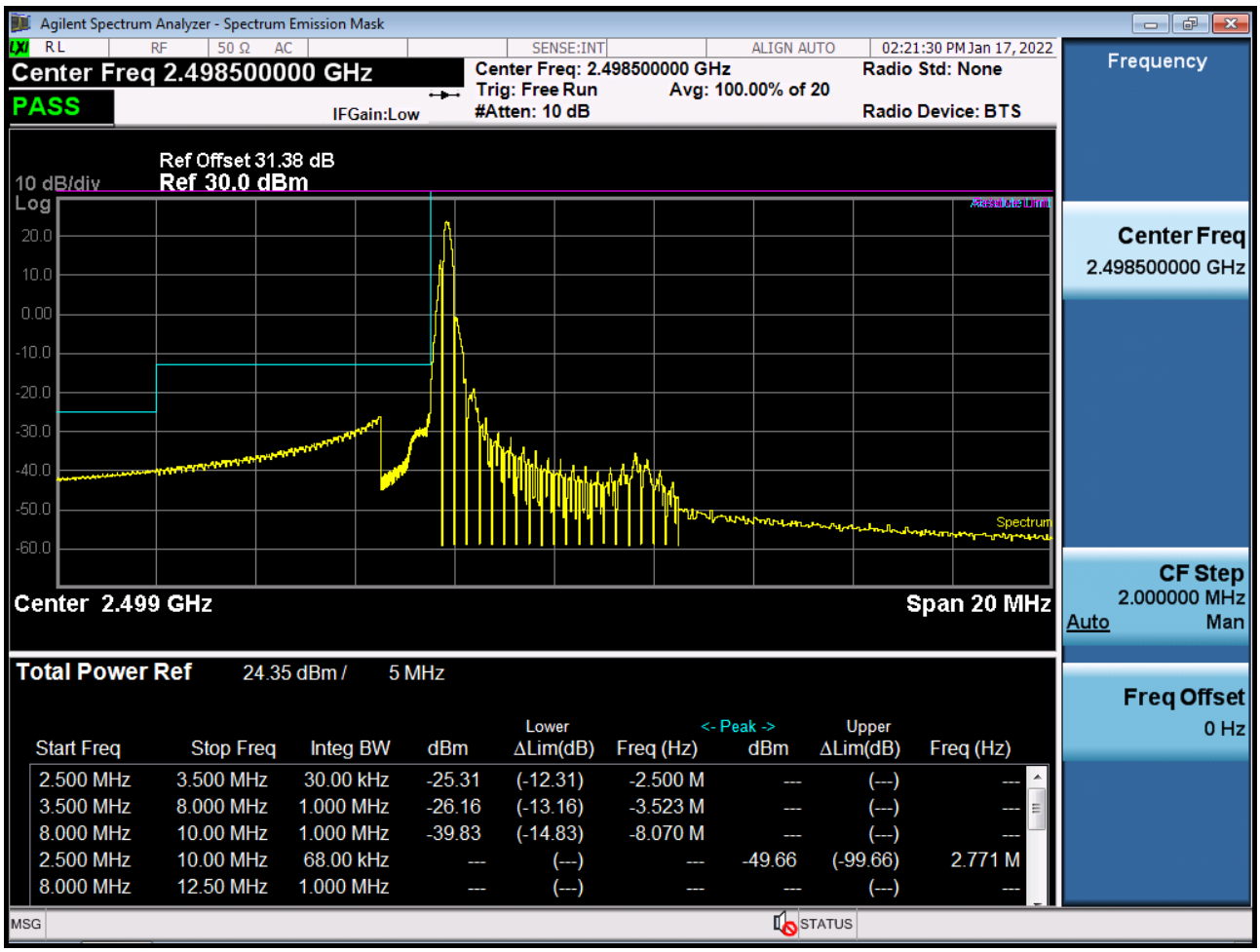
PAR Plot (20 M BW_Ch.40620_64QAM_RB100_0)



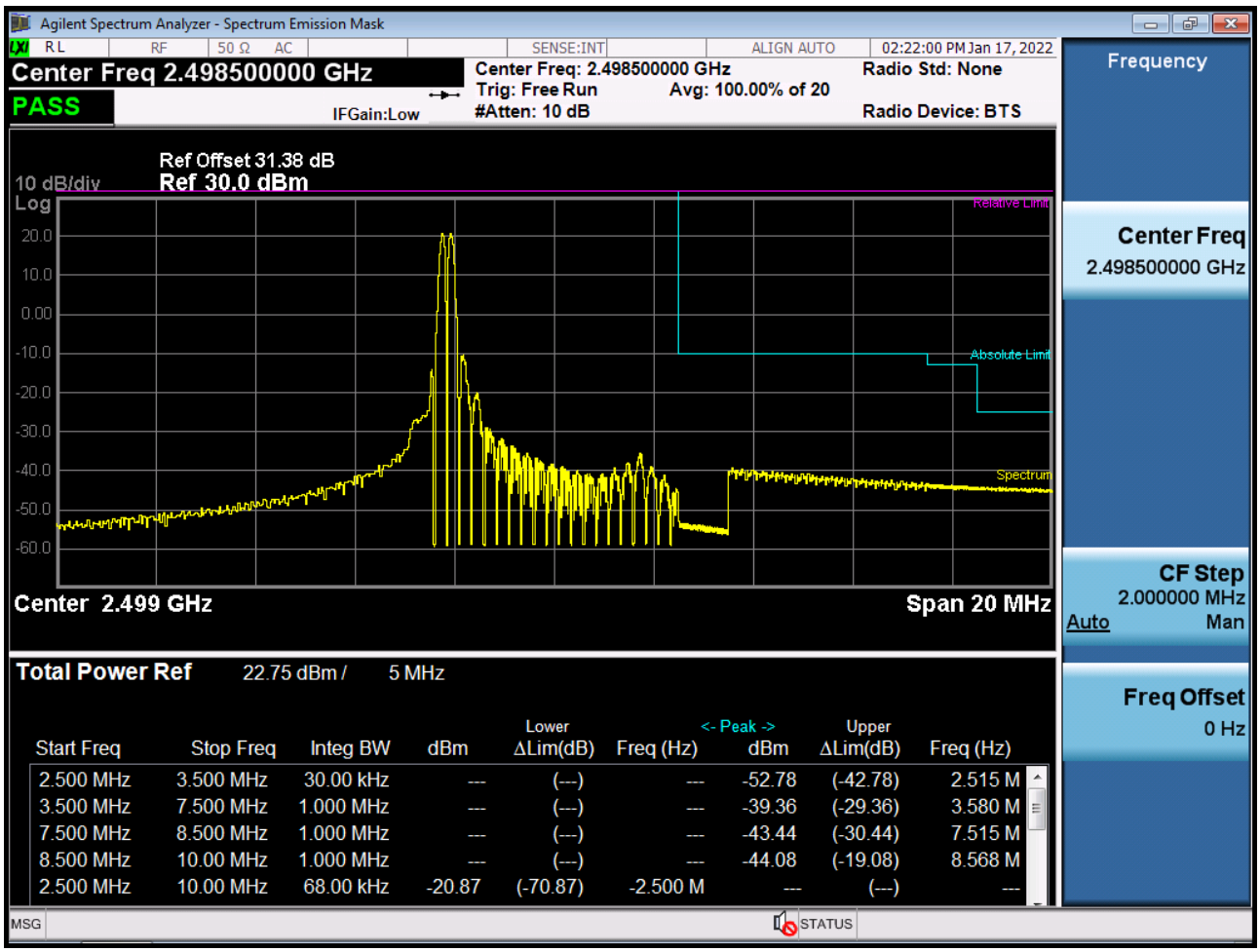
PAR Plot (20 M BW_Ch.40620_256QAM_RB100_0)



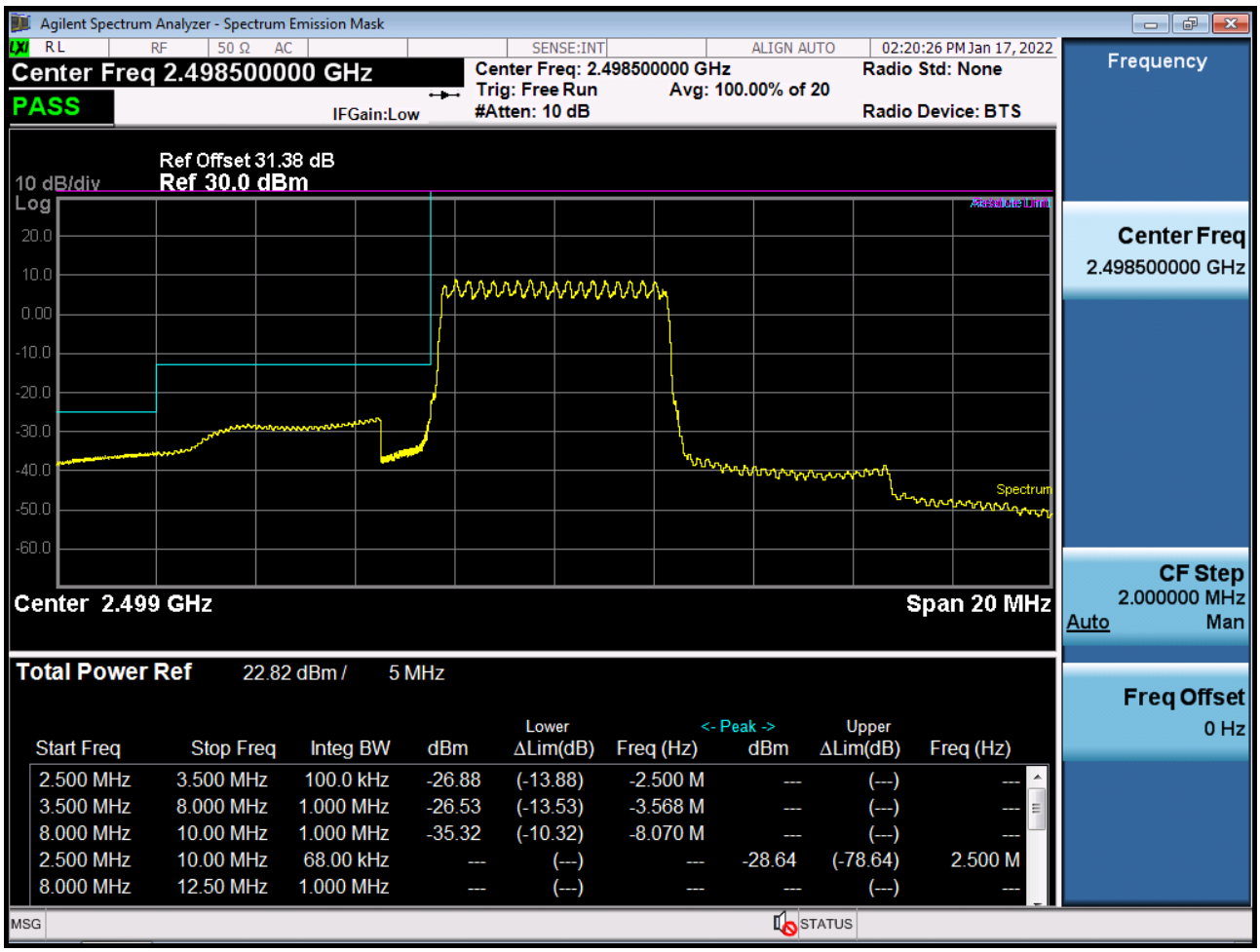
Low Channel Edge Plot (5 MHz Ch.39675 QPSK RB 1, Offset 0)-1



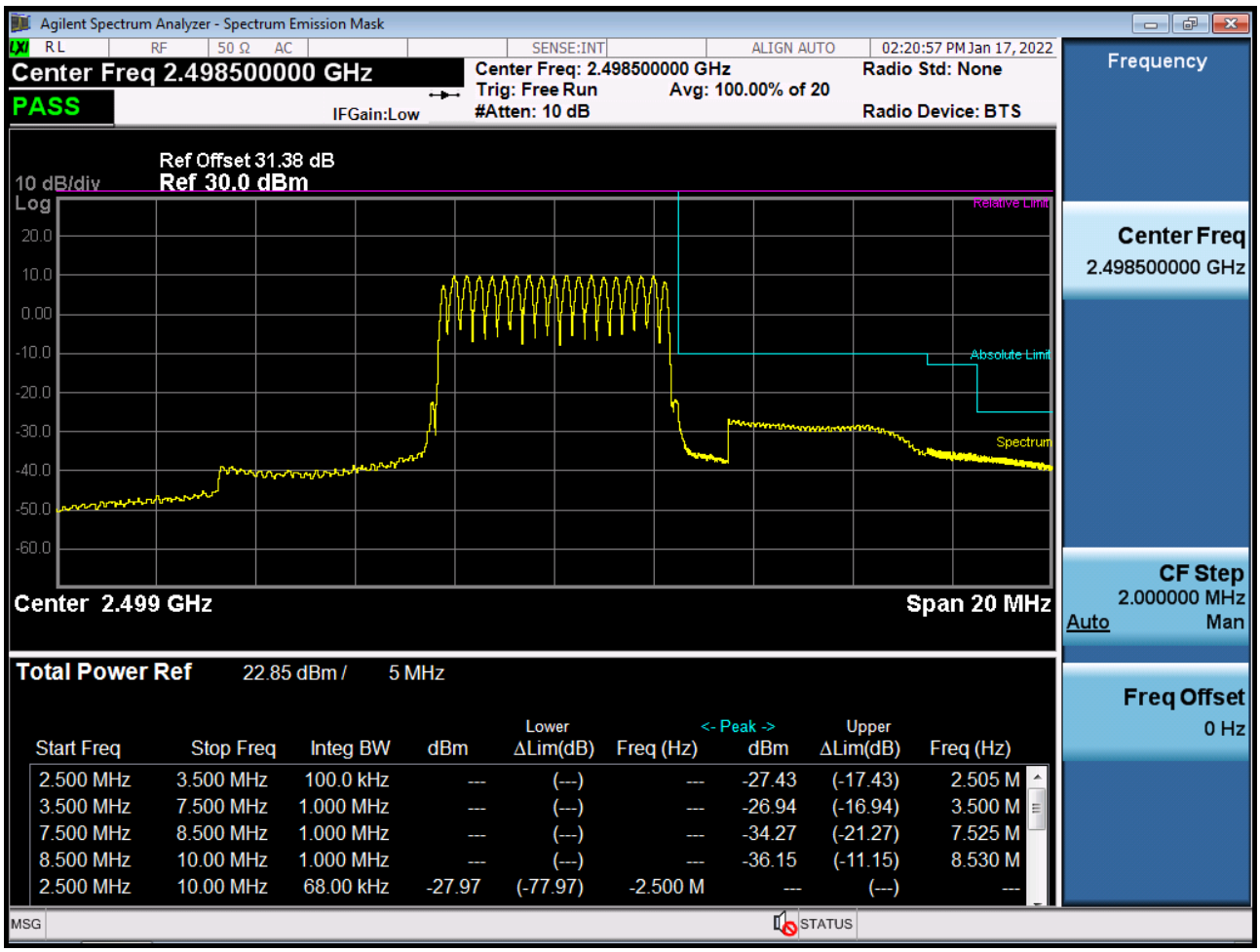
Low Channel Edge Plot (5 MHz Ch.39675 QPSK RB 1, Offset 0)-2



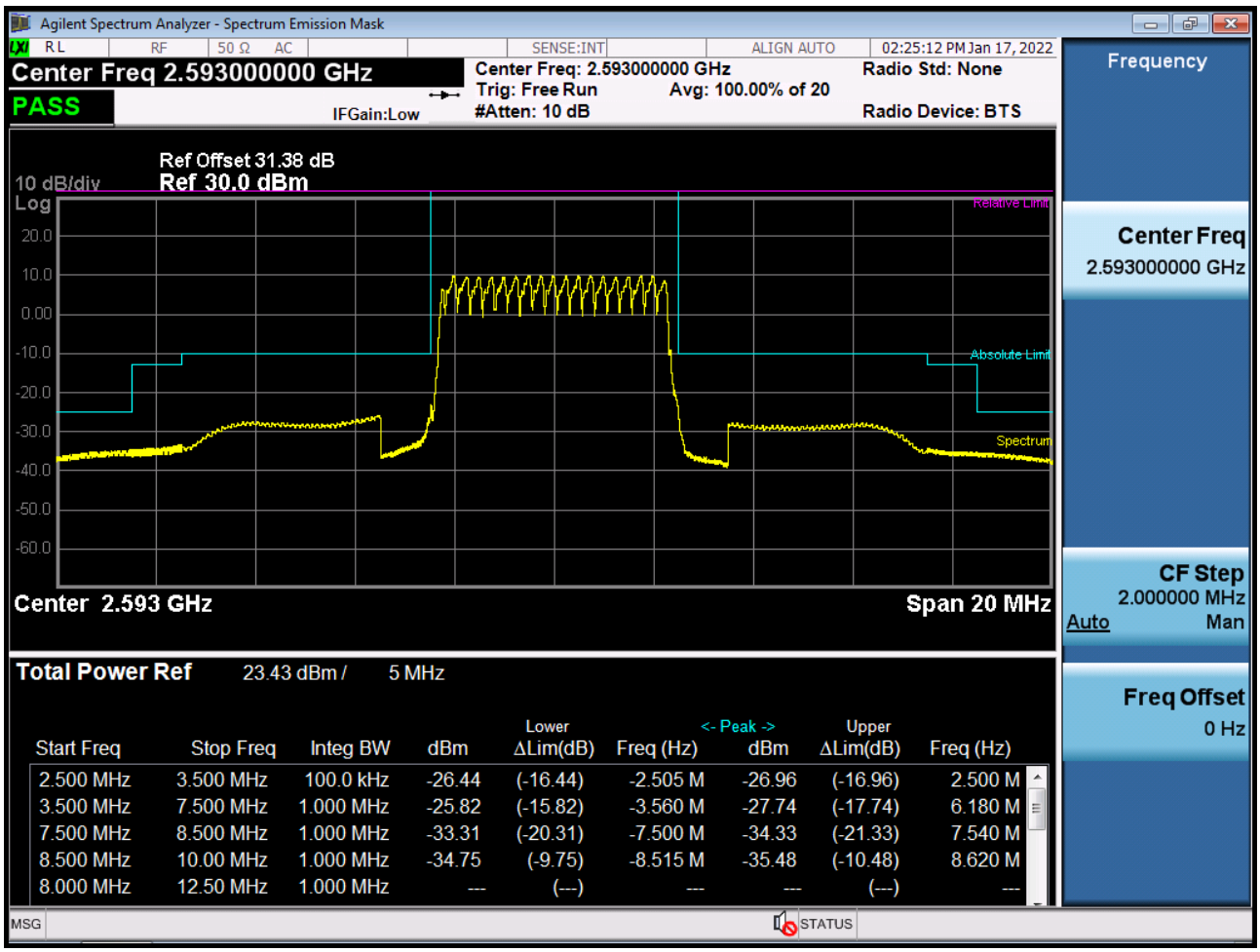
Low Channel Edge Plot (5 MHz Ch.39675 QPSK_RB25_Offset 0)-1



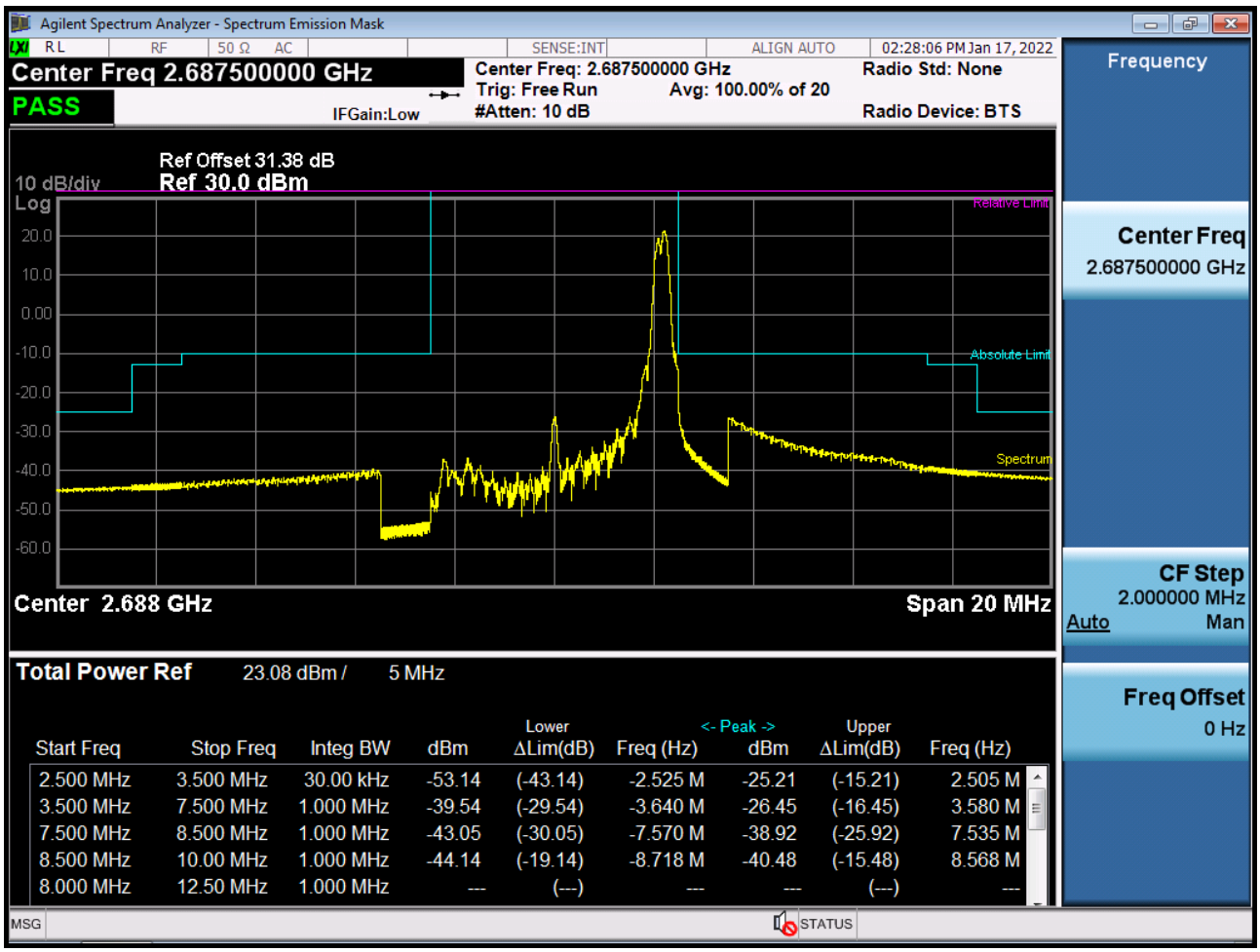
Low Channel Edge Plot (5 MHz Ch.39675 QPSK_RB25_Offset 0)-2



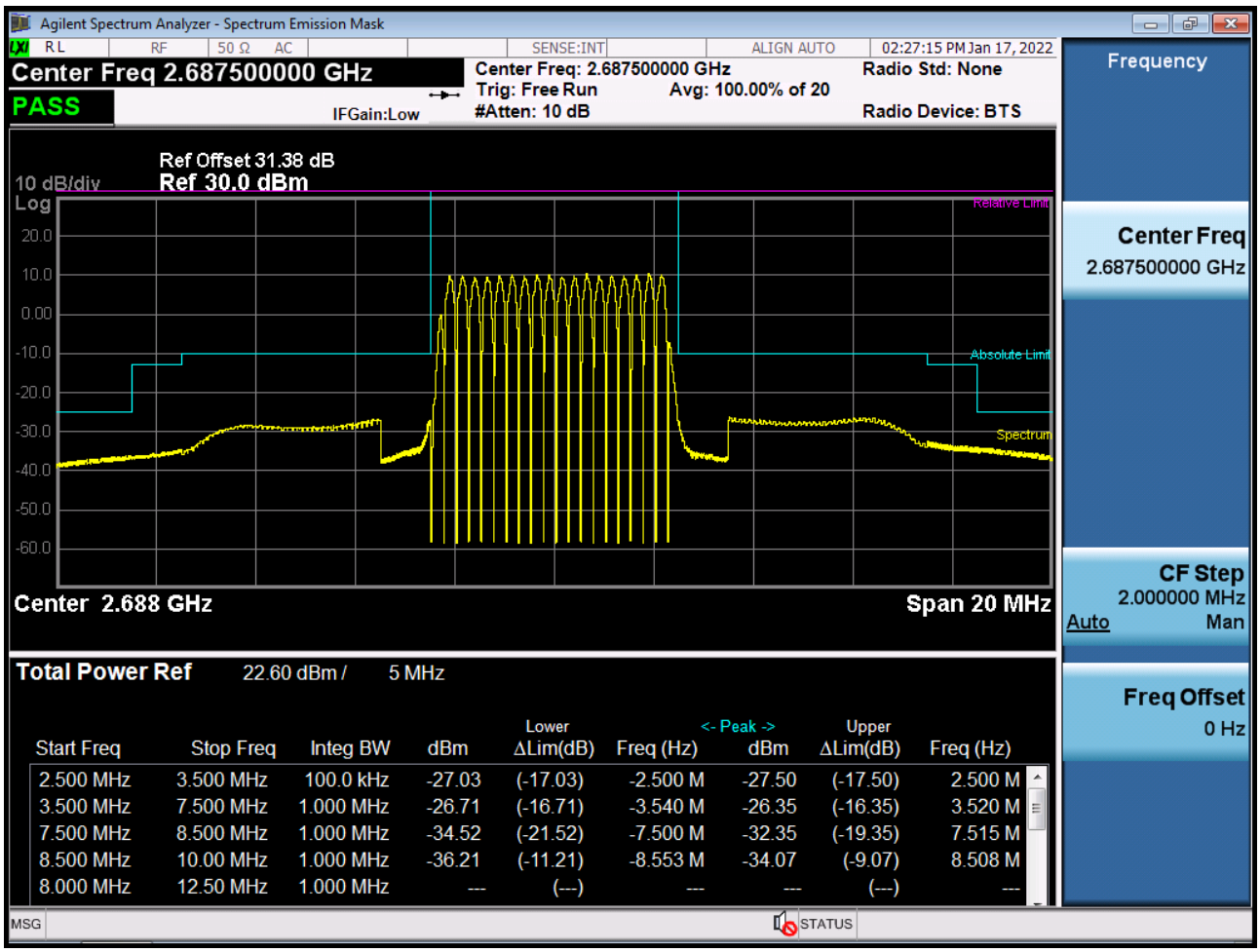
Mid Channel Edge Plot (5 MHz Ch.40620 QPSK RB 25)



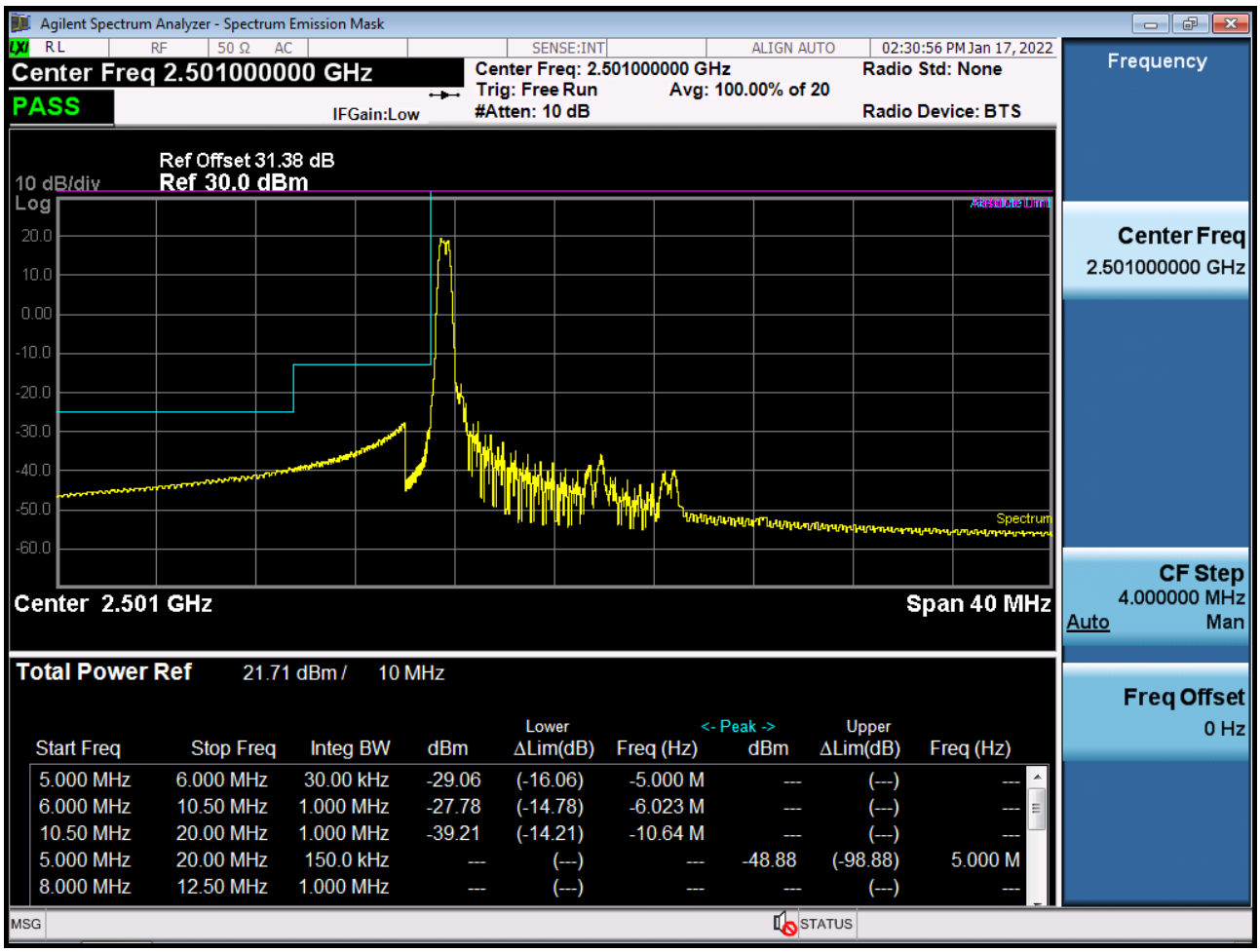
High Channel Edge Plot (5 MHz Ch.41565 QPSK RB 1, Offset 24)



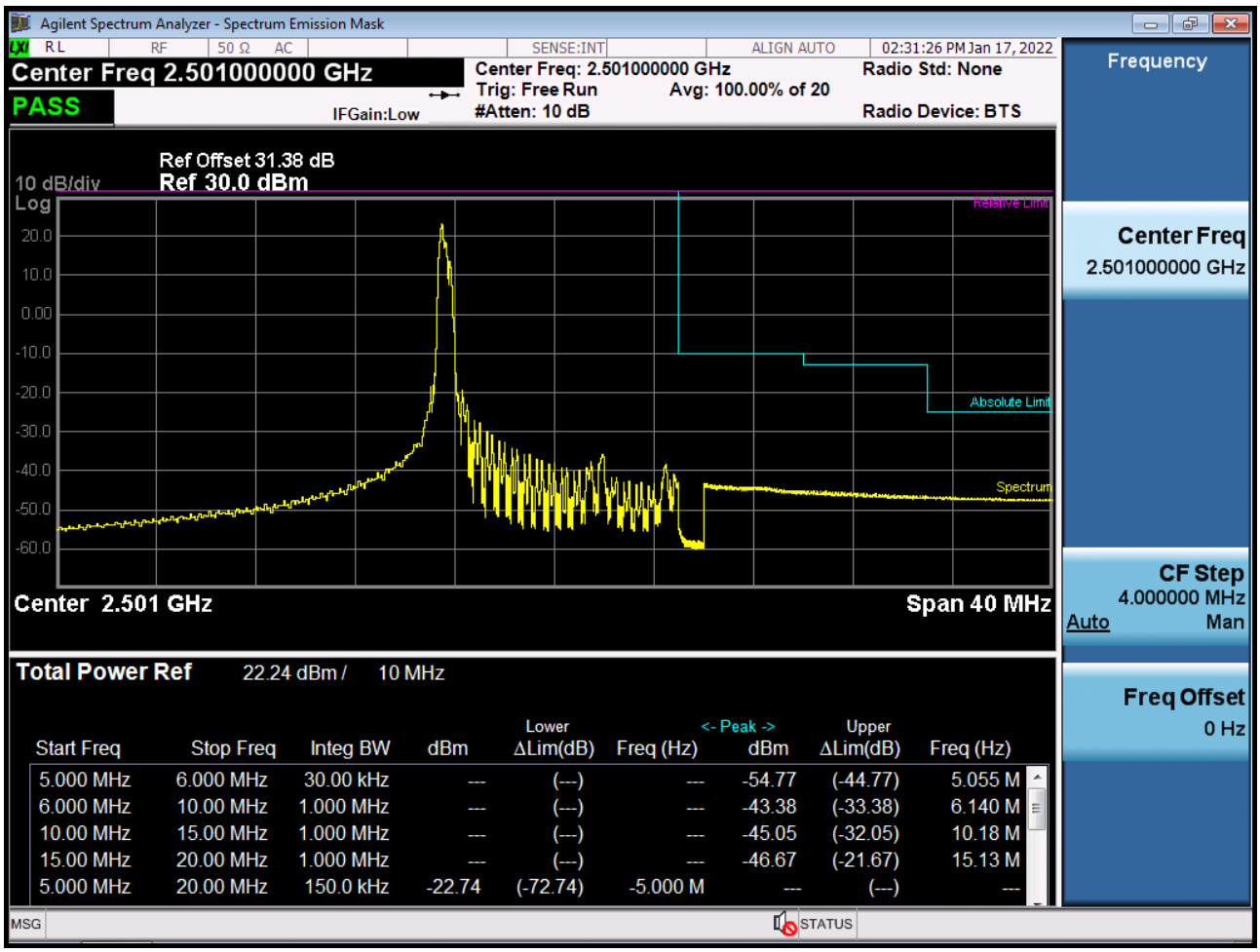
High Channel Edge Plot (5 MHz Ch.41565 QPSK_RB25_Offset 0)



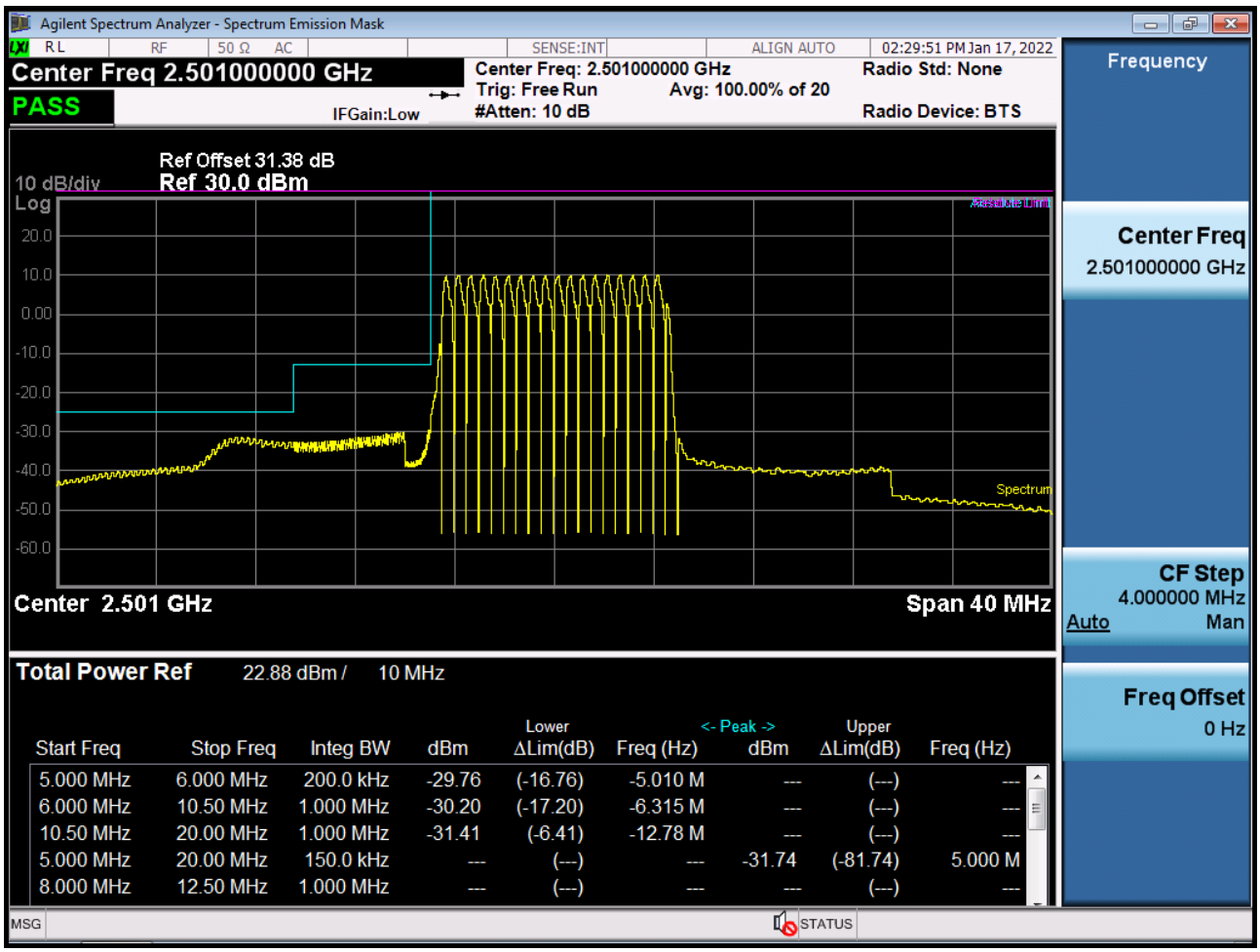
Low Channel Edge Plot (10 MHz Ch.39700 QPSK RB 1, Offset 0)-1



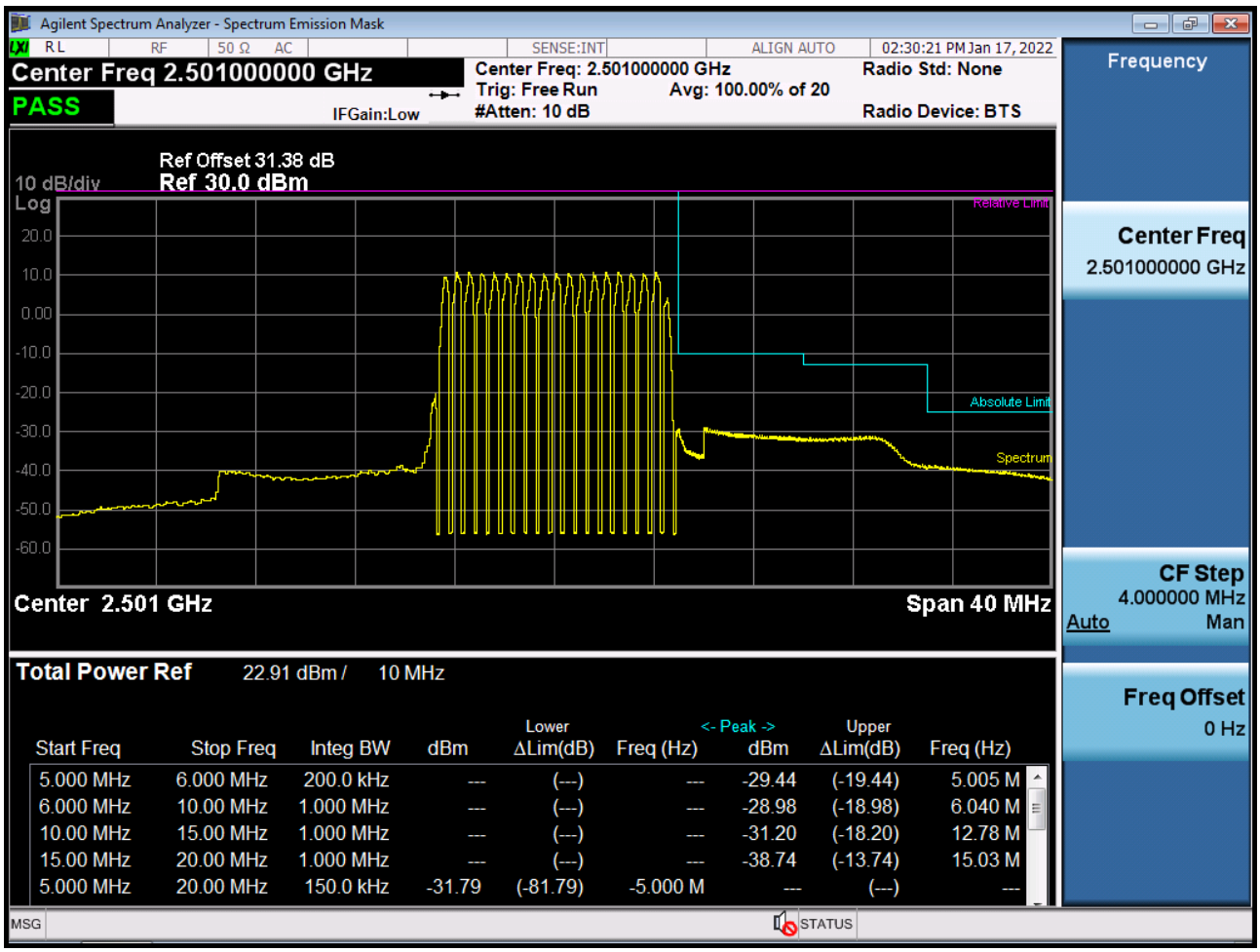
Low Channel Edge Plot (10 MHz Ch.39700 QPSK RB 1, Offset 0)-2



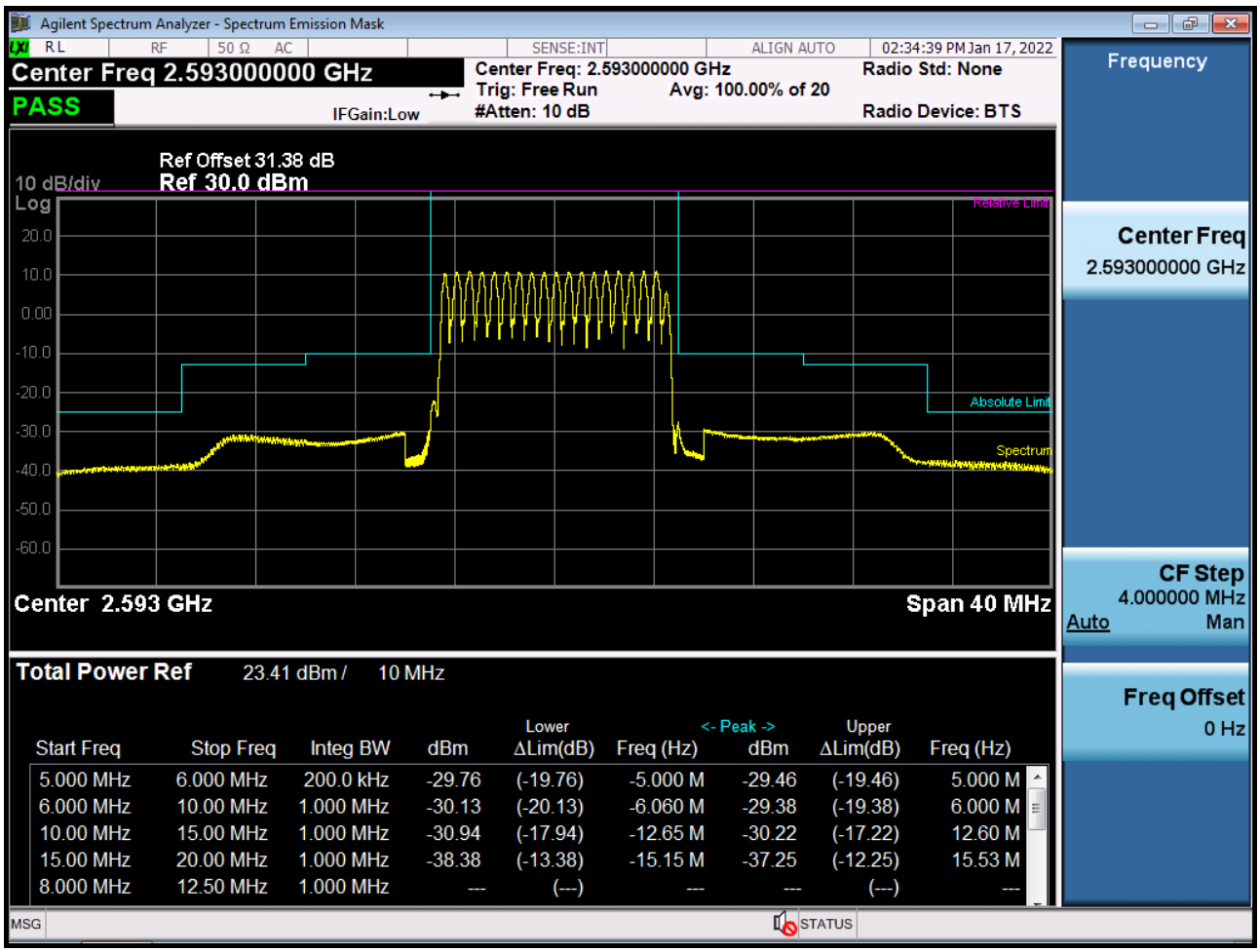
Low Channel Edge Plot (10 MHz Ch.39700 QPSK_RB50_Offset 0)-1



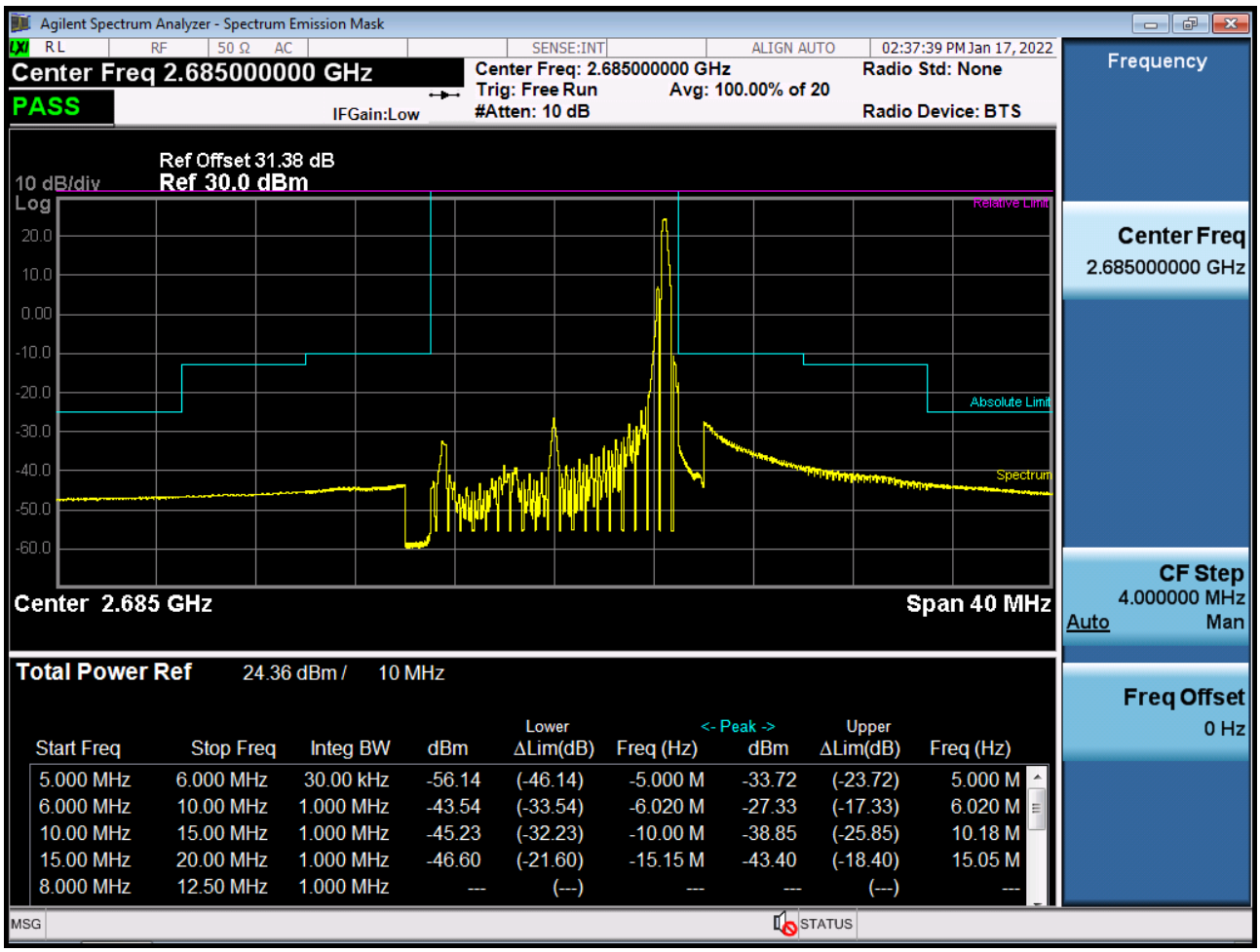
Low Channel Edge Plot (10 MHz Ch.39700 QPSK_RB50_Offset 0)-2



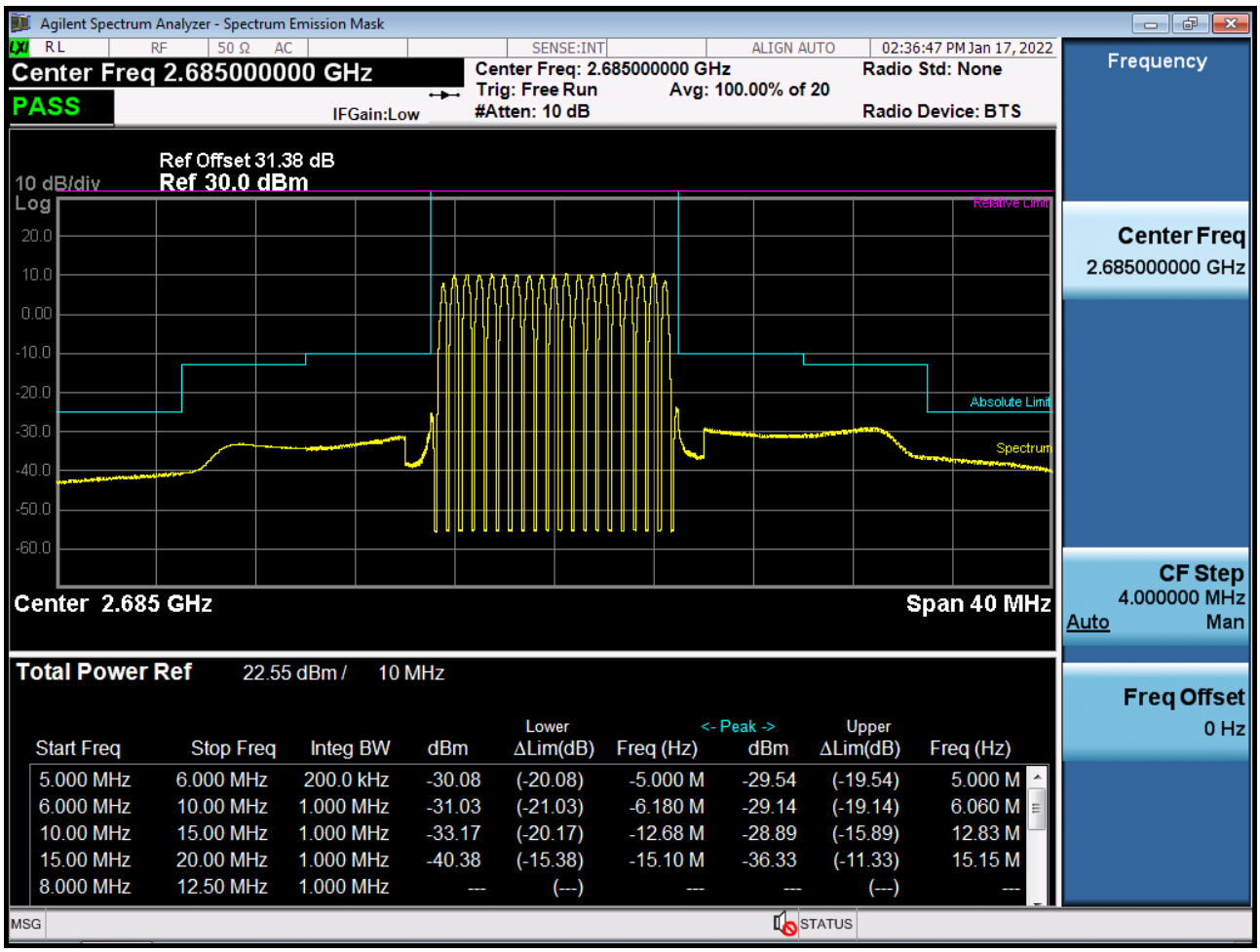
Mid Channel Edge Plot (10 MHz Ch.40620 QPSK RB 50)



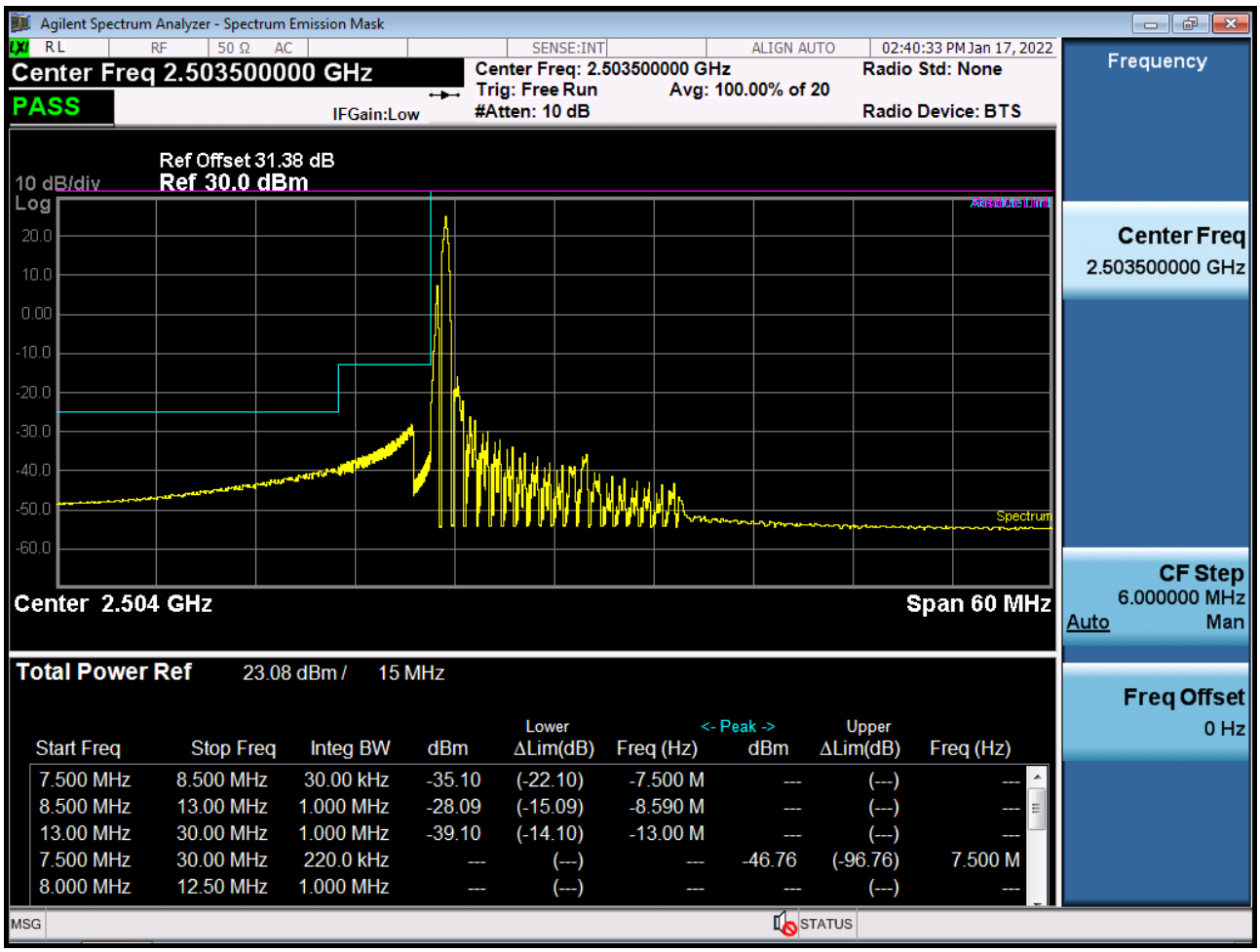
High Channel Edge Plot (10 MHz Ch.41540 QPSK RB 1, Offset 24)



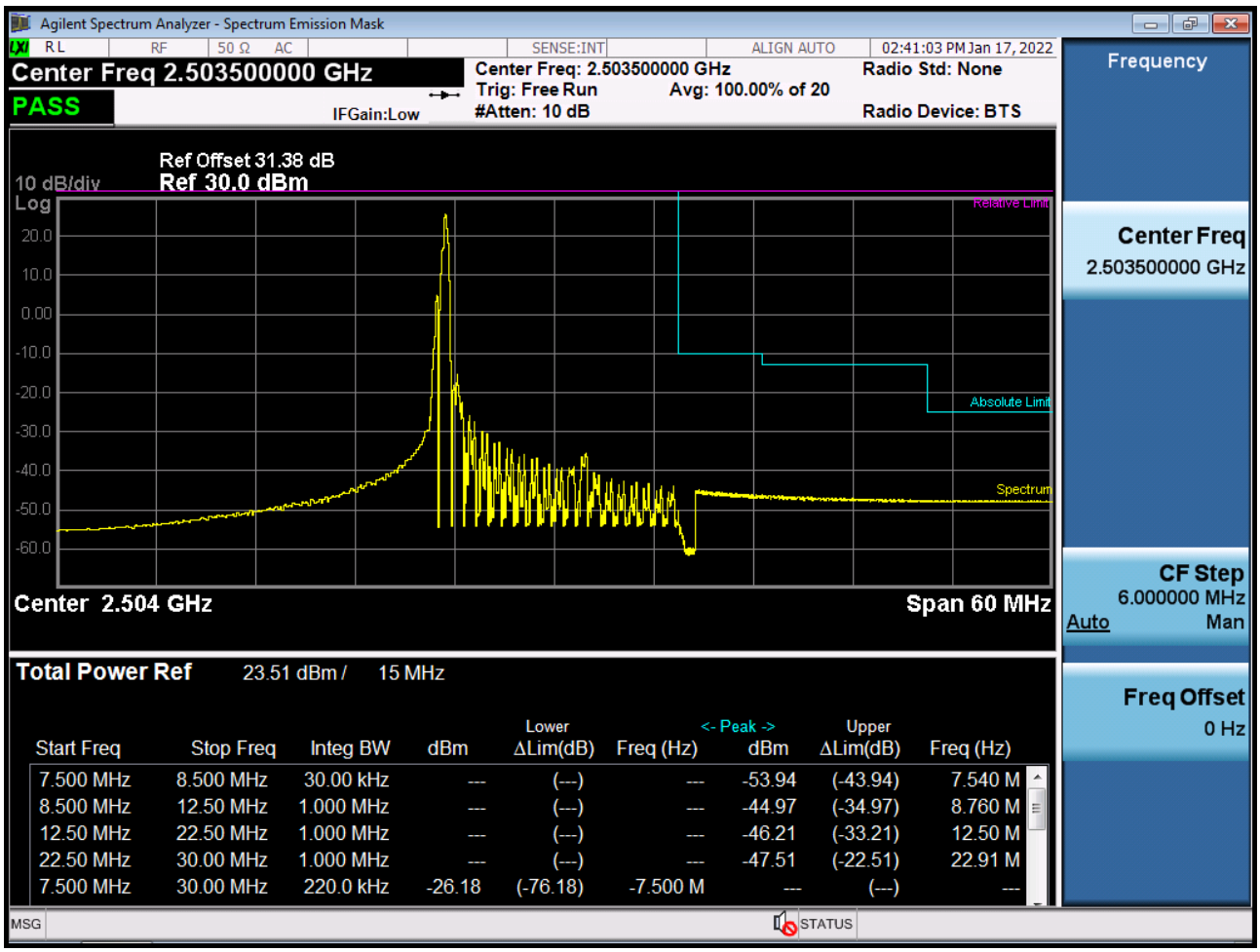
High Channel Edge Plot (10 MHz Ch.41540 QPSK_RB50_Offset 0)



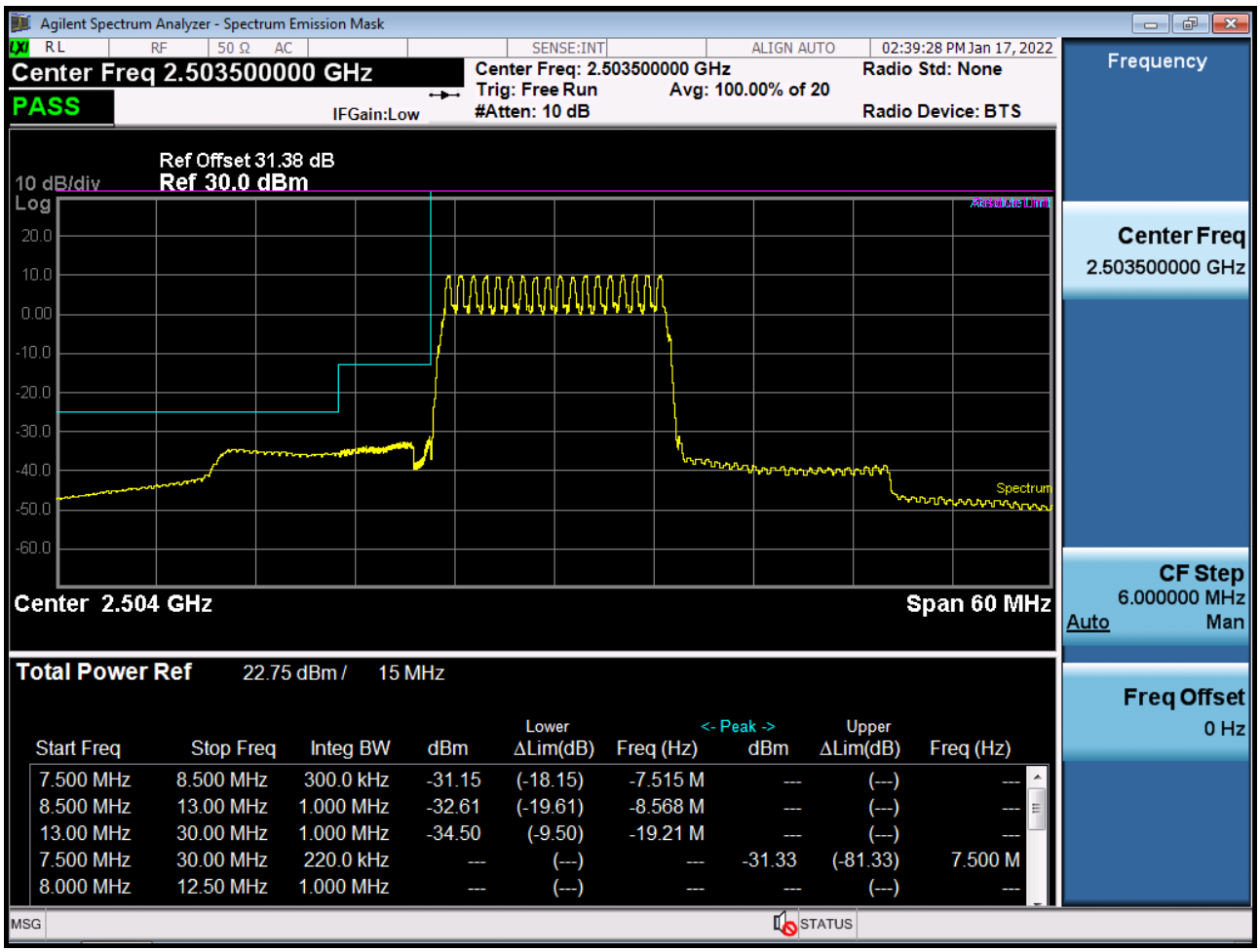
Low Channel Edge Plot (15 MHz Ch.39725 QPSK RB 1, Offset 0)-1



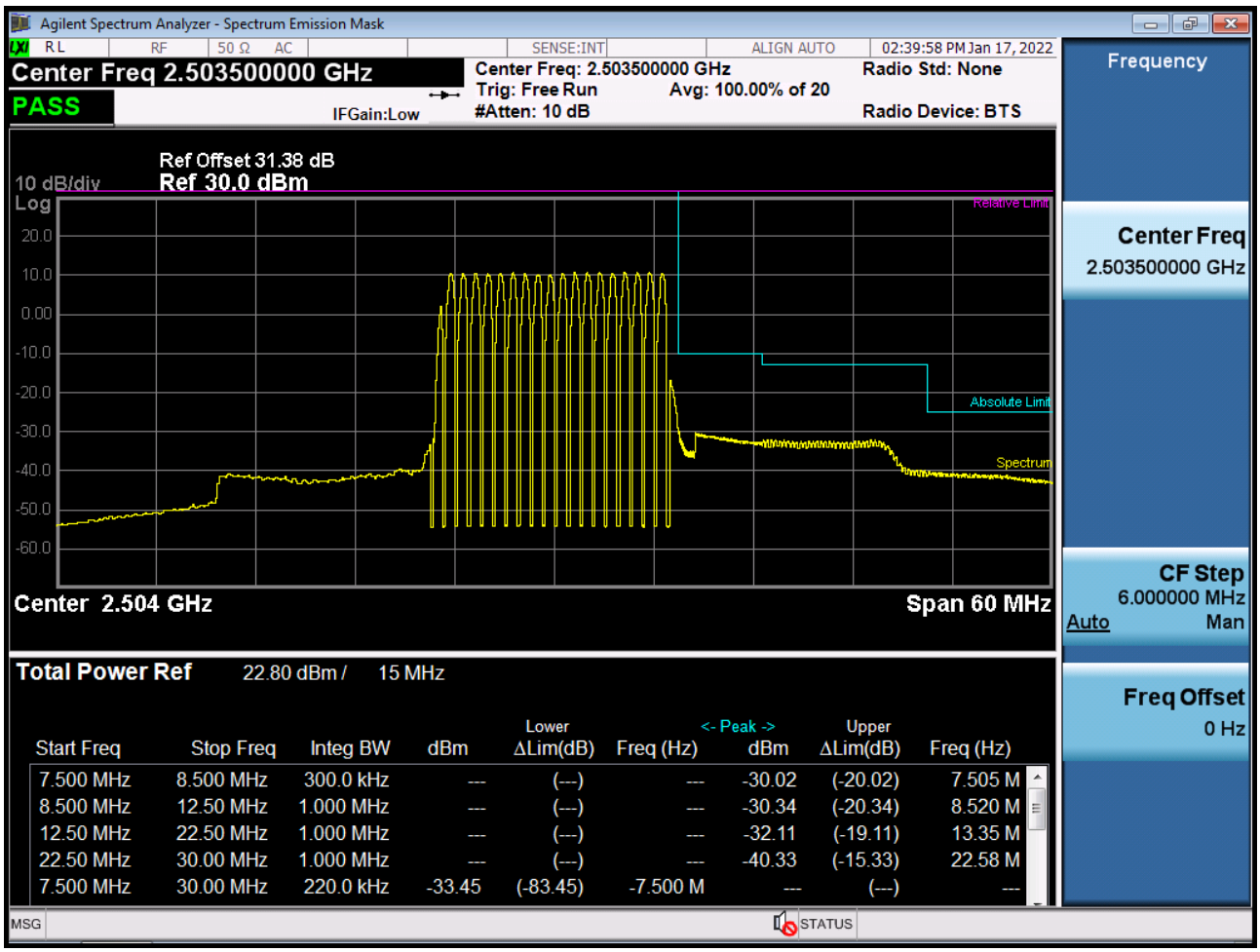
Low Channel Edge Plot (15 MHz Ch.39725 QPSK RB 1, Offset 0)-2



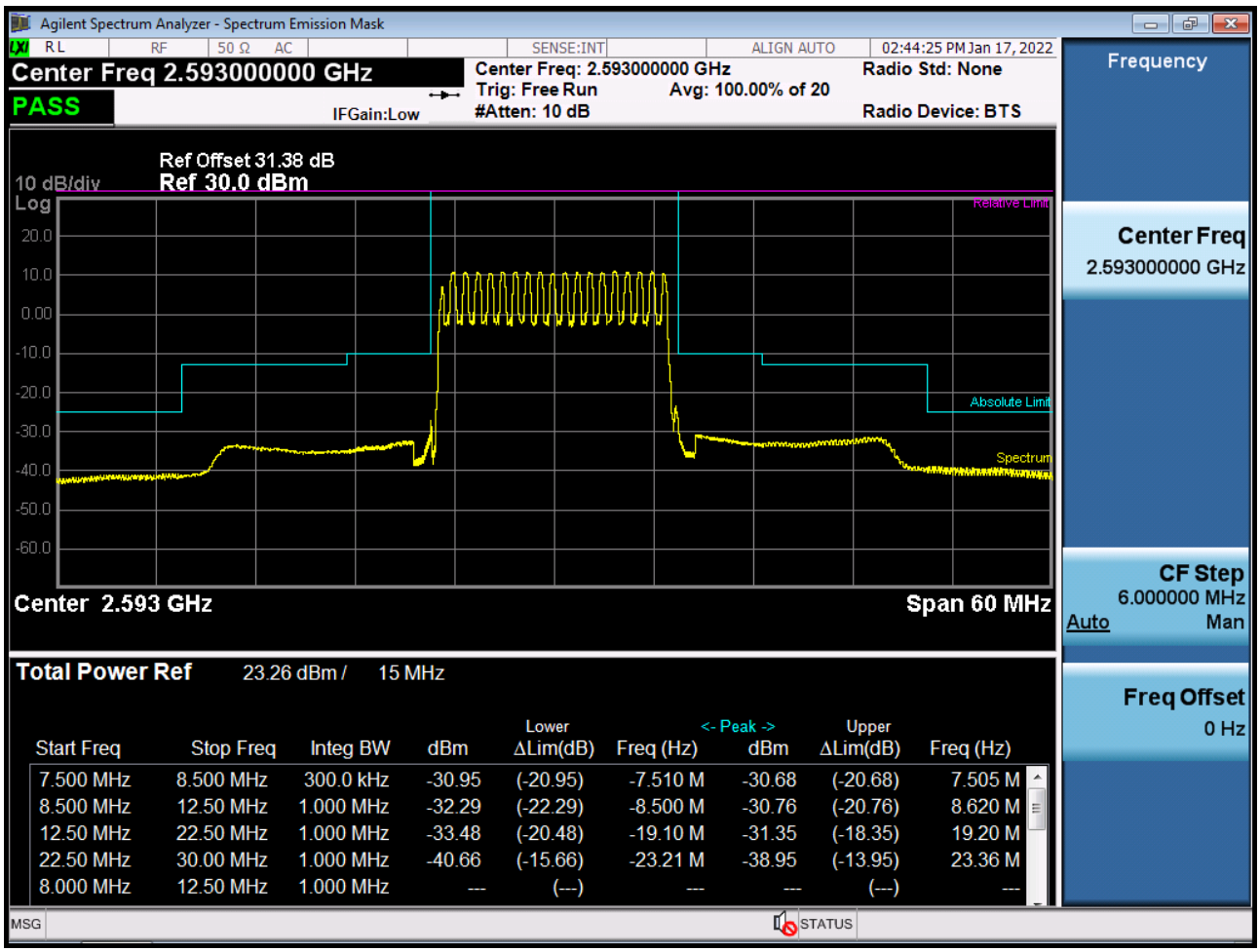
Low Channel Edge Plot (15 MHz Ch.39725 QPSK_RB75_Offset 0)-1



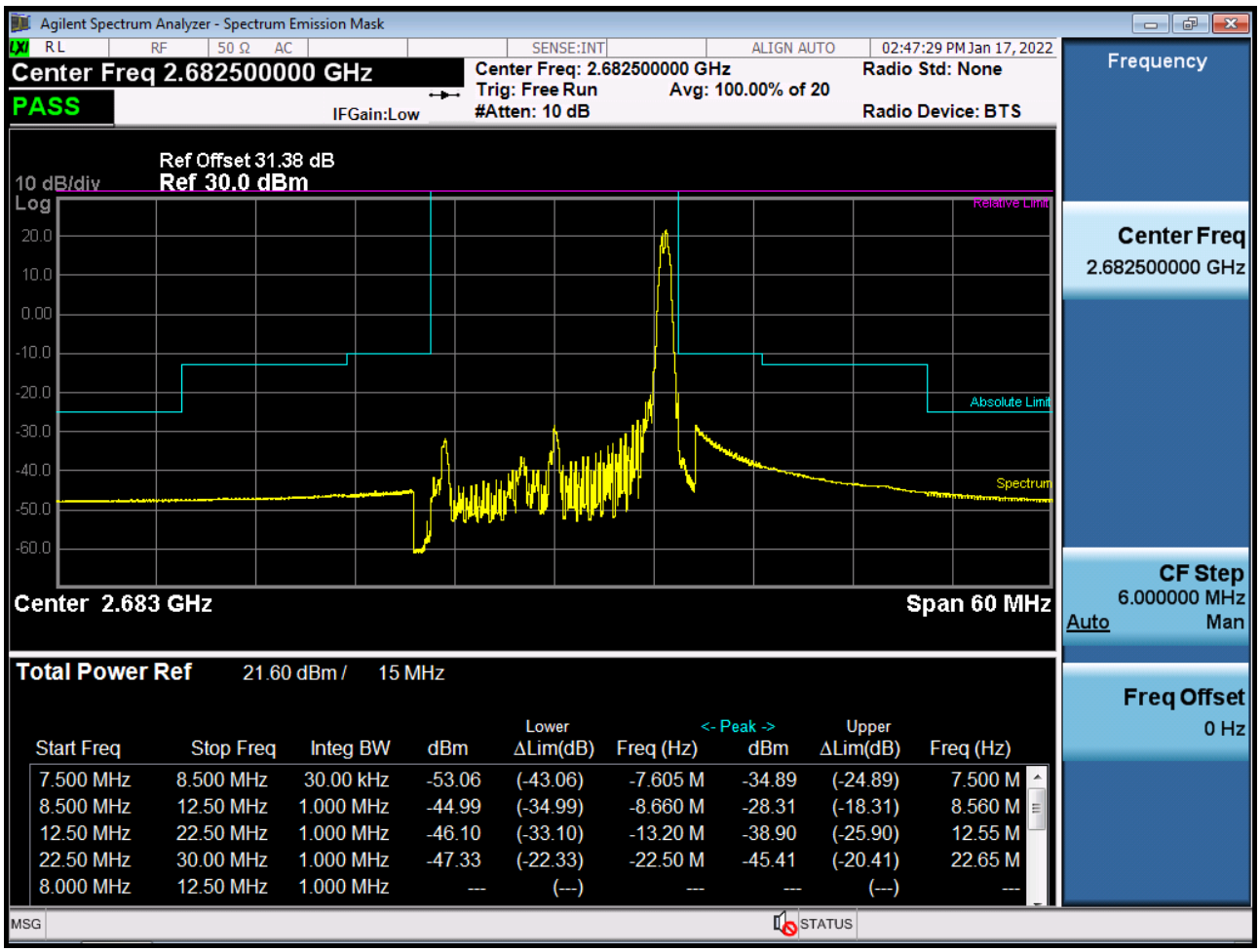
Low Channel Edge Plot (15 MHz Ch.39725 QPSK_RB75_Offset 0)-2



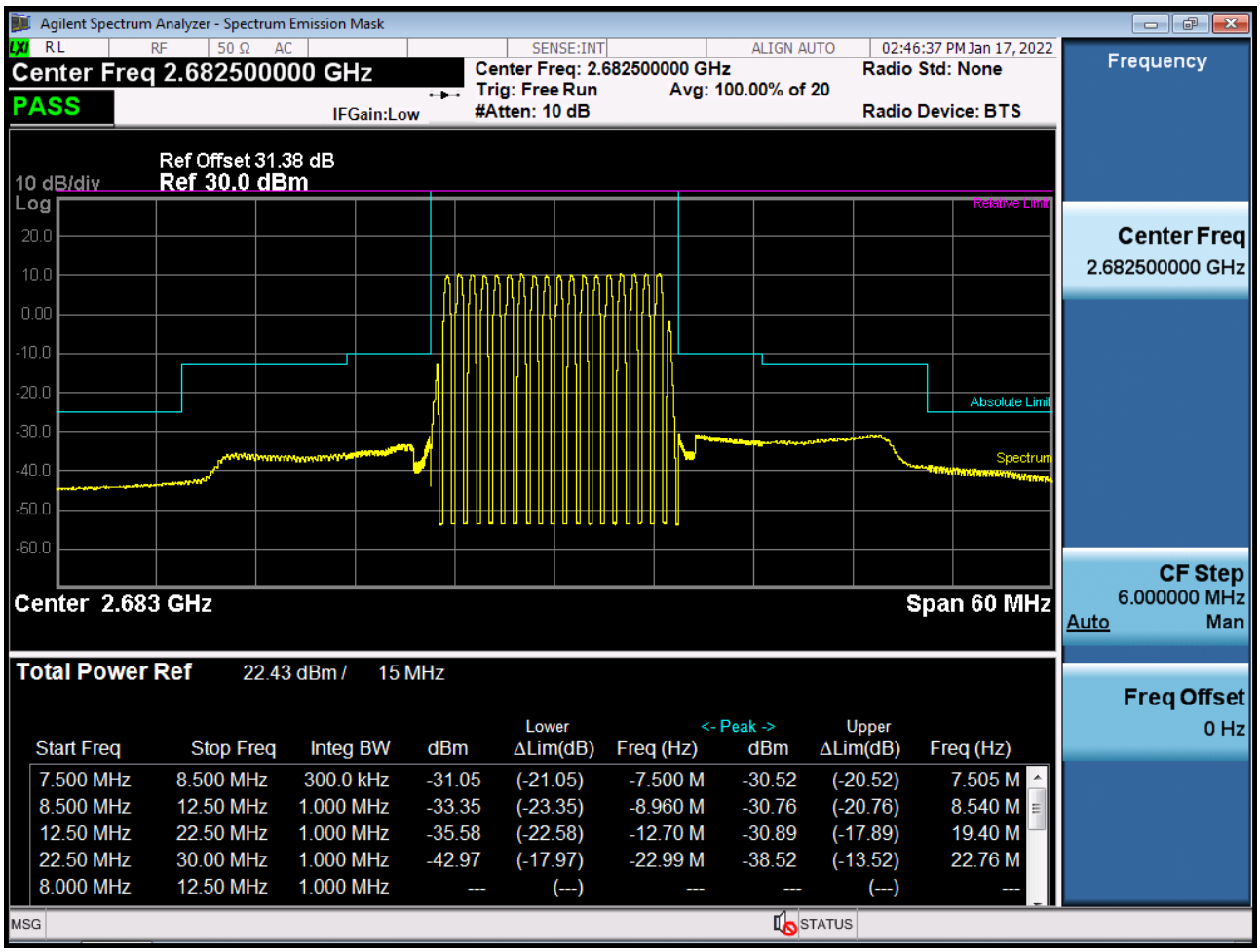
Mid Channel Edge Plot (15 MHz Ch.40620 QPSK RB 75)



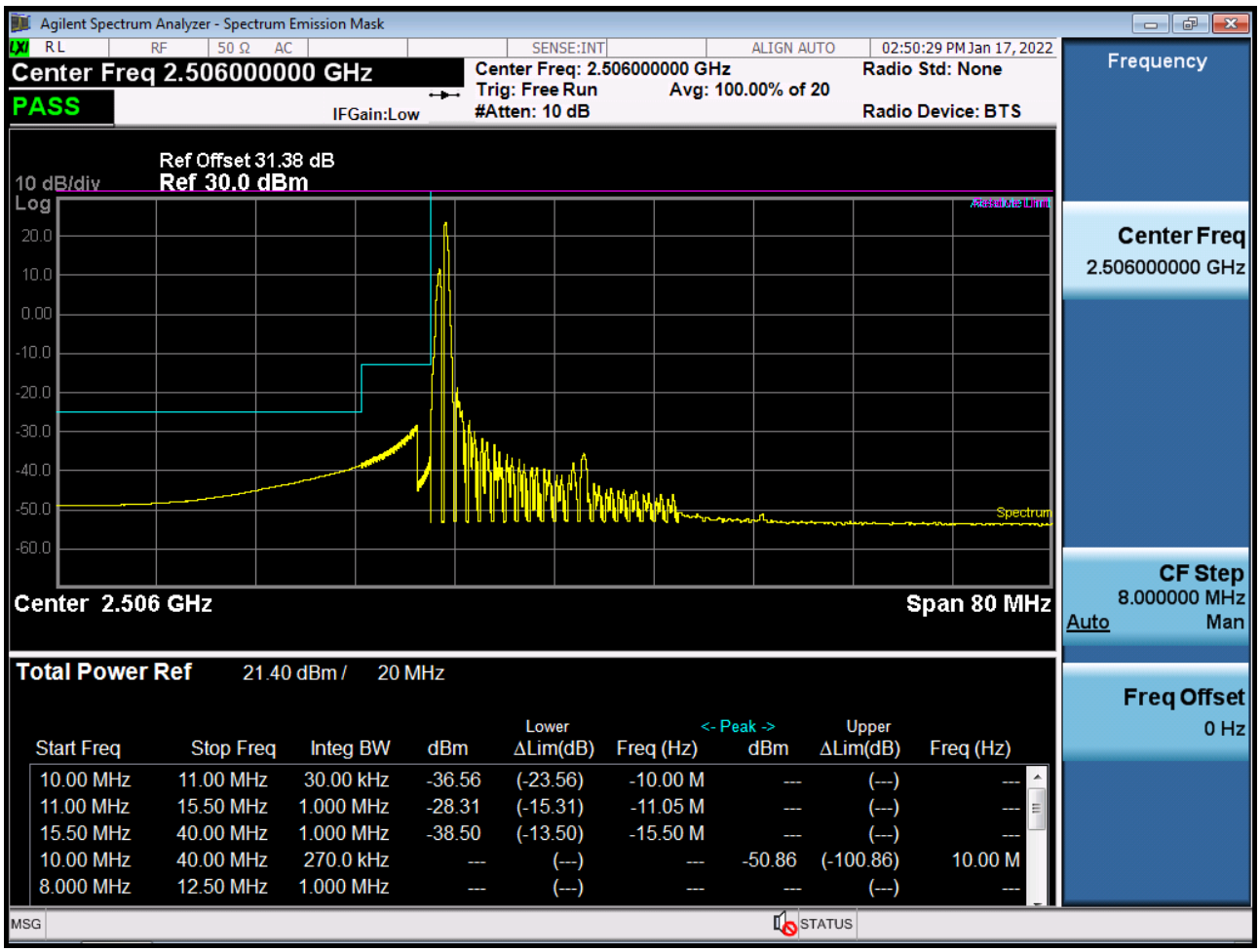
High Channel Edge Plot (15 MHz Ch.41515 QPSK RB 1, Offset 74)



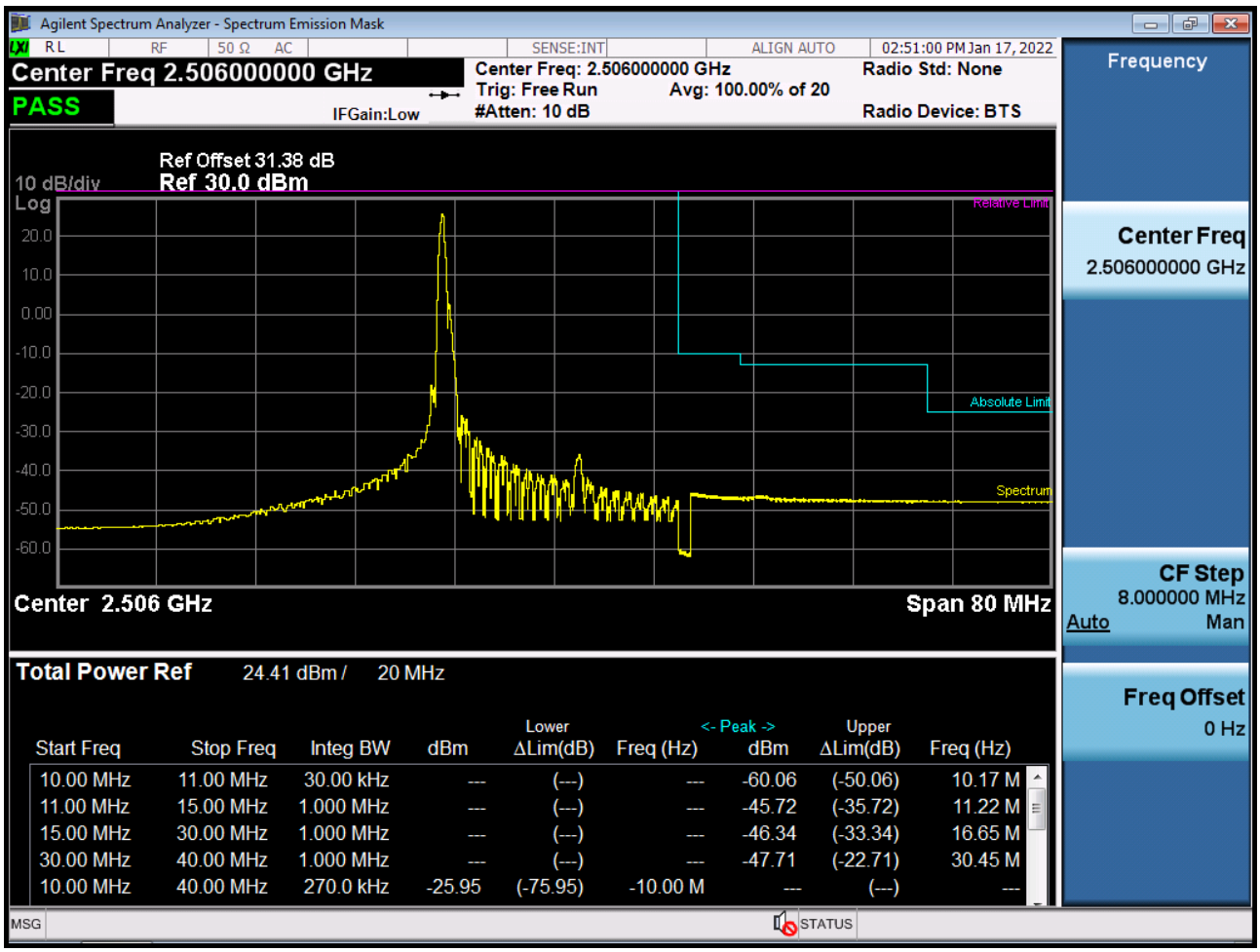
High Channel Edge Plot (15 MHz Ch.41515 QPSK_RB75_Offset 0)



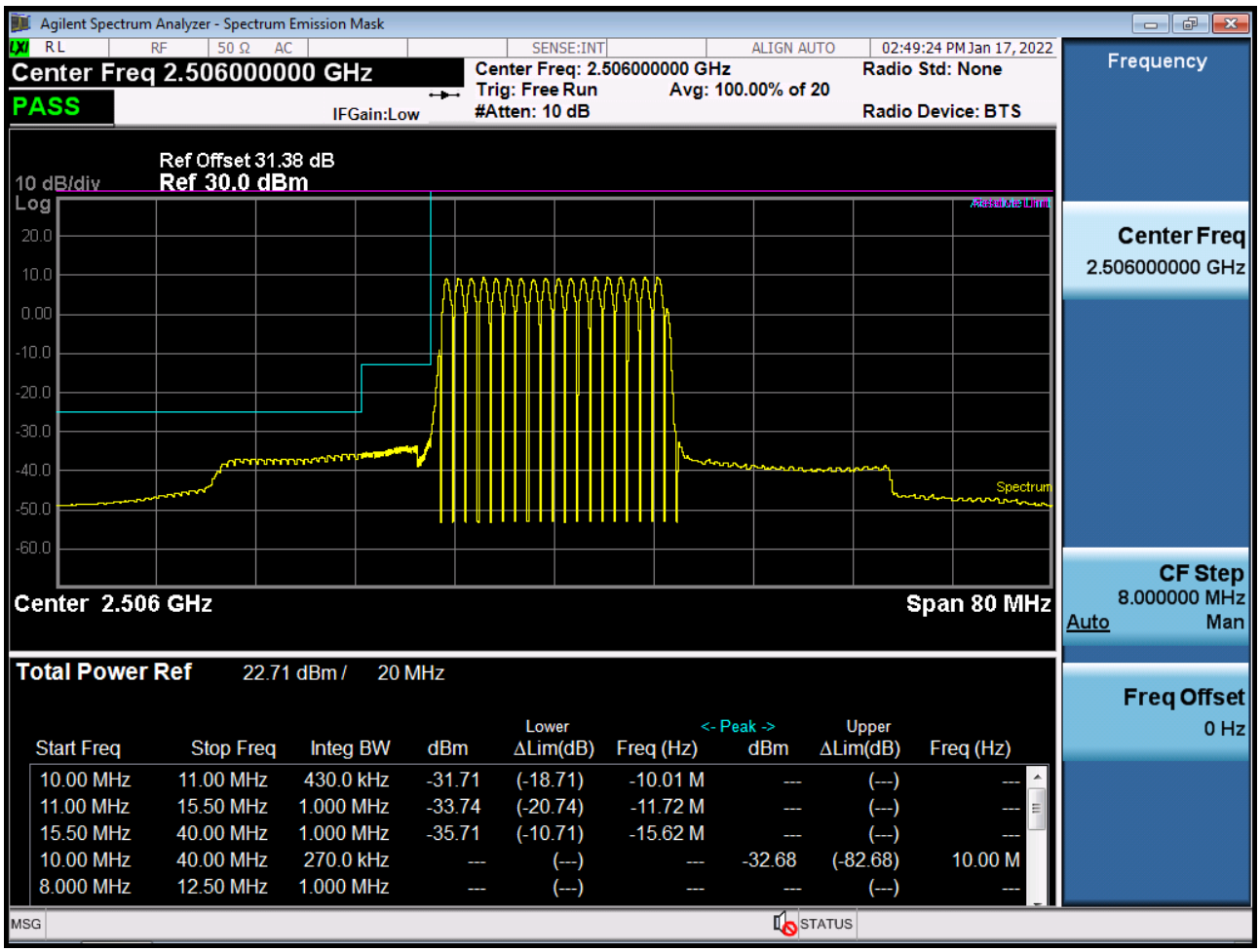
Low Channel Edge Plot (20 MHz Ch.39750 QPSK RB 1, Offset 0)-1



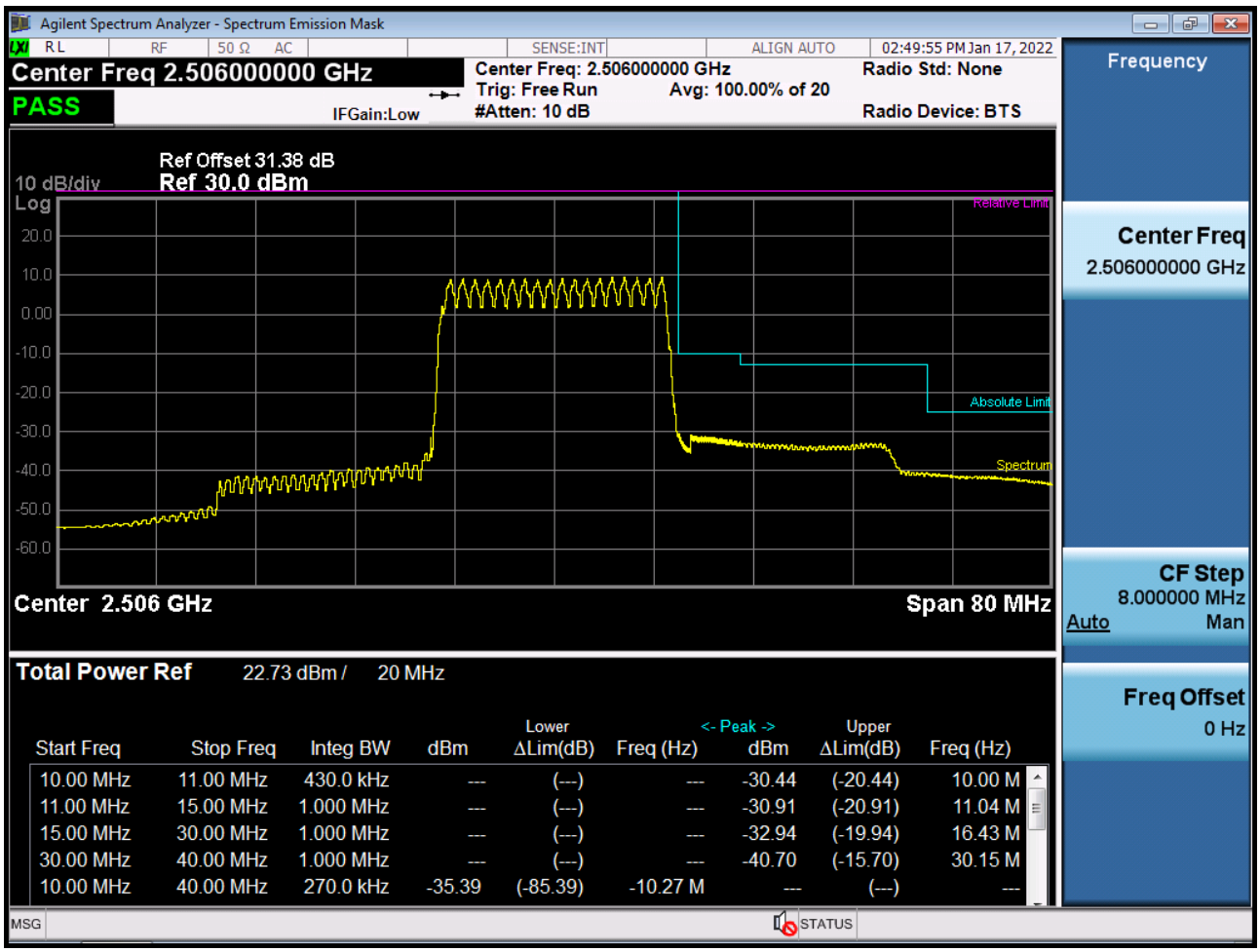
Low Channel Edge Plot (20 MHz Ch.39750 QPSK RB 1, Offset 0)-2



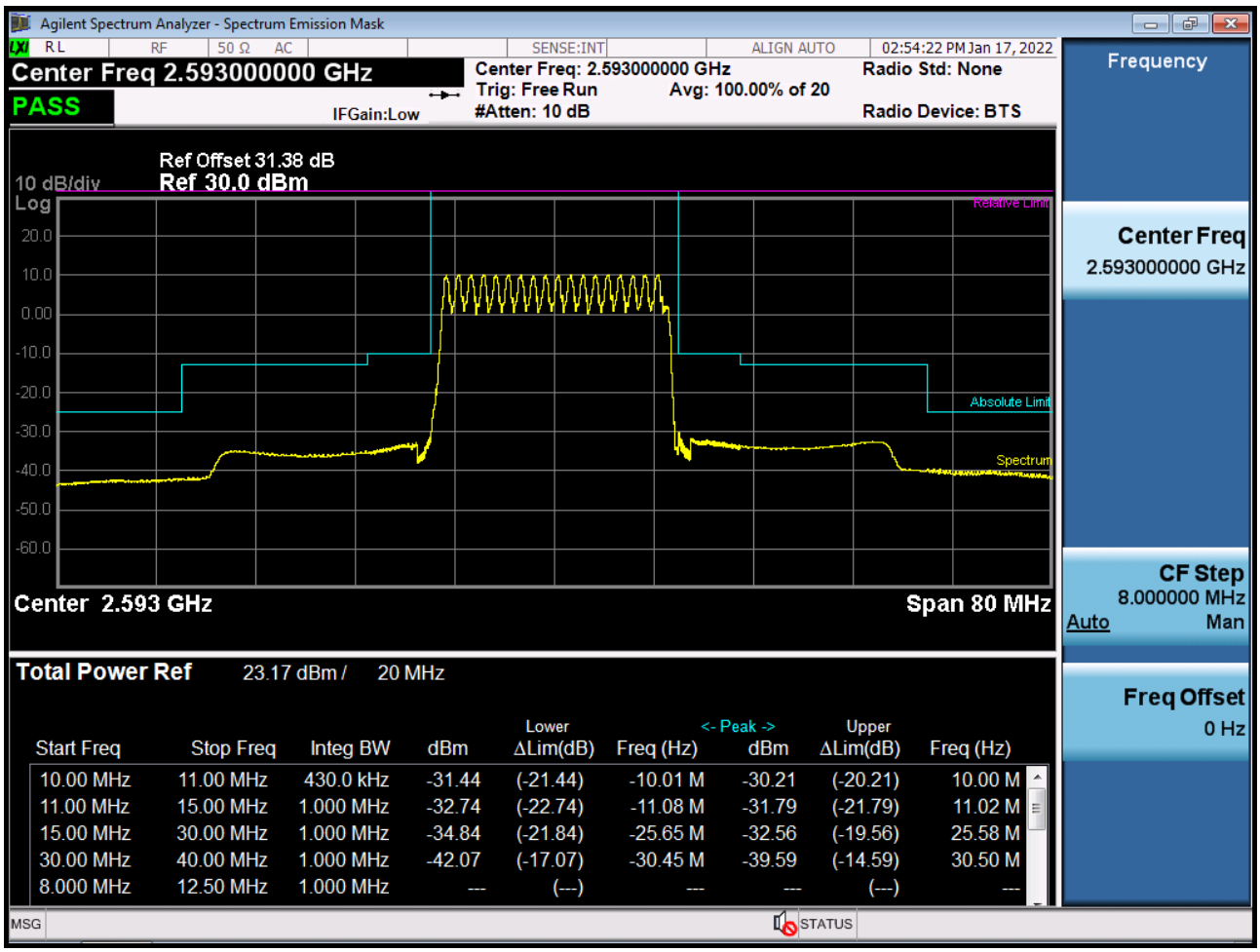
Low Channel Edge Plot (20 MHz Ch.39750 QPSK_RB100_Offset 0)-1



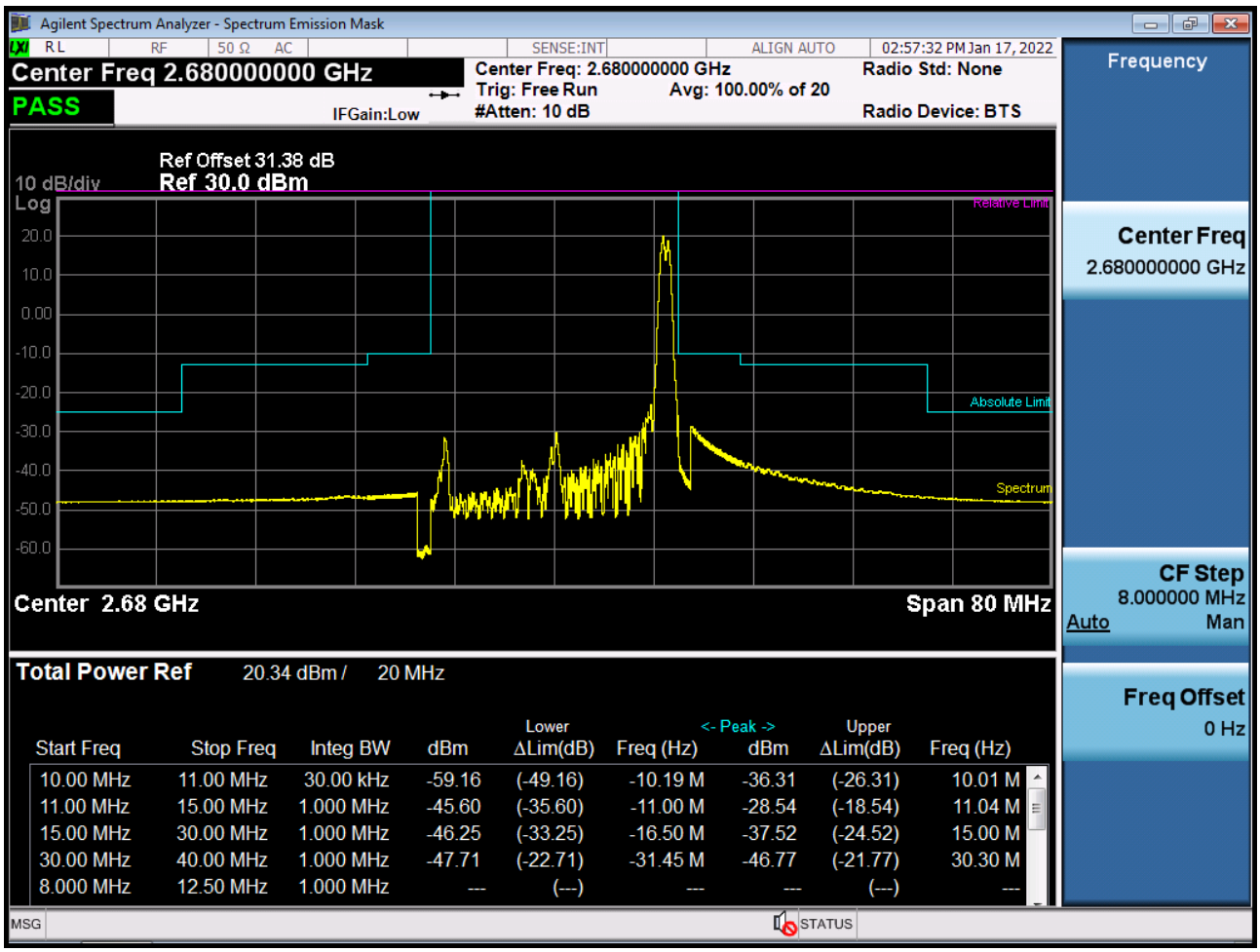
Low Channel Edge Plot (20 MHz Ch.39750 QPSK_RB100_Offset 0)-2



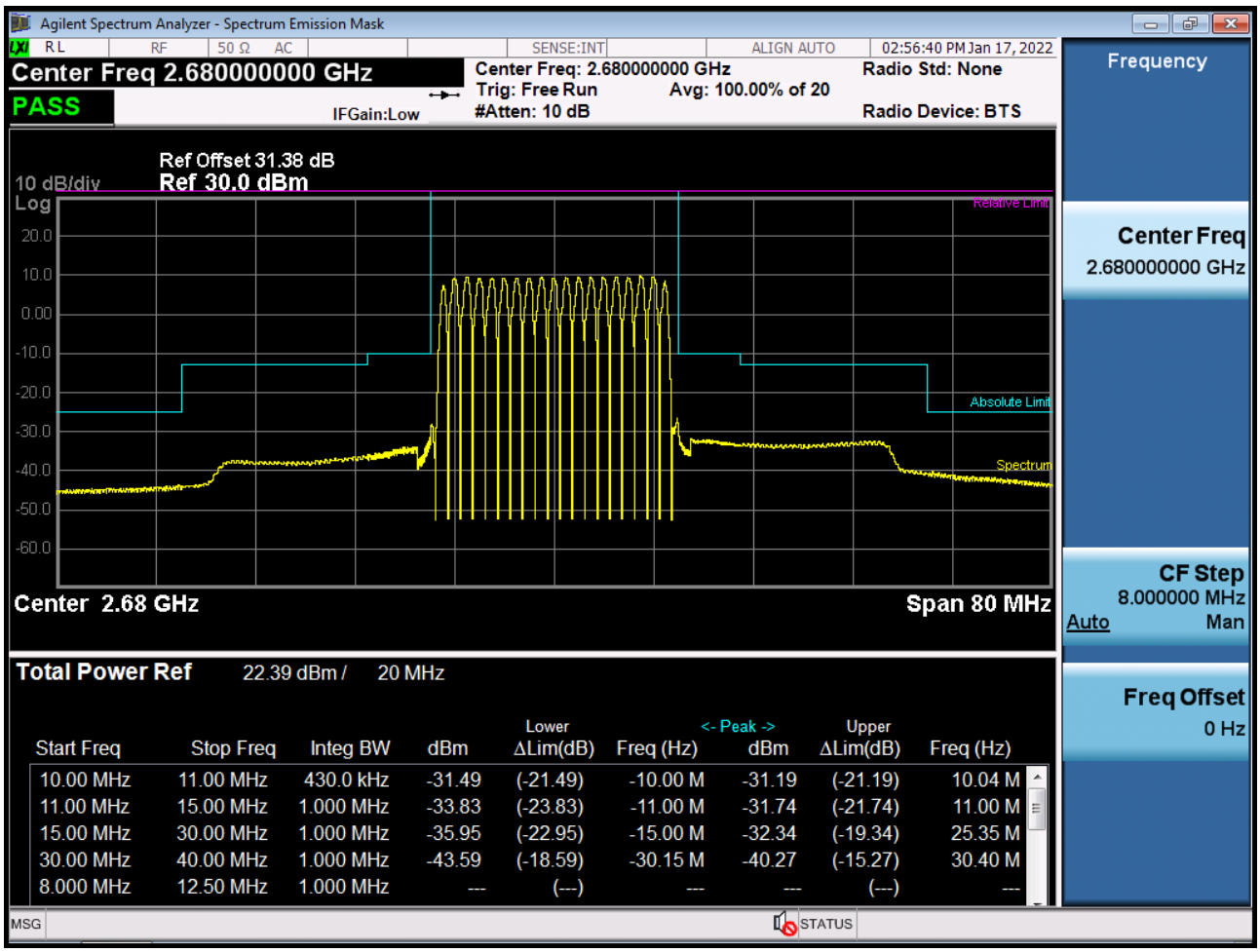
Mid Channel Edge Plot (20 MHz Ch.40620 QPSK RB 100)



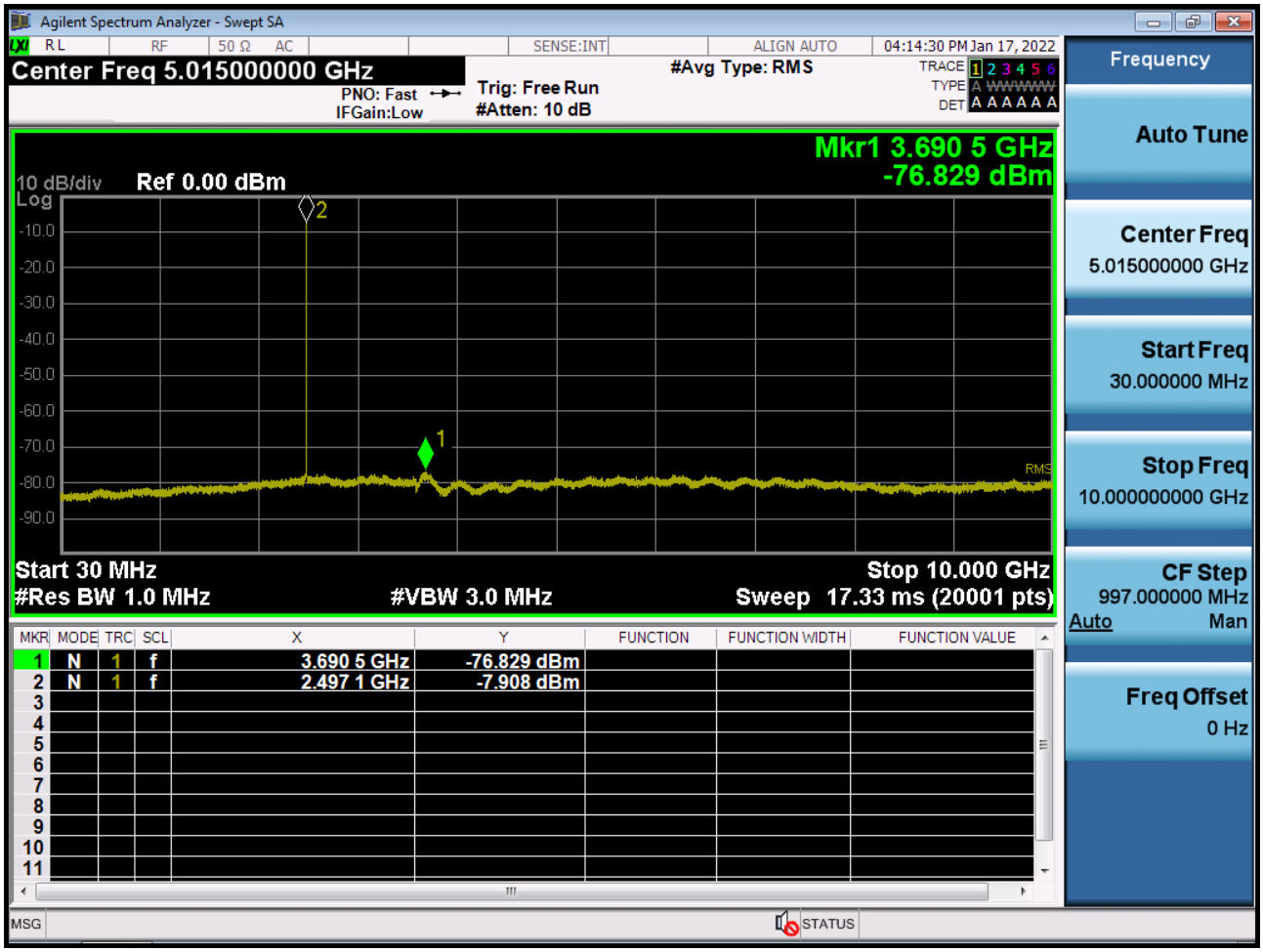
High Channel Edge Plot (20 MHz Ch.41490 QPSK RB 1, Offset 99)



High Channel Edge Plot (20 MHz Ch.41490 QPSK_RB100_Offset 0)

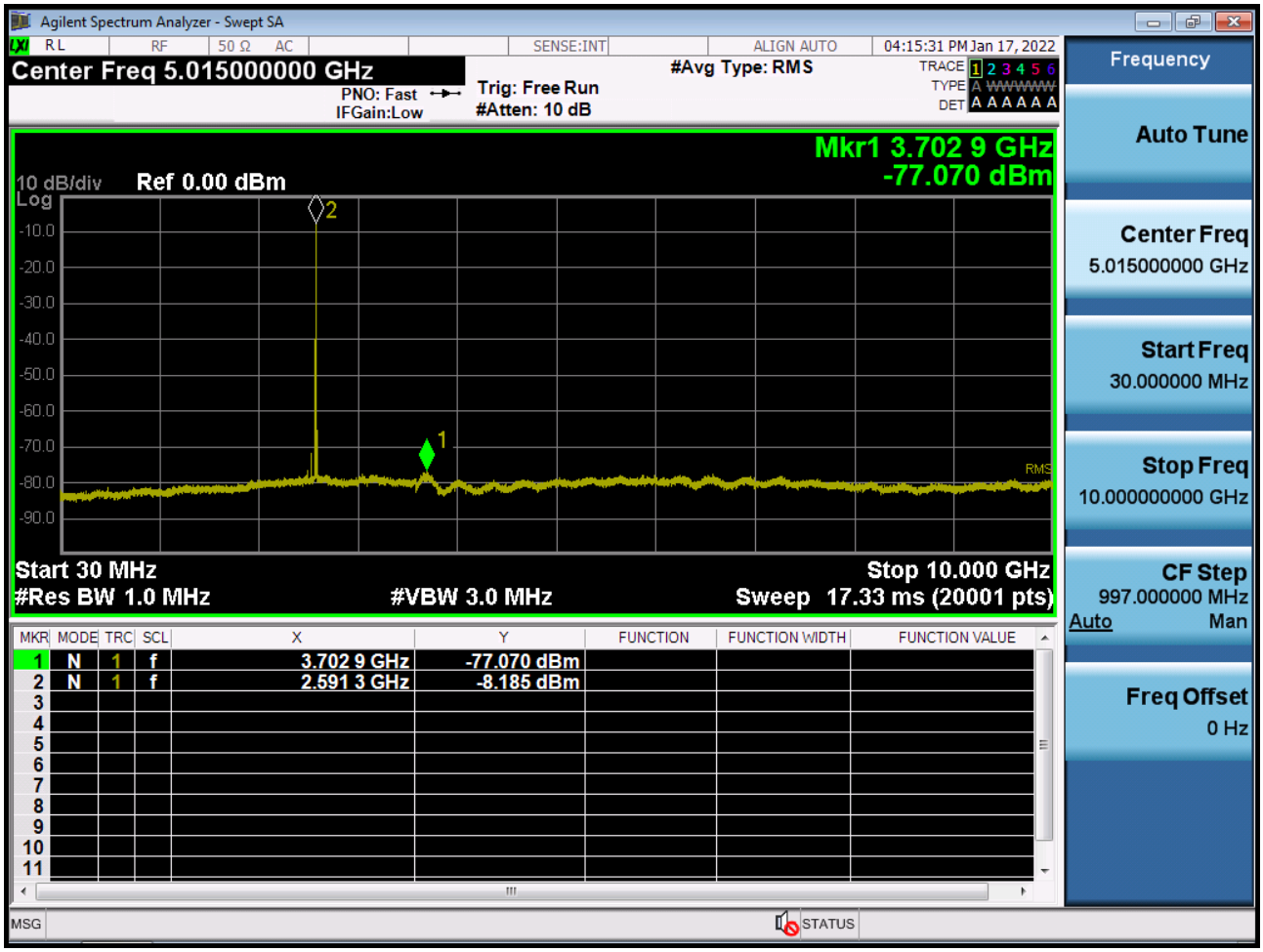


Conducted Spurious Plot 1 (5 MHz Ch.39675 QPSK RB 1, Offset 0)



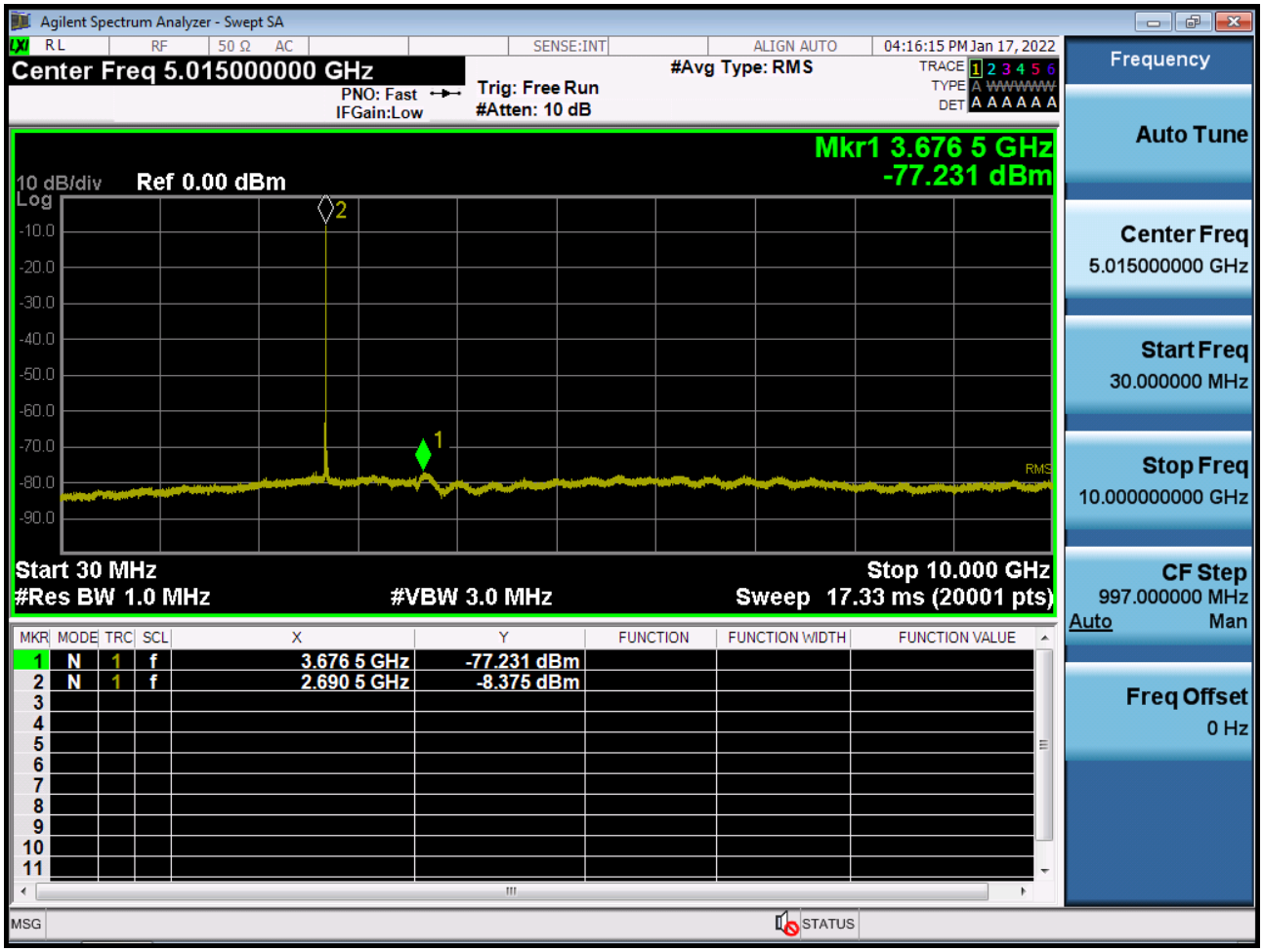
Conducted Spurious Plot 2 (5 MHz Ch. 39675 QPSK RB 1, Offset 0)

Conducted Spurious Plot 1 (5 MHz Ch.40620 QPSK RB 1, Offset 0)



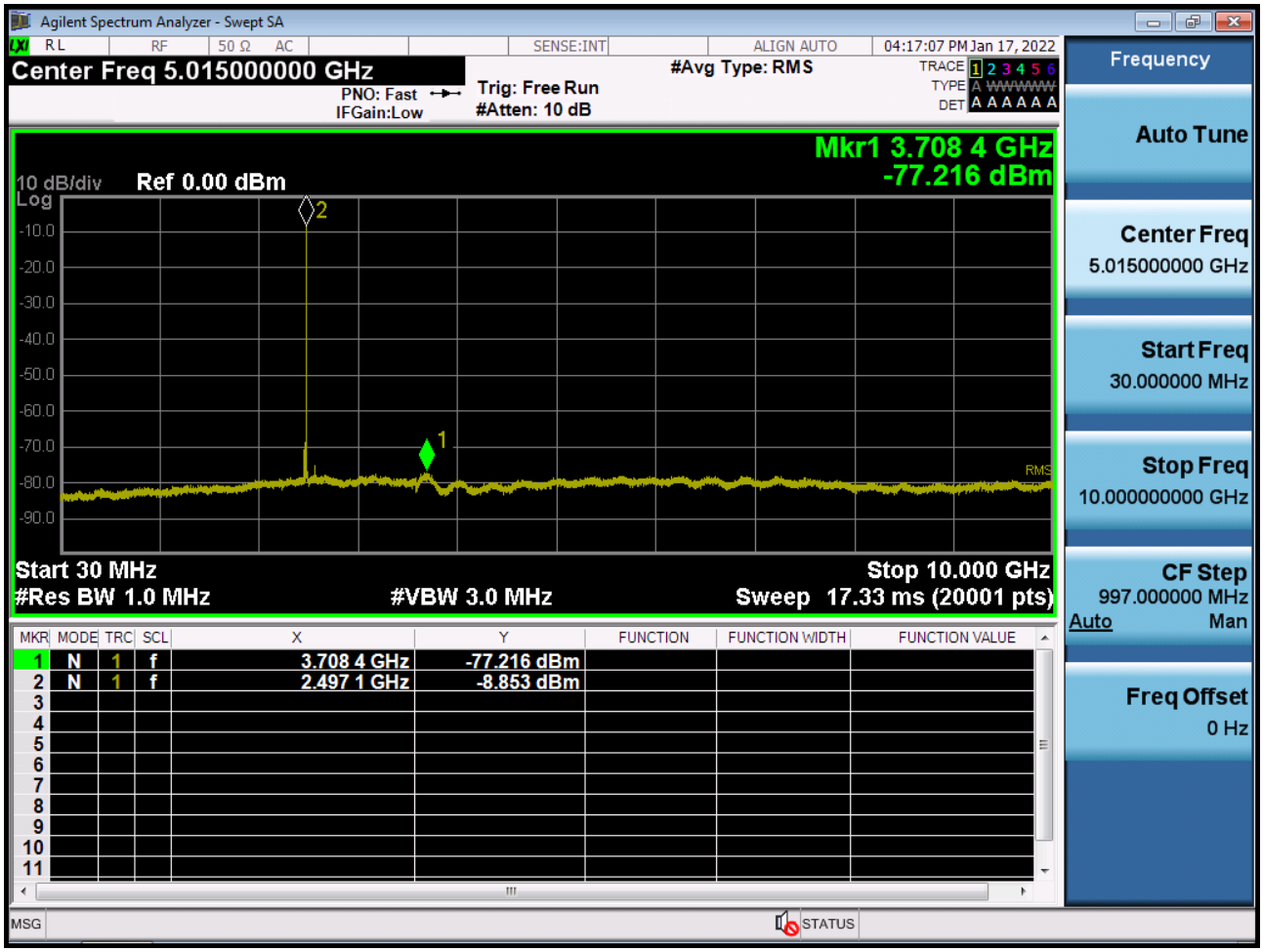
Conducted Spurious Plot 2 (5 MHz Ch. 40620 QPSK RB 1, Offset 0)

Conducted Spurious Plot 1 (5 MHz Ch.41565 QPSK RB 1, Offset 0)



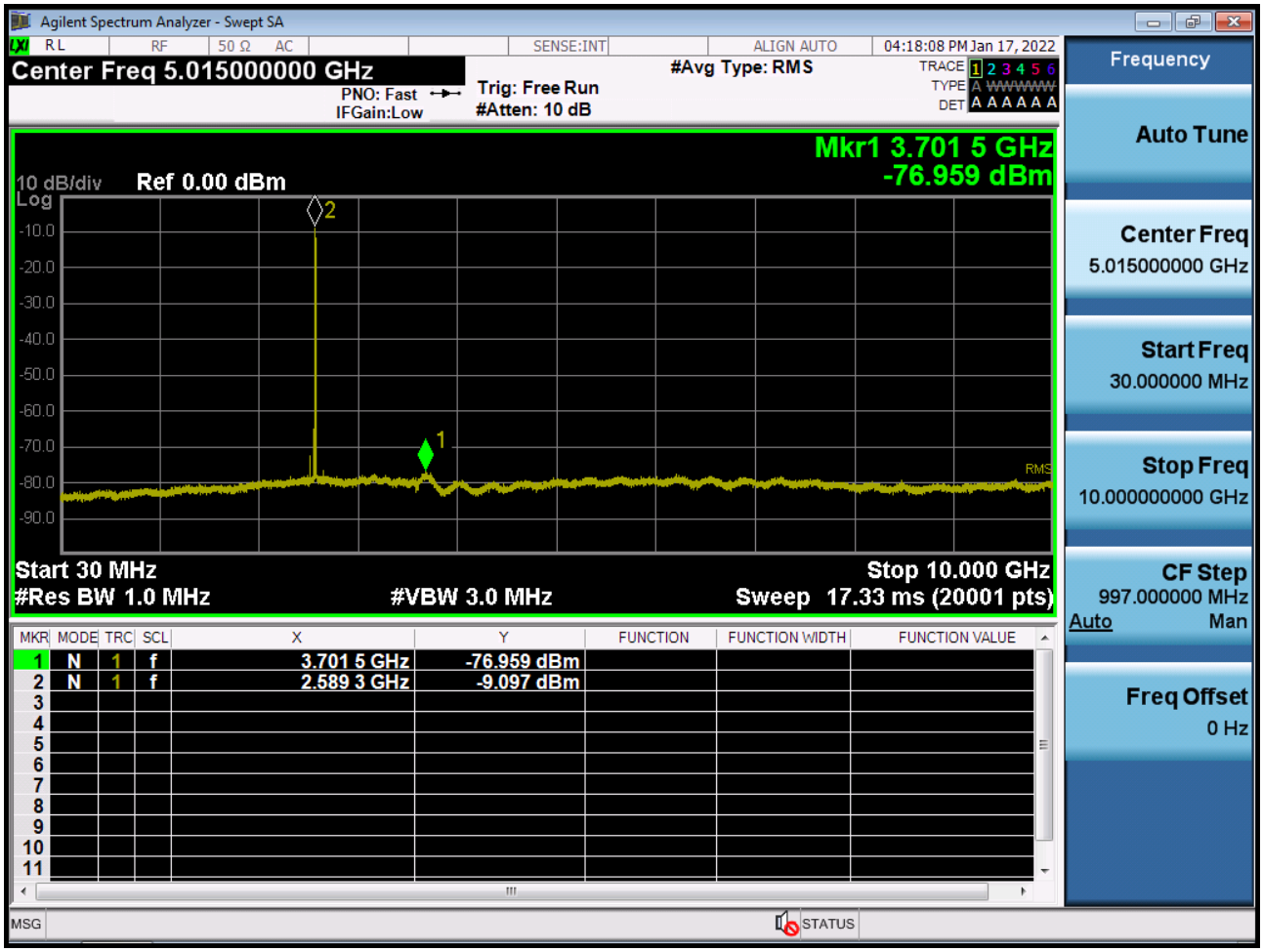
Conducted Spurious Plot 2 (5 MHz Ch. 41565 QPSK RB 1, Offset 0)

Conducted Spurious Plot 1 (10 MHz Ch.39700 QPSK RB 1, Offset 0)



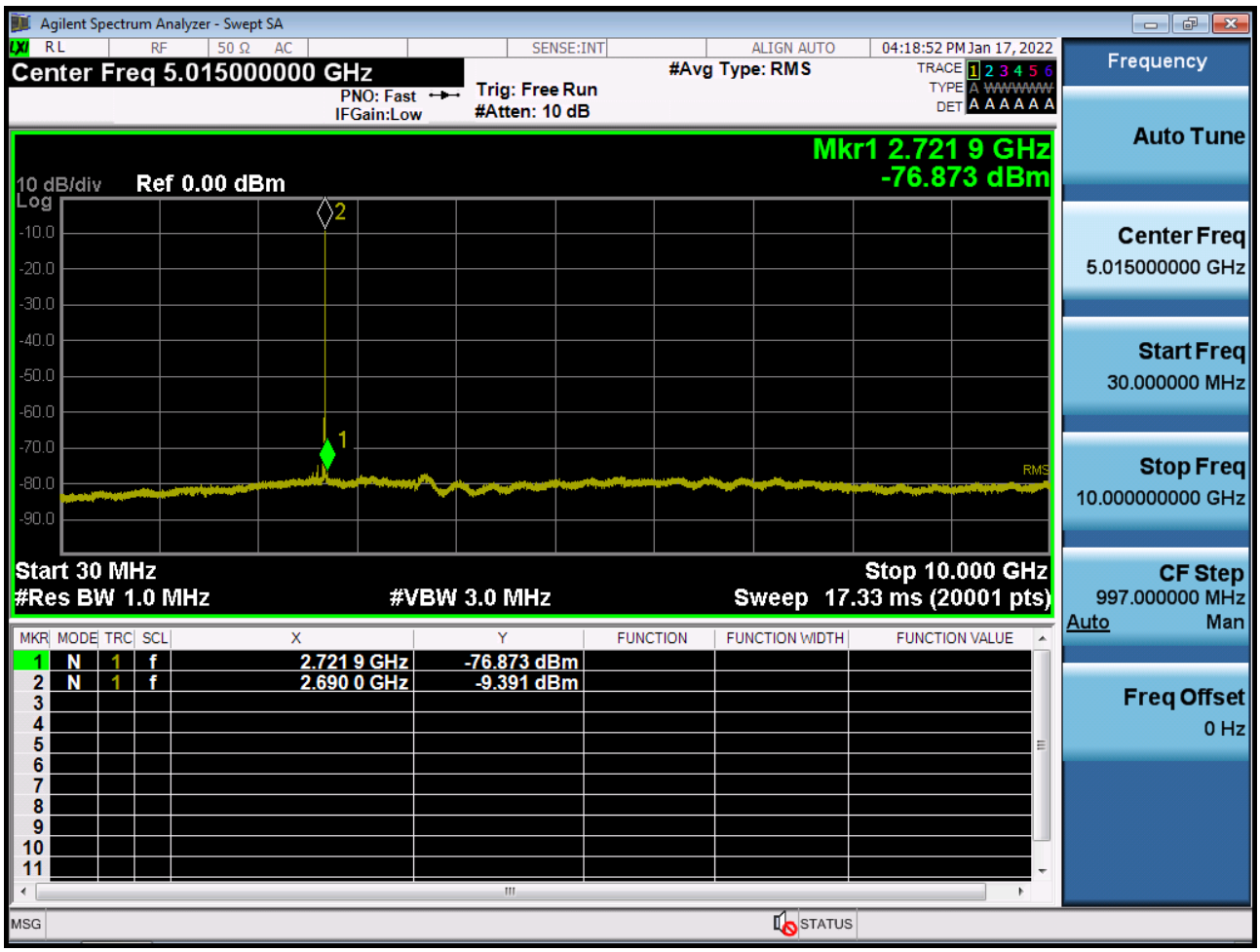
Conducted Spurious Plot 2 (10 MHz Ch. 39700 QPSK RB 1, Offset 0)

Conducted Spurious Plot 1 (10 MHz Ch.40620 QPSK RB 1, Offset 0)



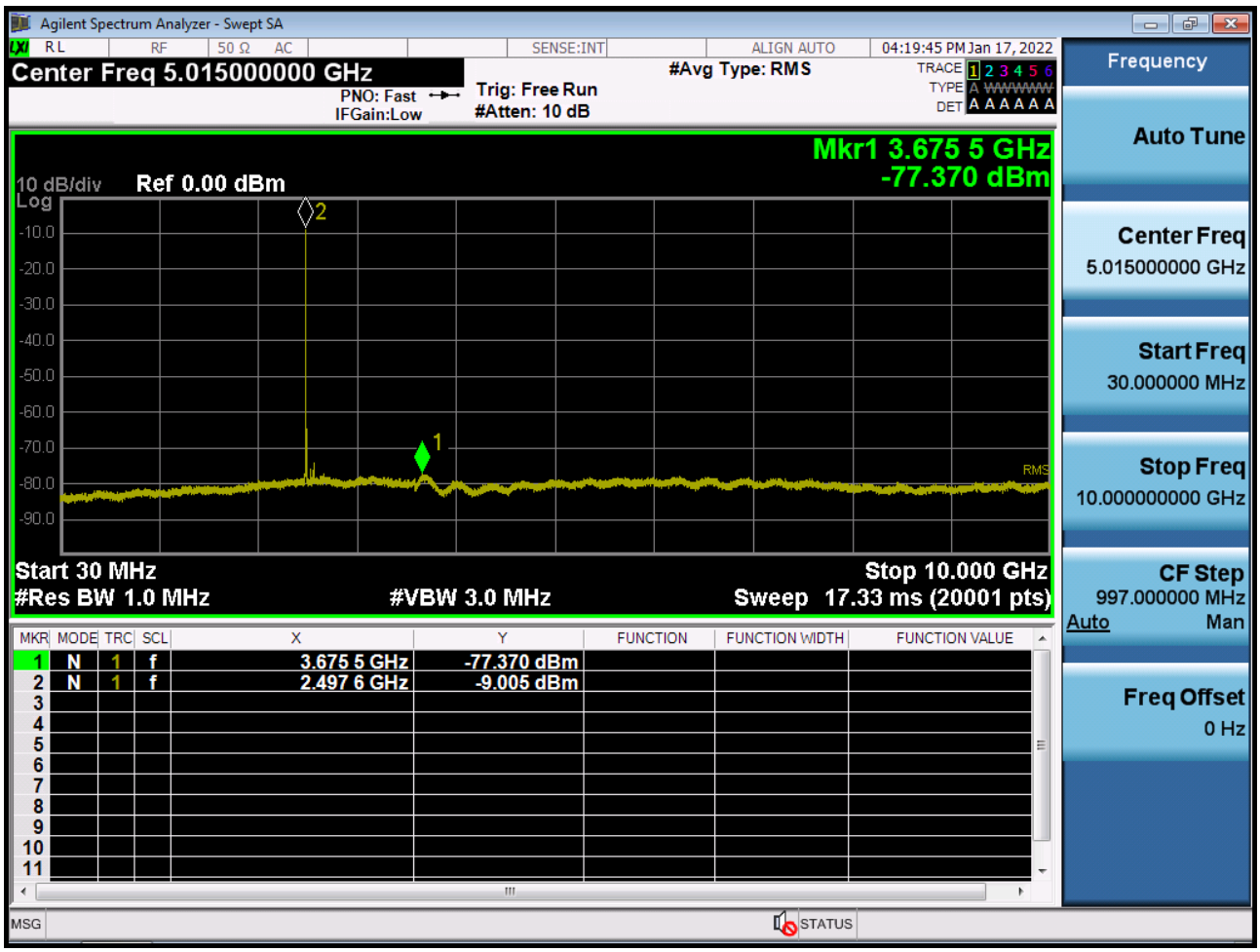
Conducted Spurious Plot 2 (10 MHz Ch. 40620 QPSK RB 1, Offset 0)

Conducted Spurious Plot 1 (10 MHz Ch. 41540 QPSK RB 1, Offset 0)



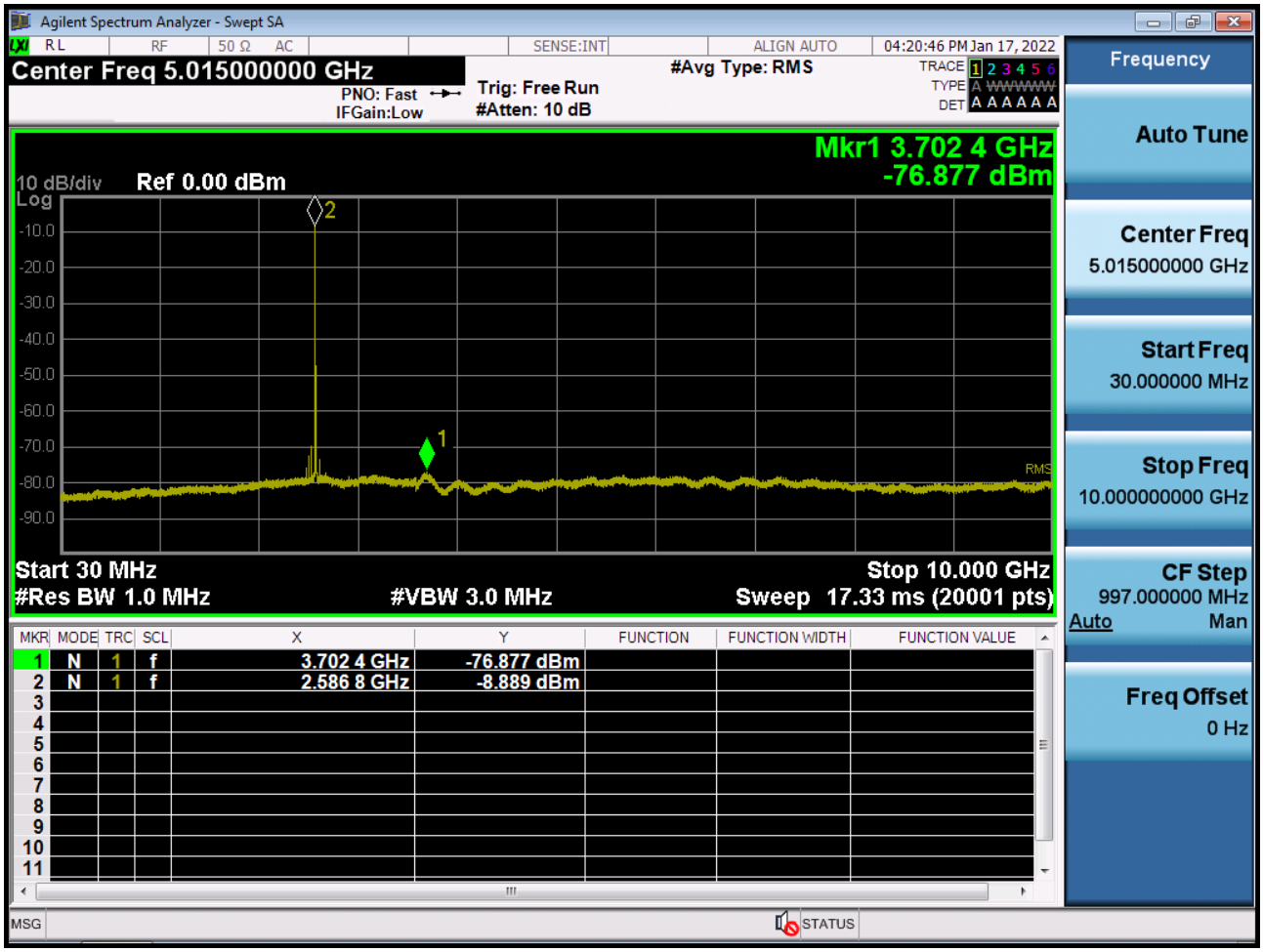
Conducted Spurious Plot 2 (10 MHz Ch. 41540 QPSK RB 1, Offset 0)

Conducted Spurious Plot 1 (15 MHz Ch.39725 QPSK RB 1, Offset 0)



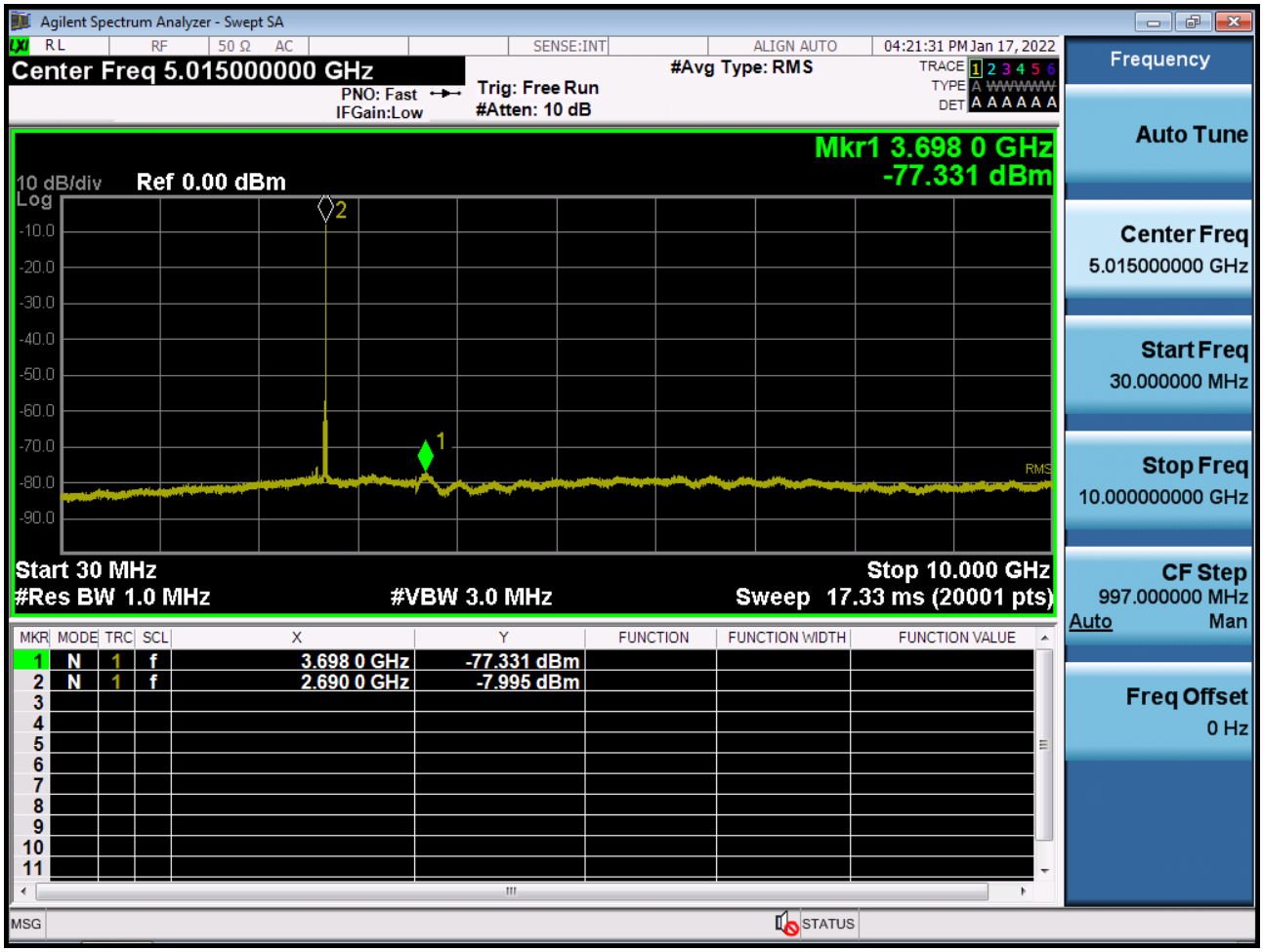
Conducted Spurious Plot 2 (15 MHz Ch. 39725 QPSK RB 1, Offset 0)

Conducted Spurious Plot 1 (15 MHz Ch.40620 QPSK RB 1, Offset 0)



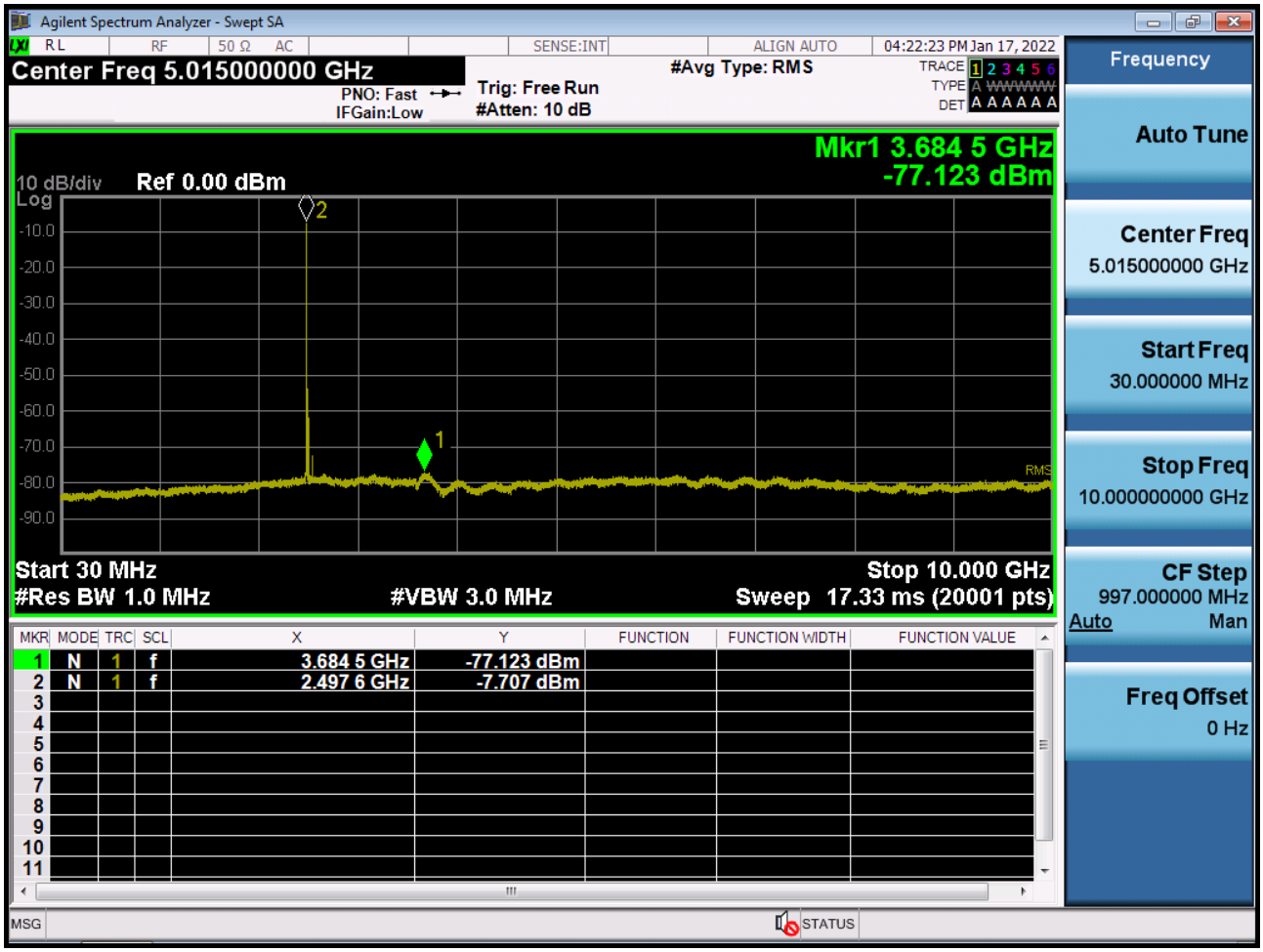
Conducted Spurious Plot 2 (15 MHz Ch. 40620 QPSK RB 1, Offset 0)

Conducted Spurious Plot 1 (15 MHz Ch.41515 QPSK RB 1, Offset 0)



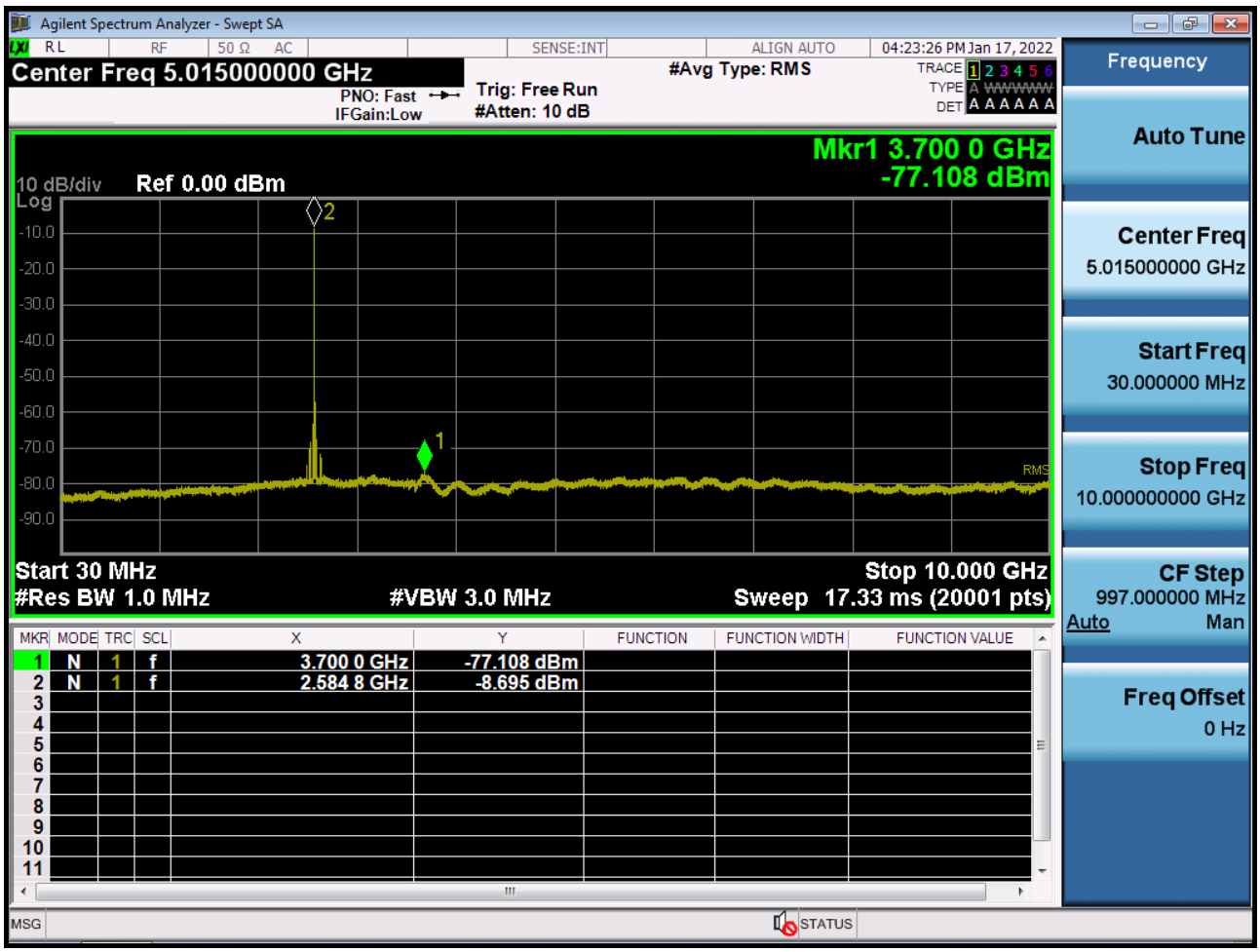
Conducted Spurious Plot 2 (15 MHz Ch. 41515 QPSK RB 1, Offset 0)

Conducted Spurious Plot 1 (20 MHz Ch.39750 QPSK RB 1, Offset 0)



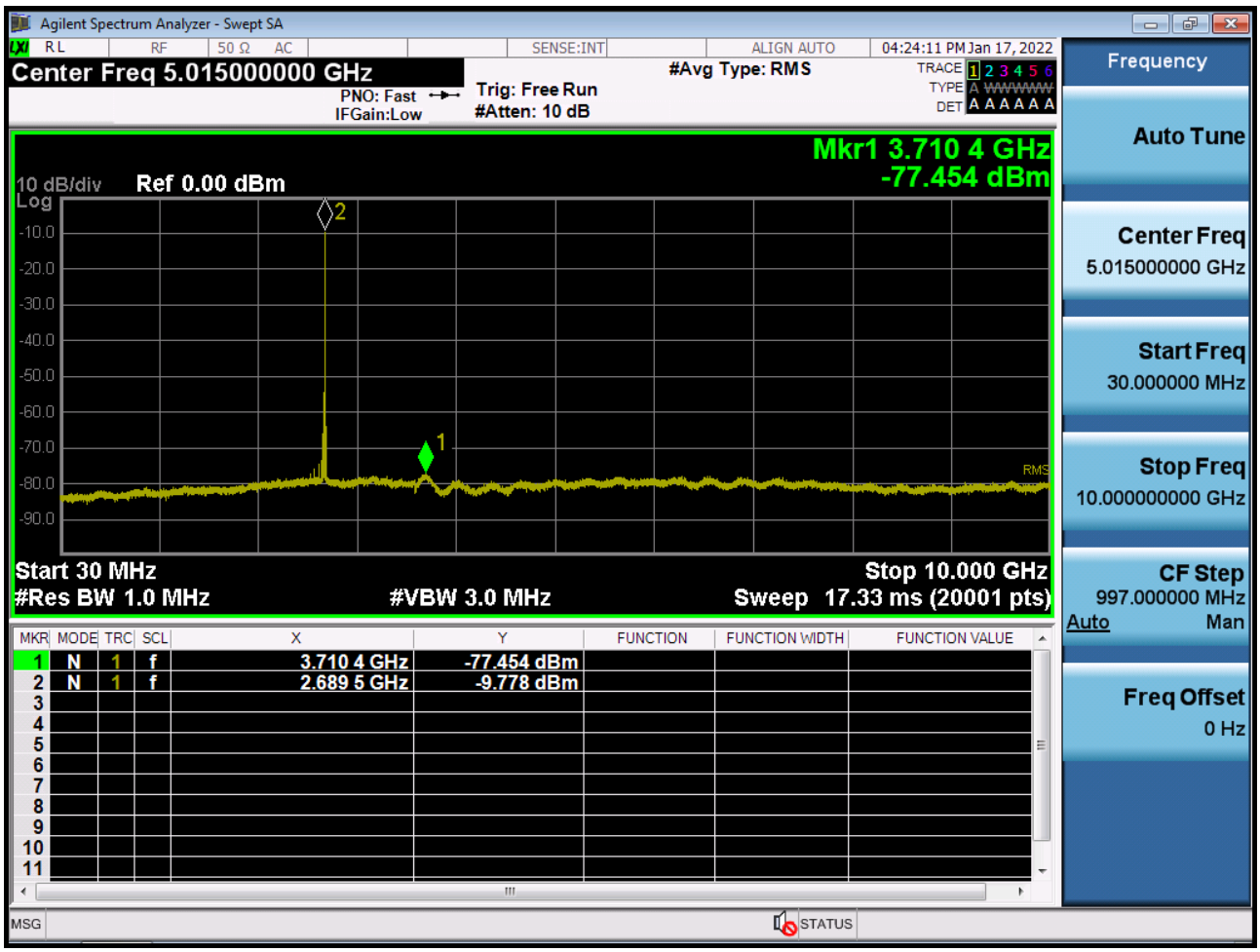
Conducted Spurious Plot 2 (20 MHz Ch. 39750 QPSK RB 1, Offset 0)

Conducted Spurious Plot 1 (20 MHz Ch.40620 QPSK RB 1, Offset 0)



Conducted Spurious Plot 2 (20 MHz Ch. 40620 QPSK RB 1, Offset 0)

Conducted Spurious Plot 1 (20 MHz Ch.41490 QPSK RB 1, Offset 0)



Conducted Spurious Plot 2 (20 MHz Ch. 41490 QPSK RB 1, Offset 0)

10. ANNEX A_ TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-2202-FC012-P