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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:
May 09, 2023

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

Report No.: HCT-RF-2305-FC016

FCC ID:	**A3LSMX818U**
APPLICANT:	**SAMSUNG Electronics Co., Ltd.**

Model(s): SM-X818U
EUT Type: Tablet
FCC Classification: PCS Licensed Transmitter (PCB)
FCC Rule Part(s): §27, §2

	Mode (MHz)	Tx Frequency (MHz)	Emission Designator	Modulation	EIRP	
					Max. Power (W)	Max. Power (dBm)
Power Class 2	LTE – Band 41 (5)	2498.5 – 2687.5	4M51G7D	QPSK	0.448	26.51
			4M51W7D	16QAM	0.363	25.60
			4M52W7D	64QAM	0.288	24.59
			4M51W7D	256QAM	0.142	21.52
	LTE – Band 41 (10)	2501.0 – 2685.0	9M02G7D	QPSK	0.472	26.74
			9M00W7D	16QAM	0.384	25.84
			8M98W7D	64QAM	0.301	24.78
			8M98W7D	256QAM	0.150	21.75
	LTE – Band 41 (15)	2503.5 – 2682.5	13M5G7D	QPSK	0.450	26.53
			13M5W7D	16QAM	0.360	25.56
			13M5W7D	64QAM	0.286	24.57
			13M5W7D	256QAM	0.145	21.61
	LTE – Band 41 (20)	2506.0 – 2680.0	17M9G7D	QPSK	0.499	26.98
			18M0W7D	16QAM	0.394	25.95
			18M0W7D	64QAM	0.314	24.97
			18M0W7D	256QAM	0.158	22.00

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-2305-FC016	May 09, 2023	- 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:	A3LSMX818U
Application Type:	Certification
FCC Classification:	PCS Licensed Transmitter (PCB)
FCC Rule Part(s):	§27, §2
EUT Type:	Tablet
Model(s):	SM-X818U
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:	March 13, 2023 ~ April 24, 2023
Serial number:	Radiated: R32W2003H3M Conducted: R32W2003JJD

2. INTRODUCTION

2.1. DESCRIPTION OF EUT

The EUT was a Tablet with UMTS and LTE, Sub6.

It also supports IEEE 802.11 a/b/g/n/ac/ax (20/40/80/160 MHz),WIFI 6E AIT, Keyboard, S-pen, mmWave.

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
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;

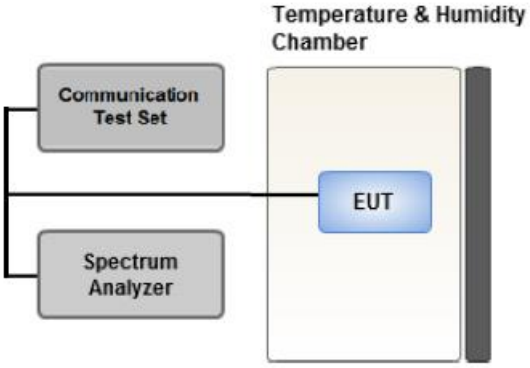
$$\text{Result}_{(dBm)} = \text{Pg}_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dBi)}$$

   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.

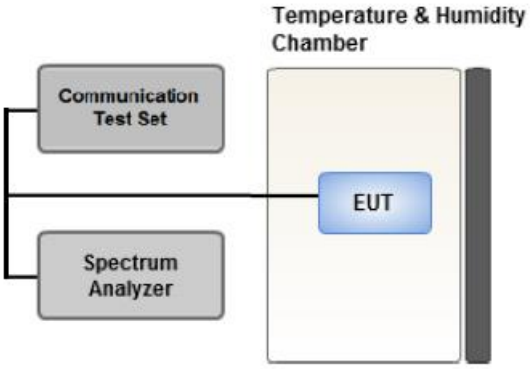
1. Set the RBW ≥ OBW.
2. Set VBW ≥ 3 × RBW.
3. Set span ≥ 2 × OBW.
4. Sweep time ≥ 10 × (number of points in sweep) × (transmission symbol period).
5. Detector = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the peak amplitude level.

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.

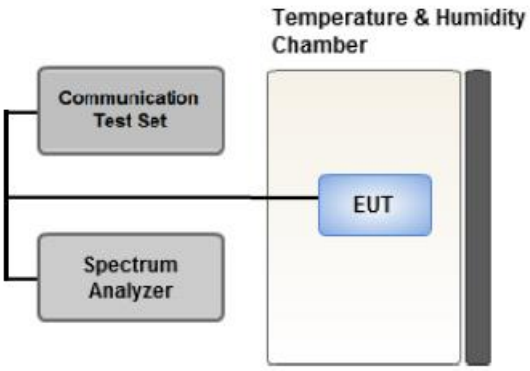
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

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

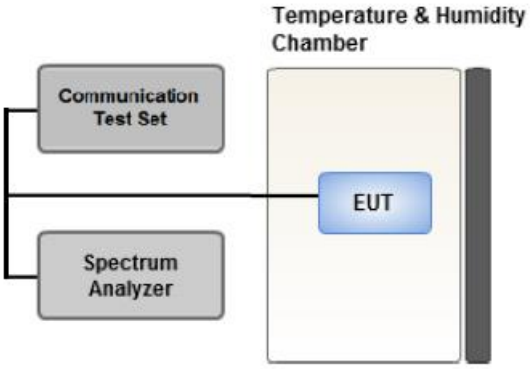
Test Overview

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

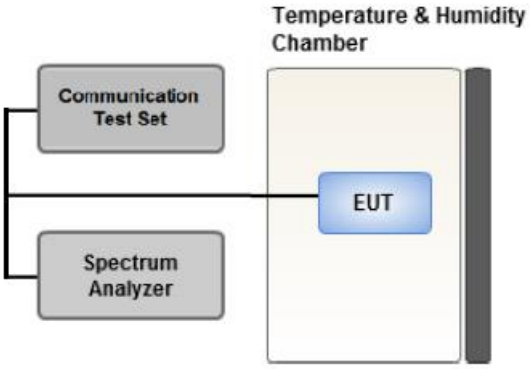
1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. Within 1MHz of the channel edge the RBW should be 2 % of EBW, then 1 MHz after that.
4. VBW > 3 x RBW
5. 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

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

3.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE



Test setup

Test Overview

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

The frequency stability of the transmitter is measured by:

1. Temperature:

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

2. Primary Supply Voltage:

   .- Unless otherwise specified, vary primary supply voltage from 85 % to 115 % of the nominal value for other than hand carried battery equipment.

   .- For hand carried, battery powered equipment, reduce the primary ac or dc supply voltage to the battery operating end point, which shall be specified by the manufacturer.

Test Settings

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

3.9 WORST CASE(RADIATED TEST)

- The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
- All modes of operation were investigated and the worst case configuration results are reported.
  Mode : Stand alone, Stand alone + External accessories (Earphone, AC adapter, etc)
  Worst case : Stand alone
- We were performed the RSE test in condition of co-location.
  Mode : Stand alone, Simultaneous transmission scenarios
  Worst case : Stand alone
- The worst case is reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the test data.
- All power classes were tested, and the results were reported for the worst case PC2.
- Please refer to the table below.

[Worst case]

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

3.10 WORST CASE(CONDUCTED TEST)

- All modes of operation were investigated and the worst case configuration results are reported.
- All power classes were tested, and the results were reported for the worst case PC2.

[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	-	01/19/2024	Annual
H.P.F	FBSR-02B(WHK3.3/18 G-10EF)	T&M SYSTEM	-	01/19/2024	Annual
Power Splitter(DC ~ 26.5 GHz)	11667B	Hewlett Packard	5001	04/19/2024	Annual
DC Power Supply	E3632A	Agilent	MY40010147	06/21/2023	Annual
Dipole Antenna	UHAP	Schwarzbeck	557	03/09/2025	Biennial
Dipole Antenna	UHAP	Schwarzbeck	558	03/09/2025	Biennial
Chamber	SU-642	ESPEC	93008124	02/22/2024	Annual
Horn Antenna(1 ~ 18 GHz)	BBHA 9120D	Schwarzbeck	147	08/30/2023	Biennial
Horn Antenna(1 ~ 18 GHz)	BBHA 9120D	Schwarzbeck	9120D-1298	09/15/2023	Biennial
Horn Antenna(15 ~ 40 GHz)	BBHA 9170	Schwarzbeck	BBHA9170342	09/29/2024	Biennial
Horn Antenna(15 ~ 40 GHz)	BBHA 9170	Schwarzbeck	BBHA9170124	03/28/2025	Biennial
Signal Analyzer(10 Hz ~ 26.5 GHz)	N9020A	Agilent	MY52090906	04/20/2024	Annual
ATTENUATOR(20 dB)	8493C	Hewlett Packard	17280	04/19/2024	Annual
Spectrum Analyzer(10 Hz ~ 40 GHz)	FSV40	REOHDE & SCHWARZ	100931	08/29/2023	Annual
Base Station	8960 (E5515C)	Agilent	MY48360800	08/18/2023	Annual
Loop Antenna(9 kHz ~ 30 MHz)	FMZB1513	Schwarzbeck	1513-333	03/17/2024	Biennial
Trilog Broadband Antenna	VULB9168	Schwarzbeck	895	08/16/2024	Biennial
Trilog Broadband Antenna	VULB9168	Schwarzbeck	1135	03/21/2024	Biennial
Wideband Radio Communication Tester	MT8821C	Anritsu Corp.	6262094331	12/01/2023	Annual
Wideband Radio Communication Tester	MT8820C	Anritsu Corp.	6201026545	01/05/2024	Annual
SIGNAL GENERATOR (100 kHz ~ 40 GHz)	SMB100A	REOHDE & SCHWARZ	177633	07/05/2023	Annual
Signal Analyzer(5 Hz ~ 40.0 GHz)	N9030B	KEYSIGHT	MY55480167	05/30/2023	Annual
FCC LTE Mobile Conducted RF Automation Test Software	-	HCT CO., LTD.,	-	-	-

Note:

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

5. MEASUREMENT UNCERTAINTY

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

Parameter	Expanded Uncertainty (±dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.90 (Confidence level about 95 %, k=2)
Radiated Disturbance (9 kHz ~ 30 MHz)	4.14 (Confidence level about 95 %, k=2)
Radiated Disturbance (30 MHz ~ 1 GHz)	5.82 (Confidence level about 95 %, k=2)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.74 (Confidence level about 95 %, k=2)
Radiated Disturbance (18 GHz ~ 40 GHz)	5.76 (Confidence level about 95 %, k=2)
Radiated Disturbance (Above 40 GHz)	5.52 (Confidence level about 95 %, k=2)

6. SUMMARY OF TEST RESULTS

6.1 Test Condition : Conducted Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Occupied Bandwidth	§2.1049	N/A	PASS
Band Edge / Spurious and Harmonic Emissions at Antenna Terminal.	§2.1051, §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
Peak- to- Average Ratio	§27.50(d)(5)	< 13 dB	PASS
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	-18.41	18.28	10.70	2.47	V	< 2.00	0.448	26.51
		16-QAM	-19.32	17.37	10.70	2.47	V		0.363	25.60
		64-QAM	-20.33	16.36	10.70	2.47	V		0.288	24.59
		256-QAM	-23.40	13.29	10.70	2.47	V		0.142	21.52
2593.0		QPSK	-18.71	17.93	10.62	2.53	V		0.400	26.02
		16-QAM	-19.62	17.02	10.62	2.53	V		0.324	25.11
		64-QAM	-20.61	16.03	10.62	2.53	V		0.258	24.12
		256-QAM	-23.64	13.00	10.62	2.53	V		0.129	21.09
2687.5		QPSK	-20.09	17.07	10.78	2.63	V		0.333	25.22
		16-QAM	-21.00	16.16	10.78	2.63	V		0.270	24.31
		64-QAM	-22.01	15.15	10.78	2.63	V		0.214	23.30
		256-QAM	-25.09	12.07	10.78	2.63	V		0.105	20.22

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	-18.18	18.51	10.70	2.47	V	< 2.00	0.472	26.74
		16-QAM	-19.08	17.61	10.70	2.47	V		0.384	25.84
		64-QAM	-20.14	16.55	10.70	2.47	V		0.301	24.78
		256-QAM	-23.17	13.52	10.70	2.47	V		0.150	21.75
2593.0		QPSK	-18.49	18.15	10.62	2.53	V		0.421	26.24
		16-QAM	-19.41	17.23	10.62	2.53	V		0.341	25.32
		64-QAM	-20.40	16.24	10.62	2.53	V		0.271	24.33
		256-QAM	-23.43	13.21	10.62	2.53	V		0.135	21.30
2685.0		QPSK	-19.85	17.41	10.77	2.63	V		0.359	25.55
		16-QAM	-20.73	16.53	10.77	2.63	V		0.293	24.67
		64-QAM	-21.75	15.51	10.77	2.63	V		0.232	23.65
		256-QAM	-24.82	12.44	10.77	2.63	V		0.114	20.58

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	-18.38	18.31	10.70	2.48	V	< 2.00	0.450	26.53
		16-QAM	-19.35	17.34	10.70	2.48	V		0.360	25.56
		64-QAM	-20.34	16.35	10.70	2.48	V		0.286	24.57
		256-QAM	-23.30	13.39	10.70	2.48	V		0.145	21.61
2593.0		QPSK	-18.50	18.14	10.62	2.53	V		0.420	26.23
		16-QAM	-19.38	17.26	10.62	2.53	V		0.343	25.35
		64-QAM	-20.37	16.27	10.62	2.53	V		0.273	24.36
		256-QAM	-23.43	13.21	10.62	2.53	V		0.135	21.30
2682.5		QPSK	-20.10	17.25	10.76	2.63	V		0.345	25.38
		16-QAM	-20.96	16.39	10.76	2.63	V		0.283	24.52
		64-QAM	-21.97	15.38	10.76	2.63	V		0.224	23.51
		256-QAM	-25.03	12.32	10.76	2.63	V		0.111	20.45

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	-17.93	18.76	10.70	2.48	V	< 2.00	0.499	26.98
		16-QAM	-18.96	17.73	10.70	2.48	V		0.394	25.95
		64-QAM	-19.94	16.75	10.70	2.48	V		0.314	24.97
		256-QAM	-22.91	13.78	10.70	2.48	V		0.158	22.00
2593.0		QPSK	-18.27	18.37	10.62	2.53	V		0.443	26.46
		16-QAM	-19.18	17.46	10.62	2.53	V		0.359	25.55
		64-QAM	-20.15	16.49	10.62	2.53	V		0.287	24.58
		256-QAM	-23.22	13.42	10.62	2.53	V		0.142	21.51
2680.0		QPSK	-20.04	17.31	10.76	2.63	V		0.350	25.44
		16-QAM	-20.92	16.43	10.76	2.63	V		0.286	24.56
		64-QAM	-21.96	15.39	10.76	2.63	V		0.225	23.52
		256-QAM	-25.04	12.31	10.76	2.63	V		0.111	20.44

8.2 RADIATED SPURIOUS EMISSIONS

▣ OPERATING FREQUENCY : 2498.5 MHz

▣ MEASURED OUTPUT POWER: 26.51 dBm = 0.448 W

▣ MODE: LTE B41

▣ MODULATION SIGNAL: 5 MHz QPSK

▣ DISTANCE: 1 meters

▣ LIMIT: 55 + 10 log10 (W) = 51.51 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	-55.09	12.60	-65.08	3.81	V	-56.29	82.81
	7 495.50	-45.93	10.80	-45.68	4.60	H	-39.47	65.98
	9 994.00	-59.83	11.19	-55.29	5.58	V	-49.68	76.19
40620 (2593.0)	5 186.00	-53.33	12.44	-62.66	3.74	V	-53.96	80.47
	7 779.00	-55.12	11.40	-54.80	4.68	V	-48.08	74.60
	10 372.00	-57.54	11.40	-52.01	5.71	V	-46.32	72.84
41565 (2687.5)	5 375.00	-52.81	13.00	-62.17	3.77	V	-52.94	79.45
	8 062.50	-53.32	10.80	-51.46	4.79	H	-45.45	71.96
	10 750.00	-59.10	11.20	-53.63	5.72	H	-48.15	74.66

▣ OPERATING FREQUENCY : 2501.0 MHz

▣ MEASURED OUTPUT POWER: 26.74 dBm = 0.472 W

▣ MODE: LTE B41

▣ MODULATION SIGNAL: 10 MHz QPSK

▣ DISTANCE: 1 meters

▣ LIMIT: 55 + 10 log10 (W) = 51.74 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	-54.90	12.60	-64.89	3.81	V	-56.10	82.85
	7 503.00	-44.61	10.80	-44.24	4.60	H	-38.04	64.78
	10 004.00	-58.97	11.21	-54.95	5.53	V	-49.27	76.01
40620 (2593.0)	5 186.00	-53.62	12.44	-62.95	3.74	V	-54.25	80.99
	7 779.00	-52.33	11.40	-52.01	4.68	V	-45.29	72.04
	10 372.00	-59.33	11.40	-53.80	5.71	H	-48.11	74.86
41540 (2685.0)	5 370.00	-53.27	13.00	-62.66	3.75	V	-53.41	80.15
	8 055.00	-49.98	10.80	-48.08	4.80	H	-42.08	68.82
	10 740.00	-59.04	11.22	-53.60	5.60	H	-47.98	74.72

▣ OPERATING FREQUENCY : 2503.5 MHz

▣ MEASURED OUTPUT POWER: 26.53 dBm = 0.450 W

▣ MODE: LTE B41

▣ MODULATION SIGNAL: 15 MHz QPSK

▣ DISTANCE: 1 meters

▣ LIMIT: 55 + 10 log10 (W) = 51.53 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	-55.03	12.58	-65.37	3.76	V	-56.55	83.08
	7 510.50	-42.90	10.82	-42.58	4.61	V	-36.37	62.90
	10 014.00	-59.88	11.23	-56.06	5.46	V	-50.29	76.82
40620 (2593.0)	5 186.00	-52.57	12.44	-61.90	3.74	V	-53.20	79.73
	7 779.00	-53.27	11.40	-52.95	4.68	V	-46.23	72.76
	10 372.00	-59.07	11.40	-53.54	5.71	H	-47.85	74.38
41515 (2682.5)	5 365.00	-54.12	13.00	-63.49	3.75	V	-54.23	80.76
	8 047.50	-51.37	10.80	-49.42	4.80	H	-43.42	69.95
	10 730.00	-59.20	11.24	-54.06	5.59	H	-48.41	74.94

▣ OPERATING FREQUENCY : 2506.0 MHz

▣ MEASURED OUTPUT POWER: 26.98 dBm = 0.499 W

▣ MODE: LTE B41

▣ MODULATION SIGNAL: 20 MHz QPSK

▣ DISTANCE: 1 meters

▣ LIMIT: 55 + 10 log10 (W) = 51.98 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	-53.13	12.58	-63.47	3.76	V	-54.65	81.63
	7 518.00	-43.51	10.84	-43.43	4.61	H	-37.20	64.18
	10 024.00	-58.84	11.25	-54.92	5.41	H	-49.07	76.05
40620 (2593.0)	5 186.00	-53.56	12.44	-62.89	3.74	H	-54.19	81.17
	7 779.00	-50.90	11.40	-50.58	4.68	V	-43.86	70.84
	10 372.00	-57.93	11.40	-52.40	5.71	H	-46.71	73.69
41490 (2680.0)	5 360.00	-53.24	13.00	-62.58	3.74	V	-53.32	80.30
	8 040.00	-53.89	10.82	-52.05	4.79	V	-46.02	73.00
	10 720.00	-58.90	11.26	-54.00	5.68	H	-48.42	75.40

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	5.66
			16-QAM			6.69
			64-QAM			7.17
			256-QAM			7.43
	10 MHz		QPSK	50		5.77
			16-QAM			6.49
			64-QAM			7.04
			256-QAM			7.40
	15 MHz		QPSK	75		5.63
			16-QAM			6.49
			64-QAM			6.83
			256-QAM			7.08
	20 MHz		QPSK	100		5.61
			16-QAM			6.47
			64-QAM			6.84
			256-QAM			6.98

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	4.5139
			16-QAM			4.5142
			64-QAM			4.5203
			256-QAM			4.5138
	10 MHz		QPSK	50		9.0230
			16-QAM			8.9987
			64-QAM			8.9760
			256-QAM			8.9794
	15 MHz		QPSK	75		13.525
			16-QAM			13.472
			64-QAM			13.526
			256-QAM			13.487
	20 MHz		QPSK	100		17.926
			16-QAM			17.994
			64-QAM			18.009
			256-QAM			17.995

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	26.1147	34.110	-76.637	-42.527	-25.00
		2593.0	25.8380	34.110	-76.176	-42.066	
		2687.5	26.1882	34.110	-76.488	-42.378	
	10	2501.0	26.1670	34.110	-76.391	-42.281	
		2593.0	26.1045	34.110	-76.370	-42.260	
		2685.0	26.1504	34.110	-76.408	-42.298	
	15	2503.5	26.1572	34.110	-76.459	-42.349	
		2593.0	26.1296	34.110	-76.446	-42.336	
		2682.5	26.1394	34.110	-76.445	-42.335	
	20	2506.0	26.1147	34.110	-76.338	-42.228	
		2593.0	26.1151	34.110	-76.499	-42.389	
		2680.0	26.1644	34.110	-76.425	-42.315	

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	-23.54	-23.33	-27.33	-25.89	-36.15	-34.44	-37.01
10 MHz	2501.0	QPSK	50/0	-25.78	-25.14	-25.25	-24.83	-31.31	-30.07	-37.16
15 MHz	2503.5	QPSK	75/0	-31.47	-29.89	-30.90	-28.71	-33.24	-30.75	-37.97
20 MHz	2506.0	QPSK	100/0	-32.70	-30.82	-32.04	-29.95	-34.66	-32.01	-38.87
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	-20.83	-20.33	-22.31	-19.56
	2687.5	QPSK	25	0	-20.07	-19.11	-20.61	-18.16
10 MHz	2593.0	QPSK	50	0	-23.74	-22.81	-23.85	-21.48
	2685.0	QPSK	50	0	-23.36	-21.72	-23.29	-20.04
15 MHz	2593.0	QPSK	75	0	-26.91	-24.99	-26.07	-22.89
	2682.5	QPSK	75	0	-26.73	-24.37	-26.22	-22.59
20 MHz	2593.0	QPSK	100	0	-27.84	-25.80	-27.25	-23.86
	2680.0	QPSK	100	0	-27.67	-25.30	-27.77	-23.74
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	-32.36	-31.59	-32.84	-33.00
	2687.5	QPSK	25	0	-30.98	-29.72	-33.32	-31.91
10 MHz	2593.0	QPSK	50	0	-28.71	-25.41	-35.10	-34.99
	2685.0	QPSK	50	0	-29.99	-24.94	-36.71	-33.38
15 MHz	2593.0	QPSK	75	0	-29.15	-25.83	-34.57	-34.07
	2682.5	QPSK	75	0	-29.24	-24.76	-34.84	-33.82
20 MHz	2593.0	QPSK	100	0	-29.70	-26.44	-36.28	-35.59
	2680.0	QPSK	100	0	-29.91	-25.31	-36.57	-36.50
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

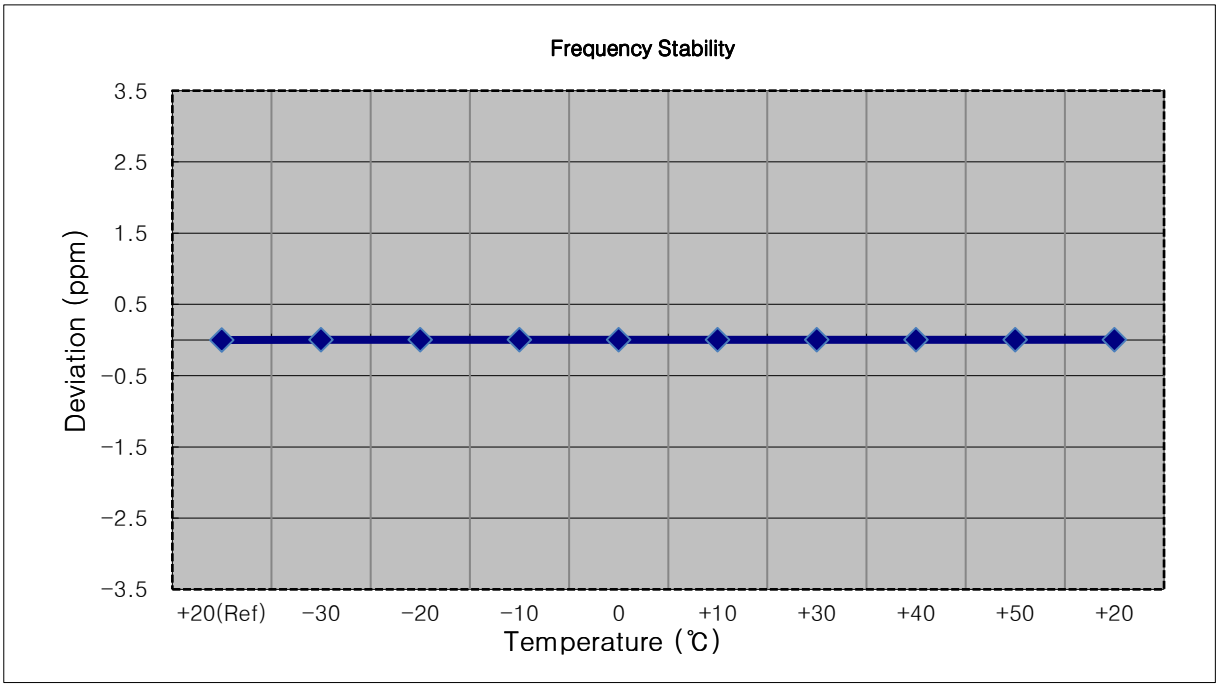
▣ OPERATING FREQUENCY: 2498,500,000 Hz

▣ BANDWIDTH: 39675 (5 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	2498 500 006	0.0	0.000 000	0.000
100 %		-30	2498 500 012	5.8	0.000 000	0.002
100 %		-20	2498 500 016	9.8	0.000 000	0.004
100 %		-10	2498 500 016	9.3	0.000 000	0.004
100 %		0	2498 500 012	5.7	0.000 000	0.002
100 %		+10	2498 500 015	9.2	0.000 000	0.004
100 %		+30	2498 500 012	5.8	0.000 000	0.002
100 %		+40	2498 500 015	8.8	0.000 000	0.004
100 %		+50	2498 500 015	8.5	0.000 000	0.003
Batt. Endpoint	3.400	+20	2498 500 018	11.4	0.000 000	0.005



▣ MODE: LTE 41

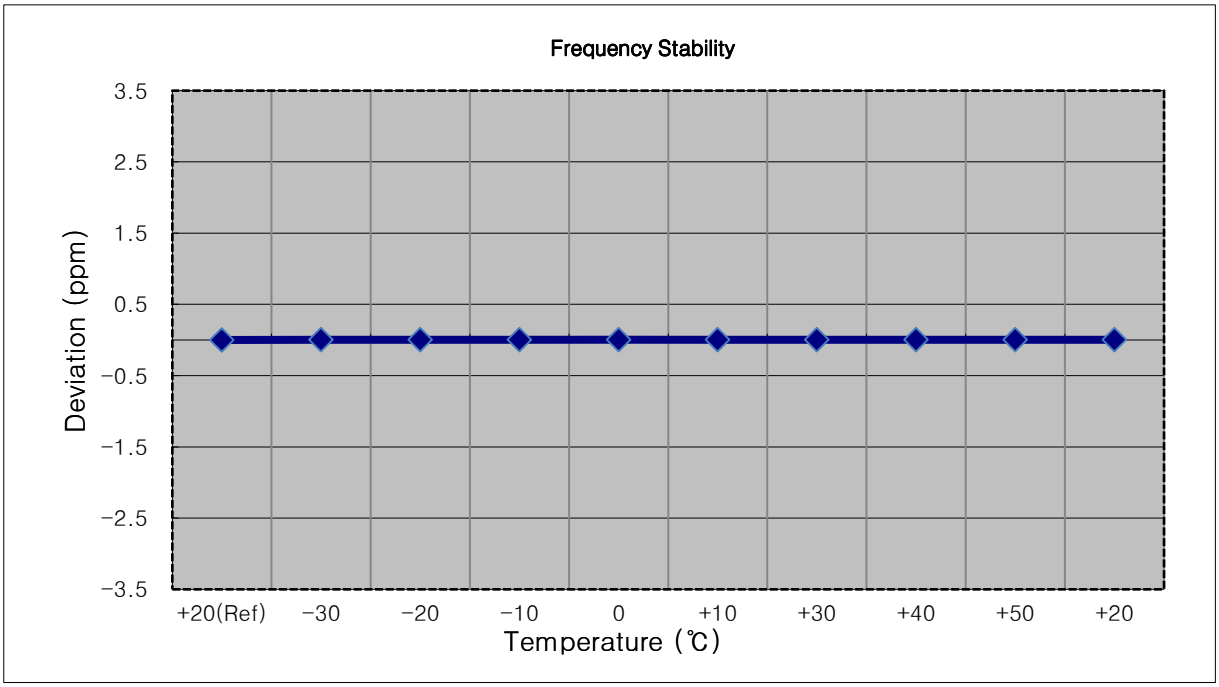
▣ OPERATING FREQUENCY: 2501,000,000 Hz

▣ BANDWIDTH: 39700 (10 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	2501 000 004	0.0	0.000 000	0.000
100 %		-30	2501 000 009	5.2	0.000 000	0.002
100 %		-20	2501 000 010	5.5	0.000 000	0.002
100 %		-10	2501 000 010	5.9	0.000 000	0.002
100 %		0	2501 000 013	9.2	0.000 000	0.004
100 %		+10	2501 000 007	2.8	0.000 000	0.001
100 %		+30	2501 000 009	4.8	0.000 000	0.002
100 %		+40	2501 000 012	8.3	0.000 000	0.003
100 %		+50	2501 000 010	5.7	0.000 000	0.002
Batt. Endpoint	3.400	+20	2501 000 013	8.5	0.000 000	0.003



▣ MODE: LTE 41

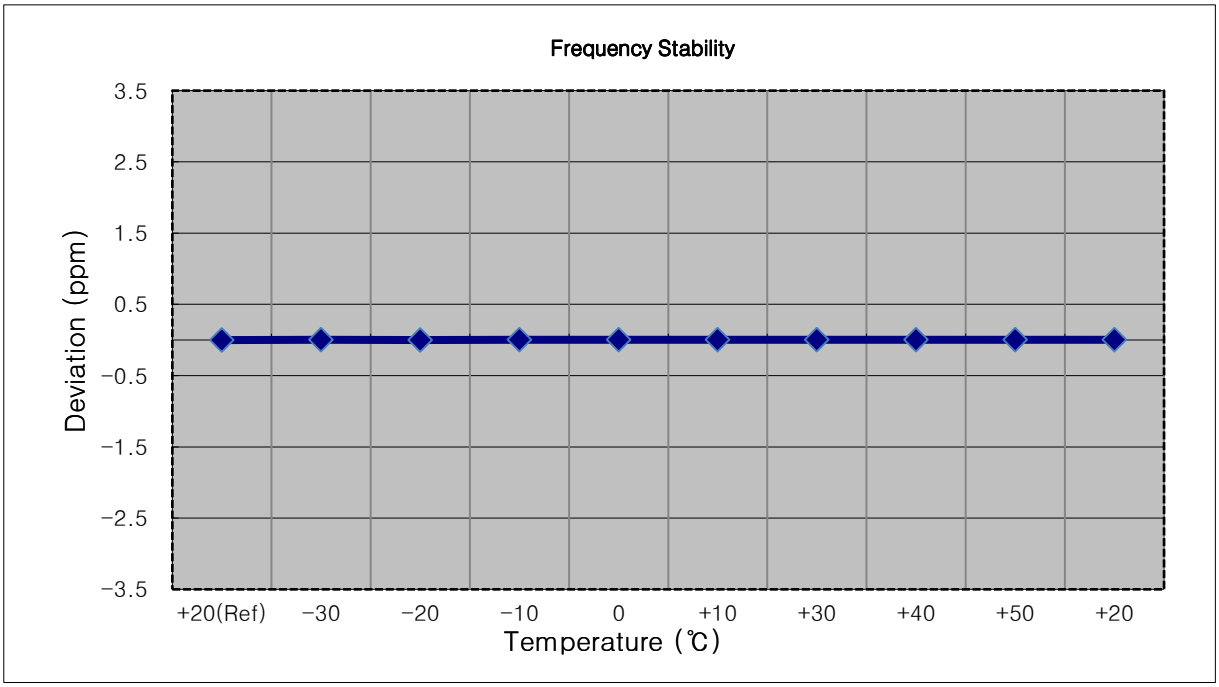
▣ OPERATING FREQUENCY: 2503,500,000 Hz

▣ BANDWIDTH: 39725 (15 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	2503 500 003	0.0	0.000 000	0.000
100 %		-30	2503 500 006	3.1	0.000 000	0.001
100 %		-20	2503 500 001	-1.9	0.000 000	-0.001
100 %		-10	2503 500 006	3.4	0.000 000	0.001
100 %		0	2503 500 007	4.8	0.000 000	0.002
100 %		+10	2503 500 005	2.7	0.000 000	0.001
100 %		+30	2503 500 008	5.8	0.000 000	0.002
100 %		+40	2503 500 008	5.4	0.000 000	0.002
100 %		+50	2503 500 009	6.1	0.000 000	0.002
Batt. Endpoint	3.400	+20	2503 500 005	2.8	0.000 000	0.001



▣ MODE: LTE 41

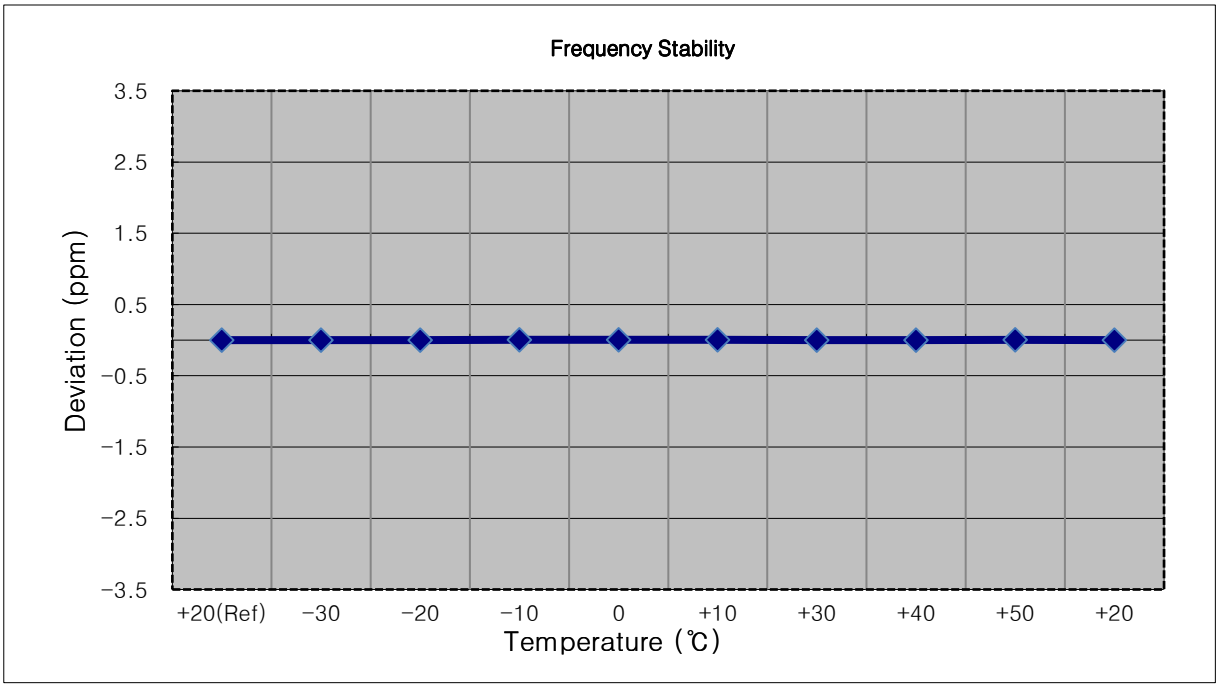
▣ OPERATING FREQUENCY: 2506,000,000 Hz

▣ BANDWIDTH: 39750 (20 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	2506 000 006	0.0	0.000 000	0.000
100 %		-30	2506 000 012	6.3	0.000 000	0.003
100 %		-20	2506 000 012	6.5	0.000 000	0.003
100 %		-10	2506 000 015	9.2	0.000 000	0.004
100 %		0	2506 000 013	7.5	0.000 000	0.003
100 %		+10	2506 000 013	7.2	0.000 000	0.003
100 %		+30	2506 000 009	3.0	0.000 000	0.001
100 %		+40	2506 000 010	4.2	0.000 000	0.002
100 %		+50	2506 000 015	9.6	0.000 000	0.004
Batt. Endpoint	3.400	+20	2506 000 012	6.1	0.000 000	0.002



▣ MODE: LTE 41

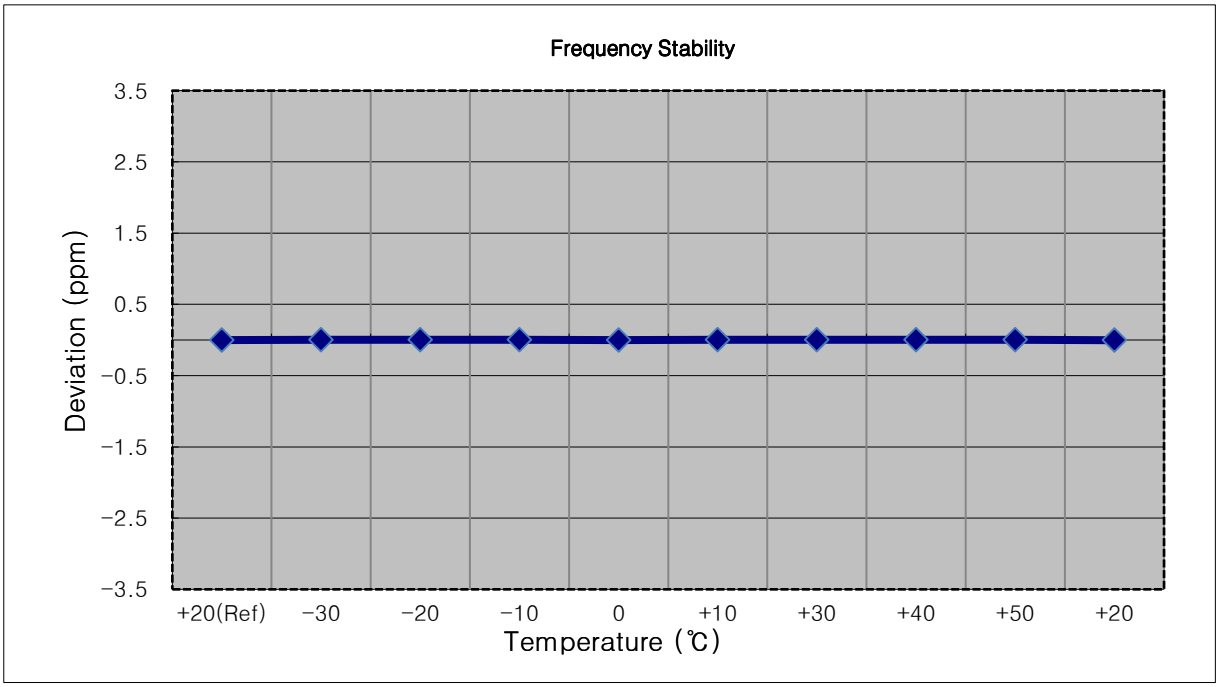
▣ OPERATING FREQUENCY: 2593,000,000 Hz

▣ BANDWIDTH: 40620 (5 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	2593 000 005	0.0	0.000 000	0.000
100 %		-30	2593 000 008	3.1	0.000 000	0.001
100 %		-20	2593 000 010	5.2	0.000 000	0.002
100 %		-10	2593 000 011	5.4	0.000 000	0.002
100 %		0	2592 999 999	-6.5	0.000 000	-0.003
100 %		+10	2593 000 010	4.7	0.000 000	0.002
100 %		+30	2593 000 010	4.5	0.000 000	0.002
100 %		+40	2593 000 010	4.9	0.000 000	0.002
100 %		+50	2593 000 013	7.5	0.000 000	0.003
Batt. Endpoint	3.400	+20	2592 999 996	-9.0	0.000 000	-0.003



▣ MODE: LTE 41

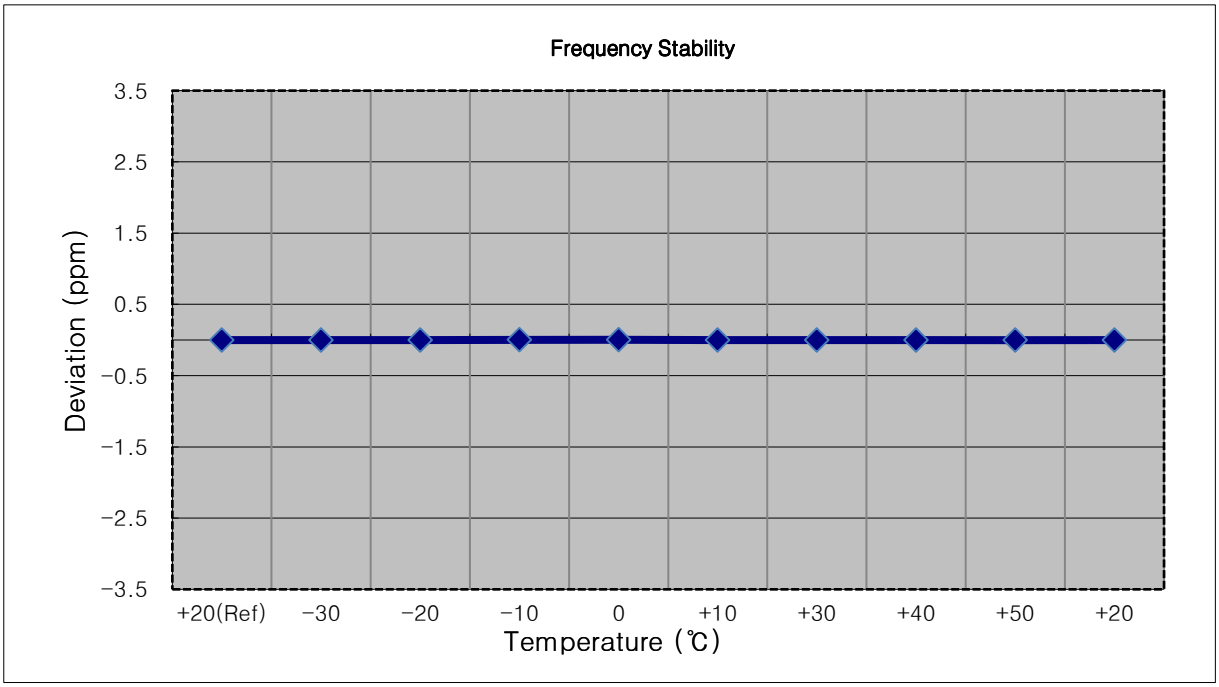
▣ OPERATING FREQUENCY: 2593,000,000 Hz

▣ BANDWIDTH: 40620 (10 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	2593 000 004	0.0	0.000 000	0.000
100 %		-30	2593 000 002	-2.2	0.000 000	-0.001
100 %		-20	2593 000 001	-2.9	0.000 000	-0.001
100 %		-10	2593 000 008	3.6	0.000 000	0.001
100 %		0	2593 000 006	2.5	0.000 000	0.001
100 %		+10	2593 000 000	-4.2	0.000 000	-0.002
100 %		+30	2593 000 001	-3.3	0.000 000	-0.001
100 %		+40	2592 999 998	-5.5	0.000 000	-0.002
100 %		+50	2592 999 997	-7.0	0.000 000	-0.003
Batt. Endpoint	3.400	+20	2593 000 000	-4.3	0.000 000	-0.002



▣ MODE: LTE 41

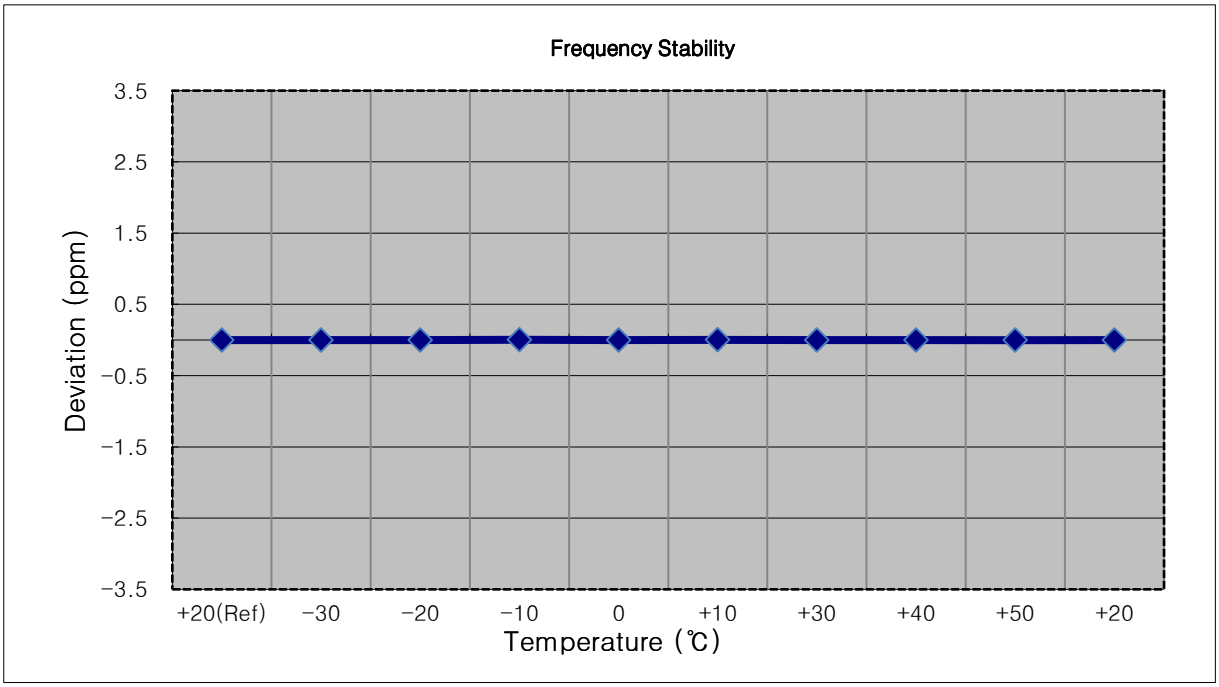
▣ OPERATING FREQUENCY: 2593,000,000 Hz

▣ BANDWIDTH: 40620 (15 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	2592 999 997	0.0	0.000 000	0.000
100 %		-30	2592 999 992	-4.9	0.000 000	-0.002
100 %		-20	2592 999 995	-2.1	0.000 000	-0.001
100 %		-10	2593 000 000	2.9	0.000 000	0.001
100 %		0	2592 999 992	-4.6	0.000 000	-0.002
100 %		+10	2593 000 001	4.3	0.000 000	0.002
100 %		+30	2592 999 994	-3.0	0.000 000	-0.001
100 %		+40	2592 999 992	-5.1	0.000 000	-0.002
100 %		+50	2592 999 989	-7.7	0.000 000	-0.003
Batt. Endpoint	3.400	+20	2592 999 992	-5.2	0.000 000	-0.002



▣ MODE: LTE 41

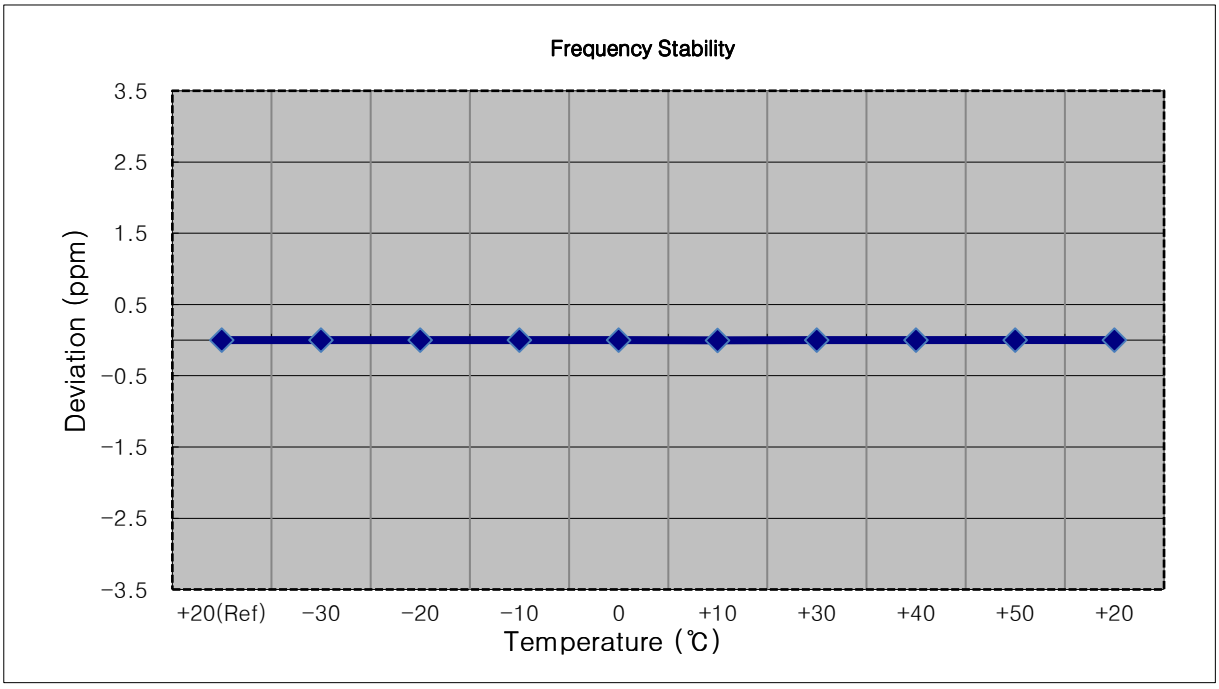
▣ OPERATING FREQUENCY: 2593,000,000 Hz

▣ BANDWIDTH: 40620 (20 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	2592 999 998	0.0	0.000 000	0.000
100 %		-30	2593 000 002	3.1	0.000 000	0.001
100 %		-20	2592 999 995	-3.1	0.000 000	-0.001
100 %		-10	2592 999 996	-2.5	0.000 000	-0.001
100 %		0	2592 999 995	-3.1	0.000 000	-0.001
100 %		+10	2592 999 991	-7.5	0.000 000	-0.003
100 %		+30	2593 000 002	3.6	0.000 000	0.001
100 %		+40	2592 999 994	-4.1	0.000 000	-0.002
100 %		+50	2593 000 002	3.9	0.000 000	0.002
Batt. Endpoint	3.400	+20	2592 999 995	-3.5	0.000 000	-0.001



▣ MODE: LTE 41

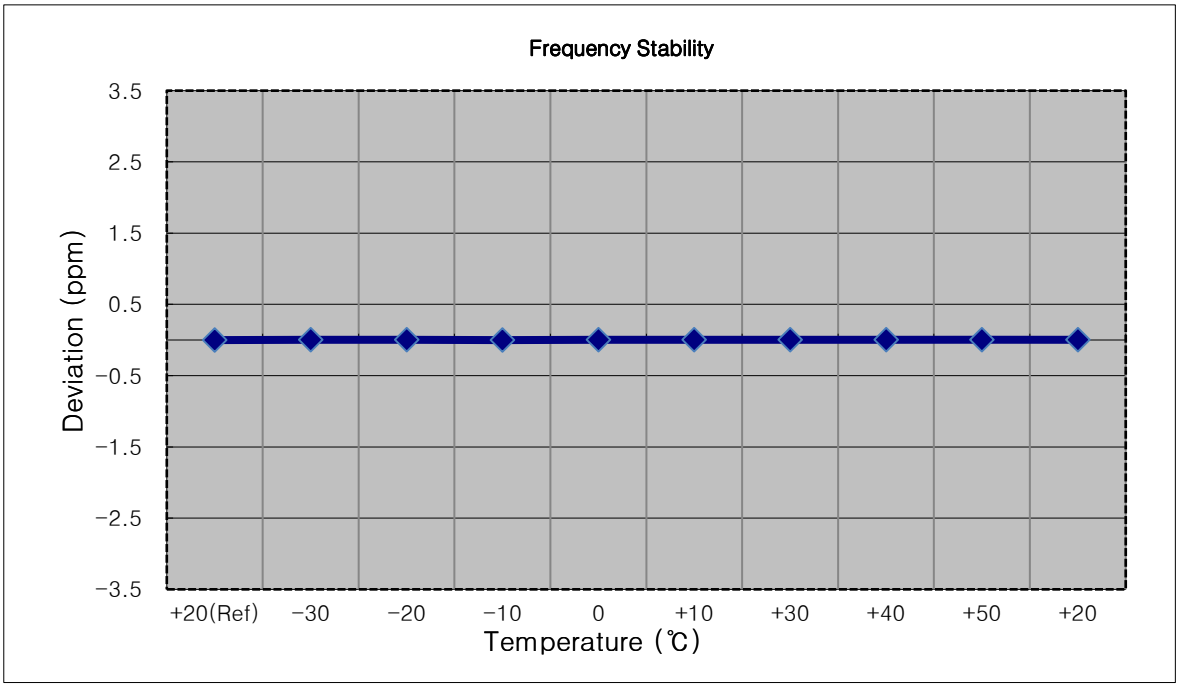
▣ OPERATING FREQUENCY: 2687,500,000 Hz

▣ BANDWIDTH: 41565 (5 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	2687 499 992	0.0	0.000 000	0.000
100 %		-30	2687 499 998	5.7	0.000 000	0.002
100 %		-20	2687 499 995	2.9	0.000 000	0.001
100 %		-10	2687 499 988	-4.5	0.000 000	-0.002
100 %		0	2687 499 998	5.8	0.000 000	0.002
100 %		+10	2687 499 995	2.4	0.000 000	0.001
100 %		+30	2687 499 997	5.0	0.000 000	0.002
100 %		+40	2687 500 000	7.1	0.000 000	0.003
100 %		+50	2687 500 002	9.9	0.000 000	0.004
Batt. Endpoint	3.400	+20	2687 500 001	8.1	0.000 000	0.003



▣ MODE: LTE 41

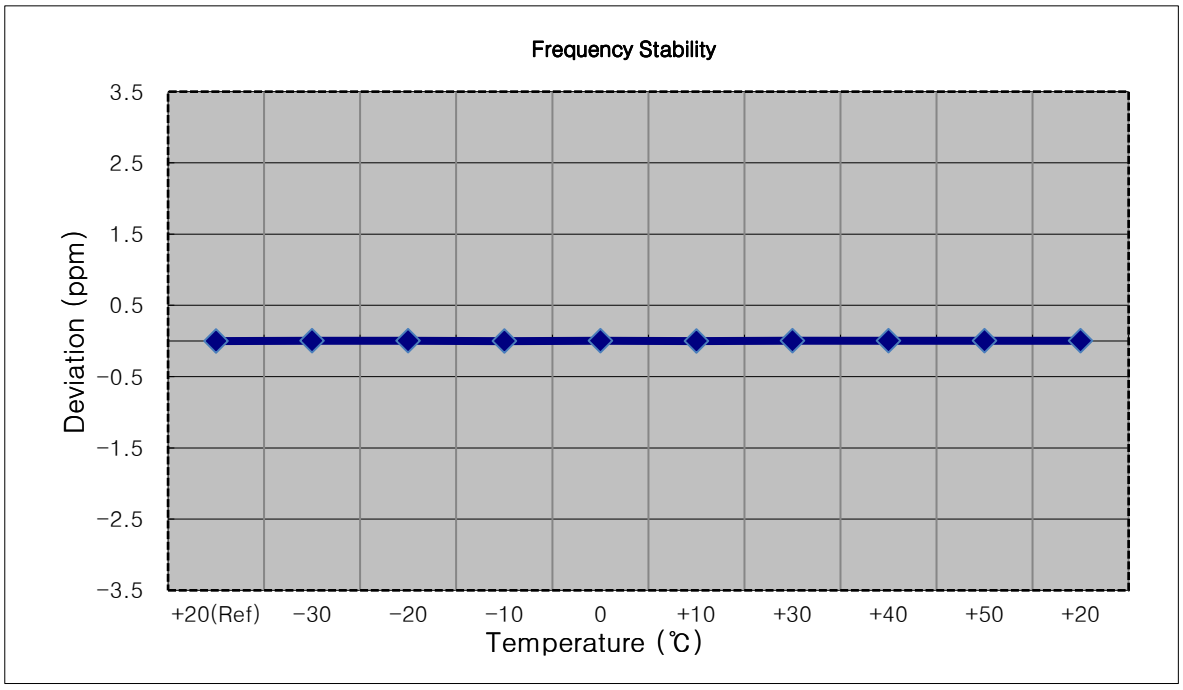
▣ OPERATING FREQUENCY: 2685,000,000 Hz

▣ BANDWIDTH: 41540 (10 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	2685 000 006	0.0	0.000 000	0.000
100 %		-30	2685 000 011	4.9	0.000 000	0.002
100 %		-20	2685 000 010	4.1	0.000 000	0.002
100 %		-10	2685 000 000	-5.8	0.000 000	-0.002
100 %		0	2685 000 009	3.2	0.000 000	0.001
100 %		+10	2685 000 002	-4.4	0.000 000	-0.002
100 %		+30	2685 000 016	9.6	0.000 000	0.004
100 %		+40	2685 000 012	6.4	0.000 000	0.002
100 %		+50	2685 000 009	3.4	0.000 000	0.001
Batt. Endpoint	3.400	+20	2685 000 012	6.3	0.000 000	0.002



▣ MODE: LTE 41

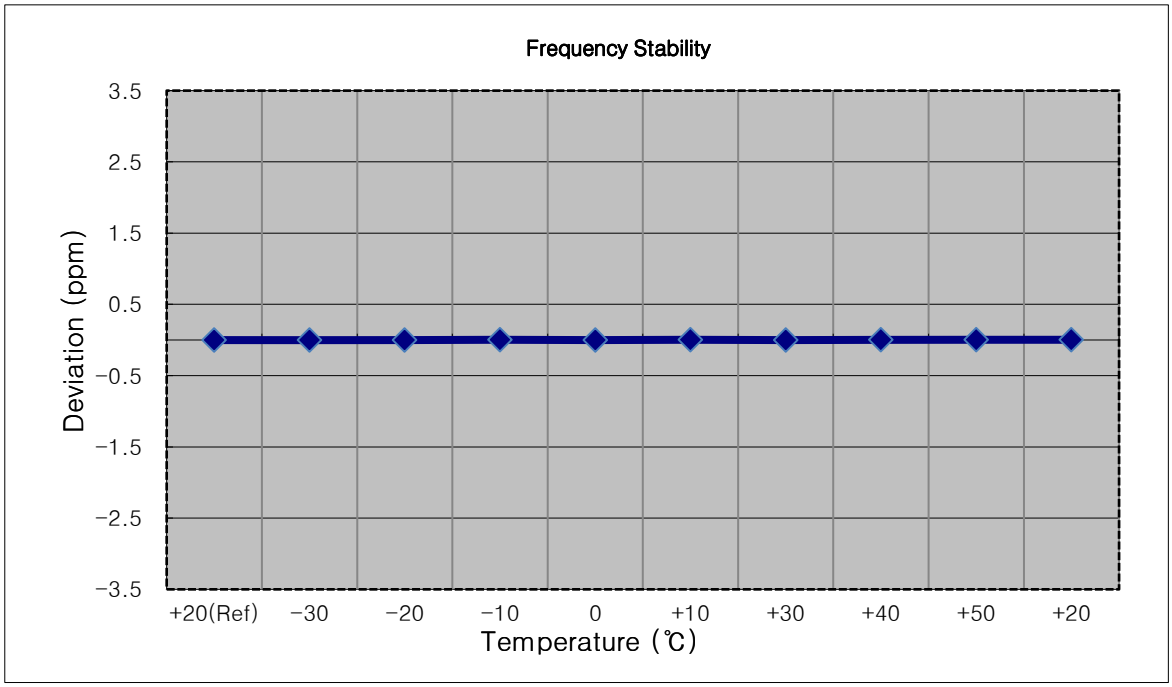
▣ OPERATING FREQUENCY: 2682,500,000 Hz

▣ BANDWIDTH: 41515 (15 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	2682 500 004	0.0	0.000 000	0.000
100 %		-30	2682 499 998	-5.9	0.000 000	-0.002
100 %		-20	2682 500 000	-4.2	0.000 000	-0.002
100 %		-10	2682 500 007	3.2	0.000 000	0.001
100 %		0	2682 500 002	-2.2	0.000 000	-0.001
100 %		+10	2682 500 007	3.0	0.000 000	0.001
100 %		+30	2682 500 001	-3.2	0.000 000	-0.001
100 %		+40	2682 500 009	4.6	0.000 000	0.002
100 %		+50	2682 500 008	3.9	0.000 000	0.001
Batt. Endpoint	3.400	+20	2682 500 008	4.1	0.000 000	0.002



▣ MODE: LTE 41

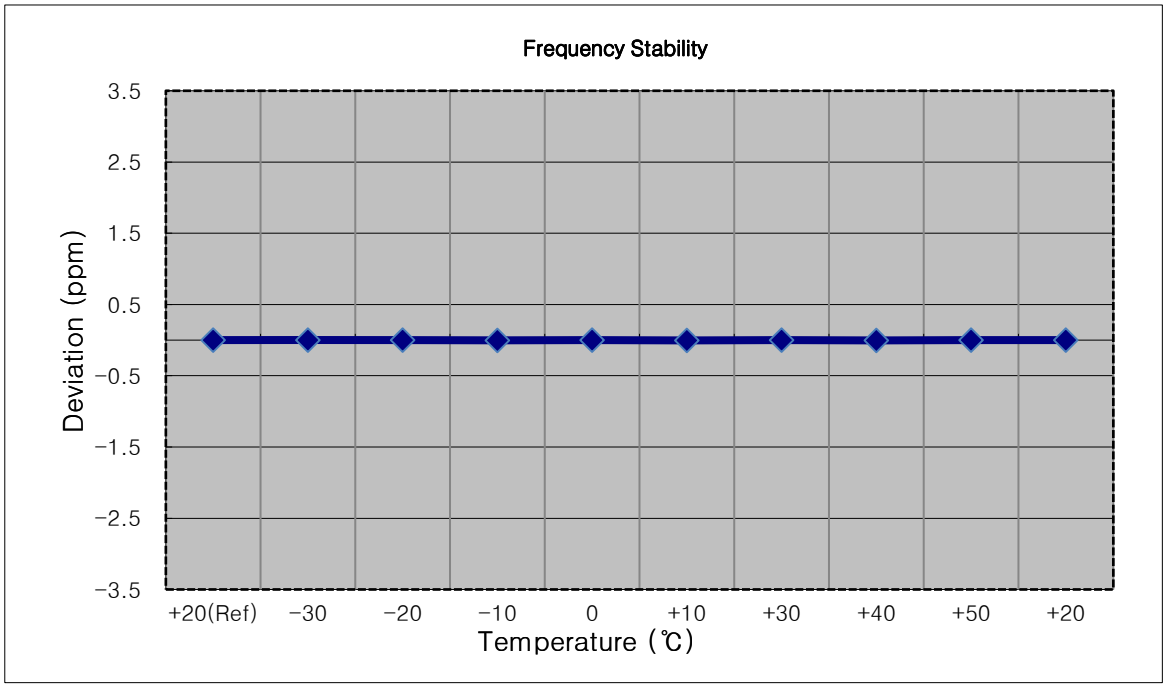
▣ OPERATING FREQUENCY: 2680,000,000 Hz

▣ BANDWIDTH: 41490 (20 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

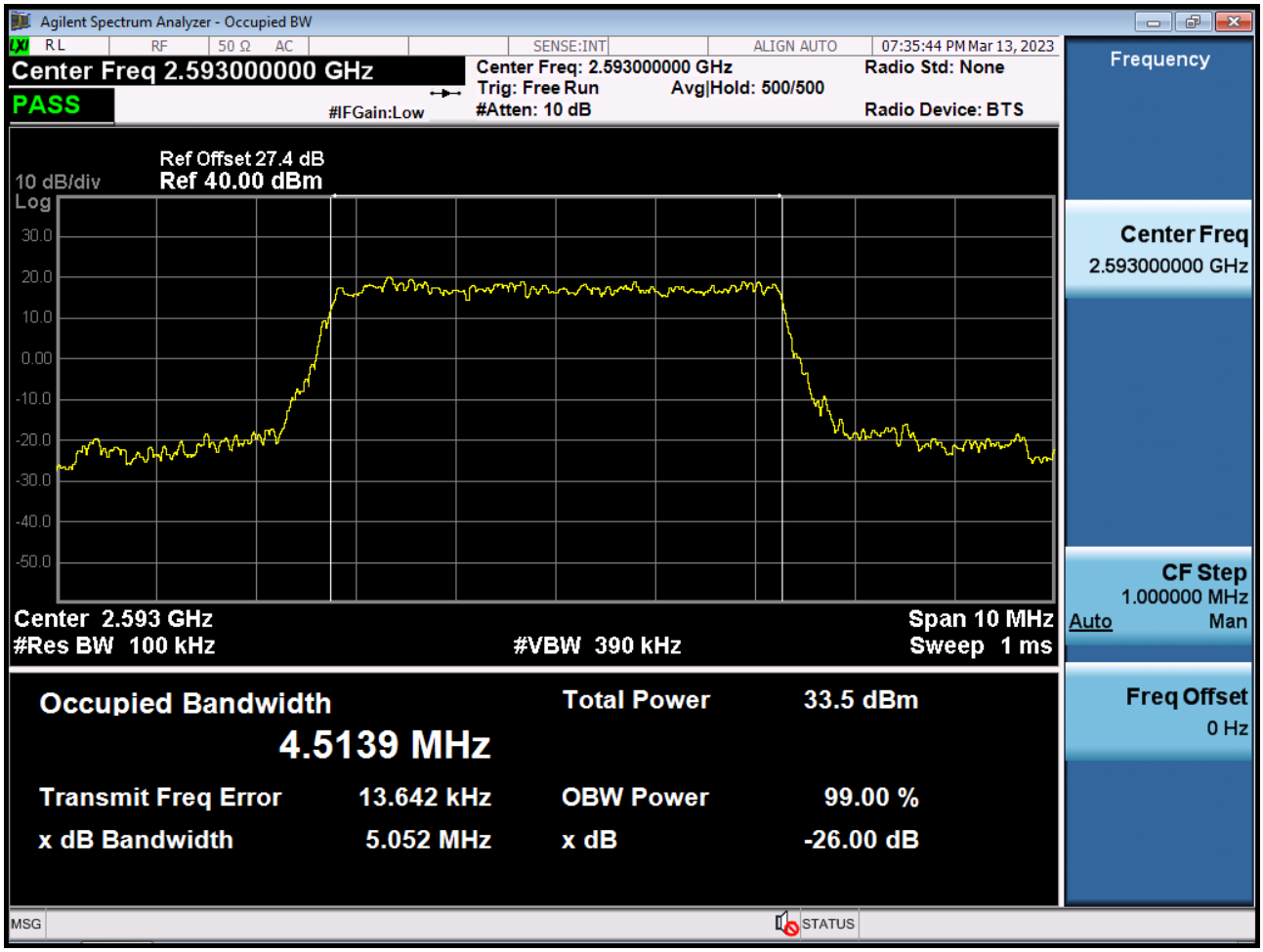
▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	2679 999 997	0.0	0.000 000	0.000
100 %		-30	2680 000 001	4.4	0.000 000	0.002
100 %		-20	2679 999 993	-3.6	0.000 000	-0.001
100 %		-10	2679 999 989	-7.6	0.000 000	-0.003
100 %		0	2680 000 000	3.8	0.000 000	0.001
100 %		+10	2679 999 990	-6.3	0.000 000	-0.002
100 %		+30	2679 999 992	-4.3	0.000 000	-0.002
100 %		+40	2679 999 989	-7.3	0.000 000	-0.003
100 %		+50	2679 999 998	1.7	0.000 000	0.001
Batt. Endpoint	3.400	+20	2679 999 995	-1.2	0.000 000	0.000

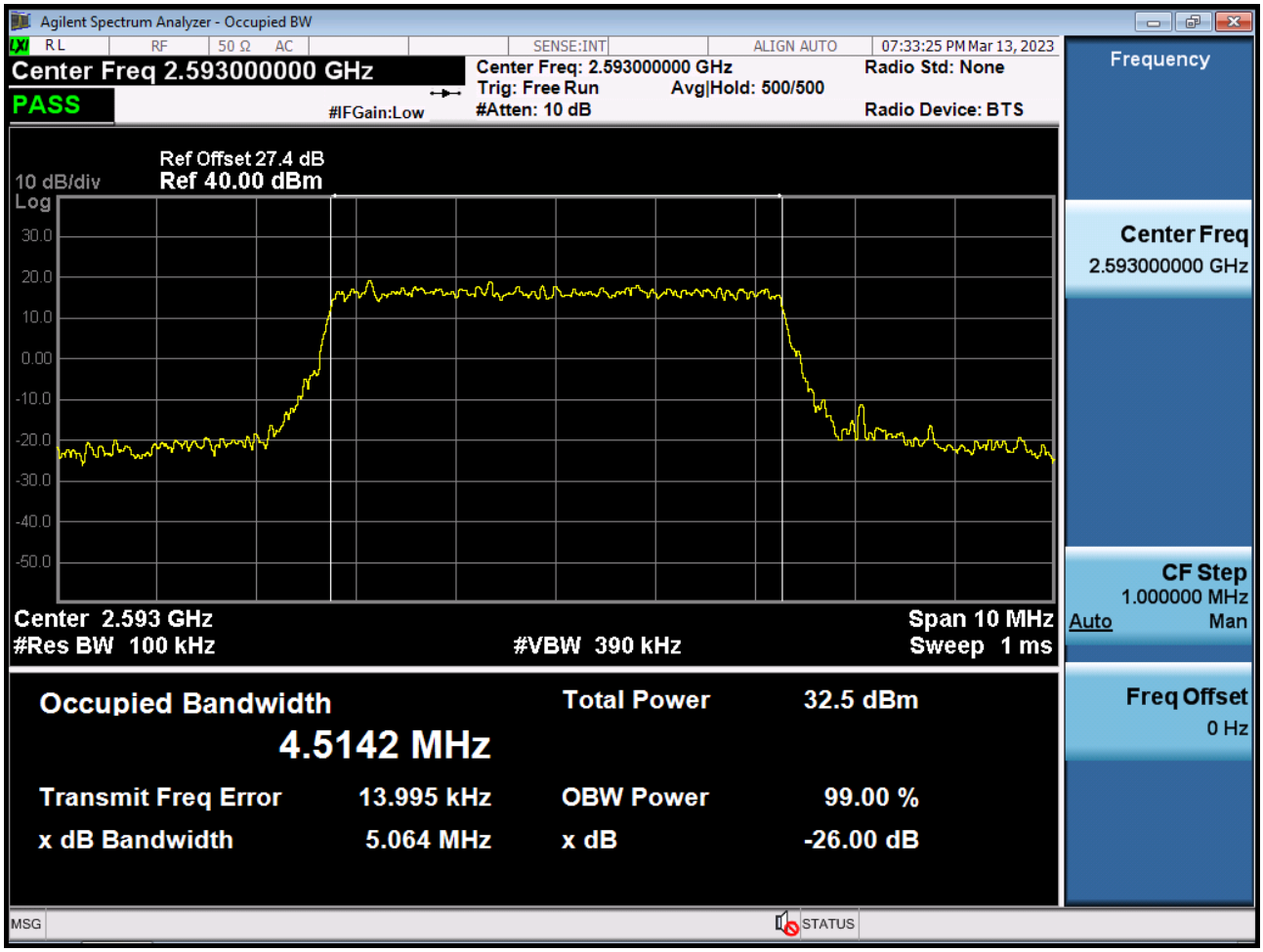


9. TEST PLOTS

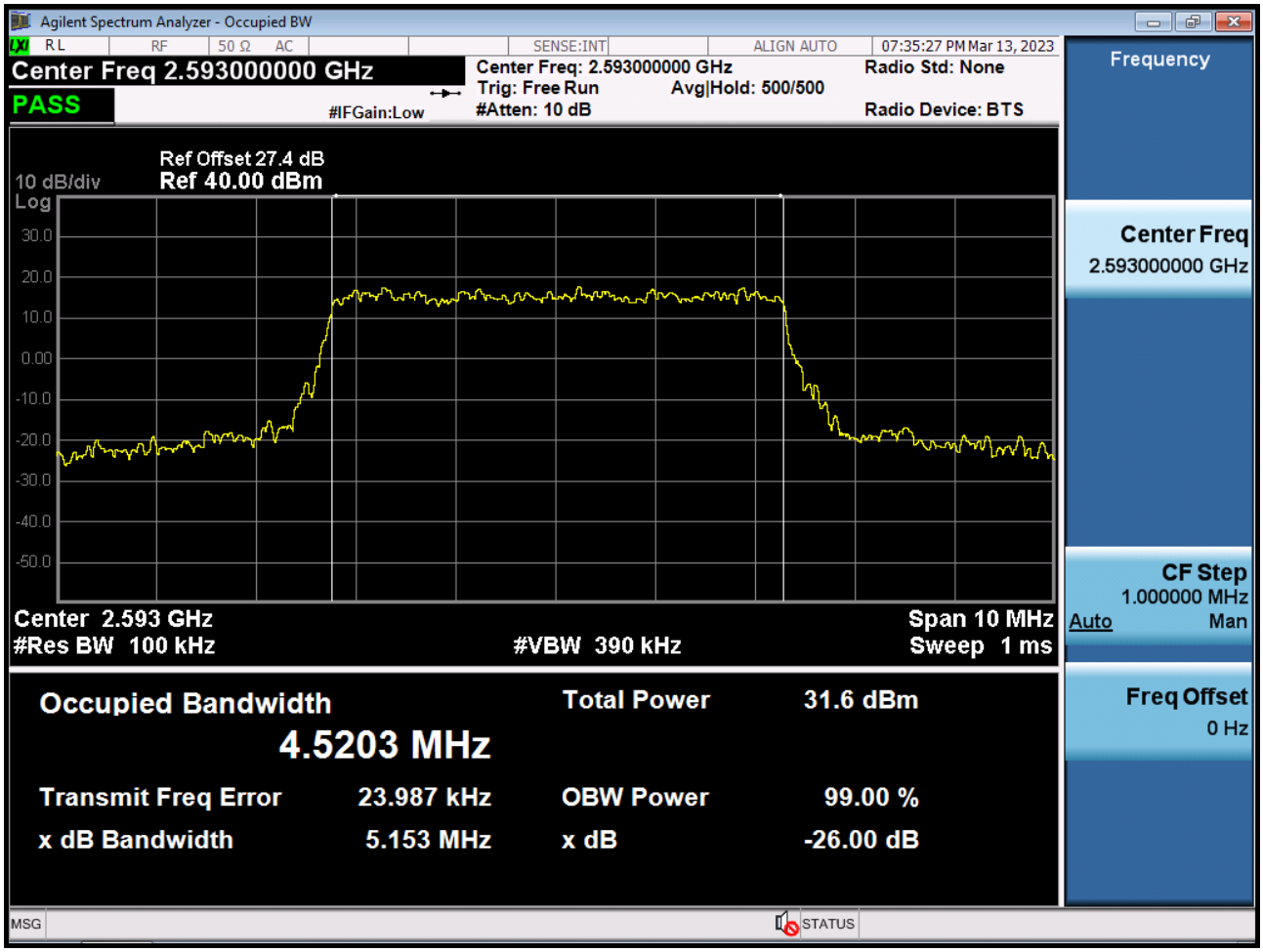
Occupied Bandwidth Plot (5 MHz Ch.40620 QPSK RB 25)



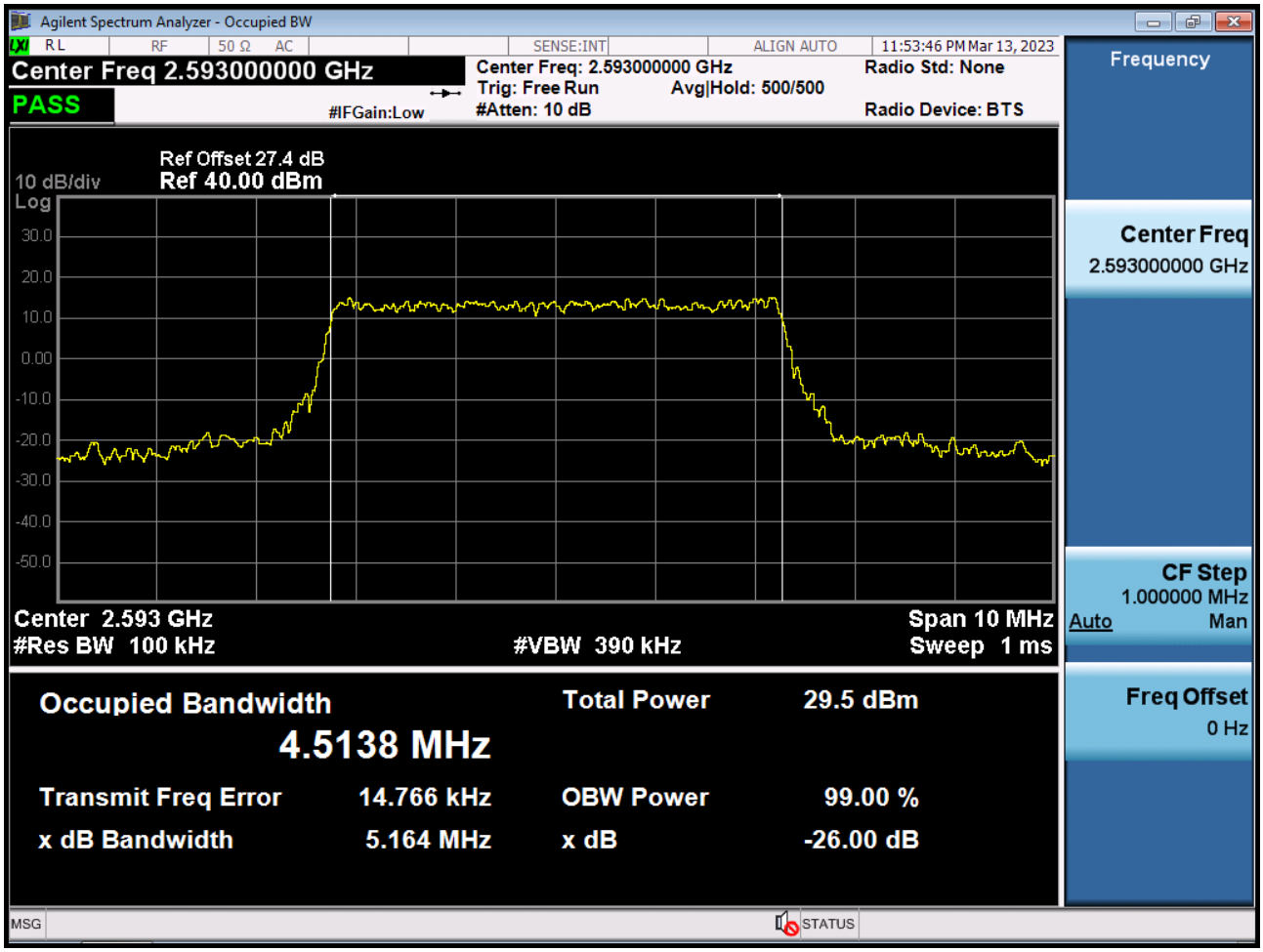
Occupied Bandwidth Plot (5 MHz Ch.40620 16-QAM RB 25)



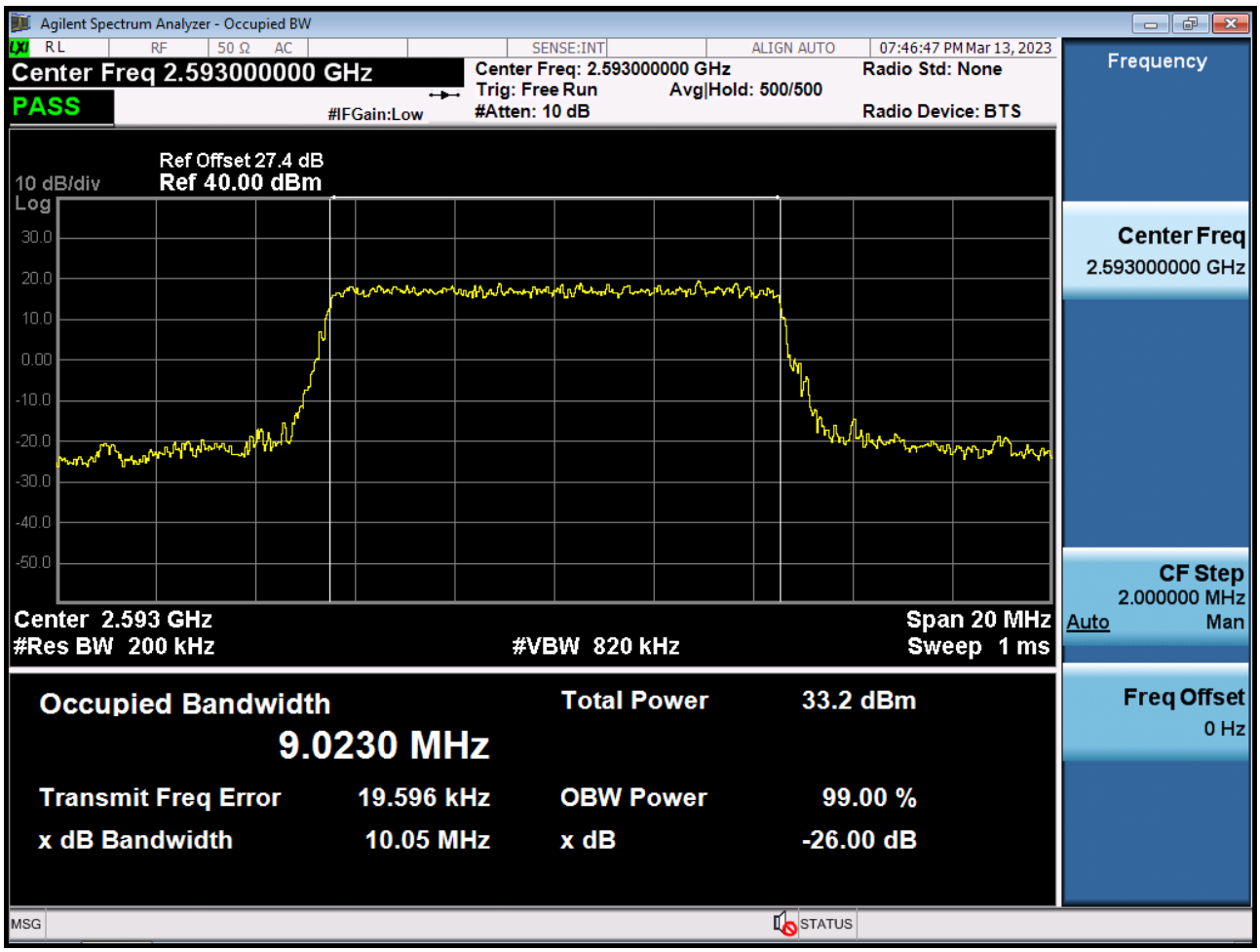
Occupied Bandwidth Plot (5 MHz Ch.40620 64-QAM RB 25)



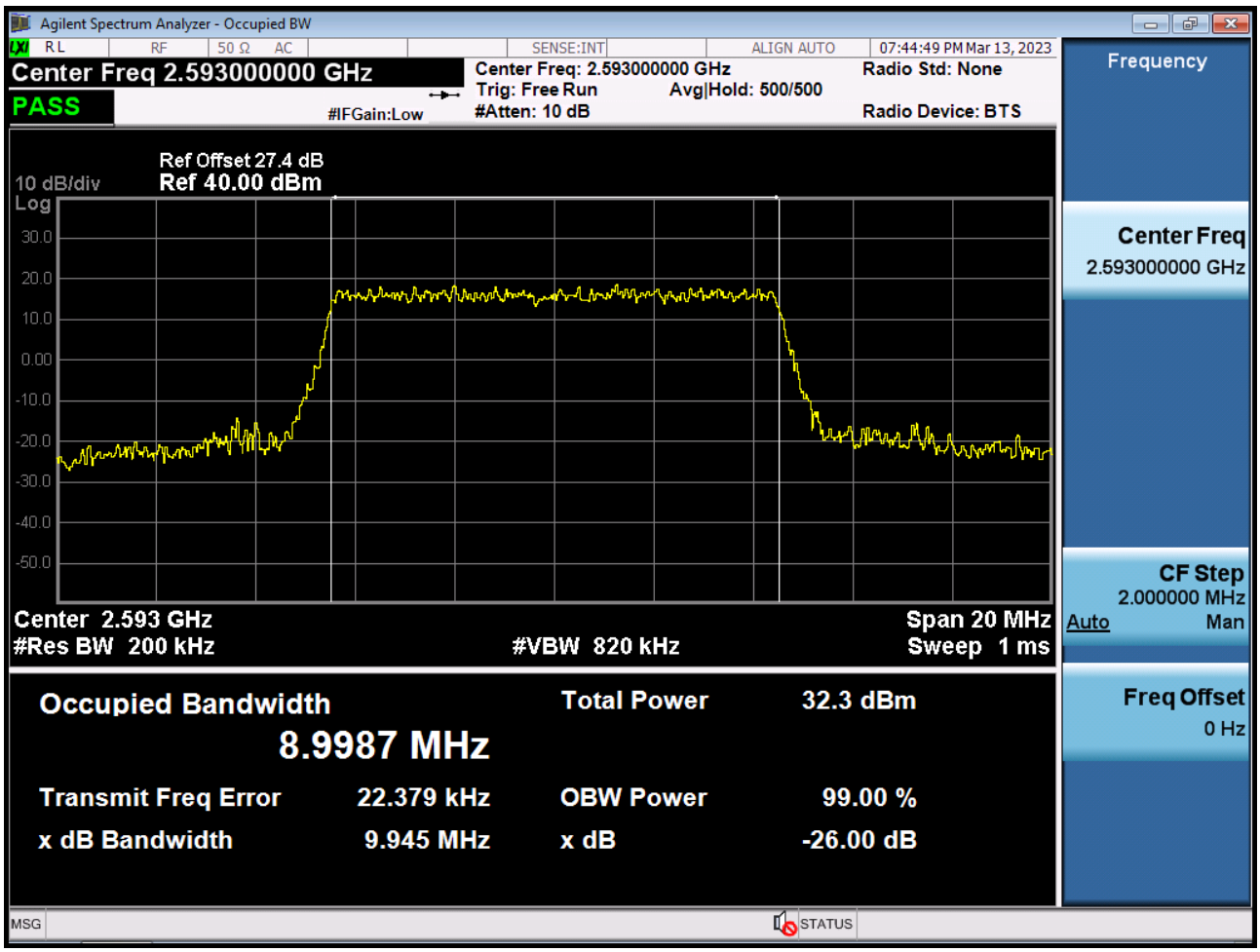
Occupied Bandwidth Plot (5 MHz Ch.40620 256-QAM RB 25)



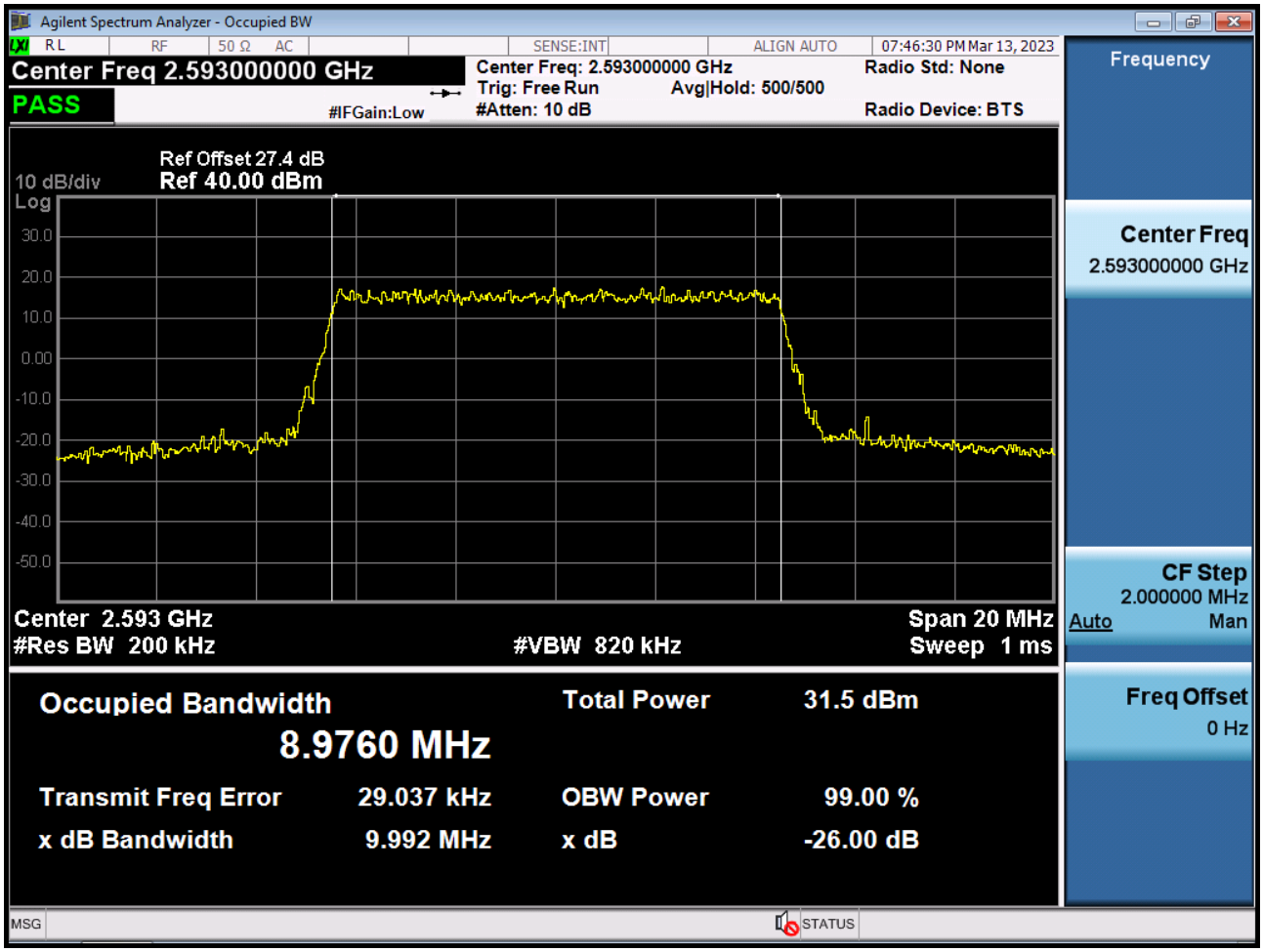
Occupied Bandwidth Plot (10 MHz Ch.40620 QPSK RB 50)



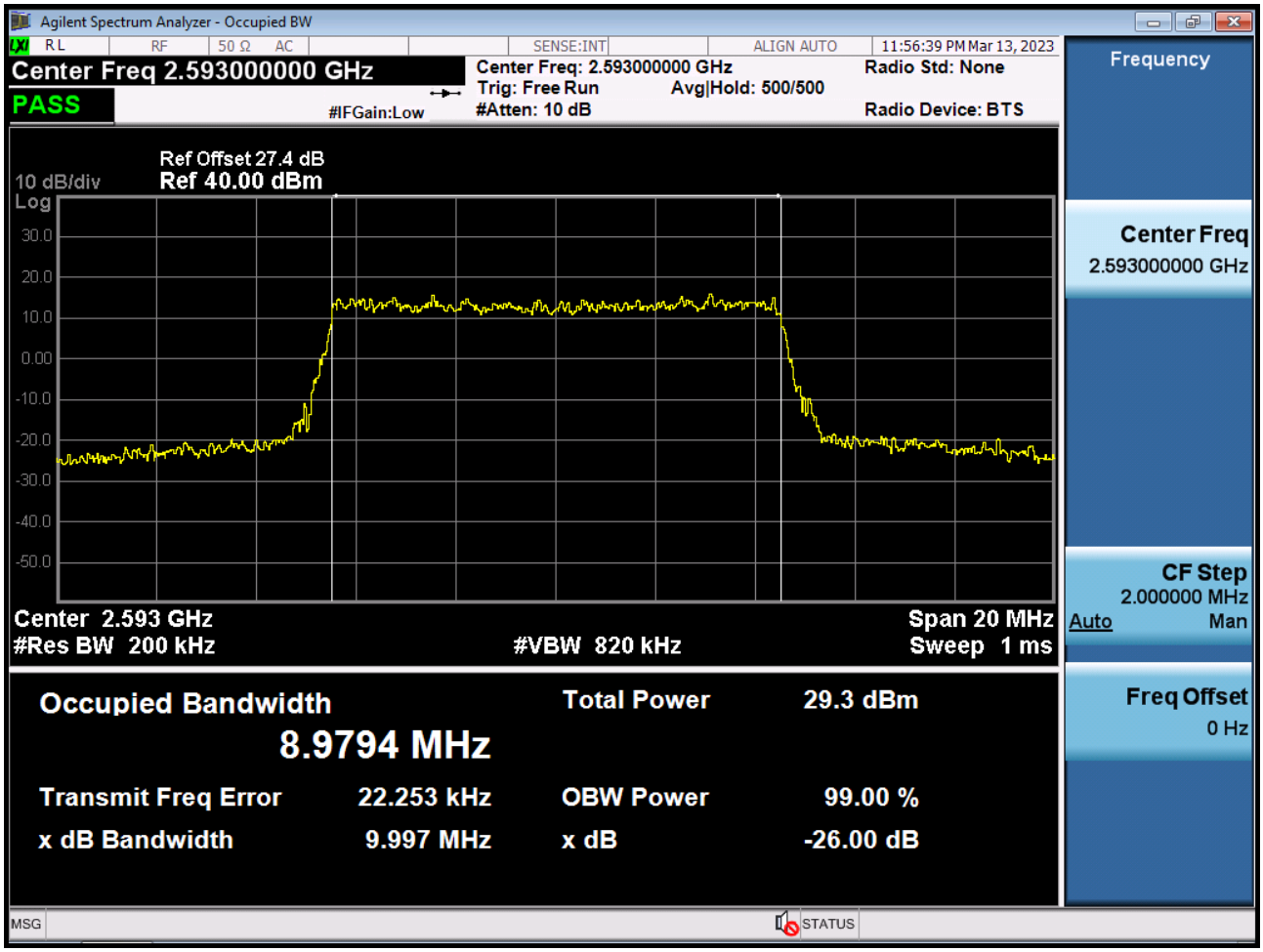
Occupied Bandwidth Plot (10 MHz Ch.40620 16-QAM RB 50)



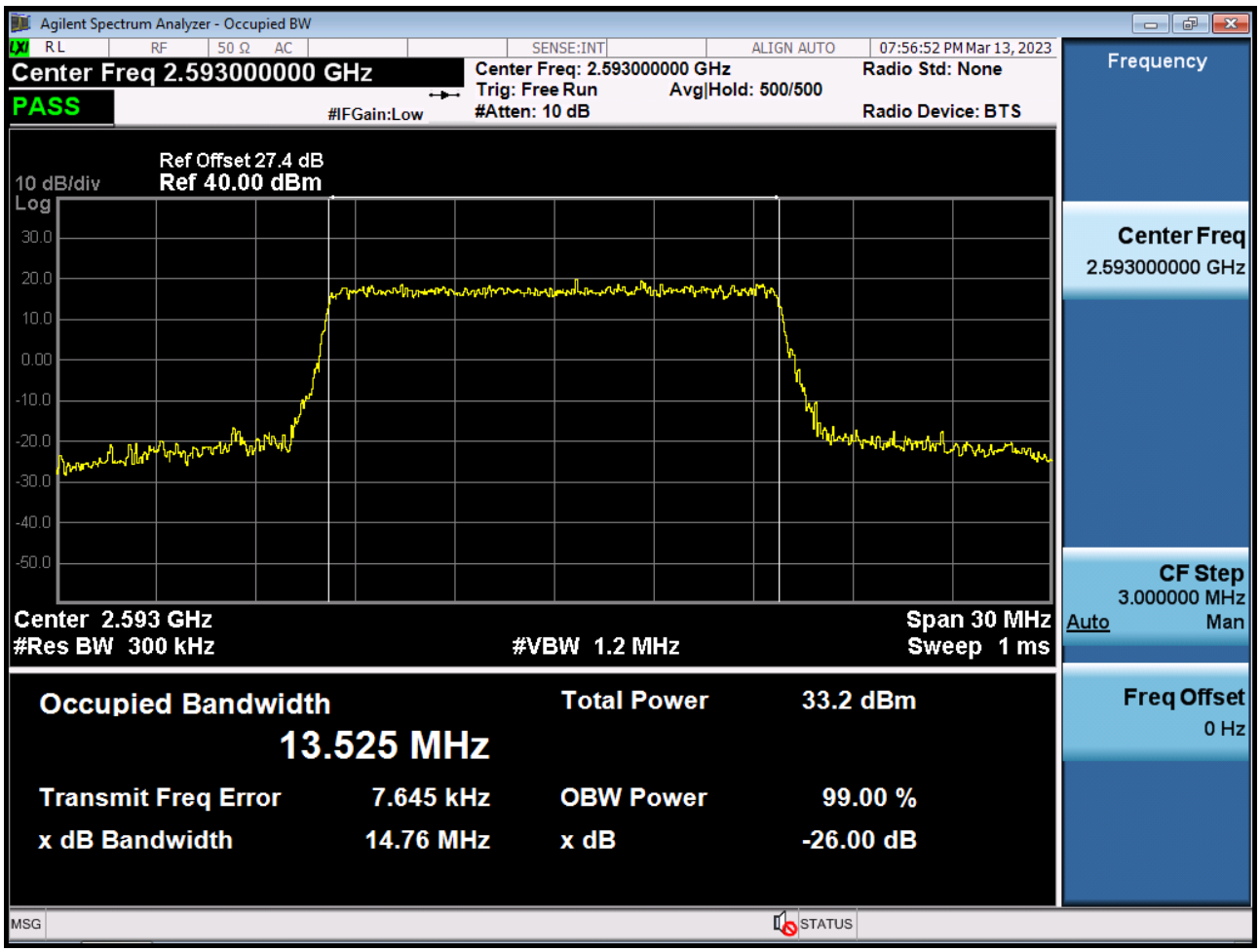
Occupied Bandwidth Plot (10 MHz Ch.40620 64-QAM RB 50)



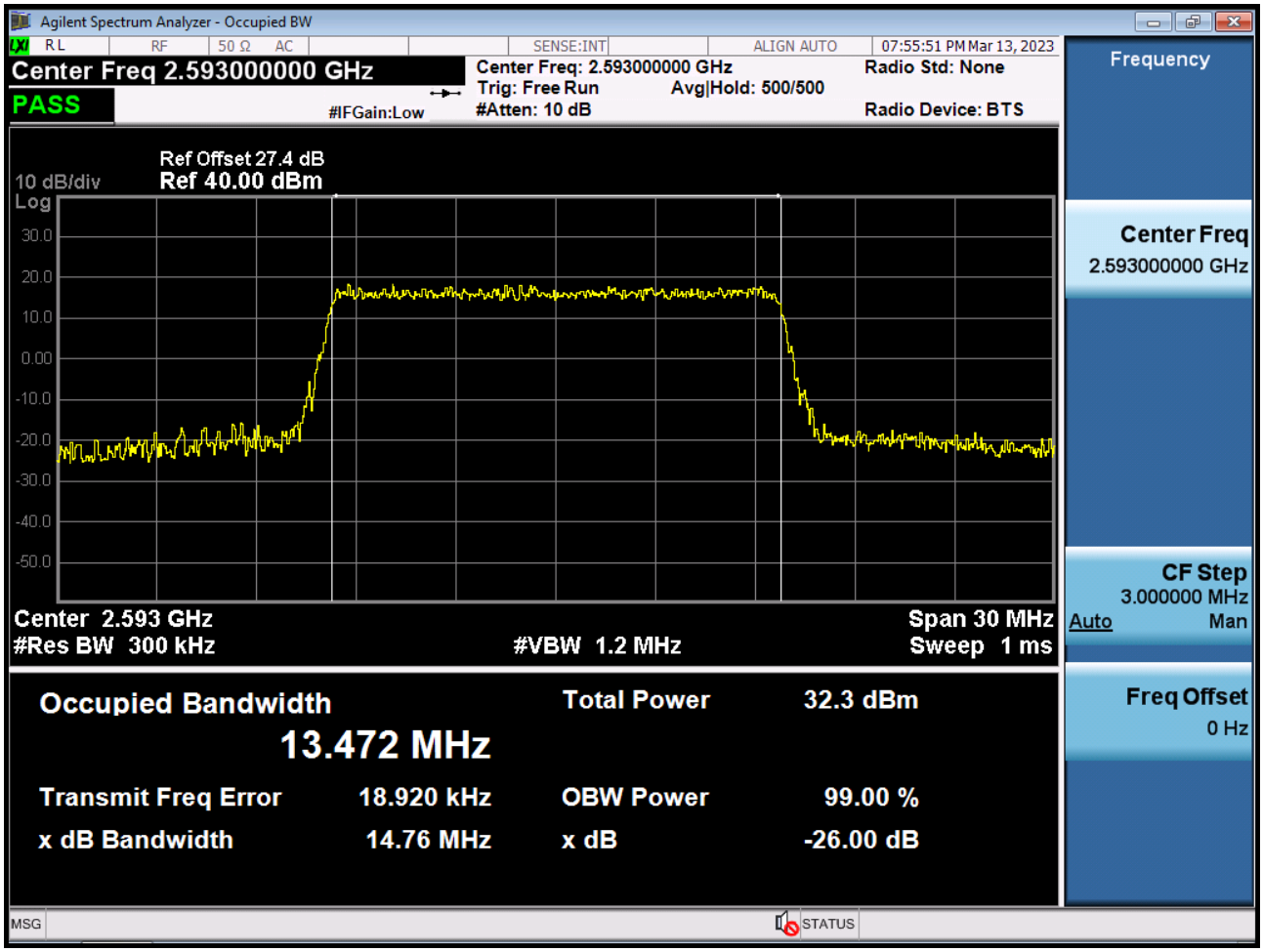
Occupied Bandwidth Plot (10 MHz Ch.40620 256-QAM RB 50)



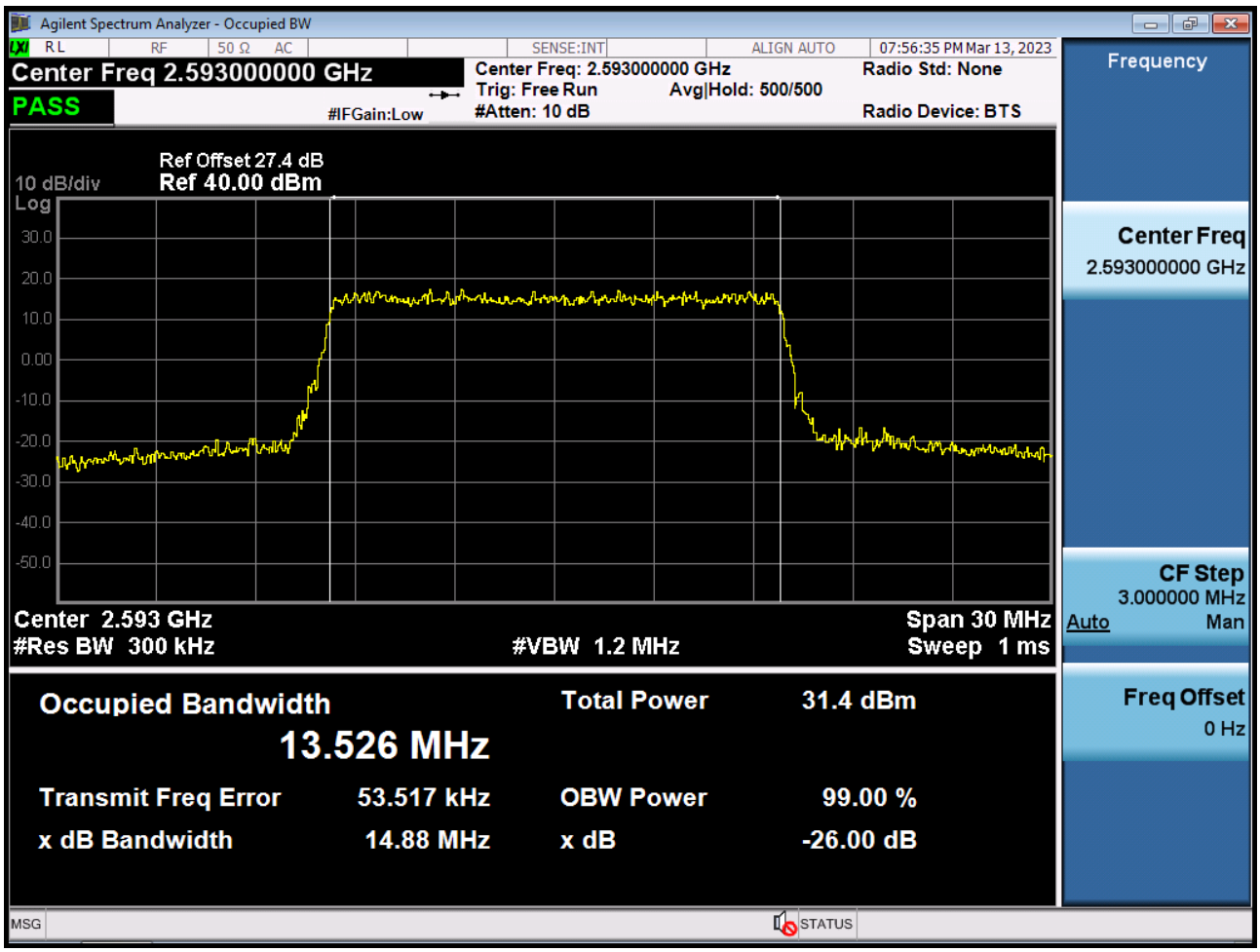
Occupied Bandwidth Plot (15 MHz Ch.40620 QPSK RB 75)



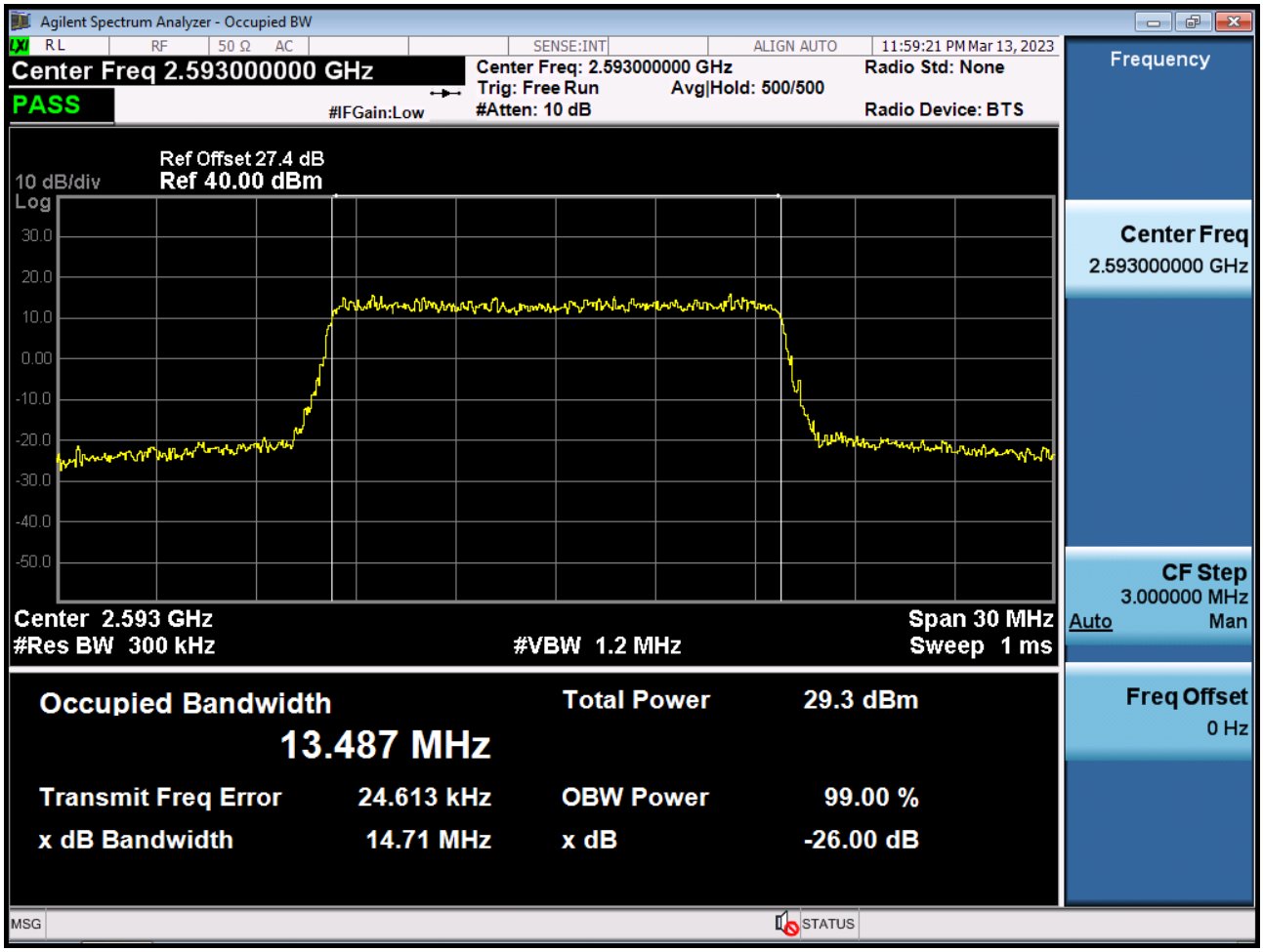
Occupied Bandwidth Plot (15 MHz Ch.40620 16-QAM RB 75)



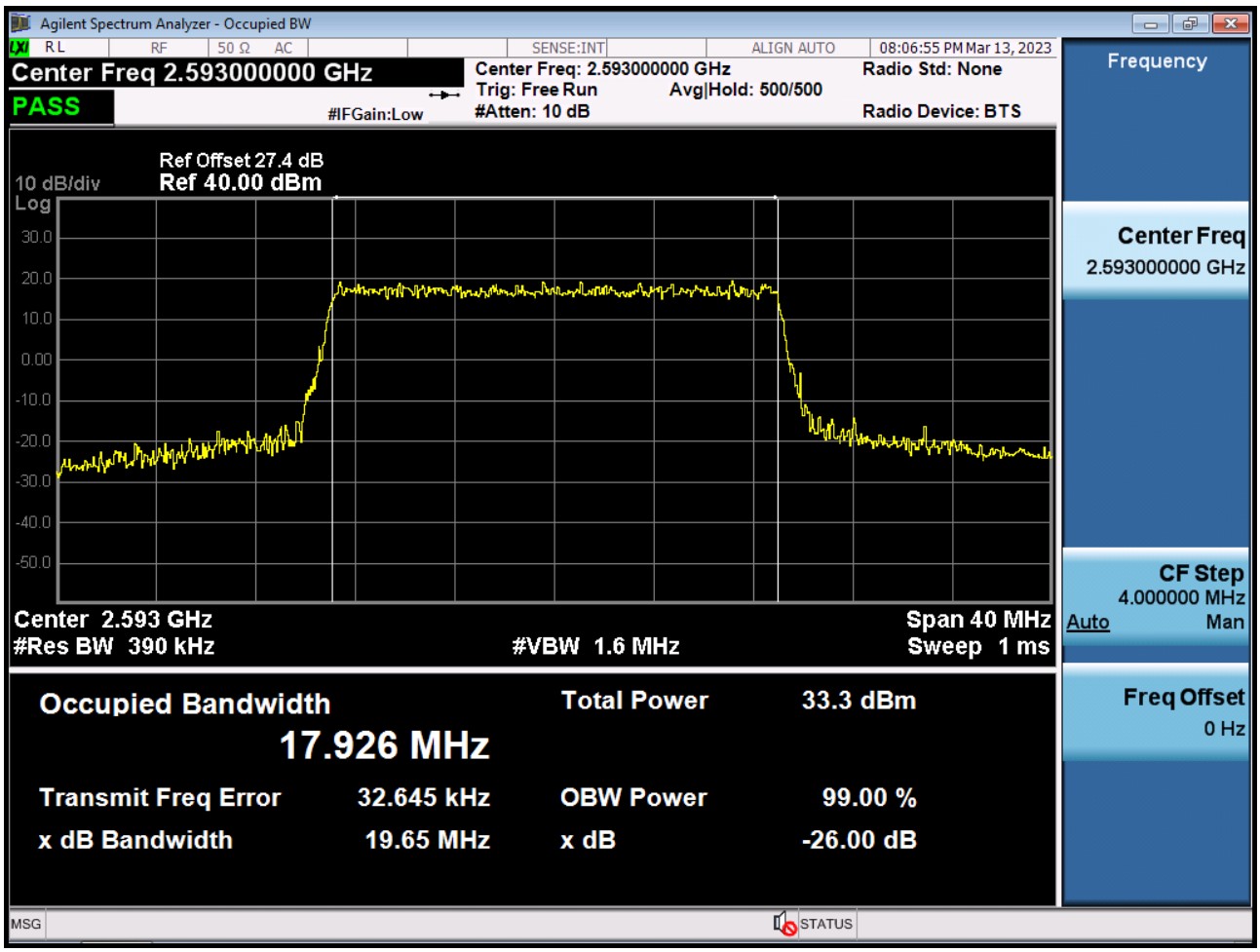
Occupied Bandwidth Plot (15 MHz Ch.40620 64-QAM RB 75)



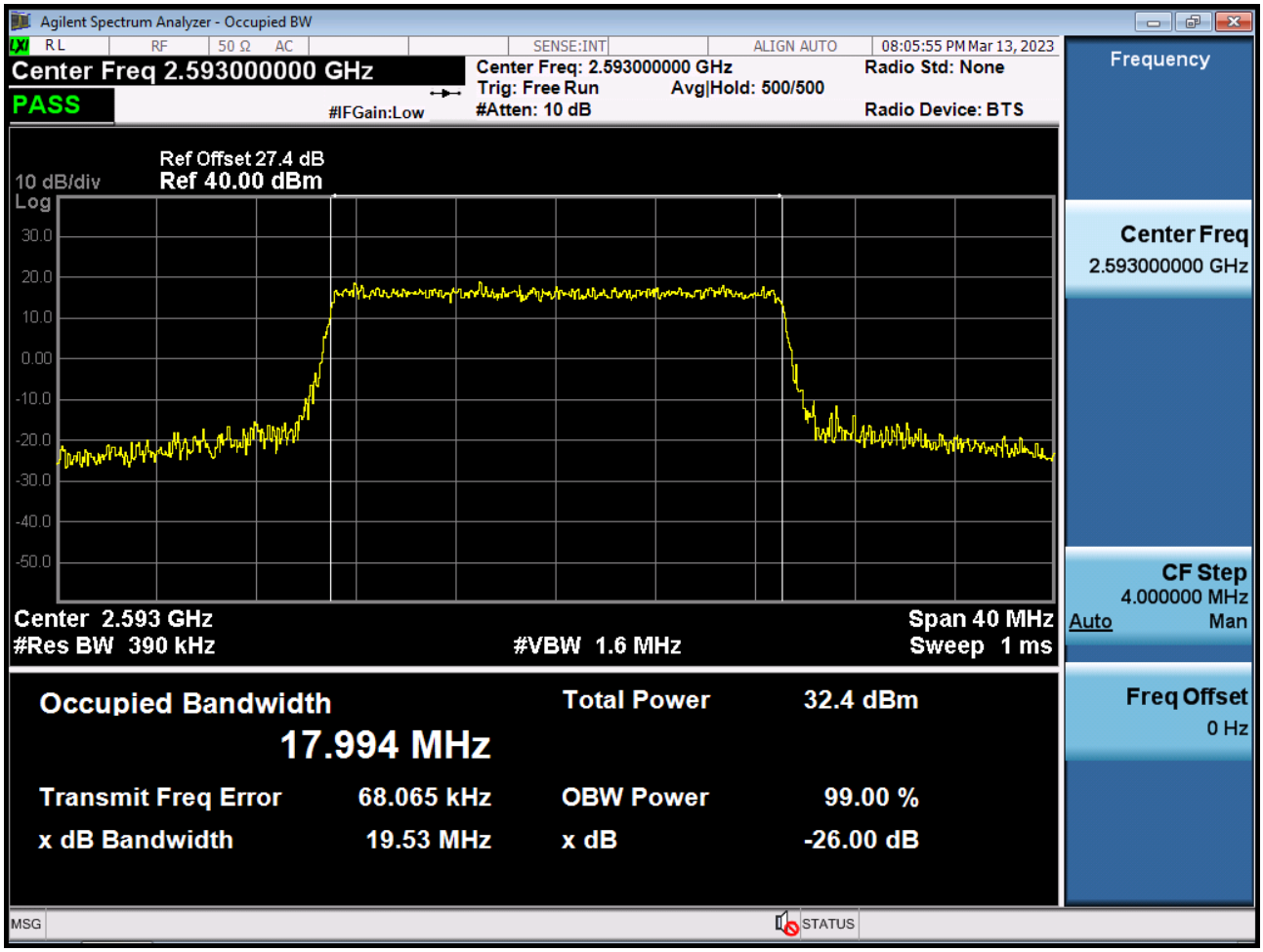
Occupied Bandwidth Plot (15 MHz Ch.40620 256-QAM RB 75)



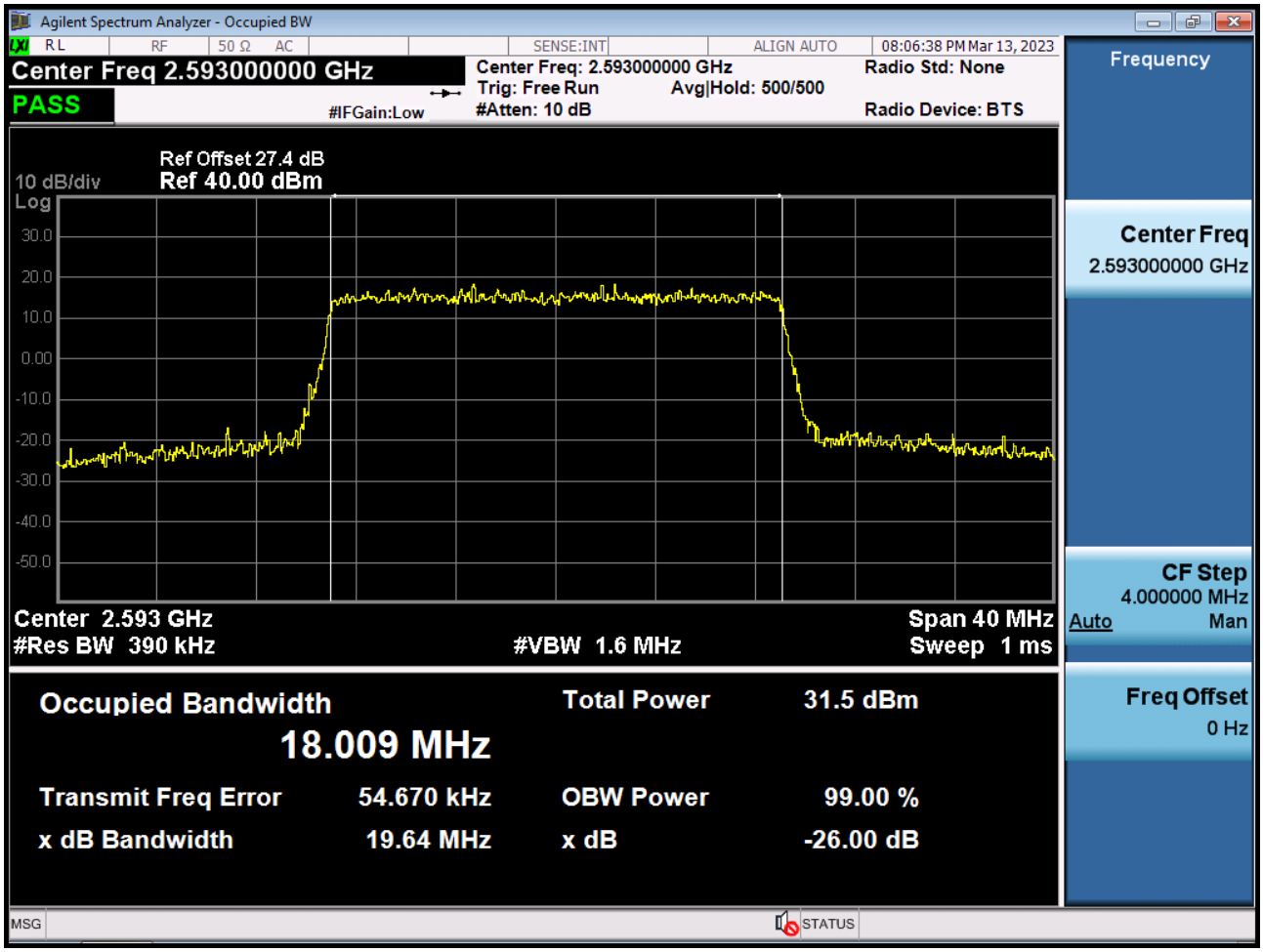
Occupied Bandwidth Plot (20 MHz Ch.40620 QPSK RB 100)



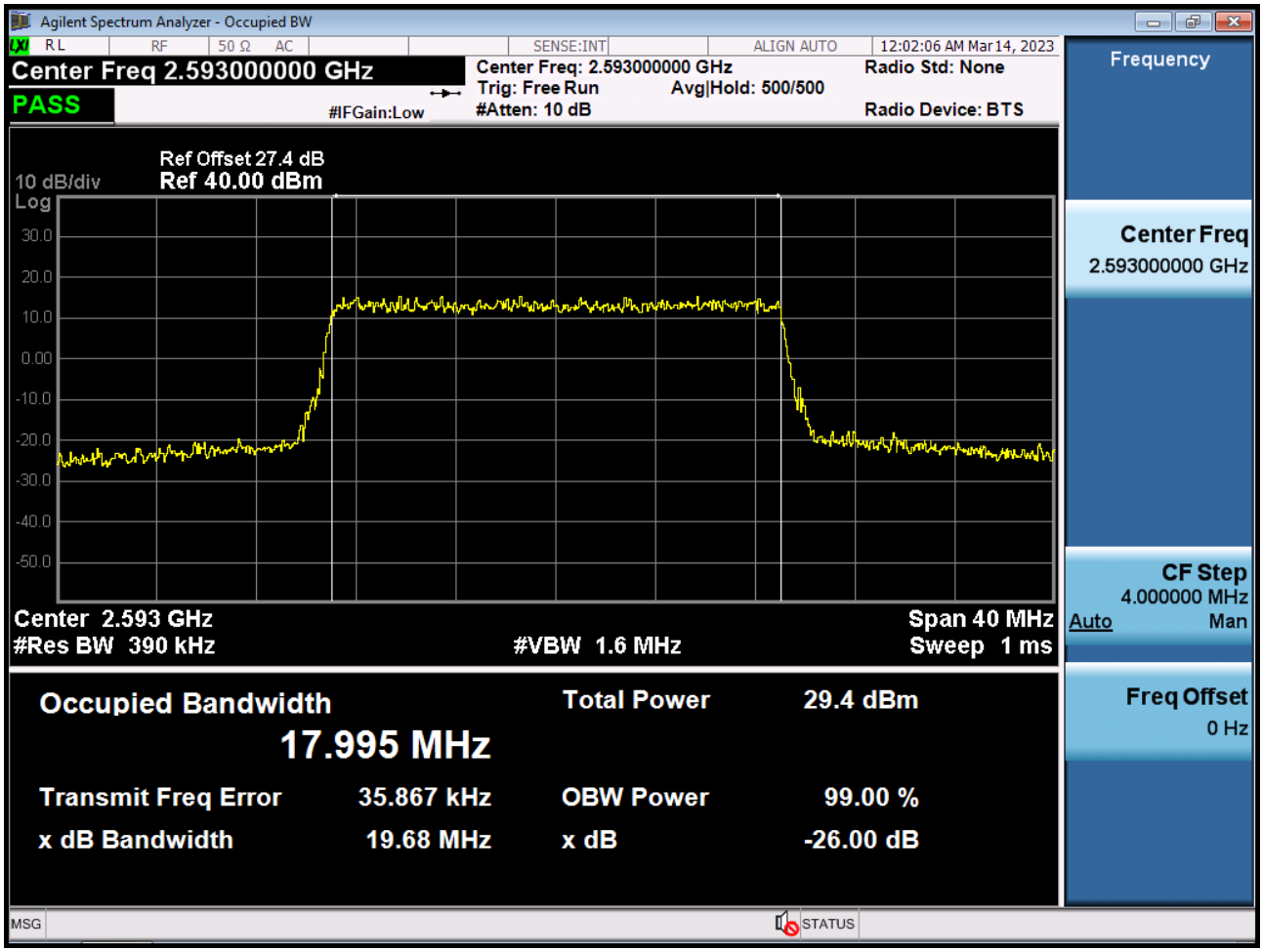
Occupied Bandwidth Plot (20 MHz Ch.40620 16-QAM RB 100)



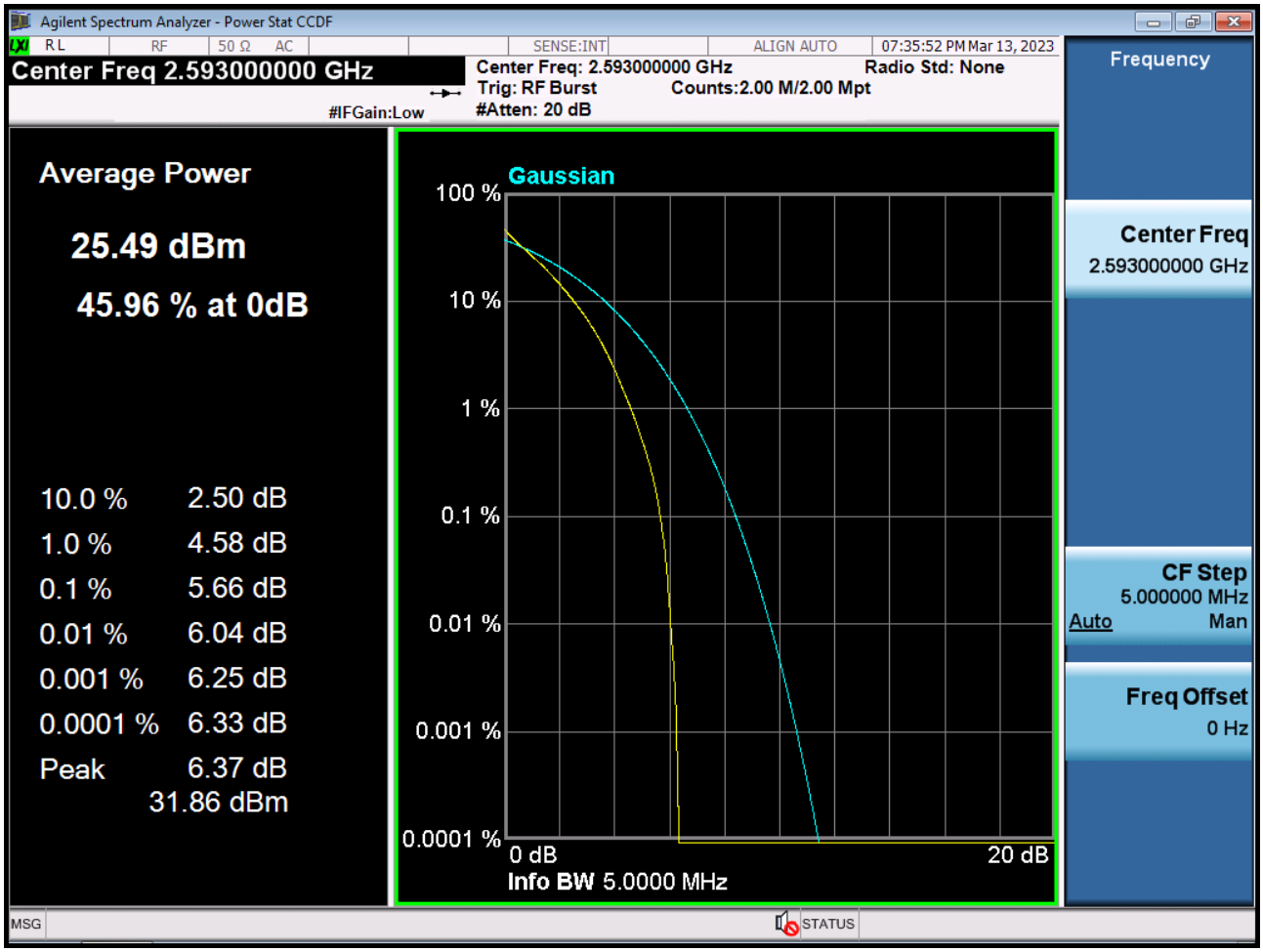
Occupied Bandwidth Plot (20 MHz Ch.40620 64-QAM RB 100)



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

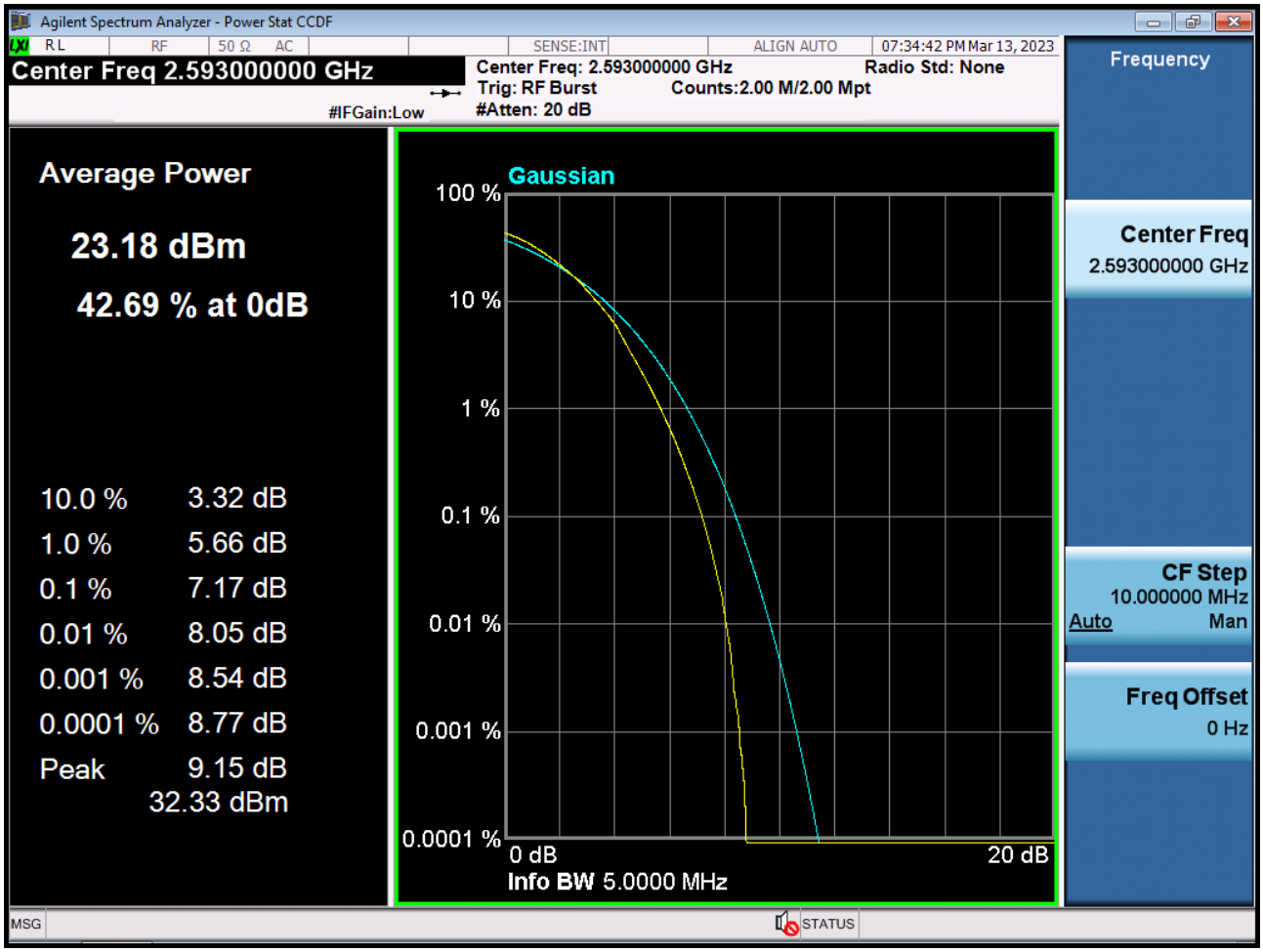


PAR Plot (5 M BW_Ch.40620_QPSK_RB25_0)

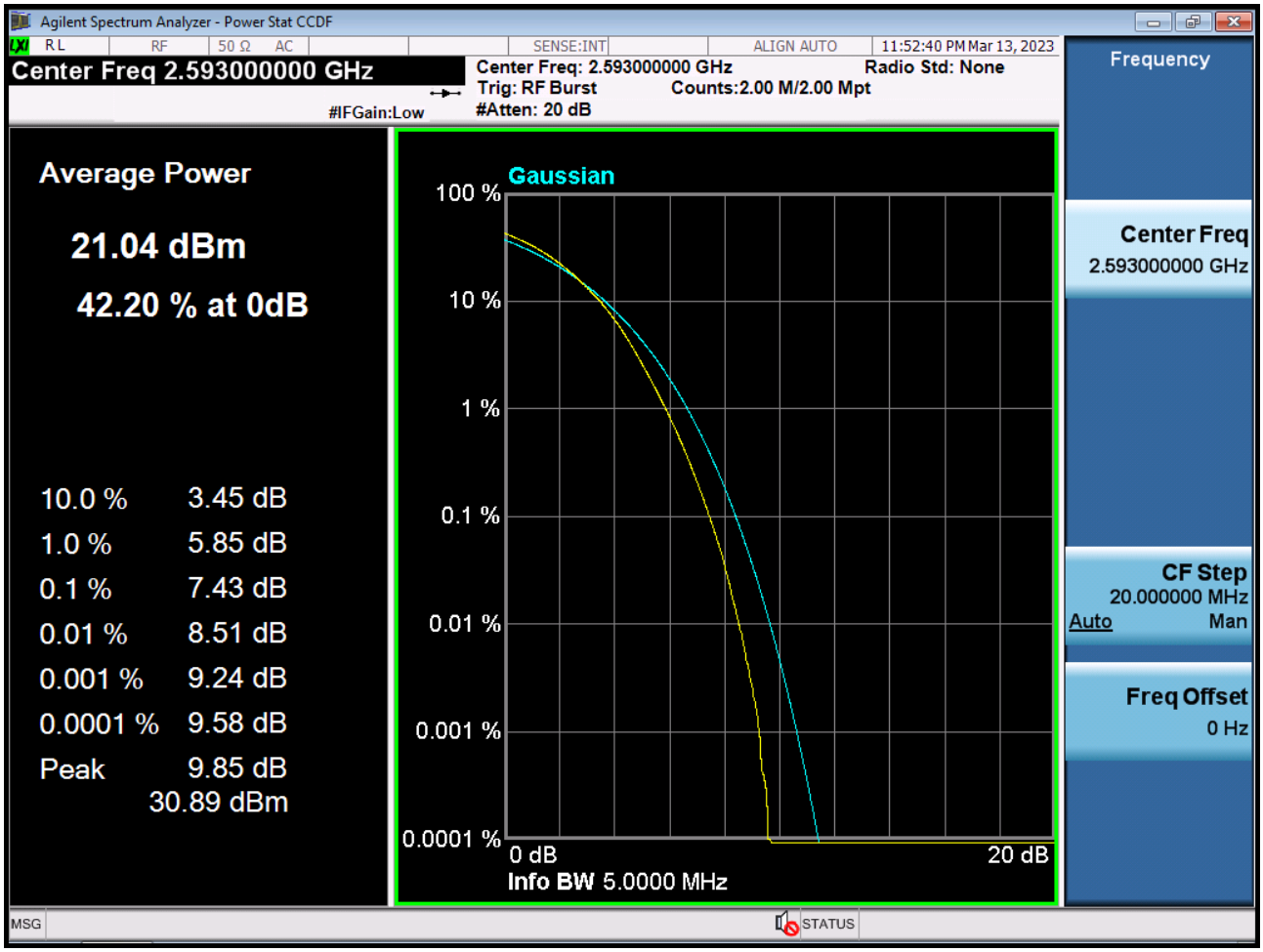


PAR Plot (5 M BW_Ch.40620_16QAM_RB25_0)

PAR Plot (5 M BW_Ch.40620_64QAM_RB25_0)

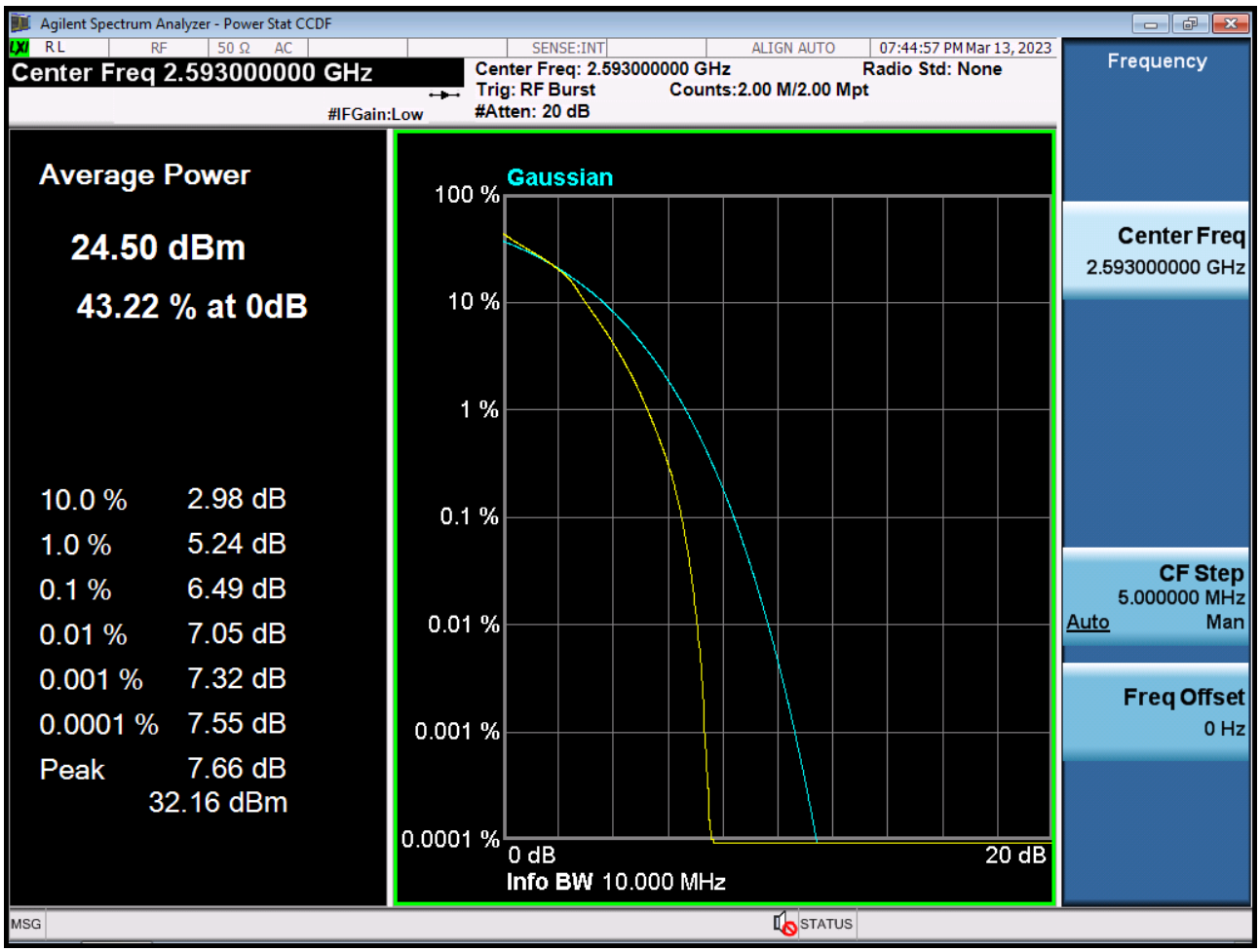


PAR Plot (5 M BW_Ch.40620_256QAM_RB25_0)

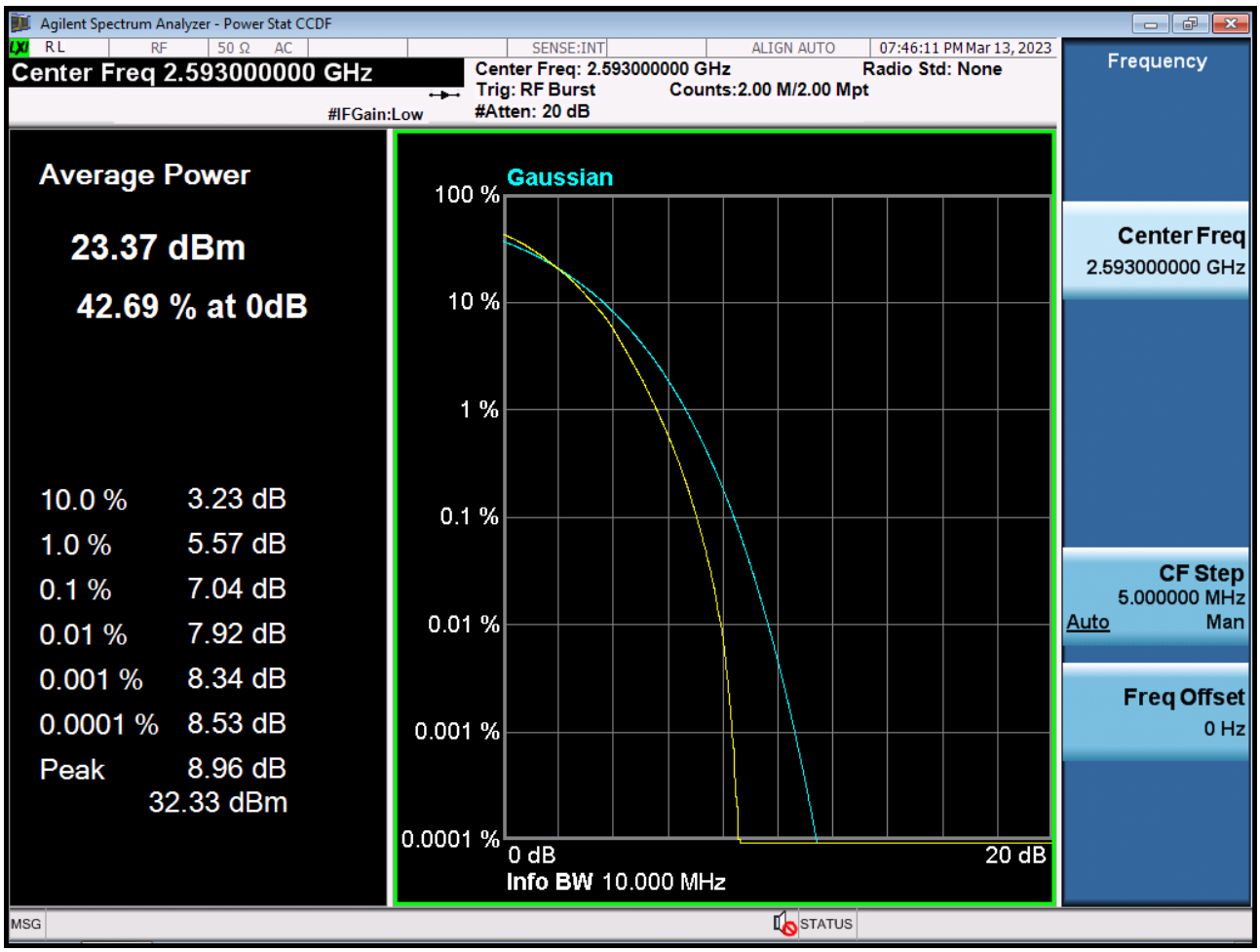


PAR Plot (10 M BW_Ch.40620_QPSK_RB50_0)

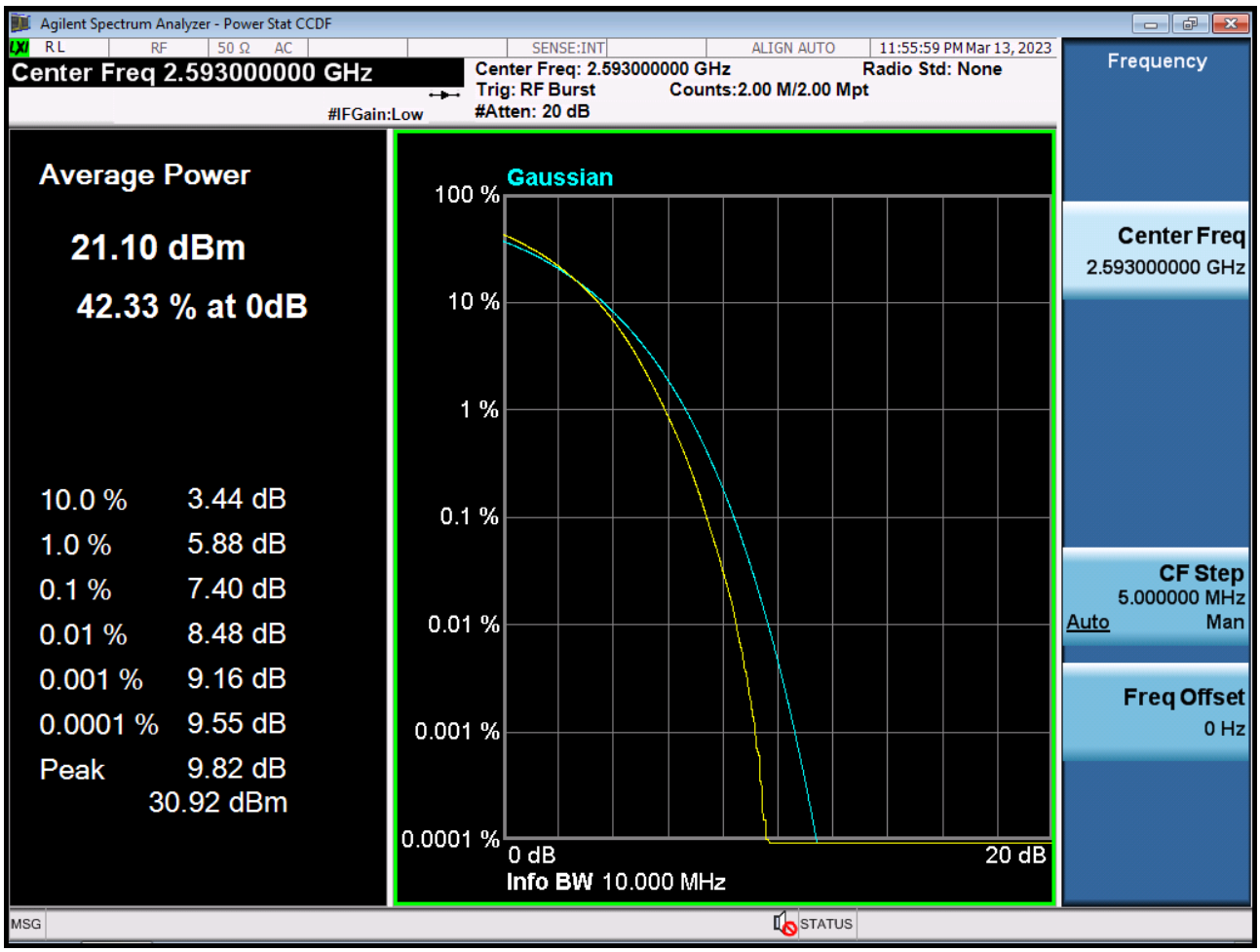
PAR Plot (10 M BW_Ch.40620_16QAM_RB50_0)



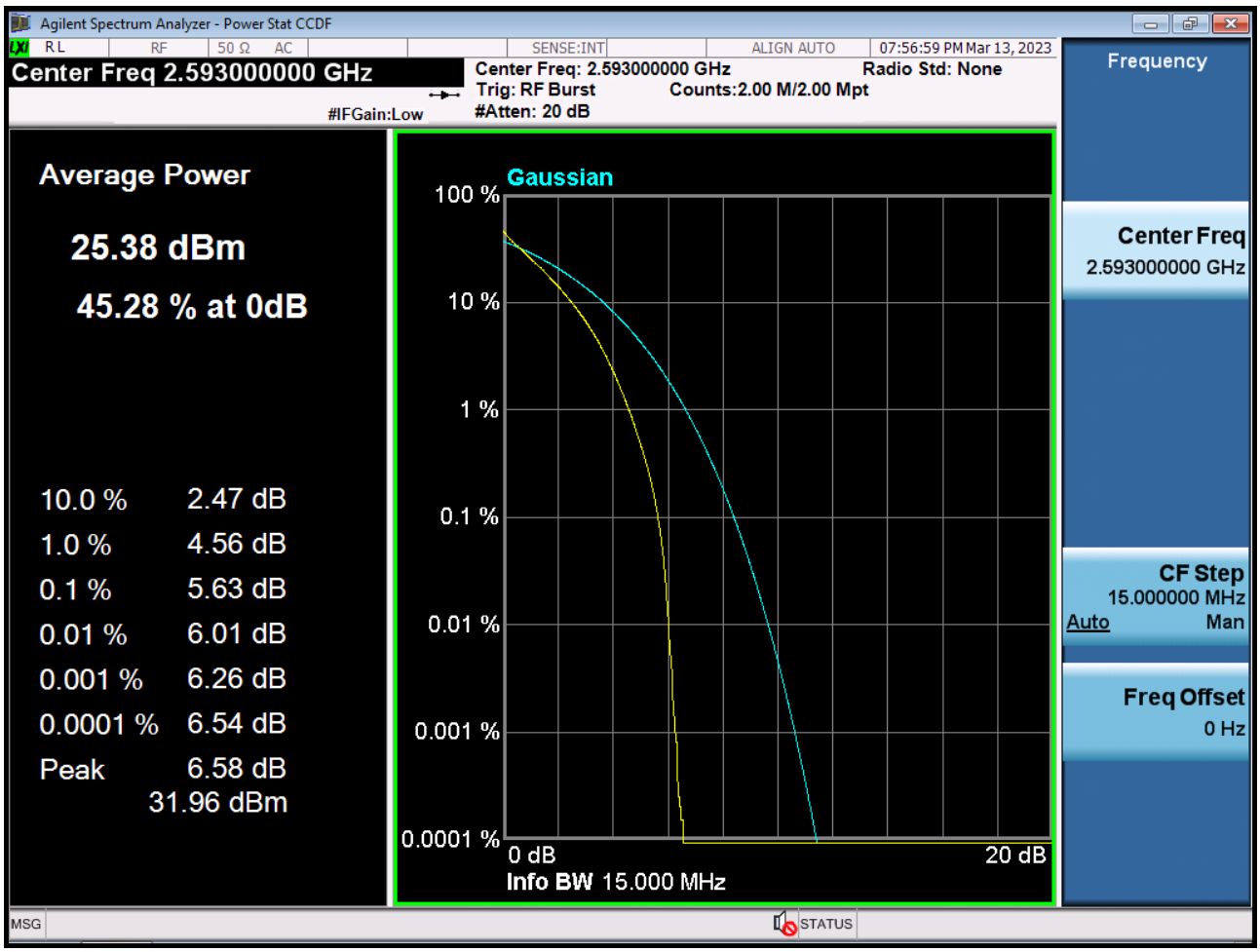
PAR Plot (10 M BW_Ch.40620_64QAM_RB50_0)



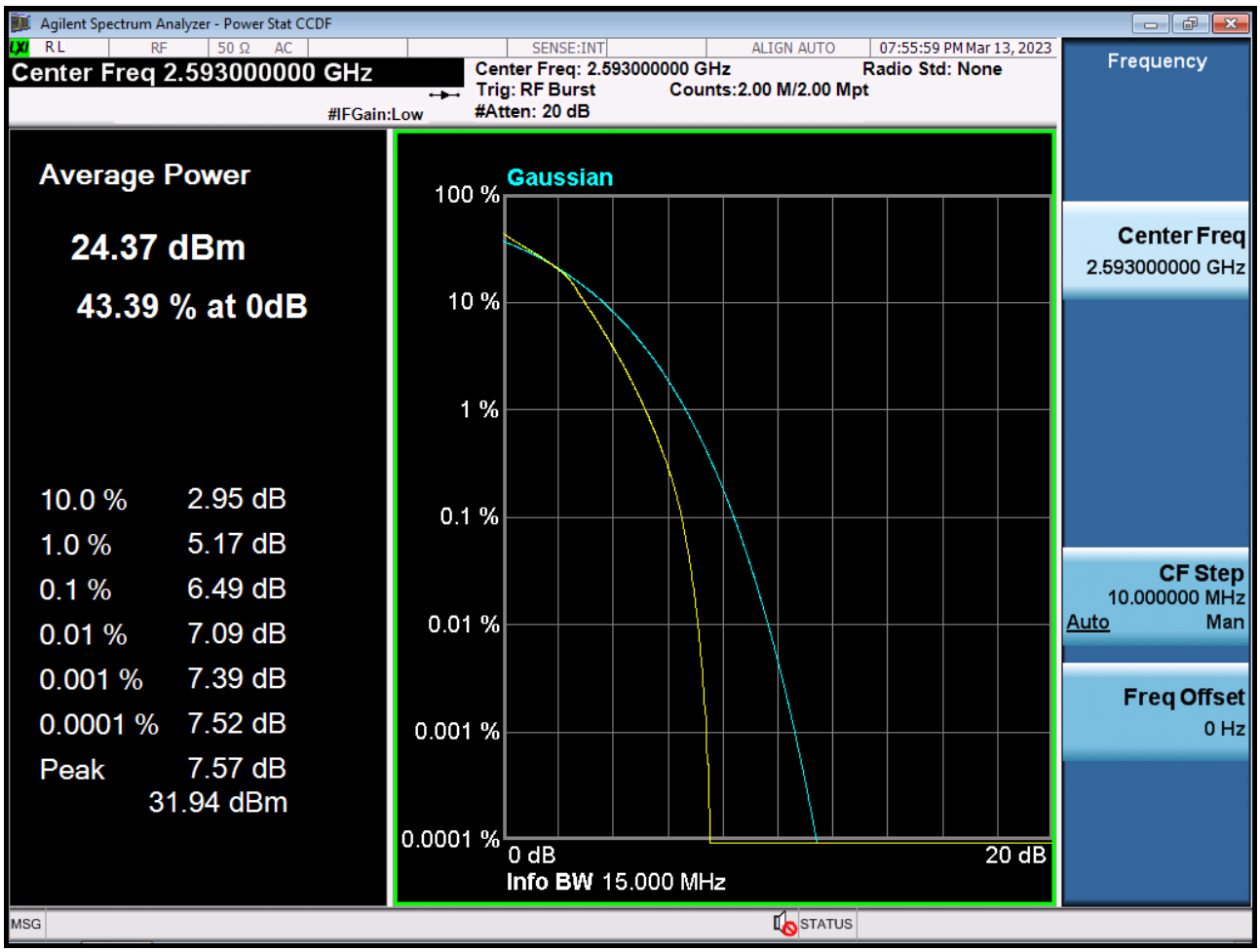
PAR Plot (10 M BW_Ch.40620_256QAM_RB50_0)



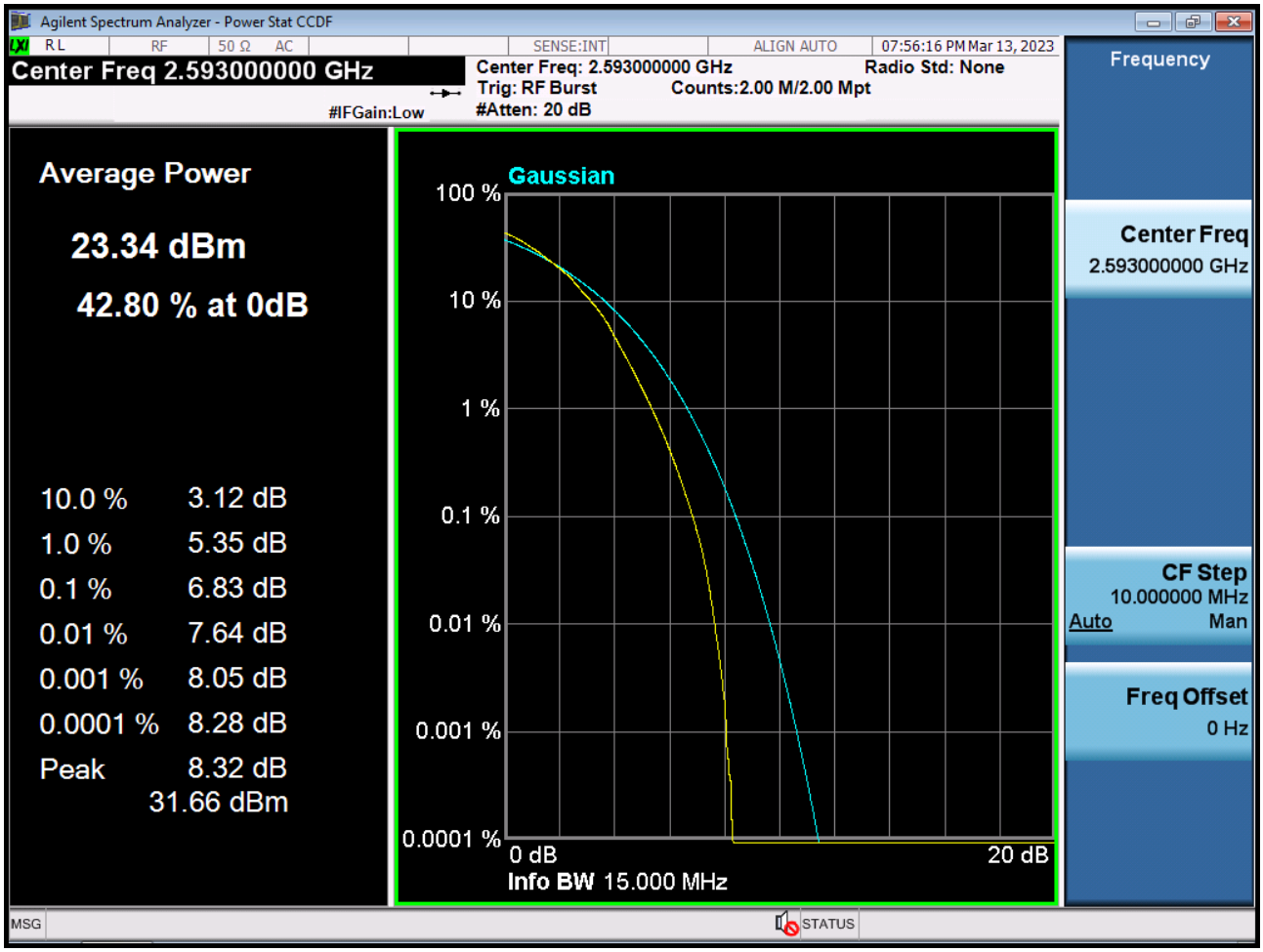
PAR Plot (15 M BW_Ch.40620_QPSK_RB75_0)



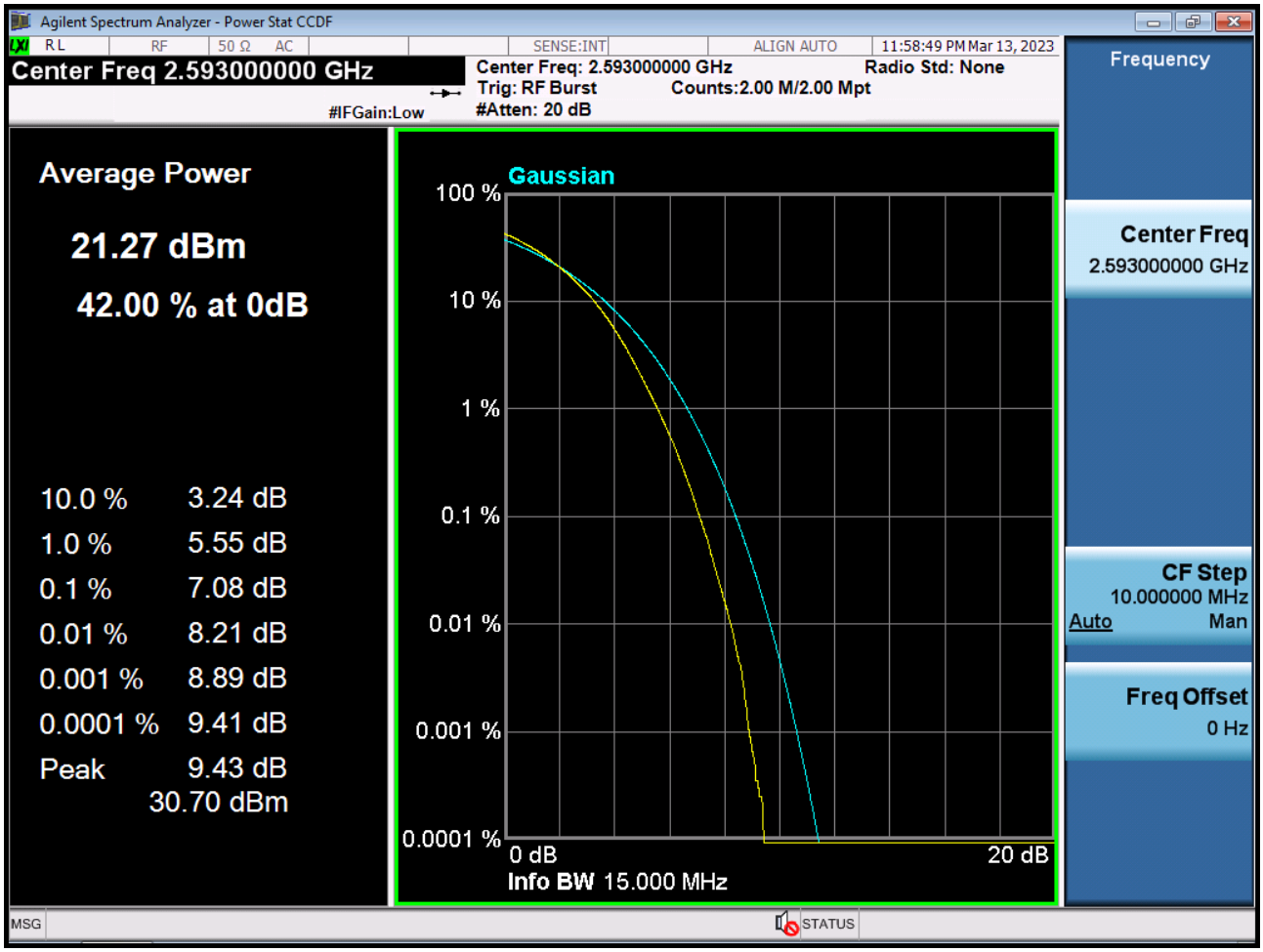
PAR Plot (15 M BW_Ch.40620_16QAM_RB75_0)



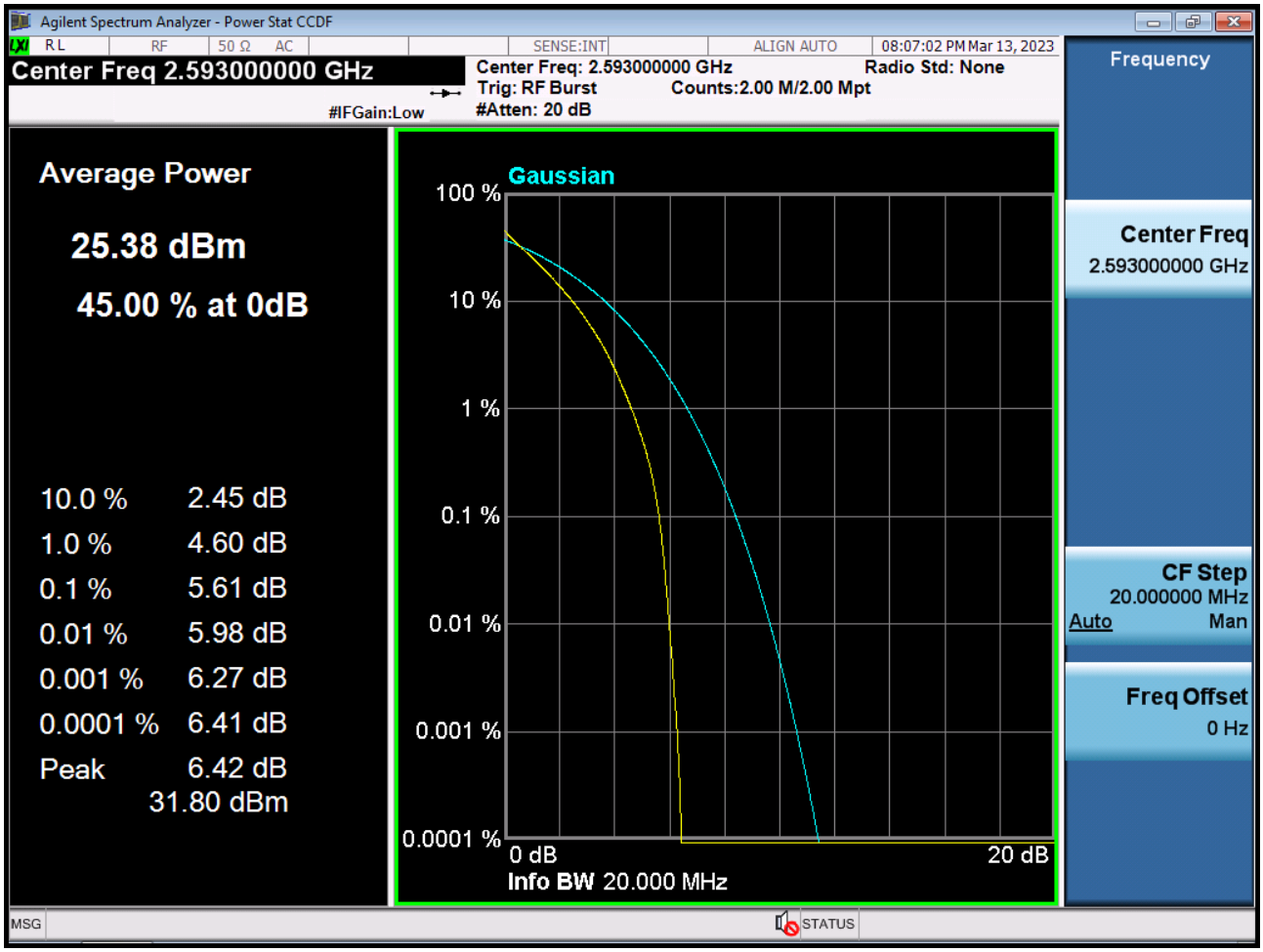
PAR Plot (15 M BW_Ch.40620_64QAM_RB75_0)



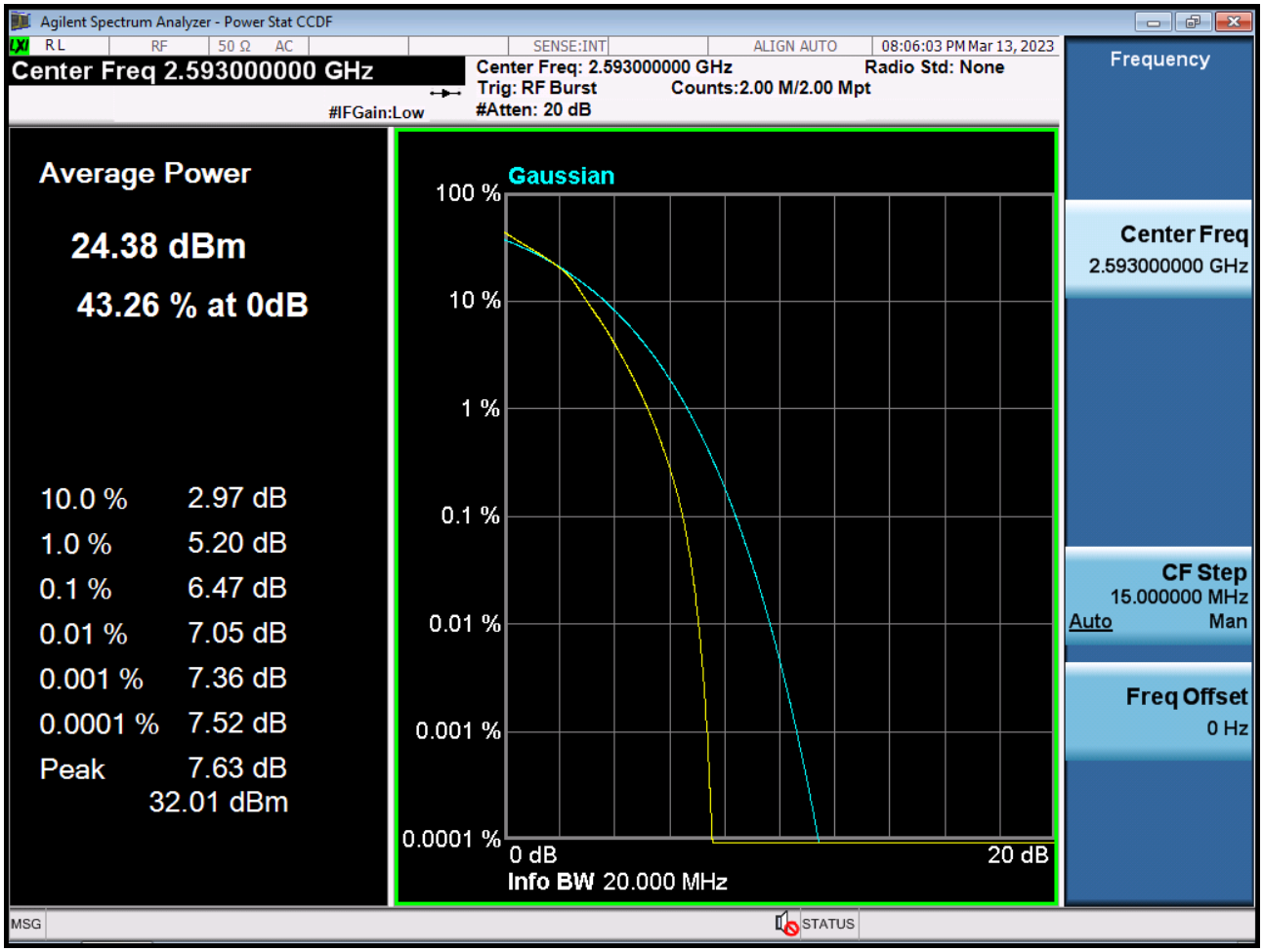
PAR Plot (15 M BW_Ch.40620_256QAM_RB75_0)



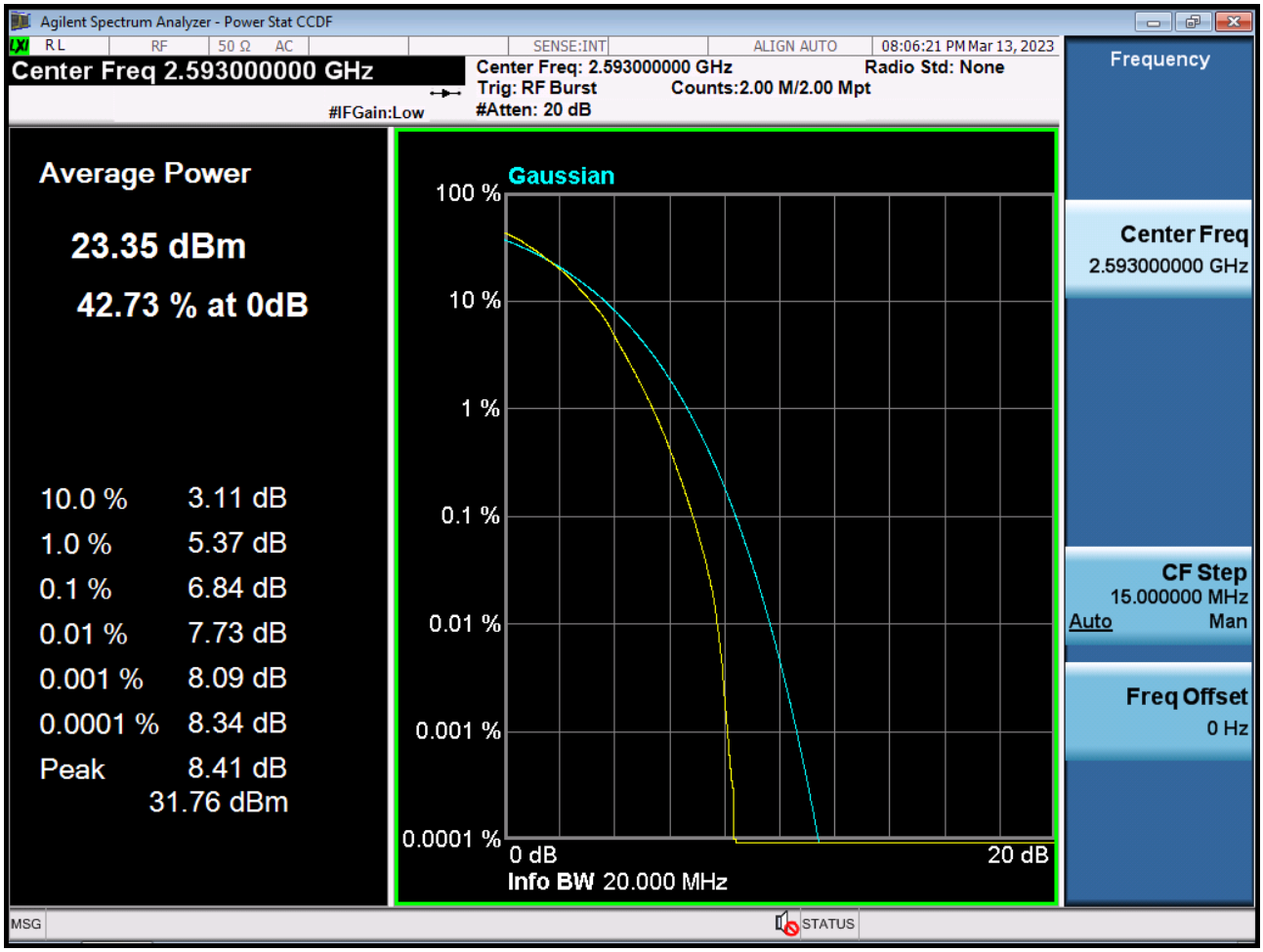
PAR Plot (20 M BW_Ch.40620_QPSK_RB100_0)



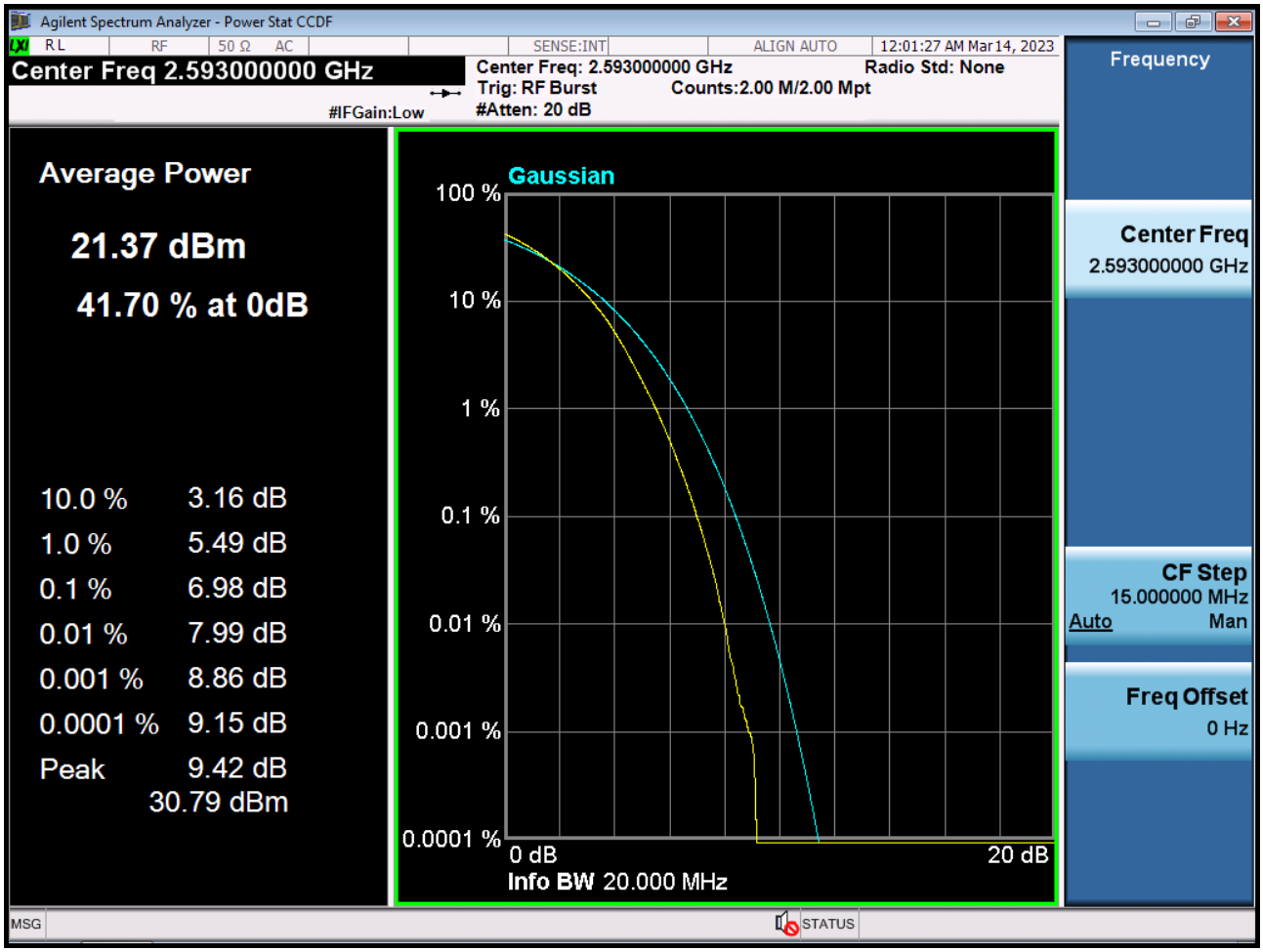
PAR Plot (20 M BW_Ch.40620_16QAM_RB100_0)



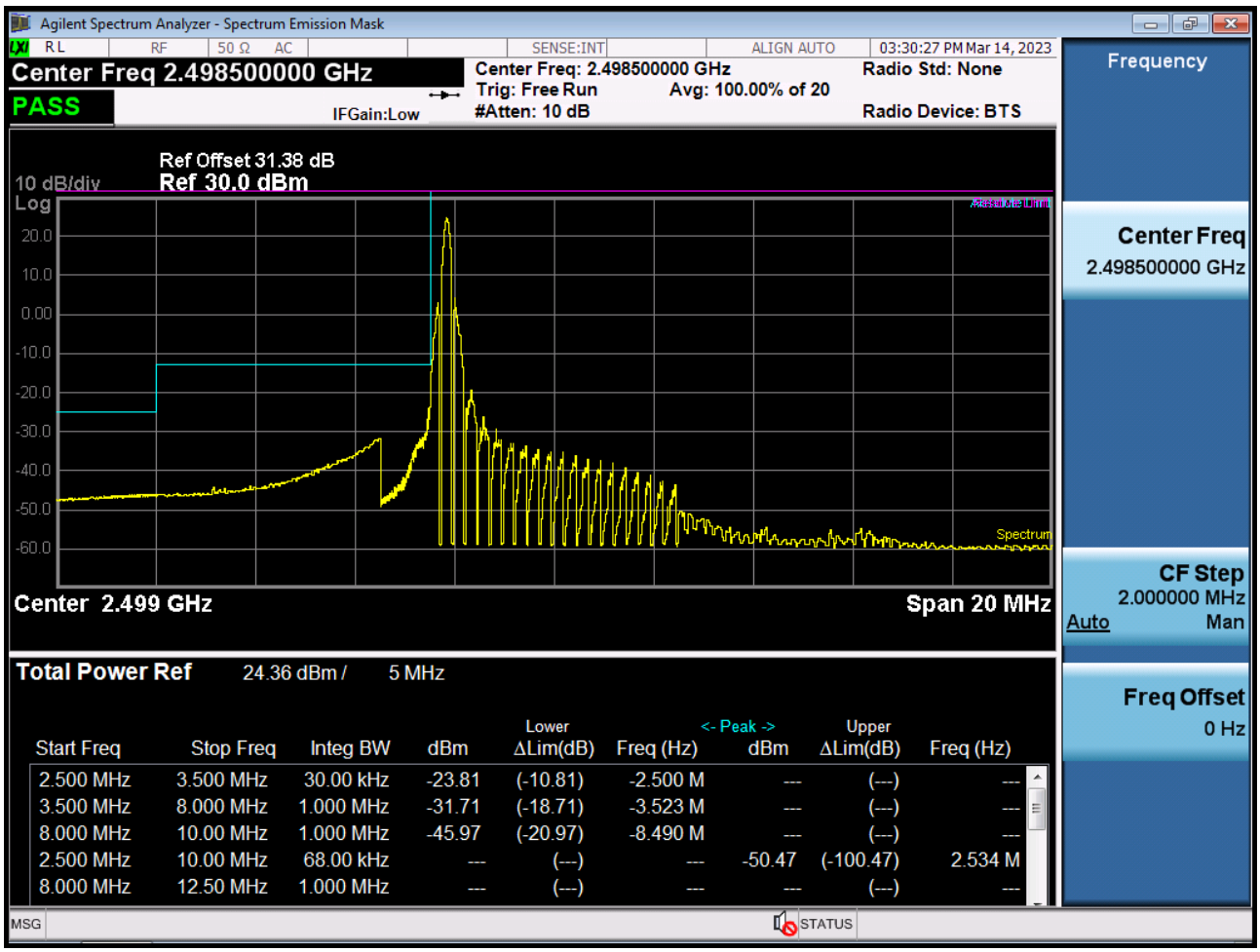
PAR Plot (20 M BW_Ch.40620_64QAM_RB100_0)



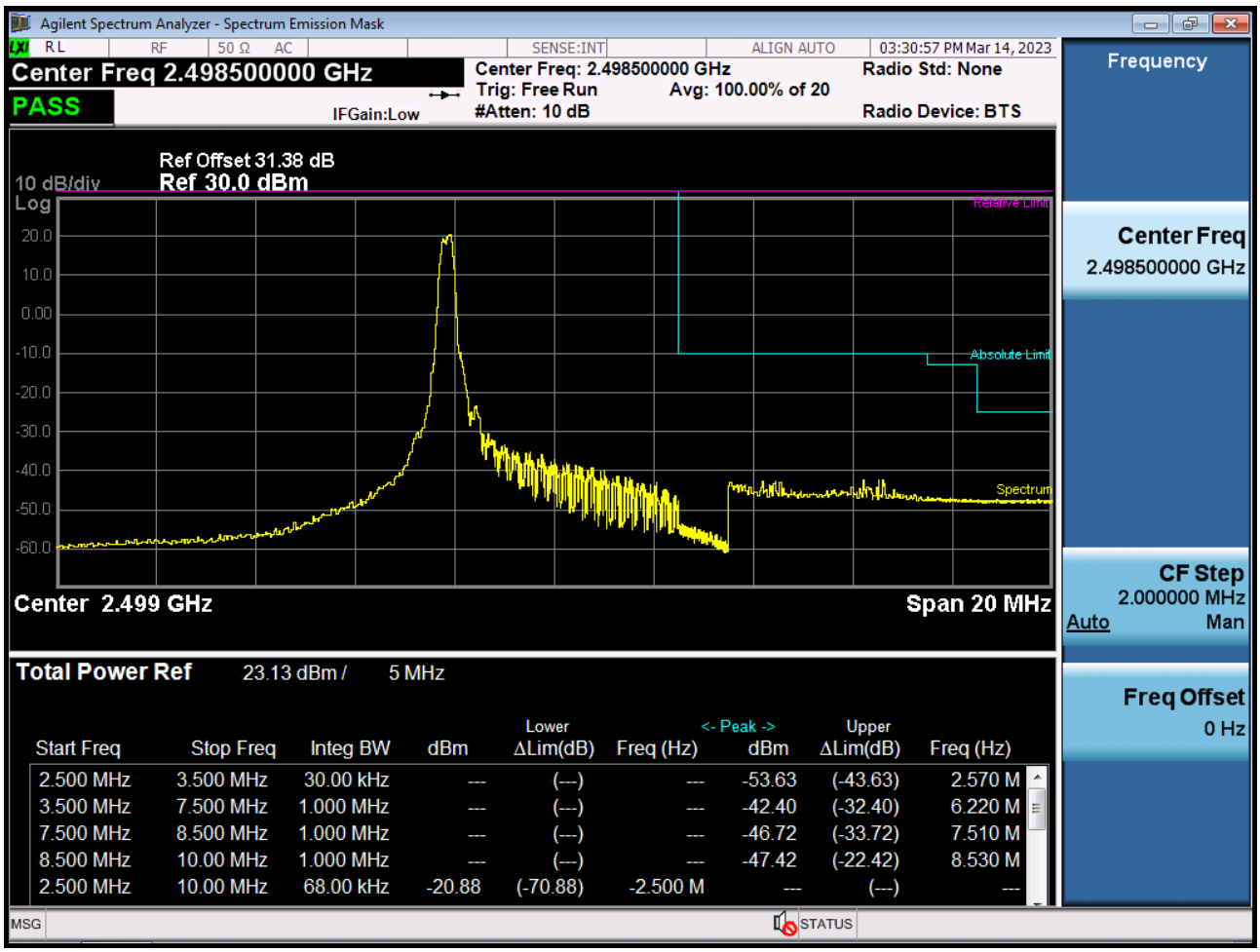
PAR Plot (20 M BW_Ch.40620_256QAM_RB100_0)



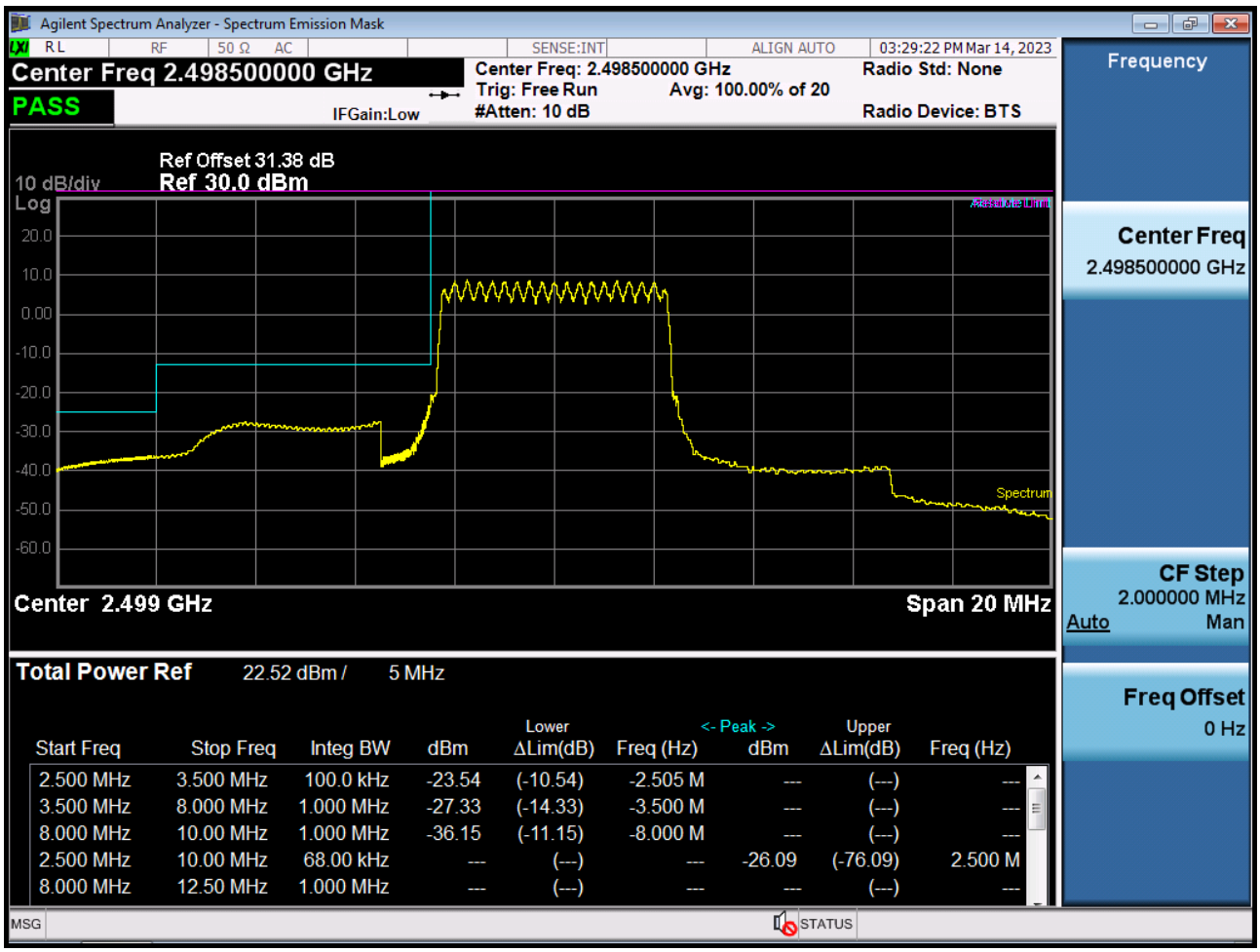
Low Channel Edge Plot (5 MHz Ch.39675 QPSK RB 1, Offset 0)-1



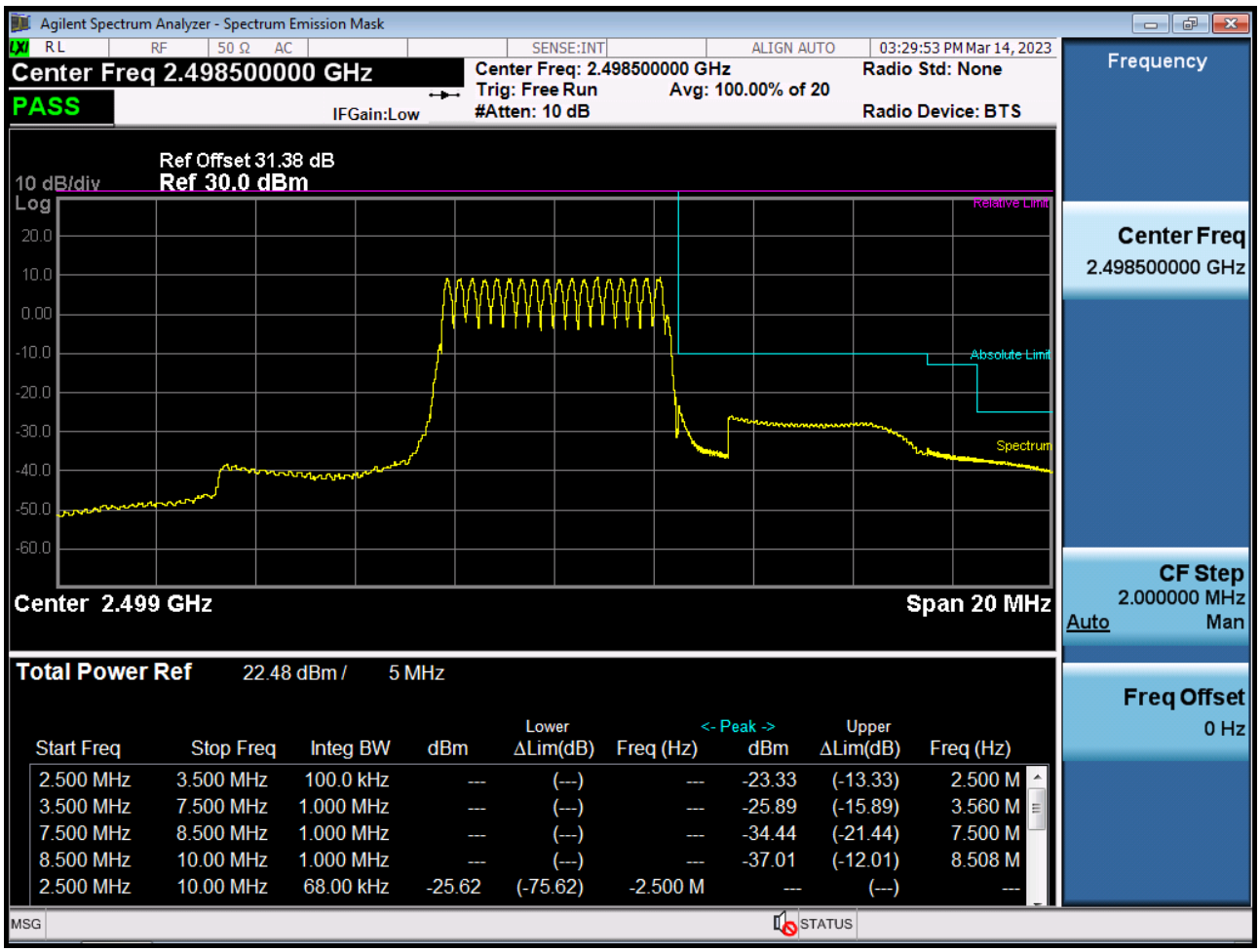
Low Channel Edge Plot (5 MHz Ch.39675 QPSK RB 1, Offset 0)-2



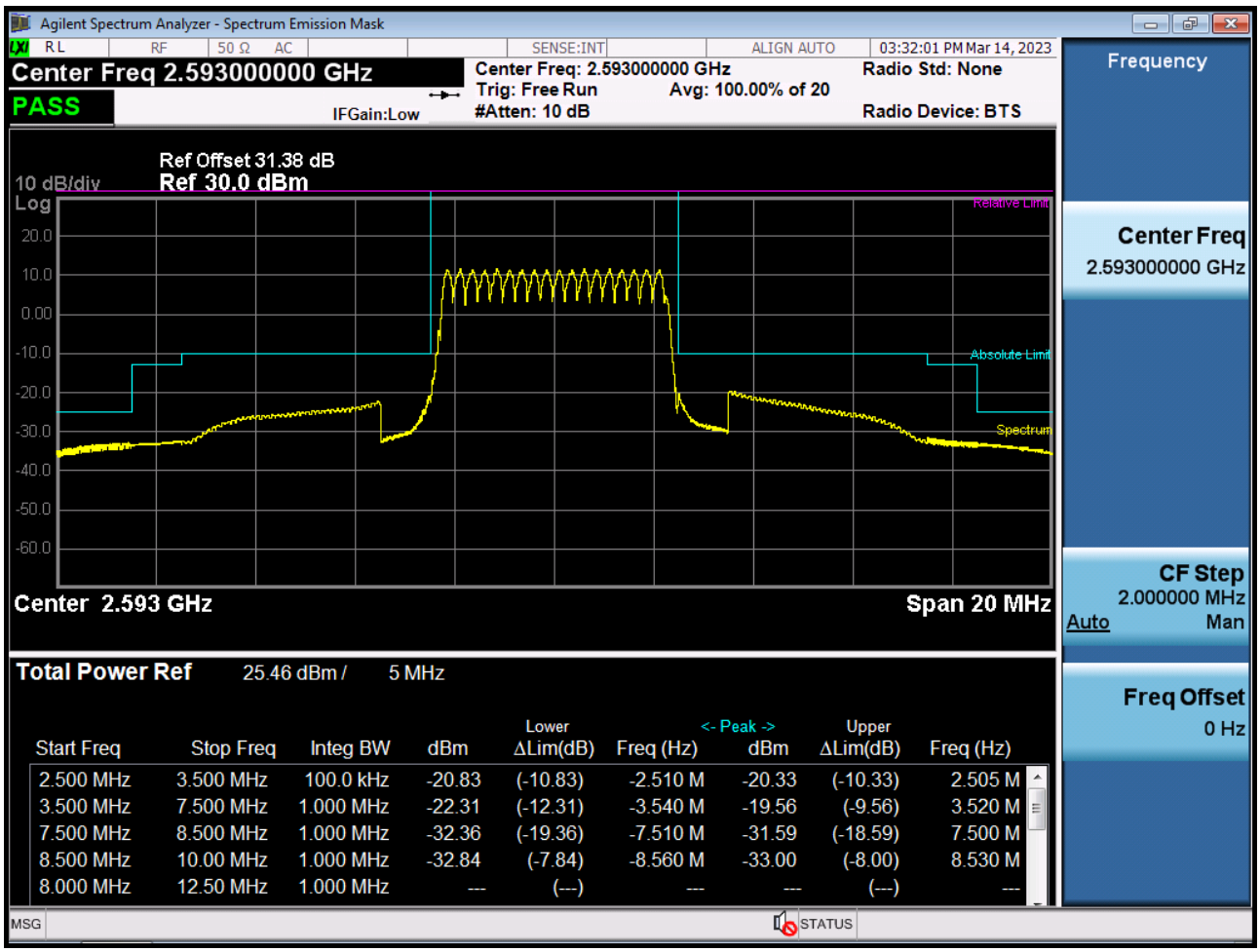
Low Channel Edge Plot (5 MHz Ch.39675 QPSK_RB25_Offset 0)-1



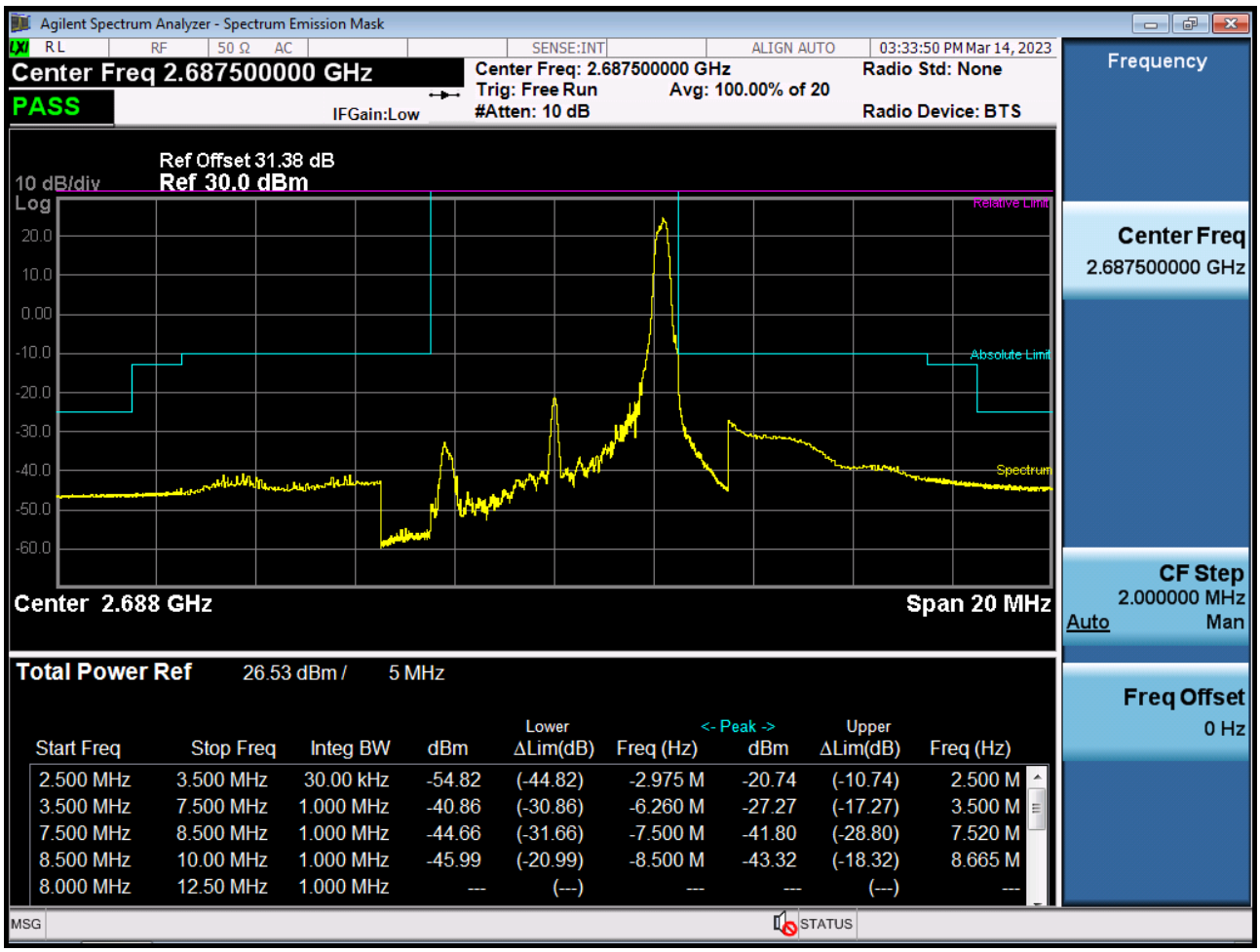
Low Channel Edge Plot (5 MHz Ch.39675 QPSK_RB25_Offset 0)-2



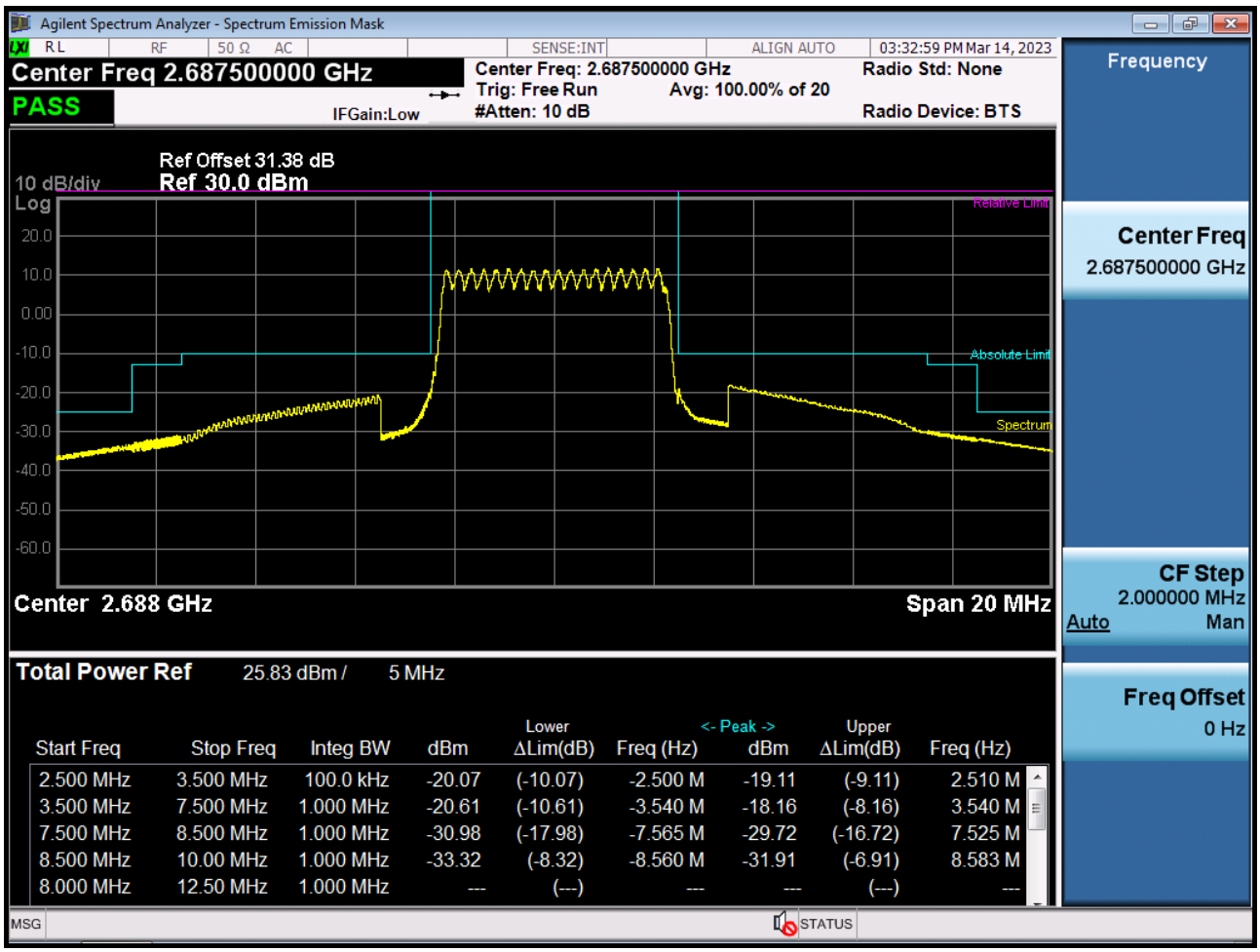
Mid Channel Edge Plot (5 MHz Ch.40620 QPSK RB 25)



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

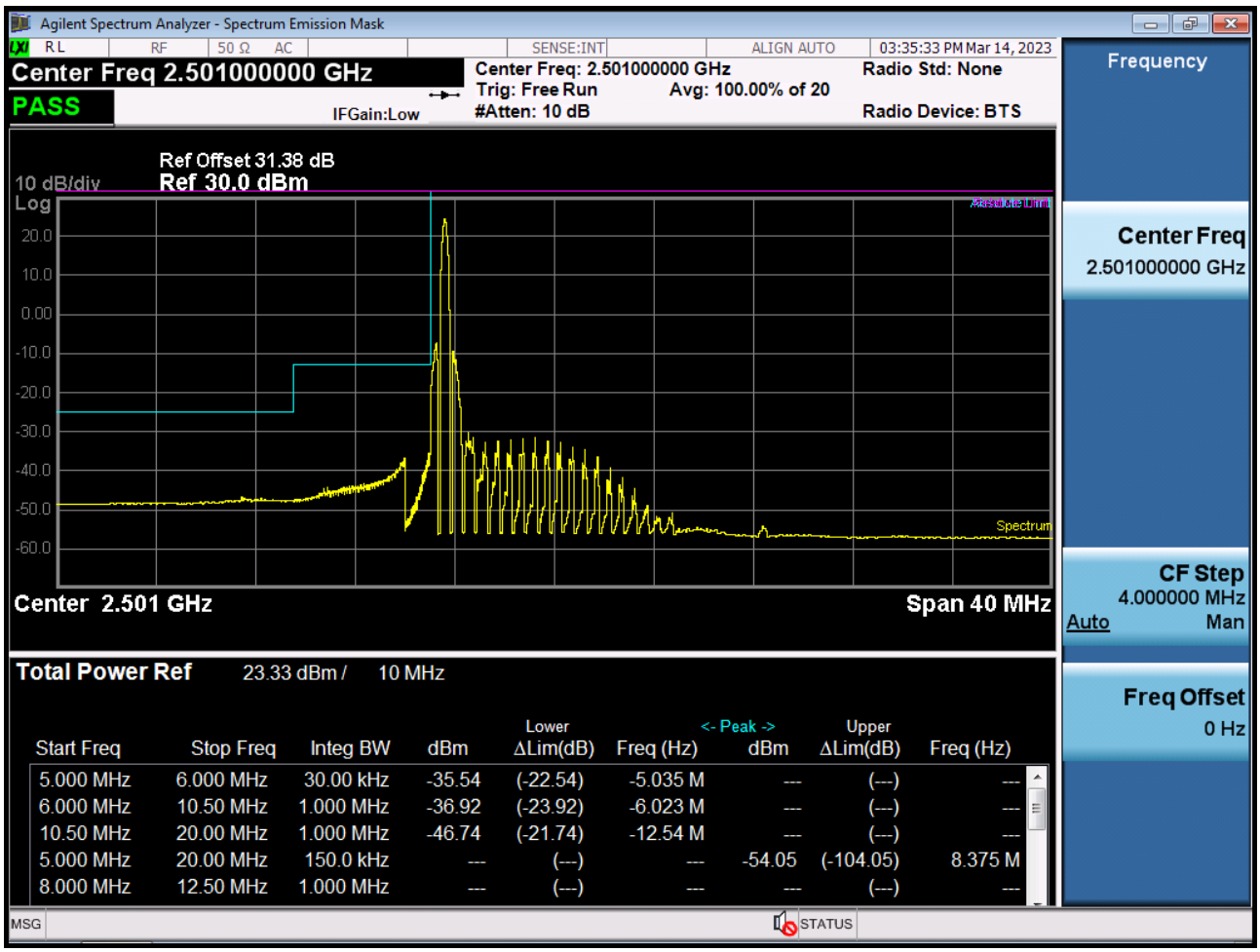


High Channel Edge Plot (5 MHz Ch.41565 QPSK_RB25_Offset 0)

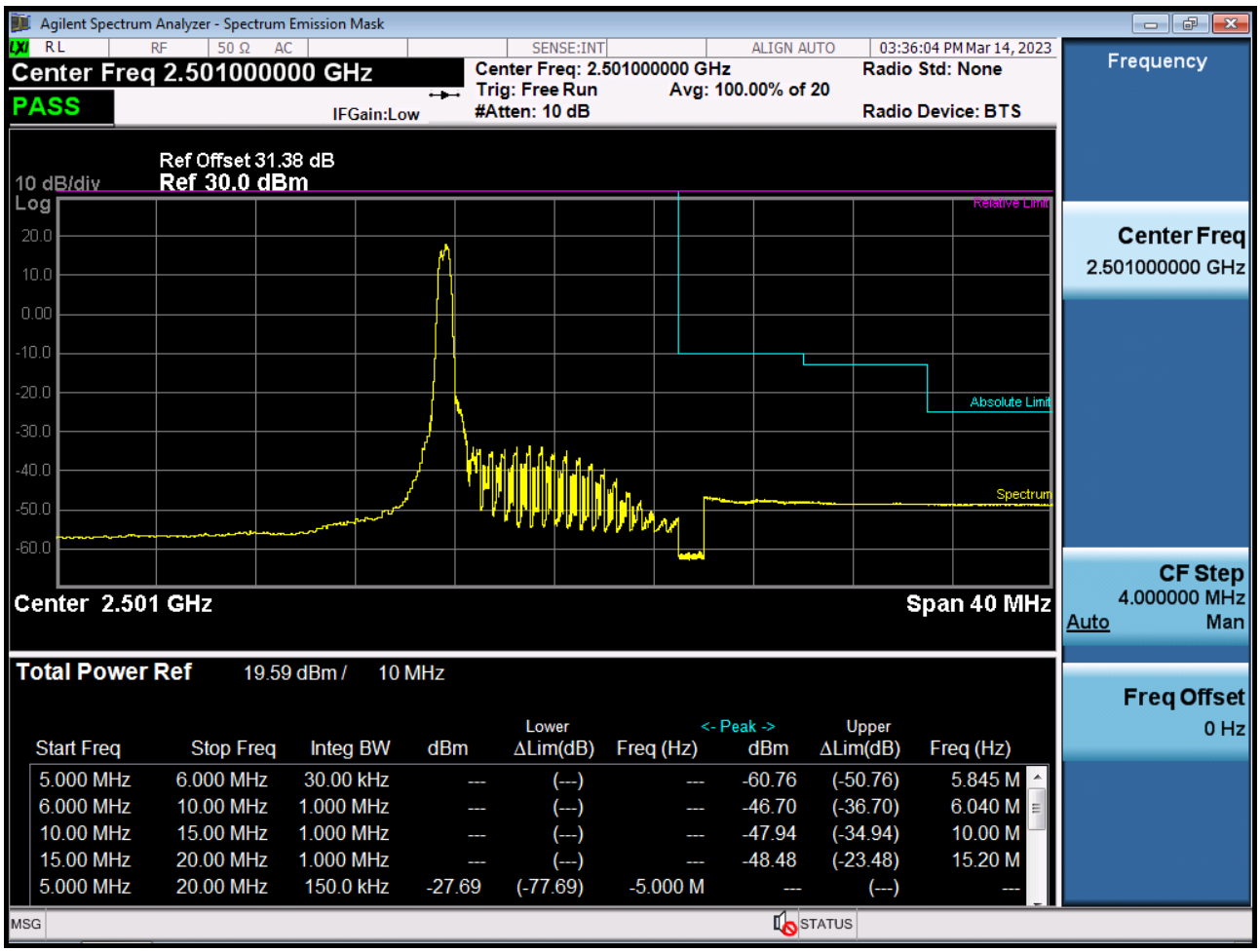


Start Freq	Stop Freq	Integ BW	dBm	Lower ΔLim(dB)	Freq (Hz)	<- Peak -> dBm	Upper ΔLim(dB)	Freq (Hz)
2.500 MHz	3.500 MHz	100.0 kHz	-20.07	(-10.07)	-2.500 M	-19.11	(-9.11)	2.510 M
3.500 MHz	7.500 MHz	1.000 MHz	-20.61	(-10.61)	-3.540 M	-18.16	(-8.16)	3.540 M
7.500 MHz	8.500 MHz	1.000 MHz	-30.98	(-17.98)	-7.565 M	-29.72	(-16.72)	7.525 M
8.500 MHz	10.00 MHz	1.000 MHz	-33.32	(-8.32)	-8.560 M	-31.91	(-6.91)	8.583 M
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---

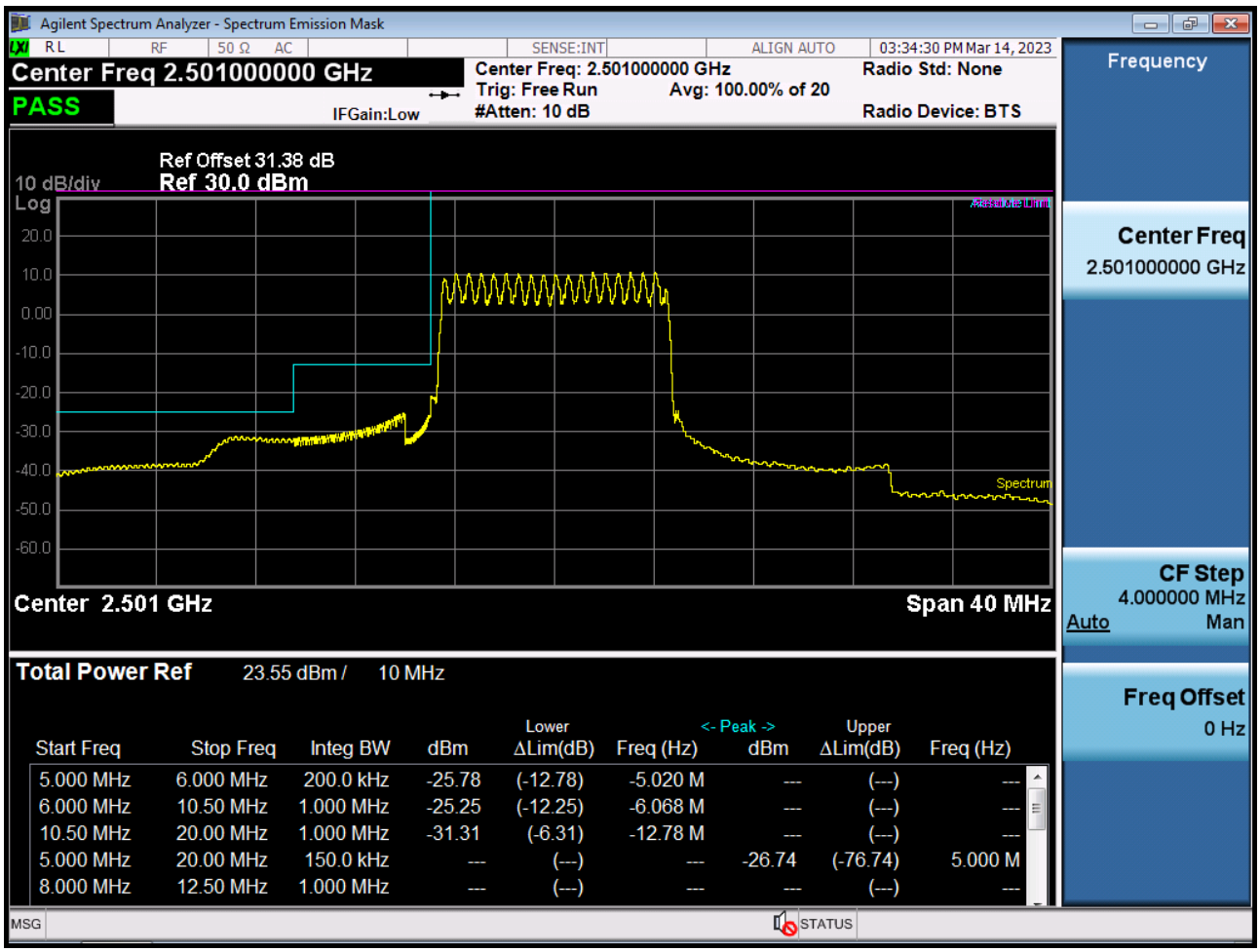
Low Channel Edge Plot (10 MHz Ch.39700 QPSK RB 1, Offset 0)-1



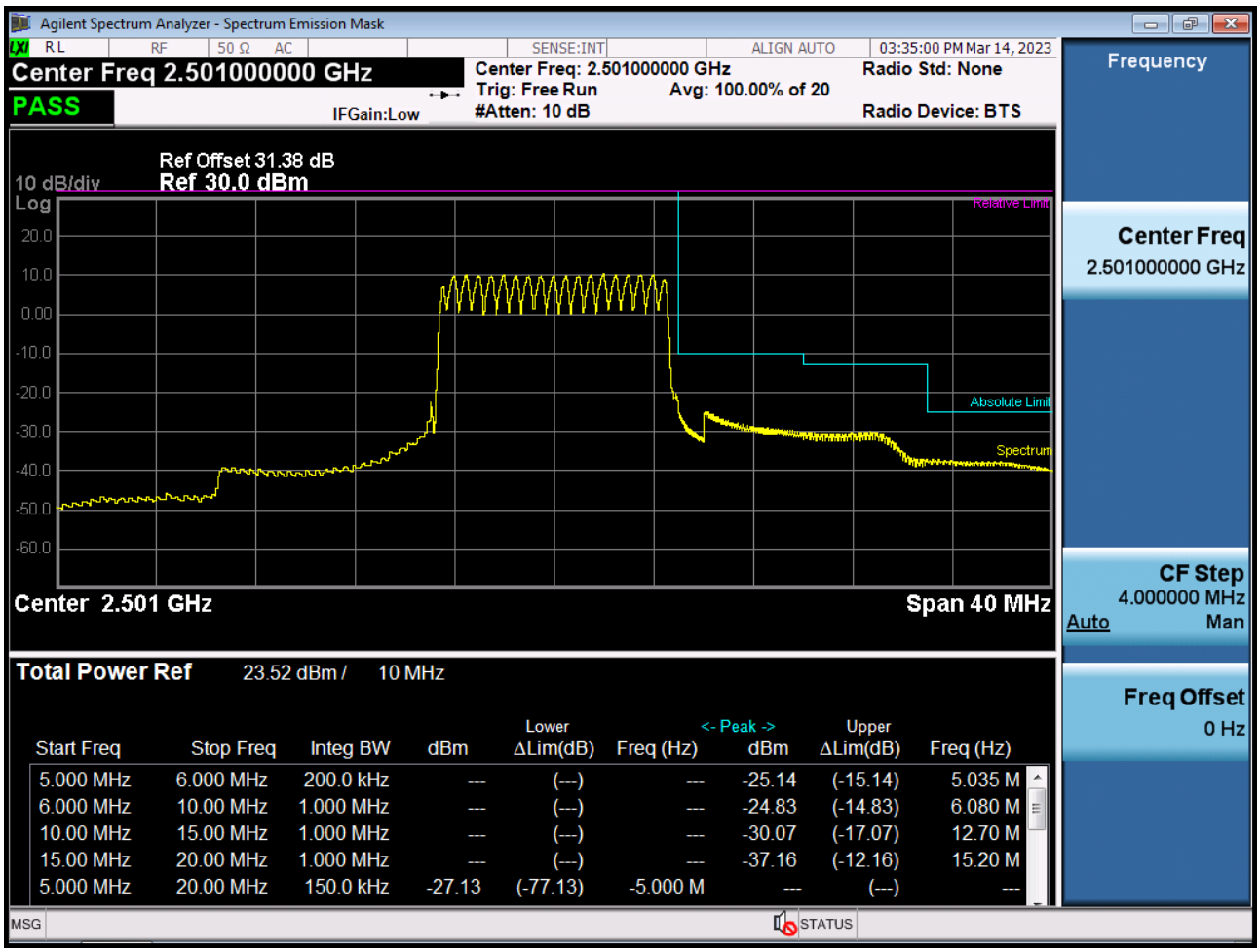
Low Channel Edge Plot (10 MHz Ch.39700 QPSK RB 1, Offset 0)-2



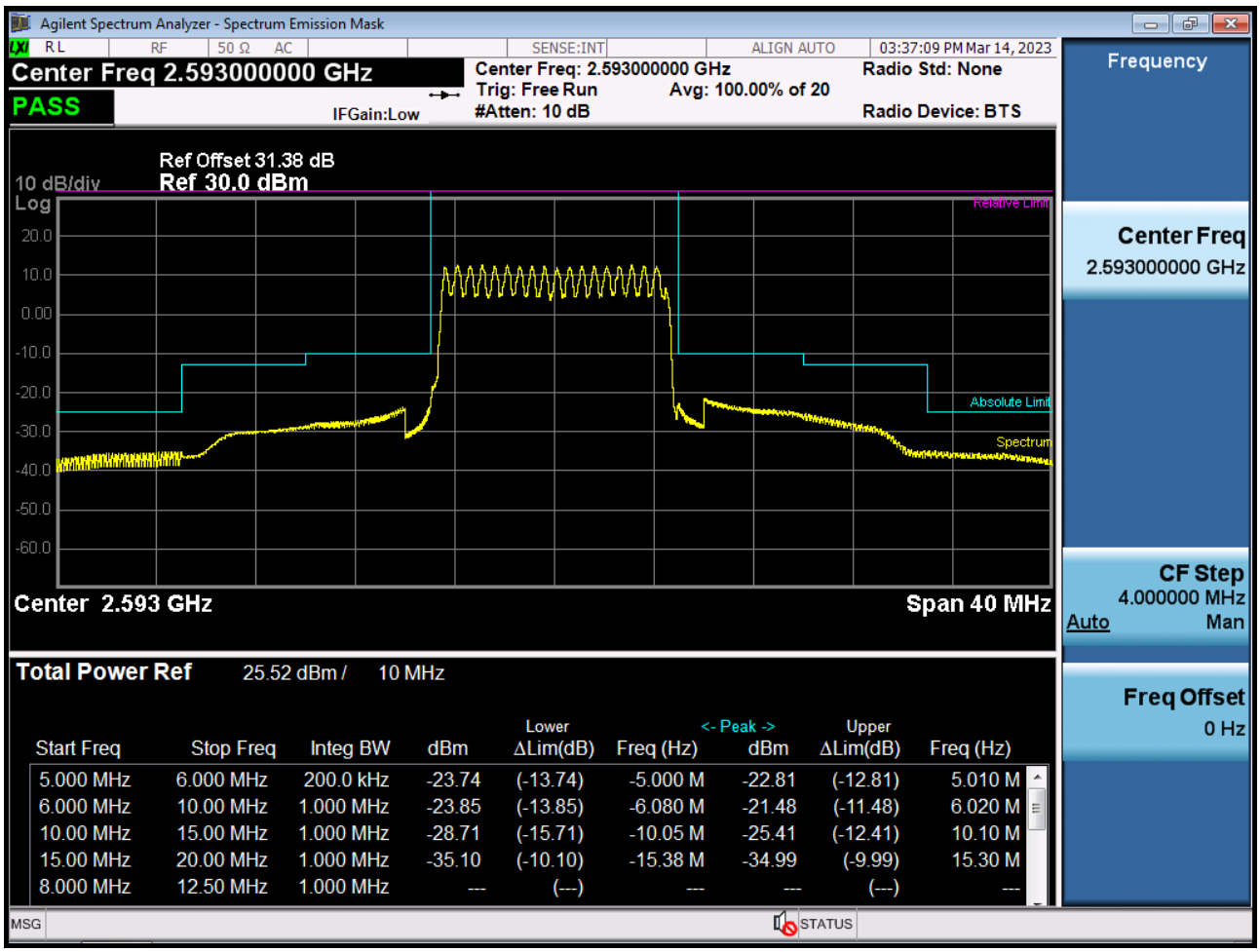
Low Channel Edge Plot (10 MHz Ch.39700 QPSK_RB50_Offset 0)-1



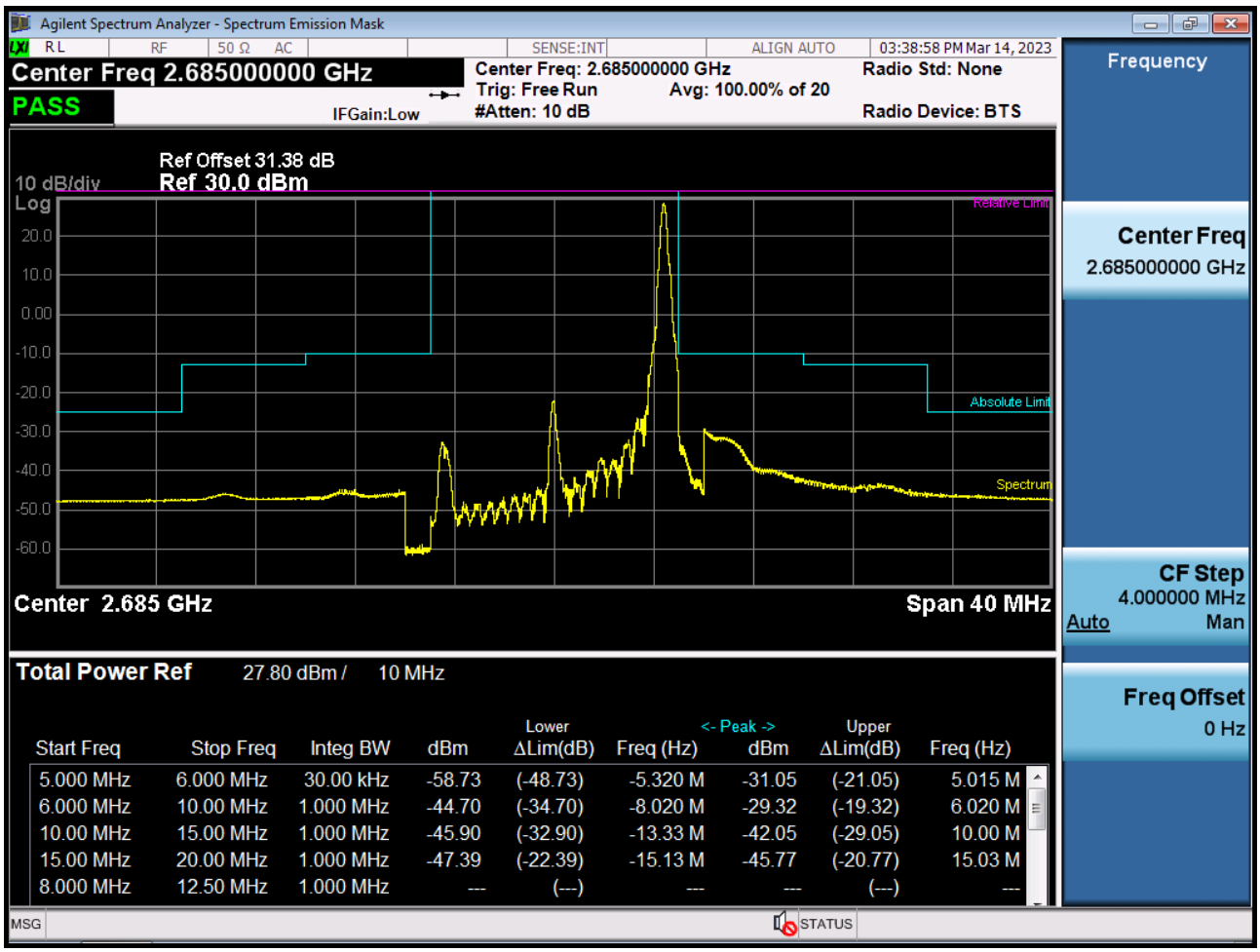
Low Channel Edge Plot (10 MHz Ch.39700 QPSK_RB50_Offset 0)-2



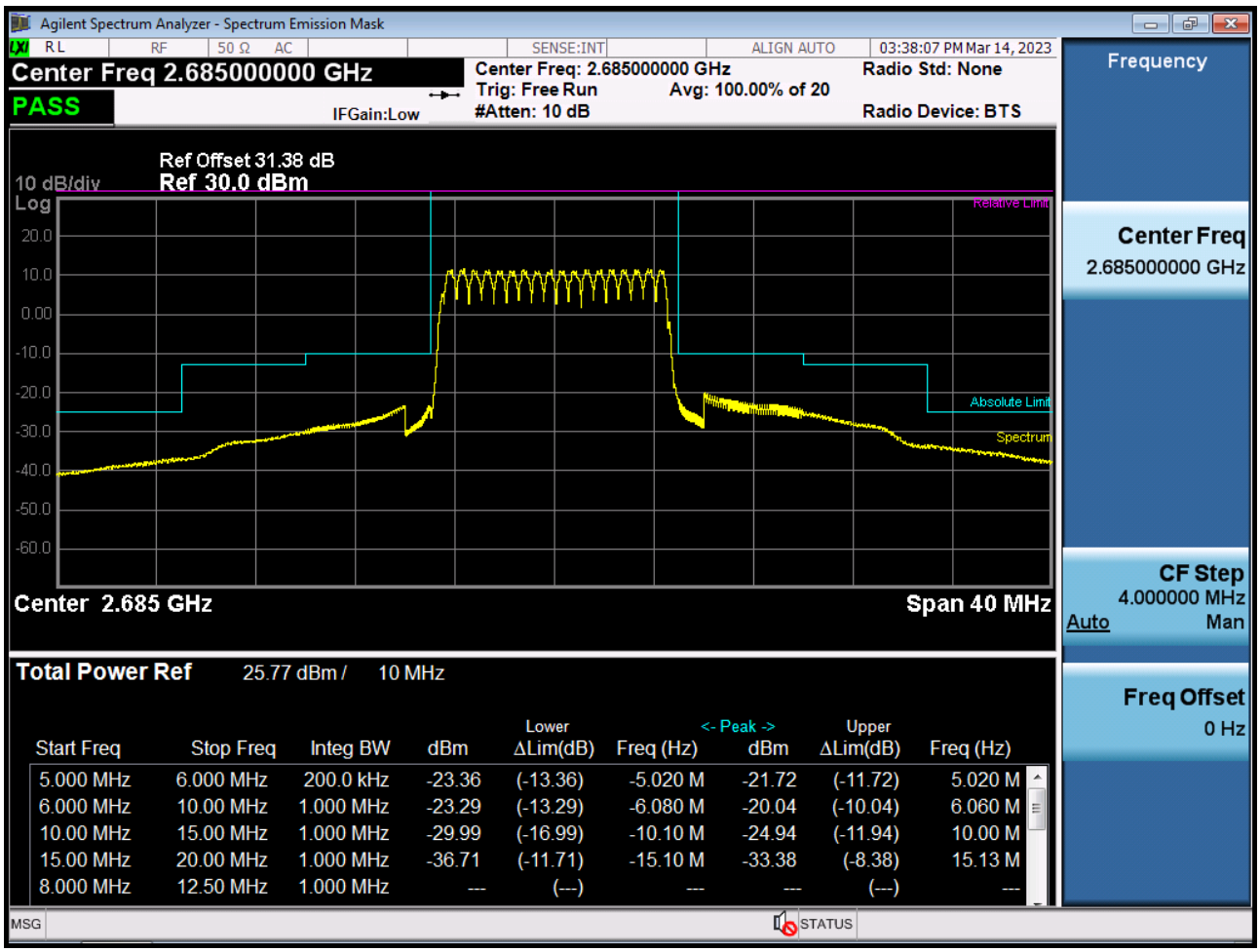
Mid Channel Edge Plot (10 MHz Ch.40620 QPSK RB 50)



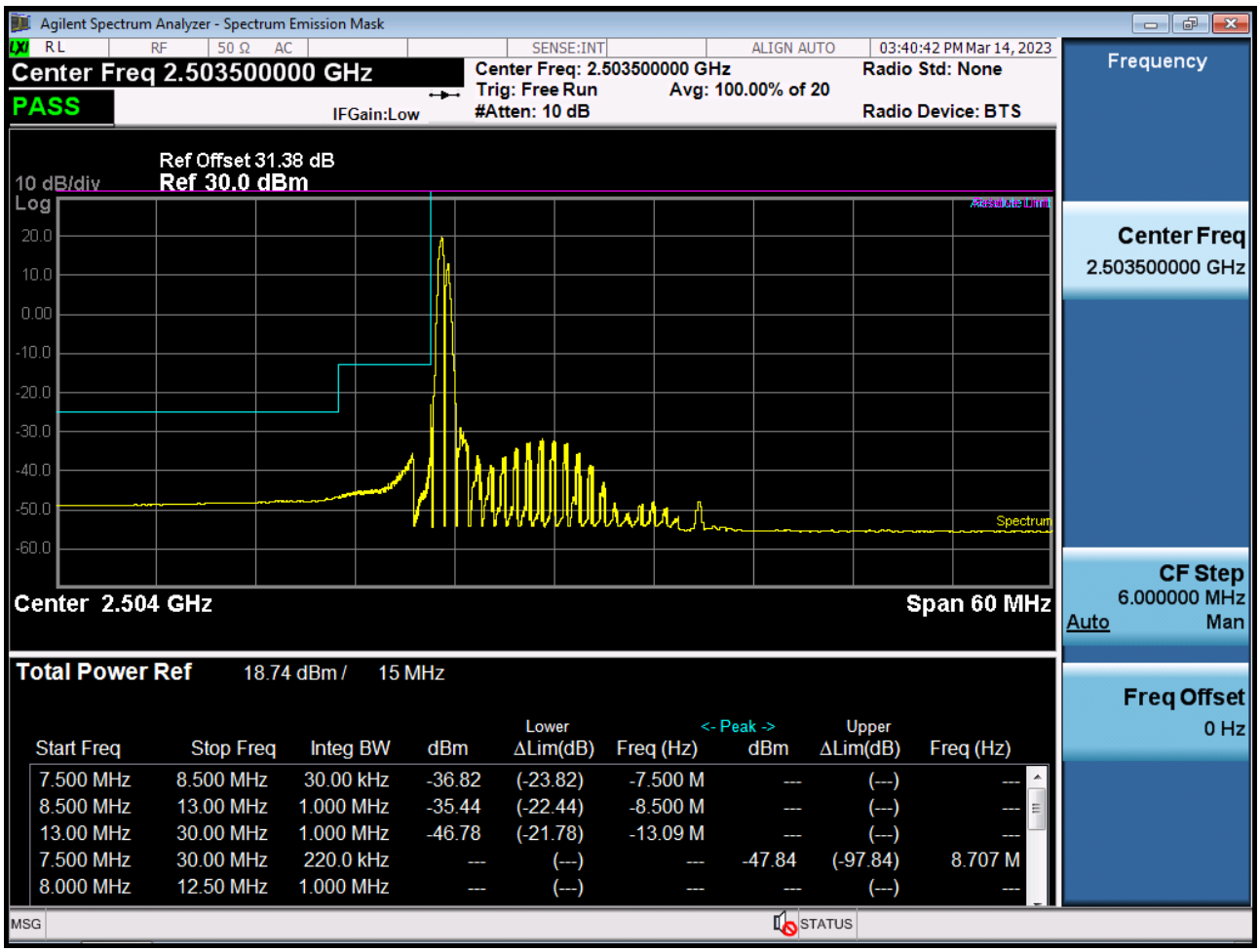
High Channel Edge Plot (10 MHz Ch.41540 QPSK RB 1, Offset 24)



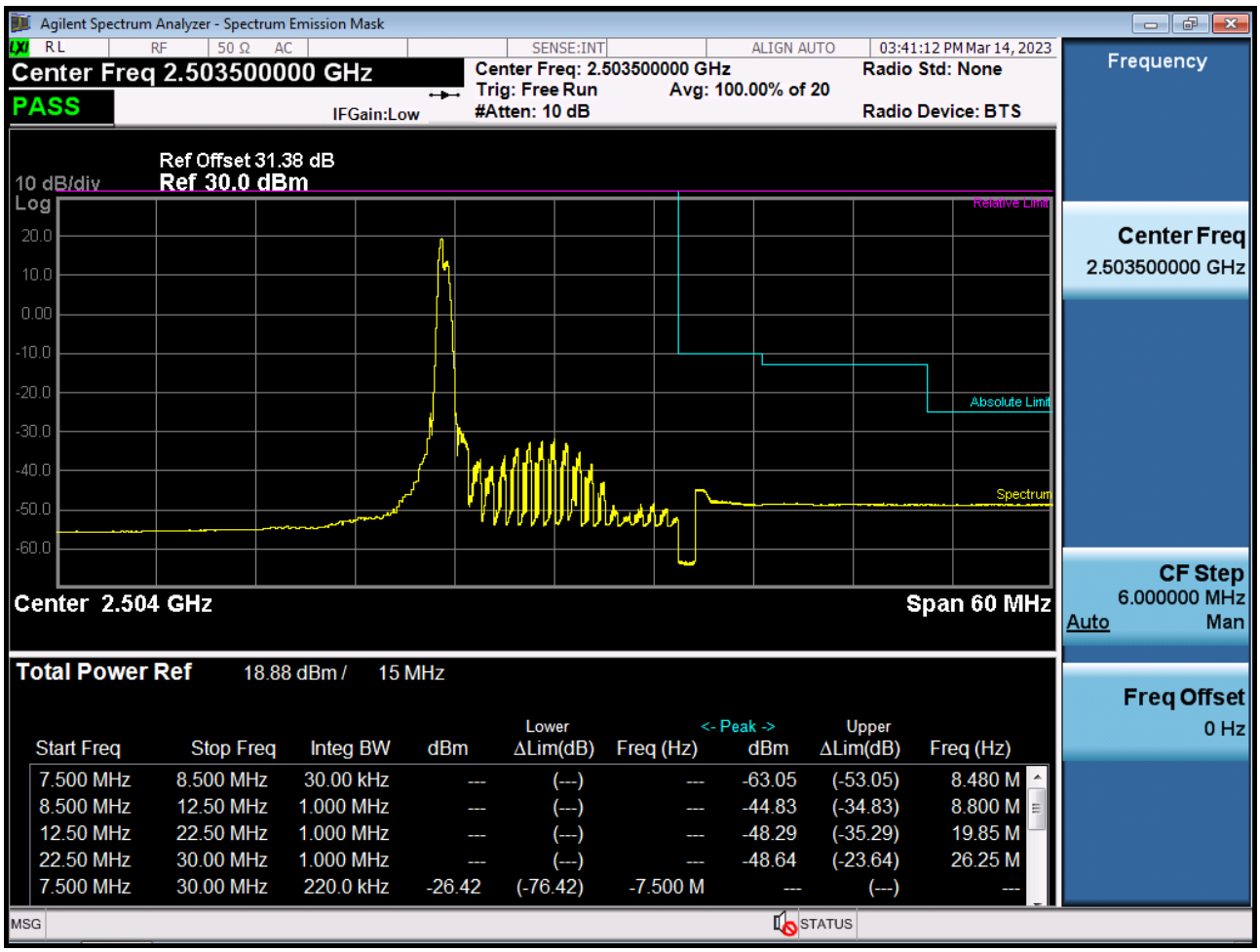
High Channel Edge Plot (10 MHz Ch.41540 QPSK_RB50_Offset 0)



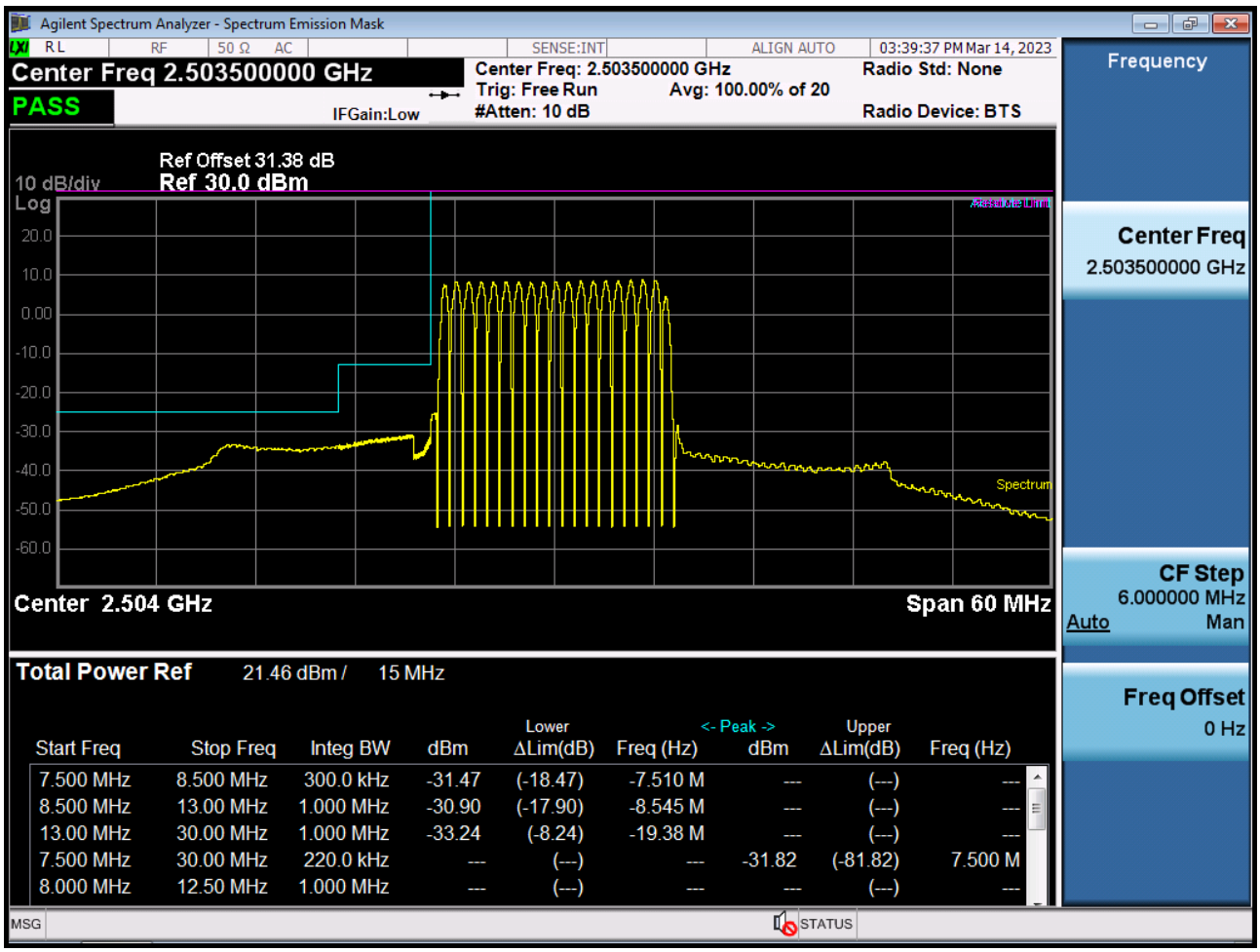
Low Channel Edge Plot (15 MHz Ch.39725 QPSK RB 1, Offset 0)-1



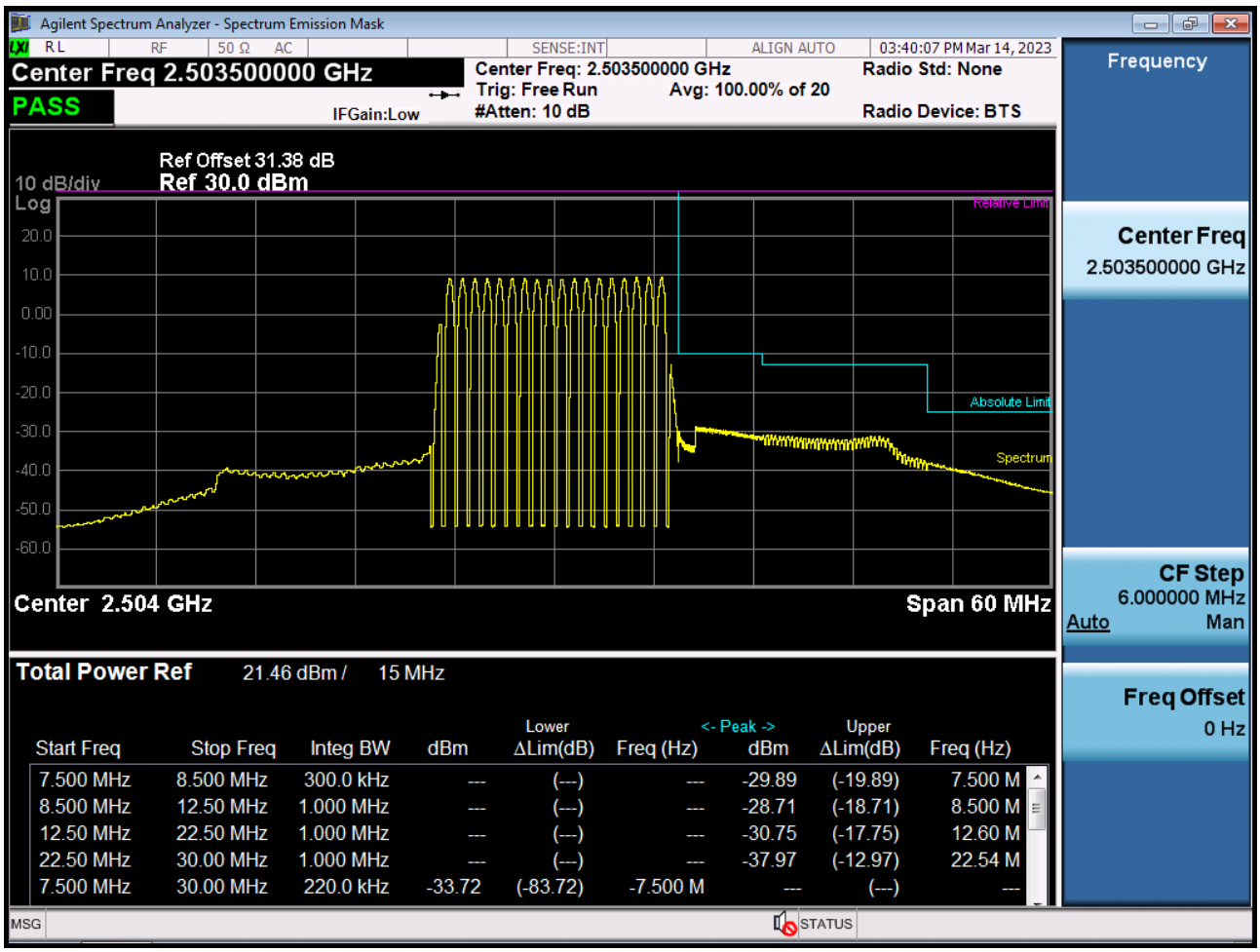
Low Channel Edge Plot (15 MHz Ch.39725 QPSK RB 1, Offset 0)-2



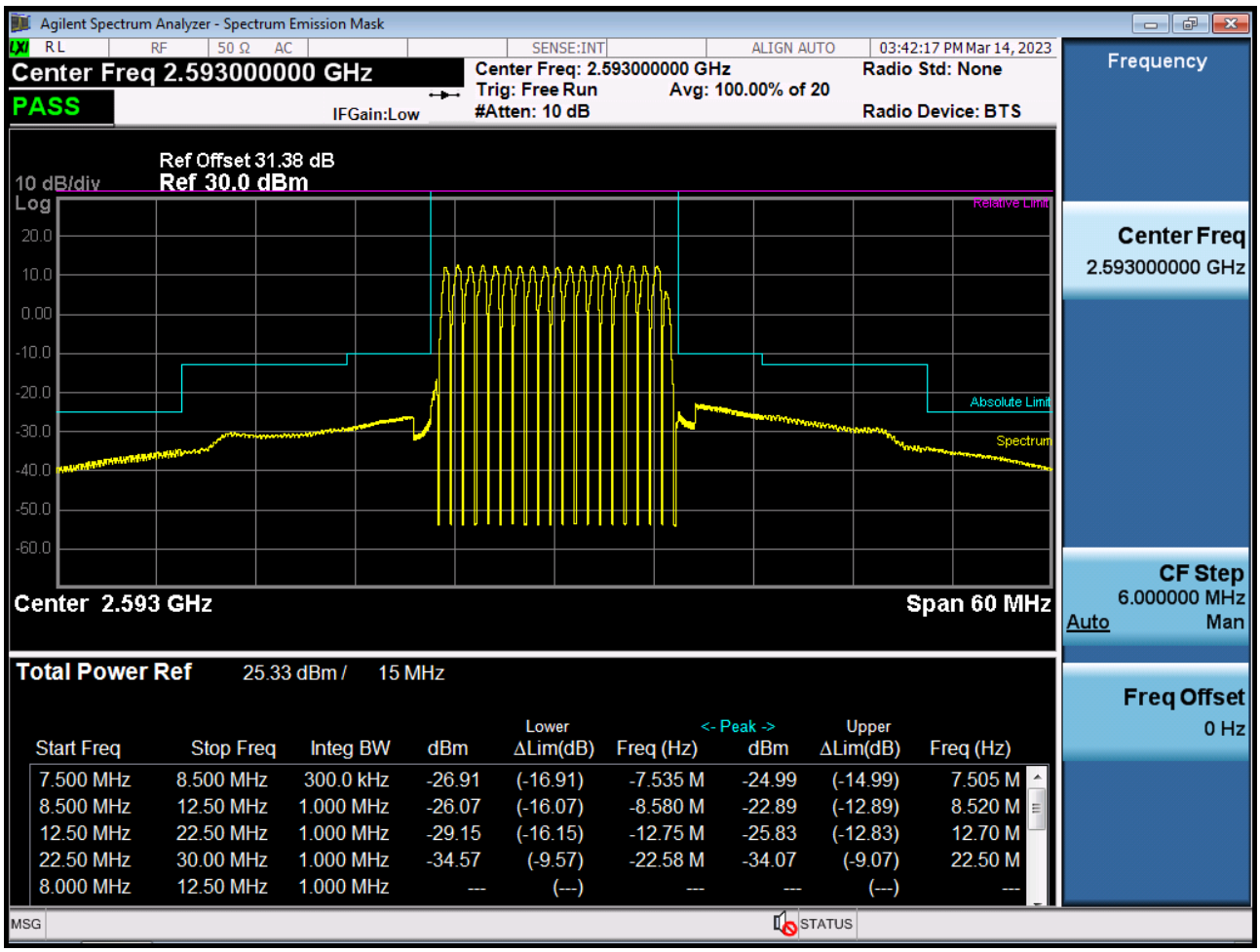
Low Channel Edge Plot (15 MHz Ch.39725 QPSK_RB75_Offset 0)-1



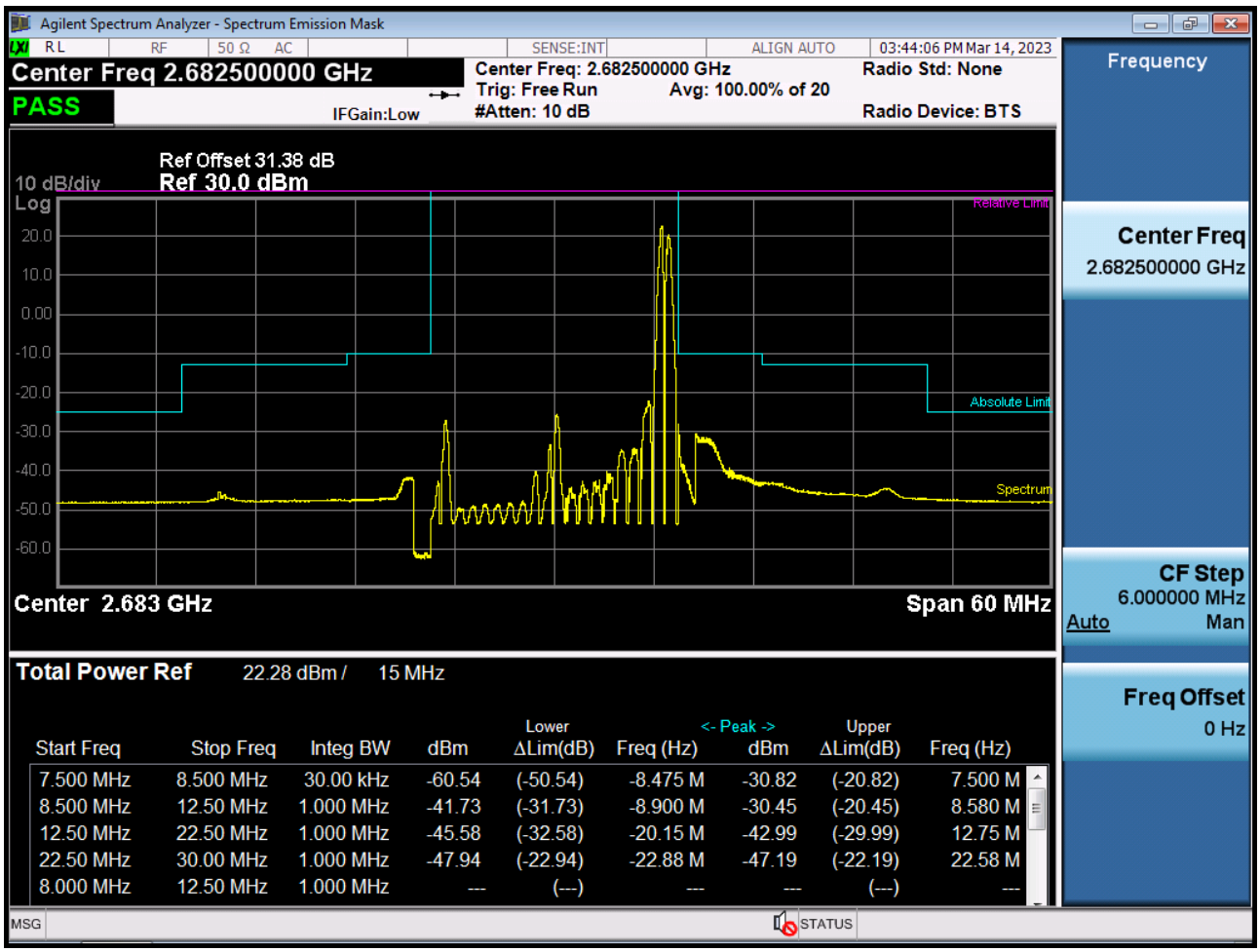
Low Channel Edge Plot (15 MHz Ch.39725 QPSK_RB75_Offset 0)-2



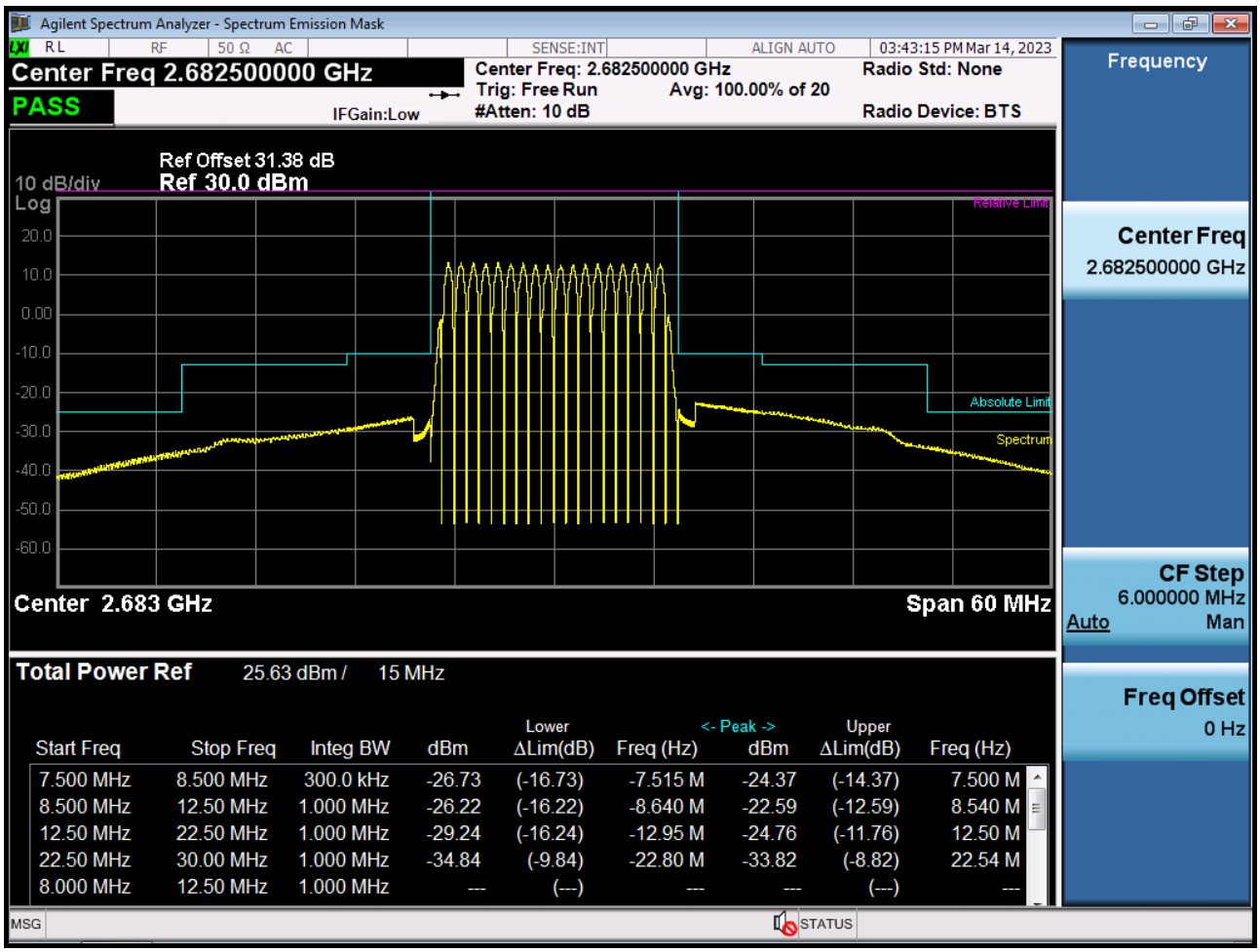
Mid Channel Edge Plot (15 MHz Ch.40620 QPSK RB 75)



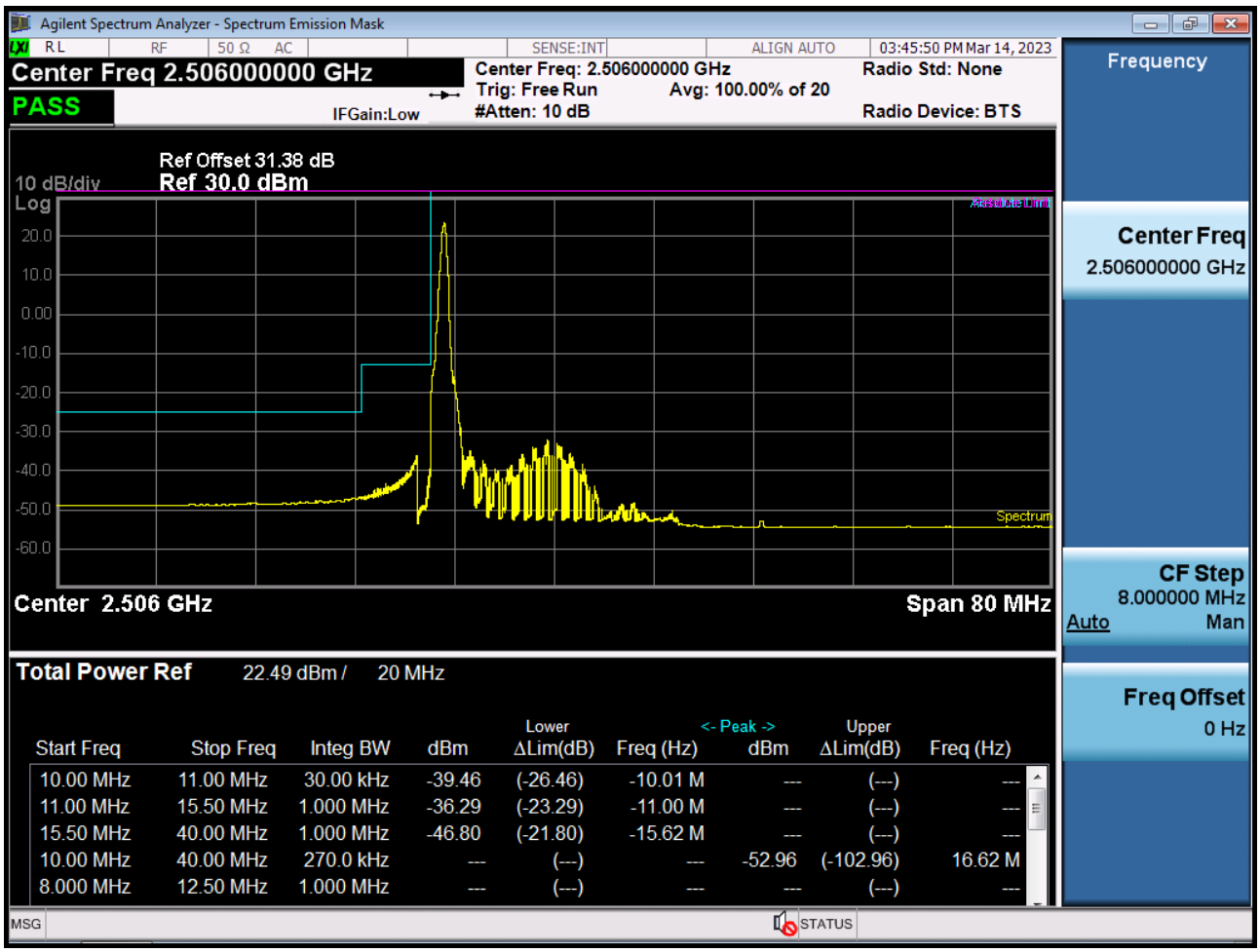
High Channel Edge Plot (15 MHz Ch.41515 QPSK RB 1, Offset 74)



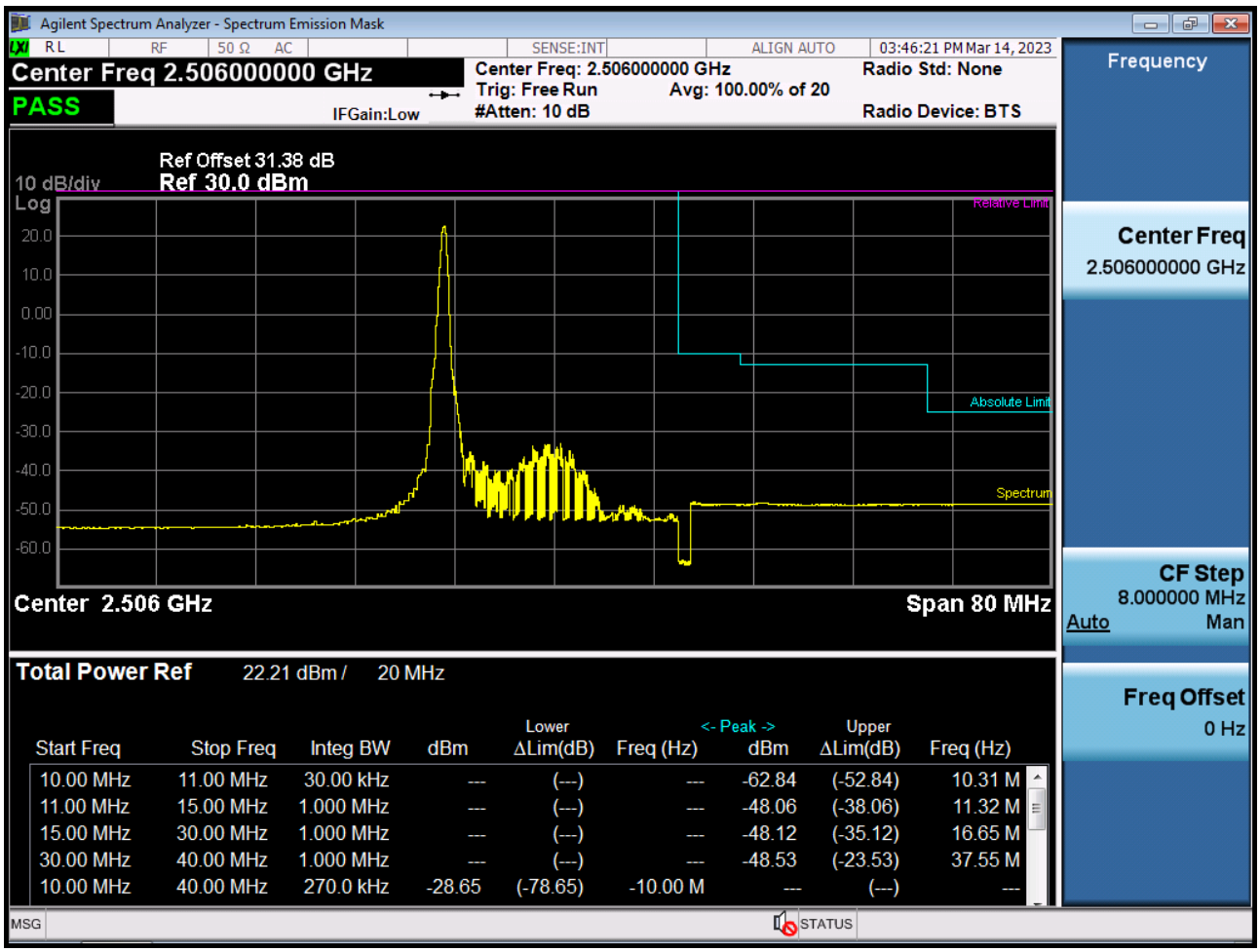
High Channel Edge Plot (15 MHz Ch.41515 QPSK_RB75_Offset 0)



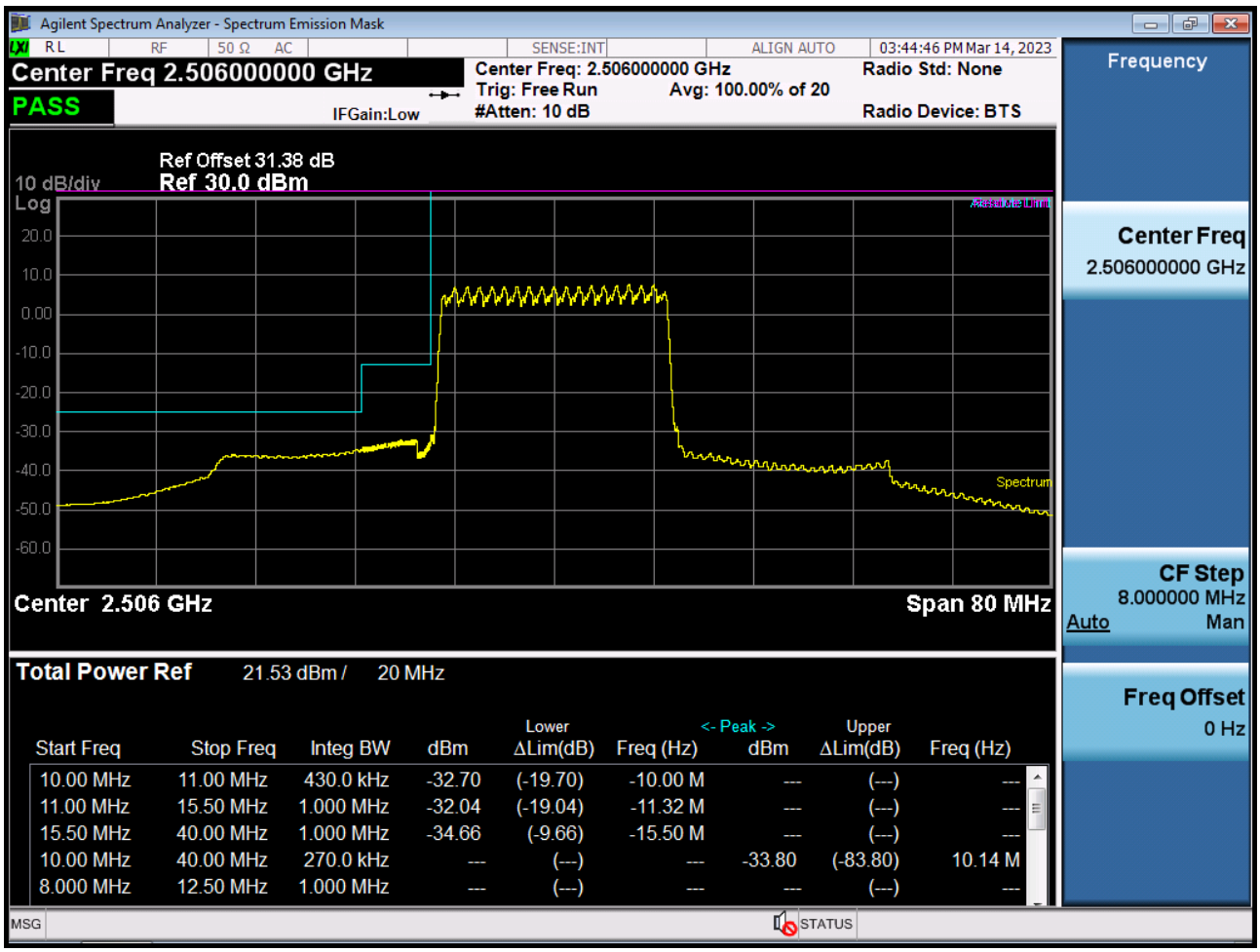
Low Channel Edge Plot (20 MHz Ch.39750 QPSK RB 1, Offset 0)-1



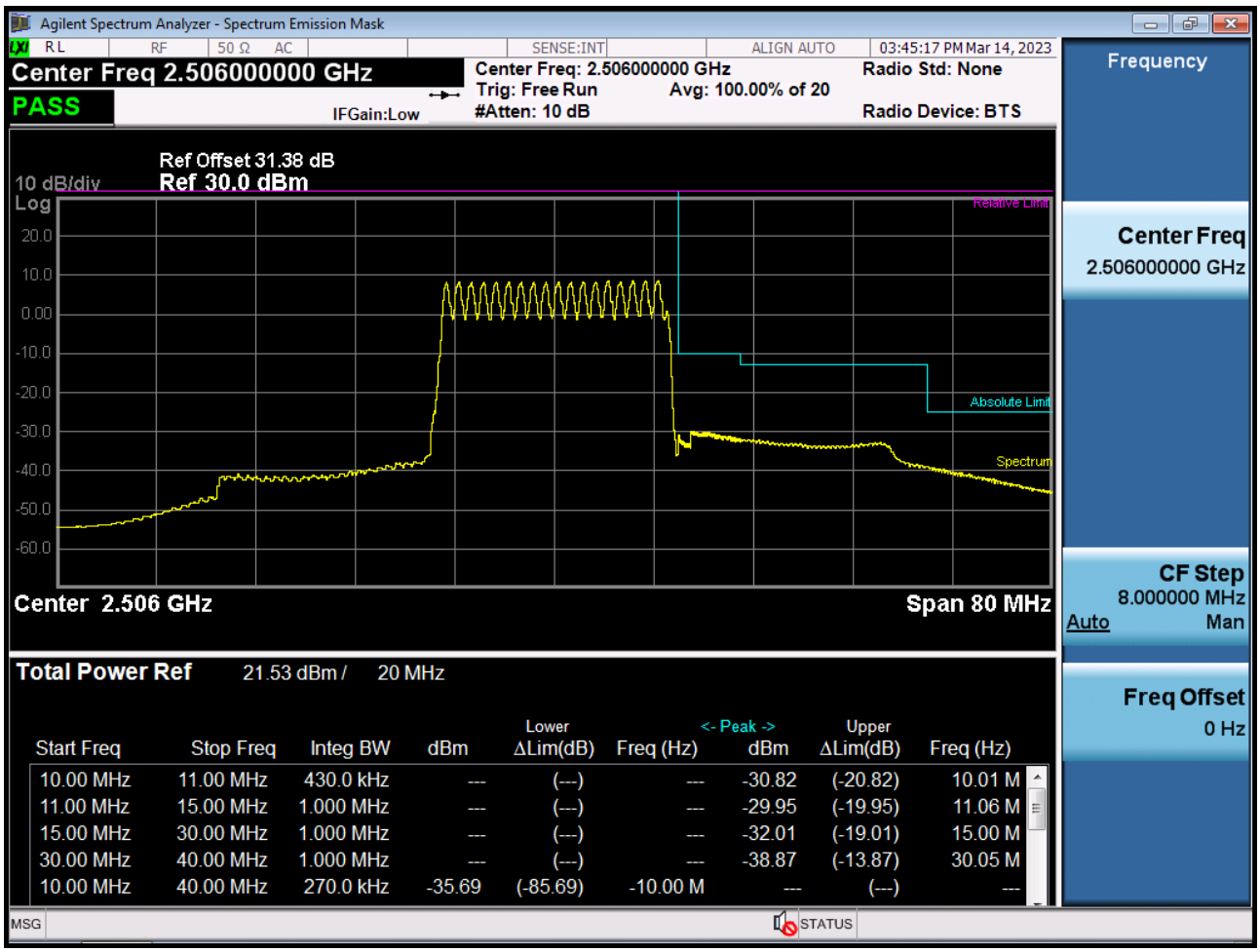
Low Channel Edge Plot (20 MHz Ch.39750 QPSK RB 1, Offset 0)-2



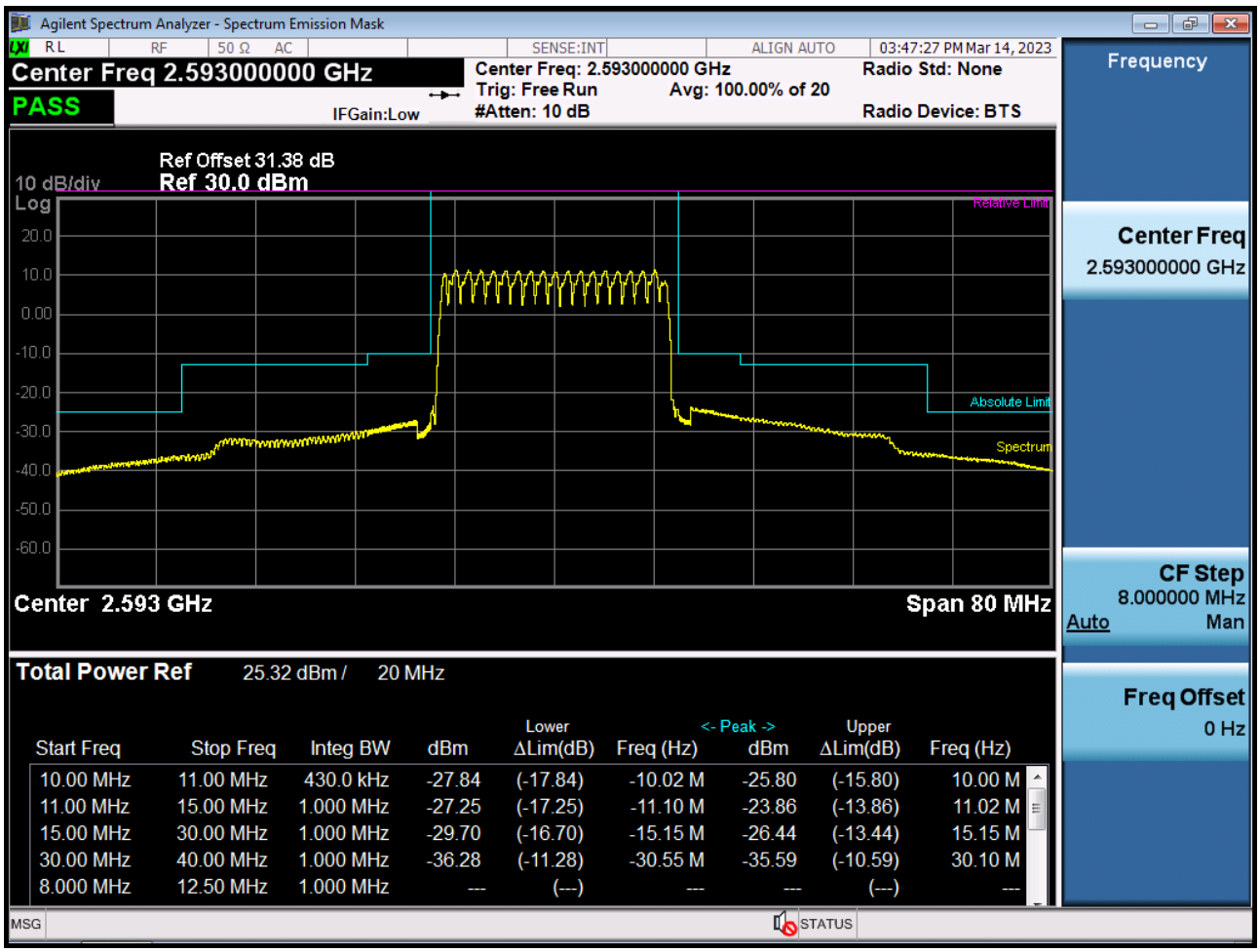
Low Channel Edge Plot (20 MHz Ch.39750 QPSK_RB100_Offset 0)-1



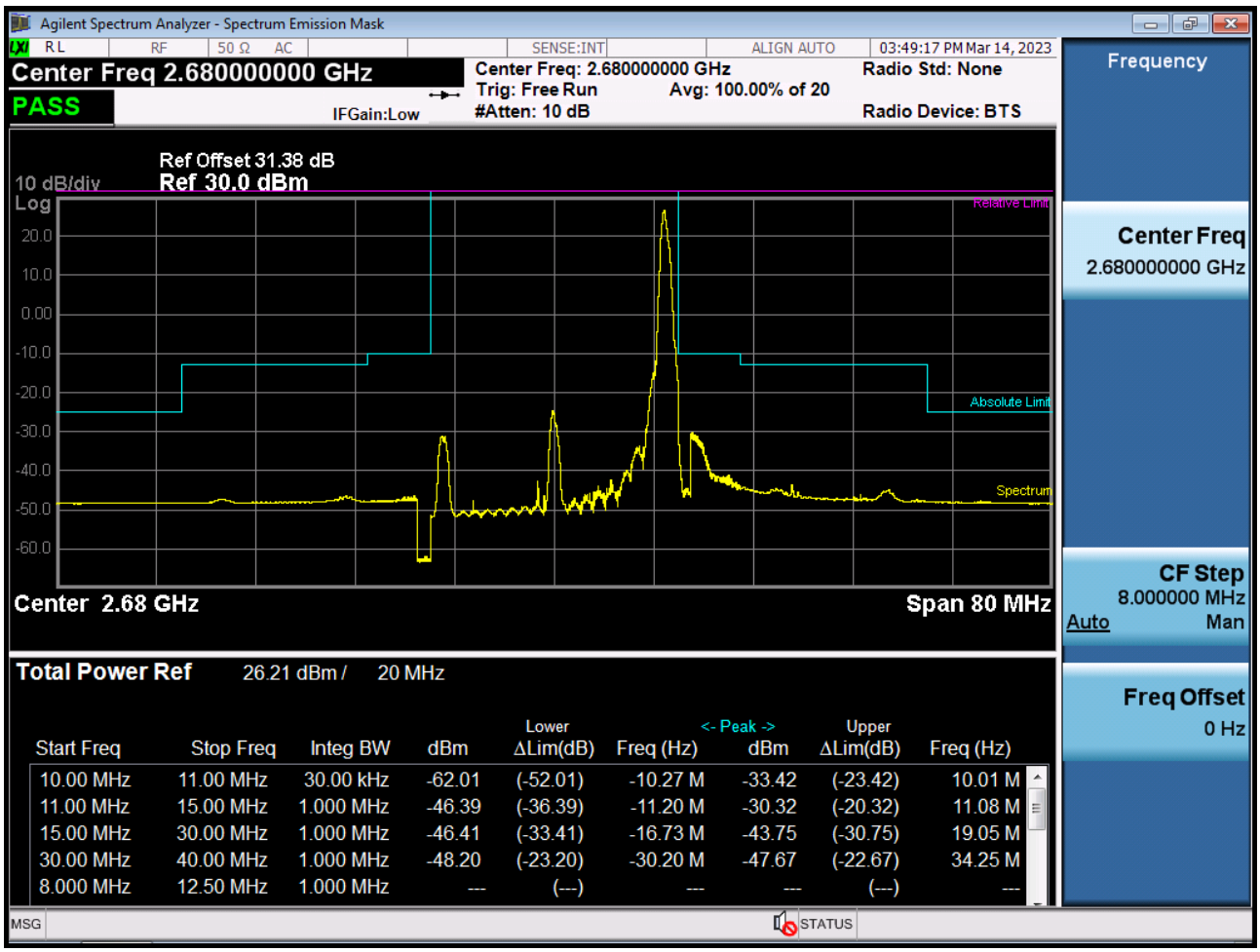
Low Channel Edge Plot (20 MHz Ch.39750 QPSK_RB100_Offset 0)-2



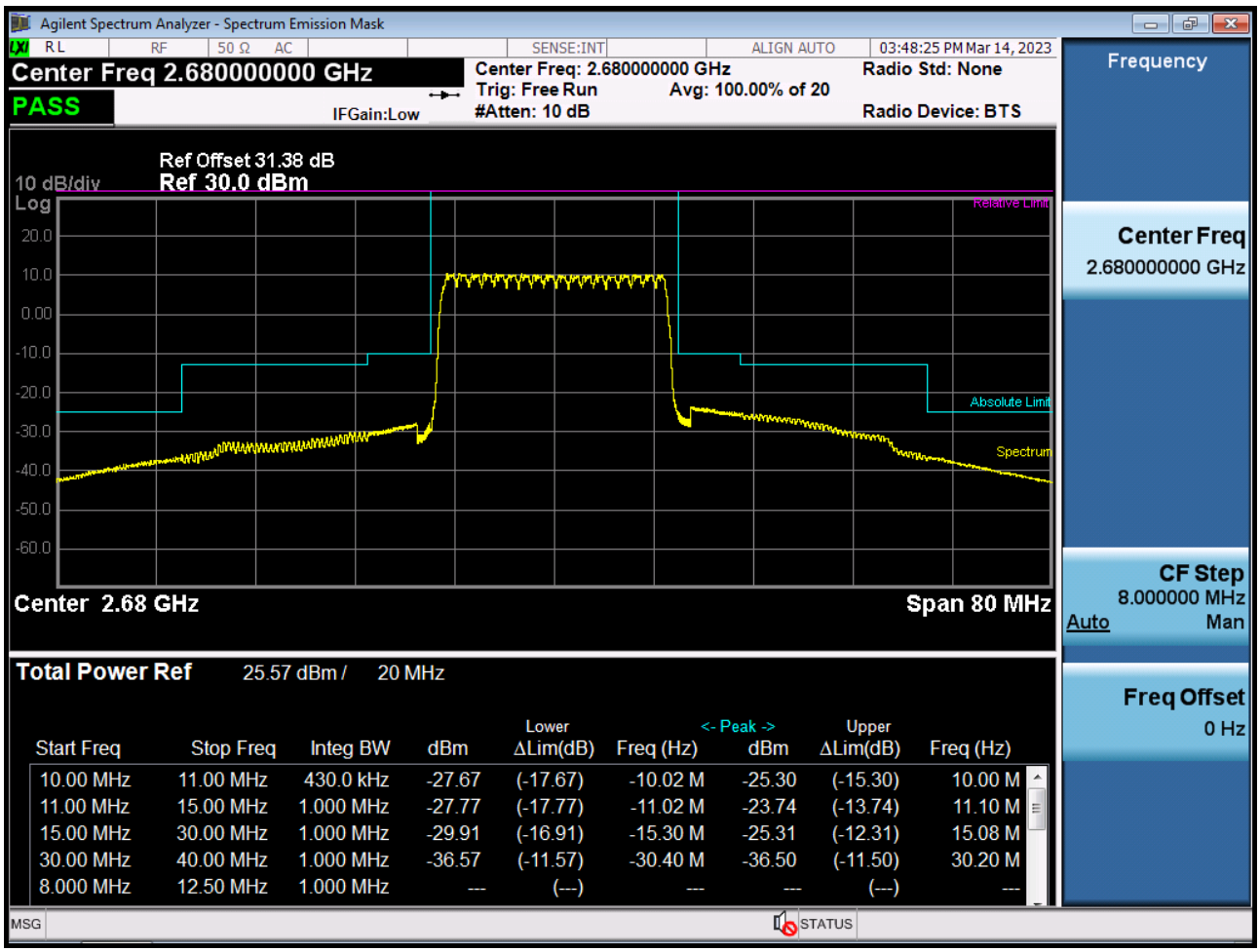
Mid Channel Edge Plot (20 MHz Ch.40620 QPSK RB 100)



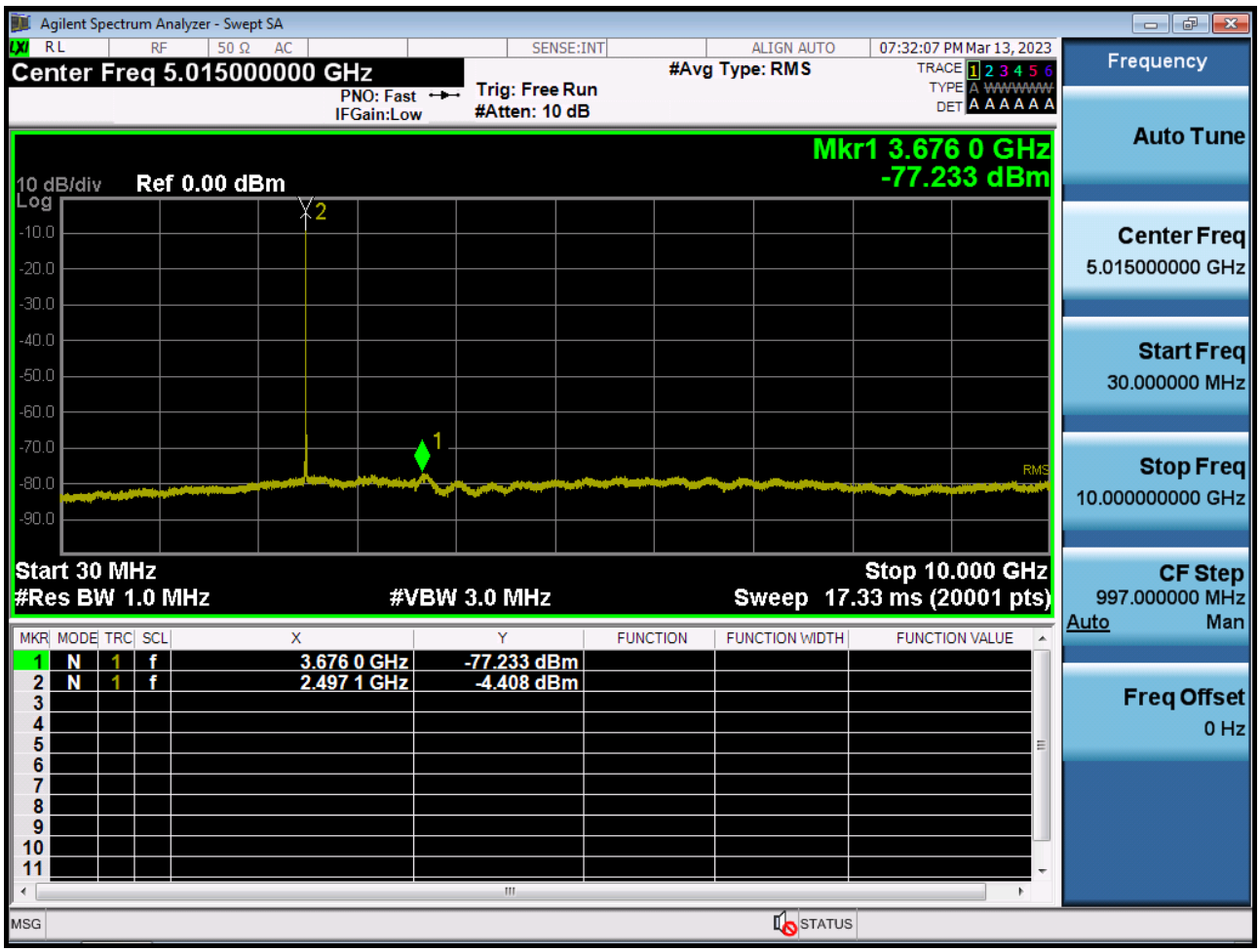
High Channel Edge Plot (20 MHz Ch.41490 QPSK RB 1, Offset 99)



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

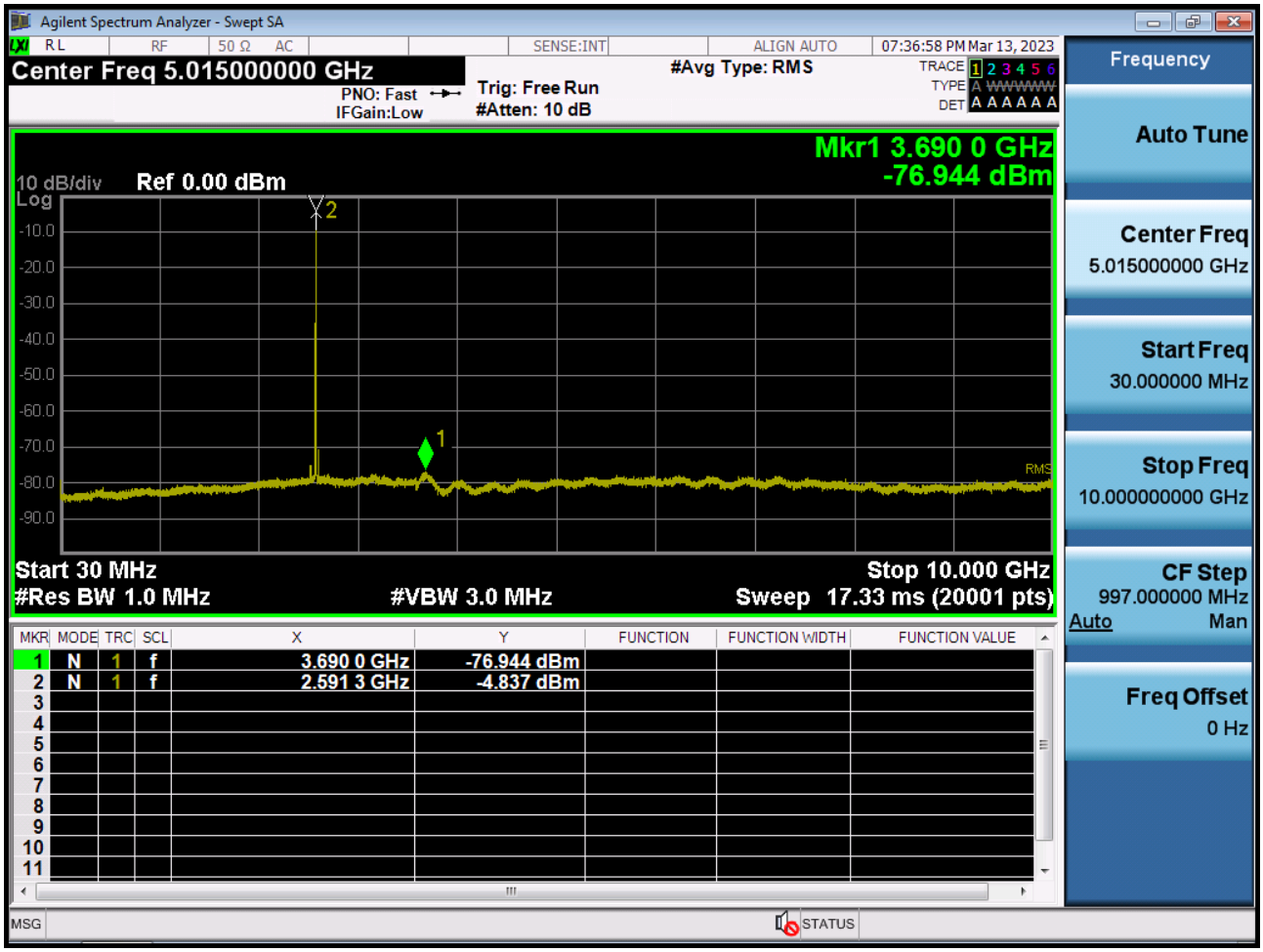


Conducted Spurious Plot 1 (5 MHz Ch.39675 QPSK RB 1, Offset 0)



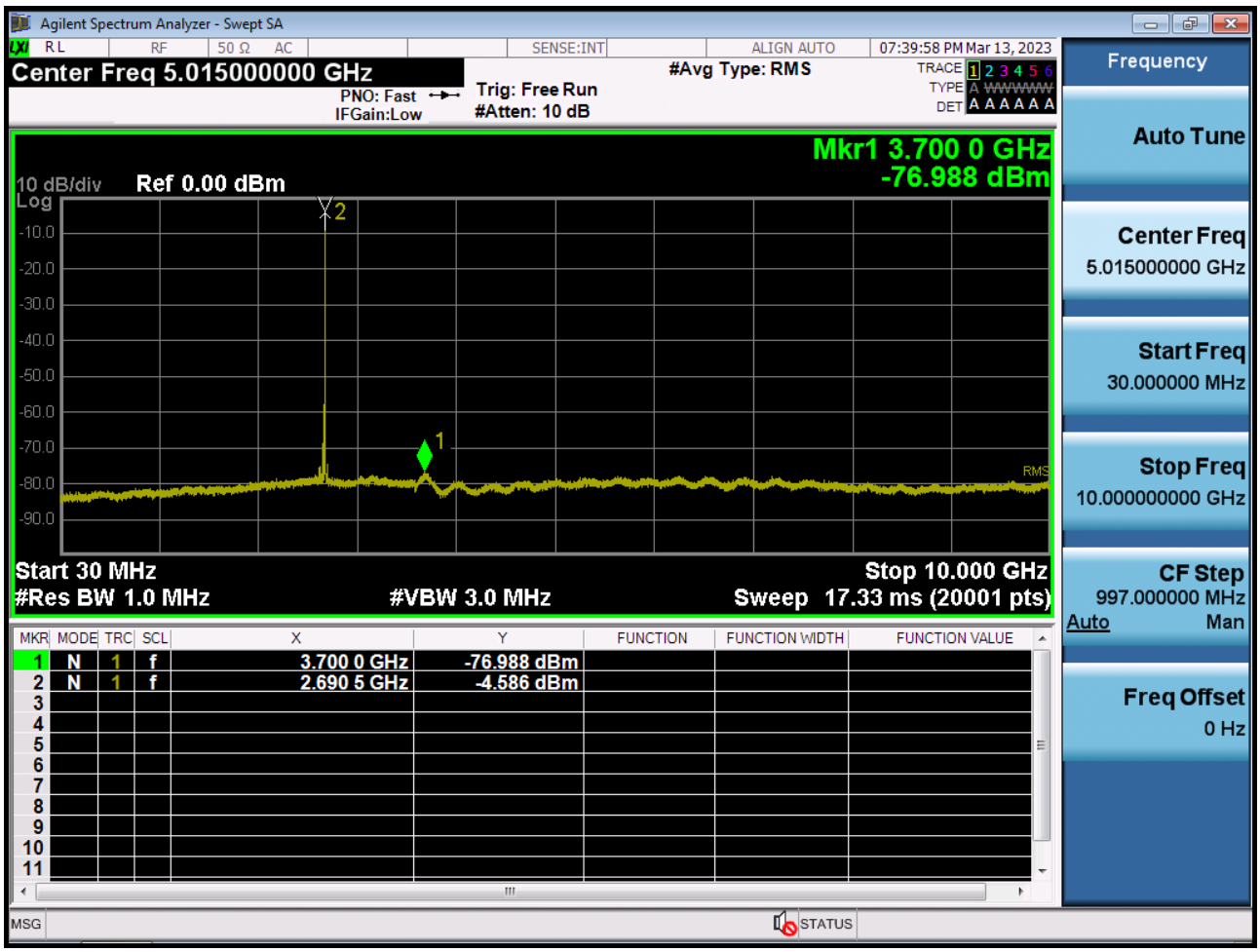
Conducted Spurious Plot 2 (5 MHz Ch. 39675 QPSK RB 1, Offset 0)

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



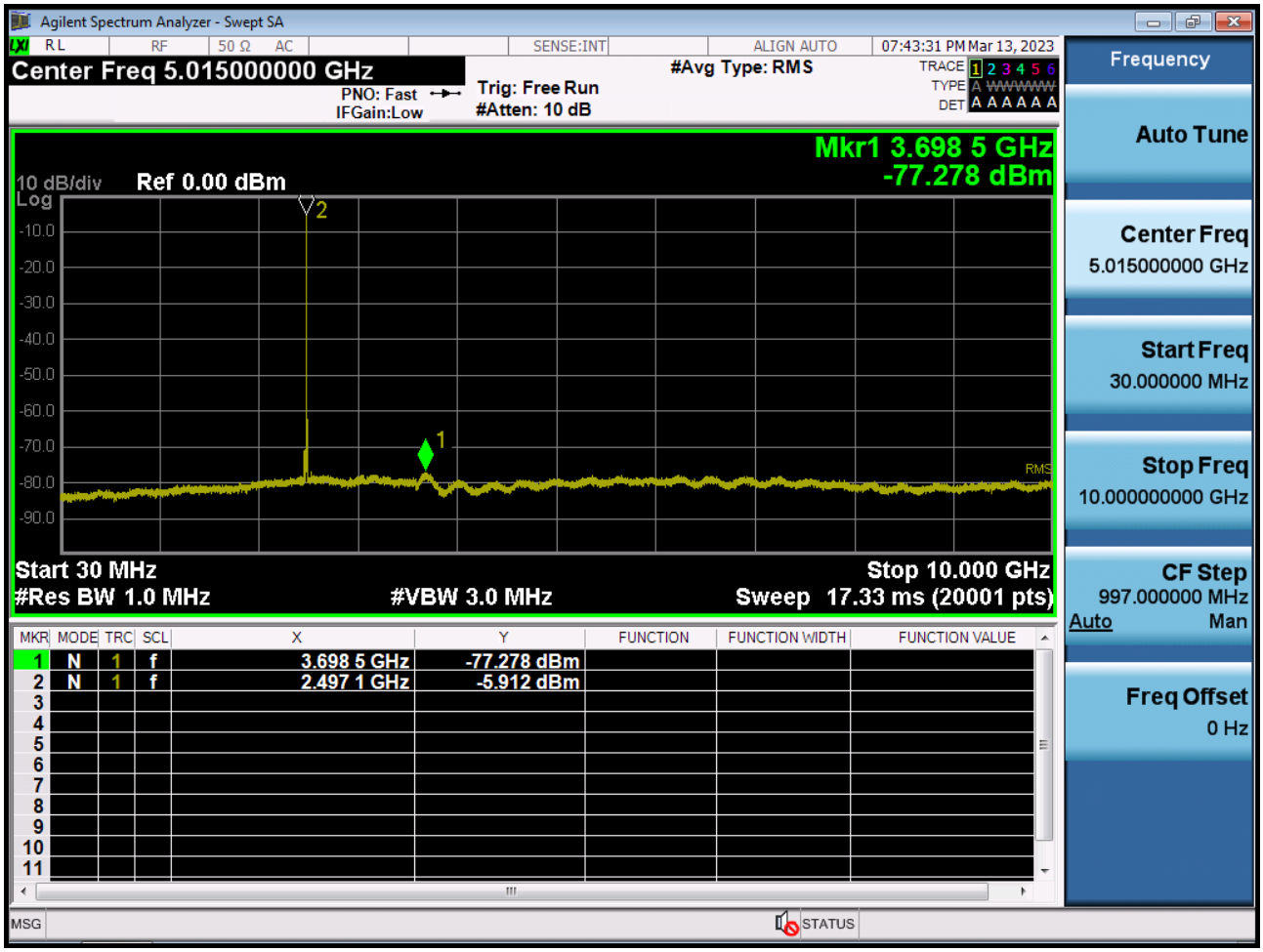
Conducted Spurious Plot 2 (5 MHz Ch. 40620 QPSK RB 1, Offset 0)

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



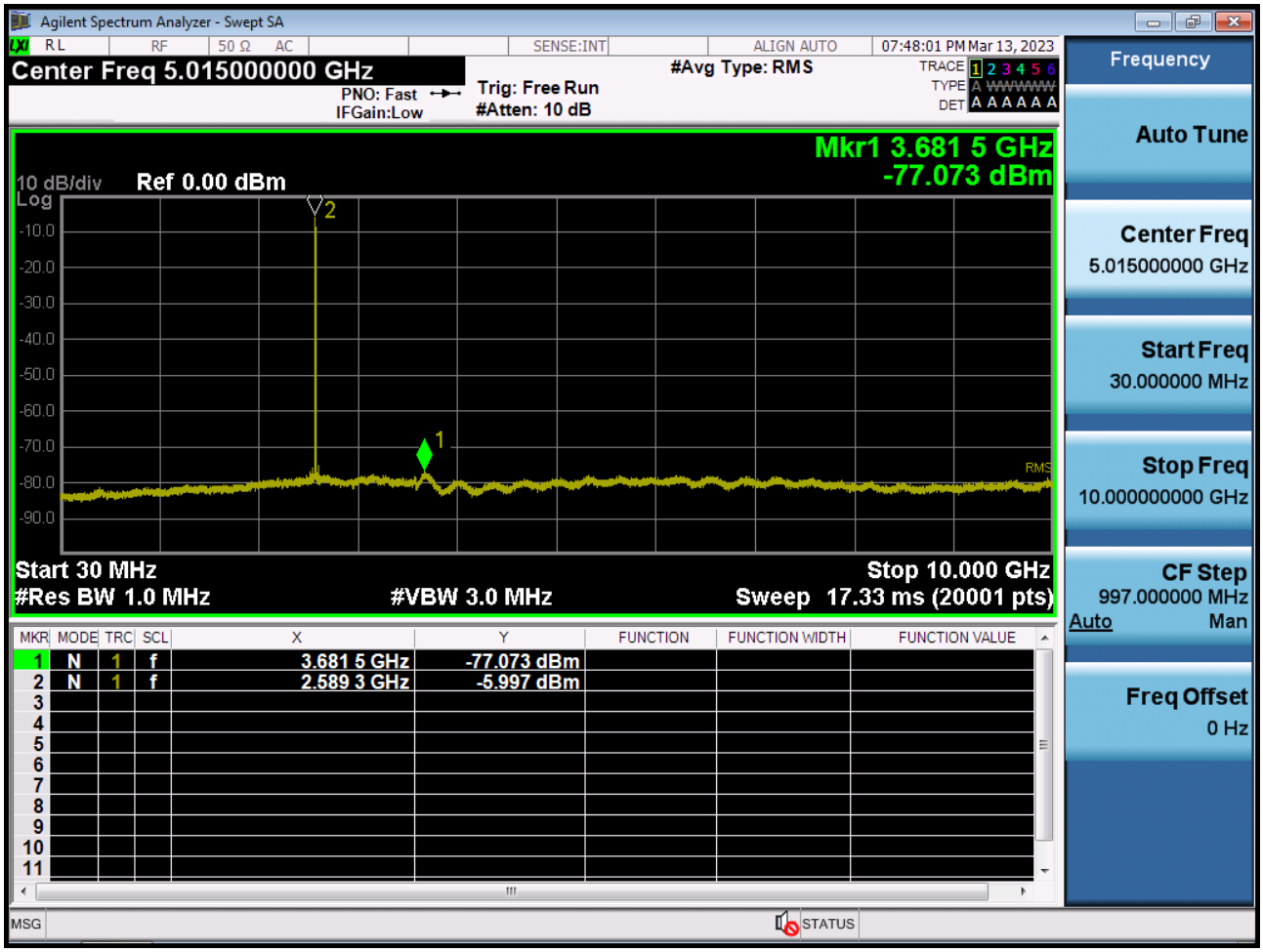
Conducted Spurious Plot 2 (5 MHz Ch. 41565 QPSK RB 1, Offset 0)

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



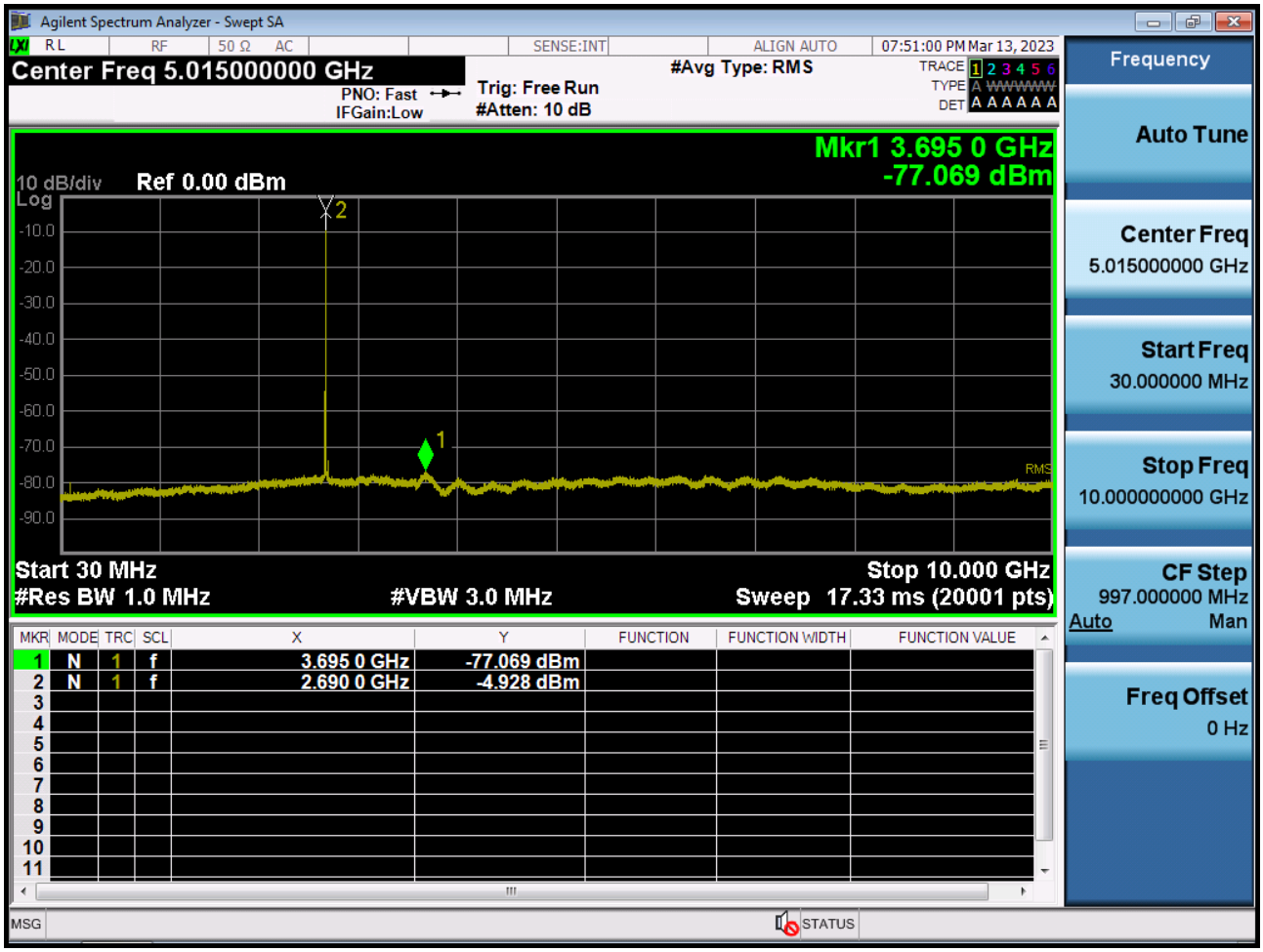
Conducted Spurious Plot 2 (10 MHz Ch. 39700 QPSK RB 1, Offset 0)

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



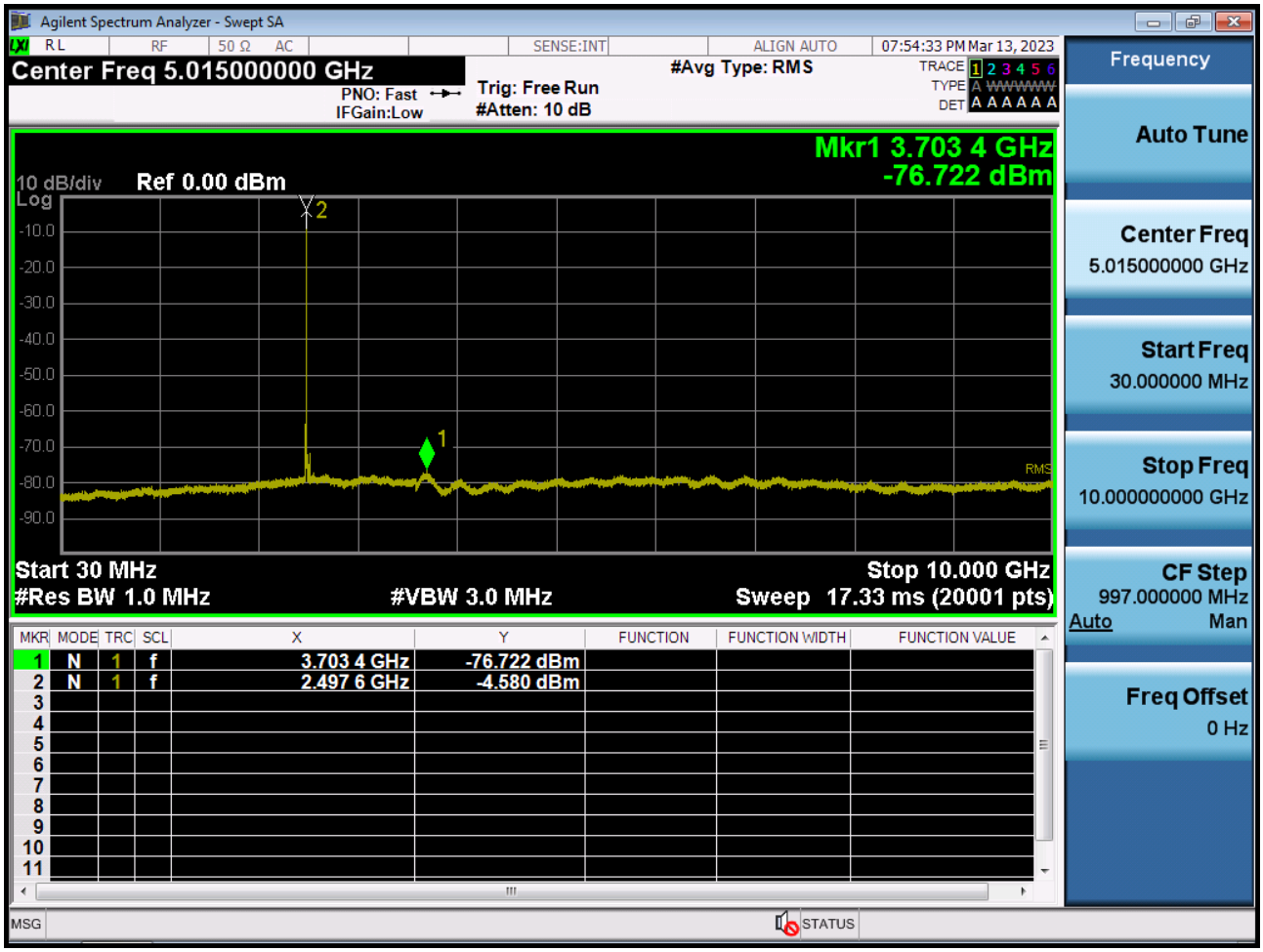
Conducted Spurious Plot 2 (10 MHz Ch. 40620 QPSK RB 1, Offset 0)

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



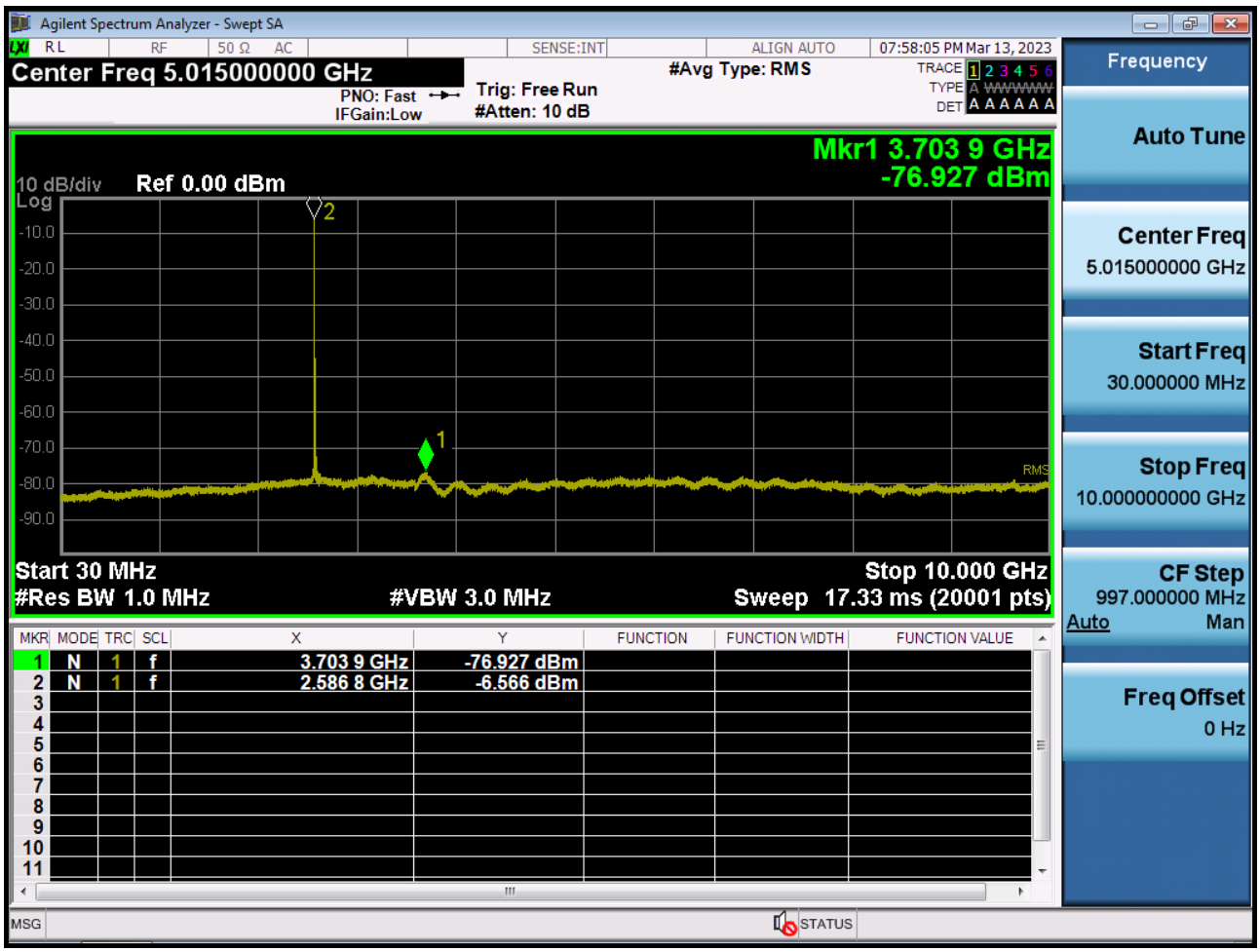
Conducted Spurious Plot 2 (10 MHz Ch. 41540 QPSK RB 1, Offset 0)

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



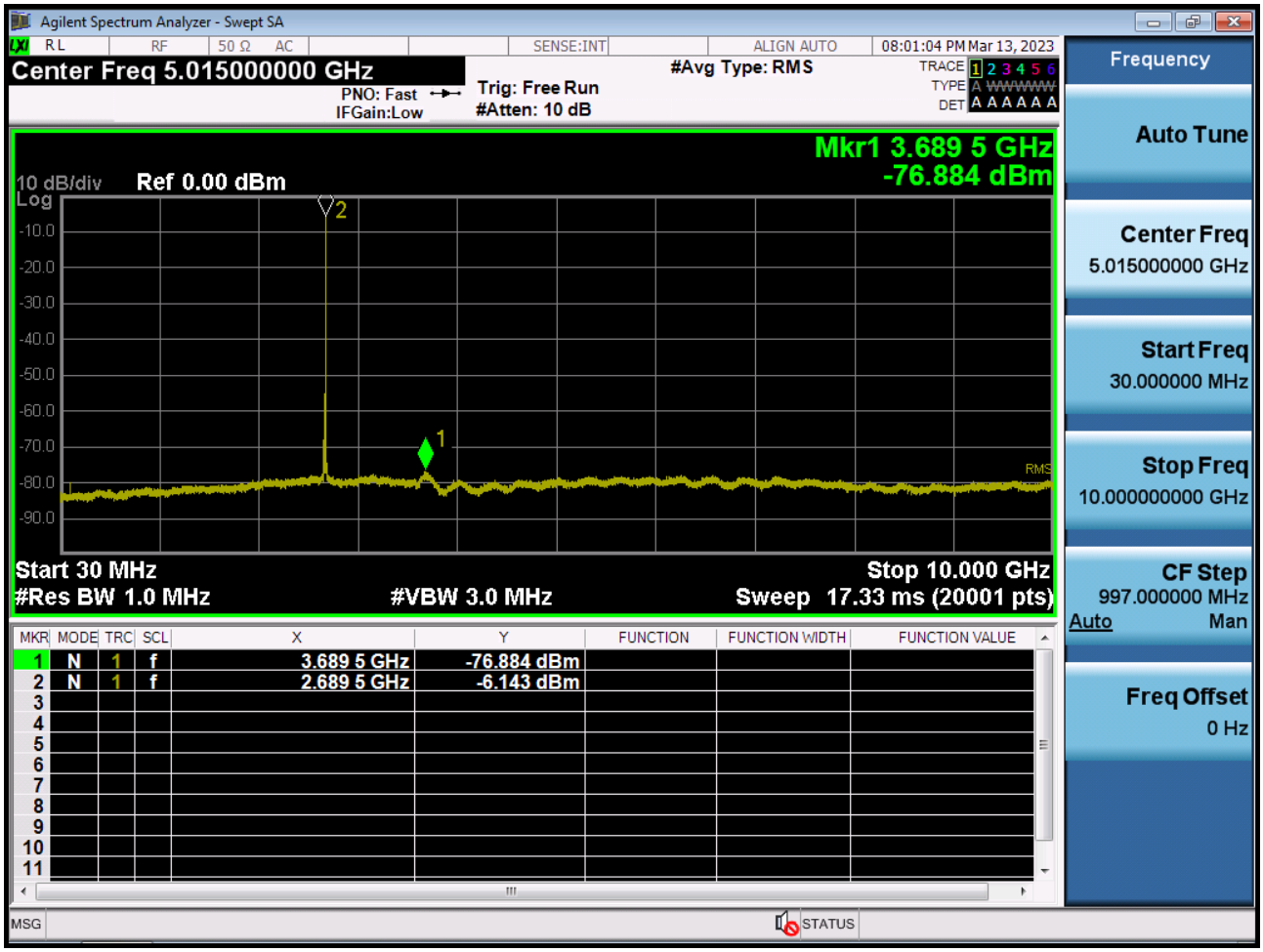
Conducted Spurious Plot 2 (15 MHz Ch. 39725 QPSK RB 1, Offset 0)

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



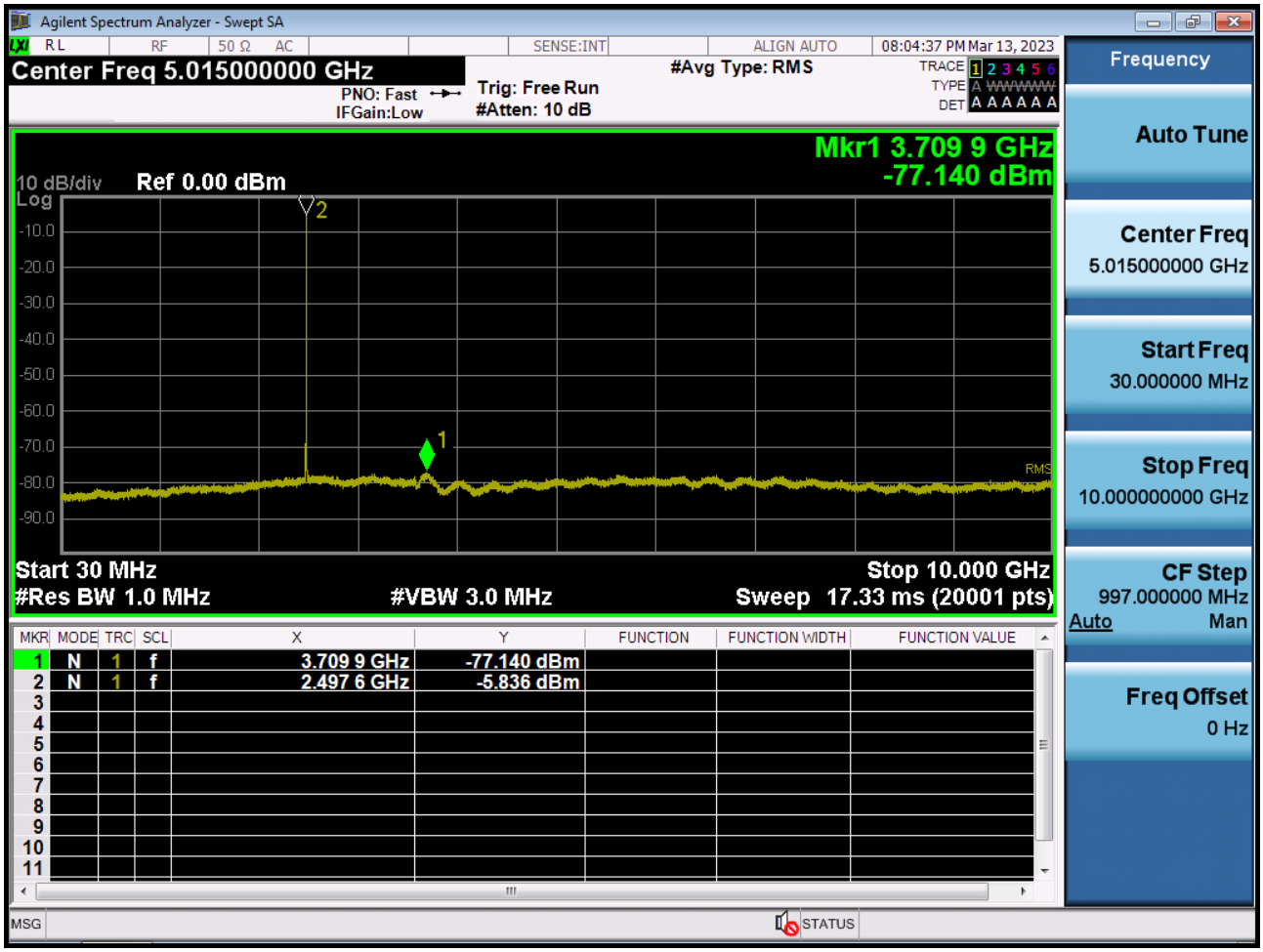
Conducted Spurious Plot 2 (15 MHz Ch. 40620 QPSK RB 1, Offset 0)

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



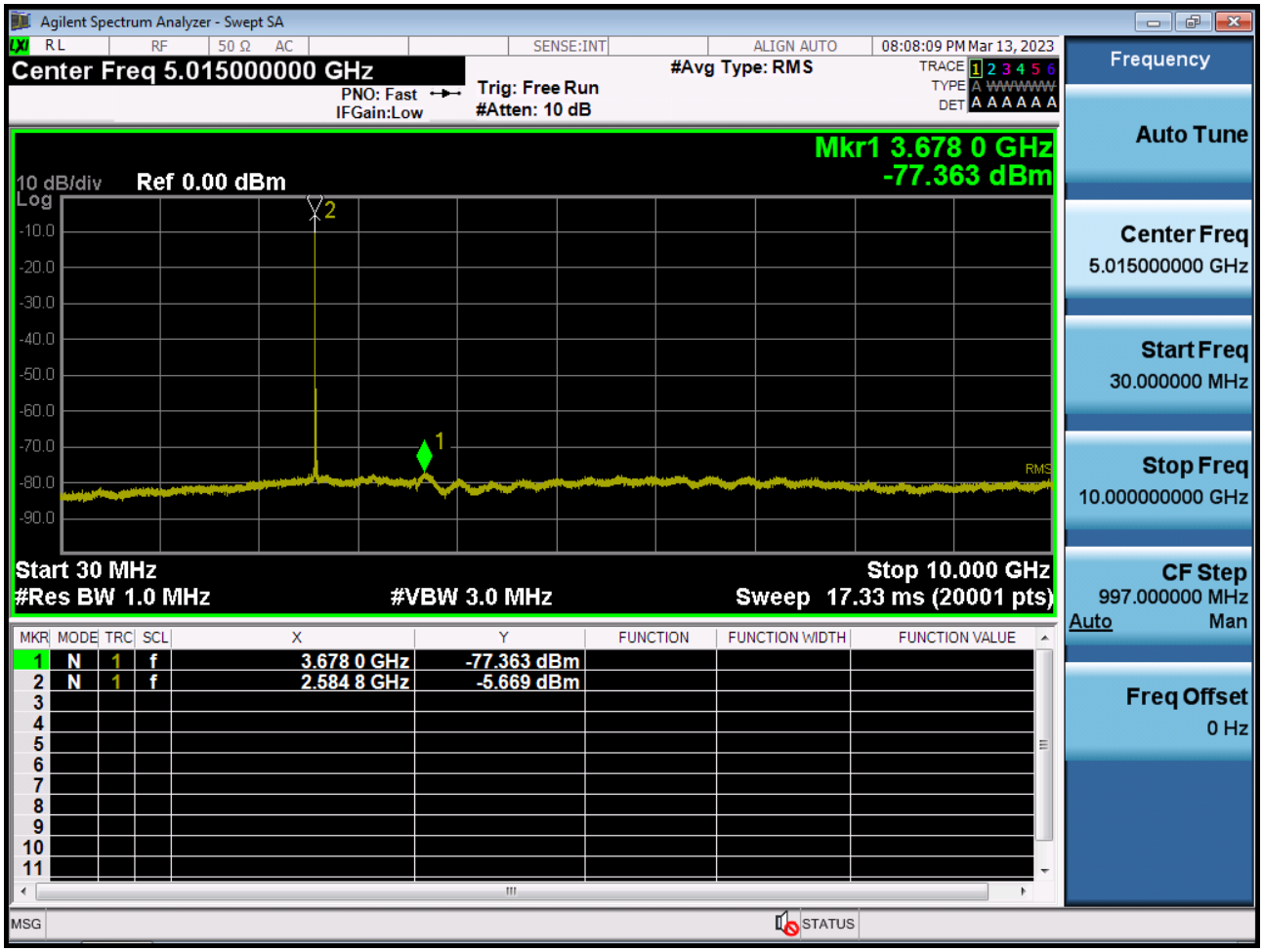
Conducted Spurious Plot 2 (15 MHz Ch. 41515 QPSK RB 1, Offset 0)

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



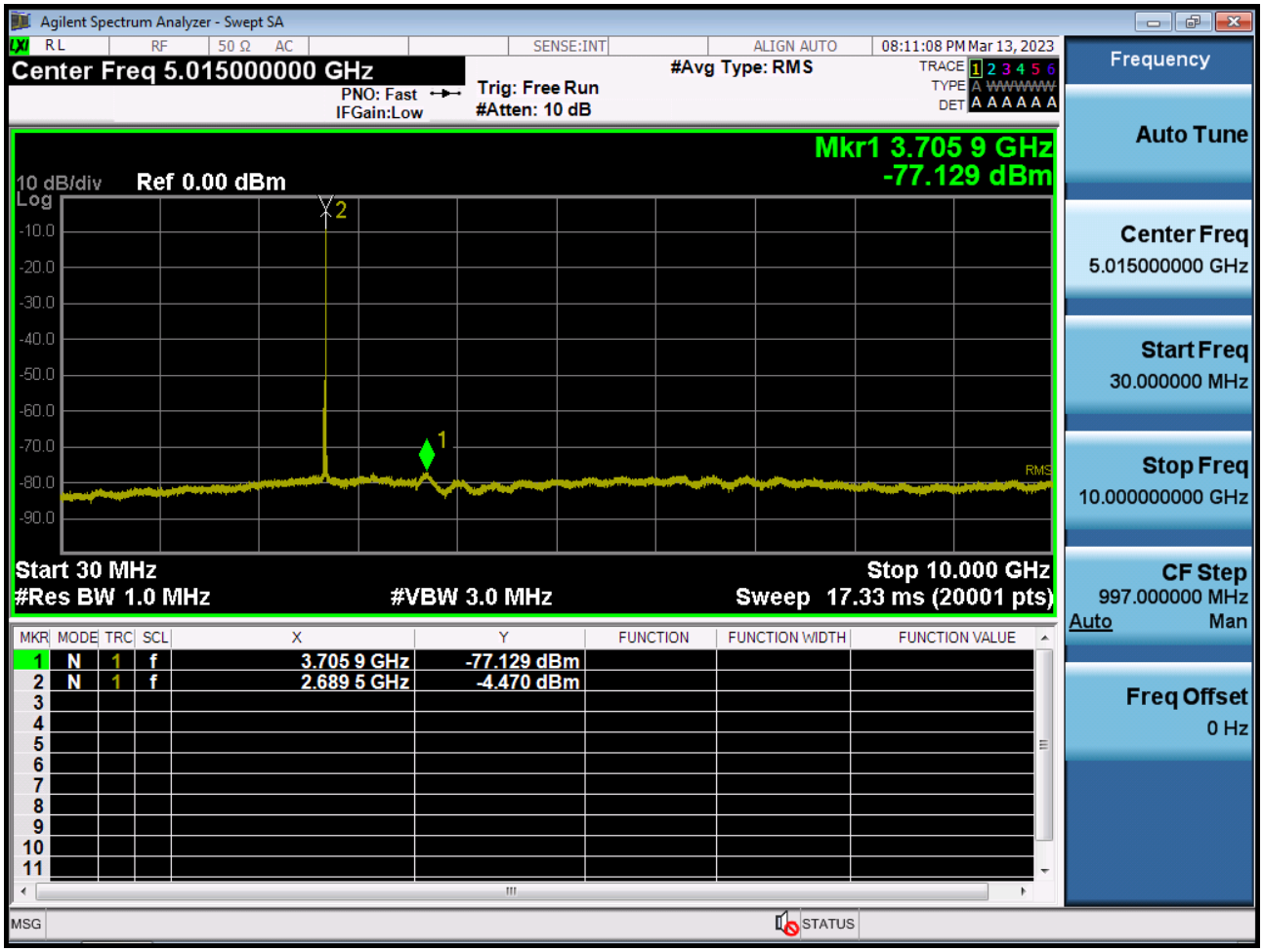
Conducted Spurious Plot 2 (20 MHz Ch. 39750 QPSK RB 1, Offset 0)

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-2305-FC016-P