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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:
July 14, 2021

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

Report No.: HCT-RF-2106-FC007-R1

FCC ID:	**A3LSMG990B**
APPLICANT:	**SAMSUNG Electronics Co., Ltd.**

Model(s):	SM-G990B/DS
Additional Model(s):	SM-G990B
EUT Type:	Mobile Phone
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part(s):	§90, §22, §2

Mode (MHz)	Tx Frequency (MHz)	Emission Designator	Modulation	Conducted Output Power	
				Max. Power (W)	Max. Power (dBm)
LTE – Band26 (1.4)	814.7 – 823.3	1M09G7D	QPSK	0.236	23.72
		1M09W7D	16QAM	0.206	23.13
		1M09W7D	64QAM	0.158	21.98
		1M08W7D	256QAM	0.079	18.97
LTE – Band26 (3)	815.5 – 822.5	2M71G7D	QPSK	0.236	23.73
		2M70W7D	16QAM	0.210	23.23
		2M71W7D	64QAM	0.163	22.13
		2M70W7D	256QAM	0.080	19.01
LTE – Band26 (5)	816.5 – 821.5	4M50G7D	QPSK	0.241	23.82
		4M50W7D	16QAM	0.209	23.21
		4M49W7D	64QAM	0.162	22.10
		4M49W7D	256QAM	0.098	19.90
LTE – Band26 (10)	819.0	8M96G7D	QPSK	0.237	23.74
		8M97W7D	16QAM	0.219	23.40
		8M98W7D	64QAM	0.168	22.26
		8M97W7D	256QAM	0.081	19.11
LTE – Band26 (15)	821.5	13M5G7D	QPSK	0.239	23.78
		13M5W7D	16QAM	0.226	23.55
		13M5W7D	64QAM	0.164	22.15
		13M4W7D	256QAM	0.096	19.82

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-2106-FC007	June 30, 2021	- First Approval Report
HCT-RF-2106-FC007-R1	July 14, 2021	- Revised the Limit on page 24

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:	A3LSMG990B
Application Type:	Certification
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part(s):	§90, §22, §2
EUT Type:	Mobile Phone
Model(s):	SM-G990B/DS
Additional Model(s):	SM-G990B
Tx Frequency:	814.7 MHz – 823.3 MHz (LTE – Band 26 (1.4 MHz)) 815.5 MHz – 822.5 MHz (LTE – Band 26 (3 MHz)) 816.5 MHz – 821.5 MHz (LTE – Band 26 (5 MHz)) 819.0 MHz (LTE – Band 26 (10 MHz)) 821.5 MHz (LTE – Band 26 (15 MHz))
Date(s) of Tests:	May 03, 2021 ~ June 07, 2021
Serial number:	Radiated: 543da2b1d81f7ece Conducted: 524d0f0dc71e7ece

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 (HT20/40/80), Bluetooth, BT LE, NFC, WPT.

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	- KDB 971168 D01 v03r01 - Section 5.2.4 - ANSI C63.26-2015 - Section 5.2.1 & 5.2.4.2
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 CONDUCTED OUTPUT POWER

Test Overview

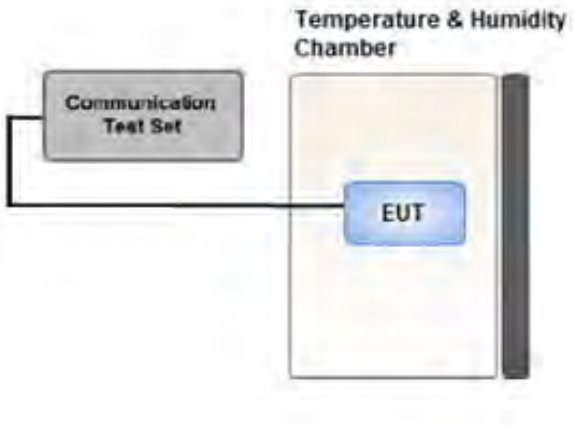
According to ANSI C63.26-2015 Section 5.2.1 when measuring the maximum RF output power from such devices, control over the EUT must be provided either through special test software (provided by manufacturer specifically for compliance testing, but not accessible by an end user) or through use of a base station emulator, communications test set, call box, or similar instrumentation that is capable of establishing a communications link with the EUT to enable control over variable parameters (e.g., output power, OBW, etc.).

In some cases, these instruments also include basic digital spectrum analyzer and/or power meter capabilities that can be utilized to measure the RF output power if the specified detectors and requirements can be realized and the measurement functions have been calibrated.

Test Procedure

1. The RF port of the EUT was connected to the Communication Tester via an RF cable.
2. Conducted average power was measured using a calibrated Radio Communication Tester.

Test setup



3.3 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 1MHz
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 1GHz, 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.

3.4 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 = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
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 1GHz, 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;

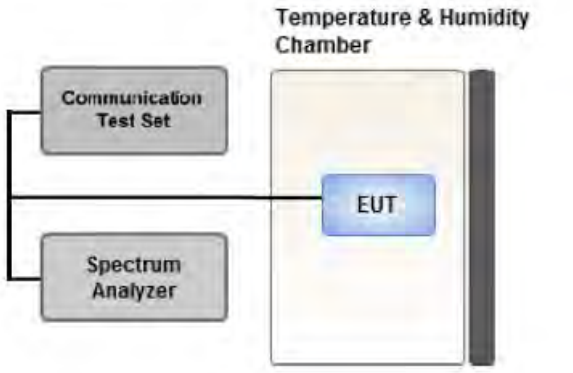
$$Result_{(dBm)} = Pg_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dBi)}$$

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

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

$$EIRP_{(dBm)} = ERP_{(dBm)} + 2.15$$

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.

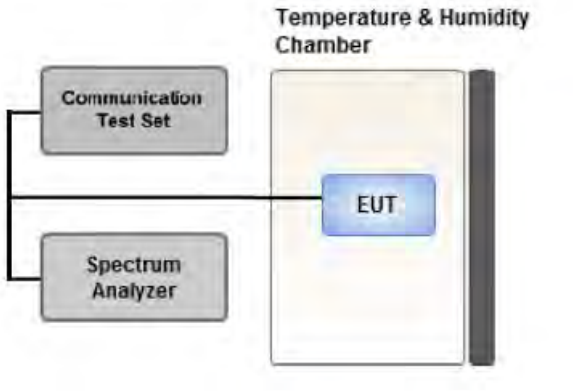
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

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 26dB 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.

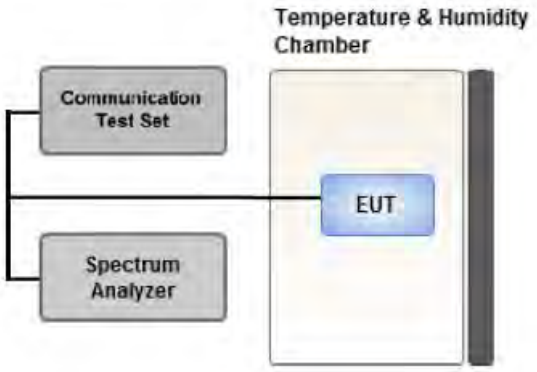
All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

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 = trace 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.

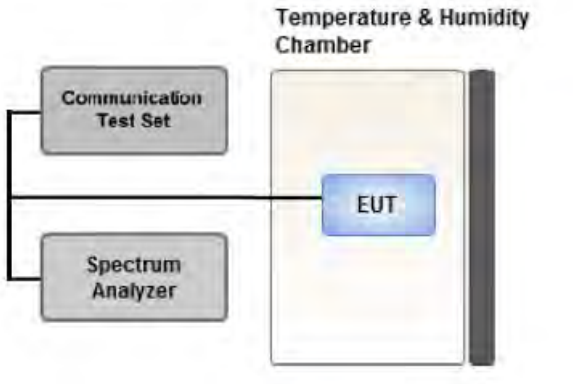
Test Settings

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. RBW :
   .- EA licensee's frequency block by up to and including 37.5 kHz : 300Hz
   .- EA licensee's frequency block greater than 37.5 kHz : 100kHz
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

For 90.691(a), RBW=300 Hz for offset less than 37.5 kHz from channel edge and RBW=100 kHz for offsets greater than 37.5 kHz is allowed.

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.

(In the case of radiated spurious emissions, only the B.W result that confirmed the maximum radiated power was reported.)

- The worst case is reported with the EUT positioning, modulations, and paging service configurations shown in the test data.
- All modes of operation were tested and the worst case results are reported.
- Please refer to the table below.
- SM-G990B/DS & additional models were tested and the worst case results are reported.

(Worst case : SM-G990B/DS)

[Worst case]

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

3.10 WORST CASE(CONDUCTED TEST)

- All modes of operation were investigated and the worst case configuration results are reported.
- SM-G990B/DS & additional models were tested and the worst case results are reported.

(Worst case : SM-G990B/DS)

[Worst case]

Test Description	Modulation	Bandwidth (MHz)	Frequency	RB size	RB offset
Occupied Bandwidth	QPSK, 16QAM, 64QAM, 256QAM	1.4, 3, 5	High	Full RB	0
	QPSK, 16QAM, 64QAM, 256QAM	10, 15	Mid	Full RB	0
Channel Edge	QPSK	1.4	Low	1	0
			High	1	5
		3	Low	1	0
			High	1	14
		5	Low	1	0
			High	1	24
		10	Mid	1	0
				1	49
		15	Mid	1	0
				1	74
		1.4, 3, 5	Low, High	Full RB	0
		10, 15	Mid	Full RB	0
Band Edge (Staddle Channel)	QPSK	1.4	Mid	1	5
		3	Mid	1	14
		5	Mid	1	24
		10	Mid	1	49
		15	Mid	1	74
		1.4, 3, 5 10,15	Mid	Full RB	0
Spurious and Harmonic Emissions at Antenna Terminal	QPSK	1.4, 3, 5	Low, High	1	0
		10, 15	Mid	1	0

4. LIST OF TEST EQUIPMENT

Manufacture	Model/ Equipment	Serial Number	Calibration Date	Calibration Interval	Calibration Due
T&M SYSTEM	FBSR-02B(WHK1.2/15G-10EF)/H.P.F	-	03/02/2021	Annual	03/02/2022
T&M SYSTEM	FBSR-02B(WHK3.3/18G-10EF)/H.P.F	-	03/02/2021	Annual	03/02/2022
Hewlett Packard	11667B / Power Splitter(DC~26.5 GHz)	11275	04/07/2021	Annual	04/07/2022
Hewlett Packard	E3632A/DC Power Supply	MY40004427	09/16/2020	Annual	09/16/2021
Schwarzbeck	UHAP/ Dipole Antenna	557	04/05/2021	Biennial	04/05/2023
Schwarzbeck	UHAP/ Dipole Antenna	558	04/05/2021	Biennial	04/05/2023
ESPEC	SU-642 / Chamber	93008124	03/15/2021	Annual	03/15/2022
Schwarzbeck	BBHA 9120D/ Horn Antenna(1~18GHz)	147	08/29/2019	Biennial	08/29/2021
Schwarzbeck	BBHA 9120D/ Horn Antenna(1~18GHz)	9120D-1298	09/25/2019	Biennial	09/25/2021
Schwarzbeck	BBHA 9170/ Horn Antenna(15~40GHz)	BBHA9170342	10/13/2020	Biennial	10/13/2022
Schwarzbeck	BBHA 9170/ Horn Antenna(15~40GHz)	BBHA9170124	02/11/2020	Biennial	02/11/2022
Agilent	N9020A/Signal Analyzer(10Hz~26.5GHz)	MY50200093	11/17/2020	Annual	11/17/2021
Hewlett Packard	8493C/ATTENUATOR(20dB)	17280	06/01/2021	Annual	06/01/2022
REOHDE & SCHWARZ	FSV40/Spectrum Analyzer(10Hz~40GHz)	100931	10/14/2020	Annual	10/14/2021
Agilent	8960 (E5515C)/ Base Station	MY48360800	08/26/2020	Annual	08/26/2021
Schwarzbeck	FMZB1513/ Loop Antenna(9kHz~30MHz)	1513-333	03/19/2020	Biennial	03/19/2022
Schwarzbeck	VULB9160/ Bilog Antenna	3150	03/03/2021	Biennial	03/03/2023
Schwarzbeck	VULB9168/ Hybrid Antenna	760	02/22/2021	Biennial	02/22/2023
Anritsu Corp.	MT8821C/Wideband Radio Communication Tester	6262116770	07/22/2020	Annual	07/22/2021
Anritsu Corp.	MT8820C/Wideband Radio Communication Tester	6201026545	01/07/2021	Annual	01/07/2022
REOHDE & SCHWARZ	SMB100A/ SIGNAL GENERATOR (100kHz~40GHz)	177633	07/13/2020	Annual	07/13/2021
KEYSIGHT	N9030B / Signal Analyzer(5Hz~40.0GHz)	MY55480167	06/02/2021	Annual	06/02/2022
HCT CO., LTD.,	FCC LTE Mobile Conducted RF Automation Test Software	-	-	-	-

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
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70
Radiated Disturbance (18 GHz ~ 40 GHz)	5.05

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
Channel Edge / Spurious and Harmonic Emissions at Antenna Terminal.	§2.1051, §90.691	< 50 + 10log10 (P[Watts]) at Band Edge and for all out-of-band emissions within 37.5 kHz of Block Edge	PASS
Band Edge / Spurious and Harmonic Emissions at Antenna Terminal.	§2.1051, §22.917(a)	< 43 + 10log10 (P[Watts]) at Band Edge and for all out-of-band emissions	PASS
Conducted Output Power	§2.1046 §90.635	< 100 Watts	PASS
Frequency stability / variation of ambient temperature	§2.1055, §90.213 §22.355	< 2.5 ppm	PASS

6.2 Test Condition : Radiated Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Effective Radiated Power	§22.913(a)(5)	< 7 Watts max. ERP	PASS
Radiated Spurious and Harmonic Emissions	§2.1053, §90.691 §22.917(a)	< 43 + 10log10 (P[Watts]) for all out-of band emissions	PASS

7. SAMPLE CALCULATION

7.1 ERP Sample Calculation

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

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

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

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

3) Record the field strength meter's level.

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

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

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

7.3. Emission Designator

GSM Emission Designator

Emission Designator = 249KGXW
GSM BW = 249 kHz
G = Phase Modulation
X = Cases not otherwise covered
W = Combination (Audio/Data)

EDGE Emission Designator

Emission Designator = 249KG7W
GSM BW = 249 kHz
G = Phase Modulation
7 = Quantized/Digital Info
W = Combination (Audio/Data)

WCDMA Emission Designator

Emission Designator = 4M17F9W
WCDMA BW = 4.17 MHz
F = Frequency Modulation
9 = Composite Digital Info
W = Combination (Audio/Data)

QPSK Modulation

Emission Designator = 4M48G7D
LTE BW = 4.48 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data transmission; telemetry; telecommand

QAM Modulation

Emission Designator = 4M48W7D
LTE BW = 4.48 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data transmission; telemetry; telecommand

8. TEST DATA

8.1 CONDUCTED OUTPUT POWER

Band Width	Modulation	RB Size	RB Offset	Max. output power(dBm)				Limit (W)
				814.7MHz		823.3MHz		
				dBm	W	dBm	W	
1.4	QPSK	1	0	23.69	0.234	23.70	0.234	100
		1	3	23.62	0.230	23.64	0.231	100
		1	5	23.66	0.232	23.68	0.233	100
		3	0	23.62	0.230	23.64	0.231	100
		3	1	23.70	0.234	23.72	0.236	100
		3	3	23.65	0.232	23.67	0.233	100
		6	0	22.69	0.186	22.71	0.187	100
	16QAM	1	0	22.90	0.195	22.92	0.196	100
		1	3	23.10	0.204	23.13	0.206	100
		1	5	22.85	0.193	22.88	0.194	100
		3	0	22.97	0.198	22.99	0.199	100
		3	1	22.93	0.196	22.95	0.197	100
		3	3	22.99	0.199	23.00	0.200	100
		6	0	21.89	0.155	21.92	0.156	100
	64QAM	1	0	21.83	0.152	21.85	0.153	100
		1	3	21.94	0.156	21.96	0.157	100
		1	5	21.88	0.154	21.91	0.155	100
		3	0	21.96	0.157	21.98	0.158	100
		3	1	21.75	0.150	21.78	0.151	100
		3	3	21.66	0.147	21.68	0.147	100
		6	0	20.70	0.117	20.72	0.118	100
	256QAM	1	0	18.88	0.077	18.90	0.078	100
		1	3	18.85	0.077	18.88	0.077	100
		1	5	18.80	0.076	18.82	0.076	100
		3	0	18.79	0.076	18.80	0.076	100
		3	1	18.95	0.079	18.97	0.079	100
		3	3	18.86	0.077	18.89	0.077	100
		6	0	18.72	0.074	18.75	0.075	100

Band Width	Modulation	RB Size	RB Offset	Max. output power(dBm)				Limit (W)
				815.5MHz		822.5MHz		
				dBm	W	dBm	W	
3	QPSK	1	0	23.52	0.225	23.55	0.226	100
		1	7	23.70	0.234	23.73	0.236	100
		1	14	23.59	0.229	23.62	0.230	100
		8	0	22.80	0.191	22.82	0.191	100
		8	3	22.85	0.193	22.87	0.194	100
		8	7	22.83	0.192	22.85	0.193	100
		15	0	22.81	0.191	22.83	0.192	100
	16QAM	1	0	23.21	0.209	23.23	0.210	100
		1	7	23.05	0.202	23.07	0.203	100
		1	14	23.07	0.203	23.09	0.204	100
		8	0	21.81	0.152	21.86	0.153	100
		8	3	21.90	0.155	21.93	0.156	100
		8	7	21.85	0.153	21.88	0.154	100
		15	0	21.82	0.152	21.85	0.153	100
	64QAM	1	0	21.85	0.153	21.87	0.154	100
		1	7	22.10	0.162	22.13	0.163	100
		1	14	21.95	0.157	21.98	0.158	100
		8	0	20.79	0.120	20.82	0.121	100
		8	3	20.81	0.121	20.83	0.121	100
		8	7	20.91	0.123	20.93	0.124	100
		15	0	20.86	0.122	20.88	0.122	100
	256QAM	1	0	18.82	0.076	18.85	0.077	100
		1	7	18.79	0.076	18.82	0.076	100
		1	14	18.99	0.079	19.01	0.080	100
		8	0	18.78	0.076	18.80	0.076	100
		8	3	18.87	0.077	18.89	0.077	100
		8	7	18.78	0.076	18.81	0.076	100
		15	0	18.78	0.076	18.80	0.076	100

Band Width	Modulation	RB Size	RB Offset	Max. output power(dBm)				Limit (W)
				816.5MHz		821.5MHz		
				dBm	W	dBm	W	
5	QPSK	1	0	23.43	0.220	23.50	0.224	100
		1	12	23.76	0.238	23.78	0.239	100
		1	24	23.74	0.237	23.82	0.241	100
		12	0	22.80	0.191	22.83	0.192	100
		12	6	22.78	0.190	22.85	0.193	100
		12	11	22.83	0.192	22.89	0.195	100
		25	0	22.78	0.190	22.82	0.191	100
	16QAM	1	0	23.06	0.202	23.08	0.203	100
		1	12	22.90	0.195	23.00	0.200	100
		1	24	23.04	0.201	23.21	0.209	100
		12	0	21.79	0.151	21.89	0.155	100
		12	6	21.86	0.153	21.99	0.158	100
		12	11	21.88	0.154	21.98	0.158	100
		25	0	21.86	0.153	21.90	0.155	100
	64QAM	1	0	21.75	0.150	21.86	0.153	100
		1	12	21.99	0.158	22.03	0.160	100
		1	24	22.01	0.159	22.10	0.162	100
		12	0	20.79	0.120	20.82	0.121	100
		12	6	20.85	0.122	20.93	0.124	100
		12	11	20.89	0.123	20.93	0.124	100
		25	0	20.77	0.119	20.84	0.121	100
	256QAM	1	0	18.77	0.075	18.82	0.076	100
		1	12	18.91	0.078	18.99	0.079	100
		1	24	18.87	0.077	19.90	0.098	100
		12	0	18.72	0.074	18.78	0.076	100
		12	6	18.82	0.076	18.90	0.078	100
		12	11	18.81	0.076	18.90	0.078	100
		25	0	18.82	0.076	18.85	0.077	100

Band Width	Modulation	RB Size	RB Offset	Max. output power(dBm) 819MHz		Limit (W)
				dBm	W	
10	QPSK	1	0	23.74	0.237	100
		1	24	23.74	0.237	100
		1	49	23.55	0.226	100
		25	0	22.64	0.184	100
		25	12	22.91	0.195	100
		25	24	22.84	0.192	100
		50	0	22.82	0.191	100
	16QAM	1	0	23.40	0.219	100
		1	24	23.31	0.214	100
		1	49	23.32	0.215	100
		25	0	21.70	0.148	100
		25	12	21.91	0.155	100
		25	24	21.81	0.152	100
		50	0	21.82	0.152	100
	64QAM	1	0	21.94	0.156	100
		1	24	22.00	0.158	100
		1	49	22.26	0.168	100
		25	0	20.68	0.117	100
		25	12	20.85	0.122	100
		25	24	20.90	0.123	100
		50	0	20.86	0.122	100
	256QAM	1	0	18.50	0.071	100
		1	24	19.11	0.081	100
		1	49	18.78	0.076	100
		25	0	18.73	0.075	100
		25	12	18.91	0.078	100
		25	24	18.90	0.078	100
		50	0	18.82	0.076	100

Band Width	Modulation	RB Size	RB Offset	Max. output power(dBm) 821.5MHz		Limit (W)
				dBm	W	
15	QPSK	1	0	23.78	0.239	100
		1	36	23.65	0.232	100
		1	74	23.63	0.231	100
		36	0	22.76	0.189	100
		36	18	22.84	0.192	100
		36	39	22.82	0.191	100
		75	0	22.73	0.187	100
	16QAM	1	0	23.55	0.226	100
		1	36	23.47	0.222	100
		1	74	23.51	0.224	100
		36	0	21.77	0.150	100
		36	18	21.80	0.151	100
		36	39	21.80	0.151	100
		75	0	21.73	0.149	100
	64QAM	1	0	22.15	0.164	100
		1	36	21.99	0.158	100
		1	74	21.90	0.155	100
		36	0	20.70	0.117	100
		36	18	20.82	0.121	100
		36	39	20.94	0.124	100
		75	0	20.80	0.120	100
	256QAM	1	0	18.64	0.073	100
		1	36	18.91	0.078	100
		1	74	19.82	0.096	100
		36	0	18.73	0.075	100
		36	18	18.84	0.077	100
		36	39	18.76	0.075	100
		75	0	18.83	0.076	100

8.2 EFFECTIVE RADIATED POWER

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBd)	C.L	Pol	Limit	ERP	
								W	W	dBm
814.7	LTE B26/ 1.4 MHz	QPSK	-31.68	31.57	-10.43	1.39	H	< 100	0.094	19.75
		16QAM	-32.41	30.84	-10.43	1.39	H		0.080	19.02
		64QAM	-33.30	29.95	-10.43	1.39	H		0.065	18.13
		256QAM	-36.45	26.80	-10.43	1.39	H		0.031	14.98
823.3		QPSK	-31.66	31.92	-10.42	1.39	H		0.103	20.11
		16QAM	-32.32	31.26	-10.42	1.39	H		0.088	19.45
		64QAM	-33.36	30.22	-10.42	1.39	H		0.069	18.41
		256QAM	-36.46	27.12	-10.42	1.39	H		0.034	15.31

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBd)	C.L	Pol	Limit	ERP	
								W	W	dBm
815.5	LTE B26/ 3 MHz	QPSK	-31.66	31.59	-10.43	1.39	H	< 100	0.095	19.77
		16QAM	-32.24	31.01	-10.43	1.39	H		0.083	19.19
		64QAM	-33.24	30.01	-10.43	1.39	H		0.066	18.19
		256QAM	-36.41	26.84	-10.43	1.39	H		0.032	15.02
822.5		QPSK	-31.52	31.99	-10.42	1.39	H		0.104	20.18
		16QAM	-32.12	31.39	-10.42	1.39	H		0.091	19.58
		64QAM	-33.22	30.29	-10.42	1.39	H		0.070	18.48
		256QAM	-36.37	27.14	-10.42	1.39	H		0.034	15.33

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBd)	C.L	Pol	Limit	ERP	
								W	W	dBm
816.5	LTE B26/ 5 MHz	QPSK	-31.78	31.48	-10.43	1.39	H	< 100	0.092	19.66
		16QAM	-32.29	30.97	-10.43	1.39	H		0.082	19.15
		64QAM	-33.29	29.97	-10.43	1.39	H		0.065	18.15
		256QAM	-36.47	26.79	-10.43	1.39	H		0.031	14.97
821.5		QPSK	-31.57	31.89	-10.42	1.39	H		0.102	20.08
		16QAM	-32.17	31.29	-10.42	1.39	H		0.089	19.48
		64QAM	-33.24	30.22	-10.42	1.39	H		0.069	18.41
		256QAM	-36.47	26.99	-10.42	1.39	H		0.033	15.18

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBd)	C.L	Pol	Limit	ERP	
								W	W	dBm
819.0	LTE B26/ 10 MHz	QPSK	-31.72	31.63	-10.43	1.39	H	< 100	0.096	19.81
		16QAM	-32.22	31.13	-10.43	1.39	H		0.085	19.31
		64QAM	-33.37	29.98	-10.43	1.39	H		0.065	18.16
		256QAM	-36.81	26.54	-10.43	1.39	H		0.030	14.72

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBd)	C.L	Pol	Limit	ERP	
								W	W	dBm
821.5	LTE B26/ 15 MHz	QPSK	-31.68	31.78	-10.42	1.39	H	< 7.00	0.099	19.97
		16QAM	-32.17	31.29	-10.42	1.39	H		0.089	19.48
		64QAM	-33.48	29.98	-10.42	1.39	H		0.066	18.17
		256QAM	-36.79	26.67	-10.42	1.39	H		0.031	14.86

Note

1. Limit: None (for reporting purposes only)

8.3 RADIATED SPURIOUS EMISSIONS

▣ MODE: LTE B26

▣ MODULATION SIGNAL: 3 MHz QPSK

▣ DISTANCE: 3 meters

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit
26705 (815.5)	1 631.00	-52.67	9.40	-62.10	1.98	H	-54.68	-13.00
	2 446.50	-32.34	10.47	-36.08	2.46	V	-28.07	-13.00
	3 262.00	-57.76	12.00	-58.41	2.88	V	-49.29	-13.00
26775 (822.5)	1 645.00	-52.78	9.48	-62.47	1.98	V	-54.97	-13.00
	2 467.50	-31.58	10.60	-35.71	2.47	V	-27.58	-13.00
	3 290.00	-57.82	12.20	-58.94	2.88	V	-49.62	-13.00

8.4 OCCUPIED BANDWIDTH

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
Band 26	1.4 MHz	823.3	QPSK	6	0	1.0926
			16QAM			1.0897
			64QAM			1.0919
			256QAM			1.0827
	3 MHz	822.5	QPSK	15		2.7058
			16QAM			2.6954
			64QAM			2.7127
			256QAM			2.7037
	5 MHz	821.5	QPSK	25		4.4988
			16QAM			4.5009
			64QAM			4.4944
			256QAM			4.4941
	10 MHz	819.0	QPSK	50		8.9604
			16QAM			8.9692
			64QAM			8.9816
			256QAM			8.9678
	15 MHz	821.5	QPSK	75		13.480
			16QAM			13.452
			64QAM			13.447
			256QAM			13.442

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 45 ~ 64.

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)
26	1.4	814.7	3.6885	27.976	-67.377	-39.401	-13.00
		823.3	3.7020	27.976	-67.093	-39.117	
	3	815.5	3.6720	27.976	-67.256	-39.280	
		822.5	3.6955	27.976	-66.976	-39.000	
	5	816.5	3.1760	27.976	-67.154	-39.178	
		821.5	3.6870	27.976	-67.321	-39.345	
	10	819.0	3.7089	27.976	-67.110	-39.134	
	15	821.5	3.7109	27.976	-67.173	-39.197	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 85 ~ 92.
2. Conducted Spurious Emissions was Tested QPSK Modulation, Resource Block Size 1 and Resource Block Offset 0
3. Result (dBm) = Measurement Maximum Data (dBm) + Factor (dB)
4. Factor(dB) = Cable Loss + Attenuator + Power Splitter

Frequency Range (GHz)	Factor [dB]
0.03 – 1	25.270
1 – 5	27.976
5 – 10	28.591
10 – 15	29.116
15 – 20	29.489
Above 20(26.5)	30.131

8.6 CHANNEL EDGE

- Plots of the EUT's Band Edge are shown Page 65 ~ 84.

8.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

▣ MODE: LTE 26

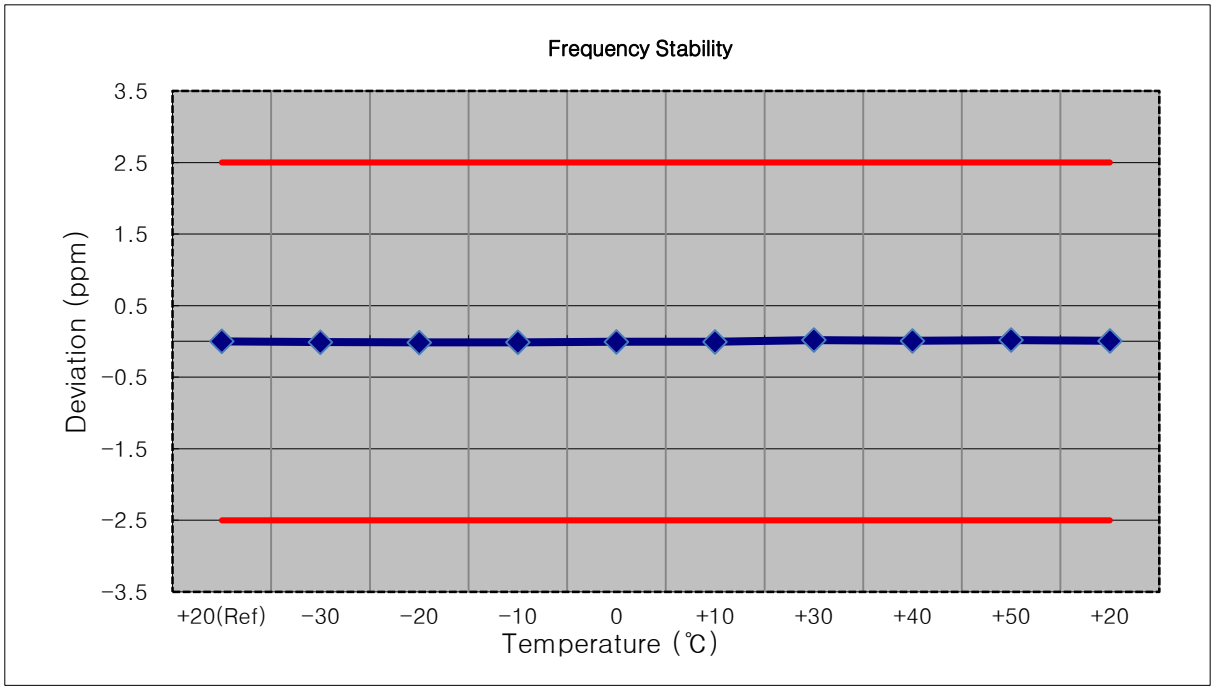
▣ OPERATING FREQUENCY: 814,700,000 Hz

▣ CHANNEL: 26697(1.4MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.200	+20(Ref)	814 700 006	0.0	0.000 000	0.000
100%		-30	814 699 997	-9.2	-0.000 001	-0.011
100%		-20	814 699 995	-11.9	-0.000 001	-0.015
100%		-10	814 699 997	-9.8	-0.000 001	-0.012
100%		0	814 700 002	-4.9	-0.000 001	-0.006
100%		+10	814 700 001	-5.3	-0.000 001	-0.007
100%		+30	814 700 022	15.8	0.000 002	0.019
100%		+40	814 700 014	7.1	0.000 001	0.009
100%		+50	814 700 021	14.9	0.000 002	0.018
Batt. Endpoint	3.650	+20	814 700 013	6.7	0.000 001	0.008



▣ MODE: LTE 26

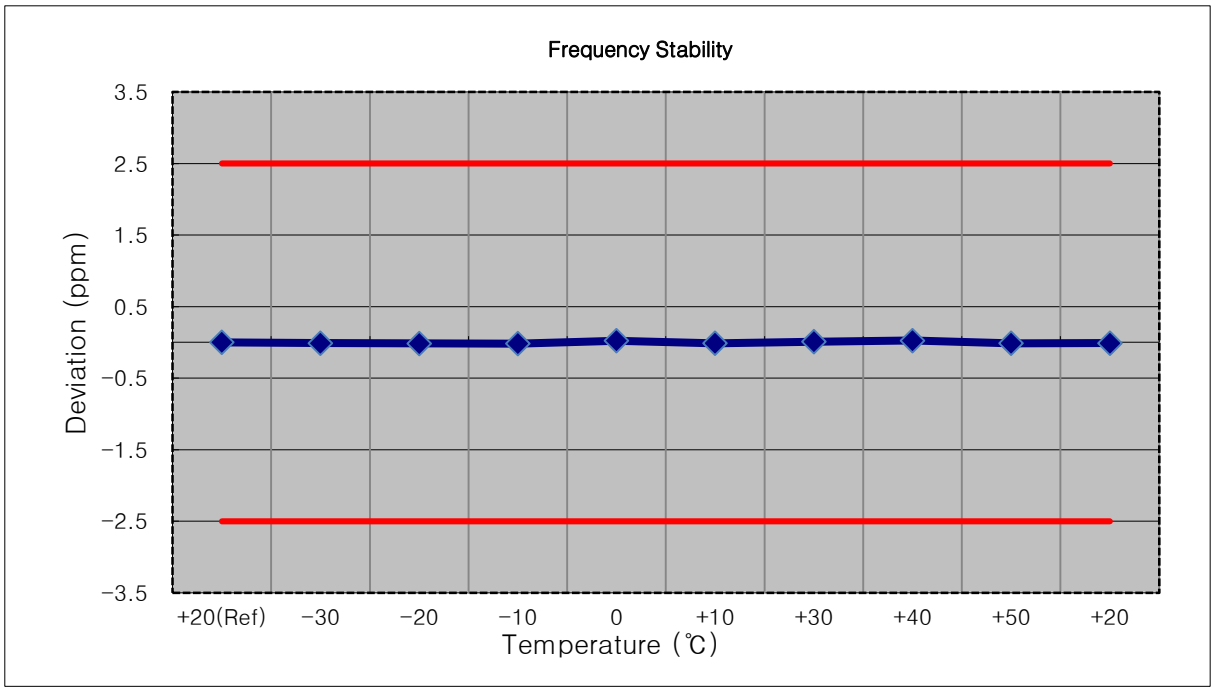
▣ OPERATING FREQUENCY: 815,500,000 Hz

▣ CHANNEL: 26705(3MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.200	+20(Ref)	815 499 987	0.0	0.000 000	0.000
100%		-30	815 499 978	-8.7	-0.000 001	-0.011
100%		-20	815 499 974	-12.5	-0.000 002	-0.015
100%		-10	815 499 973	-13.8	-0.000 002	-0.017
100%		0	815 500 005	18.4	0.000 002	0.023
100%		+10	815 499 977	-9.9	-0.000 001	-0.012
100%		+30	815 499 995	8.8	0.000 001	0.011
100%		+40	815 500 007	20.7	0.000 003	0.025
100%		+50	815 499 976	-10.4	-0.000 001	-0.013
Batt. Endpoint	3.650	+20	815 499 979	-7.9	-0.000 001	-0.010



▣ MODE: LTE 26

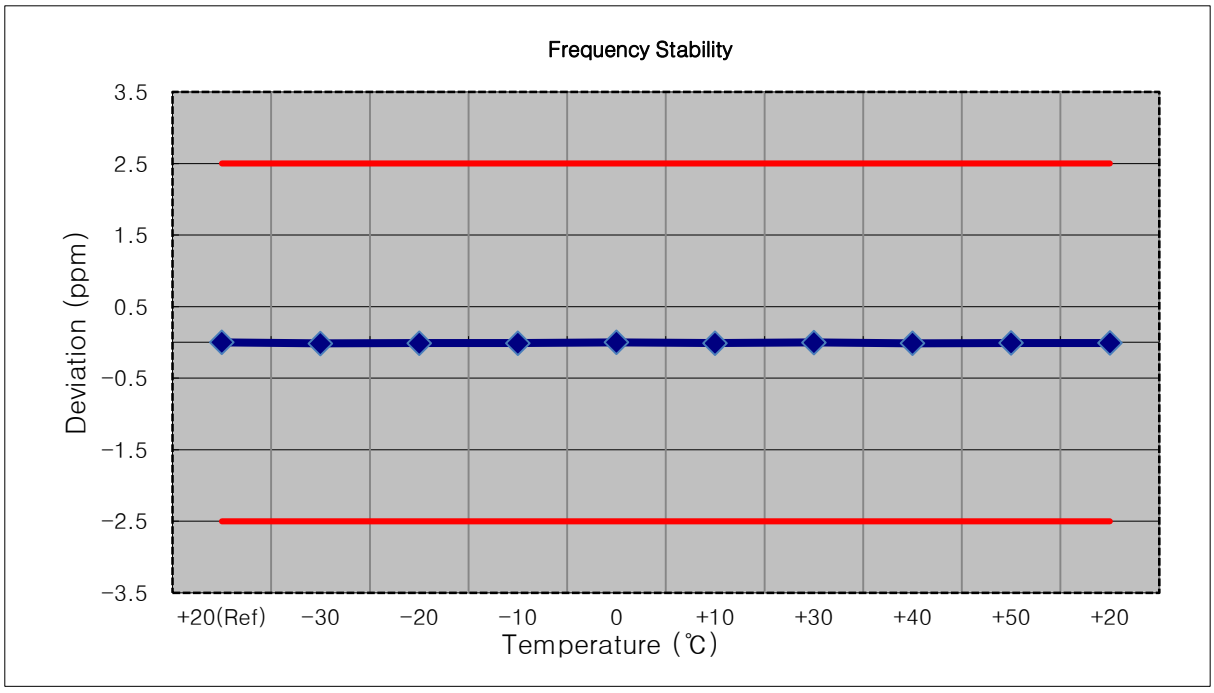
▣ OPERATING FREQUENCY: 816,500,000 Hz

▣ CHANNEL: 26715(5MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.200	+20(Ref)	816 499 995	0.0	0.000 000	0.000
100%		-30	816 499 983	-12.2	-0.000 001	-0.015
100%		-20	816 499 986	-8.8	-0.000 001	-0.011
100%		-10	816 499 987	-7.7	-0.000 001	-0.009
100%		0	816 499 996	1.5	0.000 000	0.002
100%		+10	816 499 986	-9.0	-0.000 001	-0.011
100%		+30	816 499 993	-1.6	0.000 000	-0.002
100%		+40	816 499 985	-10.1	-0.000 001	-0.012
100%		+50	816 499 988	-6.9	-0.000 001	-0.008
Batt. Endpoint	3.650	+20	816 499 988	-7.1	-0.000 001	-0.009



▣ MODE: LTE 26

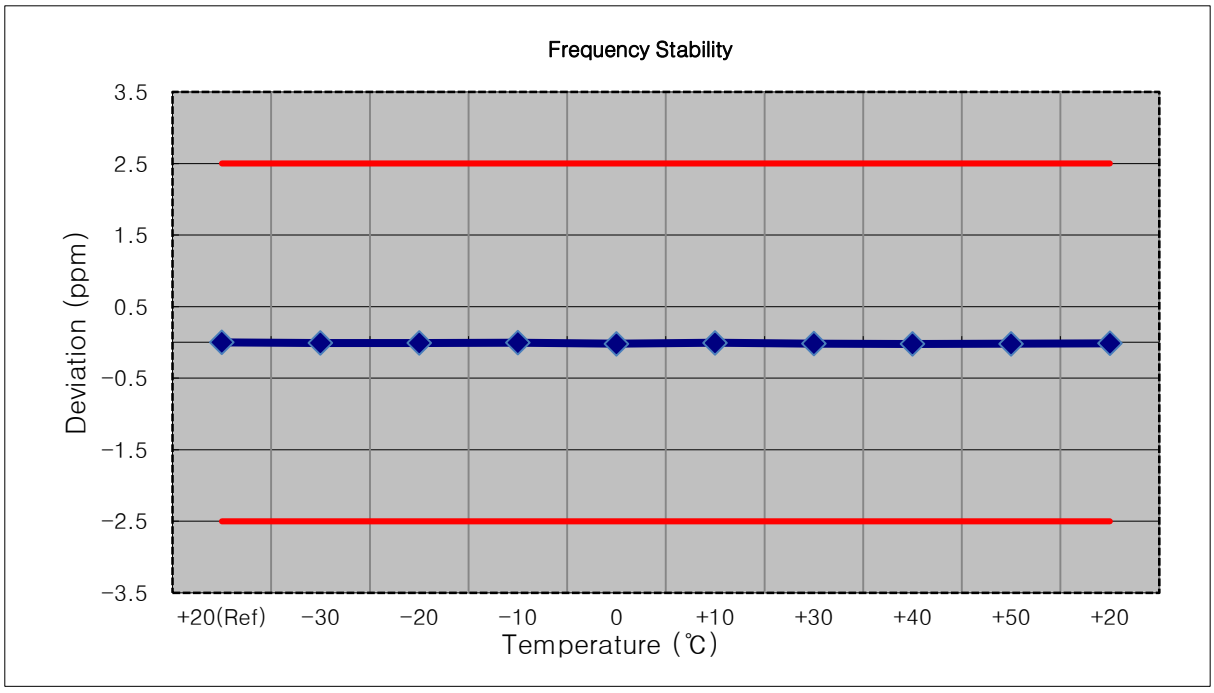
▣ OPERATING FREQUENCY: 819,000,000 Hz

▣ CHANNEL: 26740(10 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.200	+20(Ref)	818 999 994	0.0	0.000 000	0.000
100%		-30	818 999 987	-7.3	-0.000 001	-0.009
100%		-20	818 999 988	-6.1	-0.000 001	-0.007
100%		-10	818 999 991	-2.9	0.000 000	-0.004
100%		0	818 999 978	-15.9	-0.000 002	-0.019
100%		+10	818 999 989	-4.9	-0.000 001	-0.006
100%		+30	818 999 981	-13.4	-0.000 002	-0.016
100%		+40	818 999 977	-16.9	-0.000 002	-0.021
100%		+50	818 999 979	-14.7	-0.000 002	-0.018
Batt. Endpoint	3.650	+20	818 999 985	-9.2	-0.000 001	-0.011



▣ MODE: LTE 26

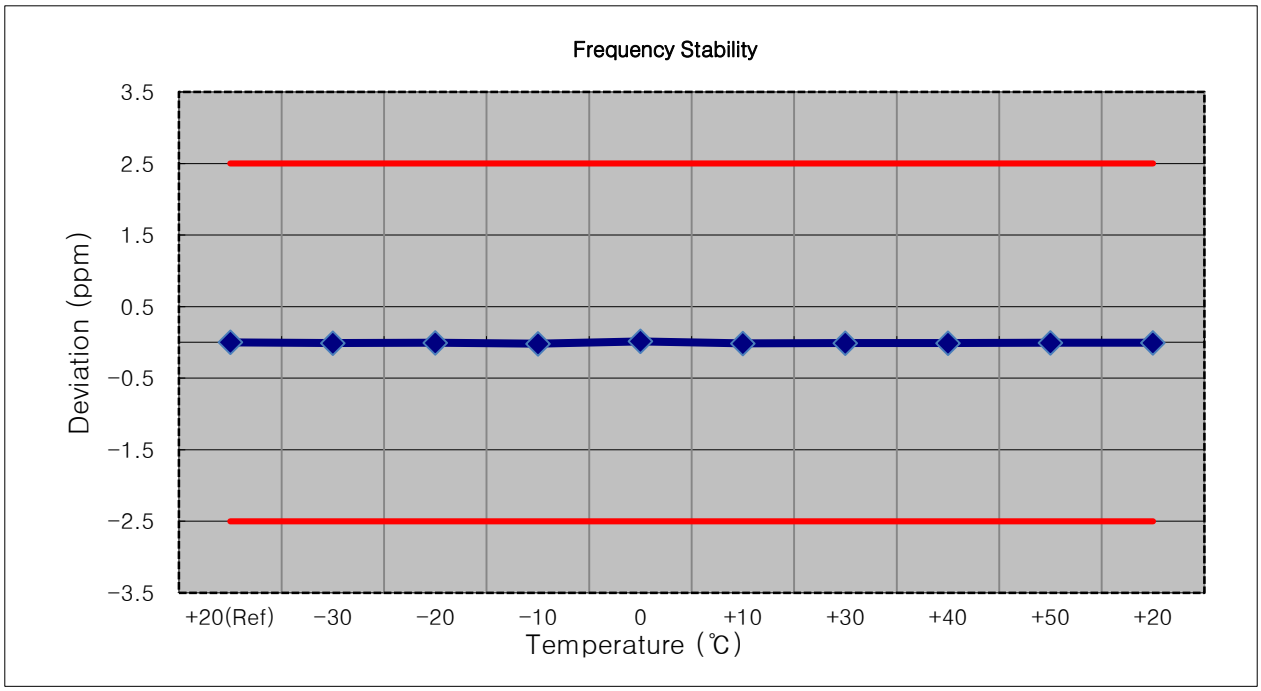
▣ OPERATING FREQUENCY: 821,500,000 Hz

▣ CHANNEL: 26765(15 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.200	+20(Ref)	821 500 012	0.0	0.000 000	0.000
100%		-30	821 500 003	-8.6	-0.000 001	-0.010
100%		-20	821 500 007	-4.2	-0.000 001	-0.005
100%		-10	821 499 996	-15.3	-0.000 002	-0.019
100%		0	821 500 024	12.5	0.000 002	0.015
100%		+10	821 499 999	-12.4	-0.000 002	-0.015
100%		+30	821 500 003	-9.0	-0.000 001	-0.011
100%		+40	821 500 004	-7.6	-0.000 001	-0.009
100%		+50	821 500 008	-3.7	0.000 000	-0.005
Batt. Endpoint	3.650	+20	821 500 008	-3.7	0.000 000	-0.005



8.8 STADDLE CHANNEL

8.8.1 CONDUCTED OUTPUT POWER

Band Width	Modulation	RB Size	RB Offset	Max. output power(dBm)		Limit (W)
				824MHz		
				dBm	W	
1.4	QPSK	1	0	23.73	0.236	100
		1	3	23.97	0.249	100
		1	5	23.80	0.240	100
		3	0	23.72	0.236	100
		3	1	23.81	0.240	100
		3	3	23.75	0.237	100
		6	0	22.85	0.193	100
	16QAM	1	0	22.83	0.192	100
		1	3	23.07	0.203	100
		1	5	23.03	0.201	100
		3	0	23.18	0.208	100
		3	1	23.08	0.203	100
		3	3	23.03	0.201	100
		6	0	21.91	0.155	100
	64QAM	1	0	22.44	0.175	100
		1	3	22.50	0.178	100
		1	5	22.14	0.164	100
		3	0	22.00	0.158	100
		3	1	21.86	0.153	100
		3	3	21.94	0.156	100
		6	0	20.88	0.122	100
	256QAM	1	0	18.87	0.077	100
		1	3	19.01	0.080	100
		1	5	18.87	0.077	100
		3	0	18.95	0.079	100
		3	1	19.08	0.081	100
		3	3	18.97	0.079	100
		6	0	18.84	0.077	100

Band Width	Modulation	RB Size	RB Offset	Max. output power(dBm)		Limit (W)
				824MHz		
				dBm	W	
3	QPSK	1	0	23.80	0.240	100
		1	7	23.77	0.238	100
		1	14	23.88	0.244	100
		8	0	22.95	0.197	100
		8	3	23.00	0.200	100
		8	7	22.98	0.199	100
		15	0	22.94	0.197	100
	16QAM	1	0	23.30	0.214	100
		1	7	23.25	0.211	100
		1	14	23.22	0.210	100
		8	0	21.95	0.157	100
		8	3	21.98	0.158	100
		8	7	22.00	0.158	100
		15	0	21.90	0.155	100
	64QAM	1	0	22.03	0.160	100
		1	7	22.14	0.164	100
		1	14	22.18	0.165	100
		8	0	20.87	0.122	100
		8	3	20.85	0.122	100
		8	7	21.00	0.126	100
		15	0	20.92	0.124	100
	256QAM	1	0	18.92	0.078	100
		1	7	19.00	0.079	100
		1	14	18.94	0.078	100
		8	0	18.90	0.078	100
		8	3	18.92	0.078	100
		8	7	18.91	0.078	100
		15	0	18.85	0.077	100

Band Width	Modulation	RB Size	RB Offset	Max. output power(dBm)		Limit (W)
				824MHz		
				dBm	W	
5	QPSK	1	0	23.77	0.238	100
		1	12	23.77	0.238	100
		1	24	23.58	0.228	100
		12	0	22.68	0.185	100
		12	6	22.95	0.197	100
		12	11	22.88	0.194	100
		25	0	22.86	0.193	100
	16QAM	1	0	23.43	0.220	100
		1	12	23.35	0.216	100
		1	24	23.65	0.232	100
		12	0	21.74	0.149	100
		12	6	21.93	0.156	100
		12	11	21.83	0.152	100
		25	0	21.85	0.153	100
	64QAM	1	0	21.98	0.158	100
		1	12	22.04	0.160	100
		1	24	22.30	0.170	100
		12	0	20.72	0.118	100
		12	6	20.89	0.123	100
		12	11	20.94	0.124	100
		25	0	20.90	0.123	100
	256QAM	1	0	18.54	0.071	100
		1	12	19.15	0.082	100
		1	24	18.82	0.076	100
		12	0	18.77	0.075	100
		12	6	18.96	0.079	100
		12	11	19.94	0.099	100
		25	0	18.85	0.077	100

Band Width	Modulation	RB Size	RB Offset	Max. output power(dBm)		Limit (W)
				824MHz		
				dBm	W	
10	QPSK	1	0	23.78	0.239	100
		1	24	23.68	0.233	100
		1	49	23.66	0.232	100
		25	0	22.80	0.191	100
		25	12	22.86	0.193	100
		25	24	22.83	0.192	100
		50	0	22.76	0.189	100
	16QAM	1	0	23.57	0.228	100
		1	24	23.60	0.229	100
		1	49	23.69	0.234	100
		25	0	21.77	0.150	100
		25	12	21.80	0.151	100
		25	24	21.81	0.152	100
		50	0	21.75	0.150	100
	64QAM	1	0	22.17	0.165	100
		1	24	22.00	0.158	100
		1	49	21.91	0.155	100
		25	0	20.72	0.118	100
		25	12	20.76	0.119	100
		25	24	20.97	0.125	100
		50	0	20.81	0.121	100
	256QAM	1	0	18.65	0.073	100
		1	24	18.91	0.078	100
		1	49	18.84	0.077	100
		25	0	18.75	0.075	100
		25	12	18.85	0.077	100
		25	24	18.80	0.076	100
		50	0	18.83	0.076	100

8.8.2 EFFECTIVE RADIATED POWER

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBd)	C.L	Pol	Limit	ERP	
								W	W	dBm
824.0	LTE B26/ 1.4 MHz	QPSK	-31.78	31.79	-10.42	1.39	H	< 7.00	0.099	19.98
		16QAM	-32.46	31.11	-10.42	1.39	H		0.085	19.30
		64QAM	-33.49	30.08	-10.42	1.39	H		0.067	18.27
		256QAM	-36.59	26.98	-10.42	1.39	H		0.033	15.17

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBd)	C.L	Pol	Limit	ERP	
								W	W	dBm
824.0	LTE B26/ 3 MHz	QPSK	-31.70	31.87	-10.42	1.39	H	< 7.00	0.101	20.06
		16QAM	-32.31	31.26	-10.42	1.39	H		0.088	19.45
		64QAM	-33.44	30.13	-10.42	1.39	H		0.068	18.32
		256QAM	-36.57	27.00	-10.42	1.39	H		0.033	15.19

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBd)	C.L	Pol	Limit	ERP	
								W	W	dBm
824.0	LTE B26/ 5 MHz	QPSK	-31.58	31.99	-10.42	1.39	H	< 7.00	0.104	20.18
		16QAM	-32.18	31.39	-10.42	1.39	H		0.091	19.58
		64QAM	-33.29	30.28	-10.42	1.39	H		0.070	18.47
		256QAM	-36.50	27.07	-10.42	1.39	H		0.034	15.26

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBd)	C.L	Pol	Limit	ERP	
								W	W	dBm
824.0	LTE B26/ 10 MHz	QPSK	-31.48	32.09	-10.42	1.39	H	< 7.00	0.107	20.28
		16QAM	-32.12	31.45	-10.42	1.39	H		0.092	19.64
		64QAM	-33.31	30.26	-10.42	1.39	H		0.070	18.45
		256QAM	-36.73	26.84	-10.42	1.39	H		0.032	15.03

8.8.3 RADIATED SPURIOUS EMISSIONS

▣ MODE: LTE B26

▣ MODULATION SIGNAL: 10 MHz QPSK

▣ DISTANCE: 3 meters

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit
26790 (824.0)	1 648.00	-52.32	9.50	-61.93	1.99	V	-54.42	-13.00
	2 472.00	-31.60	10.60	-35.73	2.47	V	-27.60	-13.00
	3 296.00	-57.66	12.25	-58.74	2.89	V	-49.38	-13.00

8.8.4 CONDUCTED SPURIOUS EMISSIONS

Band	Band Width (MHz)	Frequency (MHz)	Frequency of Maximum Harmonic (GHz)	Factor (dB)	Measurement Maximum Data (dBm)	Result (dBm)	Limit (dBm)
26	1.4	824.0	3.6830	27.976	-66.890	-38.914	-13.00
	3		3.6870	27.976	-67.182	-39.206	
	5		3.6980	27.976	-67.287	-39.311	
	10		3.7094	27.976	-67.113	-39.137	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 94 ~ 97.
2. Conducted Spurious Emissions was Tested QPSK Modulation, Resource Block Size 1 and Resource Block Offset 0
3. Result (dBm) = Measurement Maximum Data (dBm) + Factor (dB)
4. Factor(dB) = Cable Loss + Attenuator + Power Splitter

Frequency Range (GHz)	Factor [dB]
0.03 – 1	25.270
1 – 5	27.976
5 – 10	28.591
10 – 15	29.116
15 – 20	29.489
Above 20(26.5)	30.131

8.8.5 CHANNEL EDGE(Part90)

- Test Channel : 26790(824.0MHz)

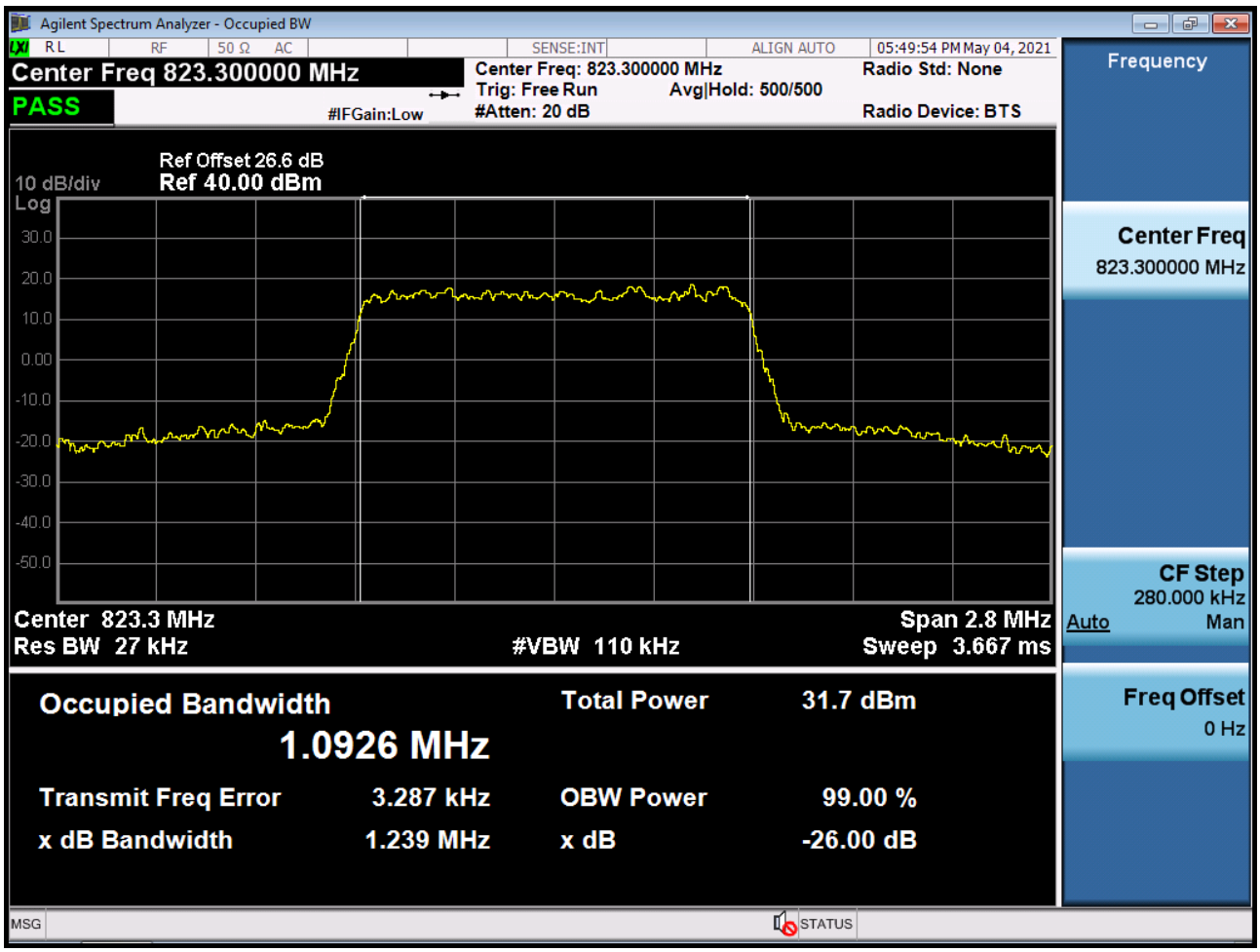
Plots of the EUT's Band Edge are shown Page 98 ~ 109.

8.8.6 BAND EDGE(Part22)

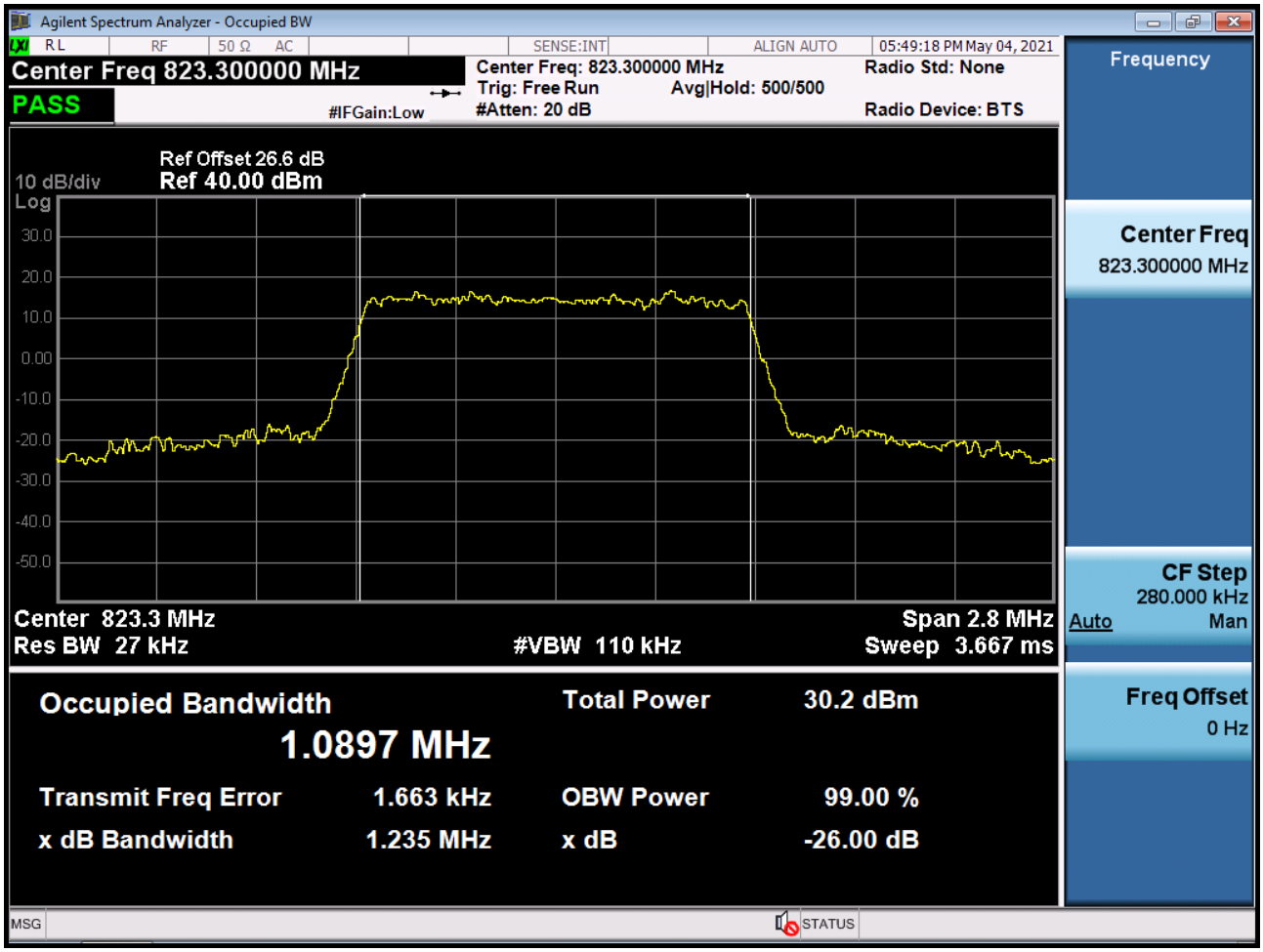
- Test Channel : 26790(824.0MHz)
- Plots of the EUT's Band Edge are shown Page 110 ~ 117.

9. TEST PLOTS

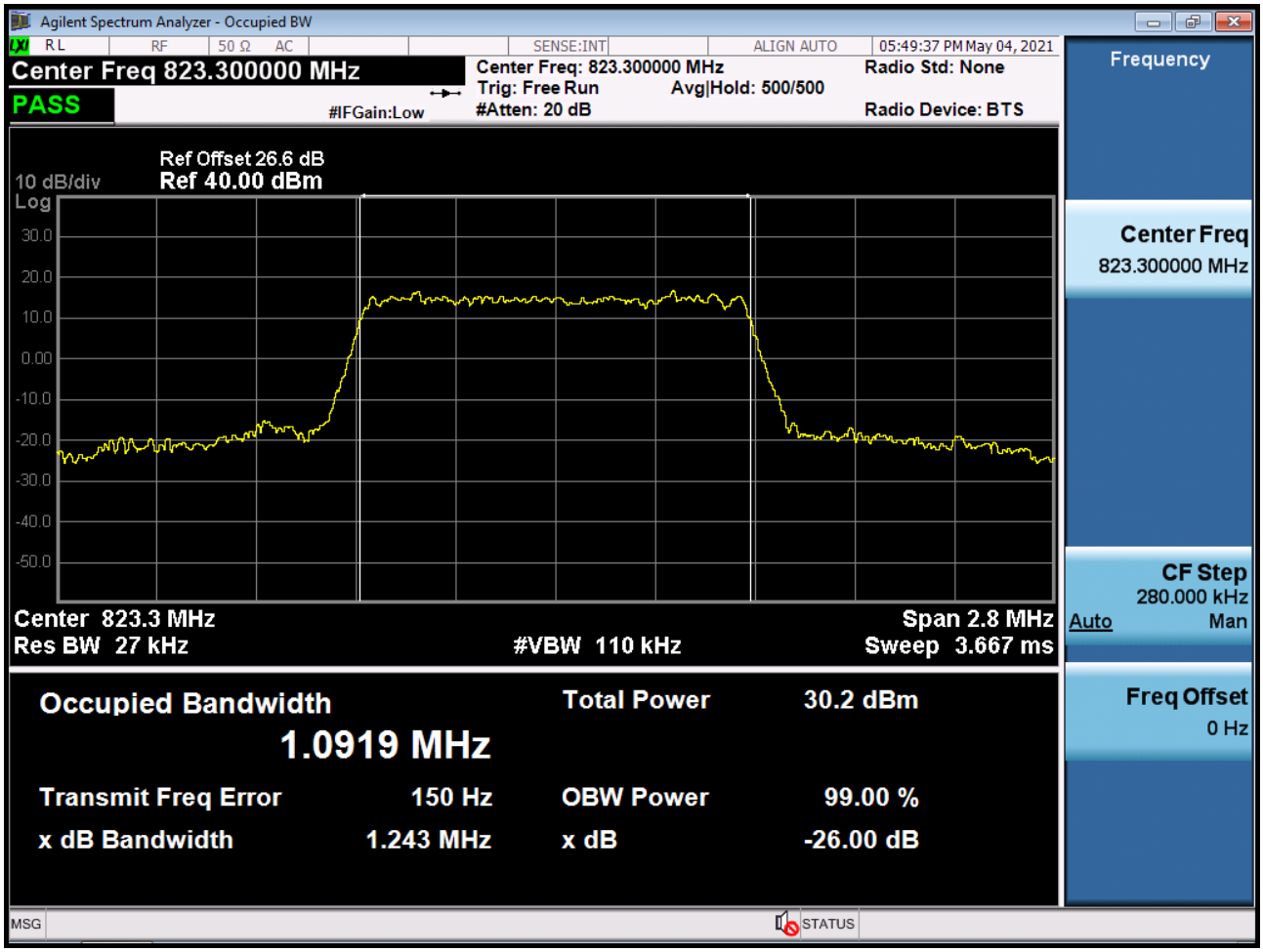
BAND 26. Occupied Bandwidth Plot (1.4M BW Ch.26783 QPSK RB 6_0)



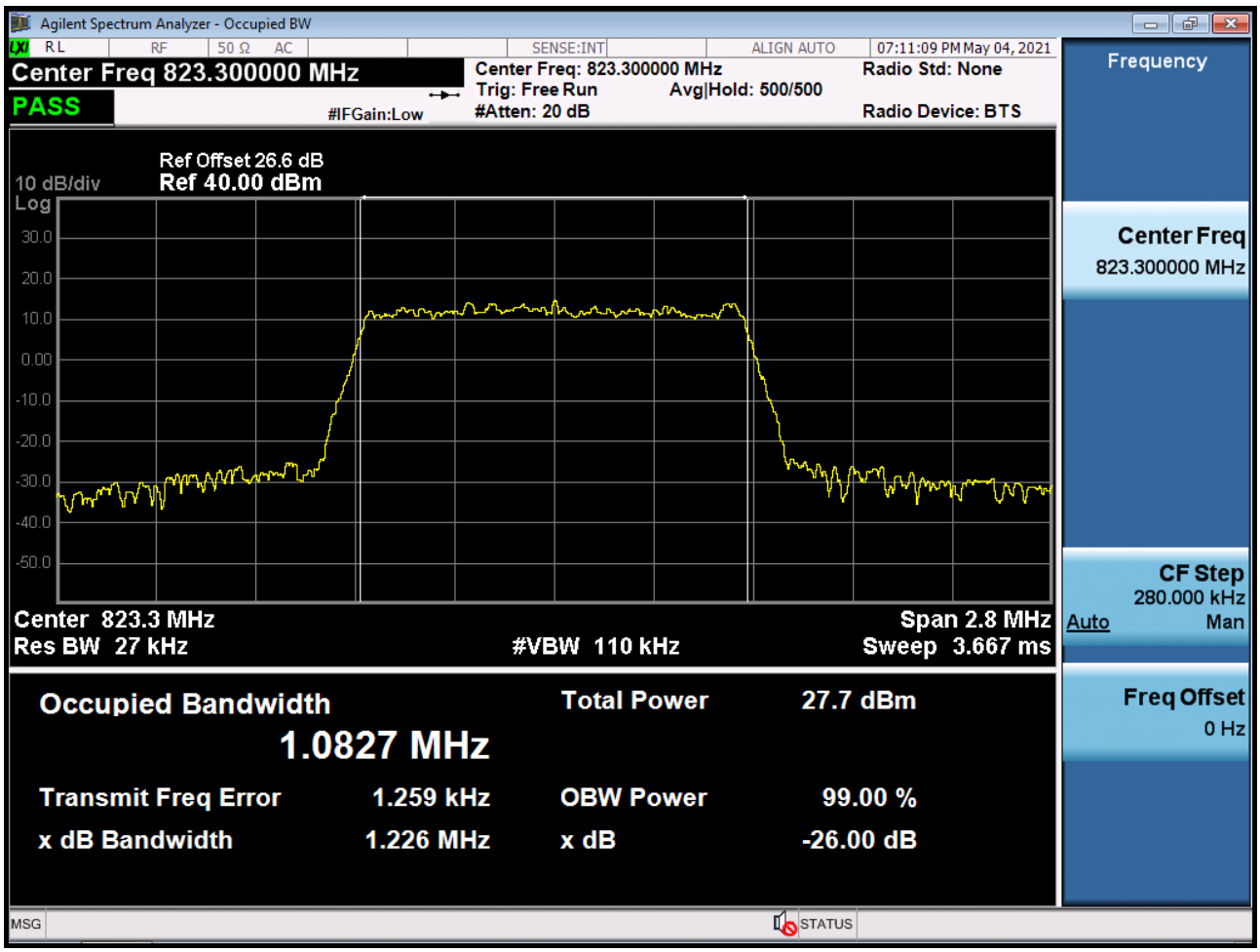
BAND 26. Occupied Bandwidth Plot (1.4M BW Ch.26783 16QAM RB 6_0)



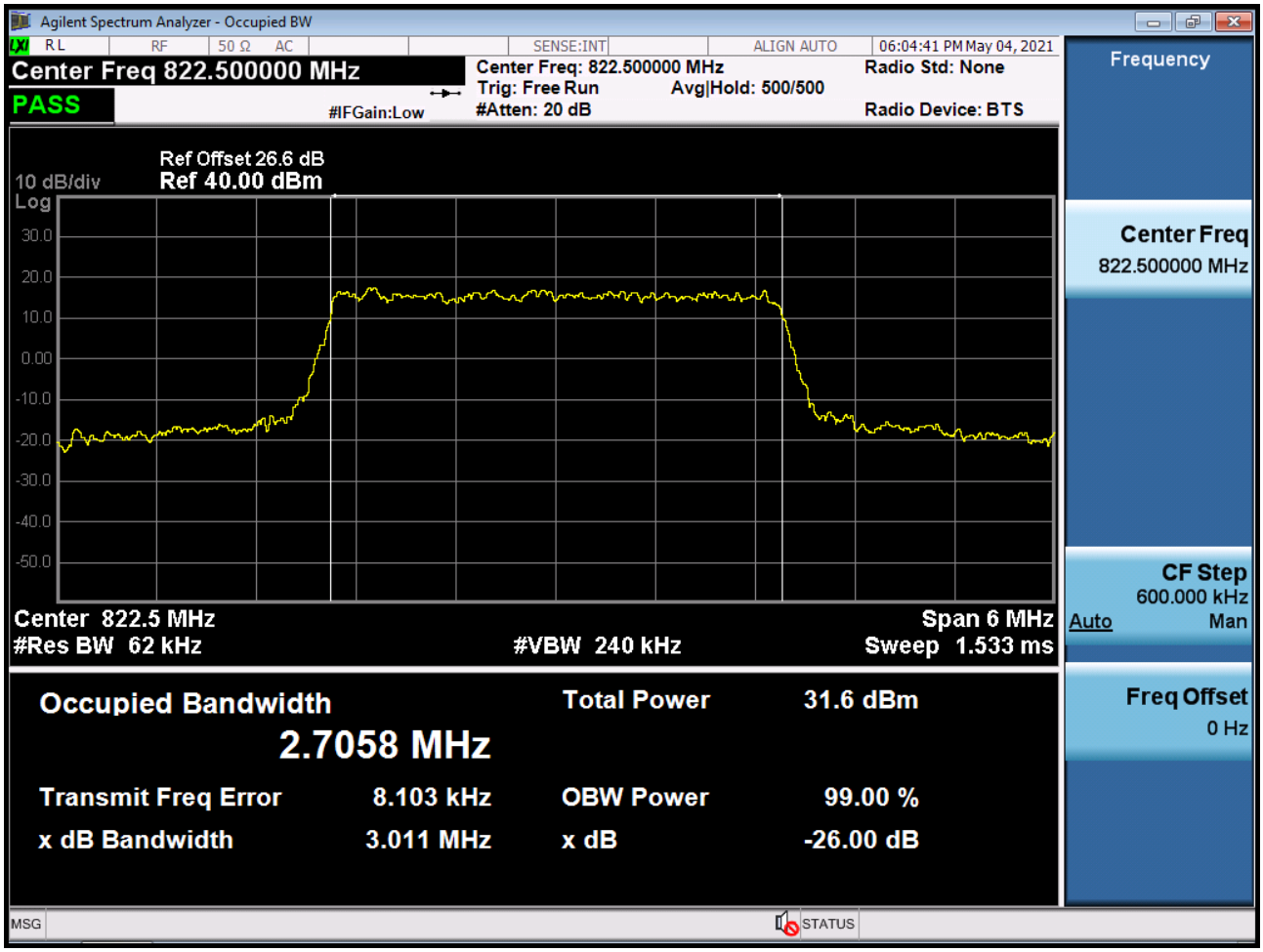
BAND 26. Occupied Bandwidth Plot (1.4M BW Ch.26783 64QAM RB 6_0)



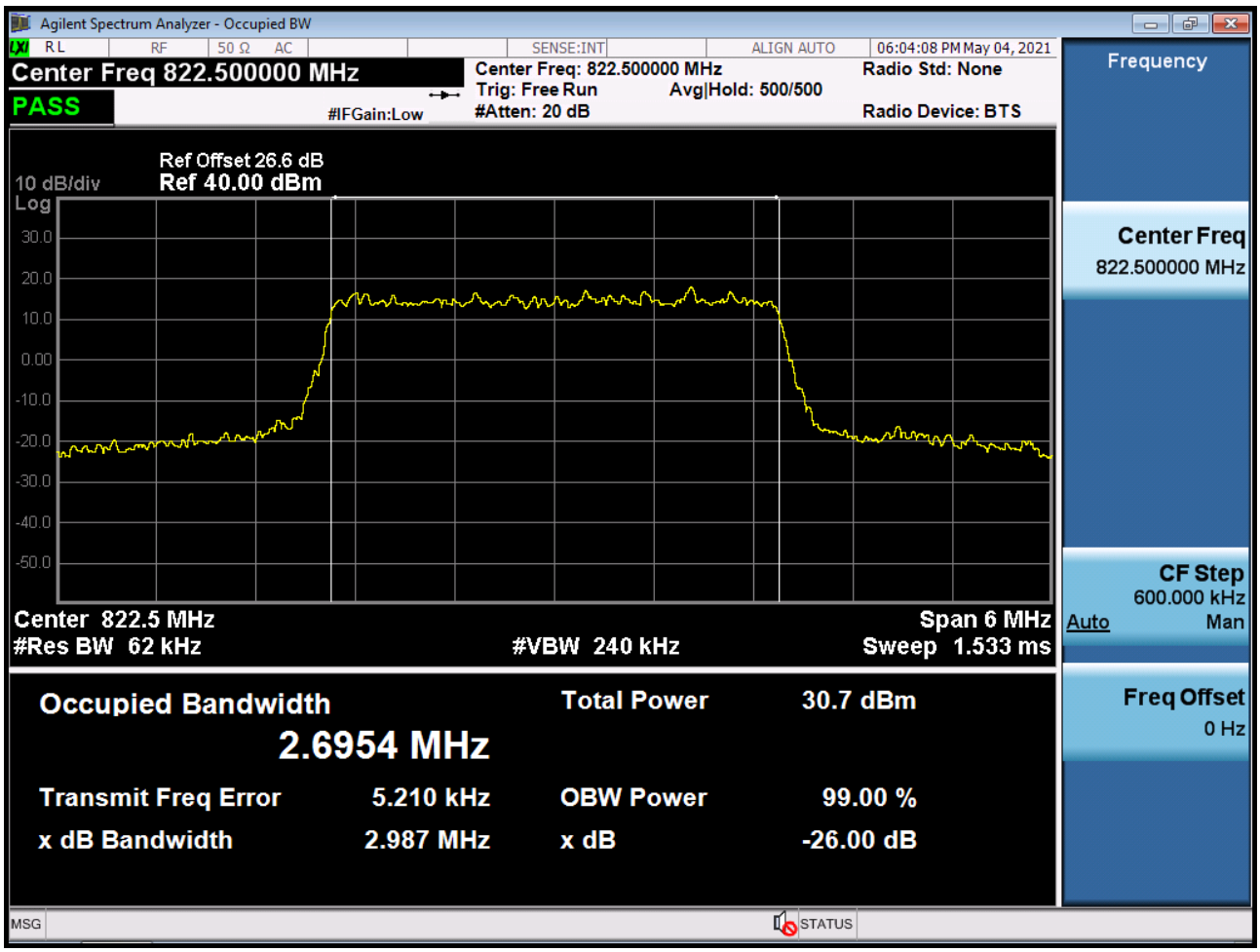
BAND 26. Occupied Bandwidth Plot (1.4M BW Ch.26783 256QAM RB 6_0)



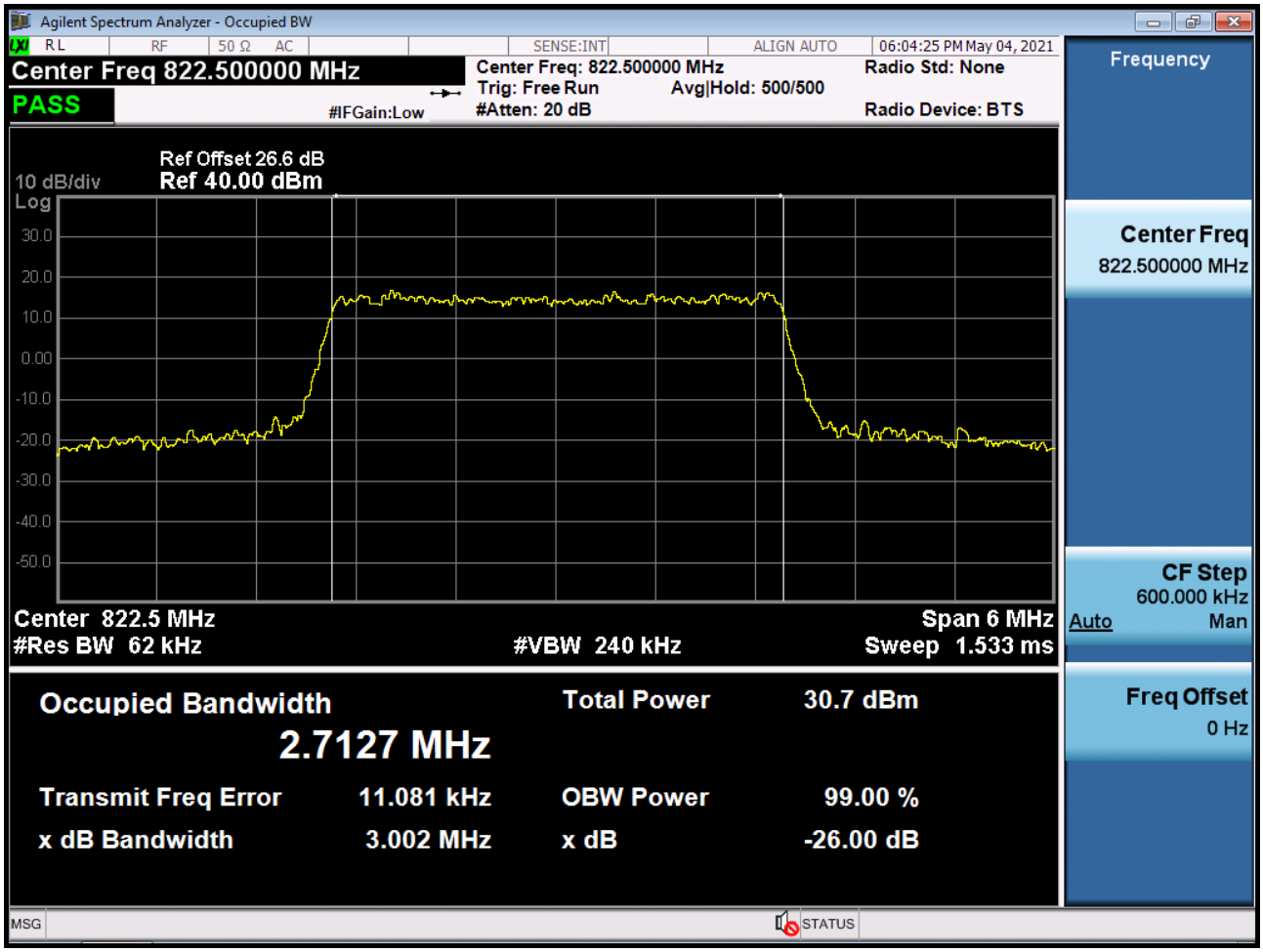
BAND 26. Occupied Bandwidth Plot (3M BW Ch.26775 QPSK RB 15_0)



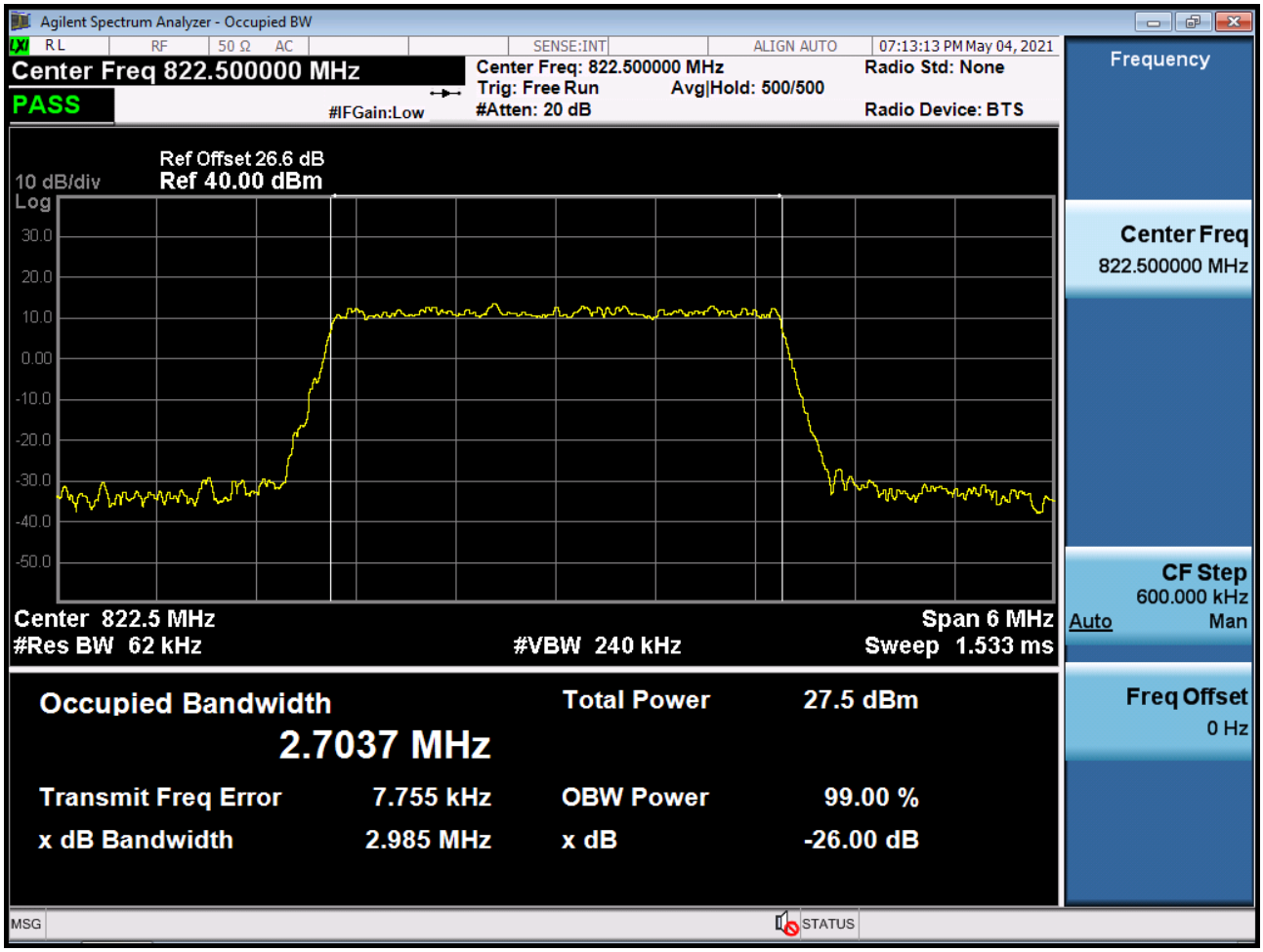
BAND 26. Occupied Bandwidth Plot (3M BW Ch.26775 16QAM RB 15_0)



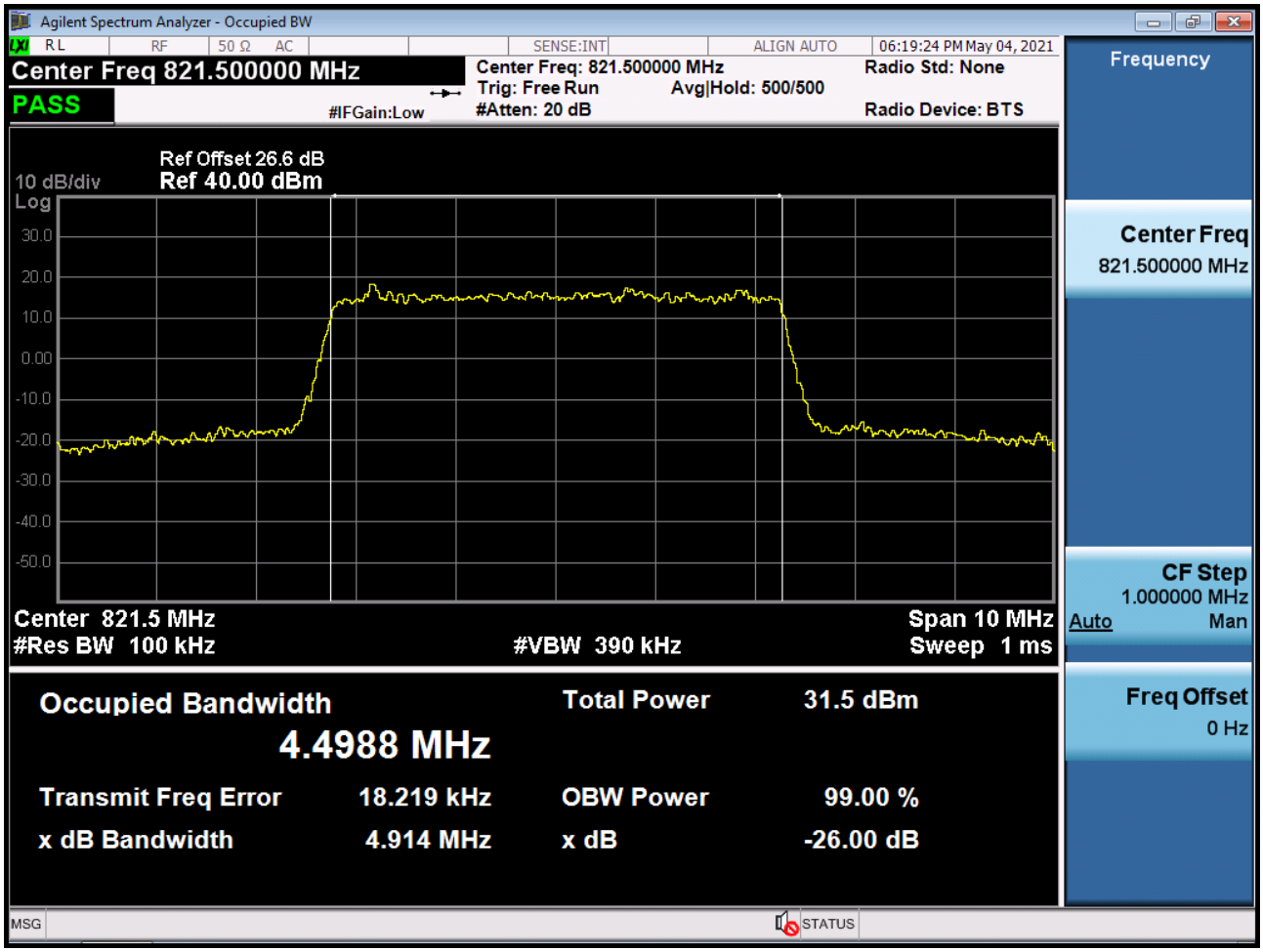
BAND 26. Occupied Bandwidth Plot (3M BW Ch.26775 64QAM RB 15_0)



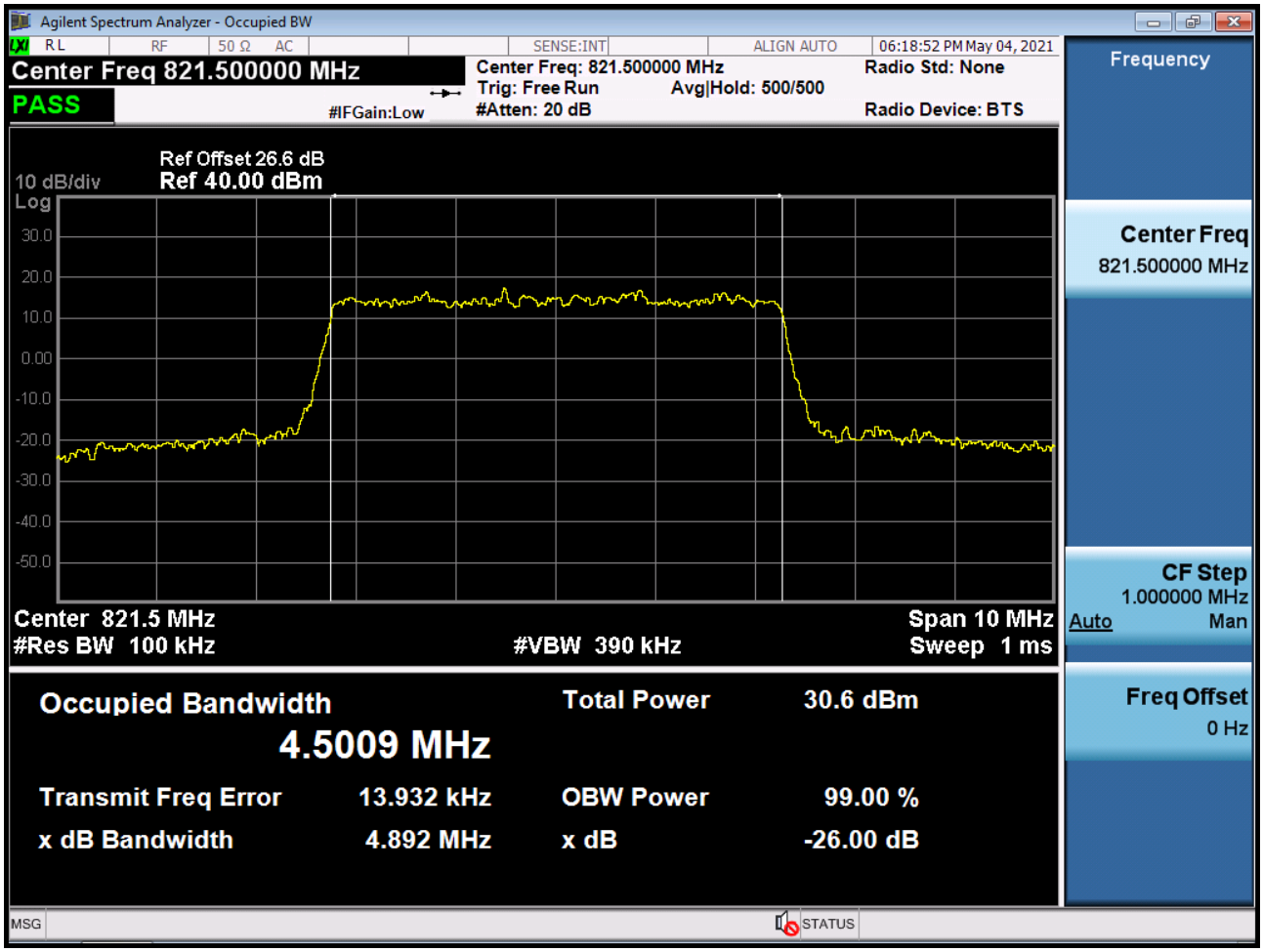
BAND 26. Occupied Bandwidth Plot (3M BW Ch.26775 256QAM RB 15_0)



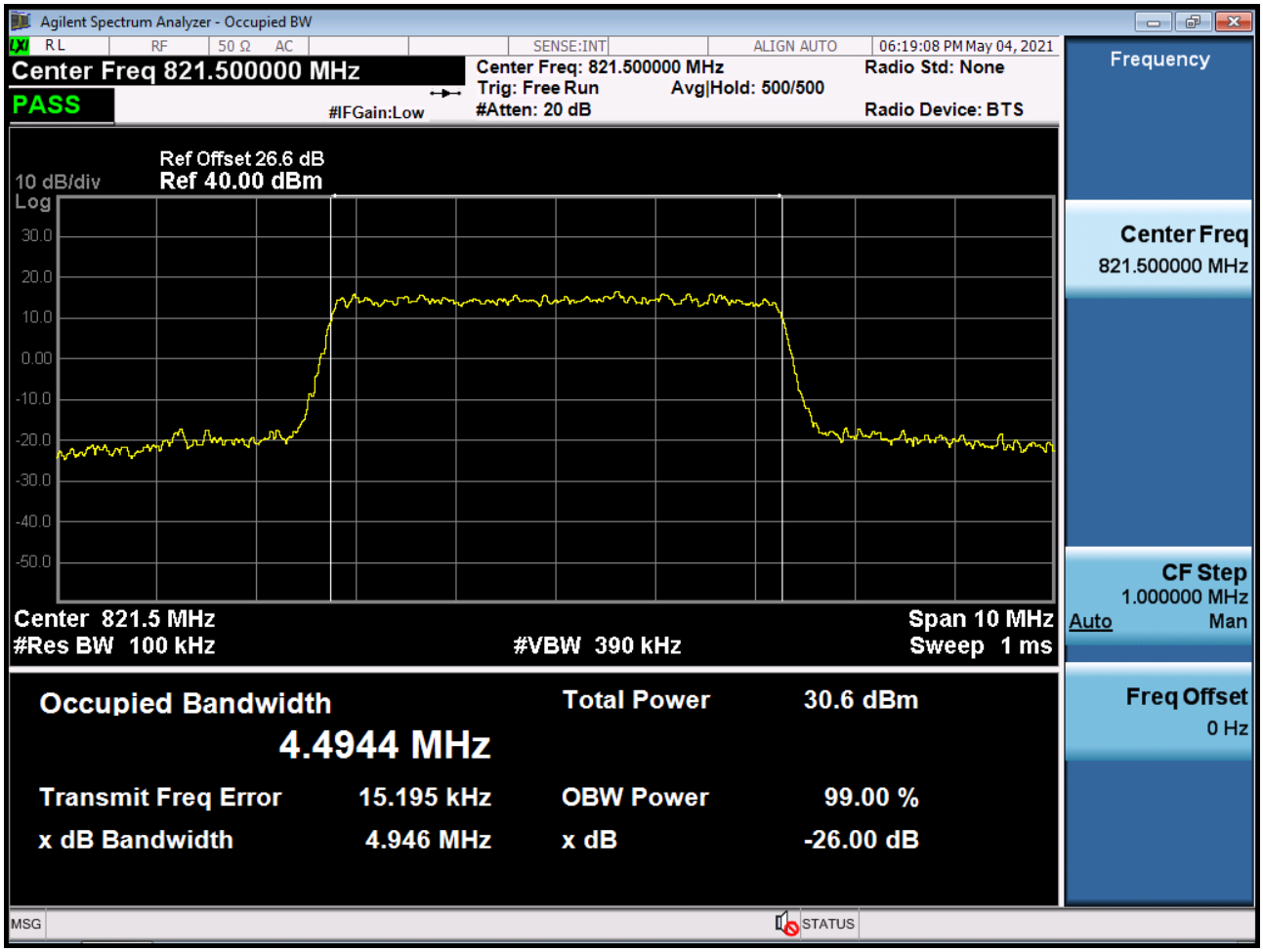
BAND 26. Occupied Bandwidth Plot (5M BW Ch.26765 QPSK RB 25_0)



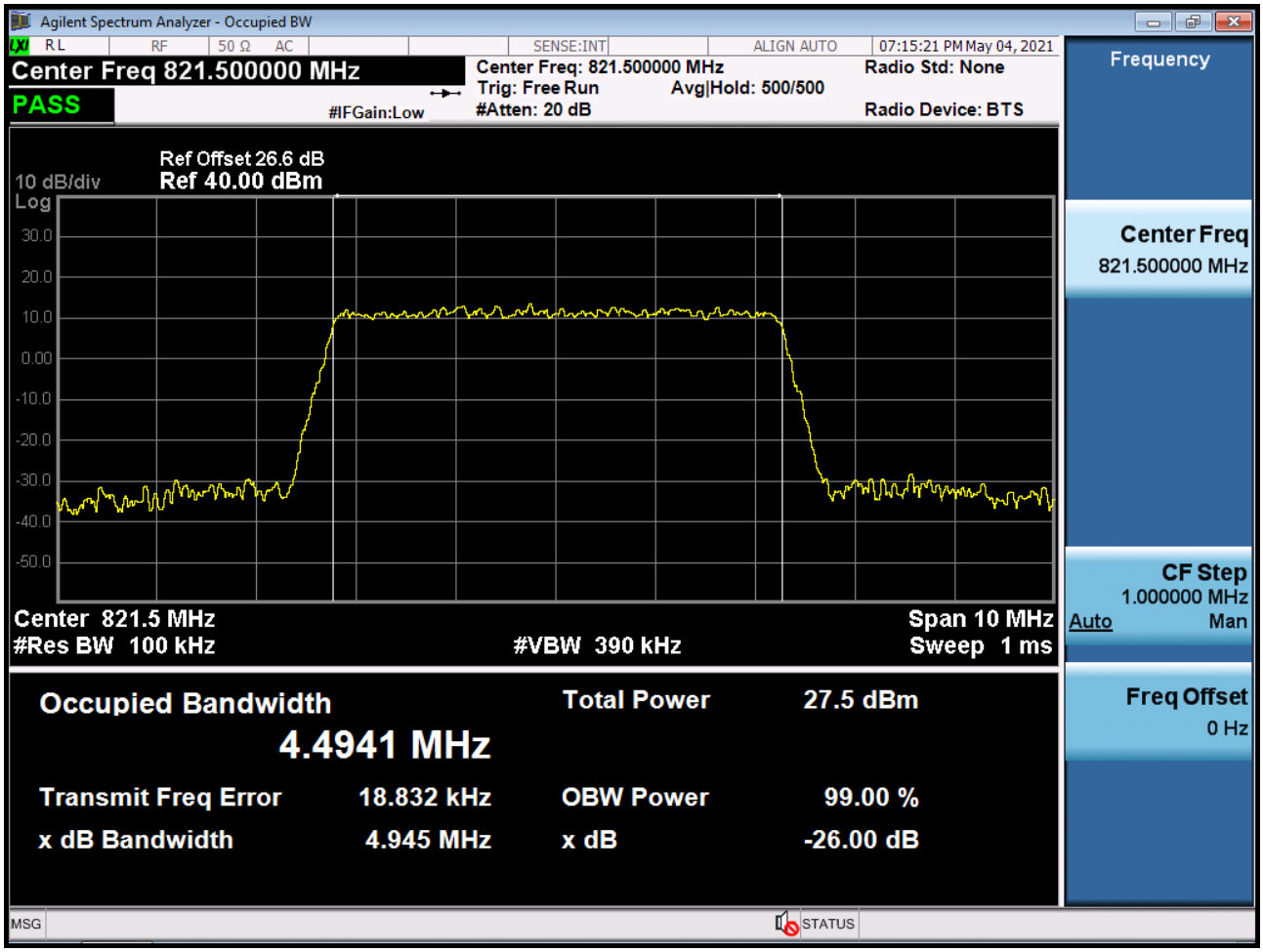
BAND 26. Occupied Bandwidth Plot (5M BW Ch.26765 16QAM RB 25_0)



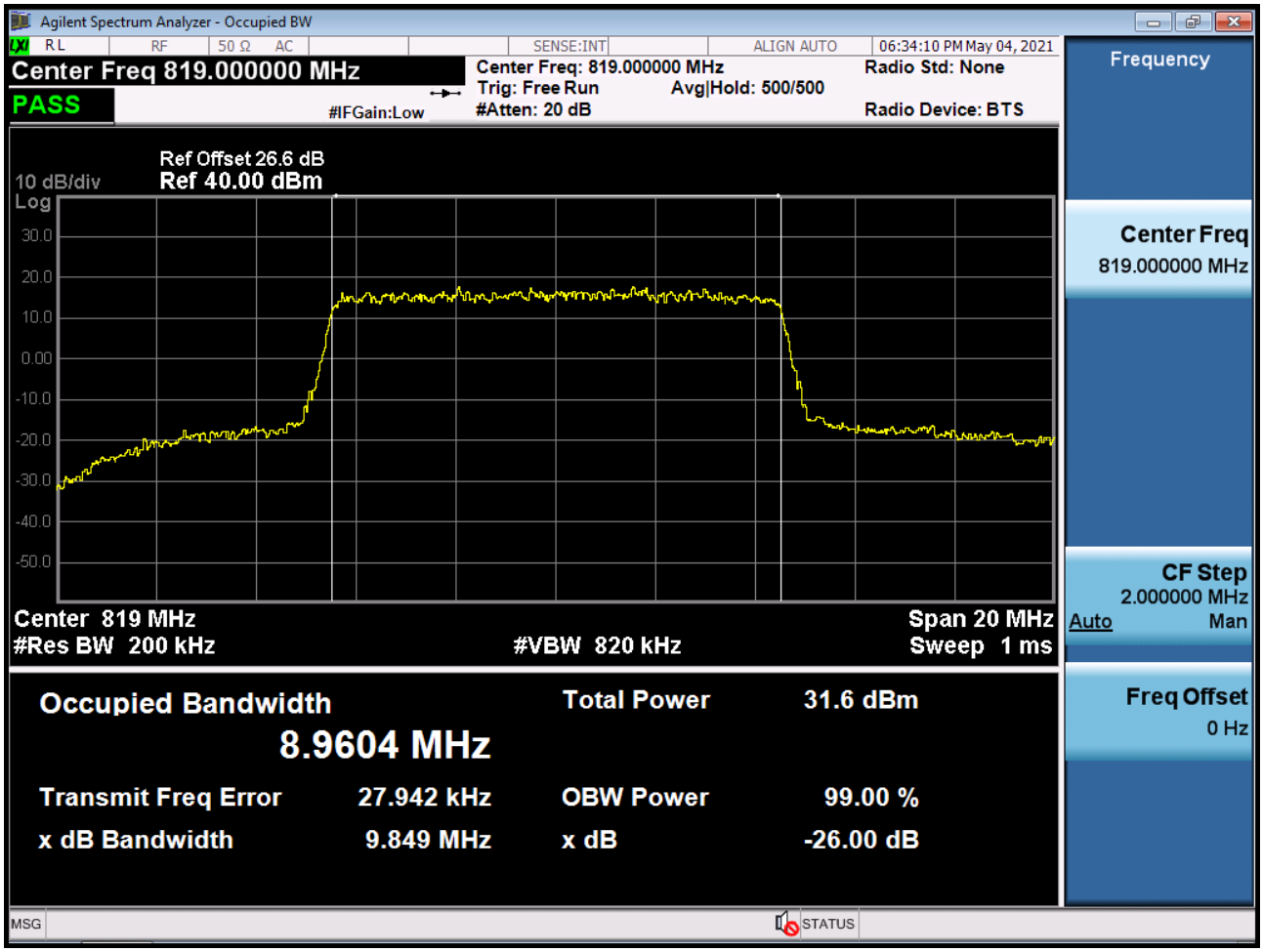
BAND 26. Occupied Bandwidth Plot (5M BW Ch.26765 64QAM RB 25_0)



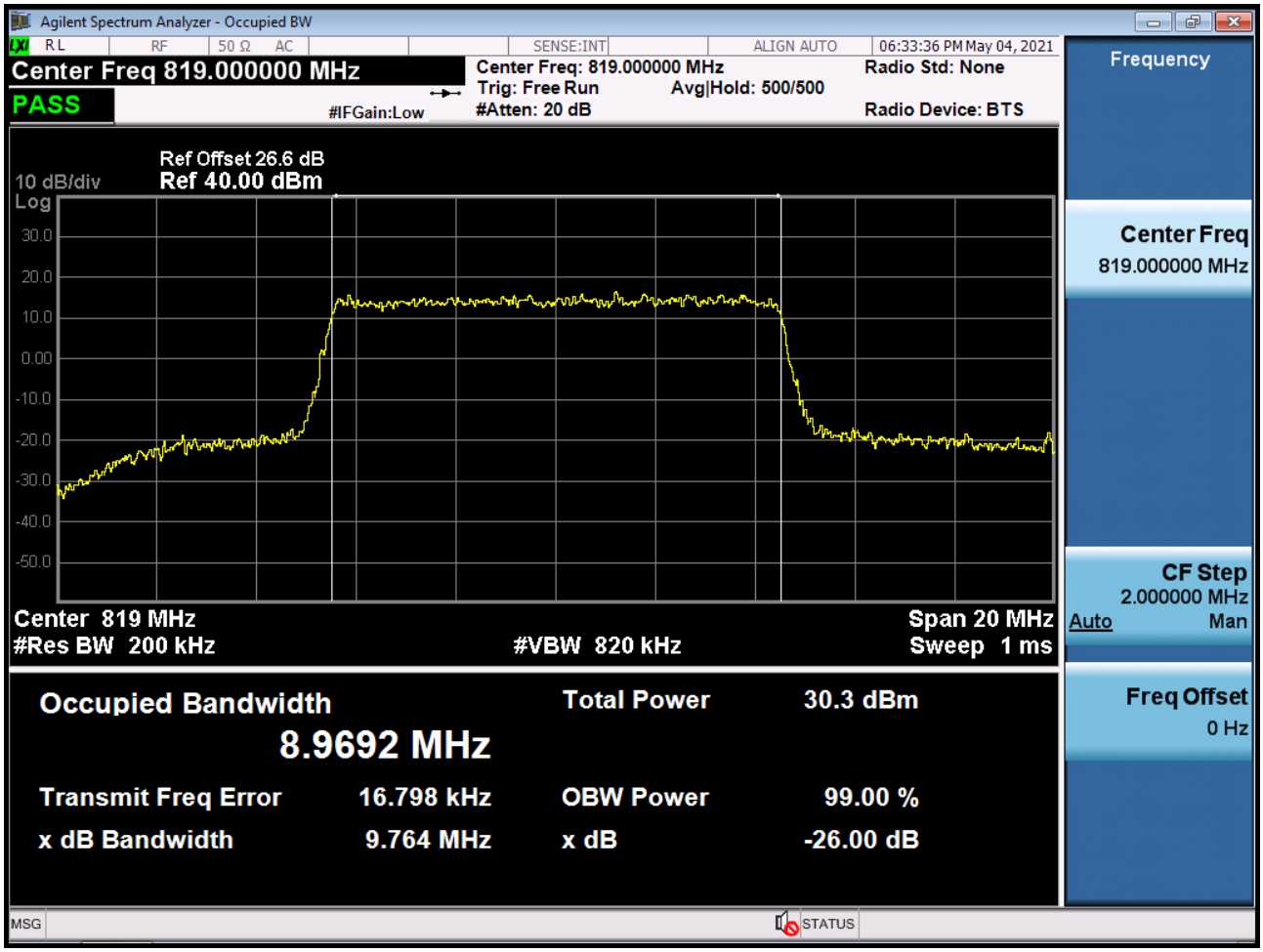
BAND 26. Occupied Bandwidth Plot (5M BW Ch.26765 256QAM RB 25_0)



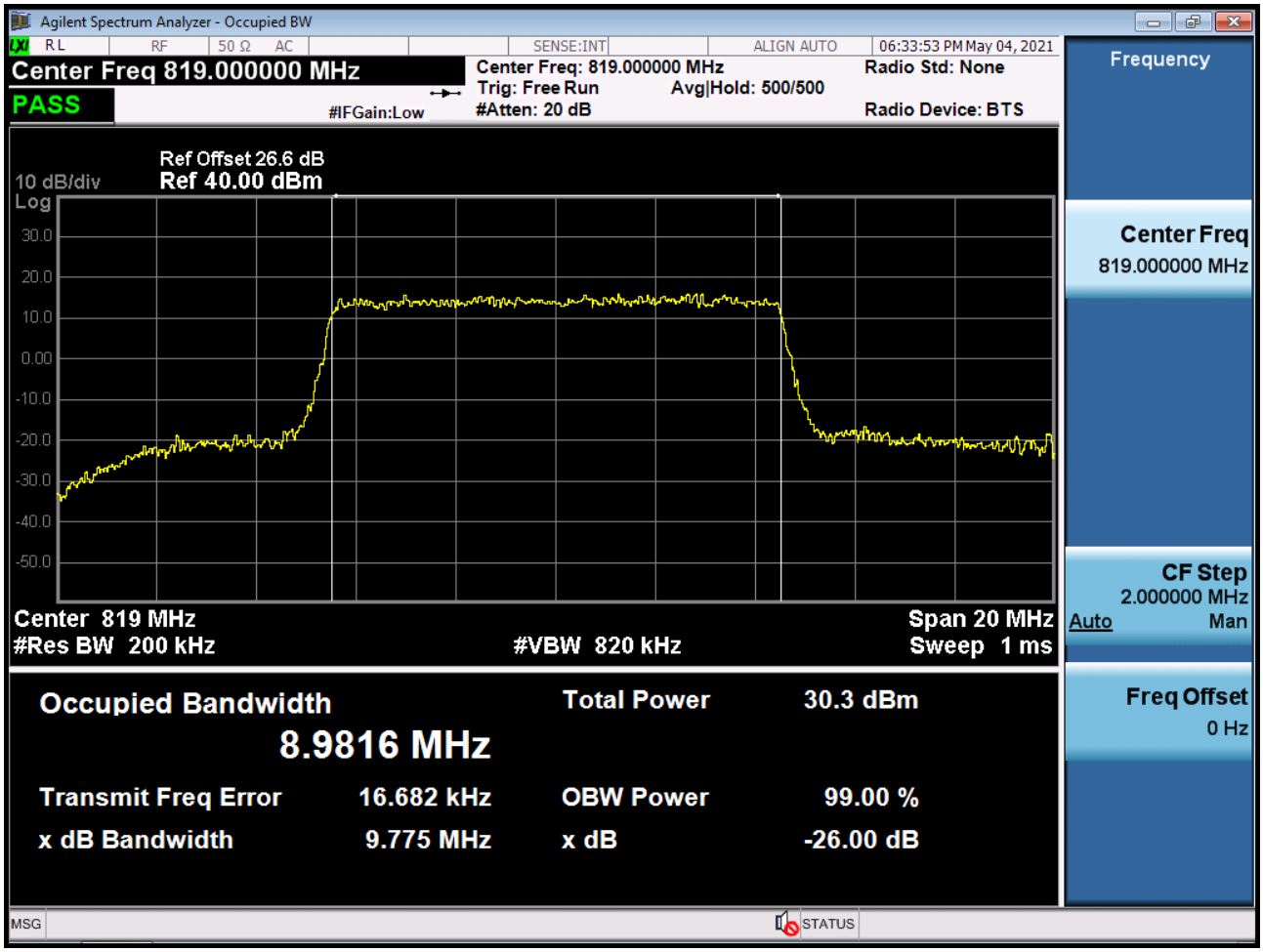
BAND 26. Occupied Bandwidth Plot (10M BW Ch.26740 QPSK RB 50_0)



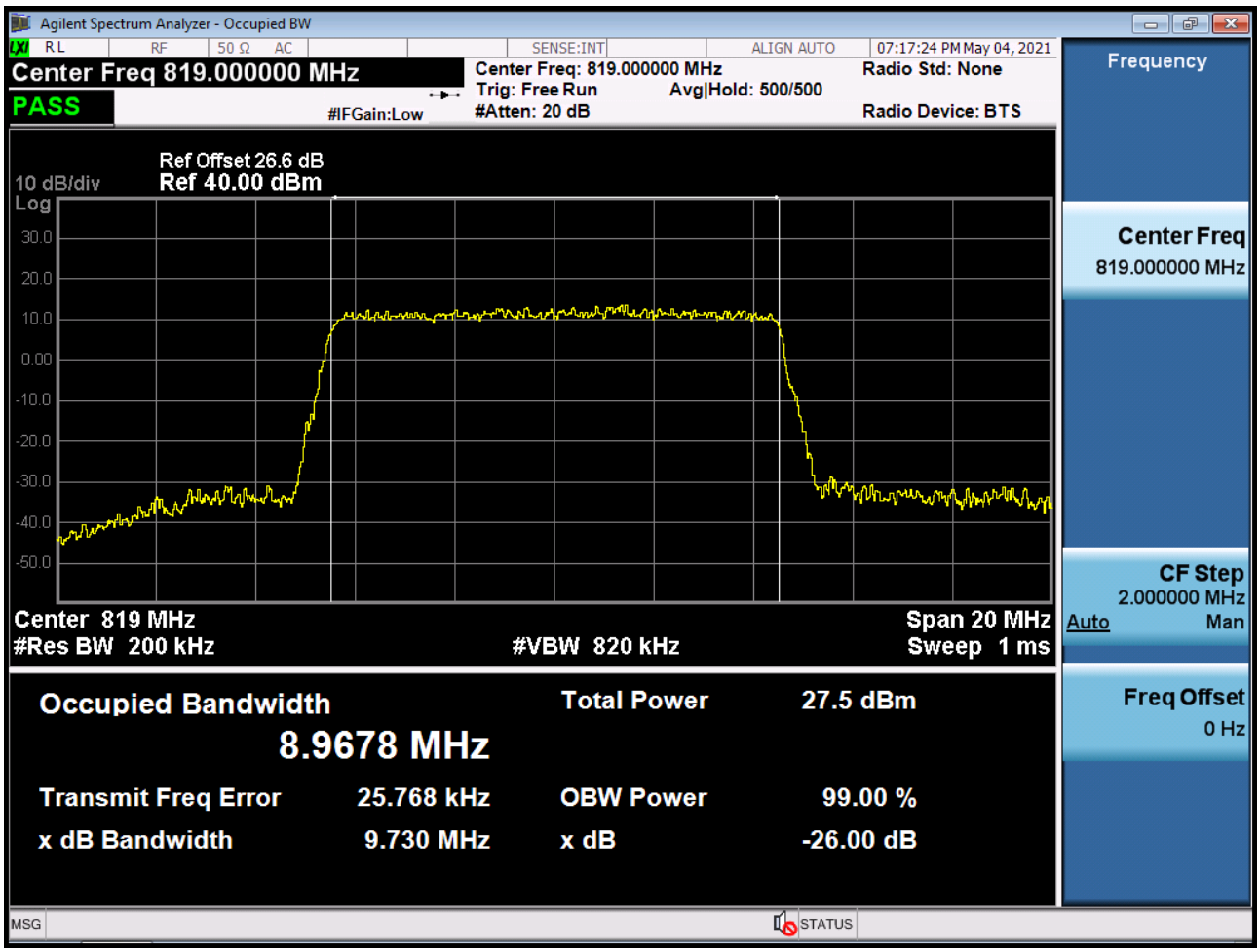
BAND 26. Occupied Bandwidth Plot (10M BW Ch.26740 16QAM RB 50_0)



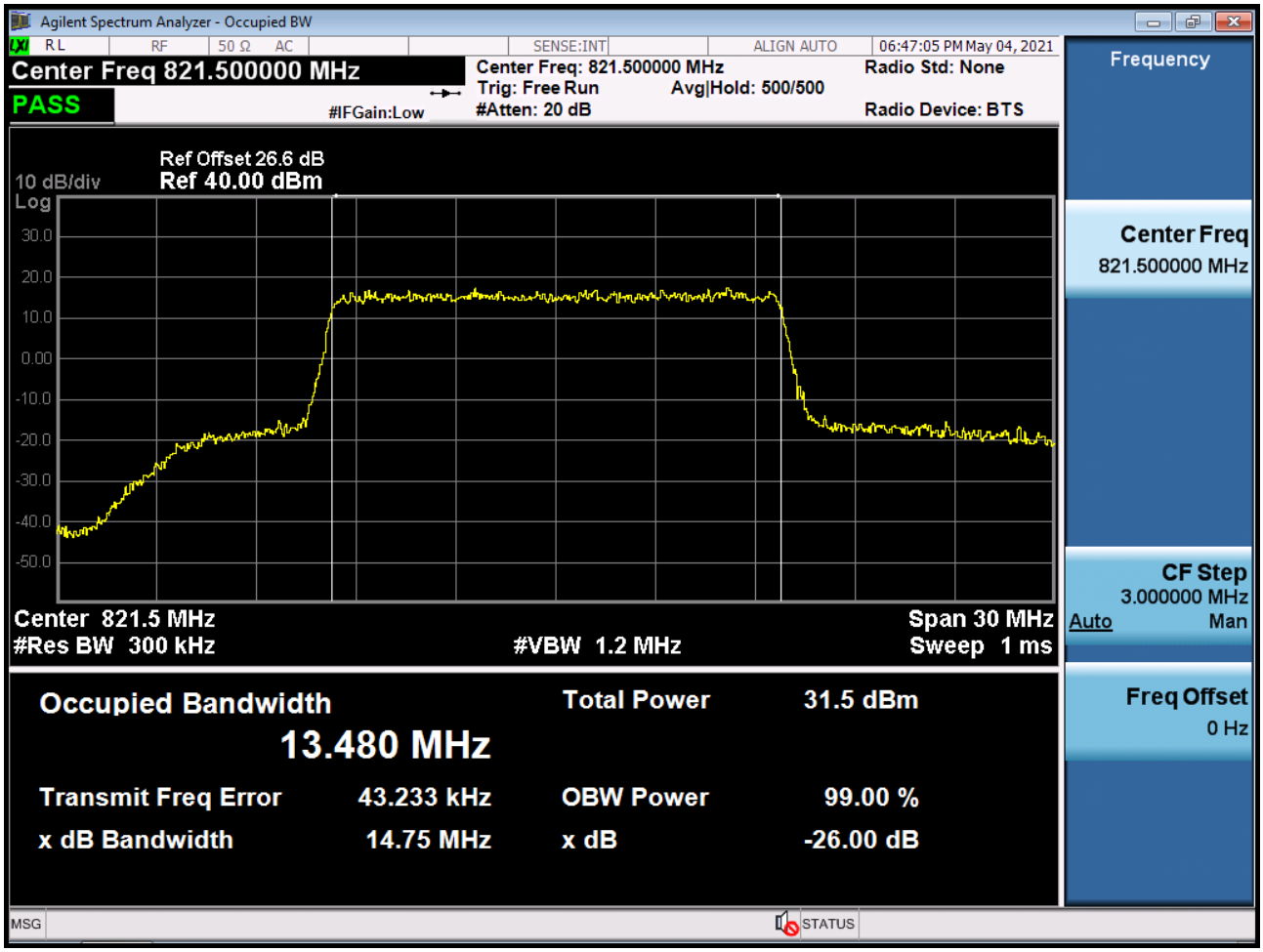
BAND 26. Occupied Bandwidth Plot (10M BW Ch.26740 64QAM RB 50_0)



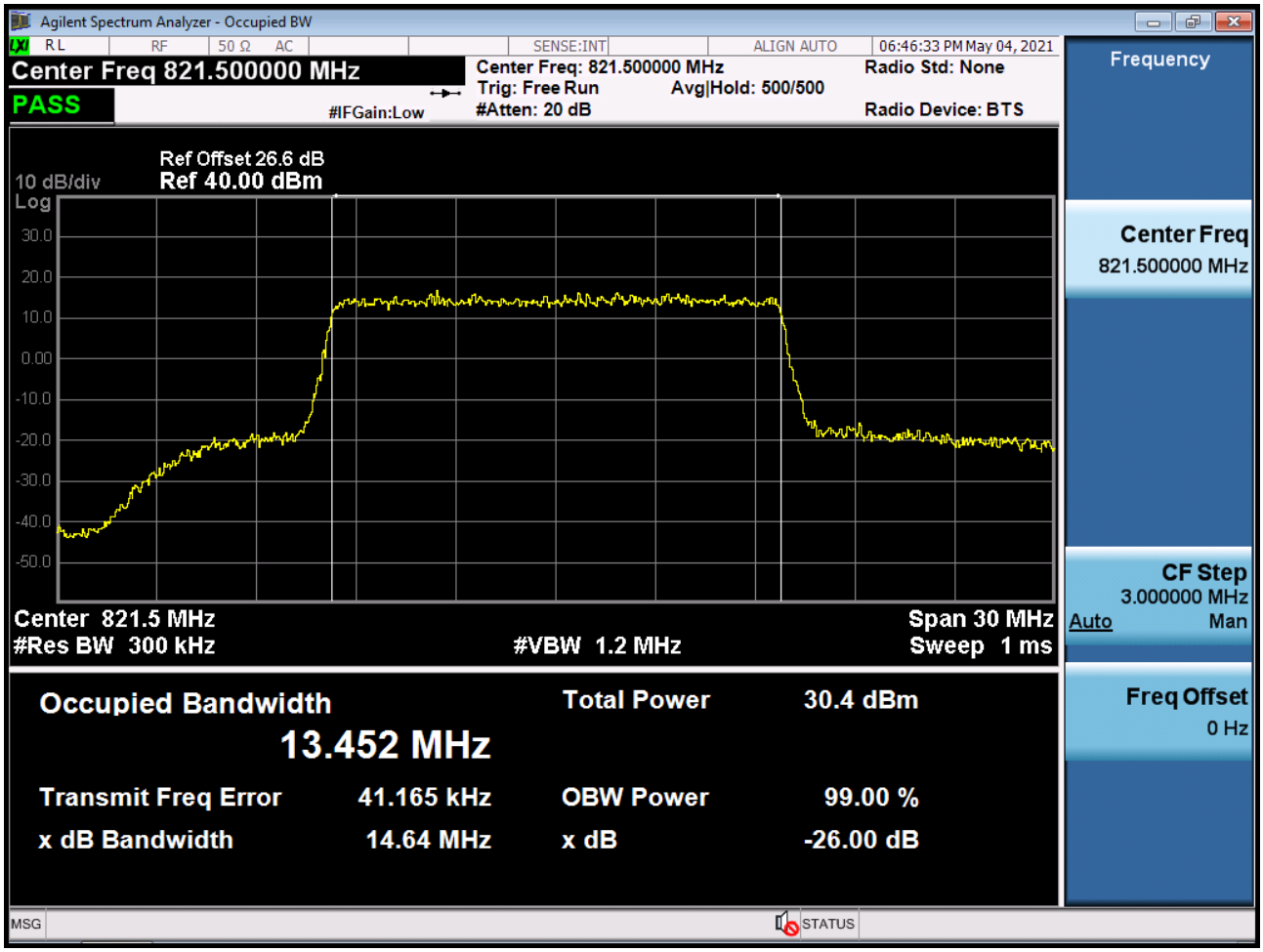
BAND 26. Occupied Bandwidth Plot (10M BW Ch.26740 256QAM RB 50_0)



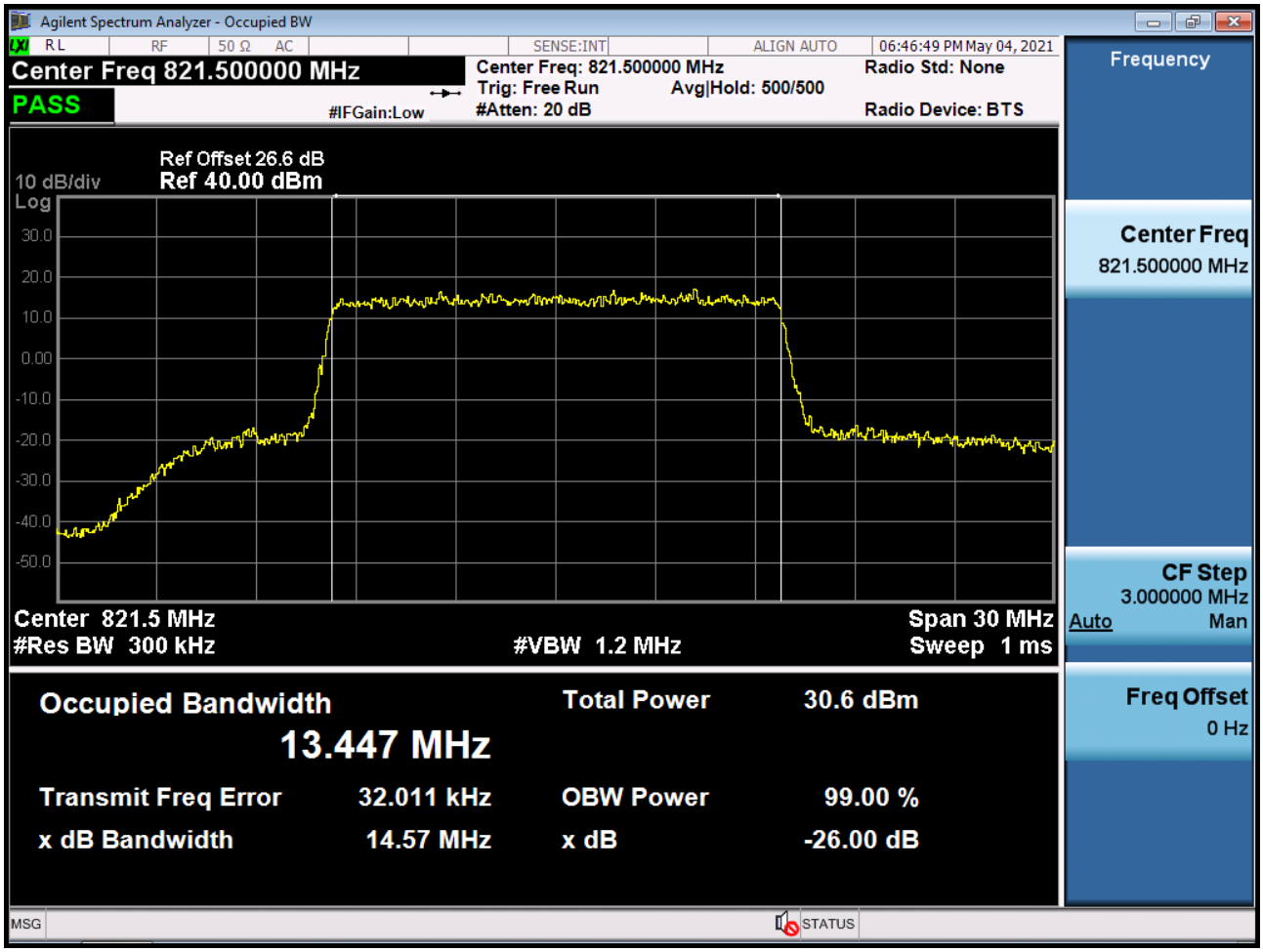
BAND 26. Occupied Bandwidth Plot (15M BW Ch.26765 QPSK RB 75_0)



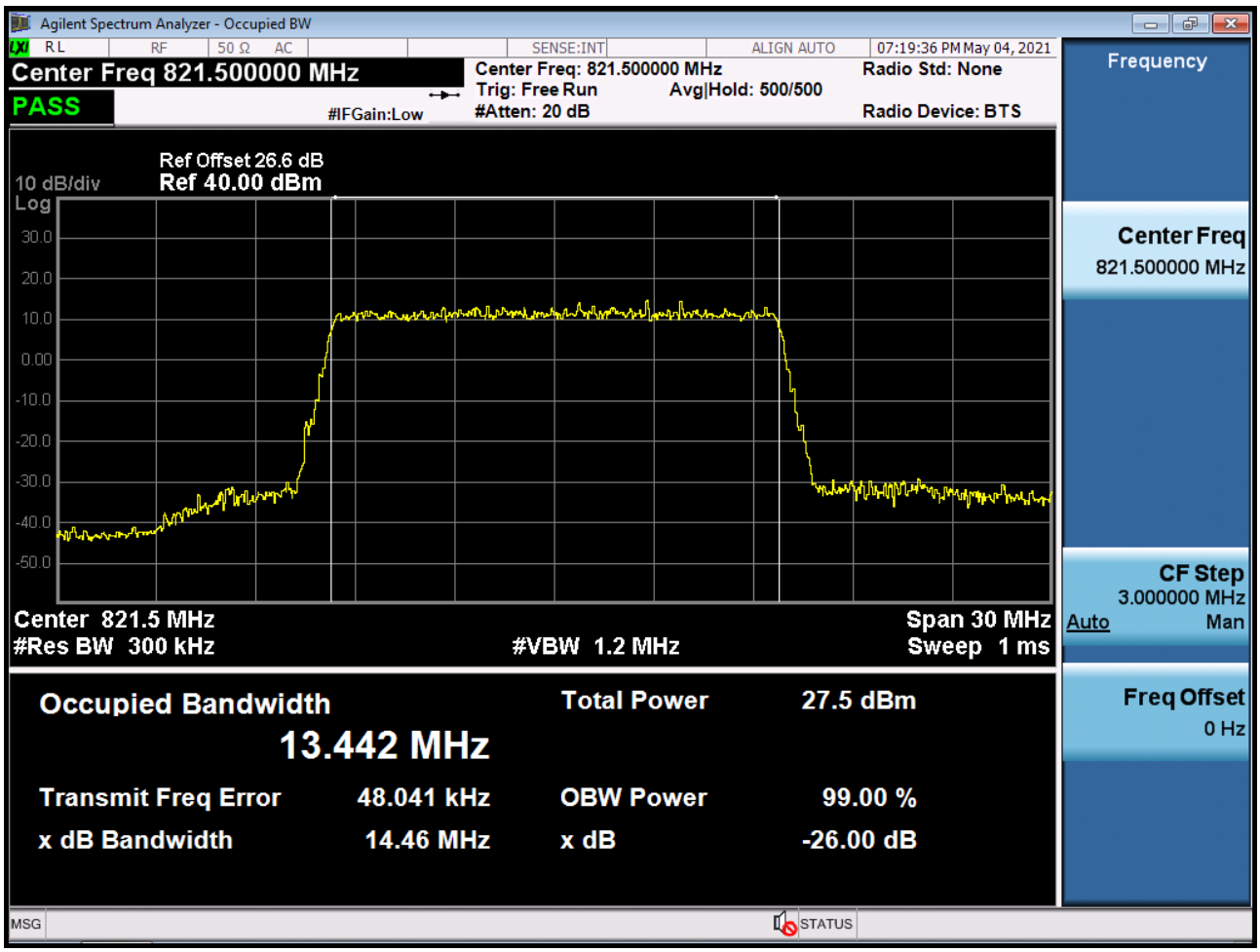
BAND 26. Occupied Bandwidth Plot (15M BW Ch.26765 16QAM RB 75_0)



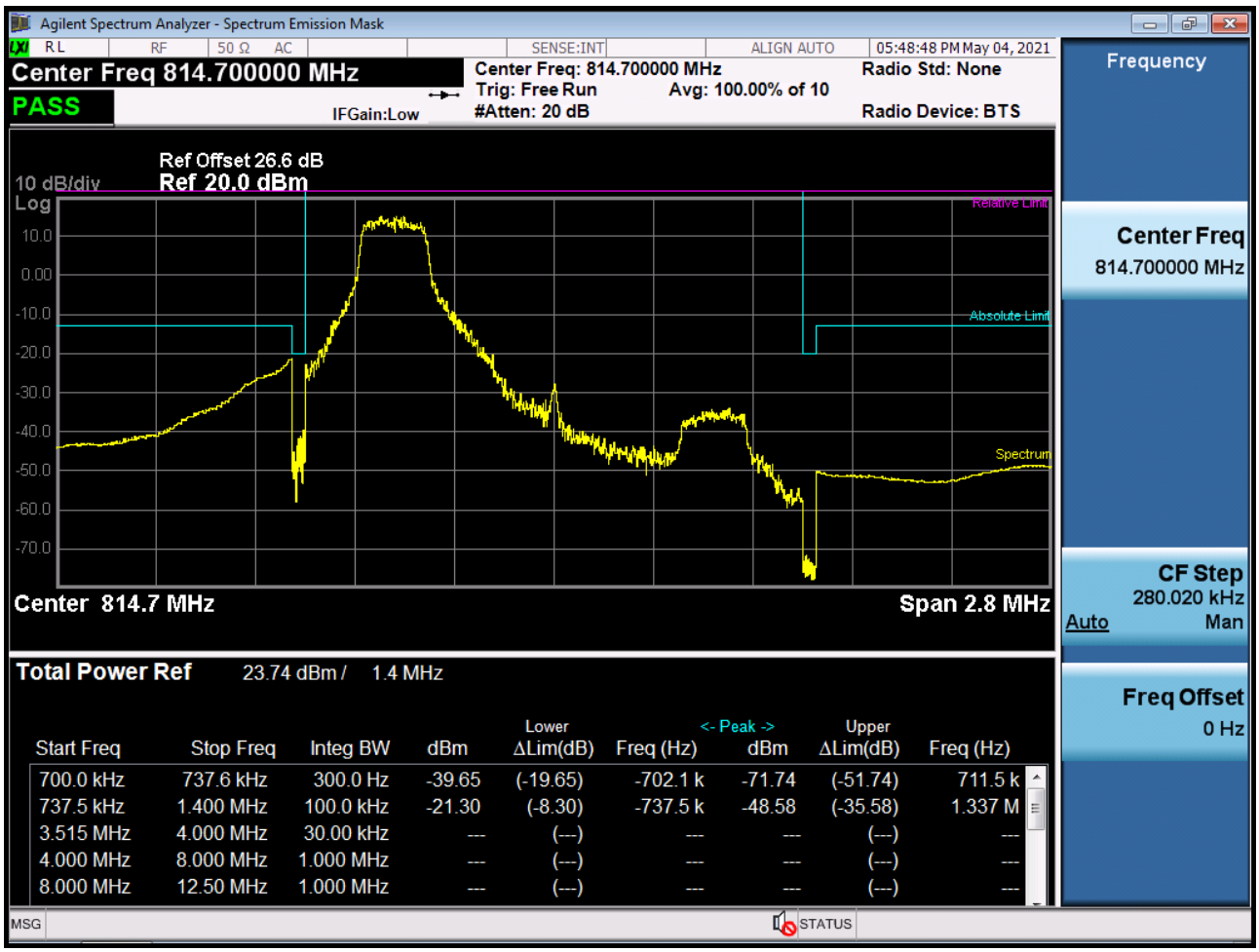
BAND 26. Occupied Bandwidth Plot (15M BW Ch.26765 64QAM RB 75_0)



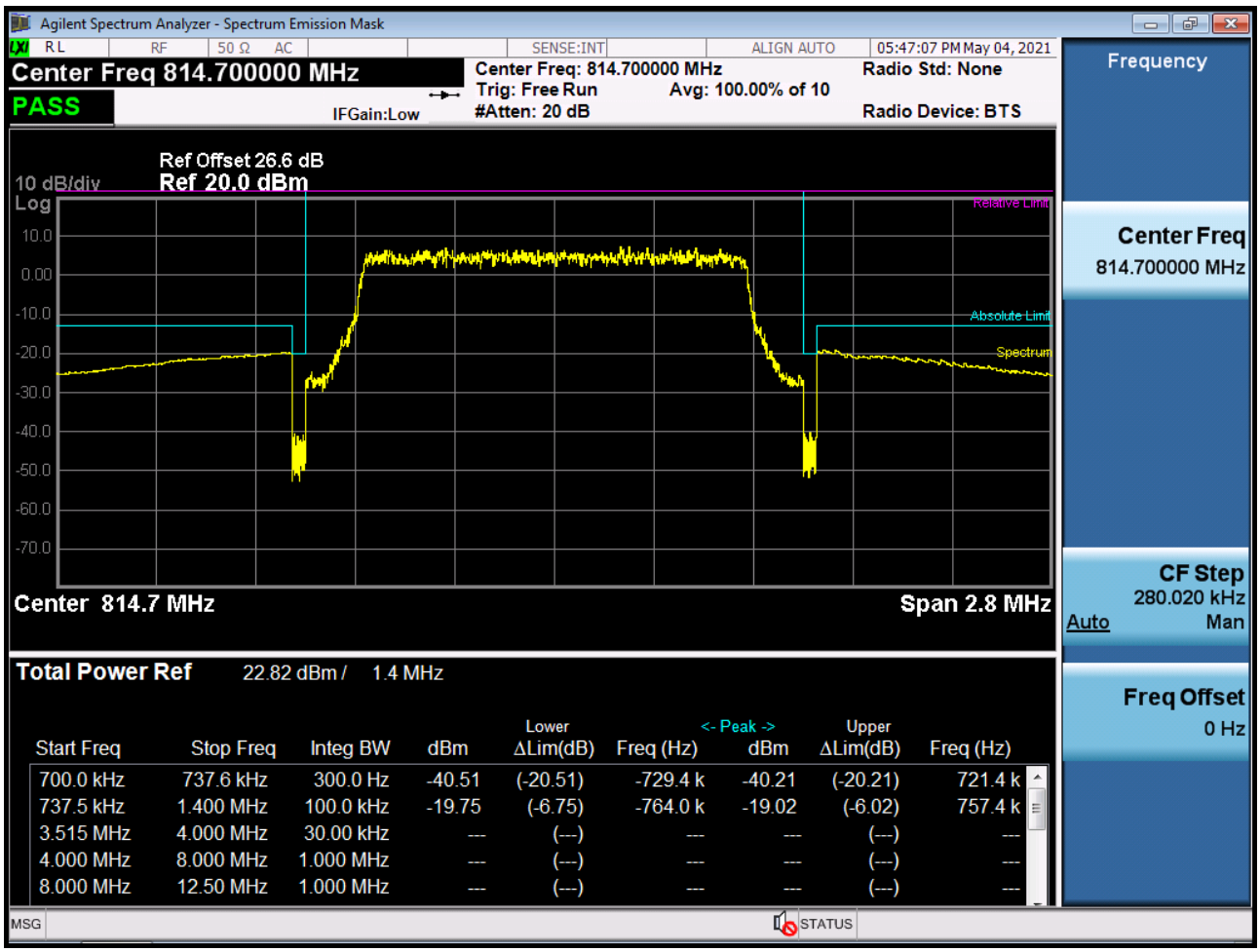
BAND 26. Occupied Bandwidth Plot (15M BW Ch.26765 256QAM RB 75_0)



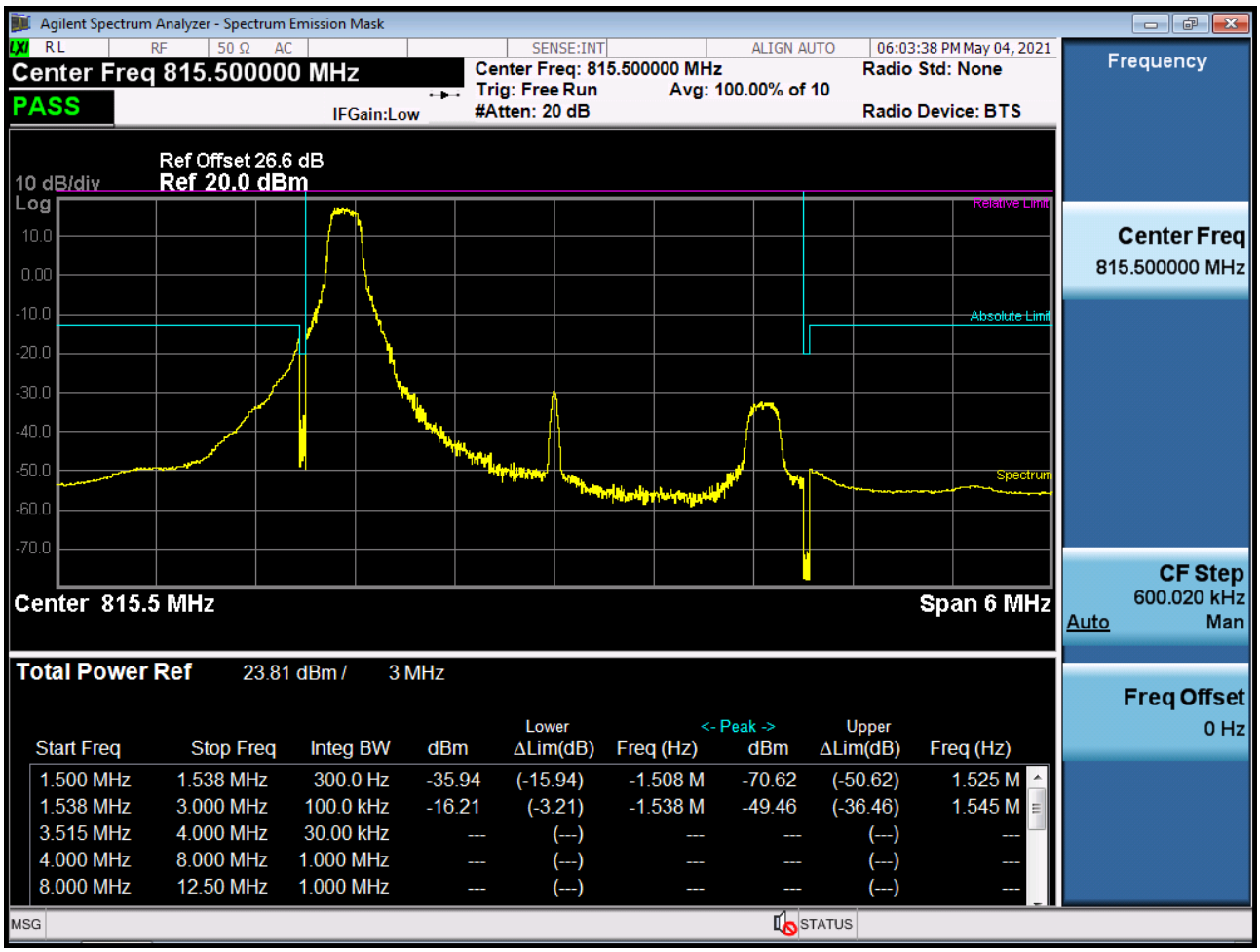
BAND 26. Lower Channel Edge Plot (1.4M BW Ch.26697 QPSK RB 1, Offset 0)



BAND 26. Lower Channel Edge Plot (1.4M BW Ch.26697 QPSK_RB6_Offset 0)

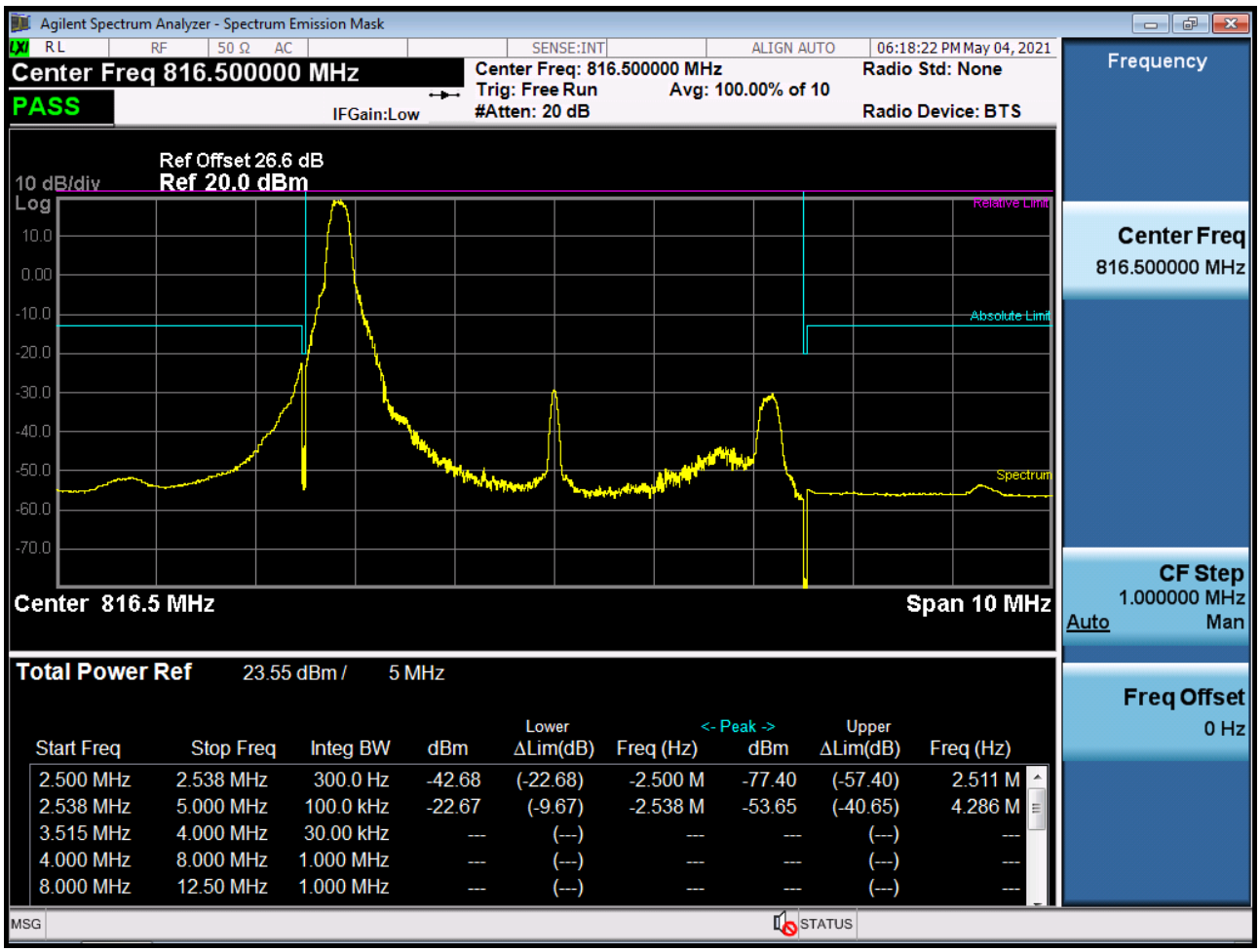


BAND 26. Lower Channel Edge Plot (3M BW Ch.26705 QPSK RB 1, Offset 0)

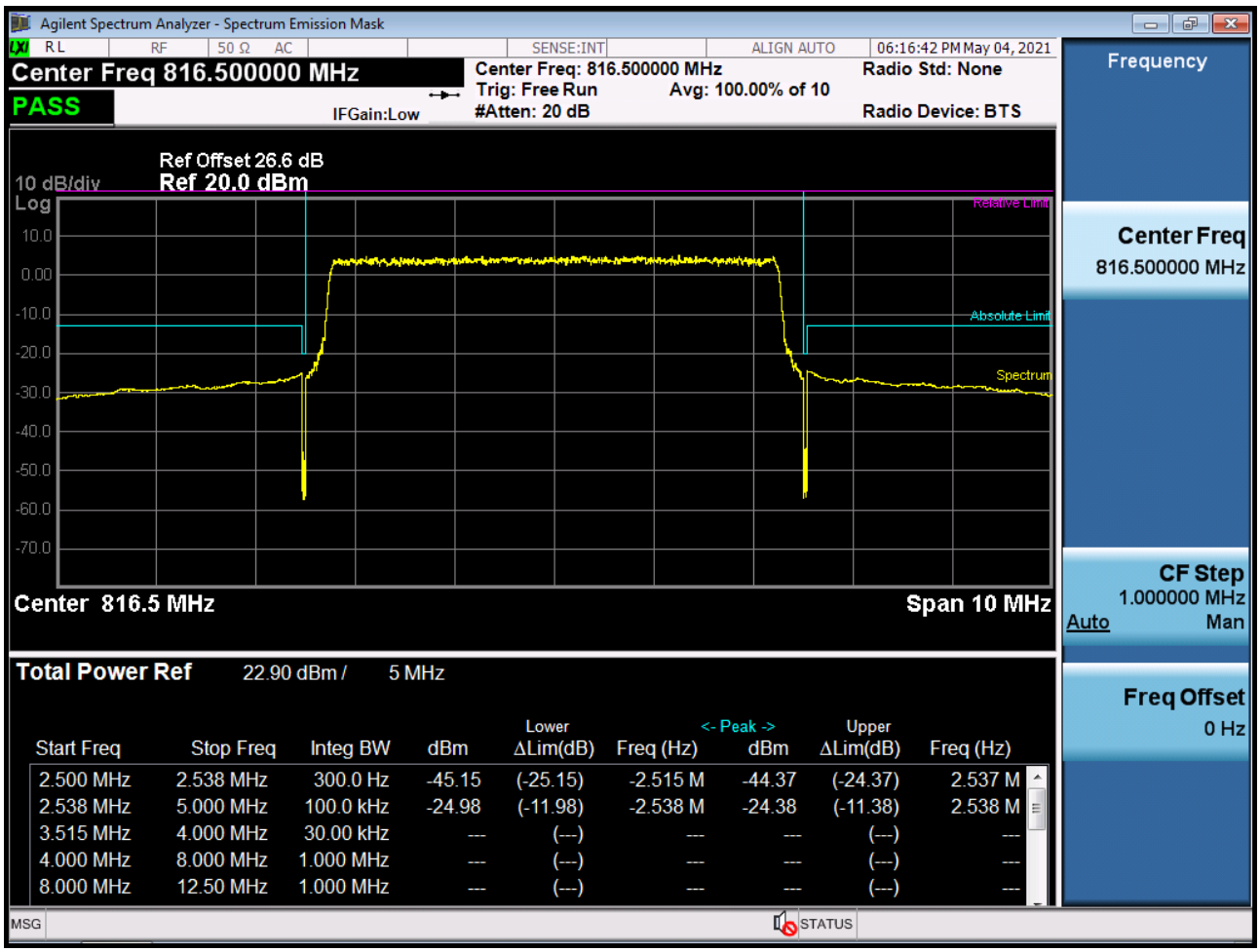


BAND 26. Lower Channel Edge Plot (3M BW Ch.26705 QPSK_RB15_Offset 0)

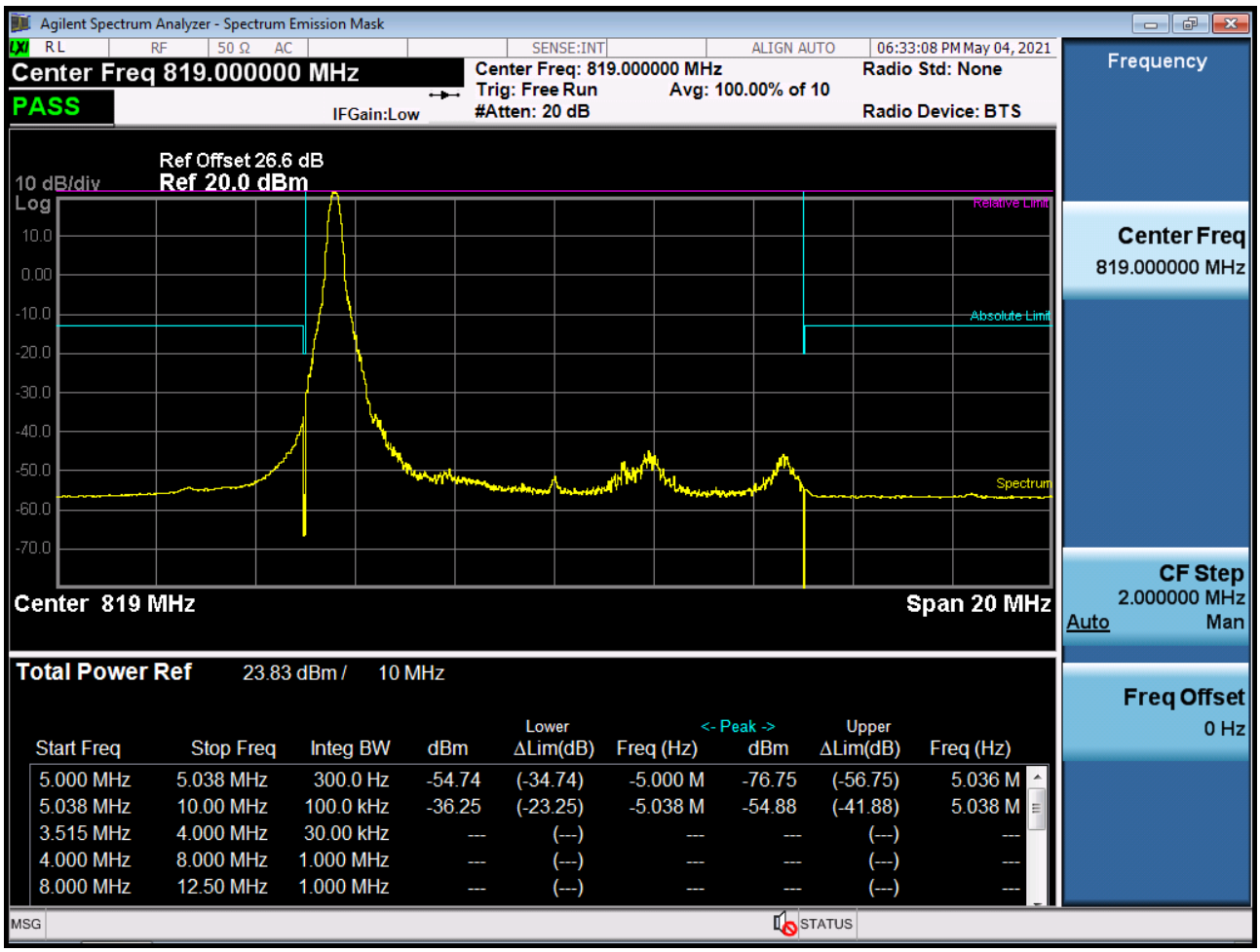
BAND 26. Lower Channel Edge Plot (5M BW Ch.26715 QPSK RB 1, Offset 0)



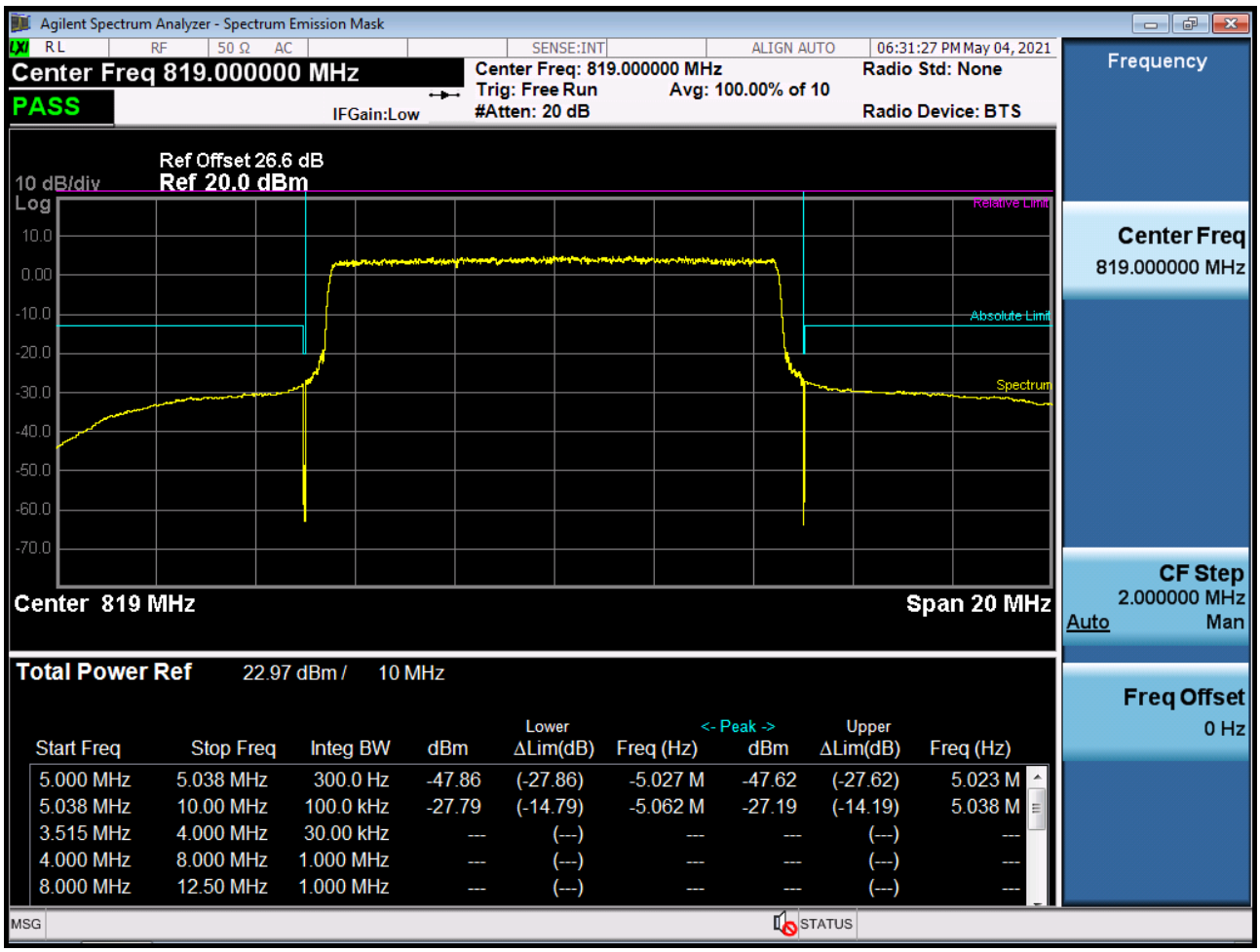
BAND 26. Lower Channel Edge Plot (5M BW Ch.26715 QPSK_RB25_Offset 0)



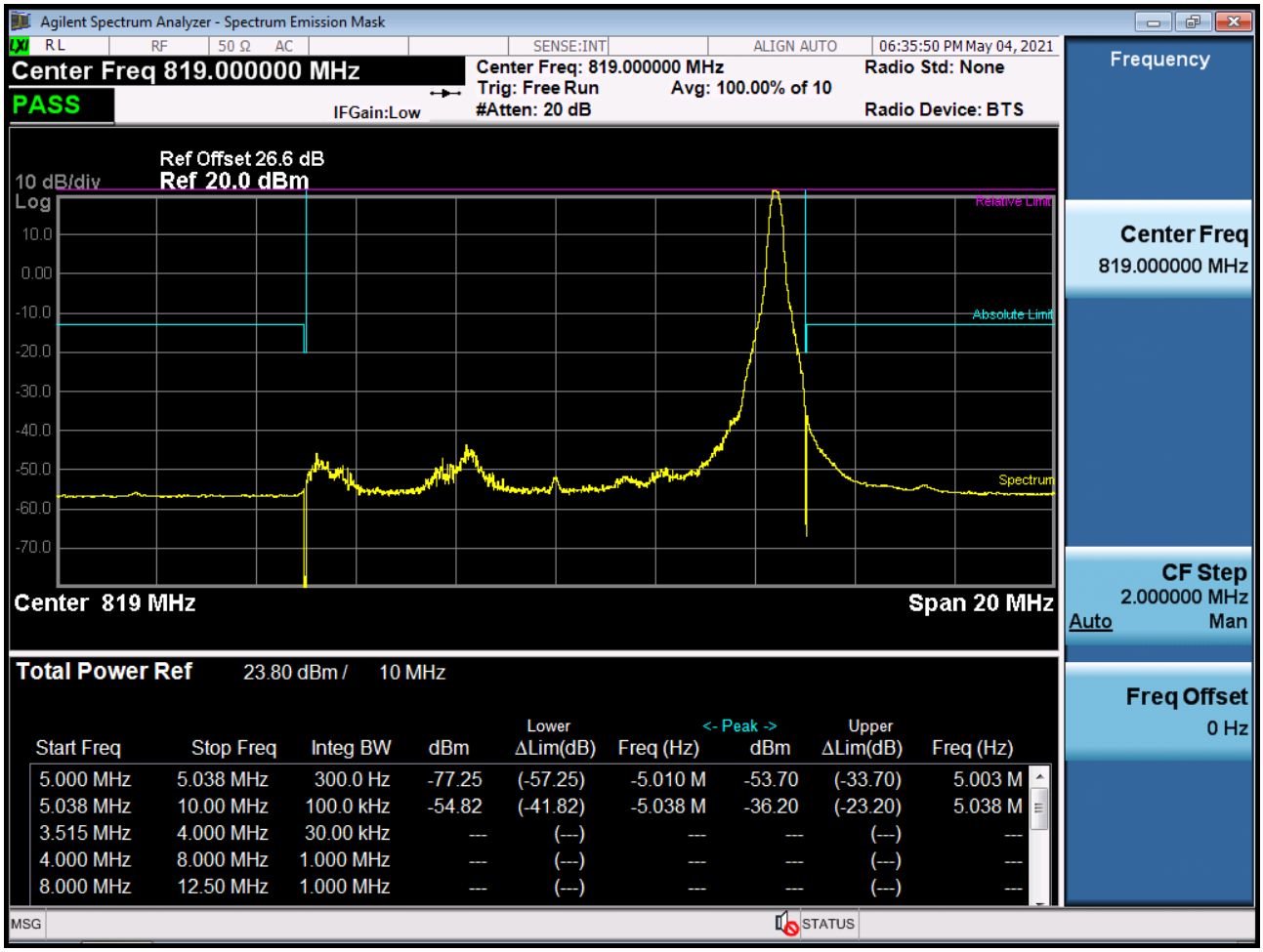
BAND 26. Low Channel Edge Plot (10M BW Ch.26740 QPSK RB 1, Offset 0)



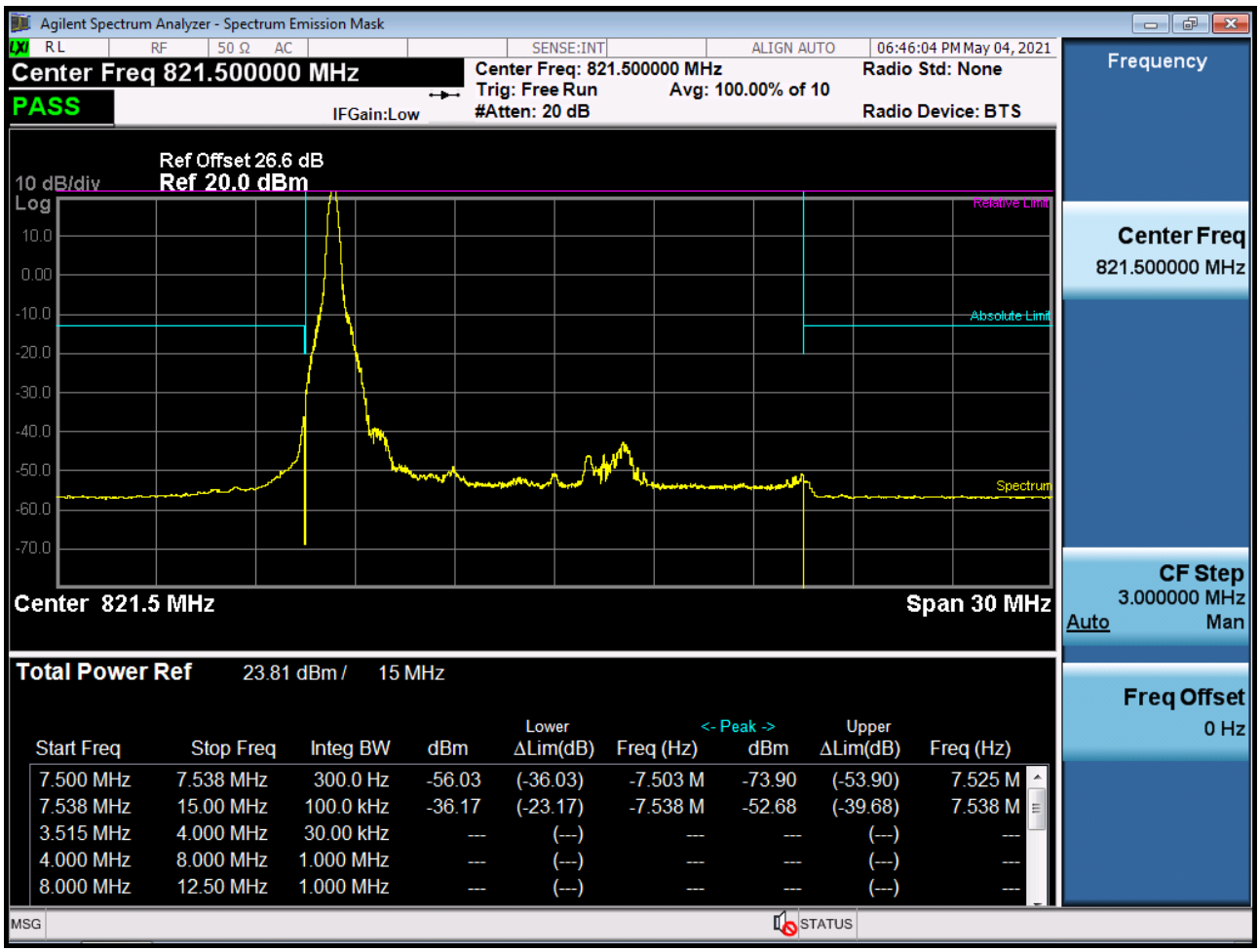
BAND 26. Low Channel Edge Plot (10M BW Ch.26740 QPSK_RB50_Offset 0)



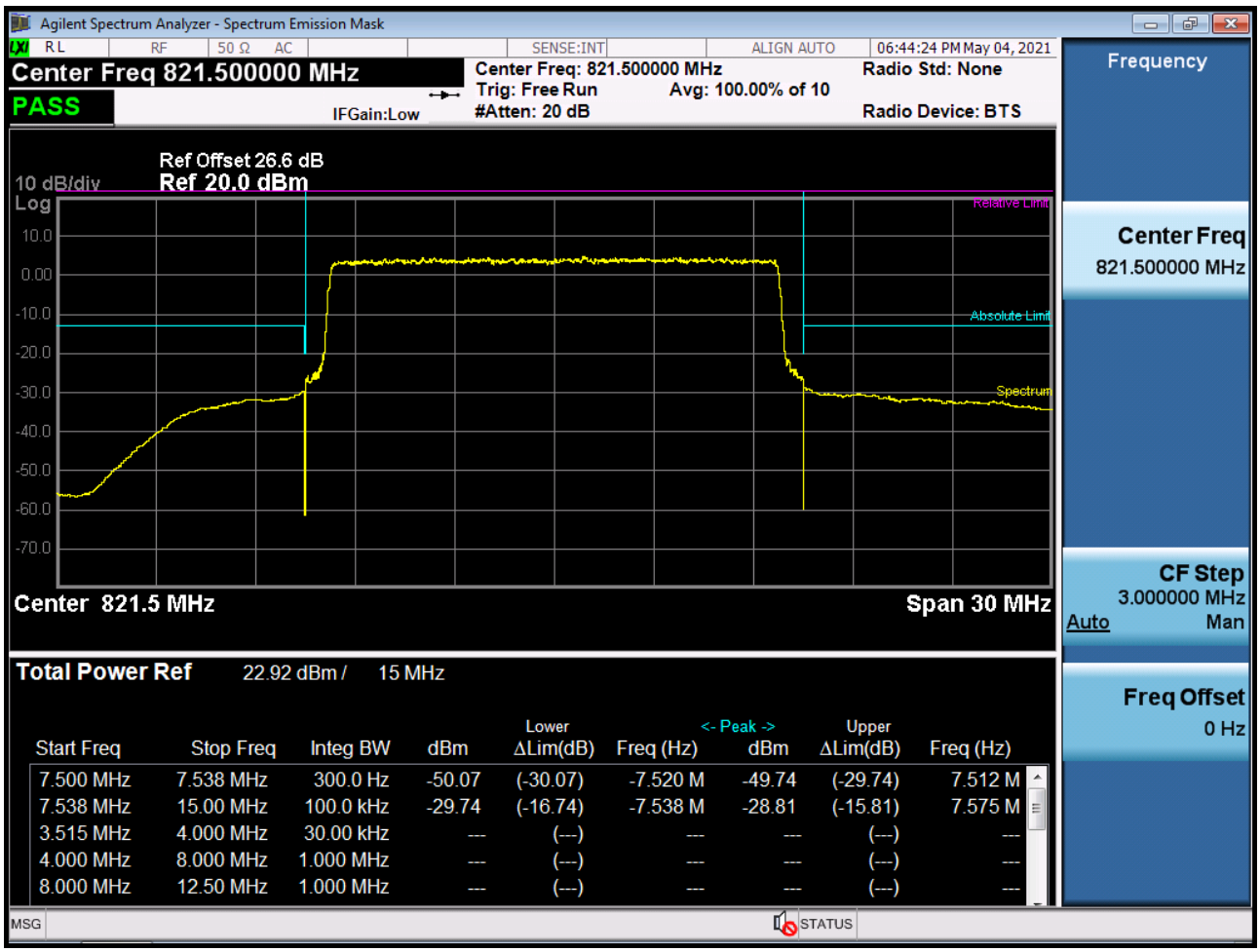
BAND 26. Mid Channel Edge Plot (10M BW Ch. 26740 QPSK_RB1_Offset 49)



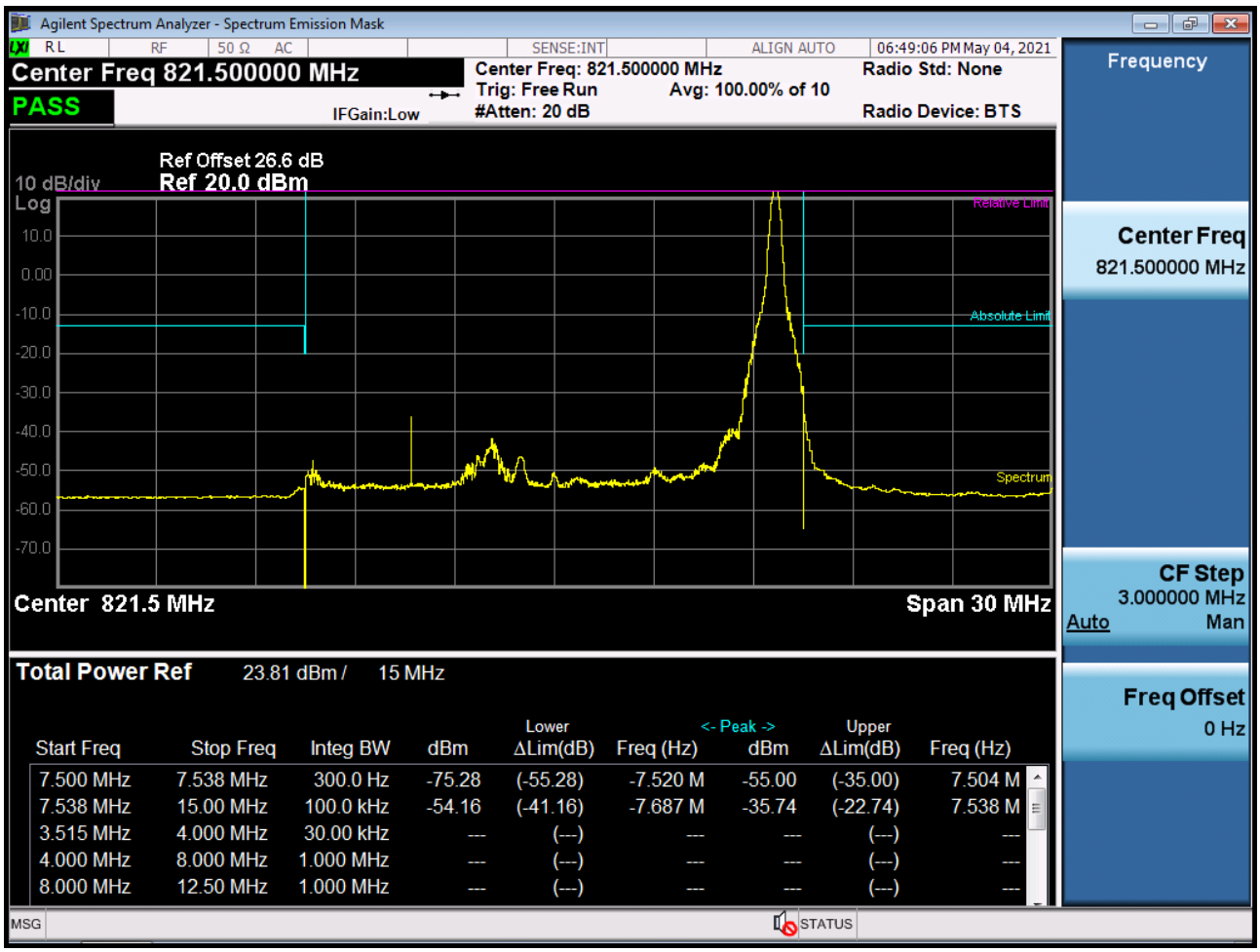
BAND 26. Low Channel Edge Plot (15M BW Ch.26765 QPSK RB 1, Offset 0)



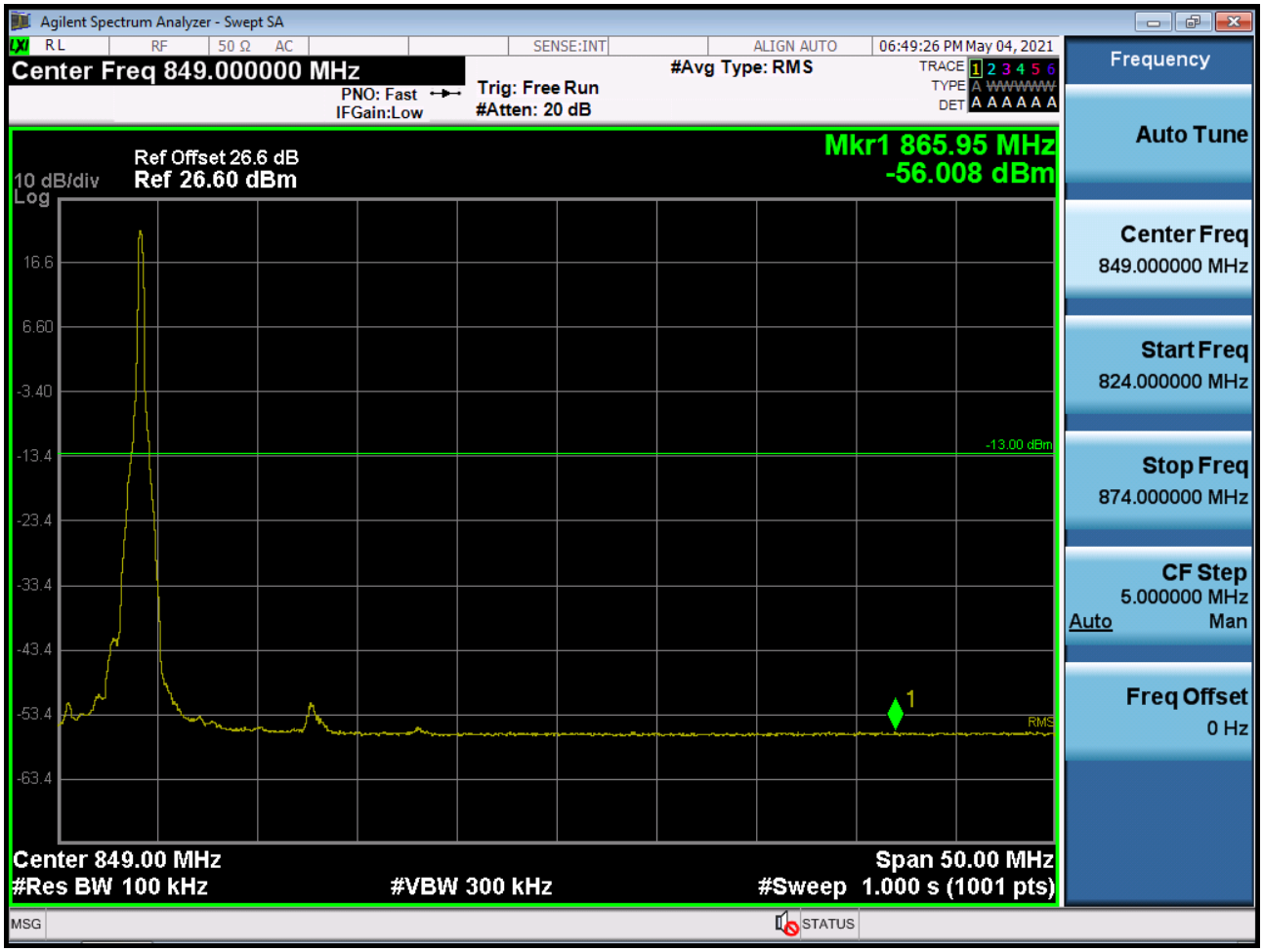
BAND 26. Low Channel Edge Plot (15M BW Ch.26765 QPSK RB 75, Offset0)



BAND 26. Mid Channel Edge Plot (15M BW Ch.26765 QPSK_RB1_Offset 74)

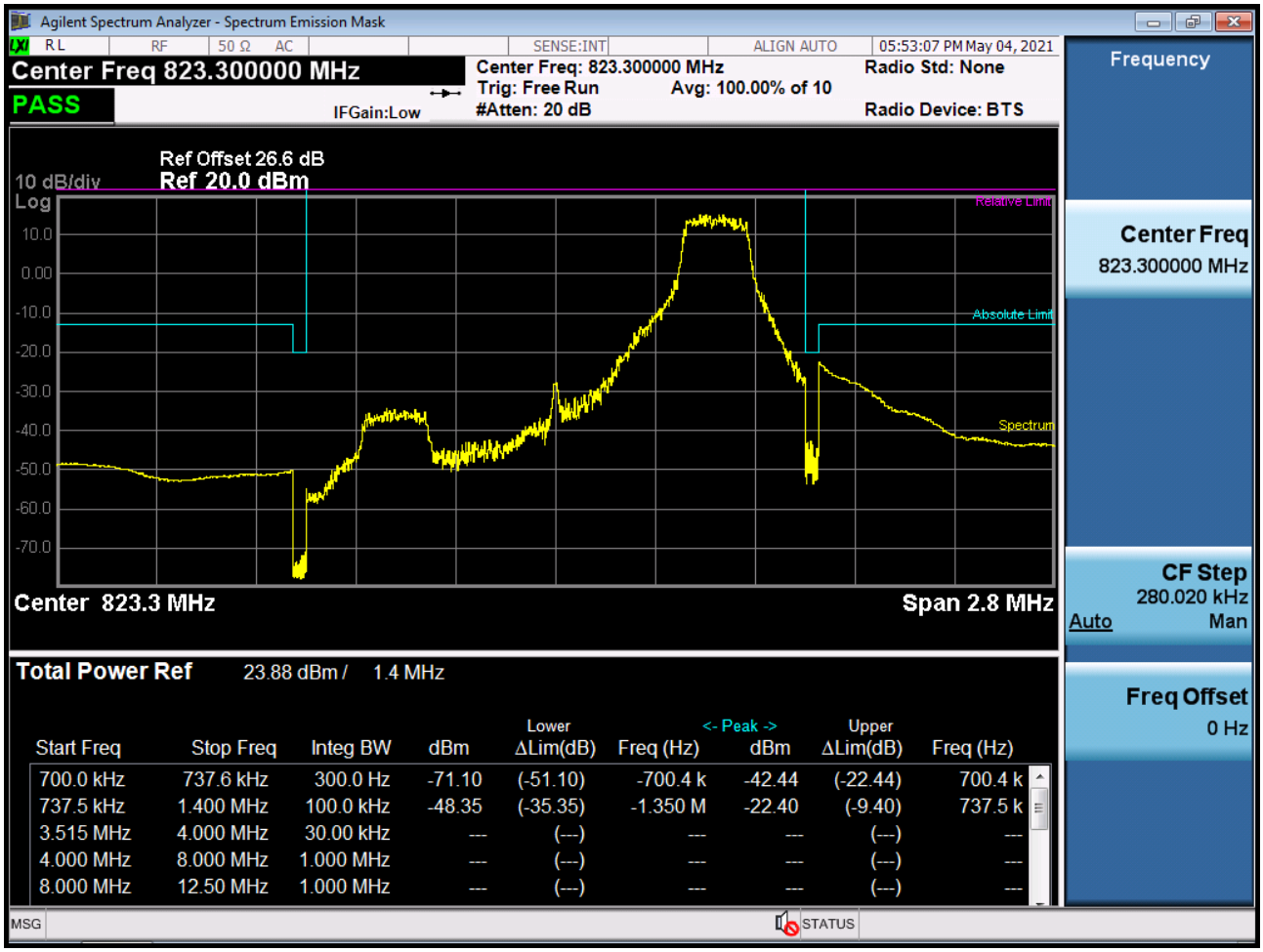


BAND 26. Mid Band Edge Plot (15M BW Ch.26765 QPSK RB 1, Offset74)

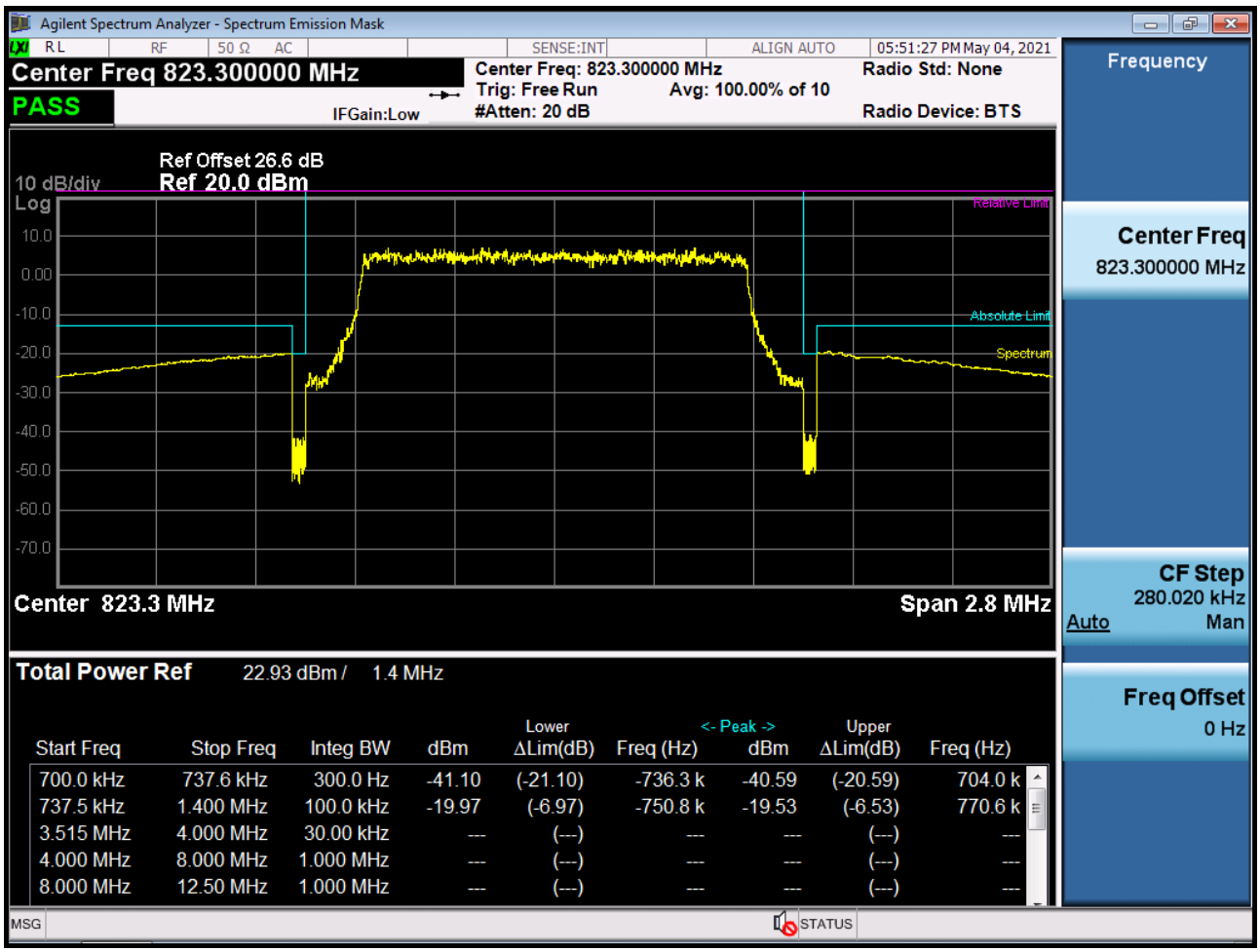


BAND 26. Mid Band Edge Plot (15M BW Ch.26765 QPSK_RB75_Offset 0)

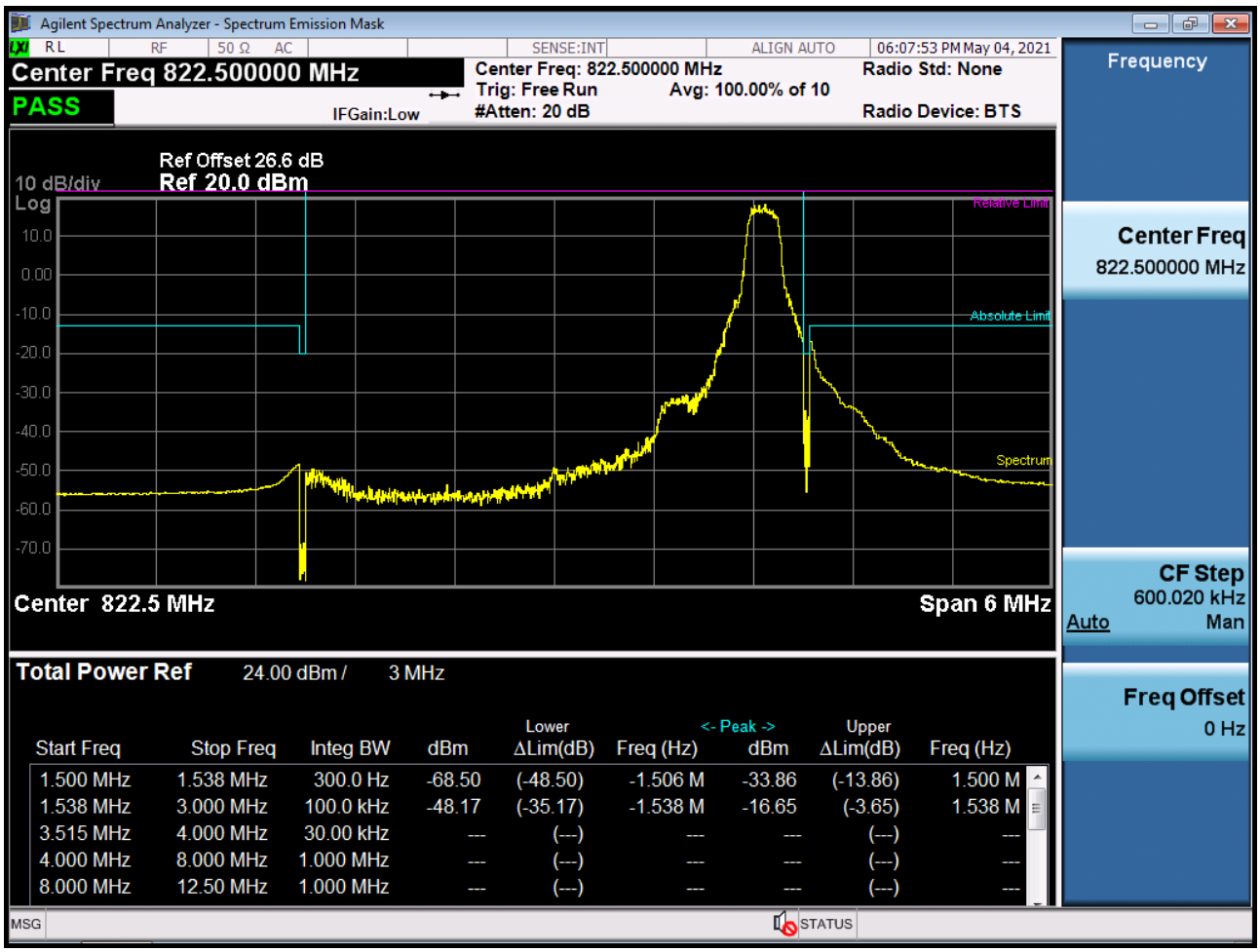
BAND 26. Upper Channel Edge Plot (1.4M BW Ch.26783 QPSK_RB1_Offset 5)



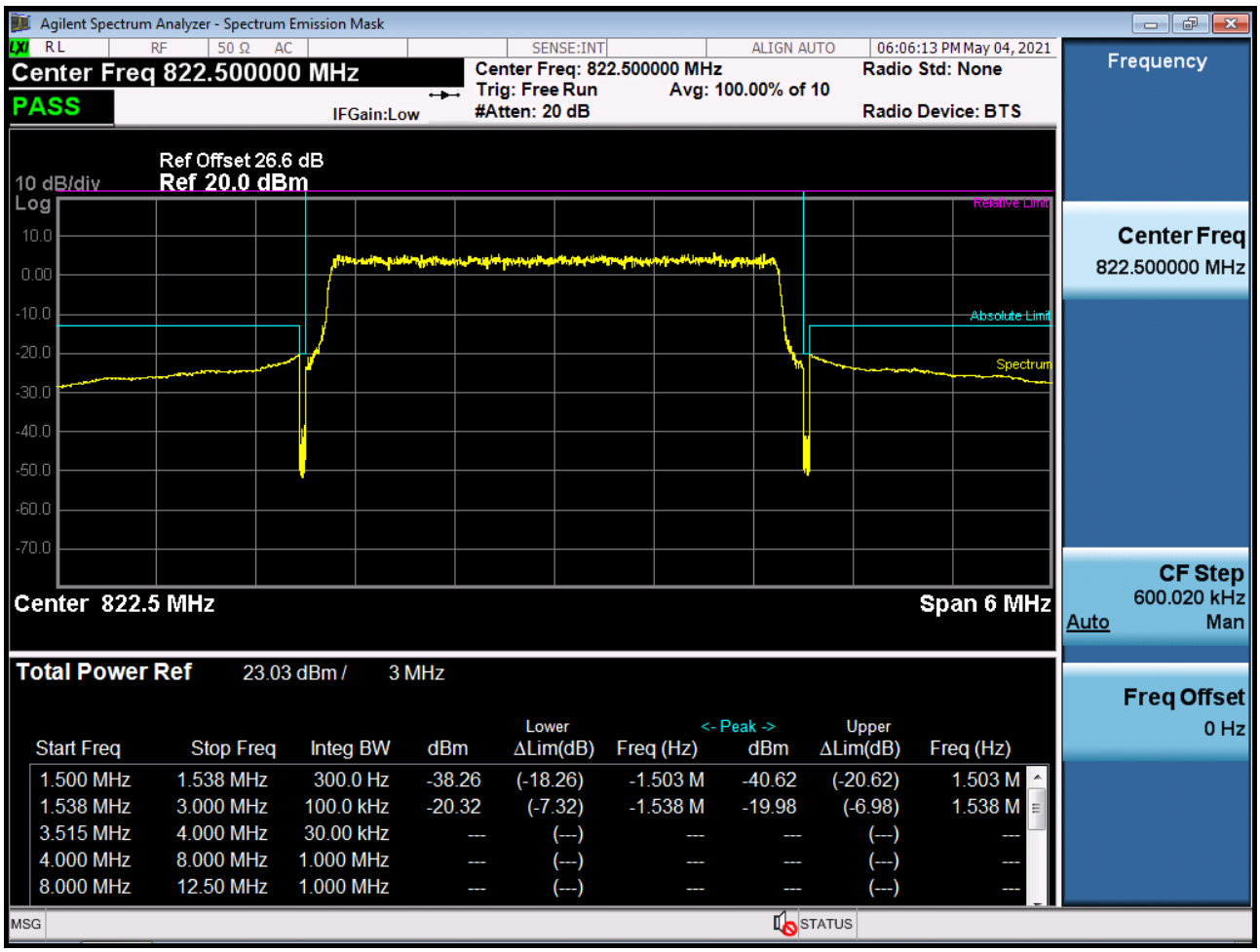
BAND 26. Upper Channel Edge Plot (1.4M BW Ch.26783 QPSK_RB6_Offset 0)



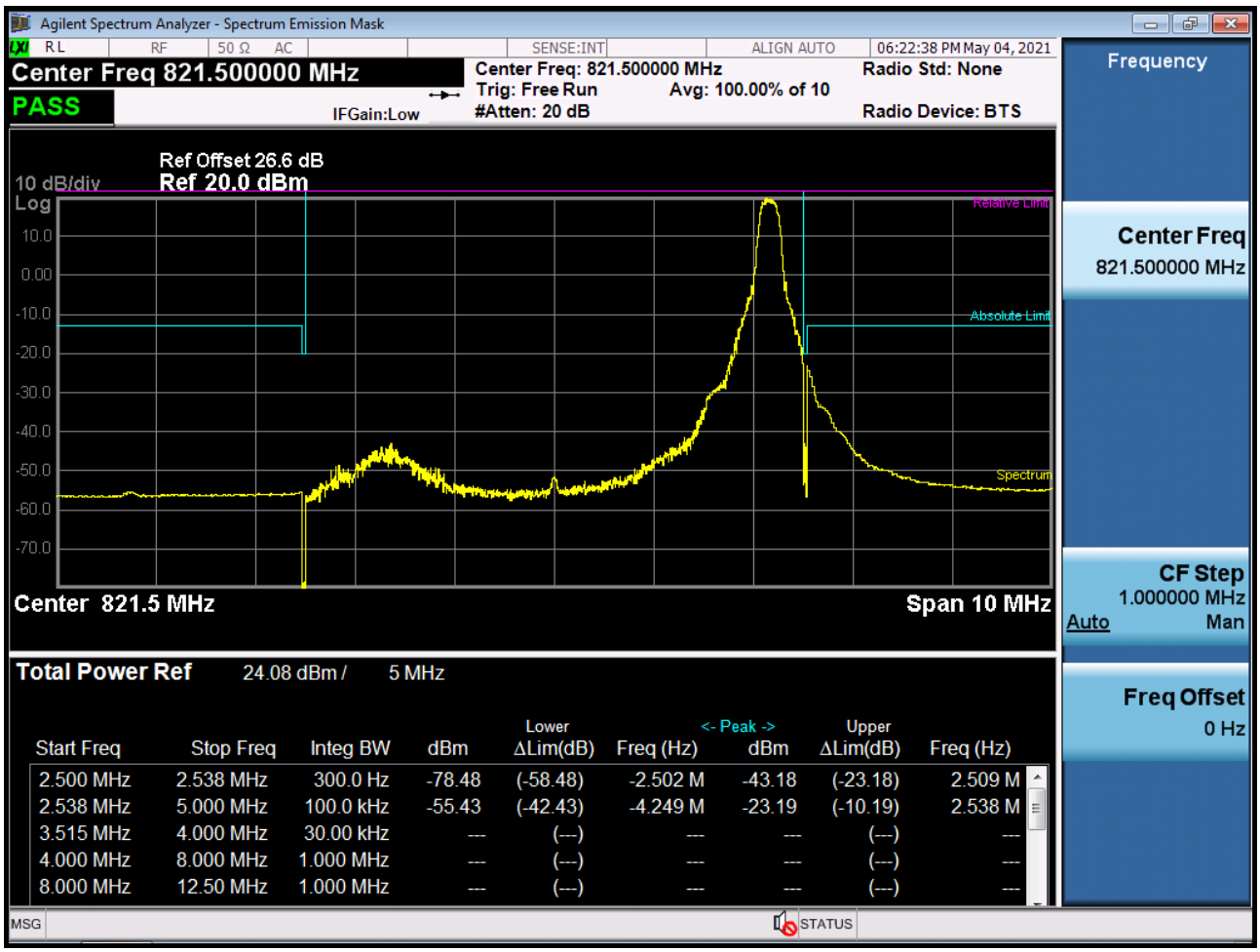
BAND 26. Upper Channel Edge Plot (3M BW Ch.26775 QPSK_RB1_Offset 14)



BAND 26. Upper Channel Edge Plot (3M BW Ch.26775 QPSK_RB15_Offset 0)

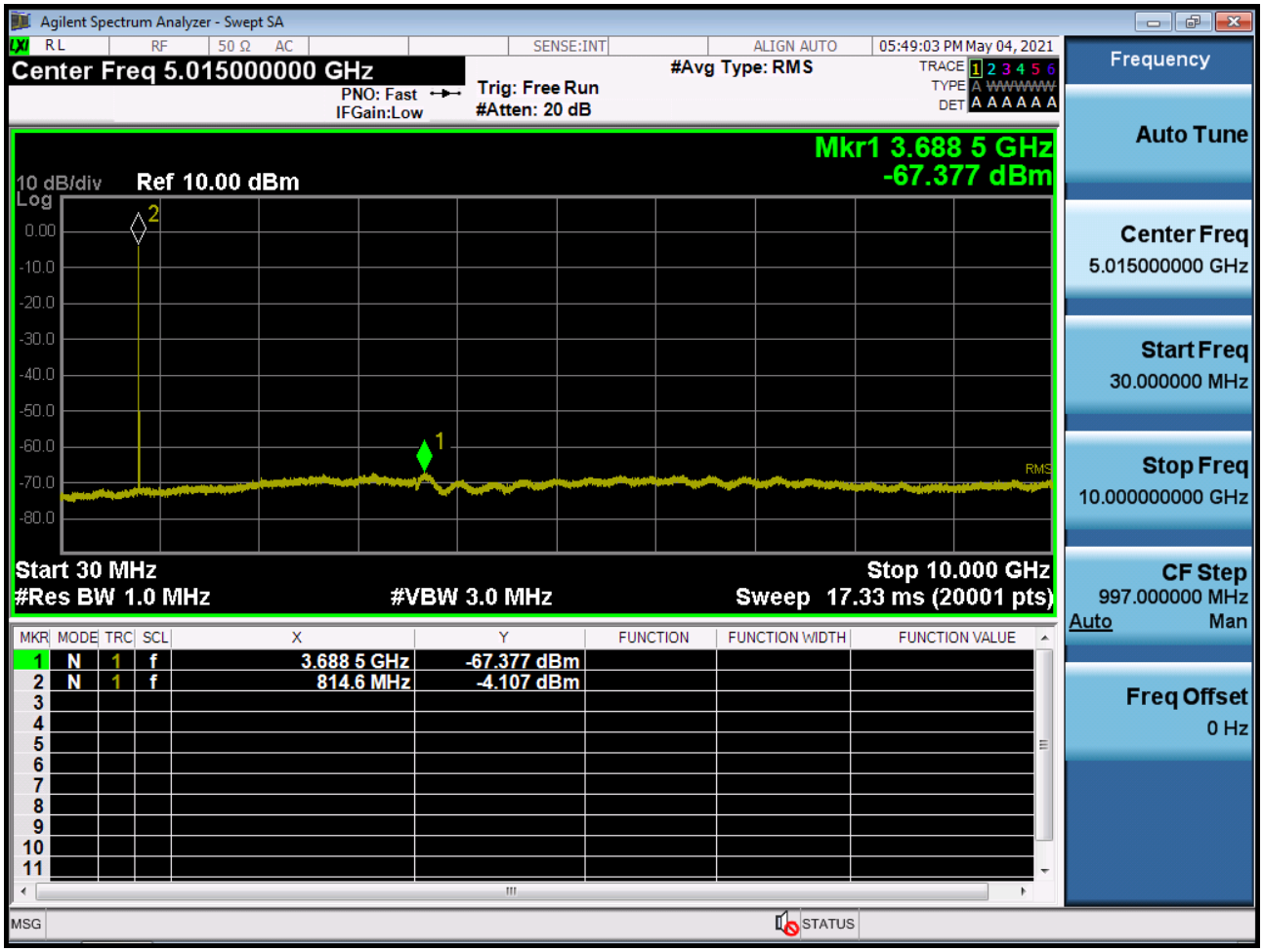


BAND 26. Upper Channel Edge Plot (5M BW Ch.26765 QPSK_RB1_Offset 24)

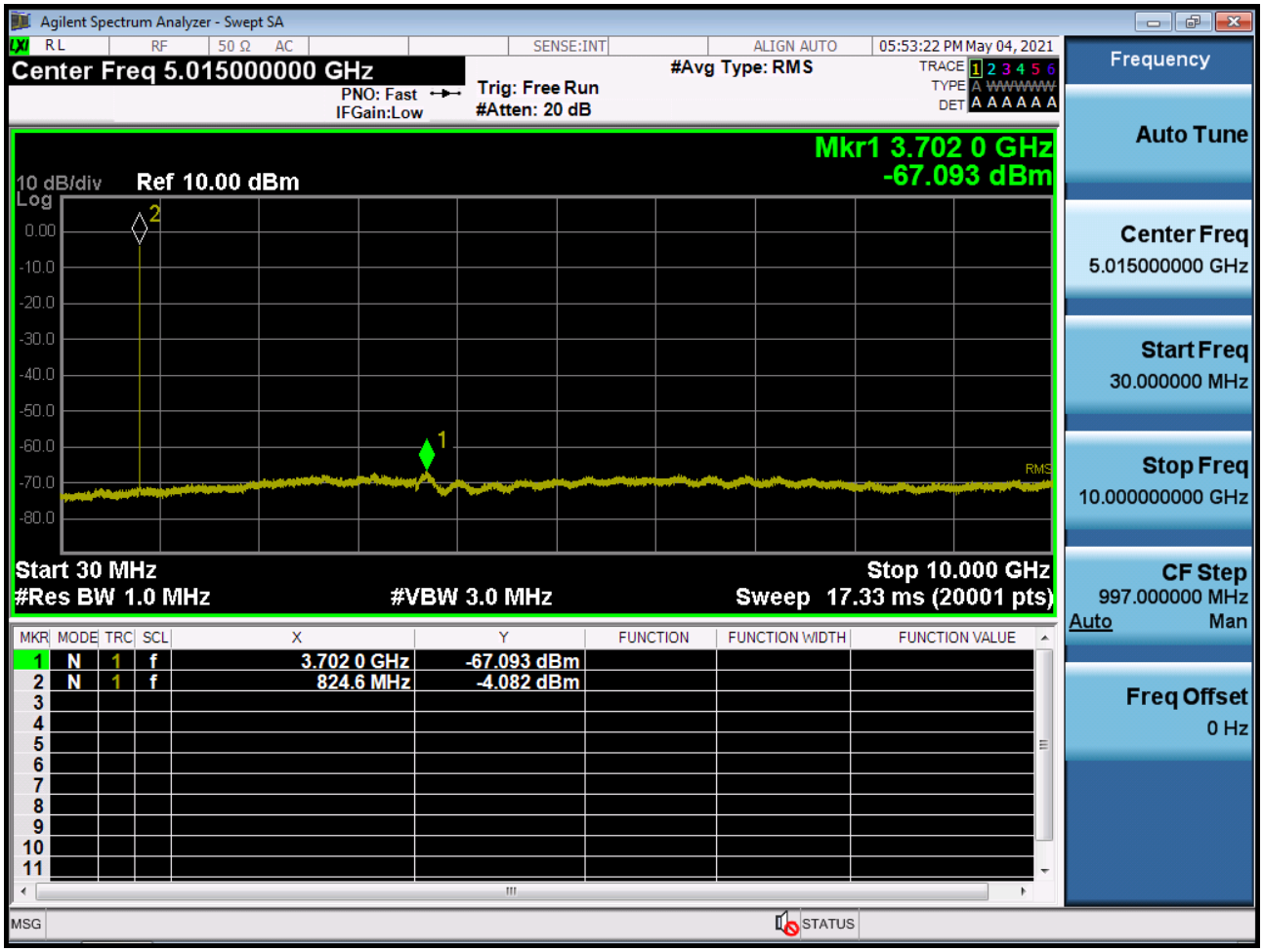


BAND 26. Upper Channel Edge Plot (5M BW Ch.26765 QPSK_RB25_Offset 0)

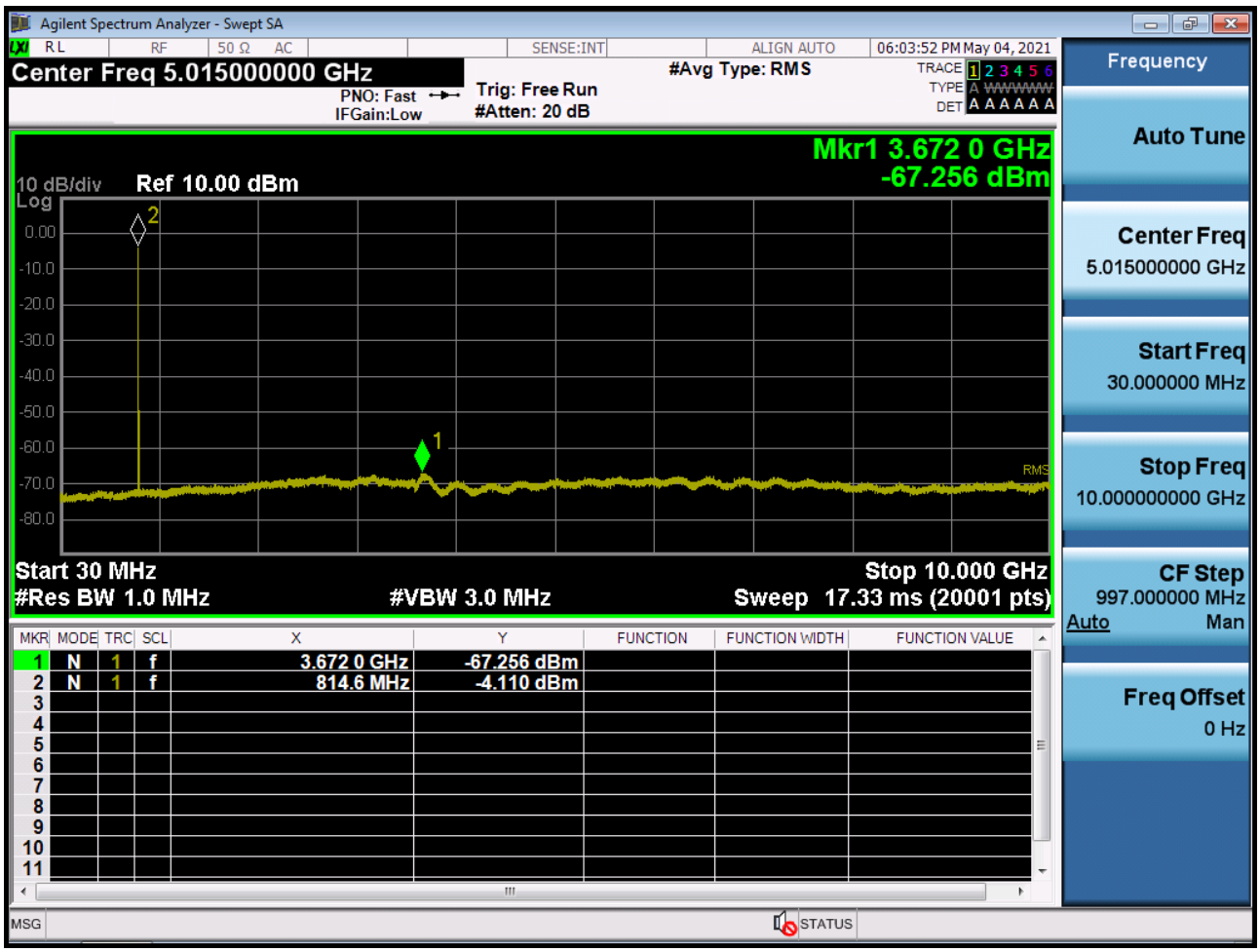
BAND 26. Conducted Spurious (26697 ch_1.4MHz_QPSK_RB 1_0)



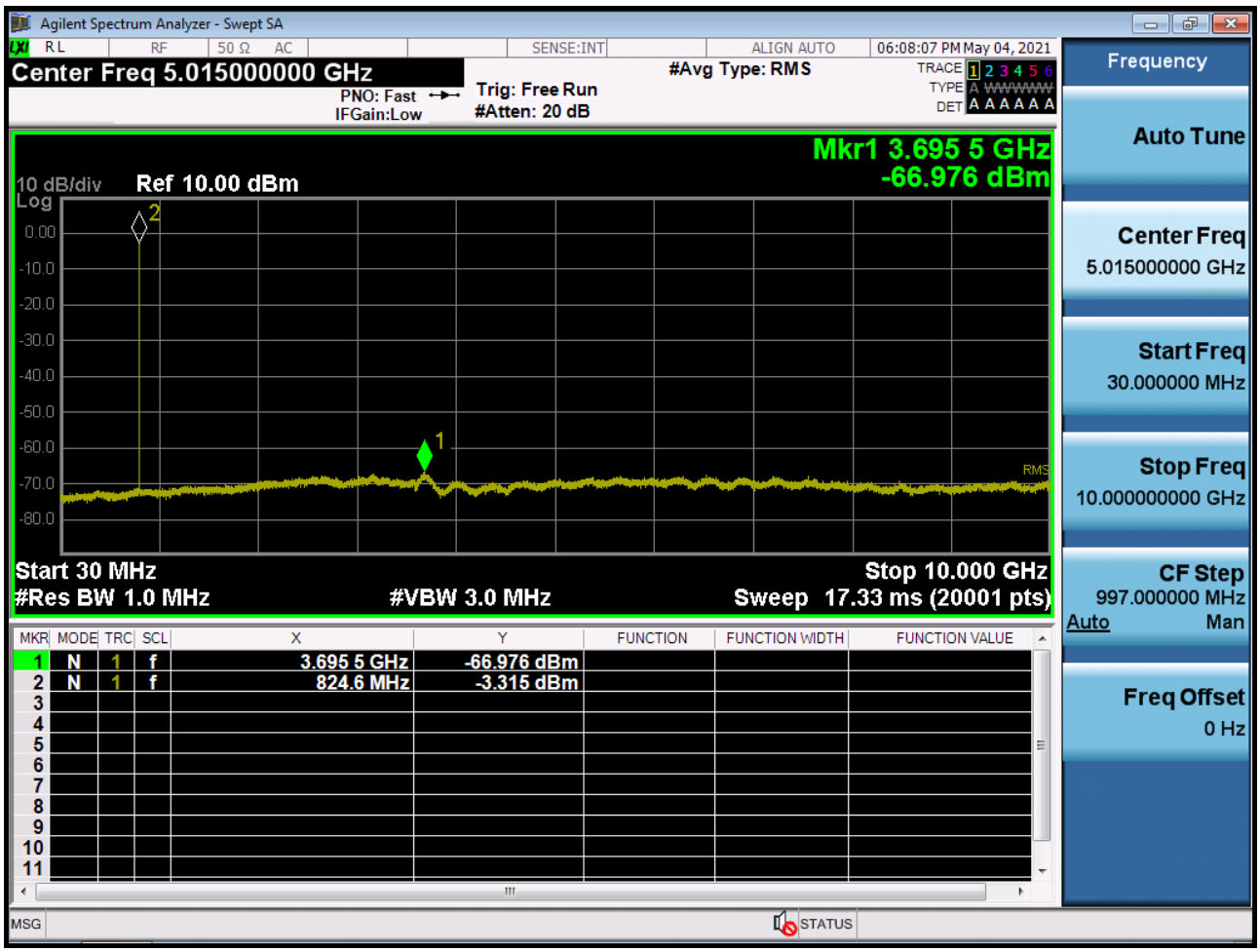
BAND 26. Conducted Spurious (26783 ch_1.4MHz_QPSK_RB 1_0)



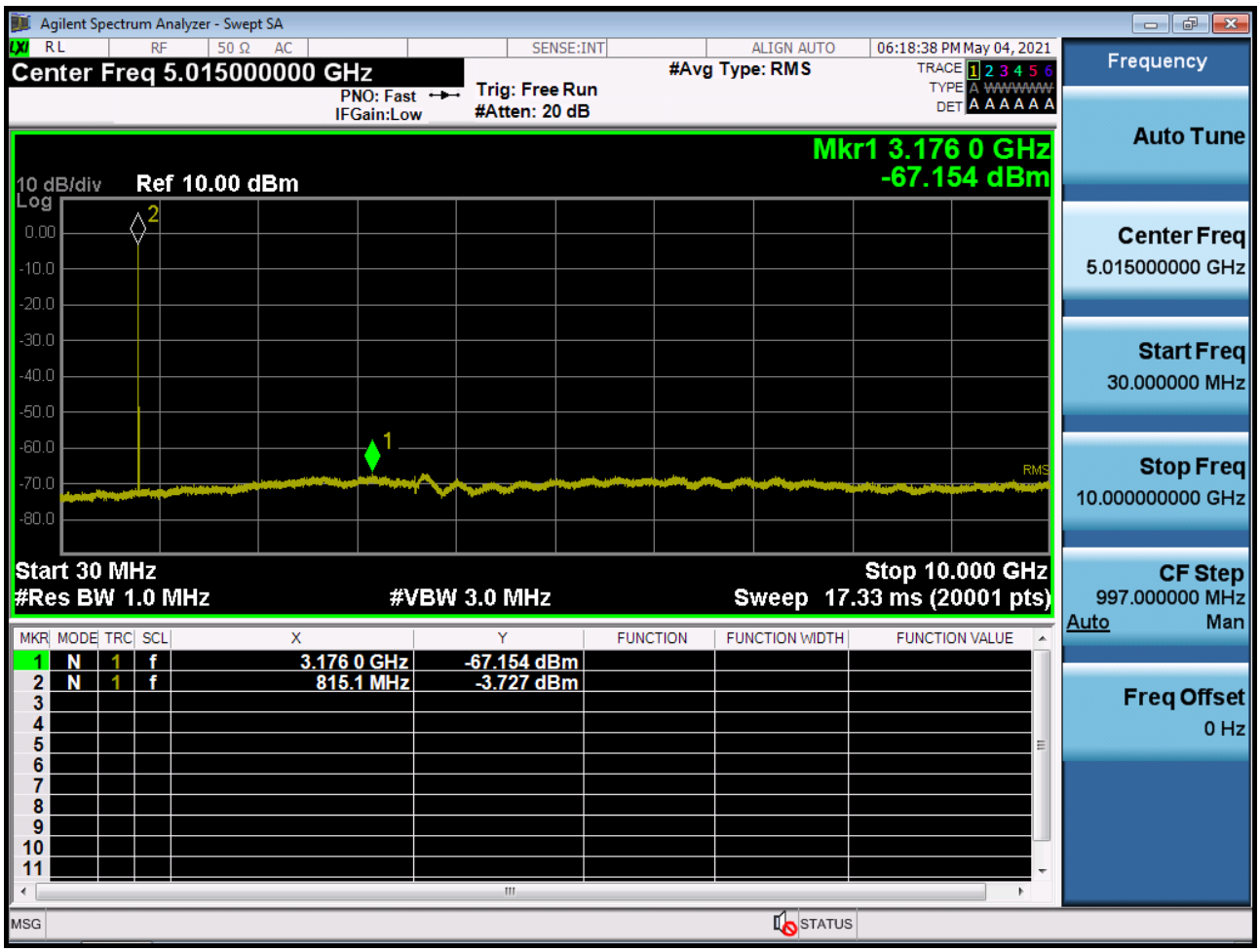
BAND 26. Conducted Spurious (26705 ch_3MHz_QPSK_RB 1_0)



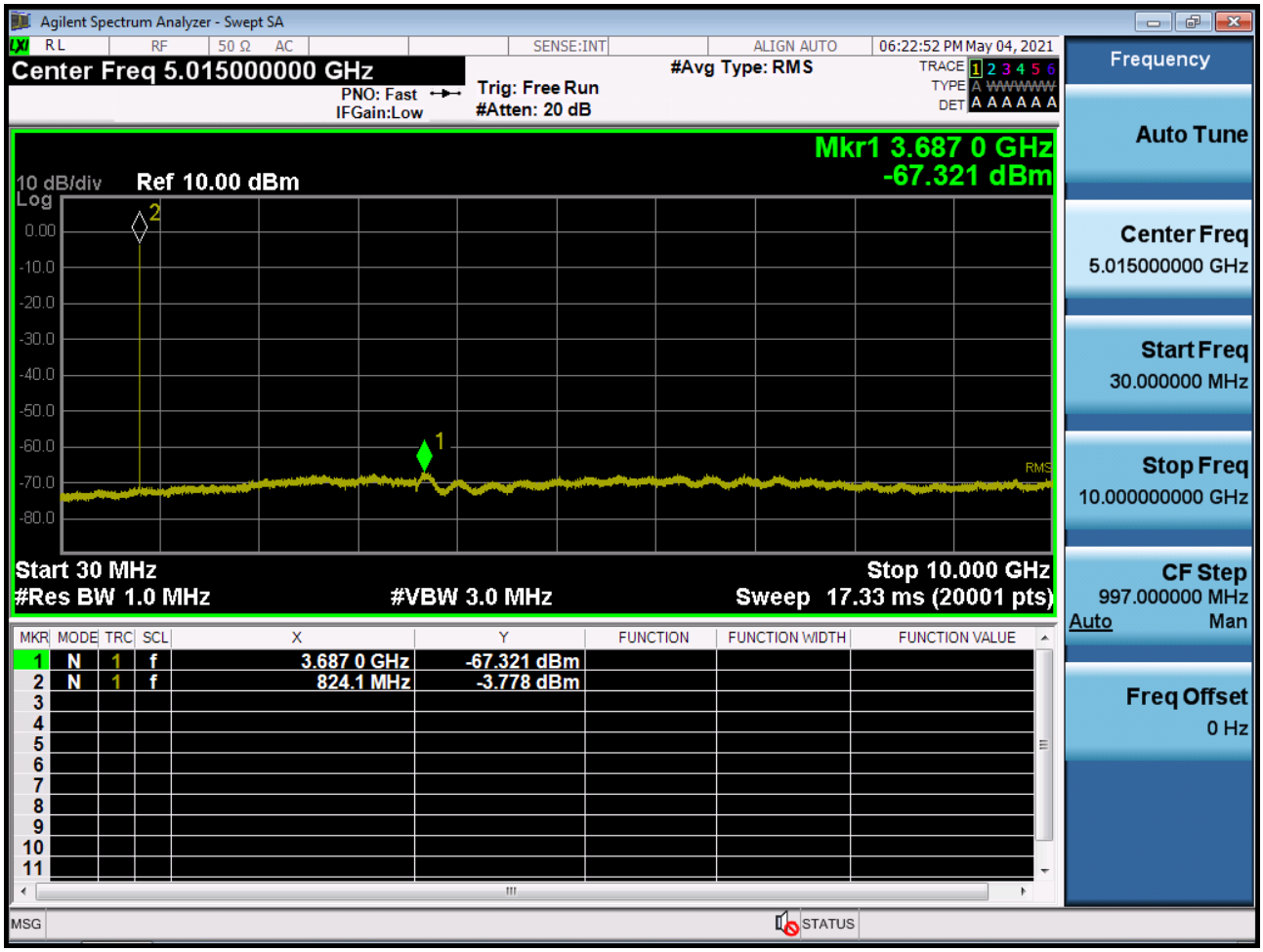
BAND 26. Conducted Spurious (26775 ch_3MHz_QPSK_RB 1_0)



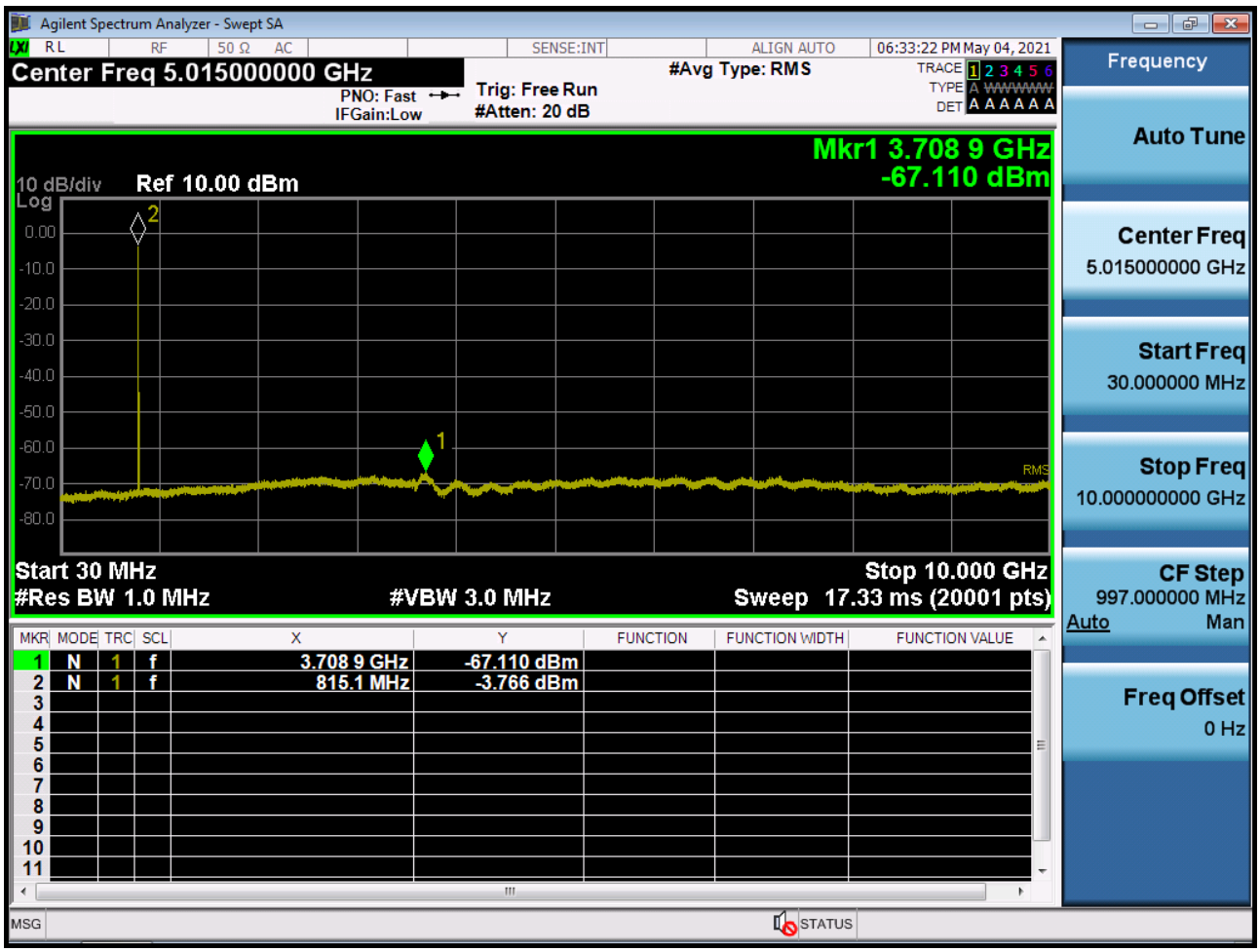
BAND 26. Conducted Spurious (26715 ch_5MHz_QPSK_RB 1_0)



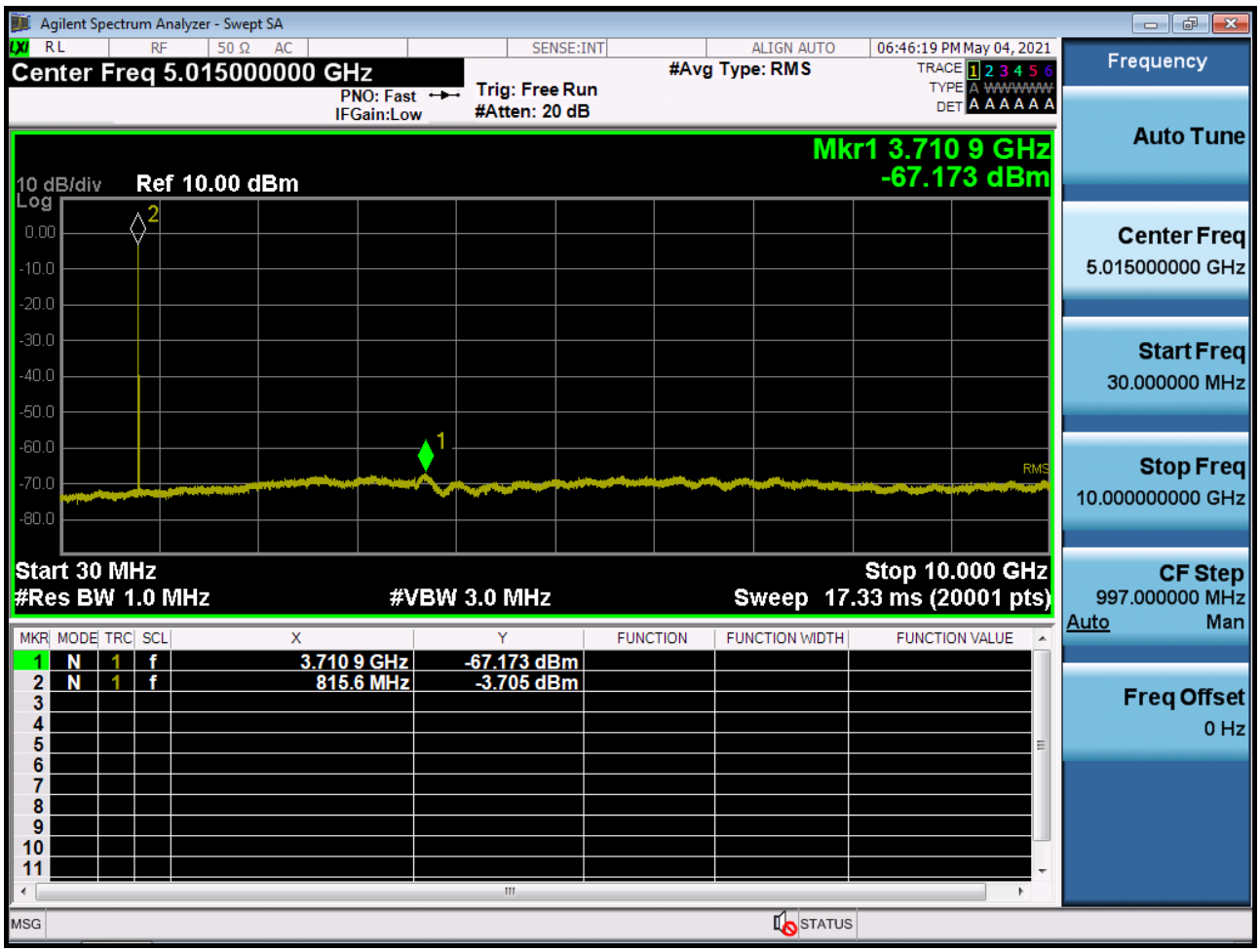
BAND 26. Conducted Spurious (26765 ch_5MHz_QPSK_RB 1_0)



BAND 26. Conducted Spurious (26740 ch_10MHz_QPSK_RB 1_0)

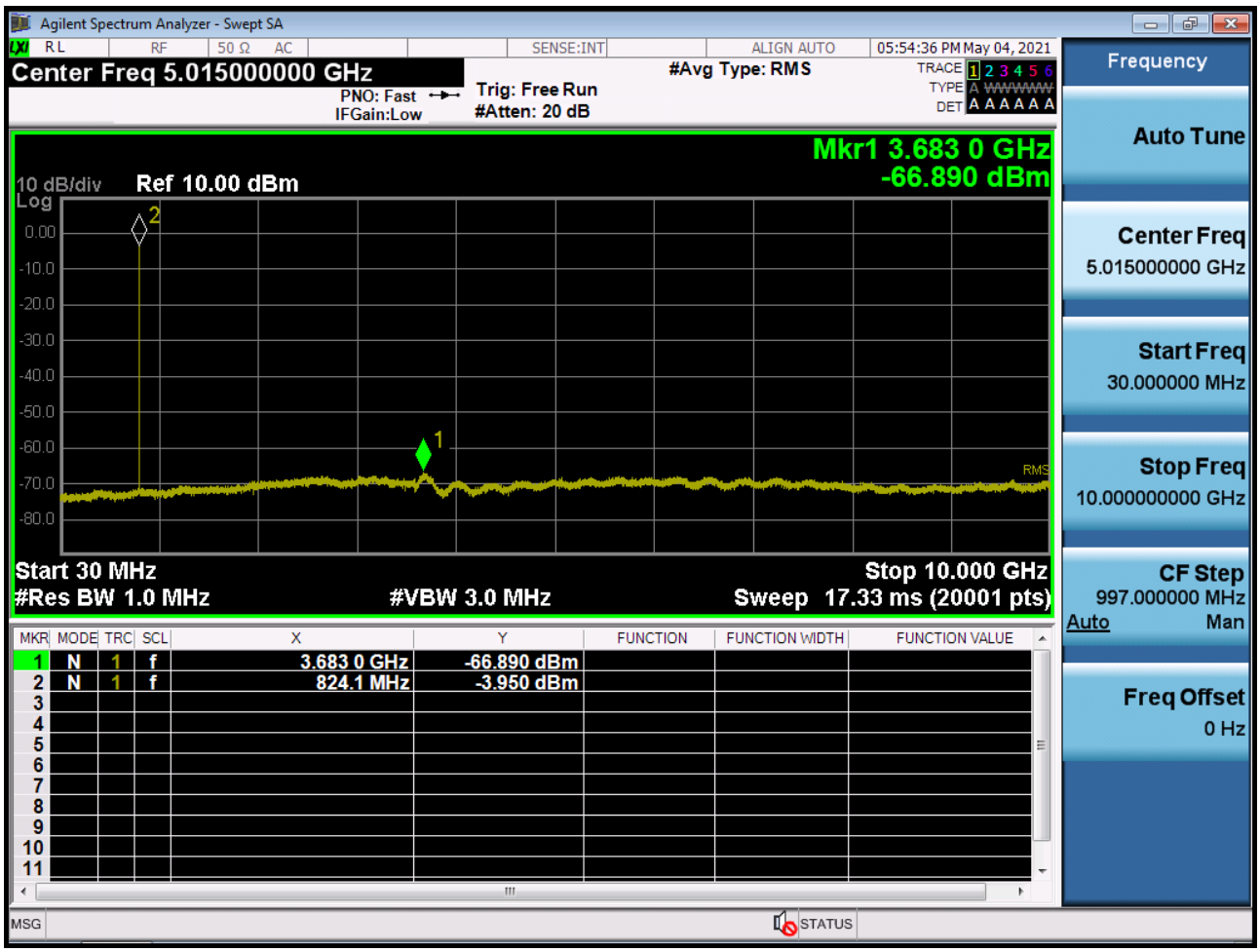


BAND 26. Conducted Spurious (26765 ch_15MHz_QPSK_RB 1_0)

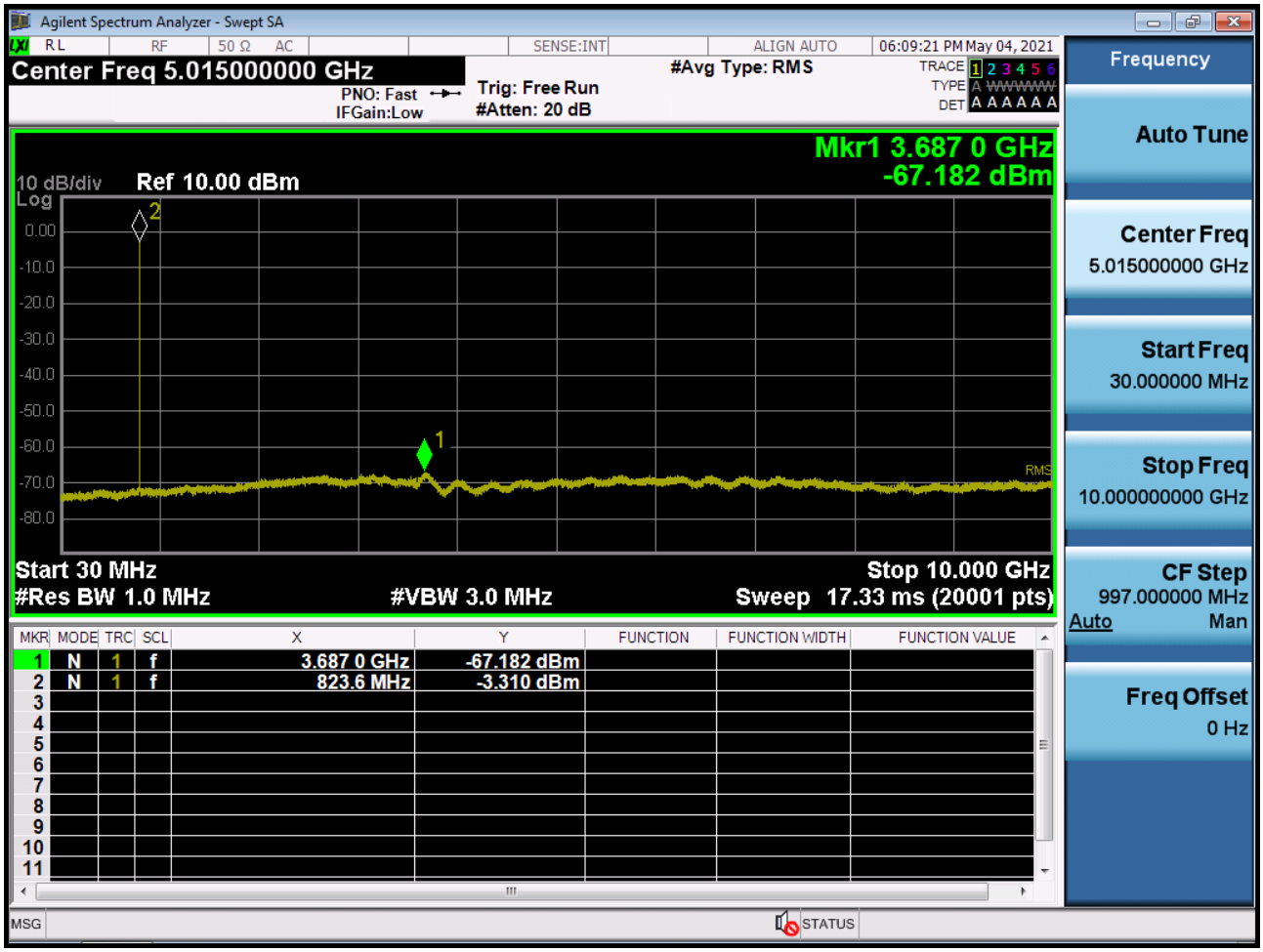


10. TEST PLOTS (STRADDLE CHANNEL)

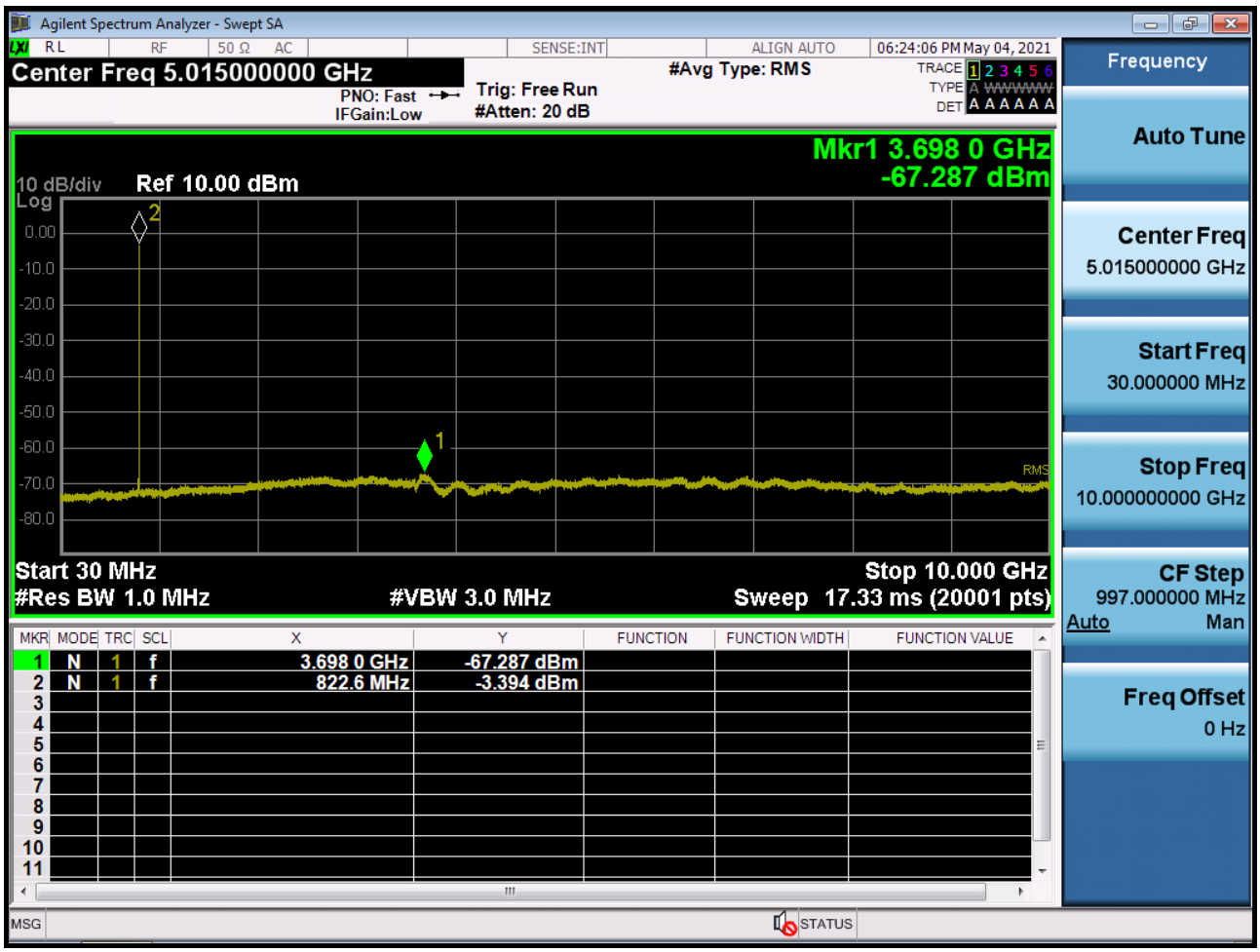
BAND 26. Conducted Spurious (1.4MHz_QPSK_RB 1_0)



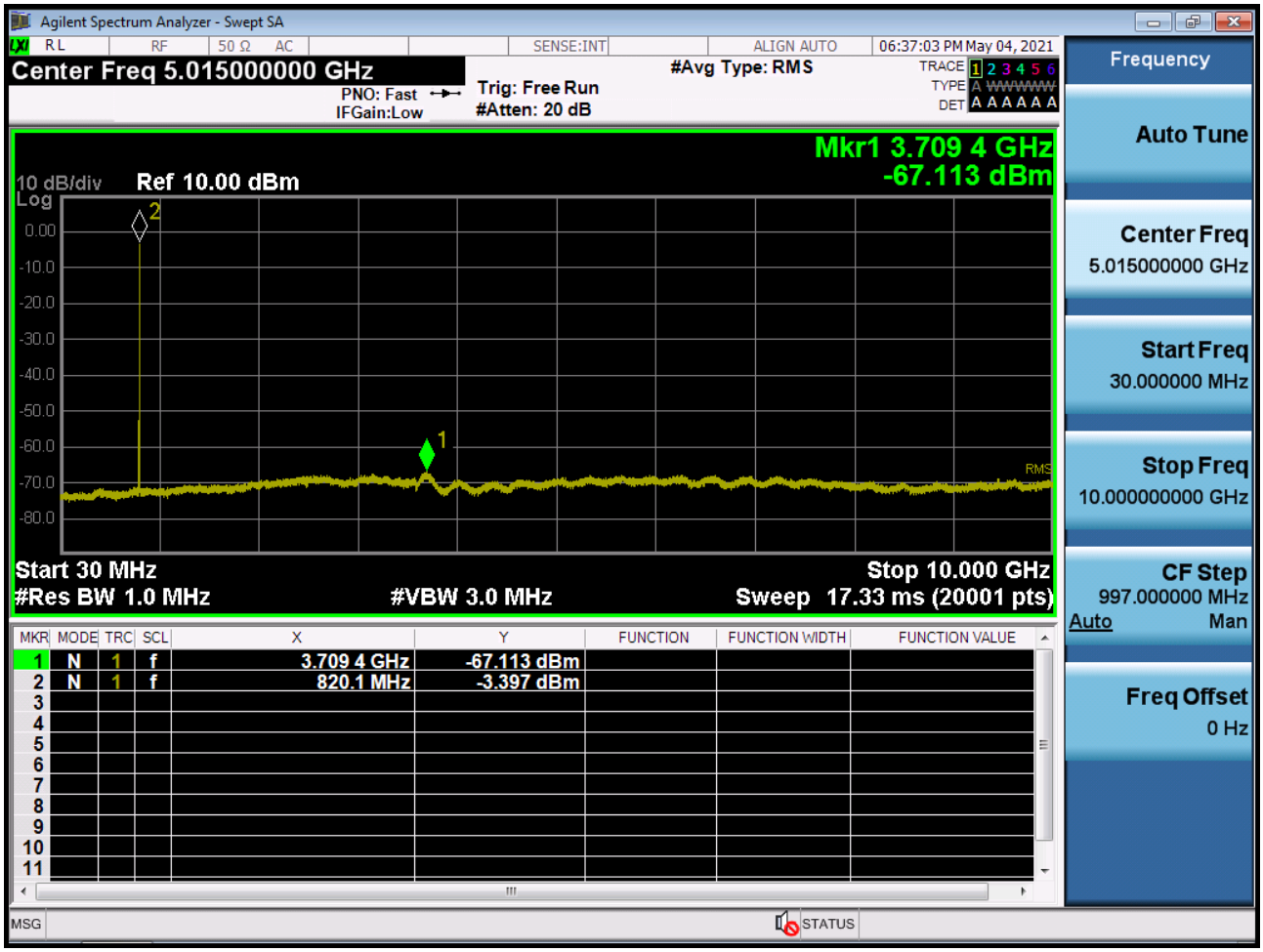
BAND 26. Conducted Spurious (3MHz_QPSK_RB 1_0)



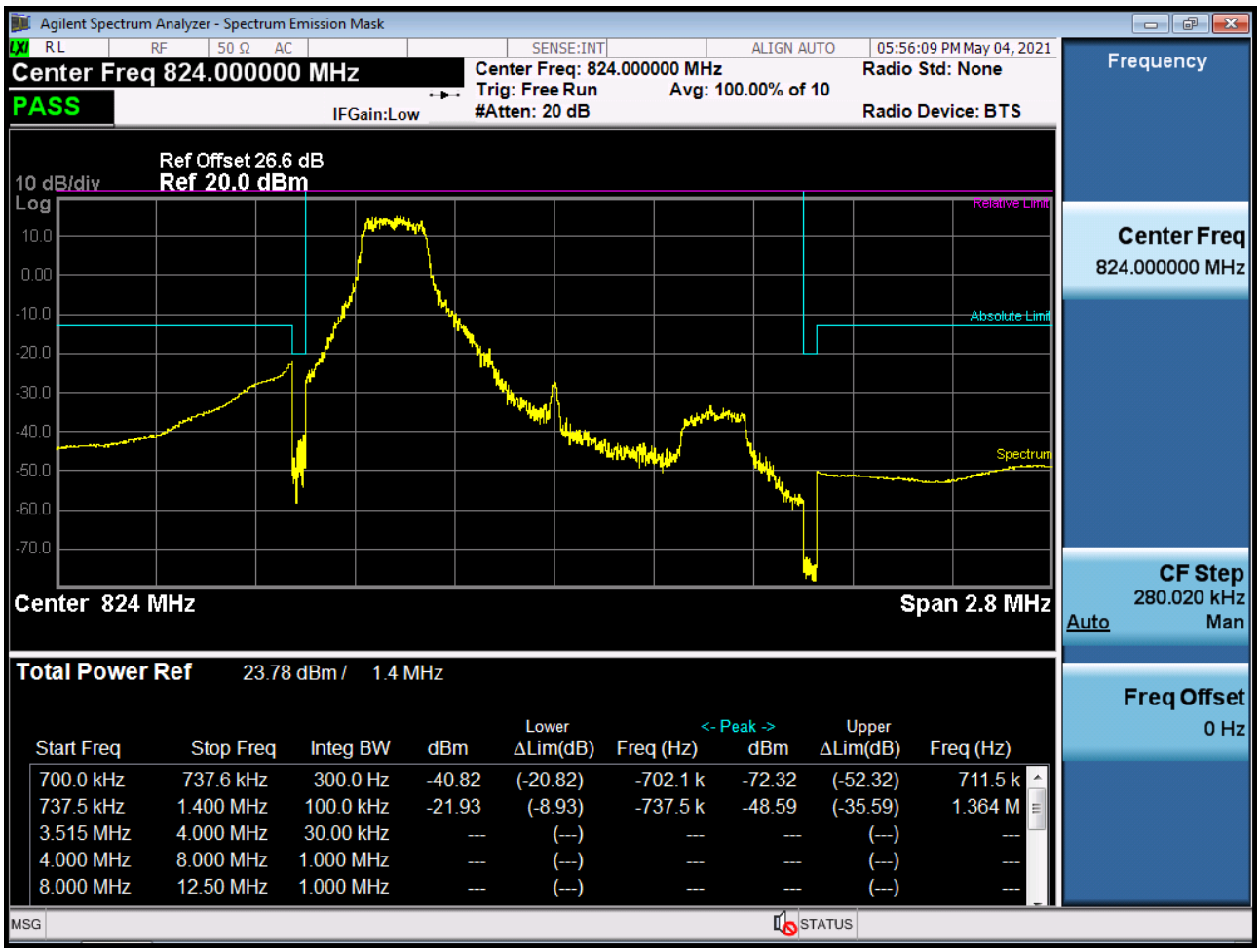
BAND 26. Conducted Spurious (5MHz_QPSK_RB 1_0)



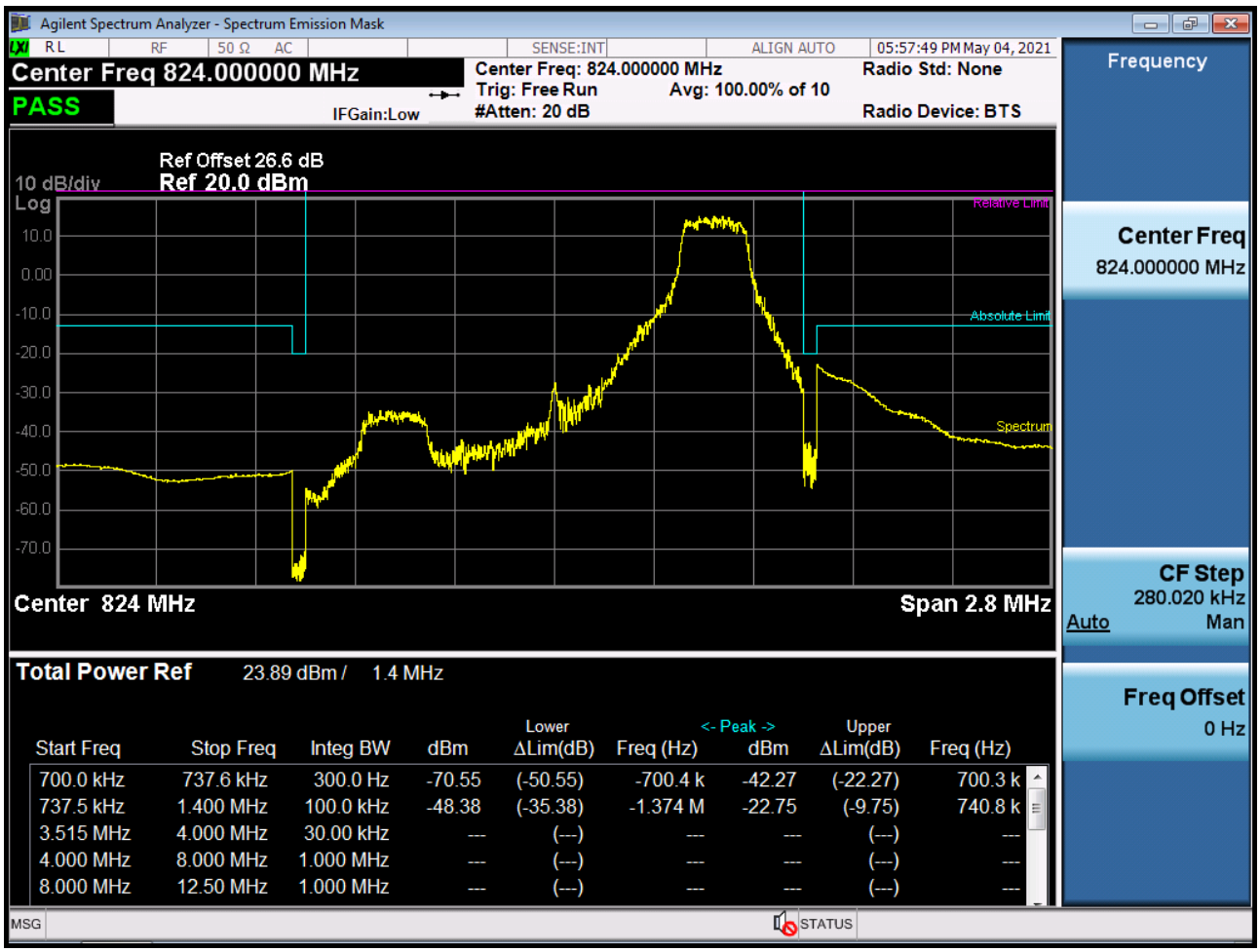
BAND 26. Conducted Spurious (10MHz_QPSK_RB 1_0)



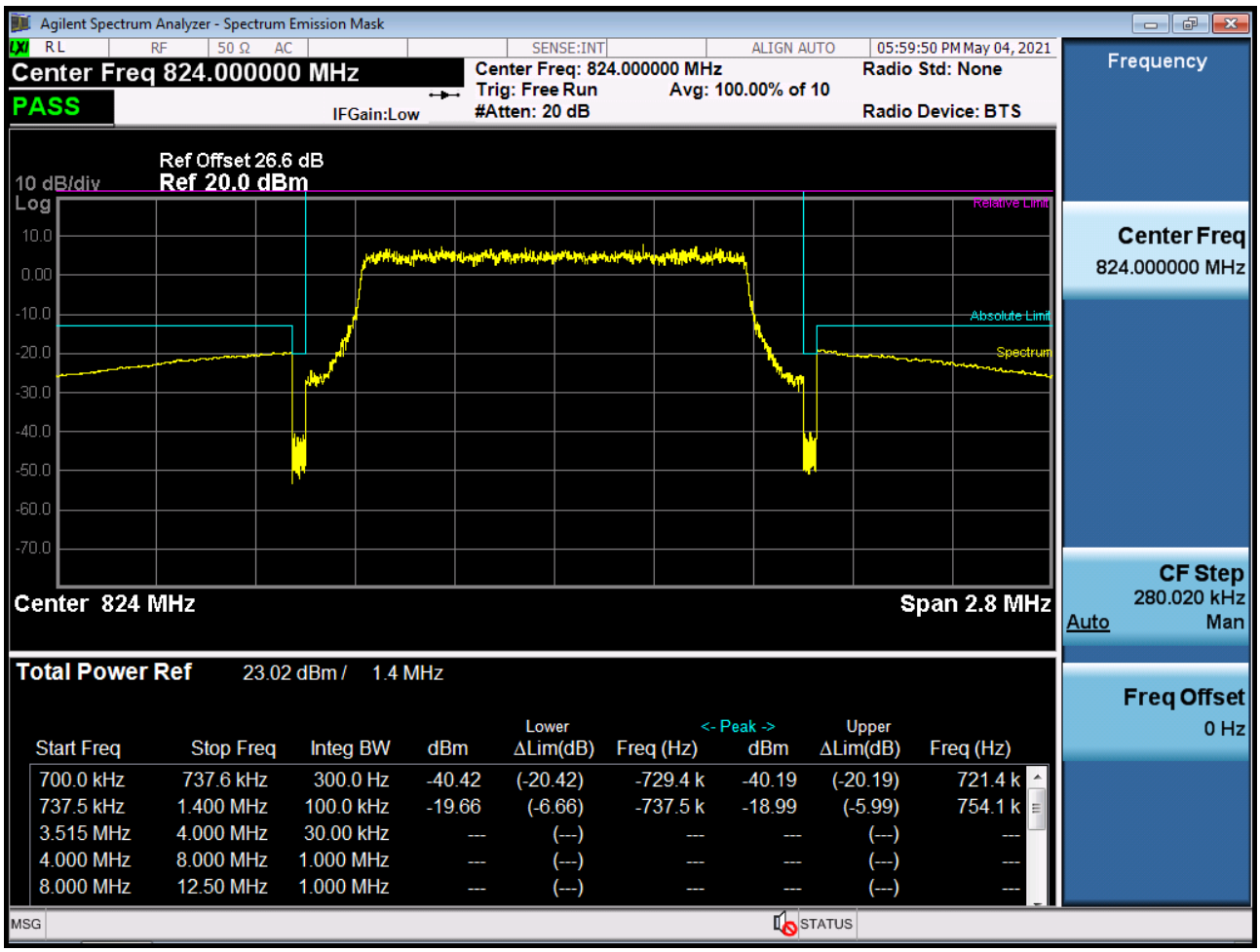
BAND 26. Channel Edge (1.4MHz_QPSK_RB 1_0)



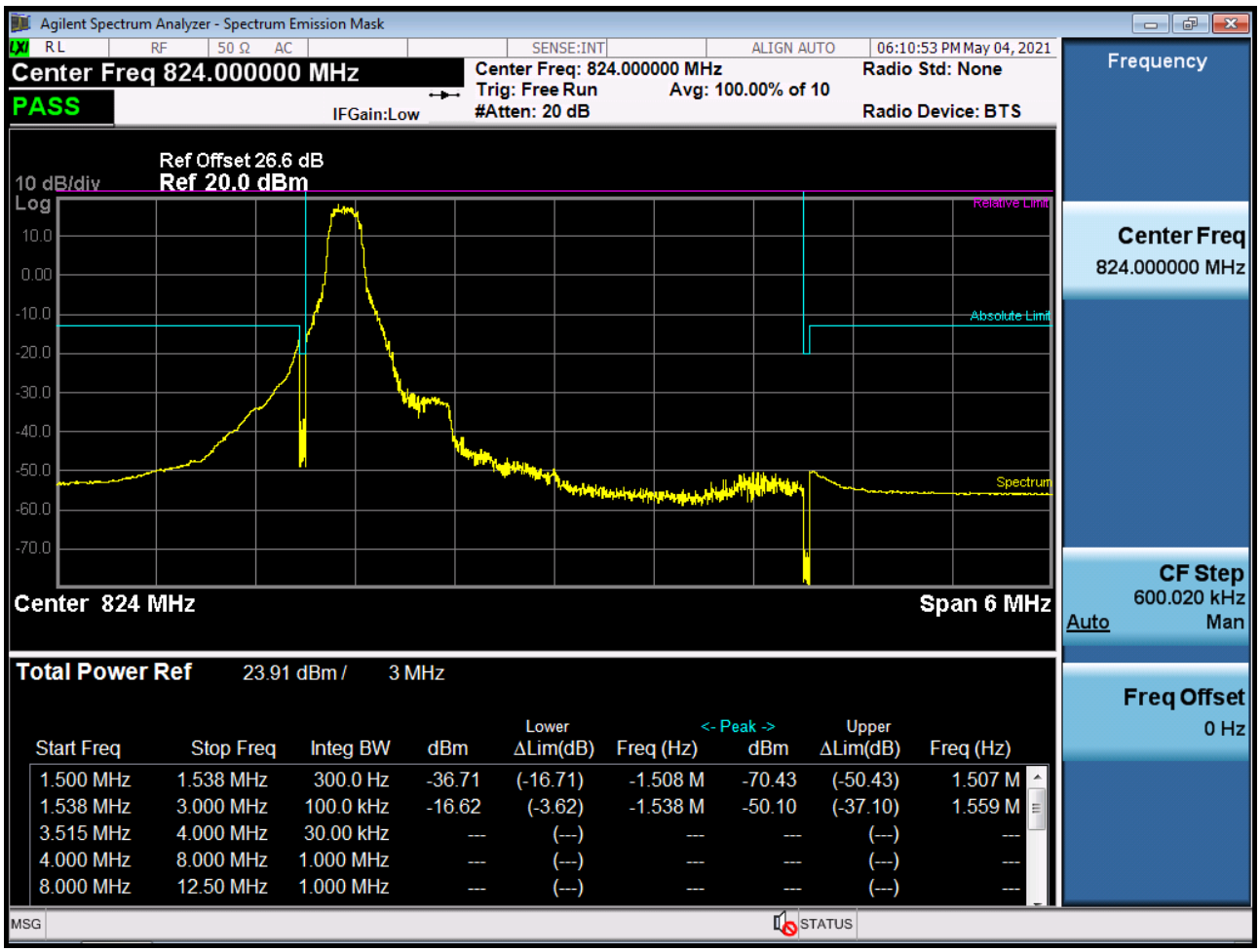
BAND 26. Channel Edge (1.4MHz_QPSK_RB 1_5)



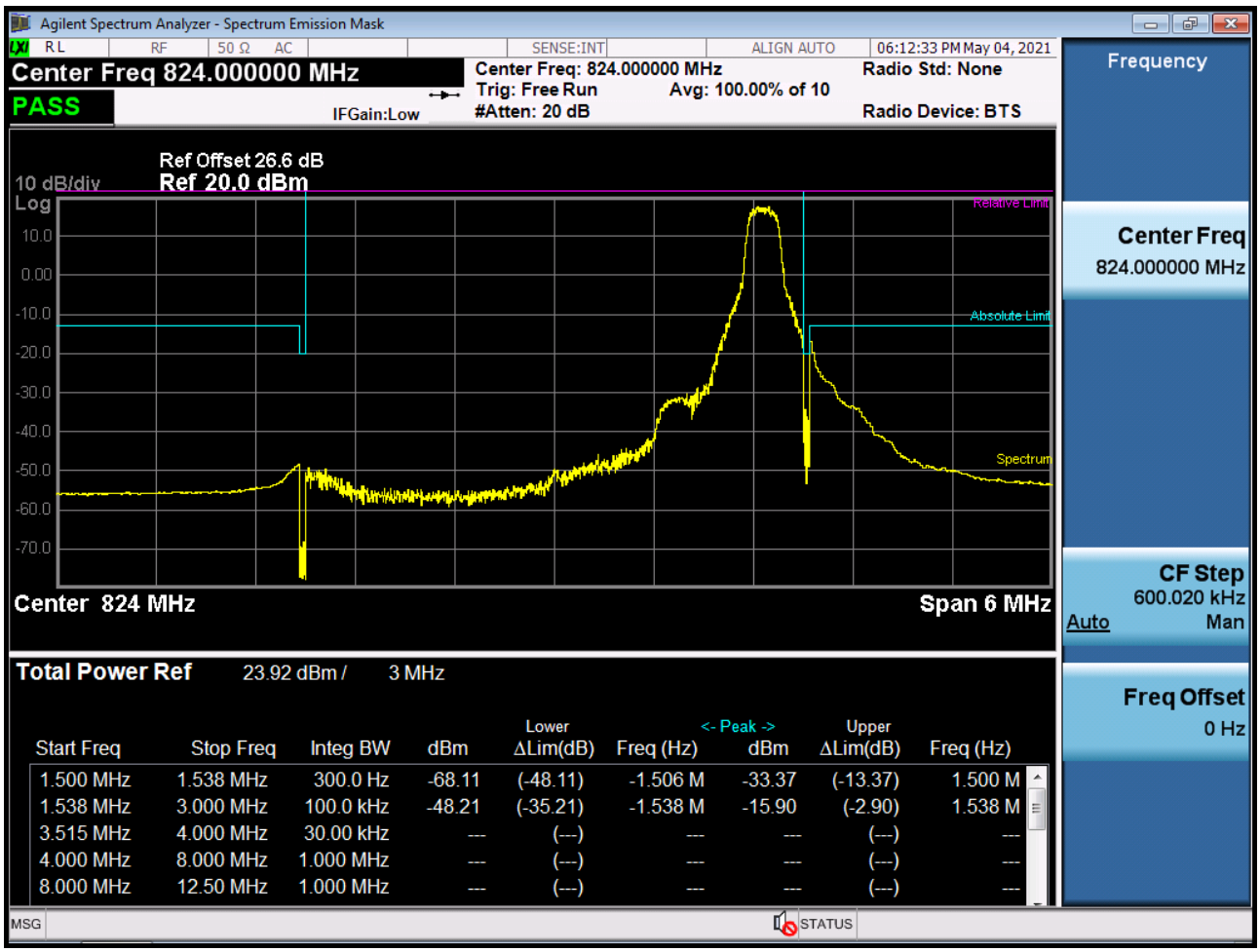
BAND 26. Channel Edge (1.4MHz_QPSK_Full RB)



BAND 26. Channel Edge (3MHz_QPSK_RB 1_0)

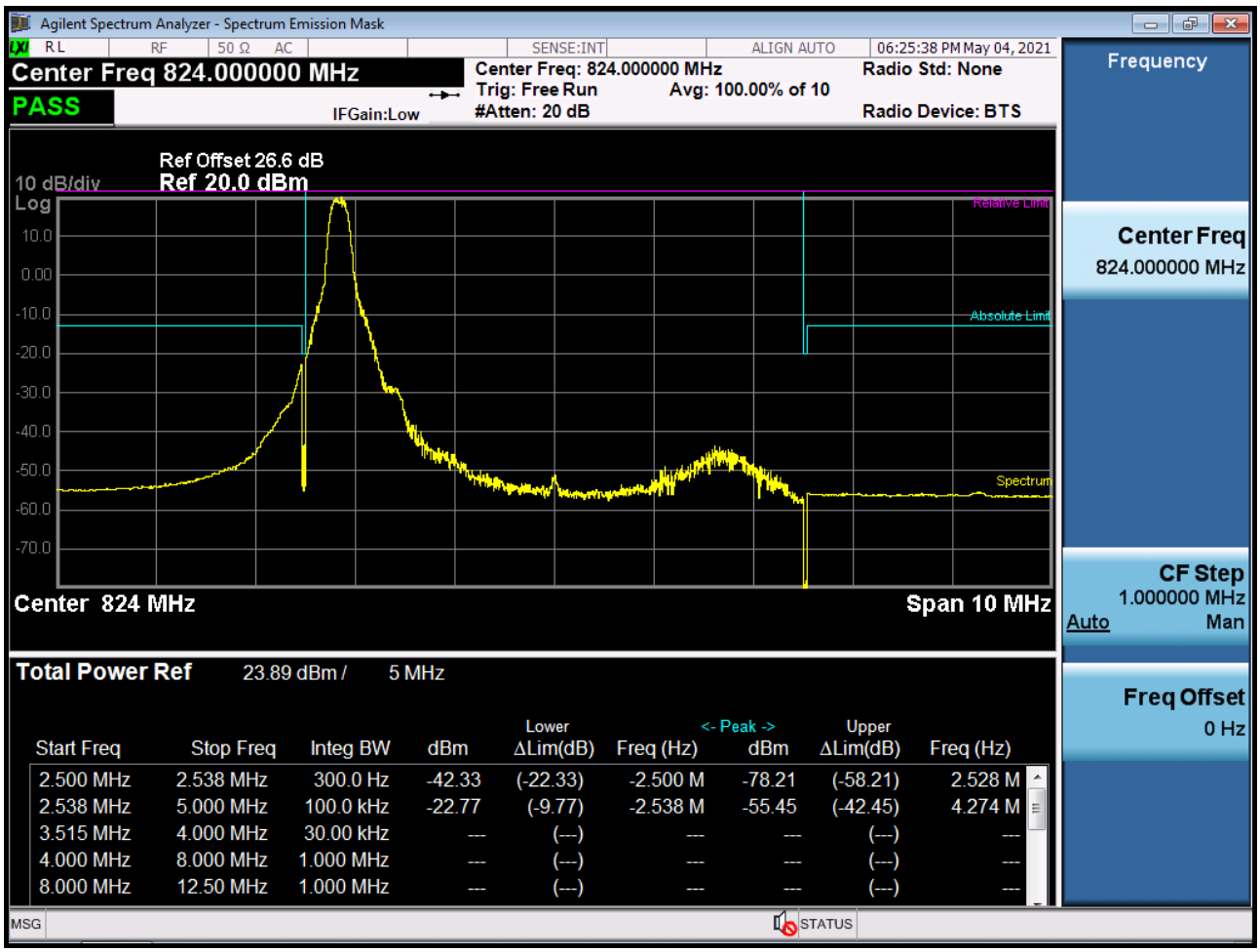


BAND 26. Channel Edge (3MHz_QPSK_RB 1_14)

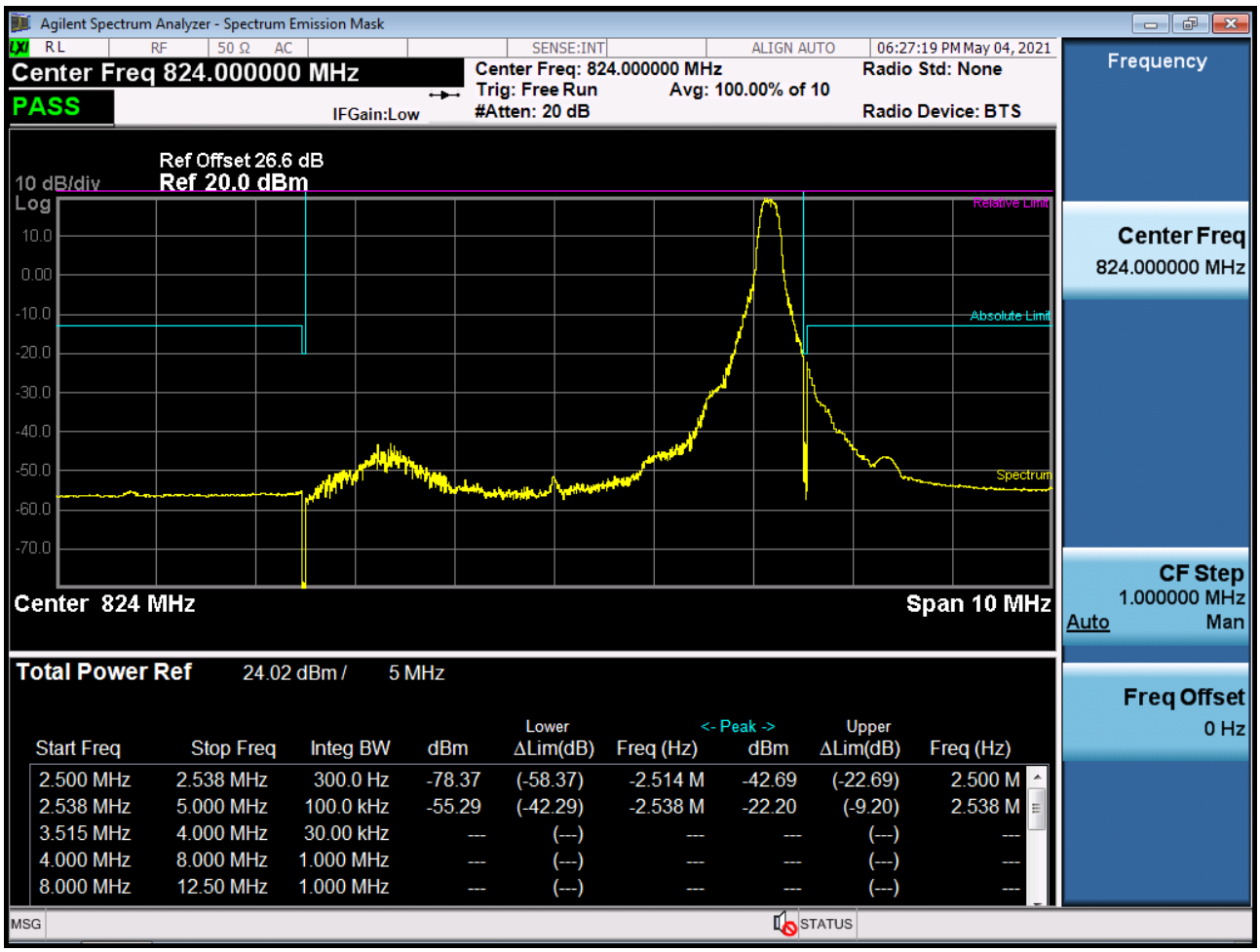


BAND 26. Channel Edge (3MHz_QPSK_Full RB)

BAND 26. Channel Edge (5MHz_QPSK_RB 1_0)

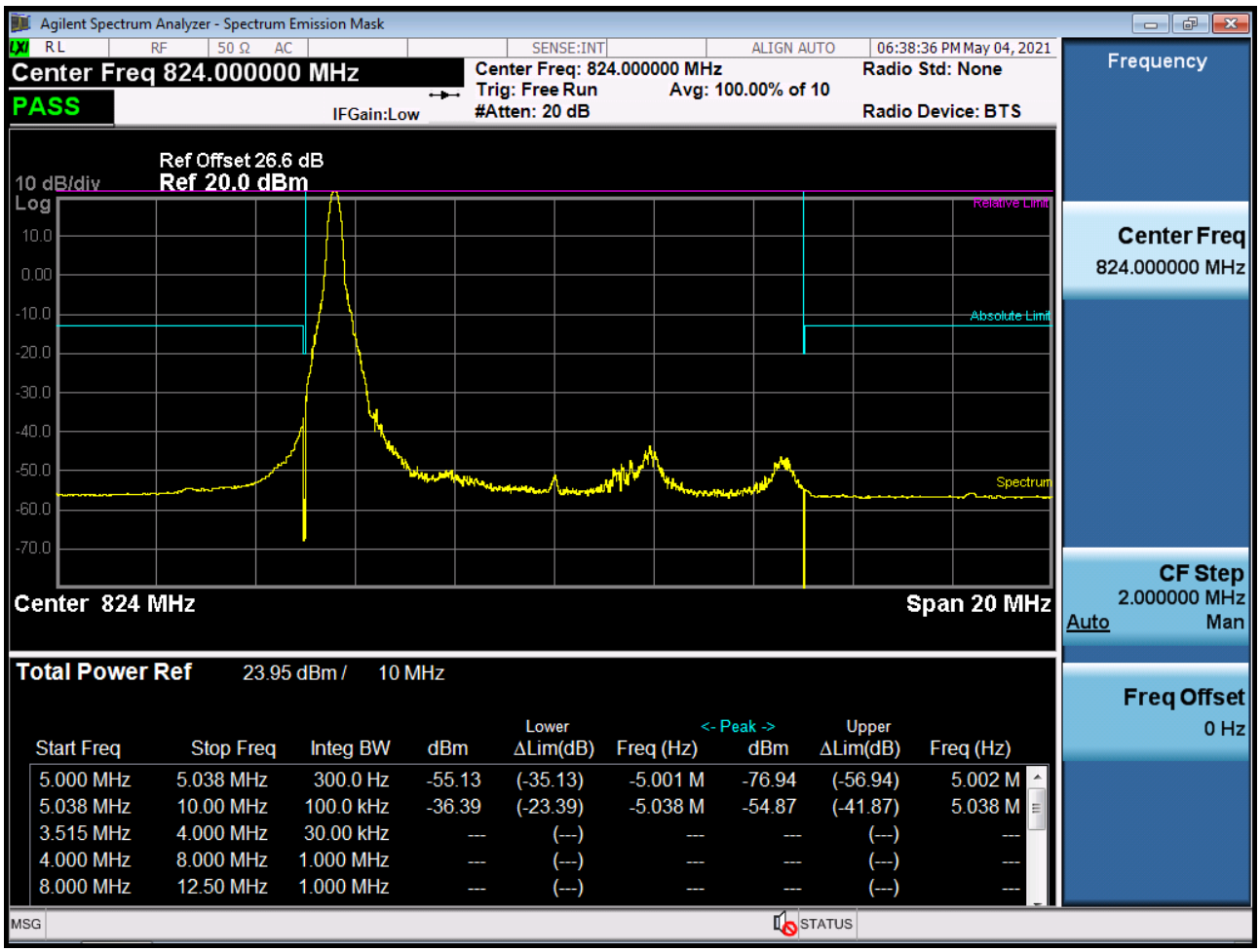


BAND 26. Channel Edge (5MHz_QPSK_RB 1_24)

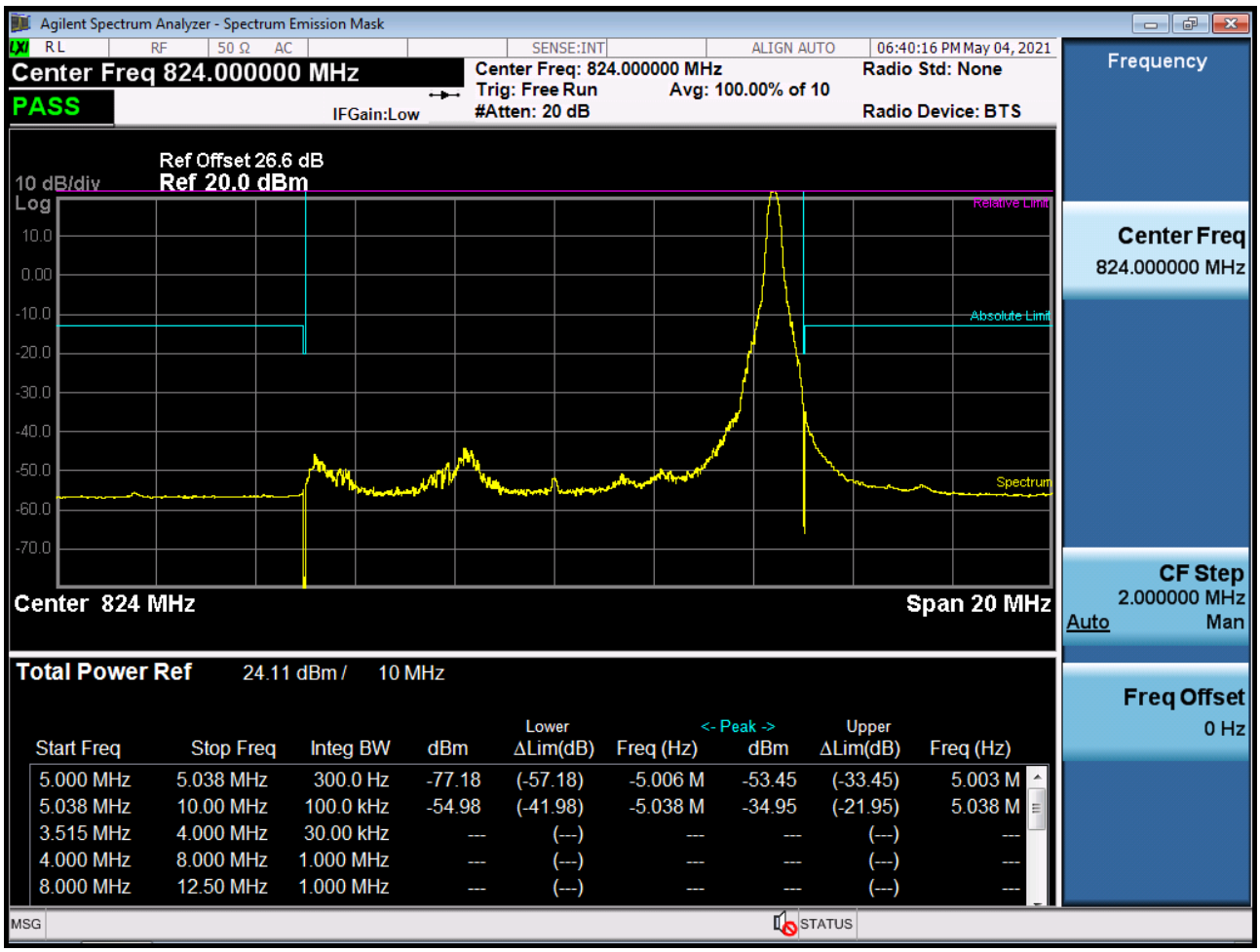


BAND 26. Channel Edge (5MHz_QPSK_Full RB)

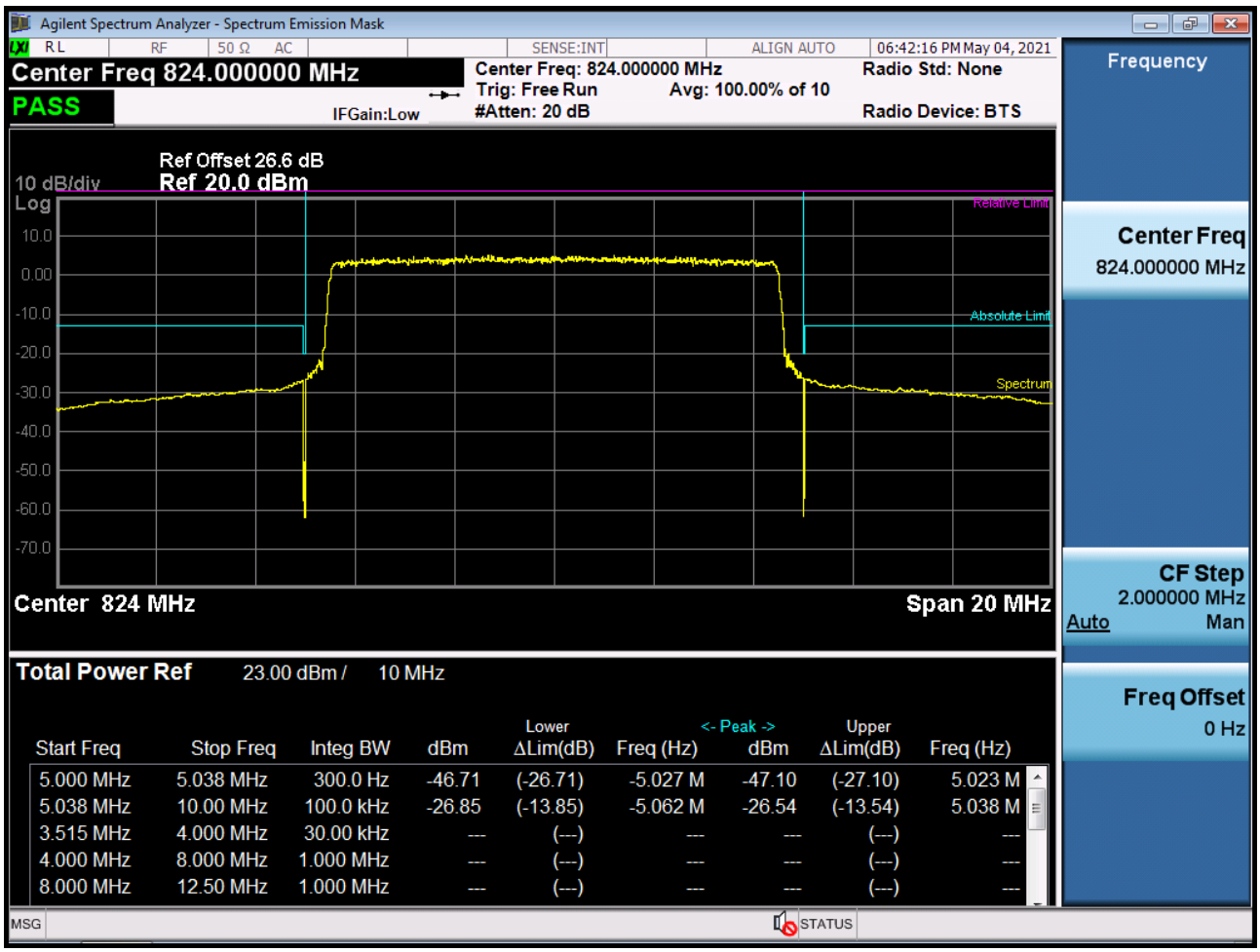
BAND 26. Channel Edge (10MHz_QPSK_RB 1_0)



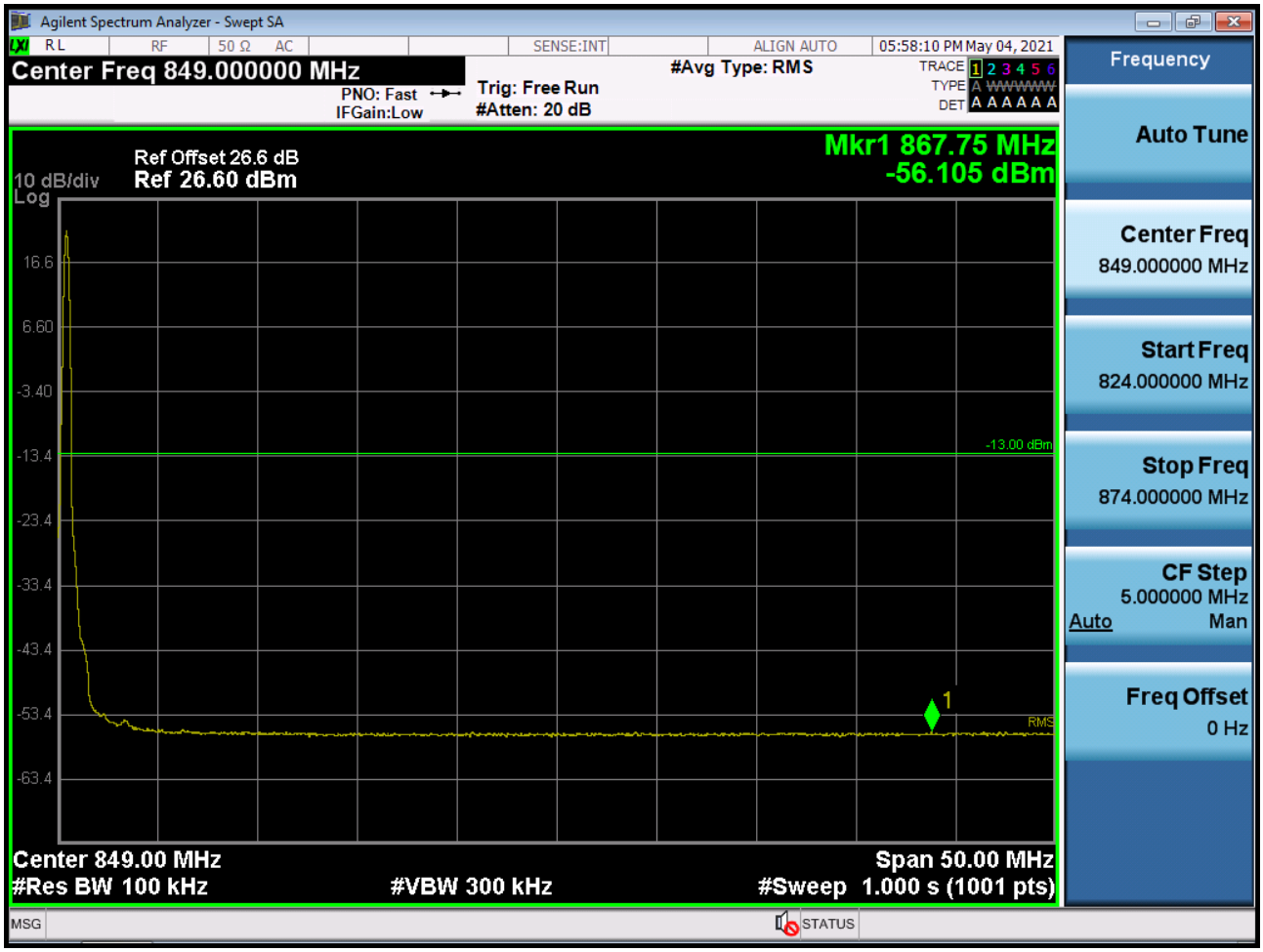
BAND 26. Channel Edge (10MHz_QPSK_RB 1_49)



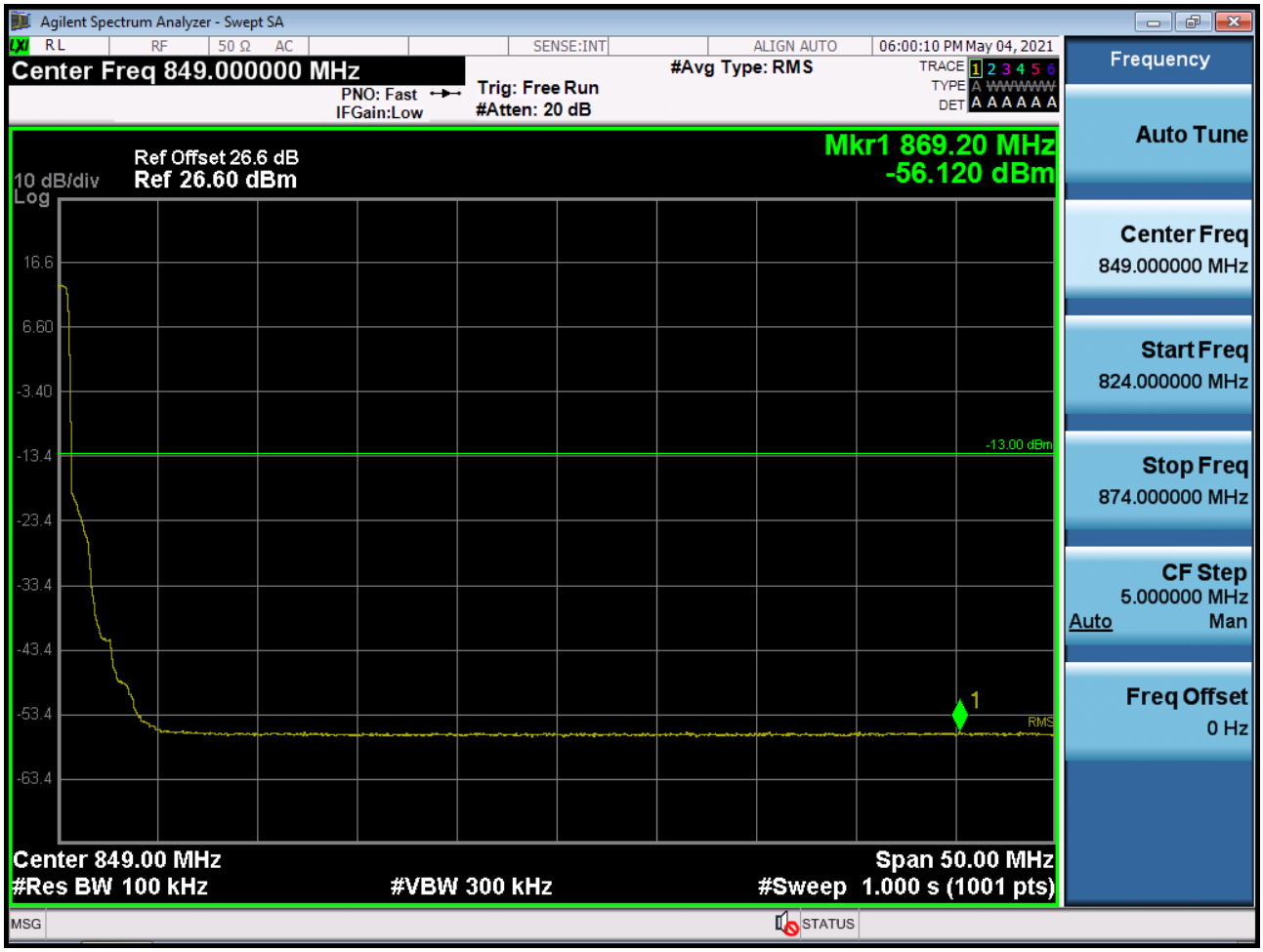
BAND 26. Channel Edge (10MHz_QPSK_Full RB)



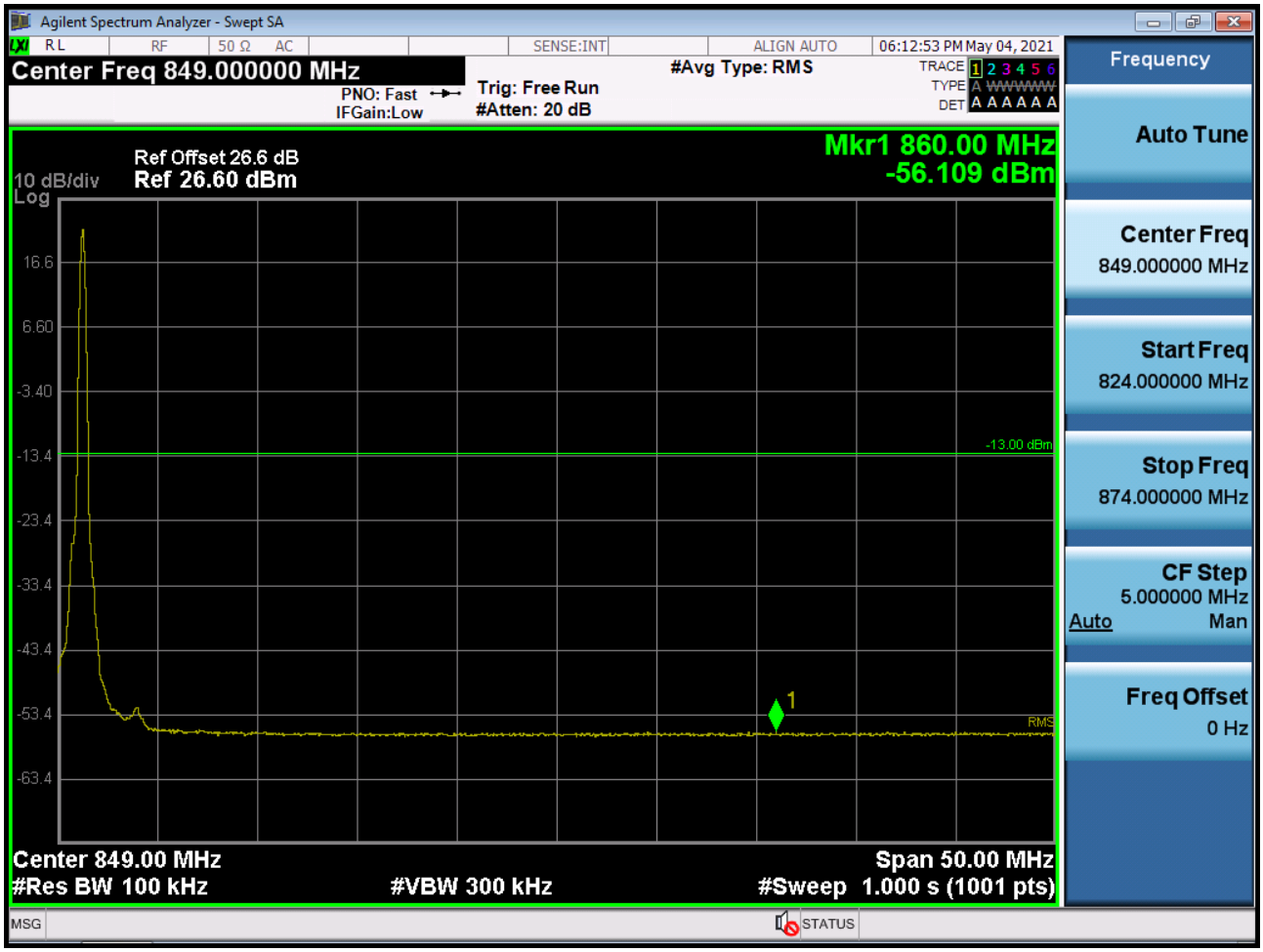
BAND 26. Band Edge (1.4MHz_QPSK_RB 1_5)



BAND 26. Band Edge (1.4MHz_QPSK_FullRB)

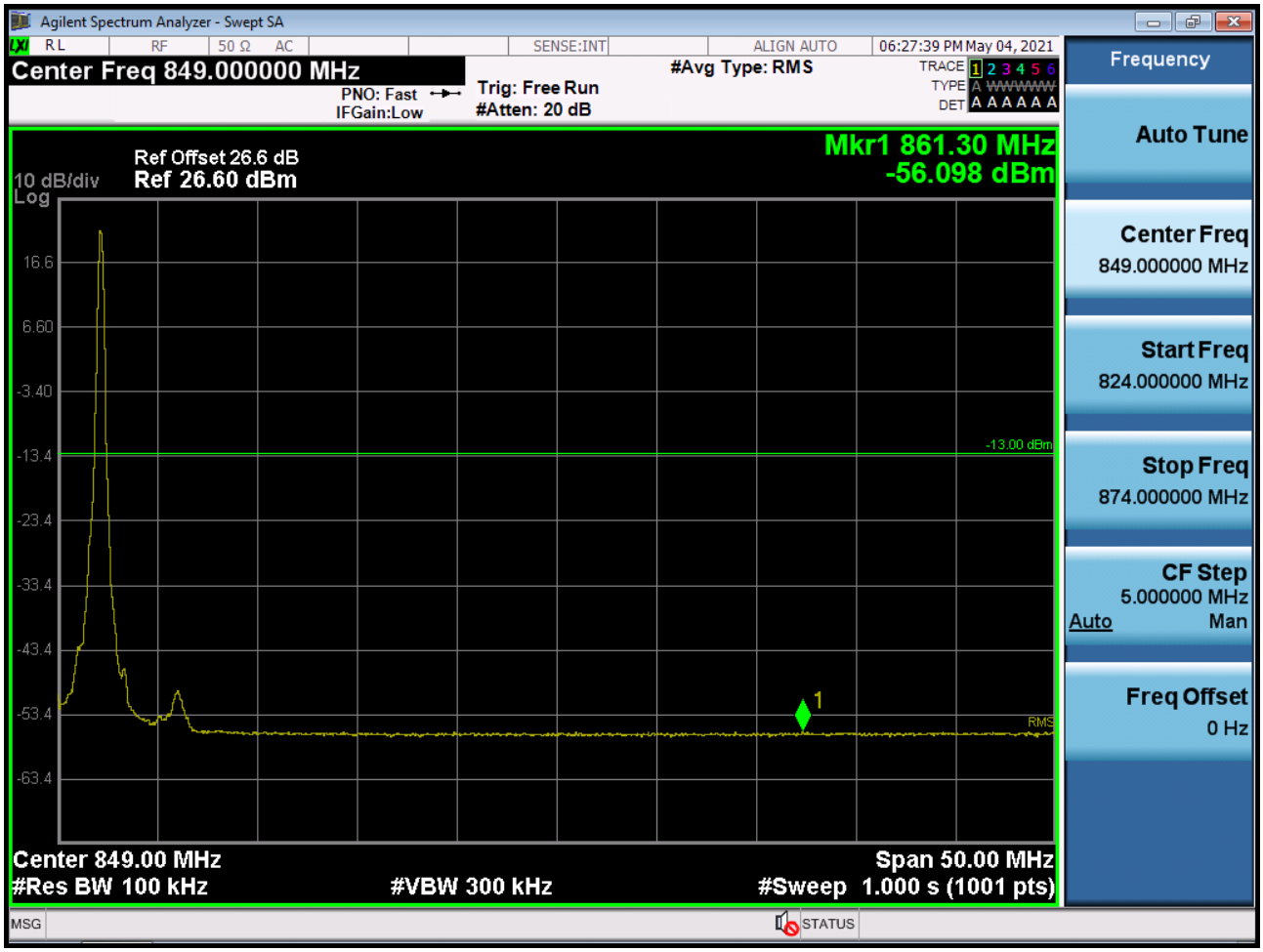


BAND 26. Band Edge (3MHz_QPSK_RB 1_14)



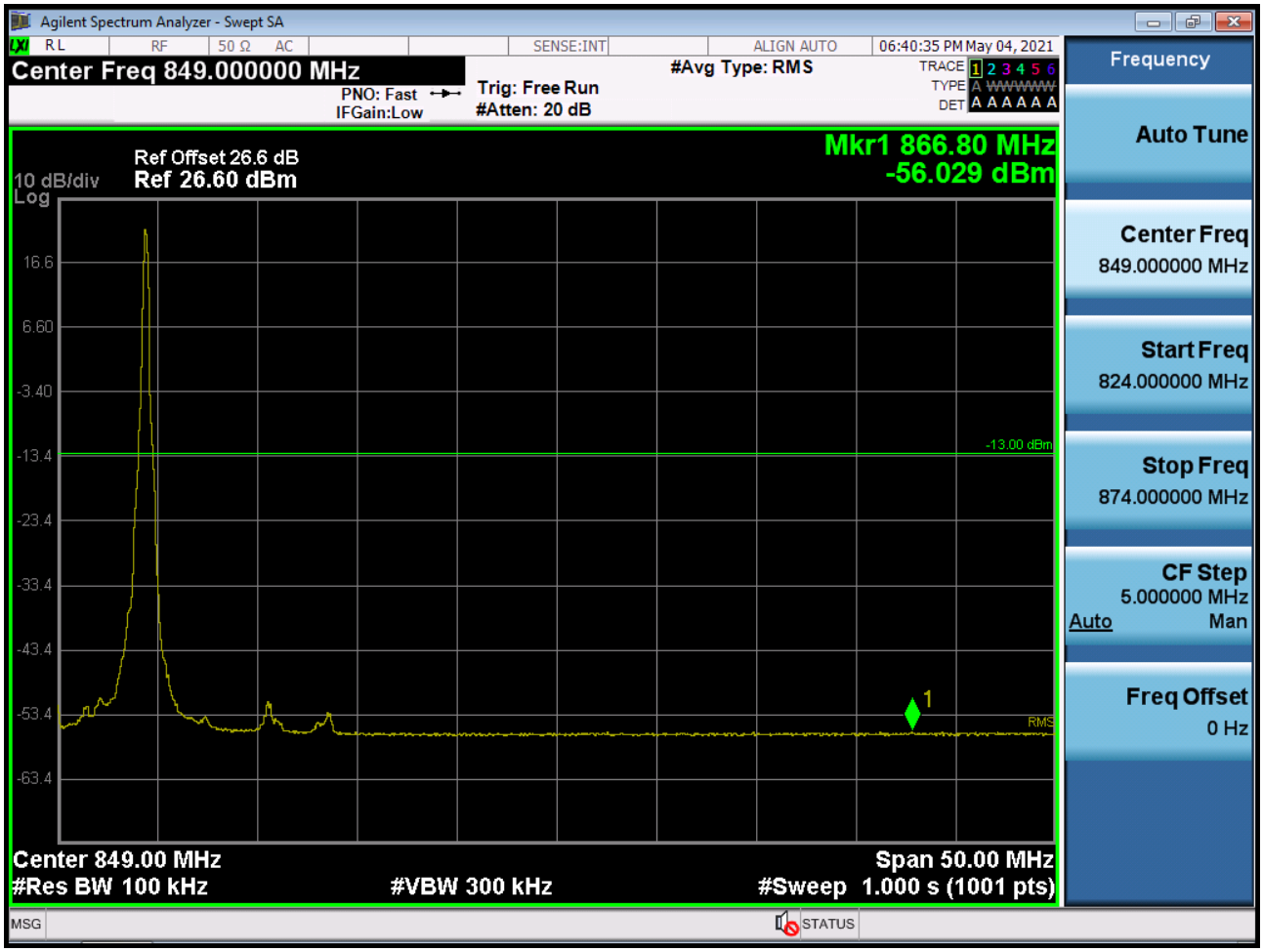
BAND 26. Band Edge (3MHz_QPSK_ Full RB)

BAND 26. Band Edge (5MHz_QPSK_RB 1_24)



BAND 26. Band Edge (5MHz_QPSK_ Full RB)

BAND 26. Band Edge (10MHz_QPSK_RB 1_49)



BAND 26. Band Edge (10MHz_QPSK_ Full RB)

11 ANNEX A_ TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-2106-FC007-P