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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:
September 17, 2021

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

Report No.: HCT-RF-2109-FC028

FCC ID:	**A3LSMG990E**
APPLICANT:	**SAMSUNG Electronics Co., Ltd.**

Model(s):	SM-G990E/DS
Additional Model(s):	SM-G990E
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	1M10G7D	QPSK	0.275	24.40
		1M10W7D	16QAM	0.231	23.63
		1M10W7D	64QAM	0.132	21.21
		1M10W7D	256QAM	0.104	20.17
LTE – Band26 (3)	815.5 – 822.5	2M73G7D	QPSK	0.274	24.38
		2M71W7D	16QAM	0.226	23.54
		2M71W7D	64QAM	0.128	21.08
		2M72W7D	256QAM	0.102	20.08
LTE – Band26 (5)	816.5 – 821.5	4M52G7D	QPSK	0.274	24.37
		4M52W7D	16QAM	0.229	23.59
		4M51W7D	64QAM	0.131	21.16
		4M52W7D	256QAM	0.102	20.10
LTE – Band26 (10)	819.0	9M04G7D	QPSK	0.286	24.57
		9M04W7D	16QAM	0.234	23.70
		9M02W7D	64QAM	0.137	21.37
		8M99W7D	256QAM	0.105	20.21
LTE – Band26 (15)	821.5	13M5G7D	QPSK	0.276	24.41
		13M4W7D	16QAM	0.232	23.65
		13M4W7D	64QAM	0.131	21.18
		13M5W7D	256QAM	0.103	20.11

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-2109-FC028	September 17, 2021	- 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:	A3LSMG990E
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-G990E/DS
Additional Model(s):	SM-G990E
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:	August 18, 2021 ~ September 14, 2021
Serial number:	Radiated: R3CR903MSRT Conducted: 572a0a14503f7ece

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

2.2. MEASURING INSTRUMENT CALIBRATION

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

2.3. TEST FACILITY

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

3. DESCRIPTION OF TESTS

3.1 TEST PROCEDURE

Test Description	Test Procedure Used
Occupied Bandwidth	- KDB 971168 D01 v03r01 – Section 4.3 - ANSI C63.26-2015 – Section 5.4.4
Channel Edge	- KDB 971168 D01 v03r01 – Section 6.0 - ANSI C63.26-2015 – Section 5.7
Spurious and Harmonic Emissions at Antenna Terminal	- KDB 971168 D01 v03r01 – Section 6.0 - ANSI C63.26-2015 – Section 5.7
Conducted Output Power	- 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

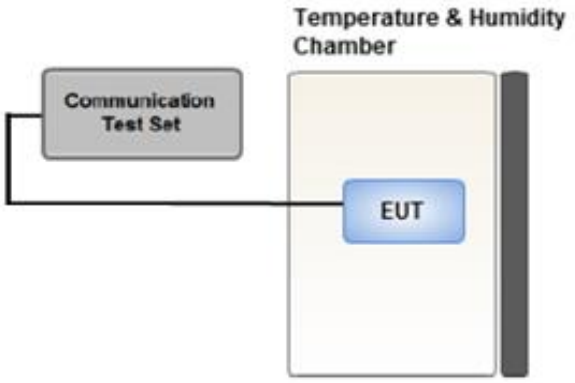
According to ANSI C63.26-2015 Section 5.2.1 when measuring the maximum RF output power from such devices, control over the EUT must be provided either through special test software (provided by manufacturer specifically for compliance testing, but not accessible by an end user) or through use of a base 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 1 MHz
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.

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

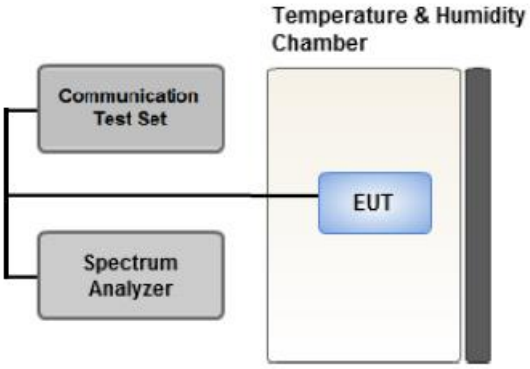
$$\text{Result}_{(dBm)} = \text{Pg}_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dBi)}$$

   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.

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

3.5 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.

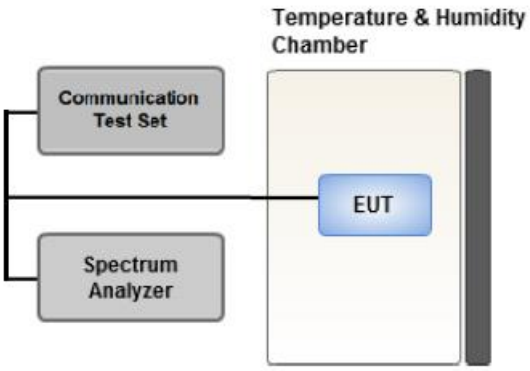
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

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.

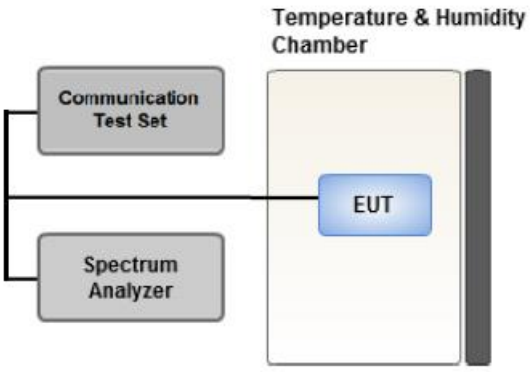
All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

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 = 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.

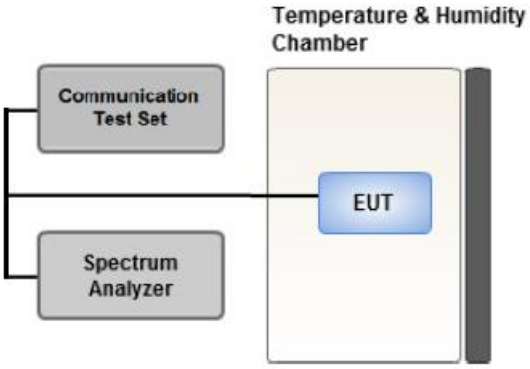
Test Settings

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 : 300 Hz
   .- EA licensee's frequency block greater than 37.5 kHz : 100 kHz
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-G990E/DS & additional models were tested and the worst case results are reported.

(Worst case : SM-G990E/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	Y

3.10 WORST CASE(CONDUCTED TEST)

-Worst case : Of all modulation, We have tested modulation of the high Conducted Output Power.

- SM-G990E/DS & additional models were tested and the worst case results are reported.

(Worst case : SM-G990E/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
		1.4, 3, 5 10	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

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
H.P.F	FBSR-02B(WHK1.2/15 G-10EF)	T&M SYSTEM	-	03/02/2022	Annual
H.P.F	FBSR-02B(WHK3.3/18 G-10EF)	T&M SYSTEM	-	03/02/2022	Annual
Power Splitter(DC ~ 26.5 GHz)	11667B	Hewlett Packard	11275	04/07/2022	Annual
DC Power Supply	E3632A	Agilent	MY40010147	06/28/2022	Annual
Dipole Antenna	UHAP	Schwarzbeck	557	04/05/2023	Biennial
Dipole Antenna	UHAP	Schwarzbeck	558	04/05/2023	Biennial
Chamber	SU-642	ESPEC	93008124	03/15/2022	Annual
Horn Antenna(1 ~ 18 GHz)	BBHA 9120D	Schwarzbeck	147	08/30/2022	Biennial
Horn Antenna(1 ~ 18 GHz)	BBHA 9120D	Schwarzbeck	9120D-1298	09/25/2021	Biennial
Horn Antenna(15 ~ 40 GHz)	BBHA 9170	Schwarzbeck	BBHA9170342	10/13/2022	Biennial
Horn Antenna(15 ~ 40 GHz)	BBHA 9170	Schwarzbeck	BBHA9170124	02/11/2022	Biennial
Signal Analyzer(10 Hz ~ 26.5 GHz)	N9020A	Agilent	MY50200093	11/17/2021	Annual
ATTENUATOR(20 dB)	8493C	Hewlett Packard	17280	06/01/2022	Annual
Spectrum Analyzer(10 Hz ~ 40 GHz)	FSV40	REOHDE & SCHWARZ	100931	10/14/2021	Annual
Base Station	8960 (E5515C)	Agilent	MY48360800	08/18/2022	Annual
Loop Antenna(9 kHz ~ 30 MHz)	FMZB1513	Schwarzbeck	1513-333	03/19/2022	Biennial
Bilog Antenna	VULB9160	Schwarzbeck	3150	03/03/2023	Biennial
Hybrid Antenna	VULB9168	Schwarzbeck	760	02/22/2023	Biennial
Wideband Radio Communication Tester	MT8821C	Anritsu Corp.	6262116770	07/12/2022	Annual
Wideband Radio Communication Tester	MT8820C	Anritsu Corp.	6201026545	01/07/2022	Annual
SIGNAL GENERATOR (100 kHz ~ 40 GHz)	SMB100A	REOHDE & SCHWARZ	177633	07/05/2022	Annual
Signal Analyzer(5 Hz ~ 40.0 GHz)	N9030B	KEYSIGHT	MY55480167	06/02/2022	Annual
FCC LTE Mobile Conducted RF Automation Test Software	-	HCT CO., LTD.,	-	-	-

Note:

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

5. MEASUREMENT UNCERTAINTY

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

Parameter	Expanded Uncertainty (±dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82 (Confidence level about 95 %, k=2)
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40 (Confidence level about 95 %, k=2)
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80 (Confidence level about 95 %, k=2)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70 (Confidence level about 95 %, k=2)
Radiated Disturbance (18 GHz ~ 40 GHz)	5.05 (Confidence level about 95 %, k=2)

6. SUMMARY OF TEST RESULTS

6.1 Test Condition : Conducted Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Occupied Bandwidth	§2.1049	N/A	PASS
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 Level (dBm)	Substitute Level (dBm)	Ant. Gain (dBd)	C.L	Pol.	ERP	
channel	Freq.(MHz)						W	dBm
128	824.20	-21.37	38.40	-10.61	0.95	H	0.483	26.84

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

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

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

3) Record the field strength meter's level.

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

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

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

7.2 EIRP Sample Calculation

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

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

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

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

3) Record the field strength meter's level.

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

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

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

7.3. Emission Designator

GSM Emission Designator

Emission Designator = 249KGXW

GSM BW = 249 kHz

G = Phase Modulation

X = Cases not otherwise covered

W = Combination (Audio/Data)

EDGE Emission Designator

Emission Designator = 249KG7W

GSM BW = 249 kHz

G = Phase Modulation

7 = Quantized/Digital Info

W = Combination (Audio/Data)

WCDMA Emission Designator

Emission Designator = 4M17F9W

WCDMA BW = 4.17 MHz

F = Frequency Modulation

9 = Composite Digital Info

W = Combination (Audio/Data)

QPSK Modulation

Emission Designator = 4M48G7D

LTE BW = 4.48 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

QAM Modulation

Emission Designator = 4M48W7D

LTE BW = 4.48 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

8. TEST DATA

8.1 CONDUCTED OUTPUT POWER

Band Width	Modulation	RB Size	RB Offset	Max. output power(dBm)				Limit (W)
				814.7 MHz		823.3 MHz		
				dBm	W	dBm	W	
1.4	QPSK	1	0	24.19	0.262	24.21	0.264	100
		1	3	24.17	0.261	24.23	0.265	100
		1	5	24.32	0.270	24.35	0.272	100
		3	0	24.38	0.274	24.40	0.275	100
		3	1	24.32	0.270	24.37	0.274	100
		3	3	24.34	0.272	24.35	0.272	100
		6	0	23.42	0.220	23.44	0.221	100
	16QAM	1	0	23.61	0.230	23.63	0.231	100
		1	3	23.49	0.223	23.48	0.223	100
		1	5	23.58	0.228	23.57	0.228	100
		3	0	23.42	0.220	23.45	0.221	100
		3	1	23.41	0.219	23.50	0.224	100
		3	3	23.46	0.222	23.48	0.223	100
		6	0	22.41	0.174	22.46	0.176	100
	64QAM	1	0	21.17	0.131	21.19	0.132	100
		1	3	21.04	0.127	21.05	0.127	100
		1	5	21.19	0.132	21.21	0.132	100
		3	0	21.01	0.126	21.04	0.127	100
		3	1	20.99	0.126	21.02	0.126	100
		3	3	21.02	0.126	21.05	0.127	100
		6	0	20.00	0.100	20.04	0.101	100
	256QAM	1	0	20.17	0.104	20.15	0.104	100
		1	3	20.11	0.103	20.10	0.102	100
		1	5	20.11	0.103	20.12	0.103	100
		3	0	19.99	0.100	20.01	0.100	100
		3	1	19.96	0.099	20.00	0.100	100
		3	3	19.83	0.096	20.02	0.100	100
		6	0	18.91	0.078	18.93	0.078	100

Band Width	Modulation	RB Size	RB Offset	Max. output power(dBm)				Limit (W)
				815.5 MHz		822.5 MHz		
				dBm	W	dBm	W	
3	QPSK	1	0	24.36	0.273	24.38	0.274	100
		1	7	24.35	0.272	24.37	0.274	100
		1	14	24.25	0.266	24.27	0.267	100
		8	0	23.38	0.218	23.40	0.219	100
		8	3	23.37	0.217	23.41	0.219	100
		8	7	23.42	0.220	23.44	0.221	100
		15	0	23.39	0.218	23.40	0.219	100
	16QAM	1	0	23.50	0.224	23.51	0.224	100
		1	7	23.37	0.217	23.39	0.218	100
		1	14	23.51	0.224	23.54	0.226	100
		8	0	22.46	0.176	22.48	0.177	100
		8	3	22.43	0.175	22.46	0.176	100
		8	7	22.38	0.173	22.40	0.174	100
		15	0	22.43	0.175	22.45	0.176	100
	64QAM	1	0	21.04	0.127	21.08	0.128	100
		1	7	20.88	0.122	20.90	0.123	100
		1	14	21.05	0.127	21.05	0.127	100
		8	0	19.94	0.099	19.96	0.099	100
		8	3	19.90	0.098	19.93	0.098	100
		8	7	20.00	0.100	20.01	0.100	100
		15	0	19.97	0.099	20.01	0.100	100
	256QAM	1	0	19.92	0.098	19.98	0.100	100
		1	7	19.97	0.099	19.99	0.100	100
		1	14	20.06	0.101	20.08	0.102	100
		8	0	18.81	0.076	18.85	0.077	100
		8	3	18.86	0.077	18.90	0.078	100
		8	7	18.84	0.077	18.90	0.078	100
		15	0	18.77	0.075	18.81	0.076	100

Band Width	Modulation	RB Size	RB Offset	Max. output power(dBm)				Limit (W)
				816.5 MHz		821.5 MHz		
				dBm	W	dBm	W	
5	QPSK	1	0	24.31	0.270	24.33	0.271	100
		1	12	24.32	0.270	24.35	0.272	100
		1	24	24.35	0.272	24.37	0.274	100
		12	0	23.41	0.219	23.45	0.221	100
		12	6	23.37	0.217	23.39	0.218	100
		12	11	23.40	0.219	23.42	0.220	100
		25	0	23.45	0.221	23.47	0.222	100
	16QAM	1	0	23.57	0.228	23.59	0.229	100
		1	12	23.46	0.222	23.48	0.223	100
		1	24	23.48	0.223	23.50	0.224	100
		12	0	22.48	0.177	22.50	0.178	100
		12	6	22.43	0.175	22.45	0.176	100
		12	11	22.40	0.174	22.43	0.175	100
		25	0	22.41	0.174	22.44	0.175	100
	64QAM	1	0	21.14	0.130	21.14	0.130	100
		1	12	21.13	0.130	21.10	0.129	100
		1	24	21.15	0.130	21.16	0.131	100
		12	0	19.95	0.099	19.99	0.100	100
		12	6	19.96	0.099	19.20	0.083	100
		12	11	20.01	0.100	20.04	0.101	100
		25	0	19.89	0.097	19.92	0.098	100
	256QAM	1	0	19.94	0.099	19.96	0.099	100
		1	12	19.97	0.099	19.99	0.100	100
		1	24	20.00	0.100	20.10	0.102	100
		12	0	18.85	0.077	18.88	0.077	100
		12	6	18.83	0.076	18.85	0.077	100
		12	11	18.84	0.077	18.89	0.077	100
		25	0	18.84	0.077	18.89	0.077	100

Band Width	Modulation	RB Size	RB Offset	Max. output power(dBm)		Limit (W)
				819 MHz		
				dBm	W	
10	QPSK	1	0	24.57	0.286	100
		1	24	24.47	0.280	100
		1	49	24.42	0.277	100
		25	0	23.63	0.231	100
		25	12	23.64	0.231	100
		25	24	23.58	0.228	100
		50	0	23.65	0.232	100
	16QAM	1	0	23.68	0.233	100
		1	24	23.60	0.229	100
		1	49	23.70	0.234	100
		25	0	22.63	0.183	100
		25	12	22.64	0.184	100
		25	24	22.55	0.180	100
		50	0	22.61	0.182	100
	64QAM	1	0	21.37	0.137	100
		1	24	21.26	0.134	100
		1	49	21.21	0.132	100
		25	0	20.07	0.102	100
		25	12	20.06	0.101	100
		25	24	20.04	0.101	100
		50	0	20.05	0.101	100
	256QAM	1	0	20.21	0.105	100
		1	24	20.20	0.105	100
		1	49	20.08	0.102	100
		25	0	19.05	0.080	100
		25	12	19.00	0.079	100
		25	24	19.01	0.080	100
		50	0	19.02	0.080	100

Band Width	Modulation	RB Size	RB Offset	Max. output power(dBm)		Limit (W)
				821.5 MHz		
				dBm	W	
15	QPSK	1	0	24.41	0.276	100
		1	36	24.40	0.275	100
		1	74	24.38	0.274	100
		36	0	23.49	0.223	100
		36	18	23.52	0.225	100
		36	39	23.48	0.223	100
		75	0	23.49	0.223	100
	16QAM	1	0	23.65	0.232	100
		1	36	23.65	0.232	100
		1	74	23.61	0.230	100
		36	0	22.51	0.178	100
		36	18	22.48	0.177	100
		36	39	22.40	0.174	100
		75	0	22.50	0.178	100
	64QAM	1	0	21.18	0.131	100
		1	36	21.08	0.128	100
		1	74	21.13	0.130	100
		36	0	20.05	0.101	100
		36	18	20.00	0.100	100
		36	39	20.00	0.100	100
		75	0	19.99	0.100	100
	256QAM	1	0	20.11	0.103	100
		1	36	19.97	0.099	100
		1	74	20.08	0.102	100
		36	0	18.94	0.078	100
		36	18	18.91	0.078	100
		36	39	18.90	0.078	100
		75	0	18.90	0.078	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	-34.09	28.45	-10.29	1.38	H	< 100	0.048	16.78
		16QAM	-34.61	27.93	-10.29	1.38	H		0.042	16.26
		64QAM	-37.13	25.41	-10.29	1.38	H		0.024	13.74
		256QAM	-38.28	24.26	-10.29	1.38	H		0.018	12.59
823.3		QPSK	-33.08	29.97	-10.25	1.39	H		0.068	18.33
		16QAM	-33.72	29.33	-10.25	1.39	H		0.059	17.69
		64QAM	-36.28	26.77	-10.25	1.39	H		0.033	15.13
		256QAM	-37.43	25.62	-10.25	1.39	H		0.025	13.98

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	-33.89	28.69	-10.29	1.39	H	< 100	0.050	17.02
		16QAM	-34.68	27.90	-10.29	1.39	H		0.042	16.23
		64QAM	-37.20	25.38	-10.29	1.39	H		0.023	13.71
		256QAM	-38.21	24.37	-10.29	1.39	H		0.019	12.70
822.5		QPSK	-32.98	30.13	-10.26	1.39	H		0.071	18.49
		16QAM	-33.78	29.33	-10.26	1.39	H		0.059	17.69
		64QAM	-36.36	26.75	-10.26	1.39	H		0.032	15.11
		256QAM	-37.39	25.72	-10.26	1.39	H		0.026	14.08

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	-34.11	28.58	-10.28	1.39	H	< 100	0.049	16.91
		16QAM	-34.86	27.83	-10.28	1.39	H		0.041	16.16
		64QAM	-37.35	25.34	-10.28	1.39	H		0.023	13.67
		256QAM	-38.51	24.18	-10.28	1.39	H		0.018	12.51
821.5		QPSK	-33.36	29.68	-10.26	1.39	H		0.064	18.03
		16QAM	-34.03	29.01	-10.26	1.39	H		0.054	17.36
		64QAM	-36.55	26.49	-10.26	1.39	H		0.030	14.84
		256QAM	-37.70	25.34	-10.26	1.39	H		0.023	13.69

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	-33.69	29.19	-10.27	1.39	H	< 100	0.057	17.53
		16QAM	-34.49	28.39	-10.27	1.39	H		0.047	16.73
		64QAM	-36.95	25.93	-10.27	1.39	H		0.027	14.27
		256QAM	-38.05	24.83	-10.27	1.39	H		0.021	13.17

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	-33.65	29.39	-10.26	1.39	H	< 7.00	0.059	17.74
		16QAM	-34.37	28.67	-10.26	1.39	H		0.050	17.02
		64QAM	-36.94	26.10	-10.26	1.39	H		0.028	14.45
		256QAM	-37.97	25.07	-10.26	1.39	H		0.022	13.42

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	-52.36	9.50	-62.32	1.98	H	-54.80	-13.00
	2 446.50	-29.78	10.28	-34.26	2.47	V	-26.44	-13.00
	3 262.00	-57.72	11.86	-58.93	2.88	V	-49.95	-13.00
26775 (822.5)	1 645.00	-52.88	9.65	-63.23	1.99	V	-55.56	-13.00
	2 467.50	-30.31	10.46	-34.96	2.47	H	-26.97	-13.00
	3 290.00	-57.88	12.04	-59.28	2.88	H	-50.12	-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	1.0964
			16QAM			1.0982
			64QAM			1.0996
			256QAM			1.0991
	3 MHz	822.5	QPSK	15		2.7281
			16QAM			2.7065
			64QAM			2.7114
			256QAM			2.7174
	5 MHz	821.5	QPSK	25		4.5235
			16QAM			4.5243
			64QAM			4.5098
			256QAM			4.5227
	10 MHz	819.0	QPSK	50		9.0360
			16QAM			9.0401
			64QAM			9.0163
			256QAM			8.9942
	15 MHz	821.5	QPSK	75		13.492
			16QAM			13.443
			64QAM			13.425
			256QAM			13.466

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	3.6875	27.976	-67.054	-39.078	-13.00
		823.3	3.6905	27.976	-67.220	-39.244	
	3	815.5	3.7059	27.976	-67.074	-39.098	
		822.5	3.6656	27.976	-67.414	-39.438	
	5	816.5	3.6820	27.976	-67.095	-39.119	
		821.5	3.6955	27.976	-67.183	-39.207	
	10	819.0	3.7005	27.976	-67.102	-39.126	
	15	821.5	3.6930	27.976	-67.323	-39.347	

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	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

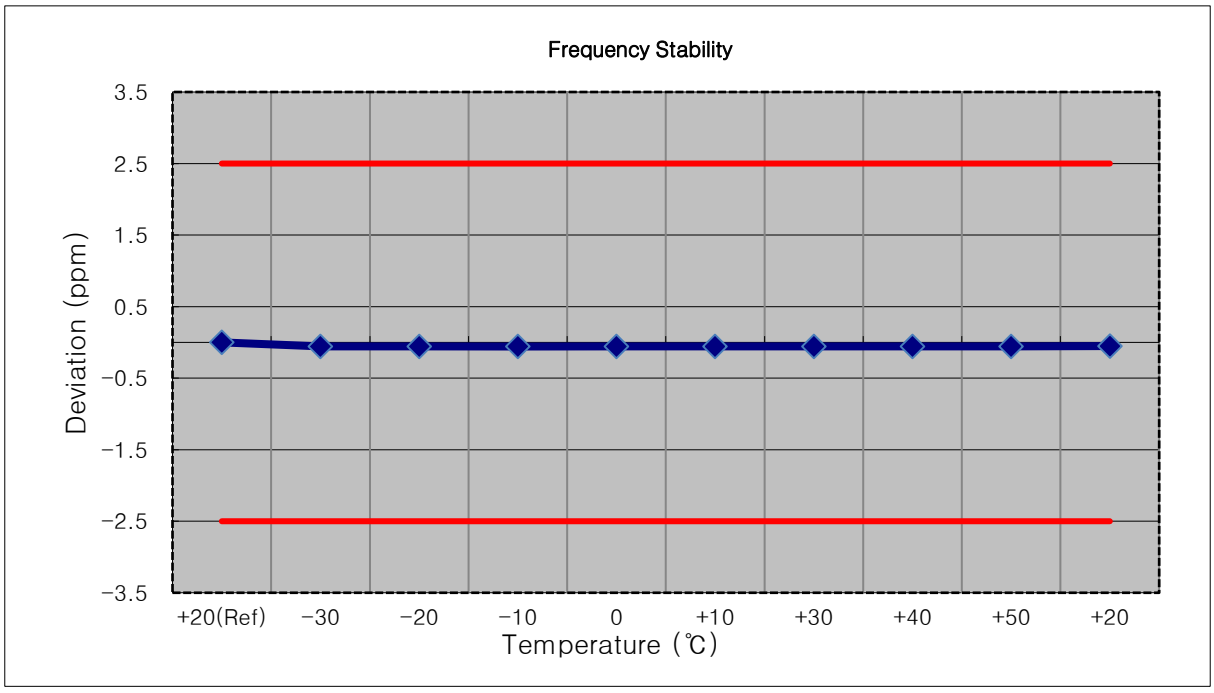
▣ OPERATING FREQUENCY: 814,700,000 Hz

▣ CHANNEL: 26697(1.4 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)	814 699 951	0.0	0.000 000	0.000
100%		-30	814 699 904	-47.4	-0.000 006	-0.058
100%		-20	814 699 906	-44.8	-0.000 005	-0.055
100%		-10	814 699 903	-47.6	-0.000 006	-0.058
100%		0	814 699 906	-45.2	-0.000 006	-0.055
100%		+10	814 699 904	-46.8	-0.000 006	-0.057
100%		+30	814 699 905	-46.0	-0.000 006	-0.056
100%		+40	814 699 907	-44.5	-0.000 005	-0.055
100%		+50	814 699 906	-45.1	-0.000 006	-0.055
Batt. Endpoint	3.400	+20	814 699 910	-41.2	-0.000 005	-0.051



▣ MODE: LTE 26

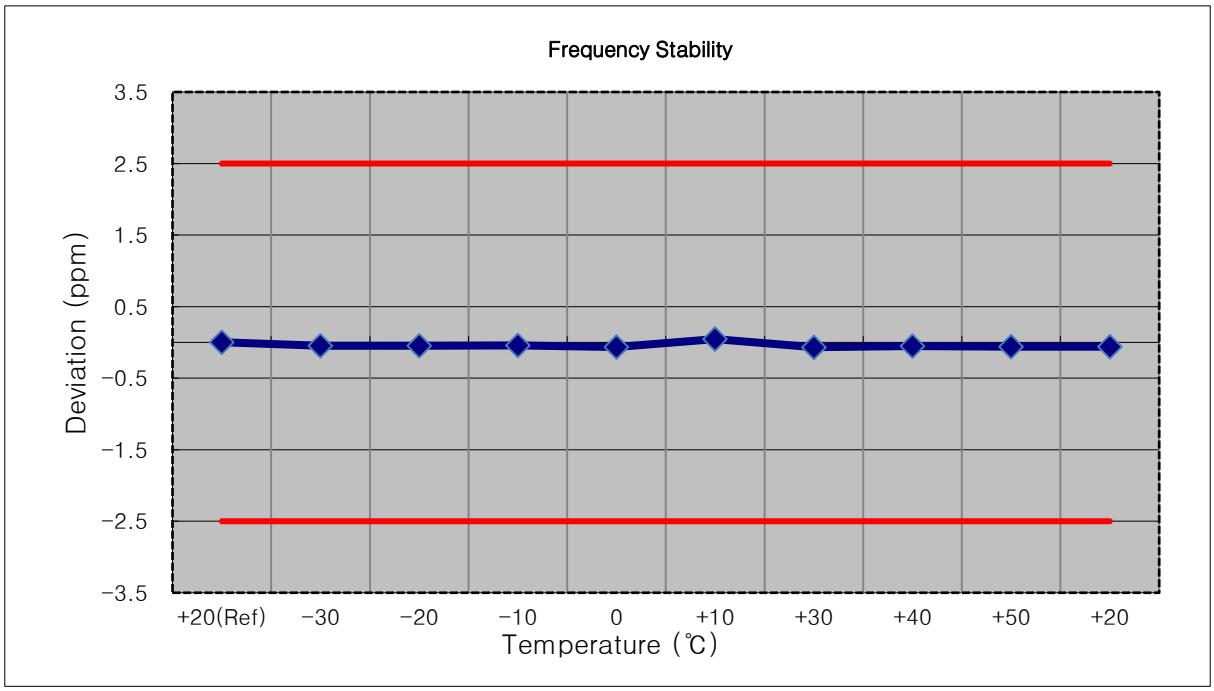
▣ OPERATING FREQUENCY: 815,500,000 Hz

▣ CHANNEL: 26705(3 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)	815 499 953	0.0	0.000 000	0.000
100%		-30	815 499 915	-38.5	-0.000 005	-0.047
100%		-20	815 499 913	-39.9	-0.000 005	-0.049
100%		-10	815 499 920	-33.2	-0.000 004	-0.041
100%		0	815 499 899	-53.8	-0.000 007	-0.066
100%		+10	815 499 991	37.8	0.000 005	0.046
100%		+30	815 499 898	-55.3	-0.000 007	-0.068
100%		+40	815 499 909	-43.7	-0.000 005	-0.054
100%		+50	815 499 905	-48.5	-0.000 006	-0.059
Batt. Endpoint	3.400	+20	815 499 904	-48.7	-0.000 006	-0.060



▣ MODE: LTE 26

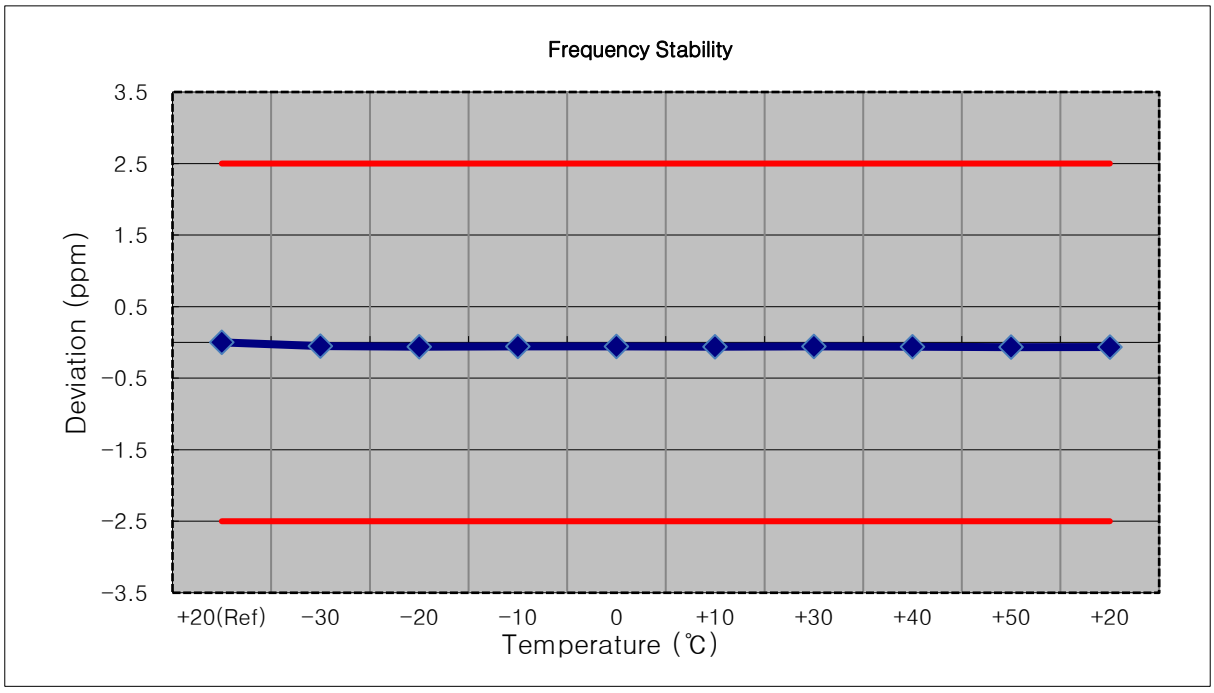
▣ OPERATING FREQUENCY: 816,500,000 Hz

▣ CHANNEL: 26715(5 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)	816 499 950	0.0	0.000 000	0.000
100%		-30	816 499 909	-40.7	-0.000 005	-0.050
100%		-20	816 499 901	-48.5	-0.000 006	-0.059
100%		-10	816 499 905	-44.3	-0.000 005	-0.054
100%		0	816 499 905	-44.9	-0.000 005	-0.055
100%		+10	816 499 899	-50.8	-0.000 006	-0.062
100%		+30	816 499 902	-47.2	-0.000 006	-0.058
100%		+40	816 499 900	-49.5	-0.000 006	-0.061
100%		+50	816 499 895	-55.0	-0.000 007	-0.067
Batt. Endpoint	3.400	+20	816 499 897	-53.1	-0.000 007	-0.065



▣ MODE: LTE 26

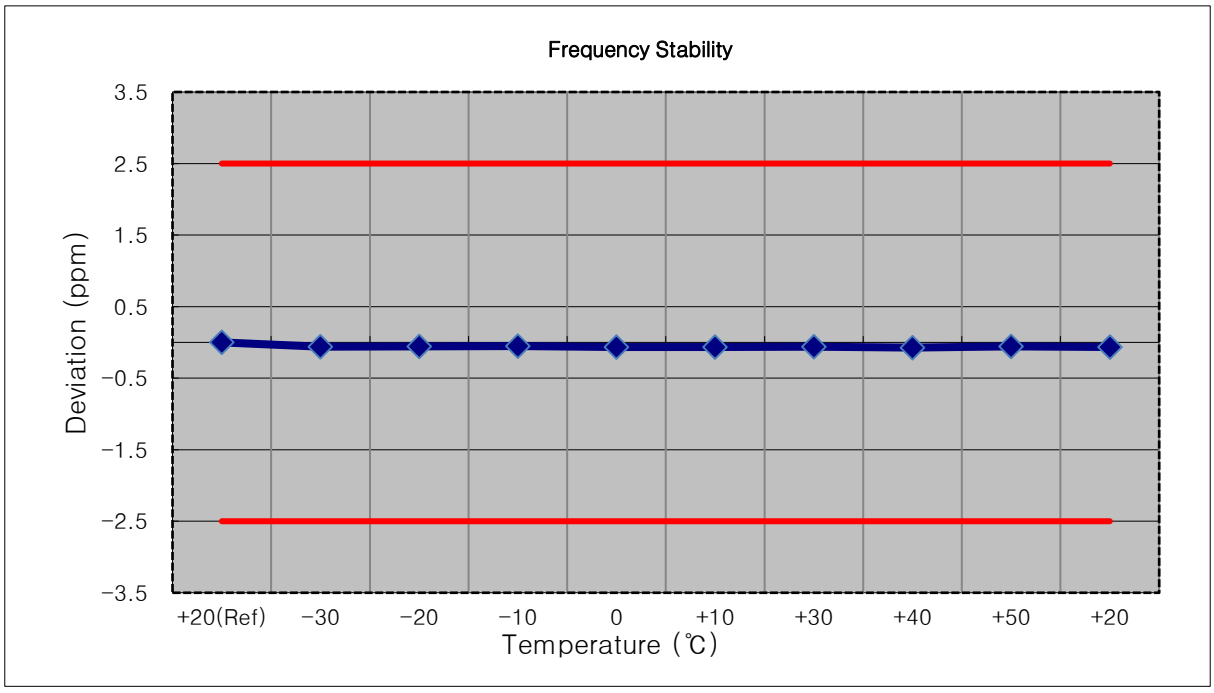
▣ OPERATING FREQUENCY: 819,000,000 Hz

▣ 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)	818 999 948	0.0	0.000 000	0.000
100%		-30	818 999 897	-51.0	-0.000 006	-0.062
100%		-20	818 999 902	-46.2	-0.000 006	-0.056
100%		-10	818 999 907	-41.6	-0.000 005	-0.051
100%		0	818 999 894	-54.5	-0.000 007	-0.067
100%		+10	818 999 894	-54.5	-0.000 007	-0.067
100%		+30	818 999 898	-50.5	-0.000 006	-0.062
100%		+40	818 999 889	-59.7	-0.000 007	-0.073
100%		+50	818 999 903	-45.4	-0.000 006	-0.055
Batt. Endpoint	3.400	+20	818 999 895	-53.8	-0.000 007	-0.066



▣ MODE: LTE 26

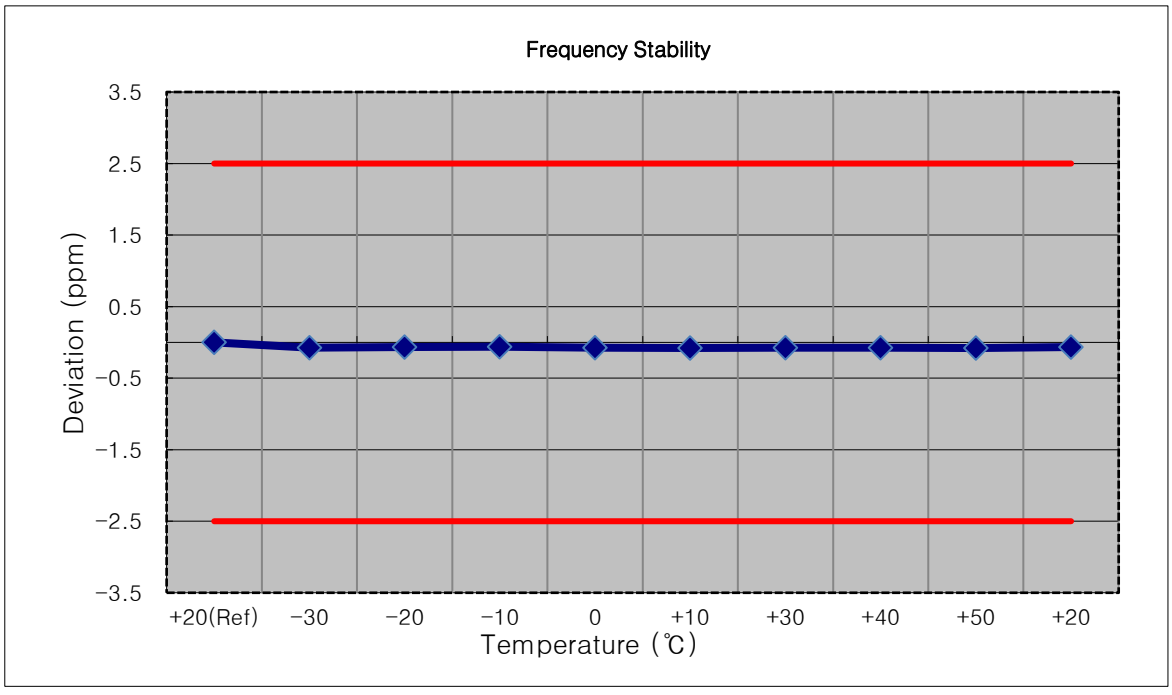
▣ OPERATING FREQUENCY: 821,500,000 Hz

▣ 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)	821 499 928	0.0	0.000 000	0.000
100%		-30	821 499 866	-62.2	-0.000 008	-0.076
100%		-20	821 499 875	-53.8	-0.000 007	-0.065
100%		-10	821 499 878	-50.8	-0.000 006	-0.062
100%		0	821 499 868	-60.4	-0.000 007	-0.074
100%		+10	821 499 865	-63.0	-0.000 008	-0.077
100%		+30	821 499 868	-59.9	-0.000 007	-0.073
100%		+40	821 499 866	-62.0	-0.000 008	-0.075
100%		+50	821 499 863	-65.0	-0.000 008	-0.079
Batt. Endpoint	3.400	+20	821 499 873	-55.1	-0.000 007	-0.067



8.8 STADDLE CHANNEL

8.8.1 CONDUCTED OUTPUT POWER

Band Width	Modulation	RB Size	RB Offset	Max. output power(dBm)		Limit (W)
				824 MHz		
				dBm	W	
1.4	QPSK	1	0	24.22	0.264	100
		1	3	24.25	0.266	100
		1	5	24.35	0.272	100
		3	0	24.40	0.275	100
		3	1	24.39	0.275	100
		3	3	24.36	0.273	100
		6	0	23.45	0.221	100
	16QAM	1	0	23.70	0.234	100
		1	3	23.46	0.222	100
		1	5	23.57	0.228	100
		3	0	23.50	0.224	100
		3	1	23.58	0.228	100
		3	3	23.51	0.224	100
		6	0	22.49	0.177	100
	64QAM	1	0	21.25	0.133	100
		1	3	21.06	0.128	100
		1	5	21.20	0.132	100
		3	0	21.05	0.127	100
		3	1	21.03	0.127	100
		3	3	21.07	0.128	100
		6	0	20.06	0.101	100
	256QAM	1	0	20.10	0.102	100
		1	3	20.11	0.103	100
		1	5	20.12	0.103	100
		3	0	20.03	0.101	100
		3	1	20.05	0.101	100
		3	3	20.08	0.102	100
		6	0	18.93	0.078	100

Band Width	Modulation	RB Size	RB Offset	Max. output power(dBm)		Limit (W)
				824 MHz		
				dBm	W	
3	QPSK	1	0	24.40	0.275	100
		1	7	24.40	0.275	100
		1	14	24.34	0.272	100
		8	0	23.44	0.221	100
		8	3	23.41	0.219	100
		8	7	23.42	0.220	100
		15	0	23.44	0.221	100
	16QAM	1	0	23.51	0.224	100
		1	7	23.42	0.220	100
		1	14	23.61	0.230	100
		8	0	22.50	0.178	100
		8	3	22.51	0.178	100
		8	7	22.50	0.178	100
		15	0	22.46	0.176	100
	64QAM	1	0	21.18	0.131	100
		1	7	21.13	0.130	100
		1	14	21.06	0.128	100
		8	0	19.96	0.099	100
		8	3	19.95	0.099	100
		8	7	20.01	0.100	100
		15	0	20.02	0.100	100
	256QAM	1	0	20.10	0.102	100
		1	7	20.02	0.100	100
		1	14	20.08	0.102	100
		8	0	18.85	0.077	100
		8	3	18.90	0.078	100
		8	7	18.91	0.078	100
		15	0	18.80	0.076	100

Band Width	Modulation	RB Size	RB Offset	Max. output power(dBm)		Limit (W)
				824 MHz		
				dBm	W	
5	QPSK	1	0	24.36	0.273	100
		1	12	24.44	0.278	100
		1	24	24.42	0.277	100
		12	0	23.48	0.223	100
		12	6	23.44	0.221	100
		12	11	23.50	0.224	100
		25	0	23.47	0.222	100
	16QAM	1	0	23.60	0.229	100
		1	12	23.55	0.226	100
		1	24	23.51	0.224	100
		12	0	22.50	0.178	100
		12	6	22.50	0.178	100
		12	11	22.49	0.177	100
		25	0	22.51	0.178	100
	64QAM	1	0	21.13	0.130	100
		1	12	21.10	0.129	100
		1	24	21.16	0.131	100
		12	0	20.03	0.101	100
		12	6	20.07	0.102	100
		12	11	20.08	0.102	100
		25	0	19.99	0.100	100
	256QAM	1	0	20.03	0.101	100
		1	12	20.00	0.100	100
		1	24	20.06	0.101	100
		12	0	19.88	0.097	100
		12	6	18.91	0.078	100
		12	11	18.90	0.078	100
		25	0	18.94	0.078	100

Band Width	Modulation	RB Size	RB Offset	Max. output power(dBm)		Limit (W)
				824 MHz		
				dBm	W	
10	QPSK	1	0	24.50	0.282	100
		1	24	24.40	0.275	100
		1	49	24.40	0.275	100
		25	0	23.57	0.228	100
		25	12	23.56	0.227	100
		25	24	23.55	0.226	100
		50	0	23.60	0.229	100
	16QAM	1	0	23.70	0.234	100
		1	24	23.58	0.228	100
		1	49	23.55	0.226	100
		25	0	22.58	0.181	100
		25	12	22.52	0.179	100
		25	24	22.51	0.178	100
		50	0	22.56	0.180	100
	64QAM	1	0	21.30	0.135	100
		1	24	21.11	0.129	100
		1	49	21.13	0.130	100
		25	0	20.04	0.101	100
		25	12	20.03	0.101	100
		25	24	19.98	0.100	100
		50	0	20.04	0.101	100
	256QAM	1	0	20.22	0.105	100
		1	24	20.14	0.103	100
		1	49	20.90	0.123	100
		25	0	19.06	0.081	100
		25	12	19.00	0.079	100
		25	24	18.99	0.079	100
		50	0	19.03	0.080	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	-32.86	30.07	-10.25	1.39	H	< 7.00	0.070	18.43
		16QAM	-33.65	29.28	-10.25	1.39	H		0.058	17.64
		64QAM	-36.12	26.81	-10.25	1.39	H		0.033	15.17
		256QAM	-37.21	25.72	-10.25	1.39	H		0.026	14.08

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	-32.84	30.09	-10.25	1.39	H	< 7.00	0.070	18.45
		16QAM	-33.65	29.28	-10.25	1.39	H		0.058	17.64
		64QAM	-36.25	26.68	-10.25	1.39	H		0.032	15.04
		256QAM	-37.25	25.68	-10.25	1.39	H		0.025	14.04

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	-33.16	29.77	-10.25	1.39	H	< 7.00	0.065	18.13
		16QAM	-33.91	29.02	-10.25	1.39	H		0.055	17.38
		64QAM	-36.51	26.42	-10.25	1.39	H		0.030	14.78
		256QAM	-37.60	25.33	-10.25	1.39	H		0.023	13.69

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	-33.04	29.89	-10.25	1.39	H	< 7.00	0.067	18.25
		16QAM	-33.88	29.05	-10.25	1.39	H		0.055	17.41
		64QAM	-36.36	26.57	-10.25	1.39	H		0.031	14.93
		256QAM	-37.49	25.44	-10.25	1.39	H		0.024	13.80

8.8.3 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
26790 (824.0)	1 648.00	-52.16	9.70	-62.48	1.99	H	-54.77	-13.00
	2 472.00	-31.00	10.46	-35.65	2.47	H	-27.66	-13.00
	3 296.00	-57.24	12.07	-58.73	2.89	H	-49.54	-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	3.6880	27.976	-67.283	-39.307	-13.00
	3		3.6915	27.976	-67.219	-39.243	
	5		3.6681	27.976	-67.375	-39.399	
	10		3.7089	27.976	-67.451	-39.475	

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	30.131

8.8.5 CHANNEL EDGE(Part90)

- Test Channel : 26790(824.0MHz)

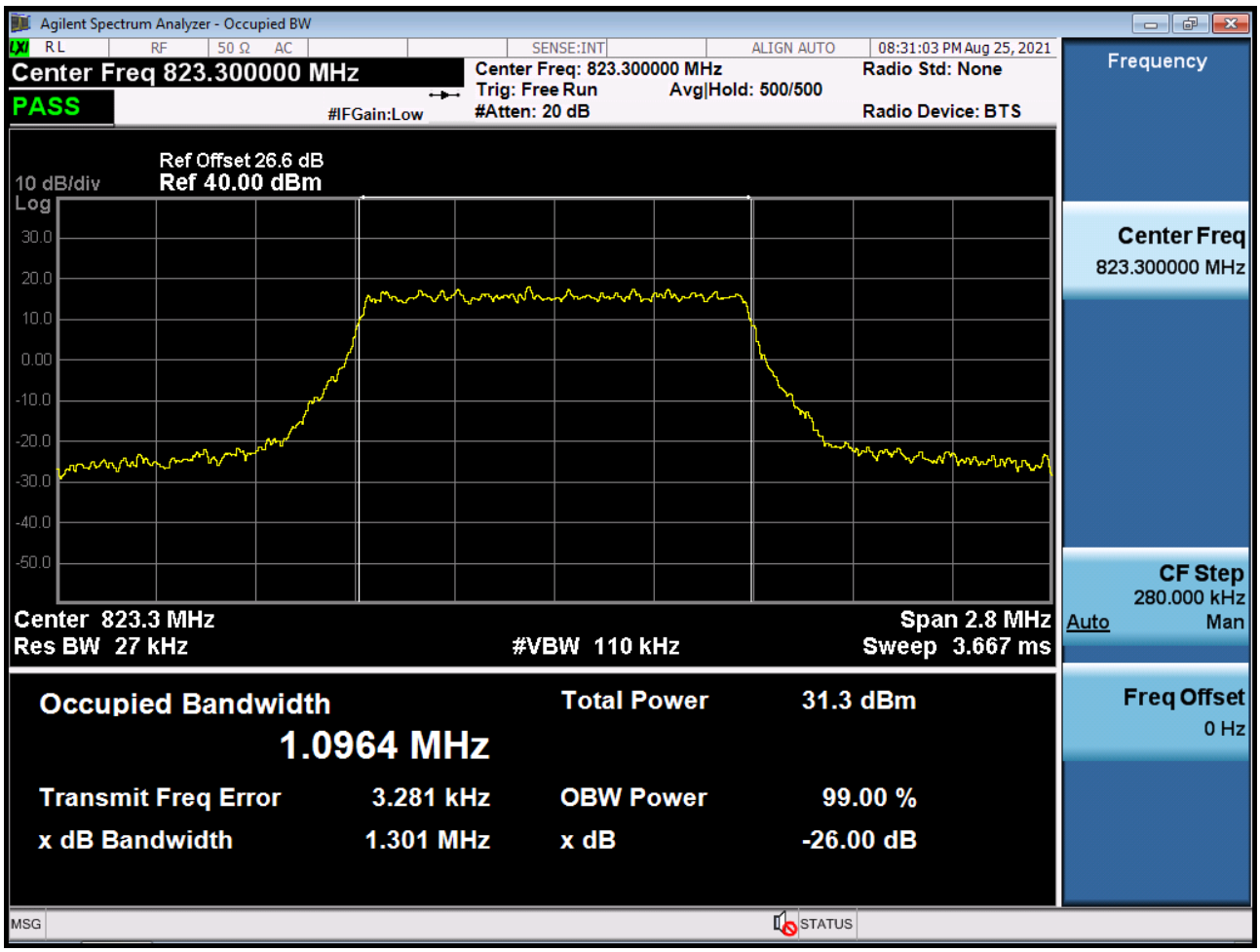
Plots of the EUT's Band Edge are shown Page 98 ~ 109.

8.8.6 BAND EDGE(Part22)

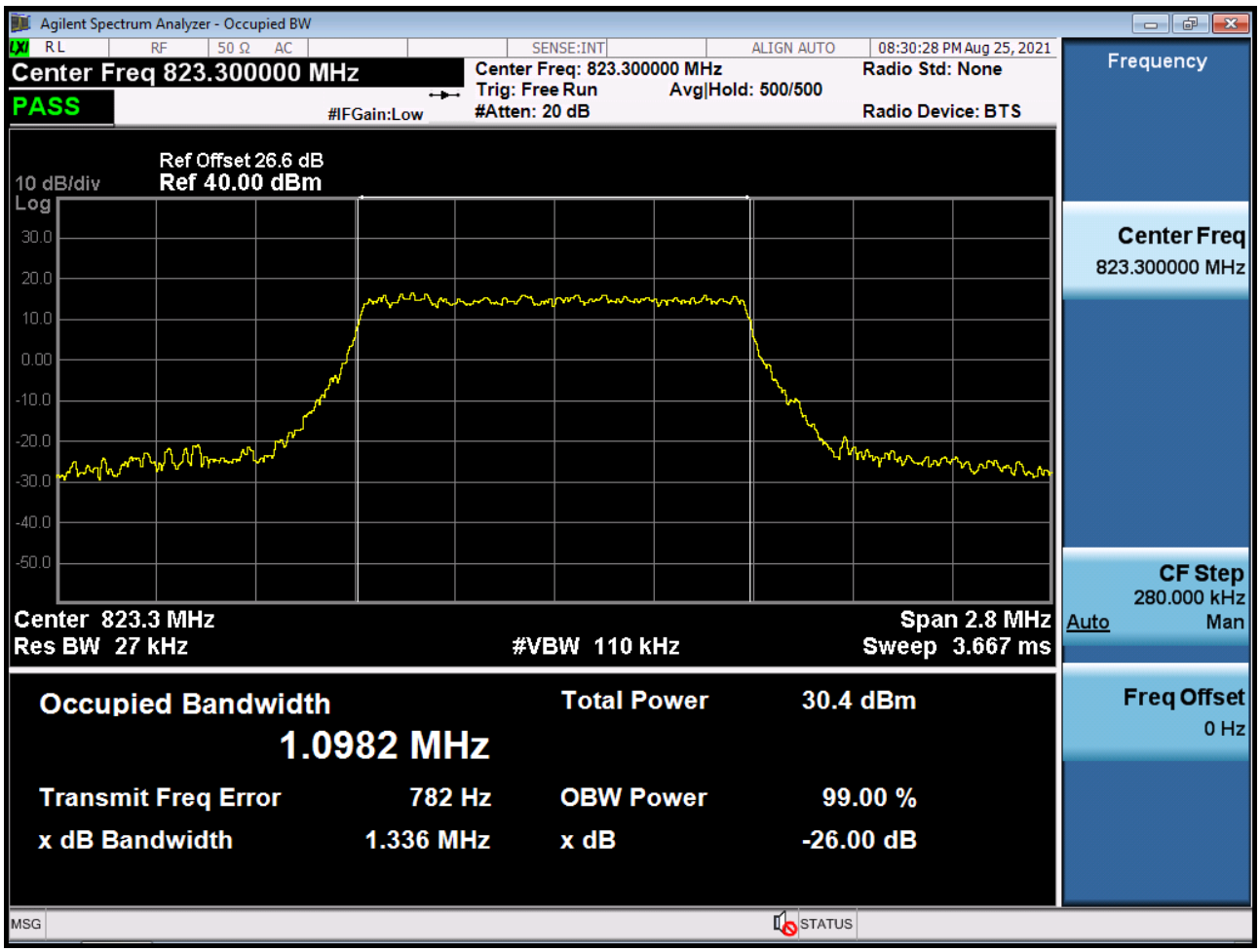
- Test Channel : 26790(824.0 MHz)
- Plots of the EUT's Band Edge are shown Page 110 ~ 117.

9. TEST PLOTS

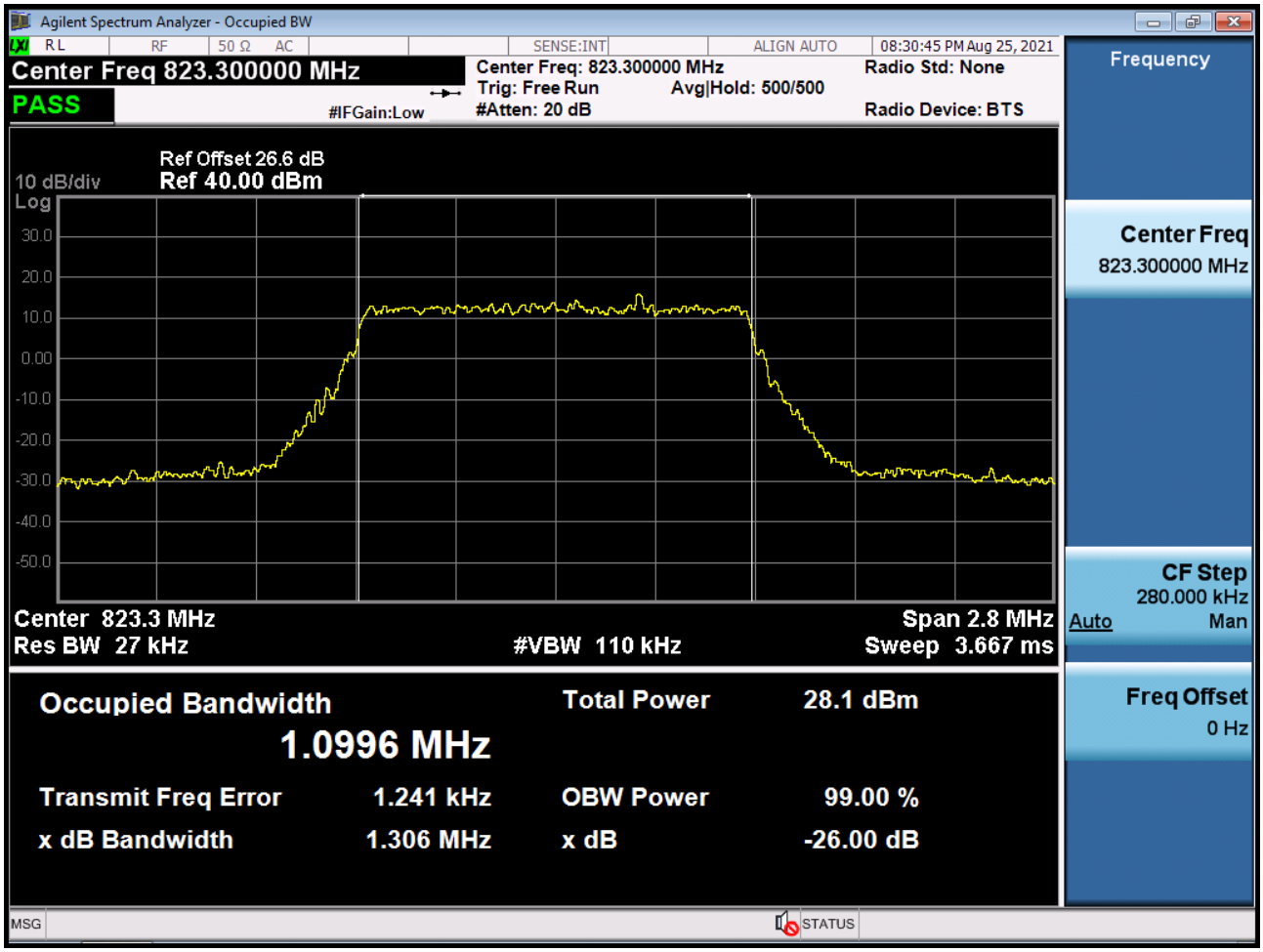
BAND 26. Occupied Bandwidth Plot (1.4 M BW Ch.26783 QPSK RB 6_0)



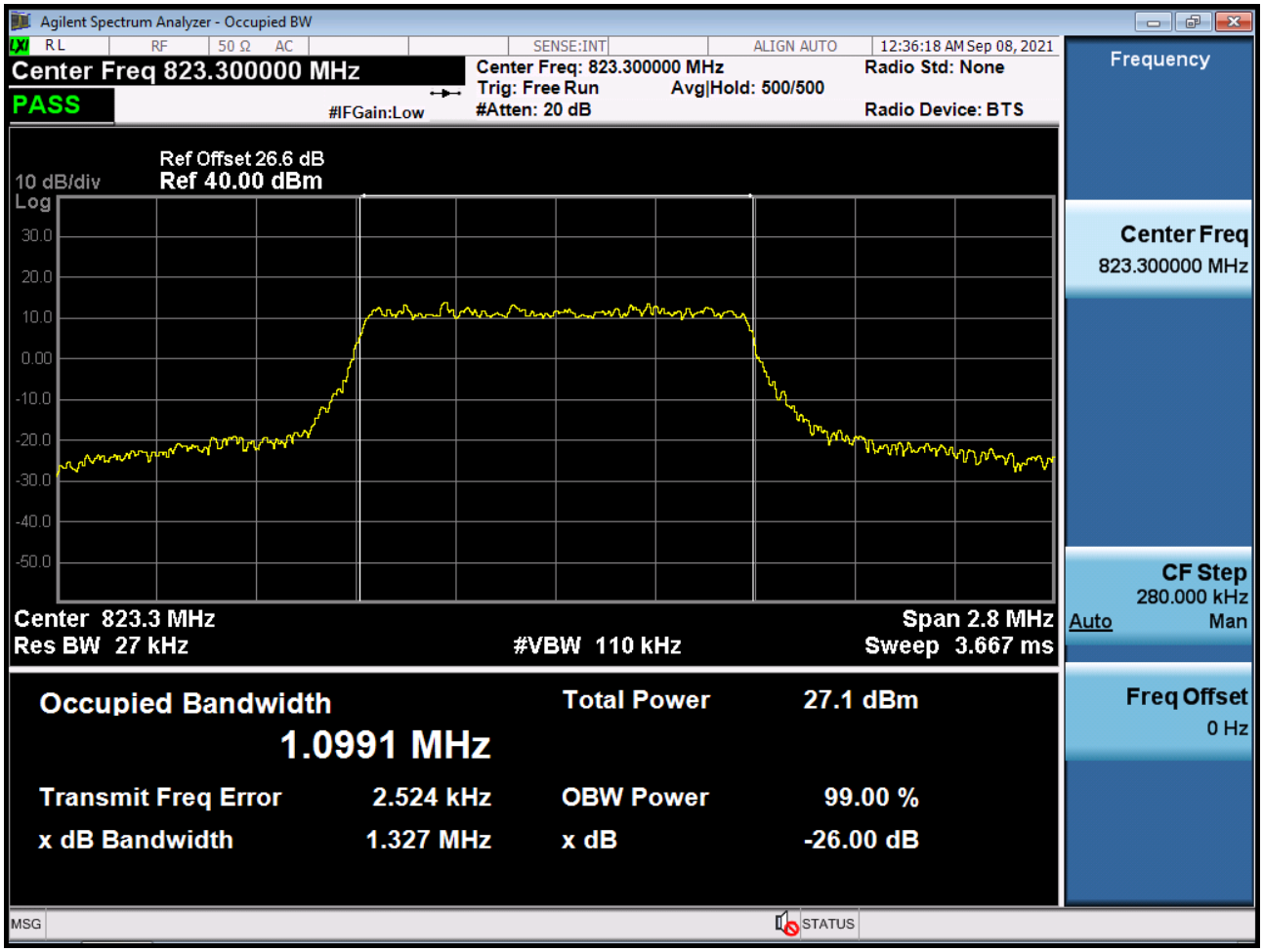
BAND 26. Occupied Bandwidth Plot (1.4 M BW Ch.26783 16QAM RB 6_0)



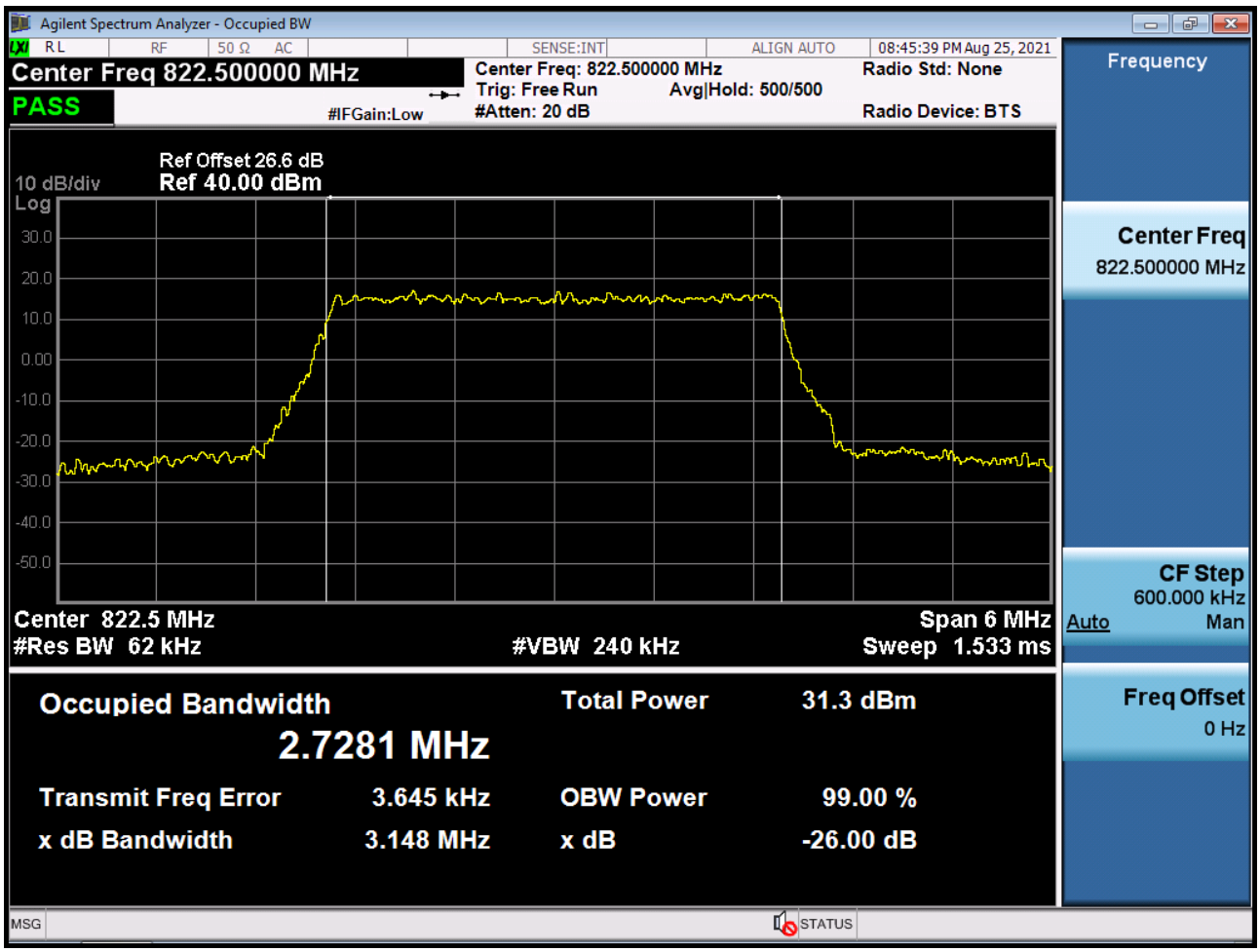
BAND 26. Occupied Bandwidth Plot (1.4 M BW Ch.26783 64QAM RB 6_0)



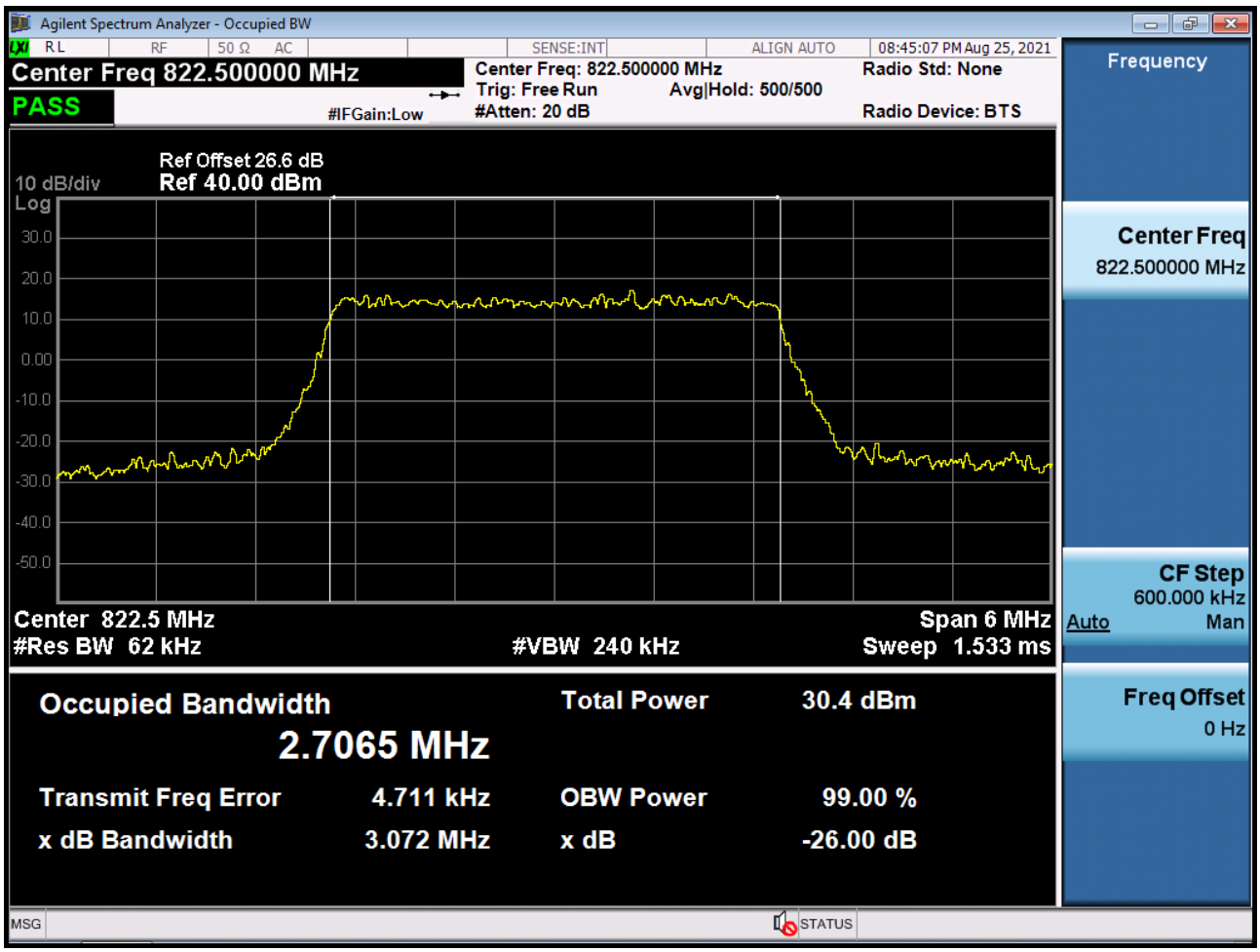
BAND 26. Occupied Bandwidth Plot (1.4 M BW Ch.26783 256QAM RB 6_0)



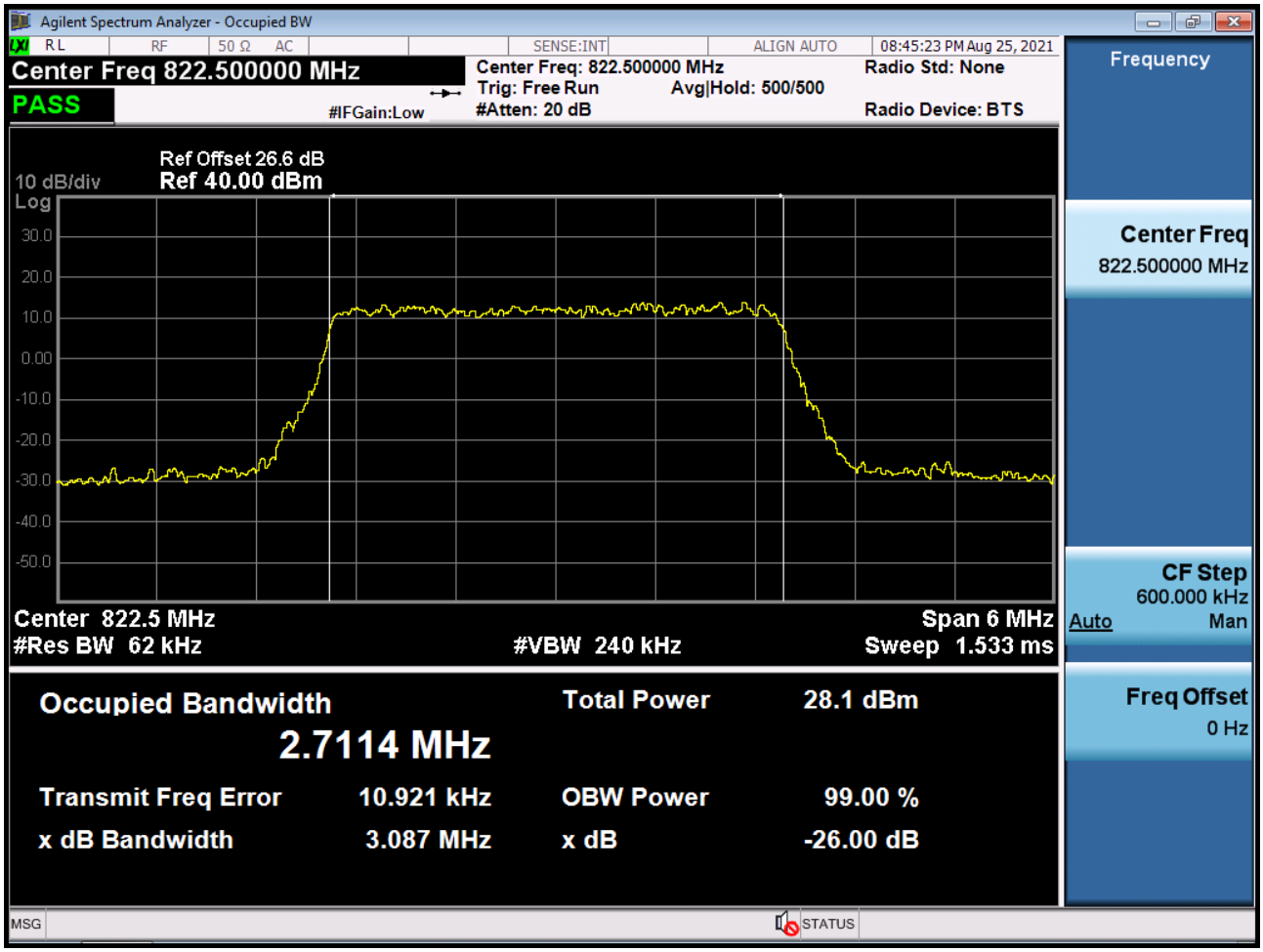
BAND 26. Occupied Bandwidth Plot (3 M BW Ch.26775 QPSK RB 15_0)



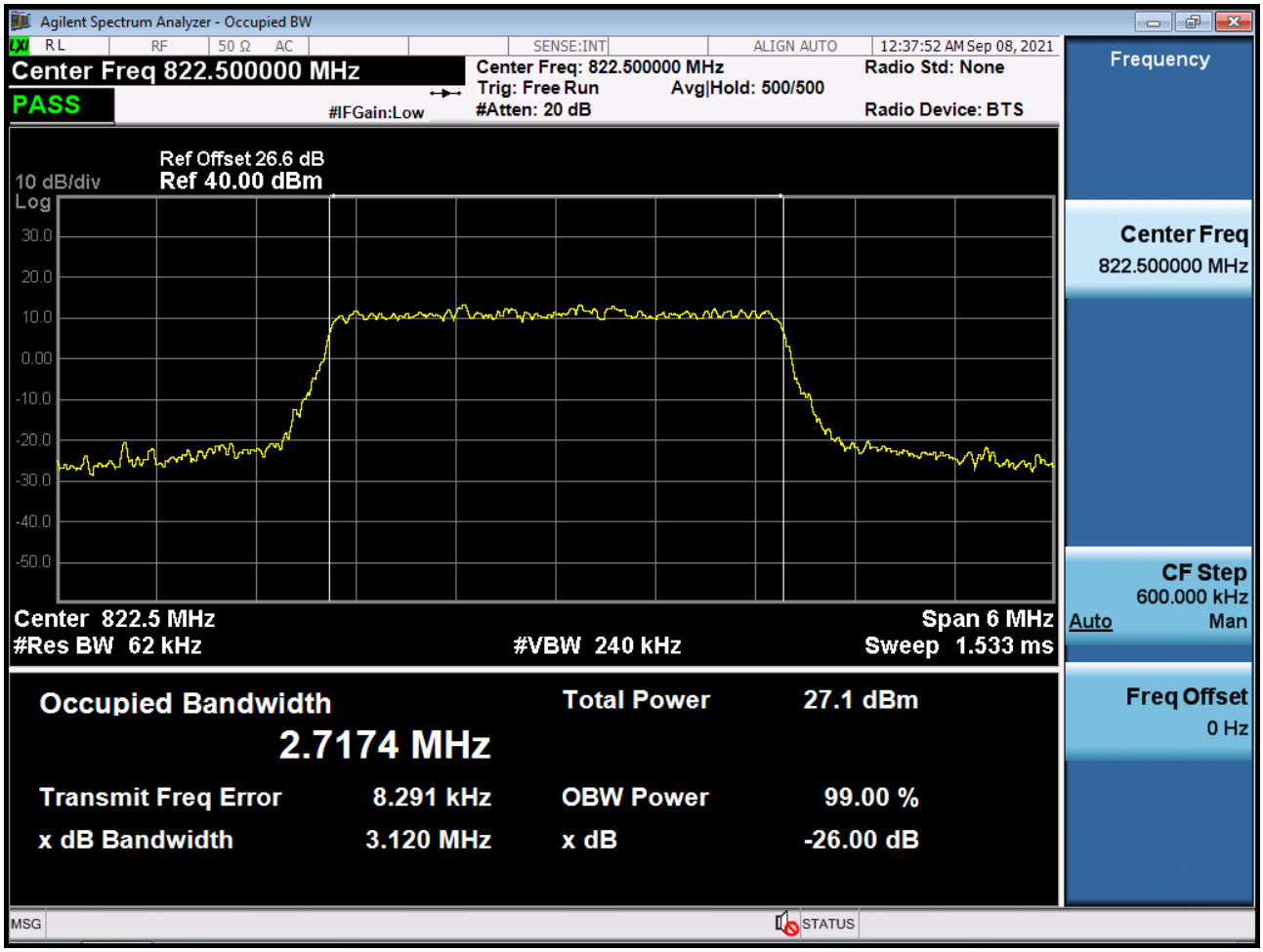
BAND 26. Occupied Bandwidth Plot (3 M BW Ch.26775 16QAM RB 15_0)



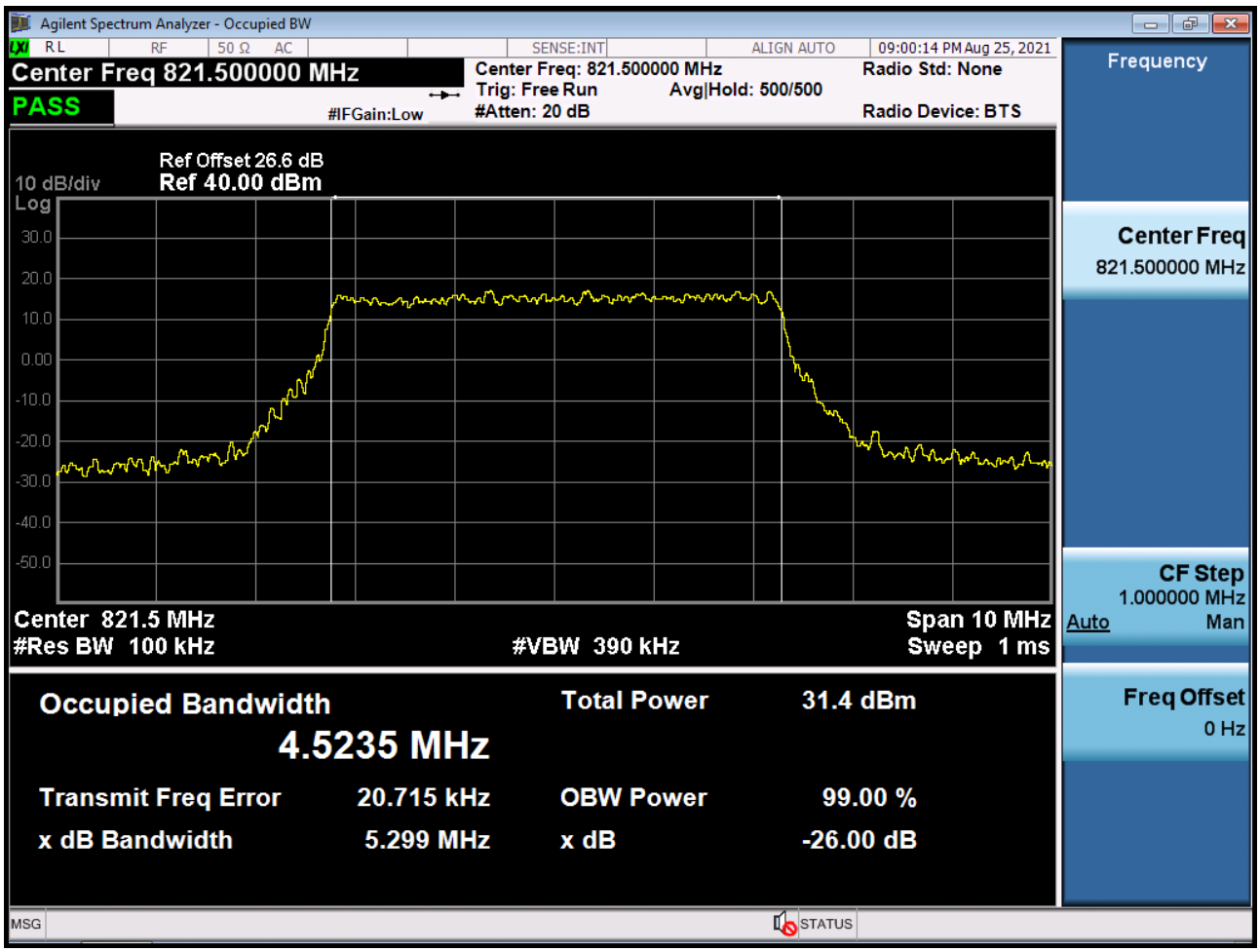
BAND 26. Occupied Bandwidth Plot (3 M BW Ch.26775 64QAM RB 15_0)



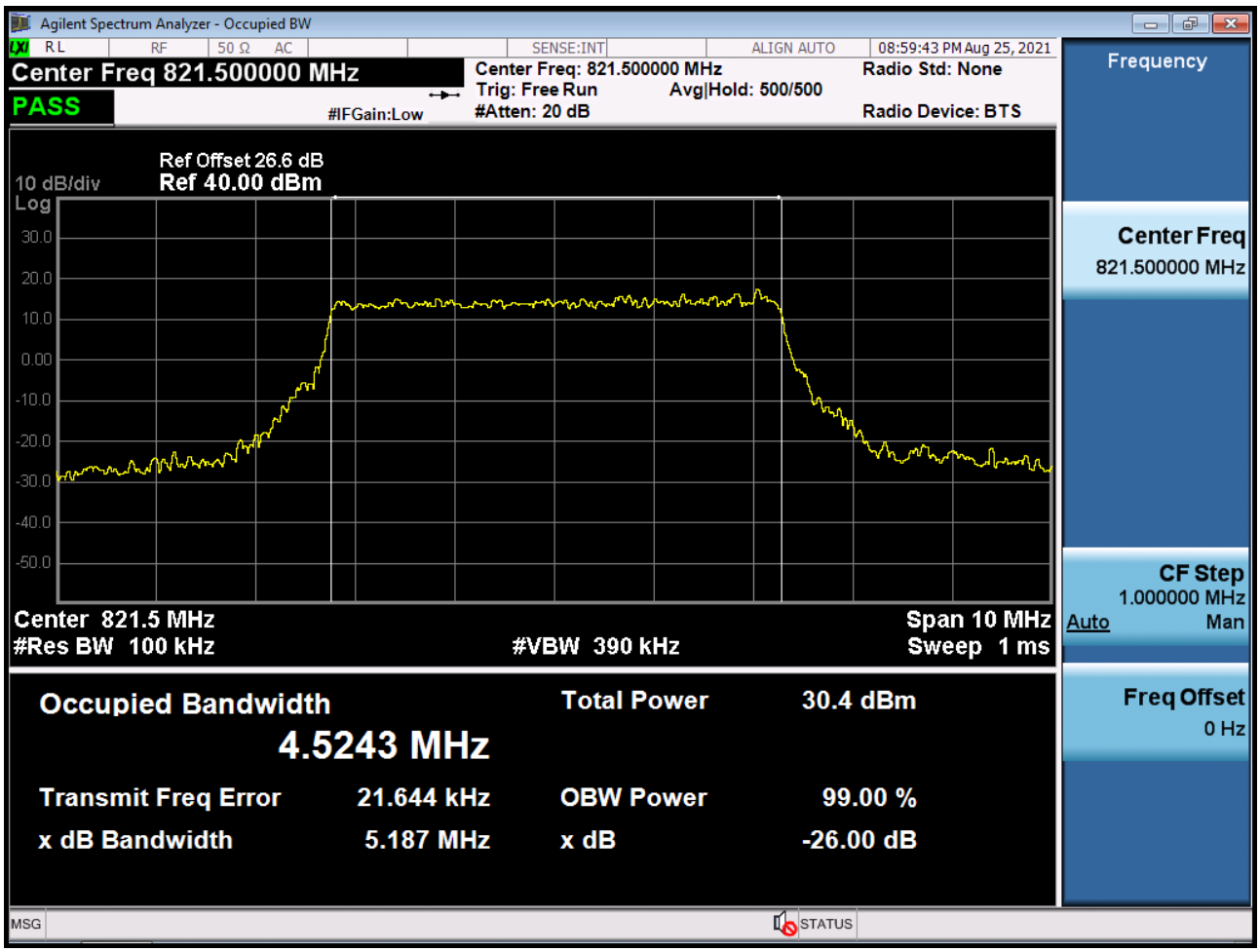
BAND 26. Occupied Bandwidth Plot (3 M BW Ch.26775 256QAM RB 15_0)



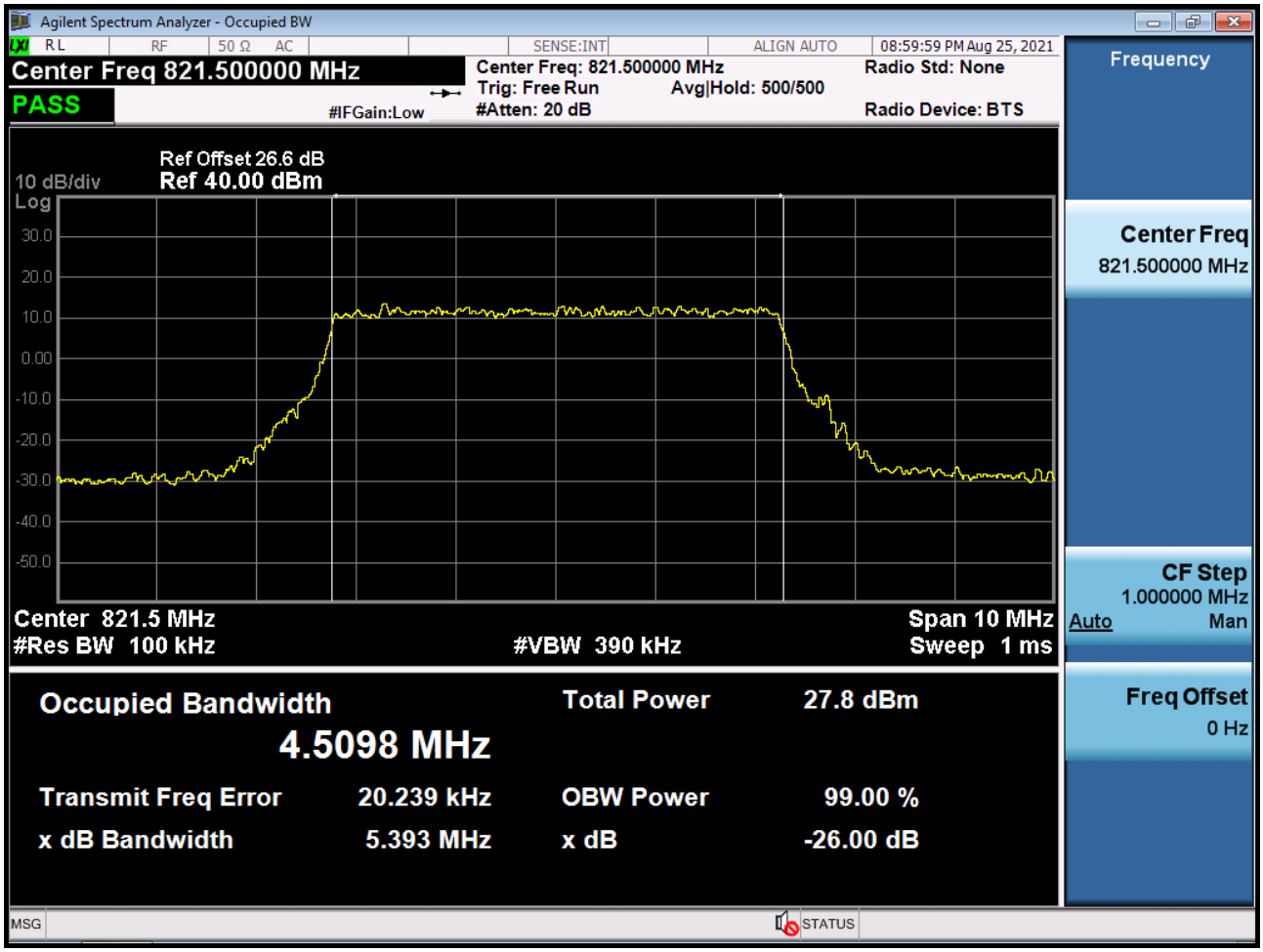
BAND 26. Occupied Bandwidth Plot (5 M BW Ch.26765 QPSK RB 25_0)



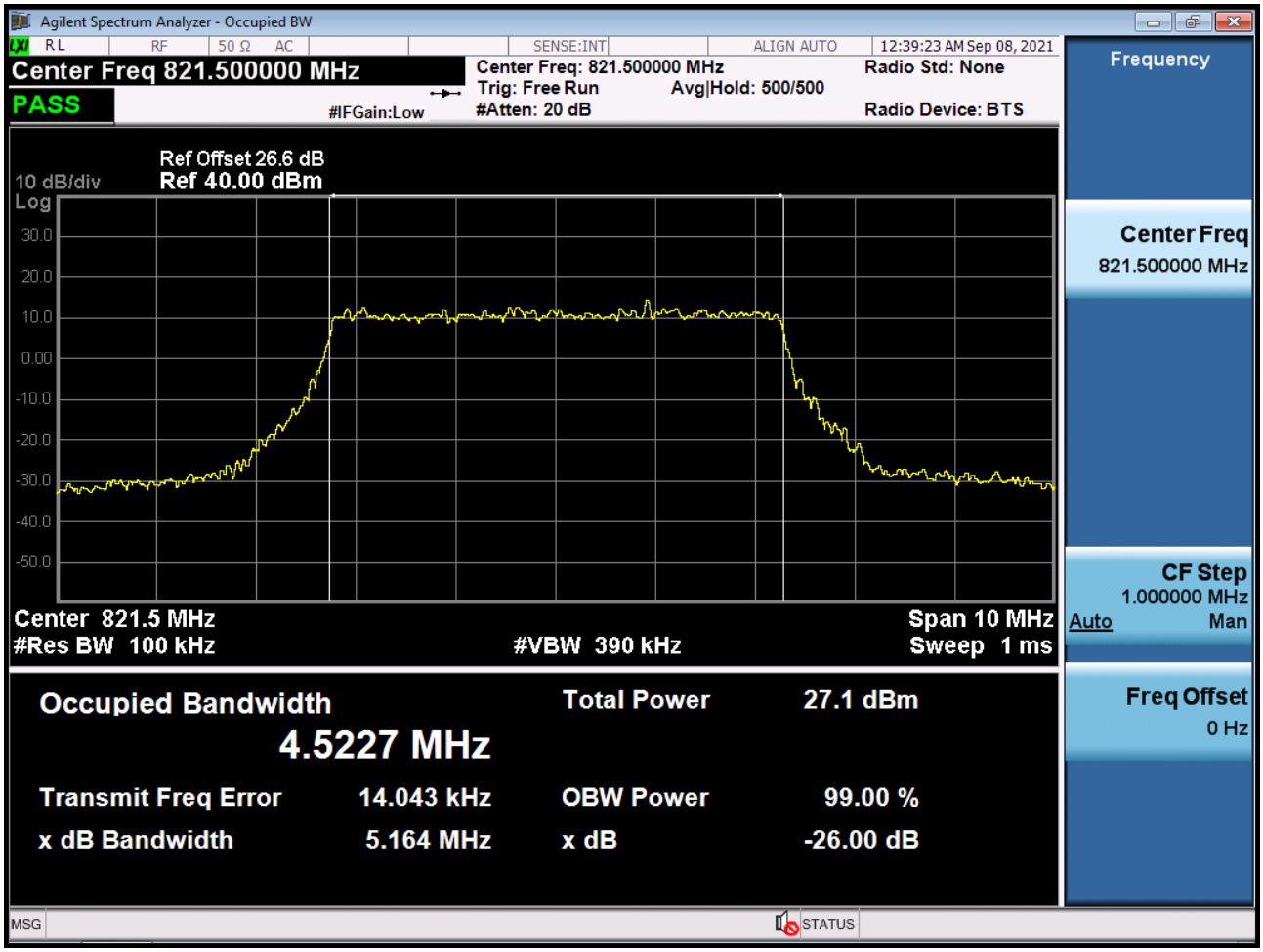
BAND 26. Occupied Bandwidth Plot (5 M BW Ch.26765 16QAM RB 25_0)



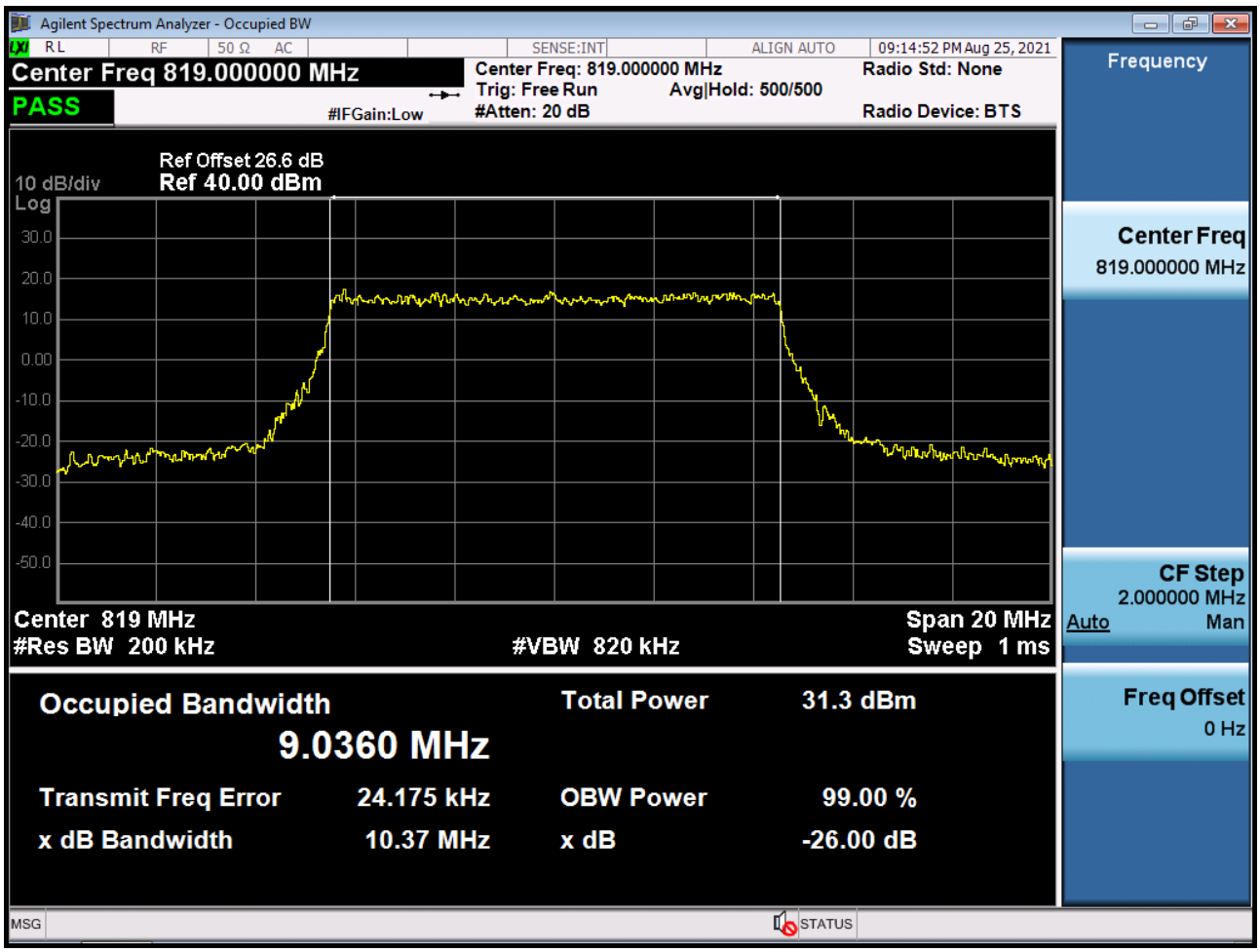
BAND 26. Occupied Bandwidth Plot (5 M BW Ch.26765 64QAM RB 25_0)



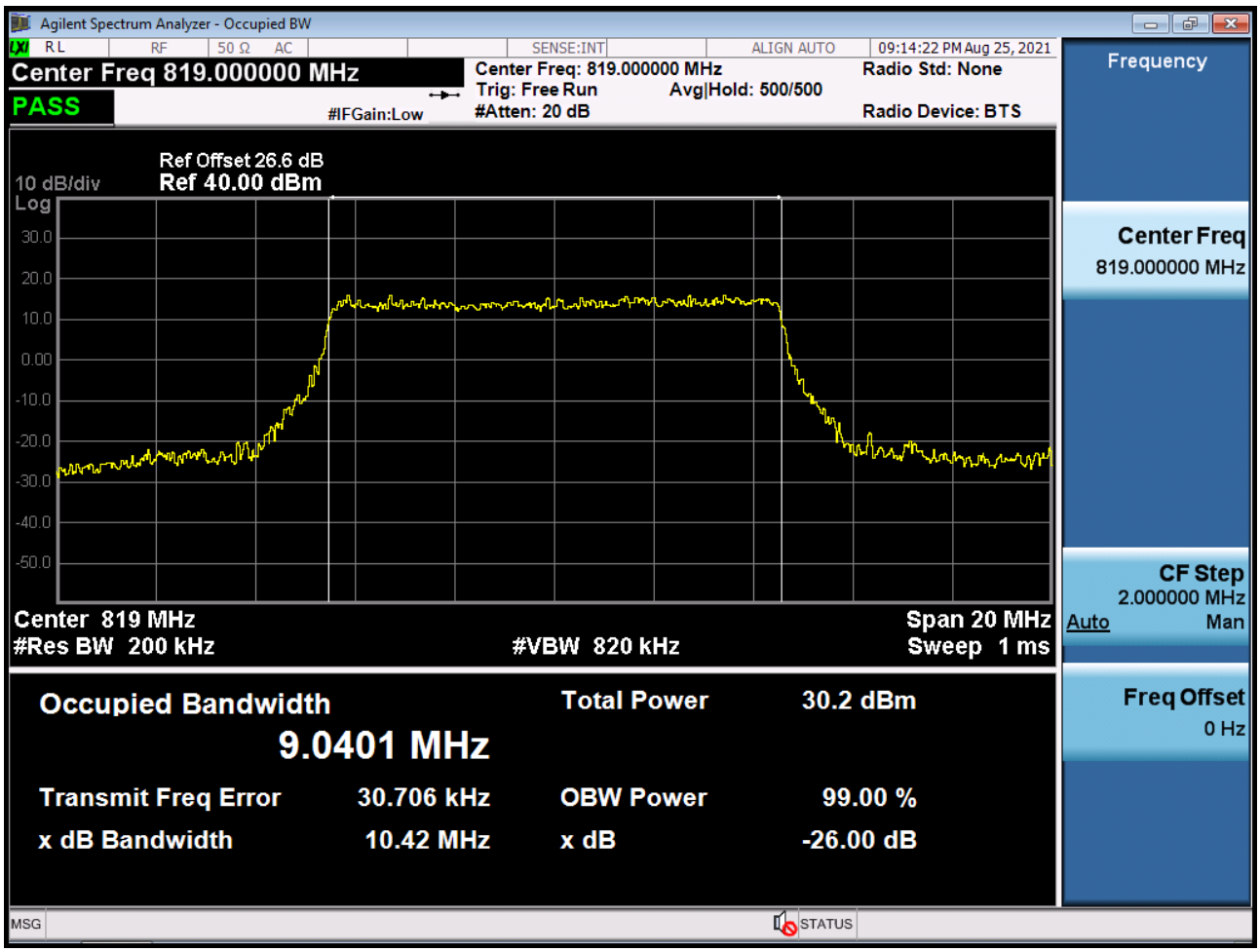
BAND 26. Occupied Bandwidth Plot (5 M BW Ch.26765 256QAM RB 25_0)



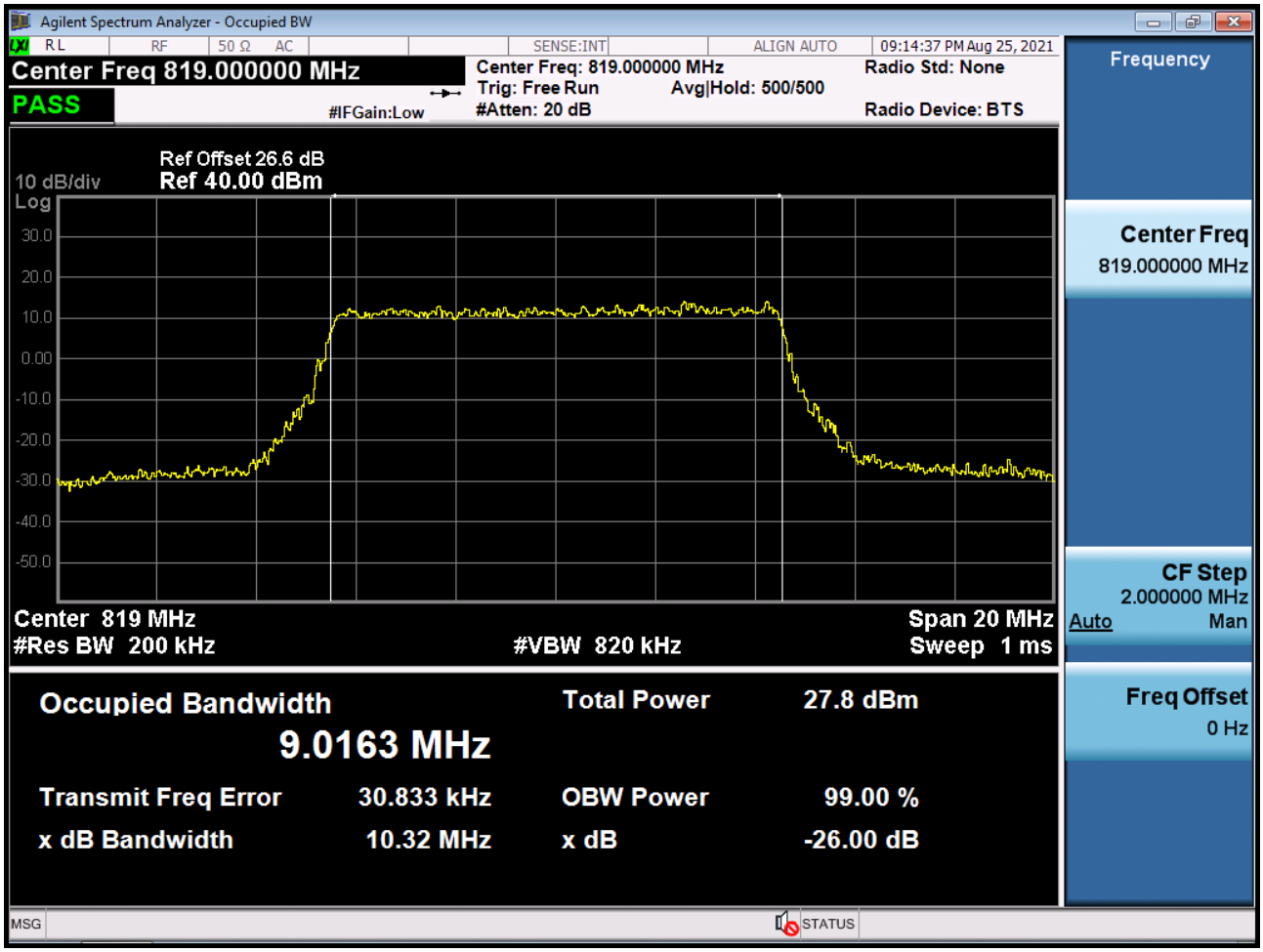
BAND 26. Occupied Bandwidth Plot (10 M BW Ch.26740 QPSK RB 50_0)



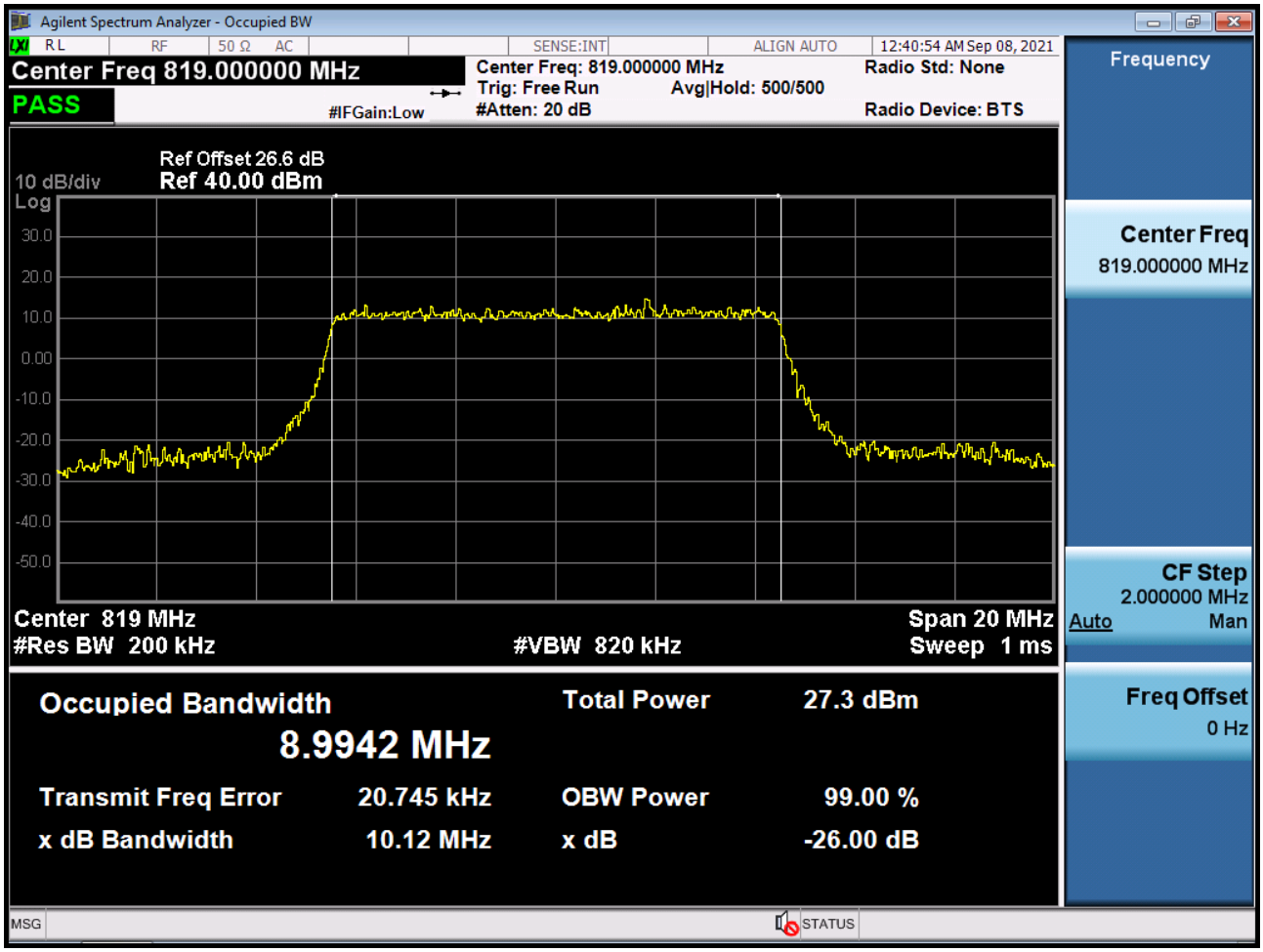
BAND 26. Occupied Bandwidth Plot (10 M BW Ch.26740 16QAM RB 50_0)



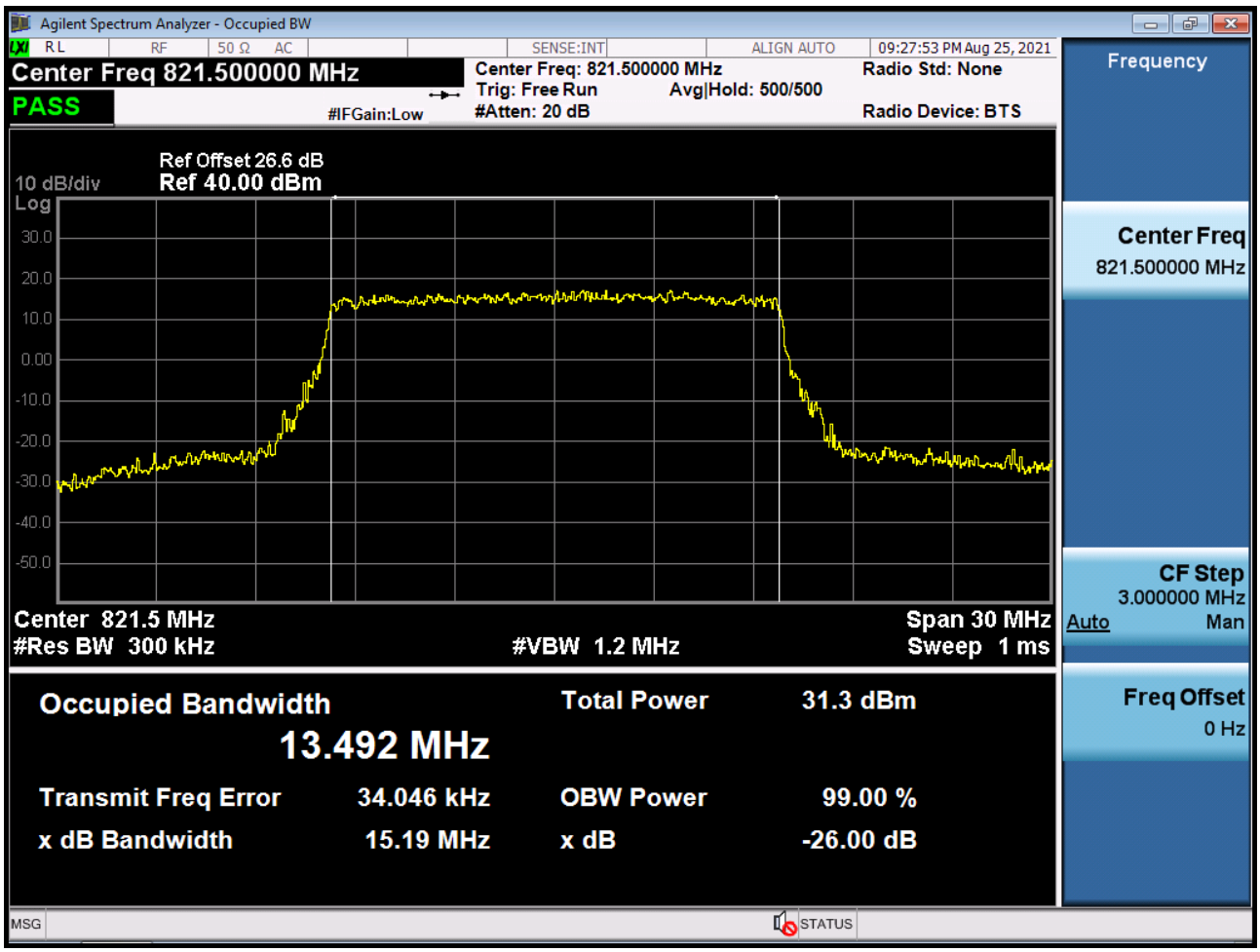
BAND 26. Occupied Bandwidth Plot (10 M BW Ch.26740 64QAM RB 50_0)



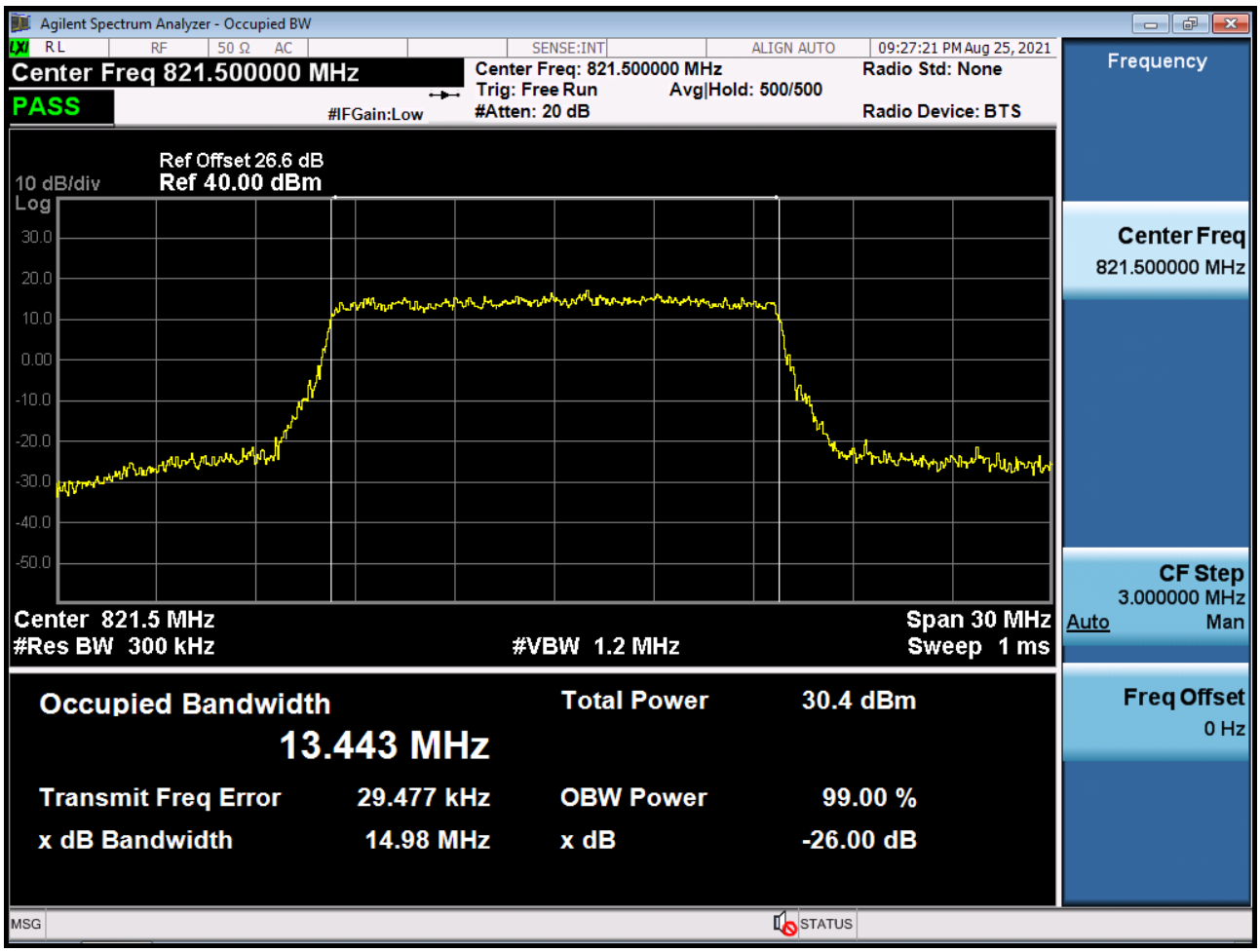
BAND 26. Occupied Bandwidth Plot (10 M BW Ch.26740 256QAM RB 50_0)



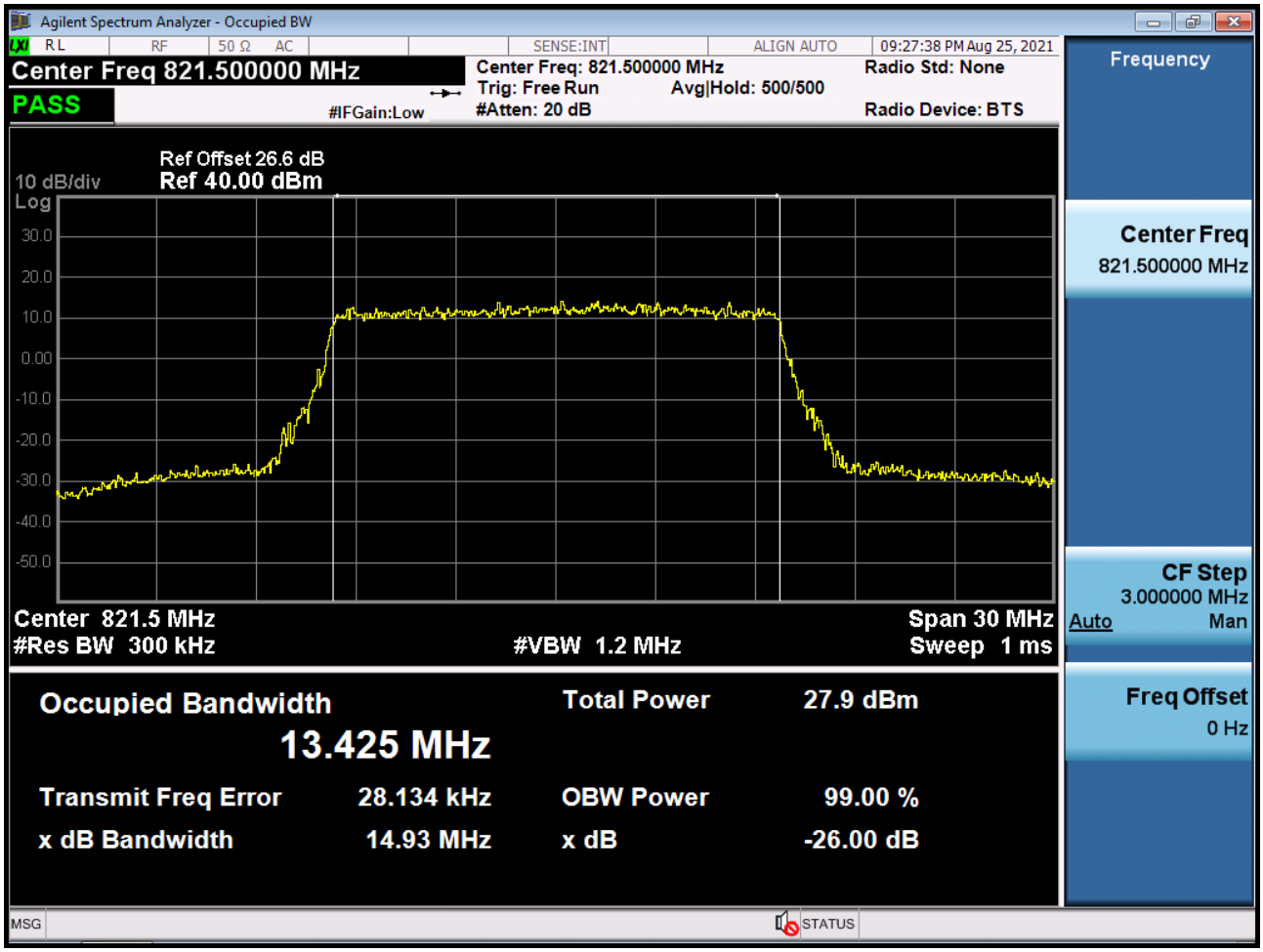
BAND 26. Occupied Bandwidth Plot (15 M BW Ch.26765 QPSK RB 75_0)



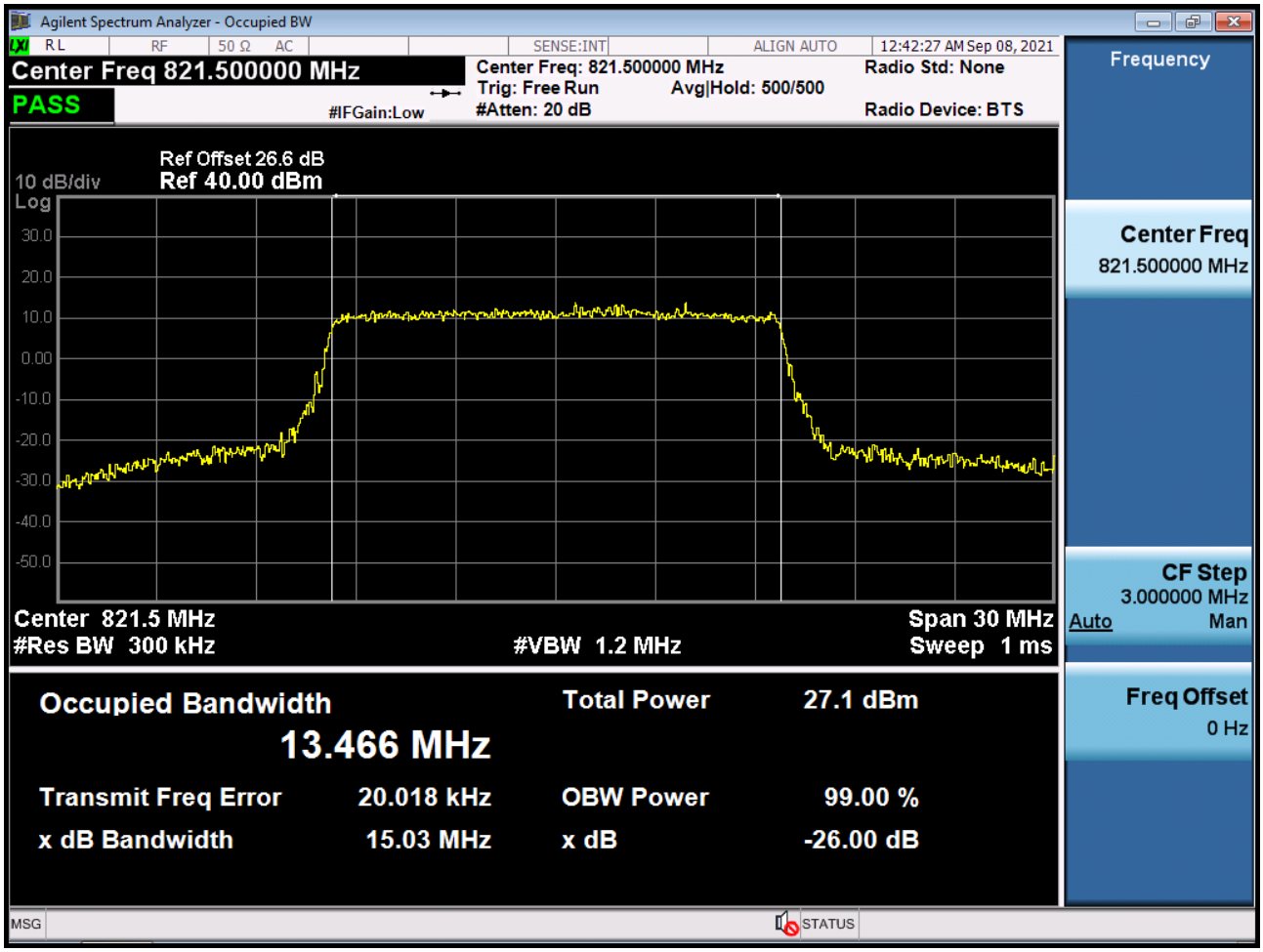
BAND 26. Occupied Bandwidth Plot (15 M BW Ch.26765 16QAM RB 75_0)



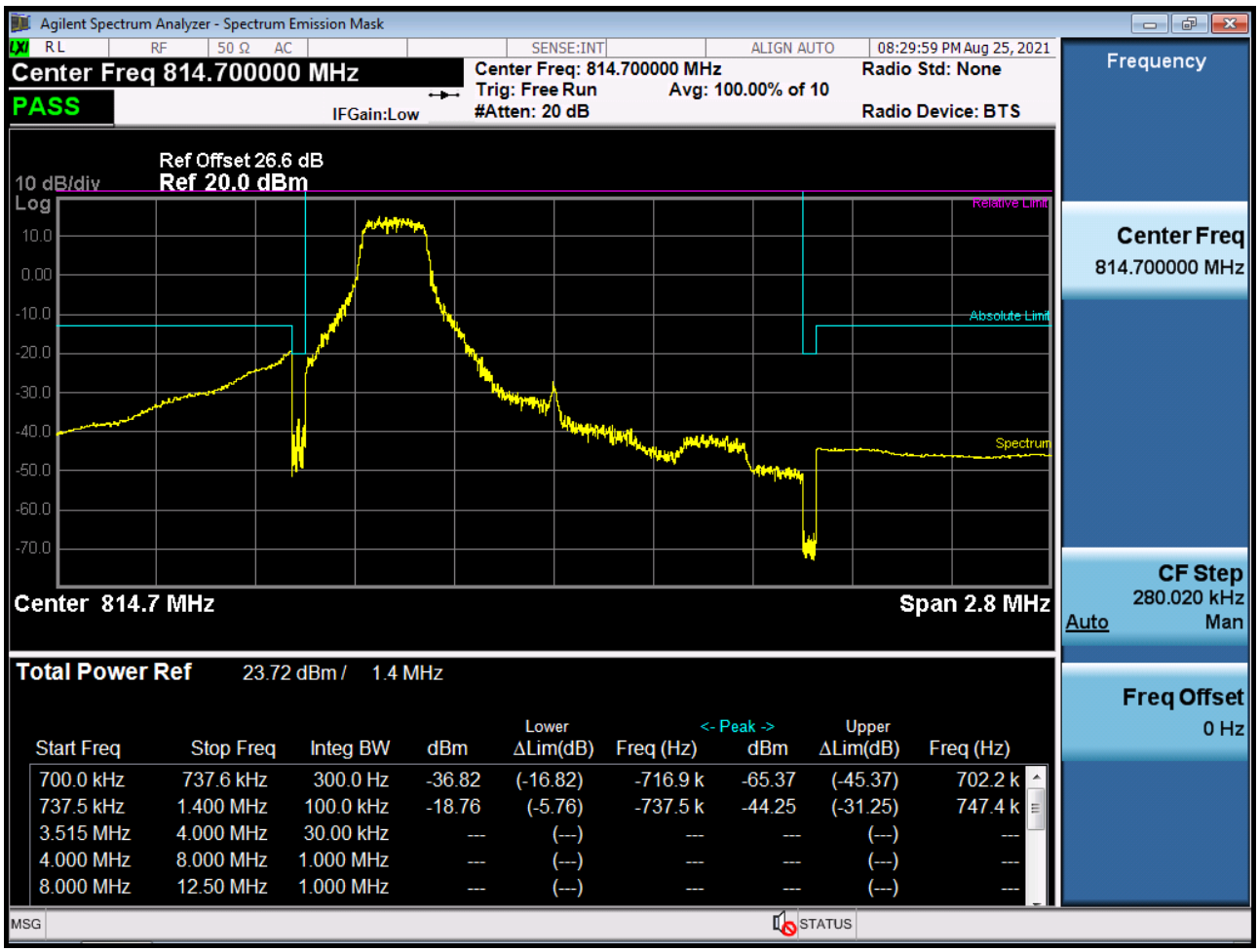
BAND 26. Occupied Bandwidth Plot (15 M BW Ch.26765 64QAM RB 75_0)



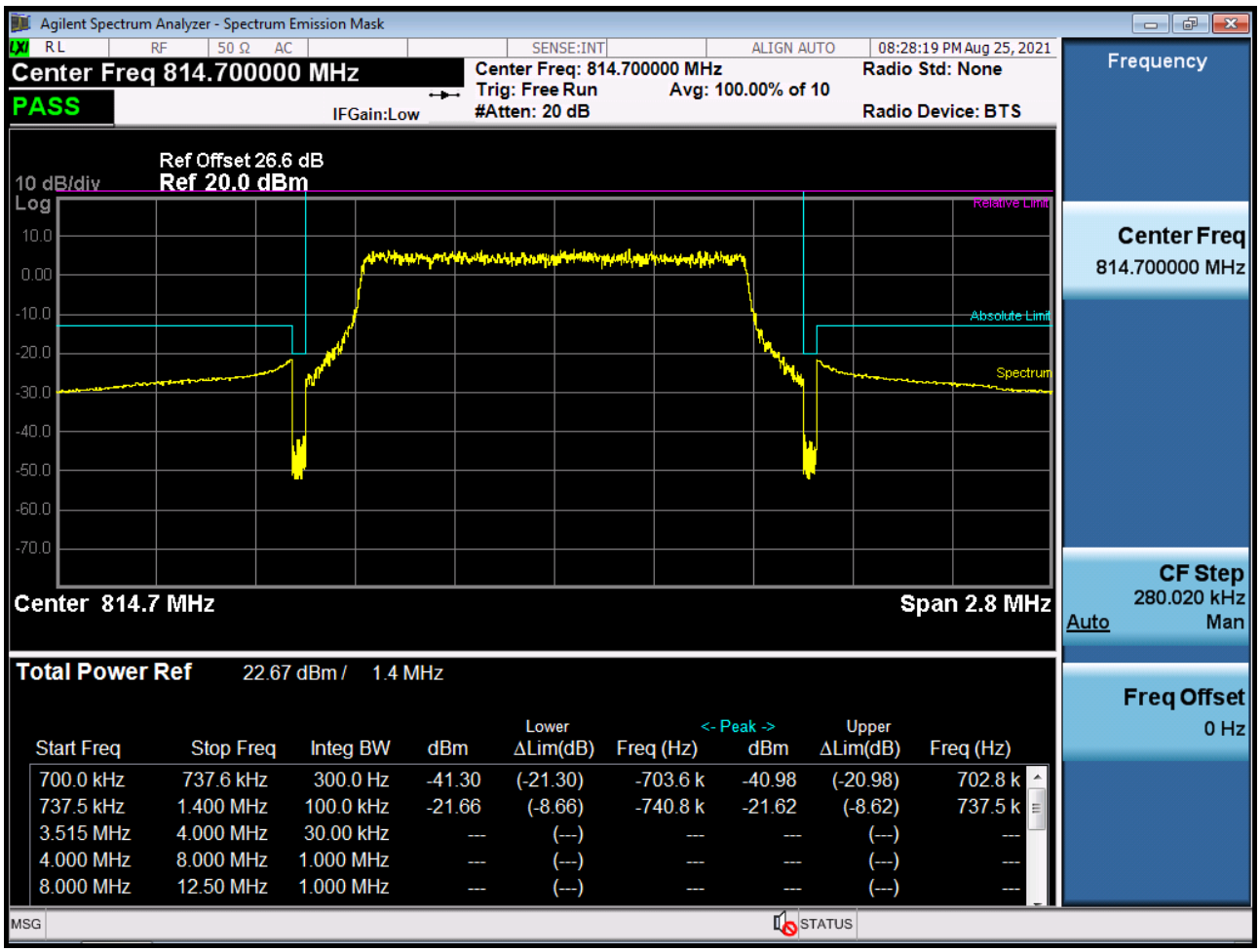
BAND 26. Occupied Bandwidth Plot (15 M BW Ch.26765 256QAM RB 75_0)



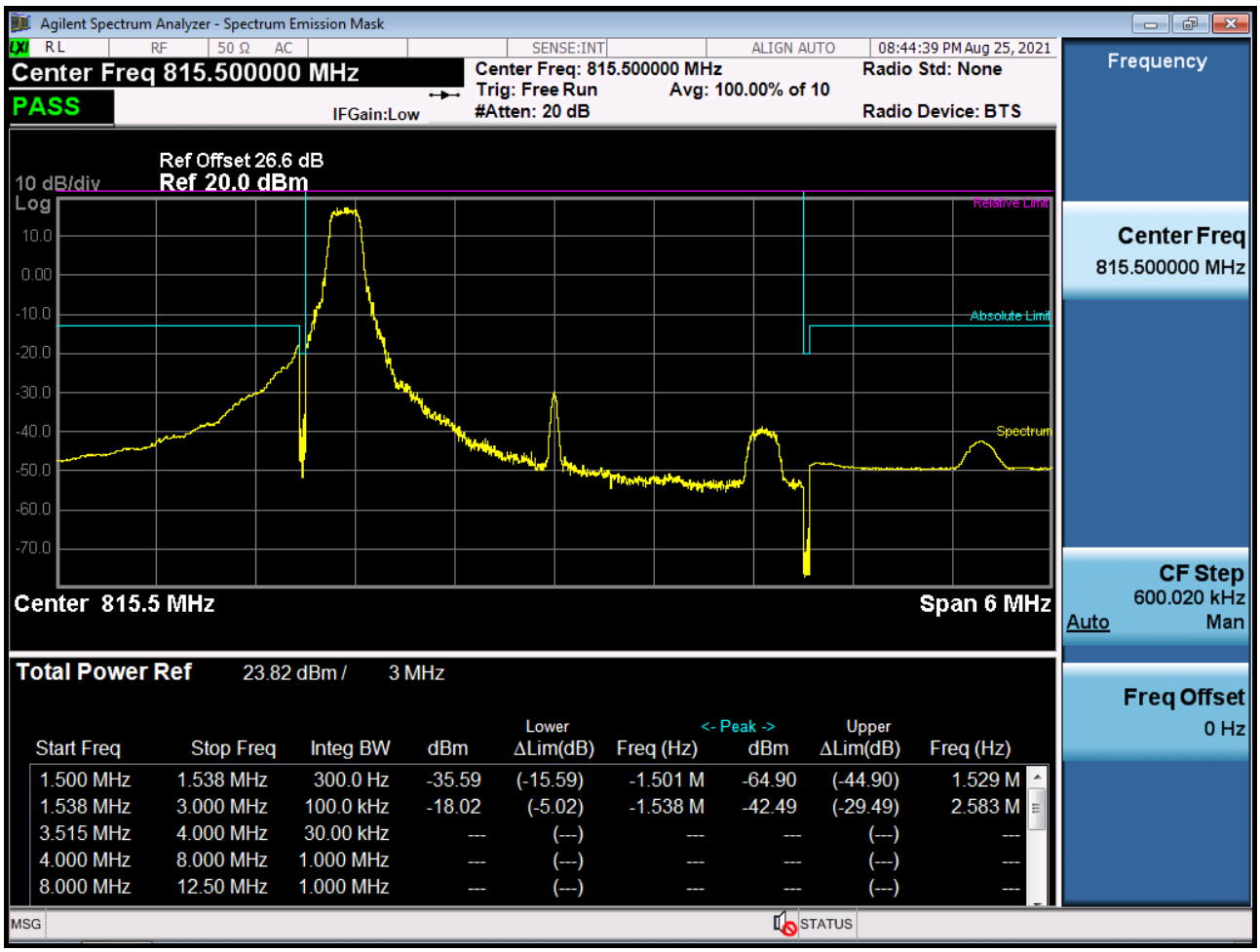
BAND 26. Lower Channel Edge Plot (1.4 M BW Ch.26697 QPSK RB 1, Offset 0)



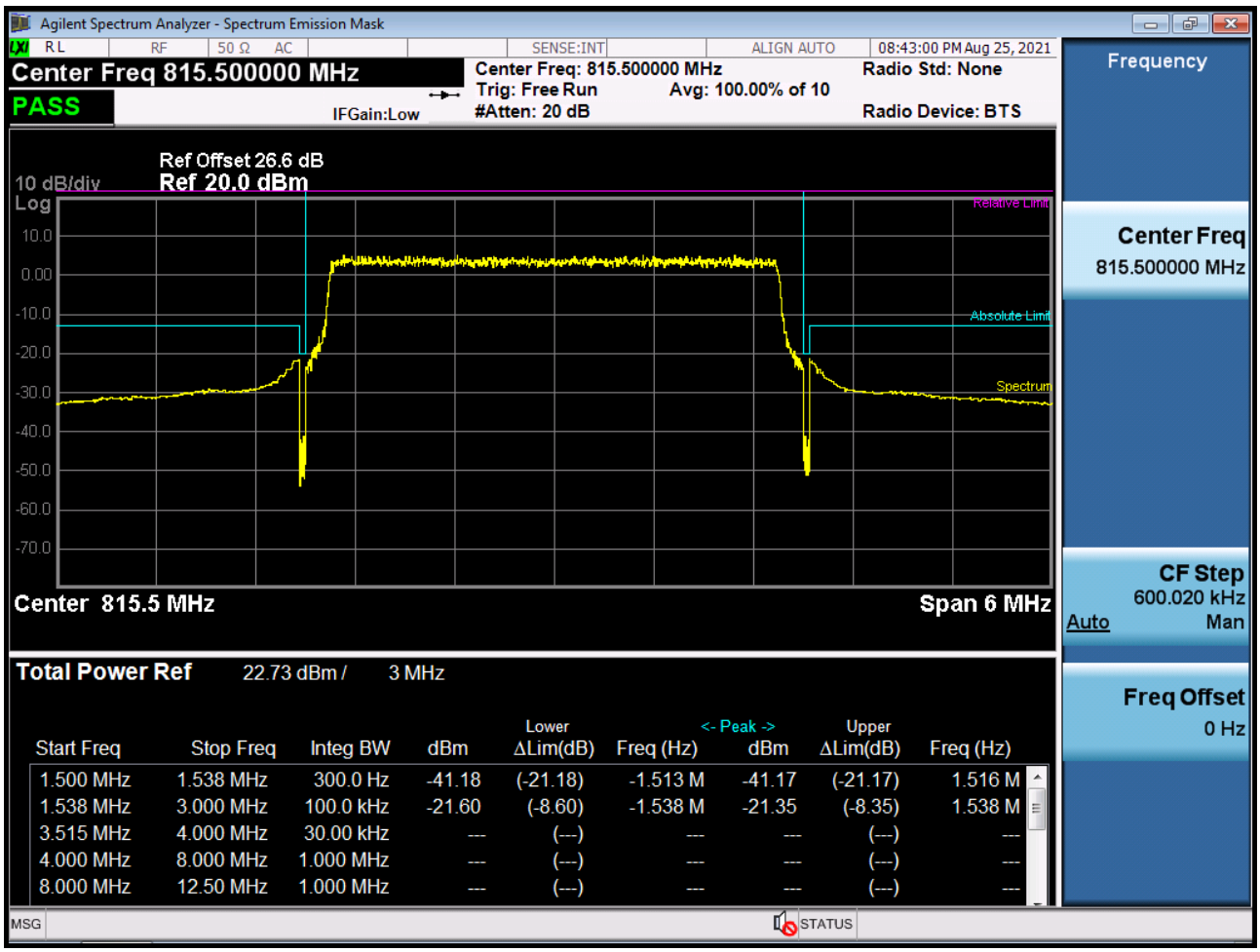
BAND 26. Lower Channel Edge Plot (1.4 M BW Ch.26697 QPSK_RB6_Offset 0)



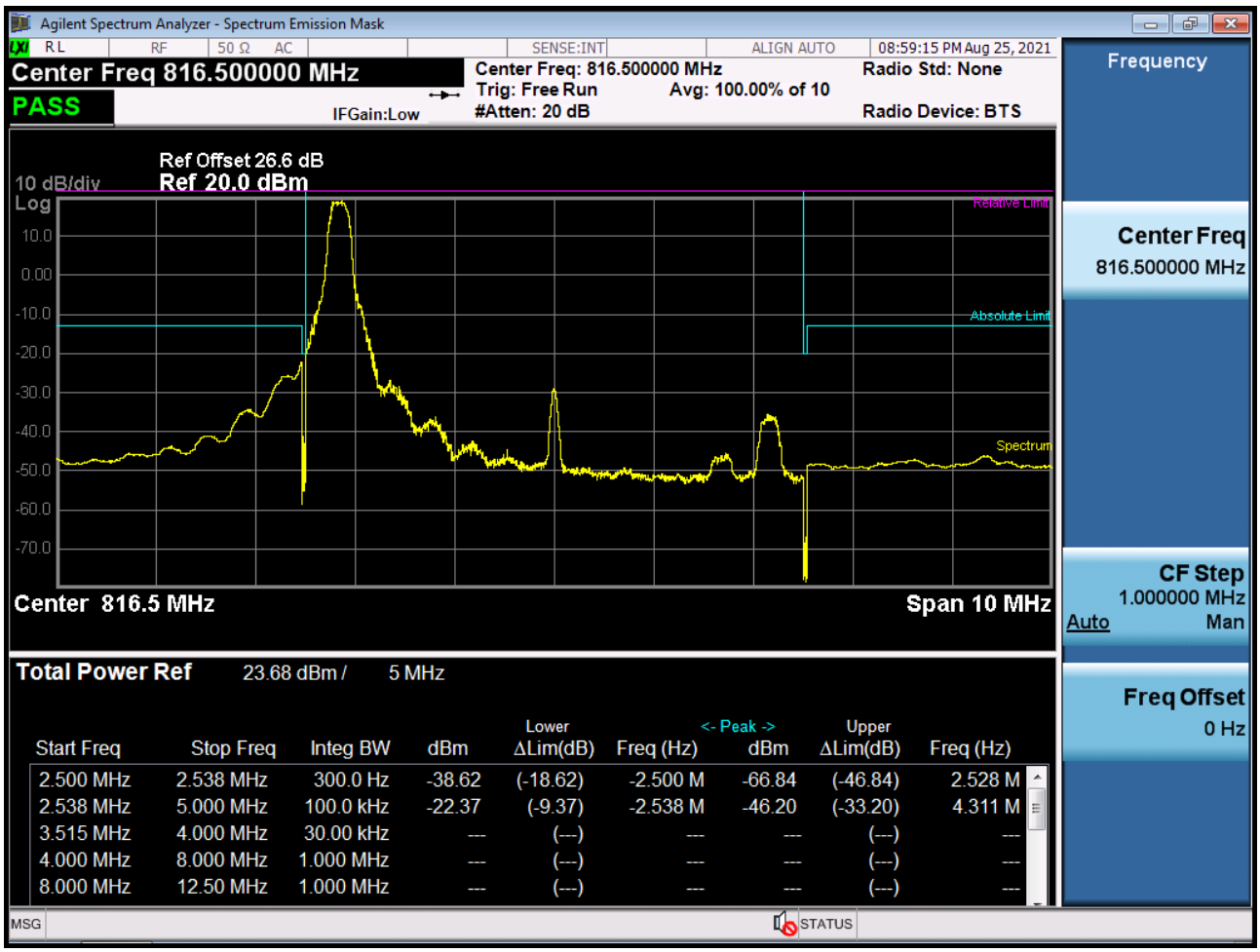
BAND 26. Lower Channel Edge Plot (3 M BW Ch.26705 QPSK RB 1, Offset 0)



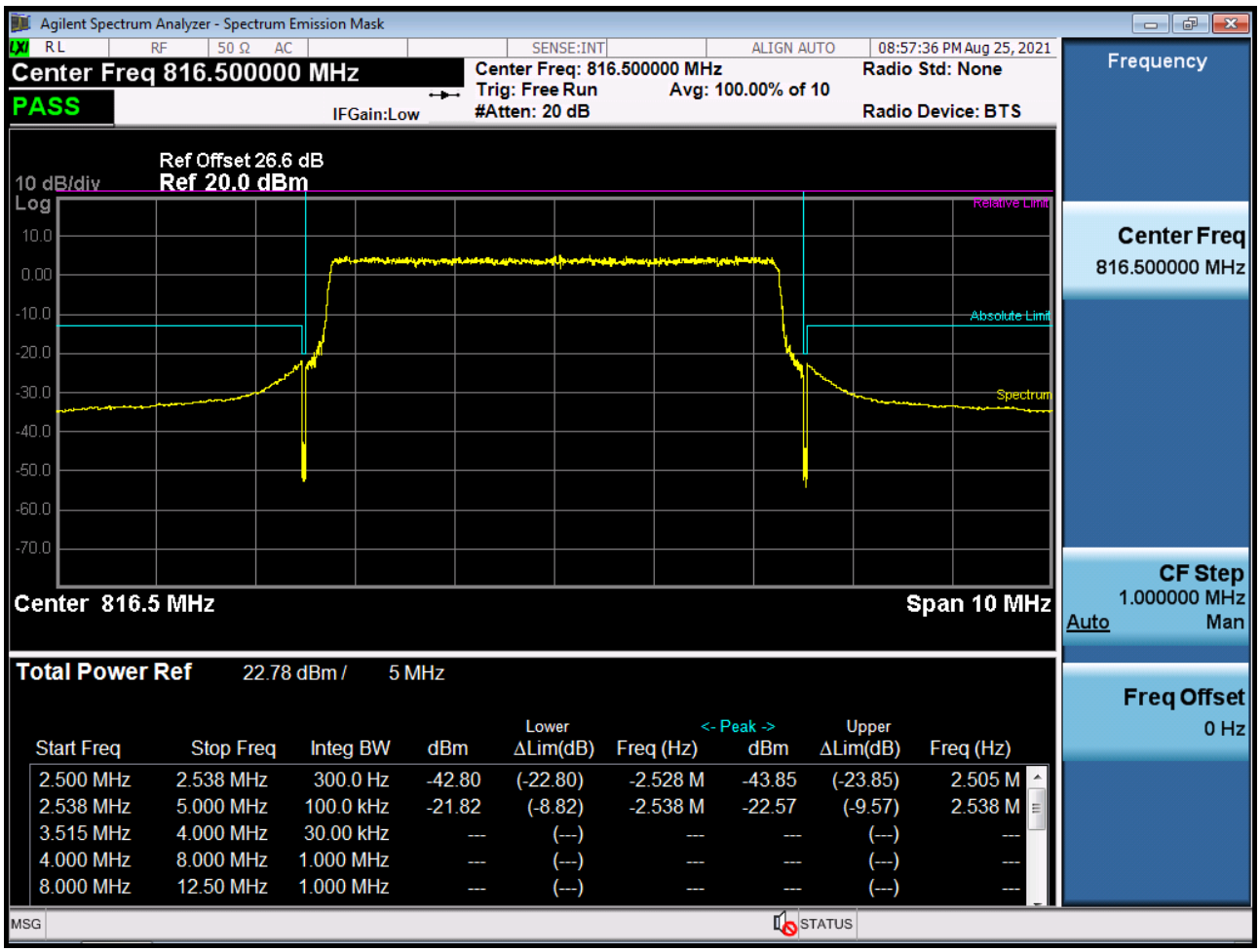
BAND 26. Lower Channel Edge Plot (3 M BW Ch.26705 QPSK_RB15_Offset 0)



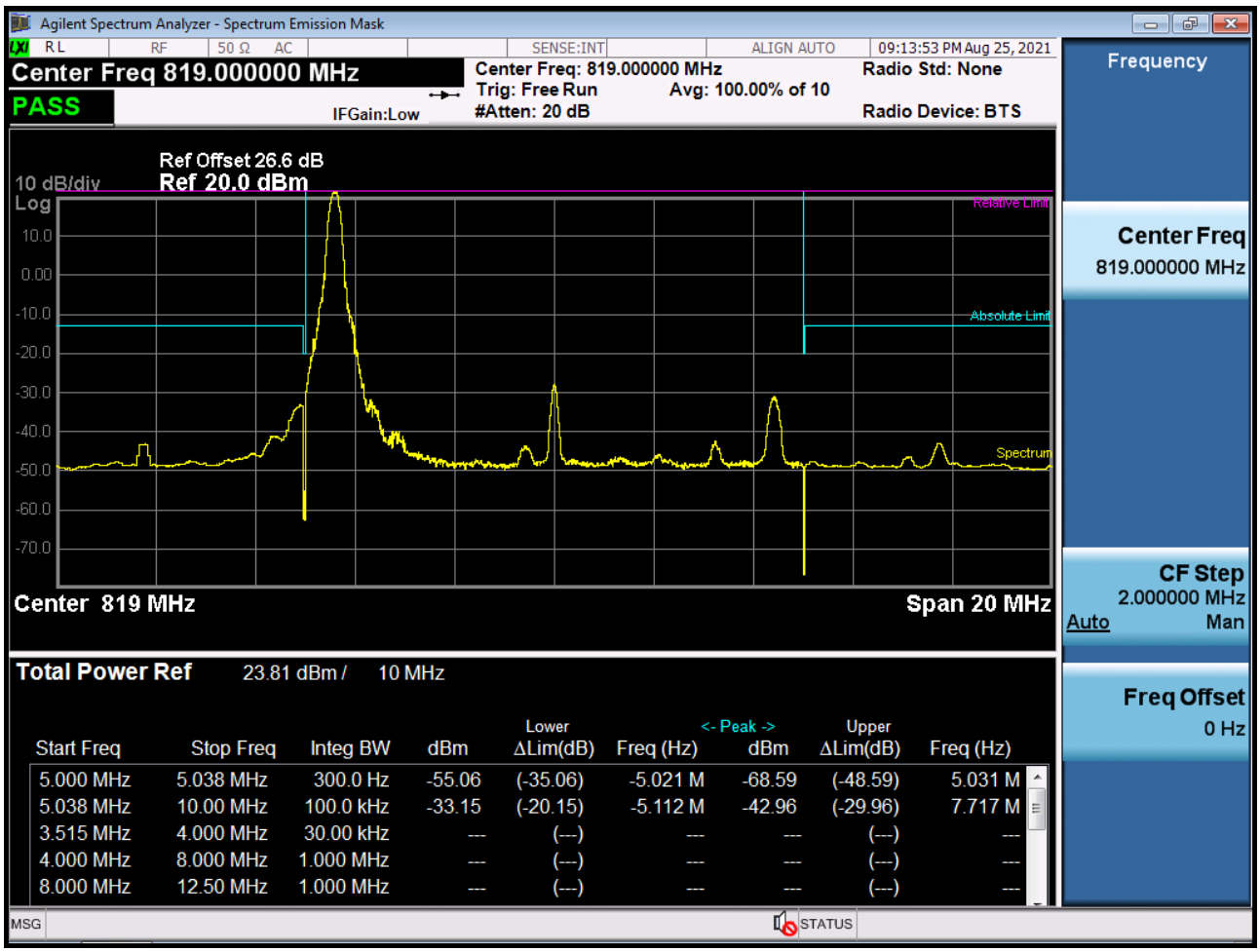
BAND 26. Lower Channel Edge Plot (5 M BW Ch.26715 QPSK RB 1, Offset 0)



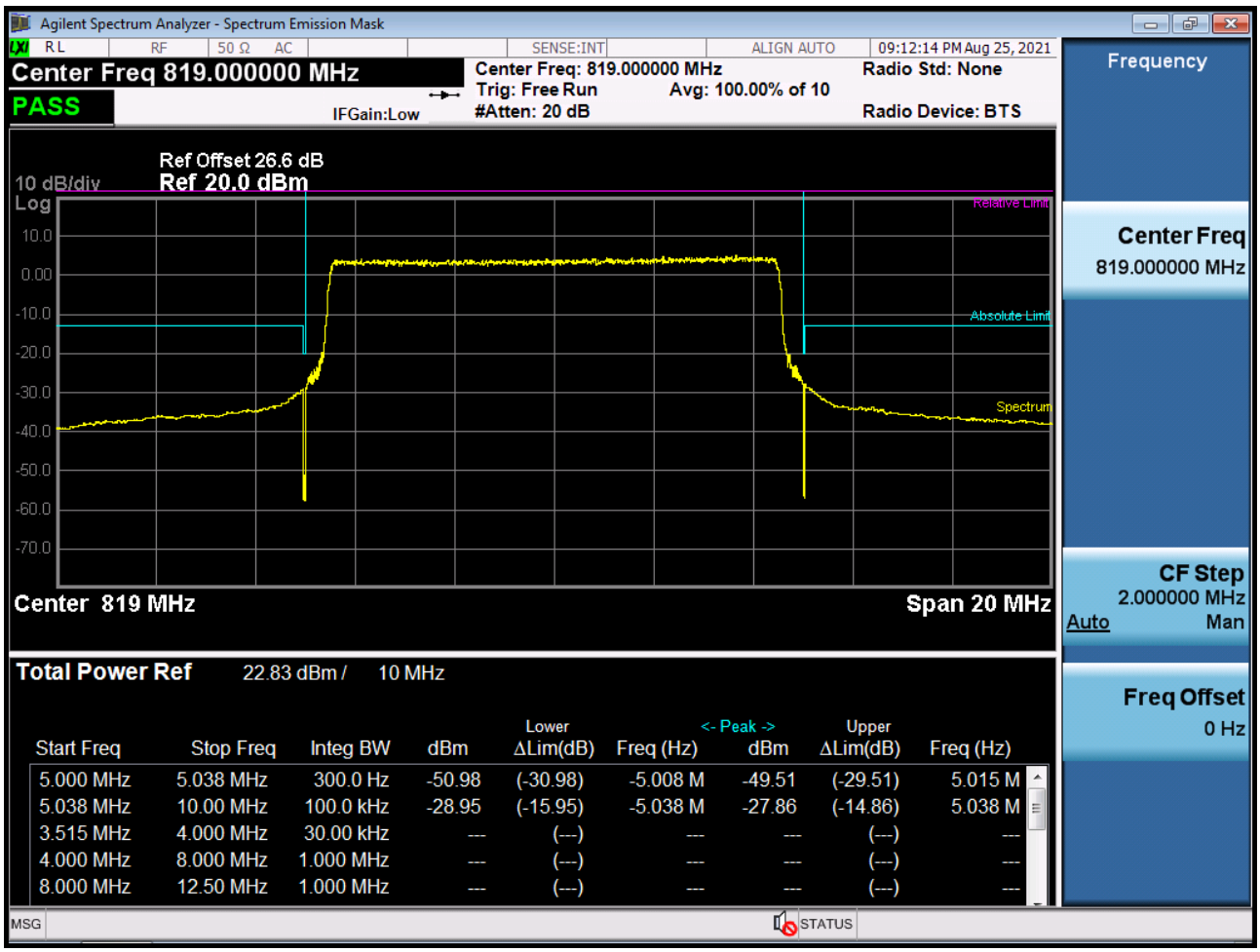
BAND 26. Lower Channel Edge Plot (5 M BW Ch.26715 QPSK_RB25_Offset 0)



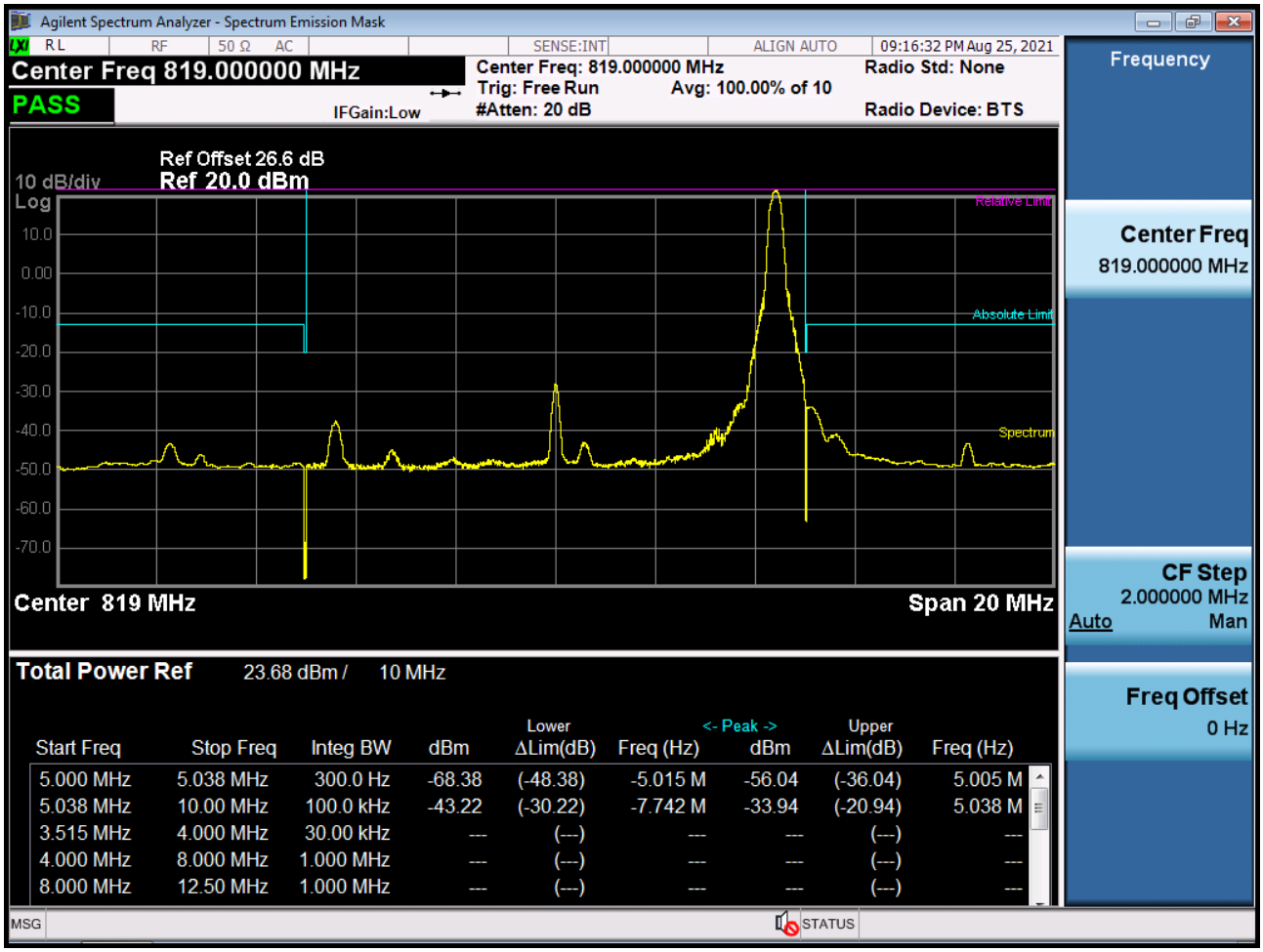
BAND 26. Low Channel Edge Plot (10 M BW Ch.26740 QPSK RB 1, Offset 0)



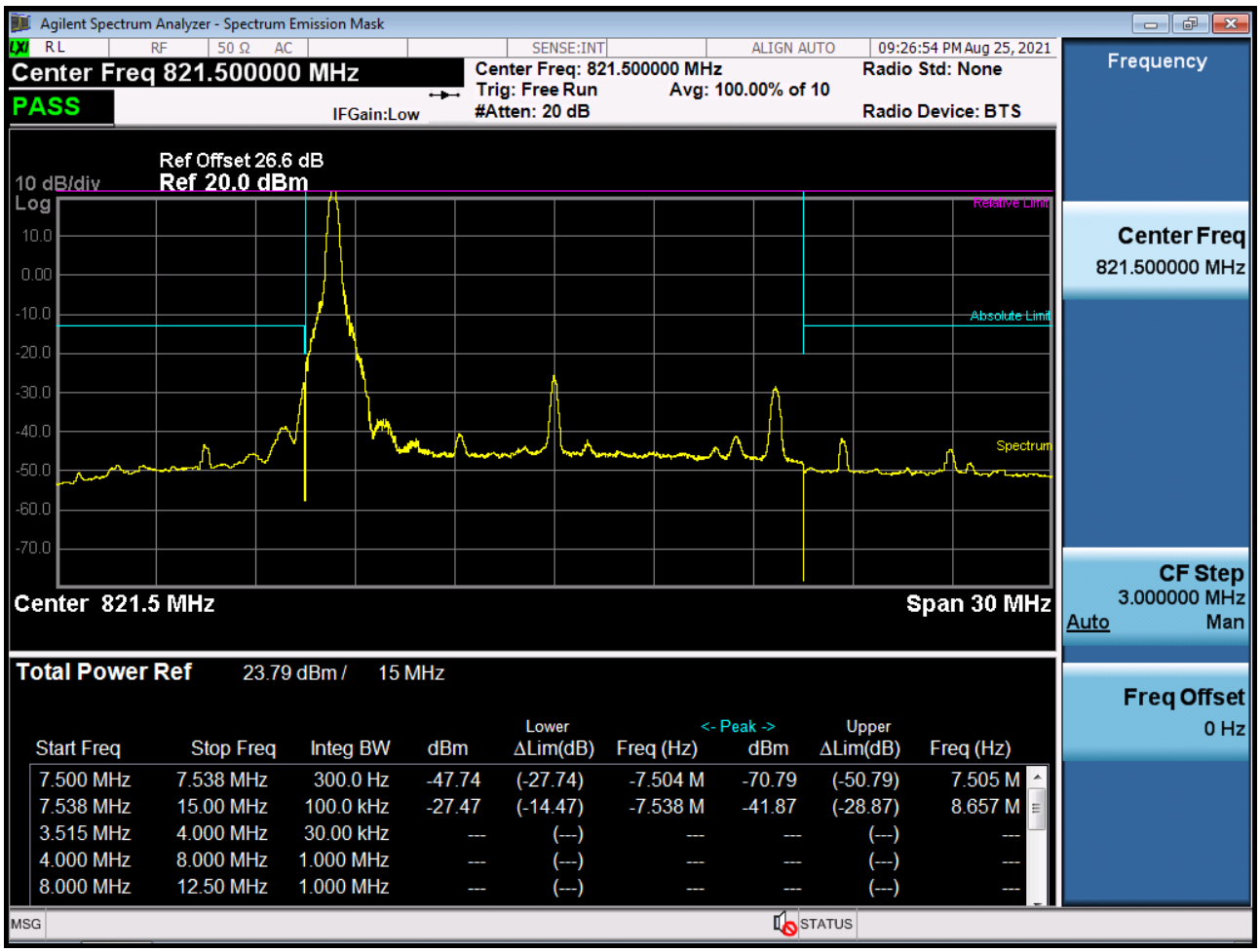
BAND 26. Low Channel Edge Plot (10 M BW Ch.26740 QPSK_RB50_Offset 0)



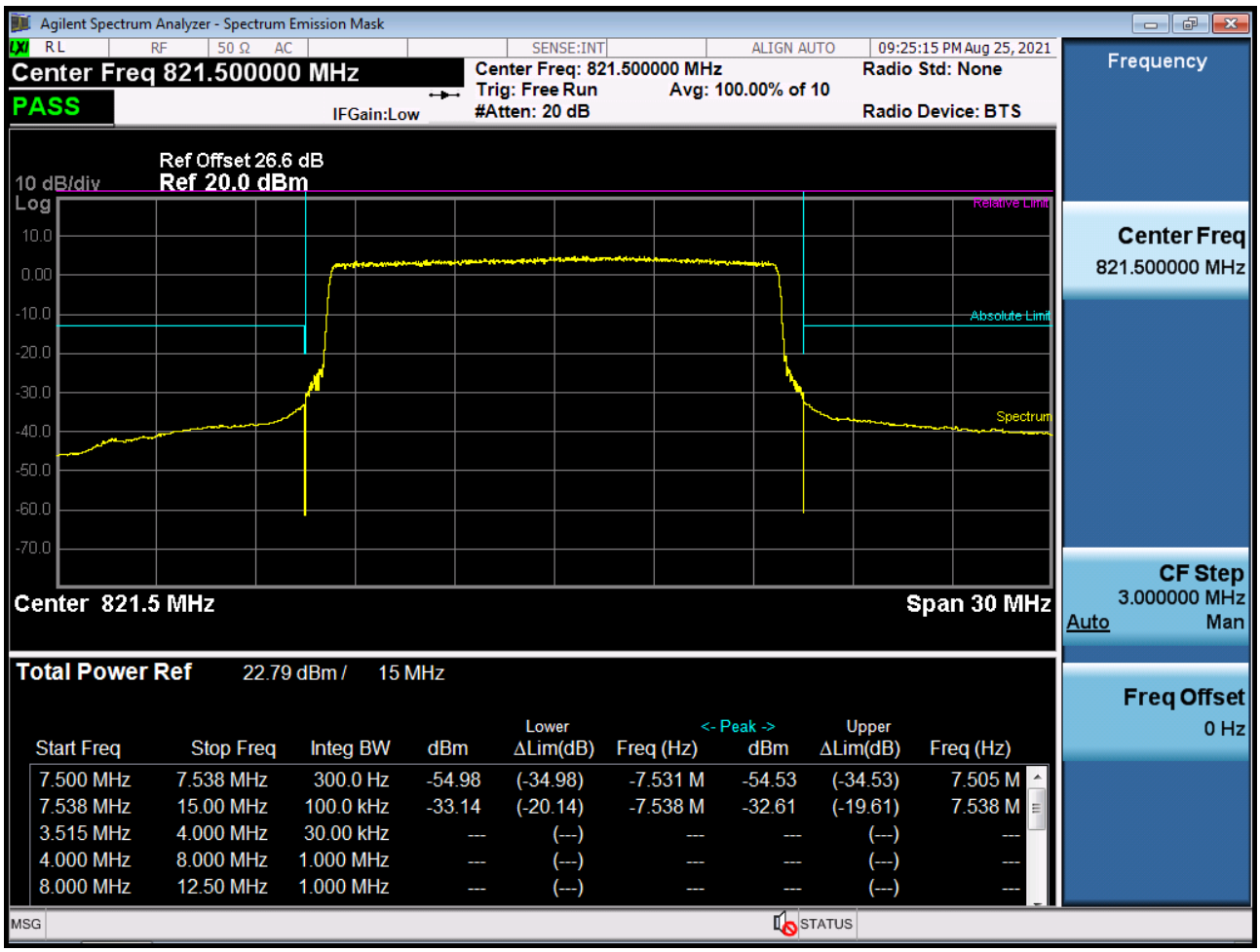
BAND 26. Mid Channel Edge Plot (10 M BW Ch. 26740 QPSK_RB1_Offset 49)



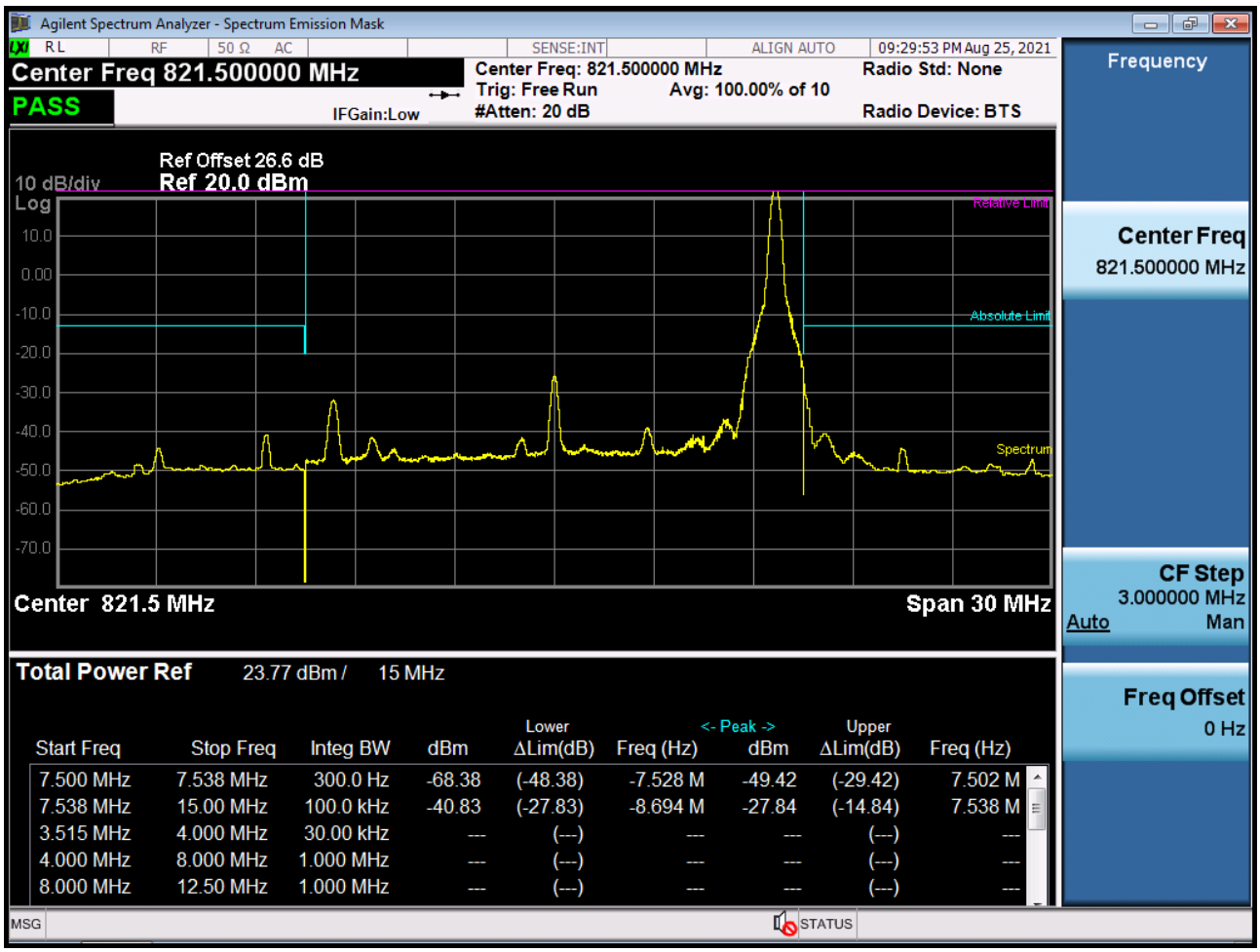
BAND 26. Low Channel Edge Plot (15 M BW Ch.26765 QPSK RB 1, Offset 0)



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



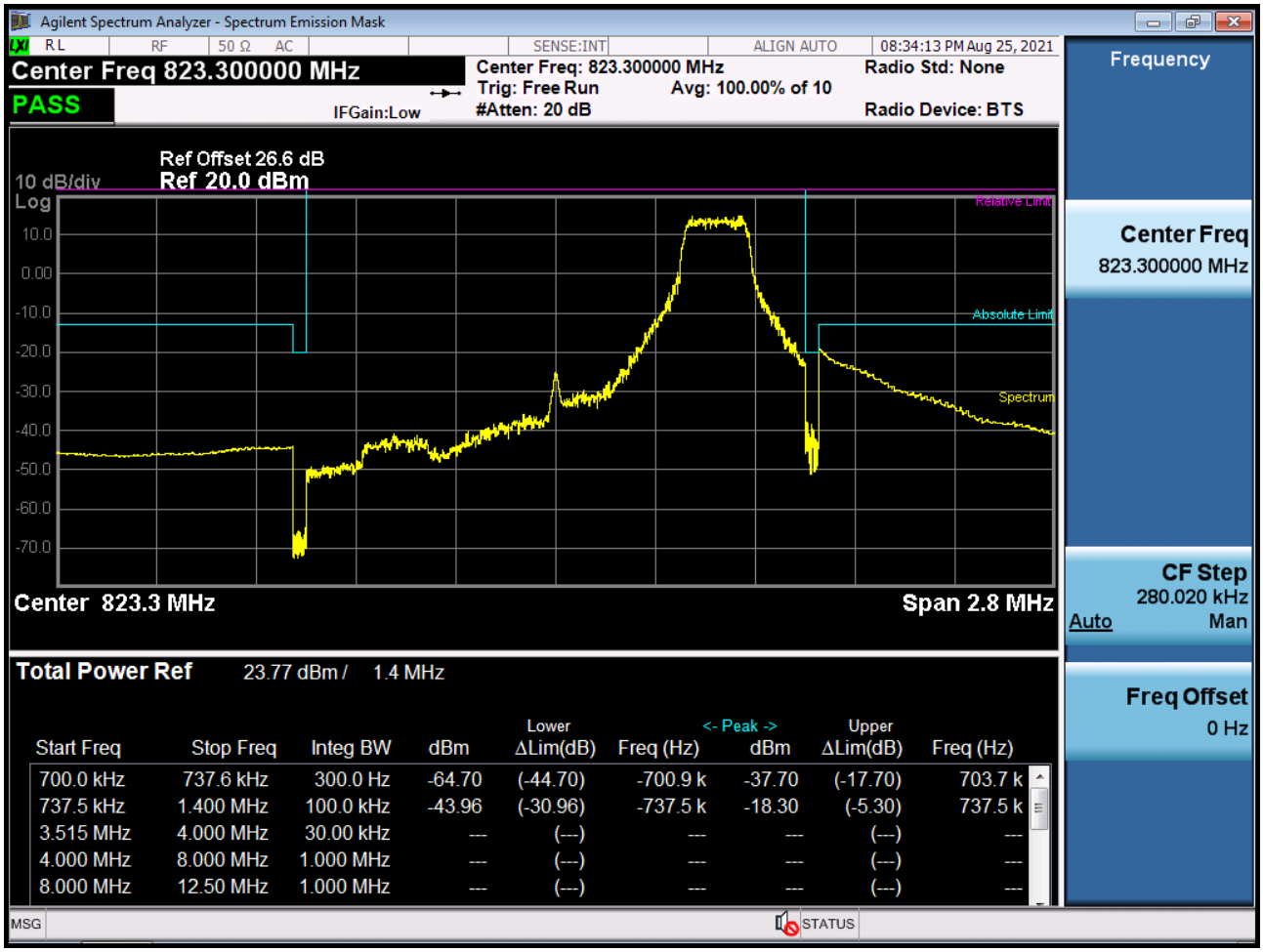
BAND 26. Mid Channel Edge Plot (15 M BW Ch.26765 QPSK_RB1_Offset 74)



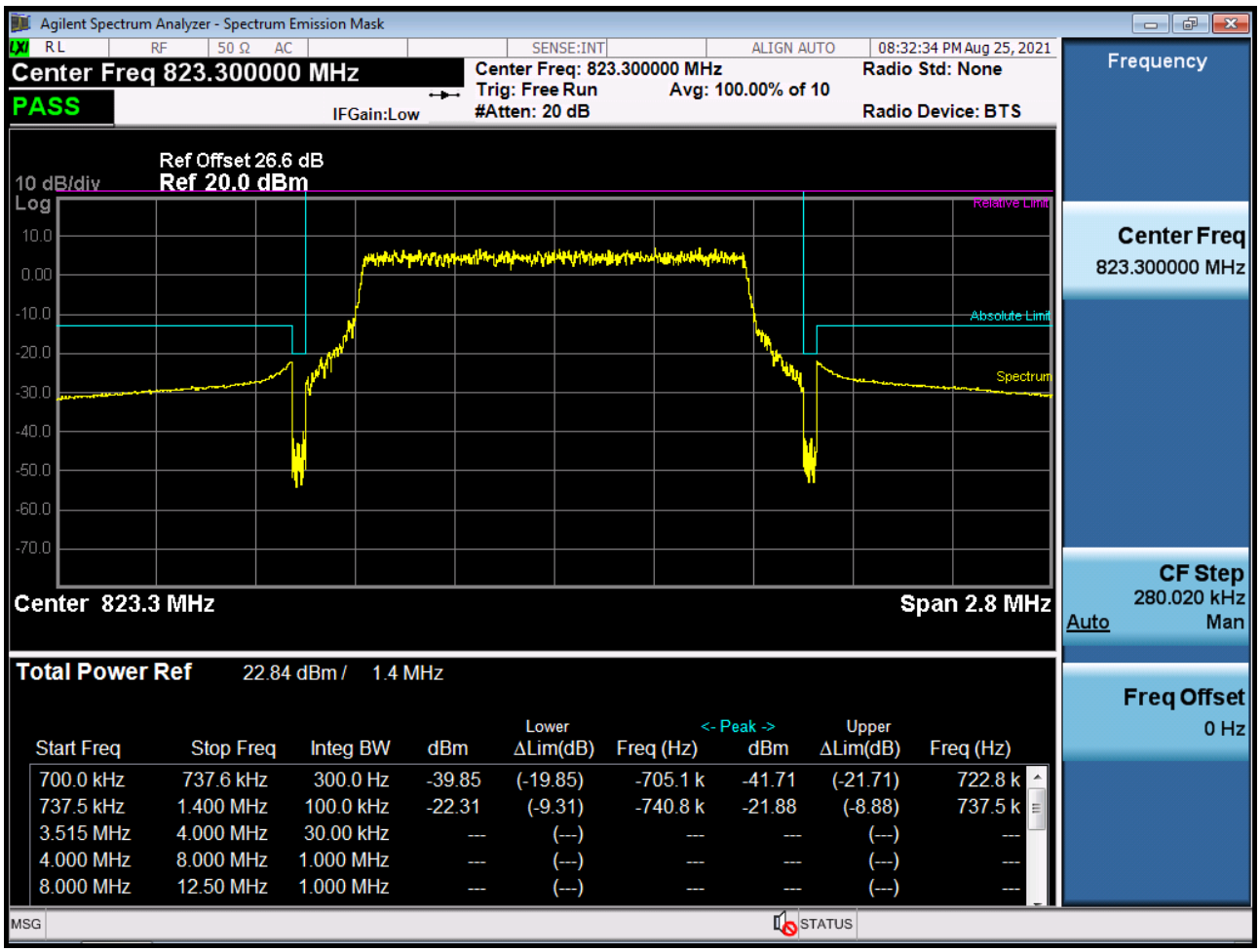
BAND 26. Mid Band Edge Plot (15 M BW Ch.26765 QPSK RB 1, Offset74)

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

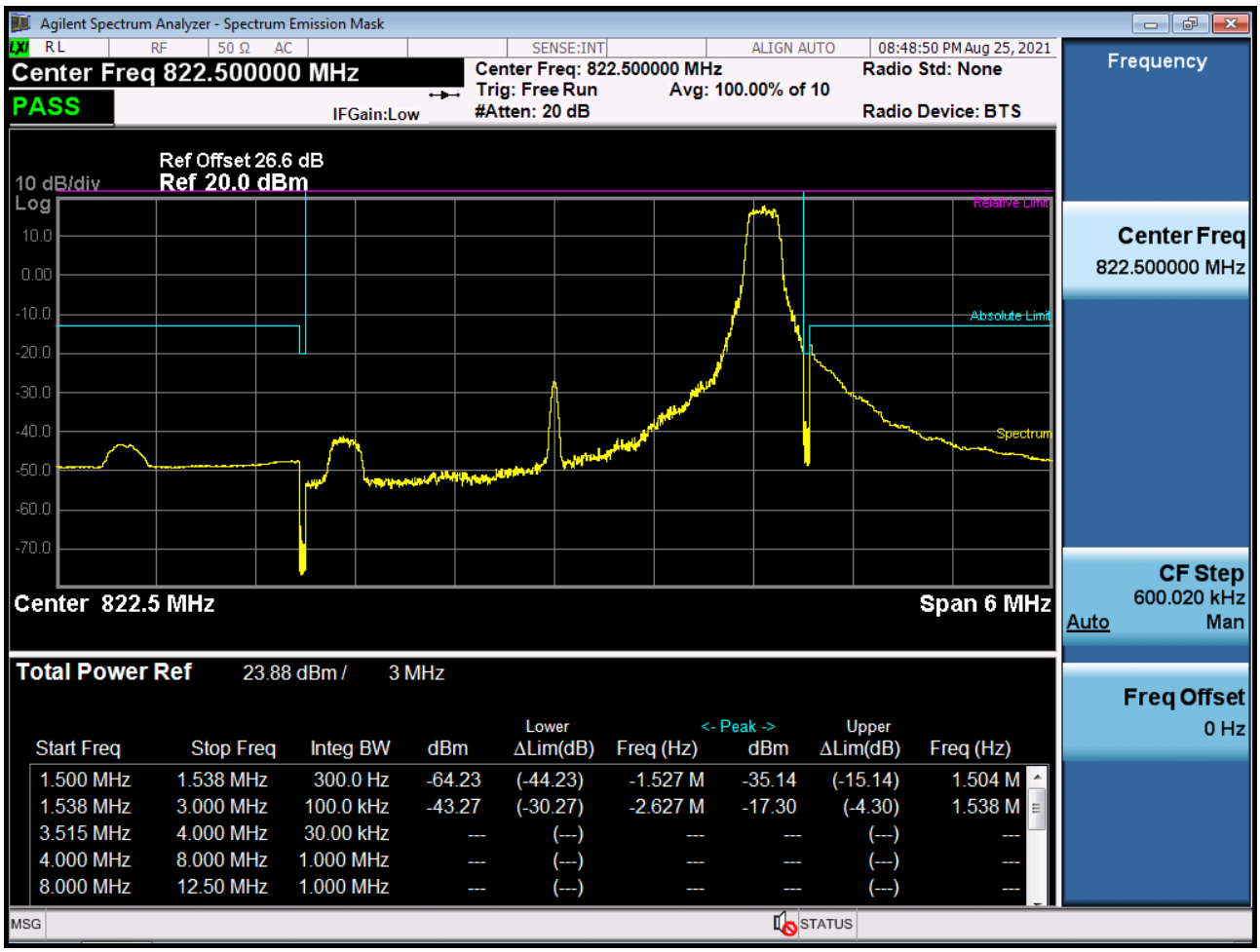
BAND 26. Upper Channel Edge Plot (1.4 M BW Ch.26783 QPSK_RB1_Offset 5)



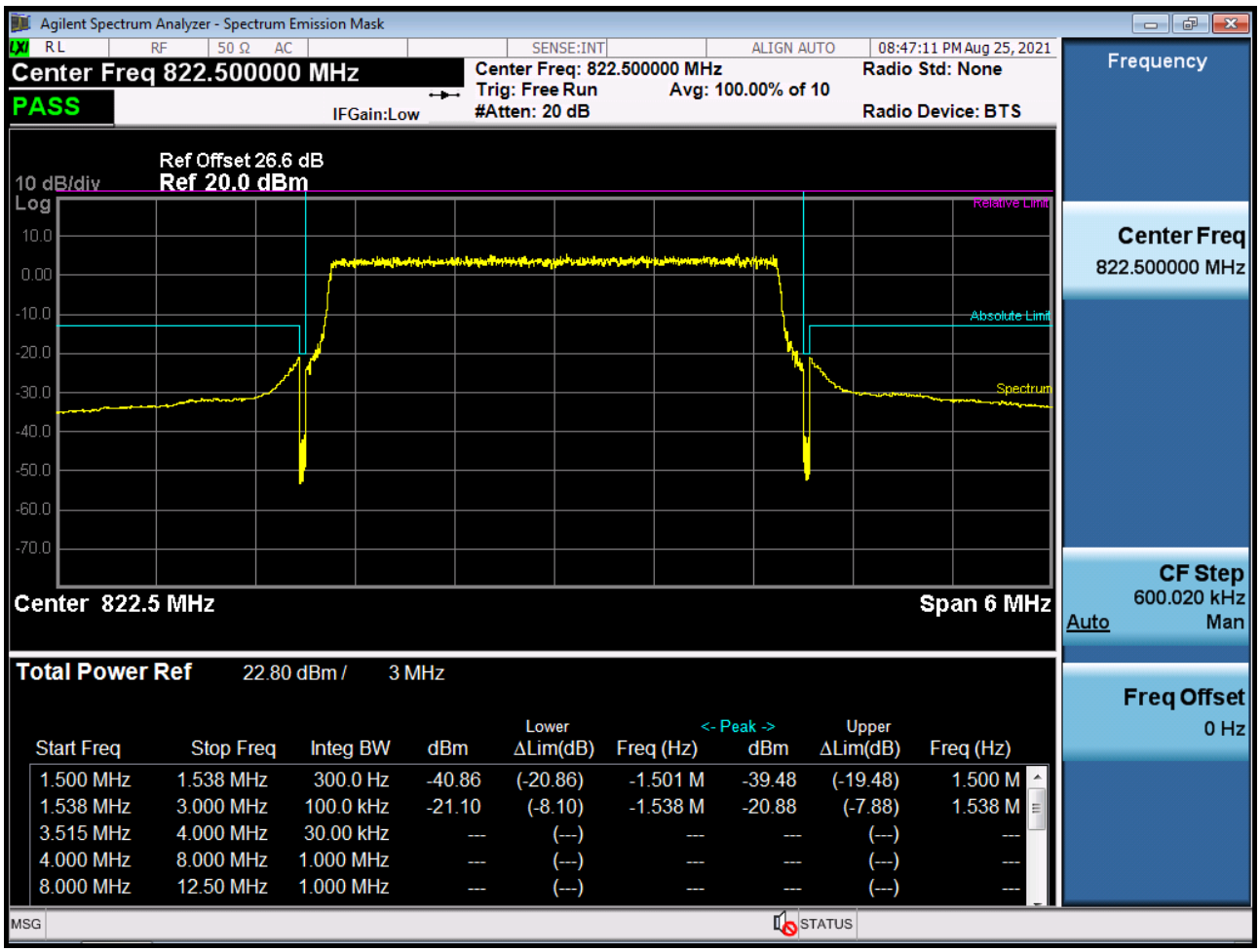
BAND 26. Upper Channel Edge Plot (1.4 M BW Ch.26783 QPSK_RB6_Offset 0)



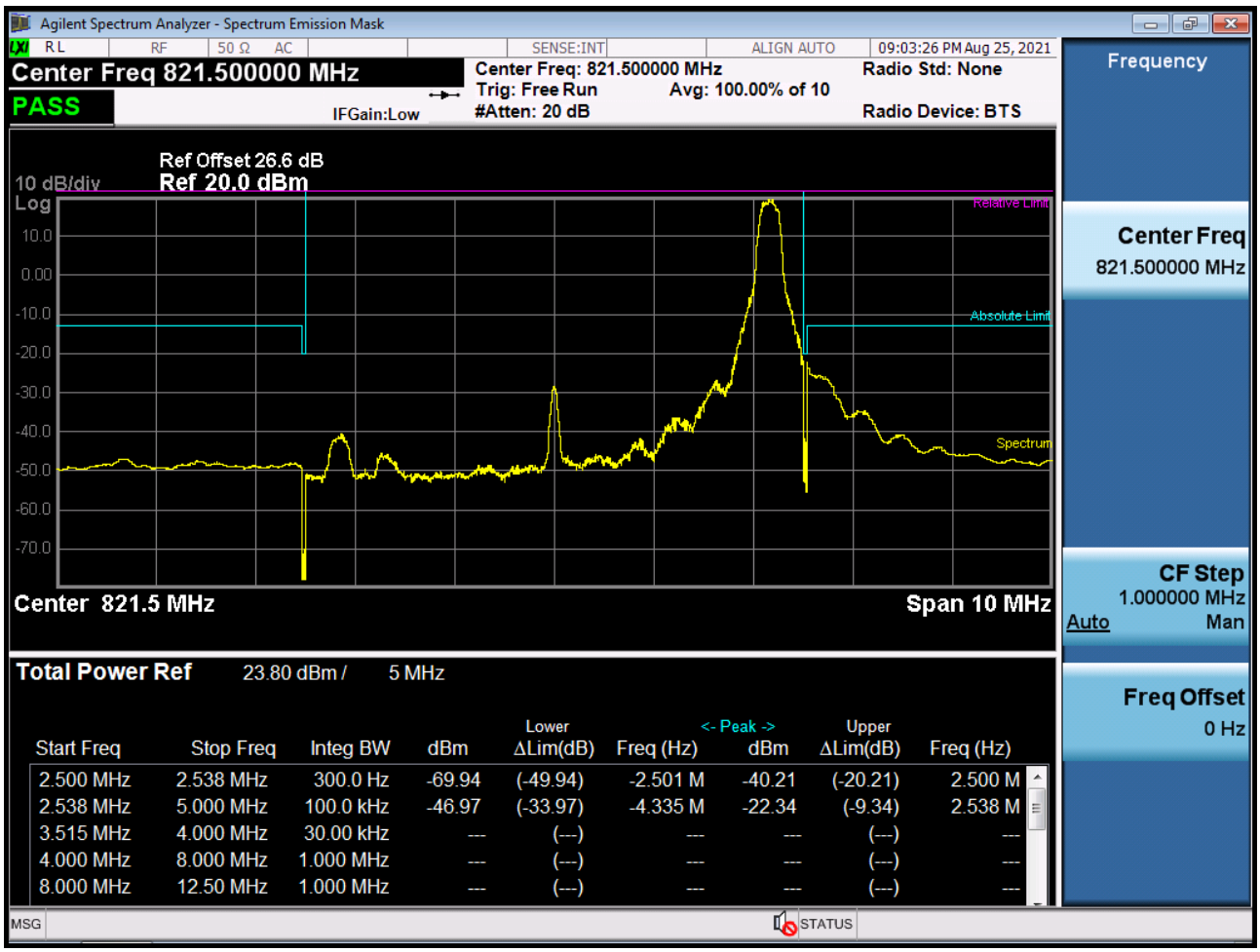
BAND 26. Upper Channel Edge Plot (3 M BW Ch.26775 QPSK_RB1_Offset 14)



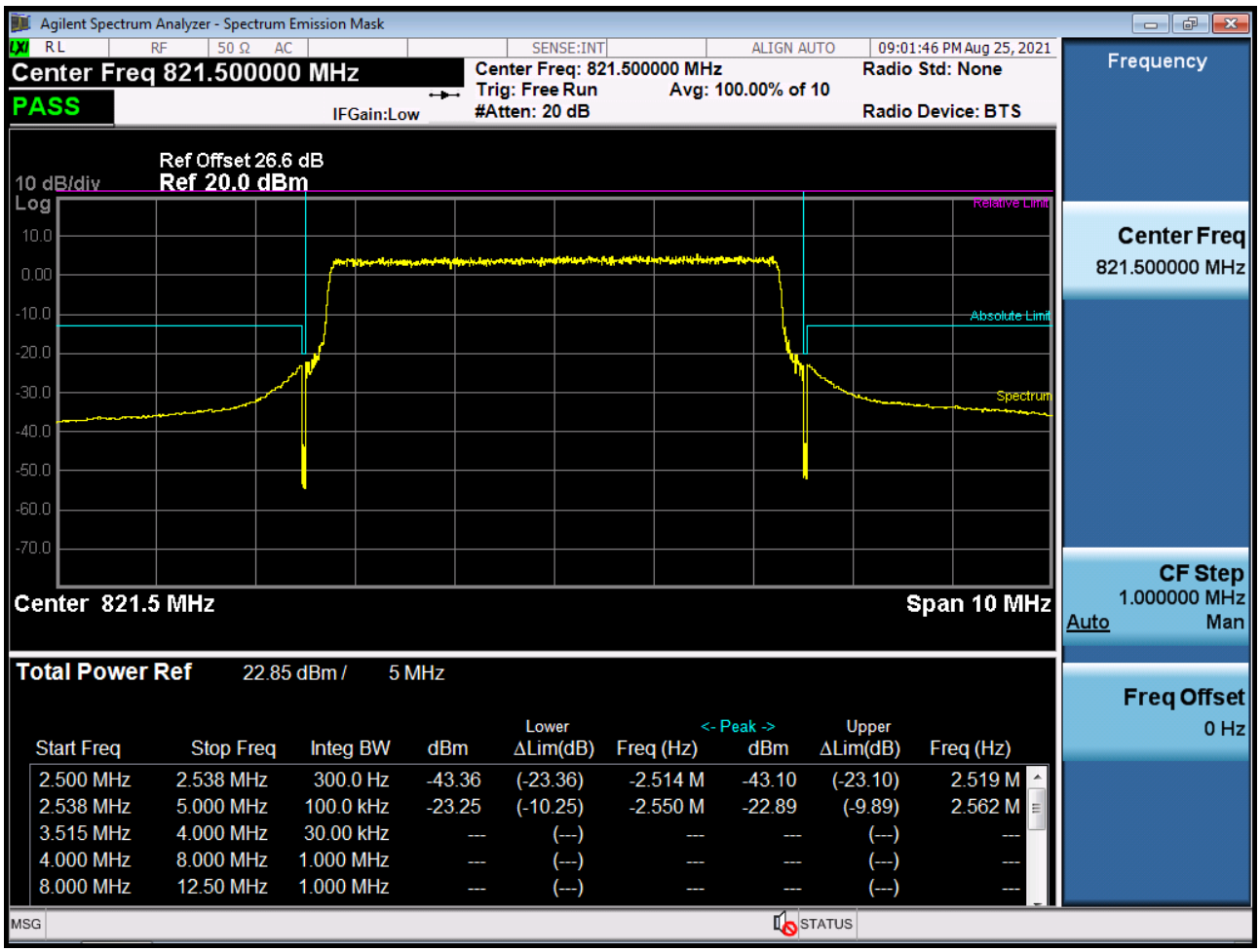
BAND 26. Upper Channel Edge Plot (3 M BW Ch.26775 QPSK_RB15_Offset 0)



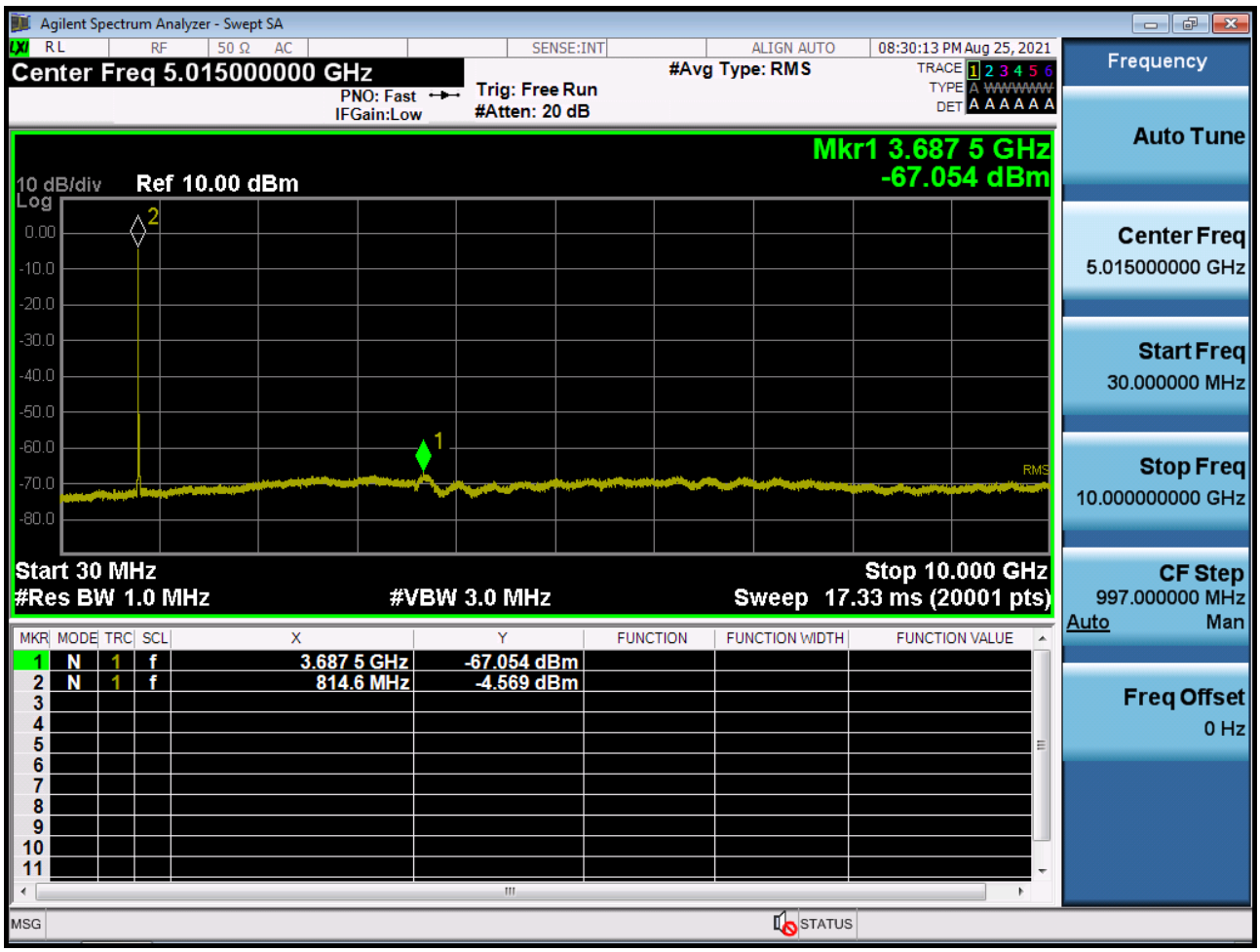
BAND 26. Upper Channel Edge Plot (5 M BW Ch.26765 QPSK_RB1_Offset 24)



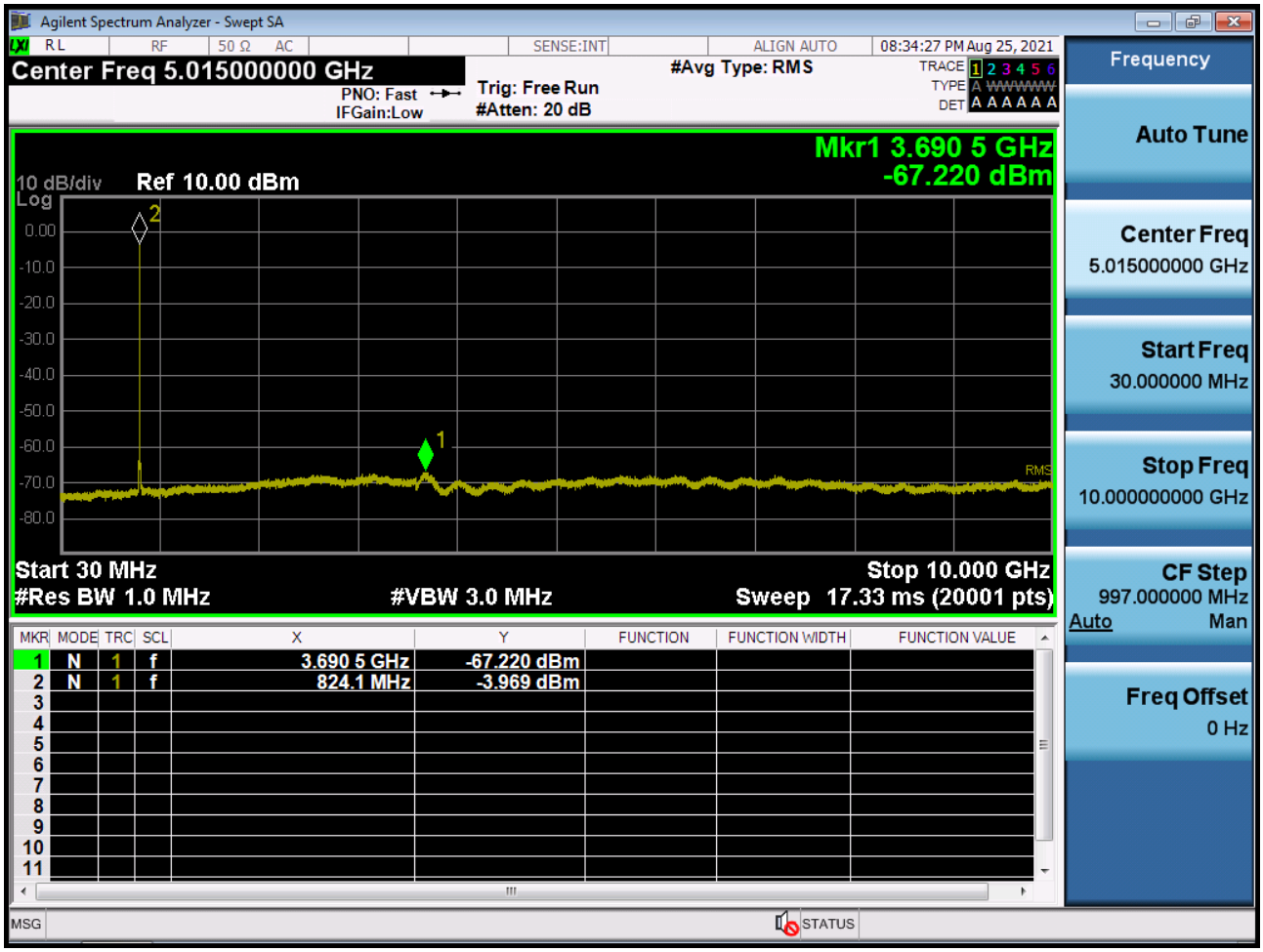
BAND 26. Upper Channel Edge Plot (5 M BW Ch.26765 QPSK_RB25_Offset 0)



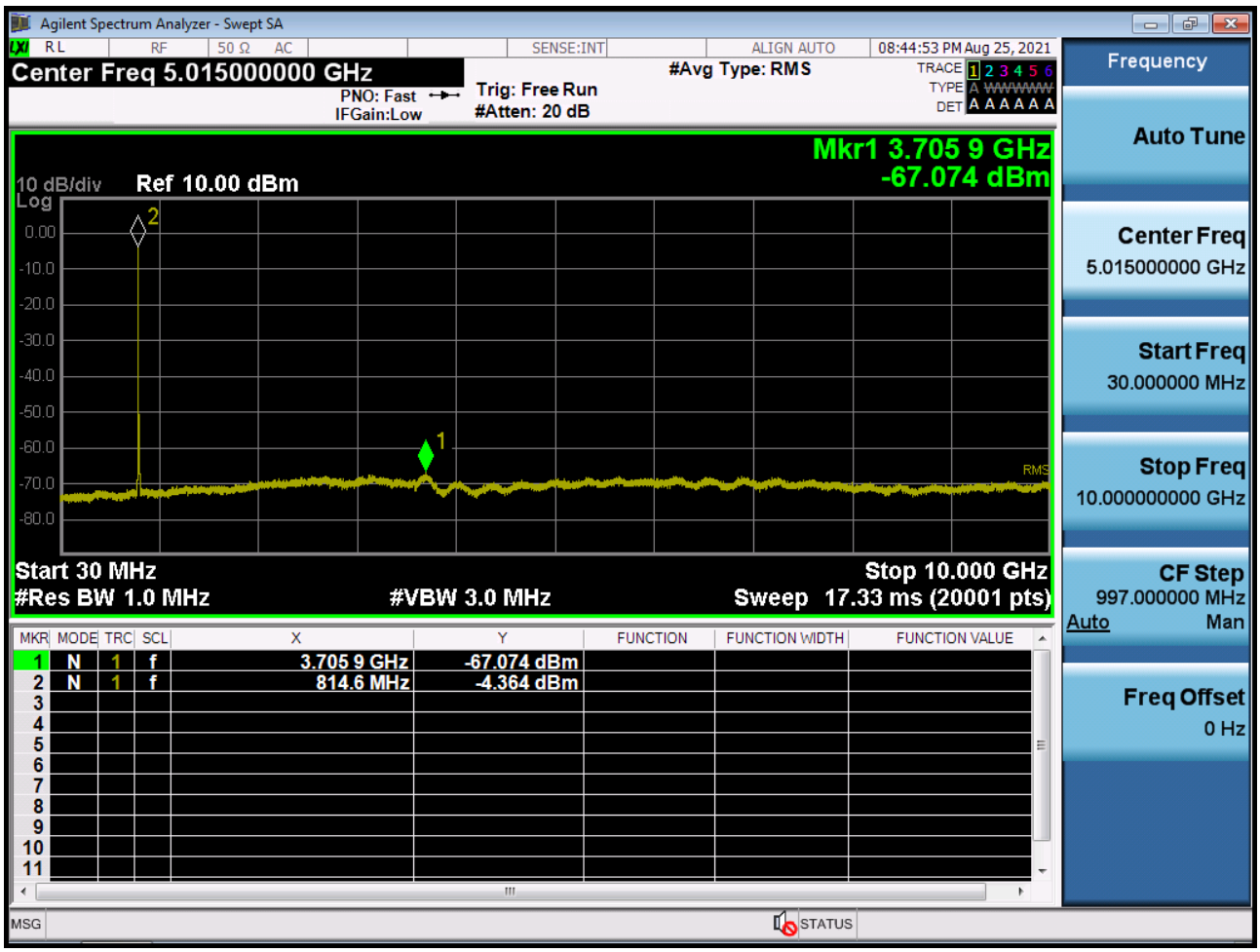
BAND 26. Conducted Spurious (26697 ch_1.4 MHz_QPSK_RB 1_0)



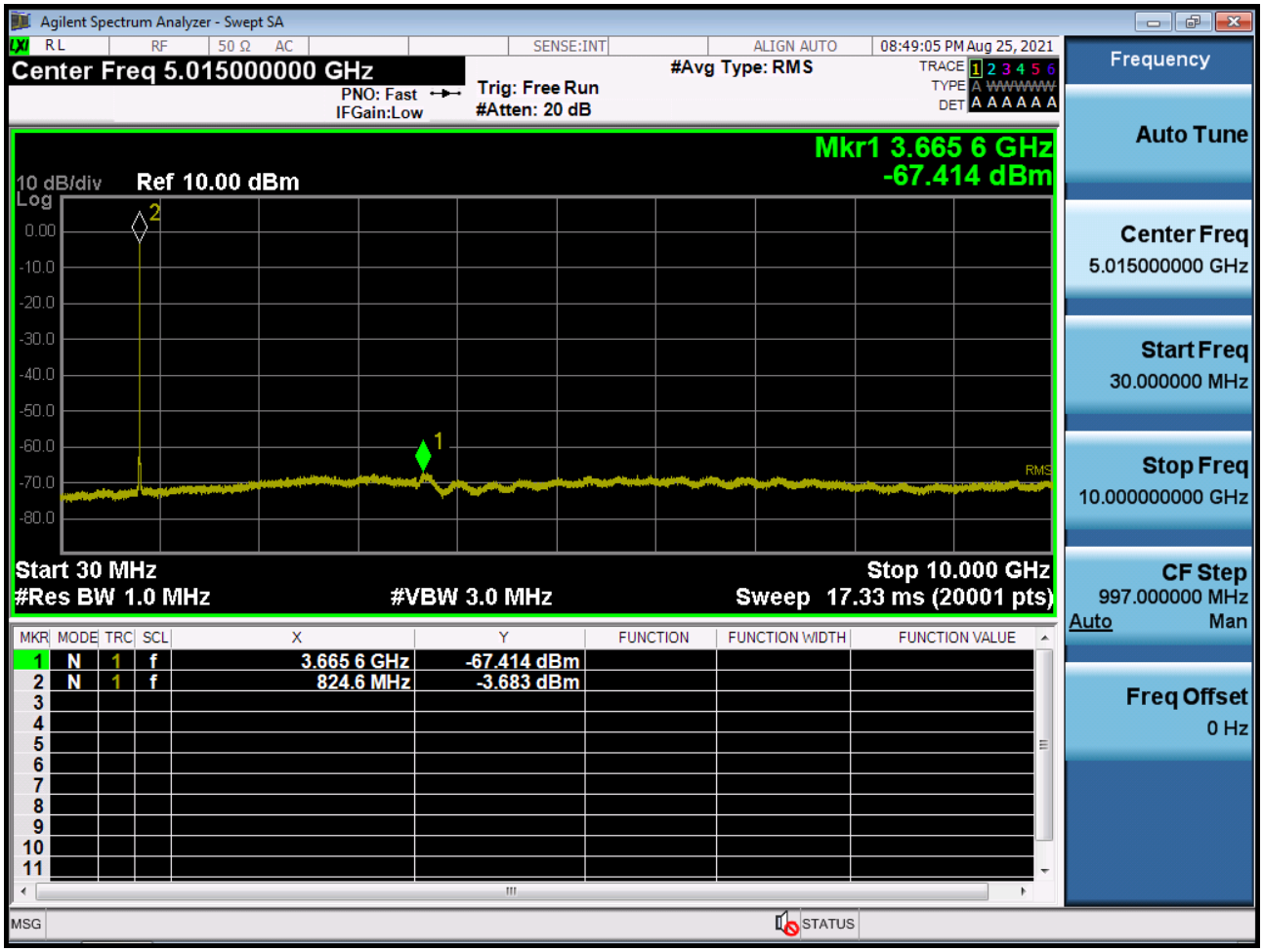
BAND 26. Conducted Spurious (26783 ch_1.4 MHz_QPSK_RB 1_0)



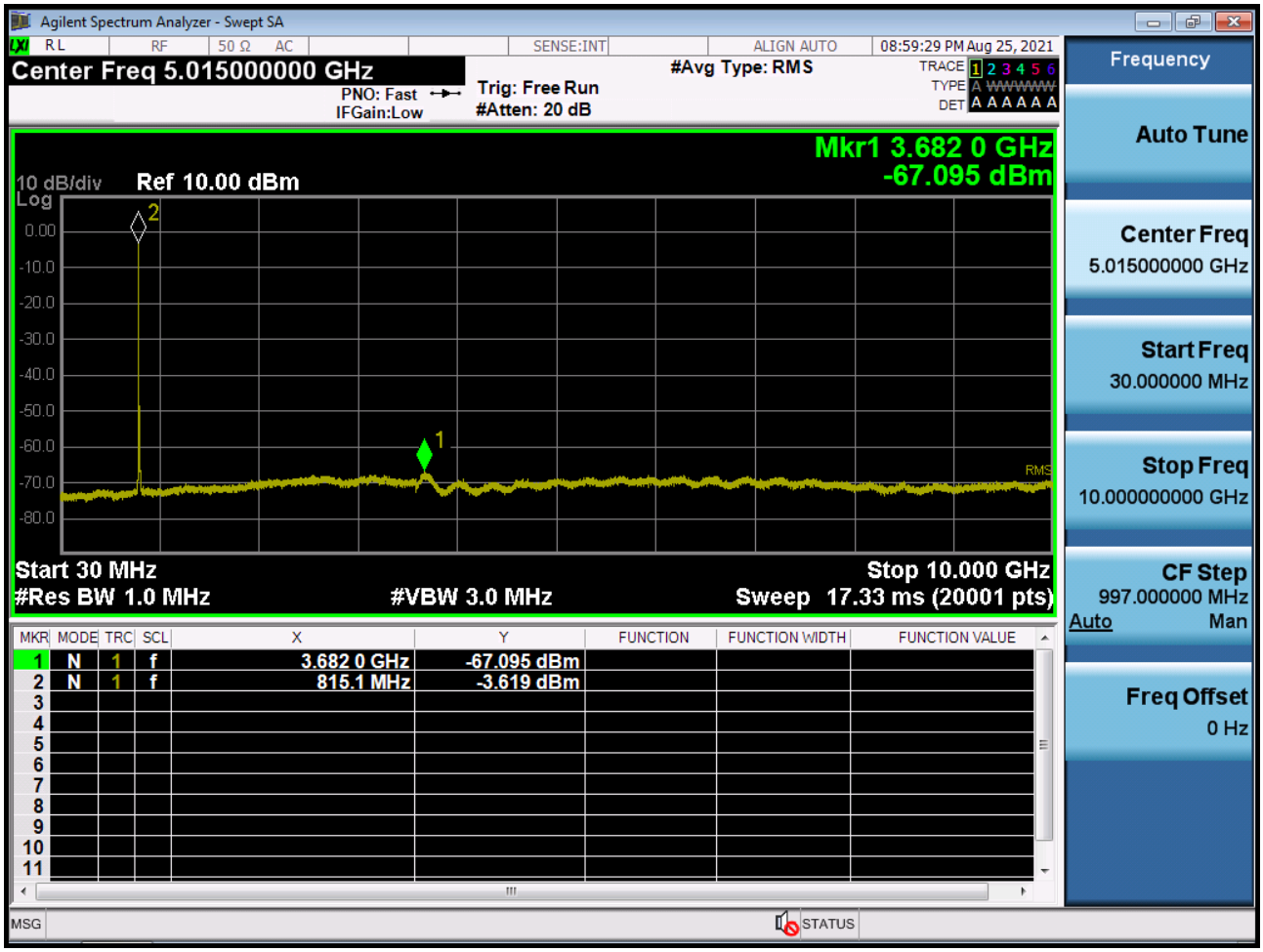
BAND 26. Conducted Spurious (26705 ch_3 MHz_QPSK_RB 1_0)



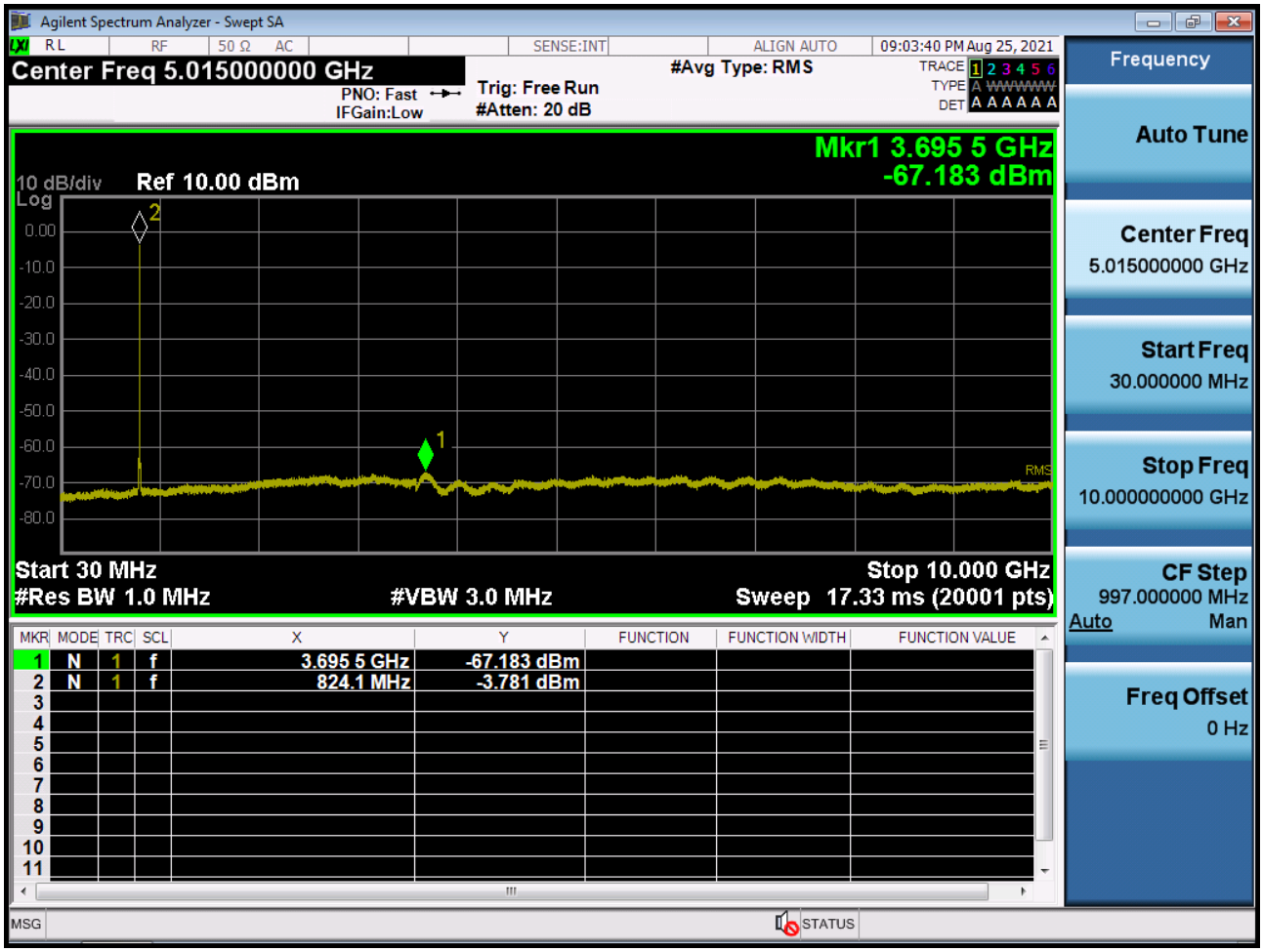
BAND 26. Conducted Spurious (26775 ch_3 MHz_QPSK_RB 1_0)



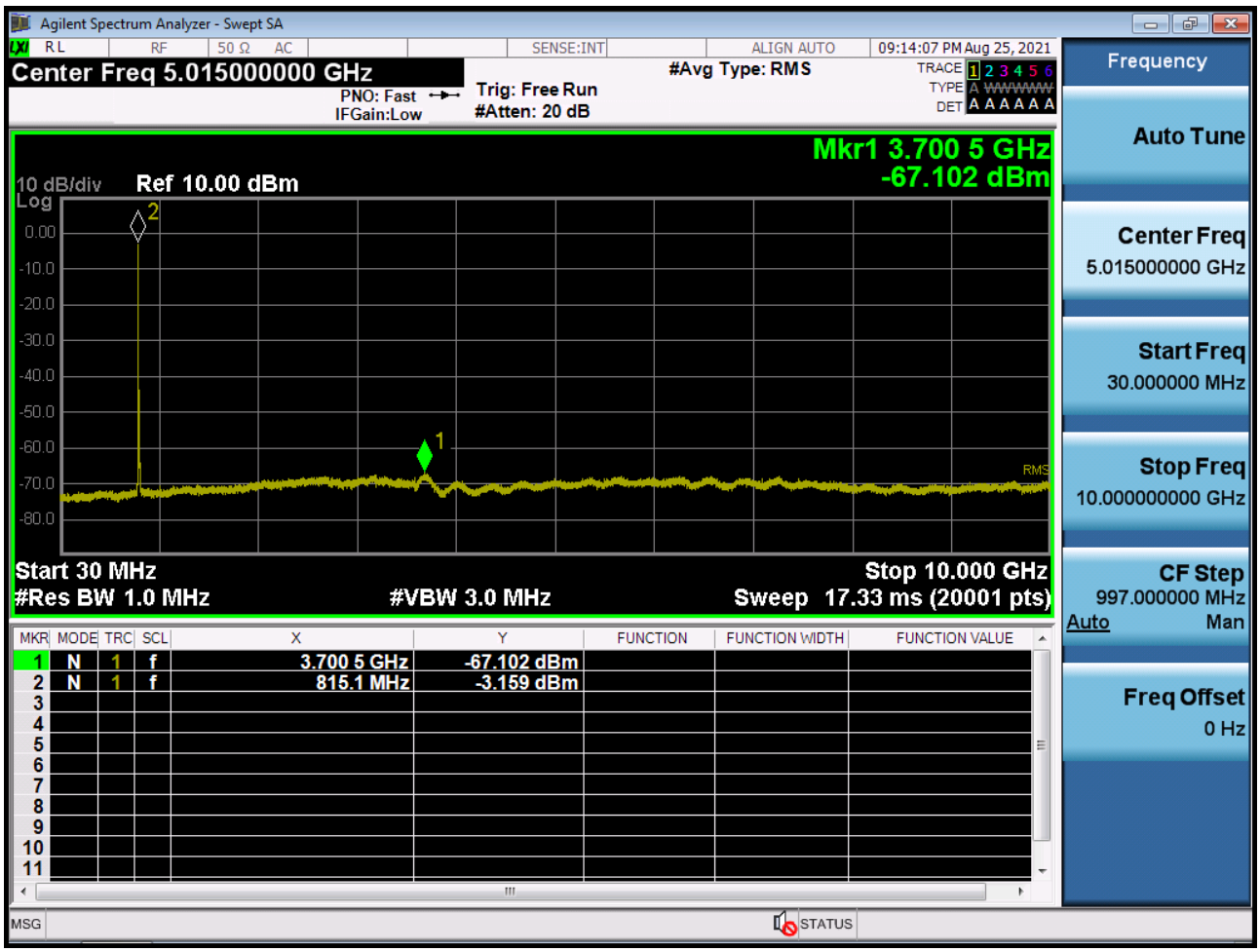
BAND 26. Conducted Spurious (26715 ch_5 MHz_QPSK_RB 1_0)



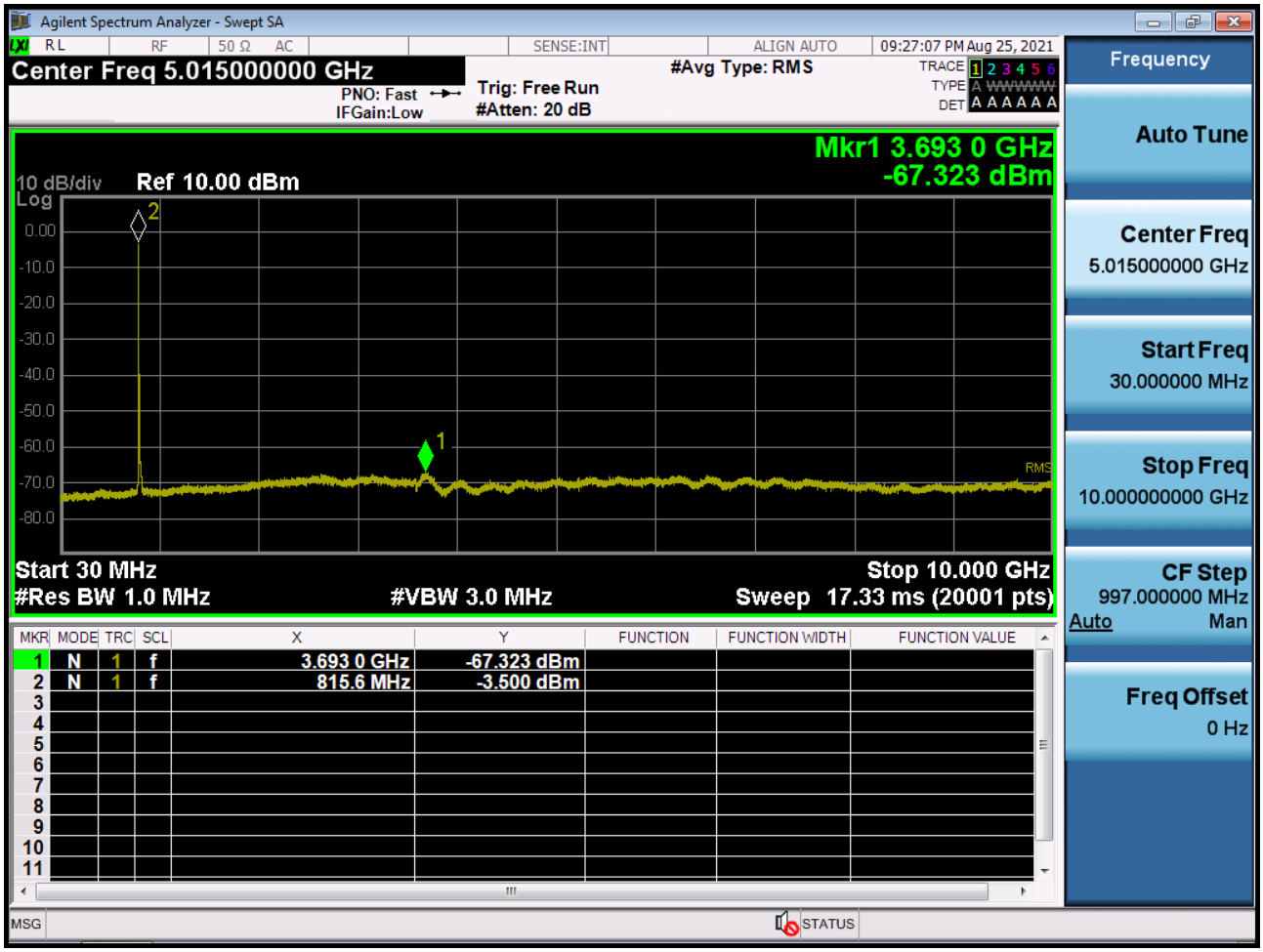
BAND 26. Conducted Spurious (26765 ch_5 MHz_QPSK_RB 1_0)



BAND 26. Conducted Spurious (26740 ch_10 MHz_QPSK_RB 1_0)

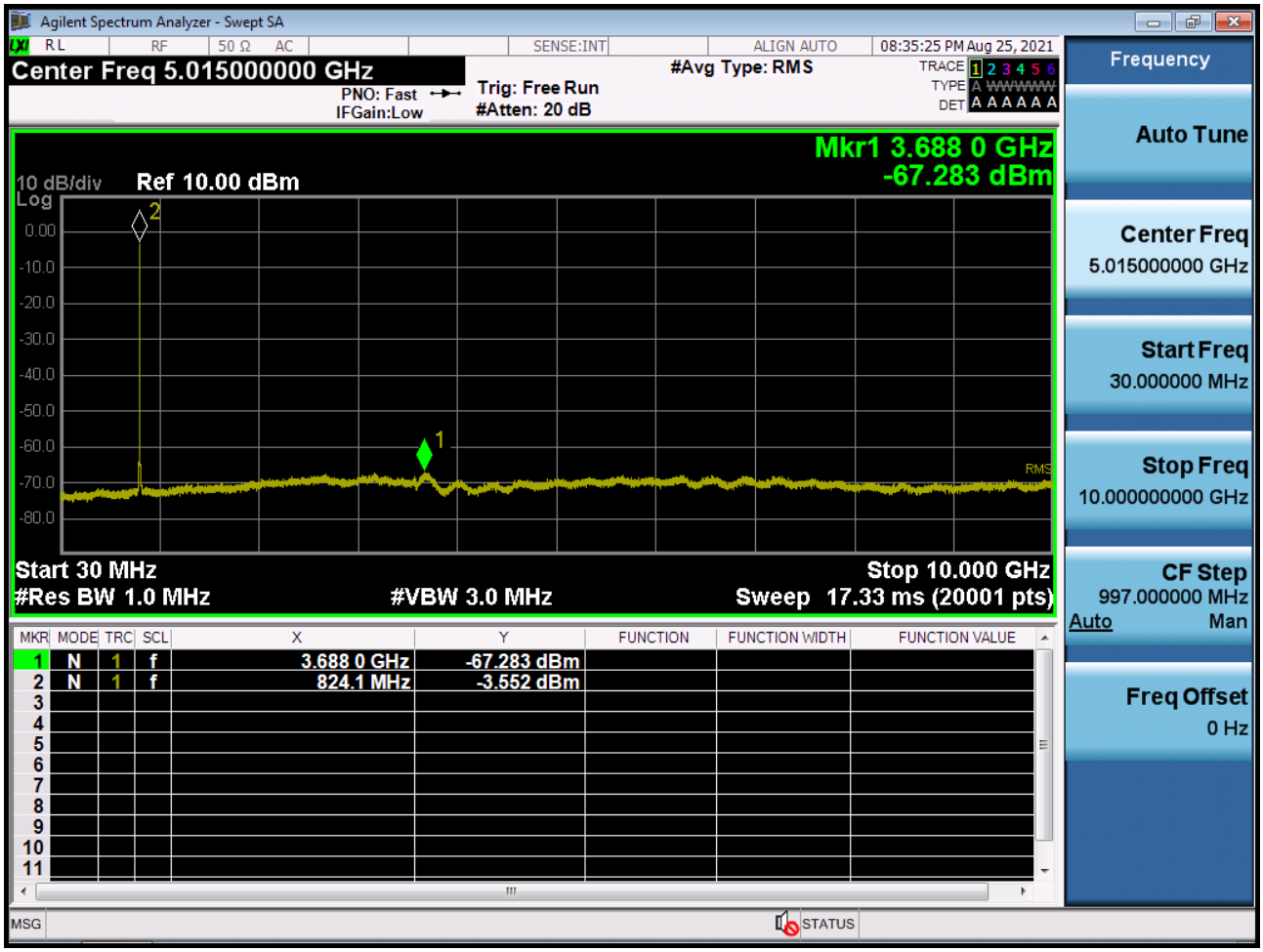


BAND 26. Conducted Spurious (26765 ch_15 MHz_QPSK_RB 1_0)

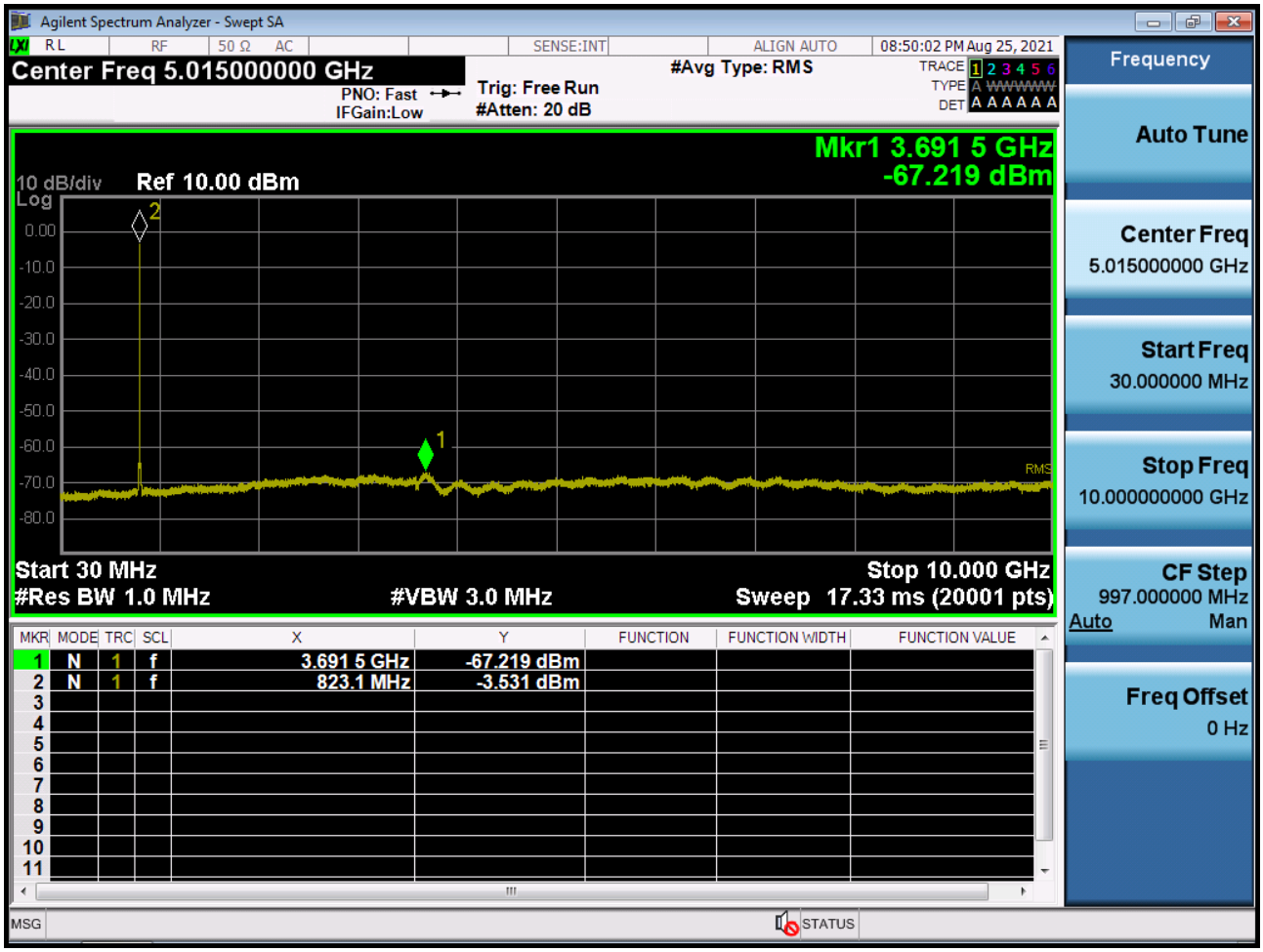


10. TEST PLOTS (STRADDLE CHANNEL)

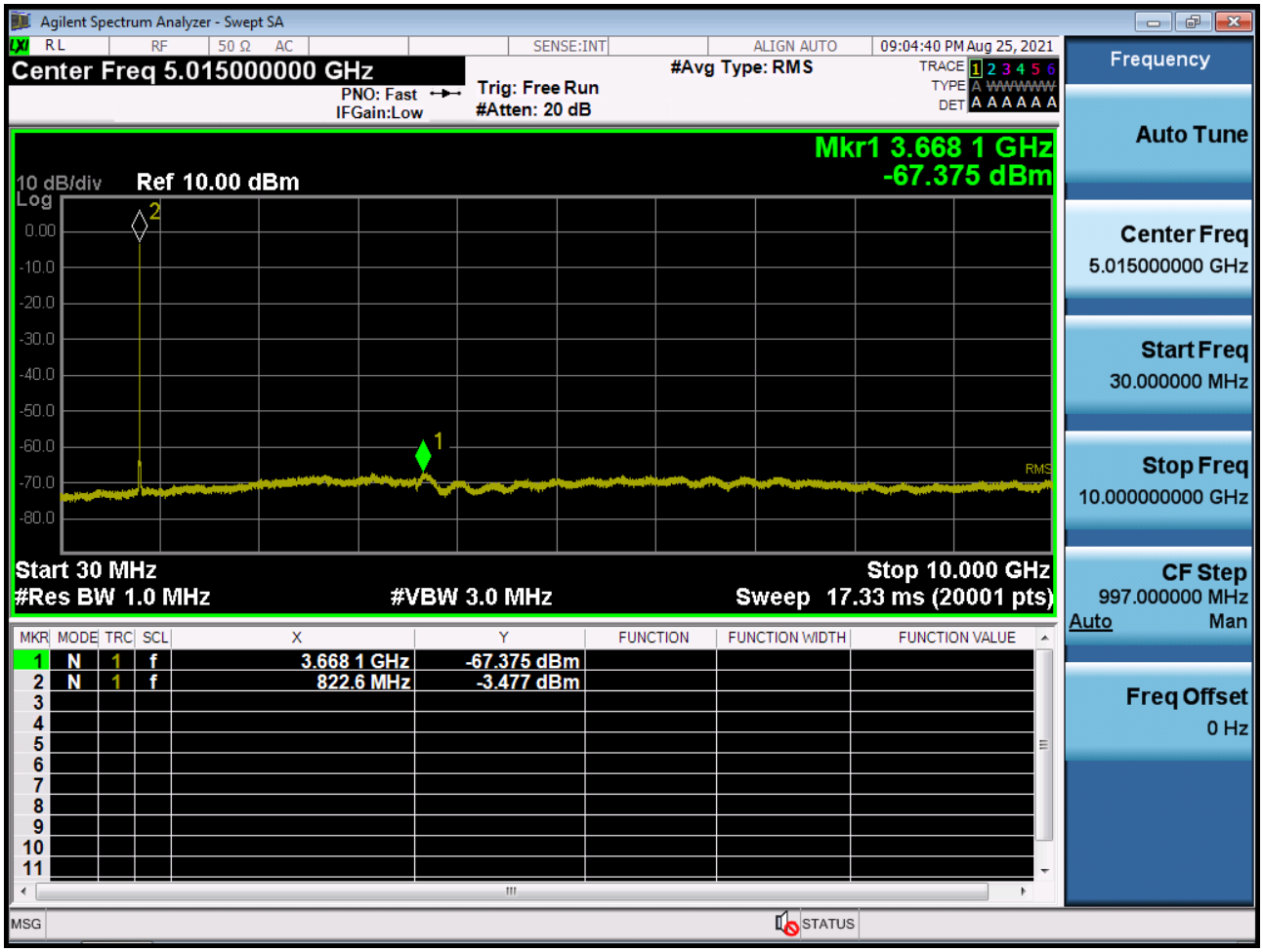
BAND 26. Conducted Spurious (1.4 MHz_QPSK_RB 1_0)



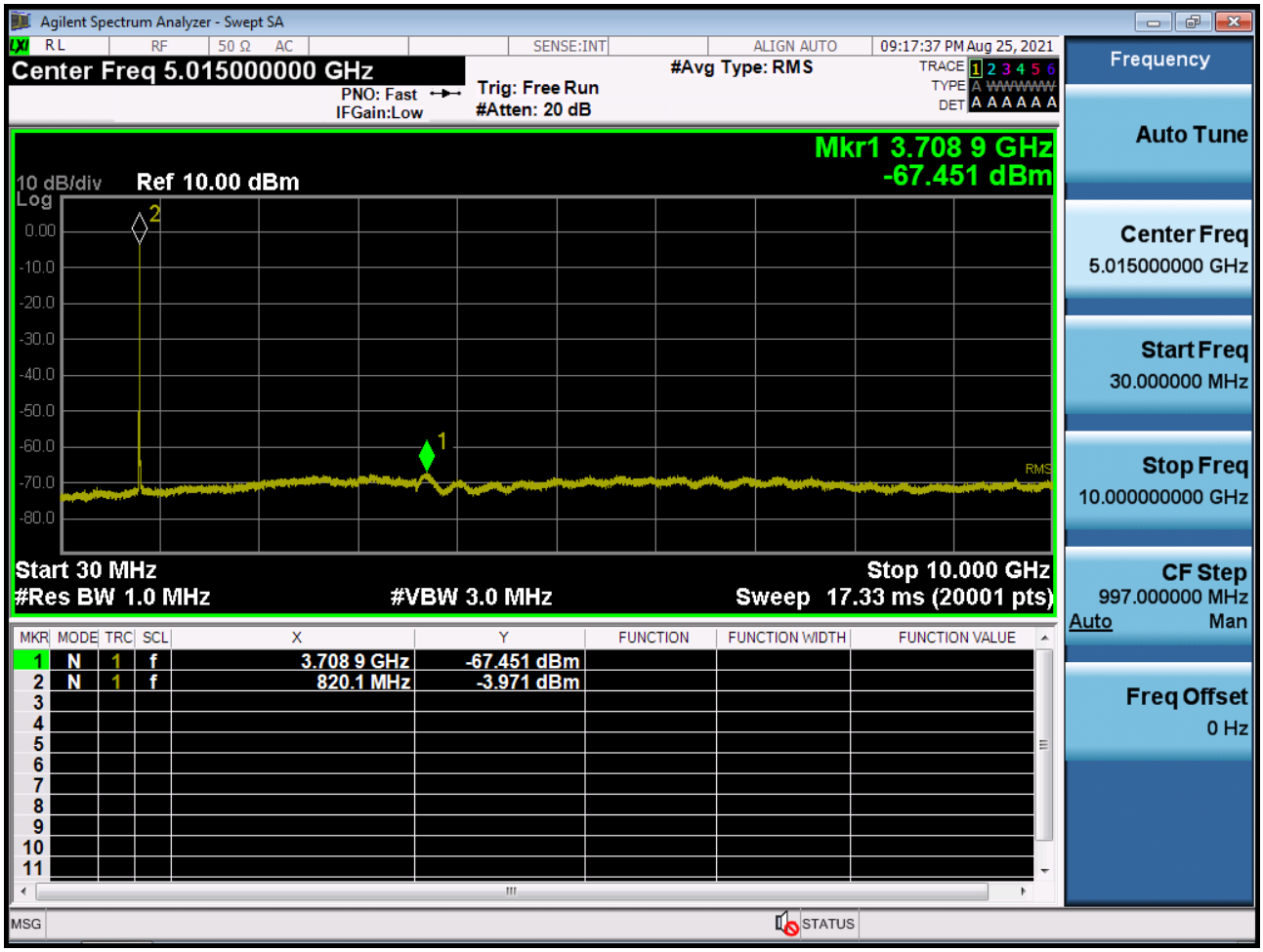
BAND 26. Conducted Spurious (3 MHz_QPSK_RB 1_0)



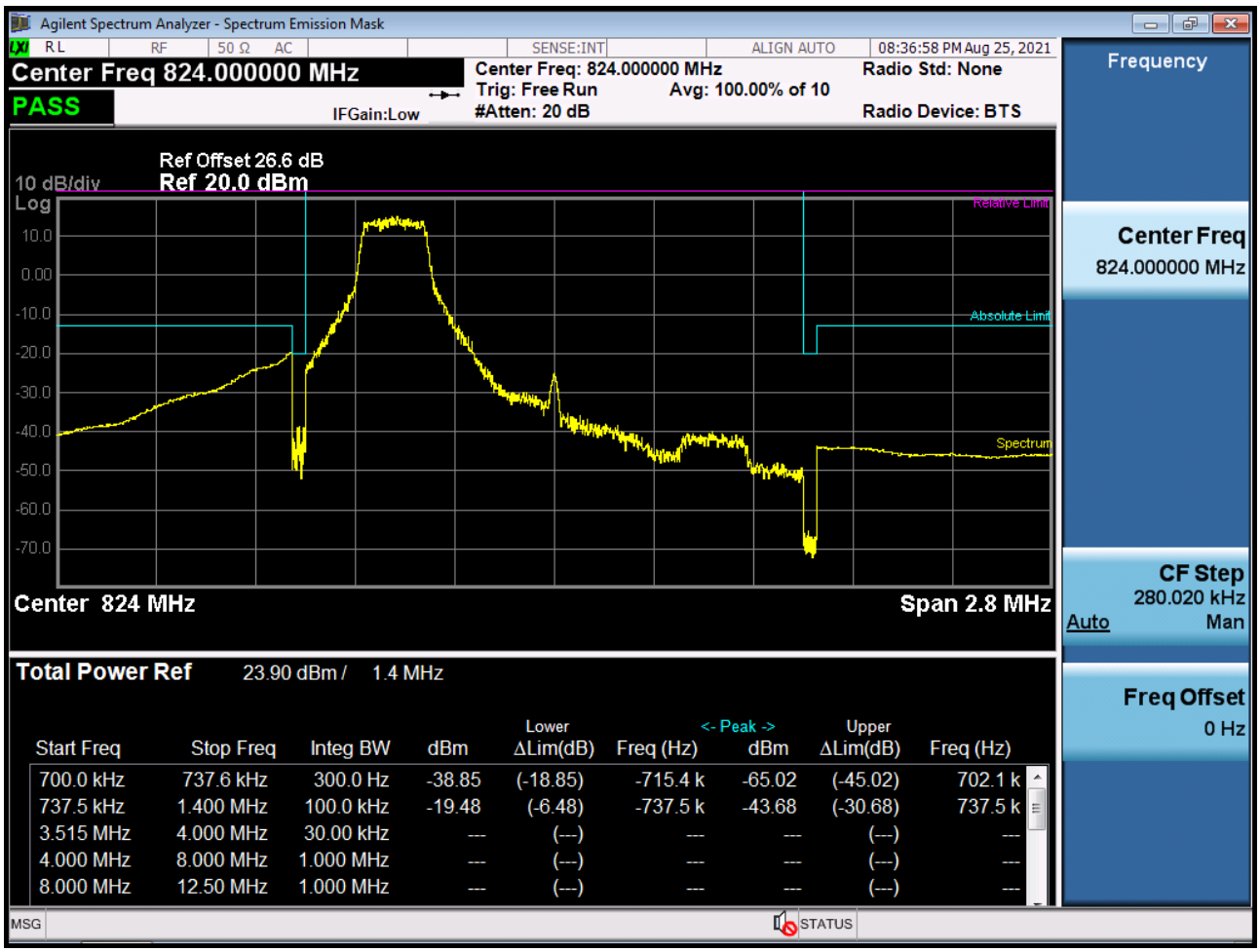
BAND 26. Conducted Spurious (5 MHz_QPSK_RB 1_0)



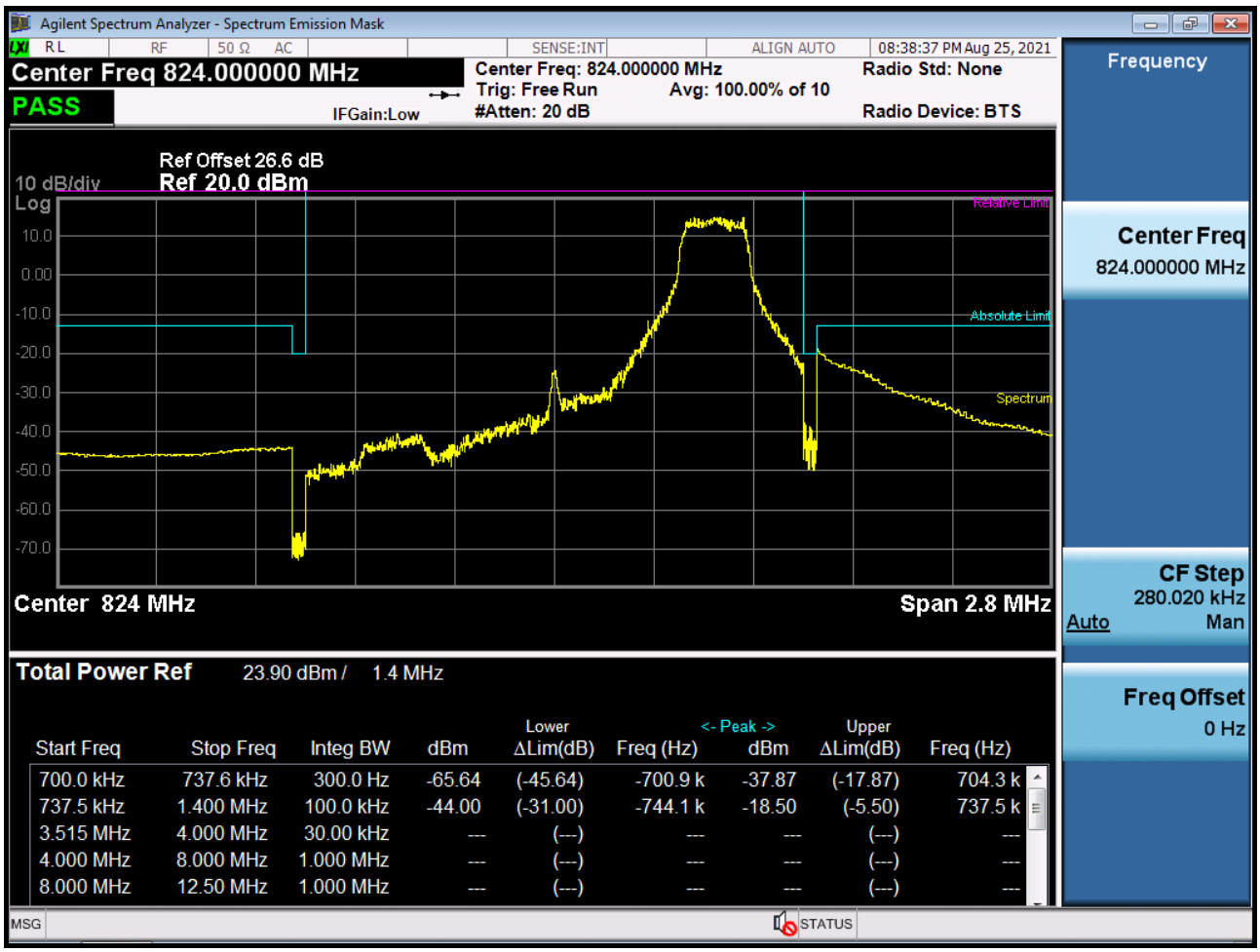
BAND 26. Conducted Spurious (10 MHz_QPSK_RB 1_0)



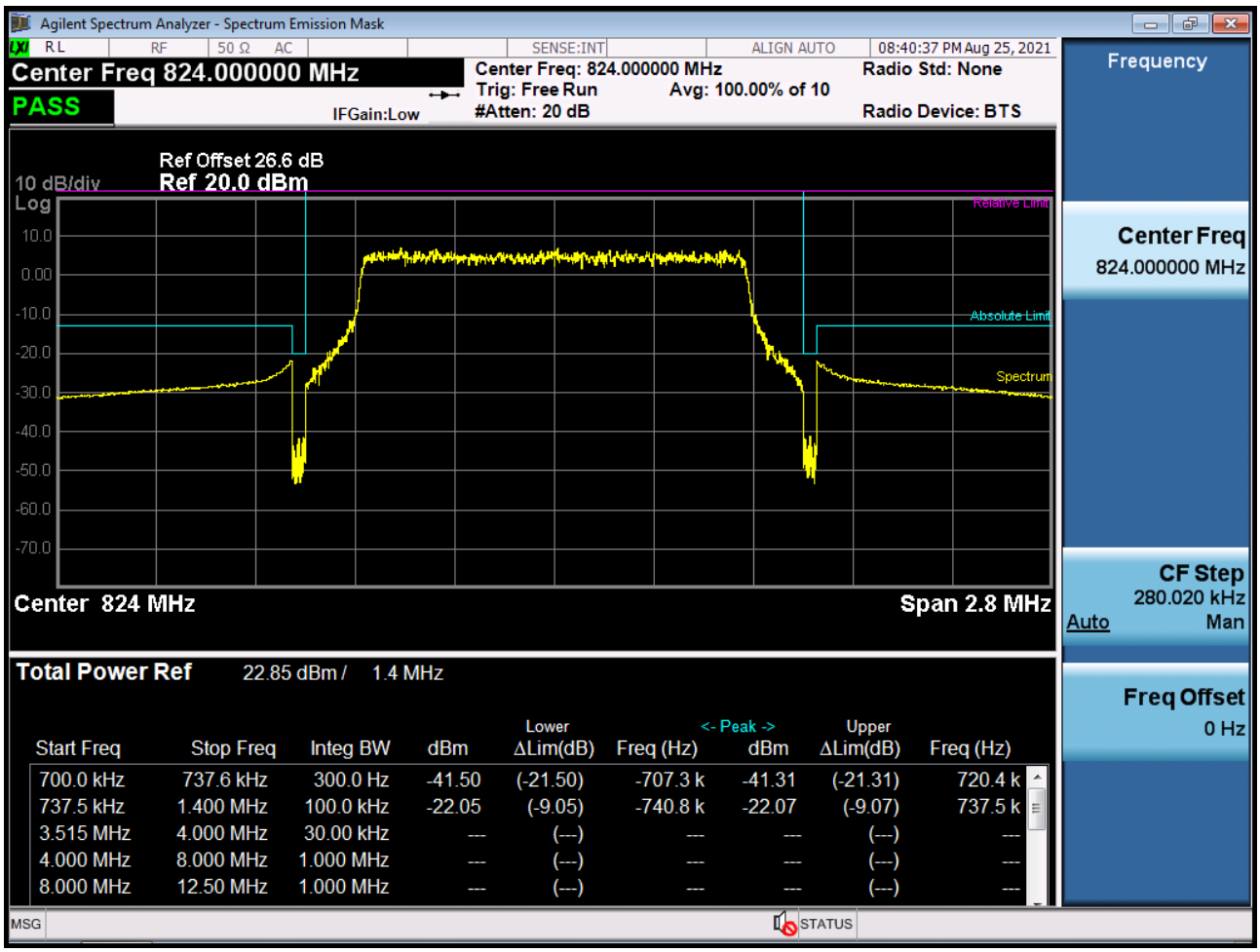
BAND 26. Channel Edge (1.4 MHz_QPSK_RB 1_0)



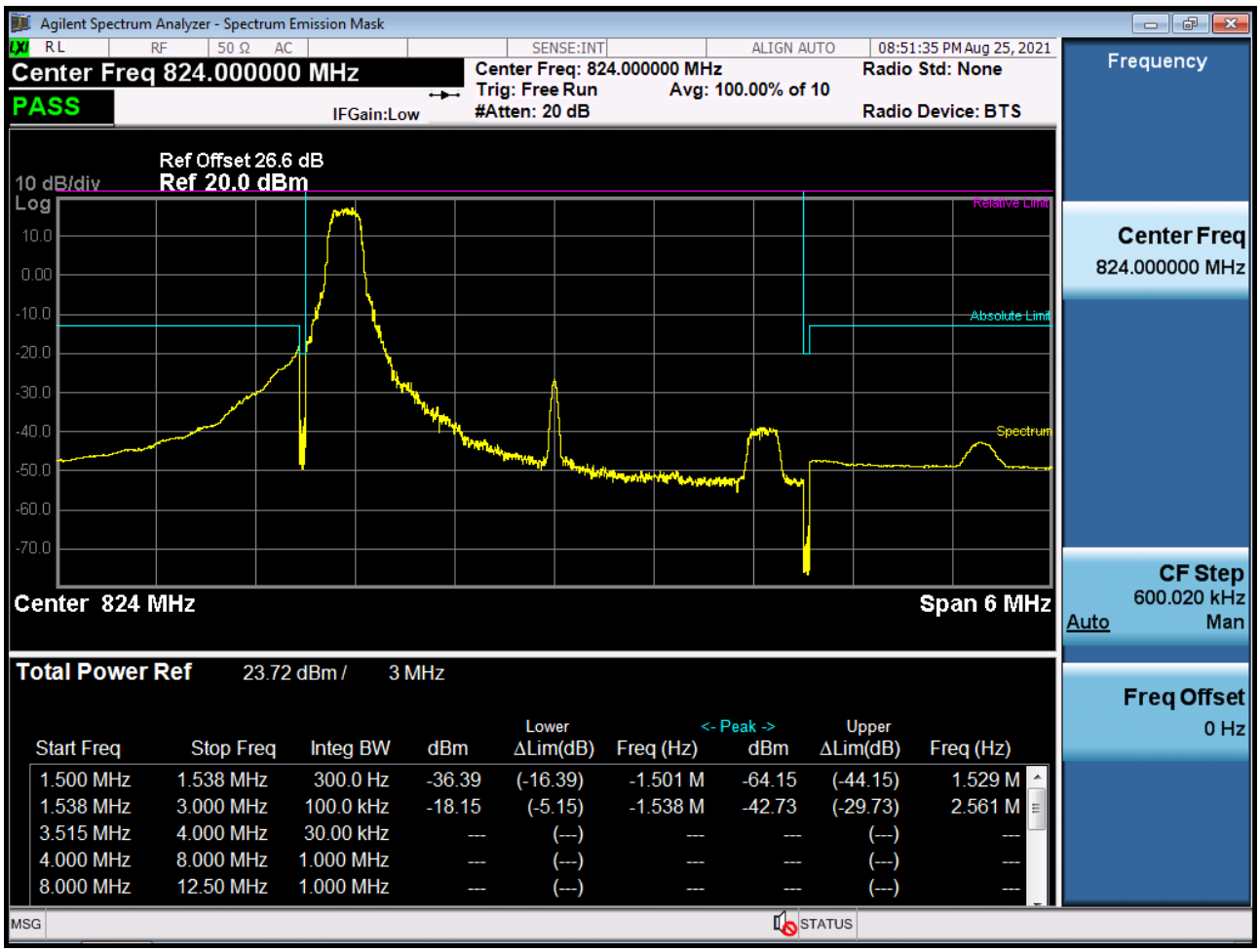
BAND 26. Channel Edge (1.4 MHz_QPSK_RB 1_5)



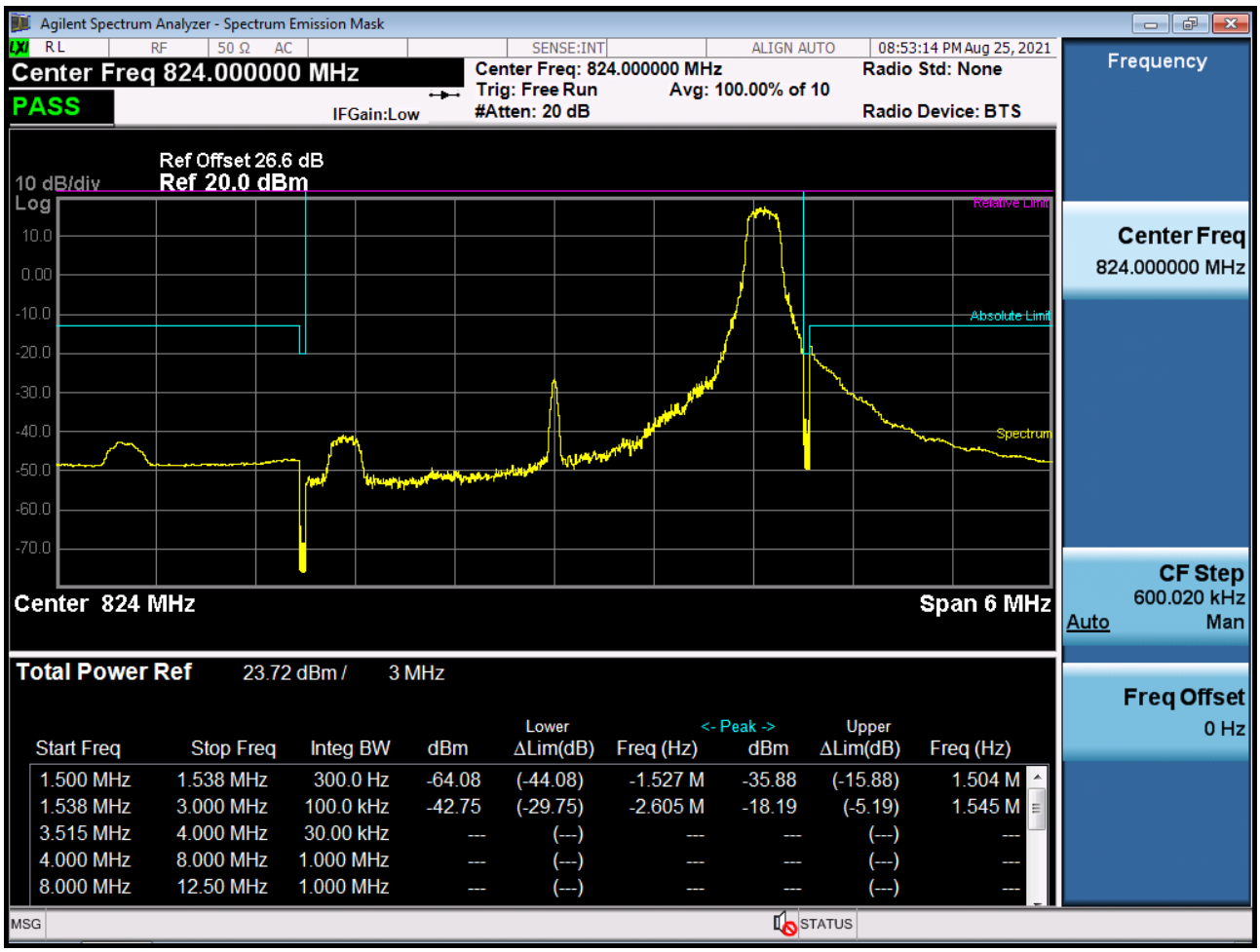
BAND 26. Channel Edge (1.4 MHz_QPSK_Full RB)



BAND 26. Channel Edge (3 MHz_QPSK_RB 1_0)

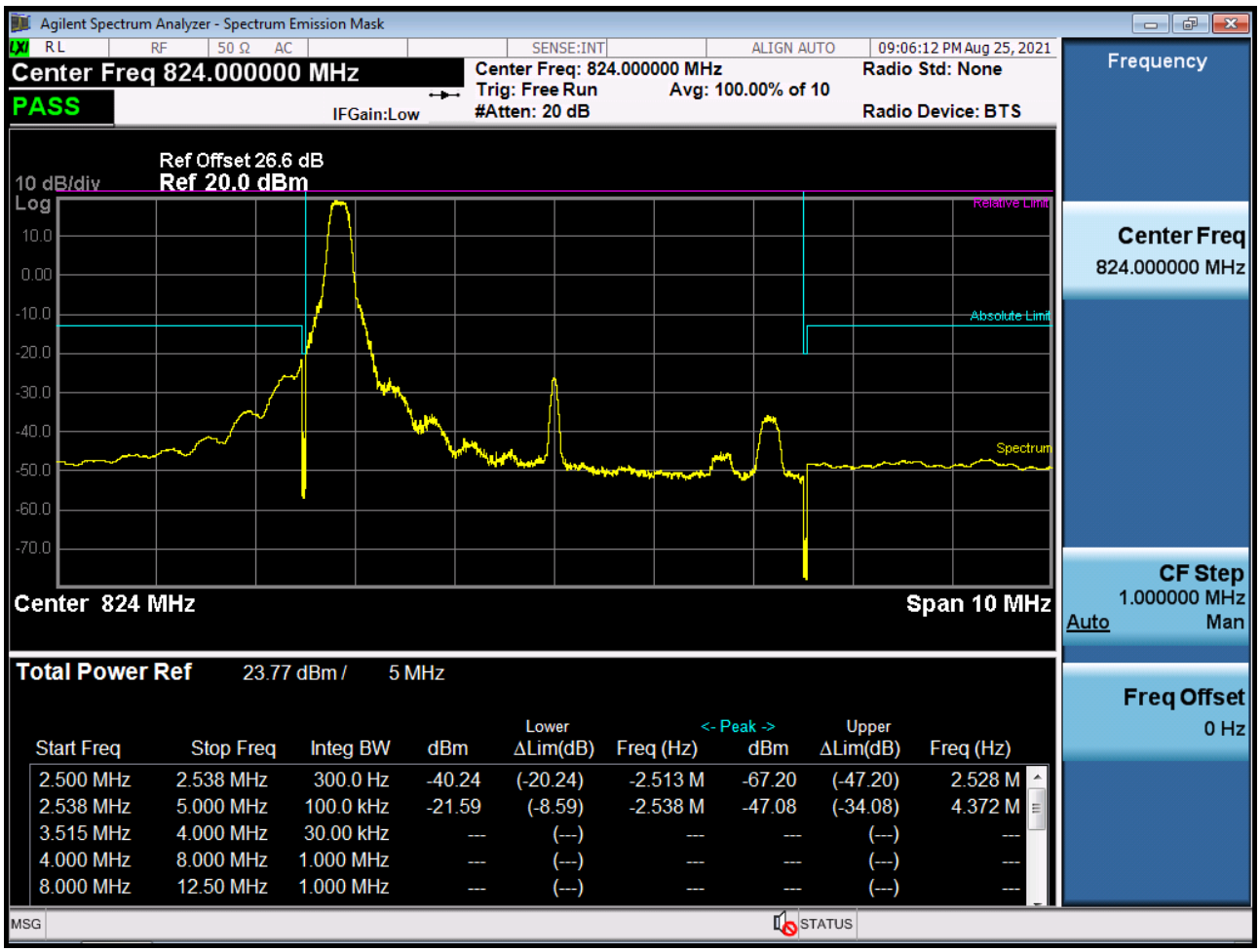


BAND 26. Channel Edge (3 MHz_QPSK_RB 1_14)

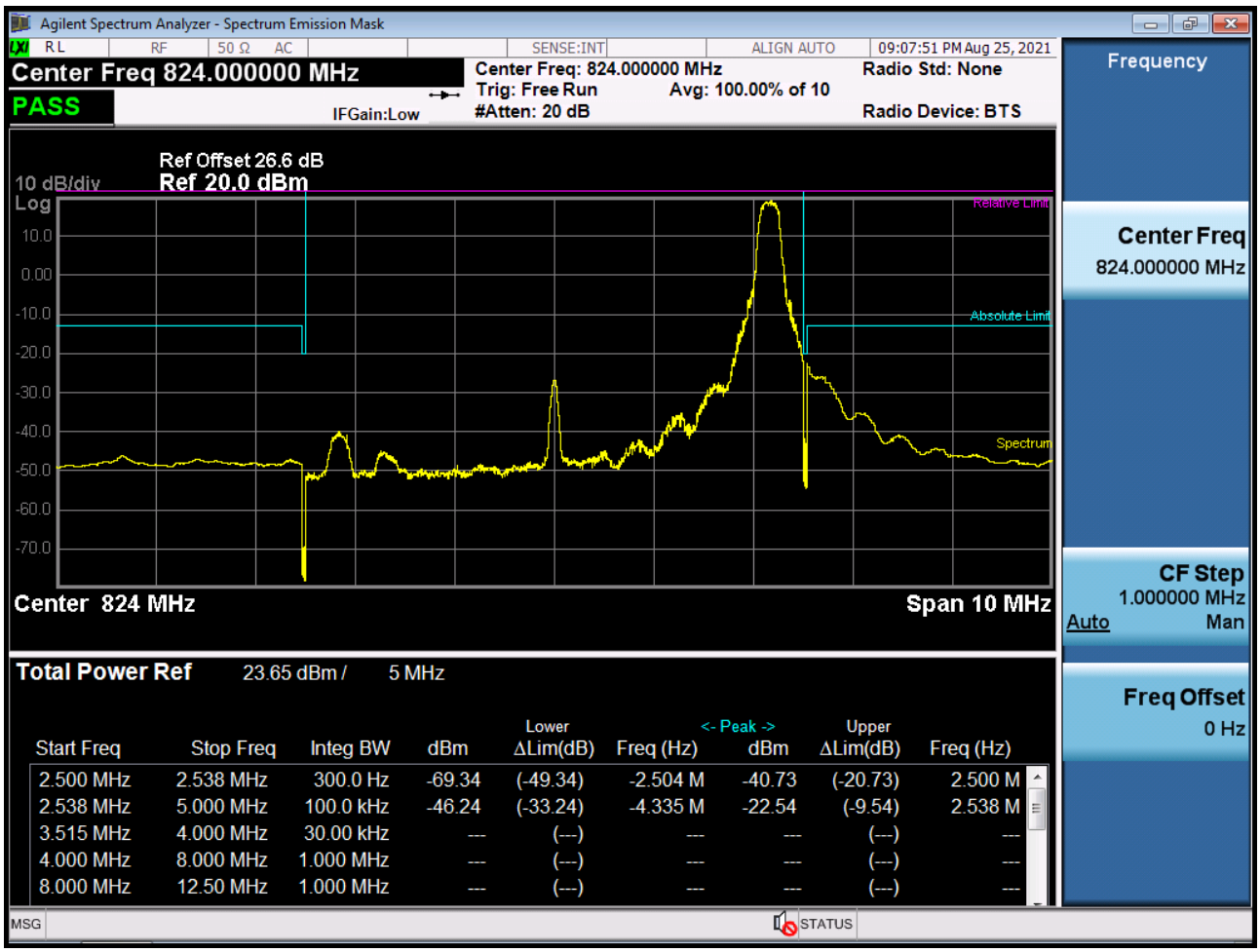


BAND 26. Channel Edge (3 MHz_QPSK_Full RB)

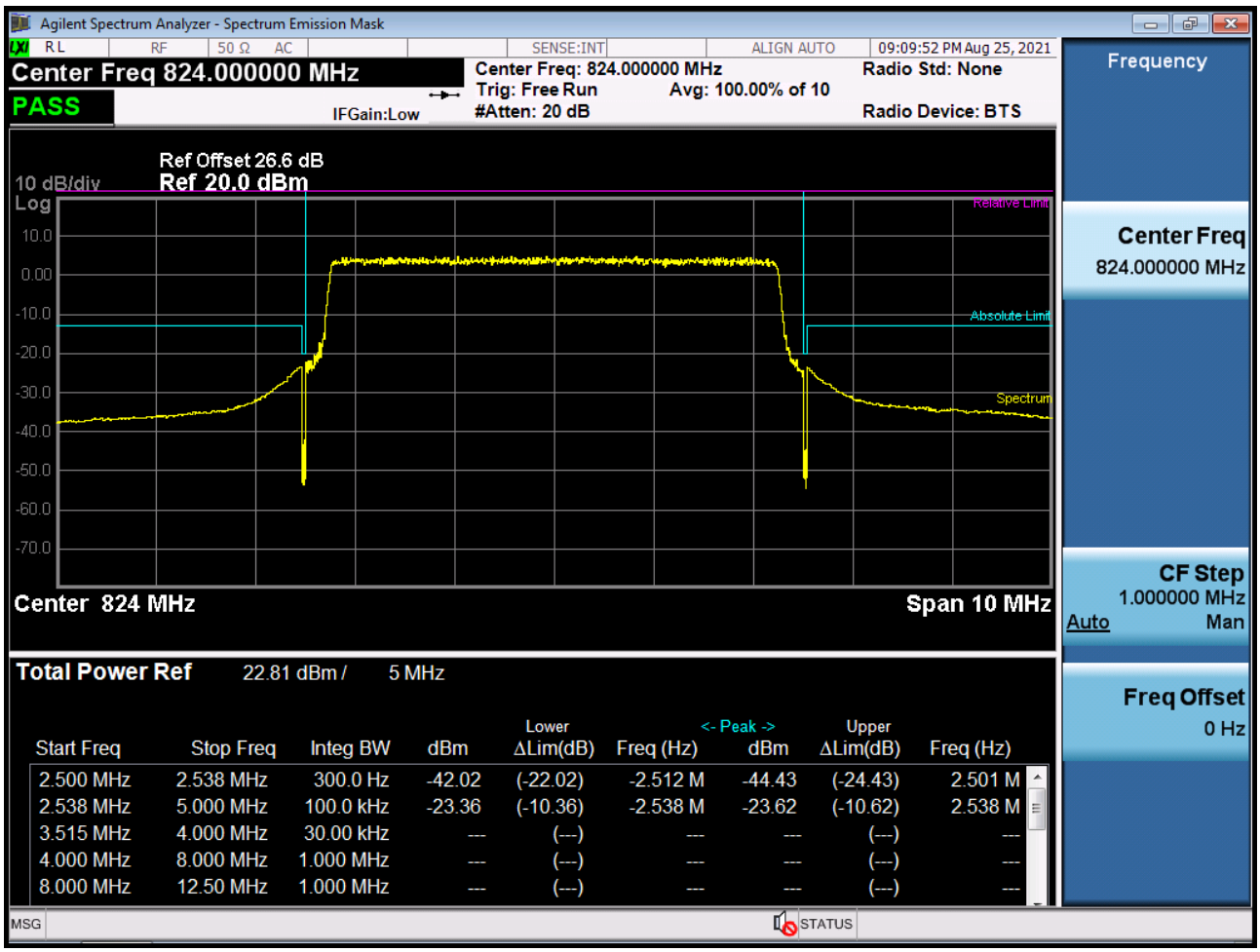
BAND 26. Channel Edge (5 MHz_QPSK_RB 1_0)



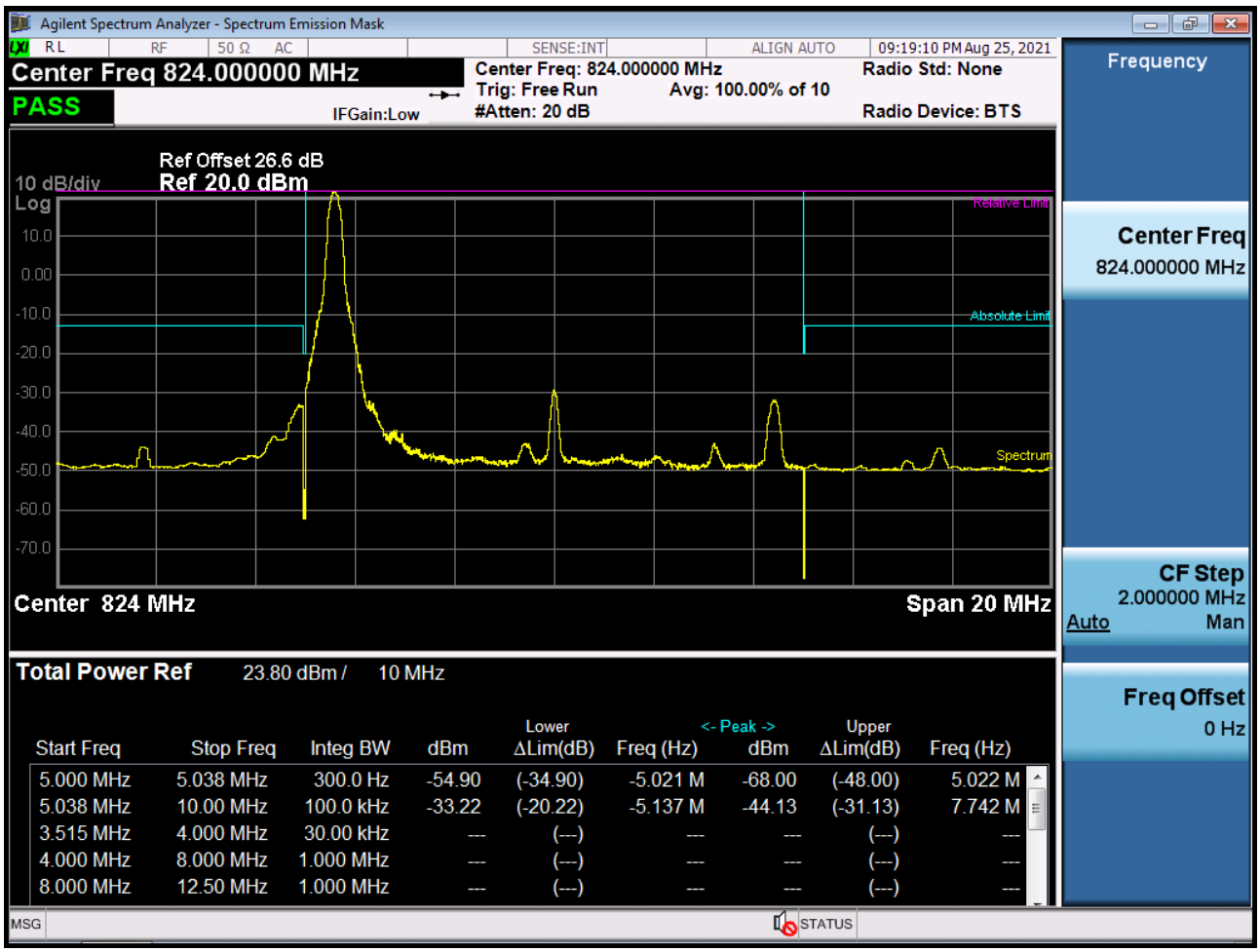
BAND 26. Channel Edge (5 MHz_QPSK_RB 1_24)



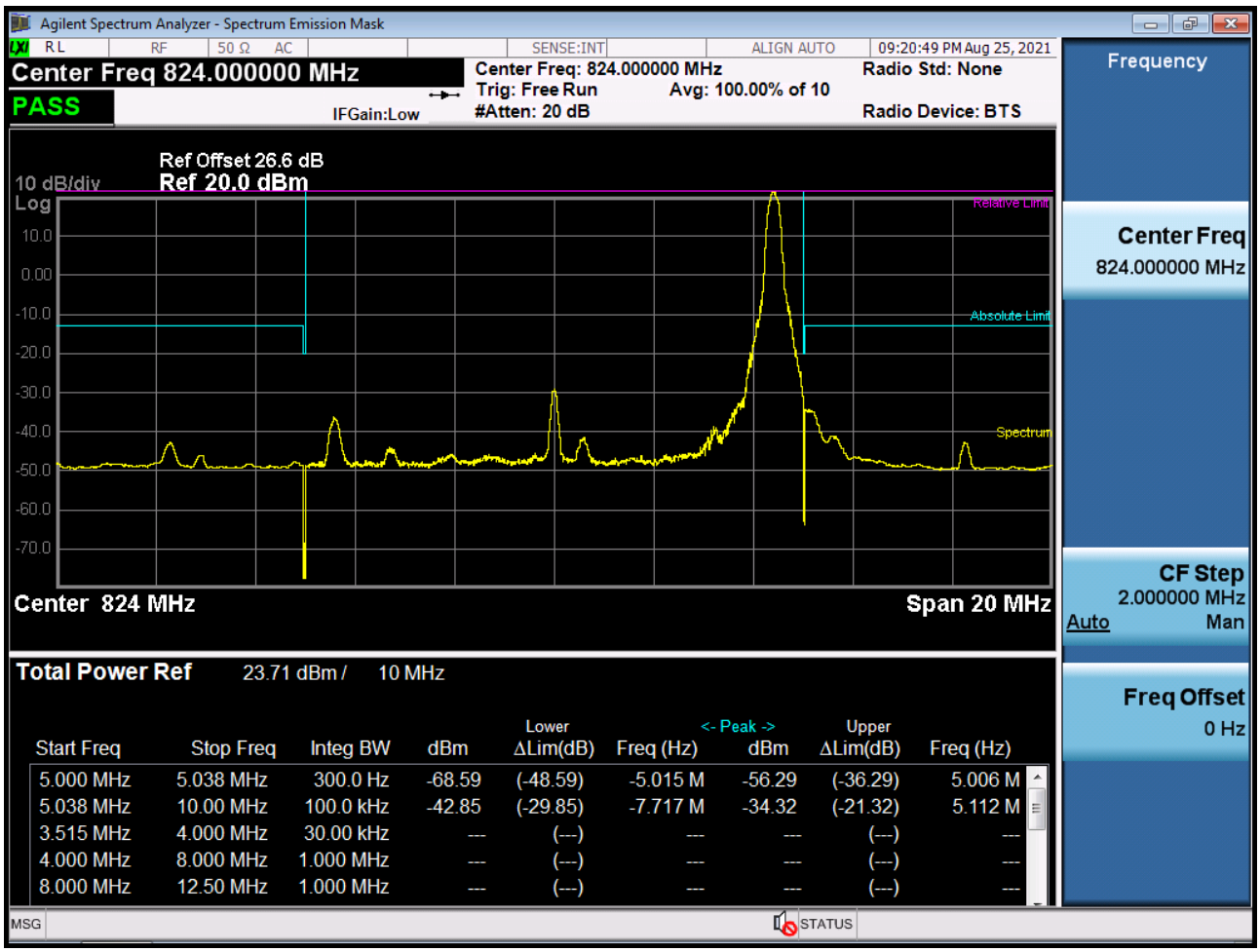
BAND 26. Channel Edge (5 MHz_QPSK_Full RB)



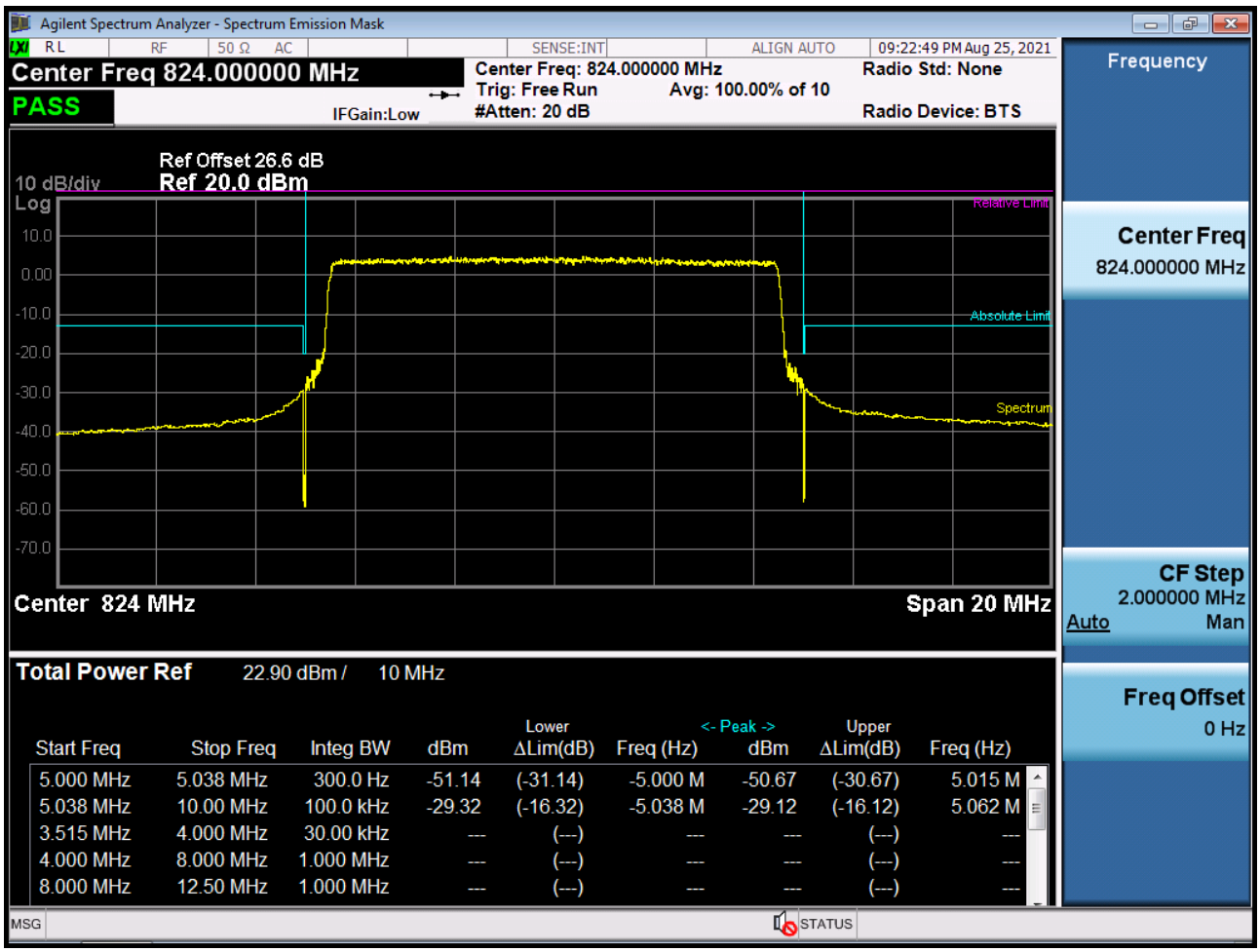
BAND 26. Channel Edge (10 MHz_QPSK_RB 1_0)



BAND 26. Channel Edge (10 MHz_QPSK_RB 1_49)



BAND 26. Channel Edge (10 MHz_QPSK_Full RB)



BAND 26. Band Edge (1.4 MHz_QPSK_RB 1_5)

BAND 26. Band Edge (1.4 MHz_QPSK_FullRB)

BAND 26. Band Edge (3 MHz_QPSK_RB 1_14)

BAND 26. Band Edge (3 MHz_QPSK_ Full RB)

BAND 26. Band Edge (5 MHz_QPSK_RB 1_24)

BAND 26. Band Edge (5 MHz_QPSK_ Full RB)

BAND 26. Band Edge (10 MHz_QPSK_RB 1_49)

BAND 26. Band Edge (10 MHz_QPSK_ Full RB)

11 ANNEX A_ TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-2109-FC028-P