74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA
TEL: +82-31-645-6300 FAX: +82-31-645-6401

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:
October 20, 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-FC057

FCC ID:	**A3LSMA136U**
APPLICANT:	**SAMSUNG Electronics Co., Ltd.**

Model(s):	SM-A136U
Additional Model(s):	SM-A136U1, SM-S136DL
EUT Type:	Mobile Phone
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part(s):	§27, §2

Mode (MHz)	Tx Frequency (MHz)	Emission Designator	Modulation	EIRP	
				Max. Power (W)	Max. Power (dBm)
LTE – Band 7 (5)	2502.5 – 2567.5	4M49G7D	QPSK	0.217	23.37
		4M51W7D	16QAM	0.181	22.58
		4M51W7D	64QAM	0.142	21.52
LTE – Band 7 (10)	2505.0 – 2565.0	8M97G7D	QPSK	0.222	23.47
		8M99W7D	16QAM	0.185	22.68
		8M98W7D	64QAM	0.144	21.57
LTE – Band 7 (15)	2507.5 – 2562.5	13M5G7D	QPSK	0.227	23.55
		13M5W7D	16QAM	0.189	22.77
		13M5W7D	64QAM	0.147	21.68
LTE – Band 7 (20)	2510.0 – 2560.0	18M0G7D	QPSK	0.219	23.41
		18M0W7D	16QAM	0.183	22.63
		18M0W7D	64QAM	0.148	21.69

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-FC057	October 20, 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:	A3LSMA136U
Application Type:	Certification
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part(s):	§27, §2
EUT Type:	Mobile Phone
Model(s):	SM-A136U
Additional Model(s):	SM-A136U1, SM-S136DL
Tx Frequency:	2502.5 – 2567.5 : 5 MHz 2505.0 – 2565.0 : 10 MHz 2507.5 – 2562.5 : 15 MHz 2510.0 – 2560.0 : 20 MHz
Date(s) of Tests:	August 30, 2021 ~ September 29, 2021
Serial number:	Radiated: 420015e6dca788ff Conducted: R3CR807JS3X

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
Band Edge	- KDB 971168 D01 v03r01 – Section 6.0 - ANSI C63.26-2015 – Section 5.7
Spurious and Harmonic Emissions at Antenna Terminal	- KDB 971168 D01 v03r01 – Section 6.0 - ANSI C63.26-2015 – Section 5.7
Conducted Output Power	- N/A (See SAR Report)
Peak- to- Average Ratio	- KDB 971168 D01 v03r01 – Section 5.7 - ANSI C63.26-2015 – Section 5.2.3.4 - ANSI C63.26-2015 – Section 5.2.6(only GSM)
Frequency stability	- ANSI C63.26-2015 – Section 5.6
Effective Radiated Power/ Effective Isotropic Radiated Power	- KDB 971168 D01 v03r01 – Section 5.2 & 5.8 - ANSI/TIA-603-E-2016 – Section 2.2.17
Radiated Spurious and Harmonic Emissions	- KDB 971168 D01 v03r01 – Section 6.2 - ANSI/TIA-603-E-2016 – Section 2.2.12

3.2 RADIATED POWER

Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

The equipment under test is placed on a non-conductive table 3-meters away from the receive antenna in accordance with ANSI/TIA-603-E-2016 Clause 2.2.17.

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5 % of the expected OBW, not to exceed 1 MHz
3. VBW ≥ 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points > 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

Test Note

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

   The power is calculated by the following formula;

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

   Where: P_{d} is the dipole equivalent power and P_{g} is the generator output power into the substitution antenna.

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

3.3 RADIATED SPURIOUS EMISSIONS

Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

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

Test Settings

1. RBW = 100 kHz for emissions below 1 GHz and 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;

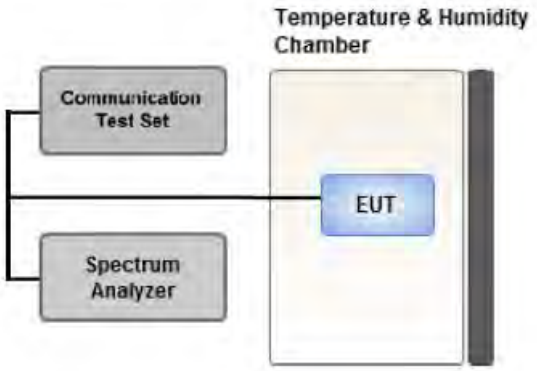
$$\text{Result}_{(dBm)} = Pg_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dBi)}$$

   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.

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

3.4 PEAK- TO- AVERAGE RATIO



Test setup

① CCDF Procedure for PAPR

Test Settings

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

② **Alternate Procedure for PAPR**

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

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

Test Settings(Peak Power)

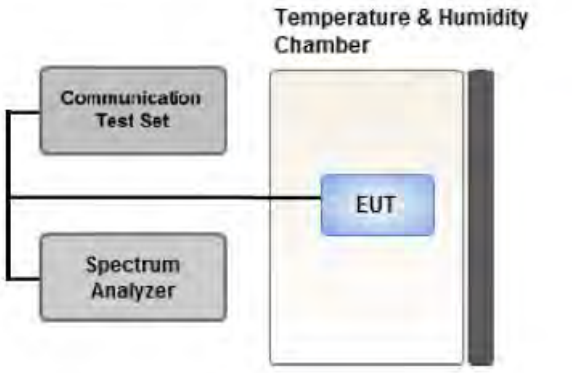
The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW ≥ 3 × RBW.

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

Test Settings(Average Power)

1. Set span to 2 × to 3 × the OBW.
2. Set RBW ≥ OBW.
3. Set VBW ≥ 3 × RBW.
4. Set number of measurement points in sweep ≥ 2 × span / RBW.
5. Sweep time:
   Set ≥ [10 × (number of points in sweep) × (transmission period)] for single sweep (automation-compatible) measurement. The transmission period is the (on + off) time.
6. Detector = power averaging (rms).
7. Set sweep trigger to “free run.”
8. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. (To accurately determine the average power over the on and off period of the transmitter, it can be necessary to increase the number of traces to be averaged above 100 or, if using a manually configured sweep time, increase the sweep time.)
9. Use the peak marker function to determine the maximum amplitude level.
10. Add [10 log (1/duty cycle)] to the measured maximum power level to compute the average power during continuous transmission. For example, add [10 log (1/0.25)] = 6 dB if the duty cycle is a constant 25 %.

3.5 OCCUPIED BANDWIDTH.



Test setup

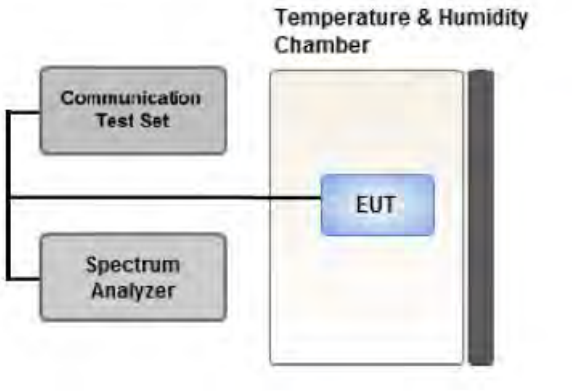
The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

The EUT makes a call to the communication simulator.
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth

Test Settings

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

3.6 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL



Test setup

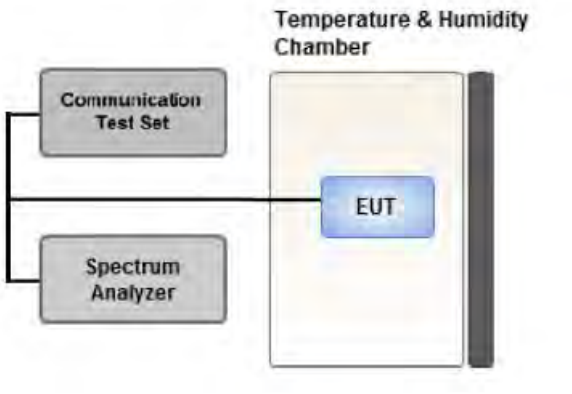
Test Overview

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

Test Settings

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

3.7 BAND 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 > 1 % of the emission bandwidth
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

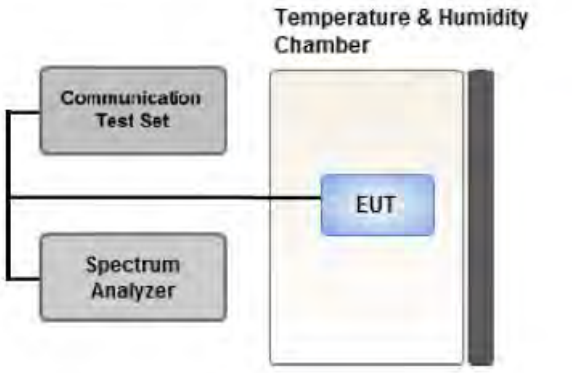
Test Notes

According to FCC 22.917, 24.238, 27.53 specified that power of any emission outside of The authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

All measurements were done at 2 channels(low and high operational frequency range.)

The band edge measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

3.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE



Test setup

Test Overview

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

The frequency stability of the transmitter is measured by:

1. Temperature:

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

2. Primary Supply Voltage:

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

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

Test Settings

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

3.9 WORST CASE(RADIATED TEST)

- The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
- All modes of operation were investigated and the worst case configuration results are reported.
- The worst case is reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the test data.
- SM-A136U & additional models were tested and the worst case results are reported. (Worst case : SM-A136U)

[Worst case]

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

3.10 WORST CASE(CONDUCTED TEST)

[Worst case]

Test Description	Modulation	Bandwidth (MHz)	Frequency	RB size	RB offset
Occupied Bandwidth	QPSK, 16QAM, 64QAM	5, 10, 15, 20	Mid	Full RB	0
Peak-To-Average Ratio	QPSK, 16QAM, 64QAM	5, 10, 15, 20	Mid	Full RB	0
Band Edge	QPSK	5	Low	1	0
			High	1	24
		10	Low	1	0
			High	1	49
		15	Low	1	0
			High	1	74
		20	Low	1	0
			High	1	99
		5, 10, 15, 20	Low, High	Full RB	0
Spurious and Harmonic Emissions at Antenna Terminal	QPSK	5, 10, 15, 20	Low, Mid, High	1	0

- All modes of operation were investigated and the worst case configuration results are reported.
- SM-A136U & additional models were tested and the worst case results are reported.

(Worst case : SM-A136U)

4. LIST OF TEST EQUIPMENT

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
H.P.F	FBSR-02B(WHK1.2/15 G-10EF)	T&M SYSTEM	-	03/02/2022	Annual
H.P.F	FBSR-02B(WHK3.3/18 G-10EF)	T&M SYSTEM	-	03/02/2022	Annual
Power Splitter(DC ~ 26.5 GHz)	11667B	Hewlett Packard	11275	04/07/2022	Annual
DC Power Supply	E3632A	Agilent	MY40010147	06/28/2022	Annual
Dipole Antenna	UHAP	Schwarzbeck	557	04/05/2023	Biennial
Dipole Antenna	UHAP	Schwarzbeck	558	04/05/2023	Biennial
Chamber	SU-642	ESPEC	93008124	03/15/2022	Annual
Horn Antenna(1 ~ 18 GHz)	BBHA 9120D	Schwarzbeck	147	08/30/2022	Biennial
Horn Antenna(1 ~ 18 GHz)	BBHA 9120D	Schwarzbeck	9120D-1298	09/15/2023	Biennial
Horn Antenna(15 ~ 40 GHz)	BBHA 9170	Schwarzbeck	BBHA9170342	10/13/2022	Biennial
Horn Antenna(15 ~ 40 GHz)	BBHA 9170	Schwarzbeck	BBHA9170124	02/11/2022	Biennial
Signal Analyzer(10 Hz ~ 26.5 GHz)	N9020A	Agilent	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	09/29/2022	Annual
Base Station	8960 (E5515C)	Agilent	MY48360800	08/18/2022	Annual
Loop Antenna(9 kHz ~ 30 MHz)	FMZB1513	Schwarzbeck	1513-333	03/19/2022	Biennial
Bilog Antenna	VULB9160	Schwarzbeck	3150	03/03/2023	Biennial
Hybrid Antenna	VULB9168	Schwarzbeck	760	02/22/2023	Biennial
Wideband Radio Communication Tester	MT8821C	Anritsu Corp.	6262116770	07/12/2022	Annual
Wideband Radio Communication Tester	MT8820C	Anritsu Corp.	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
Band Edge / Spurious and Harmonic Emissions at Antenna Terminal.	§2.1051, §27.53(m)(4)	■ < 40 + 10log10 (P[Watts]) at Channel edges ■ < 43 + 10log10 (P[Watts]) between 5 and X MHz from Channel edges ■ < 55 + 10log10 (P[Watts]) beyond X MHz beyond from Channel edges ■ < 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz	PASS
Conducted Output Power	§2.1046	N/A	See Note1
Frequency stability / variation of ambient temperature	§2.1055, §27.54	Emission must remain in band	PASS

Note:

1. See SAR Report

6.2 Test Condition : Radiated Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Equivalent Isotropic Radiated Power	§27.50(h)(2)	< 2 Watts max. EIRP	PASS
Radiated Spurious and Harmonic Emissions	§2.1053, §27.53(m)(4)	< 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 EQUIVALENT ISOTROPIC RADIATED POWER

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
2502.5	LTE B7/ 5 MHz	QPSK	-21.78	15.12	10.70	2.49	H	< 2.00	0.215	23.33
		16-QAM	-22.57	14.33	10.70	2.49	H		0.179	22.54
		64-QAM	-23.66	13.24	10.70	2.49	H		0.140	21.45
2535.0		QPSK	-21.94	15.18	10.70	2.51	H		0.217	23.37
		16-QAM	-22.73	14.39	10.70	2.51	H		0.181	22.58
		64-QAM	-23.79	13.33	10.70	2.51	H		0.142	21.52
2567.5		QPSK	-22.46	14.56	10.66	2.52	H		0.186	22.70
		16-QAM	-23.29	13.73	10.66	2.52	H		0.154	21.87
		64-QAM	-24.32	12.70	10.66	2.52	H		0.121	20.84

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
2505.0	LTE B7/ 10 MHz	QPSK	-21.77	15.19	10.70	2.50	H	< 2.00	0.218	23.39
		16-QAM	-22.56	14.40	10.70	2.50	H		0.182	22.60
		64-QAM	-23.66	13.30	10.70	2.50	H		0.141	21.50
2535.0		QPSK	-21.84	15.28	10.70	2.51	H		0.222	23.47
		16-QAM	-22.63	14.49	10.70	2.51	H		0.185	22.68
		64-QAM	-23.74	13.38	10.70	2.51	H		0.144	21.57
2565.0		QPSK	-22.29	14.74	10.67	2.52	H		0.194	22.89
		16-QAM	-23.09	13.94	10.67	2.52	H		0.162	22.09
		64-QAM	-24.18	12.85	10.67	2.52	H		0.126	21.00

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
2507.5	LTE B7/ 15 MHz	QPSK	-21.86	15.16	10.70	2.50	H	< 2.00	0.217	23.36
		16-QAM	-22.63	14.39	10.70	2.50	H		0.182	22.59
		64-QAM	-23.71	13.31	10.70	2.50	H		0.142	21.51
2535.0		QPSK	-21.76	15.36	10.70	2.51	H		0.227	23.55
		16-QAM	-22.54	14.58	10.70	2.51	H		0.189	22.77
		64-QAM	-23.63	13.49	10.70	2.51	H		0.147	21.68
2562.5		QPSK	-22.24	14.79	10.68	2.52	H		0.197	22.95
		16-QAM	-23.02	14.01	10.68	2.52	H		0.165	22.17
		64-QAM	-24.09	12.94	10.68	2.52	H		0.129	21.10

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
2510.0	LTE B7/ 20 MHz	QPSK	-21.88	15.14	10.70	2.50	H	< 2.00	0.216	23.34
		16-QAM	-22.64	14.38	10.70	2.50	H		0.181	22.58
		64-QAM	-23.75	13.27	10.70	2.50	H		0.140	21.47
2535.0		QPSK	-21.90	15.22	10.70	2.51	H		0.219	23.41
		16-QAM	-22.68	14.44	10.70	2.51	H		0.183	22.63
		64-QAM	-23.79	13.33	10.70	2.51	H		0.142	21.52
2560.0		QPSK	-22.07	14.96	10.68	2.52	H		0.205	23.12
		16-QAM	-22.88	14.15	10.68	2.52	H		0.170	22.31
		64-QAM	-23.50	13.53	10.68	2.52	H		0.148	21.69

8.2 RADIATED SPURIOUS EMISSIONS

▣ OPERATING FREQUENCY : 2535.0 MHz

▣ MEASURED OUTPUT POWER: 23.37 dBm = 0.217 W

▣ MODE: LTE B7

▣ MODULATION SIGNAL: 5 MHz QPSK

▣ DISTANCE: 1 meters

▣ LIMIT: 55 + 10 log10 (W) = 48.37 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
20775 (2502.5)	5 005.00	-51.08	12.59	-60.67	3.60	H	-51.68	75.06
	7 507.50	-55.01	10.82	-55.88	4.48	H	-49.54	72.91
	10 010.00	-43.54	11.22	-39.04	5.27	V	-33.09	56.46
	12 512.50	-52.74	13.20	-48.26	6.02	V	-41.08	64.45
21100 (2535.0)	5 070.00	-51.87	12.38	-59.73	3.65	H	-51.00	74.37
	7 605.00	-53.13	11.12	-54.34	4.49	H	-47.70	71.08
	10 140.00	-45.04	11.40	-41.29	5.29	V	-35.18	58.55
21425 (2567.5)	5 135.00	-51.68	12.27	-60.45	3.67	H	-51.85	75.22
	7 702.50	-49.43	11.40	-50.47	4.51	H	-43.58	66.96
	10 270.00	-42.54	11.50	-37.61	5.40	V	-31.51	54.89

▣ OPERATING FREQUENCY : 2535.0 MHz

▣ MEASURED OUTPUT POWER: 23.47 dBm = 0.222 W

▣ MODE: LTE B7

▣ MODULATION SIGNAL: 10 MHz QPSK

▣ DISTANCE: 1 meters

▣ LIMIT: 55 + 10 log10 (W) = 48.47 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
20800 (2505.0)	5 010.00	-52.32	12.58	-62.07	3.59	V	-53.08	76.55
	7 515.00	-57.30	10.83	-58.01	4.47	V	-51.65	75.12
	10 020.00	-44.91	11.24	-40.44	5.27	V	-34.47	57.94
	12 525.00	-54.14	13.20	-49.84	5.94	V	-42.57	66.04
21100 (2535.0)	5 070.00	-52.88	12.38	-60.74	3.65	V	-52.01	75.38
	7 605.00	-56.49	11.12	-57.70	4.49	V	-51.06	74.44
	10 140.00	-42.69	11.40	-38.94	5.29	V	-32.83	56.20
	12 675.00	-56.70	13.15	-51.29	6.03	V	-44.16	67.53
21400 (2565.0)	5 130.00	-51.44	12.26	-60.14	3.67	V	-51.55	75.03
	7 695.00	-53.41	11.39	-54.73	4.51	V	-47.85	71.32
	10 260.00	-41.92	11.50	-37.26	5.40	V	-31.16	54.63

▣ OPERATING FREQUENCY : 2535.0 MHz

▣ MEASURED OUTPUT POWER: 23.55 dBm = 0.227 W

▣ MODE: LTE B7

▣ MODULATION SIGNAL: 15 MHz QPSK

▣ DISTANCE: 1 meters

▣ LIMIT: 55 + 10 log10 (W) = 48.55 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
20825 (2507.5)	5 015.00	-52.27	12.57	-62.17	3.60	V	-53.19	76.75
	7 522.50	-56.86	10.84	-57.42	4.46	V	-51.04	74.59
	10 030.00	-44.15	11.26	-39.84	5.29	V	-33.87	57.43
	12 537.50	-55.27	13.20	-51.01	5.93	V	-43.74	67.30
21100 (2535.0)	5 070.00	-53.95	12.38	-61.81	3.65	V	-53.08	76.45
	7 605.00	-54.55	11.12	-55.76	4.49	V	-49.12	72.50
	10 140.00	-43.97	11.40	-40.22	5.29	V	-34.11	57.48
	12 675.00	-56.25	13.15	-50.84	6.03	V	-43.71	67.08
21375 (2562.5)	5 125.00	-53.84	12.25	-62.35	3.67	V	-53.77	77.32
	7 687.50	-54.23	11.38	-55.82	4.51	V	-48.95	72.50
	10 250.00	-45.39	11.50	-40.79	5.39	V	-34.68	58.23

▣ OPERATING FREQUENCY : 2535.0 MHz

▣ MEASURED OUTPUT POWER: 23.41 dBm = 0.219 W

▣ MODE: LTE B7

▣ MODULATION SIGNAL: 20 MHz QPSK

▣ DISTANCE: 1 meters

▣ LIMIT: 55 + 10 log10 (W) = 48.41 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
20850 (2510.0)	5 020.00	-52.79	12.56	-62.84	3.60	V	-53.88	77.29
	7 530.00	-56.07	10.86	-56.21	4.45	V	-49.80	73.21
	10 040.00	-44.61	11.28	-40.51	5.32	V	-34.55	57.96
	12 550.00	-55.11	13.20	-50.80	5.98	V	-43.58	66.99
21100 (2535.0)	5 070.00	-52.64	12.38	-60.50	3.65	V	-51.77	75.14
	7 605.00	-56.47	11.12	-57.68	4.49	V	-51.04	74.42
	10 140.00	-45.55	11.40	-41.80	5.29	V	-35.69	59.06
21350 (2560.0)	5 120.00	-54.00	12.24	-62.31	3.67	V	-53.74	77.15
	7 680.00	-52.81	11.36	-54.56	4.50	V	-47.70	71.11
	10 240.00	-43.46	11.50	-38.90	5.37	V	-32.77	56.18

8.3 PEAK-TO-AVERAGE RATIO

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (dB)
7	5 MHz	2535.0	QPSK	25	0	5.44
			16-QAM	25	0	6.16
			64-QAM	25	0	6.40
	10 MHz		QPSK	50	0	5.51
			16-QAM	50	0	6.15
			64-QAM	50	0	6.43
	15 MHz		QPSK	75	0	5.48
			16-QAM	75	0	6.13
			64-QAM	75	0	6.47
	20 MHz		QPSK	100	0	5.42
			16-QAM	100	0	6.14
			64-QAM	100	0	6.45

Note:

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 58 ~ 69.

8.4 OCCUPIED BANDWIDTH

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
7	5 MHz	2535.0	QPSK	25	0	4.4930
			16-QAM	25		4.5053
			64-QAM	25		4.5106
	10 MHz		QPSK	50		8.9703
			16-QAM	50		8.9922
			64-QAM	50		8.9834
	15 MHz		QPSK	75		13.489
			16-QAM	75		13.457
			64-QAM	75		13.467
	20 MHz		QPSK	100		17.982
			16-QAM	100		17.971
			64-QAM	100		17.976

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 46 ~ 57.

8.5 CONDUCTED SPURIOUS EMISSIONS

Band	Band Width (MHz)	Frequency (MHz)	Frequency of Maximum Harmonic (GHz)	Factor (dB)	Measurement Maximum Data (dBm)	Result (dBm)	Limit (dBm)
7	5	2502.5	26.1164	30.131	-76.685	-46.554	-25.00
		2535.0	26.1355	30.131	-76.702	-46.571	
		2567.5	5.1401	28.591	-76.140	-47.549	
	10	2505.0	26.1649	30.131	-76.693	-46.562	
		2535.0	26.1445	30.131	-76.579	-46.448	
		2565.0	5.1391	28.591	-76.098	-47.507	
	15	2507.5	26.1916	30.131	-76.769	-46.638	
		2535.0	26.1309	30.131	-76.562	-46.431	
		2562.5	26.1564	30.131	-76.635	-46.504	
	20	2510.0	26.1224	30.131	-76.358	-46.227	
		2535.0	26.1194	30.131	-76.766	-46.635	
		2560.0	25.8567	30.131	-76.582	-46.451	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 94 ~117.
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

Band Width (Modulation)	Frequency (MHz)	RB Size / Offset	C.E ~ (C.E ± 1 MHz)		2 496 MHz ~ 2 499 MHz	(C.E + 1 MHz) ~ (C.E + 5 MHz)	2 490.5 MHz ~ 2 496 MHz	(C.E + 5 MHz) ~ (C.E + X MHz)	Below 2 490.5 MHz	Above (C.E + X MHz)
			Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
5 MHz	2502.5	25 / 0	-26.80	-26.99	-21.75	-22.25	-29.50	-32.87	-45.19	-35.92
10 MHz	2505.0	50 / 0	-28.25	-28.06	-23.11	-23.35	-25.67	-27.19	-37.77	-35.08
15 MHz	2507.5	75 / 0	-29.29	-29.05	-25.36	-25.44	-26.80	-28.25	-31.77	-37.50
20 MHz	2510.0	100 / 0	-30.20	-30.05	-27.63	-27.69	-28.42	-29.55	-32.41	-39.05
Limit			-10.0		-10.0		-13.0		-25.0	

Band Width (Modulation)	Frequency (MHz)	RB Size / Offset	C.E ~ (C.E ± 1 MHz)		(C.E ± 1 MHz) ~ (C.E ± 5 MHz)	
			Lower	Upper	Lower	Upper
5 MHz (QPSK)	2535.0	25 / 0	-26.26	-26.64	-20.97	-21.59
	2567.5	25 / 0	-20.40	-20.05	-13.20	-12.68
10 MHz (QPSK)	2535.0	50 / 0	-27.52	-27.95	-22.25	-23.24
	2565.0	50 / 0	-21.82	-22.25	-16.41	-16.70
15 MHz (QPSK)	2535.0	75 / 0	-27.91	-28.84	-23.76	-25.06
	2562.5	75 / 0	-22.87	-24.64	-18.43	-20.66
20 MHz (QPSK)	2535.0	100 / 0	-27.50	-29.12	-24.50	-26.45
	2560.0	100 / 0	-23.32	-25.59	-20.32	-22.80
Limit			-10.0		-10.0	

Band Width (Modulation)	Frequency (MHz)	Resource Block Size	(C.E ± 5 MHz) ~ (C.E ± X MHz)		Above (C.E ± X MHz)	
			Lower	Upper	Lower	Upper
5 MHz (QPSK)	2535.0	25 / 0	-34.58	-34.02	-37.12	-36.45
	2567.5	25 / 0	-30.15	-31.01	-33.09	-34.55
10 MHz (QPSK)	2535.0	50 / 0	-25.88	-26.90	-37.11	-35.77
	2565.0	50 / 0	-20.33	-21.68	-34.51	-37.69
15 MHz (QPSK)	2535.0	75 / 0	-25.68	-27.88	-39.48	-38.62
	2562.5	75 / 0	-20.58	-24.17	-37.76	-48.51
20 MHz (QPSK)	2535.0	100 / 0	-25.96	-28.67	-42.19	-39.87
	2560.0	100 / 0	-22.29	-25.93	-38.34	-51.79
Limit			-13.0		-25.0	

Note:

1. C.E = Channel Edge
2. X = X is the greater of 6 MHz or the actual emission bandwidth.
3. X = 6 MHz(5 MHz Bandwidth), 10 MHz(10 MHz Bandwidth), 15 MHz(15 MHz Bandwidth), 20 MHz(20 MHz Bandwidth)
4. Plots of the EUT's Channel Edge are shown Page 70 ~ 93.

8.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

▣ MODE: LTE 7

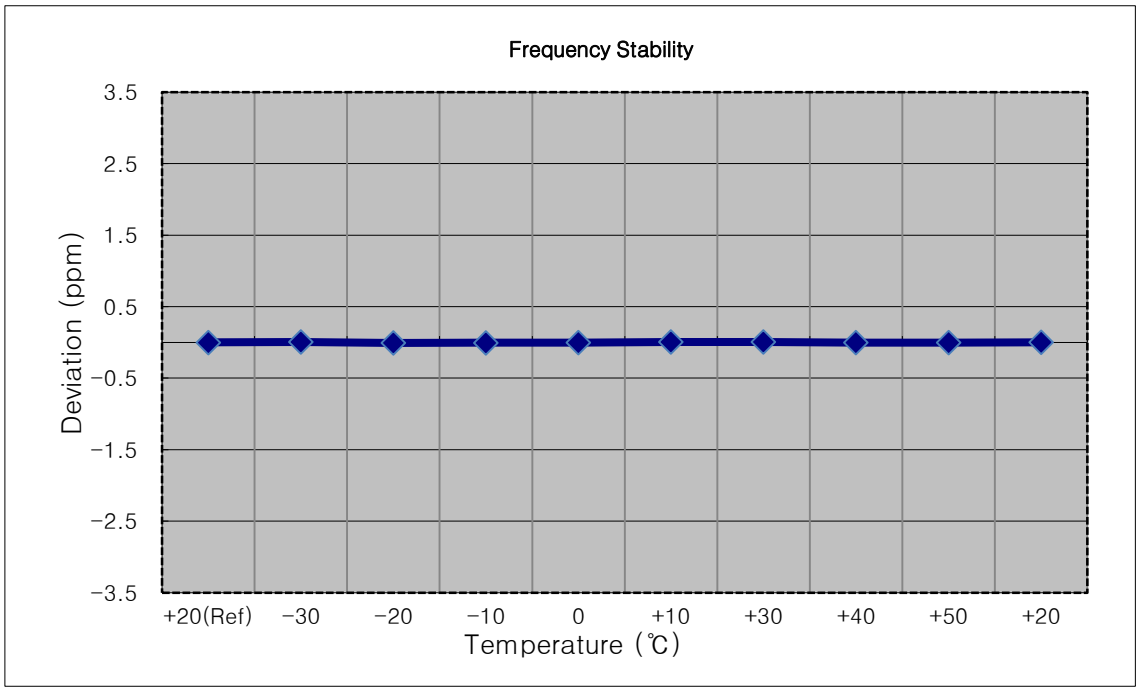
▣ OPERATING FREQUENCY: 2,502,500,000 Hz

▣ CHANNEL: 20775 (5 MHz)

▣ REFERENCE VOLTAGE: 3.850 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	2502 499 988	0.0	0.000 000	0.000
100 %		-30	2502 500 004	16.1	0.000 001	0.006
100 %		-20	2502 499 971	-17.0	-0.000 001	-0.007
100 %		-10	2502 499 977	-10.7	0.000 000	-0.004
100 %		0	2502 499 985	-3.0	0.000 000	-0.001
100 %		+10	2502 500 004	15.6	0.000 001	0.006
100 %		+30	2502 500 007	18.5	0.000 001	0.007
100 %		+40	2502 499 985	-3.5	0.000 000	-0.001
100 %		+50	2502 499 984	-4.3	0.000 000	-0.002
Batt. Endpoint	3.400	+20	2502 499 994	5.8	0.000 000	0.002



▣ MODE: LTE 7

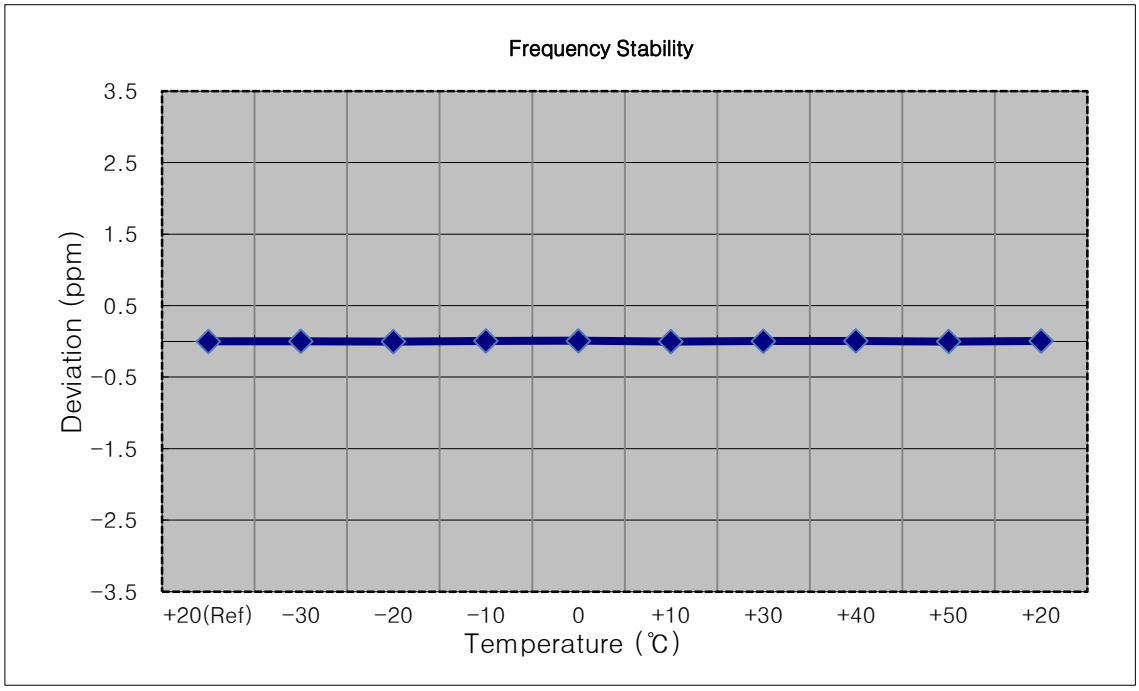
▣ OPERATING FREQUENCY: 2,505,000,000 Hz

▣ CHANNEL: 20800 (10 MHz)

▣ REFERENCE VOLTAGE: 3.850 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	2505 000 007	0.0	0.000 000	0.000
100 %		-30	2505 000 010	3.7	0.000 000	0.001
100 %		-20	2505 000 002	-4.4	0.000 000	-0.002
100 %		-10	2505 000 025	18.5	0.000 001	0.007
100 %		0	2505 000 031	23.9	0.000 001	0.010
100 %		+10	2505 000 002	-5.1	0.000 000	-0.002
100 %		+30	2505 000 017	10.7	0.000 000	0.004
100 %		+40	2505 000 025	18.2	0.000 001	0.007
100 %		+50	2505 000 003	-3.8	0.000 000	-0.002
Batt. Endpoint	3.400	+20	2505 000 025	17.9	0.000 001	0.007



▣ MODE: LTE 7

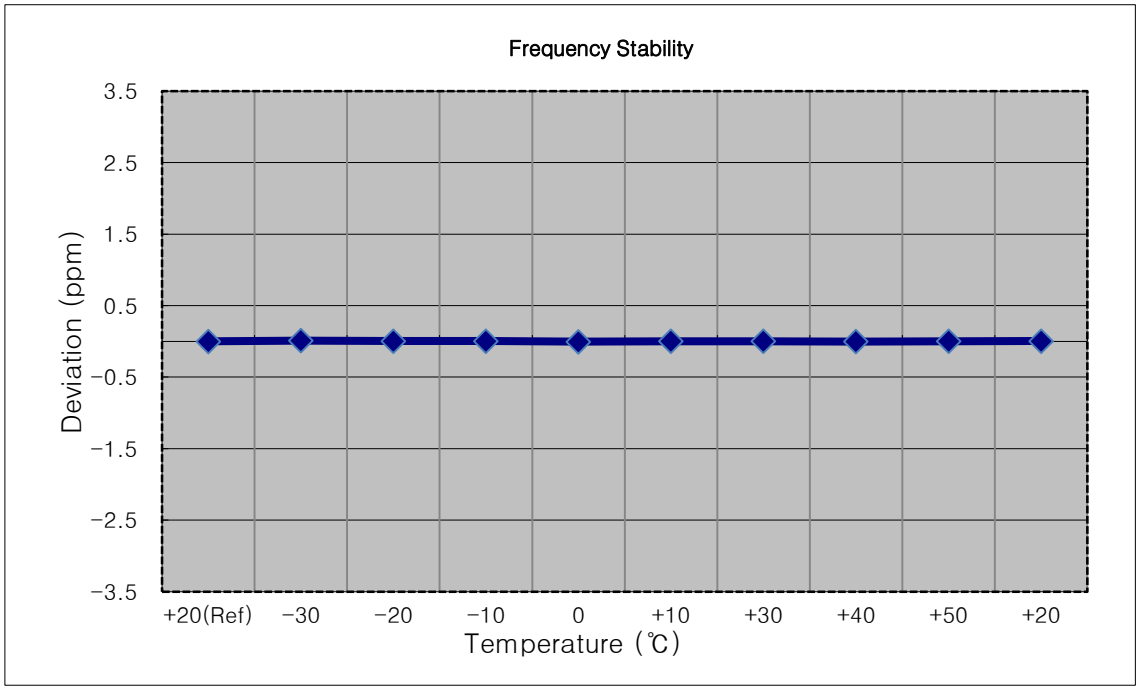
▣ OPERATING FREQUENCY: 2,507,500,000 Hz

▣ CHANNEL: 20825 (15 MHz)

▣ REFERENCE VOLTAGE: 3.850 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	2507 499 993	0.0	0.000 000	0.000
100 %		-30	2507 500 019	26.8	0.000 001	0.011
100 %		-20	2507 500 002	9.0	0.000 000	0.004
100 %		-10	2507 500 001	8.8	0.000 000	0.004
100 %		0	2507 499 983	-9.5	0.000 000	-0.004
100 %		+10	2507 500 000	7.3	0.000 000	0.003
100 %		+30	2507 500 000	7.3	0.000 000	0.003
100 %		+40	2507 499 990	-3.0	0.000 000	-0.001
100 %		+50	2507 499 999	6.8	0.000 000	0.003
Batt. Endpoint	3.400	+20	2507 500 003	10.5	0.000 000	0.004



▣ MODE: LTE 7

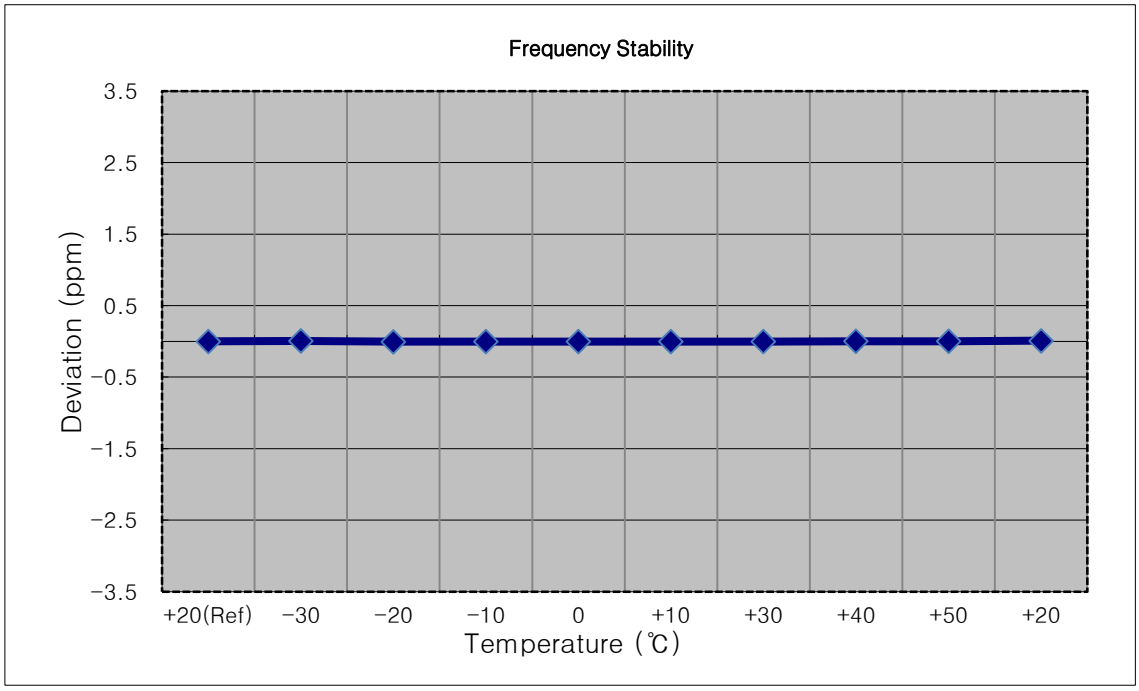
▣ OPERATING FREQUENCY: 2,510,000,000 Hz

▣ CHANNEL: 20850 (20 MHz)

▣ REFERENCE VOLTAGE: 3.850 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	2510 000 014	0.0	0.000 000	0.000
100 %		-30	2510 000 032	17.9	0.000 001	0.007
100 %		-20	2510 000 003	-10.9	0.000 000	-0.004
100 %		-10	2510 000 006	-7.7	0.000 000	-0.003
100 %		0	2510 000 006	-8.1	0.000 000	-0.003
100 %		+10	2510 000 009	-5.1	0.000 000	-0.002
100 %		+30	2510 000 009	-5.3	0.000 000	-0.002
100 %		+40	2510 000 020	5.8	0.000 000	0.002
100 %		+50	2510 000 020	5.7	0.000 000	0.002
Batt. Endpoint	3.400	+20	2510 000 034	19.9	0.000 001	0.008



▣ MODE: LTE 7

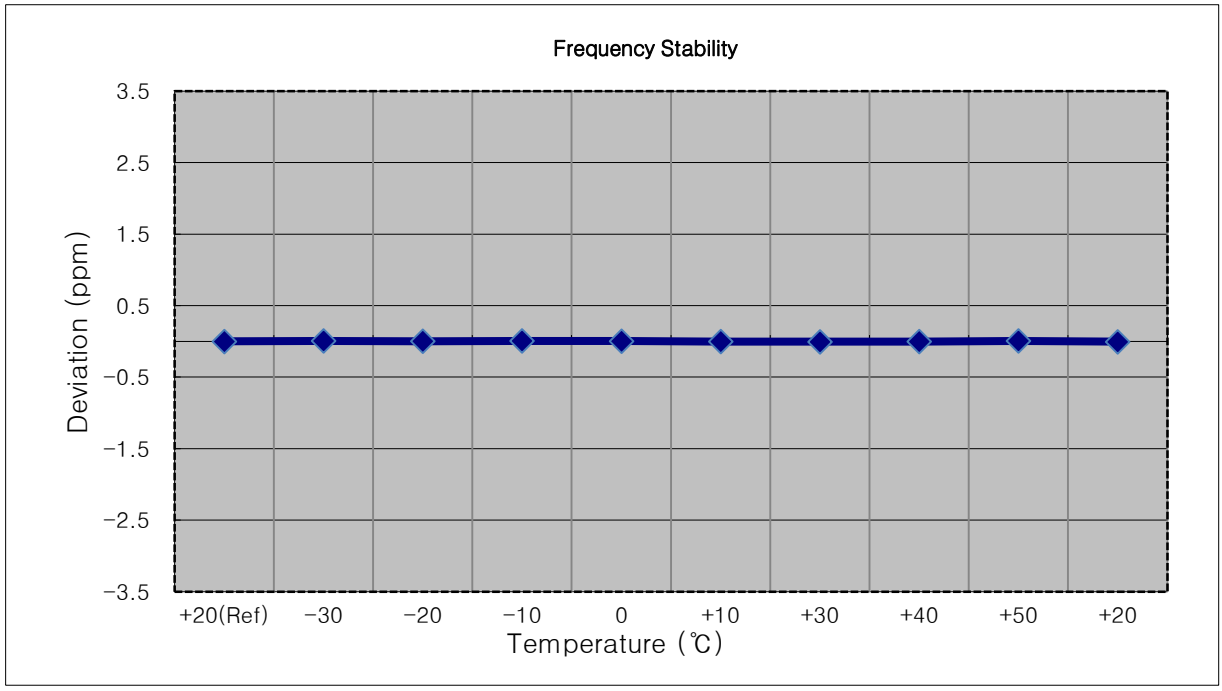
▣ OPERATING FREQUENCY: 2,535,000,000 Hz

▣ CHANNEL: 21100 (5 MHz)

▣ REFERENCE VOLTAGE: 3.850 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	2535 000 013	0.0	0.000 000	0.000
100 %		-30	2535 000 028	15.0	0.000 001	0.006
100 %		-20	2535 000 021	7.9	0.000 000	0.003
100 %		-10	2535 000 028	14.9	0.000 001	0.006
100 %		0	2535 000 023	9.7	0.000 000	0.004
100 %		+10	2535 000 006	-6.8	0.000 000	-0.003
100 %		+30	2535 000 000	-13.0	-0.000 001	-0.005
100 %		+40	2535 000 008	-5.4	0.000 000	-0.002
100 %		+50	2535 000 031	17.5	0.000 001	0.007
Batt. Endpoint	3.400	+20	2535 000 003	-9.9	0.000 000	-0.004



▣ MODE: LTE 7

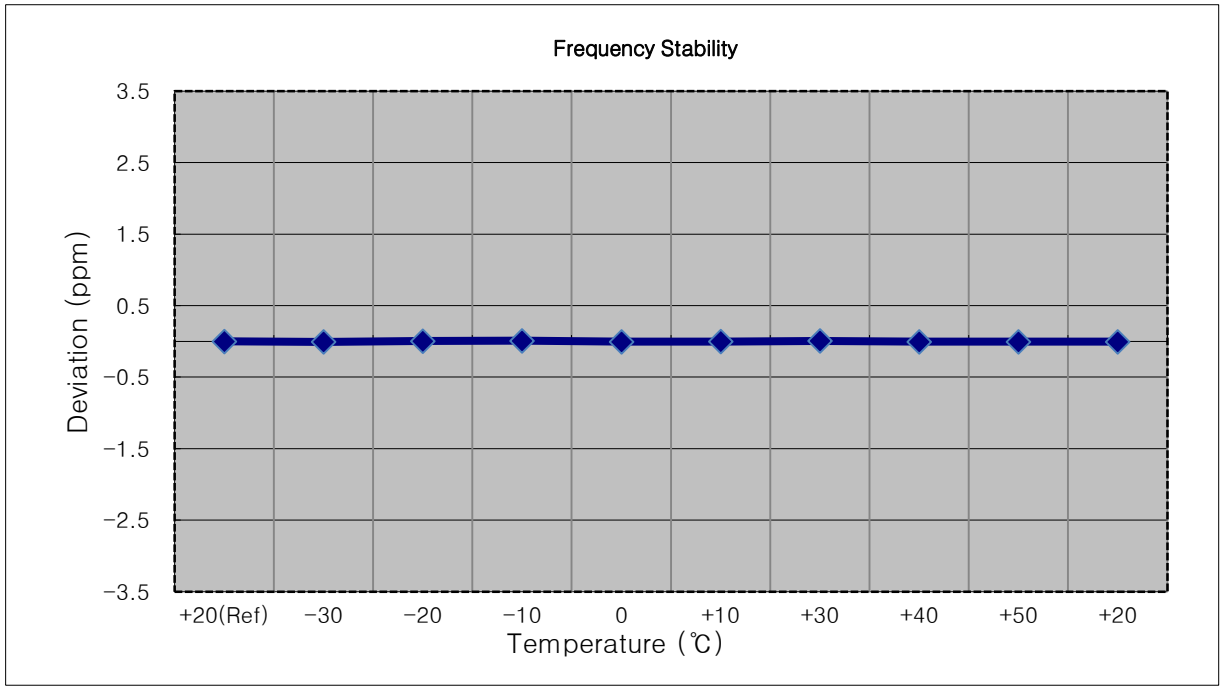
▣ OPERATING FREQUENCY: 2,535,000,000 Hz

▣ CHANNEL: 21100 (10 MHz)

▣ REFERENCE VOLTAGE: 3.850 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	2535 000 015	0.0	0.000 000	0.000
100 %		-30	2535 000 001	-14.6	-0.000 001	-0.006
100 %		-20	2535 000 025	10.0	0.000 000	0.004
100 %		-10	2535 000 037	22.1	0.000 001	0.009
100 %		0	2535 000 004	-11.3	0.000 000	-0.004
100 %		+10	2535 000 011	-4.3	0.000 000	-0.002
100 %		+30	2535 000 034	18.9	0.000 001	0.007
100 %		+40	2535 000 005	-10.1	0.000 000	-0.004
100 %		+50	2535 000 002	-12.8	-0.000 001	-0.005
Batt. Endpoint	3.400	+20	2535 000 006	-9.6	0.000 000	-0.004



▣ MODE: LTE 7

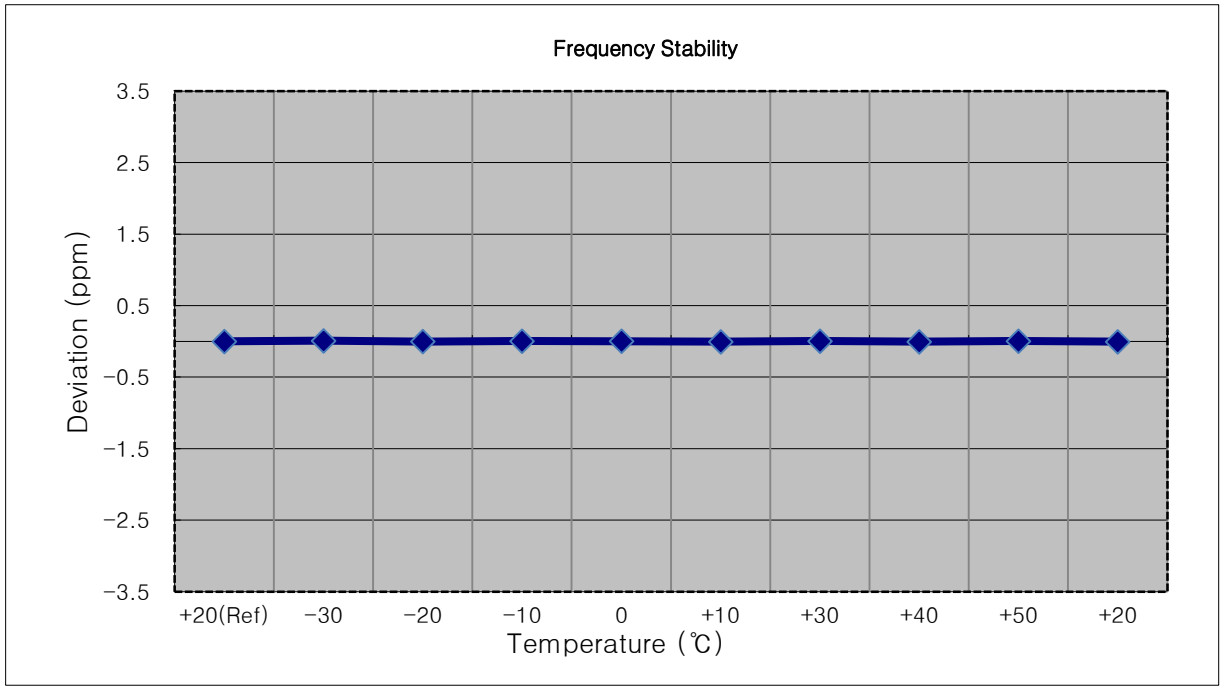
▣ OPERATING FREQUENCY: 2,535,000,000 Hz

▣ CHANNEL: 21100 (15 MHz)

▣ REFERENCE VOLTAGE: 3.850 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	2534 999 986	0.0	0.000 000	0.000
100 %		-30	2535 000 007	20.3	0.000 001	0.008
100 %		-20	2534 999 978	-8.3	0.000 000	-0.003
100 %		-10	2534 999 996	9.6	0.000 000	0.004
100 %		0	2534 999 991	4.6	0.000 000	0.002
100 %		+10	2534 999 975	-11.1	0.000 000	-0.004
100 %		+30	2534 999 999	12.5	0.000 000	0.005
100 %		+40	2534 999 972	-14.2	-0.000 001	-0.006
100 %		+50	2534 999 995	8.9	0.000 000	0.004
Batt. Endpoint	3.400	+20	2534 999 975	-11.5	0.000 000	-0.005



▣ MODE: LTE 7

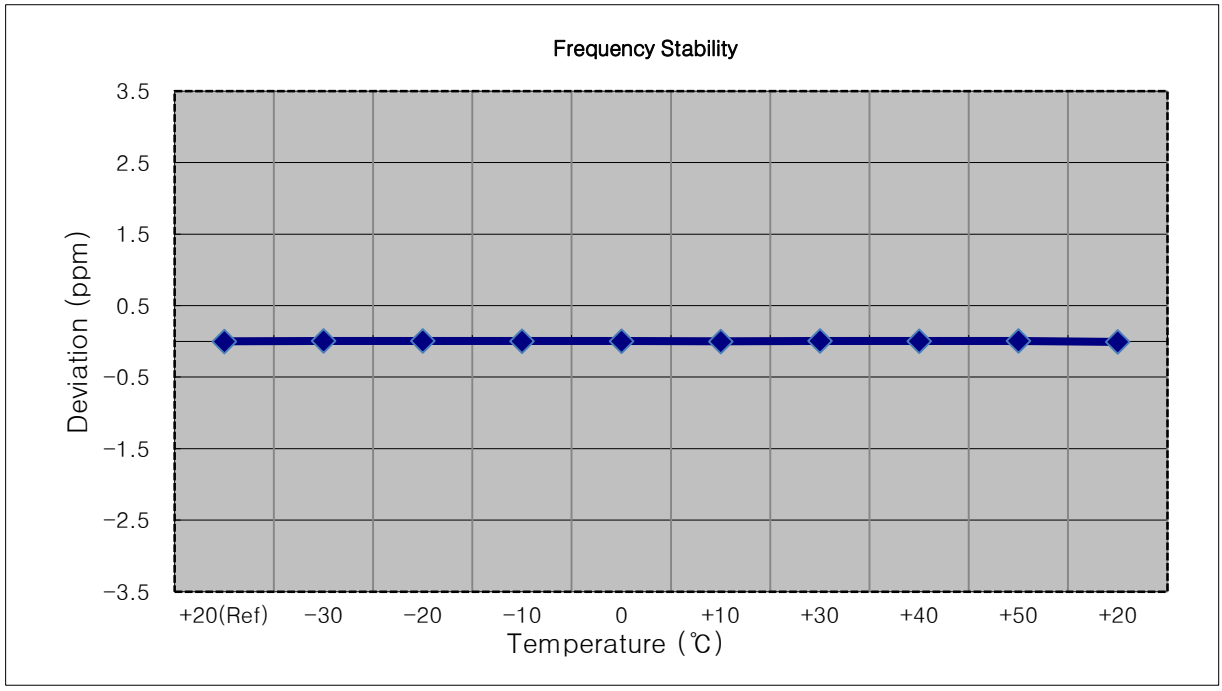
▣ OPERATING FREQUENCY: 2,535,000,000 Hz

▣ CHANNEL: 21100 (20 MHz)

▣ REFERENCE VOLTAGE: 3.850 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	2535 000 014	0.0	0.000 000	0.000
100 %		-30	2535 000 031	17.0	0.000 001	0.007
100 %		-20	2535 000 032	17.5	0.000 001	0.007
100 %		-10	2535 000 028	13.9	0.000 001	0.005
100 %		0	2535 000 023	8.5	0.000 000	0.003
100 %		+10	2535 000 017	2.7	0.000 000	0.001
100 %		+30	2535 000 034	19.1	0.000 001	0.008
100 %		+40	2535 000 024	9.4	0.000 000	0.004
100 %		+50	2535 000 033	18.1	0.000 001	0.007
Batt. Endpoint	3.400	+20	2534 999 999	-15.8	-0.000 001	-0.006



▣ MODE: LTE 7

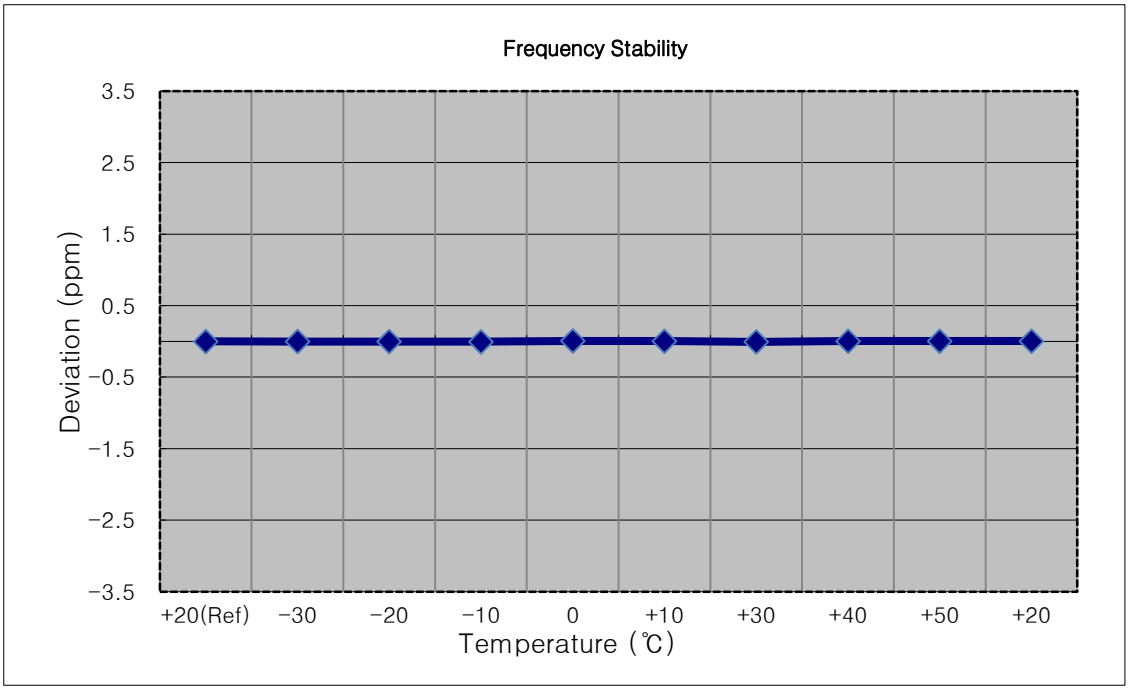
▣ OPERATING FREQUENCY: 2,567,500,000 Hz

▣ CHANNEL: 21425 (5 MHz)

▣ REFERENCE VOLTAGE: 3.850 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	2567 500 026	0.0	0.000 000	0.000
100 %		-30	2567 500 020	-6.1	0.000 000	-0.002
100 %		-20	2567 500 018	-7.8	0.000 000	-0.003
100 %		-10	2567 500 016	-10.0	0.000 000	-0.004
100 %		0	2567 500 042	15.9	0.000 001	0.006
100 %		+10	2567 500 035	9.2	0.000 000	0.004
100 %		+30	2567 500 009	-16.6	-0.000 001	-0.006
100 %		+40	2567 500 039	12.6	0.000 000	0.005
100 %		+50	2567 500 036	10.0	0.000 000	0.004
Batt. Endpoint	3.400	+20	2567 500 040	13.8	0.000 001	0.005



▣ MODE: LTE 7

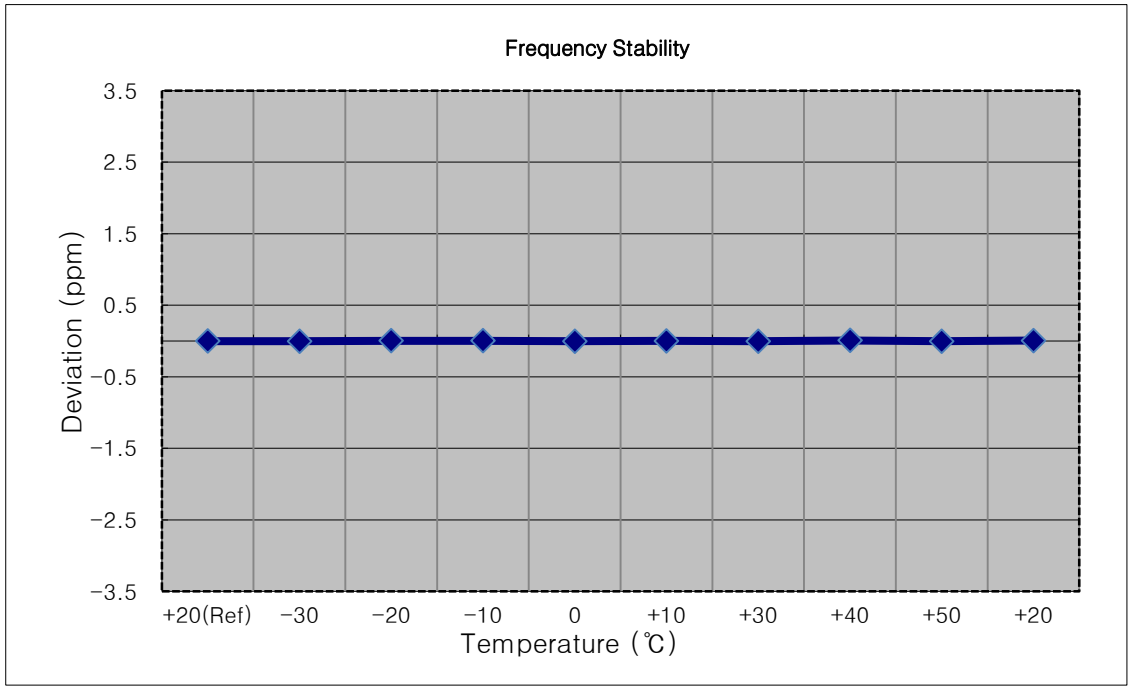
▣ OPERATING FREQUENCY: 2,565,000,000 Hz

▣ CHANNEL: 21400 (10 MHz)

▣ REFERENCE VOLTAGE: 3.850 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	2565 000 013	0.0	0.000 000	0.000
100 %		-30	2565 000 006	-7.7	0.000 000	-0.003
100 %		-20	2565 000 024	10.4	0.000 000	0.004
100 %		-10	2565 000 021	7.6	0.000 000	0.003
100 %		0	2565 000 007	-6.2	0.000 000	-0.002
100 %		+10	2565 000 018	5.1	0.000 000	0.002
100 %		+30	2565 000 008	-4.9	0.000 000	-0.002
100 %		+40	2565 000 036	23.1	0.000 001	0.009
100 %		+50	2565 000 007	-6.2	0.000 000	-0.002
Batt. Endpoint	3.400	+20	2565 000 027	13.3	0.000 001	0.005



▣ MODE: LTE 7

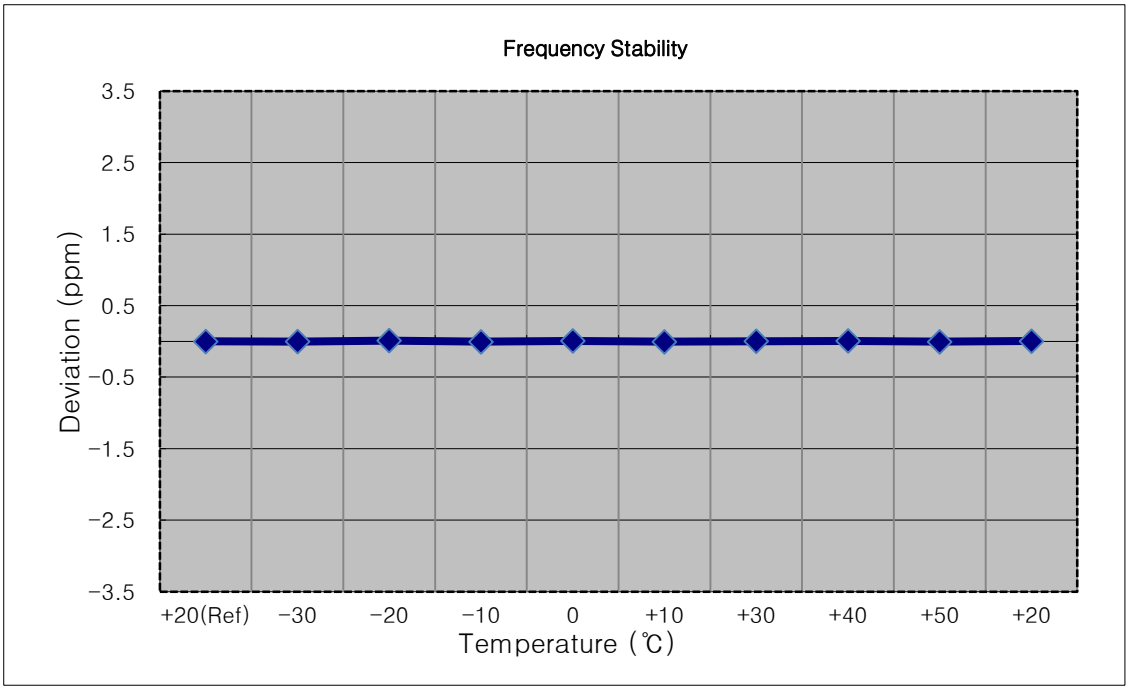
▣ OPERATING FREQUENCY: 2,562,500,000 Hz

▣ CHANNEL: 21375 (15 MHz)

▣ REFERENCE VOLTAGE: 3.850 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	2562 500 006	0.0	0.000 000	0.000
100 %		-30	2562 499 999	-6.1	0.000 000	-0.002
100 %		-20	2562 500 033	27.1	0.000 001	0.011
100 %		-10	2562 499 994	-12.0	0.000 000	-0.005
100 %		0	2562 500 022	16.7	0.000 001	0.007
100 %		+10	2562 499 992	-13.3	-0.000 001	-0.005
100 %		+30	2562 500 012	6.2	0.000 000	0.002
100 %		+40	2562 500 023	17.1	0.000 001	0.007
100 %		+50	2562 499 994	-11.2	0.000 000	-0.004
Batt. Endpoint	3.400	+20	2562 500 015	9.5	0.000 000	0.004



▣ MODE: LTE 7

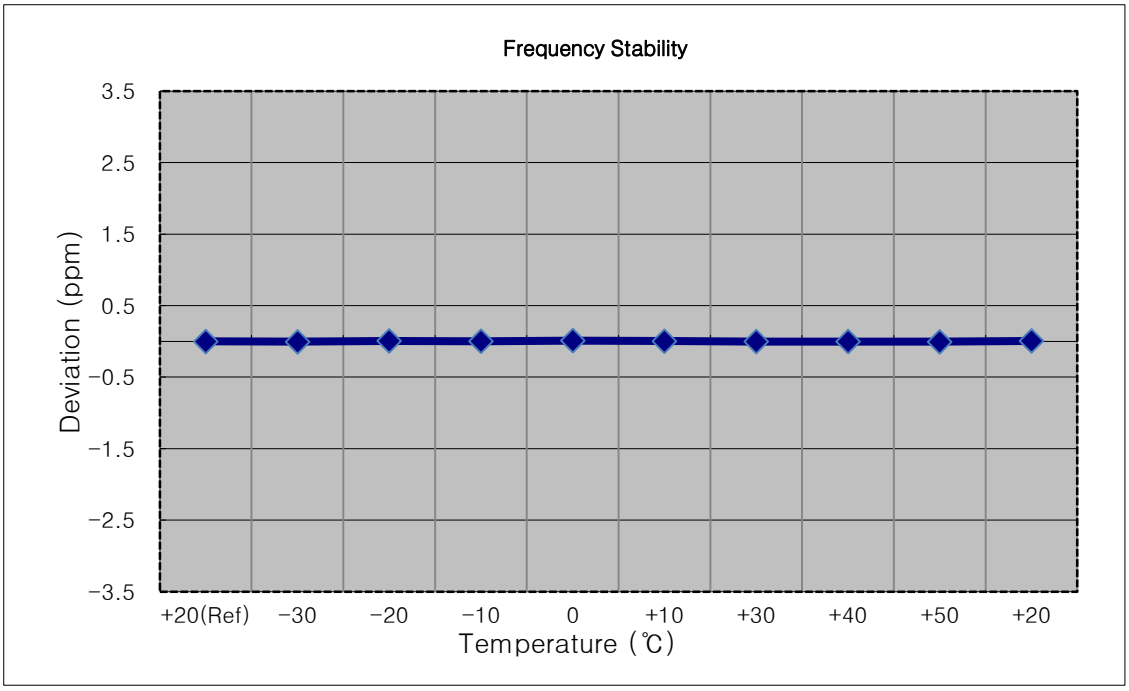
▣ OPERATING FREQUENCY: 2,560,000,000 Hz

▣ CHANNEL: 21350 (20 MHz)

▣ REFERENCE VOLTAGE: 3.850 VDC

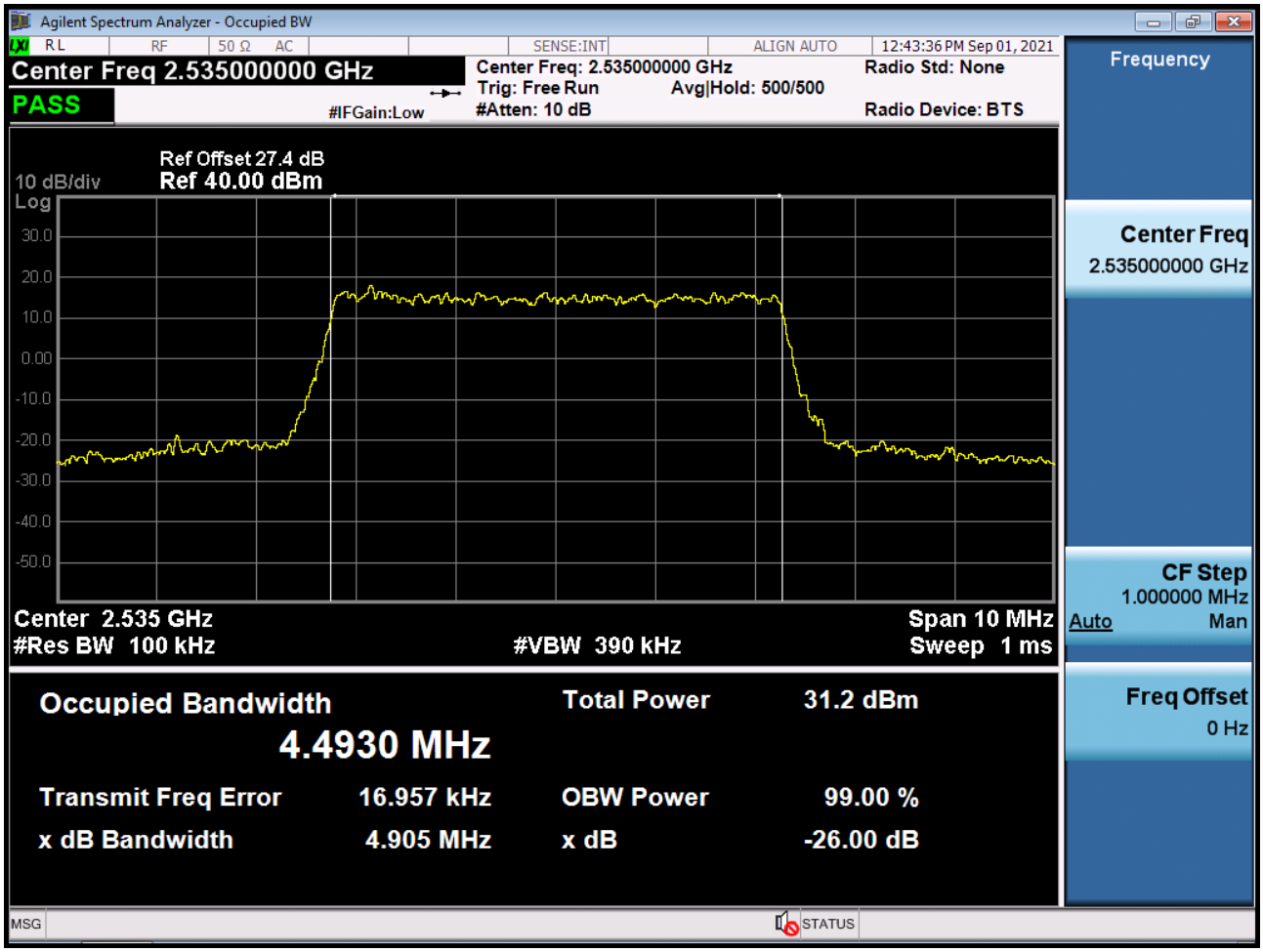
▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	2560 000 010	0.0	0.000 000	0.000
100 %		-30	2559 999 998	-12.2	0.000 000	-0.005
100 %		-20	2560 000 029	19.0	0.000 001	0.007
100 %		-10	2560 000 018	7.9	0.000 000	0.003
100 %		0	2560 000 040	29.7	0.000 001	0.012
100 %		+10	2560 000 022	11.5	0.000 000	0.004
100 %		+30	2560 000 005	-5.0	0.000 000	-0.002
100 %		+40	2560 000 002	-8.6	0.000 000	-0.003
100 %		+50	2559 999 997	-13.5	-0.000 001	-0.005
Batt. Endpoint	3.400	+20	2560 000 030	19.5	0.000 001	0.008

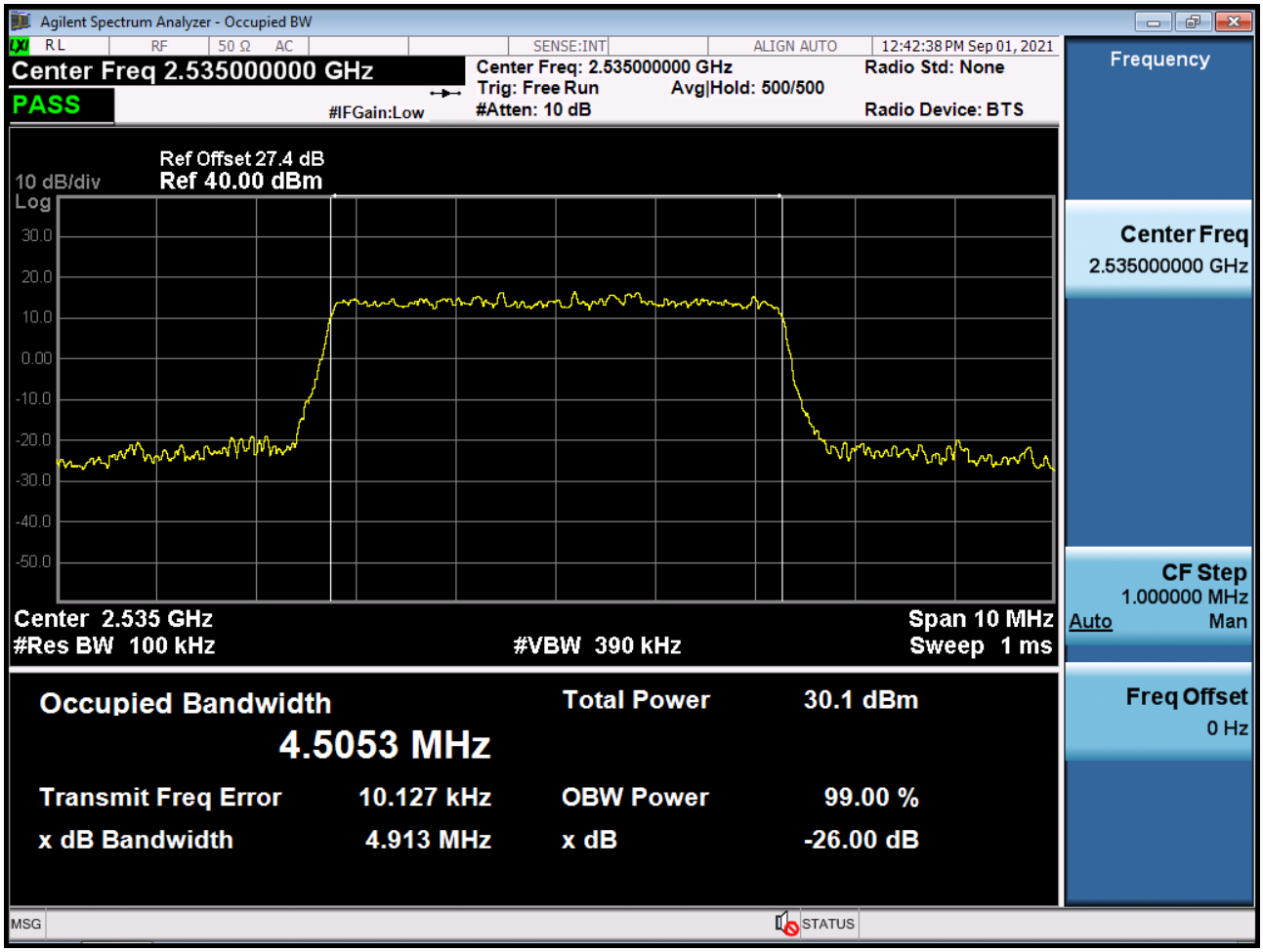


9. TEST PLOTS

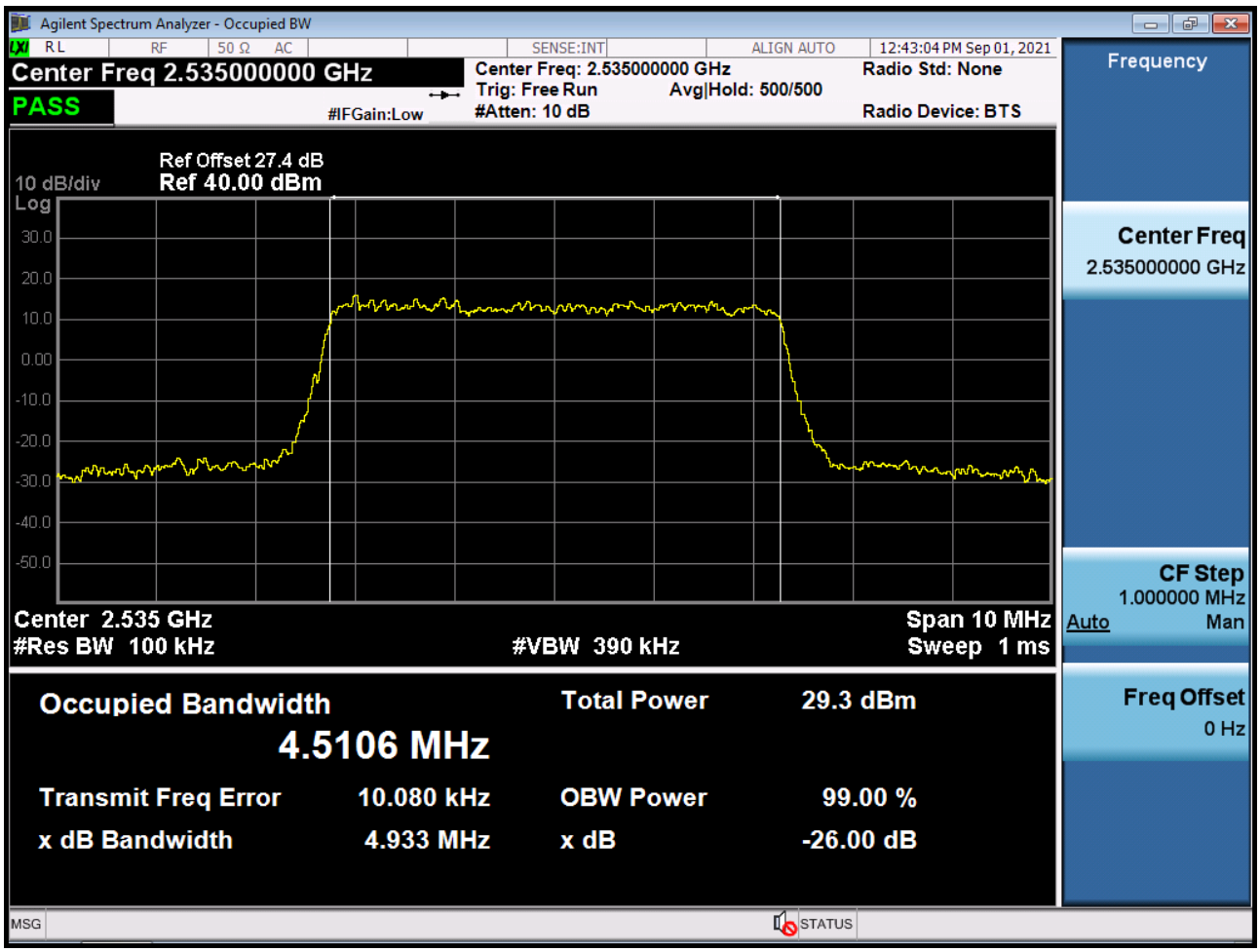
BAND 7. Occupied Bandwidth Plot (5 MHz Ch.21100 QPSK RB 25)



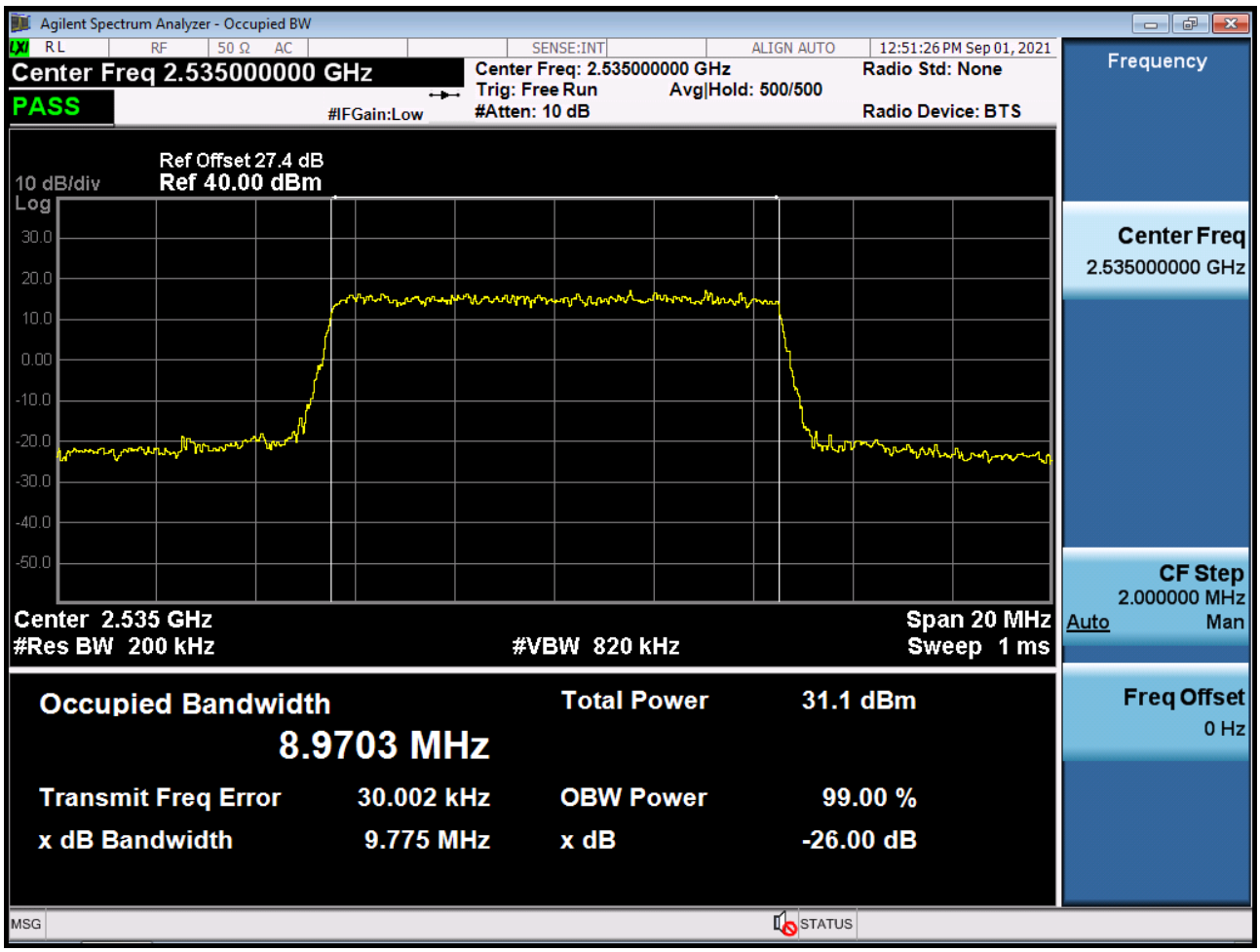
BAND 7. Occupied Bandwidth Plot (5 MHz Ch.21100 16-QAM RB 25)



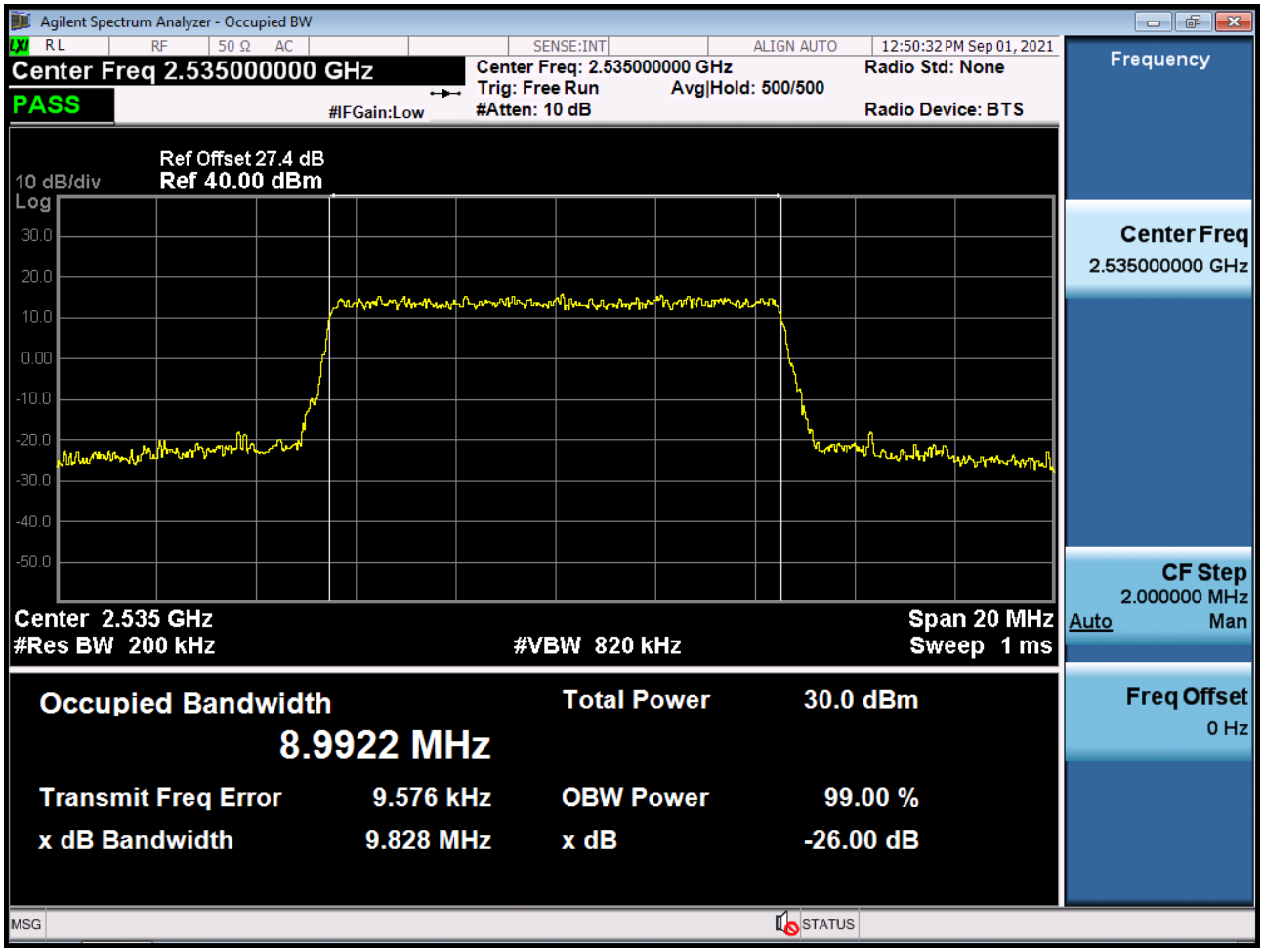
BAND 7. Occupied Bandwidth Plot (5 MHz Ch.21100 64-QAM RB 25)



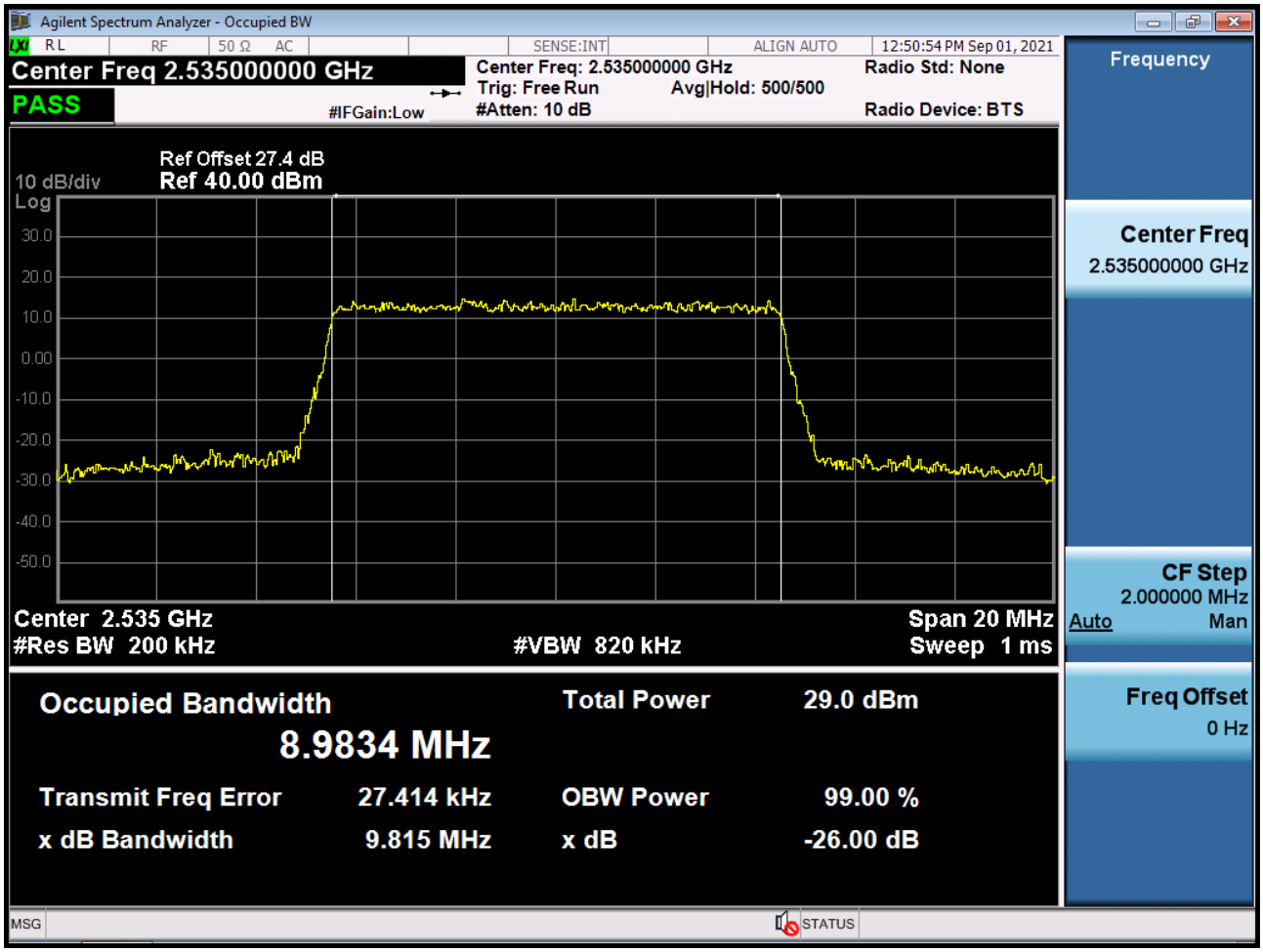
BAND 7. Occupied Bandwidth Plot (10 MHz Ch.21100 QPSK RB 50)



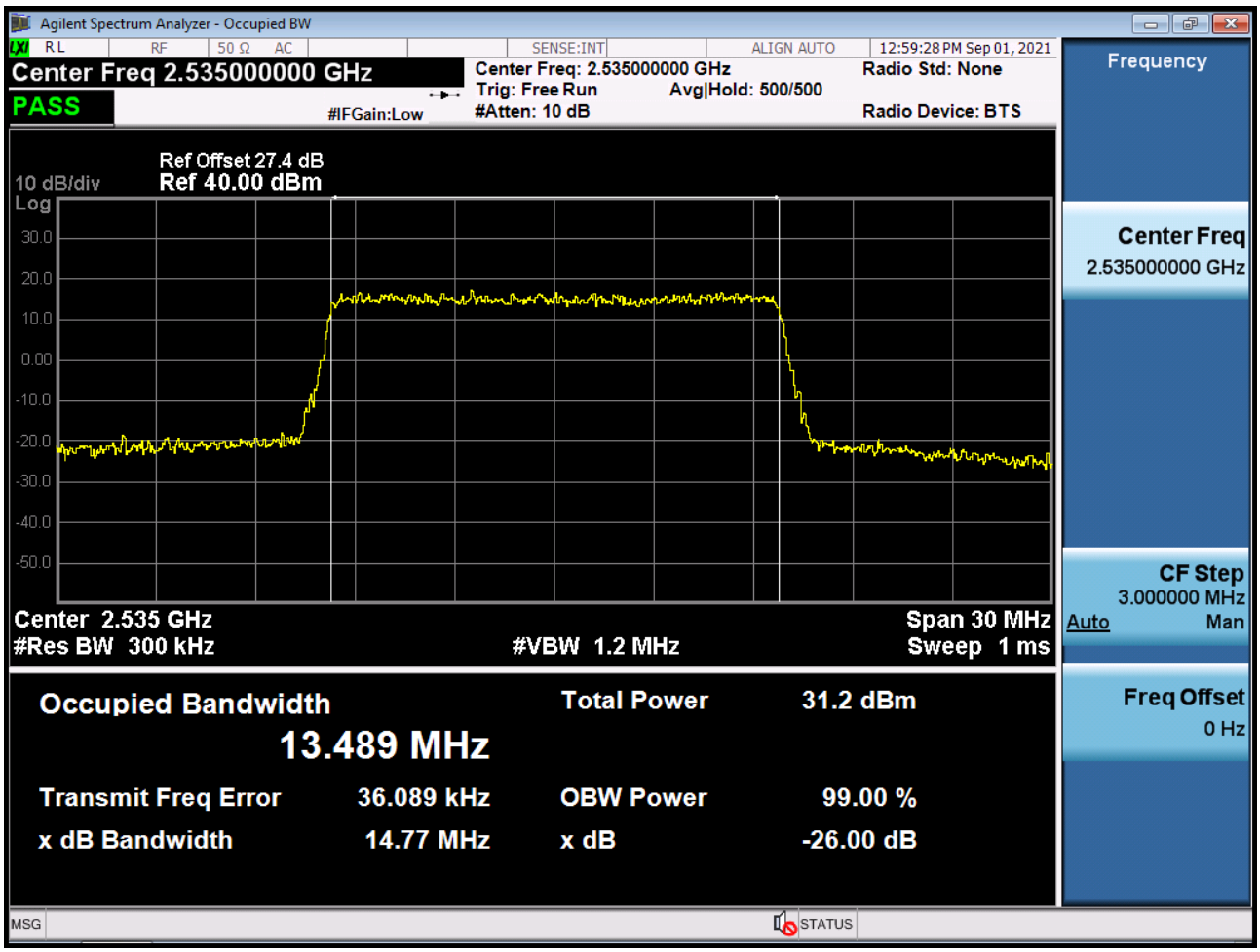
BAND 7. Occupied Bandwidth Plot (10 MHz Ch.21100 16-QAM RB 50)



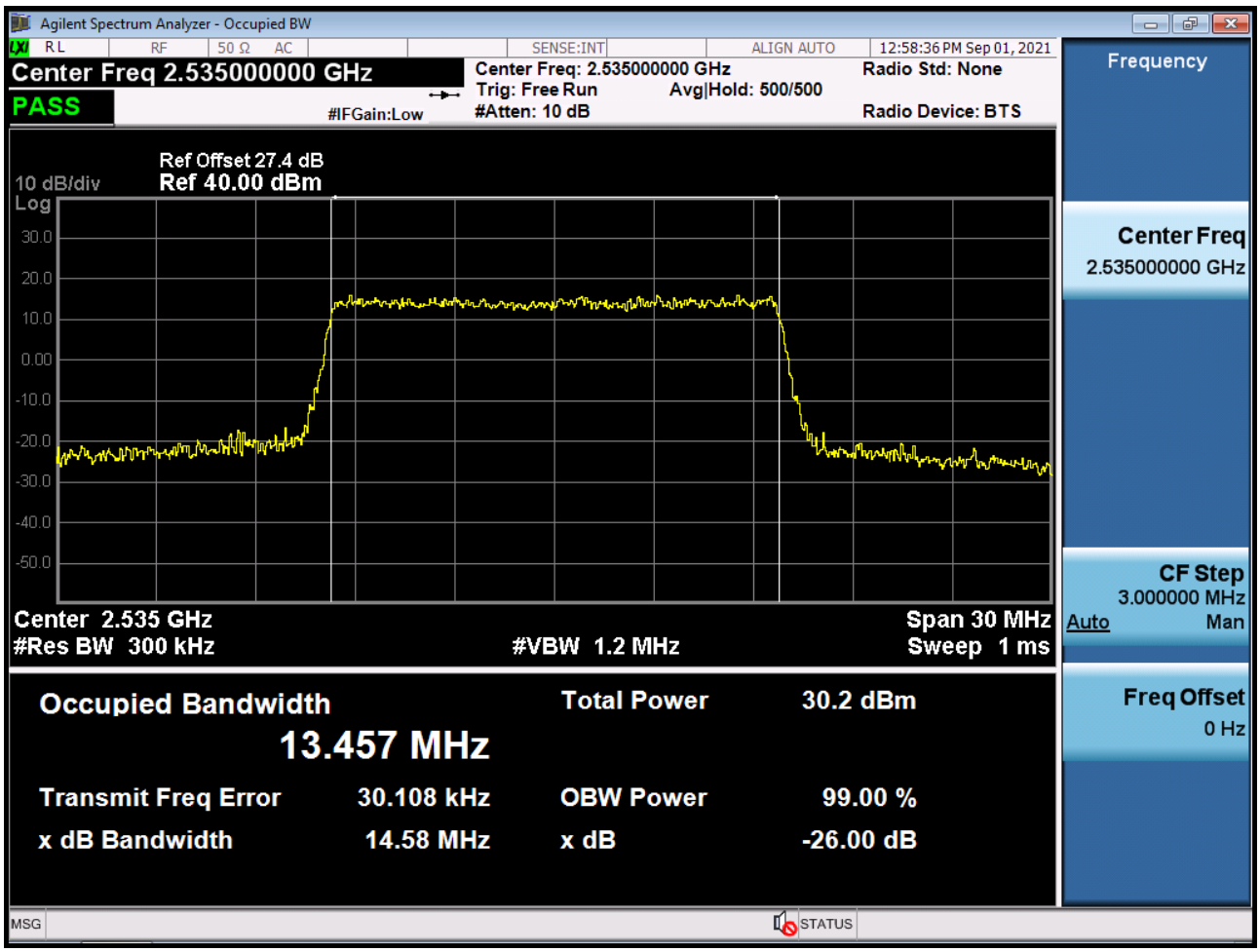
BAND 7. Occupied Bandwidth Plot (10 MHz Ch.21100 64-QAM RB 50)



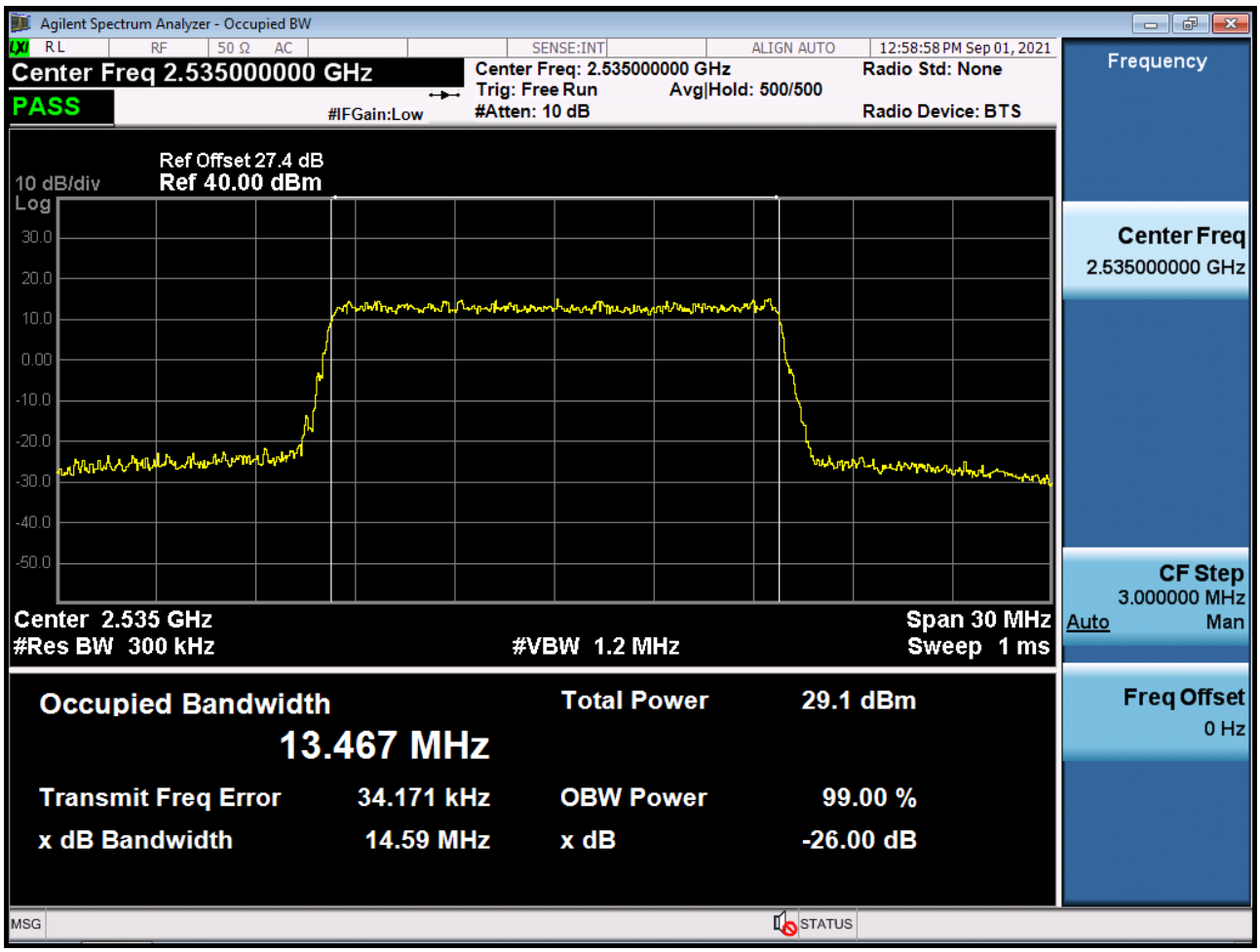
BAND 7. Occupied Bandwidth Plot (15 MHz Ch.21100 QPSK RB 75)



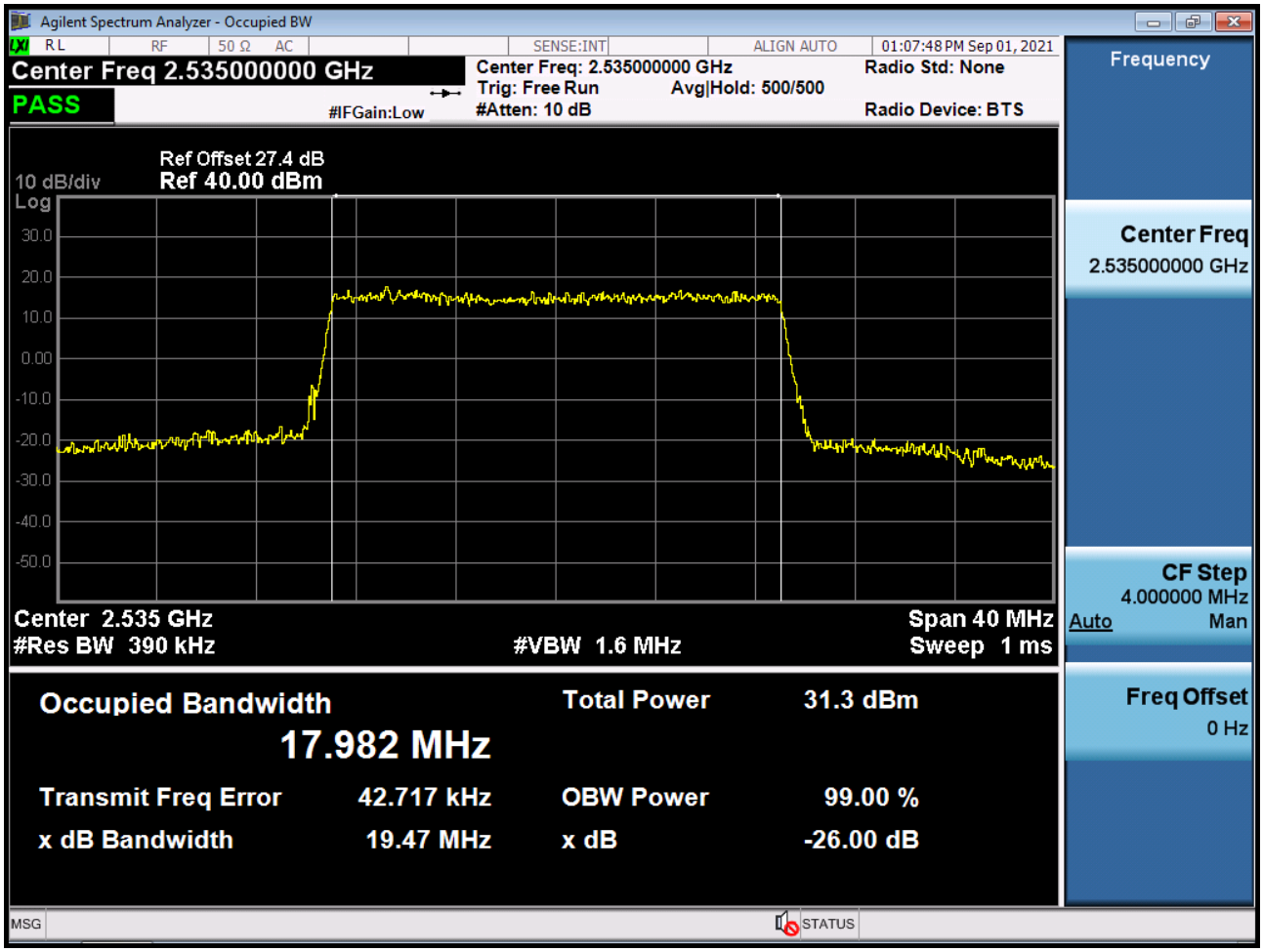
BAND 7. Occupied Bandwidth Plot (15 MHz Ch.21100 16-QAM RB 75)



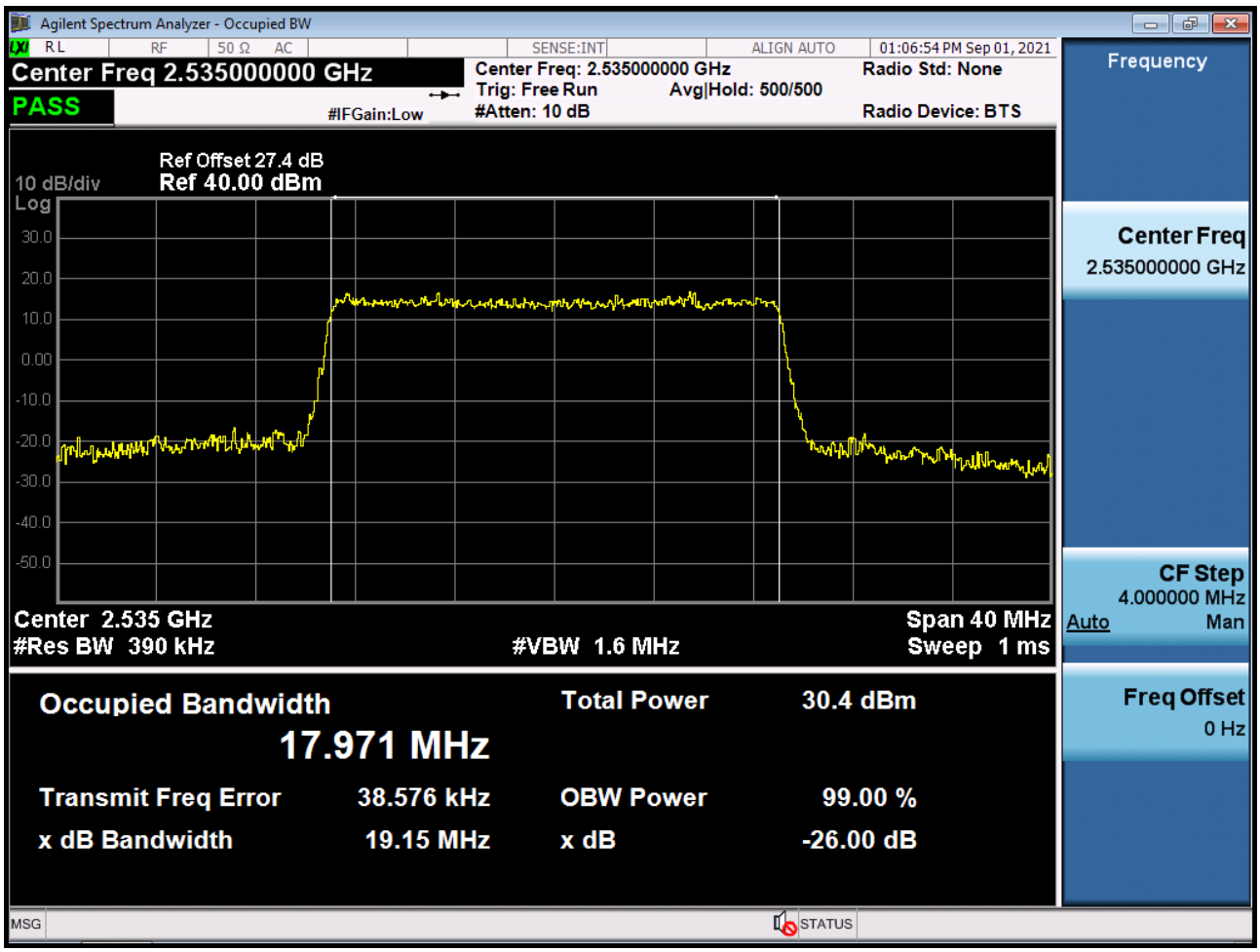
BAND 7. Occupied Bandwidth Plot (15 MHz Ch.21100 64-QAM RB 75)



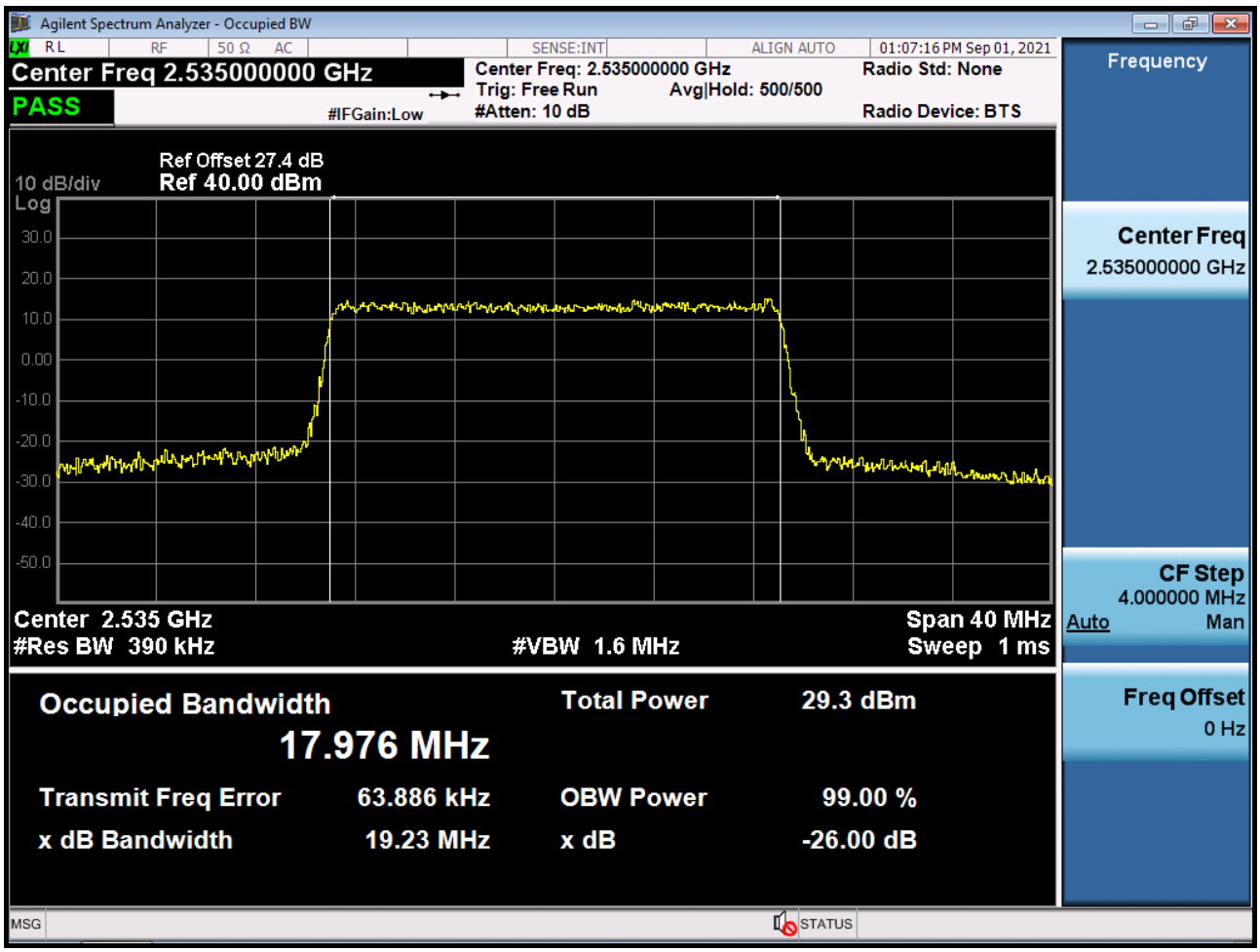
BAND 7. Occupied Bandwidth Plot (20 MHz Ch.21100 QPSK RB 100)



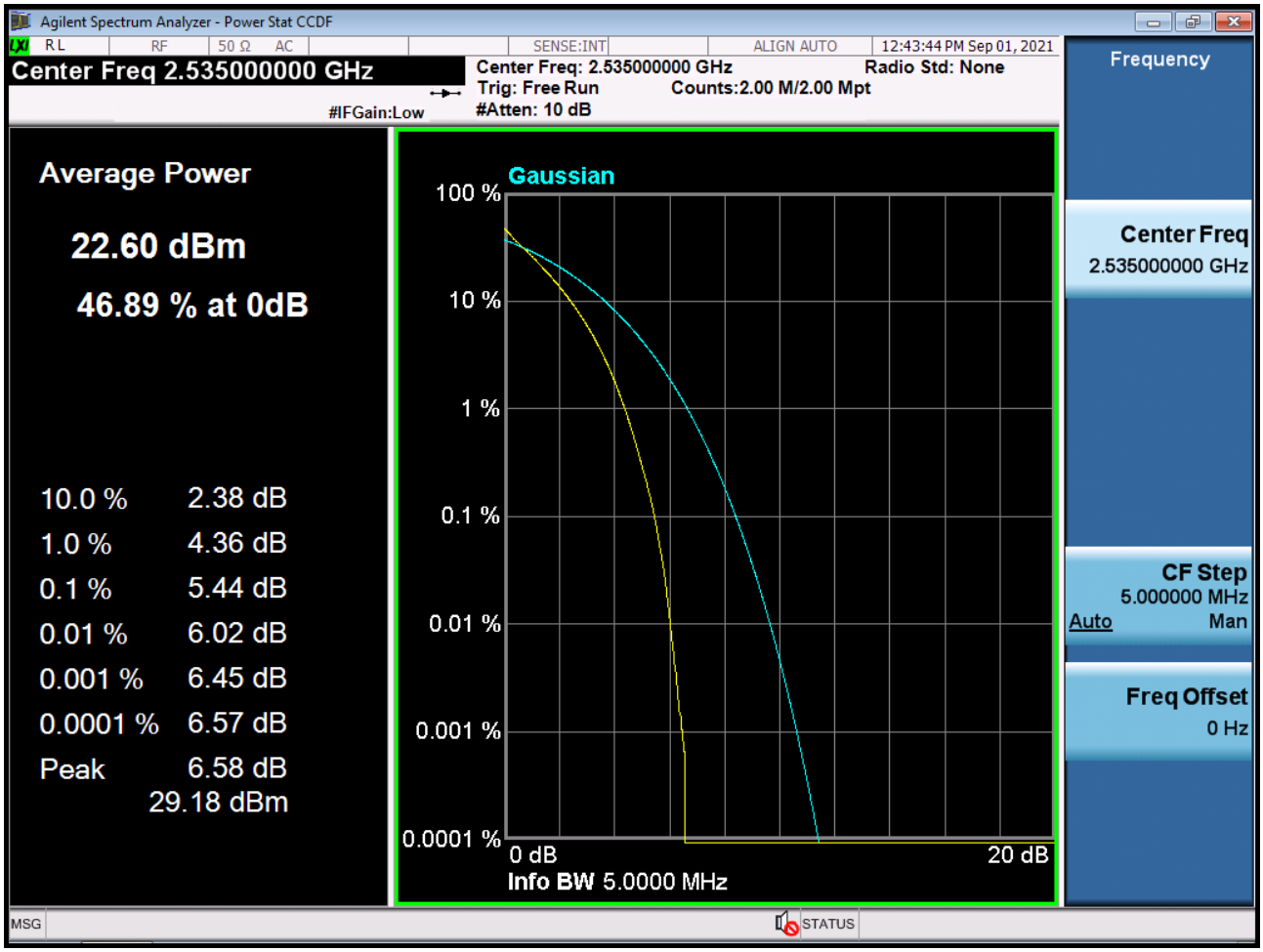
BAND 7. Occupied Bandwidth Plot (20 MHz Ch.21100 16-QAM RB 100)



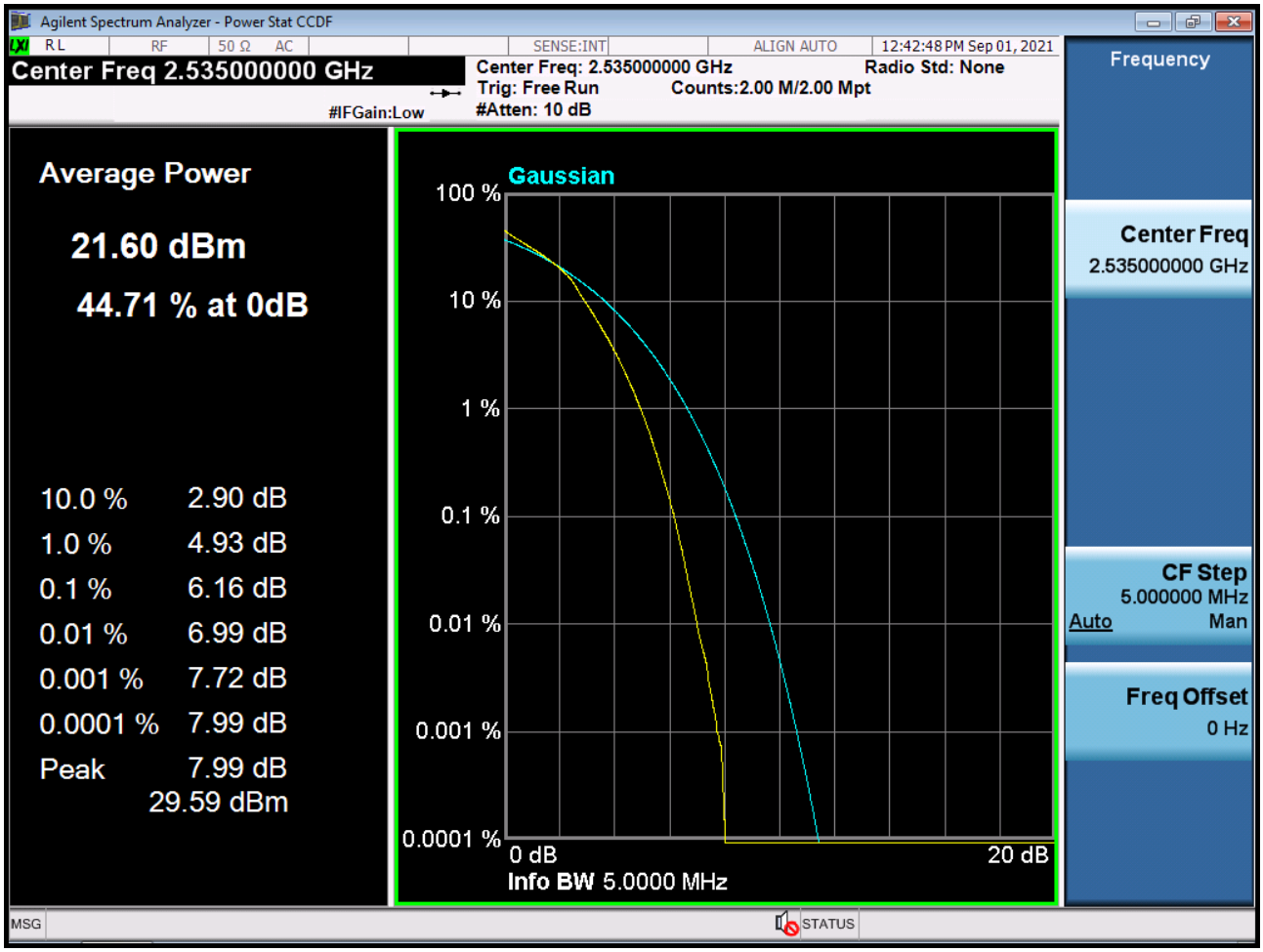
BAND 7. Occupied Bandwidth Plot (20 MHz Ch.21100 64-QAM RB 100)



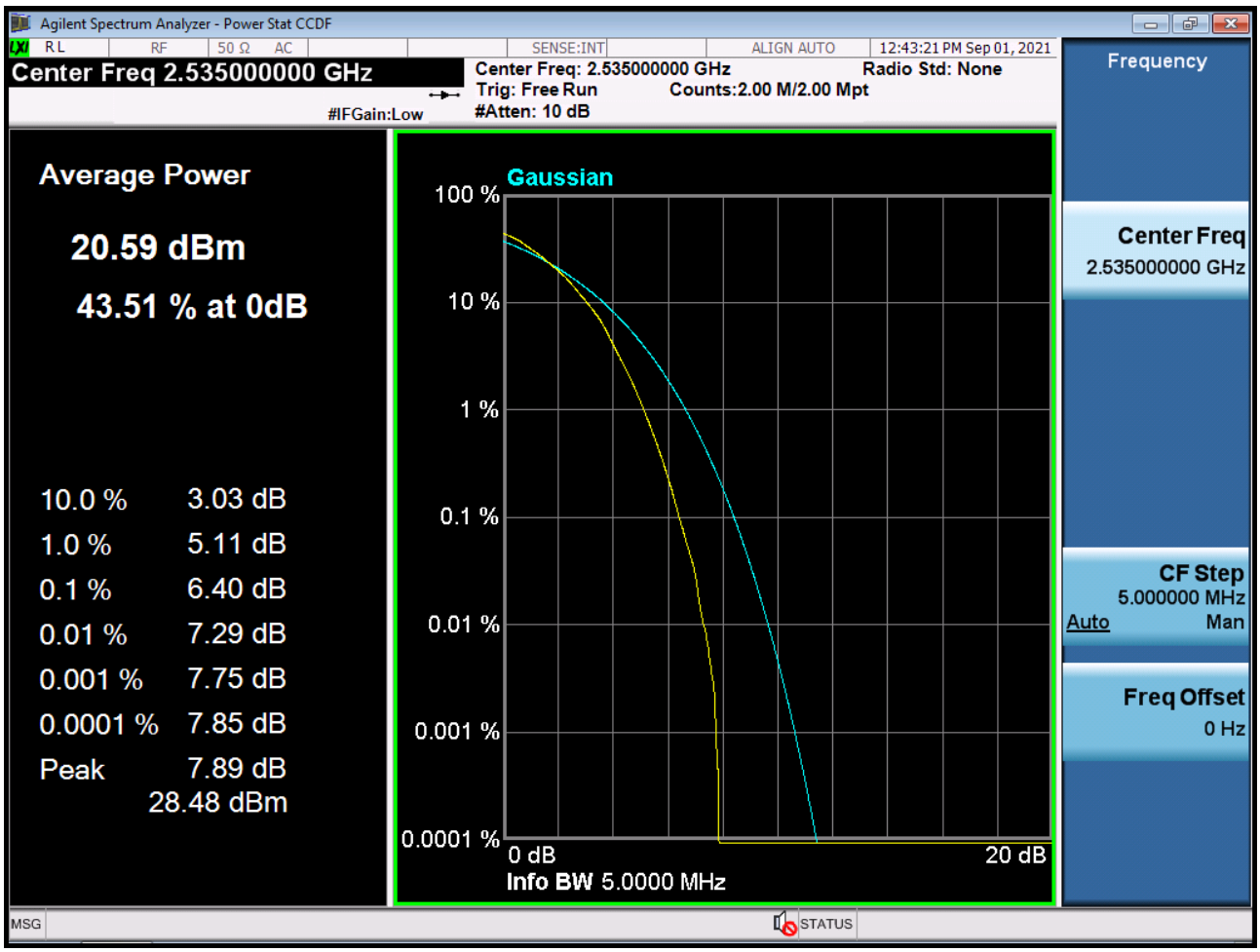
BAND 7. PAR Plot (5 M BW Ch.21100 QPSK RB 25_0)



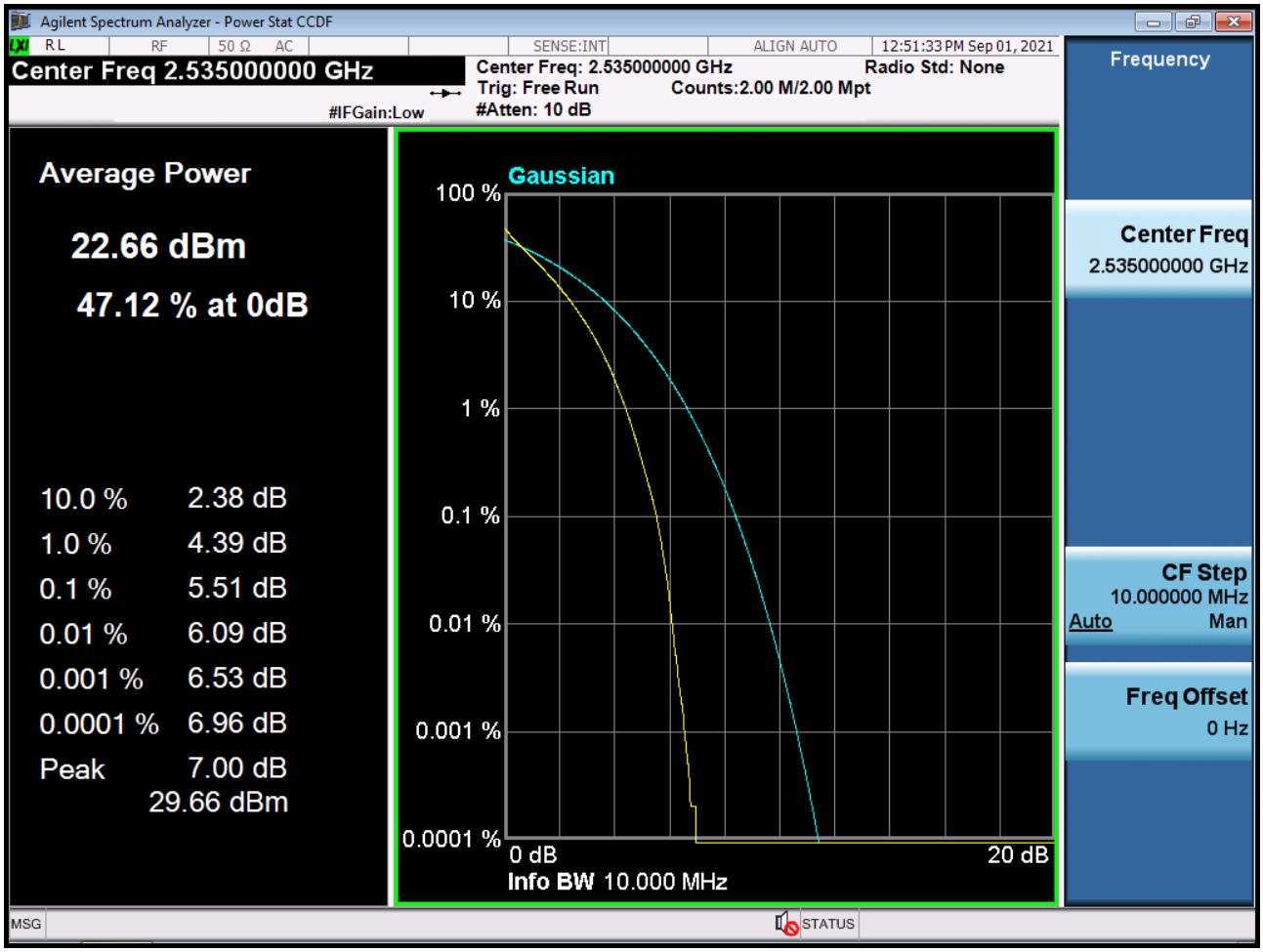
BAND 7. PAR Plot (5 M BW Ch.21100 16QAM RB 25_0)



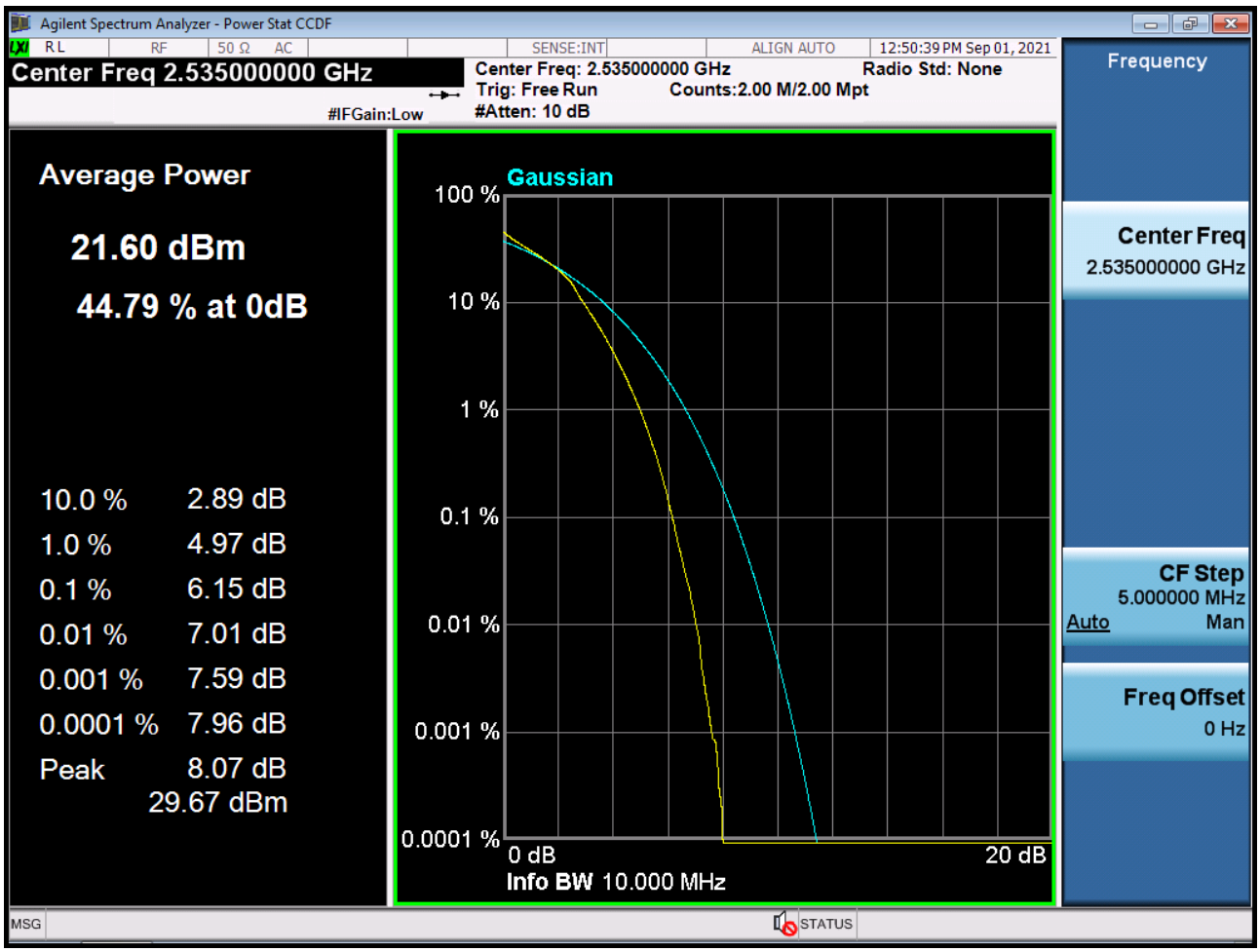
BAND 7. PAR Plot (5 M BW Ch.21100 64QAM RB 25_0)



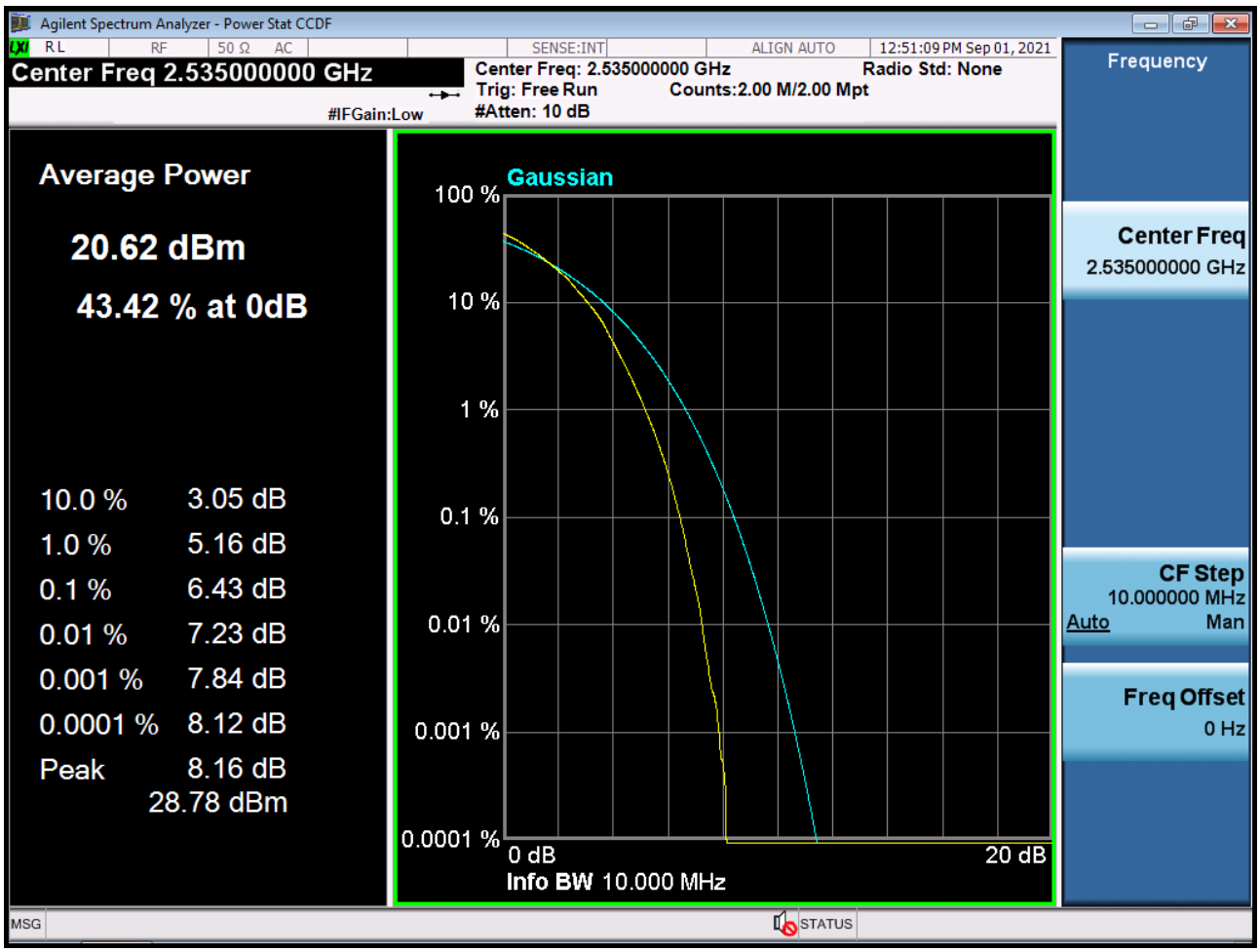
BAND 7. PAR Plot (10 M BW Ch.21100 QPSK RB 50_0)



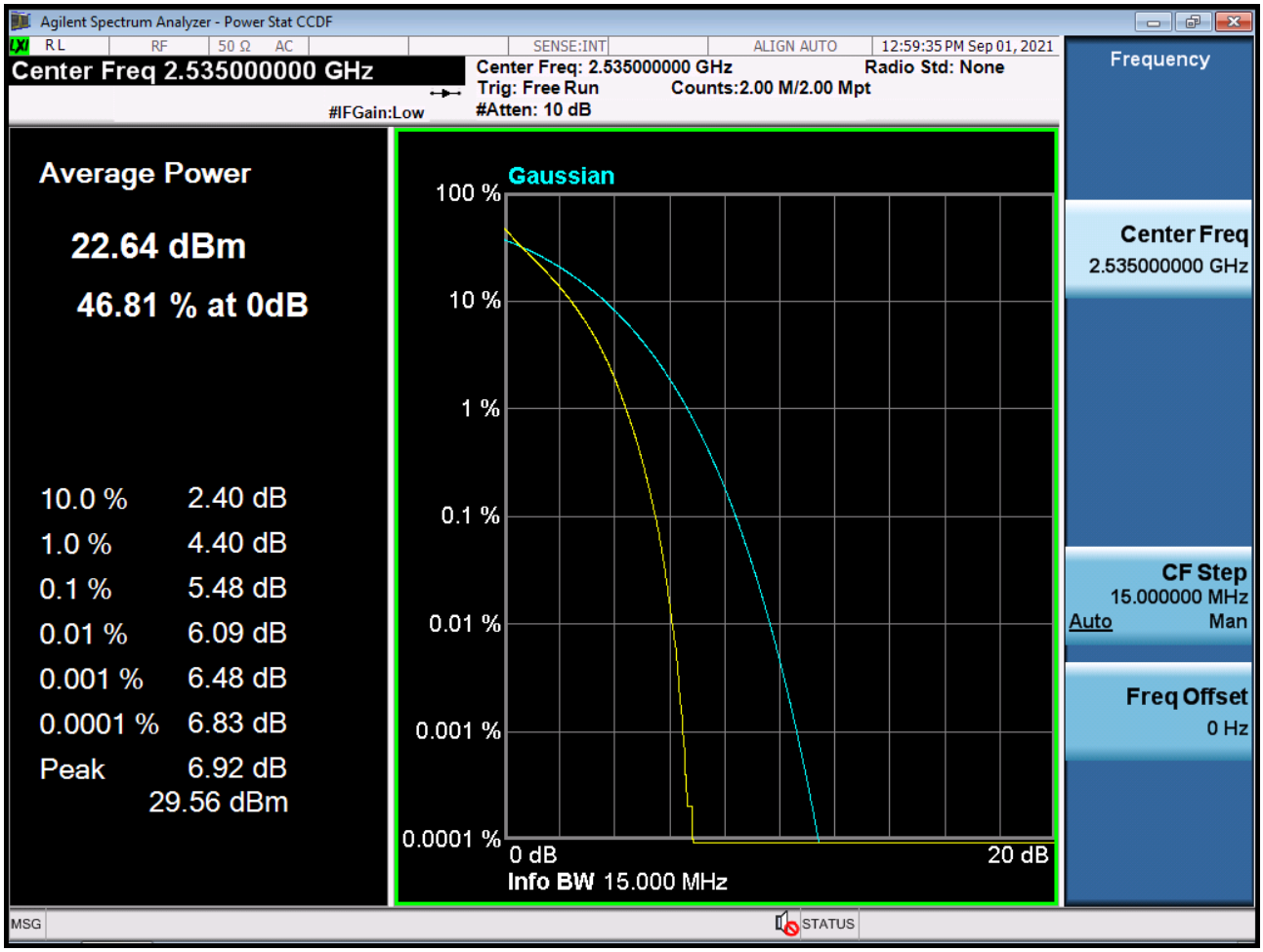
BAND 7. PAR Plot (10 M BW Ch.21100 16QAM RB 50_0)



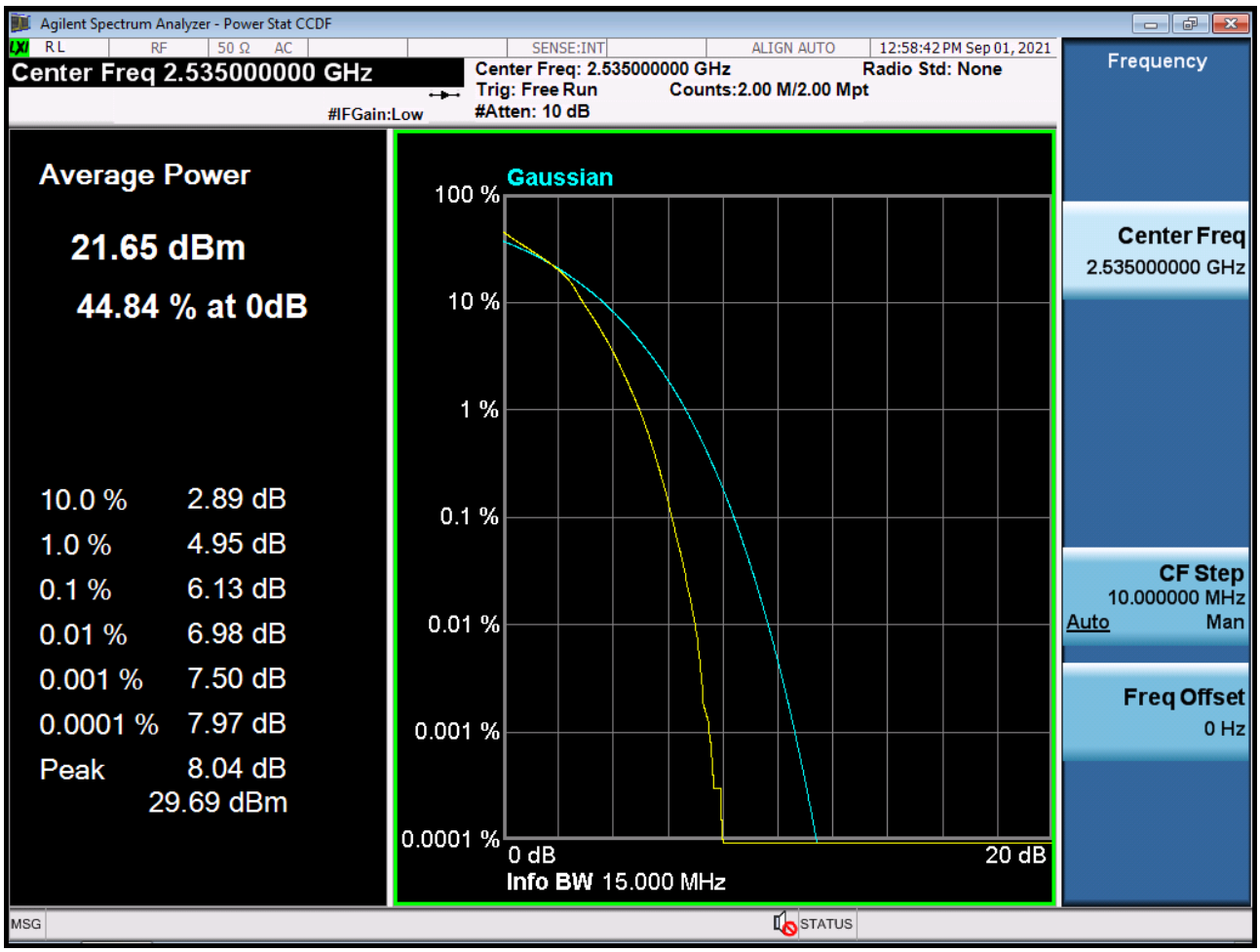
BAND 7. PAR Plot (10 M BW Ch.21100 64QAM RB 50_0)



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

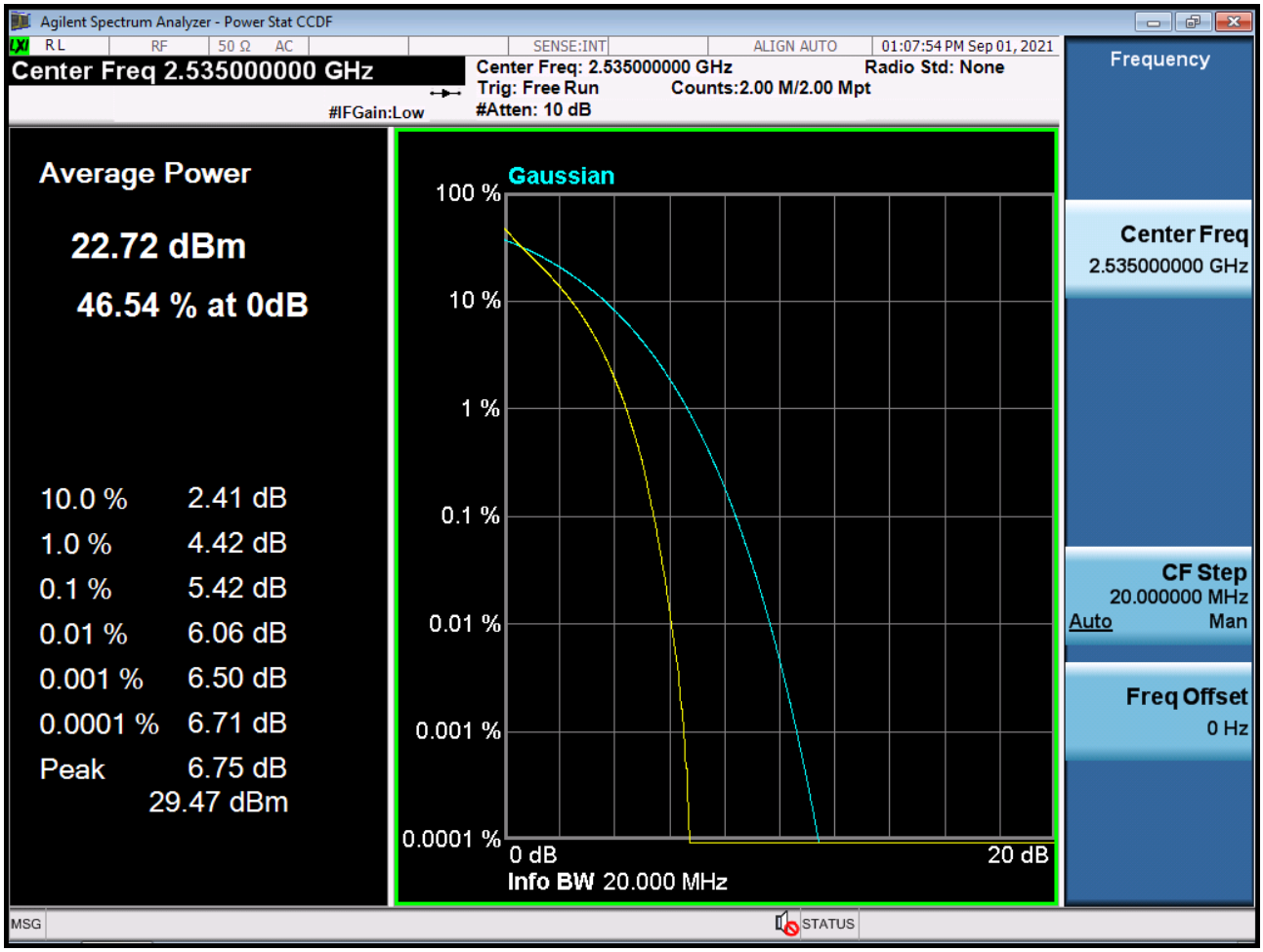


BAND 7. PAR Plot (15 M BW Ch.21100 16QAM RB 75_0)

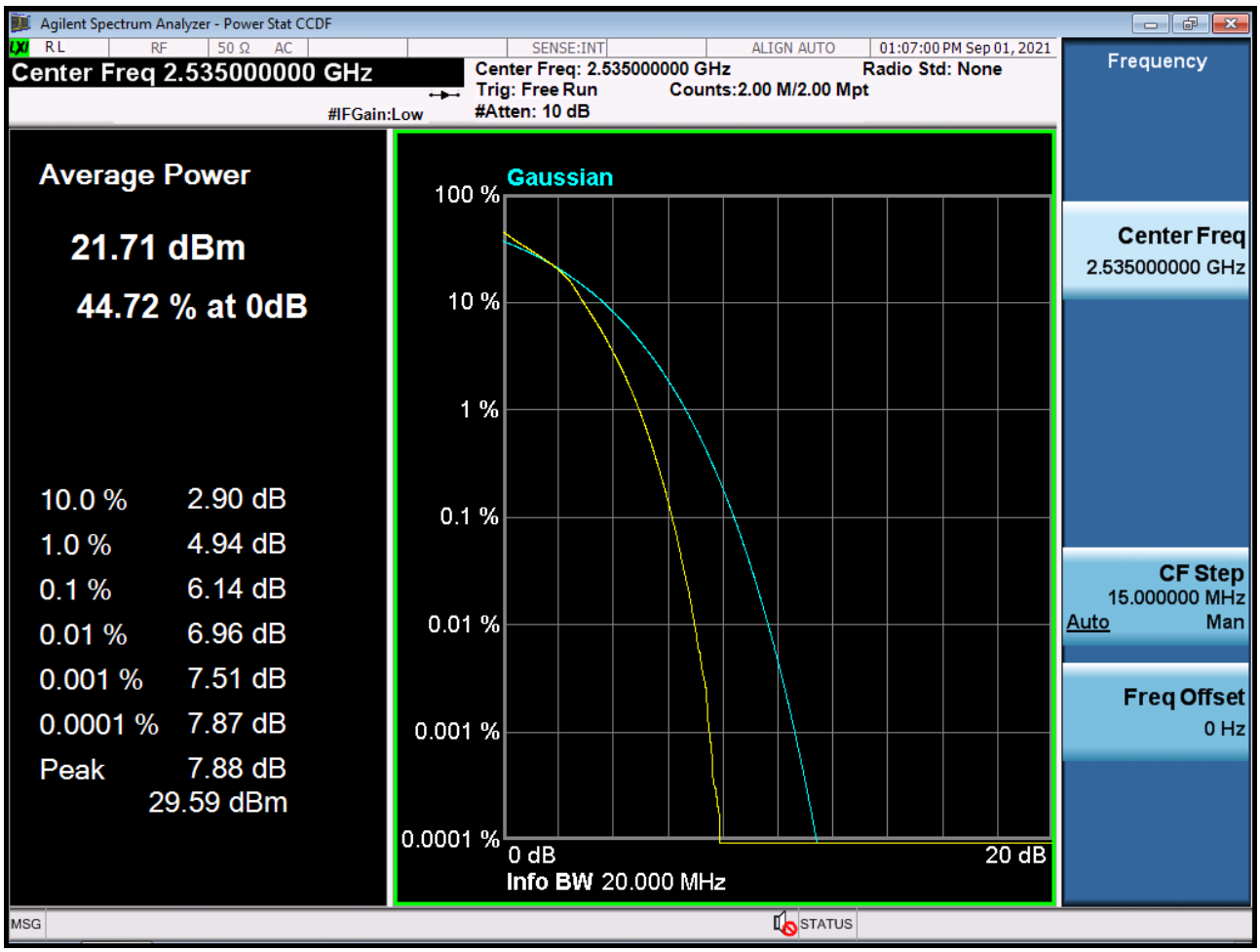


BAND 7. PAR Plot (15 M BW Ch.21100 64QAM RB 75_0)

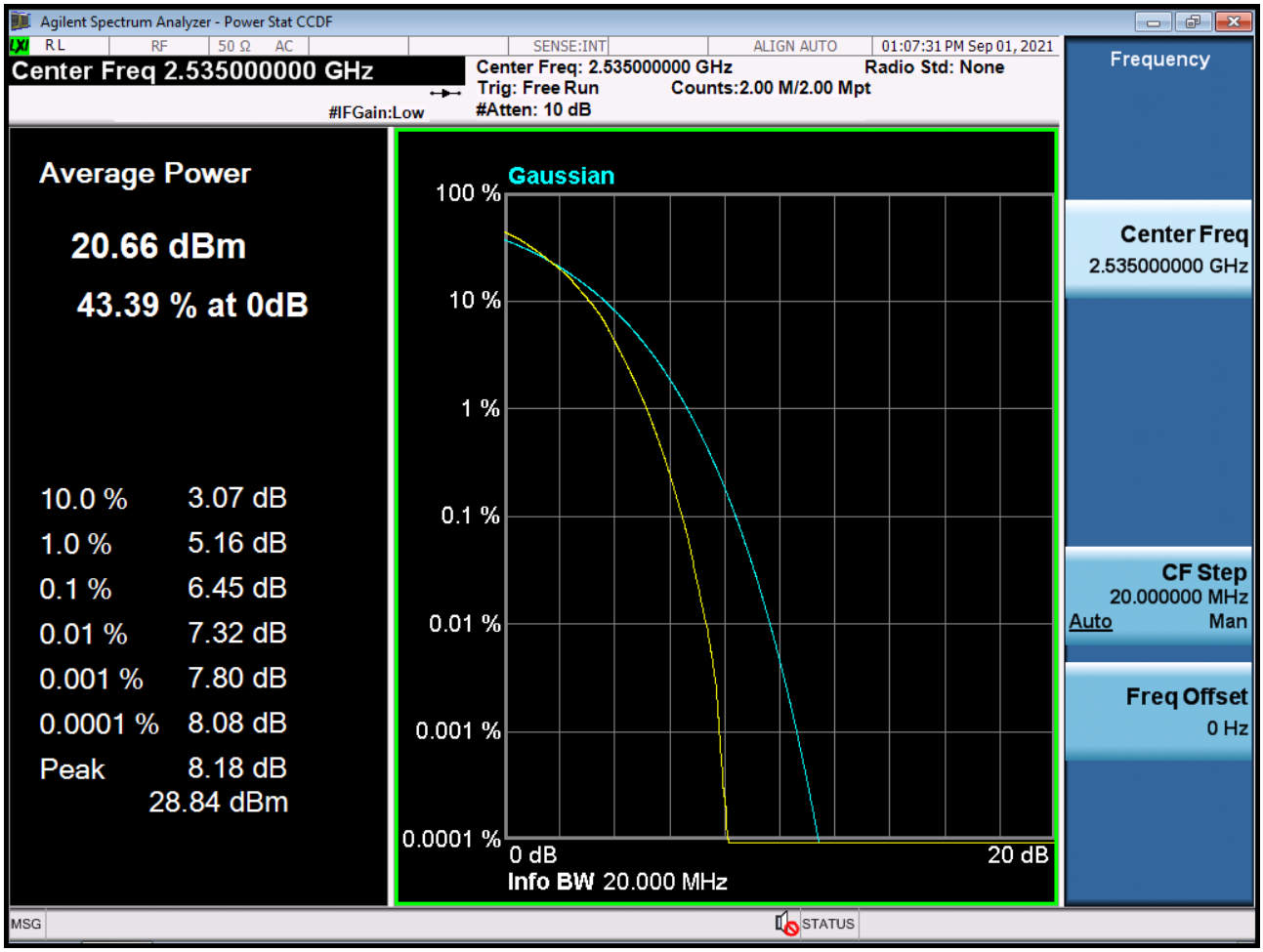
BAND 7. PAR Plot (20 M BW Ch.21100 QPSK RB 100_0)



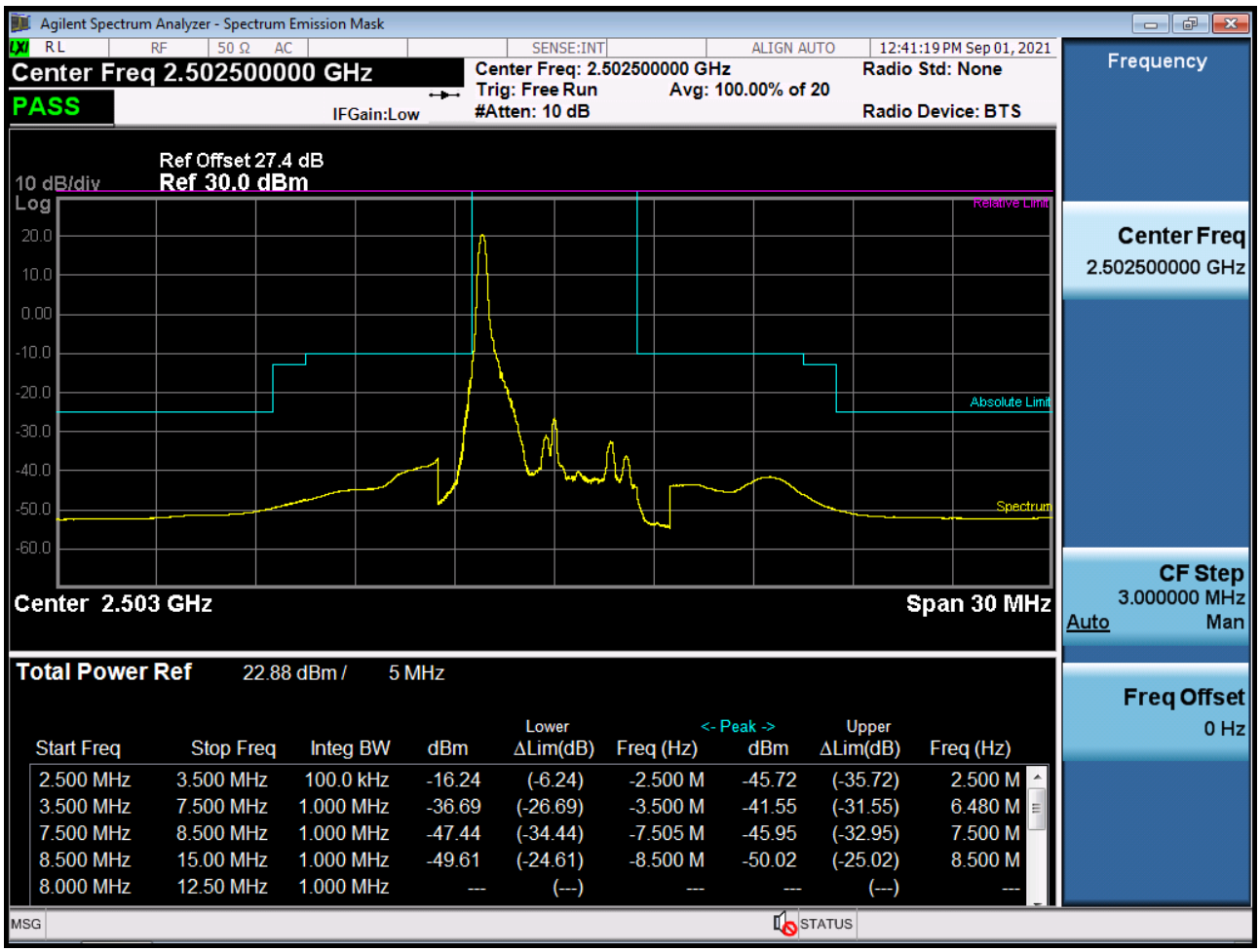
BAND 7. PAR Plot (20 M BW Ch.21100 16QAM RB 100_0)



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

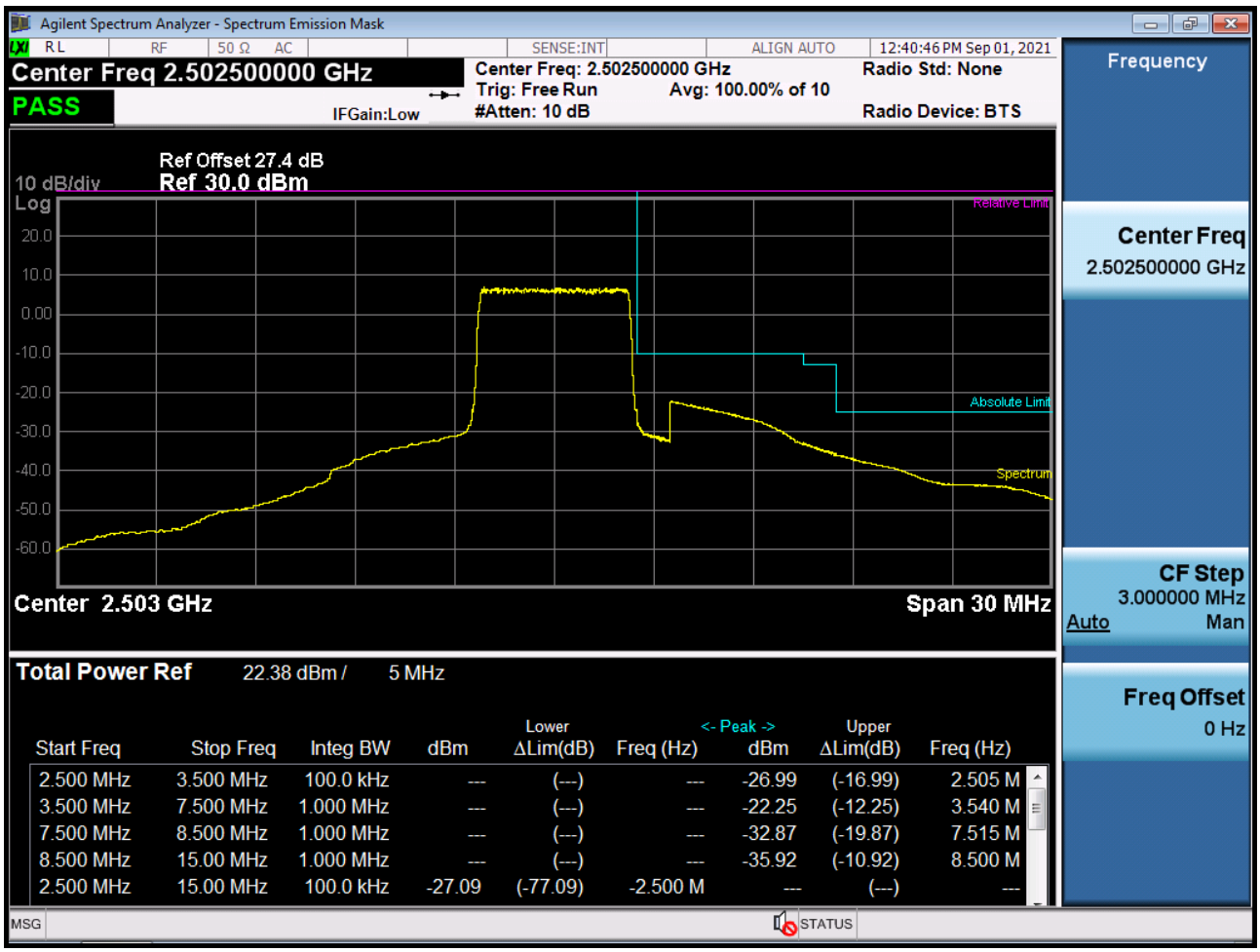


BAND 7. Low Channel Edge Plot (5 MHz Ch.20775 QPSK RB 1, Offset 0)

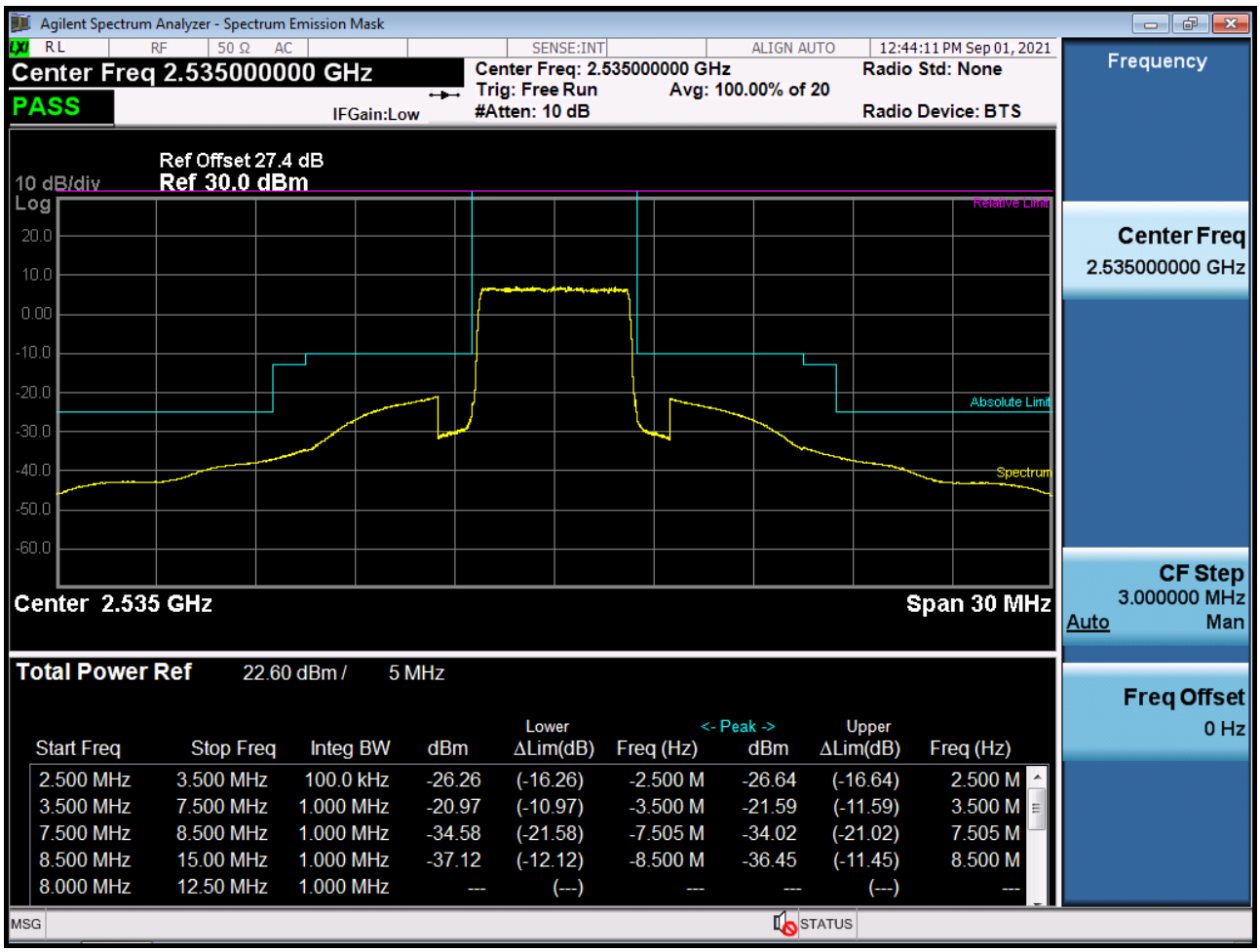


BAND 7. Low Channel Edge Plot (5 MHz Ch.20775 QPSK RB 25, Offset 0)

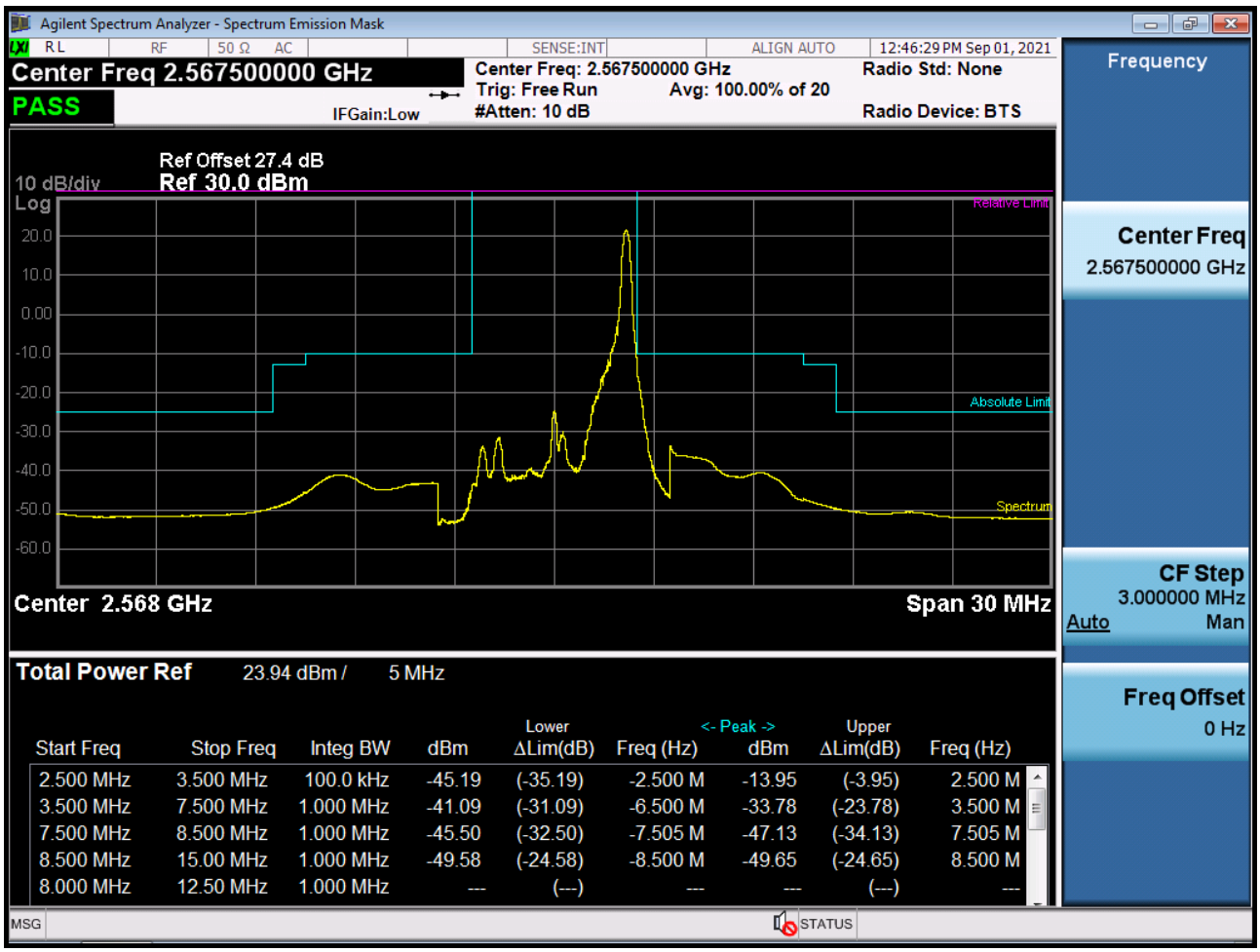
BAND 7. Low Channel Edge Plot (5 MHz Ch.20775 QPSK_RB 1_Offset 24)



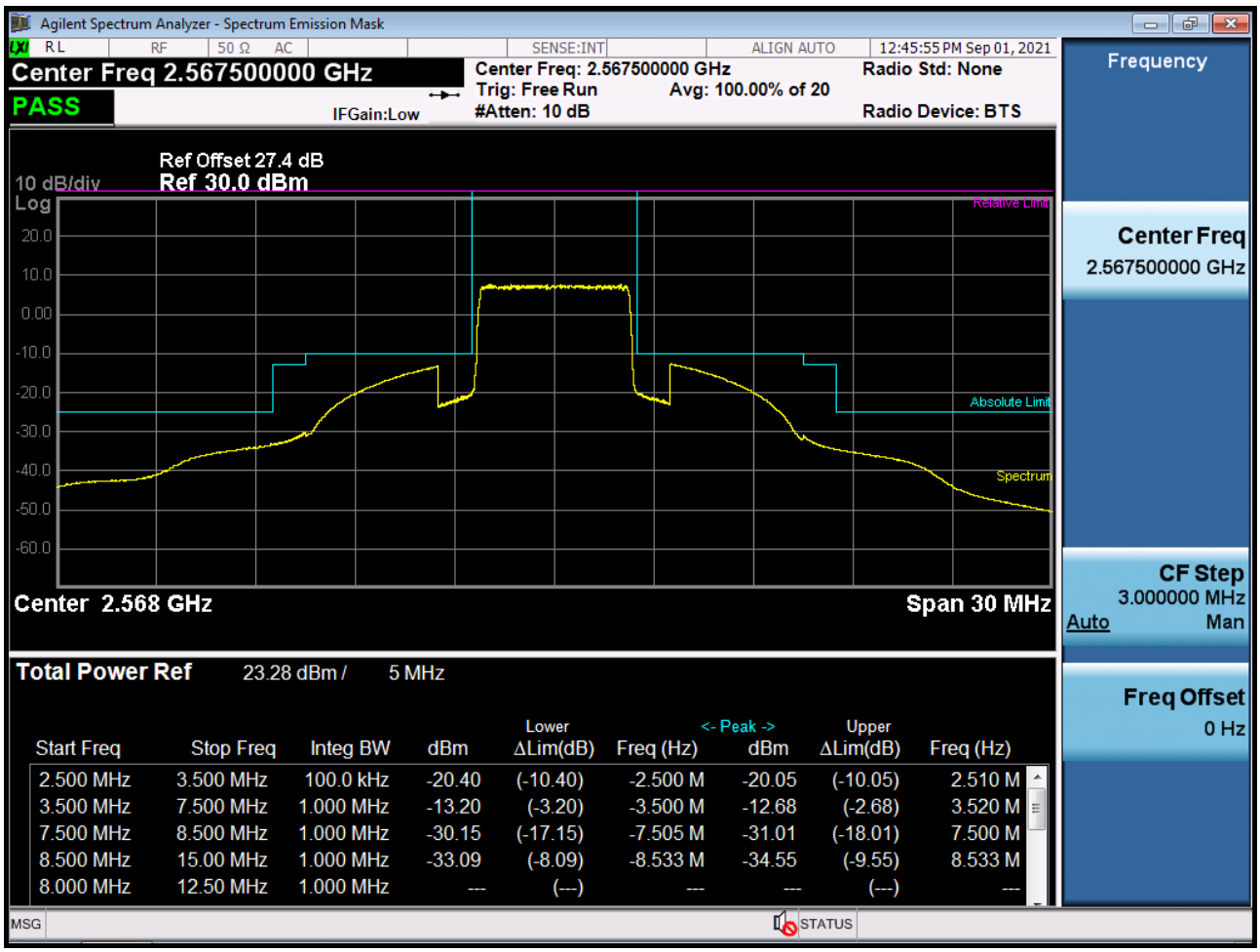
BAND 7. Mid Channel Edge Plot (5 MHz Ch.21100 QPSK RB 25)



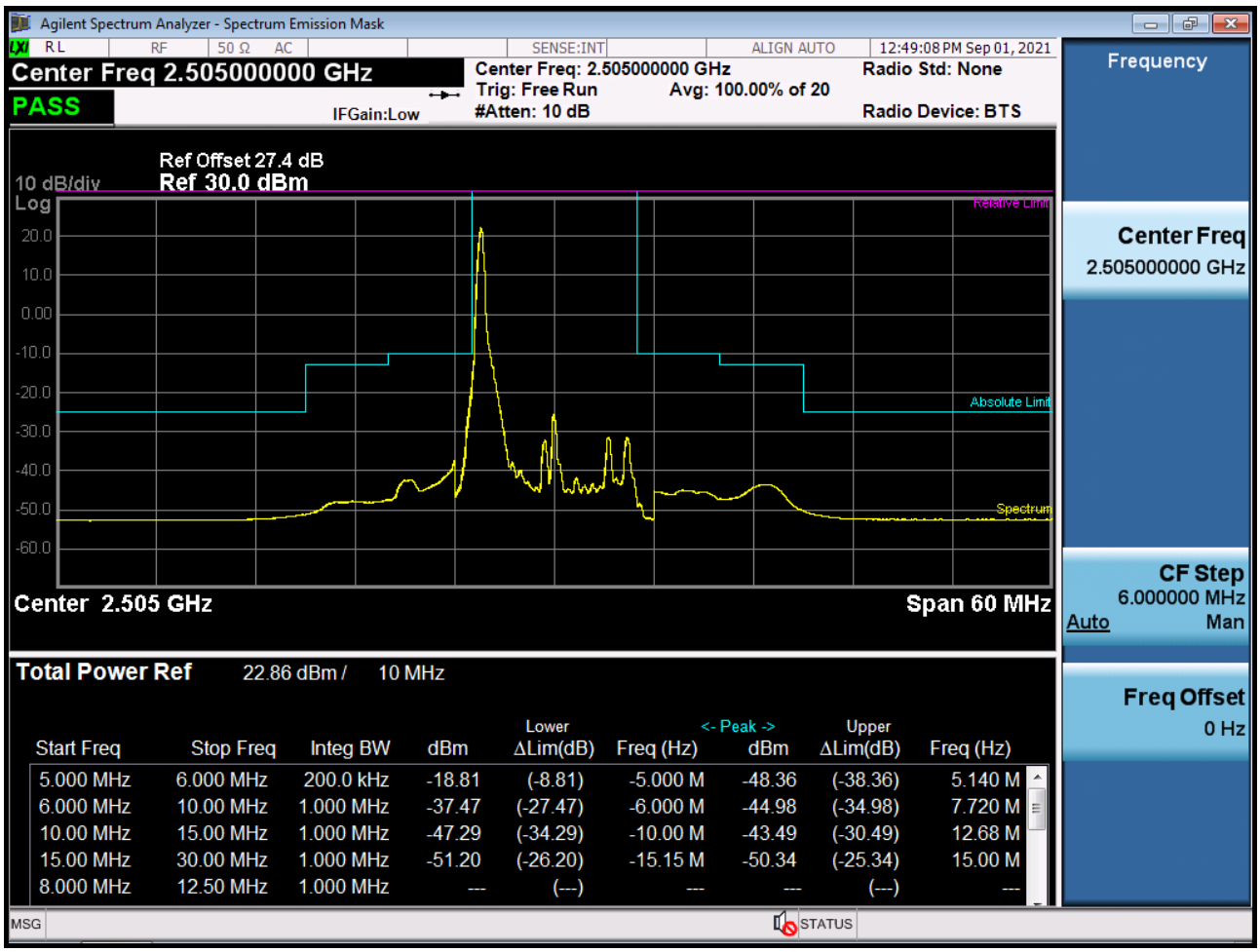
BAND 7. High Channel Edge Plot (5 MHz Ch.21425 QPSK RB 1, Offset 24)



BAND 7. High Channel Edge Plot (5 MHz Ch.21425 QPSK_RB25_Offset 0)



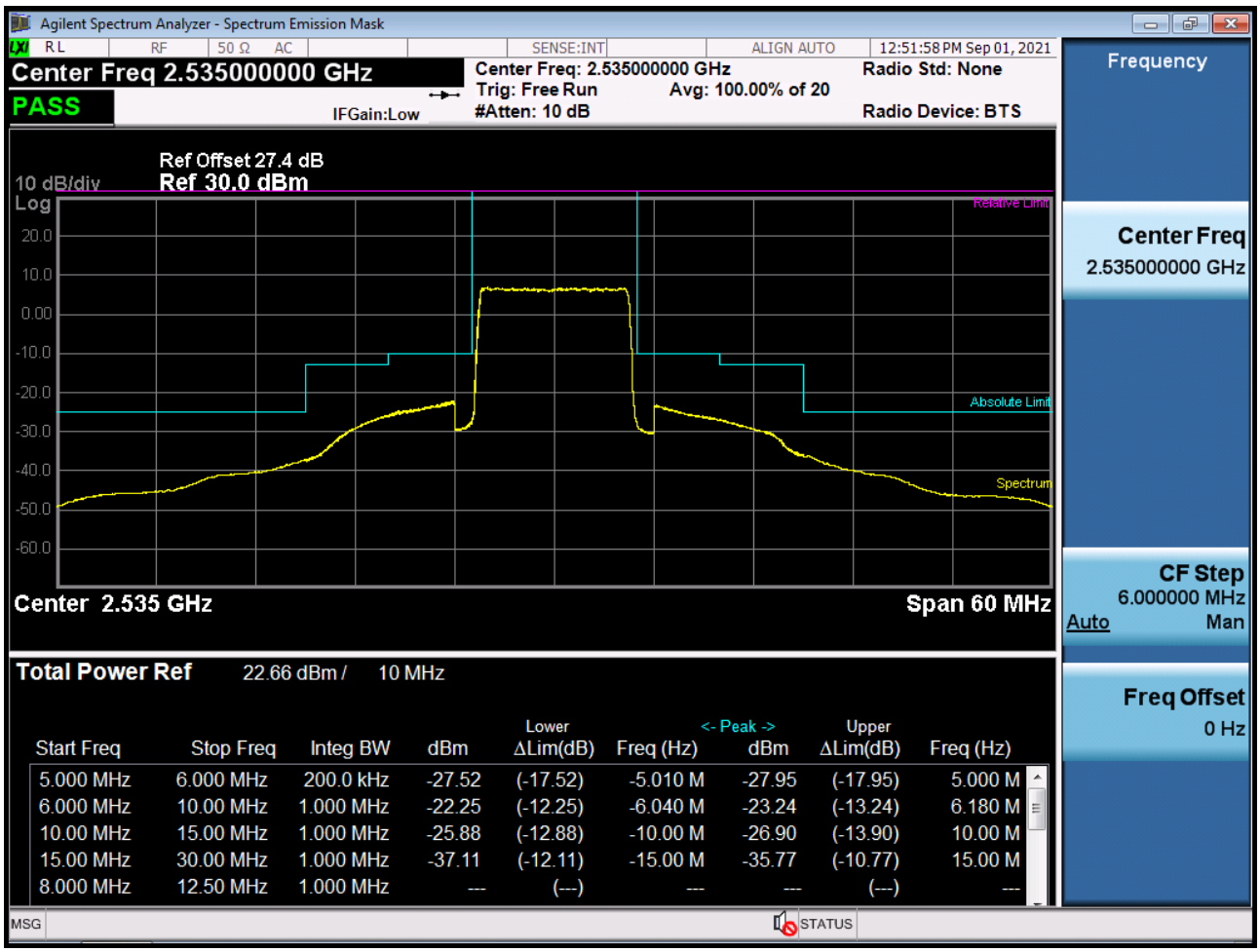
BAND 7. Low Channel Edge Plot (10 MHz Ch.20800 QPSK RB 1, Offset 0)



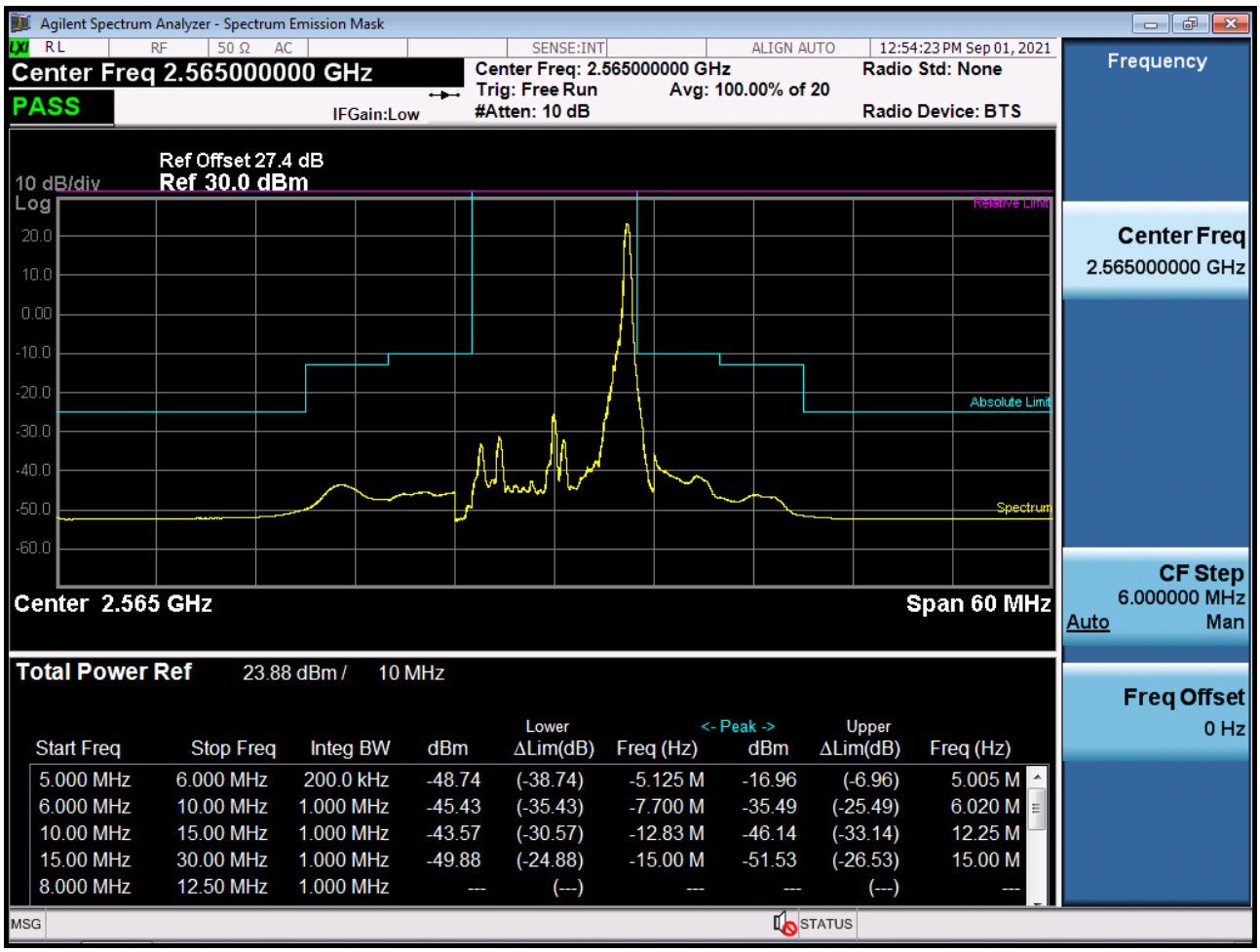
BAND 7. Low Channel Edge Plot (10 MHz Ch.20800 QPSK RB 50, Offset 0)-1

BAND 7. Low Channel Edge Plot (10 MHz Ch.20800 QPSK_RB50_Offset 0)-2

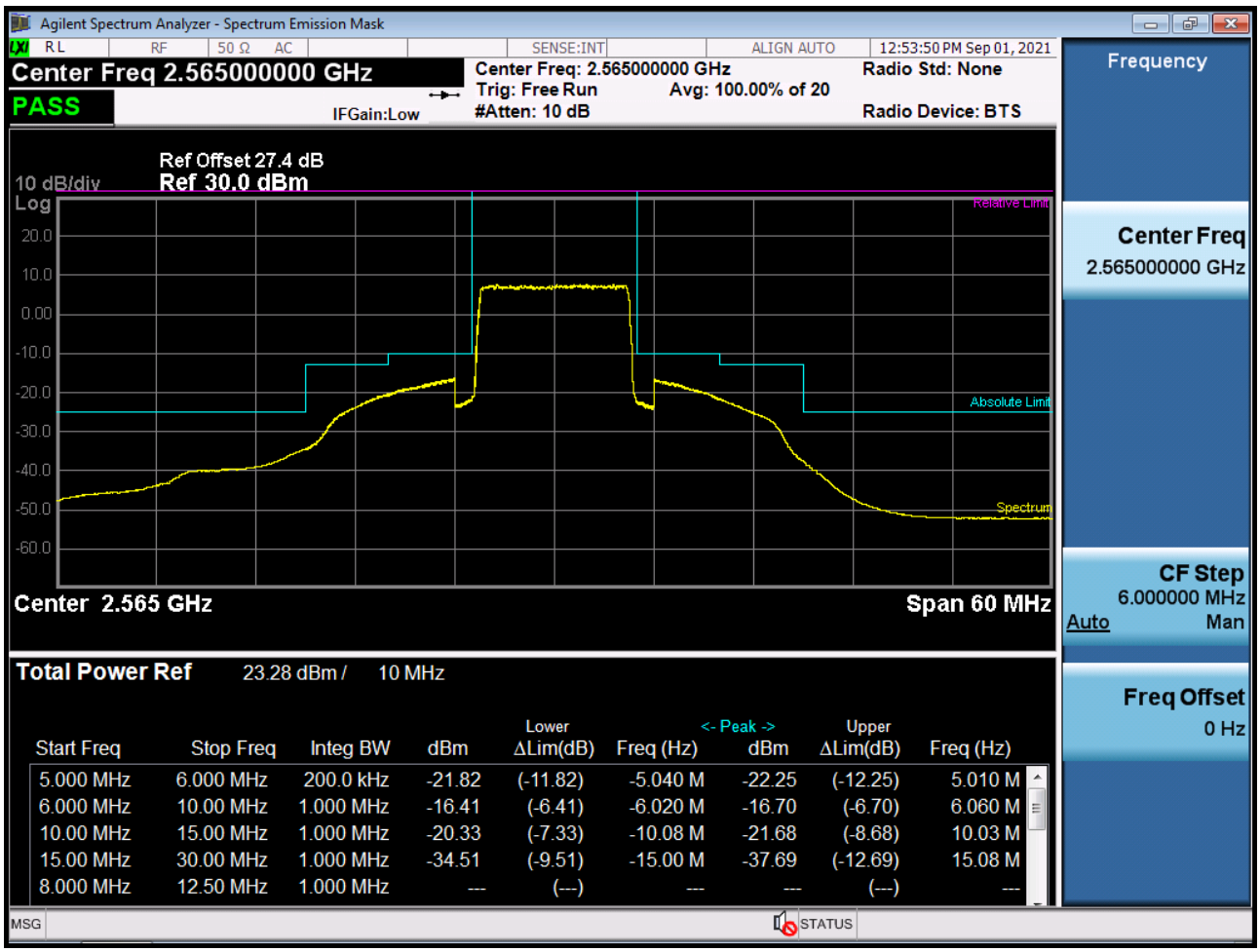
BAND 7. Mid Channel Edge Plot (10 MHz Ch.21100 QPSK RB 50)



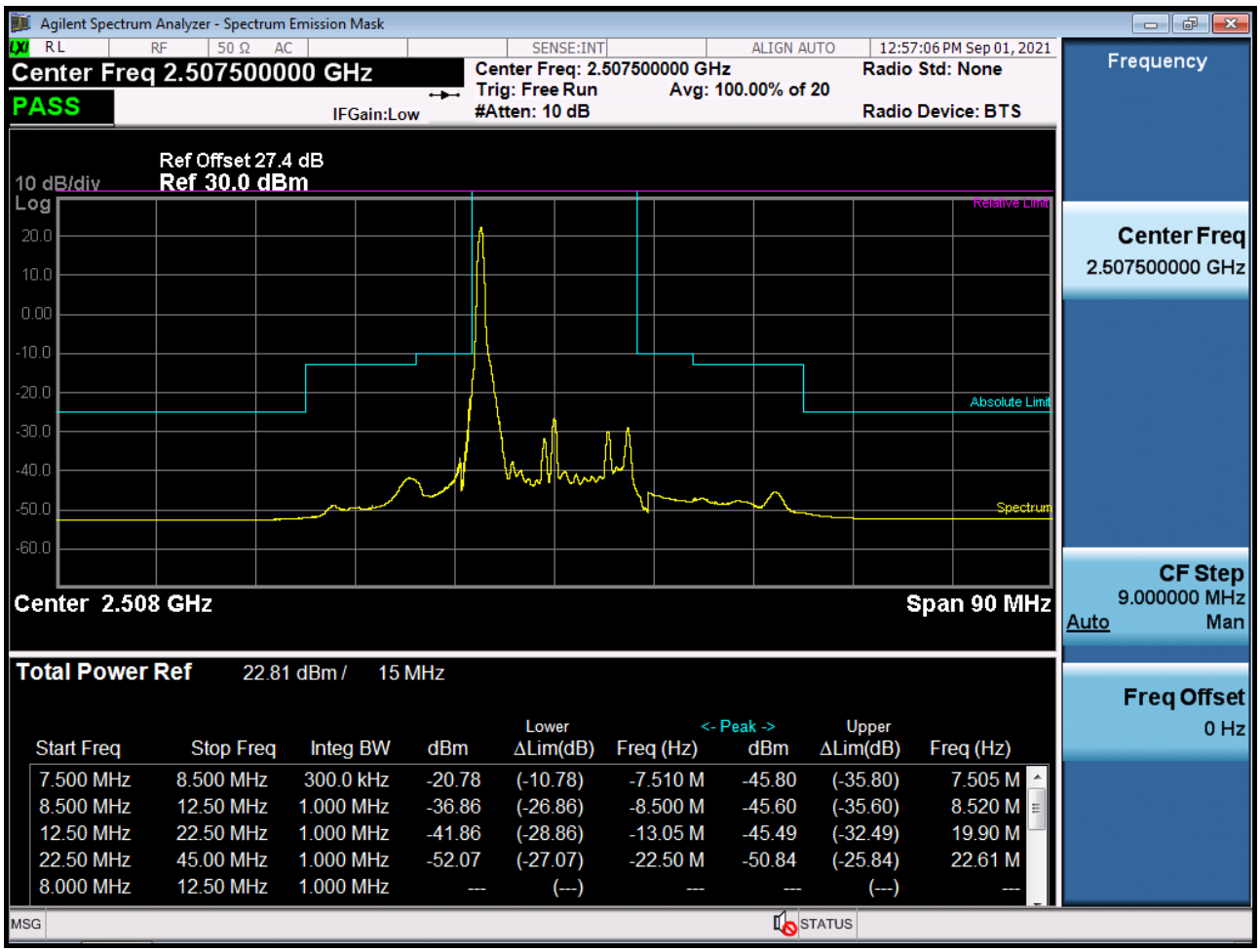
BAND 7. High Channel Edge Plot (10 MHz Ch.21400 QPSK RB 1, Offset 49)



BAND 7. High Channel Edge Plot (10 MHz Ch.21400 QPSK_RB50_Offset 0)



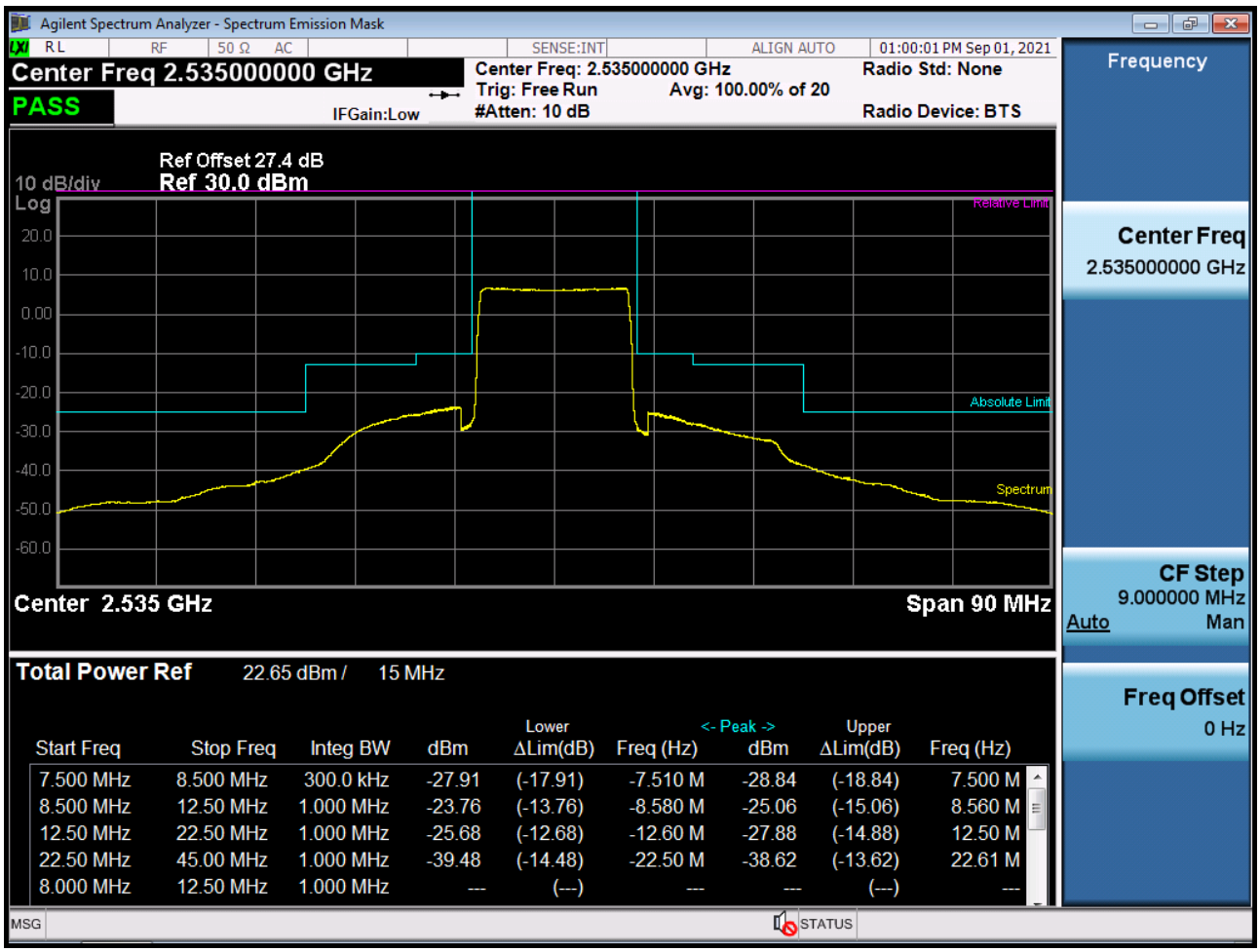
BAND 7. Low Channel Edge Plot (15 MHz Ch.20825 QPSK RB 1, Offset 0)



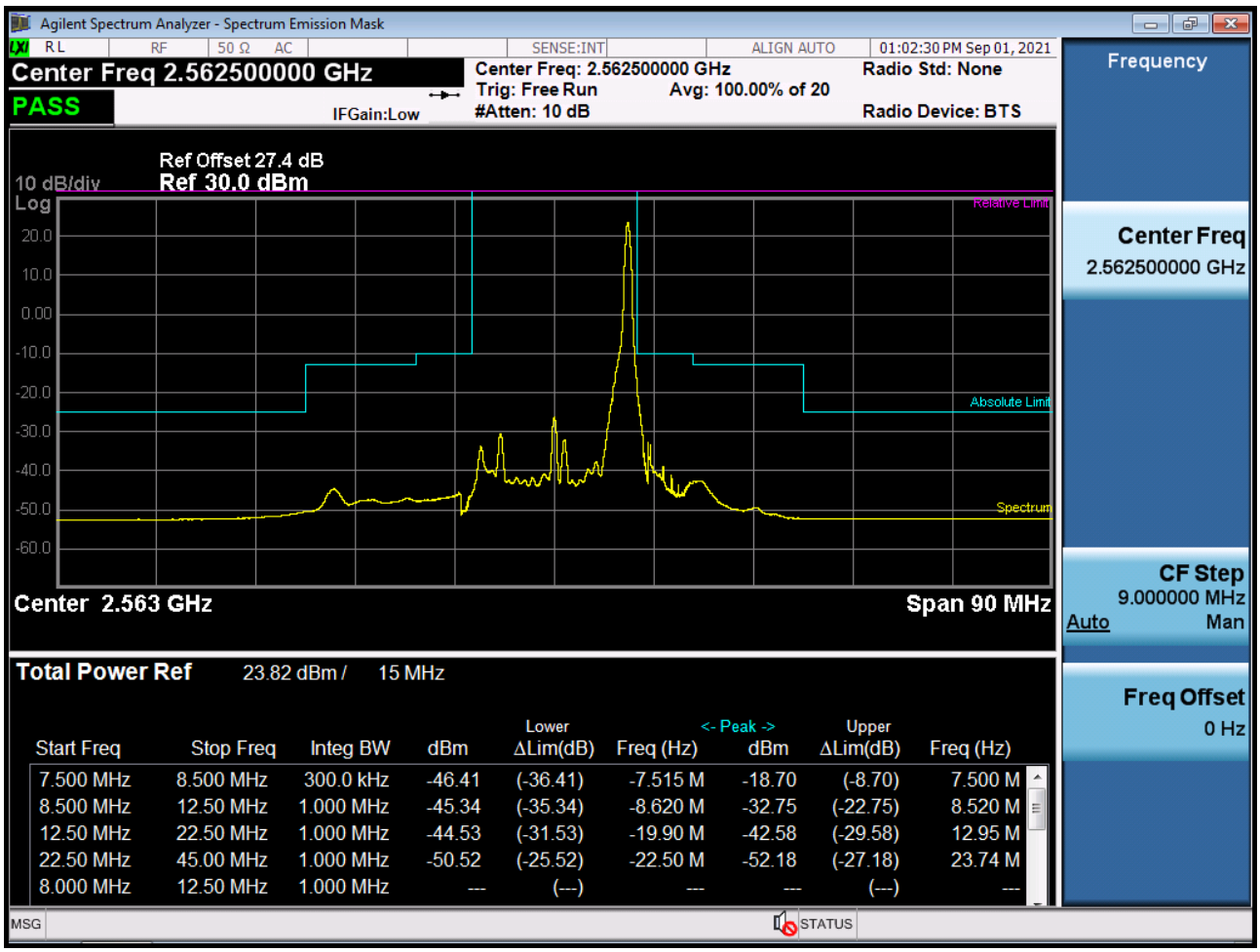
BAND 7. Low Channel Edge Plot (15 MHz Ch.20825 QPSK RB75, Offset 0)-1

BAND 7. Low Channel Edge Plot (15 MHz Ch.20825 QPSK_RB75_Offset 0)-2

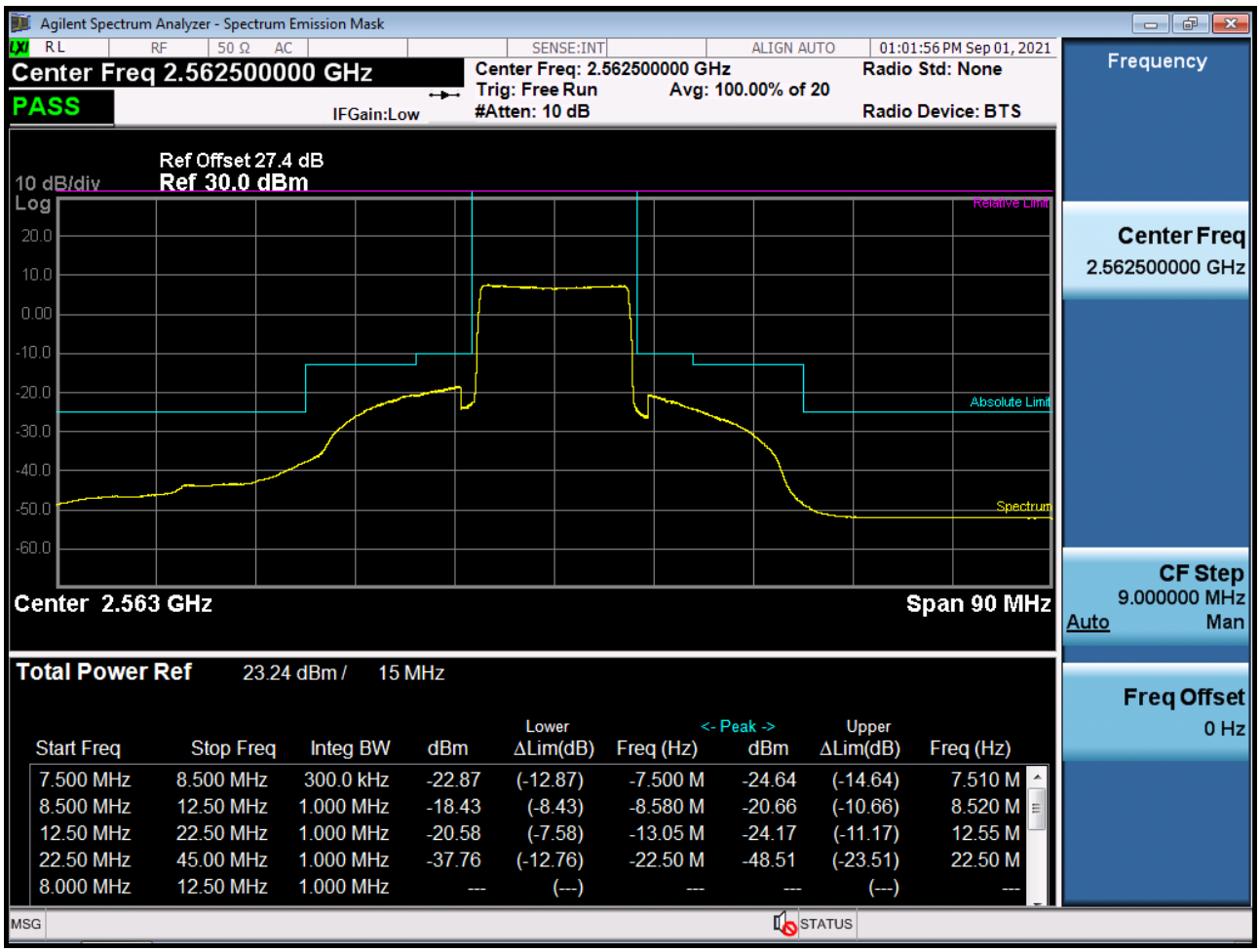
BAND 7. Mid Channel Edge Plot (15 MHz Ch.21100 QPSK RB 75, Offset 0)



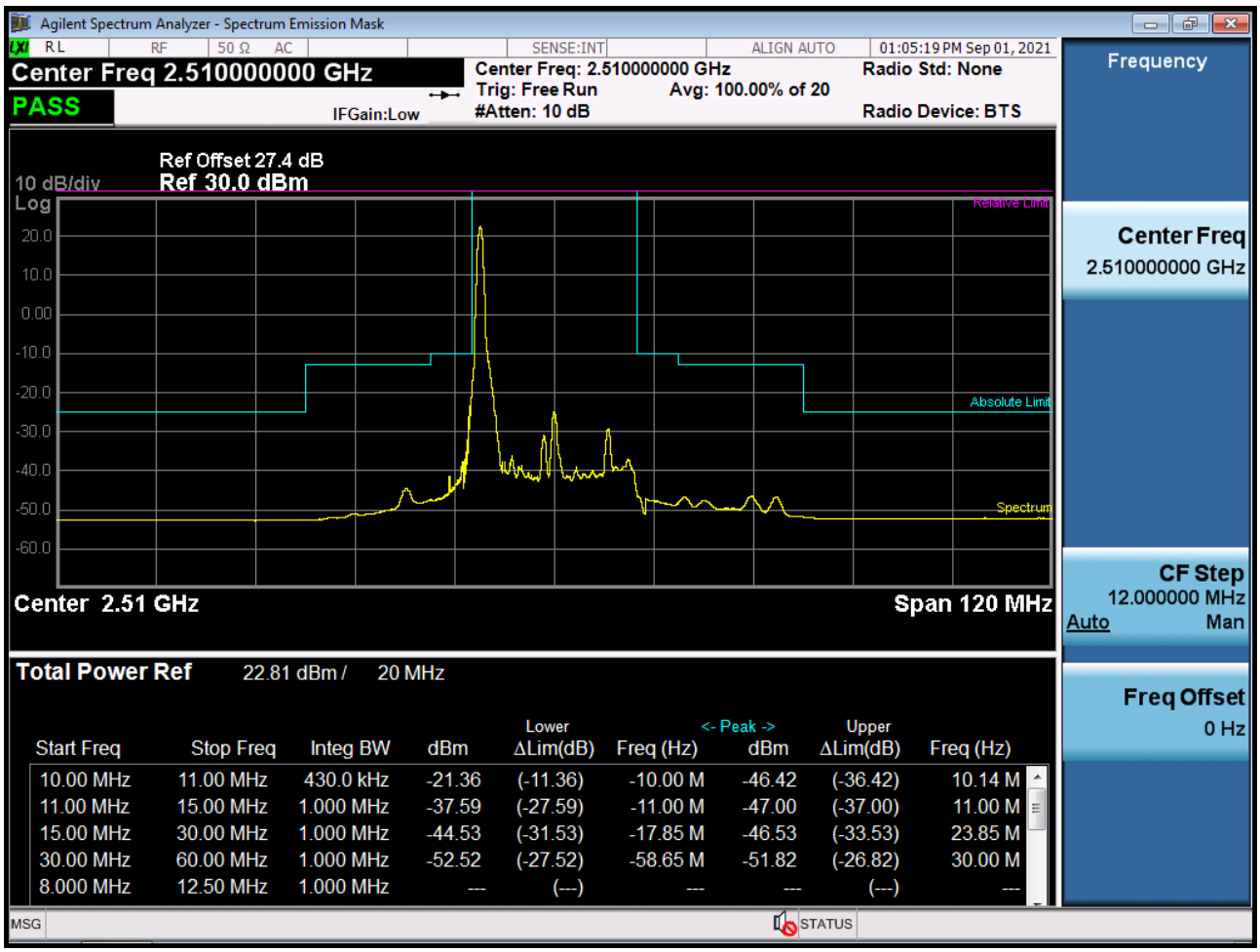
BAND 7. High Channel Edge Plot (15 MHz Ch.21375 QPSK RB 1, Offset 74)



BAND 7. High Channel Edge Plot (15 MHz Ch.21375 QPSK_RB75_Offset 0)



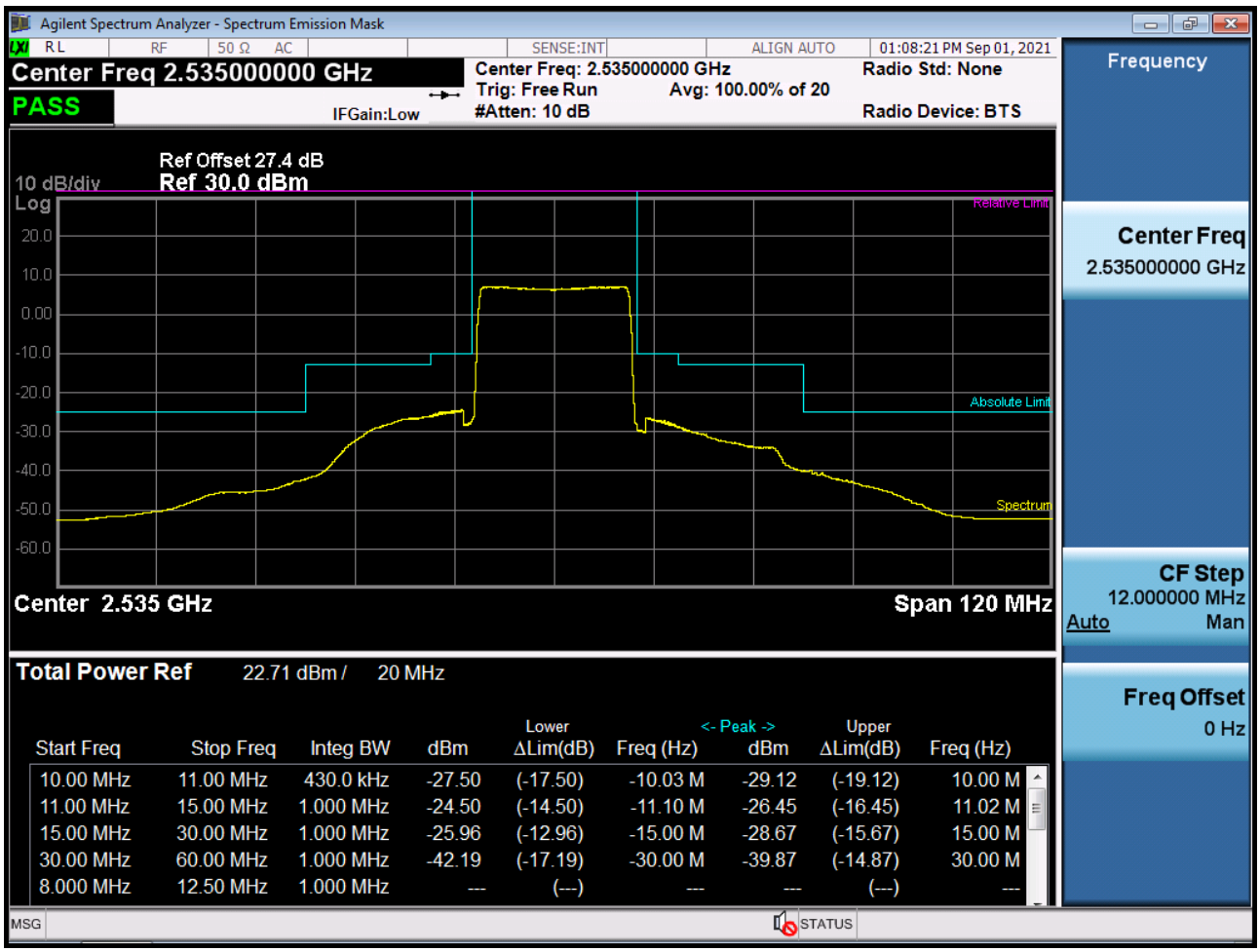
BAND 7. Low Channel Edge Plot (20 MHz Ch.20850 QPSK RB 1, Offset 0)



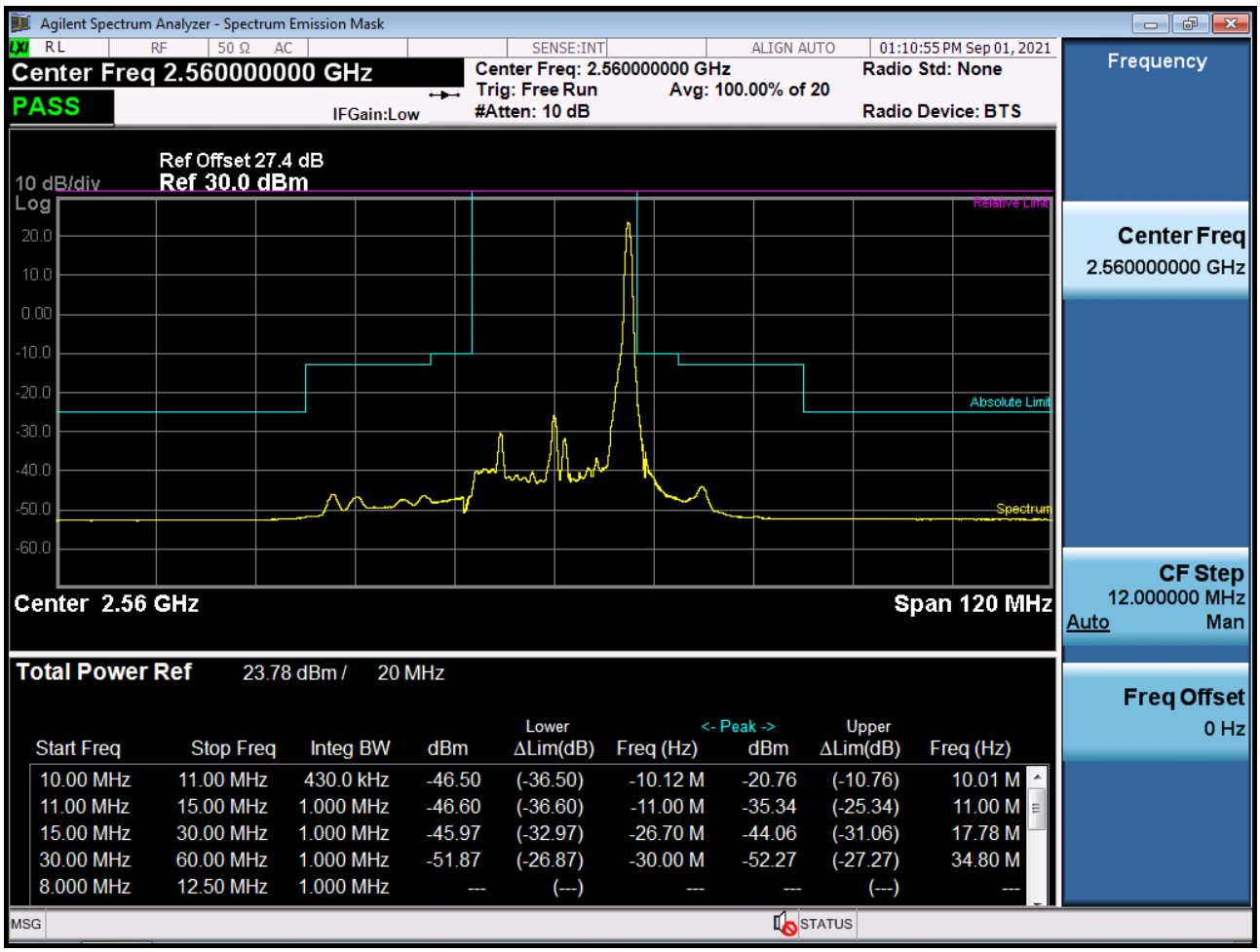
BAND 7. Low Channel Edge Plot (20 MHz Ch.20850 QPSK RB100, Offset 0)-1

BAND 7. Low Channel Edge Plot (20 MHz Ch.20850 QPSK_RB100_Offset 0)-2

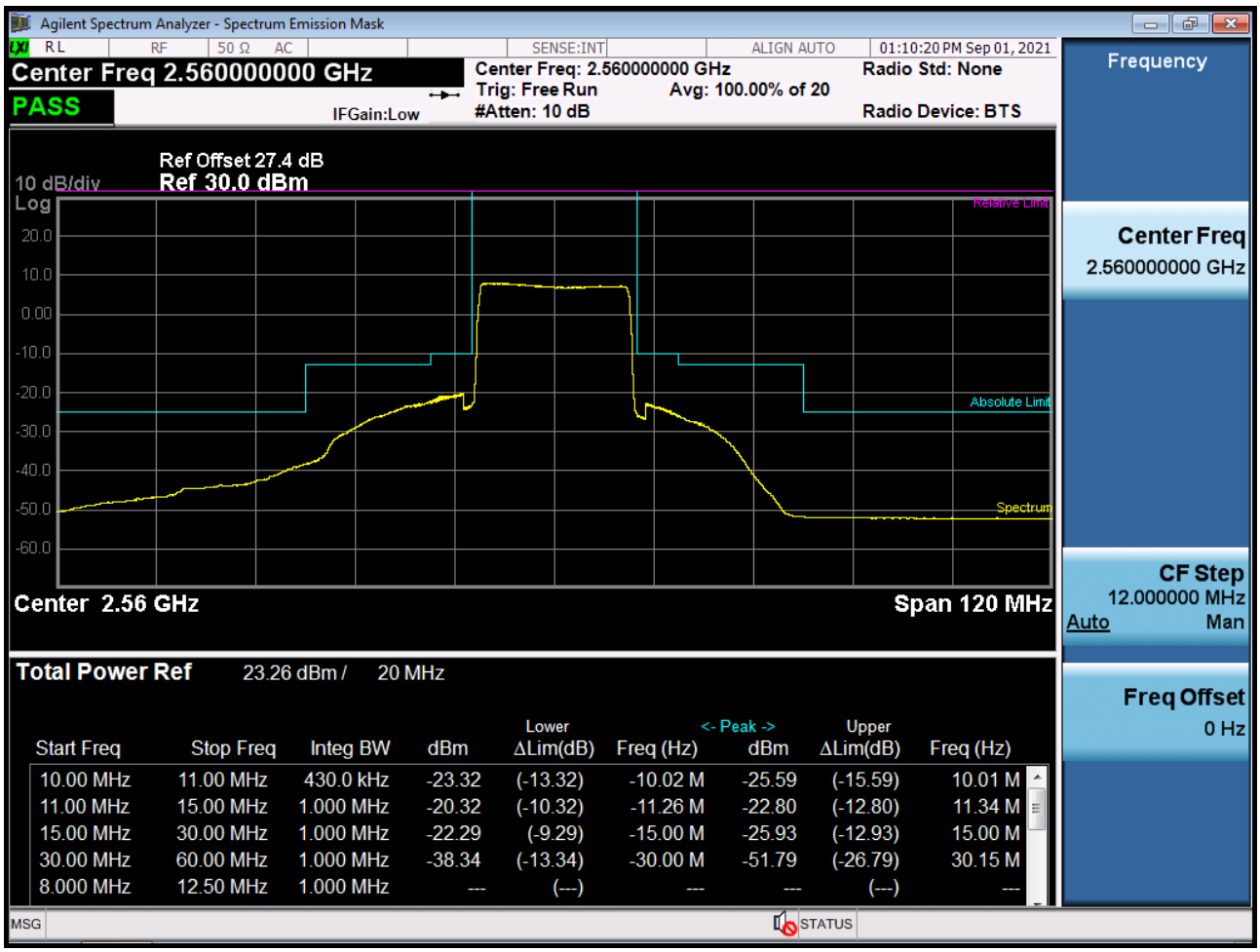
BAND 7. Mid Channel Edge Plot (20 MHz Ch.21100 QPSK RB 100, offset 0)



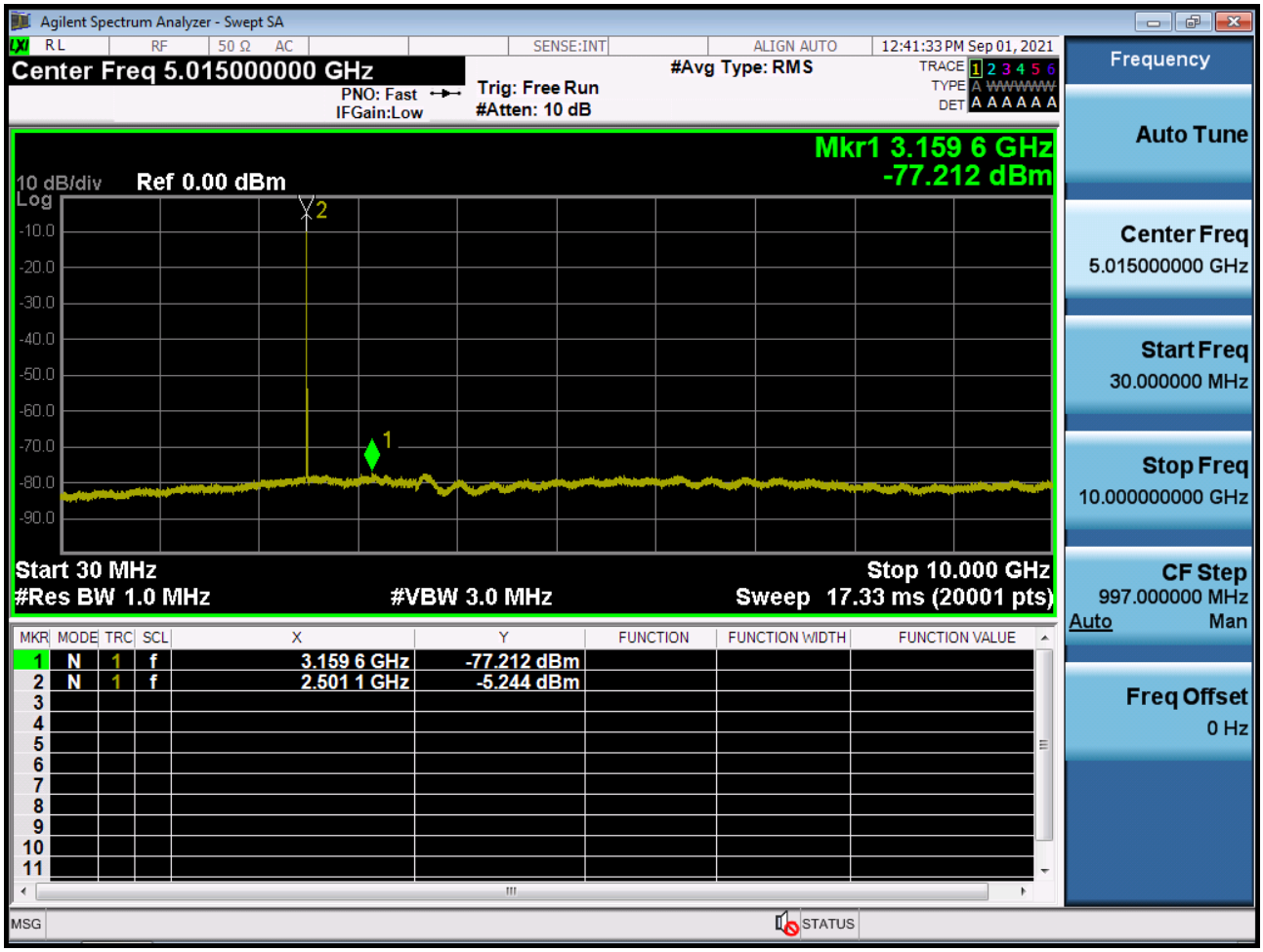
BAND 7. High Channel Edge Plot (20 MHz Ch.21350 QPSK RB 1, Offset 99)



BAND 7. High Channel Edge Plot (20 MHz Ch.21350 QPSK_RB100_Offset 0)

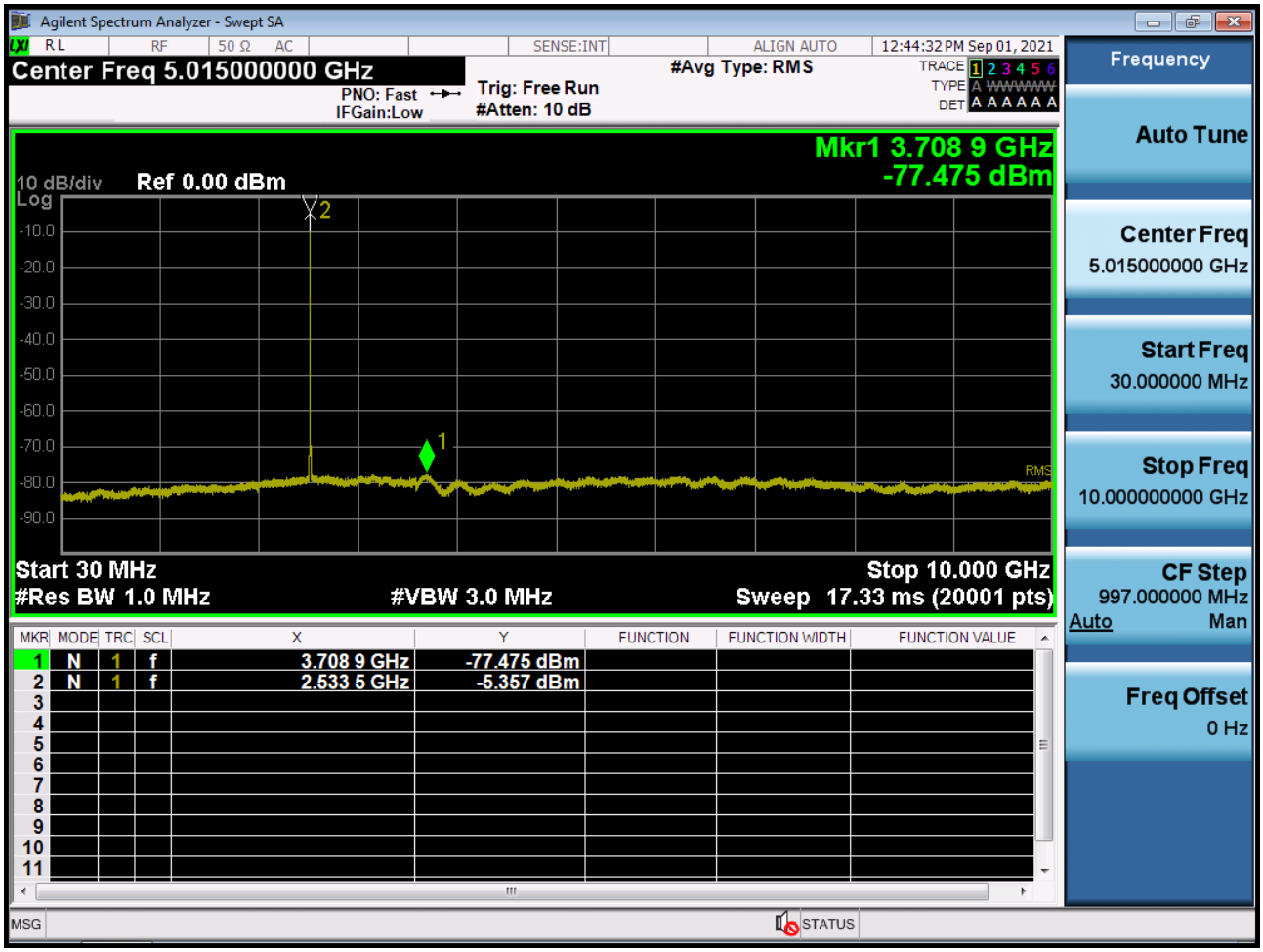


BAND 7. Conducted Spurious_1 (20775ch_5 MHz_QPSK_RB 1_0)



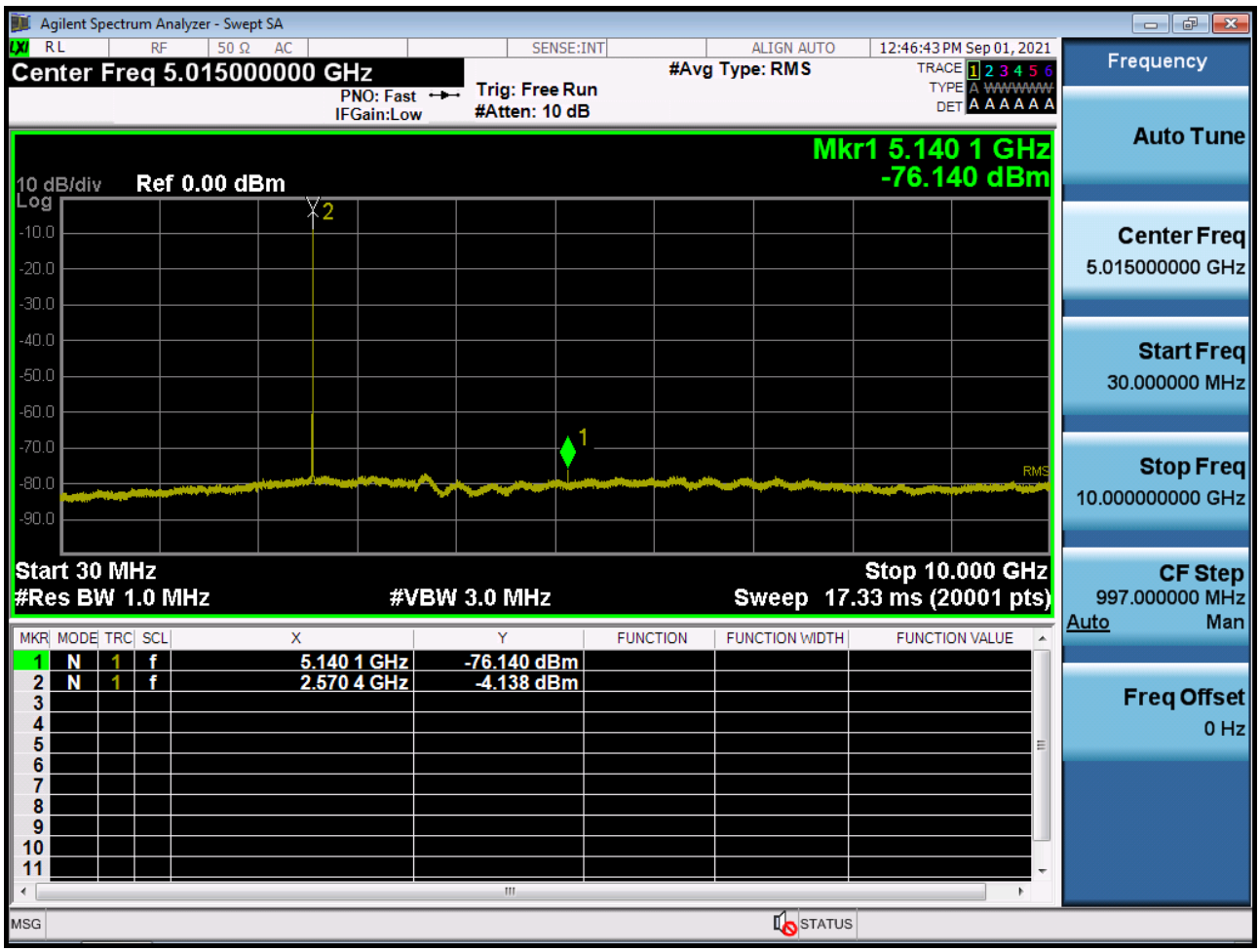
BAND 7. Conducted Spurious_2 (20775ch_5 MHz_QPSK_RB 1_0)

BAND 7. Conducted Spurious_1 (21100ch_5 MHz_QPSK_RB 1_0)



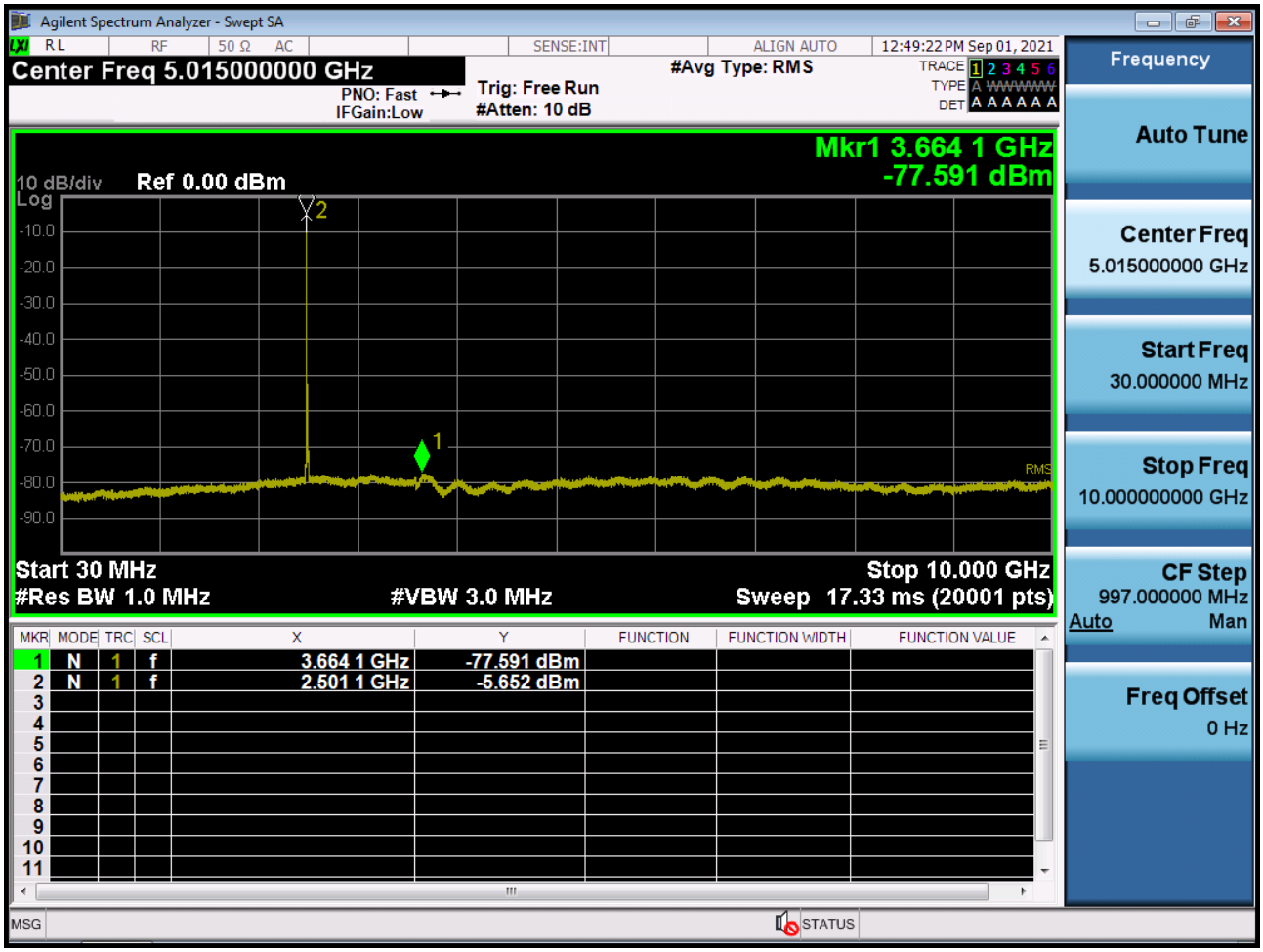
BAND 7. Conducted Spurious_2 (21100ch_5 MHz_QPSK_RB 1_0)

BAND 7. Conducted Spurious_1 (21425ch_5 MHz_QPSK_RB 1_0)



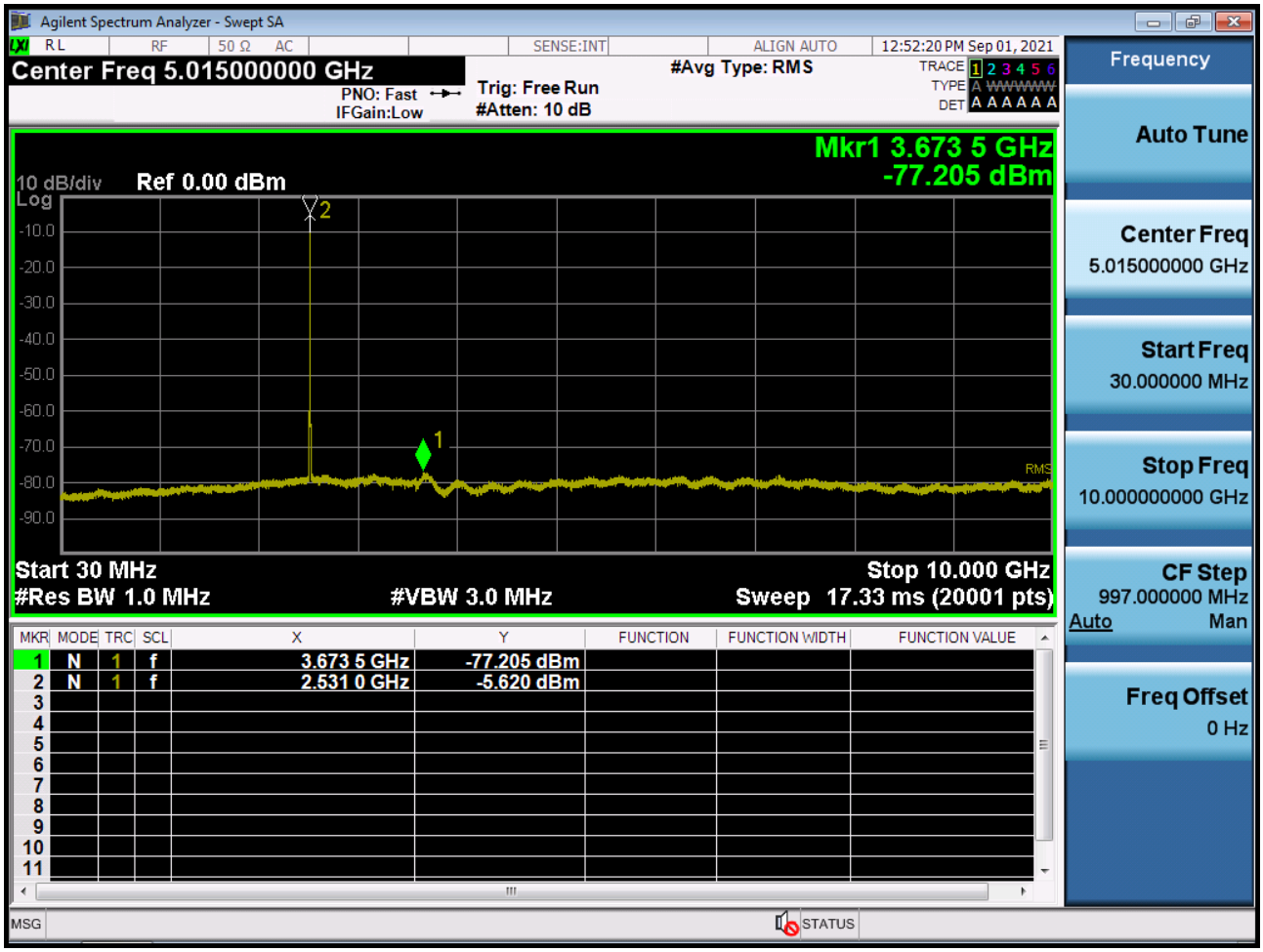
BAND 7. Conducted Spurious_2 (21425ch_5 MHz_QPSK_RB 1_0)

BAND 7. Conducted Spurious_1 (20800ch_10 MHz_QPSK_RB 1_0)



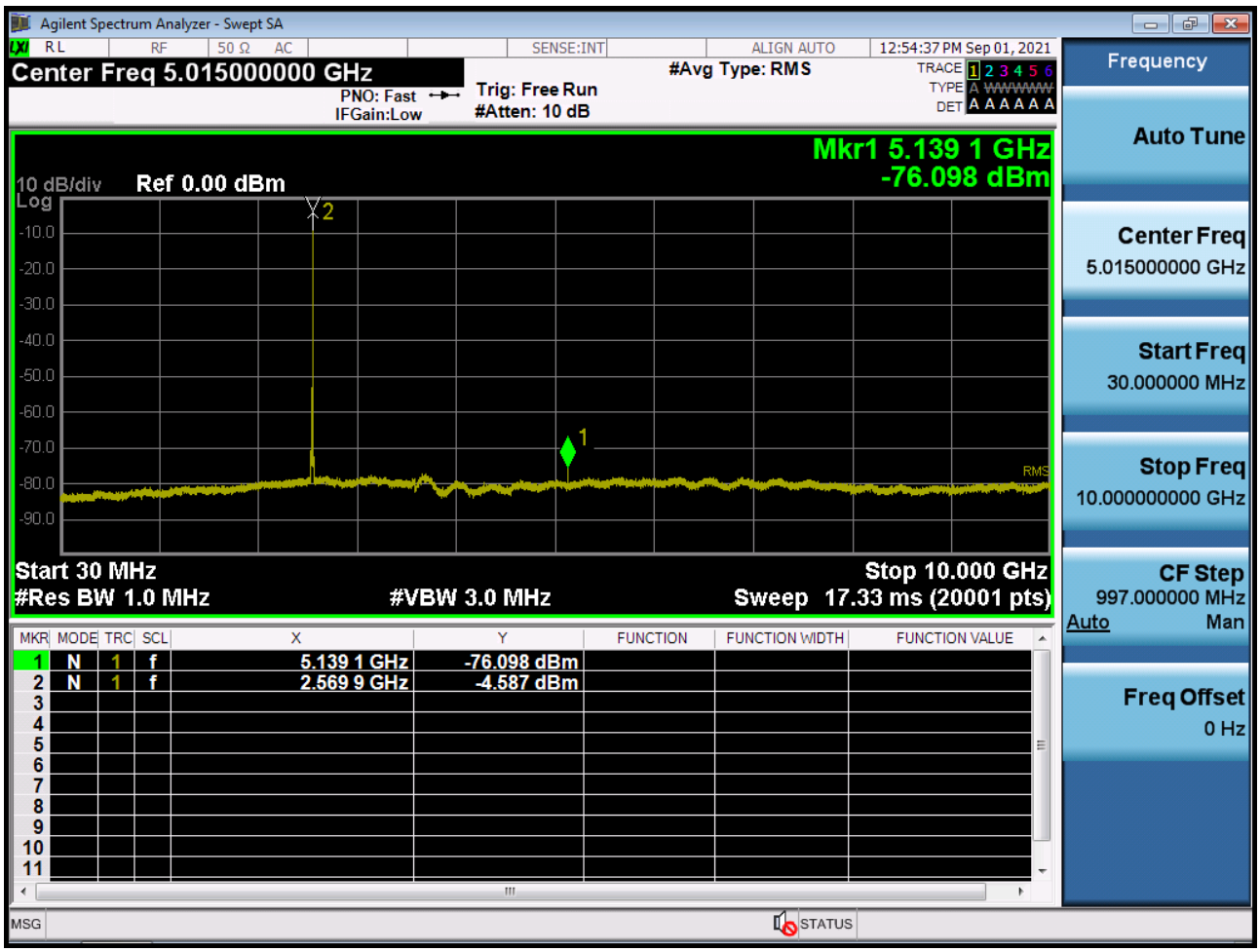
BAND 7. Conducted Spurious_2 (20800ch_10 MHz_QPSK_RB 1_0)

BAND 7. Conducted Spurious_1 (21100ch_10 MHz_QPSK_RB 1_0)



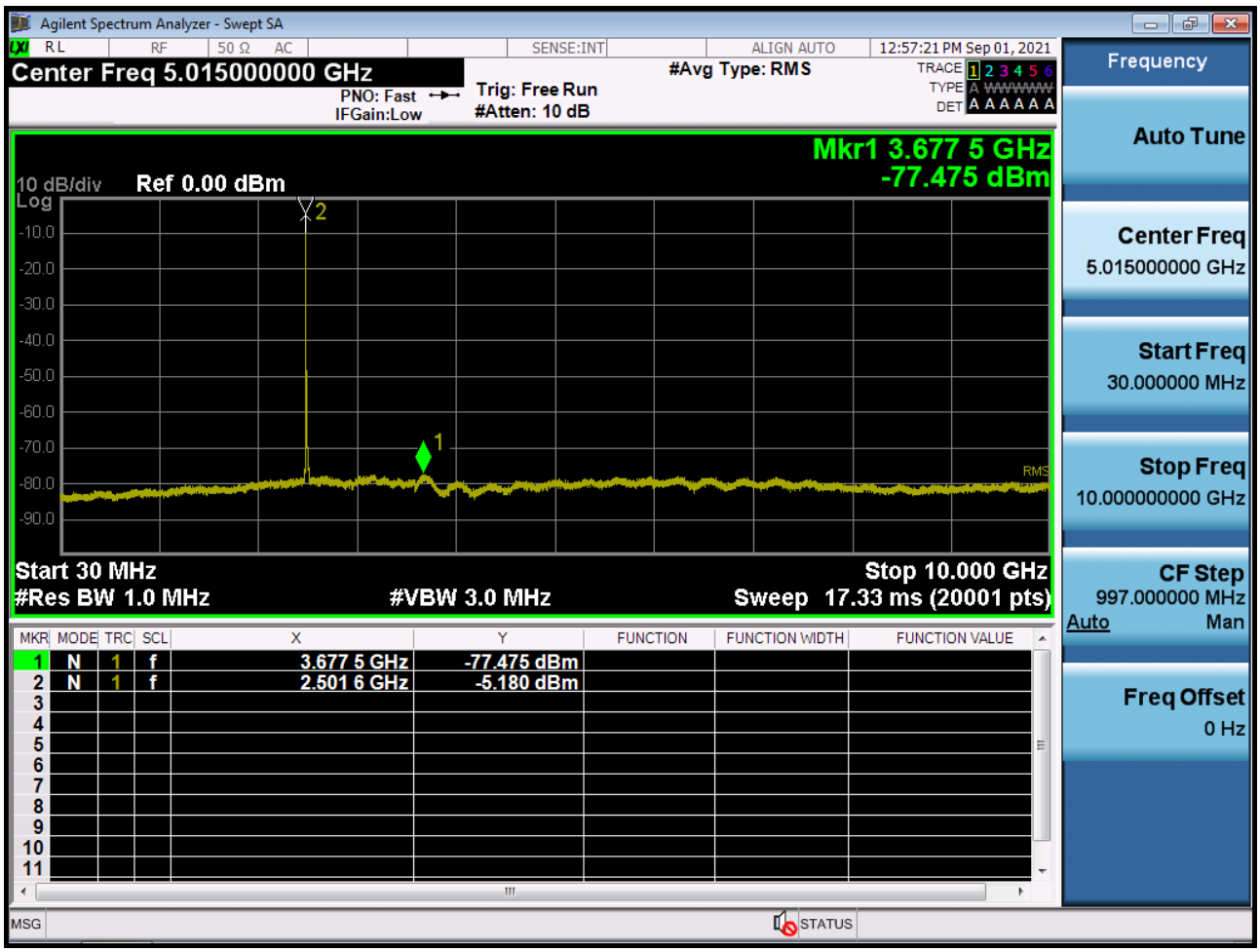
BAND 7. Conducted Spurious_2 (21100ch_10 MHz_QPSK_RB 1_0)

BAND 7. Conducted Spurious_1 (21400ch_10 MHz_QPSK_RB 1_0)



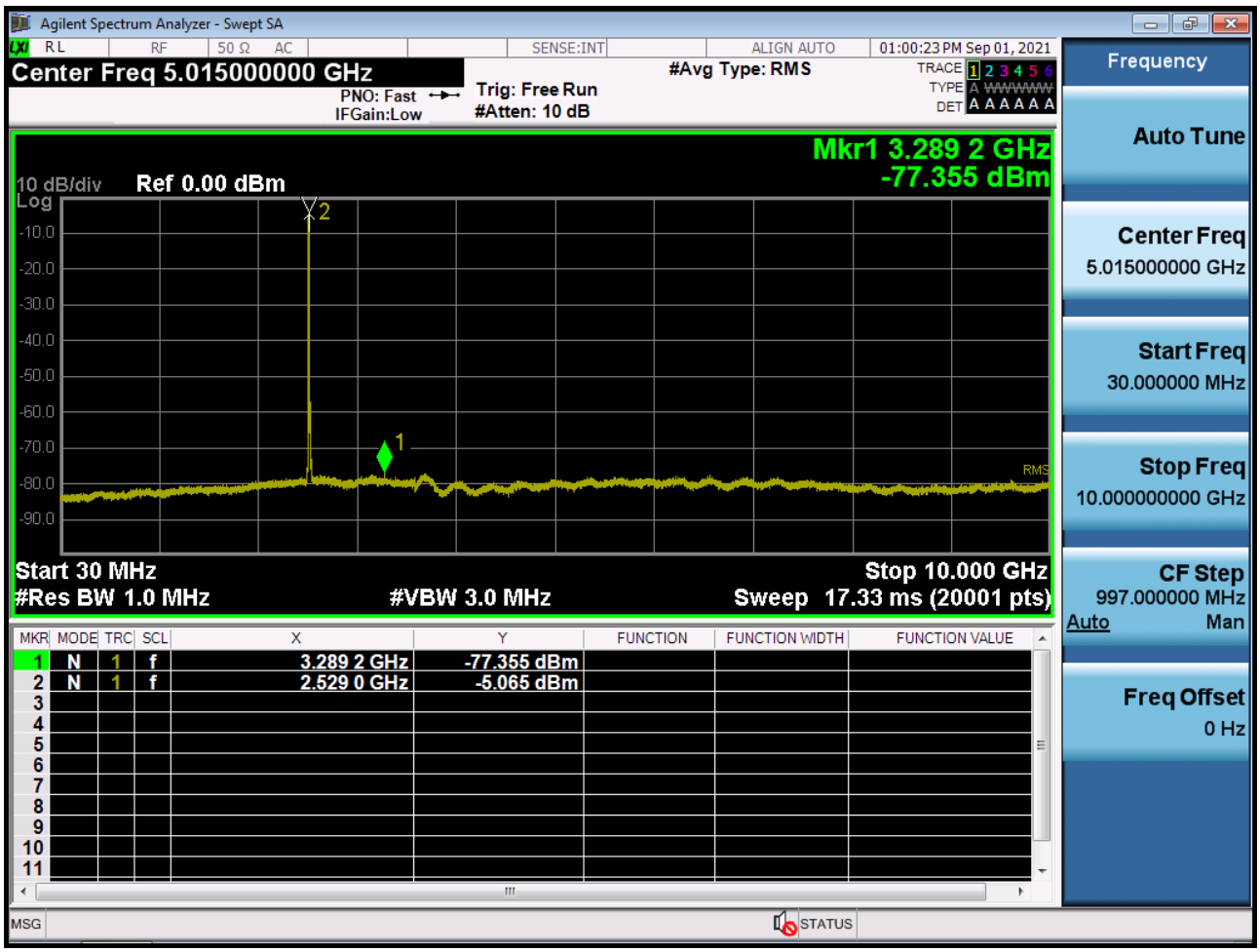
BAND 7. Conducted Spurious_2 (21400ch_10 MHz_QPSK_RB 1_0)

BAND 7. Conducted Spurious_1 (20825ch_15 MHz_QPSK_RB 1_0)



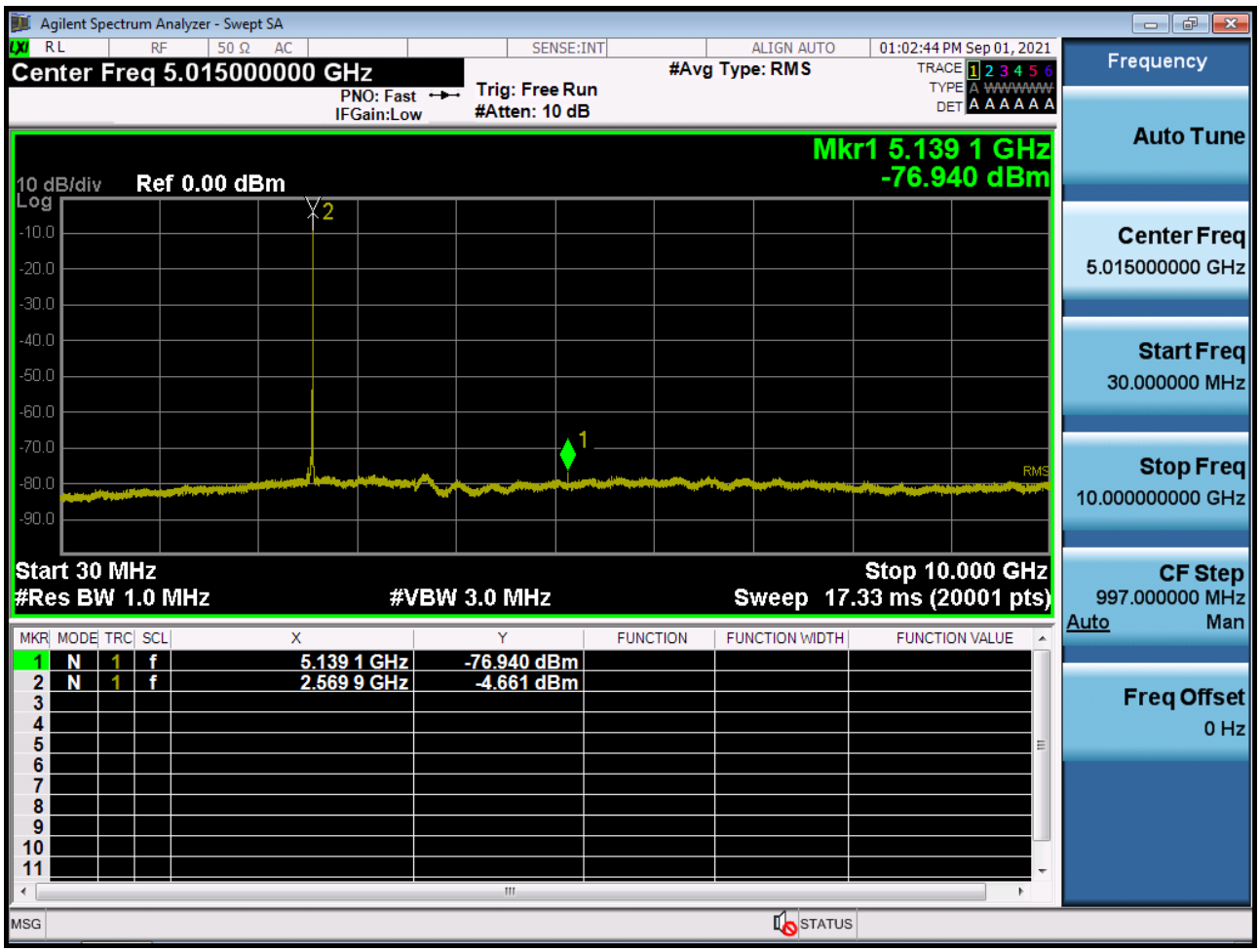
BAND 7. Conducted Spurious_2 (20825ch_15 MHz_QPSK_RB 1_0)

BAND 7. Conducted Spurious_1 (21100ch_15 MHz_QPSK_RB 1_0)



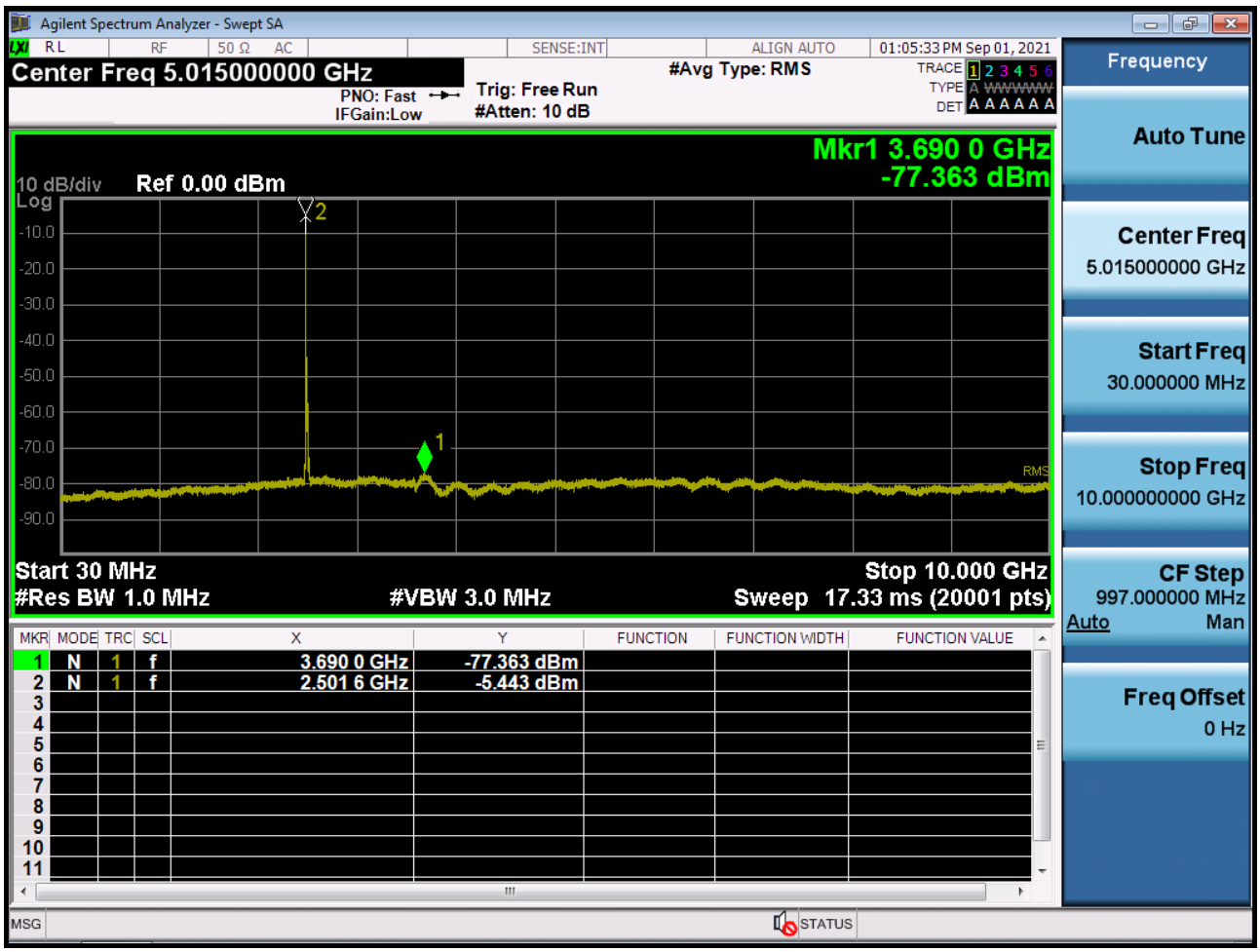
BAND 7. Conducted Spurious_2 (21100ch_15 MHz_QPSK_RB 1_0)

BAND 7. Conducted Spurious_1 (21375ch_15 MHz_QPSK_RB 1_0)



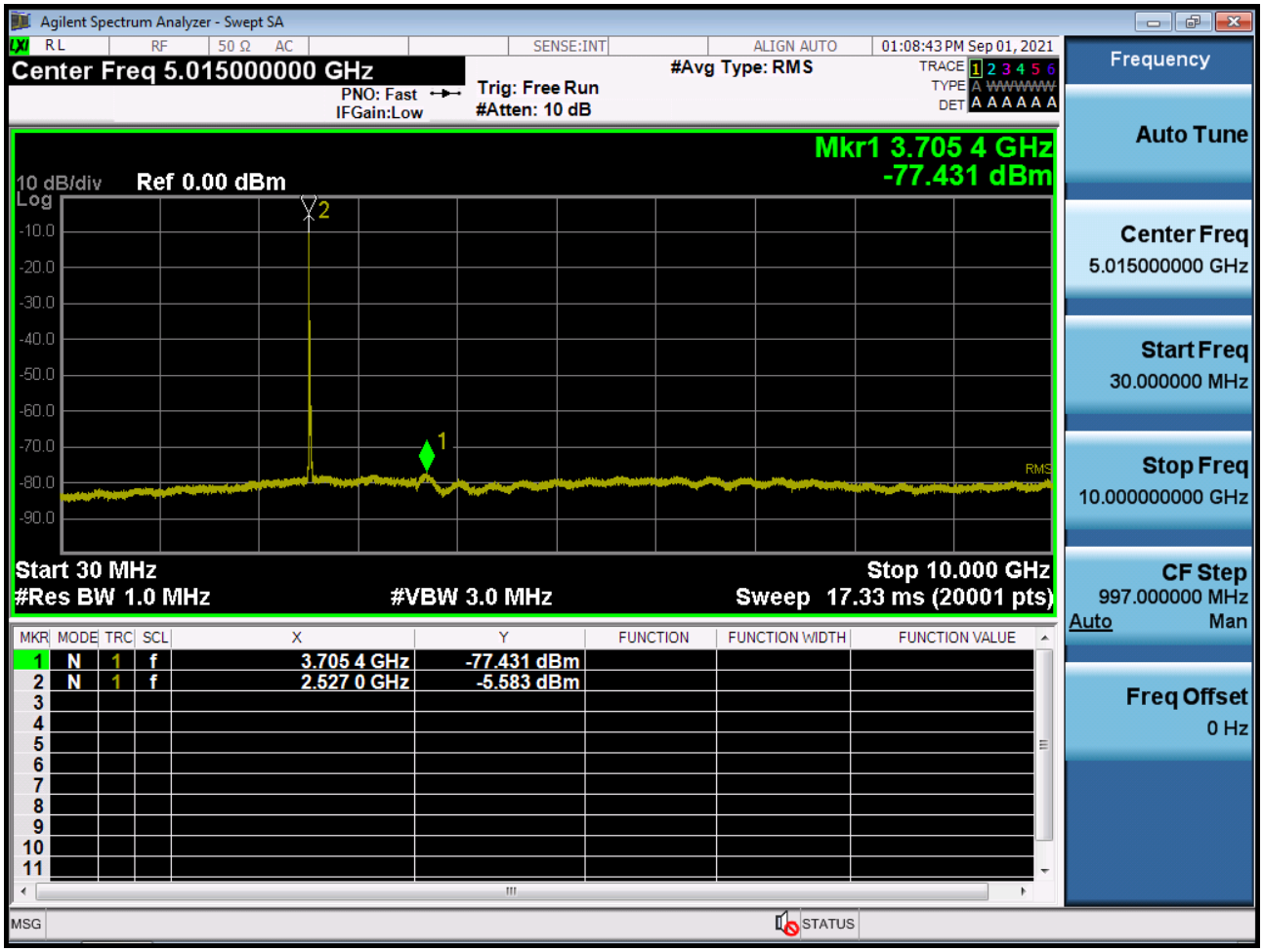
BAND 7. Conducted Spurious_2 (21375ch_15 MHz_QPSK_RB 1_0)

BAND 7. Conducted Spurious_1 (20850ch_20 MHz_QPSK_RB 1_0)



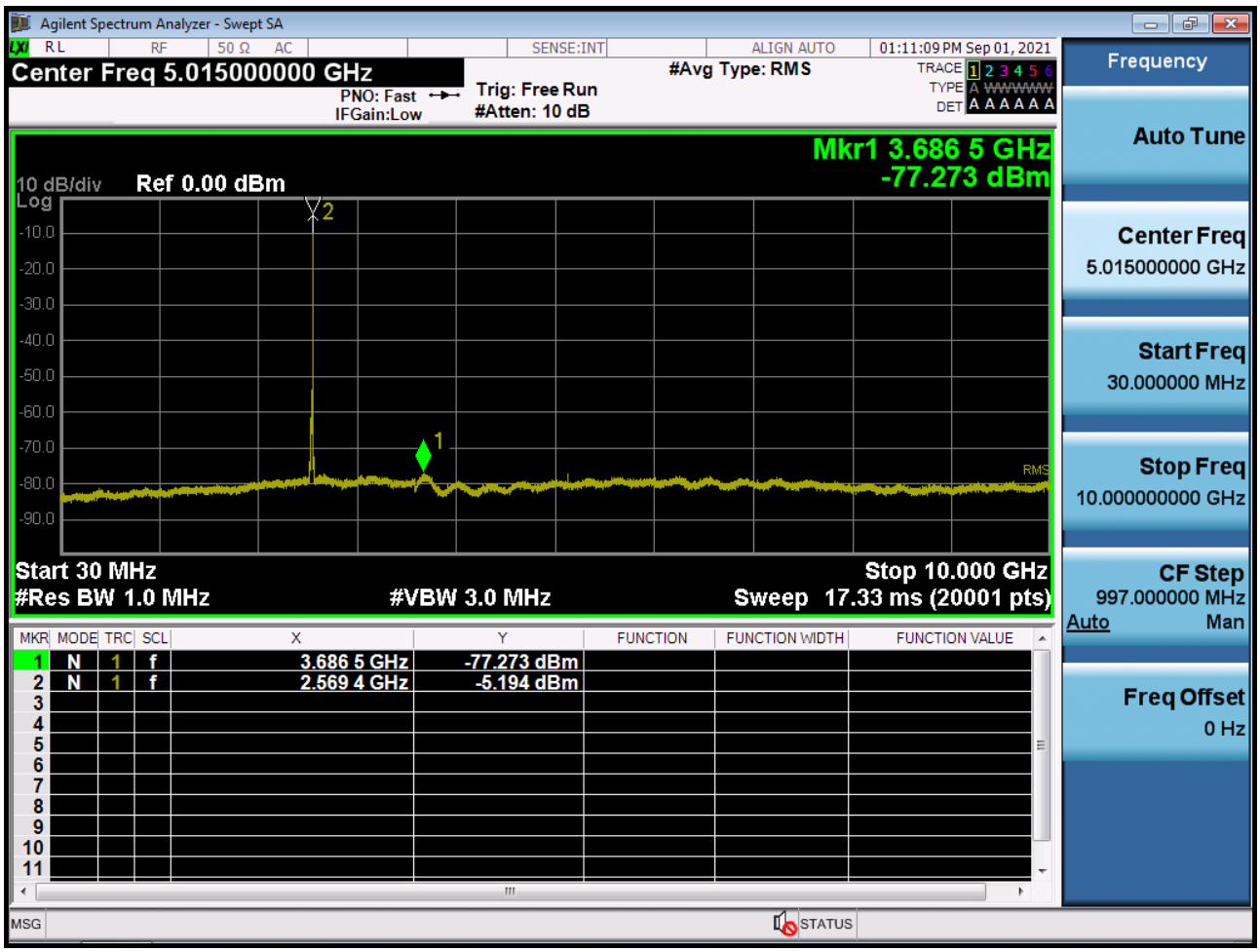
BAND 7. Conducted Spurious_2 (20850ch_20 MHz_QPSK_RB 1_0)

BAND 7. Conducted Spurious_1 (21100ch_20 MHz_QPSK_RB 1_0)



BAND 7. Conducted Spurious_2 (21100ch_20 MHz_QPSK_RB 1_0)

BAND 7. Conducted Spurious_1 (21350ch_20 MHz_QPSK_RB 1_0)



BAND 7. Conducted Spurious_2 (21350ch_20 MHz_QPSK_RB 1_0)

10. APPENDIX A_ TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-2109-FC057-P