74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA
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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:
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-FC058

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 38 (5)	2572.5 – 2617.5	4M49G7D	QPSK	0.231	23.63
		4M50W7D	16QAM	0.185	22.67
		4M52W7D	64QAM	0.147	21.68
LTE – Band 38 (10)	2575.0 – 2615.0	8M98G7D	QPSK	0.234	23.69
		8M98W7D	16QAM	0.190	22.79
		8M98W7D	64QAM	0.149	21.74
LTE – Band 38 (15)	2577.5 – 2612.5	13M5G7D	QPSK	0.237	23.74
		13M5W7D	16QAM	0.191	22.80
		13M5W7D	64QAM	0.151	21.79
LTE – Band 38 (20)	2580.0 – 2610.0	18M0G7D	QPSK	0.235	23.70
		18M0W7D	16QAM	0.188	22.74
		17M9W7D	64QAM	0.149	21.73

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-FC058	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:	2572.5 – 2617.5 : 5 MHz 2575.0 – 2615.0 : 10 MHz 2577.5 – 2612.5 : 15 MHz 2580.0 – 2610.0 : 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
Channel Edge	- KDB 971168 D01 v03r01 – Section 6.0 - ANSI C63.26-2015 – Section 5.7
Spurious and Harmonic Emissions at Antenna Terminal	- KDB 971168 D01 v03r01 – Section 6.0 - ANSI C63.26-2015 – Section 5.7
Conducted Output Power	- N/A (See SAR Report)
Peak- to- Average Ratio	- KDB 971168 D01 v03r01 – Section 5.7 - ANSI C63.26-2015 – Section 5.2.3.4 - ANSI C63.26-2015 – Section 5.2.6(only GSM)
Frequency stability	- ANSI C63.26-2015 – Section 5.6
Effective Radiated Power/ Effective Isotropic Radiated Power	- KDB 971168 D01 v03r01 – Section 5.2 & 5.8 - ANSI/TIA-603-E-2016 – Section 2.2.17
Radiated Spurious and Harmonic Emissions	- KDB 971168 D01 v03r01 – Section 6.2 - ANSI/TIA-603-E-2016 – Section 2.2.12

3.2 RADIATED POWER

Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

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

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5 % of the expected OBW, not to exceed 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;

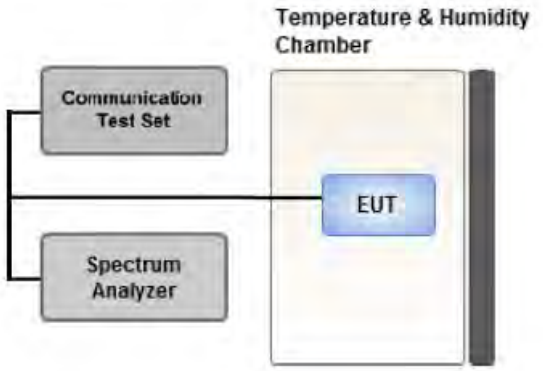
$$\text{Result}_{(dBm)} = \text{Pg}_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dBi)}$$

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

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

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

3.4 PEAK- TO- AVERAGE RATIO



Test setup

① CCDF Procedure for PAPR

Test Settings

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

② **Alternate Procedure for PAPR**

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

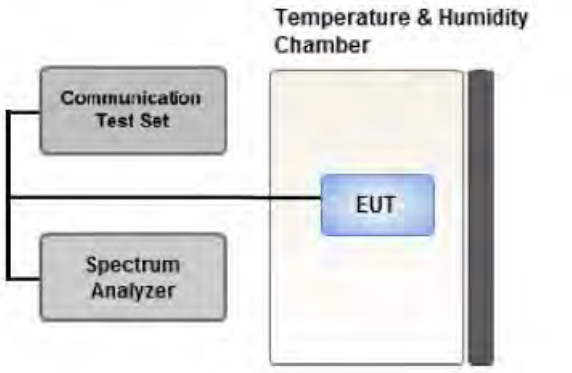
The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW ≥ 3 × RBW.

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.

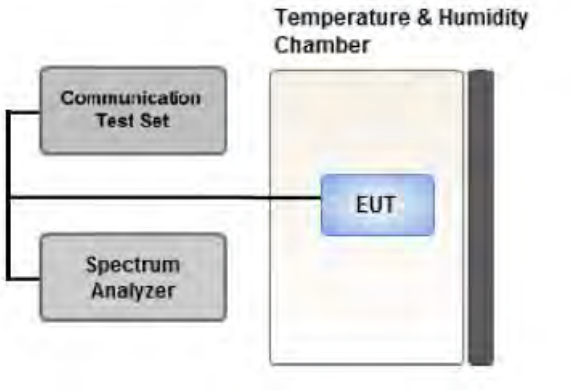
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

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.

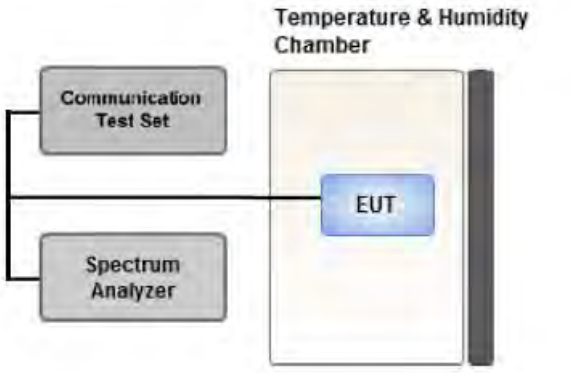
Test Settings

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

Test Notes

1. Duty Cycle factor already applied on the factor.
   - Duty Cycle factor(dB) = 3.98
   - Factor(dB) = Duty Cycle factor + Cable Loss + Ext. Attenuator + Power Splitter
   - Result(dBm) = Reading + Factor

3.7 CHANNEL EDGE



Test setup

Test Overview

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

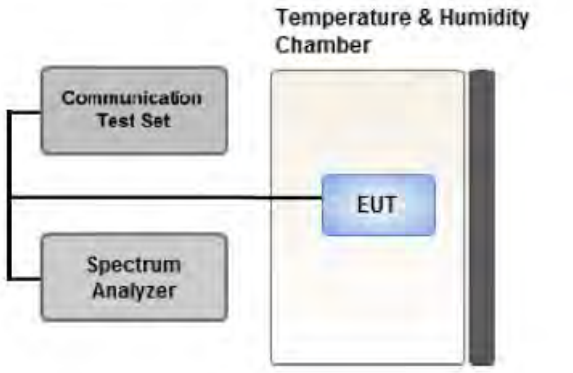
Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. Within 1 MHz of the channel edge the RBW should be 2% of EBW, then 1 MHz after that.
4. VBW > 3 x RBW
5. Detector = RMS
6. Number of sweep points ≥ 2 x Span/RBW
7. Trace mode = trace average
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Notes

1. The attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge,
2. 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge.
3. 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge.
4. The attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz.
5. 55 + 10 log (P) dB at or below 2490.5 MHz.
6. X is the greater of 6 MHz or the actual emission bandwidth
7. The band edge measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer

3.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE



Test setup

Test Overview

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

The frequency stability of the transmitter is measured by:

1. Temperature:

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

2. Primary Supply Voltage:

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

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

Test Settings

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

3.9 WORST CASE(RADIATED TEST)

- The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
- All modes of operation were investigated and the worst case configuration results are reported.
- The worst case is reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the test data.
- Please refer to the table below.
- All modes of operation were investigated and the worst case configuration results are reported.
- Please refer to the table below.
- 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)

- 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)

[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 Radio	QPSK, 16QAM, 64QAM	5, 10, 15, 20	Mid	Full RB	0
Channel Edge	QPSK	5	Low	1	0
			High	1	24
		10	Low	1	0
			High	1	49
		15	Low	1	0
			High	1	74
		20	Low	1	0
			High	1	99
		5, 10, 15, 20	Low, Mid, High	Full RB	0
Spurious and Harmonic Emissions at Antenna Terminal	QPSK	5, 10, 15, 20	Low, Mid, High	1	0

4. LIST OF TEST EQUIPMENT

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
H.P.F	FBSR-02B(WHK1.2/15 G-10EF)	T&M SYSTEM	-	03/02/2022	Annual
H.P.F	FBSR-02B(WHK3.3/18 G-10EF)	T&M SYSTEM	-	03/02/2022	Annual
Power Splitter(DC ~ 26.5 GHz)	11667B	Hewlett Packard	11275	04/07/2022	Annual
DC Power Supply	E3632A	Agilent	MY40010147	06/28/2022	Annual
Dipole Antenna	UHAP	Schwarzbeck	557	04/05/2023	Biennial
Dipole Antenna	UHAP	Schwarzbeck	558	04/05/2023	Biennial
Chamber	SU-642	ESPEC	93008124	03/15/2022	Annual
Horn Antenna(1 ~ 18 GHz)	BBHA 9120D	Schwarzbeck	147	08/30/2022	Biennial
Horn Antenna(1 ~ 18 GHz)	BBHA 9120D	Schwarzbeck	9120D-1298	09/15/2023	Biennial
Horn Antenna(15 ~ 40 GHz)	BBHA 9170	Schwarzbeck	BBHA9170342	10/13/2022	Biennial
Horn Antenna(15 ~ 40 GHz)	BBHA 9170	Schwarzbeck	BBHA9170124	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
Peak- to- Average Ratio	§27.50(d)(5)	< 13 dB	PASS
Frequency stability / variation of ambient temperature	§2.1055, §27.54	Emission must remain in band	PASS

Note:

1. See SAR Report

6.2 Test Condition : Radiated Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Equivalent Isotropic Radiated Power	§27.50(h)(2)	< 2 Watts max. EIRP	PASS
Radiated Spurious and Harmonic Emissions	§2.1053, §27.53(m)(4)	< 55 + 10log10 (P[Watts])	PASS
Receiver Spurious Emissions	N/A	Section 8.8	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
38000	2595.0	-15.75	18.45	9.90	1.76	H	0.456	26.59

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

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

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

3) Record the field strength meter's level.

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

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

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

7.3. Emission Designator

GSM Emission Designator

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

EDGE Emission Designator

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

WCDMA Emission Designator

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

QPSK Modulation

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

QAM Modulation

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

8. TEST DATA

8.1 EQUIVALENT ISOTROPIC RADIATED POWER

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
2572.5	LTE B38/ 5 MHz	QPSK	-21.53	15.49	10.66	2.52	V	< 2.00	0.231	23.63
		16-QAM	-22.49	14.53	10.66	2.52	V		0.185	22.67
		64-QAM	-23.48	13.54	10.66	2.52	V		0.147	21.68
2595.0		QPSK	-22.27	14.97	10.61	2.54	V		0.201	23.04
		16-QAM	-23.22	14.02	10.61	2.54	V		0.162	22.09
		64-QAM	-24.20	13.04	10.61	2.54	V		0.129	21.11
2617.5		QPSK	-23.59	13.49	10.64	2.56	V		0.144	21.57
		16-QAM	-24.57	12.51	10.64	2.56	V		0.115	20.59
		64-QAM	-25.54	11.54	10.64	2.56	V		0.092	19.62

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
2575.0	LTE B38/ 10 MHz	QPSK	-21.57	15.57	10.65	2.53	V	< 2.00	0.234	23.69
		16-QAM	-22.47	14.67	10.65	2.53	V		0.190	22.79
		64-QAM	-23.52	13.62	10.65	2.53	V		0.149	21.74
2595.0		QPSK	-22.21	15.03	10.61	2.54	V		0.204	23.10
		16-QAM	-23.14	14.10	10.61	2.54	V		0.165	22.17
		64-QAM	-24.16	13.08	10.61	2.54	V		0.130	21.15
2615.0		QPSK	-23.48	13.68	10.63	2.56	V		0.150	21.76
		16-QAM	-24.40	12.76	10.63	2.56	V		0.121	20.84
		64-QAM	-25.42	11.74	10.63	2.56	V		0.096	19.82

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
2577.5	LTE B38/ 15 MHz	QPSK	-21.62	15.64	10.64	2.54	V	< 2.00	0.237	23.74
		16-QAM	-22.56	14.70	10.64	2.54	V		0.191	22.80
		64-QAM	-23.57	13.69	10.64	2.54	V		0.151	21.79
2595.0		QPSK	-22.08	15.16	10.61	2.54	V		0.210	23.23
		16-QAM	-23.03	14.21	10.61	2.54	V		0.169	22.28
		64-QAM	-24.02	13.22	10.61	2.54	V		0.135	21.29
2612.5		QPSK	-23.04	14.22	10.62	2.55	V		0.169	22.29
		16-QAM	-23.99	13.27	10.62	2.55	V		0.136	21.34
		64-QAM	-24.98	12.28	10.62	2.55	V		0.108	20.35

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
2580.0	LTE B38/ 20 MHz	QPSK	-21.66	15.60	10.64	2.54	V	< 2.00	0.235	23.70
		16-QAM	-22.62	14.64	10.64	2.54	V		0.188	22.74
		64-QAM	-23.63	13.63	10.64	2.54	V		0.149	21.73
2595.0		QPSK	-22.06	15.18	10.61	2.54	V		0.211	23.25
		16-QAM	-23.01	14.23	10.61	2.54	V		0.170	22.30
		64-QAM	-24.01	13.23	10.61	2.54	V		0.135	21.30
2610.0		QPSK	-22.71	14.55	10.62	2.55	V		0.183	22.62
		16-QAM	-23.66	13.60	10.62	2.55	V		0.147	21.67
		64-QAM	-24.66	12.60	10.62	2.55	V		0.117	20.67

8.2 RADIATED SPURIOUS EMISSIONS

▣ OPERATING FREQUENCY : 2572.5 MHz

▣ MEASURED OUTPUT POWER: 23.63 dBm = 0.231 W

▣ MODE: LTE B38

▣ MODULATION SIGNAL: 5 MHz QPSK

▣ DISTANCE: 1 meters

▣ LIMIT: 55 + 10 log10 (W) = 48.63 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
37775 (2572.5)	5 145.00	-51.89	12.29	-60.60	3.66	H	-51.97	75.60
	7 717.50	-48.24	11.40	-48.40	4.50	H	-41.50	65.13
	10 290.00	-44.47	11.50	-39.14	5.40	V	-33.04	56.68
38000 (2595.0)	5 190.00	-50.54	12.46	-59.39	3.70	V	-50.63	74.26
	7 785.00	-46.23	11.40	-46.91	4.54	H	-40.05	63.68
	10 380.00	-44.30	11.40	-39.03	5.44	V	-33.07	56.70
38225 (2617.5)	5 235.00	-50.80	12.71	-61.10	3.70	H	-52.08	75.71
	7 852.50	-49.82	11.40	-50.34	4.53	H	-43.47	67.10
	10 470.00	-48.23	11.26	-43.01	5.46	V	-37.21	60.84

▣ OPERATING FREQUENCY : 2575.0 MHz

▣ MEASURED OUTPUT POWER: 23.69 dBm = 0.234 W

▣ MODE: LTE B38

▣ MODULATION SIGNAL: 10 MHz QPSK

▣ DISTANCE: 1 meters

▣ LIMIT: 55 + 10 log10 (W) = 48.69 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
37800 (2575.0)	5 150.00	-51.68	12.30	-60.27	3.65	H	-51.62	75.25
	7 725.00	-47.97	11.40	-48.15	4.50	H	-41.25	64.88
	10 300.00	-43.92	11.50	-38.46	5.40	V	-32.36	56.00
38000 (2595.0)	5 190.00	-52.56	12.46	-61.41	3.70	H	-52.65	76.28
	7 785.00	-46.15	11.40	-46.83	4.54	H	-39.97	63.60
	10 380.00	-43.29	11.40	-38.02	5.44	V	-32.06	55.69
38200 (2615.0)	5 230.00	-52.46	12.68	-62.88	3.69	H	-53.89	77.52
	7 845.00	-46.43	11.40	-46.81	4.53	H	-39.94	63.57
	10 460.00	-44.42	11.28	-39.57	5.48	V	-33.77	57.41

▣ OPERATING FREQUENCY : 2577.5 MHz

▣ MEASURED OUTPUT POWER: 23.74 dBm = 0.237 W

▣ MODE: LTE B38

▣ MODULATION SIGNAL: 15 MHz QPSK

▣ DISTANCE: 1 meters

▣ LIMIT: 55 + 10 log10 (W) = 48.74 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
37825 (2577.5)	5 155.00	-50.62	12.32	-58.98	3.65	H	-50.31	73.94
	7 732.50	-47.42	11.40	-47.62	4.50	H	-40.72	64.35
	10 310.00	-44.96	11.48	-39.49	5.39	V	-33.40	57.03
38000 (2595.0)	5 190.00	-50.06	12.46	-58.91	3.70	H	-50.15	73.78
	7 785.00	-48.45	11.40	-49.13	4.54	H	-42.27	65.90
	10 380.00	-42.34	11.40	-37.07	5.44	V	-31.11	54.74
38175 (2612.5)	5 225.00	-53.05	12.65	-63.50	3.70	V	-54.55	78.18
	7 837.50	-46.04	11.40	-46.28	4.53	H	-39.41	63.04
	10 450.00	-45.48	11.30	-40.98	5.47	V	-35.15	58.78

▣ OPERATING FREQUENCY : 2580.0 MHz

▣ MEASURED OUTPUT POWER: 23.70 dBm = 0.235 W

▣ MODE: LTE B38

▣ MODULATION SIGNAL: 20 MHz QPSK

▣ DISTANCE: 1 meters

▣ LIMIT: 55 + 10 log10 (W) = 48.70 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
37850 (2580.0)	5 160.00	-51.26	12.34	-59.39	3.65	H	-50.70	74.33
	7 740.00	-47.38	11.40	-47.98	4.50	H	-41.08	64.71
	10 320.00	-43.33	11.46	-37.94	5.38	V	-31.86	55.50
38000 (2595.0)	5 190.00	-51.77	12.46	-60.62	3.70	H	-51.86	75.49
	7 785.00	-48.16	11.40	-48.84	4.54	H	-41.98	65.61
	10 380.00	-42.43	11.40	-37.16	5.44	V	-31.20	54.83
38150 (2610.0)	5 220.00	-52.07	12.62	-62.56	3.70	H	-53.64	77.27
	7 830.00	-45.18	11.40	-45.10	4.53	H	-38.23	61.86
	10 440.00	-44.51	11.32	-40.19	5.45	V	-34.32	57.95

8.3 PEAK-TO-AVERAGE RATIO

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (dB)
38	5 MHz	2595.0	QPSK	25	0	5.29
			16-QAM			6.49
			64-QAM			6.73
	10 MHz		QPSK	50		5.47
			16-QAM			6.14
			64-QAM			6.58
	15 MHz		QPSK	75		5.38
			16-QAM			6.12
			64-QAM			6.64
	20 MHz		QPSK	100		5.37
			16-QAM			6.08
			64-QAM			6.44

Note:

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 60 ~ 71.

8.4 OCCUPIED BANDWIDTH

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
38	5 MHz	2595.0	QPSK	25	0	4.4921
			16-QAM			4.4980
			64-QAM			4.5171
	10 MHz		QPSK	50		8.9831
			16-QAM			8.9801
			64-QAM			8.9798
	15 MHz		QPSK	75		13.488
			16-QAM			13.469
			64-QAM			13.462
	20 MHz		QPSK	100		17.999
			16-QAM			17.947
			64-QAM			17.907

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 48 ~ 59.

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)
38	5	2572.5	26.1232	34.110	-76.581	-42.471	-25.00
		2595.0	26.1793	34.110	-76.687	-42.577	
		2617.5	26.1122	34.110	-76.436	-42.326	
	10	2575.0	26.1351	34.110	-76.733	-42.623	
		2595.0	26.1368	34.110	-76.542	-42.432	
		2615.0	26.4220	34.110	-76.744	-42.634	
	15	2577.5	26.1806	34.110	-76.489	-42.379	
		2595.0	26.1266	34.110	-76.382	-42.272	
		2612.5	26.1134	34.110	-76.554	-42.444	
	20	2580.0	26.1517	34.110	-76.197	-42.087	
		2595.0	26.1559	34.110	-76.739	-42.629	
		2610.0	26.1198	34.110	-76.436	-42.326	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 92 ~ 115.

2. Duty Cycle factor already applied on the factor.

- Duty Cycle factor(dB) = 3.98

- Factor(dB) = Duty Cycle factor + Cable Loss + Ext. Attenuator + Power Splitter

- Result(dBm) = Reading + Factor

Frequency Range (GHz)	Factor [dB]
0.03 – 1	29.249
1 – 5	32.355
5 – 10	32.570
10 – 15	33.095
15 – 20	33.468
Above 20	34.110

8.6 CHANNEL EDGE

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resoure Block Offset	C.E ~ (C.E ± 1 MHz)		(C.E ± 1 MHz) ~ (C.E ± 5 MHz)	
						Lower	Upper	Lower	Upper
Band 38	5 MHz	2572.5	QPSK	25	0	-27.19	-27.42	-21.21	-22.18
		2595.0	QPSK	25	0	-27.09	-28.01	-23.00	-22.97
		2617.5	QPSK	25	0	-28.14	-28.97	-24.90	-25.21
	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	C.E ~ (C.E ± 1 MHz)		(C.E ± 1 MHz) ~ (C.E ± 5 MHz)	
						Lower	Upper	Lower	Upper
	10 MHz	2575.0	QPSK	50	0	-28.47	-28.32	-23.15	-23.45
		2595.0	QPSK	50	0	-29.65	-29.23	-24.84	-24.66
		2615.0	QPSK	50	0	-30.93	-30.90	-26.60	-26.43
	15 MHz	2577.5	QPSK	75	0	-28.79	-28.90	-25.21	-25.52
		2595.0	QPSK	75	0	-29.79	-30.26	-26.89	-27.02
		2612.5	QPSK	75	0	-31.22	-31.26	-28.19	-28.28
	20 MHz	2580.0	QPSK	100	0	-29.27	-29.62	-26.47	-26.66
		2595.0	QPSK	100	0	-30.39	-30.66	-27.49	-27.66
		2610.0	QPSK	100	0	-31.29	-31.78	-28.93	-28.91
Limit						-10.0		-10.0	

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resoure Block Offset	(C.E ± 5 MHz) ~ (C.E ± X MHz)		Above (C.E ± X MHz)	
						Lower	Upper	Lower	Upper
Band 38	5 MHz	2572.5	QPSK	25	0	-31.79	-32.28	-35.46	-36.06
		2595.0	QPSK	25	0	-33.49	-33.29	-36.28	-36.50
		2617.5	QPSK	25	0	-36.04	-35.63	-38.96	-38.14
	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	(C.E ± 5 MHz) ~ (C.E ± X MHz)		Above (C.E ± X MHz)	
						Lower	Upper	Lower	Upper
	10 MHz	2575.0	QPSK	50	0	-26.72	-27.12	-34.68	-35.07
		2595.0	QPSK	50	0	-28.08	-28.65	-36.37	-36.33
		2615.0	QPSK	50	0	-31.25	-30.86	-39.34	-38.07
	15 MHz	2577.5	QPSK	75	0	-27.13	-27.98	-36.45	-37.04
		2595.0	QPSK	75	0	-29.05	-29.07	-37.91	-37.94
		2612.5	QPSK	75	0	-30.88	-31.16	-40.70	-39.51
	20 MHz	2580.0	QPSK	100	0	-28.02	-28.62	-38.25	-38.65
		2595.0	QPSK	100	0	-29.49	-29.88	-39.59	-39.47
		2610.0	QPSK	100	0	-31.20	-31.47	-41.55	-39.93
Limit						-13.0		-25.0	

Note:

1. C.E = Channel Edge
2. X = X is the greater of 6 MHz or the actual emission bandwidth.
3. X = 6 MHz(5 MHz Bandwidth), 10 MHz(10 MHz Bandwidth), 15 MHz(15 MHz Bandwidth), 20 MHz(20 MHz Bandwidth)
4. RB = Resource Block
5. Duty Cycle factor already applied on the factor.
   - Factor(dB) = Duty Cycle factor + Cable Loss + Ext. Attenuator + Power Splitter
   - Result(dBm) = Reading + Factor
   - Duty Cycle Factor(dB) = 3.979
6. Plots of the EUT's Channel Edge are shown Page 72 ~ 91. (1RB & Full RB)

8.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

▣ MODE: LTE 38

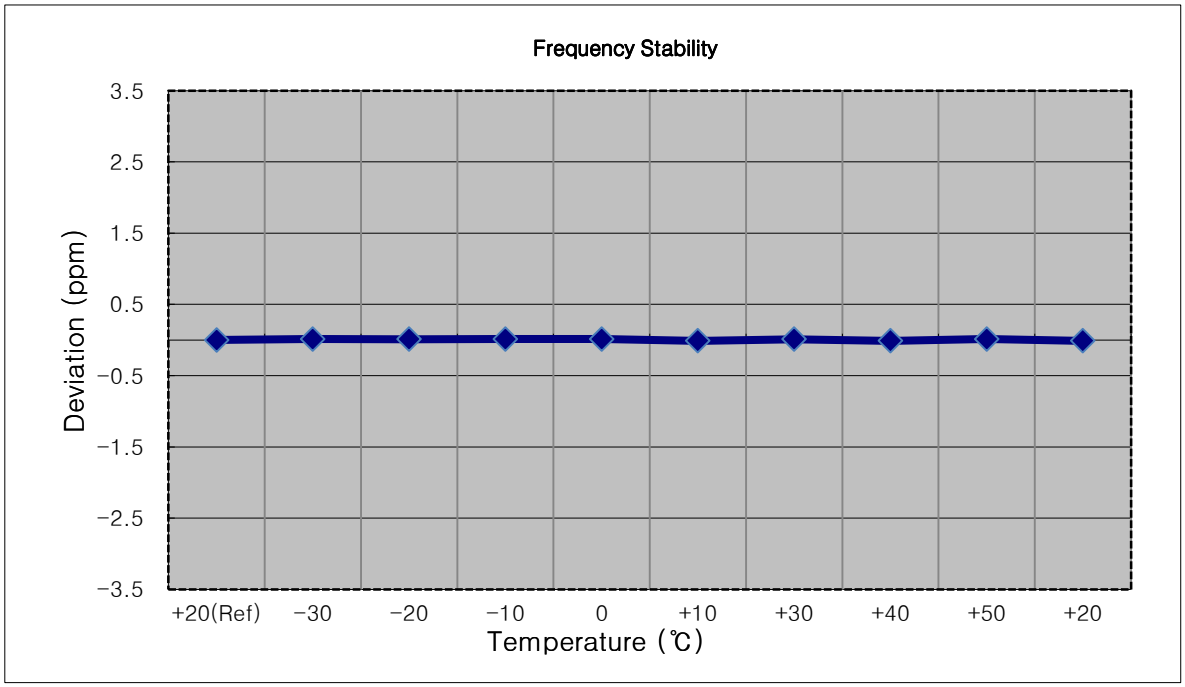
▣ OPERATING FREQUENCY: 2572,500,000 Hz

▣ BANDWIDTH: 37775 (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)	2572 499 971	0.0	0.000 000	0.000
100 %		-30	2572 500 003	32.5	0.000 001	0.013
100 %		-20	2572 499 999	28.1	0.000 001	0.011
100 %		-10	2572 500 006	35.1	0.000 001	0.014
100 %		0	2572 500 006	35.7	0.000 001	0.014
100 %		+10	2572 499 940	-30.3	-0.000 001	-0.012
100 %		+30	2572 500 001	30.3	0.000 001	0.012
100 %		+40	2572 499 940	-30.2	-0.000 001	-0.012
100 %		+50	2572 500 003	32.5	0.000 001	0.013
Batt. Endpoint	3.400	+20	2572 499 941	-30.0	-0.000 001	-0.012



▣ MODE: LTE 38

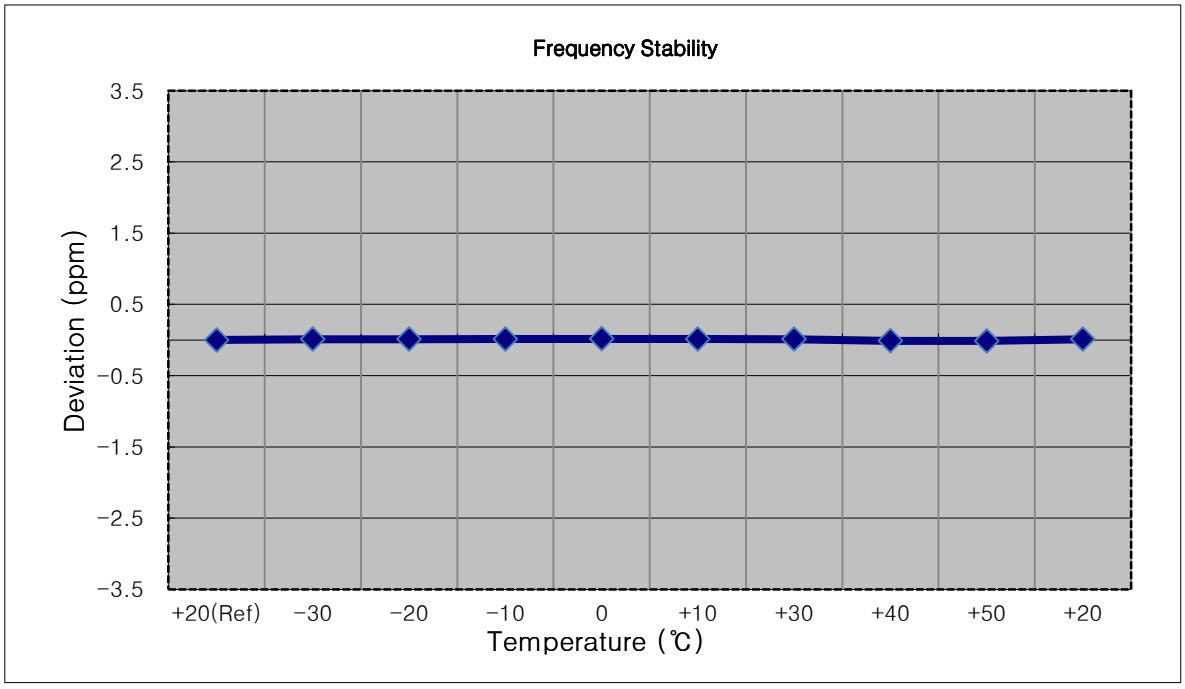
▣ OPERATING FREQUENCY: 2575,000,000 Hz

▣ BANDWIDTH: 37800 (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)	2575 000 031	0.0	0.000 000	0.000
100 %		-30	2575 000 061	29.6	0.000 001	0.011
100 %		-20	2575 000 062	30.8	0.000 001	0.012
100 %		-10	2575 000 065	33.8	0.000 001	0.013
100 %		0	2575 000 069	37.3	0.000 001	0.014
100 %		+10	2575 000 063	31.2	0.000 001	0.012
100 %		+30	2575 000 061	30.0	0.000 001	0.012
100 %		+40	2574 999 999	-31.9	-0.000 001	-0.012
100 %		+50	2574 999 998	-33.8	-0.000 001	-0.013
Batt. Endpoint	3.400	+20	2575 000 058	26.8	0.000 001	0.010



▣ MODE: LTE 38

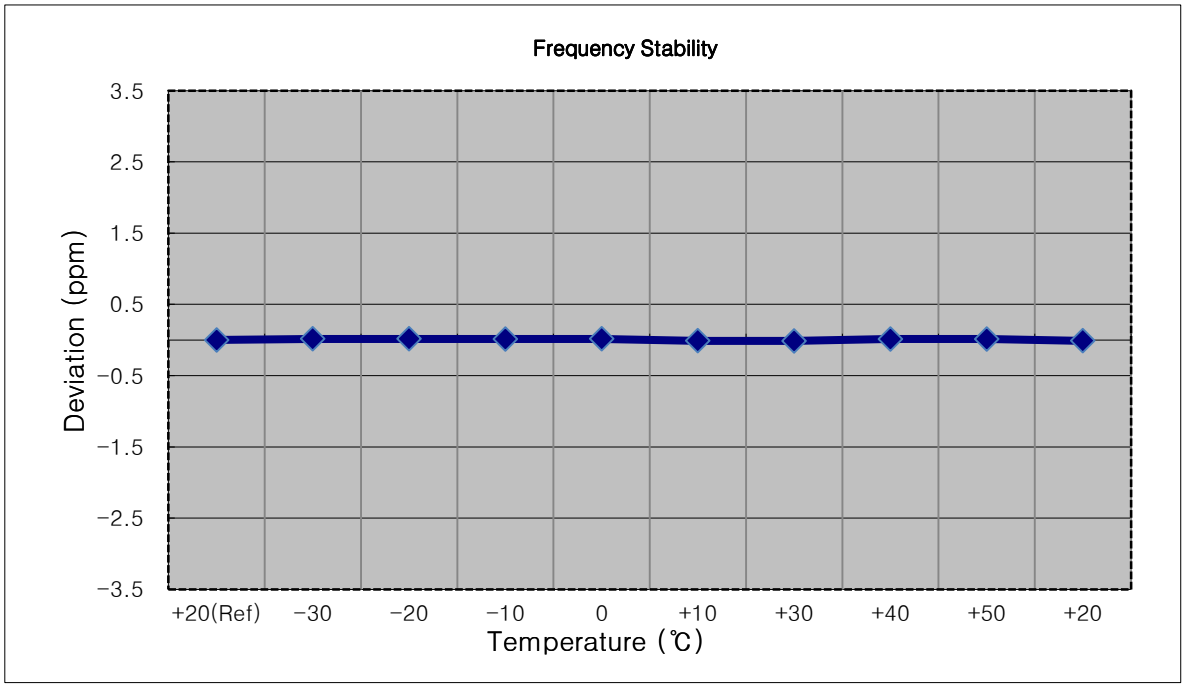
▣ OPERATING FREQUENCY: 2577,500,000 Hz

▣ BANDWIDTH: 37825 (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)	2577 500 030	0.0	0.000 000	0.000
100 %		-30	2577 500 070	40.4	0.000 002	0.016
100 %		-20	2577 500 069	39.5	0.000 002	0.015
100 %		-10	2577 500 063	33.0	0.000 001	0.013
100 %		0	2577 500 071	41.2	0.000 002	0.016
100 %		+10	2577 499 998	-32.0	-0.000 001	-0.012
100 %		+30	2577 499 996	-34.1	-0.000 001	-0.013
100 %		+40	2577 500 063	33.2	0.000 001	0.013
100 %		+50	2577 500 063	33.1	0.000 001	0.013
Batt. Endpoint	3.400	+20	2577 499 998	-31.7	-0.000 001	-0.012



▣ MODE: LTE 38

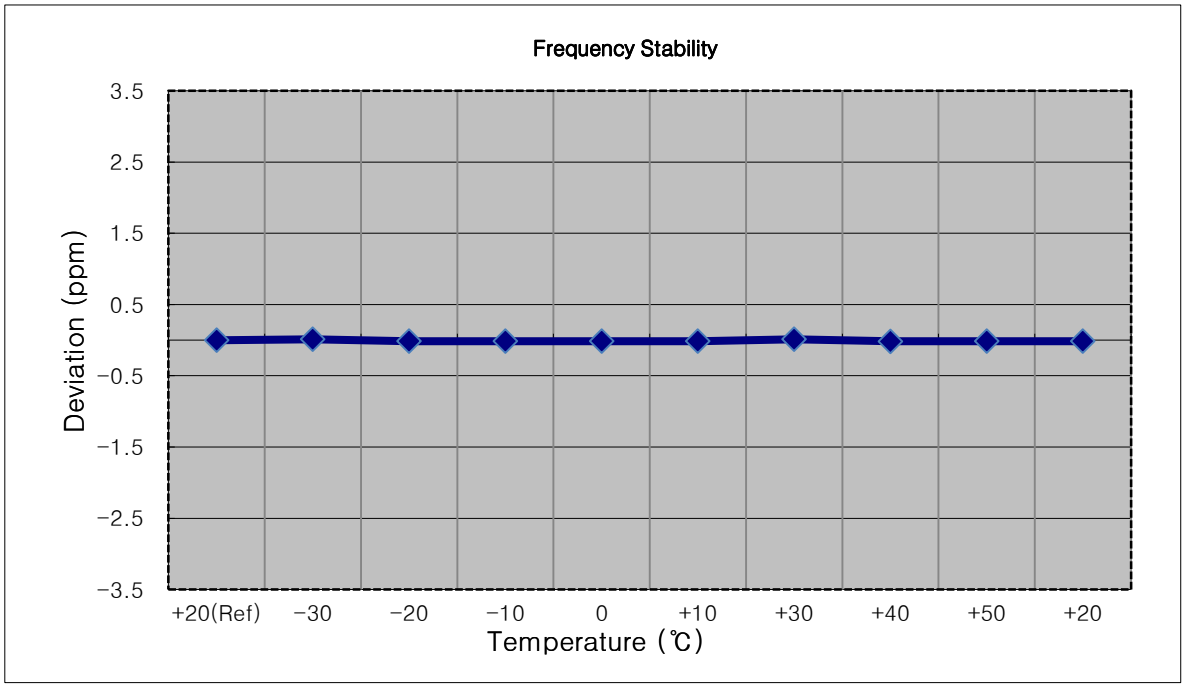
▣ OPERATING FREQUENCY: 2580,000,000 Hz

▣ BANDWIDTH: 37850 (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)	2580 000 035	0.0	0.000 000	0.000
100 %		-30	2580 000 067	31.5	0.000 001	0.012
100 %		-20	2579 999 996	-39.0	-0.000 002	-0.015
100 %		-10	2580 000 001	-34.6	-0.000 001	-0.013
100 %		0	2579 999 999	-36.1	-0.000 001	-0.014
100 %		+10	2580 000 001	-34.8	-0.000 001	-0.013
100 %		+30	2580 000 068	32.1	0.000 001	0.012
100 %		+40	2579 999 990	-45.1	-0.000 002	-0.017
100 %		+50	2580 000 000	-35.0	-0.000 001	-0.014
Batt. Endpoint	3.400	+20	2580 000 000	-35.1	-0.000 001	-0.014



▣ MODE: LTE 38

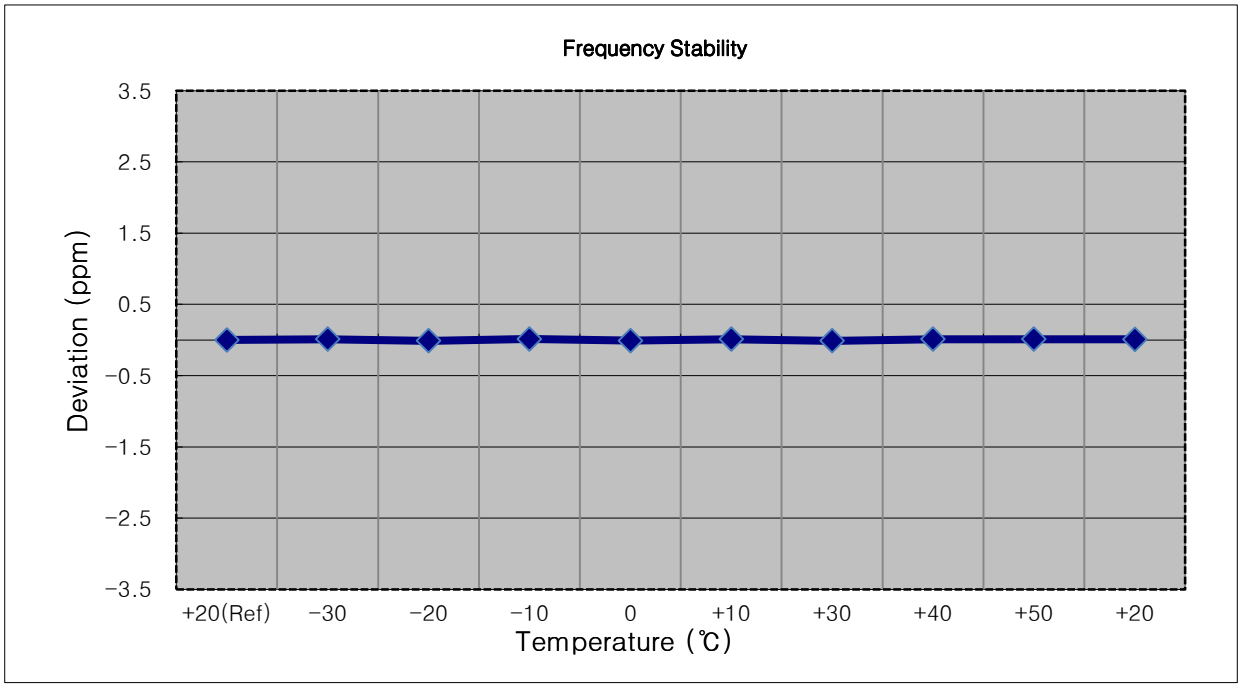
▣ OPERATING FREQUENCY: 2595,000,000 Hz

▣ BANDWIDTH: 38000 (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)	2595 000 030	0.0	0.000 000	0.000
100 %		-30	2595 000 058	27.7	0.000 001	0.011
100 %		-20	2594 999 999	-30.9	-0.000 001	-0.012
100 %		-10	2595 000 067	36.7	0.000 001	0.014
100 %		0	2595 000 005	-25.4	-0.000 001	-0.010
100 %		+10	2595 000 057	26.9	0.000 001	0.010
100 %		+30	2594 999 998	-32.2	-0.000 001	-0.012
100 %		+40	2595 000 059	29.2	0.000 001	0.011
100 %		+50	2595 000 060	30.5	0.000 001	0.012
Batt. Endpoint	3.400	+20	2595 000 054	24.1	0.000 001	0.009



▣ MODE: LTE 38

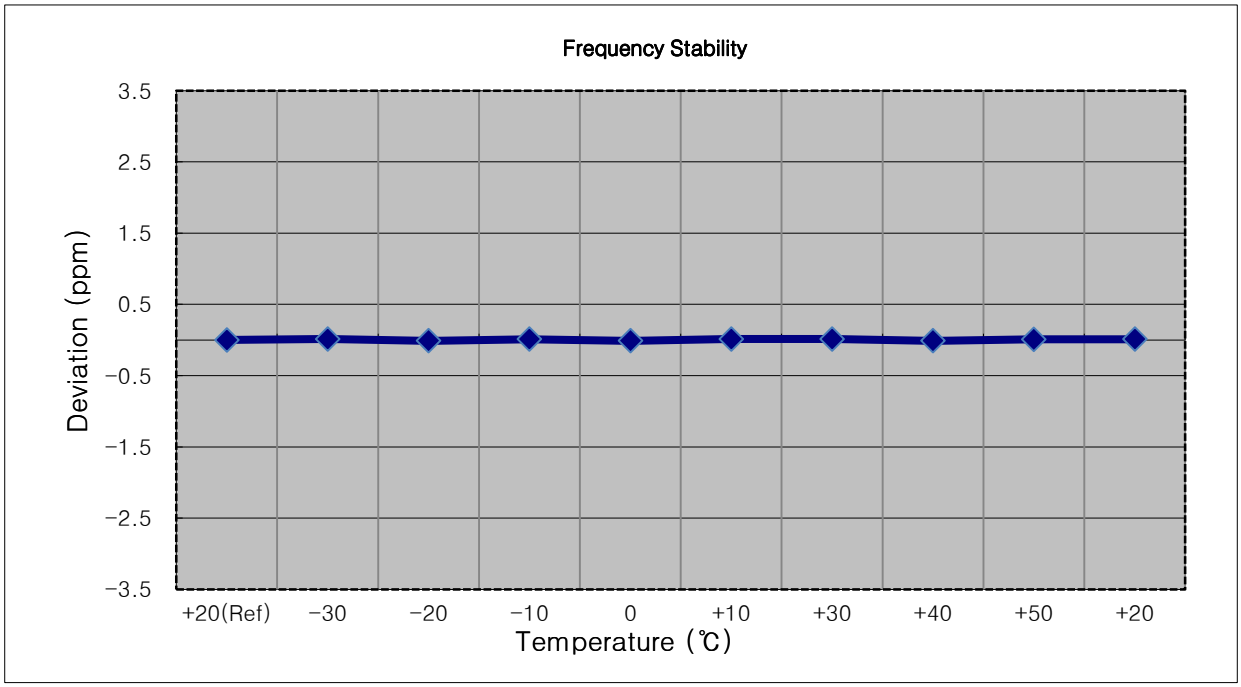
▣ OPERATING FREQUENCY: 2595,000,000 Hz

▣ BANDWIDTH: 38000 (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)	2595 000 027	0.0	0.000 000	0.000
100 %		-30	2595 000 062	34.7	0.000 001	0.013
100 %		-20	2594 999 998	-29.6	-0.000 001	-0.011
100 %		-10	2595 000 057	30.2	0.000 001	0.012
100 %		0	2594 999 997	-30.4	-0.000 001	-0.012
100 %		+10	2595 000 063	35.7	0.000 001	0.014
100 %		+30	2595 000 064	36.9	0.000 001	0.014
100 %		+40	2594 999 997	-30.1	-0.000 001	-0.012
100 %		+50	2595 000 051	24.1	0.000 001	0.009
Batt. Endpoint	3.400	+20	2595 000 056	29.0	0.000 001	0.011



▣ MODE: LTE 38

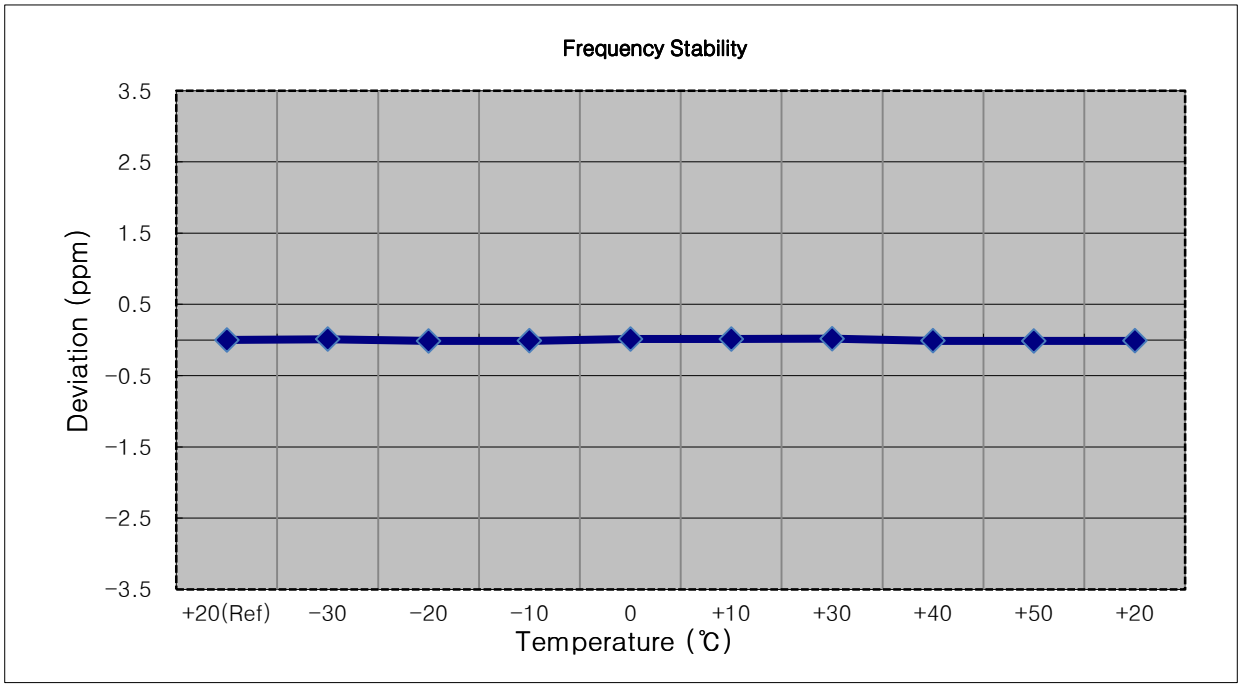
▣ OPERATING FREQUENCY: 2595,000,000 Hz

▣ BANDWIDTH: 38000 (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)	2594 999 969	0.0	0.000 000	0.000
100 %		-30	2594 999 998	29.1	0.000 001	0.011
100 %		-20	2594 999 934	-35.0	-0.000 001	-0.013
100 %		-10	2594 999 938	-30.7	-0.000 001	-0.012
100 %		0	2595 000 001	32.5	0.000 001	0.013
100 %		+10	2595 000 004	35.5	0.000 001	0.014
100 %		+30	2595 000 012	43.3	0.000 002	0.017
100 %		+40	2594 999 937	-31.2	-0.000 001	-0.012
100 %		+50	2594 999 934	-34.3	-0.000 001	-0.013
Batt. Endpoint	3.400	+20	2594 999 938	-30.6	-0.000 001	-0.012



▣ MODE: LTE 38

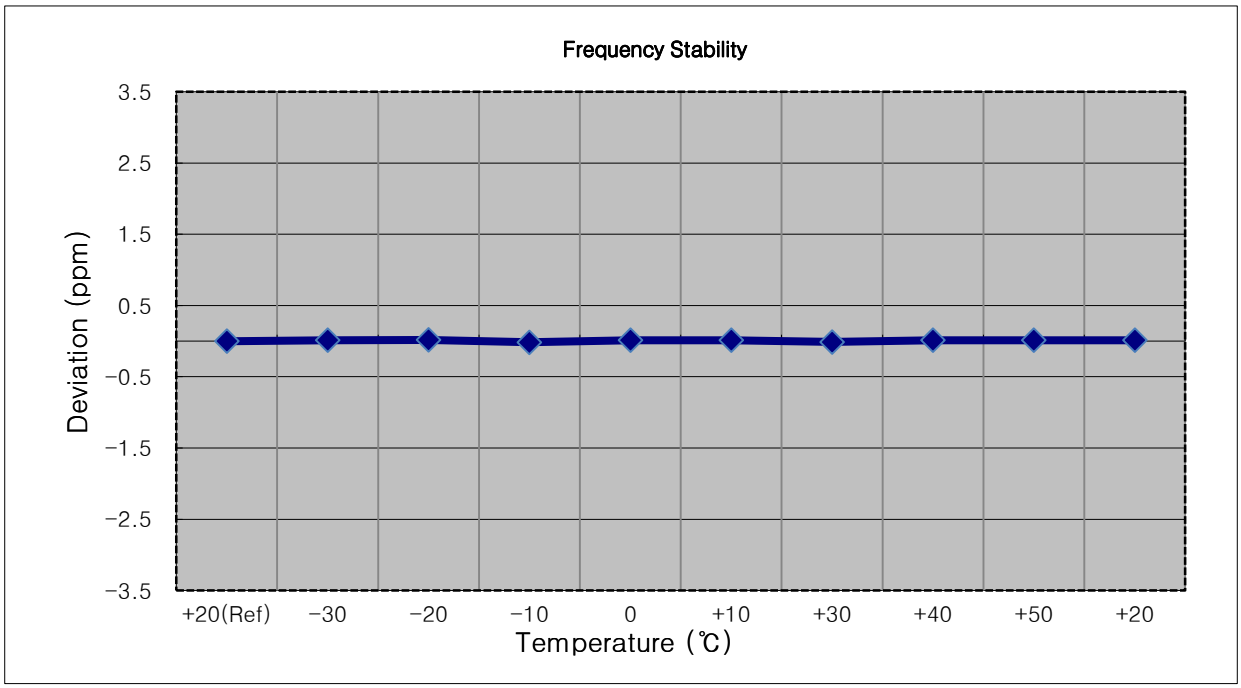
▣ OPERATING FREQUENCY: 2595,000,000 Hz

▣ BANDWIDTH: 38000 (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)	2595 000 034	0.0	0.000 000	0.000
100 %		-30	2595 000 070	35.8	0.000 001	0.014
100 %		-20	2595 000 080	45.4	0.000 002	0.017
100 %		-10	2594 999 994	-40.5	-0.000 002	-0.016
100 %		0	2595 000 065	30.7	0.000 001	0.012
100 %		+10	2595 000 068	33.8	0.000 001	0.013
100 %		+30	2595 000 003	-31.4	-0.000 001	-0.012
100 %		+40	2595 000 069	34.6	0.000 001	0.013
100 %		+50	2595 000 067	32.4	0.000 001	0.012
Batt. Endpoint	3.400	+20	2595 000 066	32.1	0.000 001	0.012



▣ MODE: LTE 38

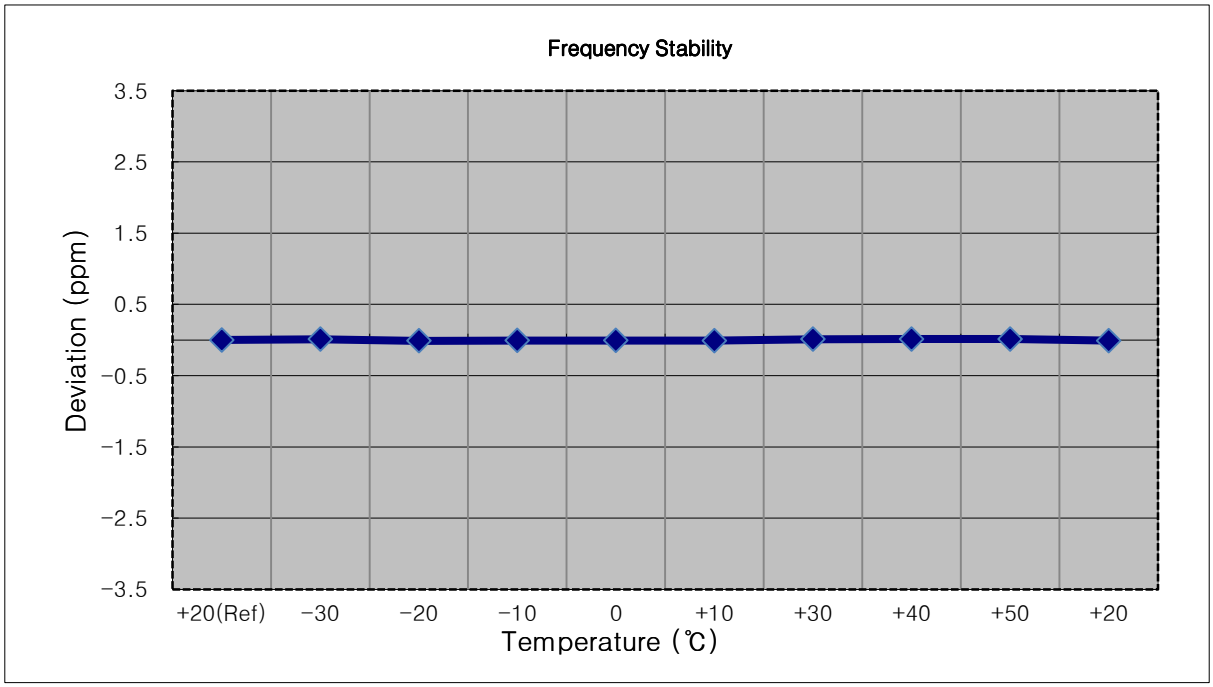
▣ OPERATING FREQUENCY: 2617,500,000 Hz

▣ BANDWIDTH: 38225 (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)	2617 499 971	0.0	0.000 000	0.000
100 %		-30	2617 499 999	28.1	0.000 001	0.011
100 %		-20	2617 499 941	-29.4	-0.000 001	-0.011
100 %		-10	2617 499 951	-19.9	-0.000 001	-0.008
100 %		0	2617 499 951	-19.8	-0.000 001	-0.008
100 %		+10	2617 499 949	-22.0	-0.000 001	-0.008
100 %		+30	2617 499 998	27.5	0.000 001	0.011
100 %		+40	2617 500 002	31.6	0.000 001	0.012
100 %		+50	2617 500 002	31.5	0.000 001	0.012
Batt. Endpoint	3.400	+20	2617 499 945	-25.4	-0.000 001	-0.010



▣ MODE: LTE 38

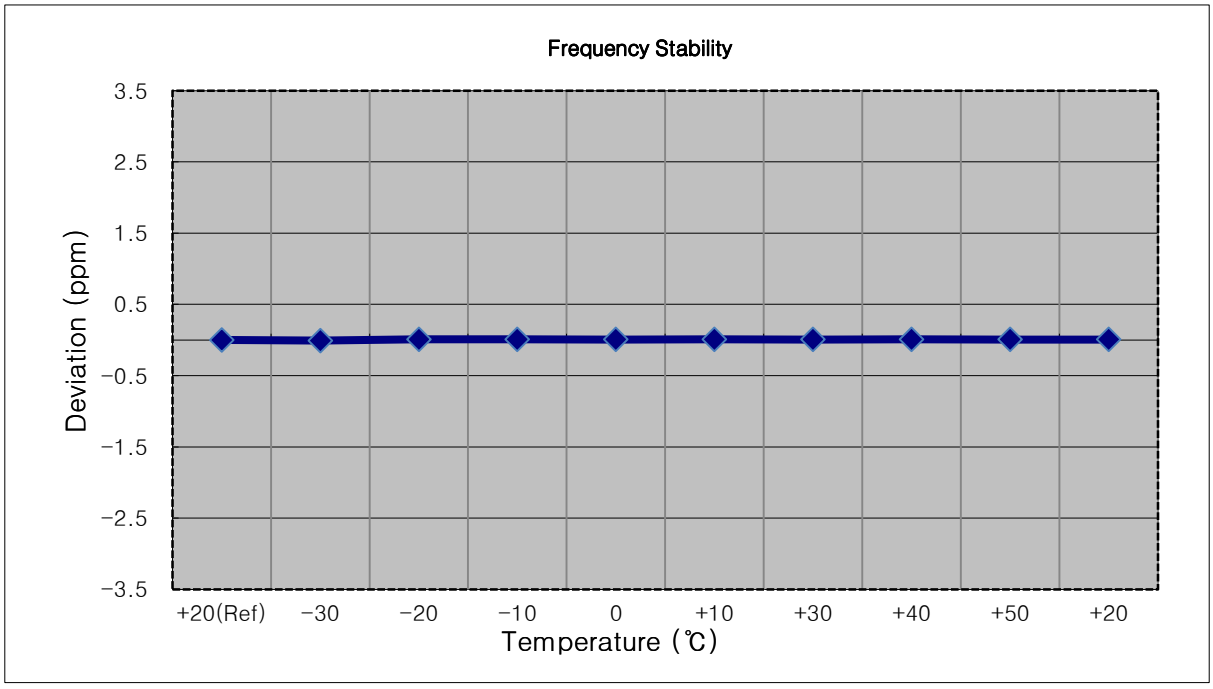
▣ OPERATING FREQUENCY: 2615,000,000 Hz

▣ BANDWIDTH: 38200 (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)	2614 999 981	0.0	0.000 000	0.000
100 %		-30	2614 999 955	-25.5	-0.000 001	-0.010
100 %		-20	2615 000 006	24.7	0.000 001	0.009
100 %		-10	2615 000 002	21.1	0.000 001	0.008
100 %		0	2615 000 000	18.9	0.000 001	0.007
100 %		+10	2615 000 001	20.0	0.000 001	0.008
100 %		+30	2615 000 000	18.6	0.000 001	0.007
100 %		+40	2615 000 001	20.1	0.000 001	0.008
100 %		+50	2614 999 999	18.3	0.000 001	0.007
Batt. Endpoint	3.400	+20	2615 000 000	19.1	0.000 001	0.007



▣ MODE: LTE 38

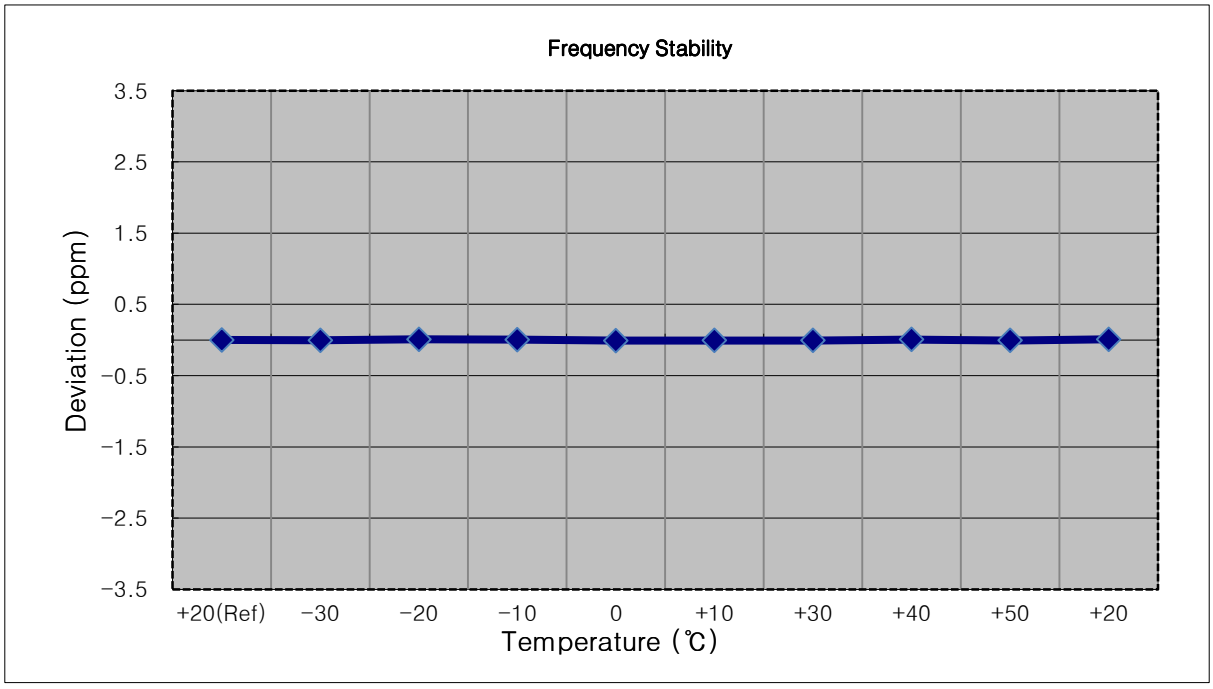
▣ OPERATING FREQUENCY: 2612,500,000 Hz

▣ BANDWIDTH: 38175 (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)	2612 500 021	0.0	0.000 000	0.000
100 %		-30	2612 500 009	-12.1	0.000 000	-0.005
100 %		-20	2612 500 043	21.9	0.000 001	0.008
100 %		-10	2612 500 033	12.5	0.000 000	0.005
100 %		0	2612 499 999	-22.4	-0.000 001	-0.009
100 %		+10	2612 500 003	-18.2	-0.000 001	-0.007
100 %		+30	2612 500 002	-19.0	-0.000 001	-0.007
100 %		+40	2612 500 038	17.4	0.000 001	0.007
100 %		+50	2612 500 002	-18.8	-0.000 001	-0.007
Batt. Endpoint	3.400	+20	2612 500 043	21.8	0.000 001	0.008



▣ MODE: LTE 38

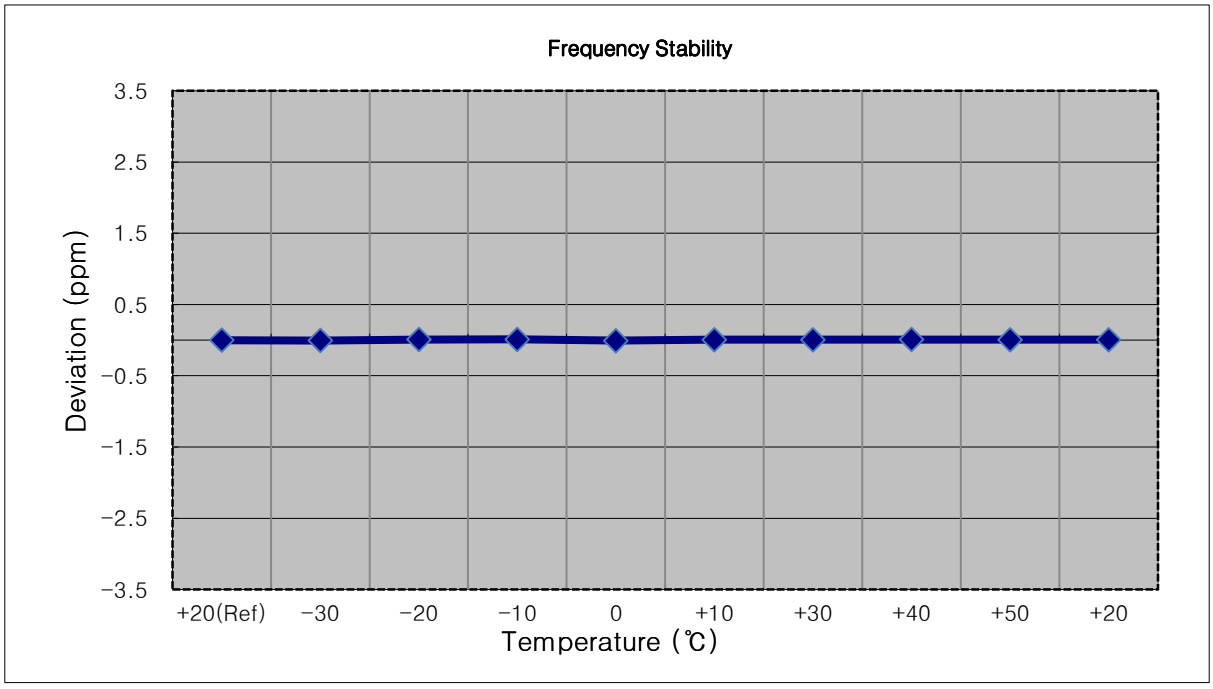
▣ OPERATING FREQUENCY: 2610,000,000 Hz

▣ BANDWIDTH: 38150 (20 MHz)

▣ REFERENCE VOLTAGE: 3.850 VDC

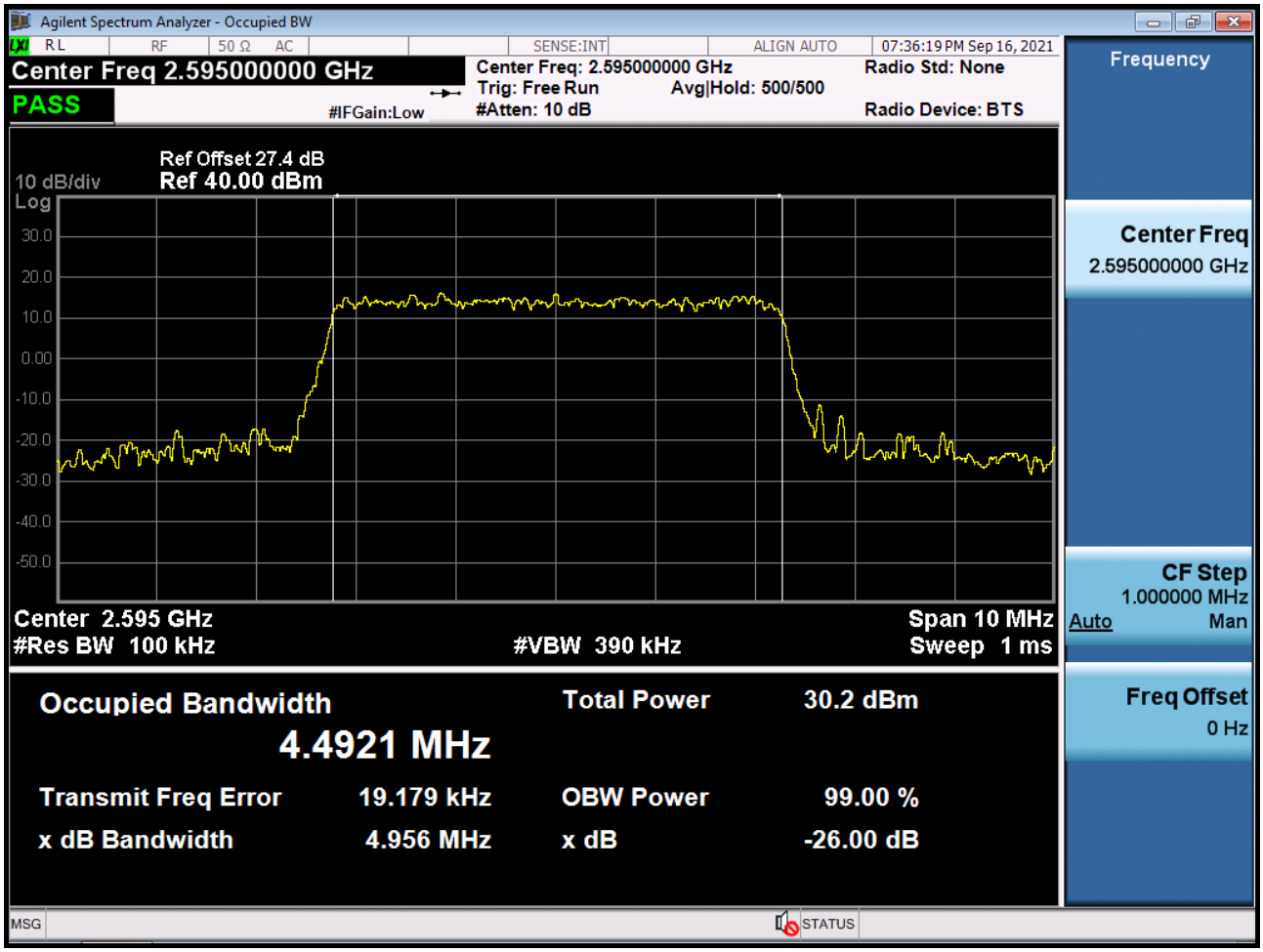
▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	2610 000 017	0.0	0.000 000	0.000
100 %		-30	2610 000 001	-15.4	-0.000 001	-0.006
100 %		-20	2610 000 038	21.7	0.000 001	0.008
100 %		-10	2610 000 042	25.1	0.000 001	0.010
100 %		0	2609 999 998	-18.1	-0.000 001	-0.007
100 %		+10	2610 000 033	16.2	0.000 001	0.006
100 %		+30	2610 000 032	15.5	0.000 001	0.006
100 %		+40	2610 000 039	22.6	0.000 001	0.009
100 %		+50	2610 000 032	15.5	0.000 001	0.006
Batt. Endpoint	3.400	+20	2610 000 032	15.6	0.000 001	0.006

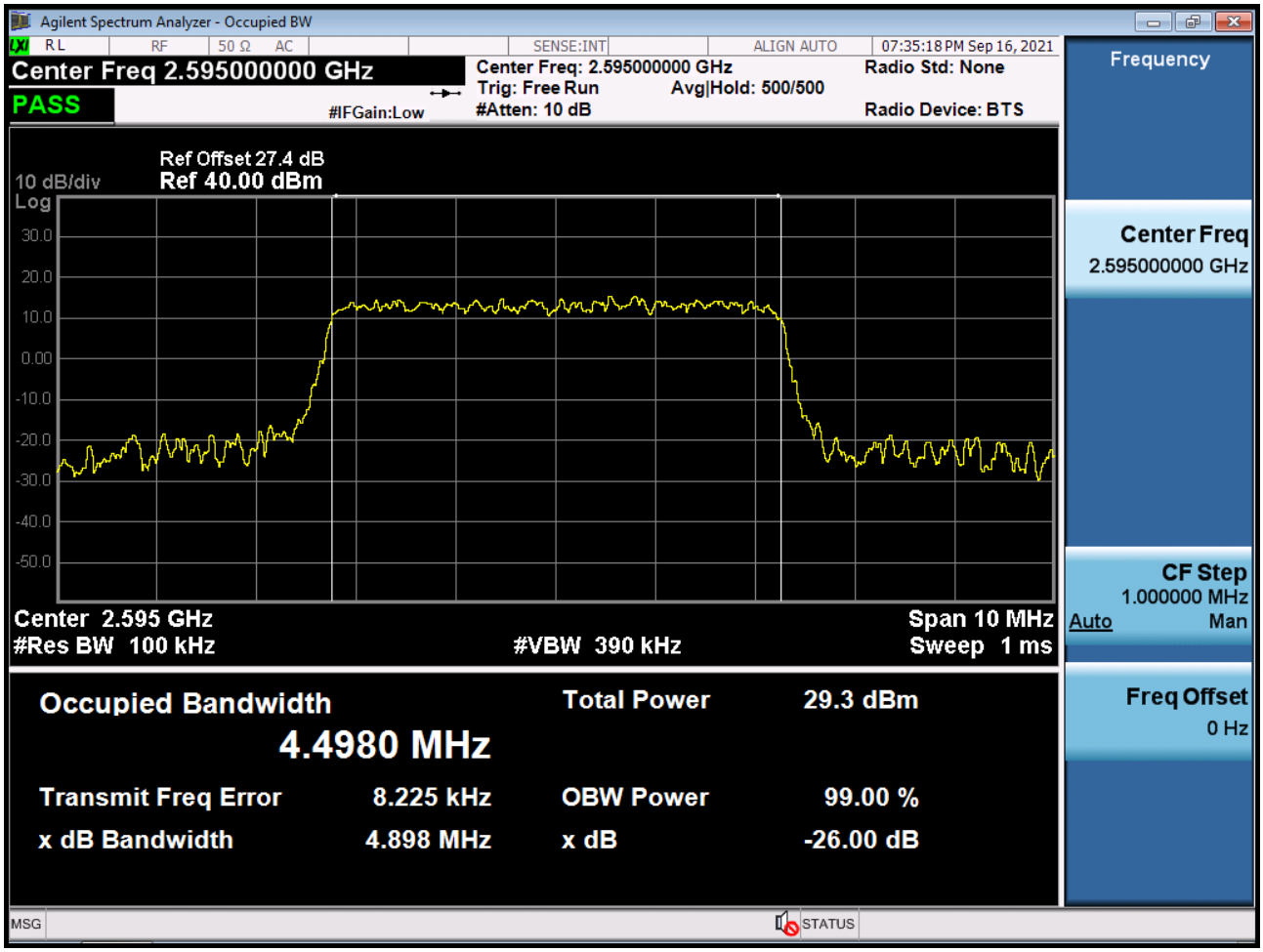


9. TEST PLOTS

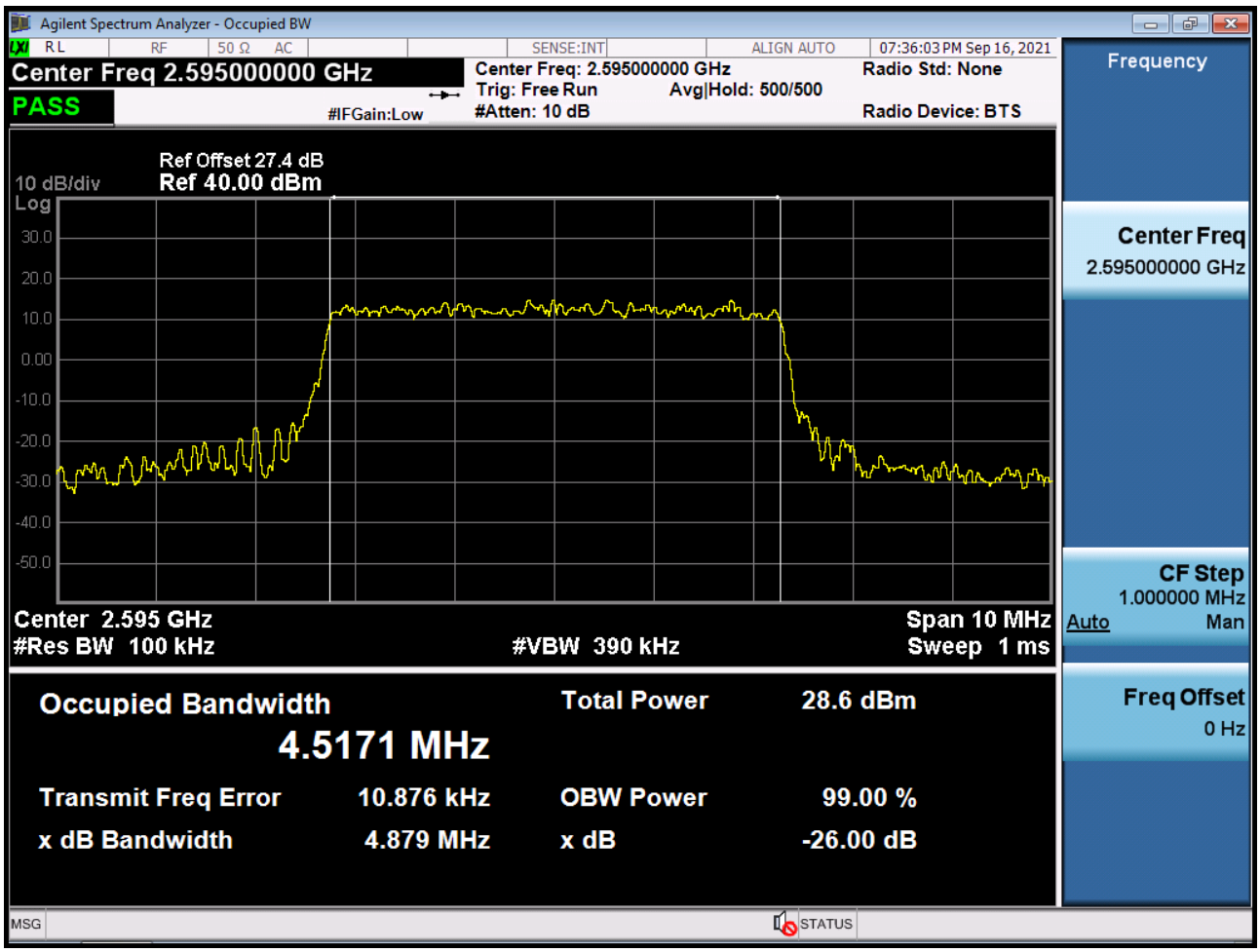
BAND 38. Occupied Bandwidth Plot (5 MHz Ch.38000 QPSK RB 25)



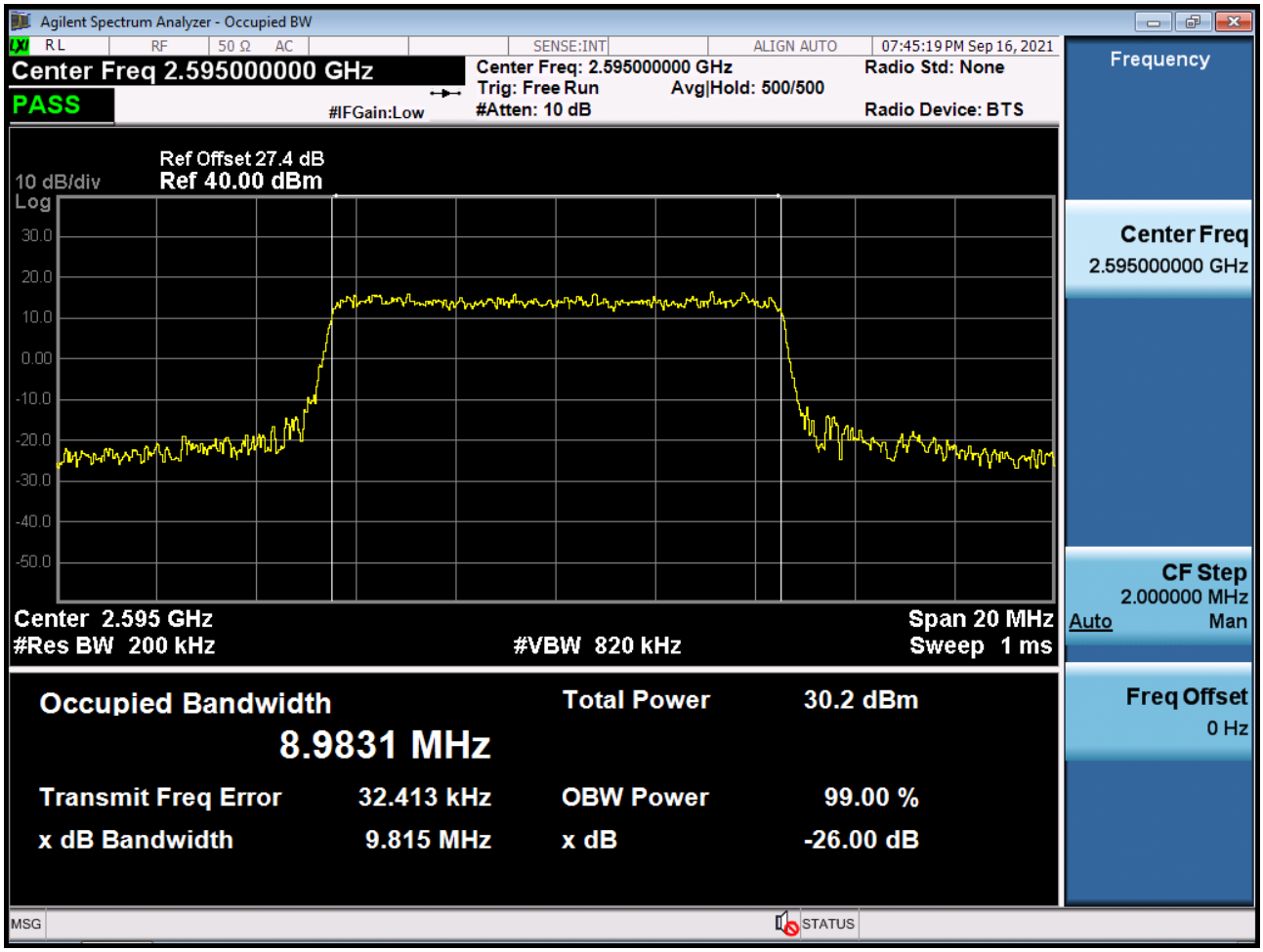
BAND 38. Occupied Bandwidth Plot (5 MHz Ch.38000 16-QAM RB 25)



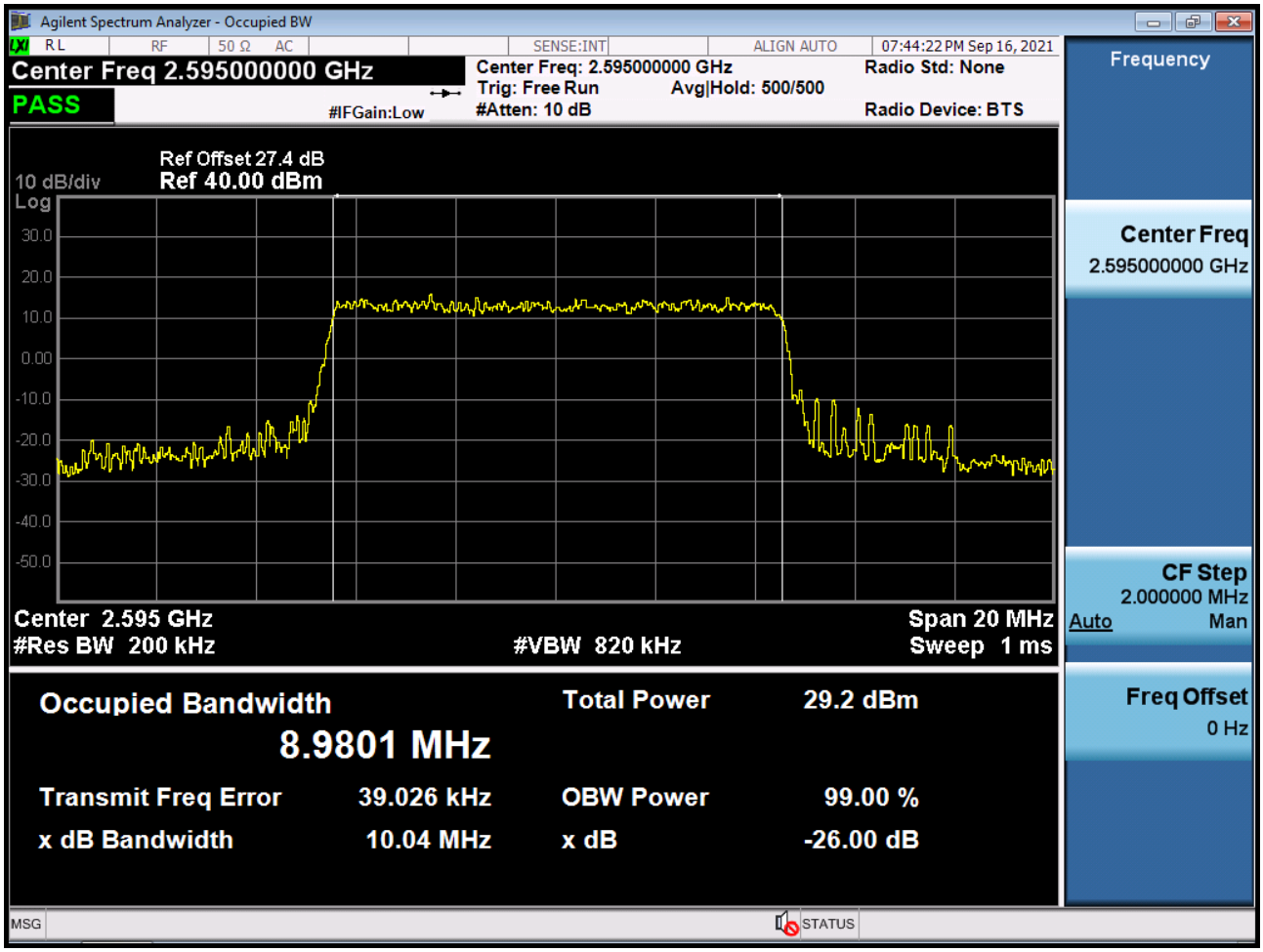
BAND 38. Occupied Bandwidth Plot (5 MHz Ch.38000 64-QAM RB 25)



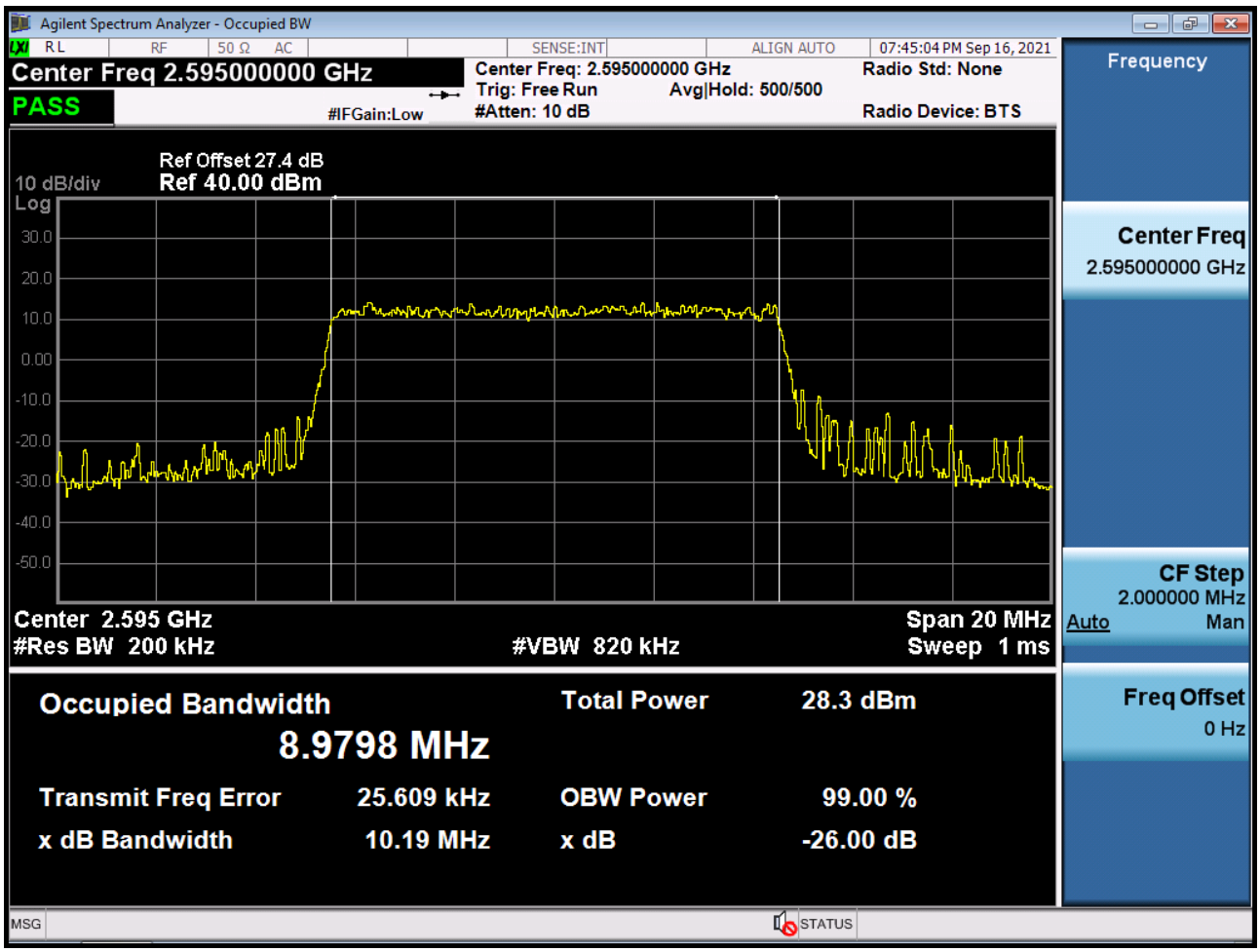
BAND 38. Occupied Bandwidth Plot (10 MHz Ch.38000 QPSK RB 50)



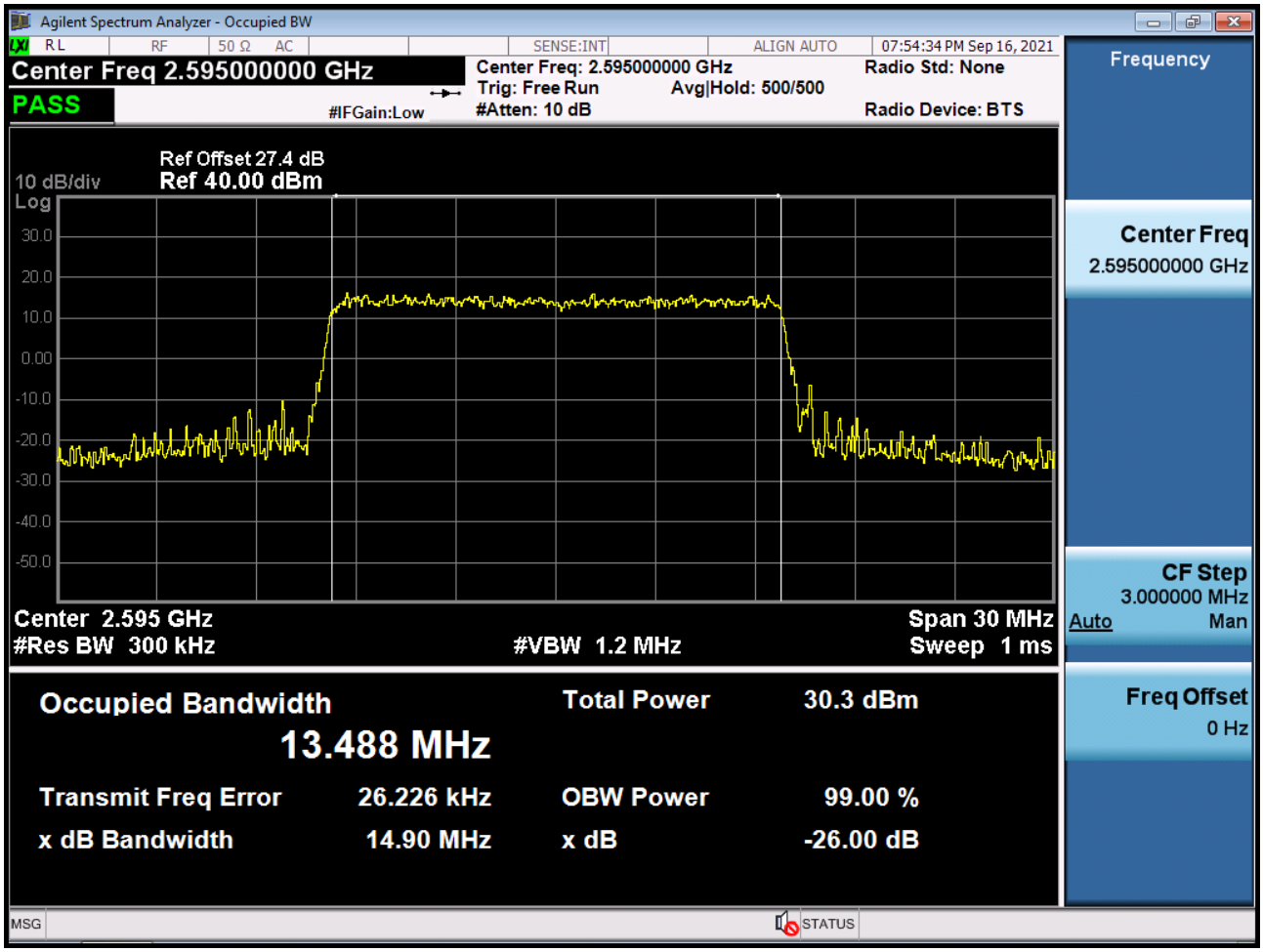
BAND 38. Occupied Bandwidth Plot (10 MHz Ch.38000 16-QAM RB 50)



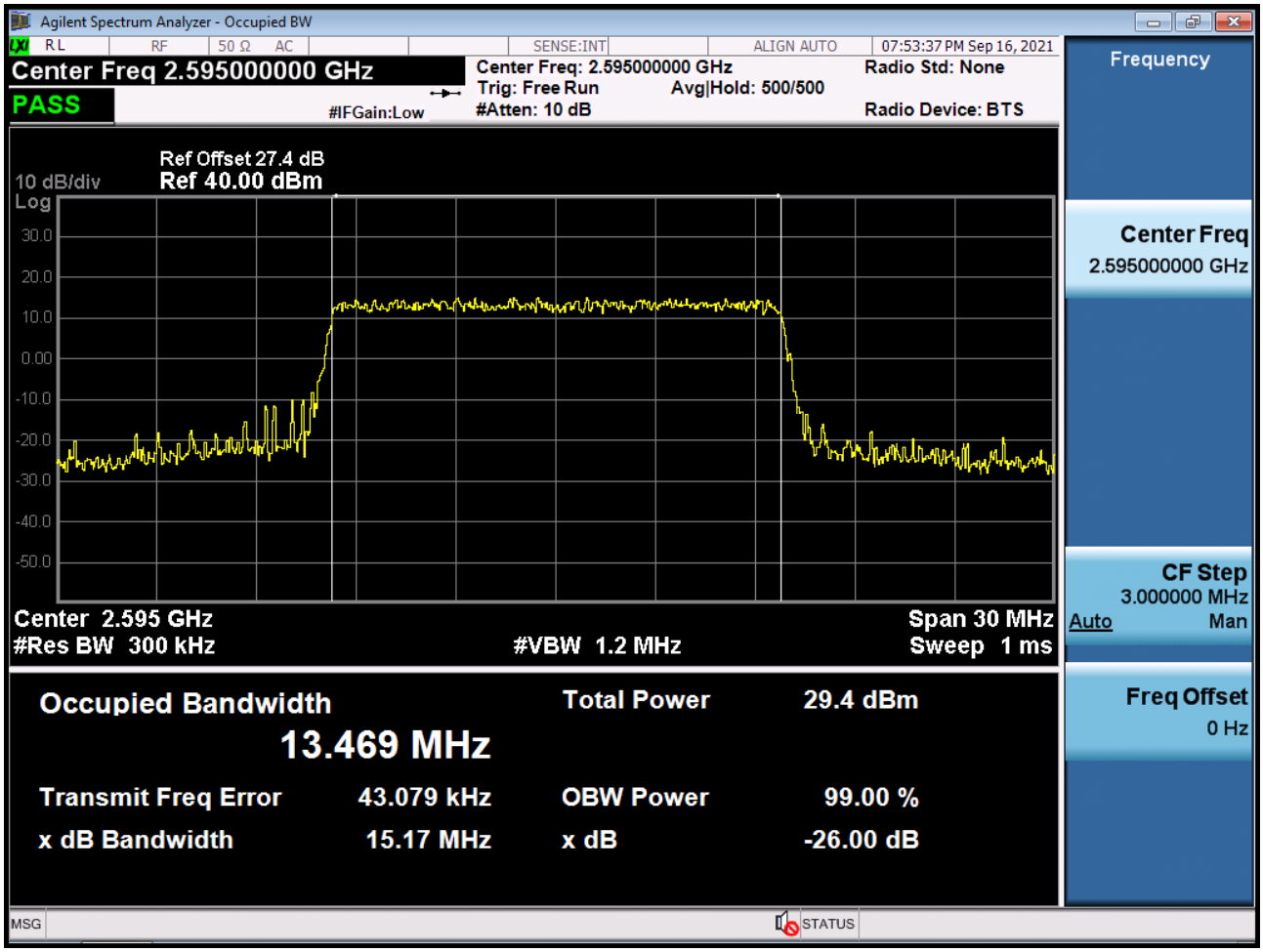
BAND 38. Occupied Bandwidth Plot (10 MHz Ch.38000 64-QAM RB 50)



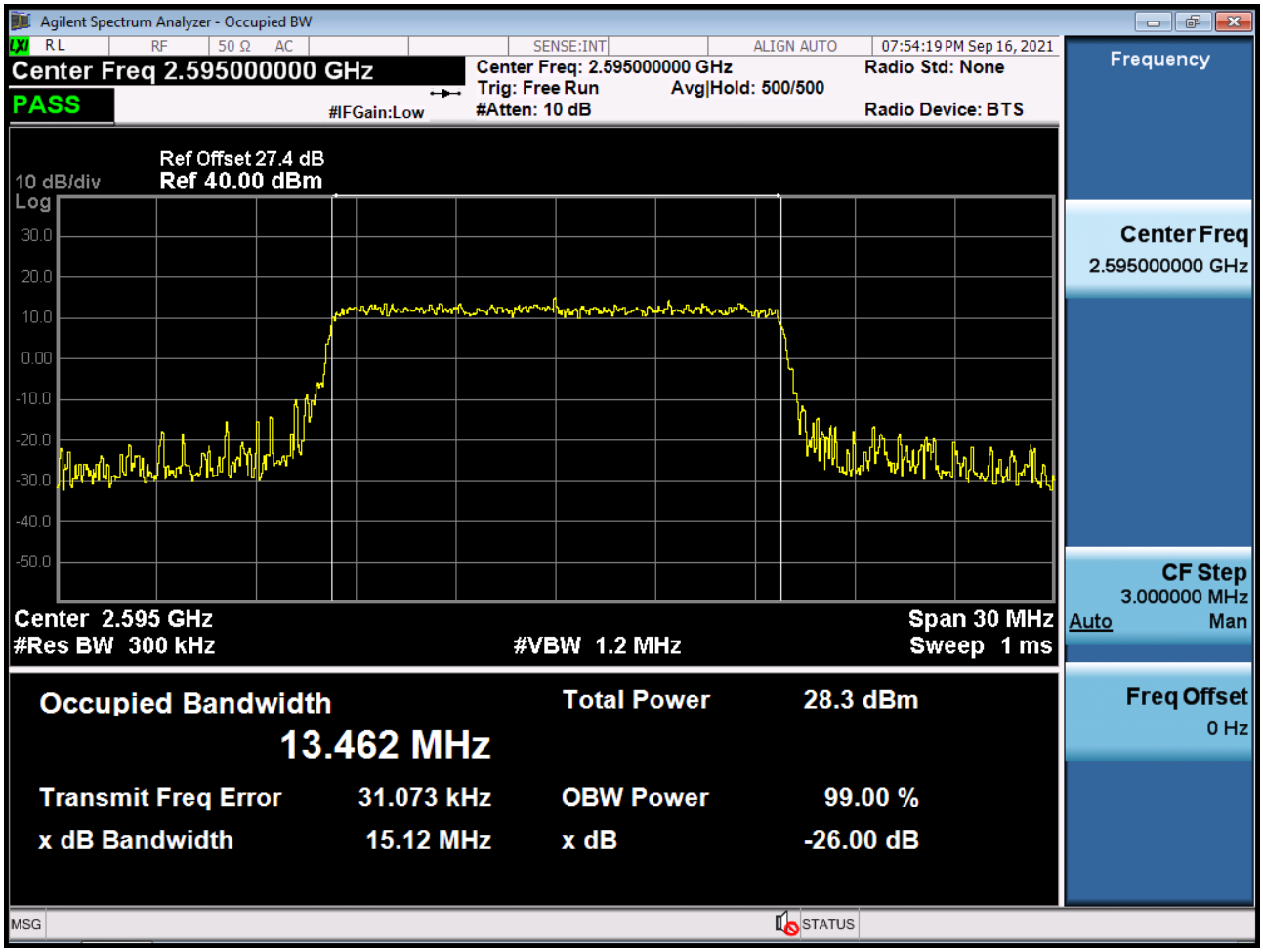
BAND 38. Occupied Bandwidth Plot (15 MHz Ch.38000 QPSK RB 75)



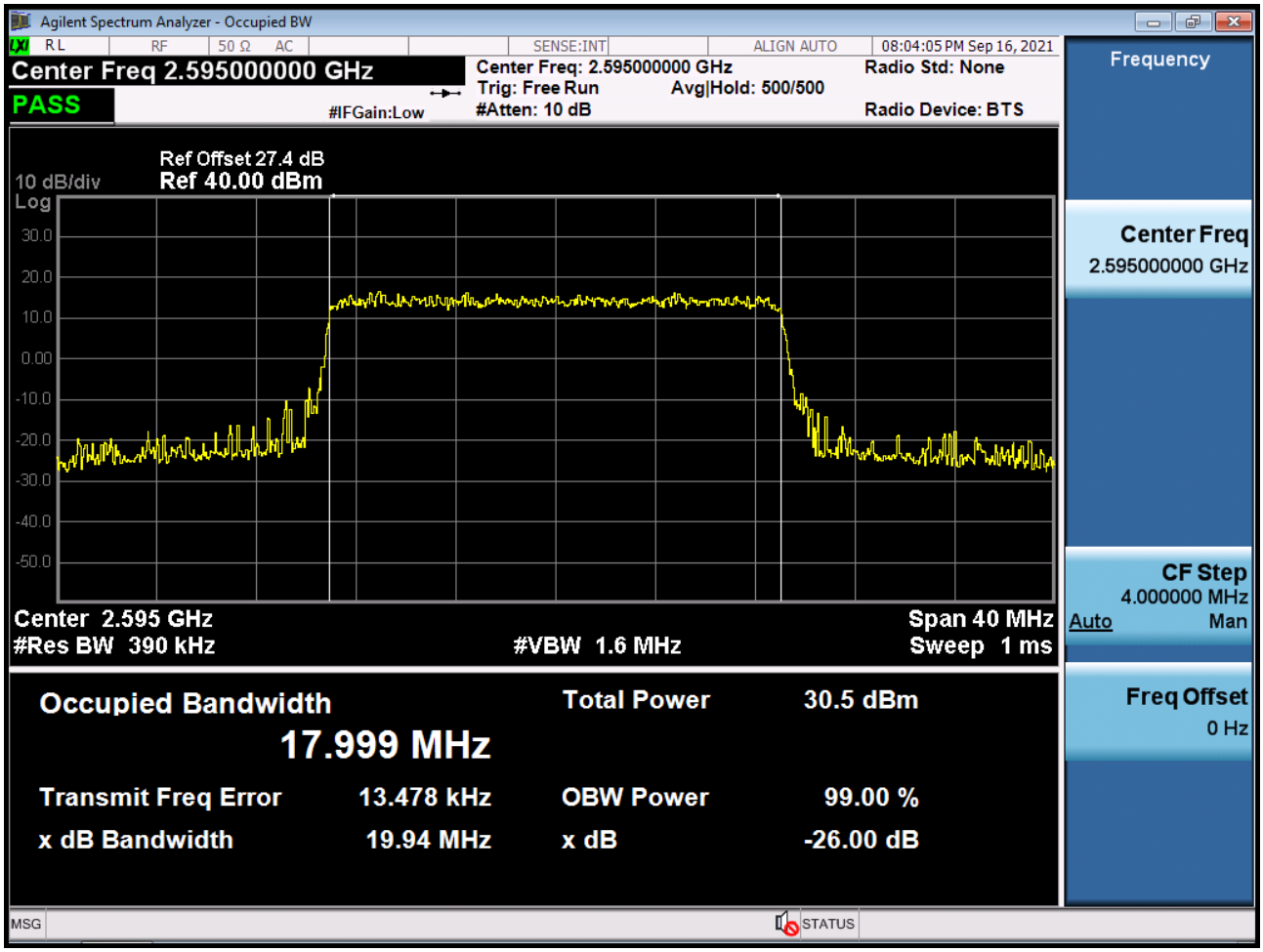
BAND 38. Occupied Bandwidth Plot (15 MHz Ch.38000 16-QAM RB 75)



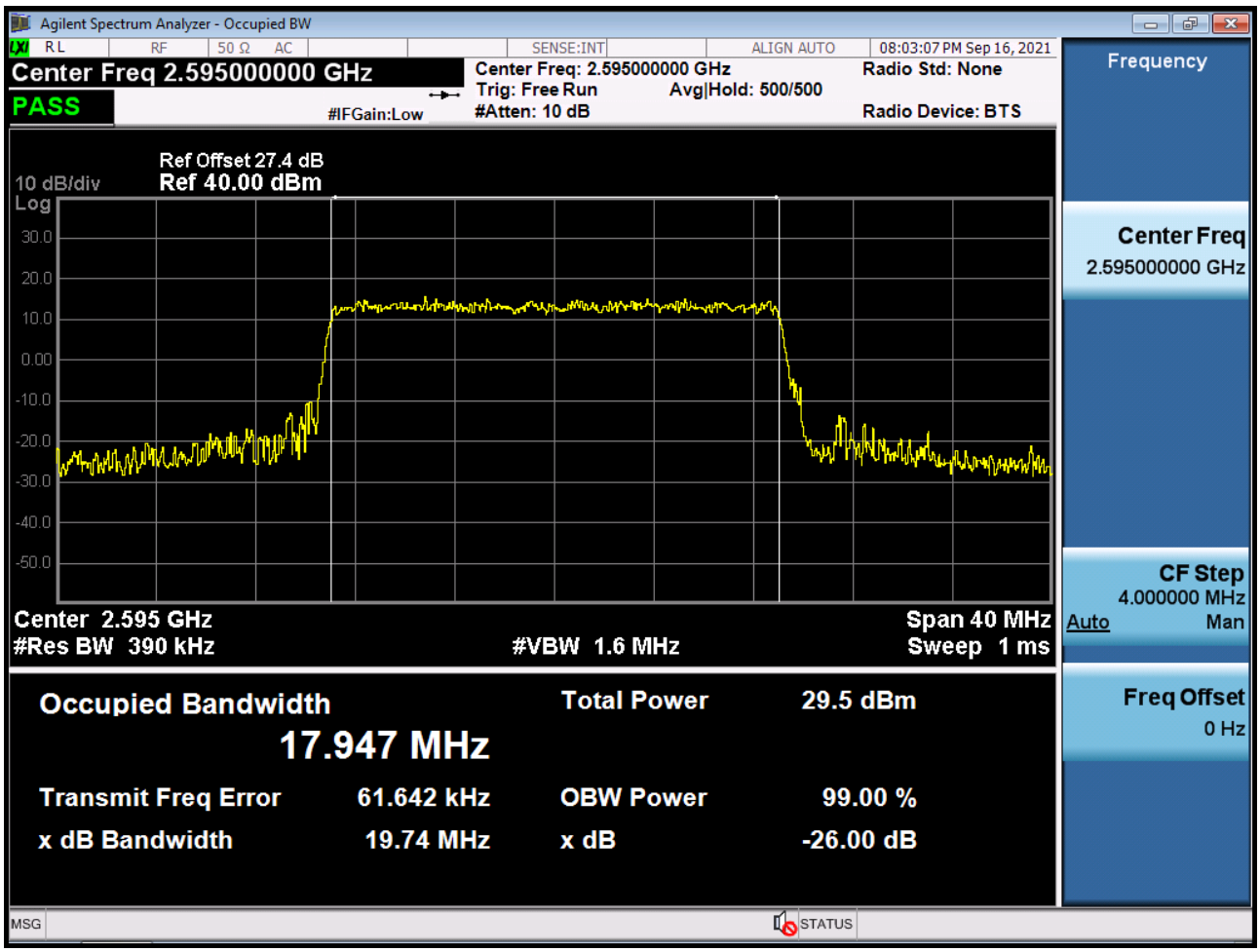
BAND 38. Occupied Bandwidth Plot (15 MHz Ch.38000 64-QAM RB 75)



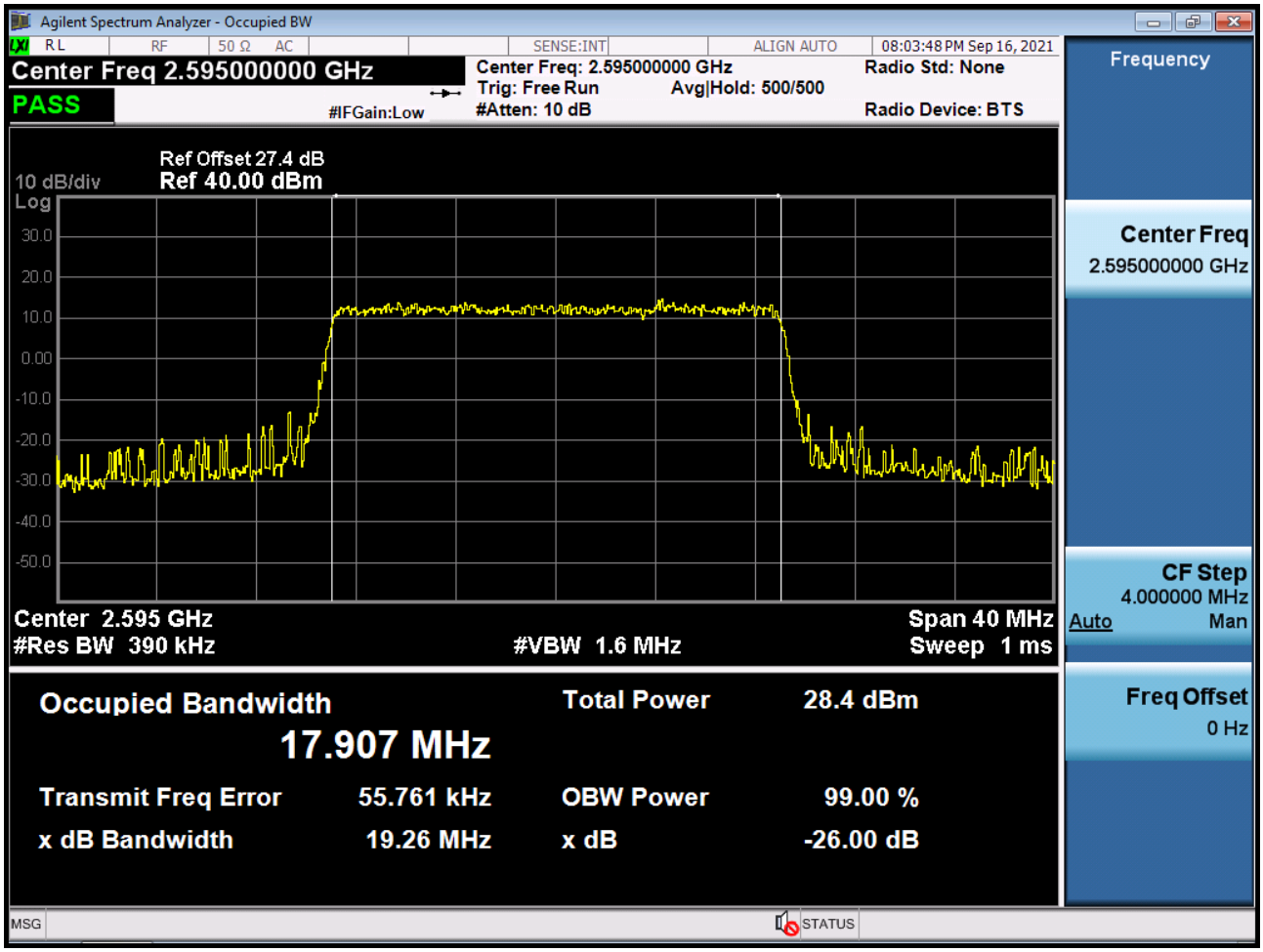
BAND 38. Occupied Bandwidth Plot (20 MHz Ch.38000 QPSK RB 100)



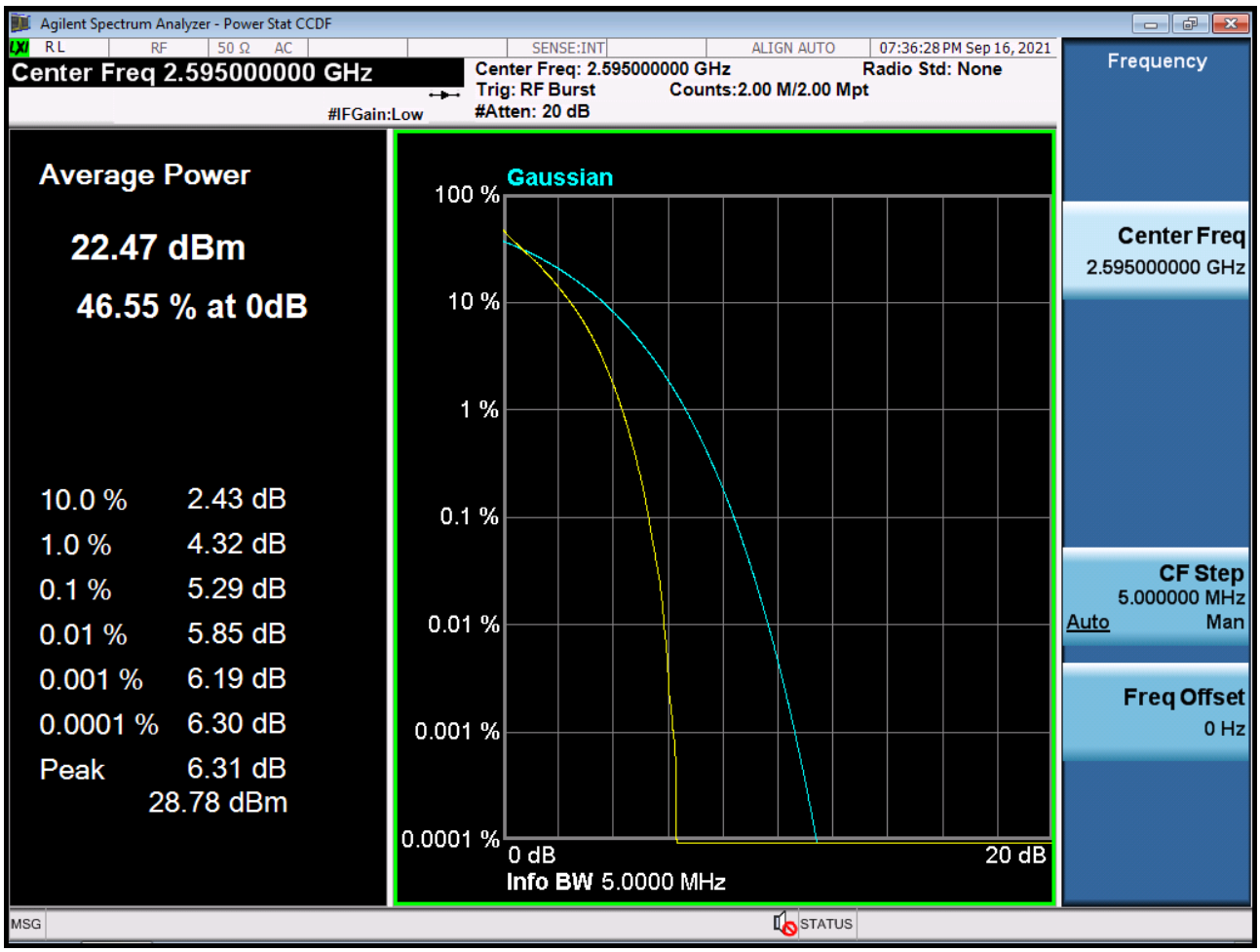
BAND 38. Occupied Bandwidth Plot (20 MHz Ch.38000 16-QAM RB 100)



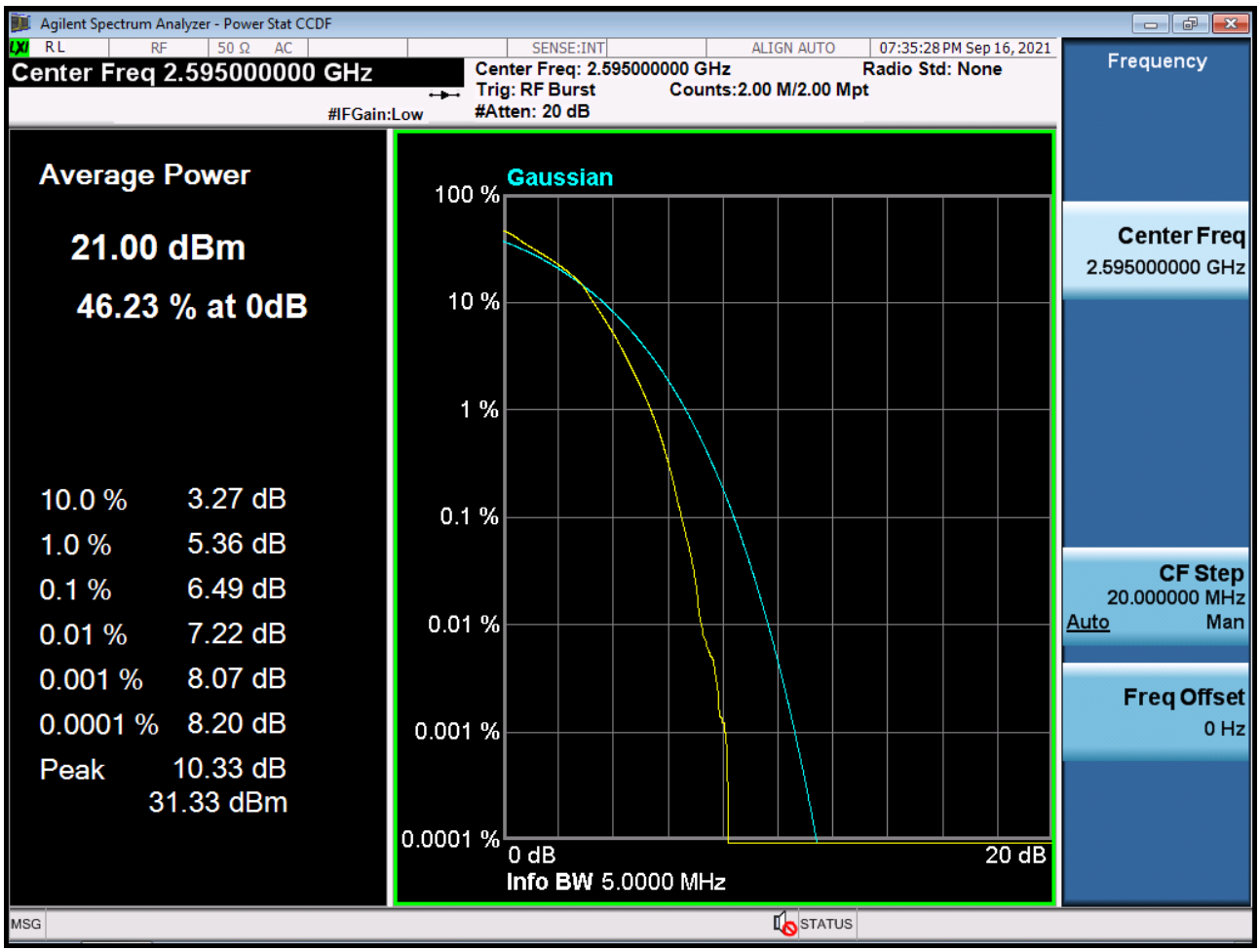
BAND 38. Occupied Bandwidth Plot (20 MHz Ch.38000 64-QAM RB 100)



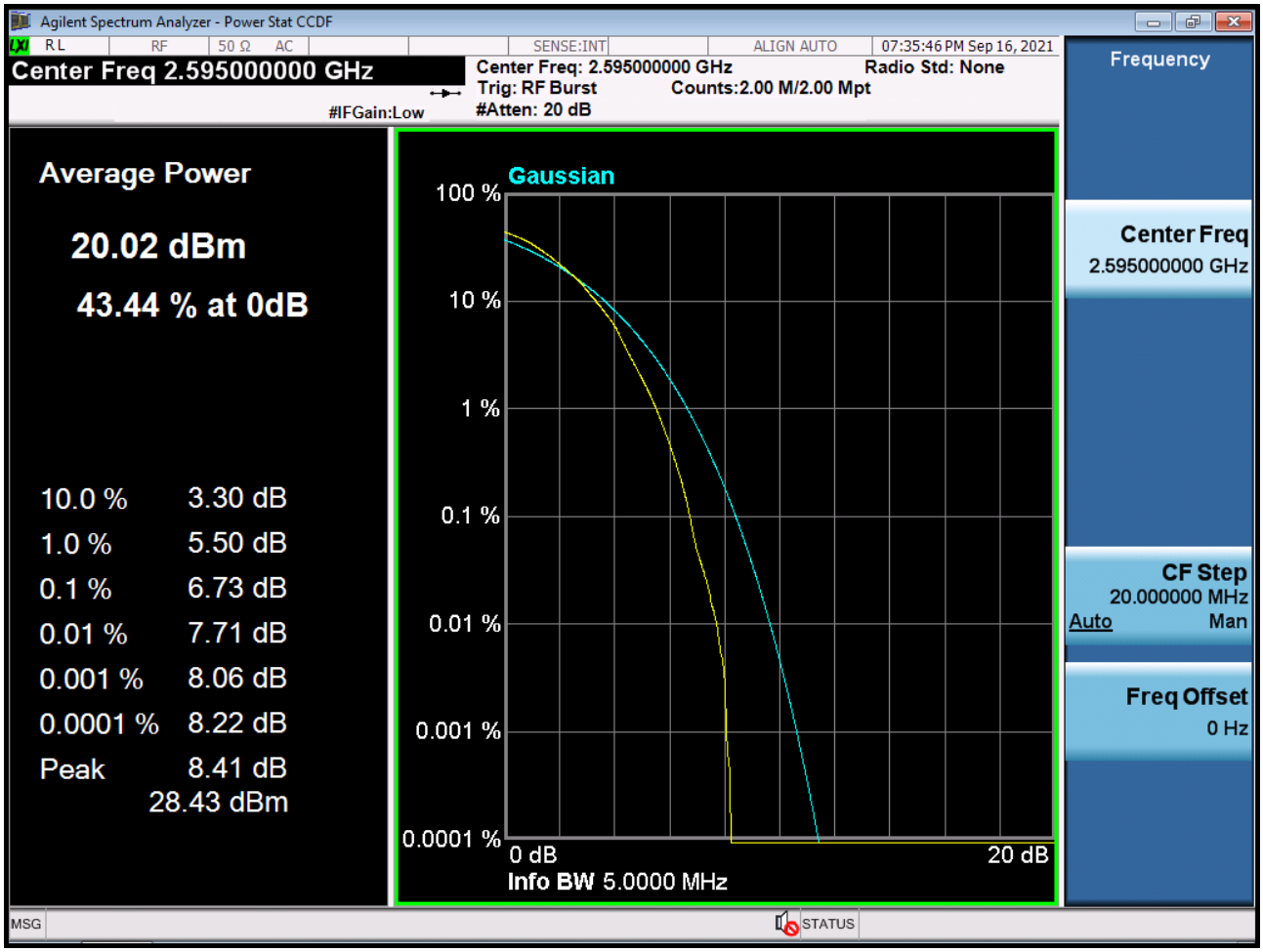
BAND 38. PAR Plot (5 M BW_Ch.38000_QPSK_RB25_0)



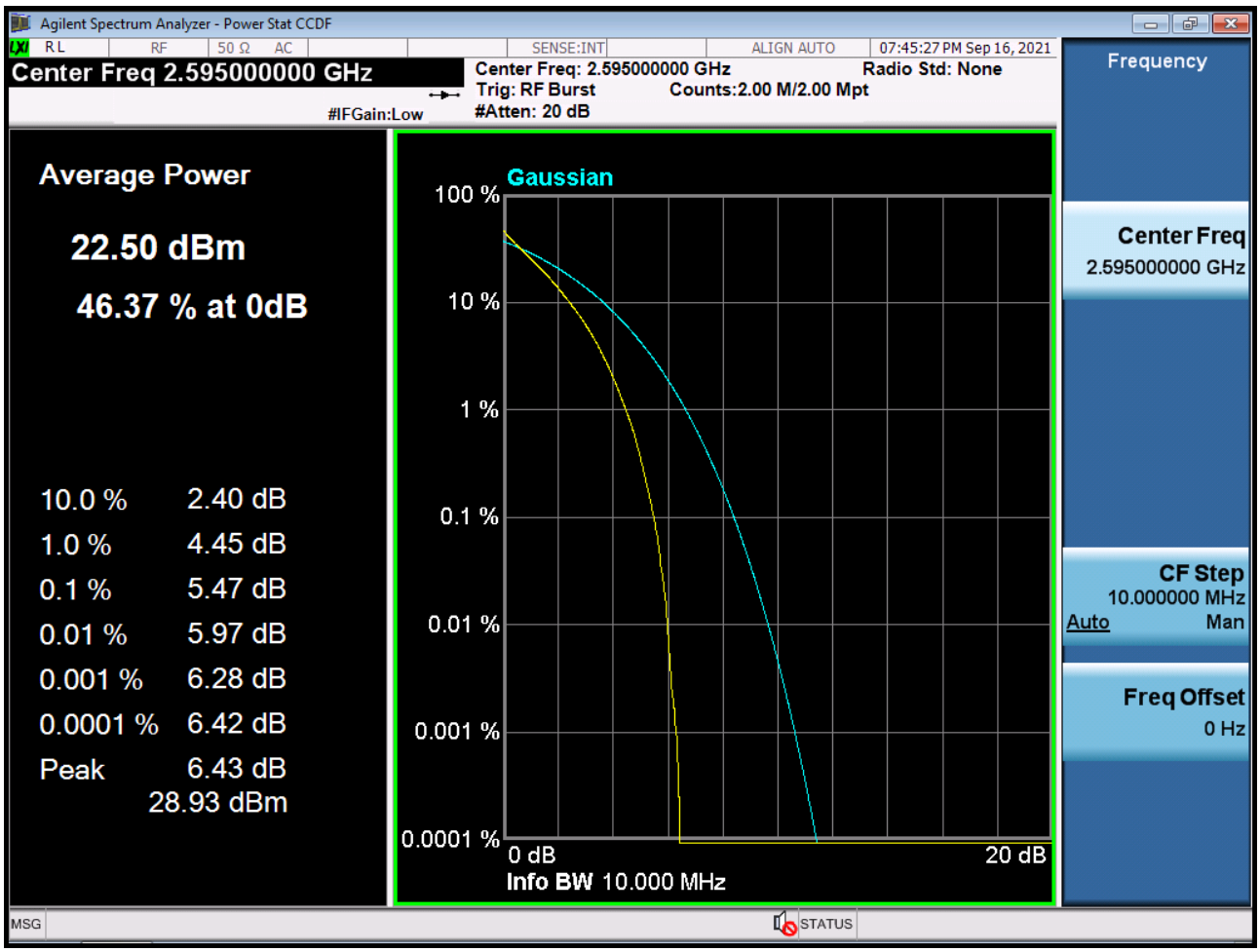
BAND 38. PAR Plot (5 M BW_Ch.38000_16QAM_RB25_0)



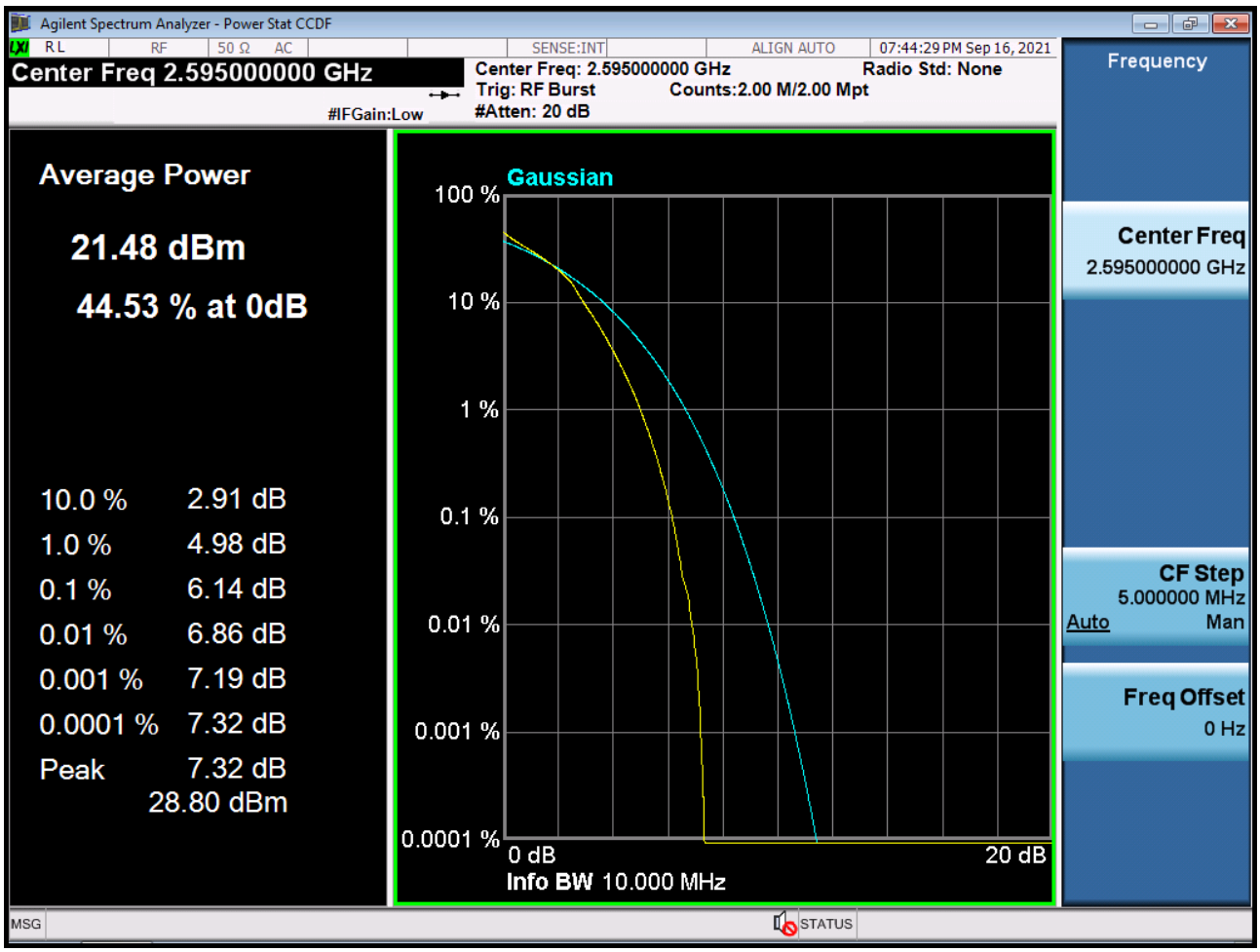
BAND 38. PAR Plot (5 M BW_Ch.38000_64QAM_RB25_0)



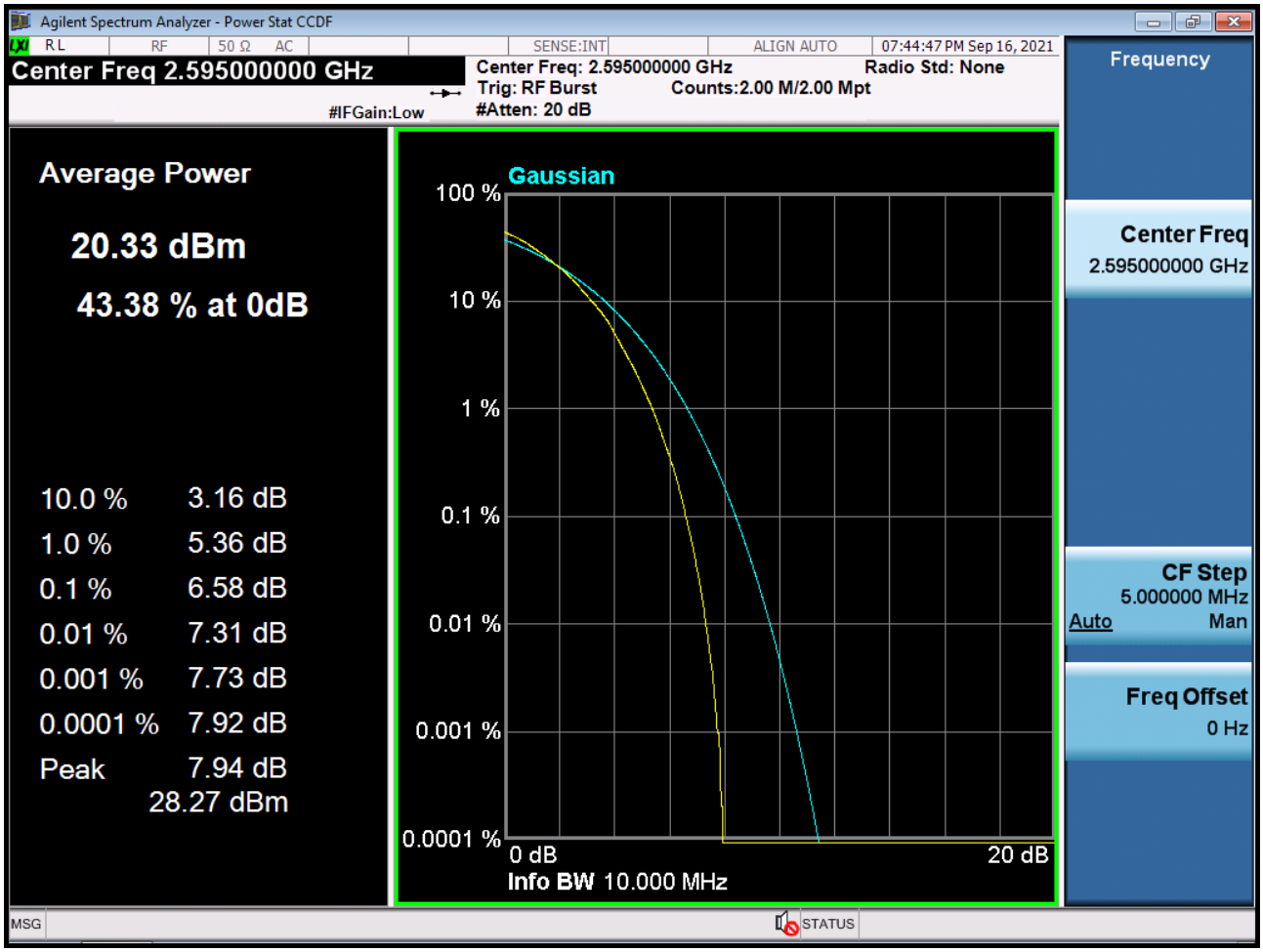
BAND 38. PAR Plot (10 M BW_Ch.38000_QPSK_RB50_0)



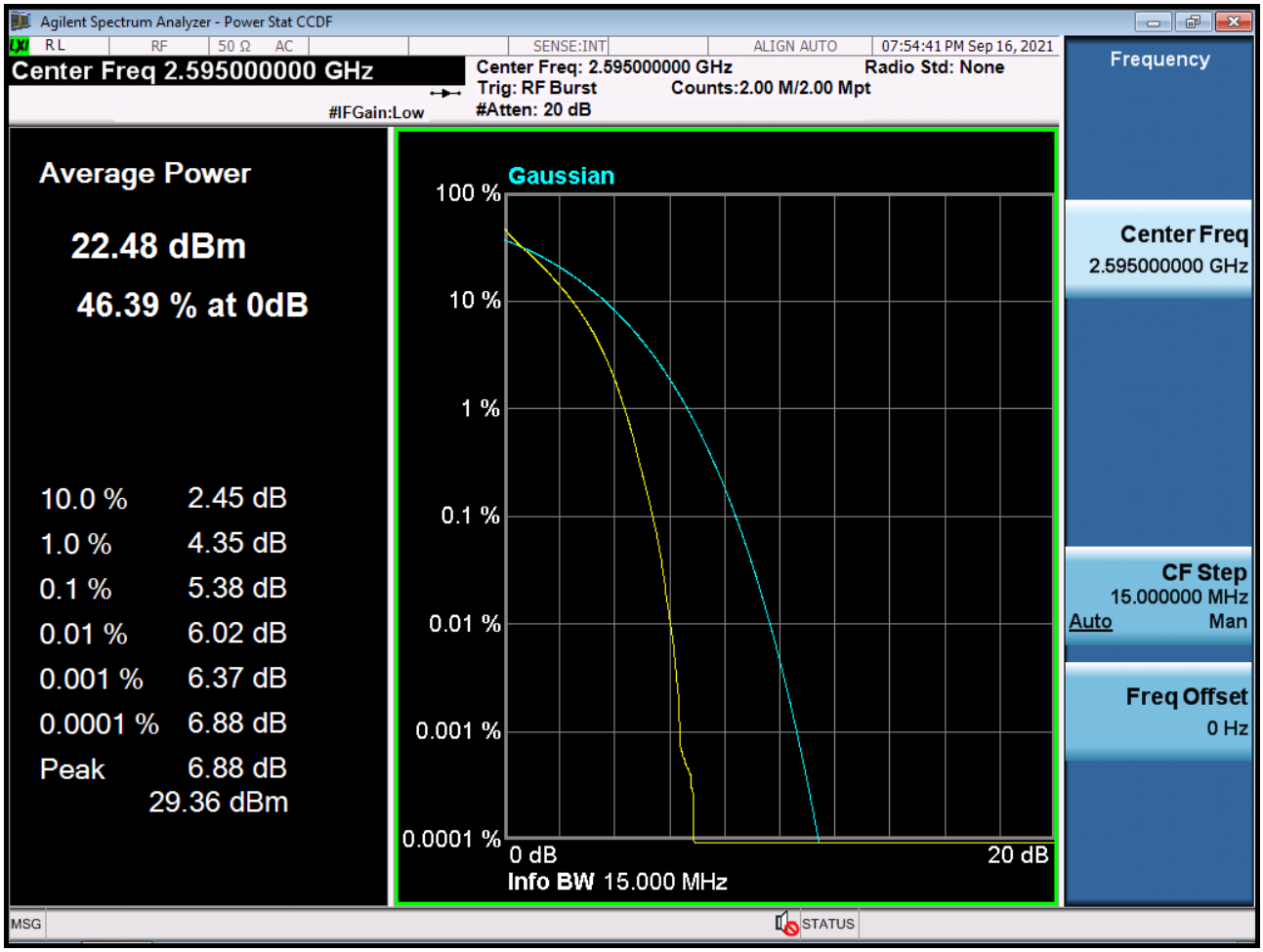
BAND 38. PAR Plot (10 M BW_Ch.38000_16QAM_RB50_0)



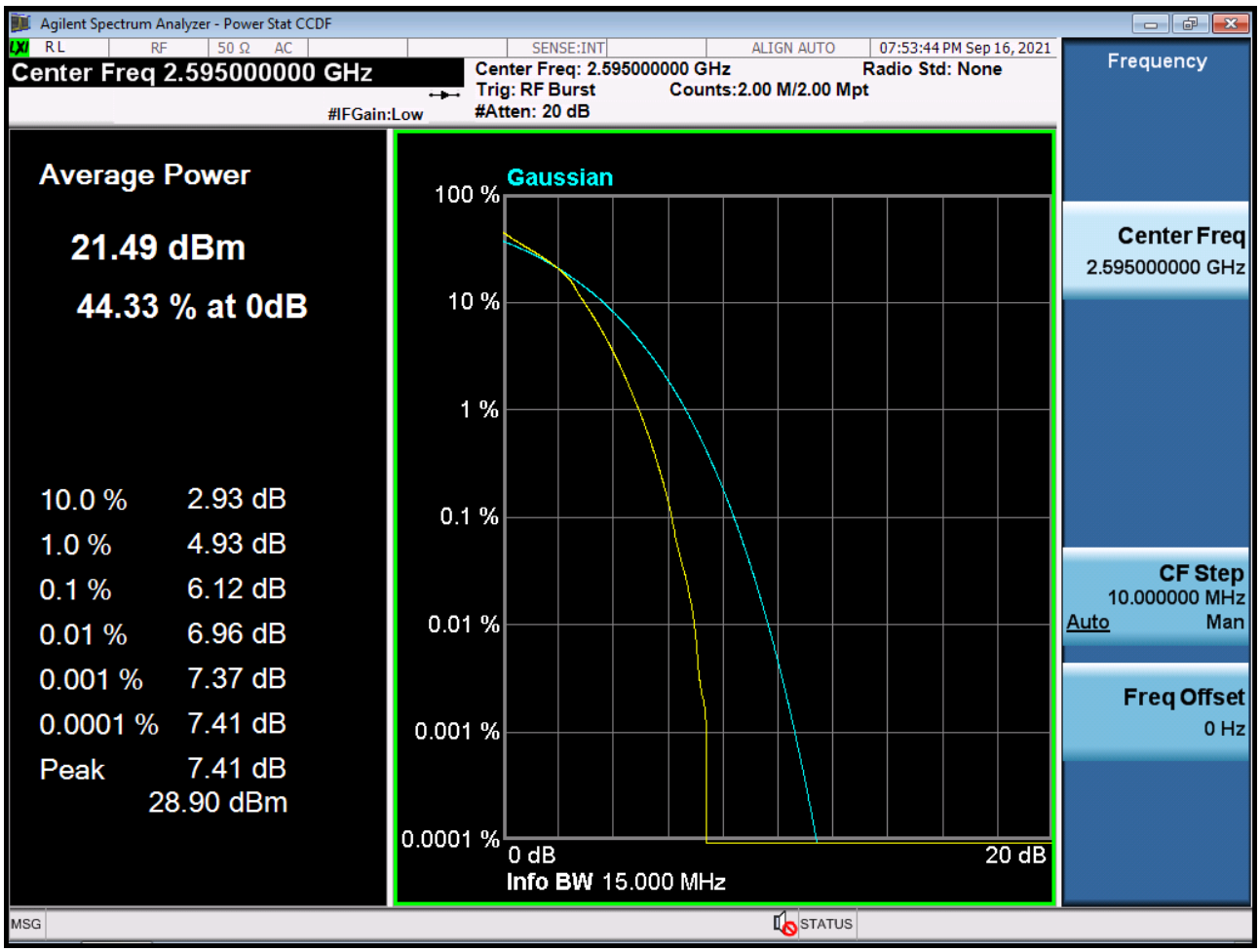
BAND 38. PAR Plot (10 M BW_Ch.38000_64QAM_RB50_0)



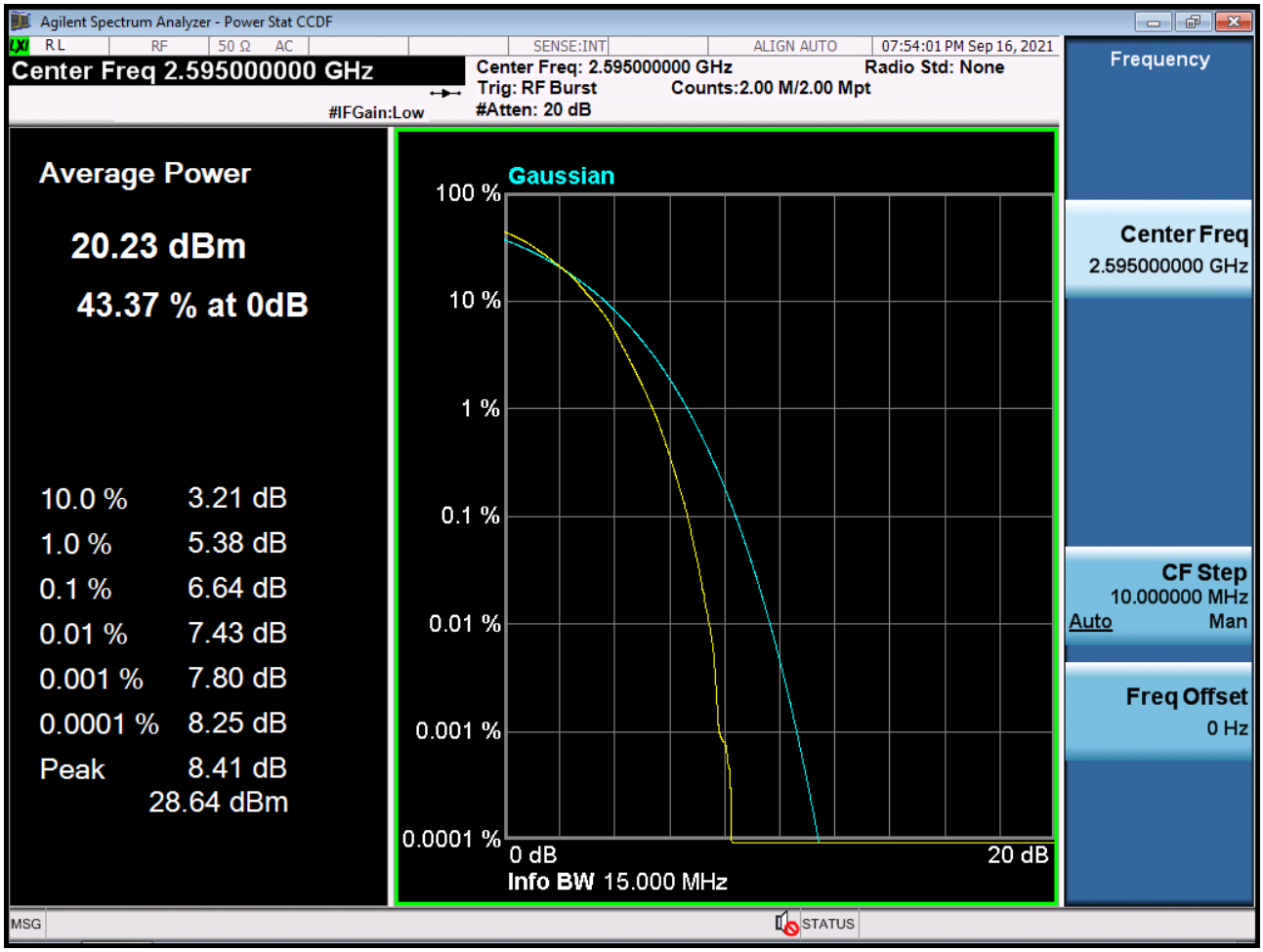
BAND 38. PAR Plot (15 M BW_Ch.38000_QPSK_RB75_0)



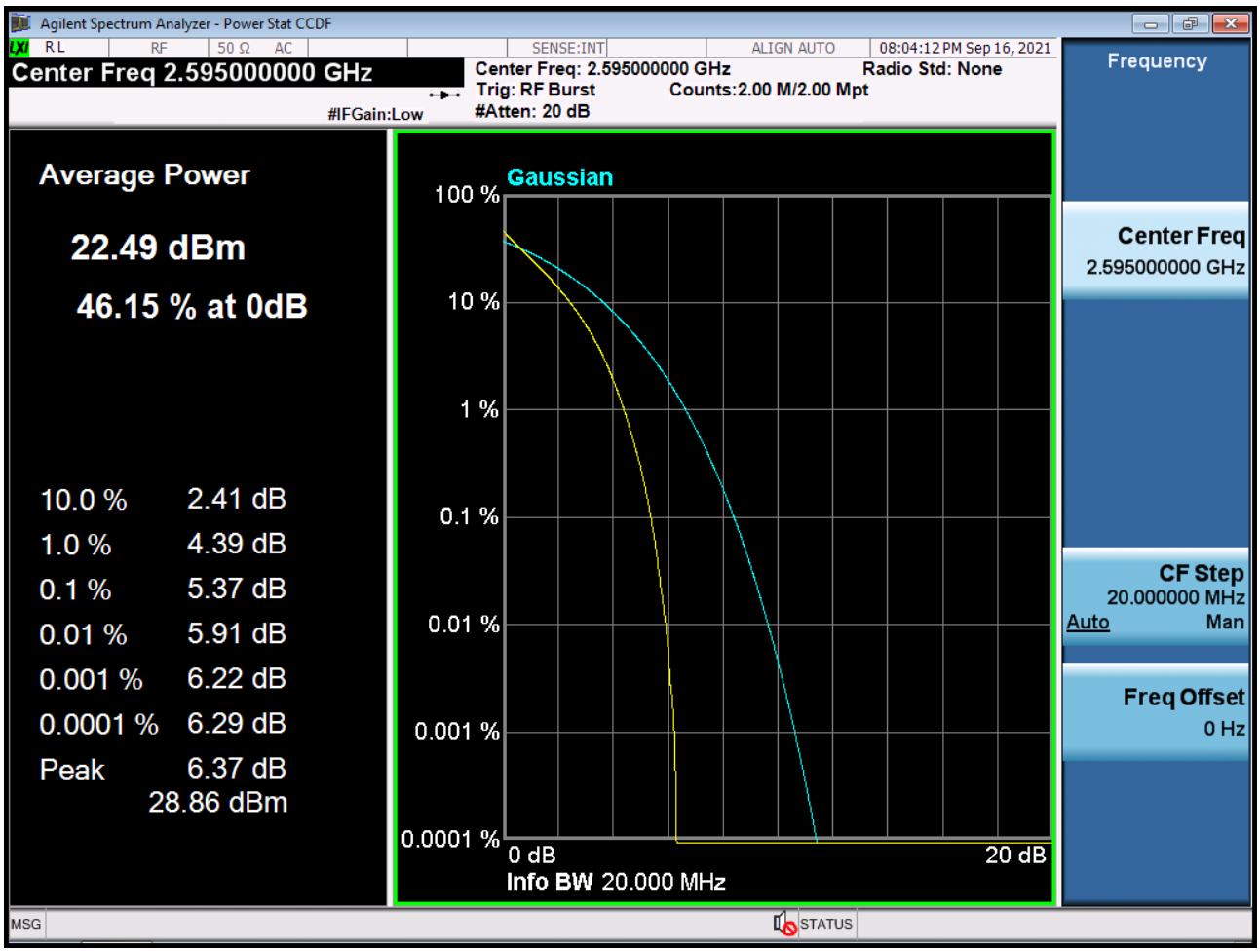
BAND 38. PAR Plot (15 M BW_Ch.38000_16QAM_RB75_0)



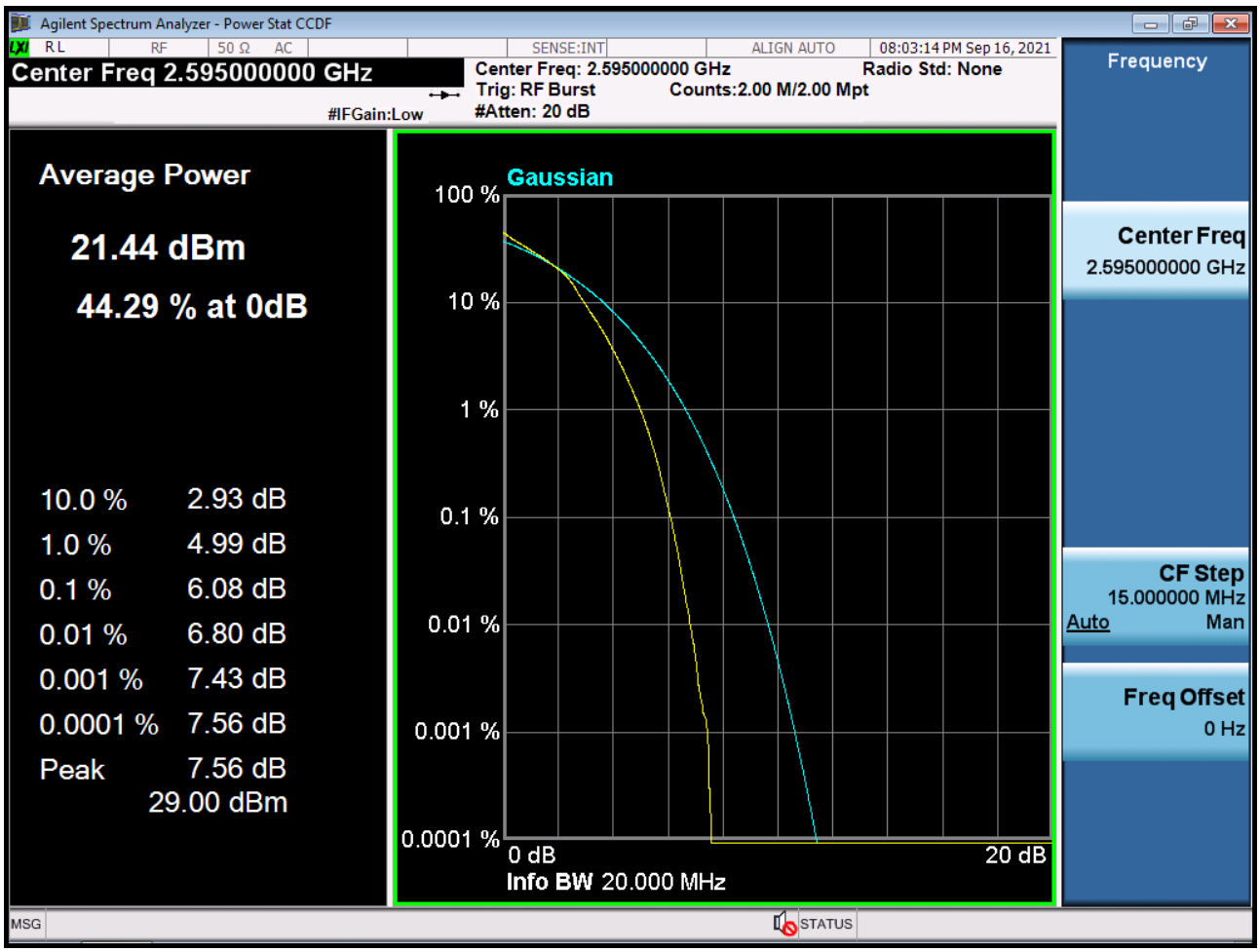
BAND 38. PAR Plot (15 M BW_Ch.38000_64QAM_RB75_0)



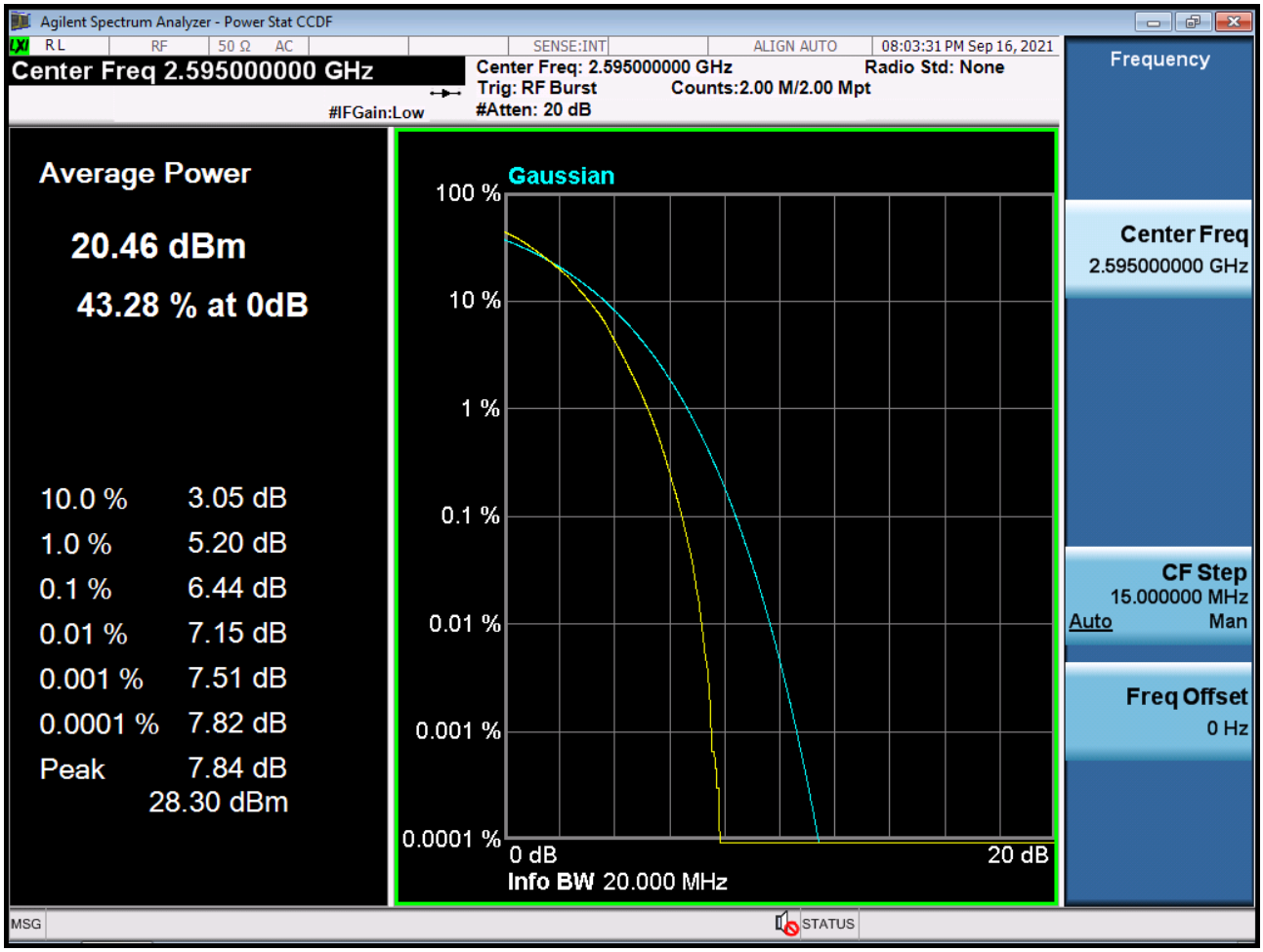
BAND 38. PAR Plot (20 M BW_Ch.38000_QPSK_RB100_0)



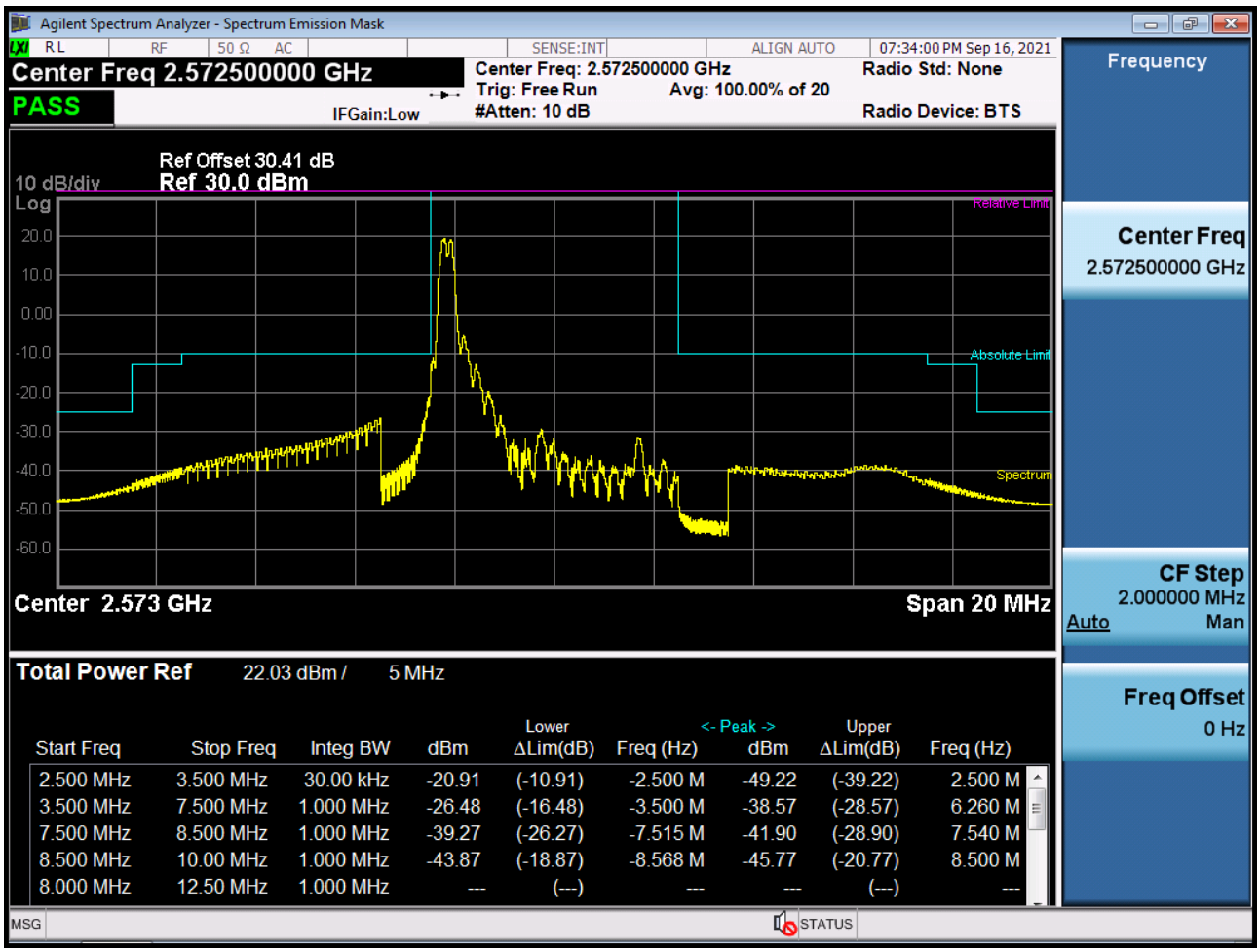
BAND 38. PAR Plot (20 M BW_Ch.38000_16QAM_RB100_0)



BAND 38. PAR Plot (20 M BW_Ch.38000_64QAM_RB100_0)

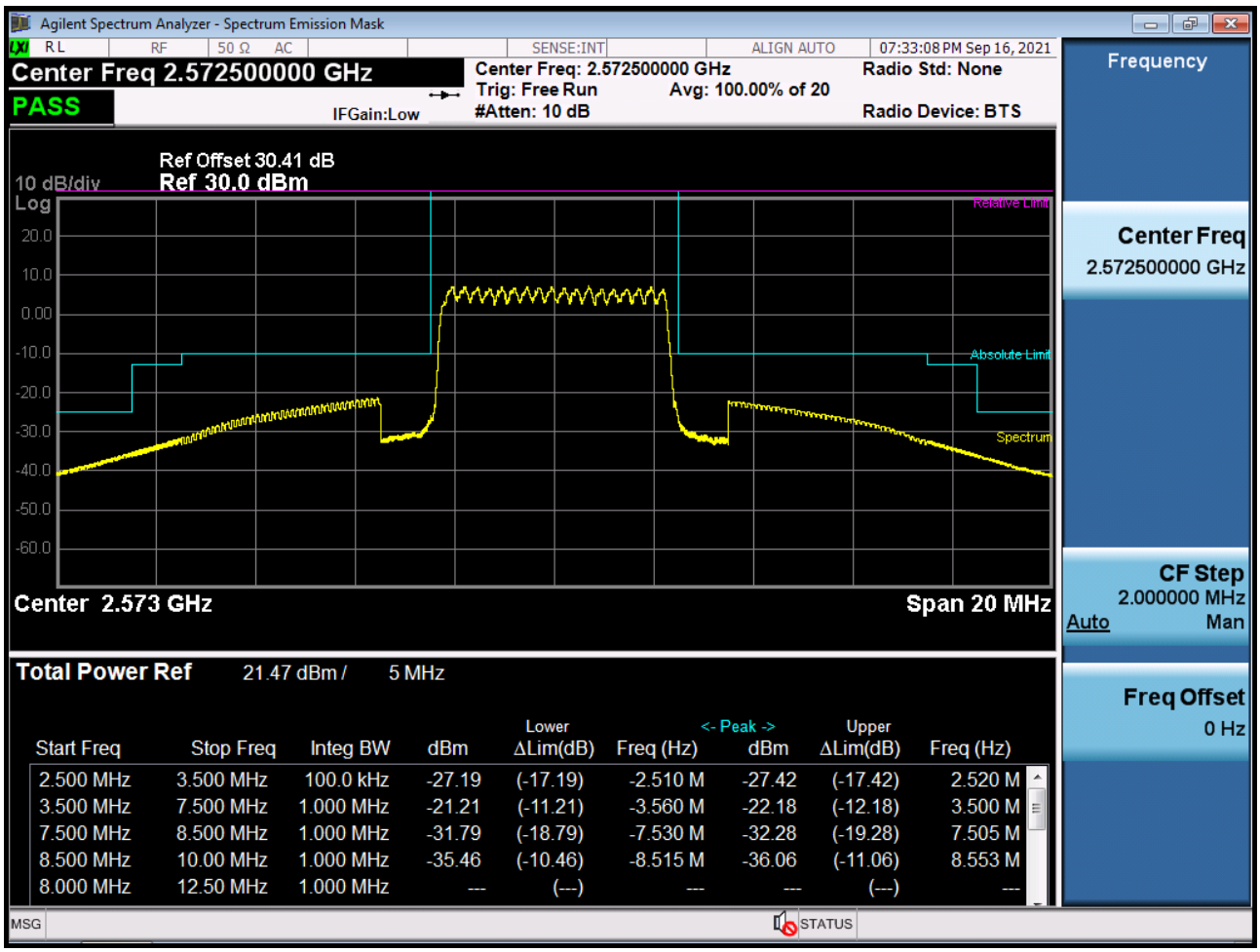


BAND 38. Low Channel Edge Plot (5 MHz Ch.37775 QPSK RB 1, Offset 0)

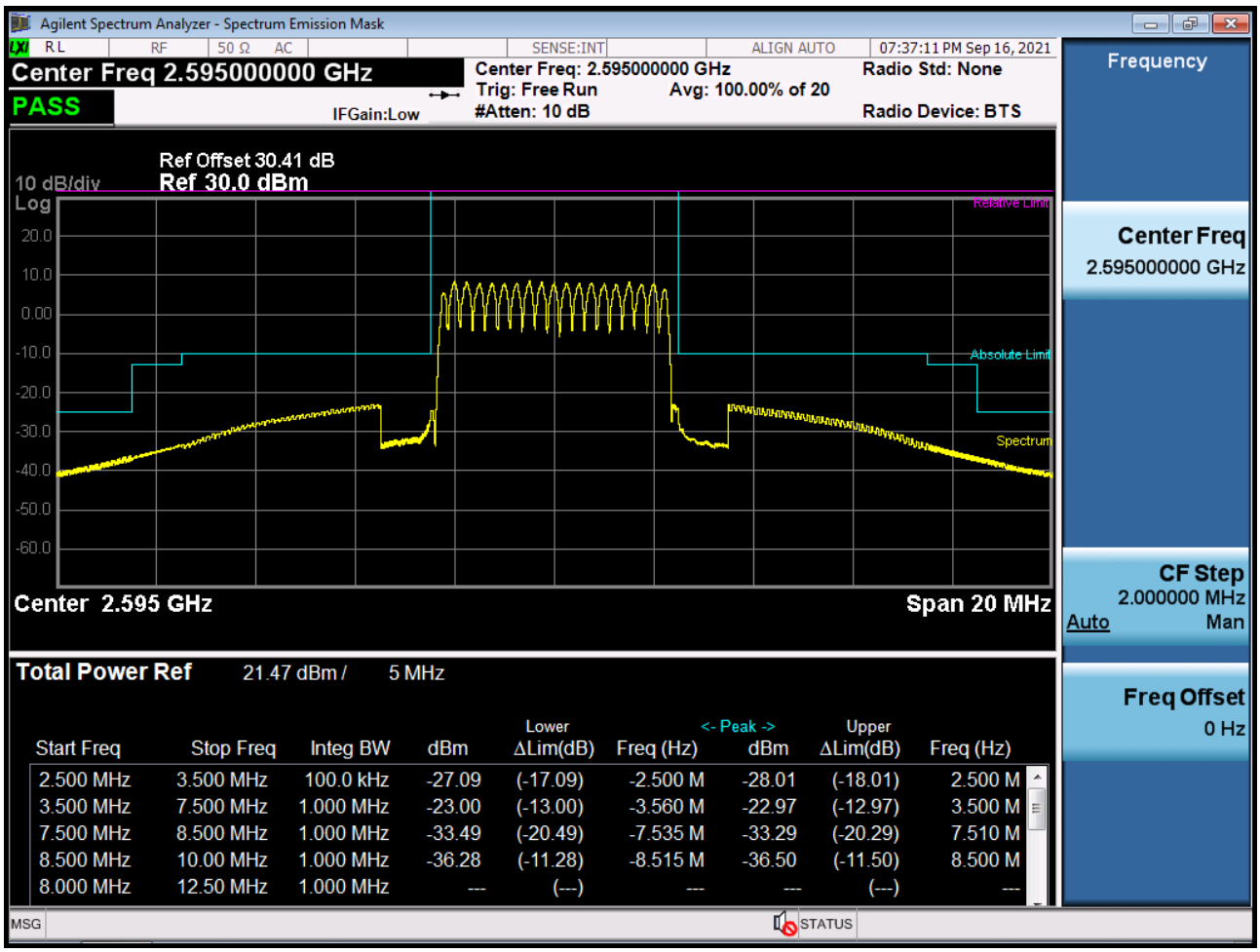


Start Freq	Stop Freq	Integ BW	dBm	Lower ΔLim(dB)	Lower Freq (Hz)	<- Peak -> dBm	Upper ΔLim(dB)	Upper Freq (Hz)
2.500 MHz	3.500 MHz	30.00 kHz	-20.91	(-10.91)	-2.500 M	-49.22	(-39.22)	2.500 M
3.500 MHz	7.500 MHz	1.000 MHz	-26.48	(-16.48)	-3.500 M	-38.57	(-28.57)	6.260 M
7.500 MHz	8.500 MHz	1.000 MHz	-39.27	(-26.27)	-7.515 M	-41.90	(-28.90)	7.540 M
8.500 MHz	10.00 MHz	1.000 MHz	-43.87	(-18.87)	-8.568 M	-45.77	(-20.77)	8.500 M
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---

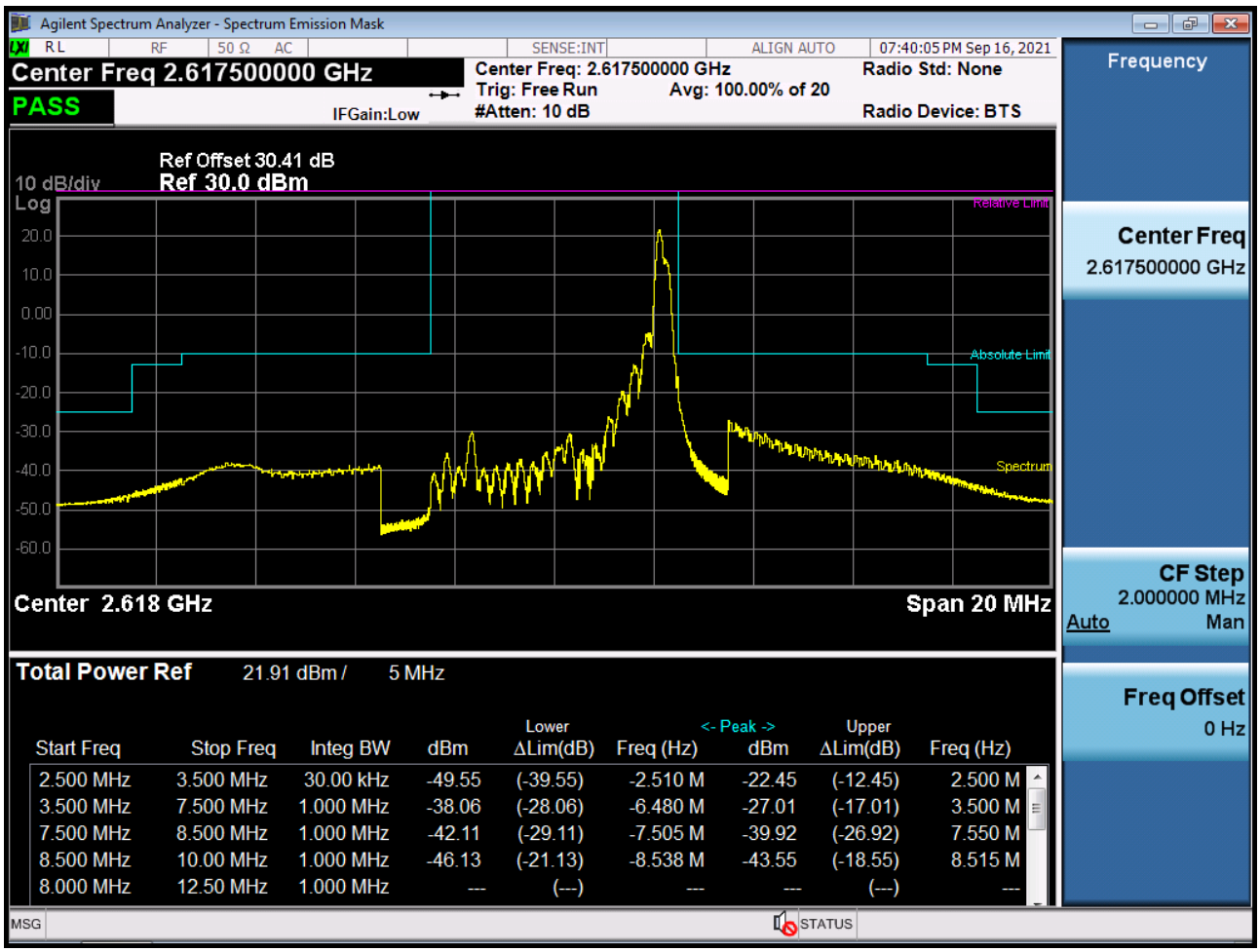
BAND 38. Low Channel Edge Plot (5 MHz Ch.37775 QPSK RB 25, Offset 0)



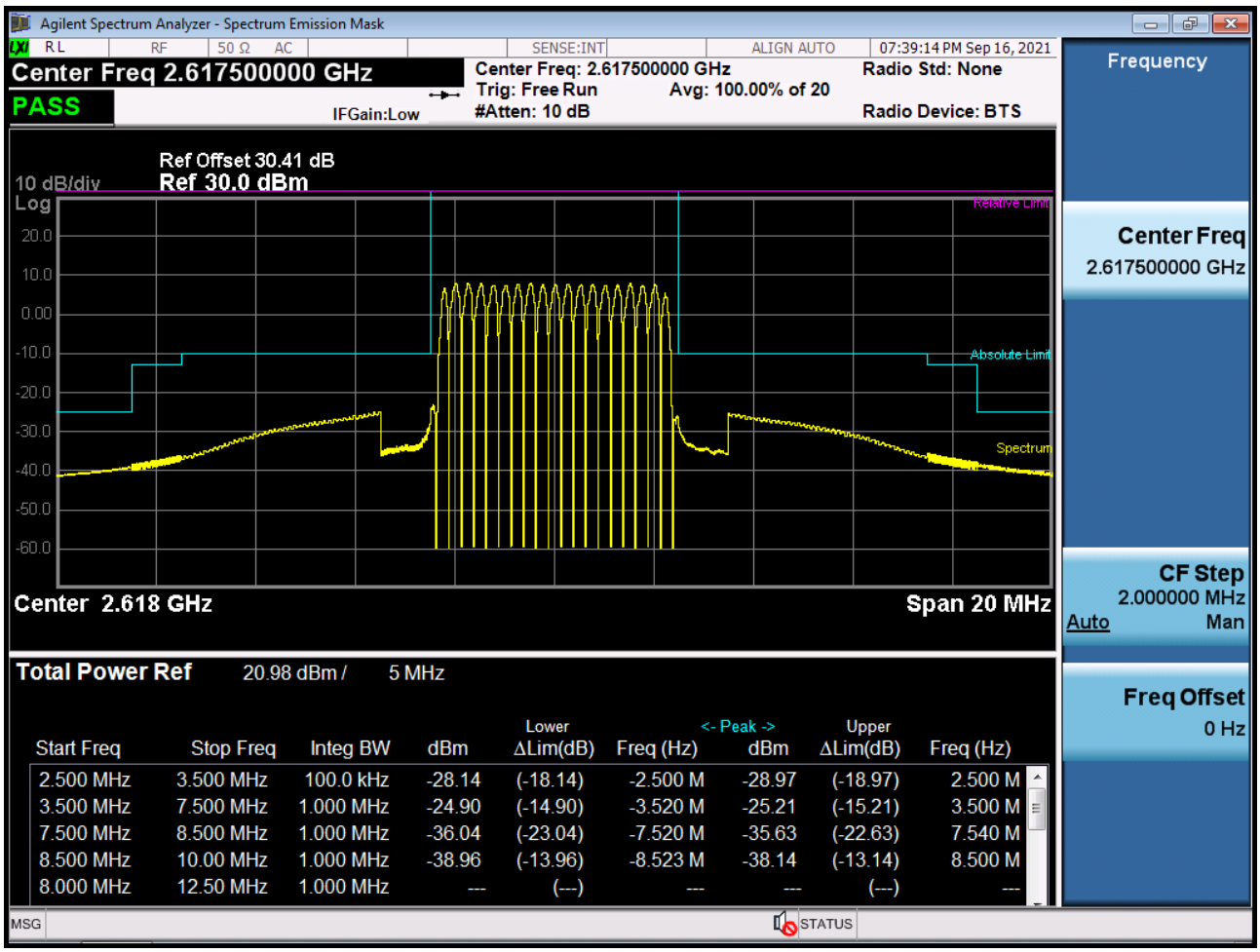
BAND 38. Mid Channel Edge Plot (5 MHz Ch.38000 QPSK RB 25)



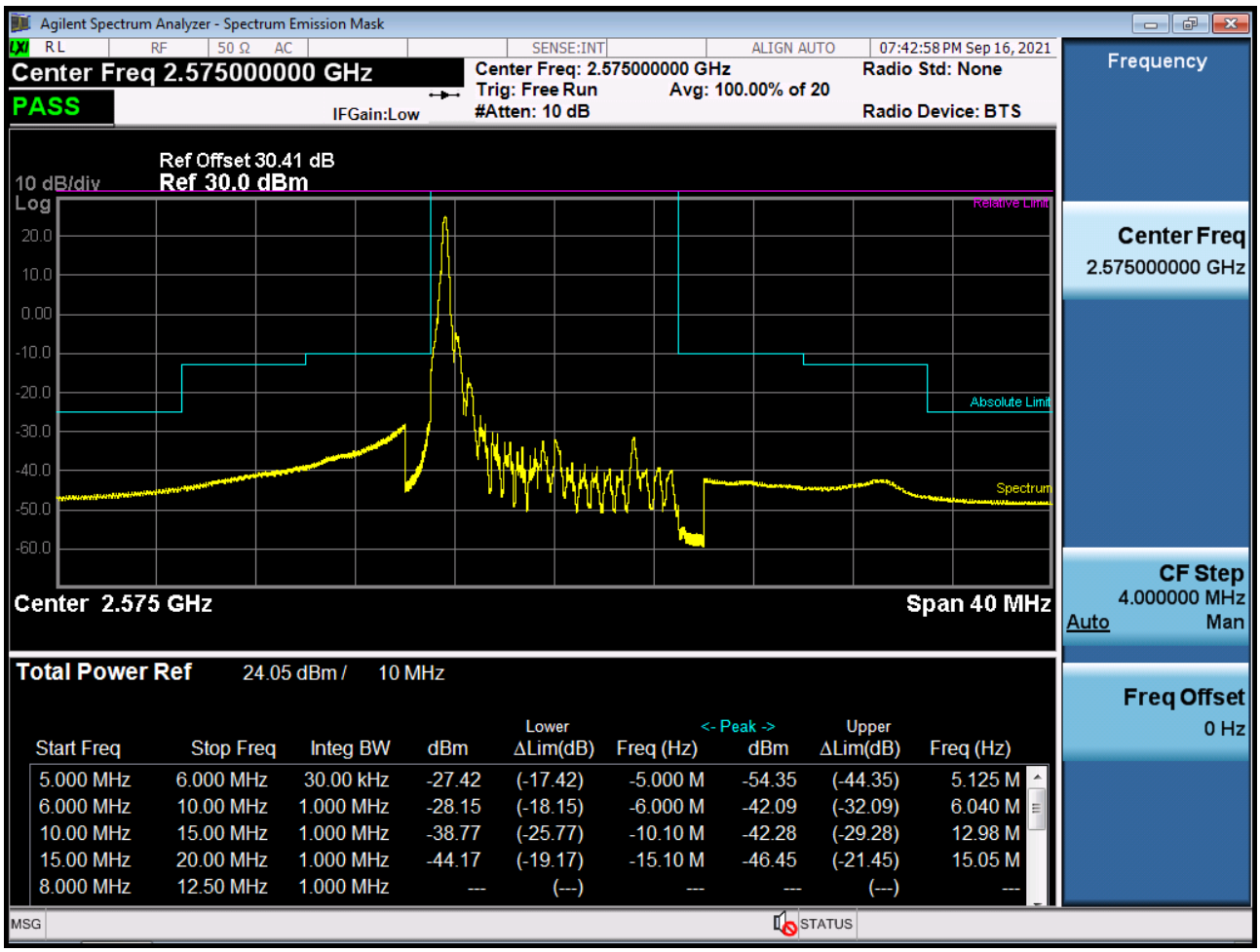
BAND 38. High Channel Edge Plot (5 MHz Ch.38225 QPSK RB 1, Offset 0)



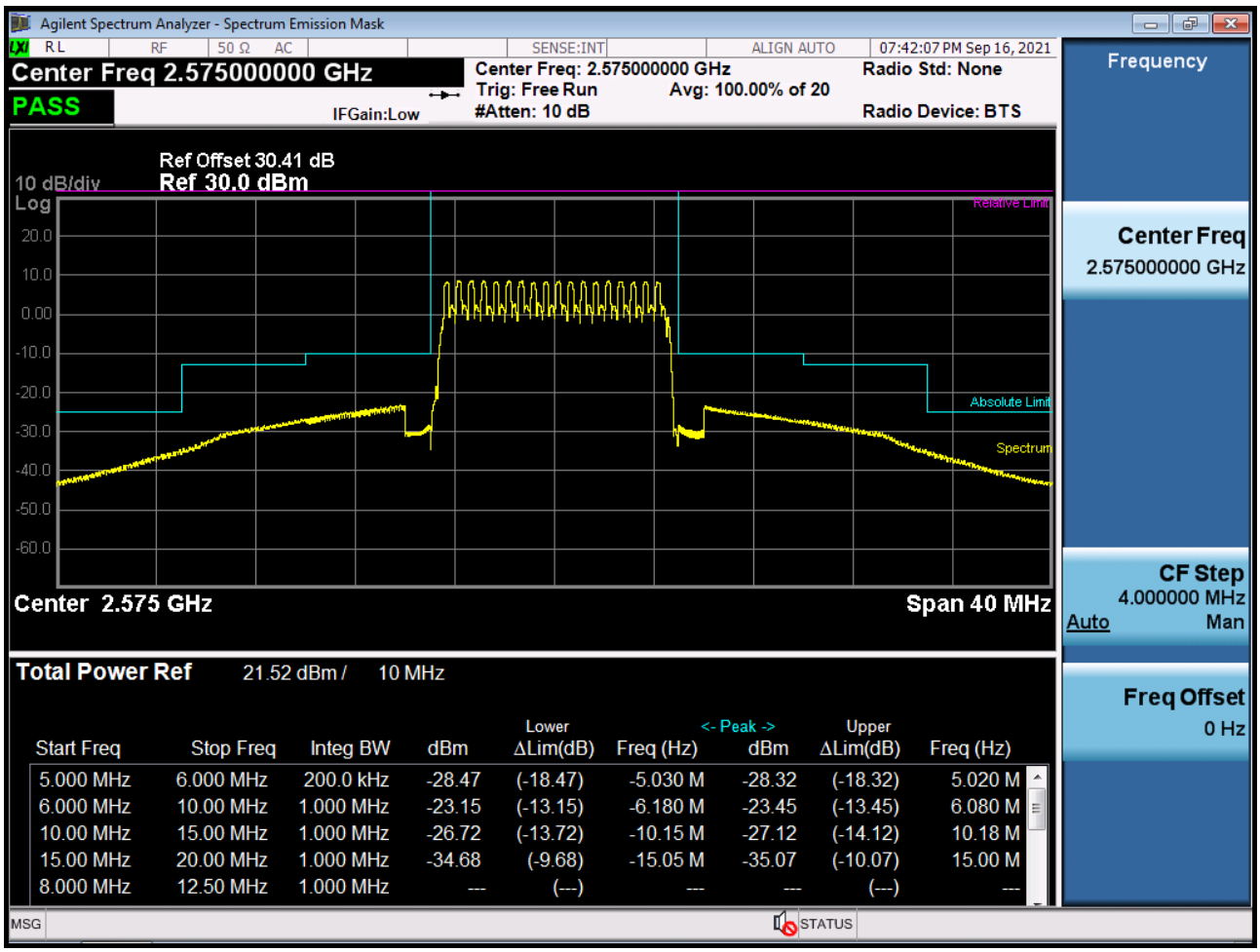
BAND 38. High Channel Edge Plot (5 MHz Ch.38225 QPSK_RB25_Offset 0)



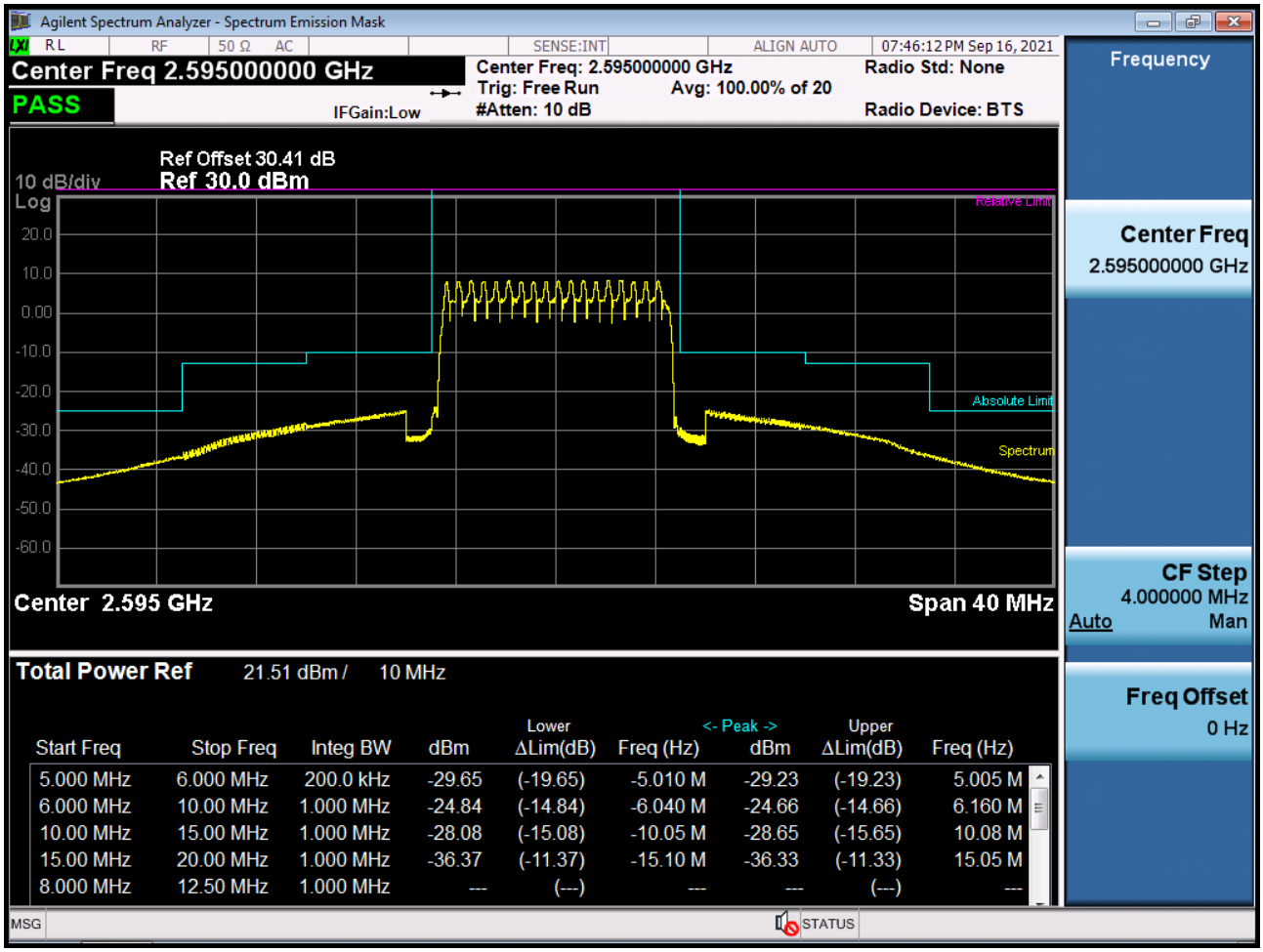
BAND 38. Low Channel Edge Plot (10 MHz Ch.37800 QPSK RB 1, Offset 0)



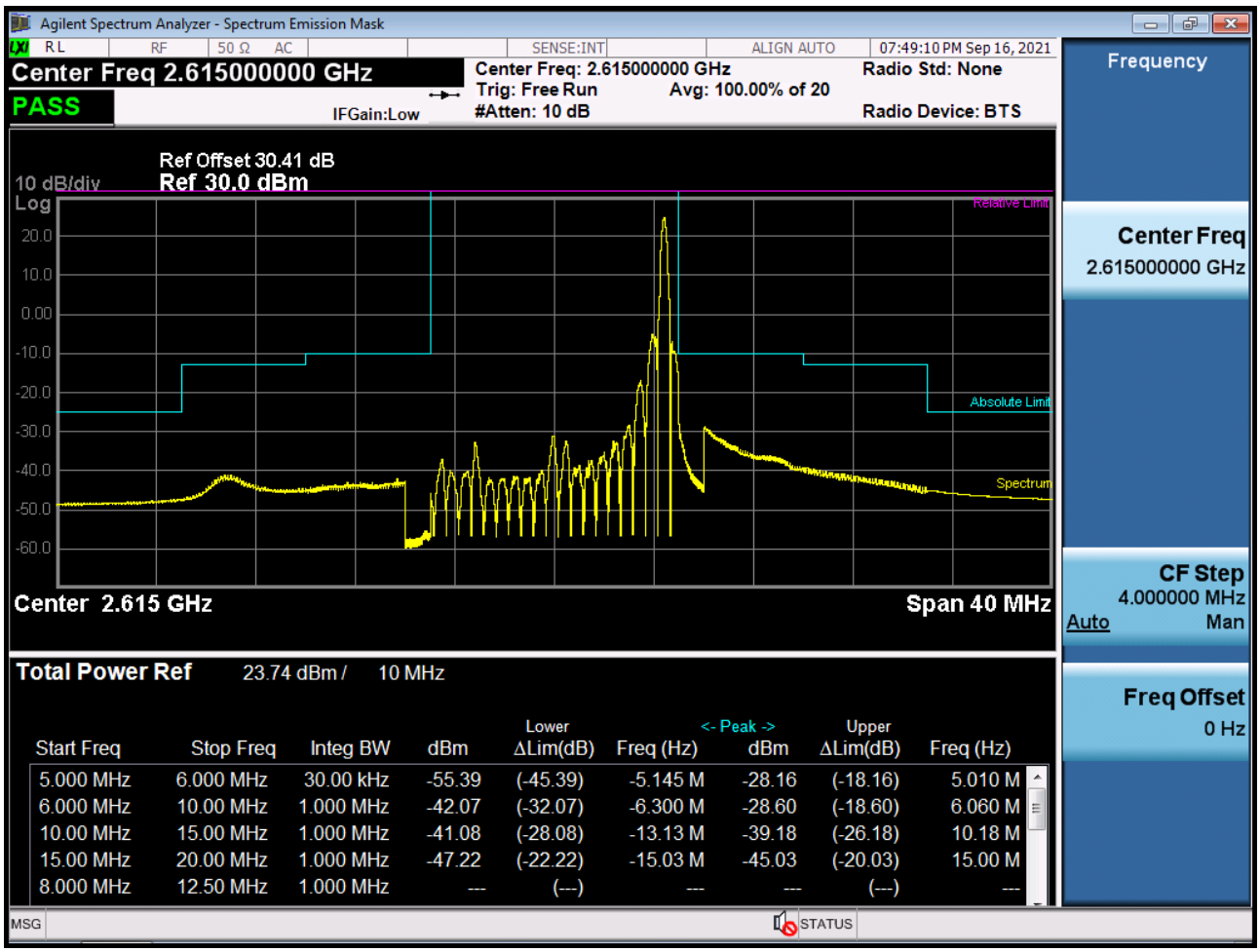
BAND 38. Low Channel Edge Plot (10 MHz Ch.37800 QPSK RB 25, Offset 0)



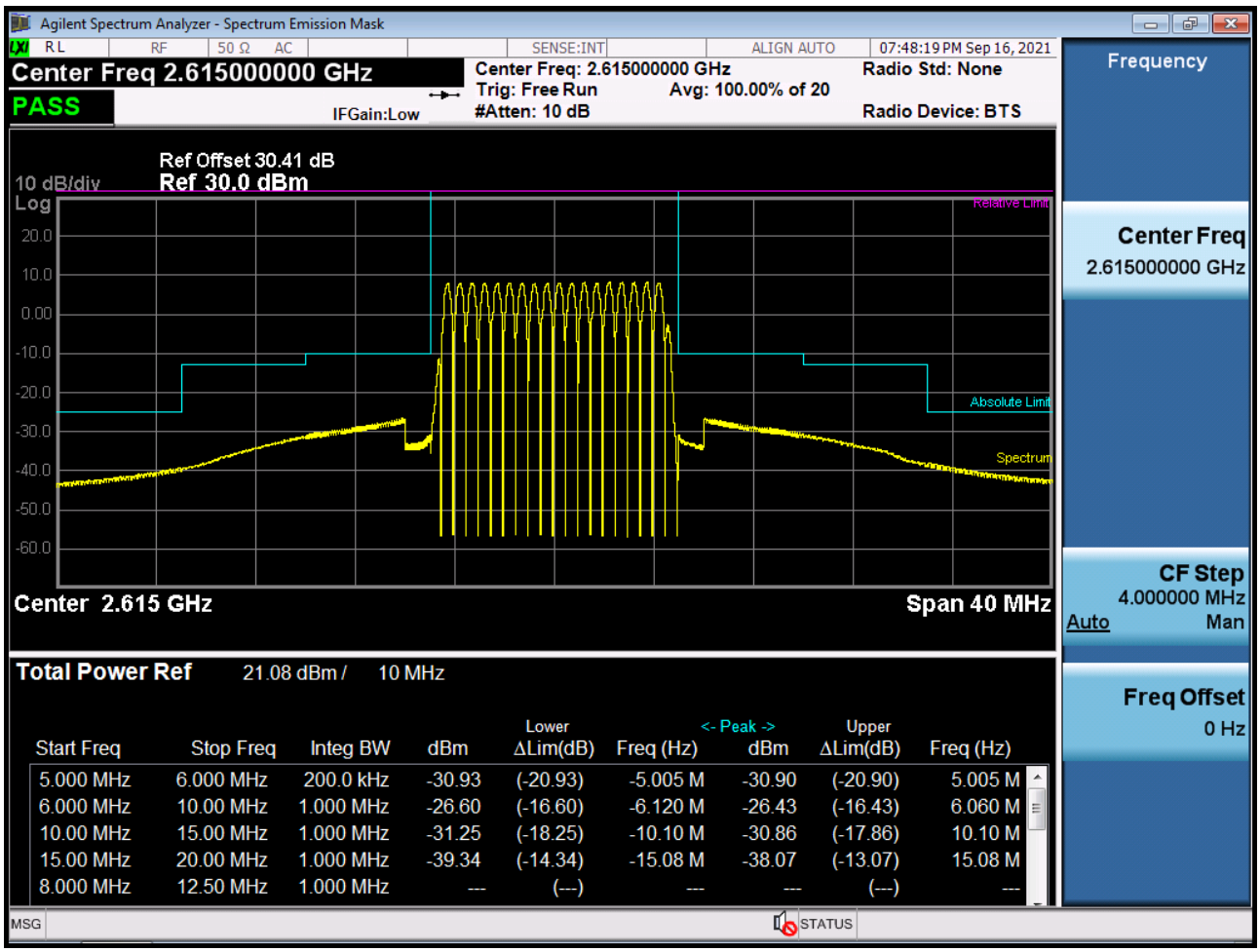
BAND 38. Mid Channel Edge Plot (10 MHz Ch.38000 QPSK RB 50)



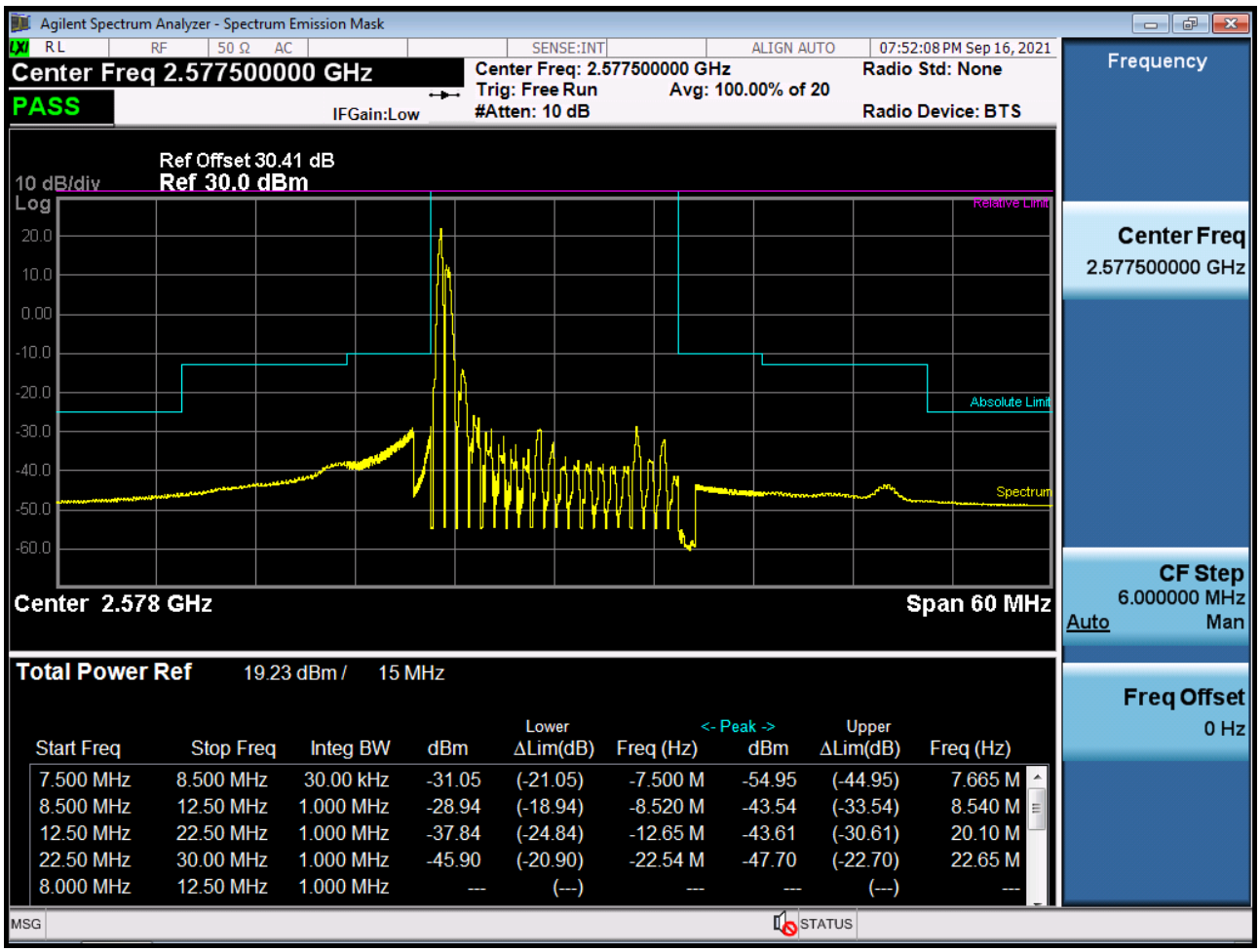
BAND 38. High Channel Edge Plot (10 MHz Ch.38200 QPSK RB 1, Offset 0)



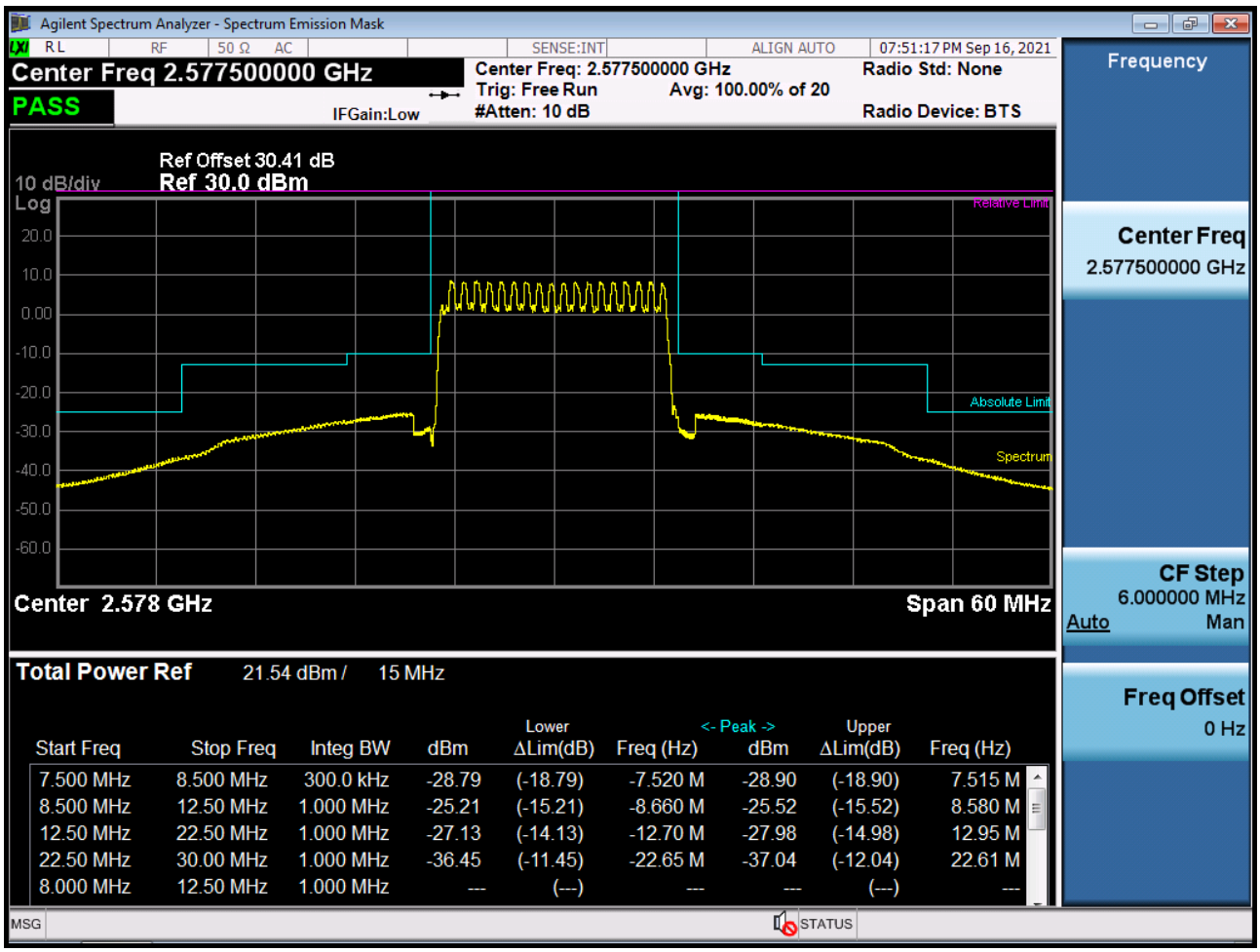
BAND 38. High Channel Edge Plot (10 MHz Ch.38200 QPSK_RB50_Offset 0)



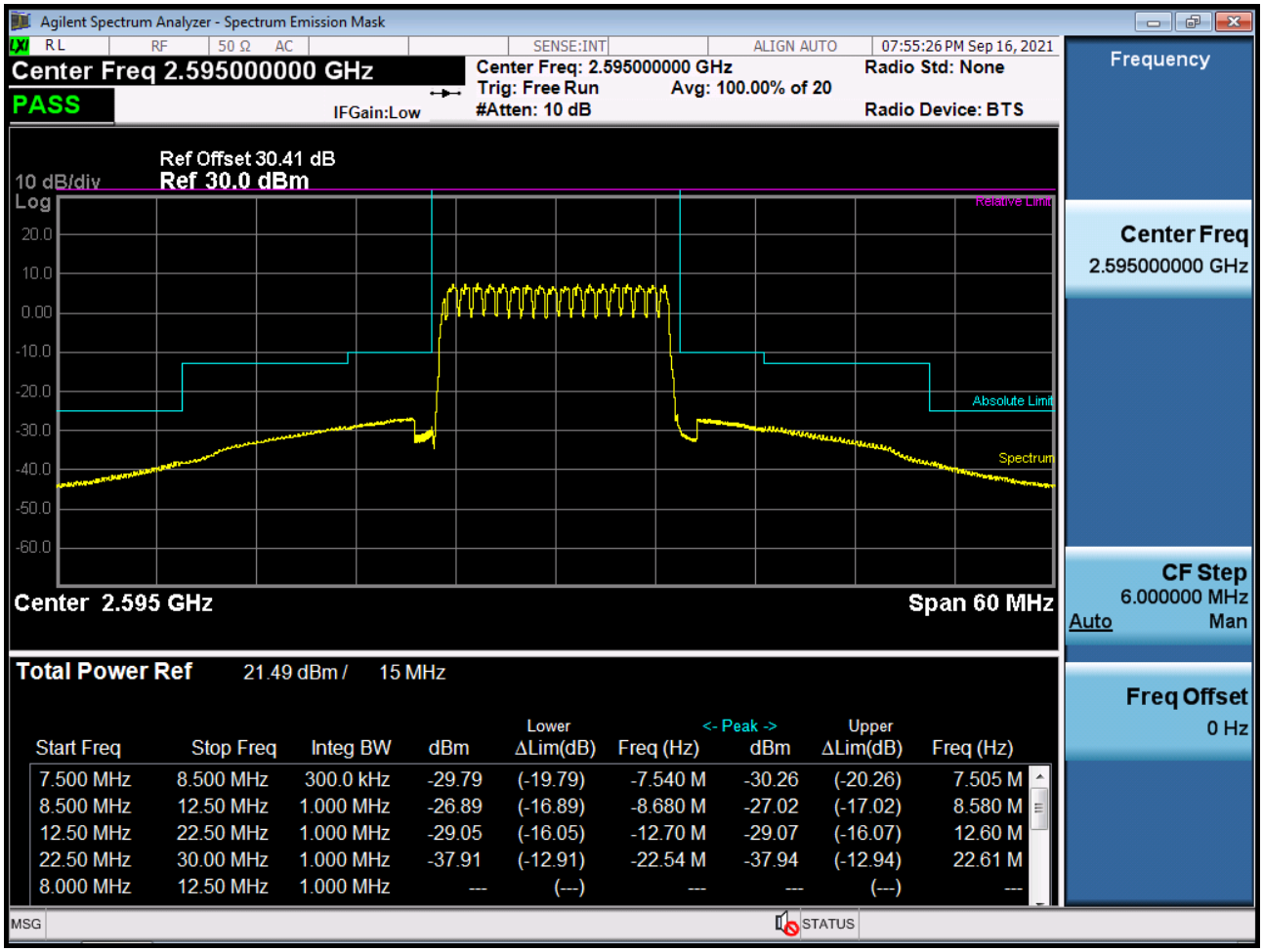
BAND 38. Low Channel Edge Plot (15 MHz Ch.37825 QPSK RB 1, Offset 0)



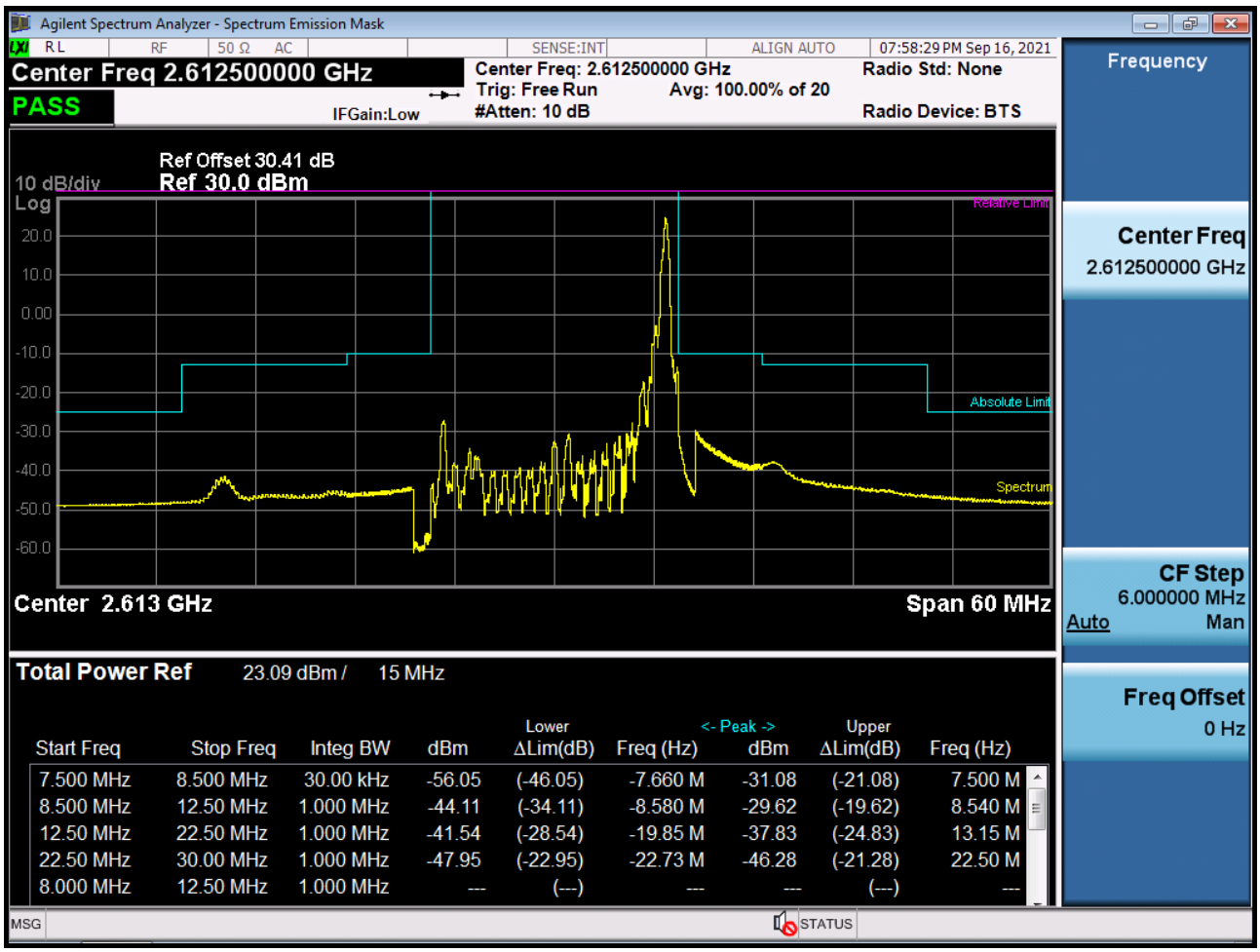
BAND 38. Low Channel Edge Plot (15 MHz Ch.37825 QPSK RB 75, Offset 0)



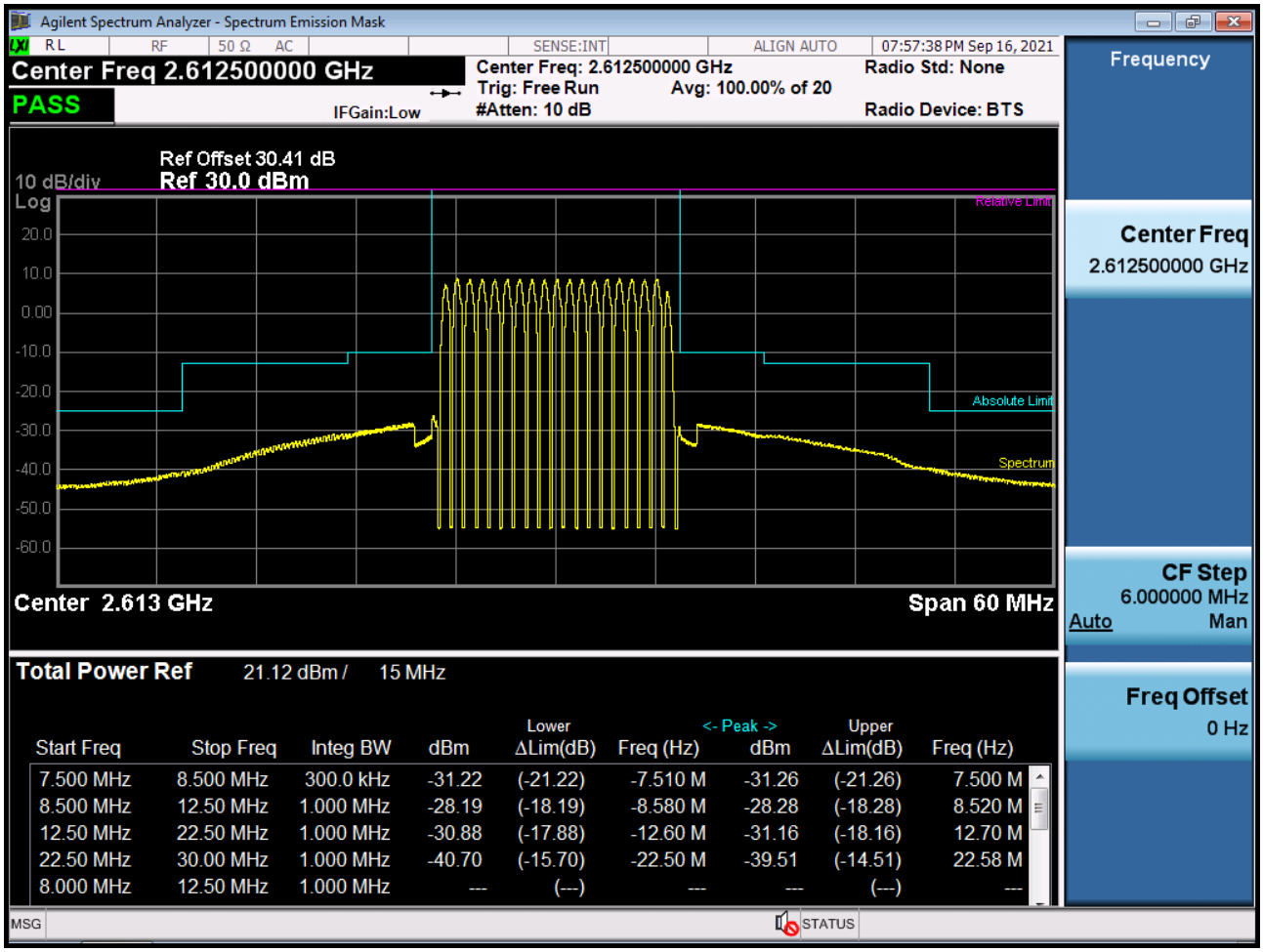
BAND 38. Mid Channel Edge Plot (15 MHz Ch.38000 QPSK RB 75)



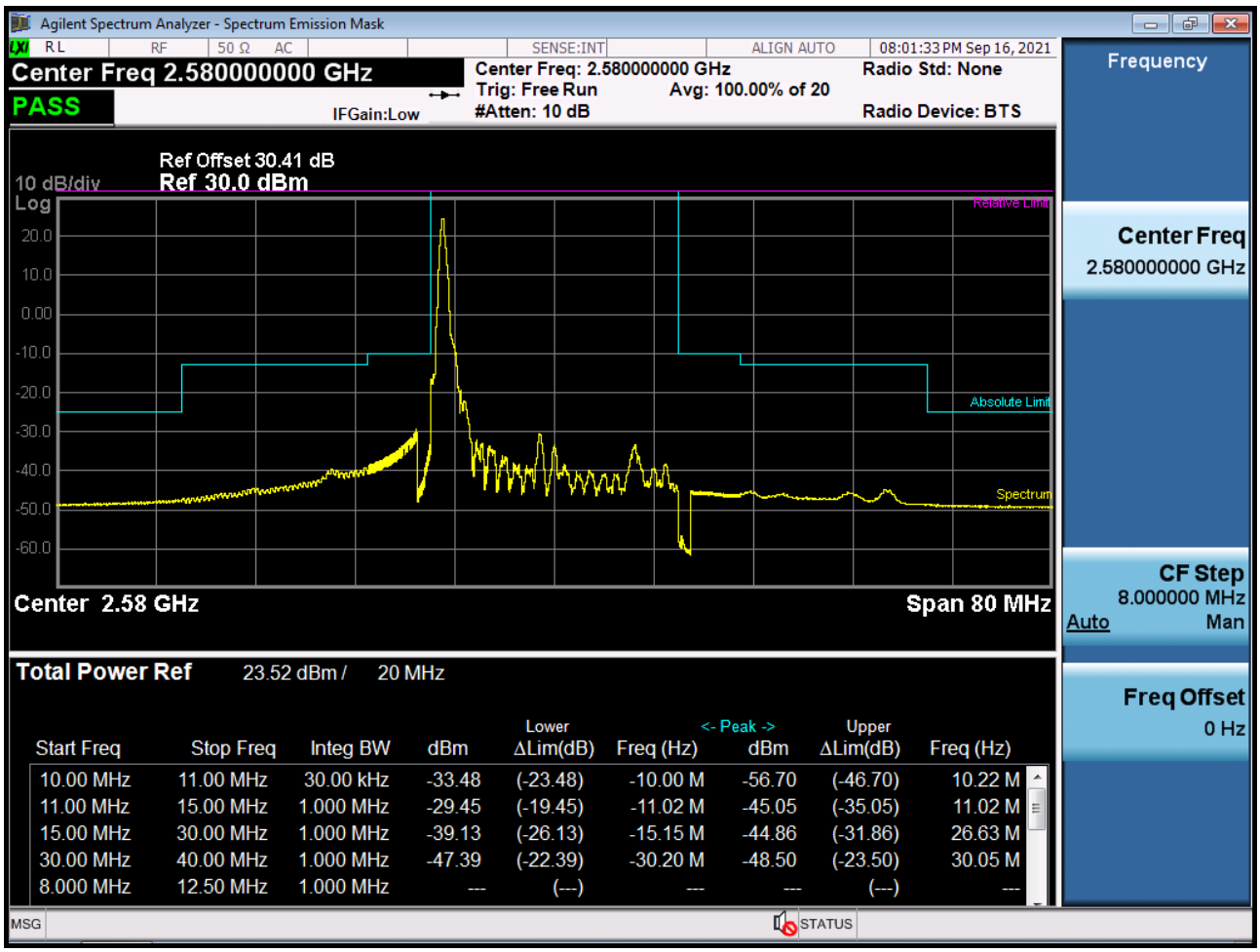
BAND 38. High Channel Edge Plot (15 MHz Ch.38175 QPSK RB 1, Offset 0)



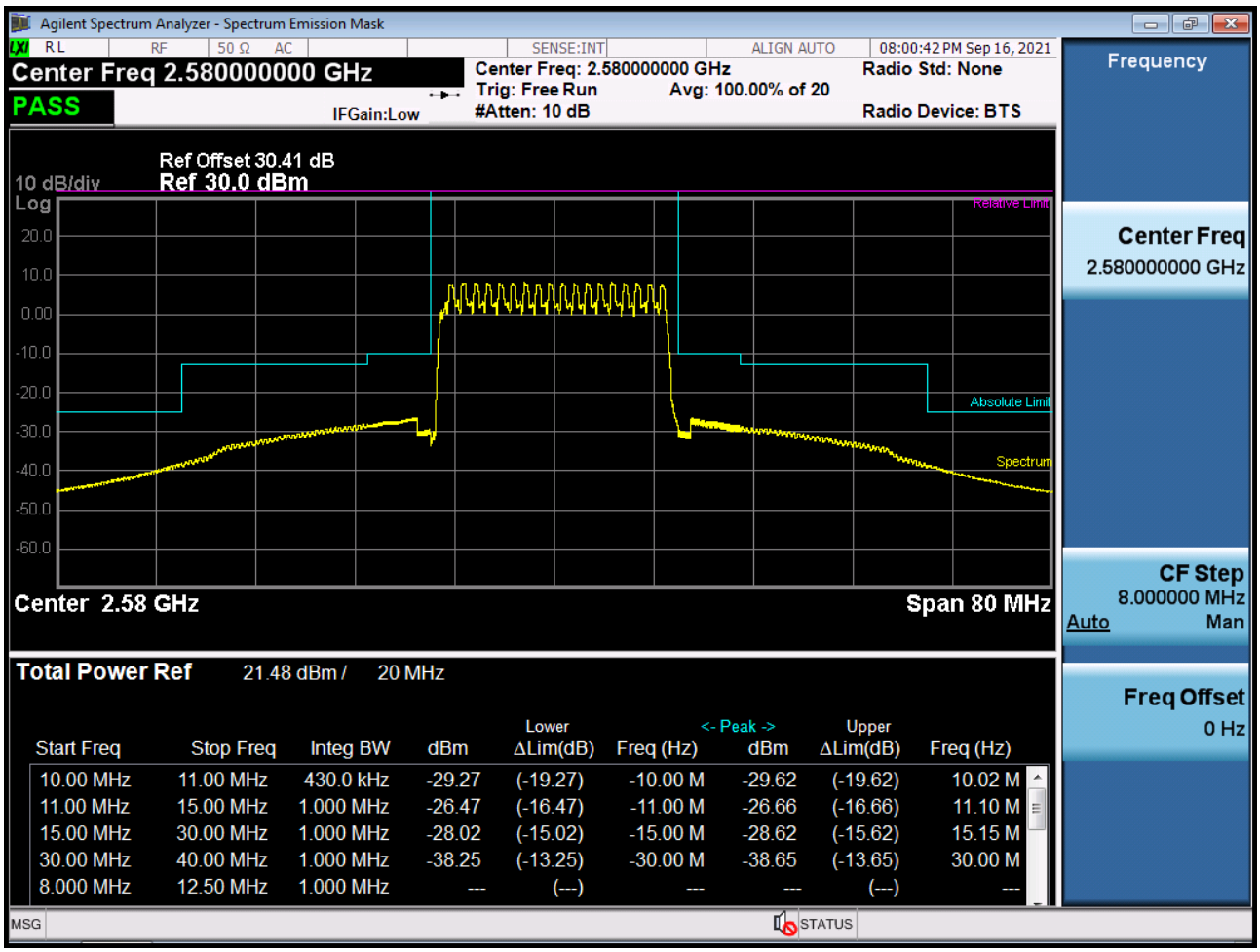
BAND 38. High Channel Edge Plot (15 MHz Ch.38175 QPSK_RB75_Offset 0)



BAND 38. Low Channel Edge Plot (20 MHz Ch.37850 QPSK RB 1, Offset 0)

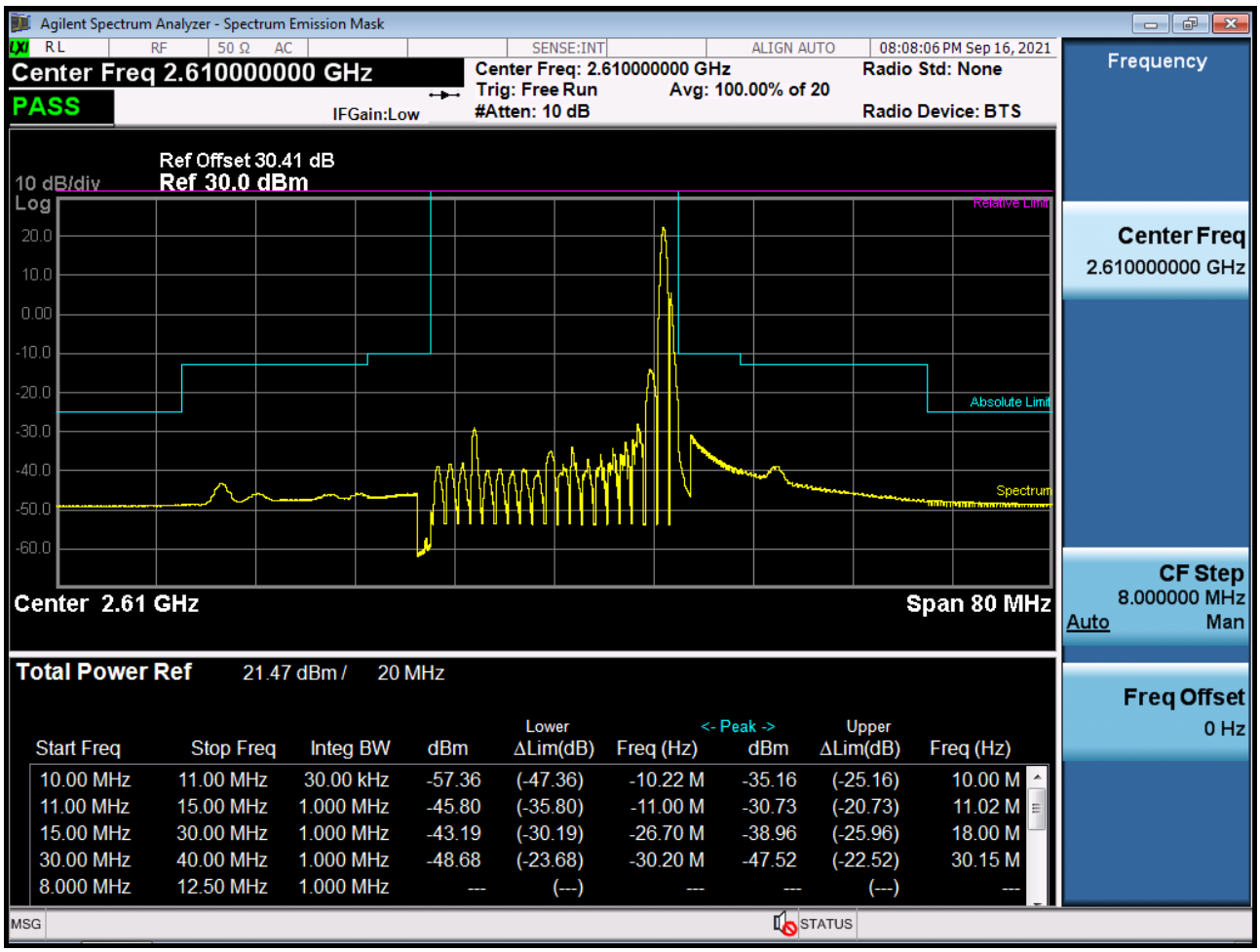


BAND 38. Low Channel Edge Plot (20 MHz Ch.37850 QPSK RB 25, Offset 0)

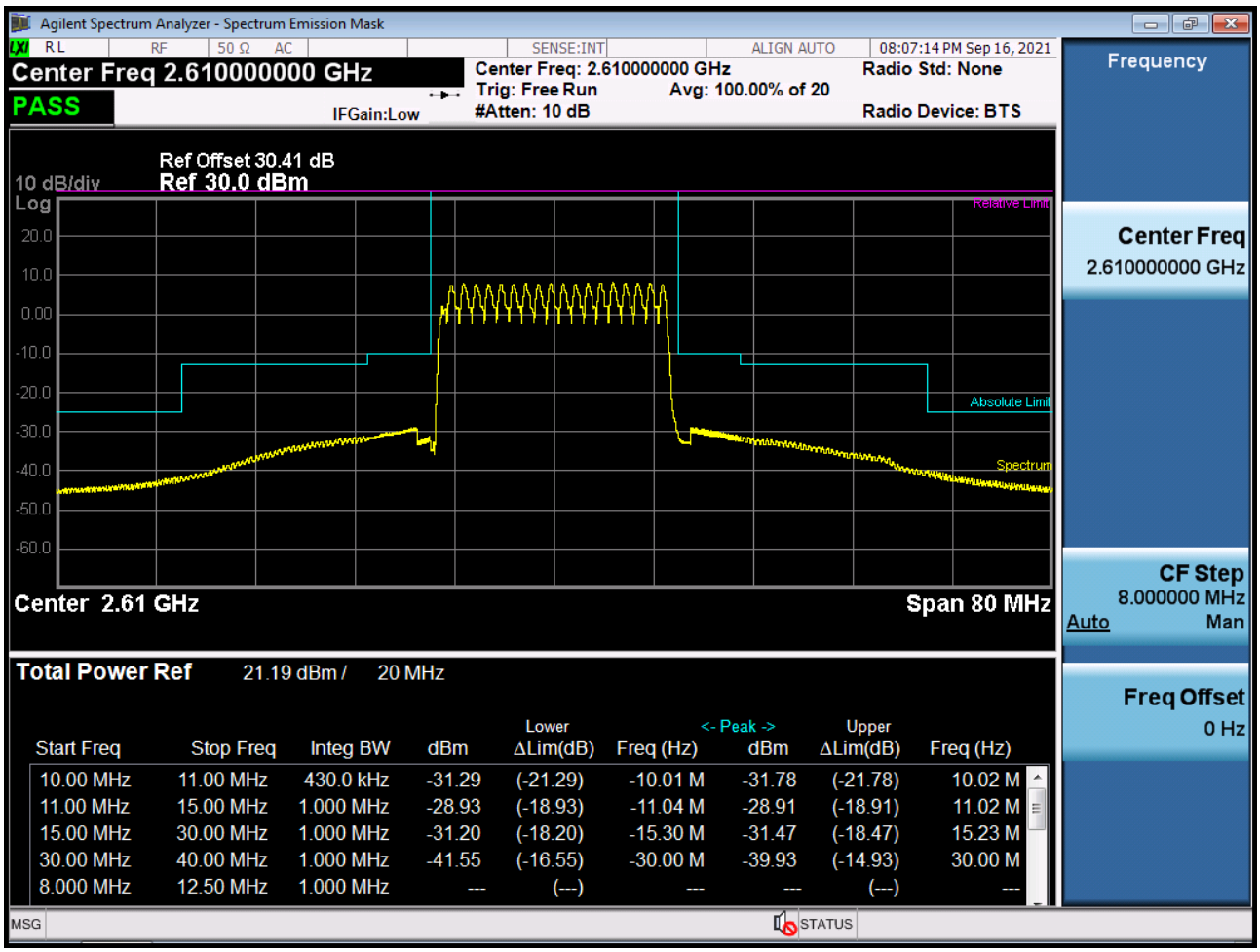


BAND 38. Mid Channel Edge Plot (20 MHz Ch.38000 QPSK RB 100)

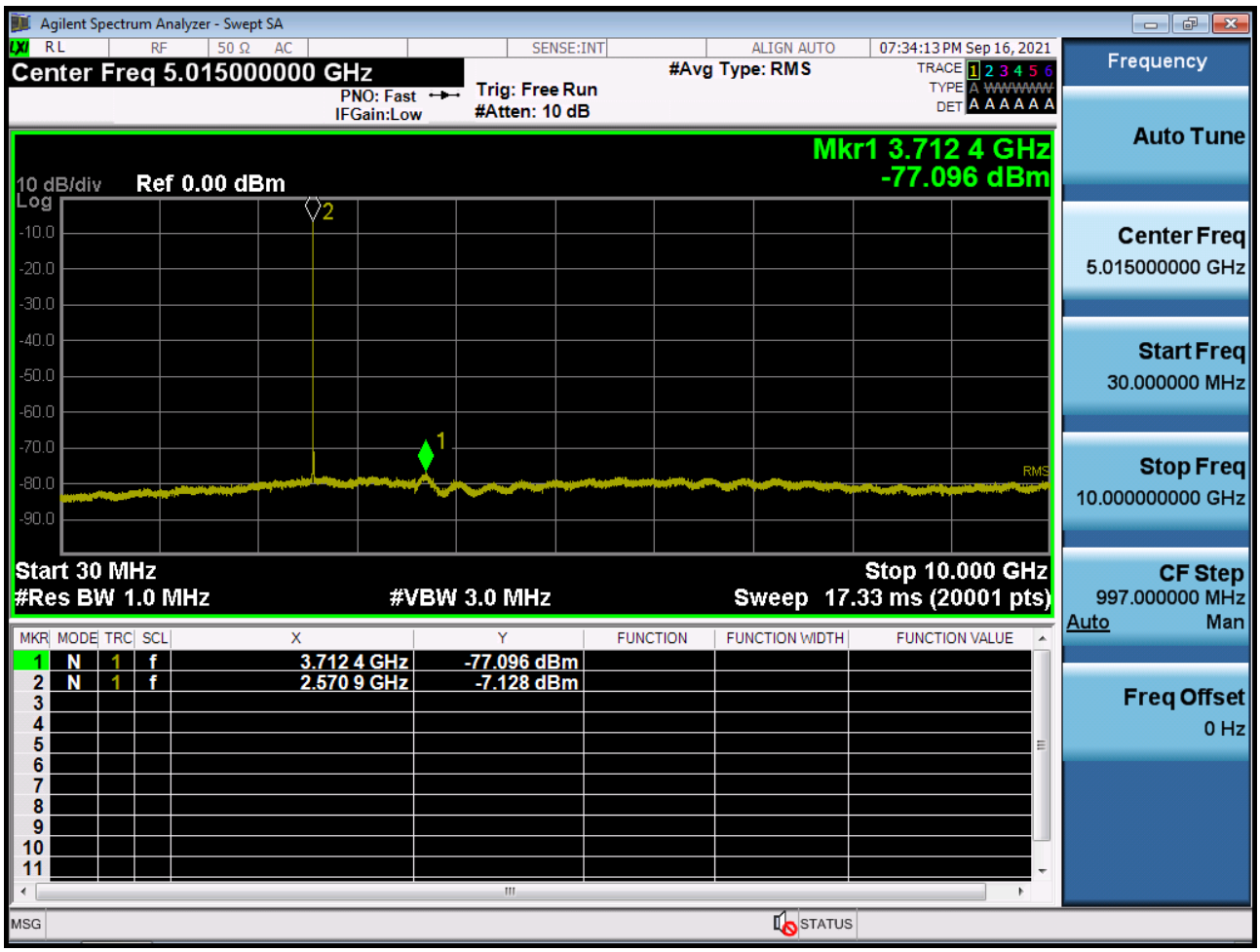
BAND 38. High Channel Edge Plot (20 MHz Ch.38150 QPSK RB 1, Offset 0)



BAND 38. High Channel Edge Plot (20 MHz Ch.38150 QPSK_RB100_Offset 0)

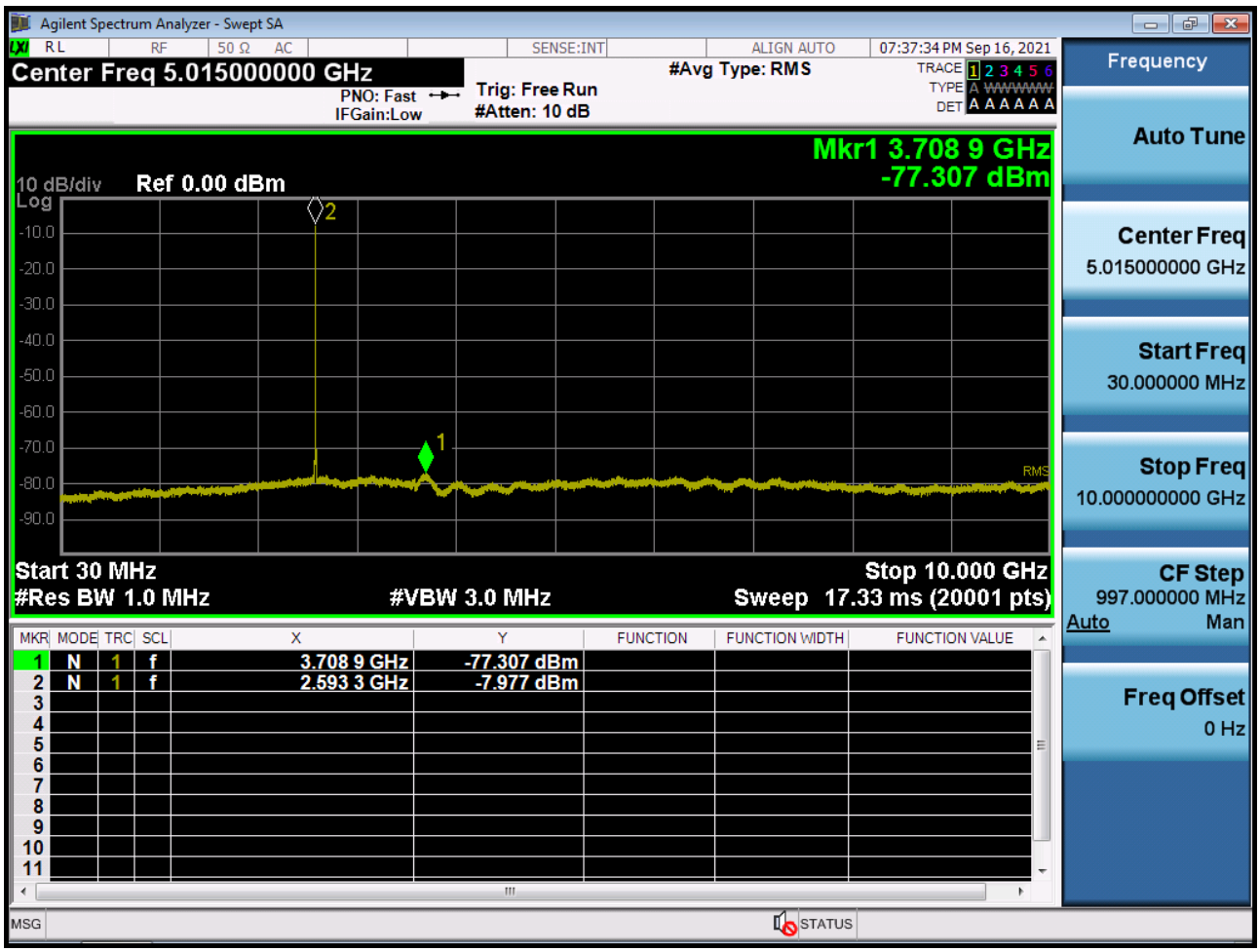


BAND 38. Conducted Spurious Plot 1 (5 MHz Ch.37775 QPSK RB 1, Offset 0)



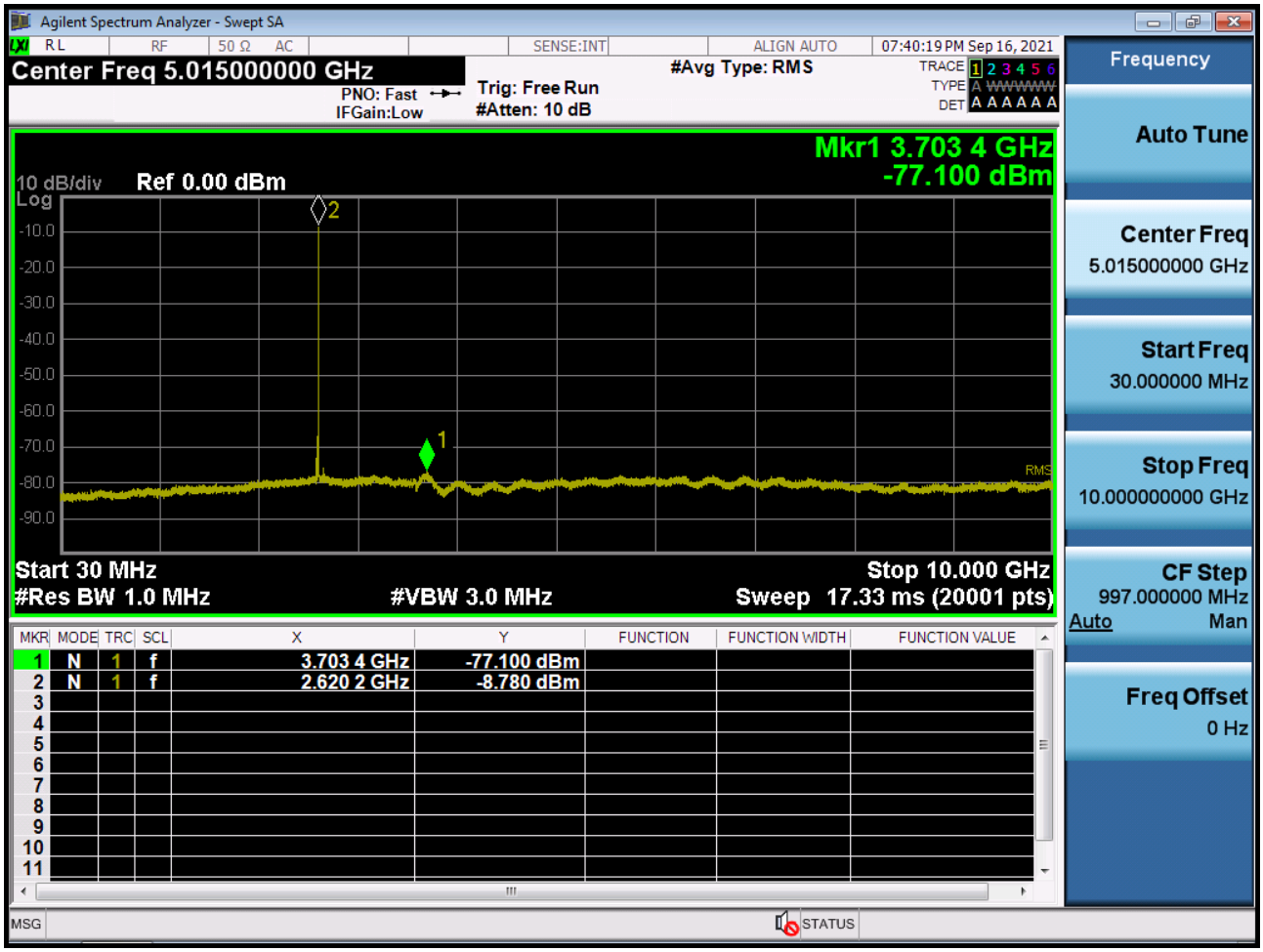
BAND 38. Conducted Spurious Plot 2 (5 MHz Ch. 37775 QPSK RB 1, Offset 0)

BAND 38. Conducted Spurious Plot 1 (5 MHz Ch.38000 QPSK RB 1, Offset 0)



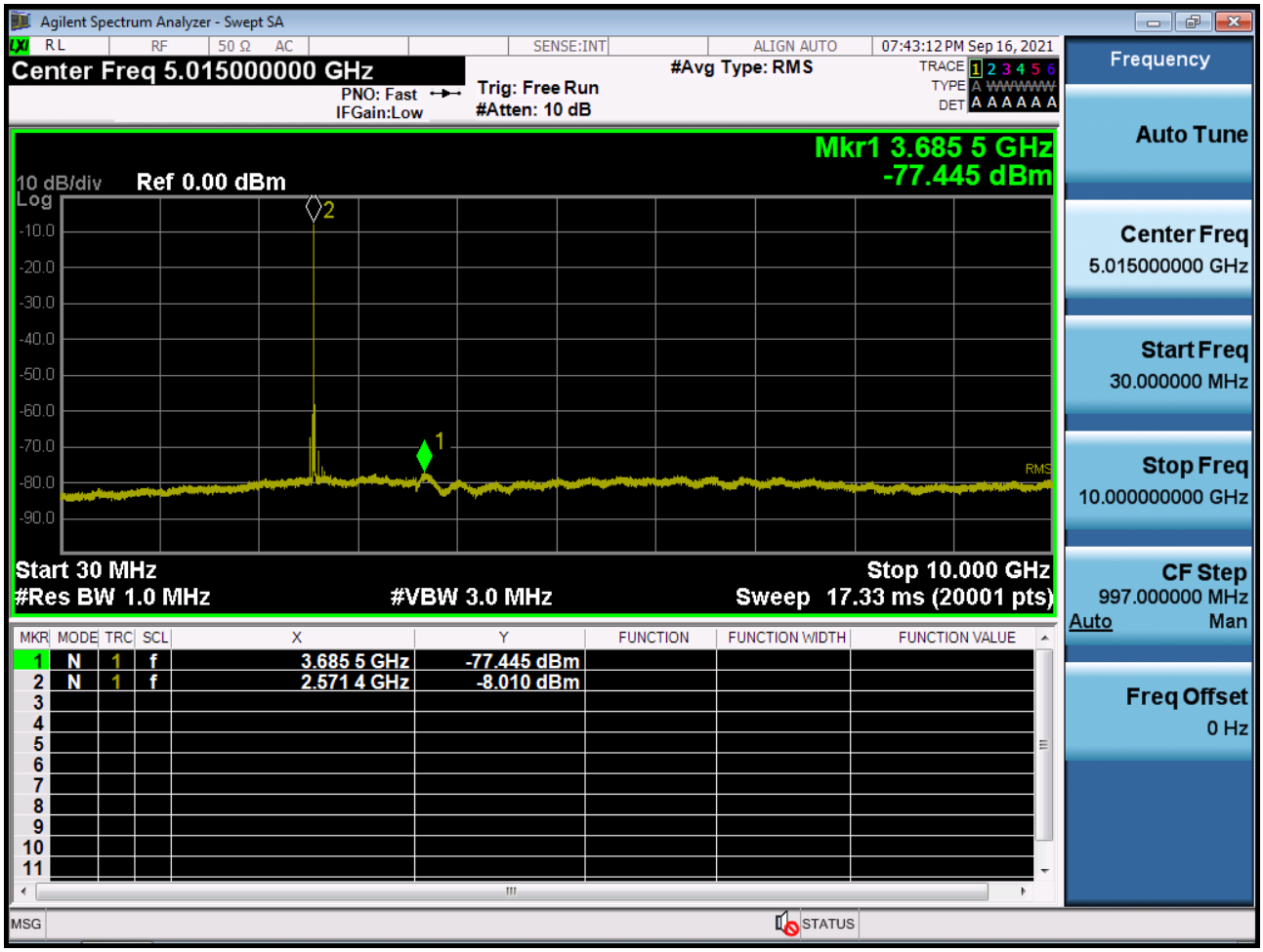
BAND 38. Conducted Spurious Plot 2 (5 MHz Ch. 38000 QPSK RB 1, Offset 0)

BAND 38. Conducted Spurious Plot 1 (5 MHz Ch.38225 QPSK RB 1, Offset 0)



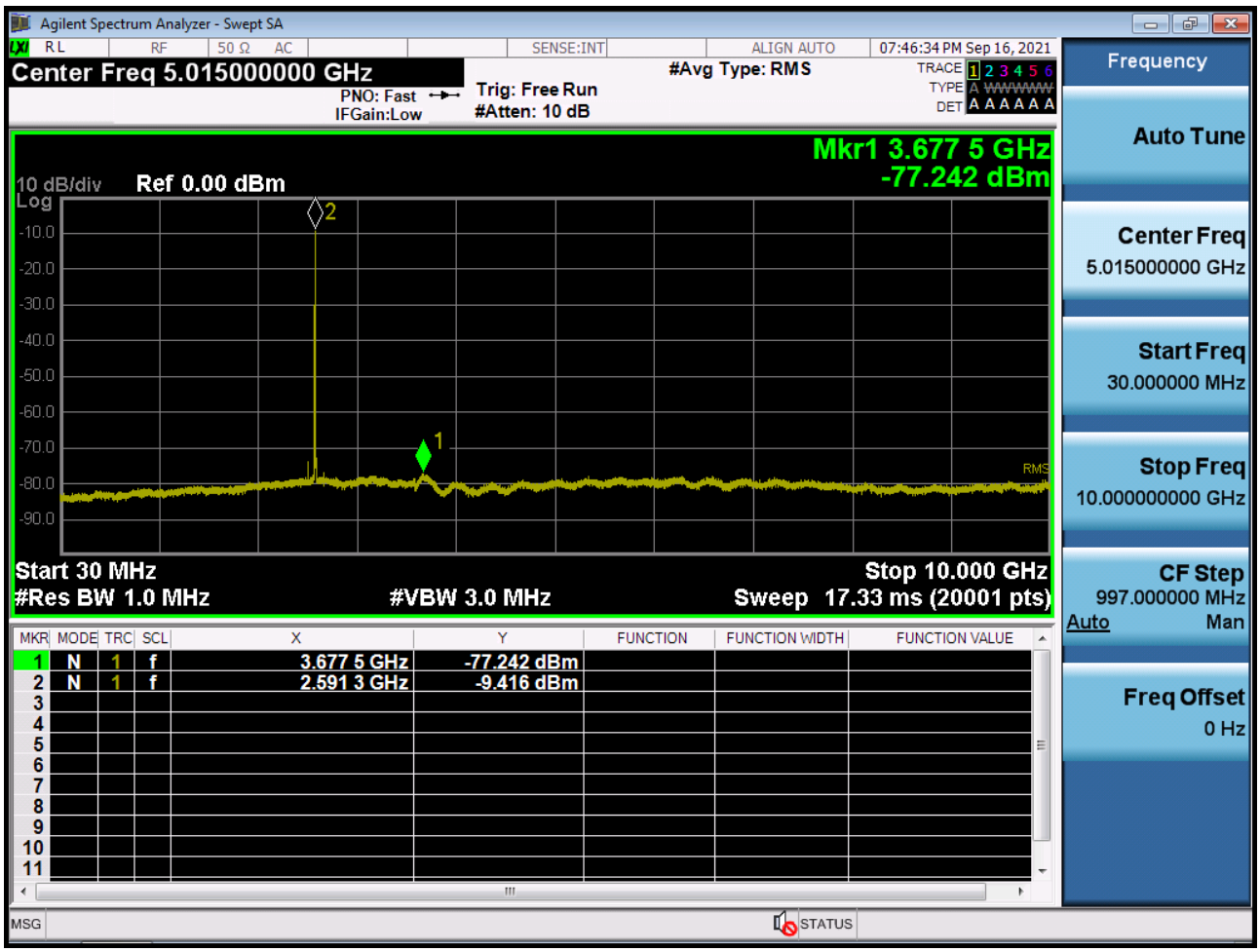
BAND 38. Conducted Spurious Plot 2 (5 MHz Ch. 38225 QPSK RB 1, Offset 0)

BAND 38. Conducted Spurious Plot 1 (10 MHz Ch.37800 QPSK RB 1, Offset 0)



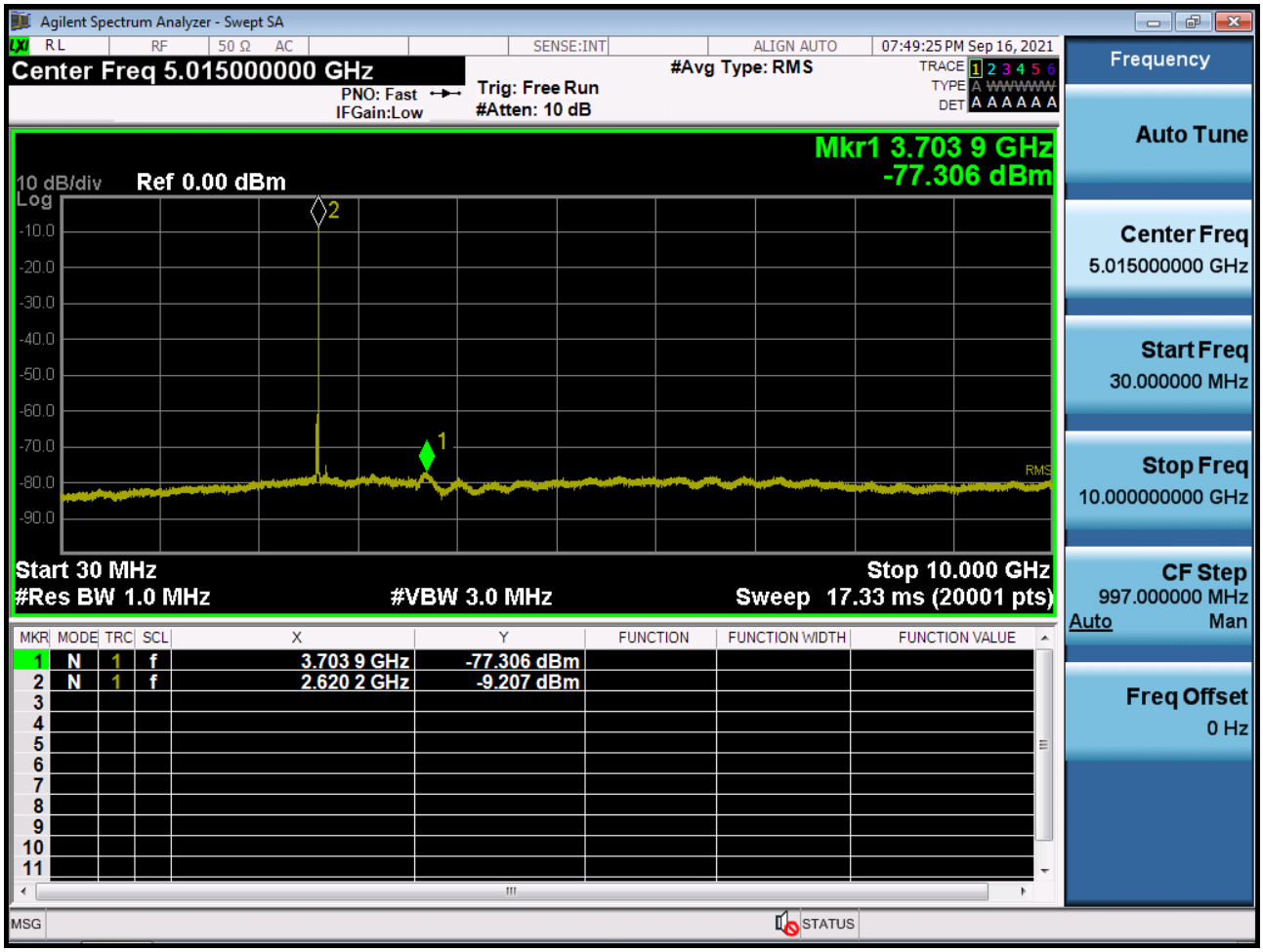
BAND 38. Conducted Spurious Plot 2 (10 MHz Ch. 37800 QPSK RB 1, Offset 0)

BAND 38. Conducted Spurious Plot 1 (10 MHz Ch.38000 QPSK RB 1, Offset 0)



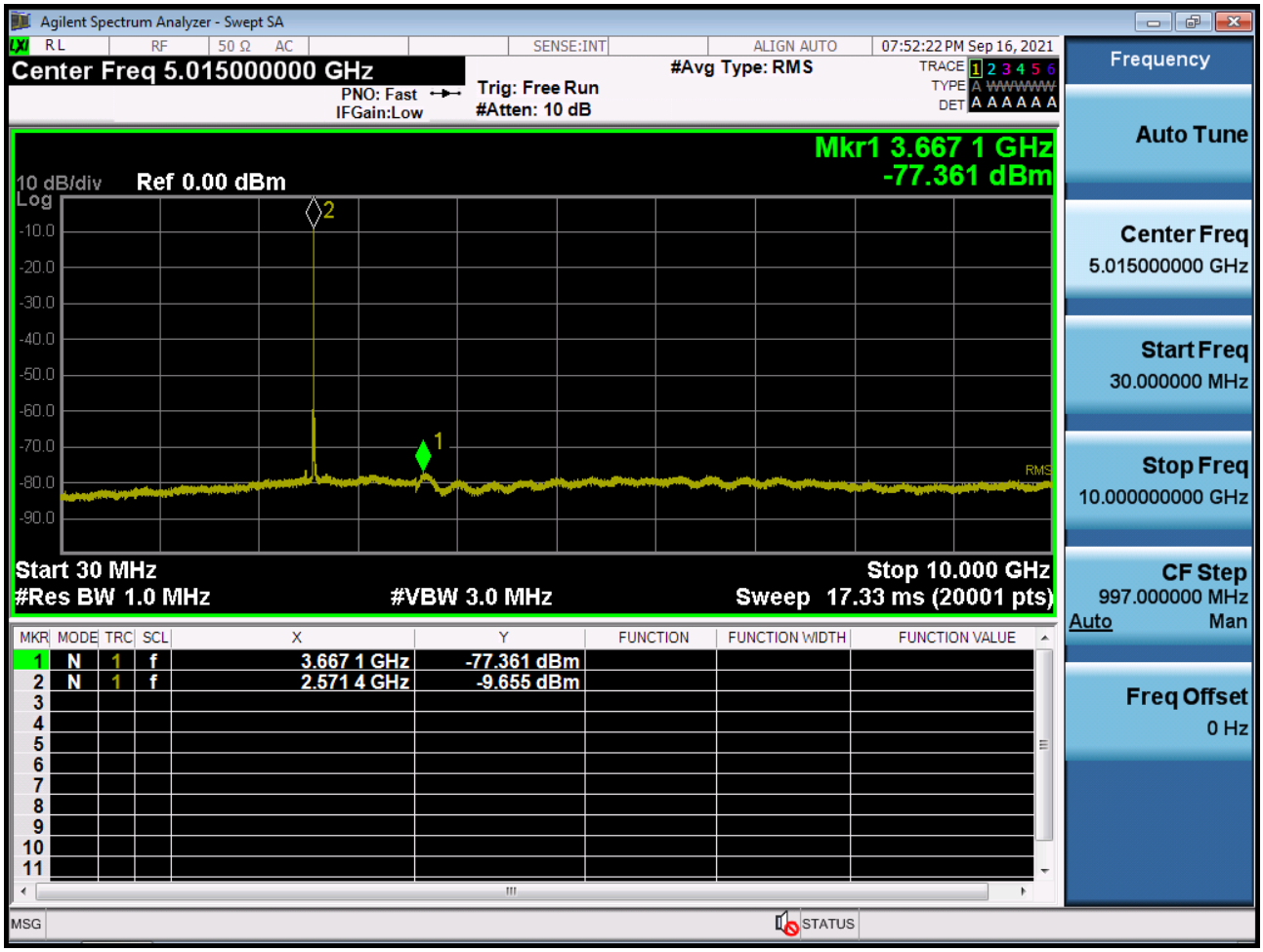
BAND 38. Conducted Spurious Plot 2 (10 MHz Ch. 38000 QPSK RB 1, Offset 0)

BAND 38. Conducted Spurious Plot 1 (10 MHz Ch. 38200 QPSK RB 1, Offset 0)



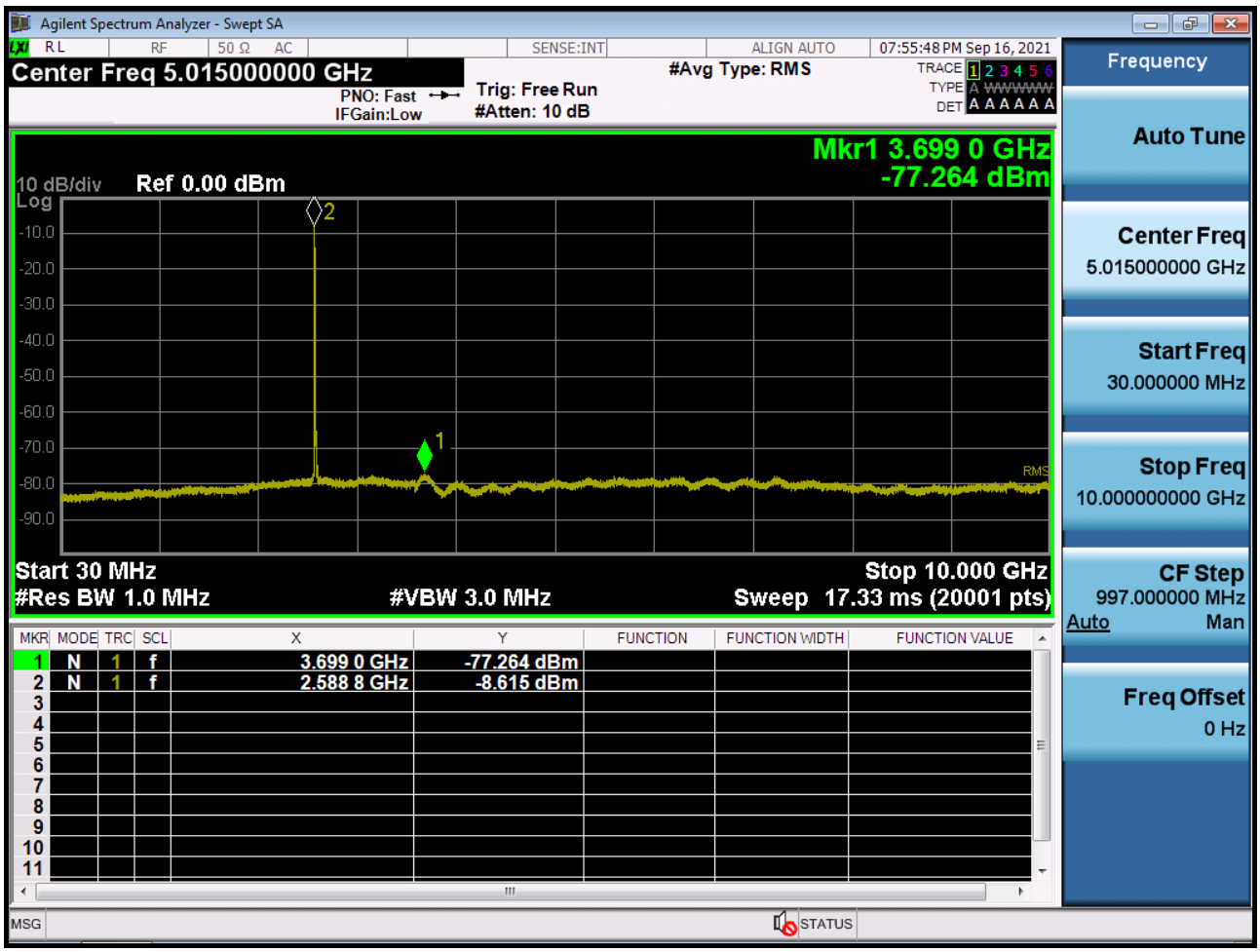
BAND 38. Conducted Spurious Plot 2 (10 MHz Ch. 38200 QPSK RB 1, Offset 0)

BAND 38. Conducted Spurious Plot 1 (15 MHz Ch.37825 QPSK RB 1, Offset 0)



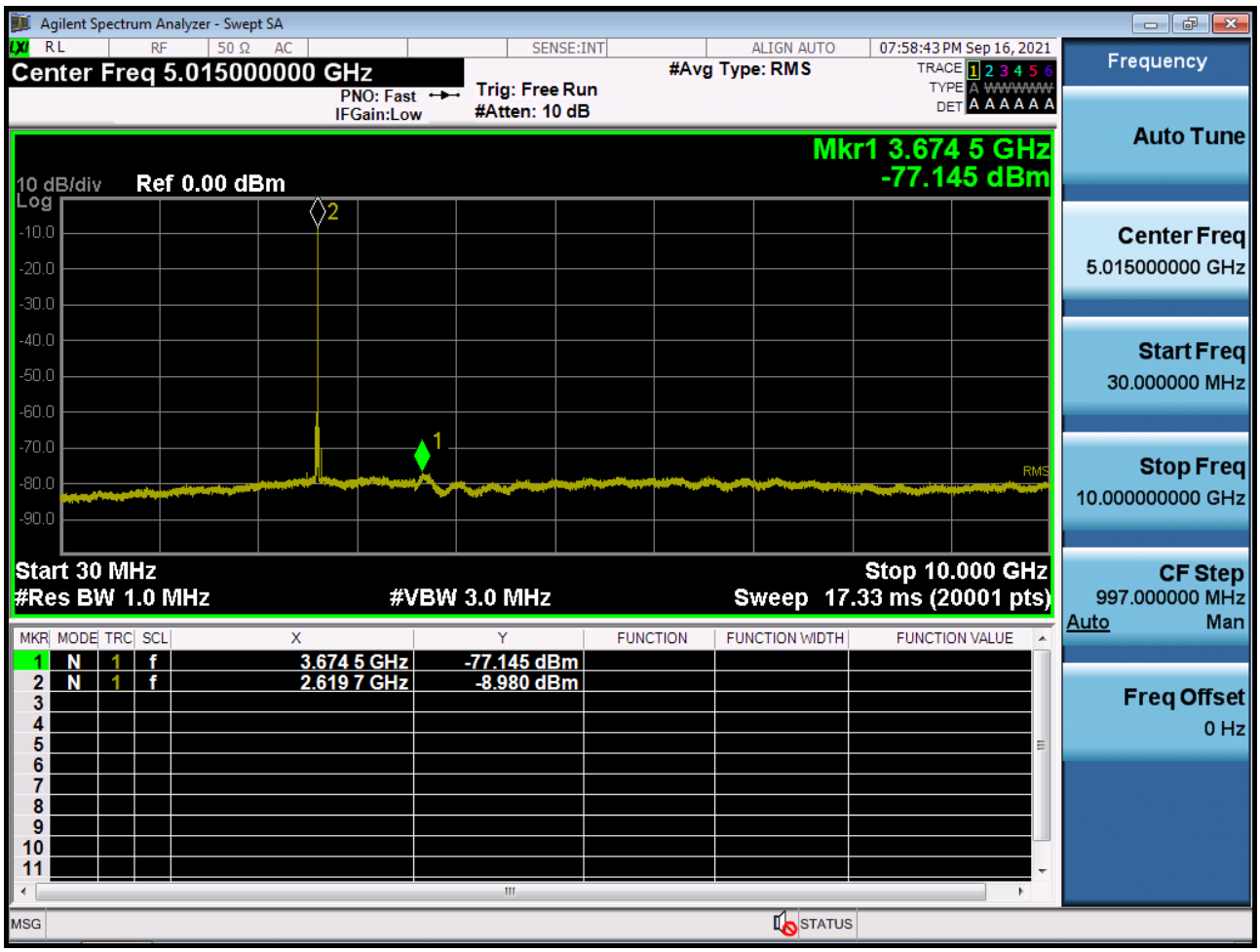
BAND 38. Conducted Spurious Plot 2 (15 MHz Ch. 37825 QPSK RB 1, Offset 0)

BAND 38. Conducted Spurious Plot 1 (15 MHz Ch.38000 QPSK RB 1, Offset 0)



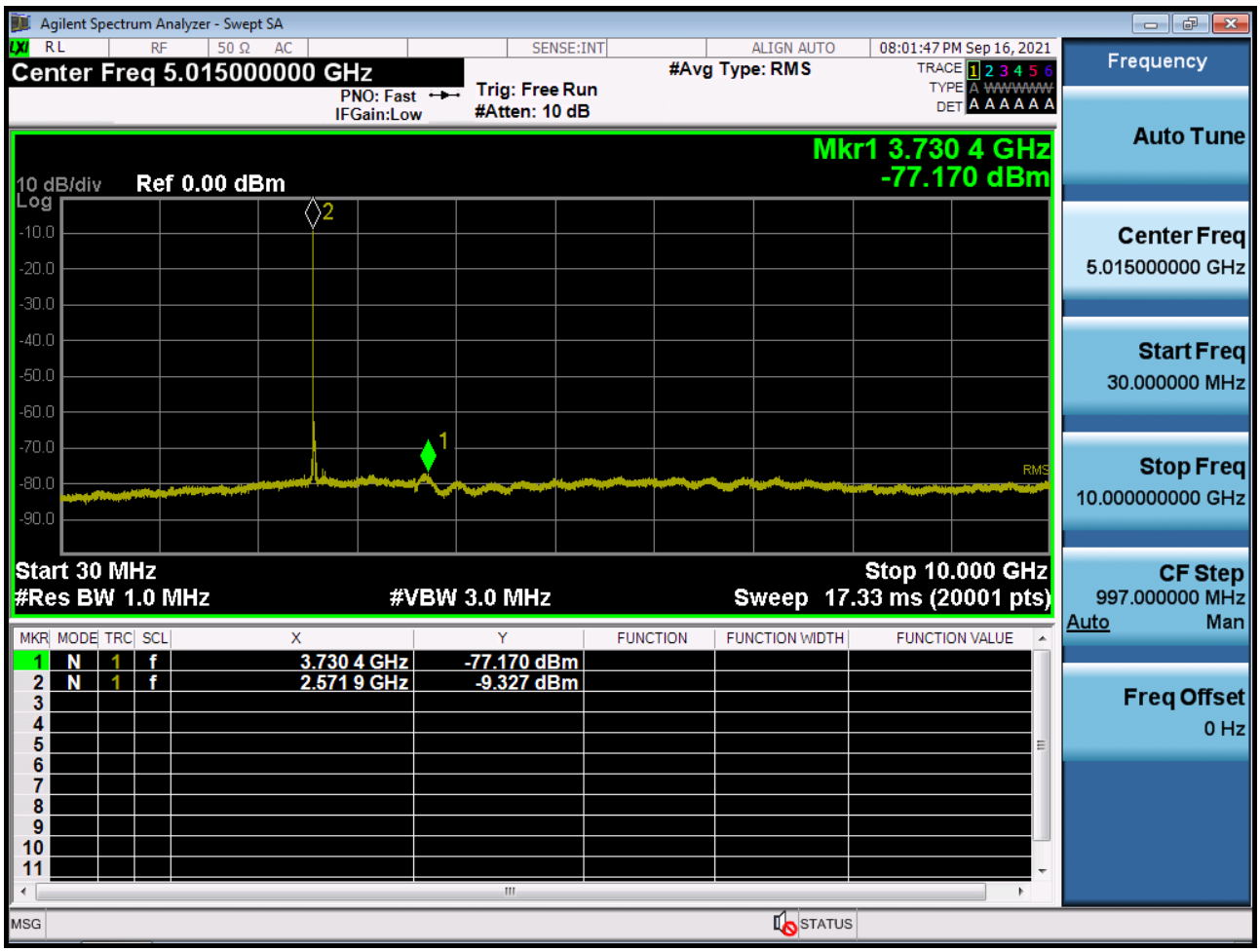
BAND 38. Conducted Spurious Plot 2 (15 MHz Ch. 38000 QPSK RB 1, Offset 0)

BAND 38. Conducted Spurious Plot 1 (15 MHz Ch.38175 QPSK RB 1, Offset 0)



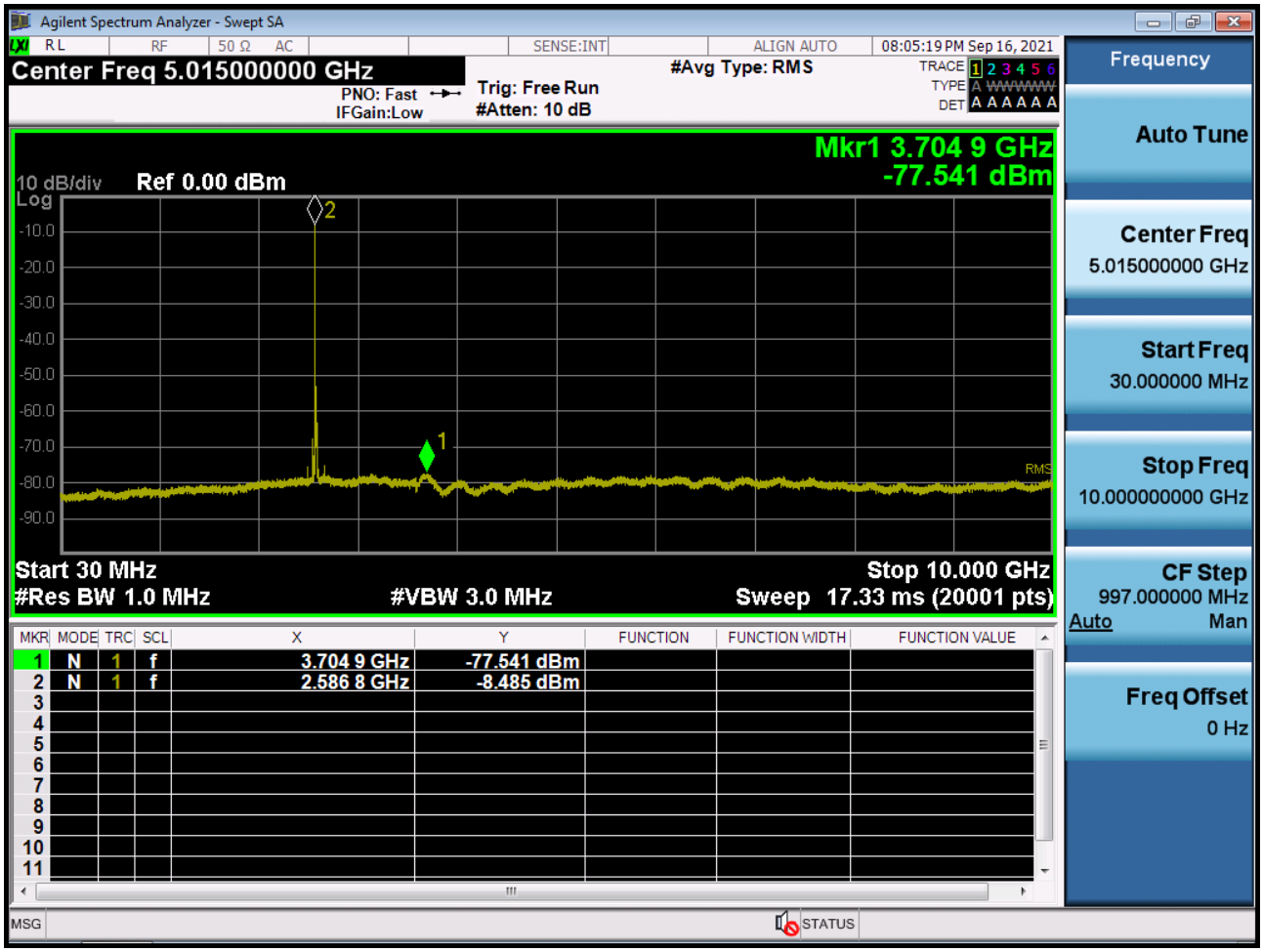
BAND 38. Conducted Spurious Plot 2 (15 MHz Ch. 38175 QPSK RB 1, Offset 0)

BAND 38. Conducted Spurious Plot 1 (20 MHz Ch.37850 QPSK RB 1, Offset 0)



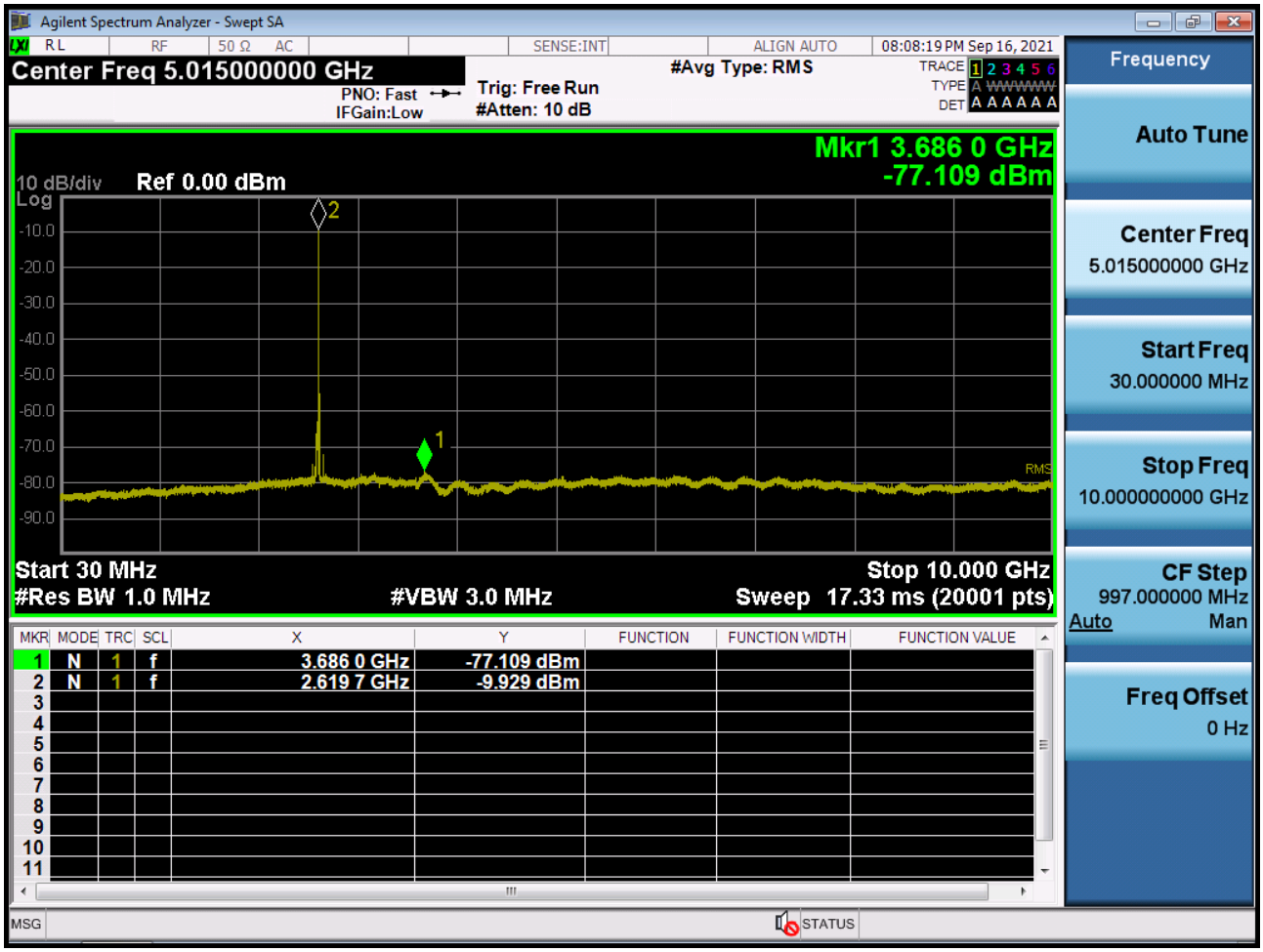
BAND 38. Conducted Spurious Plot 2 (20 MHz Ch. 37850 QPSK RB 1, Offset 0)

BAND 38. Conducted Spurious Plot 1 (20 MHz Ch.38000 QPSK RB 1, Offset 0)



BAND 38. Conducted Spurious Plot 2 (20 MHz Ch. 38000 QPSK RB 1, Offset 0)

BAND 38. Conducted Spurious Plot 1 (20 MHz Ch.38150 QPSK RB 1, Offset 0)



BAND 38. Conducted Spurious Plot 2 (20 MHz Ch. 38150 QPSK RB 1, Offset 0)

10. ANNEX A_ TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-2109-FC058-P