

FCC LTE REPORT

Certification

Applicant Name:
SAMSUNG Electronics Co., Ltd.

Date of Issue:
October 20, 2021

Address:
129, Samsung-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

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

Report No.: HCT-RF-2110-FC020

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 40 (5)	2307.5 – 2312.5	4M50G7D	QPSK	0.007	8.17
		4M49W7D	16QAM	0.006	8.03
		4M48W7D	64QAM	0.006	7.89
	2352.5 – 2357.5	4M50G7D	QPSK	0.004	6.51
		4M50W7D	16QAM	0.004	6.39
		4M50W7D	64QAM	0.004	6.23
LTE – Band 40 (10)	2310.0	8M99G7D	QPSK	0.006	8.09
		8M97W7D	16QAM	0.006	7.96
		8M99W7D	64QAM	0.006	7.85
	2355.0	8M97G7D	QPSK	0.004	6.38
		8M96W7D	16QAM	0.004	6.25
		8M97W7D	64QAM	0.004	6.12

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)

Report No.: HCT-RF-2110-FC020

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)

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Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2110-FC020	October 20, 2021	- First Approval Report

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.

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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(Lower Side):	2307.5 MHz – 2312.5 MHz (LTE – Band40 (5 MHz)) 2310.0 MHz (LTE – Band40 (10 MHz))
Tx Frequency(Upper Side):	2352.5 MHz – 2357.5 MHz (LTE – Band40 (5 MHz)) 2355.0 MHz (LTE – Band40 (10 MHz))
Date(s) of Tests:	August 30, 2021 ~ October 07, 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 \geq 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;

$$P_d \text{ (dBm)} = P_g \text{ (dBm)} - \text{cable loss (dB)} + \text{antenna gain (dB)}$$

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 $\geq 3 \times$ RBW
3. Span = 1.5 times the OBW
4. No. of sweep points $> 2 \times$ 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 10th 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;

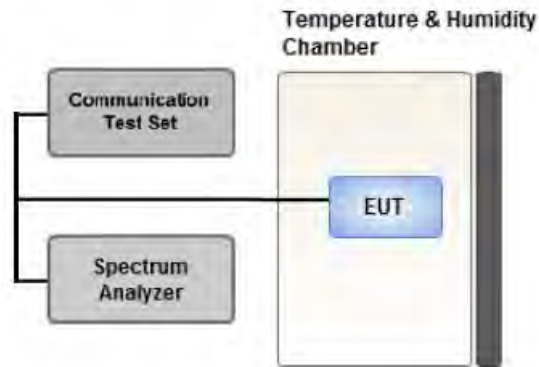
$$\text{Result}_{(\text{dBm})} = P_g_{(\text{dBm})} - \text{cable loss}_{(\text{dB})} + \text{antenna gain}_{(\text{dBi})}$$

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.

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

3.4 PEAK- TO- AVERAGE RATIO



Test setup

① CCDF Procedure for PAPR

Test Settings

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

② Alternate Procedure for PAPR

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

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

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 $\geq 3 \times$ RBW.

1. Set the RBW \geq OBW.
2. Set VBW $\geq 3 \times$ RBW.
3. Set span $\geq 2 \times$ OBW.
4. Sweep time $\geq 10 \times$ (number of points in sweep) \times (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 $2 \times$ to $3 \times$ the OBW.
2. Set RBW \geq OBW.
3. Set VBW $\geq 3 \times$ RBW.
4. Set number of measurement points in sweep $\geq 2 \times$ span / RBW.
5. Sweep time:
Set $\geq [10 \times (\text{number of points in sweep}) \times (\text{transmission period})]$ 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 $[10 \log (1/\text{duty cycle})]$ 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.

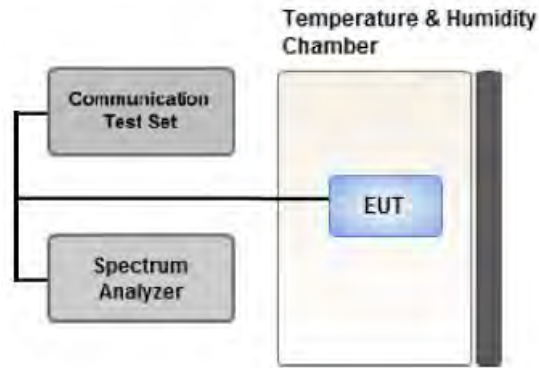
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

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 \geq 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

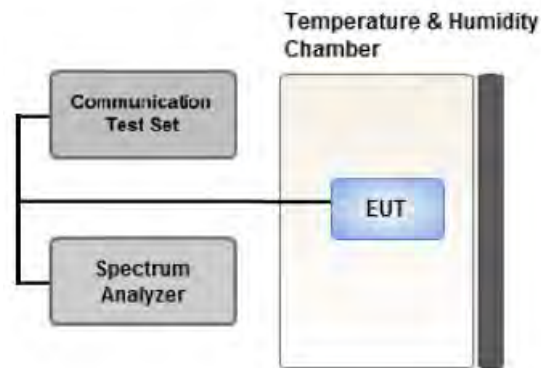
Test Overview

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 \geq 3 MHz
3. Detector = RMS
4. Trace Mode = Average
5. Sweep time = auto
6. Number of points in sweep \geq 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 $\geq 2 \times \text{Span/RBW}$
7. Trace mode = trace average
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Limit

§27.53(a)

(4) For mobile and portable stations operating in the 2305-2315 MHz and 2350-2360 MHz bands:

- (i) By a factor of not less than: $43 + 10 \log (P)$ dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than $55 + 10 \log (P)$ dB on all frequencies between 2320 and 2324 MHz and on all frequencies between 2341 and 2345 MHz, not less than $61 + 10 \log (P)$ dB on all frequencies between 2324 and 2328 MHz and on all frequencies between 2337 and 2341 MHz, and not less than $67 + 10 \log (P)$ dB on all frequencies between 2328 and 2337 MHz;
- (ii) By a factor of not less than $43 + 10 \log (P)$ dB on all frequencies between 2300 and 2305 MHz, $55 + 10 \log (P)$ dB on all frequencies between 2296 and 2300 MHz, $61 + 10 \log (P)$ dB on all frequencies between 2292 and 2296 MHz, $67 + 10 \log (P)$ dB on all frequencies between 2288 and 2292 MHz, and $70 + 10 \log (P)$ dB below 2288 MHz;
- (iii) By a factor of not less than $43 + 10 \log (P)$ dB on all frequencies between 2360 and 2365 MHz, and not less than $70 + 10 \log (P)$ dB above 2365 MHz

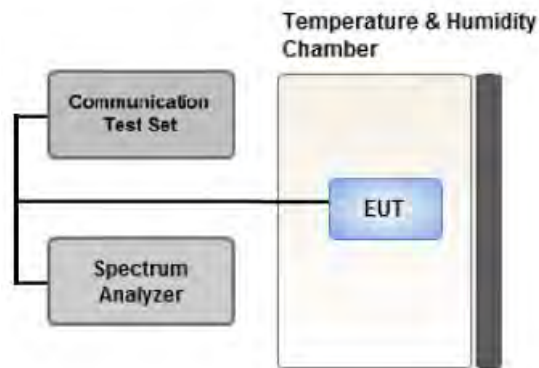
Test Notes

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.
- Please refer to the table below.
- 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	RB size	RB offset	Axis
Effective Isotropic Radiated Power	QPSK, 16QAM, 64QAM	1	0	Z
Radiated Spurious and Harmonic Emissions	QPSK	1	0	Y

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	Mid	Full RB	0
Peak-To-Average Ratio	QPSK, 16QAM, 64QAM	5, 10	Mid	Full RB	0
Band Edge	QPSK	5	Low, Mid, High	1	0, 24
		10	Mid	1	0, 49
		5	Low, Mid, High	Full RB	0
		10	Mid	Full RB	0
Spurious and Harmonic Emissions at Antenna Terminal	QPSK	5	Low, Mid, High	1	0
		10	Mid	1	0

4. LIST OF TEST EQUIPMENT

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
H.P.F	FBSR-02B(WHK1.2/15 G-10EF)	T&M SYSTEM	-	03/02/2022	Annual
H.P.F	FBSR-02B(WHK3.3/18 G-10EF)	T&M SYSTEM	-	03/02/2022	Annual
Power Splitter(DC ~ 26.5 GHz)	11667B	Hewlett Packard	11275	04/07/2022	Annual
DC Power Supply	E3632A	Agilent	MY40010147	06/28/2022	Annual
Dipole Antenna	UHAP	Schwarzbeck	557	04/05/2023	Biennial
Dipole Antenna	UHAP	Schwarzbeck	558	04/05/2023	Biennial
Chamber	SU-642	ESPEC	93008124	03/15/2022	Annual
Horn Antenna(1 ~ 18 GHz)	BBHA 9120D	Schwarzbeck	147	08/30/2022	Biennial
Horn Antenna(1 ~ 18 GHz)	BBHA 9120D	Schwarzbeck	9120D-1298	09/15/2023	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 (\pm 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(a)	Section 3.7	PASS
Conducted Output Power	§2.1046	N/A	<u>See Note1</u>
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(a)(3)	< 0.25 Watts max. EIRP	PASS
Radiated Spurious and Harmonic Emissions	§2.1053, §27.53(a)	< 70 + 10log10 (P[Watts])	PASS

7. SAMPLE CALCULATION

7.1 ERP Sample Calculation

Ch./ Freq.		Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain (dBd)	C.L	Pol.	ERP	
channel	Freq.(MHz)						W	dBm
128	824.20	-21.37	38.40	-10.61	0.95	H	0.483	26.84

$$\text{ERP} = \text{Substitute LEVEL(dBm)} + \text{Ant. Gain} - \text{CL(Cable Loss)}$$

- 1) The EUT mounted on a non-conductive turntable is 2.5 meter above test site ground level.
- 2) During the test , the turn table is rotated until the maximum signal is found.
- 3) Record the field strength meter's level.
- 4) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.
- 5) Increase the signal generator output till the field strength meter's level is equal to the item (3).
- 6) The signal generator output level with Ant. Gain and cable loss are the rating of effective radiated power.

7.2 EIRP Sample Calculation

Ch./ Freq.		Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain (dBi)	C.L	Pol.	EIRP	
channel	Freq.(MHz)						W	dBm
40620	2593.0	-15.75	18.45	9.90	1.76	H	0.456	26.59

$$\text{EIRP} = \text{Substitute LEVEL(dBm)} + \text{Ant. Gain} - \text{CL(Cable Loss)}$$

- 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
2307.5	LTE B40/ 5 MHz	QPSK	-36.94	0.98	9.54	2.38	V	< 2.00	0.007	8.14
		16-QAM	-37.08	0.84	9.54	2.38	V		0.006	8.00
		64-QAM	-37.26	0.66	9.54	2.38	V		0.006	7.82
2310.0		QPSK	-36.91	1.01	9.54	2.38	V		0.007	8.17
		16-QAM	-37.05	0.87	9.54	2.38	V		0.006	8.03
		64-QAM	-37.19	0.73	9.54	2.38	V		0.006	7.89
2312.5		QPSK	-37.00	0.92	9.54	2.38	V		0.006	8.08
		16-QAM	-37.14	0.78	9.54	2.38	V		0.006	7.94
		64-QAM	-37.26	0.66	9.54	2.38	V		0.006	7.82

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
2310.0	LTE B40/ 10 MHz	QPSK	-36.99	0.93	9.54	2.38	V	< 2.00	0.006	8.09
		16-QAM	-37.12	0.80	9.54	2.38	V		0.006	7.96
		64-QAM	-37.23	0.69	9.54	2.38	V		0.006	7.85

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
2352.5	LTE B40/ 5 MHz	QPSK	-38.95	-1.31	10.10	2.41	V	< 2.00	0.004	6.38
		16-QAM	-39.08	-1.44	10.10	2.41	V		0.004	6.25
		64-QAM	-39.21	-1.57	10.10	2.41	V		0.004	6.12
2355.0		QPSK	-38.89	-1.26	10.10	2.41	V		0.004	6.43
		16-QAM	-39.04	-1.41	10.10	2.41	V		0.004	6.28
		64-QAM	-39.15	-1.52	10.10	2.41	V		0.004	6.17
2357.5		QPSK	-38.80	-1.18	10.10	2.41	V		0.004	6.51
		16-QAM	-38.92	-1.30	10.10	2.41	V		0.004	6.39
		64-QAM	-39.08	-1.46	10.10	2.41	V		0.004	6.23

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
2355.0	LTE B40/ 10 MHz	QPSK	-38.94	-1.31	10.10	2.41	V	< 2.00	0.004	6.38
		16-QAM	-39.07	-1.44	10.10	2.41	V		0.004	6.25
		64-QAM	-39.20	-1.57	10.10	2.41	V		0.004	6.12

8.2 RADIATED SPURIOUS EMISSIONS

- ▣ OPERATING FREQUENCY : 2310.0 MHz
- ▣ MEASURED OUTPUT POWER: 8.17 dBm = 0.007 W
- ▣ MODE: LTE B40
- ▣ MODULATION SIGNAL: 5 MHz QPSK
- ▣ DISTANCE: 1 meters
- ▣ LIMIT: -40 dBm

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit (dBm)
38725 (2307.5)	4 615.00	-55.37	12.57	-66.50	3.47	H	-57.40	-40.00
	6 922.50	-55.64	11.82	-57.46	4.29	V	-49.93	-40.00
	9 230.00	-58.04	10.58	-54.88	5.06	V	-49.36	-40.00
38750 (2310.0)	4 620.00	-56.13	12.56	-67.19	3.47	V	-58.10	--40.00
	6 930.00	-55.87	11.78	-58.19	4.28	V	-50.69	-40.00
	9 240.00	-57.33	10.54	-53.93	5.07	H	-48.46	-40.00
38775 (2312.5)	4 625.00	-54.65	12.55	-65.69	3.47	V	-56.61	-40.00
	6 937.50	-55.88	11.74	-59.06	4.28	H	-51.60	--40.00
	9 250.00	-57.78	10.50	-54.03	5.06	H	-48.59	--40.00

- ▣ OPERATING FREQUENCY : 2310.0 MHz
- ▣ MEASURED OUTPUT POWER: 8.09 dBm = 0.006 W
- ▣ MODE: LTE B40
- ▣ MODULATION SIGNAL: 10 MHz QPSK
- ▣ DISTANCE: 1 meters
- ▣ LIMIT: -40 dBm

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit (dBm)
38750 (2310.0)	4 620.00	-56.04	12.56	-67.10	3.47	H	-58.01	-40.00
	6 930.00	-56.29	11.78	-58.61	4.28	H	-51.11	-40.00
	9 240.00	-58.77	10.54	-55.37	5.07	H	-49.90	-40.00

- ▣ OPERATING FREQUENCY : 2357.5 MHz
- ▣ MEASURED OUTPUT POWER: 6.51 dBm = 0.004 W
- ▣ MODE: LTE B40
- ▣ MODULATION SIGNAL: 5 MHz QPSK
- ▣ DISTANCE: 1 meters
- ▣ LIMIT: -40 dBm

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit (dBm)
39175 (2352.5)	4 705.00	-55.35	12.51	-66.04	3.51	H	-57.04	-40.00
	7 057.50	-56.68	11.06	-59.09	4.30	H	-52.33	-40.00
	9 410.00	-58.65	10.54	-55.10	5.09	H	-49.65	-40.00
39200 (2355.0)	4 710.00	-56.27	12.52	-66.91	3.52	H	-57.91	-40.00
	7 065.00	-57.28	11.04	-59.38	4.05	H	-52.39	-40.00
	9 420.00	-58.39	10.58	-55.12	5.12	H	-49.66	-40.00
39225 (2357.5)	4 715.00	-56.07	12.53	-66.58	3.52	H	-57.57	-40.00
	7 072.50	-56.11	11.02	-57.38	4.31	H	-50.67	-40.00
	9 430.00	-58.47	10.62	-55.16	5.12	H	-49.66	-40.00

- ▣ OPERATING FREQUENCY : 2355.0 MHz
- ▣ MEASURED OUTPUT POWER: 6.38 dBm = 0.004 W
- ▣ MODE: LTE B40
- ▣ MODULATION SIGNAL: 10 MHz QPSK
- ▣ DISTANCE: 1 meters
- ▣ LIMIT: -40 dBm

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit (dBm)
39200 (2355.0)	4 710.00	-55.73	12.52	-66.37	3.52	H	-57.37	-40.00
	7 065.00	-56.02	11.04	-58.12	4.05	H	-51.13	-40.00
	9 420.00	-58.87	10.58	-55.60	5.12	H	-50.14	-40.00

8.3 PEAK-TO-AVERAGE RATIO

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (dB)
40	5 MHz	2310.0	QPSK	25	0	5.57
			16-QAM			6.43
			64-QAM			6.42
	10 MHz		QPSK	50		5.66
			16-QAM			6.44
			64-QAM			6.46

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (dB)
40	5 MHz	2355.0	QPSK	25	0	5.75
			16-QAM			6.50
			64-QAM			6.67
	10 MHz		QPSK	50		5.81
			16-QAM			6.72
			64-QAM			6.56

Note:

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 62 ~ 73.

8.4 OCCUPIED BANDWIDTH

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
40	5 MHz	2310.0	QPSK	25	0	4.5014
			16-QAM			4.4902
			64-QAM			4.4787
	10 MHz		QPSK	50		8.9925
			16-QAM			8.9651
			64-QAM			8.9851

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
40	5 MHz	2355.0	QPSK	25	0	4.4970
			16-QAM			4.5039
			64-QAM			4.4988
	10 MHz		QPSK	50		8.9743
			16-QAM			8.9628
			64-QAM			8.9686

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 50 ~ 61.

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)
40	5	2307.5	3.7074	33.206	-77.451	-44.245	-40.00
		2310.0	3.6935	33.206	-77.185	-43.979	
		2312.5	3.7044	33.206	-77.431	-44.225	
	10	2310.0	3.7129	33.206	-77.181	-43.975	

Band	Band Width (MHz)	Frequency (MHz)	Frequency of Maximum Harmonic (GHz)	Factor (dB)	Measurement Maximum Data (dBm)	Result (dBm)	Limit (dBm)
40	5	2352.5	3.7144	33.206	-77.266	-44.060	-40.00
		2355.0	3.6975	33.206	-77.269	-44.063	
		2357.5	3.7010	33.206	-77.210	-44.004	
	10	2355.0	3.6845	33.206	-77.325	-44.119	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 298 ~ 313.
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) + Duty Cycle factor
4. Factor(dB) = Cable Loss + Attenuator + Power Splitter

Frequency Range (GHz)	Factor [dB]
0.03 – 1	30.500
1 – 5	33.206
5 – 10	33.821
10 – 15	34.346
15 – 20	34.719
Above 20	35.361

8.6 BAND EDGE

8.6.1 Lower Side

Band Width (MHz)	Frequency (MHz)	Modulation	RB (Size/ Offset)	Frequency Range (MHz)	Result (dBm)	Limit (dBm)
5	2307.5	QPSK	25/0	Below 2288	-48.046	-40
				2288 - 2292	-48.008	-37
				2292 - 2296	-47.937	-31
				2296 - 2300	-46.419	-25
				2300 - 2304	-37.424	-13
				2304 - 2305	-42.420	-13
				2315 - 2320	-46.187	-13
				2320 - 2324	-47.764	-25
				2324 - 2328	-47.774	-31
				2328 - 2337	-47.729	-37
				2337 - 2341	-47.736	-31
				2341 - 2345	-47.702	-25
				2345 - 2365	-47.707	-13
	Above 2365	-47.692	-40			
	2310.0	QPSK	25/0	Below 2288	-48.054	-40
				2288 - 2292	-48.028	-37
				2292 - 2296	-47.978	-31
				2296 - 2300	-47.645	-25
				2300 - 2305	-40.128	-13
				2315 - 2320	-39.215	-13
				2320 - 2324	-47.351	-25
				2324 - 2328	-47.753	-31
				2328 - 2337	-47.731	-37
				2337 - 2341	-47.712	-31
				2341 - 2345	-47.717	-25
				2345 - 2365	-47.706	-13
				Above 2365	-47.679	-40
	2312.5	QPSK	25/0	Below 2288	-48.074	-40
				2288 - 2292	-48.019	-37
				2292 - 2296	-47.975	-31
				2296 - 2300	-47.935	-25
				2300 - 2305	-46.587	-13

				2315 - 2316	-42.400	-13
				2316 - 2320	-36.735	-13
				2320 - 2324	-46.487	-25
				2324 - 2328	-47.760	-31
				2328 - 2337	-47.723	-37
				2337 - 2341	-47.723	-31
				2341 - 2345	-47.714	-25
				2345 - 2365	-47.686	-13
				Above 2365	-47.725	-40
10	2310.0	QPSK	50/0	Below 2288	-47.816	-40
				2288 - 2292	-47.256	-37
				2292 - 2296	-46.506	-31
				2296 - 2300	-42.621	-25
				2300 - 2304	-39.179	-13
				2304 - 2305	-44.544	-13
				2315 - 2316	-44.935	-13
				2316 - 2320	-38.987	-13
				2320 - 2324	-41.106	-25
				2324 - 2328	-46.156	-31
				2328 - 2337	-47.274	-37
				2337 - 2341	-47.611	-31
				2341 - 2345	-47.666	-25
				2345 - 2365	-47.644	-13
				Above 2365	-47.686	-40

Note:

1. Duty Cycle factor already applied on the factor.
2. Duty Cycle factor(dB) = 5.23 dB
3. Factor(dB) = Duty Cycle factor + Cable Loss + Ext. Attenuator + Power Splitter
4. Result(dBm) = Reading + Factor

Band Width (MHz)	Frequency (MHz)	Modulation	RB (Size/ Offset)	Frequency Range (MHz)	Result (dBm)	Limit (dBm)
5	2307.5	QPSK	1/0	Below 2288	-48.048	-40
				2288 - 2292	-47.994	-37
				2292 - 2296	-47.979	-31
				2296 - 2300	-47.141	-25
				2300 - 2304	-39.109	-13
				2304 - 2305	-30.861	-13
			1/24	2315 - 2320	-47.106	-13
				2320 - 2324	-47.776	-25
				2324 - 2328	-47.733	-31
				2328 - 2337	-47.738	-37
				2337 - 2341	-47.733	-31
				2341 - 2345	-47.715	-25
				2345 - 2365	-47.699	-13
				Above 2365	-47.697	-40
	2310.0	QPSK	1/0	Below 2288	-48.028	-40
				2288 - 2292	-48.003	-37
				2292 - 2296	-47.976	-31
				2296 - 2300	-47.920	-25
				2300 - 2305	-44.893	-13
				2315 - 2320	-44.930	-13
			1/24	2320 - 2324	-47.707	-25
				2324 - 2328	-47.773	-31
				2328 - 2337	-47.728	-37
				2337 - 2341	-47.726	-31
				2341 - 2345	-47.694	-25
				2345 - 2365	-47.674	-13
				Above 2365	-47.715	-40
2312.5				QPSK	1/0	Below 2288
	2288 - 2292	-48.019	-37			
	2292 - 2296	-47.977	-31			
	2296 - 2300	-47.947	-25			
	2300 - 2305	-47.313	-13			
	2315 - 2316	-30.351	-13			
	1/24	2316 - 2320	-39.450		-13	

10	2310.0	QPSK	1/0	2320 - 2324	-46.970	-25
				2324 - 2328	-47.753	-31
				2328 - 2337	-47.725	-37
				2337 - 2341	-47.714	-31
				2341 - 2345	-47.713	-25
				2345 - 2365	-47.672	-13
				Above 2365	-47.704	-40
			1/49	Below 2288	-47.963	-40
				2288 - 2292	-47.703	-37
				2292 - 2296	-47.425	-31
				2296 - 2300	-46.615	-25
				2300 - 2304	-39.707	-13
				2304 - 2305	-32.586	-13
				2315 - 2316	-32.723	-13
2316 - 2320	-39.933	-13				
2320 - 2324	-45.812	-25				
2324 - 2328	-47.052	-31				
2328 - 2337	-47.658	-37				
2337 - 2341	-47.667	-31				
2341 - 2345	-47.702	-25				
2345 - 2365	-47.708	-13				
Above 2365	-47.709	-40				

Note:

1. Duty Cycle factor already applied on the factor.
2. Duty Cycle factor(dB) = 5.23 dB
3. Factor(dB) = Duty Cycle factor + Cable Loss + Ext. Attenuator + Power Splitter
4. Result(dBm) = Reading + Factor

8.6.2 Upper Side

Band Width (MHz)	Frequency (MHz)	Modulation	RB (Size/ Offset)	Frequency Range (MHz)	Result (dBm)	Limit (dBm)
5	2352.5	QPSK	25/0	Below 2288	-48.063	-40
				2288 - 2292	-48.013	-37
				2292 - 2296	-47.981	-31
				2296 - 2300	-47.950	-25
				2300 - 2320	-47.851	-13
				2320 - 2324	-47.809	-25
				2324 - 2328	-47.767	-31
				2328 - 2337	-47.735	-37
				2337 - 2341	-47.708	-31
				2341 - 2345	-46.575	-25
				2345 - 2349	-41.436	-13
				2349 - 2350	-42.493	-13
				2360 - 2365	-46.766	-13
				Above 2365	-47.676	-40
	2355.0	QPSK	25/0	Below 2288	-48.060	-40
				2288 - 2292	-48.026	-37
				2292 - 2296	-47.964	-31
				2296 - 2300	-47.954	-25
				2300 - 2320	-47.842	-13
				2320 - 2324	-47.812	-25
				2324 - 2328	-47.785	-31
				2328 - 2337	-47.730	-37
				2337 - 2341	-47.702	-31
				2341 - 2345	-47.545	-25
				2345 - 2350	-44.532	-13
				2360 - 2365	-44.593	-13
				Above 2365	-47.530	-40
				2357.5	QPSK	25/0
	2288 - 2292	-48.041	-37			
	2292 - 2296	-48.003	-31			
	2296 - 2300	-47.980	-25			
	2300 - 2320	-47.858	-13			

				2320 - 2324	-47.818	-25
				2324 - 2328	-47.786	-31
				2328 - 2337	-47.738	-37
				2337 - 2341	-47.701	-31
				2341 - 2345	-47.697	-25
				2345 - 2350	-46.732	-13
				2360 - 2364	-42.022	-13
				2364 - 2365	-42.301	-13
				Above 2365	-45.952	-40
10	2355.0	QPSK	50/0	Below 2288	-48.043	-40
				2288 - 2292	-48.056	-37
				2292 - 2296	-47.992	-31
				2296 - 2300	-47.957	-25
				2300 - 2320	-47.823	-13
				2320 - 2324	-47.723	-25
				2324 - 2328	-47.528	-31
				2328 - 2337	-47.046	-37
				2337 - 2341	-46.038	-31
				2341 - 2345	-45.003	-25
				2345 - 2349	-41.127	-13
				2349 - 2350	-46.393	-13
				2360 - 2364	-46.317	-13
				2364 - 2365	-43.688	-13
Above 2365	-46.254	-40				

Note:

1. Duty Cycle factor already applied on the factor.
2. Duty Cycle factor(dB) = 5.23 dB
3. Factor(dB) = Duty Cycle factor + Cable Loss + Ext. Attenuator + Power Splitter
4. Result(dBm) = Reading + Factor

Band Width (MHz)	Frequency (MHz)	Modulation	RB (Size/Offset)	Frequency Range (MHz)	Result (dBm)	Limit (dBm)
5	2352.5	QPSK	1/0	Below 2288	-48.023	-40
				2288 - 2292	-48.012	-37
				2292 - 2296	-47.981	-31
				2296 - 2300	-47.949	-25
				2300 - 2320	-47.820	-13
				2320 - 2324	-47.791	-25
				2324 - 2328	-47.764	-31
				2328 - 2337	-47.702	-37
				2337 - 2341	-47.687	-31
				2341 - 2345	-46.936	-25
				2345 - 2349	-39.769	-13
			2349 - 2350	-28.953	-13	
			1/24	2360 - 2365	-46.759	-13
	Above 2365	-47.708		-40		
	2355.0	QPSK	1/0	Below 2288	-48.059	-40
				2288 - 2292	-48.015	-37
				2292 - 2296	-47.986	-31
				2296 - 2300	-47.957	-25
				2300 - 2320	-47.840	-13
				2320 - 2324	-47.815	-25
				2324 - 2328	-47.784	-31
				2328 - 2337	-47.683	-37
				2337 - 2341	-47.669	-31
				2341 - 2345	-47.477	-25
				2345 - 2350	-43.714	-13
			1/24	2360 - 2365	-44.593	-13
				Above 2365	-47.663	-40
	2357.5	QPSK	1/0	Below 2288	-48.038	-40
				2288 - 2292	-48.011	-37
				2292 - 2296	-47.992	-31
				2296 - 2300	-47.983	-25
				2300 - 2320	-47.841	-13
				2320 - 2324	-47.782	-25

10	2355.0	QPSK		2324 - 2328	-47.788	-31
				2328 - 2337	-47.729	-37
				2337 - 2341	-47.724	-31
				2341 - 2345	-47.646	-25
				2345 - 2350	-46.884	-13
			1/24	2360 - 2361	-30.032	-13
			2361 - 2365	-38.547	-13	
			Above 2365	-46.876	-40	
			1/0	Below 2288	-48.055	-40
				2288 - 2292	-48.042	-37
				2292 - 2296	-47.978	-31
				2296 - 2300	-47.976	-25
				2300 - 2320	-47.861	-13
				2320 - 2324	-47.766	-25
				2324 - 2328	-47.716	-31
2328 - 2337	-47.482	-37				
2337 - 2341	-46.941	-31				
2341 - 2345	-45.644	-25				
1/49	2345 - 2349	-39.692	-13			
	2349 - 2350	-33.608	-13			
	2360 - 2361	-32.655	-13			
	2361 - 2365	-40.525	-13			
			Above 2365	-46.546	-40	

Note:

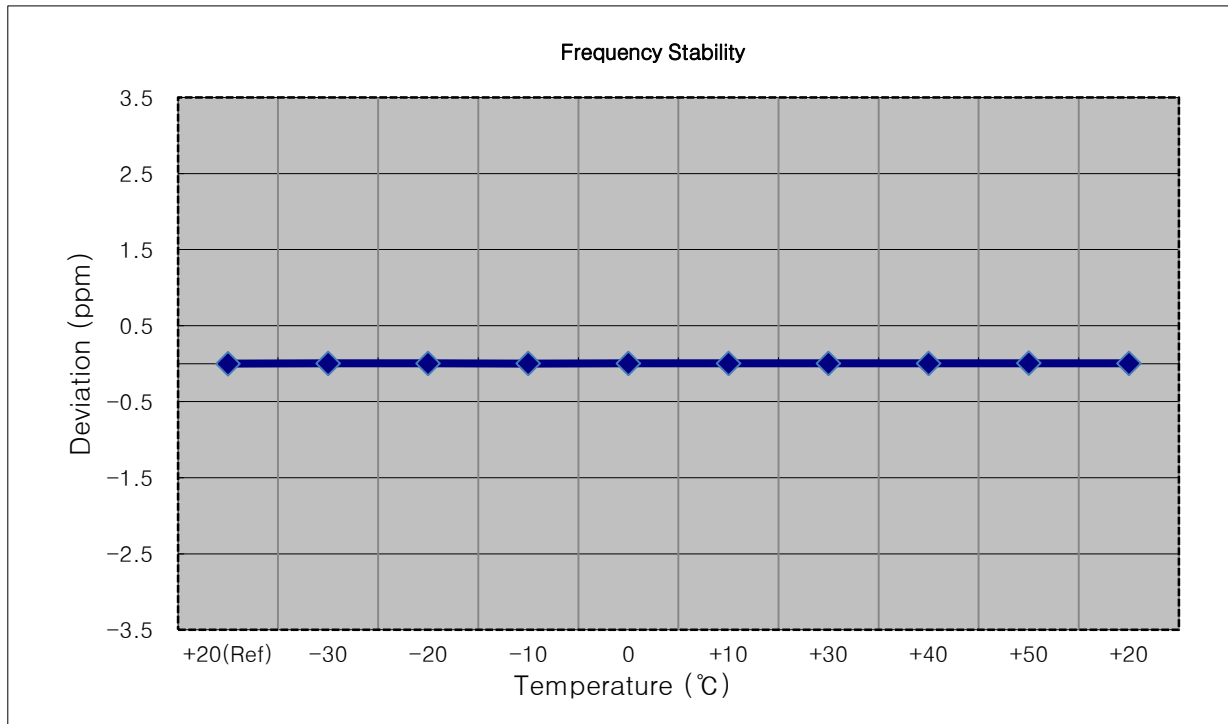
1. Duty Cycle factor already applied on the factor.
2. Duty Cycle factor(dB) = 5.23 dB
3. Factor(dB) = Duty Cycle factor + Cable Loss + Ext. Attenuator + Power Splitter
4. Result(dBm) = Reading + Factor
5. Plots of the EUT's BandEdge(Lower & Upper) are shown Page 74 ~ 297.

8.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

8.7.1 Lower Side

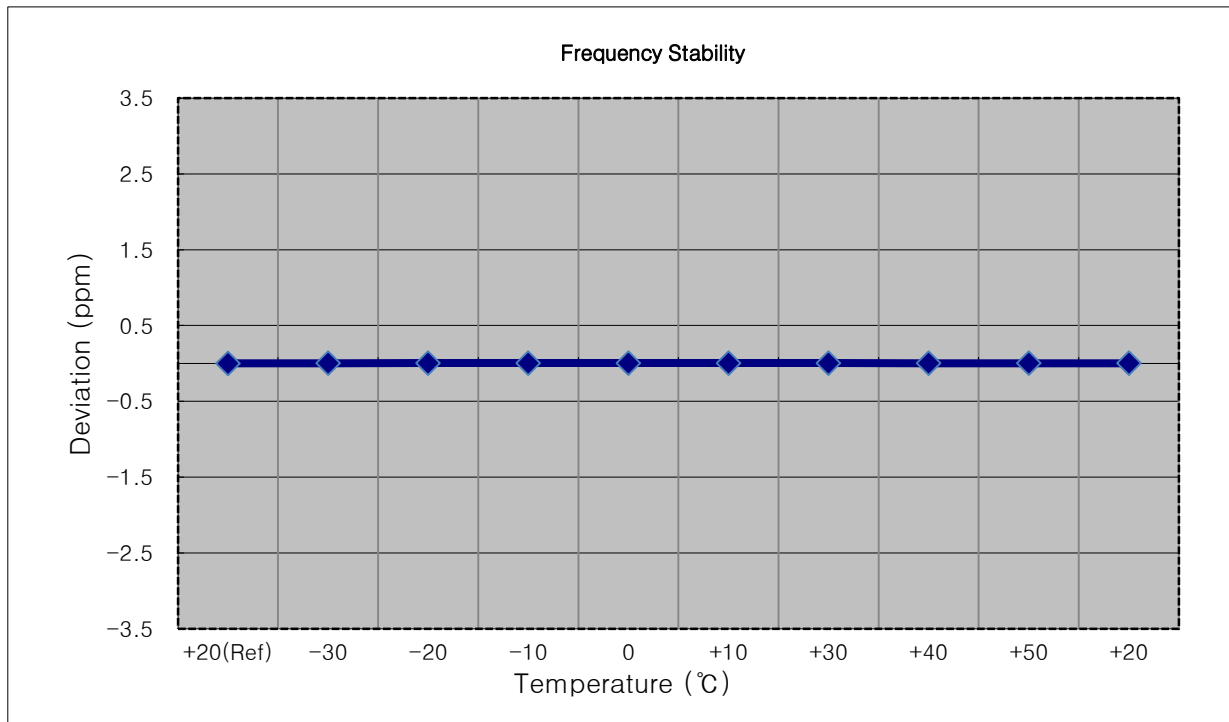
- ▣ MODE: LTE 40
- ▣ OPERATING FREQUENCY: 2307,500,000 Hz
- ▣ BANDWIDTH: 38725 (5 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	2307 500 002	0.00	0.000 000	0.0000
100 %		-30	2307 500 010	7.70	0.000 000	0.0033
100 %		-20	2307 500 009	6.70	0.000 000	0.0029
100 %		-10	2307 500 006	3.70	0.000 000	0.0016
100 %		0	2307 500 012	9.70	0.000 000	0.0042
100 %		+10	2307 500 008	5.80	0.000 000	0.0025
100 %		+30	2307 500 010	8.00	0.000 000	0.0035
100 %		+40	2307 500 012	9.50	0.000 000	0.0041
100 %		+50	2307 500 013	11.00	0.000 000	0.0048
Batt. Endpoint		3.400	+20	2307 500 010	7.70	0.000 000



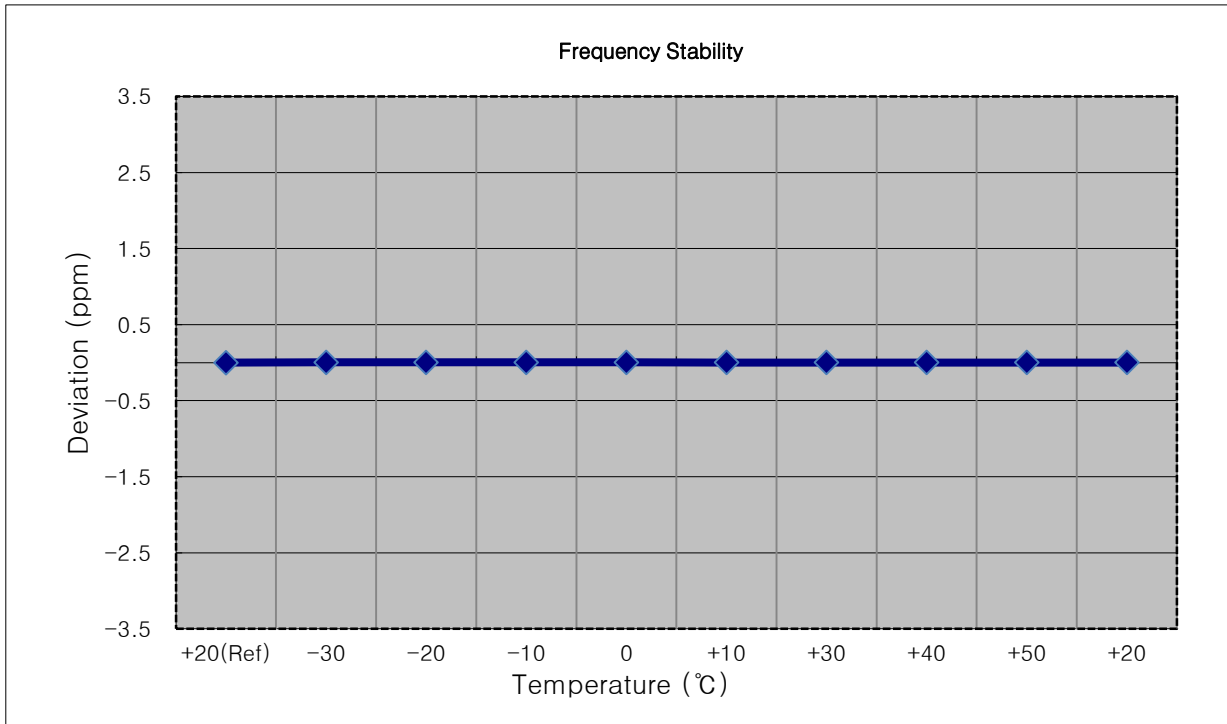
- ▣ MODE: LTE 40
- ▣ OPERATING FREQUENCY: 2310,000,000 Hz
- ▣ BANDWIDTH: 38750 (5 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	2310 000 010	0.00	0.000 000	0.0000
100 %		-30	2310 000 016	6.60	0.000 000	0.0029
100 %		-20	2310 000 019	9.10	0.000 000	0.0039
100 %		-10	2310 000 021	10.90	0.000 000	0.0047
100 %		0	2310 000 020	10.10	0.000 000	0.0044
100 %		+10	2310 000 022	12.60	0.000 001	0.0055
100 %		+30	2310 000 019	9.40	0.000 000	0.0041
100 %		+40	2310 000 016	6.50	0.000 000	0.0028
100 %		+50	2310 000 016	6.40	0.000 000	0.0028
Batt. Endpoint		3.400	+20	2310 000 016	6.50	0.000 000



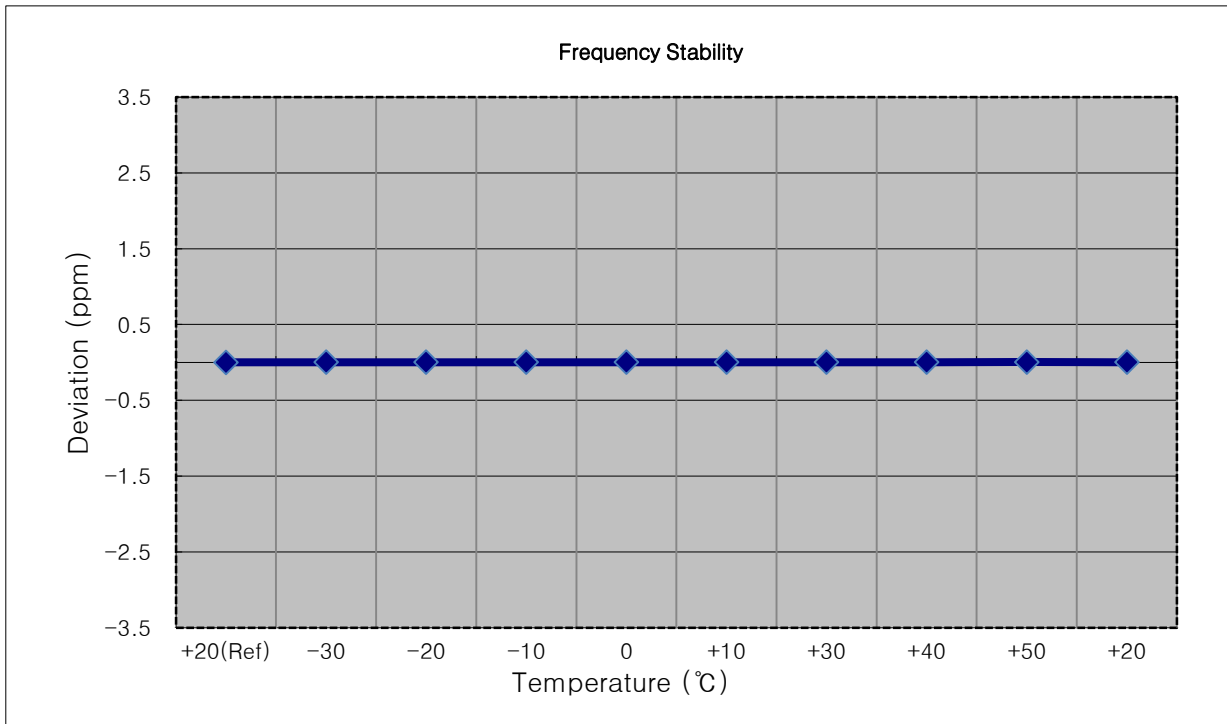
- ▣ MODE: LTE 40
- ▣ OPERATING FREQUENCY: 2312,500,000 Hz
- ▣ BANDWIDTH: 38775 (5 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	2312 500 007	0.00	0.000 000	0.0000
100 %		-30	2312 500 014	7.10	0.000 000	0.0031
100 %		-20	2312 500 016	9.20	0.000 000	0.0040
100 %		-10	2312 500 016	8.90	0.000 000	0.0038
100 %		0	2312 500 016	9.00	0.000 000	0.0039
100 %		+10	2312 500 012	4.80	0.000 000	0.0021
100 %		+30	2312 500 013	5.60	0.000 000	0.0024
100 %		+40	2312 500 013	5.80	0.000 000	0.0025
100 %		+50	2312 500 012	4.40	0.000 000	0.0019
Batt. Endpoint		3.400	+20	2312 500 013	5.60	0.000 000



- ▣ MODE: LTE 40
- ▣ OPERATING FREQUENCY: 2310,000,000 Hz
- ▣ BANDWIDTH: 38750 (10 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

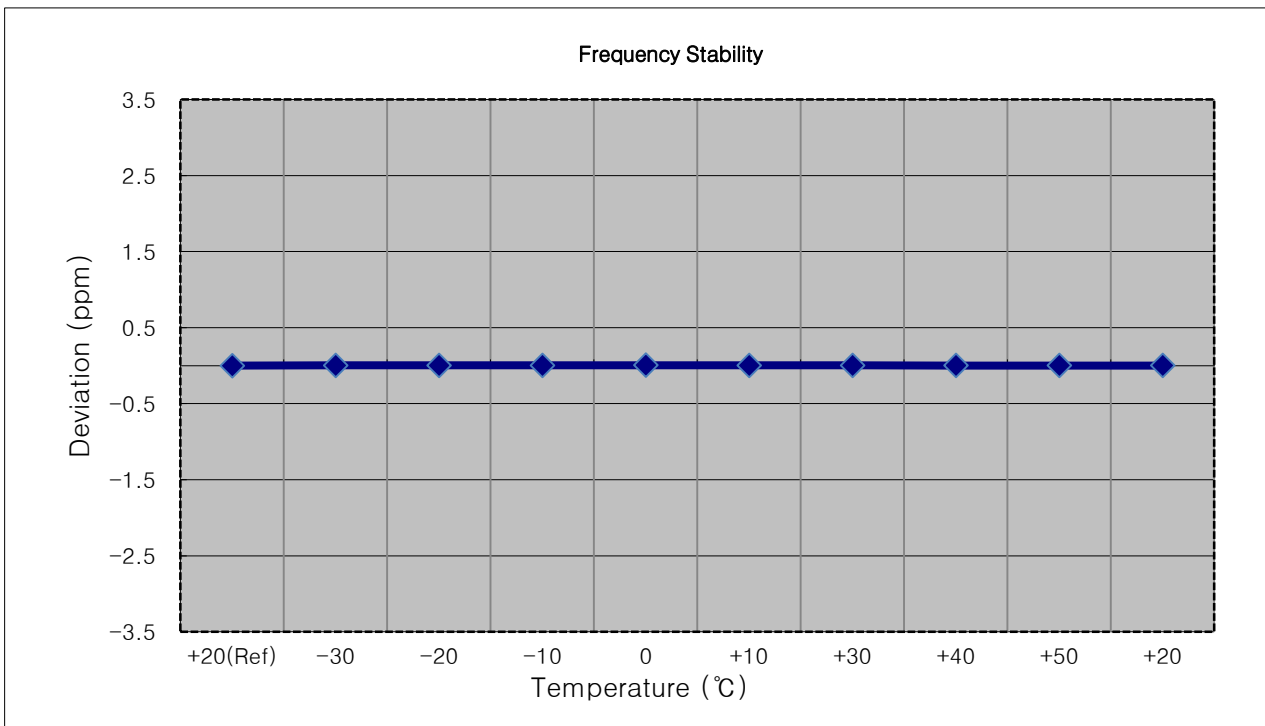
Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	2310 000 005	0.00	0.000 000	0.0000
100 %		-30	2310 000 011	6.00	0.000 000	0.0026
100 %		-20	2310 000 010	5.70	0.000 000	0.0025
100 %		-10	2310 000 012	7.10	0.000 000	0.0031
100 %		0	2310 000 010	5.00	0.000 000	0.0022
100 %		+10	2310 000 011	6.60	0.000 000	0.0029
100 %		+30	2310 000 011	6.40	0.000 000	0.0028
100 %		+40	2310 000 013	8.10	0.000 000	0.0035
100 %		+50	2310 000 018	13.00	0.000 001	0.0056
Batt. Endpoint	3.400	+20	2310 000 013	8.20	0.000 000	0.0035



8.7.2 Upper Side

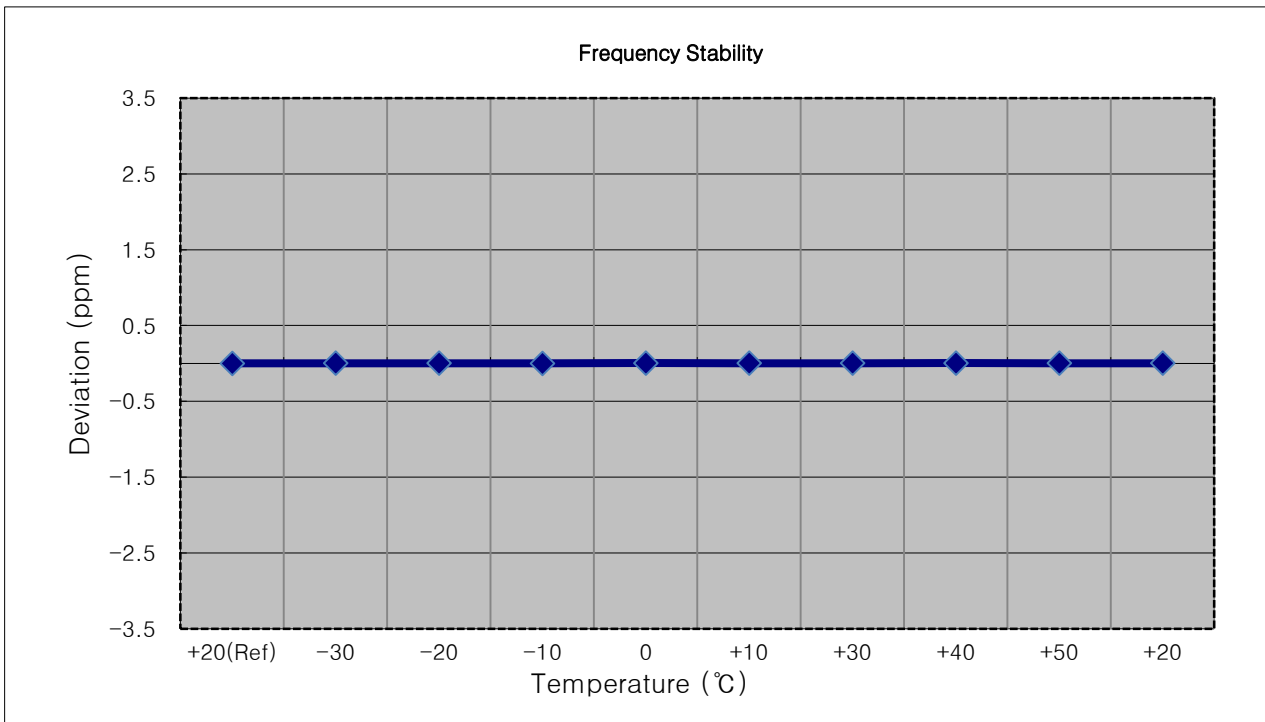
- ▣ MODE: LTE 40
- ▣ OPERATING FREQUENCY: 2352,500,000 Hz
- ▣ BANDWIDTH: 39175 (5 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	2352 500 007	0.00	0.000 000	0.0000
100 %		-30	2352 500 014	6.70	0.000 000	0.0028
100 %		-20	2352 500 017	10.00	0.000 000	0.0043
100 %		-10	2352 500 015	7.20	0.000 000	0.0031
100 %		0	2352 500 019	11.50	0.000 000	0.0049
100 %		+10	2352 500 017	9.40	0.000 000	0.0040
100 %		+30	2352 500 017	9.40	0.000 000	0.0040
100 %		+40	2352 500 012	4.50	0.000 000	0.0019
100 %		+50	2352 500 013	5.30	0.000 000	0.0023
Batt. Endpoint		3.400	+20	2352 500 011	3.70	0.000 000



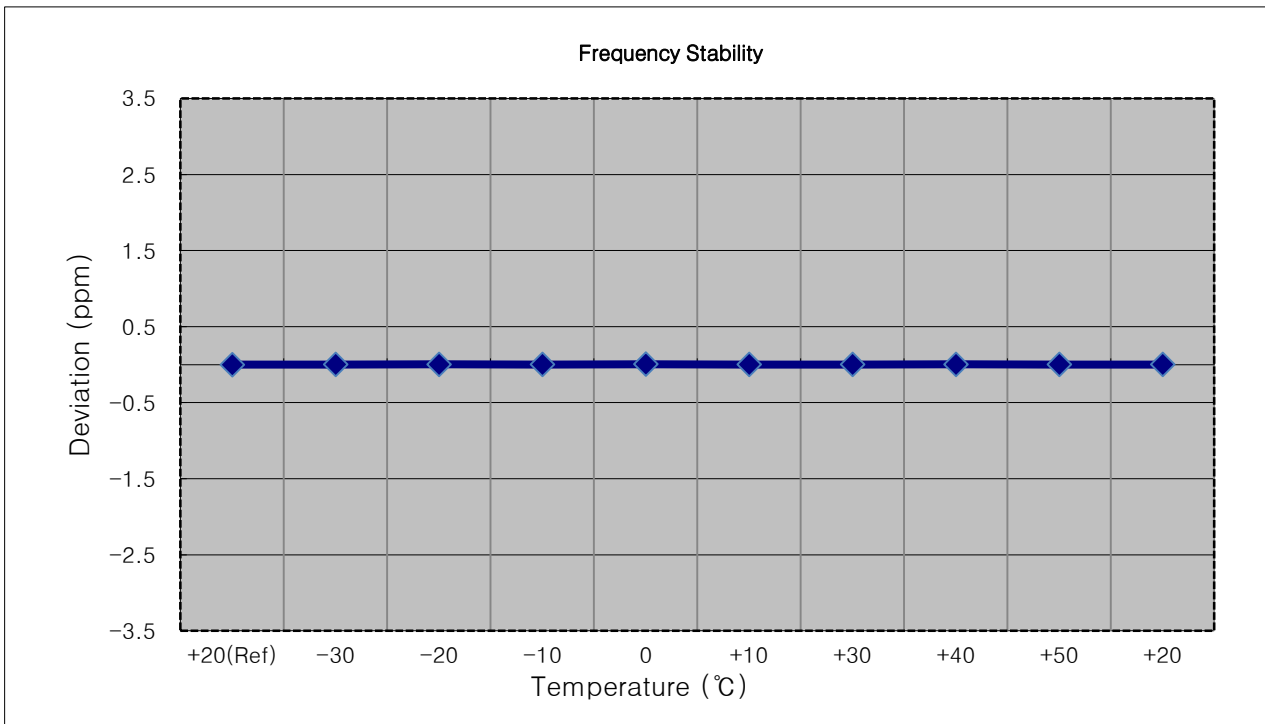
- ▣ MODE: LTE 40
- ▣ OPERATING FREQUENCY: 2355,000,000 Hz
- ▣ BANDWIDTH: 39200 (5 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	2355 000 007	0.00	0.000 000	0.0000
100 %		-30	2355 000 013	5.40	0.000 000	0.0023
100 %		-20	2355 000 013	5.60	0.000 000	0.0024
100 %		-10	2355 000 011	3.80	0.000 000	0.0016
100 %		0	2355 000 017	9.30	0.000 000	0.0039
100 %		+10	2355 000 016	8.20	0.000 000	0.0035
100 %		+30	2355 000 015	7.70	0.000 000	0.0033
100 %		+40	2355 000 020	12.60	0.000 001	0.0054
100 %		+50	2355 000 014	6.40	0.000 000	0.0027
Batt. Endpoint		3.400	+20	2355 000 013	5.80	0.000 000



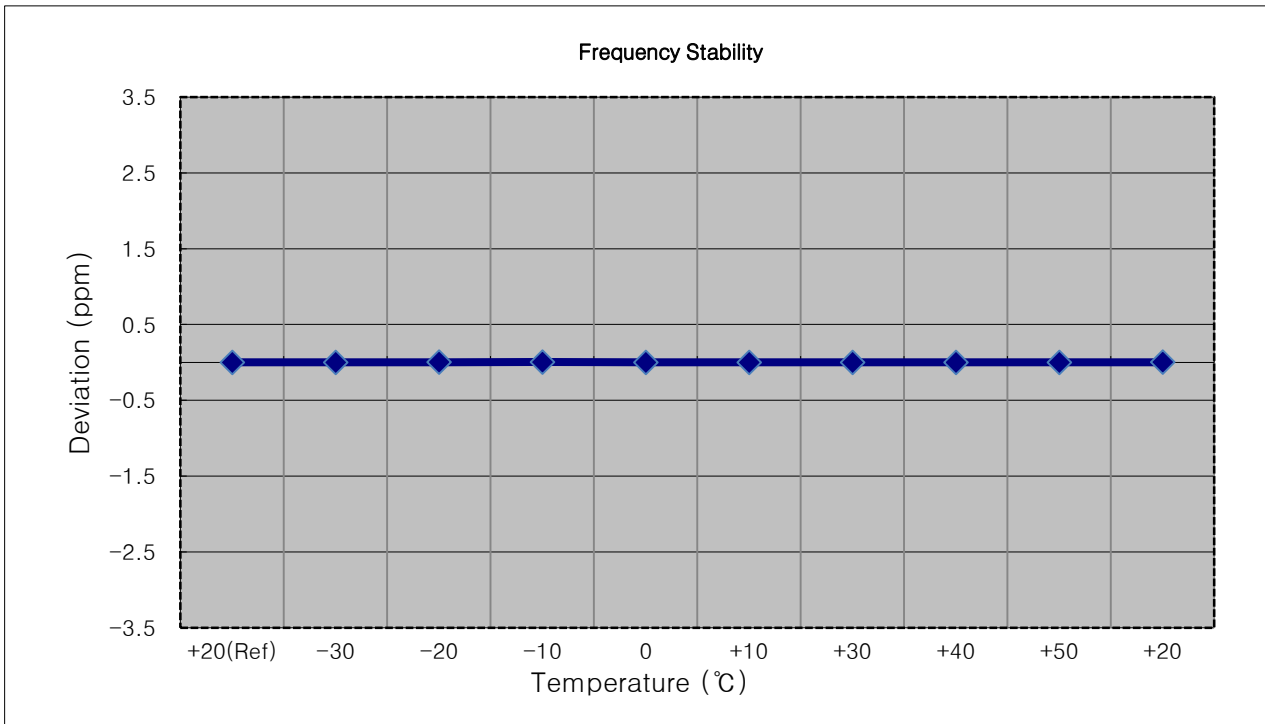
- ▣ MODE: LTE 40
- ▣ OPERATING FREQUENCY: 2357,500,000 Hz
- ▣ BANDWIDTH: 39225 (5 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	2357 500 004	0.00	0.000 000	0.0000
100 %		-30	2357 500 008	4.10	0.000 000	0.0017
100 %		-20	2357 500 011	6.70	0.000 000	0.0028
100 %		-10	2357 500 009	5.50	0.000 000	0.0023
100 %		0	2357 500 015	11.10	0.000 000	0.0047
100 %		+10	2357 500 009	4.70	0.000 000	0.0020
100 %		+30	2357 500 007	3.10	0.000 000	0.0013
100 %		+40	2357 500 011	7.30	0.000 000	0.0031
100 %		+50	2357 500 009	4.70	0.000 000	0.0020
Batt. Endpoint		3.400	+20	2357 500 007	2.70	0.000 000



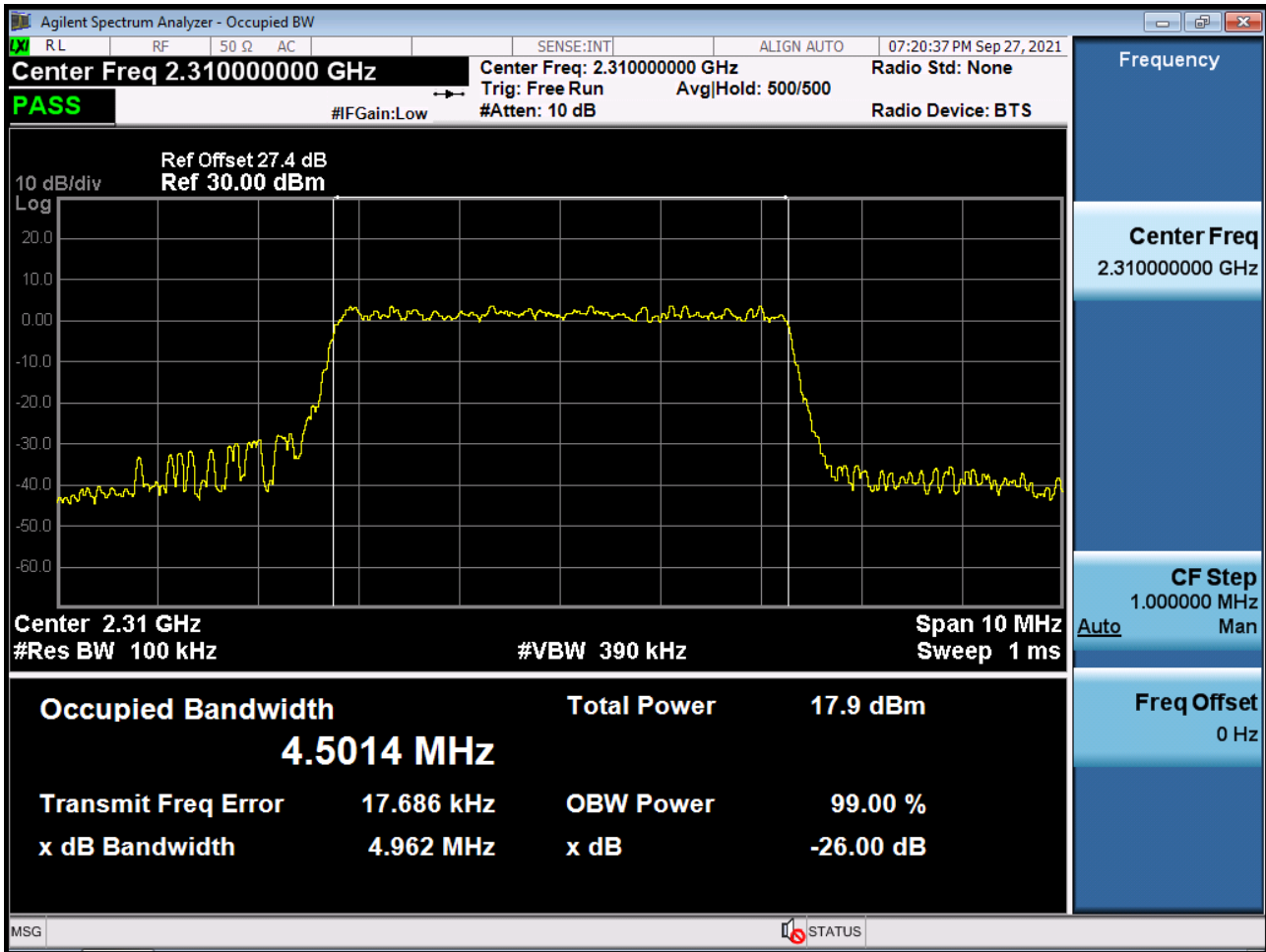
- ▣ MODE: LTE 40
- ▣ OPERATING FREQUENCY: 2355,000,000 Hz
- ▣ BANDWIDTH: 39200 (10 MHz)
- ▣ REFERENCE VOLTAGE: 3.850 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.850	+20(Ref)	2354 999 997	0.00	0.000 000	0.0000
100 %		-30	2354 999 999	2.20	0.000 000	0.0009
100 %		-20	2355 000 001	4.00	0.000 000	0.0017
100 %		-10	2355 000 006	8.90	0.000 000	0.0038
100 %		0	2354 999 996	-0.90	0.000 000	-0.0004
100 %		+10	2355 000 000	2.90	0.000 000	0.0012
100 %		+30	2354 999 996	-1.10	0.000 000	-0.0005
100 %		+40	2354 999 998	1.50	0.000 000	0.0006
100 %		+50	2354 999 998	1.70	0.000 000	0.0007
Batt. Endpoint	3.400	+20	2355 000 001	4.60	0.000 000	0.0020

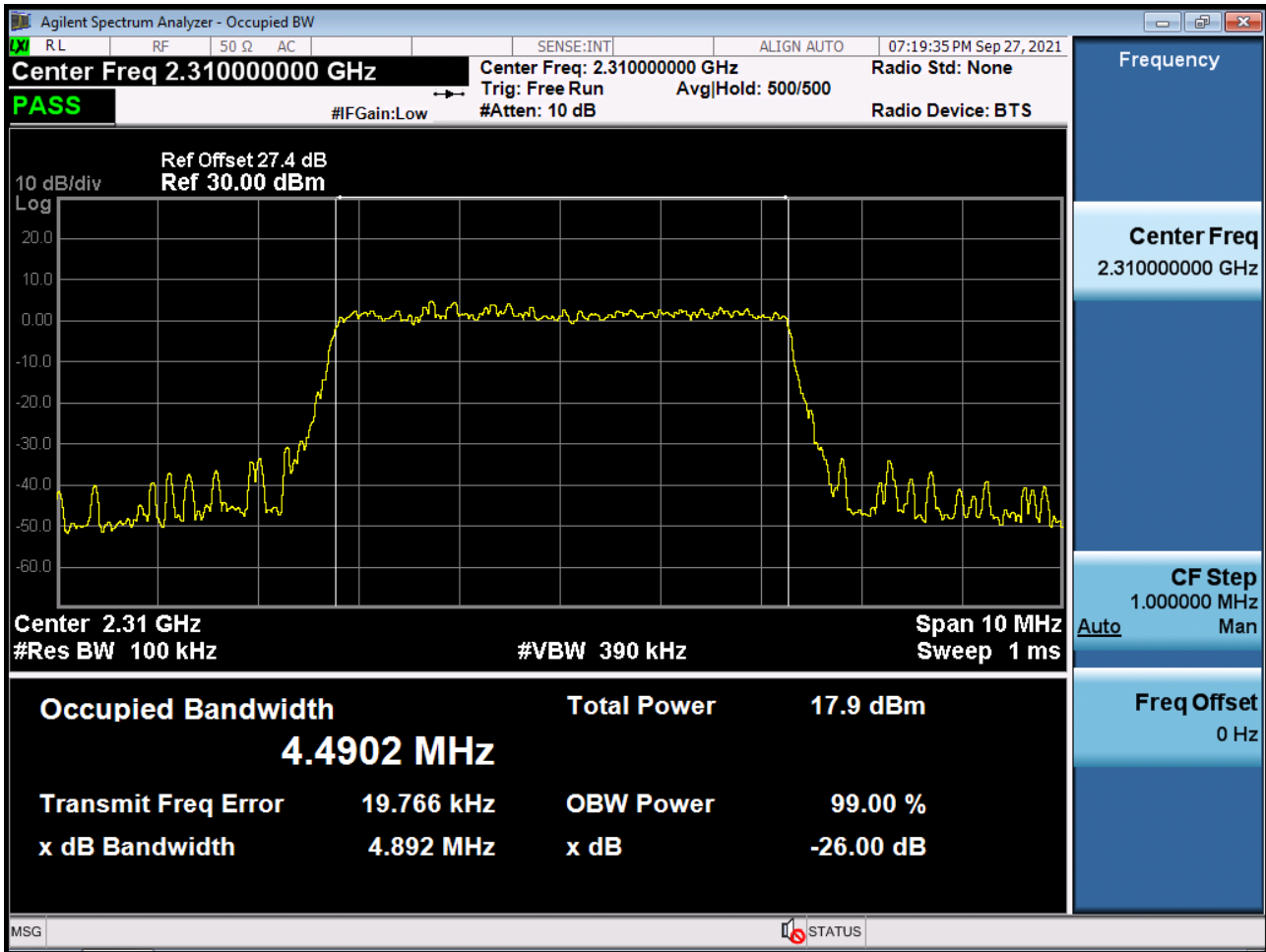


9. TEST PLOTS

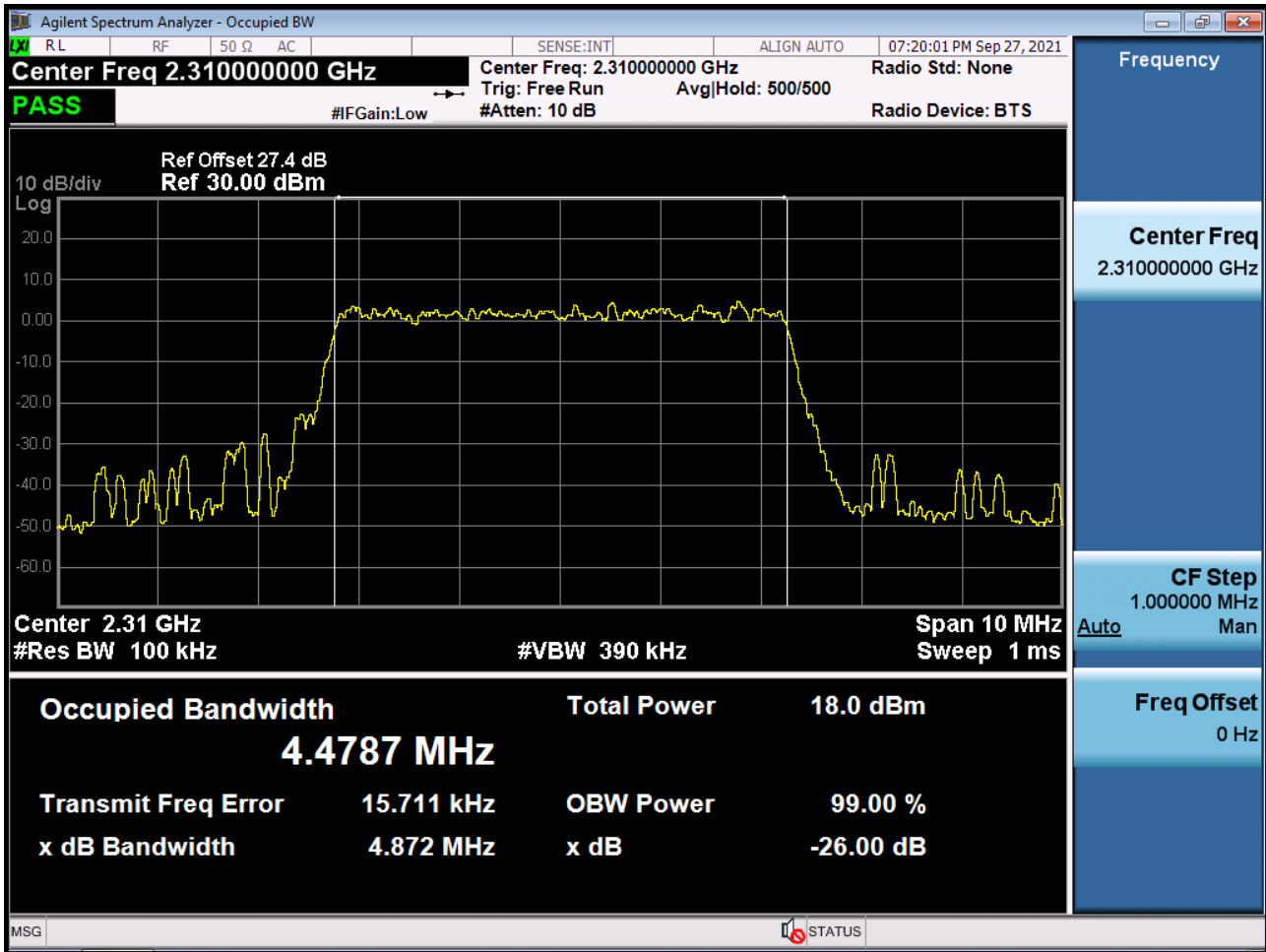
BAND 40. Occupied Bandwidth Plot (5 MHz 2310 MHz_QPSK_FullIRB)



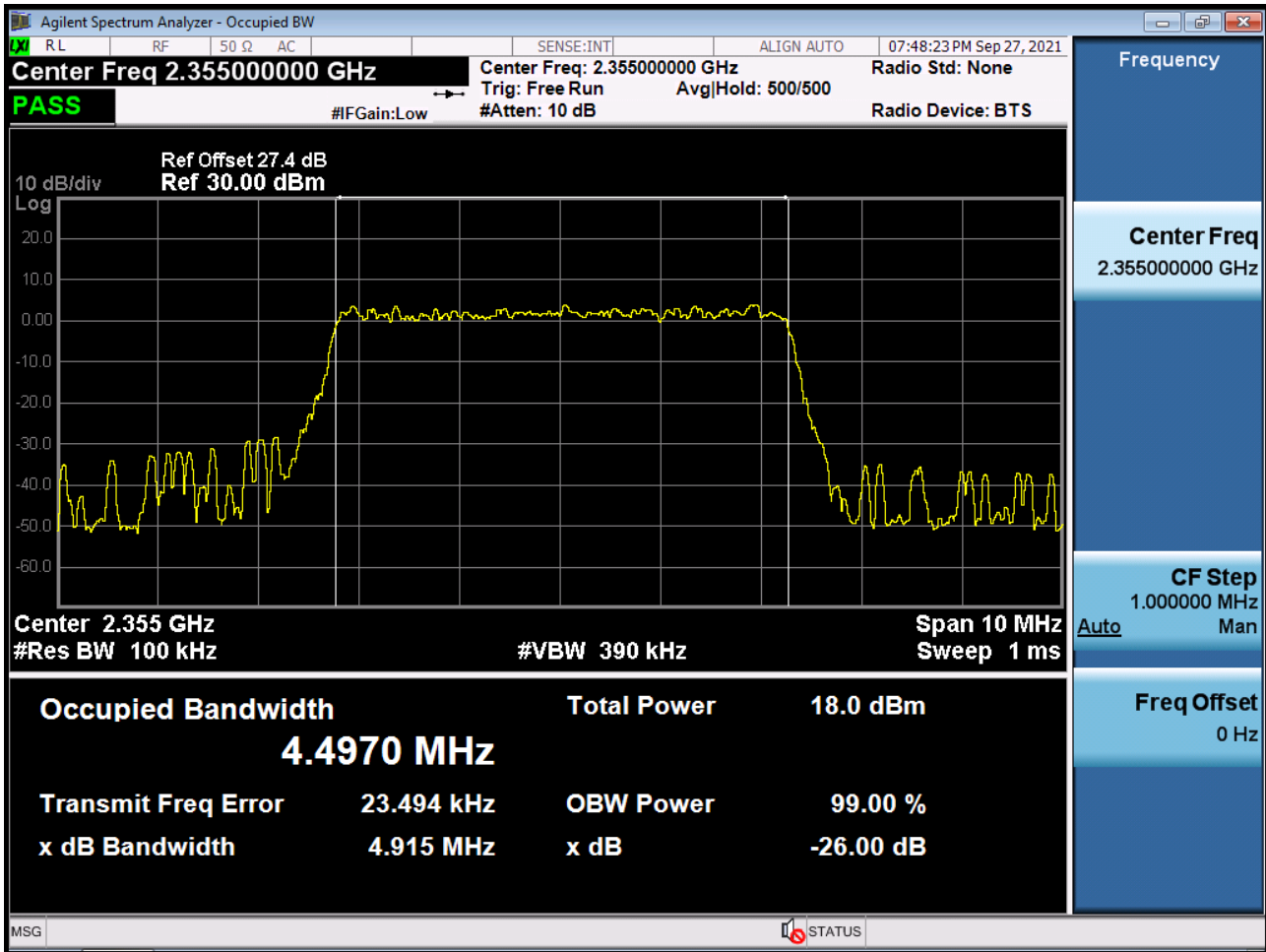
BAND 40. Occupied Bandwidth Plot (5 MHz 2310 MHz_16QAM_FullIRB)



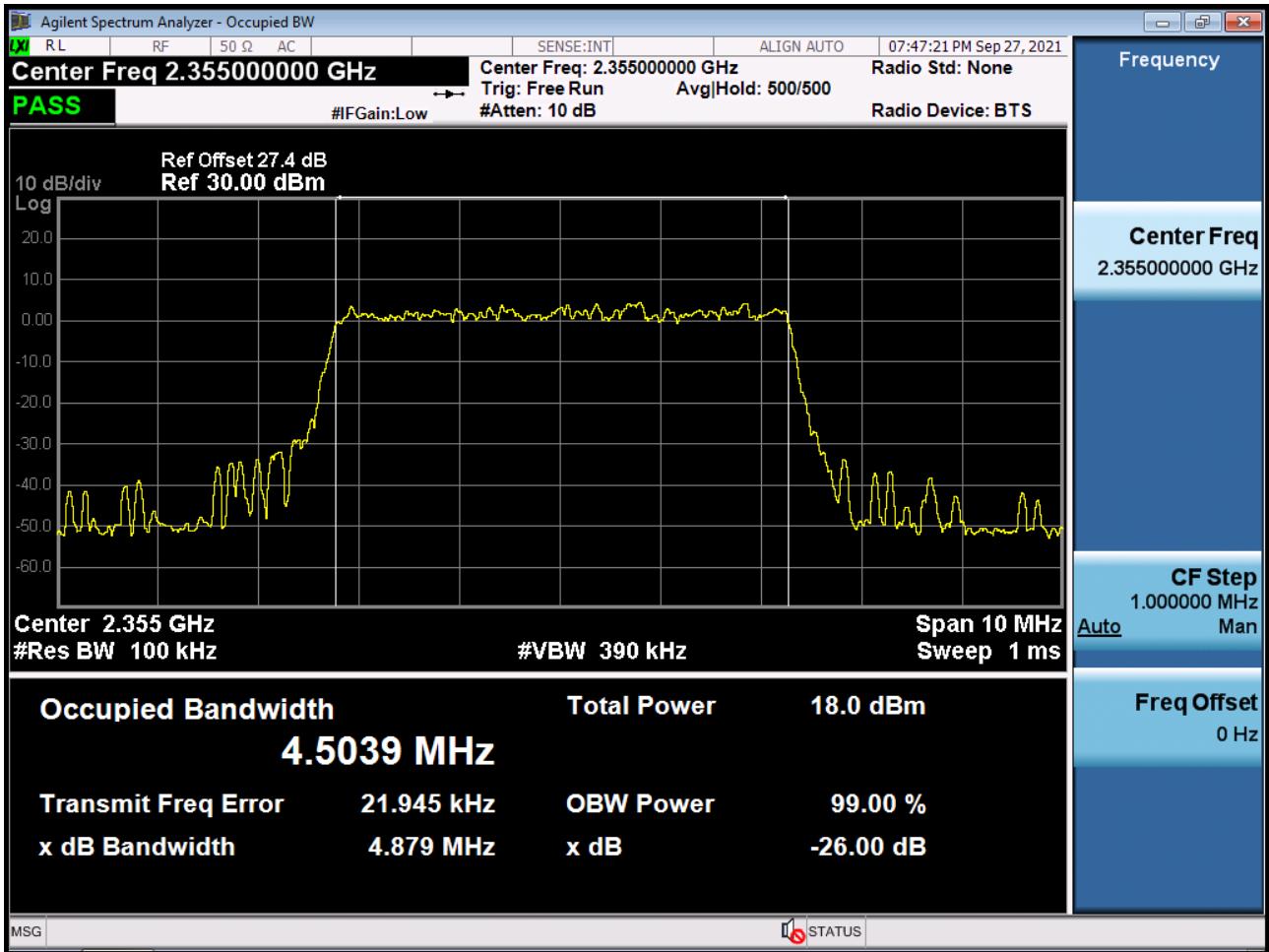
BAND 40. Occupied Bandwidth Plot (5 MHz 2310 MHz_64QAM_FullIRB)



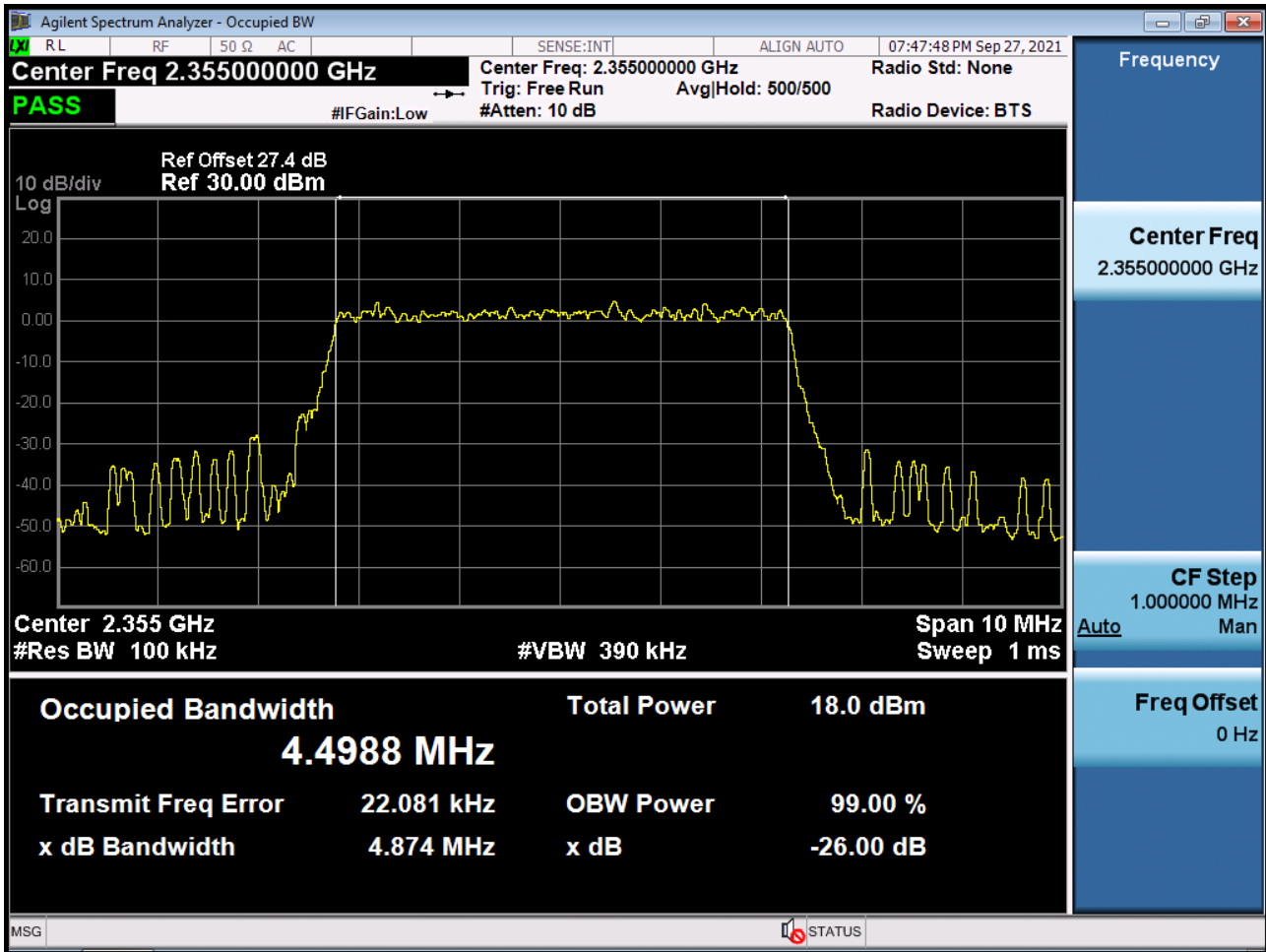
BAND 40. Occupied Bandwidth Plot (5 MHz 2355 MHz_QPSK_FullIRB)



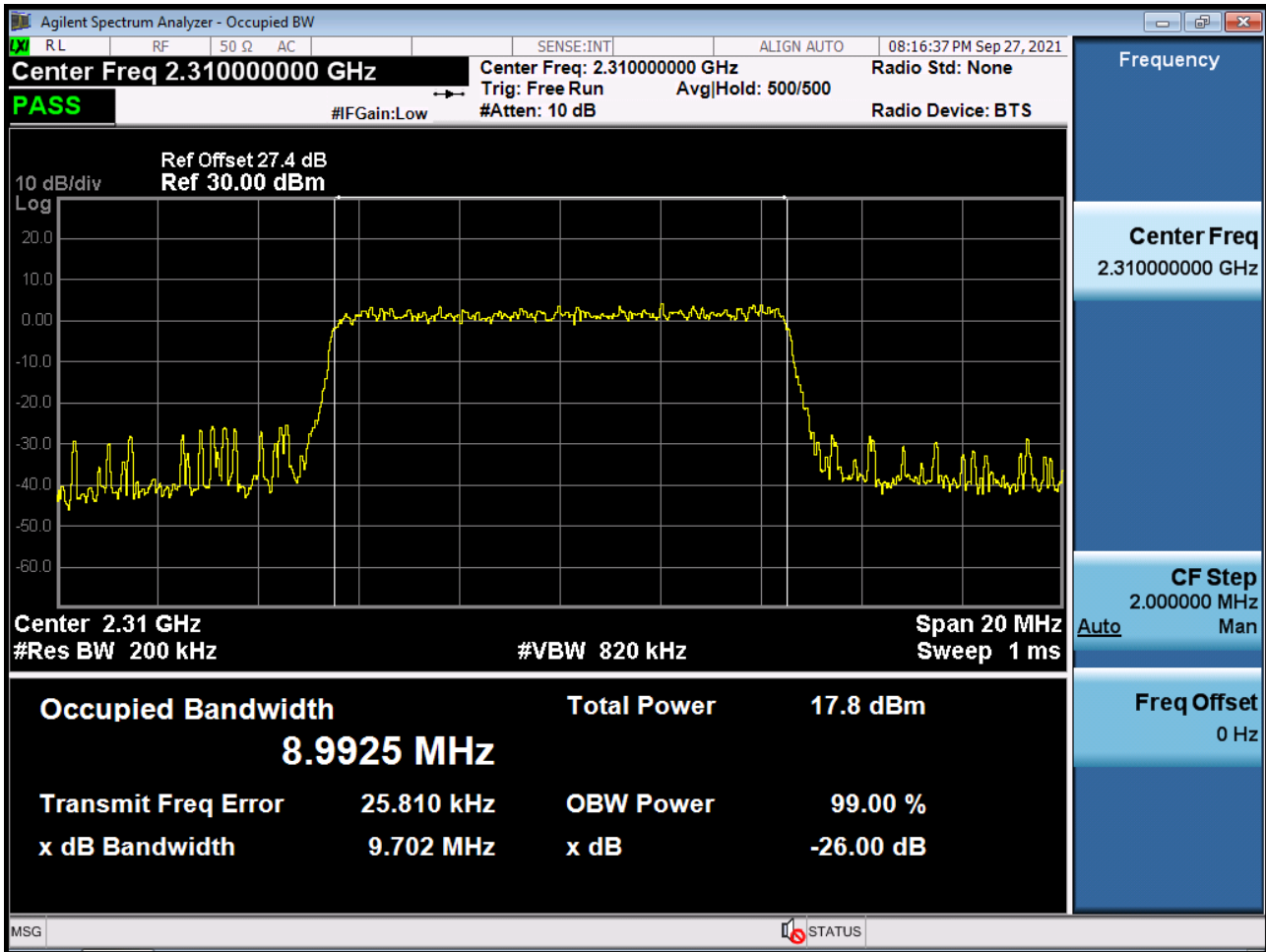
BAND 40. Occupied Bandwidth Plot (5 MHz 2355 MHz_16QAM_FullIRB)



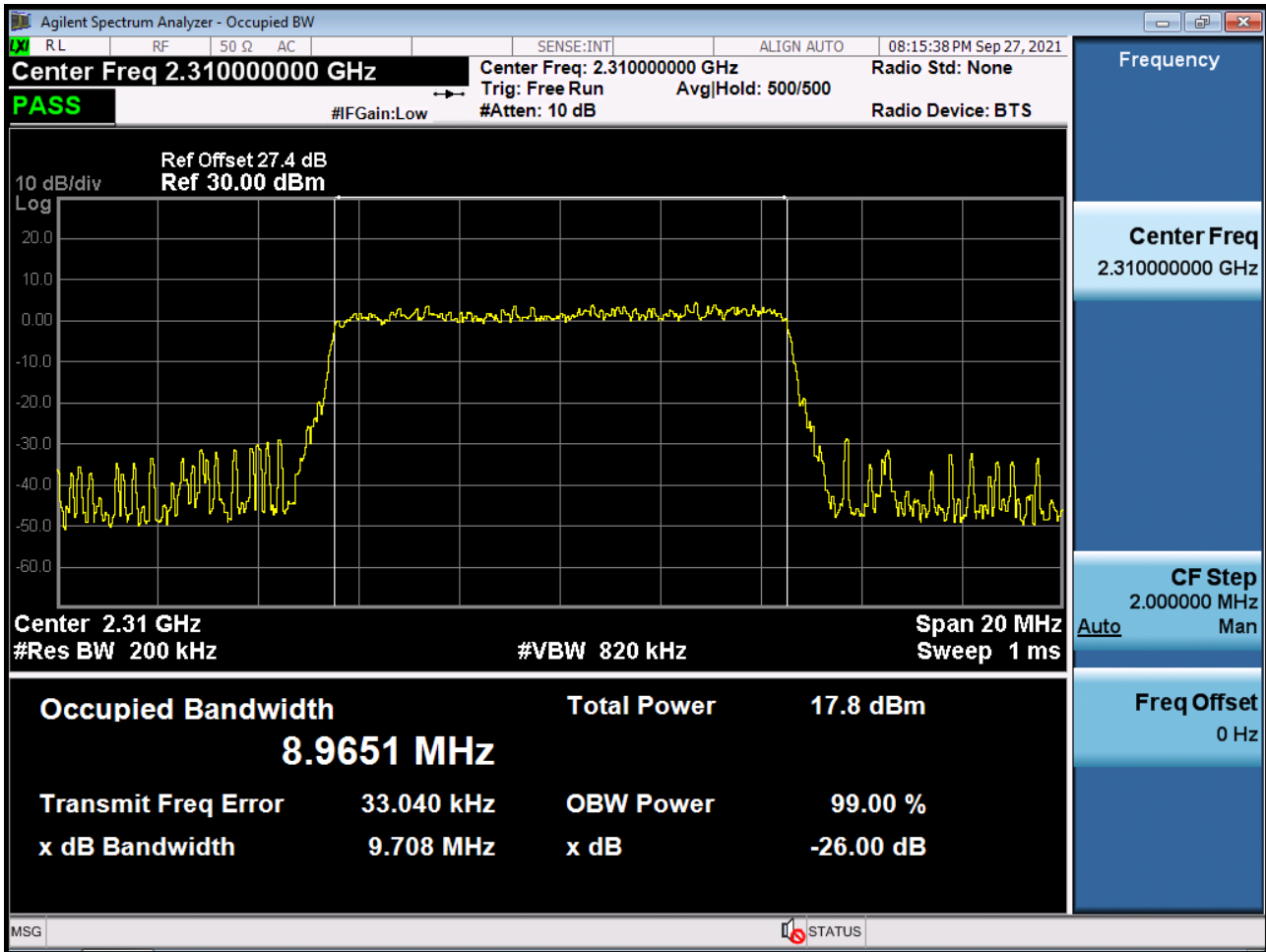
BAND 40. Occupied Bandwidth Plot (5 MHz 2355 MHz_64QAM_FullIRB)



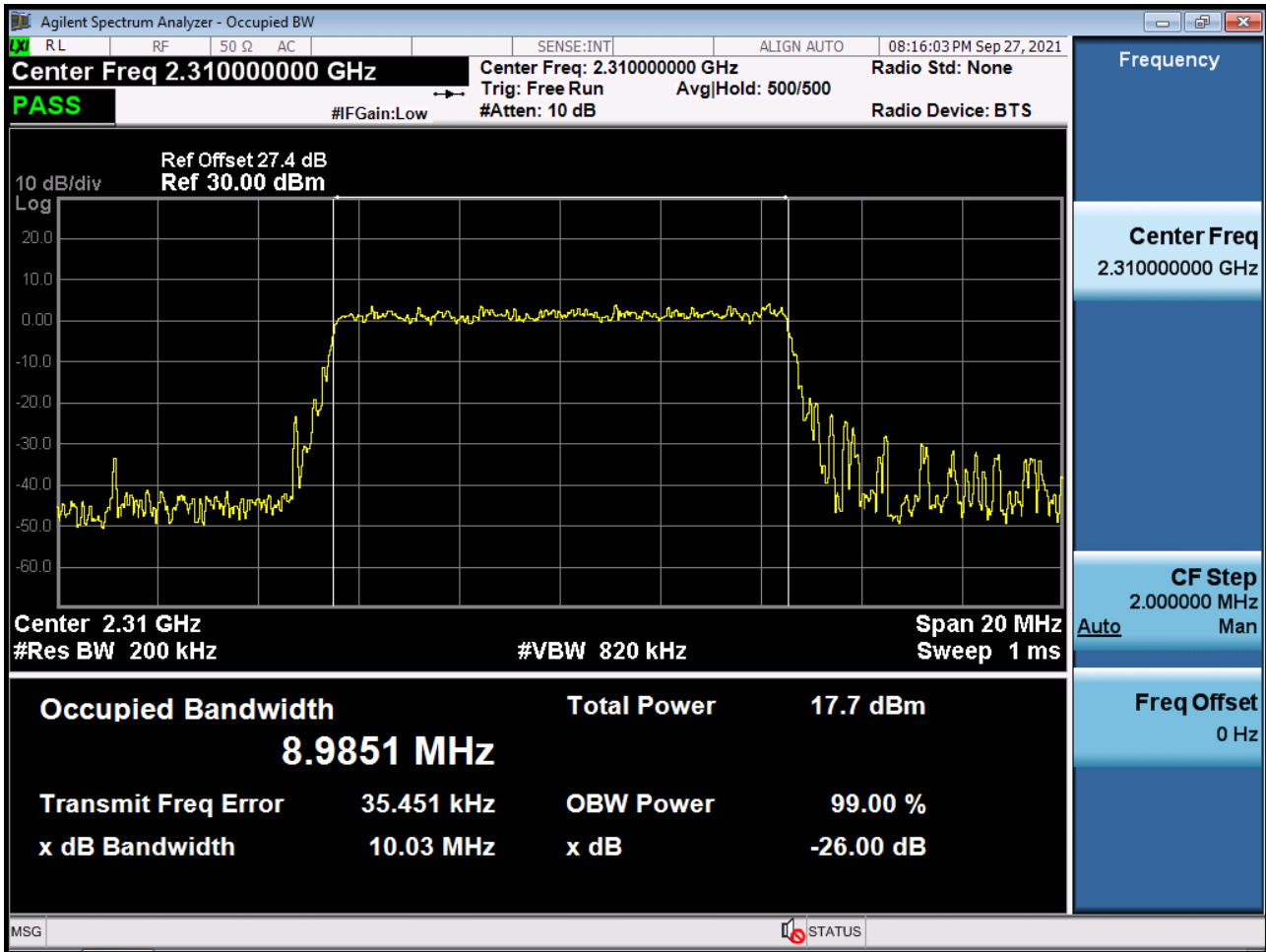
BAND 40. Occupied Bandwidth Plot (10 MHz 2310 MHz_QPSK_FullIRB)



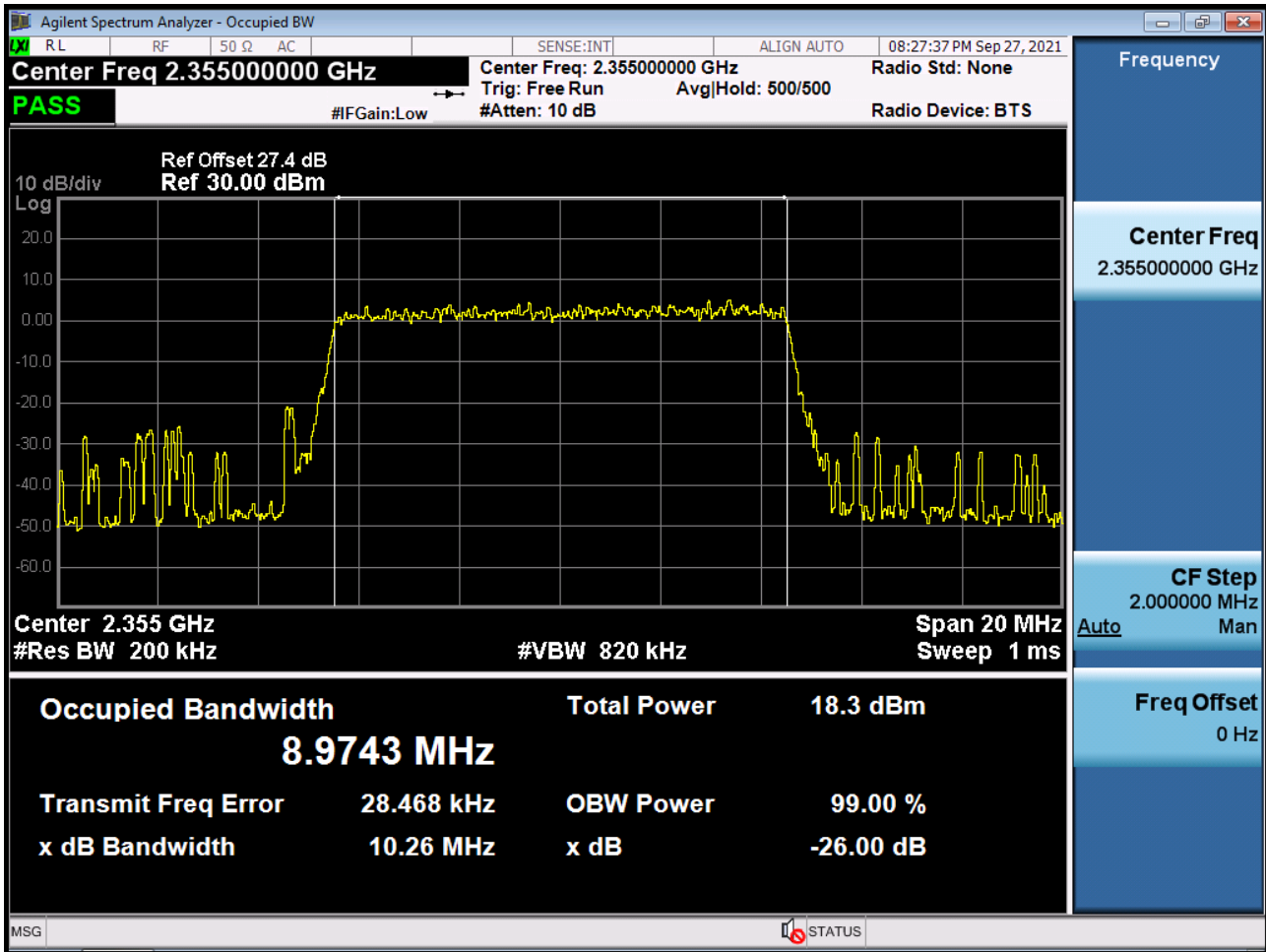
BAND 40. Occupied Bandwidth Plot (10 MHz 2310 MHz_16QAM_FullRB)



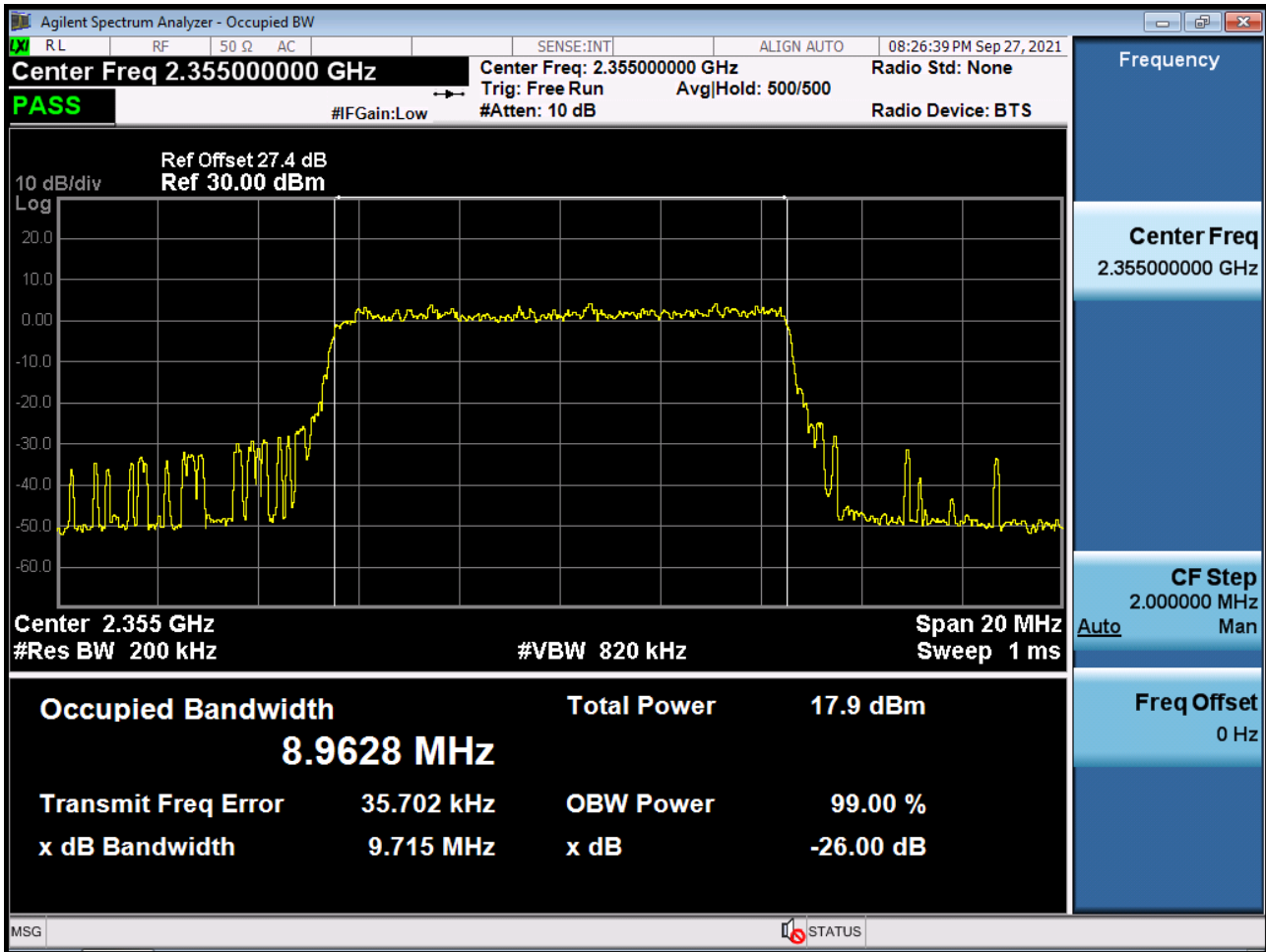
BAND 40. Occupied Bandwidth Plot (10 MHz 2310 MHz_64QAM_FullRB)



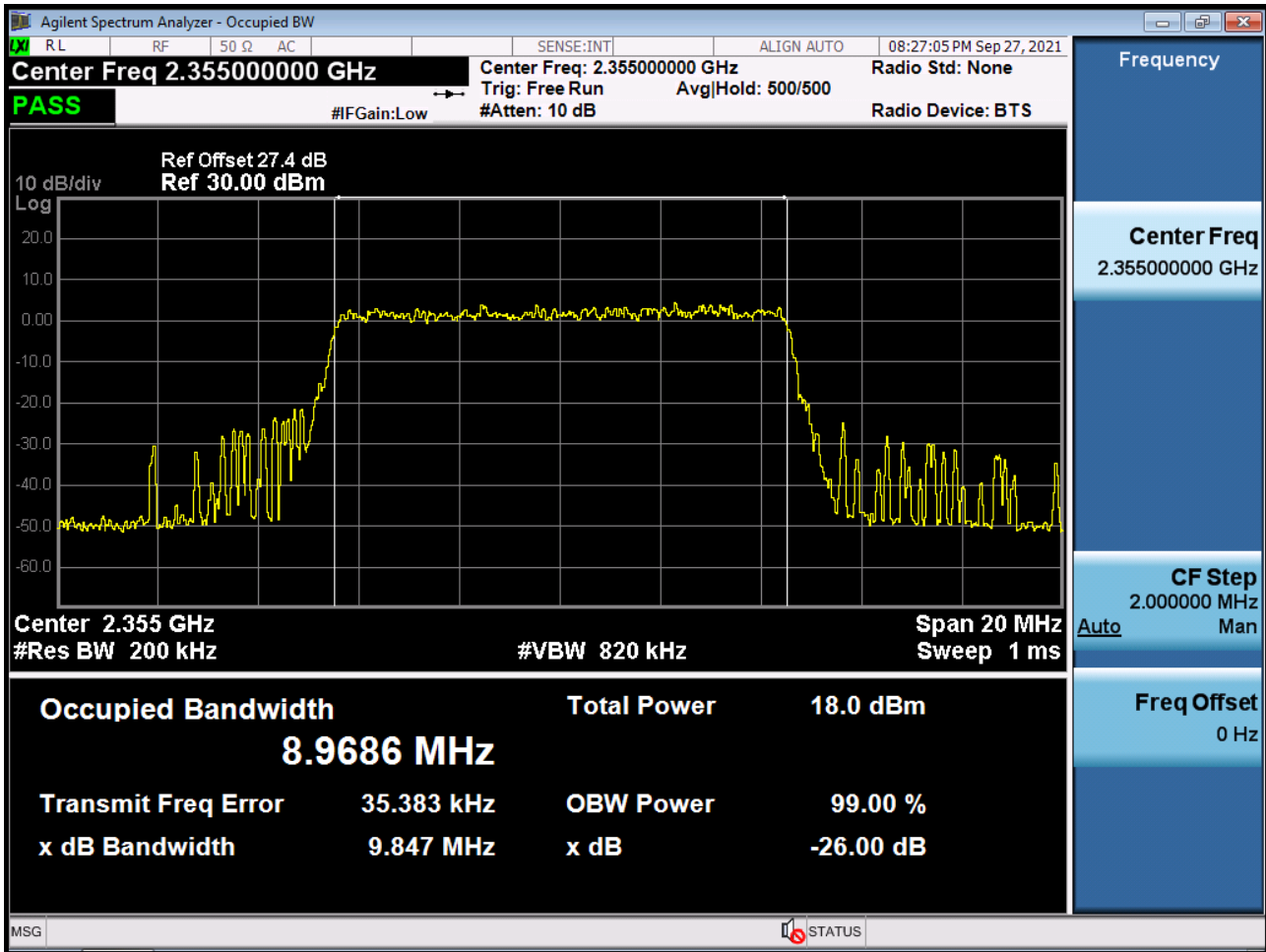
BAND 40. Occupied Bandwidth Plot (10 MHz 2355 MHz_QPSK_FullIRB)



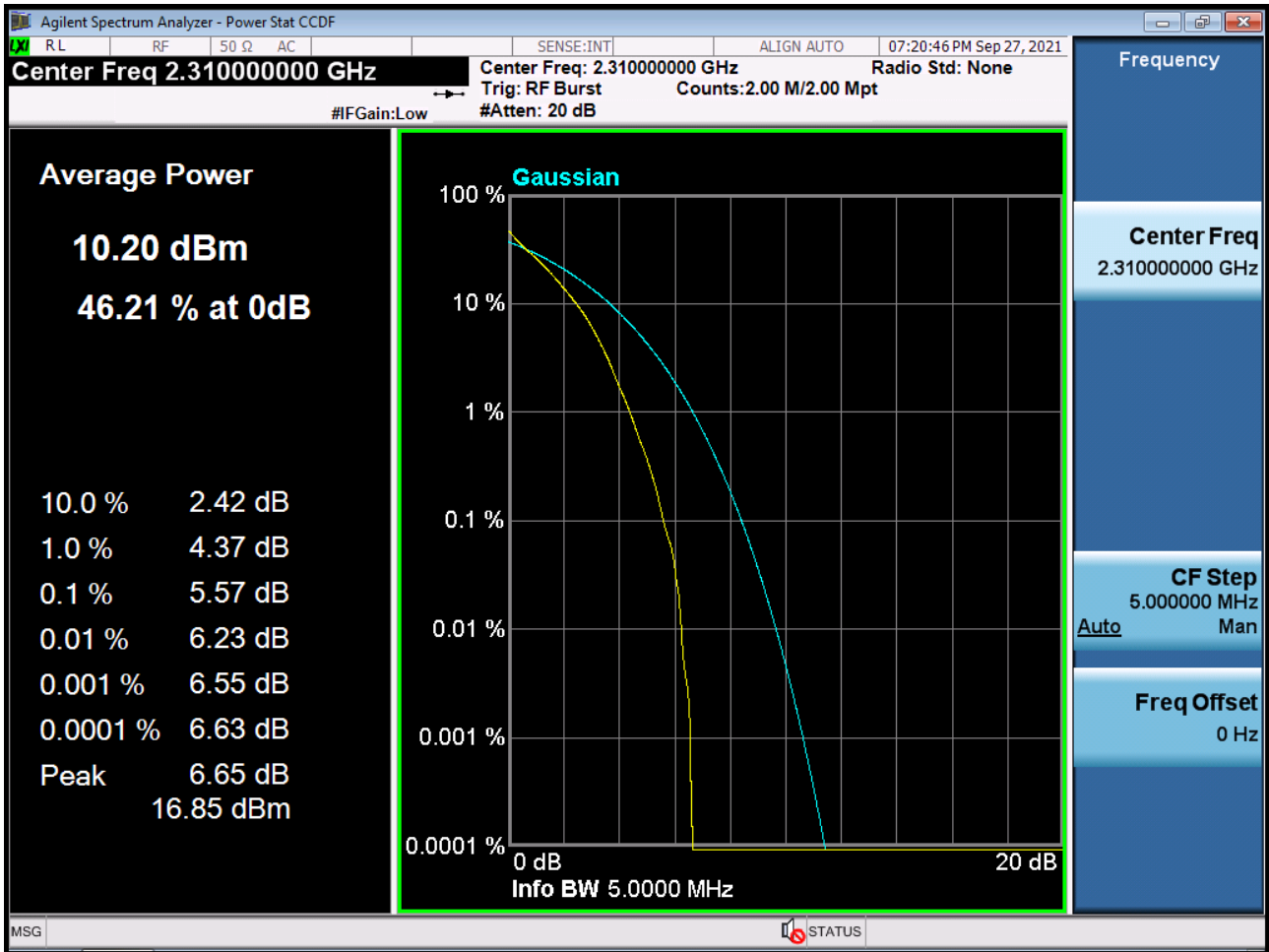
BAND 40. Occupied Bandwidth Plot (10 MHz 2355 MHz_16QAM_FullRB)



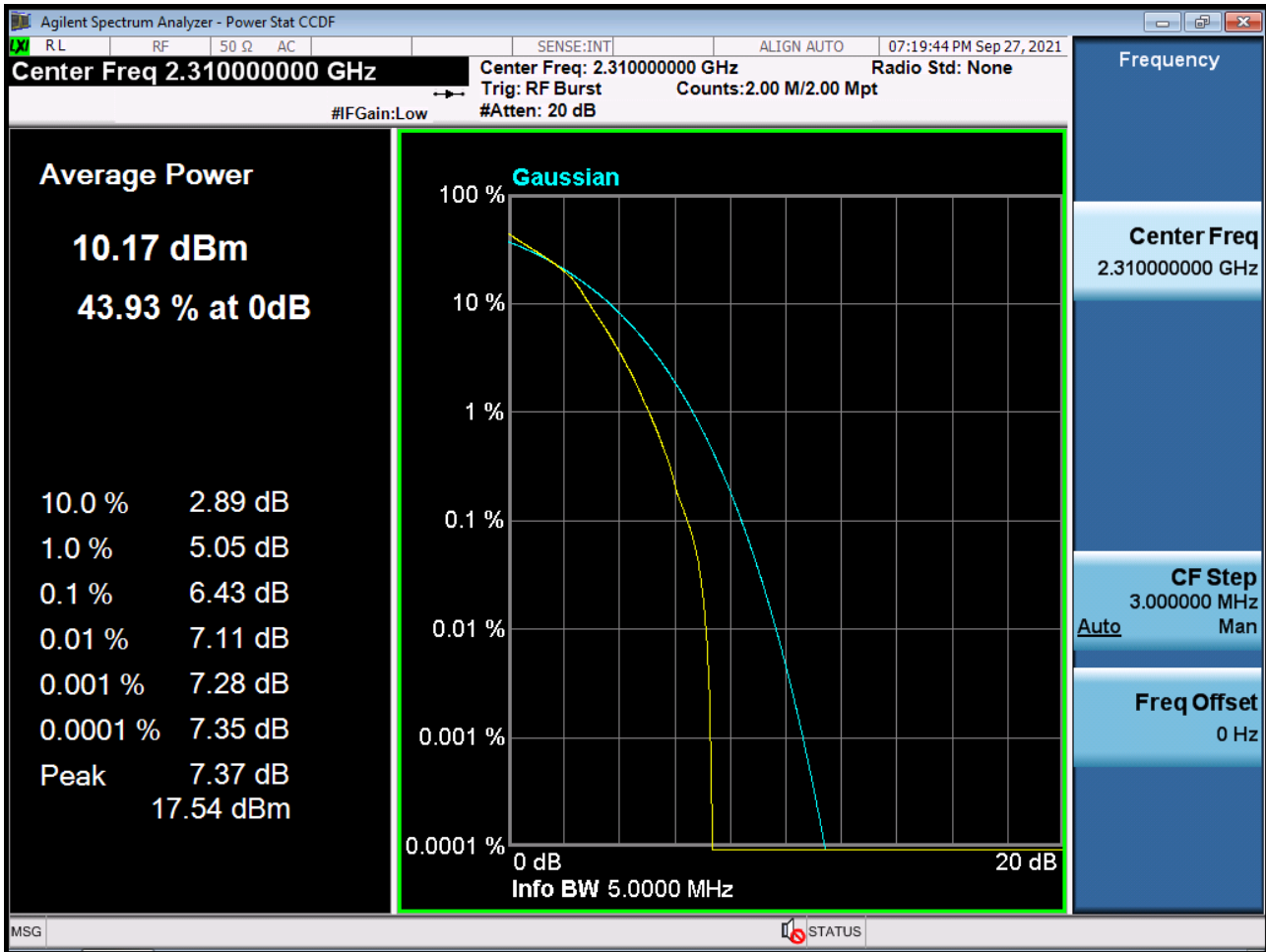
BAND 40. Occupied Bandwidth Plot (10 MHz 2355 MHz_64QAM_FullRB)



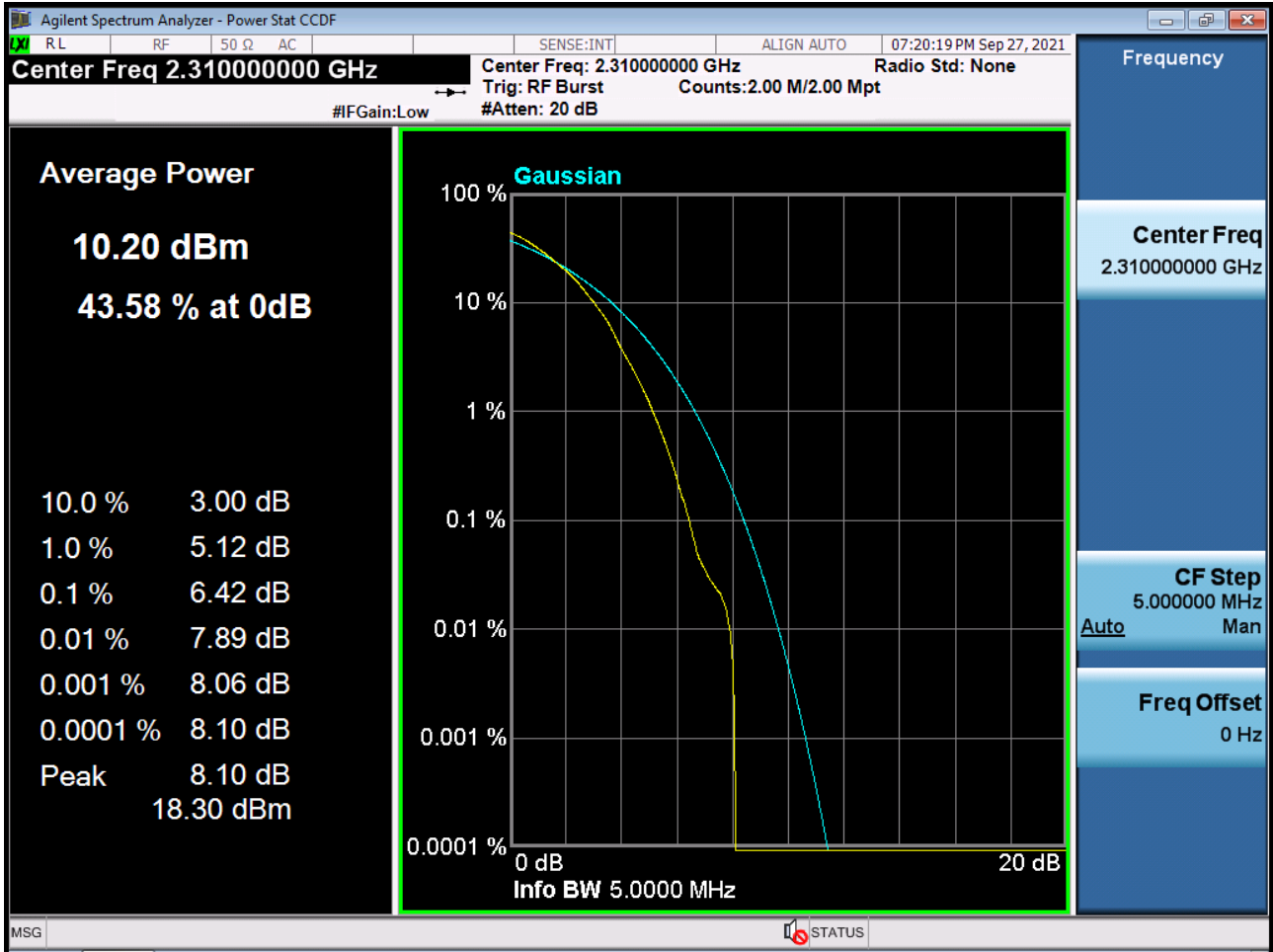
BAND 40. PAR Plot (5 M BW_2310 MHz_QPSK_FullIRB)



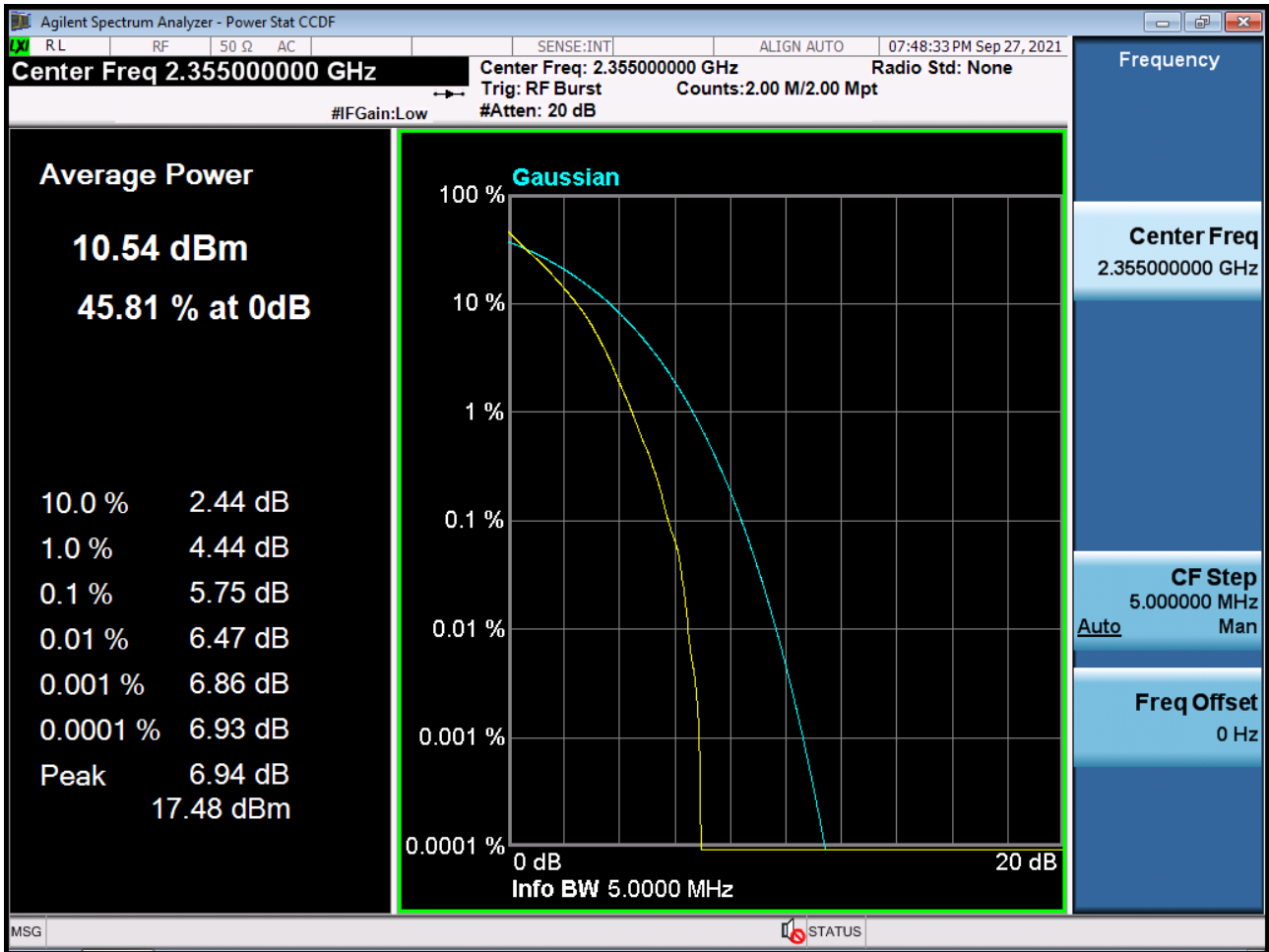
BAND 40. PAR Plot (5 M BW_2310 MHz_16QAM_FullRB)



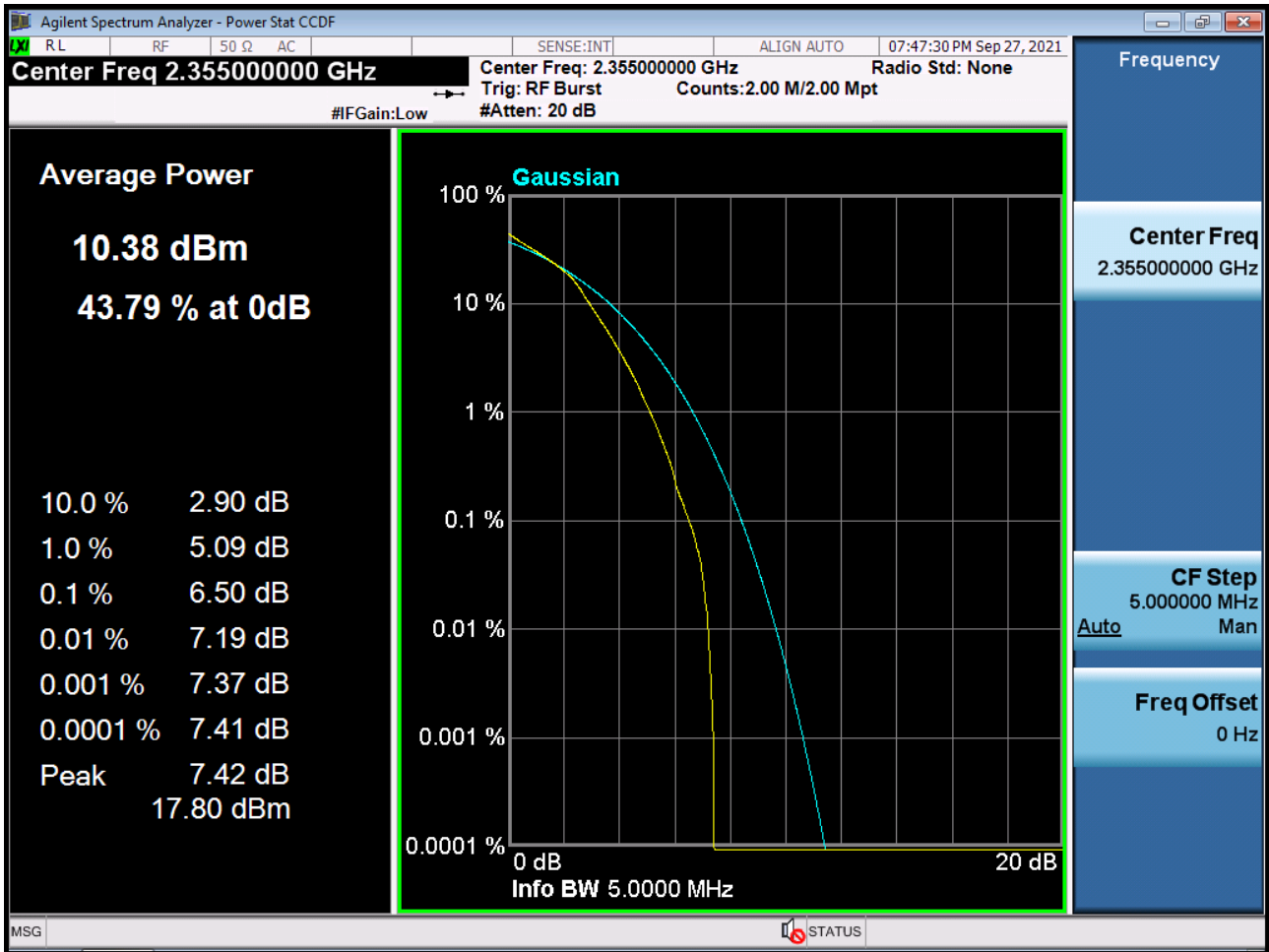
BAND 40. PAR Plot (5 M BW_2310 MHz_64QAM_FullIRB)



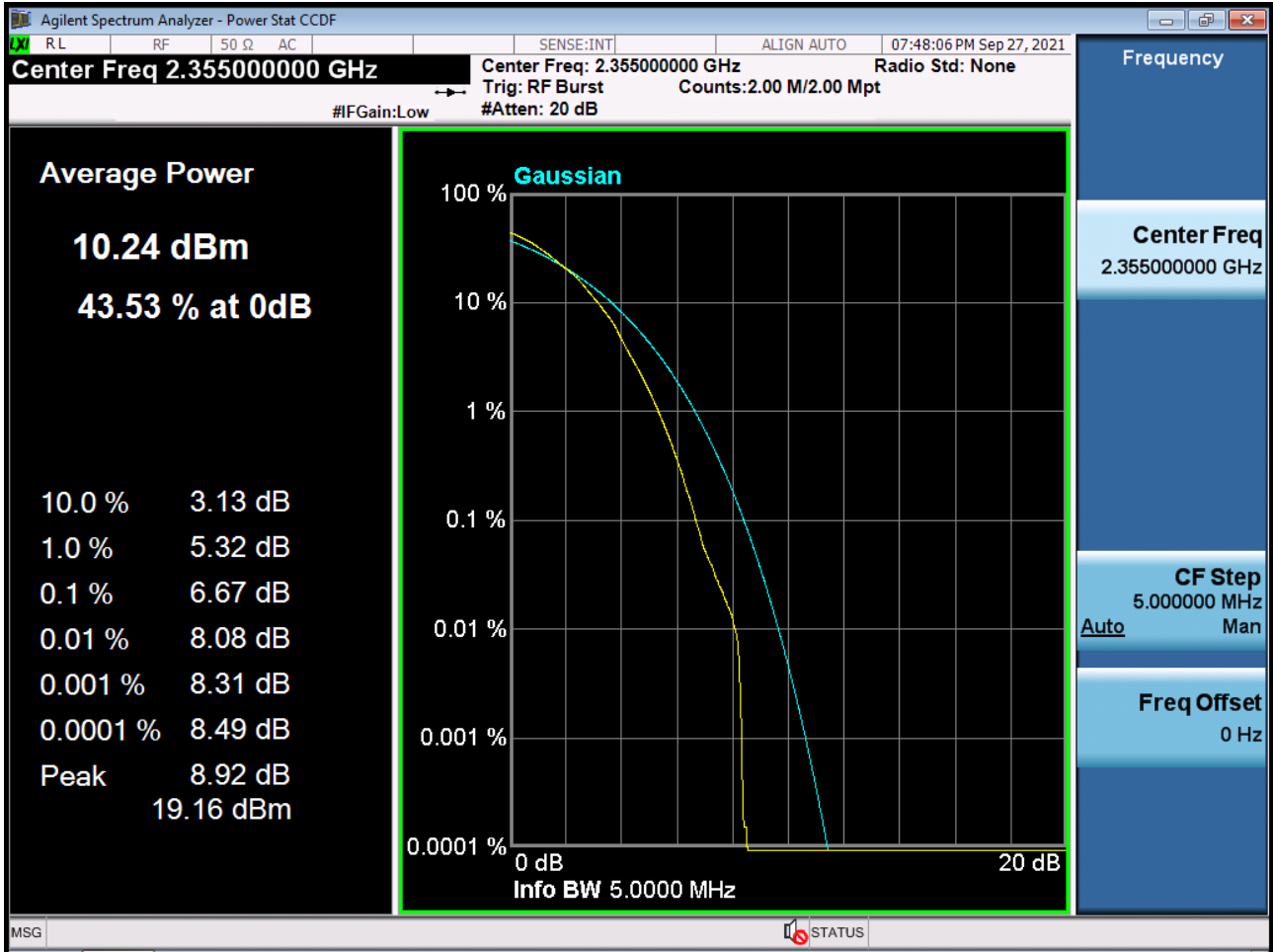
BAND 40. PAR Plot (5 M BW_2355 MHz_QPSK_FullIRB)



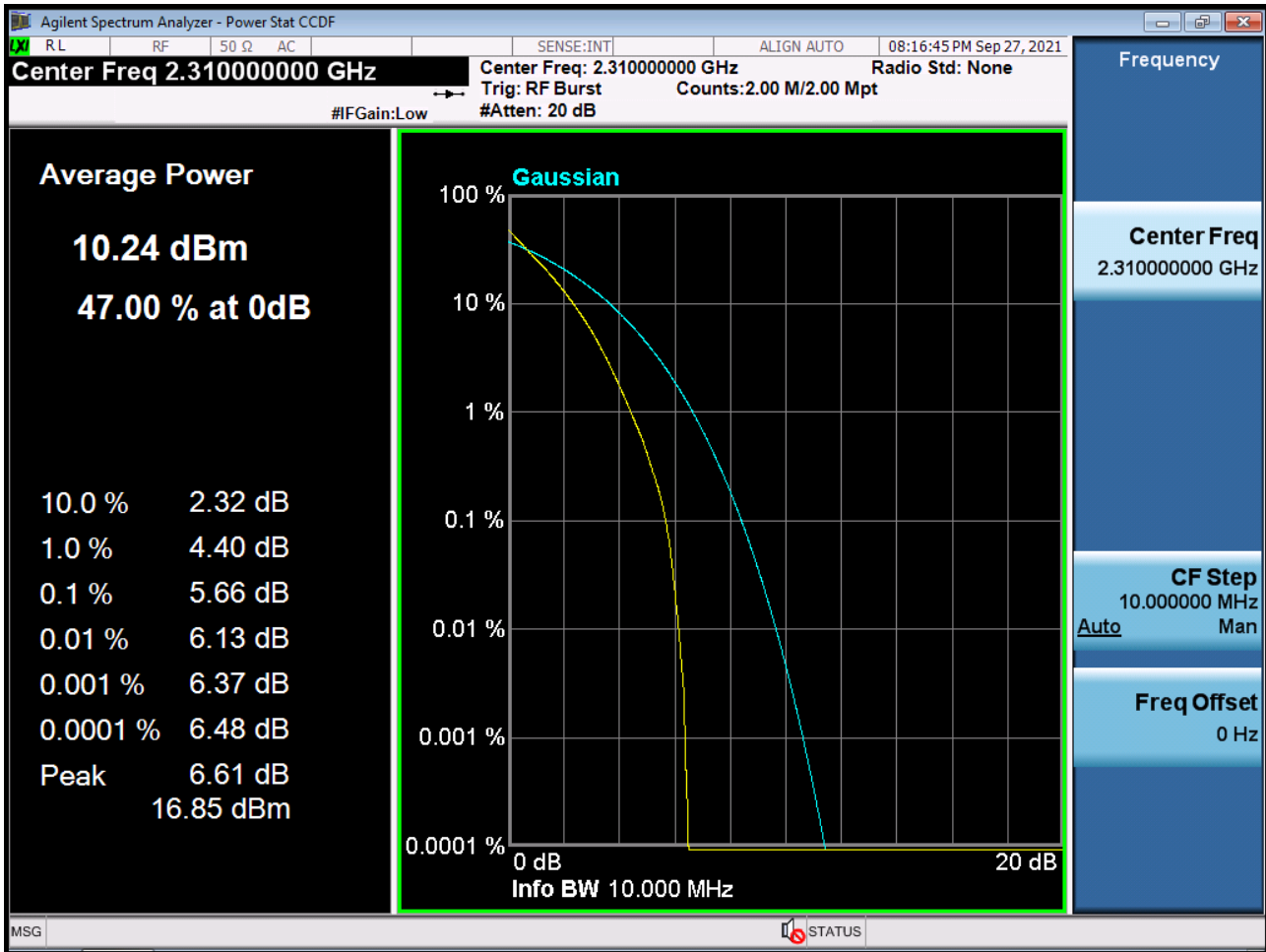
BAND 40. PAR Plot (5 M BW_2355 MHz_16QAM_FullRB)



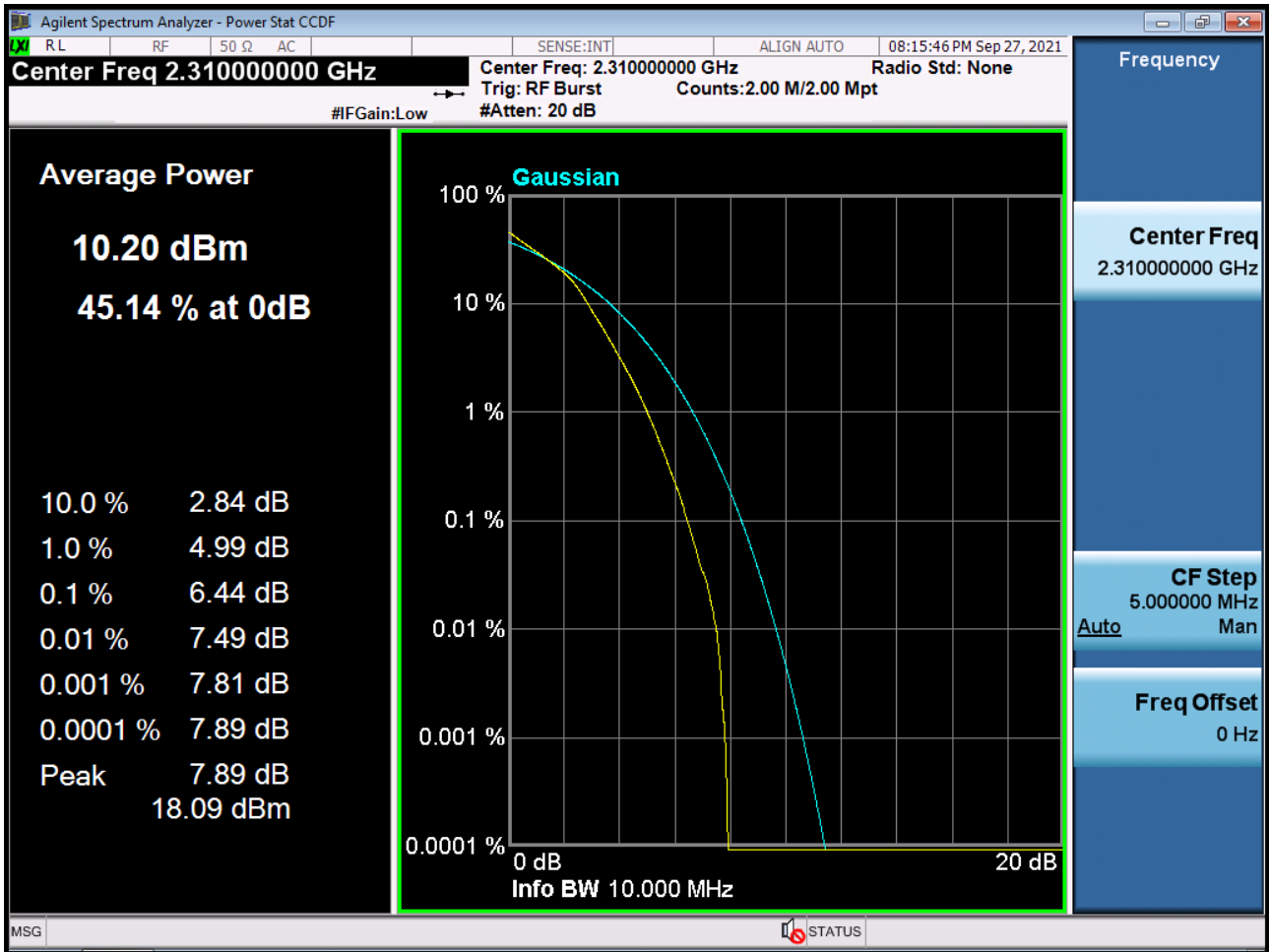
BAND 40. PAR Plot (5 M BW_2355 MHz_64QAM_FullIRB)



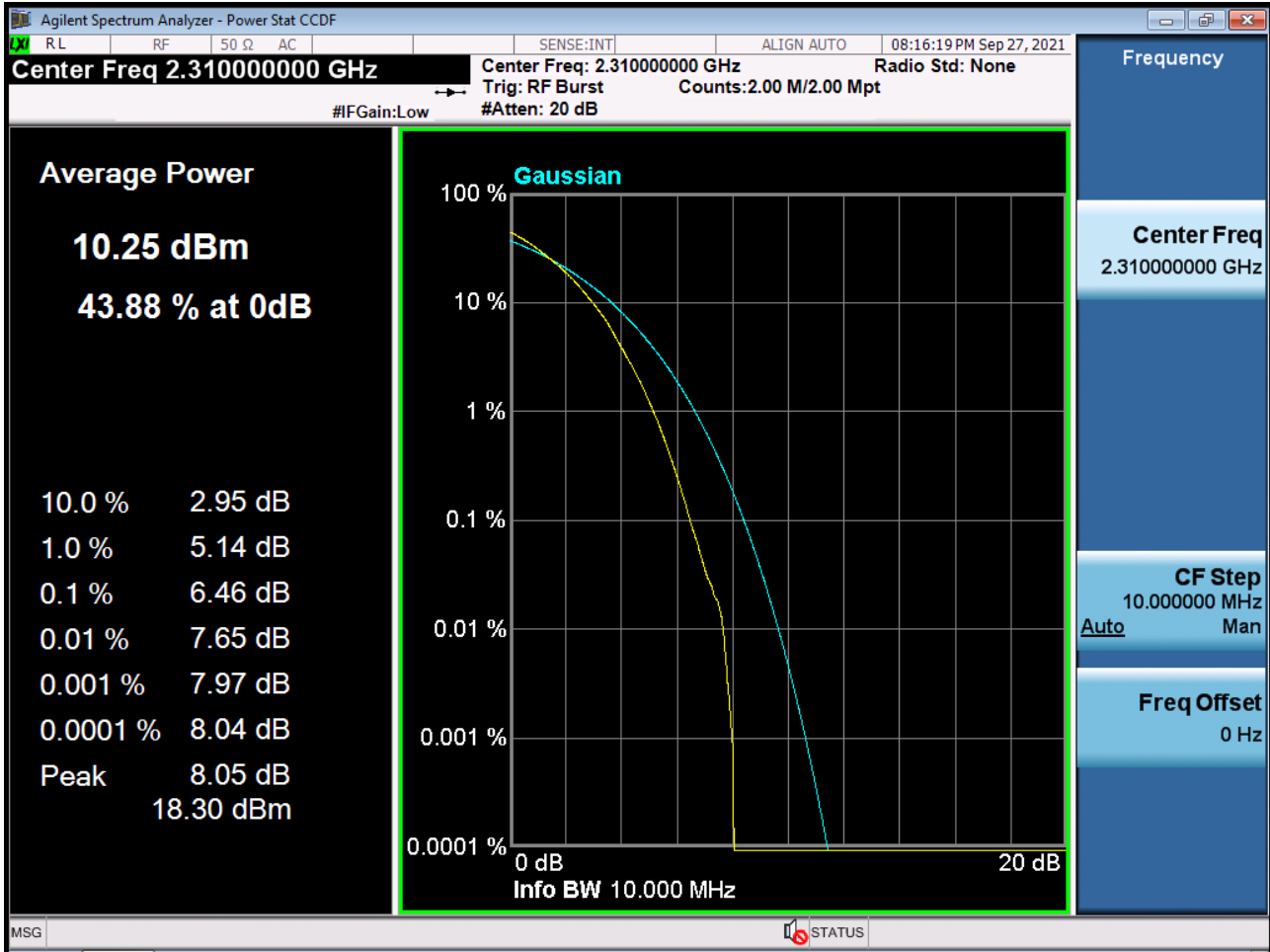
BAND 40. PAR Plot (10 M BW_ 2310 MHz_QPSK_FullRB)



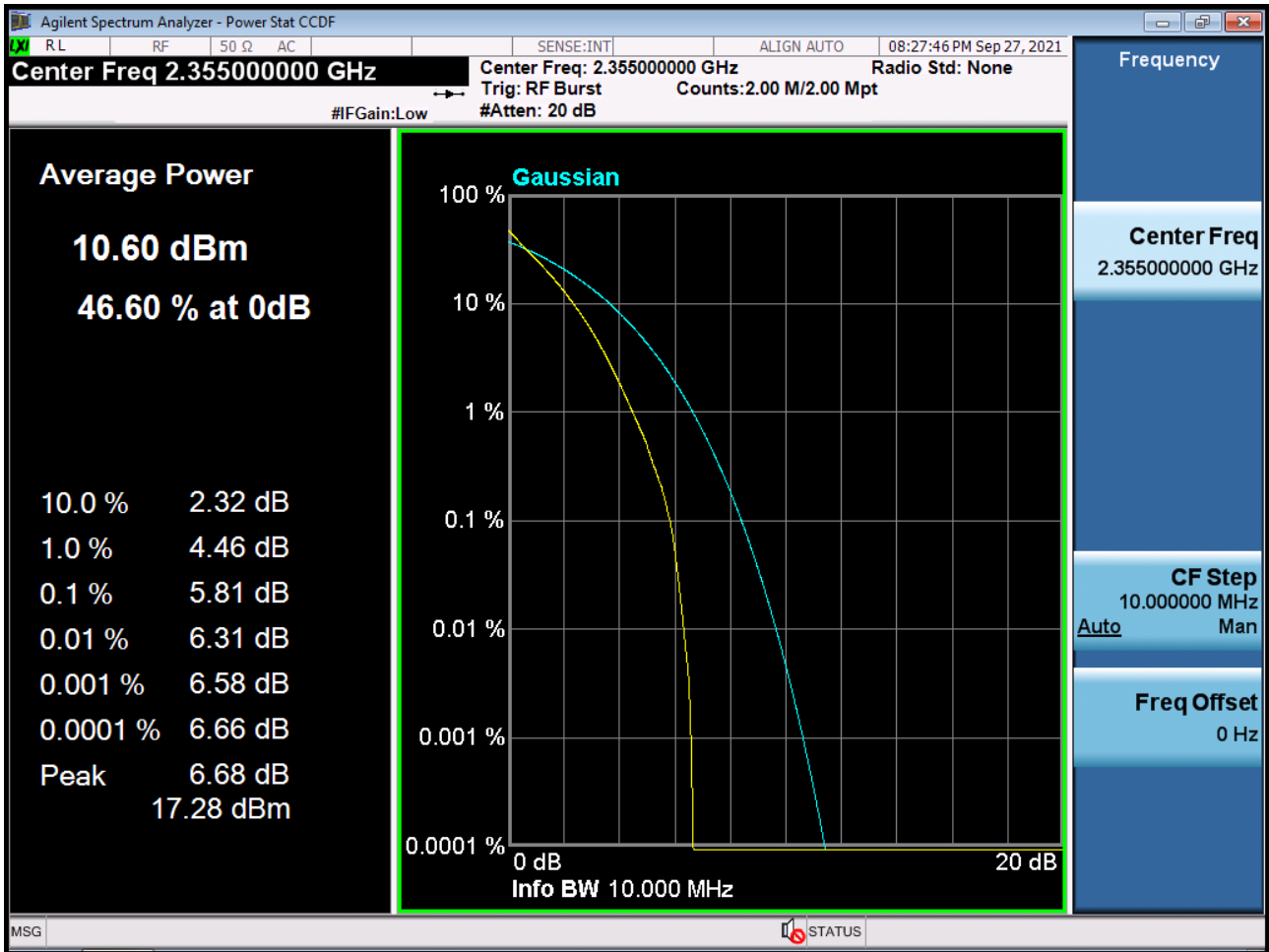
BAND 40. PAR Plot (10 M BW_ 2310 MHz_16QAM_FullIRB)



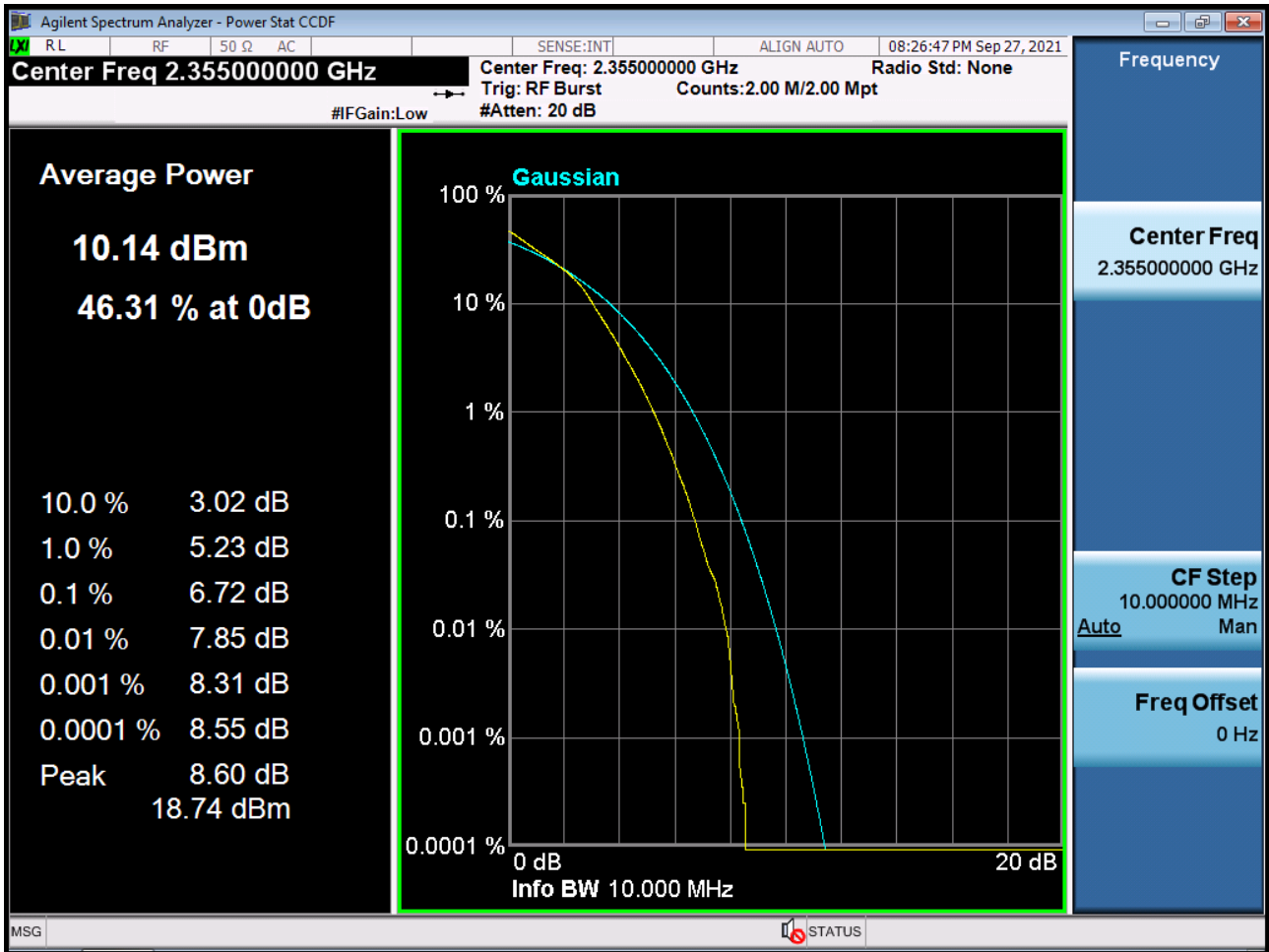
BAND 40. PAR Plot (10 M BW_ 2310 MHz_64QAM_FullIRB)



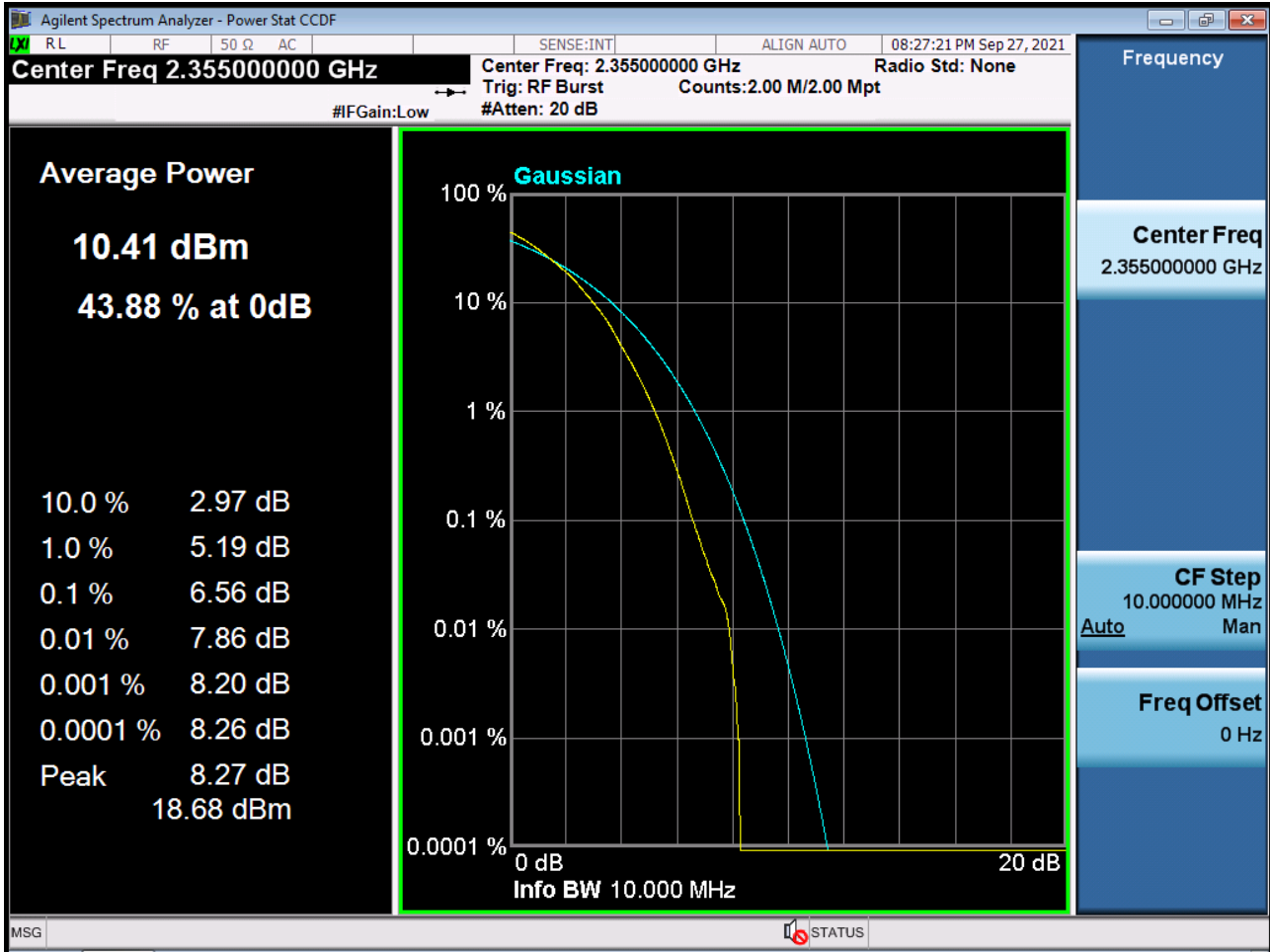
BAND 40. PAR Plot (10 M BW_ 2355 MHz_QPSK_FullRB)



BAND 40. PAR Plot (10 M BW_ 2355 MHz_ 16QAM_FullIRB)



BAND 40. PAR Plot (10 M BW_ 2355 MHz_64QAM_FullIRB)

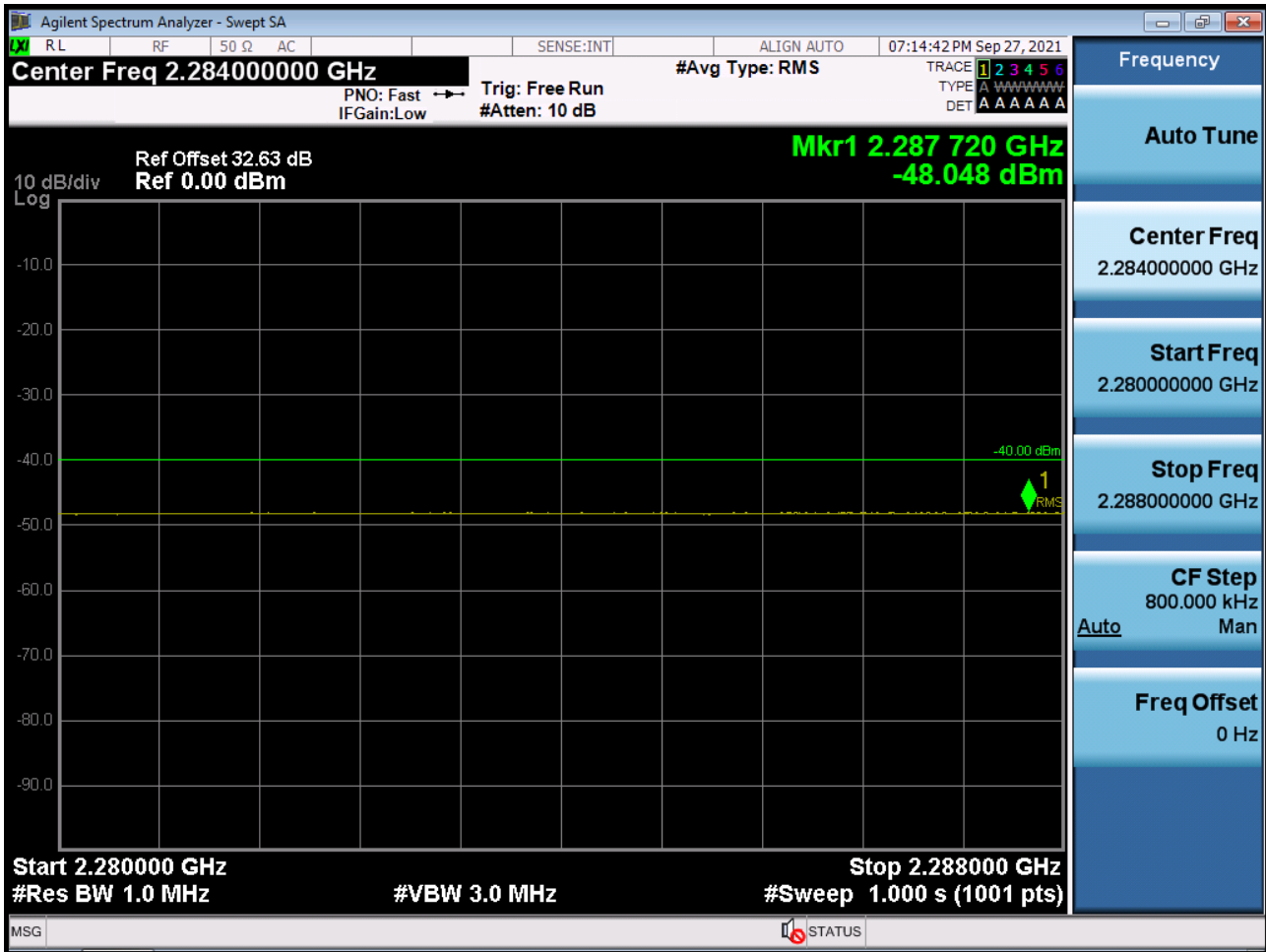


- Lower Side-

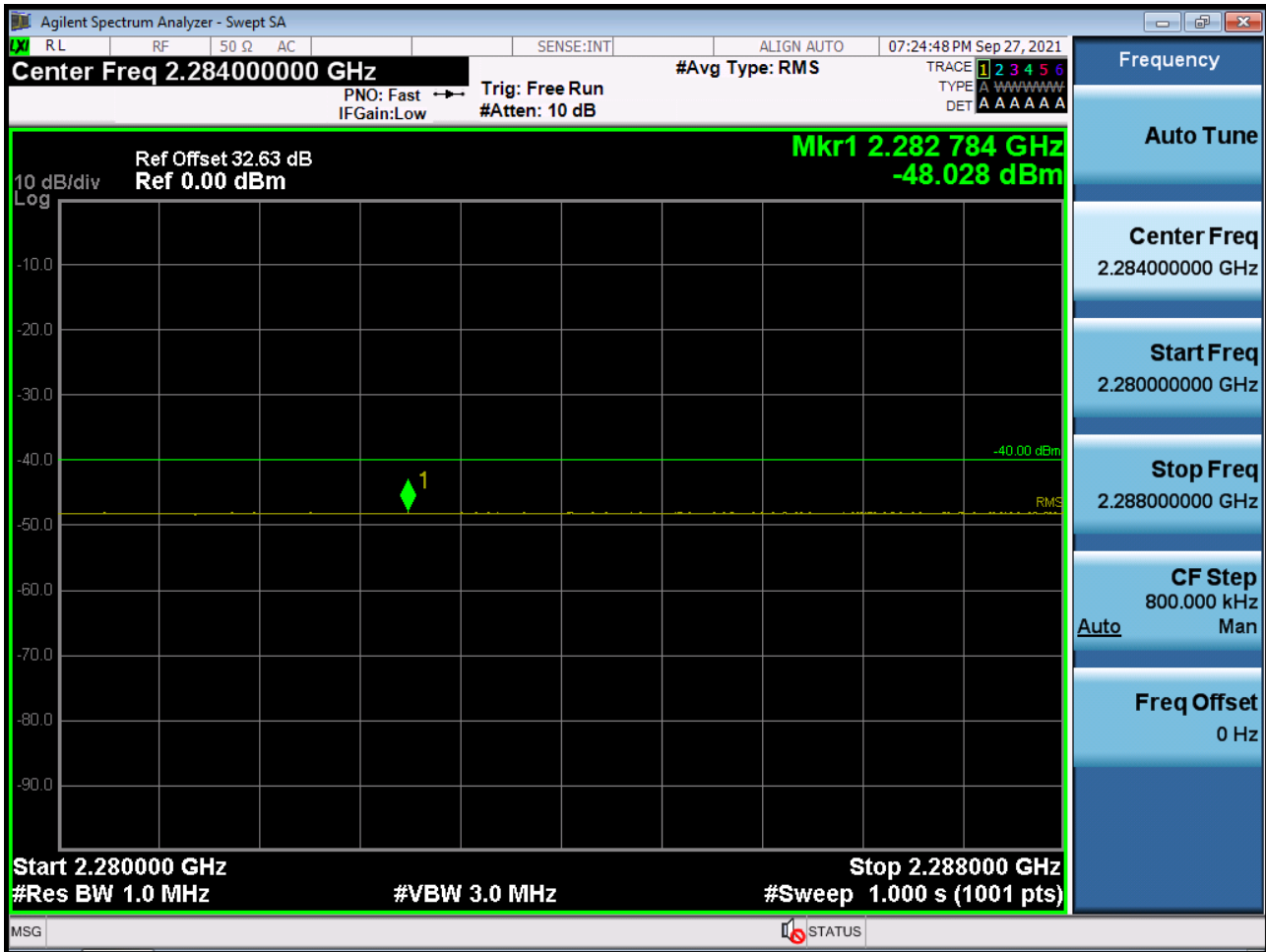
BAND 40. 5 M_BandEdge(2280 MHz-2288 MHz)_2312.5 MHz_1RB



BAND 40. 5 M_BandEdge(2280 MHz-2288 MHz)_2307.5 MHz_1RB



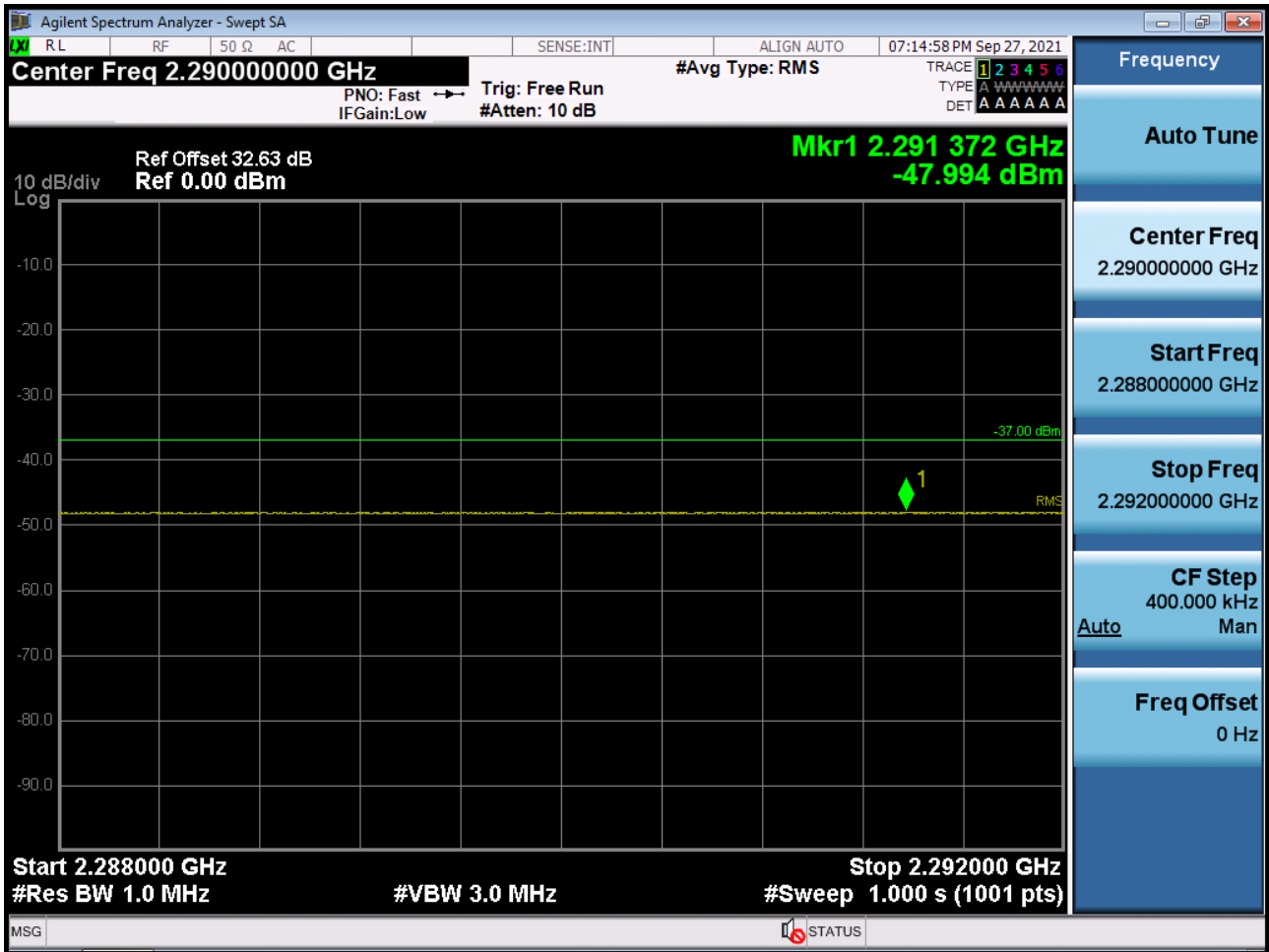
BAND 40. 5 M_BandEdge(2280 MHz-2288 MHz)_2310 MHz_1RB



BAND 40. 5 M_BandEdge(2288 MHz-2292 MHz)_2312.5 MHz_1RB



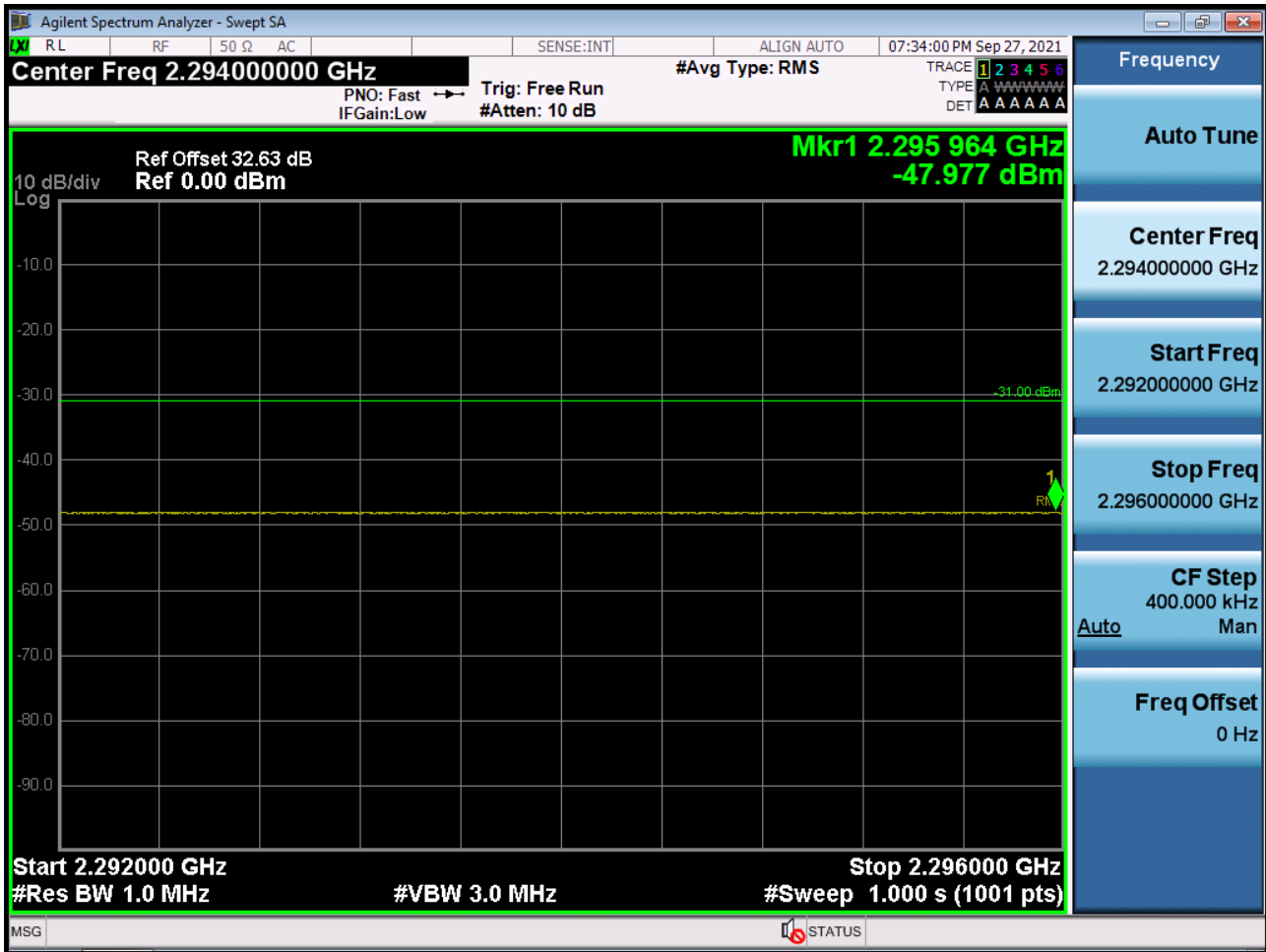
BAND 40. 5 M_BandEdge(2288 MHz-2292 MHz)_2307.5 MHz_1RB



BAND 40. 5 M_BandEdge(2288 MHz-2292 MHz)_2310 MHz_1RB



BAND 40. 5 M_BandEdge(2292 MHz-2296 MHz)_2312.5 MHz_1RB



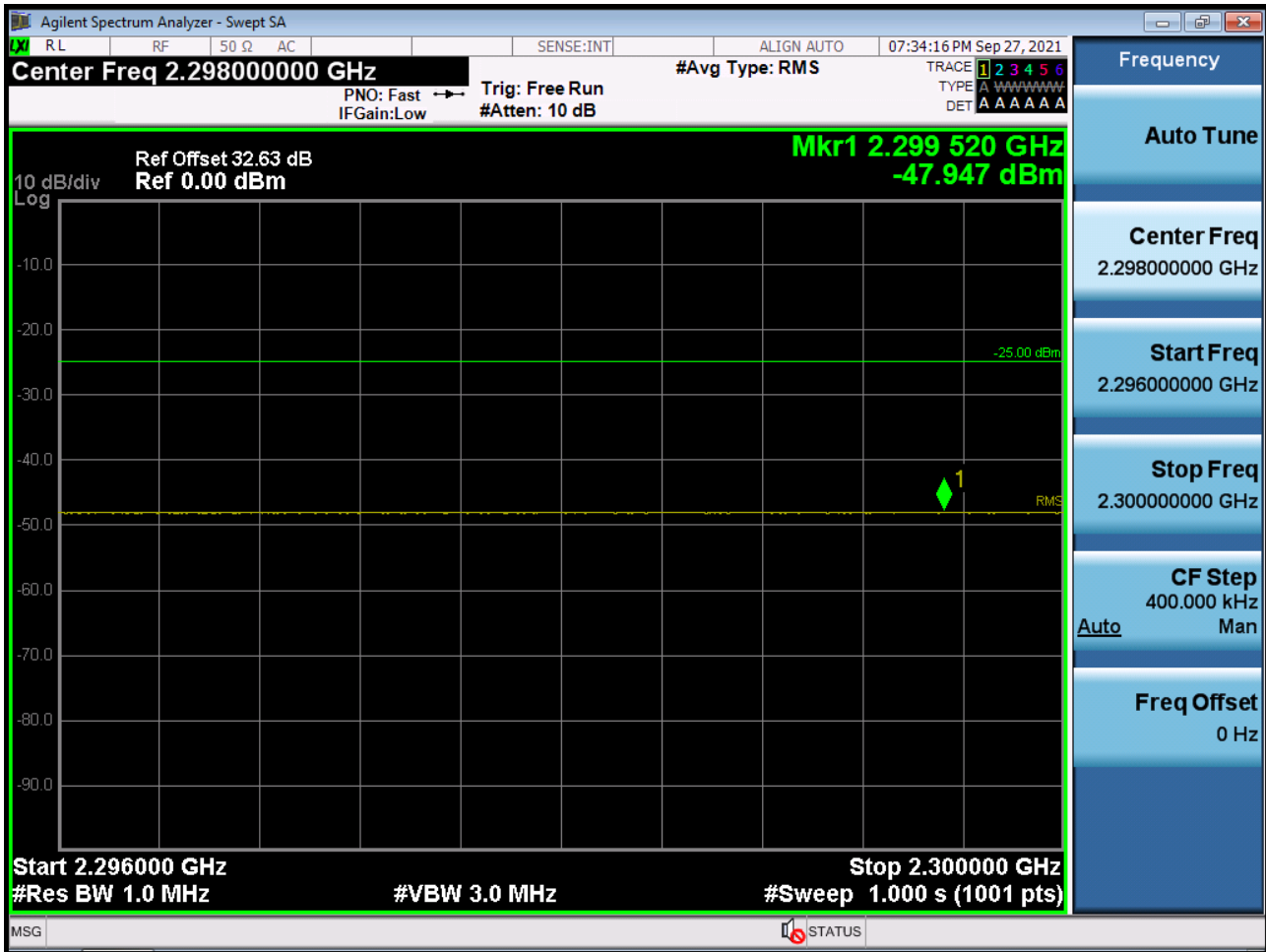
BAND 40. 5 M_BandEdge(2292 MHz-2296 MHz)_2307.5 MHz_1RB



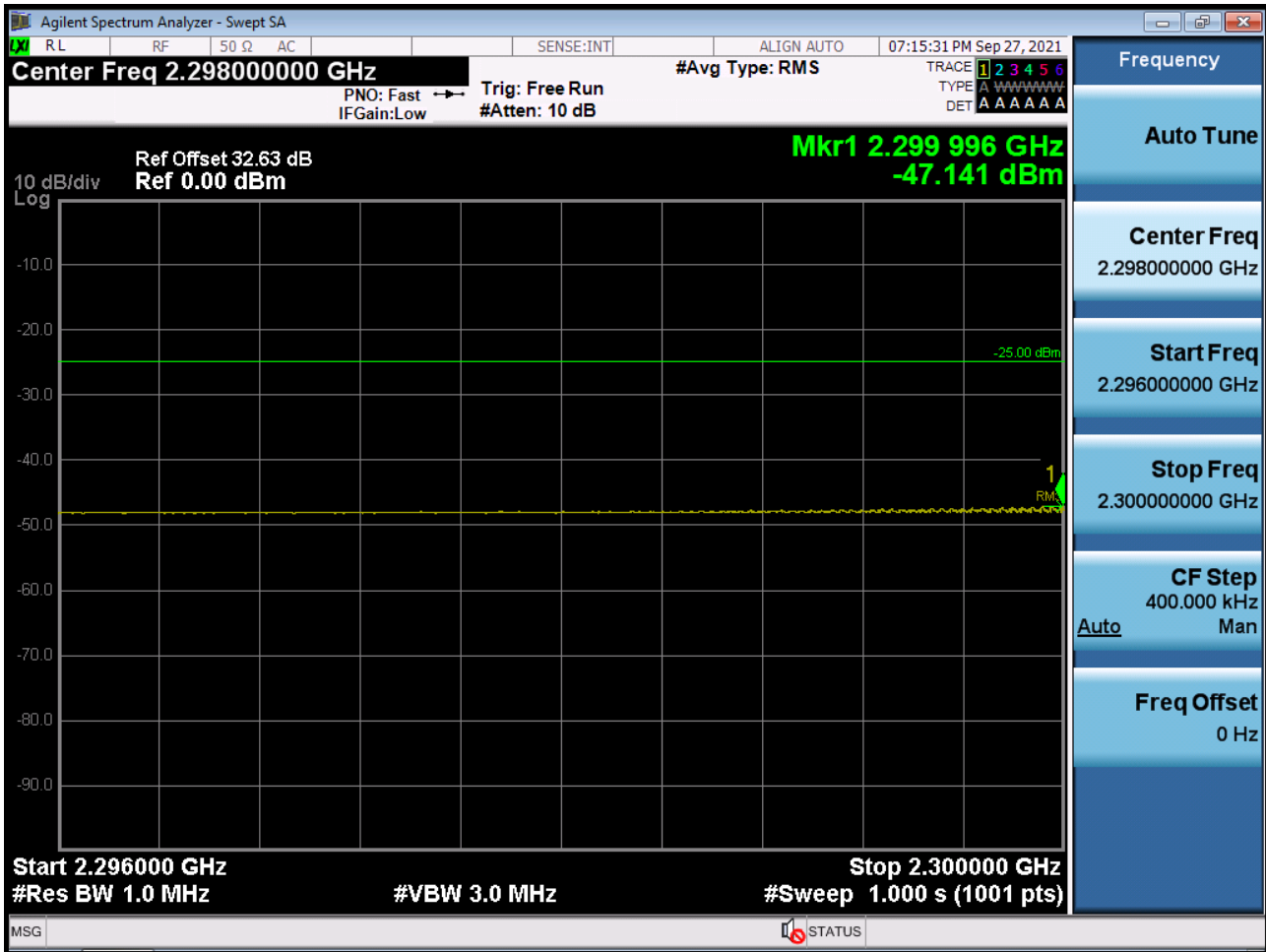
BAND 40. 5 M_BandEdge(2292 MHz-2296 MHz)_2310 MHz_1RB



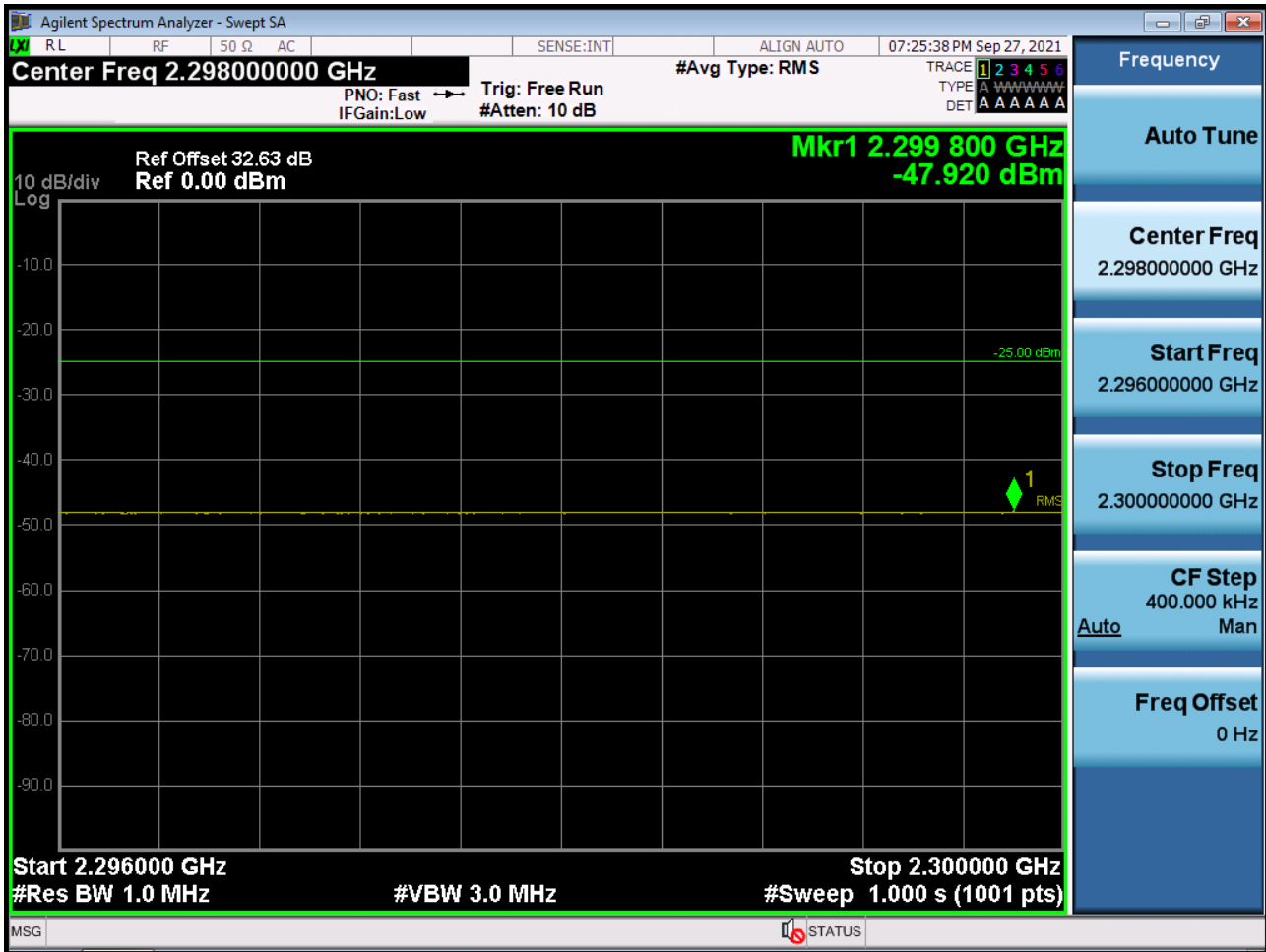
BAND 40. 5 M_BandEdge(2296 MHz-2300 MHz)_2312.5 MHz_1RB



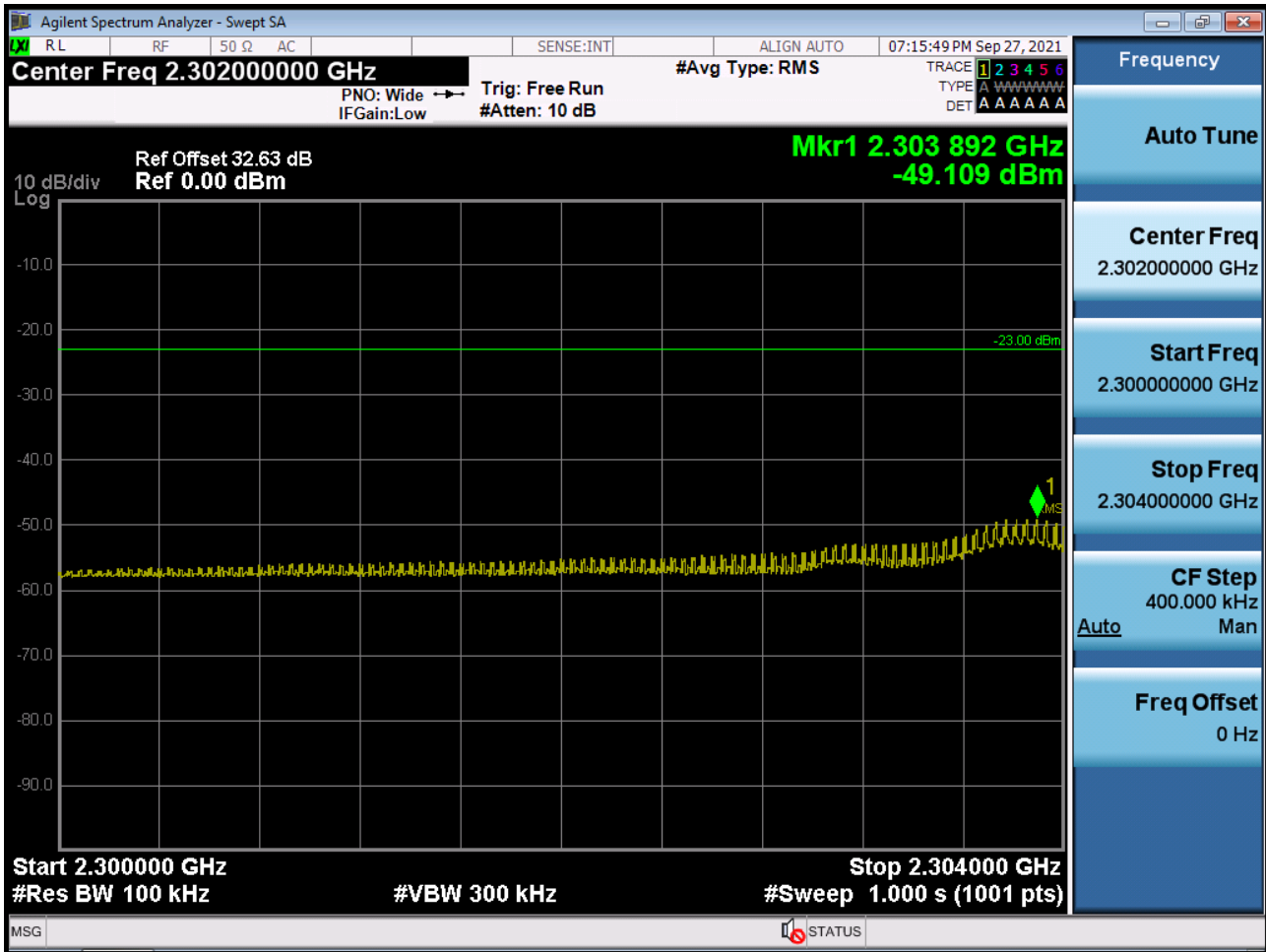
BAND 40. 5 M_BandEdge(2296 MHz-2300 MHz)_2307.5 MHz_1RB



BAND 40. 5 M_BandEdge(2296 MHz-2300 MHz)_2310 MHz_1RB



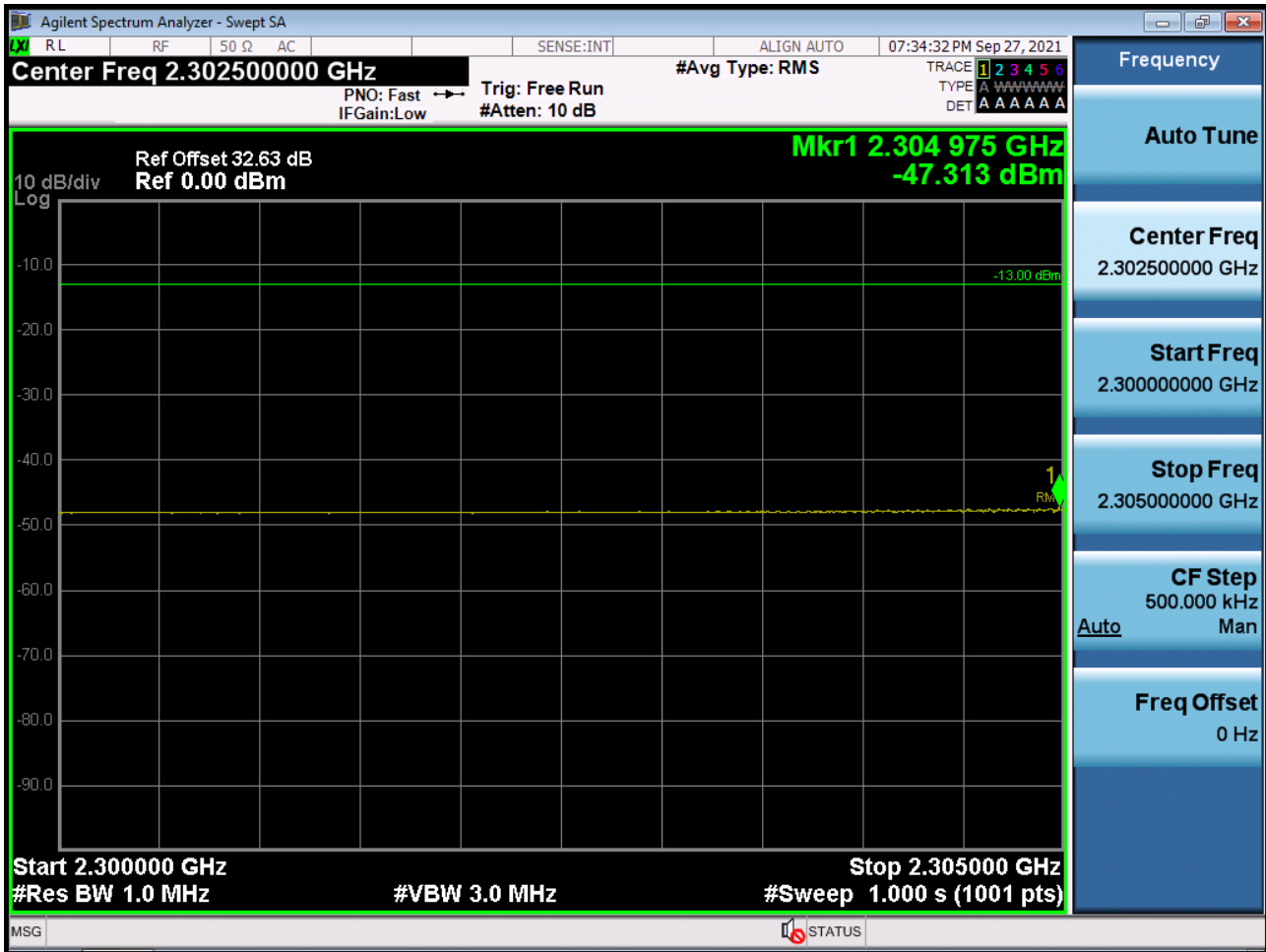
BAND 40. 5 M_BandEdge(2300 MHz-2304 MHz)_2307.5 MHz_1RB



Note : We used a narrower RBW in order to increase accuracy.

Calculation = Reading Value + 10 x log(1 MHz/100 kHz) dB = -49.109 dBm + 10 dB = -39.109 dBm

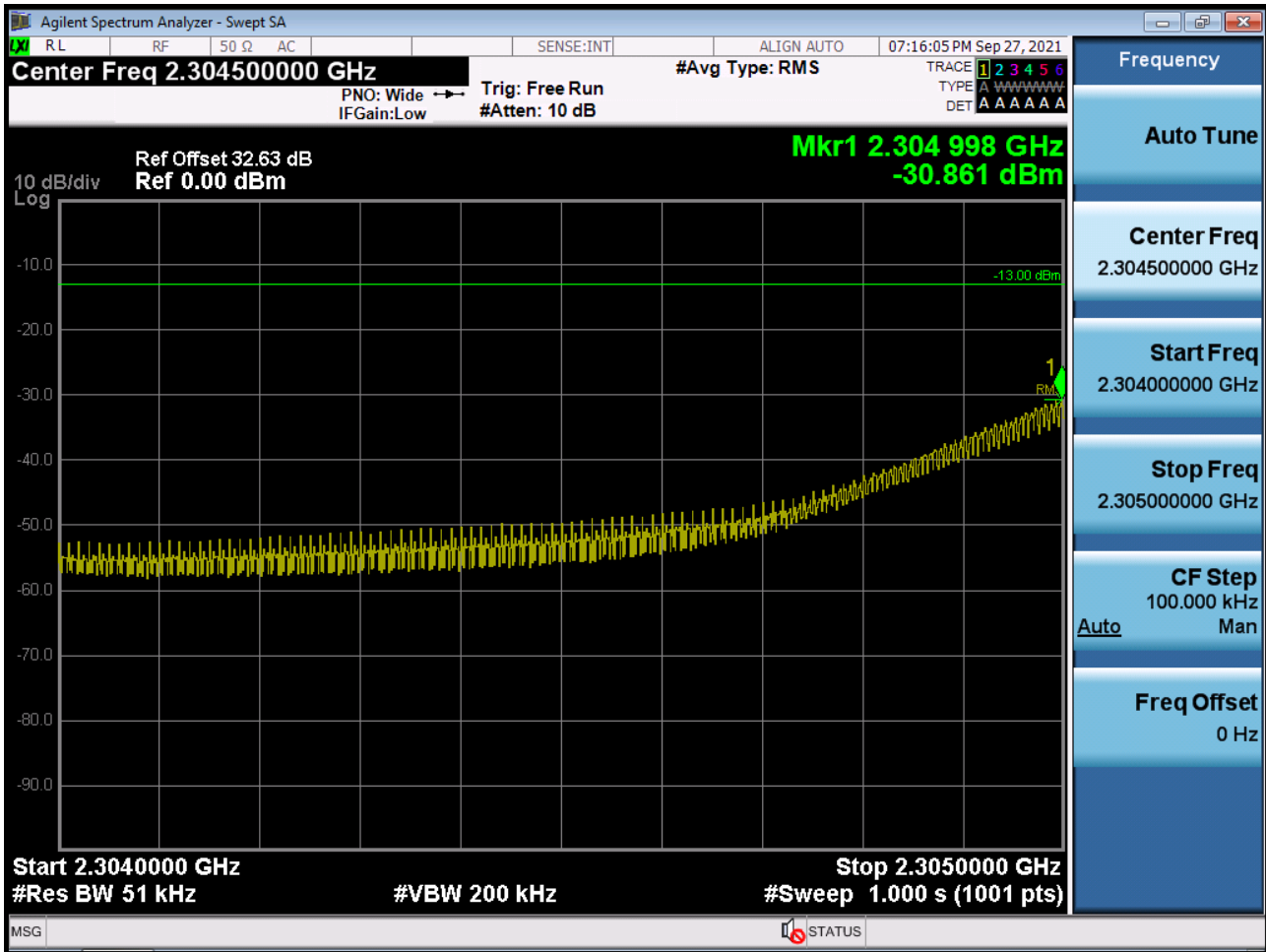
BAND 40. 5 M_BandEdge(2300 MHz-2305 MHz)_2312.5 MHz_1RB



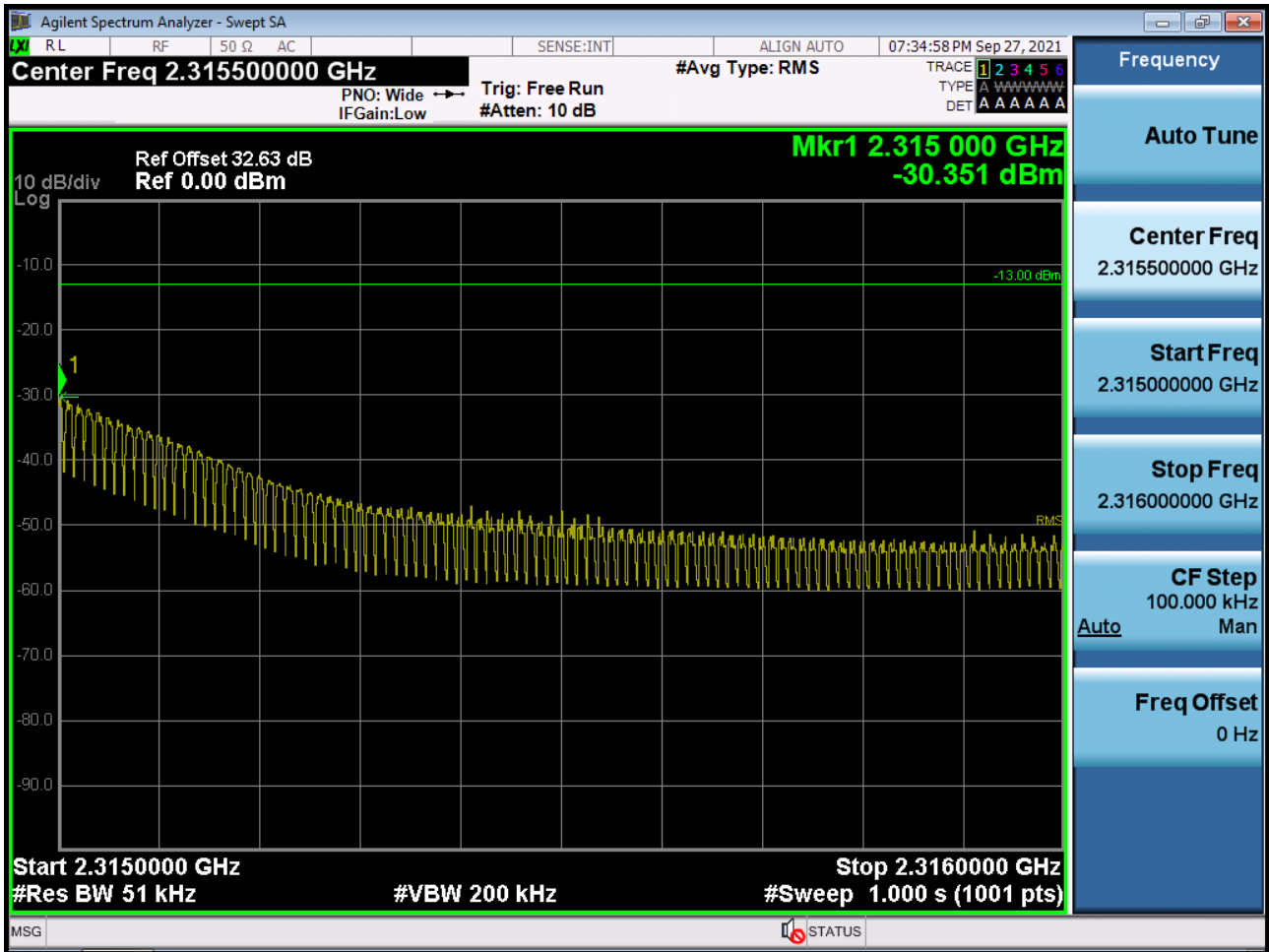
BAND 40. 5 M_BandEdge(2300 MHz-2305 MHz)_2310 MHz_1RB



BAND 40. 5 M_BandEdge(2304 MHz-2305 MHz)_2307.5 MHz_1RB



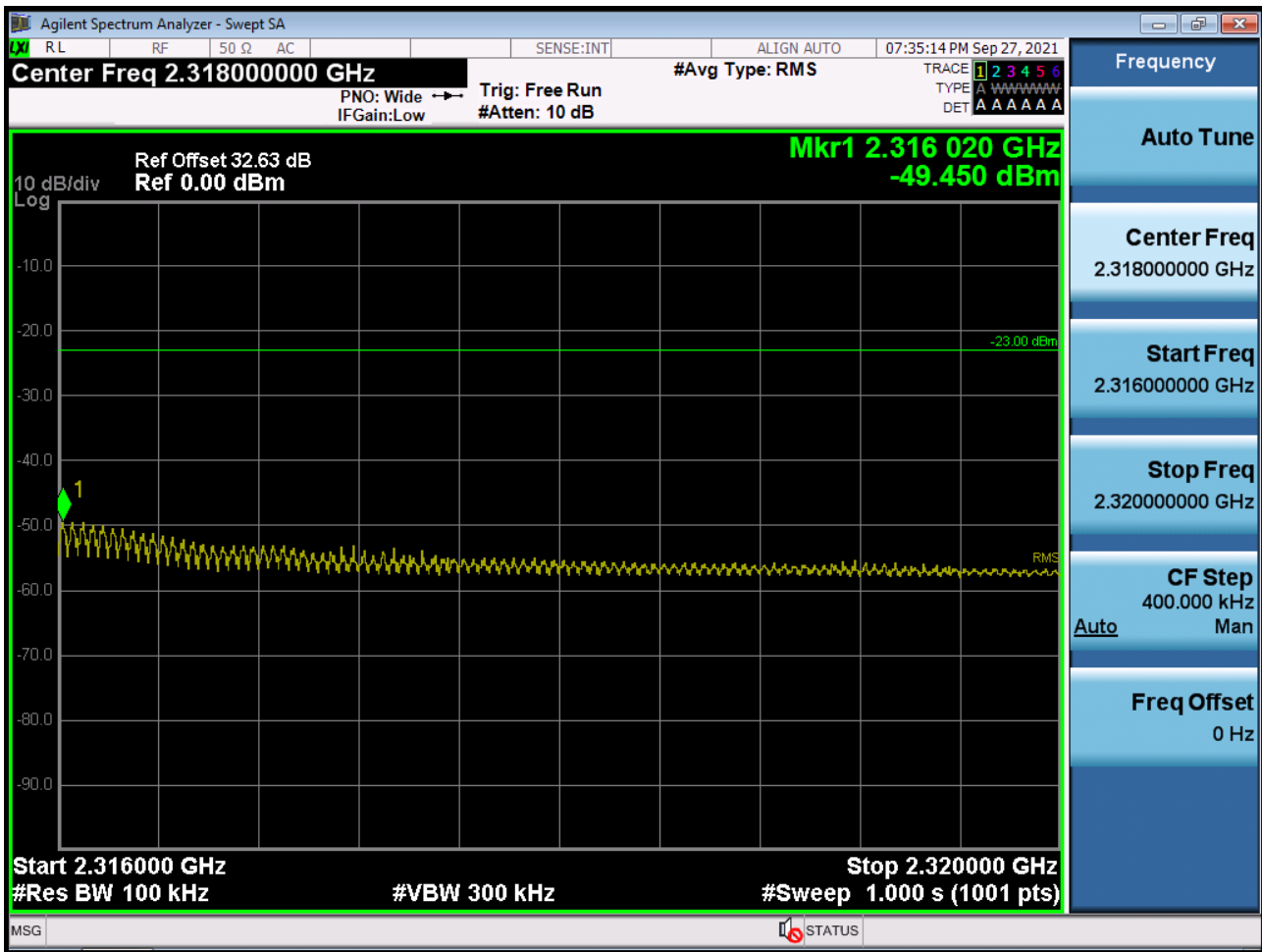
BAND 40. 5 M_BandEdge(2315 MHz-2316 MHz)_2312.5 MHz_1RB



BAND 40. 5 M_BandEdge(2315 MHz-2320 MHz)_2310 MHz_1RB



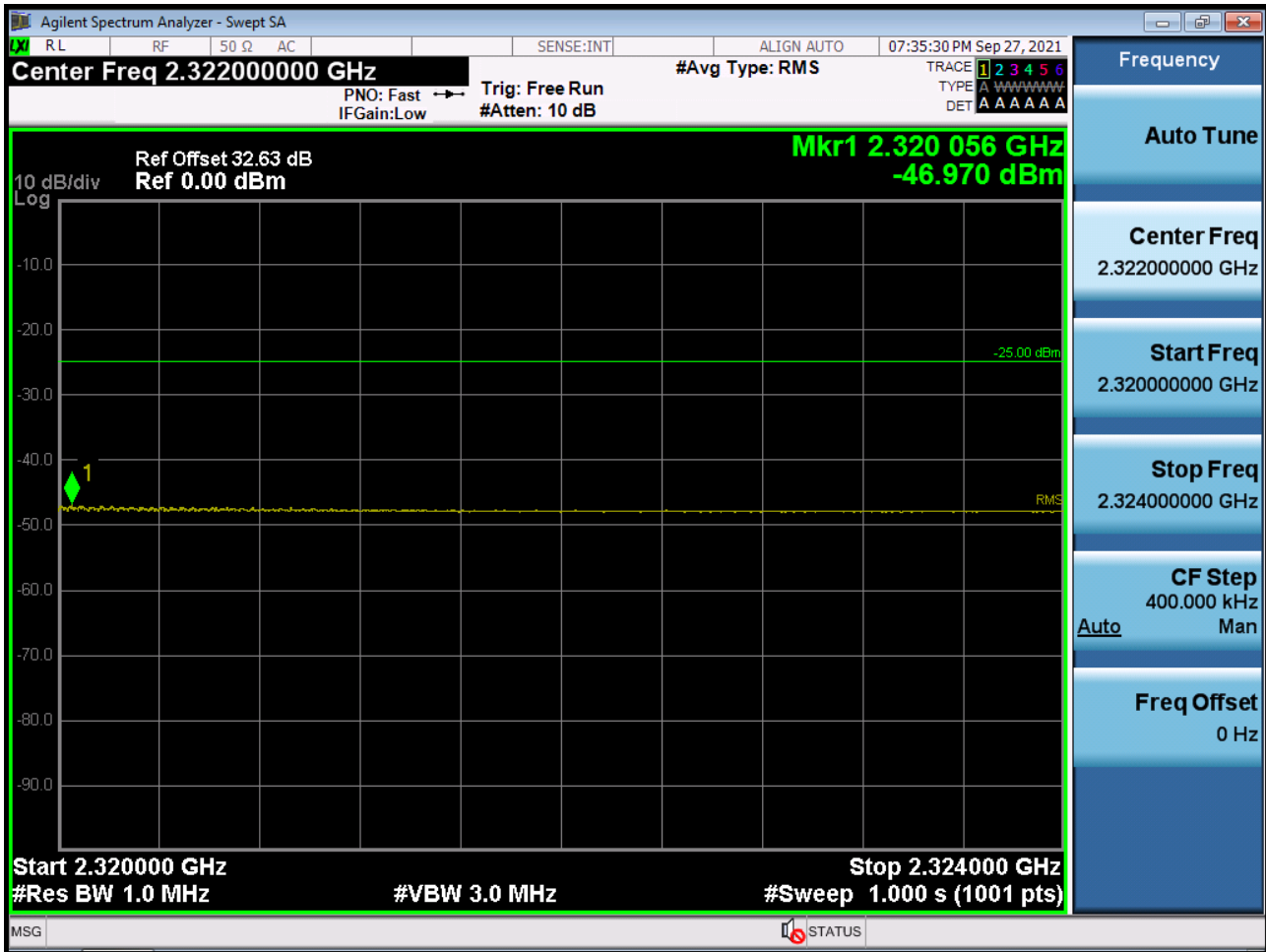
BAND 40. 5 M_BandEdge(2316 MHz-2320 MHz)_2312.5 MHz_1RB



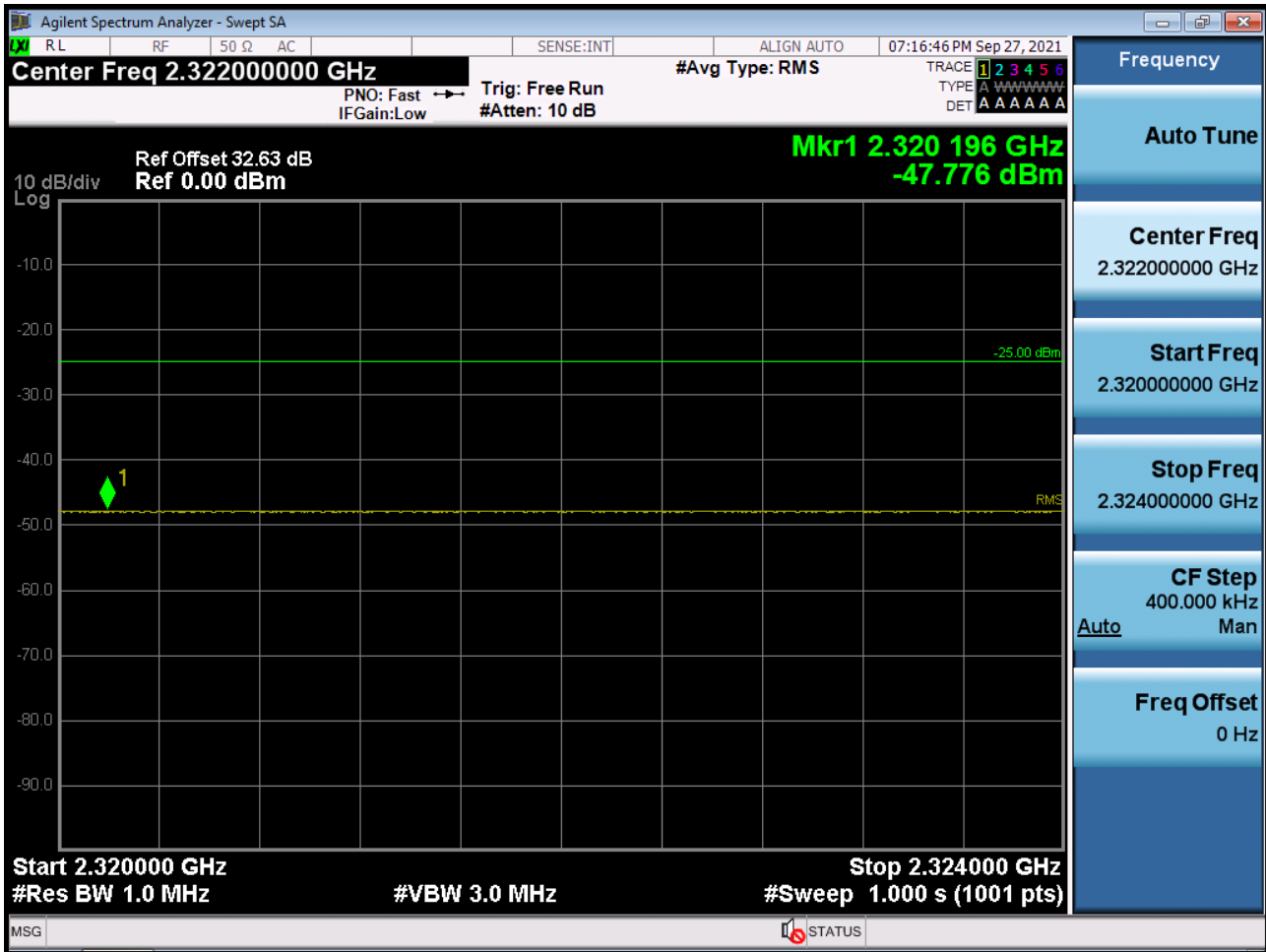
Note : We used a narrower RBW in order to increase accuracy.

Calculation = Reading Value + 10 x log(1 MHz/100 kHz) dB = -49.450 dBm + 10 dB = -39.450 dBm

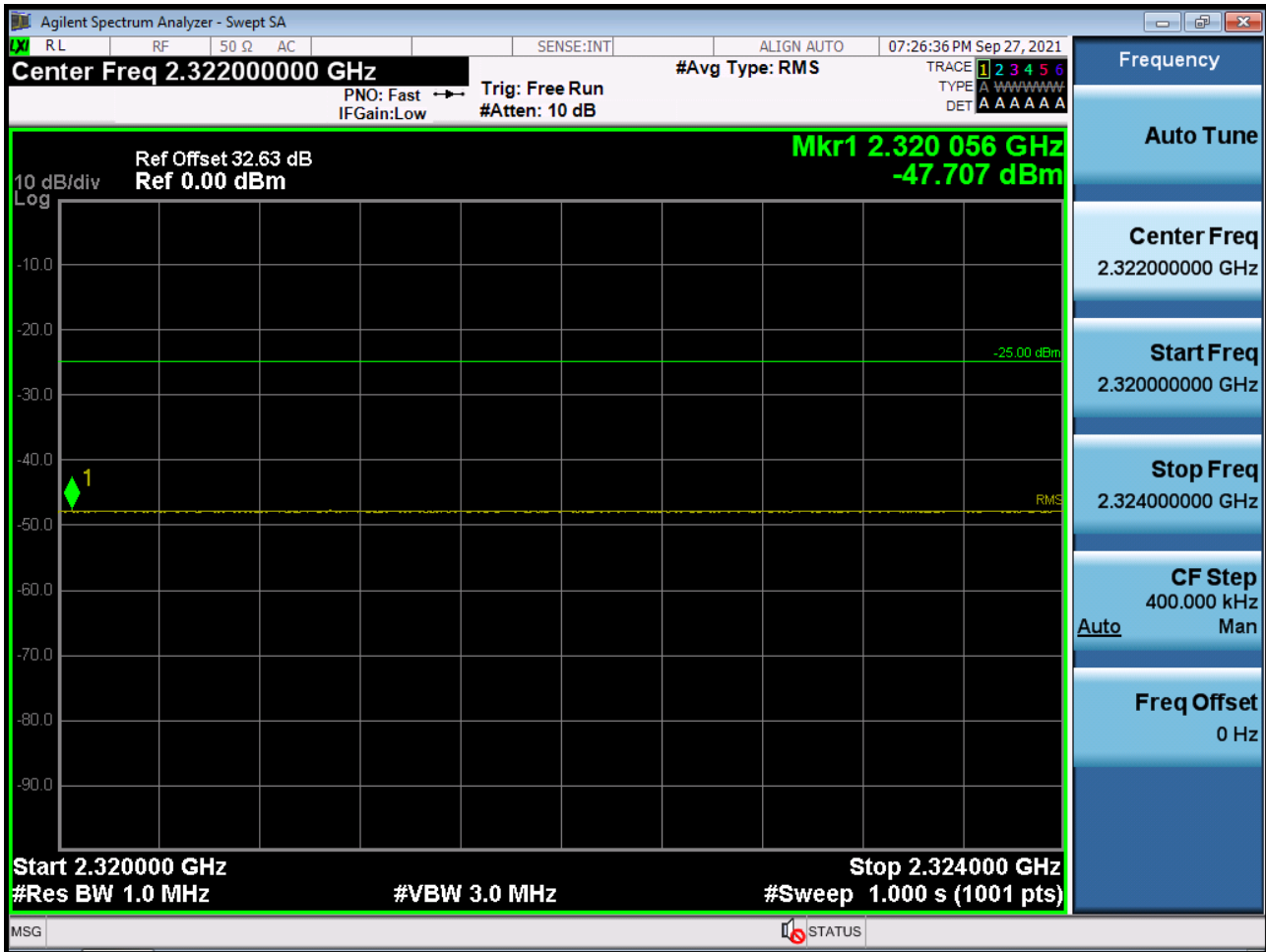
BAND 40. 5 M_BandEdge(2320 MHz-2324 MHz)_2312.5 MHz_1RB



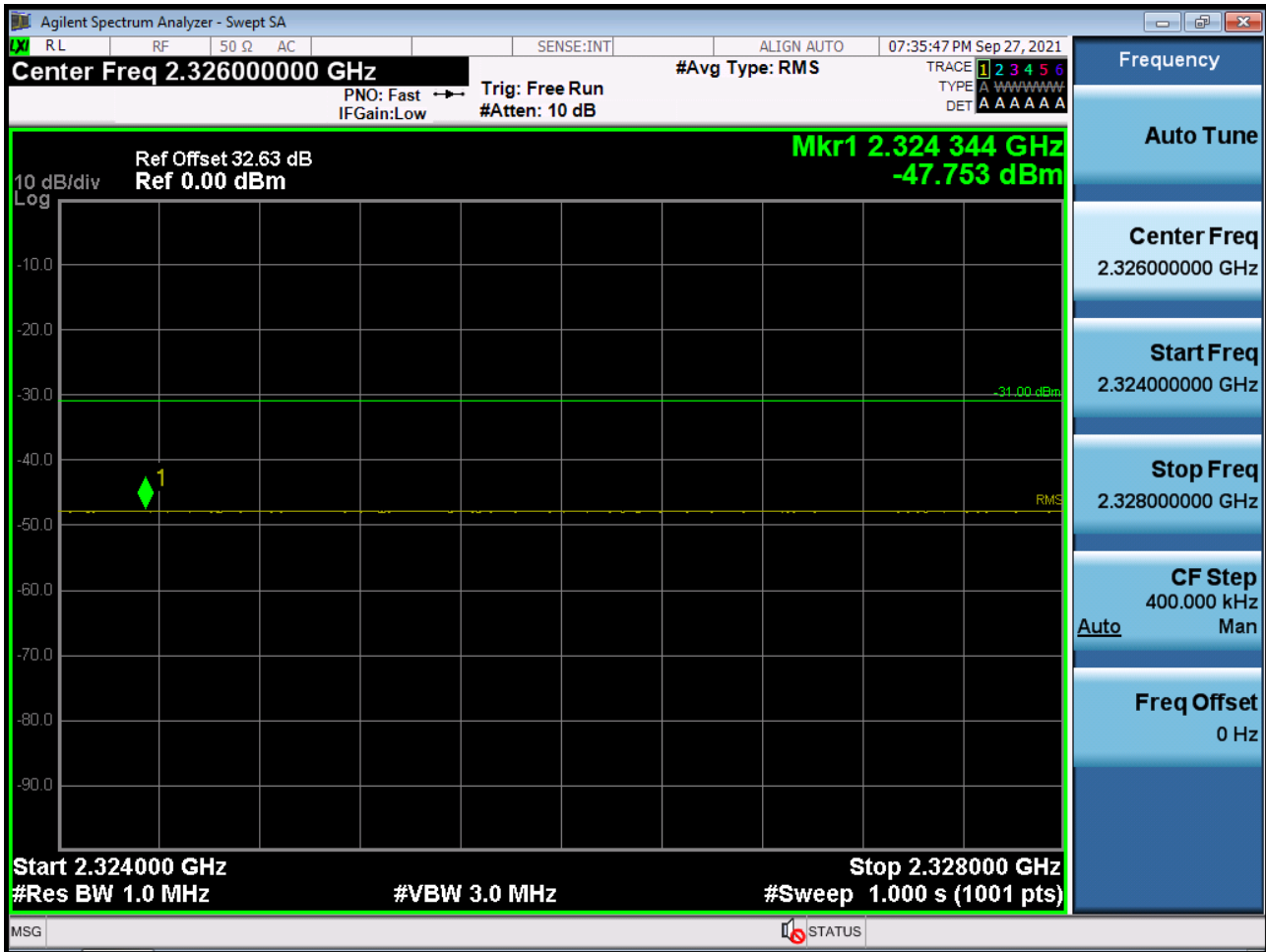
BAND 40. 5 M_BandEdge(2320 MHz-2324 MHz)_2307.5 MHz_1RB



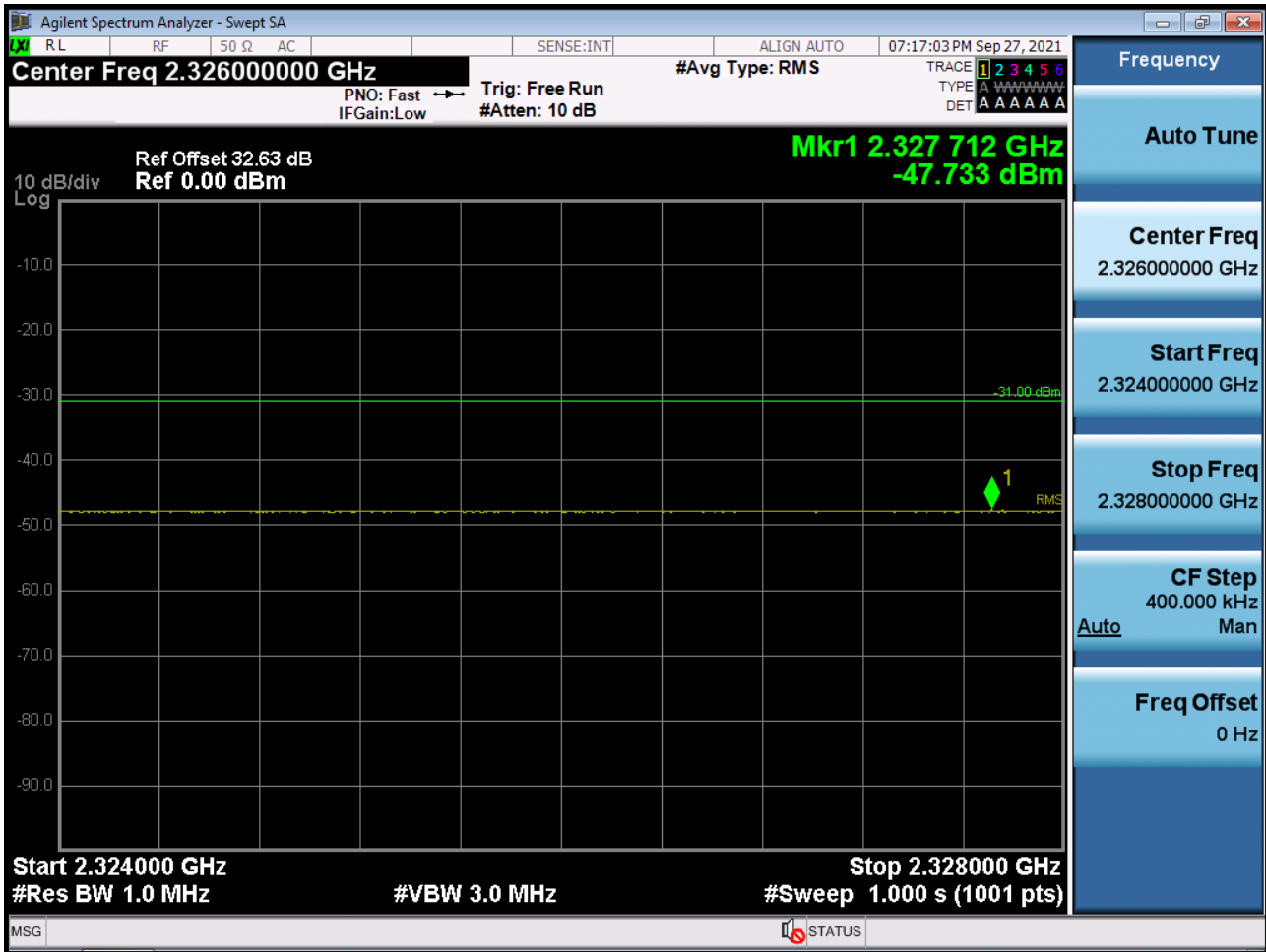
BAND 40. 5 M_BandEdge(2320 MHz-2324 MHz)_2310 MHz_1RB



BAND 40. 5 M_BandEdge(2324 MHz-2328 MHz)_2312.5 MHz_1RB



BAND 40. 5 M_BandEdge(2324 MHz-2328 MHz)_2307.5 MHz_1RB



BAND 40. 5 M_BandEdge(2324 MHz-2328 MHz)_ 2310 MHz_1RB



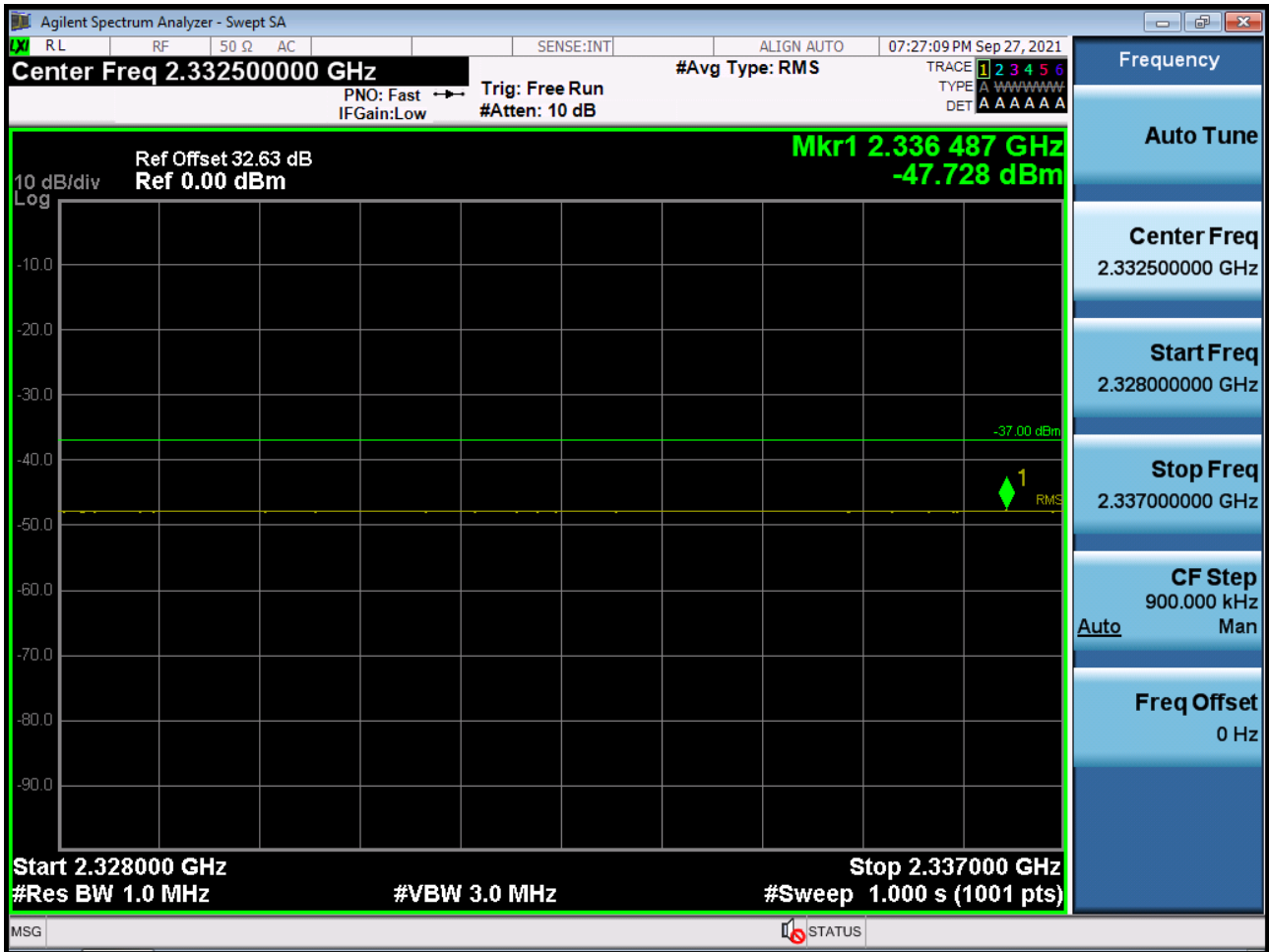
BAND 40. 5 M_BandEdge(2328 MHz-2337 MHz)_2312.5 MHz_1RB



BAND 40. 5 M_BandEdge(2328 MHz-2337 MHz)_2307.5 MHz_1RB



BAND 40. 5 M_BandEdge(2328 MHz-2337 MHz)_2310 MHz_1RB



BAND 40. 5 M_BandEdge(2337 MHz-2341 MHz)_2312.5 MHz_1RB



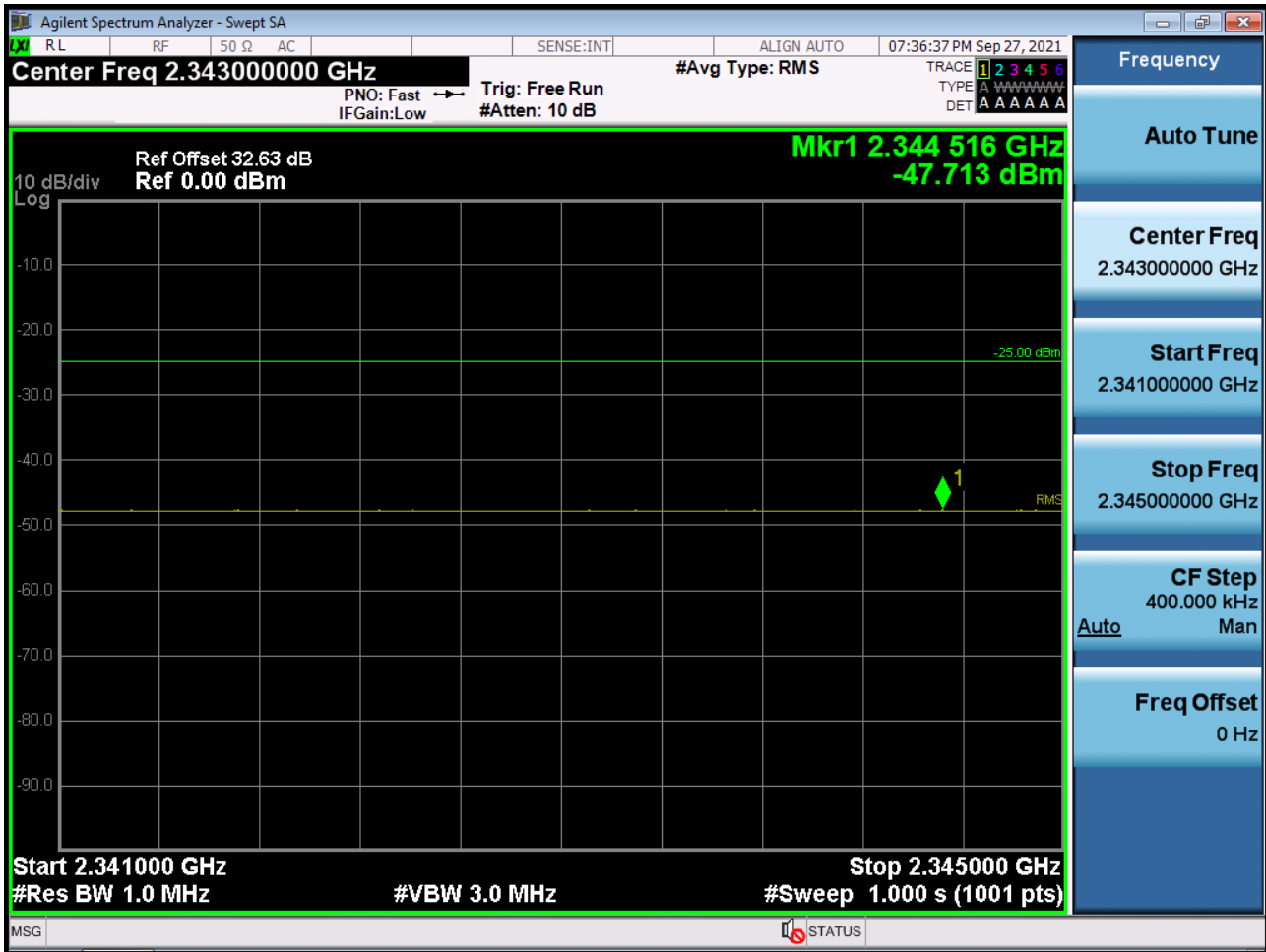
BAND 40. 5 M_BandEdge(2337 MHz-2341 MHz)_2307.5 MHz_1RB



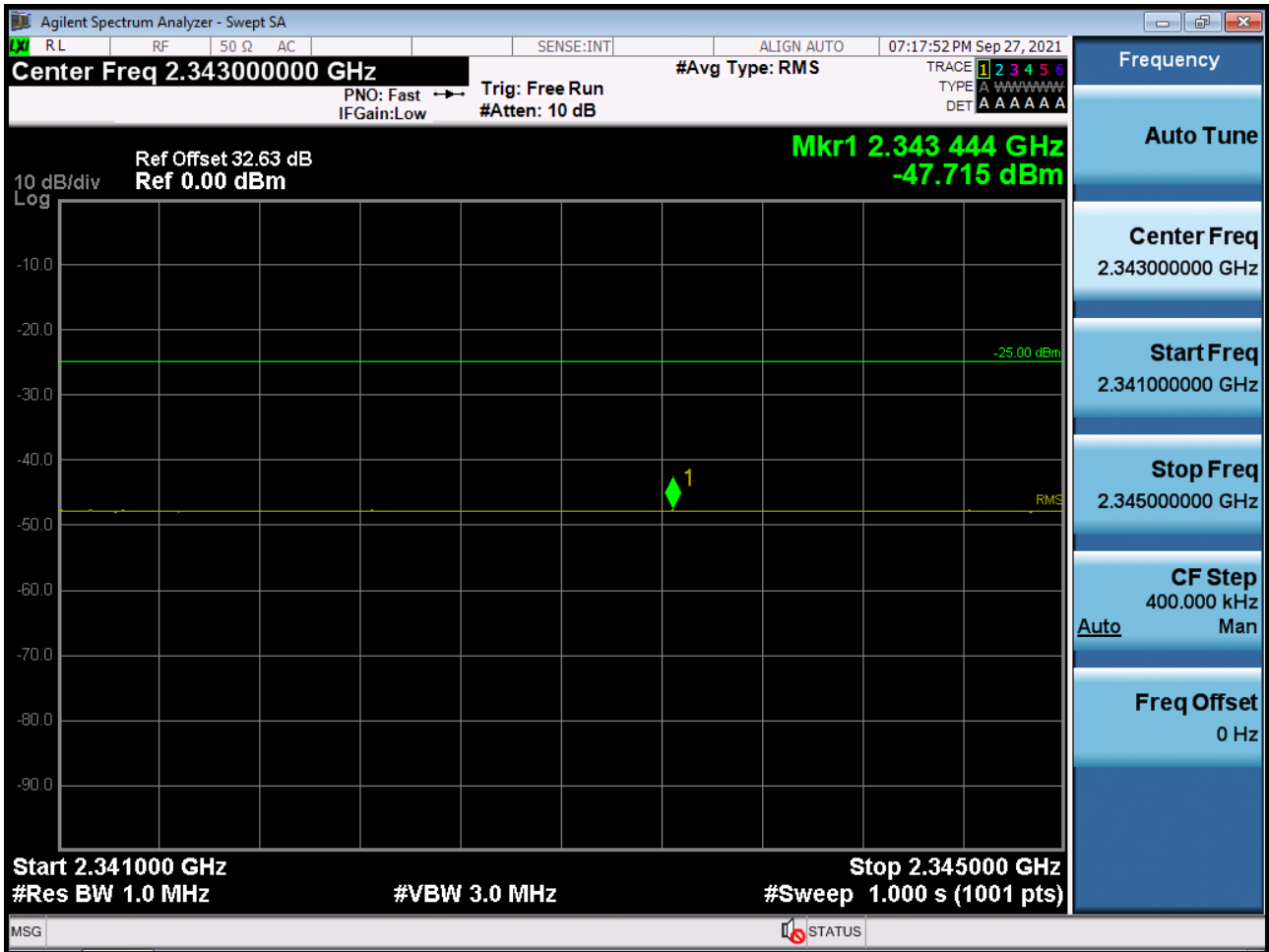
BAND 40. 5 M_BandEdge(2337 MHz-2341 MHz)_2310 MHz_1RB



BAND 40. 5 M_BandEdge(2341 MHz-2345 MHz)_2312.5 MHz_1RB



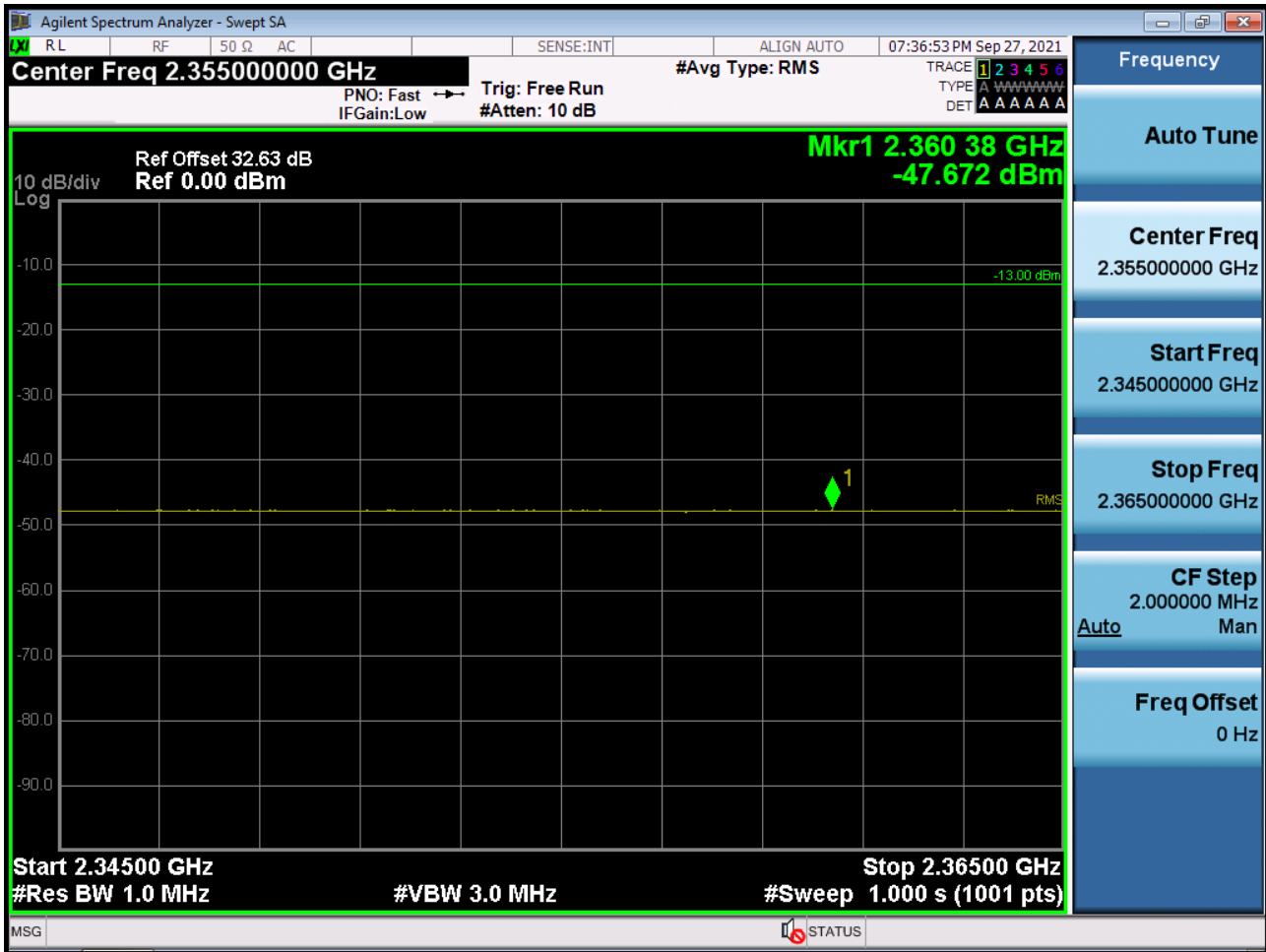
BAND 40. 5 M_BandEdge(2341 MHz-2345 MHz)_2307.5 MHz_1RB



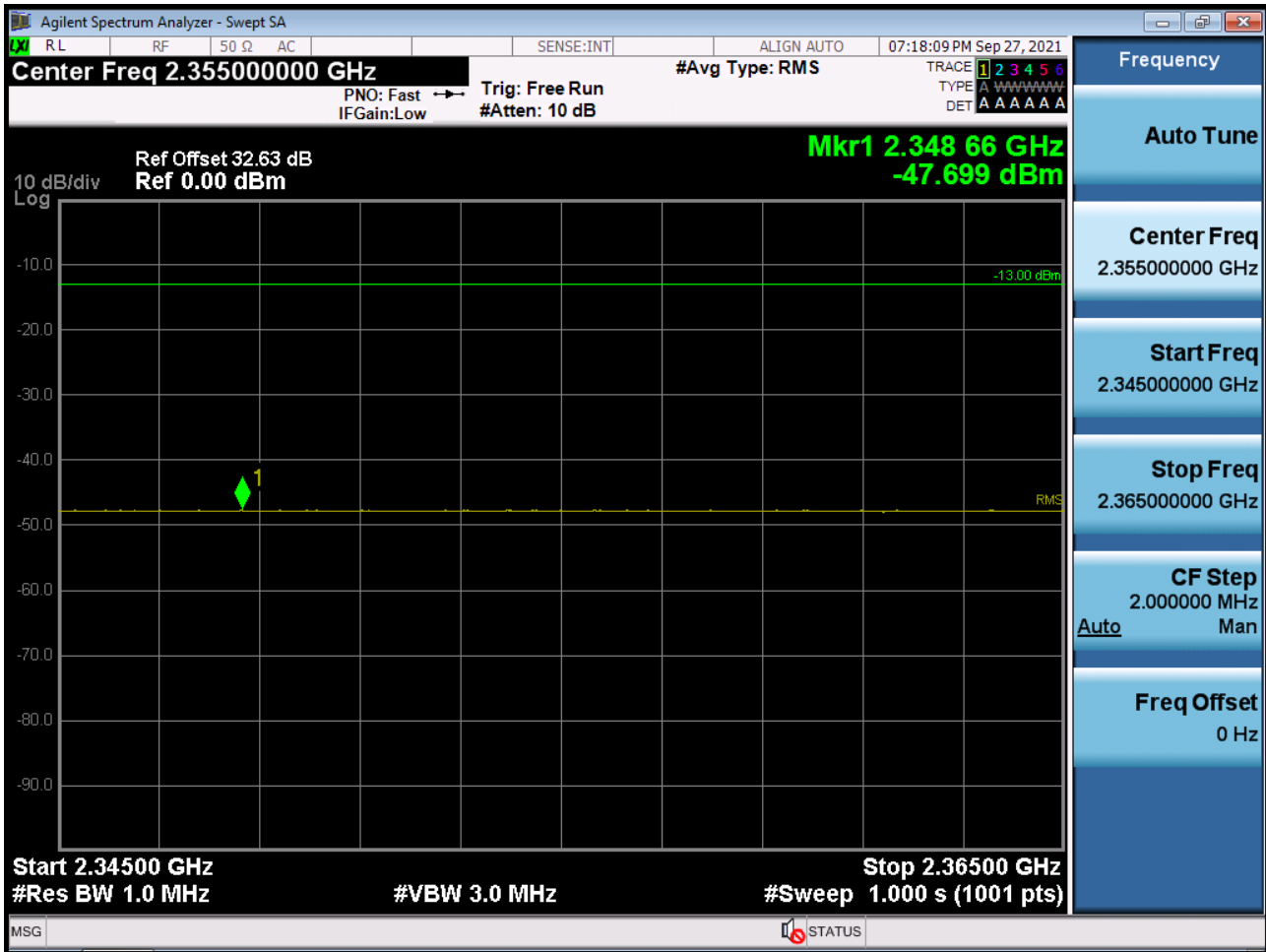
BAND 40. 5 M_BandEdge(2341 MHz-2345 MHz)_2310 MHz_1RB



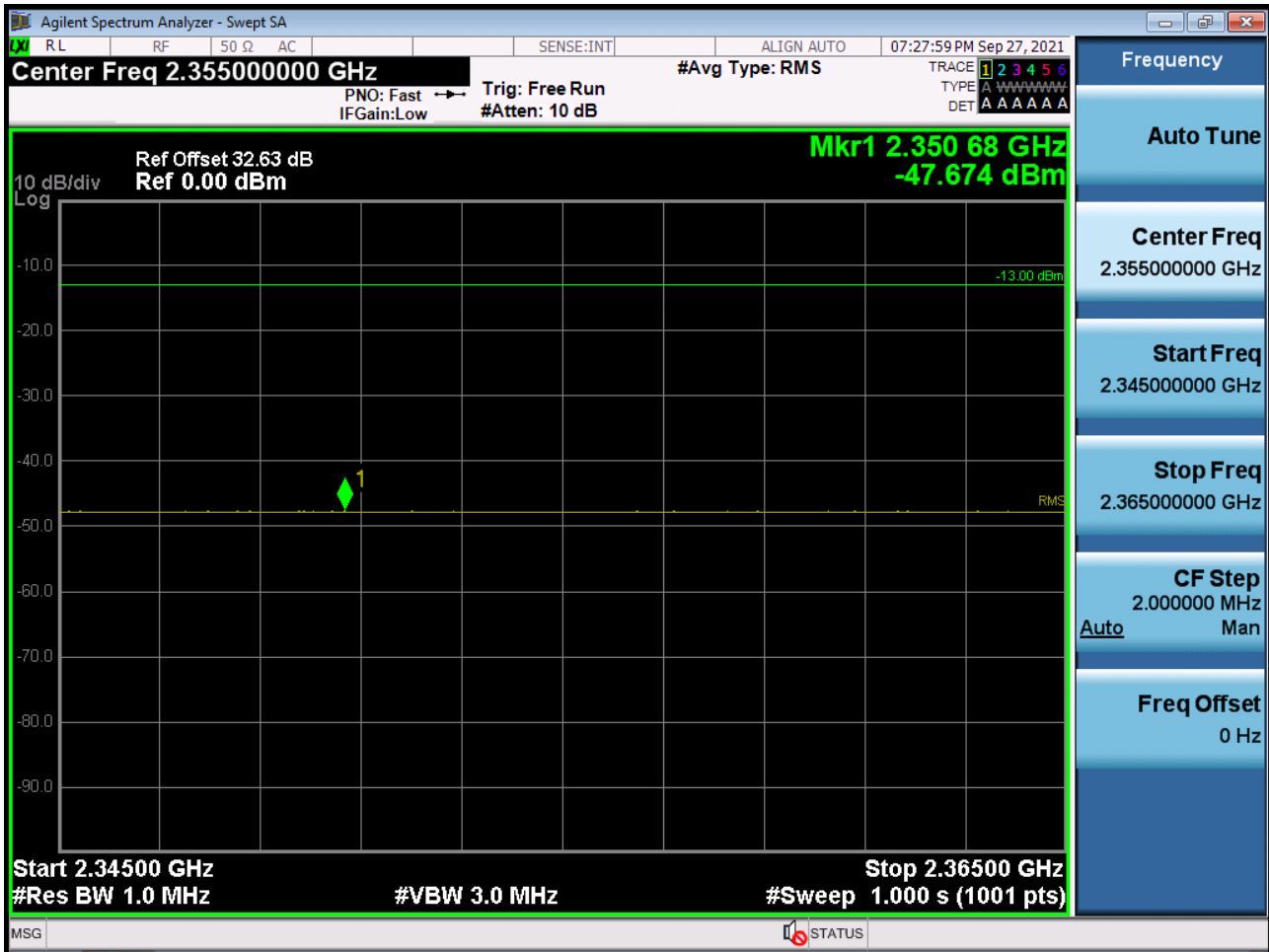
BAND 40. 5 M_BandEdge(2345 MHz-2365 MHz)_2312.5 MHz_1RB



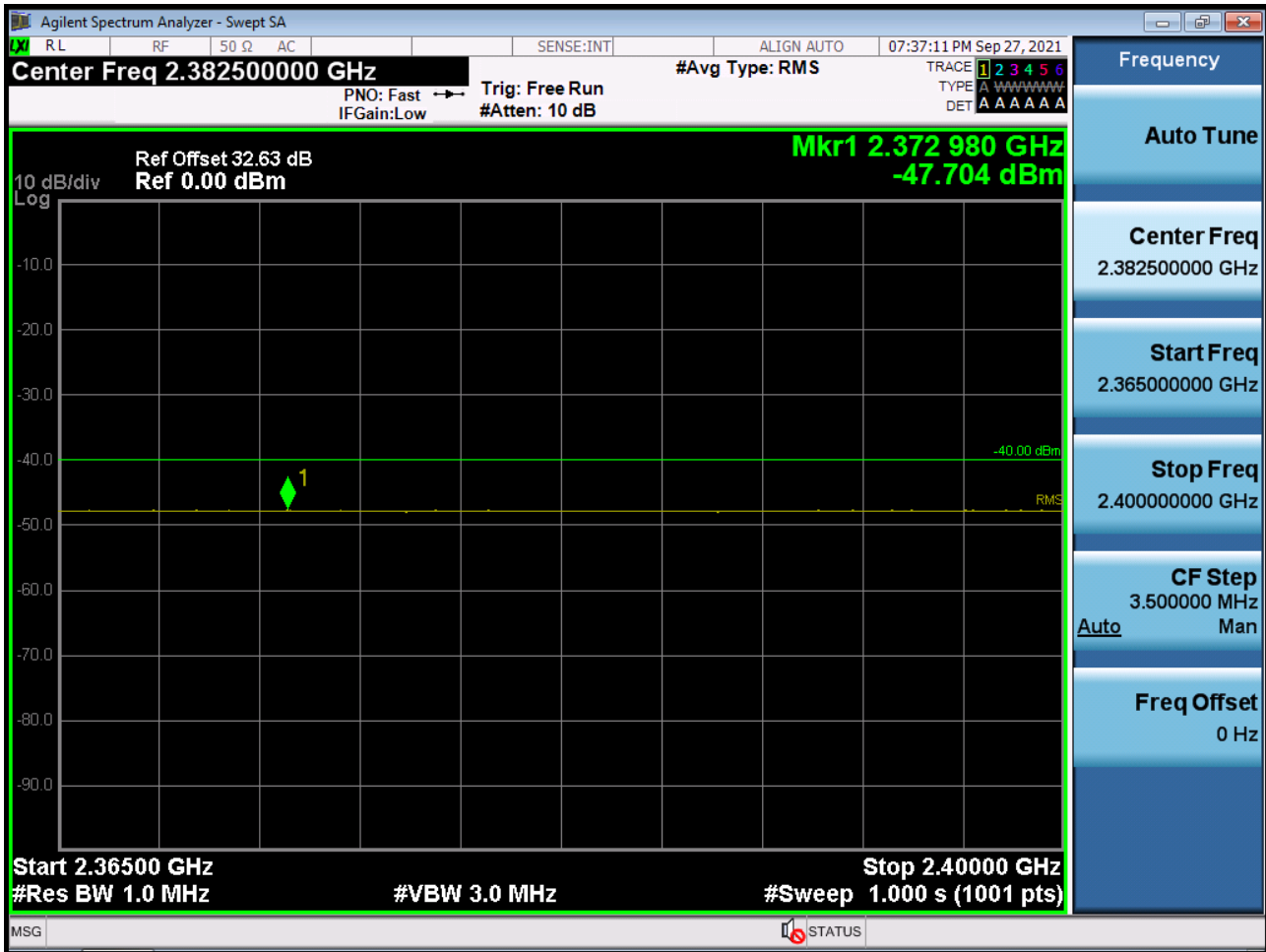
BAND 40. 5 M_BandEdge(2345 MHz-2365 MHz)_2307.5 MHz_1RB



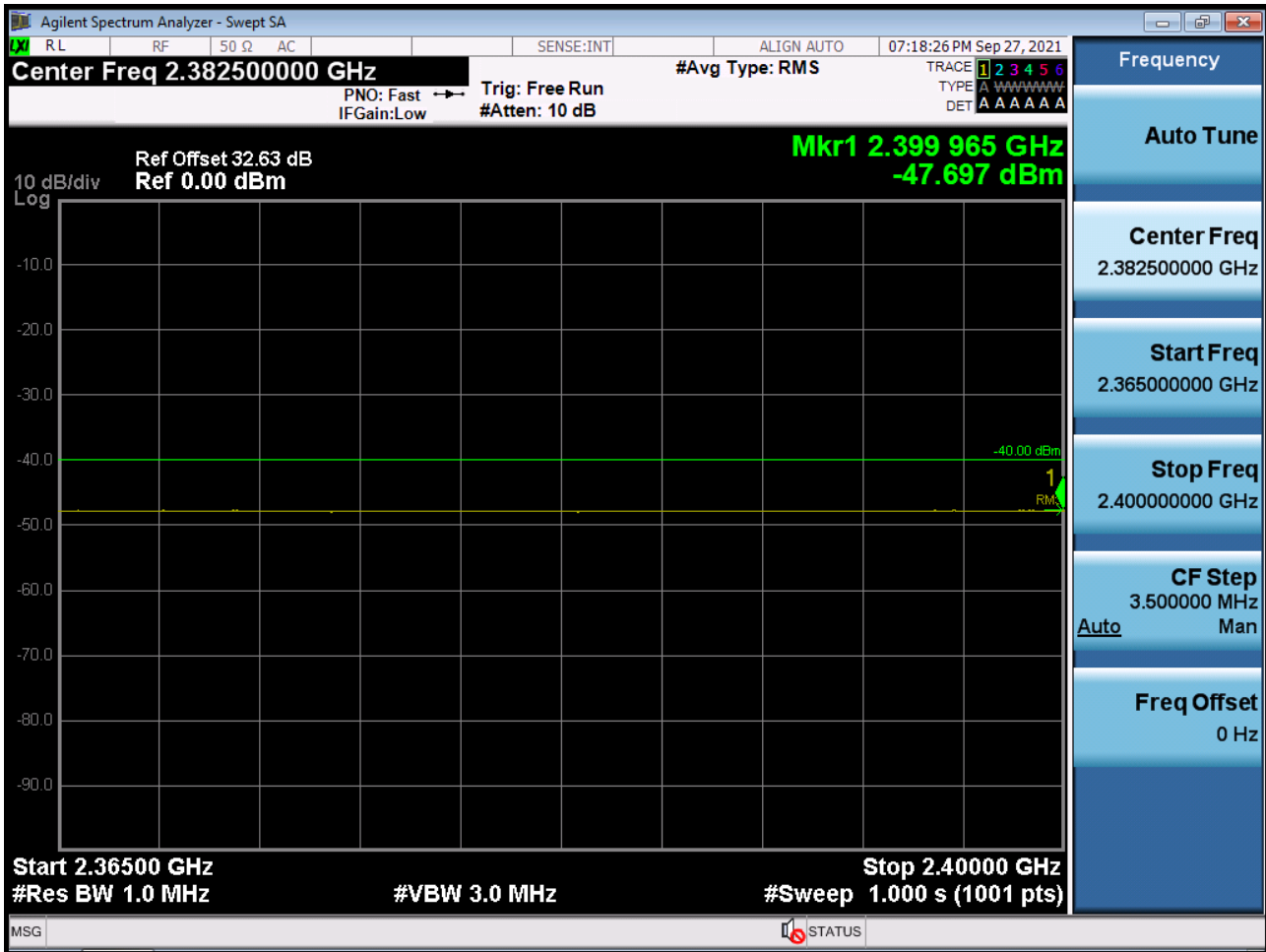
BAND 40. 5 M_BandEdge(2345 MHz-2365 MHz)_2310 MHz_1RB



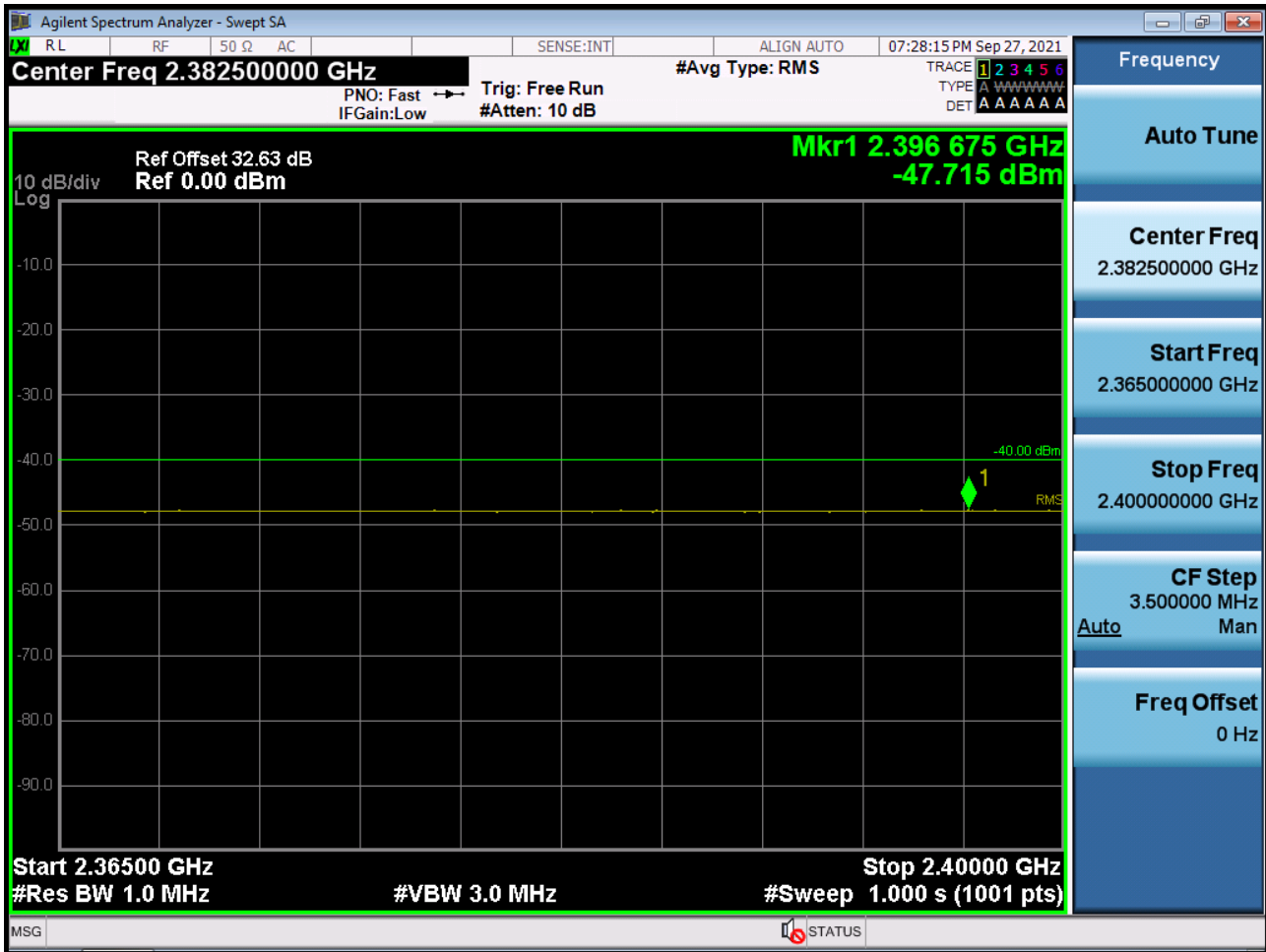
BAND 40. 5 M_BandEdge(2365 MHz-2400 MHz)_2312.5 MHz_1RB



BAND 40. 5 M_BandEdge(2365 MHz-2400 MHz)_2307.5 MHz_1RB



BAND 40. 5 M_BandEdge(2365 MHz-2400 MHz)_2310 MHz_1RB



BAND 40. 10 M_BandEdge(2280 MHz-2288 MHz)_2310 MHz_1RB



BAND 40. 10 M_BandEdge(2288 MHz-2292 MHz)_2310 MHz_1RB



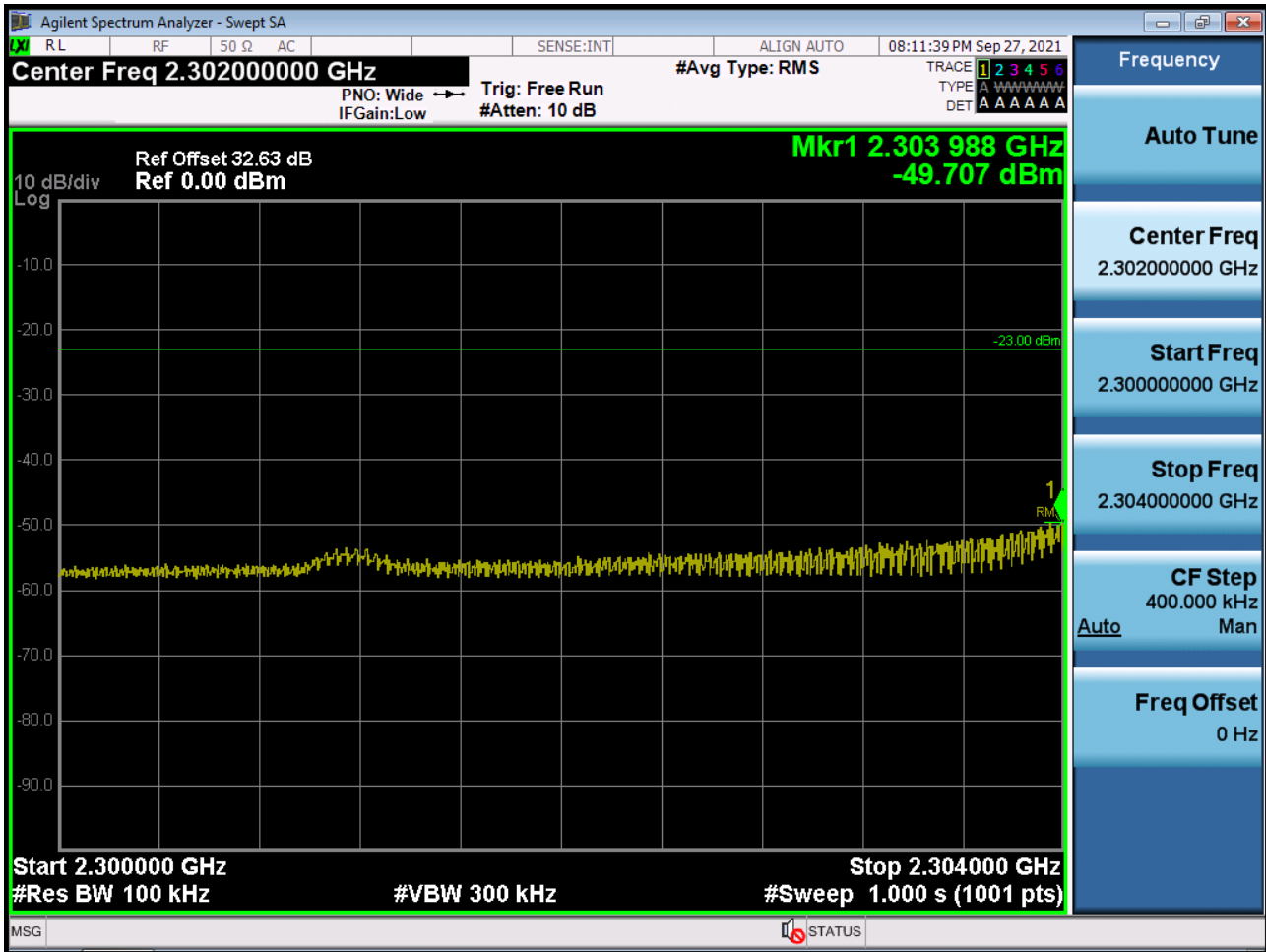
BAND 40. 10 M_BandEdge(2292 MHz-2296 MHz)_2310 MHz_1RB



BAND 40. 10 M_BandEdge(2296 MHz-2300 MHz)_2310 MHz_1RB



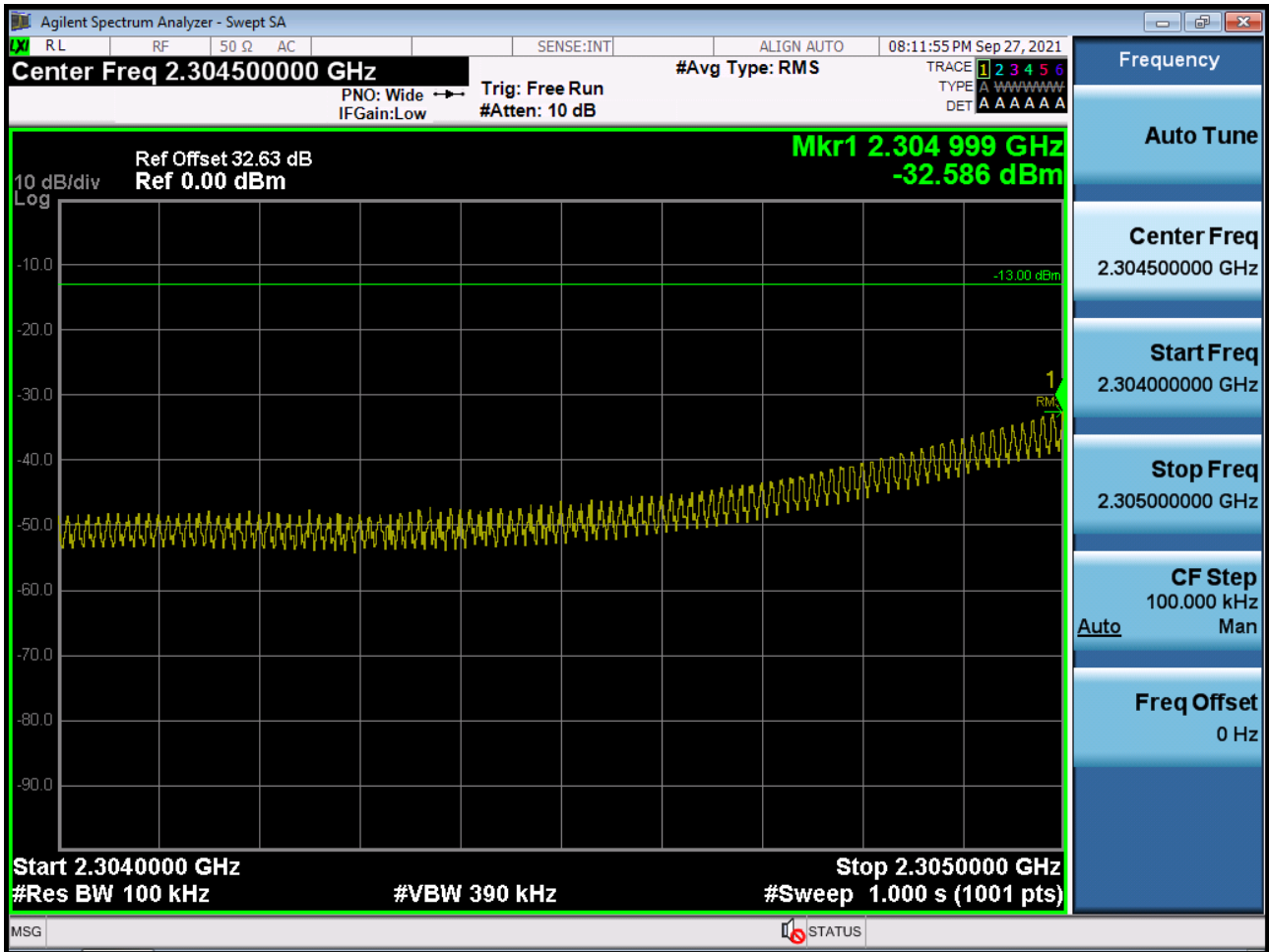
BAND 40. 10 M_BandEdge(2300 MHz-2304 MHz)_2310 MHz_1RB



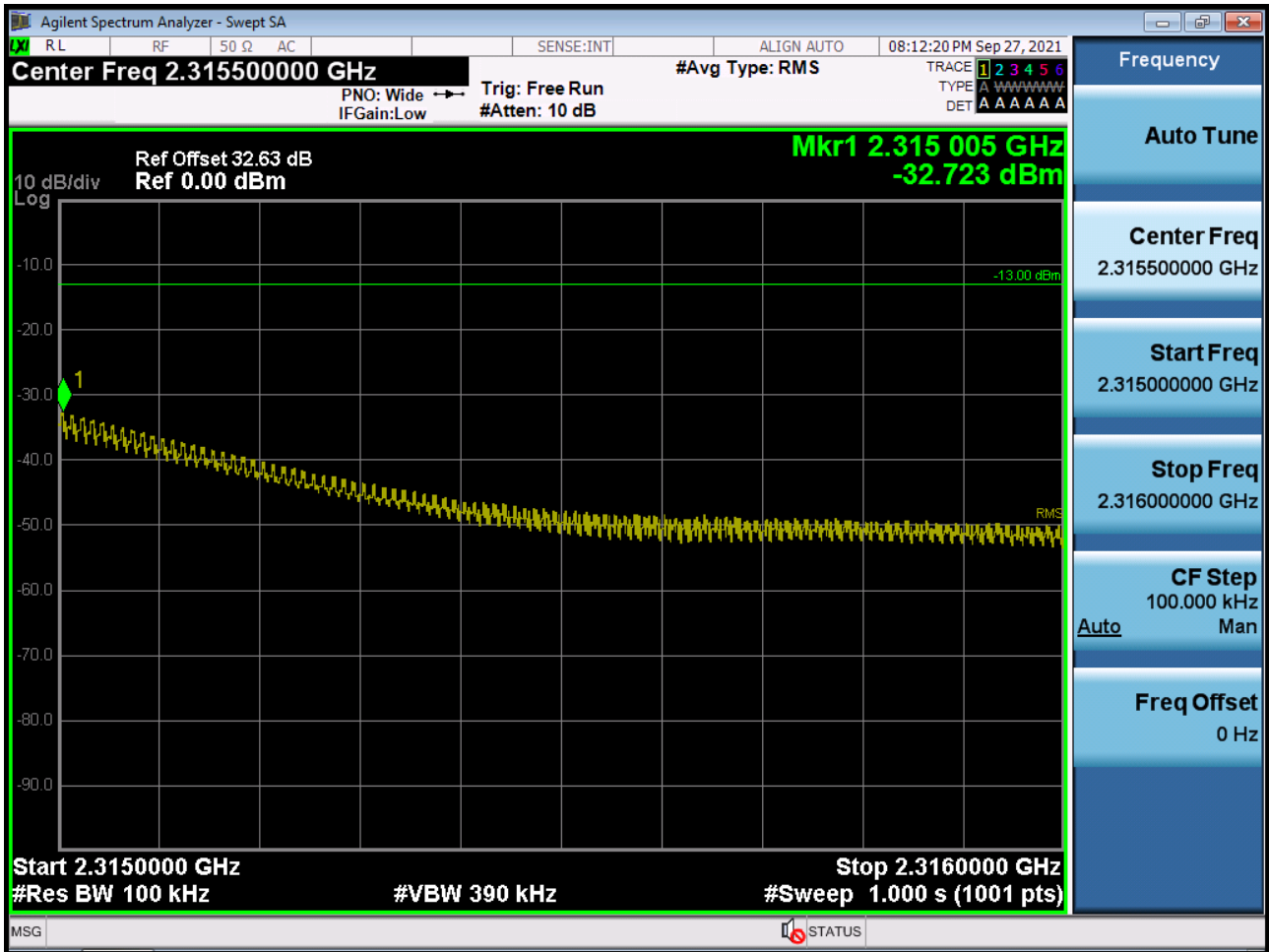
Note : We used a narrower RBW in order to increase accuracy.

Calculation = Reading Value + 10 x log(1 MHz/100 kHz) dB = -49.707 dBm + 10 dB = -39.707 dBm

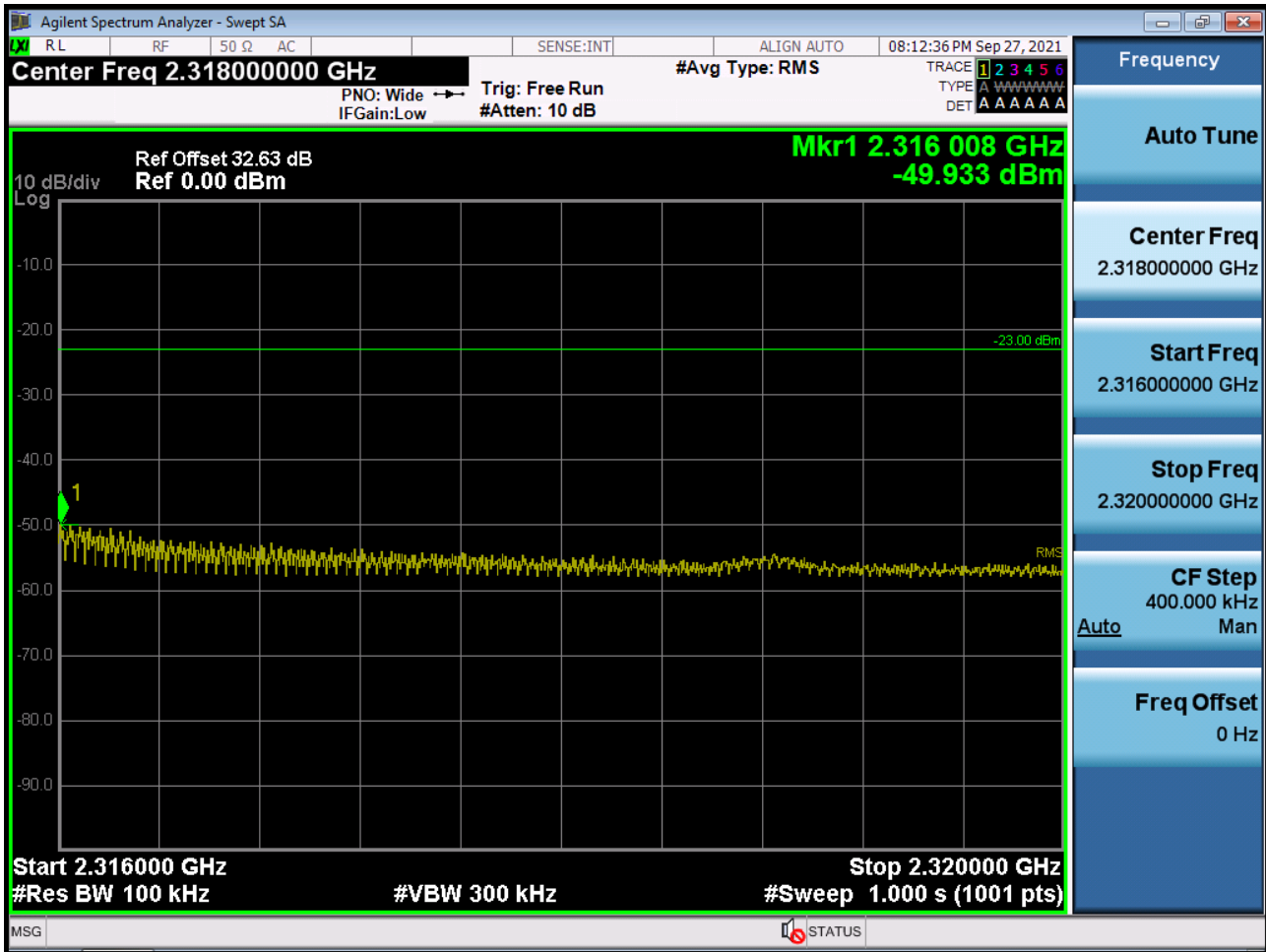
BAND 40. 10 M_BandEdge(2304 MHz-2305 MHz)_2310 MHz_1RB



BAND 40. 10 M_BandEdge(2315 MHz-2316 MHz)_2310 MHz_1RB



BAND 40. 10 M_BandEdge(2316 MHz-2320 MHz)_2310 MHz_1RB



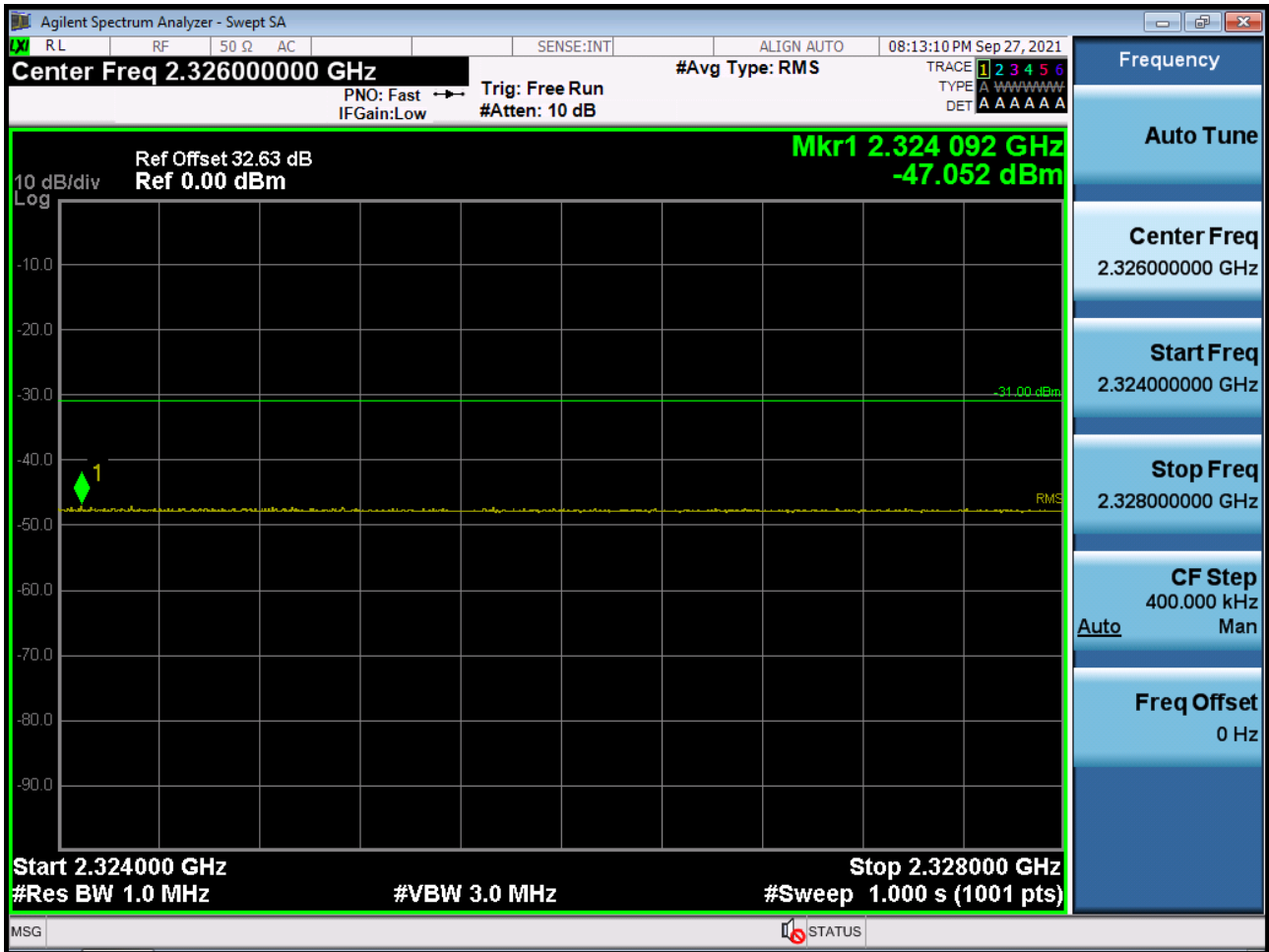
Note : We used a narrower RBW in order to increase accuracy.

Calculation = Reading Value + 10 x log(1 MHz/100 kHz) dB = -49.933 dBm + 10 dB = -39.933 dBm

BAND 40. 10 M_BandEdge(2320 MHz-2324 MHz)_2310 MHz_1RB



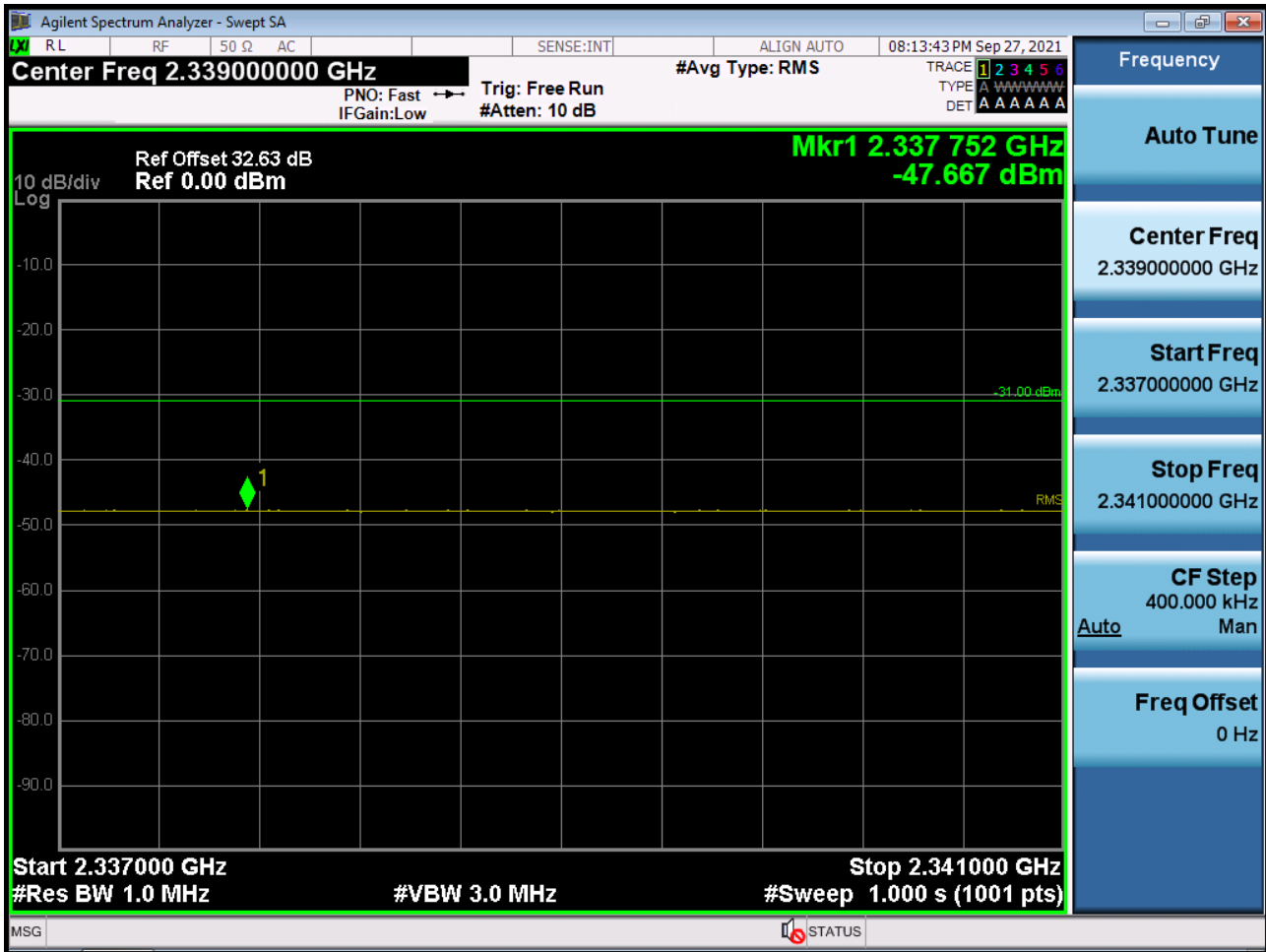
BAND 40. 10 M_BandEdge(2324 MHz-2328 MHz)_2310 MHz_1RB



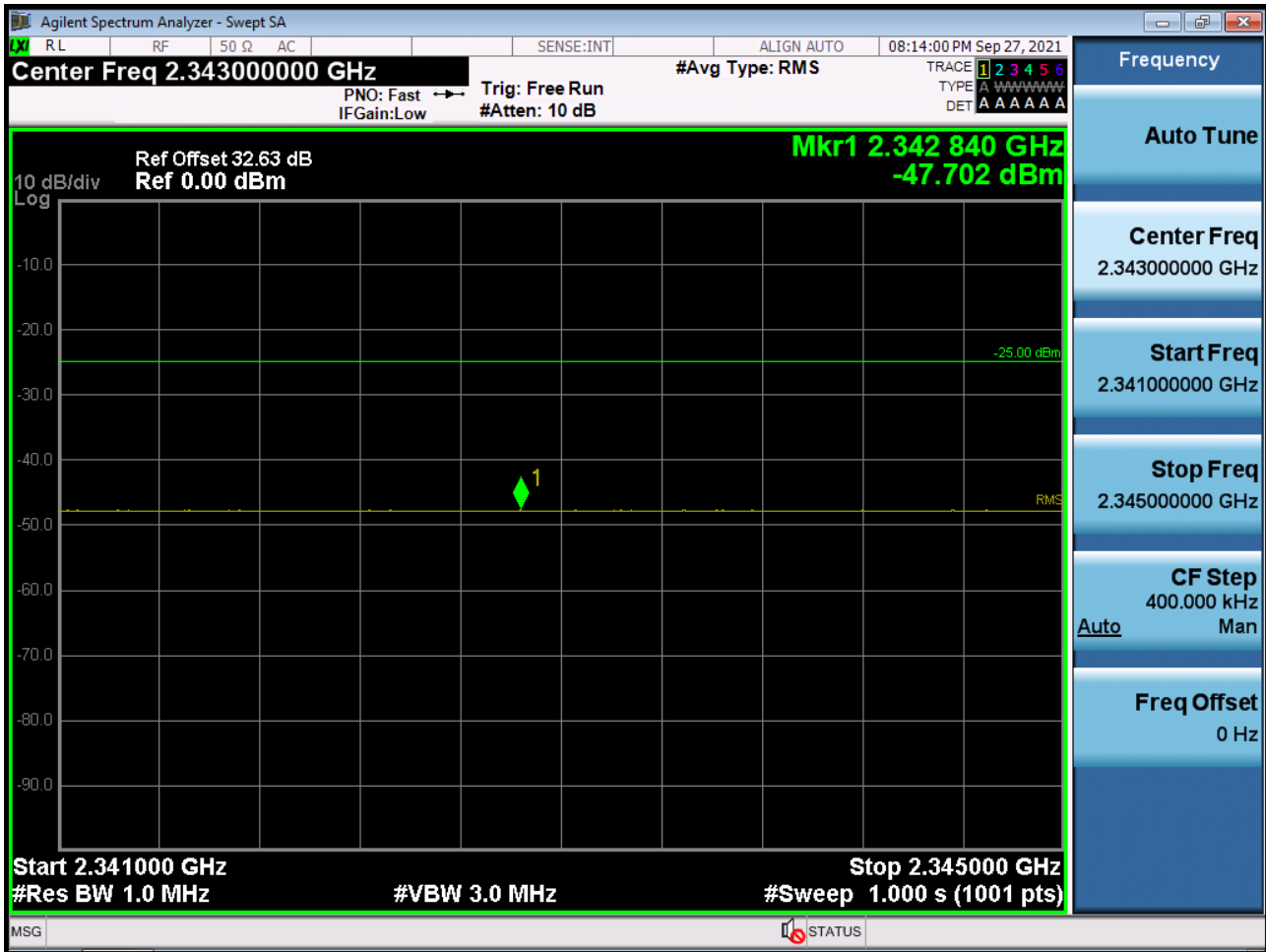
BAND 40. 10 M_BandEdge(2328 MHz-2337 MHz)_2310 MHz_1RB



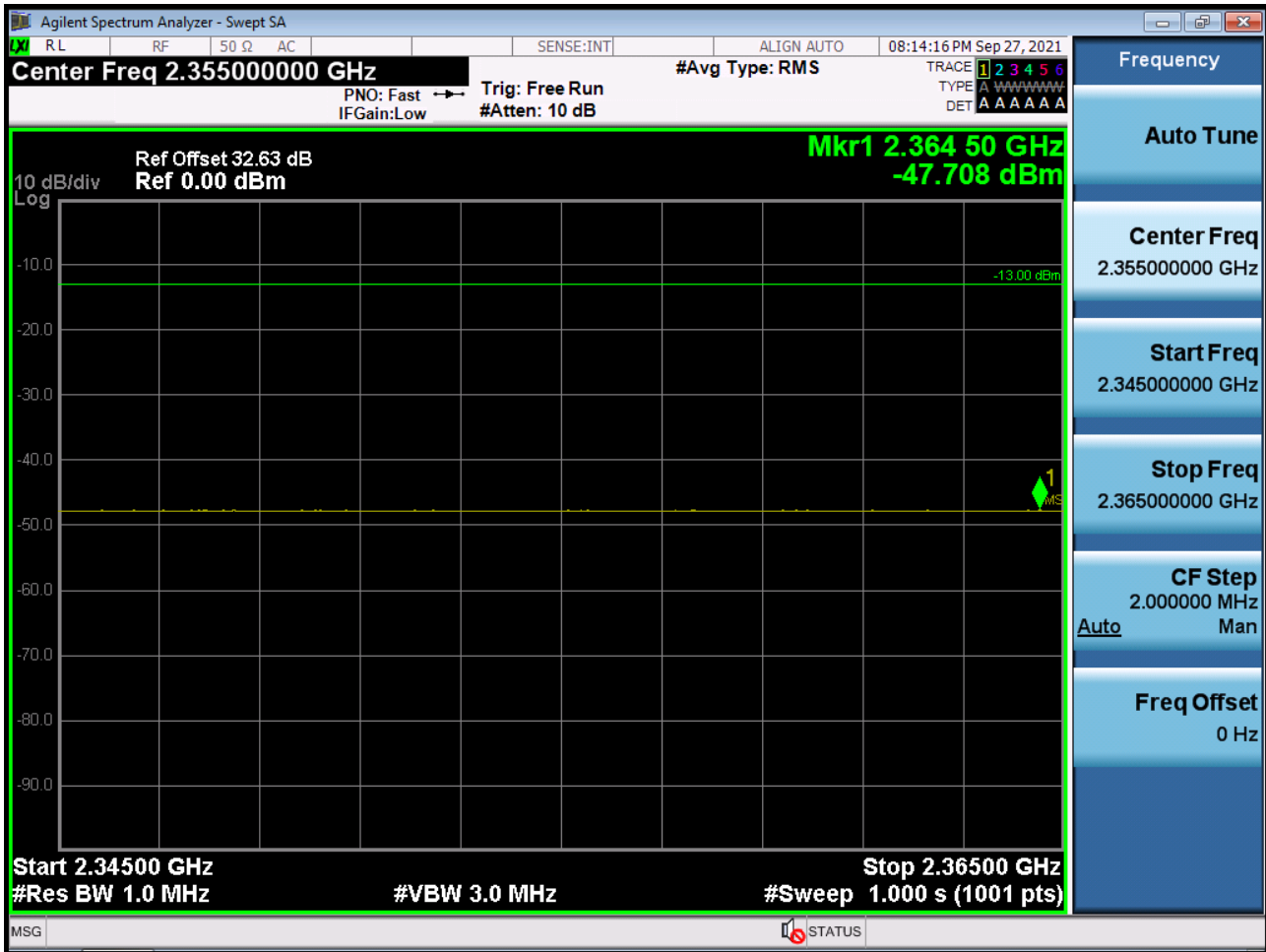
BAND 40. 10 M_BandEdge(2337 MHz-2341 MHz)_2310 MHz_1RB



BAND 40. 10 M_BandEdge(2341 MHz-2345 MHz)_2310 MHz_1RB



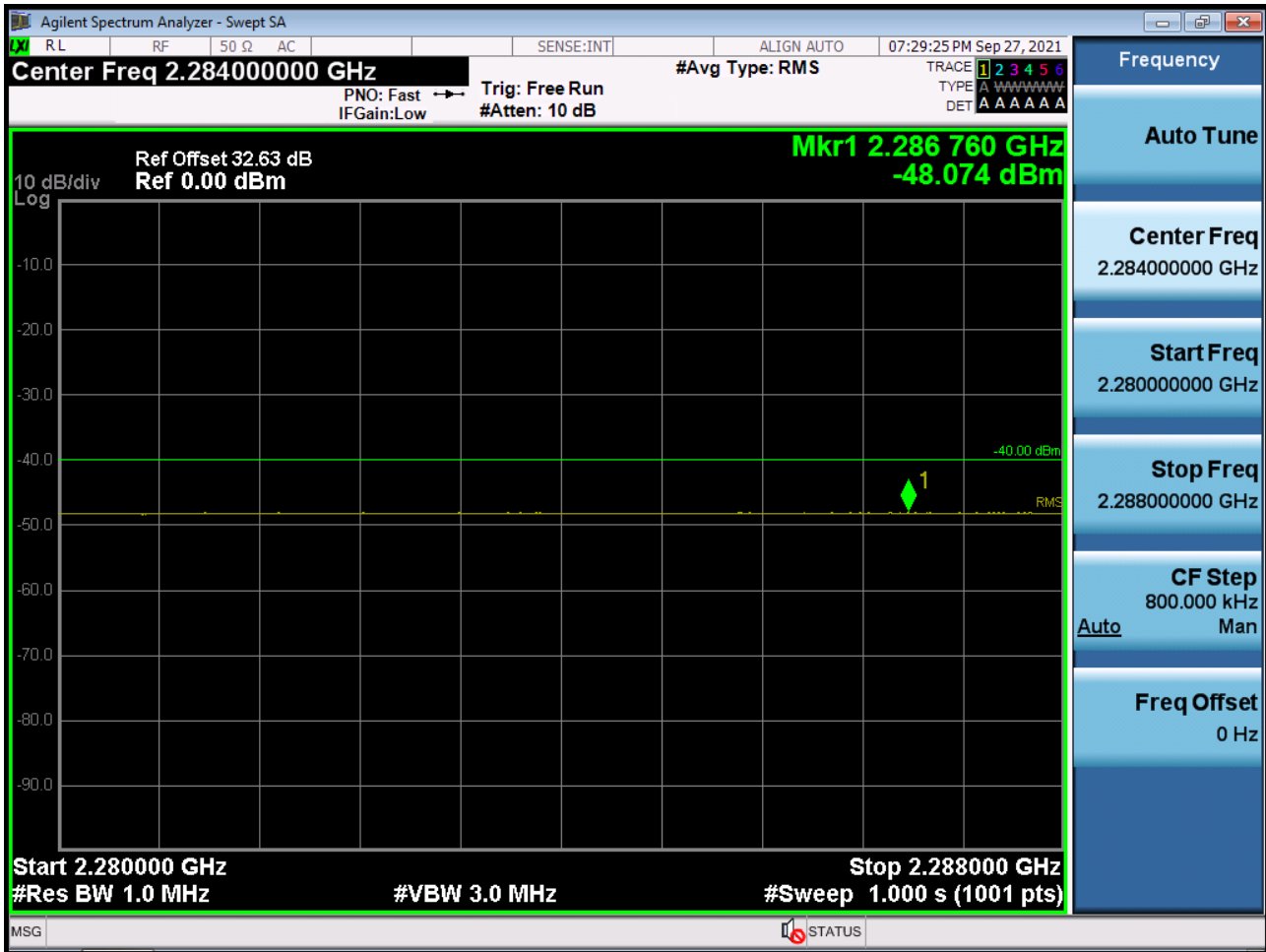
BAND 40. 10 M_BandEdge(2345 MHz-2365 MHz)_2310 MHz_1RB



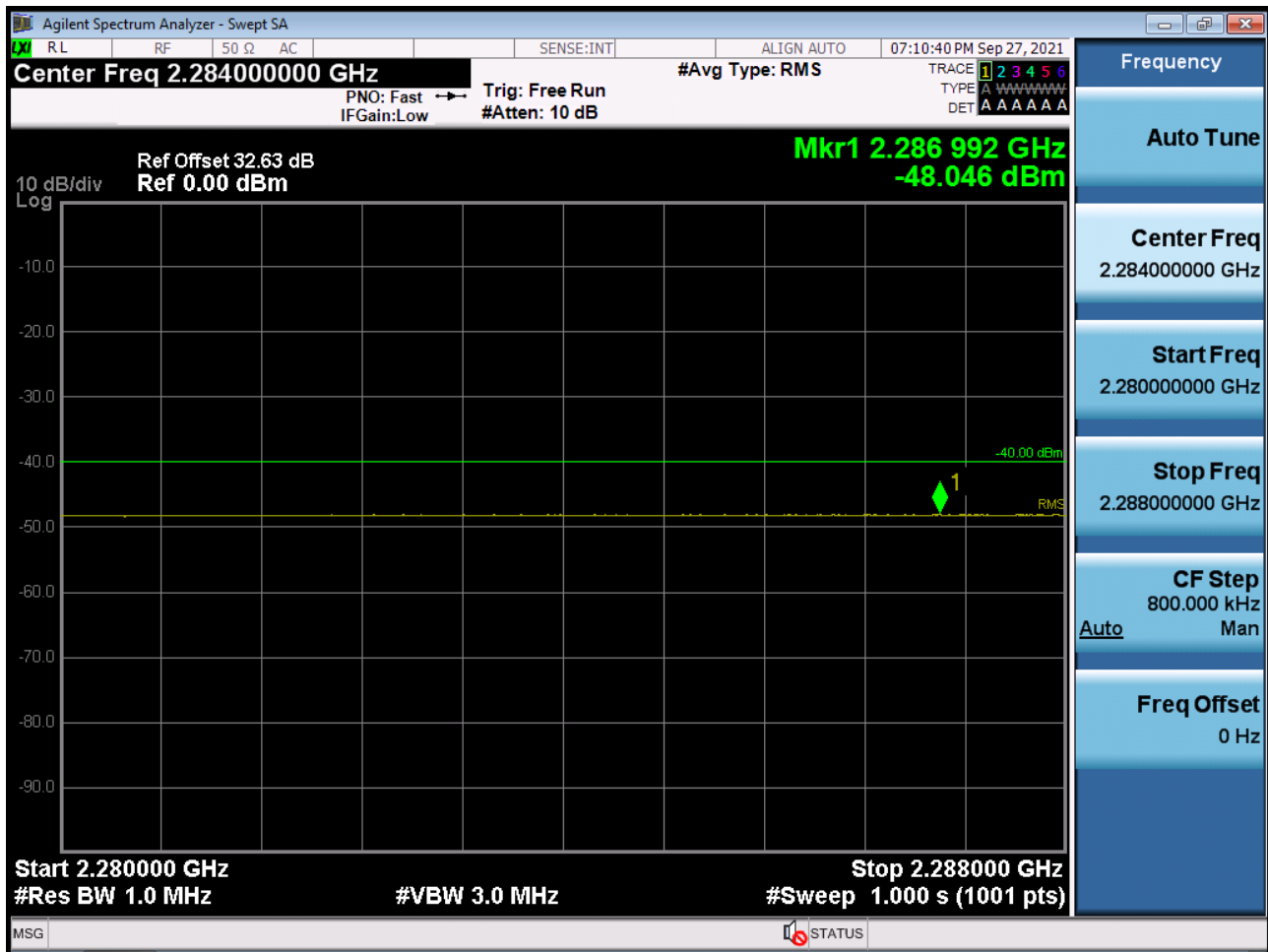
BAND 40. 10 M_BandEdge(2365 MHz-2400 MHz)_2310 MHz_1RB



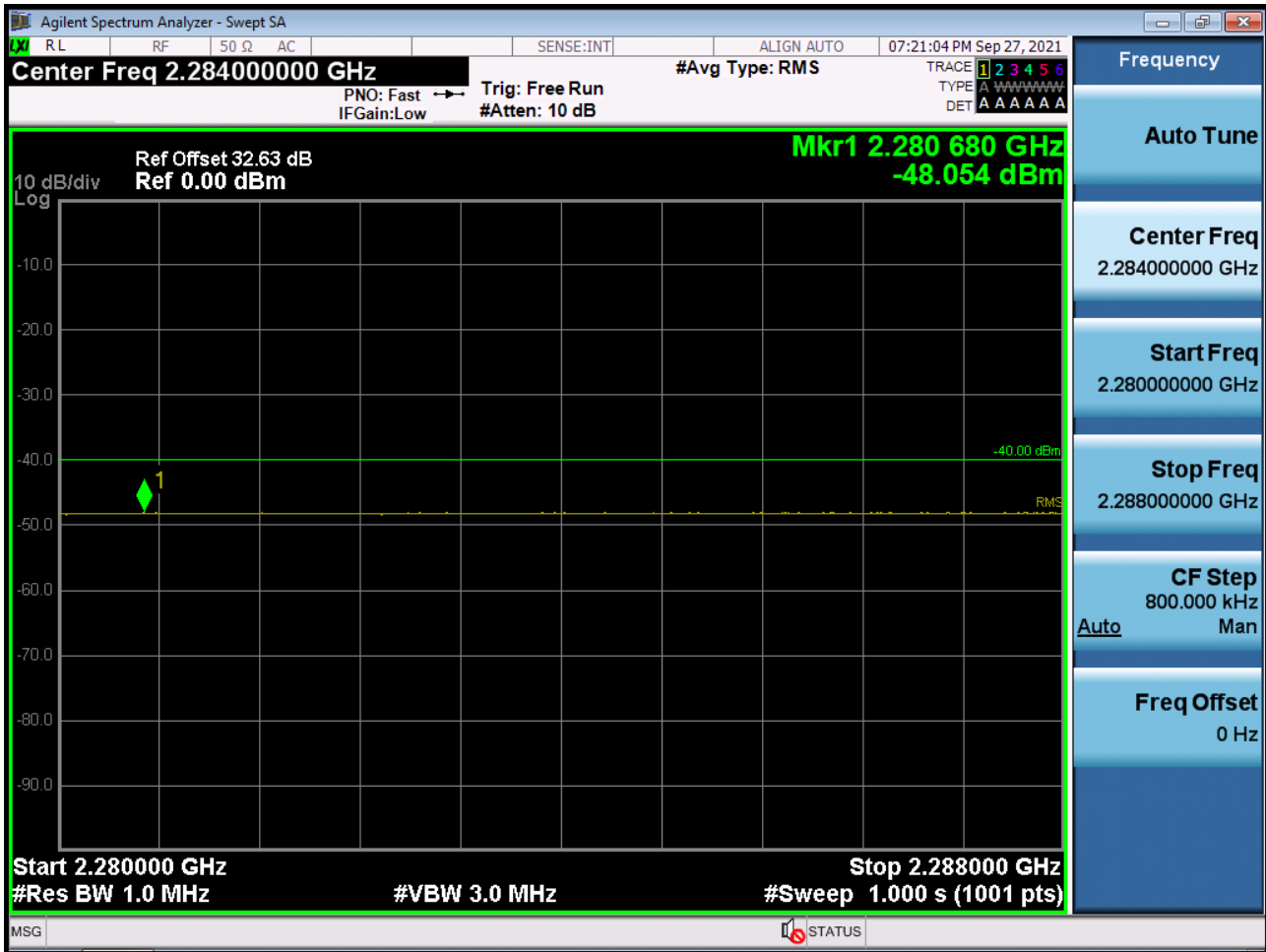
BAND 40. 5 M_BandEdge(2280 MHz-2288 MHz)_2312.5 MHz_FullIRB



BAND 40. 5 M_BandEdge(2280 MHz-2288 MHz)_2307.5 MHz_FullIRB



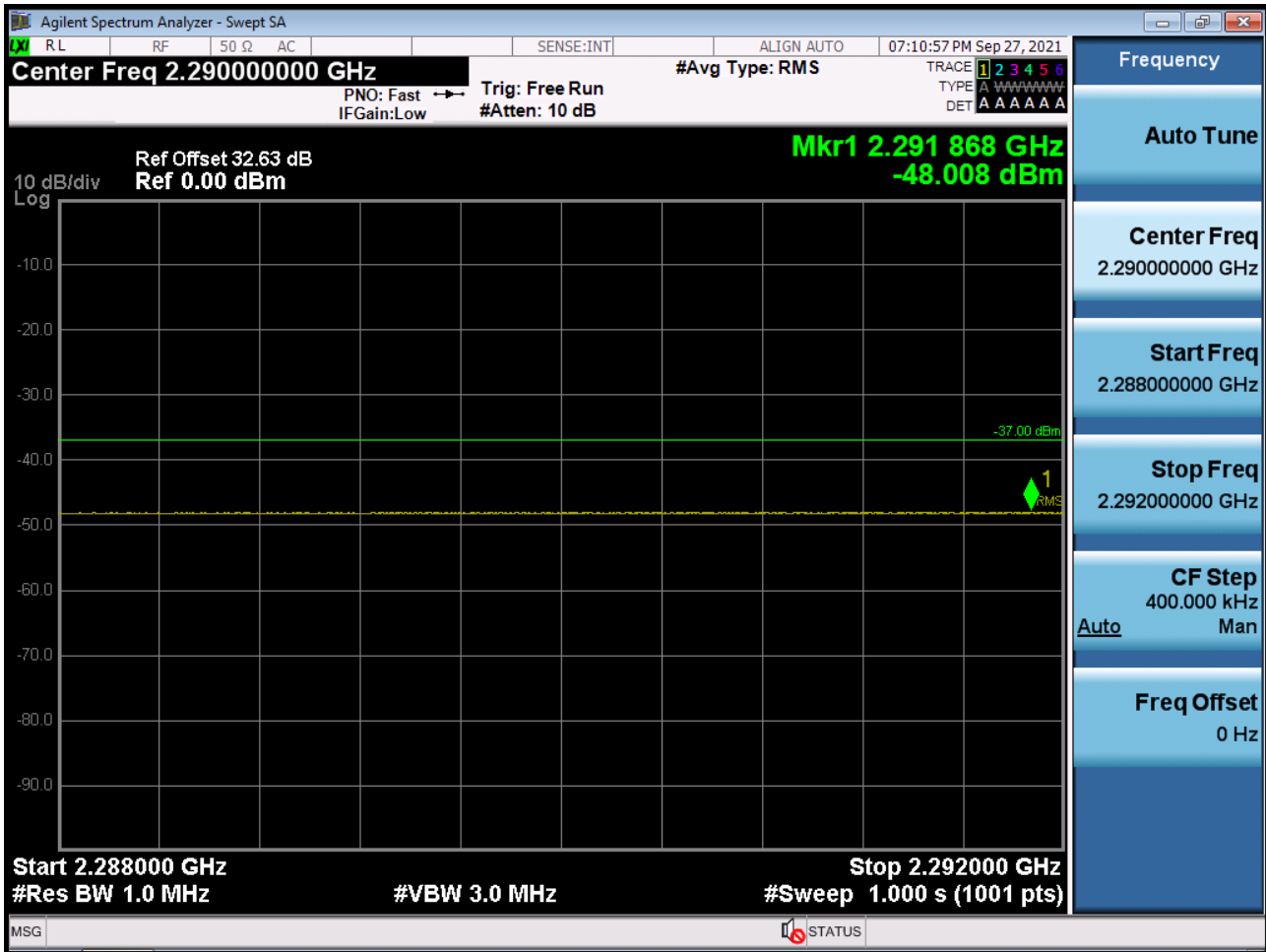
BAND 40. 5 M_BandEdge(2280 MHz-2288 MHz)_2310 MHz_FullIRB



BAND 40. 5 M_BandEdge(2288 MHz-2292 MHz)_2312.5 MHz_FullIRB



BAND 40. 5 M_BandEdge(2288 MHz-2292 MHz)_2307.5 MHz_FullIRB



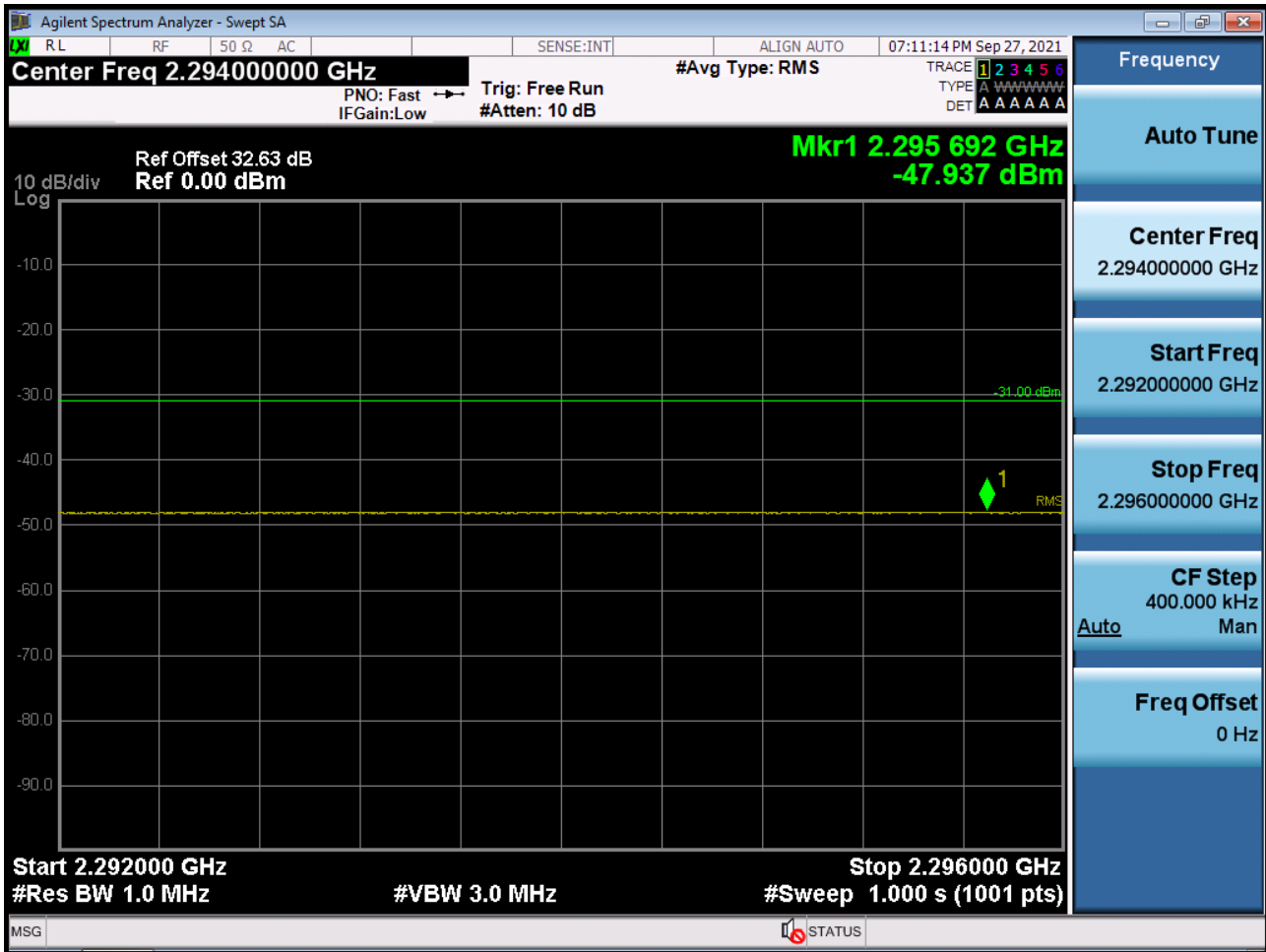
BAND 40. 5 M_BandEdge(2288 MHz-2292 MHz)_2310 MHz_FullIRB



BAND 40. 5 M_BandEdge(2292 MHz-2296 MHz)_2312.5 MHz_FullIRB



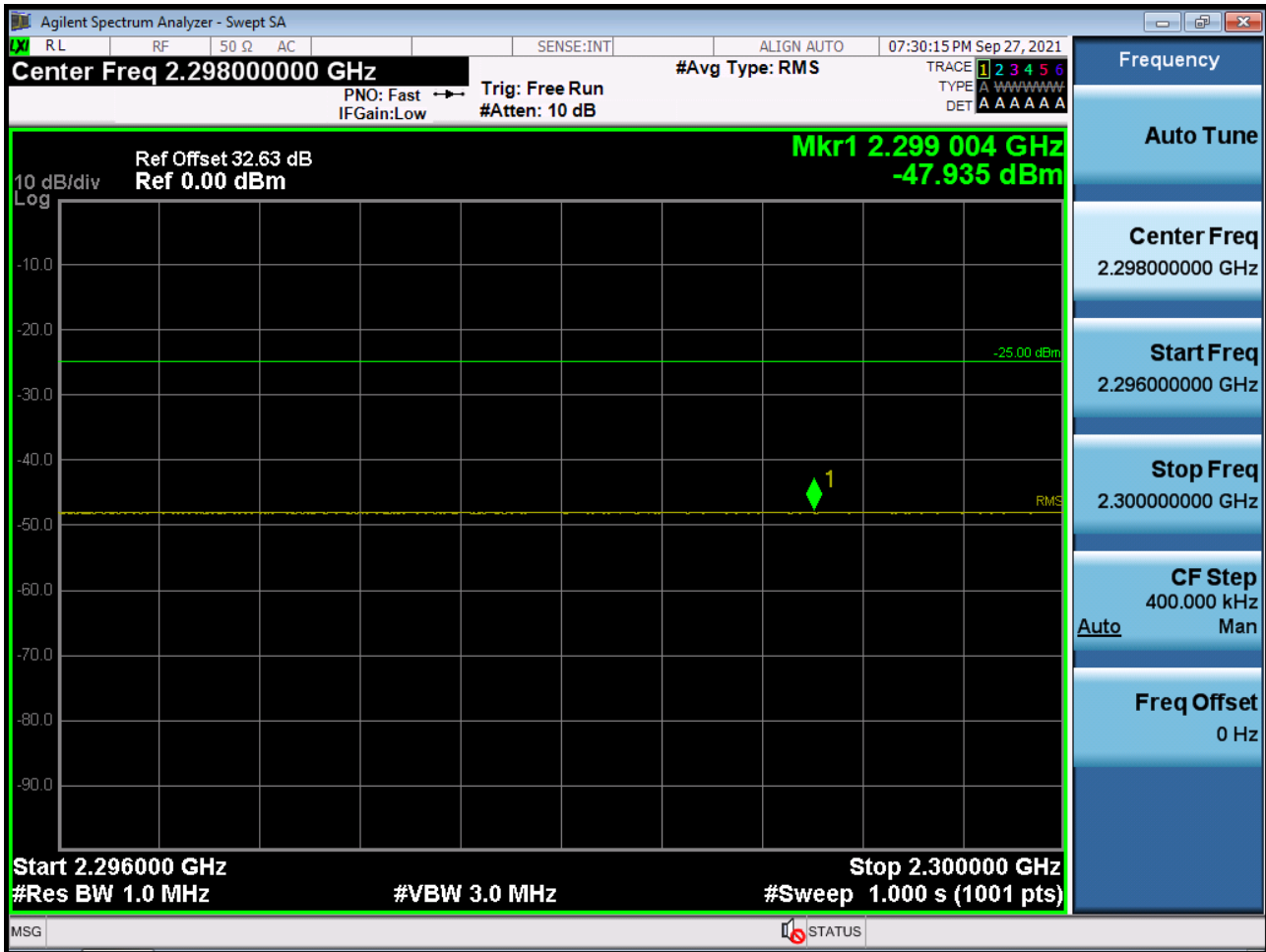
BAND 40. 5 M_BandEdge(2292 MHz-2296 MHz)_2307.5 MHz_FullIRB



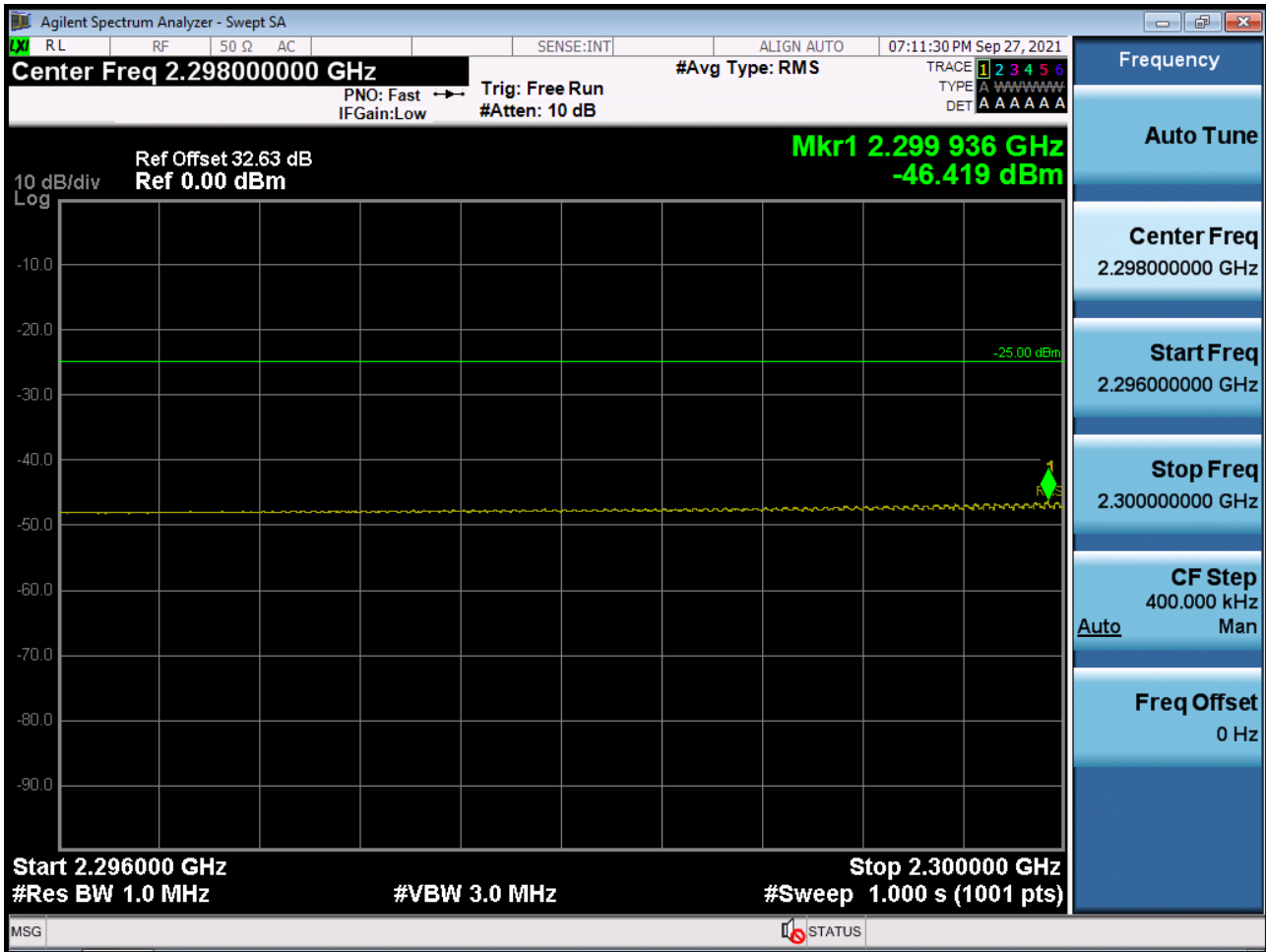
BAND 40. 5 M_BandEdge(2292 MHz-2296 MHz)_2310 MHz_FullIRB



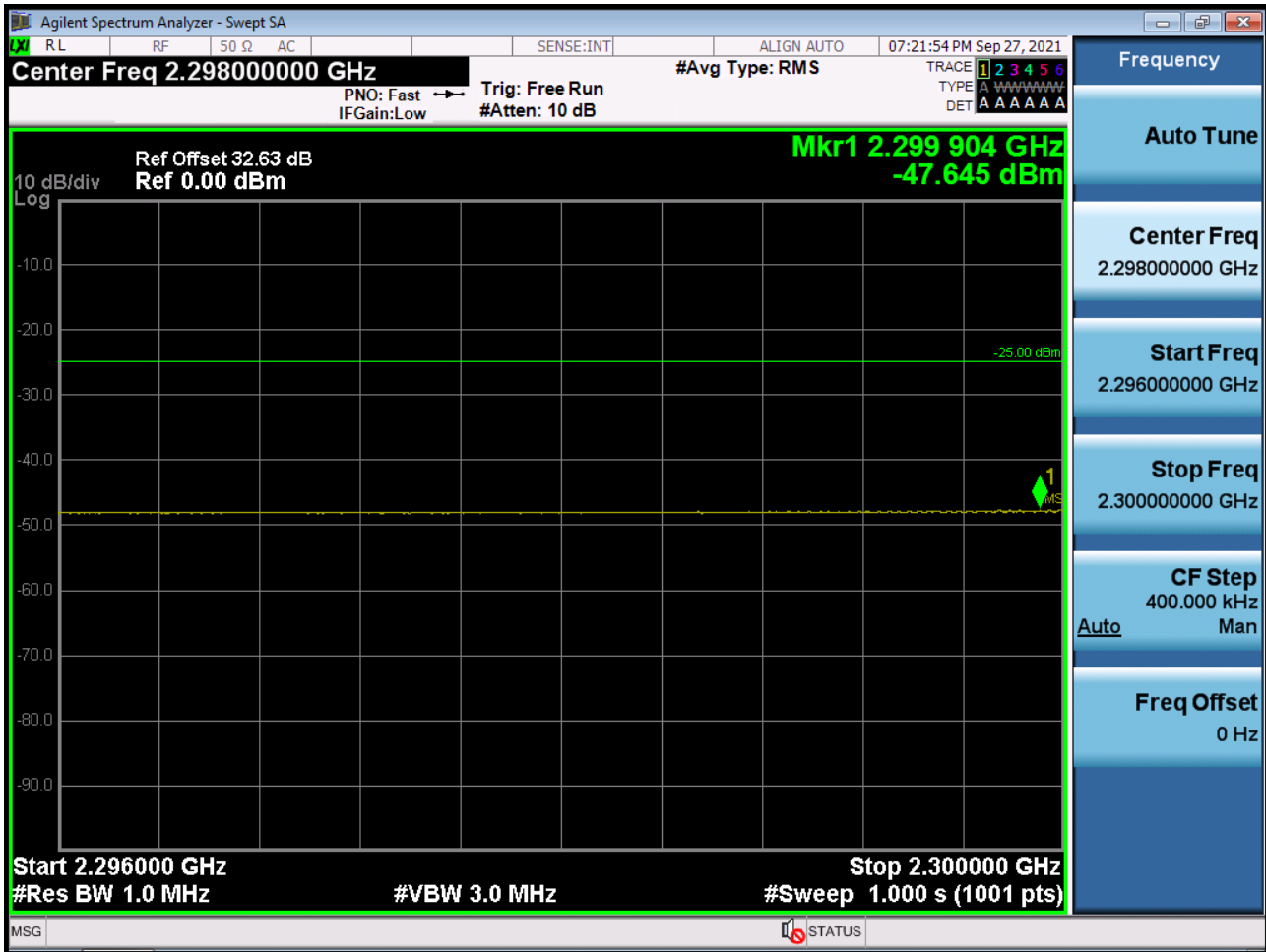
BAND 40. 5 M_BandEdge(2296 MHz-2300 MHz)_2312.5 MHz_FullIRB



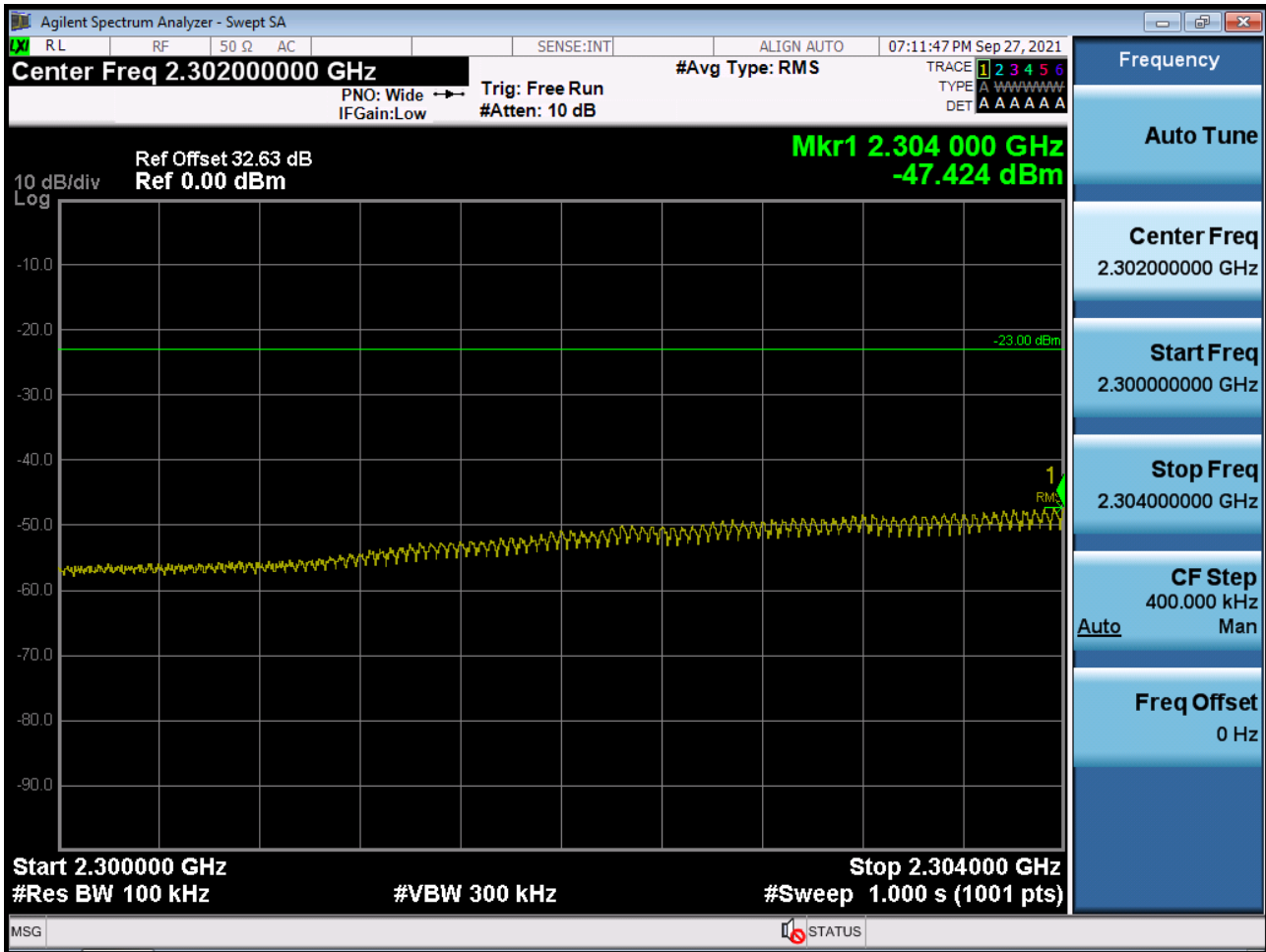
BAND 40. 5 M_BandEdge(2296 MHz-2300 MHz)_2307.5 MHz_FullIRB



BAND 40. 5 M_BandEdge(2296 MHz-2300 MHz)_2310 MHz_FullIRB



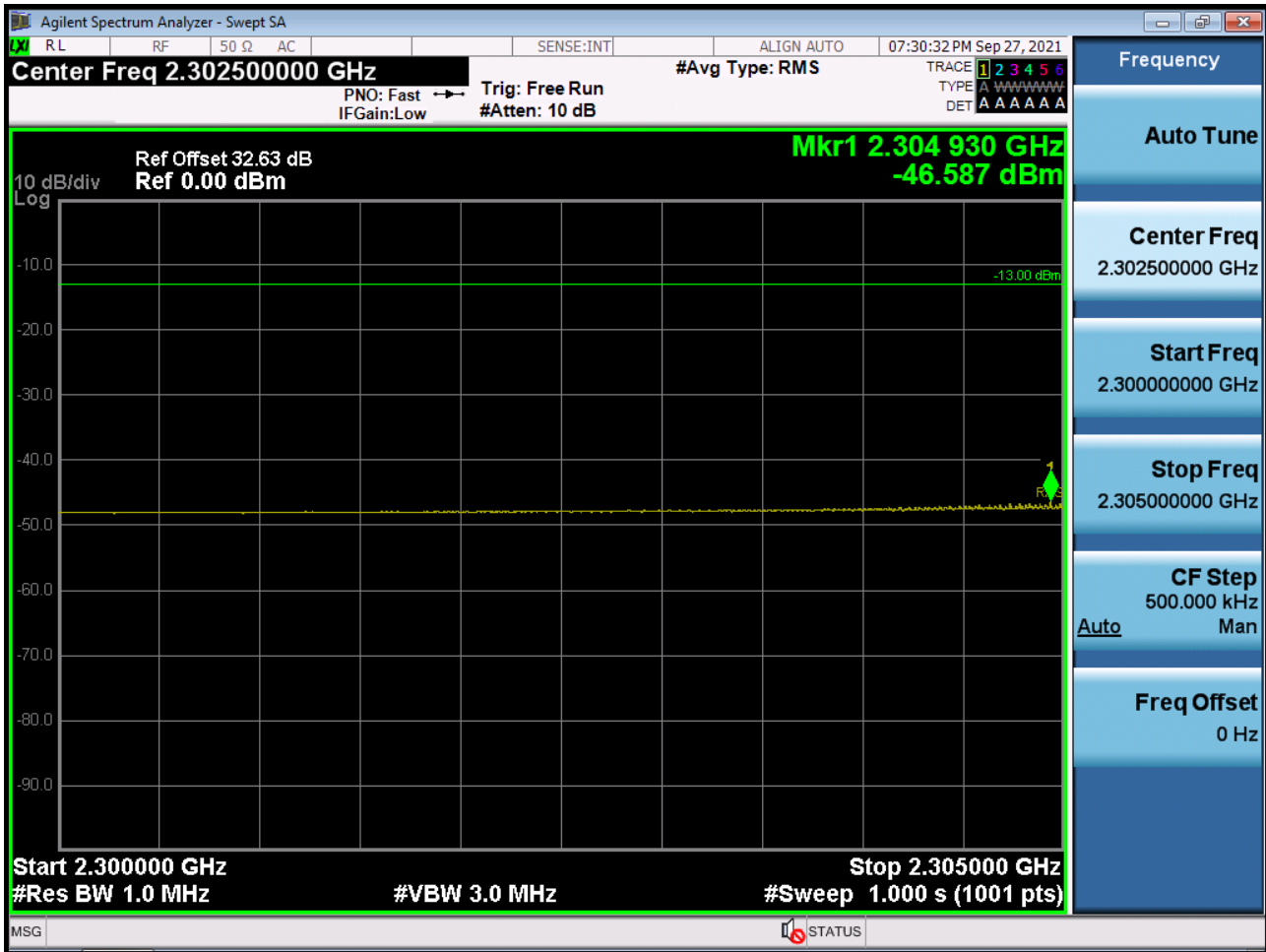
BAND 40. 5 M_BandEdge(2300 MHz-2304 MHz)_2307.5 MHz_FullRB



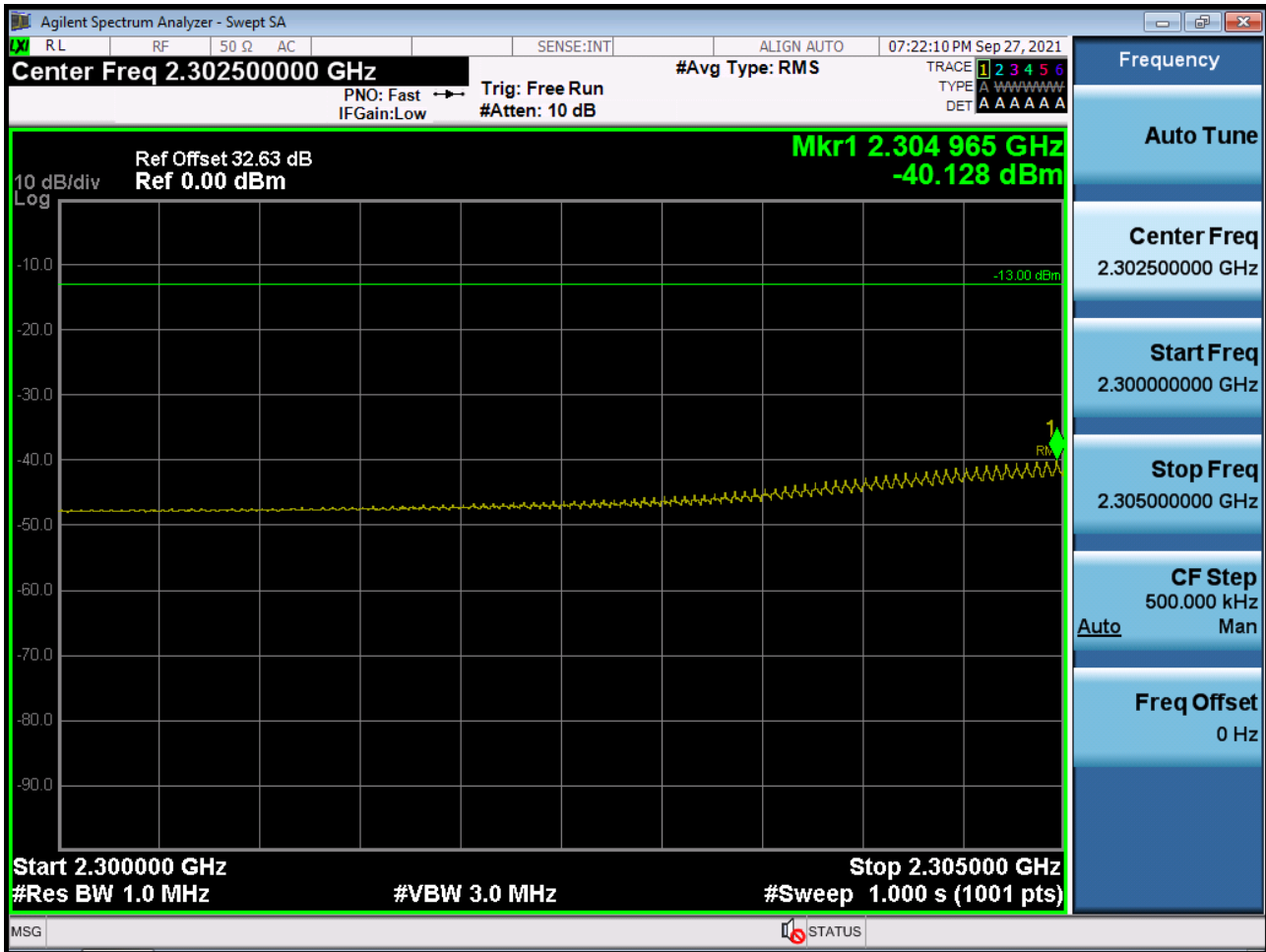
Note : We used a narrower RBW in order to increase accuracy.

Calculation = Reading Value + 10 x log(1 MHz/100 kHz) dB = -47.424 dBm + 10 dB = -37.424 dBm

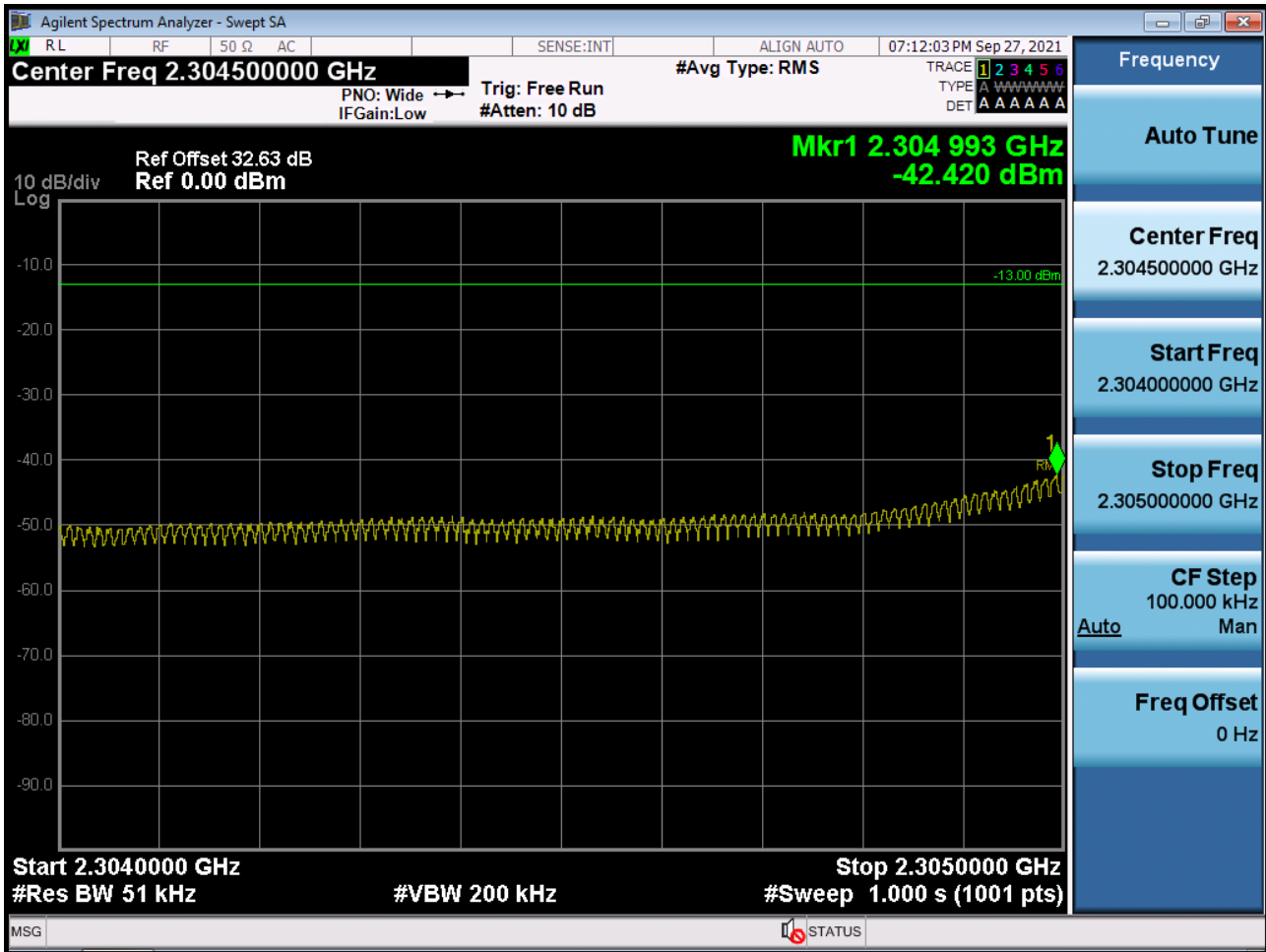
BAND 40. 5 M_BandEdge(2300 MHz-2305 MHz)_2312.5 MHz_FullIRB



BAND 40.5 M_BandEdge(2300 MHz-2305 MHz)_2310 MHz_FullRB



BAND 40. 5 M_BandEdge(2304 MHz-2305 MHz)_ 2307.5 MHz_FullIRB



BAND 40. 5 M_BandEdge(2315 MHz-2316 MHz)_2312.5 MHz_FullIRB

