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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:
January 21, 2021

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

Report No.: HCT-RF-2101-FC077

FCC ID:	**A3LSMA325M**
APPLICANT:	**SAMSUNG Electronics Co., Ltd.**

Model(s):	SM-A325M/DS
Additional Model(s):	SM-A325M
EUT Type:	Mobile Phone
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part(s):	§22, §2

Mode (MHz)	Tx Frequency (MHz)	Emission Designator	Modulation	ERP	
				Max. Power (W)	Max. Power (dBm)
LTE – Band26 (1.4)	824.7 – 848.3	1M09G7D	QPSK	0.075	18.76
		1M09W7D	16QAM	0.064	18.08
		1M10W7D	64QAM	0.050	16.97
LTE – Band26 (3)	825.5 – 847.5	2M70G7D	QPSK	0.076	18.80
		2M69W7D	16QAM	0.065	18.13
		2M69W7D	64QAM	0.050	17.01
LTE – Band26 (5)	826.5 – 846.5	4M51G7D	QPSK	0.066	18.19
		4M49W7D	16QAM	0.056	17.52
		4M51W7D	64QAM	0.044	16.39
LTE – Band26 (10)	829.0 – 844.0	8M97G7D	QPSK	0.068	18.30
		8M98W7D	16QAM	0.057	17.59
		8M98W7D	64QAM	0.044	16.48
LTE – Band26 (15)	831.5 – 841.5	13M5G7D	QPSK	0.070	18.43
		13M5W7D	16QAM	0.059	17.69
		13M4W7D	64QAM	0.045	16.57

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-2101-FC077	January 21, 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:	A3LSMA325M
Application Type:	Certification
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part(s):	§22, §2
EUT Type:	Mobile Phone
Model(s):	SM-A325M/DS
Additional Model(s):	SM-A325M
Tx Frequency:	824.7 MHz – 848.3 MHz (LTE – Band 26 (1.4 MHz)) 825.5 MHz – 847.5 MHz (LTE – Band 26 (3 MHz)) 826.5 MHz – 846.5 MHz (LTE – Band 26 (5 MHz)) 829.0 MHz – 844.0 MHz (LTE – Band 26 (10 MHz)) 831.5 MHz – 841.5 MHz (LTE – Band 26 (15 MHz))
Date(s) of Tests:	December 16, 2020 ~ January 12, 2021
Serial number:	Radiated: R38NB02J7SE Conducted: R38NC01F5SF

2. INTRODUCTION

2.1. DESCRIPTION OF EUT

The EUT was a Mobile Phone with GSM/GPRS/EGPRS/UMTS and LTE.

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)
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 1MHz
3. VBW ≥ 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points > 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

Test Note

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

   The power is calculated by the following formula;

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

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

3.3 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 = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW ≥ 3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points > 2 x span / RBW
5. Detector = Peak
6. Trace mode = Max Hold
7. The trace was allowed to stabilize
8. Test channel : Low/ Middle/ High
9. Frequency range : We are performed all frequency to 10^{th} harmonics from 9 kHz.

Test Note

1. Measurements value show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
2. The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the test data
3. For spurious emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated.
   The spurious emissions is calculated by the following formula;

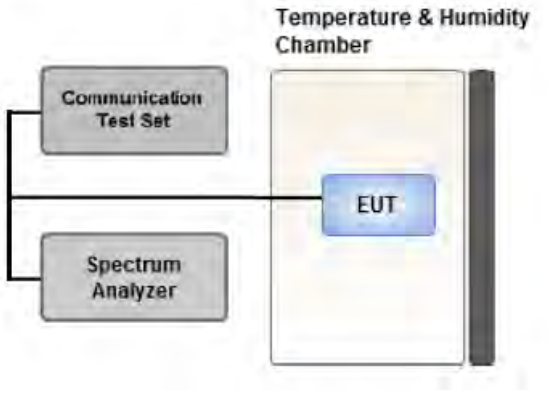
$$Result_{(dBm)} = Pg_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dBi)}$$

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

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

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

3.4 OCCUPIED BANDWIDTH.



Test setup

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

The EUT makes a call to the communication simulator.

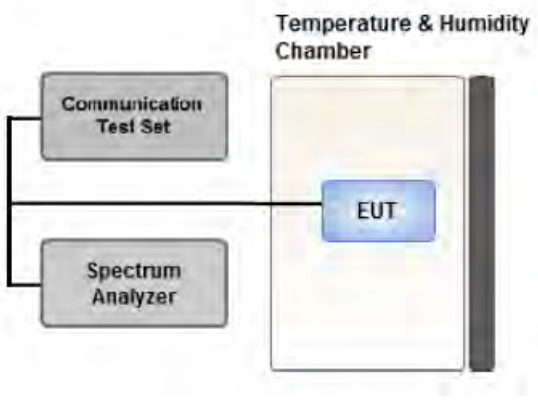
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth

Test Settings

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

3.5 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL



Test setup

Test Overview

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic.

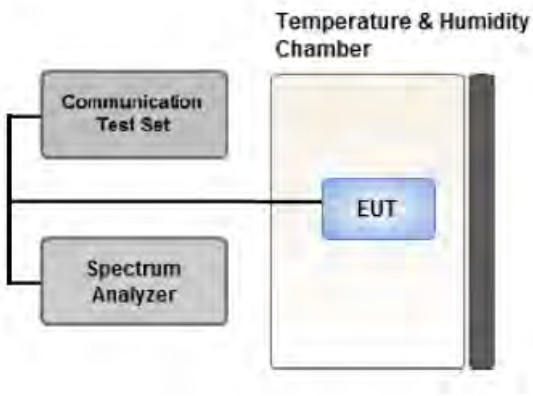
All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

Test Settings

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

3.6 BAND EDGE



Test setup

Test Overview

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

Test Settings

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

Test Notes

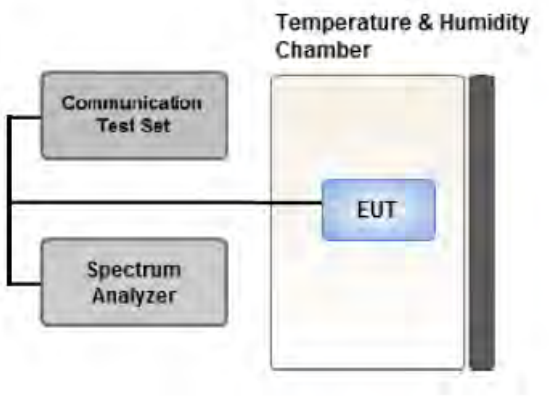
According to FCC 22.917, 24.238, 27.53 specified that power of any emission outside of The authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

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

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

3.7 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.

3.8 WORST CASE(RADIATED TEST)

- The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
- All modes of operation were investigated and the worst case configuration results are reported.

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

- The worst case is reported with the EUT positioning, modulations, and paging service configurations shown in the test data.
- SM-A325M/DS & additional models were tested and the worst case results are reported.

(Worst case : SM-A325M/DS)

[Worst case]

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

3.9 WORST CASE(CONDUCTED TEST)

- All modes of operation were investigated and the worst case configuration results are reported.
- SM-A325M/DS & additional models were tested and the worst case results are reported.

(Worst case : SM-A325M/DS)

[Worst case]

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

4. LIST OF TEST EQUIPMENT

Manufacture	Model/ Equipment	Serial Number	Calibration Date	Calibration Interval	Calibration Due
T&M SYSTEM	FBSR-02B(WHK1.2/15G-10EF)/H.P.F	-	03/09/2020	Annual	03/09/2021
T&M SYSTEM	FBSR-02B(WHK3.3/18G-10EF)/H.P.F	-	03/09/2020	Annual	03/09/2021
Hewlett Packard	11667B / Power Splitter(DC~26.5 GHz)	11275	04/27/2020	Annual	04/27/2021
Hewlett Packard	E3632A/DC Power Supply	MY40004427	09/16/2020	Annual	09/16/2021
Schwarzbeck	UHAP/ Dipole Antenna	557	03/29/2019	Biennial	03/29/2021
Schwarzbeck	UHAP/ Dipole Antenna	558	03/29/2019	Biennial	03/29/2021
ESPEC	SU-642 / Chamber	93008124	03/18/2020	Annual	03/18/2021
Schwarzbeck	BBHA 9120D/ Horn Antenna(1~18GHz)	147	08/29/2019	Biennial	08/29/2021
Schwarzbeck	BBHA 9120D/ Horn Antenna(1~18GHz)	9120D-1298	09/25/2019	Biennial	09/25/2021
Schwarzbeck	BBHA 9170/ Horn Antenna(15~40GHz)	BBHA9170342	04/29/2019	Biennial	04/29/2021
Schwarzbeck	BBHA 9170/ Horn Antenna(15~40GHz)	BBHA9170124	02/11/2020	Biennial	02/11/2022
Agilent	N9020A/Signal Analyzer(10Hz~26.5GHz)	MY51110063	04/27/2020	Annual	04/27/2021
Hewlett Packard	8493C/ATTENUATOR(20dB)	17280	06/04/2020	Annual	06/04/2021
REOHDE & SCHWARZ	FSV40/Spectrum Analyzer(10Hz~40GHz)	100931	10/14/2020	Annual	10/14/2021
Agilent	8960 (E5515C)/ Base Station	MY48360800	08/26/2020	Annual	08/26/2021
Schwarzbeck	FMZB1513/ Loop Antenna(9kHz~30MHz)	1513-175	04/26/2019	Biennial	04/26/2021
Schwarzbeck	VULB9160/ Bilog Antenna	3150	03/12/2019	Biennial	03/12/2021
Schwarzbeck	VULB9160/ Hybrid Antenna	760	03/22/2019	Biennial	03/22/2021
Anritsu Corp.	MT8821C/Wideband Radio Communication Tester	6262116770	07/22/2020	Annual	07/22/2021
Anritsu Corp.	MT8820C/Wideband Radio Communication Tester	6201026545	01/07/2021	Annual	01/07/2022
REOHDE & SCHWARZ	SMB100A/ SIGNAL GENERATOR (100kHz~40GHz)	177633	07/13/2020	Annual	07/13/2021
KEYSIGHT	N9030B / Signal Analyzer(5Hz~40.0GHz)	MY55480167	06/04/2020	Annual	06/04/2021
HCT CO., LTD.,	FCC LTE Mobile Conducted RF Automation Test Software	-	-	-	-

Note:

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

5. MEASUREMENT UNCERTAINTY

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

Parameter	Expanded Uncertainty (±dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70
Radiated Disturbance (18 GHz ~ 40 GHz)	5.05

6. SUMMARY OF TEST RESULTS

6.1 Test Condition : Conducted Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Occupied Bandwidth	§2.1049	N/A	PASS
Band Edge / Spurious and Harmonic Emissions at Antenna Terminal.	§2.1051, §22.917(a)	< 43 + 10log10 (P[Watts]) at Band Edge and for all out-of-band emissions	PASS
Conducted Output Power	§2.1046	N/A	See Note1
Frequency stability / variation of ambient temperature	§2.1055, §22.355	< 2.5 ppm	PASS

Note:

1. See SAR Report

6.2 Test Condition : Radiated Test

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

7. SAMPLE CALCULATION

7.1 ERP Sample Calculation

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

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

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

7.2 EIRP Sample Calculation

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

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

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

7.3. Emission Designator

GSM Emission Designator

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

EDGE Emission Designator

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

WCDMA Emission Designator

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

QPSK Modulation

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

QAM Modulation

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

8. TEST DATA

8.1 EFFECTIVE RADIATED POWER

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBd)	C.L	Pol	Limit	ERP	
								W	W	dBm
824.7	LTE 26 (1.4 MHz)	QPSK	-33.10	30.40	-10.24	1.40	H	< 7.00	0.075	18.76
		16-QAM	-33.78	29.72	-10.24	1.40	H		0.064	18.08
		64-QAM	-34.89	28.61	-10.24	1.40	H		0.050	16.97
836.5		QPSK	-34.21	29.72	-10.19	1.41	H		0.065	18.12
		16-QAM	-34.97	28.96	-10.19	1.41	H		0.054	17.36
		64-QAM	-36.01	27.92	-10.19	1.41	H		0.043	16.32
848.3		QPSK	-34.04	30.10	-10.14	1.42	H		0.071	18.54
		16-QAM	-34.74	29.40	-10.14	1.42	H		0.061	17.84
		64-QAM	-35.81	28.33	-10.14	1.42	H		0.048	16.77

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBd)	C.L	Pol	Limit	ERP	
								W	W	dBm
825.5	LTE 26 (3 MHz)	QPSK	-33.07	30.44	-10.24	1.40	H	< 7.00	0.076	18.80
		16-QAM	-33.74	29.77	-10.24	1.40	H		0.065	18.13
		64-QAM	-34.86	28.65	-10.24	1.40	H		0.050	17.01
836.5		QPSK	-34.17	29.76	-10.19	1.41	H		0.065	18.16
		16-QAM	-34.91	29.02	-10.19	1.41	H		0.055	17.42
		64-QAM	-35.98	27.95	-10.19	1.41	H		0.043	16.35
847.5		QPSK	-34.08	30.02	-10.15	1.42	H		0.070	18.45
		16-QAM	-34.78	29.32	-10.15	1.42	H		0.060	17.75
		64-QAM	-35.88	28.22	-10.15	1.42	H		0.046	16.65

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBd)	C.L	Pol	Limit	ERP	
								W	W	dBm
826.5	LTE 26 (5 MHz)	QPSK	-34.15	29.43	-10.24	1.40	H	< 7.00	0.060	17.79
		16-QAM	-34.84	28.74	-10.24	1.40	H		0.051	17.10
		64-QAM	-35.93	27.65	-10.24	1.40	H		0.040	16.01
836.5		QPSK	-34.21	29.72	-10.19	1.41	H		0.065	18.12
		16-QAM	-34.95	28.98	-10.19	1.41	H		0.055	17.38
		64-QAM	-36.02	27.91	-10.19	1.41	H		0.043	16.31
846.5		QPSK	-34.24	29.76	-10.15	1.42	H		0.066	18.19
		16-QAM	-34.91	29.09	-10.15	1.42	H		0.056	17.52
		64-QAM	-36.04	27.96	-10.15	1.42	H		0.044	16.39

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBd)	C.L	Pol	Limit	ERP	
								W	W	dBm
829.0	LTE 26 (10 MHz)	QPSK	-34.04	29.67	-10.22	1.40	H	< 7.00	0.064	18.05
		16-QAM	-34.75	28.96	-10.22	1.40	H		0.054	17.34
		64-QAM	-35.87	27.84	-10.22	1.40	H		0.042	16.22
836.5		QPSK	-34.03	29.90	-10.19	1.41	H		0.068	18.30
		16-QAM	-34.74	29.19	-10.19	1.41	H		0.057	17.59
		64-QAM	-35.85	28.08	-10.19	1.41	H		0.044	16.48
844.0		QPSK	-34.26	29.60	-10.16	1.41	H		0.064	18.03
		16-QAM	-34.95	28.91	-10.16	1.41	H		0.054	17.34
		64-QAM	-36.08	27.78	-10.16	1.41	H		0.042	16.21

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBd)	C.L	Pol	Limit	ERP	
								W	W	dBm
831.5	LTE B26 (15 MHz)	QPSK	-34.05	29.78	-10.21	1.40	H	< 7.00	0.066	18.17
		16-QAM	-34.75	29.08	-10.21	1.40	H		0.056	17.47
		64-QAM	-35.84	27.99	-10.21	1.40	H		0.043	16.38
836.5		QPSK	-33.90	30.03	-10.19	1.41	H		0.070	18.43
		16-QAM	-34.64	29.29	-10.19	1.41	H		0.059	17.69
		64-QAM	-35.76	28.17	-10.19	1.41	H		0.045	16.57
841.5		QPSK	-34.10	29.80	-10.17	1.41	H		0.066	18.22
		16-QAM	-34.85	29.05	-10.17	1.41	H		0.056	17.47
		64-QAM	-35.91	27.99	-10.17	1.41	H		0.044	16.41

8.2 RADIATED SPURIOUS EMISSIONS

▣ MODE: LTE B26

▣ MODULATION SIGNAL: 3 MHz QPSK

▣ DISTANCE: 3 meters

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBd)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit
26805 (825.5)	1 651.00	-53.41	9.50	-63.02	1.99	H	-55.51	-13.00
	2 476.50	-55.23	10.60	-59.43	2.48	H	-51.31	-13.00
	3 302.00	-57.92	12.30	-58.98	2.89	H	-49.57	-13.00
26915 (836.5)	1 673.00	-53.28	9.65	-63.05	2.01	H	-55.41	-13.00
	2 509.50	-55.18	10.75	-58.90	2.50	V	-50.65	-13.00
	3 346.00	-57.81	12.48	-58.80	2.92	V	-49.24	-13.00
27025 (847.5)	1 695.00	-51.38	9.76	-60.98	2.03	H	-53.25	-13.00
	2 542.50	-56.39	10.85	-59.92	2.51	H	-51.58	-13.00
	3 390.00	-57.88	12.65	-58.69	2.94	H	-48.98	-13.00

8.3 OCCUPIED BANDWIDTH

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
26	1.4 MHz	836.5	QPSK	6	0	1.0935
			16-QAM			1.0889
			64-QAM			1.0961
	3 MHz		QPSK	15		2.6961
			16-QAM			2.6913
			64-QAM			2.6943
	5 MHz		QPSK	25		4.5102
			16-QAM			4.4876
			64-QAM			4.5071
	10 MHz		QPSK	50		8.9693
			16-QAM			8.9787
			64-QAM			8.9831
	15 MHz		QPSK	75		13.471
			16-QAM			13.451
			64-QAM			13.423

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 33 ~ 47.

8.4 CONDUCTED SPURIOUS EMISSIONS

Band	Band Width (MHz)	Frequency (MHz)	Frequency of Maximum Harmonic (GHz)	Factor (dB)	Measurement Maximum Data (dBm)	Result (dBm)	Limit (dBm)
26	1.4	824.7	3.6980	27.976	-67.150	-39.174	-13.00
		836.5	3.7159	27.976	-66.850	-38.874	
		848.3	3.6965	27.976	-66.942	-38.966	
	3	825.5	3.6686	27.976	-67.458	-39.482	
		836.5	3.6895	27.976	-67.048	-39.072	
		847.5	3.6890	27.976	-67.145	-39.169	
	5	826.5	3.7134	27.976	-67.219	-39.243	
		836.5	3.6770	27.976	-67.048	-39.072	
		846.5	3.7144	27.976	-66.997	-39.021	
	10	829.0	3.7074	27.976	-66.916	-38.940	
		836.5	3.6960	27.976	-66.734	-38.758	
		844.0	3.6985	27.976	-67.186	-39.210	
	15	831.5	3.7079	27.976	-67.334	-39.358	
		836.5	3.6845	27.976	-66.891	-38.915	
		841.5	3.7209	27.976	-67.110	-39.134	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 78 ~ 92.
2. Conducted Spurious Emissions was Tested QPSK Modulation, Resource Block Size 1 and Resource Block Offset 0
3. Result (dBm) = Measurement Maximum Data (dBm) + Factor (dB)
4. Factor(dB) = Cable Loss + Attenuator + Power Splitter

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

8.5 BAND EDGE

- Plots of the EUT's Band Edge are shown Page 48 ~ 77.

8.6 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

▣ MODE: LTE 26

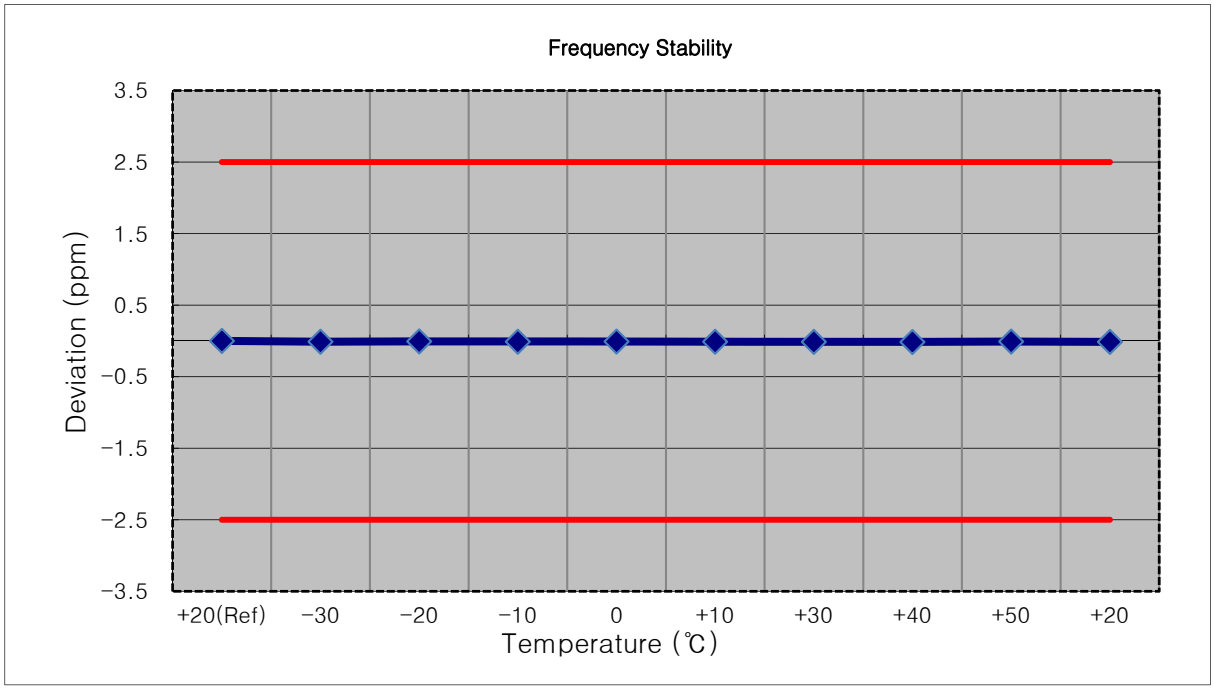
▣ OPERATING FREQUENCY: 836,500,000 Hz

▣ CHANNEL: 26915 (1.4 MHz)

▣ REFERENCE VOLTAGE: 3.86 VDC

▣ DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.860	+20(Ref)	836 499 988	0.0	0.000 000	0.000
100%		-30	836 499 978	-9.9	-0.000 001	-0.012
100%		-20	836 499 982	-6.2	-0.000 001	-0.007
100%		-10	836 499 979	-8.7	-0.000 001	-0.010
100%		0	836 499 981	-6.7	-0.000 001	-0.008
100%		+10	836 499 979	-9.2	-0.000 001	-0.011
100%		+30	836 499 977	-10.4	-0.000 001	-0.012
100%		+40	836 499 975	-12.5	-0.000 001	-0.015
100%		+50	836 499 980	-8.1	-0.000 001	-0.010
Batt. Endpoint	3.400	+20	836 499 976	-11.7	-0.000 001	-0.014



▣ MODE: LTE 26

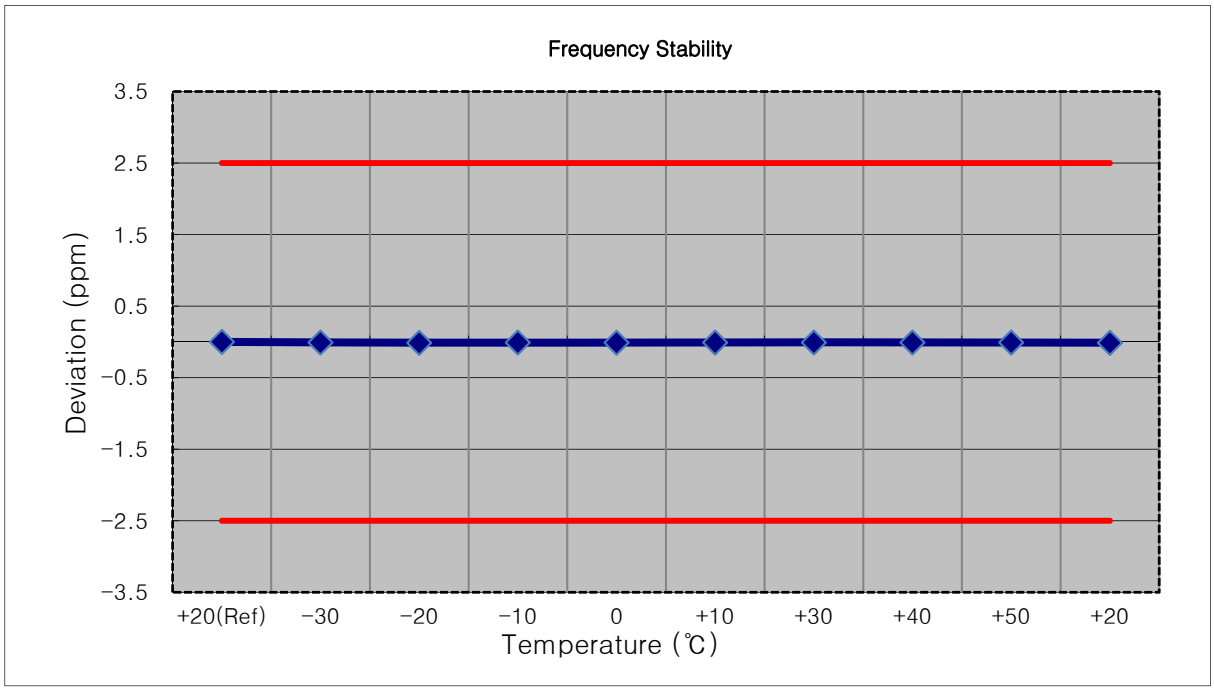
▣ OPERATING FREQUENCY: 836,500,000 Hz

▣ CHANNEL: 26915 (3 MHz)

▣ REFERENCE VOLTAGE: 3.86 VDC

▣ DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.860	+20(Ref)	836 499 990	0.0	0.000 000	0.000
100%		-30	836 499 983	-6.7	-0.000 001	-0.008
100%		-20	836 499 980	-10.4	-0.000 001	-0.012
100%		-10	836 499 982	-7.9	-0.000 001	-0.009
100%		0	836 499 981	-8.8	-0.000 001	-0.011
100%		+10	836 499 983	-7.3	-0.000 001	-0.009
100%		+30	836 499 983	-6.7	-0.000 001	-0.008
100%		+40	836 499 984	-6.3	-0.000 001	-0.008
100%		+50	836 499 982	-8.0	-0.000 001	-0.010
Batt. Endpoint	3.400	+20	836 499 980	-10.3	-0.000 001	-0.012



▣ MODE: LTE 26

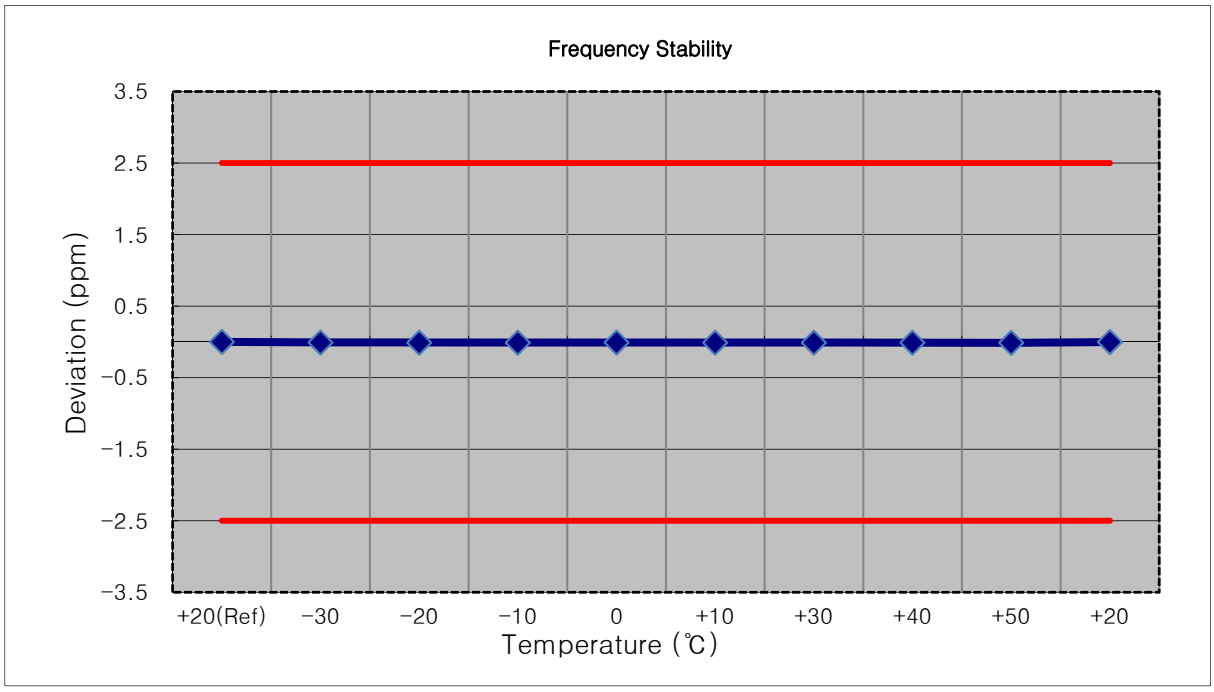
▣ OPERATING FREQUENCY: 836,500,000 Hz

▣ CHANNEL: 26915 (5 MHz)

▣ REFERENCE VOLTAGE: 3.86 VDC

▣ DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.860	+20(Ref)	836 499 996	0.0	0.000 000	0.000
100%		-30	836 499 990	-6.3	-0.000 001	-0.008
100%		-20	836 499 987	-8.7	-0.000 001	-0.010
100%		-10	836 499 988	-8.3	-0.000 001	-0.010
100%		0	836 499 989	-7.0	-0.000 001	-0.008
100%		+10	836 499 988	-8.4	-0.000 001	-0.010
100%		+30	836 499 987	-9.2	-0.000 001	-0.011
100%		+40	836 499 987	-8.6	-0.000 001	-0.010
100%		+50	836 499 986	-10.2	-0.000 001	-0.012
Batt. Endpoint	3.400	+20	836 499 994	-2.1	0.000 000	-0.003



▣ MODE: LTE 26

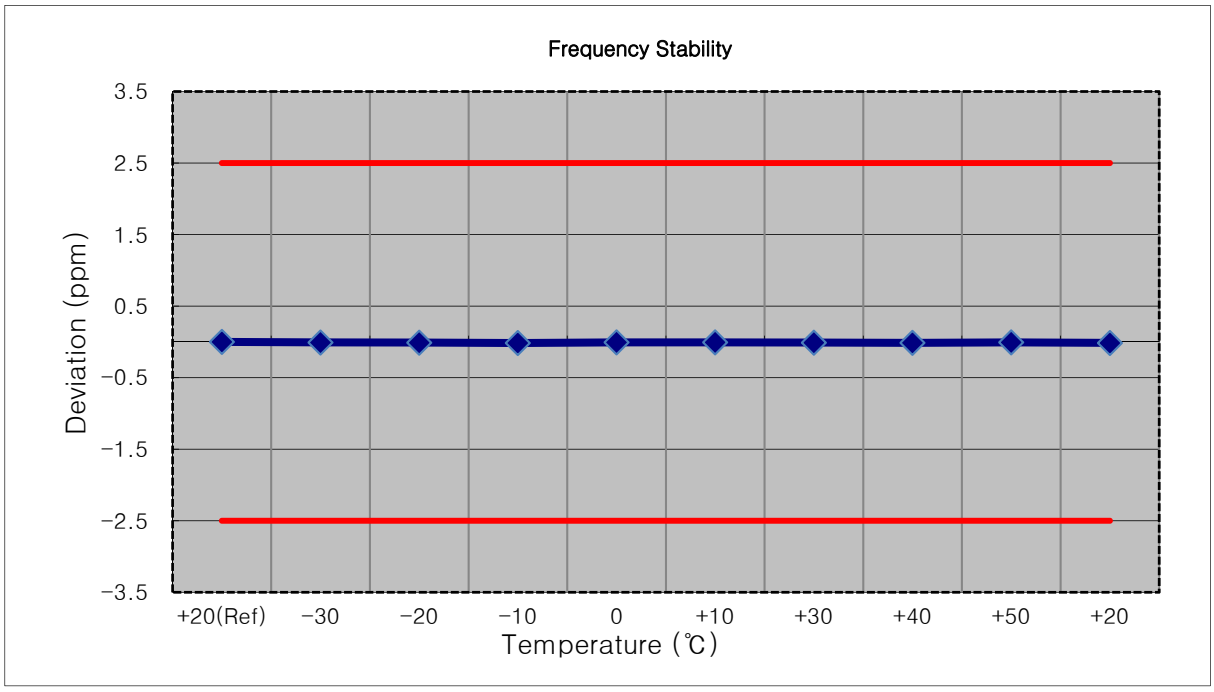
▣ OPERATING FREQUENCY: 836,500,000 Hz

▣ CHANNEL: 26915 (10 MHz)

▣ REFERENCE VOLTAGE: 3.86 VDC

▣ DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.860	+20(Ref)	836 499 988	0.0	0.000 000	0.000
100%		-30	836 499 981	-6.9	-0.000 001	-0.008
100%		-20	836 499 979	-8.8	-0.000 001	-0.011
100%		-10	836 499 976	-12.4	-0.000 001	-0.015
100%		0	836 499 982	-6.0	-0.000 001	-0.007
100%		+10	836 499 982	-5.8	-0.000 001	-0.007
100%		+30	836 499 979	-8.6	-0.000 001	-0.010
100%		+40	836 499 977	-11.0	-0.000 001	-0.013
100%		+50	836 499 982	-5.8	-0.000 001	-0.007
Batt. Endpoint	3.400	+20	836 499 976	-12.0	-0.000 001	-0.014



▣ MODE: LTE B26

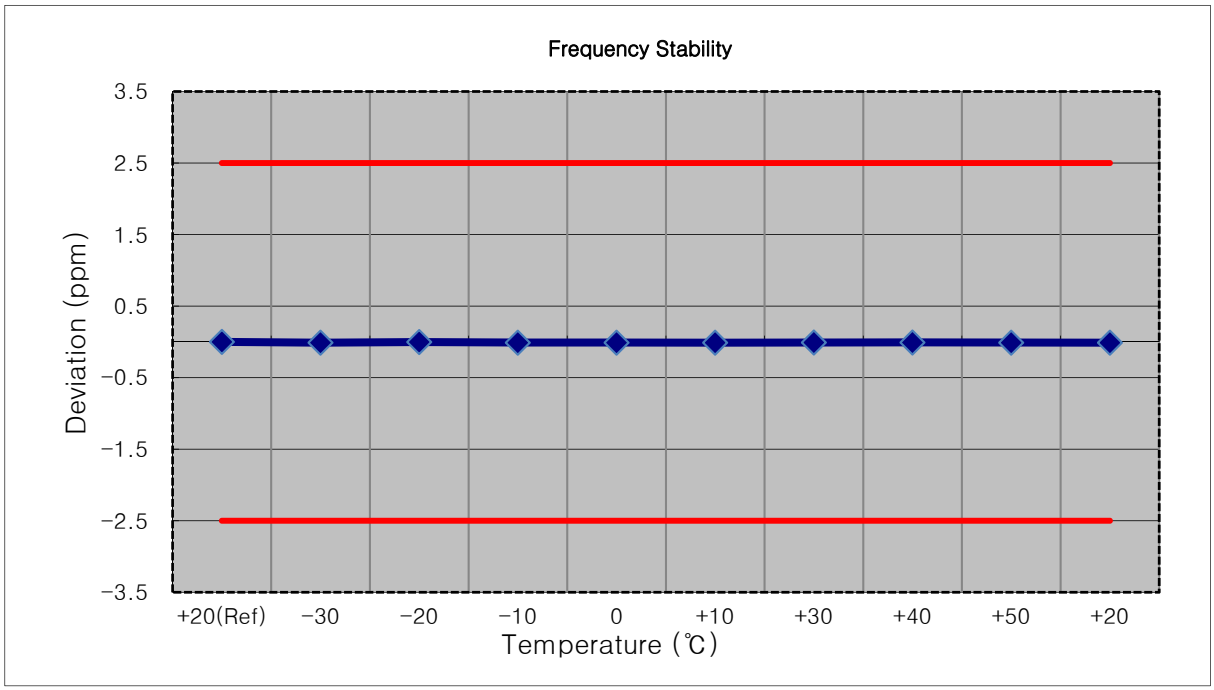
▣ OPERATING FREQUENCY: 836,500,000 Hz

▣ CHANNEL: 26915 (15 MHz)

▣ REFERENCE VOLTAGE: 3.86 VDC

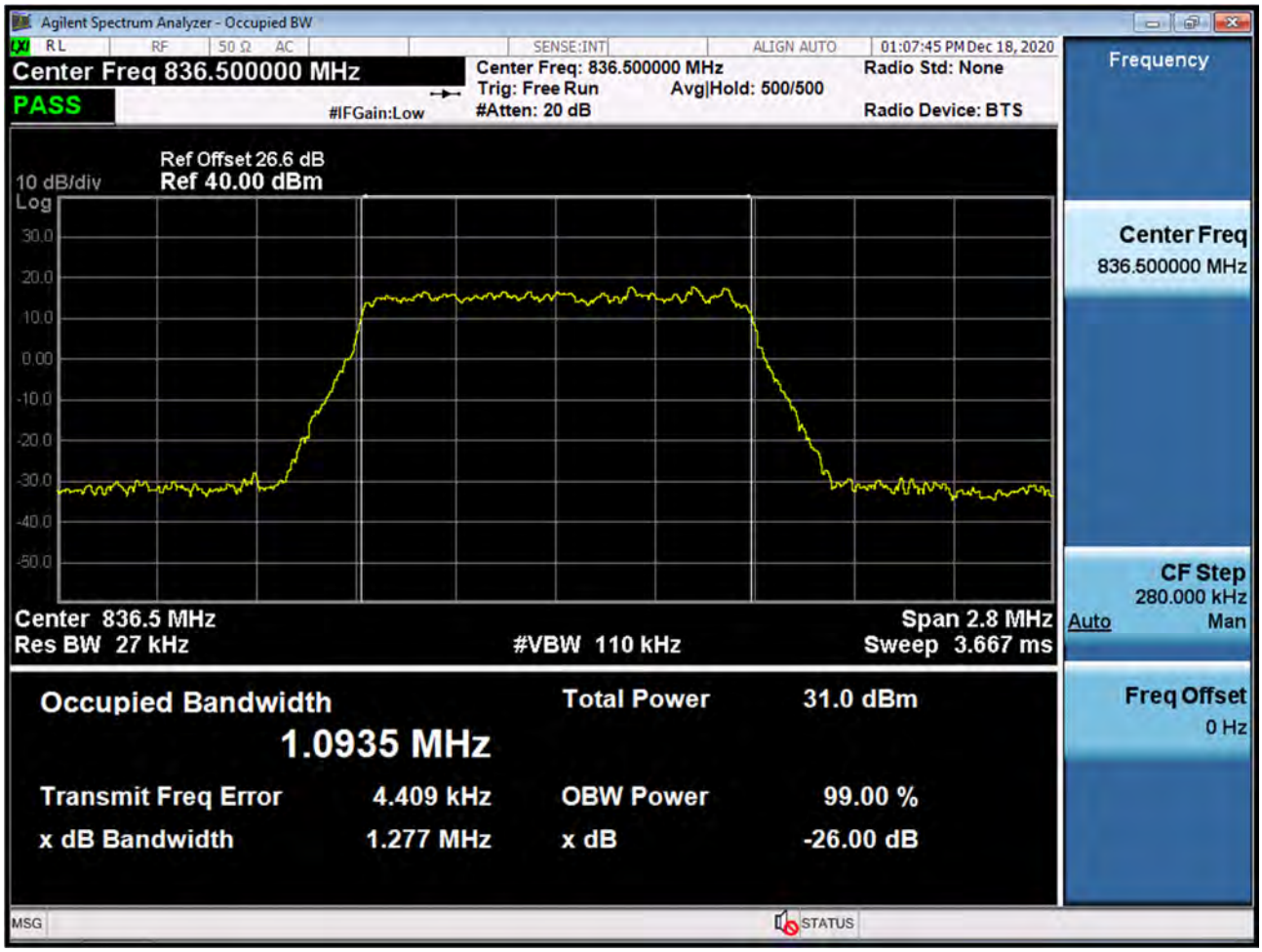
▣ DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.860	+20(Ref)	836 499 989	0.0	0.000 000	0.000
100%		-30	836 499 979	-9.5	-0.000 001	-0.011
100%		-20	836 499 986	-2.5	0.000 000	-0.003
100%		-10	836 499 980	-8.5	-0.000 001	-0.010
100%		0	836 499 979	-8.7	-0.000 001	-0.010
100%		+10	836 499 979	-9.2	-0.000 001	-0.011
100%		+30	836 499 980	-7.8	-0.000 001	-0.009
100%		+40	836 499 982	-6.4	-0.000 001	-0.008
100%		+50	836 499 980	-8.4	-0.000 001	-0.010
Batt. Endpoint	3.400	+20	836 499 979	-9.3	-0.000 001	-0.011

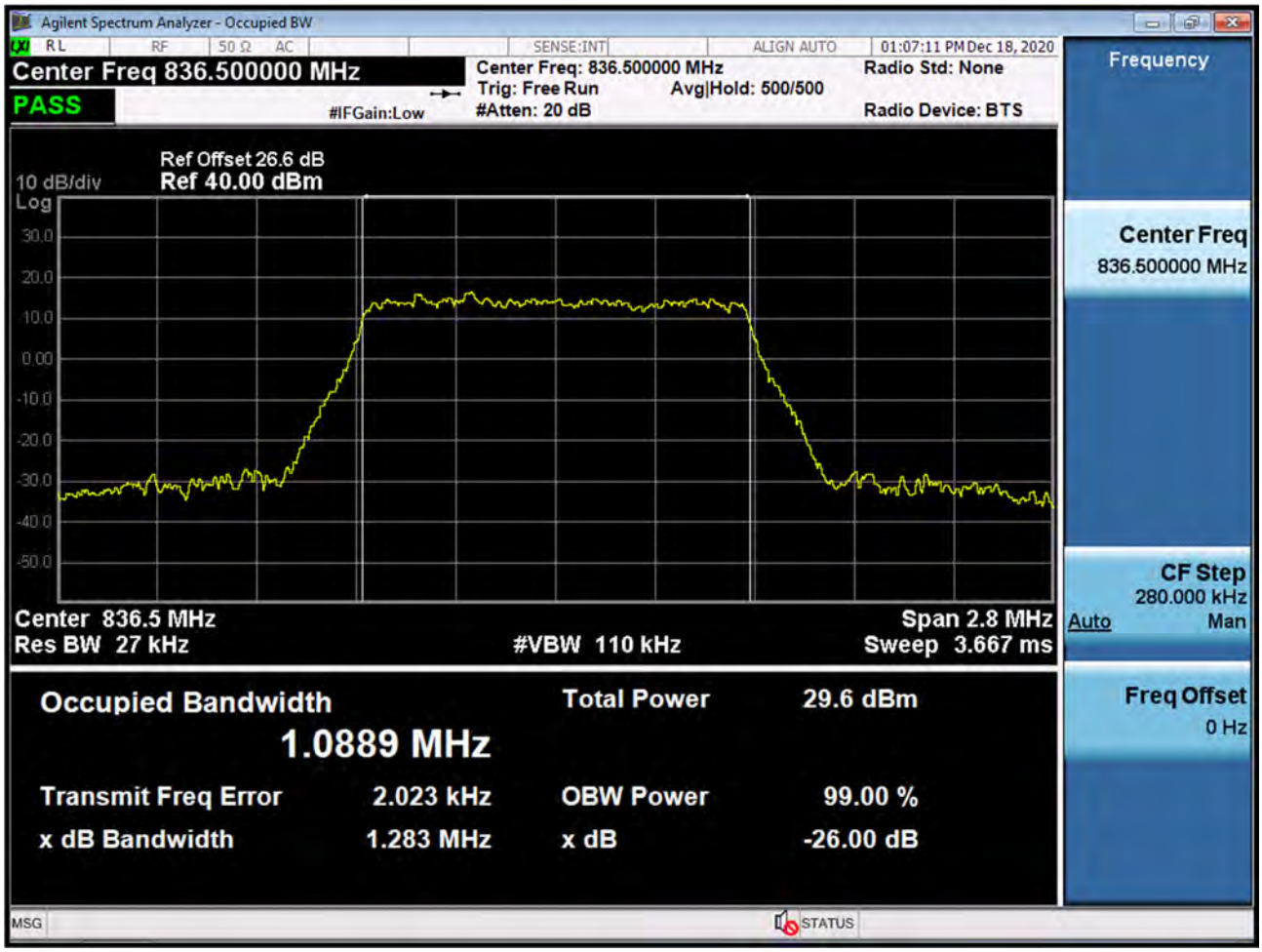


9. TEST PLOTS

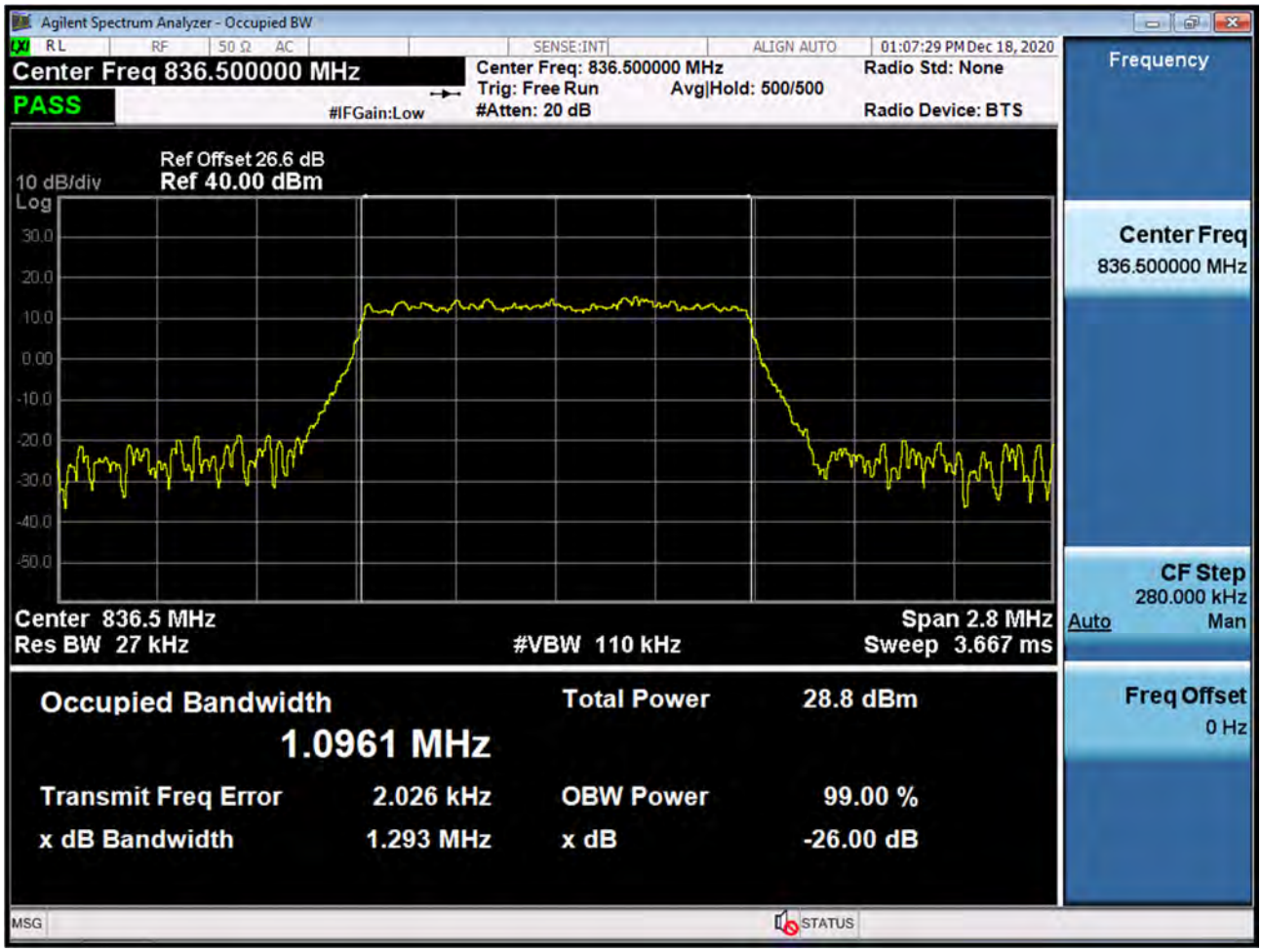
BAND26. Occupied Bandwidth Plot (1.4M BW Ch.26915 QPSK_RB6_0)



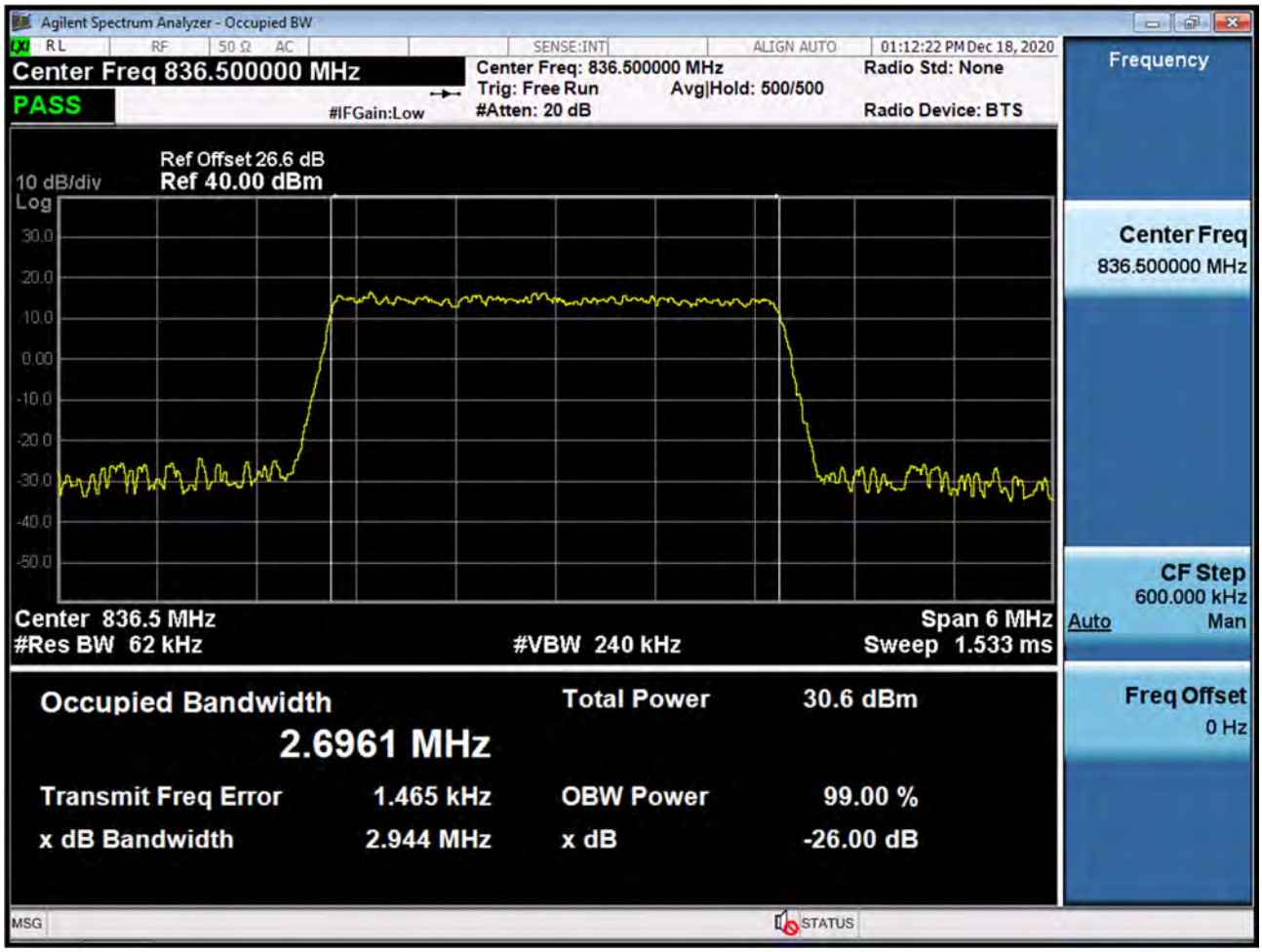
BAND26. Occupied Bandwidth Plot (1.4M BW Ch.26915 16QAM_RB6_0)



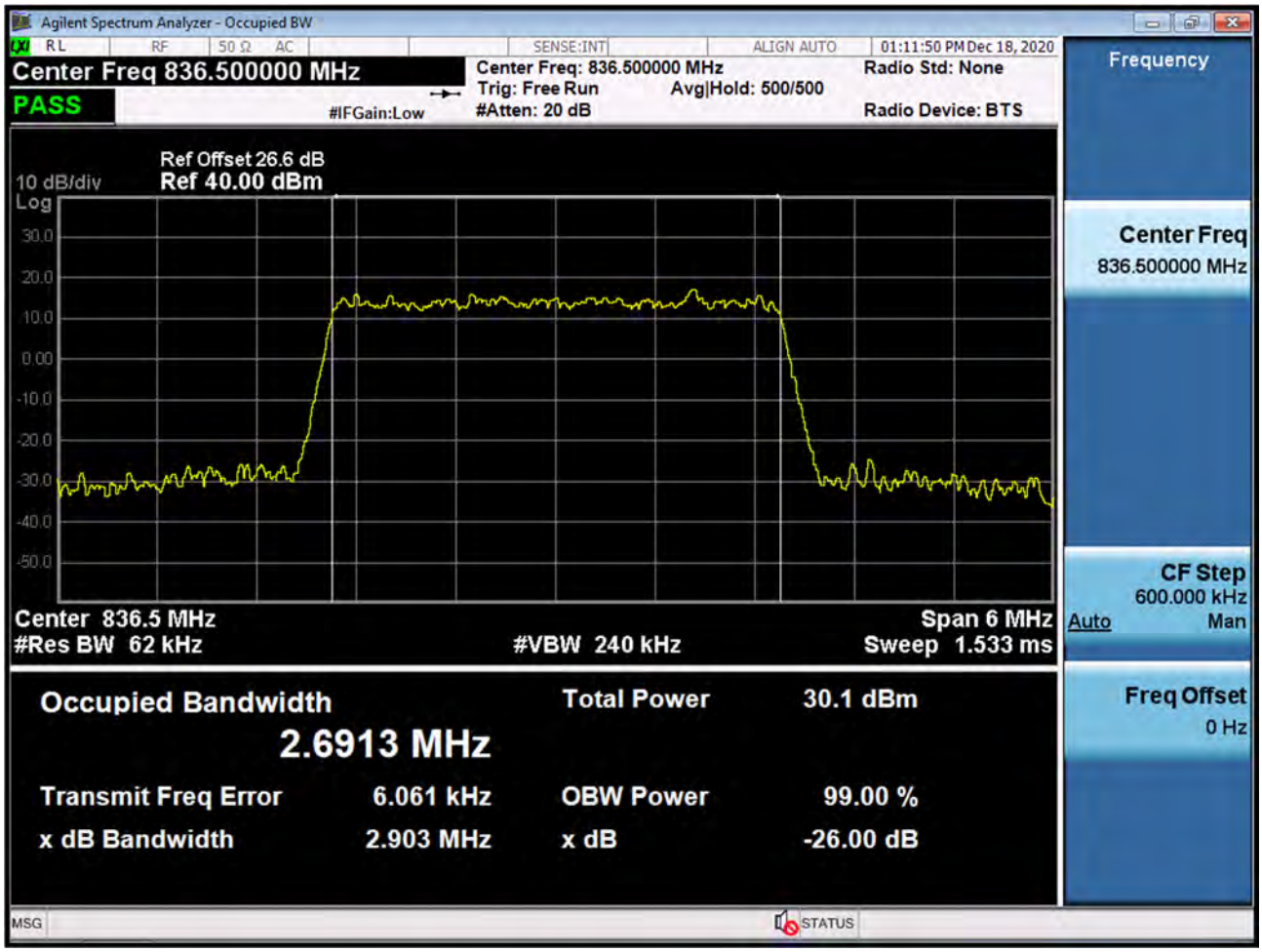
BAND26. Occupied Bandwidth Plot (1.4M BW Ch.26915 64QAM_RB6_0)



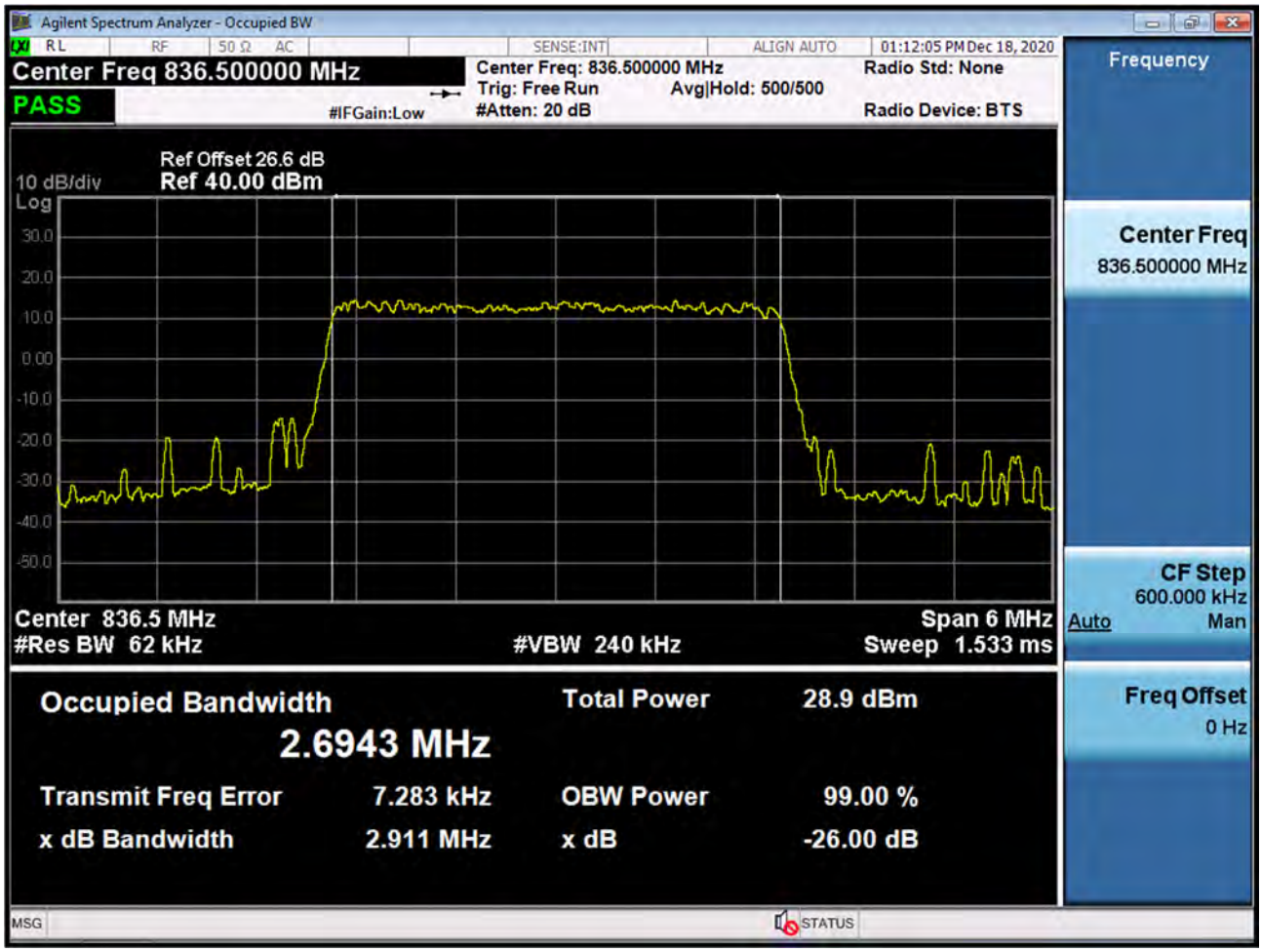
BAND26. Occupied Bandwidth Plot (3M BW Ch.26915 QPSK_RB15_0)



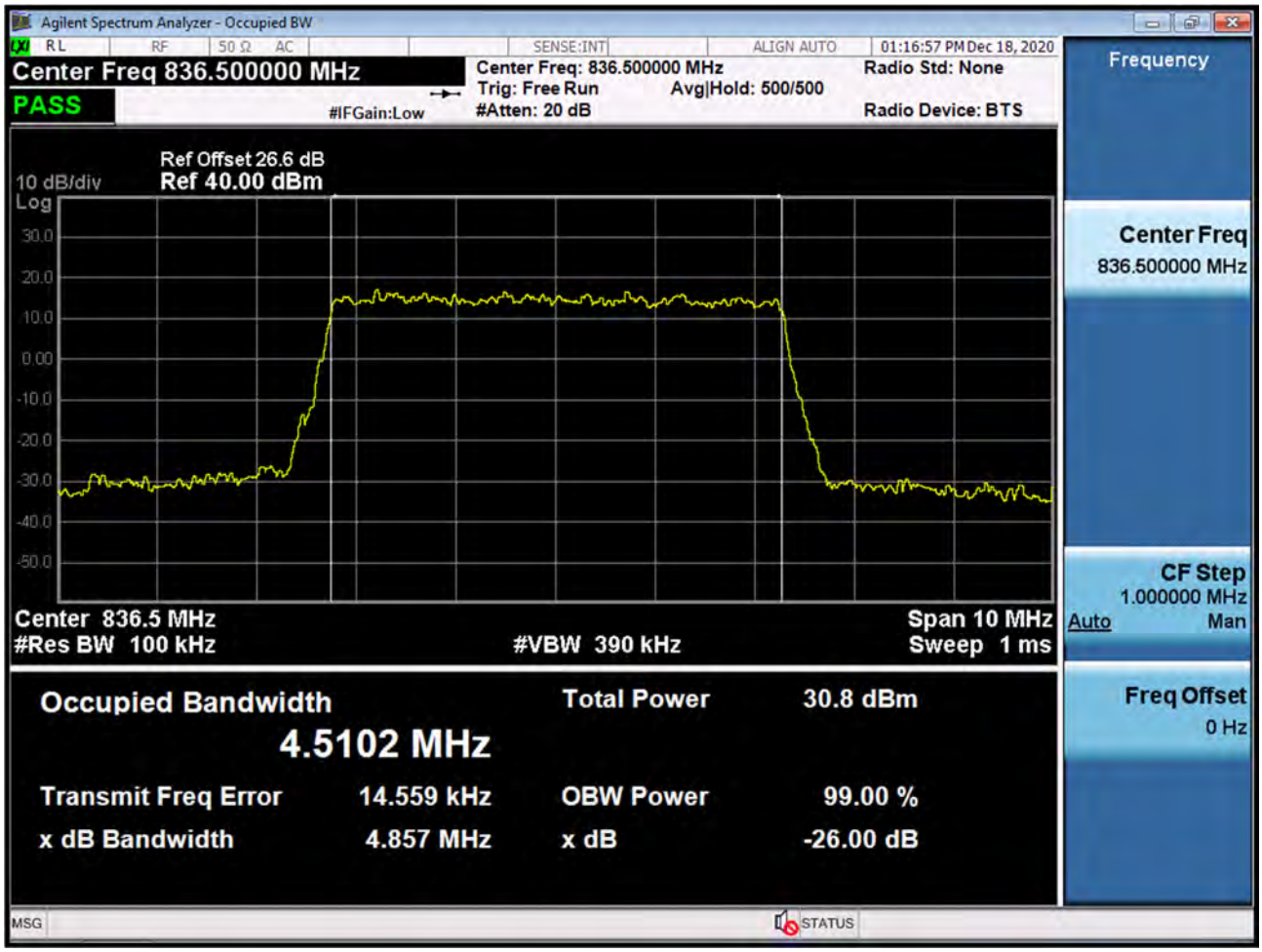
BAND26. Occupied Bandwidth Plot (3M BW Ch.26915 16QAM_RB15_0)



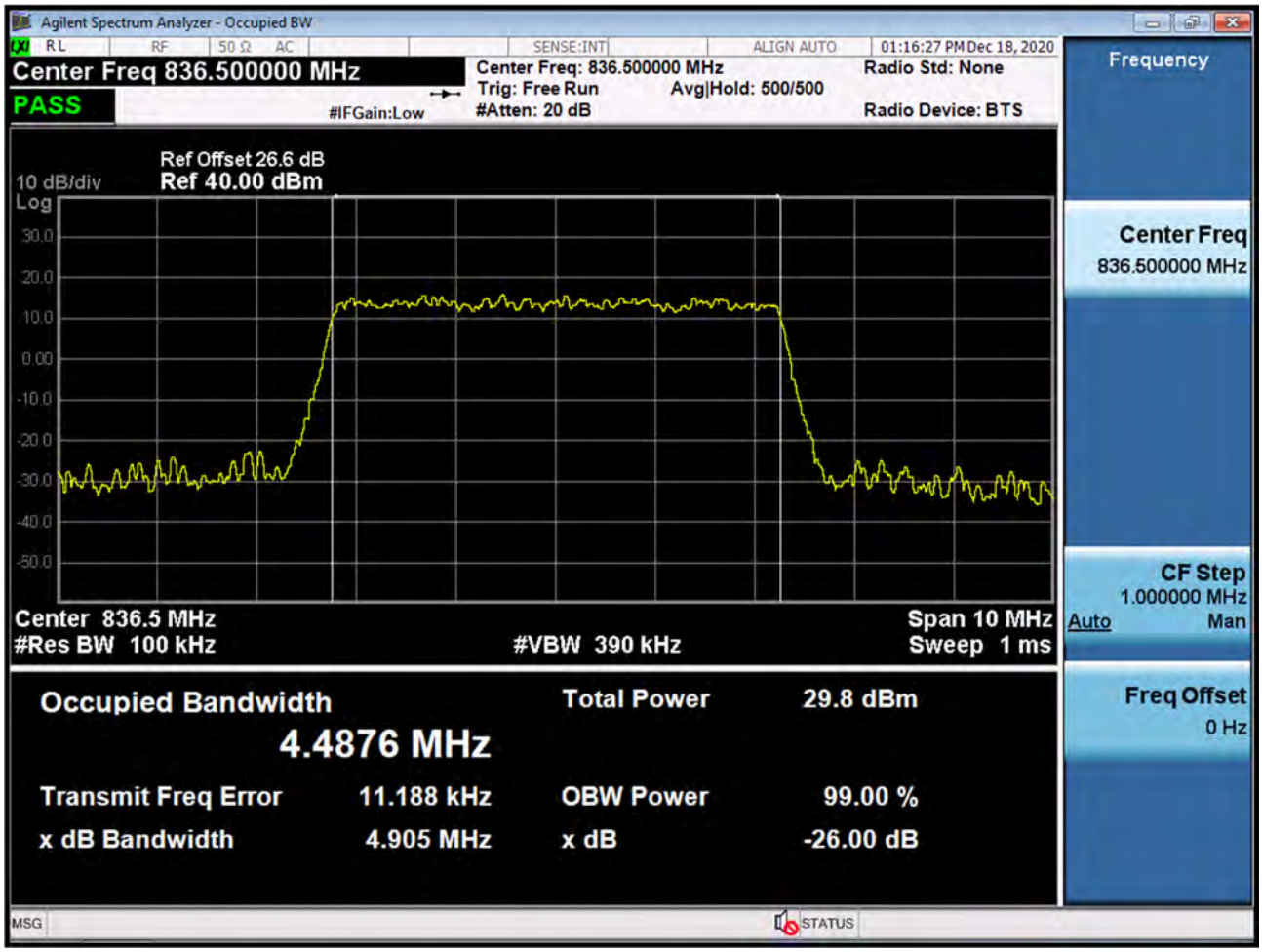
BAND26. Occupied Bandwidth Plot (3M BW Ch.26915 64QAM_RB15_0)



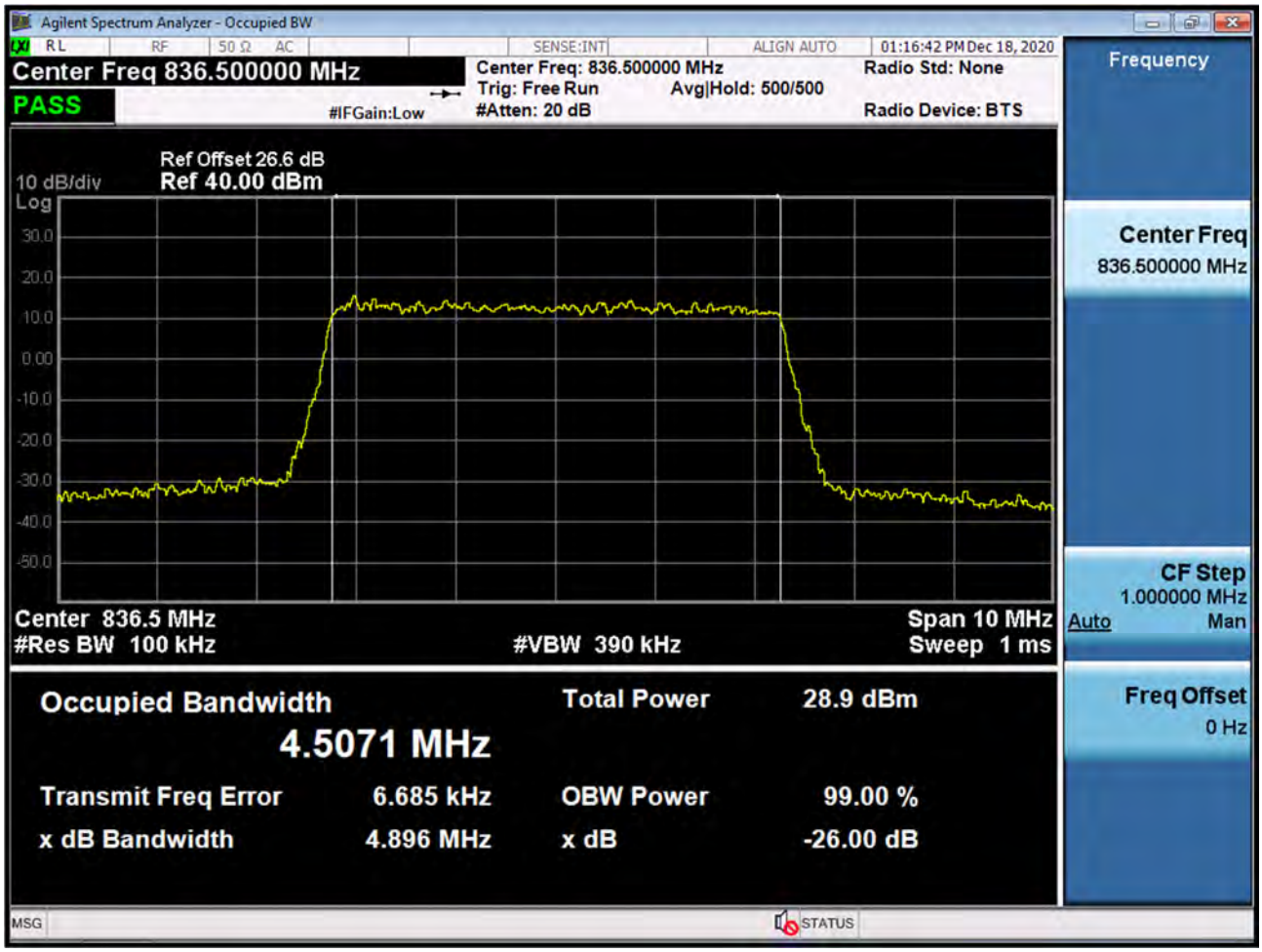
BAND26. Occupied Bandwidth Plot (5M BW Ch.26915 QPSK_RB25_0)



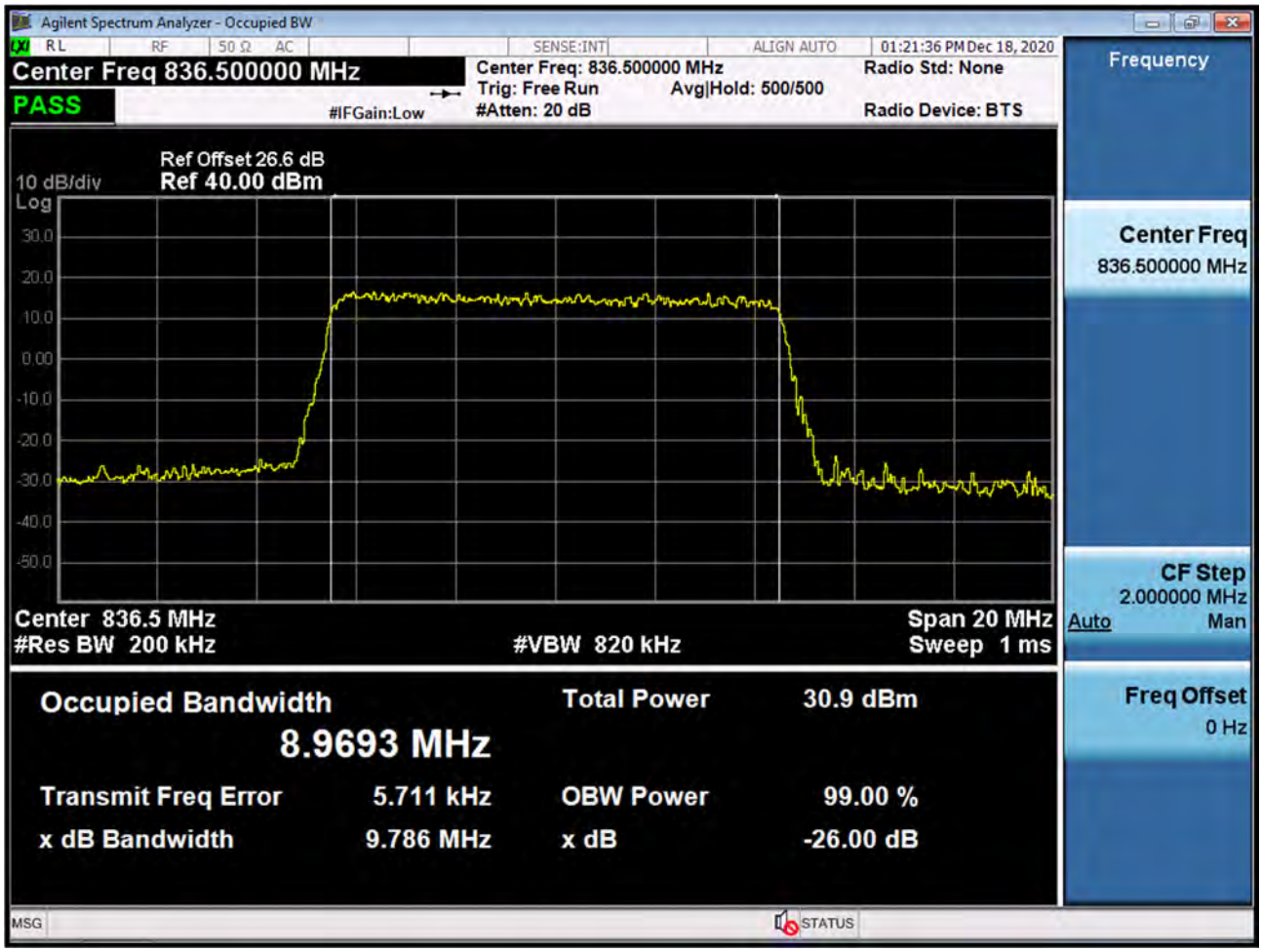
BAND26. Occupied Bandwidth Plot (5M BW Ch.26915 16QAM_RB25_0)



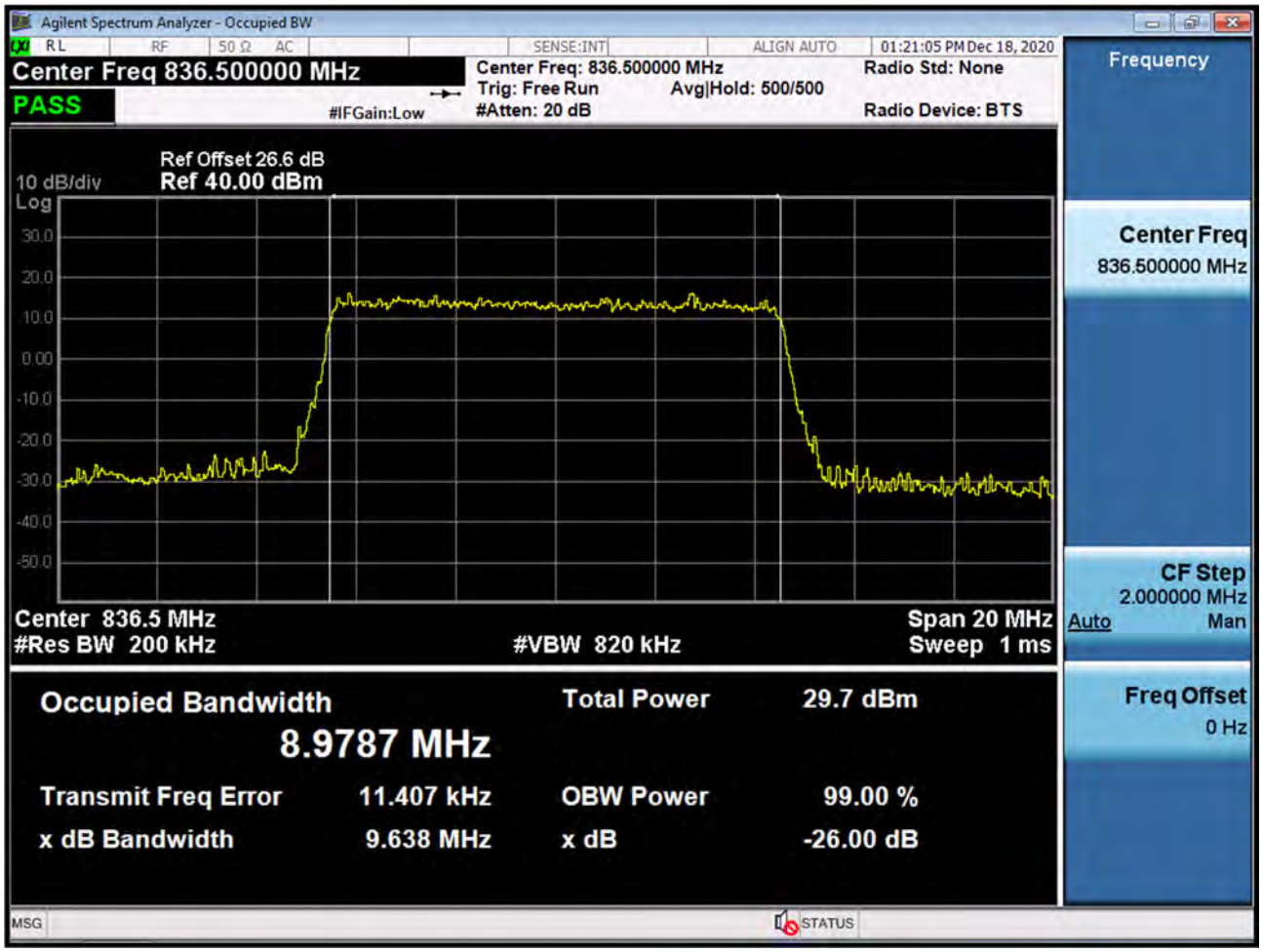
BAND26. Occupied Bandwidth Plot (5M BW Ch.26915 64QAM_RB25_0)



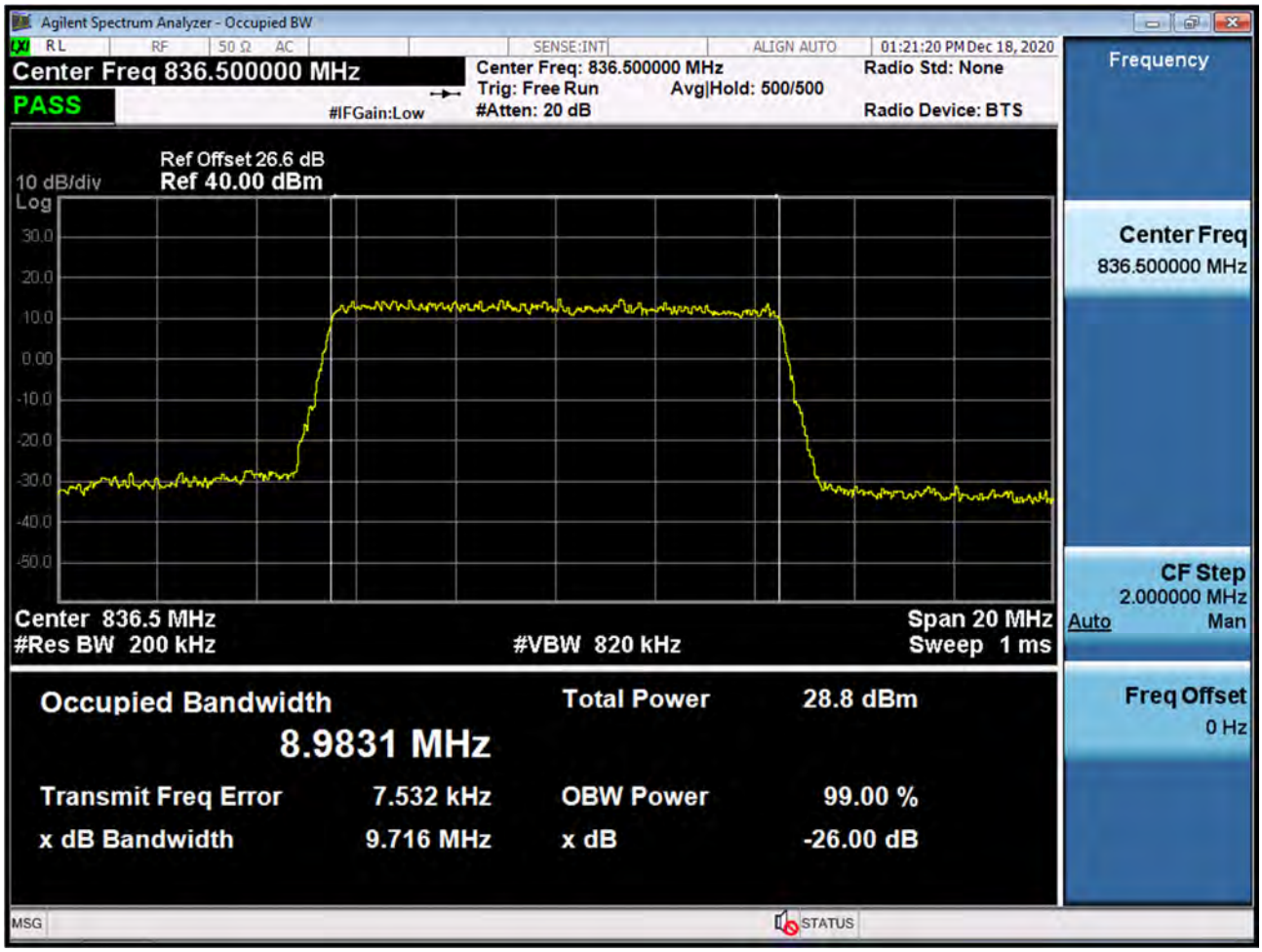
BAND26. Occupied Bandwidth Plot (10M BW Ch.26915 QPSK_RB50_0)



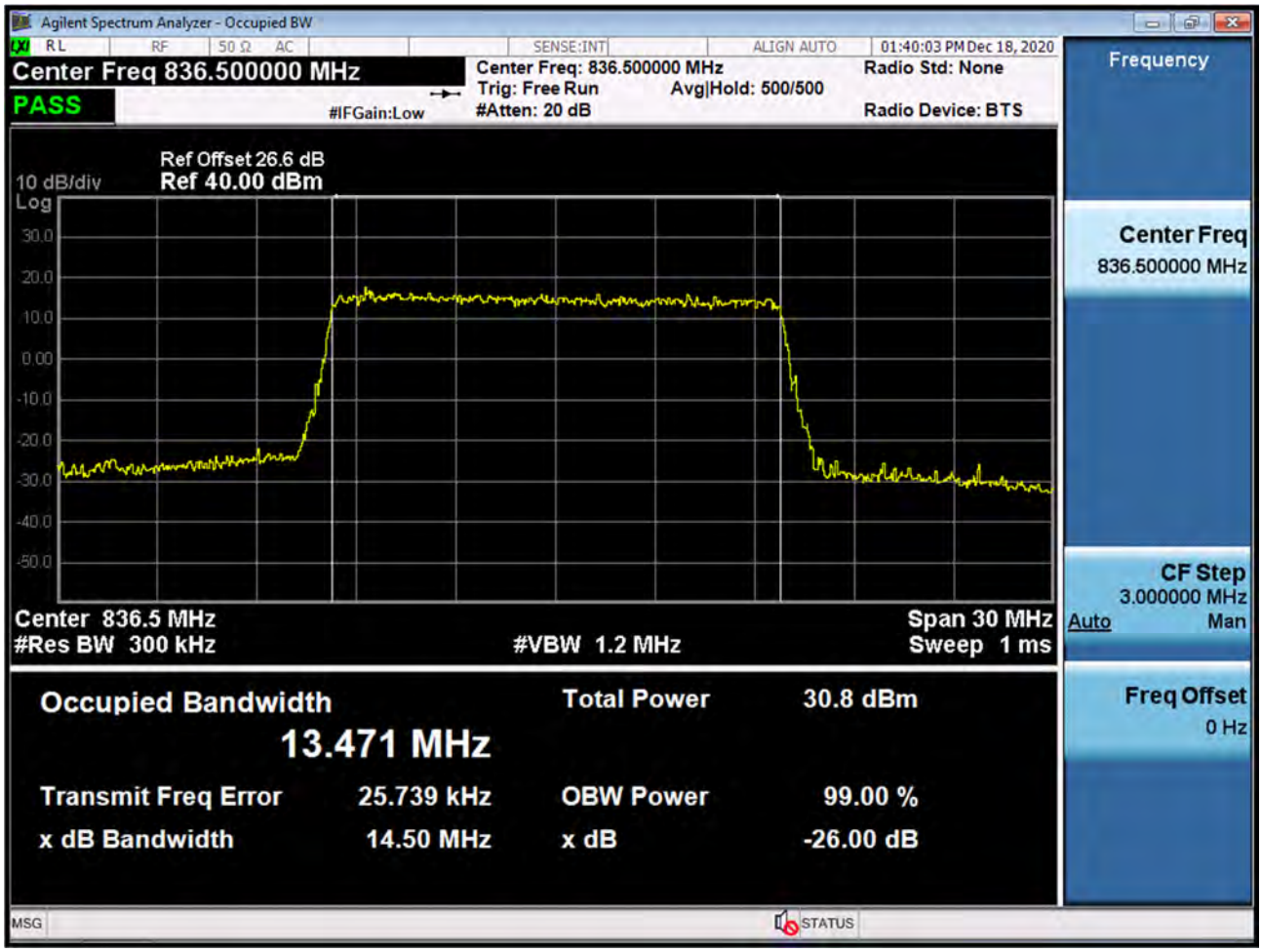
BAND26. Occupied Bandwidth Plot (10M BW Ch.26915 16QAM_RB50_0)



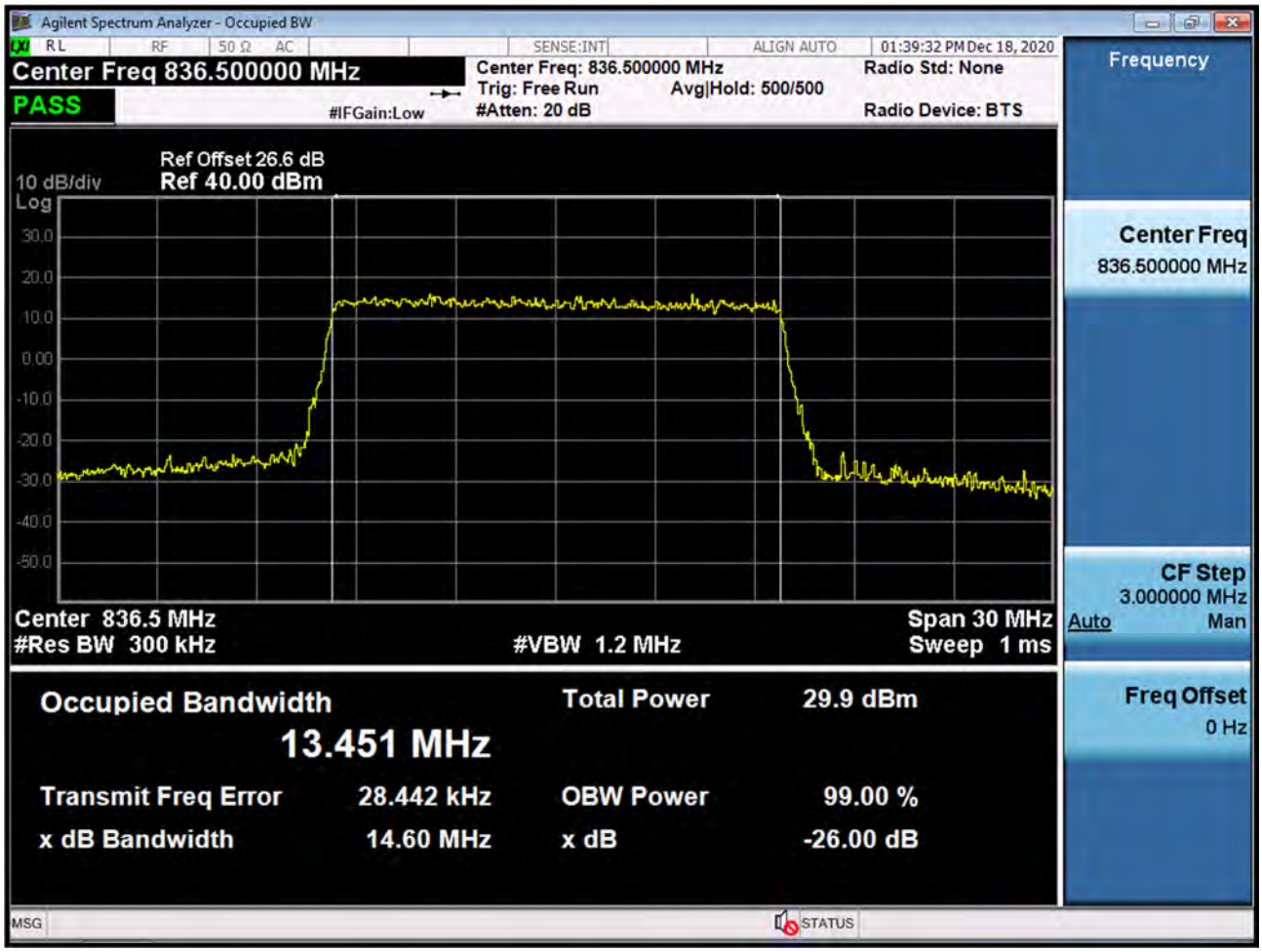
BAND26. Occupied Bandwidth Plot (10M BW Ch.26915 64QAM_RB50_0)



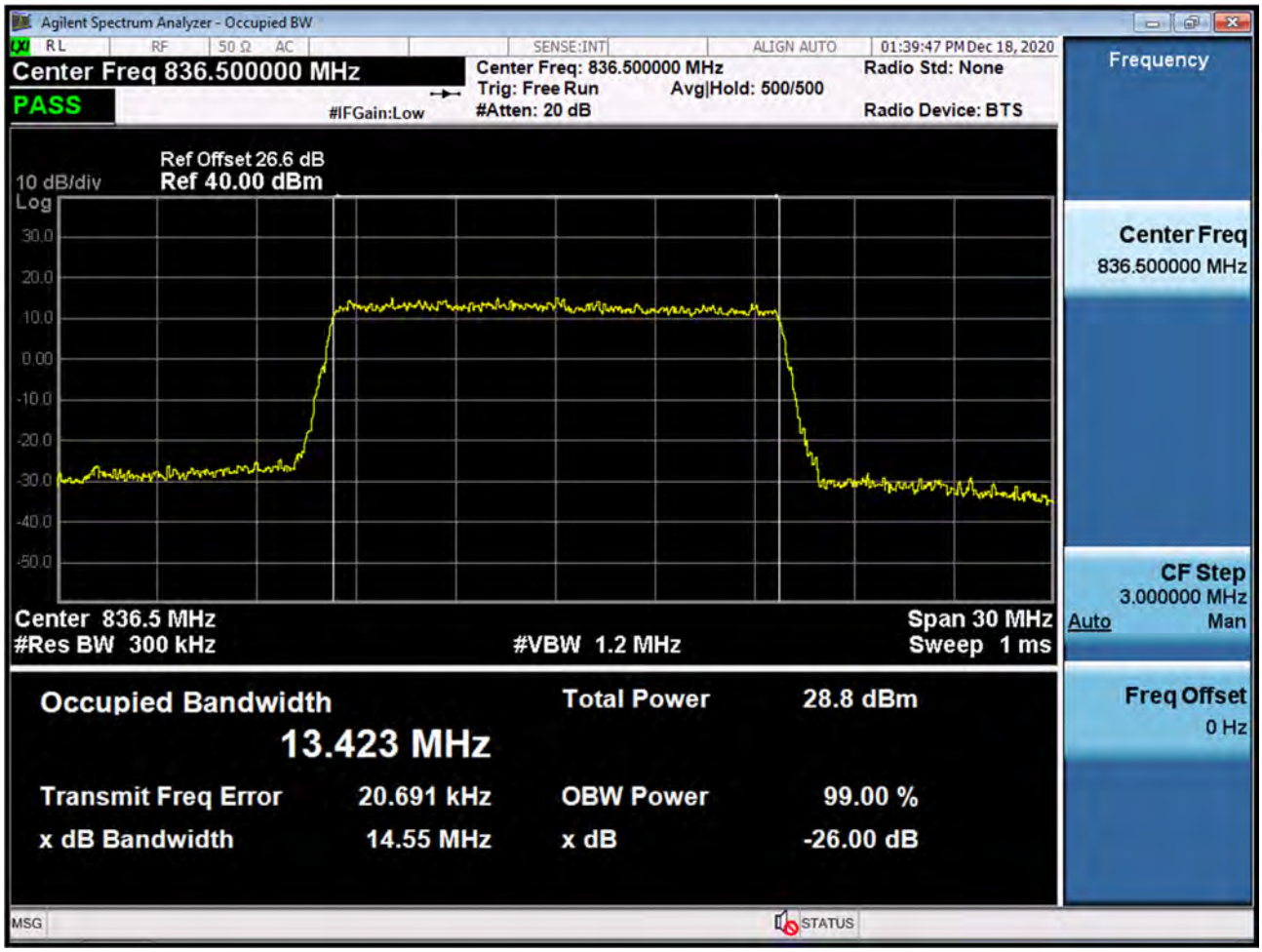
BAND 26. Occupied Bandwidth Plot (15M BW Ch.26915 QPSK RB 75_0)



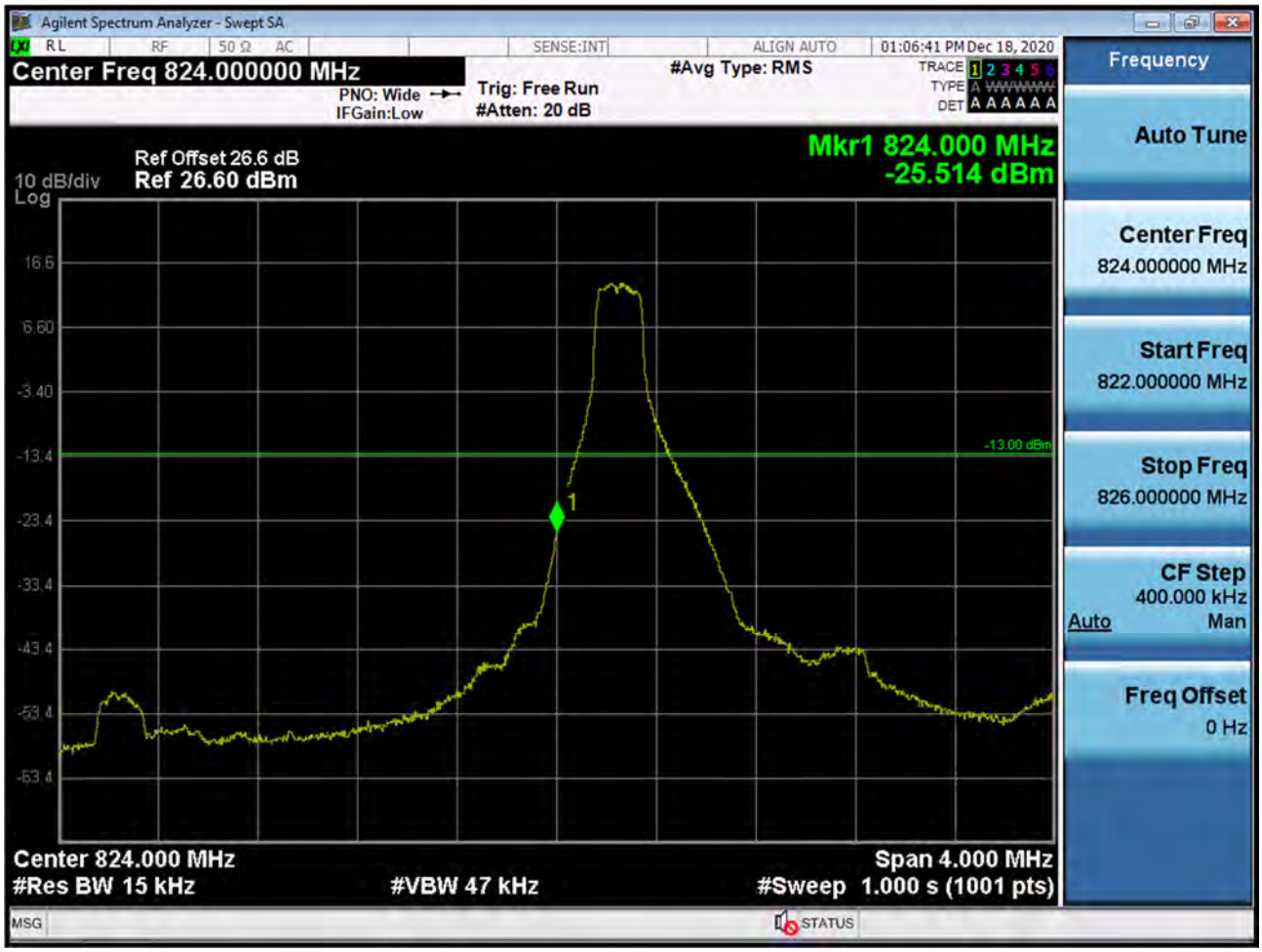
BAND 26. Occupied Bandwidth Plot (15M BW Ch.26915 16QAM RB 75_0)



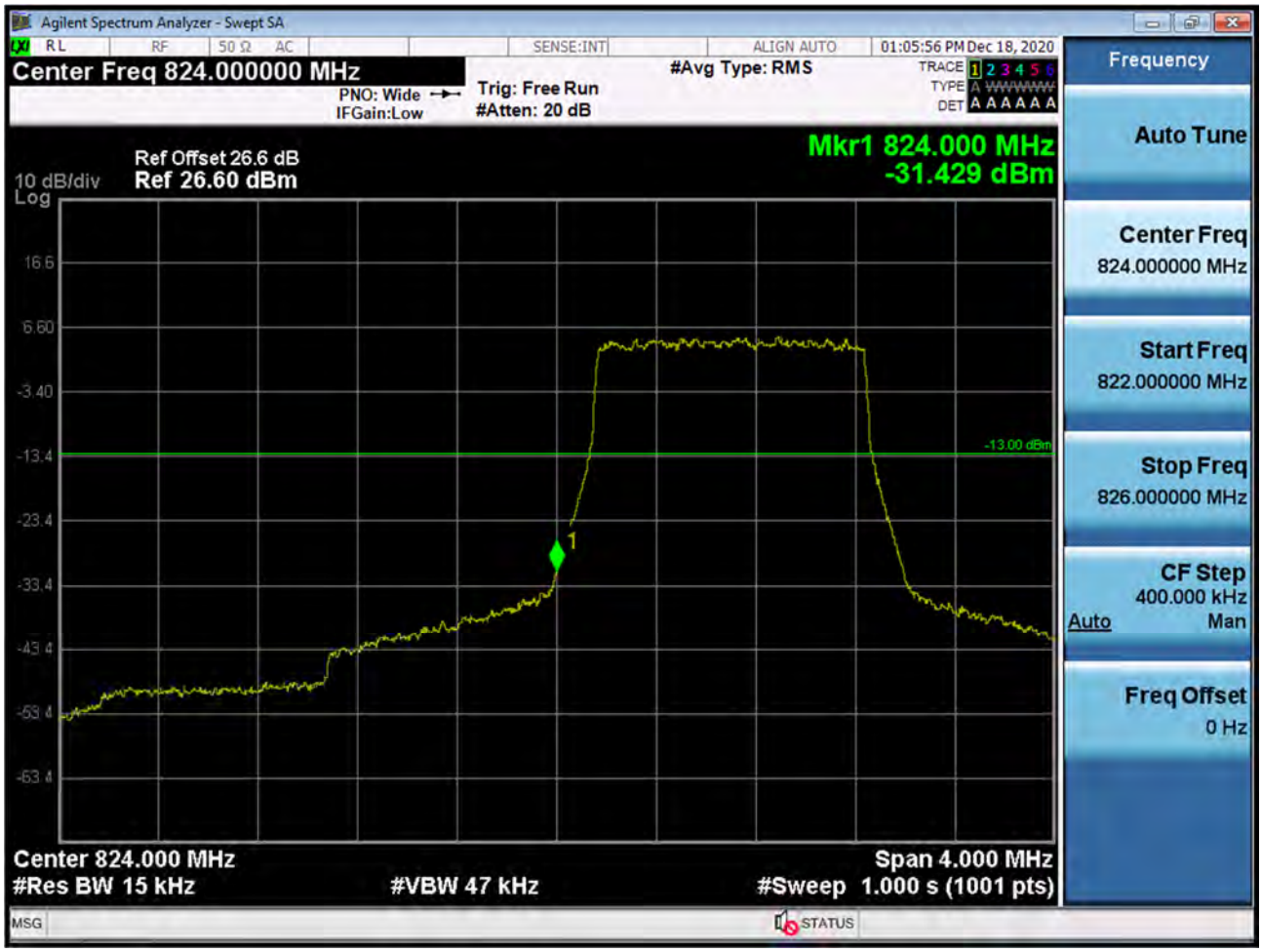
BAND 26. Occupied Bandwidth Plot (15M BW Ch.26915 64QAM RB 75_0)



BAND26. Lower Band Edge Plot (1.4M BW Ch.26797 QPSK_RB1_Offset 0)



BAND26. Lower Band Edge Plot (1.4M BW Ch.26797 QPSK_RB6_Offset 0)



BAND26. Lower Extended Band Edge Plot (1.4M BW Ch.26797 QPSK_RB6_0)

BAND26. Lower Band Edge Plot (3M BW Ch.26805 QPSK_RB1_Offset 0)

BAND26. Lower Band Edge Plot (3M BW Ch.26805 QPSK_RB15_Offset 0)

BAND26. Lower Extended Band Edge Plot (3M BW Ch.26805 QPSK_RB15_0)

BAND26. Lower Band Edge Plot (5M BW Ch.26815 QPSK_RB1_Offset 0)

BAND26. Lower Band Edge Plot (5M BW Ch.26815 QPSK_RB25_Offset 0)

BAND26. Lower Extended Band Edge Plot (5M BW Ch.26815 QPSK_RB25_0)

BAND26. Lower Band Edge Plot (10M BW Ch.26840 QPSK_RB1_Offset 0)

BAND26. Lower Band Edge Plot (10M BW Ch.26840 QPSK_RB50_Offset 0)

BAND26. Lower Extended Band Edge Plot (10M BW Ch.26840 QPSK_RB50_0)

BAND 26. Lower Band Edge Plot (15M BW Ch.26865 QPSK_RB1_Offset 0)

BAND 26. Lower Band Edge Plot (15M BW Ch.26865 QPSK_RB75_Offset 0)

BAND 26. Lower Extended Band Edge Plot (15M BW Ch.26865 QPSK_RB75_0)

BAND26. Upper Band Edge Plot (1.4M BW Ch.27033 QPSK_RB1_Offset 5)

BAND26. Upper Band Edge Plot (1.4M BW Ch.27033 QPSK_RB6_Offset 0)

BAND26. Upper Extended Band Edge Plot (1.4M BW Ch.27033 QPSK_RB6_0)

BAND26. Upper Band Edge Plot (3M BW Ch.27025 QPSK_RB1_Offset 14)

BAND26. Upper Band Edge Plot (3M BW Ch.27025 QPSK_RB15_Offset 0)

BAND26. Upper Extended Band Edge Plot (3M BW Ch.27025 QPSK_RB15_0)

BAND26. Upper Band Edge Plot (5M BW Ch.27015 QPSK_RB1_Offset 24)

BAND26. Upper Band Edge Plot (5M BW Ch.27015 QPSK_RB25_Offset 0)

BAND26. Upper Extended Band Edge Plot (5M BW Ch.27015 QPSK_RB25_0)

BAND26. Upper Band Edge Plot (10M BW Ch.26990 QPSK_RB1_Offset 49)

BAND26. Upper Band Edge Plot (10M BW Ch.26990 QPSK_RB50_Offset 0)

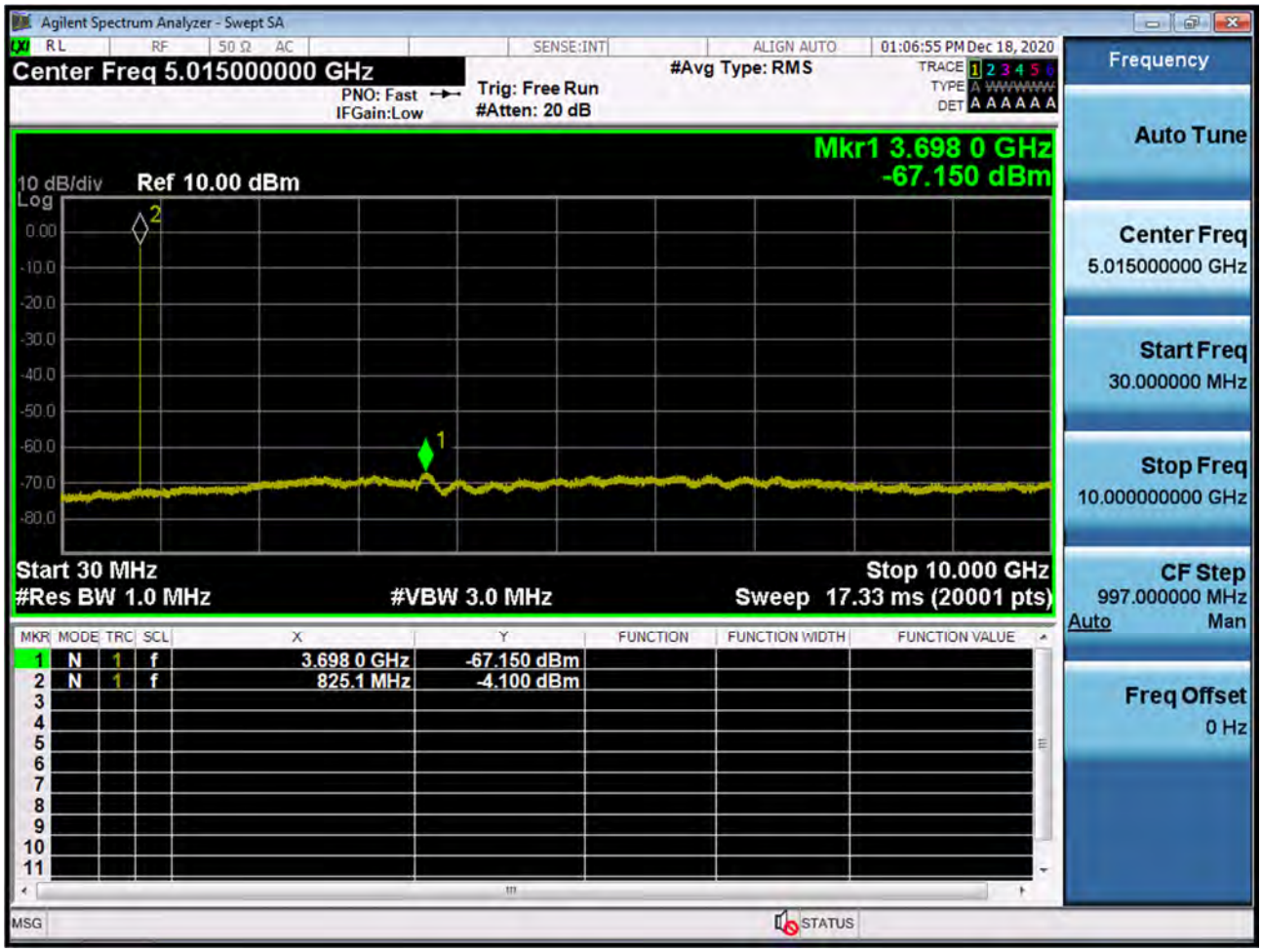
BAND26. Upper Extended Band Edge Plot (10M BW Ch.26990 QPSK_RB50_0)

BAND 26. Upper Band Edge Plot (15M BW Ch.26965 QPSK_RB1_Offset 74)

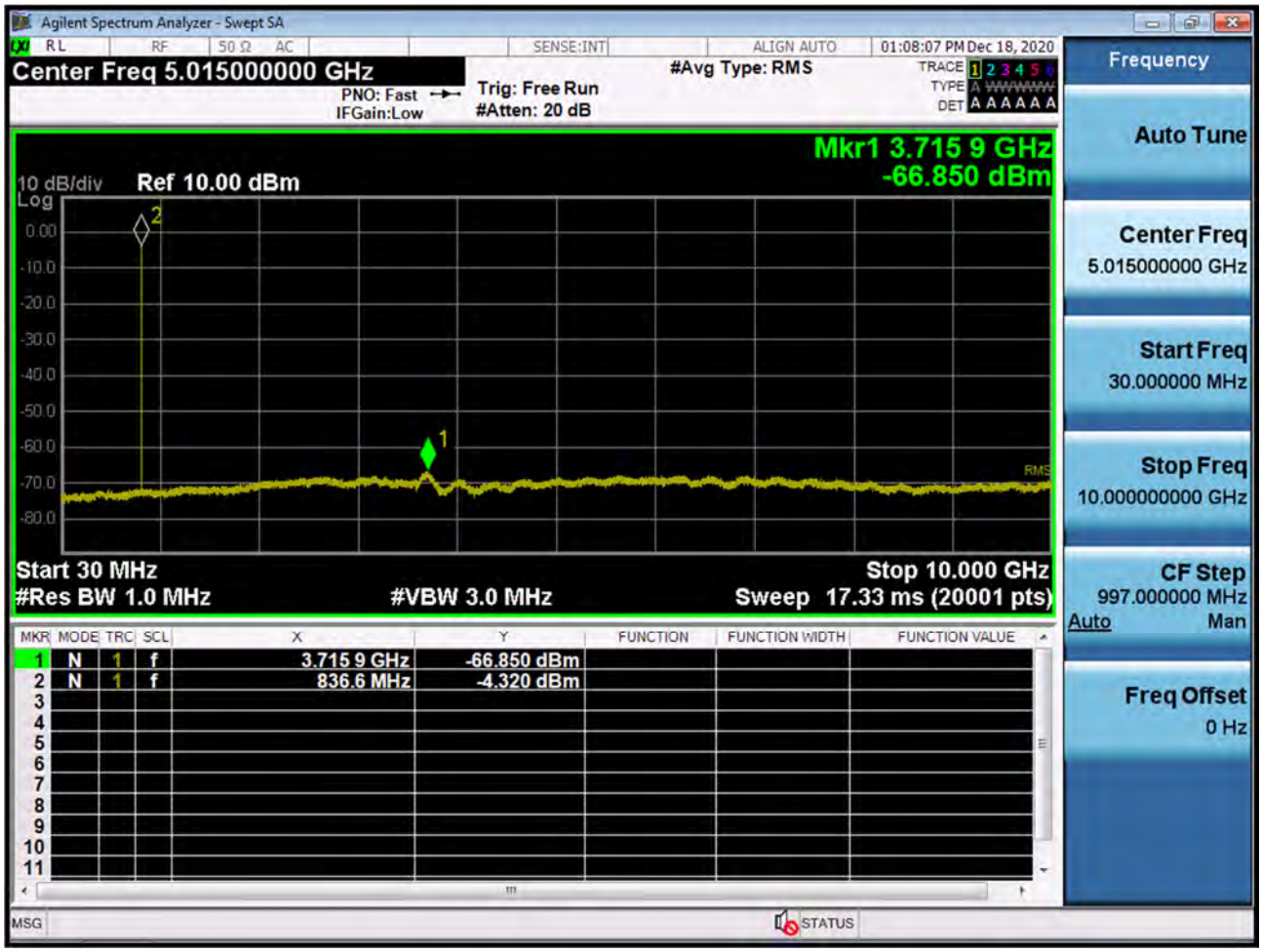
BAND 26. Upper Band Edge Plot (15M BW Ch.26965 QPSK_RB75_Offset 0)

BAND 26. Upper Extended Band Edge Plot (15M BW Ch.26965 QPSK_RB75_0)

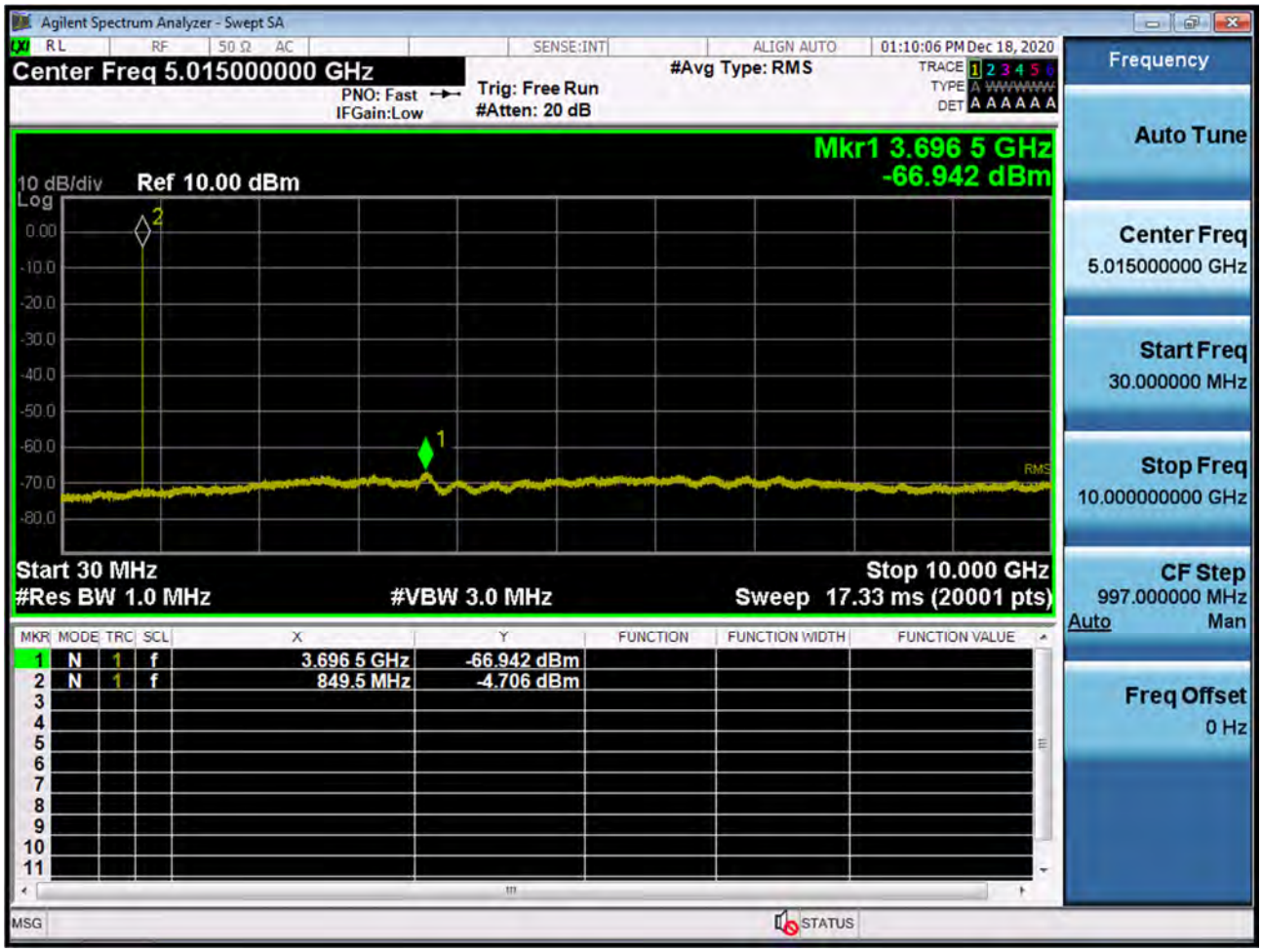
BAND26. Conducted Spurious Plot (26797ch_1.4MHz_QPSK_RB 1_0)



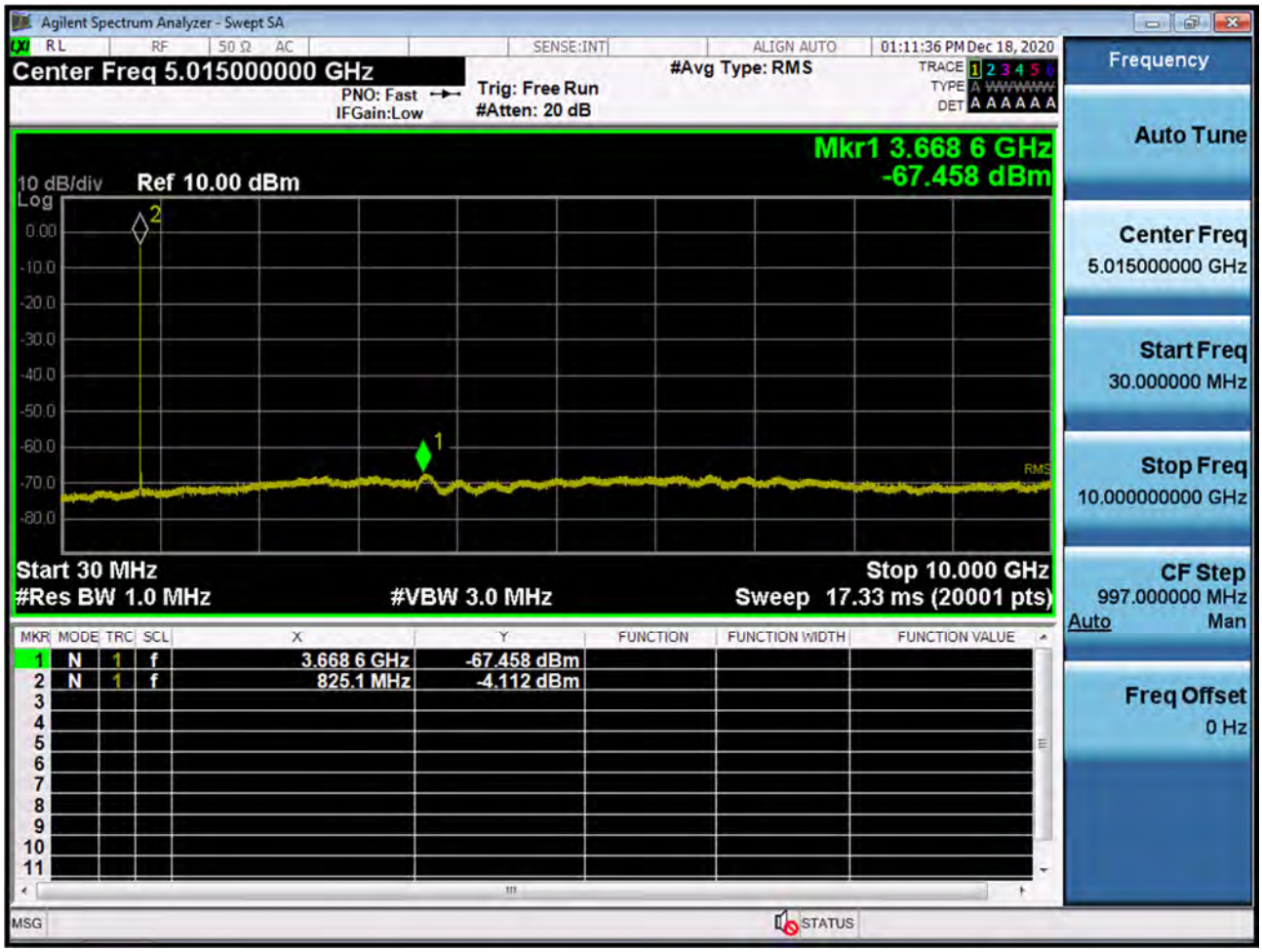
BAND26. Conducted Spurious Plot (26915ch_1.4MHz_QPSK_RB 1_0)



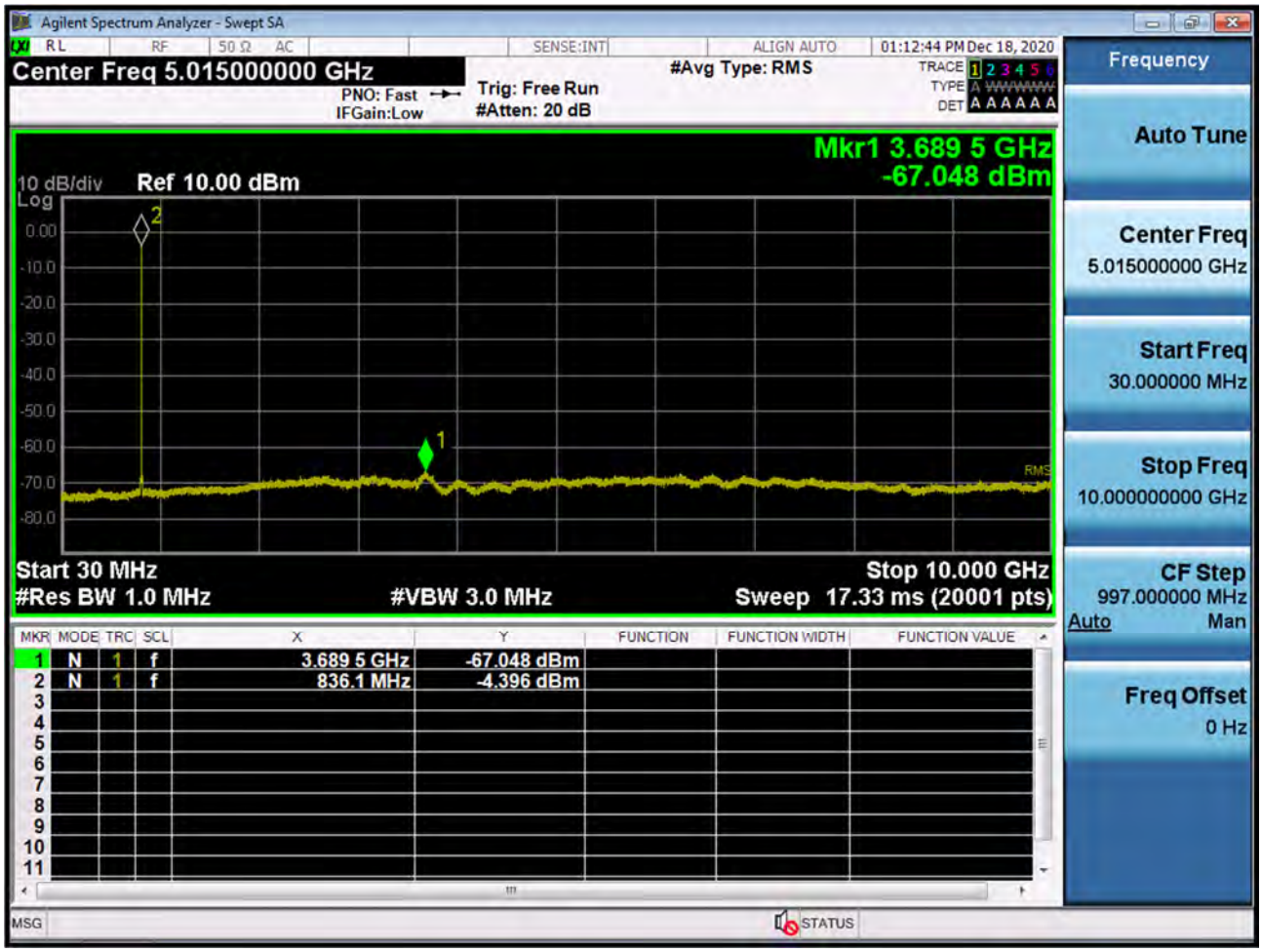
BAND26. Conducted Spurious Plot (27033ch_1.4MHz_QPSK_RB 1_0)



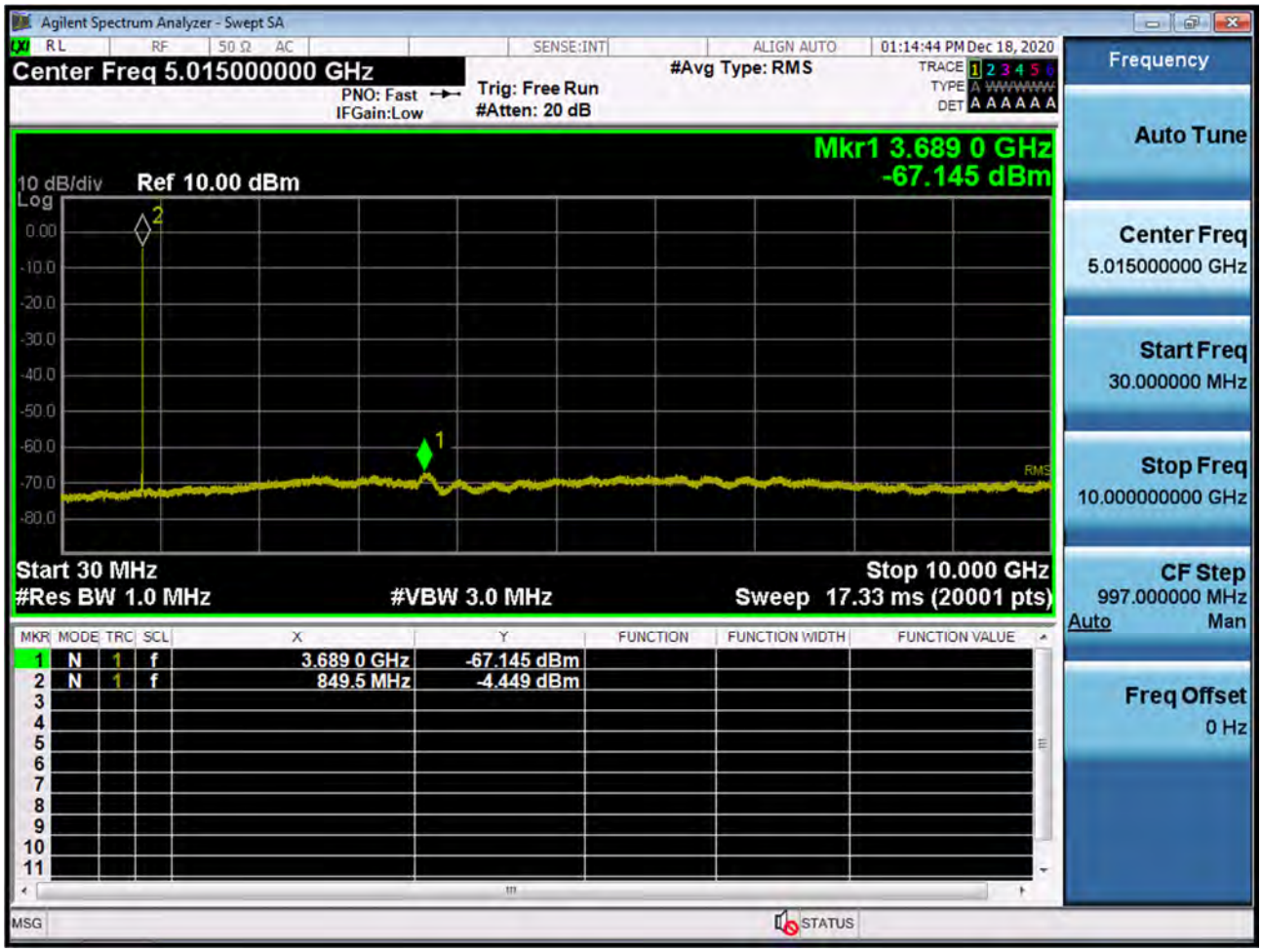
BAND26. Conducted Spurious Plot (26805ch_3MHz_QPSK_RB 1_0)



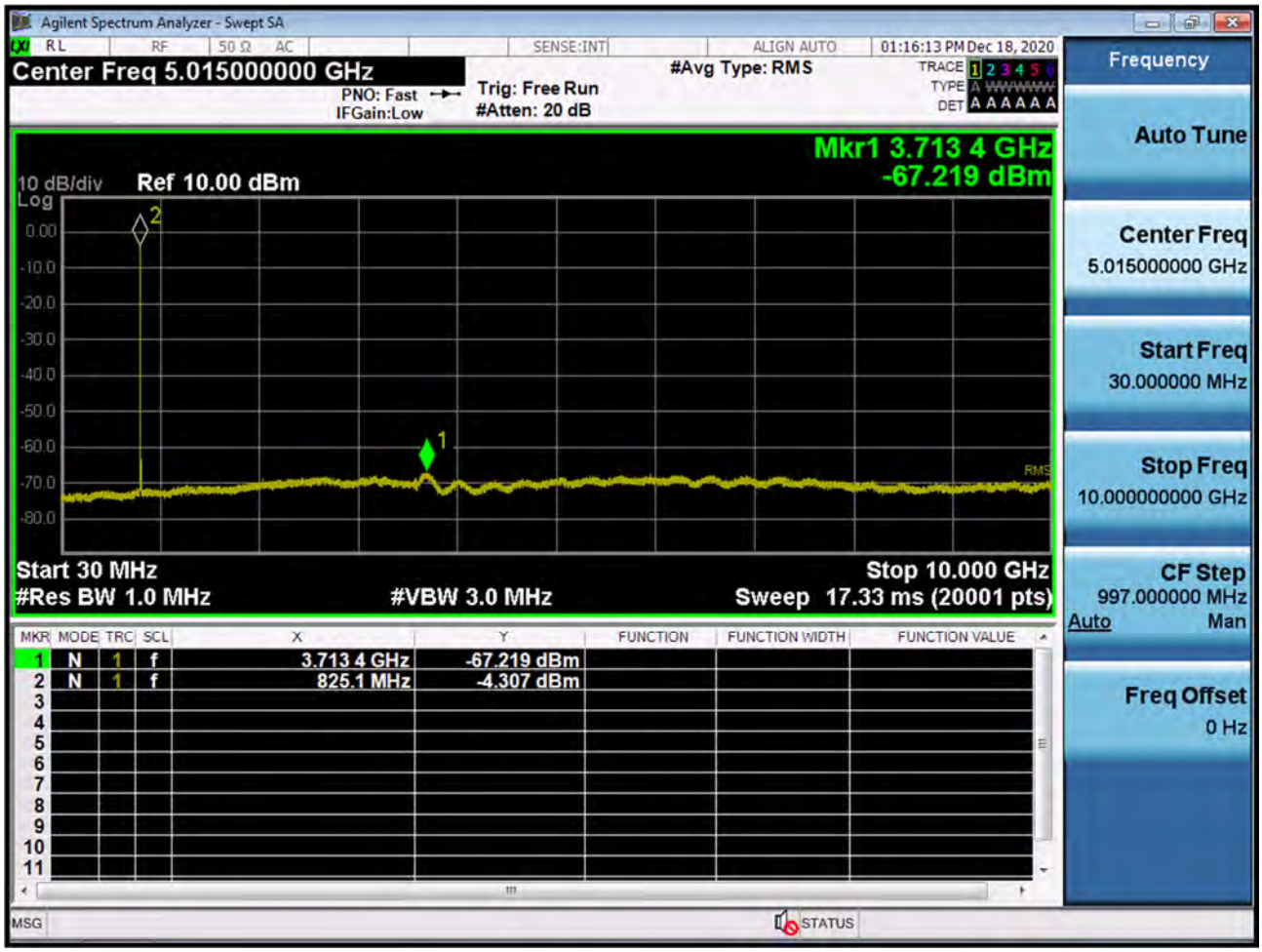
BAND26. Conducted Spurious Plot (26915ch_3MHz_QPSK_RB 1_0)



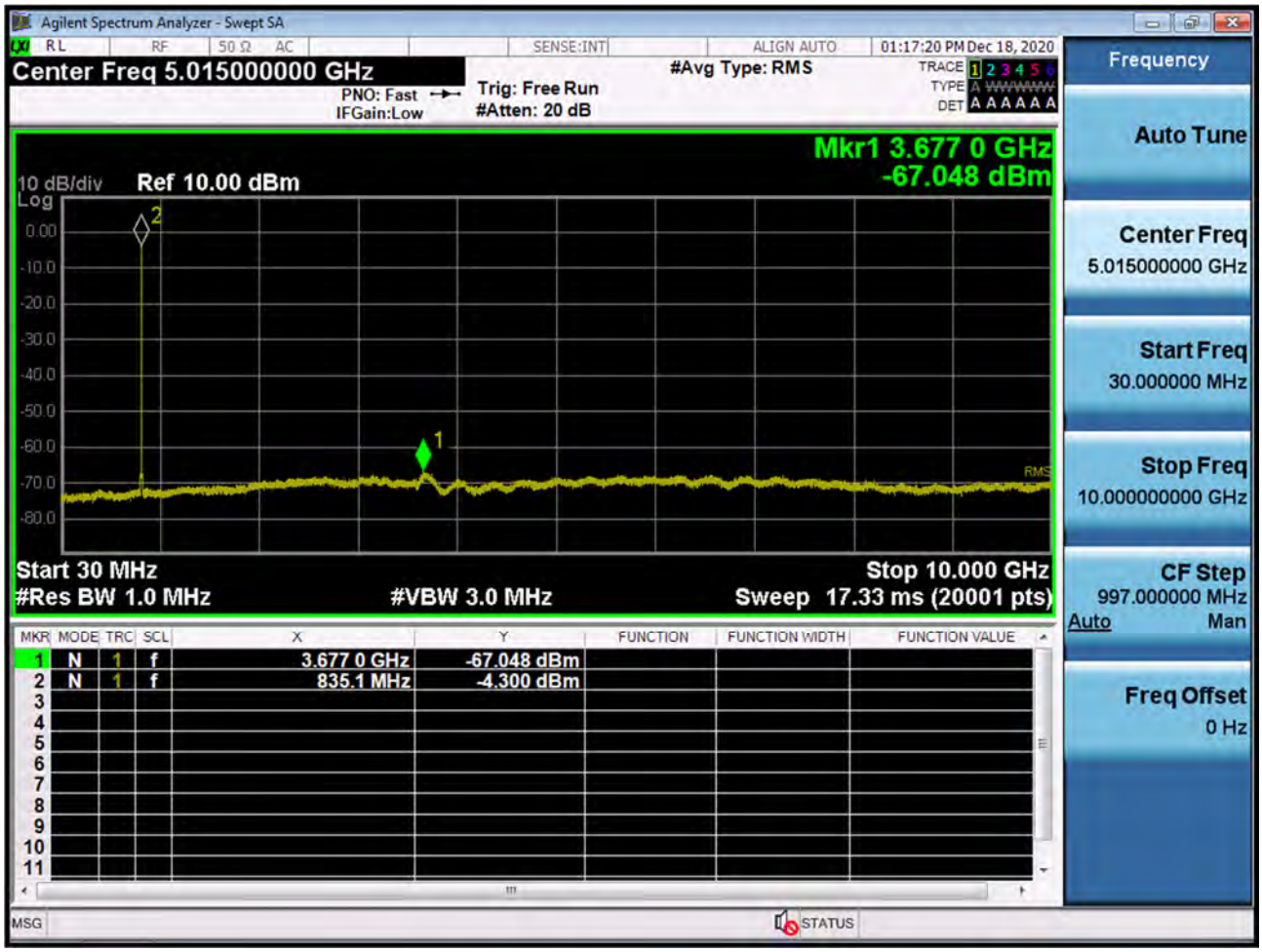
BAND26. Conducted Spurious Plot (27025ch_3MHz_QPSK_RB 1_0)



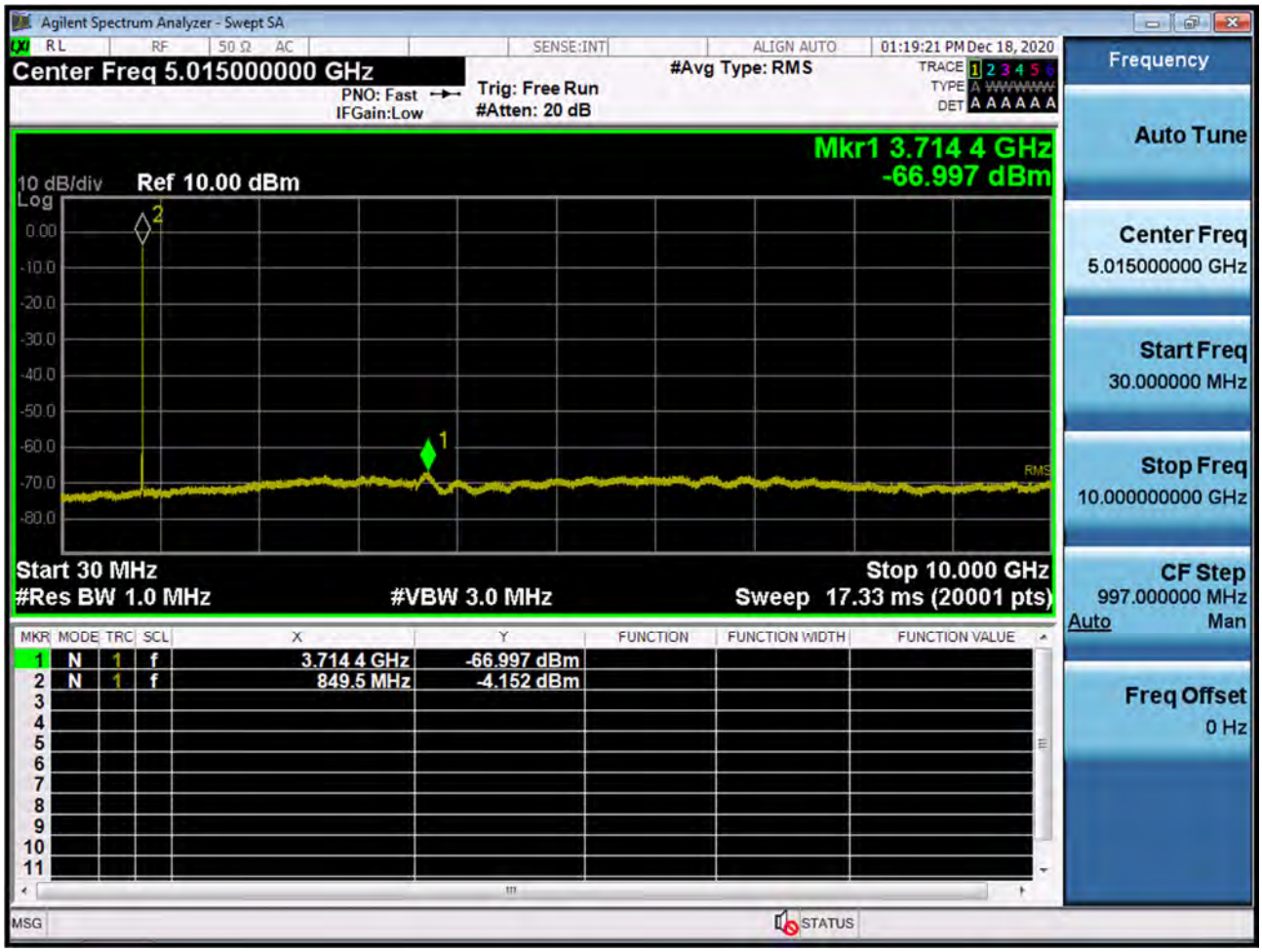
BAND26. Conducted Spurious Plot (26815ch_5MHz_QPSK_RB 1_0)



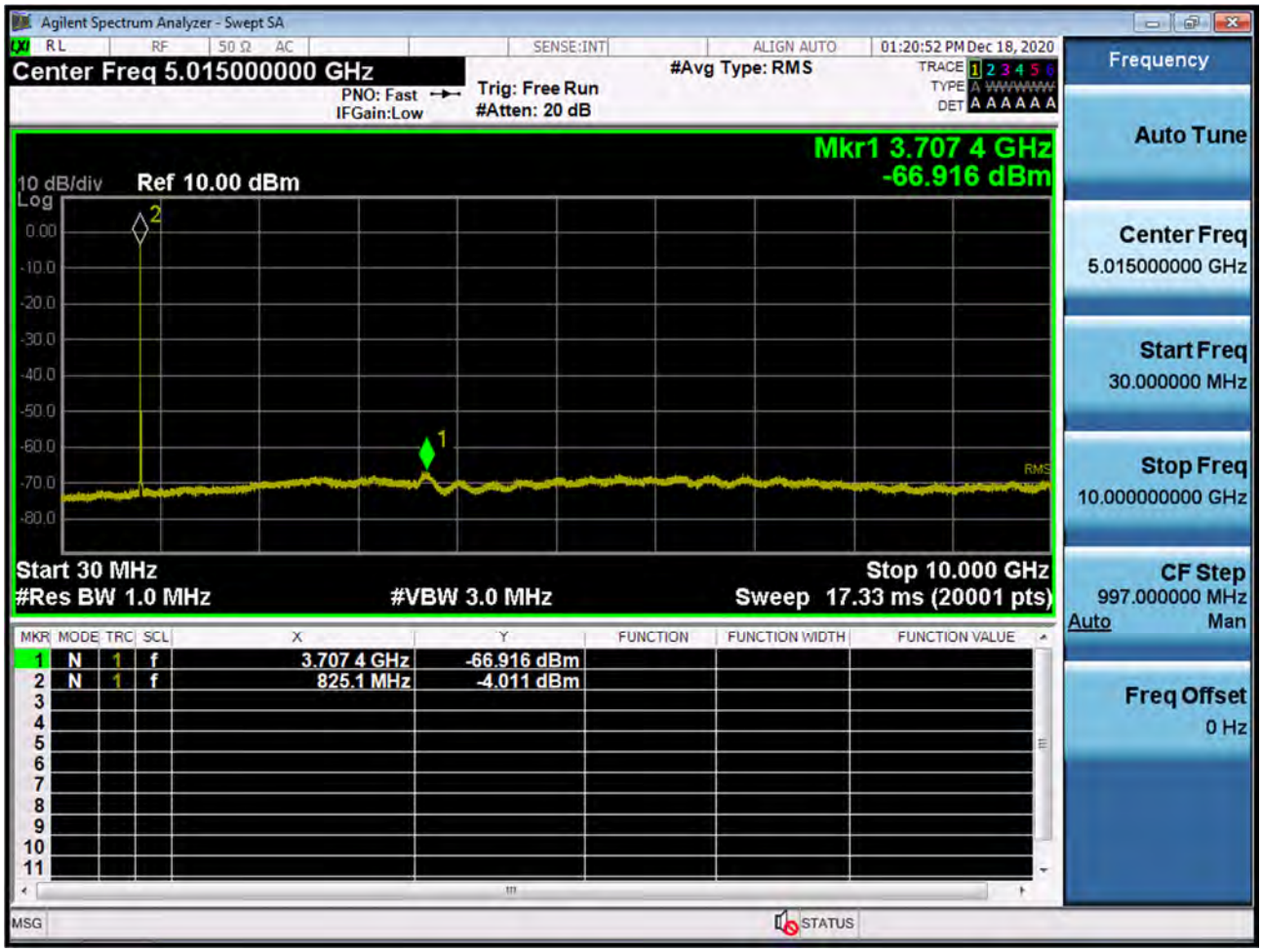
BAND26. Conducted Spurious Plot (26915ch_5MHz_QPSK_RB 1_0)



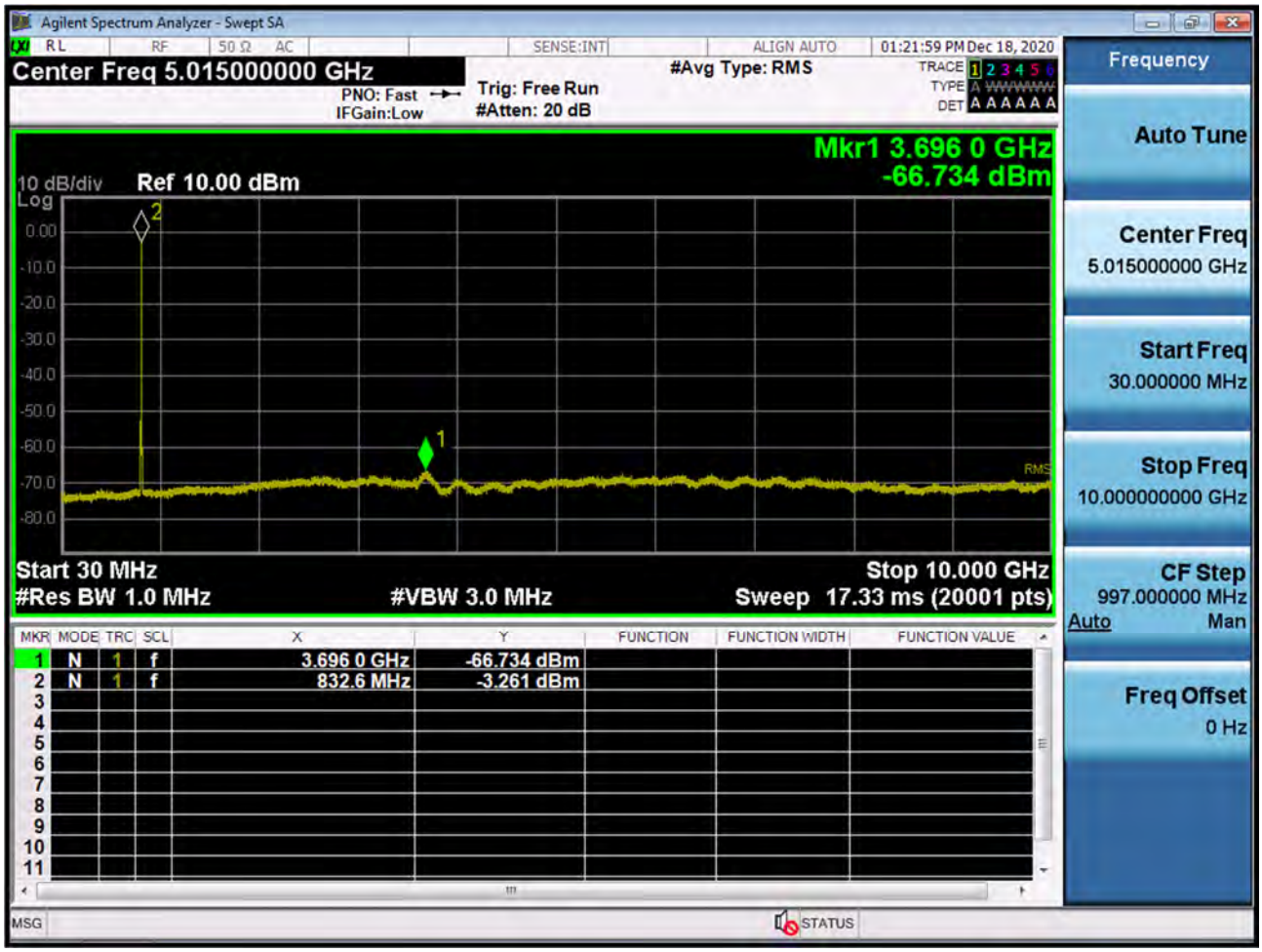
BAND26. Conducted Spurious Plot (27015ch_5MHz_QPSK_RB 1_0)



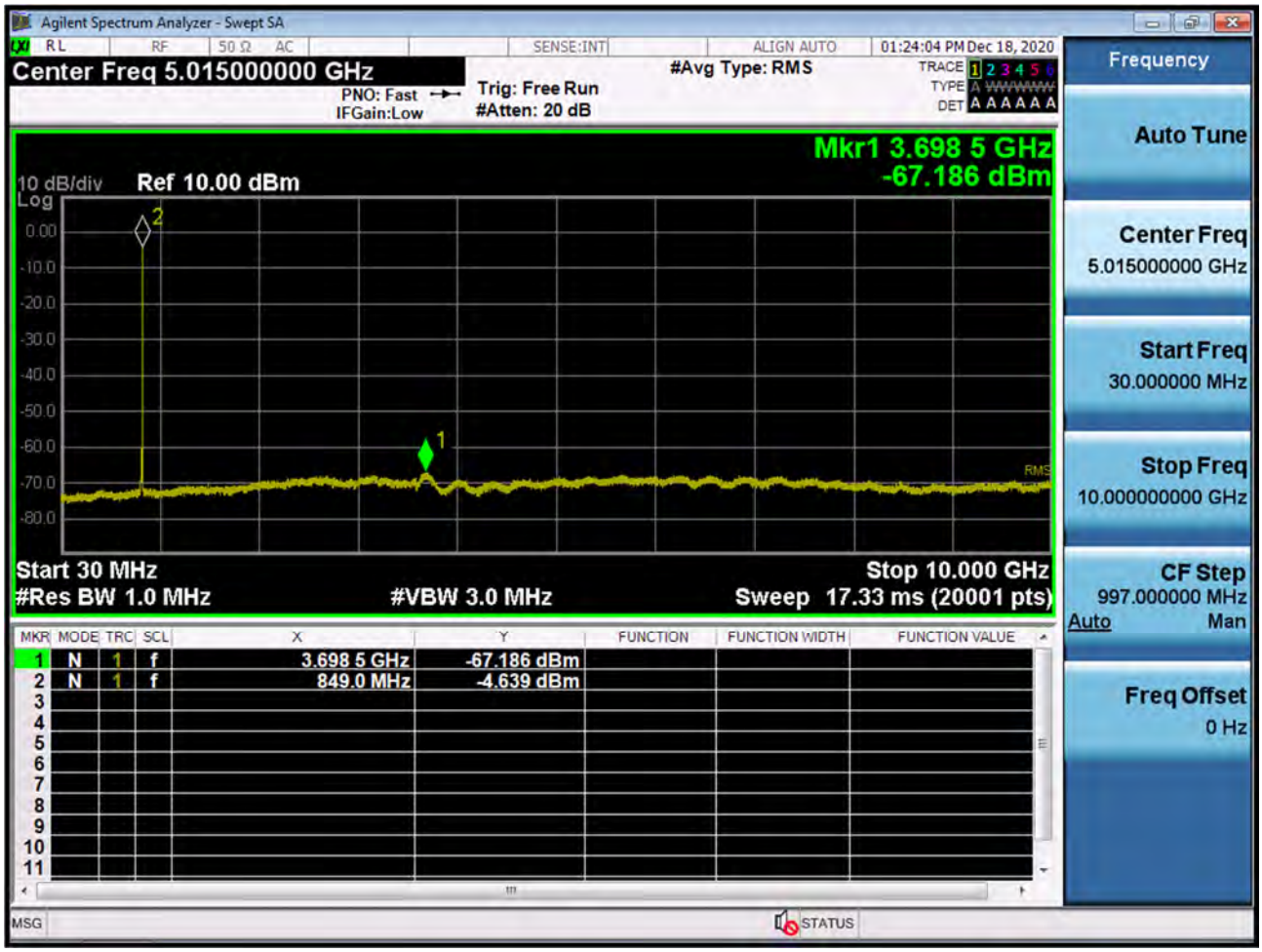
BAND26. Conducted Spurious Plot (26840ch_10MHz_QPSK_RB 1_0)



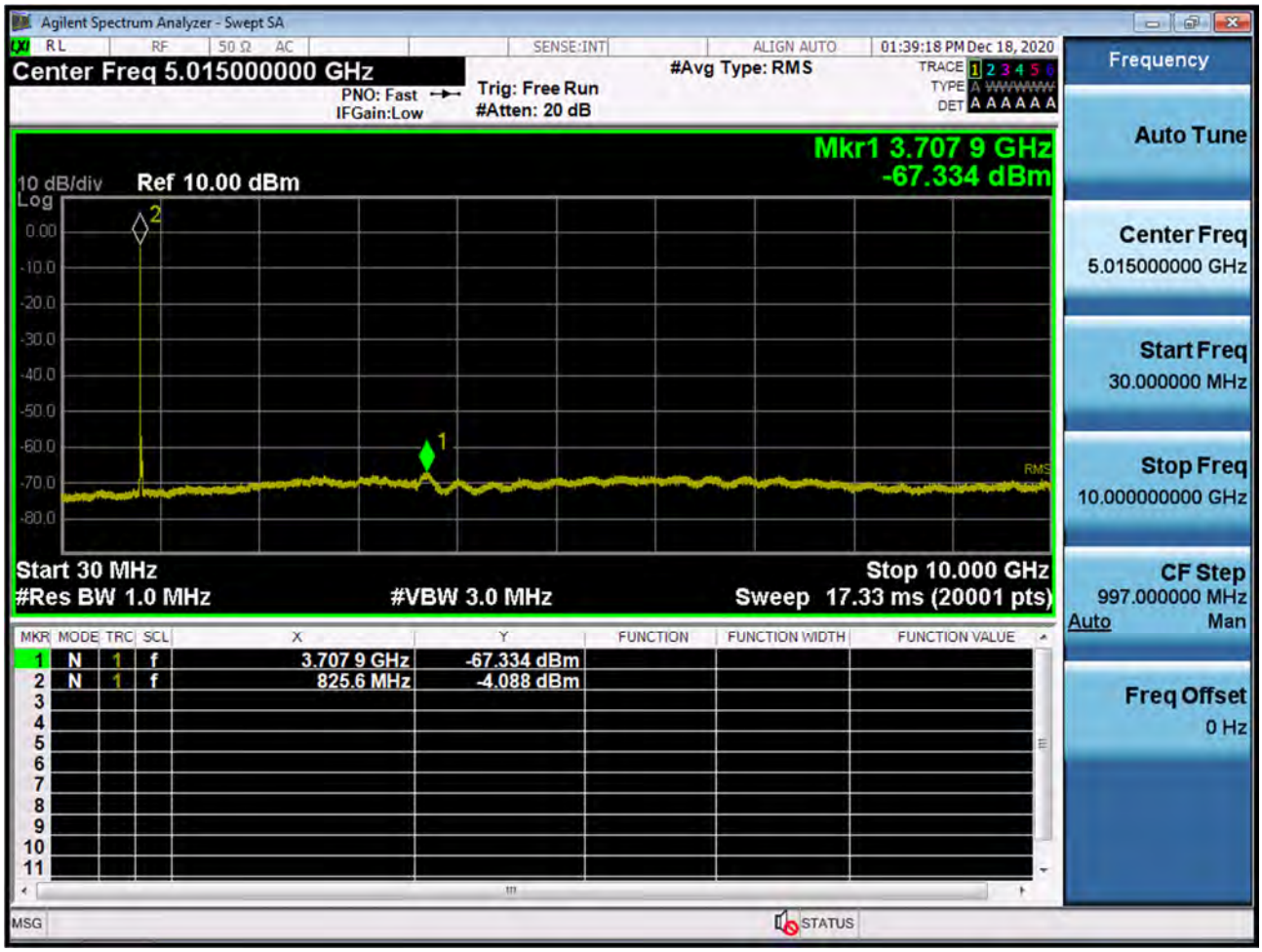
BAND26. Conducted Spurious Plot (26915ch_10MHz_QPSK_RB 1_0)



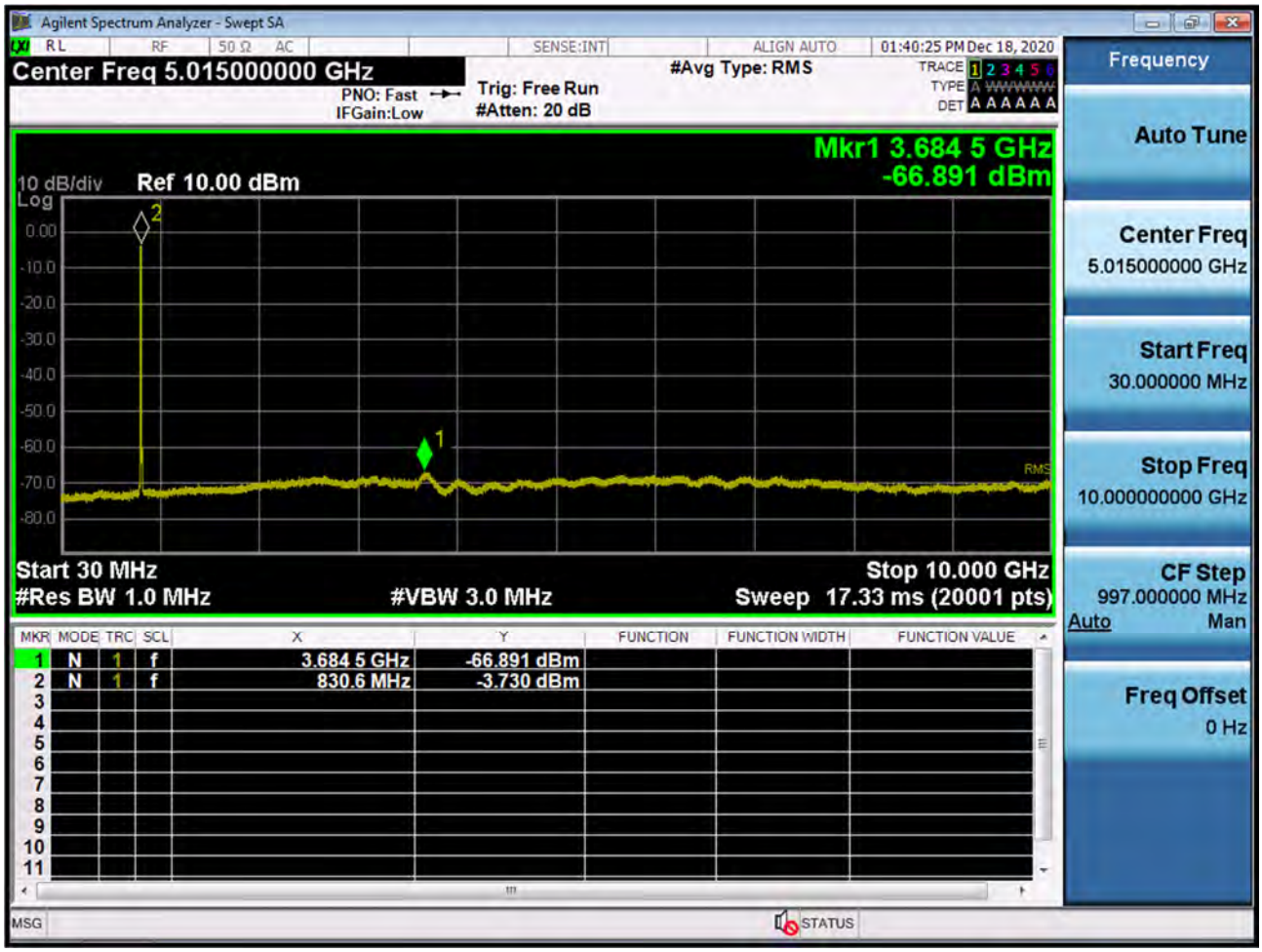
BAND26. Conducted Spurious Plot (26990ch_10MHz_QPSK_RB 1_0)



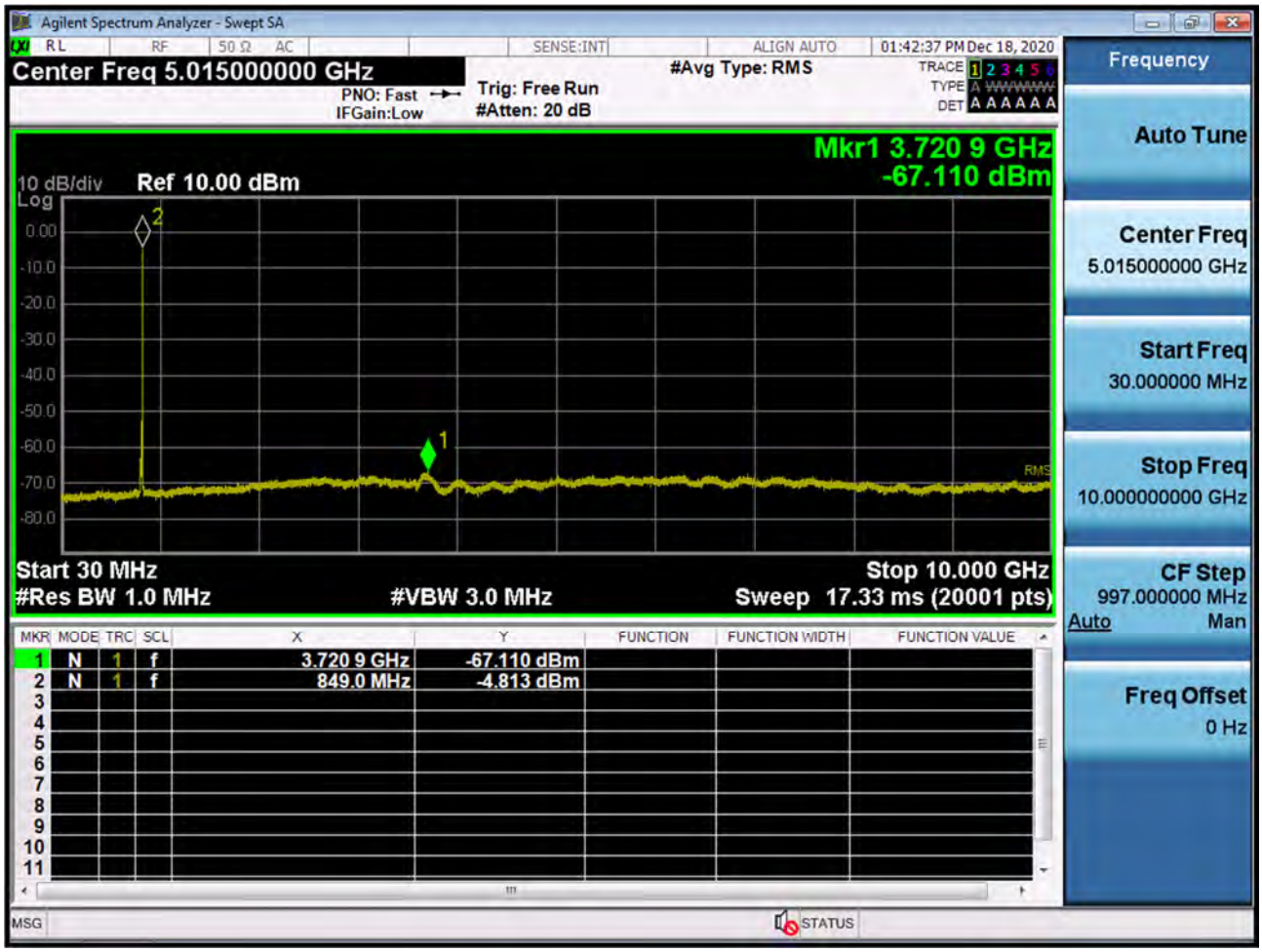
BAND 26. Conducted Spurious (26865ch_15MHz_QPSK_RB 1_0)



BAND 26. Conducted Spurious (26915ch_15MHz_QPSK_RB 1_0)



BAND 26. Conducted Spurious (26965ch_15MHz_QPSK_RB 1_0)



10. ANNEX A_ TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-2101-FC077-P