

FCC LTE REPORT

Certification

Applicant Name:

SAMSUNG Electronics Co., Ltd.

Date of Issue:

January 06, 2021

Address:

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

Location:

HCT CO., LTD.,
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 Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA

Report No.: HCT-RF-2101-FC005

FCC ID: A3LSMA022M

APPLICANT: SAMSUNG Electronics Co., Ltd.

Model(s): SM-A022M/DS
 Additional Model(s): SM-A022M, SM-M022M/DS
 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 – Band66/4 (1.4)	1710.7 – 1779.3	1M09G7D	QPSK	0.195	22.91
		1M09W7D	16QAM	0.166	22.20
		1M10W7D	64QAM	0.129	21.12
LTE – Band66/4 (3)	1711.5 – 1778.5	2M70G7D	QPSK	0.209	23.21
		2M69W7D	16QAM	0.177	22.47
		2M70W7D	64QAM	0.143	21.56
LTE – Band66/4 (5)	1712.5 – 1777.5	4M51G7D	QPSK	0.206	23.14
		4M51W7D	16QAM	0.174	22.41
		4M52W7D	64QAM	0.141	21.48
LTE – Band66/4 (10)	1715.0 – 1775.0	8M97G7D	QPSK	0.202	23.05
		8M99W7D	16QAM	0.171	22.32
		8M98W7D	64QAM	0.132	21.22
LTE – Band66/4 (15)	1717.5 – 1772.5	13M5G7D	QPSK	0.207	23.15
		13M5W7D	16QAM	0.175	22.42
		13M5W7D	64QAM	0.137	21.36
LTE – Band66/4 (20)	1720.0 – 1770.0	18M0G7D	QPSK	0.191	22.82
		17M9W7D	16QAM	0.170	22.29
		18M0W7D	64QAM	0.133	21.25

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-2101-FC005

REVIEWED BY



Report prepared by : Jae Ryang 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-2101-FC005	January 06, 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:	A3LSMA022M
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-A022M/DS
Additional Model(s):	SM-A022M, SM-M022M/DS
Tx Frequency:	1710.7 MHz – 1779.3 MHz (LTE – Band 66/4 (1.4 MHz)) 1711.5 MHz – 1778.5 MHz (LTE – Band 66/4 (3 MHz)) 1712.5 MHz – 1777.5 MHz (LTE – Band 66/4 (5 MHz)) 1715.0 MHz – 1775.0 MHz (LTE – Band 66/4 (10 MHz)) 1717.5 MHz – 1772.5 MHz (LTE – Band 66/4 (15 MHz)) 1720.0 MHz – 1770.0 MHz (LTE – Band 66/4 (20 MHz))
Date(s) of Tests:	December 08, 2020 ~ December 31, 2020
Serial number:	Radiated: R38NB03QV5M Conducted: R38NB03QV2D

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 b/g/n (HT20), Bluetooth, BT LE.

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 1MHz
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 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;

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

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 = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW \geq 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 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 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;

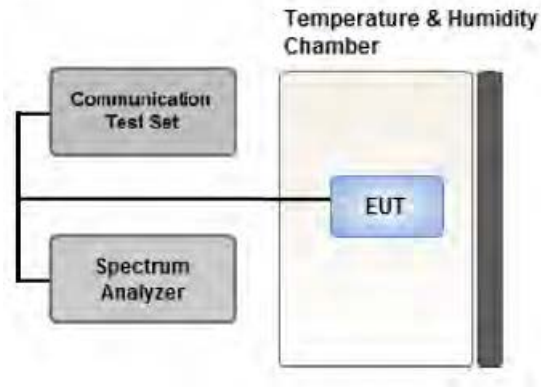
$$\text{Result}_{(\text{dBm})} = P_{g(\text{dBm})} - \text{cable loss}_{(\text{dB})} + \text{antenna gain}_{(\text{dBi})}$$

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

If the fundamental frequency is below 1GHz, 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)

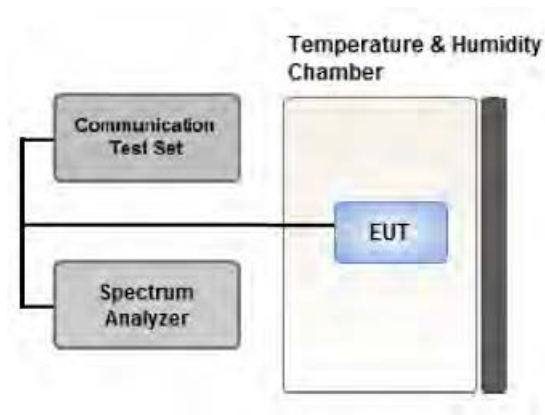
The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW $\geq 3 \times$ RBW.

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 $[10 \log (1/0.25)] = 6 \text{ dB}$ 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.

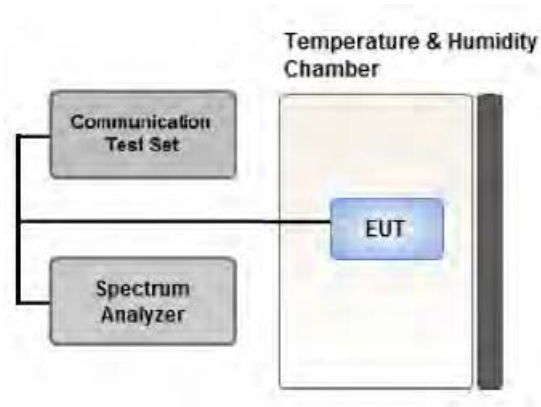
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

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 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 $\geq 3 \times$ 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.

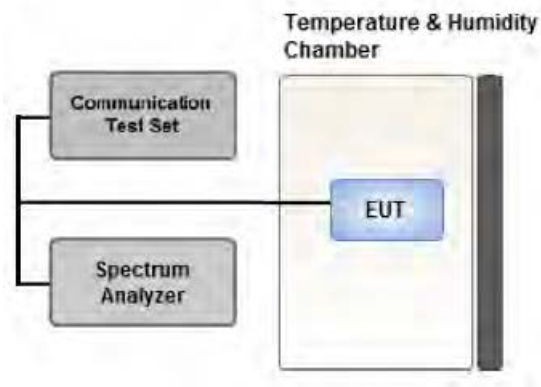
All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

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 = trace 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

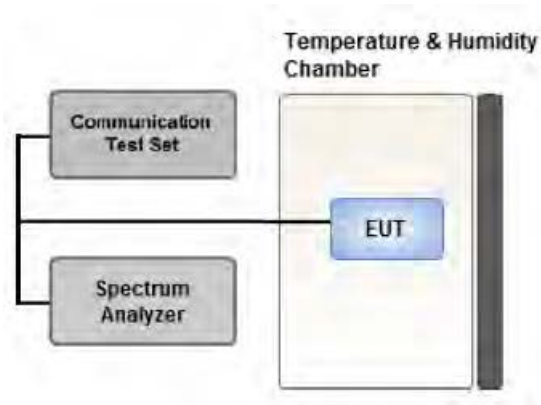
Test Notes

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.

(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, RB sizes and offsets, and channel bandwidth configurations shown in the test data.

- Please refer to the table below.

- LTE Band 66 (1710 – 1780 MHz) overlaps the entire frequency range of LTE Band 4 (1710 - 1755 MHz) and they have the same Tune-up power.

Therefore, test data provided in this report covers Band 4 as well as Band 66.

- SM-A022M/DS & additional models were tested and the worst case results are reported.

(Worst case : SM-A022M/DS)

[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	Z

3.10 WORST CASE(CONDUCTED TEST)

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

Conducted Output Power value can be confirmed on the SAR report.

- LTE Band 66 (1710 – 1780 MHz) overlaps the entire frequency range of LTE Band 4 (1710 - 1755 MHz) and they have the same Tune-up power.

Therefore, test data provided in this report covers Band 4 as well as Band 66.

- SM-A022M/DS & additional models were tested and the worst case results are reported.

(Worst case : SM-A022M/DS)

[Worst case]

Test Description	Modulation	Bandwidth (MHz)	Frequency	RB size	RB offset		
Occupied Bandwidth	QPSK, 16QAM, 64QAM	1.4, 3, 5, 10, 15, 20	Mid	Full RB	0		
Peak-To-Average Ratio	QPSK, 16QAM, 64QAM	1.4, 3, 5, 10, 15, 20	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		
		20	Low	1	0		
			High	1	99		
				1.4, 3, 5, 10, 15, 20	Low, High	Full RB	0
		Spurious and Harmonic Emissions at Antenna Terminal	QPSK	1.4, 3, 5, 10, 15, 20	Low, Mid, High	1	0

4. LIST OF TEST EQUIPMENT

Manufacture	Model/ Equipment	Serial Number	Calibration Date	Calibration Interval	Calibration Due
Wainwright Instruments	WHKX10-900-1000-15000-40SS/ High Pass Filter	5	07/13/2020	Annual	07/13/2021
Wainwright Instruments	WHKX10-2700-3000-18000-40SS/ High Pass Filter	145	09/03/2020	Annual	09/03/2021
Hewlett Packard	11667B / Power Splitter(DC~26.5 GHz)	11275	04/27/2020	Annual	04/27/2021
CERNEX	LOW NOISE AMP (100MHz ~ 18GHz)	26822	06/04/2020	Annual	06/04/2021
CERNEX	CBL18265035 / Power Amplifier	22966	12/04/2020	Annual	12/04/2021
CERNEX	CBL26405040 / Power Amplifier	25956	03/23/2020	Annual	03/23/2021
Hewlett Packard	E3632A/DC Power Supply	MY40004427	09/16/2020	Annual	09/16/2021
Schwarzbeck	UHAP / Precision Dipole Antenna	01273	05/30/2020	Biennial	05/30/2022
Schwarzbeck	UHAP / Precision Dipole Antenna	01274	05/30/2020	Biennial	05/30/2022
ESPEC	SU-642 / Chamber	93008124	03/18/2020	Annual	03/18/2021
Schwarzbeck	BBHA 9120D/ Horn Antenna(1~18GHz)	02289	05/08/2020	Biennial	05/08/2022
Schwarzbeck	BBHA 9120D/ Horn Antenna(1~18GHz)	9120D-1299	05/10/2019	Biennial	05/10/2021
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)	101436	03/16/2020	Annual	03/16/2021
Agilent	8960 (E5515C)/ Base Station	MY48360800	08/26/2020	Annual	08/26/2021
Rohde & Schwarz	FMZB1513/ Loop Antenna(9kHz~30MHz)	1513-175	05/18/2020	Biennial	05/18/2022
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	01/22/2020	Annual	01/22/2021
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 (\pm 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, §27.53(h)	< 43 + 10log10 (P[Watts]) at Band Edge and for all out-of-band emissions	PASS
Conducted Output Power	§2.1046	N/A	<u>See Note1</u>
Peak- to- Average Ratio	27.50(d)(5)	< 13 dB	PASS
Frequency stability / variation of ambient temperature	§2.1055, § 27.54	Emission must remain in band	PASS

Note:

1. See SAR Report

6.2 Test Condition : Radiated Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Equivalent Isotropic Radiated Power	27.50(d)(4)	< 1 Watts max. EIRP	PASS
Radiated Spurious and Harmonic Emissions	§2.1053, §27.53(h)	< 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
132322	1,732.50	-15.75	18.45	9.90	1.76	H	0.456	26.59

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

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

7.3. Emission Designator

GSM Emission Designator

Emission Designator = 249KGXW

GSM BW = 249 kHz

G = Phase Modulation

X = Cases not otherwise covered

W = Combination (Audio/Data)

EDGE Emission Designator

Emission Designator = 249KG7W

GSM BW = 249 kHz

G = Phase Modulation

7 = Quantized/Digital Info

W = Combination (Audio/Data)

WCDMA Emission Designator

Emission Designator = 4M17F9W

WCDMA BW = 4.17 MHz

F = Frequency Modulation

9 = Composite Digital Info

W = Combination (Audio/Data)

QPSK Modulation

Emission Designator = 4M48G7D

LTE BW = 4.48 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

QAM Modulation

Emission Designator = 4M48W7D

LTE BW = 4.48 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

8. TEST DATA

8.1 EQUIVALENT ISOTROPIC RADIATED POWER

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1710.7	LTE B66/ B4 1.4 MHz	QPSK	-17.61	14.31	9.76	1.87	V	< 1.00	0.166	22.20
		16-QAM	-18.33	13.59	9.76	1.87	V		0.140	21.48
		64-QAM	-19.42	12.50	9.76	1.87	H		0.109	20.39
1745.0		QPSK	-17.24	14.58	9.97	1.88	V		0.185	22.67
		16-QAM	-17.96	13.86	9.97	1.88	V		0.157	21.95
		64-QAM	-18.94	12.88	9.97	1.88	H		0.125	20.97
1779.3		QPSK	-17.00	14.71	10.12	1.92	V		0.195	22.91
		16-QAM	-17.71	14.00	10.12	1.92	V		0.166	22.20
		64-QAM	-18.79	12.92	10.12	1.92	H		0.129	21.12

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1711.5	LTE B66/ B4 3 MHz	QPSK	-17.58	14.34	9.76	1.87	V	< 1.00	0.167	22.23
		16-QAM	-18.31	13.61	9.76	1.87	V		0.141	21.50
		64-QAM	-19.41	12.51	9.76	1.87	H		0.110	20.40
1745.0		QPSK	-16.70	15.12	9.97	1.88	V		0.209	23.21
		16-QAM	-17.44	14.38	9.97	1.88	V		0.177	22.47
		64-QAM	-18.54	13.28	9.97	1.88	H		0.137	21.37
1778.5		QPSK	-16.81	14.90	10.12	1.92	V		0.204	23.10
		16-QAM	-17.52	14.19	10.12	1.92	V		0.173	22.39
		64-QAM	-18.35	13.36	10.12	1.92	H		0.143	21.56

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1712.5	LTE B66/ B4 5 MHz	QPSK	-17.68	14.24	9.76	1.87	V	< 1.00	0.163	22.13
		16-QAM	-18.40	13.52	9.76	1.87	V		0.138	21.41
		64-QAM	-19.51	12.41	9.76	1.87	H		0.107	20.30
1745.0		QPSK	-16.77	15.05	9.97	1.88	V		0.206	23.14
		16-QAM	-17.50	14.32	9.97	1.88	V		0.174	22.41
		64-QAM	-18.59	13.23	9.97	1.88	H		0.136	21.32
1777.5		QPSK	-16.84	14.87	10.12	1.92	V		0.203	23.07
		16-QAM	-17.55	14.16	10.12	1.92	V		0.172	22.36
		64-QAM	-18.43	13.28	10.12	1.92	H		0.141	21.48

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1715.0	LTE B66/ B4 10 MHz	QPSK	-17.62	14.26	9.79	1.87	V	< 1.00	0.165	22.18
		16-QAM	-18.33	13.55	9.79	1.87	V		0.140	21.47
		64-QAM	-19.44	12.44	9.79	1.87	H		0.109	20.36
1745.0		QPSK	-16.86	14.96	9.97	1.88	V		0.202	23.05
		16-QAM	-17.59	14.23	9.97	1.88	V		0.171	22.32
		64-QAM	-18.69	13.13	9.97	1.88	H		0.132	21.22
1775.0		QPSK	-17.02	14.77	10.10	1.92	V		0.197	22.95
		16-QAM	-17.74	14.05	10.10	1.92	V		0.167	22.23
		64-QAM	-18.84	12.95	10.10	1.92	H		0.130	21.13

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1717.5	LTE B66/ B4 15 MHz	QPSK	-17.68	14.16	9.82	1.87	V	< 1.00	0.162	22.11
		16-QAM	-18.41	13.43	9.82	1.87	V		0.137	21.38
		64-QAM	-19.34	12.50	9.82	1.87	H		0.111	20.45
1745.0		QPSK	-17.05	14.77	9.97	1.88	V		0.193	22.86
		16-QAM	-17.75	14.07	9.97	1.88	V		0.164	22.16
		64-QAM	-18.84	12.98	9.97	1.88	H		0.128	21.07
1772.5		QPSK	-16.88	14.98	10.08	1.91	V		0.207	23.15
		16-QAM	-17.61	14.25	10.08	1.91	V		0.175	22.42
		64-QAM	-18.67	13.19	10.08	1.91	H		0.137	21.36

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1720.0	LTE B66/ B4 20 MHz	QPSK	-17.50	14.34	9.82	1.87	V	< 1.00	0.169	22.29
		16-QAM	-18.30	13.54	9.82	1.87	V		0.141	21.49
		64-QAM	-19.26	12.58	9.82	1.87	H		0.113	20.53
1745.0		QPSK	-17.09	14.73	9.97	1.88	V		0.191	22.82
		16-QAM	-17.80	14.02	9.97	1.88	V		0.163	22.11
		64-QAM	-18.95	12.87	9.97	1.88	H		0.125	20.96
1770.0		QPSK	-17.24	14.62	10.08	1.91	V		0.190	22.79
		16-QAM	-17.74	14.12	10.08	1.91	V		0.170	22.29
		64-QAM	-18.78	13.08	10.08	1.91	H		0.133	21.25

8.2 RADIATED SPURIOUS EMISSIONS

- ▣ OPERATING FREQUENCY: 1745.0 MHz
- ▣ MEASURED OUTPUT POWER: 23.21 dBm = 0.209 W
- ▣ MODE: LTE B66 / B4
- ▣ MODULATION SIGNAL: 3 MHz QPSK
- ▣ DISTANCE: 3 meters
- ▣ LIMIT: $43 + 10 \log_{10}(W) =$ 36.21 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
131987 (1711.5)	3 423.00	-58.55	11.30	-63.08	2.70	V	-54.48	77.69
	5 134.50	-59.81	11.34	-56.29	3.36	H	-48.31	71.53
	6 846.00	-62.04	11.19	-52.78	3.94	H	-45.53	68.74
132322 (1745.0)	3 490.00	-58.57	11.46	-62.55	2.74	V	-53.83	77.05
	5 235.00	-59.86	11.57	-57.35	3.39	H	-49.17	72.38
	6 980.00	-61.94	11.16	-51.65	3.96	H	-44.45	67.66
132657 (1778.5)	3 557.00	-58.50	11.74	-62.14	2.77	V	-53.17	76.38
	5 335.50	-60.09	11.77	-57.60	3.43	H	-49.26	72.47
	7 114.00	-61.93	10.94	-49.89	4.01	H	-42.95	66.16

8.3 PEAK-TO-AVERAGE RATIO

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (dB)
66/4	1.4 MHz	1745.0	QPSK	6	0	5.34
			16-QAM			6.08
			64-QAM			6.33
	3 MHz		QPSK	15		5.43
			16-QAM			6.09
			64-QAM			6.36
	5 MHz		QPSK	25		5.47
			16-QAM			6.16
			64-QAM			6.37
	10 MHz		QPSK	50		5.56
			16-QAM			6.18
			64-QAM			6.36
	15 MHz		QPSK	75		5.53
			16-QAM			6.20
			64-QAM			6.41
20 MHz	QPSK	100	5.51			
	16-QAM		6.23			
	64-QAM		6.41			

Note:

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 69 ~ 86.

8.4 OCCUPIED BANDWIDTH

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
66/4	1.4 MHz	1745.0	QPSK	6	0	1.0928
			16-QAM			1.0913
			64-QAM			1.0952
	3 MHz		QPSK	15		2.6977
			16-QAM			2.6915
			64-QAM			2.6953
	5 MHz		QPSK	25		4.5055
			16-QAM			4.5054
			64-QAM			4.5153
	10 MHz		QPSK	50		8.9712
			16-QAM			8.9922
			64-QAM			8.9749
	15 MHz		QPSK	75		13.474
			16-QAM			13.476
			64-QAM			13.466
20 MHz	QPSK	100	17.970			
	16-QAM		17.902			
	64-QAM		17.957			

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 51~ 68.

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)
66/4	1.4	1710.7	6.8415	28.591	-73.898	-45.307	-13.00
		1745.0	3.4896	27.976	-74.197	-46.221	
		1779.3	3.5599	27.976	-74.438	-46.462	
	3	1711.5	6.8415	28.591	-74.510	-45.919	
		1745.0	3.4881	27.976	-74.419	-46.443	
		1778.5	3.5604	27.976	-74.213	-46.237	
	5	1712.5	6.8420	28.591	-74.648	-46.057	
		1745.0	3.4861	27.976	-75.787	-47.811	
		1777.5	3.5599	27.976	-74.345	-46.369	
	10	1715.0	6.8430	28.591	-74.429	-45.838	
		1745.0	6.9631	28.591	-75.707	-47.116	
		1775.0	3.5594	27.976	-74.635	-46.659	
	15	1717.5	6.8440	28.591	-73.905	-45.314	
		1745.0	3.4771	27.976	-74.776	-46.800	
		1772.5	3.5589	27.976	-74.778	-46.802	
	20	1720.0	6.8450	28.591	-73.957	-45.366	
		1745.0	3.4726	27.976	-75.176	-47.200	
		1770.0	3.5584	27.976	-75.031	-47.055	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 123 ~ 158.
2. Conducted Spurious Emissions was Tested QPSK Modulation, Resource Block Size 1 and Resource Block Offset 0
3. Result (dBm) = Measurement Maximum Data (dBm) + Factor (dB)
4. Factor(dB) = Cable Loss + Attenuator + Power Splitter

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

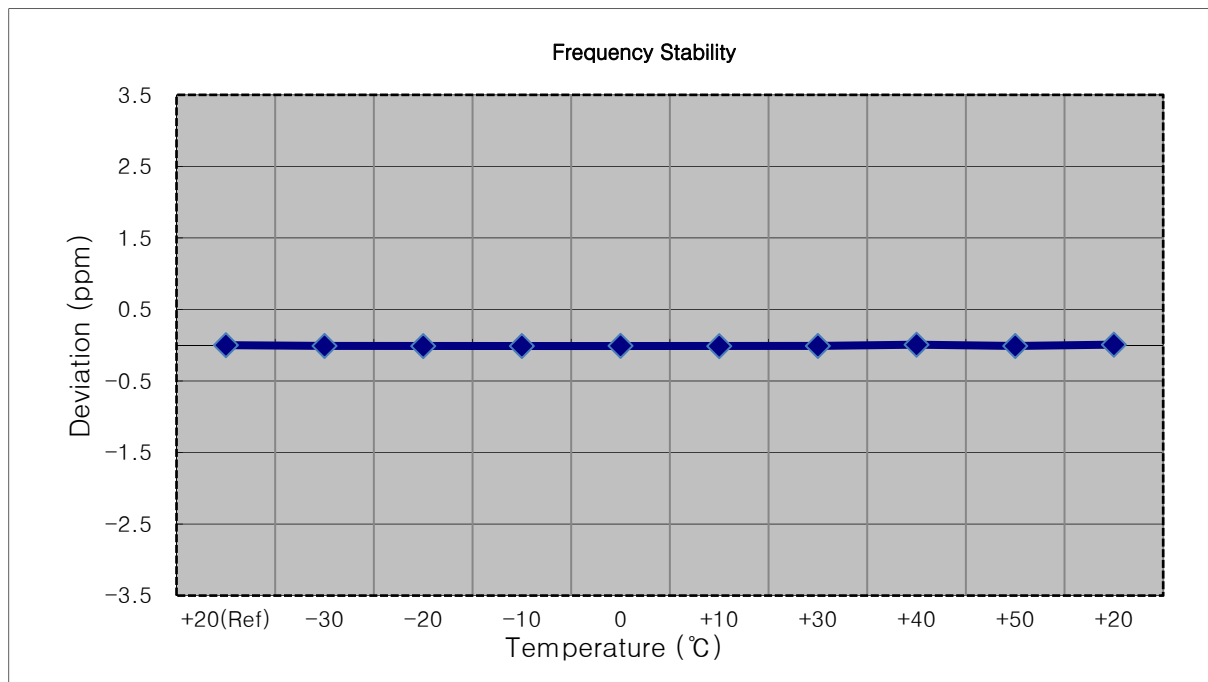
8.6 BAND EDGE

- Plots of the EUT's Band Edge are shown Page 87 ~ 122.

8.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

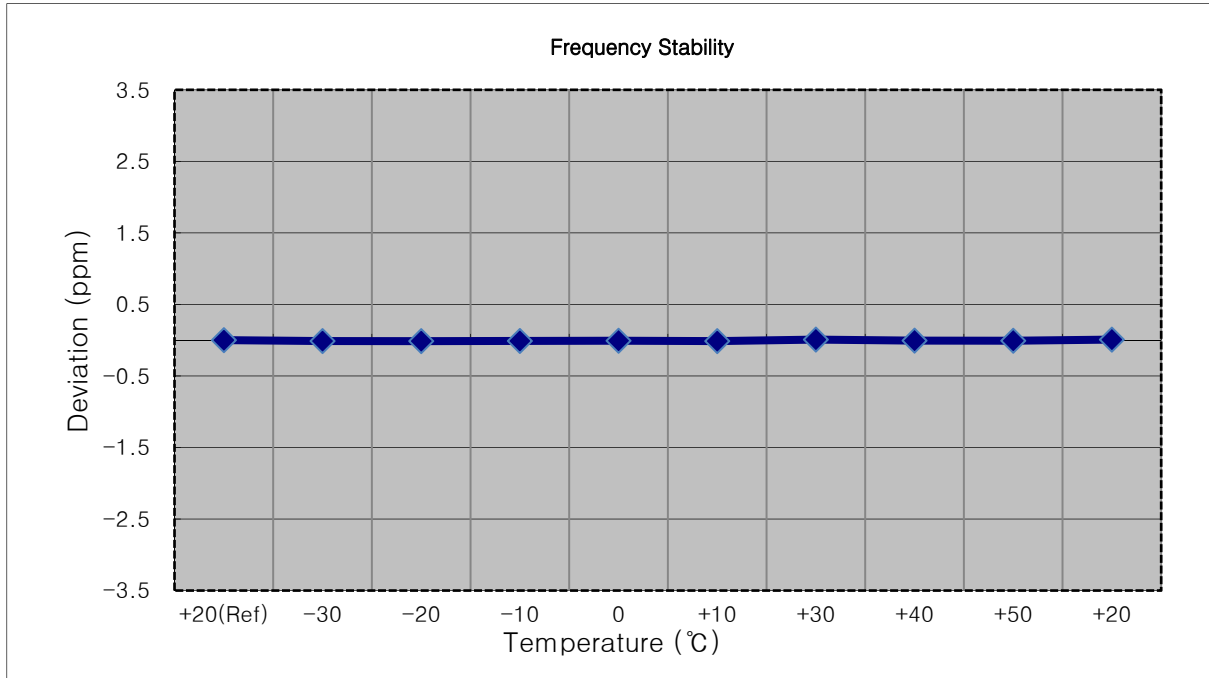
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1710,700,000 Hz
- ▣ CHANNEL: 131979 (1.4 MHz)
- ▣ REFERENCE VOLTAGE: 3.85 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1710 699 981	0.0	0.000 000	0.000
100%		-30	1710 699 963	-17.9	-0.000 001	-0.010
100%		-20	1710 699 959	-21.4	-0.000 001	-0.013
100%		-10	1710 699 960	-20.4	-0.000 001	-0.012
100%		0	1710 699 965	-15.2	-0.000 001	-0.009
100%		+10	1710 699 958	-22.1	-0.000 001	-0.013
100%		+30	1710 699 963	-17.4	-0.000 001	-0.010
100%		+40	1710 699 992	11.7	0.000 001	0.007
100%		+50	1710 699 962	-18.6	-0.000 001	-0.011
Batt. Endpoint		3.370	+20	1710 699 994	13.4	0.000 001



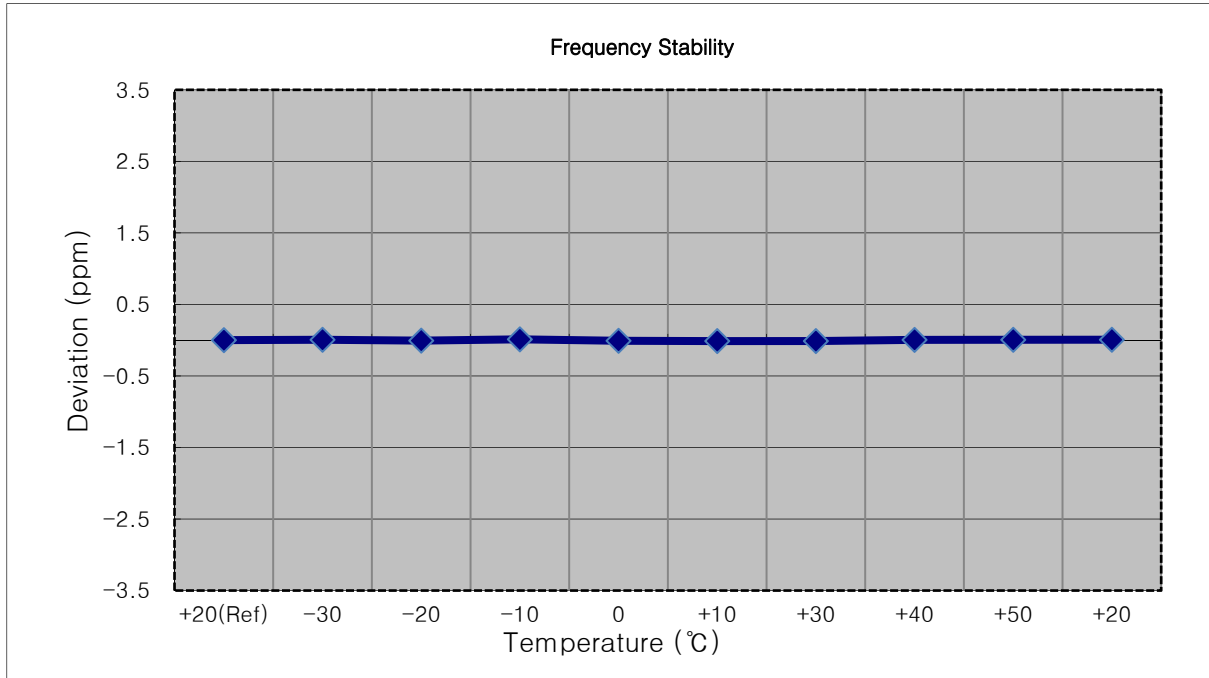
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1711.500.000 Hz
- ▣ CHANNEL: 131987 (3 MHz)
- ▣ REFERENCE VOLTAGE: 3.85 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1711 499 981	0.0	0.000 000	0.000
100%		-30	1711 499 960	-21.4	-0.000 001	-0.013
100%		-20	1711 499 958	-22.9	-0.000 001	-0.013
100%		-10	1711 499 962	-18.9	-0.000 001	-0.011
100%		0	1711 499 968	-12.9	-0.000 001	-0.008
100%		+10	1711 499 959	-22.4	-0.000 001	-0.013
100%		+30	1711 499 995	14.2	0.000 001	0.008
100%		+40	1711 499 970	-11.3	-0.000 001	-0.007
100%		+50	1711 499 967	-13.9	-0.000 001	-0.008
Batt. Endpoint	3.370	+20	1711 499 994	12.9	0.000 001	0.008



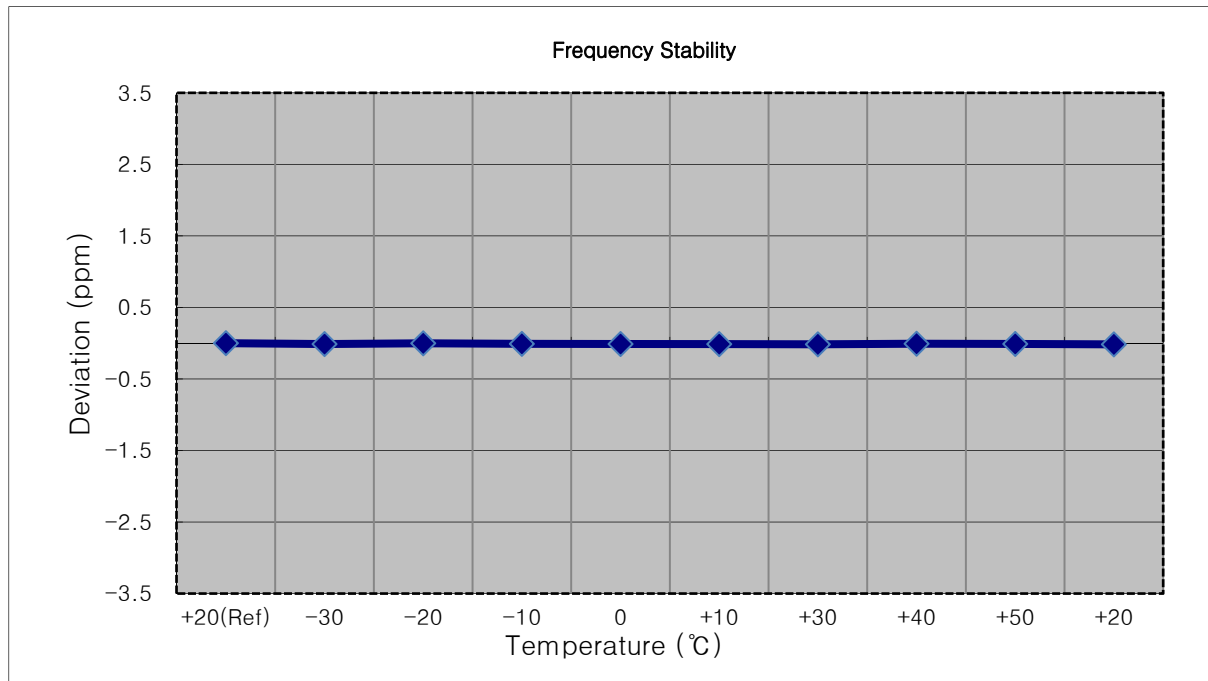
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1712.500.000 Hz
- ▣ CHANNEL: 131997 (5 MHz)
- ▣ REFERENCE VOLTAGE: 3.85 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1712 500 018	0.0	0.000 000	0.000
100%		-30	1712 500 028	9.9	0.000 001	0.006
100%		-20	1712 500 007	-11.0	-0.000 001	-0.006
100%		-10	1712 500 038	20.2	0.000 001	0.012
100%		0	1712 500 004	-14.3	-0.000 001	-0.008
100%		+10	1712 499 997	-21.4	-0.000 001	-0.012
100%		+30	1712 499 997	-20.9	-0.000 001	-0.012
100%		+40	1712 500 025	6.8	0.000 000	0.004
100%		+50	1712 500 027	9.0	0.000 001	0.005
Batt. Endpoint	3.370	+20	1712 500 029	11.3	0.000 001	0.007



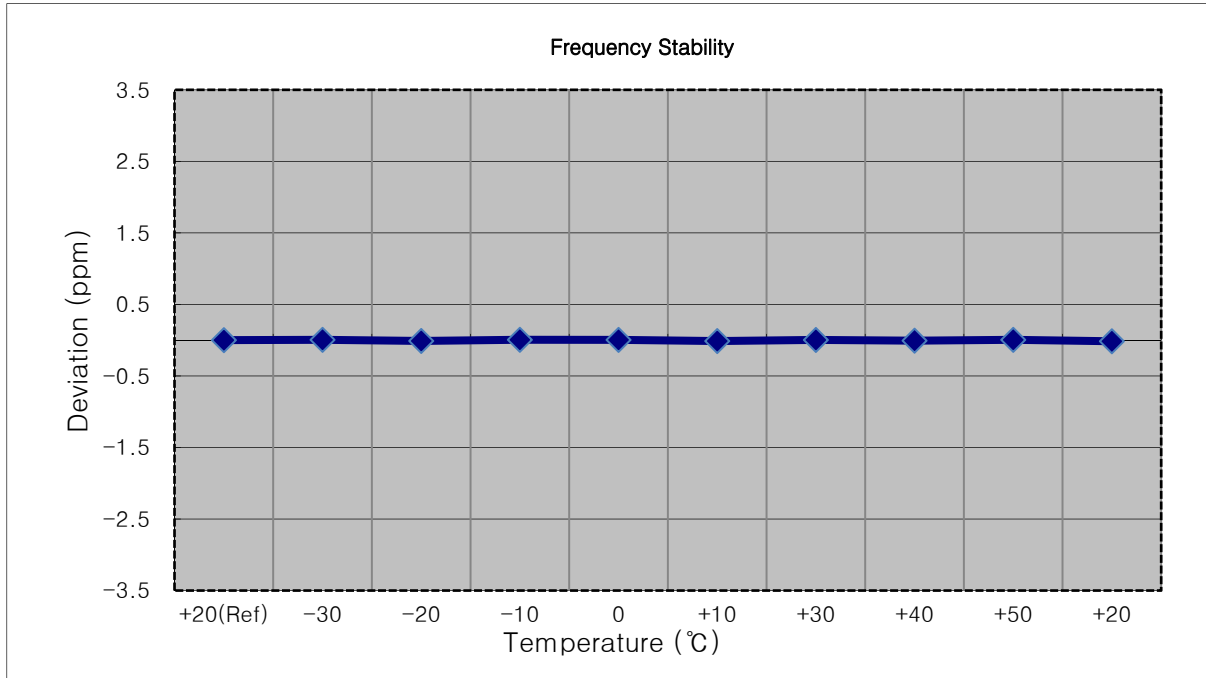
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1715,000,000 Hz
- ▣ CHANNEL: 132022 (10 MHz)
- ▣ REFERENCE VOLTAGE: 3.85 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1714 999 992	0.0	0.000 000	0.000
100%		-30	1714 999 970	-21.6	-0.000 001	-0.013
100%		-20	1714 999 988	-3.4	0.000 000	-0.002
100%		-10	1714 999 976	-15.4	-0.000 001	-0.009
100%		0	1714 999 972	-19.7	-0.000 001	-0.011
100%		+10	1714 999 969	-22.7	-0.000 001	-0.013
100%		+30	1714 999 965	-27.0	-0.000 002	-0.016
100%		+40	1714 999 978	-13.1	-0.000 001	-0.008
100%		+50	1714 999 973	-18.8	-0.000 001	-0.011
Batt. Endpoint	3.370	+20	1714 999 963	-28.4	-0.000 002	-0.017



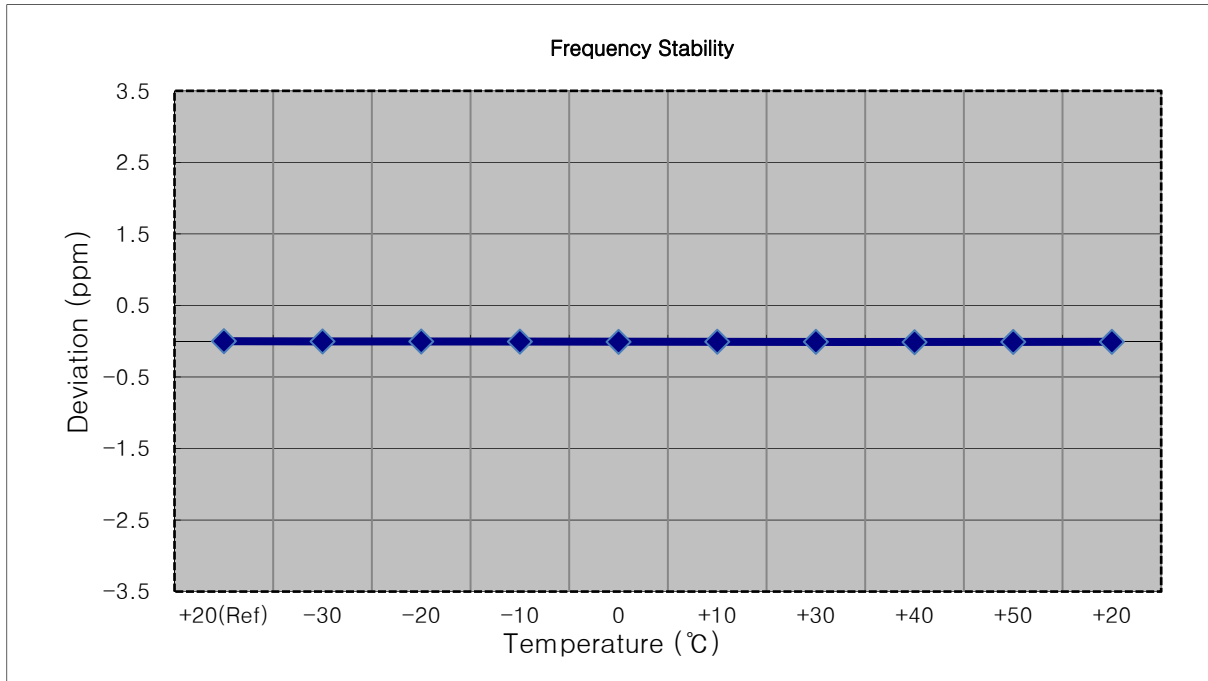
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1717.500.000 Hz
- ▣ CHANNEL: 132047 (15 MHz)
- ▣ REFERENCE VOLTAGE: 3.85 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1717 500 013	0.0	0.000 000	0.000
100%		-30	1717 500 021	8.2	0.000 000	0.005
100%		-20	1717 499 995	-18.3	-0.000 001	-0.011
100%		-10	1717 500 023	10.1	0.000 001	0.006
100%		0	1717 500 020	7.3	0.000 000	0.004
100%		+10	1717 499 992	-20.8	-0.000 001	-0.012
100%		+30	1717 500 019	6.3	0.000 000	0.004
100%		+40	1717 500 001	-12.0	-0.000 001	-0.007
100%		+50	1717 500 021	7.7	0.000 000	0.004
Batt. Endpoint	3.370	+20	1717 499 987	-25.8	-0.000 002	-0.015



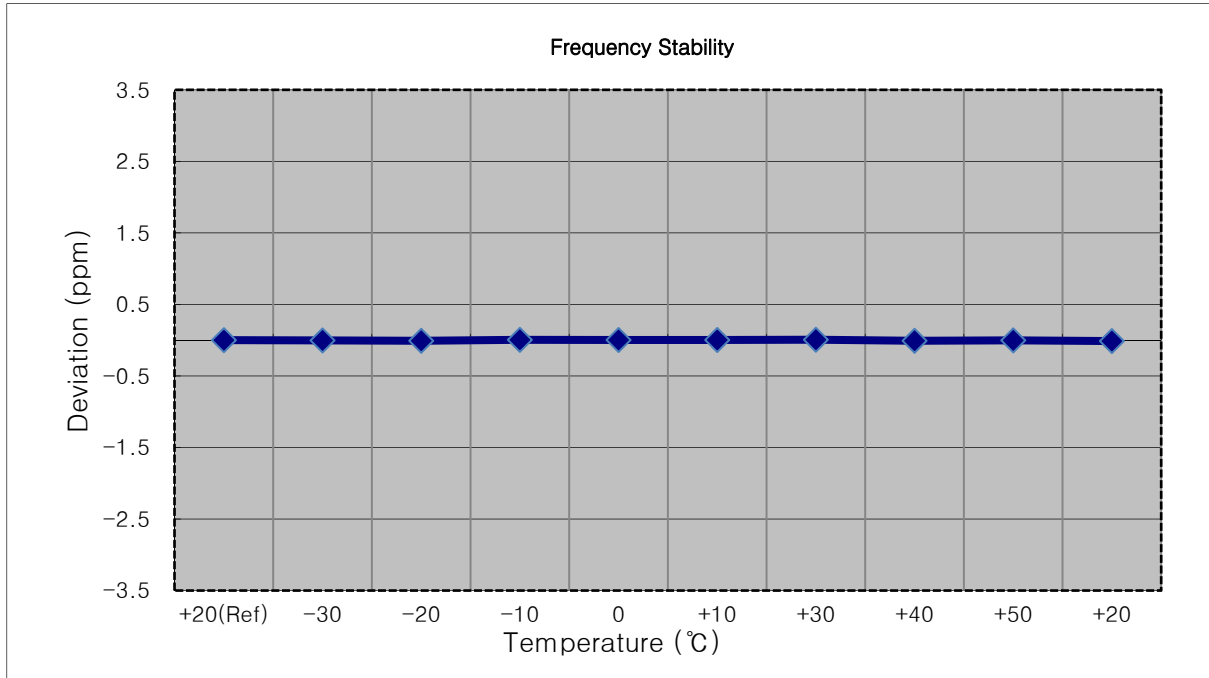
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1720,000,000 Hz
- ▣ CHANNEL: 132072 (20 MHz)
- ▣ REFERENCE VOLTAGE: 3.85 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1719 999 984	0.0	0.000 000	0.000
100%		-30	1719 999 978	-5.6	0.000 000	-0.003
100%		-20	1719 999 977	-7.2	0.000 000	-0.004
100%		-10	1719 999 974	-10.2	-0.000 001	-0.006
100%		0	1719 999 967	-16.6	-0.000 001	-0.010
100%		+10	1719 999 972	-12.0	-0.000 001	-0.007
100%		+30	1719 999 969	-14.6	-0.000 001	-0.008
100%		+40	1719 999 960	-24.0	-0.000 001	-0.014
100%		+50	1719 999 967	-16.9	-0.000 001	-0.010
Batt. Endpoint		3.370	+20	1719 999 969	-15.3	-0.000 001



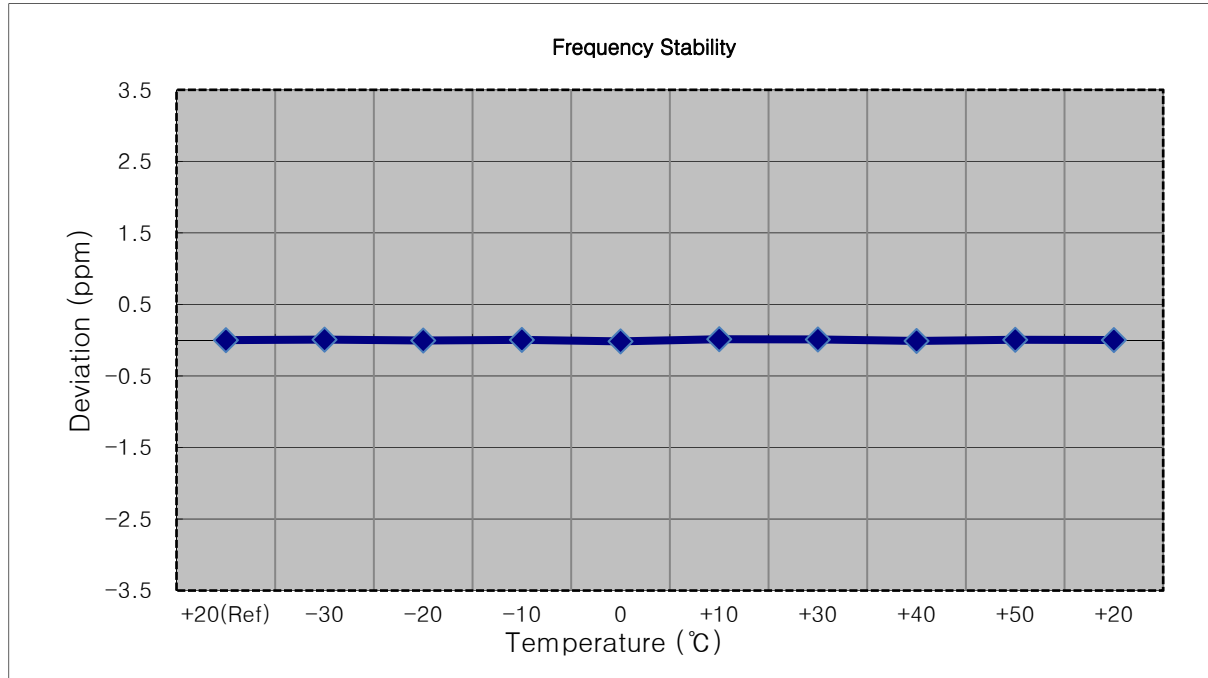
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1745,000,000 Hz
- ▣ CHANNEL: 132322 (1.4 MHz)
- ▣ REFERENCE VOLTAGE: 3.85 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1744 999 995	0.0	0.000 000	0.000
100%		-30	1744 999 989	-5.9	0.000 000	-0.003
100%		-20	1744 999 980	-14.6	-0.000 001	-0.008
100%		-10	1745 000 004	8.9	0.000 001	0.005
100%		0	1745 000 000	4.5	0.000 000	0.003
100%		+10	1744 999 999	4.3	0.000 000	0.002
100%		+30	1745 000 006	11.4	0.000 001	0.007
100%		+40	1744 999 979	-15.6	-0.000 001	-0.009
100%		+50	1744 999 990	-5.2	0.000 000	-0.003
Batt. Endpoint	3.370	+20	1744 999 974	-21.1	-0.000 001	-0.012



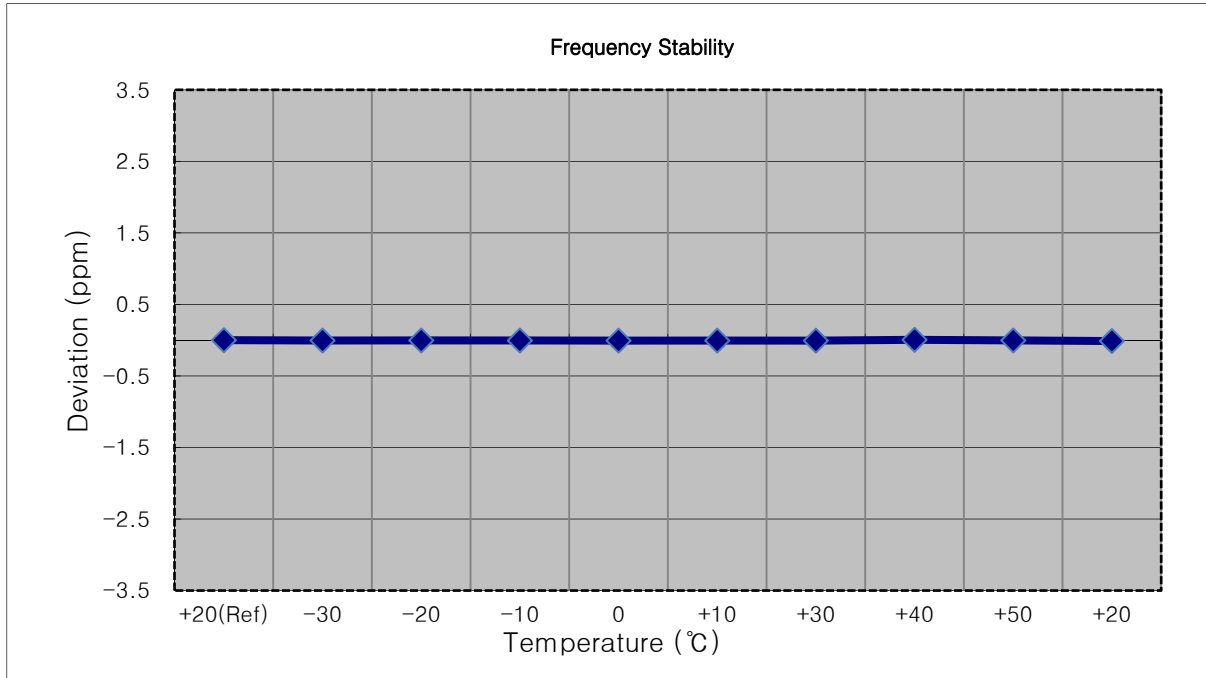
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1745,000,000 Hz
- ▣ CHANNEL: 132322 (3 MHz)
- ▣ REFERENCE VOLTAGE: 3.85 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1744 999 989	0.0	0.000 000	0.000
100%		-30	1745 000 003	13.8	0.000 001	0.008
100%		-20	1744 999 981	-8.1	0.000 000	-0.005
100%		-10	1744 999 996	6.7	0.000 000	0.004
100%		0	1744 999 960	-29.3	-0.000 002	-0.017
100%		+10	1745 000 013	23.5	0.000 001	0.013
100%		+30	1745 000 006	17.1	0.000 001	0.010
100%		+40	1744 999 971	-18.4	-0.000 001	-0.011
100%		+50	1744 999 999	9.9	0.000 001	0.006
Batt. Endpoint	3.370	+20	1744 999 993	3.6	0.000 000	0.002



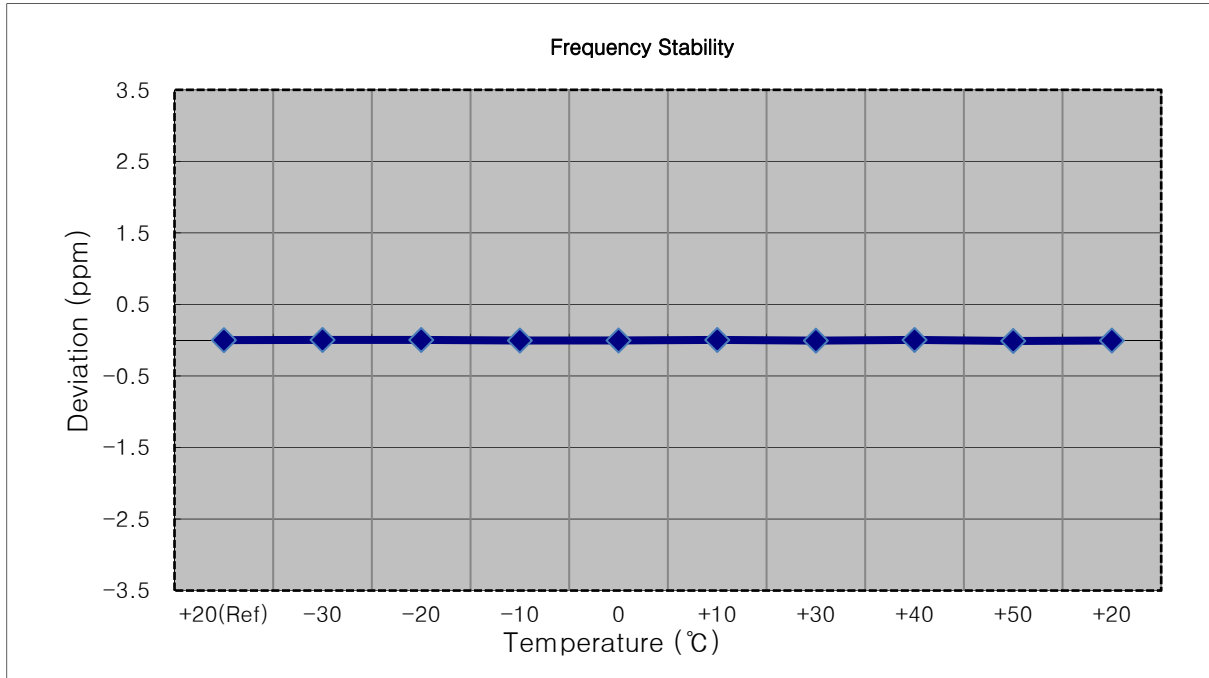
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1745,000,000 Hz
- ▣ CHANNEL: 132322 (5 MHz)
- ▣ REFERENCE VOLTAGE: 3.85 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1744 999 979	0.0	0.000 000	0.000
100%		-30	1744 999 971	-8.3	0.000 000	-0.005
100%		-20	1744 999 974	-5.6	0.000 000	-0.003
100%		-10	1744 999 972	-6.9	0.000 000	-0.004
100%		0	1744 999 968	-10.8	-0.000 001	-0.006
100%		+10	1744 999 969	-10.2	-0.000 001	-0.006
100%		+30	1744 999 968	-11.4	-0.000 001	-0.007
100%		+40	1744 999 988	8.5	0.000 000	0.005
100%		+50	1744 999 973	-5.9	0.000 000	-0.003
Batt. Endpoint	3.370	+20	1744 999 959	-20.3	-0.000 001	-0.012



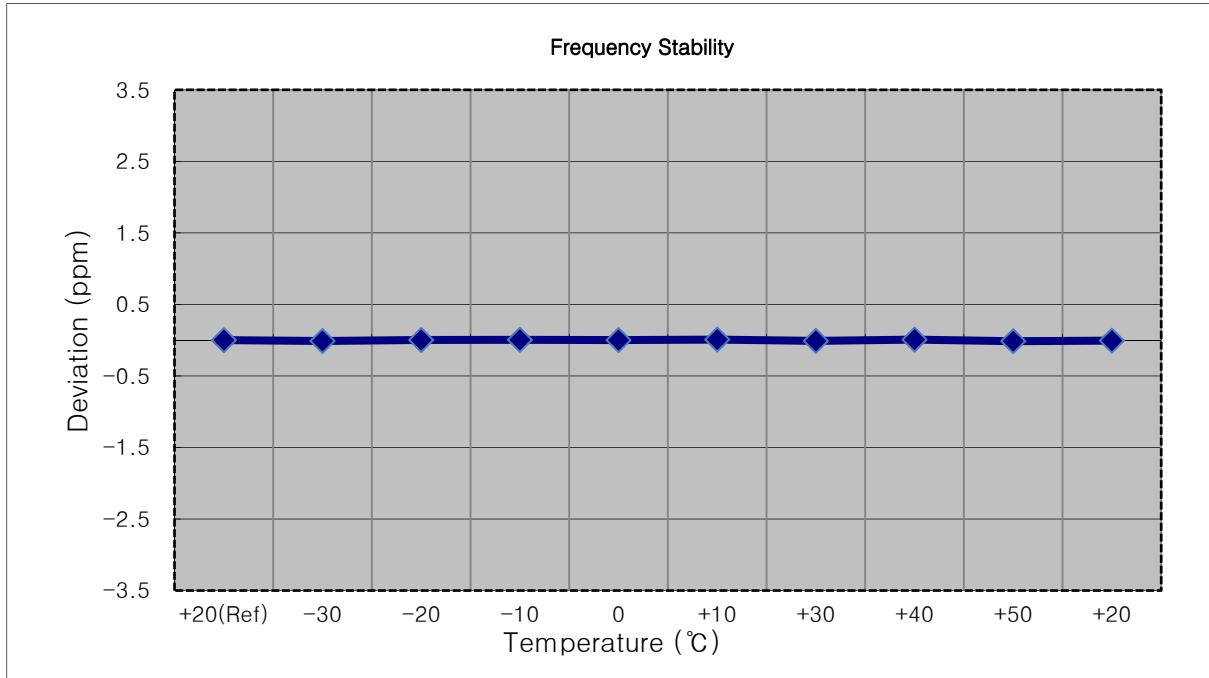
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1745,000,000 Hz
- ▣ CHANNEL: 132322 (10 MHz)
- ▣ REFERENCE VOLTAGE: 3.85 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1744 999 990	0.0	0.000 000	0.000
100%		-30	1744 999 996	6.4	0.000 000	0.004
100%		-20	1744 999 996	5.8	0.000 000	0.003
100%		-10	1744 999 982	-8.5	0.000 000	-0.005
100%		0	1744 999 983	-7.3	0.000 000	-0.004
100%		+10	1744 999 996	6.3	0.000 000	0.004
100%		+30	1744 999 979	-11.1	-0.000 001	-0.006
100%		+40	1744 999 996	5.6	0.000 000	0.003
100%		+50	1744 999 971	-19.3	-0.000 001	-0.011
Batt. Endpoint		3.370	+20	1744 999 982	-8.0	0.000 000



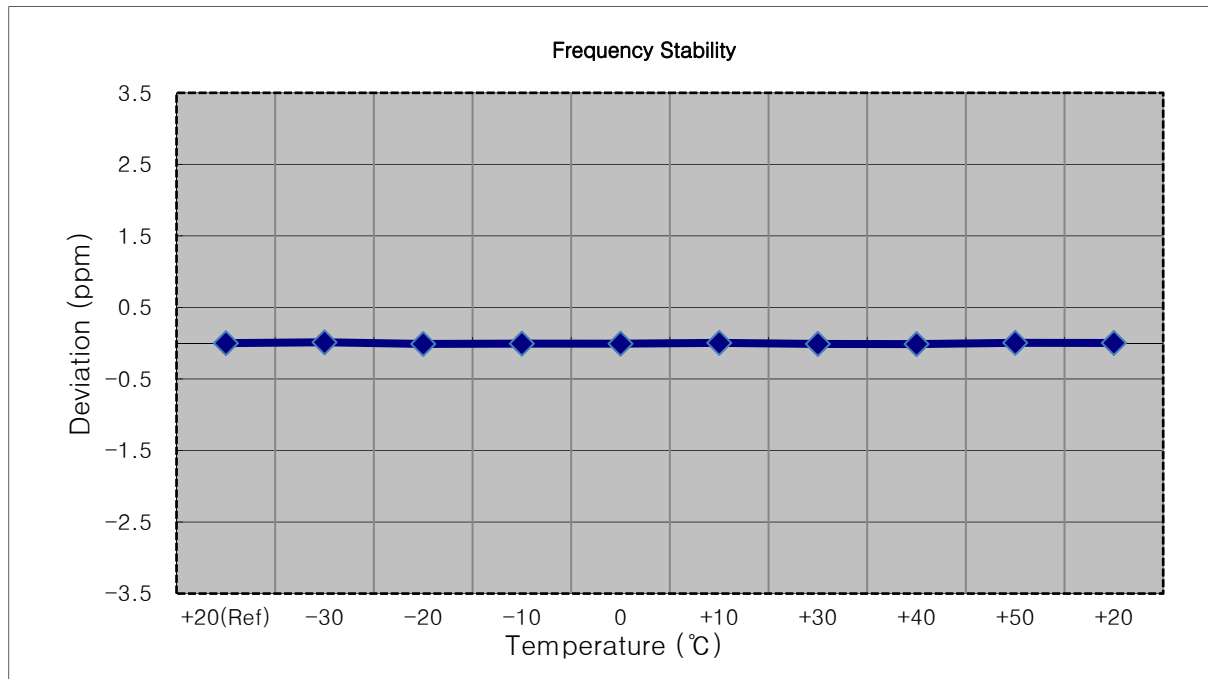
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1745,000,000 Hz
- ▣ CHANNEL: 132322 (15 MHz)
- ▣ REFERENCE VOLTAGE: 3.85 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1744 999 978	0.0	0.000 000	0.000
100%		-30	1744 999 958	-19.6	-0.000 001	-0.011
100%		-20	1744 999 982	4.4	0.000 000	0.003
100%		-10	1744 999 986	7.9	0.000 000	0.005
100%		0	1744 999 980	2.5	0.000 000	0.001
100%		+10	1744 999 992	14.6	0.000 001	0.008
100%		+30	1744 999 961	-17.2	-0.000 001	-0.010
100%		+40	1744 999 991	13.5	0.000 001	0.008
100%		+50	1744 999 953	-24.4	-0.000 001	-0.014
Batt. Endpoint	3.370	+20	1744 999 967	-10.7	-0.000 001	-0.006



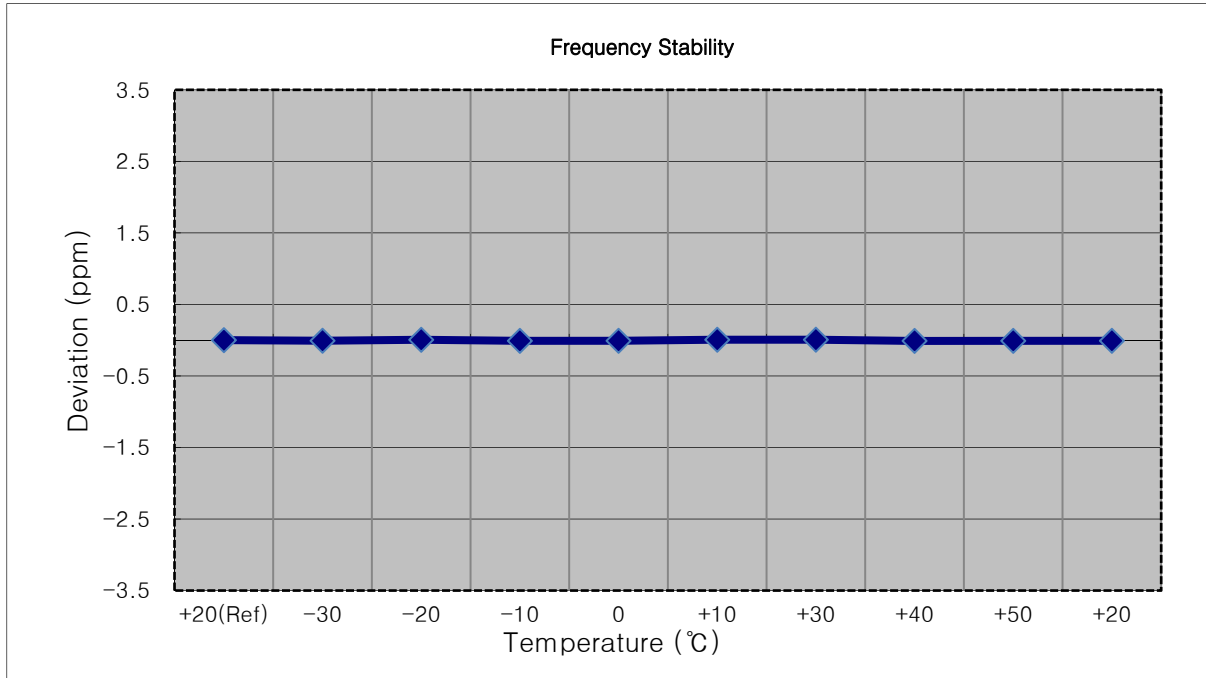
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1745,000,000 Hz
- ▣ CHANNEL: 132322 (20 MHz)
- ▣ REFERENCE VOLTAGE: 3.85 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1745 000 012	0.0	0.000 000	0.000
100%		-30	1745 000 033	21.6	0.000 001	0.012
100%		-20	1744 999 992	-19.2	-0.000 001	-0.011
100%		-10	1745 000 000	-11.1	-0.000 001	-0.006
100%		0	1745 000 000	-12.0	-0.000 001	-0.007
100%		+10	1745 000 019	7.5	0.000 000	0.004
100%		+30	1744 999 992	-19.4	-0.000 001	-0.011
100%		+40	1744 999 989	-22.4	-0.000 001	-0.013
100%		+50	1745 000 020	8.8	0.000 001	0.005
Batt. Endpoint	3.370	+20	1745 000 017	5.0	0.000 000	0.003



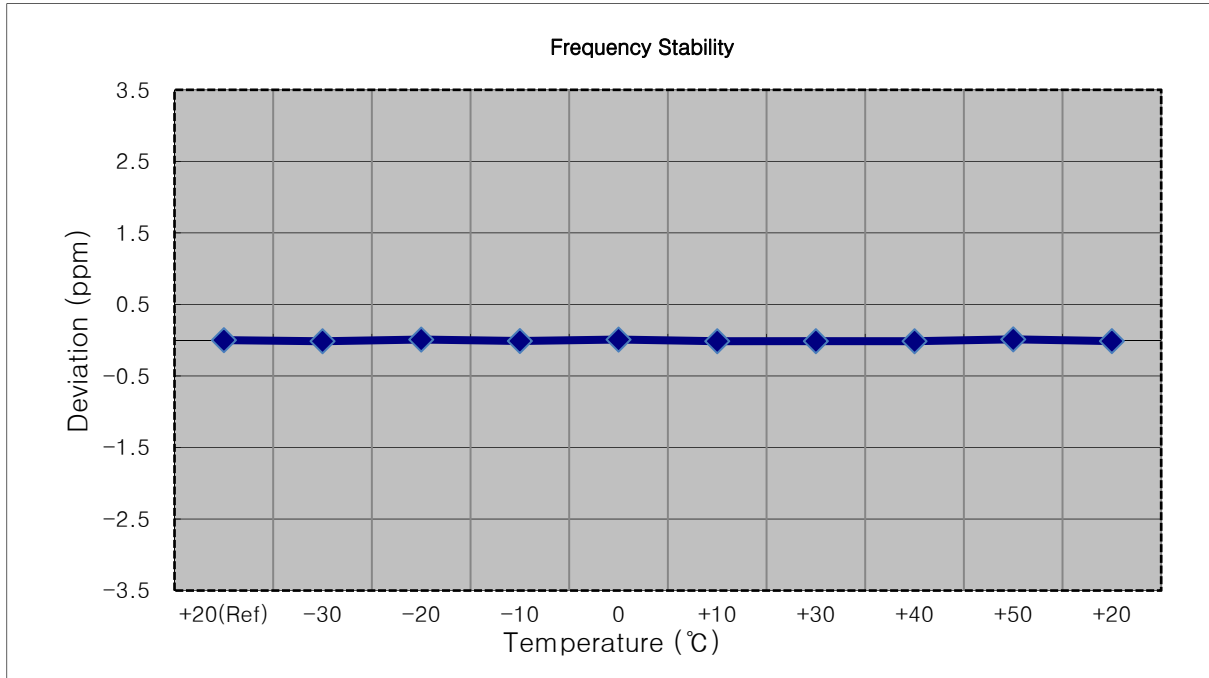
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1779,300,000 Hz
- ▣ CHANNEL: 132665 (1.4 MHz)
- ▣ REFERENCE VOLTAGE: 3.85 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1779 300 005	0.0	0.000 000	0.000
100%		-30	1779 299 991	-13.4	-0.000 001	-0.008
100%		-20	1779 300 015	10.2	0.000 001	0.006
100%		-10	1779 299 988	-16.8	-0.000 001	-0.009
100%		0	1779 299 989	-15.7	-0.000 001	-0.009
100%		+10	1779 300 015	10.7	0.000 001	0.006
100%		+30	1779 300 017	12.4	0.000 001	0.007
100%		+40	1779 299 986	-18.3	-0.000 001	-0.010
100%		+50	1779 299 988	-16.9	-0.000 001	-0.009
Batt. Endpoint	3.370	+20	1779 299 989	-15.5	-0.000 001	-0.009



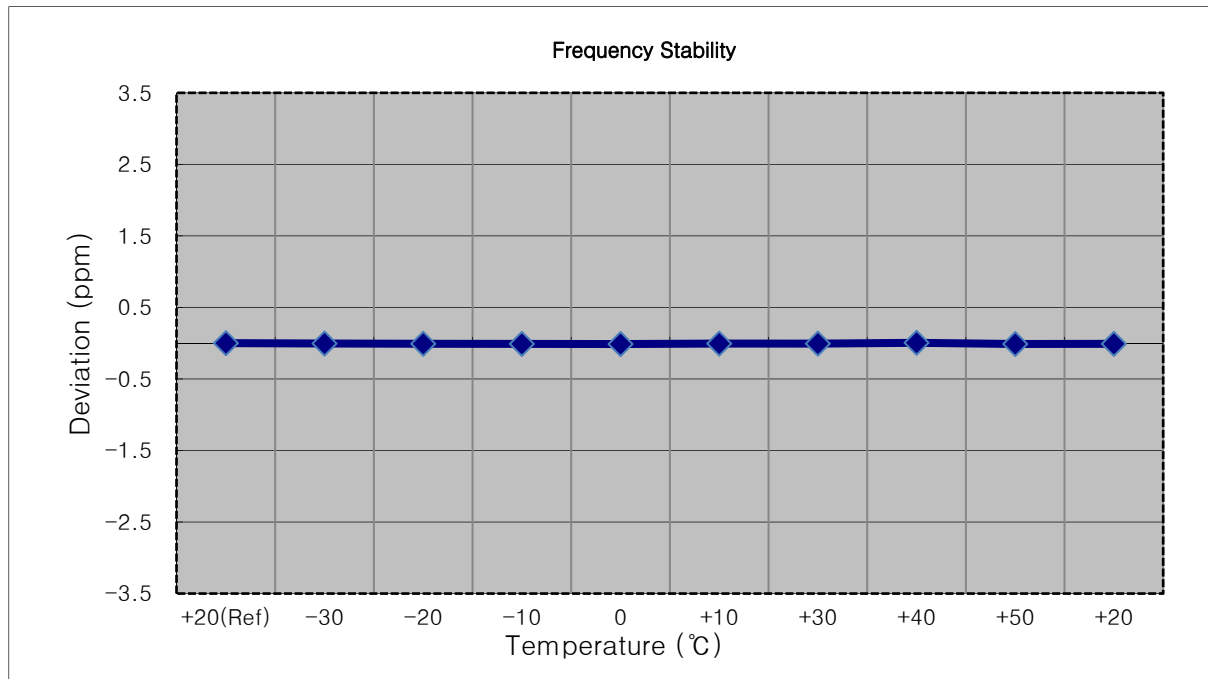
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1778,500,000 Hz
- ▣ CHANNEL: 132657 (3 MHz)
- ▣ REFERENCE VOLTAGE: 3.85 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1778 500 021	0.0	0.000 000	0.000
100%		-30	1778 499 995	-26.2	-0.000 001	-0.015
100%		-20	1778 500 036	14.8	0.000 001	0.008
100%		-10	1778 500 000	-21.2	-0.000 001	-0.012
100%		0	1778 500 036	14.8	0.000 001	0.008
100%		+10	1778 499 995	-25.6	-0.000 001	-0.014
100%		+30	1778 499 996	-24.5	-0.000 001	-0.014
100%		+40	1778 499 995	-26.1	-0.000 001	-0.015
100%		+50	1778 500 042	21.0	0.000 001	0.012
Batt. Endpoint	3.370	+20	1778 499 998	-22.8	-0.000 001	-0.013



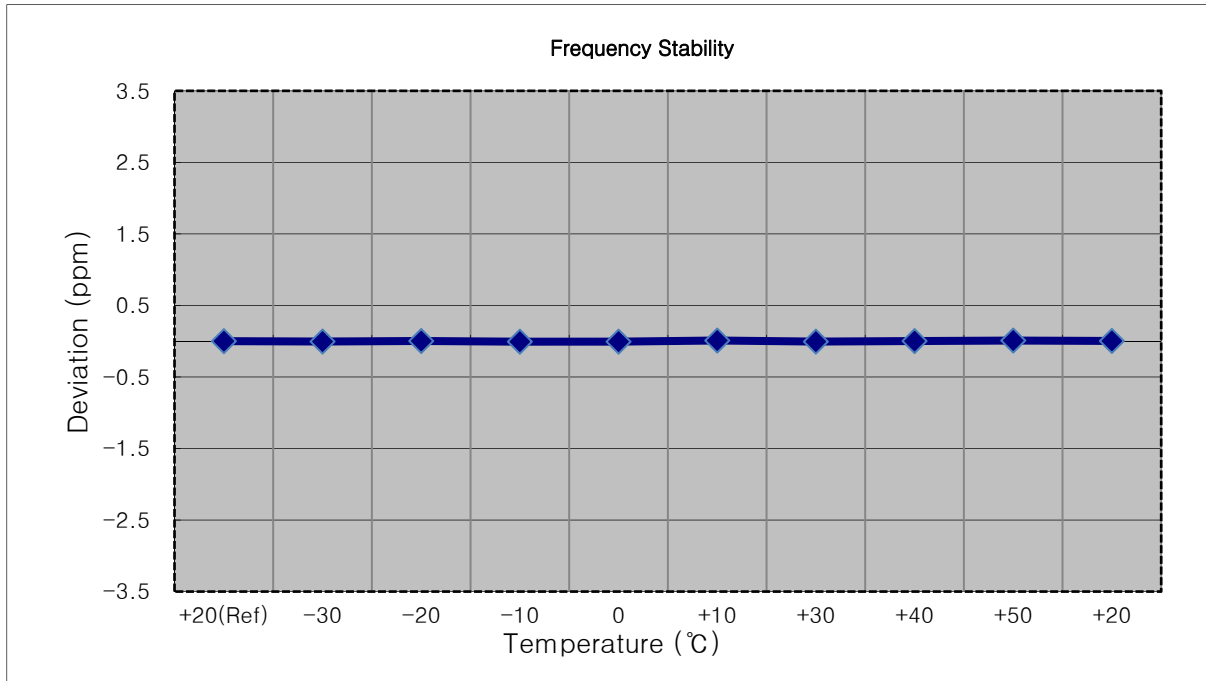
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1777.500.000 Hz
- ▣ CHANNEL: 132647 (5 MHz)
- ▣ REFERENCE VOLTAGE: 3.85 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1777 499 986	0.0	0.000 000	0.000
100%		-30	1777 499 978	-8.5	0.000 000	-0.005
100%		-20	1777 499 971	-15.8	-0.000 001	-0.009
100%		-10	1777 499 969	-17.8	-0.000 001	-0.010
100%		0	1777 499 965	-21.4	-0.000 001	-0.012
100%		+10	1777 499 976	-10.3	-0.000 001	-0.006
100%		+30	1777 499 975	-11.8	-0.000 001	-0.007
100%		+40	1777 499 996	9.5	0.000 001	0.005
100%		+50	1777 499 966	-20.6	-0.000 001	-0.012
Batt. Endpoint	3.370	+20	1777 499 970	-16.7	-0.000 001	-0.009



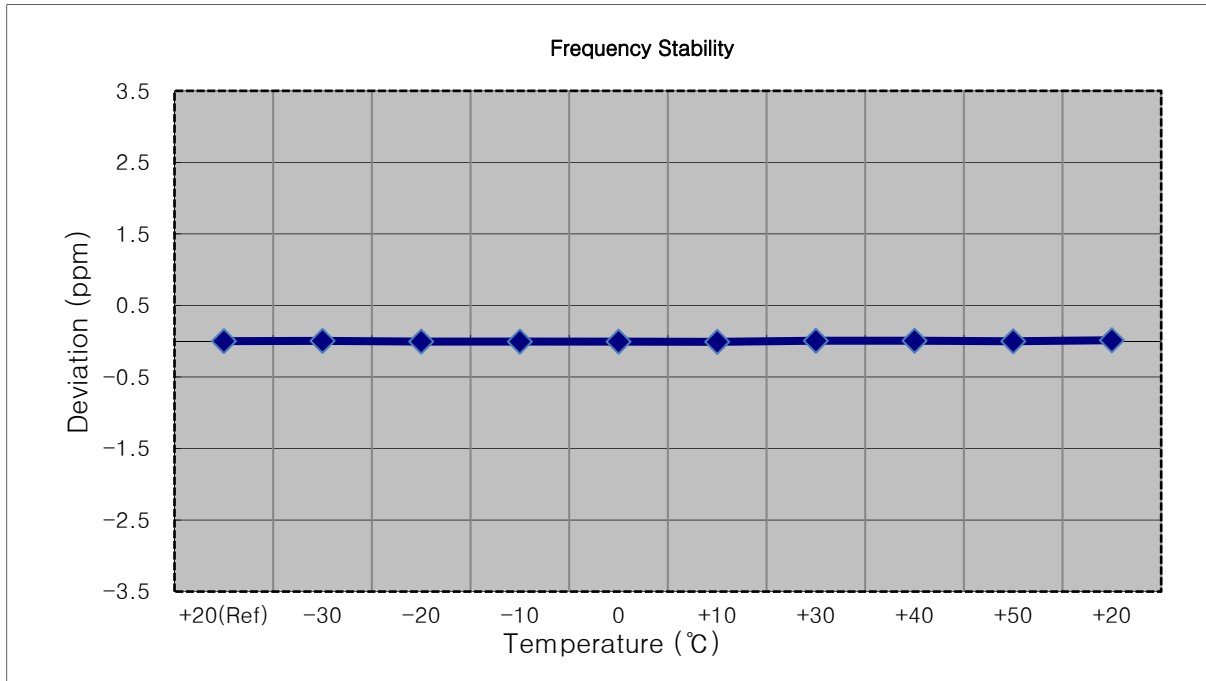
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1775,000,000 Hz
- ▣ CHANNEL: 132622 (10 MHz)
- ▣ REFERENCE VOLTAGE: 3.85 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1775 000 010	0.0	0.000 000	0.000
100%		-30	1775 000 002	-8.3	0.000 000	-0.005
100%		-20	1775 000 015	5.2	0.000 000	0.003
100%		-10	1774 999 999	-11.5	-0.000 001	-0.006
100%		0	1774 999 999	-10.8	-0.000 001	-0.006
100%		+10	1775 000 026	16.1	0.000 001	0.009
100%		+30	1775 000 001	-9.5	-0.000 001	-0.005
100%		+40	1775 000 013	3.0	0.000 000	0.002
100%		+50	1775 000 026	16.2	0.000 001	0.009
Batt. Endpoint		3.370	+20	1775 000 016	6.2	0.000 000



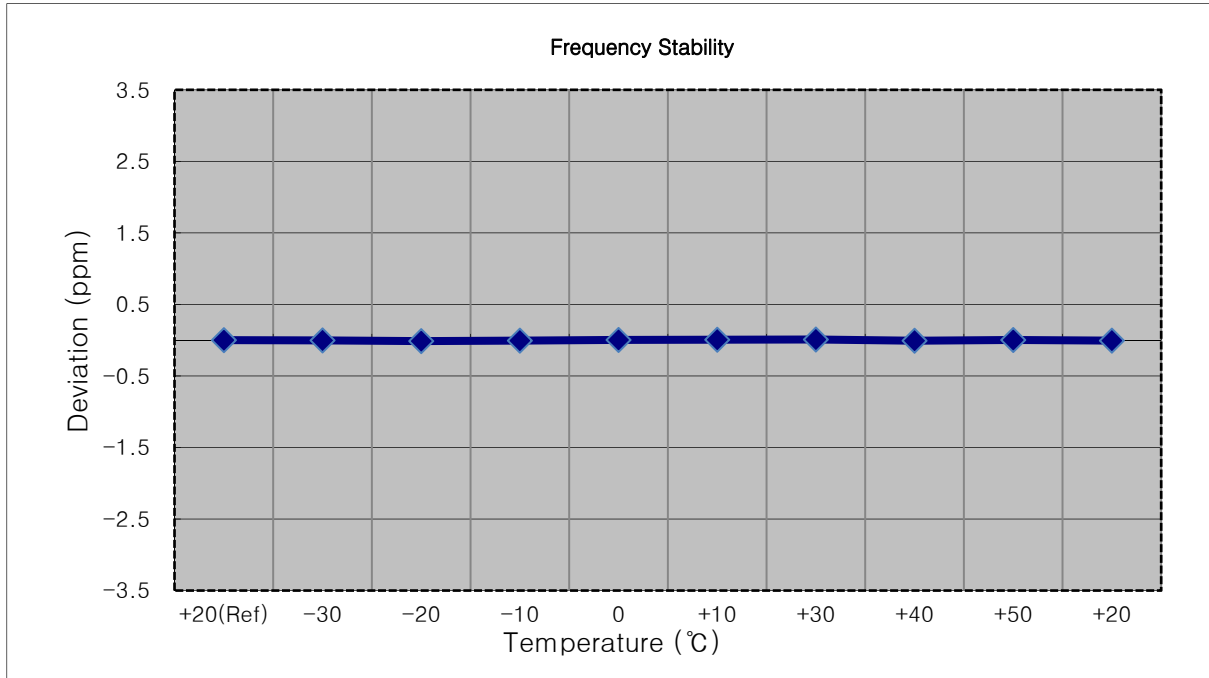
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1772.500.000 Hz
- ▣ CHANNEL: 132597 (15 MHz)
- ▣ REFERENCE VOLTAGE: 3.85 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1772 500 011	0.0	0.000 000	0.000
100%		-30	1772 500 017	6.8	0.000 000	0.004
100%		-20	1772 500 000	-10.2	-0.000 001	-0.006
100%		-10	1772 500 001	-9.8	-0.000 001	-0.006
100%		0	1772 499 999	-11.6	-0.000 001	-0.007
100%		+10	1772 499 994	-16.4	-0.000 001	-0.009
100%		+30	1772 500 021	10.6	0.000 001	0.006
100%		+40	1772 500 022	11.4	0.000 001	0.006
100%		+50	1772 500 008	-2.5	0.000 000	-0.001
Batt. Endpoint		3.370	+20	1772 500 034	23.6	0.000 001



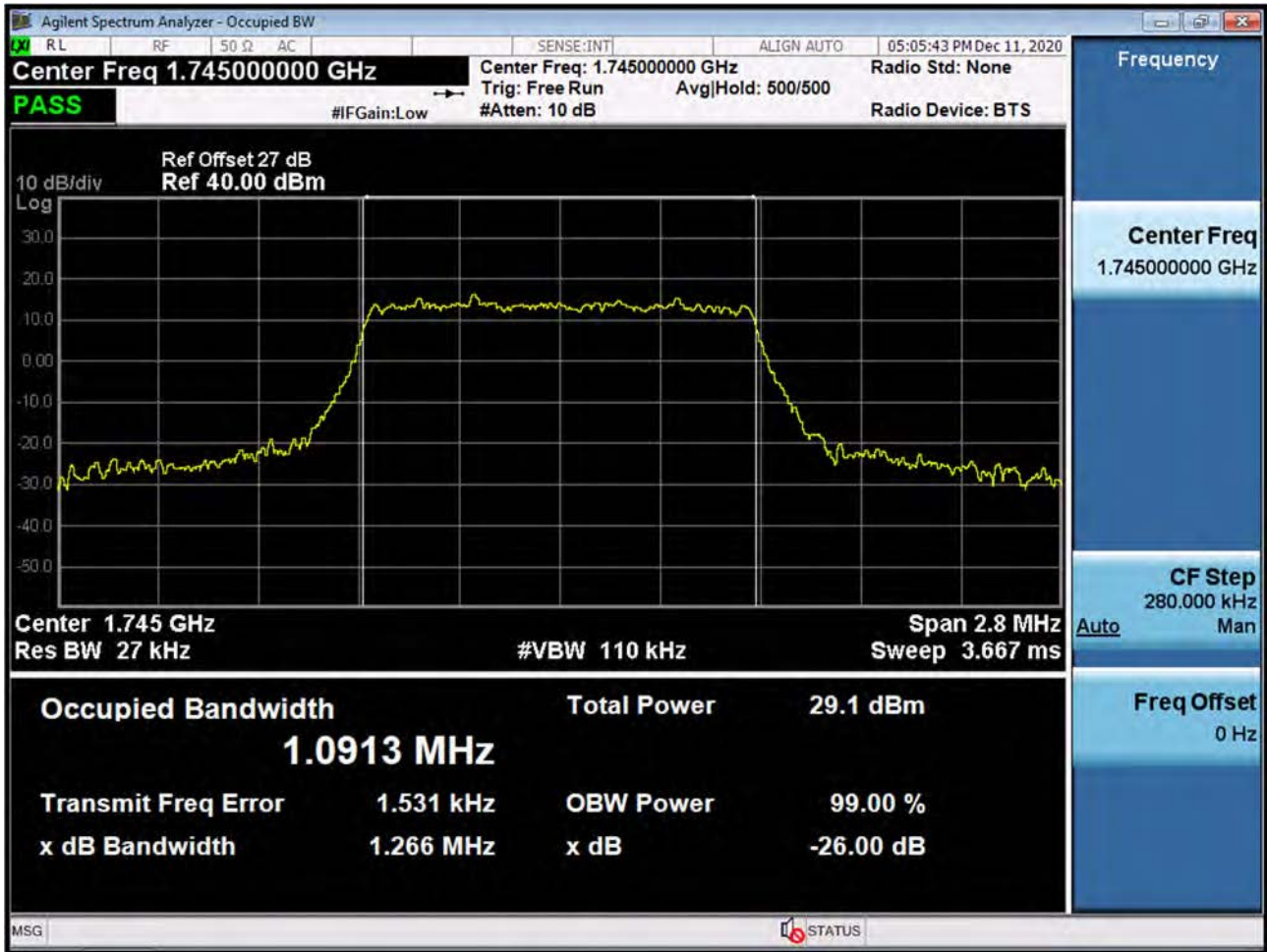
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1770,000,000 Hz
- ▣ CHANNEL: 132572 (20 MHz)
- ▣ REFERENCE VOLTAGE: 3.85 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1769 999 980	0.0	0.000 000	0.000
100%		-30	1769 999 974	-5.7	0.000 000	-0.003
100%		-20	1769 999 956	-23.1	-0.000 001	-0.013
100%		-10	1769 999 968	-11.6	-0.000 001	-0.007
100%		0	1769 999 985	5.9	0.000 000	0.003
100%		+10	1769 999 991	11.5	0.000 001	0.006
100%		+30	1769 999 996	16.9	0.000 001	0.010
100%		+40	1769 999 966	-13.3	-0.000 001	-0.008
100%		+50	1769 999 984	4.9	0.000 000	0.003
Batt. Endpoint	3.370	+20	1769 999 968	-11.4	-0.000 001	-0.006

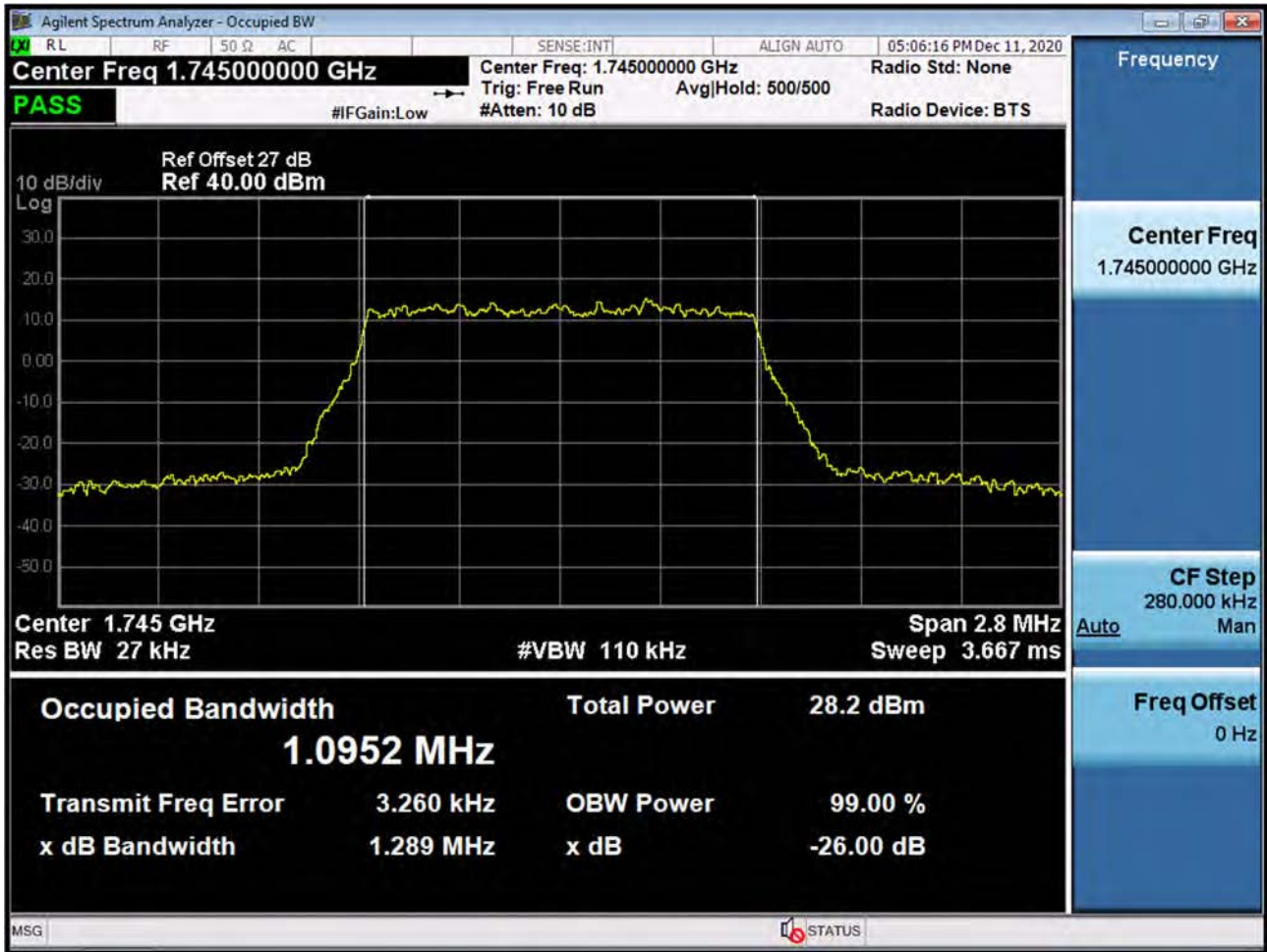


9. TEST PLOTS

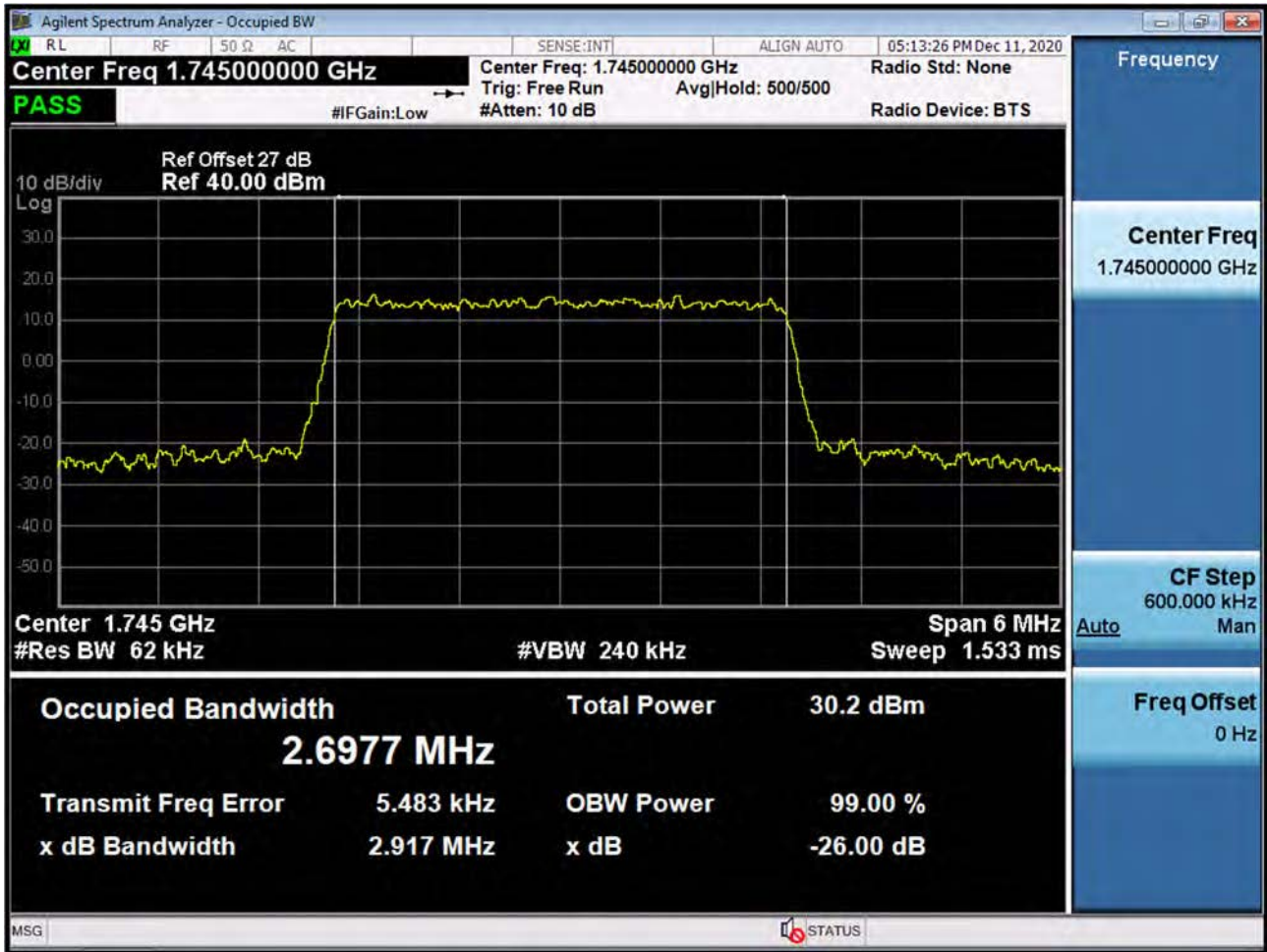
BAND 66/4. Occupied Bandwidth Plot (1.4M BW Ch.132322 16QAM RB 6)



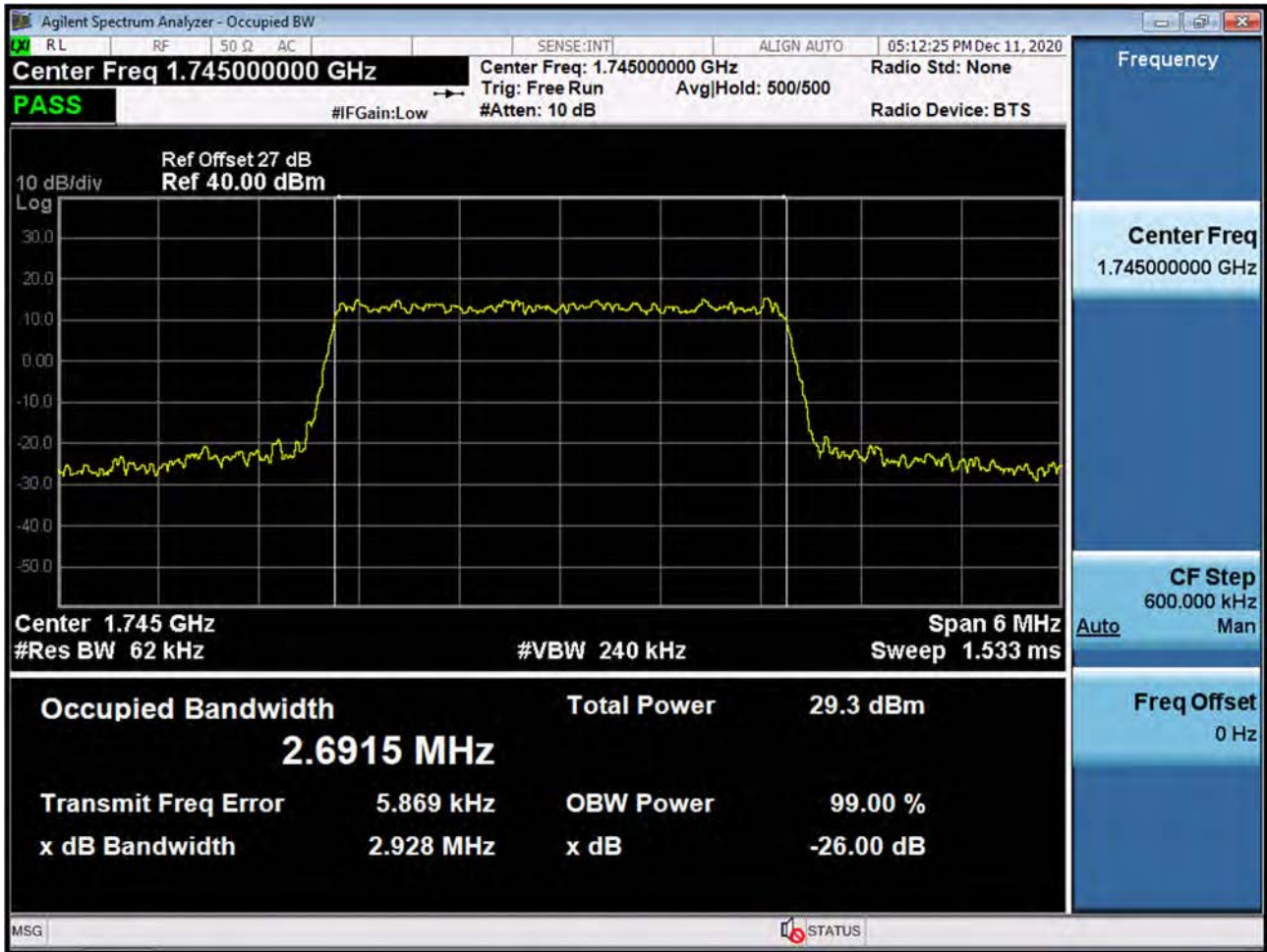
BAND 66/4. Occupied Bandwidth Plot (1.4M BW Ch.132322 64QAM RB 6)



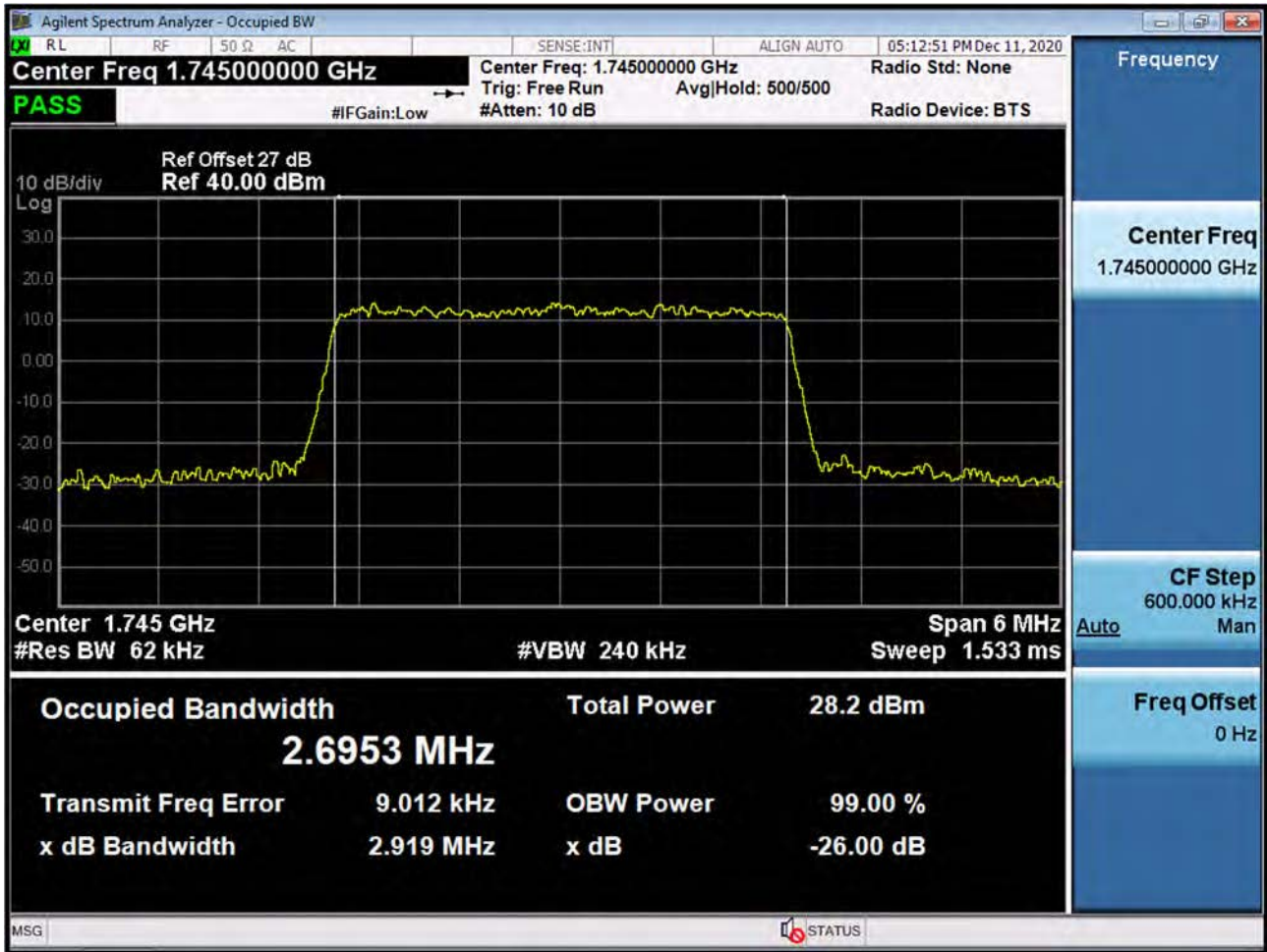
BAND 66/4. Occupied Bandwidth Plot (3M BW Ch.132322 QPSK RB 15)



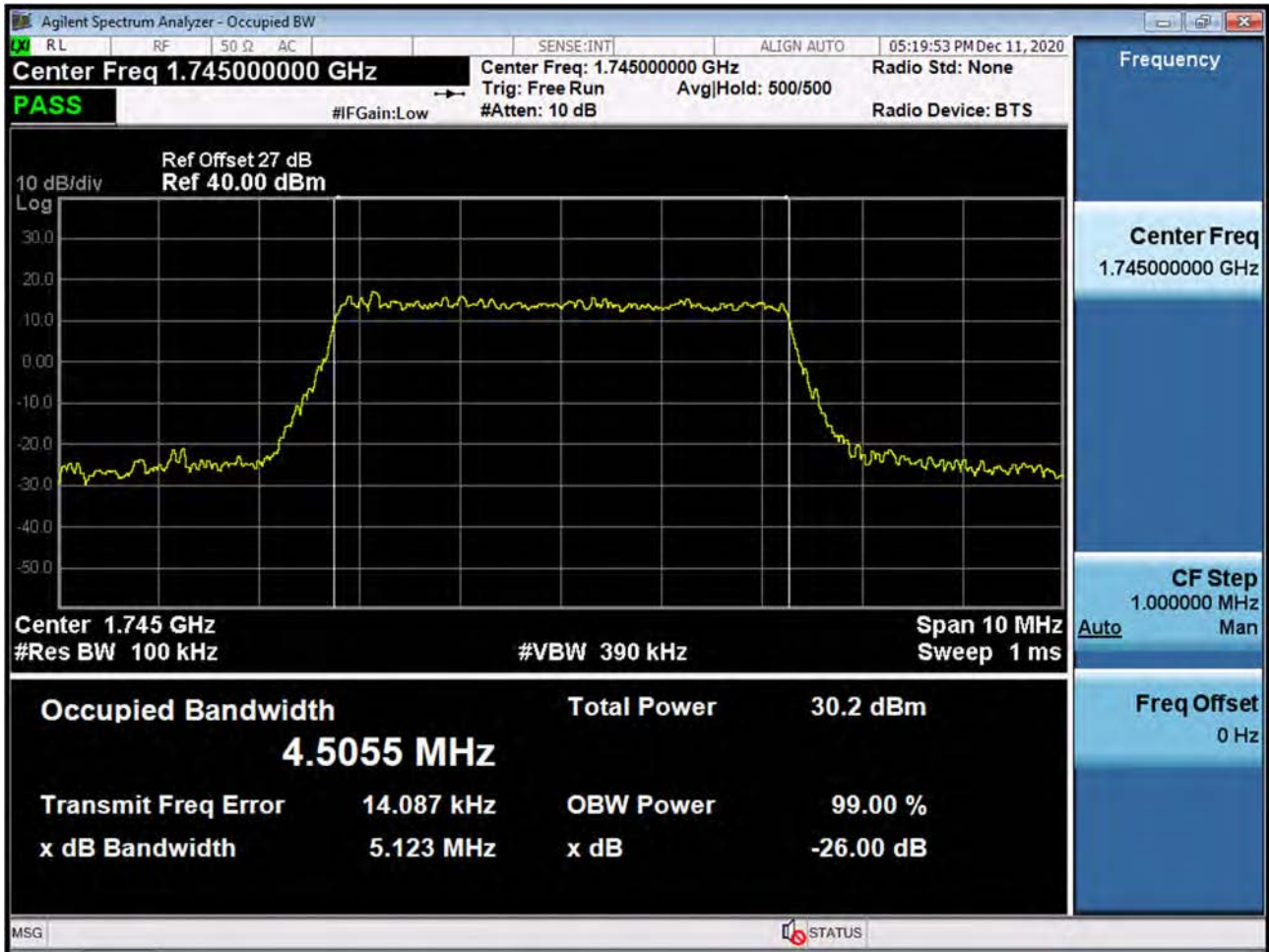
BAND 66/4. Occupied Bandwidth Plot (3M BW Ch.132322 16QAM RB 15)



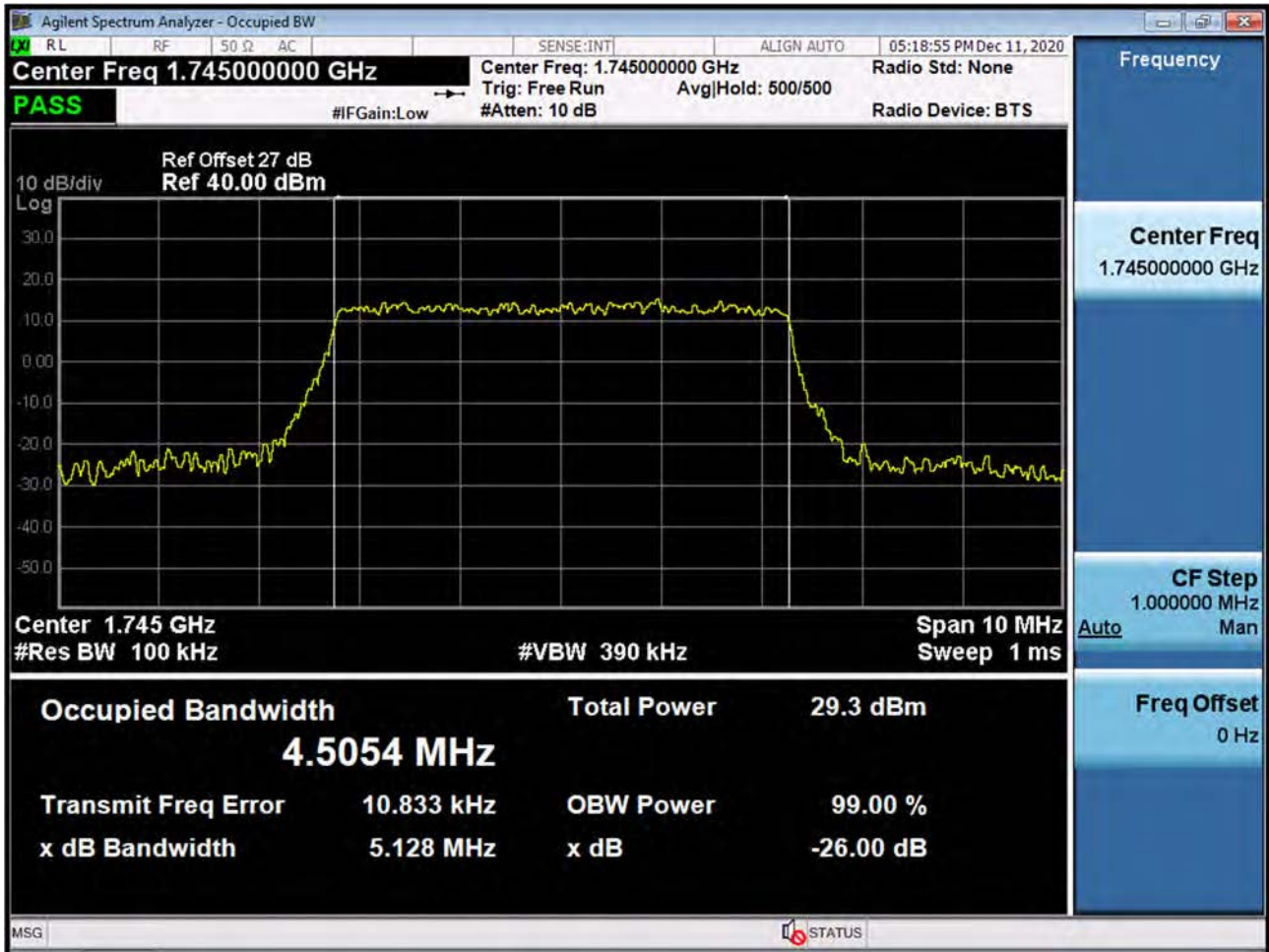
BAND 66/4. Occupied Bandwidth Plot (3M BW Ch.132322 64QAM RB 15)



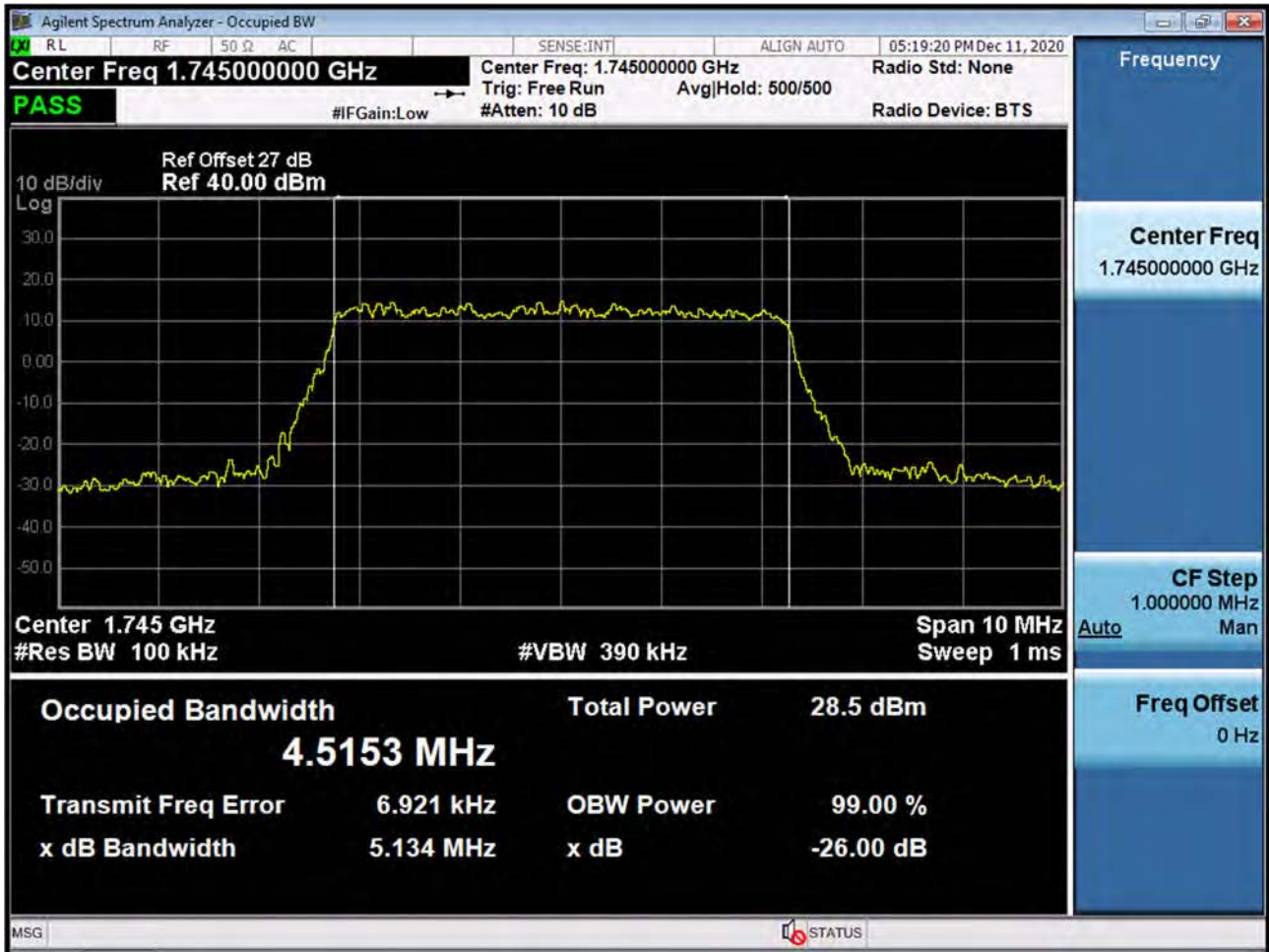
BAND 66/4. Occupied Bandwidth Plot (5M BW Ch.132322 QPSK RB 25)



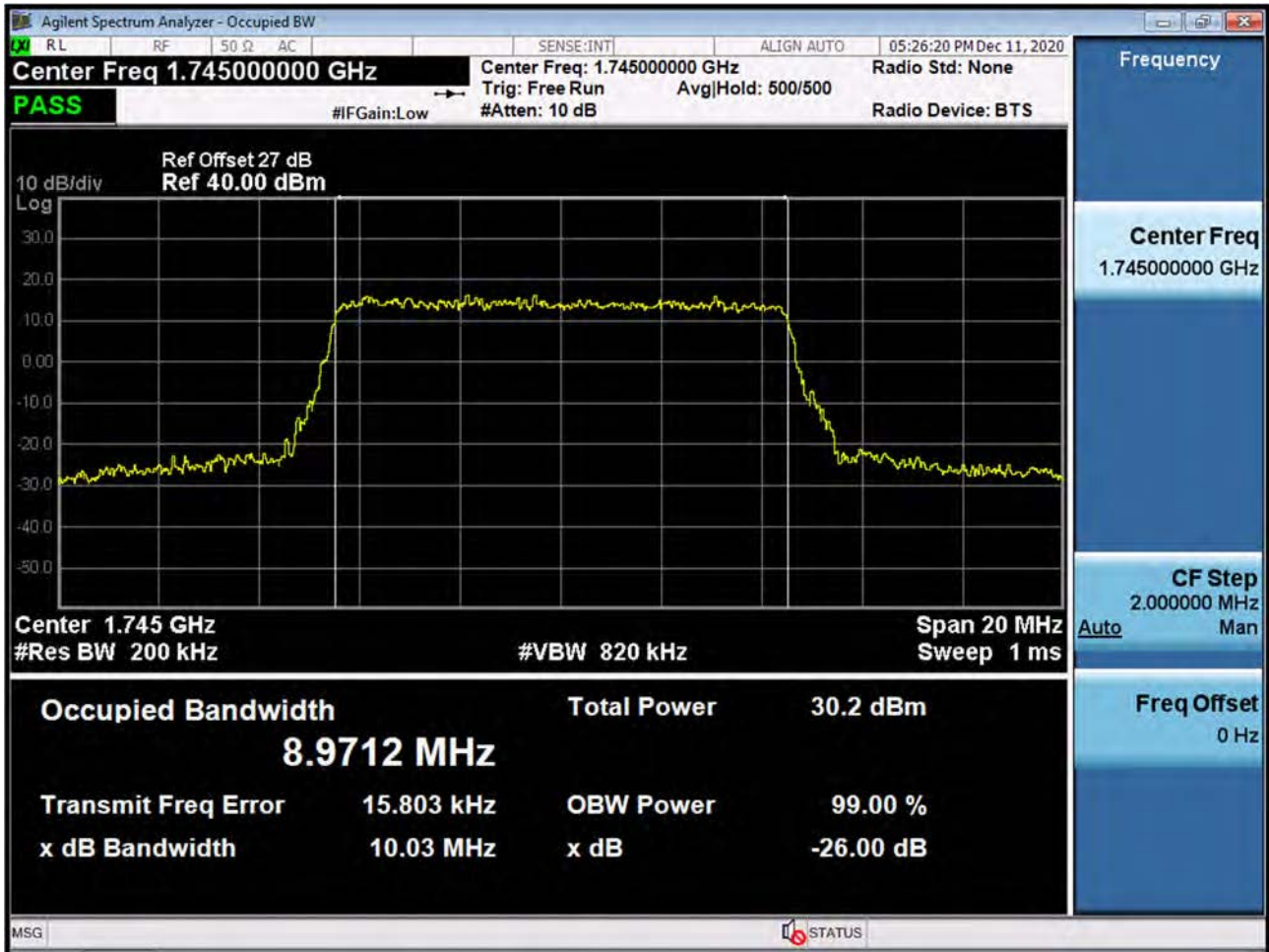
BAND 66/4. Occupied Bandwidth Plot (5M BW Ch.132322 16QAM RB 25)



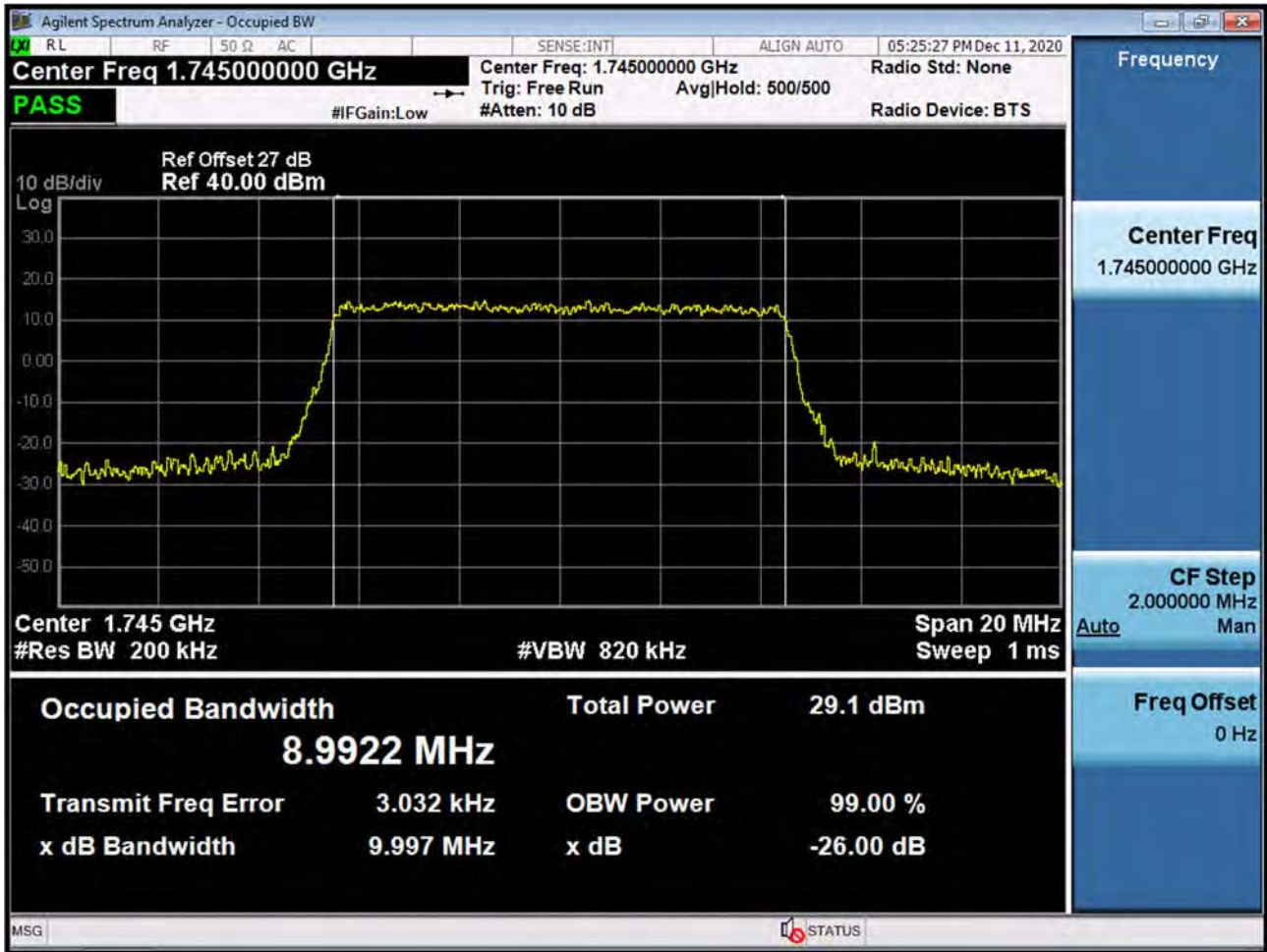
BAND 66/4. Occupied Bandwidth Plot (5M BW Ch.132322 64QAM RB 25)



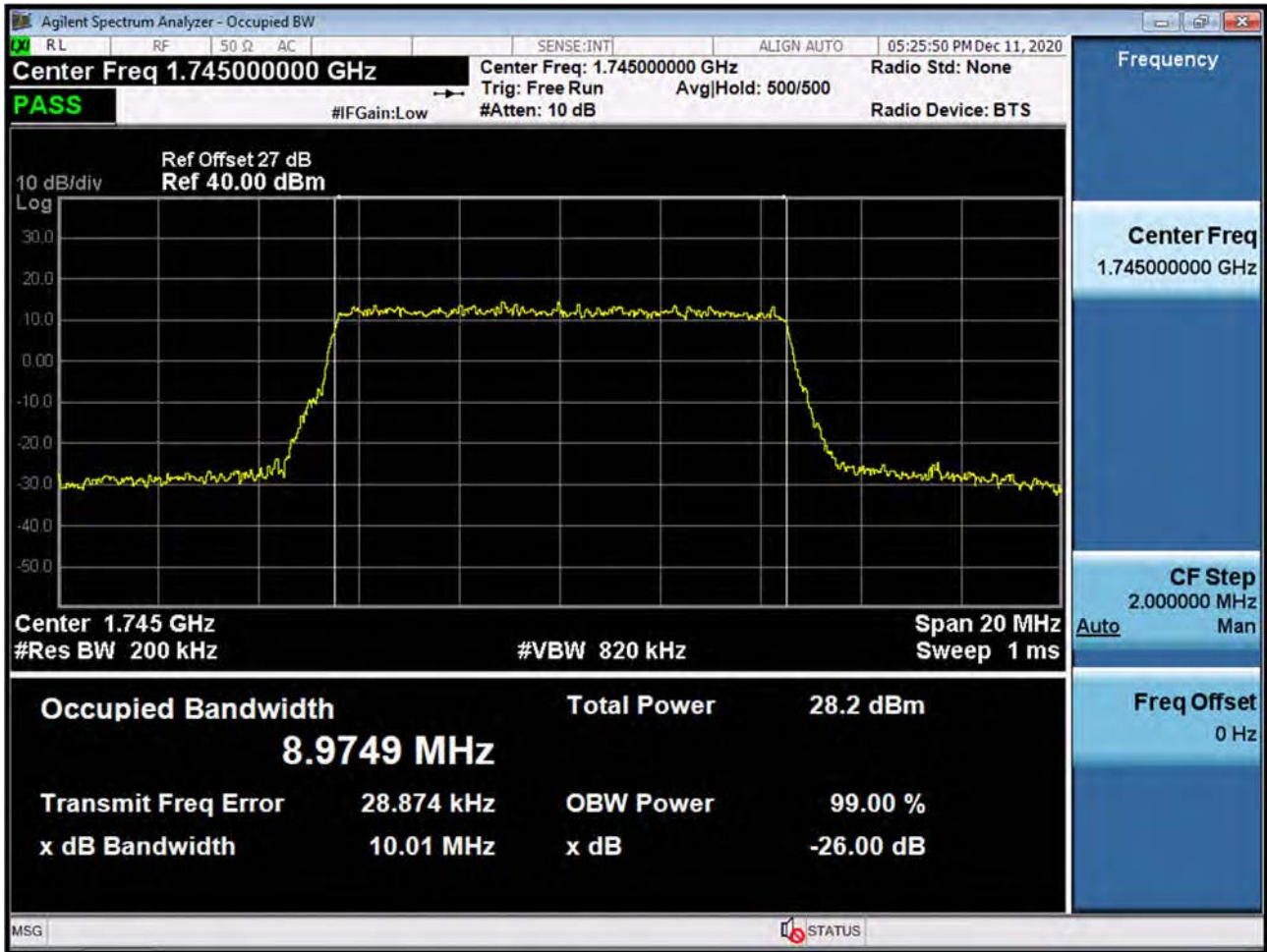
BAND 66/4. Occupied Bandwidth Plot (10M BW Ch.132322 QPSK RB 50)



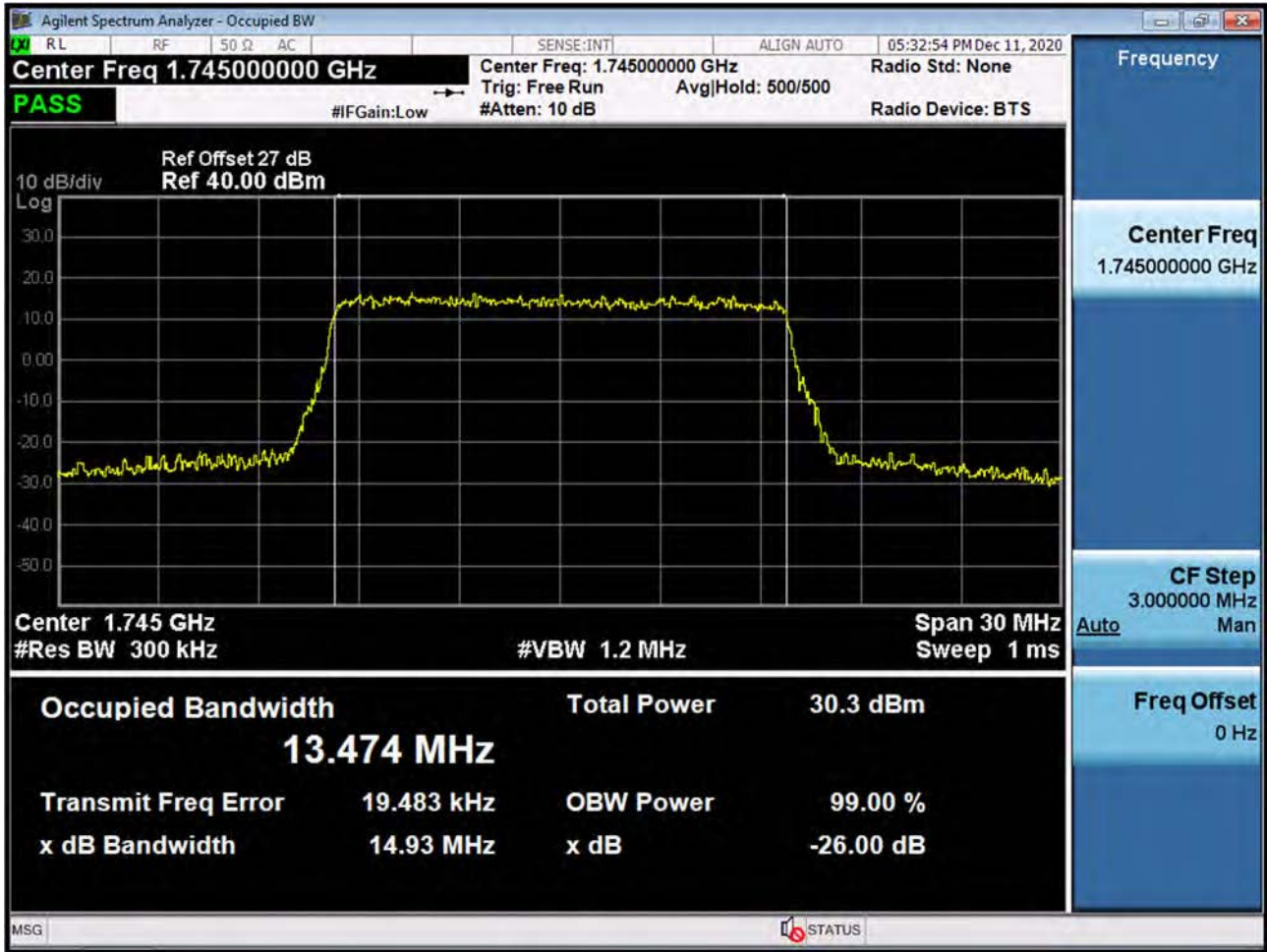
BAND 66/4. Occupied Bandwidth Plot (10M BW Ch.132322 16QAM RB 50)



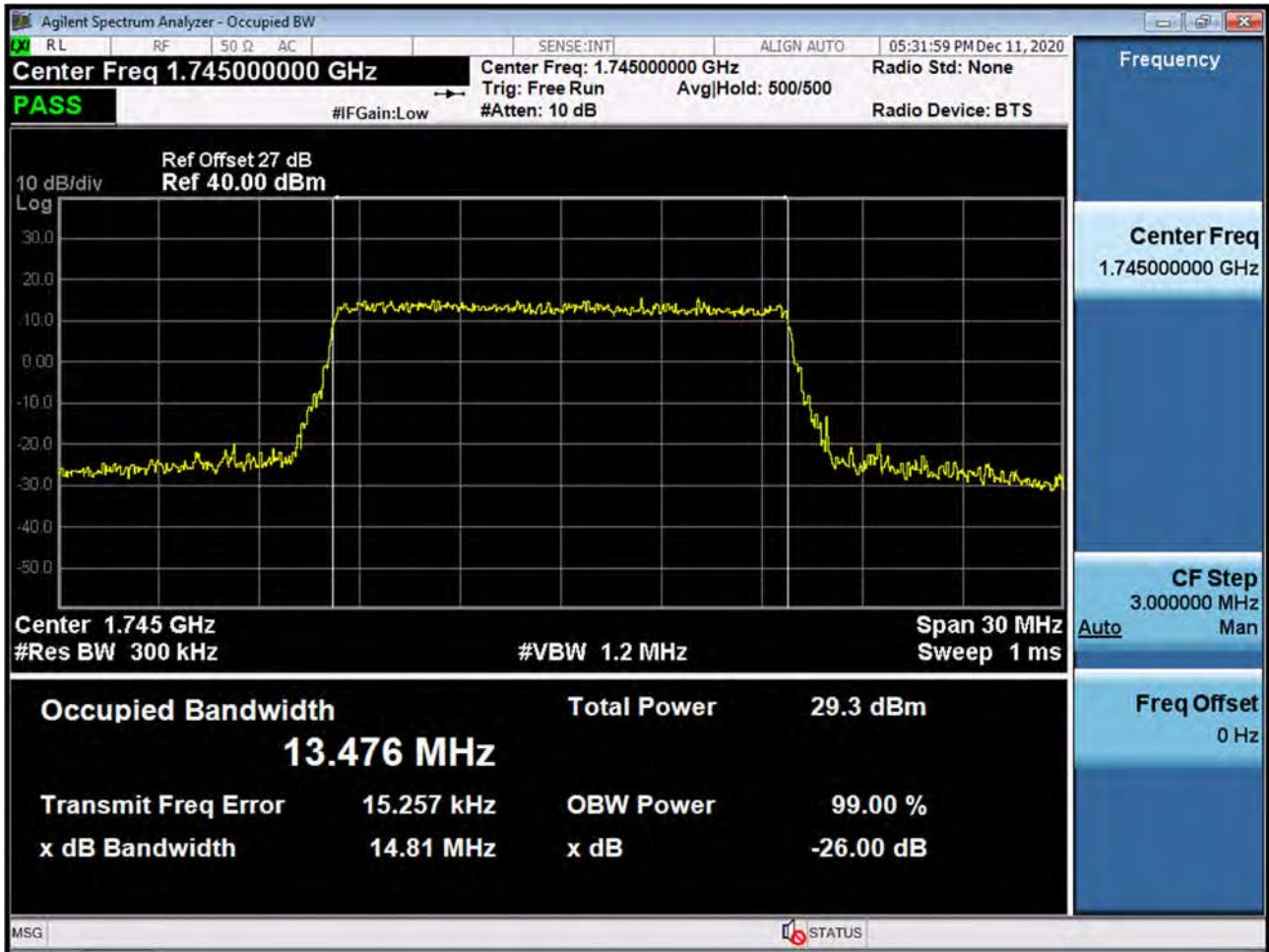
BAND 66/4. Occupied Bandwidth Plot (10M BW Ch.132322 64QAM RB 50)



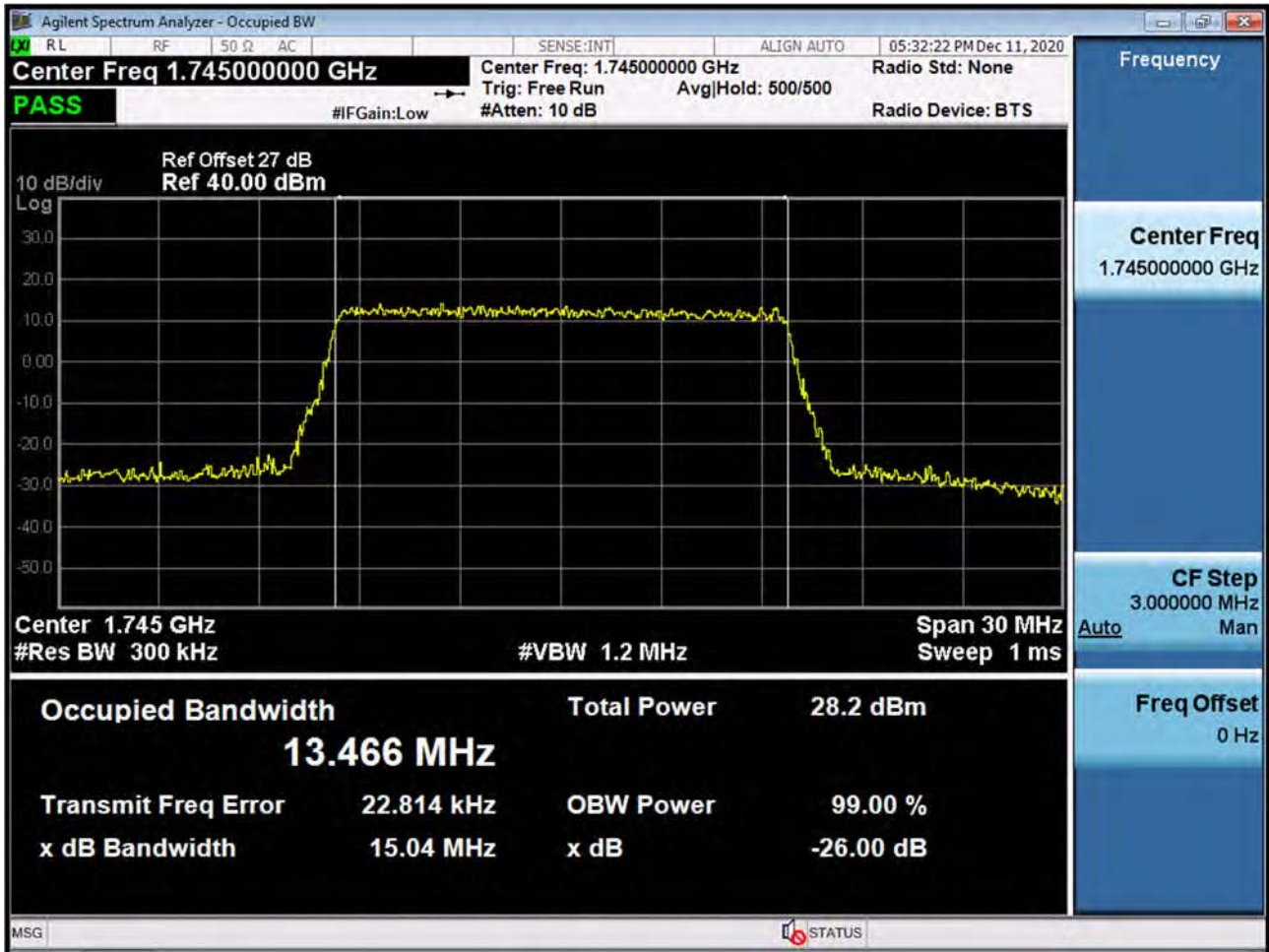
BAND 66/4. Occupied Bandwidth Plot (15M BW Ch.132322 QPSK RB 75)



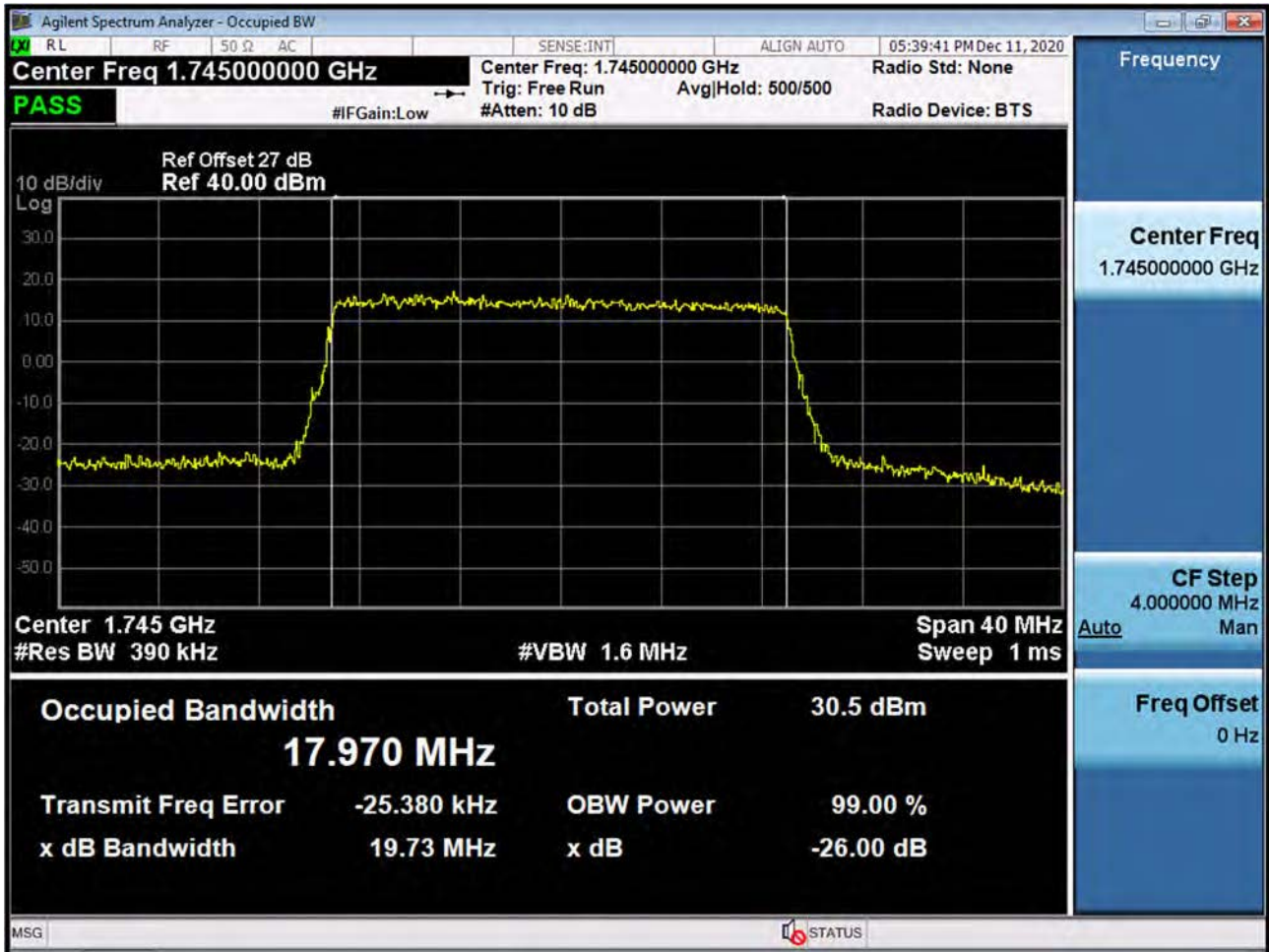
BAND 66/4. Occupied Bandwidth Plot (15M BW Ch.132322 16QAM RB 75)



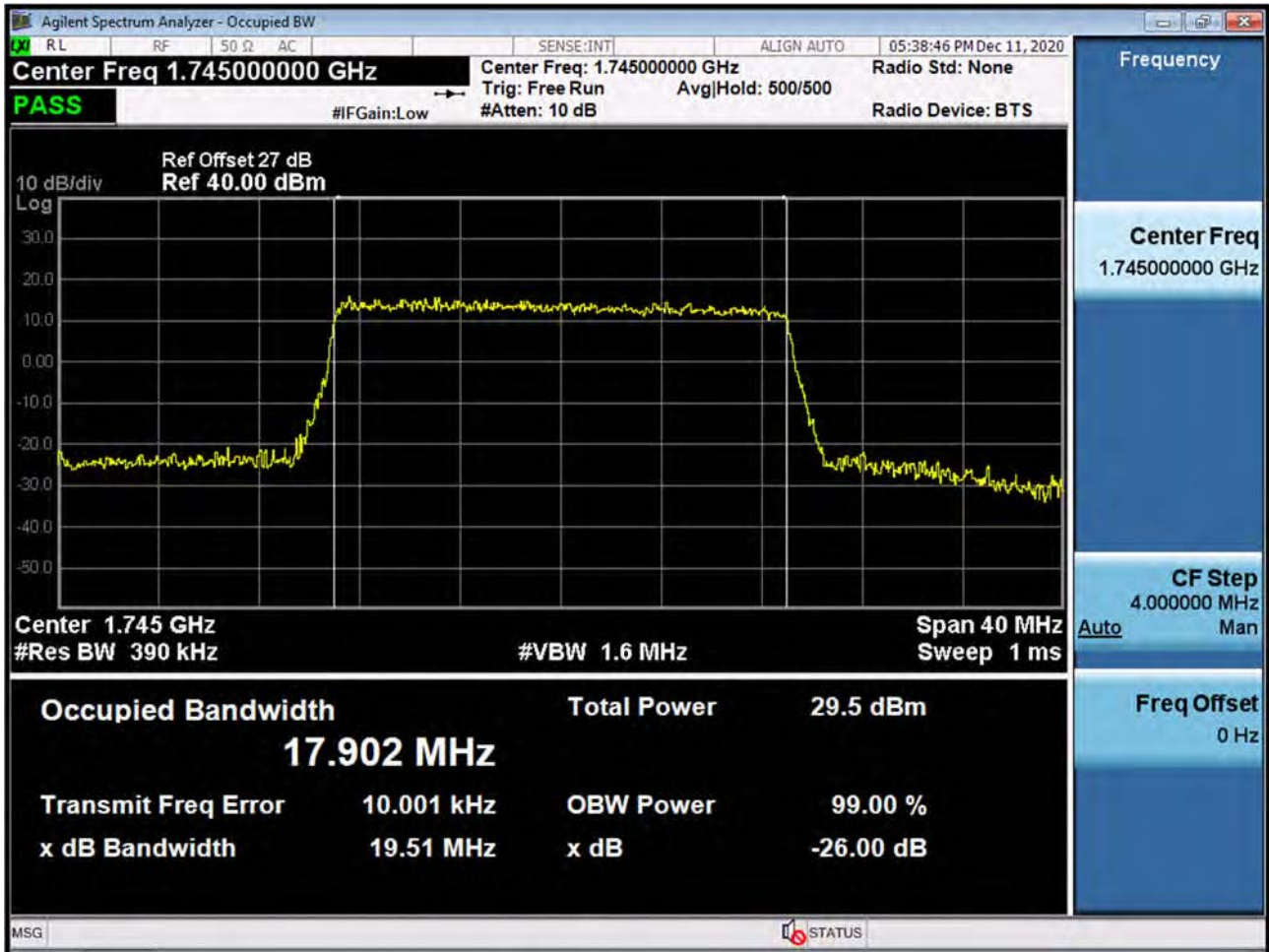
BAND 66/4. Occupied Bandwidth Plot (15M BW Ch.132322 64QAM RB 75)



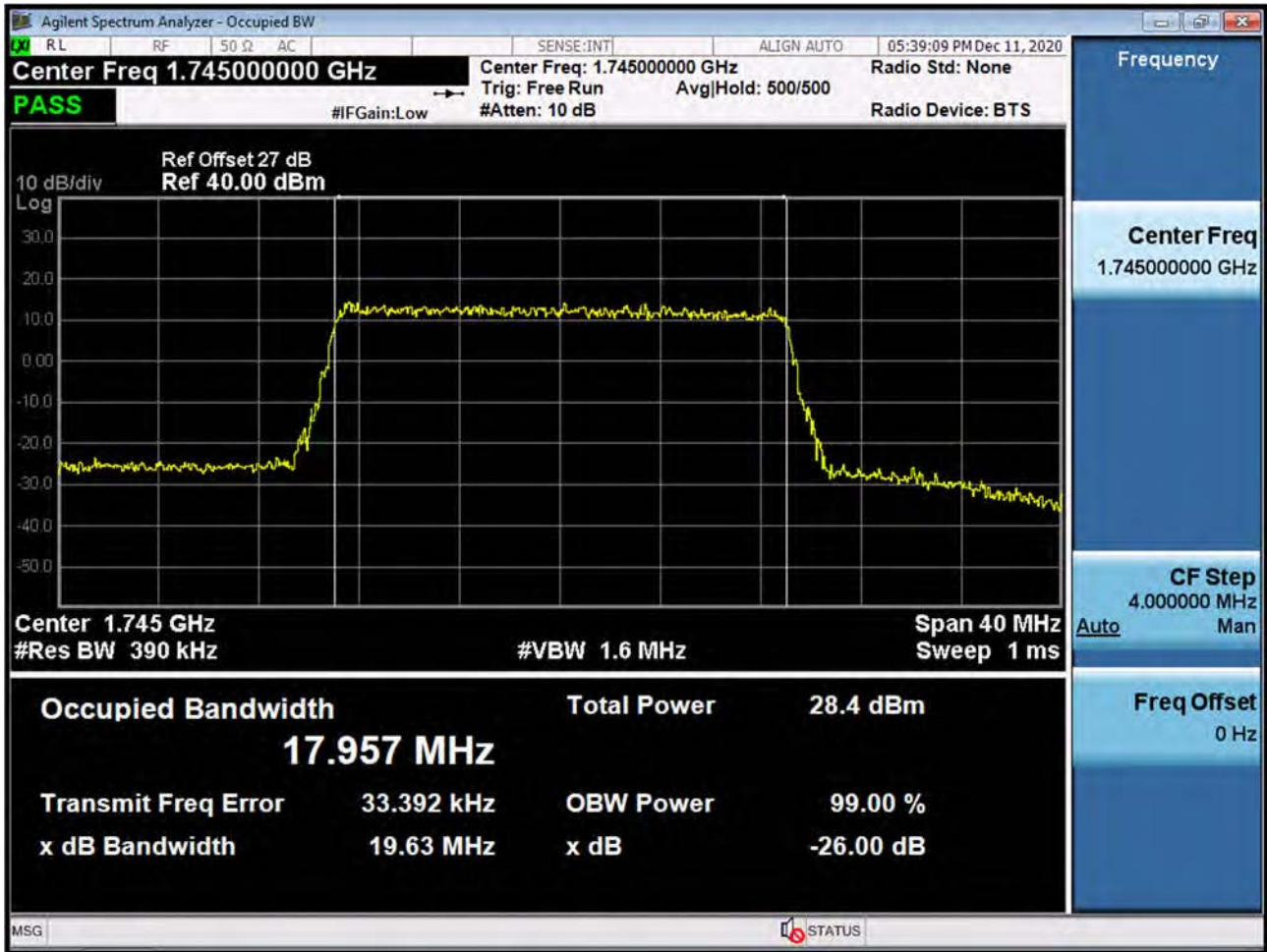
BAND 66/4. Occupied Bandwidth Plot (20M BW Ch.132322 QPSK RB 100)



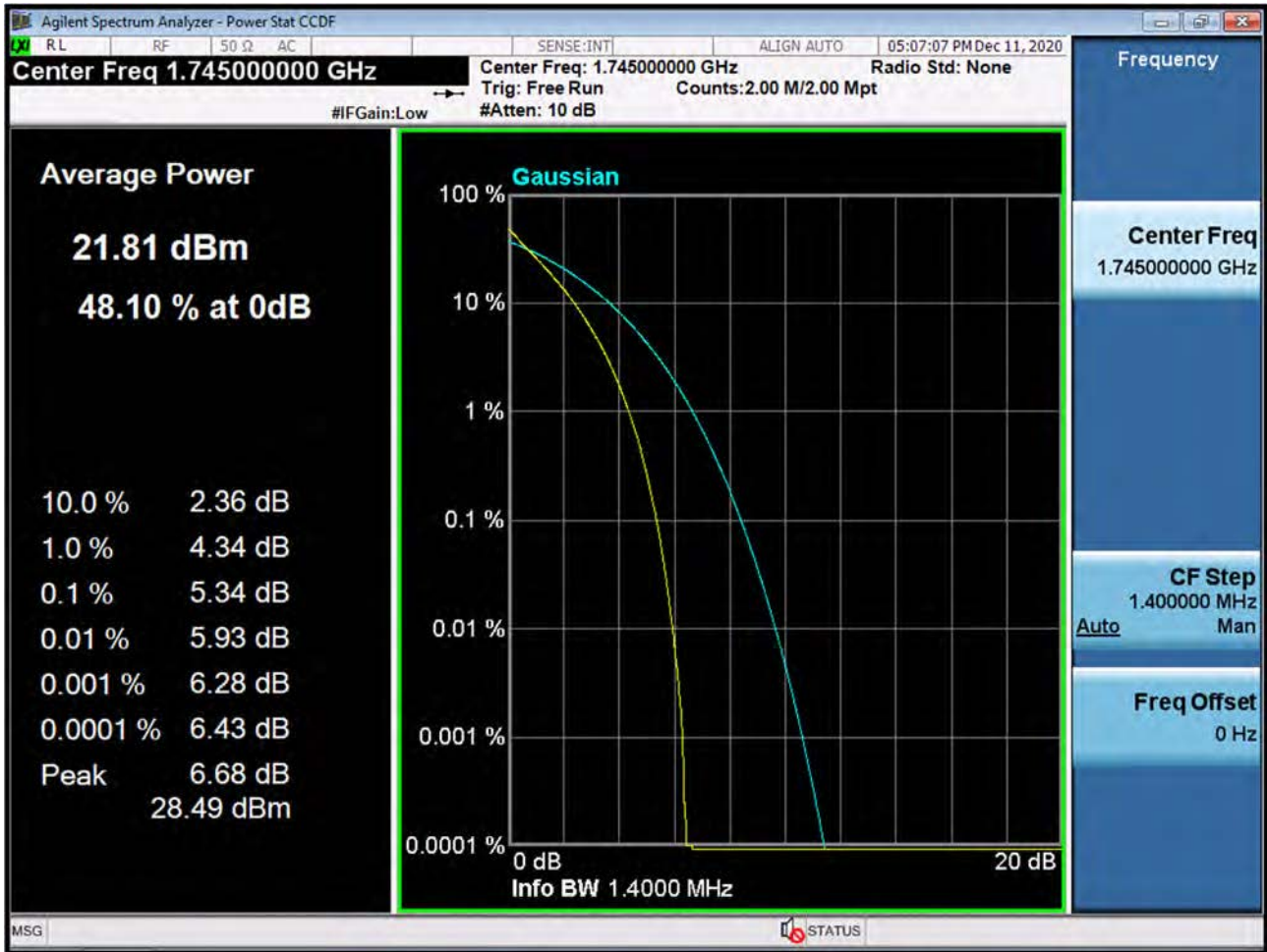
BAND 66/4. Occupied Bandwidth Plot (20M BW Ch.132322 16QAM RB 100)



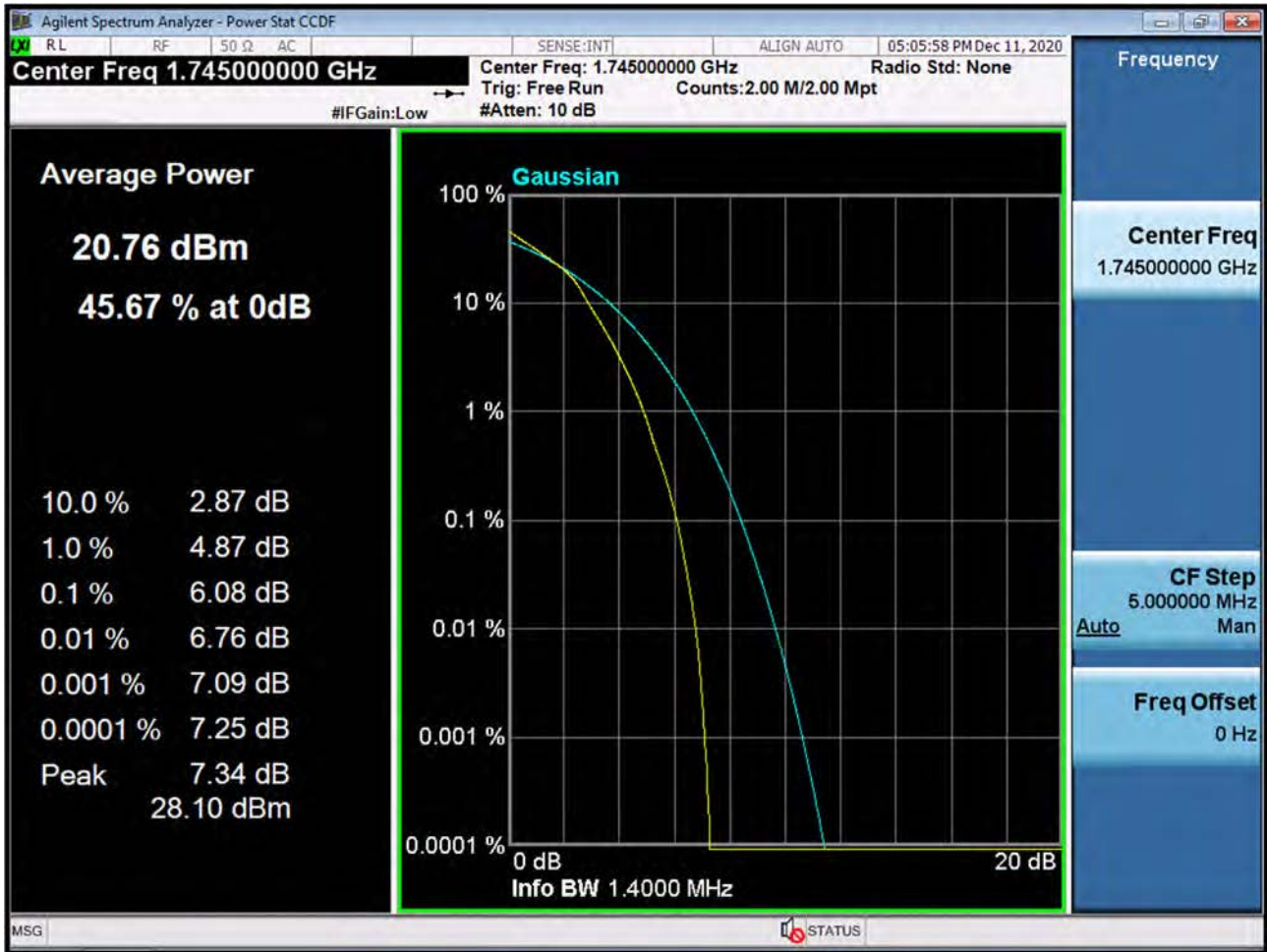
BAND 66/4. Occupied Bandwidth Plot (20M BW Ch.132322 64QAM RB 100)



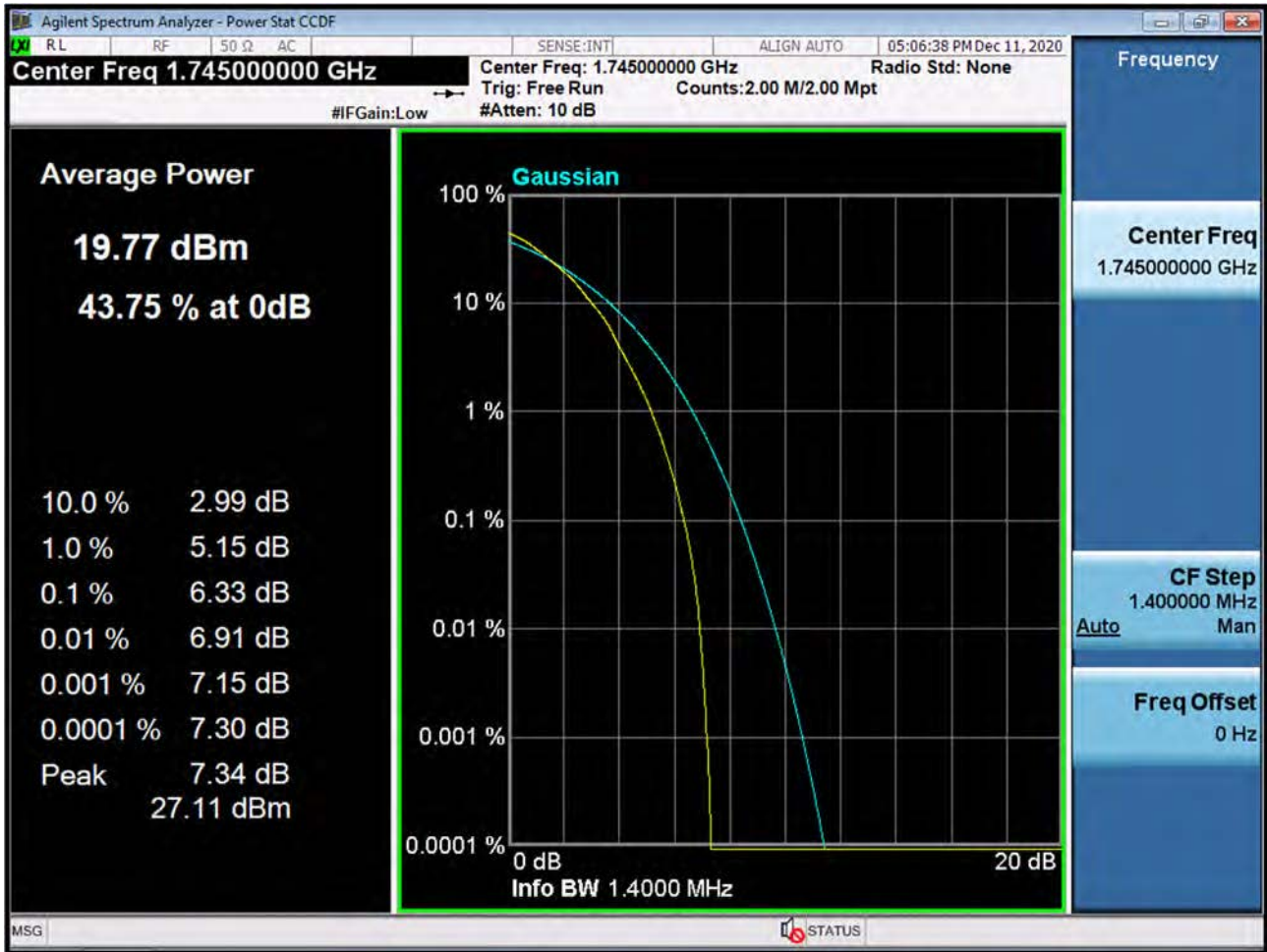
BAND 66/4. PAR Plot (1.4M BW_Ch.132322_QPSK_RB6_0)



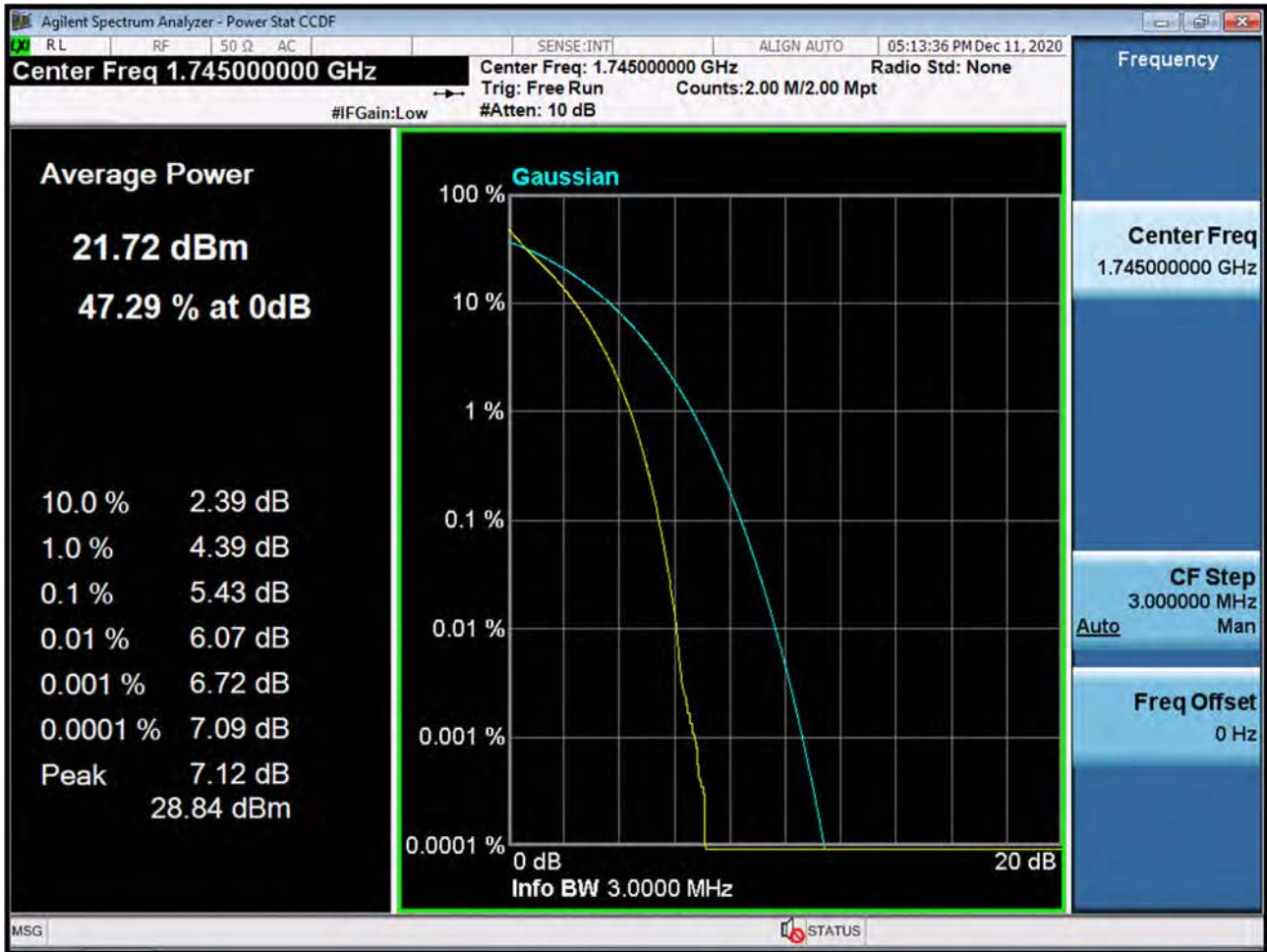
BAND 66/4. PAR Plot (1.4M BW_Ch.132322_16QAM_RB6_0)



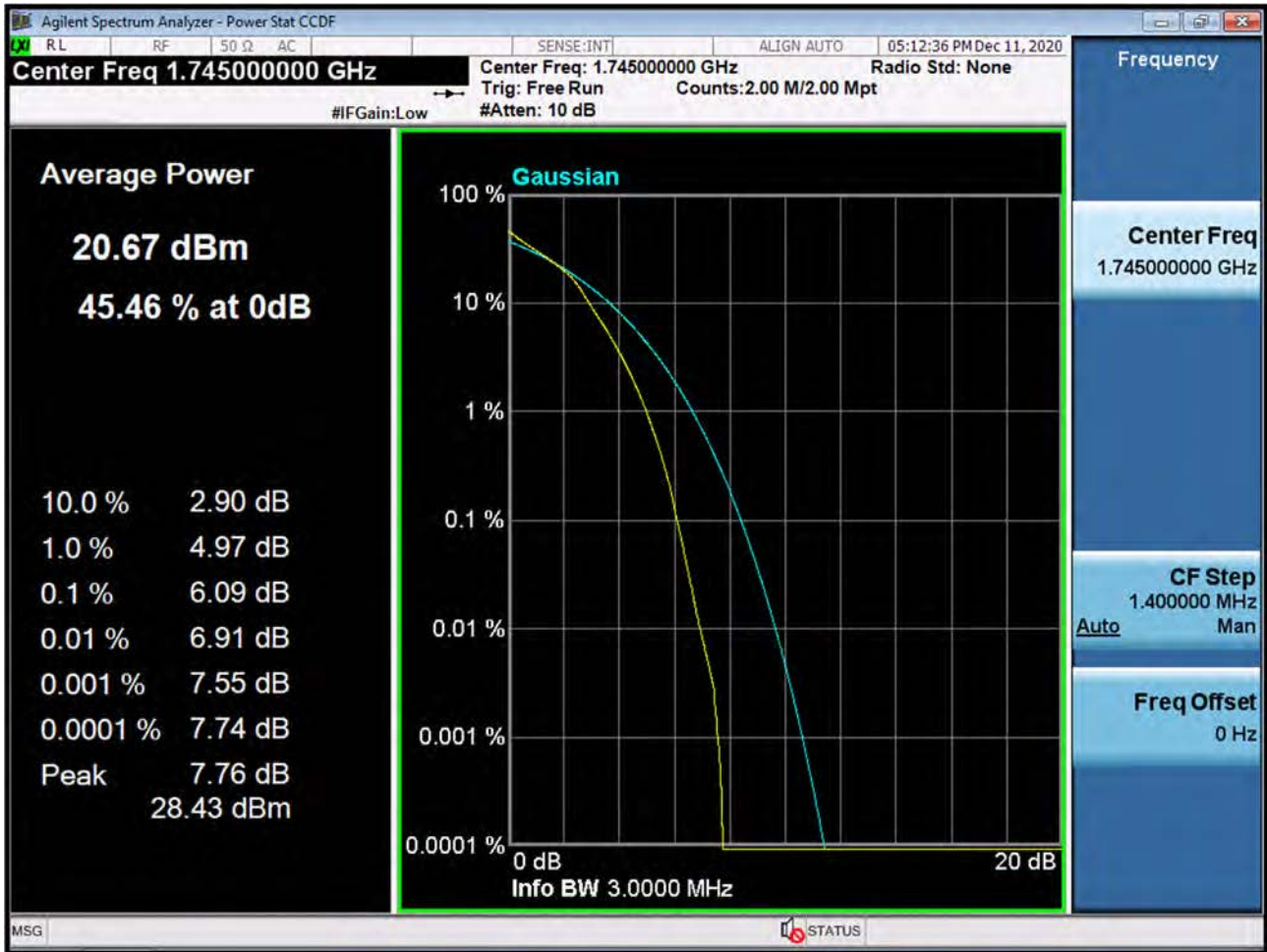
BAND 66/4. PAR Plot (1.4M BW_Ch.132322_64QAM_RB6_0)



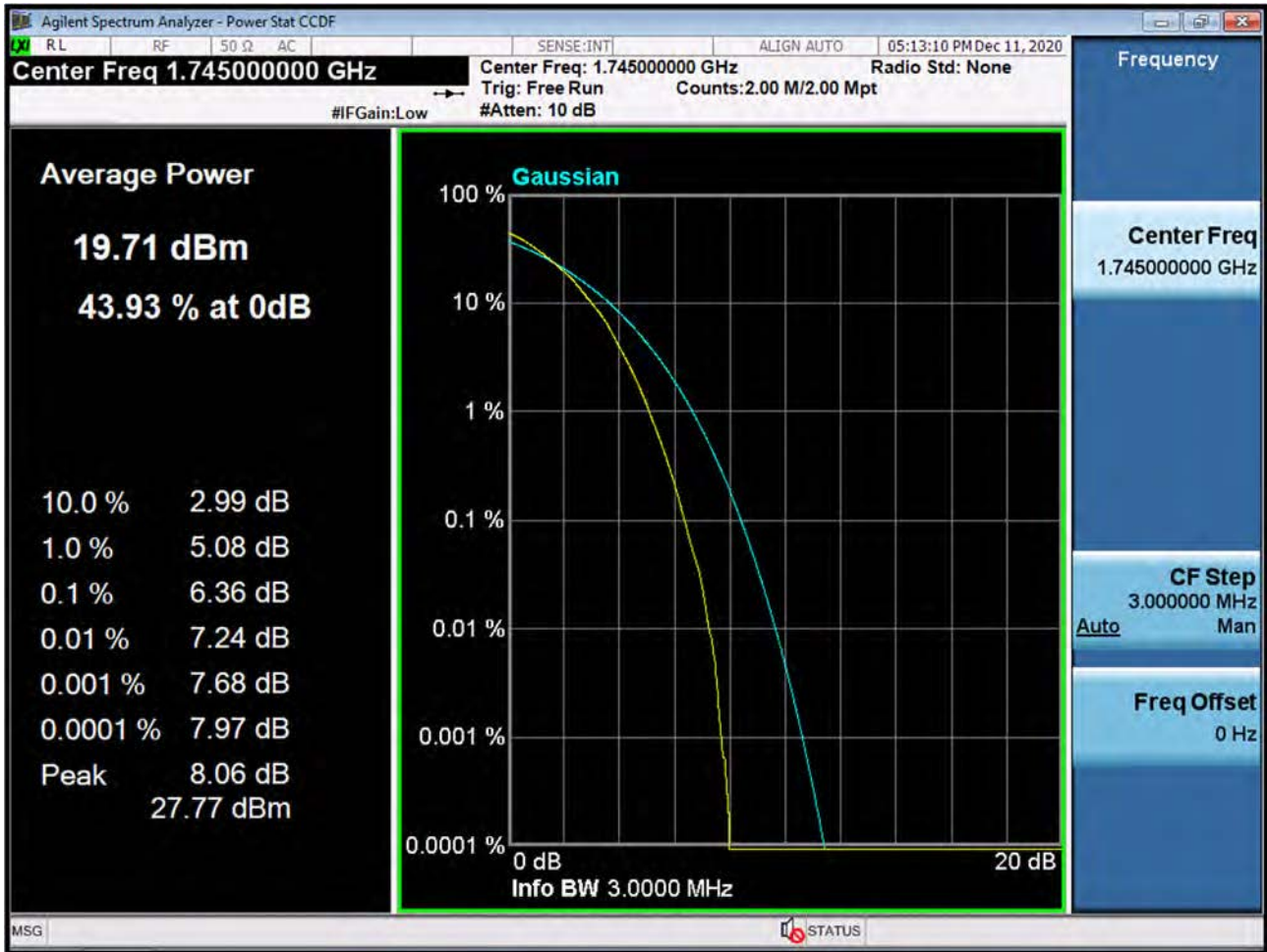
BAND 66/4. PAR Plot (3M BW_Ch.132322_QPSK_RB15_0)



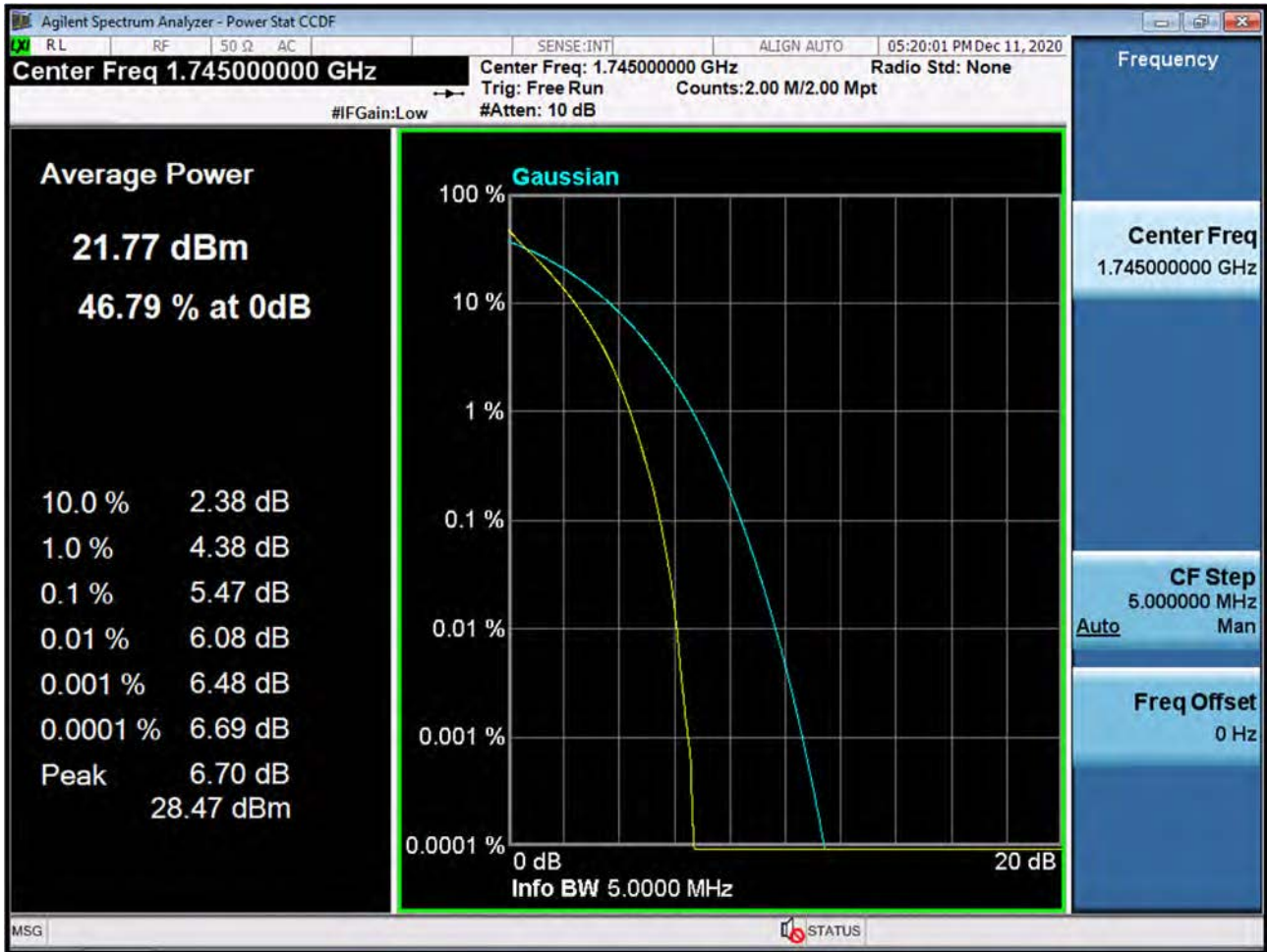
BAND 66/4. PAR Plot (3M BW_Ch.132322_16QAM_RB15_0)



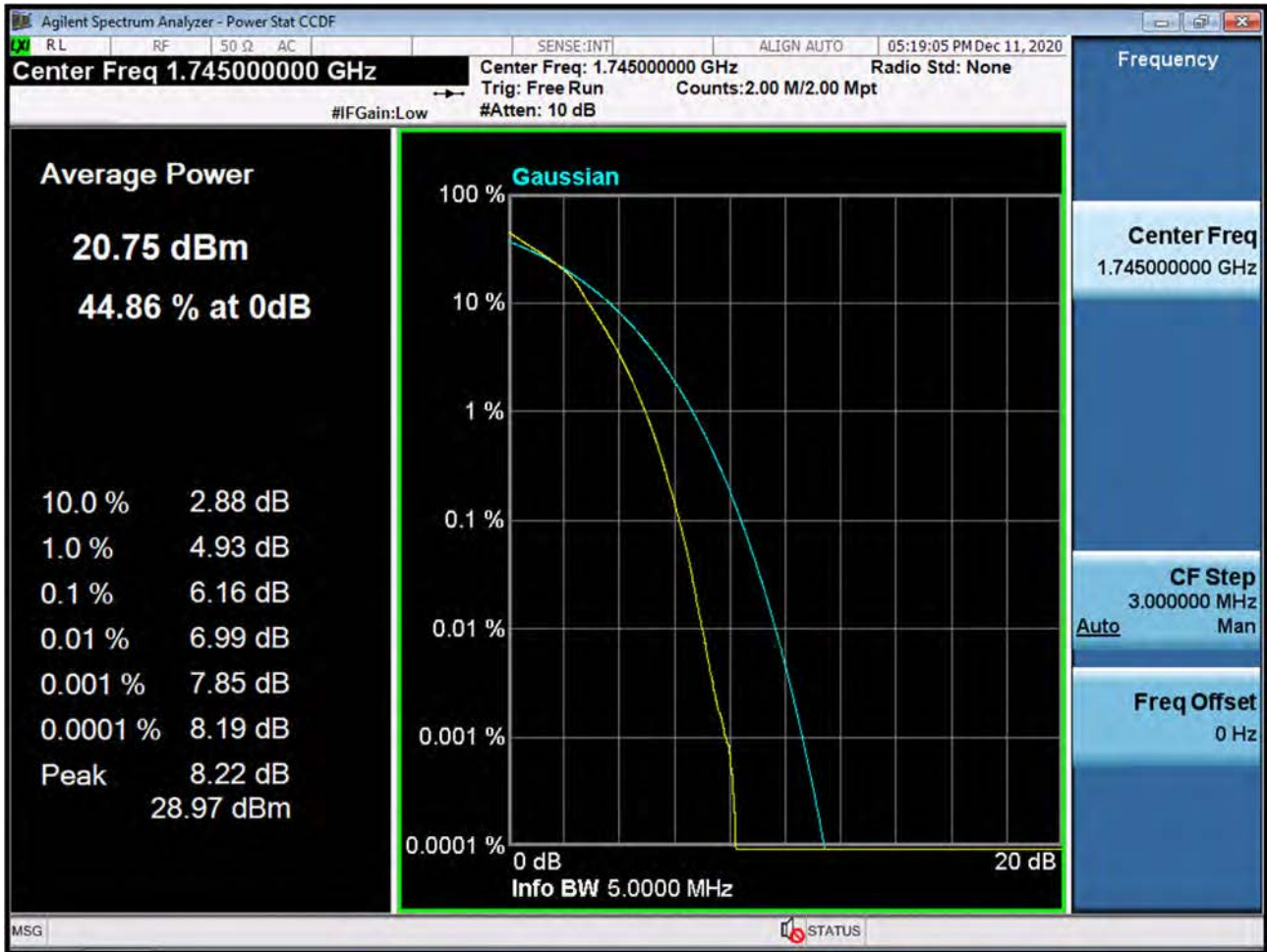
BAND 66/4. PAR Plot (3M BW_Ch.132322_64QAM_RB15_0)



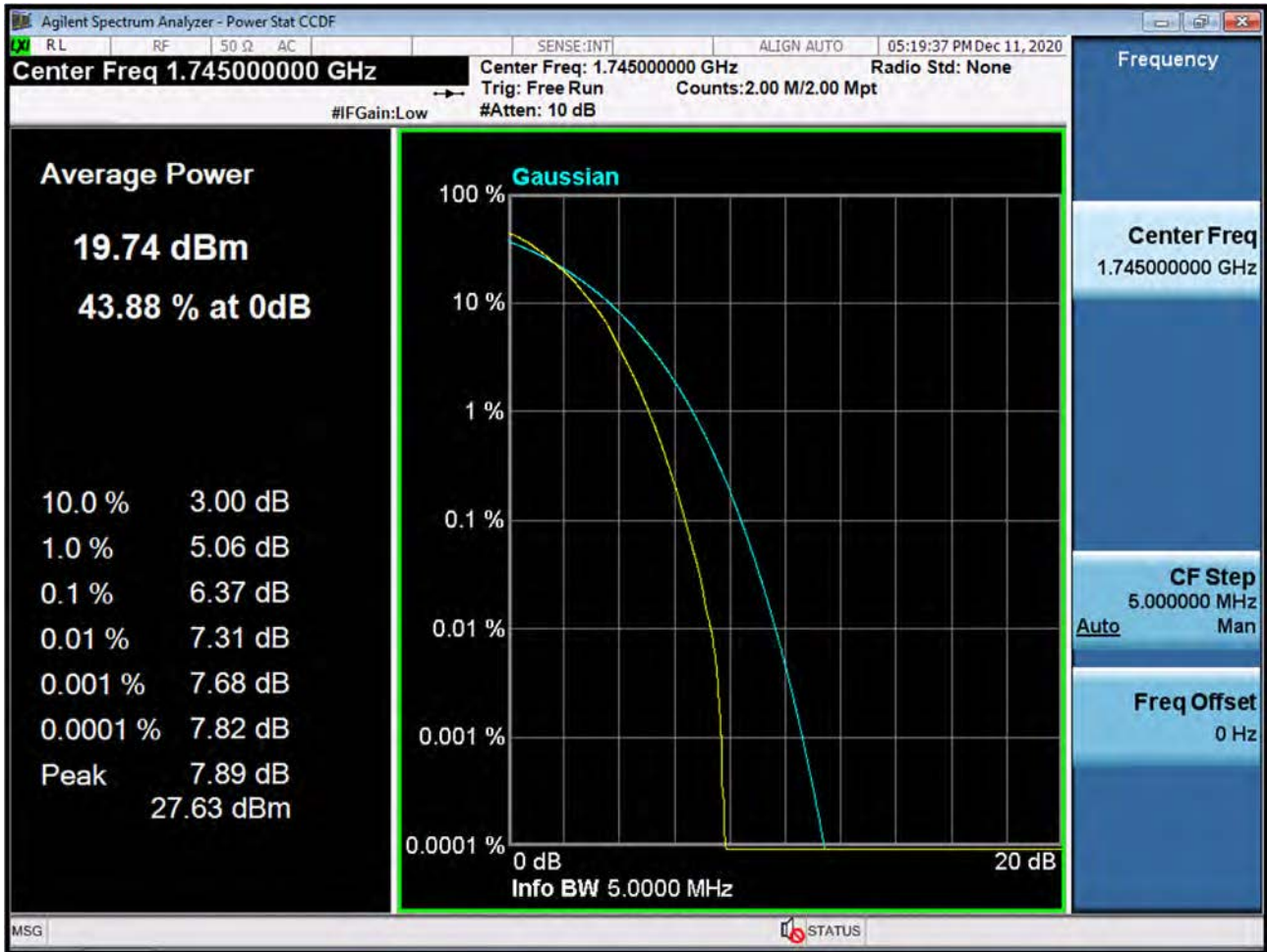
BAND 66/4. PAR Plot (5M BW_Ch.132322_QPSK_RB25_0)



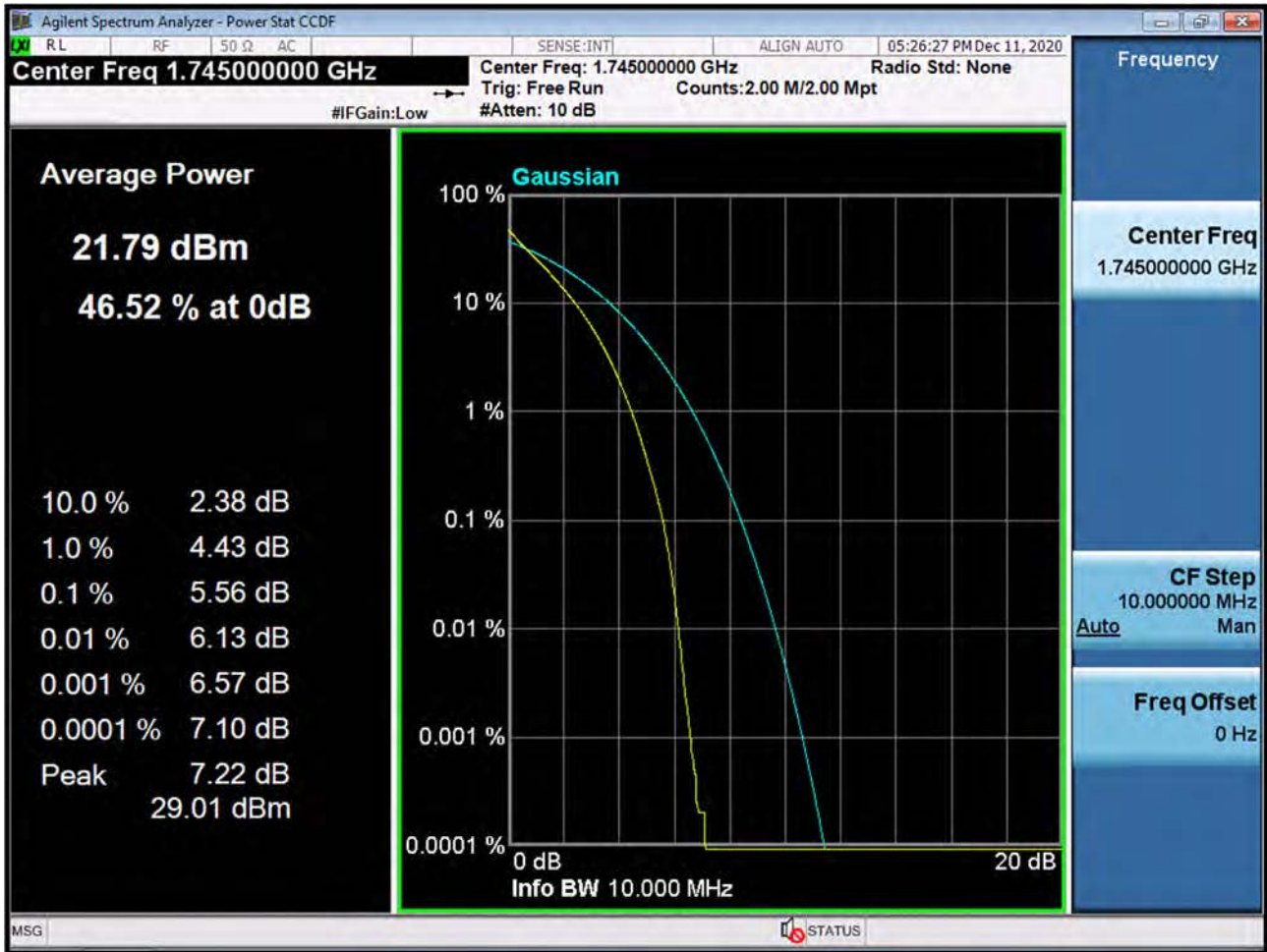
BAND 66/4. PAR Plot (5M BW_Ch.132322_16QAM_RB25_0)



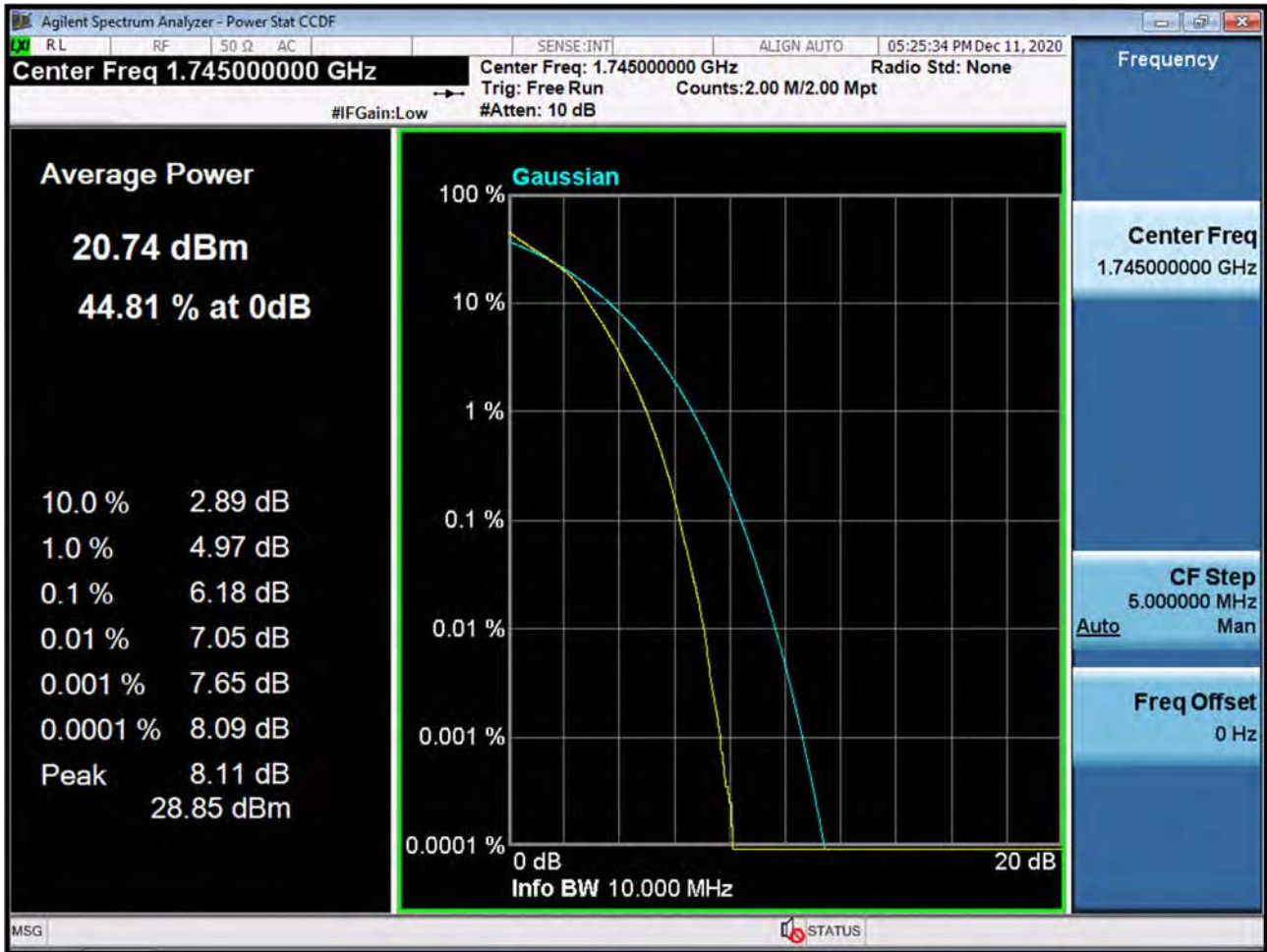
BAND 66/4. PAR Plot (5M BW_Ch.132322_64QAM_RB25_0)



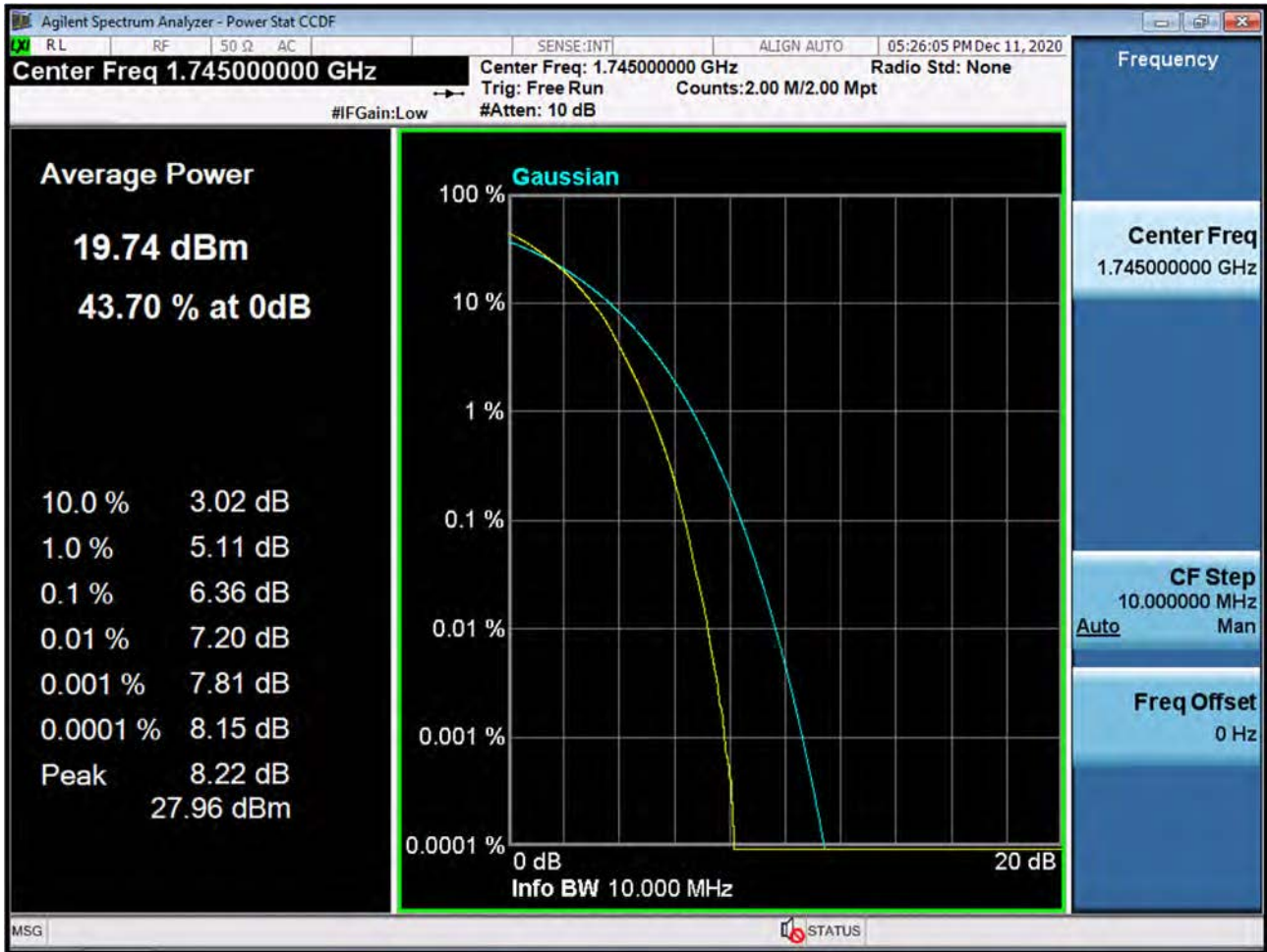
BAND 66/4. PAR Plot (10M BW_Ch.132322_QPSK_RB50_0)



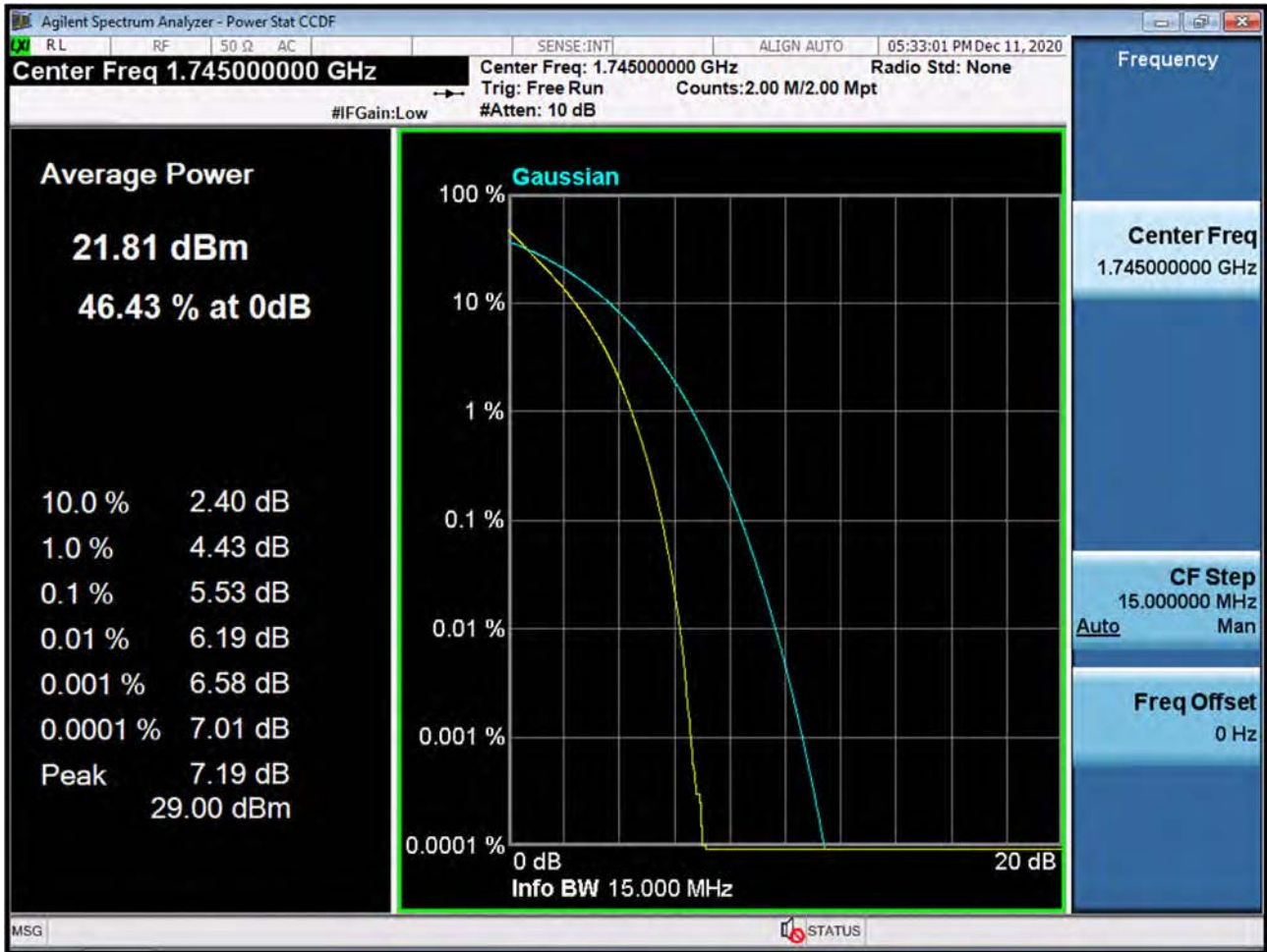
BAND 66/4. PAR Plot (10M BW_Ch.132322_16QAM_RB50_0)



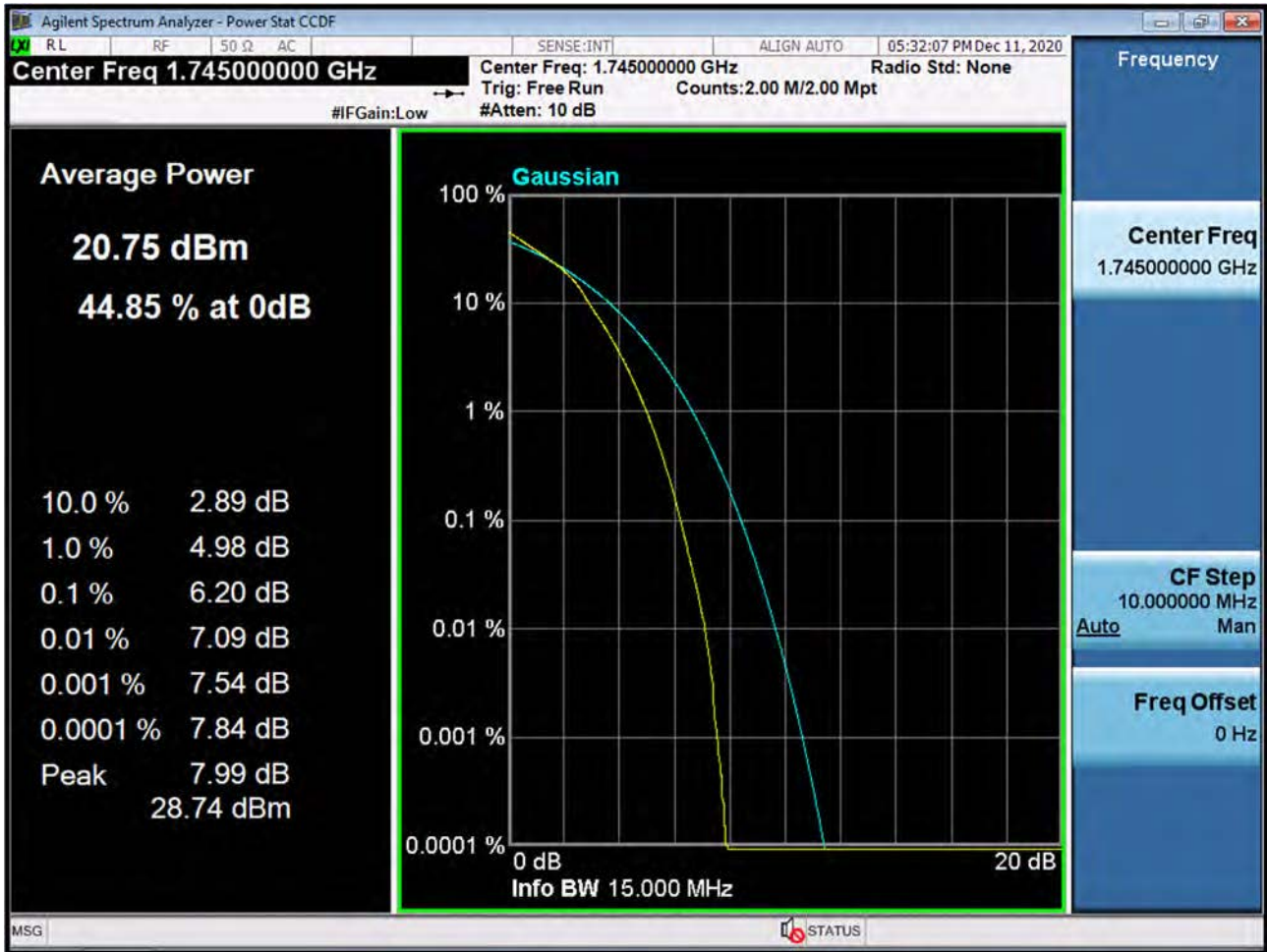
BAND 66/4. PAR Plot (10M BW_Ch.132322_64QAM_RB50_0)



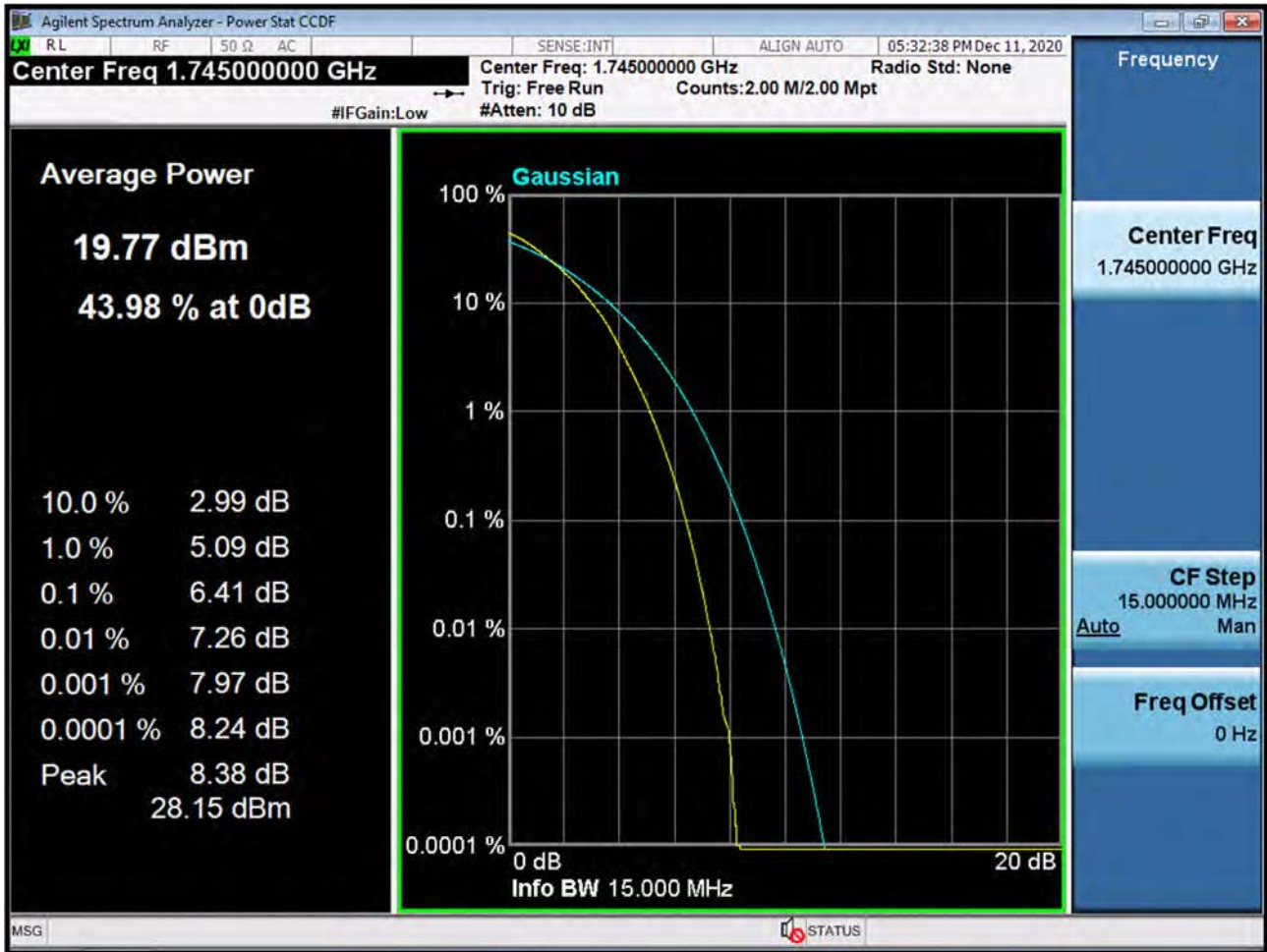
BAND 66/4. PAR Plot (15M BW_Ch.132322_QPSK_RB75_0)



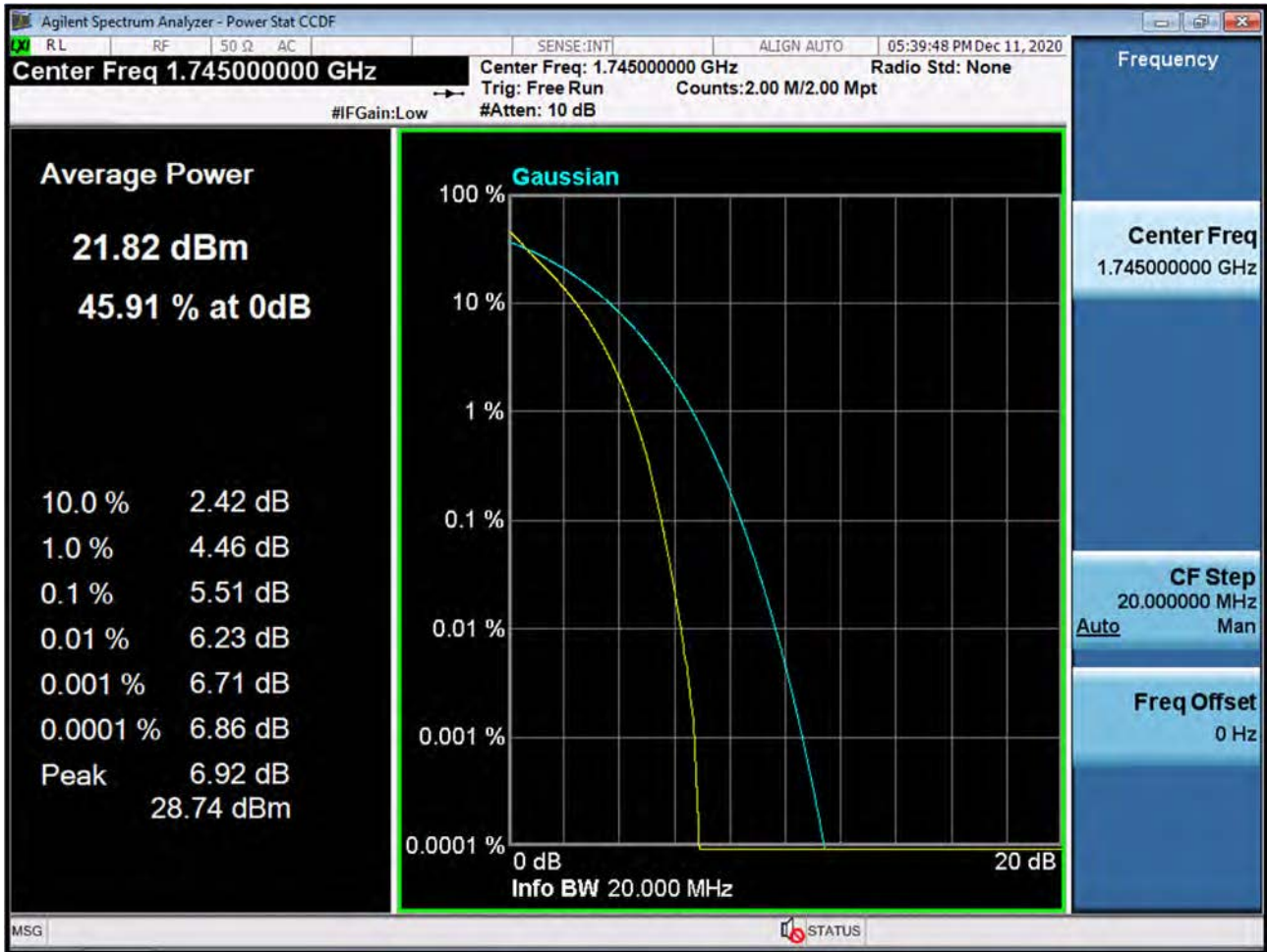
BAND 66/4. PAR Plot (15M BW_Ch.132322_16QAM_RB75_0)



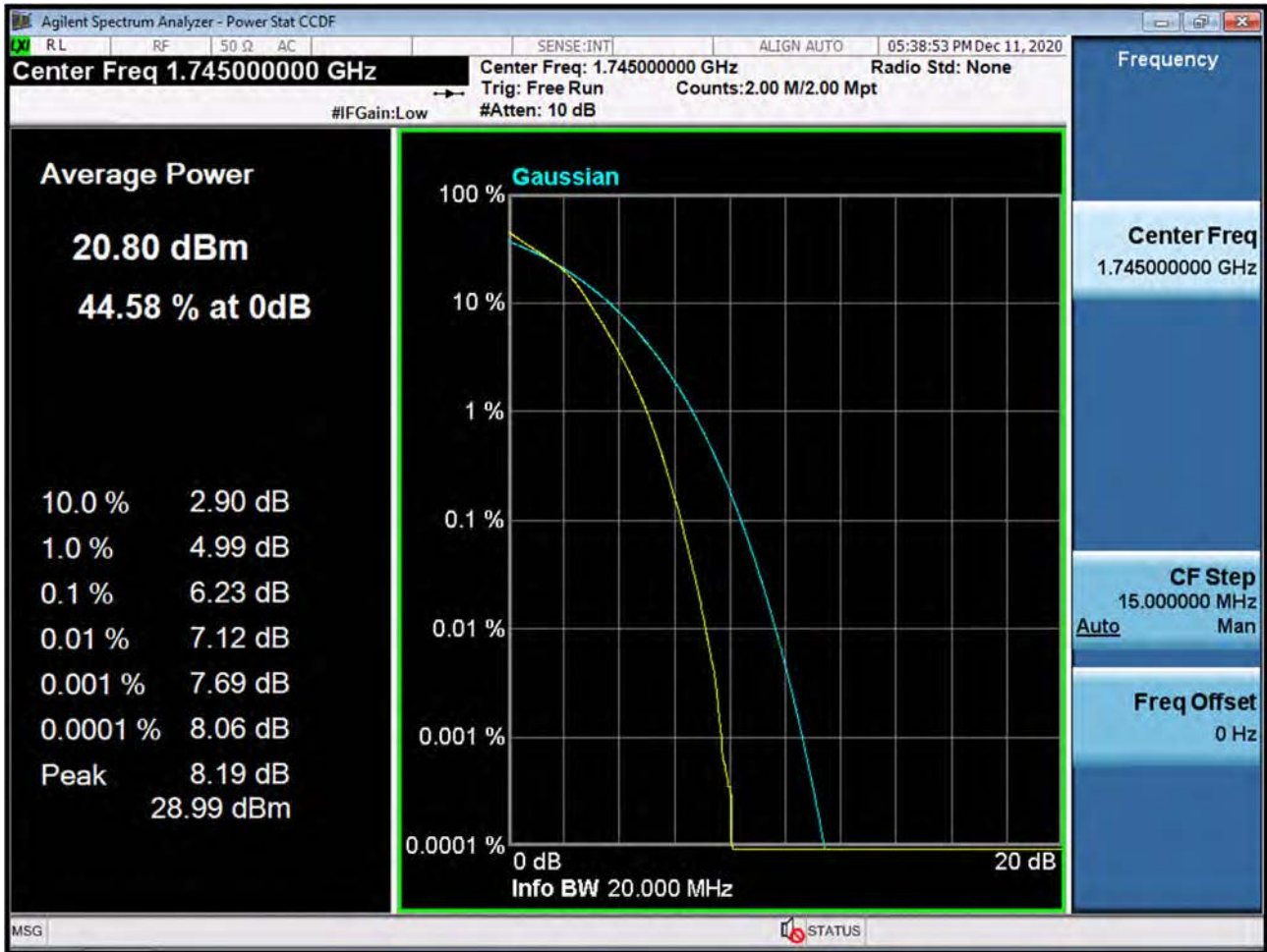
BAND 66/4. PAR Plot (15M BW_Ch.132322_64QAM_RB75_0)



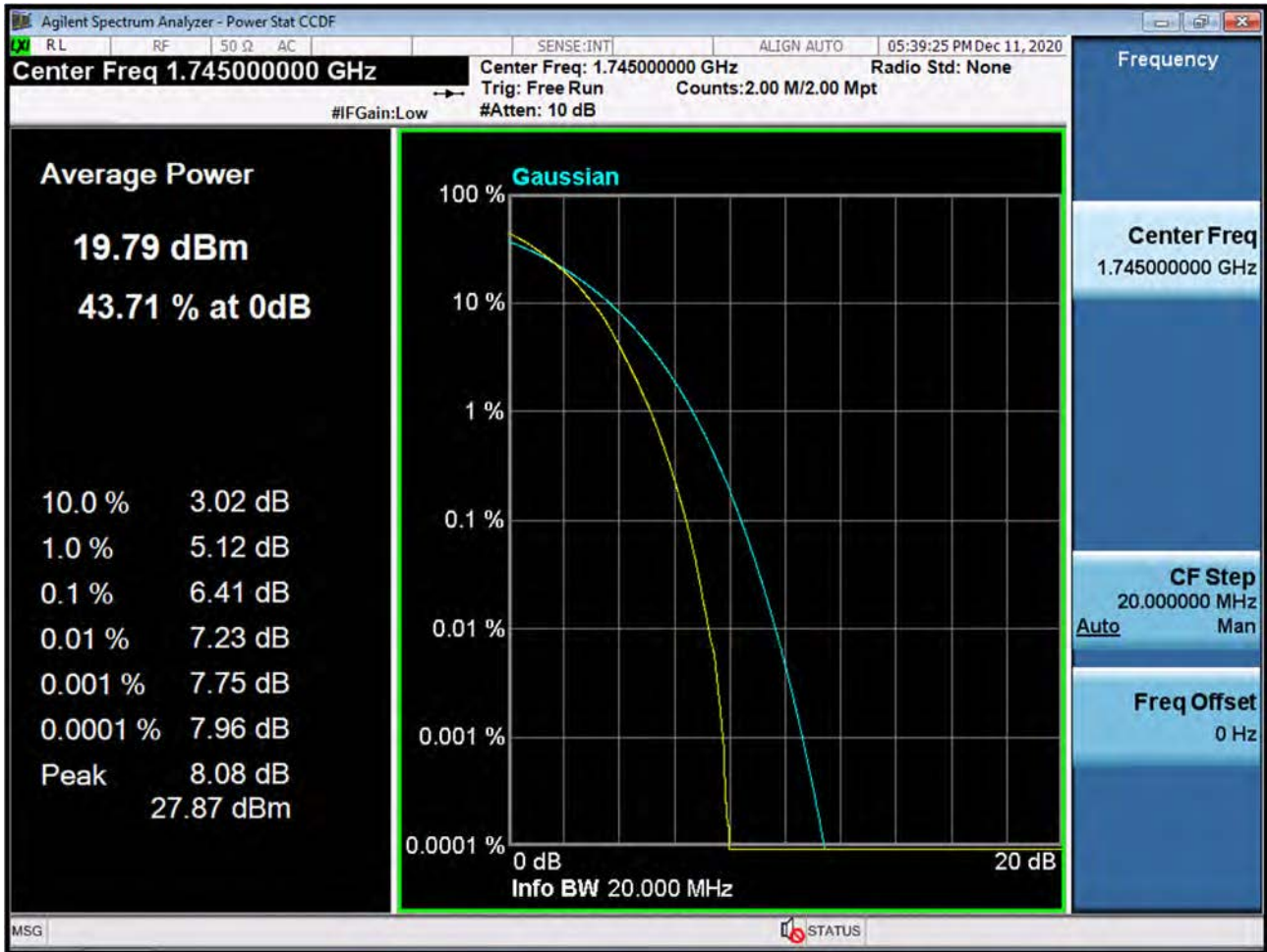
BAND 66/4. PAR Plot (20M BW_Ch.132322_QPSK_RB100_0)



BAND 66/4. PAR Plot (20M BW_Ch.132322_16QAM_RB100_0)



BAND 66/4. PAR Plot (20M BW_Ch.132322_64QAM_RB100_0)



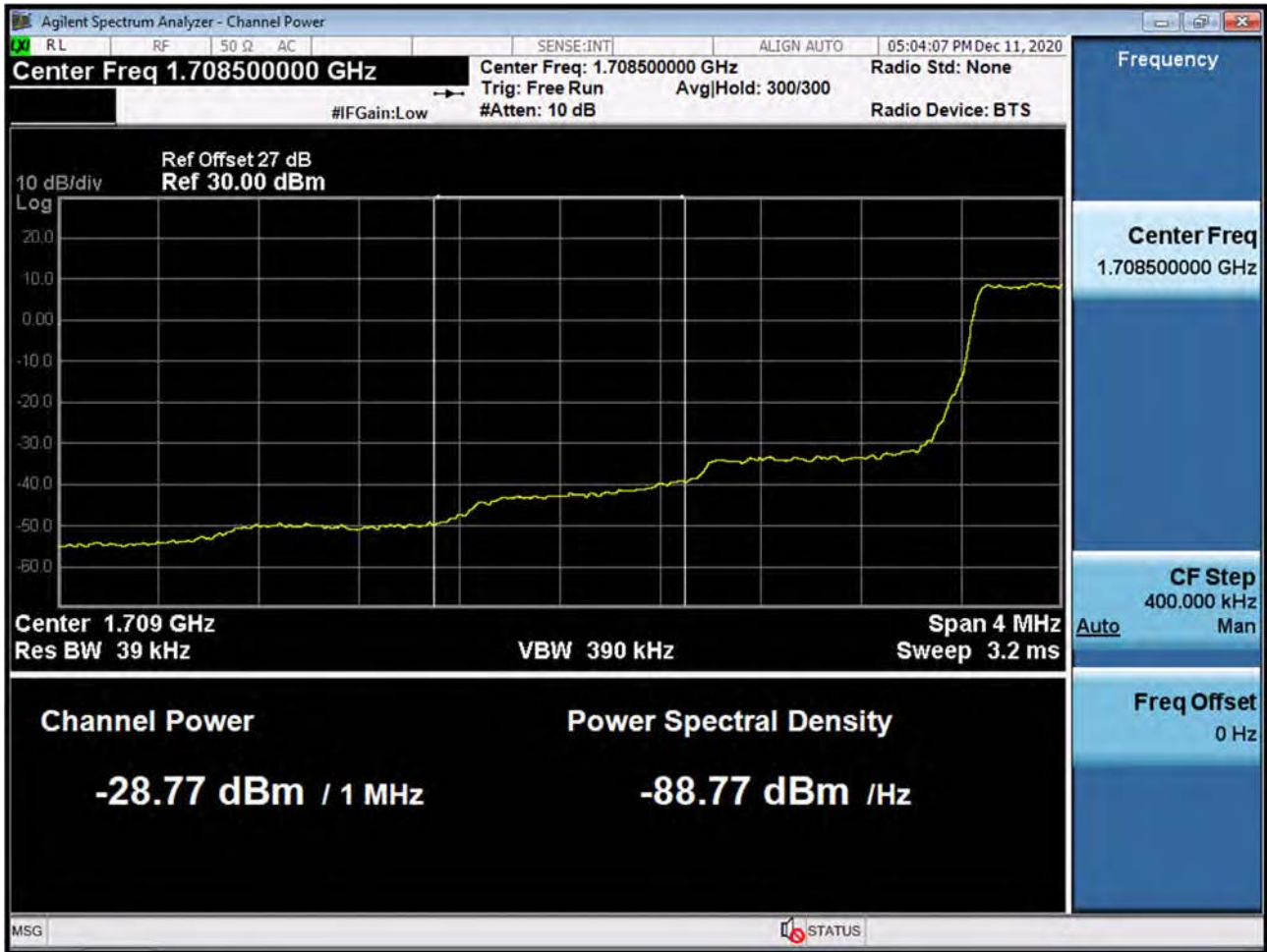
BAND 66/4. Lower Band Edge Plot (1.4M BW Ch.131979 QPSK RB 1, Offset 0) -1



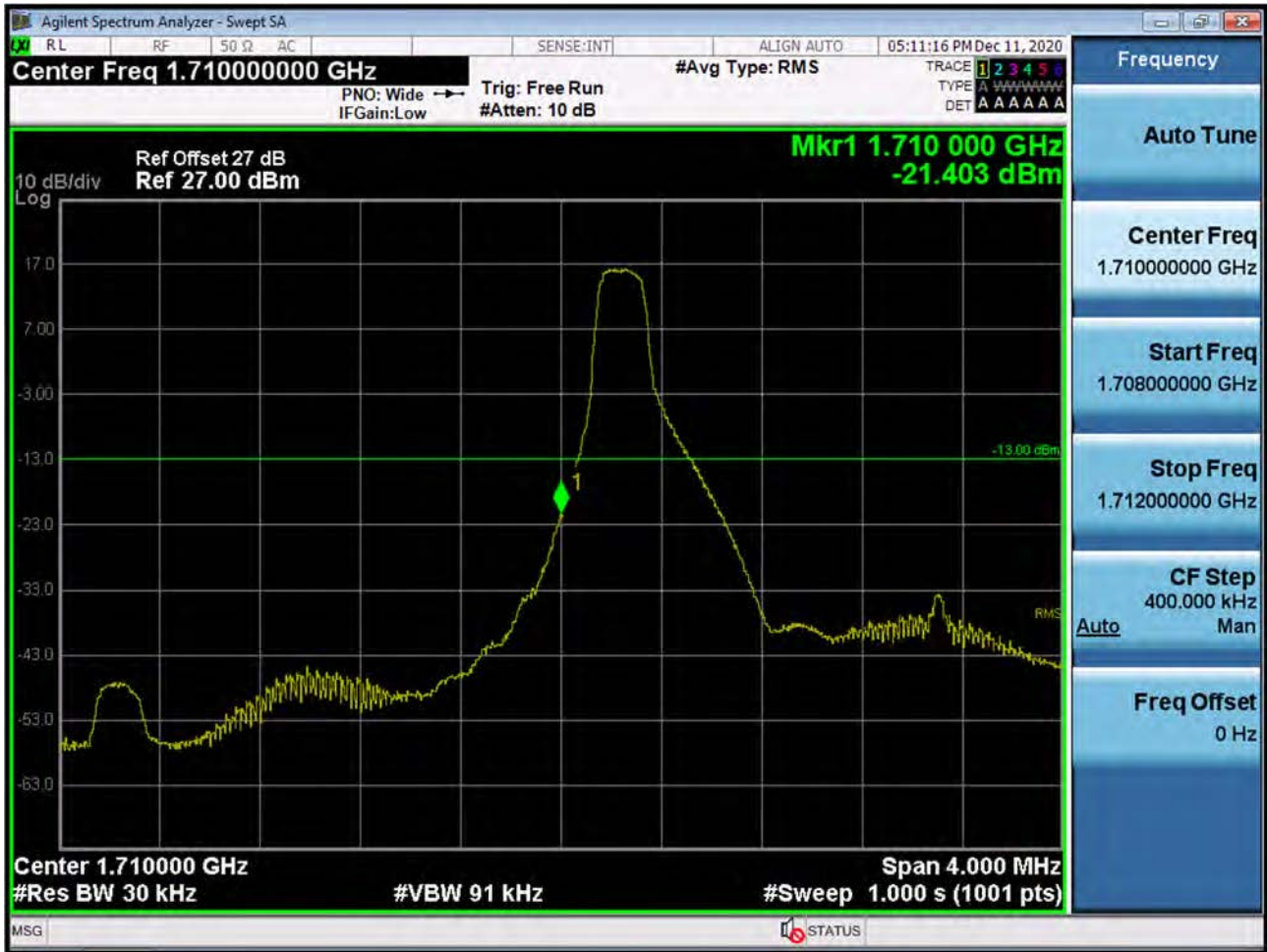
BAND 66/4. Lower Band Edge Plot (1.4M BW Ch.131979 QPSK RB 6_0) -2



BAND 66/4. Lower Extended Band Edge Plot (1.4M BW Ch.131979 QPSK_RB6_0) -3



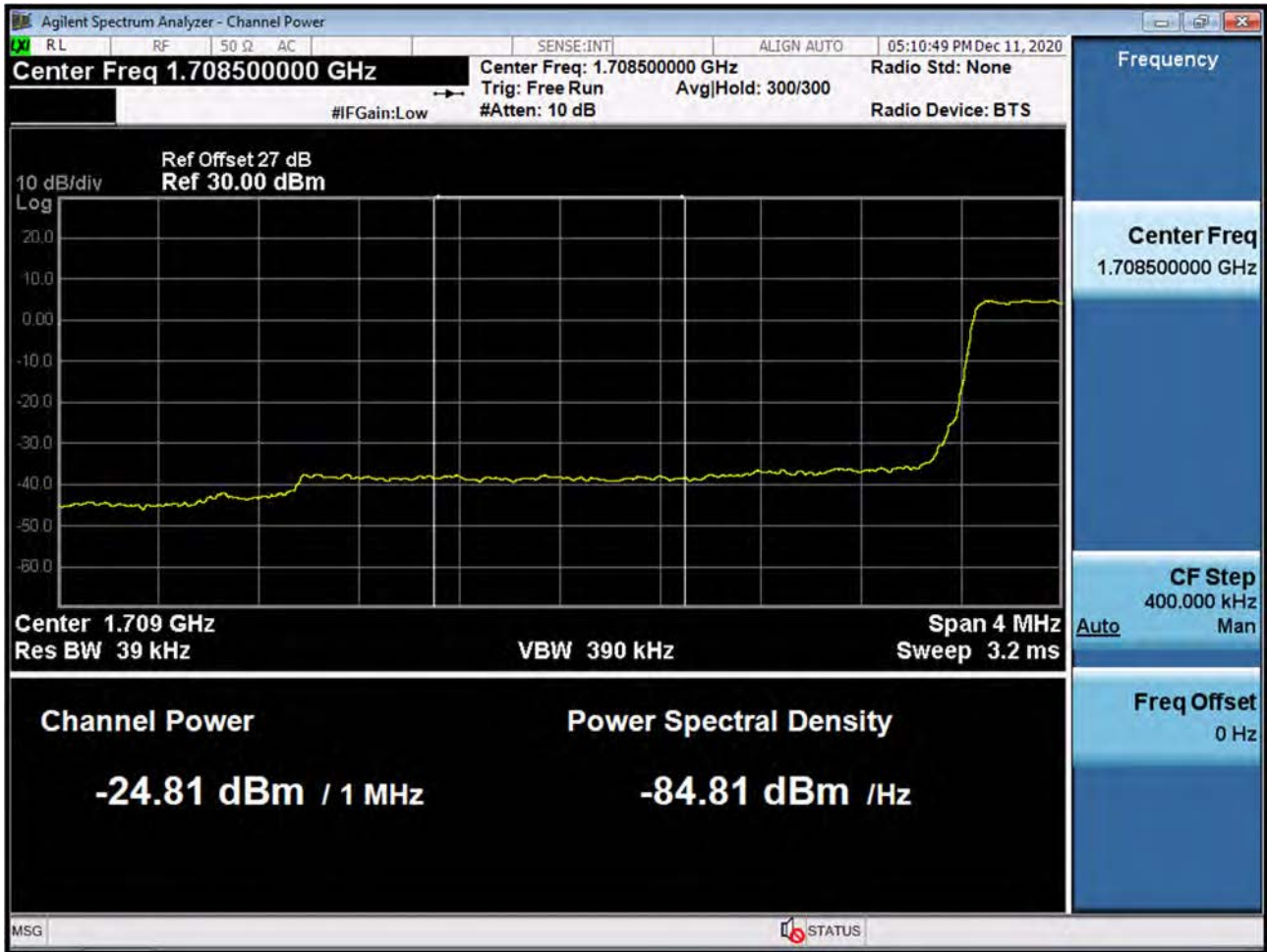
BAND 66/4. Lower Band Edge Plot (3M BW Ch.131987 QPSK RB 1, Offset 0) -1



BAND 66/4. Lower Band Edge Plot (3M BW Ch.131987 QPSK RB 15_0) -2



BAND 66/4. Lower Extended Band Edge Plot (3M BW Ch.131987 QPSK_RB15_0) -3



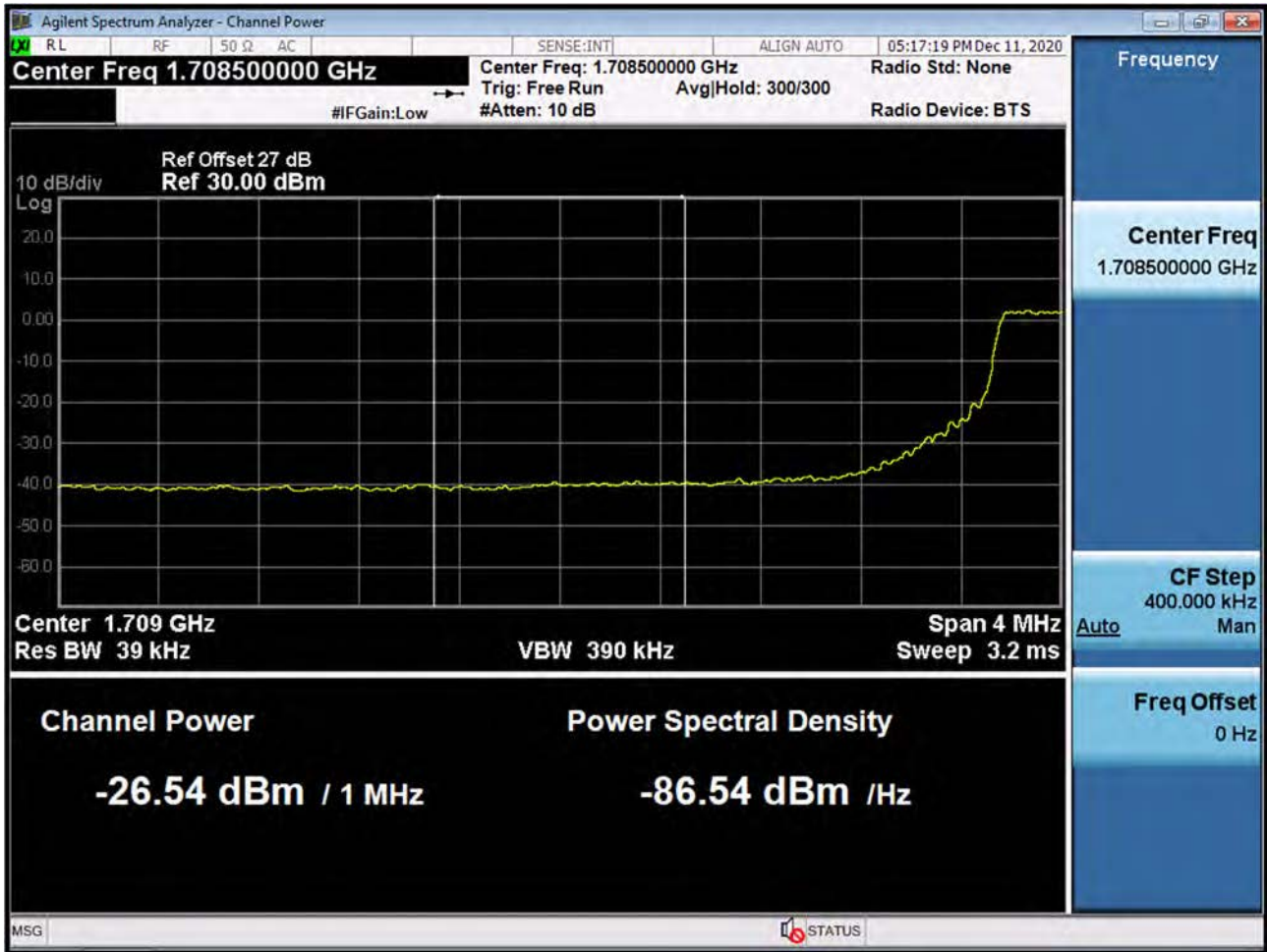
BAND 66/4. Lower Band Edge Plot (5M BW Ch.131997 QPSK RB 1, Offset 0) -1



BAND 66/4. Lower Band Edge Plot (5M BW Ch.131997 QPSK RB 25_0) -2



BAND 66/4. Lower Extended Band Edge Plot (5M BW Ch.131997 QPSK_RB25_0) -3



BAND 66/4. Lower Band Edge Plot (10M BW Ch.132022 QPSK RB 1, Offset 0) -1



BAND 66/4. Lower Band Edge Plot (10M BW Ch.132022 QPSK RB 50_0) -2



BAND 66/4. Lower Extended Band Edge Plot (10M BW Ch.132022 QPSK_RB50_0) -3



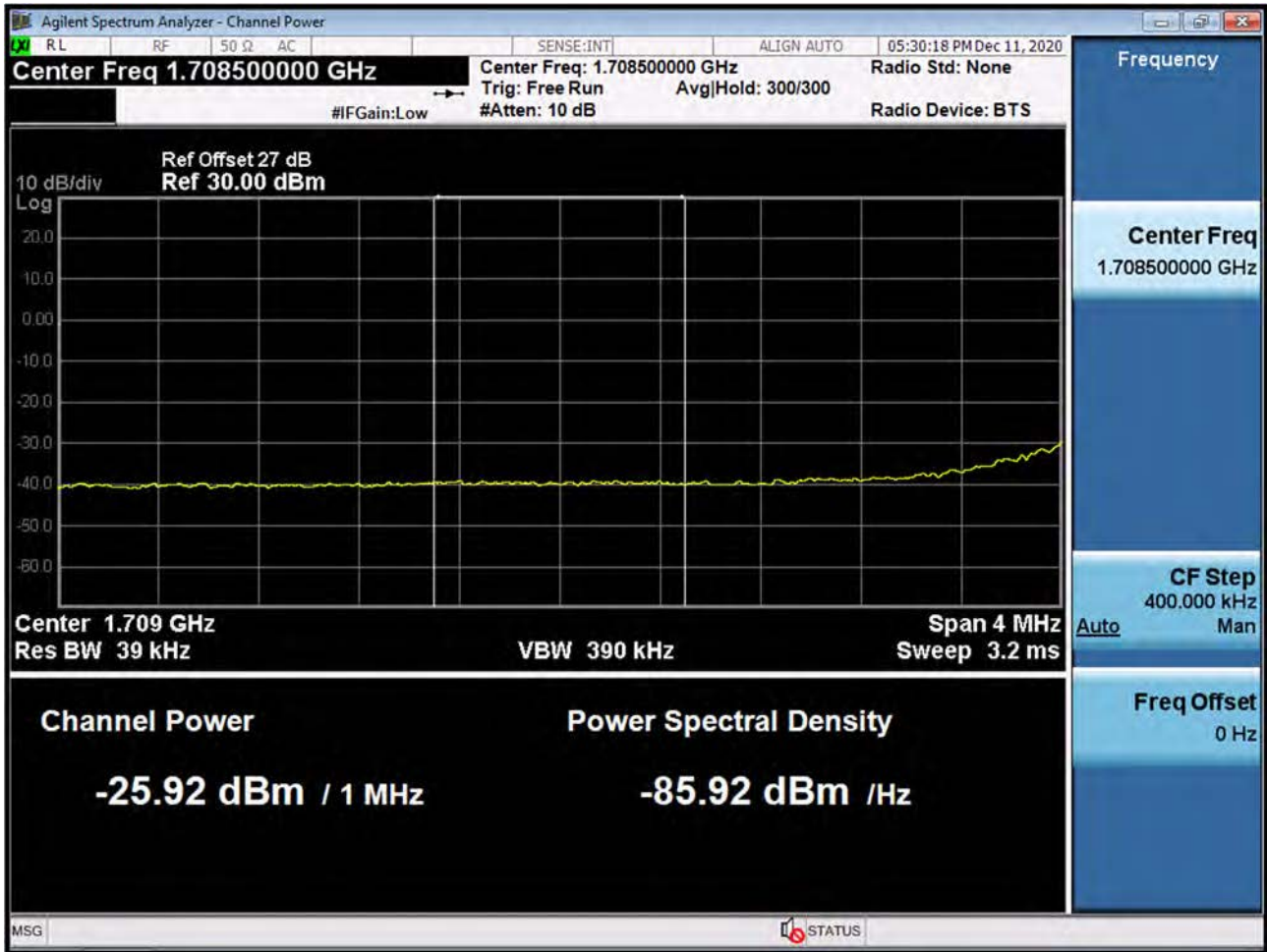
BAND 66/4. Lower Band Edge Plot (15M BW Ch.132047 QPSK RB 1, Offset 0) -1



BAND 66/4. Lower Band Edge Plot (15M BW Ch.132047 QPSK RB 75_0) -2



BAND 66/4. Lower Extended Band Edge Plot (15M BW Ch.132047 QPSK_RB75_0) -3



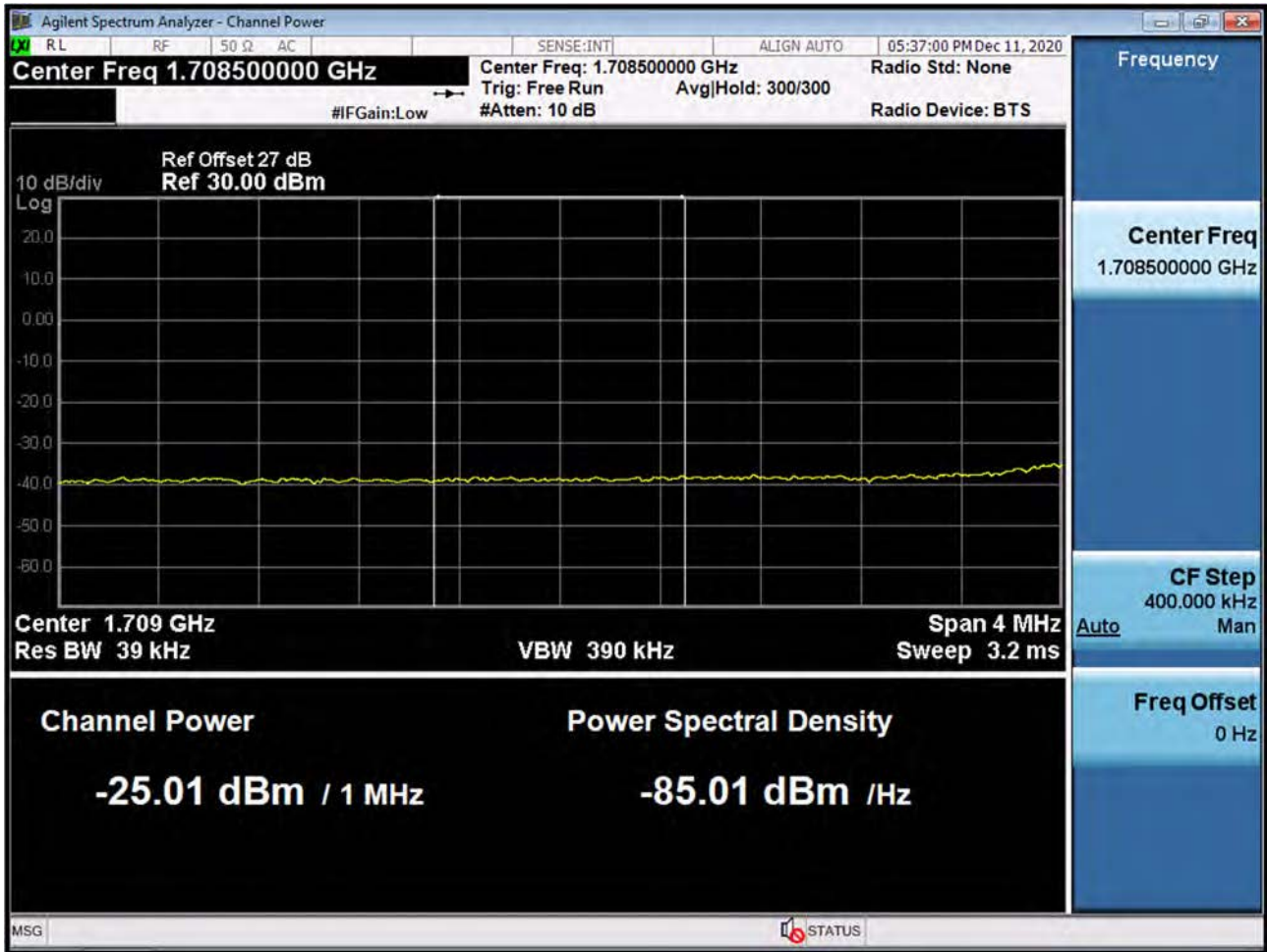
BAND 66/4. Lower Band Edge Plot (20M BW Ch.132072 QPSK RB 1, Offset 0) -1



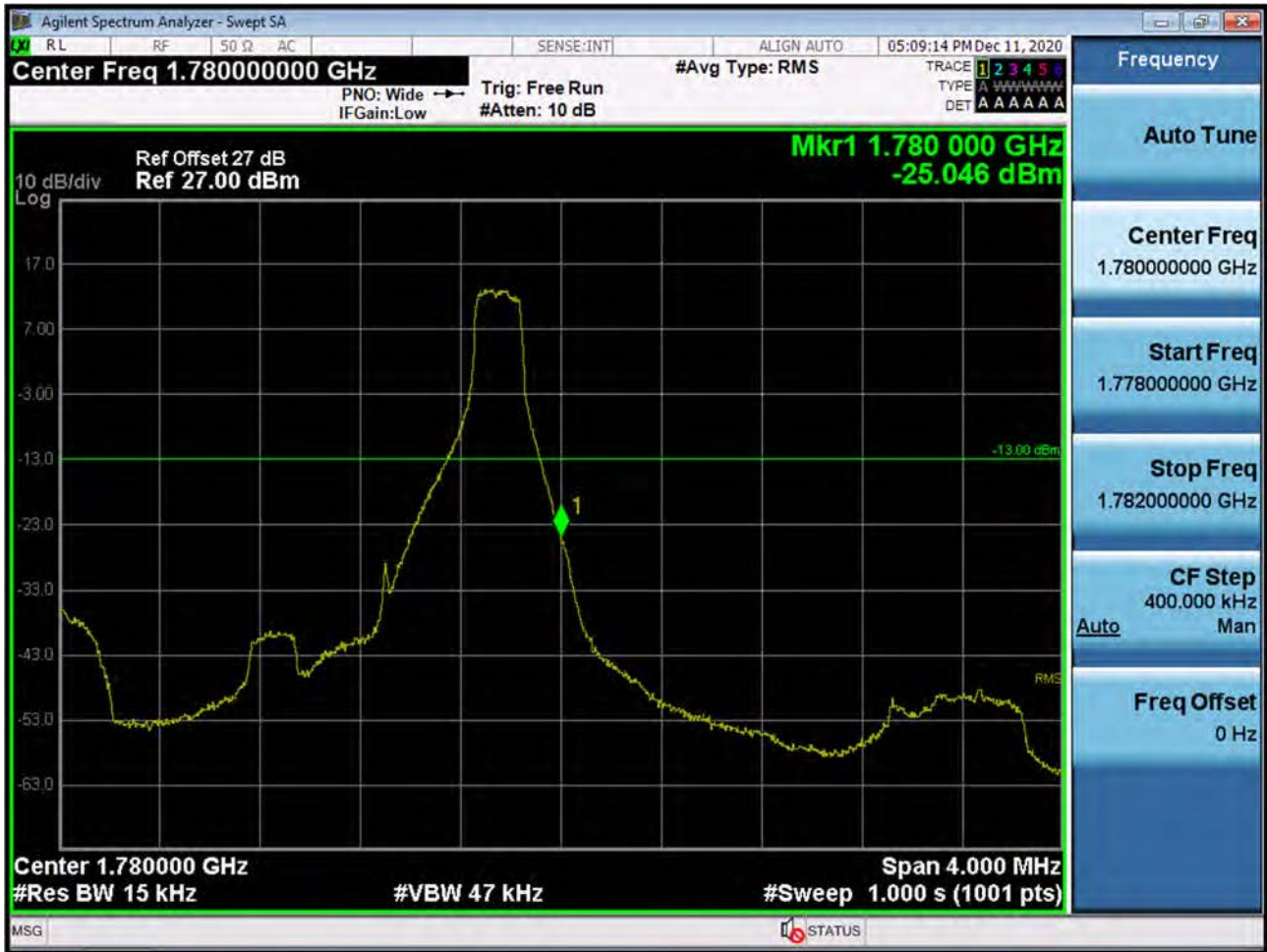
BAND 66/4. Lower Band Edge Plot (20M BW Ch.132072 QPSK RB 100_0) -2



BAND 66/4. Lower Extended Band Edge Plot (20M BW Ch.132072 QPSK_RB100_0) -3



BAND 66/4. Upper Band Edge Plot (1.4M BW Ch.132665 QPSK_RB1_Offset 5) -1



BAND 66/4. Upper Band Edge Plot (1.4M BW Ch.132665 QPSK_RB6_0) -2

