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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:
June 30, 2021

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

Report No.: HCT-RF-2106-FC004

FCC ID:	**A3LSMG990B**
APPLICANT:	**SAMSUNG Electronics Co., Ltd.**

Model(s):	SM-G990B/DS
Additional Model(s):	SM-G990B
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	0.123	20.89
		1M09W7D	16QAM	0.106	20.27
		1M09W7D	64QAM	0.083	19.18
		1M09W7D	256QAM	0.041	16.12
LTE – Band66/4 (3)	1711.5 – 1778.5	2M71G7D	QPSK	0.127	21.03
		2M70W7D	16QAM	0.109	20.39
		2M70W7D	64QAM	0.085	19.30
		2M71W7D	256QAM	0.042	16.26
LTE – Band66/4 (5)	1712.5 – 1777.5	4M51G7D	QPSK	0.124	20.95
		4M50W7D	16QAM	0.108	20.35
		4M50W7D	64QAM	0.083	19.20
		4M49W7D	256QAM	0.042	16.19
LTE – Band66/4 (10)	1715.0 – 1775.0	8M97G7D	QPSK	0.118	20.70
		8M97W7D	16QAM	0.103	20.12
		8M97W7D	64QAM	0.079	18.95
		8M99W7D	256QAM	0.039	15.93
LTE – Band66/4 (15)	1717.5 – 1772.5	13M5G7D	QPSK	0.116	20.65
		13M5W7D	16QAM	0.100	20.00
		13M5W7D	64QAM	0.078	18.90
		13M5W7D	256QAM	0.039	15.88
LTE – Band66/4 (20)	1720.0 – 1770.0	18M0G7D	QPSK	0.111	20.47
		17M9W7D	16QAM	0.095	19.78
		18M0W7D	64QAM	0.074	18.69
		17M9W7D	256QAM	0.037	15.68

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-2106-FC004	June 30, 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:	A3LSMG990B
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-G990B/DS
Additional Model(s):	SM-G990B
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:	May 03, 2021 ~ June 07, 2021
Serial number:	Radiated: 543da2b1d81f7ece Conducted: 524d0f0dc71e7ece

2. INTRODUCTION

2.1. DESCRIPTION OF EUT

The EUT was a Mobile Phone with GSM/GPRS/EGPRS/UMTS and LTE, Sub6.

It also supports IEEE 802.11 a/b/g/n/ac/ax (HT20/40/80), Bluetooth, BT LE, NFC, WPT.

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 ≥ 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;

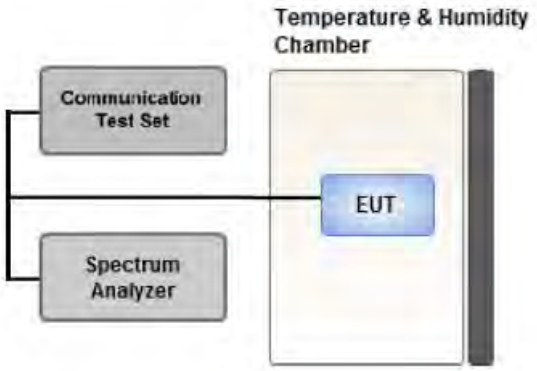
$$Result_{(dBm)} = Pg_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dBi)}$$

   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 PEAK- TO- AVERAGE RATIO



Test setup

① CCDF Procedure for PAPR

Test Settings

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

② **Alternate Procedure for PAPR**

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

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

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

Test Settings(Peak Power)

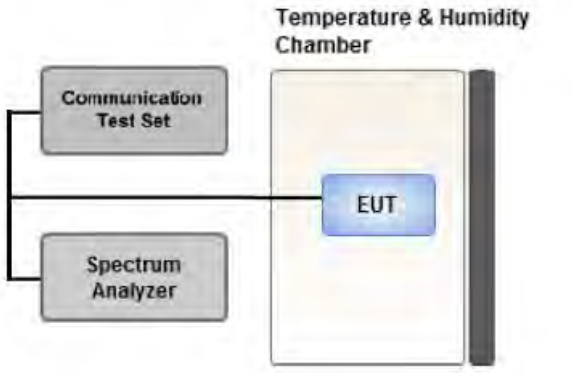
The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW ≥ 3 × RBW.

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

Test Settings(Average Power)

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

3.5 OCCUPIED BANDWIDTH.



Test setup

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

The EUT makes a call to the communication simulator.

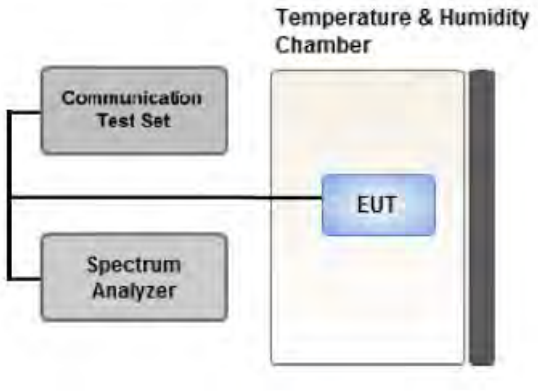
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

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

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 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

3.6 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL



Test setup

Test Overview

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

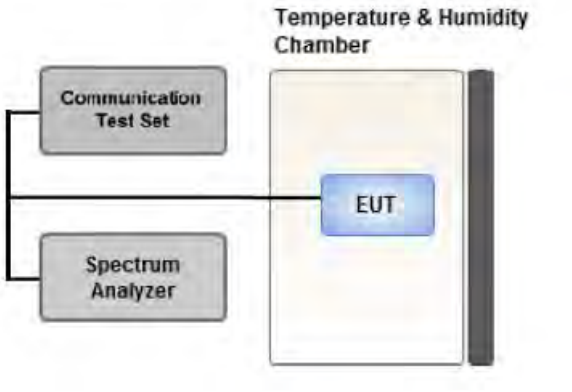
All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

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

Test Settings

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

3.7 BAND EDGE



Test setup

Test Overview

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

Test Settings

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

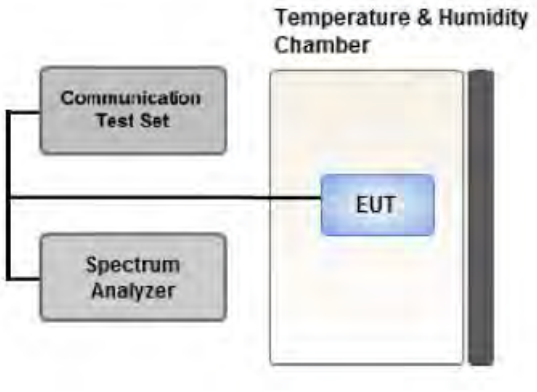
Test Notes

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

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

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

3.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE



Test setup

Test Overview

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

The frequency stability of the transmitter is measured by:

1. Temperature:

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

2. Primary Supply Voltage:

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

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

Test Settings

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

3.9 WORST CASE(RADIATED TEST)

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

(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.

- Please refer to the table below.
- SM-G990B/DS & additional models were tested and the worst case results are reported.

(Worst case : SM-G990B/DS)

[Worst case]

Test Description	Modulation	RB size	RB offset	Axis
Effective Isotropic Radiated Power	QPSK, 16QAM, 64QAM, 256QAM	1	0	X
Radiated Spurious and Harmonic Emissions	QPSK	1	0	Y

3.10 WORST CASE(CONDUCTED TEST)

- All modes of operation were investigated and the worst case configuration results are reported.
- 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-G990B/DS & additional models were tested and the worst case results are reported.

(Worst case : SM-G990B/DS)

[Worst case]

Test Description	Modulation	Bandwidth (MHz)	Frequency	RB size	RB offset
Occupied Bandwidth	QPSK, 16QAM, 64QAM, 256QAM	1.4, 3, 5, 10, 15, 20	Mid	Full RB	0
Peak-To-Average Ratio	QPSK, 16QAM, 64QAM, 256QAM	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
T&M SYSTEM	FBSR-02B(WHK1.2/15G-10EF)/H.P.F	-	03/02/2021	Annual	03/02/2022
T&M SYSTEM	FBSR-02B(WHK3.3/18G-10EF)/H.P.F	-	03/02/2021	Annual	03/02/2022
Hewlett Packard	11667B / Power Splitter(DC~26.5 GHz)	11275	04/07/2021	Annual	04/07/2022
Hewlett Packard	E3632A/DC Power Supply	MY40004427	09/16/2020	Annual	09/16/2021
Schwarzbeck	UHAP/ Dipole Antenna	557	04/05/2021	Biennial	04/05/2023
Schwarzbeck	UHAP/ Dipole Antenna	558	04/05/2021	Biennial	04/05/2023
ESPEC	SU-642 / Chamber	93008124	03/15/2021	Annual	03/15/2022
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	10/13/2020	Biennial	10/13/2022
Schwarzbeck	BBHA 9170/ Horn Antenna(15~40GHz)	BBHA9170124	02/11/2020	Biennial	02/11/2022
Agilent	N9020A/Signal Analyzer(10Hz~26.5GHz)	MY50200093	11/17/2020	Annual	11/17/2021
Hewlett Packard	8493C/ATTENUATOR(20dB)	17280	06/01/2021	Annual	06/01/2022
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)	1513-333	03/19/2020	Biennial	03/19/2022
Schwarzbeck	VULB9160/ Bilog Antenna	3150	03/03/2021	Biennial	03/03/2023
Schwarzbeck	VULB9168/ Hybrid Antenna	760	02/22/2021	Biennial	02/22/2023
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	06/02/2021	Annual	06/02/2022
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, §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	**See Note1**
Peak- to- Average Ratio	§27.50(d)(5)	< 13 dB	PASS
Frequency stability / variation of ambient temperature	§2.1055, § 27.54	Emission must remain in band	PASS

Note:

1. See SAR Report

6.2 Test Condition : Radiated Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Equivalent Isotropic Radiated Power	§27.50(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	-20.55	13.09	9.85	2.05	H	< 1.00	0.123	20.89
		16-QAM	-21.17	12.47	9.85	2.05	H		0.106	20.27
		64-QAM	-22.26	11.38	9.85	2.05	H		0.083	19.18
		256-QAM	-25.32	8.32	9.85	2.05	H		0.041	16.12
1745.0		QPSK	-21.03	12.74	9.98	2.06	H		0.116	20.66
		16-QAM	-21.57	12.20	9.98	2.06	H		0.103	20.12
		64-QAM	-22.77	11.00	9.98	2.06	H		0.078	18.92
		256-QAM	-25.81	7.96	9.98	2.06	H		0.039	15.88
1779.3		QPSK	-21.42	12.23	10.05	2.07	H		0.105	20.21
		16-QAM	-22.02	11.63	10.05	2.07	H		0.091	19.61
		64-QAM	-23.19	10.46	10.05	2.07	H		0.070	18.44
		256-QAM	-26.21	7.44	10.05	2.07	H		0.035	15.42

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	-20.41	13.23	9.85	2.05	H	< 1.00	0.127	21.03
		16-QAM	-21.05	12.59	9.85	2.05	H		0.109	20.39
		64-QAM	-22.14	11.50	9.85	2.05	H		0.085	19.30
		256-QAM	-25.18	8.46	9.85	2.05	H		0.042	16.26
1745.0		QPSK	-21.00	12.77	9.98	2.06	H		0.117	20.69
		16-QAM	-21.63	12.14	9.98	2.06	H		0.101	20.06
		64-QAM	-22.80	10.97	9.98	2.06	H		0.077	18.89
		256-QAM	-25.81	7.96	9.98	2.06	H		0.039	15.88
1778.5		QPSK	-21.36	12.29	10.05	2.07	H		0.106	20.27
		16-QAM	-22.00	11.65	10.05	2.07	H		0.092	19.63
		64-QAM	-23.19	10.46	10.05	2.07	H		0.070	18.44
		256-QAM	-26.18	7.47	10.05	2.07	H		0.035	15.45

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	-20.49	13.15	9.85	2.05	H	< 1.00	0.124	20.95
		16-QAM	-21.09	12.55	9.85	2.05	H		0.108	20.35
		64-QAM	-22.24	11.40	9.85	2.05	H		0.083	19.20
		256-QAM	-25.25	8.39	9.85	2.05	H		0.042	16.19
1745.0		QPSK	-21.07	12.70	9.98	2.06	H		0.115	20.62
		16-QAM	-21.70	12.07	9.98	2.06	H		0.100	19.99
		64-QAM	-22.84	10.93	9.98	2.06	H		0.077	18.85
		256-QAM	-25.87	7.90	9.98	2.06	H		0.038	15.82
1777.5		QPSK	-21.39	12.26	10.05	2.07	H		0.106	20.24
		16-QAM	-22.03	11.62	10.05	2.07	H		0.091	19.60
		64-QAM	-23.23	10.42	10.05	2.07	H		0.069	18.40
		256-QAM	-26.21	7.44	10.05	2.07	H		0.035	15.42

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	-20.77	12.88	9.88	2.05	H	< 1.00	0.118	20.70
		16-QAM	-21.35	12.30	9.88	2.05	H		0.103	20.12
		64-QAM	-22.52	11.13	9.88	2.05	H		0.079	18.95
		256-QAM	-25.54	8.11	9.88	2.05	H		0.039	15.93
1745.0		QPSK	-21.30	12.47	9.98	2.06	H		0.109	20.39
		16-QAM	-21.89	11.88	9.98	2.06	H		0.095	19.80
		64-QAM	-23.10	10.67	9.98	2.06	H		0.072	18.59
		256-QAM	-26.13	7.64	9.98	2.06	H		0.036	15.56
1775.0		QPSK	-21.92	11.76	10.05	2.07	H		0.094	19.74
		16-QAM	-22.60	11.08	10.05	2.07	H		0.081	19.06
		64-QAM	-23.76	9.92	10.05	2.07	H		0.062	17.90
		256-QAM	-26.69	6.99	10.05	2.07	H		0.031	14.97

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	-20.86	12.80	9.90	2.05	H	< 1.00	0.127	21.05
		16-QAM	-21.51	12.15	9.90	2.05	H		0.100	20.00
		64-QAM	-22.61	11.05	9.90	2.05	H		0.078	18.90
		256-QAM	-25.63	8.03	9.90	2.05	H		0.039	15.88
1745.0		QPSK	-21.76	12.01	9.98	2.06	H		0.098	19.93
		16-QAM	-22.42	11.35	9.98	2.06	H		0.085	19.27
		64-QAM	-23.44	10.33	9.98	2.06	H		0.067	18.25
		256-QAM	-26.50	7.27	9.98	2.06	H		0.033	15.19
1772.5		QPSK	-21.70	12.01	10.05	2.07	H		0.100	19.99
		16-QAM	-22.32	11.39	10.05	2.07	H		0.087	19.37
		64-QAM	-23.38	10.33	10.05	2.07	H		0.068	18.31
		256-QAM	-26.57	7.14	10.05	2.07	H		0.033	15.12

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	-21.04	12.62	9.90	2.05	H	< 1.00	0.111	20.47
		16-QAM	-21.73	11.93	9.90	2.05	H		0.095	19.78
		64-QAM	-22.82	10.84	9.90	2.05	H		0.074	18.69
		256-QAM	-25.83	7.83	9.90	2.05	H		0.037	15.68
1745.0		QPSK	-21.66	12.11	9.98	2.06	H		0.101	20.03
		16-QAM	-22.30	11.47	9.98	2.06	H		0.087	19.39
		64-QAM	-23.36	10.41	9.98	2.06	H		0.068	18.33
		256-QAM	-26.40	7.37	9.98	2.06	H		0.034	15.29
1770.0		QPSK	-22.40	11.31	10.05	2.07	H		0.085	19.29
		16-QAM	-23.00	10.71	10.05	2.07	H		0.074	18.69
		64-QAM	-24.10	9.61	10.05	2.07	H		0.057	17.59
		256-QAM	-27.42	6.29	10.05	2.07	H		0.027	14.27

8.2 RADIATED SPURIOUS EMISSIONS

▣ OPERATING FREQUENCY: 1710.7 MHz

▣ MEASURED OUTPUT POWER: 20.65 dBm = 0.116 W

▣ MODE: LTE B66 / B4

▣ MODULATION SIGNAL: 15 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 log10 (W) = 33.65 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
132047 (1717.5)	3 435.00	-53.87	12.58	-59.68	2.97	H	-50.07	70.71
	5 152.50	-56.54	12.50	-53.97	3.65	V	-45.12	65.76
	6 870.00	-55.65	12.15	-49.03	4.27	V	-41.15	61.80
132322 (1745.0)	3 490.00	-55.15	12.35	-60.75	2.97	V	-51.37	72.01
	5 235.00	-56.55	13.09	-55.59	3.70	H	-46.19	66.84
	6 980.00	-55.56	11.85	-47.39	4.28	V	-39.82	60.47
132597 (1772.5)	3 545.00	-54.18	12.13	-59.37	3.02	H	-50.26	70.91
	5 317.50	-56.07	13.35	-54.87	3.73	H	-45.25	65.89
	7 090.00	-56.32	11.35	-47.48	4.35	H	-40.48	61.12

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	5.43
			16-QAM			6.25
			64-QAM			6.79
			256-QAM			6.77
	3 MHz		QPSK	15		5.37
			16-QAM			6.19
			64-QAM			6.66
			256-QAM			6.78
	5 MHz		QPSK	25		5.35
			16-QAM			6.16
			64-QAM			6.73
			256-QAM			6.80
	10 MHz		QPSK	50		5.44
			16-QAM			6.19
			64-QAM			6.79
			256-QAM			6.84
	15 MHz		QPSK	75		5.41
			16-QAM			6.18
			64-QAM			6.75
			256-QAM			6.82
	20 MHz		QPSK	100		5.43
			16-QAM			6.21
			64-QAM			6.79
			256-QAM			6.85

Note:

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 111 ~ 134.

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	1.0927
			16-QAM			1.0931
			64-QAM			1.0890
			256-QAM			1.0908
	3 MHz		QPSK	15		2.7087
			16-QAM			2.6964
			64-QAM			2.7016
			256-QAM			2.7066
	5 MHz		QPSK	25		4.5138
			16-QAM			4.4991
			64-QAM			4.5005
			256-QAM			4.4916
	10 MHz		QPSK	50		8.9702
			16-QAM			8.9672
			64-QAM			8.9713
			256-QAM			8.9856
	15 MHz		QPSK	75		13.462
			16-QAM			13.463
			64-QAM			13.452
			256-QAM			13.455
	20 MHz		QPSK	100		17.961
			16-QAM			17.940
			64-QAM			17.962
			256-QAM			17.938

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 87~ 110.

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	3.4213	27.976	-75.075	-47.099	-13.00
		1745.0	3.4896	27.976	-76.075	-48.099	
		1779.3	3.5604	27.976	-75.971	-47.995	
	3	1711.5	3.4208	27.976	-74.542	-46.566	
		1745.0	3.4881	27.976	-73.884	-45.908	
		1778.5	3.5604	27.976	-75.817	-47.841	
	5	1712.5	3.4213	27.976	-74.180	-46.204	
		1745.0	3.4861	27.976	-74.814	-46.838	
		1777.5	3.5599	27.976	-74.363	-46.387	
	10	1715.0	3.4218	27.976	-75.125	-47.149	
		1745.0	3.4816	27.976	-75.283	-47.307	
		1775.0	3.5594	27.976	-76.428	-48.452	
	15	1717.5	3.4223	27.976	-74.390	-46.414	
		1745.0	3.4776	27.976	-75.247	-47.271	
		1772.5	3.5589	27.976	-75.755	-47.779	
	20	1720.0	3.4228	27.976	-74.767	-46.791	
		1745.0	3.4726	27.976	-75.762	-47.786	
		1770.0	3.5584	27.976	-75.206	-47.230	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 135 ~ 170.

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 + Ext. 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(26.5)	30.131

8.6 BAND EDGE

- Plots of the EUT's Band Edge are shown Page 51 ~ 86.

8.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

▣ MODE: LTE 66/4

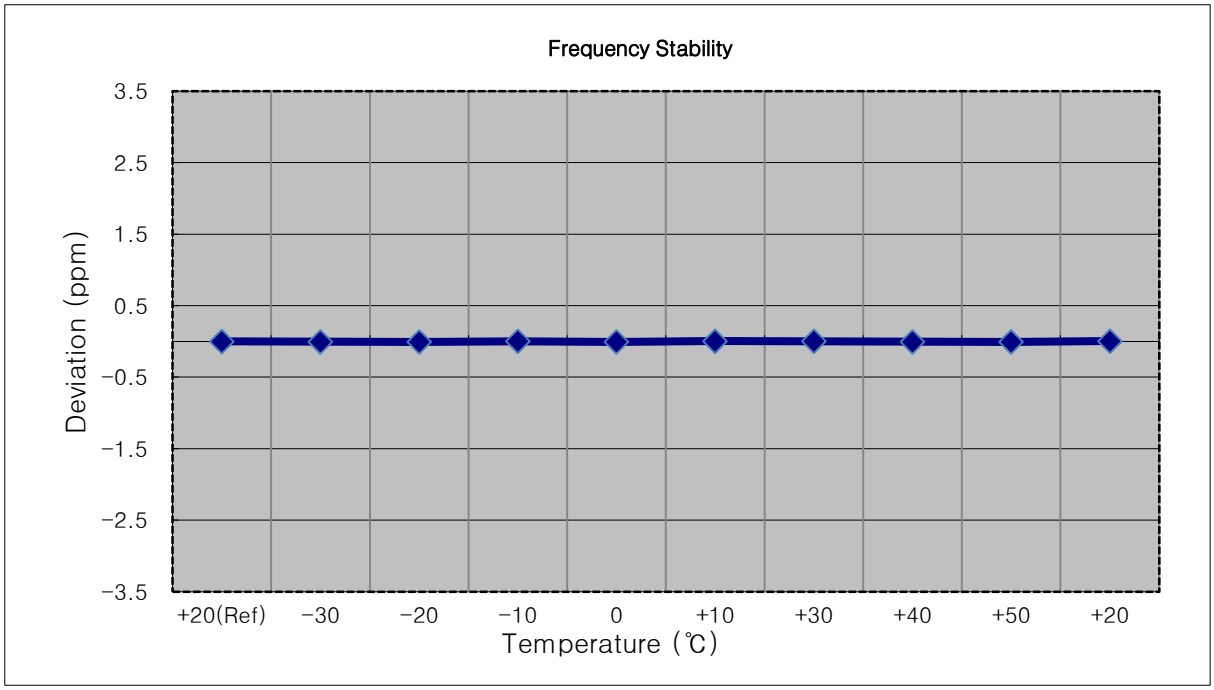
▣ OPERATING FREQUENCY: 1710,700,000 Hz

▣ CHANNEL: 131979 (1.4 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.200	+20(Ref)	1710 699 989	0.0	0.000 000	0.000
100%		-30	1710 699 982	-7.4	0.000 000	-0.004
100%		-20	1710 699 977	-12.8	-0.000 001	-0.007
100%		-10	1710 699 994	5.0	0.000 000	0.003
100%		0	1710 699 979	-10.4	-0.000 001	-0.006
100%		+10	1710 699 997	7.8	0.000 000	0.005
100%		+30	1710 699 993	4.1	0.000 000	0.002
100%		+40	1710 699 982	-7.5	0.000 000	-0.004
100%		+50	1710 699 979	-10.4	-0.000 001	-0.006
Batt. Endpoint	3.650	+20	1710 699 996	6.7	0.000 000	0.004



▣ MODE: LTE 66/4

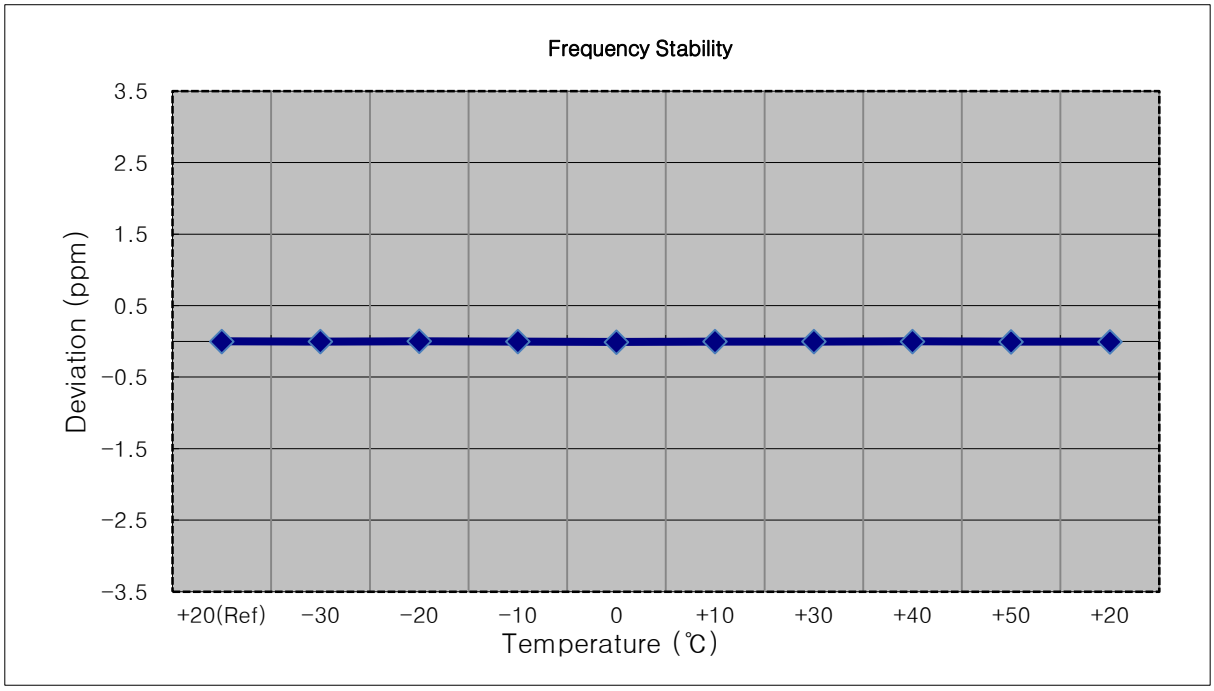
▣ OPERATING FREQUENCY: 1711,500,000 Hz

▣ CHANNEL: 131987 (3 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.200	+20(Ref)	1711 499 981	0.0	0.000 000	0.000
100%		-30	1711 499 976	-4.7	0.000 000	-0.003
100%		-20	1711 499 986	5.0	0.000 000	0.003
100%		-10	1711 499 975	-5.2	0.000 000	-0.003
100%		0	1711 499 965	-15.7	-0.000 001	-0.009
100%		+10	1711 499 977	-3.2	0.000 000	-0.002
100%		+30	1711 499 976	-4.9	0.000 000	-0.003
100%		+40	1711 499 982	1.6	0.000 000	0.001
100%		+50	1711 499 975	-5.9	0.000 000	-0.003
Batt. Endpoint	3.650	+20	1711 499 973	-8.0	0.000 000	-0.005



▣ MODE: LTE 66/4

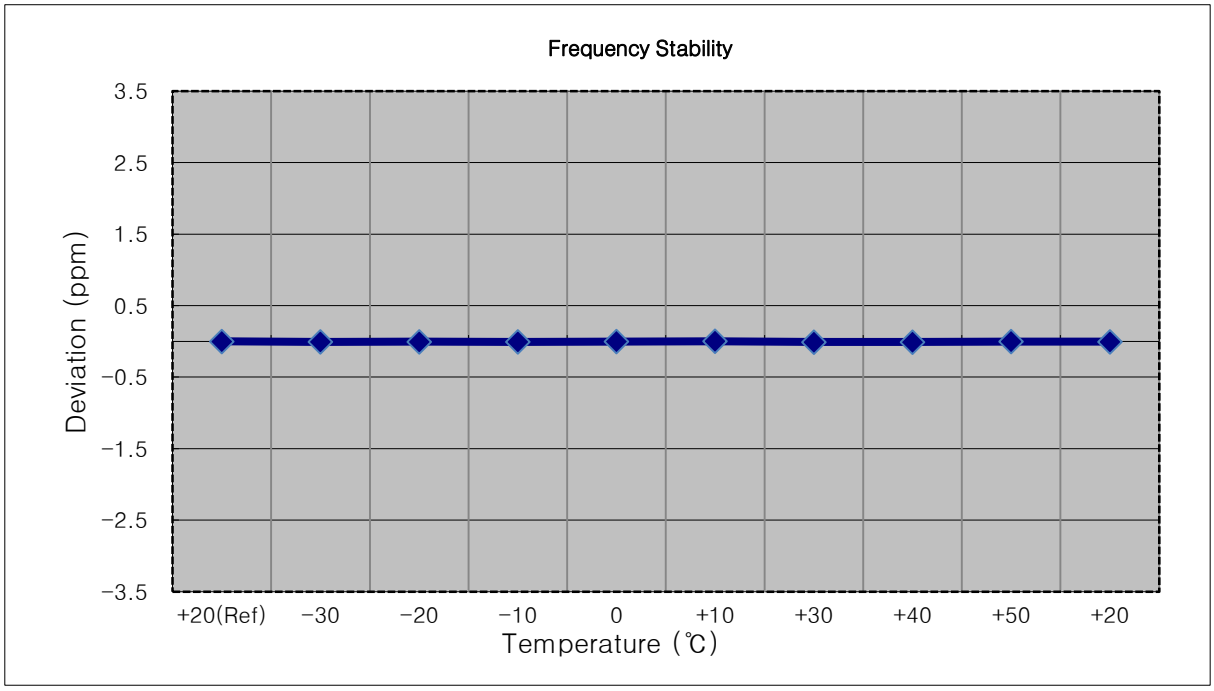
▣ OPERATING FREQUENCY: 1712,500,000 Hz

▣ CHANNEL: 131997 (5 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.200	+20(Ref)	1712 500 007	0.0	0.000 000	0.000
100%		-30	1712 499 995	-12.1	-0.000 001	-0.007
100%		-20	1712 500 001	-5.8	0.000 000	-0.003
100%		-10	1712 499 997	-10.1	-0.000 001	-0.006
100%		0	1712 500 002	-4.6	0.000 000	-0.003
100%		+10	1712 500 011	4.6	0.000 000	0.003
100%		+30	1712 499 992	-15.1	-0.000 001	-0.009
100%		+40	1712 499 992	-14.3	-0.000 001	-0.008
100%		+50	1712 500 004	-3.1	0.000 000	-0.002
Batt. Endpoint	3.650	+20	1712 499 998	-8.8	-0.000 001	-0.005



▣ MODE: LTE 66/4

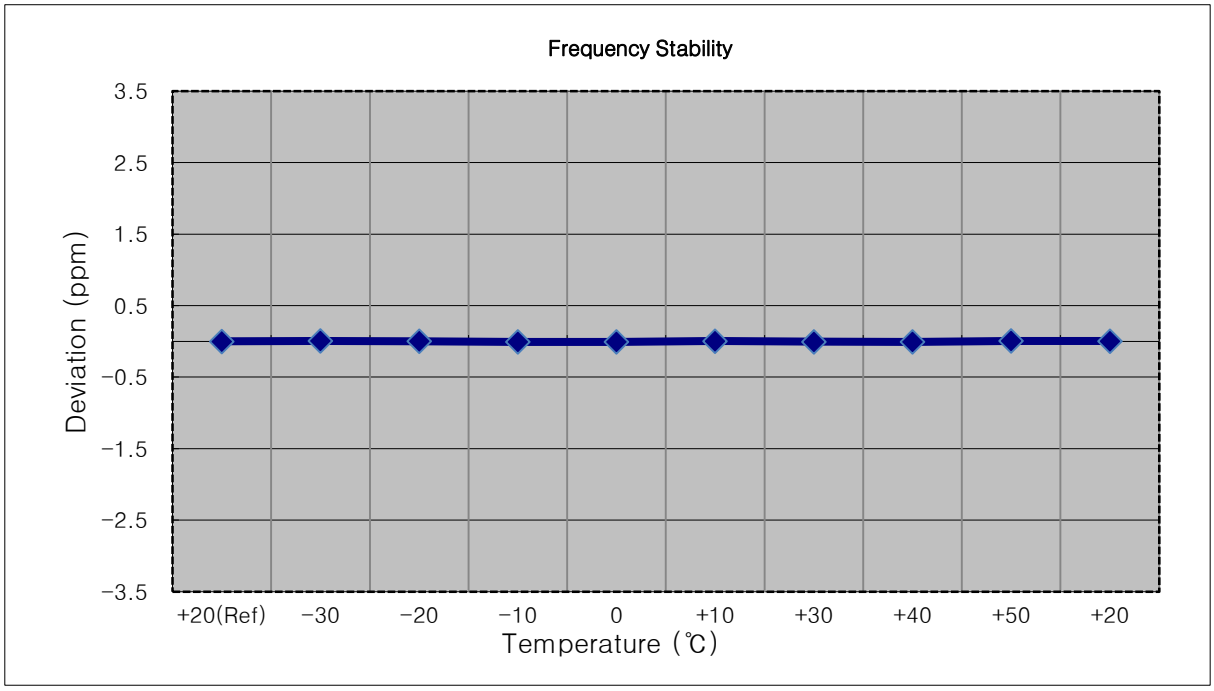
▣ OPERATING FREQUENCY: 1715,000,000 Hz

▣ CHANNEL: 132022 (10 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.200	+20(Ref)	1715 000 010	0.0	0.000 000	0.000
100%		-30	1715 000 020	9.8	0.000 001	0.006
100%		-20	1715 000 015	4.2	0.000 000	0.002
100%		-10	1714 999 998	-12.2	-0.000 001	-0.007
100%		0	1714 999 998	-12.1	-0.000 001	-0.007
100%		+10	1715 000 018	7.6	0.000 000	0.004
100%		+30	1715 000 001	-9.1	-0.000 001	-0.005
100%		+40	1714 999 999	-11.8	-0.000 001	-0.007
100%		+50	1715 000 021	10.6	0.000 001	0.006
Batt. Endpoint	3.650	+20	1715 000 020	9.3	0.000 001	0.005



▣ MODE: LTE 66/4

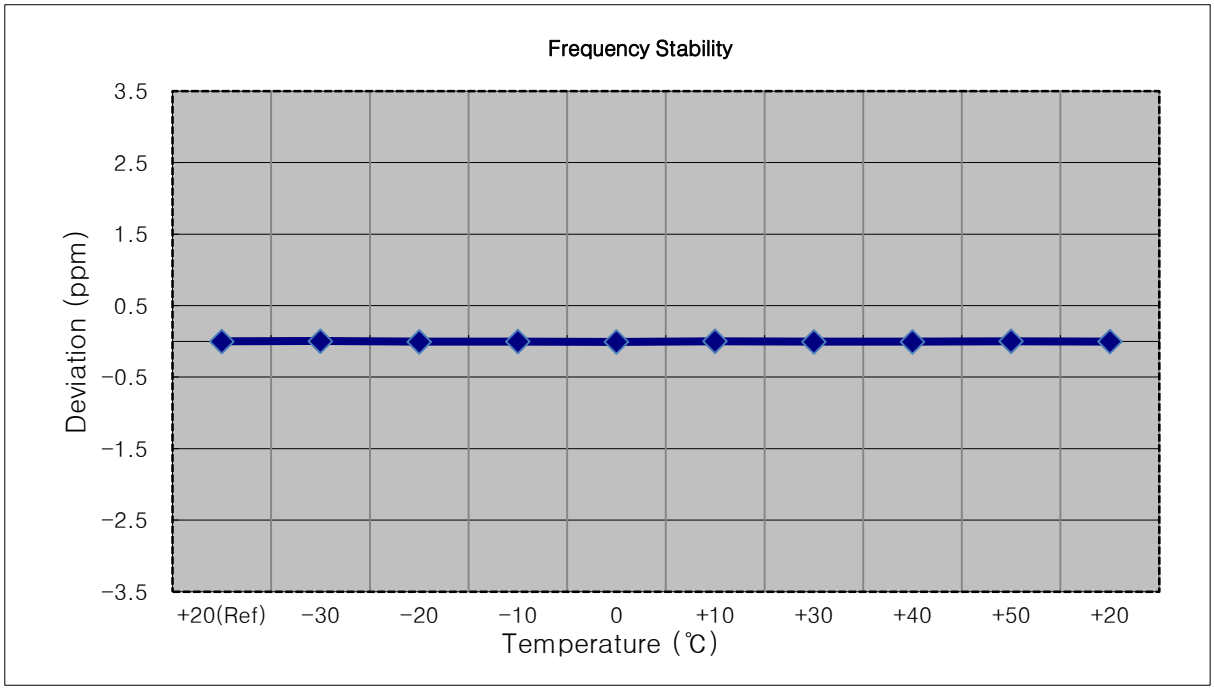
▣ OPERATING FREQUENCY: 1717,500,000 Hz

▣ CHANNEL: 132047 (15 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.200	+20(Ref)	1717 500 005	0.0	0.000 000	0.000
100%		-30	1717 500 012	7.6	0.000 000	0.004
100%		-20	1717 499 999	-6.3	0.000 000	-0.004
100%		-10	1717 500 000	-4.5	0.000 000	-0.003
100%		0	1717 499 991	-13.4	-0.000 001	-0.008
100%		+10	1717 500 010	5.0	0.000 000	0.003
100%		+30	1717 499 997	-7.5	0.000 000	-0.004
100%		+40	1717 499 996	-8.7	-0.000 001	-0.005
100%		+50	1717 500 009	4.3	0.000 000	0.003
Batt. Endpoint	3.650	+20	1717 500 002	-3.2	0.000 000	-0.002



▣ MODE: LTE 66/4

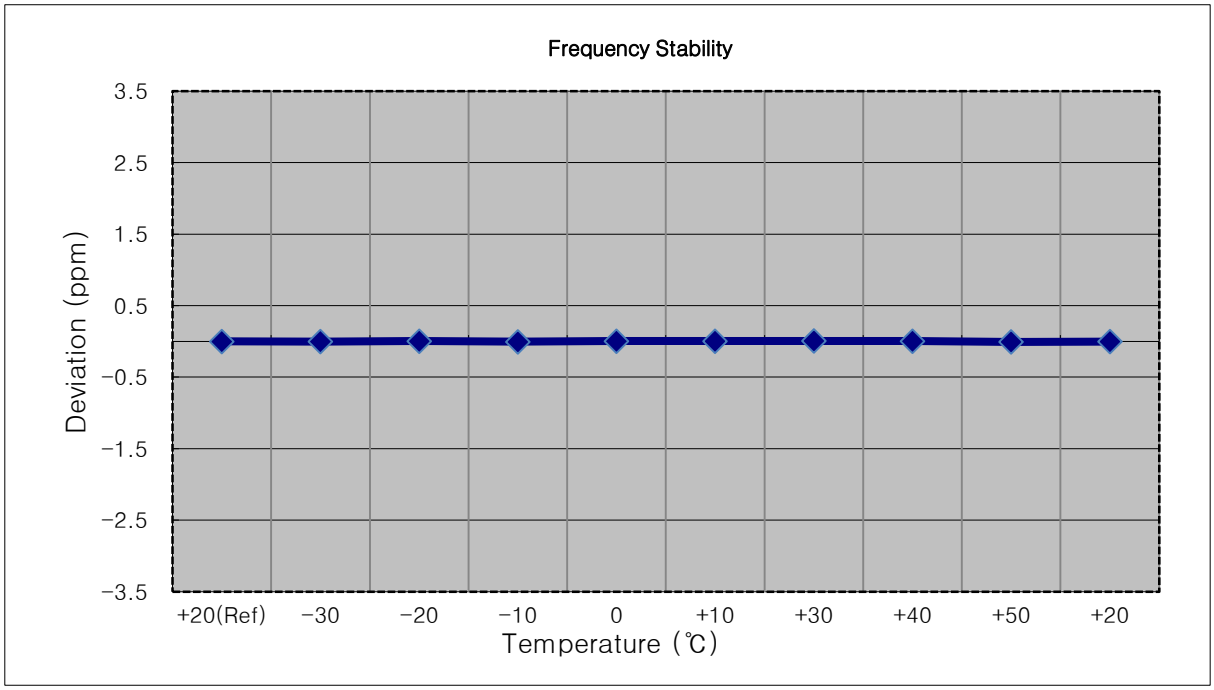
▣ OPERATING FREQUENCY: 1720,000,000 Hz

▣ CHANNEL: 132072 (20 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.200	+20(Ref)	1719 999 994	0.0	0.000 000	0.000
100%		-30	1719 999 990	-3.8	0.000 000	-0.002
100%		-20	1720 000 002	7.9	0.000 000	0.005
100%		-10	1719 999 985	-9.0	-0.000 001	-0.005
100%		0	1720 000 000	6.0	0.000 000	0.003
100%		+10	1720 000 001	7.5	0.000 000	0.004
100%		+30	1720 000 004	10.1	0.000 001	0.006
100%		+40	1720 000 003	9.3	0.000 001	0.005
100%		+50	1719 999 983	-11.2	-0.000 001	-0.007
Batt. Endpoint	3.650	+20	1719 999 989	-4.4	0.000 000	-0.003



▣ MODE: LTE 66/4

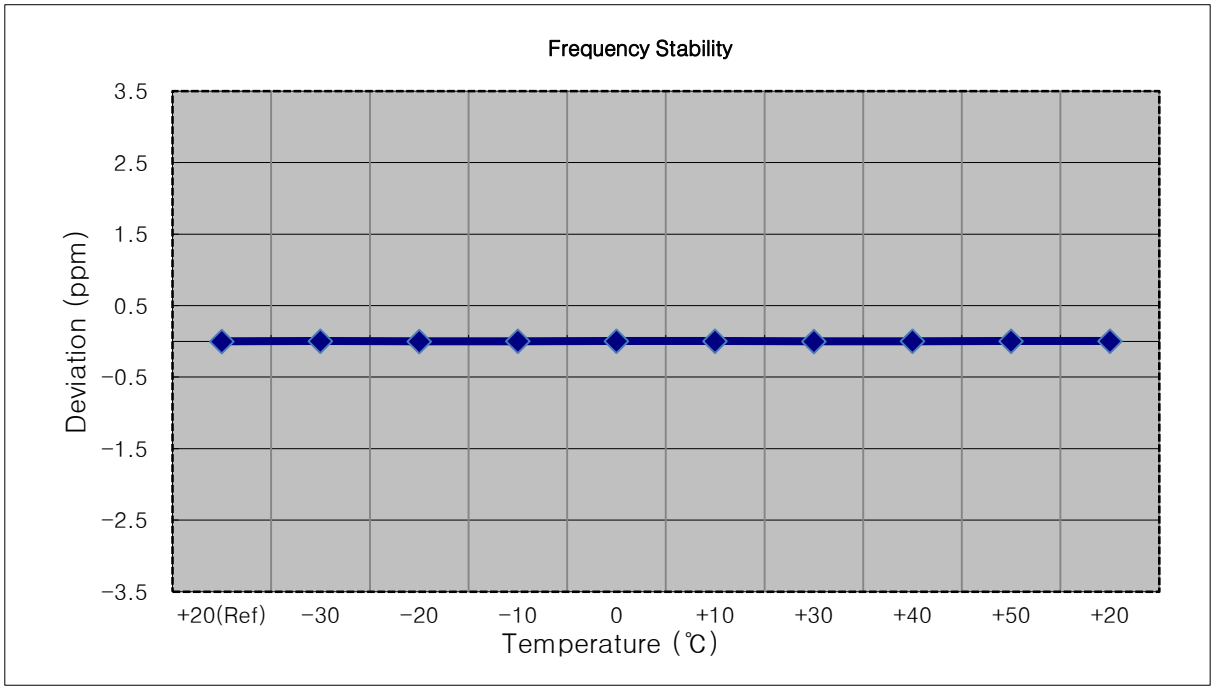
▣ OPERATING FREQUENCY: 1745,000,000 Hz

▣ CHANNEL: 132322 (1.4 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.200	+20(Ref)	1745 000 003	0.0	0.000 000	0.000
100%		-30	1745 000 009	6.2	0.000 000	0.004
100%		-20	1745 000 001	-2.0	0.000 000	-0.001
100%		-10	1745 000 006	3.4	0.000 000	0.002
100%		0	1745 000 010	7.4	0.000 000	0.004
100%		+10	1745 000 009	6.4	0.000 000	0.004
100%		+30	1745 000 002	-1.1	0.000 000	-0.001
100%		+40	1745 000 006	2.8	0.000 000	0.002
100%		+50	1745 000 011	7.9	0.000 000	0.005
Batt. Endpoint	3.650	+20	1745 000 009	6.4	0.000 000	0.004



▣ MODE: LTE 66/4

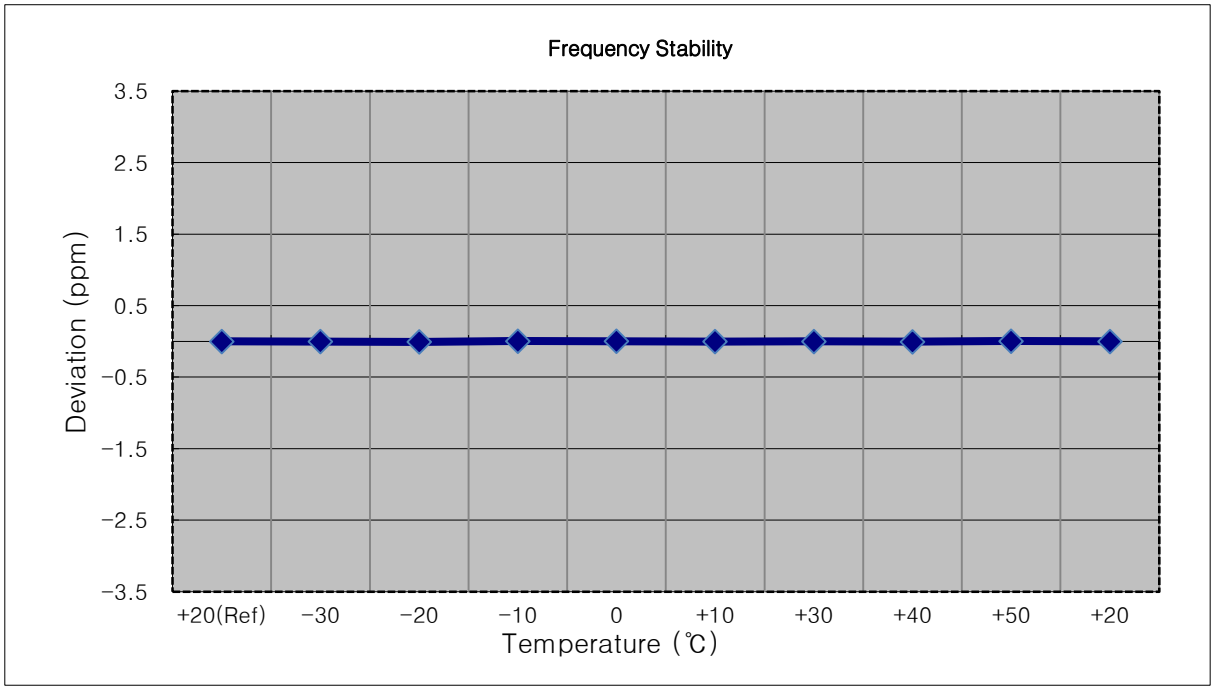
▣ OPERATING FREQUENCY: 1745,000,000 Hz

▣ CHANNEL: 132322 (3 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.200	+20(Ref)	1745 000 007	0.0	0.000 000	0.000
100%		-30	1745 000 002	-4.7	0.000 000	-0.003
100%		-20	1744 999 997	-9.9	-0.000 001	-0.006
100%		-10	1745 000 013	6.7	0.000 000	0.004
100%		0	1745 000 013	5.8	0.000 000	0.003
100%		+10	1745 000 002	-4.3	0.000 000	-0.002
100%		+30	1745 000 005	-2.0	0.000 000	-0.001
100%		+40	1745 000 000	-6.8	0.000 000	-0.004
100%		+50	1745 000 015	8.5	0.000 000	0.005
Batt. Endpoint	3.650	+20	1745 000 009	1.8	0.000 000	0.001



▣ MODE: LTE 66/4

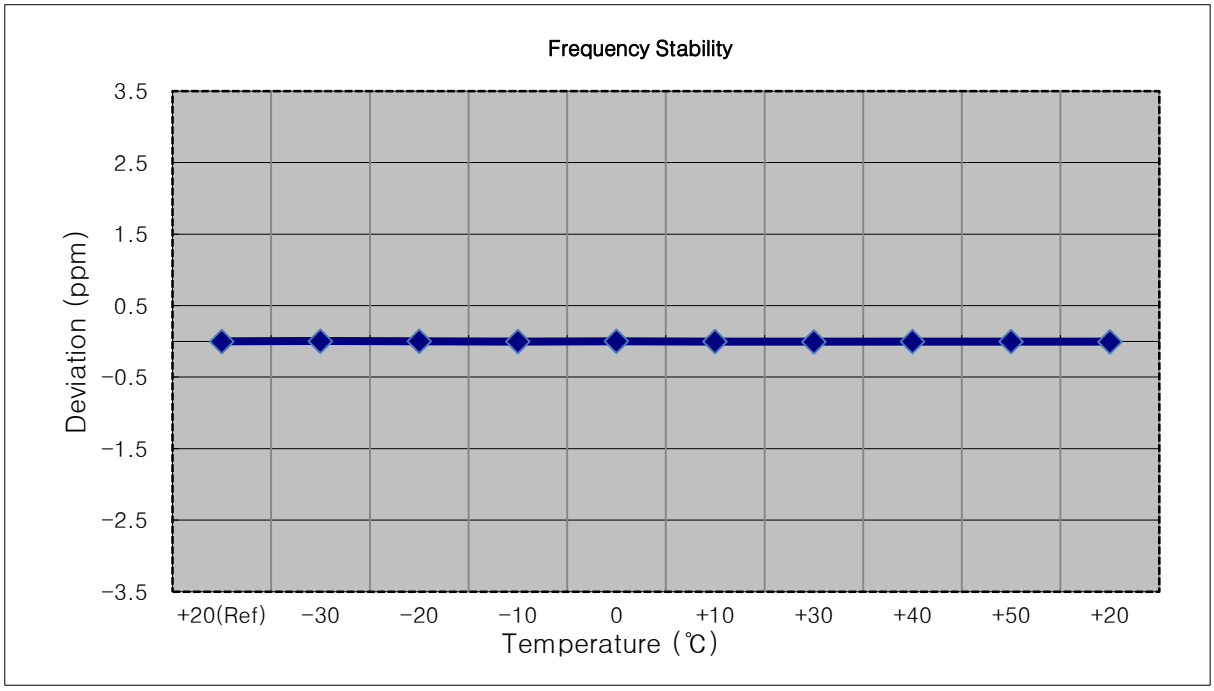
▣ OPERATING FREQUENCY: 1745,000,000 Hz

▣ CHANNEL: 132322 (5 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.200	+20(Ref)	1745 000 005	0.0	0.000 000	0.000
100%		-30	1745 000 015	9.2	0.000 001	0.005
100%		-20	1745 000 009	3.1	0.000 000	0.002
100%		-10	1745 000 001	-4.3	0.000 000	-0.002
100%		0	1745 000 010	4.2	0.000 000	0.002
100%		+10	1745 000 003	-2.1	0.000 000	-0.001
100%		+30	1744 999 996	-9.4	-0.000 001	-0.005
100%		+40	1745 000 000	-5.5	0.000 000	-0.003
100%		+50	1745 000 000	-5.3	0.000 000	-0.003
Batt. Endpoint	3.650	+20	1744 999 999	-6.2	0.000 000	-0.004



▣ MODE: LTE 66/4

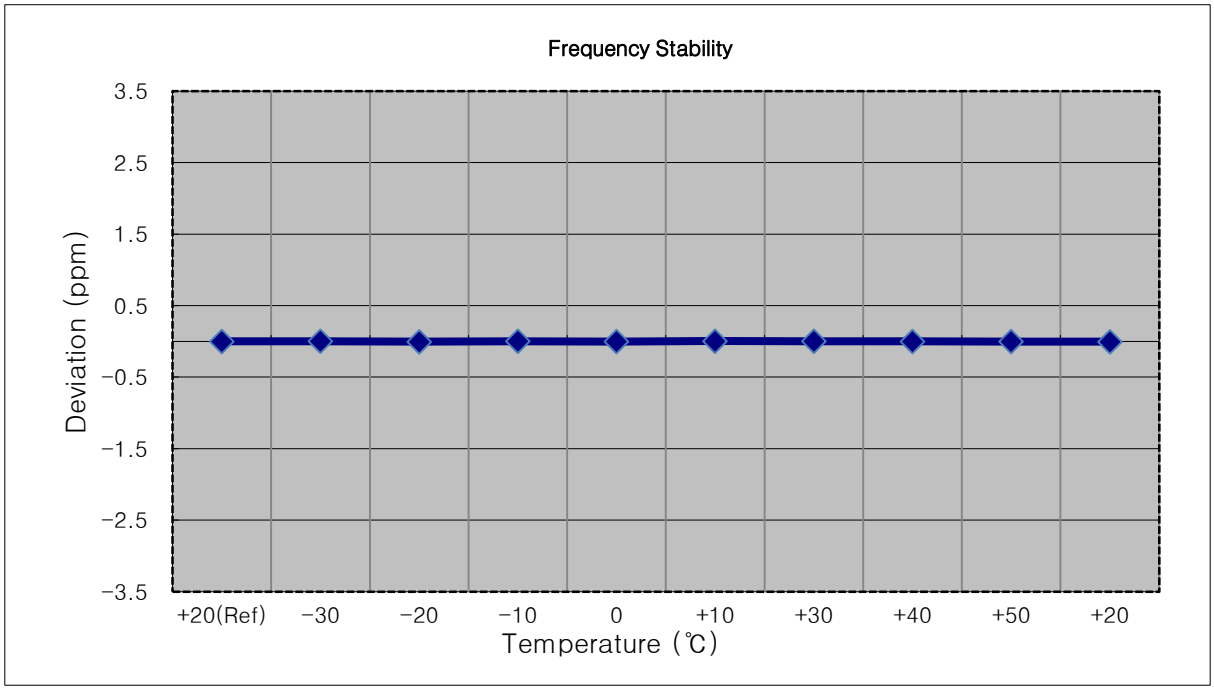
▣ OPERATING FREQUENCY: 1745,000,000 Hz

▣ CHANNEL: 132322 (10 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.200	+20(Ref)	1745 000 004	0.0	0.000 000	0.000
100%		-30	1745 000 007	3.6	0.000 000	0.002
100%		-20	1744 999 996	-8.2	0.000 000	-0.005
100%		-10	1745 000 007	3.0	0.000 000	0.002
100%		0	1745 000 000	-4.0	0.000 000	-0.002
100%		+10	1745 000 011	7.1	0.000 000	0.004
100%		+30	1745 000 009	5.1	0.000 000	0.003
100%		+40	1745 000 006	1.9	0.000 000	0.001
100%		+50	1745 000 000	-3.5	0.000 000	-0.002
Batt. Endpoint	3.650	+20	1744 999 997	-7.3	0.000 000	-0.004



▣ MODE: LTE 66/4

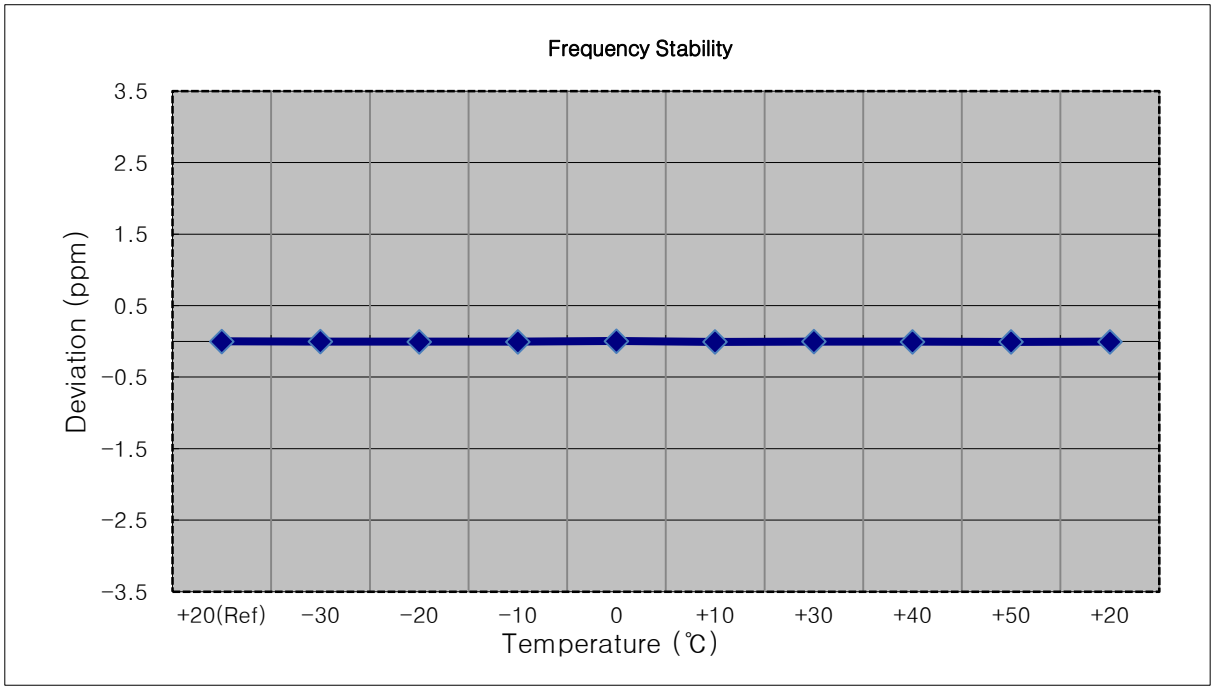
▣ OPERATING FREQUENCY: 1745,000,000 Hz

▣ CHANNEL: 132322 (15 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.200	+20(Ref)	1745 000 004	0.0	0.000 000	0.000
100%		-30	1745 000 001	-3.0	0.000 000	-0.002
100%		-20	1744 999 995	-8.6	0.000 000	-0.005
100%		-10	1744 999 995	-9.0	-0.000 001	-0.005
100%		0	1745 000 012	7.5	0.000 000	0.004
100%		+10	1744 999 993	-10.9	-0.000 001	-0.006
100%		+30	1745 000 001	-2.7	0.000 000	-0.002
100%		+40	1744 999 995	-8.7	0.000 000	-0.005
100%		+50	1744 999 993	-11.1	-0.000 001	-0.006
Batt. Endpoint	3.650	+20	1744 999 995	-8.9	-0.000 001	-0.005



▣ MODE: LTE 66/4

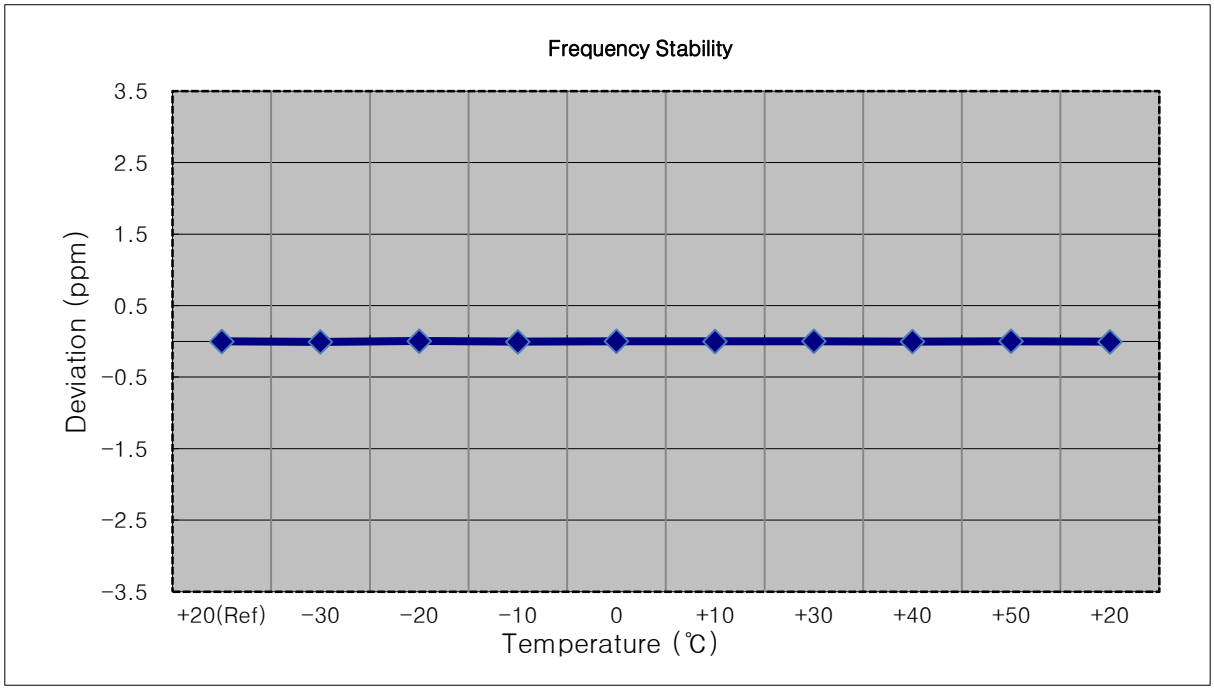
▣ OPERATING FREQUENCY: 1745,000,000 Hz

▣ CHANNEL: 132322 (20 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.200	+20(Ref)	1744 999 994	0.0	0.000 000	0.000
100%		-30	1744 999 984	-10.1	-0.000 001	-0.006
100%		-20	1745 000 000	6.3	0.000 000	0.004
100%		-10	1744 999 985	-9.4	-0.000 001	-0.005
100%		0	1745 000 000	5.8	0.000 000	0.003
100%		+10	1744 999 992	-1.8	0.000 000	-0.001
100%		+30	1744 999 999	4.5	0.000 000	0.003
100%		+40	1744 999 989	-4.8	0.000 000	-0.003
100%		+50	1745 000 000	5.7	0.000 000	0.003
Batt. Endpoint	3.650	+20	1744 999 986	-7.8	0.000 000	-0.004



▣ MODE: LTE 66/4

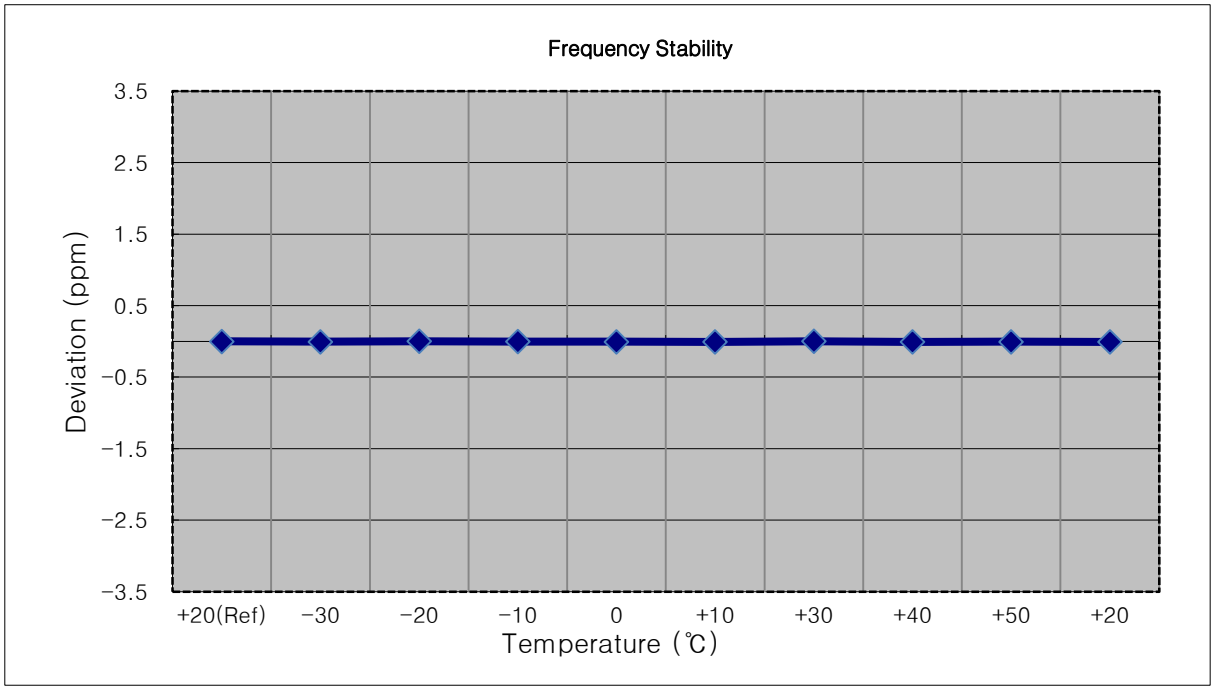
▣ OPERATING FREQUENCY: 1779,300,000 Hz

▣ CHANNEL: 132665 (1.4 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.200	+20(Ref)	1779 300 008	0.0	0.000 000	0.000
100%		-30	1779 300 002	-6.4	0.000 000	-0.004
100%		-20	1779 300 014	5.4	0.000 000	0.003
100%		-10	1779 300 003	-5.0	0.000 000	-0.003
100%		0	1779 300 002	-6.7	0.000 000	-0.004
100%		+10	1779 299 998	-10.2	-0.000 001	-0.006
100%		+30	1779 300 014	5.3	0.000 000	0.003
100%		+40	1779 299 996	-11.9	-0.000 001	-0.007
100%		+50	1779 300 000	-8.3	0.000 000	-0.005
Batt. Endpoint	3.650	+20	1779 299 995	-13.3	-0.000 001	-0.007



▣ MODE: LTE 66/4

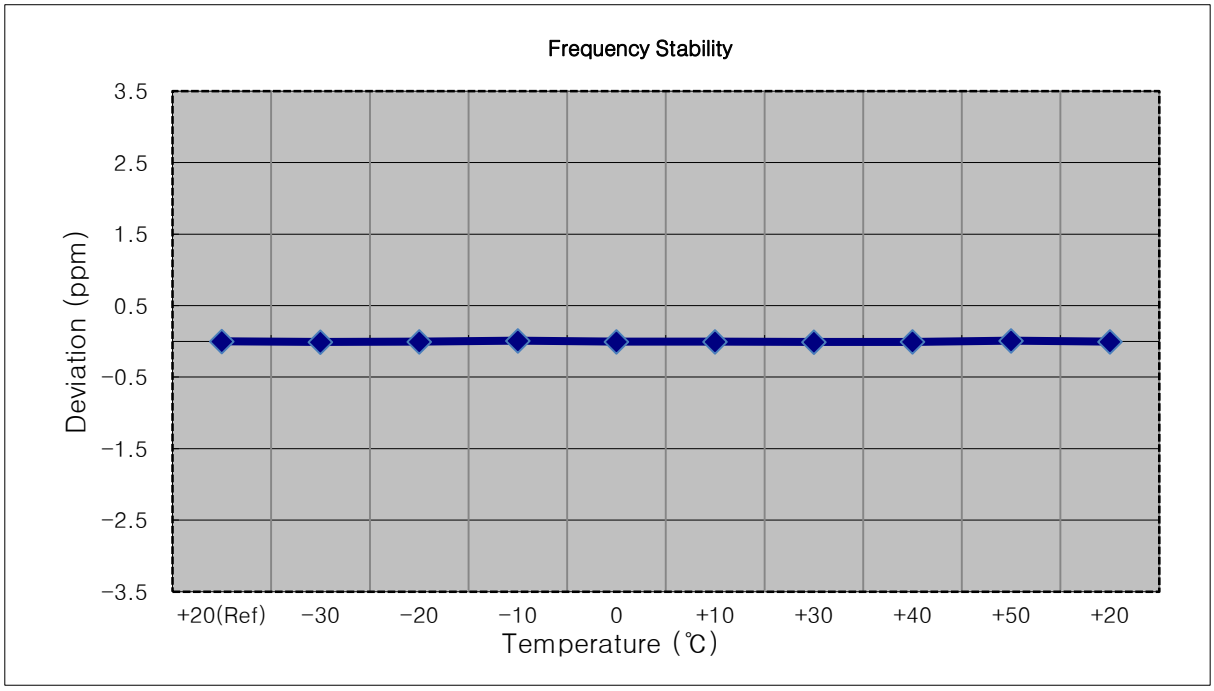
▣ OPERATING FREQUENCY: 1778,500,000 Hz

▣ CHANNEL: 132657 (3 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.200	+20(Ref)	1778 499 989	0.0	0.000 000	0.000
100%		-30	1778 499 972	-17.4	-0.000 001	-0.010
100%		-20	1778 499 981	-8.4	0.000 000	-0.005
100%		-10	1778 500 007	17.6	0.000 001	0.010
100%		0	1778 499 980	-9.2	-0.000 001	-0.005
100%		+10	1778 499 979	-9.9	-0.000 001	-0.006
100%		+30	1778 499 974	-15.0	-0.000 001	-0.008
100%		+40	1778 499 976	-13.4	-0.000 001	-0.008
100%		+50	1778 500 005	16.3	0.000 001	0.009
Batt. Endpoint	3.650	+20	1778 499 980	-8.6	0.000 000	-0.005



▣ MODE: LTE 66/4

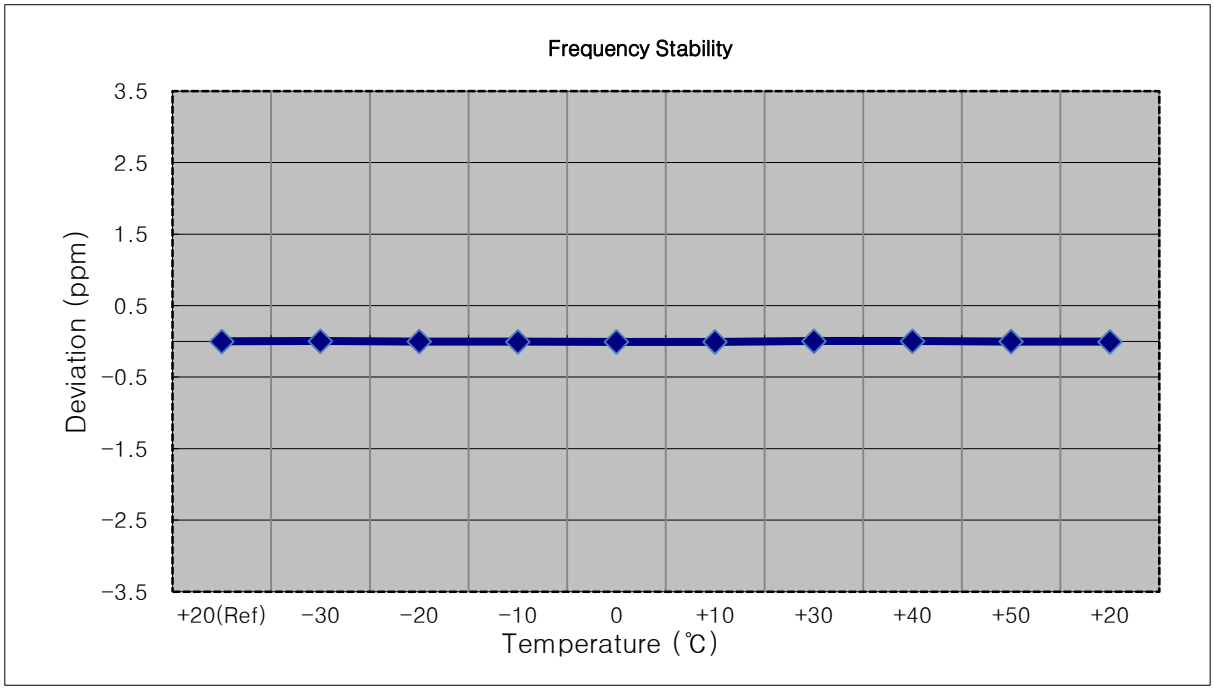
▣ OPERATING FREQUENCY: 1777,500,000 Hz

▣ CHANNEL: 132647 (5 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.200	+20(Ref)	1777 499 998	0.0	0.000 000	0.000
100%		-30	1777 500 005	6.9	0.000 000	0.004
100%		-20	1777 499 993	-5.2	0.000 000	-0.003
100%		-10	1777 499 990	-8.7	0.000 000	-0.005
100%		0	1777 499 988	-10.2	-0.000 001	-0.006
100%		+10	1777 499 987	-10.8	-0.000 001	-0.006
100%		+30	1777 500 005	7.1	0.000 000	0.004
100%		+40	1777 500 005	6.4	0.000 000	0.004
100%		+50	1777 499 994	-4.2	0.000 000	-0.002
Batt. Endpoint	3.650	+20	1777 499 988	-9.9	-0.000 001	-0.006



▣ MODE: LTE 66/4

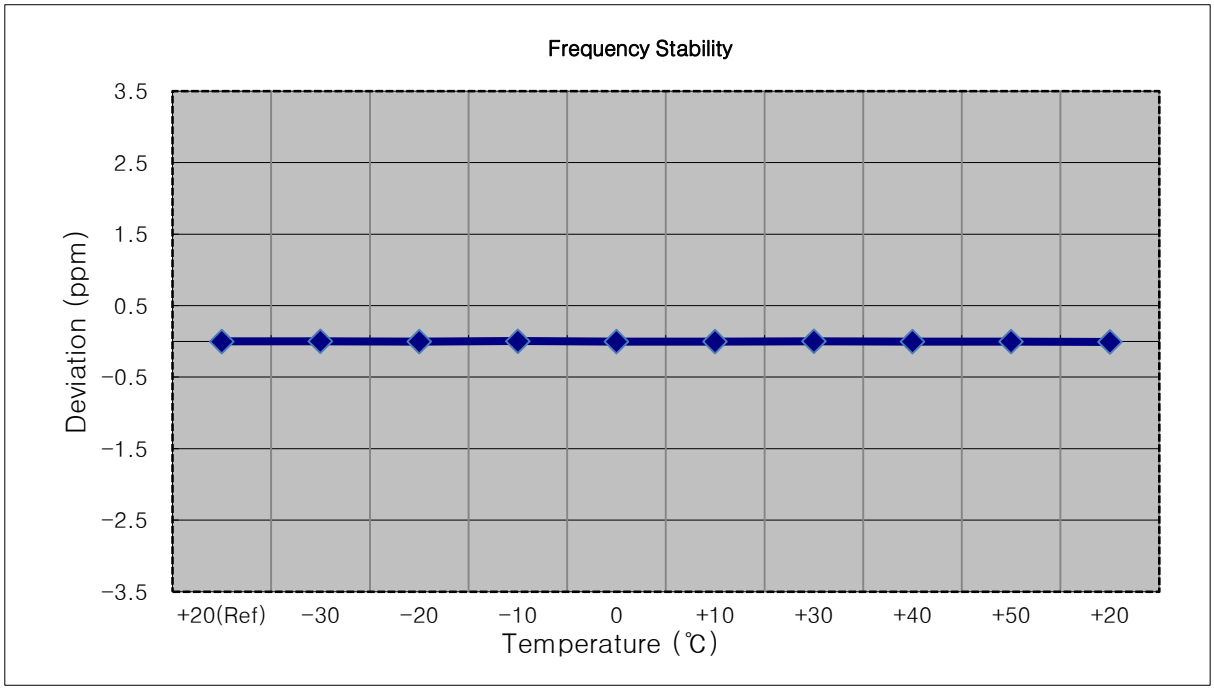
▣ OPERATING FREQUENCY: 1775,000,000 Hz

▣ CHANNEL: 132622 (10 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.200	+20(Ref)	1774 999 992	0.0	0.000 000	0.000
100%		-30	1774 999 996	3.4	0.000 000	0.002
100%		-20	1774 999 987	-5.1	0.000 000	-0.003
100%		-10	1775 000 001	9.1	0.000 001	0.005
100%		0	1774 999 989	-3.4	0.000 000	-0.002
100%		+10	1774 999 987	-5.1	0.000 000	-0.003
100%		+30	1774 999 997	4.3	0.000 000	0.002
100%		+40	1774 999 990	-2.1	0.000 000	-0.001
100%		+50	1774 999 988	-4.3	0.000 000	-0.002
Batt. Endpoint	3.650	+20	1774 999 981	-11.0	-0.000 001	-0.006



▣ MODE: LTE 66/4

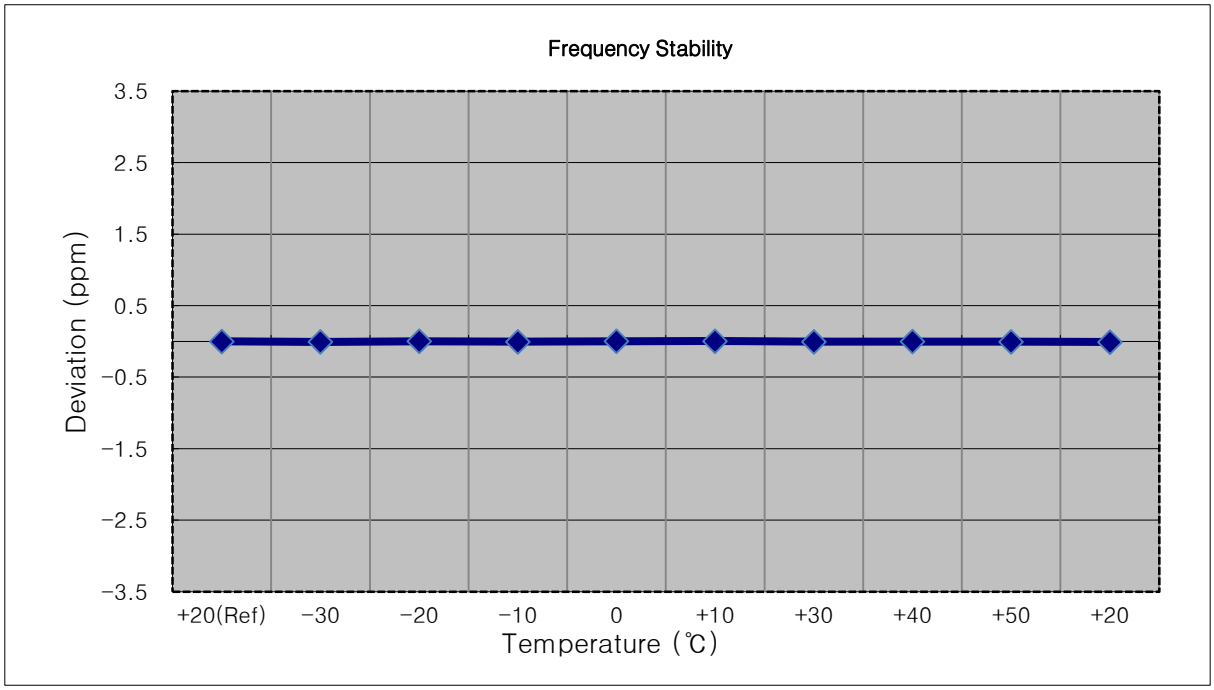
▣ OPERATING FREQUENCY: 1772,500,000 Hz

▣ CHANNEL: 132597 (15 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.200	+20(Ref)	1772 499 987	0.0	0.000 000	0.000
100%		-30	1772 499 975	-11.9	-0.000 001	-0.007
100%		-20	1772 499 992	5.2	0.000 000	0.003
100%		-10	1772 499 977	-9.7	-0.000 001	-0.005
100%		0	1772 499 990	2.9	0.000 000	0.002
100%		+10	1772 499 993	5.9	0.000 000	0.003
100%		+30	1772 499 979	-8.0	0.000 000	-0.005
100%		+40	1772 499 981	-5.8	0.000 000	-0.003
100%		+50	1772 499 980	-6.9	0.000 000	-0.004
Batt. Endpoint	3.650	+20	1772 499 970	-17.3	-0.000 001	-0.010



▣ MODE: LTE 66/4

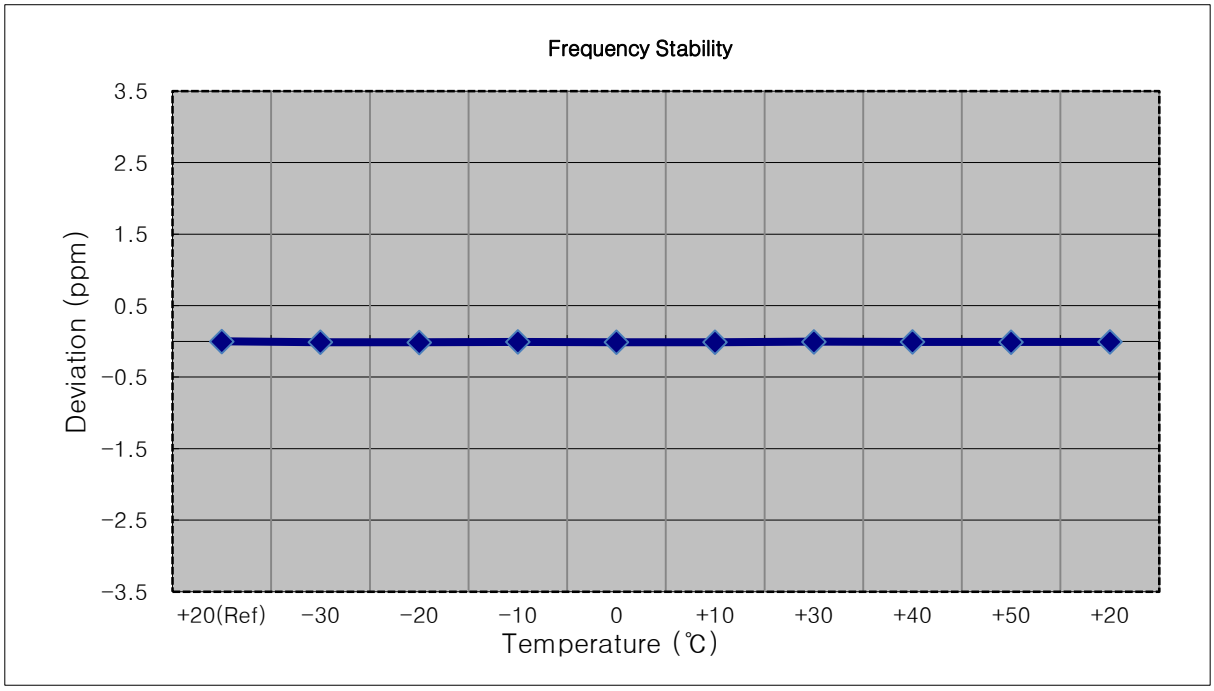
▣ OPERATING FREQUENCY: 1770,000,000 Hz

▣ CHANNEL: 132572 (20 MHz)

▣ REFERENCE VOLTAGE: 4.200 VDC

▣ DEVIATION LIMIT: Emission must remain in band

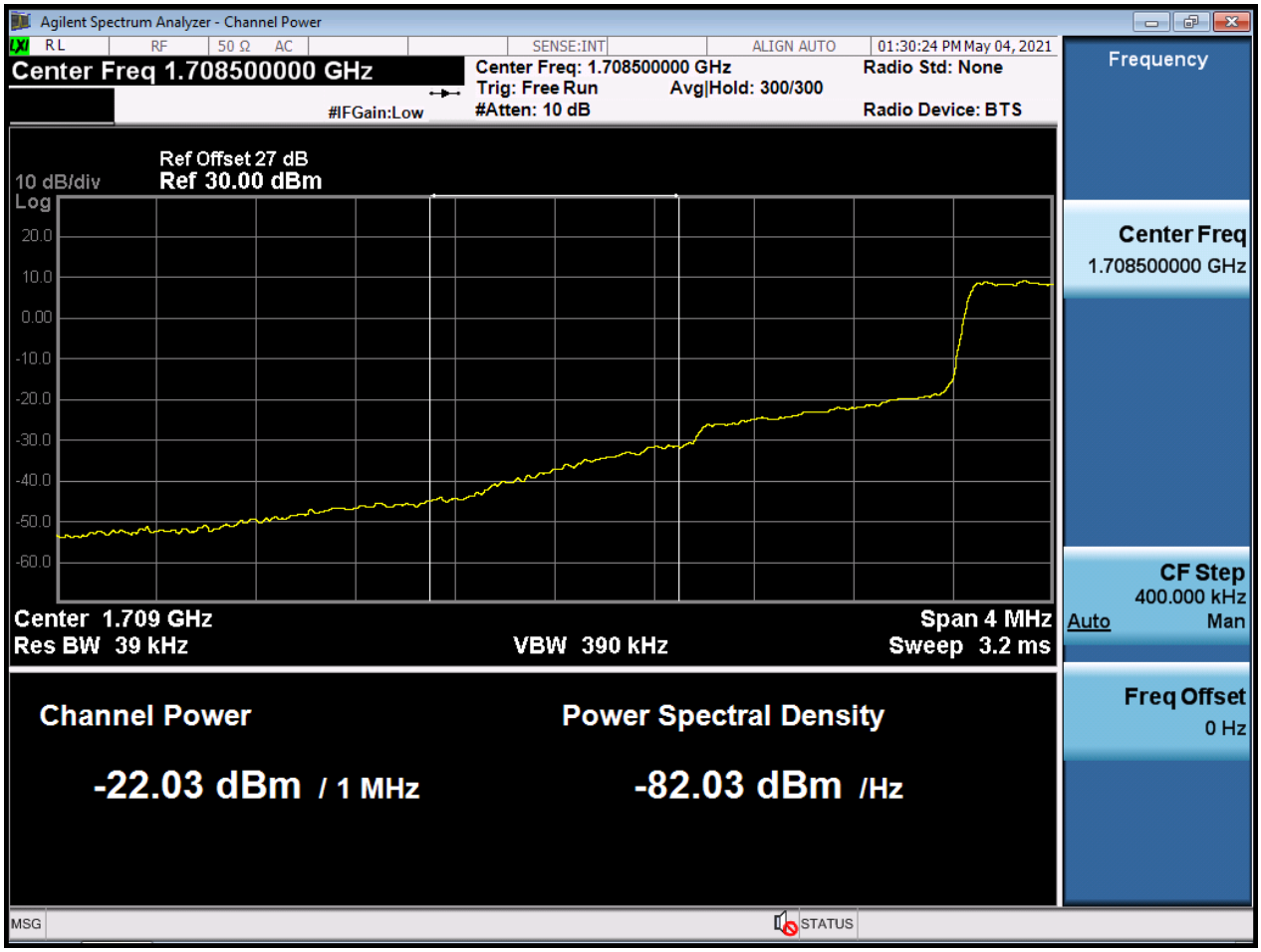
Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.200	+20(Ref)	1769 999 993	0.0	0.000 000	0.000
100%		-30	1769 999 972	-21.7	-0.000 001	-0.012
100%		-20	1769 999 970	-22.9	-0.000 001	-0.013
100%		-10	1769 999 983	-10.6	-0.000 001	-0.006
100%		0	1769 999 975	-18.7	-0.000 001	-0.011
100%		+10	1769 999 972	-21.4	-0.000 001	-0.012
100%		+30	1769 999 987	-6.4	0.000 000	-0.004
100%		+40	1769 999 983	-10.3	-0.000 001	-0.006
100%		+50	1769 999 979	-14.6	-0.000 001	-0.008
Batt. Endpoint	3.650	+20	1769 999 980	-12.9	-0.000 001	-0.007



9. TEST PLOTS

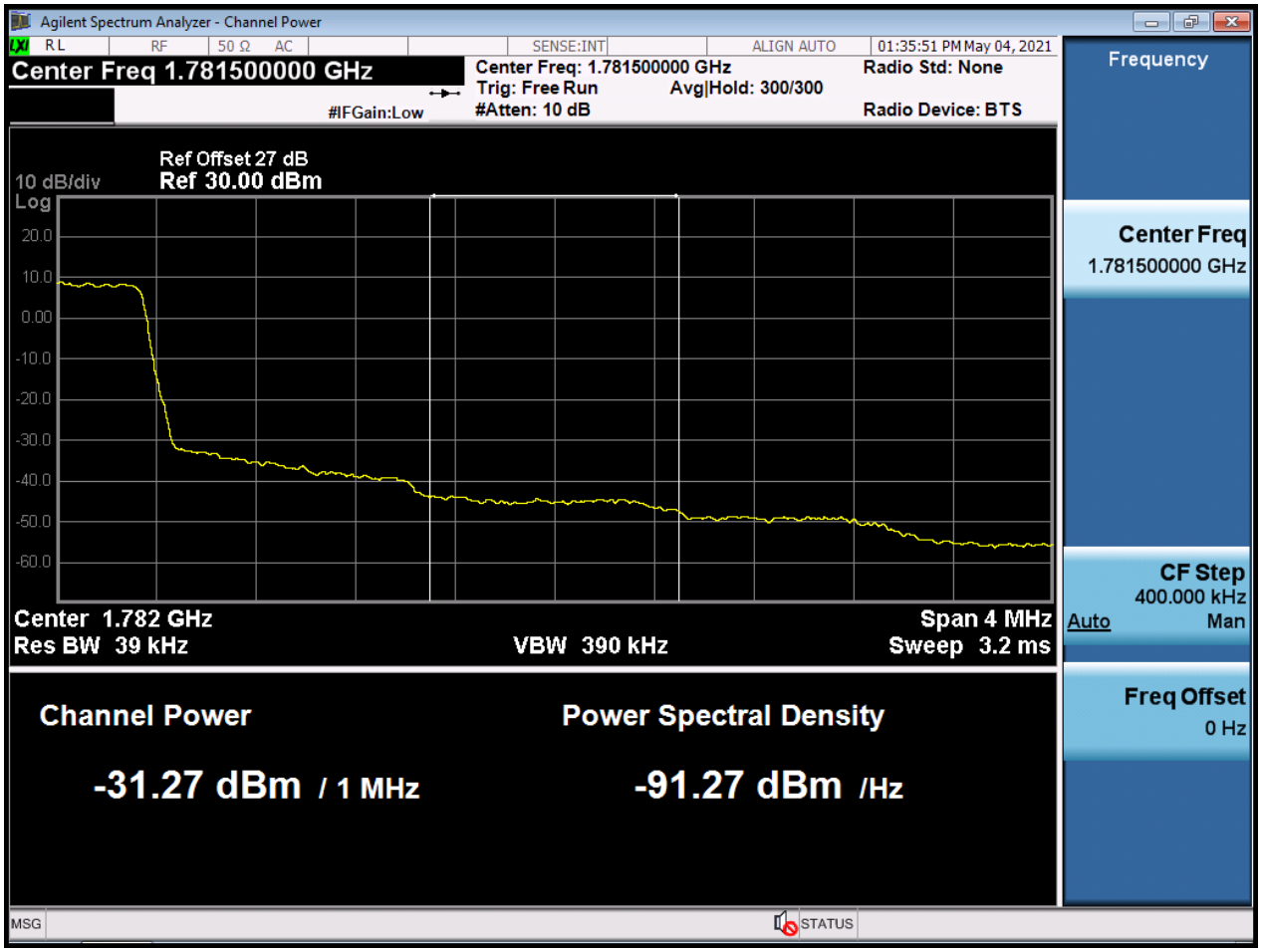
BW1.4M_BandEdge_Lowest Channel_QPSK_FullRB(1)

BW1.4M_BandEdge_Lowest Channel_QPSK_FullRB(2)

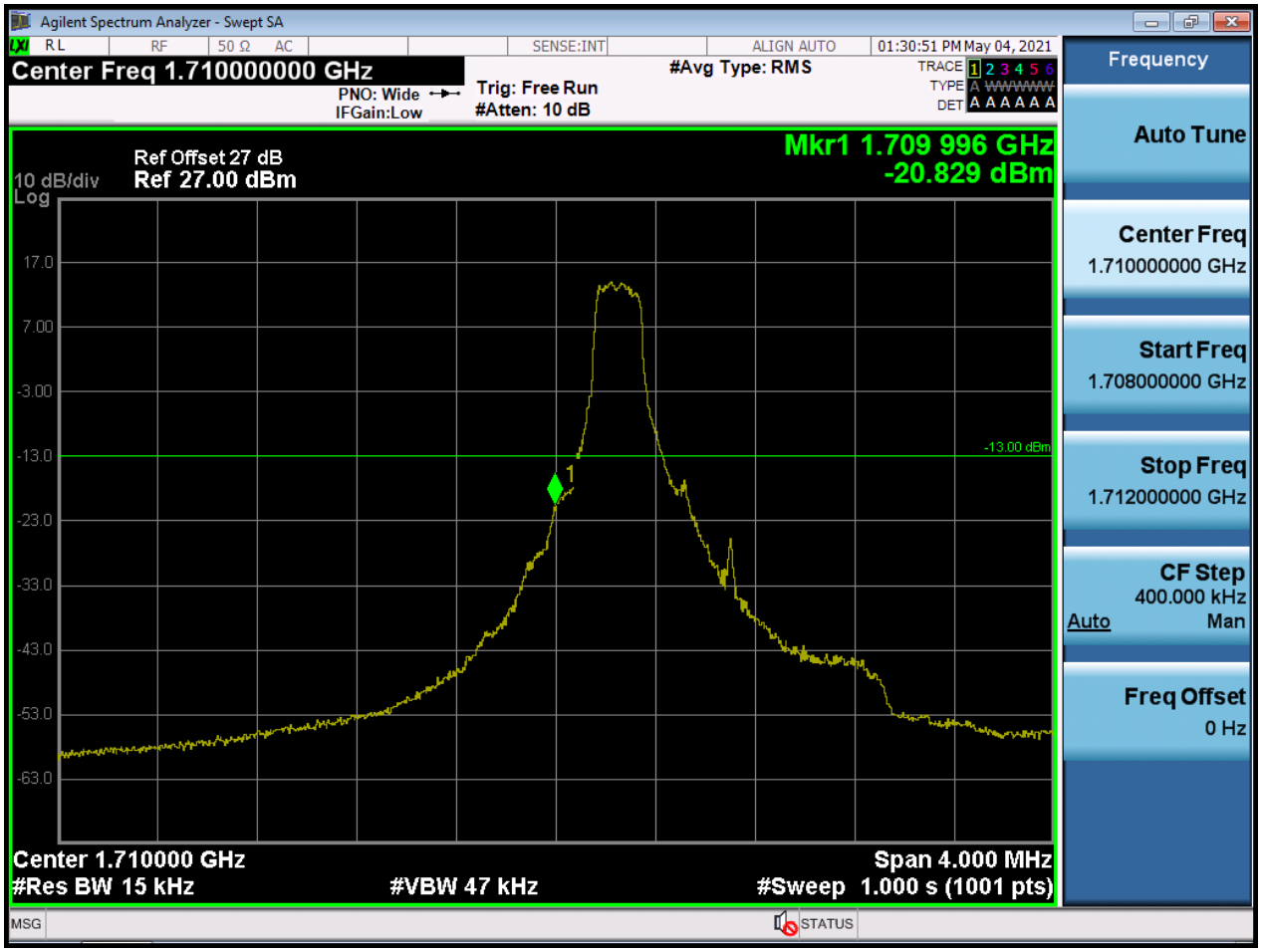


BW1.4M_BandEdge_Highest Channel_QPSK_FullRB(1)

BW1.4M_BandEdge_Highest Channel_QPSK_FullRB(2)



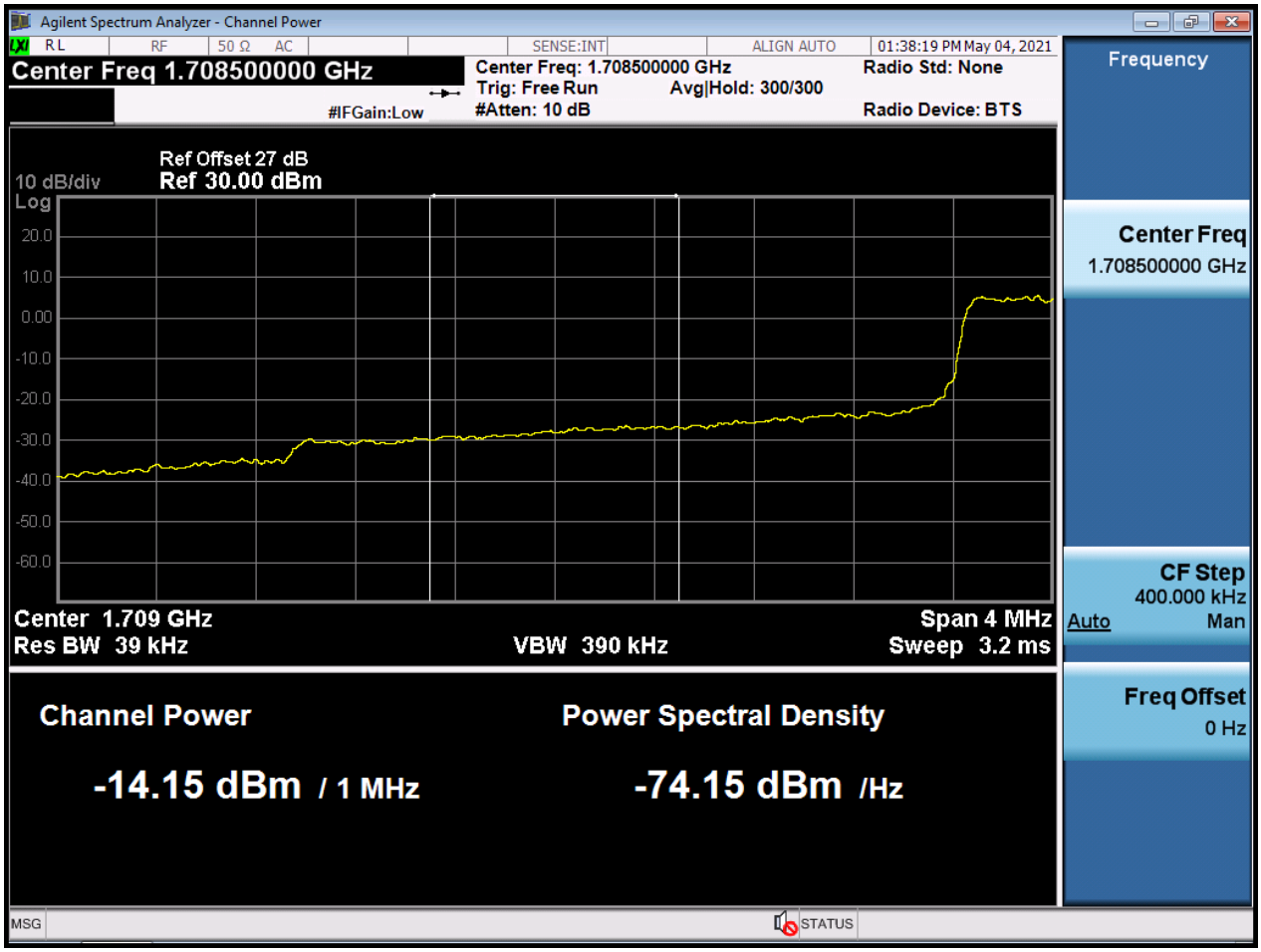
BW1.4M_BandEdge_Lowest Channel_QPSK_1RB



BW1.4M_BandEdge_Highest Channel_QPSK_1RB

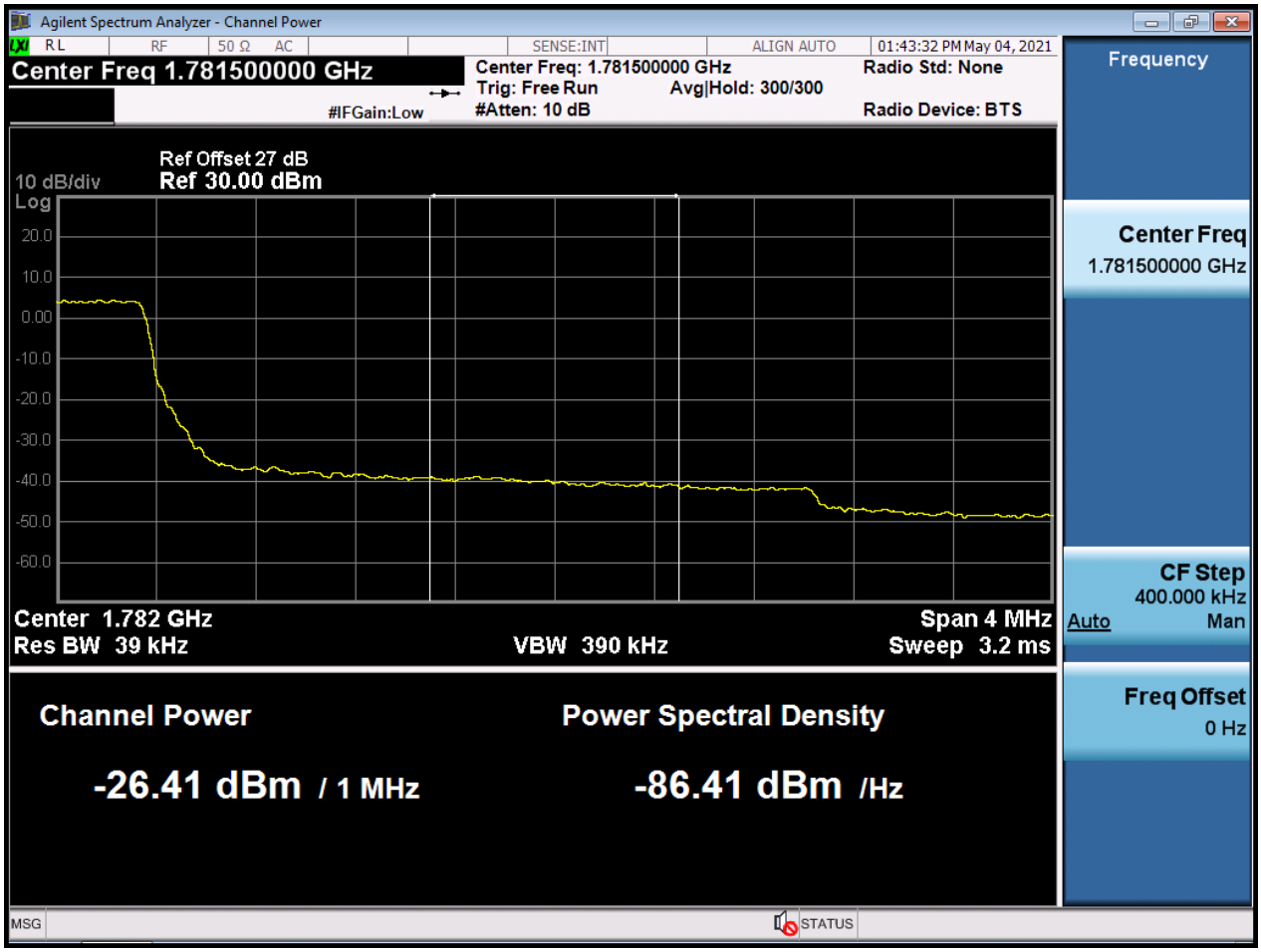
BW3M_BandEdge_Lowest Channel_QPSK_FullRB(1)

BW3M_BandEdge_Lowest Channel_QPSK_FullRB(2)

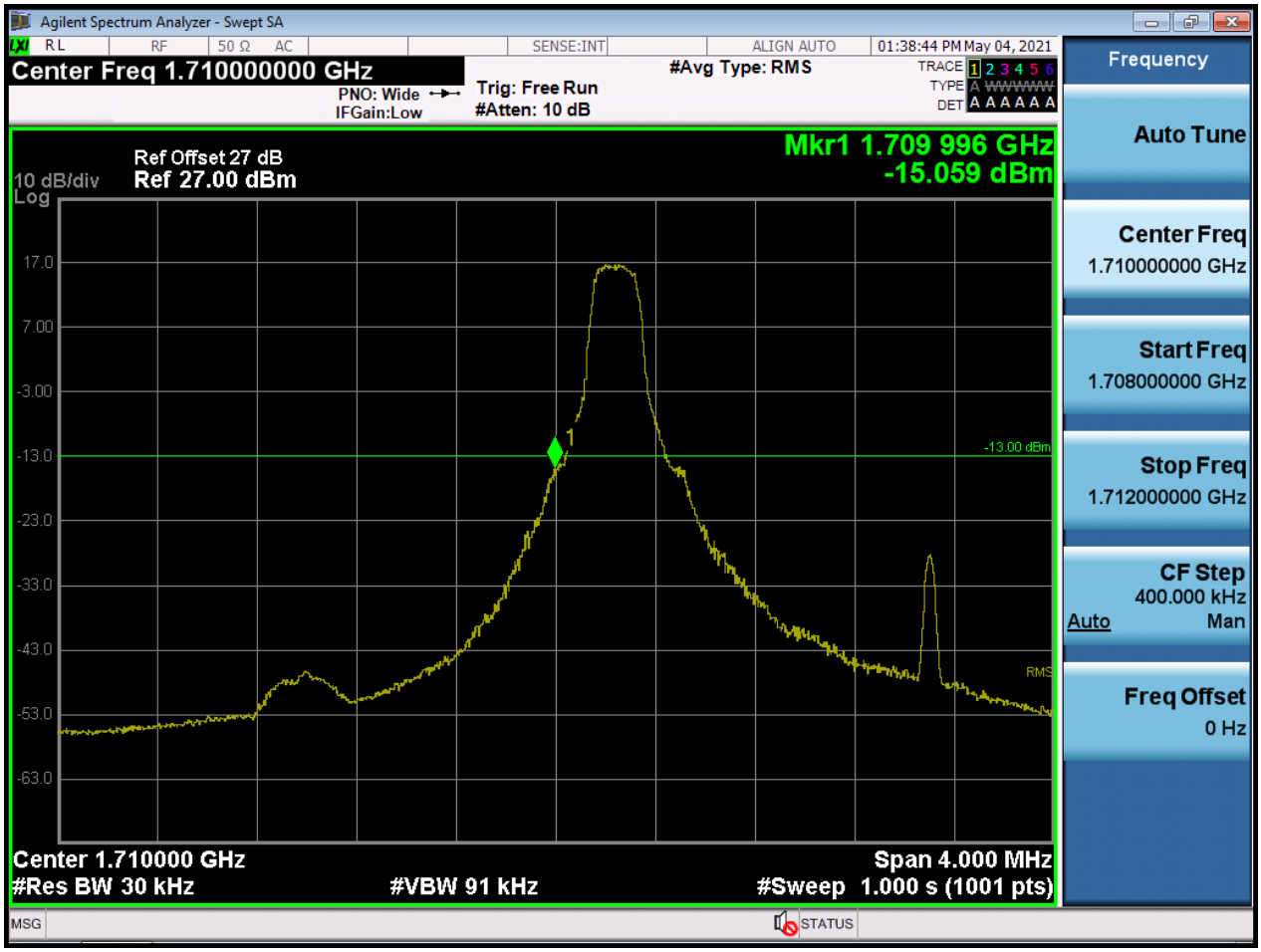


BW3M_BandEdge_Highest Channel_QPSK_FullRB(1)

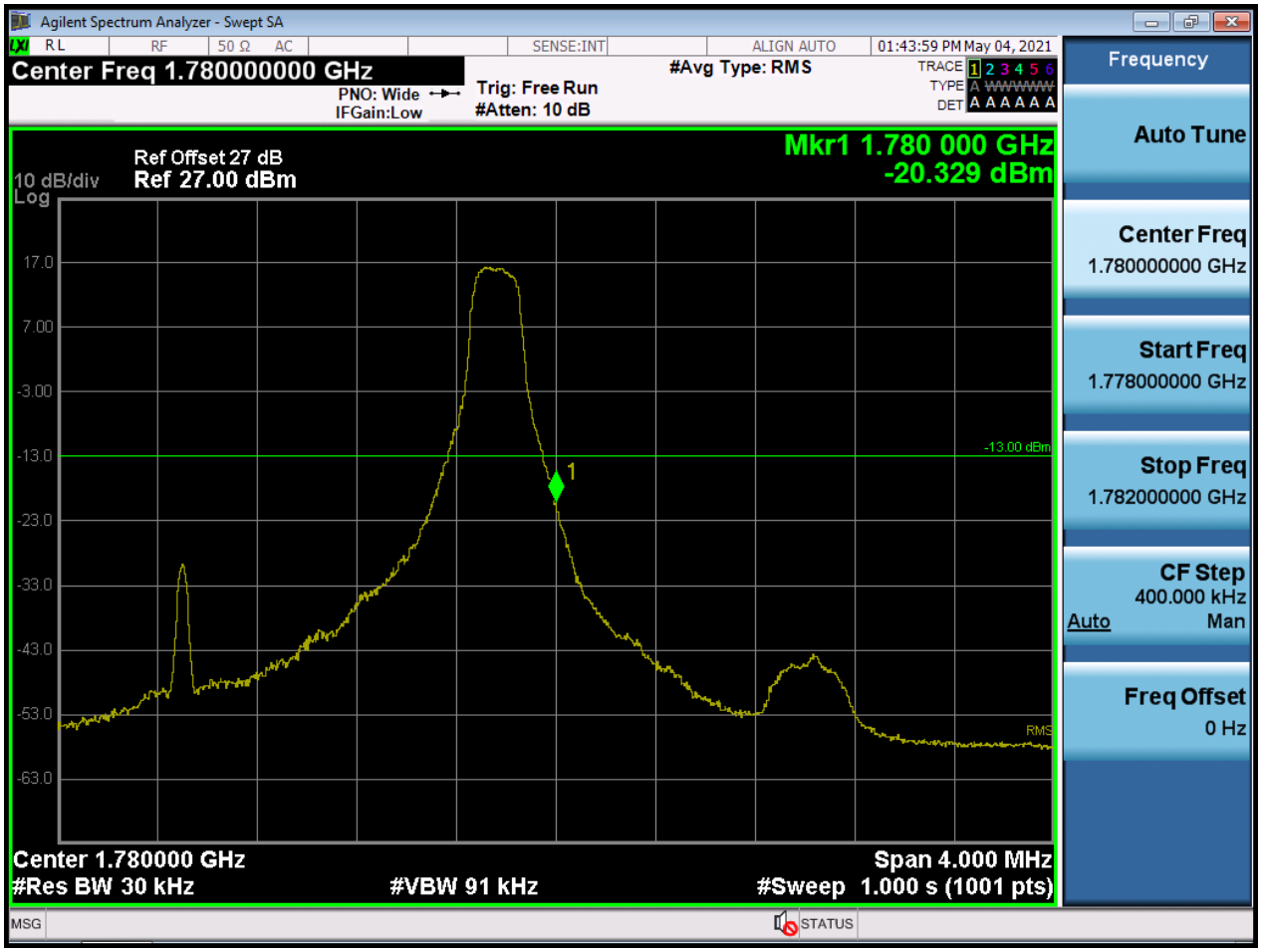
BW3M_BandEdge_Highest Channel_QPSK_FullRB(2)



BW3M_BandEdge_Lowest Channel_QPSK_1RB

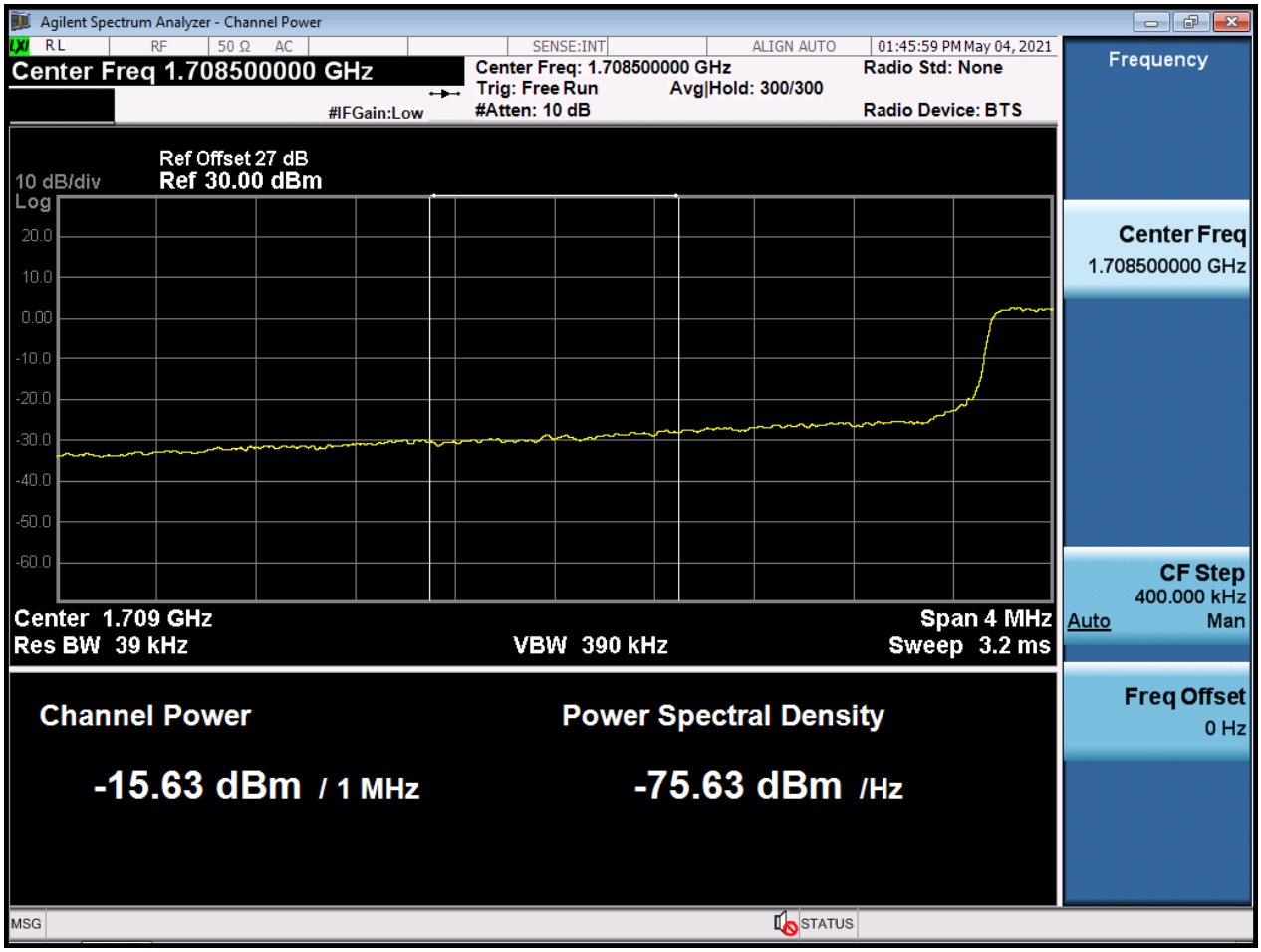


BW3M_BandEdge_Highest Channel_QPSK_1RB



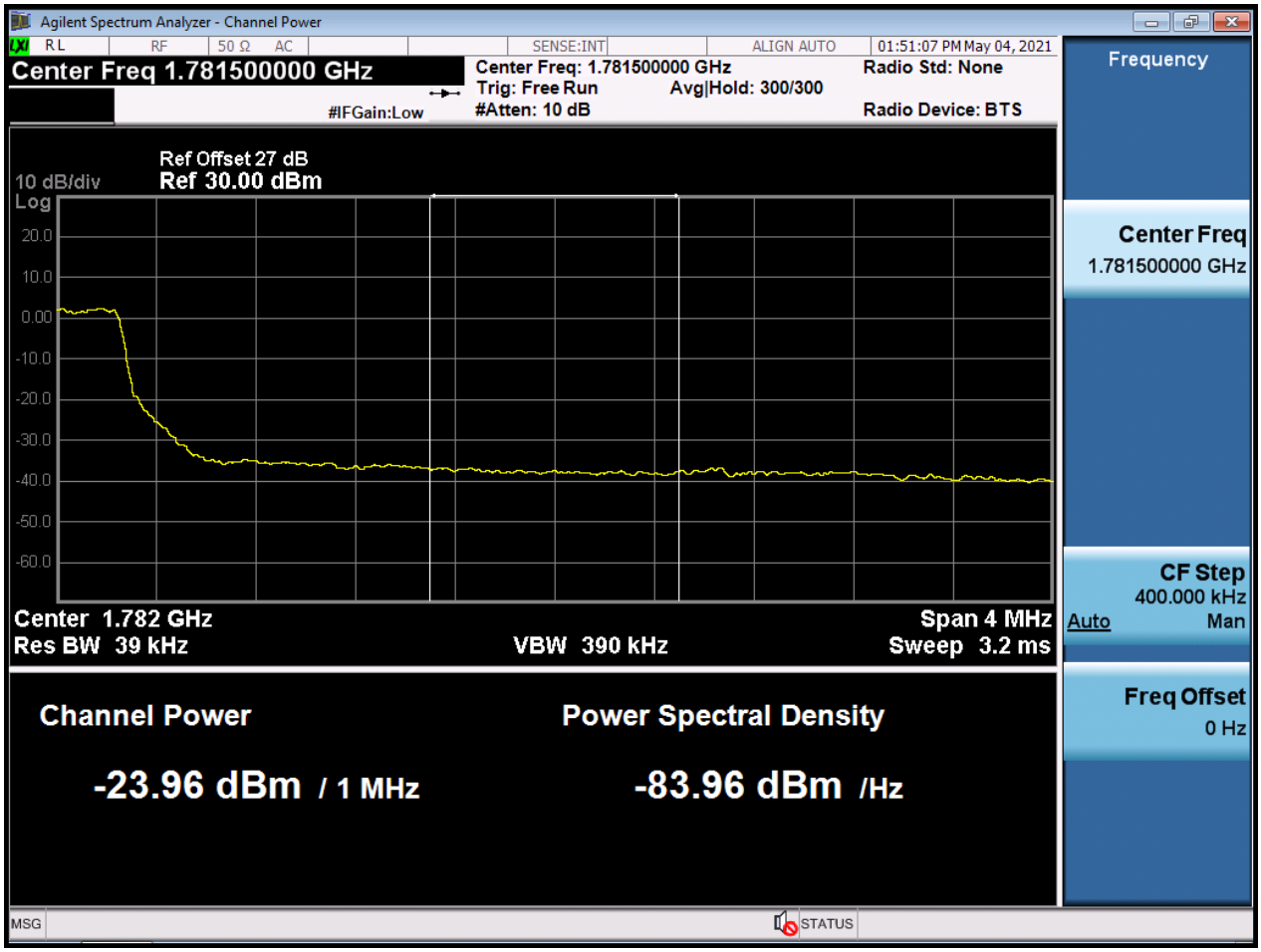
BW5M_BandEdge_Lowest Channel_QPSK_FullRB(1)

BW5M_BandEdge_Lowest Channel_QPSK_FullRB(2)

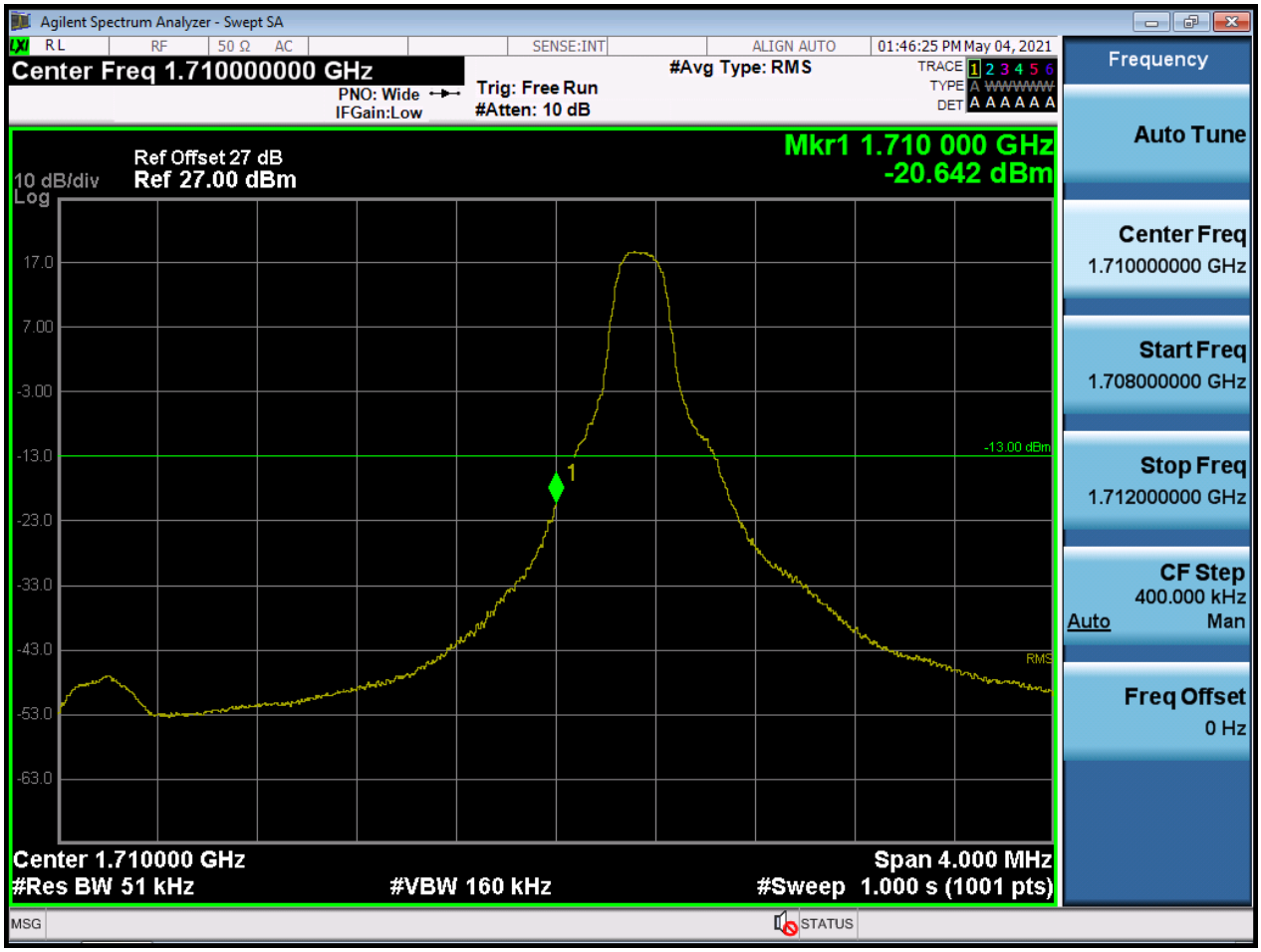


BW5M_BandEdge_Highest Channel_QPSK_FullRB(1)

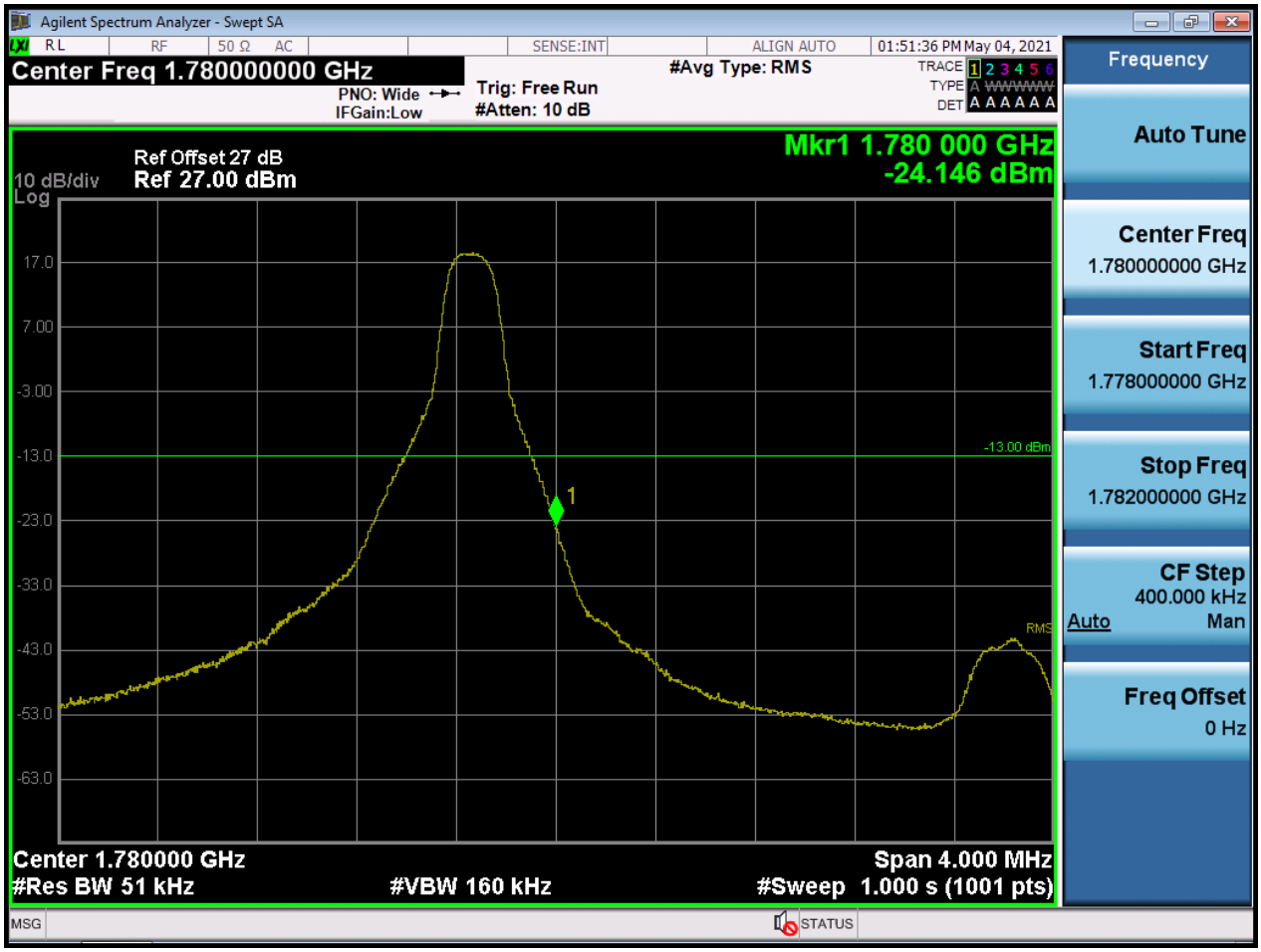
BW5M_BandEdge_Highest Channel_QPSK_FullRB(2)



BW5M_BandEdge_Lowest Channel_QPSK_1RB

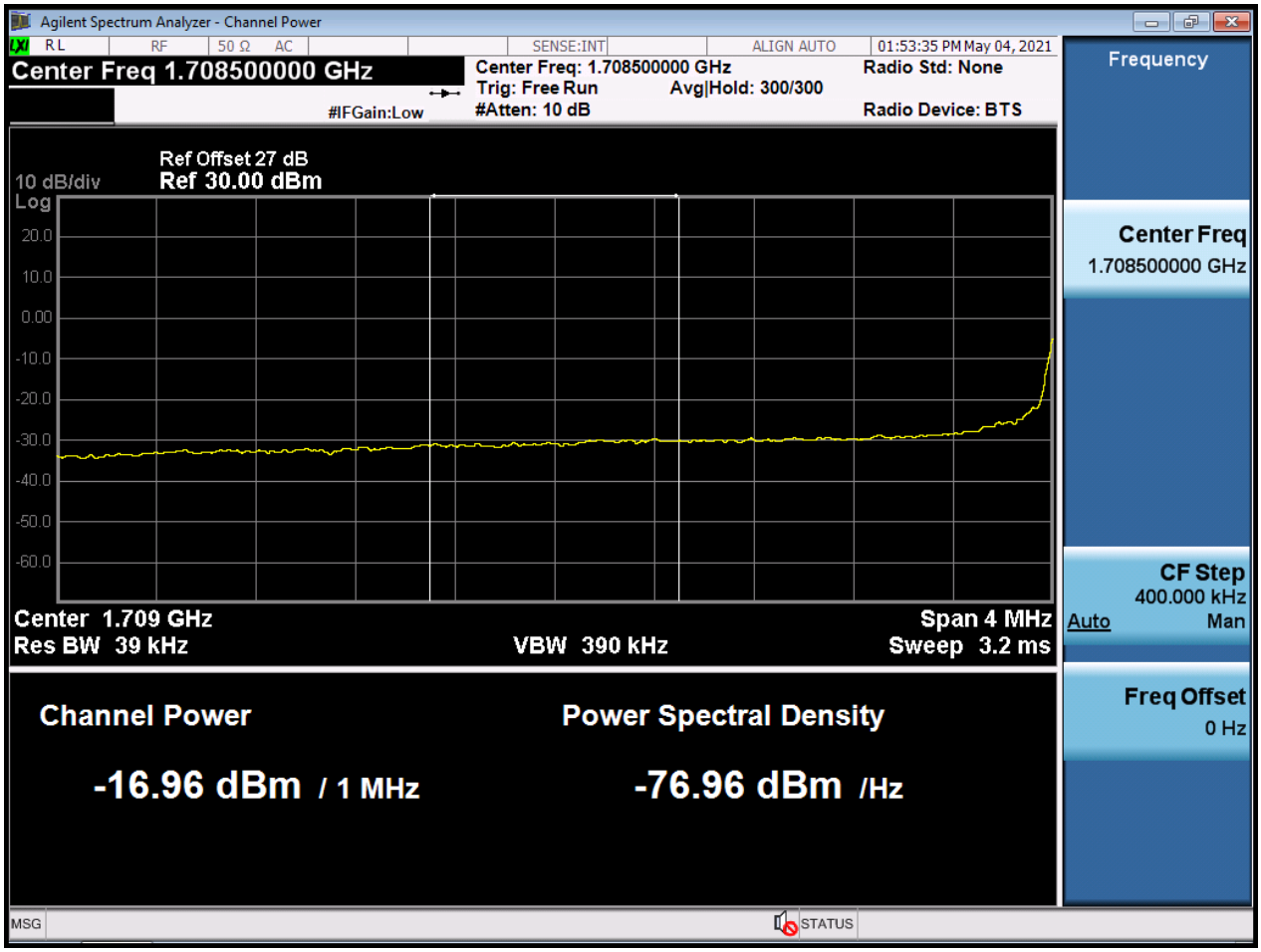


BW5M_BandEdge_Highest Channel_QPSK_1RB



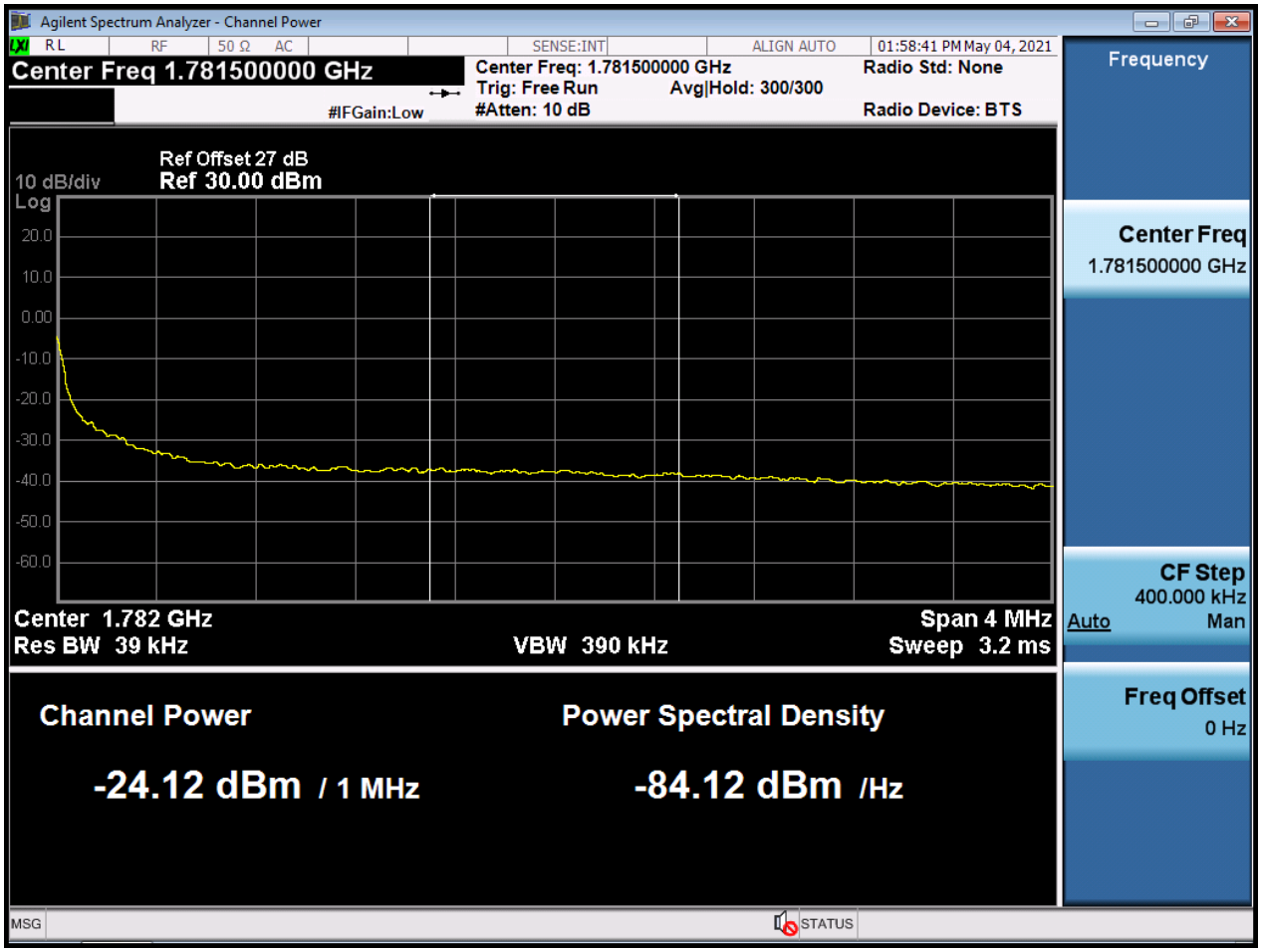
BW10M_BandEdge_Lowest Channel_QPSK_FullRB(1)

BW10M_BandEdge_Lowest Channel_QPSK_FullRB(2)



BW10M_BandEdge_Highest Channel_QPSK_FullRB(1)

BW10M_BandEdge_Highest Channel_QPSK_FullRB(2)

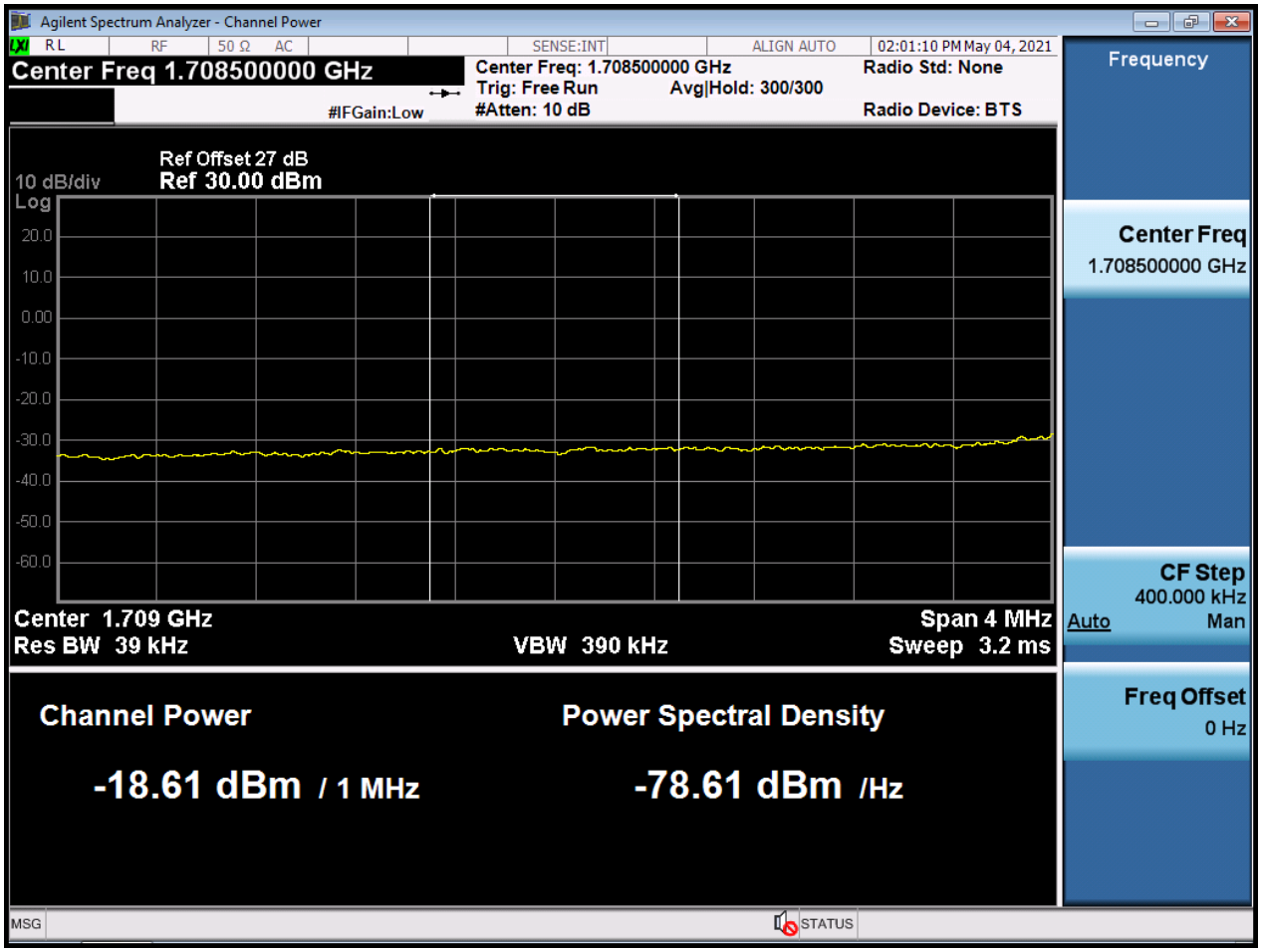


BW10M_BandEdge_Lowest Channel_QPSK_1RB

BW10M_BandEdge_Highest Channel_QPSK_1RB

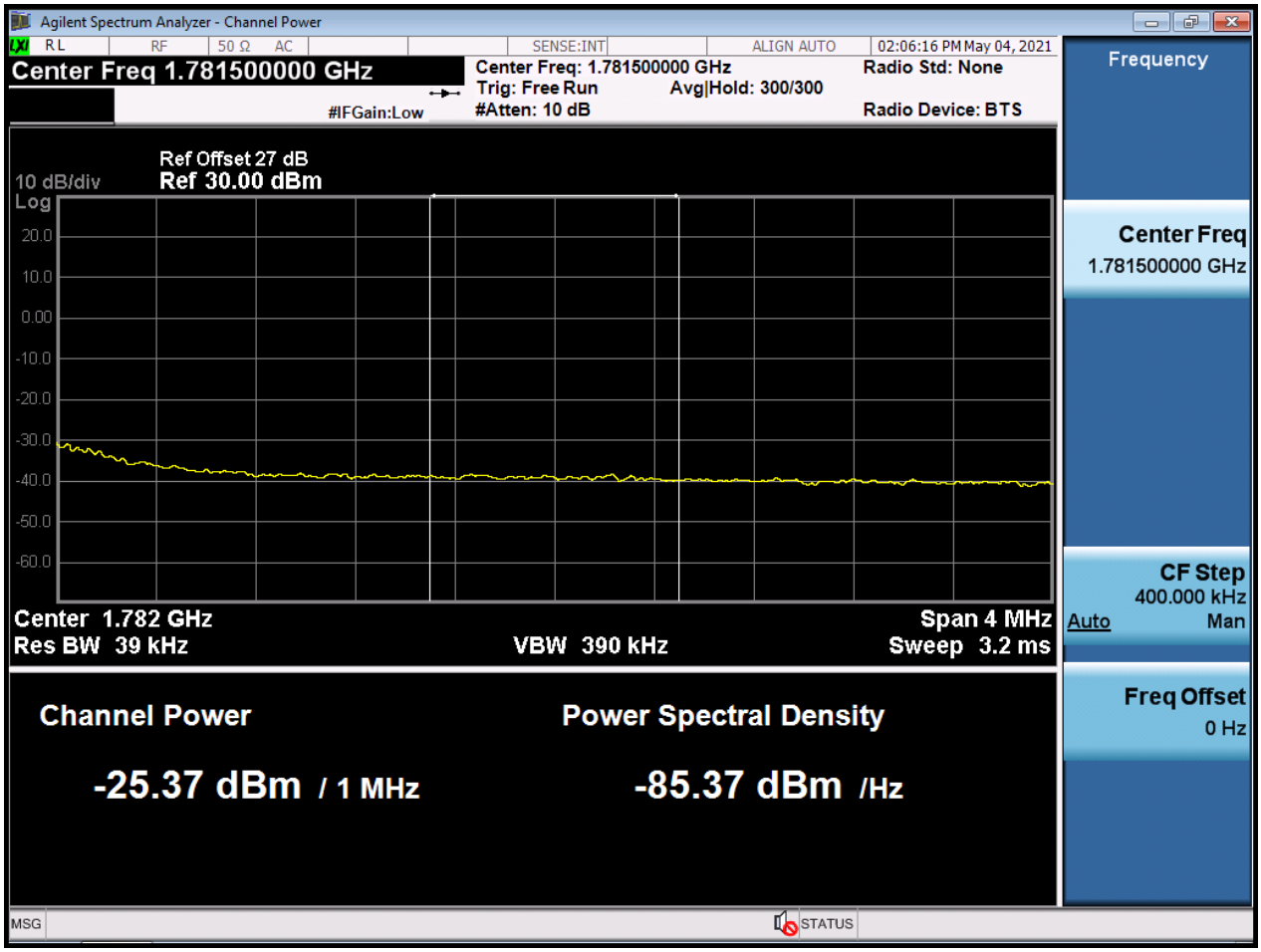
BW15M_BandEdge_Lowest Channel_QPSK_FullRB(1)

BW15M_BandEdge_Lowest Channel_QPSK_FullRB(2)



BW15M_BandEdge_Highest Channel_QPSK_FullRB(1)

BW15M_BandEdge_Highest Channel_QPSK_FullRB(2)

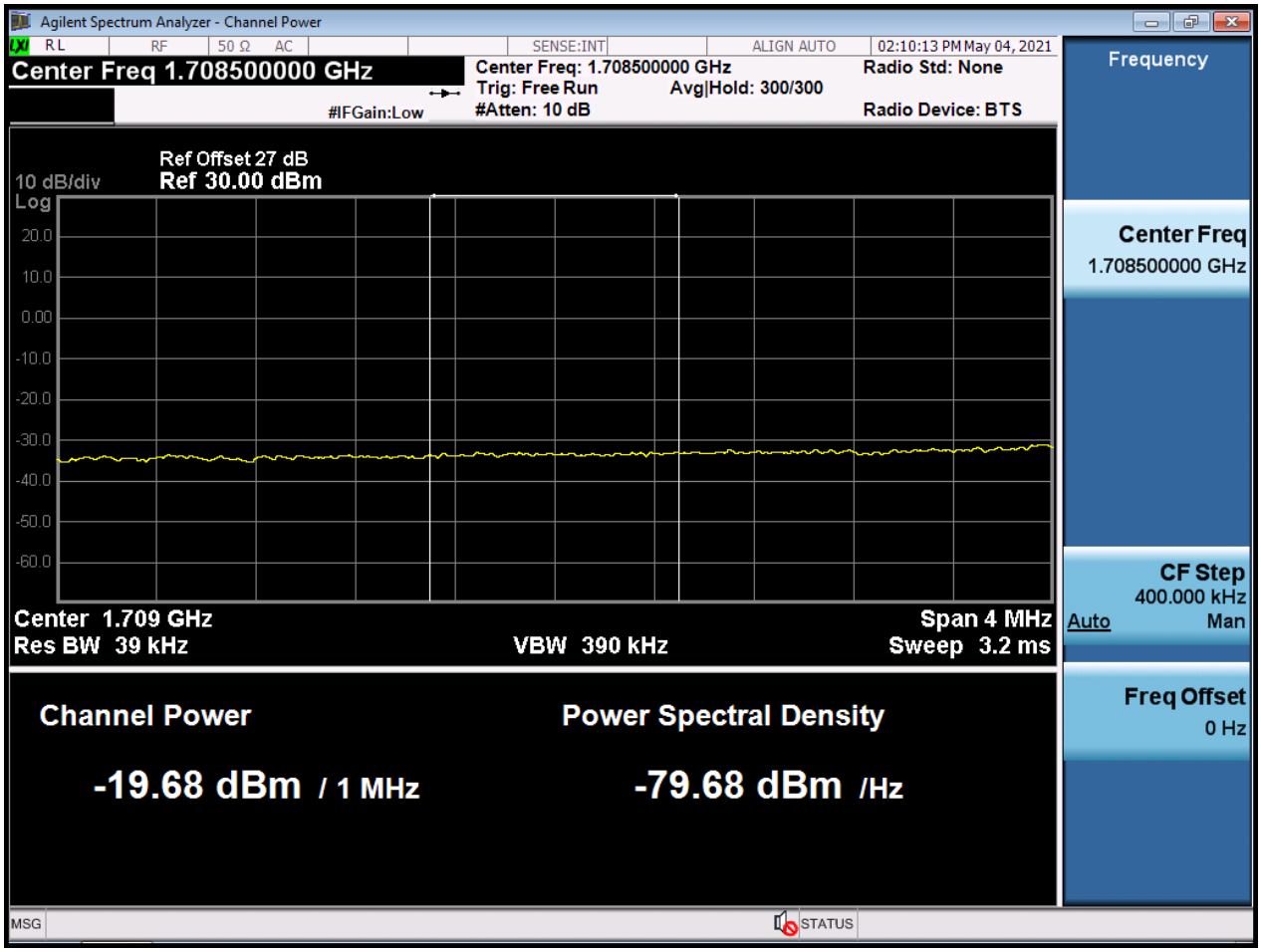


BW15M_BandEdge_Lowest Channel_QPSK_1RB

BW15M_BandEdge_Highest Channel_QPSK_1RB

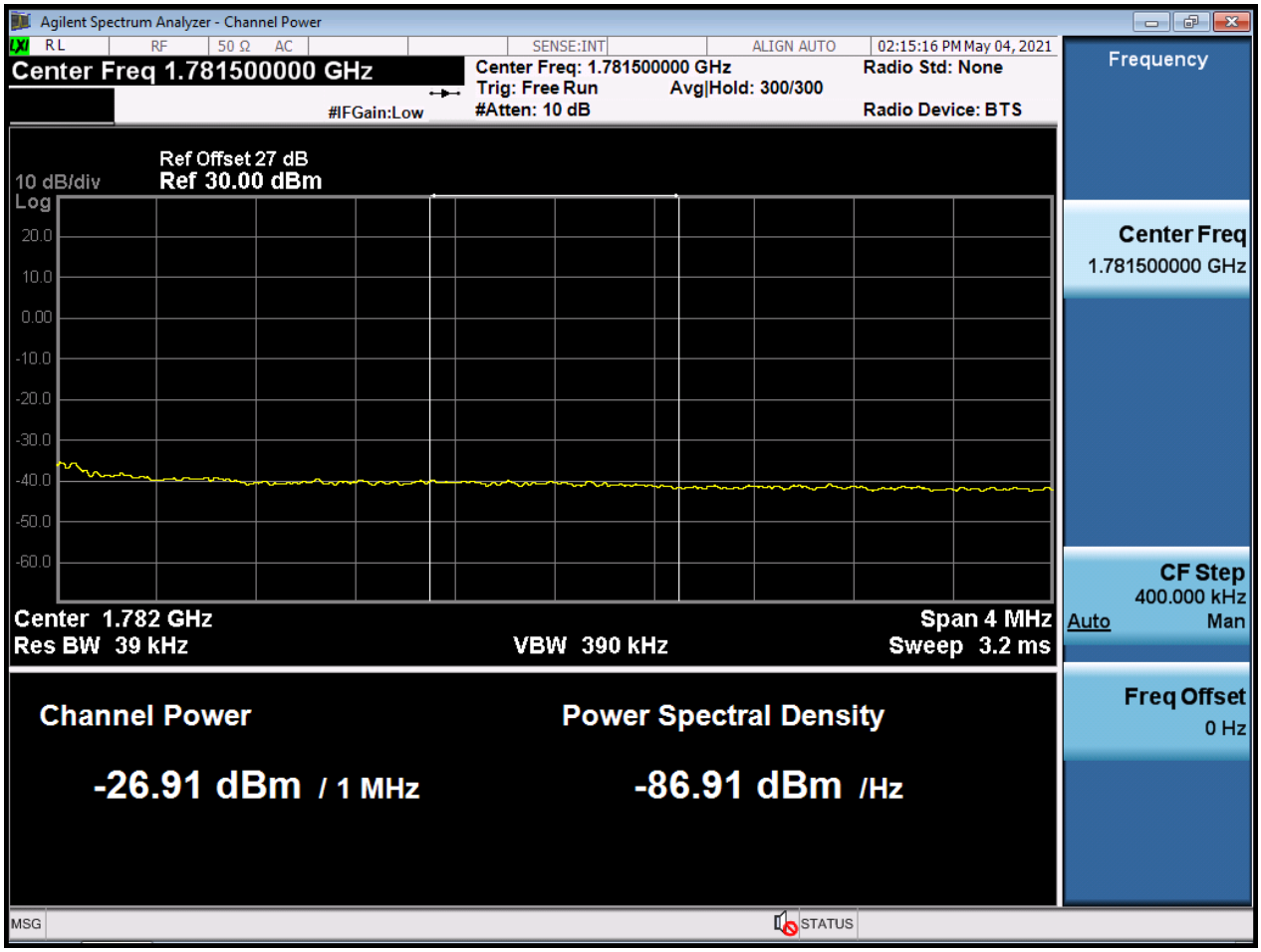
BW20M_BandEdge_Lowest Channel_QPSK_FullRB(1)

BW20M_BandEdge_Lowest Channel_QPSK_FullRB(2)



BW20M_BandEdge_Highest Channel_QPSK_FullRB(1)

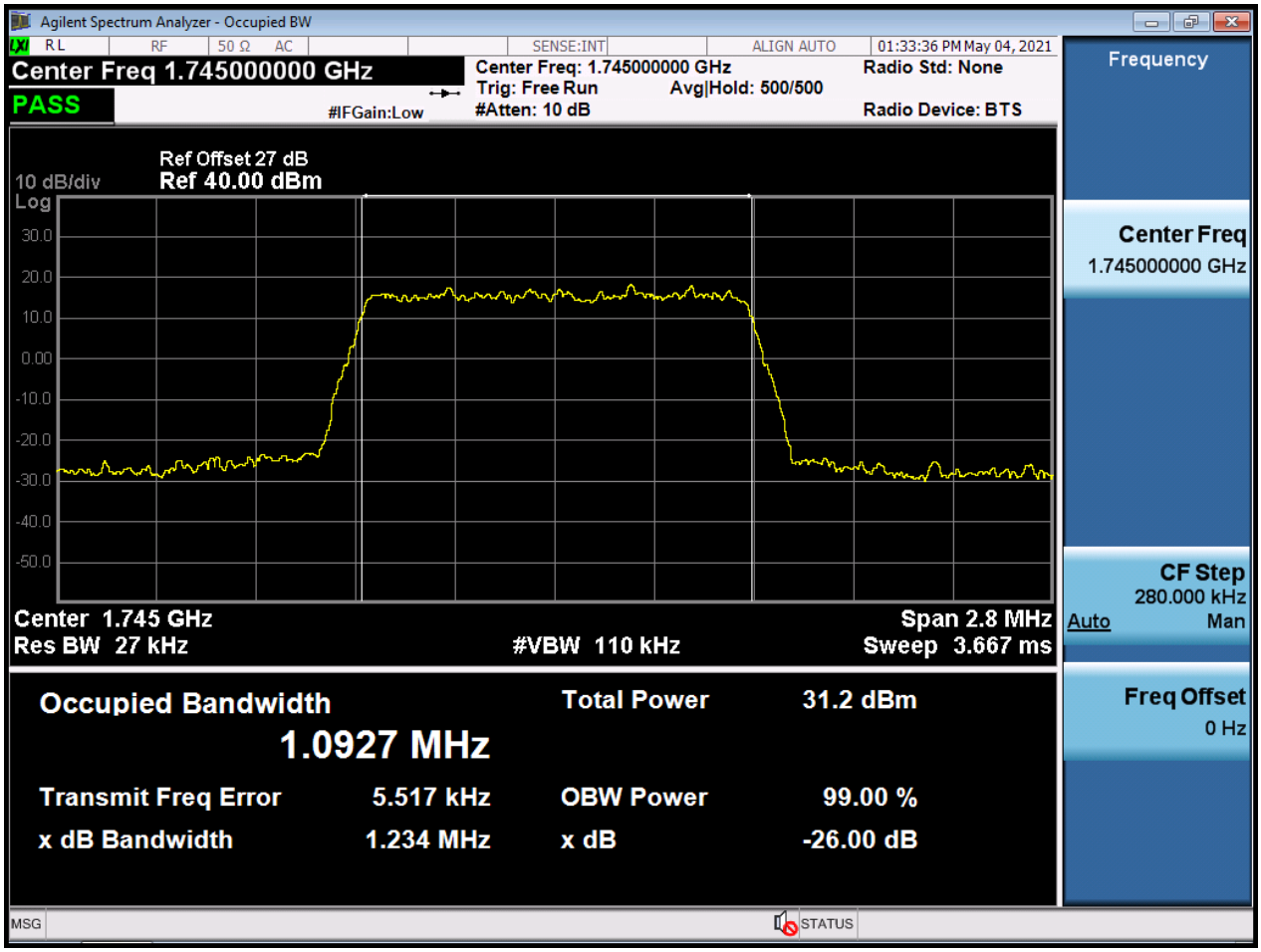
BW20M_BandEdge_Highest Channel_QPSK_FullRB(2)



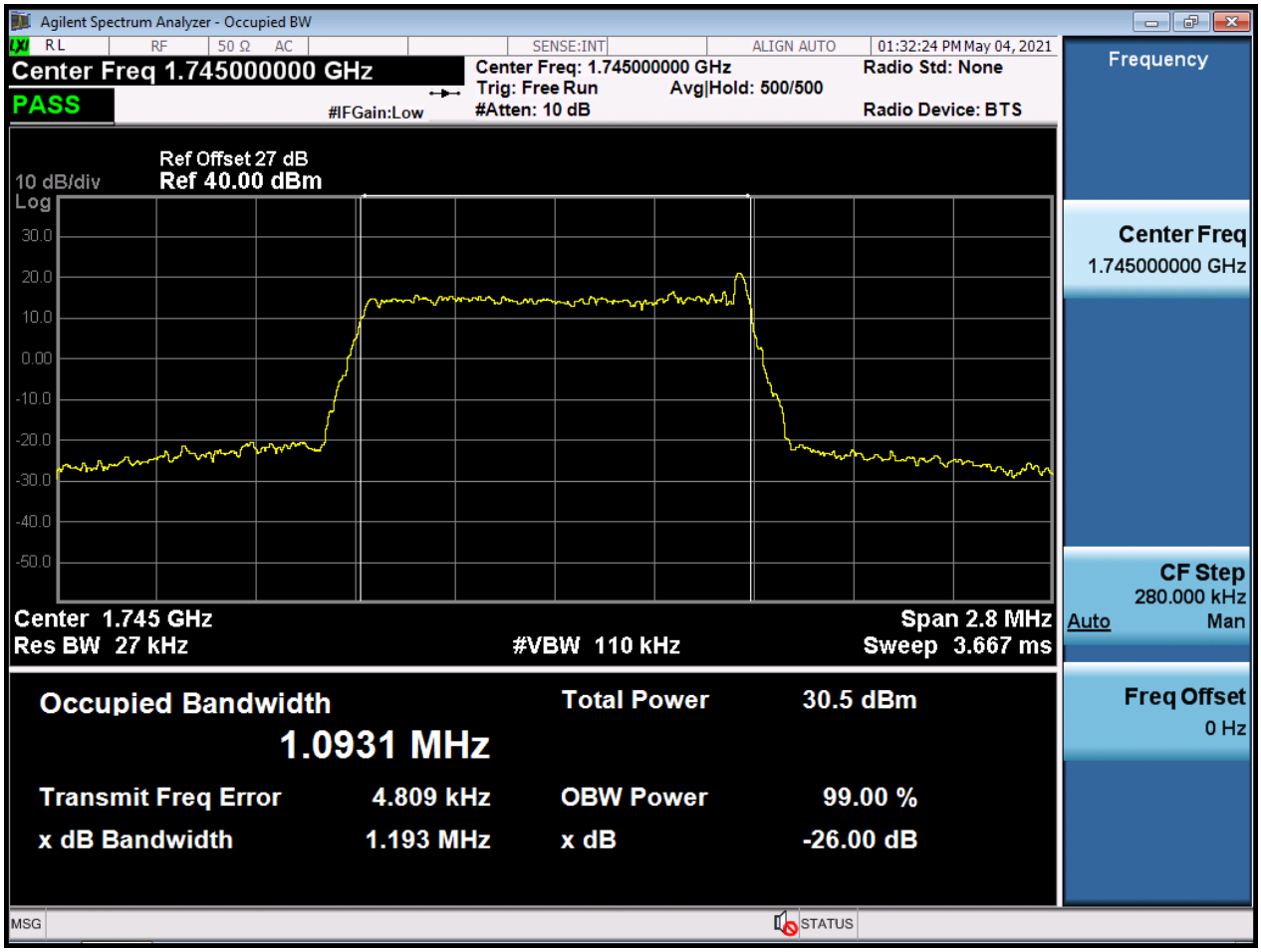
BW20M_BandEdge_Lowest Channel_QPSK_1RB

BW20M_BandEdge_Highest Channel_QPSK_1RB

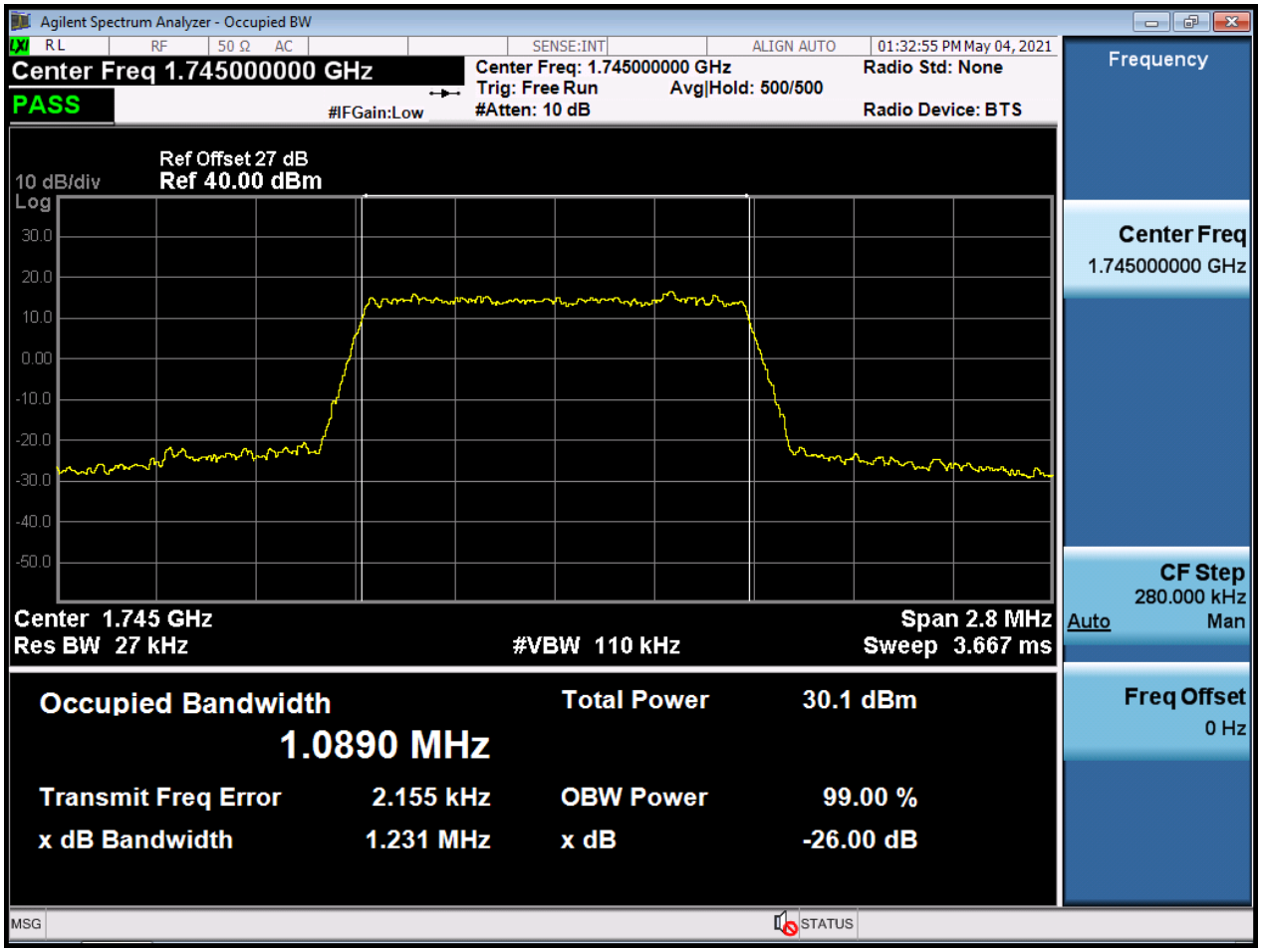
BW1.4M_OBW_Middle Channel_QPSK_FullRB



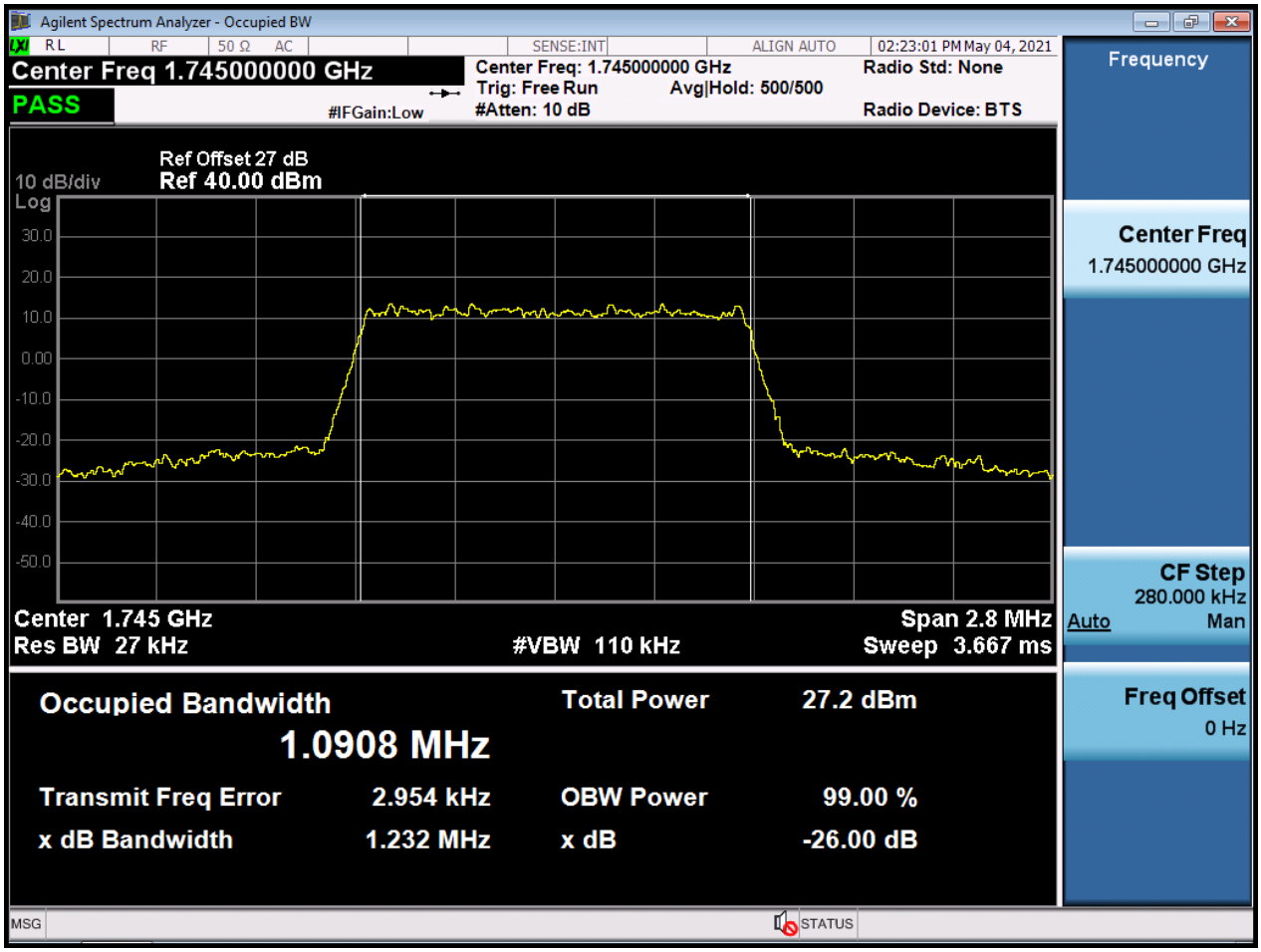
BW1.4M_OBW_Middle Channel_16QAM_FullRB



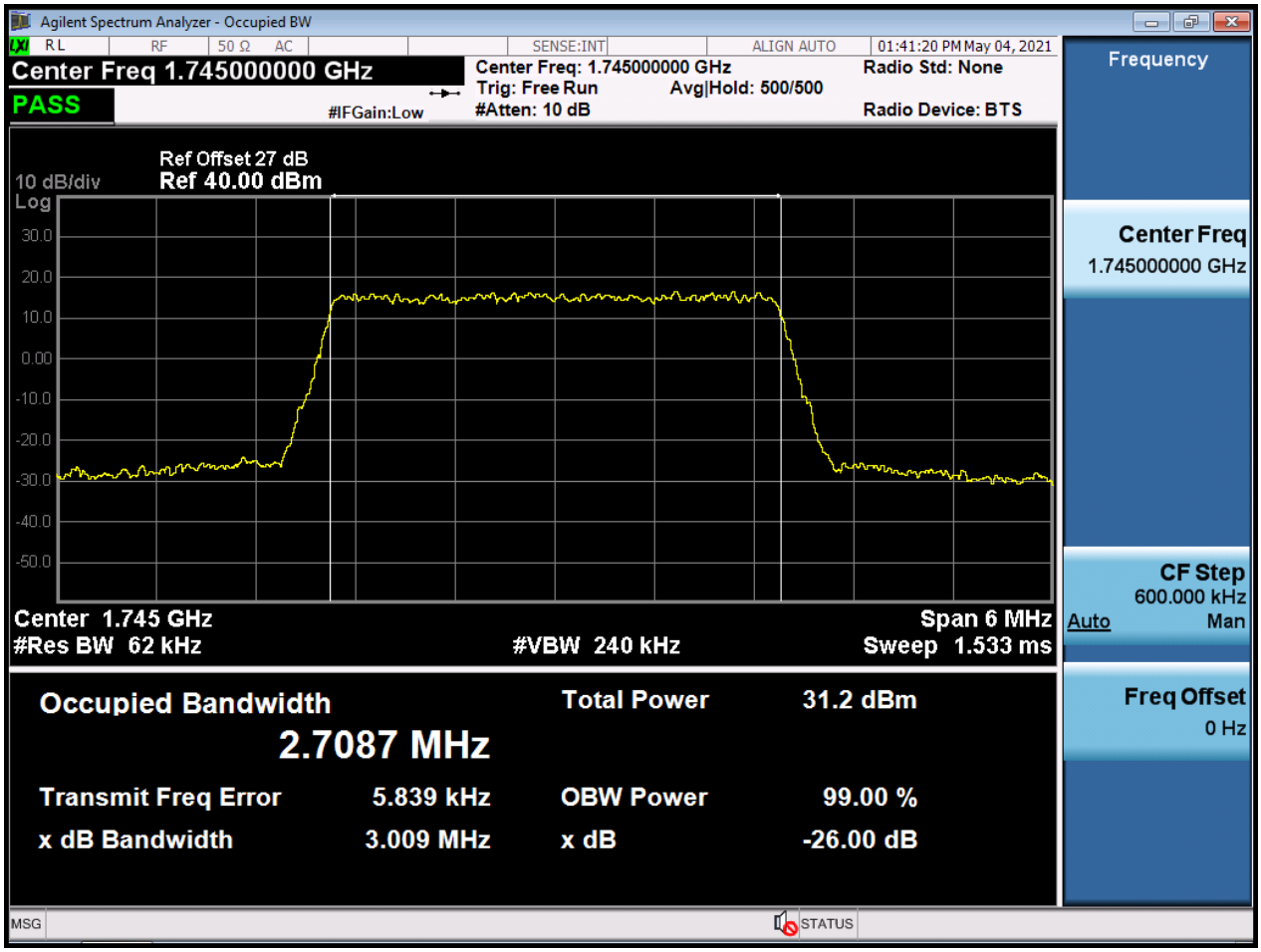
BW1.4M_OBW_Middle Channel_64QAM_FullRB



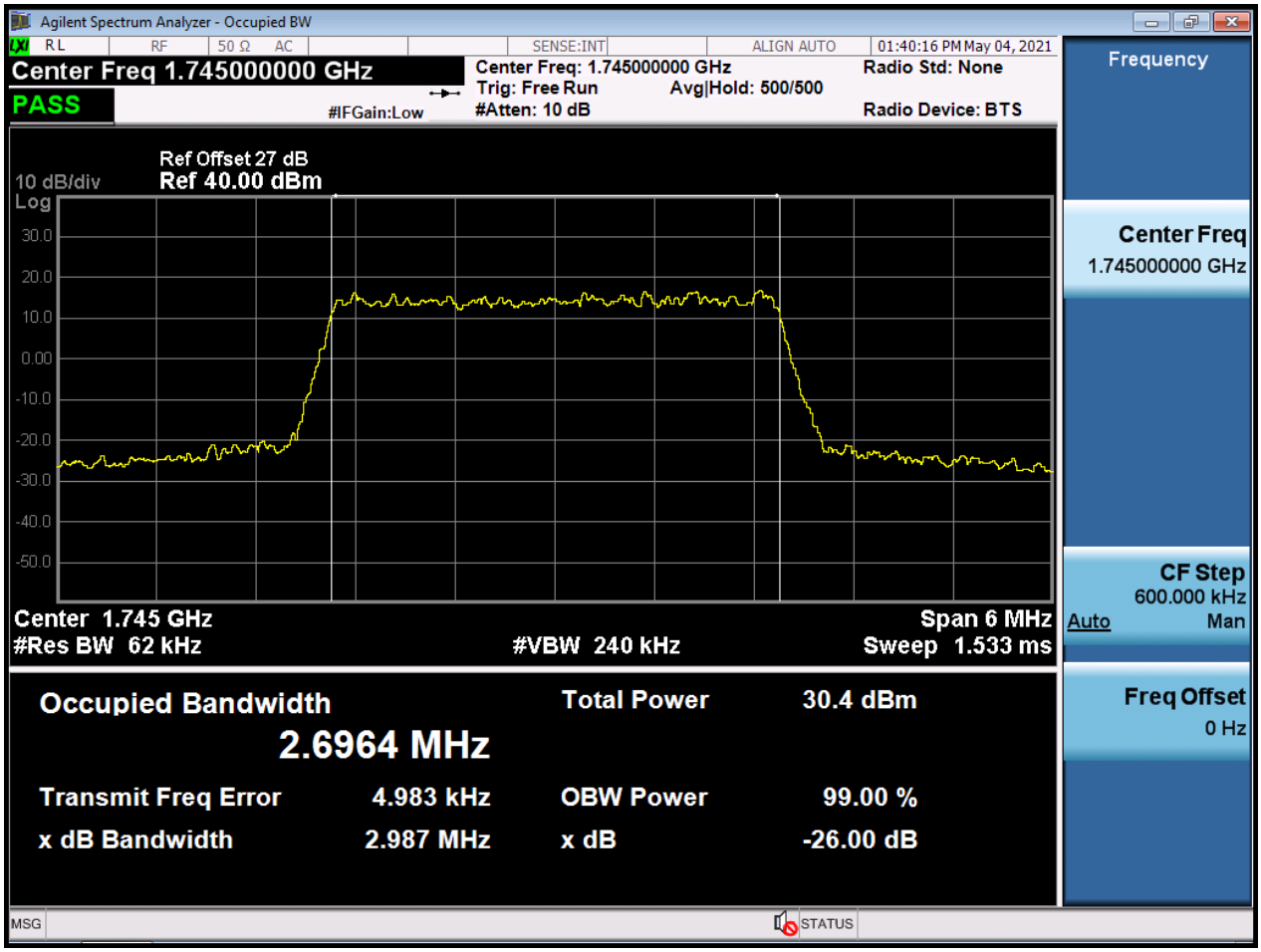
BW1.4M_OBW_Middle Channel_256QAM_FullRB



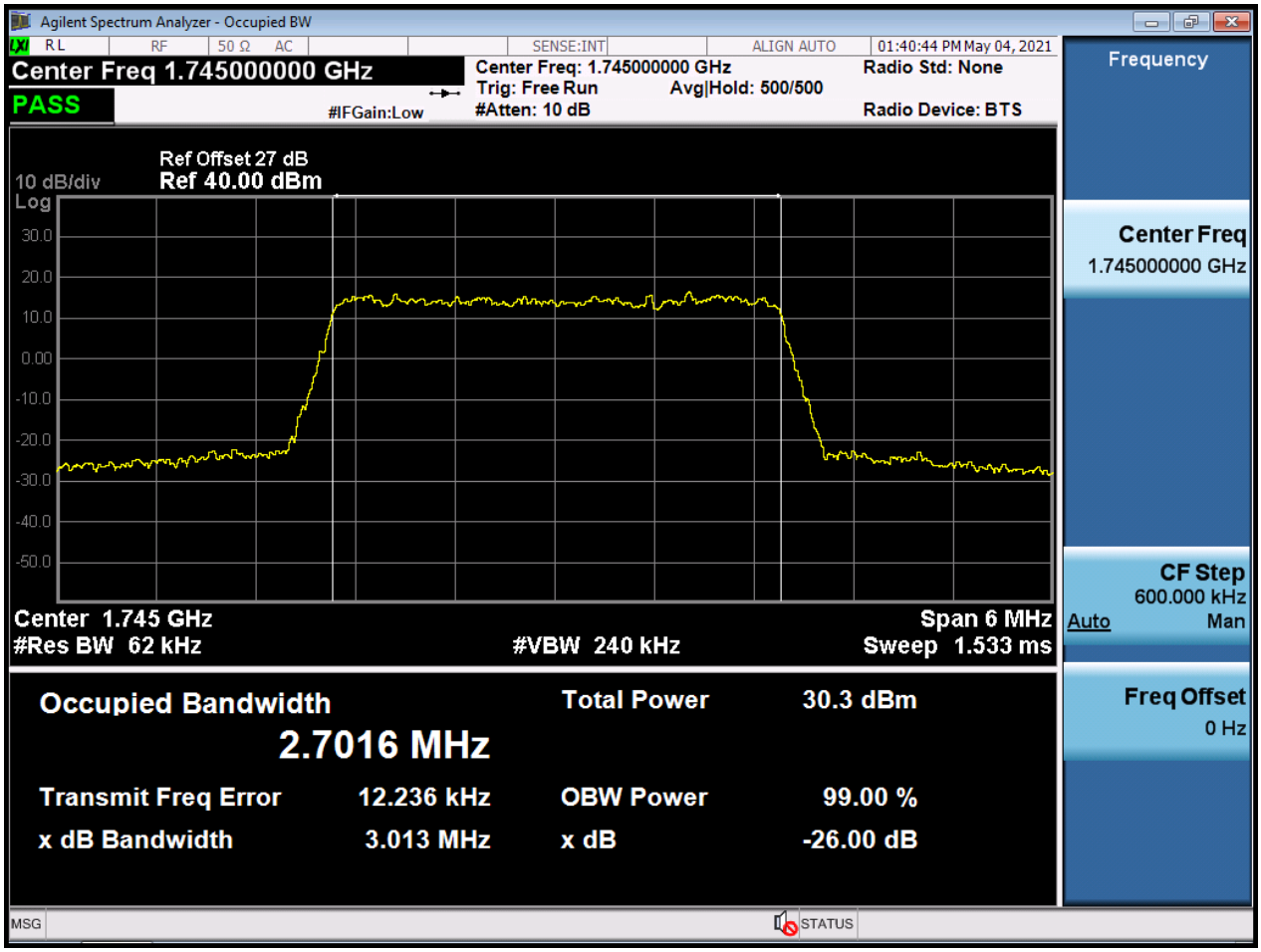
BW3M_OBW_Middle Channel_QPSK_FullRB



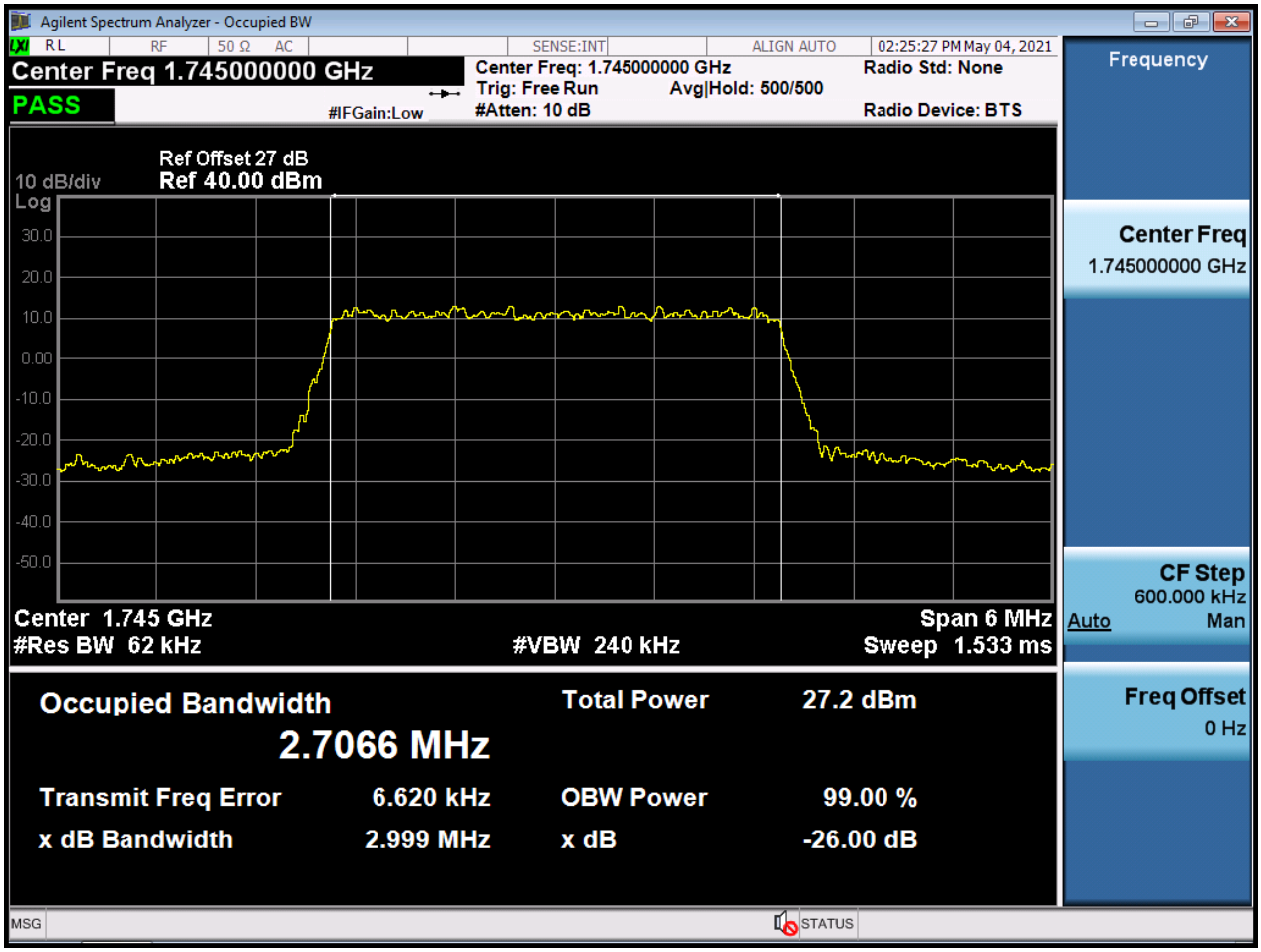
BW3M_OBW_Middle Channel_16QAM_FullRB



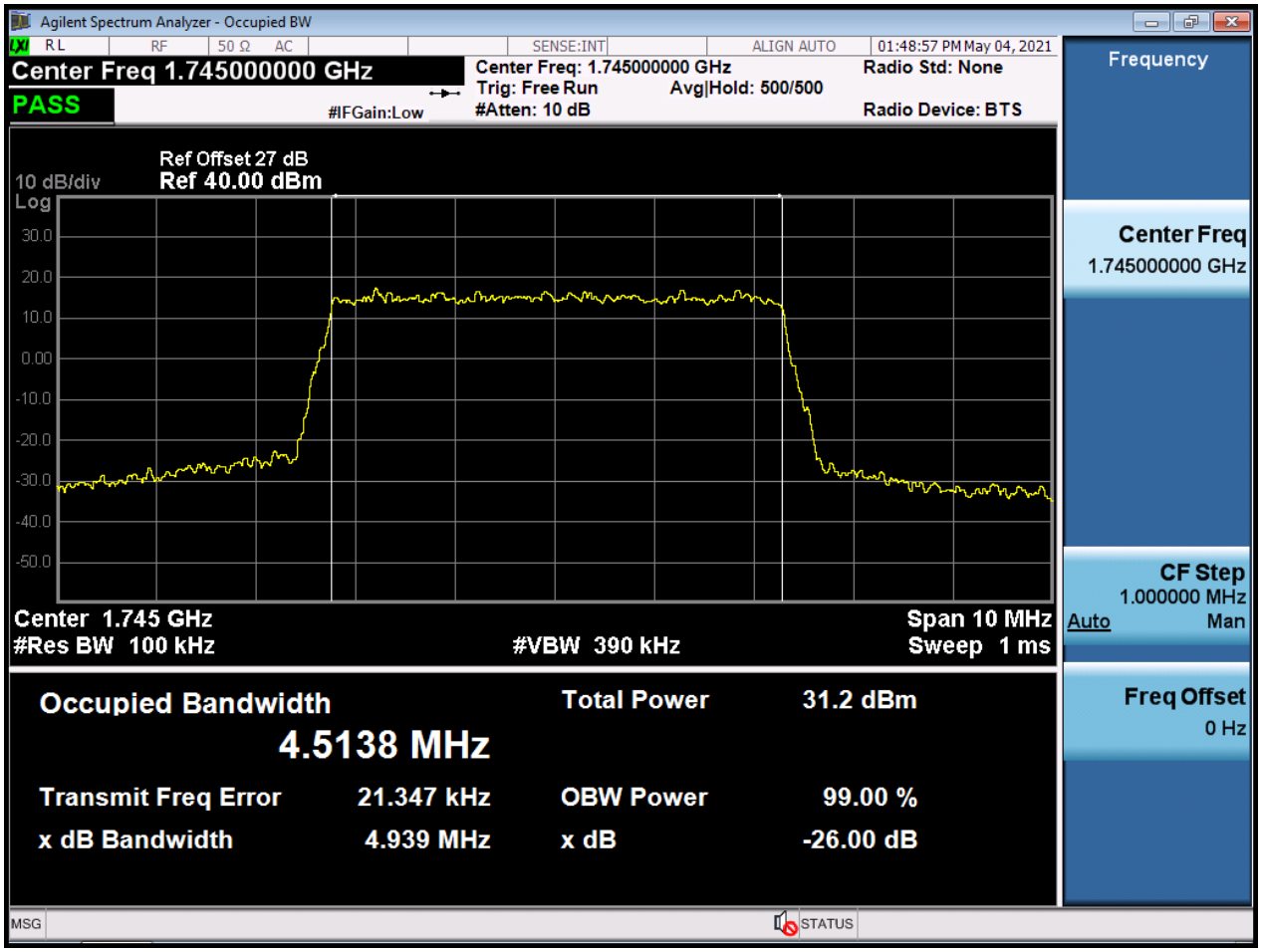
BW3M_OBW_Middle Channel_64QAM_FullRB



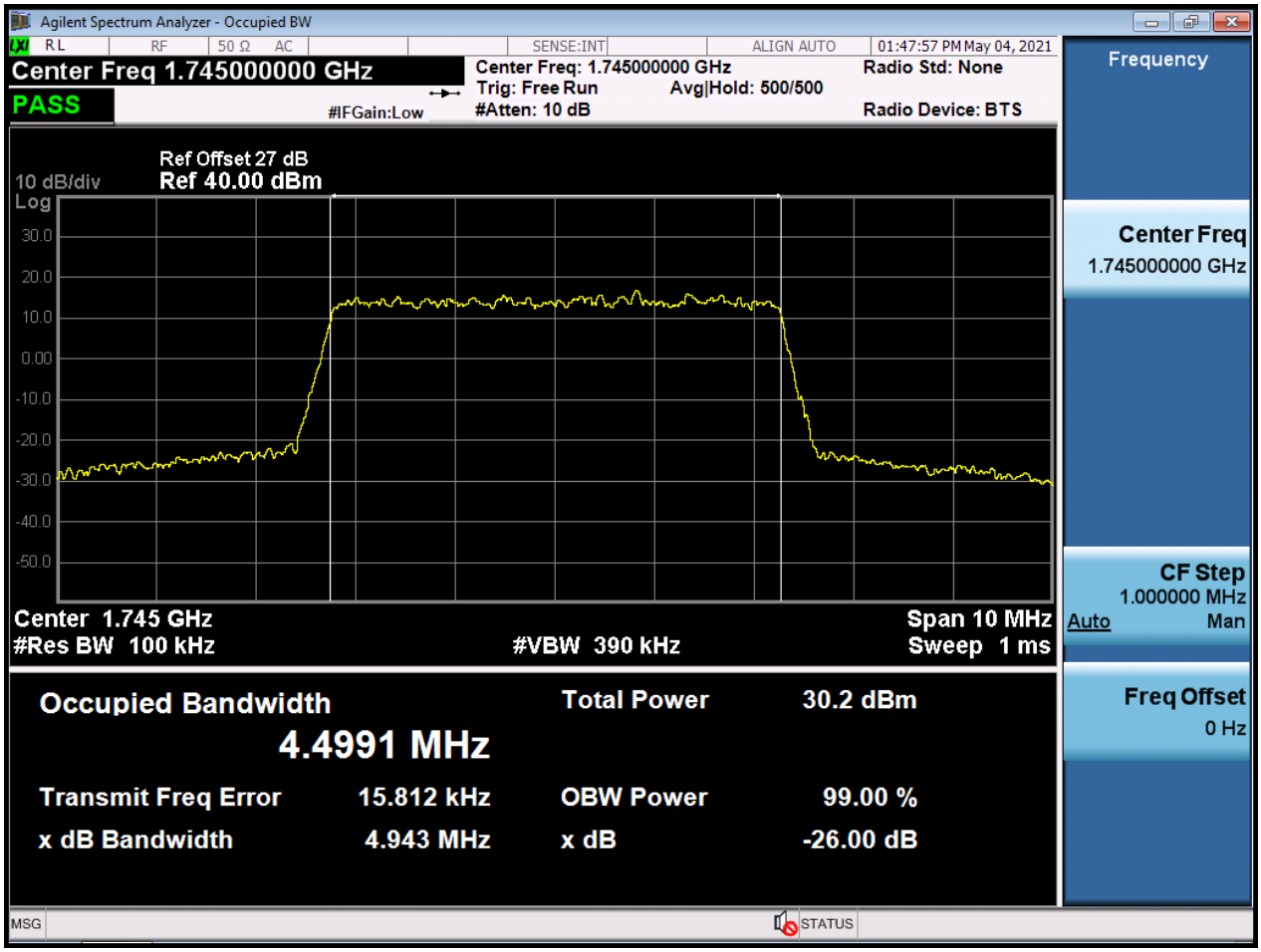
BW3M_OBW_Middle Channel_256QAM_FullRB



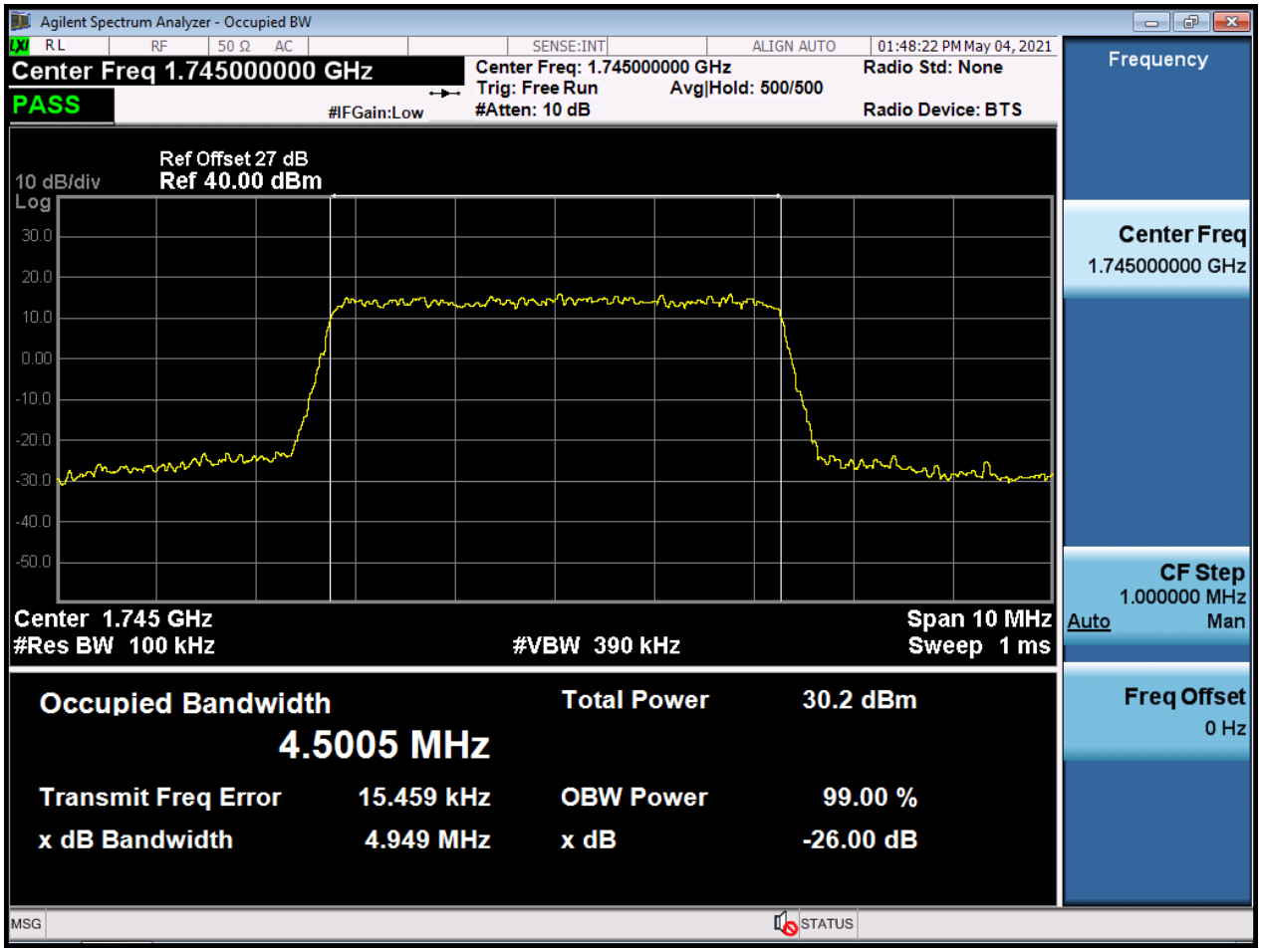
BW5M_OBW_Middle Channel_QPSK_FullRB



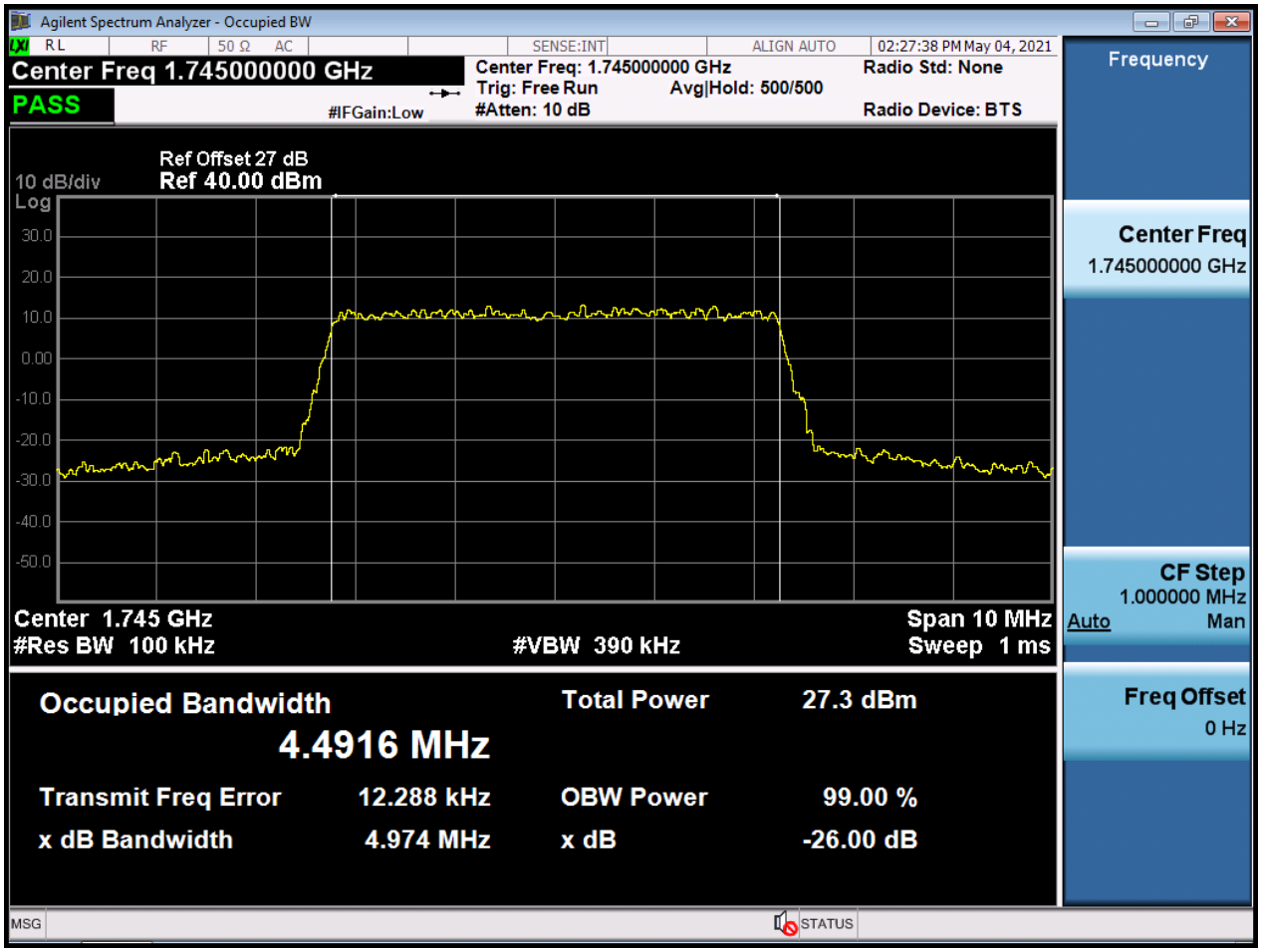
BW5M_OBW_Middle Channel_16QAM_FullRB



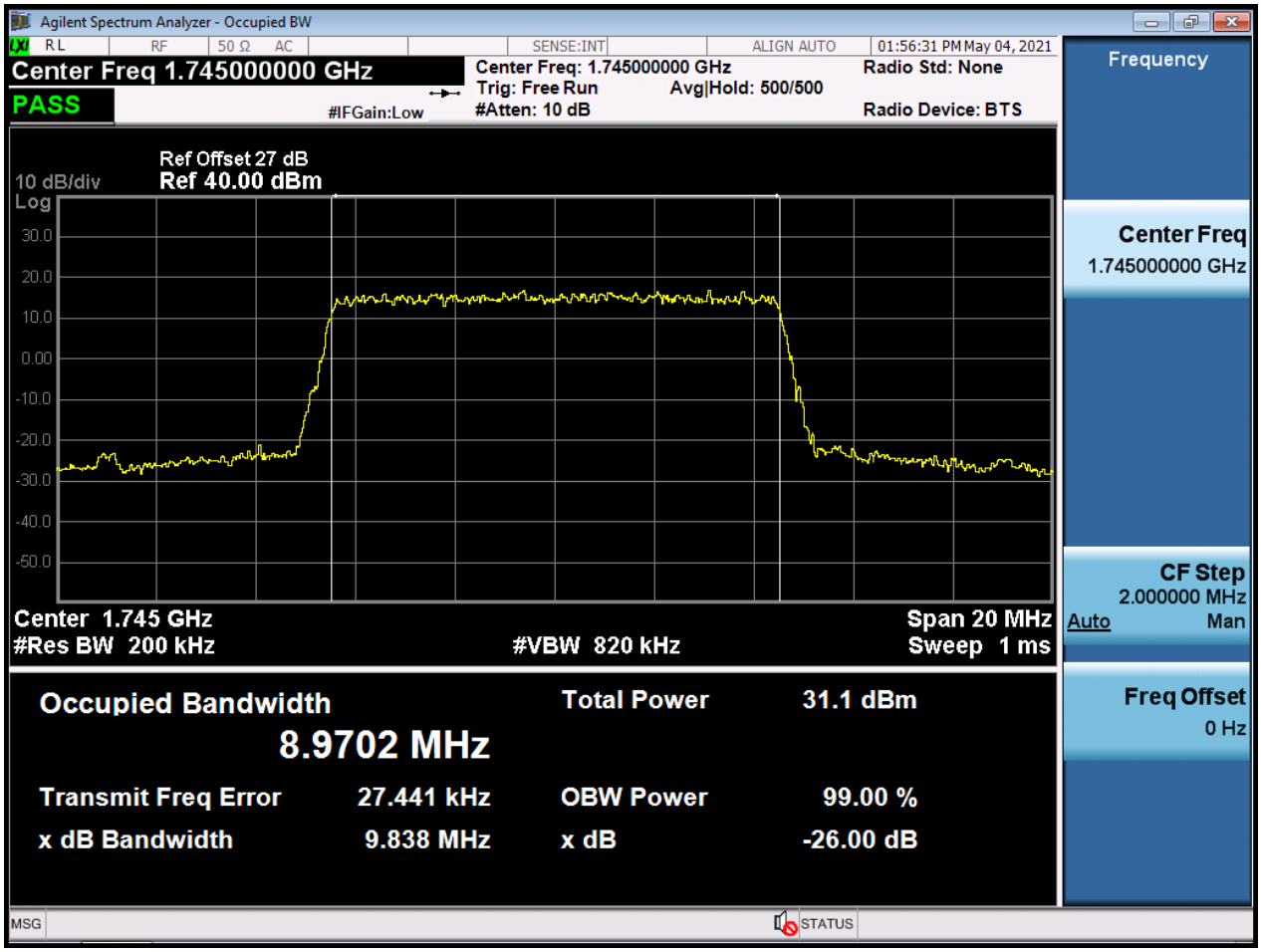
BW5M_OBW_Middle Channel_64QAM_FullRB



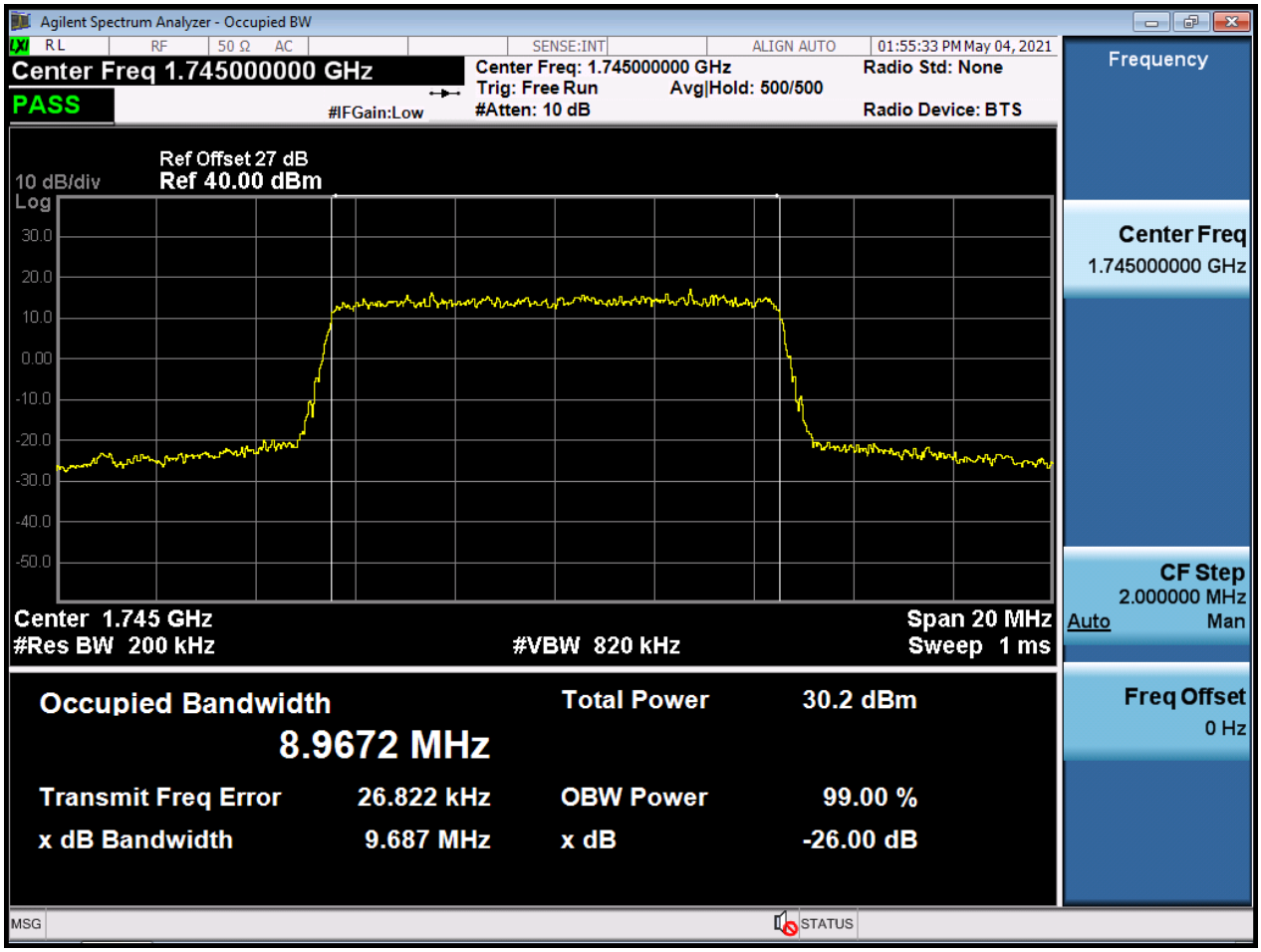
BW5M_OBW_Middle Channel_256QAM_FullRB



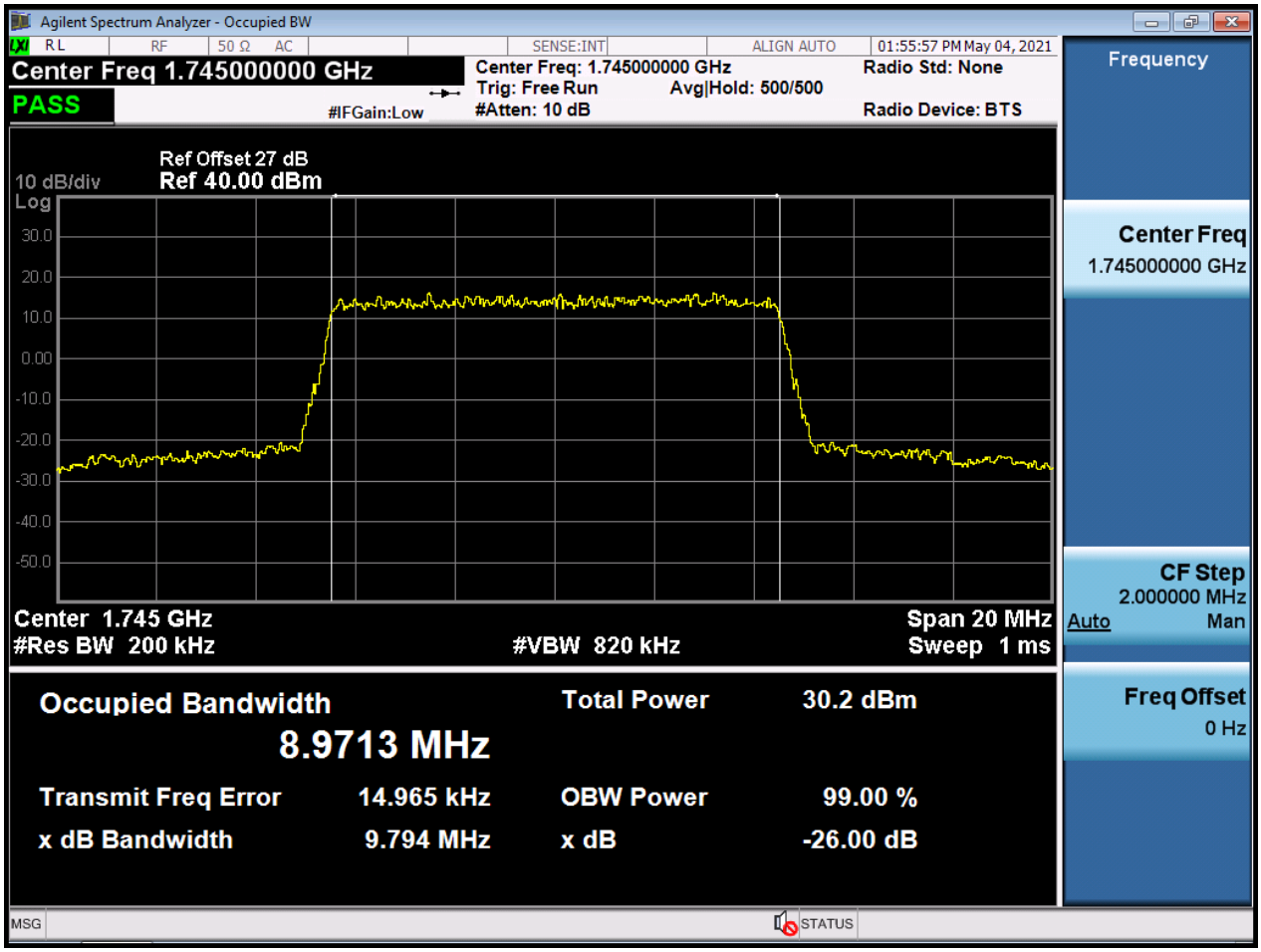
BW10M_OBW_Middle Channel_QPSK_FullRB



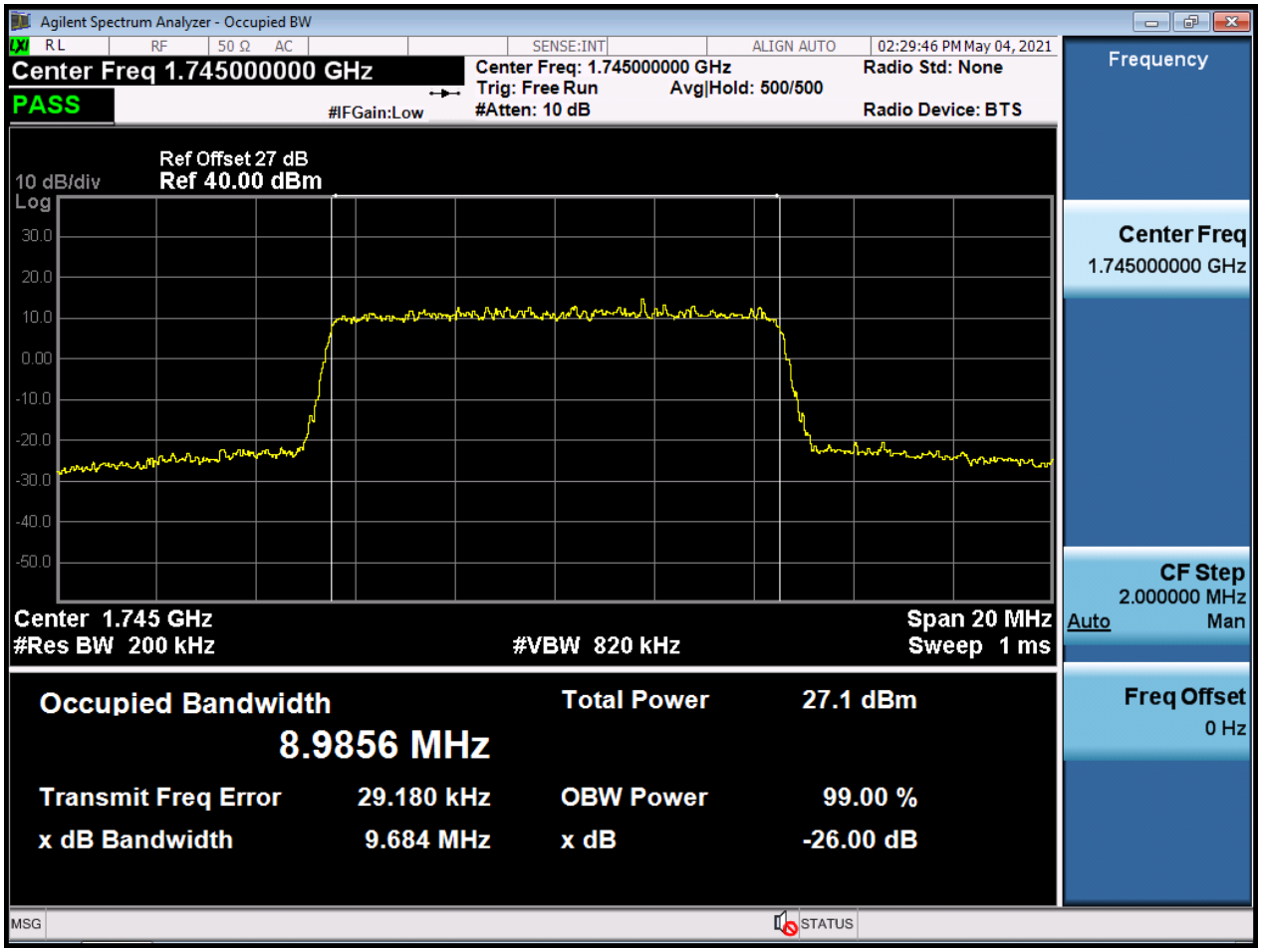
BW10M_OBW_Middle Channel_16QAM_FullRB



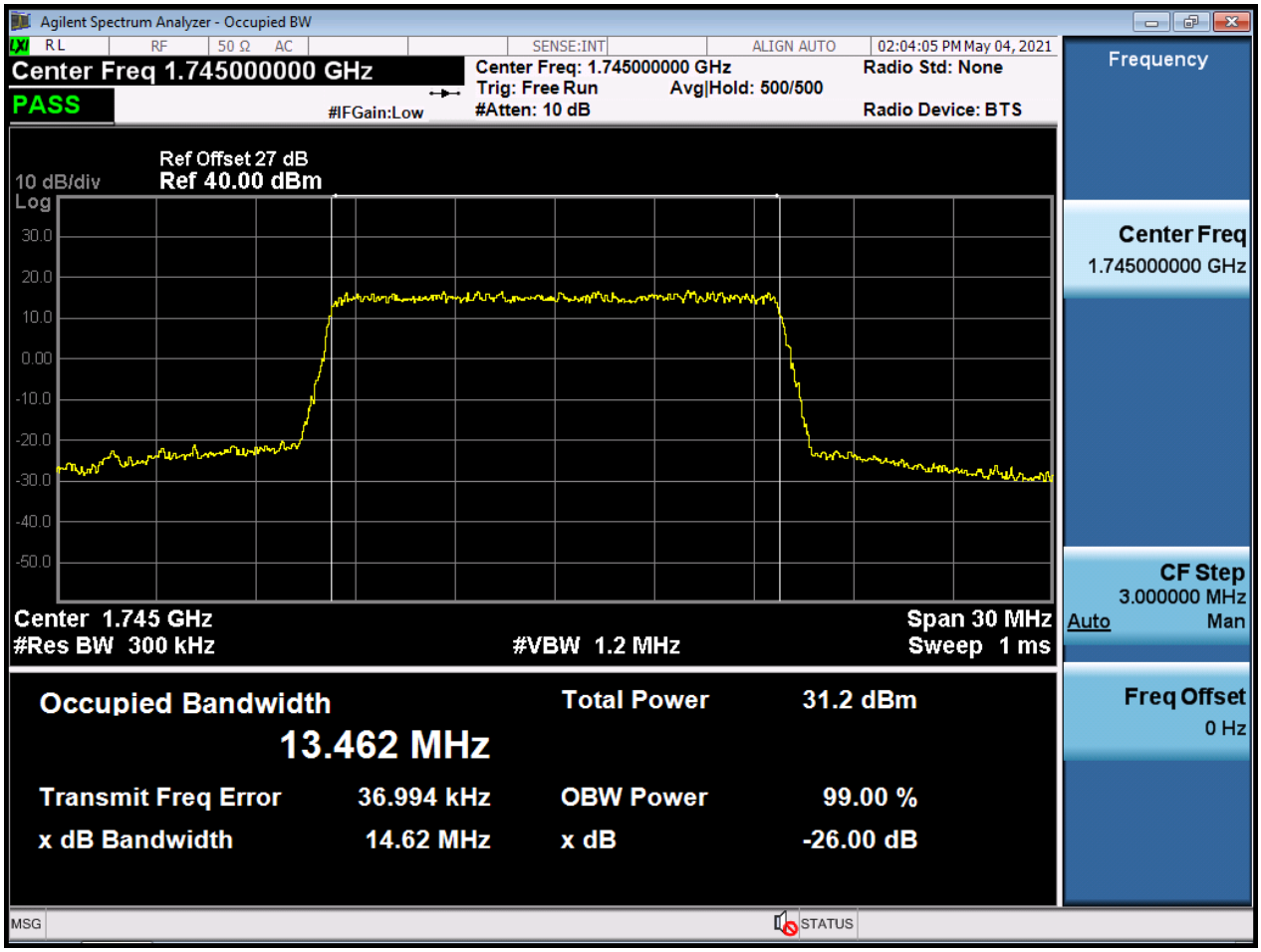
BW10M_OBW_Middle Channel_64QAM_FullRB



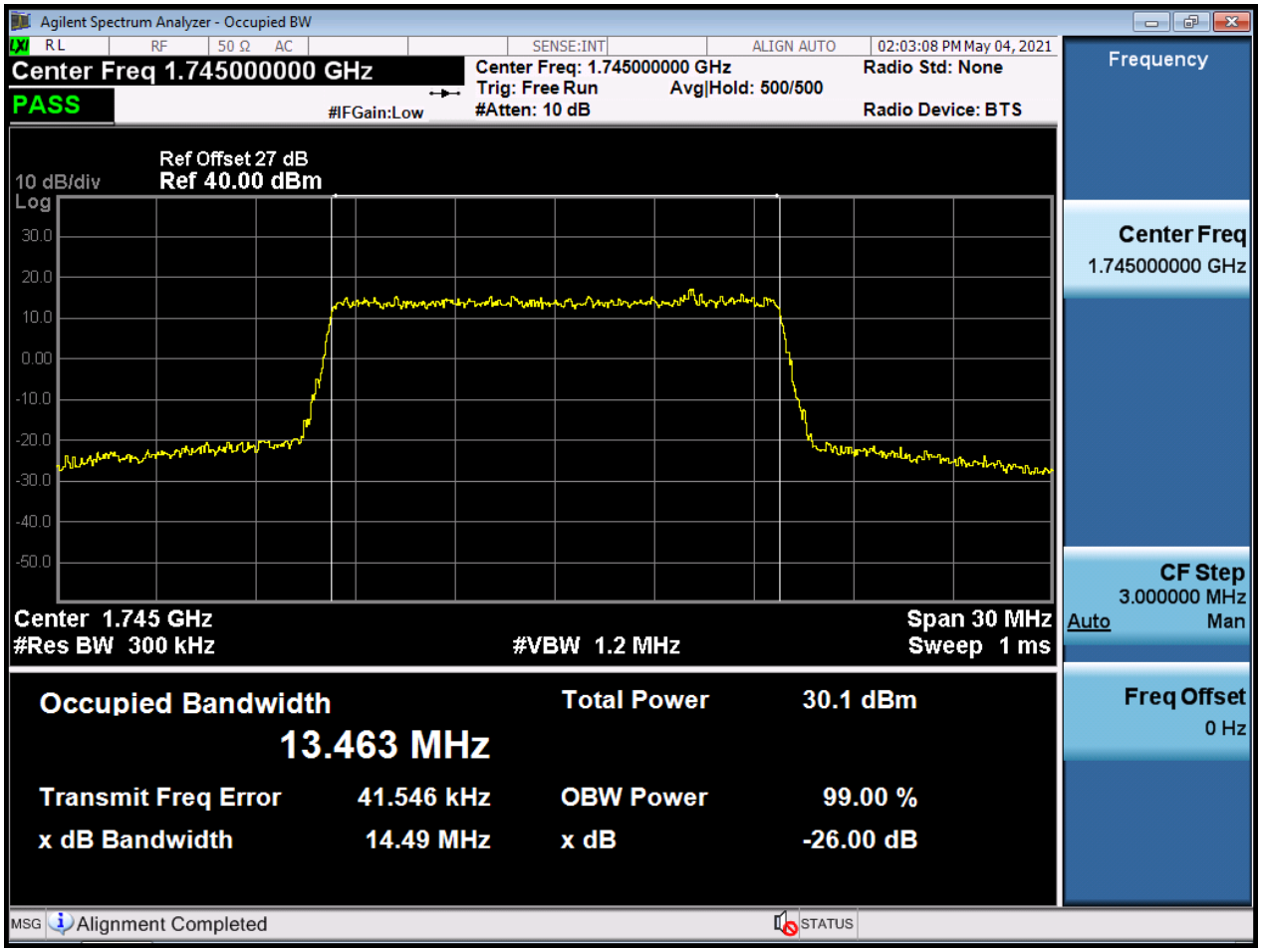
BW10M_OBW_Middle Channel_256QAM_FullRB



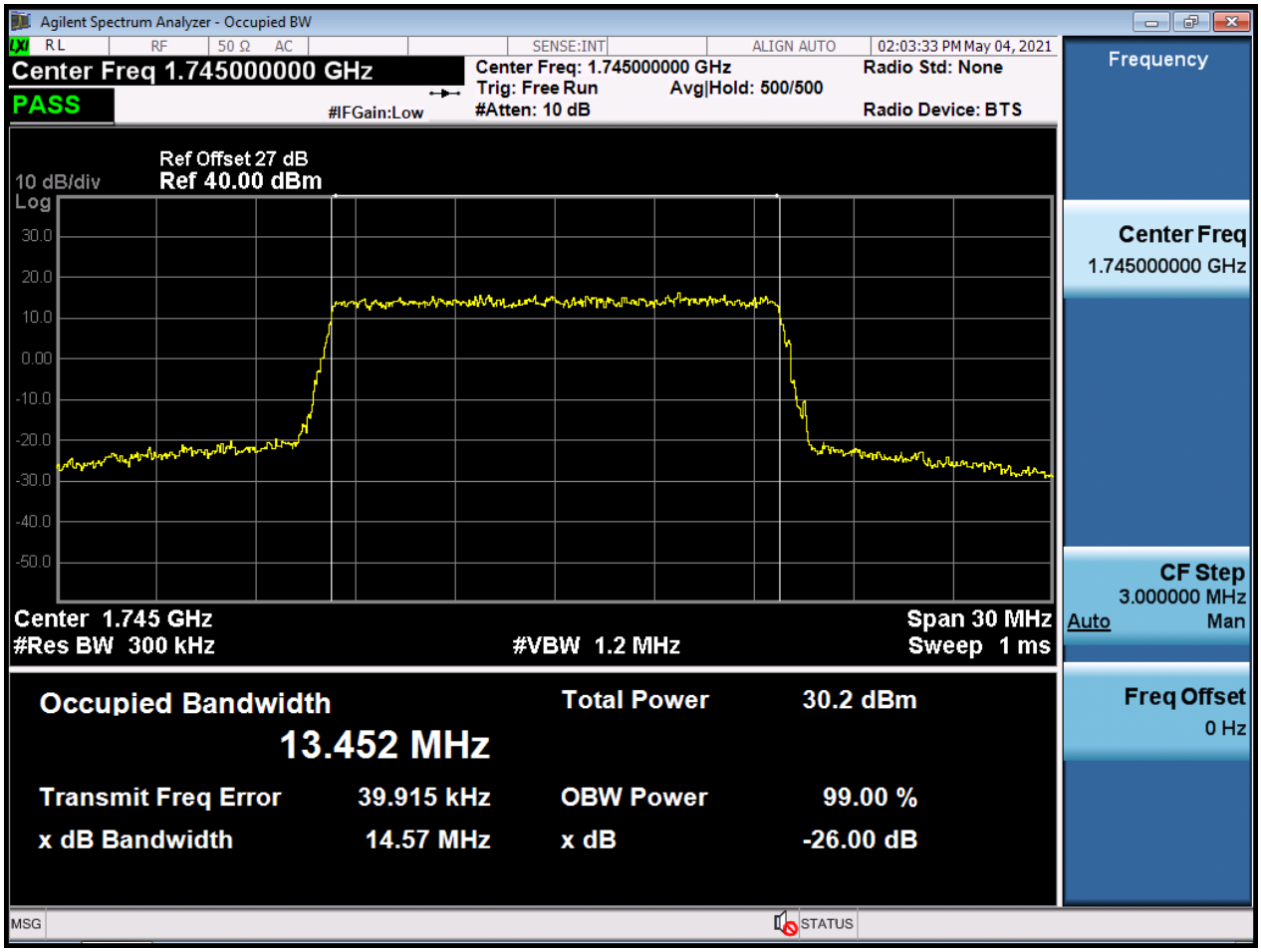
BW15M_OBW_Middle Channel_QPSK_FullRB



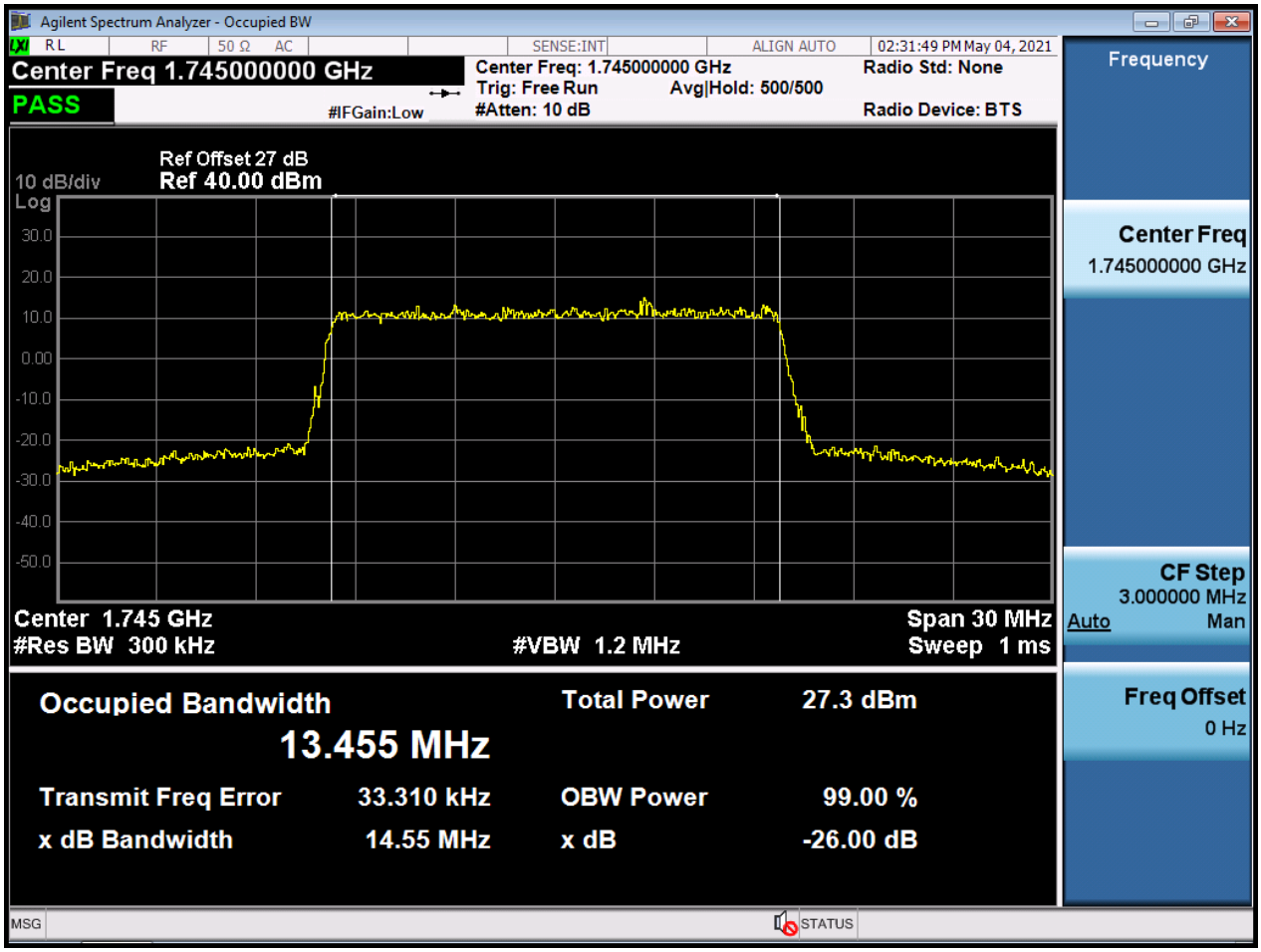
BW15M_OBW_Middle Channel_16QAM_FullRB



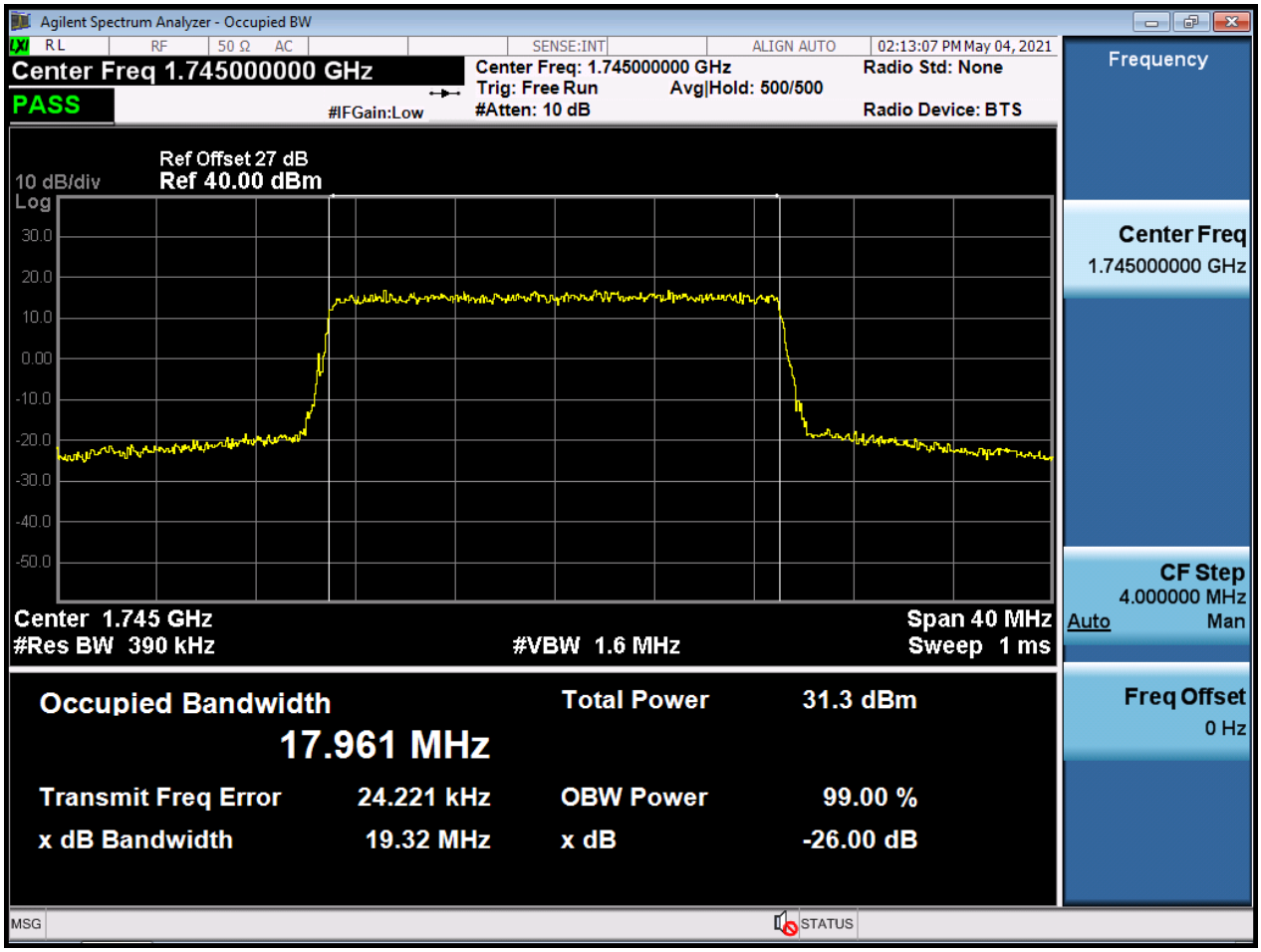
BW15M_OBW_Middle Channel_64QAM_FullRB



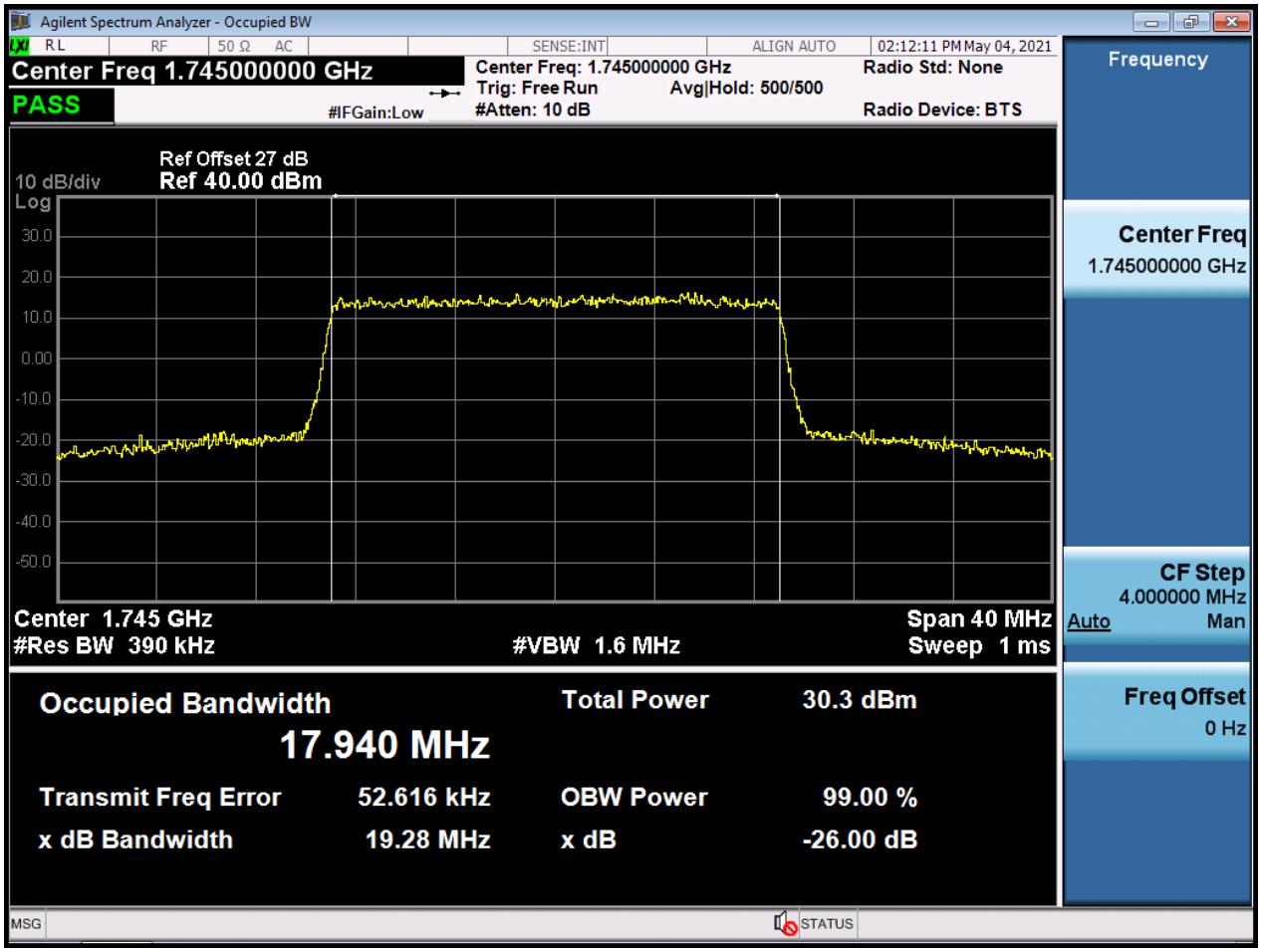
BW15M_OBW_Middle Channel_256QAM_FullRB



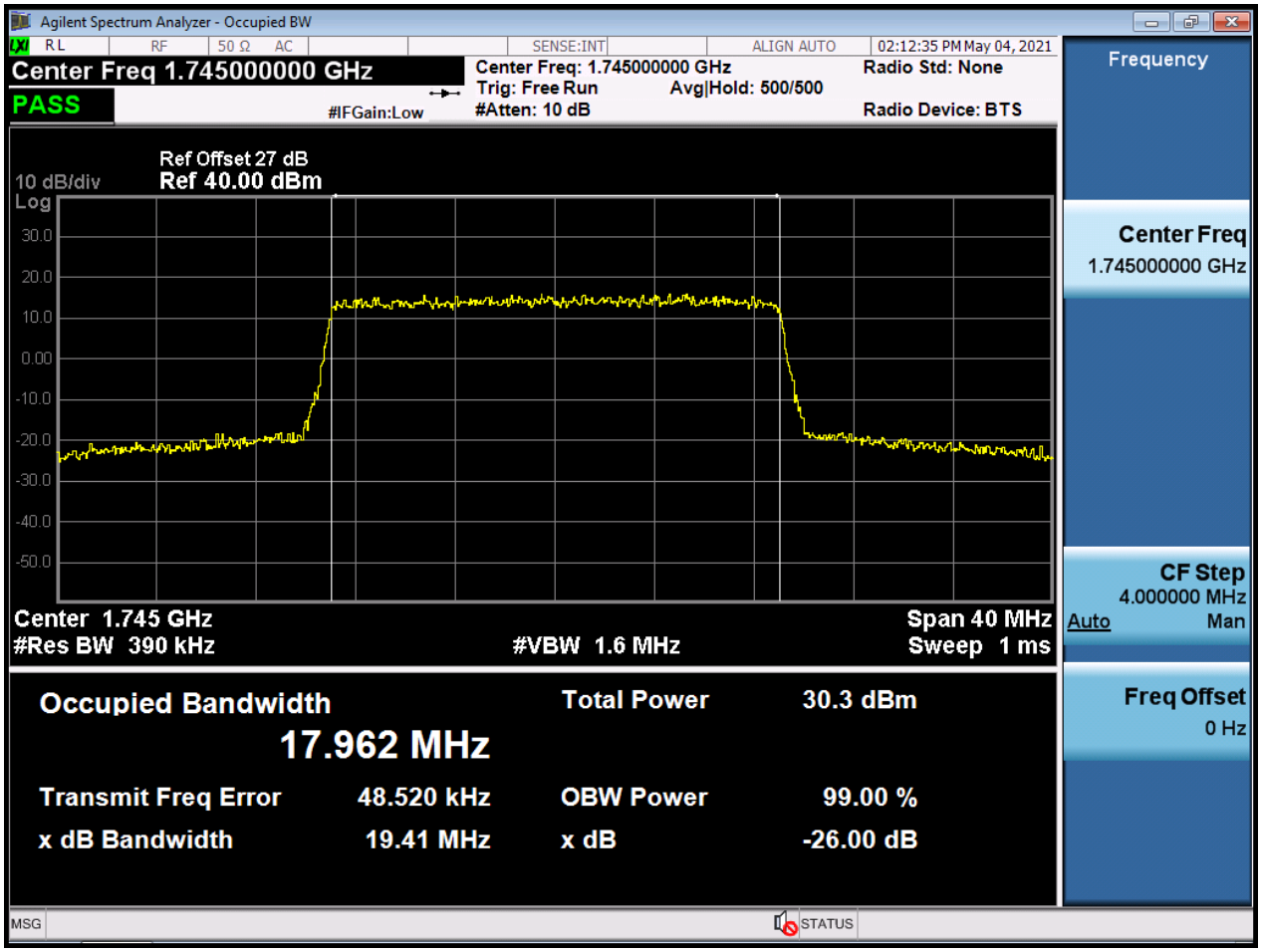
BW20M_OBW_Middle Channel_QPSK_FullRB



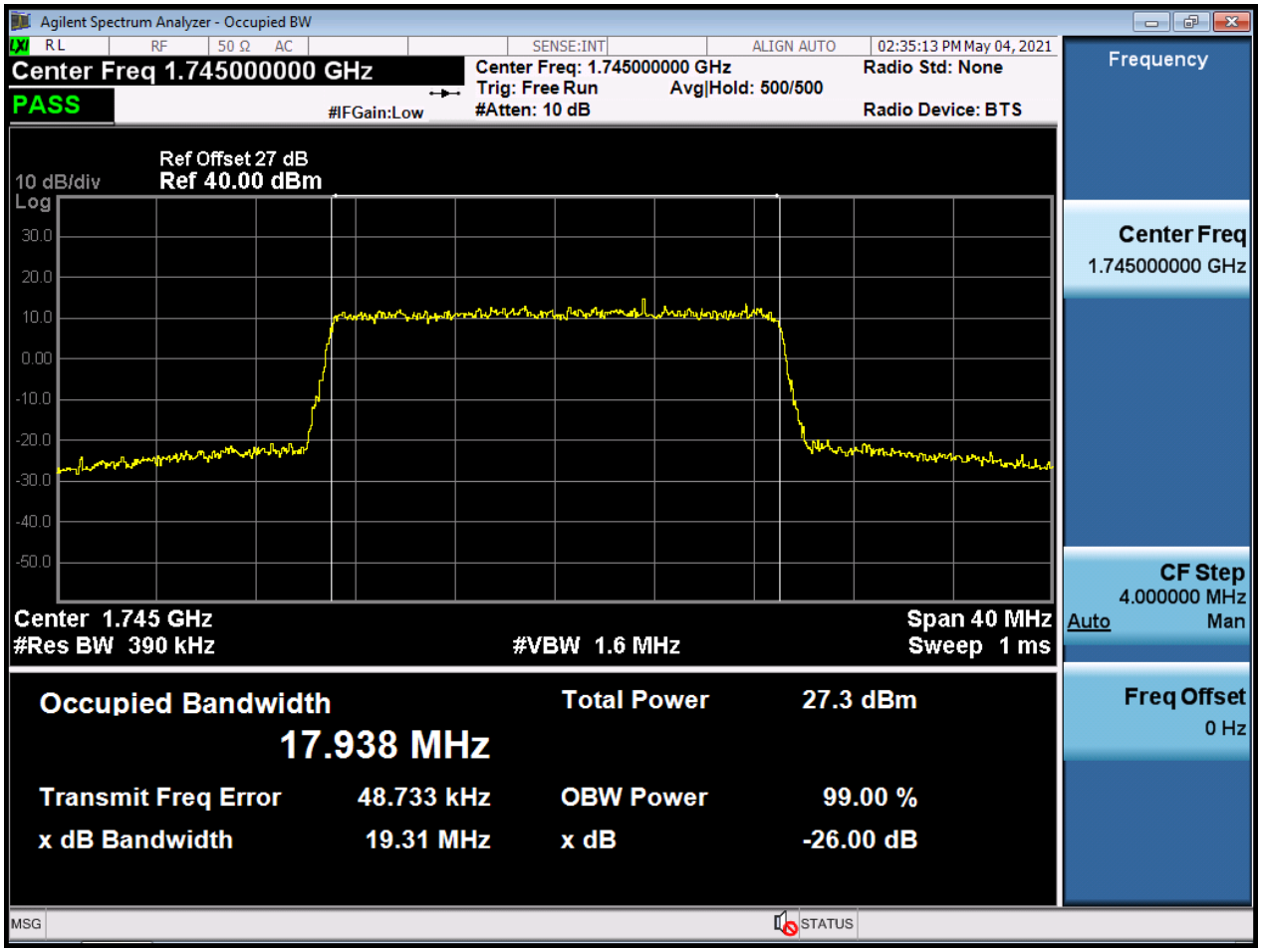
BW20M_OBW_Middle Channel_16QAM_FullRB



BW20M_OBW_Middle Channel_64QAM_FullRB

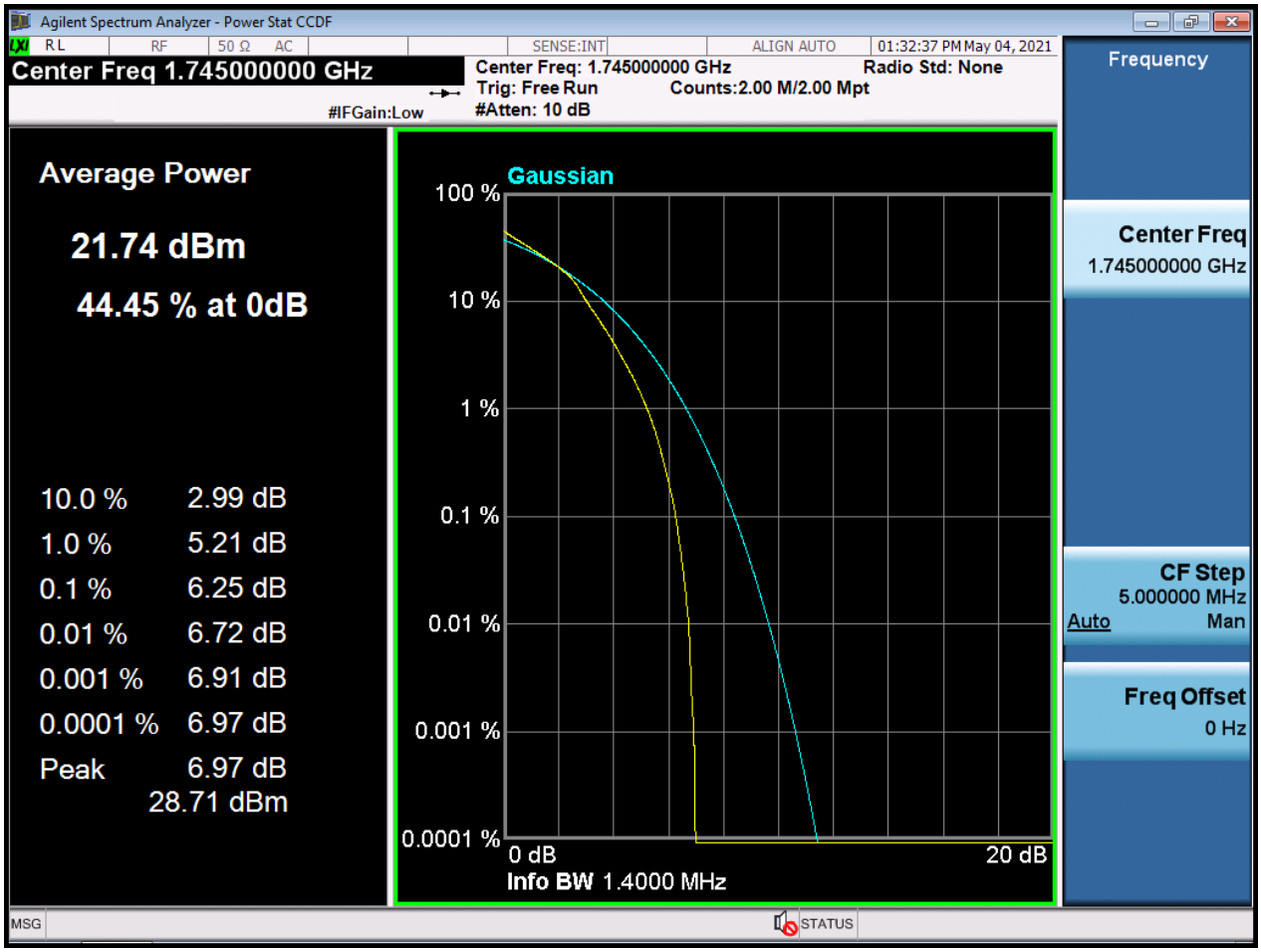


BW20M_OBW_Middle Channel_256QAM_FullRB



BW1.4M_PAR_Middle Channel_QPSK_FullRB

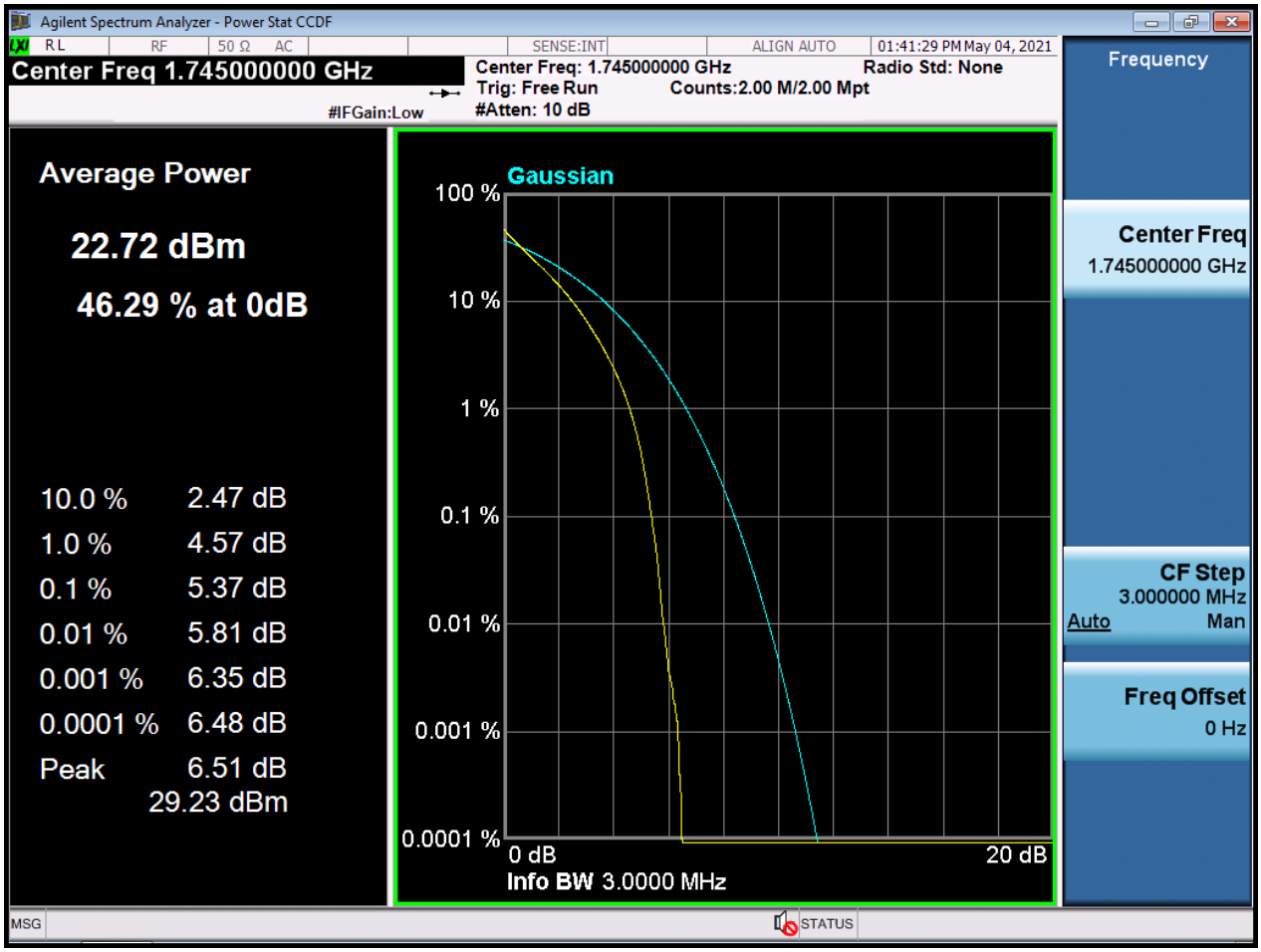
BW1.4M_PAR_Middle Channel_16QAM_FullRB



BW1.4M_PAR_Middle Channel_64QAM_FullRB

BW1.4M_PAR_Middle Channel_256QAM_FullRB

BW3M_PAR_Middle Channel_QPSK_FullRB

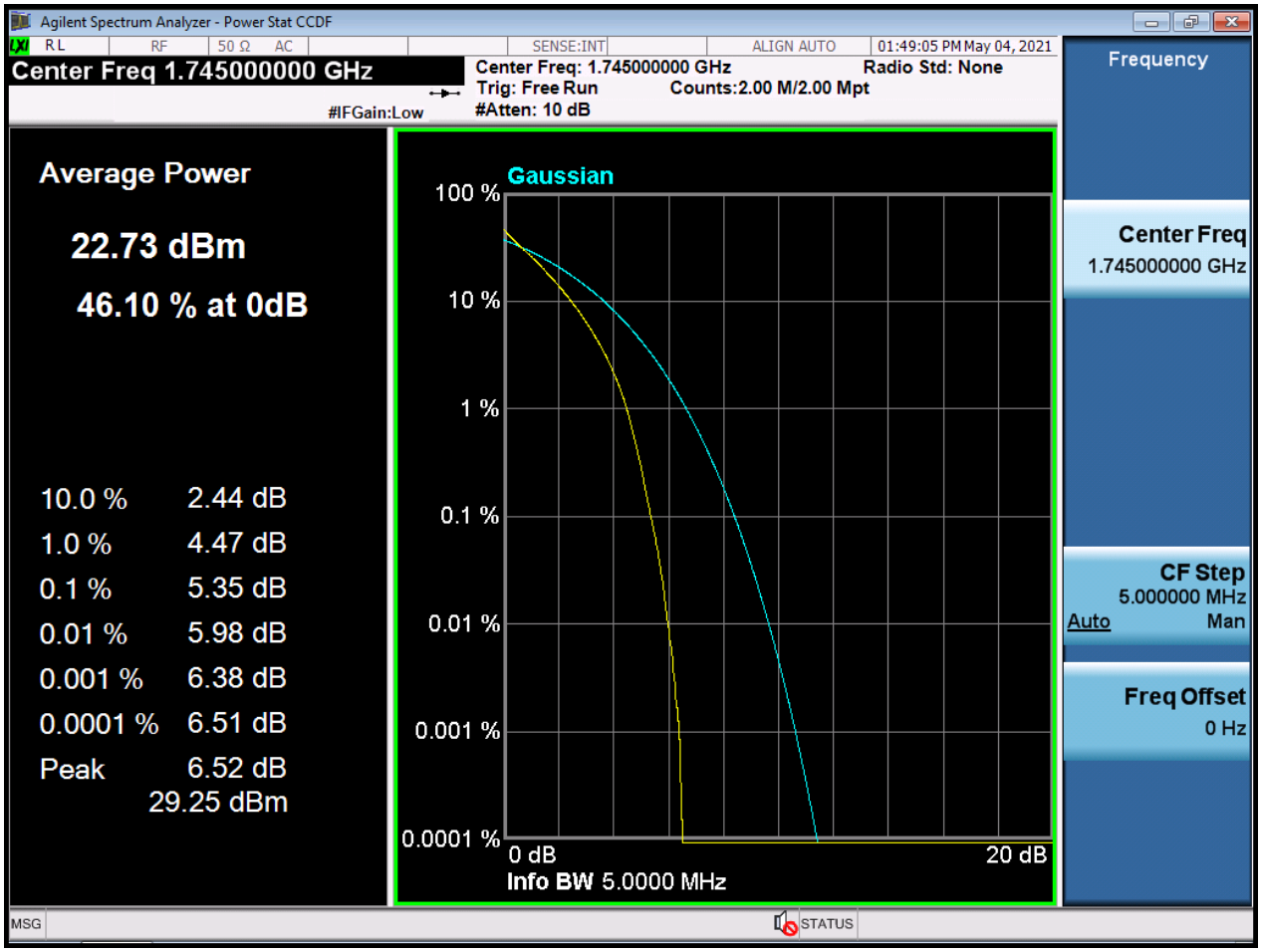


BW3M_PAR_Middle Channel_16QAM_FullRB

BW3M_PAR_Middle Channel_64QAM_FullRB

BW3M_PAR_Middle Channel_256QAM_FullRB

BW5M_PAR_Middle Channel_QPSK_FullRB

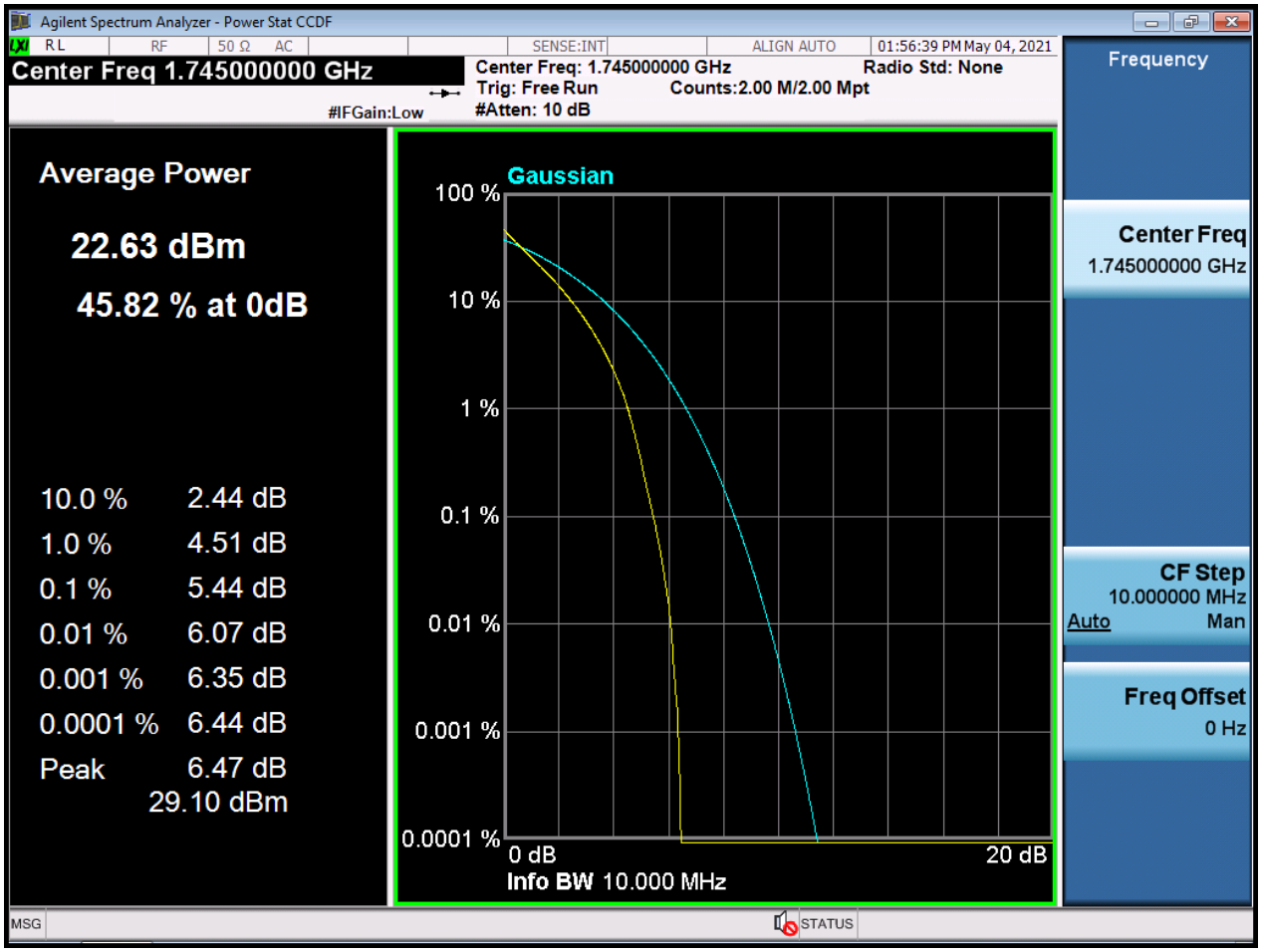


BW5M_PAR_Middle Channel_16QAM_FullRB

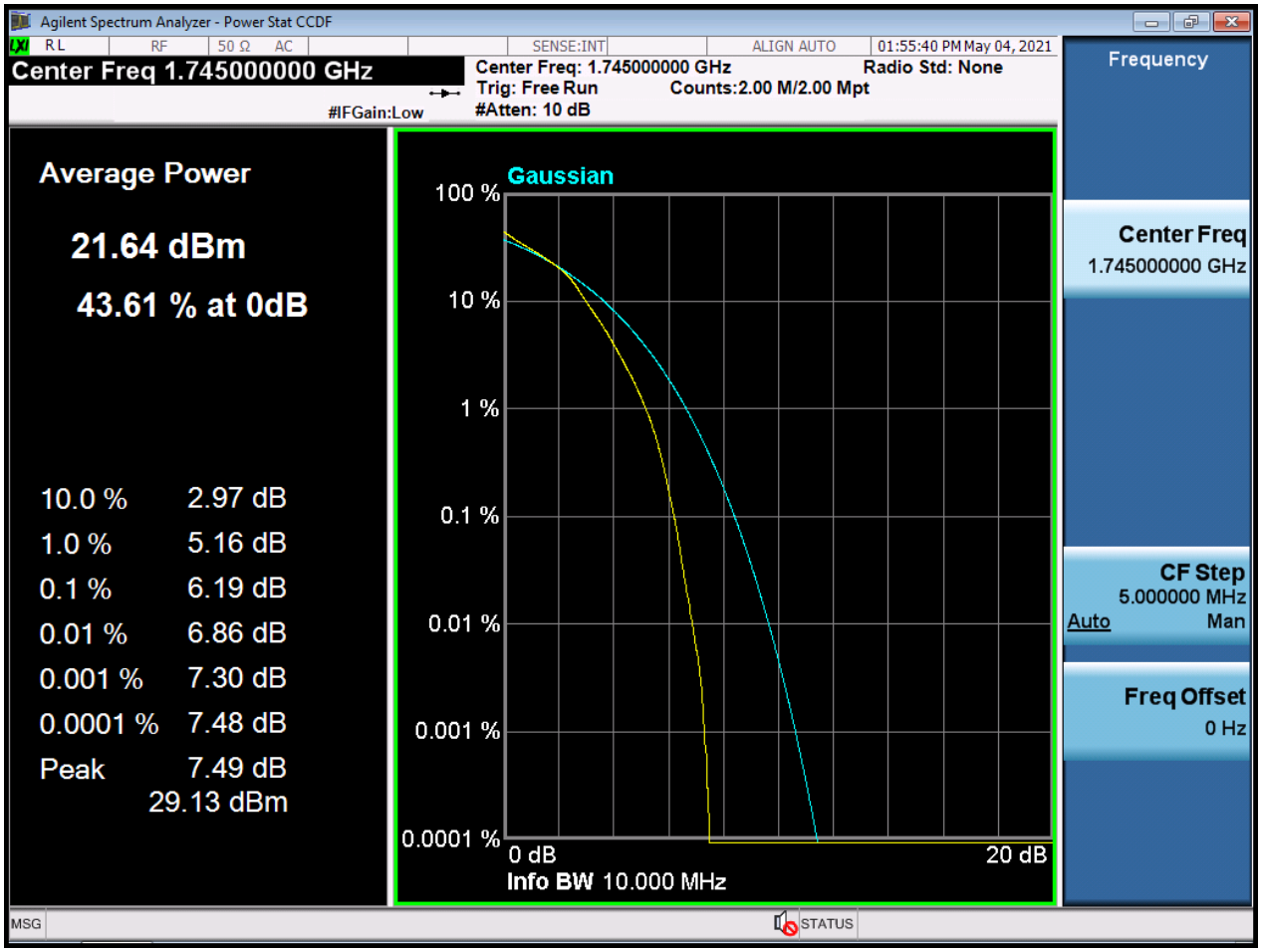
BW5M_PAR_Middle Channel_64QAM_FullRB

BW5M_PAR_Middle Channel_256QAM_FullRB

BW10M_PAR_Middle Channelz_QPSK_FullRB

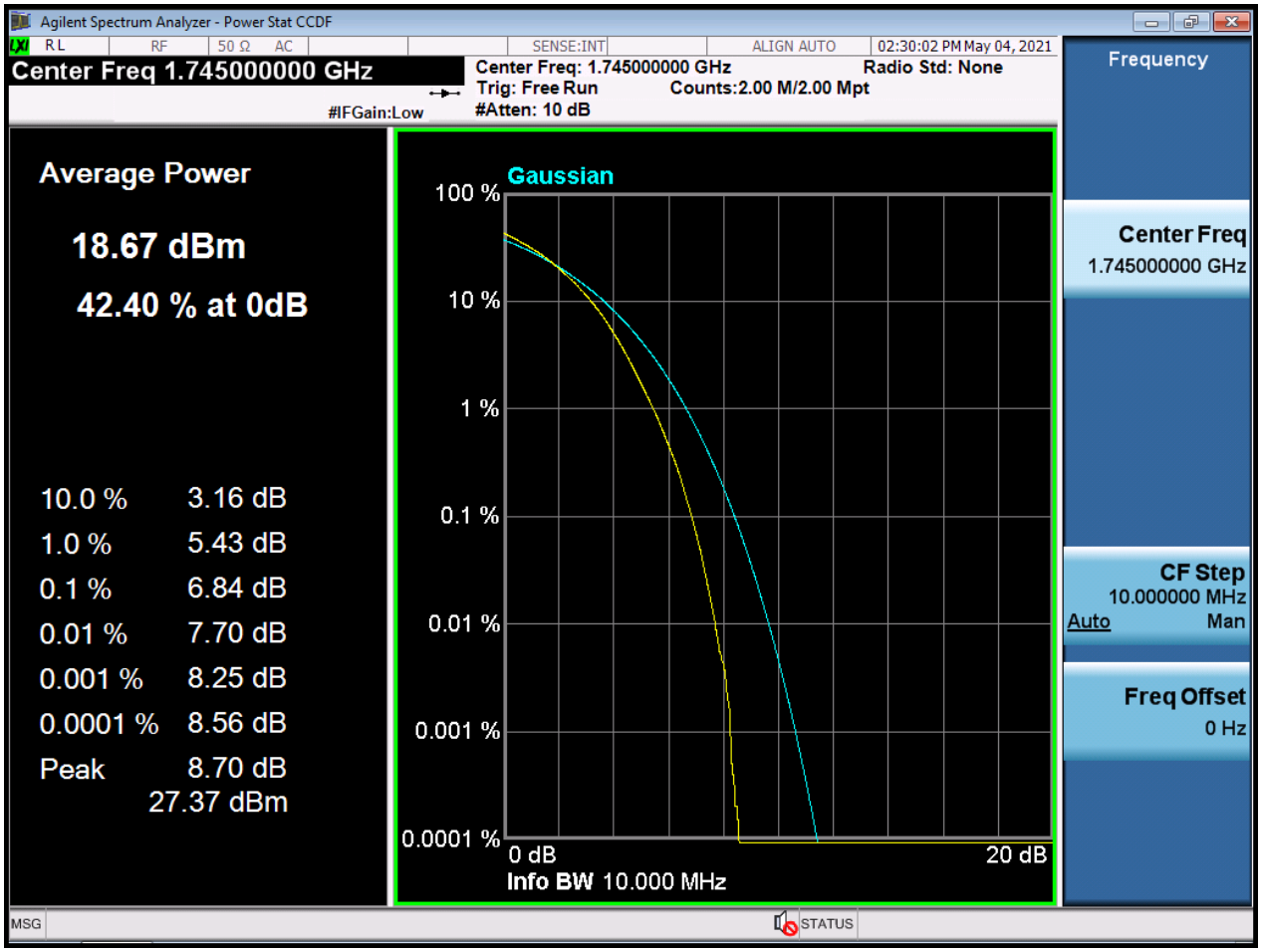


BW10M_PAR_Middle Channel_16QAM_FullRB

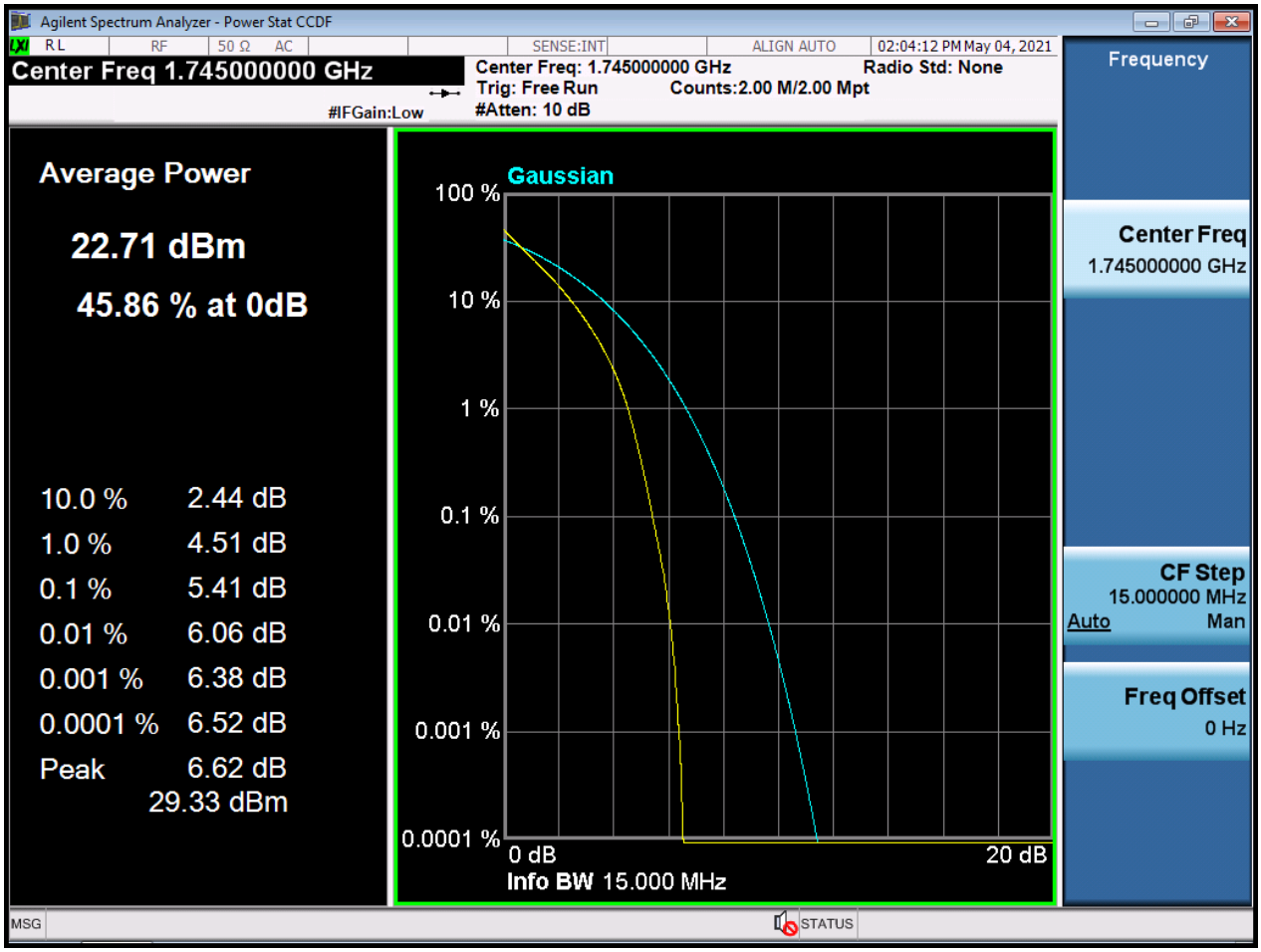


BW10M_PAR_Middle Channel_64QAM_FullRB

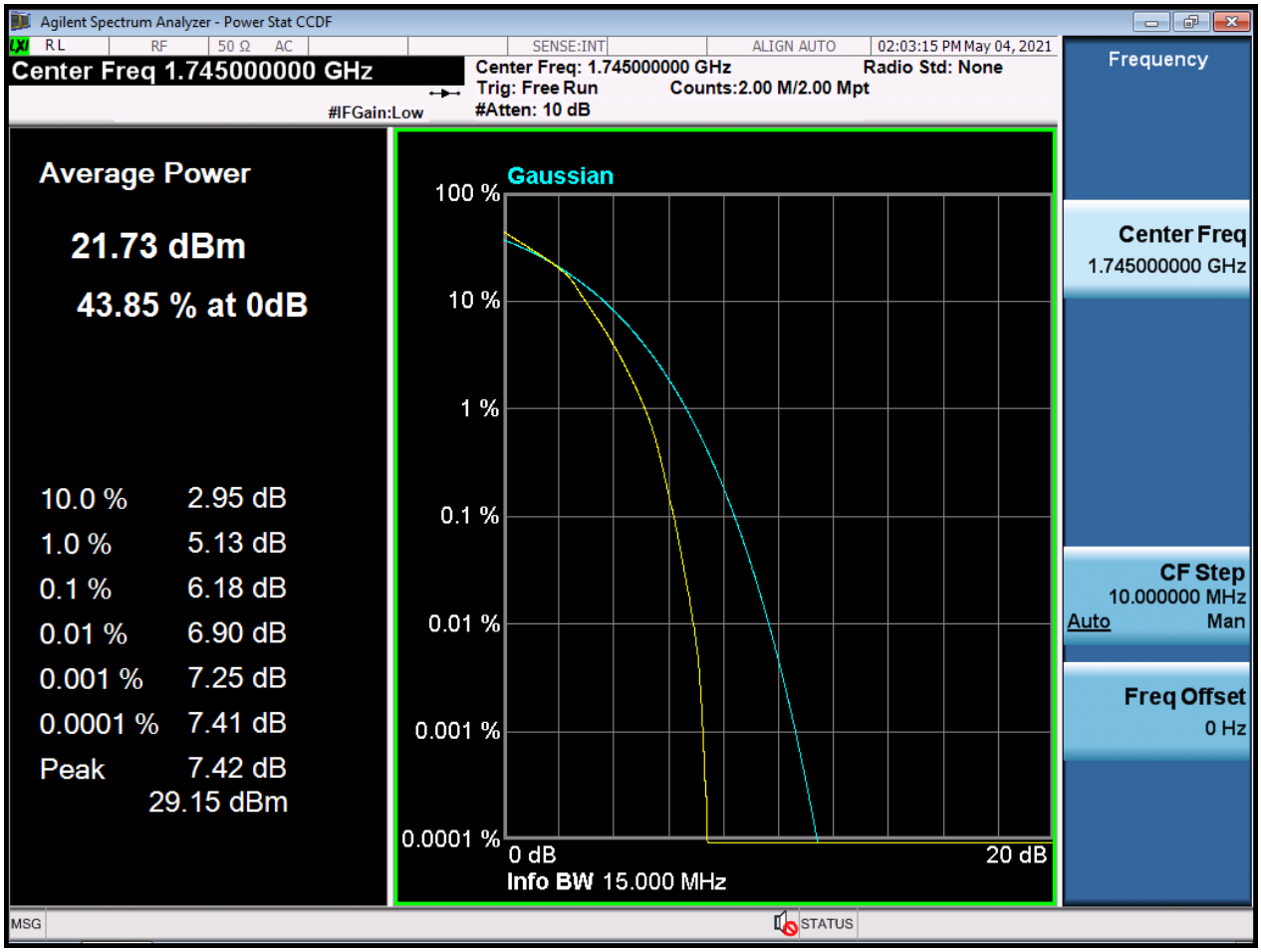
BW10M_PAR_Middle Channel_256QAM_FullRB



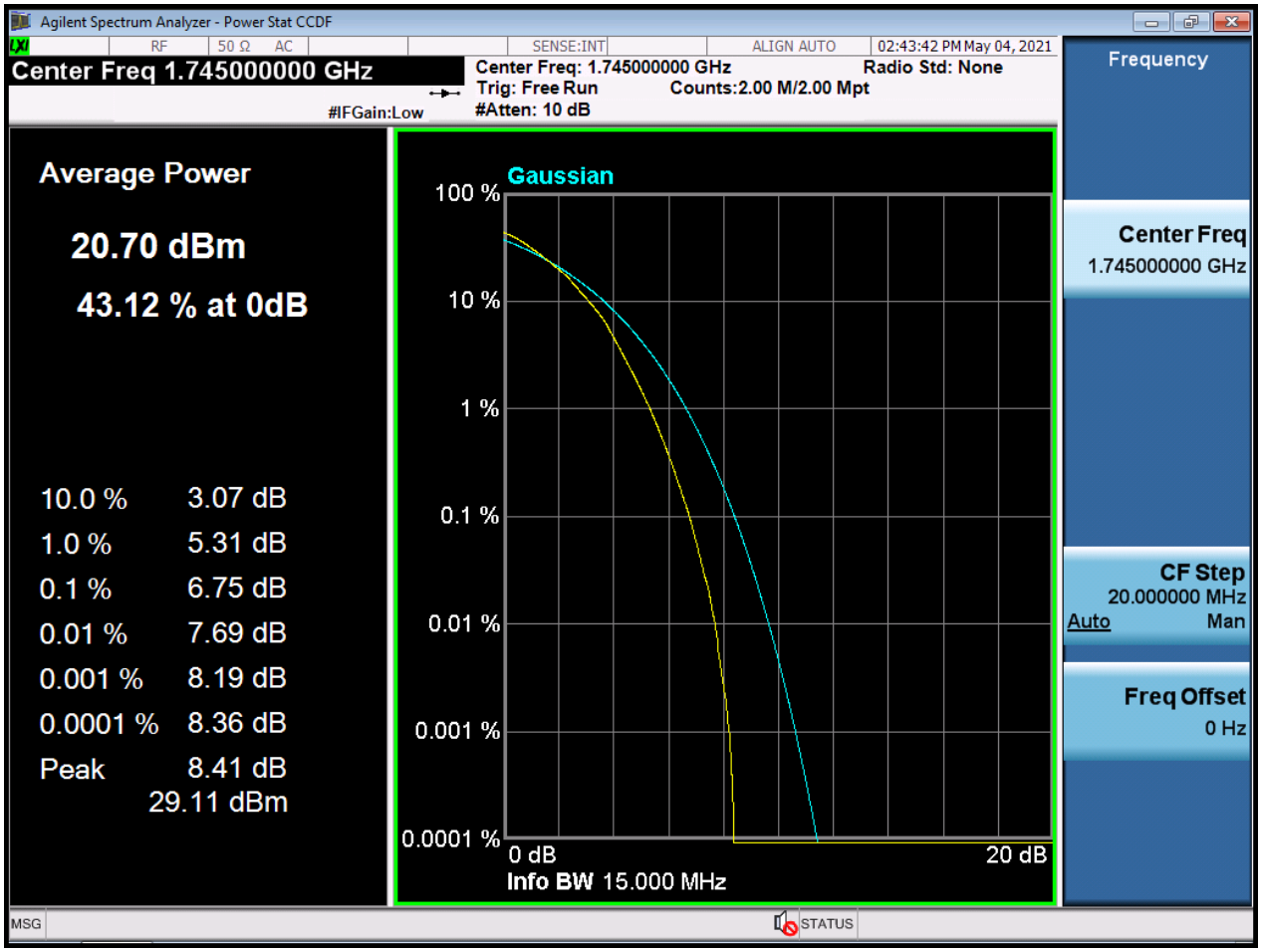
BW15M_PAR_Middle Channel_QPSK_FullRB



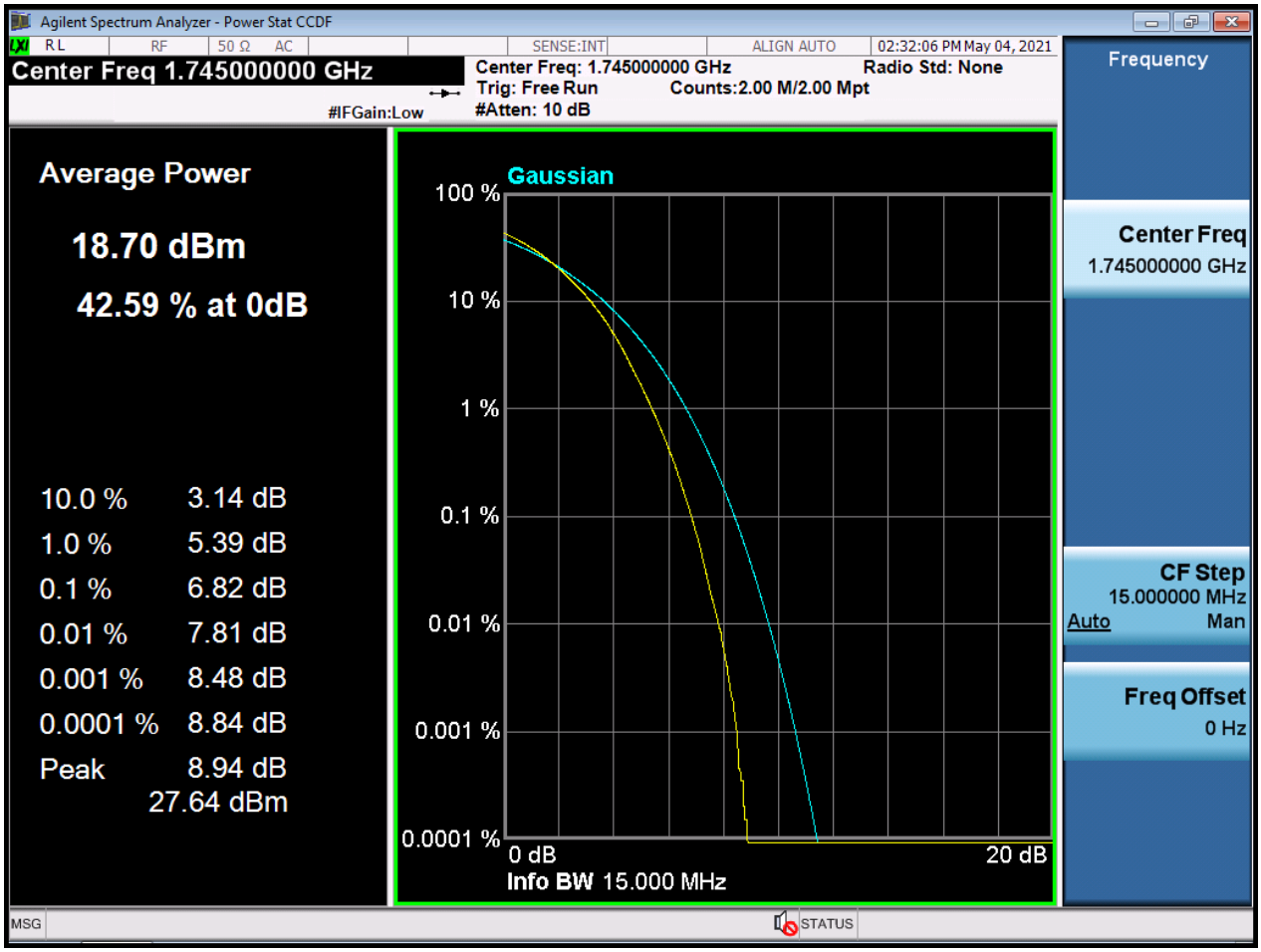
BW15M_PAR_Middle Channel_16QAM_FullRB



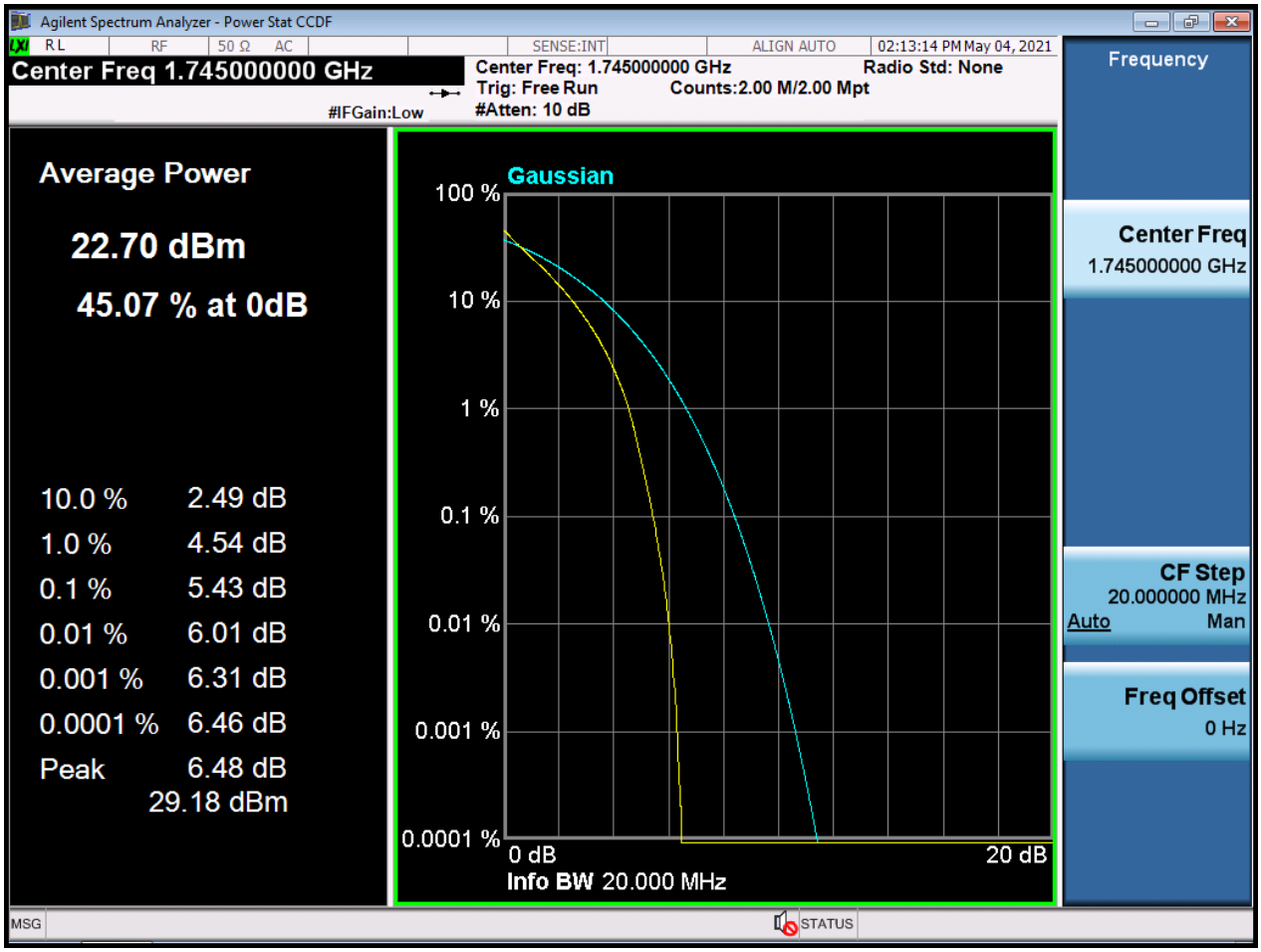
BW15M_PAR_Middle Channel_64QAM_FullRB



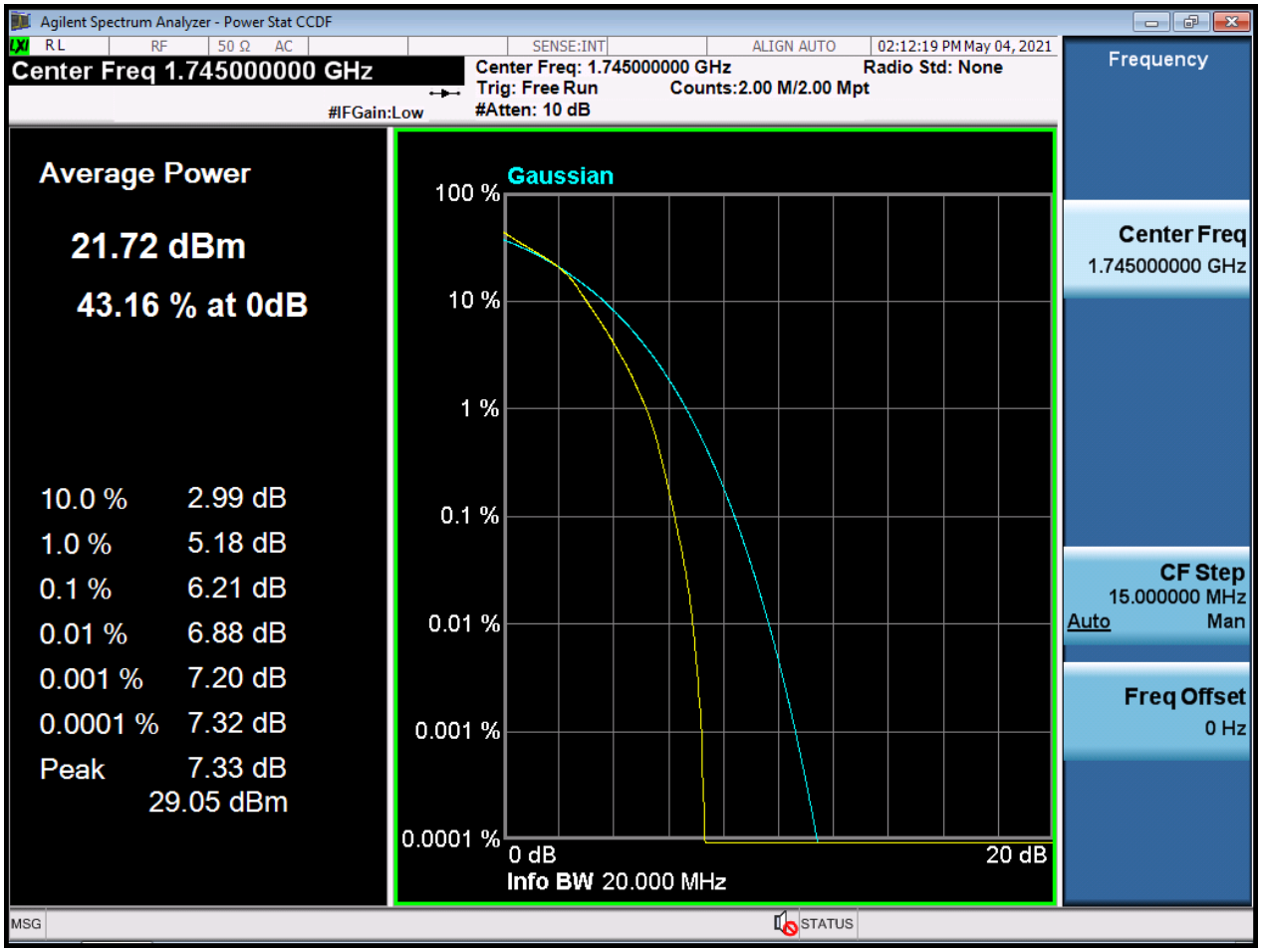
BW15M_PAR_Middle Channel_256QAM_FullRB



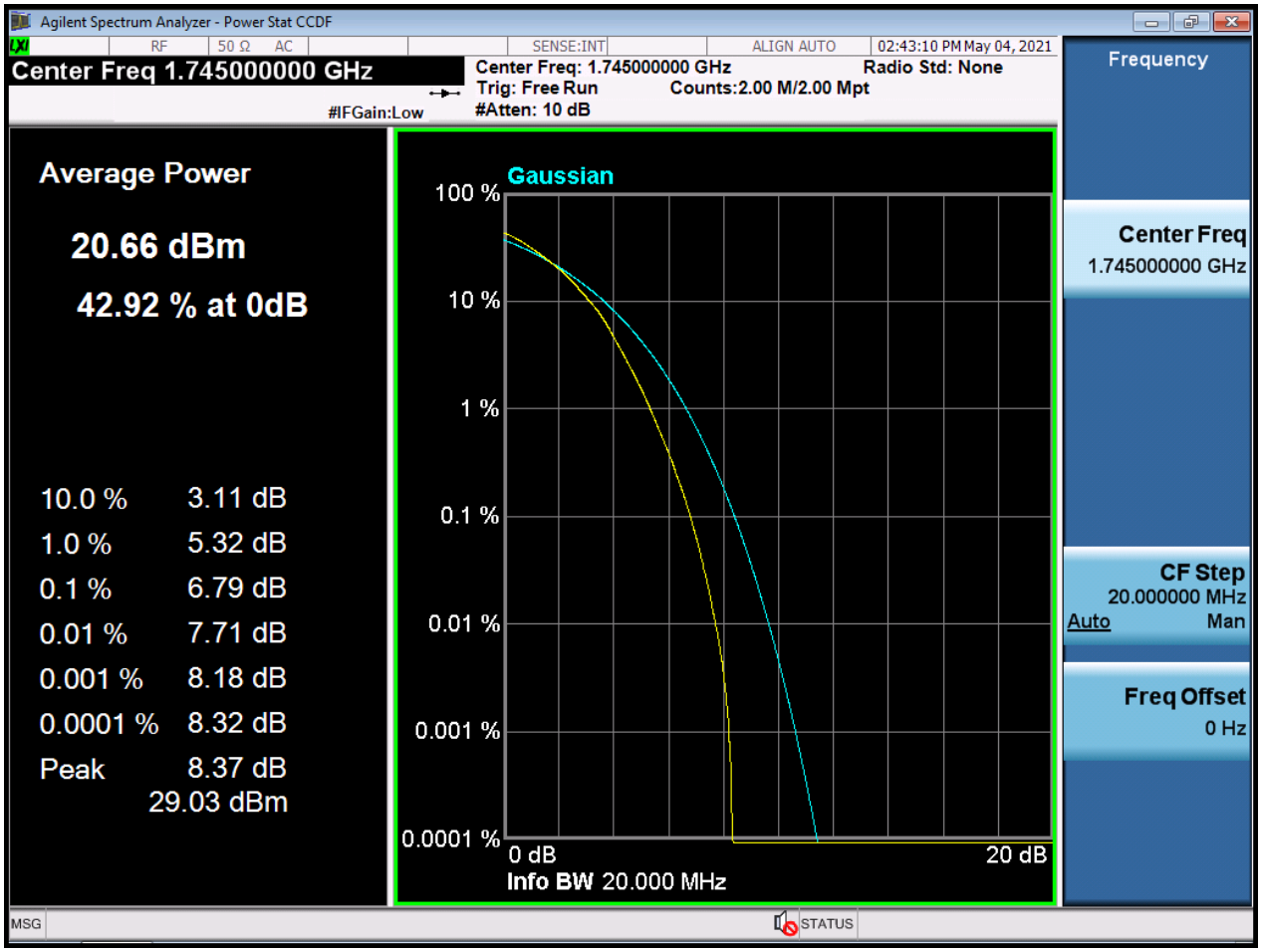
BW20M_PAR_Middle Channel_QPSK_FullRB



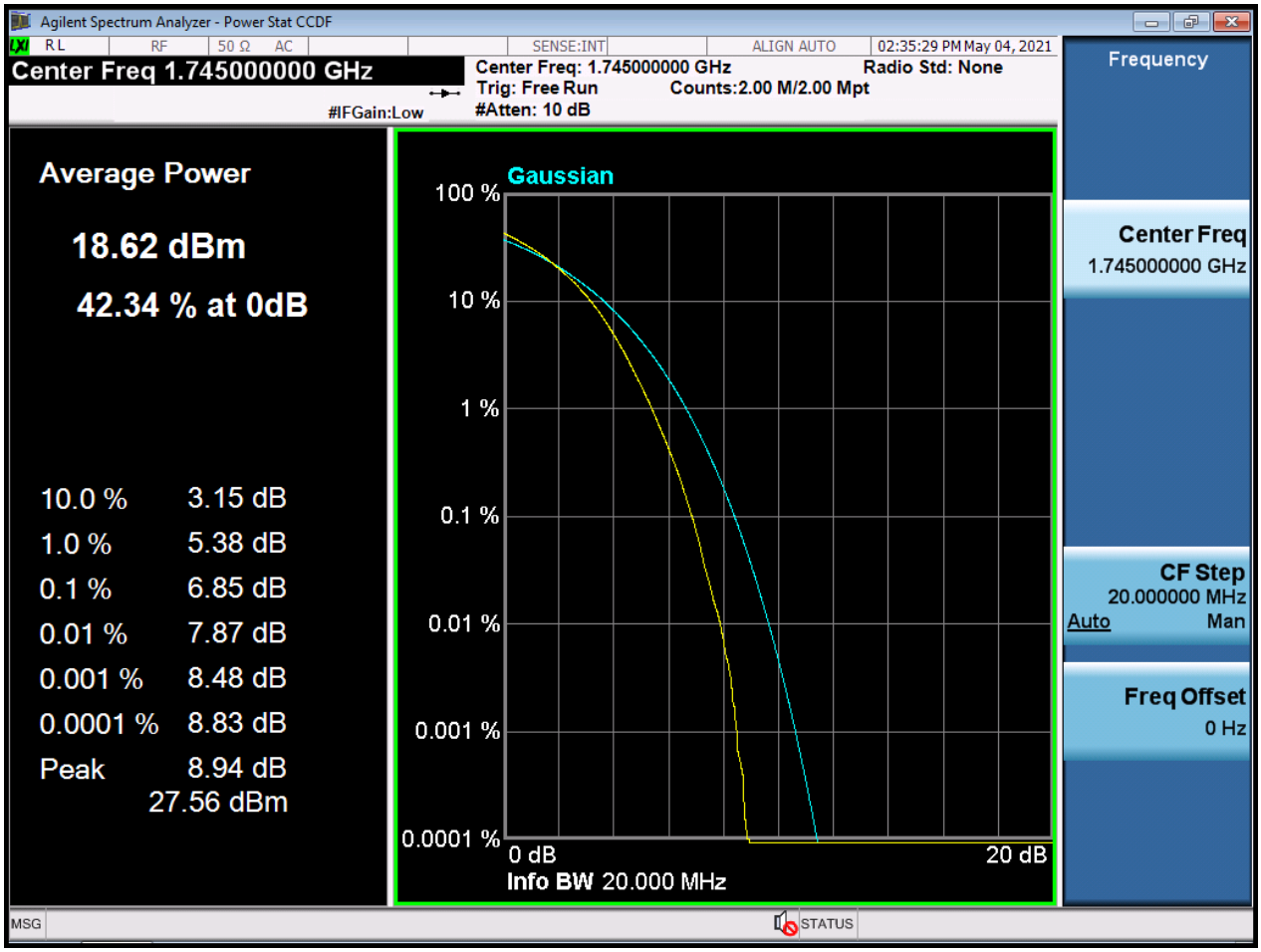
BW20M_PAR_Middle Channel_16QAM_FullRB



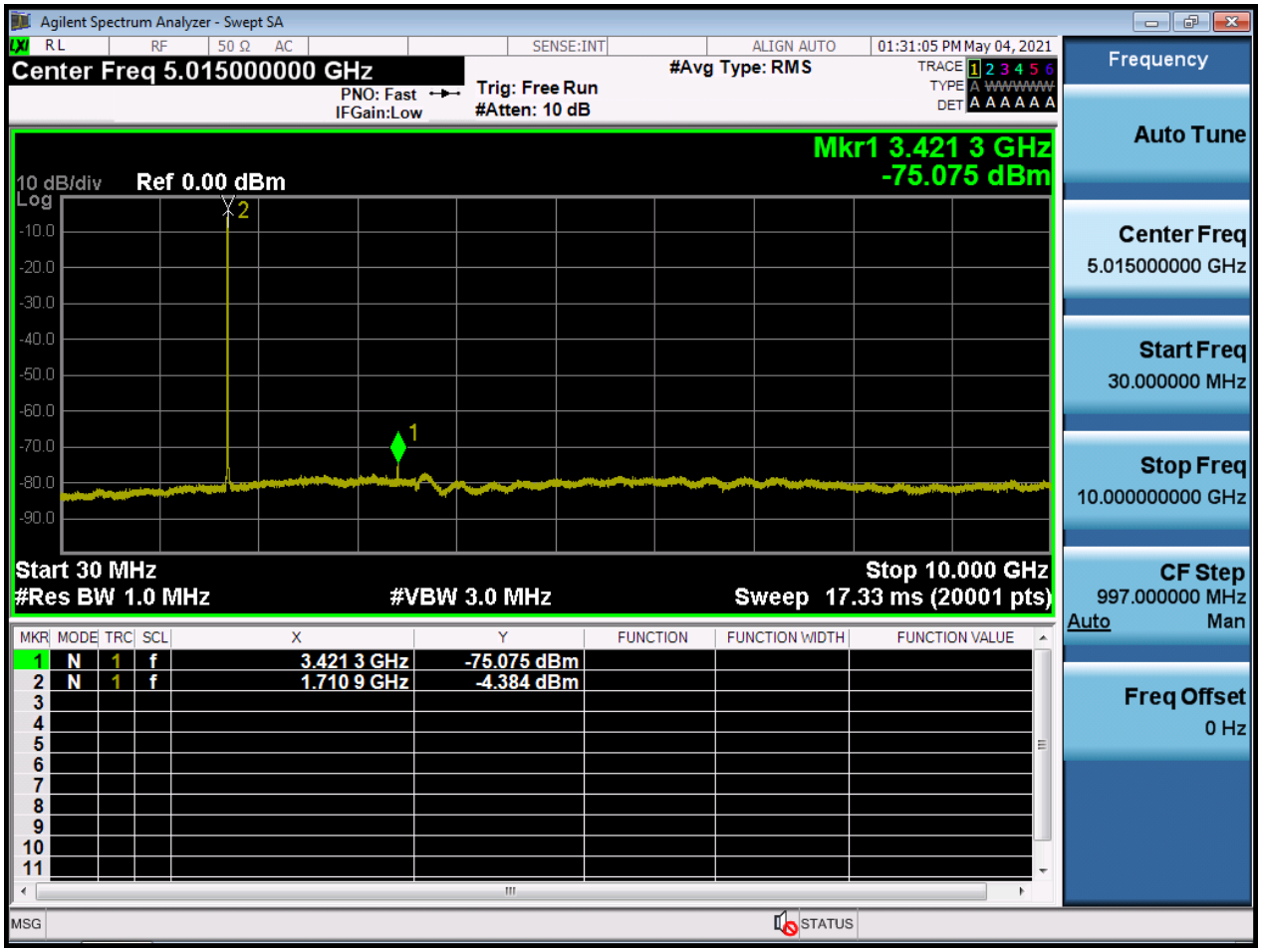
BW20M_PAR_Middle Channel_64QAM_FullRB



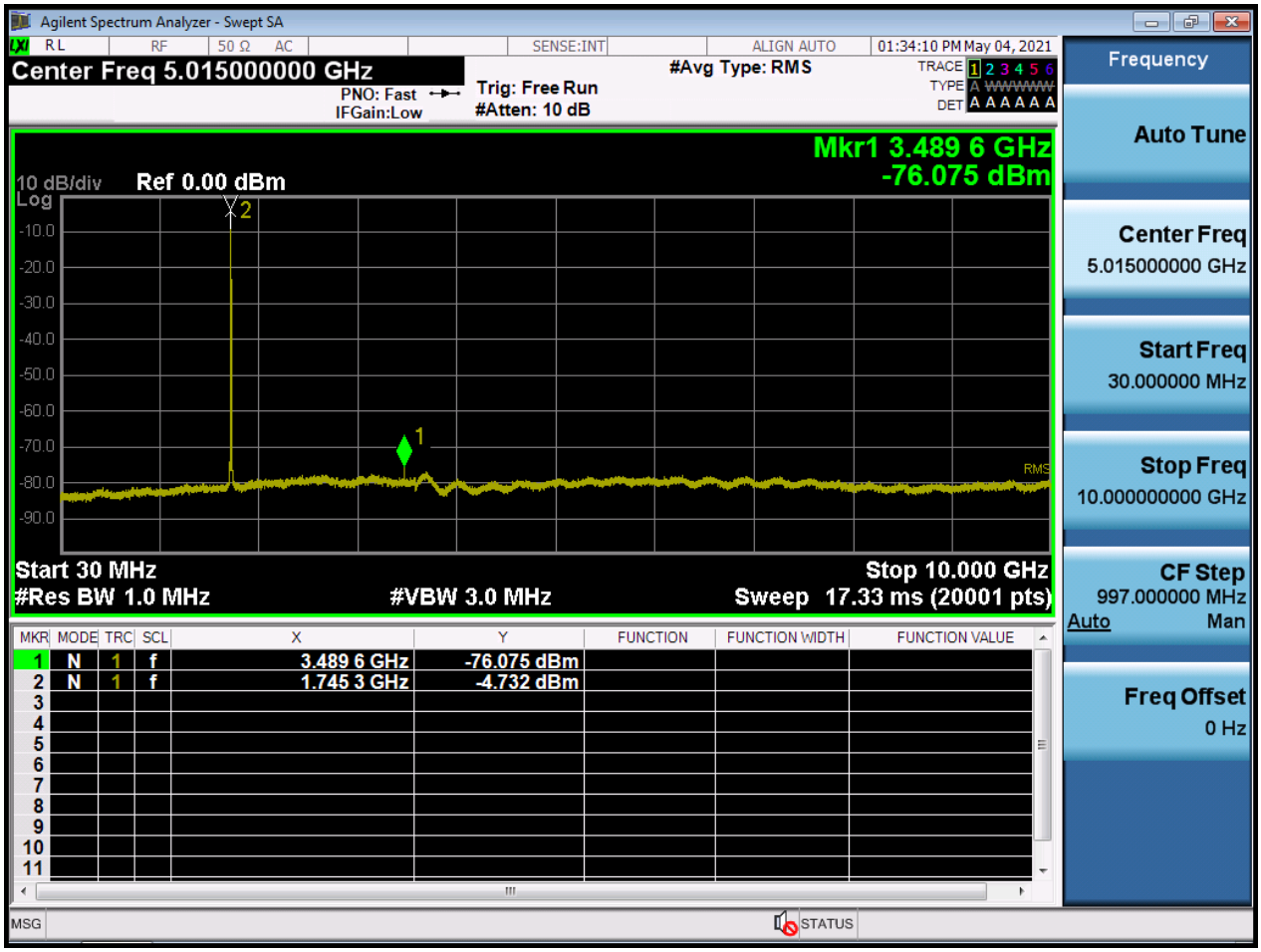
BW20M_PAR_Middle Channel_256QAM_FullRB



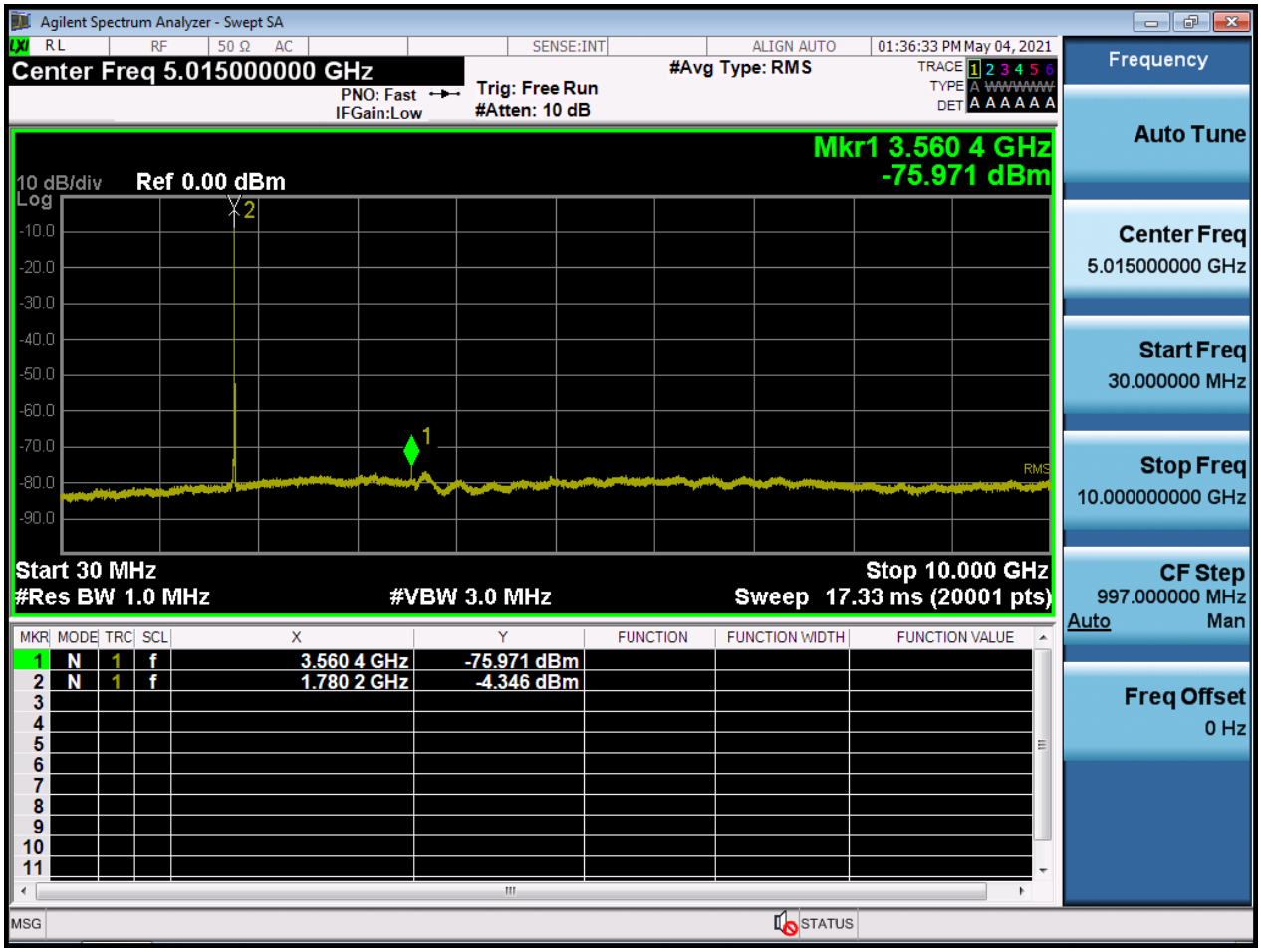
BW1.4M_CSE(30M-10G)_Lowest Channel_QPSK_1RB



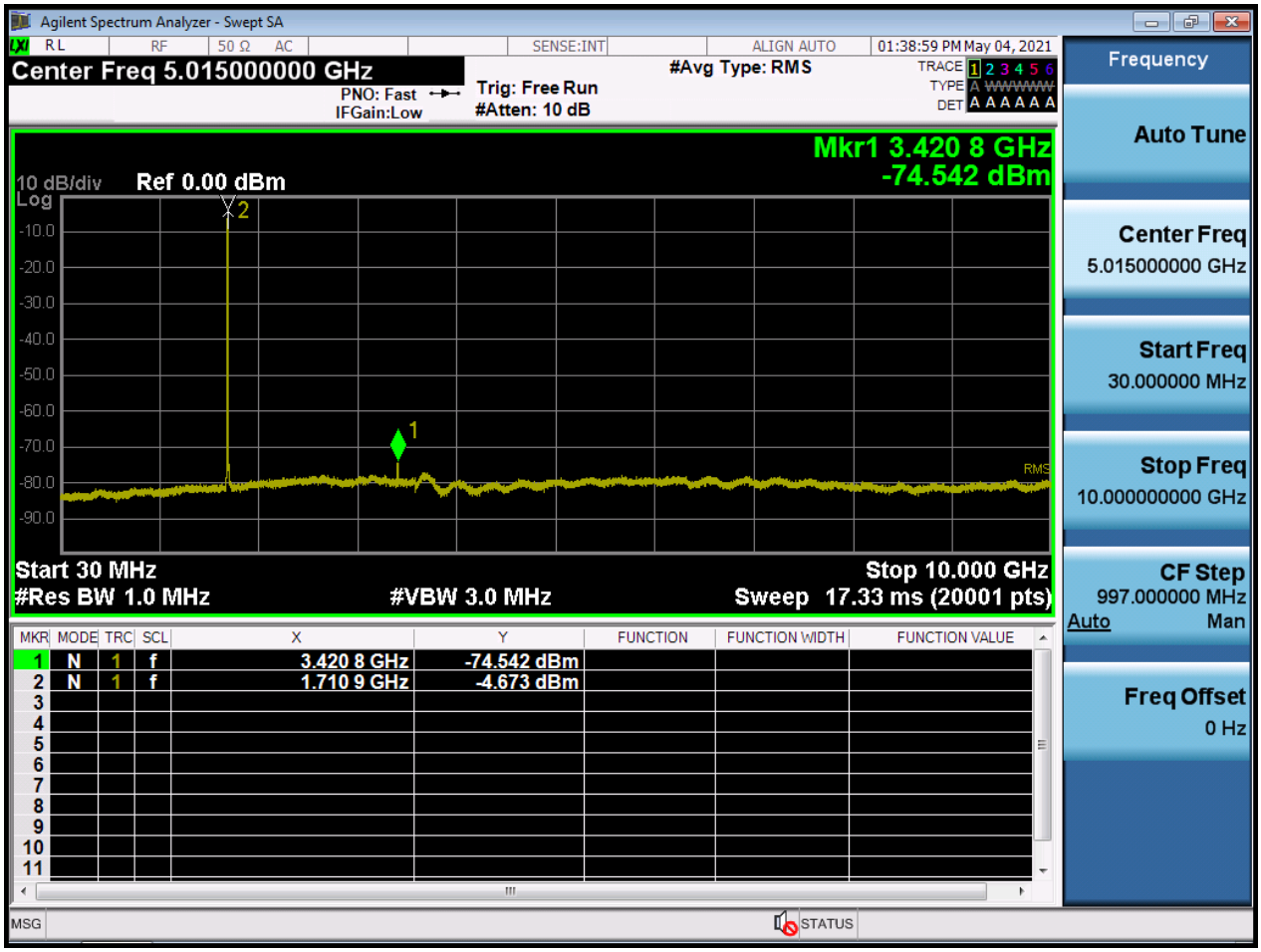
BW1.4M_CSE(30M-10G)_Middle Channel_QPSK_1RB



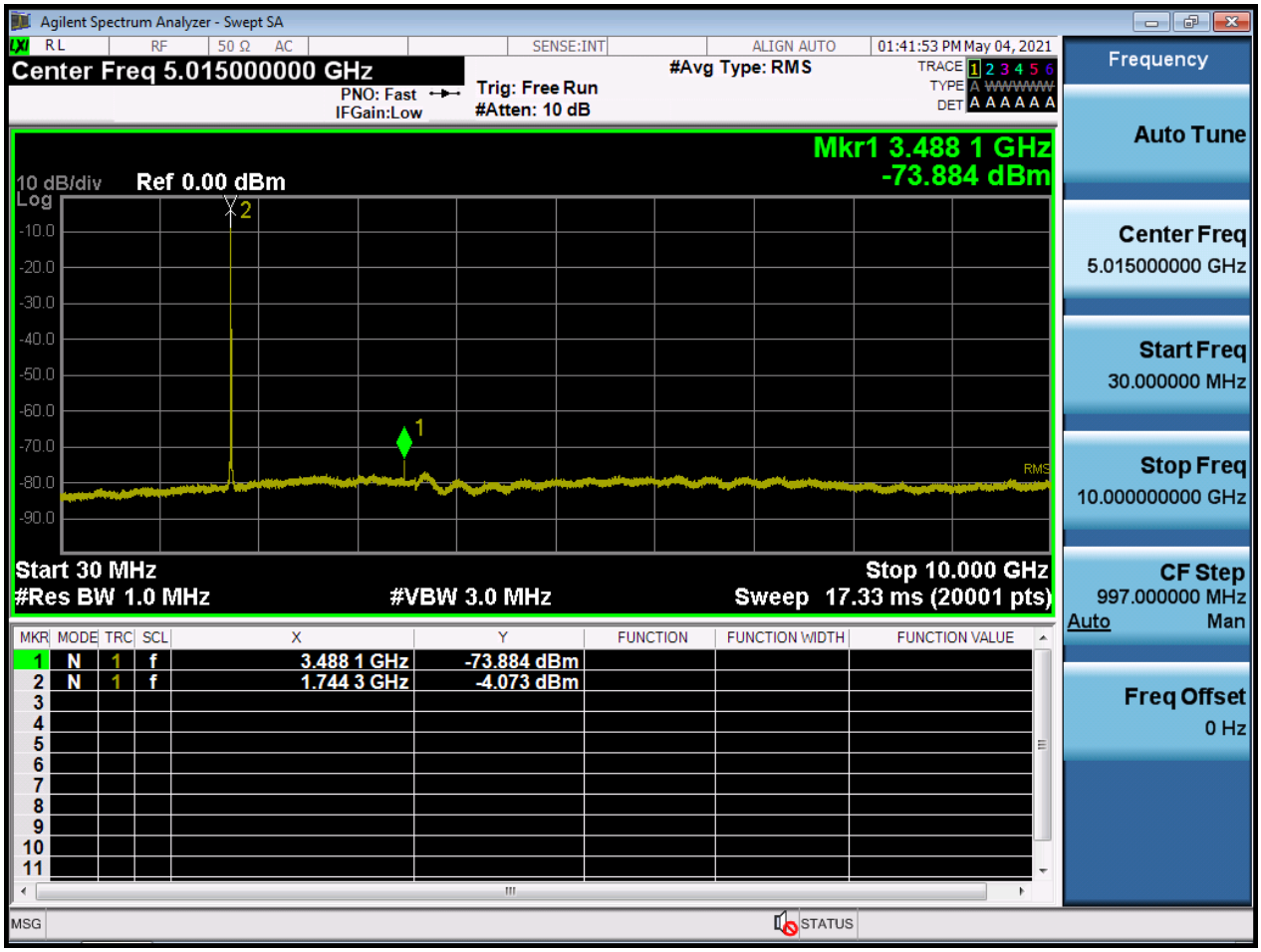
BW1.4M_CSE(30M-10G)_Highest Channel_QPSK_1RB



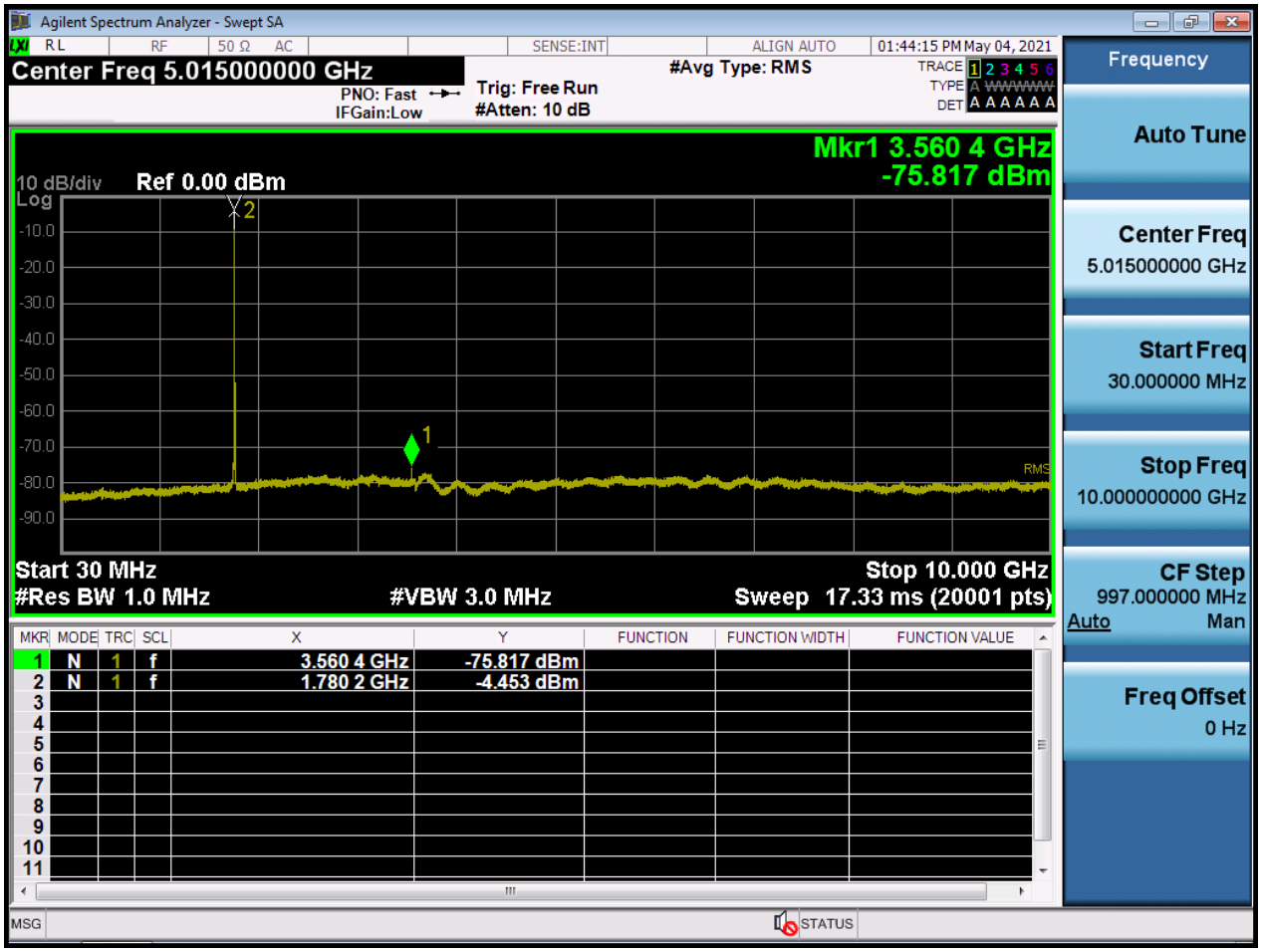
BW3M_CSE(30M-10G)_Lowest Channel_QPSK_1RB



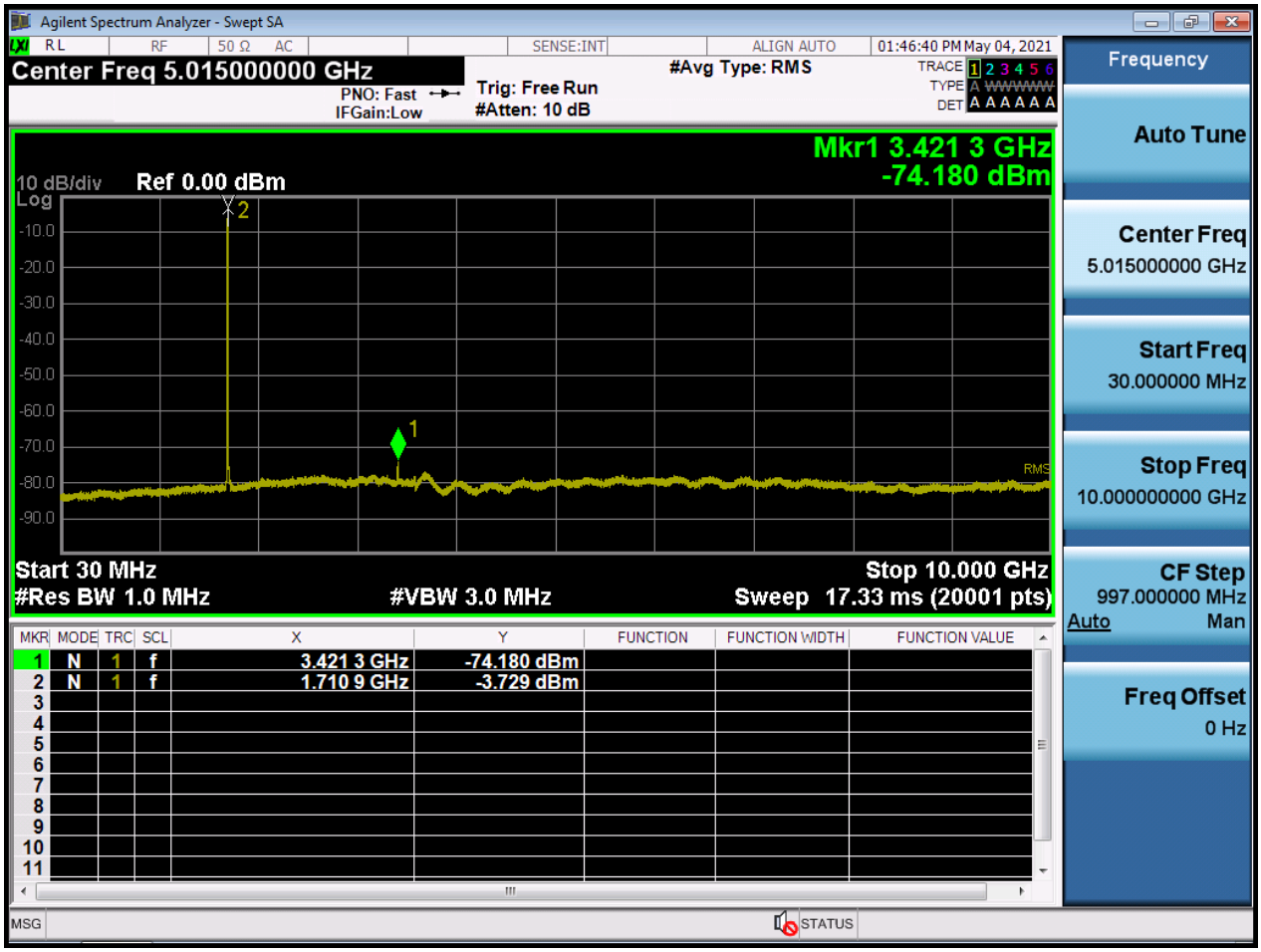
BW3M_CSE(30M-10G)_Middle Channel_QPSK_1RB



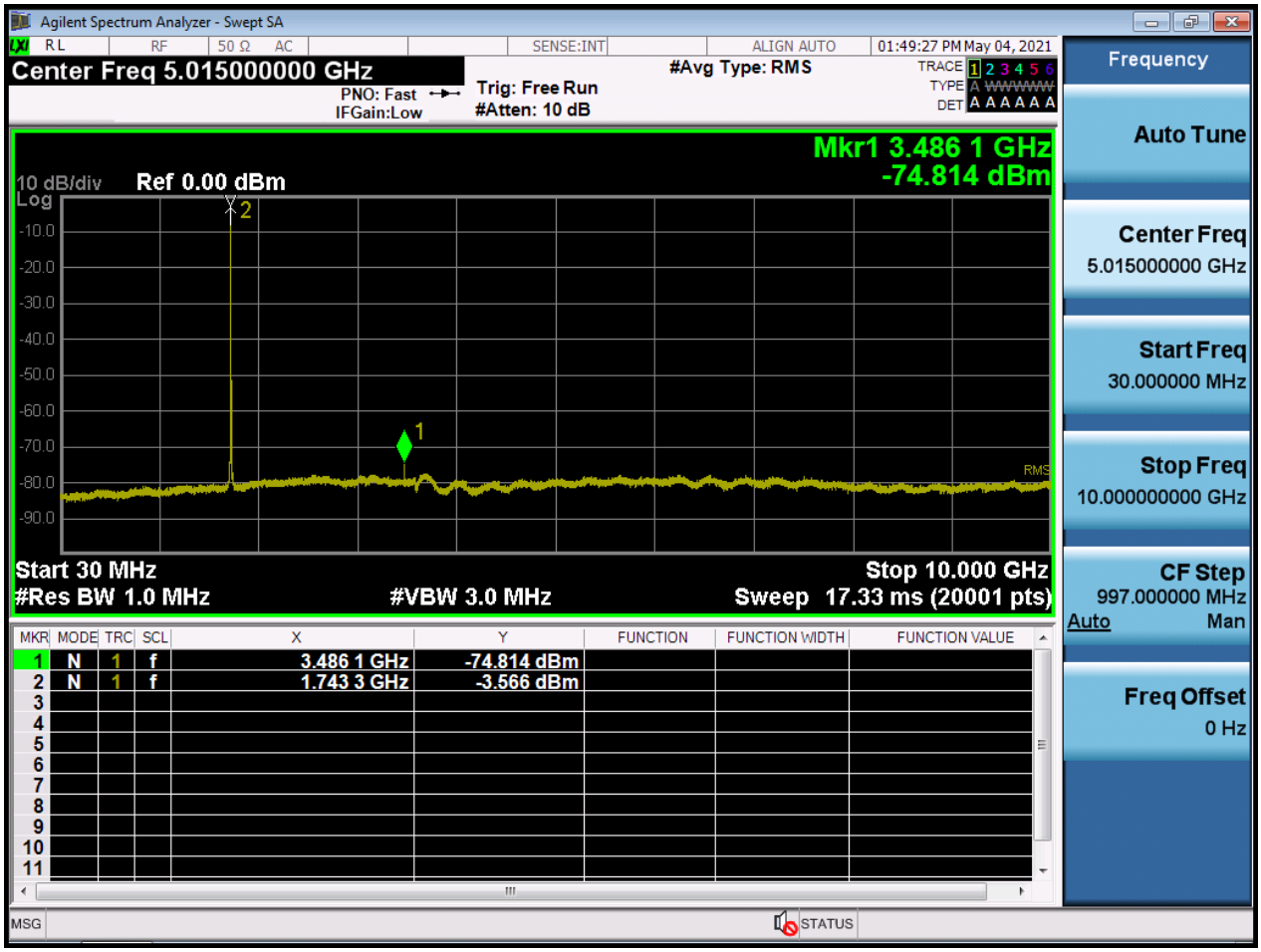
BW3M_CSE(30M-10G)_Highest Channel_QPSK_1RB



BW5M_CSE(30M-10G)_Lowest Channel_QPSK_1RB



BW5M_CSE(30M-10G)_Middle Channel_QPSK_1RB



BW5M_CSE(30M-10G)_Highest Channel_QPSK_1RB