

# TEST REPORT

FCC LTE B13 Test for SM-A566E/DS  
Certification

**APPLICANT**  
SAMSUNG Electronics Co., Ltd.

**REPORT NO.**  
HCT-RF-2412-FC066

**DATE OF ISSUE**  
December 23, 2024

**Tested by**  
Jae Ryang Do



**Technical Manager**  
Jong Seok Lee



**HCT CO., LTD.**  
*Bongjai Huh*  
BongJai Huh / CEO

**HCT CO.,LTD.**

2-6, 73, 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Republic of Korea  
Tel. +82 31 645 6300 Fax. +82 31 645 6401

# TEST REPORT

**REPORT NO.**

HCT-RF-2412-FC066

**DATE OF ISSUE**

December 23, 2024

**Additional Model**

SM-A566E

**Applicant****SAMSUNG Electronics Co., Ltd.**

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

**Product Name**

Mobile Phone

**Model Name**

SM-A566E/DS

**Date of Test**

November 25, 2024 ~ December 20, 2024

**FCC ID**

A3LSMA566E

**Location of Test**

☒ Permanent Testing Lab ☐ On Site Testing

(Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Republic of Korea)

**FCC Classification:**

PCS Licensed Transmitter Held to Ear (PCE)

**Test Standard Used**

FCC Rule Part: § 27

**Test Results**

PASS

## REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	December 23, 2024	Initial Release

## Notice

---

### Content

---

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)

The results shown in this test report only apply to the sample(s), as received, provided by the applicant, unless otherwise stated.

The test results have only been applied with the test methods required by the standard(s).

The laboratory is not accredited for the test results marked \*.

Information provided by the applicant is marked \*\*.

Test results provided by external providers are marked \*\*\*.

When confirmation of authenticity of this test report is required, please contact [www.hct.co.kr](http://www.hct.co.kr)

The test results in this test report are not associated with the ((KS Q) ISO/IEC 17025) accreditation by KOLAS (Korea Laboratory Accreditation Scheme) / A2LA (American Association for Laboratory Accreditation) that are under the ILAC (International Laboratory Accreditation Cooperation) Mutual Recognition Agreement (MRA).

---

## CONTENTS

1. GENERAL INFORMATION .....	6
1.1. MAXIMUM OUTPUT POWER .....	7
2. INTRODUCTION .....	8
2.1. DESCRIPTION OF EUT .....	8
2.2. MEASURING INSTRUMENT CALIBRATION .....	8
2.3. TEST FACILITY .....	8
3. DESCRIPTION OF TESTS .....	9
3.1 TEST PROCEDURE .....	9
3.2 RADIATED POWER .....	10
3.3 RADIATED SPURIOUS EMISSIONS .....	11
3.4 OCCUPIED BANDWIDTH. ....	12
3.5 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL .....	13
3.6 BAND EDGE .....	14
3.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE .....	16
3.8 PEAK- TO- AVERAGE RATIO .....	17
3.9 WORST CASE(RADIATED TEST) .....	19
3.10 WORST CASE(CONDUCTED TEST) .....	20
4. LIST OF TEST EQUIPMENT .....	21
5. MEASUREMENT UNCERTAINTY .....	22
6. SUMMARY OF TEST RESULTS .....	23
7. SAMPLE CALCULATION .....	24
8. TEST DATA(Main 1 ANT) .....	26
8.1 EFFECTIVE RADIATED POWER .....	26
8.2 RADIATED SPURIOUS EMISSIONS .....	27
8.3 PEAK-TO-AVERAGE RATIO .....	30
8.4 OCCUPIED BANDWIDTH .....	31
8.5 CONDUCTED SPURIOUS EMISSIONS .....	32
8.6 BAND EDGE .....	32
8.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE .....	33
9. TEST DATA(Sub 1 ANT) .....	37
9.1 EFFECTIVE RADIATED POWER .....	37
9.2 RADIATED SPURIOUS EMISSIONS .....	38
9.3 PEAK-TO-AVERAGE RATIO .....	41
9.4 OCCUPIED BANDWIDTH .....	42
9.5 CONDUCTED SPURIOUS EMISSIONS .....	43
9.6 BAND EDGE .....	43
9.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE .....	44

10. TEST PLOTS(Main 1 ANT) .....	48
11. TEST PLOTS(Sub 1 ANT).....	81
12. ANNEX A_ TEST SETUP PHOTO .....	114

## MEASUREMENT REPORT

### 1. GENERAL INFORMATION

<b>Applicant Name:</b>	SAMSUNG Electronics Co., Ltd.
<b>Address:</b>	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
<b>FCC ID:</b>	A3LSMA566E
<b>Application Type:</b>	Certification
<b>FCC Classification:</b>	PCS Licensed Transmitter Held to Ear (PCE)
<b>FCC Rule Part(s):</b>	§ 27
<b>EUT Type:</b>	Mobile phone
<b>Model(s):</b>	SM-A566E/DS
<b>Additional Model(s)</b>	SM-A566E
<b>Tx Frequency:</b>	779.5 MHz – 784.5 MHz (LTE – Band 13 (5 MHz)) 782 MHz (LTE – Band 13 (10 MHz))
<b>Date(s) of Tests:</b>	November 25, 2024 ~ December 20, 2024
<b>Serial number:</b>	Radiated : R3CXB08Q36K Conducted : R3CXB08Q3GW
<b>Antenna Information</b>	Please refer to the Antenna Approval Specification document.

## 1.1. MAXIMUM OUTPUT POWER

### Main 1 ANT

Mode (MHz)	Tx Frequency (MHz)	Emission Designator	Modulation	ERP	
				Max. Power (W)	Max. Power (dBm)
LTE – Band13 (5)	779.5 – 784.5	4M53G7D	QPSK	0.066	18.21
		4M51W7D	16-QAM	0.056	17.47
		4M52W7D	64-QAM	0.044	16.41
		4M55W7D	256-QAM	0.021	13.32
LTE – Band13 (10)	782.0	9M01G7D	QPSK	0.075	18.73
		8M99W7D	16-QAM	0.061	17.82
		9M01W7D	64-QAM	0.048	16.78
		9M03W7D	256-QAM	0.024	13.84

### Sub 1 ANT

Mode (MHz)	Tx Frequency (MHz)	Emission Designator	Modulation	ERP	
				Max. Power (W)	Max. Power (dBm)
LTE – Band13 (5)	779.5 – 784.5	4M54G7D	QPSK	0.103	20.13
		4M51W7D	16QAM	0.086	19.35
		4M53W7D	64QAM	0.067	18.28
		4M55W7D	256QAM	0.033	15.24
LTE – Band13 (10)	782.0	9M02G7D	QPSK	0.113	20.52
		9M03W7D	16QAM	0.091	19.61
		9M03W7D	64QAM	0.072	18.57
		9M03W7D	256QAM	0.037	15.66

## 2. INTRODUCTION

### 2.1. DESCRIPTION OF EUT

The EUT was a Mobile Phone with GSM/GPRS/EGPRS/UMTS and LTE, Sub 6  
It also supports IEEE 802.11 a/b/g/n/ac/ax (20/40/80 MHz), Bluetooth, BT LE, NFC

### 2.2. MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

### 2.3. TEST FACILITY

The Fully-anechoic chamber and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Republic 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
Frequency stability	- ANSI C63.26-2015 – Section 5.6
Radiated Power	- ANSI C63.26-2015 – Section 5.2.4.4 - KDB 971168 D01 v03r01 – Section 5.8
Radiated Spurious and Harmonic Emissions	- ANSI C63.26-2015 – Section 5.5.3 - KDB 971168 D01 v03r01 – Section 5.8

### 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.

#### Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5 % of the expected OBW, not to exceed 1 MHz
3. VBW  $\geq$  3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points > 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

#### Test Note

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

The power is calculated by the following formula;

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

Where:  $P_d$  is the dipole equivalent power and  $P_g$  is the generator output power into the substitution antenna.

3. The maximum value is calculated by adding the forward power to the calibrated source plus its appropriate gain value.

These steps are repeated with the receiving antenna in both vertical and horizontal polarization. the difference between the gain of the horn and an isotropic antenna are taken into consideration

4. The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
5. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

### 3.3 RADIATED SPURIOUS EMISSIONS

#### Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

Radiated Spurious Emission Measurements at 3 meters by Substitution Method.

#### Test Settings

1. RBW = 100 kHz for emissions below 1 GHz and 1 MHz for emissions above 1 GHz
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 10<sup>th</sup> harmonics from 9 kHz.

#### Test Note

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

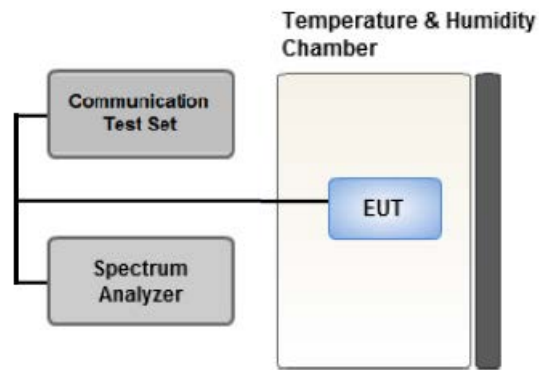
$$\text{Result}_{(\text{dBm})} = P_g_{(\text{dBm})} - \text{cable loss}_{(\text{dB})} + \text{antenna gain}_{(\text{dBi})}$$

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

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

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

### 3.4 OCCUPIED BANDWIDTH.



#### Test setup

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

The EUT makes a call to the communication simulator.

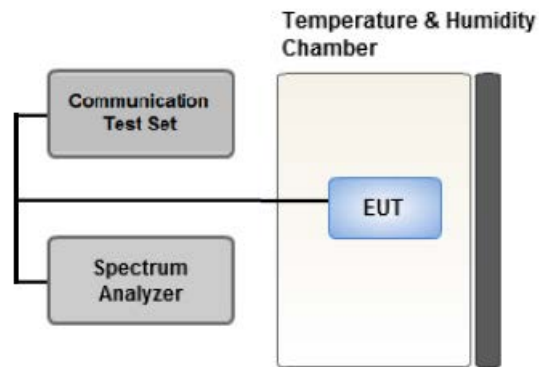
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

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

#### Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99 % occupied bandwidth and the 26 dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5 % of the expected OBW
3. VBW  $\geq 3 \times$  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

### 3.5 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL



Test setup

#### Test Overview

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

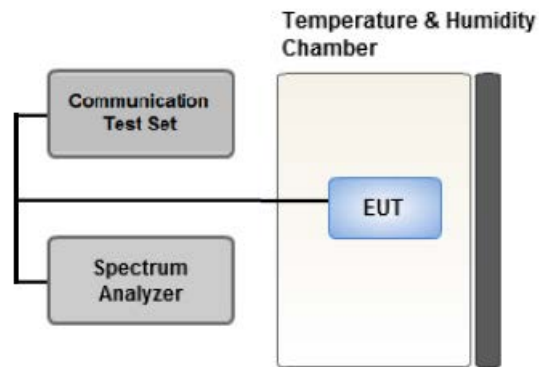
All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

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

#### Test Settings

1. RBW = 1 MHz
2. VBW  $\geq$  3 MHz
3. Detector = Peak
4. Trace Mode = Max Hold
5. Sweep time = auto
6. Number of points in sweep  $\geq$  2 x Span / RBW

### 3.6 BAND EDGE



Test setup

#### Test Overview

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

#### Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW > 1 % of the emission bandwidth
4. VBW > 3 x RBW
5. Detector = RMS
6. Number of sweep points  $\geq 2 \times \text{Span/RBW}$
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.

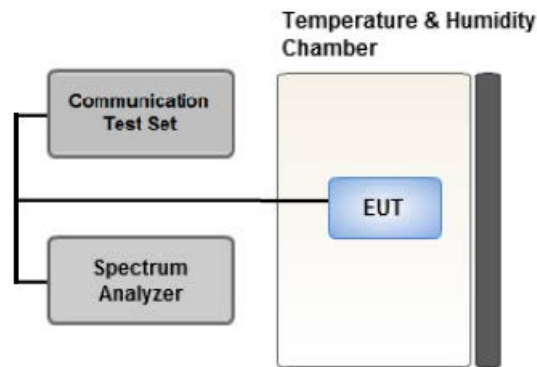
In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

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.

Where  $\text{Margin} < 1$  dB the emission level is either corrected by  $10 \log(1 \text{ MHz} / \text{RB})$  or the emission is integrated over a 1 MHz bandwidth to determine the final result. When using the integration method the integration window is either centered on the emission or, for emissions at the band edge, centered by an offset of 500 kHz from the block edge so that the integration window is the 1 MHz adjacent to the block edge.

### 3.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE



#### Test setup

##### Test Overview

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

The frequency stability of the transmitter is measured by:

1. Temperature:

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

2. Primary Supply Voltage:

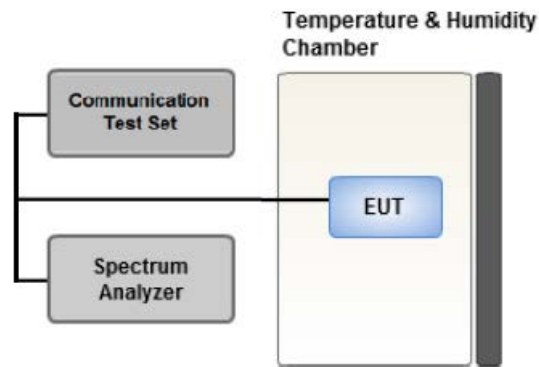
- .- Unless otherwise specified, vary primary supply voltage from 85 % to 115 % of the nominal value for other than hand carried battery equipment.
- .- For hand carried, battery powered equipment, reduce the primary ac or dc supply voltage to the battery operating end point, which shall be specified by the manufacturer.

##### Test Settings

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



### 3.8 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 %.

### 3.9 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.  
Mode : Stand alone, Stand alone + External accessories (Earphone, AC adapter, etc)  
Worst case : Stand alone
- All simultaneous transmission scenarios of operation were investigated, and the test results showed no additional significant emissions relative to the least restrictive limit were observed.  
Therefore, only the worst case(stand-alone) results were reported.
- The worst case is reported with the EUT positioning, modulations, and paging service configurations shown in the test data
- Please refer to the table below.
- SM-A566E/DS & additional models were tested and the worst case results are reported.  
(Worst case : SM-A566E/DS)

[Main 1 ANT Worst case ]

Test Description	Modulation	RB size	RB offset	Axis
Effective Radiated Power	QPSK, 16QAM, 64QAM, 256QAM	See Section 8.1		X
Radiated Spurious and Harmonic Emissions	QPSK	See Section 8.2		X

[Sub 1 ANT Worst case ]

Test Description	Modulation	RB size	RB offset	Axis
Effective Radiated Power	QPSK, 16QAM, 64QAM, 256QAM	See Section 9.1		X
Radiated Spurious and Harmonic Emissions	QPSK	See Section 9.2		Y

### 3.10 WORST CASE(CONDUCTED TEST)

- All modes of operation were investigated and the worst case configuration results are reported.
  - SM-A566E/DS & additional models were tested and the worst case results are reported.
- (Worst case : SM-A566E/DS)

[ Worst case ]

Test Description	Modulation	Bandwidth (MHz)	Frequency	RB size	RB offset
Occupied Bandwidth	QPSK, 16QAM, 64QAM, 256QAM	5, 10	Mid	Full RB	0
PEAK- TO- AVERAGE RATIO	QPSK, 16QAM, 64QAM, 256QAM	5, 10	Mid	Full RB	0
Band Edge	QPSK	5	Low	1	0
			High	1	24
		10	Low	1	0
			High	1	49
		5, 10	Low, High	Full RB	0
Spurious and Harmonic Emissions at Antenna Terminal	QPSK	5, 10	Low, Mid, High	1	0

#### 4. LIST OF TEST EQUIPMENT

Equipment	Model	Manufacture	Serial No.	Due to Calibration	Calibration Interval
RF Switching System	Switch box(1.2 G HPF+LNA)	HCT CO., LTD.,	F1L1	11/11/2025	Annual
RF Switching System	Switch box(3.3 G HPF+LNA)	HCT CO., LTD.,	F1L2	11/11/2025	Annual
RF Switching System	Switch box(LNA)	HCT CO., LTD.,	F1L4	11/11/2025	Annual
RF Switching System	Switch box(6 G HPF+LNA)	HCT CO., LTD.,	F1L7	11/11/2025	Annual
Power Splitter(DC ~ 26.5 GHz)	11667B	Hewlett Packard	5001	04/17/2025	Annual
DC Power Supply	E3632A	Agilent	MY40010147	08/06/2025	Annual
Dipole Antenna	UHAP	Schwarzbeck	01274	03/10/2026	Biennial
Dipole Antenna	UHAP	Schwarzbeck	01288	08/07/2026	Biennial
Chamber	SU-642	ESPEC	93008124	02/19/2025	Annual
Horn Antenna(1 ~ 18 GHz)	BBHA 9120D	Schwarzbeck	147	08/17/2025	Biennial
Horn Antenna(1 ~ 18 GHz)	BBHA 9120D	Schwarzbeck	9120D-1298	09/11/2025	Biennial
Horn Antenna(15 ~ 40 GHz)	BBHA 9170	Schwarzbeck	BBHA9170342	09/20/2026	Biennial
Horn Antenna(15 ~ 40 GHz)	BBHA 9170	Schwarzbeck	BBHA9170124	03/28/2025	Biennial
Signal Analyzer(10 Hz ~ 26.5 GHz)	N9020A	Agilent	MY52090906	04/19/2025	Annual
ATTENUATOR(20 dB)	8493C	Hewlett Packard	17280	04/17/2025	Annual
Spectrum Analyzer(10 Hz ~ 40 GHz)	FSV40	REOHDE & SCHWARZ	100931	08/06/2025	Annual
Base Station	8960 (E5515C)	Agilent	MY48360800	08/05/2025	Annual
Loop Antenna(9 kHz ~ 30 MHz)	FMZB1513	Schwarzbeck	1513-333	03/07/2026	Biennial
Trilog Broadband Antenna	VULB9168	Schwarzbeck	895	08/28/2026	Biennial
Trilog Broadband Antenna	VULB9168	Schwarzbeck	1135	08/19/2026	Biennial
Wideband Radio Communication Tester	MT8821C	Anritsu Corp.	6262094331	11/13/2025	Annual
Wideband Radio Communication Tester	MT8820C	Anritsu Corp.	6201026545	11/20/2025	Annual
SIGNAL GENERATOR (100 kHz ~ 40 GHz)	SMB100A	REOHDE & SCHWARZ	177633	07/26/2025	Annual
Signal Analyzer(5 Hz ~ 40.0 GHz)	N9030B	KEYSIGHT	MY55480167	05/17/2025	Annual
FCC LTE Mobile Conducted RF Automation Test Software	-	HCT CO., LTD.,	-	-	-

##### Note:

- Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.
- 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  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty ( $\pm$ kHz)
Occupied Bandwidth	95 (Confidence level about 95 %, $k=2$ )
Frequency stability	28 (Confidence level about 95 %, $k=2$ )

Parameter	Expanded Uncertainty ( $\pm$ dB)
Block Edge	0.70 (Confidence level about 95 %, $k=2$ )
Conducted Spurious Emissions	1.18 (Confidence level about 95 %, $k=2$ )
Peak- to- Average Ratio	0.68 (Confidence level about 95 %, $k=2$ )
Radiated Power	4.74 (Confidence level about 95 %, $k=2$ )
Radiated Disturbance (9 kHz ~ 30 MHz)	4.36 (Confidence level about 95 %, $k=2$ )
Radiated Disturbance (30 MHz ~ 1 GHz)	5.70 (Confidence level about 95 %, $k=2$ )
Radiated Disturbance (1 GHz ~ 18 GHz)	5.52 (Confidence level about 95 %, $k=2$ )
Radiated Disturbance (18 GHz ~ 40 GHz)	5.66 (Confidence level about 95 %, $k=2$ )
Radiated Disturbance (Above 40 GHz)	5.58 (Confidence level about 95 %, $k=2$ )

## 6. SUMMARY OF TEST RESULTS

### 6.1 Test Condition: Conducted Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Occupied Bandwidth	§ 2.1049	N/A	PASS
Band Edge / Spurious and Harmonic Emissions at Antenna Terminal.	§ 2.1051, § 27.53(c)	< 43 + 10log10 (P[Watts]) at Band Edge and for all out-of-band emissions	PASS
On all frequencies between 763-775 MHz and 793-805 MHz.	§ 27.53(c)(4)	< 65 + 10log10 (P[Watts])	PASS (See Note2)
Conducted Output Power	§ 2.1046	N/A	See Note1
Frequency stability / variation of ambient temperature	§ 2.1055, § 27.54	Emission must remain in band	PASS

#### Note:

1. See SAR Report
2. Since it was not possible to set the resolution bandwidth to 6.25 kHz with the available equipment, a bandwidth of 10 kHz was used instead to show compliance.

### 6.2 Test Condition: Radiated Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Effective Radiated Power	§ 27.50(b)(10)	< 3 Watts max. ERP	PASS
Radiated Spurious and Harmonic Emissions	§ 2.1053, § 27.53(c)	< 43 + 10log10 (P[Watts]) for all out-of band emissions	PASS
Undesirable Emissions in the 1559 – 1610 MHz band	§ 2.1053, 27.53(f)	< -70dBW/MHz EIRP (wideband) < -80dBW EIRP (narrowband)	PASS

## 7. SAMPLE CALCULATION

### 7.1 ERP Sample Calculation

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

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

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

### 7.2 EIRP Sample Calculation

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

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

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



### 7.3. Emission Designator

#### GSM Emission Designator

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

#### EDGE Emission Designator

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

#### WCDMA Emission Designator

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

#### QPSK Modulation

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

#### QAM Modulation

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

## 8. TEST DATA(Main 1 ANT)

### 8.1 EFFECTIVE RADIATED POWER

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain (dBd)	C.L	Pol	Limit	ERP		RB	
								W	W	dBm	Size	Offset
779.5	LTE B13 (5 MHz)	QPSK	-33.13	29.45	-9.85	1.39	H	< 3.00	0.066	18.21	1	0
		16-QAM	-33.87	28.71	-9.85	1.39	H		0.056	17.47		
		64-QAM	-34.93	27.65	-9.85	1.39	H		0.044	16.41		
		256-QAM	-38.02	24.56	-9.85	1.39	H		0.021	13.32		
782.0		QPSK	-33.38	29.25	-9.90	1.40	H		0.062	17.95	1	0
		16-QAM	-34.21	28.42	-9.90	1.40	H		0.052	17.12		
		64-QAM	-35.25	27.38	-9.90	1.40	H		0.041	16.08		
		256-QAM	-38.23	24.40	-9.90	1.40	H		0.020	13.10		
784.5		QPSK	-33.67	28.88	-9.90	1.40	H		0.057	17.58	1	0
		16-QAM	-34.51	28.04	-9.90	1.40	H		0.047	16.74		
		64-QAM	-35.58	26.97	-9.90	1.40	H		0.037	15.67		
		256-QAM	-38.54	24.01	-9.90	1.40	H		0.019	12.71		

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain (dBd)	C.L	Pol	Limit	ERP		RB	
								W	W	dBm	Size	Offset
782.0	LTE B13 (10 MHz)	QPSK	-32.60	30.03	-9.90	1.40	H	< 3.00	0.075	18.73	1	0
		16-QAM	-33.51	29.12	-9.90	1.40	H		0.061	17.82		
		64-QAM	-34.55	28.08	-9.90	1.40	H		0.048	16.78		
		256-QAM	-37.49	25.14	-9.90	1.40	V		0.024	13.84		

## 8.2 RADIATED SPURIOUS EMISSIONS

■ MODE: LTE B13  
 ■ MODULATION SIGNAL: 5 MHz QPSK  
 ■ DISTANCE: 3 meters

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit (dBm)	RB	
									Size	Offset
23205 (779.5)	1 559.0	-57.43	8.90	-65.10	1.94	H	-58.14	-40.00	1	0
	2 338.5	-57.51	10.89	-63.40	2.42	V	-54.93	-13.00		
	3 118.0	-58.33	10.79	-60.38	2.83	V	-52.42	-13.00		
23230 (782.0)	1 564.0	-57.21	8.93	-64.89	1.95	H	-57.91	-40.00	1	0
	2 346.0	-57.62	10.92	-63.47	2.45	V	-55.00	-13.00		
	3 128.0	-58.46	10.81	-60.88	2.86	H	-52.93	-13.00		
23255 (784.5)	1 569.0	-56.43	8.95	-64.10	1.96	V	-57.11	-40.00	1	0
	2 353.5	-57.07	10.96	-62.73	2.48	H	-54.25	-13.00		
	3 138.0	-57.79	10.85	-59.73	2.90	H	-51.78	-13.00		

☐ MODE: LTE B13  
☐ MODULATION SIGNAL: 10 MHz QPSK  
☐ DISTANCE: 3 meters

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit (dBm)	RB	
									Size	Offset
23230 (782.0)	1 564.0	-56.27	8.93	-63.95	1.95	H	-56.97	-40.00	1	0
	2 346.0	-56.97	10.92	-62.82	2.45	H	-54.35	-13.00		
	3 128.0	-57.78	10.81	-60.20	2.86	V	-52.25	-13.00		

### 1559 MHz ~ 1610 MHz BAND

- ▣ OPERATING FREQUENCY: 779.5 MHz, 782.0 MHz, 784.5 MHz
- ▣ MEASURED OUTPUT POWER: 5 MHz QPSK
- ▣ DISTANCE: 3 meters
- ▣ WIDEBAND EMISSION LIMIT: -70 dBW/ MHz (= -40 dBm/ MHz)

Operating Frequency (MHz)	Measured Frequency (MHz)	EMISSION TYPE	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Margin (dB)
779.5	1565.28	Wide Band	-55.06	8.93	-62.74	1.95	V	-55.76	15.76
782.0	1609.75		-54.84	9.21	-64.11	1.99	V	-56.89	16.89
784.5	1571.73		-55.10	8.95	-62.77	1.96	V	-55.78	15.78

#### Note:

Since the bandwidth of that Spurious emission is greater than 700 Hz, we applied -70 dBW/MHz according to § 27.53(f).

- ▣ OPERATING FREQUENCY: 782.0 MHz
- ▣ MEASURED OUTPUT POWER: 10 MHz QPSK
- ▣ DISTANCE: 3 meters
- ▣ WIDEBAND EMISSION LIMIT: -70 dBW/ MHz (= -40 dBm/ MHz)

Operating Frequency (MHz)	Measured Frequency (MHz)	EMISSION TYPE	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Margin (dB)
782.0	1561.79	Wide Band	-54.81	8.90	-62.48	1.94	V	-55.52	15.52

#### Note:

Since the bandwidth of that Spurious emission is greater than 700 Hz, we applied -70 dBW/MHz according to § 27.53(f).

### 8.3 PEAK-TO-AVERAGE RATIO

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data ( dB )
13	5 MHz	782.0	QPSK	25	0	5.11
			16-QAM			5.77
			64-QAM			5.89
			256-QAM			5.87
	10 MHz		QPSK	50		5.02
			16-QAM			5.61
			64-QAM			5.79
			256-QAM			5.71

**Note:**

1. Plots of the EUT's P.A.P.R are shown Page 49 ~ 56.
2. P.A.P.R is not required. These values are reported for information only.

## 8.4 OCCUPIED BANDWIDTH

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data ( MHz )
13	5 MHz	782.0	QPSK	25	0	4.5326
			16-QAM			4.5076
			64-QAM			4.5191
			256-QAM			4.5490
	10 MHz		QPSK	50		9.0135
			16-QAM			8.9877
			64-QAM			9.0078
			256-QAM			9.0307

### Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 57 ~ 64.

## 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)
13	5	779.50	5.6122	28.5910	-57.445	-28.854	-13.00
		782.00	5.8669	28.5910	-57.696	-29.105	
		784.50	6.5000	28.5910	-57.790	-29.199	
	10	782.00	6.9342	28.5910	-57.404	-28.813	

### Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 65 ~ 68.
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(26.5)	30.131

## 8.6 BAND EDGE

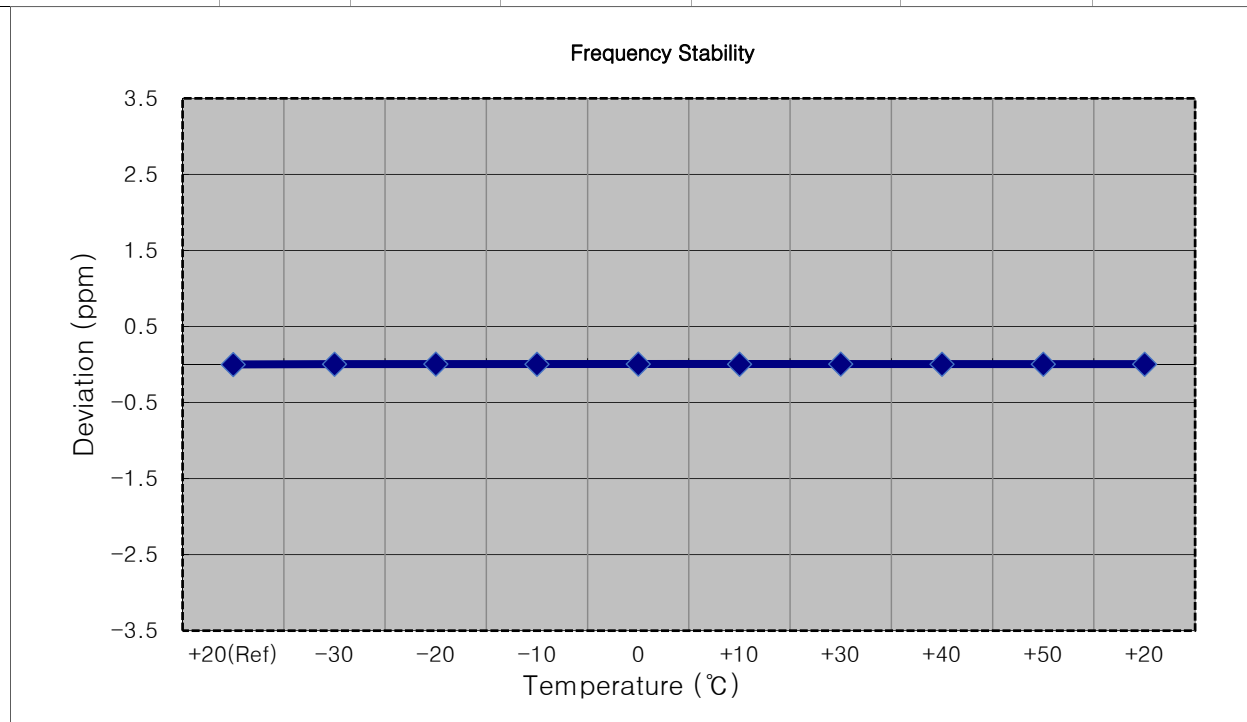
- Plots of the EUT's Band Edge are shown Page 69 ~ 80.



## 8.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

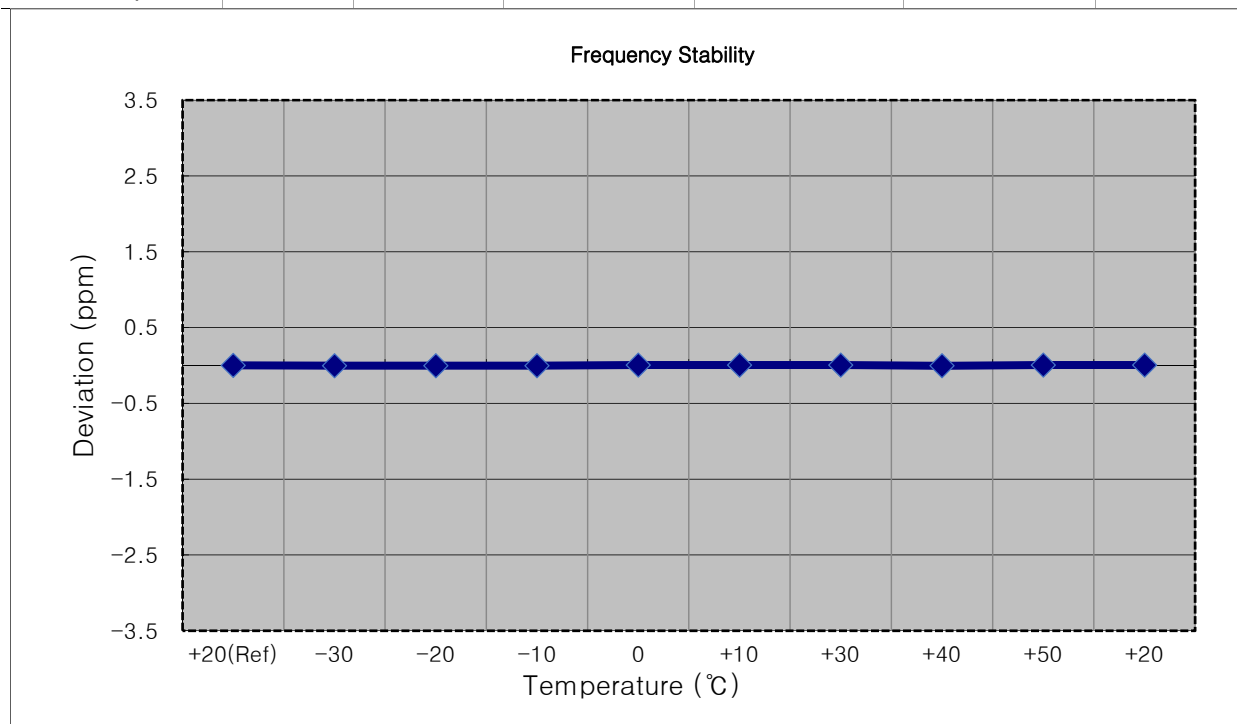
MODE:	<u>LTE 13</u>
OPERATING FREQUENCY:	<u>779,500,000 Hz</u>
CHANNEL:	<u>23205 (5 MHz)</u>
REFERENCE VOLTAGE:	<u>4.200 VDC</u>
DEVIATION LIMIT:	<u>Emission must remain in band</u>

Voltage	Power	Temp.	Frequency	Frequency Error	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	(Hz)	(%)	
100 %	4.200	+20(Ref)	779 500 003	0.00	0.000 000	0.0000
100 %		-30	779 500 007	3.60	0.000 000	0.0046
100 %		-20	779 500 007	4.50	0.000 001	0.0058
100 %		-10	779 500 005	2.50	0.000 000	0.0032
100 %		0	779 500 007	4.00	0.000 001	0.0051
100 %		+10	779 500 006	2.90	0.000 000	0.0037
100 %		+30	779 500 008	4.70	0.000 001	0.0060
100 %		+40	779 500 006	2.90	0.000 000	0.0037
100 %		+50	779 500 006	3.10	0.000 000	0.0040
Batt. Endpoint	3.300	+20	779 500 007	3.70	0.000 000	0.0047



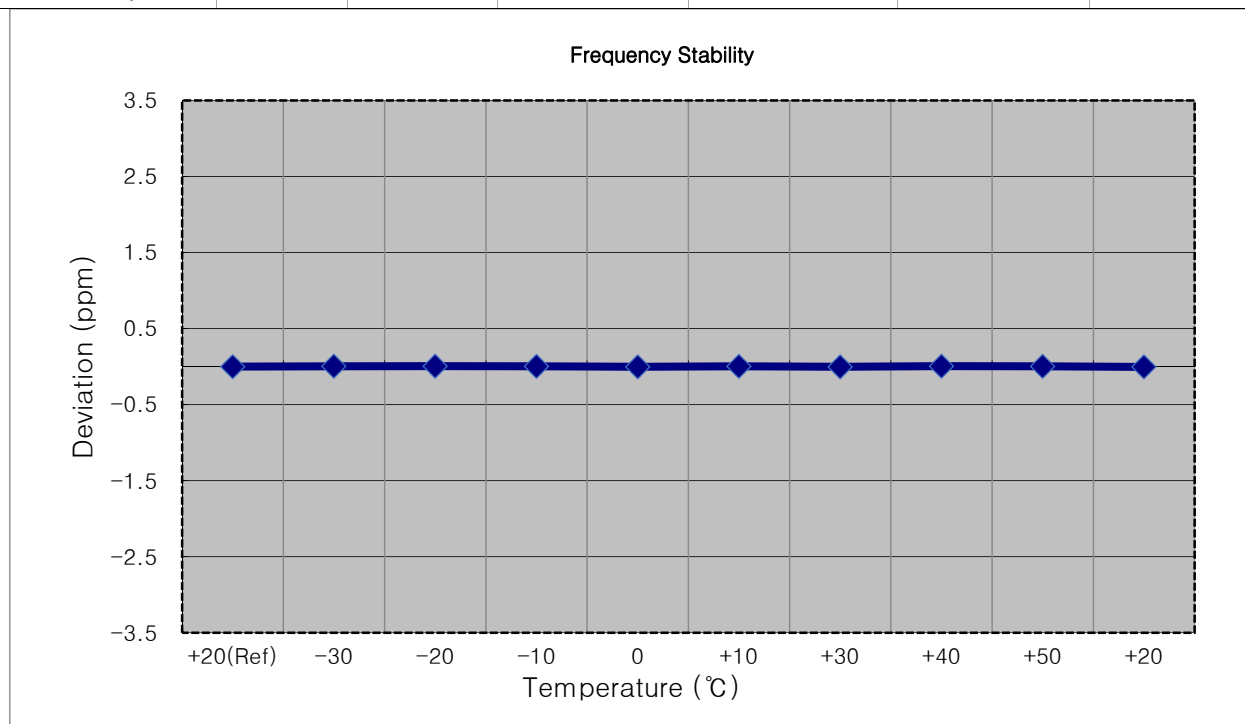
MODE:	<u>LTE 13</u>
OPERATING FREQUENCY:	<u>782,000,000 Hz</u>
CHANNEL:	<u>23230 (5 MHz)</u>
REFERENCE VOLTAGE:	<u>4.200 VDC</u>
DEVIATION LIMIT:	<u>Emission must remain in band</u>

Voltage	Power	Temp.	Frequency	Frequency Error	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	(Hz)	(%)	
100 %	4.200	+20(Ref)	782 000 004	0.00	0.000 000	0.0000
100 %		-30	782 000 001	-3.00	0.000 000	-0.0038
100 %		-20	782 000 001	-3.00	0.000 000	-0.0038
100 %		-10	782 000 001	-2.30	0.000 000	-0.0029
100 %		0	782 000 008	4.10	0.000 001	0.0052
100 %		+10	782 000 007	3.60	0.000 000	0.0046
100 %		+30	782 000 007	3.00	0.000 000	0.0038
100 %		+40	782 000 000	-3.30	0.000 000	-0.0042
100 %		+50	782 000 008	4.00	0.000 001	0.0051
Batt. Endpoint	3.300	+20	782 000 007	3.70	0.000 000	0.0047



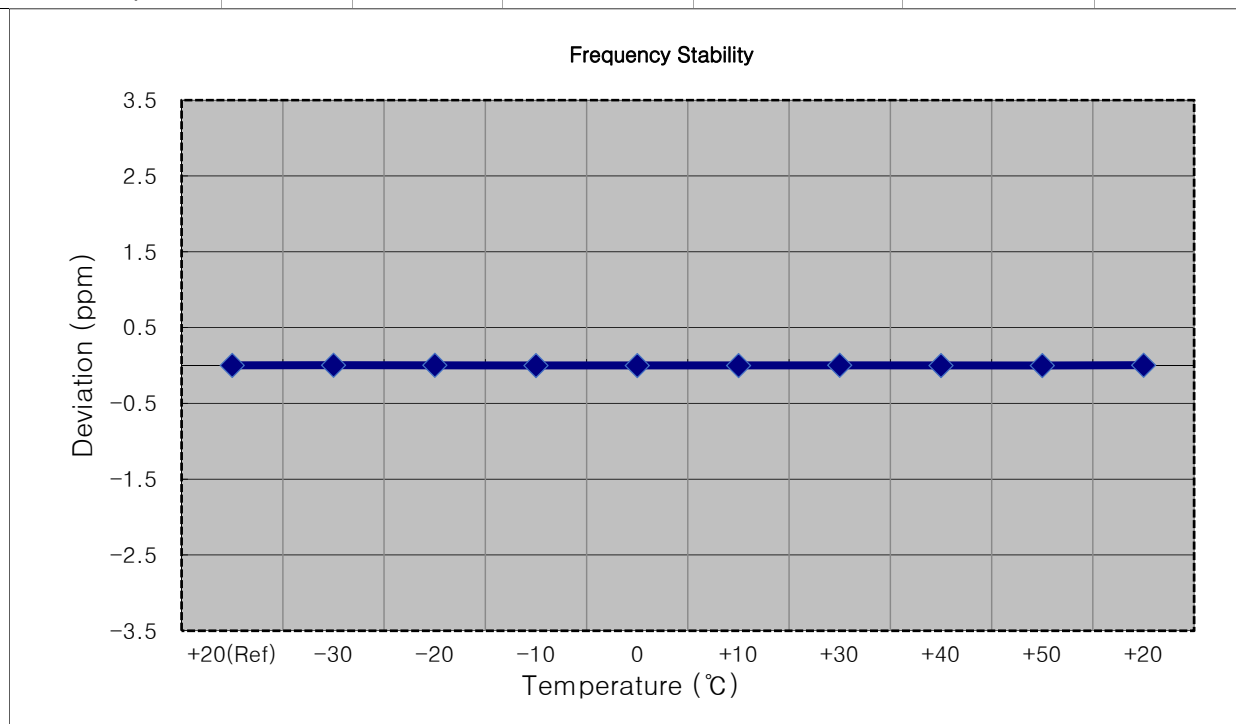
MODE: LTE 13  
 OPERATING FREQUENCY: 784,500,000 Hz  
 CHANNEL: 23255 (5 MHz)  
 REFERENCE VOLTAGE: 4.200 VDC  
 DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency Error	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	(Hz)	(%)	
100 %	4.200	+20(Ref)	784 500 003	0.00	0.000 000	0.0000
100 %		-30	784 500 007	3.70	0.000 000	0.0047
100 %		-20	784 500 007	3.40	0.000 000	0.0043
100 %		-10	784 500 006	2.60	0.000 000	0.0033
100 %		0	784 500 001	-2.50	0.000 000	-0.0032
100 %		+10	784 500 006	2.70	0.000 000	0.0034
100 %		+30	784 500 001	-2.60	0.000 000	-0.0033
100 %		+40	784 500 007	3.50	0.000 000	0.0045
100 %		+50	784 500 006	2.70	0.000 000	0.0034
Batt. Endpoint	3.300	+20	784 500 000	-2.80	0.000 000	-0.0036



MODE: LTE 13  
 OPERATING FREQUENCY: 782,000,000 Hz  
 CHANNEL: 23230 (10 MHz)  
 REFERENCE VOLTAGE: 4.200 VDC  
 DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency Error	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	(Hz)	(%)	
100 %	4.200	+20(Ref)	782 000 001	0.00	0.000 000	0.0000
100 %		-30	782 000 002	1.20	0.000 000	0.0015
100 %		-20	782 000 003	1.90	0.000 000	0.0024
100 %		-10	782 000 000	-0.90	0.000 000	-0.0012
100 %		0	782 000 000	-1.50	0.000 000	-0.0019
100 %		+10	782 000 000	-1.30	0.000 000	-0.0017
100 %		+30	782 000 003	2.00	0.000 000	0.0026
100 %		+40	782 000 000	-1.00	0.000 000	-0.0013
100 %		+50	782 000 000	-1.40	0.000 000	-0.0018
Batt. Endpoint	3.300	+20	782 000 002	1.10	0.000 000	0.0014



## 9. TEST DATA(Sub 1 ANT)

### 9.1 EFFECTIVE RADIATED POWER

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain (dBd)	C.L	Pol	Limit	ERP		RB	
								W	W	dBm	Size	Offset
779.5	LTE B13 (5 MHz)	QPSK	-31.21	31.37	-9.85	1.39	H	< 3.00	0.103	20.13	1	24
		16-QAM	-31.99	30.59	-9.85	1.39	H		0.086	19.35		
		64-QAM	-33.06	29.52	-9.85	1.39	H		0.067	18.28		
		256-QAM	-36.10	26.48	-9.85	1.39	H		0.033	15.24		
782.0		QPSK	-31.26	31.37	-9.90	1.40	H		0.102	20.07	1	24
		16-QAM	-32.06	30.57	-9.90	1.40	H		0.085	19.27		
		64-QAM	-33.12	29.51	-9.90	1.40	H		0.066	18.21		
		256-QAM	-36.13	26.50	-9.90	1.40	H		0.033	15.20		
784.5		QPSK	-31.22	31.33	-9.90	1.40	H		0.101	20.03	1	0
		16-QAM	-31.96	30.59	-9.90	1.40	H		0.085	19.29		
		64-QAM	-33.03	29.52	-9.90	1.40	H		0.066	18.22		
		256-QAM	-36.11	26.44	-9.90	1.40	H		0.033	15.14		

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain (dBd)	C.L	Pol	Limit	ERP		RB	
								W	W	dBm	Size	Offset
782.0	LTE B13 (10 MHz)	QPSK	-30.81	31.82	-9.90	1.40	H	< 3.00	0.113	20.52	1	49
		16-QAM	-31.72	30.91	-9.90	1.40	H		0.091	19.61		
		64-QAM	-32.76	29.87	-9.90	1.40	H		0.072	18.57		
		256-QAM	-35.67	26.96	-9.90	1.40	H		0.037	15.66		

## 9.2 RADIATED SPURIOUS EMISSIONS

■ MODE: LTE B13  
 ■ MODULATION SIGNAL: 5 MHz QPSK  
 ■ DISTANCE: 3 meters

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit (dBm)	RB	
									Size	Offset
23205 (779.5)	1 559.0	-56.59	8.90	-64.26	1.94	V	-57.30	-40.00	1	24
	2 338.5	-56.76	10.89	-62.65	2.42	H	-54.18	-13.00		
	3 118.0	-57.59	10.79	-59.64	2.83	V	-51.68	-13.00		
23230 (782.0)	1 564.0	-56.83	8.93	-64.51	1.95	V	-57.53	-40.00	1	24
	2 346.0	-57.54	10.92	-63.39	2.45	H	-54.92	-13.00		
	3 128.0	-58.30	10.81	-60.72	2.86	V	-52.77	-13.00		
23255 (784.5)	1 569.0	-56.60	8.95	-64.27	1.96	V	-57.28	-40.00	1	0
	2 353.5	-57.05	10.96	-62.71	2.48	V	-54.23	-13.00		
	3 138.0	-58.11	10.85	-60.05	2.90	V	-52.10	-13.00		

■ MODE: LTE B13  
 ■ MODULATION SIGNAL: 10 MHz QPSK  
 ■ DISTANCE: 3 meters

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit (dBm)	RB	
									Size	Offset
23230 (782.0)	1 564.0	-57.72	8.93	-65.40	1.95	V	-58.42	-40.00	1	49
	2 346.0	-56.67	10.92	-62.52	2.45	V	-54.05	-13.00		
	3 128.0	-58.68	10.81	-61.10	2.86	V	-53.15	-13.00		

### 1559 MHz ~ 1610 MHz BAND

- ▣ OPERATING FREQUENCY: 779.5 MHz, 782.0 MHz, 784.5 MHz
- ▣ MEASURED OUTPUT POWER: 5 MHz QPSK
- ▣ DISTANCE: 3 meters
- ▣ WIDEBAND EMISSION LIMIT: -70 dBW/ MHz (= -40 dBm/ MHz)

Operating Frequency (MHz)	Measured Frequency (MHz)	EMISSION TYPE	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Margin (dB)
779.5	1605.71	Wide Band	-54.91	9.18	-63.58	2.00	V	-56.40	16.40
782.0	1609.90		-55.29	9.21	-64.56	1.99	V	-57.34	17.34
784.5	1604.57		-54.86	9.18	-63.53	2.00	V	-56.35	16.35

#### Note:

Since the bandwidth of that Spurious emission is greater than 700 Hz, we applied -70 dBW/MHz according to § 27.53(f).

- ▣ OPERATING FREQUENCY: 782.0 MHz
- ▣ MEASURED OUTPUT POWER: 10 MHz QPSK
- ▣ DISTANCE: 3 meters
- ▣ WIDEBAND EMISSION LIMIT: -70 dBW/ MHz (= -40 dBm/ MHz)

Operating Frequency (MHz)	Measured Frequency (MHz)	EMISSION TYPE	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Margin (dB)
782.0	1603.51	Wide Band	-54.69	9.14	-62.76	2.00	V	-55.62	15.62

#### Note:

Since the bandwidth of that Spurious emission is greater than 700 Hz, we applied -70 dBW/MHz according to § 27.53(f).



### 9.3 PEAK-TO-AVERAGE RATIO

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data ( dB )
13	5 MHz	782.0	QPSK	25	0	4.92
			16-QAM			5.57
			64-QAM			5.71
			256-QAM			5.65
	10 MHz		QPSK	50		4.92
			16-QAM			5.51
			64-QAM			5.64
			256-QAM			5.60

**Note:**

1. Plots of the EUT's P.A.P.R are shown Page 82 ~ 89.
2. P.A.P.R is not required. These values are reported for information only.

## 9.4 OCCUPIED BANDWIDTH

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data ( MHz )
13	5 MHz	782.0	QPSK	25	0	4.5357
			16-QAM			4.5142
			64-QAM			4.5328
			256-QAM			4.5481
	10 MHz		QPSK	50		9.0198
			16-QAM			9.0270
			64-QAM			9.0293
			256-QAM			9.0299

### Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 90 ~ 97.

## 9.5 CONDUCTED SPURIOUS EMISSIONS

Band	Band Width (MHz)	Frequency (MHz)	Frequency of Maximum Harmonic (GHz)	Factor (dB)	Measurement Maximum Data (dBm)	Result (dBm)	Limit (dBm)
13	5	779.50	3.7289	27.9760	-57.475	-29.499	-13.00
		782.00	6.5628	28.5910	-57.798	-29.207	
		784.50	6.9916	28.5910	-57.591	-29.000	
	10	782.00	3.1830	27.9760	-57.667	-29.691	

### Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 98 ~ 101.
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(26.5)	30.131

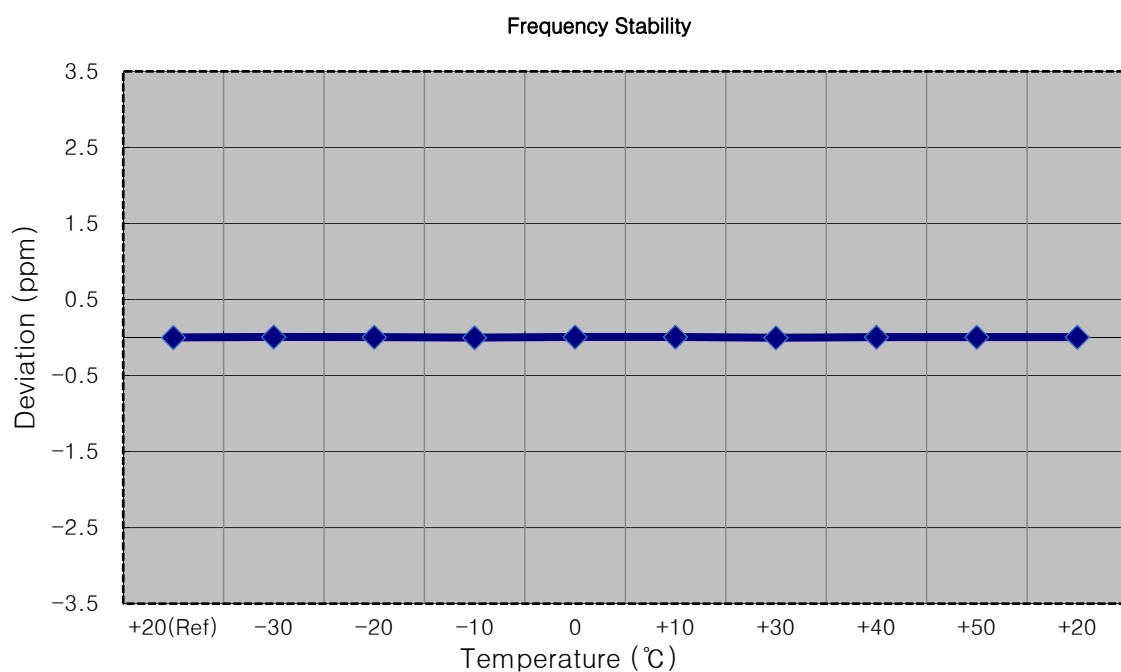
## 9.6 BAND EDGE

- Plots of the EUT's Band Edge are shown Page 102 ~ 113.

## 9.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

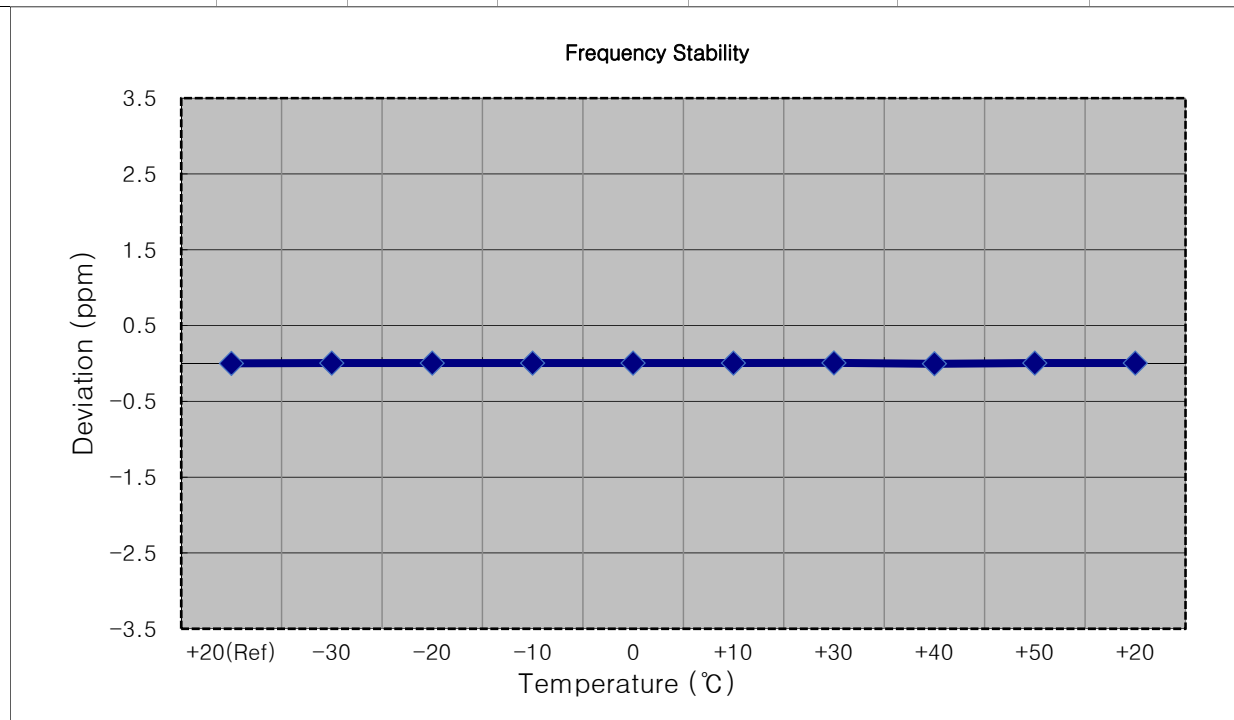
MODE:	<u>LTE 13</u>
OPERATING FREQUENCY:	<u>779,500,000 Hz</u>
CHANNEL:	<u>23205 (5 MHz)</u>
REFERENCE VOLTAGE:	<u>4.200 VDC</u>
DEVIATION LIMIT:	<u>Emission must remain in band</u>

Voltage	Power	Temp.	Frequency	Frequency Error	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	(Hz)	(%)	
100 %	4.200	+20(Ref)	779 500 002	0.00	0.000 000	0.0000
100 %		-30	779 500 006	4.10	0.000 001	0.0053
100 %		-20	779 500 005	3.10	0.000 000	0.0040
100 %		-10	779 500 000	-2.50	0.000 000	-0.0032
100 %		0	779 500 006	3.90	0.000 001	0.0050
100 %		+10	779 500 007	4.70	0.000 001	0.0060
100 %		+30	779 499 999	-2.80	0.000 000	-0.0036
100 %		+40	779 500 005	3.20	0.000 000	0.0041
100 %		+50	779 500 005	2.80	0.000 000	0.0036
Batt. Endpoint	3.300	+20	779 500 005	3.10	0.000 000	0.0040



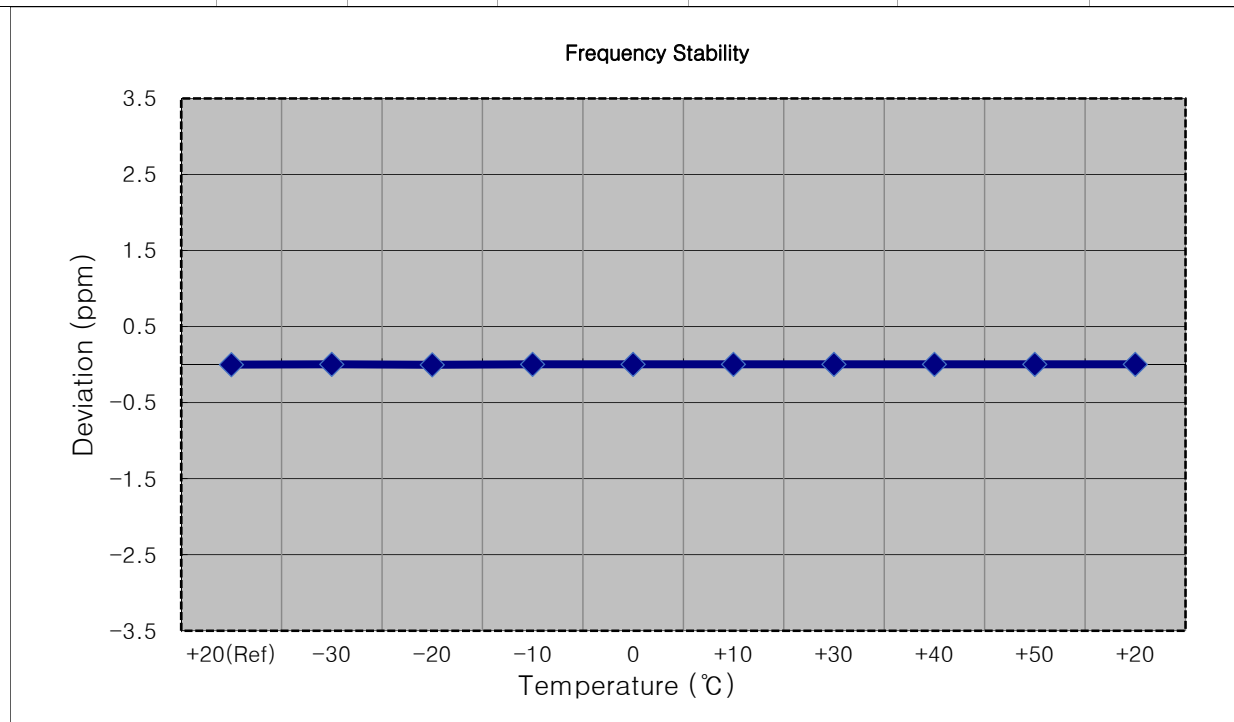
MODE: LTE 13  
 OPERATING FREQUENCY: 782,000,000 Hz  
 CHANNEL: 23230 (5 MHz)  
 REFERENCE VOLTAGE: 4.200 VDC  
 DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency Error	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	(Hz)	(%)	
100 %	4.200	+20(Ref)	782 000 004	0.00	0.000 000	0.0000
100 %		-30	782 000 008	4.10	0.000 001	0.0052
100 %		-20	782 000 008	3.90	0.000 000	0.0050
100 %		-10	782 000 008	4.10	0.000 001	0.0052
100 %		0	782 000 008	4.00	0.000 001	0.0051
100 %		+10	782 000 007	3.10	0.000 000	0.0040
100 %		+30	782 000 009	5.20	0.000 001	0.0066
100 %		+40	782 000 001	-3.40	0.000 000	-0.0043
100 %		+50	782 000 007	3.30	0.000 000	0.0042
Batt. Endpoint	3.300	+20	782 000 008	4.30	0.000 001	0.0055



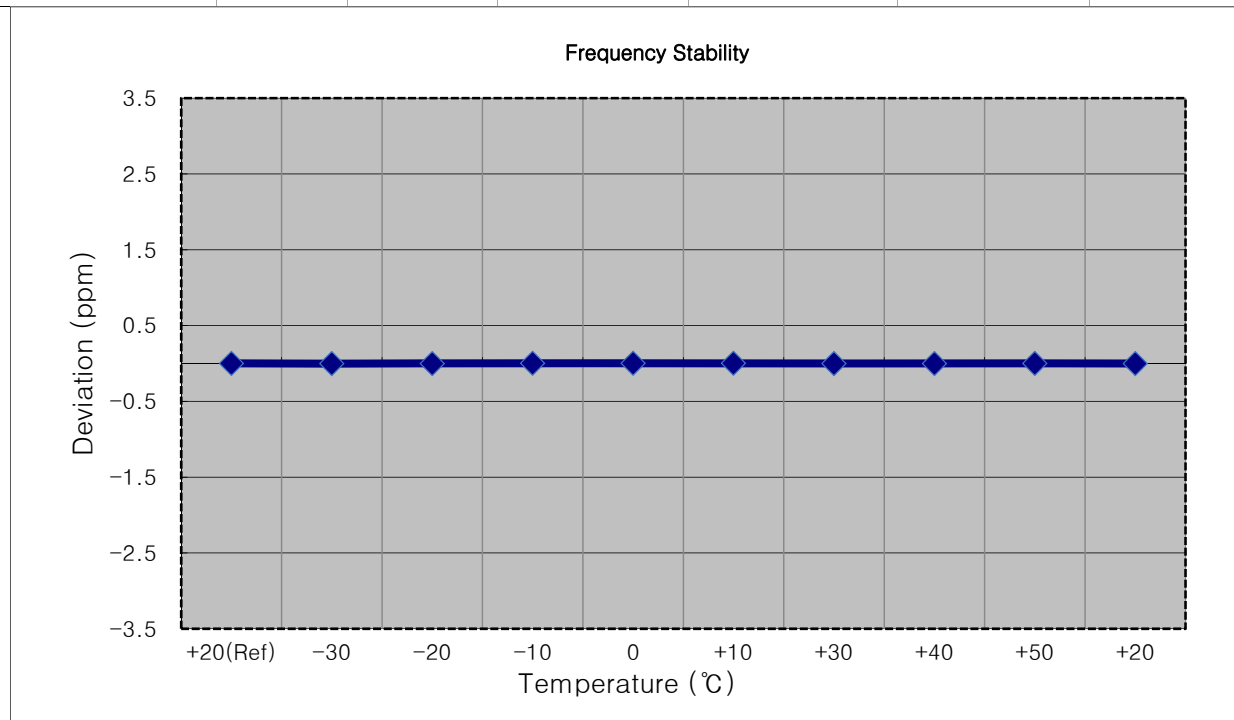
MODE: LTE 13  
 OPERATING FREQUENCY: 784,500,000 Hz  
 CHANNEL: 23255 (5 MHz)  
 REFERENCE VOLTAGE: 4.200 VDC  
 DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency Error	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	(Hz)	(%)	
100 %	4.200	+20(Ref)	784 500 003	0.00	0.000 000	0.0000
100 %		-30	784 500 006	3.30	0.000 000	0.0042
100 %		-20	784 500 001	-1.90	0.000 000	-0.0024
100 %		-10	784 500 006	3.20	0.000 000	0.0041
100 %		0	784 500 006	2.90	0.000 000	0.0037
100 %		+10	784 500 006	2.60	0.000 000	0.0033
100 %		+30	784 500 005	1.70	0.000 000	0.0022
100 %		+40	784 500 006	2.50	0.000 000	0.0032
100 %		+50	784 500 006	3.20	0.000 000	0.0041
Batt. Endpoint	3.300	+20	784 500 006	2.40	0.000 000	0.0031



- ▣ MODE: LTE 13
- ▣ OPERATING FREQUENCY: 782,000,000 Hz
- ▣ CHANNEL: 23230 (10 MHz)
- ▣ REFERENCE VOLTAGE: 4.200 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

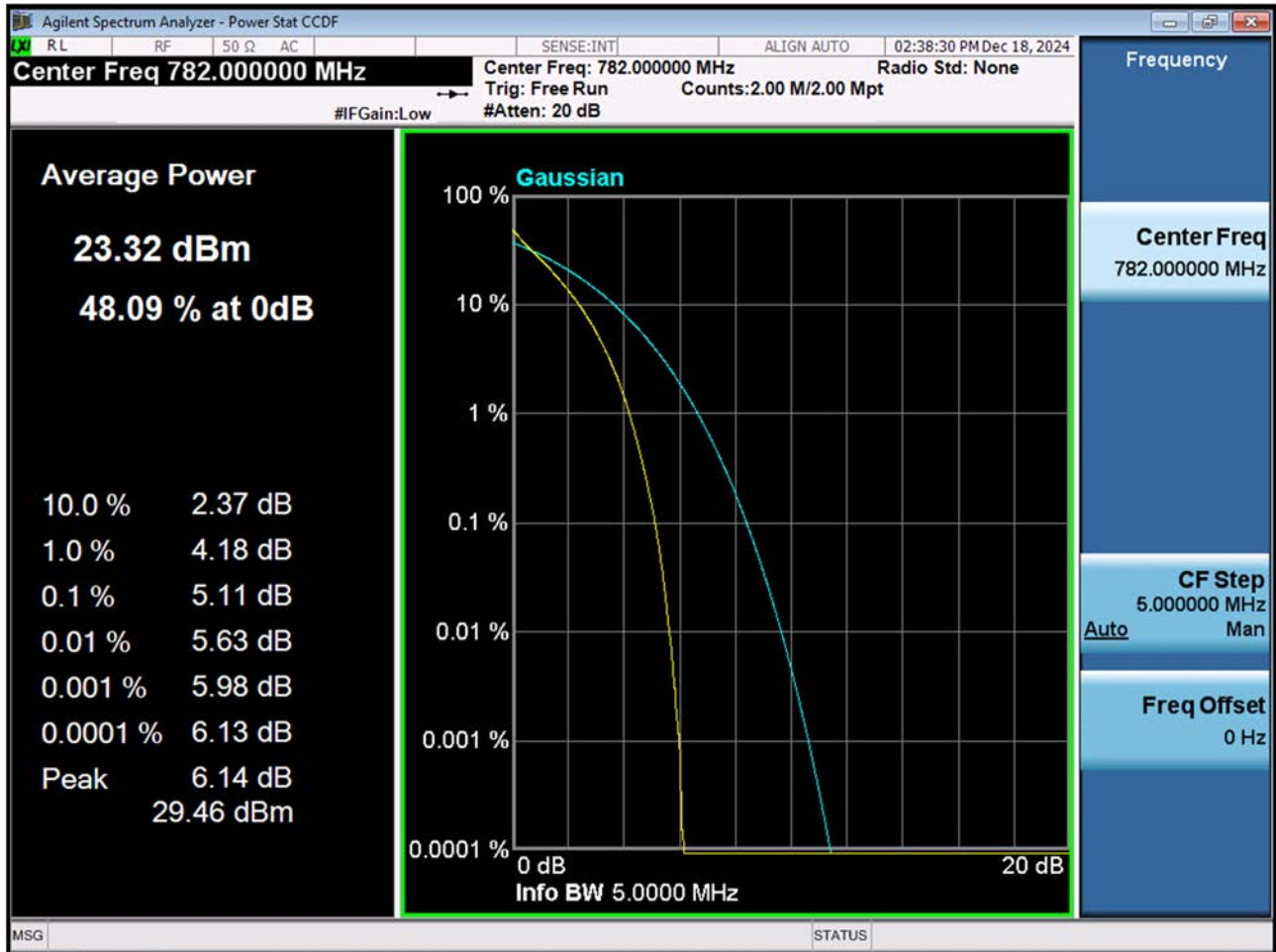
Voltage	Power	Temp.	Frequency	Frequency Error	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	(Hz)	(%)	
100 %	4.200	+20(Ref)	782 000 002	0.00	0.000 000	0.0000
100 %		-30	781 999 999	-2.10	0.000 000	-0.0027
100 %		-20	782 000 000	-1.30	0.000 000	-0.0017
100 %		-10	782 000 003	1.20	0.000 000	0.0015
100 %		0	782 000 003	1.60	0.000 000	0.0020
100 %		+10	782 000 003	1.20	0.000 000	0.0015
100 %		+30	782 000 000	-1.30	0.000 000	-0.0017
100 %		+40	782 000 001	-0.80	0.000 000	-0.0010
100 %		+50	782 000 001	-0.60	0.000 000	-0.0008
Batt. Endpoint	3.300	+20	782 000 000	-1.50	0.000 000	-0.0019



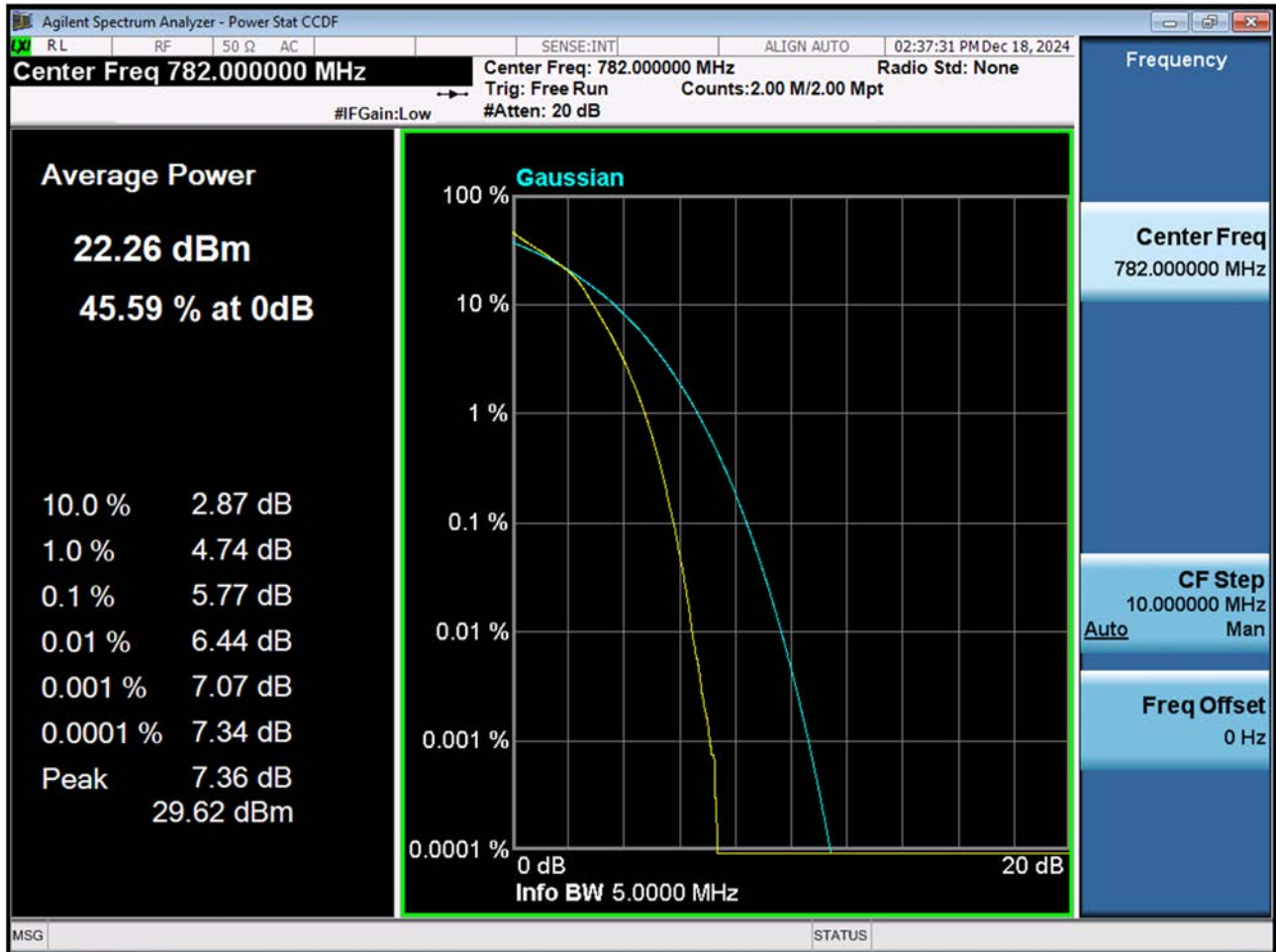
## 10. TEST PLOTS(Main 1 ANT)



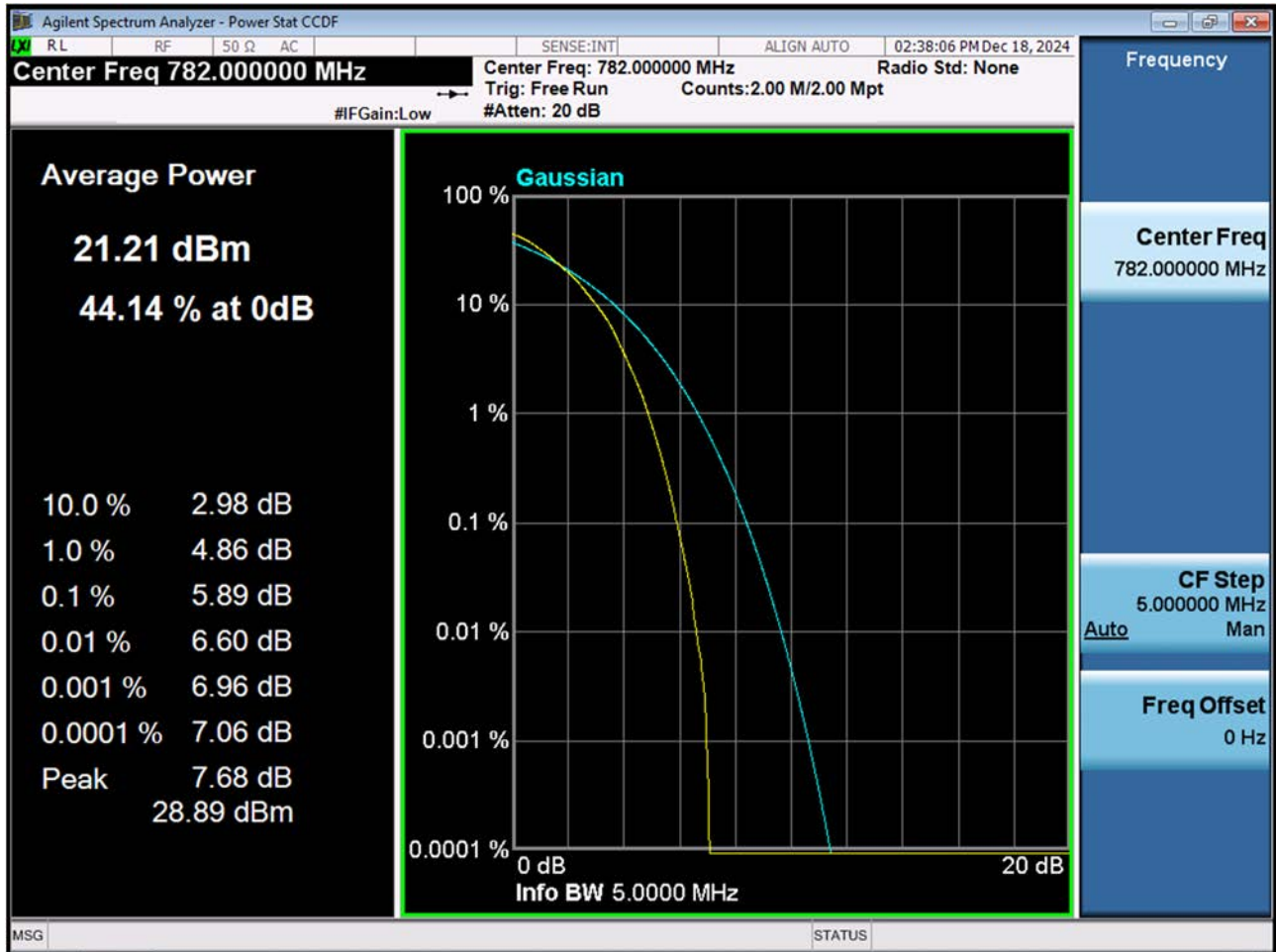
## LTE B13\_5 M\_PAR\_Mid\_QPSK\_FullRB



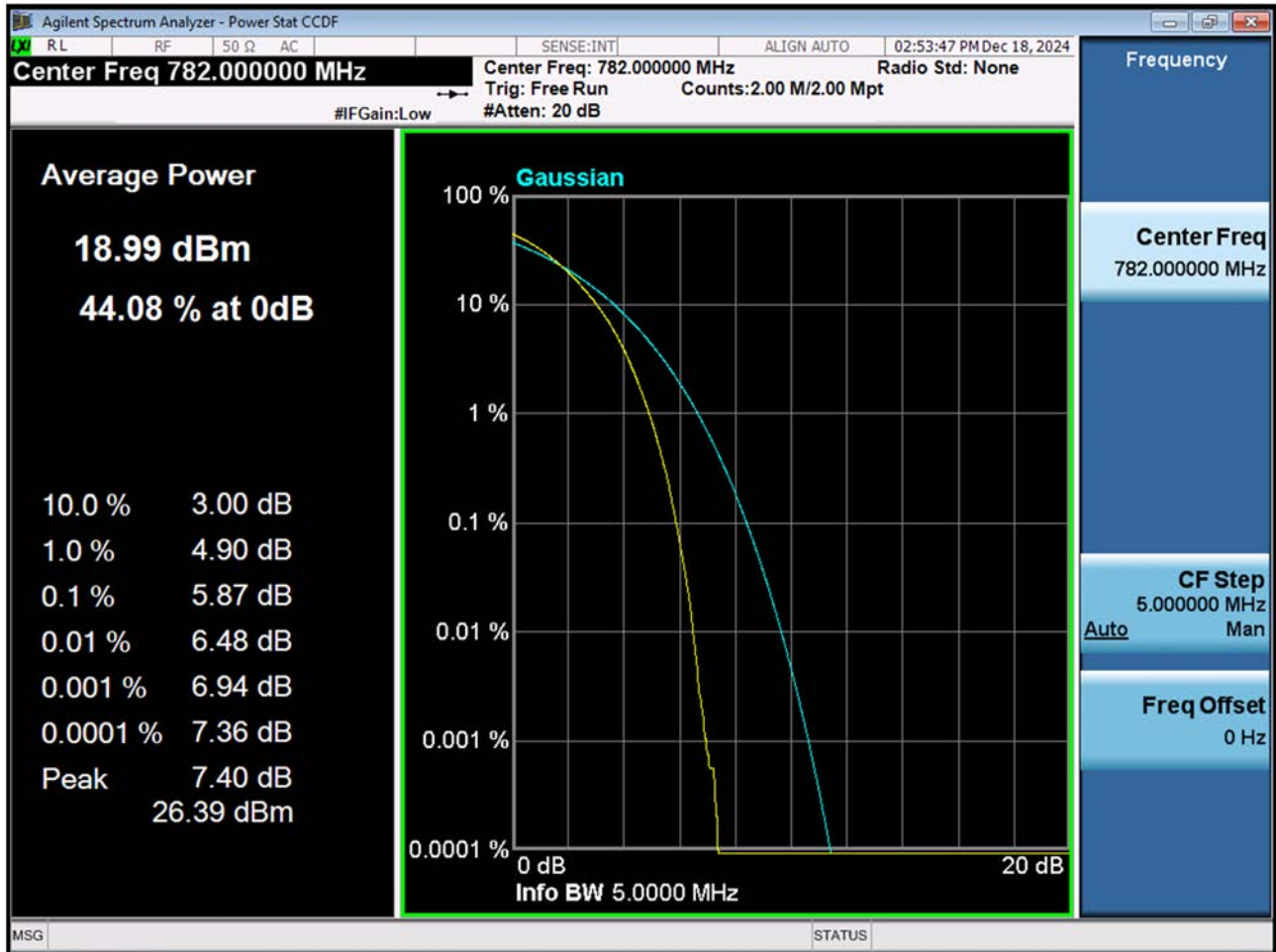
## LTE B13\_5 M\_PAR\_Mid\_16QAM\_FullRB



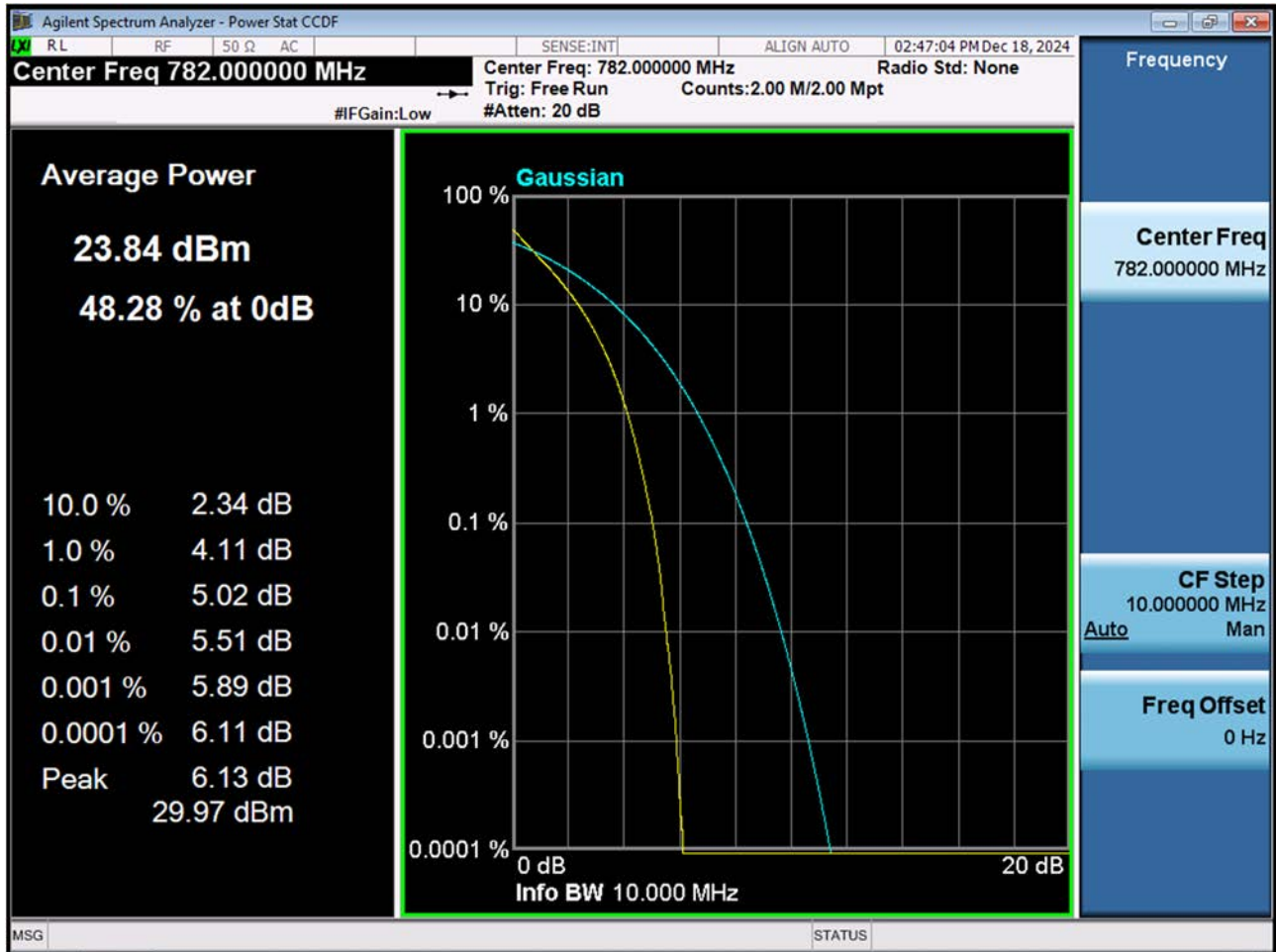
## LTE B13\_5 M\_PAR\_Mid\_64QAM\_FullRB



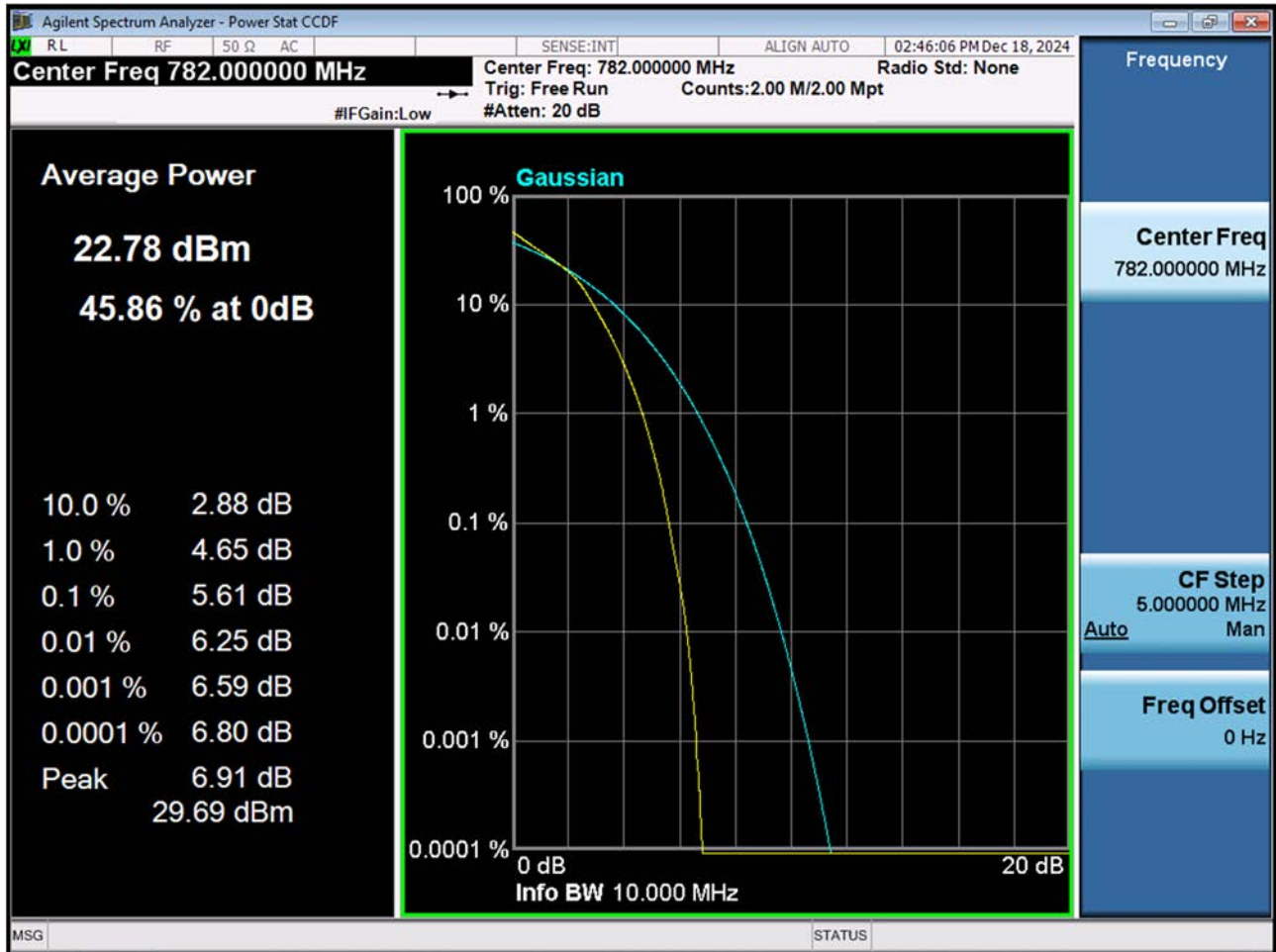
## LTE B13\_5 M\_PAR\_Mid\_256QAM\_FullRB



## LTE B13\_10 M\_PAR\_Mid\_QPSK\_FullRB

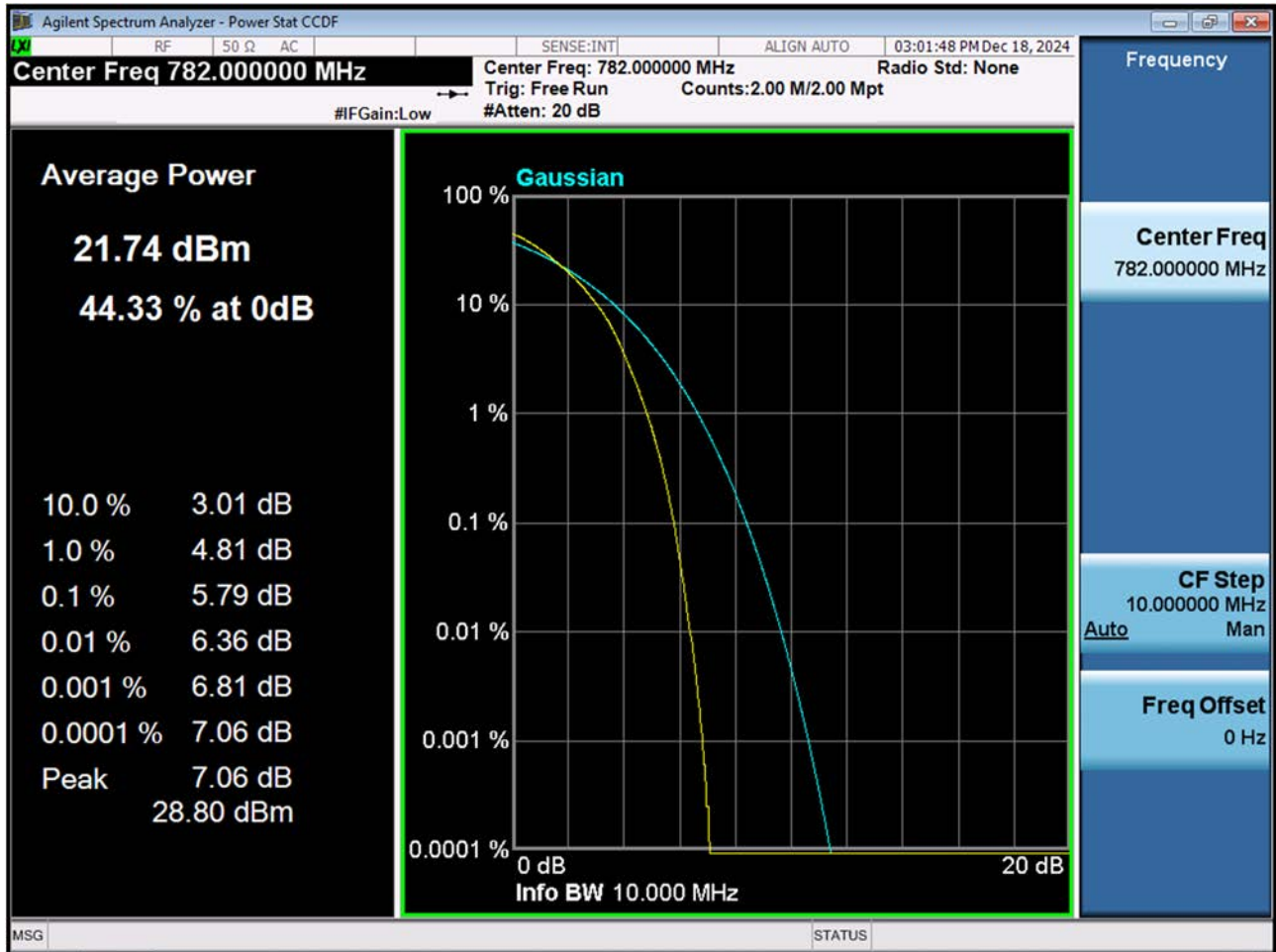


## LTE B13\_10 M\_PAR\_Mid\_16QAM\_FullRB

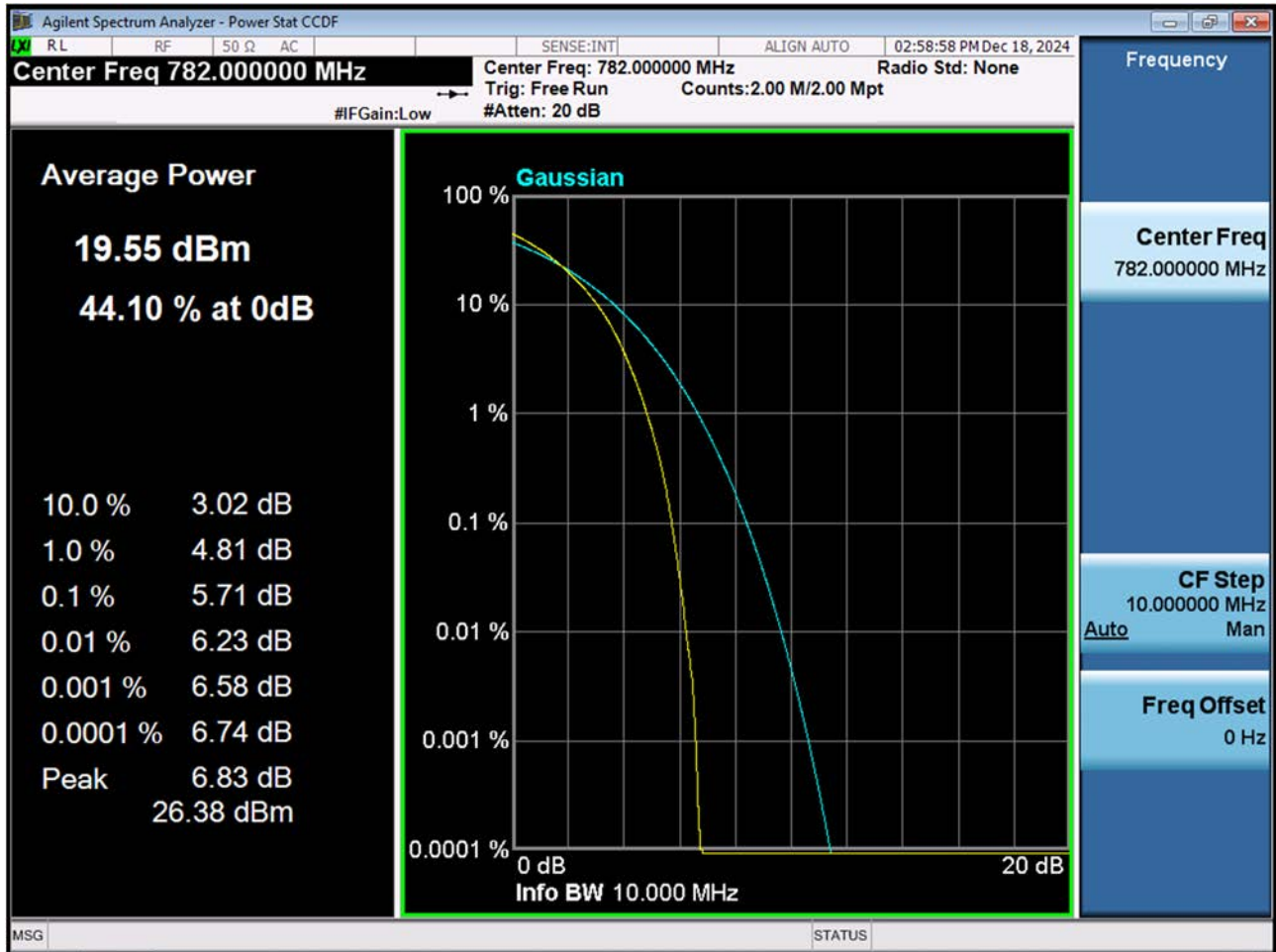




## LTE B13\_10 M\_PAR\_Mid\_64QAM\_FullRB

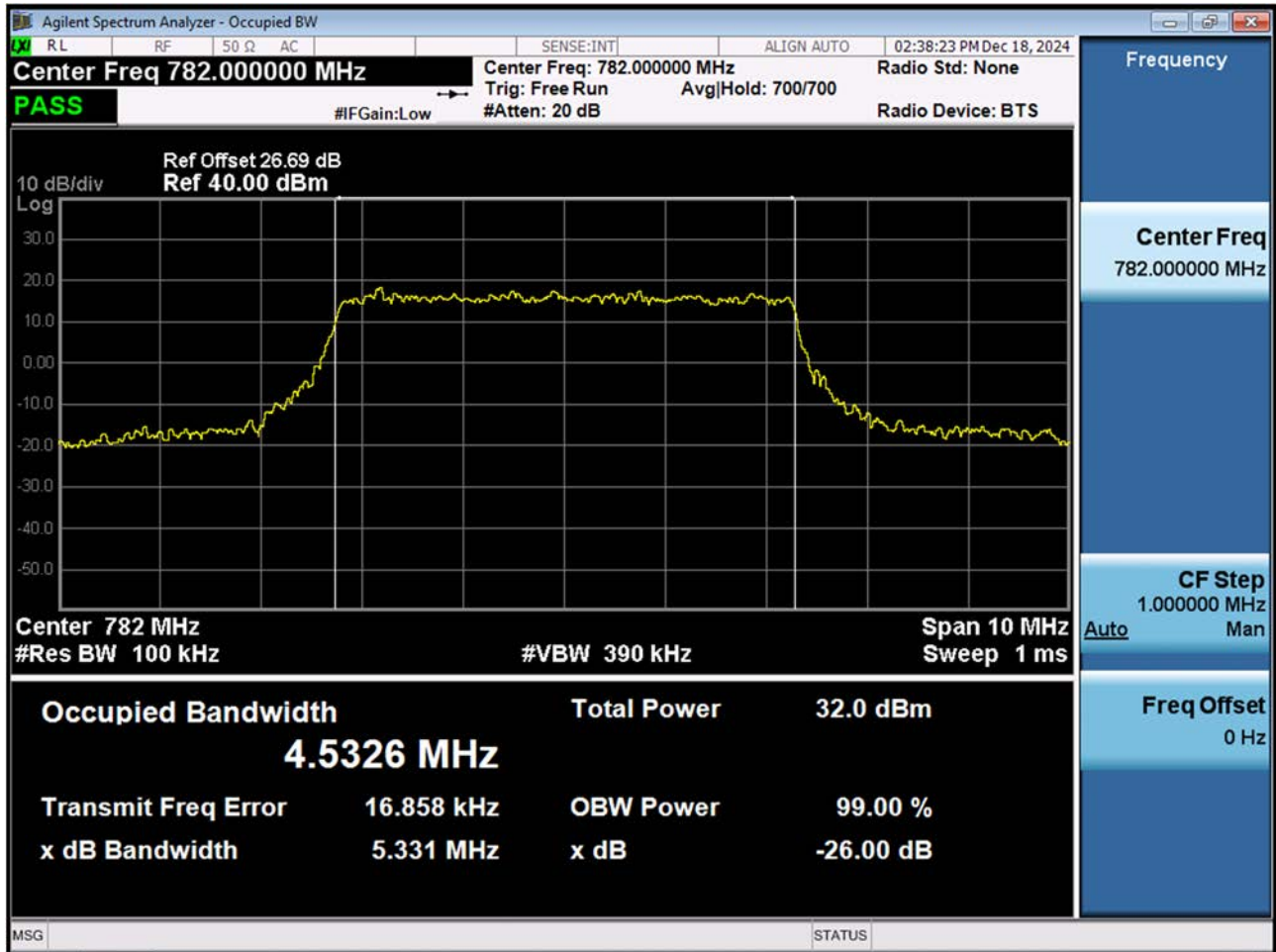


## LTE B13\_10 M\_PAR\_Mid\_256QAM\_FullRB

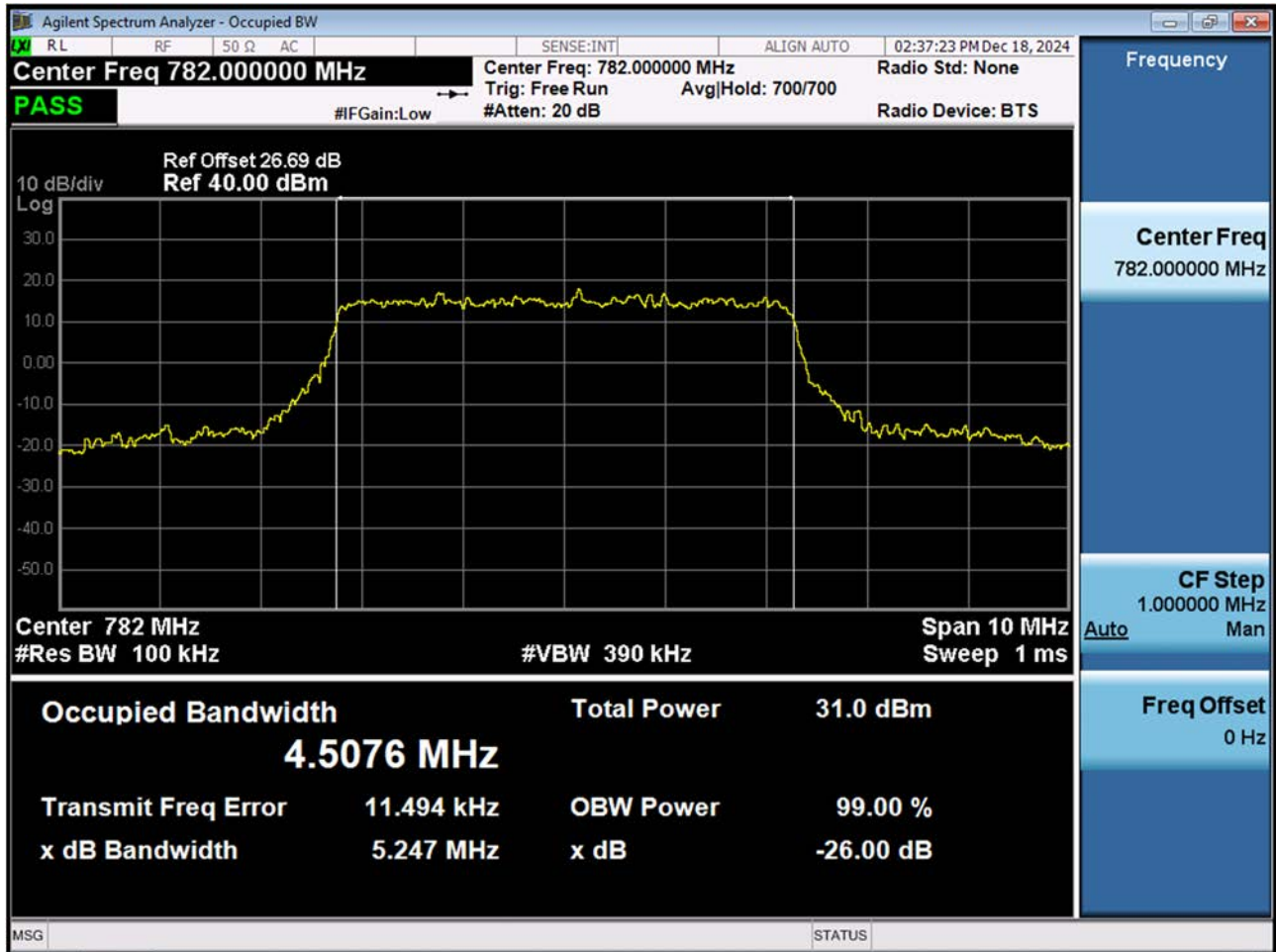




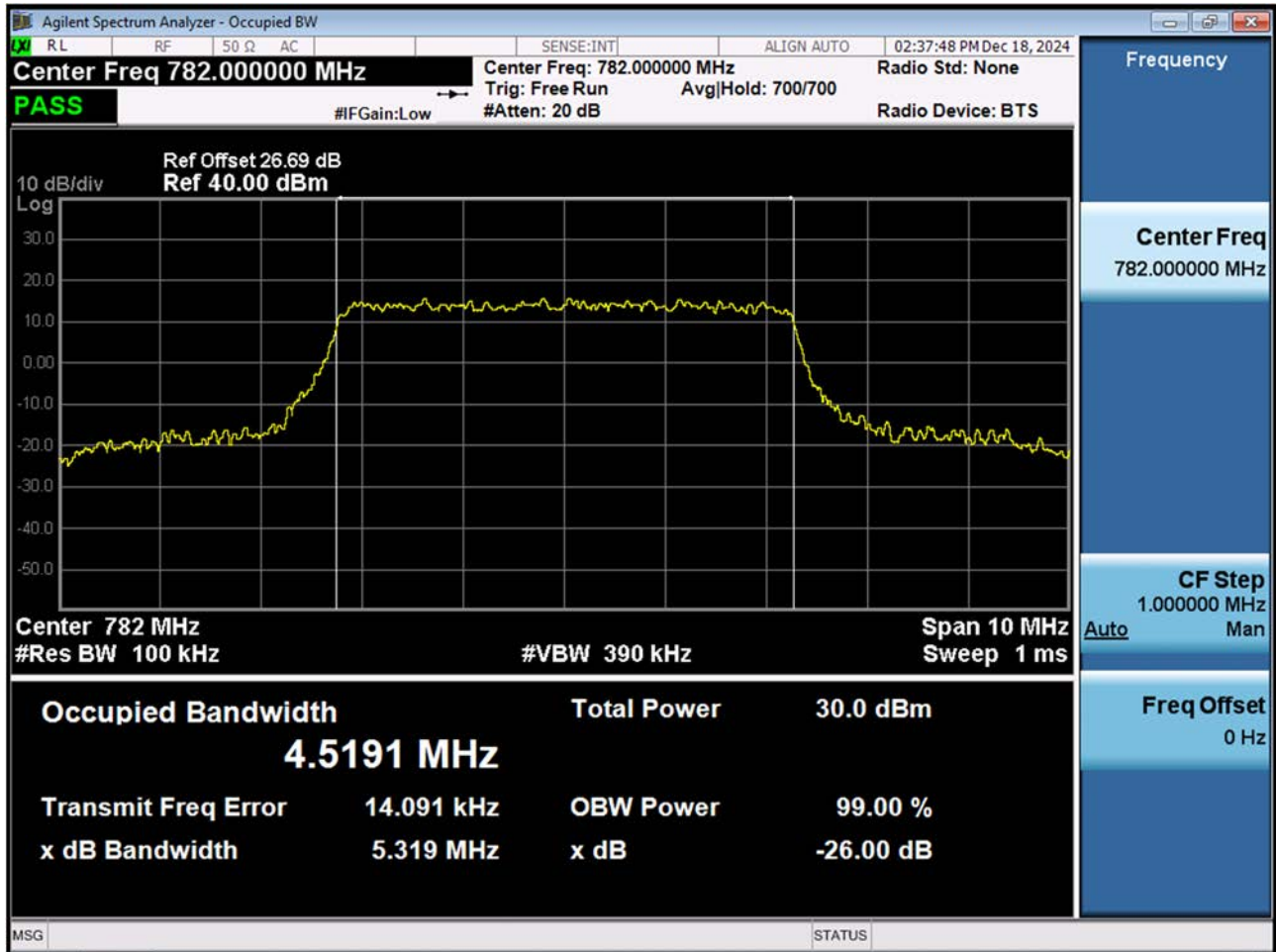
## LTE B13\_5 M\_OBW\_Mid\_QPSK\_FullRB



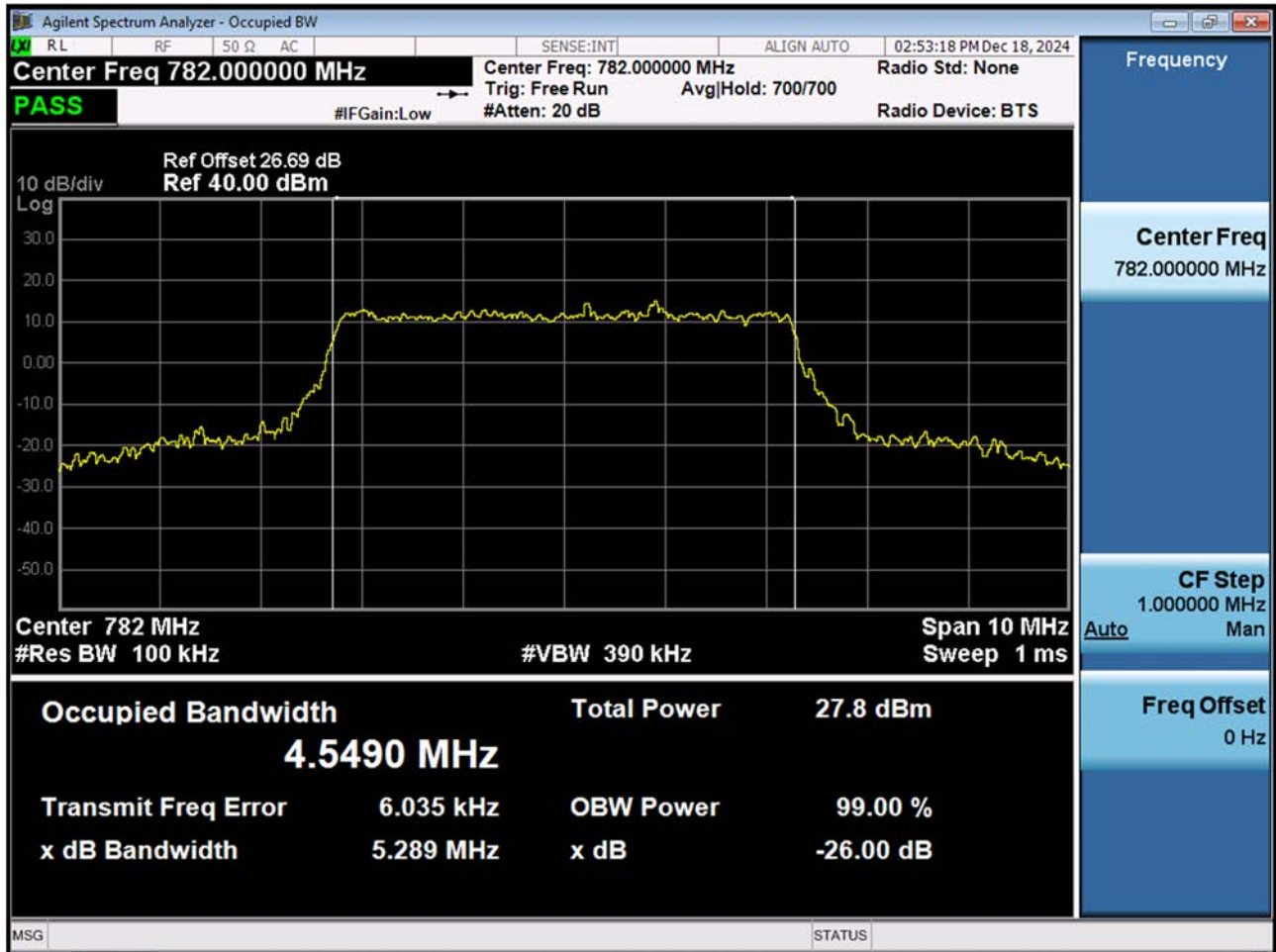
## LTE B13\_5 M\_OBW\_Mid\_16QAM\_FullRB



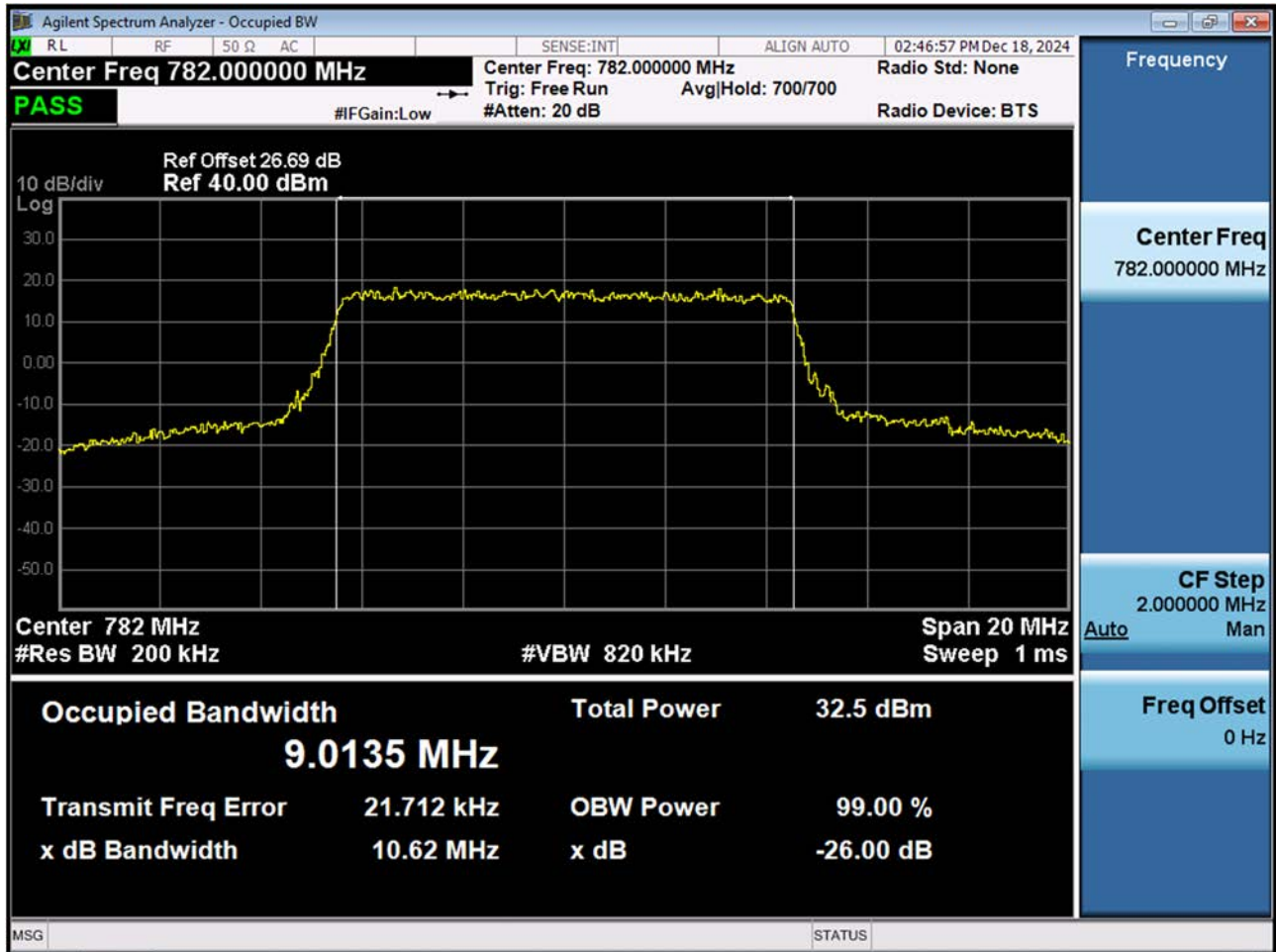
## LTE B13\_5 M\_OBW\_Mid\_64QAM\_FullRB



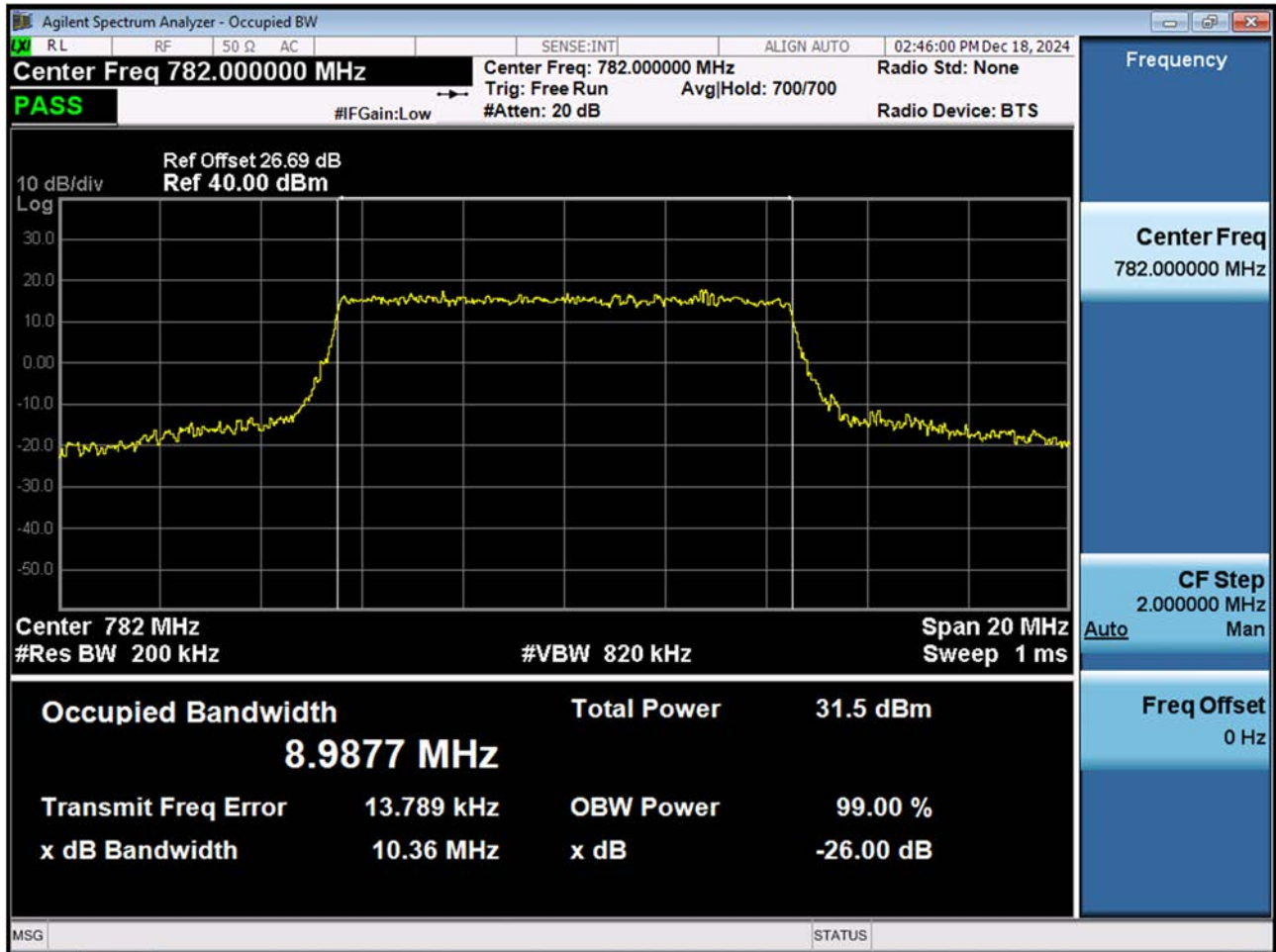
LTE B13\_5 M\_OBW\_Mid\_256QAM\_FullRB



## LTE B13\_10 M\_OBW\_Mid\_QPSK\_FullRB

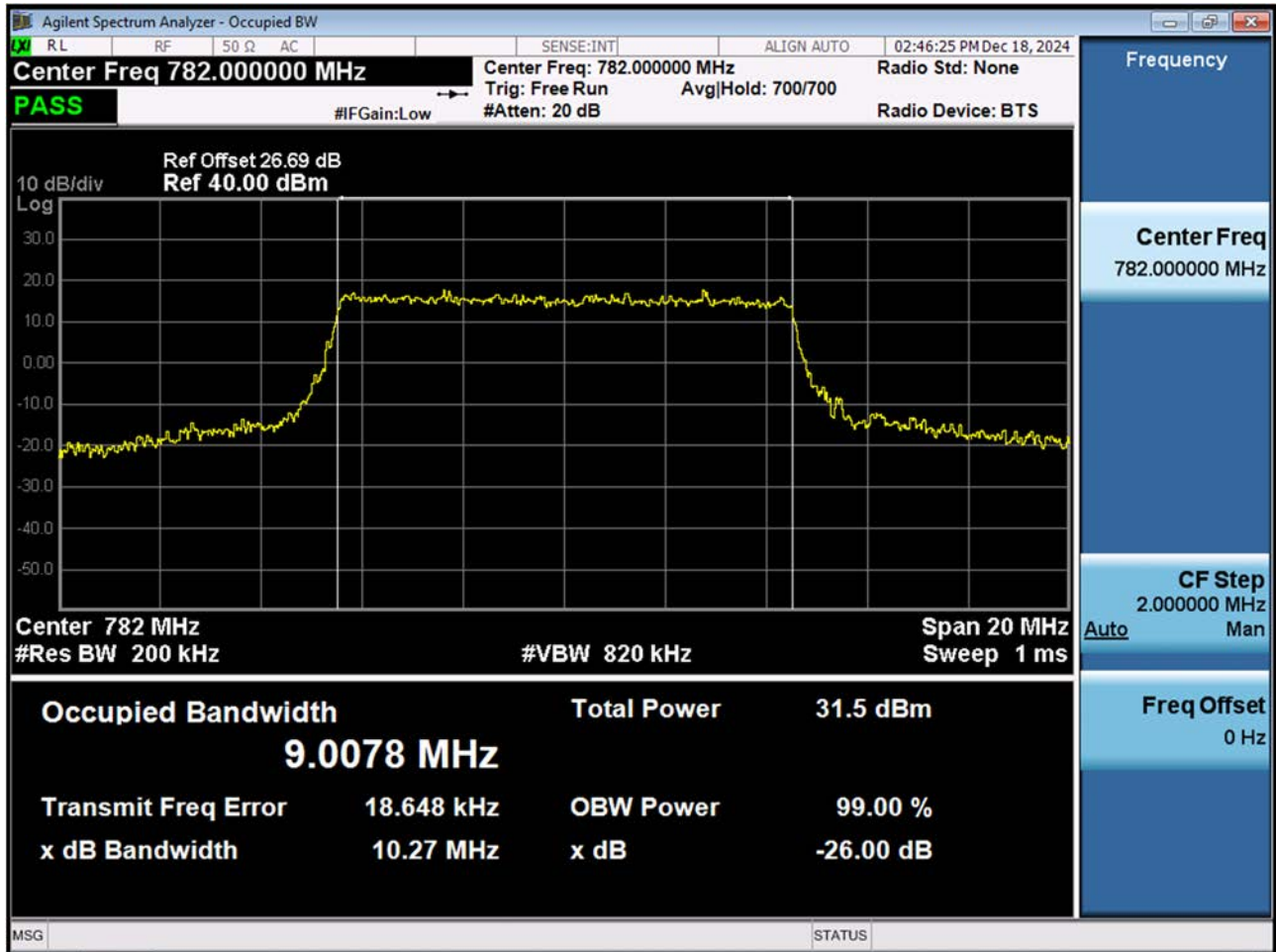


LTE B13\_10 M\_OBW\_Mid\_16QAM\_FullRB

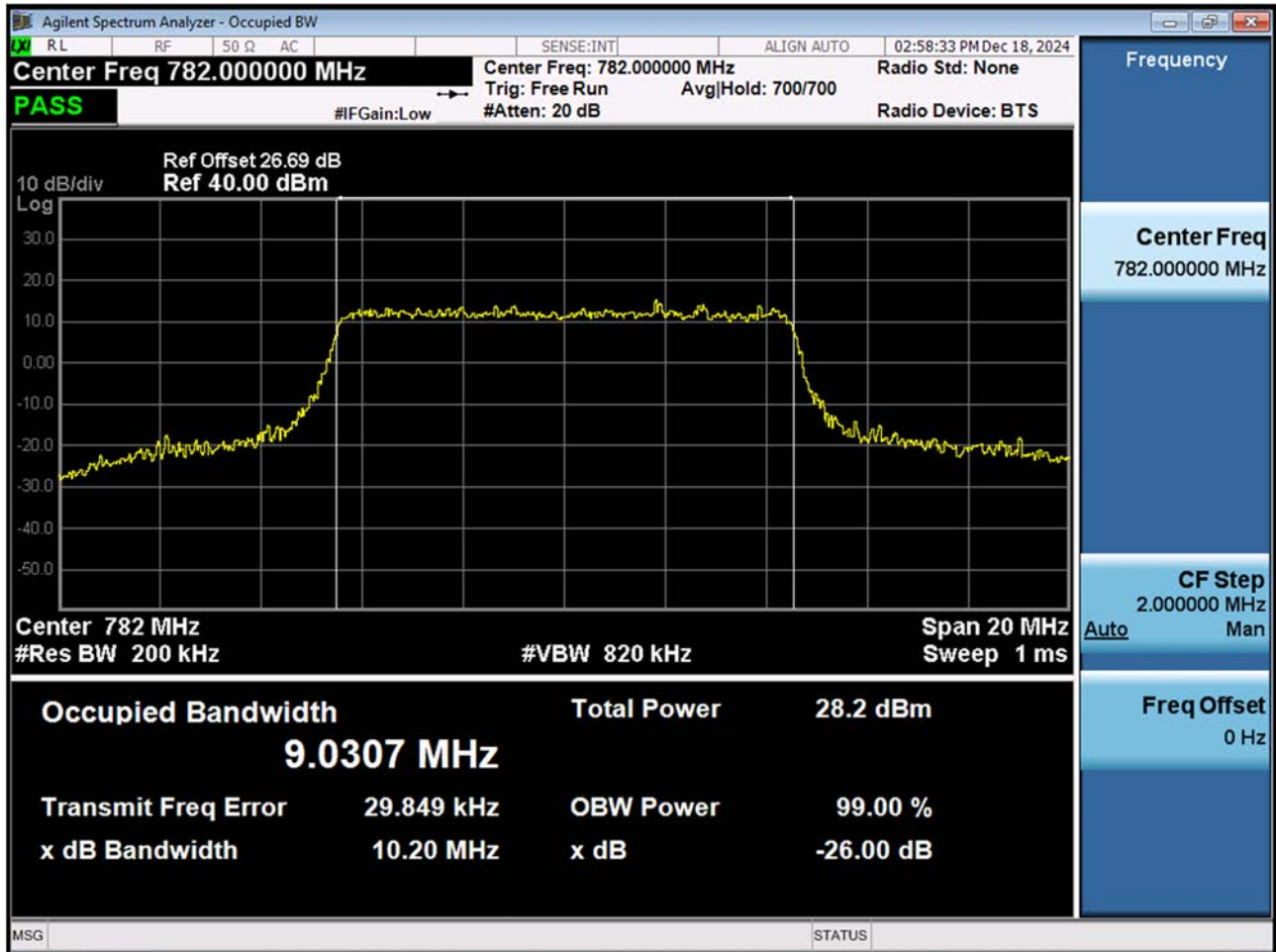




## LTE B13\_10 M\_OBW\_Mid\_64QAM\_FullRB



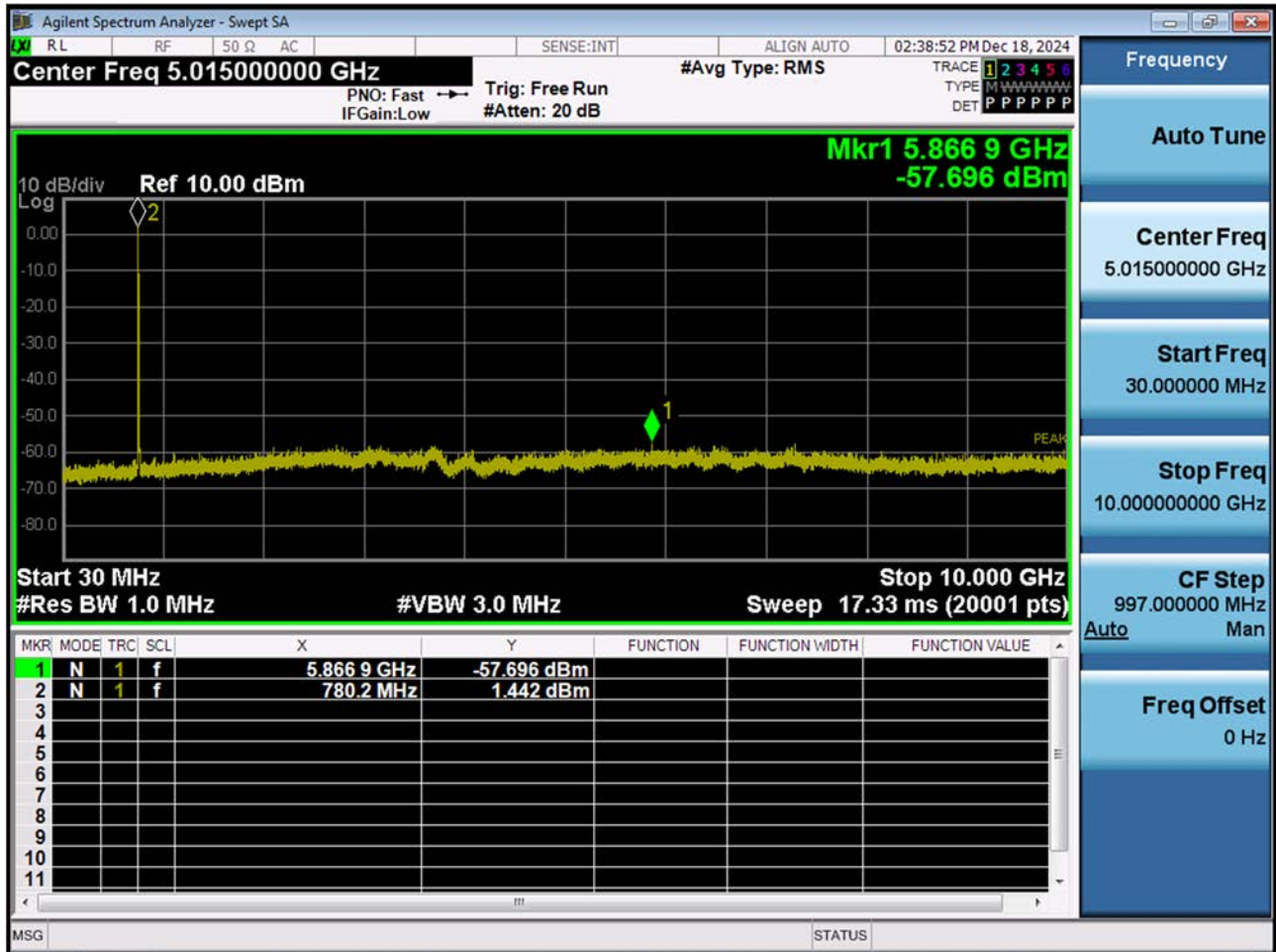
## LTE B13\_10 M\_OBW\_Mid\_256QAM\_FullRB



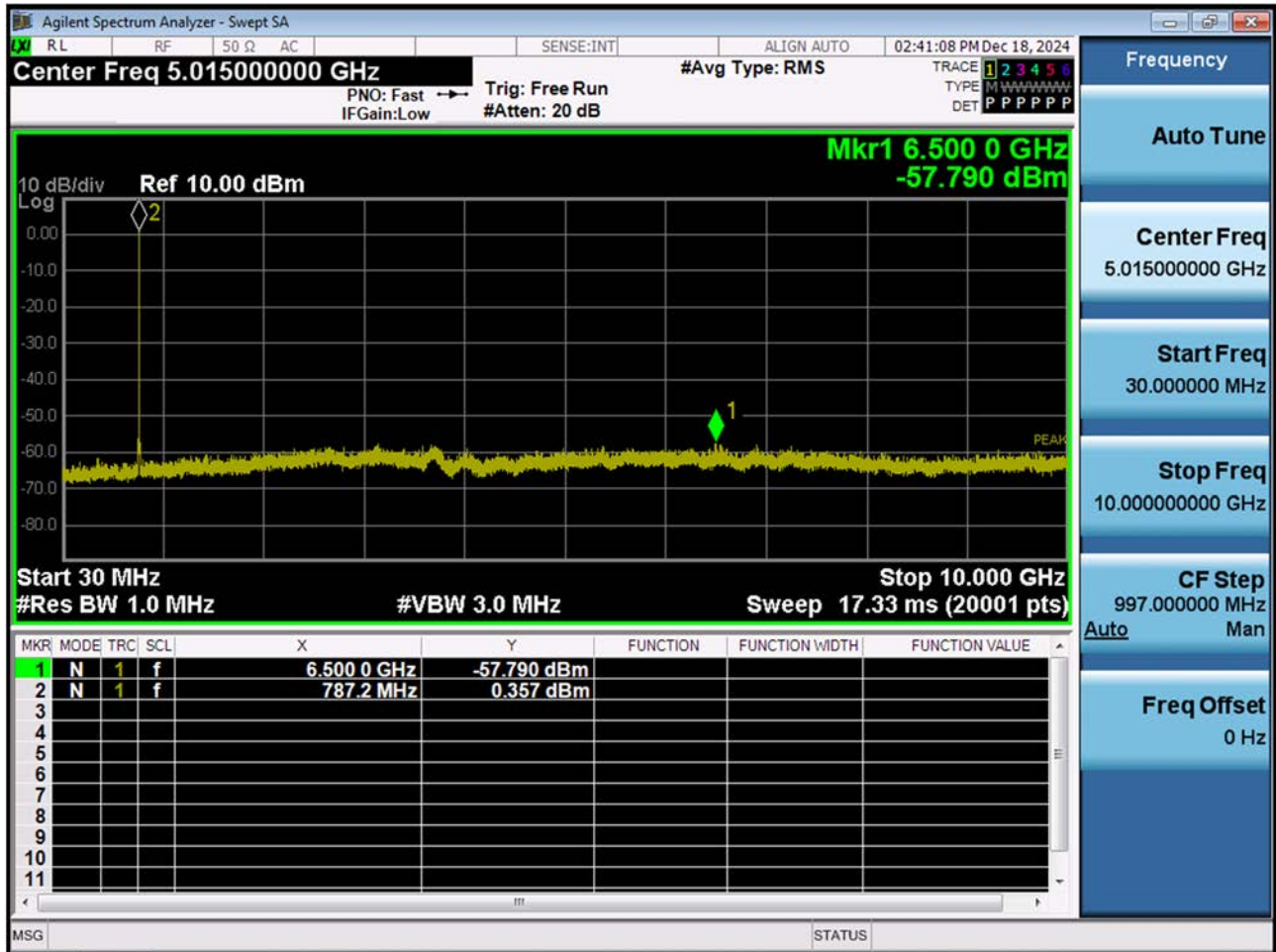


[illegible]

LTE B13\_5 M\_Conducted Spurious(30 M-10 G)\_Mid\_QPSK\_1RB



LTE B13\_5 M\_Conducted Spurious(30 M-10 G)\_High\_QPSK\_1RB



[illegible]

## LTE B13\_5 M\_Band Edge\_Low\_QPSK\_1RB

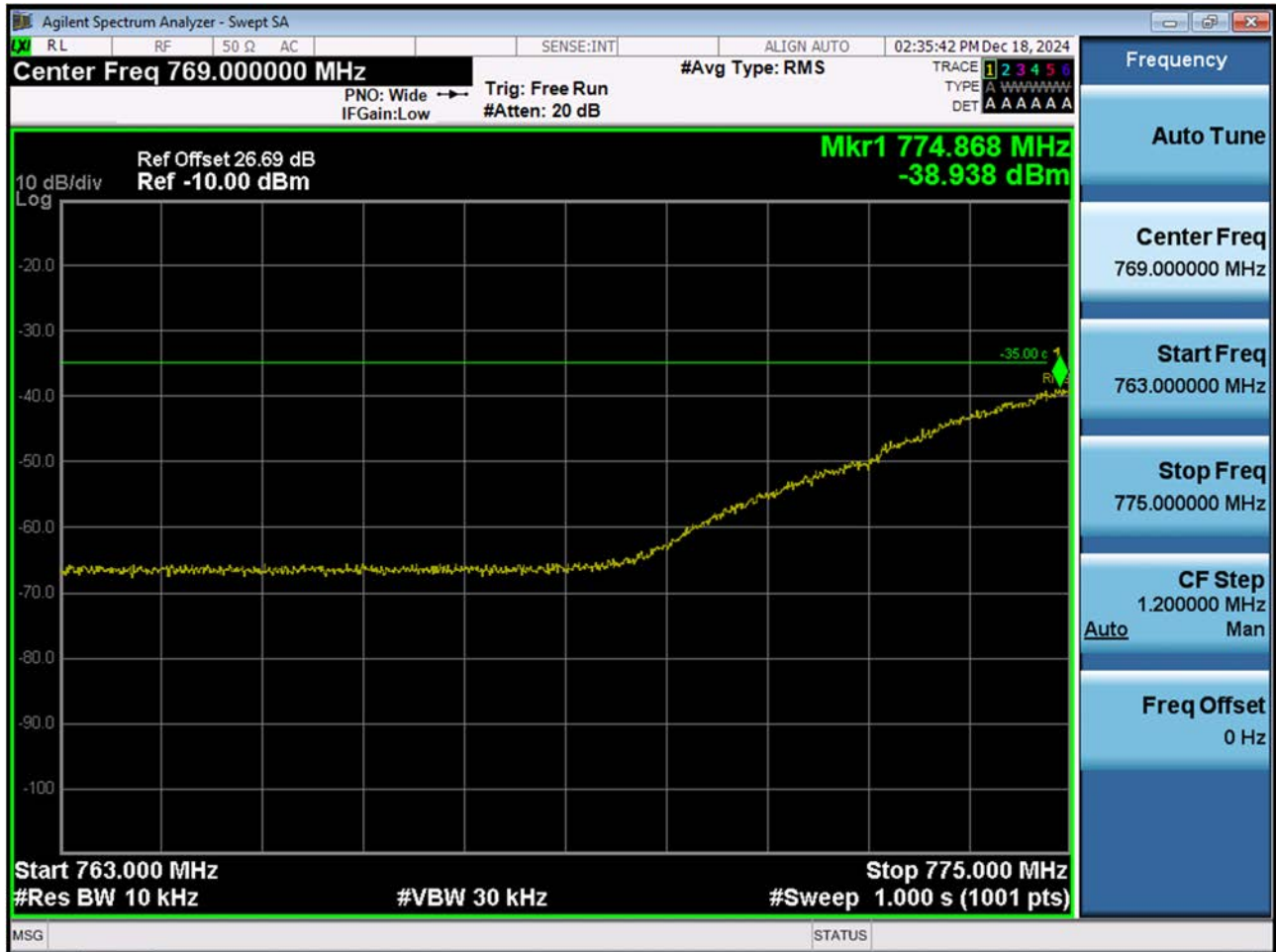


## LTE B13\_5 M\_Band Edge\_Low\_QPSK\_FullRB

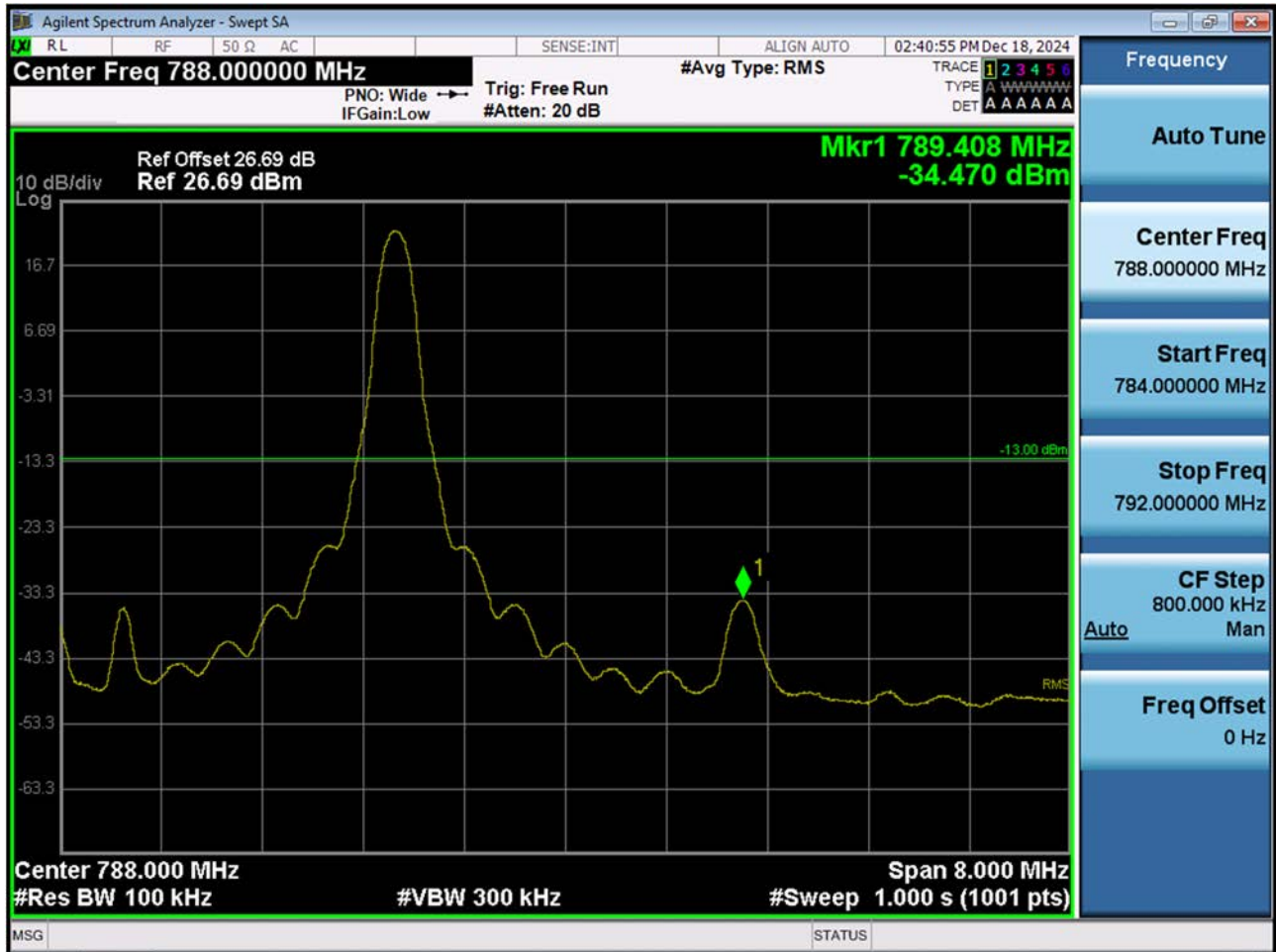




LTE B13\_5 M\_Extended Band Edge\_Low\_QPSK\_FullRB



## LTE B13\_5 M\_Band Edge\_High\_QPSK\_1RB





## LTE B13\_5 M\_Band Edge\_High\_QPSK\_FullRB



LTE B13\_5 M\_Extended Band Edge\_High\_QPSK\_FullIRB



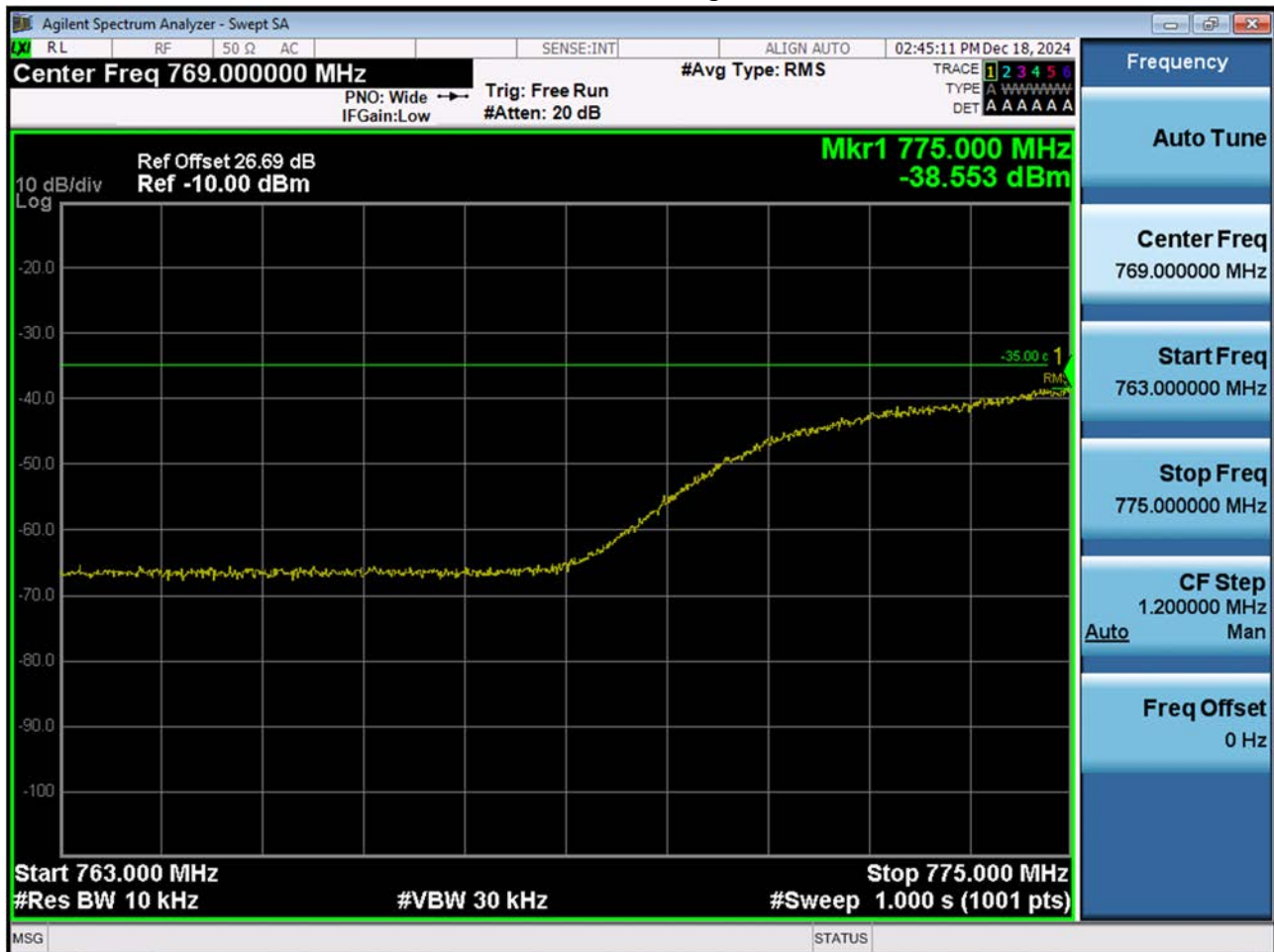
LTE B13\_10 M\_Band Edge\_Low\_QPSK\_1RB



LTE B13\_10 M\_Band Edge\_Low\_QPSK\_FullRB



LTE B13\_10 M\_Extended Band Edge\_Low\_QPSK\_FullRB



## LTE B13\_10 M\_Band Edge\_High\_QPSK\_1RB



## LTE B13\_10 M\_Band Edge\_High\_QPSK\_FullIRB





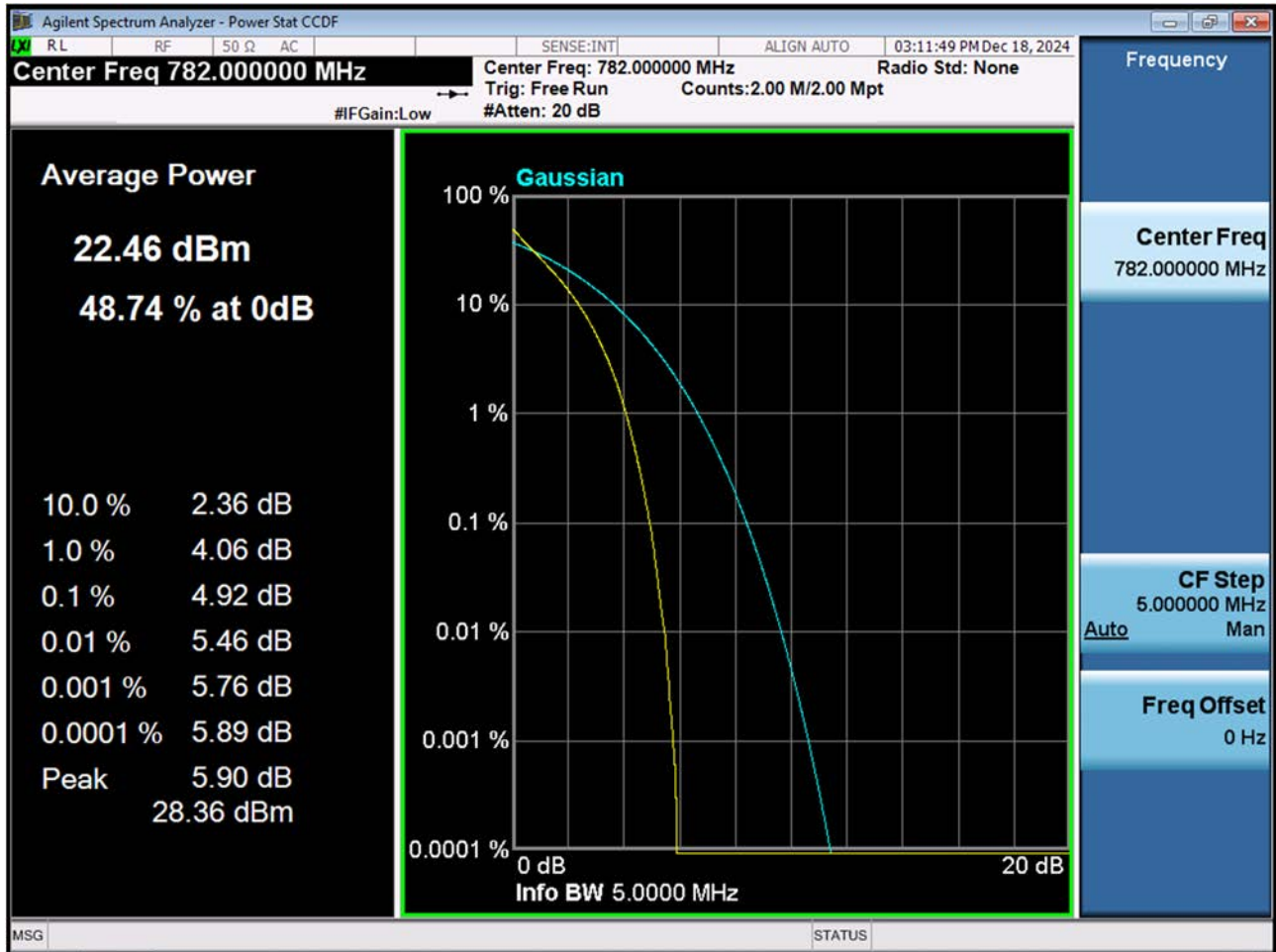
LTE B13\_10 M\_Extended Band Edge\_High\_QPSK\_FullRB



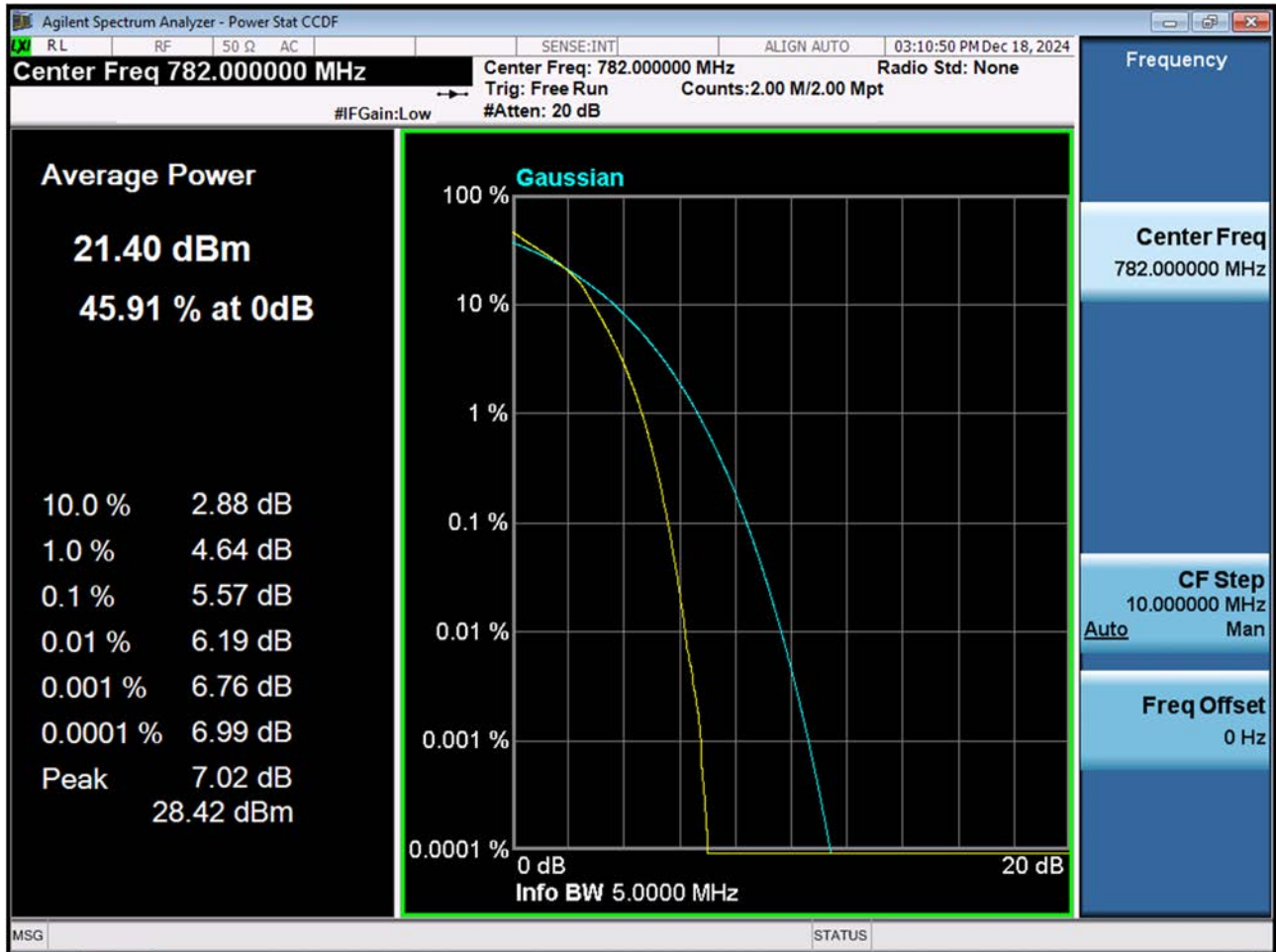


## 11. TEST PLOTS(Sub 1 ANT)

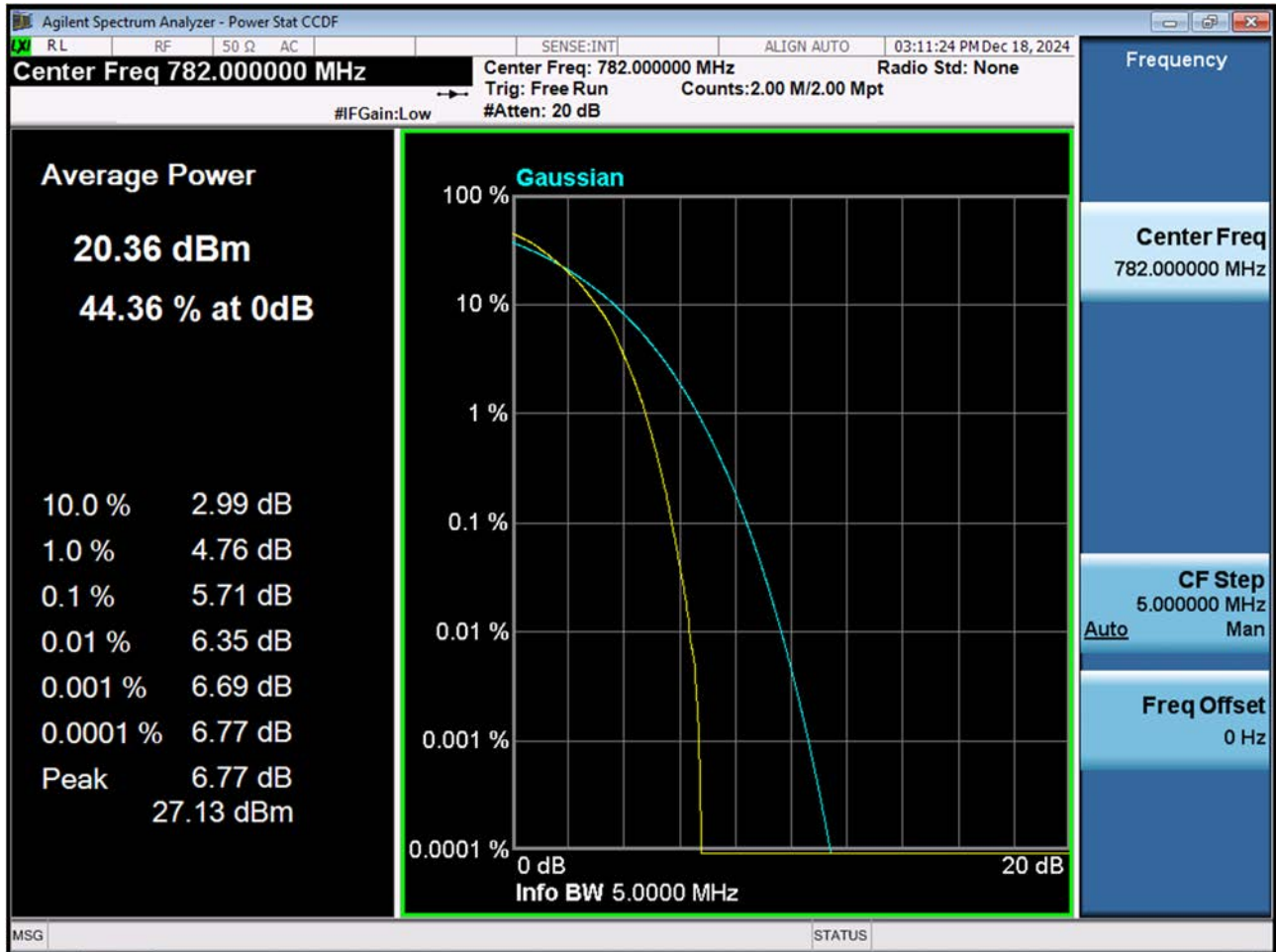
LTE B13\_5 M\_PAR\_Mid\_QPSK\_FullRB



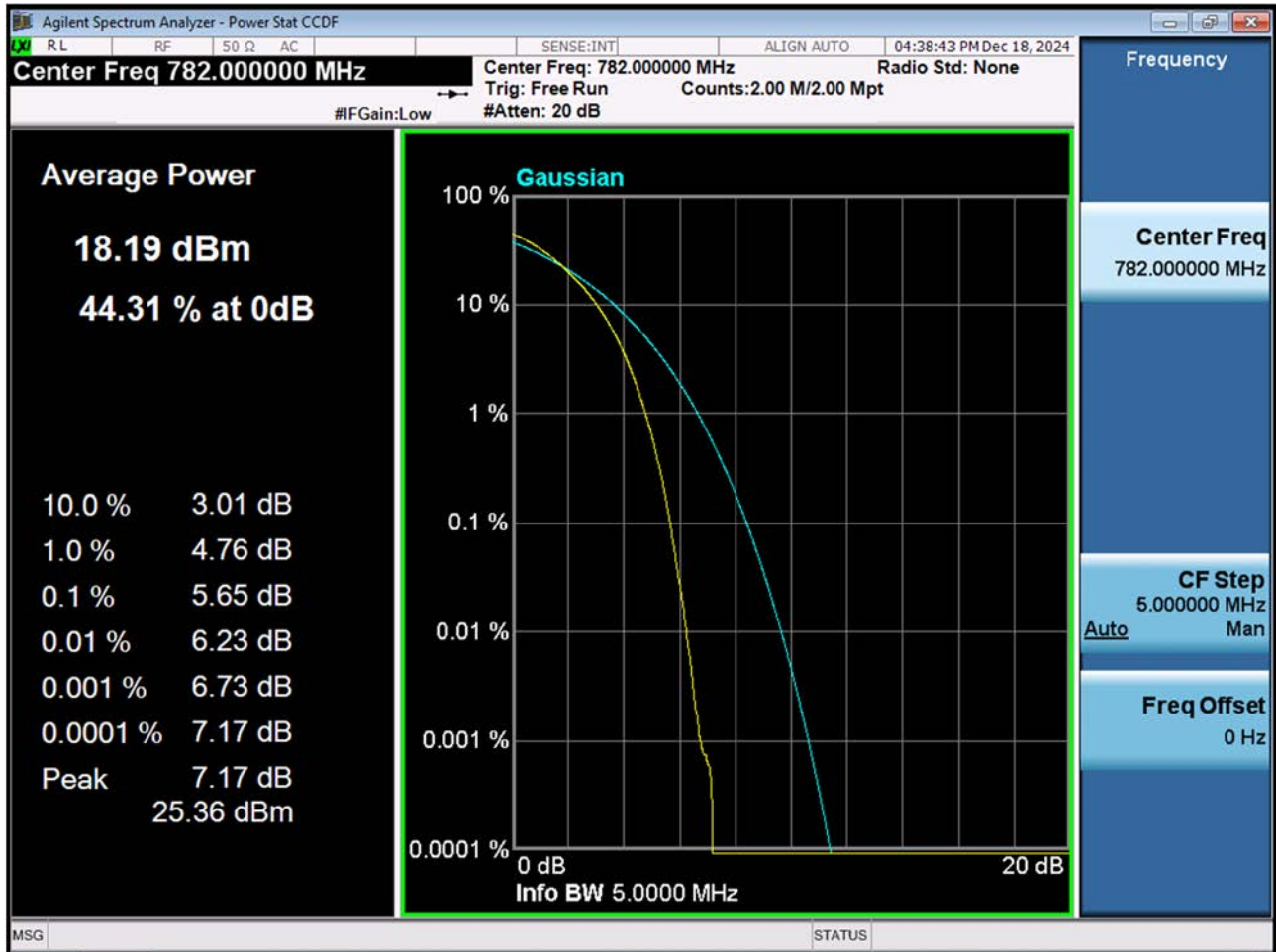
## LTE B13\_5 M\_PAR\_Mid\_16QAM\_FullRB



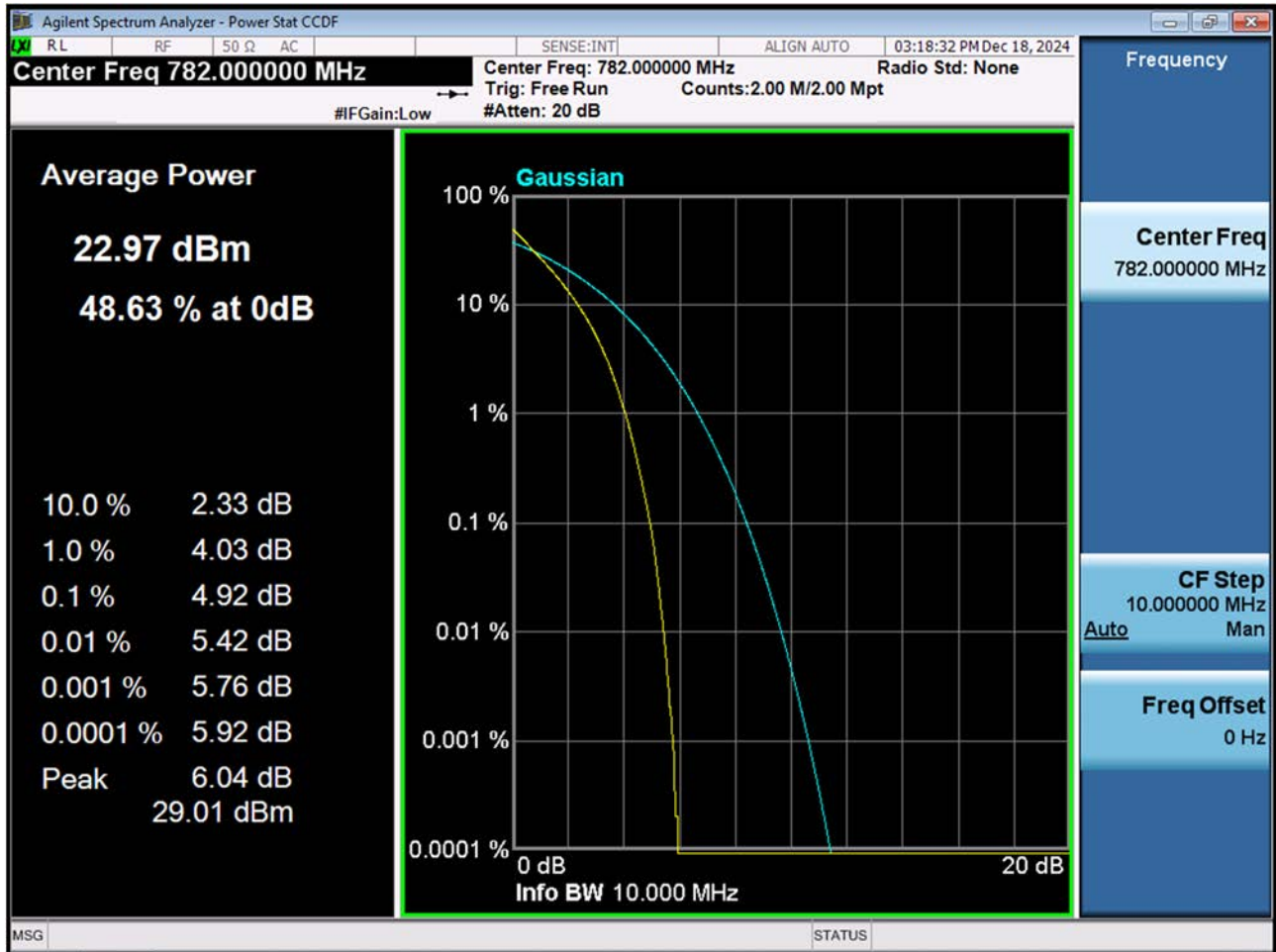
## LTE B13\_5 M\_PAR\_Mid\_64QAM\_FullRB



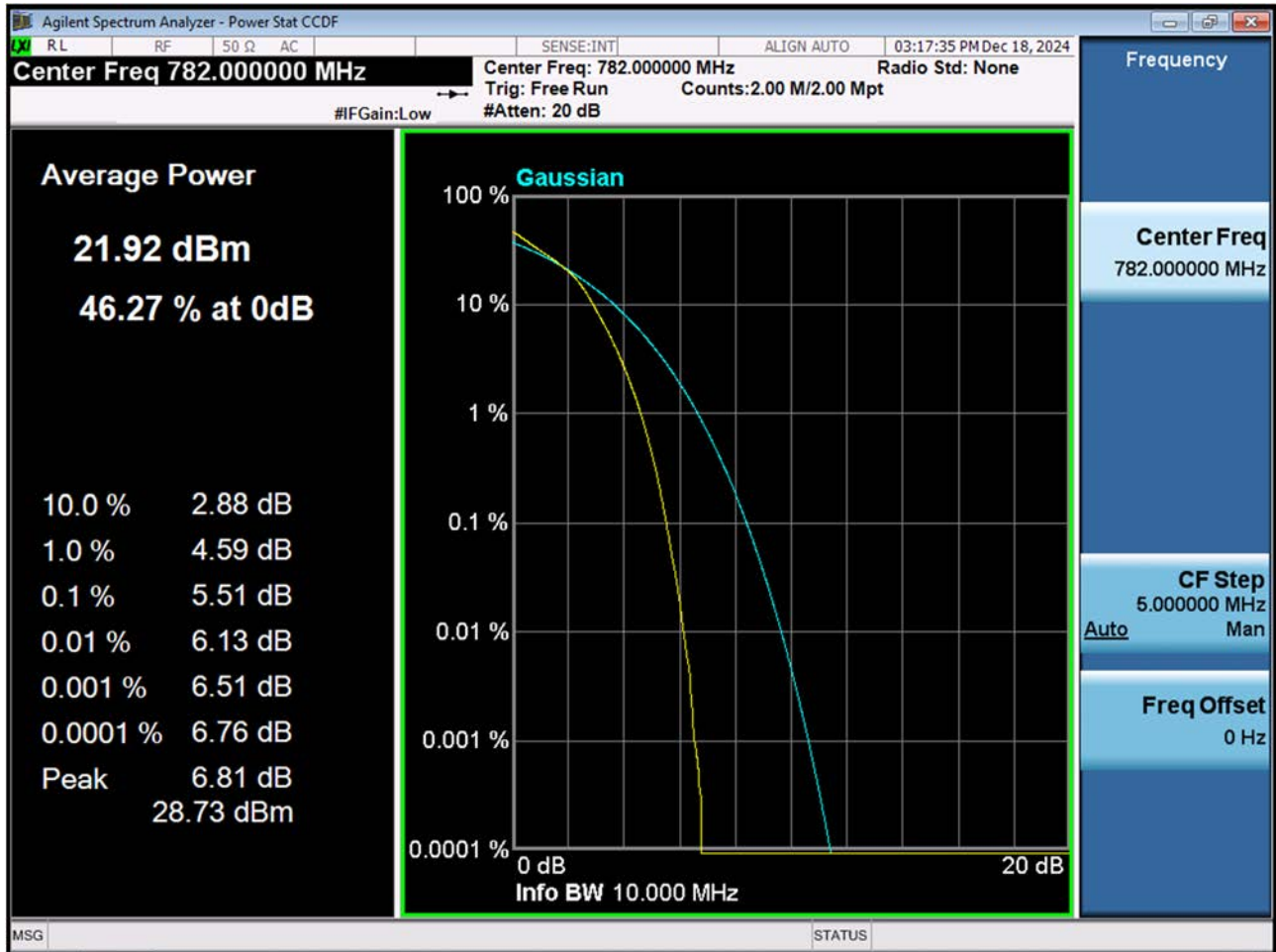
## LTE B13\_5 M\_PAR\_Mid\_256QAM\_FullRB



## LTE B13\_10 M\_PAR\_Mid\_QPSK\_FullRB

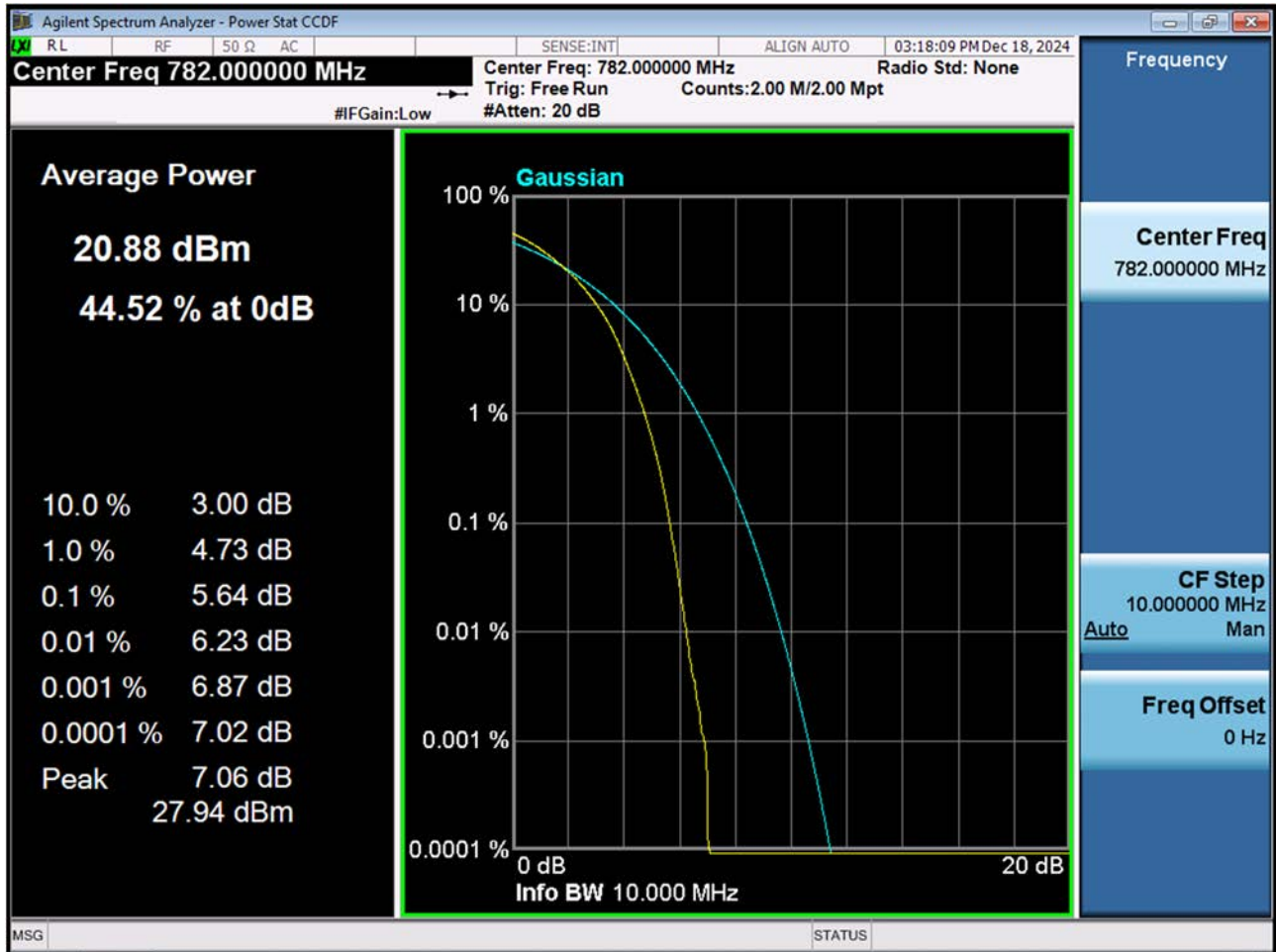


## LTE B13\_10 M\_PAR\_Mid\_16QAM\_FullRB



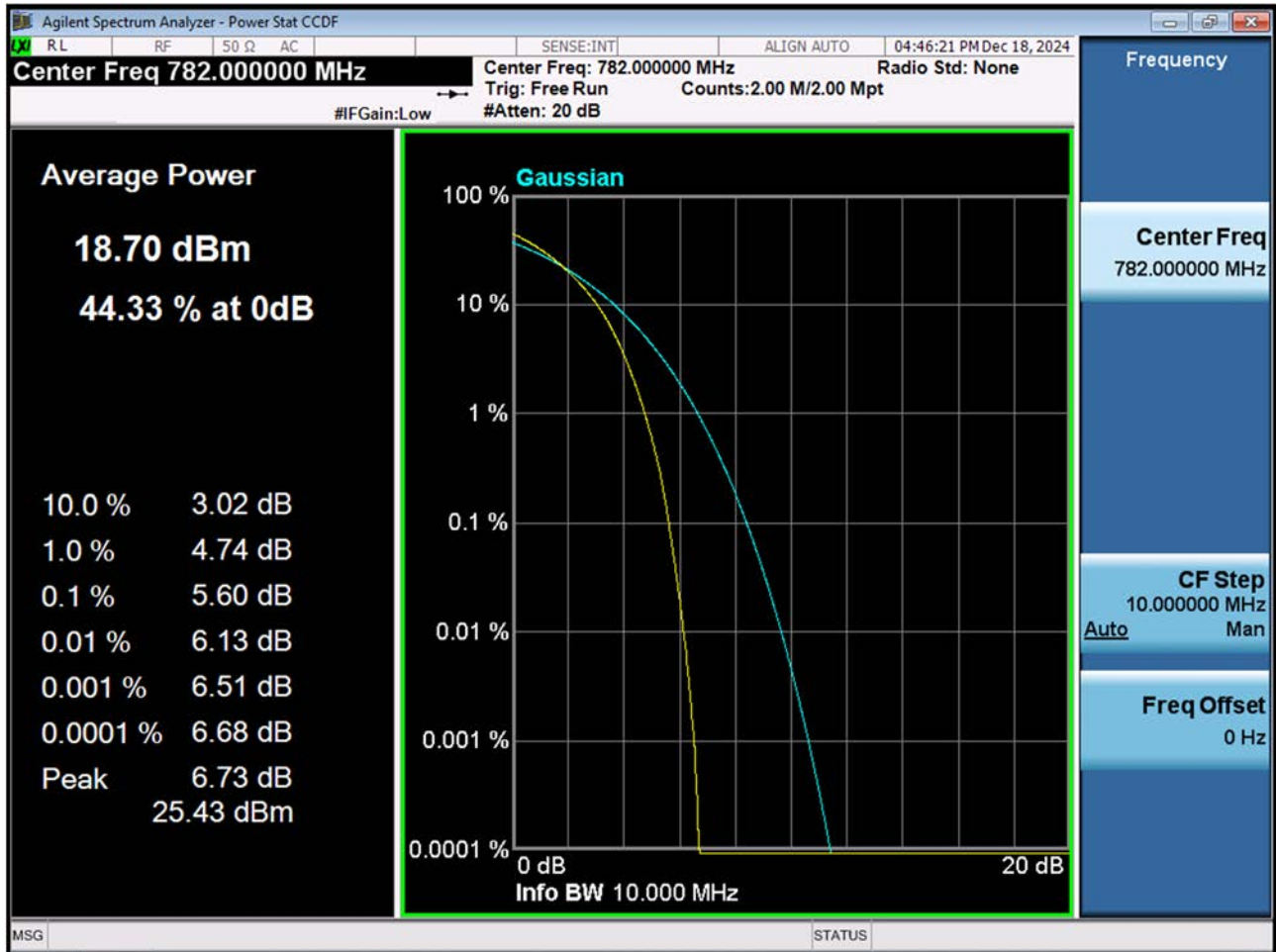


## LTE B13\_10 M\_PAR\_Mid\_64QAM\_FullRB

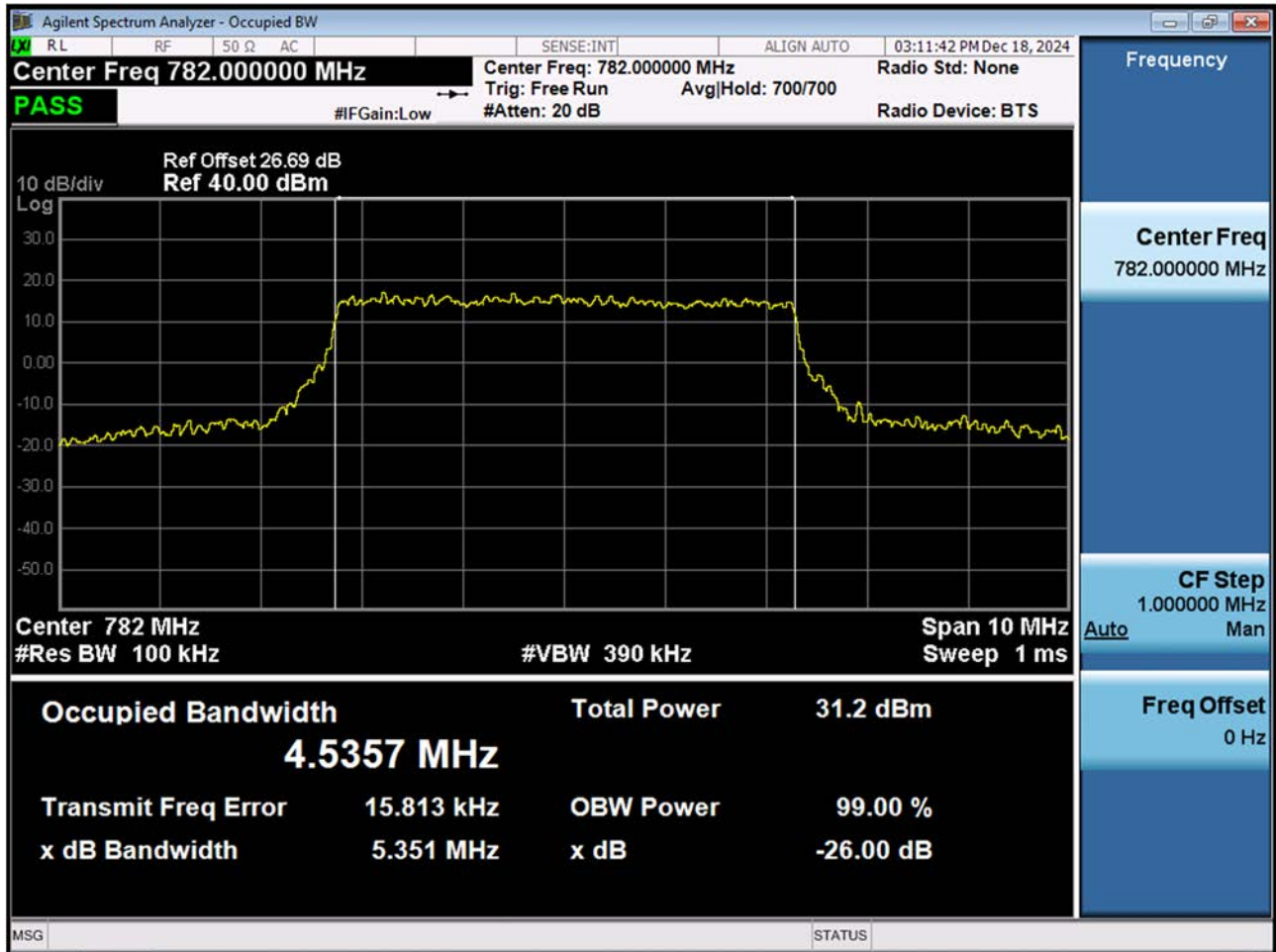




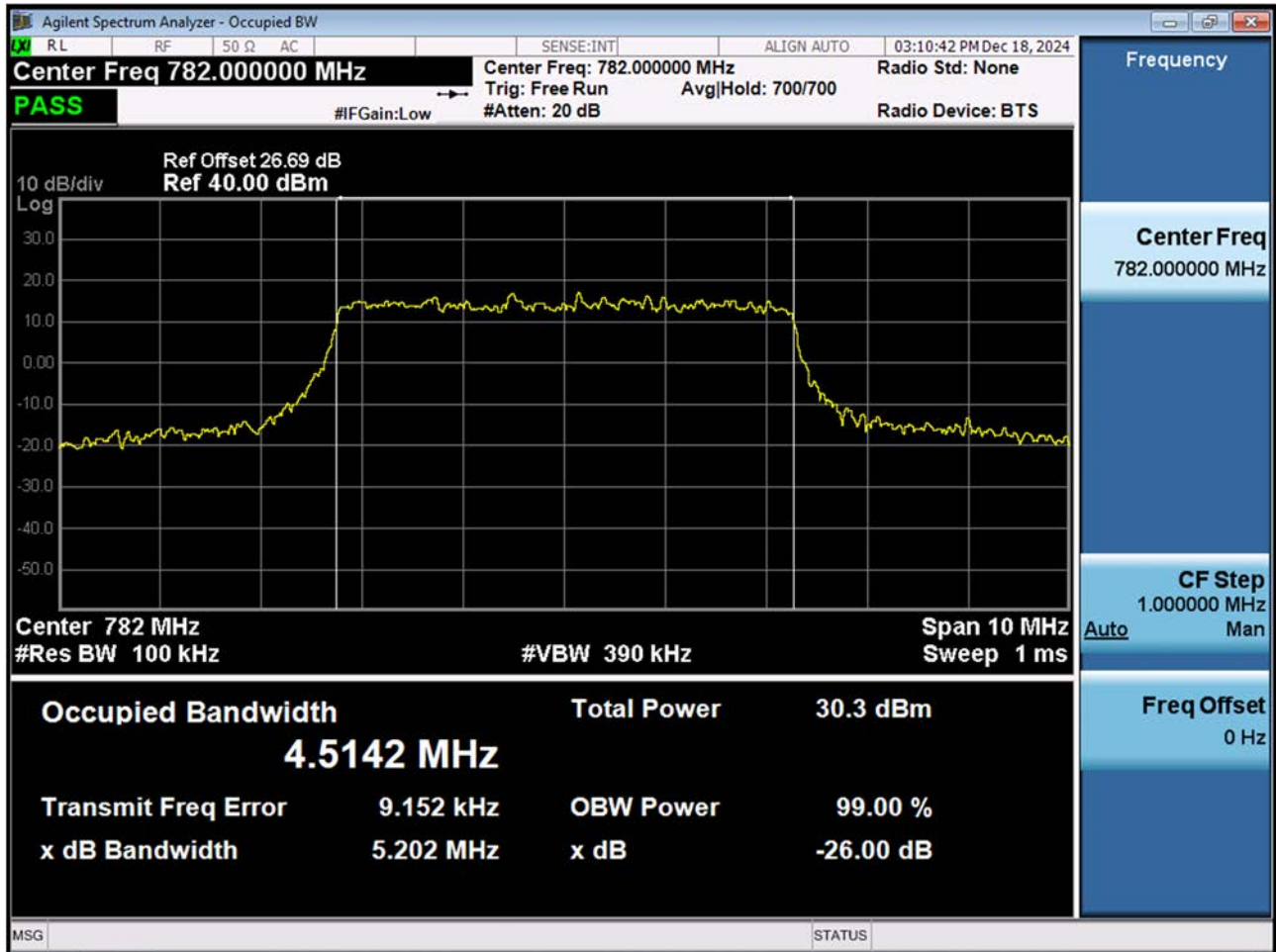
## LTE B13\_10 M\_PAR\_Mid\_256QAM\_FullRB



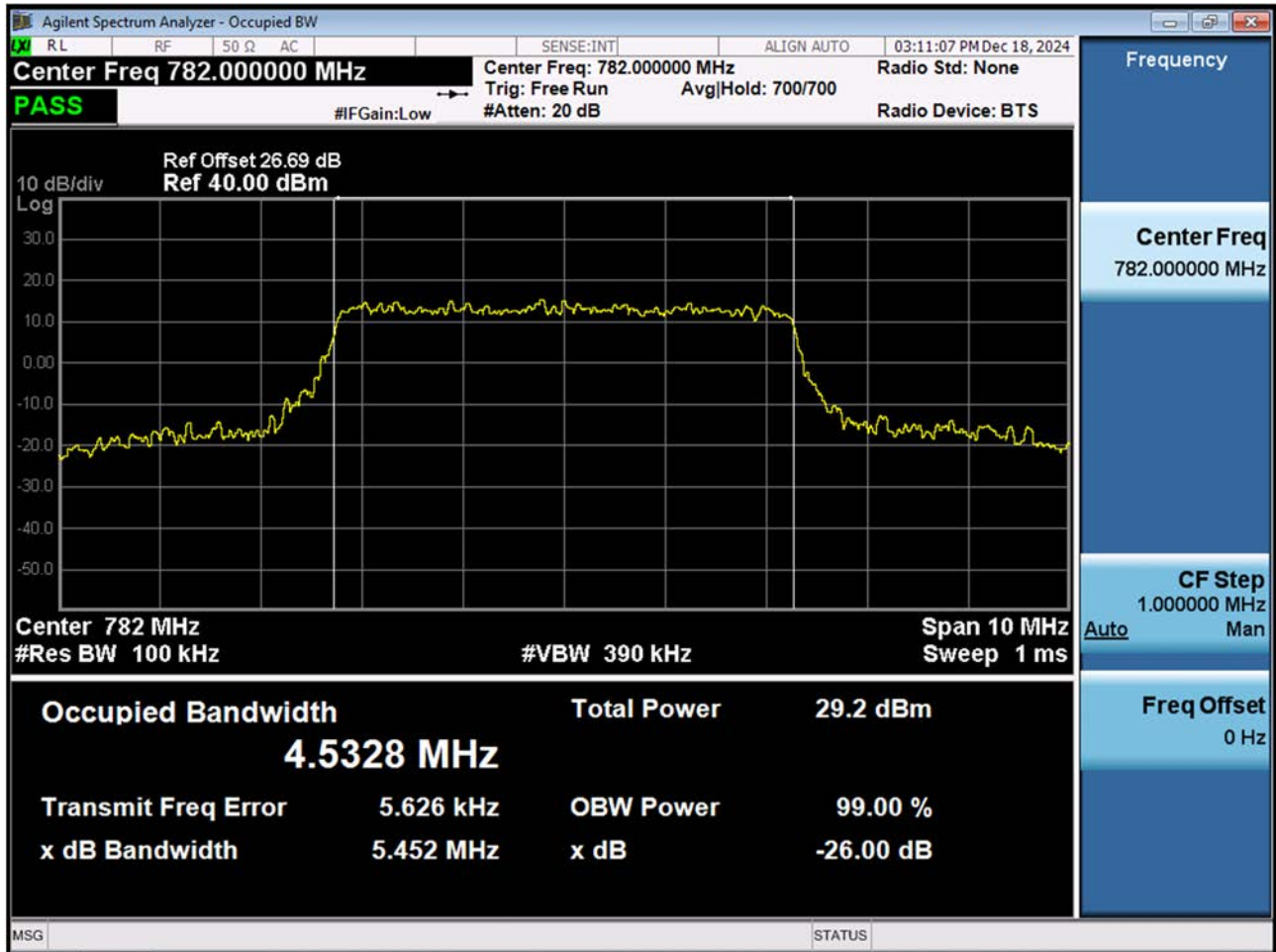
## LTE B13\_5 M\_OBW\_Mid\_QPSK\_FullRB



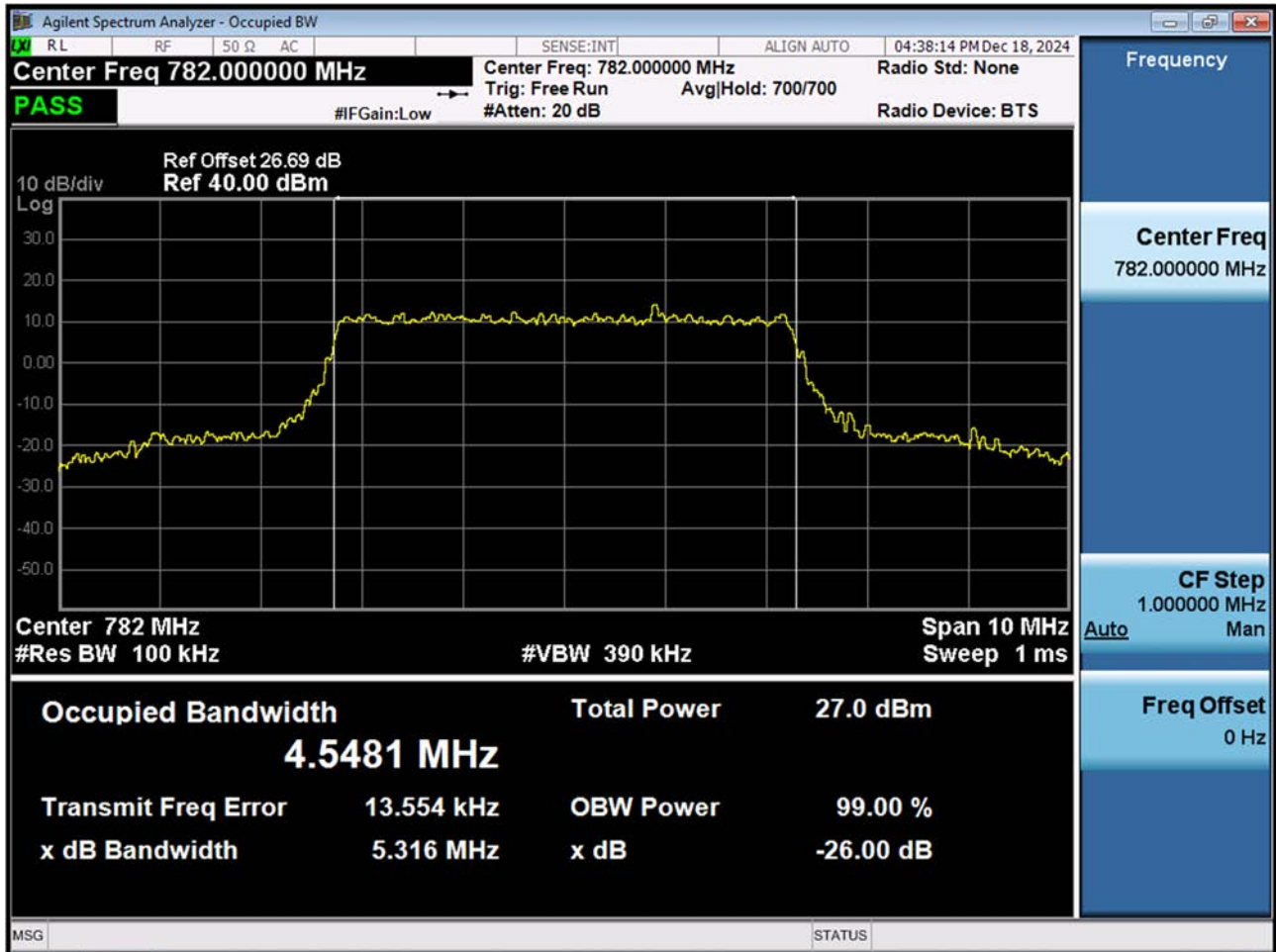
## LTE B13\_5 M\_OBW\_Mid\_16QAM\_FullRB



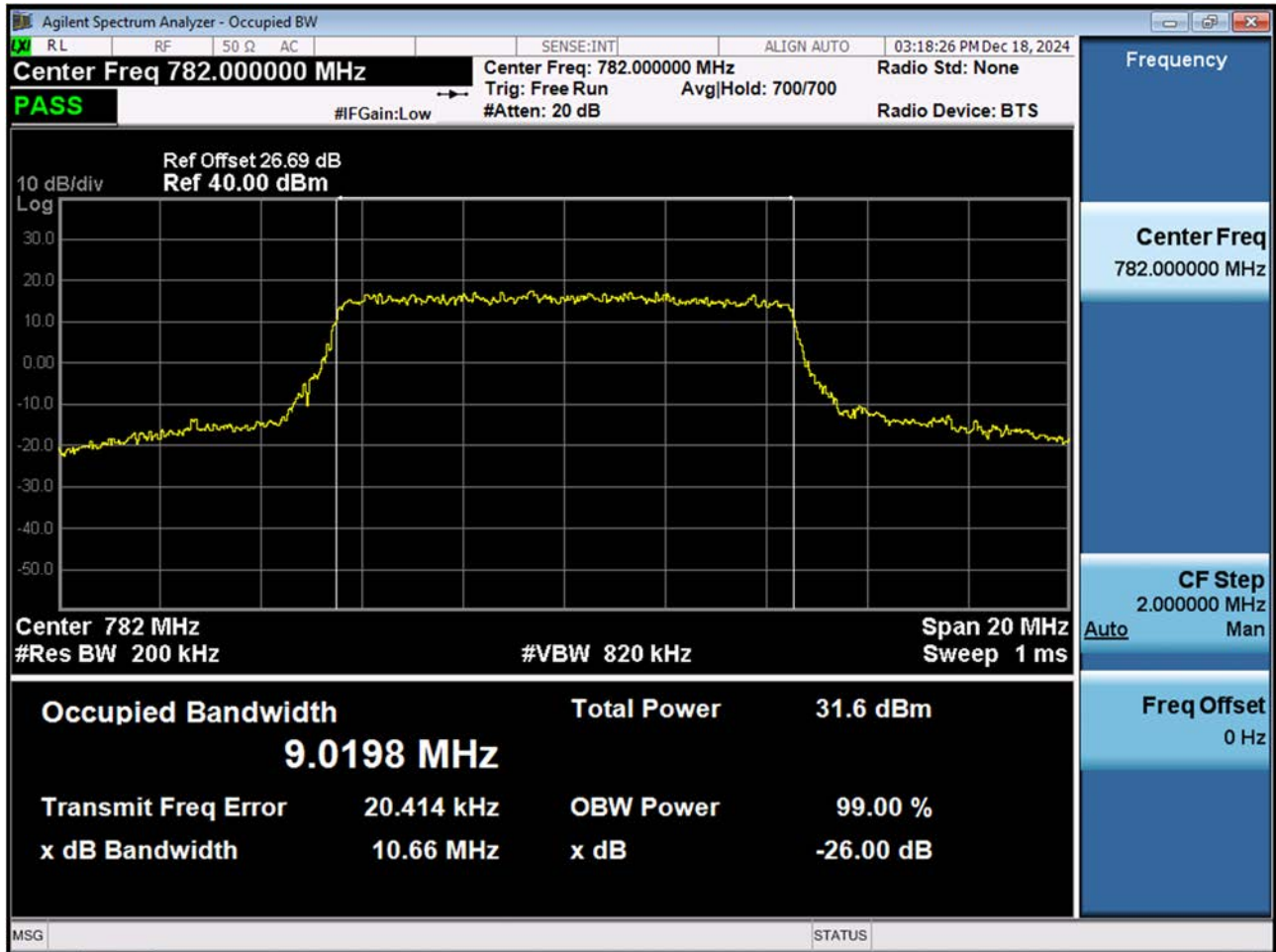
## LTE B13\_5 M\_OBW\_Mid\_64QAM\_FullRB



## LTE B13\_5 M\_OBW\_Mid\_256QAM\_FullRB

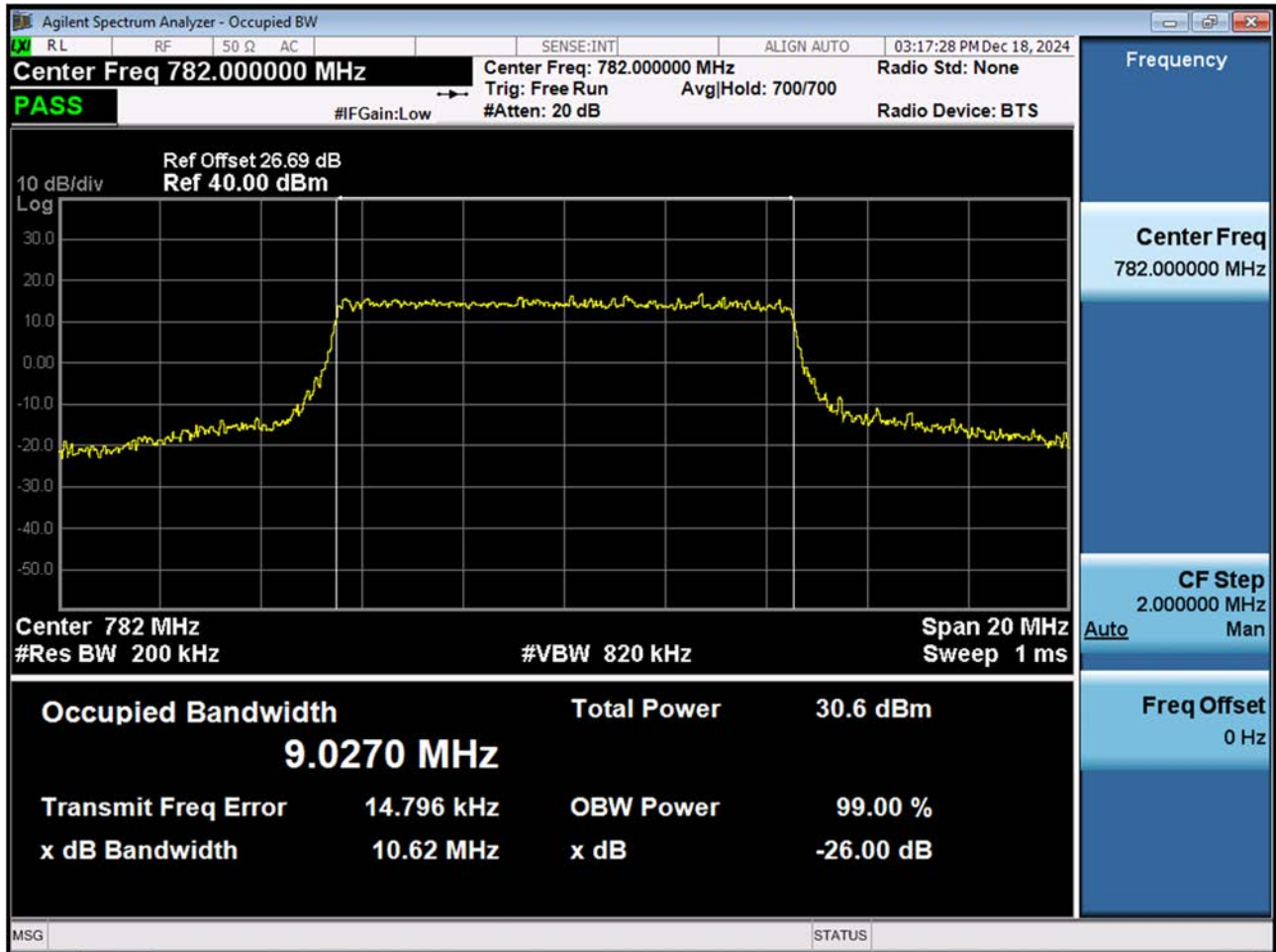


## LTE B13\_10 M\_OBW\_Mid\_QPSK\_FullRB

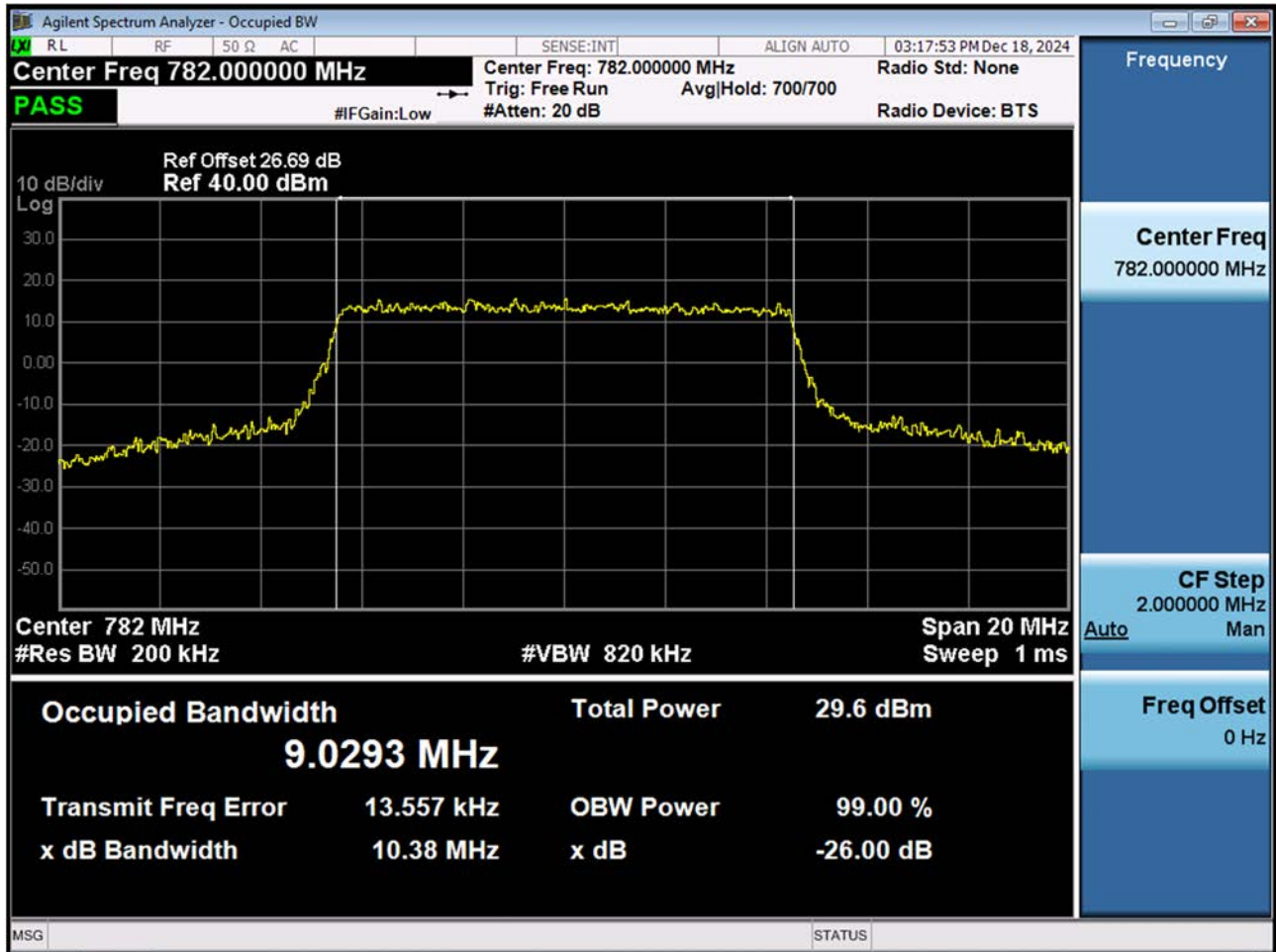




## LTE B13\_10 M\_OBW\_Mid\_16QAM\_FullIRB

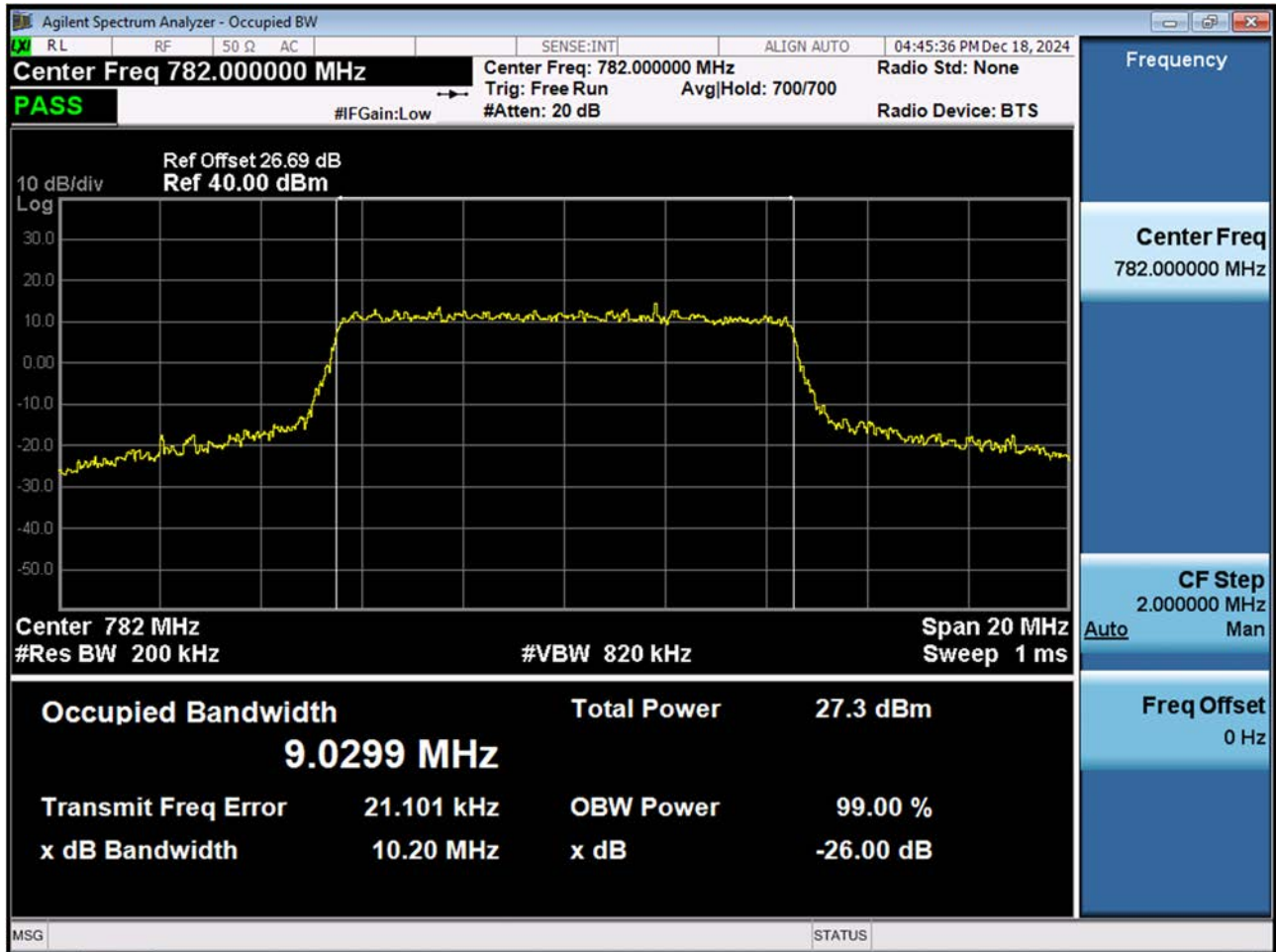


LTE B13\_10 M\_OBW\_Mid\_64QAM\_FullRB





## LTE B13\_10 M\_OBW\_Mid\_256QAM\_FullRB



Agilent Spectrum Analyzer - Swept SA

RL RF 50  $\Omega$  AC SENSE:INT ALIGN AUTO 03:09:38 PM Dec 18, 2024

Center Freq 5.01500000 GHz #Avg Type: RMS

PNO: Fast IFGain:Low Trig: Free Run #Atten: 20 dB

TRACE 1 2 3 4 5 6  
TYPE M W W W W W W W W W  
DET P P P P P P P

10 dB/div Ref 10.00 dBm

Log

0.00  
-10.0  
-20.0  
-30.0  
-40.0  
-50.0  
-60.0  
-70.0  
-80.0

Start 30 MHz Stop 10.000 GHz  
#Res BW 1.0 MHz #VBW 3.0 MHz Sweep 17.33 ms (20001 pts)

Mkr1 3.728 9 GHz  
-57.475 dBm

PEAK

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	3.728 9 GHz	-57.475 dBm			
2	N	1	f	777.8 MHz	0.907 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								

MSG STATUS

Frequency

Auto Tune

Center Freq  
5.01500000 GHz

Start Freq  
30.000000 MHz

Stop Freq  
10.00000000 GHz

CF Step  
997.000000 MHz

Auto Man

Freq Offset  
0 Hz

**Center Freq** 5.01500000 GHz  
**#Avg Type:** RMS  
 PNO: Fast → Trig: Free Run  
 IFGain:Low #Atten: 20 dB  
 TRACE 1 2 3 4 5 6  
 TYPE M W A W W A W A W  
 DET P P P P P P

**Mkr1** 6.562 8 GHz  
 -57.798 dBm

10 dB/div Ref 10.00 dBm  
 Log

**Start** 30 MHz  
**#Res BW** 1.0 MHz  
**#VBW** 3.0 MHz  
**Sweep** 17.33 ms (20001 pts)  
**Stop** 10.000 GHz

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	6.562 8 GHz	-57.798 dBm			
2	N	1	f	780.2 MHz	0.049 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								

**Frequency**  
 Auto Tune  
 Center Freq  
 5.01500000 GHz  
 Start Freq  
 30.000000 MHz  
 Stop Freq  
 10.00000000 GHz  
 CF Step  
 997.000000 MHz  
 Auto Man  
 Freq Offset  
 0 Hz

