

TEST REPORT

FCC LTE B7 Test for TM19FNEUHD2
Certification

APPLICANT
LG Electronics Inc.

REPORT NO.
HCT-RF-2412-FC053

DATE OF ISSUE
December 20, 2024

Tested by
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Technical Manager
Jong Seok Lee



Accredited by KOLAS, Republic of KOREA

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TEST REPORT

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Applicant

LG Electronics Inc.

128, Yeoui-daero, Yeongdeungpo-gu, Seoul, Republic of Korea

Product Name

Telematics

Model Name

TM19FNEUHD2

Date of Test

September 30, 2024 ~ December 10, 2024

FCC ID

BEJTM19FNEUHD2

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:

PCB Licensed Transmitter (PCB)

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 20, 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

This test report provides test result(s) under the scope accredited by the Korea Laboratory Accreditation Scheme (KOLAS), which signed the ILAC-MRA.

(KOLAS (KS Q ISO/IEC 17025) Accreditation No. KT197)

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MEASUREMENT REPORT

1. GENERAL INFORMATION

Applicant Name:	LG Electronics Inc.
Address:	128, Yeoui-daero, Yeongdeungpo-gu, Seoul, Republic of Korea
FCC ID:	BEJTM19FNEUHD2
Application Type:	Certification
FCC Classification:	PCS Licensed Transmitter (PCB)
FCC Rule Part(s):	§ 27
EUT Type:	Telematics
Model(s):	TM19FNEUHD2
Tx Frequency:	2502.5 – 2567.5 : 5 MHz 2505.0 – 2565.0 : 10 MHz 2507.5 – 2562.5 : 15 MHz 2510.0 – 2560.0 : 20 MHz
Date(s) of Tests:	September 30, 2024 ~ December 10, 2024
Serial number:	Radiated : Honda MY26 #03 Conducted : Honda MY26 #01
Antenna Information	Please refer to the Antenna Approval Specification document.

1.1. MAXIMUM OUTPUT POWER

Mode (MHz)	Tx Frequency (MHz)	Emission Designator	Modulation	Conducted Output Power	
				Max. Power (W)	Max. Power (dBm)
LTE – Band 7 (5)	2502.5 – 2567.5	4M51G7D	QPSK	0.213	23.29
		4M51W7D	16QAM	0.184	22.65
		4M51W7D	64QAM	0.146	21.63
		4M51W7D	256QAM	0.072	18.55
LTE – Band 7 (10)	2505.0 – 2565.0	8M99G7D	QPSK	0.212	23.26
		8M95W7D	16QAM	0.185	22.67
		9M00W7D	64QAM	0.142	21.52
		8M97W7D	256QAM	0.072	18.60
LTE – Band 7 (15)	2507.5 – 2562.5	13M5G7D	QPSK	0.216	23.34
		13M5W7D	16QAM	0.185	22.68
		13M5W7D	64QAM	0.145	21.62
		13M5W7D	256QAM	0.072	18.58
LTE – Band 7 (20)	2510.0 – 2560.0	17M9G7D	QPSK	0.215	23.33
		17M9W7D	16QAM	0.184	22.65
		17M9W7D	64QAM	0.146	21.64
		18M0W7D	256QAM	0.071	18.50

2. INTRODUCTION

2.1. DESCRIPTION OF EUT

The EUT was a Telematics with GSM/GPRS/EGPRS/UMTS and LTE, Sub 6.

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

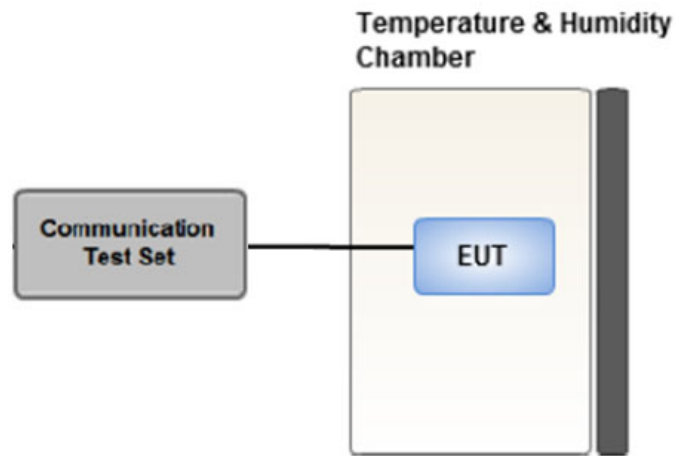
The Fully-anechoic chamber and conducted measurement facility used to collect the radiated data are located at the **74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Republic of Korea**

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	- KDB 971168 D01 v03r01 - Section 5.2.4 - ANSI C63.26-2015 - Section 5.2.1 & 5.2.4.2
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 CONDUCTED OUTPUT POWER



Test setup

Test Overview

When an average power meter is used to perform RF output power measurements, the fundamental condition that measurements be performed only over durations of active transmissions at maximum output power level applies.

Conducted Output Power was tested in accordance with KDB971168 D01 Power Meas License Digital Systems v03r01, Section 5.2.

3.3 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.

3.4 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 $\geq 3 \times$ RBW
3. Span = 1.5 times the OBW
4. No. of sweep points $> 2 \times$ span / RBW
5. Detector = Peak
6. Trace mode = Max Hold
7. The trace was allowed to stabilize
8. Test channel : Low/ Middle/ High
9. Frequency range : We are performed all frequency to 10th harmonics from 9 kHz.

Test Note

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

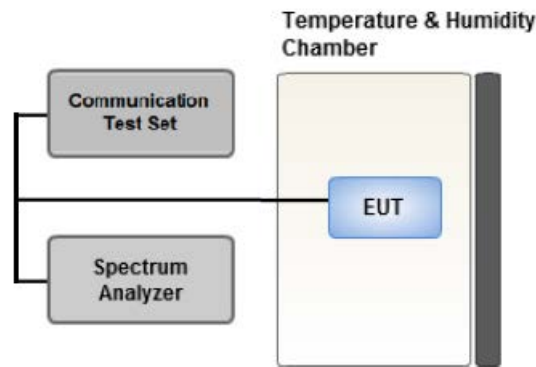
$$\text{Result}_{(\text{dBm})} = P_g_{(\text{dBm})} - \text{cable loss}_{(\text{dB})} + \text{antenna gain}_{(\text{dBi})}$$

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

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

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

3.5 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)

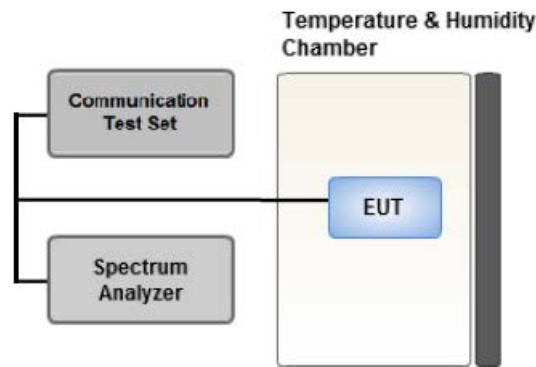
The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW $\geq 3 \times$ RBW.

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 %.

3.6 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.

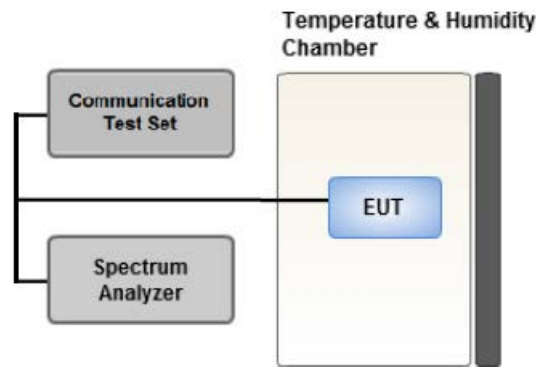
The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency.

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

3.7 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL



Test setup

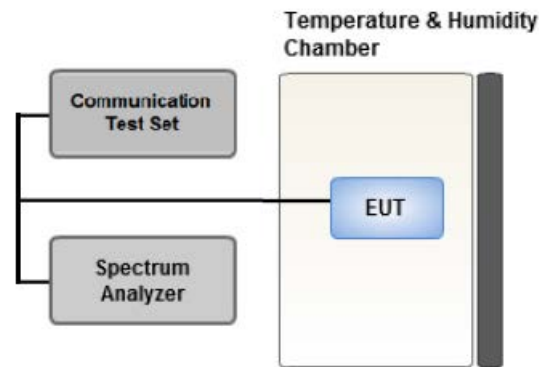
Test Overview

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

3.8 CHANNEL 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 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

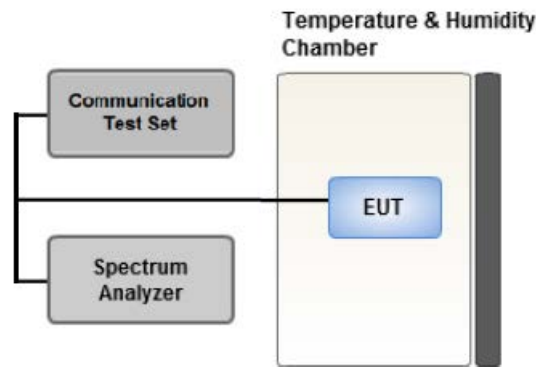
1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. Within 1MHz of the channel edge the RBW should be 2% of EBW, then 1 MHz after that.
4. VBW > 3 x RBW
5. 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

1. The attenuation factor shall be not less than $40 + 10 \log (P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge,
2. $43 + 10 \log (P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge.
3. $55 + 10 \log (P)$ dB on all frequencies more than X megahertz from the channel edge.
4. The attenuation factor shall not be less than $43 + 10 \log (P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz.
5. $55 + 10 \log (P)$ dB at or below 2490.5 MHz.
6. X is the greater of 6MHz or the actual emission bandwidth
7. The band edge measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer

Where Margin < 1 dB the emission level is either corrected by $10 \log(1 \text{ MHz/ RB})$ 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.

3.9 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.

3.10 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.
- 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.

[Worst case]				
Test Description	Modulation	RB size	RB offset	Axis
Effective Isotropic Radiated Power	QPSK, 16QAM, 64QAM, 256QAM	See Section 8.2		Z
Radiated Spurious and Harmonic Emissions	QPSK	See Section 8.3		X

3.11 WORST CASE(CONDUCTED TEST)

- All modes of operation were investigated and the worst case configuration results are reported.

[Worst case]

Test Description	Modulation	Bandwidth (MHz)	Frequency	RB size	RB offset
Occupied Bandwidth	QPSK, 16QAM, 64QAM, 256QAM	5, 10, 15, 20	Mid	Full RB	0
Peak-To-Average Ratio	QPSK, 16QAM, 64QAM, 256QAM	5, 10, 15, 20	Mid	Full RB	0
Band Edge	QPSK	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
		5, 10, 15, 20	Low, High	Full RB	0
Spurious and Harmonic Emissions at Antenna Terminal	QPSK	5, 10, 15, 20	Low, Mid, High	1	0

4. LIST OF TEST EQUIPMENT

Equipment	Model	Manufacturer	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	12/11/2024	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_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty ($\pm$ dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.98 (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(m)(4)	■ $< 40 + 10\log_{10} (P[\text{Watts}])$ at Channel edges ■ $< 43 + 10\log_{10} (P[\text{Watts}])$ between 5 and X MHz from Channel edges ■ $< 55 + 10\log_{10} (P[\text{Watts}])$ beyond X MHz beyond from Channel edges ■ $< 43 + 10 \log (P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz	PASS
Conducted Output Power	§ 2.1046	N/A	PASS
Frequency stability / variation of ambient temperature	§ 2.1055, § 27.54	Emission must remain in band	PASS

6.2 Test Condition: Radiated Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Equivalent Isotropic Radiated Power	§ 27.50(h)(2)	< 2 Watts max. EIRP	PASS
Radiated Spurious and Harmonic Emissions	§ 2.1053, § 27.53(m)(4)	$< 55 + 10\log_{10} (P[\text{Watts}])$	PASS

6.3. Data Referencing

Rule Part	Test item	Data Referencing	Comments
§2.1049	Occupied Bandwidth	Y	-
§2.1051, §27.53(m)(4)	Band Edge / Spurious and Harmonic Emissions at Antenna Terminal..	Y	-
§2.1055, §27.54	Frequency stability / variation of ambient temperature	Y	-
§27.50(h)(2)	Equivalent Isotropic Radiated Power	Y	Spot-check
§2.1053, §27.53(m)(4)	Radiated Spurious and Harmonic Emissions	Y	Spot-check
§2.1046	Conducted Output Power	Y	-

Spot-Check Result

1. Data was leveraged from model TM19FNN4HD4 for the certification of TM19FNEUHD2.
2. Please refer to the [FCC Evaluation] Report.

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

8.1 Conducted Output Power

Bandwidth	Modulation	RB Size	RB Offset	Max.Average Power (dBm)			Target MPR (dB)	Target Power
				20775	21100	21425		
				2502.5 MHz	2535 MHz	2567.5 MHz		
5 MHz	QPSK	1	0	23.16	23.13	23.14	0	23
		1	12	23.18	23.21	23.29	0	23
		1	24	23.25	23.12	23.18	0	23
		12	0	22.36	22.22	22.28	1	22
		12	6	22.31	22.16	22.28	1	22
		12	11	22.34	22.24	22.29	1	22
		25	0	22.36	22.25	22.25	1	22
	16QAM	1	0	22.65	22.47	22.55	1	22
		1	12	22.60	22.54	22.54	1	22
		1	24	22.57	22.50	22.54	1	22
		12	0	21.43	21.31	21.28	2	21
		12	6	21.41	21.24	21.32	2	21
		12	11	21.34	21.25	21.33	2	21
		25	0	21.37	21.29	21.28	2	21
	64QAM	1	0	21.41	21.34	21.46	2	21
		1	12	21.63	21.38	21.57	2	21
		1	24	21.38	21.51	21.50	2	21
		12	0	20.40	20.29	20.38	3	20
		12	6	20.39	20.22	20.34	3	20
		12	11	20.40	20.26	20.36	3	20
		25	0	20.37	20.31	20.29	3	20
	256QAM	1	0	18.27	18.55	18.48	5	18
		1	12	18.20	18.48	18.48	5	18
		1	24	18.21	18.48	18.50	5	18
		12	0	18.17	18.35	18.35	5	18
		12	6	18.17	18.32	18.34	5	18
		12	11	18.16	18.33	18.45	5	18
		25	0	18.15	18.38	18.32	5	18

Bandwidth	Modulation	RB Size	RB Offset	Max.Average Power (dBm)			Target MPR (dB)	Target Power
				20800	21100	21400		
				2505 MHz	2535 MHz	2565 MHz		
10 MHz	QPSK	1	0	23.19	23.13	23.13	0	23
		1	24	23.05	23.10	23.04	0	23
		1	49	23.26	23.21	23.07	0	23
		25	0	22.35	22.28	22.28	1	22
		25	12	22.37	22.35	22.38	1	22
		25	24	22.39	22.26	22.34	1	22
		50	0	22.30	22.29	22.33	1	22
	16QAM	1	0	22.65	22.48	22.50	1	22
		1	24	22.67	22.43	22.46	1	22
		1	49	22.52	22.51	22.54	1	22
		25	0	21.43	21.31	21.27	2	21
		25	12	21.41	21.35	21.48	2	21
		25	24	21.47	21.15	21.36	2	21
		50	0	21.41	21.30	21.36	2	21
	64QAM	1	0	21.44	21.29	21.50	2	21
		1	24	21.52	21.42	21.41	2	21
		1	49	21.51	21.31	21.51	2	21
		25	0	20.36	20.27	20.42	3	20
		25	12	20.49	20.31	20.45	3	20
		25	24	20.48	20.28	20.33	3	20
		50	0	20.44	20.20	20.36	3	20
	256QAM	1	0	18.36	18.46	18.46	5	18
		1	24	18.31	18.45	18.39	5	18
		1	49	18.51	18.60	18.46	5	18
		25	0	18.24	18.29	18.38	5	18
		25	12	18.38	18.44	18.40	5	18
		25	24	18.36	18.30	18.38	5	18
		50	0	18.25	18.38	18.44	5	18

Bandwidth	Modulation	RB Size	RB Offset	Max.Average Power (dBm)			Target MPR (dB)	Target Power
				20825	21100	21375		
				2507.5 MHz	2535 MHz	2562.5 MHz		
15 MHz	QPSK	1	0	23.24	23.22	23.34	0	23
		1	36	23.28	23.13	23.33	0	23
		1	74	23.17	23.02	23.16	0	23
		36	0	22.33	22.26	22.38	1	22
		36	18	22.44	22.20	22.30	1	22
		36	39	22.33	22.27	22.33	1	22
		75	0	22.39	22.31	22.40	1	22
	16QAM	1	0	22.57	22.60	22.67	1	22
		1	36	22.50	22.52	22.60	1	22
		1	74	22.66	22.51	22.68	1	22
		36	0	21.38	21.27	21.40	2	21
		36	18	21.49	21.30	21.29	2	21
		36	39	21.43	21.32	21.28	2	21
		75	0	21.38	21.32	21.42	2	21
	64QAM	1	0	21.42	21.41	21.62	2	21
		1	36	21.42	21.37	21.50	2	21
		1	74	21.54	21.49	21.58	2	21
		36	0	20.33	20.32	20.27	3	20
		36	18	20.47	20.28	20.36	3	20
		36	39	20.48	20.35	20.33	3	20
		75	0	20.45	20.30	20.38	3	20
	256QAM	1	0	18.43	18.48	18.31	5	18
		1	36	18.44	18.39	18.40	5	18
		1	74	18.46	18.43	18.58	5	18
		36	0	18.37	18.37	18.39	5	18
		36	18	18.35	18.29	18.38	5	18
		36	39	18.58	18.31	18.40	5	18
		75	0	18.37	18.35	18.46	5	18

Bandwidth	Modulation	RB Size	RB Offset	Max.Average Power (dBm)			Target MPR (dB)	Target Power
				20850	21100	21350		
				2510 MHz	2535 MHz	2560 MHz		
20 MHz	QPSK	1	0	23.27	23.28	23.33	0	23
		1	49	23.01	23.11	23.00	0	23
		1	99	23.12	23.12	23.16	0	23
		50	0	22.37	22.21	22.28	1	22
		50	25	22.40	22.30	22.32	1	22
		50	49	22.38	22.26	22.26	1	22
		100	0	22.39	22.30	22.28	1	22
	16QAM	1	0	22.52	22.64	22.63	1	22
		1	49	22.59	22.46	22.51	1	22
		1	99	22.65	22.39	22.52	1	22
		50	0	21.36	21.31	21.31	2	21
		50	25	21.41	21.37	21.33	2	21
		50	49	21.40	21.29	21.38	2	21
		100	0	21.38	21.37	21.29	2	21
	64QAM	1	0	21.64	21.56	21.57	2	21
		1	49	21.48	21.50	21.53	2	21
		1	99	21.60	21.35	21.46	2	21
		50	0	20.43	20.30	20.30	3	20
		50	25	20.45	20.32	20.26	3	20
		50	49	20.40	20.28	20.40	3	20
		100	0	20.40	20.33	20.35	3	20
	256QAM	1	0	18.28	18.36	18.36	5	18
		1	49	18.20	18.43	18.38	5	18
		1	99	18.37	18.41	18.50	5	18
		50	0	18.33	18.33	18.37	5	18
		50	25	18.25	18.40	18.43	5	18
		50	49	18.42	18.30	18.37	5	18
		100	0	18.46	18.41	18.45	5	18

8.2 EQUIVALENT ISOTROPIC RADIATED POWER

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured	Substitute	Ant. Gain (dBi)	C.L	Pol	Limit	EIRP		RB	
			Level (dBm)	Level (dBm)				W	W	dBm	Size	Offset
2502.5	LTE B7/ 5 MHz	QPSK	-20.38	16.64	10.70	2.51	H	< 2.00	0.304	24.83	1	0
		16-QAM	-21.06	15.96	10.70	2.51	H		0.260	24.15		
		64-QAM	-22.07	14.95	10.70	2.51	H		0.206	23.14		
		256-QAM	-25.01	12.01	10.70	2.51	H		0.105	20.20		
2535.0		QPSK	-21.02	15.80	10.70	2.54	H		0.249	23.96	1	0
		16-QAM	-21.63	15.19	10.70	2.54	H		0.216	23.35		
		64-QAM	-22.68	14.14	10.70	2.54	H		0.170	22.30		
		256-QAM	-25.65	11.17	10.70	2.54	H		0.086	19.33		
2567.5		QPSK	-21.22	15.99	10.66	2.65	H		0.251	24.00	1	0
		16-QAM	-21.90	15.31	10.66	2.65	H		0.215	23.32		
		64-QAM	-22.91	14.30	10.66	2.65	H		0.170	22.31		
		256-QAM	-25.93	11.28	10.66	2.65	H		0.085	19.29		

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured	Substitute	Ant. Gain (dBi)	C.L	Pol	Limit	EIRP		RB	
			Level (dBm)	Level (dBm)				W	W	dBm	Size	Offset
2505.0	LTE B7/ 10 MHz	QPSK	-20.40	16.62	10.70	2.51	H	< 2.00	0.303	24.81	1	0
		16-QAM	-21.05	15.97	10.70	2.51	H		0.261	24.16		
		64-QAM	-22.15	14.87	10.70	2.51	H		0.202	23.06		
		256-QAM	-25.10	11.92	10.70	2.51	H		0.103	20.11		
2535.0		QPSK	-20.74	16.08	10.70	2.54	H		0.265	24.24	1	0
		16-QAM	-21.43	15.39	10.70	2.54	H		0.226	23.55		
		64-QAM	-22.51	14.31	10.70	2.54	H		0.177	22.47		
		256-QAM	-25.51	11.31	10.70	2.54	H		0.089	19.47		
2565.0		QPSK	-21.18	16.05	10.67	2.62	H		0.257	24.10	1	0
		16-QAM	-21.85	15.38	10.67	2.62	H		0.220	23.43		
		64-QAM	-22.90	14.33	10.67	2.62	H		0.173	22.38		
		256-QAM	-25.93	11.30	10.67	2.62	H		0.086	19.35		

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured	Substitute	Ant. Gain (dBi)	C.L	Pol	Limit	EIRP		RB	
			Level (dBm)	Level (dBm)				W	W	dBm	Size	Offset
2507.5	LTE B7/ 15 MHz	QPSK	-20.31	16.76	10.70	2.51	H	< 2.00	0.313	24.95	1	0
		16-QAM	-20.95	16.12	10.70	2.51	H		0.270	24.31		
		64-QAM	-22.04	15.03	10.70	2.51	H		0.210	23.22		
		256-QAM	-25.08	11.99	10.70	2.51	H		0.104	20.18		
2535.0		QPSK	-20.56	16.26	10.70	2.54	H		0.277	24.42	1	0
		16-QAM	-21.29	15.53	10.70	2.54	H		0.234	23.69		
		64-QAM	-22.36	14.46	10.70	2.54	H		0.183	22.62		
		256-QAM	-25.39	11.43	10.70	2.54	H		0.091	19.59		
2562.5		QPSK	-21.10	16.13	10.67	2.62	H		0.262	24.18	1	0
		16-QAM	-21.78	15.45	10.67	2.62	H		0.224	23.50		
		64-QAM	-22.83	14.40	10.67	2.62	H		0.176	22.45		
		256-QAM	-25.88	11.35	10.67	2.62	H		0.087	19.40		

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured	Substitute	Ant. Gain (dBi)	C.L	Pol	Limit	EIRP		RB	
			Level (dBm)	Level (dBm)				W	W	dBm	Size	Offset
2510.0	LTE B7/ 20 MHz	QPSK	-20.29	16.78	10.70	2.51	H	< 2.00	0.314	24.97	1	0
		16-QAM	-20.95	16.12	10.70	2.51	H		0.270	24.31		
		64-QAM	-21.98	15.09	10.70	2.51	H		0.213	23.28		
		256-QAM	-25.07	12.00	10.70	2.51	H		0.104	20.19		
2535.0		QPSK	-20.65	16.17	10.70	2.54	H		0.271	24.33	1	0
		16-QAM	-21.35	15.47	10.70	2.54	H		0.231	23.63		
		64-QAM	-22.35	14.47	10.70	2.54	H		0.183	22.63		
		256-QAM	-25.42	11.40	10.70	2.54	H		0.090	19.56		
2560.0		QPSK	-20.86	16.40	10.68	2.59	H		0.281	24.49	1	0
		16-QAM	-21.51	15.75	10.68	2.59	H		0.242	23.84		
		64-QAM	-22.59	14.67	10.68	2.59	H		0.189	22.76		
		256-QAM	-25.62	11.64	10.68	2.59	H		0.094	19.73		

8.3 RADIATED SPURIOUS EMISSIONS

■ MODE: LTE B7
 ■ MODULATION SIGNAL: 5 MHz QPSK
 ■ DISTANCE: 1 meters
 ■ LIMIT: -25 dBm

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	RB	
								Size	Offset
20775 (2502.5)	5 005.00	-53.04	12.55	-64.54	3.71	H	-55.70	1	0
	7 507.50	-55.93	10.98	-55.86	4.60	H	-49.48		
	10 010.00	-56.79	10.61	-51.79	5.47	H	-46.65		
21100 (2535.0)	5 070.00	-52.71	12.35	-62.53	3.80	H	-53.98	1	0
	7 605.00	-55.26	11.33	-55.57	4.64	H	-48.88		
	10 140.00	-56.29	10.71	-51.33	5.48	H	-46.10		
21425 (2567.5)	5 135.00	-53.24	12.15	-65.07	3.81	H	-56.73	1	0
	7 702.50	-56.07	11.55	-56.40	4.66	H	-49.51		
	10 270.00	-57.23	10.69	-50.03	5.57	H	-44.91		

■ MODE: LTE B7
 ■ MODULATION SIGNAL: 10 MHz QPSK
 ■ DISTANCE: 1 meters
 ■ LIMIT: -25 dBm

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	RB	
								Size	Offset
20800 (2505.0)	5 010.00	-52.88	12.55	-64.64	3.72	H	-55.81	1	0
	7 515.00	-55.06	10.98	-54.93	4.60	H	-48.55		
	10 020.00	-58.17	10.61	-53.73	5.47	H	-48.59		
21100 (2535.0)	5 070.00	-53.46	12.35	-63.28	3.80	H	-54.73	1	0
	7 605.00	-55.65	11.33	-55.96	4.64	H	-49.27		
	10 140.00	-57.74	10.71	-52.78	5.48	H	-47.55		
21400 (2565.0)	5 130.00	-53.13	12.15	-65.18	3.81	H	-56.84	1	0
	7 695.00	-55.61	11.51	-56.35	4.66	H	-49.50		
	10 260.00	-57.08	10.69	-50.24	5.56	H	-45.11		

■ MODE: LTE B7
 ■ MODULATION SIGNAL: 15 MHz QPSK
 ■ DISTANCE: 1 meters
 ■ LIMIT: -25 dBm

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	RB	
								Size	Offset
20825 (2507.5)	5 015.00	-53.46	12.55	-65.45	3.70	H	-56.60	1	0
	7 522.50	-55.83	10.98	-55.68	4.61	H	-49.31		
	10 030.00	-57.26	10.61	-52.93	5.47	H	-47.79		
21100 (2535.0)	5 070.00	-53.58	12.35	-63.40	3.80	H	-54.85	1	0
	7 605.00	-55.27	11.33	-55.58	4.64	H	-48.89		
	10 140.00	-57.50	10.71	-52.54	5.48	H	-47.31		
21375 (2562.5)	5 125.00	-53.12	12.15	-65.27	3.81	H	-56.93	1	0
	7 687.50	-55.75	11.47	-56.71	4.66	H	-49.90		
	10 250.00	-57.48	10.69	-50.60	5.54	H	-45.45		

■ MODE: LTE B7
 ■ MODULATION SIGNAL: 20 MHz QPSK
 ■ DISTANCE: 1 meters
 ■ LIMIT: -25 dBm

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	RB	
								Size	Offset
20850 (2510.0)	5 020.00	-52.46	12.55	-64.66	3.69	V	-55.80	1	0
	7 530.00	-54.03	10.98	-53.92	4.60	V	-47.54		
	10 040.00	-56.69	10.61	-52.04	5.49	H	-46.92		
21100 (2535.0)	5 070.00	-53.16	12.35	-62.98	3.80	V	-54.43	1	0
	7 605.00	-53.51	11.33	-53.82	4.64	V	-47.13		
	10 140.00	-56.96	10.71	-52.00	5.48	V	-46.77		
21350 (2560.0)	5 070.00	-53.16	12.35	-62.98	3.80	V	-54.43	1	0
	7 605.00	-53.51	11.33	-53.82	4.64	V	-47.13		
	10 140.00	-56.96	10.71	-52.00	5.48	V	-46.77		

8.4 PEAK-TO-AVERAGE RATIO

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (dB)
7	5 MHz	2535.0	QPSK	25	0	5.32
			16-QAM			6.05
			64-QAM			6.60
			256-QAM			6.67
	10 MHz		QPSK	50		5.35
			16-QAM			6.04
			64-QAM			6.61
			256-QAM			6.64
	15 MHz		QPSK	75		5.34
			16-QAM			6.06
			64-QAM			6.60
			256-QAM			6.66
	20 MHz		QPSK	100		5.30
			16-QAM			6.02
			64-QAM			6.58
			256-QAM			6.66

Note:

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 53 ~ 68.

8.5 OCCUPIED BANDWIDTH

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
7	5 MHz	2535.0	QPSK	25	0	4.5075
			16-QAM			4.5096
			64-QAM			4.5084
			256-QAM			4.5058
	10 MHz		QPSK	50		8.9867
			16-QAM			8.9460
			64-QAM			8.9993
			256-QAM			8.9743
	15 MHz		QPSK	75		13.474
			16-QAM			13.481
			64-QAM			13.460
			256-QAM			13.479
	20 MHz		QPSK	100		17.933
			16-QAM			17.911
			64-QAM			17.921
			256-QAM			17.970

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 69 ~ 84.

8.6 CONDUCTED SPURIOUS EMISSIONS

Band	Band Width (MHz)	Frequency (MHz)	Frequency of Maximum Harmonic (GHz)	Factor (dB)	Measurement Maximum Data (dBm)	Result (dBm)	Limit (dBm)
7	5	2502.5	26.1670	30.210	-66.359	-36.149	-25.00
		2535.0	26.3200	30.210	-66.869	-36.659	
		2567.5	25.7080	30.210	-67.031	-36.821	
	10	2505.0	25.9290	30.210	-66.824	-36.614	
		2535.0	26.4560	30.210	-66.896	-36.686	
		2565.0	25.2150	30.210	-66.835	-36.625	
	15	2507.5	25.7930	30.210	-67.322	-37.112	
		2535.0	3.6890	28.112	-66.638	-38.526	
		2562.5	3.1706	28.112	-65.427	-37.315	
	20	2510.0	26.1670	30.210	-66.294	-36.084	
		2535.0	5.6132	28.634	-66.199	-37.565	
		2560.0	26.3710	30.210	-66.632	-36.422	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 85 ~ 108.
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	27.500
1 – 5	28.112
5 – 10	28.634
10 – 15	29.245
15 – 20	29.511
Above 20(26.5)	30.210

8.7 CHANNEL EDGE

Band Width (Modulation)	Frequency (MHz)	RB Size / Offset	C.E ~ (C.E ± 1 MHz)		2 496 MHz ~ 2 499 MHz	(C.E + 1 MHz) ~ (C.E + 5 MHz)	2 490.5 MHz ~ 2 496 MHz	(C.E + 5 MHz) ~ (C.E + X MHz)	Below 2 490.5 MHz	Above (C.E + X MHz)
			Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
5 MHz (QPSK)	2502.5	25 / 0	-27.52	-26.33	-25.68	-25.12	-32.67	-35.90	-38.75	-36.46
10 MHz (QPSK)	2505.0	50 / 0	-30.07	-28.79	-26.16	-26.39	-28.28	-31.20	-38.54	-36.44
15 MHz (QPSK)	2507.5	75 / 0	-31.01	-29.25	-29.40	-27.59	-31.66	-30.59	-35.45	-38.11
20 MHz (QPSK)	2510.0	100 / 0	-31.62	-30.82	-31.30	-30.73	-32.79	-32.90	-34.06	-38.44
Limit(dBm)			-10.0		-10.0		-13.0		-25.0	

Band Width (Modulation)	Frequency (MHz)	RB Size / Offset	C.E ~ (C.E ± 1 MHz)		(C.E ± 1 MHz) ~ (C.E ± 5 MHz)	
			Lower	Upper	Lower	Upper
5 MHz (QPSK)	2535.0	25 / 0	-28.07	-27.21	-29.69	-28.68
	2567.5	25 / 0	-27.89	-27.64	-28.90	-31.74
10 MHz (QPSK)	2535.0	50 / 0	-30.46	-30.32	-29.38	-30.40
	2565.0	50 / 0	-30.96	-30.83	-31.29	-31.26
15 MHz (QPSK)	2535.0	75 / 0	-31.15	-30.51	-29.91	-29.79
	2562.5	75 / 0	-30.68	-31.67	-29.96	-30.06
20 MHz (QPSK)	2535.0	100 / 0	-29.98	-30.38	-28.53	-29.59
	2560.0	100 / 0	-30.93	-31.07	-30.98	-29.66
Limit(dBm)			-10.0		-10.0	

Band Width (Modulation)	Frequency (MHz)	Resource Block Size	(C.E ± 5 MHz) ~ (C.E ± X MHz)		Above (C.E ± X MHz)	
			Lower	Upper	Lower	Upper
5 MHz (QPSK)	2535.0	25 / 0	-36.70	-37.53	-36.08	-37.94
	2567.5	25 / 0	-37.35	-36.96	-37.22	-37.22
10 MHz (QPSK)	2535.0	50 / 0	-32.88	-36.02	-38.07	-38.42
	2565.0	50 / 0	-35.43	-35.08	-40.76	-40.44
15 MHz (QPSK)	2535.0	75 / 0	-33.54	-32.78	-41.58	-41.18
	2562.5	75 / 0	-33.75	-33.09	-42.26	-42.20
20 MHz (QPSK)	2535.0	100 / 0	-31.34	-32.28	-42.43	-41.85
	2560.0	100 / 0	-33.41	-32.93	-42.17	-43.42
Limit(dBm)			-13.0		-25.0	

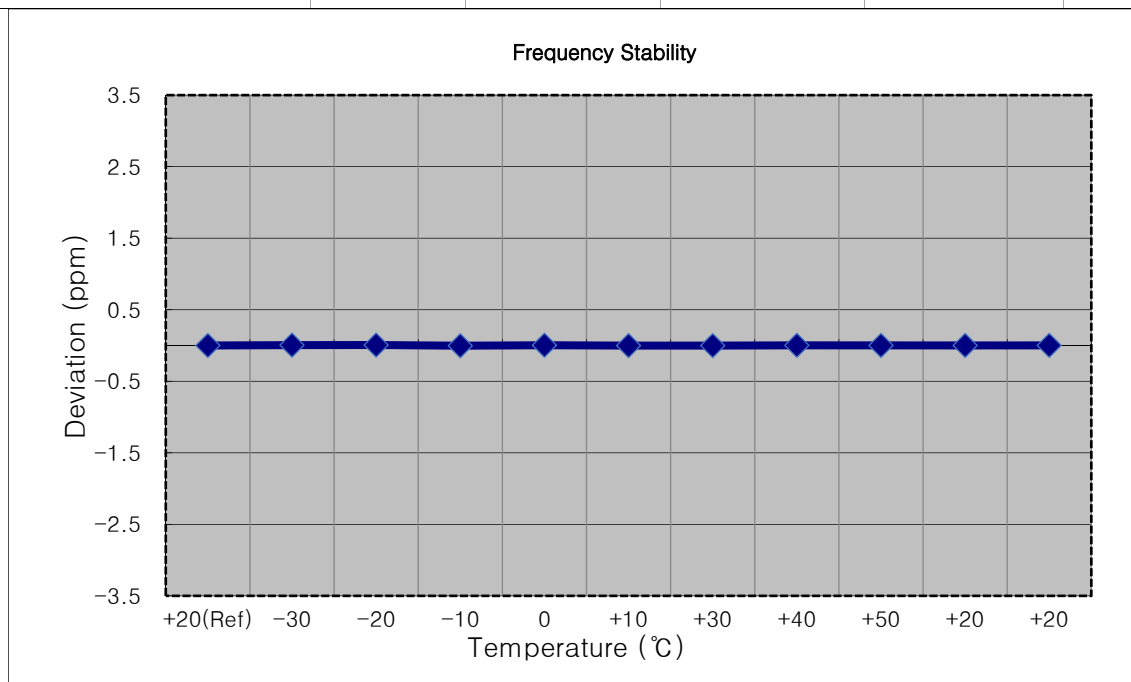
Note:

1. C.E = Channel Edge
2. X = X is the greater of 6 MHz or the actual emission bandwidth.
3. X = 6 MHz(5 MHz Bandwidth), 10 MHz(10 MHz Bandwidth), 15 MHz(15 MHz Bandwidth), 20 MHz(20 MHz Bandwidth)
4. Plots of the EUT's Channel Edge are shown Page 109 ~ 132.

8.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

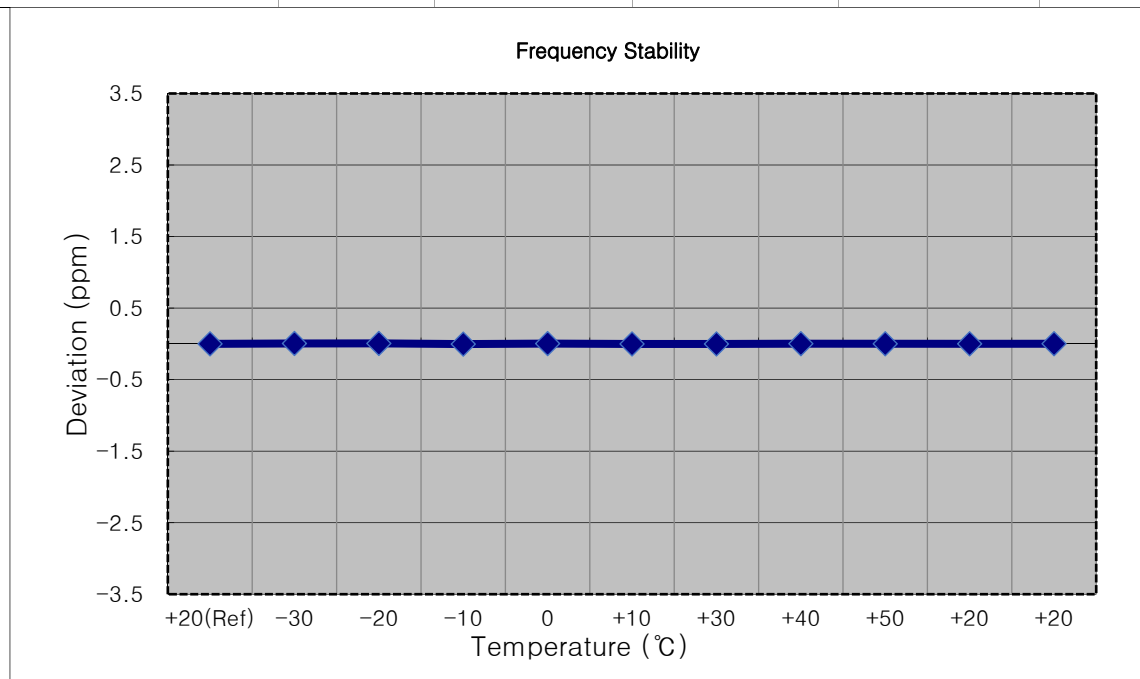
MODE:	LTE 7
OPERATING FREQUENCY:	2,502,500,000 Hz
CHANNEL:	20775 (5 MHz)
REFERENCE VOLTAGE:	13.200 VDC
DEVIATION LIMIT:	Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	13.200	+20(Ref)	2502 500 012	0.0	0.000 000	0.000
100 %		-30	2502 500 026	13.4	0.000 001	0.005
100 %		-20	2502 500 029	16.4	0.000 001	0.007
100 %		-10	2502 500 004	-8.3	0.000 000	-0.003
100 %		0	2502 500 022	9.3	0.000 000	0.004
100 %		+10	2502 500 009	-3.4	0.000 000	-0.001
100 %		+30	2502 500 009	-3.0	0.000 000	-0.001
100 %		+40	2502 500 018	6.0	0.000 000	0.002
100 %		+50	2502 500 015	3.1	0.000 000	0.001
115 %		+20	2502 500 015	2.4	0.000 000	0.001
85 %		+20	2502 500 016	4.1	0.000 000	0.002



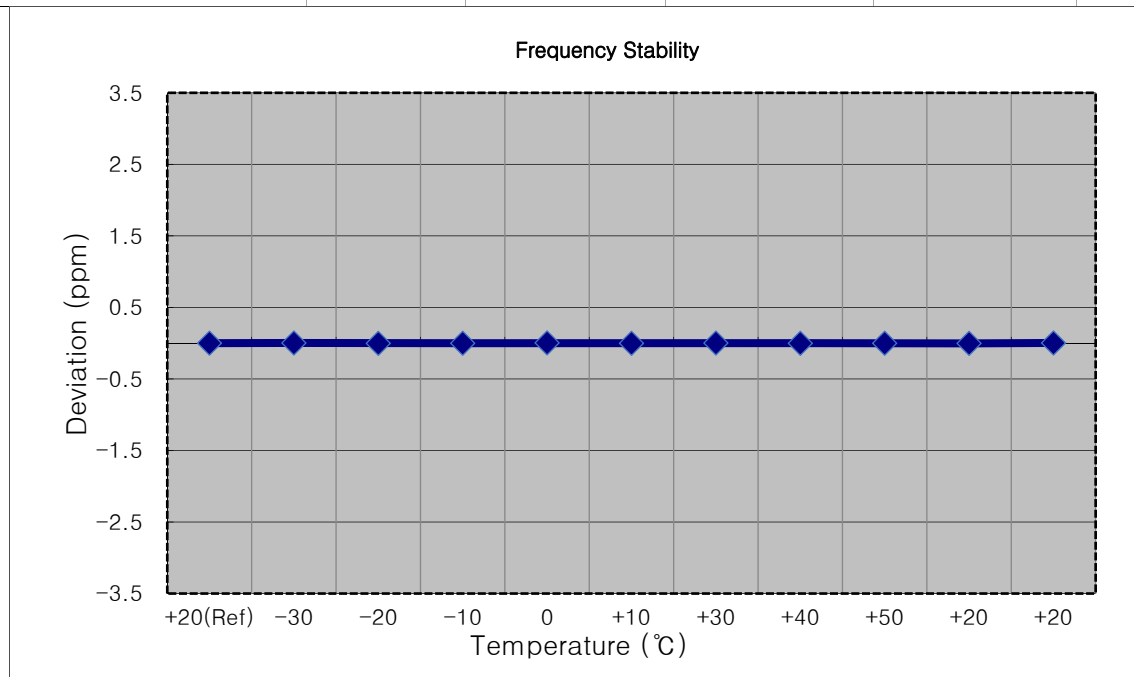
■ MODE: LTE 7
 ■ OPERATING FREQUENCY: 2,505,000,000 Hz
 ■ CHANNEL: 20800 (10 MHz)
 ■ REFERENCE VOLTAGE: 13.200 VDC
 ■ DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency Error	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	(Hz)	(%)	
100 %	13.200	+20(Ref)	2504 999 998	0.0	0.000 000	0.000
100 %		-30	2505 000 004	6.4	0.000 000	0.003
100 %		-20	2504 999 991	-6.5	0.000 000	-0.003
100 %		-10	2504 999 995	-2.8	0.000 000	-0.001
100 %		0	2505 000 007	9.6	0.000 000	0.004
100 %		+10	2504 999 994	-4.2	0.000 000	-0.002
100 %		+30	2505 000 001	3.6	0.000 000	0.001
100 %		+40	2504 999 993	-4.4	0.000 000	-0.002
100 %		+50	2504 999 994	-4.0	0.000 000	-0.002
115 %		+20	2504 999 990	-7.3	0.000 000	-0.003
85 %		+20	2505 000 004	6.5	0.000 000	0.003



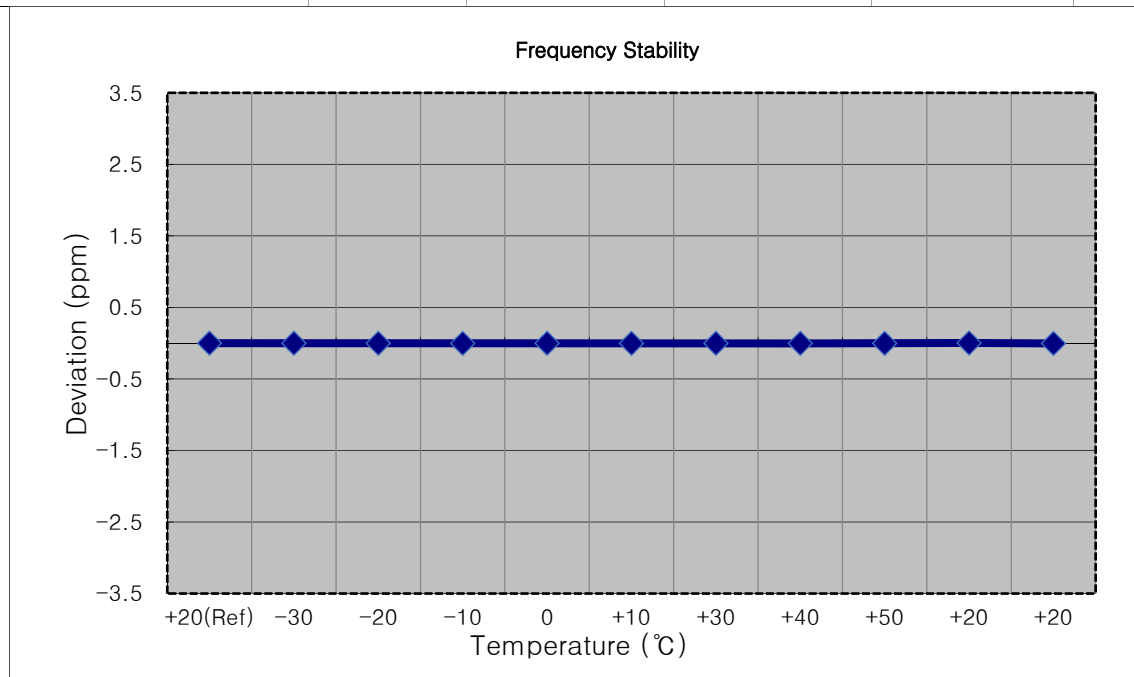
■ MODE: LTE 7
 ■ OPERATING FREQUENCY: 2,507,500,000 Hz
 ■ CHANNEL: 20825 (15 MHz)
 ■ REFERENCE VOLTAGE: 13.200 VDC
 ■ DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency Error	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	(Hz)	(%)	
100 %	13.200	+20(Ref)	2507 499 997	0.0	0.000 000	0.000
100 %		-30	2507 499 994	-3.1	0.000 000	-0.001
100 %		-20	2507 499 992	-4.4	0.000 000	-0.002
100 %		-10	2507 499 989	-8.2	0.000 000	-0.003
100 %		0	2507 499 993	-4.1	0.000 000	-0.002
100 %		+10	2507 499 991	-6.2	0.000 000	-0.002
100 %		+30	2507 499 990	-7.3	0.000 000	-0.003
100 %		+40	2507 499 990	-7.0	0.000 000	-0.003
100 %		+50	2507 499 990	-6.4	0.000 000	-0.003
115 %		+20	2507 500 003	6.5	0.000 000	0.003
85 %		+20	2507 499 987	-10.1	0.000 000	-0.004



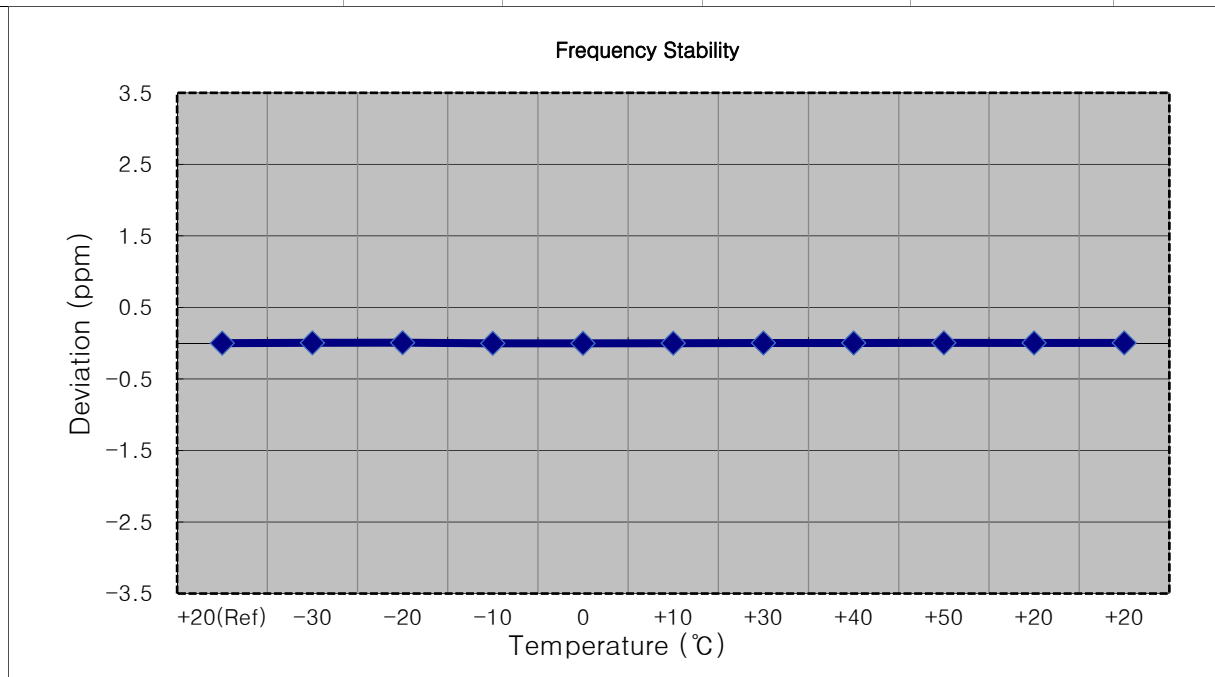
MODE:	<u>LTE 7</u>
OPERATING FREQUENCY:	<u>2,510,000,000 Hz</u>
CHANNEL:	<u>20850 (20 MHz)</u>
REFERENCE VOLTAGE:	<u>13.200 VDC</u>
DEVIATION LIMIT:	<u>Emission must remain in band</u>

Voltage	Power	Temp.	Frequency	Frequency Error	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	(Hz)	(%)	
100 %	13.200	+20(Ref)	2509 999 993	0.0	0.000 000	0.000
100 %		-30	2509 999 987	-6.4	0.000 000	-0.003
100 %		-20	2509 999 987	-6.2	0.000 000	-0.002
100 %		-10	2509 999 984	-9.6	0.000 000	-0.004
100 %		0	2509 999 988	-5.3	0.000 000	-0.002
100 %		+10	2509 999 988	-5.8	0.000 000	-0.002
100 %		+30	2509 999 986	-7.3	0.000 000	-0.003
100 %		+40	2509 999 984	-9.2	0.000 000	-0.004
100 %		+50	2509 999 987	-6.2	0.000 000	-0.002
115 %		+20	2509 999 986	-7.3	0.000 000	-0.003
85 %		+20	2509 999 985	-8.1	0.000 000	-0.003



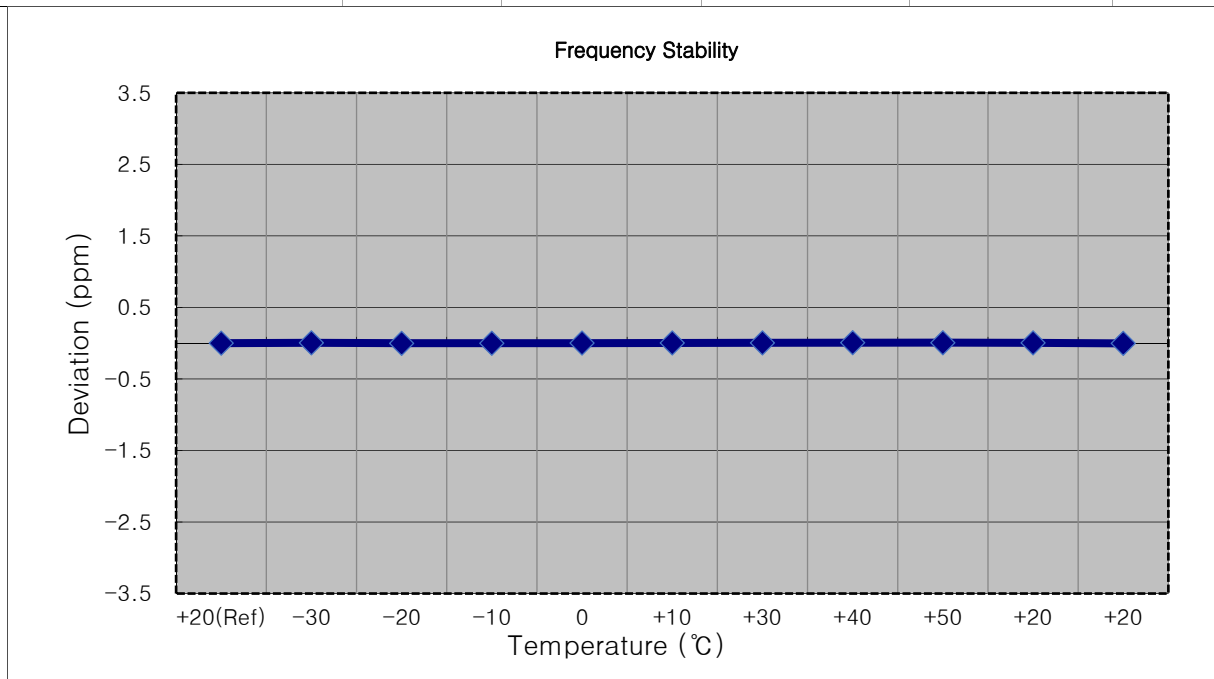
MODE: LTE 7
 OPERATING FREQUENCY: 2,535,000,000 Hz
 CHANNEL: 21100 (5 MHz)
 REFERENCE VOLTAGE: 13.200 VDC
 DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency Error	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	(Hz)	(%)	
100 %	13.200	+20(Ref)	2535 000 010	0.0	0.000 000	0.000
100 %		-30	2535 000 023	12.3	0.000 000	0.005
100 %		-20	2535 000 027	16.2	0.000 001	0.006
100 %		-10	2535 000 005	-5.6	0.000 000	-0.002
100 %		0	2535 000 004	-6.2	0.000 000	-0.002
100 %		+10	2535 000 008	-2.1	0.000 000	-0.001
100 %		+30	2535 000 016	5.3	0.000 000	0.002
100 %		+40	2535 000 016	5.7	0.000 000	0.002
100 %		+50	2535 000 021	10.6	0.000 000	0.004
115 %		+20	2535 000 018	7.4	0.000 000	0.003
85 %		+20	2535 000 020	9.9	0.000 000	0.004



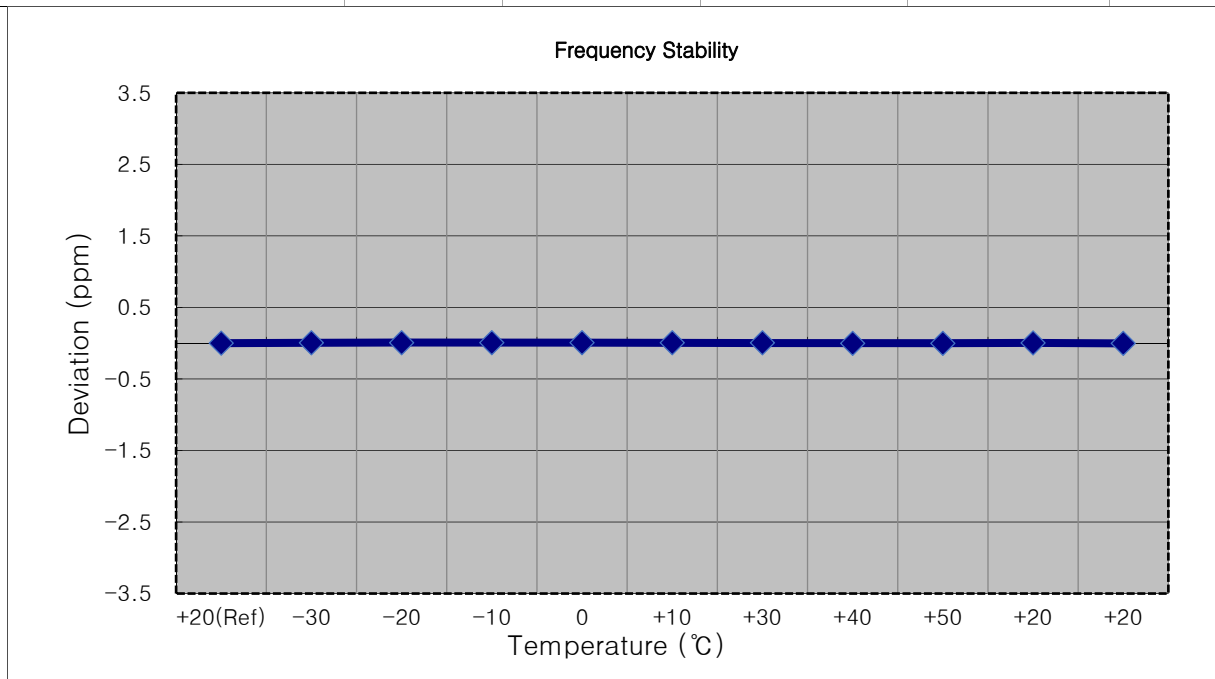
MODE: LTE 7
 OPERATING FREQUENCY: 2,535,000,000 Hz
 CHANNEL: 21100 (10 MHz)
 REFERENCE VOLTAGE: 13.200 VDC
 DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency Error	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	(Hz)	(%)	
100 %	13.200	+20(Ref)	2535 000 008	0.0	0.000 000	0.000
100 %		-30	2535 000 020	12.1	0.000 000	0.005
100 %		-20	2535 000 001	-6.6	0.000 000	-0.003
100 %		-10	2535 000 004	-3.4	0.000 000	-0.001
100 %		0	2535 000 013	4.8	0.000 000	0.002
100 %		+10	2535 000 016	8.1	0.000 000	0.003
100 %		+30	2535 000 018	10.4	0.000 000	0.004
100 %		+40	2535 000 025	17.3	0.000 001	0.007
100 %		+50	2535 000 022	14.3	0.000 001	0.006
115 %		+20	2535 000 018	10.5	0.000 000	0.004
85 %		+20	2535 000 001	-7.3	0.000 000	-0.003



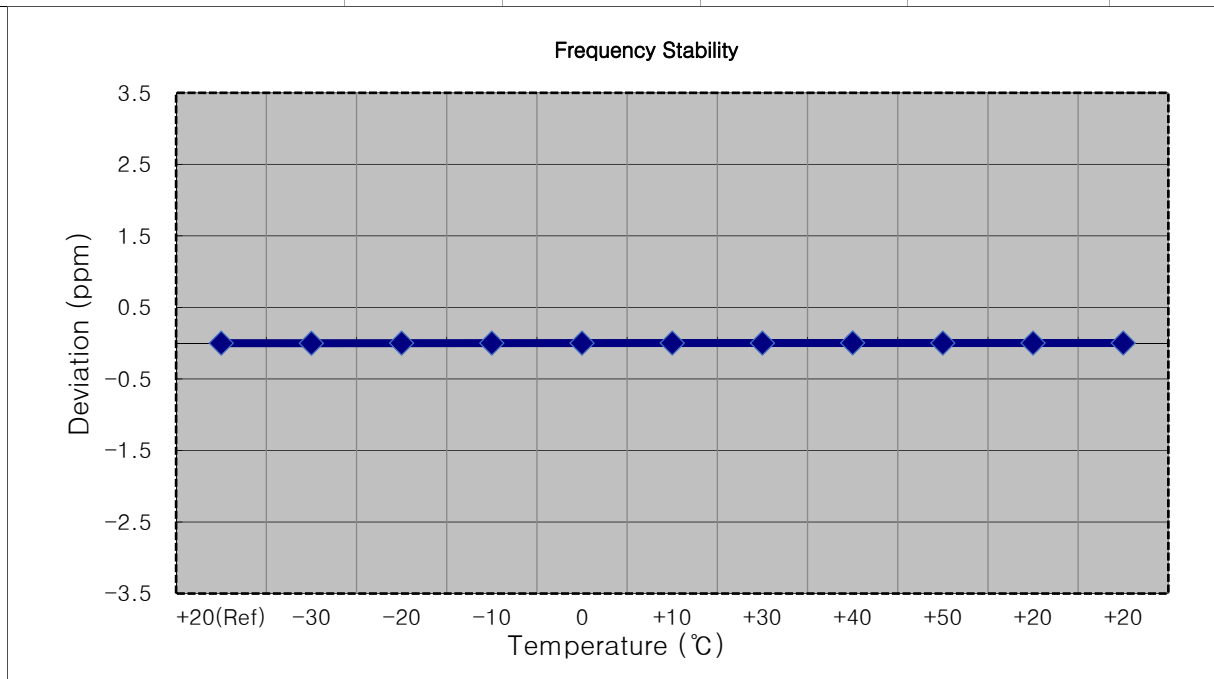
■ MODE: LTE 7
 ■ OPERATING FREQUENCY: 2,535,000,000 Hz
 ■ CHANNEL: 21100 (15 MHz)
 ■ REFERENCE VOLTAGE: 13.200 VDC
 ■ DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency Error	Deviation	
(%)	(VDC)	(°C)	(Hz)	(Hz)	(%)	ppm
100 %	13.200	+20(Ref)	2535 000 016	0.0	0.000 000	0.000
100 %		-30	2535 000 029	13.7	0.000 001	0.005
100 %		-20	2535 000 032	16.2	0.000 001	0.006
100 %		-10	2535 000 033	17.7	0.000 001	0.007
100 %		0	2535 000 033	17.2	0.000 001	0.007
100 %		+10	2535 000 031	15.9	0.000 001	0.006
100 %		+30	2535 000 029	13.4	0.000 001	0.005
100 %		+40	2535 000 008	-7.9	0.000 000	-0.003
100 %		+50	2535 000 009	-6.8	0.000 000	-0.003
115 %		+20	2535 000 024	8.4	0.000 000	0.003
85 %		+20	2535 000 008	-7.2	0.000 000	-0.003



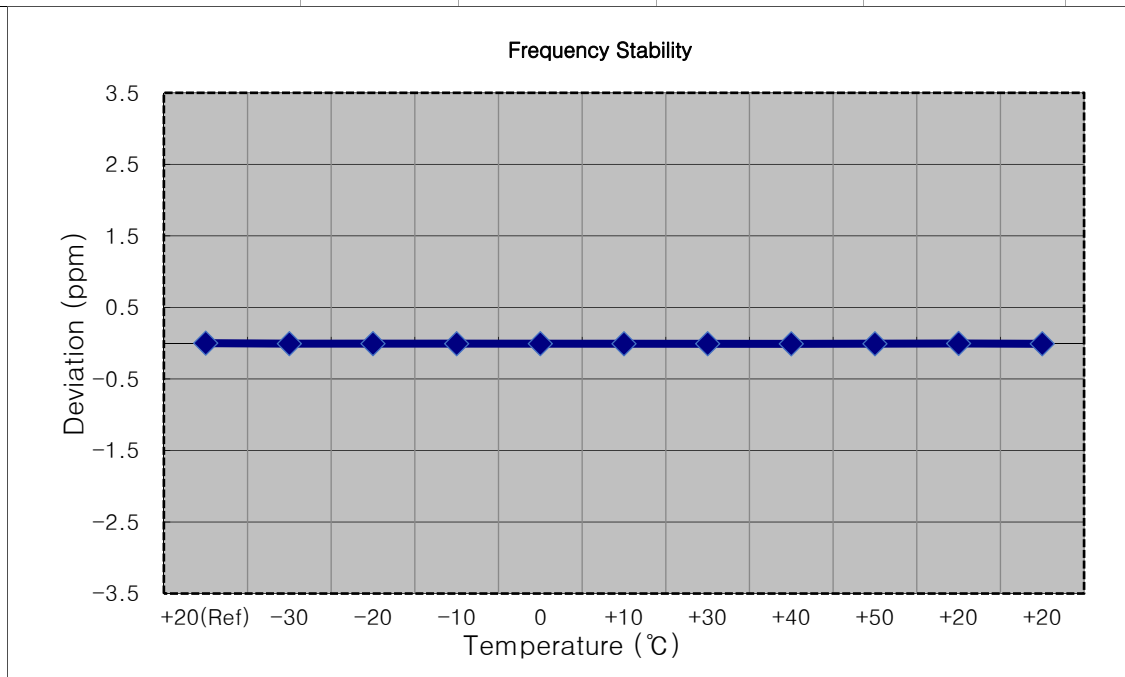
MODE:	<u>LTE 7</u>
OPERATING FREQUENCY:	<u>2,535,000,000 Hz</u>
CHANNEL:	<u>21100 (20 MHz)</u>
REFERENCE VOLTAGE:	<u>13.200 VDC</u>
DEVIATION LIMIT:	<u>Emission must remain in band</u>

Voltage	Power	Temp.	Frequency	Frequency Error	Deviation	
(%)	(VDC)	(°C)	(Hz)	(Hz)	(%)	ppm
100 %	13.200	+20(Ref)	2535 000 010	0.0	0.000 000	0.000
100 %		-30	2535 000 008	-2.4	0.000 000	-0.001
100 %		-20	2535 000 013	2.4	0.000 000	0.001
100 %		-10	2535 000 013	2.8	0.000 000	0.001
100 %		0	2535 000 012	2.1	0.000 000	0.001
100 %		+10	2535 000 014	3.5	0.000 000	0.001
100 %		+30	2535 000 013	2.3	0.000 000	0.001
100 %		+40	2535 000 021	10.2	0.000 000	0.004
100 %		+50	2535 000 014	4.1	0.000 000	0.002
115 %		+20	2535 000 015	4.5	0.000 000	0.002
85 %		+20	2535 000 015	5.1	0.000 000	0.002



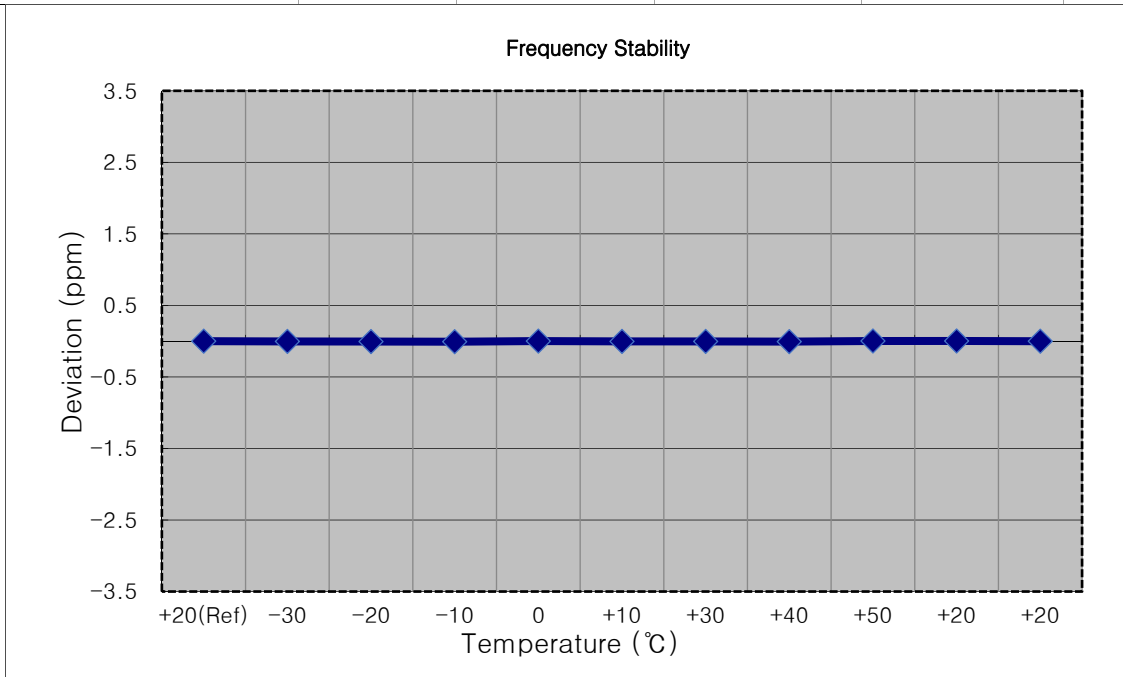
MODE:	<u>LTE 7</u>
OPERATING FREQUENCY:	<u>2,567,500,000 Hz</u>
CHANNEL:	<u>21425 (5 MHz)</u>
REFERENCE VOLTAGE:	<u>13.200 VDC</u>
DEVIATION LIMIT:	<u>Emission must remain in band</u>

Voltage	Power	Temp.	Frequency	Frequency Error	Deviation	
(%)	(VDC)	(°C)	(Hz)	(Hz)	(%)	ppm
100 %	13.200	+20(Ref)	2567 499 985	0.0	0.000 000	0.000
100 %		-30	2567 499 967	-18.6	-0.000 001	-0.007
100 %		-20	2567 499 967	-17.9	-0.000 001	-0.007
100 %		-10	2567 499 965	-20.5	-0.000 001	-0.008
100 %		0	2567 499 967	-18.5	-0.000 001	-0.007
100 %		+10	2567 499 962	-22.9	-0.000 001	-0.009
100 %		+30	2567 499 965	-20.3	-0.000 001	-0.008
100 %		+40	2567 499 962	-23.5	-0.000 001	-0.009
100 %		+50	2567 499 962	-23.3	-0.000 001	-0.009
115 %		+20	2567 499 974	-11.4	0.000 000	-0.004
85 %		+20	2567 499 962	-23.4	-0.000 001	-0.009



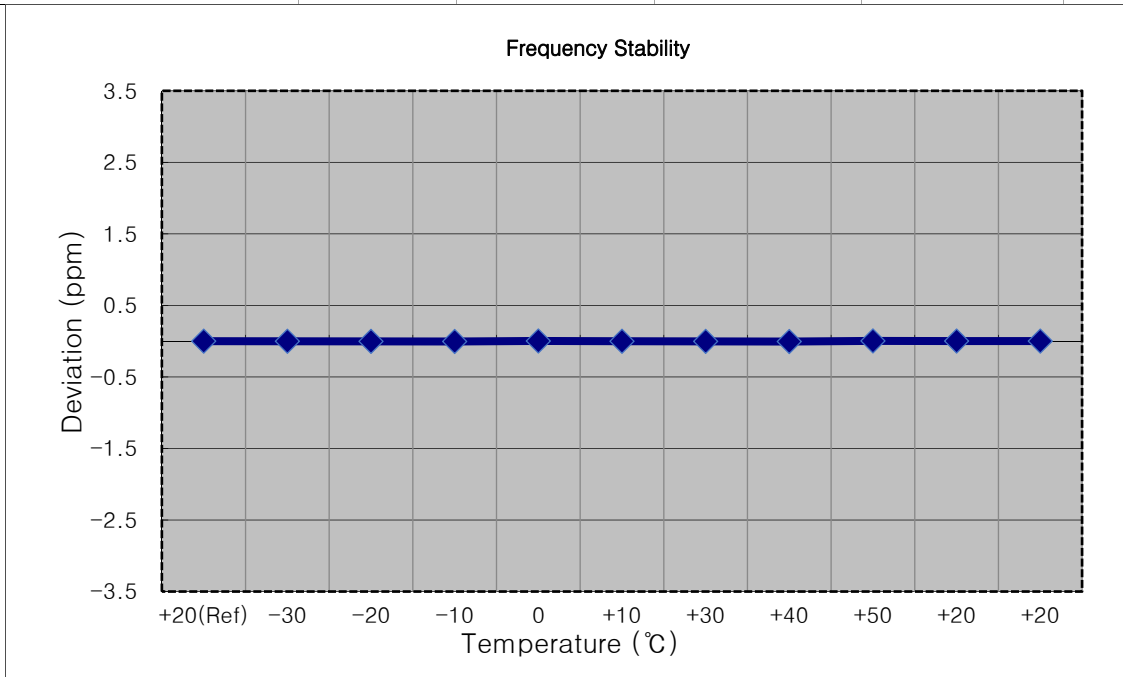
MODE:	<u>LTE 7</u>
OPERATING FREQUENCY:	<u>2,565,000,000 Hz</u>
CHANNEL:	<u>21400 (10 MHz)</u>
REFERENCE VOLTAGE:	<u>13.200 VDC</u>
DEVIATION LIMIT:	<u>Emission must remain in band</u>

Voltage	Power	Temp.	Frequency	Frequency Error	Deviation	
(%)	(VDC)	(°C)	(Hz)	(Hz)	(%)	ppm
100 %	13.200	+20(Ref)	2564 999 995	0.0	0.000 000	0.000
100 %		-30	2564 999 986	-9.3	0.000 000	-0.004
100 %		-20	2564 999 981	-14.5	-0.000 001	-0.006
100 %		-10	2564 999 976	-18.9	-0.000 001	-0.007
100 %		0	2564 999 998	3.3	0.000 000	0.001
100 %		+10	2564 999 987	-8.2	0.000 000	-0.003
100 %		+30	2564 999 986	-9.1	0.000 000	-0.004
100 %		+40	2564 999 979	-15.9	-0.000 001	-0.006
100 %		+50	2565 000 001	6.0	0.000 000	0.002
115 %		+20	2565 000 002	7.1	0.000 000	0.003
85 %		+20	2564 999 993	-1.8	0.000 000	-0.001



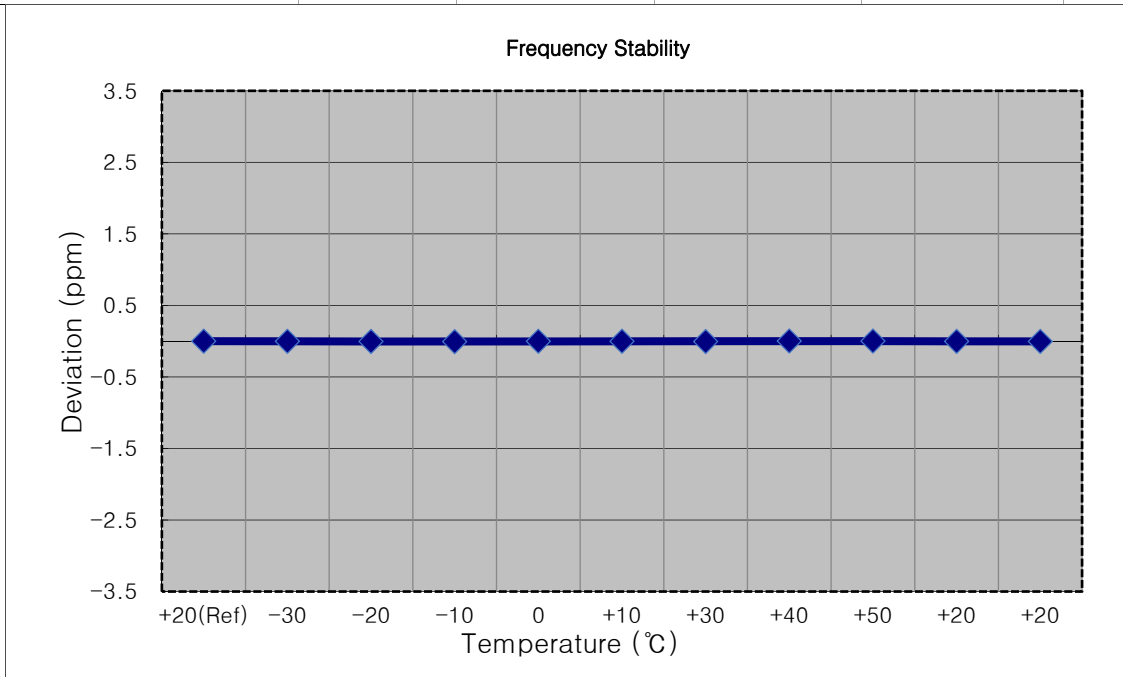
MODE:	<u>LTE 7</u>
OPERATING FREQUENCY:	<u>2,562,500,000 Hz</u>
CHANNEL:	<u>21375 (15 MHz)</u>
REFERENCE VOLTAGE:	<u>13.200 VDC</u>
DEVIATION LIMIT:	<u>Emission must remain in band</u>

Voltage	Power	Temp.	Frequency	Frequency Error	Deviation	
(%)	(VDC)	(°C)	(Hz)	(Hz)	(%)	ppm
100 %	13.200	+20(Ref)	2562 499 985	0.0	0.000 000	0.000
100 %		-30	2562 499 981	-3.9	0.000 000	-0.002
100 %		-20	2562 499 978	-7.2	0.000 000	-0.003
100 %		-10	2562 499 974	-11.1	0.000 000	-0.004
100 %		0	2562 499 991	6.5	0.000 000	0.003
100 %		+10	2562 499 982	-3.1	0.000 000	-0.001
100 %		+30	2562 499 977	-7.5	0.000 000	-0.003
100 %		+40	2562 499 972	-13.0	-0.000 001	-0.005
100 %		+50	2562 499 993	8.3	0.000 000	0.003
115 %		+20	2562 499 989	3.9	0.000 000	0.002
85 %		+20	2562 499 988	3.1	0.000 000	0.001



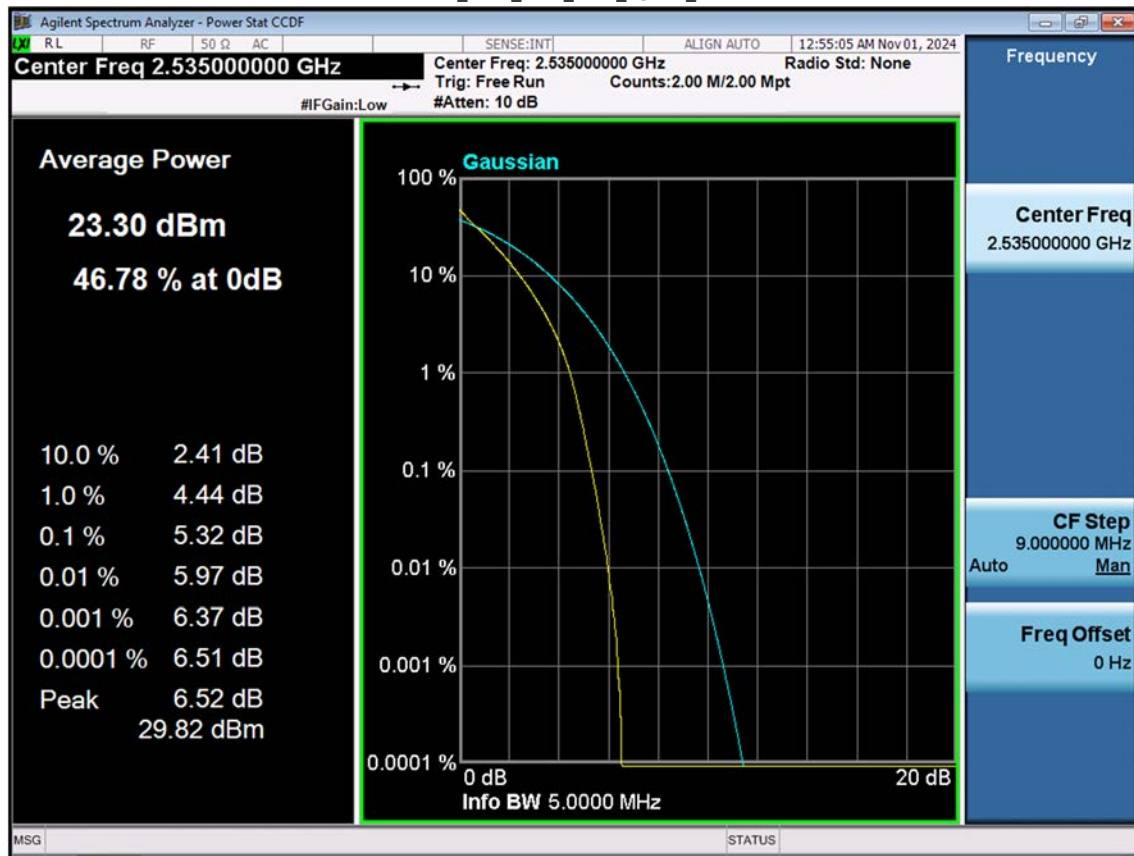
MODE:	<u>LTE 7</u>
OPERATING FREQUENCY:	<u>2,560,000,000 Hz</u>
CHANNEL:	<u>21350 (20 MHz)</u>
REFERENCE VOLTAGE:	<u>13.200 VDC</u>
DEVIATION LIMIT:	<u>Emission must remain in band</u>

Voltage	Power	Temp.	Frequency	Frequency Error	Deviation	
(%)	(VDC)	(°C)	(Hz)	(Hz)	(%)	ppm
100 %	13.200	+20(Ref)	2560 000 007	0.0	0.000 000	0.000
100 %		-30	2560 000 002	-5.2	0.000 000	-0.002
100 %		-20	2559 999 997	-10.5	0.000 000	-0.004
100 %		-10	2559 999 991	-16.6	-0.000 001	-0.006
100 %		0	2560 000 003	-4.0	0.000 000	-0.002
100 %		+10	2560 000 003	-4.0	0.000 000	-0.002
100 %		+30	2559 999 995	-12.7	0.000 000	-0.005
100 %		+40	2560 000 013	6.1	0.000 000	0.002
100 %		+50	2560 000 011	3.8	0.000 000	0.001
115 %		+20	2560 000 001	-6.6	0.000 000	-0.003
85 %		+20	2559 999 998	-8.8	0.000 000	-0.003

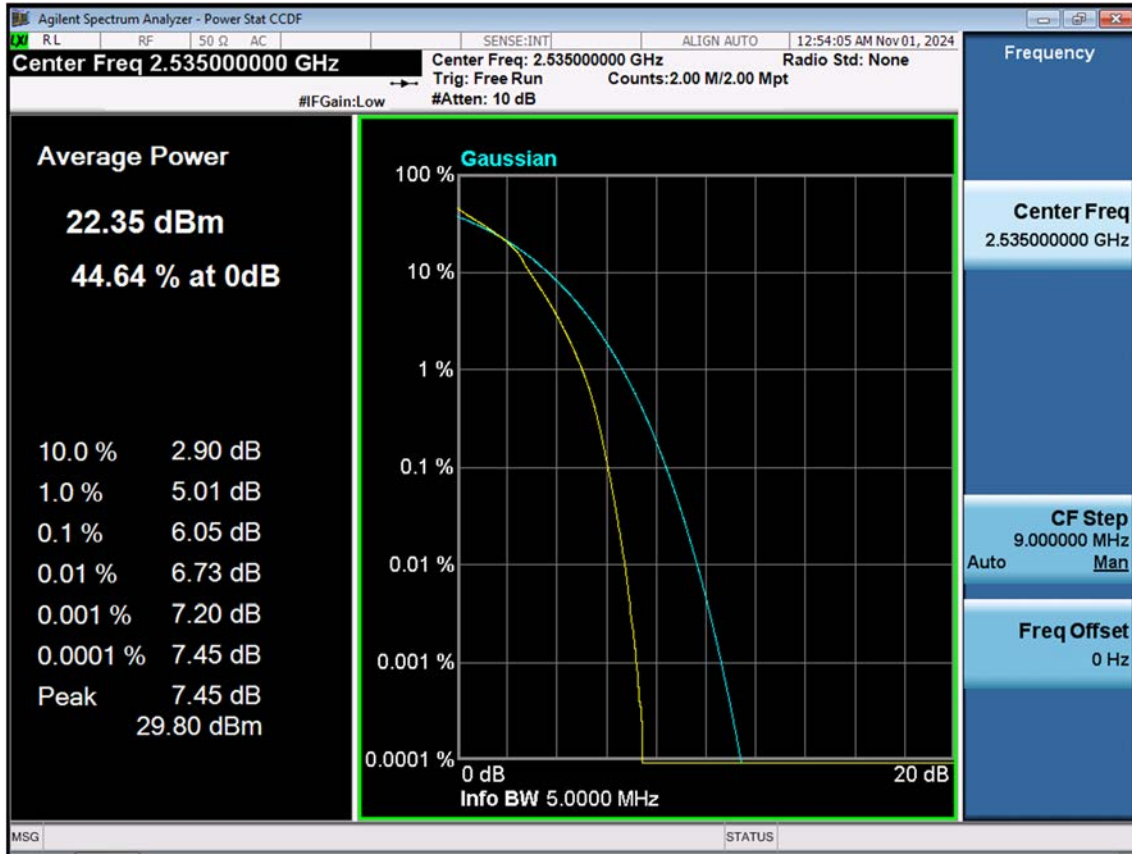


9. TEST PLOTS

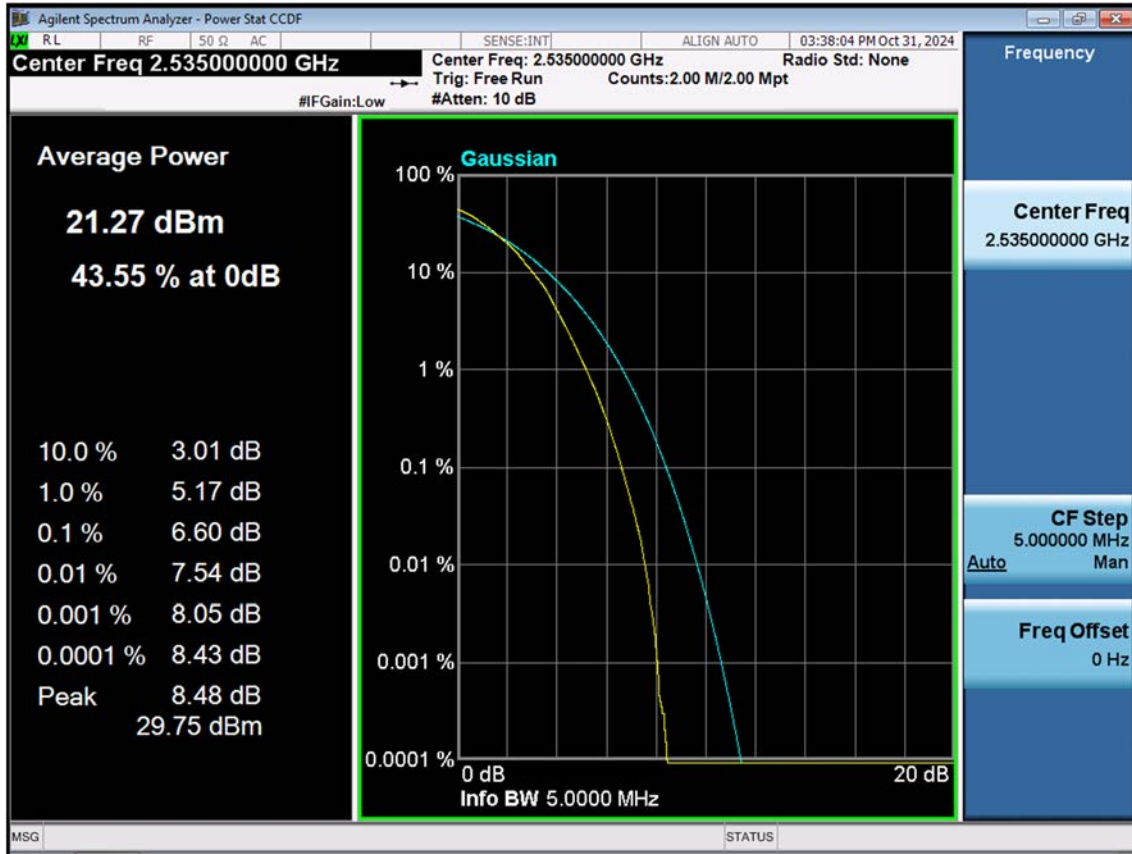
LTE B7_5 M_PAR_Mid_QPSK_FullRB



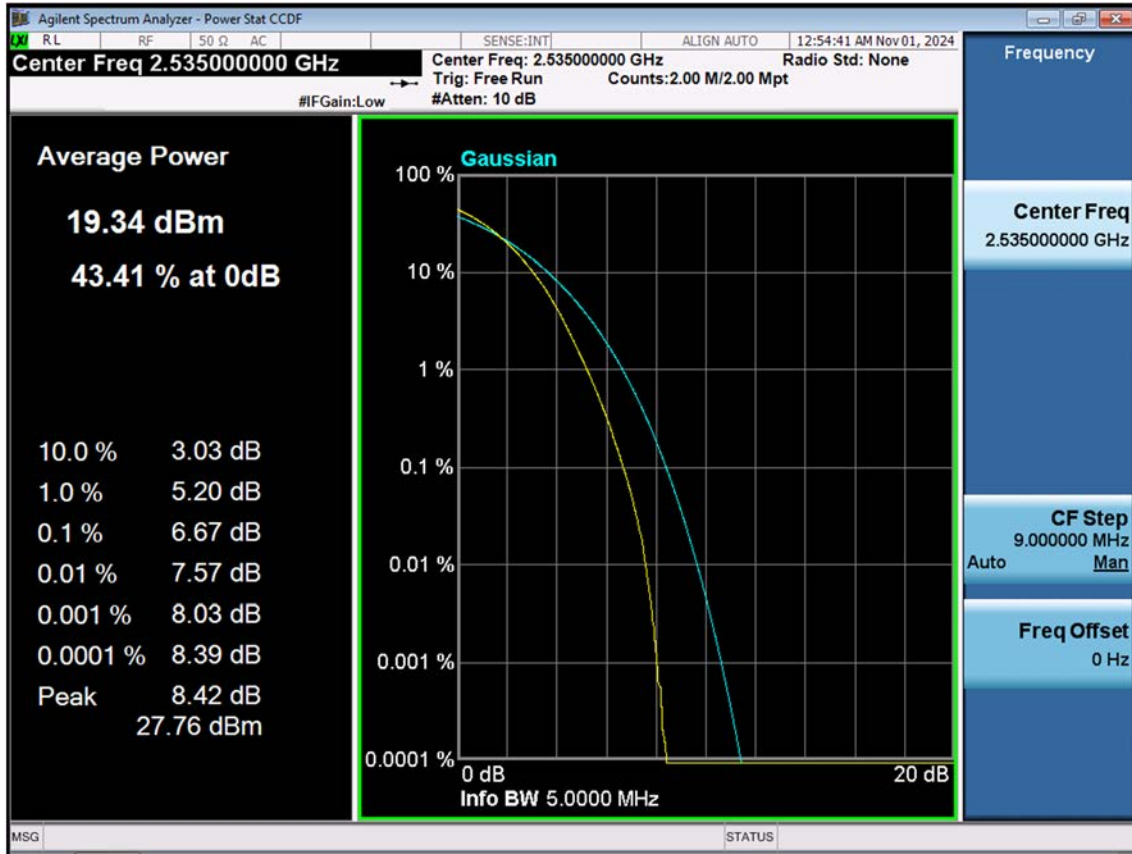
LTE B7_5 M_PAR_Mid_16QAM_FullRB



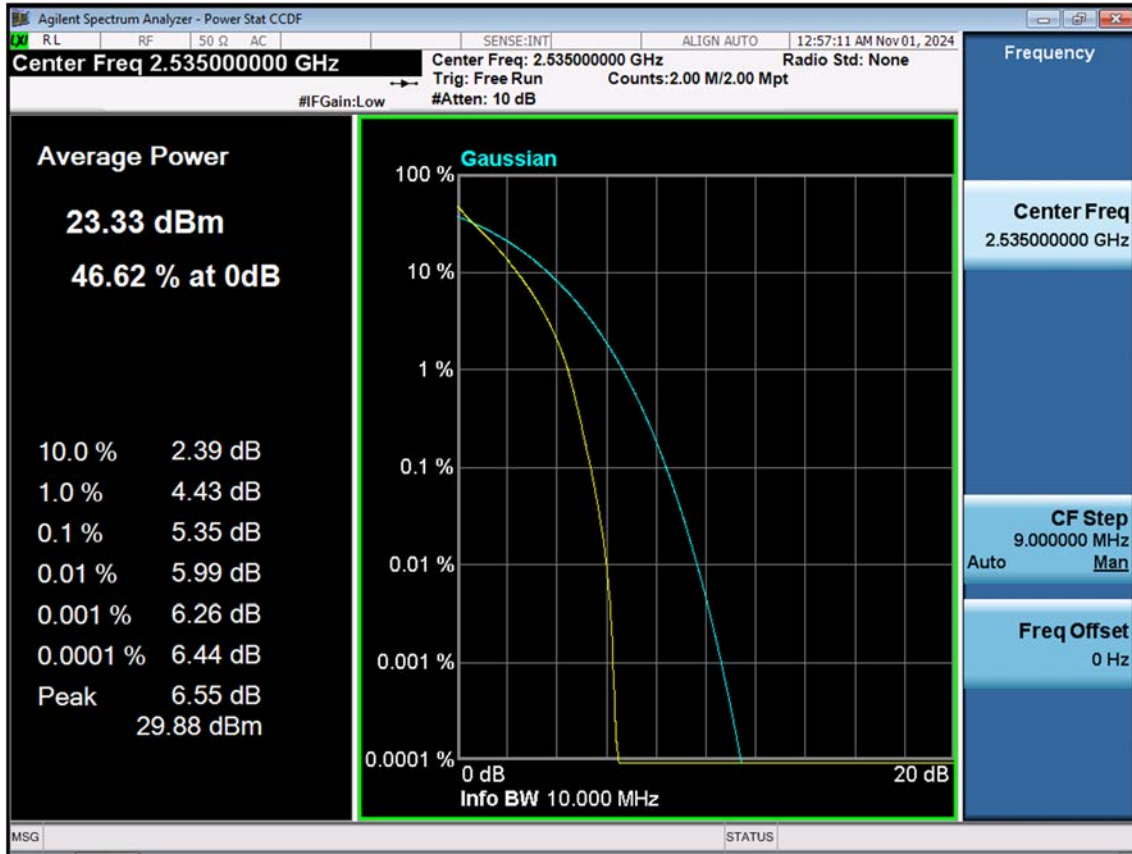
LTE B7_5 M_PAR_Mid_64QAM_FullRB



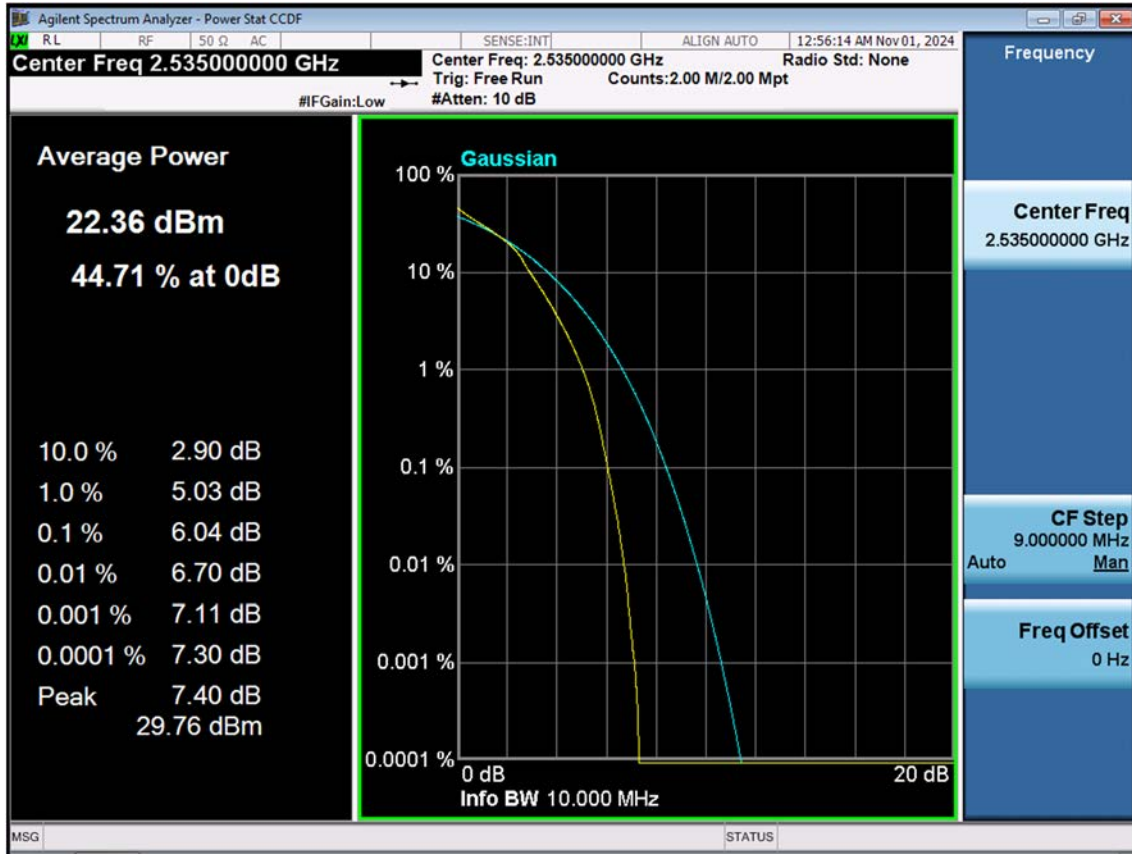
LTE B7_5 M_PAR_Mid_256QAM_FullRB



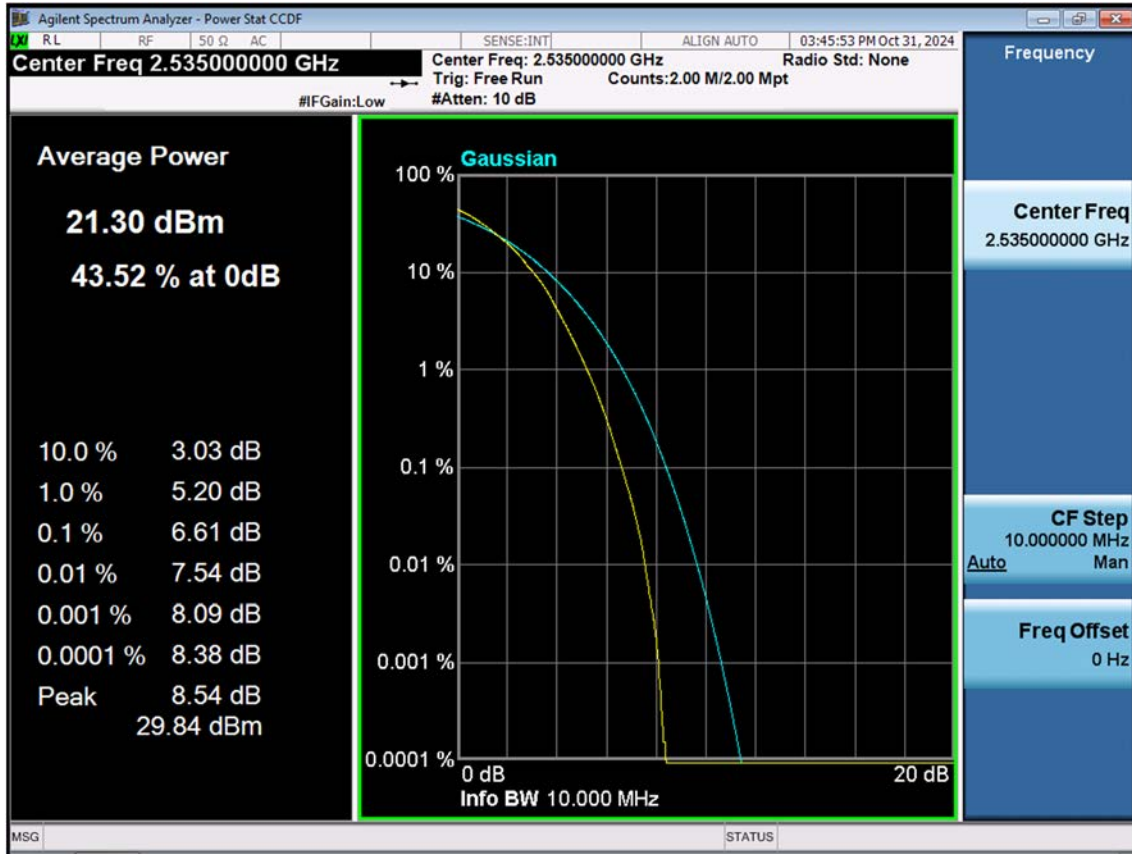
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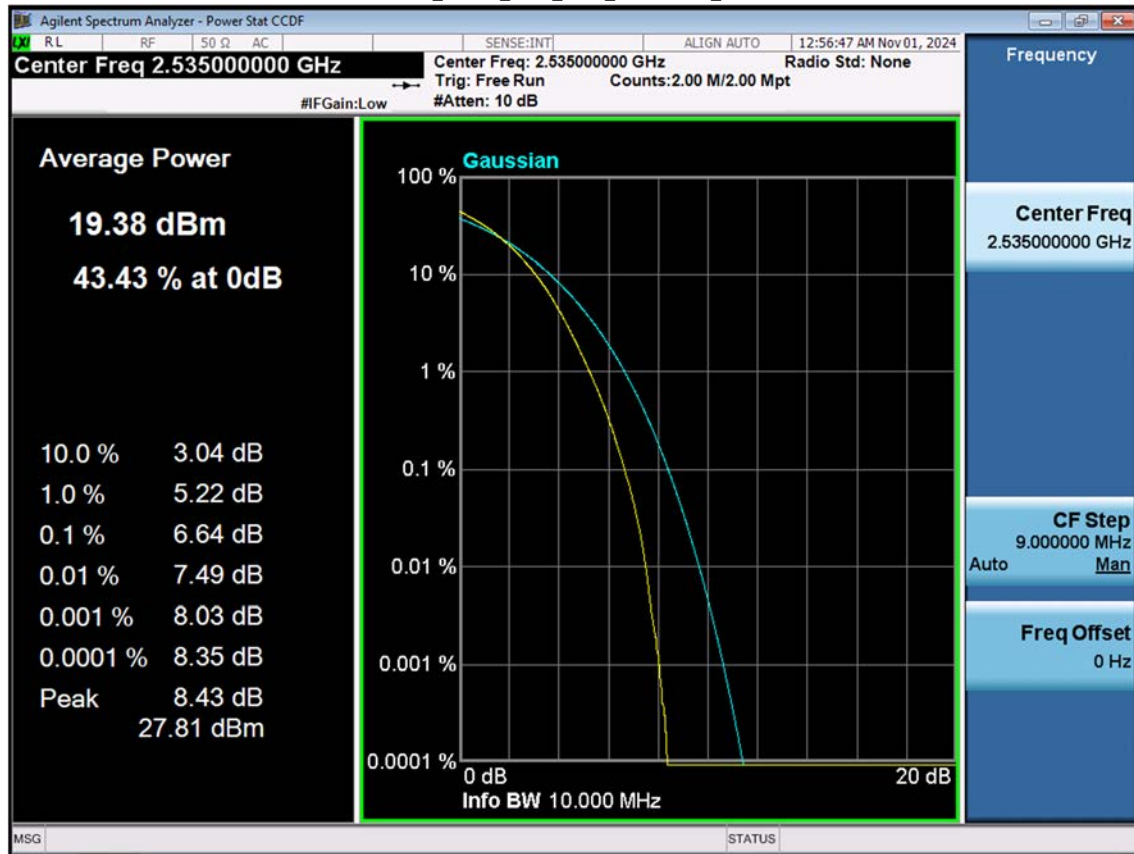
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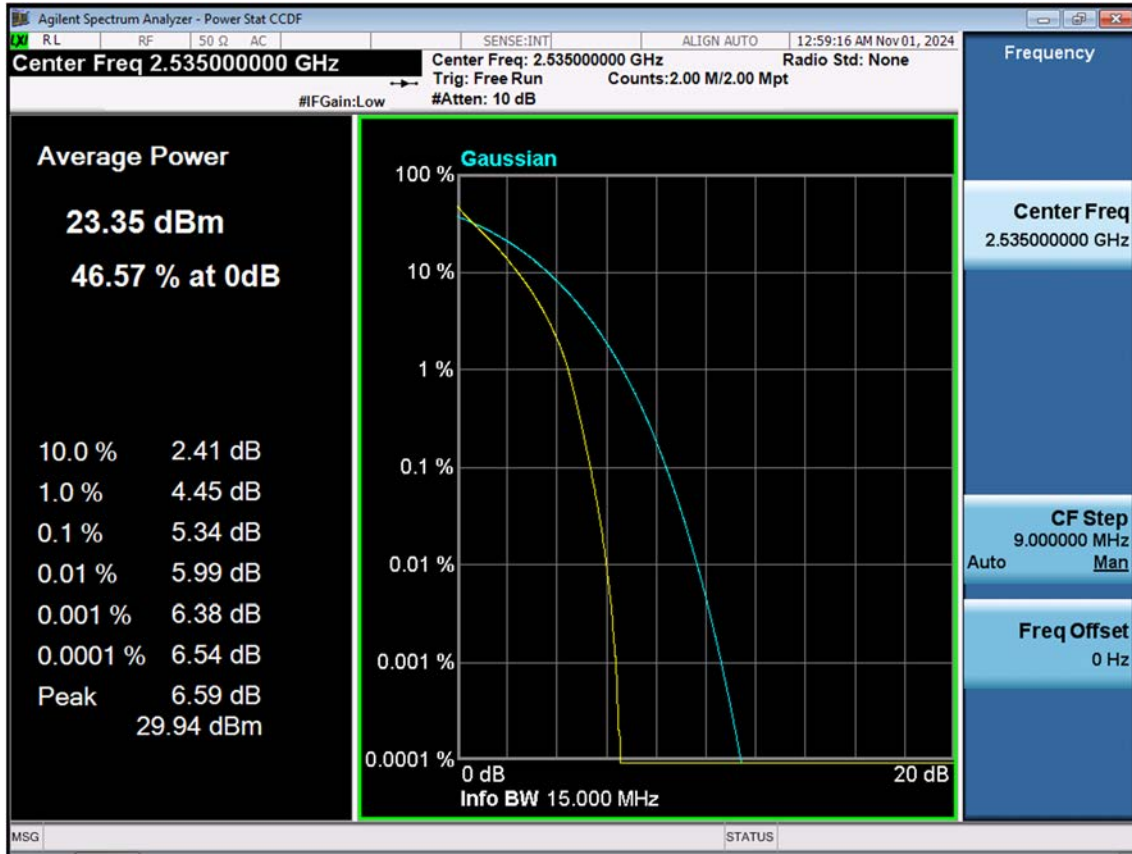
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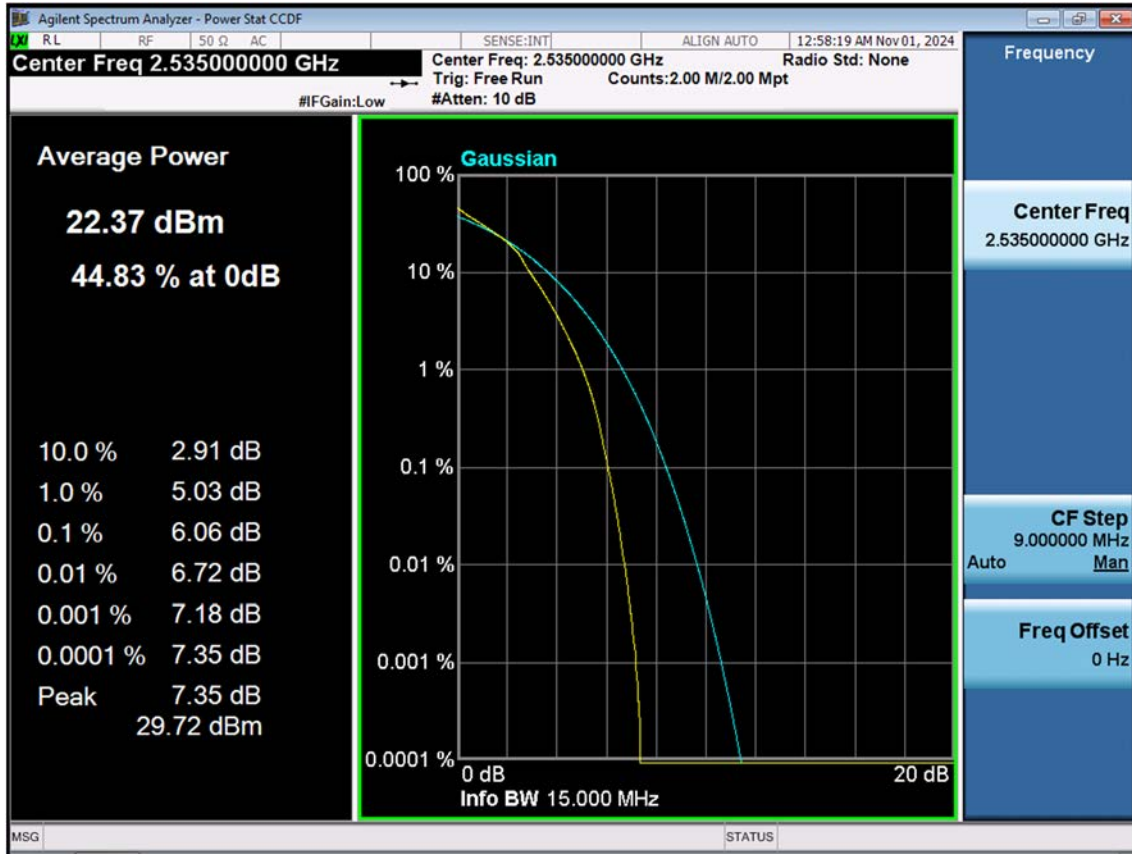
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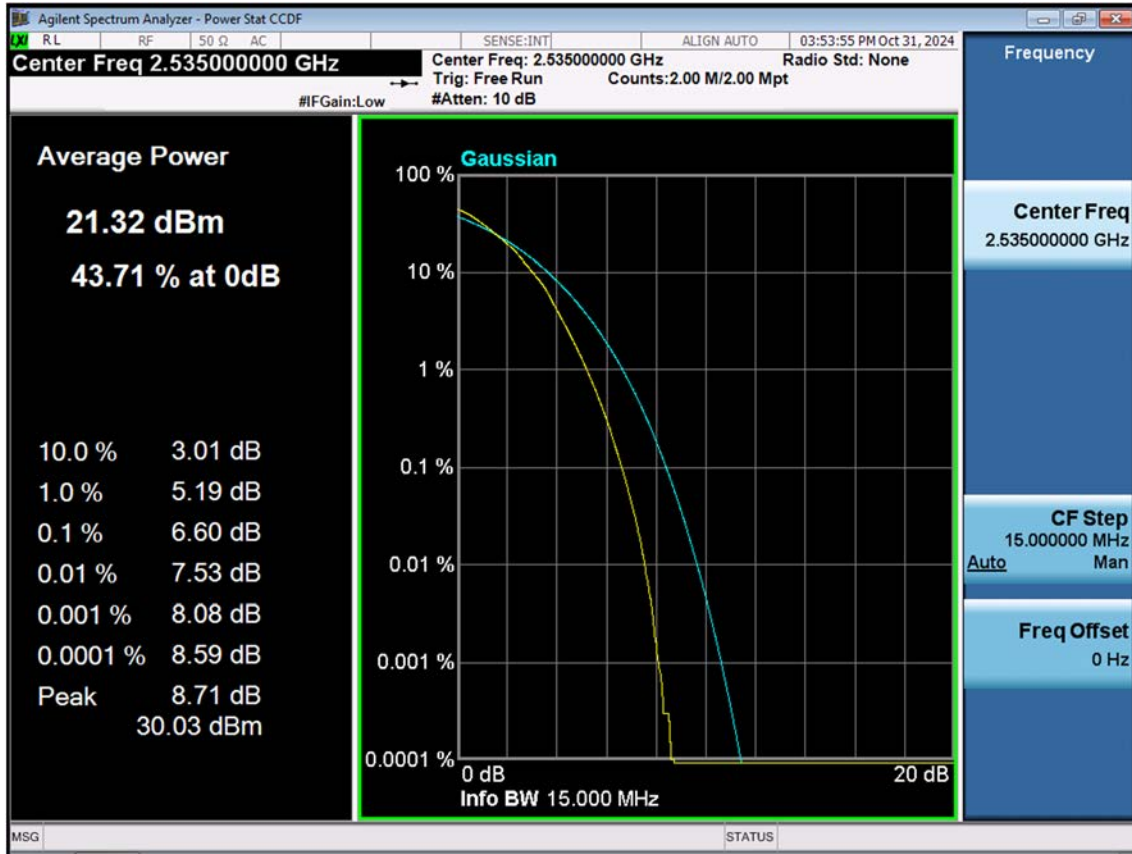
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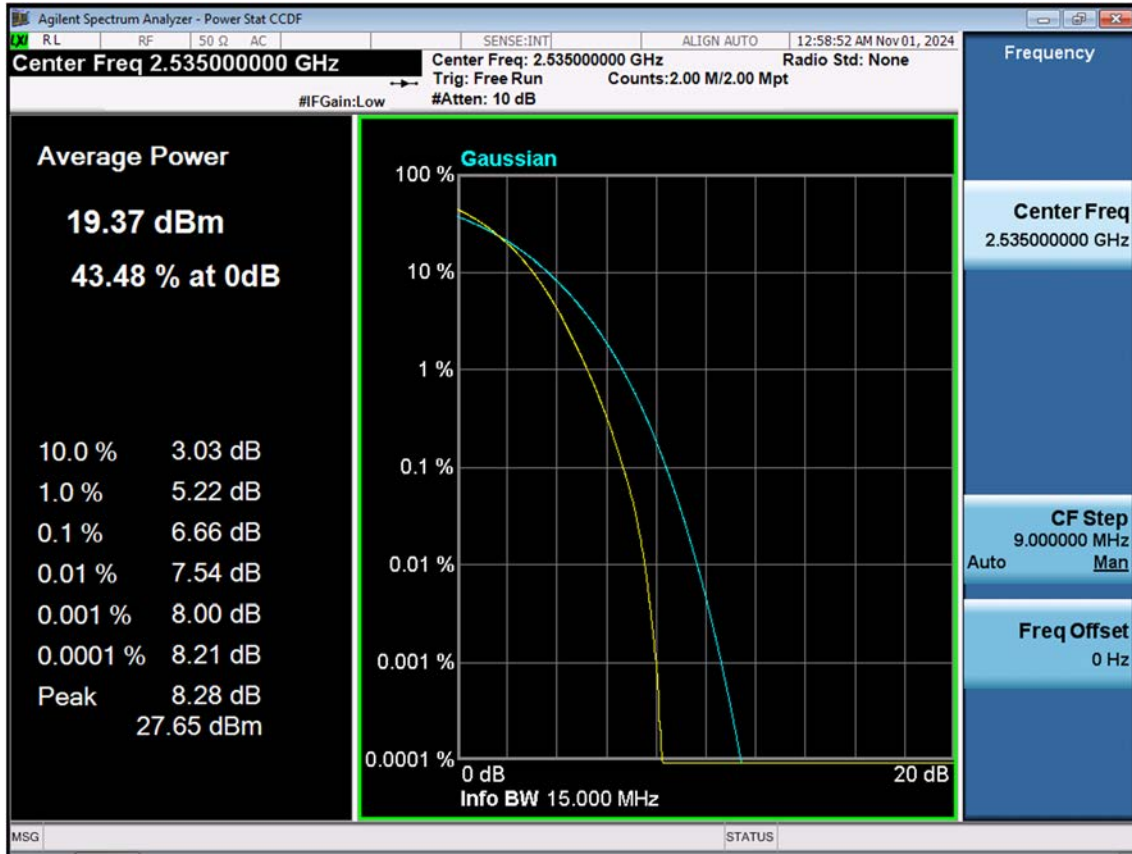
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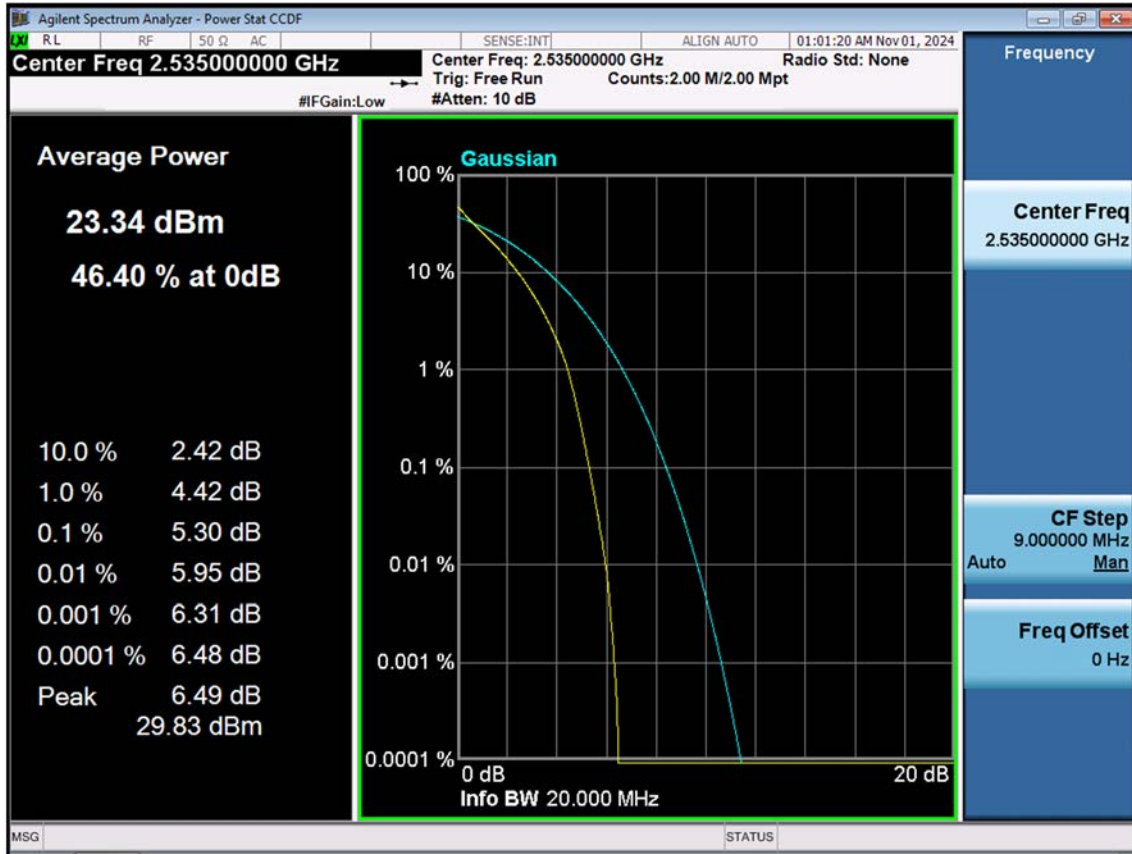
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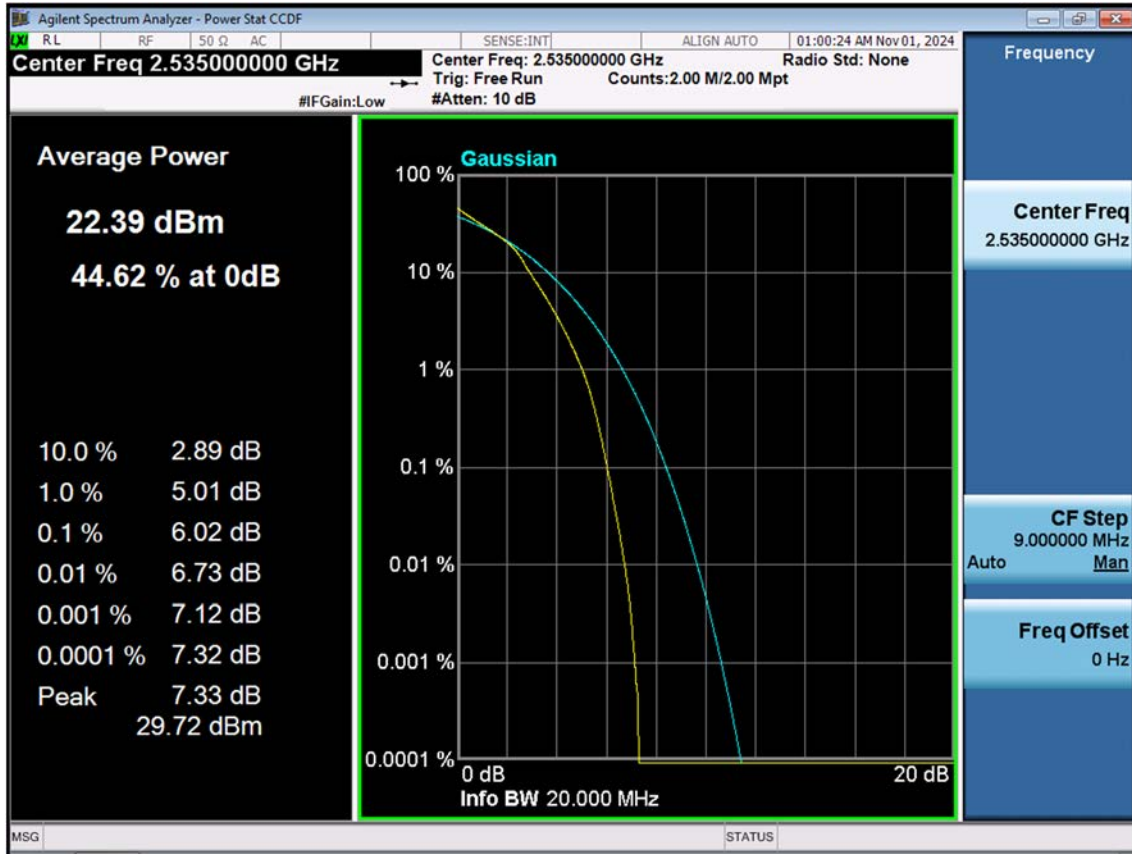
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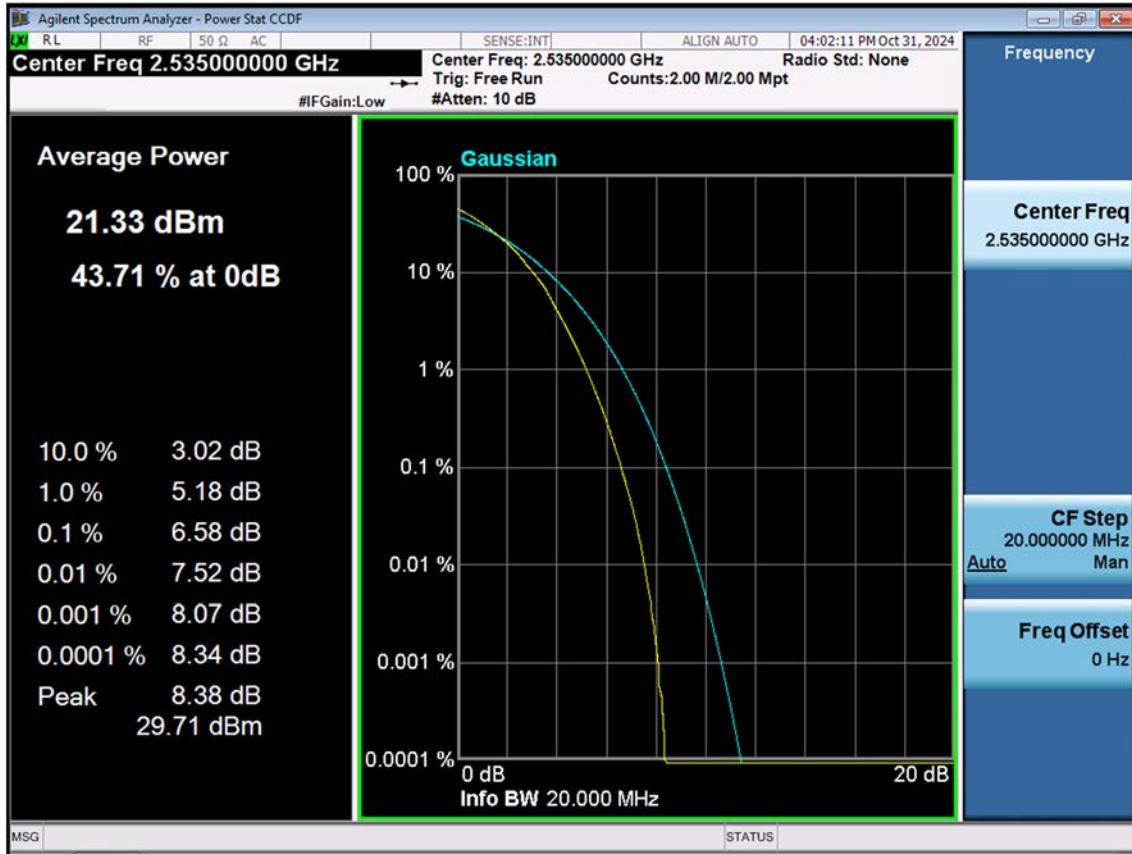
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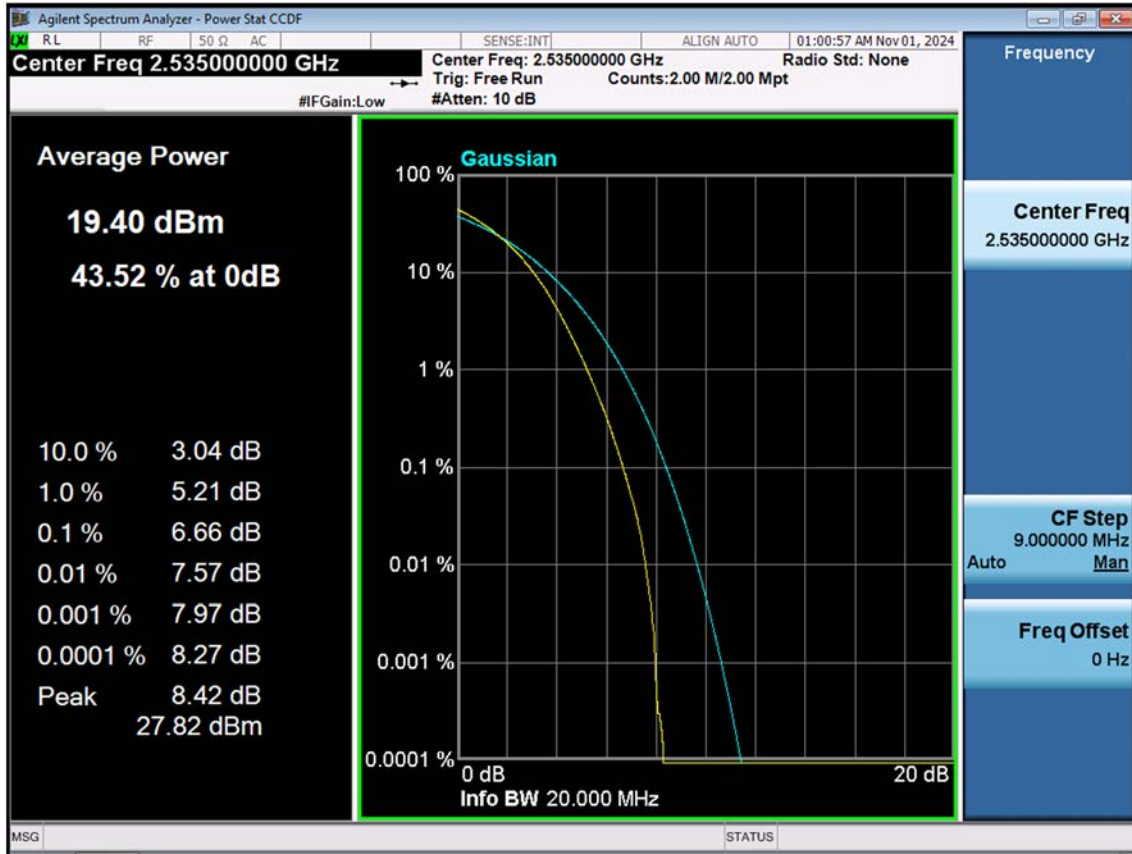
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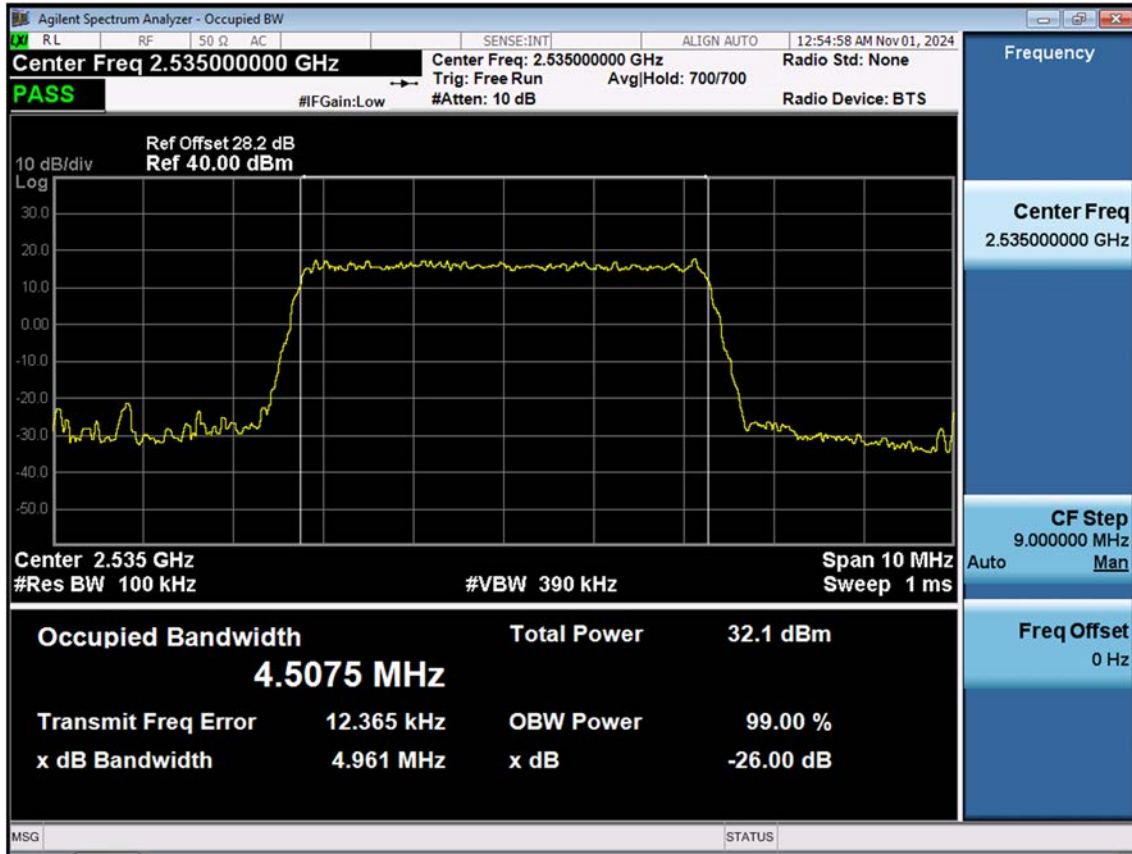
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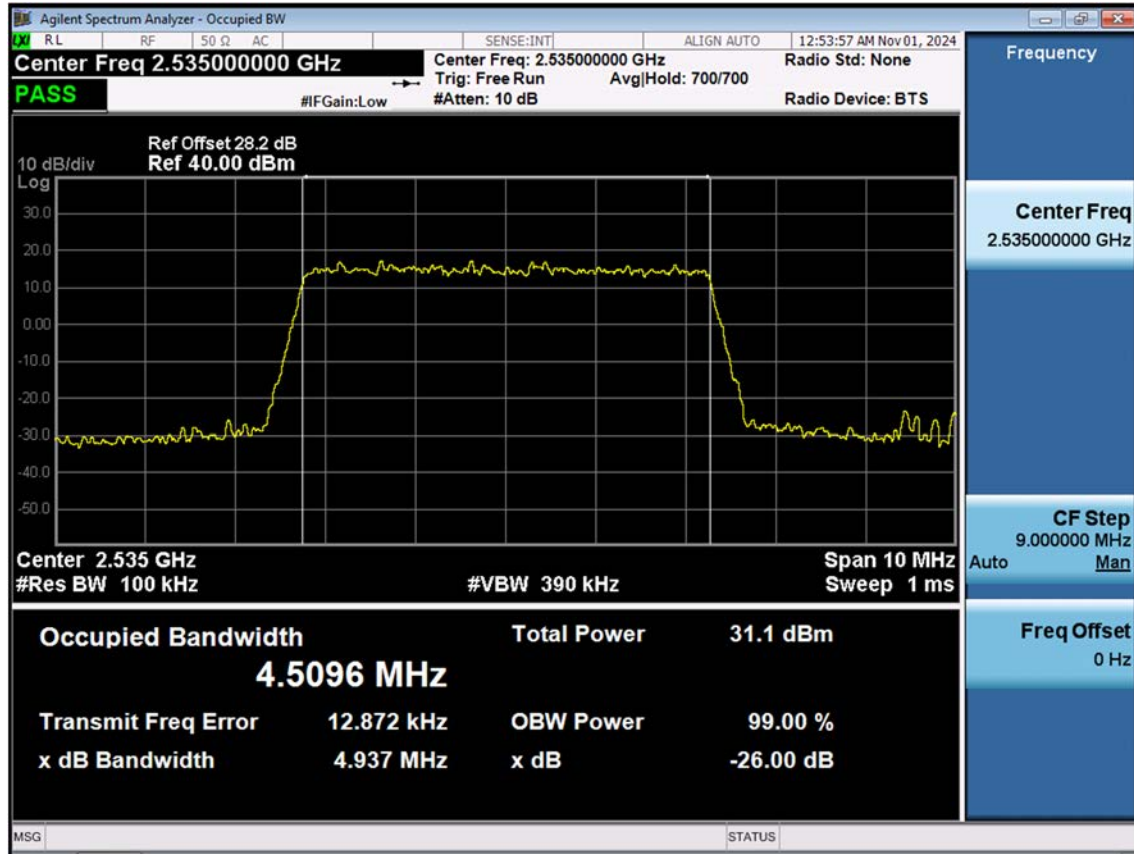
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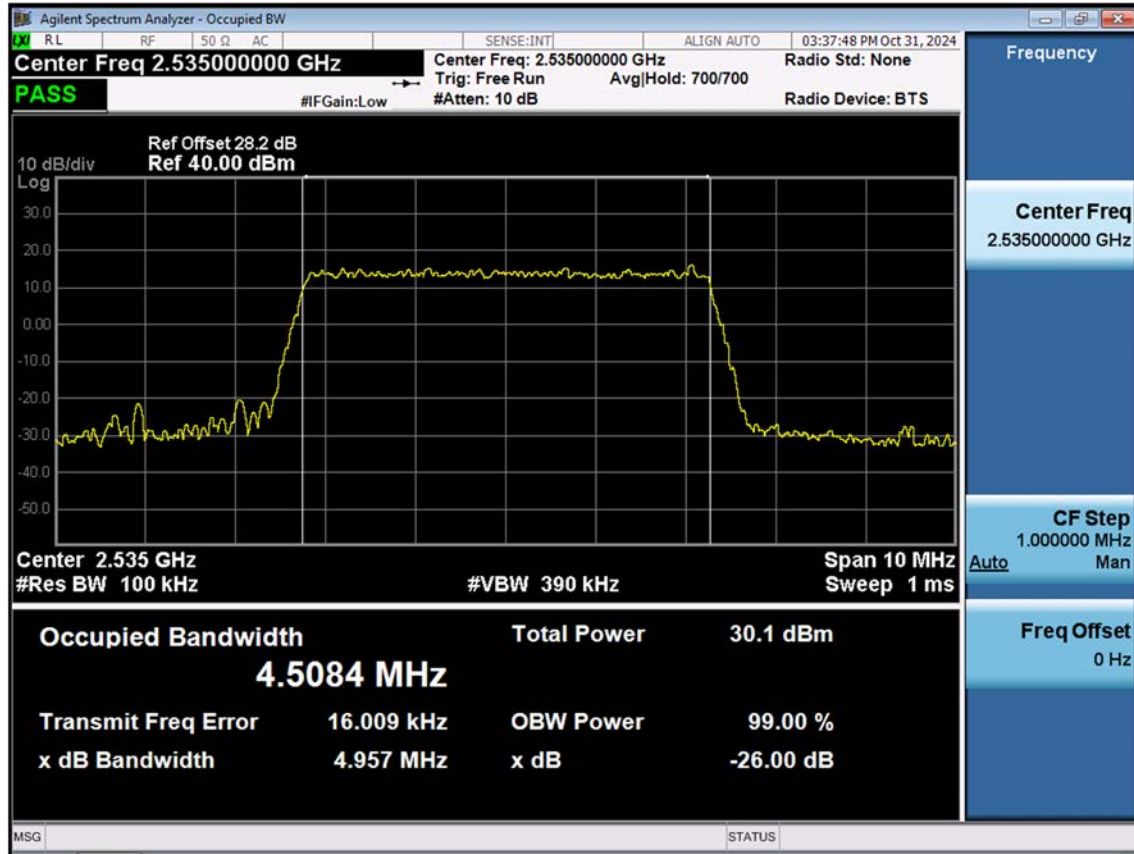
LTE B7_5 M_OBW_Mid_QPSK_FullRB



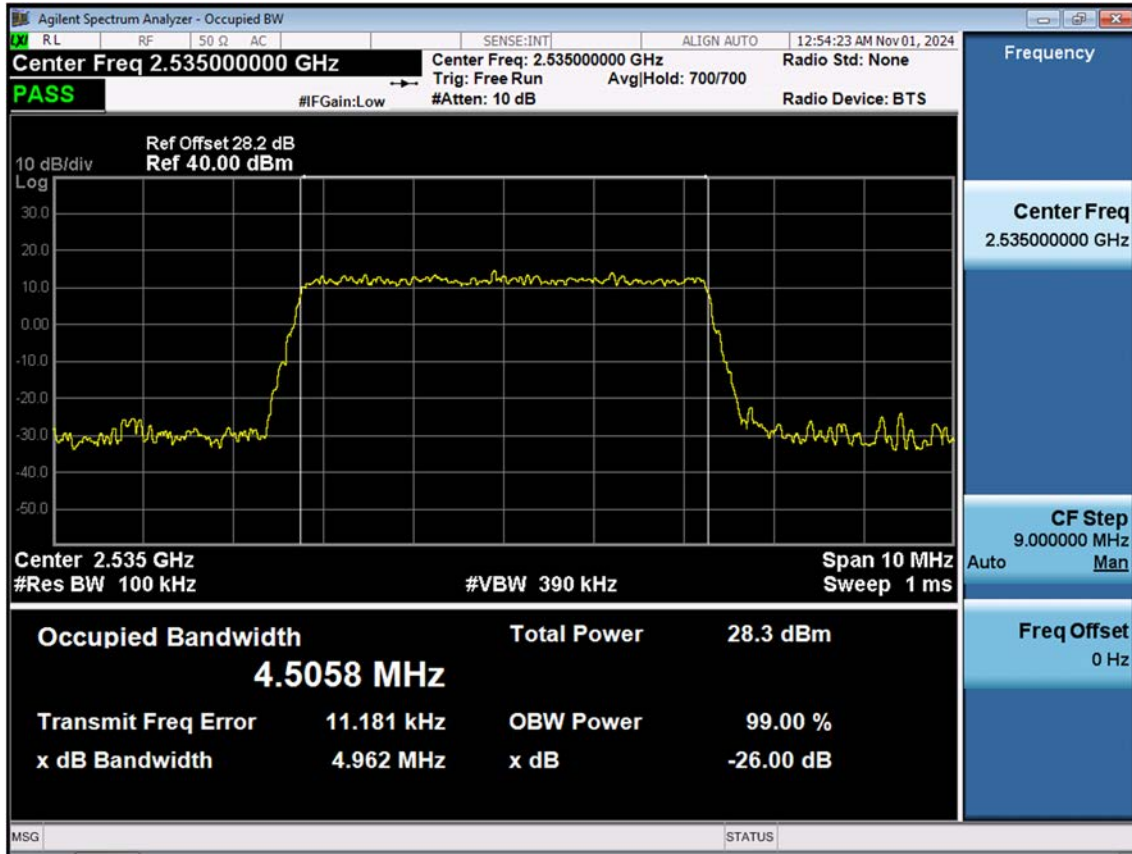
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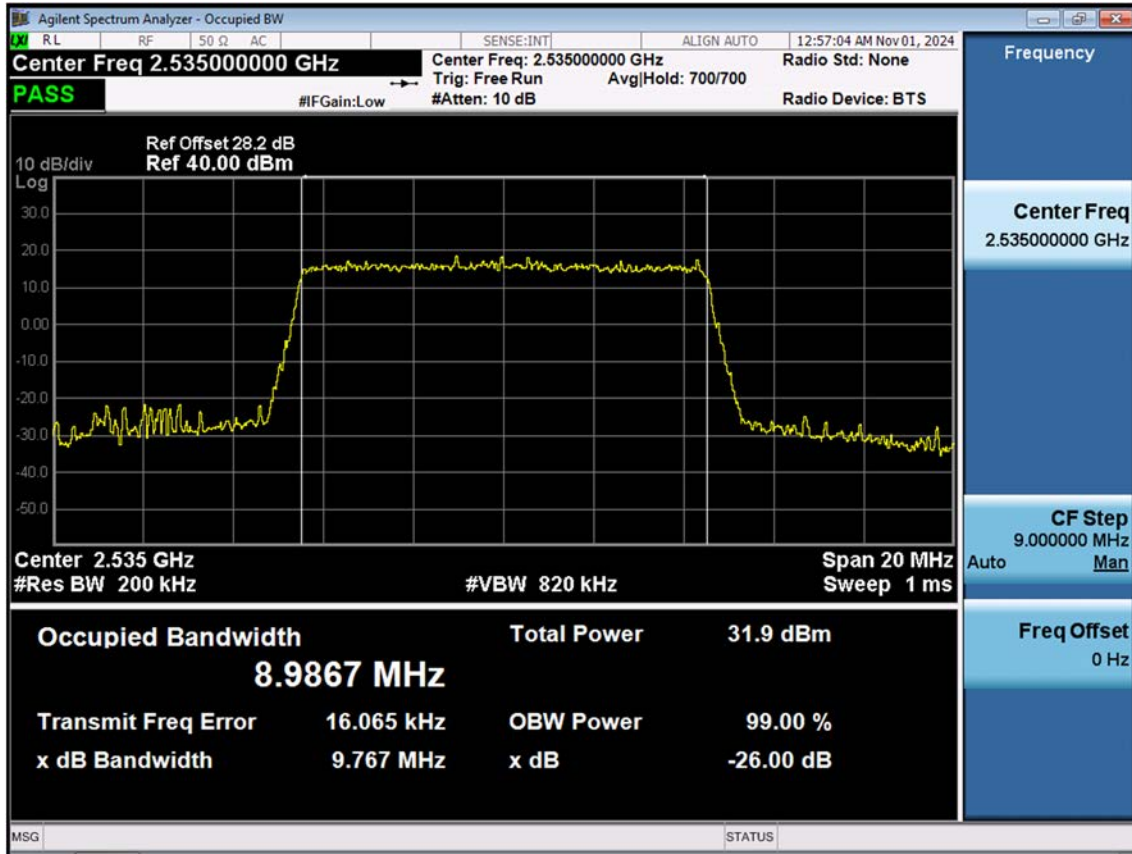
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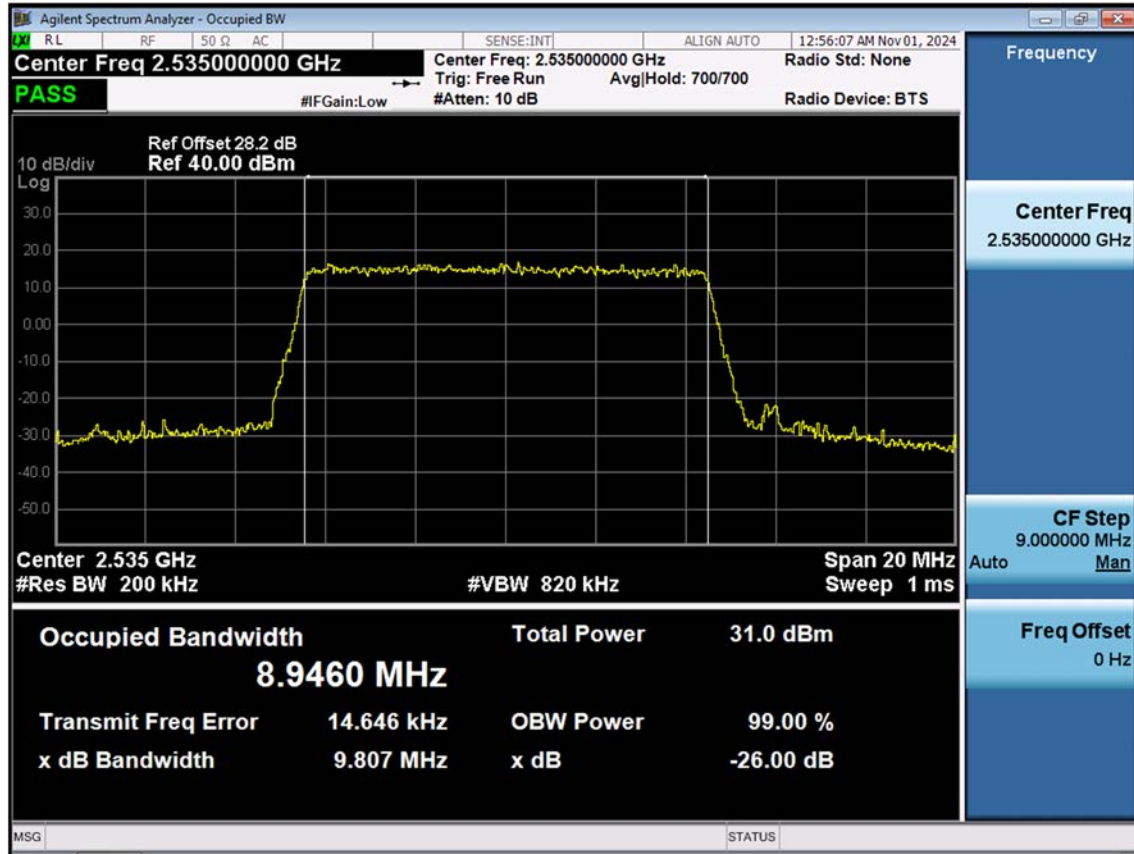
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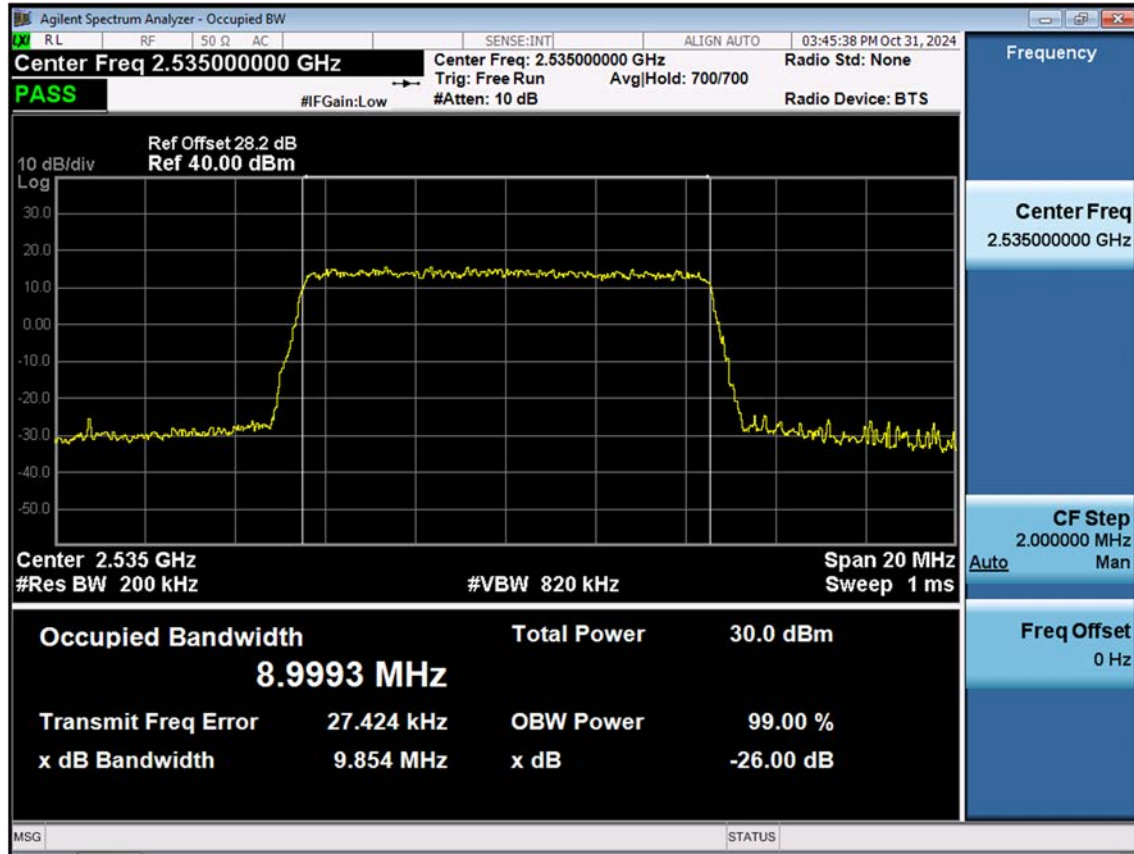
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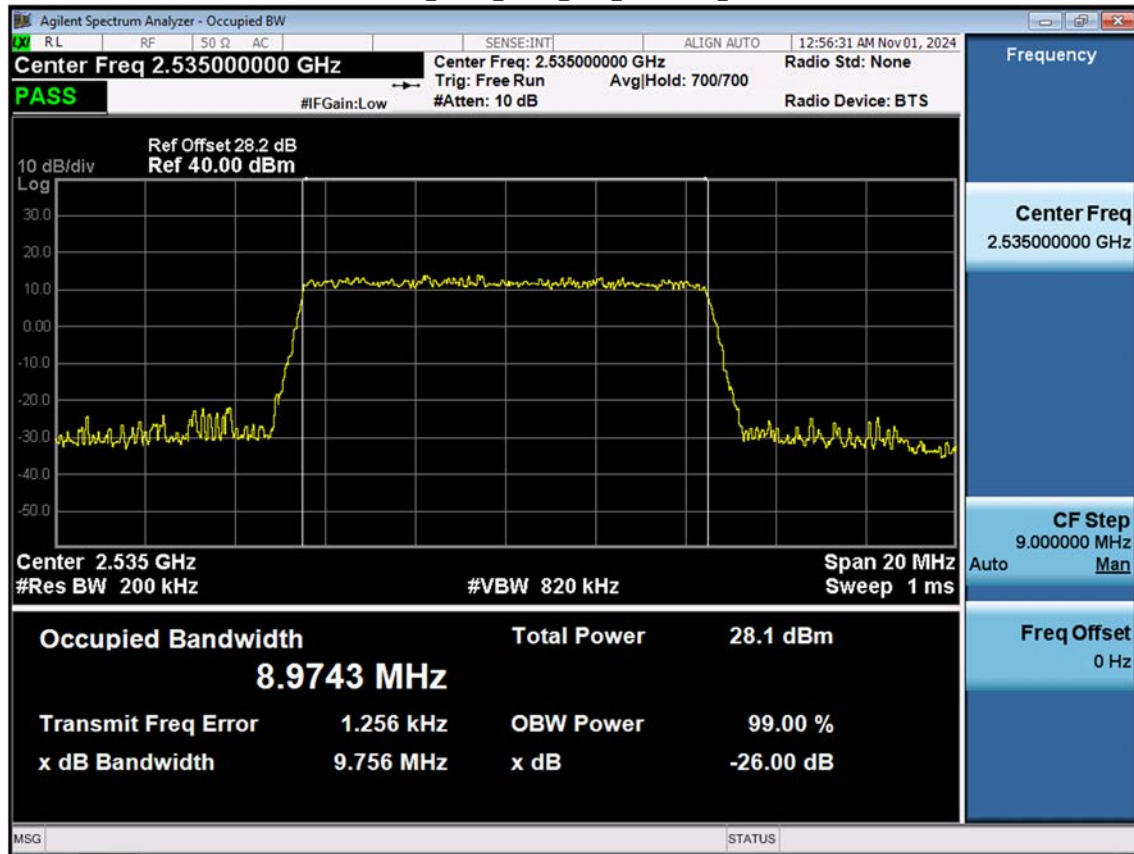
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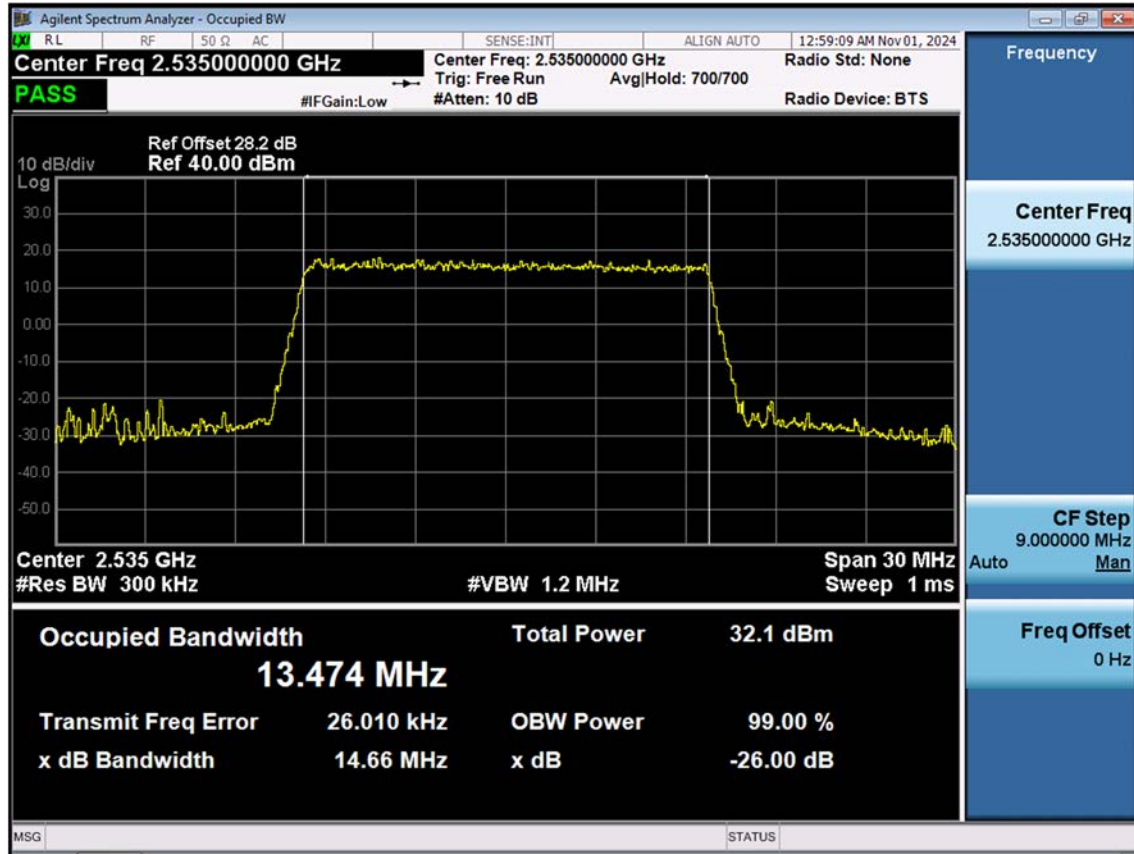
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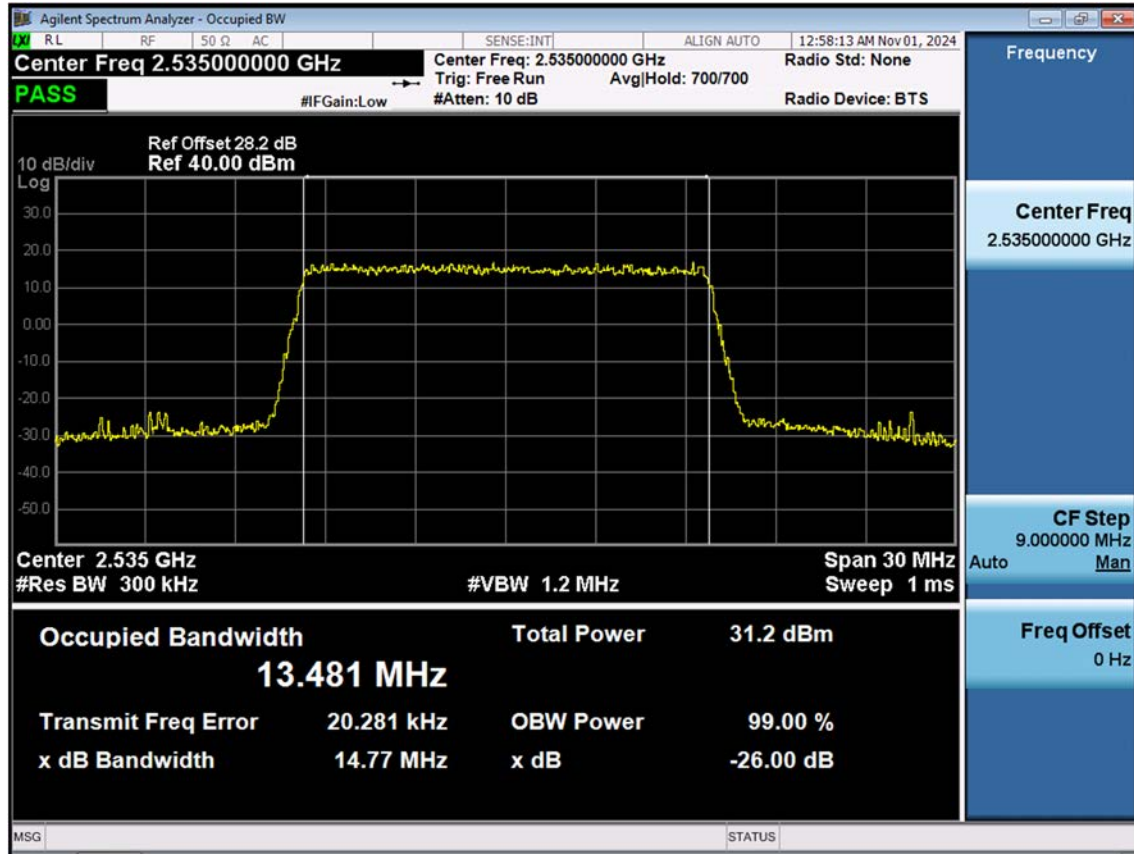
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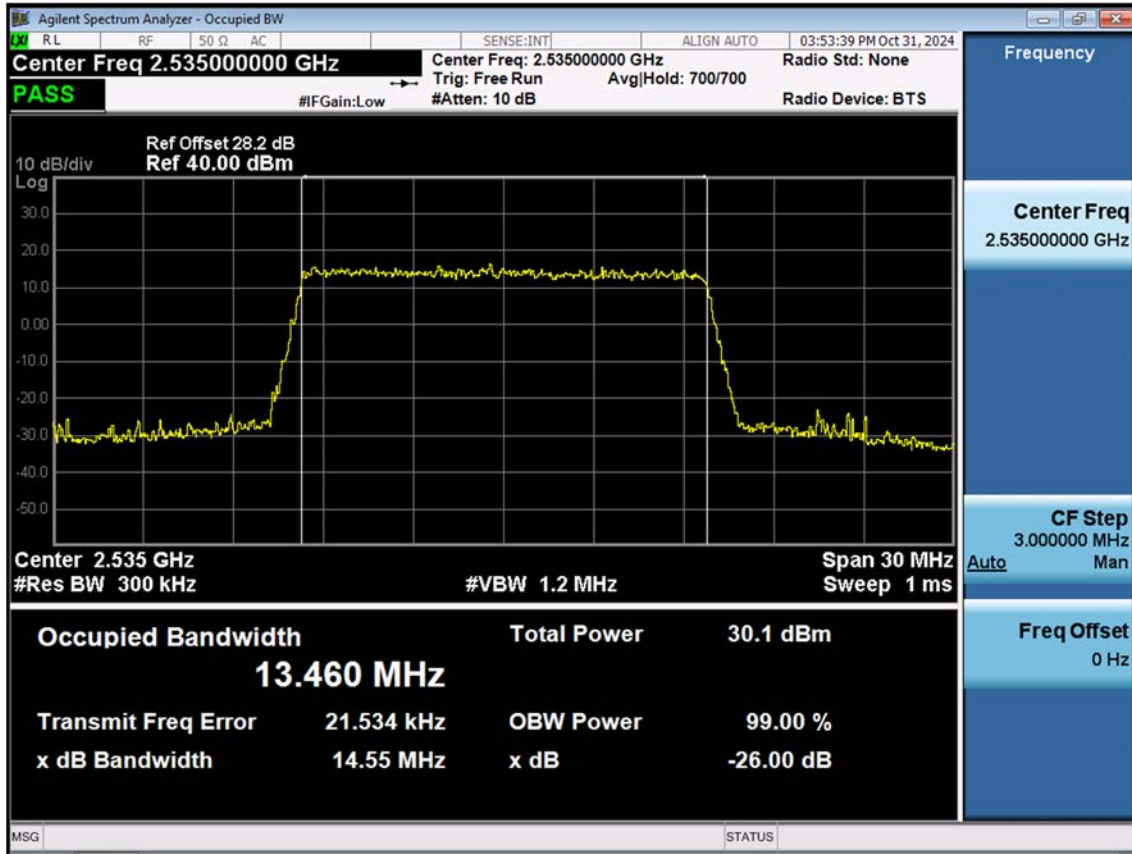
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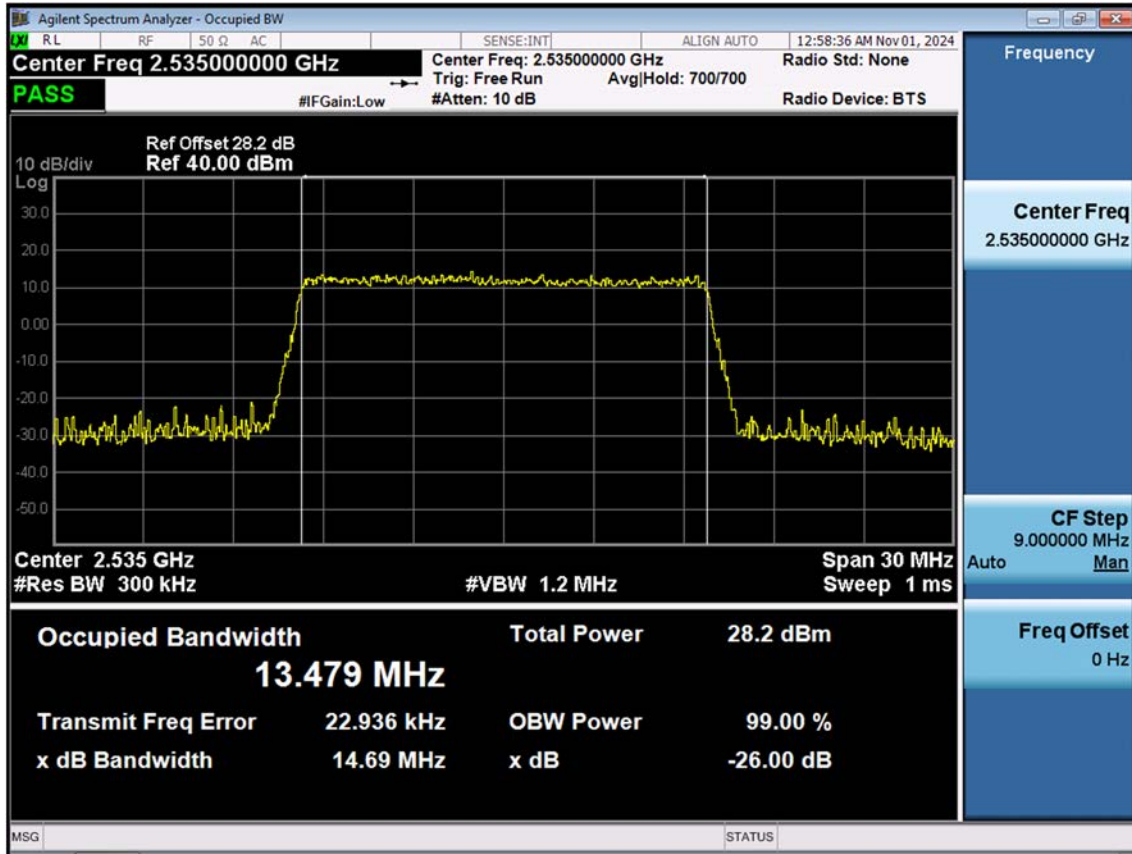
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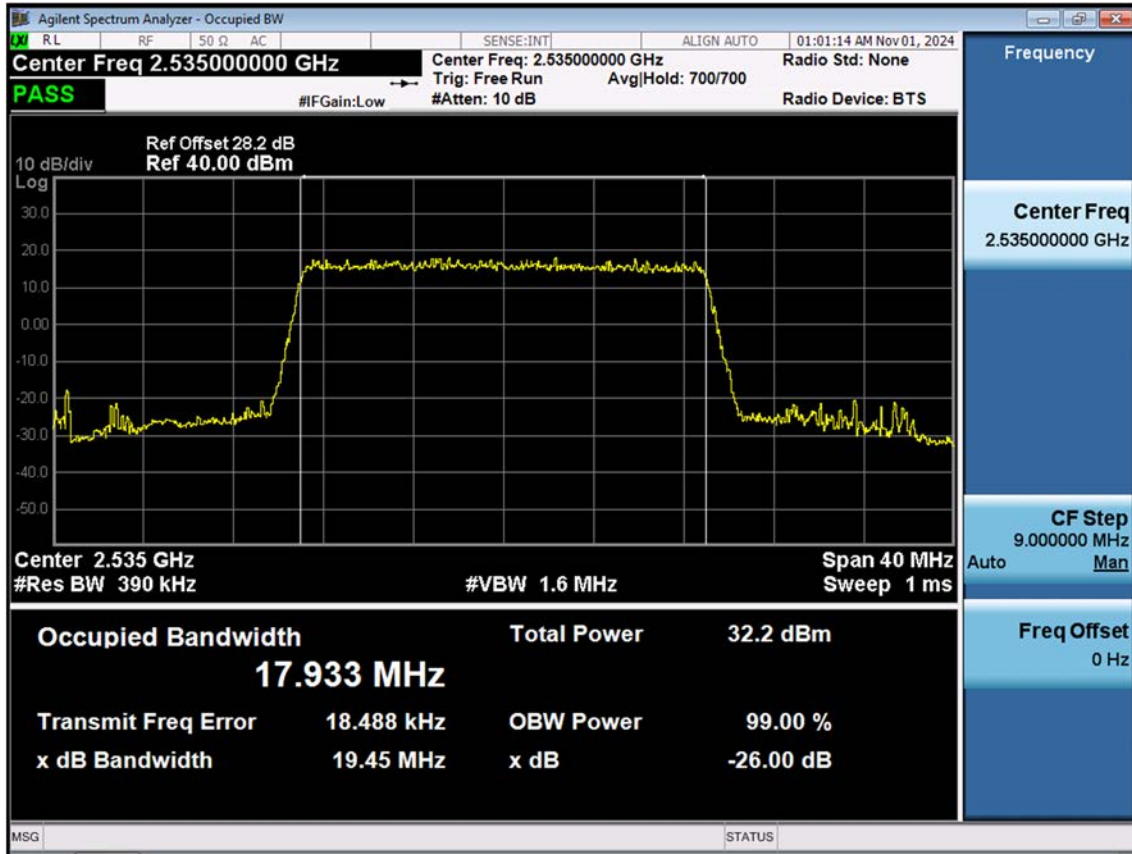
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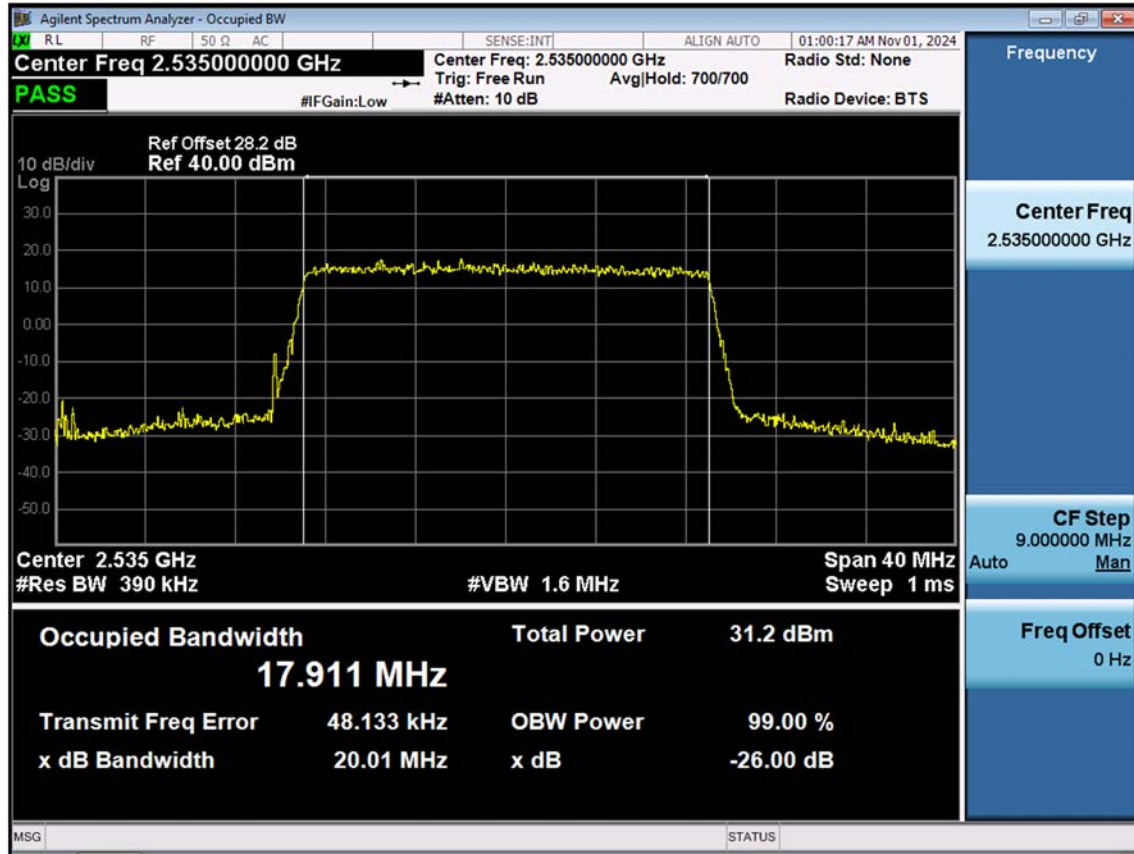
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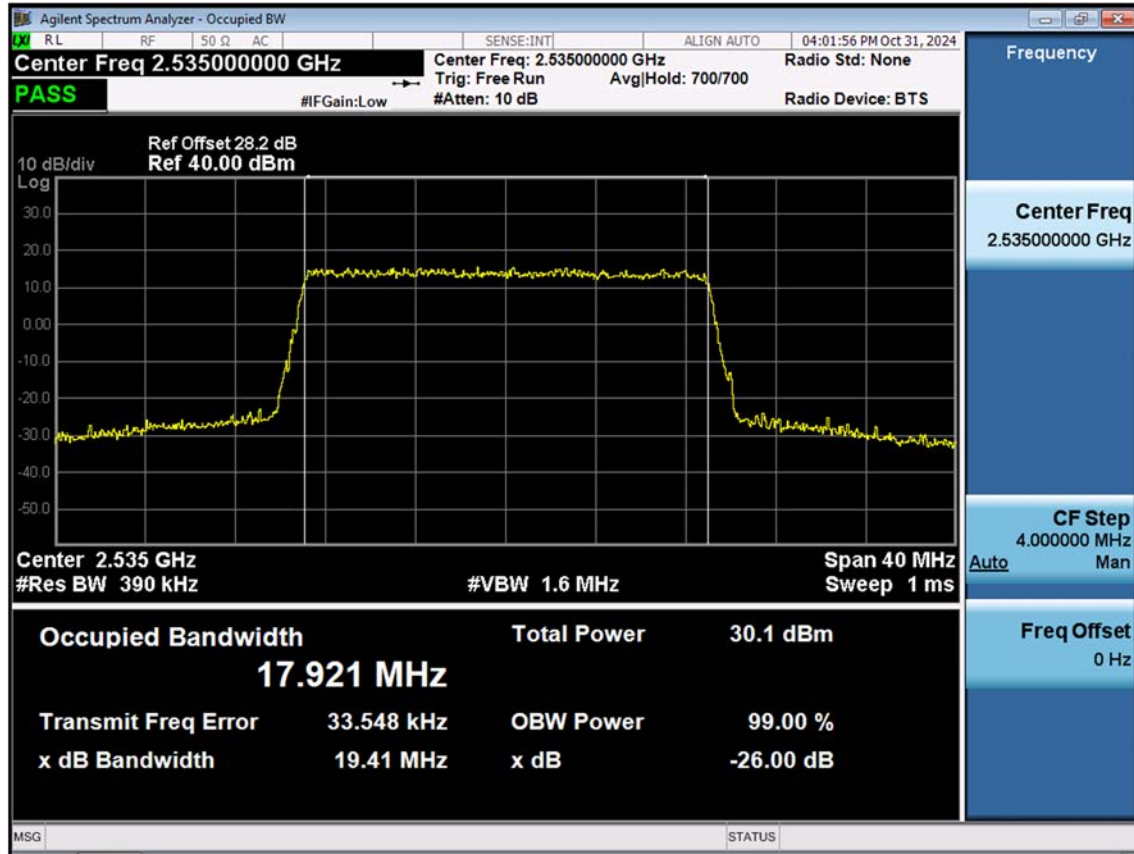
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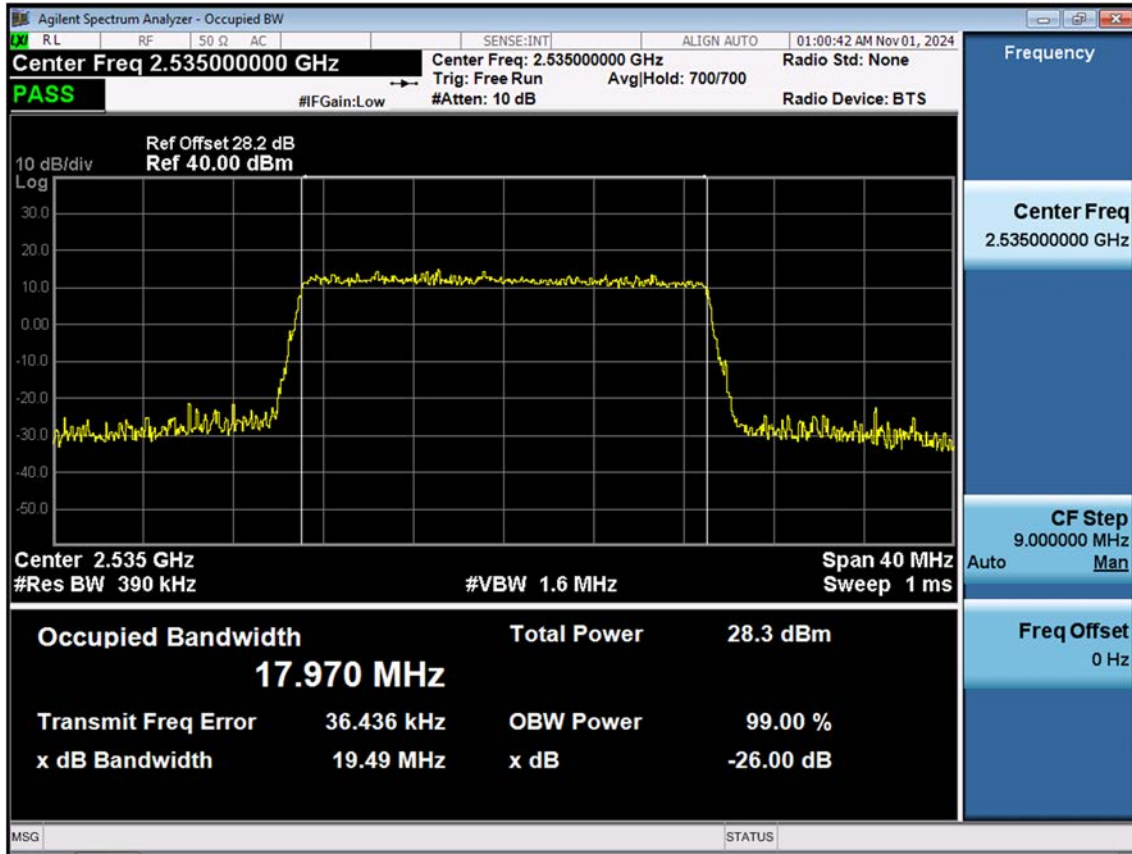
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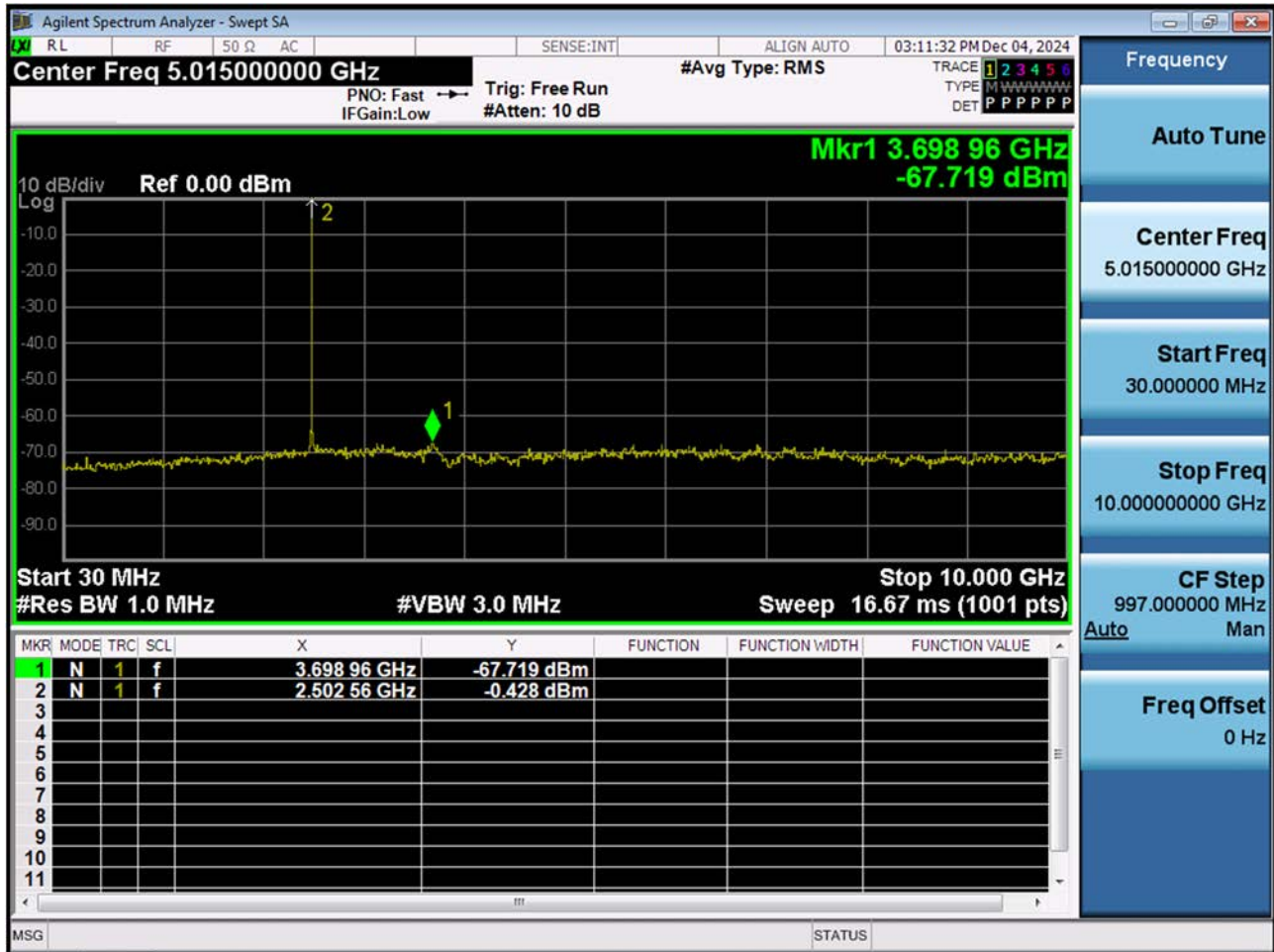
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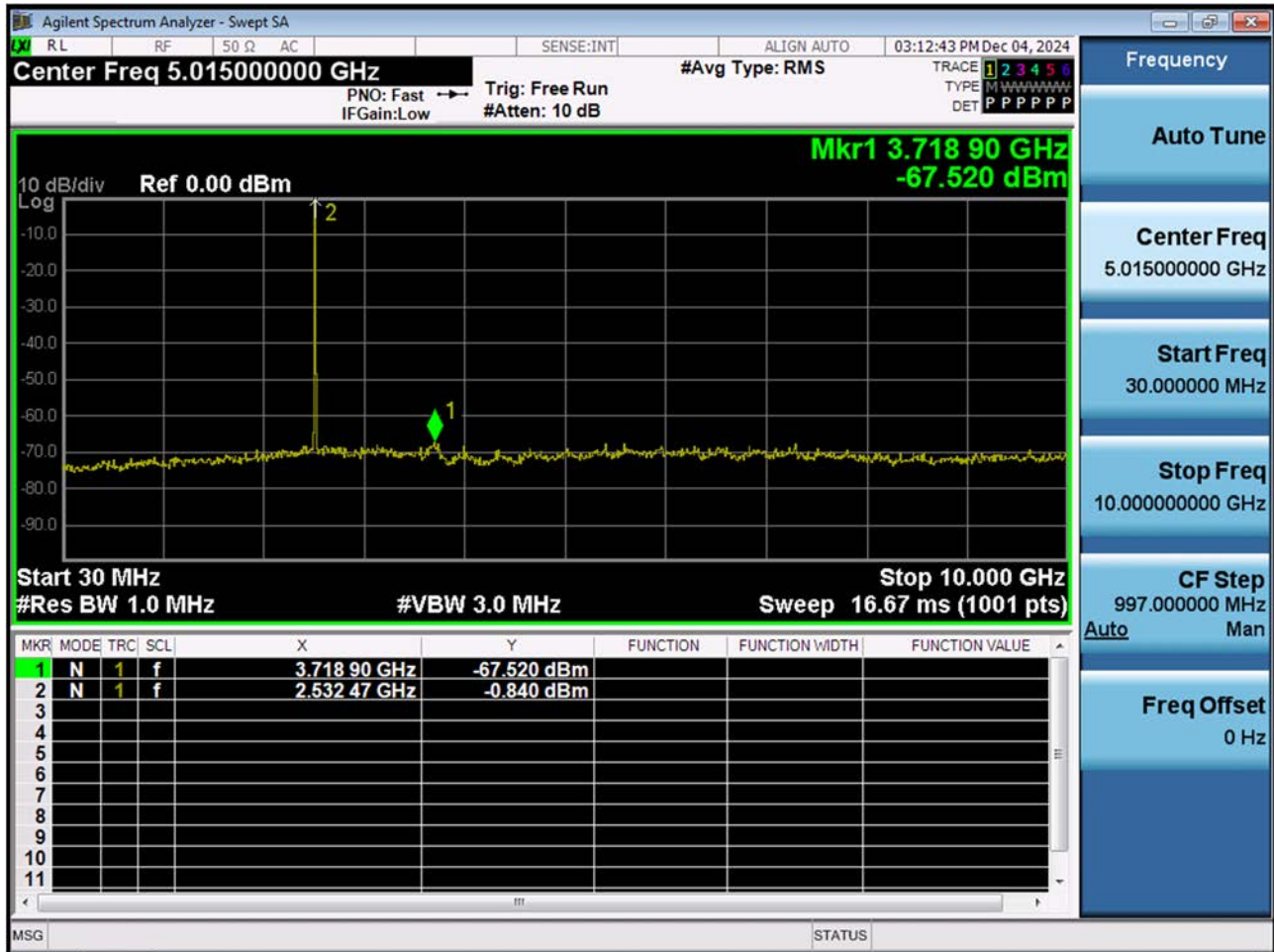
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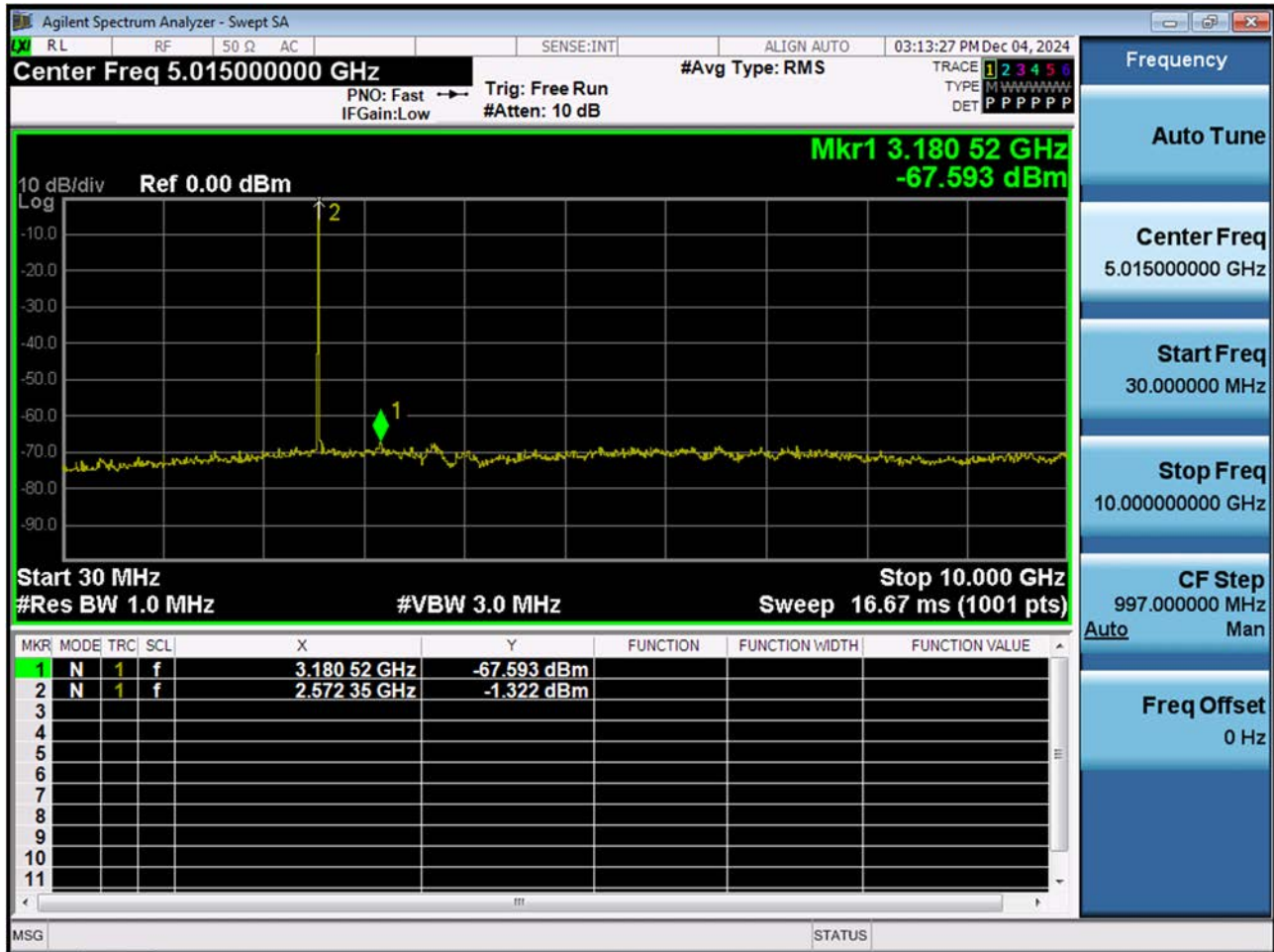
LTE B7_5 M_Conducted Spurious(30 M-10 G)_Low_QPSK_1RB



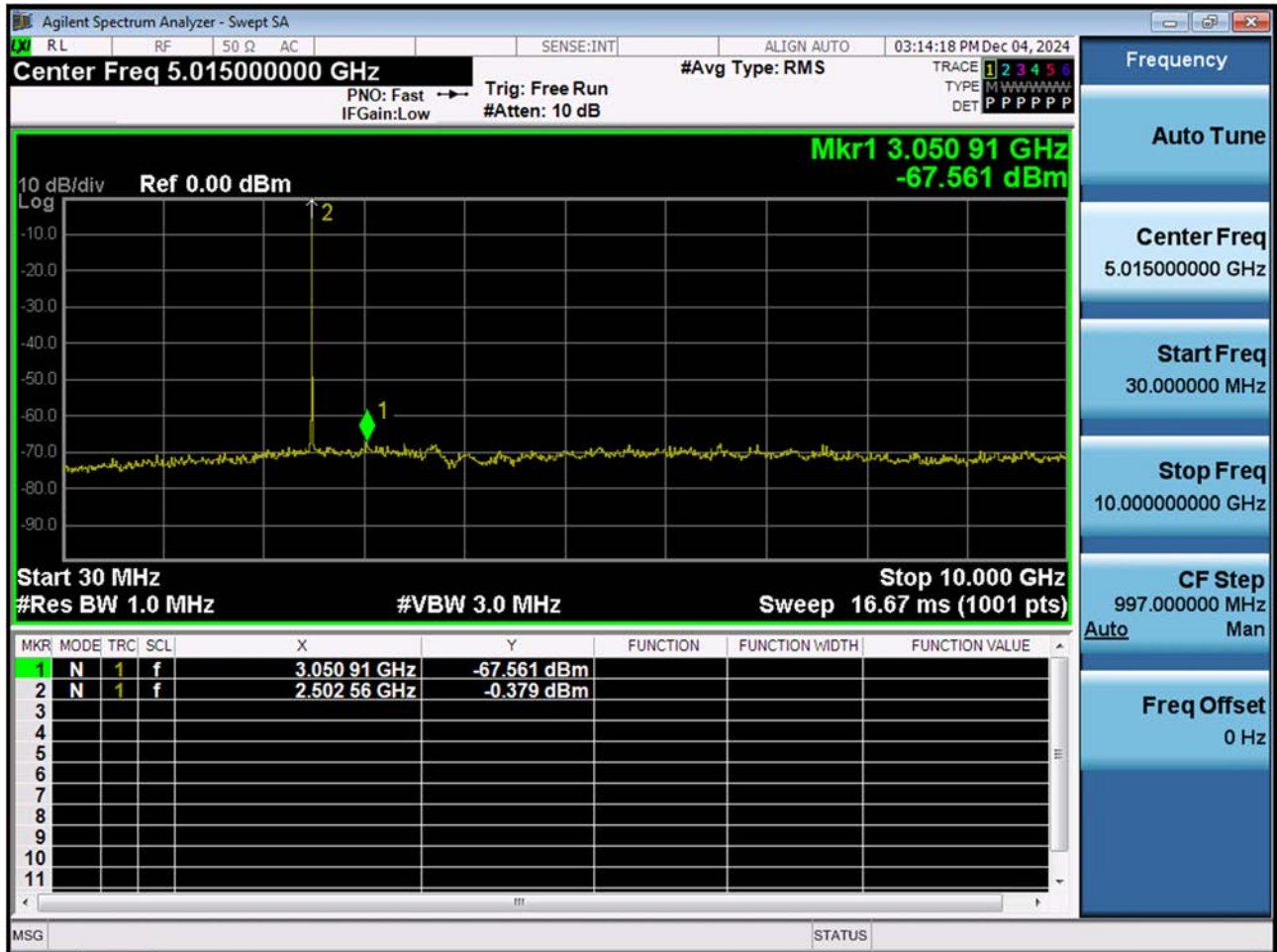
LTE B7_5 M_Conducted Spurious(30 M-10 G)_Mid_QPSK_1RB



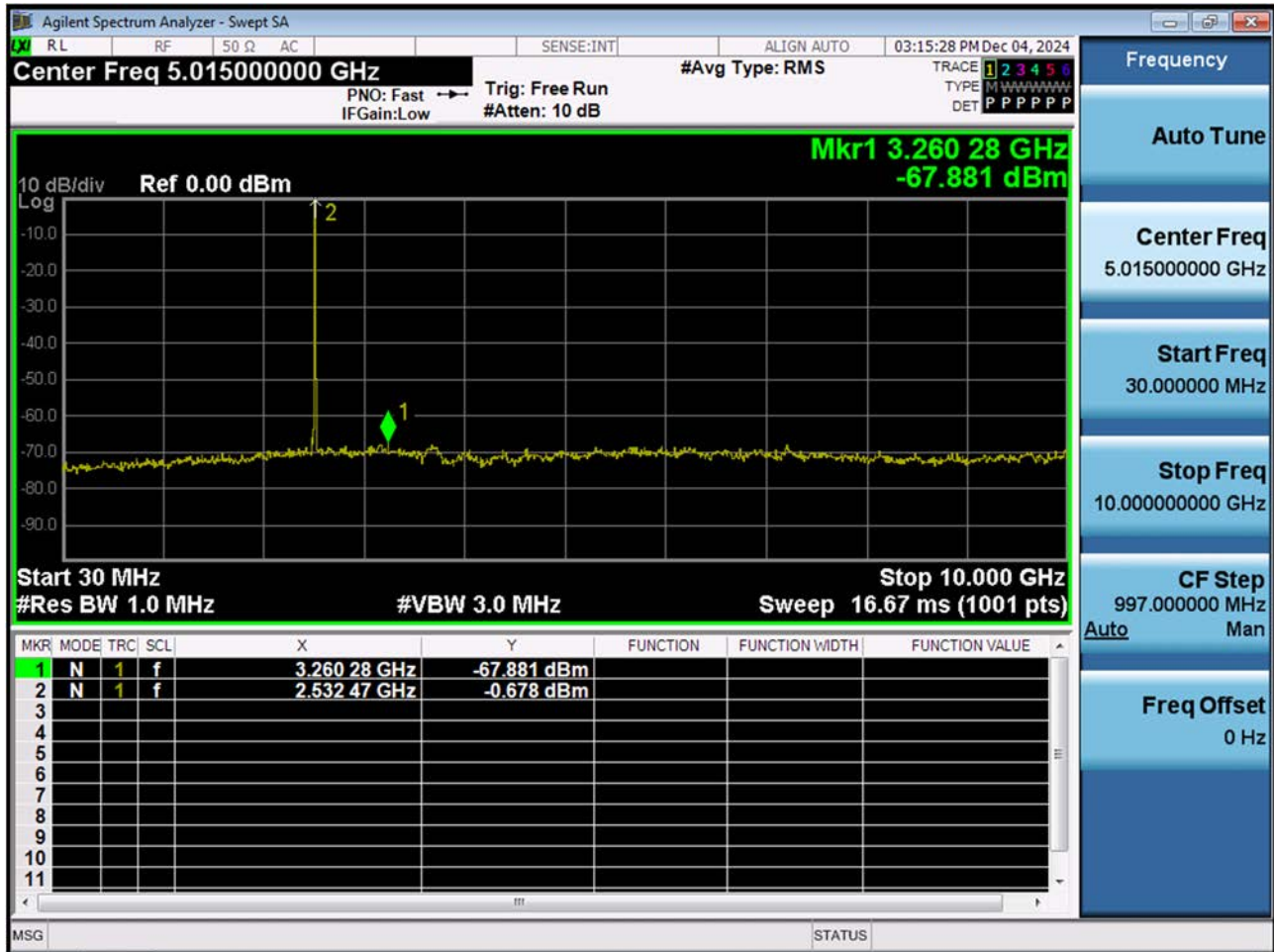
LTE B7_5 M_Conducted Spurious(30 M-10 G)_High_QPSK_1RB



LTE B7_10 M_Conducted Spurious(30 M-10 G)_Low_QPSK_1RB



LTE B7_10 M_Conducted Spurious(30 M-10 G)_Mid_QPSK_1RB



Agilent Spectrum Analyzer - Swept SA

R L RF 50 Ω AC SENSE:INT ALIGN AUTO 03:16:13 PM Dec 04, 2024

Center Freq 5.01500000 GHz #Avg Type: RMS
PNO: Fast → Trg: Free Run
IFGain:Low #Atten: 10 dB

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

Mkr1 3.639 14 GHz
-67.080 dBm

10 dB/div Ref 0.00 dBm Log

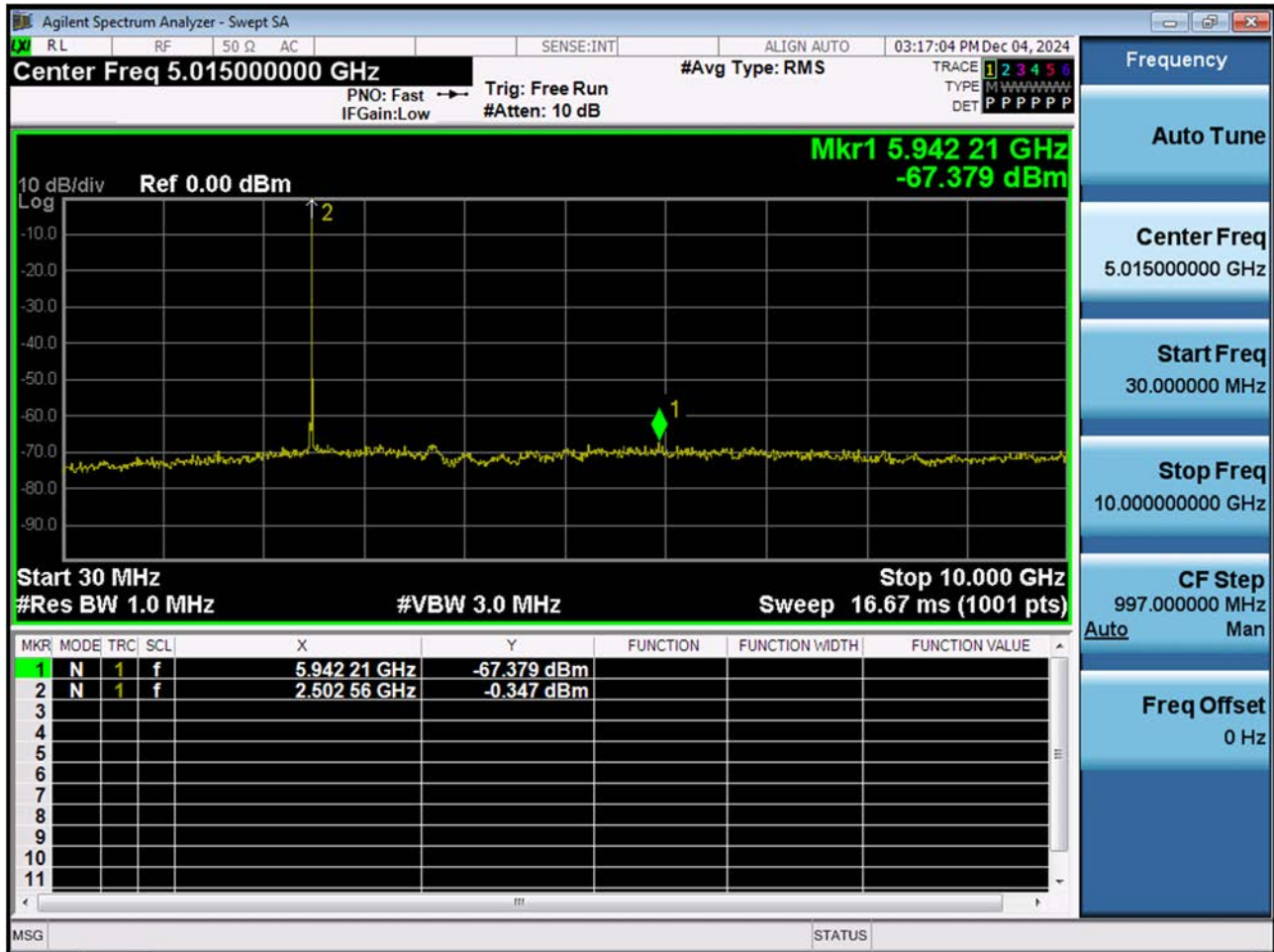
Start 30 MHz Stop 10.000 GHz
#Res BW 1.0 MHz #VBW 3.0 MHz Sweep 16.67 ms (1001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	3.639 14 GHz	-67.080 dBm			
2	N	1	f	2.572 35 GHz	-0.493 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								

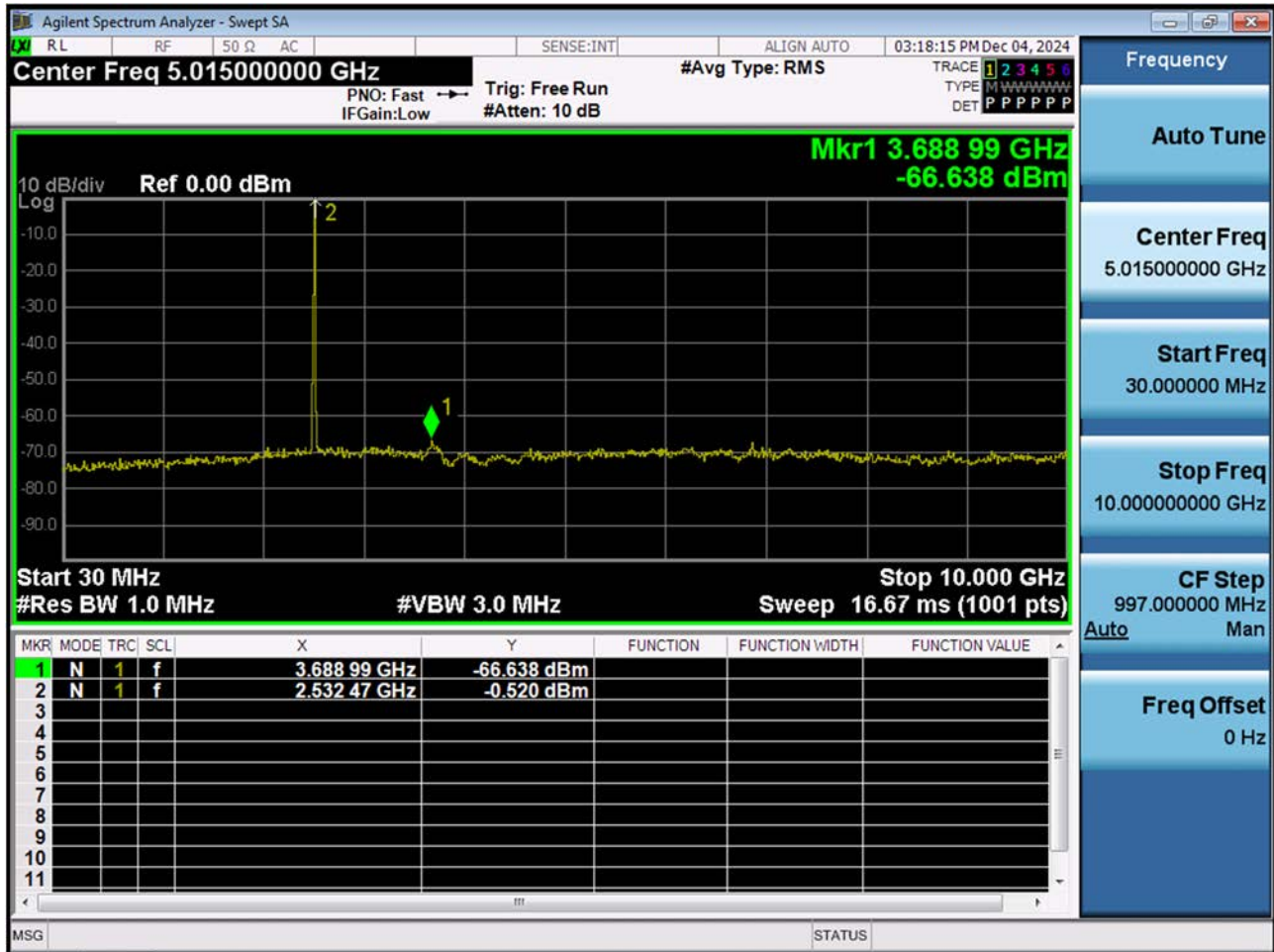
MSG STATUS

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

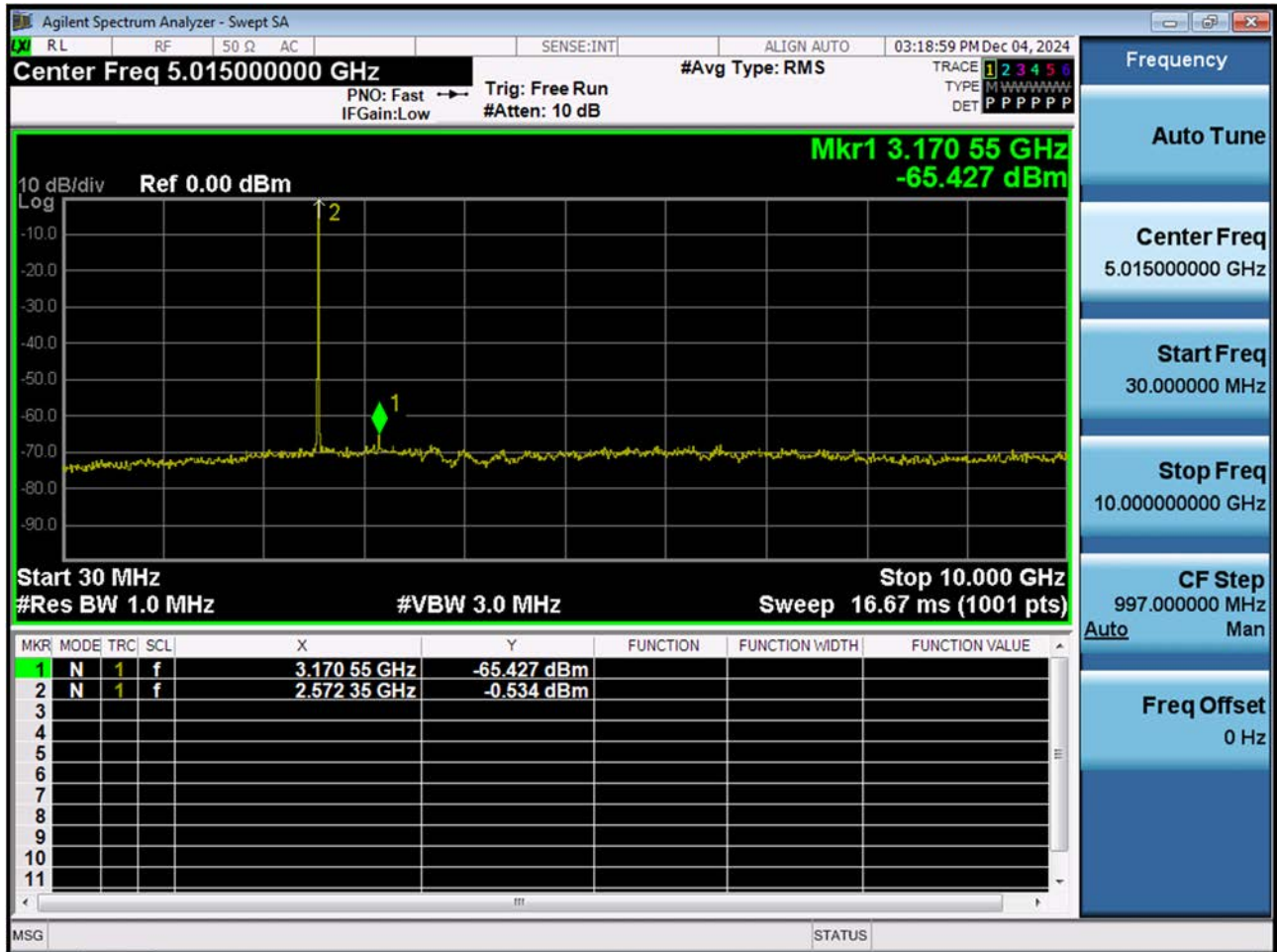
LTE B7_15 M_Conducted Spurious(30 M-10 G)_Low_QPSK_1RB



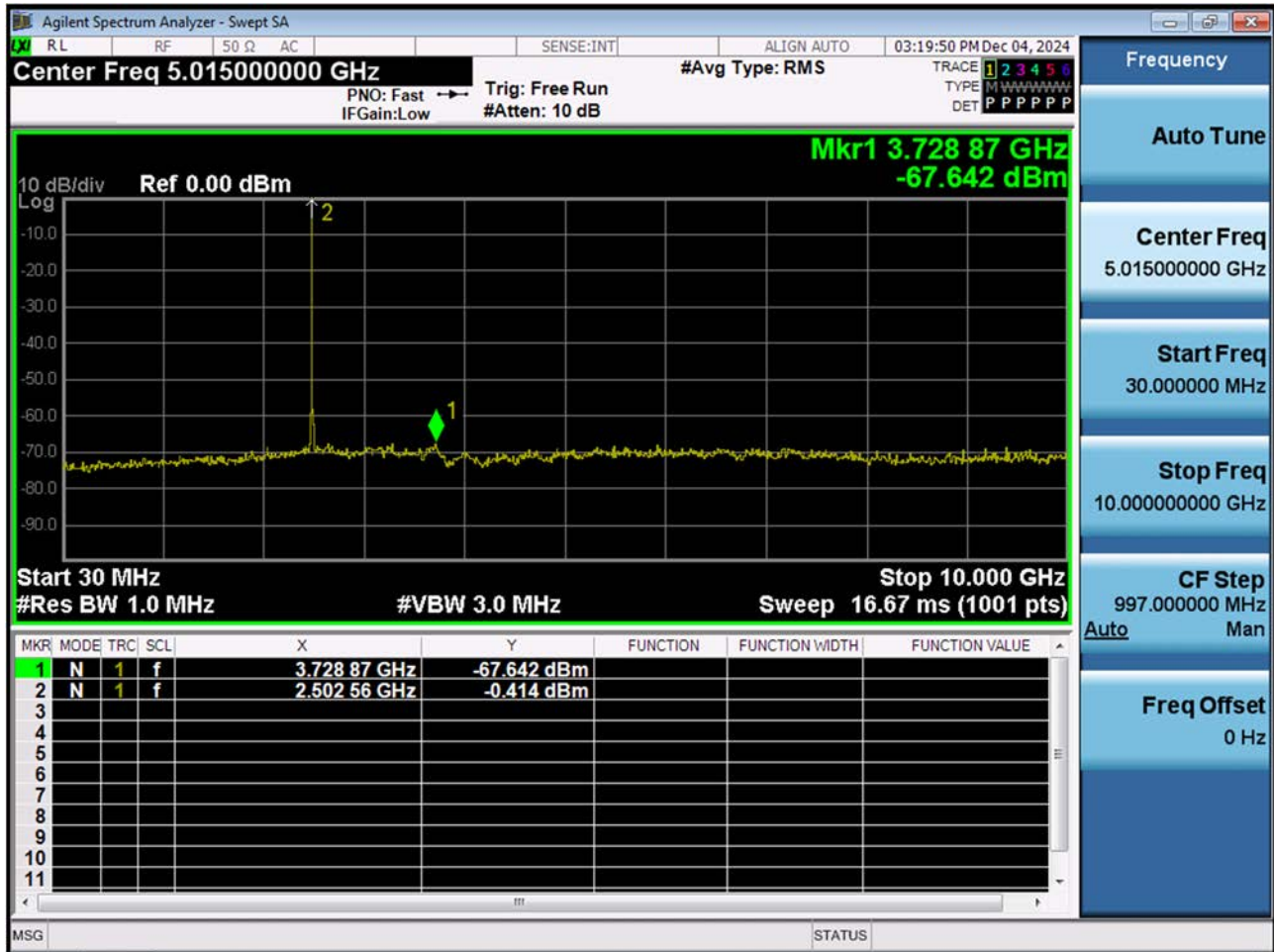
LTE B7_15 M_Conducted Spurious(30 M-10 G)_Mid_QPSK_1RB



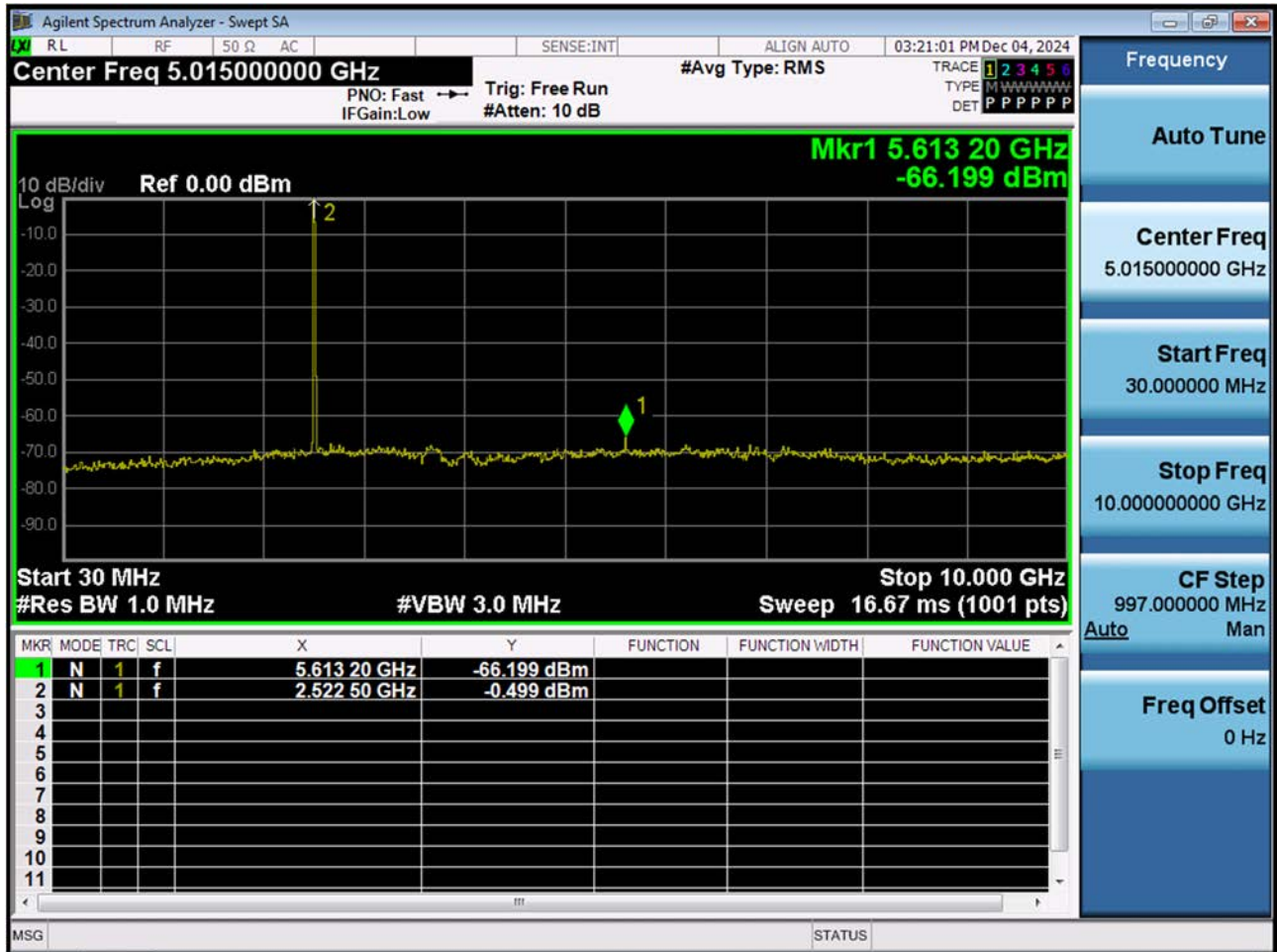
LTE B7_15 M_Conducted Spurious(30 M-10 G)_High_QPSK_1RB



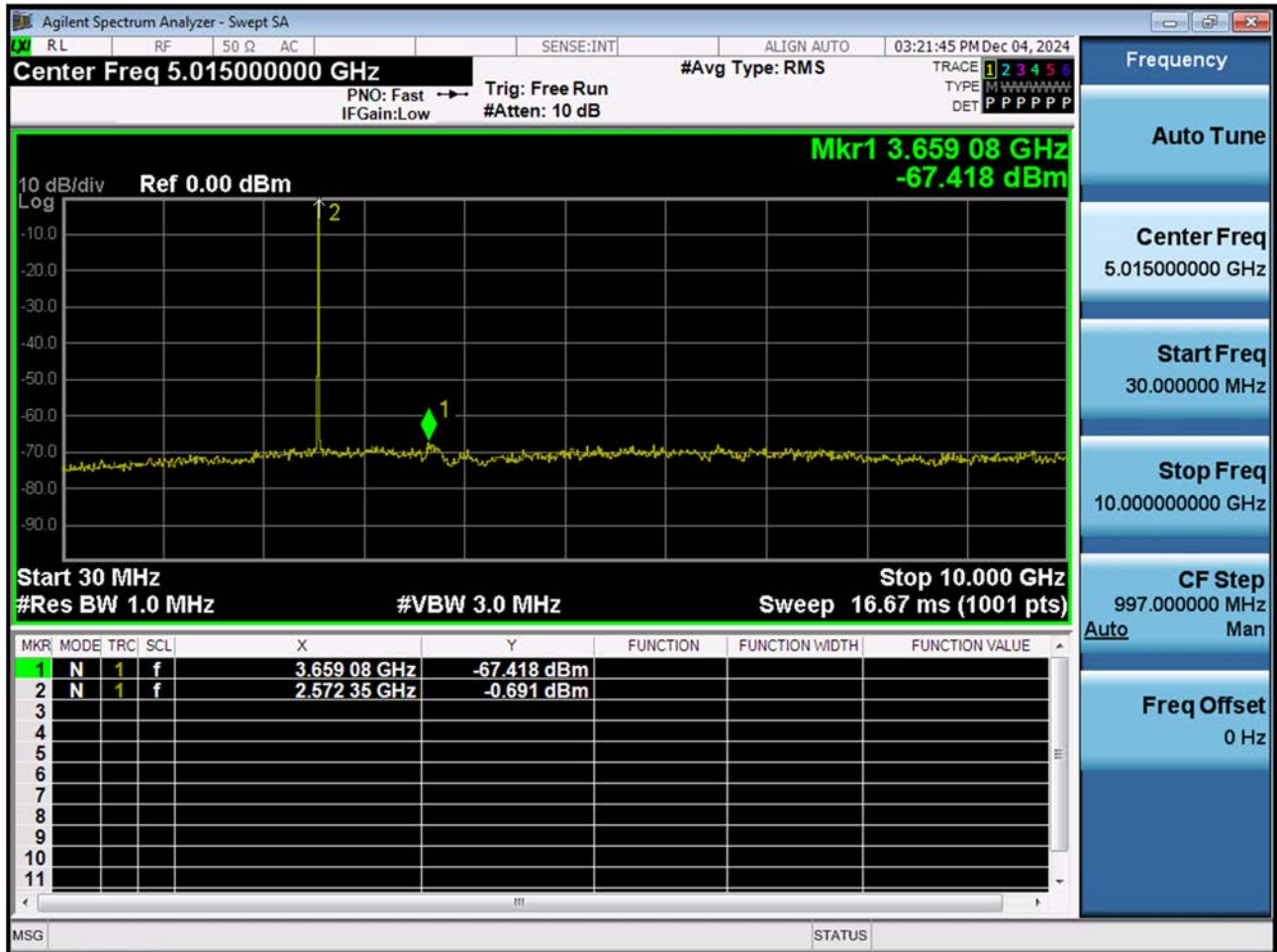
LTE B7_20 M_Conducted Spurious(30 M-10 G)_Low_QPSK_1RB



LTE B7_20 M_Conducted Spurious(30 M-10 G)_Mid_QPSK_1RB



LTE B7_20 M_Conducted Spurious(30 M-10 G)_High_QPSK_1RB



LTE B7_5 M_Conducted Spurious(10 G-26.5 G)_Low_QPSK_1RB



LTE B7_5 M_Conducted Spurious(10 G-26.5 G)_Mid_QPSK_1RB



LTE B7_5 M_Conducted Spurious(10 G-26.5 G)_High_QPSK_1RB



LTE B7_10 M_Conducted Spurious(10 G-26.5 G)_Low_QPSK_1RB



LTE B7_10 M_Conducted Spurious(10 G-26.5 G)_Mid_QPSK_1RB



LTE B7_10 M_Conducted Spurious(10 G-26.5 G)_High_QPSK_1RB



LTE B7_15 M_Conducted Spurious(10 G-26.5 G)_Low_QPSK_1RB



LTE B7_15 M_Conducted Spurious(10 G-26.5 G)_Mid_QPSK_1RB



LTE B7_15 M_Conducted Spurious(10 G-26.5 G)_High_QPSK_1RB

