# TEST REPORT

FCC LTE B12 Test for SC-54E
Certification

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

**REPORT NO.**
HCT-RF-2405-FC035-R1

**DATE OF ISSUE**
May 29, 2024

**Tested by**
Jae Mun Do

**Technical Manager**
Jong Seok Lee

HCT CO., LTD.
BongJai Huh / CEO



**HCT CO., LTD.** 2-6, 73, 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA Tel. +82 31 645 6300 Fax. +82 31 645 6401

**HCT CO.,LTD.**
2-6, 73, 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA
Tel. +82 31 645 6300 Fax. +82 31 645 6401

# TEST REPORT

REPORT NO.
HCT-RF-2405-FC035-R1

DATE OF ISSUE
May 29, 2024

Additional Model
SCG29

| | |
|---|---|
| Applicant | **SAMSUNG Electronics Co., Ltd.**<br>129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea |
| Product Name<br>Model Name | Mobile Phone<br>SC-54E |
| Date of Test | May 07, 2024 ~ May 20, 2024 |
| Location of Test | ■ Permanent Testing Lab ☐ On Site Testing<br>(Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 Republic of Korea) |
| FCC ID | A3LSMF741JPN |
| FCC Classification | PCS Licensed Transmitter Held to Ear (PCE) |
| Test Standard Used | FCC Rule Part(s) : § 27 |
| Test Results | PASS |

## REVISION HISTORY

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

| Revision No. | Date of Issue | Description |
|---|---|---|
| 0 | May 24, 2024 | Initial Release |
| 1 | May 29, 2024 | Deleted the 256QAM |

## 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.<br>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.<br>The test results have only been applied with the test methods required by the standard(s).<br>The laboratory is not accredited for the test results marked *.<br>Information provided by the applicant is marked **.<br>Test results provided by external providers are marked ***. |
| When confirmation of authenticity of this test report is required, please contact 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

# MEASUREMENT REPORT

## 1. GENERAL INFORMATION

| | |
|---|---|
| **Applicant Name:** | SAMSUNG Electronics Co., Ltd. |
| **Address:** | 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea |
| **FCC ID:** | A3LSMF741JPN |
| **Application Type:** | Certification |
| **FCC Classification:** | PCS Licensed Transmitter Held to Ear (PCE) |
| **FCC Rule Part(s):** | § 27 |
| **EUT Type:** | Mobile phone |
| **Model(s):** | SC-54E |
| **Additional Model(s)** | SCG29 |
| **Tx Frequency:** | 699.7 MHz – 715.3 MHz (LTE – Band 12 (1.4 MHz))<br>700.5 MHz – 714.5 MHz (LTE – Band 12 (3 MHz))<br>701.5 MHz – 713.5 MHz (LTE – Band 12 (5 MHz))<br>704.0 MHz – 711.0 MHz (LTE – Band 12 (10 MHz)) |
| **Date(s) of Tests:** | May 07, 2024 ~ May 20, 2024 |
| **Serial number:** | Radiated : R3CX30L0NDB<br>Conducted : R3CX30L0KYR |

## 1.1. MAXIMUM OUTPUT POWER

| Mode (MHz) | Tx Frequency (MHz) | Emission Designator | Modulation | ERP | |
|---|---|---|---|---|---|
| | | | | Max. Power (W) | Max. Power (dBm) |
| LTE – Band12 (1.4) | 699.7 – 715.3 | 1M10G7D | QPSK | 0.065 | 18.10 |
| | | 1M10W7D | 16QAM | 0.053 | 17.24 |
| | | 1M10W7D | 64QAM | 0.042 | 16.20 |
| LTE – Band12 (3) | 700.5 – 714.5 | 2M71G7D | QPSK | 0.063 | 17.98 |
| | | 2M71W7D | 16QAM | 0.054 | 17.32 |
| | | 2M72W7D | 64QAM | 0.041 | 16.17 |
| LTE – Band12 (5) | 701.5 – 713.5 | 4M51G7D | QPSK | 0.062 | 17.89 |
| | | 4M51W7D | 16QAM | 0.052 | 17.16 |
| | | 4M52W7D | 64QAM | 0.040 | 16.03 |
| LTE – Band12 (10) | 704.0 – 711.0 | 9M00G7D | QPSK | 0.061 | 17.86 |
| | | 8M99W7D | 16QAM | 0.052 | 17.13 |
| | | 8M98W7D | 64QAM | 0.040 | 16.02 |

# 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 (20/40/80/160 MHz), Bluetooth(iPA, ePA), BT LE(iPA, ePA), NFC, WPT, WIFI 6E.

## 2.2. MEASURING INSTRUMENT CALIBRATION

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

## 2.3. TEST FACILITY

The Fully-anechoic chamber and conducted measurement facility used to collect the radiated data are located at the **74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA.**

# 3. DESCRIPTION OF TESTS

## 3.1 TEST PROCEDURE

| Test Description | Test Procedure Used |
|---|---|
| Occupied Bandwidth | - KDB 971168 D01 v03r01 – Section 4.3<br>- ANSI C63.26-2015 – Section 5.4.4 |
| Band Edge | - KDB 971168 D01 v03r01 – Section 6.0<br>- ANSI C63.26-2015 – Section 5.7 |
| Spurious and Harmonic Emissions at Antenna Terminal | - KDB 971168 D01 v03r01 – Section 6.0<br>- ANSI C63.26-2015 – Section 5.7 |
| Conducted Output Power | - N/A (See SAR Report) |
| Frequency stability | - ANSI C63.26-2015 – Section 5.6 |
| Effective Radiated Power/ Effective Isotropic Radiated Power | - KDB 971168 D01 v03r01 – Section 5.2 & 5.8<br>- ANSI/TIA-603-E-2016 – Section 2.2.17 |
| Radiated Spurious and Harmonic Emissions | - KDB 971168 D01 v03r01 – Section 6.2<br>- ANSI/TIA-603-E-2016 – Section 2.2.12 |

## 3.2 RADIATED POWER

**Test Overview**

Radiated tests are performed in the Fully-anechoic chamber.
The equipment under test is placed on a non-conductive table 3-meters away from the receive antenna in accordance with ANSI/TIA-603-E-2016 Clause 2.2.17.

**Test Settings**

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

**Test Note**

1. The turntable is rotated through 360 degrees, and the receiving antenna scans in order to determine the level of the maximized emission.
2. A half wave dipole is then substituted in place of the EUT. For emissions above 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;

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

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

## 3.3 RADIATED SPURIOUS EMISSIONS

**Test Overview**

Radiated tests are performed in the Fully-anechoic chamber.

Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA-603-E-2016.

**Test Settings**

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

**Test Note**

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

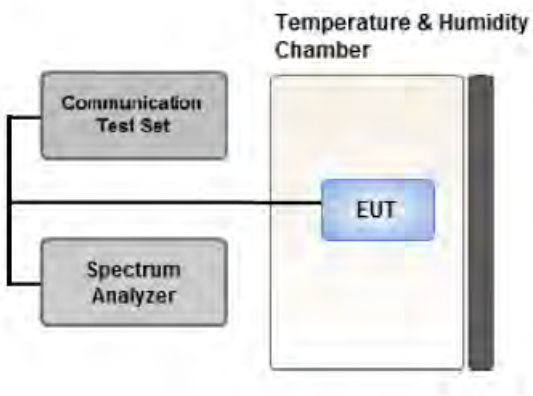
$$\text{Result}_{(dBm)} = Pg_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dBi)}$$

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

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

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

## 3.4 OCCUPIED BANDWIDTH.



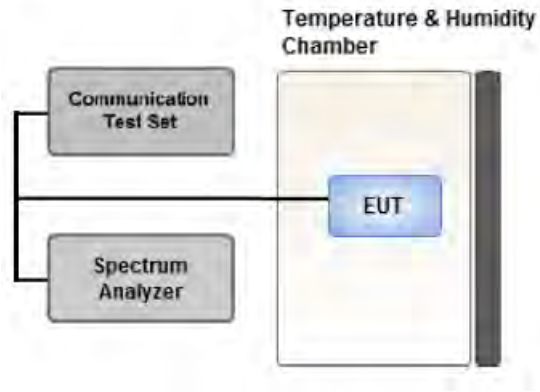

Test setup

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.
The EUT makes a call to the communication simulator.
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99 % occupied bandwidth and the 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 ≥ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5 % of the 99 % occupied bandwidth observed in Step 7

## 3.5 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL




Test setup

Test Overview

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

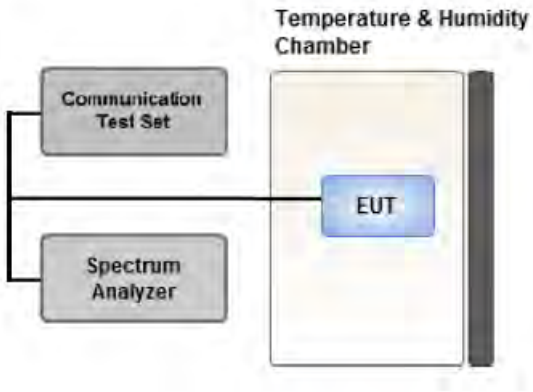
All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

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

Test Settings

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

## 3.6 BAND EDGE




Test setup

Test Overview

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

Test Settings

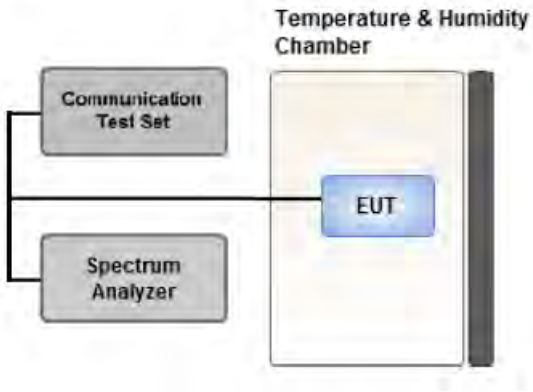
1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW > 1 % of the emission bandwidth
4. VBW > 3 x RBW
5. Detector = RMS
6. Number of sweep points ≥ 2 x Span/RBW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

**Test Notes**

According to FCC 22.917, 24.238, 27.53 specified that power of any emission outside of The authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.
In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.
All measurements were done at 2 channels(low and high operational frequency range.)
The band edge measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

Where Margin < 1 dB the emission level is either corrected by 10 log(1 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.

## 3.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE




**Test setup**

**Test Overview**

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

The frequency stability of the transmitter is measured by:

1. Temperature:

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

2. Primary Supply Voltage:

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

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

**Test Settings**

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

### 3.8 WORST CASE(RADIATED TEST)

- The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
- All modes of operation were investigated and the worst case configuration results are reported.
  Mode : Stand alone, Stand alone + External accessories (Earphone, AC adapter, etc)
  Worst case : Stand alone
- We were performed the RSE test in condition of co-location.
  Mode : Stand alone, Simultaneous transmission scenarios
  Worst case : Stand alone
- In the case of radiated spurious emissions, all bandwidth of operation were investigated and the worst case bandwidth results are reported. (Worst case : 1.4 MHz)
- The EUT was tested in three modes(Open, Half-folded, Closed), the worst case configuration results are reported.

  Worst case: Open mode.
- 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.
- SC-54E & additional models were tested and the worst case results are reported.
  (Worst case : SC-54E)

[ Worst case ]

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

### 3.9 WORST CASE(CONDUCTED TEST)

- All modes of operation were investigated and the worst case configuration results are reported.
- SC-54E & additional models were tested and the worst case results are reported.
  (Worst case : SC-54E)

[ Worst case ]

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

## 4. LIST OF TEST EQUIPMENT

| Equipment | Model | Manufacturer | Serial No. | Due to Calibration | Calibration Interval |
|---|---|---|---|---|---|
| RF Switching System | FBSR-02B(1.2G HPF+LNA) | T&M SYSTEM | F1L1 | 12/11/2024 | Annual |
| RF Switching System | FBSR-02B(3.3G HPF+LNA) | T&M SYSTEM | F1L2 | 12/11/2024 | Annual |
| Power Splitter(DC ~ 26.5 GHz) | 11667B | Hewlett Packard | 5001 | 04/17/2025 | Annual |
| DC Power Supply | E3632A | Agilent | MY40010147 | 06/23/2024 | Annual |
| Dipole Antenna | UHAP | Schwarzbeck | 557 | 03/09/2025 | Biennial |
| Dipole Antenna | UHAP | Schwarzbeck | 558 | 03/09/2025 | 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 | 09/29/2024 | 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 | 08/17/2024 | Annual |
| Base Station | 8960 (E5515C) | Agilent | MY48360800 | 08/10/2024 | Annual |
| Loop Antenna(9 kHz ~ 30 MHz) | FMZB1513 | Schwarzbeck | 1513-333 | 03/07/2026 | Biennial |
| Trilog Broadband Antenna | VULB9168 | Schwarzbeck | 895 | 09/16/2024 | Biennial |
| Trilog Broadband Antenna | VULB9168 | Schwarzbeck | 1135 | 09/16/2024 | Biennial |
| Wideband Radio Communication Tester | MT8821C | Anritsu Corp. | 6262094331 | 11/17/2024 | Annual |
| Wideband Radio Communication Tester | MT8820C | Anritsu Corp. | 6201026545 | 12/11/2024 | Annual |
| SIGNAL GENERATOR (100 kHz ~ 40 GHz) | SMB100A | REOHDE & SCHWARZ | 177633 | 06/22/2024 | 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:

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

## 5. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4:2014.

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

| Parameter | Expanded Uncertainty (±dB) |
|---|---|
| Conducted Disturbance (150 kHz ~ 30 MHz) | 1.98 (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(g) | < 43 + 10log10 (P[Watts]) at Band Edge and for all out-of-band emissions | PASS |
| Conducted Output Power | § 2.1046 | N/A | See Note1 |
| Frequency stability / variation of ambient temperature | § 2.1055, § 27.54 | Emission must remain in band | PASS |

Note:

1. See SAR Report

6.2 Test Condition: Radiated Test

| Test Description | FCC Part Section(s) | Test Limit | Test Result |
|---|---|---|---|
| Effective Radiated Power | § 27.50(c)(10) | < 3 Watts max. ERP | PASS |
| Radiated Spurious and Harmonic Emissions | § 2.1053, § 27.53(g) | < 43 + 10log10 (P[Watts]) for all out-of band emissions | PASS |

## 7. SAMPLE CALCULATION

7.1 ERP Sample Calculation

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

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

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

7.2 EIRP Sample Calculation

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

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

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

7.3. Emission Designator

GSM Emission Designator

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

EDGE Emission Designator

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

WCDMA Emission Designator

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

QPSK Modulation

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

QAM Modulation

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

# 8. TEST DATA

## 8.1 EFFECTIVE RADIATED POWER

| Freq (MHz) | Mod/ Bandwidth | Modulation | Measured Level (dBm) | Substitute Level (dBm) | Ant. Gain (dBd) | C.L | Pol | Limit | ERP | | RB | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | W | W | dBm | Size | Offset |
| 699.7 | LTE B12 (1.4 MHz) | QPSK | -30.19 | 28.93 | -9.55 | 1.28 | V | < 3.00 | 0.065 | 18.10 | 1 | 0 |
| | | 16-QAM | -31.05 | 28.07 | -9.55 | 1.28 | V | | 0.053 | 17.24 | | |
| | | 64-QAM | -32.09 | 27.03 | -9.55 | 1.28 | V | | 0.042 | 16.20 | | |
| 707.5 | | QPSK | -30.37 | 28.47 | -9.55 | 1.28 | V | | 0.058 | 17.64 | 1 | 0 |
| | | 16-QAM | -31.32 | 27.52 | -9.55 | 1.28 | V | | 0.047 | 16.69 | | |
| | | 64-QAM | -32.30 | 26.54 | -9.55 | 1.28 | V | | 0.037 | 15.71 | | |
| 715.3 | | QPSK | -30.61 | 28.64 | -9.55 | 1.28 | V | | 0.060 | 17.81 | 1 | 3 |
| | | 16-QAM | -31.45 | 27.80 | -9.55 | 1.28 | V | | 0.050 | 16.97 | | |
| | | 64-QAM | -32.43 | 26.82 | -9.55 | 1.28 | V | | 0.040 | 15.99 | | |

| 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 |
| 700.5 | LTE B12 (3 MHz) | QPSK | -30.24 | 28.81 | -9.55 | 1.28 | V | < 3.00 | 0.063 | 17.98 | 1 | 0 |
| | | 16-QAM | -30.90 | 28.15 | -9.55 | 1.28 | V | | 0.054 | 17.32 | | |
| | | 64-QAM | -32.05 | 27.00 | -9.55 | 1.28 | V | | 0.041 | 16.17 | | |
| 707.5 | | QPSK | -30.44 | 28.40 | -9.55 | 1.28 | V | | 0.057 | 17.57 | 1 | 0 |
| | | 16-QAM | -31.12 | 27.72 | -9.55 | 1.28 | V | | 0.049 | 16.89 | | |
| | | 64-QAM | -32.17 | 26.67 | -9.55 | 1.28 | V | | 0.038 | 15.84 | | |
| 714.5 | | QPSK | -30.50 | 28.71 | -9.55 | 1.28 | V | | 0.061 | 17.88 | 1 | 8 |
| | | 16-QAM | -31.21 | 28.00 | -9.55 | 1.28 | V | | 0.052 | 17.17 | | |
| | | 64-QAM | -32.30 | 26.91 | -9.55 | 1.28 | V | | 0.041 | 16.08 | | |

| 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 |
| 701.5 | LTE B12 (5 MHz) | QPSK | -30.25 | 28.70 | -9.55 | 1.28 | V | < 3.00 | 0.061 | 17.87 | 1 | 0 |
| | | 16-QAM | -31.04 | 27.91 | -9.55 | 1.28 | V | | 0.051 | 17.08 | | |
| | | 64-QAM | -32.12 | 26.83 | -9.55 | 1.28 | V | | 0.040 | 16.00 | | |
| 707.5 | | QPSK | -30.30 | 28.54 | -9.55 | 1.28 | V | | 0.059 | 17.71 | 1 | 0 |
| | | 16-QAM | -31.06 | 27.78 | -9.55 | 1.28 | V | | 0.050 | 16.95 | | |
| | | 64-QAM | -32.19 | 26.65 | -9.55 | 1.28 | V | | 0.038 | 15.82 | | |
| 713.5 | | QPSK | -30.41 | 28.72 | -9.55 | 1.28 | V | | 0.062 | 17.89 | 1 | 13 |
| | | 16-QAM | -31.14 | 27.99 | -9.55 | 1.28 | V | | 0.052 | 17.16 | | |
| | | 64-QAM | -32.27 | 26.86 | -9.55 | 1.28 | V | | 0.040 | 16.03 | | |

| 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 |
| 704.0 | LTE B12 (10 MHz) | QPSK | -30.22 | 28.69 | -9.55 | 1.28 | V | < 3.00 | 0.061 | 17.86 | 1 | 0 |
| | | 16-QAM | -31.05 | 27.86 | -9.55 | 1.28 | V | | 0.050 | 17.03 | | |
| | | 64-QAM | -32.06 | 26.85 | -9.55 | 1.28 | V | | 0.040 | 16.02 | | |
| 707.5 | | QPSK | -30.34 | 28.50 | -9.55 | 1.28 | V | | 0.058 | 17.67 | 1 | 0 |
| | | 16-QAM | -31.10 | 27.74 | -9.55 | 1.28 | V | | 0.049 | 16.91 | | |
| | | 64-QAM | -32.11 | 26.73 | -9.55 | 1.28 | V | | 0.039 | 15.90 | | |
| 711.0 | | QPSK | -30.36 | 28.69 | -9.55 | 1.28 | V | | 0.061 | 17.86 | 1 | 25 |
| | | 16-QAM | -31.09 | 27.96 | -9.55 | 1.28 | V | | 0.052 | 17.13 | | |
| | | 64-QAM | -32.20 | 26.85 | -9.55 | 1.28 | V | | 0.040 | 16.02 | | |

## 8.2 RADIATED SPURIOUS EMISSIONS

▣ MODE: LTE B12

▣ MODULATION SIGNAL: 1.4 MHz QPSK

▣ DISTANCE: 3 meters

| Ch | Freq (MHz) | Measured Level (dBm) | Ant. Gain (dBd) | Substitute Level (dBm) | C.L | Pol | Result (dBm) | Limit (dBm) | RB | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Size | Offset |
| 23017 (699.7) | 1 399.40 | -57.59 | 7.40 | -62.99 | 1.80 | V | -57.39 | -13.00 | 1 | 0 |
| | 2 099.10 | -59.51 | 9.10 | -64.87 | 2.28 | V | -58.05 | -13.00 | | |
| | 2 798.80 | -61.48 | 10.30 | -65.35 | 2.68 | V | -57.73 | -13.00 | | |
| | 3 498.50 | -59.78 | 11.30 | -62.43 | 3.00 | V | -54.13 | -13.00 | | |
| | 4 198.20 | -61.92 | 11.20 | -61.56 | 3.30 | V | -53.66 | -13.00 | | |
| 23095 (707.5) | 1 415.00 | -56.69 | 7.40 | -63.14 | 1.80 | V | -57.54 | -13.00 | 1 | 0 |
| | 2 122.50 | -57.22 | 9.10 | -62.42 | 2.28 | V | -55.60 | -13.00 | | |
| | 2 830.00 | -57.45 | 10.30 | -61.88 | 2.69 | V | -54.27 | -13.00 | | |
| | 3 537.50 | -58.76 | 11.30 | -61.03 | 3.00 | V | -52.73 | -13.00 | | |
| | 4 245.00 | -61.00 | 11.20 | -60.55 | 3.31 | V | -52.66 | -13.00 | | |
| 23173 (715.3) | 1 430.60 | -58.77 | 7.40 | -65.29 | 1.81 | V | -59.70 | -13.00 | 1 | 3 |
| | 2 145.90 | -59.16 | 9.05 | -64.18 | 2.33 | V | -57.46 | -13.00 | | |
| | 2 861.20 | -59.72 | 10.30 | -63.17 | 2.72 | V | -55.59 | -13.00 | | |
| | 3 576.50 | -60.41 | 11.40 | -62.47 | 3.00 | V | -54.07 | -13.00 | | |
| | 4 291.80 | -59.81 | 11.20 | -58.57 | 3.33 | V | -50.70 | -13.00 | | |

## 8.3 OCCUPIED BANDWIDTH

| Band | Band Width | Frequency (MHz) | Modulation | Resource Block Size | Resource Block Offset | Data (MHz) |
|---|---|---|---|---|---|---|
| 12 | 1.4 MHz | 707.5 | QPSK | 6 | 0 | 1.0981 |
| | | | 16-QAM | | | 1.0973 |
| | | | 64-QAM | | | 1.1001 |
| | 3 MHz | | QPSK | 15 | | 2.7100 |
| | | | 16-QAM | | | 2.7109 |
| | | | 64-QAM | | | 2.7192 |
| | 5 MHz | | QPSK | 25 | | 4.5081 |
| | | | 16-QAM | | | 4.5084 |
| | | | 64-QAM | | | 4.5145 |
| | 10 MHz | | QPSK | 50 | | 8.9951 |
| | | | 16-QAM | | | 8.9924 |
| | | | 64-QAM | | | 8.9750 |

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 41 ~ 52.

## 8.4 CONDUCTED SPURIOUS EMISSIONS

| Band | Band Width (MHz) | Frequency (MHz) | Frequency of Maximum Harmonic (GHz) | Factor (dB) | Measurement Maximum Data (dBm) | Result (dBm) | Limit (dBm) |
|---|---|---|---|---|---|---|---|
| 12 | 1.4 | 699.7 | 3.7094 | 27.976 | -67.252 | -39.276 | -13.00 |
| | | 707.5 | 3.7049 | 27.976 | -67.054 | -39.078 | |
| | | 715.3 | 3.1735 | 27.976 | -67.146 | -39.170 | |
| | 3 | 700.5 | 3.6860 | 27.976 | -67.146 | -39.170 | |
| | | 707.5 | 3.6686 | 27.976 | -67.180 | -39.204 | |
| | | 714.5 | 3.7119 | 27.976 | -67.326 | -39.350 | |
| | 5 | 701.5 | 3.7194 | 27.976 | -67.151 | -39.175 | |
| | | 707.5 | 3.7079 | 27.976 | -67.165 | -39.189 | |
| | | 713.5 | 3.7010 | 27.976 | -67.421 | -39.445 | |
| | 10 | 704.0 | 3.6770 | 27.976 | -67.181 | -39.205 | |
| | | 707.5 | 3.6935 | 27.976 | -67.217 | -39.241 | |
| | | 711.0 | 3.6920 | 27.976 | -67.220 | -39.244 | |

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 53 ~ 64.
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 |

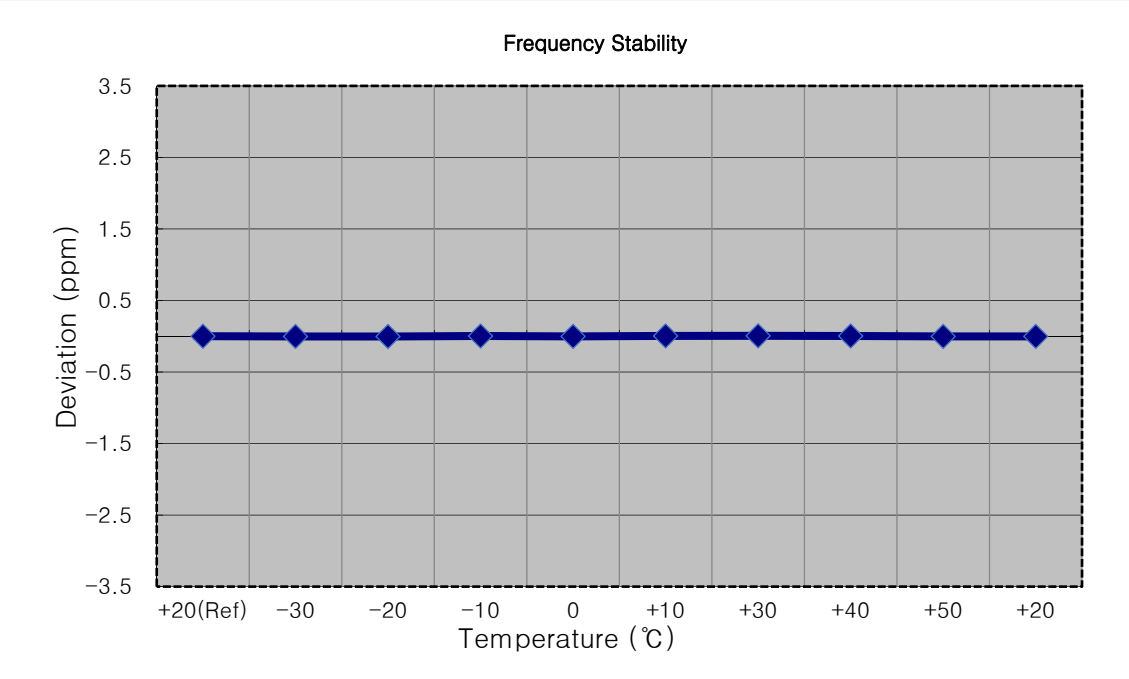
## 8.5 BAND EDGE

- Plots of the EUT's Band Edge are shown Page 65 ~ 92.

## 8.6 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

▣ MODE: LTE B12
▣ OPERATING FREQUENCY: 699,700,000 Hz
▣ CHANNEL: 23017 (1.4 MHz)
▣ REFERENCE VOLTAGE: 3.880 VDC
▣ DEVIATION LIMIT: Emission must remain in band

| Voltage | Power | Temp. | Frequency | Frequency Error | Deviation | ppm |
|---|---|---|---|---|---|---|
| (%) | (VDC) | (°C) | (Hz) | (Hz) | (%) | |
| 100 % | 3.880 | +20(Ref) | 699 699 998 | 0.0 | 0.000 000 | 0.000 |
| 100 % | | -30 | 699 699 996 | -2.3 | 0.000 000 | -0.003 |
| 100 % | | -20 | 699 699 995 | -2.7 | 0.000 000 | -0.004 |
| 100 % | | -10 | 699 700 000 | 2.2 | 0.000 000 | 0.003 |
| 100 % | | 0 | 699 699 996 | -1.7 | 0.000 000 | -0.002 |
| 100 % | | +10 | 699 700 001 | 2.9 | 0.000 000 | 0.004 |
| 100 % | | +30 | 699 700 002 | 4.2 | 0.000 001 | 0.006 |
| 100 % | | +40 | 699 700 000 | 2.5 | 0.000 000 | 0.004 |
| 100 % | | +50 | 699 699 996 | -1.9 | 0.000 000 | -0.003 |
| Batt. Endpoint | 3.300 | +20 | 699 699 996 | -1.7 | 0.000 000 | -0.002 |



▣ MODE: LTE B12

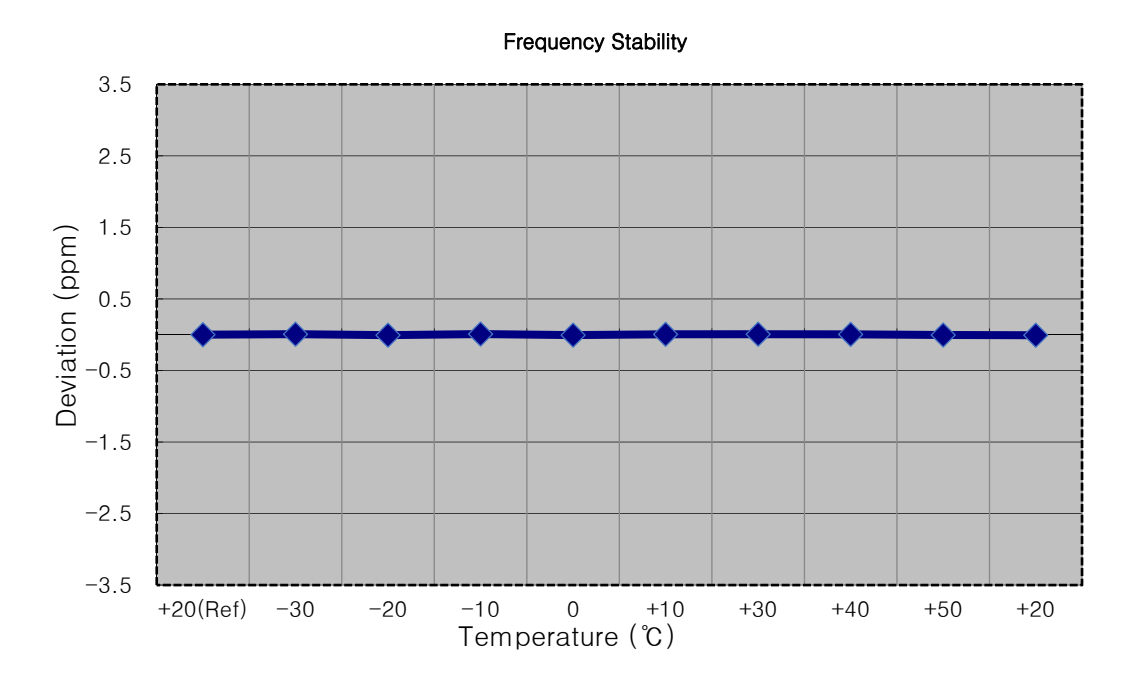
▣ OPERATING FREQUENCY: 700,500,000 Hz

▣ CHANNEL: 23025 (3 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage | Power | Temp. | Frequency | Frequency Error | Deviation | ppm |
|---|---|---|---|---|---|---|
| (%) | (VDC) | (°C) | (Hz) | (Hz) | (%) | |
| 100 % | 3.880 | +20(Ref) | 700 499 997 | 0.0 | 0.000 000 | 0.000 |
| 100 % | | -30 | 700 500 002 | 4.7 | 0.000 001 | 0.007 |
| 100 % | | -20 | 700 499 992 | -4.7 | -0.000 001 | -0.007 |
| 100 % | | -10 | 700 500 003 | 6.1 | 0.000 001 | 0.009 |
| 100 % | | 0 | 700 499 993 | -4.1 | -0.000 001 | -0.006 |
| 100 % | | +10 | 700 500 001 | 3.7 | 0.000 001 | 0.005 |
| 100 % | | +30 | 700 500 002 | 4.6 | 0.000 001 | 0.007 |
| 100 % | | +40 | 700 500 000 | 3.1 | 0.000 000 | 0.004 |
| 100 % | | +50 | 700 499 994 | -3.1 | 0.000 000 | -0.004 |
| Batt. Endpoint | 3.300 | +20 | 700 499 992 | -5.1 | -0.000 001 | -0.007 |



▣ MODE: LTE B12

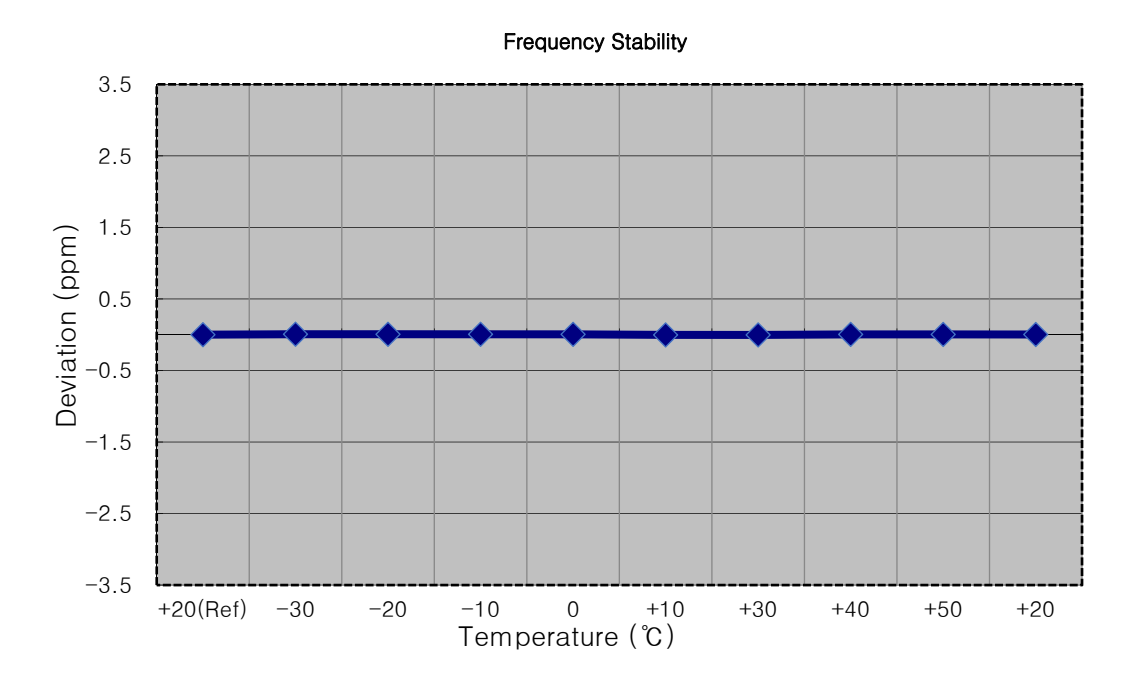
▣ OPERATING FREQUENCY: 701,500,000 Hz

▣ CHANNEL: 23035 (5 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage | Power | Temp. | Frequency | Frequency Error | Deviation | ppm |
|---|---|---|---|---|---|---|
| (%) | (VDC) | (°C) | (Hz) | (Hz) | (%) | |
| 100 % | 3.880 | +20(Ref) | 701 499 997 | 0.0 | 0.000 000 | 0.000 |
| 100 % | | -30 | 701 500 002 | 4.6 | 0.000 001 | 0.007 |
| 100 % | | -20 | 701 500 002 | 4.3 | 0.000 001 | 0.006 |
| 100 % | | -10 | 701 500 001 | 3.9 | 0.000 001 | 0.006 |
| 100 % | | 0 | 701 500 001 | 3.4 | 0.000 000 | 0.005 |
| 100 % | | +10 | 701 499 995 | -2.1 | 0.000 000 | -0.003 |
| 100 % | | +30 | 701 499 995 | -2.4 | 0.000 000 | -0.003 |
| 100 % | | +40 | 701 500 000 | 2.8 | 0.000 000 | 0.004 |
| 100 % | | +50 | 701 500 000 | 2.6 | 0.000 000 | 0.004 |
| Batt. Endpoint | 3.300 | +20 | 701 499 999 | 1.8 | 0.000 000 | 0.003 |



▣ MODE: LTE B12

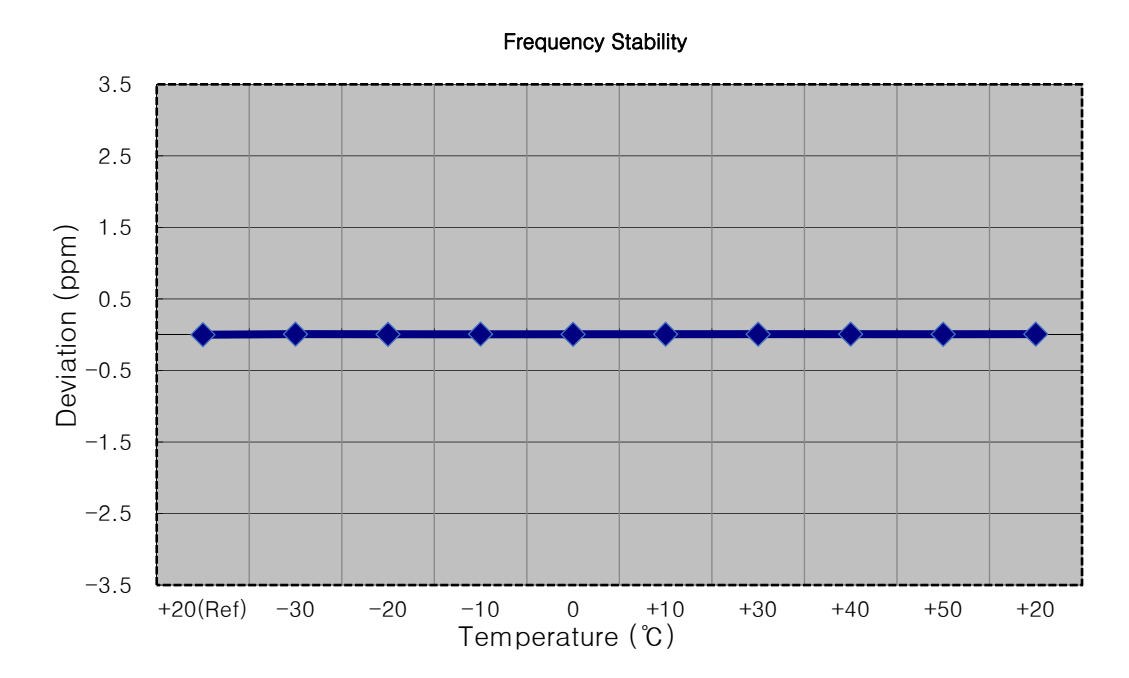
▣ OPERATING FREQUENCY: 704,000,000 Hz

▣ CHANNEL: 23060 (10 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage | Power | Temp. | Frequency | Frequency Error | Deviation | ppm |
|---|---|---|---|---|---|---|
| (%) | (VDC) | (°C) | (Hz) | (Hz) | (%) | |
| 100 % | 3.880 | +20(Ref) | 704 000 005 | 0.0 | 0.000 000 | 0.000 |
| 100 % | | -30 | 704 000 010 | 5.2 | 0.000 001 | 0.007 |
| 100 % | | -20 | 704 000 008 | 3.0 | 0.000 000 | 0.004 |
| 100 % | | -10 | 704 000 011 | 5.7 | 0.000 001 | 0.008 |
| 100 % | | 0 | 704 000 009 | 3.5 | 0.000 000 | 0.005 |
| 100 % | | +10 | 704 000 010 | 4.6 | 0.000 001 | 0.007 |
| 100 % | | +30 | 704 000 010 | 4.4 | 0.000 001 | 0.006 |
| 100 % | | +40 | 704 000 011 | 5.7 | 0.000 001 | 0.008 |
| 100 % | | +50 | 704 000 010 | 4.3 | 0.000 001 | 0.006 |
| Batt. Endpoint | 3.300 | +20 | 704 000 011 | 5.9 | 0.000 001 | 0.008 |



▣ MODE: LTE B12

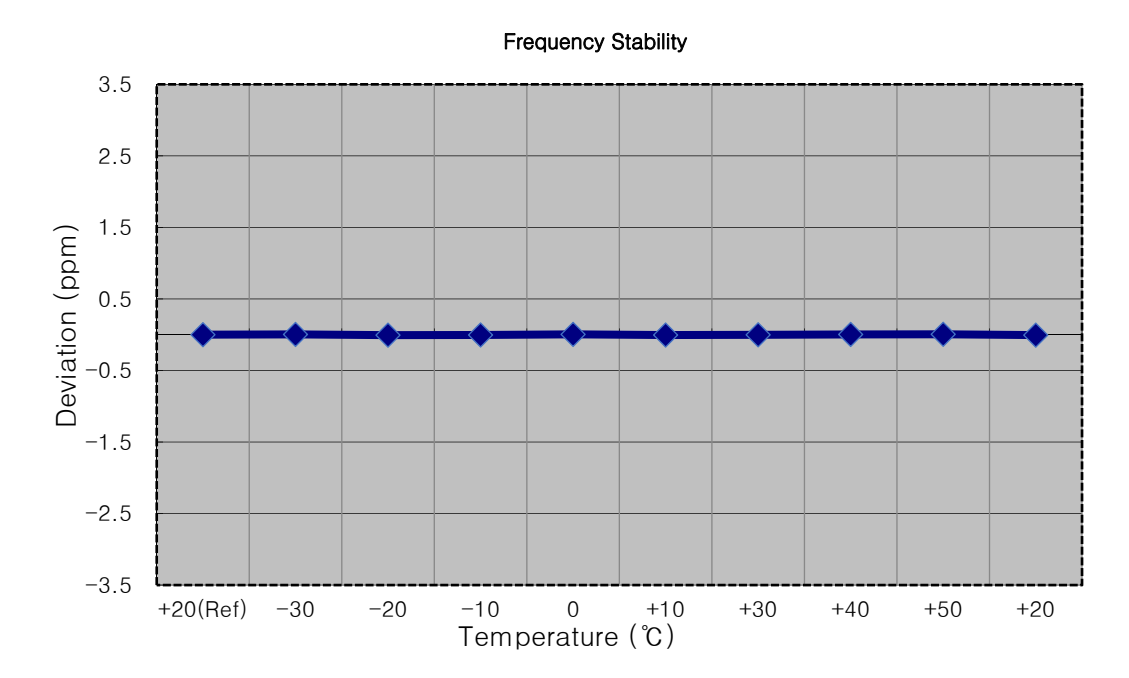
▣ OPERATING FREQUENCY: 707,500,000 Hz

▣ CHANNEL: 23095 (1.4 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage | Power | Temp. | Frequency | Frequency Error | Deviation | ppm |
|---|---|---|---|---|---|---|
| (%) | (VDC) | (°C) | (Hz) | (Hz) | (%) | |
| 100 % | 3.880 | +20(Ref) | 707 500 002 | 0.0 | 0.000 000 | 0.000 |
| 100 % | | -30 | 707 500 005 | 2.7 | 0.000 000 | 0.004 |
| 100 % | | -20 | 707 499 998 | -4.5 | -0.000 001 | -0.006 |
| 100 % | | -10 | 707 499 999 | -2.9 | 0.000 000 | -0.004 |
| 100 % | | 0 | 707 500 005 | 3.3 | 0.000 000 | 0.005 |
| 100 % | | +10 | 707 499 999 | -3.5 | 0.000 000 | -0.005 |
| 100 % | | +30 | 707 500 001 | -1.2 | 0.000 000 | -0.002 |
| 100 % | | +40 | 707 500 005 | 2.5 | 0.000 000 | 0.004 |
| 100 % | | +50 | 707 500 006 | 4.0 | 0.000 001 | 0.006 |
| Batt. Endpoint | 3.300 | +20 | 707 499 998 | -4.3 | -0.000 001 | -0.006 |



▣ MODE: LTE B12

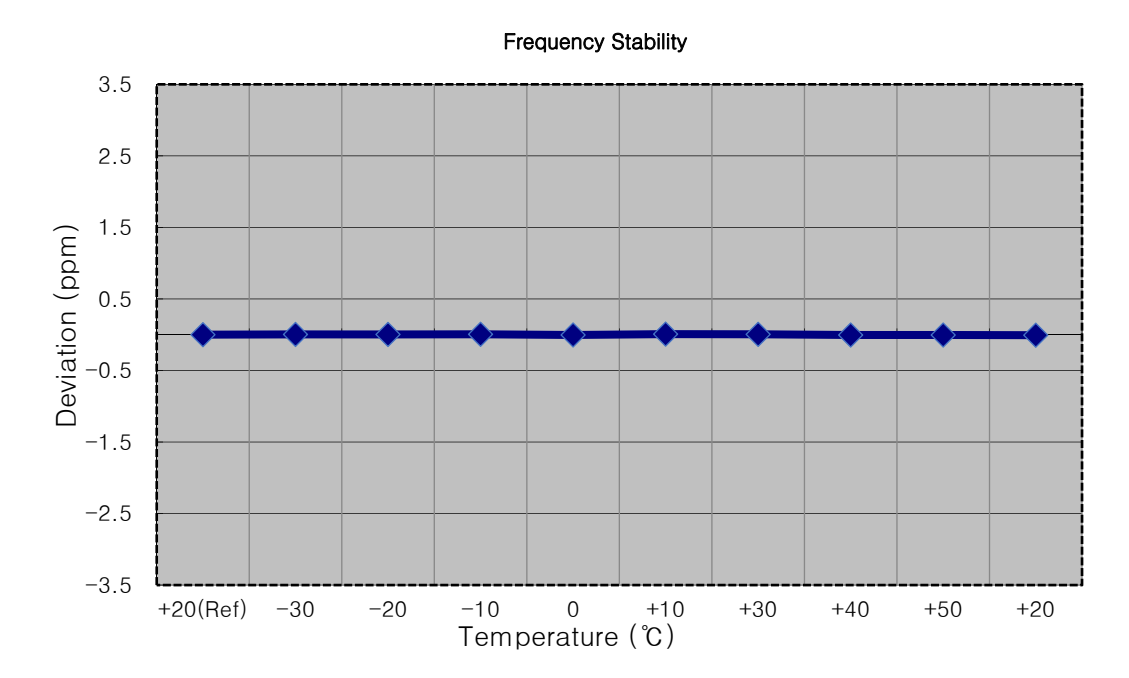
▣ OPERATING FREQUENCY: 707,500,000 Hz

▣ CHANNEL: 23095 (3 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage | Power | Temp. | Frequency | Frequency Error | Deviation | ppm |
|---|---|---|---|---|---|---|
| (%) | (VDC) | (°C) | (Hz) | (Hz) | (%) | |
| 100 % | 3.880 | +20(Ref) | 707 500 003 | 0.0 | 0.000 000 | 0.000 |
| 100 % | | -30 | 707 500 006 | 2.8 | 0.000 000 | 0.004 |
| 100 % | | -20 | 707 500 005 | 2.3 | 0.000 000 | 0.003 |
| 100 % | | -10 | 707 500 007 | 4.1 | 0.000 001 | 0.006 |
| 100 % | | 0 | 707 500 000 | -3.0 | 0.000 000 | -0.004 |
| 100 % | | +10 | 707 500 009 | 5.6 | 0.000 001 | 0.008 |
| 100 % | | +30 | 707 500 007 | 3.7 | 0.000 001 | 0.005 |
| 100 % | | +40 | 707 500 000 | -3.2 | 0.000 000 | -0.005 |
| 100 % | | +50 | 707 500 000 | -3.1 | 0.000 000 | -0.004 |
| Batt. Endpoint | 3.300 | +20 | 707 499 998 | -4.9 | -0.000 001 | -0.007 |



▣ MODE: LTE B12

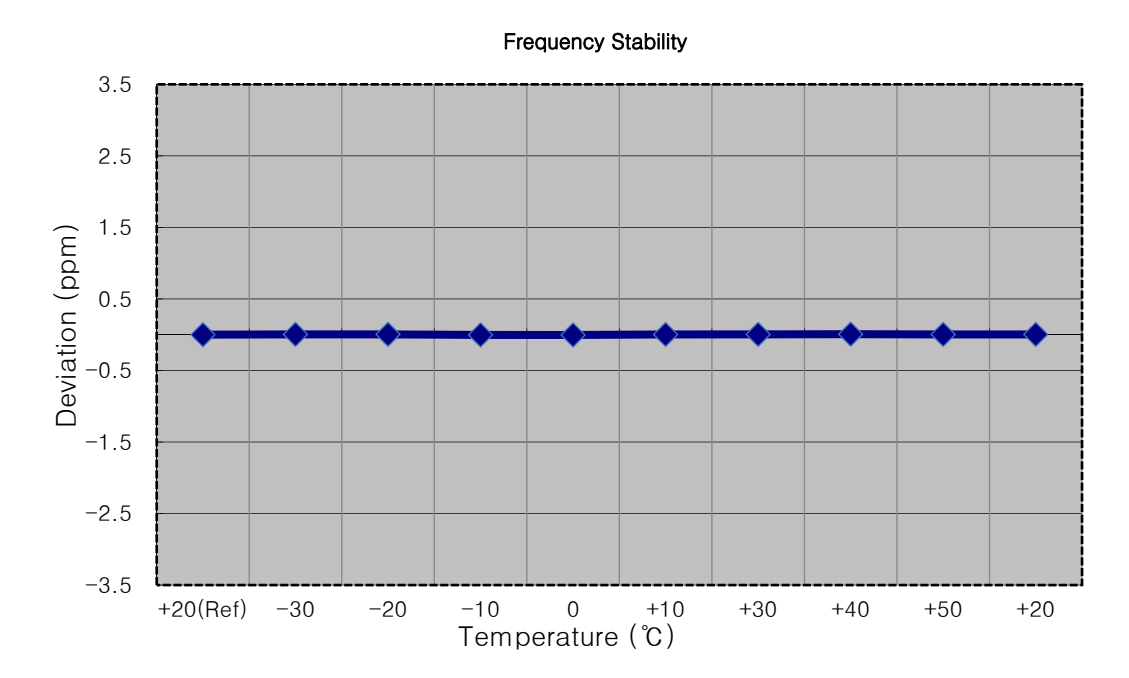
▣ OPERATING FREQUENCY: 707,500,000 Hz

▣ CHANNEL: 23095 (5 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage | Power | Temp. | Frequency | Frequency Error | Deviation | ppm |
|---|---|---|---|---|---|---|
| (%) | (VDC) | (°C) | (Hz) | (Hz) | (%) | |
| 100 % | 3.880 | +20(Ref) | 707 500 005 | 0.0 | 0.000 000 | 0.000 |
| 100 % | | -30 | 707 500 008 | 2.9 | 0.000 000 | 0.004 |
| 100 % | | -20 | 707 500 008 | 3.0 | 0.000 000 | 0.004 |
| 100 % | | -10 | 707 500 003 | -2.4 | 0.000 000 | -0.003 |
| 100 % | | 0 | 707 500 003 | -2.5 | 0.000 000 | -0.004 |
| 100 % | | +10 | 707 500 007 | 2.1 | 0.000 000 | 0.003 |
| 100 % | | +30 | 707 500 008 | 2.9 | 0.000 000 | 0.004 |
| 100 % | | +40 | 707 500 010 | 5.0 | 0.000 001 | 0.007 |
| 100 % | | +50 | 707 500 008 | 2.5 | 0.000 000 | 0.004 |
| Batt. Endpoint | 3.300 | +20 | 707 500 008 | 2.4 | 0.000 000 | 0.003 |



▣ MODE: LTE B12

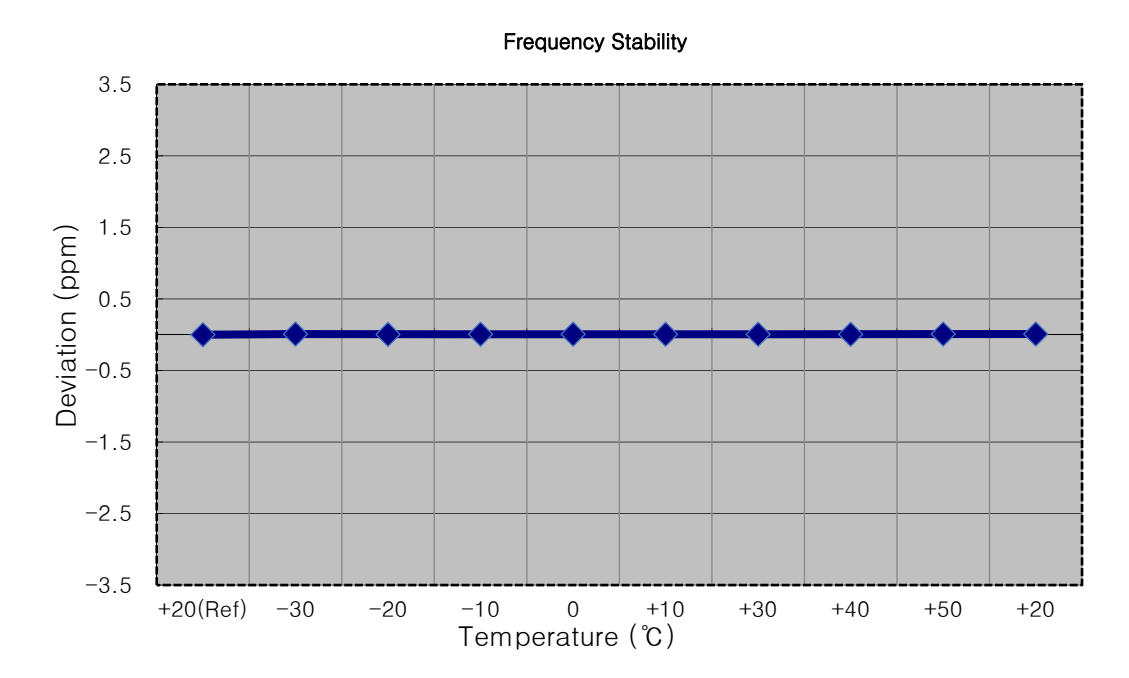
▣ OPERATING FREQUENCY: 707,500,000 Hz

▣ CHANNEL: 23095 (10 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage | Power | Temp. | Frequency | Frequency Error | Deviation | ppm |
|---|---|---|---|---|---|---|
| (%) | (VDC) | (°C) | (Hz) | (Hz) | (%) | |
| 100 % | 3.880 | +20(Ref) | 707 500 006 | 0.0 | 0.000 000 | 0.000 |
| 100 % | | -30 | 707 500 012 | 6.2 | 0.000 001 | 0.009 |
| 100 % | | -20 | 707 500 009 | 2.3 | 0.000 000 | 0.003 |
| 100 % | | -10 | 707 500 011 | 4.9 | 0.000 001 | 0.007 |
| 100 % | | 0 | 707 500 011 | 4.5 | 0.000 001 | 0.006 |
| 100 % | | +10 | 707 500 010 | 4.0 | 0.000 001 | 0.006 |
| 100 % | | +30 | 707 500 010 | 4.0 | 0.000 001 | 0.006 |
| 100 % | | +40 | 707 500 010 | 3.7 | 0.000 001 | 0.005 |
| 100 % | | +50 | 707 500 012 | 6.0 | 0.000 001 | 0.008 |
| Batt. Endpoint | 3.300 | +20 | 707 500 012 | 6.2 | 0.000 001 | 0.009 |



▣ MODE: LTE B12

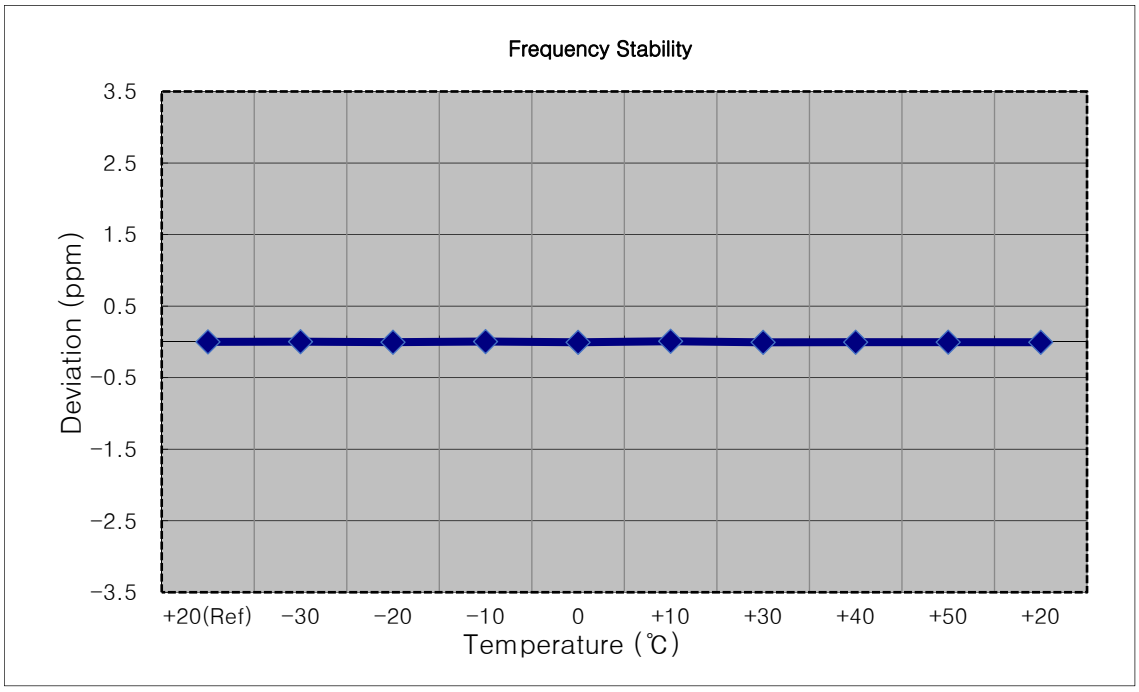
▣ OPERATING FREQUENCY: 715,300,000 Hz

▣ CHANNEL: 23173 (1.4 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage | Power | Temp. | Frequency | Frequency Error | Deviation | ppm |
|---|---|---|---|---|---|---|
| (%) | (VDC) | (°C) | (Hz) | (Hz) | (%) | |
| 100 % | 3.880 | +20(Ref) | 715 300 003 | 0.0 | 0.000 000 | 0.000 |
| 100 % | | -30 | 715 300 005 | 1.8 | 0.000 000 | 0.003 |
| 100 % | | -20 | 715 300 000 | -3.2 | 0.000 000 | -0.004 |
| 100 % | | -10 | 715 300 007 | 3.3 | 0.000 000 | 0.005 |
| 100 % | | 0 | 715 299 999 | -4.2 | -0.000 001 | -0.006 |
| 100 % | | +10 | 715 300 010 | 6.3 | 0.000 001 | 0.009 |
| 100 % | | +30 | 715 299 999 | -4.5 | -0.000 001 | -0.006 |
| 100 % | | +40 | 715 300 000 | -3.3 | 0.000 000 | -0.005 |
| 100 % | | +50 | 715 300 000 | -3.0 | 0.000 000 | -0.004 |
| Batt. Endpoint | 3.300 | +20 | 715 300 000 | -3.8 | -0.000 001 | -0.005 |



▣ MODE: LTE B12

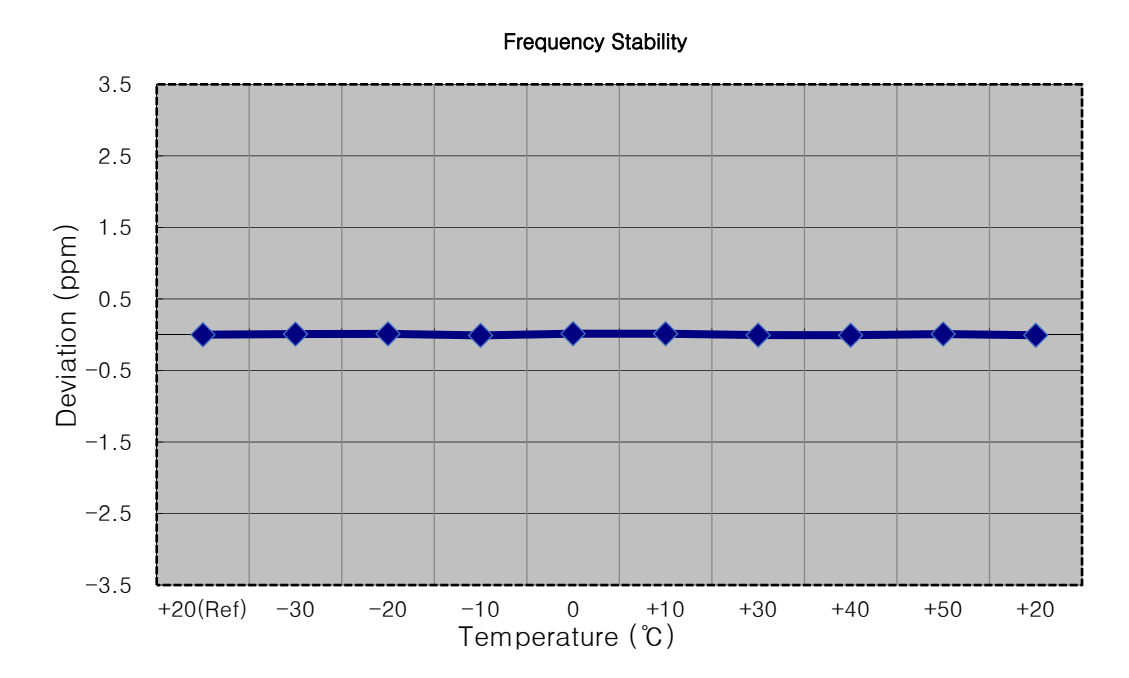
▣ OPERATING FREQUENCY: 714,500,000 Hz

▣ CHANNEL: 23165 (3 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage | Power | Temp. | Frequency | Frequency Error | Deviation | ppm |
|---|---|---|---|---|---|---|
| (%) | (VDC) | (°C) | (Hz) | (Hz) | (%) | |
| 100 % | 3.880 | +20(Ref) | 714 500 009 | 0.0 | 0.000 000 | 0.000 |
| 100 % | | -30 | 714 500 015 | 6.1 | 0.000 001 | 0.009 |
| 100 % | | -20 | 714 500 017 | 8.2 | 0.000 001 | 0.011 |
| 100 % | | -10 | 714 500 002 | -7.0 | -0.000 001 | -0.010 |
| 100 % | | 0 | 714 500 019 | 10.2 | 0.000 001 | 0.014 |
| 100 % | | +10 | 714 500 019 | 10.2 | 0.000 001 | 0.014 |
| 100 % | | +30 | 714 500 004 | -4.3 | -0.000 001 | -0.006 |
| 100 % | | +40 | 714 500 003 | -5.2 | -0.000 001 | -0.007 |
| 100 % | | +50 | 714 500 015 | 6.1 | 0.000 001 | 0.009 |
| Batt. Endpoint | 3.300 | +20 | 714 500 003 | -5.6 | -0.000 001 | -0.008 |



▣ MODE: LTE B12

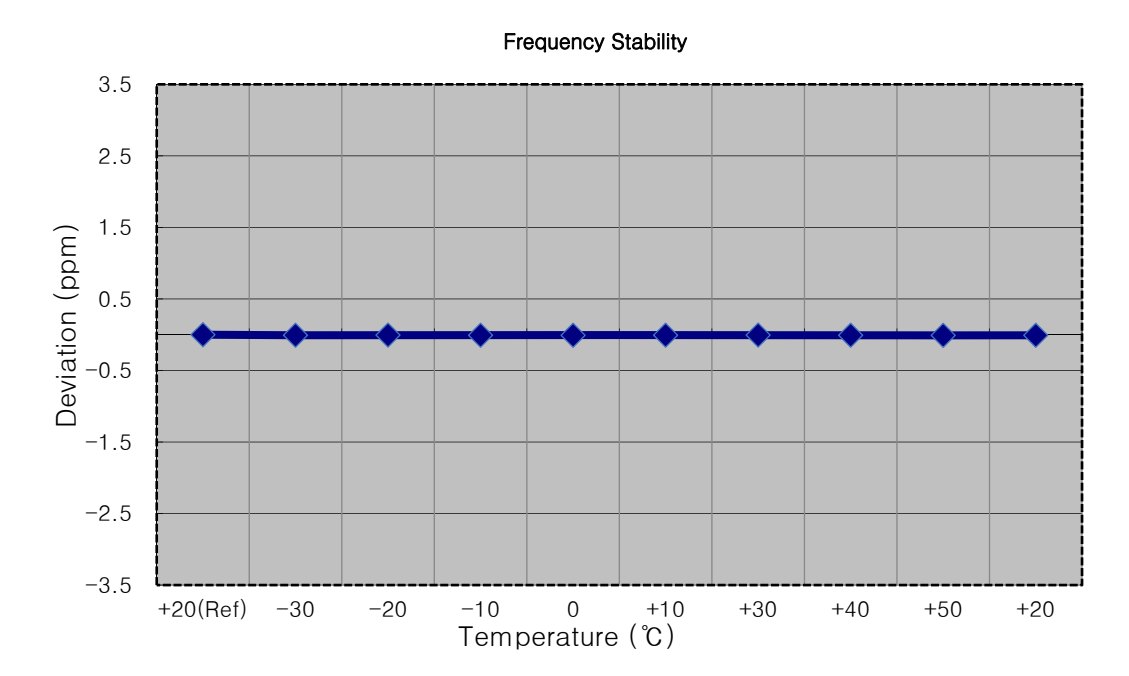
▣ OPERATING FREQUENCY: 713,500,000 Hz

▣ CHANNEL: 23155 (5 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

| Voltage | Power | Temp. | Frequency | Frequency Error | Deviation | ppm |
|---|---|---|---|---|---|---|
| (%) | (VDC) | (°C) | (Hz) | (Hz) | (%) | |
| 100 % | 3.880 | +20(Ref) | 713 499 995 | 0.0 | 0.000 000 | 0.000 |
| 100 % | | -30 | 713 499 990 | -5.5 | -0.000 001 | -0.008 |
| 100 % | | -20 | 713 499 992 | -3.8 | -0.000 001 | -0.005 |
| 100 % | | -10 | 713 499 990 | -5.3 | -0.000 001 | -0.007 |
| 100 % | | 0 | 713 499 989 | -5.9 | -0.000 001 | -0.008 |
| 100 % | | +10 | 713 499 991 | -4.7 | -0.000 001 | -0.007 |
| 100 % | | +30 | 713 499 992 | -3.8 | -0.000 001 | -0.005 |
| 100 % | | +40 | 713 499 990 | -5.6 | -0.000 001 | -0.008 |
| 100 % | | +50 | 713 499 989 | -6.7 | -0.000 001 | -0.009 |
| Batt. Endpoint | 3.300 | +20 | 713 499 989 | -6.2 | -0.000 001 | -0.009 |



▣ MODE: LTE B12

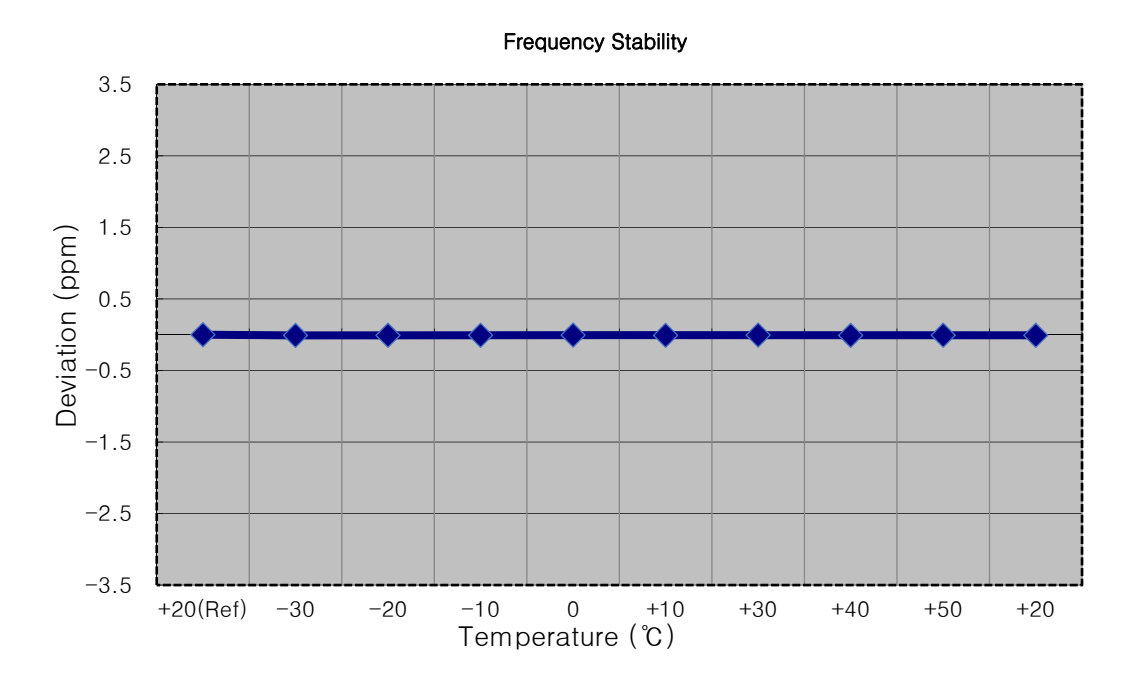
▣ OPERATING FREQUENCY: 711,000,000 Hz

▣ CHANNEL: 23130 (10 MHz)

▣ REFERENCE VOLTAGE: 3.880 VDC

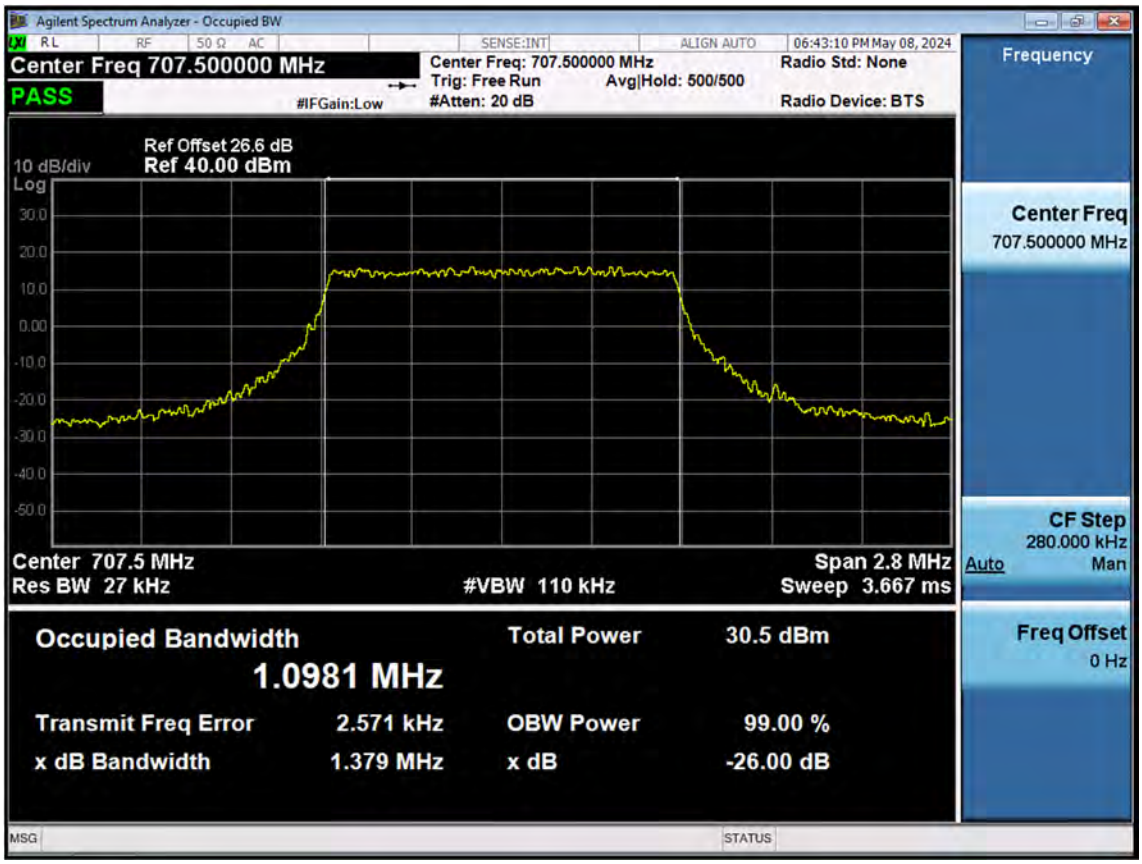
▣ DEVIATION LIMIT: Emission must remain in band

| Voltage | Power | Temp. | Frequency | Frequency Error | Deviation | ppm |
|---|---|---|---|---|---|---|
| (%) | (VDC) | (°C) | (Hz) | (Hz) | (%) | |
| 100 % | 3.880 | +20(Ref) | 710 999 995 | 0.0 | 0.000 000 | 0.000 |
| 100 % | | -30 | 710 999 988 | -7.0 | -0.000 001 | -0.010 |
| 100 % | | -20 | 710 999 989 | -5.9 | -0.000 001 | -0.008 |
| 100 % | | -10 | 710 999 989 | -6.0 | -0.000 001 | -0.008 |
| 100 % | | 0 | 710 999 991 | -3.7 | -0.000 001 | -0.005 |
| 100 % | | +10 | 710 999 989 | -6.2 | -0.000 001 | -0.009 |
| 100 % | | +30 | 710 999 991 | -3.9 | -0.000 001 | -0.005 |
| 100 % | | +40 | 710 999 988 | -7.1 | -0.000 001 | -0.010 |
| 100 % | | +50 | 710 999 989 | -5.6 | -0.000 001 | -0.008 |
| Batt. Endpoint | 3.300 | +20 | 710 999 989 | -6.2 | -0.000 001 | -0.009 |

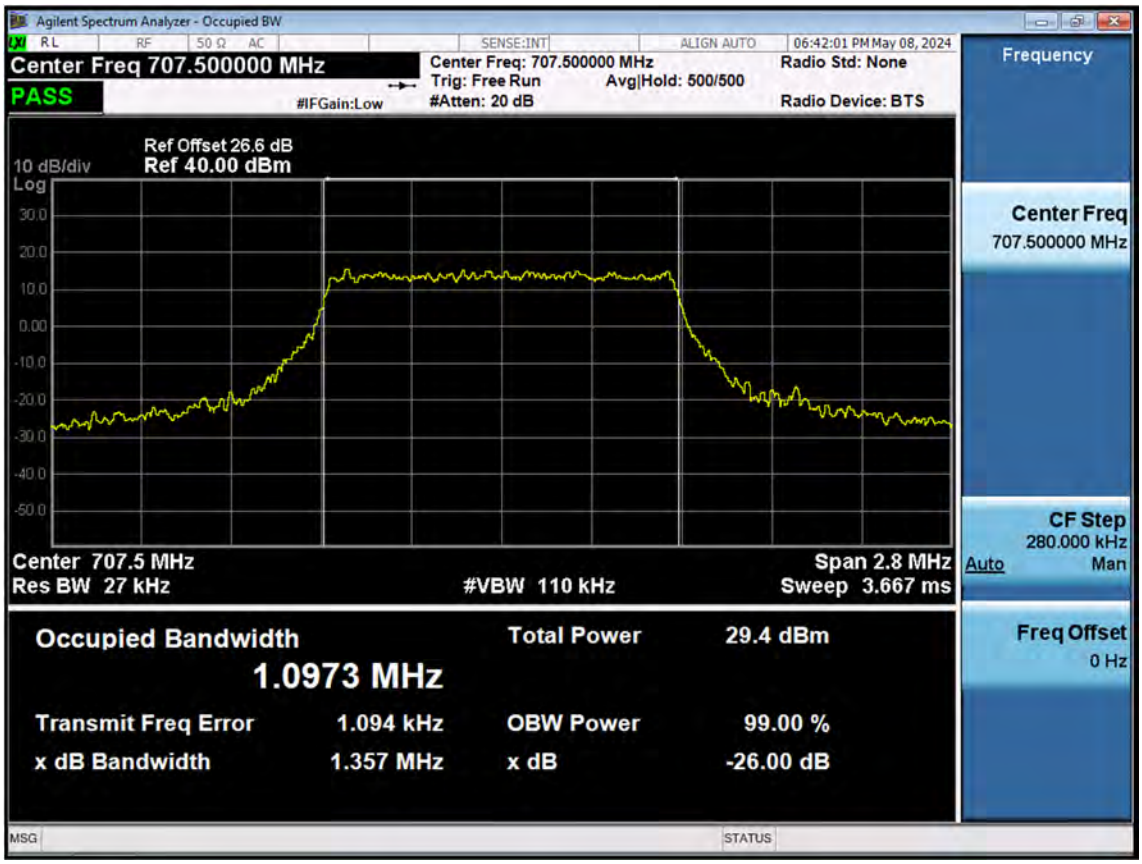


## 9. TEST PLOTS

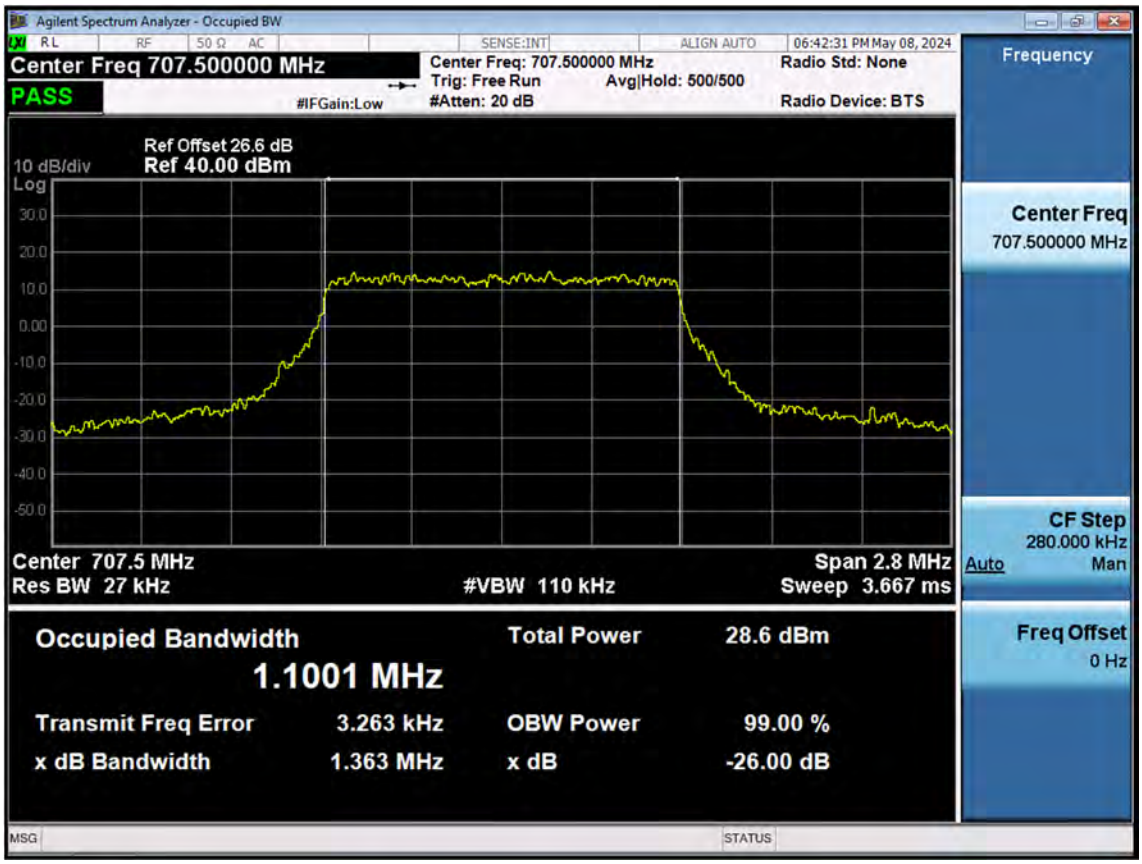
LTE B12_1.4 M_OBW_Mid_QPSK_FullRB



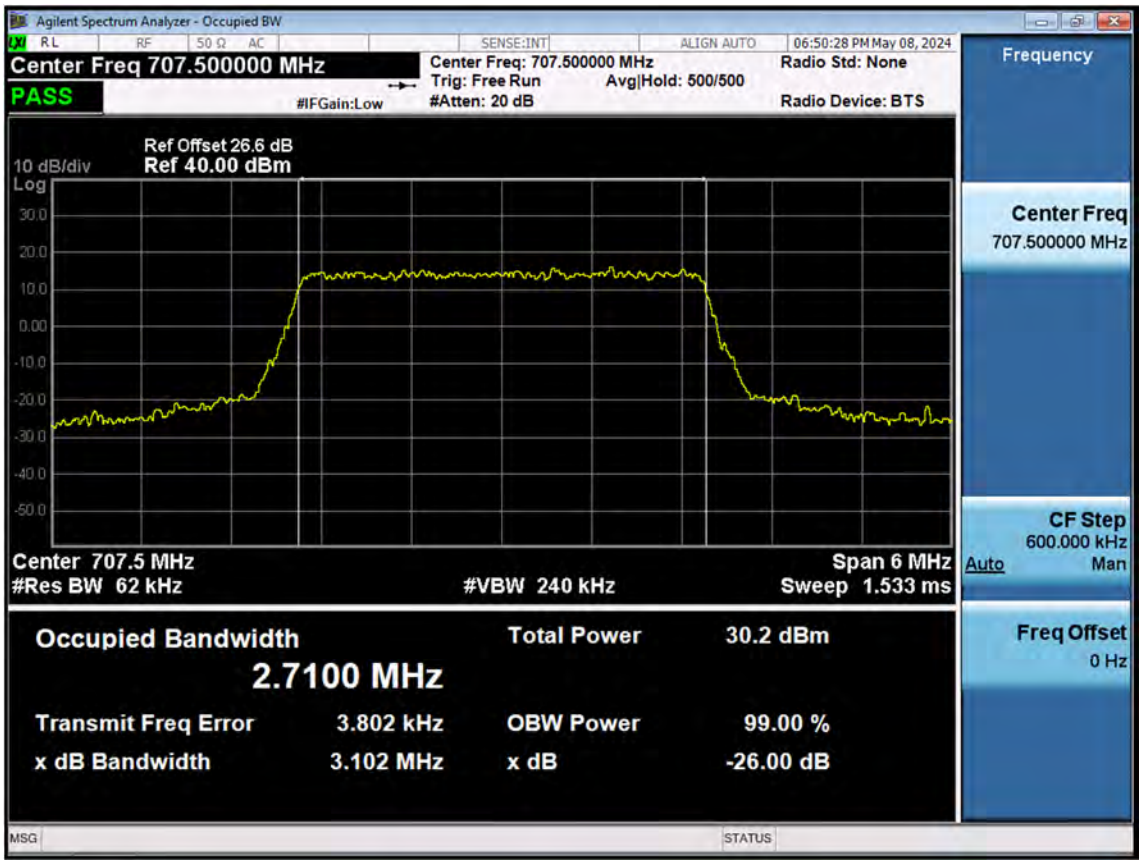
LTE B12_1.4 M_OBW_Mid_16QAM_FullRB



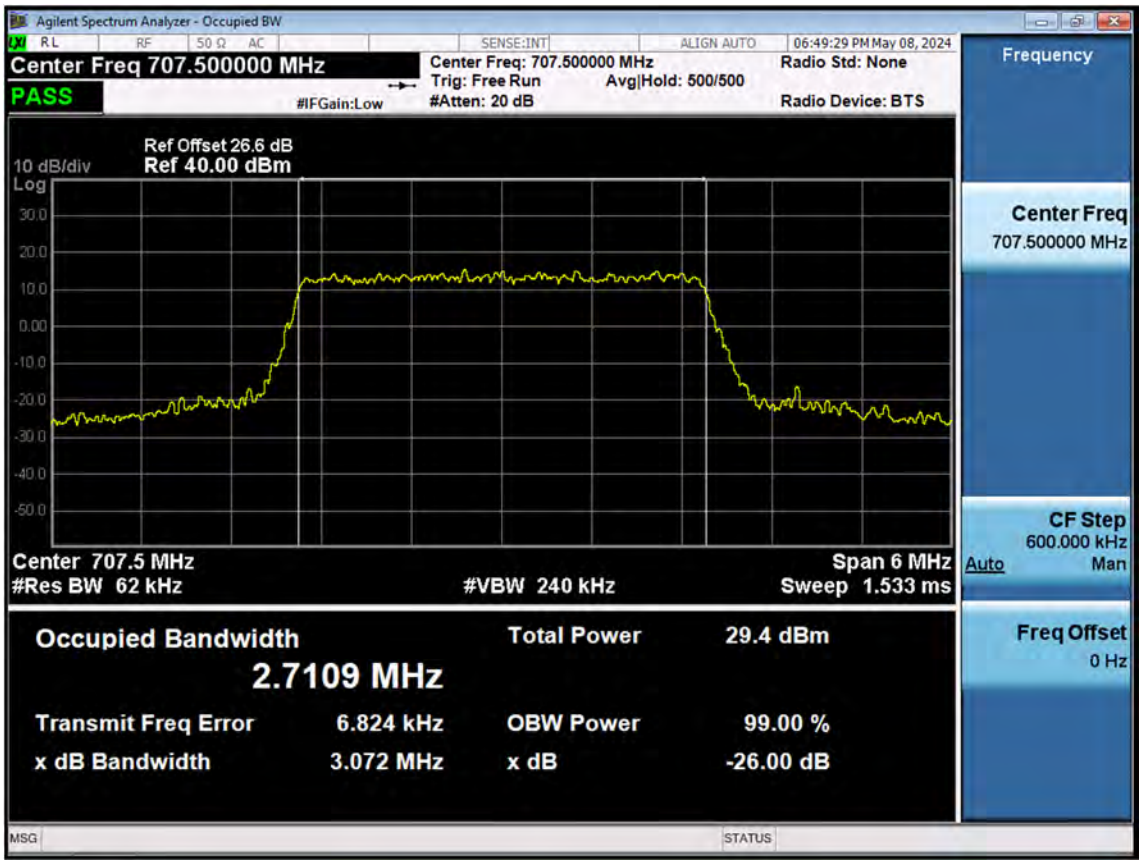
LTE B12_1.4 M_OBW_Mid_64QAM_FullRB



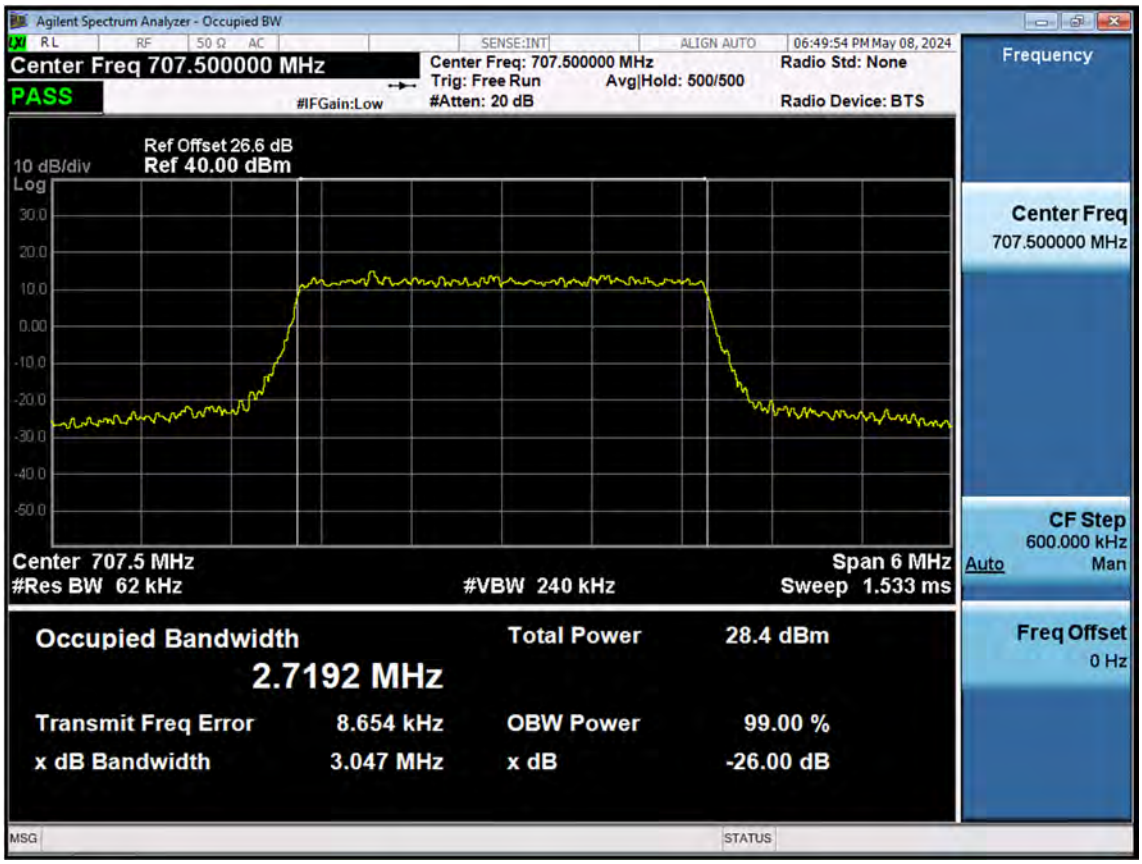
LTE B12_3 M_OBW_Mid_QPSK_FullRB



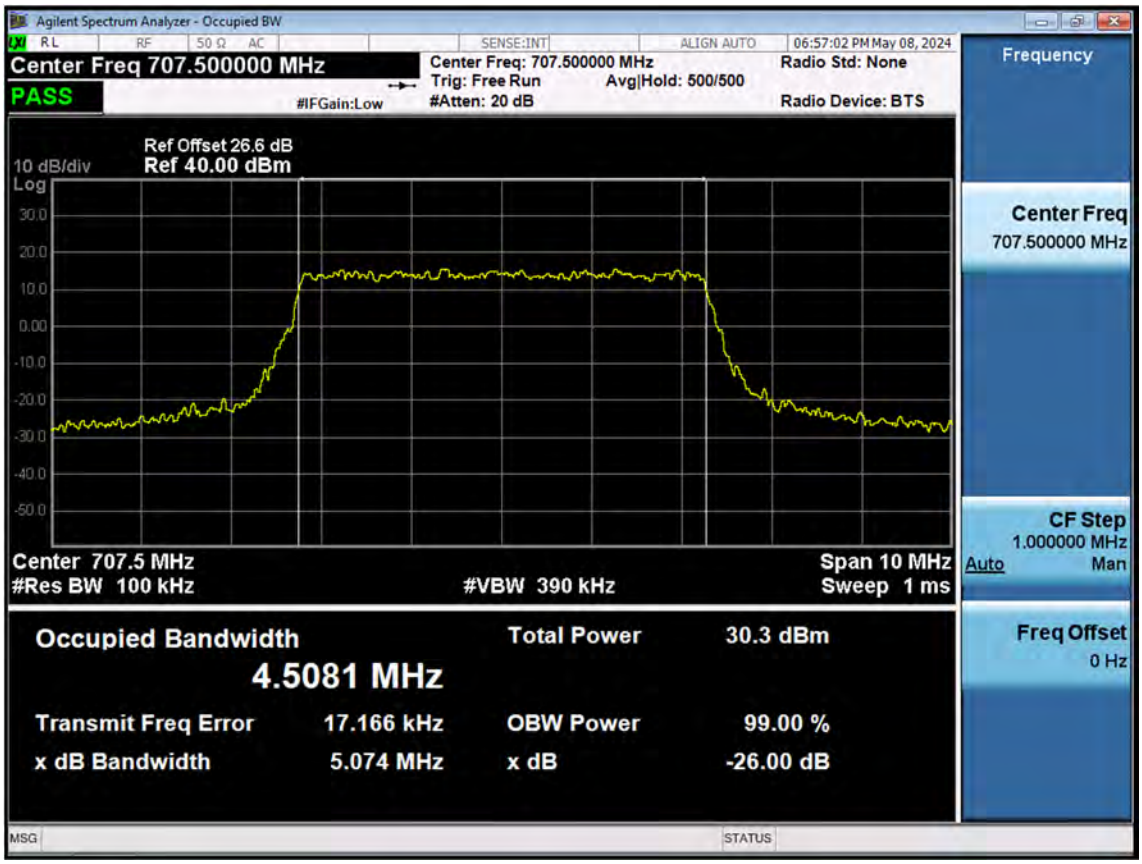
LTE B12_3 M_OBW_Mid_16QAM_FullRB



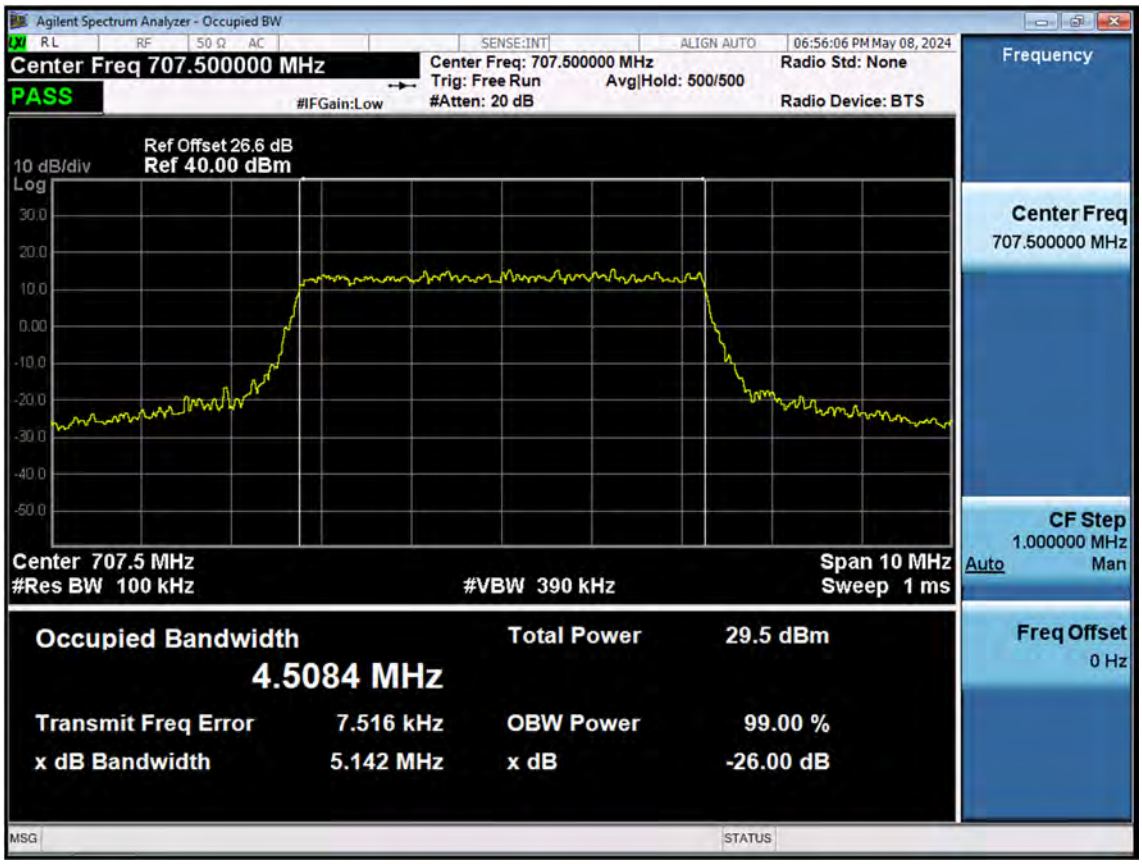
LTE B12_3 M_OBW_Mid_64QAM_FullRB



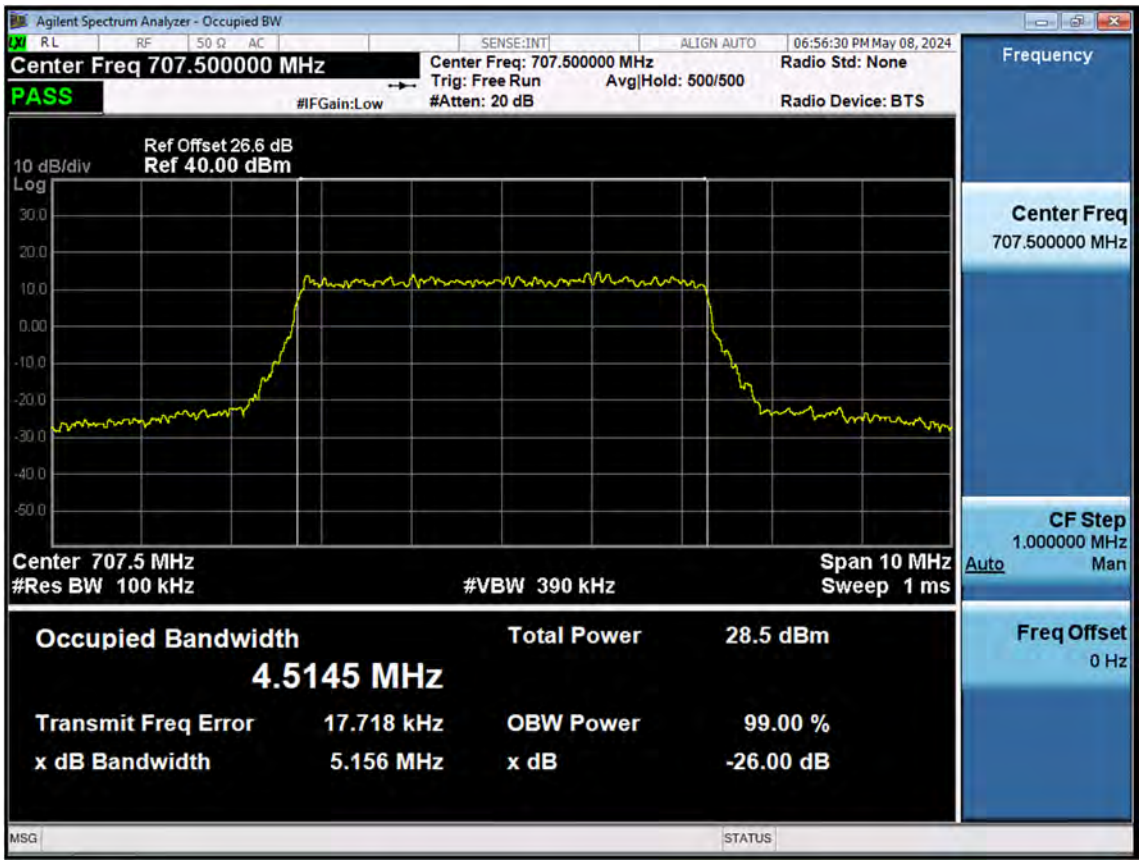
LTE B12_5 M_OBW_Mid_QPSK_FullRB



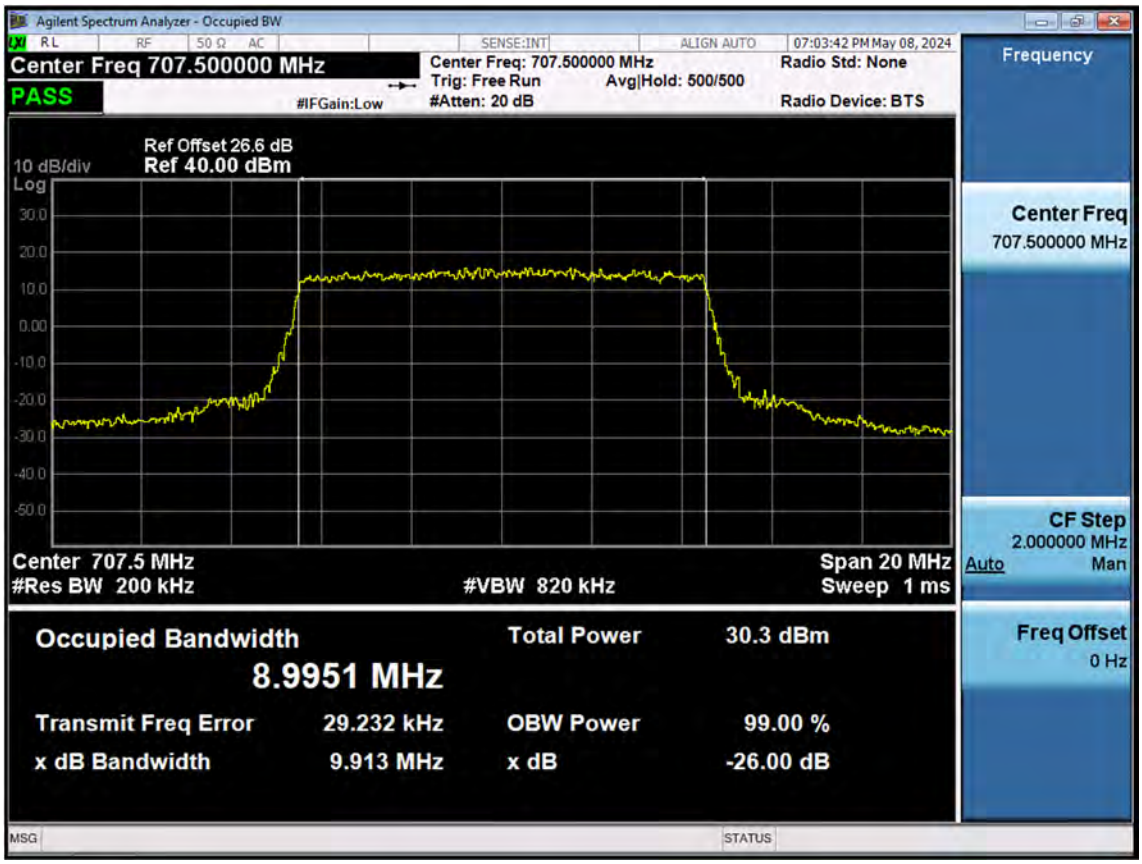
LTE B12_5 M_OBW_Mid_16QAM_FullRB



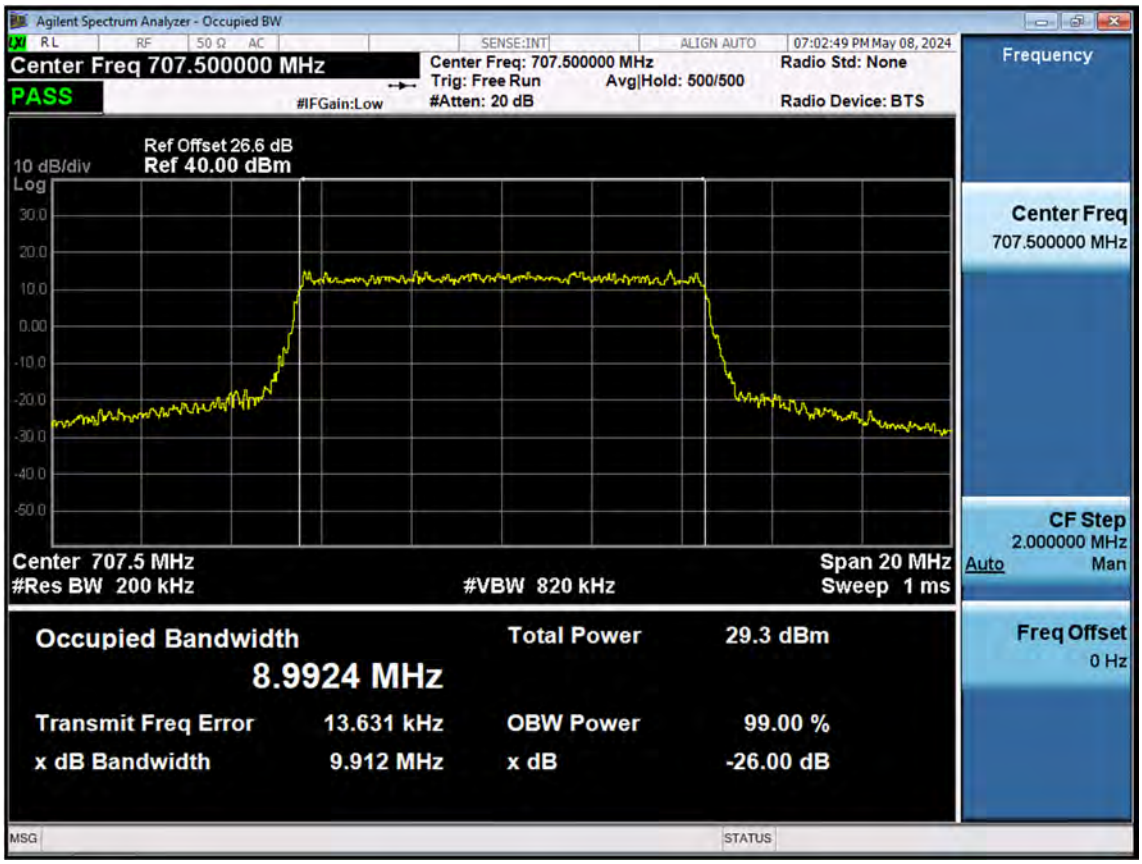
LTE B12_5 M_OBW_Mid_64QAM_FullRB



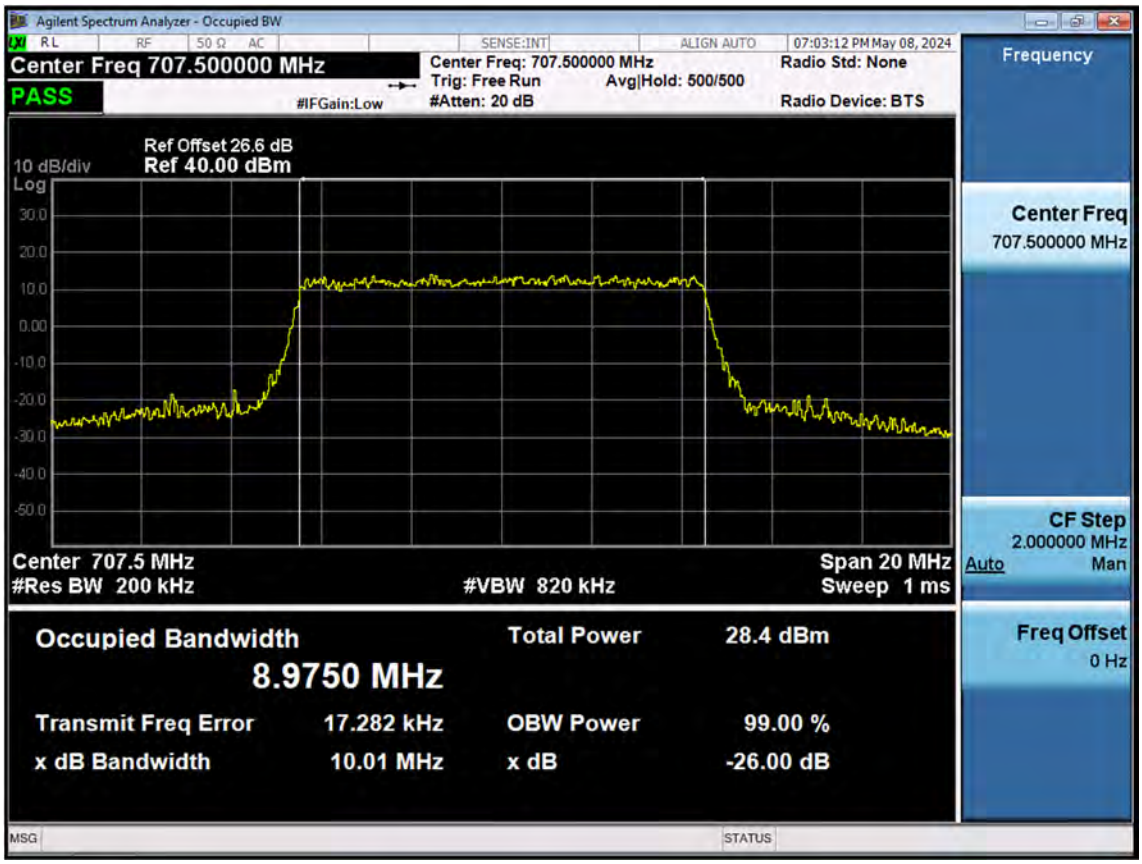
LTE B12_10 M_OBW_Mid_QPSK_FullRB



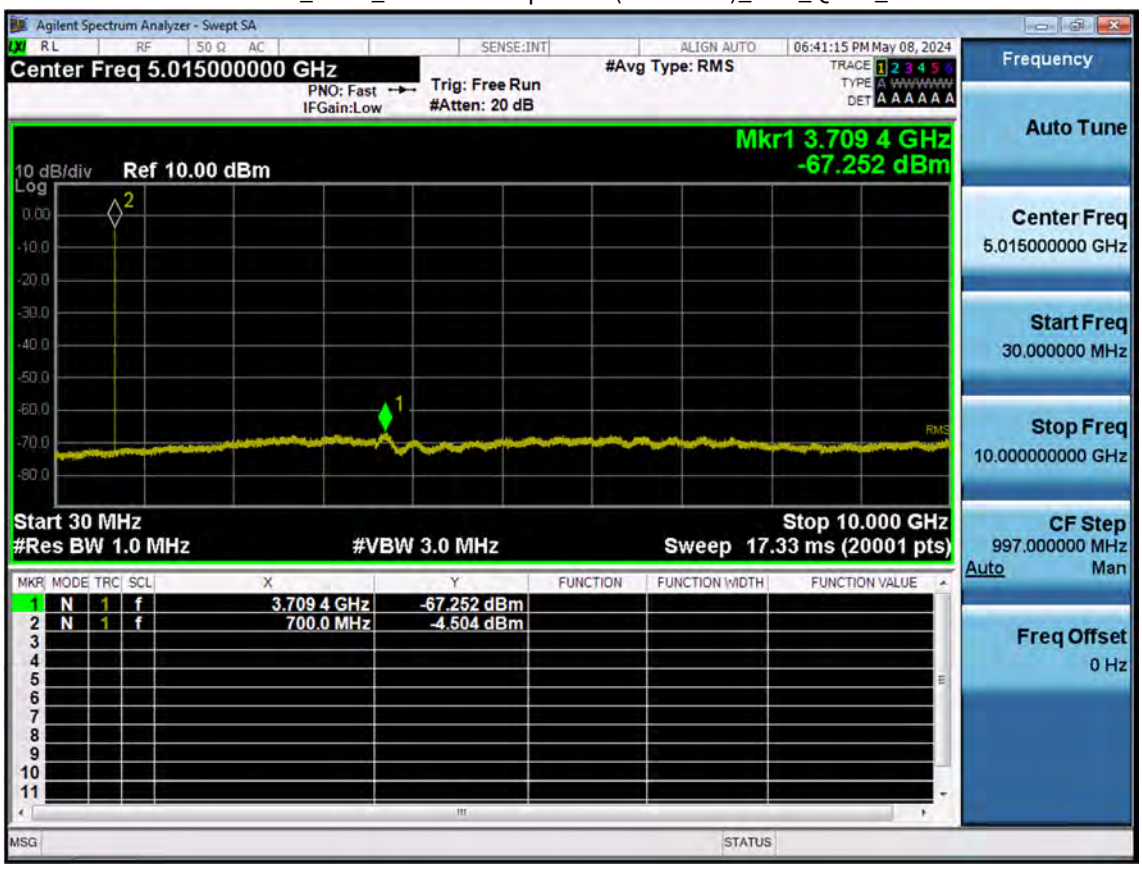
LTE B12_10 M_OBW_Mid_16QAM_FullRB



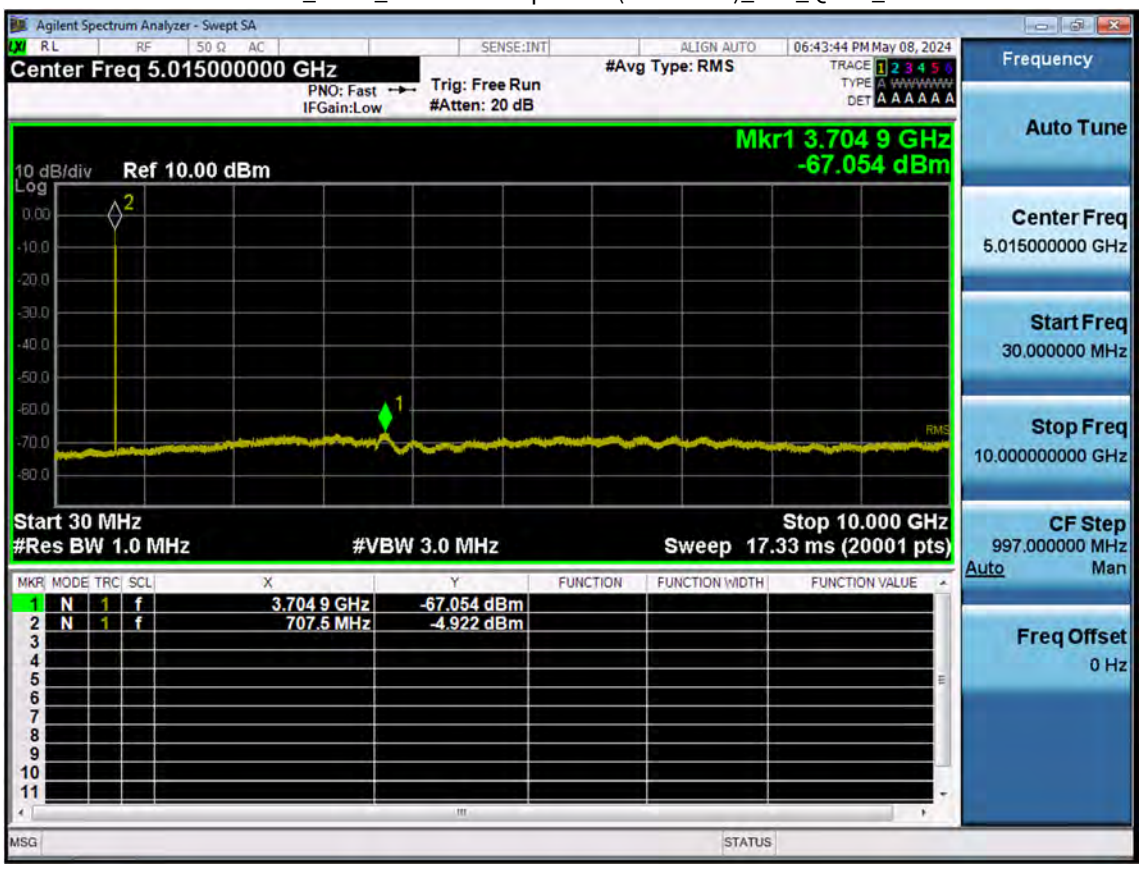
LTE B12_10 M_OBW_Mid_64QAM_FullRB



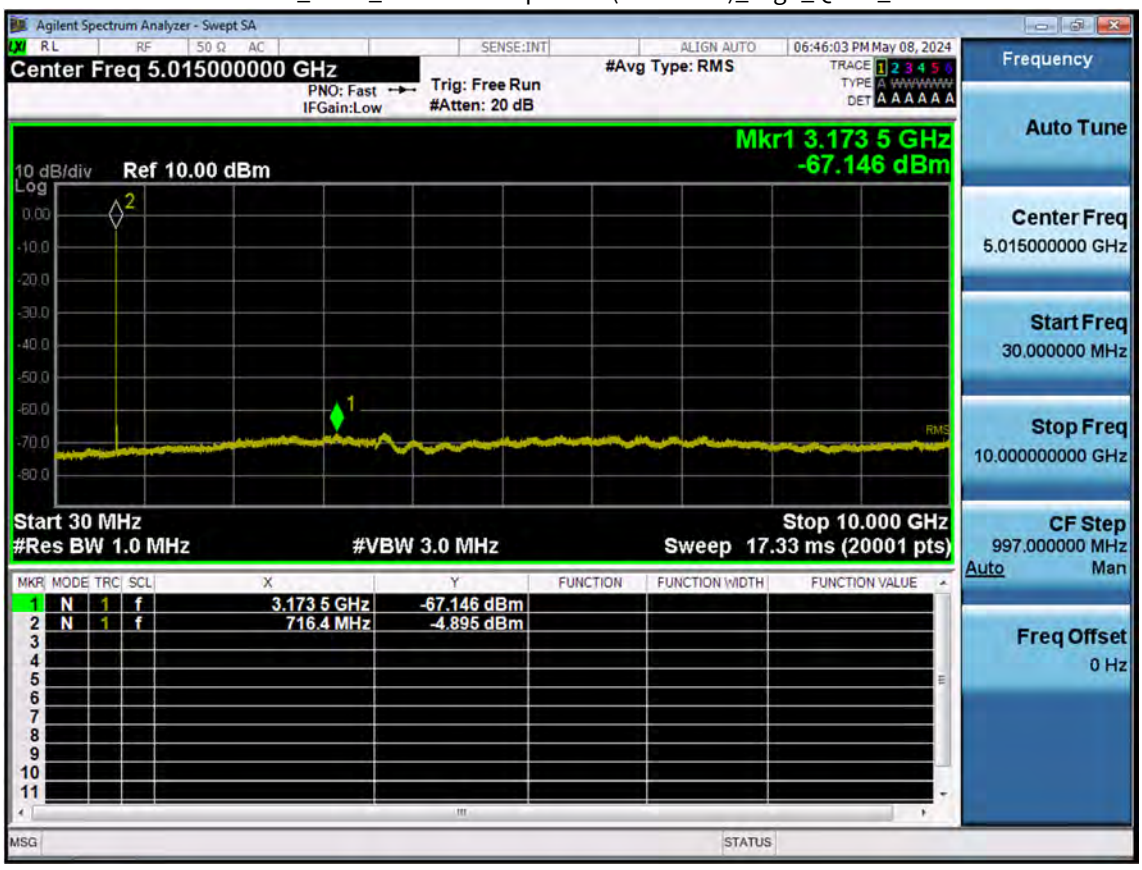
LTE B12_1.4 M_Conducted Spurious(30 M-10 G)_Low_QPSK_1RB



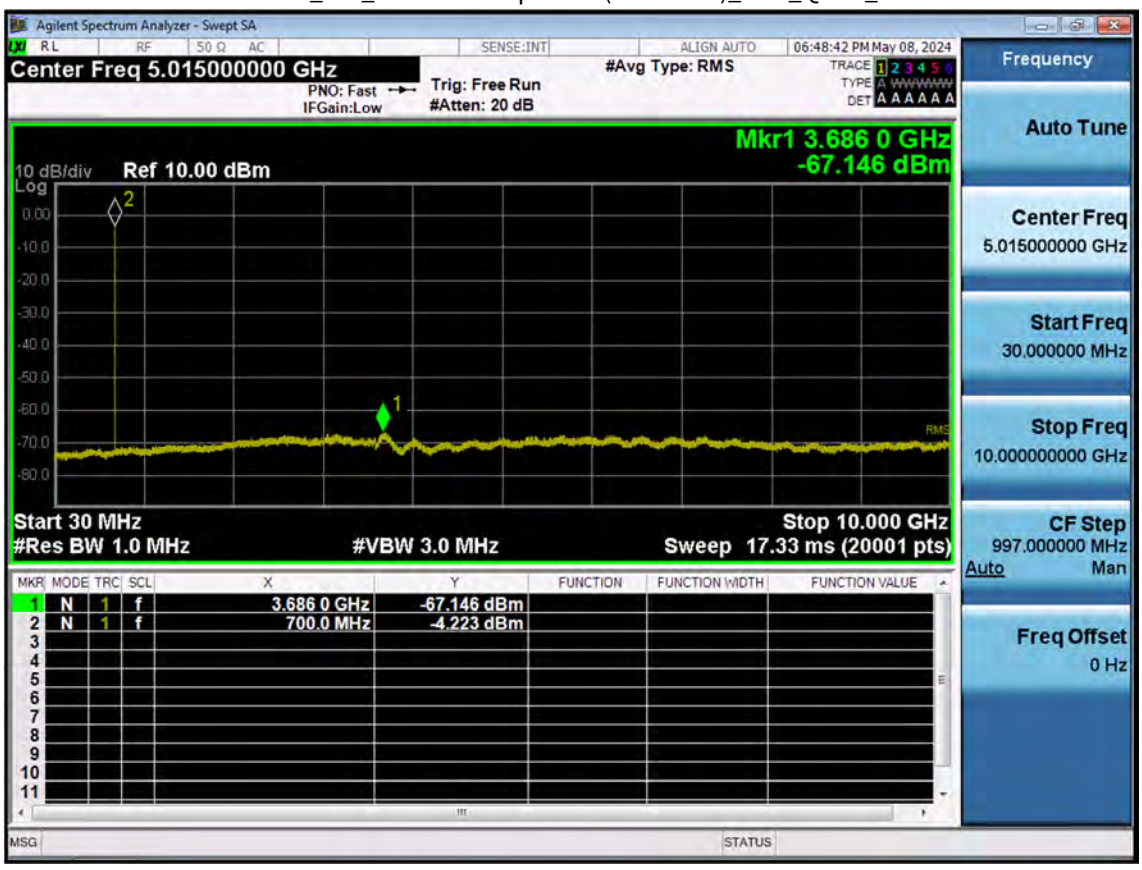
LTE B12_1.4 M_Conducted Spurious(30 M-10 G)_Mid_QPSK_1RB



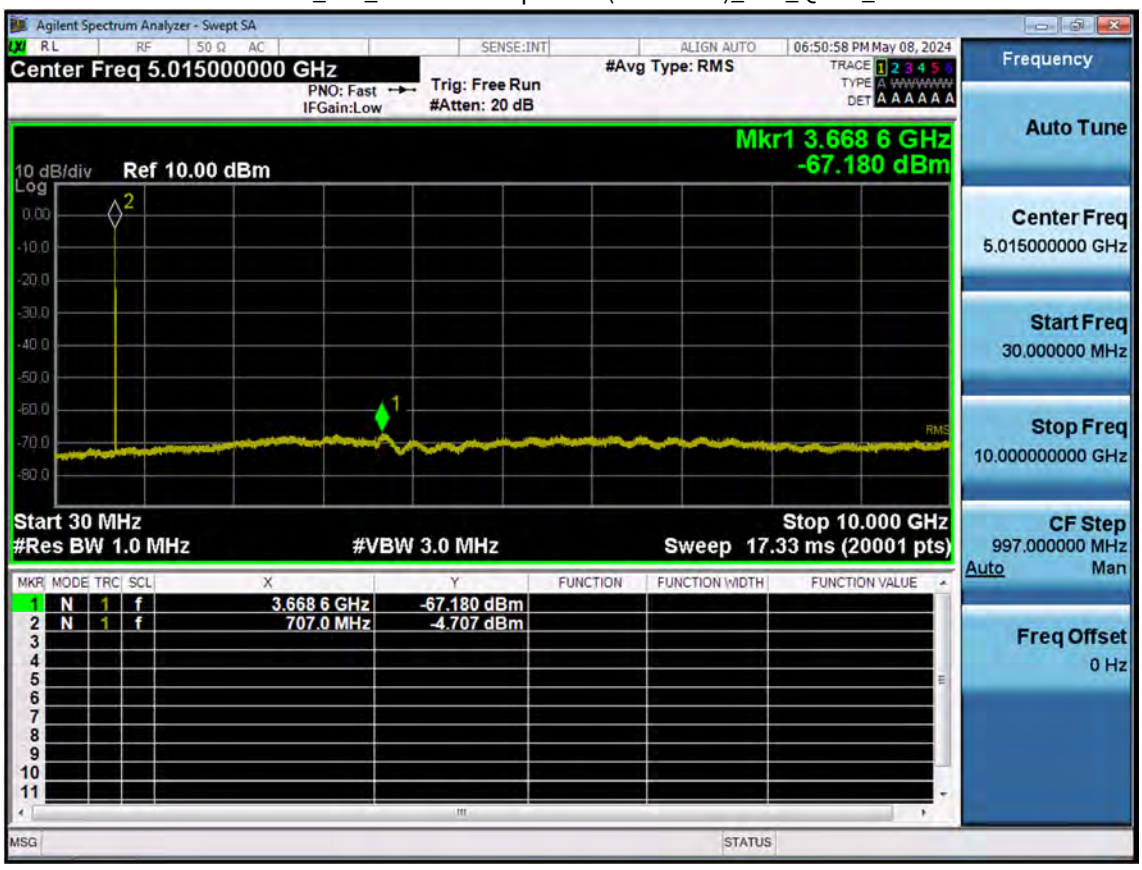
LTE B12_1.4 M_Conducted Spurious(30 M-10 G)_High_QPSK_1RB



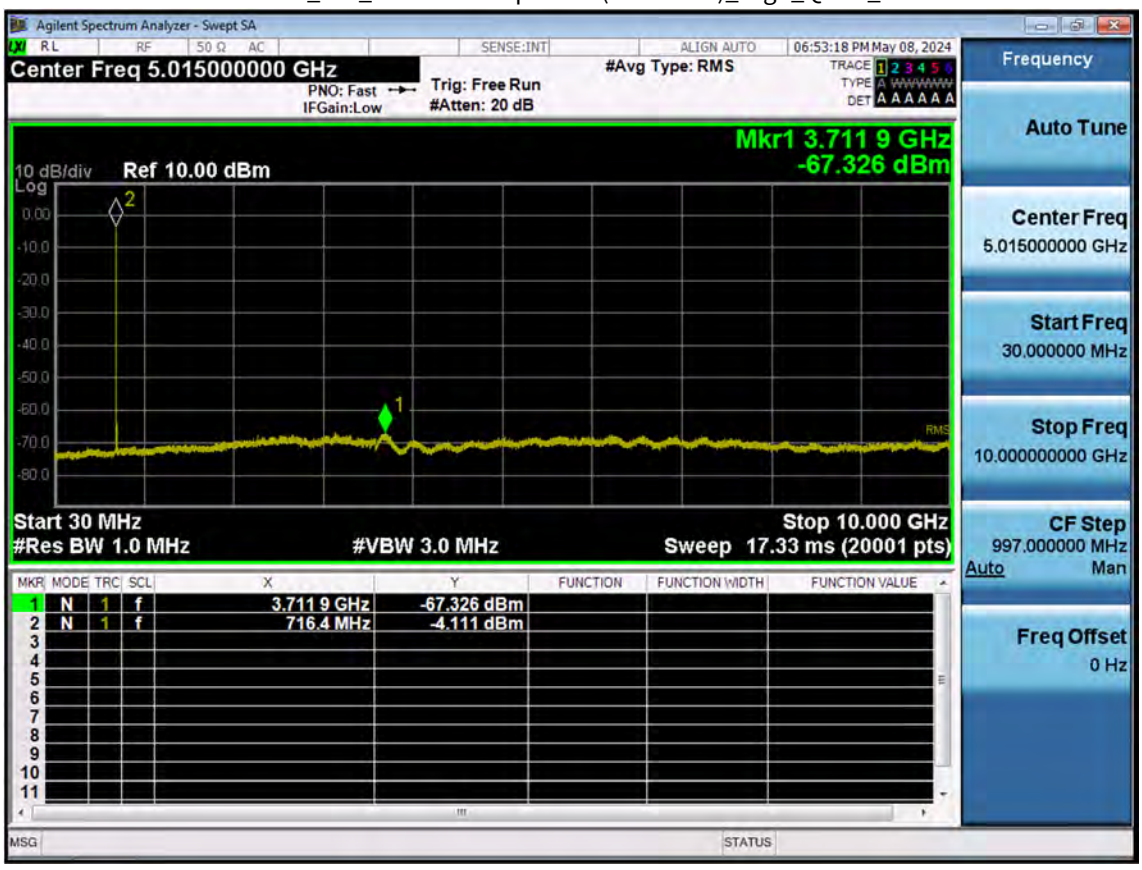
LTE B12_3 M_Conducted Spurious(30 M-10 G)_Low_QPSK_1RB



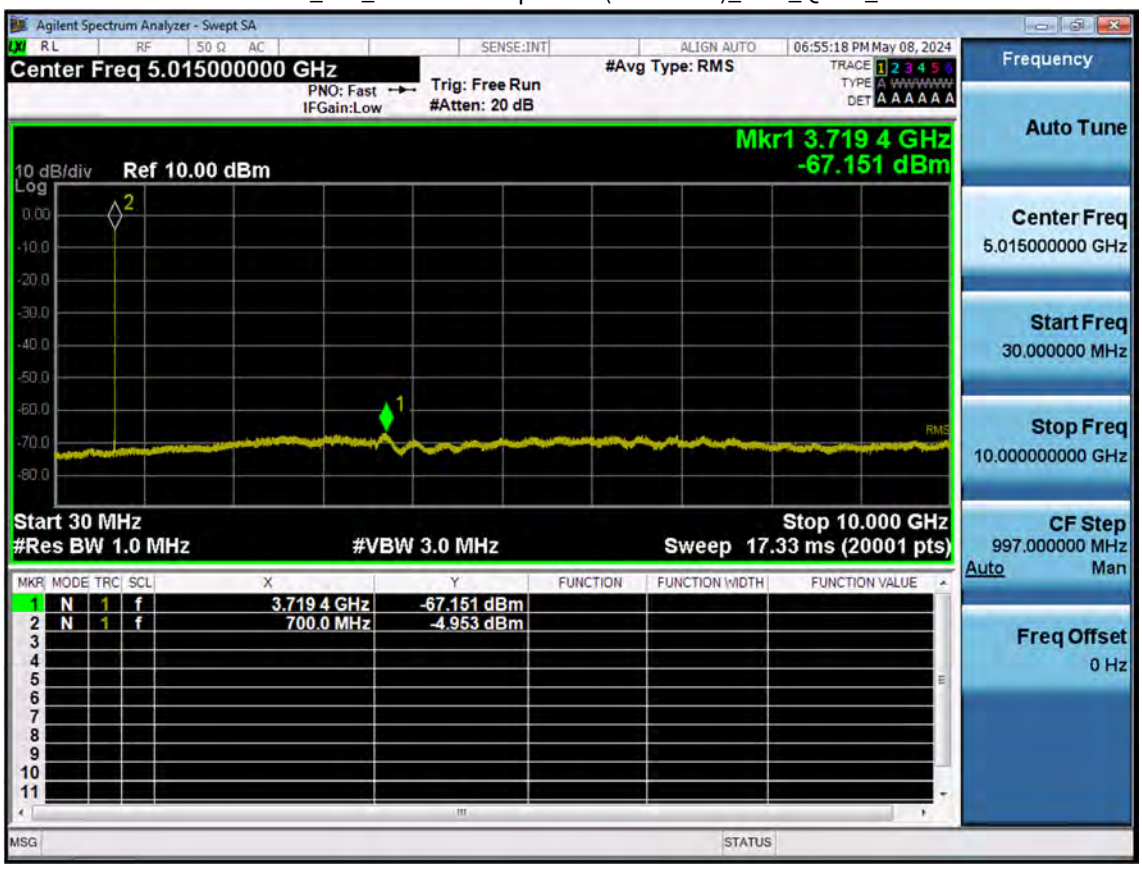
LTE B12_3 M_Conducted Spurious(30 M-10 G)_Mid_QPSK_1RB



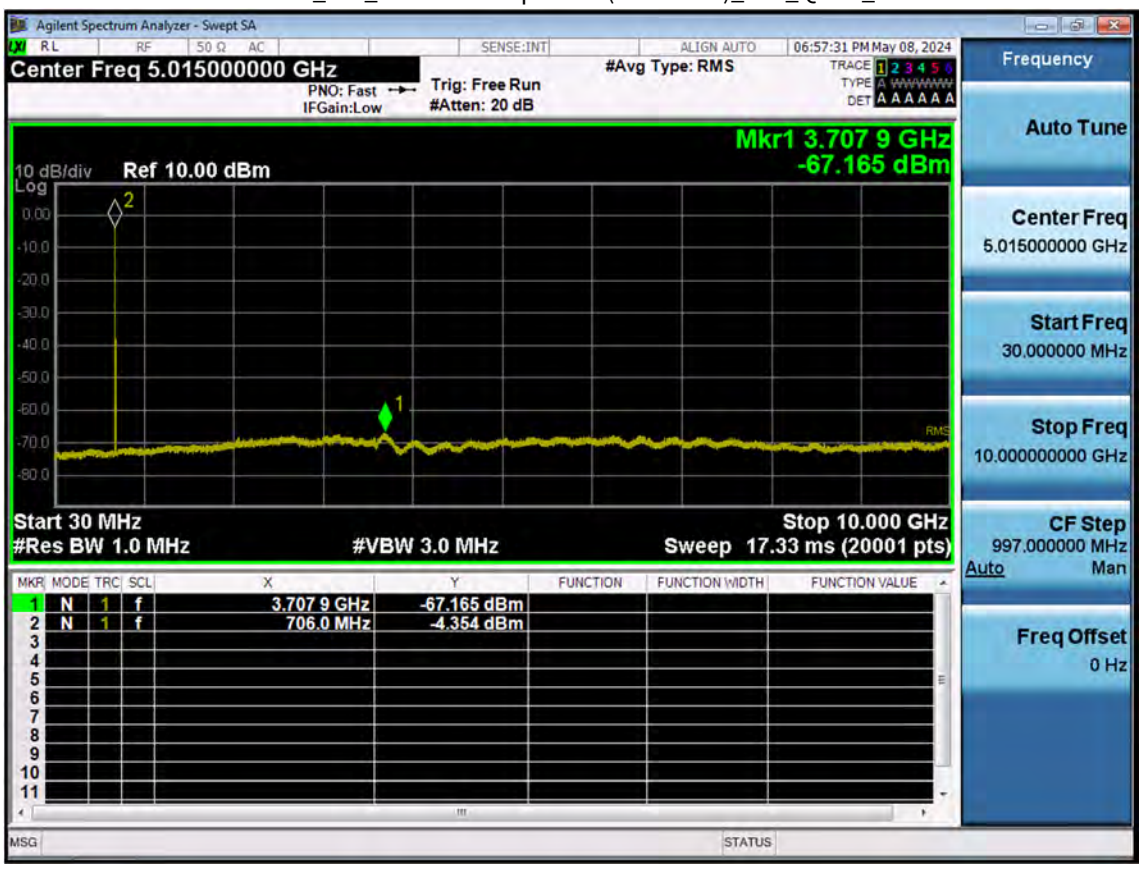
LTE B12_3 M_Conducted Spurious(30 M-10 G)_High_QPSK_1RB



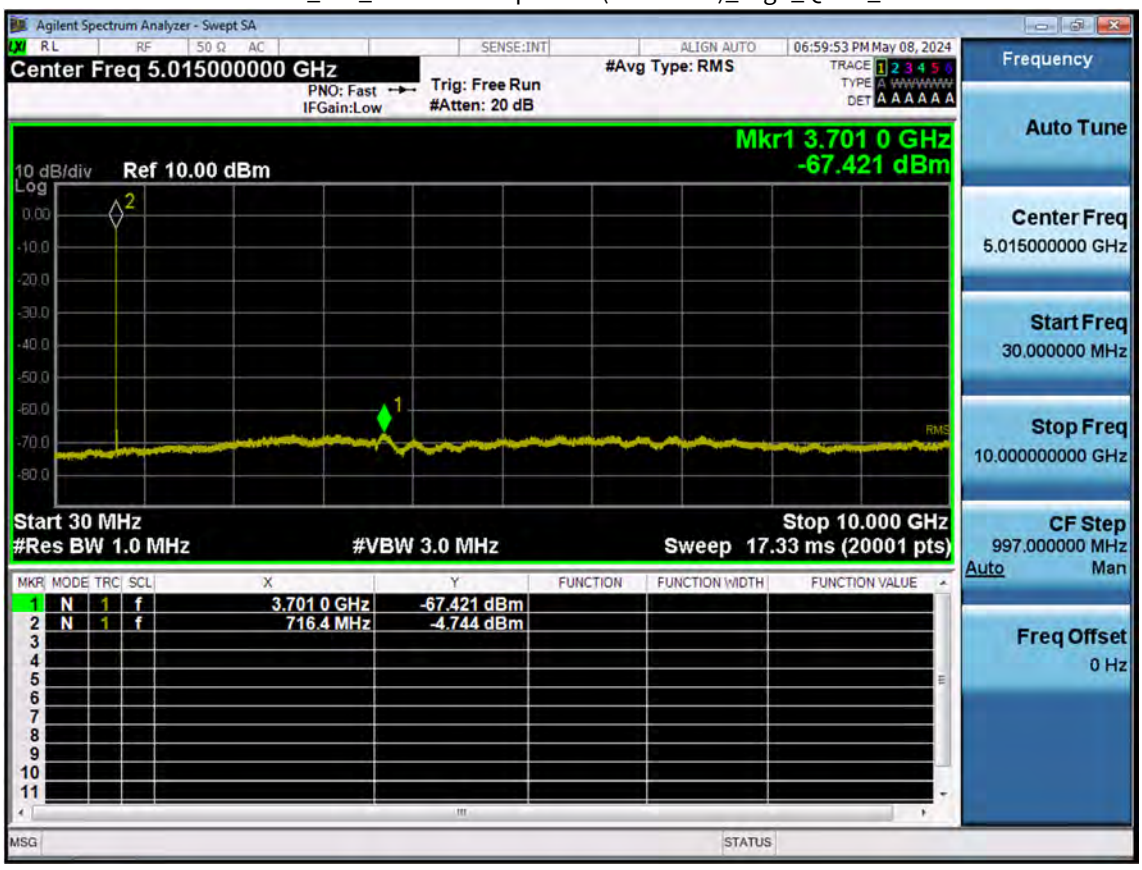
LTE B12_5 M_Conducted Spurious(30 M-10 G)_Low_QPSK_1RB



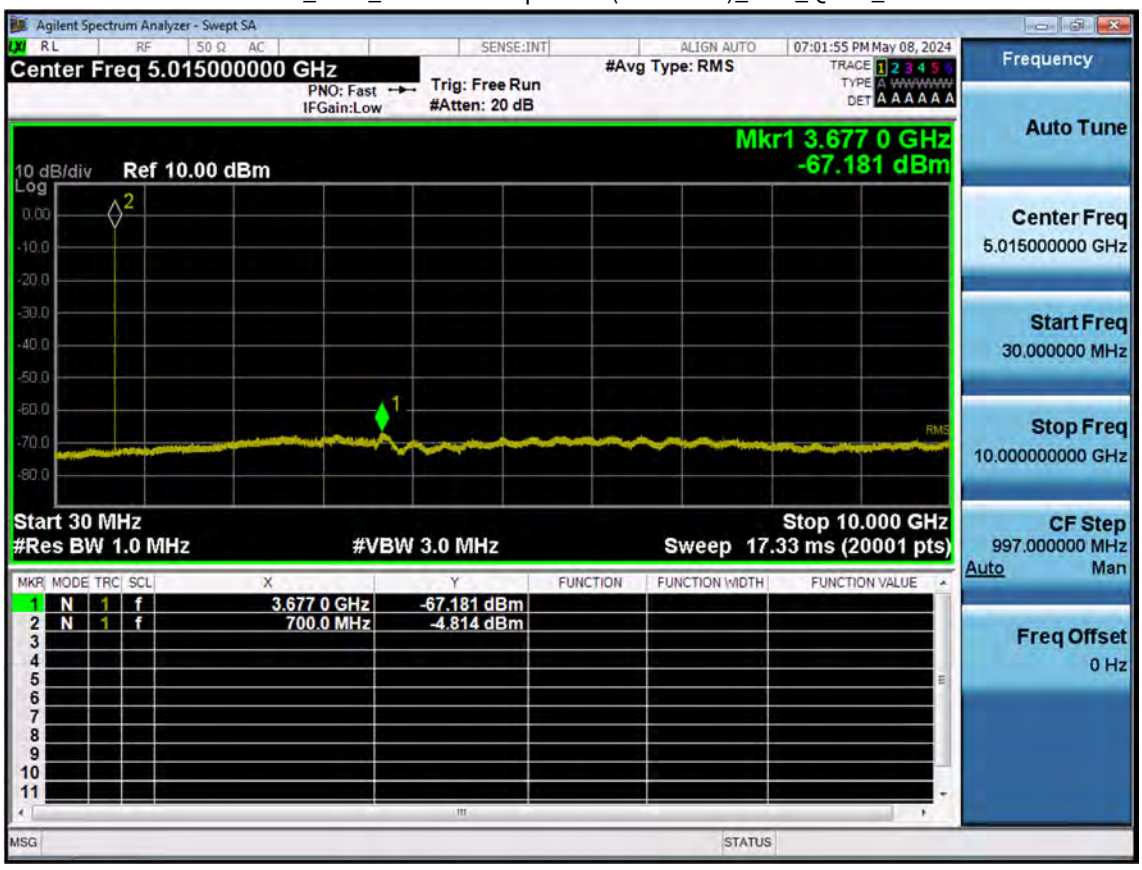
LTE B12_5 M_Conducted Spurious(30 M-10 G)_Mid_QPSK_1RB



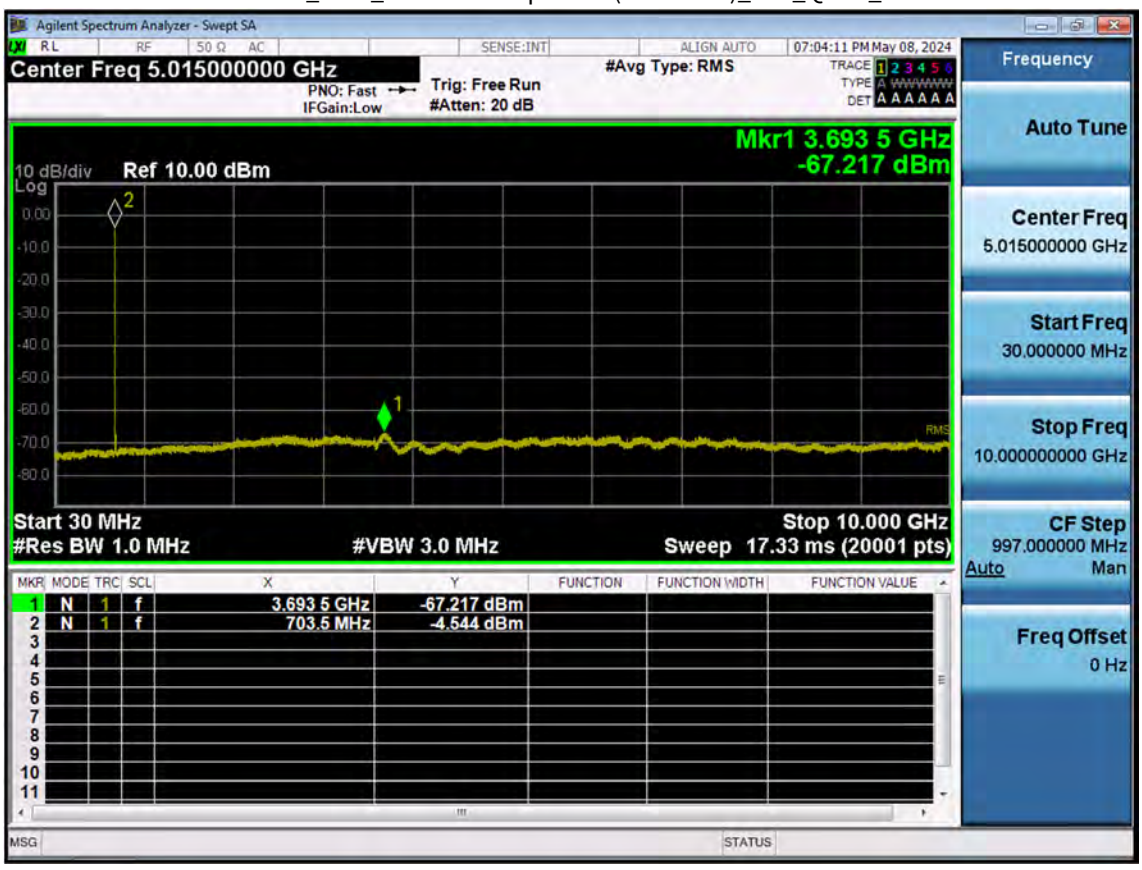
LTE B12_5 M_Conducted Spurious(30 M-10 G)_High_QPSK_1RB



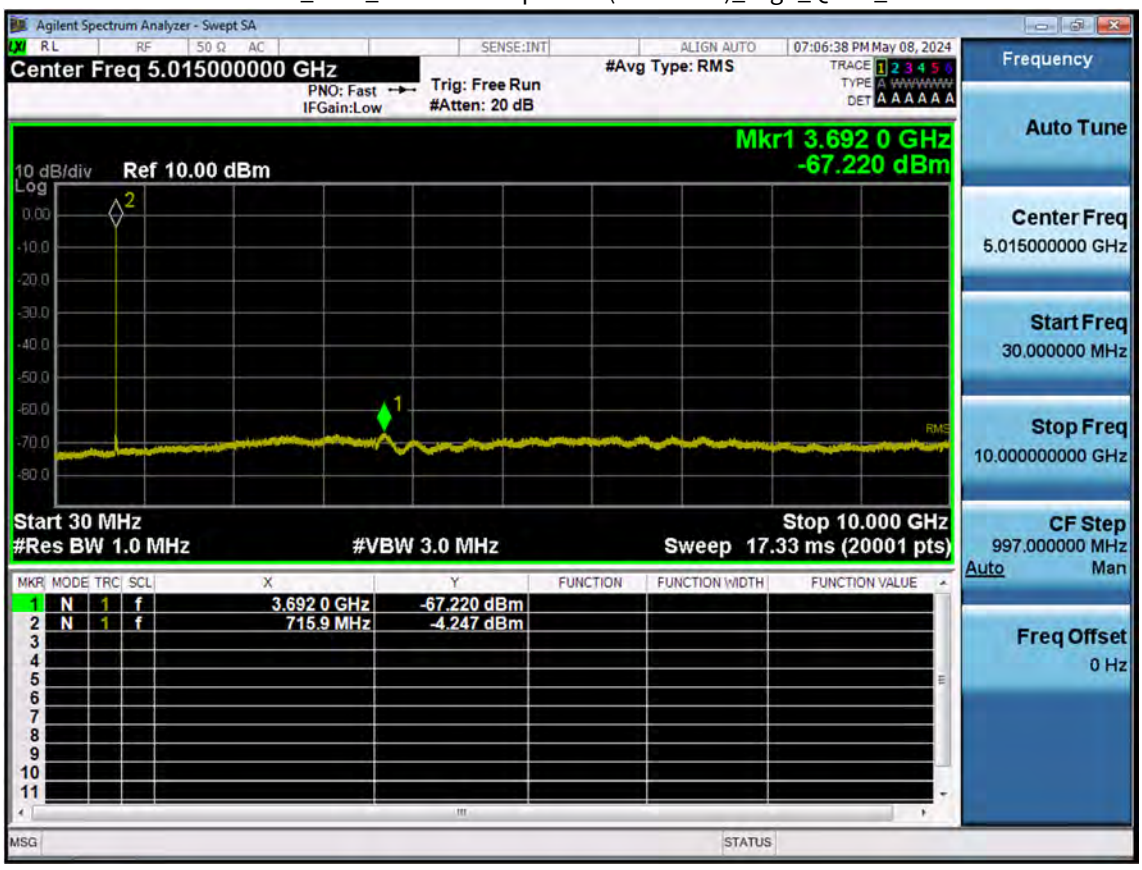
LTE B12_10 M_Conducted Spurious(30 M-10 G)_Low_QPSK_1RB



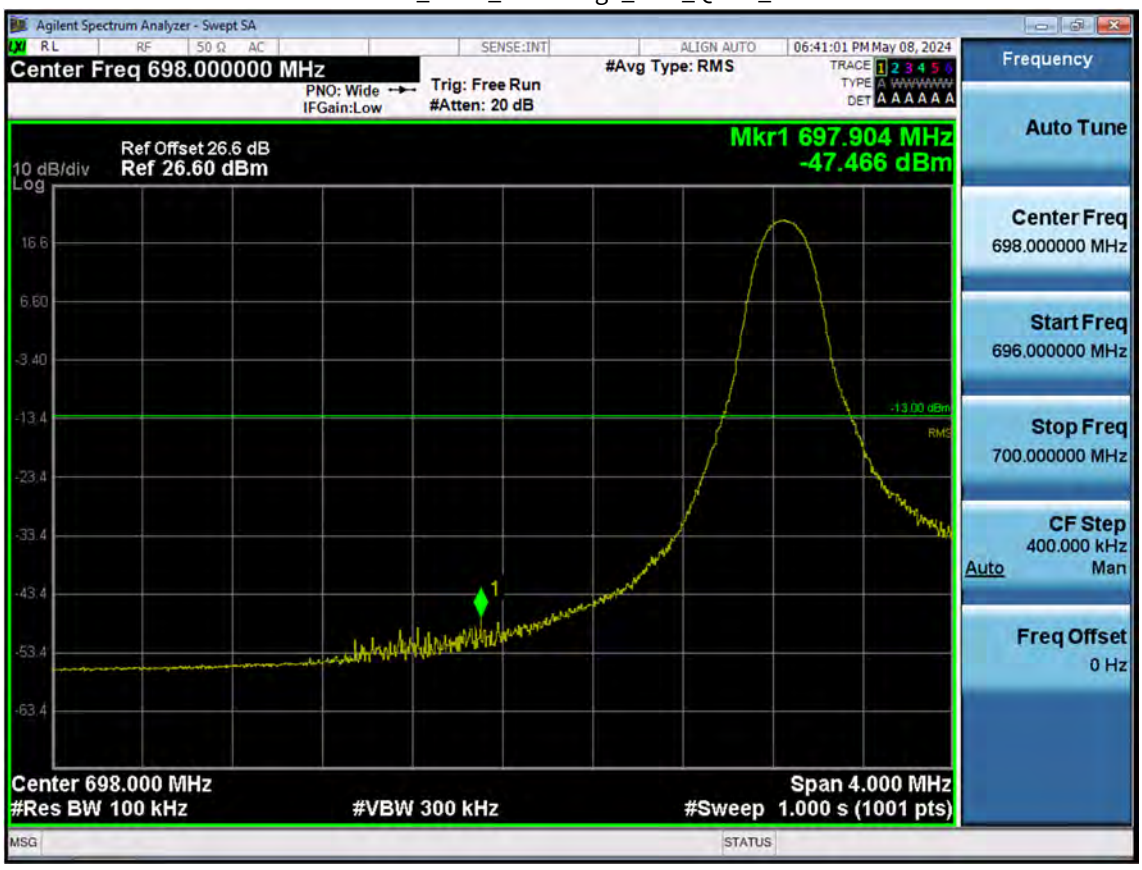
LTE B12_10 M_Conducted Spurious(30 M-10 G)_Mid_QPSK_1RB



LTE B12_10 M_Conducted Spurious(30 M-10 G)_High_QPSK_1RB



LTE B12_1.4 M_Band Edge_Low_QPSK_1RB



LTE B12_1.4 M_Band Edge_Low_QPSK_FullRB

LTE B12_1.4 M_Extended Band Edge_Low_QPSK_FullRB

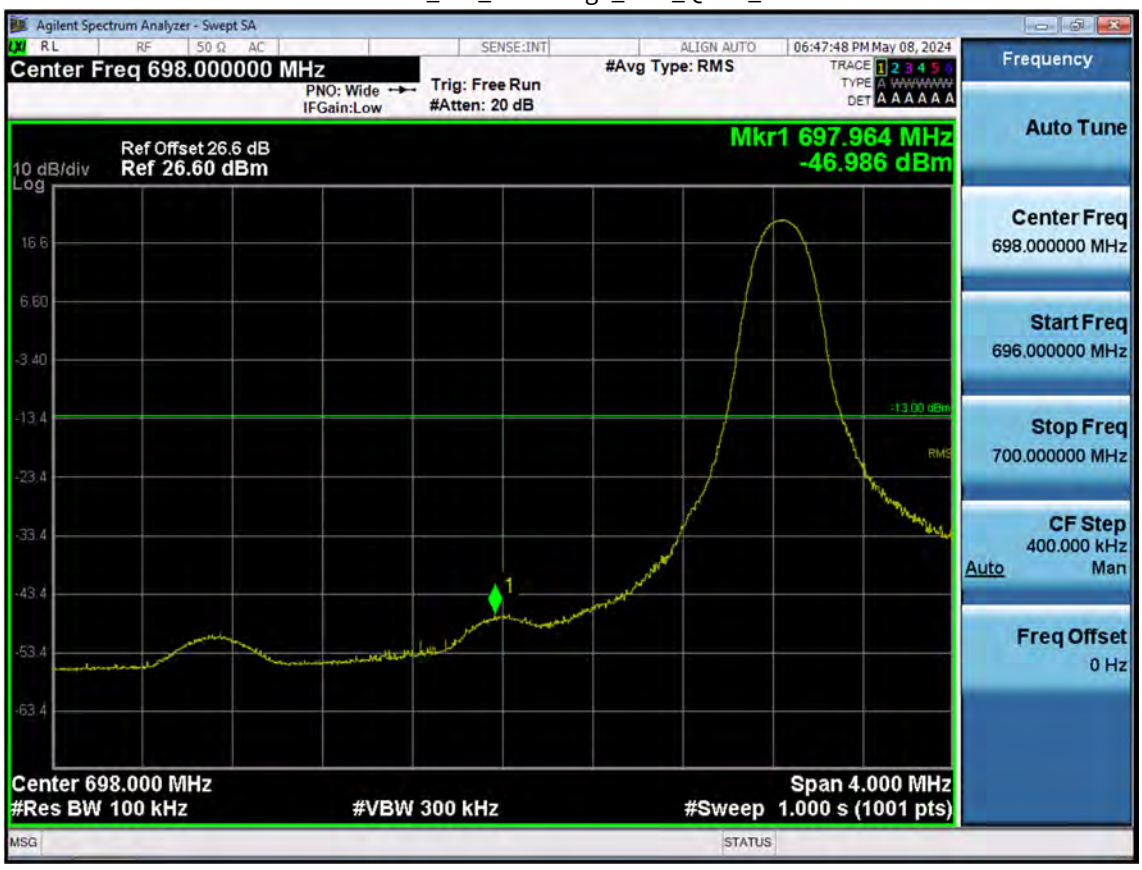
LTE B12_1.4 M_Band Edge_High_QPSK_1RB(1)

LTE B12_1.4 M_Band Edge_High_QPSK_1RB(2)

LTE B12_1.4 M_Band Edge_High_QPSK_FullRB

LTE B12_1.4 M_Extended Band Edge_High_QPSK_FullRB

LTE B12_3 M_Band Edge_Low_QPSK_1RB



LTE B12_3 M_Band Edge_Low_QPSK_FullRB

LTE B12_3 M_Extended Band Edge_Low_QPSK_FullRB

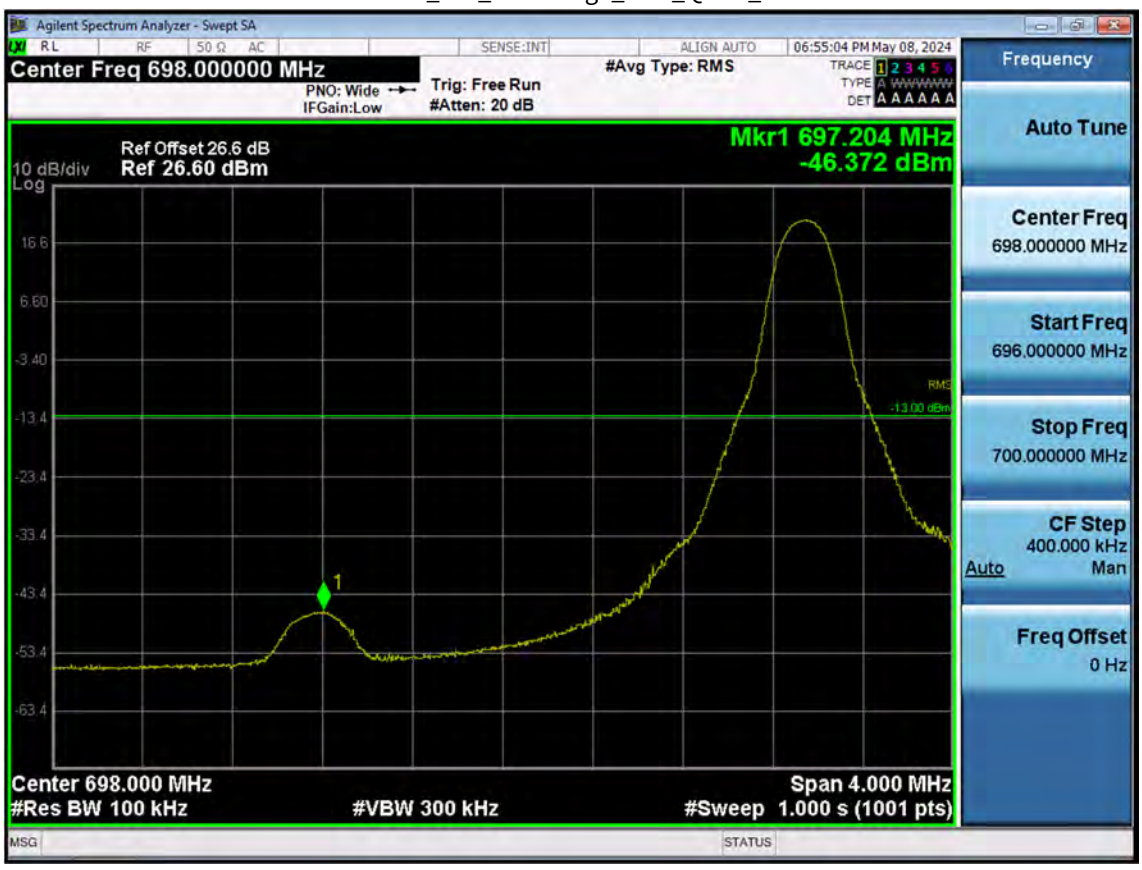
LTE B12_3 M_Band Edge_High_QPSK_1RB(1)

LTE B12_3 M_Band Edge_High_QPSK_1RB(2)

LTE B12_3 M_Band Edge_High_QPSK_FullRB

LTE B12_3 M_Extended Band Edge_High_QPSK_FullRB

LTE B12_5 M_Band Edge_Low_QPSK_1RB



LTE B12_5 M_Band Edge_Low_QPSK_FullRB

LTE B12_5 M_Extended Band Edge_Low_QPSK_FullRB

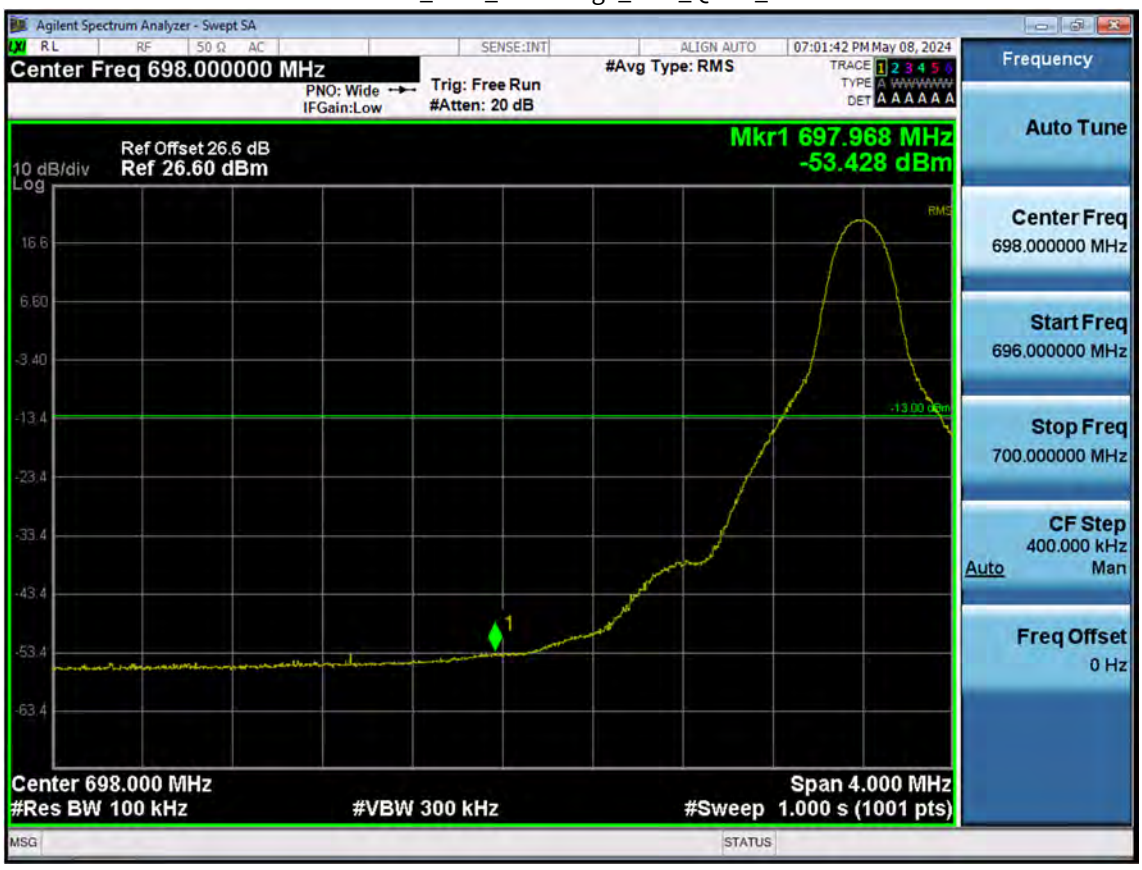
LTE B12_5 M_Band Edge_High_QPSK_1RB(1)

LTE B12_5 M_Band Edge_High_QPSK_1RB(2)

LTE B12_5 M_Band Edge_High_QPSK_FullRB

LTE B12_5 M_Extended Band Edge_High_QPSK_FullRB

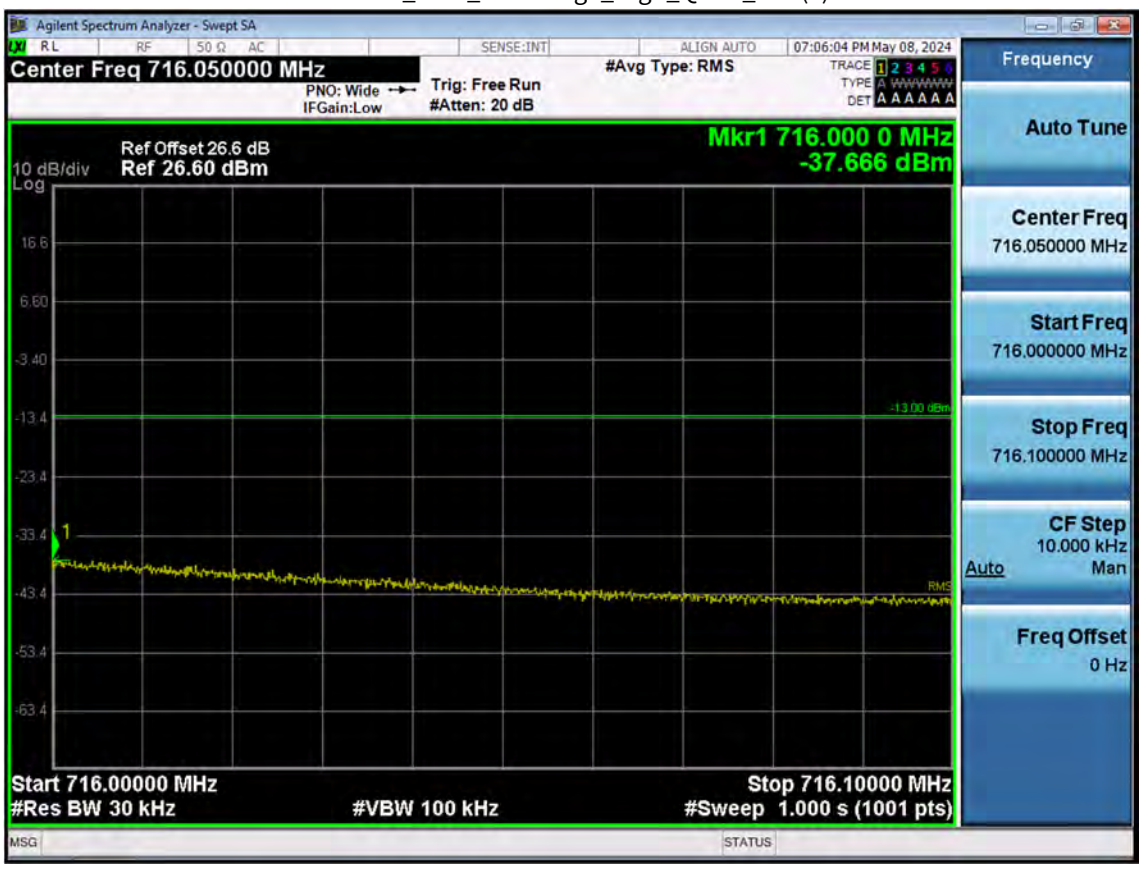
LTE B12_10 M_Band Edge_Low_QPSK_1RB



LTE B12_10 M_Band Edge_Low_QPSK_FullRB

LTE B12_10 M_Extended Band Edge_Low_QPSK_FullRB

LTE B12_10 M_Band Edge_High_QPSK_1RB(1)



LTE B12_10 M_Band Edge_High_QPSK_1RB(2)

LTE B12_10 M_Band Edge_High_QPSK_FullRB

LTE B12_10 M_Extended Band Edge_High_QPSK_FullRB

## 10. ANNEX A_ TEST SETUP PHOTO

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

| No. | Description |
|---|---|
| 1 | HCT-RF-2405-FC035 |