

# TEST REPORT

FCC LTE B30 Test for SM-S931U  
Certification

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

**REPORT NO.**  
HCT-RF-2410-FC014

**DATE OF ISSUE**  
October 22, 2024

**Tested by**  
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**TEST  
REPORT****REPORT NO.**

HCT-RF-2410-FC014

**DATE OF ISSUE**

October 22, 2024

**Additional Model**

SM-S931U1

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

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

**Product Name**

Mobile Phone

**Model Name**

SM-S931U

**Date of Test**

August 21, 2024 ~ October 22, 2024

**FCC ID**

A3LSMS931U

**Location of Test**☒ Permanent Testing Lab ☐ On Site Testing

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

**FCC Classification:**

PCS Licensed Transmitter Held to Ear (PCE)

**Test Standard Used**

FCC Rule Part: § 27

**Test Results**

PASS

## REVISION HISTORY

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

| Revision No. | Date of Issue    | Description     |
|--------------|------------------|-----------------|
| 0            | October 22, 2024 | Initial Release |

## Notice

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### Content

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The measurements shown in this report were made in accordance with the procedures specified in CFR47 section § 2.947. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998, 21 U.S. C. 853(a)

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

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

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

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

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

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

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

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## MEASUREMENT REPORT

### 1. GENERAL INFORMATION

|                            |                                                                                       |
|----------------------------|---------------------------------------------------------------------------------------|
| <b>Applicant Name:</b>     | SAMSUNG Electronics Co., Ltd.                                                         |
| <b>Address:</b>            | 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea            |
| <b>FCC ID:</b>             | A3LSMS931U                                                                            |
| <b>Application Type:</b>   | Certification                                                                         |
| <b>FCC Classification:</b> | PCS Licensed Transmitter Held to Ear (PCE)                                            |
| <b>FCC Rule Part(s):</b>   | § 27                                                                                  |
| <b>EUT Type:</b>           | Mobile phone                                                                          |
| <b>Model(s):</b>           | SM-S931U                                                                              |
| <b>Additional Model(s)</b> | SM-S931U1                                                                             |
| <b>Tx Frequency:</b>       | 2307.5 MHz – 2312.5 MHz (LTE – Band30 (5 MHz))<br>2310.0 MHz (LTE – Band30 (10 MHz))  |
| <b>Date(s) of Tests:</b>   | August 21, 2024 ~ October 22, 2024                                                    |
| <b>Serial number:</b>      | Radiated : R3CX80BGDYZ<br>Conducted : R3CX70H9H0B(Main 1 ANT), R3CX80PDM0T(Sub 2 ANT) |

## 1.1. MAXIMUM OUTPUT POWER

### Main 1 ANT

| Mode (MHz)         | Tx Frequency (MHz) | Emission Designator | Modulation | EIRP           |                  |
|--------------------|--------------------|---------------------|------------|----------------|------------------|
|                    |                    |                     |            | Max. Power (W) | Max. Power (dBm) |
| LTE – Band 30 (5)  | 2307.5 – 2312.5    | 4M53G7D             | QPSK       | 0.111          | 20.44            |
|                    |                    | 4M51W7D             | 16QAM      | 0.099          | 19.97            |
|                    |                    | 4M52W7D             | 64QAM      | 0.077          | 18.89            |
|                    |                    | 4M50W7D             | 256QAM     | 0.037          | 15.63            |
| LTE – Band 30 (10) | 2310.0             | 9M01G7D             | QPSK       | 0.111          | 20.44            |
|                    |                    | 8M99W7D             | 16QAM      | 0.093          | 19.67            |
|                    |                    | 8M98W7D             | 64QAM      | 0.071          | 18.51            |
|                    |                    | 8M98W7D             | 256QAM     | 0.035          | 15.47            |

### Sub 2 ANT

| Mode (MHz)         | Tx Frequency (MHz) | Emission Designator | Modulation | EIRP           |                  |
|--------------------|--------------------|---------------------|------------|----------------|------------------|
|                    |                    |                     |            | Max. Power (W) | Max. Power (dBm) |
| LTE – Band 30 (5)  | 2307.5 – 2312.5    | 4M50G7D             | QPSK       | 0.069          | 18.41            |
|                    |                    | 4M52W7D             | 16QAM      | 0.060          | 17.80            |
|                    |                    | 4M51W7D             | 64QAM      | 0.047          | 16.74            |
|                    |                    | 4M52W7D             | 256QAM     | 0.023          | 13.62            |
| LTE – Band 30 (10) | 2310.0             | 8M97G7D             | QPSK       | 0.069          | 18.37            |
|                    |                    | 8M99W7D             | 16QAM      | 0.057          | 17.58            |
|                    |                    | 8M99W7D             | 64QAM      | 0.045          | 16.57            |
|                    |                    | 8M96W7D             | 256QAM     | 0.022          | 13.51            |

## 2. INTRODUCTION

### 2.1. DESCRIPTION OF EUT

The EUT was a Mobile Phone with GSM/GPRS/EGPRS/UMTS and LTE, Sub 6, mmWave. It also supports IEEE 802.11 a/b/g/n/ac/ax/be (20/40/80/160/320 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, 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<br>- ANSI C63.26-2015 – Section 5.4.4                                                   |
| Channel 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)                                                                                                        |
| Peak- to- Average Ratio                                         | - KDB 971168 D01 v03r01 – Section 5.7<br>- ANSI C63.26-2015 – Section 5.2.3.4<br>- ANSI C63.26-2015 – Section 5.2.6(only GSM) |
| Frequency stability                                             | - ANSI C63.26-2015 – Section 5.6                                                                                              |
| Effective Radiated Power/<br>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  $\geq$  3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points > 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

#### Test Note

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

The power is calculated by the following formula;

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

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

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

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

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

### 3.3 RADIATED SPURIOUS EMISSIONS

#### Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

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

#### Test Note

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

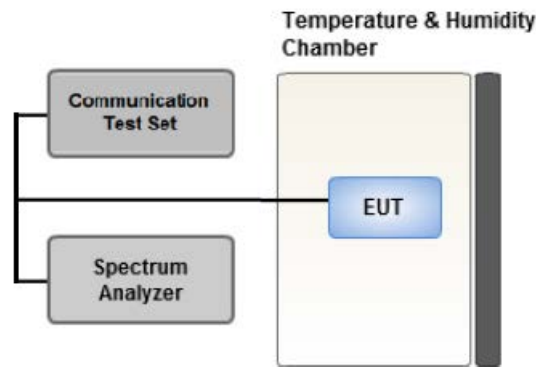
$$\text{Result}_{(\text{dBm})} = P_g_{(\text{dBm})} - \text{cable loss}_{(\text{dB})} + \text{antenna gain}_{(\text{dBi})}$$

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

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

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

## 3.4 PEAK- TO- AVERAGE RATIO



Test setup

### ① CCDF Procedure for PAPR

#### Test Settings

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

### ② Alternate Procedure for PAPR

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

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

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

**Test Settings(Peak Power)**

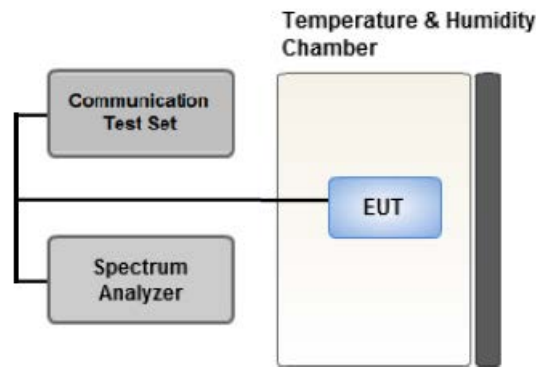
The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW  $\geq 3 \times$  RBW.

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

**Test Settings(Average Power)**

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

### 3.5 OCCUPIED BANDWIDTH.



#### Test setup

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

The EUT makes a call to the communication simulator.

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

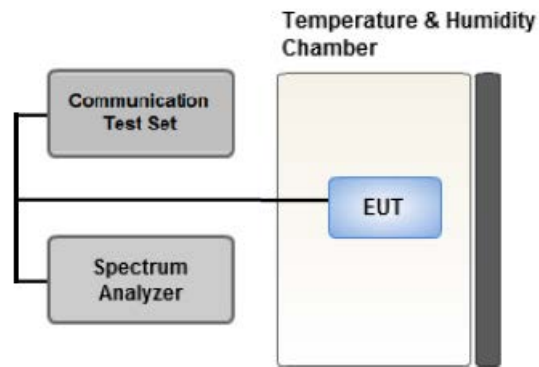
The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency.

Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth

#### Test Settings

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

### 3.6 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL



Test setup

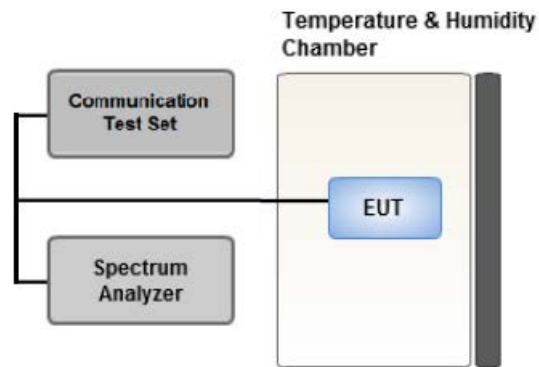
#### Test Overview

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

#### Test Settings

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

### 3.7 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 1 MHz 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 Limit**

§ 27.53(a)

- (4) For mobile and portable stations operating in the 2305-2315 MHz and 2350-2360 MHz bands:
- (i) By a factor of not less than:  $43 + 10 \log (P)$  dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than  $55 + 10 \log (P)$  dB on all frequencies between 2320 and 2324 MHz and on all frequencies between 2341 and 2345 MHz, not less than  $61 + 10 \log (P)$  dB on all frequencies between 2324 and 2328 MHz and on all frequencies between 2337 and 2341 MHz, and not less than  $67 + 10 \log (P)$  dB on all frequencies between 2328 and 2337 MHz;
  - (ii) By a factor of not less than  $43 + 10 \log (P)$  dB on all frequencies between 2300 and 2305 MHz,  $55 + 10 \log (P)$  dB on all frequencies between 2296 and 2300 MHz,  $61 + 10 \log (P)$  dB on all frequencies between 2292 and 2296 MHz,  $67 + 10 \log (P)$  dB on all frequencies between 2288 and 2292 MHz, and  $70 + 10 \log (P)$  dB below 2288 MHz;
  - (iii) By a factor of not less than  $43 + 10 \log (P)$  dB on all frequencies between 2360 and 2365 MHz, and not less than  $70 + 10 \log (P)$  dB above 2365 MHz

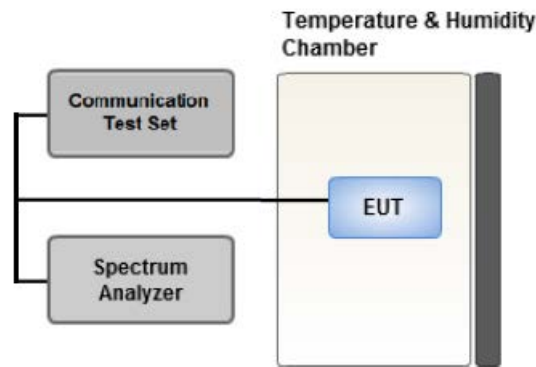
**Test Notes**

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.

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

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

### 3.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE



Test setup

#### Test Overview

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

The frequency stability of the transmitter is measured by:

1. Temperature:

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

2. Primary Supply Voltage:

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

#### Test Settings

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

### 3.9 WORST CASE(RADIATED TEST)

- The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
- All modes of operation were investigated and the worst case configuration results are reported.  
Mode : Stand alone, Stand alone + External accessories (Earphone, AC adapter, etc)  
Worst case : Stand alone
- All simultaneous transmission scenarios of operation were investigated, and the test results showed no additional significant emissions relative to the least restrictive limit were observed.  
Therefore, only the worst case(stand-alone) results were reported.
- The worst case is reported with the EUT positioning, modulations, and paging service configurations shown in the test data.
- SM-S931U & additional models were tested and the worst case results are reported.  
(Worst case : SM-S931U)

[ Main 1 ANT Worst case ]

| Test Description                         | Modulation                          | RB size         | RB offset | Axis |
|------------------------------------------|-------------------------------------|-----------------|-----------|------|
| Effective Isotropic Radiated Power       | QPSK,<br>16QAM,<br>64QAM,<br>256QAM | See Section 8.1 |           | Z    |
| Radiated Spurious and Harmonic Emissions | QPSK                                | See Section 8.2 |           | Z    |

[ Sub 2 ANT Worst case ]

| Test Description                         | Modulation                          | RB size         | RB offset | Axis |
|------------------------------------------|-------------------------------------|-----------------|-----------|------|
| Effective Isotropic Radiated Power       | QPSK,<br>16QAM,<br>64QAM,<br>256QAM | See Section 9.1 |           | Z    |
| Radiated Spurious and Harmonic Emissions | QPSK                                | See Section 9.2 |           | Z    |

### 3.10 WORST CASE(CONDUCTED TEST)

- All modes of operation were investigated and the worst case configuration results are reported.
  - SM-S931U & additional models were tested and the worst case results are reported.
- (Worst case : SM-S931U)

[ Worst case ]

| Test Description                                       | Modulation                          | Bandwidth<br>(MHz) | Frequency            | RB size | RB offset |
|--------------------------------------------------------|-------------------------------------|--------------------|----------------------|---------|-----------|
| Occupied Bandwidth                                     | QPSK,<br>16QAM,<br>64QAM,<br>256QAM | 5, 10              | Mid                  | Full RB | 0         |
| Peak-To-Average Ratio                                  | QPSK,<br>16QAM,<br>64QAM,<br>256QAM | 5, 10              | Mid                  | Full RB | 0         |
| Band Edge                                              | QPSK                                | 5                  | Low,<br>Mid,<br>High | 1       | 0, 24     |
|                                                        |                                     | 10                 | Mid                  | 1       | 0, 49     |
|                                                        |                                     | 5                  | Low,<br>Mid,<br>High | Full RB | 0         |
|                                                        |                                     | 10                 | Mid                  | Full RB | 0         |
| Spurious and Harmonic Emissions at<br>Antenna Terminal | QPSK                                | 5                  | Low,<br>Mid,<br>High | 1       | 0         |
|                                                        |                                     | 10                 | Mid                  | 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        | 08/21/2025         | Annual               |
| RF Switching System                                  | Switch box(3.3 G HPF+LNA) | HCT CO., LTD.,   | F1L2        | 08/21/2025         | Annual               |
| RF Switching System                                  | Switch box(LNA)           | HCT CO., LTD.,   | F1L4        | 08/21/2025         | Annual               |
| RF Switching System                                  | Switch box(6 G HPF+LNA)   | HCT CO., LTD.,   | F1L7        | 08/21/2025         | 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  | 11/17/2024         | Annual               |
| Wideband Radio Communication Tester                  | MT8820C                   | Anritsu Corp.    | 6201026545  | 12/11/2024         | Annual               |
| SIGNAL GENERATOR (100 kHz ~ 40 GHz)                  | SMB100A                   | REOHDE & SCHWARZ | 177633      | 07/26/2025         | Annual               |
| Signal Analyzer(5 Hz ~ 40.0 GHz)                     | N9030B                    | KEYSIGHT         | MY55480167  | 05/17/2025         | Annual               |
| FCC LTE Mobile Conducted RF Automation Test Software | -                         | HCT CO., LTD.,   | -           | -                  | -                    |

##### Note:

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

## 5. MEASUREMENT UNCERTAINTY

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

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

| Parameter                                | Expanded Uncertainty ( $\pm$ 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,<br>§ 27.53(a) | Section 3.7                  | PASS             |
| Conducted Output Power                                           | § 2.1046                | N/A                          | <u>See Note1</u> |
| Peak- to- Average Ratio                                          | § 27.50(d)(5)           | < 13 dB                      | PASS             |
| Frequency stability / variation of ambient temperature           | § 2.1055,<br>§ 27.54    | Emission must remain in band | PASS             |

#### Note:

1. See SAR Report

### 6.2 Test Condition: Radiated Test

| Test Description                         | FCC Part Section(s)     | Test Limit                            | Test Result |
|------------------------------------------|-------------------------|---------------------------------------|-------------|
| Equivalent Isotropic Radiated Power      | § 27.50(a)(3)           | < 0.25 Watts max. EIRP                | PASS        |
| Radiated Spurious and Harmonic Emissions | § 2.1053,<br>§ 27.53(a) | < 70 + 10log <sub>10</sub> (P[Watts]) | PASS        |

## 7. SAMPLE CALCULATION

### 7.1 ERP Sample Calculation

| Ch./ Freq. |            | Measured<br>Level (dBm) | Substitute<br>Level (dBm) | Ant. Gain<br>(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<br>Level (dBm) | Substitute<br>Level (dBm) | Ant. Gain<br>(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 = 4 M17F9W  
WCDMA BW = 4.17 MHz  
F = Frequency Modulation  
9 = Composite Digital Info  
W = Combination (Audio/Data)

#### QPSK Modulation

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

#### QAM Modulation

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

## 8. TEST DATA(Main 1 ANT)

### 8.1 EQUIVALENT ISOTROPIC RADIATED POWER

| Freq<br>(MHz) | Mod/<br>Bandwidth | Modulation | Measured       | Substitute     | Ant. Gain<br>(dBi) | C.L  | Pol | Limit | EIRP  |       | RB   |        |
|---------------|-------------------|------------|----------------|----------------|--------------------|------|-----|-------|-------|-------|------|--------|
|               |                   |            | Level<br>(dBm) | Level<br>(dBm) |                    |      |     | W     | W     | dBm   | Size | Offset |
| 2307.5        | LTE B30/<br>5 MHz | QPSK       | -25.11         | 13.08          | 9.54               | 2.34 | V   | <0.25 | 0.107 | 20.28 | 1    | 24     |
|               |                   | 16-QAM     | -25.59         | 12.60          | 9.54               | 2.34 | V   |       | 0.095 | 19.80 |      |        |
|               |                   | 64-QAM     | -26.72         | 11.47          | 9.54               | 2.34 | V   |       | 0.074 | 18.67 |      |        |
|               |                   | 256-QAM    | -29.98         | 8.21           | 9.54               | 2.34 | V   |       | 0.035 | 15.41 |      |        |
| 2310.0        |                   | QPSK       | -24.97         | 13.22          | 9.54               | 2.34 | V   |       | 0.110 | 20.42 | 1    | 13     |
|               |                   | 16-QAM     | -25.42         | 12.77          | 9.54               | 2.34 | V   |       | 0.099 | 19.97 |      |        |
|               |                   | 64-QAM     | -26.54         | 11.65          | 9.54               | 2.34 | V   |       | 0.077 | 18.85 |      |        |
|               |                   | 256-QAM    | -29.78         | 8.41           | 9.54               | 2.34 | V   |       | 0.036 | 15.61 |      |        |
| 2312.5        |                   | QPSK       | -25.01         | 13.16          | 9.61               | 2.33 | V   |       | 0.111 | 20.44 | 1    | 0      |
|               |                   | 16-QAM     | -25.50         | 12.67          | 9.61               | 2.33 | V   |       | 0.099 | 19.95 |      |        |
|               |                   | 64-QAM     | -26.56         | 11.61          | 9.61               | 2.33 | V   |       | 0.077 | 18.89 |      |        |
|               |                   | 256-QAM    | -29.82         | 8.35           | 9.61               | 2.33 | V   |       | 0.037 | 15.63 |      |        |

| Freq<br>(MHz) | Mod/<br>Bandwidth  | Modulation | Measured<br>Level<br>(dBm) | Substitute<br>Level<br>(dBm) | Ant. Gain<br>(dBi) | C.L  | Pol | Limit  | EIRP  |       | RB   |        |
|---------------|--------------------|------------|----------------------------|------------------------------|--------------------|------|-----|--------|-------|-------|------|--------|
|               |                    |            |                            |                              |                    |      |     | W      | W     | dBm   | Size | Offset |
| 2310.0        | LTE B30/<br>10 MHz | QPSK       | -24.95                     | 13.24                        | 9.54               | 2.34 | V   | < 0.25 | 0.111 | 20.44 | 1    | 25     |
|               |                    | 16-QAM     | -25.72                     | 12.47                        | 9.54               | 2.34 | V   |        | 0.093 | 19.67 |      |        |
|               |                    | 64-QAM     | -26.88                     | 11.31                        | 9.54               | 2.34 | V   |        | 0.071 | 18.51 |      |        |
|               |                    | 256-QAM    | -29.92                     | 8.27                         | 9.54               | 2.34 | V   |        | 0.035 | 15.47 |      |        |

## 8.2 RADIATED SPURIOUS EMISSIONS

|                          |                            |
|--------------------------|----------------------------|
| ▣ OPERATING FREQUENCY :  | <u>2312.5 MHz</u>          |
| ▣ MEASURED OUTPUT POWER: | <u>20.44 dBm = 0.111 W</u> |
| ▣ MODE:                  | <u>LTE B30</u>             |
| ▣ MODULATION SIGNAL:     | <u>5 MHz QPSK</u>          |
| ▣ DISTANCE:              | <u>1 meters</u>            |
| ▣ LIMIT:                 | <u>-40 dBm</u>             |

| Ch                | Freq (MHz) | Measured Level (dBm) | Ant. Gain (dBi) | Substitute Level (dBm) | C.L  | Pol | Result (dBm) | Limit (dBm) | RB   |        |
|-------------------|------------|----------------------|-----------------|------------------------|------|-----|--------------|-------------|------|--------|
|                   |            |                      |                 |                        |      |     |              |             | Size | Offset |
| 27685<br>(2307.5) | 4 615.00   | -49.61               | 12.57           | -68.54                 | 3.52 | H   | -59.49       | -40.00      | 1    | 24     |
|                   | 6 922.50   | -51.23               | 11.80           | -62.58                 | 4.40 | H   | -55.18       | -40.00      |      |        |
|                   | 9 230.00   | -49.63               | 10.58           | -55.51                 | 5.16 | H   | -50.09       | -40.00      |      |        |
| 27710<br>(2310.0) | 4 620.00   | -50.63               | 12.56           | -69.49                 | 3.51 | H   | -60.44       | -40.00      | 1    | 13     |
|                   | 6 930.00   | -52.84               | 11.78           | -63.76                 | 4.40 | H   | -56.38       | -40.00      |      |        |
|                   | 9 240.00   | -51.20               | 10.54           | -57.01                 | 5.16 | H   | -51.63       | -40.00      |      |        |
| 27735<br>(2312.5) | 4 625.00   | -50.83               | 12.55           | -69.71                 | 3.50 | H   | -60.66       | -40.00      | 1    | 0      |
|                   | 6 937.50   | -52.52               | 11.74           | -62.32                 | 4.41 | H   | -54.99       | -40.00      |      |        |
|                   | 9 250.00   | -50.12               | 10.50           | -55.47                 | 5.17 | H   | -50.14       | -40.00      |      |        |

■ OPERATING FREQUENCY : 2310.0 MHz  
 ■ MEASURED OUTPUT POWER: 20.44 dBm = 0.111 W  
 ■ MODE: LTE B30  
 ■ MODULATION SIGNAL: 10 MHz QPSK  
 ■ DISTANCE: 1 meters  
 ■ LIMIT: -40 dBm

| Ch                | Freq (MHz) | Measured Level (dBm) | Ant. Gain (dBi) | Substitute Level (dBm) | C.L  | Pol | Result (dBm) | Limit (dBm) | RB   |        |
|-------------------|------------|----------------------|-----------------|------------------------|------|-----|--------------|-------------|------|--------|
|                   |            |                      |                 |                        |      |     |              |             | Size | Offset |
| 27710<br>(2310.0) | 4 620.00   | -51.20               | 12.56           | -70.06                 | 3.51 | H   | -61.01       | -40.00      | 1    | 25     |
|                   | 6 930.00   | -52.72               | 11.78           | -63.64                 | 4.40 | H   | -56.26       | -40.00      |      |        |
|                   | 9 240.00   | -50.60               | 10.54           | -56.41                 | 5.16 | H   | -51.03       | -40.00      |      |        |

### 8.3 PEAK-TO-AVERAGE RATIO

| Band | Band Width | Frequency (MHz) | Modulation | Resource Block Size | Resource Block Offset | Data (dB ) |
|------|------------|-----------------|------------|---------------------|-----------------------|------------|
| 30   | 5 MHz      | 2310.0          | QPSK       | 25                  | 0                     | 4.69       |
|      |            |                 | 16-QAM     |                     |                       | 5.73       |
|      |            |                 | 64-QAM     |                     |                       | 6.56       |
|      |            |                 | 256-QAM    |                     |                       | 6.79       |
|      | 10 MHz     |                 | QPSK       | 50                  |                       | 4.60       |
|      |            |                 | 16-QAM     |                     |                       | 5.64       |
|      |            |                 | 64-QAM     |                     |                       | 6.40       |
|      |            |                 | 256-QAM    |                     |                       | 6.63       |

**Note:**

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 54 ~ 61.

## 8.4 OCCUPIED BANDWIDTH

| Band | Band Width | Frequency (MHz) | Modulation | Resource Block Size | Resource Block Offset | Data ( MHz ) |
|------|------------|-----------------|------------|---------------------|-----------------------|--------------|
| 30   | 5 MHz      | 2310.0          | QPSK       | 25                  | 0                     | 4.5267       |
|      |            |                 | 16-QAM     |                     |                       | 4.5131       |
|      |            |                 | 64-QAM     |                     |                       | 4.5217       |
|      |            |                 | 256-QAM    |                     |                       | 4.4946       |
|      | 10 MHz     |                 | QPSK       | 50                  |                       | 9.0118       |
|      |            |                 | 16-QAM     |                     |                       | 8.9859       |
|      |            |                 | 64-QAM     |                     |                       | 8.9797       |
|      |            |                 | 256-QAM    |                     |                       | 8.9780       |

### **Note:**

1. Plots of the EUT's Occupied Bandwidth are shown Page 62 ~ 69.

## 8.5 CONDUCTED SPURIOUS EMISSIONS

| Band | Band Width (MHz) | Frequency (MHz) | Frequency of Maximum Harmonic (GHz) | Factor (dB) | Measurement Maximum Data (dBm) | Result (dBm) | Limit (dBm) |
|------|------------------|-----------------|-------------------------------------|-------------|--------------------------------|--------------|-------------|
| 30   | 5                | 2307.5          | 3.7005                              | 27.976      | -76.700                        | -48.724      | -40.00      |
|      |                  | 2310.0          | 26.1649                             | 30.131      | -76.853                        | -46.722      |             |
|      |                  | 2312.5          | 26.1372                             | 30.131      | -76.826                        | -46.695      |             |
|      | 10               | 2310.0          | 26.1343                             | 30.131      | -76.425                        | -46.294      |             |

### Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 70 ~ 77.
2. Conducted Spurious Emissions was Tested QPSK Modulation, Resource Block Size 1 and Resource Block Offset 0
3. Result (dBm) = Measurement Maximum Data (dBm) + Factor (dB)
4. Factor(dB) = Cable Loss + Attenuator + Power Splitter

| Frequency Range (GHz) | Factor [dB] |
|-----------------------|-------------|
| 0.03 – 1              | 25.270      |
| 1 – 5                 | 27.976      |
| 5 – 10                | 28.591      |
| 10 – 15               | 29.116      |
| 15 – 20               | 29.489      |
| Above 20(26.5)        | 30.131      |

## 8.6 BAND EDGE

| Band Width<br>(MHz) | Frequency<br>(MHz) | Modulation | RB<br>(Size/ Offset) | Frequency<br>Range<br>(MHz) | Maximum<br>Data<br>(dBm) | Limit<br>(dBm) |
|---------------------|--------------------|------------|----------------------|-----------------------------|--------------------------|----------------|
| 5                   | 2307.5             | QPSK       | 25/0                 | Below 2288                  | -53.119                  | -40            |
|                     |                    |            |                      | 2288 - 2292                 | -50.758                  | -37            |
|                     |                    |            |                      | 2292 - 2296                 | -36.797                  | -31            |
|                     |                    |            |                      | 2296 - 2300                 | -32.231                  | -25            |
|                     |                    |            |                      | 2300 - 2304                 | -23.818                  | -13            |
|                     |                    |            |                      | 2304 - 2305                 | -26.742                  | -13            |
|                     |                    |            |                      | 2315 - 2320                 | -35.316                  | -13            |
|                     |                    |            |                      | 2320 - 2324                 | -40.696                  | -25            |
|                     |                    |            |                      | 2324 - 2328                 | -50.087                  | -31            |
|                     |                    |            |                      | 2328 - 2337                 | -52.832                  | -37            |
|                     |                    |            |                      | 2337 - 2341                 | -52.915                  | -31            |
|                     |                    |            |                      | 2341 - 2345                 | -52.917                  | -25            |
|                     |                    |            |                      | 2345 - 2365                 | -52.701                  | -13            |
|                     |                    |            |                      | Above 2365                  | -52.910                  | -40            |
|                     | 2310.0             | QPSK       | 25/0                 | Below 2288                  | -53.225                  | -40            |
|                     |                    |            |                      | 2288 - 2292                 | -52.702                  | -37            |
|                     |                    |            |                      | 2292 - 2296                 | -49.175                  | -31            |
|                     |                    |            |                      | 2296 - 2300                 | -35.532                  | -25            |
|                     |                    |            |                      | 2300 - 2305                 | -26.874                  | -13            |
|                     |                    |            |                      | 2315 - 2320                 | -30.557                  | -13            |
|                     |                    |            |                      | 2320 - 2324                 | -38.393                  | -25            |
|                     |                    |            |                      | 2324 - 2328                 | -49.465                  | -31            |
|                     |                    |            |                      | 2328 - 2337                 | -52.726                  | -37            |
|                     |                    |            |                      | 2337 - 2341                 | -52.886                  | -31            |
|                     |                    |            |                      | 2341 - 2345                 | -52.888                  | -25            |
|                     |                    |            |                      | 2345 - 2365                 | -52.673                  | -13            |
|                     |                    |            |                      | Above 2365                  | -52.918                  | -40            |
|                     | 2312.5             | QPSK       | 25/0                 | Below 2288                  | -53.234                  | -40            |
|                     |                    |            |                      | 2288 - 2292                 | -53.041                  | -37            |
|                     |                    |            |                      | 2292 - 2296                 | -50.707                  | -31            |

|    |        |      |      |             |         |     |
|----|--------|------|------|-------------|---------|-----|
|    |        |      |      | 2296 - 2300 | -40.444 | -25 |
|    |        |      |      | 2300 - 2305 | -33.153 | -13 |
|    |        |      |      | 2315 - 2316 | -27.067 | -13 |
|    |        |      |      | 2316 - 2320 | -23.051 | -13 |
|    |        |      |      | 2320 - 2324 | -35.120 | -25 |
|    |        |      |      | 2324 - 2328 | -38.948 | -31 |
|    |        |      |      | 2328 - 2337 | -52.151 | -37 |
|    |        |      |      | 2337 - 2341 | -52.914 | -31 |
|    |        |      |      | 2341 - 2345 | -52.892 | -25 |
|    |        |      |      | 2345 - 2365 | -52.619 | -13 |
|    |        |      |      | Above 2365  | -52.917 | -40 |
| 10 | 2310.0 | QPSK | 50/0 | Below 2288  | -52.088 | -40 |
|    |        |      |      | 2288 - 2292 | -44.059 | -37 |
|    |        |      |      | 2292 - 2296 | -38.087 | -31 |
|    |        |      |      | 2296 - 2300 | -33.156 | -25 |
|    |        |      |      | 2300 - 2304 | -20.391 | -13 |
|    |        |      |      | 2304 - 2305 | -28.044 | -13 |
|    |        |      |      | 2315 - 2316 | -30.352 | -13 |
|    |        |      |      | 2316 - 2320 | -25.480 | -13 |
|    |        |      |      | 2320 - 2324 | -34.558 | -25 |
|    |        |      |      | 2324 - 2328 | -40.200 | -31 |
|    |        |      |      | 2328 - 2337 | -48.021 | -37 |
|    |        |      |      | 2337 - 2341 | -52.887 | -31 |
|    |        |      |      | 2341 - 2345 | -52.869 | -25 |
|    |        |      |      | 2345 - 2365 | -52.649 | -13 |
|    |        |      |      | Above 2365  | -52.911 | -40 |

| Band Width<br>(MHz) | Frequency<br>(MHz) | Modulation | RB<br>(Size/ Offset) | Frequency<br>Range<br>(MHz) | Maximum<br>Data<br>(dBm) | Limit<br>(dBm) |
|---------------------|--------------------|------------|----------------------|-----------------------------|--------------------------|----------------|
| 5                   | 2307.5             | QPSK       | 1/0                  | Below 2288                  | -53.199                  | -40            |
|                     |                    |            |                      | 2288 - 2292                 | -53.011                  | -37            |
|                     |                    |            |                      | 2292 - 2296                 | -51.900                  | -31            |
|                     |                    |            |                      | 2296 - 2300                 | -48.727                  | -25            |
|                     |                    |            |                      | 2300 - 2304                 | -30.348                  | -13            |
|                     |                    |            |                      | 2304 - 2305                 | -19.714                  | -13            |
|                     |                    |            | 1/24                 | 2315 - 2320                 | -48.575                  | -13            |
|                     |                    |            |                      | 2320 - 2324                 | -51.940                  | -25            |
|                     |                    |            |                      | 2324 - 2328                 | -52.555                  | -31            |
|                     |                    |            |                      | 2328 - 2337                 | -52.885                  | -37            |
|                     |                    |            |                      | 2337 - 2341                 | -52.890                  | -31            |
|                     |                    |            |                      | 2341 - 2345                 | -52.868                  | -25            |
|                     |                    |            |                      | 2345 - 2365                 | -52.650                  | -13            |
|                     |                    |            |                      | Above 2365                  | -52.893                  | -40            |
|                     | 2310.0             | QPSK       | 1/0                  | Below 2288                  | -53.191                  | -40            |
|                     |                    |            |                      | 2288 - 2292                 | -53.043                  | -37            |
|                     |                    |            |                      | 2292 - 2296                 | -52.525                  | -31            |
|                     |                    |            |                      | 2296 - 2300                 | -50.765                  | -25            |
|                     |                    |            |                      | 2300 - 2305                 | -40.679                  | -13            |
|                     |                    |            | 1/24                 | 2315 - 2320                 | -39.119                  | -13            |
|                     |                    |            |                      | 2320 - 2324                 | -50.474                  | -25            |
|                     |                    |            |                      | 2324 - 2328                 | -52.292                  | -31            |
|                     |                    |            |                      | 2328 - 2337                 | -52.886                  | -37            |
|                     |                    |            |                      | 2337 - 2341                 | -52.906                  | -31            |
|                     |                    |            |                      | 2341 - 2345                 | -52.897                  | -25            |
|                     |                    |            |                      | 2345 - 2365                 | -52.662                  | -13            |
|                     |                    |            |                      | Above 2365                  | -52.876                  | -40            |
|                     | 2312.5             | QPSK       | 1/0                  | Below 2288                  | -53.204                  | -40            |
|                     |                    |            |                      | 2288 - 2292                 | -53.116                  | -37            |
|                     |                    |            |                      | 2292 - 2296                 | -52.790                  | -31            |
|                     |                    |            |                      | 2296 - 2300                 | -51.924                  | -25            |

|    |        |      |      |             |         |     |
|----|--------|------|------|-------------|---------|-----|
|    |        |      | 1/24 | 2300 - 2305 | -47.619 | -13 |
|    |        |      |      | 2315 - 2316 | -19.386 | -13 |
|    |        |      |      | 2316 - 2320 | -30.032 | -13 |
|    |        |      |      | 2320 - 2324 | -47.348 | -25 |
|    |        |      |      | 2324 - 2328 | -51.416 | -31 |
|    |        |      |      | 2328 - 2337 | -52.874 | -37 |
|    |        |      |      | 2337 - 2341 | -52.930 | -31 |
|    |        |      |      | 2341 - 2345 | -52.904 | -25 |
|    |        |      |      | 2345 - 2365 | -52.642 | -13 |
|    |        |      |      | Above 2365  | -52.924 | -40 |
| 10 | 2310.0 | QPSK | 1/0  | Below 2288  | -53.160 | -40 |
|    |        |      |      | 2288 - 2292 | -52.824 | -37 |
|    |        |      |      | 2292 - 2296 | -51.200 | -31 |
|    |        |      |      | 2296 - 2300 | -47.856 | -25 |
|    |        |      |      | 2300 - 2304 | -34.026 | -13 |
|    |        |      |      | 2304 - 2305 | -27.645 | -13 |
|    |        |      | 1/49 | 2315 - 2316 | -24.135 | -13 |
|    |        |      |      | 2316 - 2320 | -30.688 | -13 |
|    |        |      |      | 2320 - 2324 | -47.015 | -25 |
|    |        |      |      | 2324 - 2328 | -49.918 | -31 |
|    |        |      |      | 2328 - 2337 | -52.604 | -37 |
|    |        |      |      | 2337 - 2341 | -52.914 | -31 |
|    |        |      |      | 2341 - 2345 | -52.886 | -25 |
|    |        |      |      | 2345 - 2365 | -52.633 | -13 |
|    |        |      |      | Above 2365  | -52.905 | -40 |

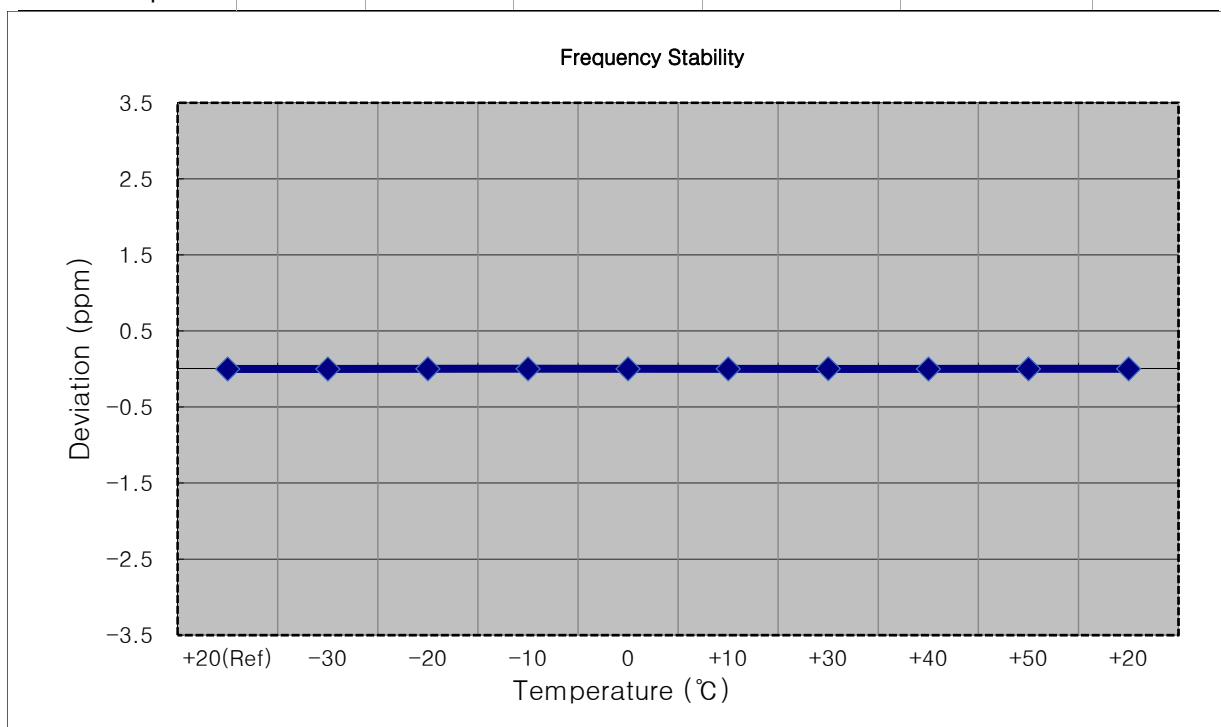
Note:

- Plots of the EUT's Band Edge are shown Page 78 ~ 189.

## 8.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

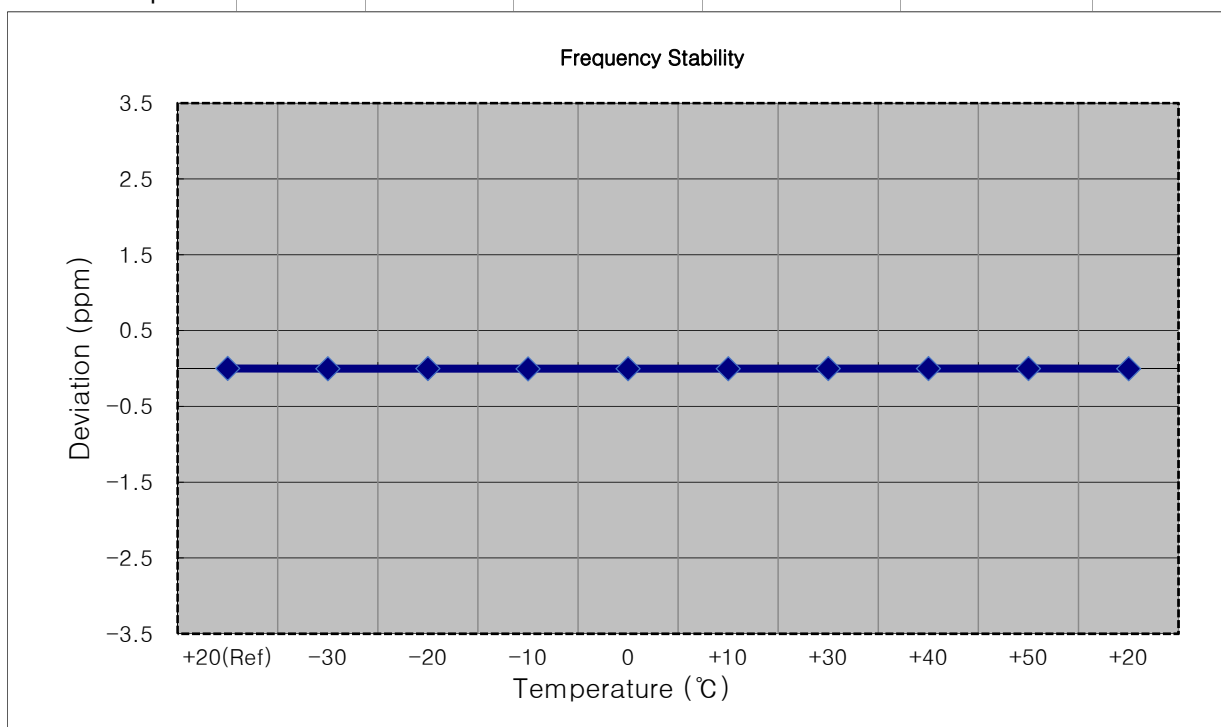
|                      |                              |
|----------------------|------------------------------|
| MODE:                | LTE 30                       |
| OPERATING FREQUENCY: | 2307,500,000 Hz              |
| CHANNEL:             | 27685 (5 MHz)                |
| REFERENCE VOLTAGE:   | 3.880 VDC                    |
| DEVIATION LIMIT:     | Emission must remain in band |

| Voltage<br>(%) | Power<br>(VDC) | Temp.<br>(°C) | Frequency<br>(Hz) | Frequency Error<br>(Hz) | Deviation<br>(%) | ppm     |
|----------------|----------------|---------------|-------------------|-------------------------|------------------|---------|
| 100 %          | 3.880          | +20(Ref)      | 2307 500 007      | 0.00                    | 0.000 000        | 0.0000  |
| 100 %          |                | -30           | 2307 500 004      | -3.40                   | 0.000 000        | -0.0015 |
| 100 %          |                | -20           | 2307 500 010      | 3.50                    | 0.000 000        | 0.0015  |
| 100 %          |                | -10           | 2307 500 012      | 4.70                    | 0.000 000        | 0.0020  |
| 100 %          |                | 0             | 2307 500 010      | 3.30                    | 0.000 000        | 0.0014  |
| 100 %          |                | +10           | 2307 500 011      | 4.20                    | 0.000 000        | 0.0018  |
| 100 %          |                | +30           | 2307 500 013      | 6.00                    | 0.000 000        | 0.0026  |
| 100 %          |                | +40           | 2307 500 003      | -3.70                   | 0.000 000        | -0.0016 |
| 100 %          |                | +50           | 2307 500 010      | 3.20                    | 0.000 000        | 0.0014  |
| Batt. Endpoint | 3.300          | +20           | 2307 500 011      | 3.90                    | 0.000 000        | 0.0017  |



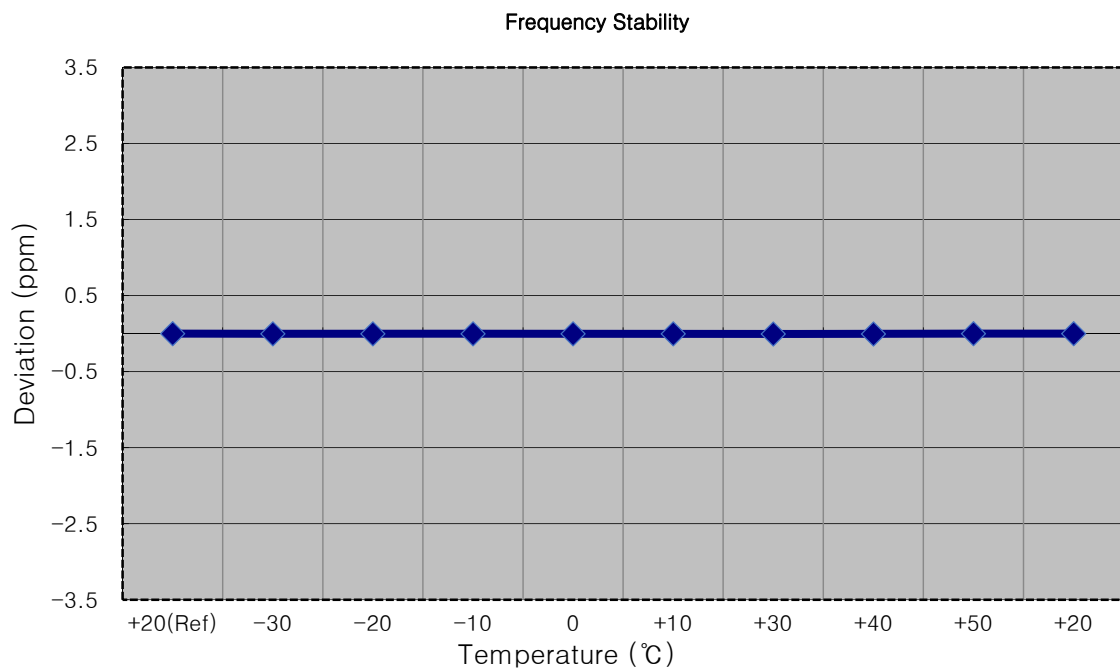
|                      |                                     |
|----------------------|-------------------------------------|
| MODE:                | <u>LTE 30</u>                       |
| OPERATING FREQUENCY: | <u>2310,000,000 Hz</u>              |
| BANDWIDTH:           | <u>27710 (5 MHz)</u>                |
| REFERENCE VOLTAGE:   | <u>3.880 VDC</u>                    |
| DEVIATION LIMIT:     | <u>Emission must remain in band</u> |

| Voltage        | Power | Temp.    | Frequency    | Frequency Error | Deviation  | ppm     |
|----------------|-------|----------|--------------|-----------------|------------|---------|
| (%)            | (VDC) | (°C)     | (Hz)         | (Hz)            | (%)        |         |
| 100 %          | 3.880 | +20(Ref) | 2309 999 993 | 0.00            | 0.000 000  | 0.0000  |
| 100 %          |       | -30      | 2309 999 986 | -7.10           | 0.000 000  | -0.0031 |
| 100 %          |       | -20      | 2309 999 988 | -5.00           | 0.000 000  | -0.0022 |
| 100 %          |       | -10      | 2309 999 981 | -11.90          | -0.000 001 | -0.0052 |
| 100 %          |       | 0        | 2309 999 982 | -10.40          | 0.000 000  | -0.0045 |
| 100 %          |       | +10      | 2309 999 985 | -7.70           | 0.000 000  | -0.0033 |
| 100 %          |       | +30      | 2309 999 987 | -5.50           | 0.000 000  | -0.0024 |
| 100 %          |       | +40      | 2309 999 986 | -6.20           | 0.000 000  | -0.0027 |
| 100 %          |       | +50      | 2309 999 987 | -5.80           | 0.000 000  | -0.0025 |
| Batt. Endpoint | 3.300 | +20      | 2309 999 986 | -7.00           | 0.000 000  | -0.0030 |



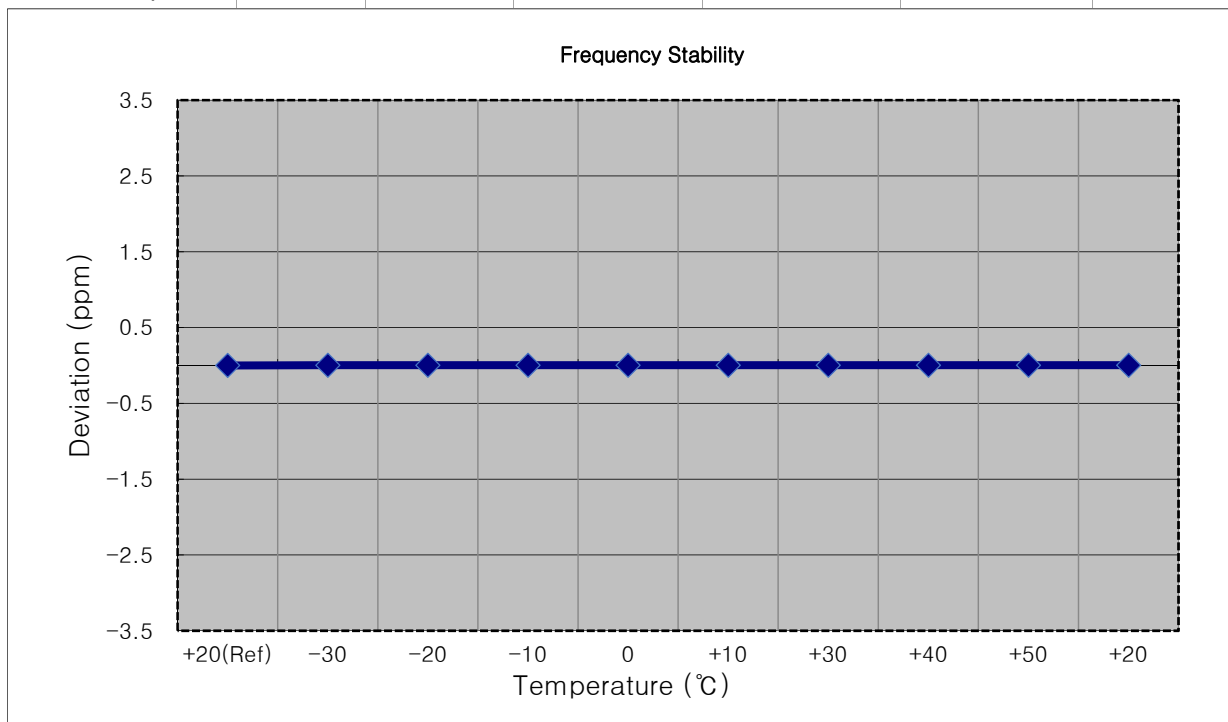
MODE: LTE 30  
 OPERATING FREQUENCY: 2312,500,000 Hz  
 BANDWIDTH: 27735 (5 MHz)  
 REFERENCE VOLTAGE: 3.880 VDC  
 DEVIATION LIMIT: Emission must remain in band

| Voltage        | Power | Temp.    | Frequency    | Frequency Error | Deviation  | ppm     |
|----------------|-------|----------|--------------|-----------------|------------|---------|
| (%)            | (VDC) | (°C)     | (Hz)         | (Hz)            | (%)        |         |
| 100 %          | 3.880 | +20(Ref) | 2312 499 995 | 0.00            | 0.000 000  | 0.0000  |
| 100 %          |       | -30      | 2312 499 988 | -6.80           | 0.000 000  | -0.0029 |
| 100 %          |       | -20      | 2312 499 988 | -6.20           | 0.000 000  | -0.0027 |
| 100 %          |       | -10      | 2312 499 988 | -7.10           | 0.000 000  | -0.0031 |
| 100 %          |       | 0        | 2312 499 988 | -7.10           | 0.000 000  | -0.0031 |
| 100 %          |       | +10      | 2312 499 986 | -9.10           | 0.000 000  | -0.0039 |
| 100 %          |       | +30      | 2312 499 984 | -10.50          | 0.000 000  | -0.0045 |
| 100 %          |       | +40      | 2312 499 983 | -11.80          | -0.000 001 | -0.0051 |
| 100 %          |       | +50      | 2312 499 990 | -4.20           | 0.000 000  | -0.0018 |
| Batt. Endpoint | 3.300 | +20      | 2312 499 991 | -4.00           | 0.000 000  | -0.0017 |



- ▣ MODE: LTE 30
- ▣ OPERATING FREQUENCY: 2310,000,000 Hz
- ▣ BANDWIDTH: 27710 (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) | 2310 000 008 | 0.00            | 0.000 000 | 0.0000 |
| 100 %          |       | -30      | 2310 000 015 | 6.50            | 0.000 000 | 0.0028 |
| 100 %          |       | -20      | 2310 000 015 | 6.30            | 0.000 000 | 0.0027 |
| 100 %          |       | -10      | 2310 000 013 | 4.90            | 0.000 000 | 0.0021 |
| 100 %          |       | 0        | 2310 000 014 | 5.40            | 0.000 000 | 0.0023 |
| 100 %          |       | +10      | 2310 000 014 | 5.40            | 0.000 000 | 0.0023 |
| 100 %          |       | +30      | 2310 000 015 | 6.60            | 0.000 000 | 0.0029 |
| 100 %          |       | +40      | 2310 000 012 | 3.20            | 0.000 000 | 0.0014 |
| 100 %          |       | +50      | 2310 000 013 | 4.70            | 0.000 000 | 0.0020 |
| Batt. Endpoint | 3.300 | +20      | 2310 000 016 | 7.70            | 0.000 000 | 0.0033 |



## 9. TEST DATA(Sub 2 ANT)

### 9.1 EQUIVALENT ISOTROPIC RADIATED POWER

| Freq<br>(MHz) | Mod/<br>Bandwidth | Modulation | Measured       | Substitute     | Ant. Gain<br>(dBi) | C.L  | Pol | Limit  | EIRP  |       | RB   |        |
|---------------|-------------------|------------|----------------|----------------|--------------------|------|-----|--------|-------|-------|------|--------|
|               |                   |            | Level<br>(dBm) | Level<br>(dBm) |                    |      |     | W      | W     | dBm   | Size | Offset |
| 2307.5        | LTE B30/<br>5 MHz | QPSK       | -27.05         | 11.14          | 9.54               | 2.34 | V   | < 0.25 | 0.068 | 18.34 | 1    | 0      |
|               |                   | 16-QAM     | -27.65         | 10.54          | 9.54               | 2.34 | V   |        | 0.059 | 17.74 |      |        |
|               |                   | 64-QAM     | -28.73         | 9.46           | 9.54               | 2.34 | V   |        | 0.046 | 16.66 |      |        |
|               |                   | 256-QAM    | -31.77         | 6.42           | 9.54               | 2.34 | V   |        | 0.023 | 13.62 |      |        |
| 2310.0        |                   | QPSK       | -26.98         | 11.21          | 9.54               | 2.34 | V   |        | 0.069 | 18.41 | 1    | 0      |
|               |                   | 16-QAM     | -27.59         | 10.60          | 9.54               | 2.34 | V   |        | 0.060 | 17.80 |      |        |
|               |                   | 64-QAM     | -28.74         | 9.45           | 9.54               | 2.34 | V   |        | 0.046 | 16.65 |      |        |
|               |                   | 256-QAM    | -32.03         | 6.16           | 9.54               | 2.34 | V   |        | 0.022 | 13.36 |      |        |
| 2312.5        |                   | QPSK       | -27.11         | 11.06          | 9.61               | 2.33 | V   |        | 0.068 | 18.34 | 1    | 0      |
|               |                   | 16-QAM     | -27.77         | 10.40          | 9.61               | 2.33 | V   |        | 0.059 | 17.68 |      |        |
|               |                   | 64-QAM     | -28.71         | 9.46           | 9.61               | 2.33 | V   |        | 0.047 | 16.74 |      |        |
|               |                   | 256-QAM    | -31.96         | 6.21           | 9.61               | 2.33 | V   |        | 0.022 | 13.49 |      |        |

| Freq<br>(MHz) | Mod/<br>Bandwidth  | Modulation | Measured<br>Level<br>(dBm) | Substitute<br>Level<br>(dBm) | Ant. Gain<br>(dBi) | C.L  | Pol | Limit  | EIRP  |       | RB   |        |
|---------------|--------------------|------------|----------------------------|------------------------------|--------------------|------|-----|--------|-------|-------|------|--------|
|               |                    |            |                            |                              |                    |      |     | W      | W     | dBm   | Size | Offset |
| 2310.0        | LTE B30/<br>10 MHz | QPSK       | -27.02                     | 11.17                        | 9.54               | 2.34 | V   | < 0.25 | 0.069 | 18.37 | 1    | 0      |
|               |                    | 16-QAM     | -27.81                     | 10.38                        | 9.54               | 2.34 | V   |        | 0.057 | 17.58 |      |        |
|               |                    | 64-QAM     | -28.82                     | 9.37                         | 9.54               | 2.34 | V   |        | 0.045 | 16.57 |      |        |
|               |                    | 256-QAM    | -31.88                     | 6.31                         | 9.54               | 2.34 | V   |        | 0.022 | 13.51 |      |        |

## 9.2 RADIATED SPURIOUS EMISSIONS

|                          |                            |
|--------------------------|----------------------------|
| ▣ OPERATING FREQUENCY :  | <u>2310.0 MHz</u>          |
| ▣ MEASURED OUTPUT POWER: | <u>18.41 dBm = 0.069 W</u> |
| ▣ MODE:                  | <u>LTE B30</u>             |
| ▣ MODULATION SIGNAL:     | <u>5 MHz QPSK</u>          |
| ▣ DISTANCE:              | <u>1 meters</u>            |
| ▣ LIMIT:                 | <u>-40 dBm</u>             |

| Ch                | Freq (MHz) | Measured Level (dBm) | Ant. Gain (dBi) | Substitute Level (dBm) | C.L  | Pol | Result (dBm) | Limit (dBm) | RB   |        |
|-------------------|------------|----------------------|-----------------|------------------------|------|-----|--------------|-------------|------|--------|
|                   |            |                      |                 |                        |      |     |              |             | Size | Offset |
| 27685<br>(2307.5) | 4 615.00   | -49.64               | 12.57           | -68.57                 | 3.52 | V   | -59.52       | -40.00      | 1    | 0      |
|                   | 6 922.50   | -47.18               | 11.80           | -58.53                 | 4.40 | V   | -51.13       | -40.00      |      |        |
|                   | 9 230.00   | -50.61               | 10.58           | -56.49                 | 5.16 | V   | -51.07       | -40.00      |      |        |
| 27710<br>(2310.0) | 4 620.00   | -48.80               | 12.56           | -67.66                 | 3.51 | V   | -58.61       | -40.00      | 1    | 0      |
|                   | 6 930.00   | -45.42               | 11.78           | -56.34                 | 4.40 | V   | -48.96       | -40.00      |      |        |
|                   | 9 240.00   | -49.96               | 10.54           | -55.77                 | 5.16 | V   | -50.39       | -40.00      |      |        |
| 27735<br>(2312.5) | 4 625.00   | -50.54               | 12.55           | -69.42                 | 3.50 | V   | -60.37       | -40.00      | 1    | 0      |
|                   | 6 937.50   | -48.55               | 11.74           | -58.35                 | 4.41 | V   | -51.02       | -40.00      |      |        |
|                   | 9 250.00   | -50.75               | 10.50           | -56.10                 | 5.17 | V   | -50.77       | -40.00      |      |        |

■ OPERATING FREQUENCY : 2310.0 MHz  
 ■ MEASURED OUTPUT POWER: 18.37 dBm = 0.069 W  
 ■ MODE: LTE B30  
 ■ MODULATION SIGNAL: 10 MHz QPSK  
 ■ DISTANCE: 1 meters  
 ■ LIMIT: -40 dBm

| Ch                | Freq (MHz) | Measured Level (dBm) | Ant. Gain (dBi) | Substitute Level (dBm) | C.L  | Pol | Result (dBm) | Limit (dBm) | RB   |        |
|-------------------|------------|----------------------|-----------------|------------------------|------|-----|--------------|-------------|------|--------|
|                   |            |                      |                 |                        |      |     |              |             | Size | Offset |
| 27710<br>(2310.0) | 4 620.00   | -49.33               | 12.56           | -68.19                 | 3.51 | V   | -59.14       | -40.00      | 1    | 0      |
|                   | 6 930.00   | -48.96               | 11.78           | -59.88                 | 4.40 | V   | -52.50       | -40.00      |      |        |
|                   | 9 240.00   | -49.96               | 10.54           | -55.77                 | 5.16 | V   | -50.39       | -40.00      |      |        |

### 9.3 PEAK-TO-AVERAGE RATIO

| Band | Band Width | Frequency (MHz) | Modulation | Resource Block Size | Resource Block Offset | Data (dB ) |
|------|------------|-----------------|------------|---------------------|-----------------------|------------|
| 30   | 5 MHz      | 2310.0          | QPSK       | 25                  | 0                     | 4.37       |
|      |            |                 | 16-QAM     |                     |                       | 5.29       |
|      |            |                 | 64-QAM     |                     |                       | 5.95       |
|      |            |                 | 256-QAM    |                     |                       | 6.63       |
|      | 10 MHz     |                 | QPSK       | 50                  |                       | 4.43       |
|      |            |                 | 16-QAM     |                     |                       | 5.35       |
|      |            |                 | 64-QAM     |                     |                       | 5.98       |
|      |            |                 | 256-QAM    |                     |                       | 6.61       |

**Note:**

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 191 ~ 198.

## 9.4 OCCUPIED BANDWIDTH

| Band | Band Width | Frequency (MHz) | Modulation | Resource Block Size | Resource Block Offset | Data ( MHz ) |
|------|------------|-----------------|------------|---------------------|-----------------------|--------------|
| 30   | 5 MHz      | 2310.0          | QPSK       | 25                  | 0                     | 4.5020       |
|      |            |                 | 16-QAM     |                     |                       | 4.5197       |
|      |            |                 | 64-QAM     |                     |                       | 4.5114       |
|      |            |                 | 256-QAM    |                     |                       | 4.5212       |
|      | 10 MHz     |                 | QPSK       | 50                  |                       | 8.9669       |
|      |            |                 | 16-QAM     |                     |                       | 8.9937       |
|      |            |                 | 64-QAM     |                     |                       | 8.9851       |
|      |            |                 | 256-QAM    |                     |                       | 8.9617       |

### **Note:**

1. Plots of the EUT's Occupied Bandwidth are shown Page 199 ~ 206.

## 9.5 CONDUCTED SPURIOUS EMISSIONS

| Band | Band Width (MHz) | Frequency (MHz) | Frequency of Maximum Harmonic (GHz) | Factor (dB) | Measurement Maximum Data (dBm) | Result (dBm) | Limit (dBm) |
|------|------------------|-----------------|-------------------------------------|-------------|--------------------------------|--------------|-------------|
| 30   | 5                | 2307.5          | 25.8316                             | 30.131      | -76.974                        | -46.843      | -40.00      |
|      |                  | 2310.0          | 26.1644                             | 30.131      | -76.990                        | -46.859      |             |
|      |                  | 2312.5          | 26.1534                             | 30.131      | -76.976                        | -46.845      |             |
|      | 10               | 2310.0          | 26.1079                             | 30.131      | -76.856                        | -46.725      |             |

### Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 207 ~ 214.
2. Conducted Spurious Emissions was Tested QPSK Modulation, Resource Block Size 1 and Resource Block Offset 0
3. Result (dBm) = Measurement Maximum Data (dBm) + Factor (dB)
4. Factor(dB) = Cable Loss + Attenuator + Power Splitter

| Frequency Range (GHz) | Factor [dB] |
|-----------------------|-------------|
| 0.03 – 1              | 25.270      |
| 1 – 5                 | 27.976      |
| 5 – 10                | 28.591      |
| 10 – 15               | 29.116      |
| 15 – 20               | 29.489      |
| Above 20(26.5)        | 30.131      |

## 9.6 BAND EDGE

| Band Width<br>(MHz) | Frequency<br>(MHz) | Modulation | RB<br>(Size/ Offset) | Frequency<br>Range<br>(MHz) | Maximum<br>Data<br>(dBm) | Limit<br>(dBm) |
|---------------------|--------------------|------------|----------------------|-----------------------------|--------------------------|----------------|
| 5                   | 2307.5             | QPSK       | 25/0                 | Below 2288                  | -53.271                  | -40            |
|                     |                    |            |                      | 2288 - 2292                 | -51.596                  | -37            |
|                     |                    |            |                      | 2292 - 2296                 | -43.842                  | -31            |
|                     |                    |            |                      | 2296 - 2300                 | -32.371                  | -25            |
|                     |                    |            |                      | 2300 - 2304                 | -18.615                  | -13            |
|                     |                    |            |                      | 2304 - 2305                 | -25.303                  | -13            |
|                     |                    |            |                      | 2315 - 2320                 | -32.211                  | -13            |
|                     |                    |            |                      | 2320 - 2324                 | -45.949                  | -25            |
|                     |                    |            |                      | 2324 - 2328                 | -52.297                  | -31            |
|                     |                    |            |                      | 2328 - 2337                 | -53.004                  | -37            |
|                     |                    |            |                      | 2337 - 2341                 | -52.993                  | -31            |
|                     |                    |            |                      | 2341 - 2345                 | -52.964                  | -25            |
|                     |                    |            |                      | 2345 - 2365                 | -52.773                  | -13            |
|                     |                    |            |                      | Above 2365                  | -52.976                  | -40            |
|                     | 2310.0             | QPSK       | 25/0                 | Below 2288                  | -53.244                  | -40            |
|                     |                    |            |                      | 2288 - 2292                 | -52.325                  | -37            |
|                     |                    |            |                      | 2292 - 2296                 | -49.402                  | -31            |
|                     |                    |            |                      | 2296 - 2300                 | -38.810                  | -25            |
|                     |                    |            |                      | 2300 - 2305                 | -22.039                  | -13            |
|                     |                    |            |                      | 2315 - 2320                 | -22.104                  | -13            |
|                     |                    |            |                      | 2320 - 2324                 | -43.029                  | -25            |
|                     |                    |            |                      | 2324 - 2328                 | -50.660                  | -31            |
|                     |                    |            |                      | 2328 - 2337                 | -52.868                  | -37            |
|                     |                    |            |                      | 2337 - 2341                 | -52.988                  | -31            |
|                     |                    |            |                      | 2341 - 2345                 | -52.977                  | -25            |
|                     |                    |            |                      | 2345 - 2365                 | -52.748                  | -13            |
|                     |                    |            |                      | Above 2365                  | -52.990                  | -40            |
|                     | 2312.5             | QPSK       | 25/0                 | Below 2288                  | -53.317                  | -40            |
|                     |                    |            |                      | 2288 - 2292                 | -53.004                  | -37            |
|                     |                    |            |                      | 2292 - 2296                 | -52.498                  | -31            |

|    |        |      |      |             |         |     |
|----|--------|------|------|-------------|---------|-----|
|    |        |      |      | 2296 - 2300 | -47.762 | -25 |
|    |        |      |      | 2300 - 2305 | -31.685 | -13 |
|    |        |      |      | 2315 - 2316 | -27.050 | -13 |
|    |        |      |      | 2316 - 2320 | -22.764 | -13 |
|    |        |      |      | 2320 - 2324 | -34.908 | -25 |
|    |        |      |      | 2324 - 2328 | -50.010 | -31 |
|    |        |      |      | 2328 - 2337 | -52.689 | -37 |
|    |        |      |      | 2337 - 2341 | -53.004 | -31 |
|    |        |      |      | 2341 - 2345 | -52.993 | -25 |
|    |        |      |      | 2345 - 2365 | -52.707 | -13 |
|    |        |      |      | Above 2365  | -52.992 | -40 |
| 10 | 2310.0 | QPSK | 50/0 | Below 2288  | -50.533 | -40 |
|    |        |      |      | 2288 - 2292 | -39.665 | -37 |
|    |        |      |      | 2292 - 2296 | -32.227 | -31 |
|    |        |      |      | 2296 - 2300 | -27.075 | -25 |
|    |        |      |      | 2300 - 2304 | -21.676 | -13 |
|    |        |      |      | 2304 - 2305 | -28.531 | -13 |
|    |        |      |      | 2315 - 2316 | -27.851 | -13 |
|    |        |      |      | 2316 - 2320 | -20.909 | -13 |
|    |        |      |      | 2320 - 2324 | -27.505 | -25 |
|    |        |      |      | 2324 - 2328 | -39.131 | -31 |
|    |        |      |      | 2328 - 2337 | -48.708 | -37 |
|    |        |      |      | 2337 - 2341 | -52.993 | -31 |
|    |        |      |      | 2341 - 2345 | -52.971 | -25 |
|    |        |      |      | 2345 - 2365 | -52.723 | -13 |
|    |        |      |      | Above 2365  | -52.937 | -40 |
|    |        |      |      |             |         |     |

| Band Width<br>(MHz) | Frequency<br>(MHz) | Modulation | RB<br>(Size/ Offset) | Frequency<br>Range<br>(MHz) | Maximum<br>Data<br>(dBm) | Limit<br>(dBm) |
|---------------------|--------------------|------------|----------------------|-----------------------------|--------------------------|----------------|
| 5                   | 2307.5             | QPSK       | 1/0                  | Below 2288                  | -53.178                  | -40            |
|                     |                    |            |                      | 2288 - 2292                 | -52.565                  | -37            |
|                     |                    |            |                      | 2292 - 2296                 | -50.982                  | -31            |
|                     |                    |            |                      | 2296 - 2300                 | -48.969                  | -25            |
|                     |                    |            |                      | 2300 - 2304                 | -33.522                  | -13            |
|                     |                    |            |                      | 2304 - 2305                 | -21.598                  | -13            |
|                     |                    |            | 1/24                 | 2315 - 2320                 | -49.864                  | -13            |
|                     |                    |            |                      | 2320 - 2324                 | -51.957                  | -25            |
|                     |                    |            |                      | 2324 - 2328                 | -52.918                  | -31            |
|                     |                    |            |                      | 2328 - 2337                 | -52.961                  | -37            |
|                     |                    |            |                      | 2337 - 2341                 | -52.979                  | -31            |
|                     |                    |            |                      | 2341 - 2345                 | -52.946                  | -25            |
|                     |                    |            |                      | 2345 - 2365                 | -52.734                  | -13            |
|                     |                    |            |                      | Above 2365                  | -52.966                  | -40            |
|                     | 2310.0             | QPSK       | 1/0                  | Below 2288                  | -53.212                  | -40            |
|                     |                    |            |                      | 2288 - 2292                 | -52.909                  | -37            |
|                     |                    |            |                      | 2292 - 2296                 | -52.452                  | -31            |
|                     |                    |            |                      | 2296 - 2300                 | -51.404                  | -25            |
|                     |                    |            |                      | 2300 - 2305                 | -44.131                  | -13            |
|                     |                    |            | 1/24                 | 2315 - 2320                 | -44.755                  | -13            |
|                     |                    |            |                      | 2320 - 2324                 | -51.498                  | -25            |
|                     |                    |            |                      | 2324 - 2328                 | -52.774                  | -31            |
|                     |                    |            |                      | 2328 - 2337                 | -52.975                  | -37            |
|                     |                    |            |                      | 2337 - 2341                 | -52.979                  | -31            |
|                     |                    |            |                      | 2341 - 2345                 | -52.972                  | -25            |
|                     |                    |            |                      | 2345 - 2365                 | -52.752                  | -13            |
|                     |                    |            |                      | Above 2365                  | -52.969                  | -40            |
|                     | 2312.5             | QPSK       | 1/0                  | Below 2288                  | -53.248                  | -40            |
|                     |                    |            |                      | 2288 - 2292                 | -53.022                  | -37            |
|                     |                    |            |                      | 2292 - 2296                 | -52.838                  | -31            |
|                     |                    |            |                      | 2296 - 2300                 | -51.895                  | -25            |

|    |        |      |      |             |         |     |
|----|--------|------|------|-------------|---------|-----|
|    |        |      | 1/24 | 2300 - 2305 | -49.907 | -13 |
|    |        |      |      | 2315 - 2316 | -23.707 | -13 |
|    |        |      |      | 2316 - 2320 | -36.019 | -13 |
|    |        |      |      | 2320 - 2324 | -49.749 | -25 |
|    |        |      |      | 2324 - 2328 | -52.290 | -31 |
|    |        |      |      | 2328 - 2337 | -52.900 | -37 |
|    |        |      |      | 2337 - 2341 | -52.973 | -31 |
|    |        |      |      | 2341 - 2345 | -52.951 | -25 |
|    |        |      |      | 2345 - 2365 | -52.708 | -13 |
|    |        |      |      | Above 2365  | -52.971 | -40 |
| 10 | 2310.0 | QPSK | 1/0  | Below 2288  | -53.027 | -40 |
|    |        |      |      | 2288 - 2292 | -52.200 | -37 |
|    |        |      |      | 2292 - 2296 | -50.159 | -31 |
|    |        |      |      | 2296 - 2300 | -49.040 | -25 |
|    |        |      |      | 2300 - 2304 | -37.375 | -13 |
|    |        |      |      | 2304 - 2305 | -29.235 | -13 |
|    |        |      | 1/49 | 2315 - 2316 | -31.265 | -13 |
|    |        |      |      | 2316 - 2320 | -39.384 | -13 |
|    |        |      |      | 2320 - 2324 | -49.902 | -25 |
|    |        |      |      | 2324 - 2328 | -52.058 | -31 |
|    |        |      |      | 2328 - 2337 | -52.873 | -37 |
|    |        |      |      | 2337 - 2341 | -52.970 | -31 |
|    |        |      |      | 2341 - 2345 | -52.972 | -25 |
|    |        |      |      | 2345 - 2365 | -52.699 | -13 |
|    |        |      |      | Above 2365  | -52.964 | -40 |

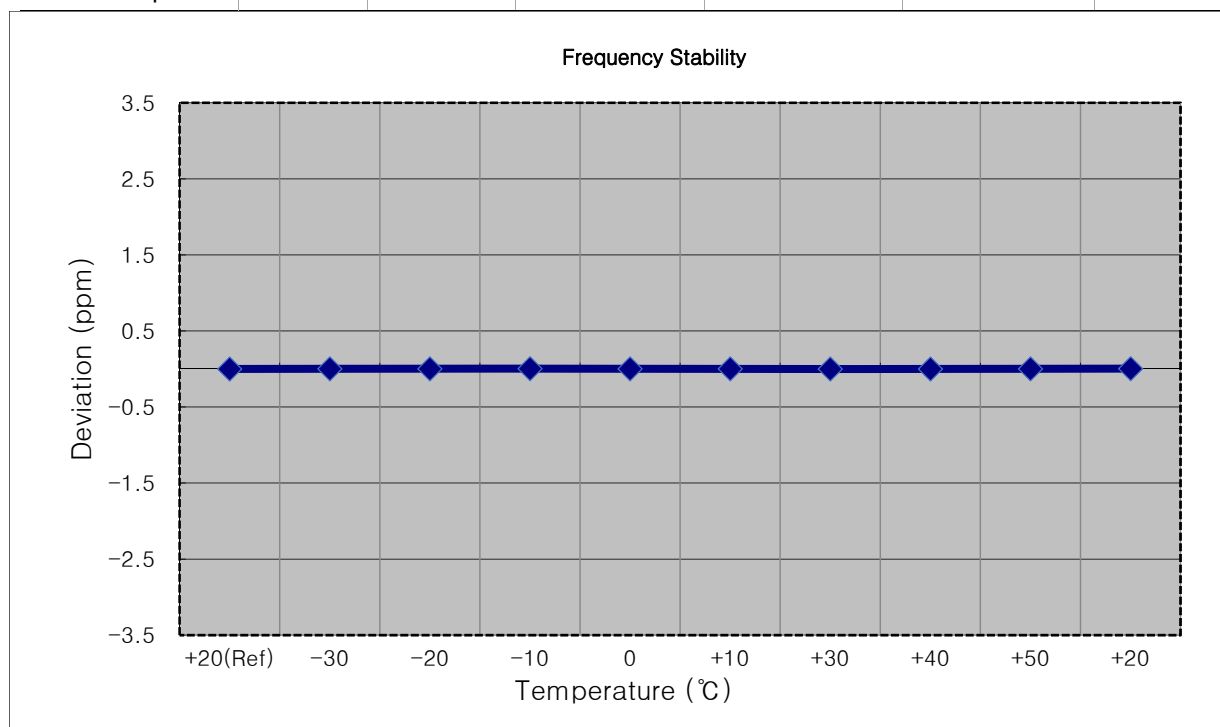
Note:

- Plots of the EUT's Band Edge are shown Page 215 ~ 326.

## 9.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

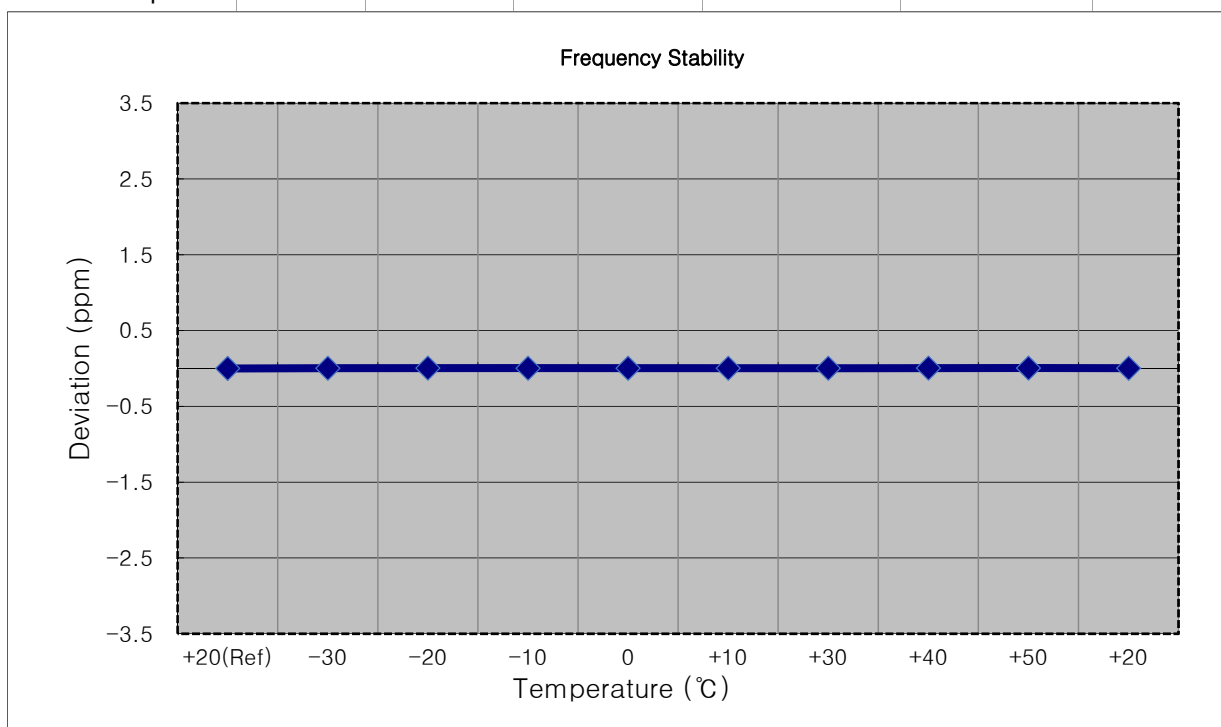
|                      |                                     |
|----------------------|-------------------------------------|
| MODE:                | <u>LTE 30</u>                       |
| OPERATING FREQUENCY: | <u>2307,500,000 Hz</u>              |
| CHANNEL:             | <u>27685 (5 MHz)</u>                |
| REFERENCE VOLTAGE:   | <u>3.880 VDC</u>                    |
| DEVIATION LIMIT:     | <u>Emission must remain in band</u> |

| Voltage<br>(%) | Power<br>(VDC) | Temp.<br>(°C) | Frequency<br>(Hz) | Frequency Error<br>(Hz) | Deviation<br>(%) | ppm     |
|----------------|----------------|---------------|-------------------|-------------------------|------------------|---------|
| 100 %          | 3.880          | +20(Ref)      | 2307 500 005      | 0.00                    | 0.000 000        | 0.0000  |
| 100 %          |                | -30           | 2307 500 009      | 4.20                    | 0.000 000        | 0.0018  |
| 100 %          |                | -20           | 2307 500 009      | 4.20                    | 0.000 000        | 0.0018  |
| 100 %          |                | -10           | 2307 500 013      | 7.80                    | 0.000 000        | 0.0034  |
| 100 %          |                | 0             | 2307 500 009      | 3.90                    | 0.000 000        | 0.0017  |
| 100 %          |                | +10           | 2307 500 009      | 4.20                    | 0.000 000        | 0.0018  |
| 100 %          |                | +30           | 2307 500 001      | -4.00                   | 0.000 000        | -0.0017 |
| 100 %          |                | +40           | 2307 500 002      | -3.20                   | 0.000 000        | -0.0014 |
| 100 %          |                | +50           | 2307 500 009      | 4.40                    | 0.000 000        | 0.0019  |
| Batt. Endpoint | 3.300          | +20           | 2307 500 010      | 5.50                    | 0.000 000        | 0.0024  |



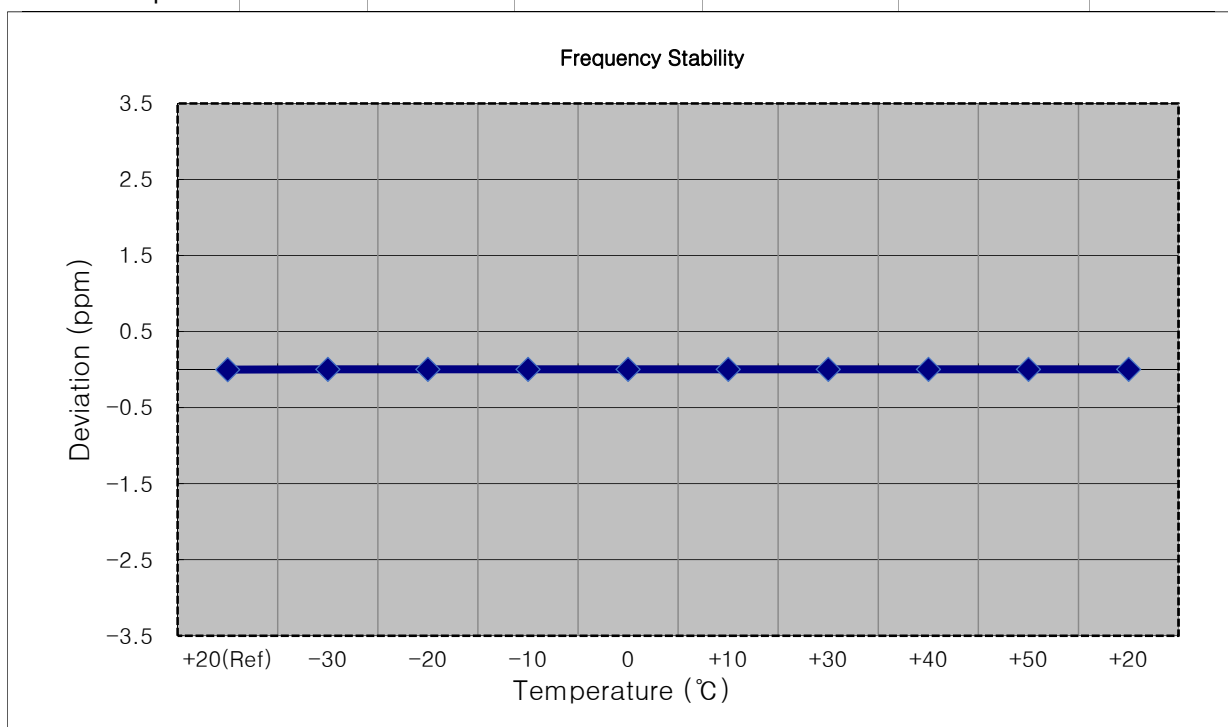
- ▣ MODE: LTE 30
- ▣ OPERATING FREQUENCY: 2310,000,000 Hz
- ▣ BANDWIDTH: 27710 (5 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

| Voltage        | Power | Temp.    | Frequency    | Frequency Error | Deviation | ppm    |
|----------------|-------|----------|--------------|-----------------|-----------|--------|
| (%)            | (VDC) | (°C)     | (Hz)         | (Hz)            | (%)       |        |
| 100 %          | 3.880 | +20(Ref) | 2310 000 007 | 0.00            | 0.000 000 | 0.0000 |
| 100 %          |       | -30      | 2310 000 013 | 6.20            | 0.000 000 | 0.0027 |
| 100 %          |       | -20      | 2310 000 015 | 7.90            | 0.000 000 | 0.0034 |
| 100 %          |       | -10      | 2310 000 012 | 5.50            | 0.000 000 | 0.0024 |
| 100 %          |       | 0        | 2310 000 012 | 5.80            | 0.000 000 | 0.0025 |
| 100 %          |       | +10      | 2310 000 012 | 5.00            | 0.000 000 | 0.0022 |
| 100 %          |       | +30      | 2310 000 014 | 7.30            | 0.000 000 | 0.0032 |
| 100 %          |       | +40      | 2310 000 015 | 8.60            | 0.000 000 | 0.0037 |
| 100 %          |       | +50      | 2310 000 015 | 8.20            | 0.000 000 | 0.0035 |
| Batt. Endpoint | 3.300 | +20      | 2310 000 013 | 6.10            | 0.000 000 | 0.0026 |



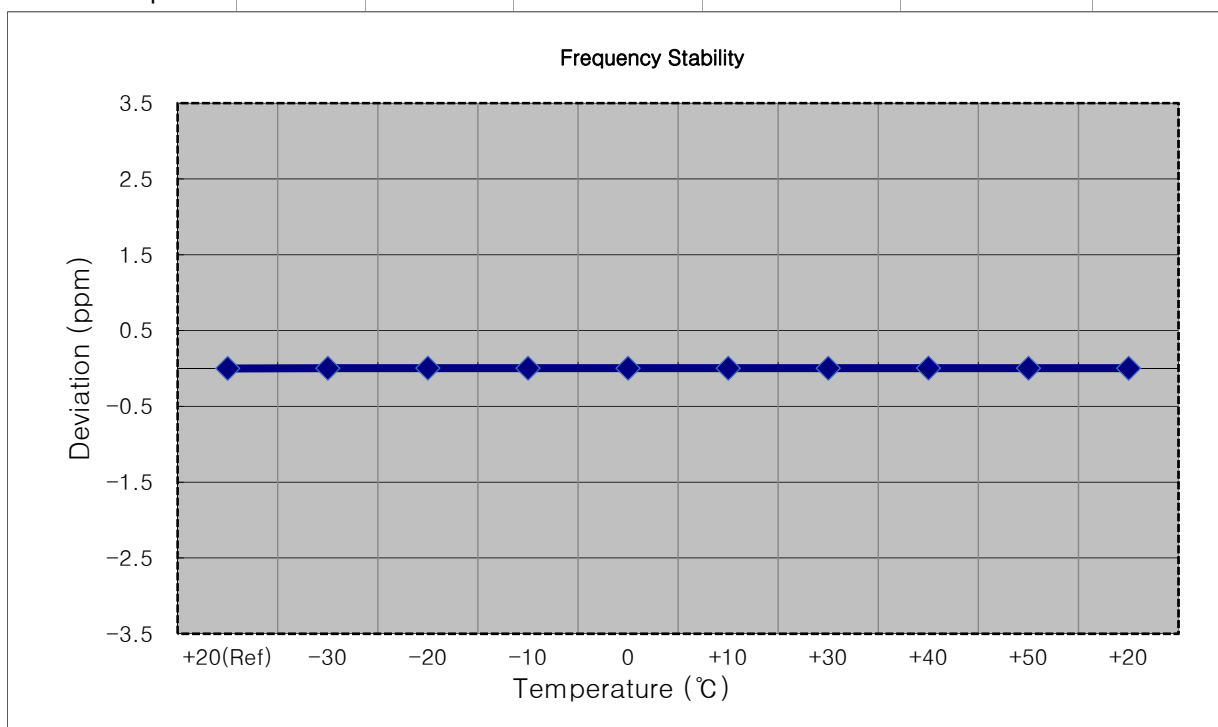
MODE: LTE 30  
 OPERATING FREQUENCY: 2312,500,000 Hz  
 BANDWIDTH: 27735 (5 MHz)  
 REFERENCE VOLTAGE: 3.880 VDC  
 DEVIATION LIMIT: Emission must remain in band

| Voltage        | Power | Temp.    | Frequency    | Frequency Error | Deviation | ppm    |
|----------------|-------|----------|--------------|-----------------|-----------|--------|
| (%)            | (VDC) | (°C)     | (Hz)         | (Hz)            | (%)       |        |
| 100 %          | 3.880 | +20(Ref) | 2312 500 005 | 0.00            | 0.000 000 | 0.0000 |
| 100 %          |       | -30      | 2312 500 012 | 7.10            | 0.000 000 | 0.0031 |
| 100 %          |       | -20      | 2312 500 011 | 6.20            | 0.000 000 | 0.0027 |
| 100 %          |       | -10      | 2312 500 011 | 6.30            | 0.000 000 | 0.0027 |
| 100 %          |       | 0        | 2312 500 011 | 5.90            | 0.000 000 | 0.0026 |
| 100 %          |       | +10      | 2312 500 011 | 6.00            | 0.000 000 | 0.0026 |
| 100 %          |       | +30      | 2312 500 012 | 7.80            | 0.000 000 | 0.0034 |
| 100 %          |       | +40      | 2312 500 010 | 5.70            | 0.000 000 | 0.0025 |
| 100 %          |       | +50      | 2312 500 010 | 5.20            | 0.000 000 | 0.0022 |
| Batt. Endpoint | 3.300 | +20      | 2312 500 012 | 7.60            | 0.000 000 | 0.0033 |



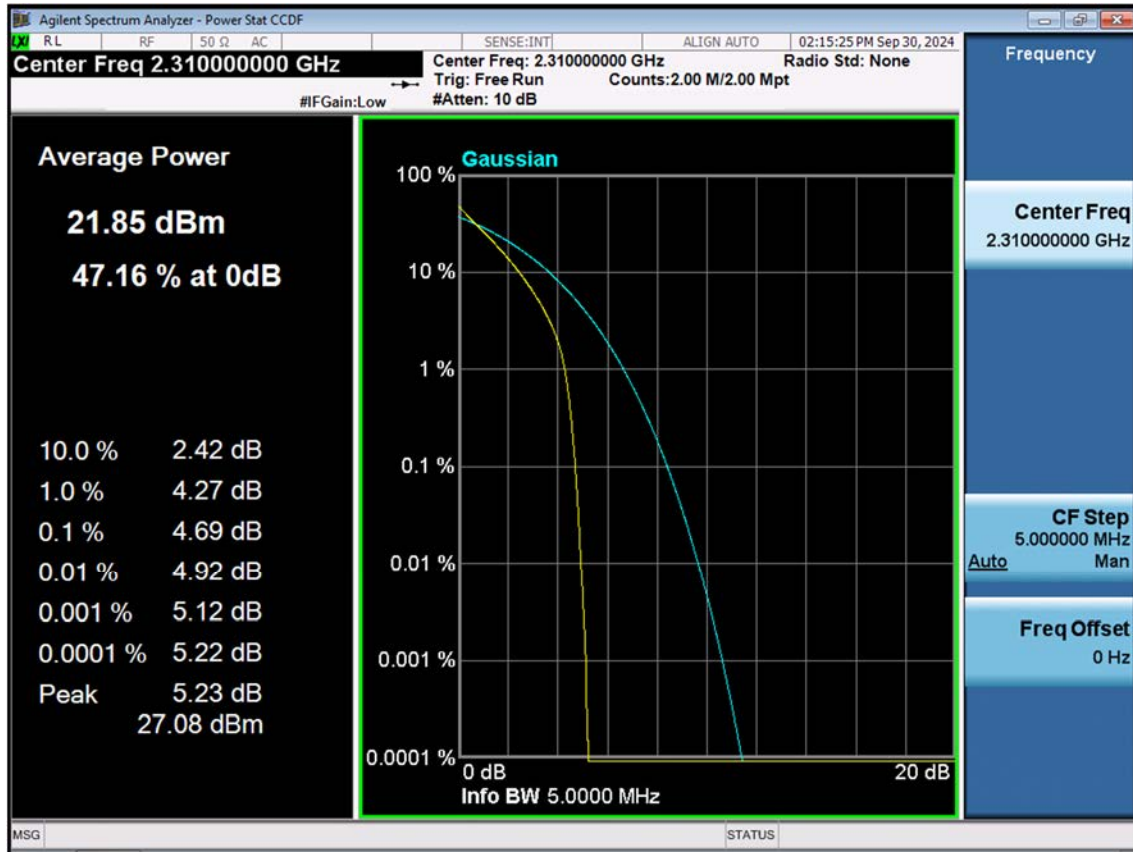
- ▣ MODE: LTE 30
- ▣ OPERATING FREQUENCY: 2310,000,000 Hz
- ▣ BANDWIDTH: 27710 (10 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

| Voltage        | Power | Temp.    | Frequency    | Frequency Error | Deviation | ppm    |
|----------------|-------|----------|--------------|-----------------|-----------|--------|
| (%)            | (VDC) | (°C)     | (Hz)         | (Hz)            | (%)       |        |
| 100 %          | 3.880 | +20(Ref) | 2310 000 008 | 0.00            | 0.000 000 | 0.0000 |
| 100 %          |       | -30      | 2310 000 014 | 5.90            | 0.000 000 | 0.0026 |
| 100 %          |       | -20      | 2310 000 016 | 8.40            | 0.000 000 | 0.0036 |
| 100 %          |       | -10      | 2310 000 014 | 6.20            | 0.000 000 | 0.0027 |
| 100 %          |       | 0        | 2310 000 012 | 3.60            | 0.000 000 | 0.0016 |
| 100 %          |       | +10      | 2310 000 013 | 5.30            | 0.000 000 | 0.0023 |
| 100 %          |       | +30      | 2310 000 015 | 6.90            | 0.000 000 | 0.0030 |
| 100 %          |       | +40      | 2310 000 016 | 7.90            | 0.000 000 | 0.0034 |
| 100 %          |       | +50      | 2310 000 013 | 5.30            | 0.000 000 | 0.0023 |
| Batt. Endpoint | 3.300 | +20      | 2310 000 012 | 4.40            | 0.000 000 | 0.0019 |

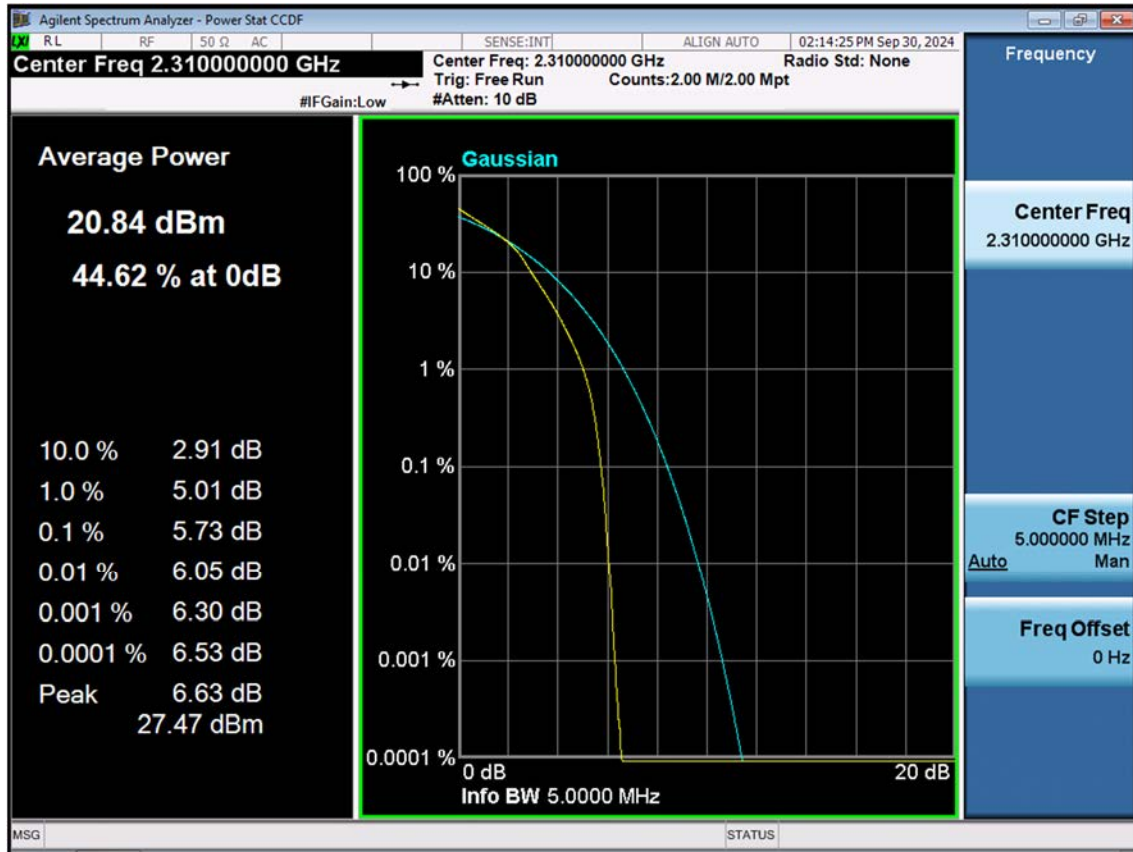


## 10. TEST PLOTS(Main 1 ANT)

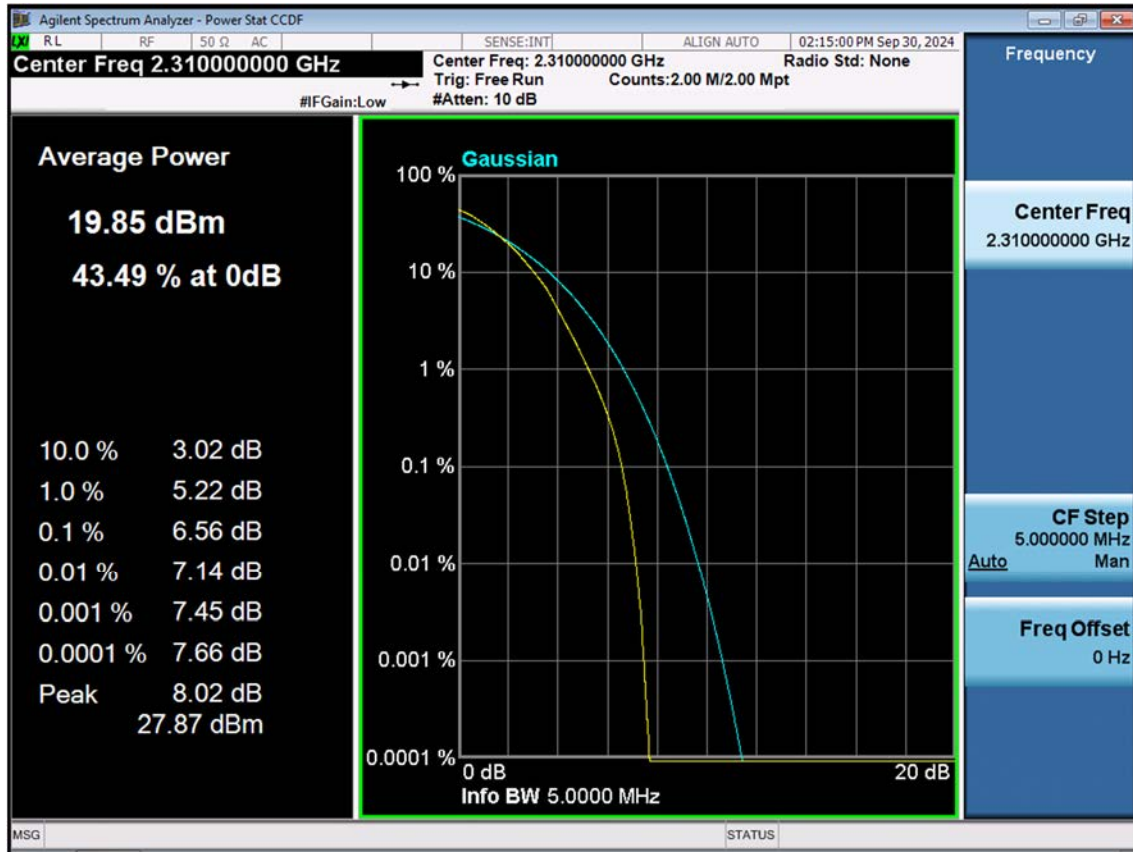
## LTE B30\_5 M\_PAR\_Mid\_QPSK\_FullRB



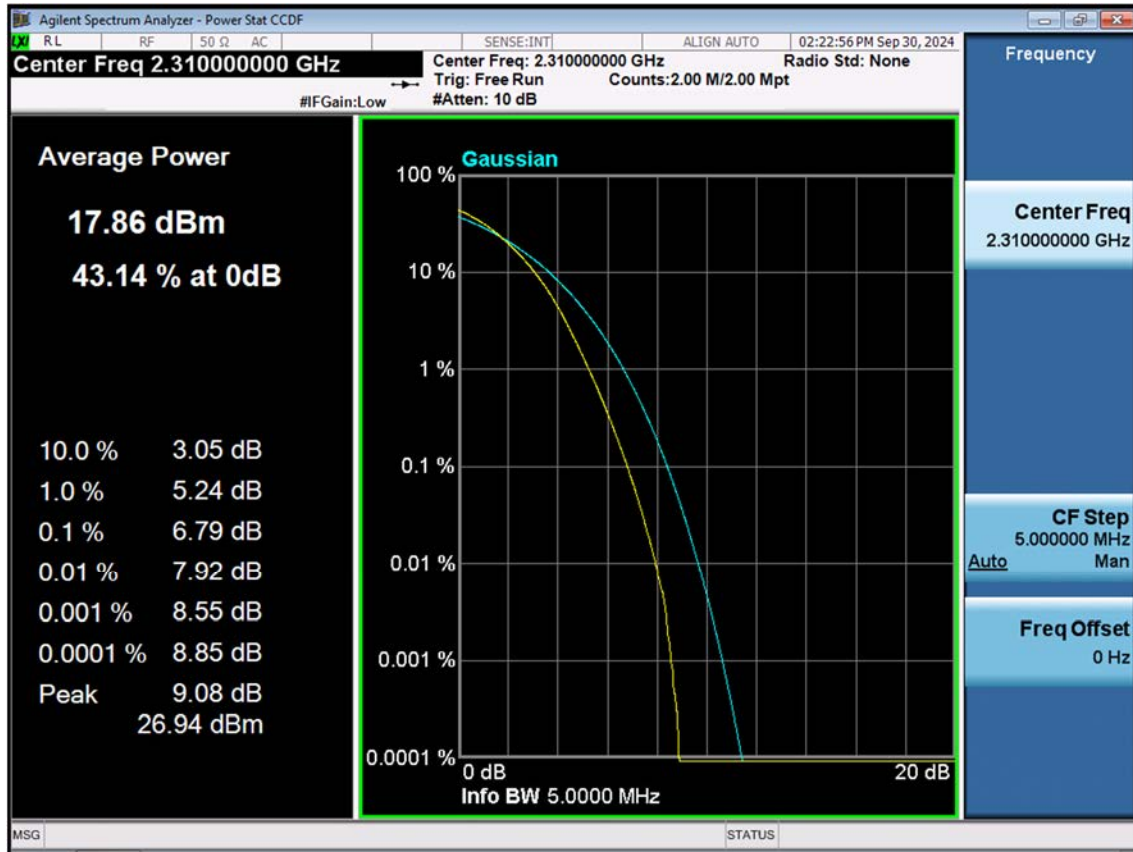
## LTE B30\_5 M\_PAR\_Mid\_16QAM\_FullRB



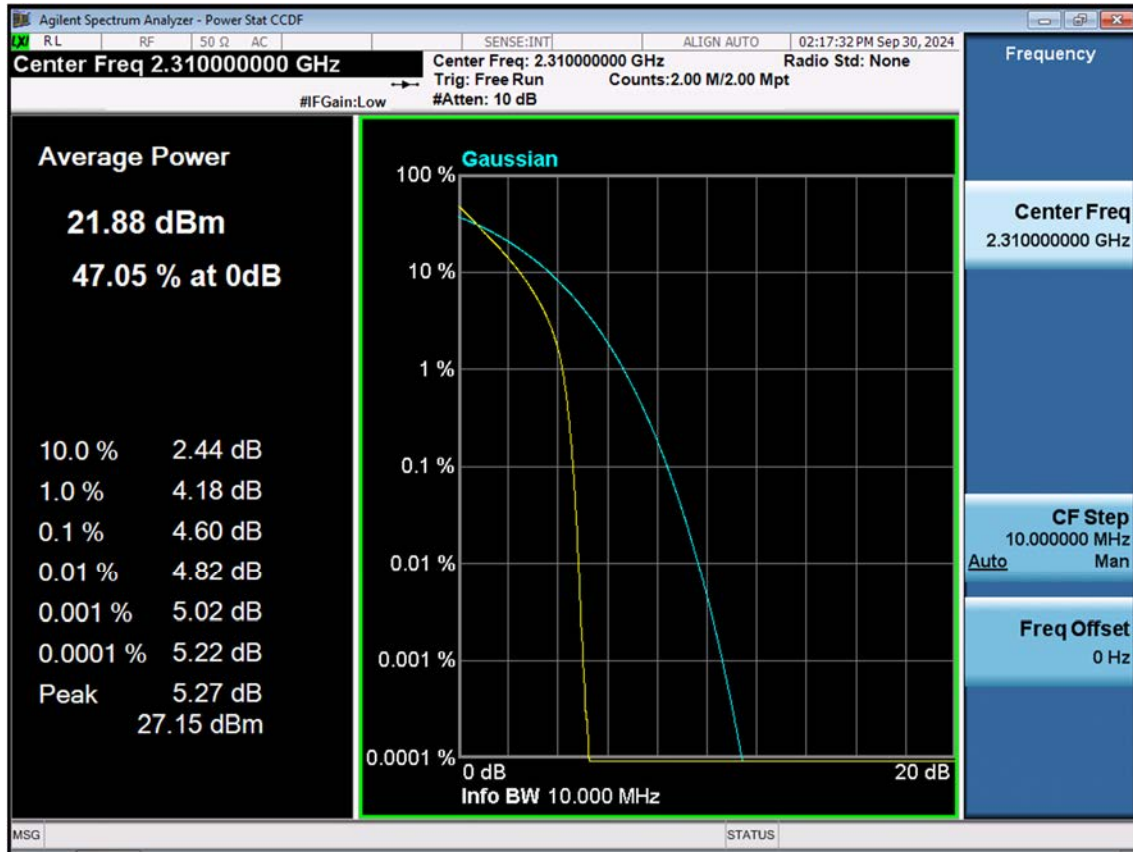
## LTE B30\_5 M\_PAR\_Mid\_64QAM\_FullRB



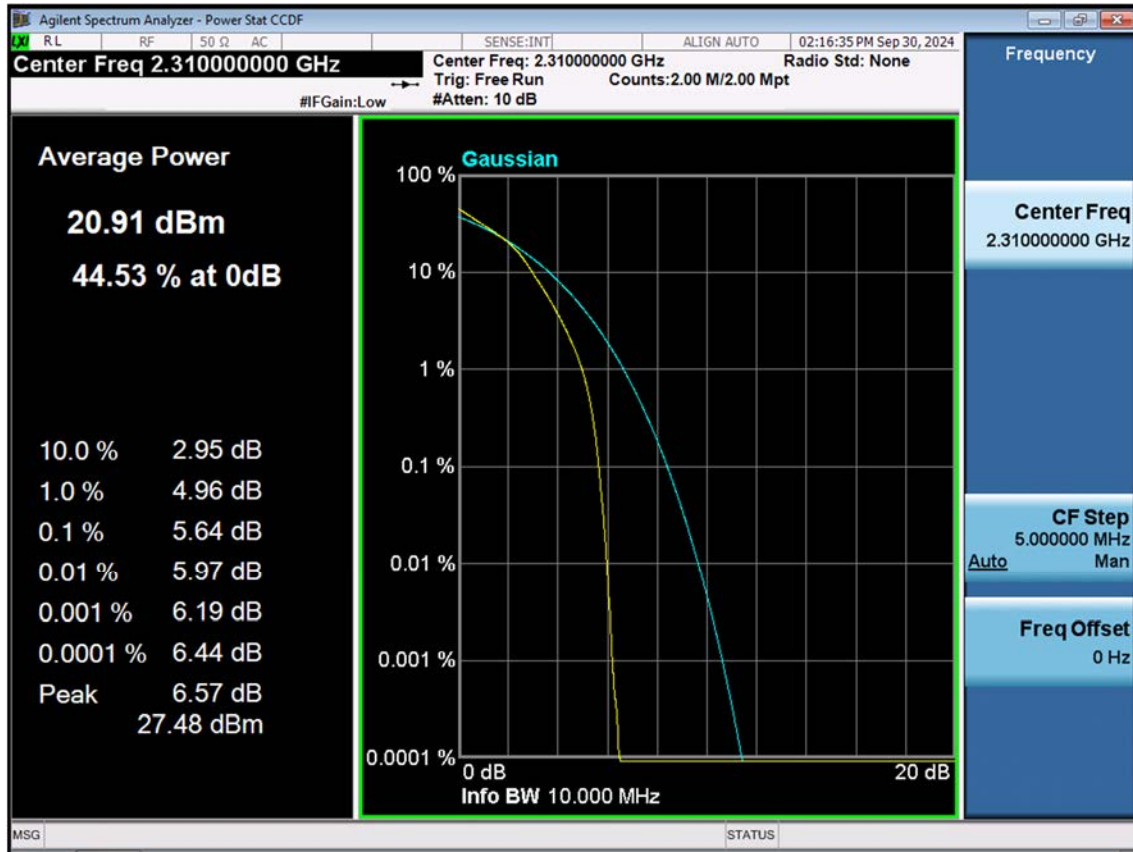
## LTE B30\_5 M\_PAR\_Mid\_256QAM\_FullRB



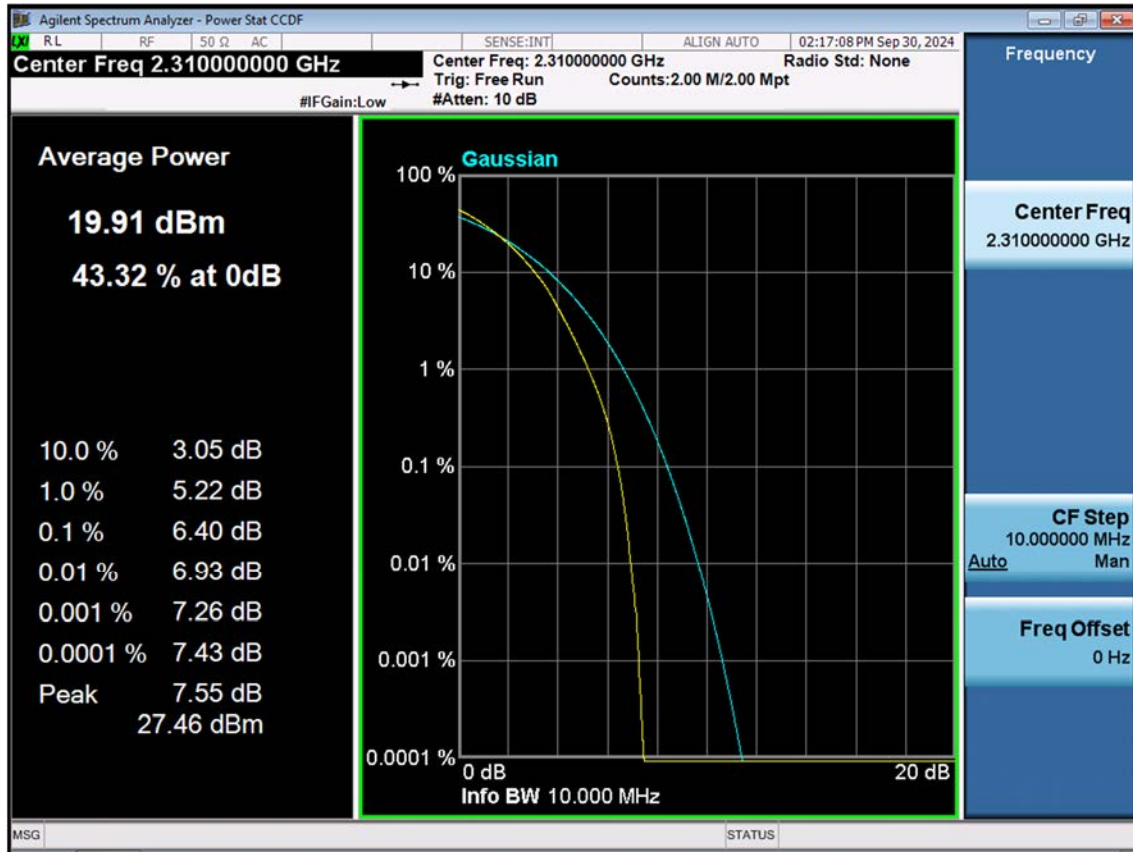
## LTE B30\_10 M\_PAR\_Low\_QPSK\_FullRB



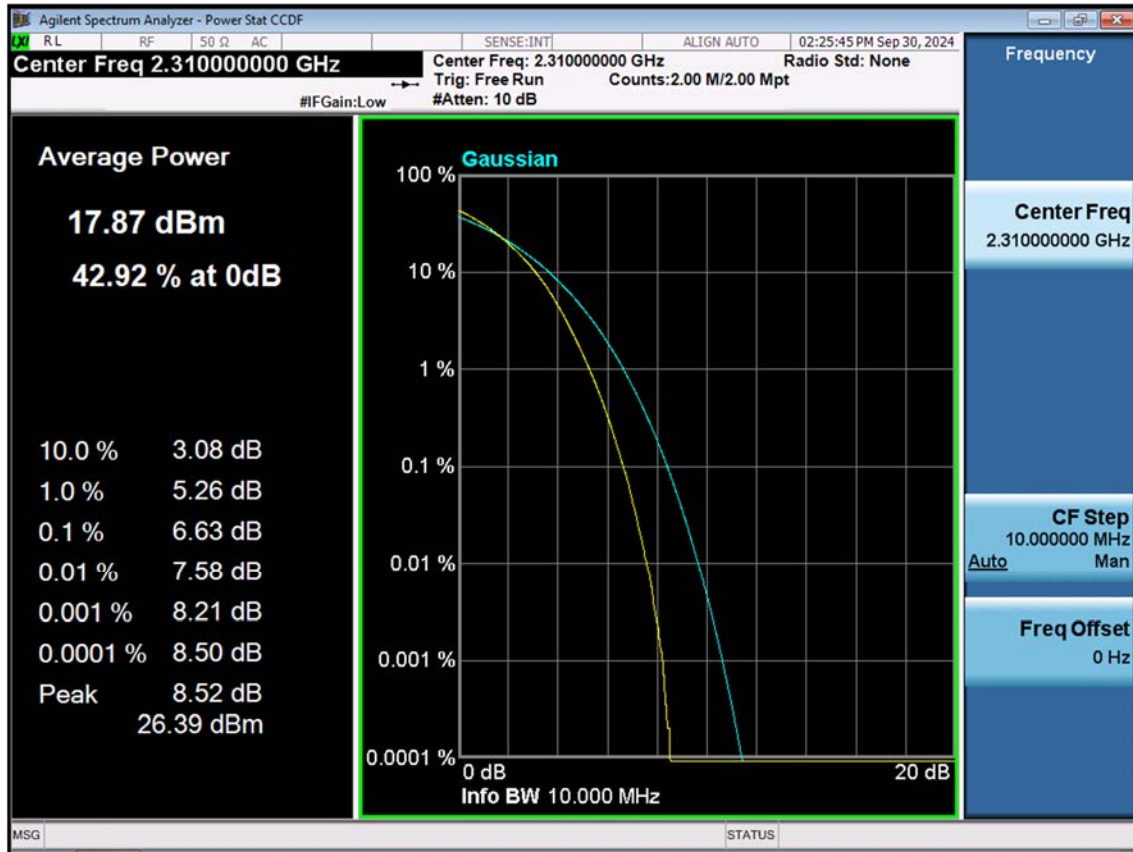
## LTE B30\_10 M\_PAR\_Low\_16QAM\_FullRB



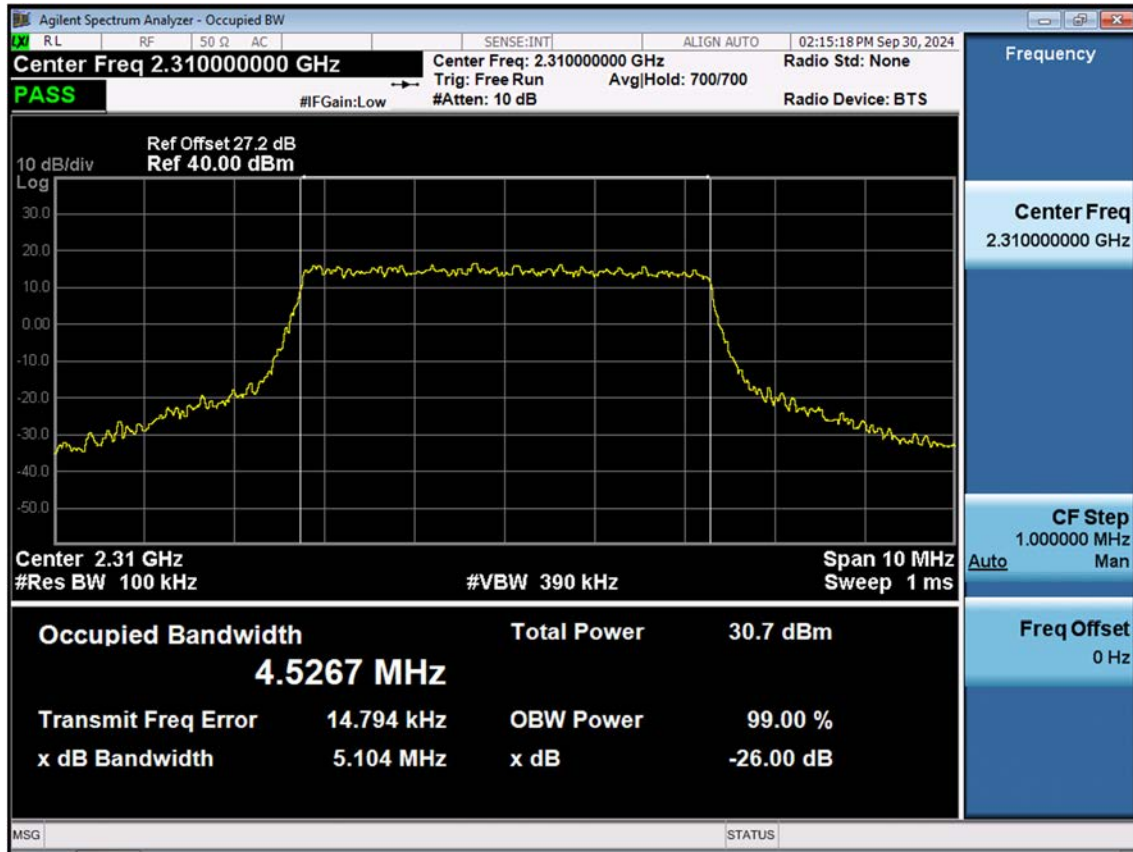
## LTE B30\_10 M\_PAR\_Low\_64QAM\_FullRB



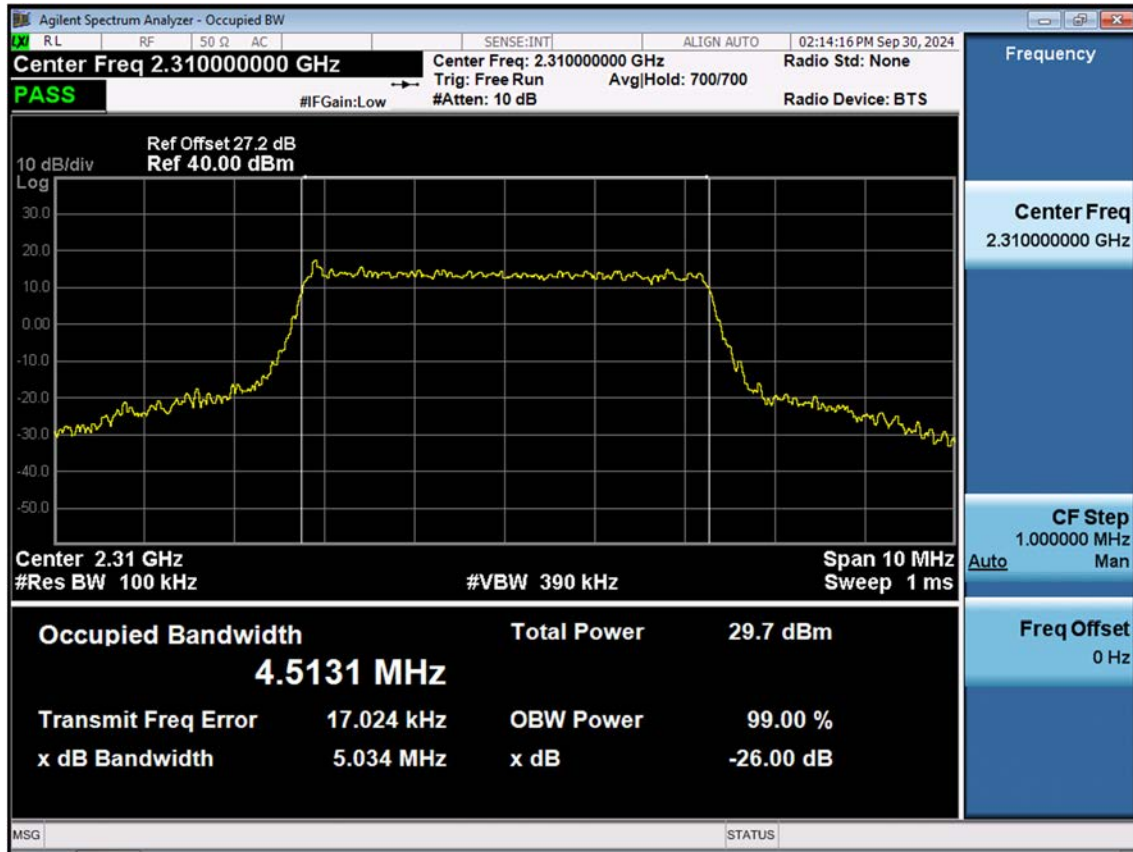
## LTE B30\_10 M\_PAR\_Low\_256QAM\_FullRB



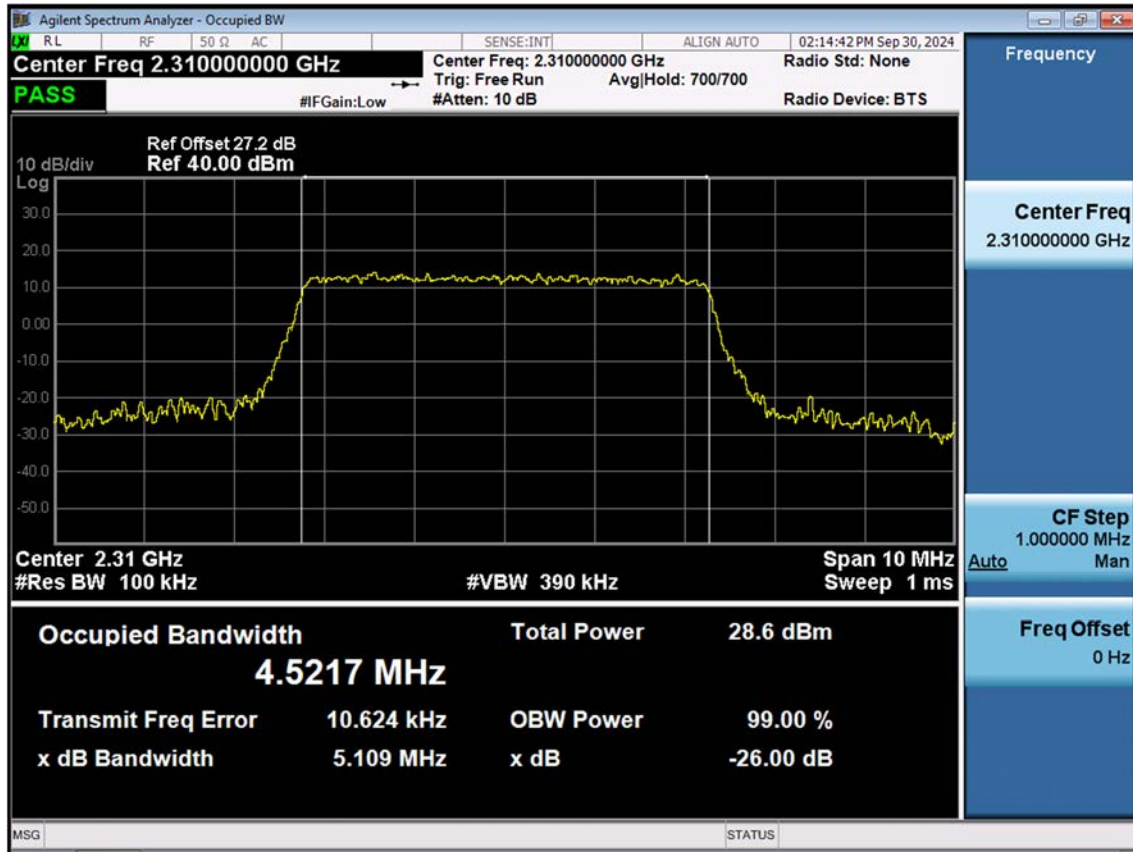
## LTE B30\_5 M\_OBW\_Mid\_QPSK\_FullRB



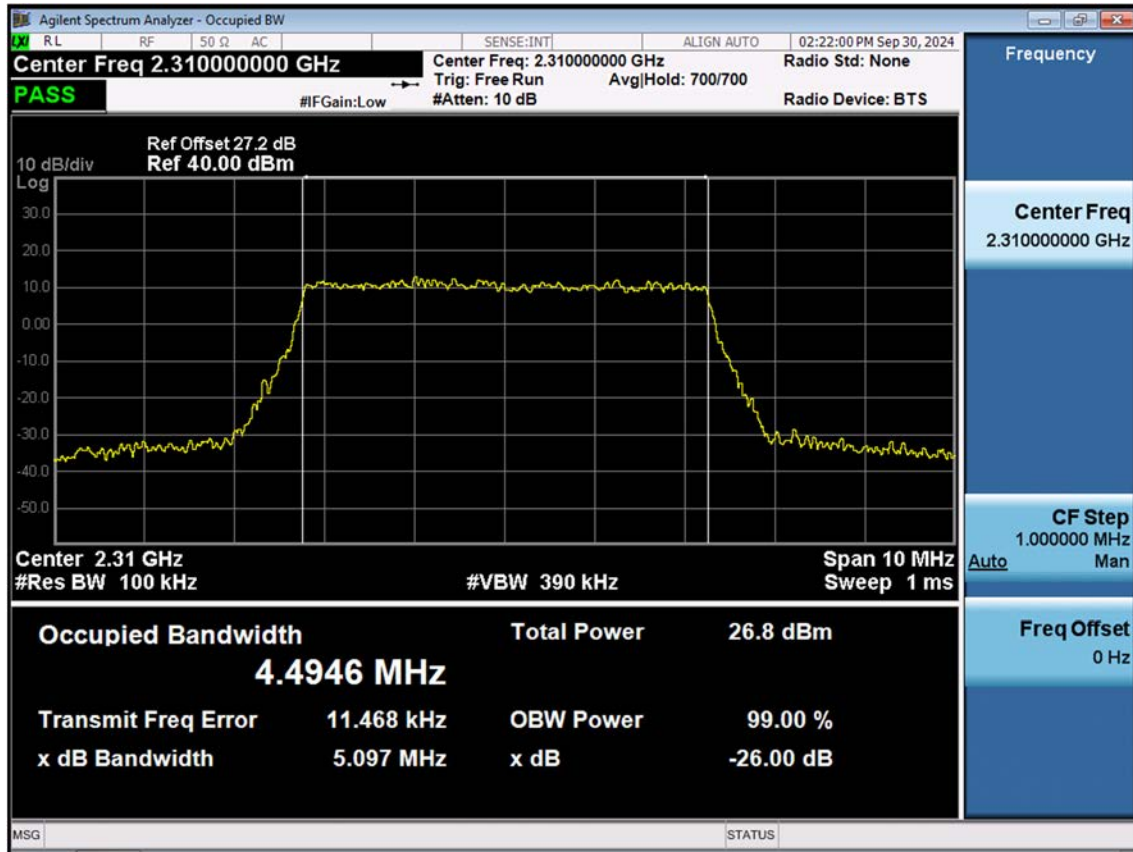
## LTE B30\_5 M\_OBW\_Mid\_16QAM\_FullRB



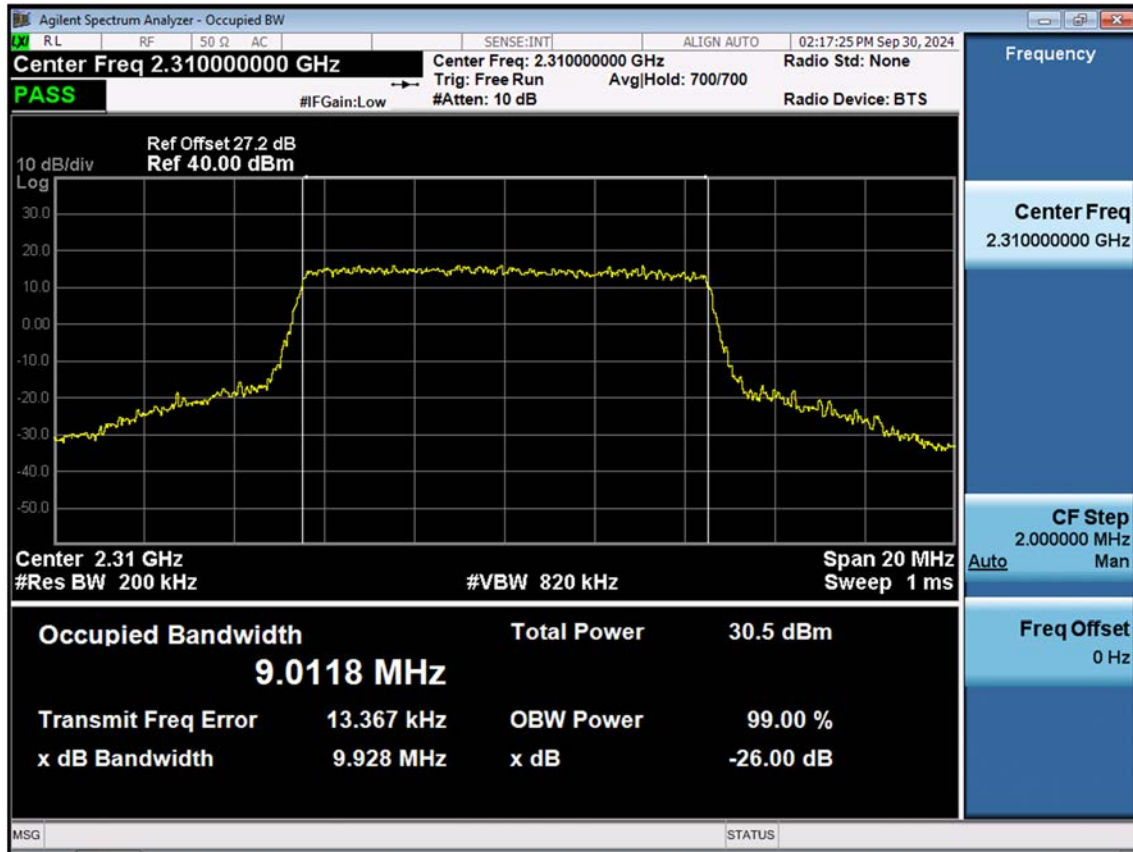
## LTE B30\_5 M\_OBW\_Mid\_64QAM\_FullRB



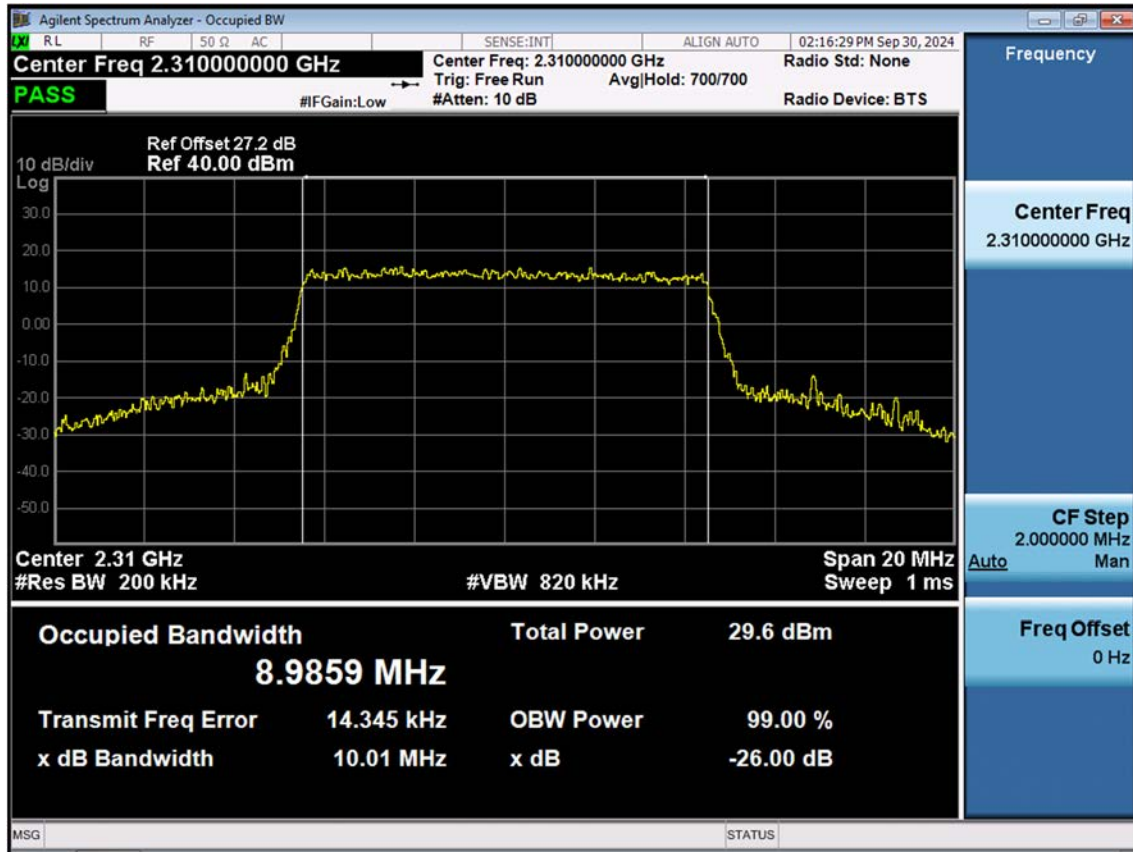
## LTE B30\_5 M\_OBW\_Mid\_256QAM\_FullRB



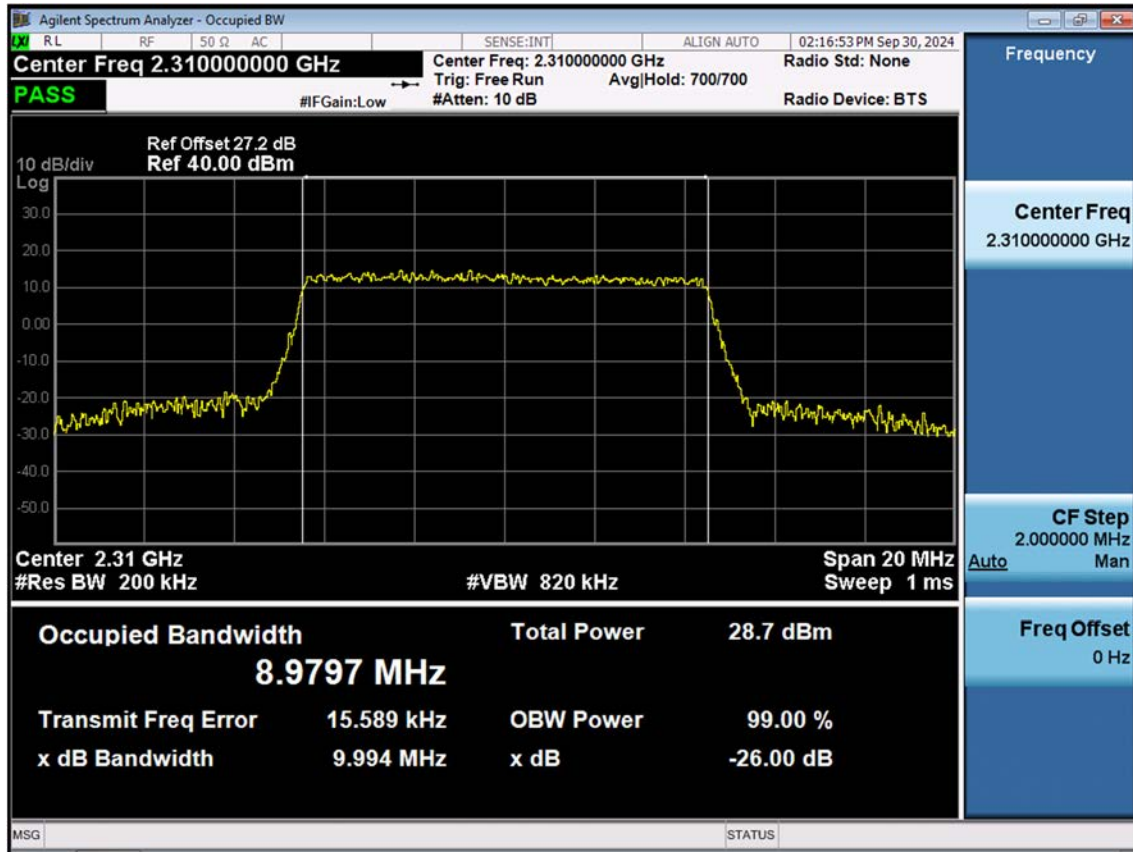
## LTE B30\_10 M\_OBW\_Low\_QPSK\_FullRB



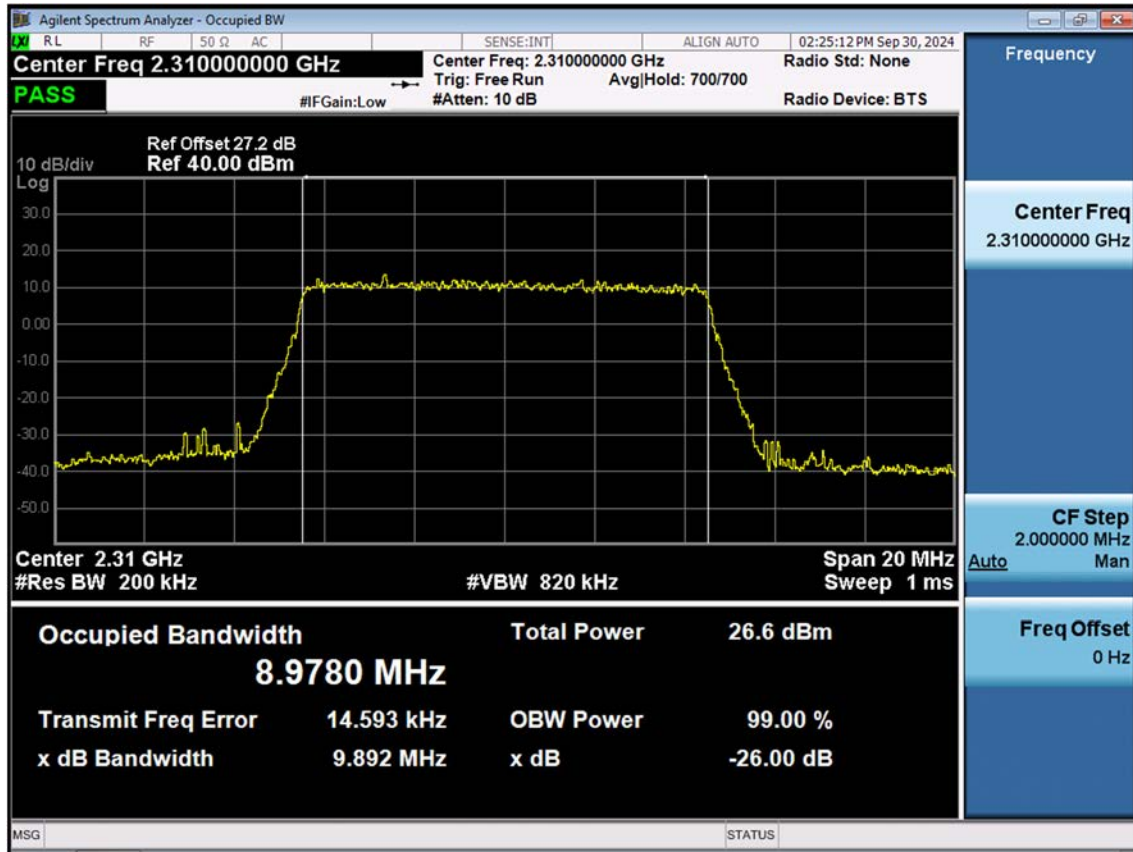
## LTE B30\_10 M\_OBW\_Low\_16QAM\_FullRB



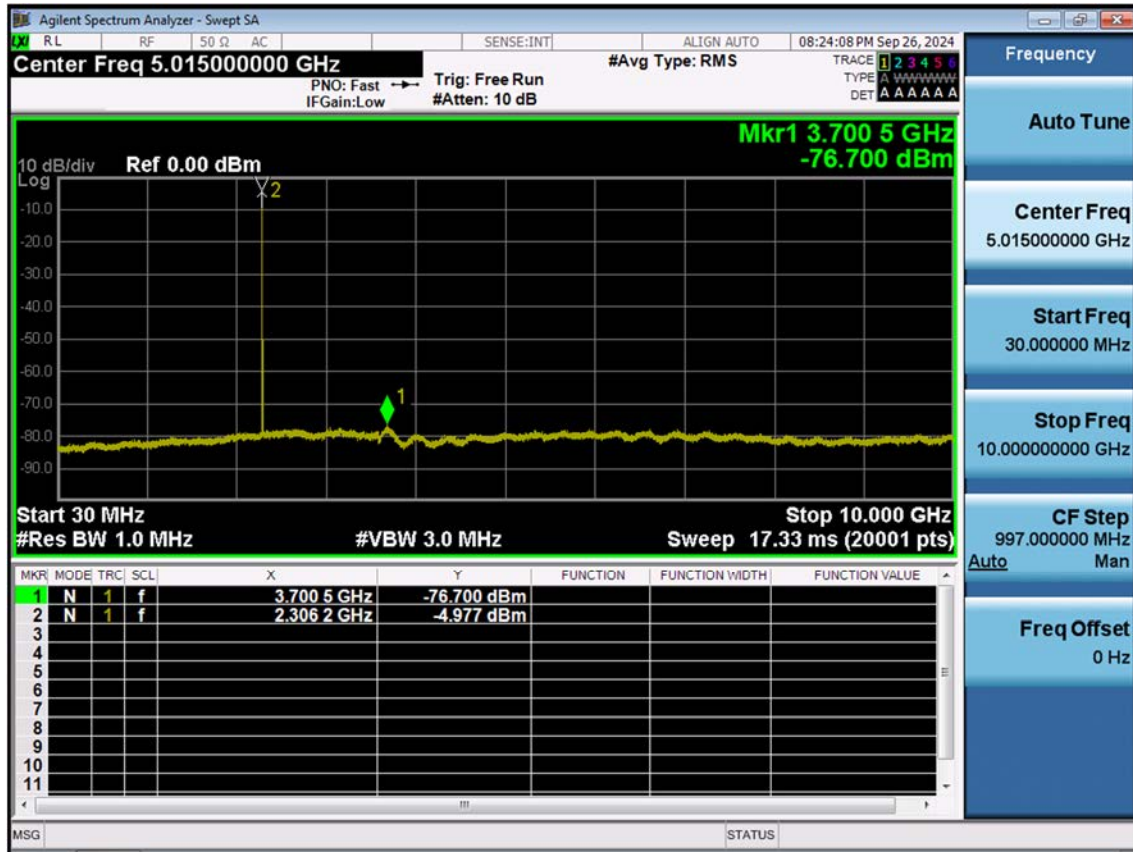
## LTE B30\_10 M\_OBW\_Low\_64QAM\_FullRB



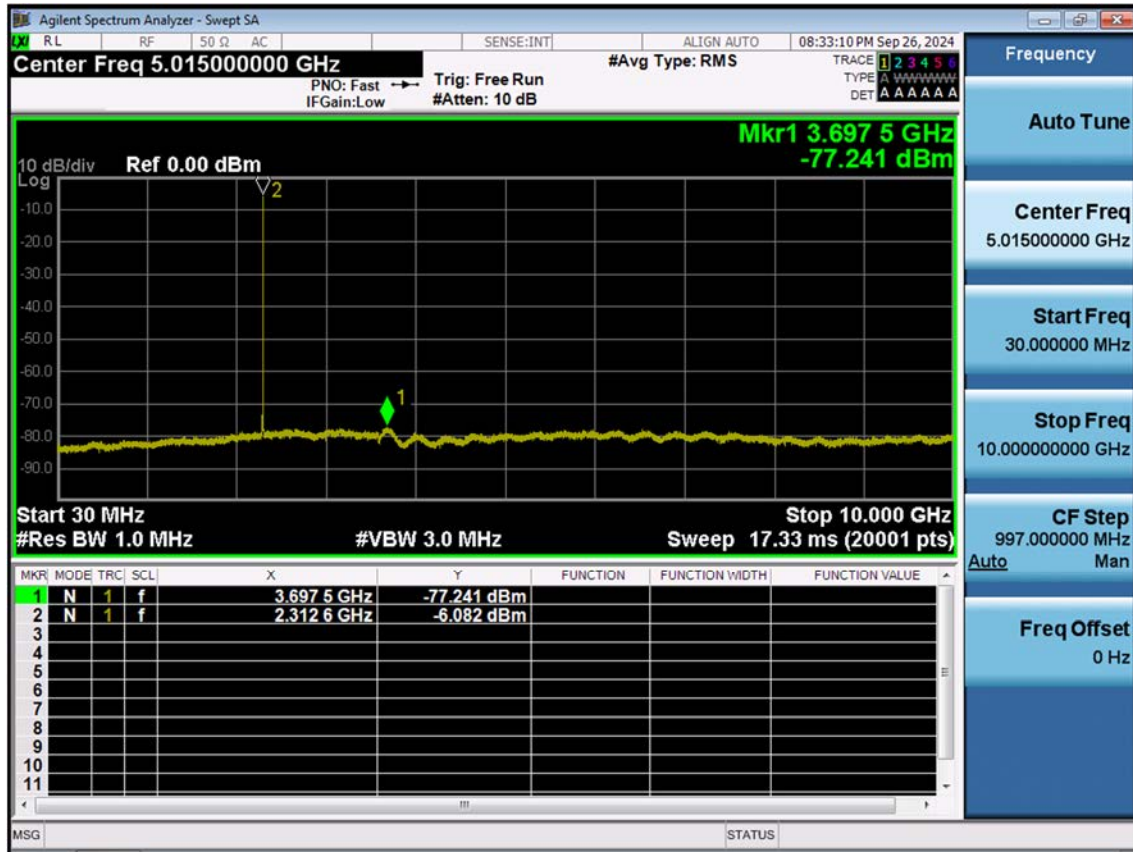
## LTE B30\_10 M\_OBW\_Low\_256QAM\_FullRB



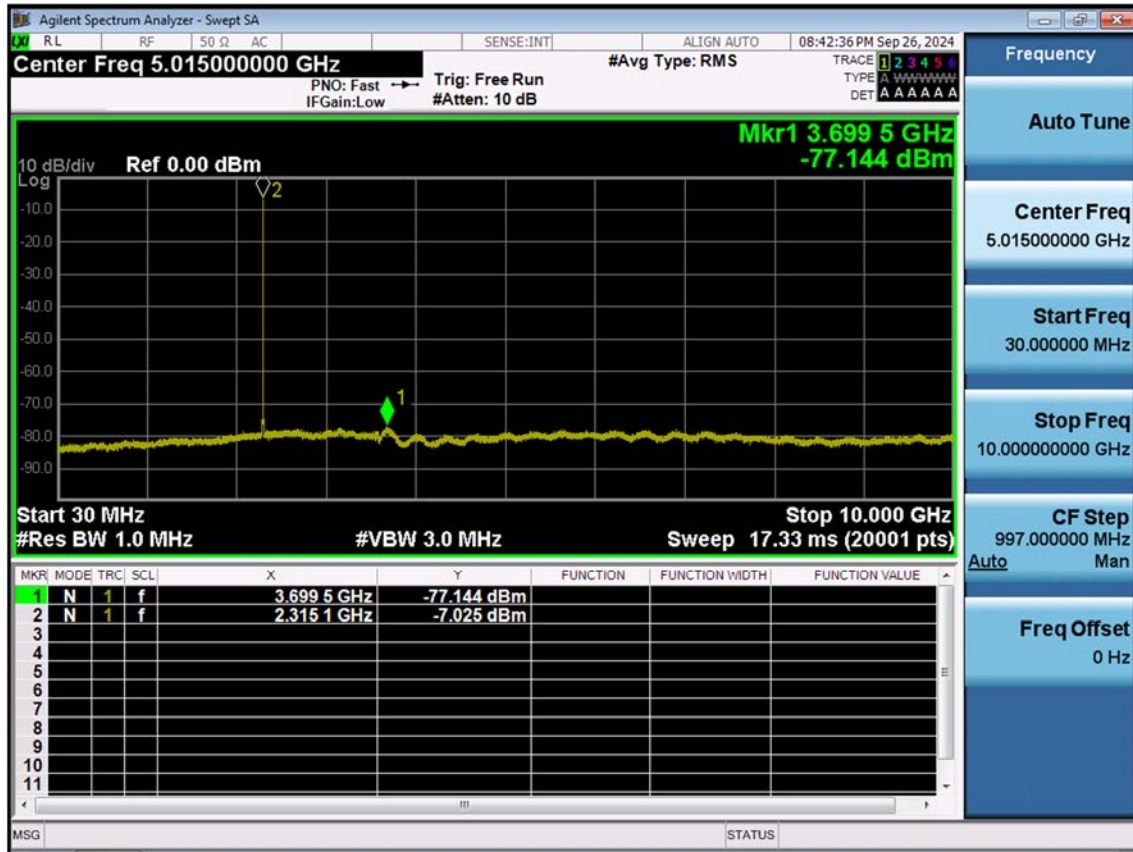
LTE B30\_5 M\_Conducted Spurious(30 M-10 G)\_Low\_QPSK\_1RB



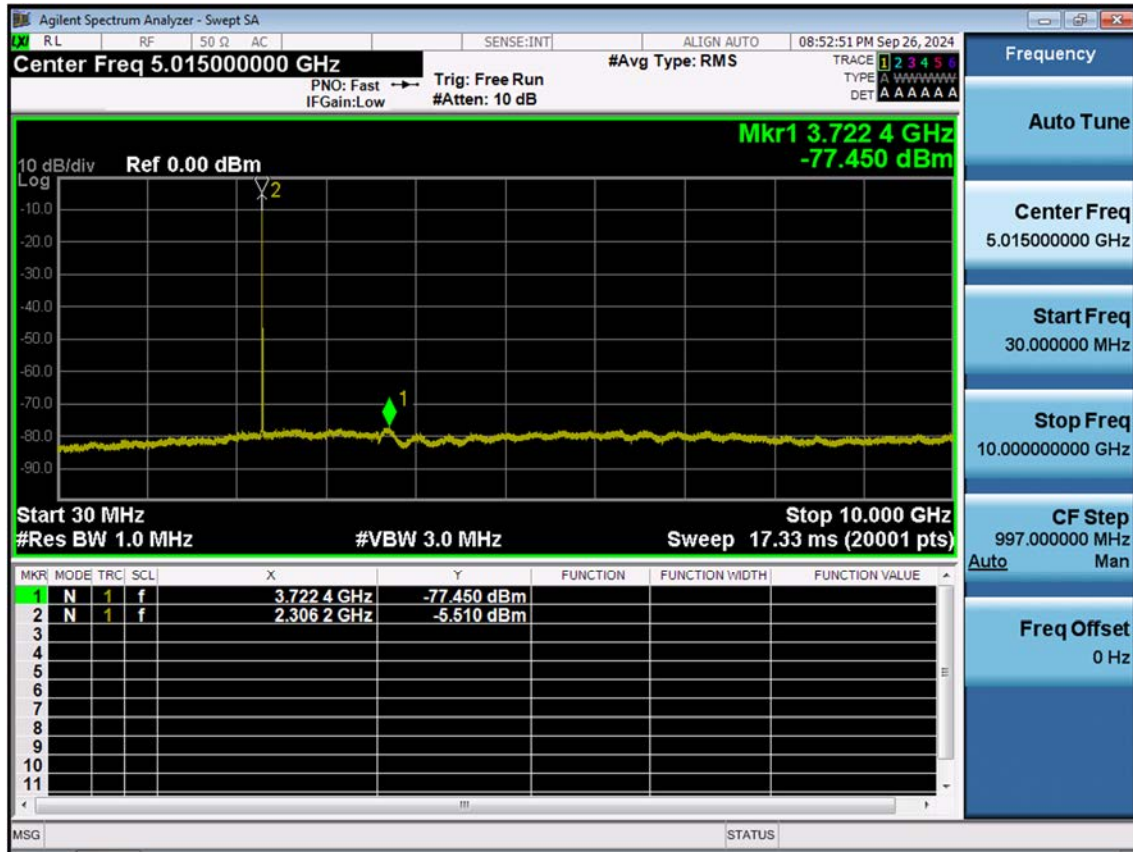
## LTE B30\_5 M\_Conducted Spurious(30 M-10 G)\_Mid\_QPSK\_1RB



LTE B30\_5 M\_Conducted Spurious(30 M-10 G)\_High\_QPSK\_1RB



LTE B30\_10 M\_Conducted Spurious(30 M-10 G)\_Low\_QPSK\_1RB



LTE B30\_5 M\_Conducted Spurious(10 G-26.5 G)\_Low\_QPSK\_1RB



LTE B30\_5 M\_Conducted Spurious(10 G-26.5 G)\_Mid\_QPSK\_1RB



LTE B30\_5 M\_Conducted Spurious(10 G-26.5 G)\_High\_QPSK\_1RB



LTE B30\_10 M\_Conducted Spurious(10 G-26.5 G)\_Low\_QPSK\_1RB



## LTE B30\_5 M\_Band Edge(2280MHz-2288MHz)\_Low\_QPSK\_FullIRB



LTE B30\_5 M\_Band Edge(2288MHz-2292MHz)\_Low\_QPSK\_FullIRB



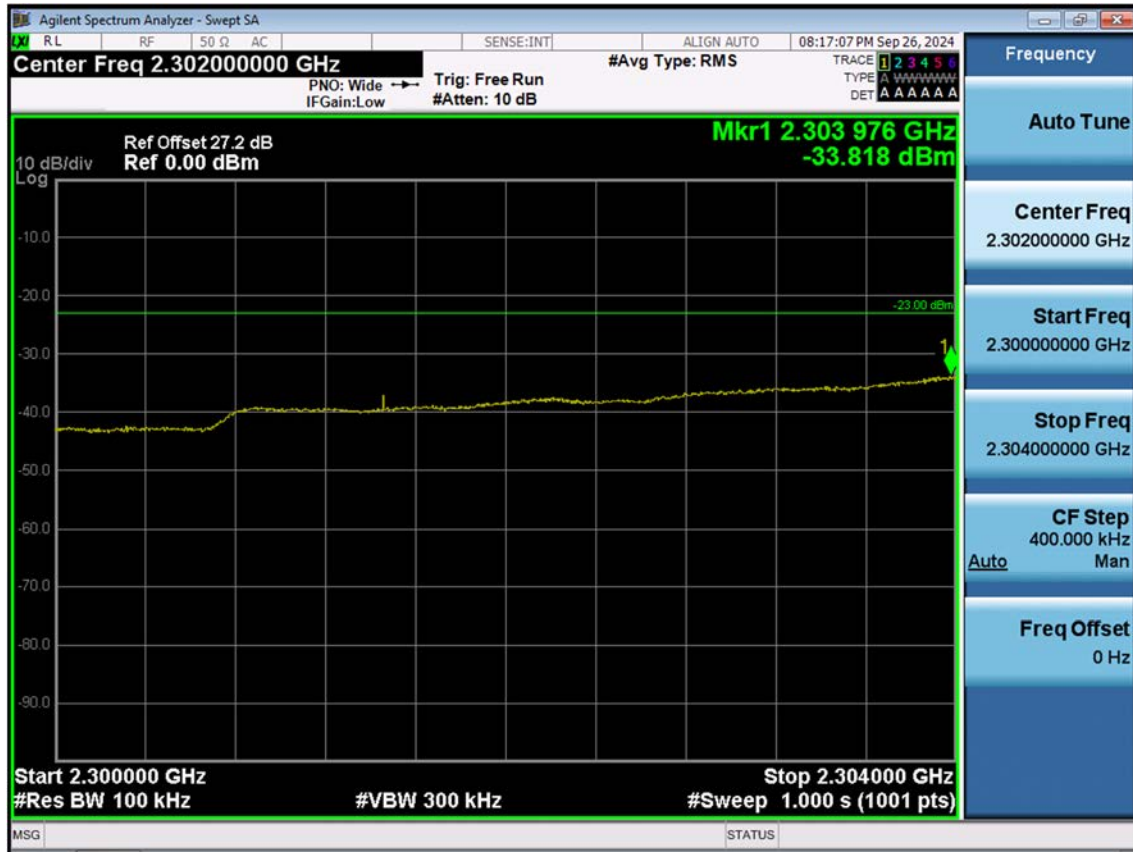
LTE B30\_5 M\_Band Edge(2292MHz-2296MHz)\_Low\_QPSK\_FullIRB



LTE B30\_5 M\_Band Edge(2296MHz-2300MHz)\_Low\_QPSK\_FullIRB



LTE B30\_5 M\_Band Edge(2300MHz-2304MHz)\_Low\_QPSK\_FullIRB



Note : We used a narrower RBW in order to increase accuracy.

Calculation = Reading Value + 10 x log(1 MHz/100 kHz) dB = -33.818 dBm + 10 dB = -23.818 dBm

LTE B30\_5 M\_Band Edge(2304MHz-2305MHz)\_Low\_QPSK\_FullIRB



LTE B30\_5 M\_Band Edge(2315MHz-2320MHz)\_Low\_QPSK\_FullIRB



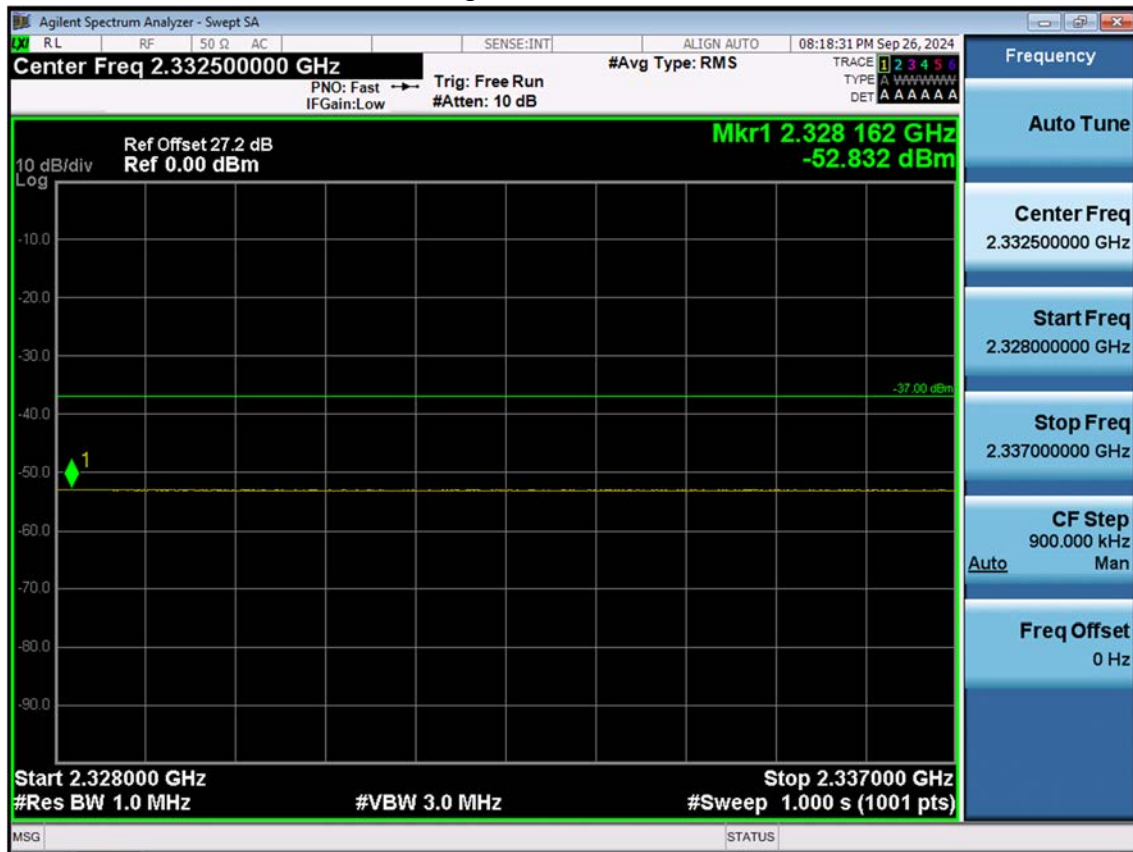
LTE B30\_5 M\_Band Edge(2320MHz-2324MHz)\_Low\_QPSK\_FullIRB



LTE B30\_5 M\_Band Edge(2324MHz-2328MHz)\_Low\_QPSK\_FullIRB



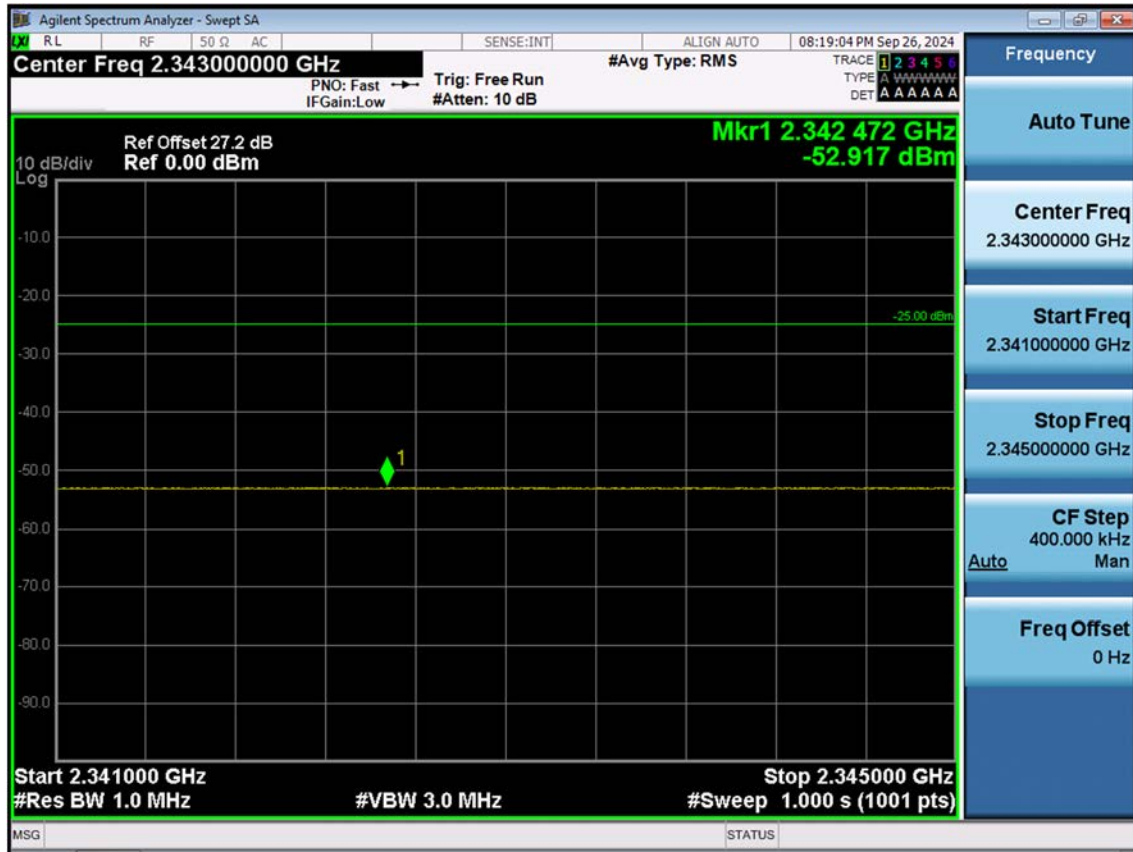
LTE B30\_5 M\_Band Edge(2328MHz-2337MHz)\_Low\_QPSK\_FullIRB



LTE B30\_5 M\_Band Edge(2337MHz-2341MHz)\_Low\_QPSK\_FullIRB



LTE B30\_5 M\_Band Edge(2341MHz-2345MHz)\_Low\_QPSK\_FullIRB



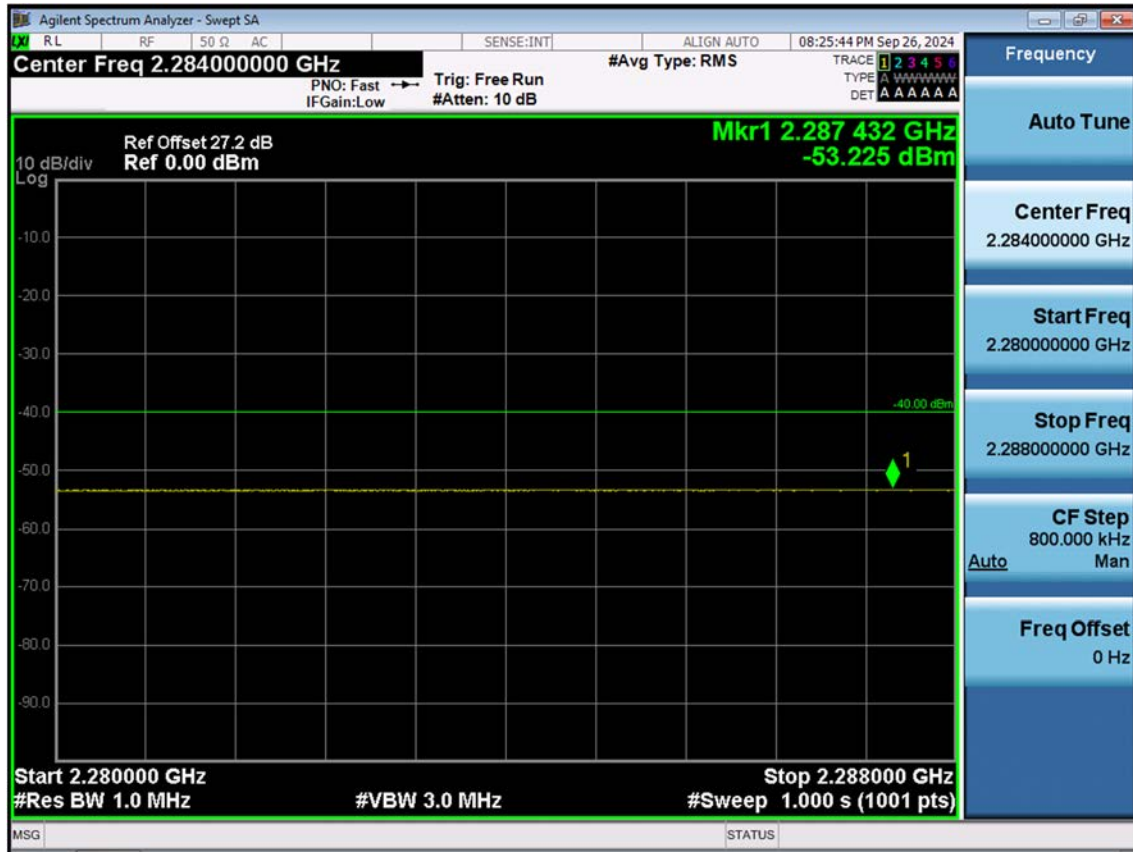
LTE B30\_5 M\_Band Edge(2345MHz-2365MHz)\_Low\_QPSK\_FullIRB



## LTE B30\_5 M\_Band Edge(2365MHz-2400MHz)\_Low\_QPSK\_FullIRB



LTE B30\_5 M\_Band Edge(2280MHz-2288MHz)\_Mid\_QPSK\_FullRB



LTE B30\_5 M\_Band Edge(2288MHz-2292MHz)\_Mid\_QPSK\_FullRB



LTE B30\_5 M\_Band Edge(2292MHz-2296MHz)\_Mid\_QPSK\_FullRB



LTE B30\_5 M\_Band Edge(2296MHz-2300MHz)\_Mid\_QPSK\_FullRB



LTE B30\_5 M\_Band Edge(2300MHz-2305MHz)\_Mid\_QPSK\_FullIRB



LTE B30\_5 M\_Band Edge(2315MHz-2320MHz)\_Mid\_QPSK\_FullRB



LTE B30\_5 M\_Band Edge(2320MHz-2324MHz)\_Mid\_QPSK\_FullRB



LTE B30\_5 M\_Band Edge(2324MHz-2328MHz)\_Mid\_QPSK\_FullRB



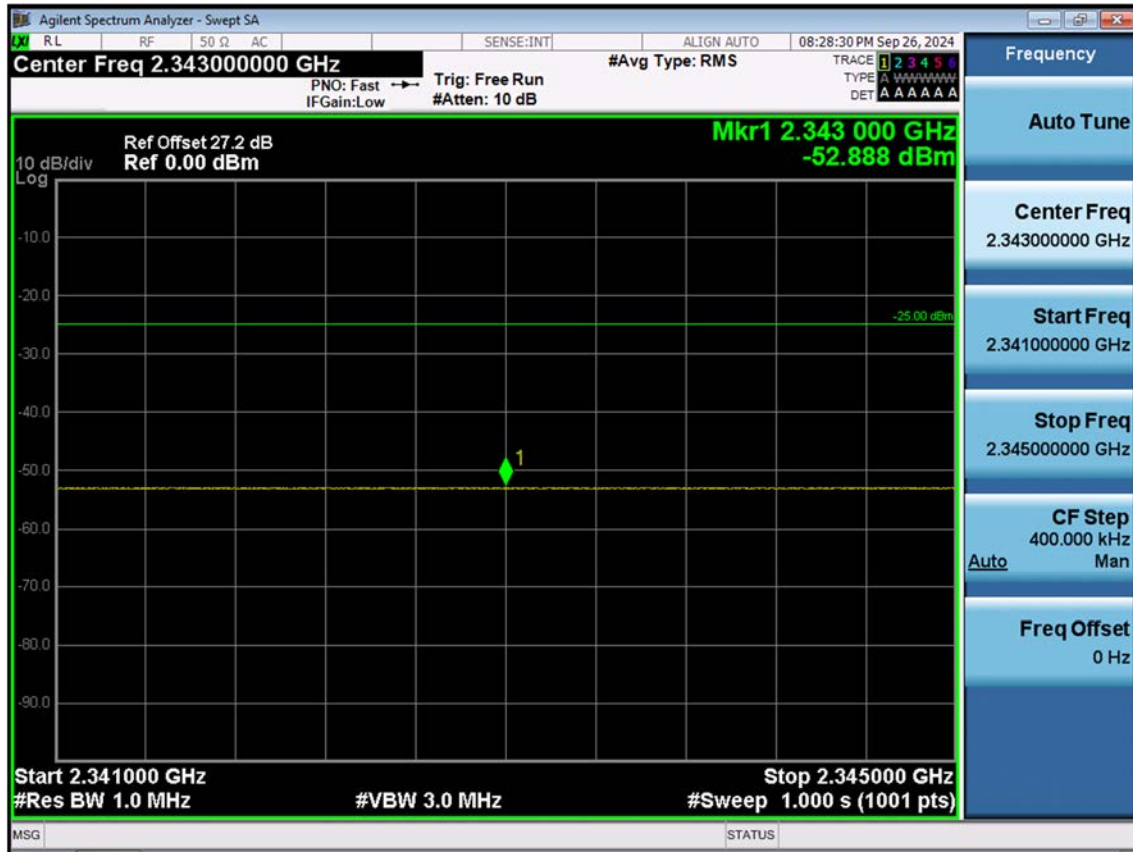
LTE B30\_5 M\_Band Edge(2328MHz-2337MHz)\_Mid\_QPSK\_FullRB



## LTE B30\_5 M\_Band Edge(2337MHz-2341MHz)\_Mid\_QPSK\_FullRB



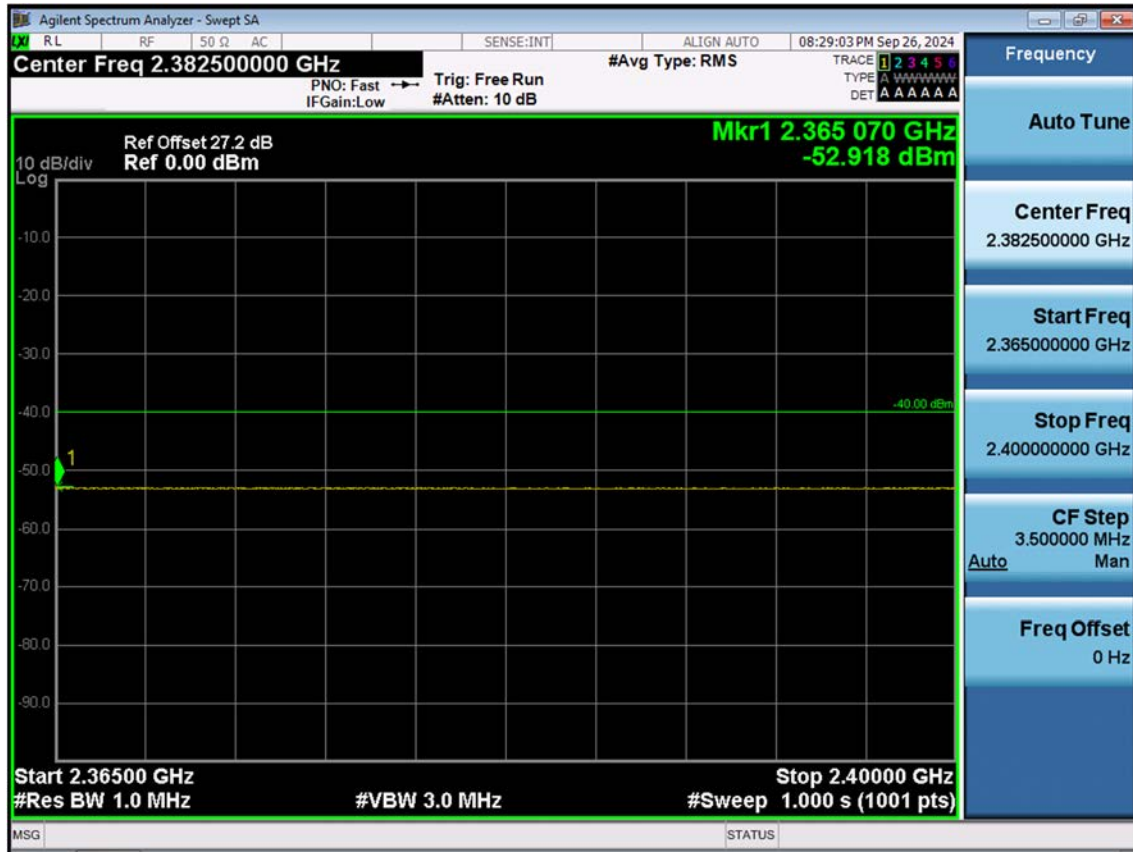
## LTE B30\_5 M\_Band Edge(2341MHz-2345MHz)\_Mid\_QPSK\_FullRB



LTE B30\_5 M\_Band Edge(2345MHz-2365MHz)\_Mid\_QPSK\_FullRB



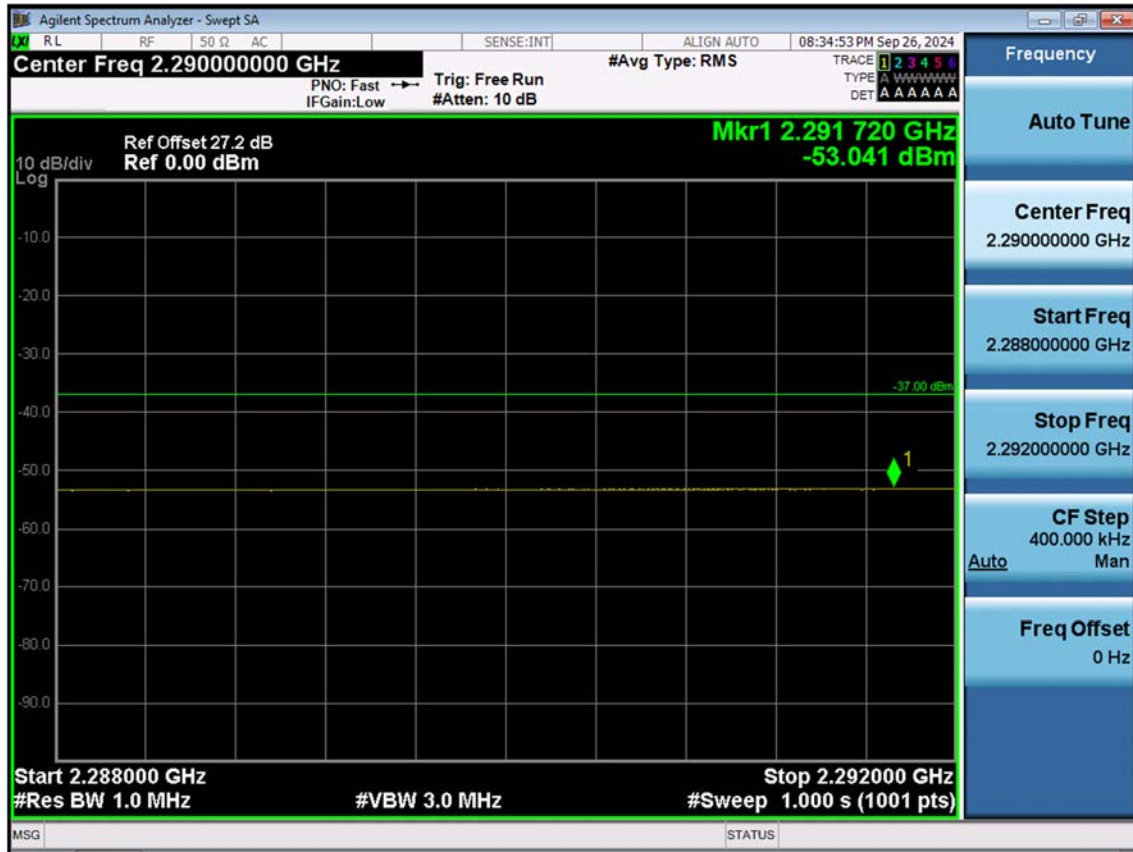
LTE B30\_5 M\_Band Edge(2365MHz-2400MHz)\_Mid\_QPSK\_FullIRB



## LTE B30\_5 M\_Band Edge(2280MHz-2288MHz)\_High\_QPSK\_FullRB



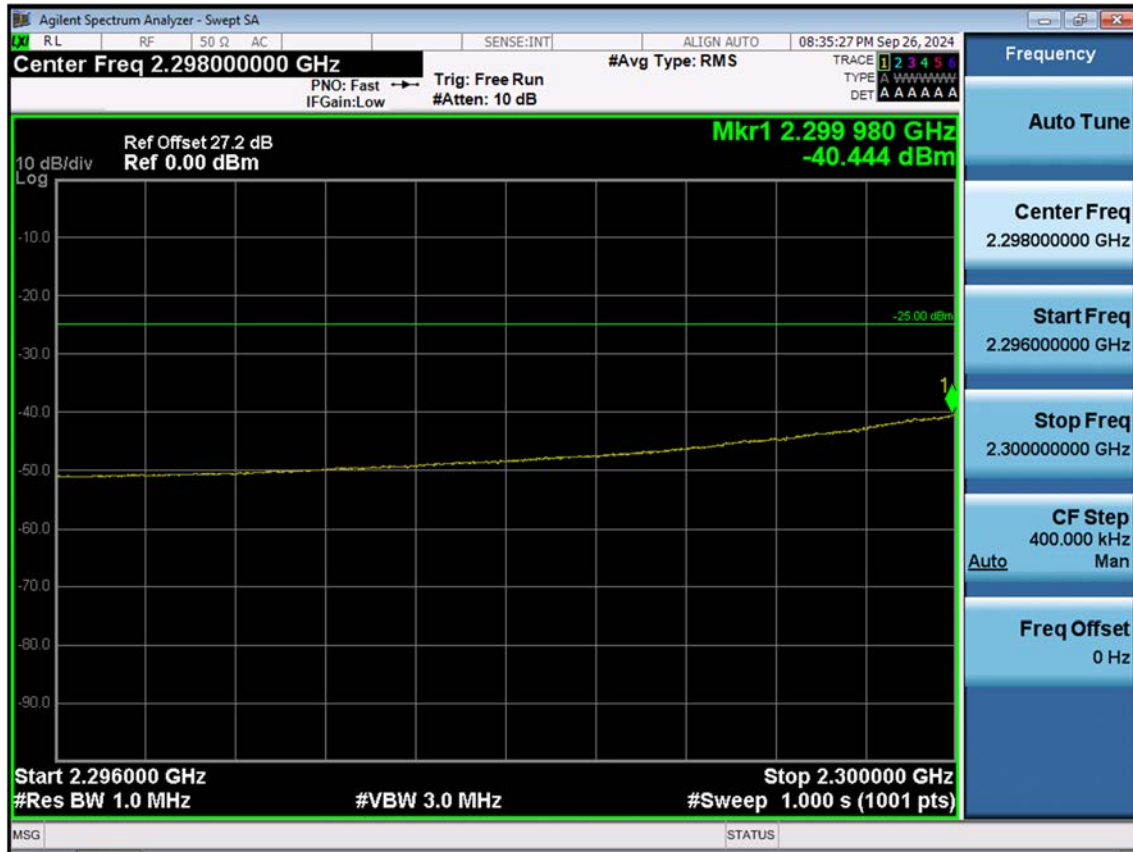
## LTE B30\_5 M\_Band Edge(2288MHz-2292MHz)\_High\_QPSK\_FullRB



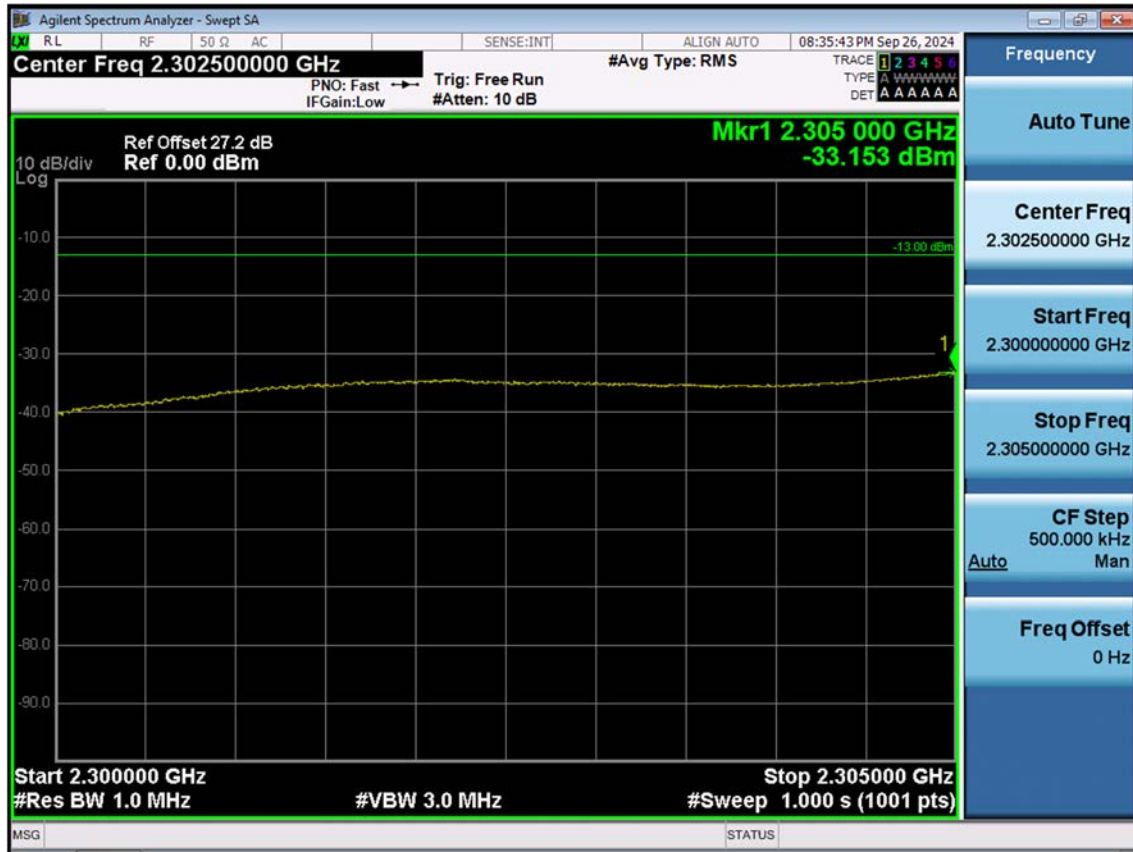
## LTE B30\_5 M\_Band Edge(2292MHz-2296MHz)\_High\_QPSK\_FullRB



LTE B30\_5 M\_Band Edge(2296MHz-2300MHz)\_High\_QPSK\_FullRB



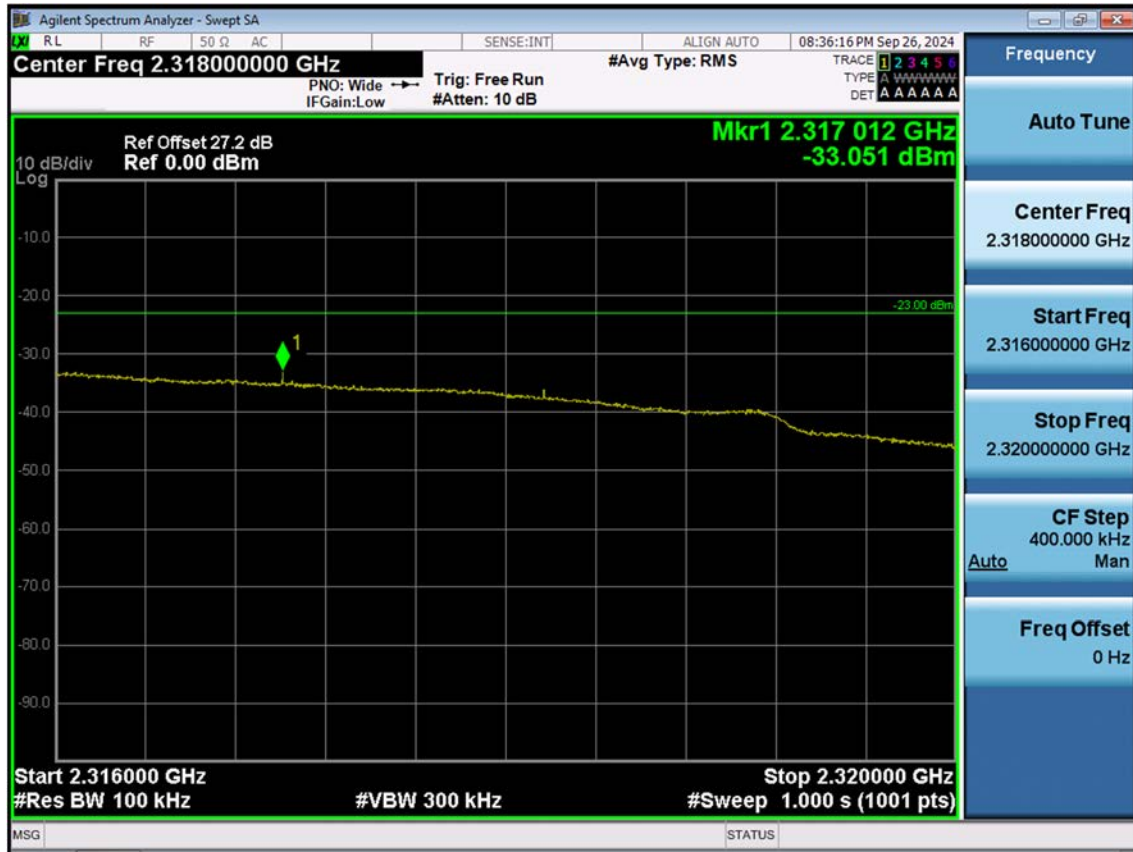
LTE B30\_5 M\_Band Edge(2300MHz-2305MHz)\_High\_QPSK\_FullRB



## LTE B30\_5 M\_Band Edge(2315MHz-2316MHz)\_High\_QPSK\_FullRB



LTE B30\_5 M\_Band Edge(2316MHz-2320MHz)\_High\_QPSK\_FullRB



Note : We used a narrower RBW in order to increase accuracy.

Calculation = Reading Value + 10 x log(1 MHz/100 kHz) dB = -33.051 dBm + 10 dB = -23.051 dBm