# TEST REPORT

FCC Sub6 n30 Test for SM-S721U
Certification

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

**REPORT NO.**
HCT-RF-2407-FC031

**DATE OF ISSUE**
July 19, 2024

**Tested by**
Jin Woo Yu

**Technical Manager**
Jong Seok Lee

HCT CO., LTD.
BongJai Huh / CEO



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

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

# TEST REPORT

REPORT NO.
HCT-RF-2407-FC031

DATE OF ISSUE
July 19, 2024

Additional Model
SM-S721U1

| | |
|---|---|
| Applicant | **SAMSUNG Electronics Co., Ltd.**<br>129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea |
| Product Name<br>Model Name | Mobile Phone<br>SM-S721U |
| Date of Test | May 21, 2024 ~ July 19, 2024 |
| FCC ID | A3LSMS721U |
| Location of Test | ■ Permanent Testing Lab ☐ On Site Testing<br>(Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 Republic of Korea) |
| FCC 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 | July 19, 2024 | Initial Release |

## Notice

| Content |
|---|
| The measurements shown in this report were made in accordance with the procedures specified in CFR47 section § 2.947. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.<br>HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a) |
| The results shown in this test report only apply to the sample(s), as received, provided by the applicant, unless otherwise stated.<br>The test results have only been applied with the test methods required by the standard(s). |
| The laboratory is not accredited for the test results marked *.<br>Information provided by the applicANT Fs marked **.<br>Test results provided by external providers are marked ***. |
| When confirmation of authenticity of this test report is required, please contact www.hct.co.kr |
| The test results in this test report are not associated with the ((KS Q) ISO/IEC 17025) accreditation by KOLAS (Korea Laboratory Accreditation Scheme) / A2LA (American Association for Laboratory Accreditation) that are under the ILAC (International Laboratory Accreditation Cooperation) Mutual Recognition Agreement (MRA). |

## CONTENTS

# MEASUREMENT REPORT

## 1. GENERAL INFORMATION

| | |
|---|---|
| **Applicant Name:** | SAMSUNG Electronics Co., Ltd. |
| **Address:** | 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea |
| **FCC ID:** | A3LSMS721U |
| **Application Type:** | Certification |
| **FCC Classification:** | PCS Licensed Transmitter Held to Ear (PCE) |
| **FCC Rule Part(s):** | § 27 |
| **EUT Type:** | Mobile phone |
| **Model(s):** | SM-S721U |
| **Additional Model(s)** | SM-S721U1 |
| **SCS(kHz):** | 15 |
| **Bandwidth(MHz):** | 5, 10 |
| **Waveform:** | CP-OFDM, DFT-S-OFDM |
| **Modulation:** | DFT-S-OFDM: PI/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM<br>CP-OFDM: QPSK, 16QAM, 64QAM, 256QAM |
| **Tx Frequency:** | 2307.5 MHz – 2312.5 MHz (Sub6 n30 (5 MHz))<br>2310.0 MHz (Sub6 n30 (10 MHz)) |
| **Date(s) of Tests:** | May 21, 2024 ~ July 19, 2024 |
| **Serial number:** | Radiated : 67d50ecc63197ece<br>Conducted : R3CX40SV7PD |

## 1.1. MAXIMUM OUTPUT POWER

### ANT A

| Mode (MHz) | Tx Frequency (MHz) | Emission Designator | Modulation | EIRP | |
|---|---|---|---|---|---|
| | | | | Max. Power (W) | Max. Power (dBm) |
| Sub6 n30 (5) | 2307.5 – 2312.5 | 4M53G7D | PI/2 BPSK | 0.128 | 21.08 |
| | | 4M53G7D | QPSK | 0.127 | 21.03 |
| | | 4M51W7D | 16QAM | 0.102 | 20.07 |
| | | 4M51W7D | 64QAM | 0.071 | 18.49 |
| | | 4M52W7D | 256QAM | 0.045 | 16.51 |
| Sub6 n30 (10) | 2310.0 | 9M00G7D | PI/2 BPSK | 0.128 | 21.07 |
| | | 9M01G7D | QPSK | 0.126 | 21.02 |
| | | 8M98W7D | 16QAM | 0.102 | 20.07 |
| | | 8M97W7D | 64QAM | 0.071 | 18.50 |
| | | 8M96W7D | 256QAM | 0.045 | 16.56 |

### ANT F

| Mode (MHz) | Tx Frequency (MHz) | Emission Designator | Modulation | EIRP | |
|---|---|---|---|---|---|
| | | | | Max. Power (W) | Max. Power (dBm) |
| Sub6 n30 (5) | 2307.5 – 2312.5 | 4M68G7D | PI/2 BPSK | 0.070 | 18.46 |
| | | 4M66G7D | QPSK | 0.069 | 18.37 |
| | | 4M68W7D | 16QAM | 0.055 | 17.40 |
| | | 4M68W7D | 64QAM | 0.040 | 16.05 |
| | | 4M75W7D | 256QAM | 0.025 | 13.94 |
| Sub6 n30 (10) | 2310.0 | 9M00G7D | PI/2 BPSK | 0.071 | 18.49 |
| | | 9M00G7D | QPSK | 0.070 | 18.46 |
| | | 9M01W7D | 16QAM | 0.056 | 17.51 |
| | | 9M03W7D | 64QAM | 0.040 | 15.99 |
| | | 8M99W7D | 256QAM | 0.024 | 13.88 |

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

## 2.2. MEASURING INSTRUMENT CALIBRATION

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

## 2.3. TEST FACILITY

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

# 3. DESCRIPTION OF TESTS

## 3.1 TEST PROCEDURE

| Test Description | Test Procedure Used |
|---|---|
| Occupied Bandwidth | - KDB 971168 D01 v03r01 – Section 4.3<br>- ANSI C63.26-2015 – Section 5.4.4 |
| 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 |
| Frequency stability | - ANSI C63.26-2015 – Section 5.6 |
| Effective Radiated Power/ Effective Isotropic Radiated Power | - KDB 971168 D01 v03r01 – Section 5.2 & 5.8<br>- ANSI/TIA-603-E-2016 – Section 2.2.17 |
| Radiated Spurious and Harmonic Emissions | - KDB 971168 D01 v03r01 – Section 6.2<br>- ANSI/TIA-603-E-2016 – Section 2.2.12 |

## 3.2 RADIATED POWER

**Test Overview**

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

**Test Settings**

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

**Test Note**

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

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

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

## 3.3 RADIATED SPURIOUS EMISSIONS

**Test Overview**

Radiated tests are performed in the Fully-anechoic chamber.

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

**Test Settings**

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

**Test Note**

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

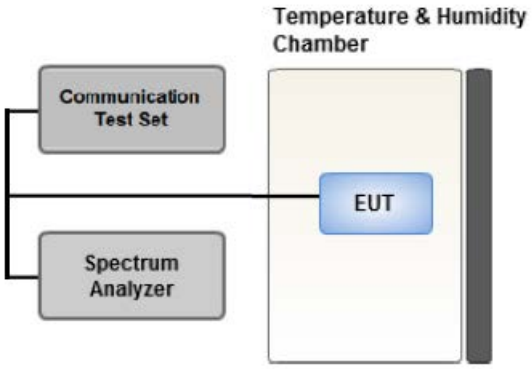
$$\text{Result}_{(dBm)} = \text{Pg}_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dBi)}$$

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

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

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

## 3.4 PEAK- TO- AVERAGE RATIO




Test setup

① CCDF Procedure for PAPR

Test Settings

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

② Alternate Procedure for PAPR

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

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

**Test Settings(Peak Power)**

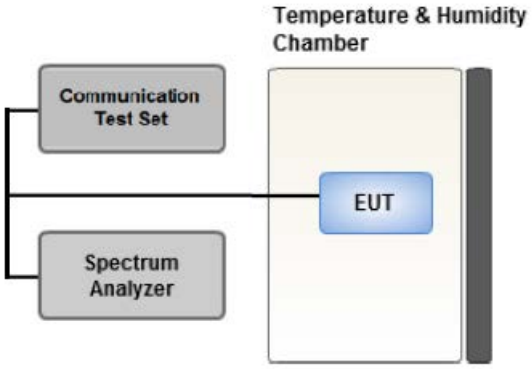
The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW ≥ 3 × RBW.

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

**Test Settings(Average Power)**

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

## 3.5 OCCUPIED BANDWIDTH.



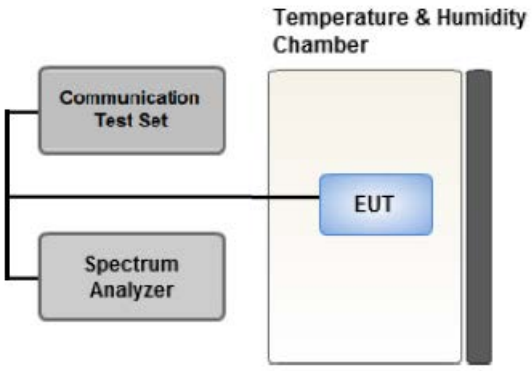

**Test setup**

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

**Test Settings**

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99 % occupied bandwidth and the 26 dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5 % of the expected OBW
3. VBW ≥ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5 % of the 99 % occupied bandwidth observed in Step 7

## 3.6 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL




Test setup

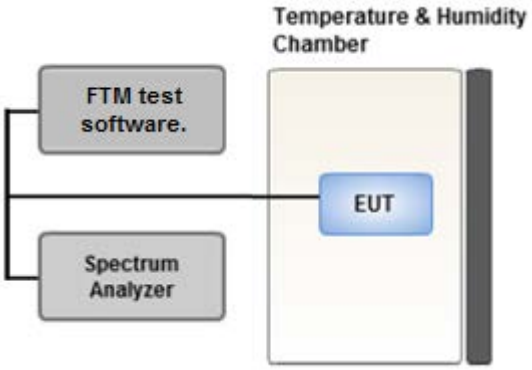
Test Overview

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

Test Settings

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

## 3.7 BAND EDGE




Test setup

Test Overview

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

Test Settings

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

**Test 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;

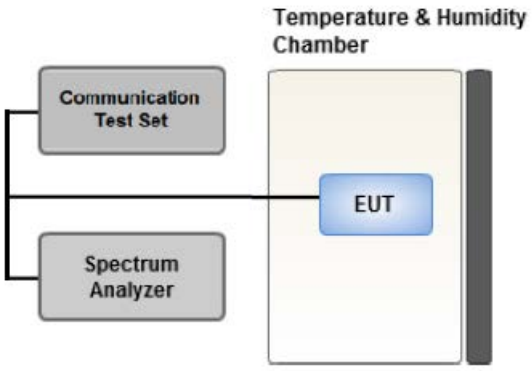
(iii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2365 MHz, and not less than 70 + 10 log (P) dB above 2365 MHz

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

## 3.8 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)

- Waveform : All Waveform of operation were investigated and the worst case configuration results are reported.
  (Worst case: DFT-S-OFDM)
- The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
- The EUT was tested in three modes(Open, Half-open, Closed), the worst case configuration results are reported.
  (Worst case: Open mode)
- All modes of operation were investigated and the worst case configuration results are reported.
  Mode: SA Only
  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.
- In the case of radiated spurious emissions, all bandwidth of operation was investigated and the worst case bandwidth results are reported. (Worst case : 5 MHz)
- SM-S721U & additional models were tested and the worst case results are reported.
  (Worst case : SM-S721U)

[ ANT A Worst case ]

| Test Description | Modulation | RB size | RB offset | Axis |
|---|---|---|---|---|
| Effective Isotropic Radiated Power | PI/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM | See Section 8.1 | | X |
| Radiated Spurious and Harmonic Emissions | PI/2 BPSK | See Section 8.1 | | X |

[ ANT F Worst case ]

| Test Description | Modulation | RB size | RB offset | Axis |
|---|---|---|---|---|
| Effective Isotropic Radiated Power | PI/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM | See Section 8.1 | | X |
| Radiated Spurious and Harmonic Emissions | PI/2 BPSK | See Section 8.1 | | Z |

## 3.10 WORST CASE(CONDUCTED TEST)

- Waveform : All Waveform of operation were investigated and the worst case configuration results are reported.
  (Worst case: DFT-S-OFDM)
- Modulation : All Modulation of operation were investigated and the worst case configuration results are reported.
  (Worst case: PI/2 BPSK)
- All modes of operation were investigated and the worst case configuration results are reported.
  Mode: SA Only
- All RB sizes, offsets of operation were investigated and the worst case configuration results are reported.
  Please refer to the table below.
- SM-S721U & additional models were tested and the worst case results are reported.
  (Worst case : SM-S721U)

[ Worst case ]

| Test Description | Modulation | Bandwidth (MHz) | Frequency | RB size | RB offset |
|---|---|---|---|---|---|
| **Occupied Bandwidth, Peak-To-Average Radio** | PI/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM | 5, 10 | Mid | Full RB | 0 |
| **Band Edge** | PI/2 BPSK | 5 | Low, Mid, High | 1 | 0, 24 |
| | | 10 | Mid | 1 | 0, 51 |
| | | 5 | Low, Mid, High | Full RB | 0 |
| | | 10 | Mid | Full RB | 0 |
| **Spurious and Harmonic Emissions at Antenna Terminal** | PI/2 BPSK | 5 | Low, Mid, High | 1 | 1 |
| | | 10 | Mid | 1 | 1 |

## 4. LIST OF TEST EQUIPMENT

| Equipment | Model | Manufacture | Serial No. | Due to Calibration | Calibration Interval |
|---|---|---|---|---|---|
| Precision Dipole Antenna | UHAP | Schwarzbeck | 01273 | 03/10/2026 | Biennial |
| Precision Dipole Antenna | UHAP | Schwarzbeck | 01274 | 03/10/2026 | Biennial |
| Horn Antenna(1~18 GHz) | BBHA 9120D | Schwarzbeck | 02289 | 02/14/2026 | Biennial |
| Horn Antenna(1~18 GHz) | BBHA 9120D | Schwarzbeck | 9120D-1299 | 04/27/2025 | Biennial |
| Horn Antenna(15~40 GHz) | BBHA 9170 | Schwarzbeck | BBHA9170342 | 09/29/2024 | Biennial |
| Horn Antenna(15~40 GHz) | BBHA 9170 | Schwarzbeck | BBHA9170124 | 03/28/2025 | Biennial |
| Loop Antenna(9 kHz~30 MHz) | FMZB1513 | Rohde & Schwarz | 1513-175 | 01/16/2025 | Biennial |
| Bilog Antenna | VULB9160 | Schwarzbeck | 3150 | 03/09/2025 | Biennial |
| Hybrid Antenna | VULB9160 | Schwarzbeck | 760 | 02/24/2025 | Biennial |
| RF Switching System | FBSR-06B (1G HPF + LNA) | T&M SYSTEM | F3L1 | 05/14/2025 | Annual |
| RF Switching System | FBSR-06B (3G HPF + LNA) | T&M SYSTEM | F3L2 | 05/14/2025 | Annual |
| RF Switching System | FBSR-06B (6G HPF + LNA) | T&M SYSTEM | F3L3 | 05/14/2025 | Annual |
| RF Switching System | FBSR-06B (LNA) | T&M SYSTEM | F3L4 | 05/14/2025 | Annual |
| Power Amplifier | CBL18265035 | CERNEX | 22966 | 11/17/2024 | Annual |
| Power Amplifier | CBL26405040 | CERNEX | 25956 | 02/26/2025 | Annual |
| DC Power Supply | E3632A | Hewlett Packard | MY40004427 | 08/25/2024 | Annual |
| Power Splitter(DC~26.5 GHz) | 11667B | Hewlett Packard | 11275 | 02/29/2025 | Annual |
| Chamber | SU-642 | ESPEC | 93008124 | 02/19/2025 | Annual |
| Signal Analyzer(10 Hz~26.5 GHz) | N9020A | Agilent | MY51110063 | 04/04/2025 | Annual |
| ATTENUATOR(20 dB) | 8493C | Hewlett Packard | 17280 | 04/17/2025 | Annual |
| Spectrum Analyzer(10 Hz~40 GHz) | FSV40 | REOHDE & SCHWARZ | 101436 | 02/13/2025 | Annual |
| Base Station | 8960 (E5515C) | Agilent | MY48360800 | 08/10/2024 | Annual |
| Wideband Radio Communication Tester | MT8821C | Anritsu Corp. | 6262287701 | 05/16/2025 | Annual |
| Wideband Radio Communication Tester | MT8000A | Anritsu Corp. | 6262302511 | 05/14/2025 | Annual |
| Signal Analyzer(5 Hz~40.0 GHz) | N9030B | KEYSIGHT | MY55480167 | 05/17/2025 | Annual |
| 4-Way Divider | ZC4PD-K1844+ | Mini-Circuits | 942907 | 09/19/2024 | Annual |
| FCC LTE Mobile Conducted RF Automation Test Software | - | HCT CO., LTD., | - | - | - |

**Note:**

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

## 5. MEASUREMENT UNCERTAINTY

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

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

| Parameter | Expanded Uncertainty (±dB) |
|---|---|
| Conducted Disturbance (150 kHz ~ 30 MHz) | 1.98 (Confidence level about 95 %, $k$=2) |
| Radiated Disturbance (9 kHz ~ 30 MHz) | 4.36 (Confidence level about 95 %, $k$=2) |
| Radiated Disturbance (30 MHz ~ 1 GHz) | 5.70 (Confidence level about 95 %, $k$=2) |
| Radiated Disturbance (1 GHz ~ 18 GHz) | 5.52 (Confidence level about 95 %, $k$=2) |
| Radiated Disturbance (18 GHz ~ 40 GHz) | 5.66 (Confidence level about 95 %, $k$=2) |
| Radiated Disturbance (Above 40 GHz) | 5.58 (Confidence level about 95 %, $k$=2) |

## 6. SUMMARY OF TEST RESULTS

6.1 Test Condition: Conducted Test

| Test Description | FCC Part Section(s) | Test Limit | Test Result |
|---|---|---|---|
| Occupied Bandwidth | § 2.1049 | N/A | PASS |
| Band Edge / Spurious and Harmonic Emissions at Antenna Terminal. | § 2.1051, § 27.53(a) | Section 3.7 | PASS |
| Conducted Output Power | § 2.1046 | N/A | See Note1 |
| Peak- to- Average Ratio | § 27.50(d)(5) | < 13 dB | PASS |
| Frequency stability / variation of ambient temperature | § 2.1055, § 27.54 | Emission must remain in band | PASS |

Note:

1. See SAR Report
2. Conducted tests were tested using 5G Wireless Tester.

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, § 27.53(a) | < 70 + 10log10 (P[Watts]) | PASS |

**Note:**

1. Radiateded tests were tested using 5G Wireless Tester

## 7. SAMPLE CALCULATION

7.1 ERP Sample Calculation

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

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

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

7.2 EIRP Sample Calculation

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

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

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

7.3. Emission Designator

GSM Emission Designator

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

EDGE Emission Designator

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

WCDMA Emission Designator

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

QPSK Modulation

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

QAM Modulation

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

# 8. TEST DATA(ANT A)

## 8.1 EQUIVALENT ISOTROPIC RADIATED POWER

| Freq (MHz) | Mod/ Bandwidth [SCS (kHz)] | Modulation | Measured Level (dBm) | Substitute Level (dBm) | Ant. Gain (dBi) | C.L | Pol | Limit | EIRP | | RB | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | W | W | dBm | Size | Offset |
| 2307.5 | Sub6 n30/ 5 MHz [15 kHz] | PI/2 BPSK | -23.00 | 13.37 | 10.00 | 2.30 | H | < 0.25 | 0.128 | 21.07 | 1 | 12 |
| | | QPSK | -23.18 | 13.19 | 10.00 | 2.30 | H | | 0.123 | 20.89 | | |
| | | 16-QAM | -24.00 | 12.37 | 10.00 | 2.30 | H | | 0.102 | 20.07 | | |
| | | 64-QAM | -25.58 | 10.79 | 10.00 | 2.30 | H | | 0.071 | 18.49 | | |
| | | 256-QAM | -27.56 | 8.81 | 10.00 | 2.30 | H | | 0.045 | 16.51 | | |
| 2310.0 | | PI/2 BPSK | -22.99 | 13.38 | 10.00 | 2.30 | H | | 0.128 | 21.08 | 1 | 12 |
| | | QPSK | -23.04 | 13.33 | 10.00 | 2.30 | H | | 0.127 | 21.03 | | |
| | | 16-QAM | -24.12 | 12.25 | 10.00 | 2.30 | H | | 0.099 | 19.95 | | |
| | | 64-QAM | -25.60 | 10.77 | 10.00 | 2.30 | H | | 0.070 | 18.47 | | |
| | | 256-QAM | -27.58 | 8.79 | 10.00 | 2.30 | H | | 0.045 | 16.49 | | |
| 2312.5 | | PI/2 BPSK | -23.09 | 13.28 | 10.00 | 2.30 | H | | 0.125 | 20.98 | 1 | 1 |
| | | QPSK | -23.17 | 13.20 | 10.00 | 2.30 | H | | 0.123 | 20.90 | | |
| | | 16-QAM | -24.17 | 12.20 | 10.00 | 2.30 | H | | 0.098 | 19.90 | | |
| | | 64-QAM | -25.70 | 10.67 | 10.00 | 2.30 | H | | 0.069 | 18.37 | | |
| | | 256-QAM | -27.61 | 8.76 | 10.00 | 2.30 | H | | 0.044 | 16.46 | | |

| Freq (MHz) | Mod/ Bandwidth [SCS (kHz)] | Modulation | Measured Level (dBm) | Substitute Level (dBm) | Ant. Gain (dBi) | C.L | Pol | Limit | EIRP | | RB | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | W | W | dBm | Size | Offset |
| 2310.0 | Sub6 n30/ 10 MHz [15 kHz] | PI/2 BPSK | -23.00 | 13.37 | 10.00 | 2.30 | H | < 0.25 | 0.128 | 21.07 | 1 | 26 |
| | | QPSK | -23.05 | 13.32 | 10.00 | 2.30 | H | | 0.126 | 21.02 | | |
| | | 16-QAM | -24.00 | 12.37 | 10.00 | 2.30 | H | | 0.102 | 20.07 | | |
| | | 64-QAM | -25.57 | 10.80 | 10.00 | 2.30 | H | | 0.071 | 18.50 | | |
| | | 256-QAM | -27.51 | 8.86 | 10.00 | 2.30 | H | | 0.045 | 16.56 | | |

## 8.2 RADIATED SPURIOUS EMISSIONS

▣ NR Band: N30

▣ Bandwidth: 5 MHz

▣ Modulation: PI/2 BPSK

▣ Distance: 1 meters

▣ SCS: 15 kHz

| Ch | Freq (MHz) | Measured Level (dBm) | Ant. Gain (dBi) | Substitute Level (dBm) | C.L | Pol | Result (dBm) | Limit (dBm) | Detector | RB | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Size | Offset |
| 461500 (2307.5) | 4615.00 | -62.16 | 11.50 | -65.93 | 3.43 | V | -57.86 | -40.00 | Peak | 1 | 12 |
| | 6922.50 | -64.52 | 10.90 | -59.32 | 4.32 | V | -52.74 | -40.00 | Peak | | |
| | 9230.00 | -62.31 | 10.80 | -54.84 | 5.02 | V | -49.06 | -40.00 | Peak | | |
| 462000 (2310.0) | 4620.00 | -61.33 | 11.50 | -65.18 | 3.43 | V | -57.11 | -40.00 | Peak | 1 | 12 |
| | 6930.00 | -64.06 | 10.90 | -58.82 | 4.32 | V | -52.24 | -40.00 | Peak | | |
| | 9240.00 | -60.60 | 10.80 | -52.52 | 5.06 | V | -46.78 | -40.00 | Peak | | |
| 462500 (2312.5) | 4625.00 | -62.80 | 11.50 | -66.81 | 3.44 | V | -58.75 | -40.00 | Peak | 1 | 1 |
| | 6937.50 | -65.46 | 10.90 | -60.34 | 4.32 | V | -53.76 | -40.00 | Peak | | |
| | 9250.00 | -61.90 | 10.80 | -54.18 | 5.10 | V | -48.48 | -40.00 | Peak | | |

▣ NR Band: N30

▣ Bandwidth: 10 MHz

▣ Modulation: PI/2 BPSK

▣ Distance: 1 meters

▣ SCS: 15 kHz

| Ch | Freq (MHz) | Measured Level (dBm) | Ant. Gain (dBi) | Substitute Level (dBm) | C.L | Pol | Result (dBm) | Limit (dBm) | Detector | RB | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Size | Offset |
| 462000 (2310.0) | 4620.00 | -62.08 | 11.50 | -65.93 | 3.43 | V | -57.86 | -40.00 | Peak | 1 | 26 |
| | 6930.00 | -63.53 | 10.90 | -58.29 | 4.32 | V | -51.71 | -40.00 | Peak | | |
| | 9240.00 | -61.20 | 10.80 | -53.12 | 5.06 | V | -47.38 | -40.00 | Peak | | |

## 8.3 PEAK-TO-AVERAGE RATIO

| Band | Band Width | Frequency (MHz) | Modulation | Resource Block Size | Resource Block Offset | Data (dB ) |
|---|---|---|---|---|---|---|
| Sub6 n30 | 5 MHz | 2310.0 | BPSK | 25 | 0 | 3.95 |
| | | | QPSK | | | 4.97 |
| | | | 16-QAM | | | 5.35 |
| | | | 64-QAM | | | 5.33 |
| | | | 256-QAM | | | 5.69 |
| | 10 MHz | | BPSK | 50 | | 4.90 |
| | | | QPSK | | | 5.23 |
| | | | 16-QAM | | | 5.54 |
| | | | 64-QAM | | | 5.58 |
| | | | 256-QAM | | | 5.91 |

Note:

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 54 ~ 63.

## 8.4 OCCUPIED BANDWIDTH

| Band | Band Width | Frequency (MHz) | Modulation | Resource Block Size | Resource Block Offset | Data ( MHz ) |
|---|---|---|---|---|---|---|
| Sub6 n30 | 5 MHz | 2310.0 | BPSK | 25 | 0 | 4.5249 |
| | | | QPSK | | | 4.5333 |
| | | | 16-QAM | | | 4.5137 |
| | | | 64-QAM | | | 4.5077 |
| | | | 256-QAM | | | 4.5177 |
| | 10 MHz | | BPSK | 50 | | 9.0004 |
| | | | QPSK | | | 9.0107 |
| | | | 16-QAM | | | 8.9801 |
| | | | 64-QAM | | | 8.9648 |
| | | | 256-QAM | | | 8.9576 |

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 64 ~ 73.

## 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) |
|---|---|---|---|---|---|---|---|
| Sub6 n30 | 5 | 2307.5 | 9.2218 | 30.015 | -71.871 | -41.856 | -40.00 |
| | | 2310.0 | 9.2318 | 30.015 | -71.714 | -41.699 | |
| | | 2312.5 | 9.2418 | 30.015 | -76.118 | -46.103 | |
| | 10 | 2310.0 | 9.2223 | 30.015 | -71.426 | -41.411 | |

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 74 ~ 81.
2. Result (dBm) = Measurement Maximum Data (dBm) + Factor (dB)
3. Factor(dB) = Cable Loss + Attenuator + Power Splitter

| Frequency Range (GHz) | Factor [dB] |
|---|---|
| 0.03 – 1 | 26.694 |
| 1 – 5 | 29.400 |
| 5 – 10 | 30.015 |
| 10 – 15 | 30.540 |
| 15 – 20 | 30.913 |
| Above 20 | 31.555 |

## 8.6 BAND EDGE

| Band Width (MHz) | Frequency (MHz) | Modulation | RB (Size/ Offset) | Frequency Range (MHz) | Maximum Data (dBm) | Limit (dBm) |
|---|---|---|---|---|---|---|
| 5 | 2307.5 | BPSK | 25/0 | Below 2288 | -65.571 | -40 |
| | | | | 2288 - 2292 | -55.256 | -37 |
| | | | | 2292 - 2296 | -42.856 | -31 |
| | | | | 2296 - 2300 | -32.272 | -25 |
| | | | | 2300 - 2304 | -18.397 | -13 |
| | | | | 2304 - 2305 | -18.159 | -13 |
| | | | | 2315 - 2320 | -32.434 | -13 |
| | | | | 2320 - 2324 | -43.816 | -25 |
| | | | | 2324 - 2328 | -51.309 | -31 |
| | | | | 2328 - 2337 | -59.175 | -37 |
| | | | | 2337 - 2341 | -65.642 | -31 |
| | | | | 2341 - 2345 | -65.702 | -25 |
| | | | | 2345 - 2365 | -64.343 | -13 |
| | | | | Above 2365 | -65.834 | -40 |
| | 2310.0 | BPSK | 25/0 | Below 2288 | -65.856 | -40 |
| | | | | 2288 - 2292 | -59.437 | -37 |
| | | | | 2292 - 2296 | -48.047 | -31 |
| | | | | 2296 - 2300 | -40.423 | -25 |
| | | | | 2300 - 2305 | -26.301 | -13 |
| | | | | 2315 - 2320 | -28.340 | -13 |
| | | | | 2320 - 2324 | -41.218 | -25 |
| | | | | 2324 - 2328 | -47.709 | -31 |
| | | | | 2328 - 2337 | -56.621 | -37 |
| | | | | 2337 - 2341 | -65.686 | -31 |
| | | | | 2341 - 2345 | -65.593 | -25 |
| | | | | 2345 - 2365 | -64.464 | -13 |
| | | | | Above 2365 | -65.668 | -40 |
| | 2312.5 | BPSK | 25/0 | Below 2288 | -66.044 | -40 |
| | | | | 2288 - 2292 | -62.330 | -37 |
| | | | | 2292 - 2296 | -52.326 | -31 |
| | | | | 2296 - 2300 | -45.448 | -25 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | 2300 - 2305 | -36.813 | -13 |
| | | | | 2315 - 2316 | -24.619 | -13 |
| | | | | 2316 - 2320 | -28.024 | -13 |
| | | | | 2320 - 2324 | -38.771 | -25 |
| | | | | 2324 - 2328 | -44.875 | -31 |
| | | | | 2328 - 2337 | -53.502 | -37 |
| | | | | 2337 - 2341 | -65.553 | -31 |
| | | | | 2341 - 2345 | -65.623 | -25 |
| | | | | 2345 - 2365 | -64.733 | -13 |
| | | | | Above 2365 | -65.798 | -40 |
| 10 | 2310.0 | BPSK | 50/0 | Below 2288 | -59.374 | -40 |
| | | | | 2288 - 2292 | -45.943 | -37 |
| | | | | 2292 - 2296 | -33.730 | -31 |
| | | | | 2296 - 2300 | -28.102 | -25 |
| | | | | 2300 - 2304 | -21.858 | -13 |
| | | | | 2304 - 2305 | -24.848 | -13 |
| | | | | 2315 - 2316 | -31.770 | -13 |
| | | | | 2316 - 2320 | -23.771 | -13 |
| | | | | 2320 - 2324 | -30.377 | -25 |
| | | | | 2324 - 2328 | -36.613 | -31 |
| | | | | 2328 - 2337 | -45.067 | -37 |
| | | | | 2337 - 2341 | -64.718 | -31 |
| | | | | 2341 - 2345 | -65.638 | -25 |
| | | | | 2345 - 2365 | -64.320 | -13 |
| | | | | Above 2365 | -65.682 | -40 |

| Band Width (MHz) | Frequency (MHz) | Modulation | RB (Size/ Offset) | Frequency Range (MHz) | Maximum Data (dBm) | Limit (dBm) |
|---|---|---|---|---|---|---|
| 5 | 2307.5 | BPSK | 1/0 | Below 2288 | -65.553 | -40 |
| | | | | 2288 - 2292 | -54.810 | -37 |
| | | | | 2292 - 2296 | -43.715 | -31 |
| | | | | 2296 - 2300 | -41.135 | -25 |
| | | | | 2300 - 2304 | -26.440 | -13 |
| | | | | 2304 - 2305 | -22.360 | -13 |
| | | | 1/24 | 2315 - 2320 | -39.907 | -13 |
| | | | | 2320 - 2324 | -45.204 | -25 |
| | | | | 2324 - 2328 | -51.563 | -31 |
| | | | | 2328 - 2337 | -59.466 | -37 |
| | | | | 2337 - 2341 | -65.549 | -31 |
| | | | | 2341 - 2345 | -65.648 | -25 |
| | | | | 2345 - 2365 | -64.362 | -13 |
| | | | | Above 2365 | -65.777 | -40 |
| | 2310.0 | BPSK | 1/0 | Below 2288 | -65.933 | -40 |
| | | | | 2288 - 2292 | -59.806 | -37 |
| | | | | 2292 - 2296 | -46.678 | -31 |
| | | | | 2296 - 2300 | -42.785 | -25 |
| | | | | 2300 - 2305 | -36.757 | -13 |
| | | | 1/24 | 2315 - 2320 | -37.657 | -13 |
| | | | | 2320 - 2324 | -41.016 | -25 |
| | | | | 2324 - 2328 | -47.523 | -31 |
| | | | | 2328 - 2337 | -56.718 | -37 |
| | | | | 2337 - 2341 | -65.667 | -31 |
| | | | | 2341 - 2345 | -65.725 | -25 |
| | | | | 2345 - 2365 | -64.430 | -13 |
| | | | | Above 2365 | -65.740 | -40 |
| | 2312.5 | BPSK | 1/0 | Below 2288 | -66.071 | -40 |
| | | | | 2288 - 2292 | -62.011 | -37 |
| | | | | 2292 - 2296 | -52.154 | -31 |
| | | | | 2296 - 2300 | -44.439 | -25 |
| | | | | 2300 - 2305 | -39.163 | -13 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | 1/24 | 2315 - 2316 | -27.751 | -13 |
| | | | | 2316 - 2320 | -30.351 | -13 |
| | | | | 2320 - 2324 | -40.016 | -25 |
| | | | | 2324 - 2328 | -44.874 | -31 |
| | | | | 2328 - 2337 | -52.988 | -37 |
| | | | | 2337 - 2341 | -65.618 | -31 |
| | | | | 2341 - 2345 | -65.703 | -25 |
| | | | | 2345 - 2365 | -64.604 | -13 |
| | | | | Above 2365 | -65.755 | -40 |
| 10 | 2310.0 | BPSK | 1/0 | Below 2288 | -65.773 | -40 |
| | | | | 2288 - 2292 | -59.488 | -37 |
| | | | | 2292 - 2296 | -47.410 | -31 |
| | | | | 2296 - 2300 | -38.178 | -25 |
| | | | | 2300 - 2304 | -26.165 | -13 |
| | | | | 2304 - 2305 | -29.593 | -13 |
| | | | 1/51 | 2315 - 2316 | -32.308 | -13 |
| | | | | 2316 - 2320 | -26.346 | -13 |
| | | | | 2320 - 2324 | -39.310 | -25 |
| | | | | 2324 - 2328 | -47.174 | -31 |
| | | | | 2328 - 2337 | -56.453 | -37 |
| | | | | 2337 - 2341 | -65.534 | -31 |
| | | | | 2341 - 2345 | -65.343 | -25 |
| | | | | 2345 - 2365 | -64.334 | -13 |
| | | | | Above 2365 | -65.546 | -40 |

Note:

- Plots of the EUT's Band Edge are shown Page 82 ~ 193.

## 8.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

▣ BandWidth: 5 MHz

▣ Voltage(100 %): 3.880 VDC

▣ Batt. Endpoint: 3.300 VDC

▣ LIMIT: Emission must remain in band

| Test. Frequncy | Voltage | Temp. | Frequency | Frequency Error | Deviation | ppm |
|---|---|---|---|---|---|---|
| (MHz) | (%) | (°C) | (Hz) | (Hz) | (%) | |
| 2307.5 | 100 % | +20(Ref) | 2307 500 000 | 0.0 | 0.000 000 | 0.000 |
| | 100 % | -30 | 2307 500 000 | -0.1 | 0.000 000 | 0.000 |
| | 100 % | -20 | 2307 500 002 | 1.2 | 0.000 000 | 0.001 |
| | 100 % | -10 | 2307 500 001 | 0.4 | 0.000 000 | 0.000 |
| | 100 % | 0 | 2307 500 001 | 0.6 | 0.000 000 | 0.000 |
| | 100 % | +10 | 2307 500 001 | 0.7 | 0.000 000 | 0.000 |
| | 100 % | +30 | 2307 500 001 | 0.5 | 0.000 000 | 0.000 |
| | 100 % | +40 | 2307 500 001 | 0.6 | 0.000 000 | 0.000 |
| | 100 % | +50 | 2307 500 001 | 0.7 | 0.000 000 | 0.000 |
| | Batt. Endpoint | +20 | 2307 500 000 | 0.0 | 0.000 000 | 0.000 |
| 2312.5 | 100 % | +20(Ref) | 2312 500 001 | 0.0 | 0.000 000 | 0.000 |
| | 100 % | -30 | 2312 500 003 | 2.0 | 0.000 000 | 0.001 |
| | 100 % | -20 | 2312 500 002 | 0.8 | 0.000 000 | 0.000 |
| | 100 % | -10 | 2312 500 002 | 1.4 | 0.000 000 | 0.001 |
| | 100 % | 0 | 2312 500 002 | 1.0 | 0.000 000 | 0.000 |
| | 100 % | +10 | 2312 500 002 | 1.4 | 0.000 000 | 0.001 |
| | 100 % | +30 | 2312 500 002 | 0.9 | 0.000 000 | 0.000 |
| | 100 % | +40 | 2312 500 003 | 2.0 | 0.000 000 | 0.001 |
| | 100 % | +50 | 2312 500 003 | 1.6 | 0.000 000 | 0.001 |
| | Batt. Endpoint | +20 | 2312 500 003 | 1.9 | 0.000 000 | 0.001 |

▣ BandWidth: 10 MHz

▣ Voltage(100 %): 3.880 VDC

▣ Batt. Endpoint: 3.300 VDC

▣ LIMIT: Emission must remain in band

| Test. Frequncy | Voltage | Temp. | Frequency | Frequency Error | Deviation | ppm |
|---|---|---|---|---|---|---|
| (MHz) | (%) | (°C) | (Hz) | (Hz) | (%) | |
| 2310.0 | 100 % | +20(Ref) | 2310 000 000 | 0.0 | 0.000 000 | 0.000 |
| | 100 % | -30 | 2310 000 001 | 0.4 | 0.000 000 | 0.000 |
| | 100 % | -20 | 2310 000 000 | 0.0 | 0.000 000 | 0.000 |
| | 100 % | -10 | 2309 999 999 | -1.1 | 0.000 000 | 0.000 |
| | 100 % | 0 | 2309 999 999 | -1.5 | 0.000 000 | -0.001 |
| | 100 % | +10 | 2310 000 000 | -0.2 | 0.000 000 | 0.000 |
| | 100 % | +30 | 2310 000 000 | -0.6 | 0.000 000 | 0.000 |
| | 100 % | +40 | 2310 000 000 | -0.7 | 0.000 000 | 0.000 |
| | 100 % | +50 | 2309 999 999 | -1.0 | 0.000 000 | 0.000 |
| | Batt. Endpoint | +20 | 2310 000 000 | -0.5 | 0.000 000 | 0.000 |

# 9. TEST DATA(ANT F)

## 9.1 EQUIVALENT ISOTROPIC RADIATED POWER

| Freq (MHz) | Mod/ Bandwidth [SCS (kHz)] | Modulation | Measured Level (dBm) | Substitute Level (dBm) | Ant. Gain (dBi) | C.L | Pol | Limit | EIRP | | RB | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | W | W | dBm | Size | Offset |
| 2307.5 | Sub6 n30/ 5 MHz [15 kHz] | PI/2 BPSK | -25.68 | 10.69 | 10.00 | 2.30 | H | < 0.25 | 0.069 | 18.39 | 1 | 1 |
| | | QPSK | -25.72 | 10.65 | 10.00 | 2.30 | H | | 0.068 | 18.35 | | |
| | | 16-QAM | -26.69 | 9.68 | 10.00 | 2.30 | H | | 0.055 | 17.38 | | |
| | | 64-QAM | -28.25 | 8.12 | 10.00 | 2.30 | H | | 0.038 | 15.82 | | |
| | | 256-QAM | -30.17 | 6.20 | 10.00 | 2.30 | H | | 0.025 | 13.90 | | |
| 2310.0 | | PI/2 BPSK | -25.64 | 10.73 | 10.00 | 2.30 | H | | 0.070 | 18.43 | 1 | 23 |
| | | QPSK | -25.71 | 10.66 | 10.00 | 2.30 | H | | 0.069 | 18.36 | | |
| | | 16-QAM | -26.68 | 9.69 | 10.00 | 2.30 | H | | 0.055 | 17.39 | | |
| | | 64-QAM | -28.16 | 8.21 | 10.00 | 2.30 | H | | 0.039 | 15.91 | | |
| | | 256-QAM | -30.13 | 6.24 | 10.00 | 2.30 | H | | 0.025 | 13.94 | | |
| 2312.5 | | PI/2 BPSK | -25.61 | 10.76 | 10.00 | 2.30 | H | | 0.070 | 18.46 | 1 | 23 |
| | | QPSK | -25.70 | 10.67 | 10.00 | 2.30 | H | | 0.069 | 18.37 | | |
| | | 16-QAM | -26.67 | 9.70 | 10.00 | 2.30 | H | | 0.055 | 17.40 | | |
| | | 64-QAM | -28.02 | 8.35 | 10.00 | 2.30 | H | | 0.040 | 16.05 | | |
| | | 256-QAM | -30.16 | 6.21 | 10.00 | 2.30 | H | | 0.025 | 13.91 | | |

| Freq (MHz) | Mod/ Bandwidth [SCS (kHz)] | Modulation | Measured Level (dBm) | Substitute Level (dBm) | Ant. Gain (dBi) | C.L | Pol | Limit | EIRP | | RB | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | W | W | dBm | Size | Offset |
| 2310.0 | Sub6 n30/ 10 MHz [15 kHz] | PI/2 BPSK | -25.58 | 10.79 | 10.00 | 2.30 | H | < 0.25 | 0.071 | 18.49 | 1 | 50 |
| | | QPSK | -25.61 | 10.76 | 10.00 | 2.30 | H | | 0.070 | 18.46 | | |
| | | 16-QAM | -26.56 | 9.81 | 10.00 | 2.30 | H | | 0.056 | 17.51 | | |
| | | 64-QAM | -28.08 | 8.29 | 10.00 | 2.30 | H | | 0.040 | 15.99 | | |
| | | 256-QAM | -30.19 | 6.18 | 10.00 | 2.30 | H | | 0.024 | 13.88 | | |

## 9.2 RADIATED SPURIOUS EMISSIONS

▣ NR Band: N30

▣ Bandwidth: 5 MHz

▣ Modulation: PI/2 BPSK

▣ Distance: 1 meters

▣ SCS: 15 kHz

| Ch | Freq (MHz) | Measured Level (dBm) | Ant. Gain (dBi) | Substitute Level (dBm) | C.L | Pol | Result (dBm) | Limit (dBm) | Detector | RB | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Size | Offset |
| 461500 (2307.5) | 4615.00 | -60.87 | 11.50 | -64.64 | 3.43 | V | -56.57 | -40.00 | Peak | 1 | 1 |
| | 6922.50 | -61.17 | 10.90 | -55.97 | 4.32 | H | -49.39 | -40.00 | Peak | | |
| | 9230.00 | -62.41 | 10.80 | -54.94 | 5.02 | H | -49.16 | -40.00 | Average | | |
| 462000 (2310.0) | 4620.00 | -61.96 | 11.50 | -65.81 | 3.43 | H | -57.74 | -40.00 | Peak | 1 | 23 |
| | 6930.00 | -61.49 | 10.90 | -56.25 | 4.32 | H | -49.67 | -40.00 | Peak | | |
| | 9240.00 | -59.85 | 10.80 | -51.77 | 5.06 | H | -46.03 | -40.00 | Average | | |
| 462500 (2312.5) | 4625.00 | -59.01 | 11.50 | -63.02 | 3.44 | H | -54.96 | -40.00 | Peak | 1 | 23 |
| | 6937.50 | -59.80 | 10.90 | -54.68 | 4.32 | H | -48.10 | -40.00 | Peak | | |
| | 9250.00 | -59.03 | 10.80 | -51.31 | 5.10 | H | -45.61 | -40.00 | Average | | |

▣ NR Band: N30

▣ Bandwidth: 10 MHz

▣ Modulation: PI/2 BPSK

▣ Distance: 1 meters

▣ SCS: 15 kHz

| Ch | Freq (MHz) | Measured Level (dBm) | Ant. Gain (dBi) | Substitute Level (dBm) | C.L | Pol | Result (dBm) | Limit (dBm) | Detector | RB | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Size | Offset |
| 462000 (2310.0) | 4620.00 | -59.73 | 11.50 | -63.58 | 3.43 | H | -55.51 | -40.00 | Peak | 1 | 50 |
| | 6930.00 | -62.26 | 10.90 | -57.02 | 4.32 | H | -50.44 | -40.00 | Peak | | |
| | 9240.00 | -58.72 | 10.80 | -50.64 | 5.06 | H | -44.90 | -40.00 | Average | | |

## 9.3 PEAK-TO-AVERAGE RATIO

| Band | Band Width | Frequency (MHz) | Modulation | Resource Block Size | Resource Block Offset | Data (dB ) |
|---|---|---|---|---|---|---|
| Sub6 n30 | 5 MHz | 2310.0 | BPSK | 25 | 0 | 4.42 |
| | | | QPSK | | | 5.58 |
| | | | 16-QAM | | | 6.23 |
| | | | 64-QAM | | | 6.27 |
| | | | 256-QAM | | | 6.08 |
| | 10 MHz | | BPSK | 50 | | 4.56 |
| | | | QPSK | | | 5.64 |
| | | | 16-QAM | | | 6.40 |
| | | | 64-QAM | | | 6.49 |
| | | | 256-QAM | | | 6.48 |

Note:

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 195 ~ 204.

## 9.4 OCCUPIED BANDWIDTH

| Band | Band Width | Frequency (MHz) | Modulation | Resource Block Size | Resource Block Offset | Data ( MHz ) |
|---|---|---|---|---|---|---|
| Sub6 n30 | 5 MHz | 2310.0 | BPSK | 25 | 0 | 4.6809 |
| | | | QPSK | | | 4.6560 |
| | | | 16-QAM | | | 4.6784 |
| | | | 64-QAM | | | 4.6784 |
| | | | 256-QAM | | | 4.7468 |
| | 10 MHz | | BPSK | 50 | | 9.0022 |
| | | | QPSK | | | 8.9998 |
| | | | 16-QAM | | | 9.0075 |
| | | | 64-QAM | | | 9.0275 |
| | | | 256-QAM | | | 8.9909 |

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 205 ~ 214.

## 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) |
|---|---|---|---|---|---|---|---|
| Sub6 n30 | 5 | 2307.5 | 8.2832 | 30.815 | -80.639 | -49.824 | -40.00 |
| | | 2310.0 | 4.6162 | 30.200 | -80.459 | -50.259 | |
| | | 2312.5 | 8.3196 | 30.815 | -80.682 | -49.867 | |
| | 10 | 2310.0 | 8.8679 | 30.815 | -80.166 | -49.351 | |

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 215 ~ 218.
2. Result (dBm) = Measurement Maximum Data (dBm) + Factor (dB)
3. Factor(dB) = Cable Loss + Attenuator + Power Splitter

| Frequency Range (GHz) | Factor [dB] |
|---|---|
| 0.03 – 1 | 27.494 |
| 1 – 5 | 30.200 |
| 5 – 10 | 30.815 |
| 10 – 15 | 31.340 |
| 15 – 20 | 31.713 |
| Above 20 | 32.355 |

## 9.6 BAND EDGE

| Band Width (MHz) | Frequency (MHz) | Modulation | RB (Size/ Offset) | Frequency Range (MHz) | Maximum Data (dBm) | Limit (dBm) |
|---|---|---|---|---|---|---|
| 5 | 2307.5 | BPSK | 25/0 | Below 2288 | -65.301 | -40 |
| | | | | 2288 - 2292 | -52.333 | -37 |
| | | | | 2292 - 2296 | -43.938 | -31 |
| | | | | 2296 - 2300 | -34.575 | -25 |
| | | | | 2300 - 2304 | -24.664 | -13 |
| | | | | 2304 - 2305 | -25.460 | -13 |
| | | | | 2315 - 2320 | -36.094 | -13 |
| | | | | 2320 - 2324 | -45.315 | -25 |
| | | | | 2324 - 2328 | -50.327 | -31 |
| | | | | 2328 - 2337 | -54.469 | -37 |
| | | | | 2337 - 2341 | -65.621 | -31 |
| | | | | 2341 - 2345 | -65.626 | -25 |
| | | | | 2345 - 2365 | -64.372 | -13 |
| | | | | Above 2365 | -65.562 | -40 |
| | 2310.0 | BPSK | 25/0 | Below 2288 | -65.780 | -40 |
| | | | | 2288 - 2292 | -55.561 | -37 |
| | | | | 2292 - 2296 | -47.103 | -31 |
| | | | | 2296 - 2300 | -40.640 | -25 |
| | | | | 2300 - 2305 | -26.476 | -13 |
| | | | | 2315 - 2320 | -27.149 | -13 |
| | | | | 2320 - 2324 | -42.320 | -25 |
| | | | | 2324 - 2328 | -47.128 | -31 |
| | | | | 2328 - 2337 | -51.529 | -37 |
| | | | | 2337 - 2341 | -65.674 | -31 |
| | | | | 2341 - 2345 | -65.528 | -25 |
| | | | | 2345 - 2365 | -64.142 | -13 |
| | | | | Above 2365 | -65.766 | -40 |
| | 2312.5 | BPSK | 25/0 | Below 2288 | -65.965 | -40 |
| | | | | 2288 - 2292 | -58.487 | -37 |
| | | | | 2292 - 2296 | -50.422 | -31 |
| | | | | 2296 - 2300 | -43.900 | -25 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | 2300 - 2305 | -31.249 | -13 |
| | | | | 2315 - 2316 | -26.600 | -13 |
| | | | | 2316 - 2320 | -22.516 | -13 |
| | | | | 2320 - 2324 | -34.055 | -25 |
| | | | | 2324 - 2328 | -43.691 | -31 |
| | | | | 2328 - 2337 | -48.575 | -37 |
| | | | | 2337 - 2341 | -65.628 | -31 |
| | | | | 2341 - 2345 | -65.725 | -25 |
| | | | | 2345 - 2365 | -64.411 | -13 |
| | | | | Above 2365 | -65.707 | -40 |
| 10 | 2310.0 | BPSK | 50/0 | Below 2288 | -65.286 | -40 |
| | | | | 2288 - 2292 | -46.564 | -37 |
| | | | | 2292 - 2296 | -38.066 | -31 |
| | | | | 2296 - 2300 | -32.550 | -25 |
| | | | | 2300 - 2304 | -27.544 | -13 |
| | | | | 2304 - 2305 | -27.419 | -13 |
| | | | | 2315 - 2316 | -33.935 | -13 |
| | | | | 2316 - 2320 | -28.830 | -13 |
| | | | | 2320 - 2324 | -31.033 | -25 |
| | | | | 2324 - 2328 | -41.765 | -31 |
| | | | | 2328 - 2337 | -43.935 | -37 |
| | | | | 2337 - 2341 | -65.653 | -31 |
| | | | | 2341 - 2345 | -65.684 | -25 |
| | | | | 2345 - 2365 | -64.220 | -13 |
| | | | | Above 2365 | -65.711 | -40 |

| Band Width (MHz) | Frequency (MHz) | Modulation | RB (Size/ Offset) | Frequency Range (MHz) | Maximum Data (dBm) | Limit (dBm) |
|---|---|---|---|---|---|---|
| 5 | 2307.5 | BPSK | 1/0 | Below 2288 | -65.349 | -40 |
| | | | | 2288 - 2292 | -51.857 | -37 |
| | | | | 2292 - 2296 | -43.627 | -31 |
| | | | | 2296 - 2300 | -40.837 | -25 |
| | | | | 2300 - 2304 | -28.709 | -13 |
| | | | | 2304 - 2305 | -27.027 | -13 |
| | | | 1/24 | 2315 - 2320 | -40.914 | -13 |
| | | | | 2320 - 2324 | -45.400 | -25 |
| | | | | 2324 - 2328 | -50.697 | -31 |
| | | | | 2328 - 2337 | -54.711 | -37 |
| | | | | 2337 - 2341 | -65.639 | -31 |
| | | | | 2341 - 2345 | -65.656 | -25 |
| | | | | 2345 - 2365 | -64.405 | -13 |
| | | | | Above 2365 | -65.703 | -40 |
| | 2310.0 | BPSK | 1/0 | Below 2288 | -65.838 | -40 |
| | | | | 2288 - 2292 | -55.582 | -37 |
| | | | | 2292 - 2296 | -46.579 | -31 |
| | | | | 2296 - 2300 | -41.725 | -25 |
| | | | | 2300 - 2305 | -35.062 | -13 |
| | | | 1/24 | 2315 - 2320 | -37.341 | -13 |
| | | | | 2320 - 2324 | -41.442 | -25 |
| | | | | 2324 - 2328 | -47.076 | -31 |
| | | | | 2328 - 2337 | -51.851 | -37 |
| | | | | 2337 - 2341 | -65.726 | -31 |
| | | | | 2341 - 2345 | -65.685 | -25 |
| | | | | 2345 - 2365 | -64.351 | -13 |
| | | | | Above 2365 | -65.701 | -40 |
| | 2312.5 | BPSK | 1/0 | Below 2288 | -66.030 | -40 |
| | | | | 2288 - 2292 | -58.857 | -37 |
| | | | | 2292 - 2296 | -50.639 | -31 |
| | | | | 2296 - 2300 | -44.227 | -25 |
| | | | | 2300 - 2305 | -40.585 | -13 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | 1/24 | 2315 - 2316 | -32.410 | -13 |
| | | | | 2316 - 2320 | -33.099 | -13 |
| | | | | 2320 - 2324 | -41.812 | -25 |
| | | | | 2324 - 2328 | -44.493 | -31 |
| | | | | 2328 - 2337 | -48.764 | -37 |
| | | | | 2337 - 2341 | -65.622 | -31 |
| | | | | 2341 - 2345 | -65.555 | -25 |
| | | | | 2345 - 2365 | -64.422 | -13 |
| | | | | Above 2365 | -65.666 | -40 |
| 10 | 2310.0 | BPSK | 1/0 | Below 2288 | -65.555 | -40 |
| | | | | 2288 - 2292 | -55.094 | -37 |
| | | | | 2292 - 2296 | -46.857 | -31 |
| | | | | 2296 - 2300 | -39.039 | -25 |
| | | | | 2300 - 2304 | -27.810 | -13 |
| | | | | 2304 - 2305 | -30.738 | -13 |
| | | | 1/49 | 2315 - 2316 | -34.452 | -13 |
| | | | | 2316 - 2320 | -31.116 | -13 |
| | | | | 2320 - 2324 | -41.783 | -25 |
| | | | | 2324 - 2328 | -47.204 | -31 |
| | | | | 2328 - 2337 | -51.630 | -37 |
| | | | | 2337 - 2341 | -65.703 | -31 |
| | | | | 2341 - 2345 | -65.733 | -25 |
| | | | | 2345 - 2365 | -64.544 | -13 |
| | | | | Above 2365 | -65.818 | -40 |

Note:

- Plots of the EUT's Band Edge are shown Page 219 ~ 334.

## 9.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

▣ BandWidth: 5 MHz

▣ Voltage(100 %): 3.880 VDC

▣ Batt. Endpoint: 3.300 VDC

▣ LIMIT: Emission must remain in band

| Test. Frequncy | Voltage | Temp. | Frequency | Frequency Error | Deviation | ppm |
|---|---|---|---|---|---|---|
| (MHz) | (%) | (℃) | (Hz) | (Hz) | (%) | |
| 2307.5 | 100 % | +20(Ref) | 2307 500 001 | 0.0 | 0.000 000 | 0.000 |
| | 100 % | -30 | 2307 500 002 | 0.5 | 0.000 000 | 0.000 |
| | 100 % | -20 | 2307 500 002 | 1.4 | 0.000 000 | 0.001 |
| | 100 % | -10 | 2307 500 002 | 0.7 | 0.000 000 | 0.000 |
| | 100 % | 0 | 2307 500 002 | 0.8 | 0.000 000 | 0.000 |
| | 100 % | +10 | 2307 500 002 | 0.7 | 0.000 000 | 0.000 |
| | 100 % | +30 | 2307 500 000 | -0.7 | 0.000 000 | 0.000 |
| | 100 % | +40 | 2307 500 002 | 1.1 | 0.000 000 | 0.000 |
| | 100 % | +50 | 2307 500 002 | 1.4 | 0.000 000 | 0.001 |
| | Batt. Endpoint | +20 | 2307 500 002 | 1.0 | 0.000 000 | 0.000 |
| 2312.5 | 100 % | +20(Ref) | 2312 500 000 | 0.0 | 0.000 000 | 0.000 |
| | 100 % | -30 | 2312 500 000 | 0.1 | 0.000 000 | 0.000 |
| | 100 % | -20 | 2312 500 000 | -0.5 | 0.000 000 | 0.000 |
| | 100 % | -10 | 2312 500 001 | 0.6 | 0.000 000 | 0.000 |
| | 100 % | 0 | 2312 500 000 | -0.1 | 0.000 000 | 0.000 |
| | 100 % | +10 | 2312 499 998 | -2.0 | 0.000 000 | -0.001 |
| | 100 % | +30 | 2312 500 000 | 0.3 | 0.000 000 | 0.000 |
| | 100 % | +40 | 2312 500 000 | -0.3 | 0.000 000 | 0.000 |
| | 100 % | +50 | 2312 500 000 | -0.5 | 0.000 000 | 0.000 |
| | Batt. Endpoint | +20 | 2312 500 001 | 0.6 | 0.000 000 | 0.000 |

▣ BandWidth: 10 MHz

▣ Voltage(100 %): 3.880 VDC

▣ Batt. Endpoint: 3.300 VDC

▣ LIMIT: Emission must remain in band

| Test. Frequncy | Voltage | Temp. | Frequency | Frequency Error | Deviation | ppm |
|---|---|---|---|---|---|---|
| (MHz) | (%) | (°C) | (Hz) | (Hz) | (%) | |
| 2310.0 | 100 % | +20(Ref) | 2309 999 998 | 0.0 | 0.000 000 | 0.000 |
| | 100 % | -30 | 2309 999 999 | 0.9 | 0.000 000 | 0.000 |
| | 100 % | -20 | 2309 999 998 | -0.2 | 0.000 000 | 0.000 |
| | 100 % | -10 | 2309 999 997 | -1.0 | 0.000 000 | 0.000 |
| | 100 % | 0 | 2309 999 998 | -0.6 | 0.000 000 | 0.000 |
| | 100 % | +10 | 2309 999 996 | -2.3 | 0.000 000 | -0.001 |
| | 100 % | +30 | 2309 999 997 | -1.2 | 0.000 000 | -0.001 |
| | 100 % | +40 | 2309 999 997 | -1.6 | 0.000 000 | -0.001 |
| | 100 % | +50 | 2309 999 997 | -1.4 | 0.000 000 | -0.001 |
| | Batt. Endpoint | +20 | 2309 999 996 | -1.9 | 0.000 000 | -0.001 |

# 10. TEST DATA (ANT A, Ant A)

## 10.1 UPLINK CARRIER AGGREGATION

Test Note

1. All tests were evaluated for the two bands using various combinations of RB size, RB offset, modulation, and channel bandwidth.
2. All modes of operation were investigated and the worst case configuration results are reported in this section. Please refer to the table below.
3. The worst case is reported with the modulations, RB sizes and offsets.
   - N30A(ANT A)-N66A(ANT A)
     (PCC - Modulation: BPSK, RB: 1, RB Offset: 12, SCC - Modulation: BPSK, RB: 1, RB Offset: 12)

Radiated Spurious Emissions

| PCC | SCC | PCC | | SCC | |
|---|---|---|---|---|---|
| | | BW(MHz) | Channel | BW(MHz) | Channel |
| N30A(ANT A) | N66A(ANT A) | 5 | 462000 | 5 | 355500 |

### 10.1.1 RADIATED SPURIOUS EMISSIONS

N30A(ANT A)(PCC)- N66A(ANT A)(SCC)

| Freq.(MHz) | Measured Level [dBm] | Ant. Gain (dBi) | Substitute Level [dBm] | C.L | Pol. | Result (dBm) | Limit (dBm) |
|---|---|---|---|---|---|---|---|
| 4 620.00 | -61.96 | 11.50 | -65.81 | 3.43 | V | -57.74 | -40.00 |
| 6 930.00 | -64.91 | 10.90 | -59.67 | 4.32 | V | -53.09 | -40.00 |
| 9 240.00 | -61.86 | 10.80 | -53.78 | 5.06 | V | -48.04 | -40.00 |

| Freq.(MHz) | Measured Level [dBm] | Ant. Gain (dBi) | Substitute Level [dBm] | C.L | Pol. | Result (dBm) | Limit (dBm) |
|---|---|---|---|---|---|---|---|
| 3 555.00 | -60.08 | 11.40 | -62.05 | 3.02 | V | -53.67 | -13.00 |
| 5 332.50 | -61.77 | 11.40 | -56.72 | 3.73 | V | -49.05 | -13.00 |
| 7 110.00 | -62.76 | 10.50 | -48.82 | 4.36 | V | -42.68 | -13.00 |

## 11. TEST PLOTS(ANT A)

5 M_PAR_Mid_BPSK_FullRB

5 M_PAR_Mid_QPSK_FullRB

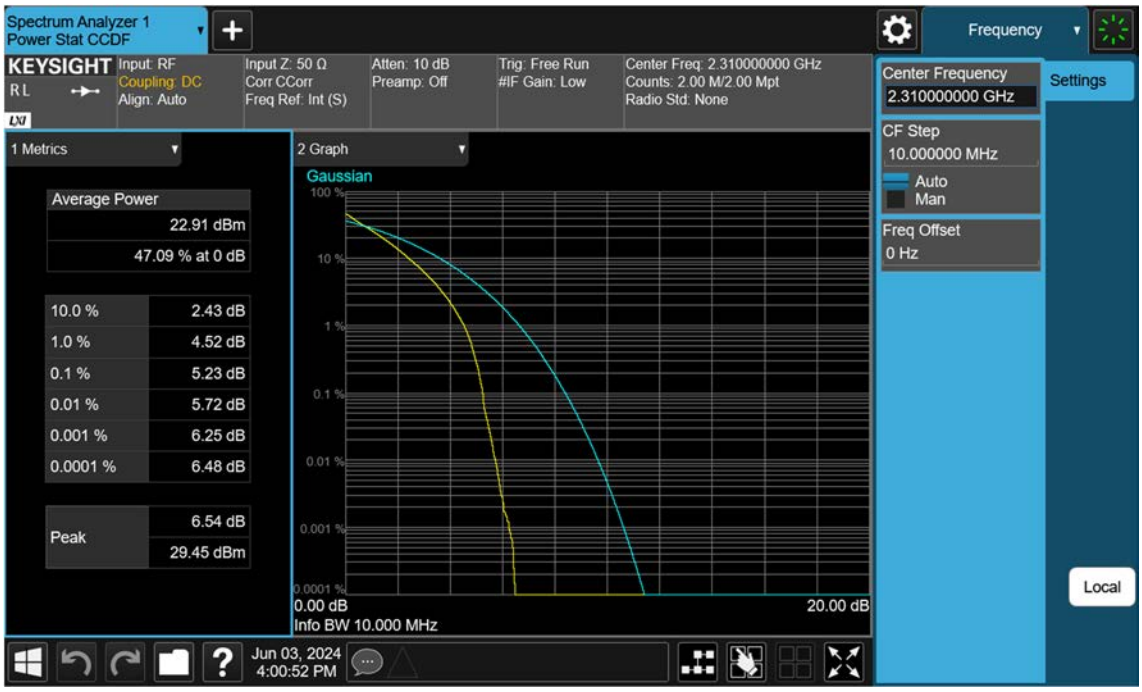
5 M_PAR_Mid_16QAM_FullRB

5 M_PAR_Mid_64QAM_FullRB

5 M_PAR_Mid_256QAM_FullRB

10 M_PAR_Mid_BPSK_FullRB

10 M_PAR_Mid_QPSK_FullRB



10 M_PAR_Mid_16QAM_FullRB

10 M_PAR_Mid_64QAM_FullRB

10 M_PAR_Mid_256QAM_FullRB

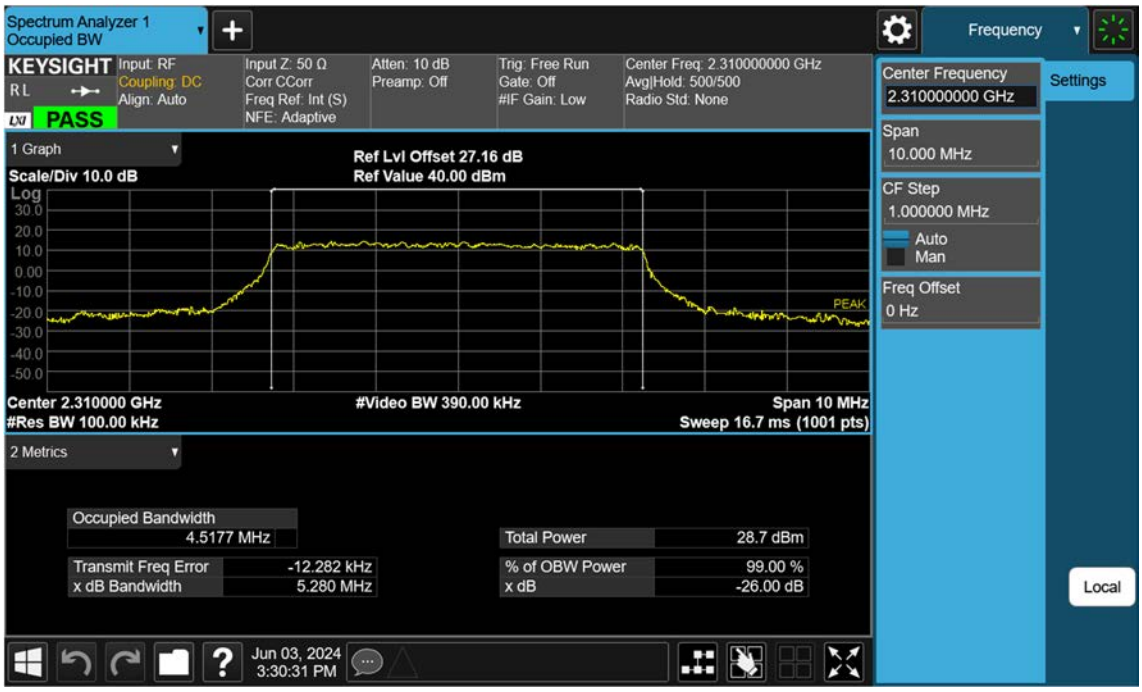
5 M_OBW_Mid_BPSK_FullRB

5 M_OBW_Mid_QPSK_FullRB

5 M_OBW_Mid_16QAM_FullRB

5 M_OBW_Mid_64QAM_FullRB

5 M_OBW_Mid_256QAM_FullRB



10 M_OBW_Mid_BPSK_FullRB

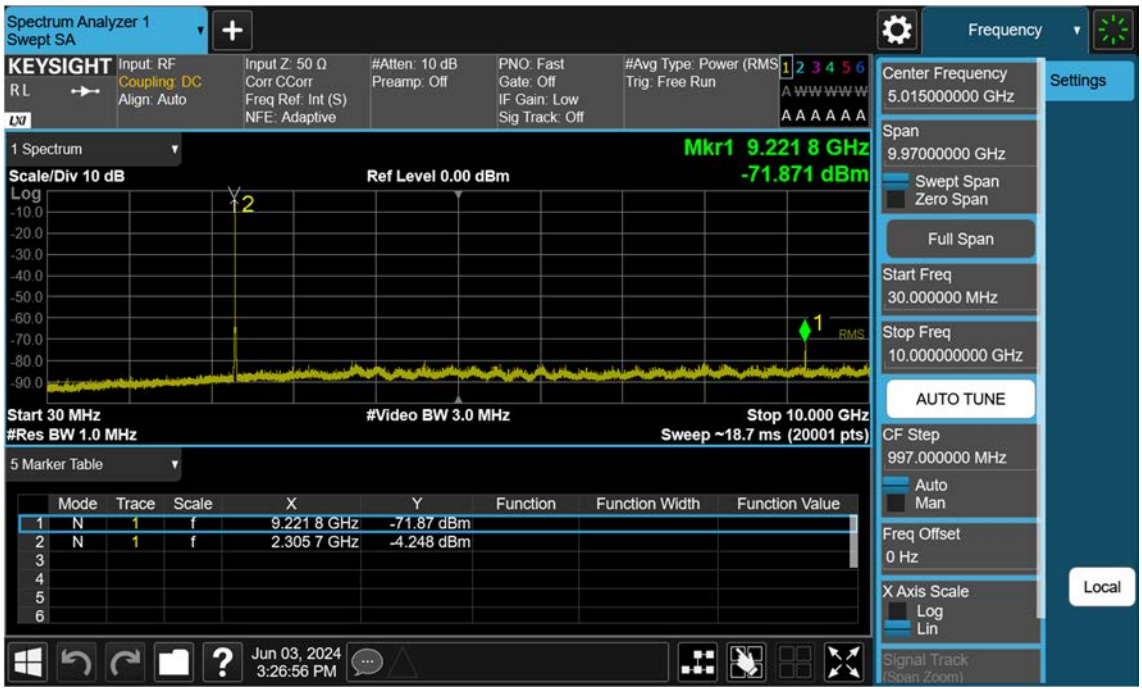
10 M_OBW_Mid_QPSK_FullRB

10 M_OBW_Mid_16QAM_FullRB

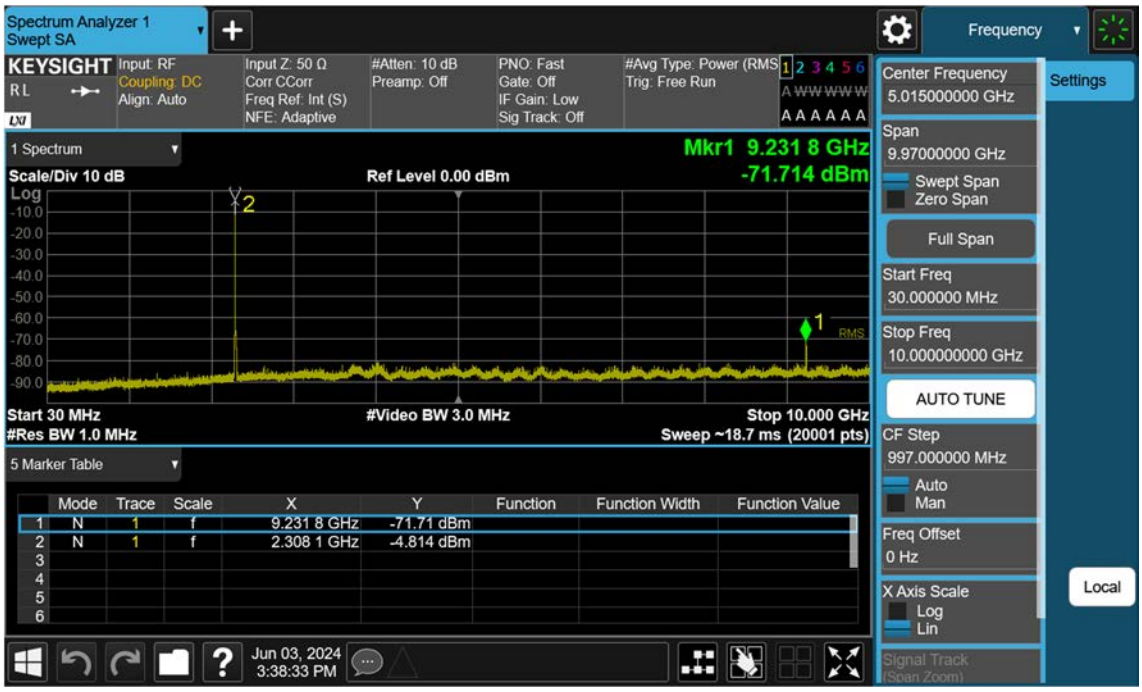
10 M_OBW_Mid_64QAM_FullRB

10 M_OBW_Mid_256QAM_FullRB

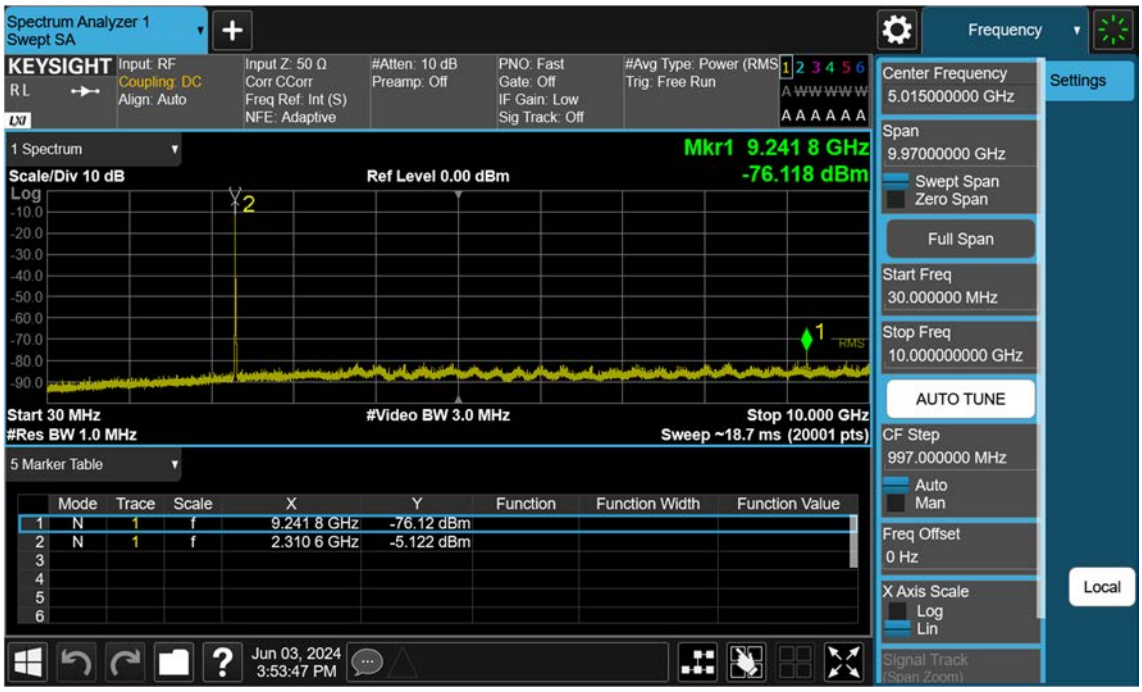
5 M_Conducted Spurious(30 M-10 G)_Low_BPSK_1RB



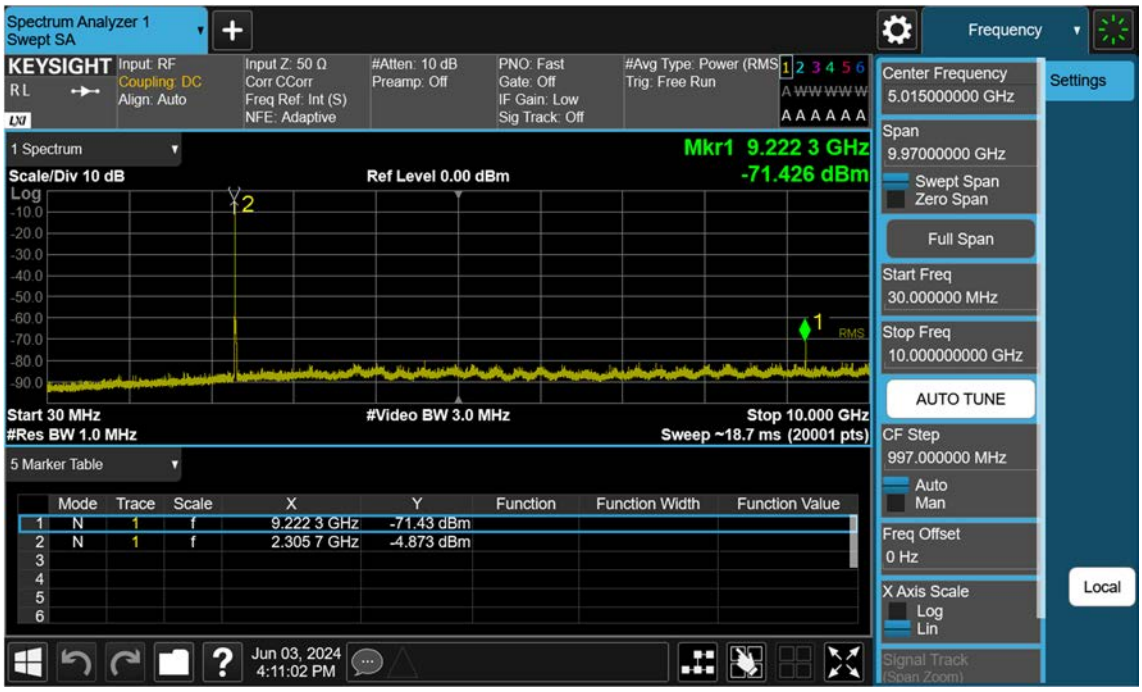
5 M_Conducted Spurious(30 M-10 G)_Mid_BPSK_1RB



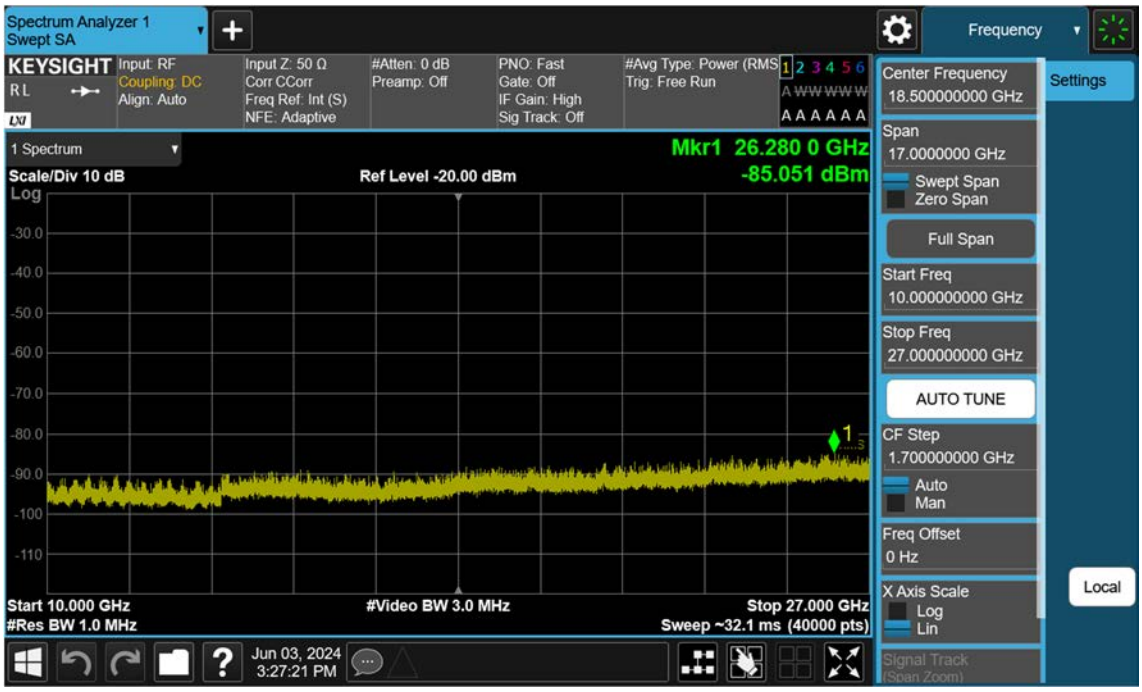
5 M_Conducted Spurious(30 M-10 G)_High_BPSK_1RB



10 M_Conducted Spurious(30 M-10 G)_Mid_BPSK_1RB



5 M_Conducted Spurious(Above10 G)_Low_BPSK_1RB



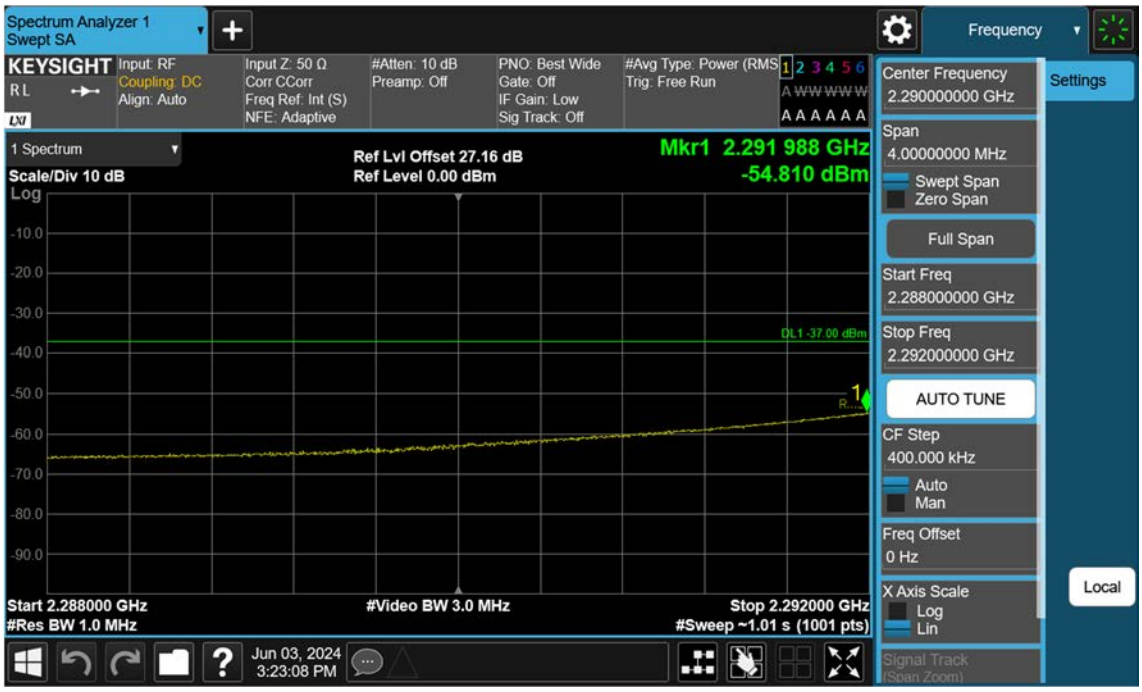
5 M_Conducted Spurious(Above10 G)_Mid_BPSK_1RB

5 M_Conducted Spurious(Above10 G)_High_BPSK_1RB

10 M_Conducted Spurious(Above10 G)_Mid_BPSK_1RB

5 M_Band Edge(2280MHz-2288MHz)_Low_BPSK_1RB

5 M_Band Edge(2288MHz-2292MHz)_Low_BPSK_1RB



5 M_Band Edge(2292MHz-2296MHz)_Low_BPSK_1RB

5 M_Band Edge(2296MHz-2300MHz)_Low_BPSK_1RB

5 M_Band Edge(2300MHz-2304MHz)_Low_BPSK_1RB


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

Calculation = Reading Value + 10 x log(1 MHz/100 kHz) dB = -36.440 dBm + 10 dB = -26.440 dBm

5 M_Band Edge(2304MHz-2305MHz)_Low_BPSK_1RB

5 M_Band Edge(2315MHz-2320MHz)_Low_BPSK_1RB

5 M_Band Edge(2320MHz-2324MHz)_Low_BPSK_1RB

5 M_Band Edge(2324MHz-2328MHz)_Low_BPSK_1RB

5 M_Band Edge(2328MHz-2337MHz)_Low_BPSK_1RB

5 M_Band Edge(2337MHz-2341MHz)_Low_BPSK_1RB

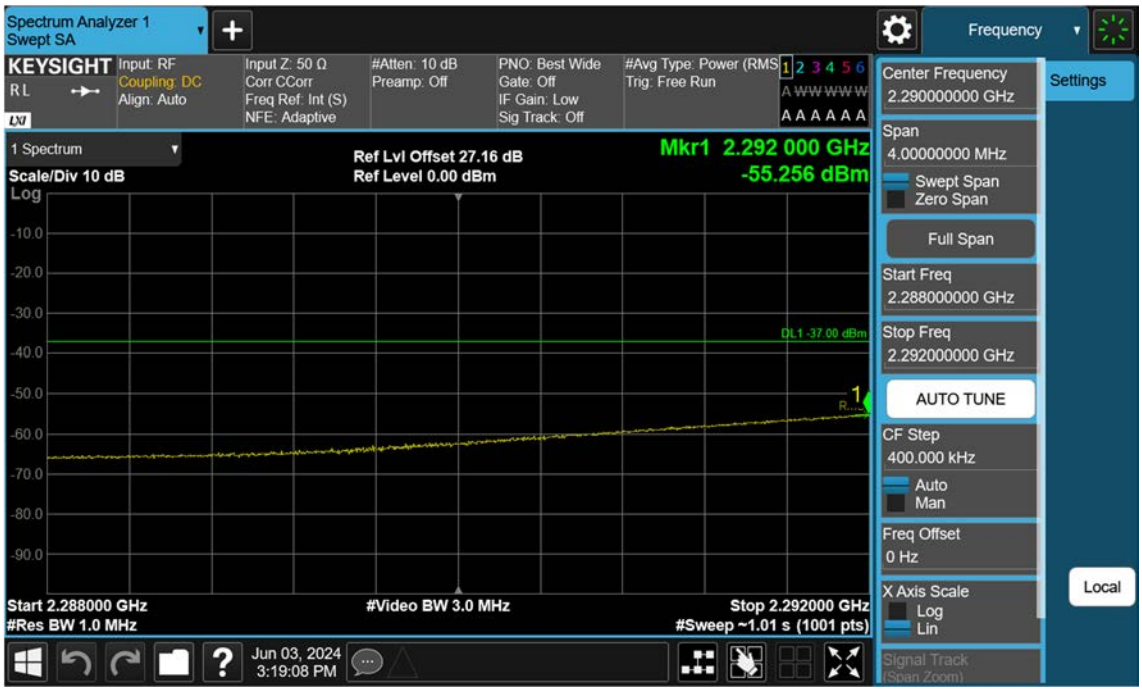
5 M_Band Edge(2341MHz-2345MHz)_Low_BPSK_1RB

5 M_Band Edge(2345MHz-2365MHz)_Low_BPSK_1RB

5 M_Band Edge(2365MHz-2400MHz)_Low_BPSK_1RB

5 M_Band Edge(2280MHz-2288MHz)_Low_BPSK_FullRB

5 M_Band Edge(2288MHz-2292MHz)_Low_BPSK_FullRB



5 M_Band Edge(2292MHz-2296MHz)_Low_BPSK_FullRB

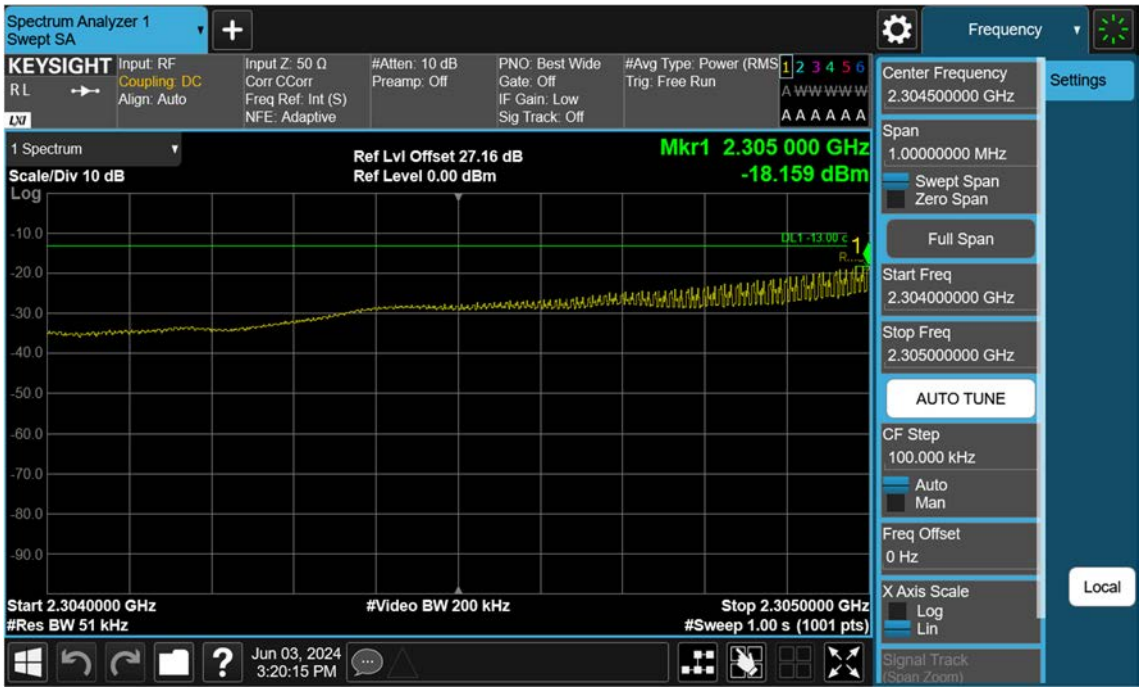
5 M_Band Edge(2296MHz-2300MHz)_Low_BPSK_FullRB

5 M_Band Edge(2300MHz-2304MHz)_Low_BPSK_FullRB


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

Calculation = Reading Value + 10 x log(1 MHz/100 kHz) dB = -28.397 dBm + 10 dB = -18.397 dBm

5 M_Band Edge(2304MHz-2305MHz)_Low_BPSK_FullRB



5 M_Band Edge(2315MHz-2320MHz)_Low_BPSK_FullRB

5 M_Band Edge(2320MHz-2324MHz)_Low_BPSK_FullRB

5 M_Band Edge(2324MHz-2328MHz)_Low_BPSK_FullRB

5 M_Band Edge(2328MHz-2337MHz)_Low_BPSK_FullRB

5 M_Band Edge(2337MHz-2341MHz)_Low_BPSK_FullRB

5 M_Band Edge(2341MHz-2345MHz)_Low_BPSK_FullRB

5 M_Band Edge(2345MHz-2365MHz)_Low_BPSK_FullRB

5 M_Band Edge(2365MHz-2400MHz)_Low_BPSK_FullRB

5 M_Band Edge(2280MHz-2288MHz)_Mid_BPSK_1RB

5 M_Band Edge(2288MHz-2292MHz)_Mid_BPSK_1RB

5 M_Band Edge(2292MHz-2296MHz)_Mid_BPSK_1RB

5 M_Band Edge(2296MHz-2300MHz)_Mid_BPSK_1RB

5 M_Band Edge(2300MHz-2305MHz)_Mid_BPSK_1RB