# MEASUREMENT REPORT

## FCC PART 96

**FCC ID:** XIA-CFW2591

**Applicant:** NetComm Wireless Pty Ltd

**Application Type:** Certification

**Product:** 5G High Power mmWave Outdoor CPE

**Model No.:** CFW-2591

**Brand Name:** Casa Systems

**FCC Rule Part(s):** Part 96

**Test Procedure(s):** ANSI C63.26: 2015

**Test Date:** October 25 ~ November 22, 2021

**Reviewed By:** Sunny Sun

**Approved By:** Robin Wu

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

The test results relate only to the samples tested.
This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.26-2015. Test results reported herein relate only to the item(s) tested.
The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

# Revision History

| Report No. | Version | Description | Issue Date | Note |
|---|---|---|---|---|
| 2110RSU037-U1 | Rev. 01 | Initial Report | 12-08-2021 | Valid |
| | | | | |

# CONTENTS

Description Page

**1. GENERAL INFORMATION ..... 5**

1.1. Applicant ..... 5
1.2. Manufacturer ..... 5
1.3. Testing Facility ..... 5
1.4. Product Information ..... 6
1.5. Radio Specification under Test ..... 6
1.6. Description of Available Antennas ..... 6
1.7. Test Methodology ..... 7
1.8. EMI Suppression Device(s)/Modifications ..... 7
1.9. Maximum Power, Frequency Tolerance, and Emission Designator ..... 7
1.10. Configuration of Tested System ..... 8
1.11. Test Environment Condition ..... 8

**2. TEST EQUIPMENT CALIBRATION DATE ..... 9**

**3. MEASUREMENT UNCERTAINTY ..... 11**

**4. TEST RESULT ..... 12**

4.1. Summary ..... 12
4.2. Occupied Bandwidth Measurement ..... 13
4.2.1. Test Limit ..... 13
4.2.2. Test Procedure ..... 13
4.2.3. Test Setting ..... 13
4.2.4. Test Setup ..... 13
4.2.4.1. Test Result ..... 14
4.3. Frequency Stability Measurement ..... 17
4.3.1. Test Limit ..... 17
4.3.2. Test Procedure ..... 17
4.3.3. Test Setting ..... 17
4.3.4. Test Setup ..... 18
4.3.5. Test Result ..... 19
4.4. Equivalent Isotropically Radiated Power Measurement ..... 20
4.4.1. Test Limit ..... 20
4.4.2. Test Procedure ..... 20
4.4.3. Test Setting ..... 20
4.4.4. Test Setup ..... 21
4.4.5. Test Result ..... 22
4.5. Band Edge Measurement ..... 24

4.5.1. Test Limit ..... 24
4.5.2. Test Procedure ..... 24
4.5.3. Test Setting ..... 24
4.5.4. Test Setup ..... 25
4.5.5. Test Result ..... 26
4.6. Conducted Spurious Emission Measurement ..... 31
4.6.1. Test Limit ..... 31
4.6.2. Test Procedure ..... 31
4.6.3. Test Setting ..... 31
4.6.4. Test Setup ..... 32
4.6.5. Test Result ..... 33
4.7. Radiated Spurious Emission Measurement ..... 36
4.7.1. Test Limit ..... 36
4.7.2. Test Procedure ..... 36
4.7.3. Test Setting ..... 36
4.7.4. Test Setup ..... 36
4.7.5. Test Result ..... 38
4.8. End User Device Additional Requirement (CBSD Protocol) ..... 39
4.8.1. Test Limit ..... 39
4.8.2. Test Procedure ..... 39
4.8.3. Test Setting ..... 39
4.8.4. Test Result ..... 40

**5. CONCLUSION ..... 42**

**Appendix A - Test Setup Photograph ..... 43**

**Appendix B - EUT Photograph ..... 44**

# 1. GENERAL INFORMATION

## 1.1. Applicant

NetComm Wireless Pty Ltd

Level 5, 18-20 Orion Road, Lane Cove, NSW, 2066, Australia

## 1.2. Manufacturer

CASA SYSTEMS, INC.

100 Old River Road, Andover MA 01810 USA

## 1.3. Testing Facility

| | | | | | |
|---|---|---|---|---|---|
| ☒ | **Test Site - MRT Suzhou Laboratory** | | | | |
| | **Laboratory Location (Suzhou - Wuzhong)**<br>D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China<br>**Laboratory Location (Suzhou - SIP)**<br>4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China | | | | |
| | **Laboratory Accreditations** | | | | |
| | A2LA: 3628.01 | | CNAS: L10551 | | |
| | FCC: CN1166 | | ISED: CN0001 | | |
| | VCCI: | ☐R-20025 | ☐G-20034 | ☐C-20020 | ☐T-20020 |
| | | ☐R-20141 | ☐G-20134 | ☐C-20103 | ☐T-20104 |
| ☐ | **Test Site - MRT Shenzhen Laboratory** | | | | |
| | **Laboratory Location (Shenzhen)**<br>1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China | | | | |
| | **Laboratory Accreditations** | | | | |
| | A2LA: 3628.02 | | CNAS: L10551 | | |
| | FCC: CN1284 | | ISED: CN0105 | | |
| ☐ | **Test Site - MRT Taiwan Laboratory** | | | | |
| | **Laboratory Location (Taiwan)**<br>No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) | | | | |
| | **Laboratory Accreditations** | | | | |
| | TAF: L3261-190725 | | | | |
| | FCC: 291082, TW3261 | | ISED: TW3261 | | |

## 1.4. Product Information

| | |
|---|---|
| Product Name | 5G High Power mmWave Outdoor CPE |
| Model No. | CFW-2591 |
| Brand Name | Casa Systems |
| IMEI | Conducted Measurement: 354796430000971<br>Radiated Measurement: 35479630001250 |
| E-UTRA Band | Band 4, 5, 12, 17, 41, 48, 66 |
| FR1 NR Band | n66 |
| FR2 NR Band | n261 |
| Bluetooth Specification | V4.1 BLE only |
| Antenna Information | Refer to section 1.6 |
| Operating Temperature | -40 ~ 55 °C |

Remark:

1. The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.

## 1.5. Radio Specification under Test

| | |
|---|---|
| Frequency Range | TDD Band 48: 3550 ~ 3700 MHz |
| Device Type | End User Device |
| Modulation | up to 256QAM |

## 1.6. Description of Available Antennas

| Technology | Frequency Range (MHz) | Antenna Type | Max Peak Gain (dBi) |
|---|---|---|---|
| LTE Band 4 | 1710 ~ 1755 | Dipole | 4.4 |
| LTE Band 5 | 824 ~ 849 | | 2.1 |
| LTE Band 12 | 699 ~ 716 | | 1.6 |
| LTE Band 17 | 704 ~ 716 | | 1.6 |
| LTE Band 41 | 2496 ~ 2690 | | 5.1 |
| LTE Band 48 | 3550 ~ 3700 | | 4.3 |
| LTE/NR Band 66 | 1710 ~ 1780 | | 4.4 |
| Bluetooth | 2402 ~ 2480 | | 3.0 |

## 1.7. Test Methodology

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ANSI C63.26:2015
- FCC CFR 47 Part 96
- FCC KDB 971168 D01 v03r01: Power Meas License Digital Systems
- FCC KDB 412172 D01 v01r01: Determining ERP and EIRP
- FCC KDB 940660 D01 v03 Certification and Test Procedures for Citizens Broadband Radio Service Devices Authorized Under Part 96
- WINNF-TS-0122 V1.0.0: Test and Certification for Citizens Broadband Radio Service (CBRS); Conformance and Performance Test Technical Specification; CBSD/DP as Unit Under Test (UUT)

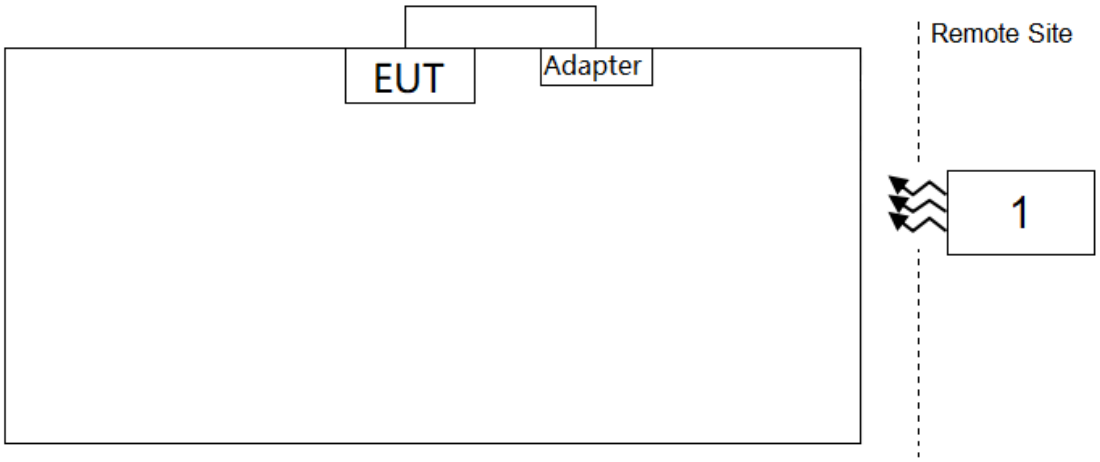
## 1.8. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

## 1.9. Maximum Power, Frequency Tolerance, and Emission Designator

| LTE Band 48 | | QPSK | | | 16QAM | | |
|---|---|---|---|---|---|---|---|
| BW (MHz) | BW (MHz) | Designator | Tolerance (ppm) | Max EIPR (W/10MHz) | Designator | Tolerance (ppm) | Max EIPR (W/10MHz) |
| 5 | 3552.5 ~ 3697.5 | 4M47G7D | - | 0.1538 | 4M46W7D | - | 0.1242 |
| 10 | 3555.0 ~ 3695.0 | 8M91G7D | - | 0.1603 | 8M91W7D | - | 0.1285 |
| 15 | 3557.5 ~ 3692.5 | 13M4G7D | - | 0.1091 | 13M4W7D | - | 0.0869 |
| 20 | 3560.0 ~ 3690.0 | 17M9G7D | -0.0074 | 0.0820 | 17M9W7D | - | 0.0656 |
| LTE Band 48 | | 64QAM | | | 256QAM | | |
| BW (MHz) | BW (MHz) | Designator | Tolerance (ppm) | Max EIPR (W/10MHz) | Designator | Tolerance (ppm) | Max EIPR (W/10MHz) |
| 5 | 3552.5 ~ 3697.5 | 4M46W7D | - | 0.0991 | 4M45W7D | - | 0.0631 |
| 10 | 3555.0 ~ 3695.0 | 8M94W7D | - | 0.1021 | 8M94W7D | - | 0.0593 |
| 15 | 3557.5 ~ 3692.5 | 13M4W7D | - | 0.0693 | 13M4W7D | - | 0.0438 |
| 20 | 3560.0 ~ 3690.0 | 17M8W7D | - | 0.0526 | 17M8W7D | - | 0.0332 |

## 1.10. Configuration of Tested System




| Product | | Manufacturer | Model No. |
|---|---|---|---|
| 1 | Wideband Radio Communication Tester | R&S | CMW 500 |

## 1.11. Test Environment Condition

| | |
|---|---|
| Ambient Temperature | 15 ~ 35°C |
| Relative Humidity | 20% ~ 75%RH |

## 2. TEST EQUIPMENT CALIBRATION DATE

Radiated Emission (WZ- AC1)

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|---|---|---|---|---|---|
| EMI Test Receiver | R&S | ESR7 | MRTSUE06001 | 1 year | 2022/01/04 |
| Wideband Radio Communication Tester | R&S | CMW 500 | MRTSUE06243 | 1 year | 2022/10/10 |
| PXA Signal Analyzer | Keysight | 9030B | MRTSUE06395 | 1 year | 2022/08/08 |
| Loop Antenna | Schwarzbeck | FMZB 1519 | MRTSUE06025 | 1 year | 2022/10/28 |
| Bilog Period Antenna | Schwarzbeck | VULB 9168 | MRTSUE06172 | 1 year | 2022/08/05 |
| Broad Band Horn Antenna | Schwarzbeck | BBHA 9120D | MRTSUE06023 | 1 year | 2022/09/16 |
| Broad Band Horn Antenna | Schwarzbeck | BBHA 9170 | MRTSUE06597 | 1 year | 2021/12/14 |
| Microwave System Amplifier | Agilent | 83017A | MRTSUE06076 | 1 year | 2022/11/14 |
| Preamplifier | Schwarzbeck | BBV 9721 | MRTSUE06121 | 1 year | 2022/06/09 |
| Thermohygrometer | Testo | 608-H1 | MRTSUE06403 | 1 year | 2022/06/28 |
| Anechoic Chamber | TDK | Chamber-AC1 | MRTSUE06212 | 1 year | 2022/04/29 |

Radiated Emission (WZ-AC2)

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|---|---|---|---|---|---|
| Spectrum Analyzer | Keysight | N9038A | MRTSUE06125 | 1 year | 2022/06/24 |
| Wideband Radio Communication Tester | R&S | CMW 500 | MRTSUE06243 | 1 year | 2022/10/10 |
| Loop Antenna | Schwarzbeck | FMZB 1519 | MRTSUE06025 | 1 year | 2022/10/28 |
| Bilog Period Antenna | Schwarzbeck | VULB 9162 | MRTSUE06022 | 1 year | 2022/05/24 |
| Horn Antenna | Schwarzbeck | BBHA9120D | MRTSUE06171 | 1 year | 2022/10/21 |
| Broad Band Horn Antenna | Schwarzbeck | BBHA 9170 | MRTSUE06597 | 1 year | 2021/12/14 |
| Broad Band Coaxial Preamplifier | Schwarzbeck | BBV 9718 | MRTSUE06176 | 1 year | 2022/11/14 |
| Preamplifier | Schwarzbeck | BBV 9721 | MRTSUE06121 | 1 year | 2022/06/09 |
| Temperature/Humidity Meter | Minggao | ETH529 | MRTSUE06170 | 1 year | 2021/12/15 |
| Anechoic Chamber | RIKEN | Chamber-AC2 | MRTSUE06213 | 1 year | 2022/04/29 |

Conducted Test Equipment (WZ-SR6, WZ-TR3)

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|---|---|---|---|---|---|
| EXA Signal Analyzer | Agilent | N9020A | MRTSUE06106 | 1 year | 2022/04/13 |
| EXA Signal Analyzer | Keysight | N9010B | MRTSUE06452 | 1 year | 2022/07/10 |
| Signal Analyzer | R&S | FSV40 | MRTSUE06218 | 1 year | 2022/04/13 |
| Wideband Radio Communication Tester | R&S | CMW 500 | MRTSUE06243 | 1 year | 2022/10/10 |
| Power Meter | Agilent | U2021XA | MRTSUE06030 | 1 year | 2022/10/10 |
| DC Power Supply | GWINSTEK | DPS-3303C | MRTSUE06064 | N/A | N/A |
| True RMS Clamp Meter | Fluke | 319 | MRTSUE06080 | 1 year | 2022/05/05 |
| Directional Coupler | Agilent | 87301D | MRTSUE06082 | 1 year | 2022/03/24 |
| Dual Directional Coupler | Agilent | 7778D | MRTSUE06083 | 1 year | 2022/03/24 |
| Attenuator | MVE | 6dB | MRTSUE06534 | 1 year | 2021/12/12 |
| Attenuator | MVE | 10dB | MRTSUE06543 | 1 year | 2021/12/12 |
| Temperature & Humidity Chamber | BAOYT | BYH-150CL | MRTSUE06051 | 1 year | 2022/10/10 |
| Thermohygrometer | testo | 608-H1 | MRTSUE06401 | 1 year | 2022/06/28 |

| Software | Version | Function |
|---|---|---|
| EMI Software | V3 | EMI Test Software |

# 3. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

| Radiated Spurious Emissions |
|---|
| Measurement Uncertainty for a Level of Confidence of 95% (U=2Uc(y)):<br>Horizontal: 9kHz ~ 300MHz: 5.04dB<br>300MHz ~ 1GHz: 4.95dB<br>1GHz ~ 40GHz: 6.40dB<br>Vertical: 9kHz ~ 300MHz: 5.24dB<br>300MHz ~ 1GHz: 6.03dB<br>1GHz ~ 40GHz: 6.40dB |
| Conducted Spurious Emissions |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)):<br>0.78dB |
| Output Power |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)):<br>1.13dB |
| Occupied Bandwidth |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)):<br>0.28% |
| Frequency Stability |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)):<br>76.2Hz |

# 4. TEST RESULT

## 4.1. Summary

| FCC Part Section(s) | Test Description | Test Limit | Test Condition | Test Result | Reference |
|---|---|---|---|---|---|
| 2.1049 | Occupied Bandwidth | N/A | Conducted | Pass | Section4.2 |
| 2.1055 | Frequency Stability | Refer to section 4.3 | | Pass | Section4.3 |
| 96.41(b) | Equivalent Isotropic Radiated Power | Refer to section 4.4 | | Pass | Section4.4 |
| 2.1051<br>96.41(e) | Spurious Emission;<br>Band Edge Emission | Refer to section 4.5, 4.6 | | Pass | Section 4.5, 4.6 |
| 2.1051, 96.41(e) | Spurious Emission | Refer to section 4.7 | Radiated | Pass | Section4.7 |
| 96.47 | End User Device Additional Requirements (CBSD Protocol) | Refer to section 4.8 | | Pass | Section4.8 |

**Notes:**

1) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part ofthe system to connect the EUT to the analyzer at all frequencies of interest.
2) Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations the worst-case was found.
3) All supported modulation types were evaluated. The worst-case emission of modulation was selected. Therefore, the Frequency Stability, Band Edge, Radiated & Conducted SpuriousEmission were presented worst case in the test report.

## 4.2. Occupied Bandwidth Measurement

### 4.2.1.Test Limit

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

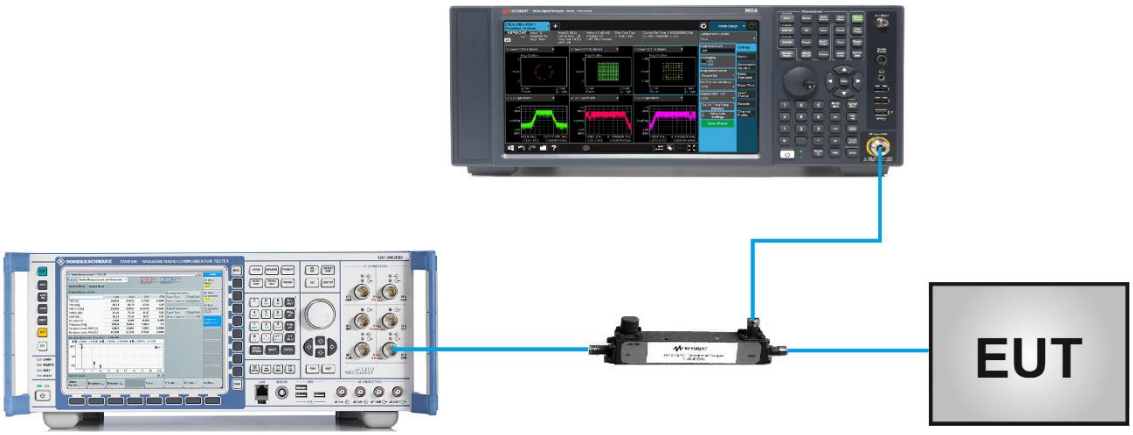
### 4.2.2.Test Procedure

ANSI C63.26-2015 - Section 5.4

### 4.2.3.Test Setting

1. Set center frequency to the nominal EUT channel center frequency
2. RBW = The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW
3. VBW ≥ 3 × RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. Allow the trace to stabilize
8. Use the 99% power bandwidth function of the instrument and report the measured bandwidth.

### 4.2.4.Test Setup



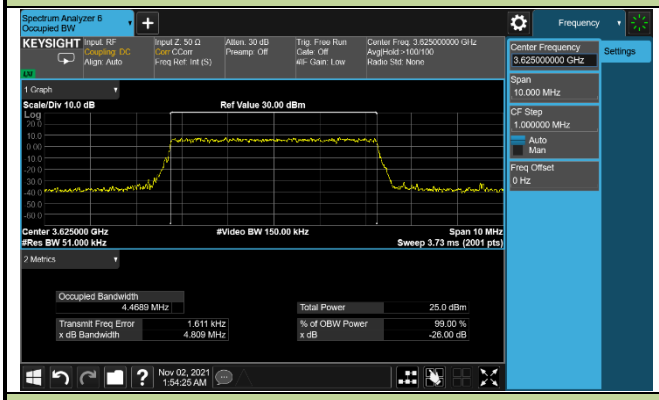
#### 4.2.4.1. Test Result

| | | | |
|---|---|---|---|
| Test Engineer | Candy Luo | Test Site | WZ-SR6 |
| Test Band | LTE Band 48 | Test Date | 2021/11/02 |

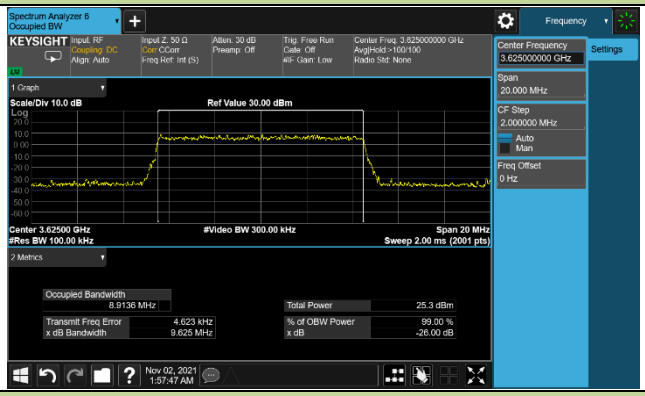
| Modulation | Frequency (MHz) | Bandwidth (MHz) | 99% Bandwidth (MHz) |
|---|---|---|---|
| QPSK | 3625.0 | 5 | 4.47 |
| | | 10 | 8.91 |
| | | 15 | 13.43 |
| | | 20 | 17.89 |
| 16QAM | 3625.0 | 5 | 4.46 |
| | | 10 | 8.91 |
| | | 15 | 13.40 |
| | | 20 | 17.85 |
| 64QAM | 3625.0 | 5 | 4.46 |
| | | 10 | 8.94 |
| | | 15 | 13.42 |
| | | 20 | 17.80 |
| 256QAM | 3625.0 | 5 | 4.45 |
| | | 10 | 8.94 |
| | | 15 | 13.38 |
| | | 20 | 17.83 |

## 99% Bandwidth - QPSK

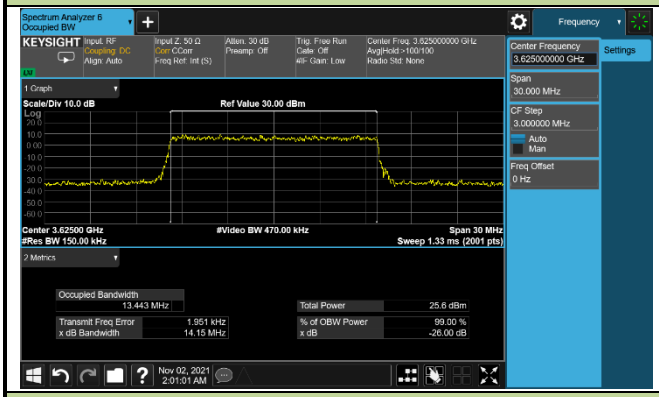
### 5MHz Channel Bandwidth



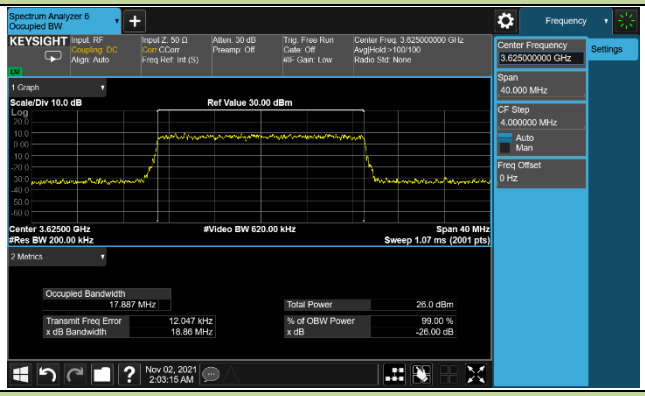

### 10MHz Channel Bandwidth




### 15MHz Channel Bandwidth

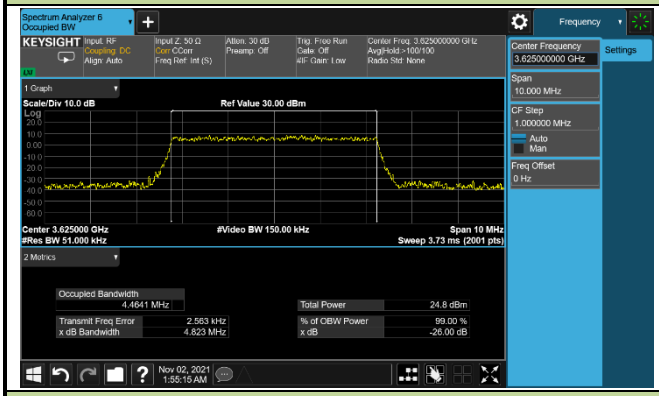



### 20MHz Channel Bandwidth

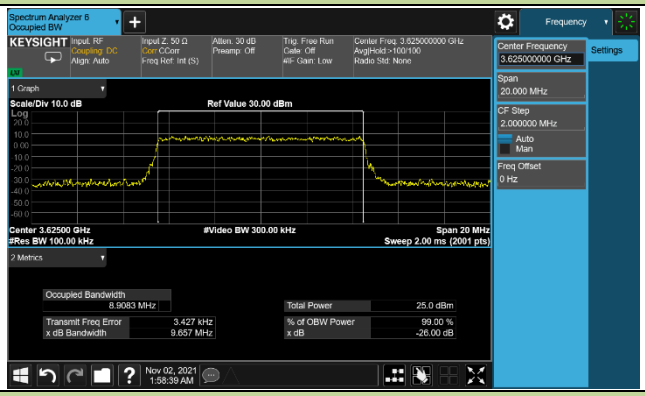



## 99% Bandwidth - 16QAM

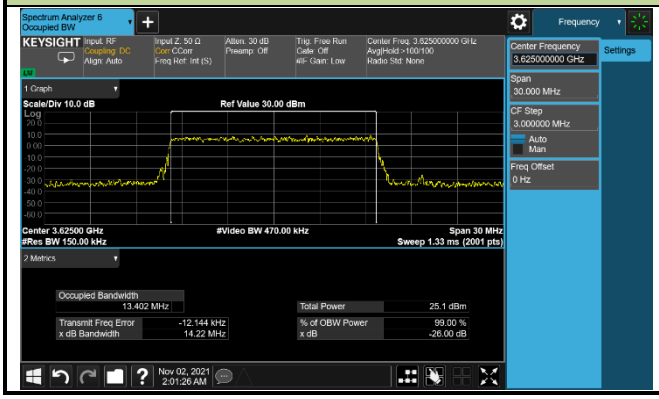
### 5MHz Channel Bandwidth



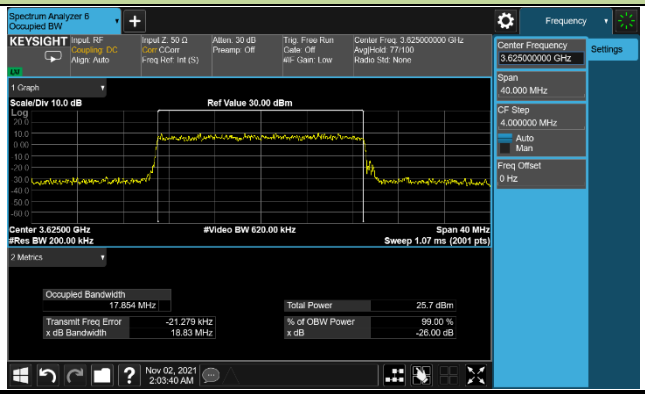

### 10MHz Channel Bandwidth




### 15MHz Channel Bandwidth

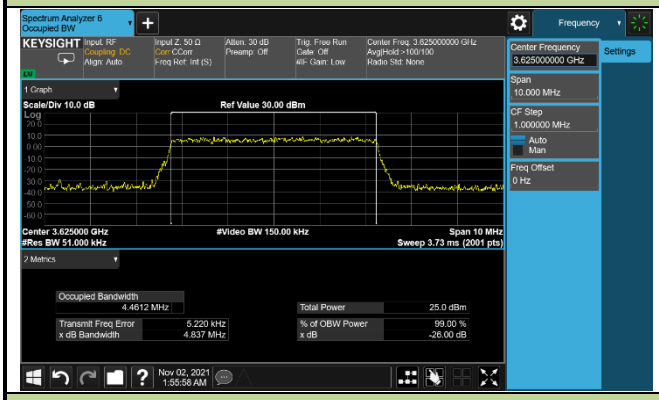



### 20MHz Channel Bandwidth

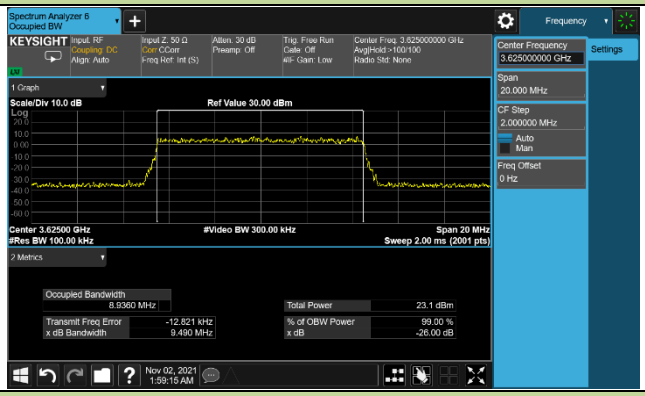


## 99% Bandwidth - 64QAM

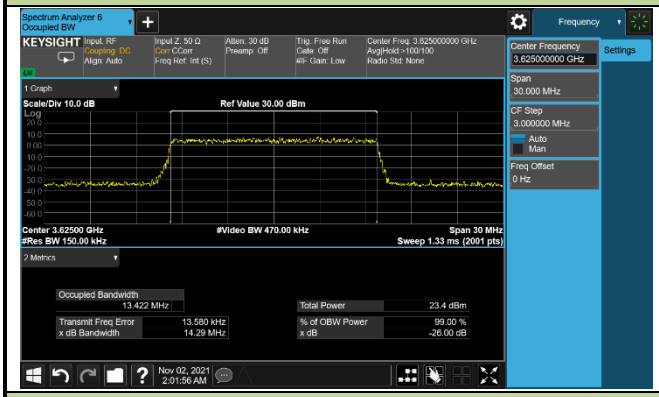
### 5MHz Channel Bandwidth



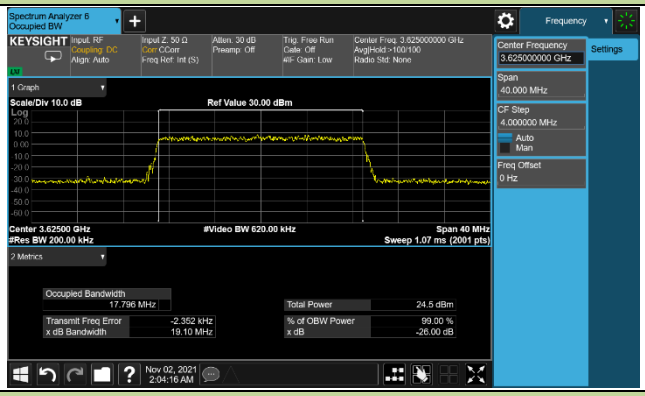

### 10MHz Channel Bandwidth




### 15MHz Channel Bandwidth

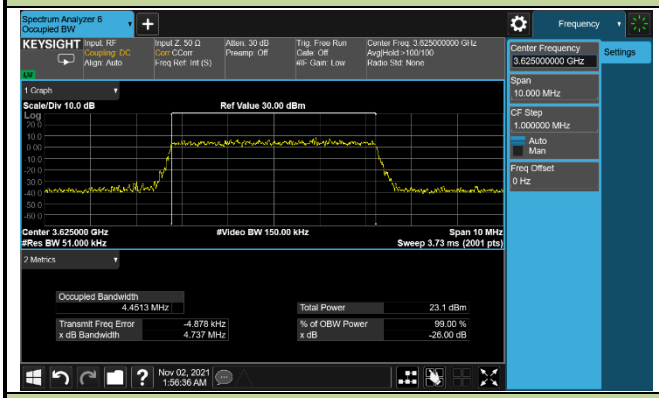



### 20MHz Channel Bandwidth

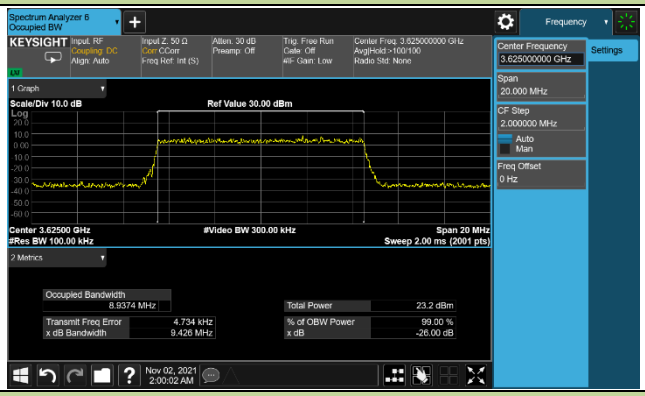



## 99% Bandwidth - 256QAM

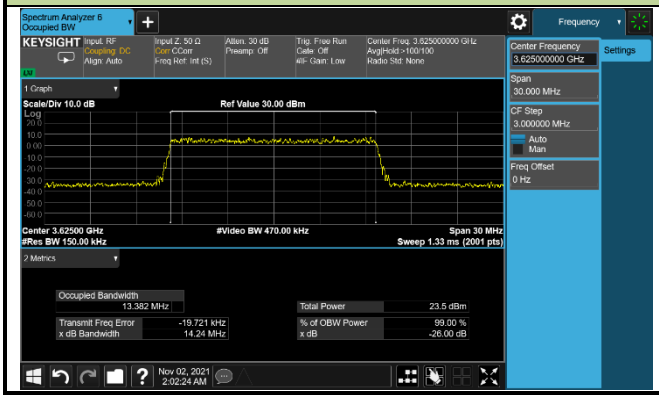
### 5MHz Channel Bandwidth



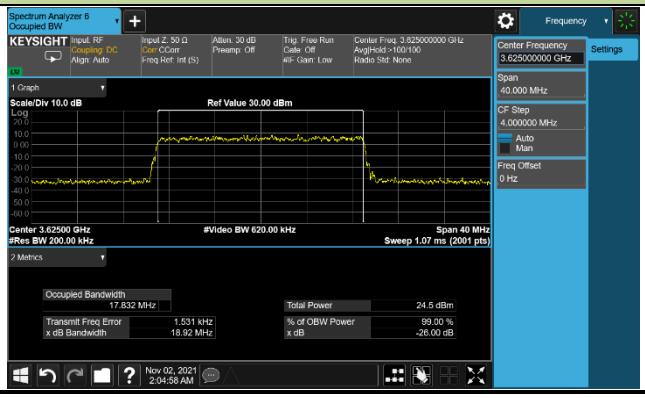

### 10MHz Channel Bandwidth




### 15MHz Channel Bandwidth




### 20MHz Channel Bandwidth



## 4.3. Frequency Stability Measurement

### 4.3.1.Test Limit

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5ppm) of the center frequency.

### 4.3.2.Test Procedure

ANSI C63.26-2015 - Section 5.6

### 4.3.3.Test Setting

**Frequency Stability Under Temperature Variations:**

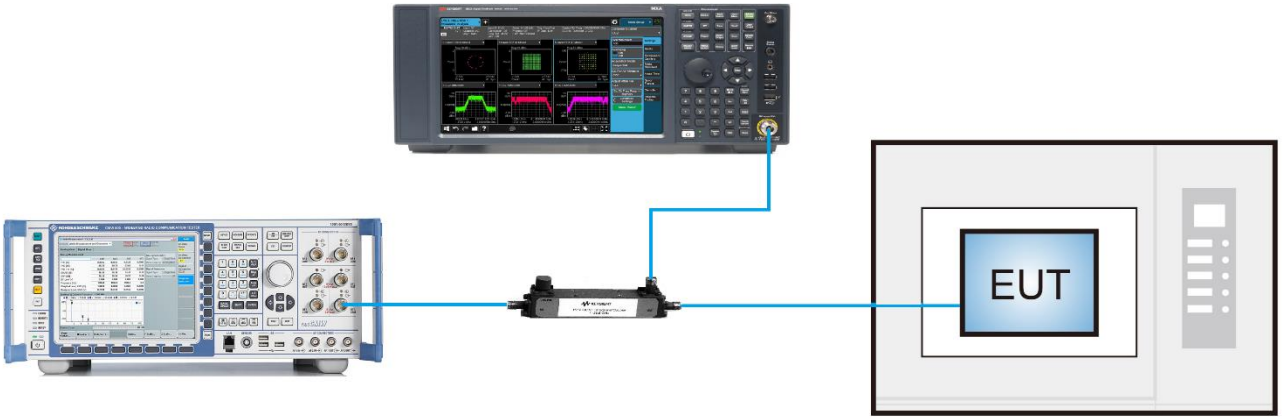
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to highest. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C decreased per stage until the lowest temperature reached.

**Frequency Stability Under Voltage Variations:**

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the inputvoltage to specify extreme voltage variation (±15%) and endpoint, recordthe maximum frequency change.

### 4.3.4.Test Setup



### 4.3.5.Test Result

| | | | |
|---|---|---|---|
| Test Engineer | Candy Luo | Test Site | SIP-TR1 |
| Test Band | LTE Band 48_QPSK | Test Date | 2021/11/03 |

| Power (Vdc) | Temp. (°C) | Frequency Tolerance (ppm) |
|---|---|---|
| 120 | - 30 | -0.0055 |
| | - 20 | -0.0054 |
| | - 10 | -0.0052 |
| | 0 | -0.0035 |
| | + 10 | -0.0062 |
| | + 20 | -0.0051 |
| | + 30 | -0.0040 |
| | + 40 | -0.0044 |
| | + 50 | -0.0060 |
| 138 | + 20 | -0.0074 |
| 102 | + 20 | -0.0028 |

## 4.4. Equivalent Isotropically Radiated Power Measurement

### 4.4.1.Test Limit

The maximum effective isotropic radiated power (EIRP) End User Device is 23dBm/10MHz

### 4.4.2.Test Procedure

ANSI C63.26-2015 - Section 5.2.4.4.2 & 5.2.5.5

### 4.4.3.Test Setting

When the fundamental condition for average power measurements cannot be realized (i.e., the EUT can not be configured to transmit at full-power on a continuous basis (i.e., duty cycle < 98%) and the instrumentation cannot be configured to measure only during active full-power transmissions), then thefollowing procedure can be used if the EUT duty cycle is constant (i.e., duty cycle variations are less thanor equal to ±2%).

a) Set span to 2 × to 3 × the OBW.

b) Set RBW = 1% to 5% of the OBW.

c) Set VBW ≥ 3 × RBW.

d) Set number of measurement points in sweep ≥ 2 × span / RBW.

e) Sweep time:

1) Set = auto-couple, or

2) Set ≥ [10 × (number of points in sweep) × (transmission symbol period)] for single sweep (automation-compatible) measurement.

f) Detector = power averaging (rms).

g) Set sweep trigger to “free run.”

h) 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 time 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.

i) Using the marker function to identify the maximum PSD.

j) Add 10 log (1/duty cycle) to the measured 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%.

The relevant equation for determining the maximum ERP or EIRP from the measured RF output

power is given in Equation (1) as follows:

ERP or EIRP = $P_{Meas} + G_T$ (1)

where

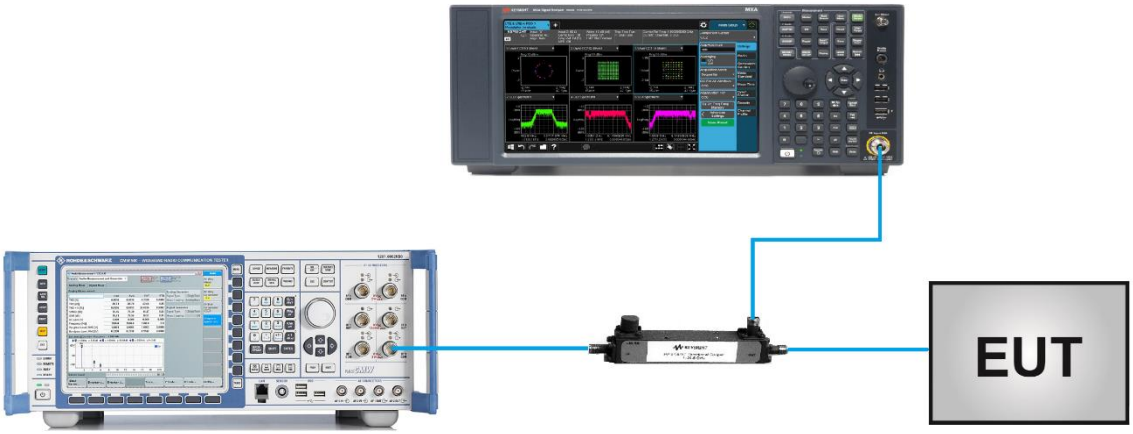
ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as $P_{Meas}$, e.g., dBm or dBW)

$P_{Meas}$ measured transmitter output power or PSD, in dBm or dBW

$G_T$ gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

For devices utilizing multiple antennas, see 6.4 for guidance with respect to determining the effective array transmit antenna gain term to be used in the above equation.

### 4.4.4.Test Setup



### 4.4.5.Test Result

| | | | |
|---|---|---|---|
| Test Engineer | Cloud Guo | Test Site | WZ-SR6 |
| Test Band | LTE Band 48 | Test Date | 2021/11/04 |

| Channel No. | Frequency (MHz) | Channel Bandwidth (MHz) | RB Size | RB Offset | Output Power (dBm/10MHz) | EIRP (dBm/ 10MHz) | Limit (dBm/ 10MHz) |
|---|---|---|---|---|---|---|---|
| QPSK | | | | | | | |
| 55265 | 3552.50 | 5 | 25 | 0 | 17.33 | 21.63 | < 23.00 |
| 55900 | 3625.00 | | | | 17.56 | 21.86 | < 23.00 |
| 56715 | 3697.50 | | | | 17.57 | 21.87 | < 23.00 |
| 55290 | 3555.00 | 10 | 50 | 0 | 17.32 | 21.62 | < 23.00 |
| 55900 | 3625.00 | | | | 17.75 | 22.05 | < 23.00 |
| 56690 | 3695.00 | | | | 17.25 | 21.55 | < 23.00 |
| 55315 | 3557.50 | 15 | 75 | 0 | 16.08 | 20.38 | < 23.00 |
| 55990 | 3625.00 | | | | 15.73 | 20.03 | < 23.00 |
| 56665 | 3692.50 | | | | 15.92 | 20.22 | < 23.00 |
| 55340 | 3560.00 | 20 | 100 | 0 | 14.84 | 19.14 | < 23.00 |
| 55990 | 3625.00 | | | | 14.60 | 18.90 | < 23.00 |
| 56640 | 3690.00 | | | | 14.80 | 19.10 | < 23.00 |
| 16QAM | | | | | | | |
| 55265 | 3552.50 | 5 | 25 | 0 | 16.41 | 20.71 | < 23.00 |
| 55900 | 3625.00 | | | | 16.63 | 20.93 | < 23.00 |
| 56715 | 3697.50 | | | | 16.64 | 20.94 | < 23.00 |
| 55290 | 3555.00 | 10 | 50 | 0 | 16.34 | 20.64 | < 23.00 |
| 55900 | 3625.00 | | | | 16.79 | 21.09 | < 23.00 |
| 56690 | 3695.00 | | | | 16.28 | 20.58 | < 23.00 |
| 55315 | 3557.50 | 15 | 75 | 0 | 15.09 | 19.39 | < 23.00 |
| 55990 | 3625.00 | | | | 14.75 | 19.05 | < 23.00 |
| 56665 | 3692.50 | | | | 14.90 | 19.20 | < 23.00 |
| 55340 | 3560.00 | 20 | 100 | 0 | 13.87 | 18.17 | < 23.00 |
| 55990 | 3625.00 | | | | 13.63 | 17.93 | < 23.00 |
| 56640 | 3690.00 | | | | 13.83 | 18.13 | < 23.00 |
| Note: The EIRP (dBm/10MHz) = Output Power (dBm/10MHz) + Antenna Gain (dBi) | | | | | | | |

| Channel No. | Frequency (MHz) | Channel Bandwidth (MHz) | RB Size | RB Offset | Output Power (dBm/10MHz) | EIRP (dBm/ 10MHz) | Limit (dBm/ 10MHz) |
|---|---|---|---|---|---|---|---|
| 64QAM | | | | | | | |
| 55265 | 3552.50 | 5 | 25 | 0 | 15.40 | 19.70 | < 23.00 |
| 55900 | 3625.00 | | | | 15.63 | 19.93 | < 23.00 |
| 56715 | 3697.50 | | | | 15.66 | 19.96 | < 23.00 |
| 55290 | 3555.00 | 10 | 50 | 0 | 15.37 | 19.67 | < 23.00 |
| 55900 | 3625.00 | | | | 15.79 | 20.09 | < 23.00 |
| 56690 | 3695.00 | | | | 15.27 | 19.57 | < 23.00 |
| 55315 | 3557.50 | 15 | 75 | 0 | 14.11 | 18.41 | < 23.00 |
| 55990 | 3625.00 | | | | 13.76 | 18.06 | < 23.00 |
| 56665 | 3692.50 | | | | 13.95 | 18.25 | < 23.00 |
| 55340 | 3560.00 | 20 | 100 | 0 | 12.91 | 17.21 | < 23.00 |
| 55990 | 3625.00 | | | | 12.66 | 16.96 | < 23.00 |
| 56640 | 3690.00 | | | | 12.83 | 17.13 | < 23.00 |
| 256QAM | | | | | | | |
| 55265 | 3552.50 | 5 | 25 | 0 | 13.38 | 17.68 | < 23.00 |
| 55900 | 3625.00 | | | | 13.64 | 17.94 | < 23.00 |
| 56715 | 3697.50 | | | | 13.70 | 18.00 | < 23.00 |
| 55290 | 3555.00 | 10 | 50 | 0 | 13.43 | 17.73 | < 23.00 |
| 55900 | 3625.00 | | | | 13.13 | 17.43 | < 23.00 |
| 56690 | 3695.00 | | | | 13.29 | 17.59 | < 23.00 |
| 55315 | 3557.50 | 15 | 75 | 0 | 12.11 | 16.41 | < 23.00 |
| 55990 | 3625.00 | | | | 11.75 | 16.05 | < 23.00 |
| 56665 | 3692.50 | | | | 11.95 | 16.25 | < 23.00 |
| 55340 | 3560.00 | 20 | 100 | 0 | 10.91 | 15.21 | < 23.00 |
| 55990 | 3625.00 | | | | 10.67 | 14.97 | < 23.00 |
| 56640 | 3690.00 | | | | 10.83 | 15.13 | < 23.00 |
| Note: The EIRP (dBm/10MHz) = Output Power (dBm/10MHz) + Antenna Gain (dBi) | | | | | | | |

## 4.5. Band Edge Measurement

### 4.5.1.Test Limit

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.

The conducted power of any emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed -13 dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any emission shall not exceed -25 dBm/MHz.

The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/MHz.

### 4.5.2.Test Procedure

ANSI C63.26-2015 - Section 5.7

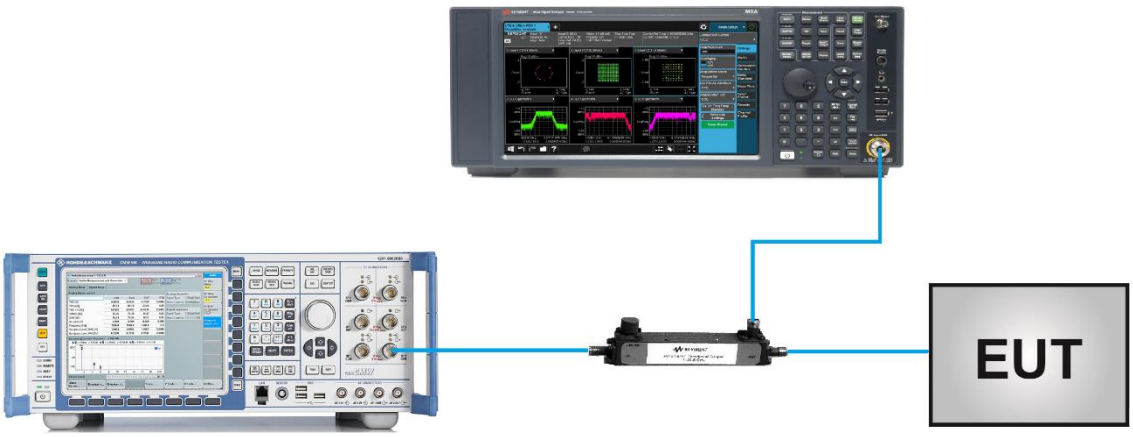
### 4.5.3.Test Setting

1. Set the analyzer frequency to low, middle, high channel.
2. RBW ≥ The nominal RBW shall be in the range of 1% of the anticipated OBW (in the 1MHz band immediately outside and adjacent to the band edge). For improvement of the accuracy in the measurement of the average power of a noise-like emission, a RBW narrower than the specified reference bandwidth can be used (generally limited to no less than 1% of the OBW), provided that a subsequent integration is performed over the full required measurement bandwidth. This integration should be performed using the spectrum analyzer’s band power functions.
3. VBW ≥ 3*RBW
4. Sweep time = auto
5. Detector = power averaging (rms)
6. Set sweep trigger to “free run.”
7. User gate triggered such that the analyzer only sweeps when the device is transmitting at full

power

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 time 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. Used power integration whenusing a measurement bandwidth smaller than the specified bandwidth.

### 4.5.4.Test Setup

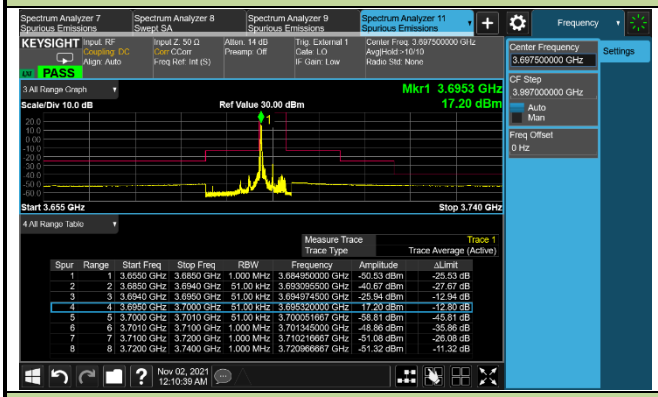


### 4.5.5.Test Result

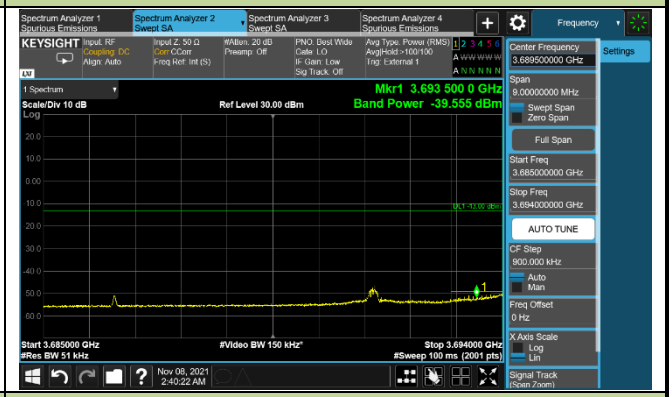
| | | | |
|---|---|---|---|
| Test Engineer | Cloud Guo | Test Site | WZ-SR6 |
| Test Band | LTE Band 48_QPSK | Test Date | 2021/11/02 ~ 2021/11/22 |

5MHz Channel Bandwidth - 1RB

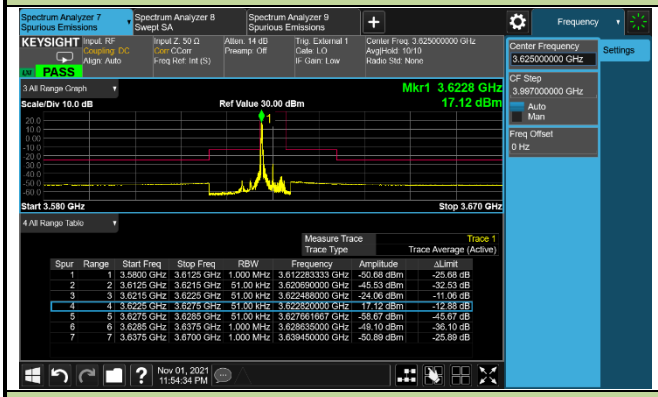
Low Channel ACP



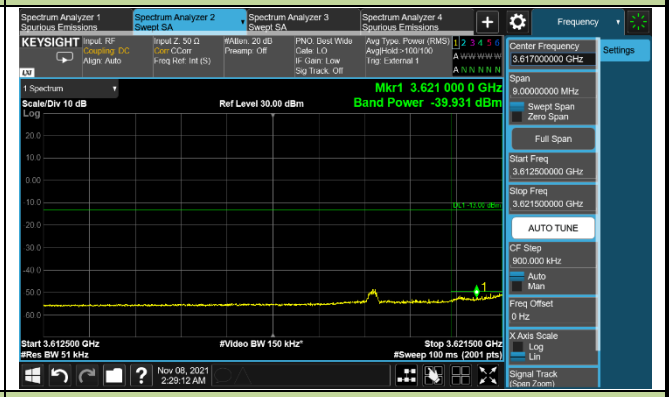

Extended Band Edge



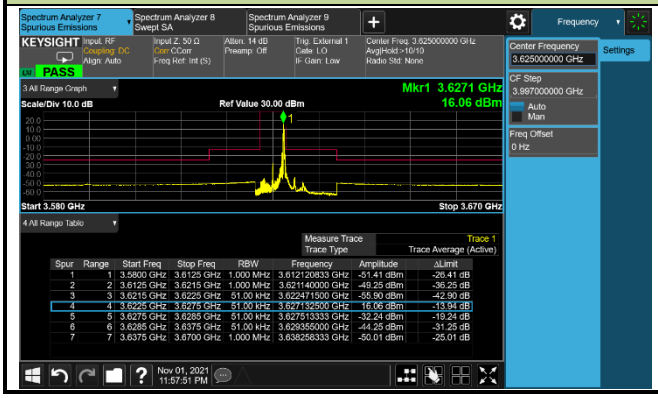

MiddleChannel ACP - Low RB Position



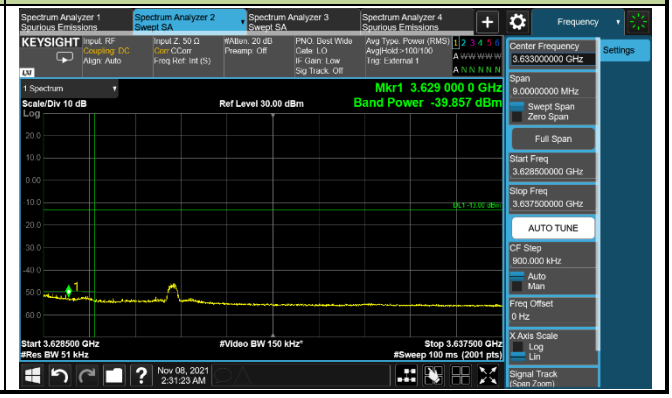

Extended Band Edge



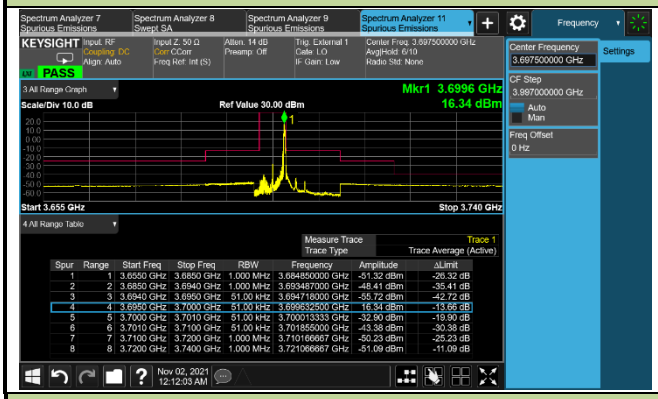

Middle Channel ACP - High RB Position



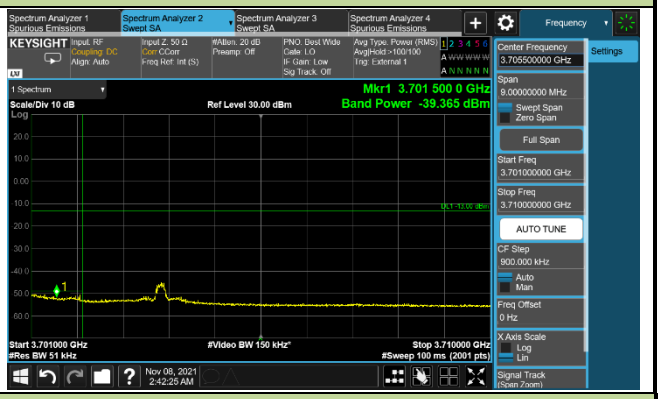

Extended Band Edge



## High Channel ACP

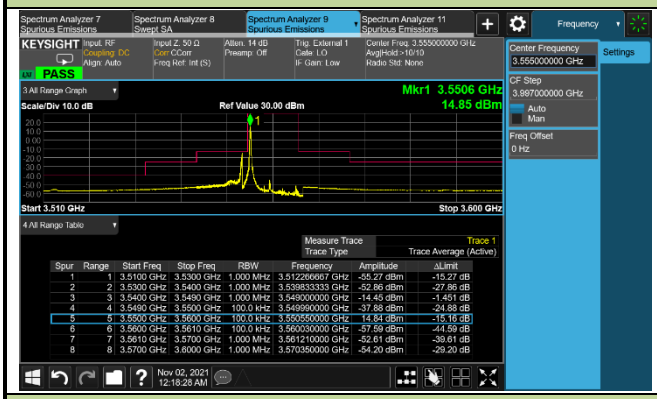



## Extended Band Edge

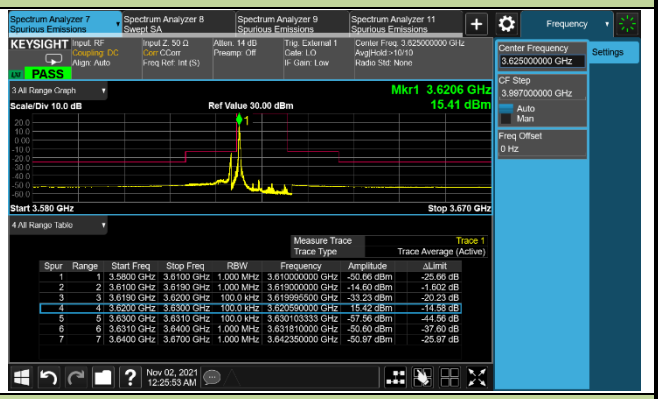



## 10MHz Channel Bandwidth - 1RB

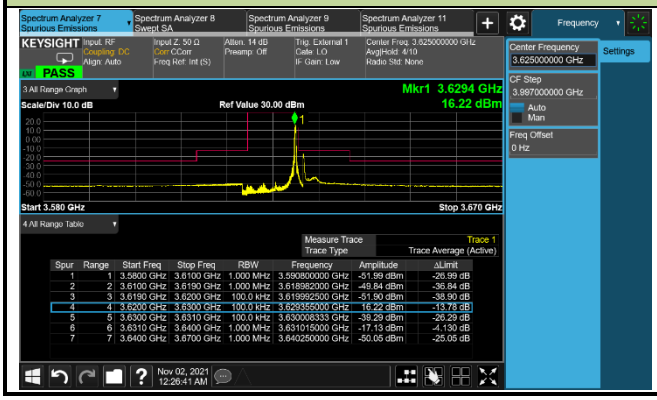
## Low Channel ACP



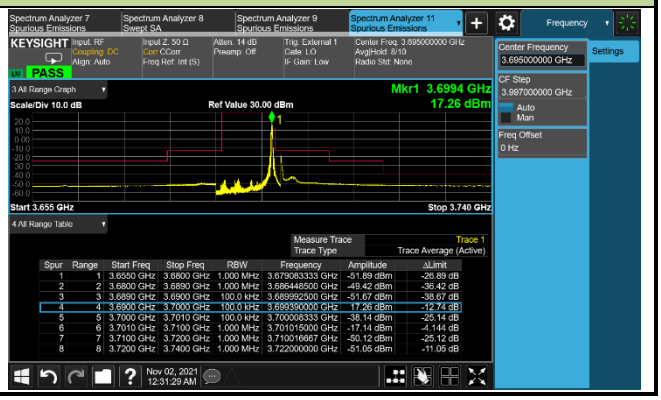

## MiddleChannel ACP - Low RB Position




## MiddleChannel ACP - High RB Position

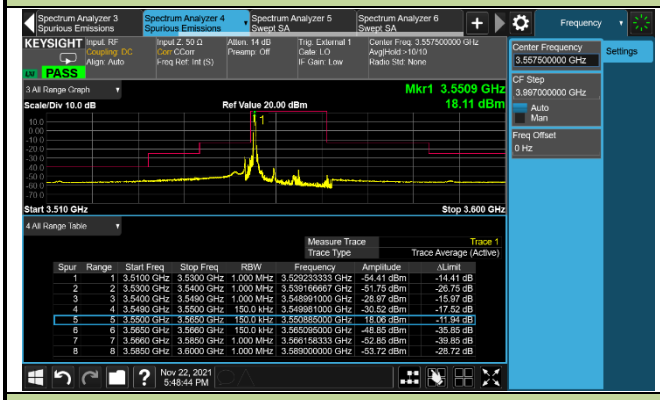



## High Channel ACP

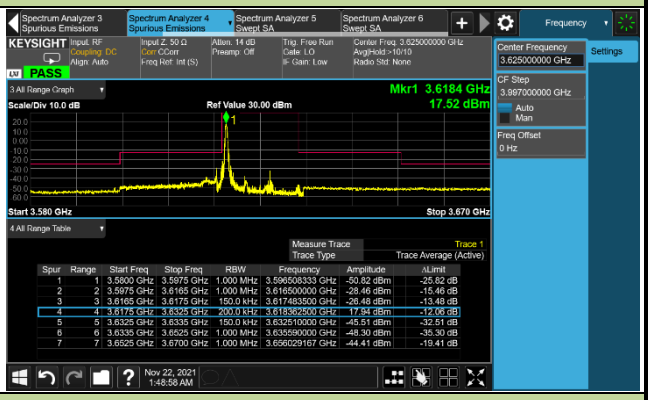


## 15MHz Channel Bandwidth - 1RB

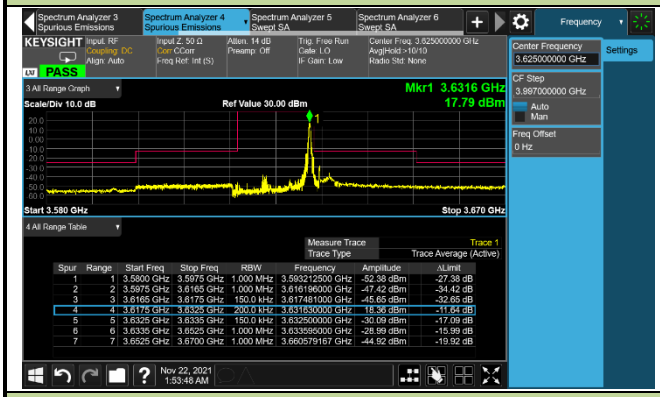
### Low Channel ACP



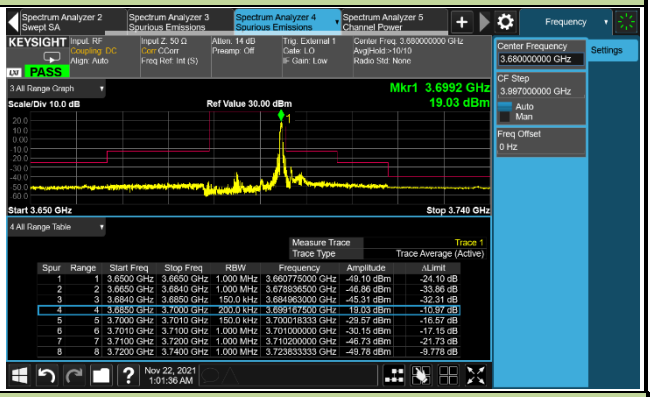

### MiddleChannel ACP - Low RB Position




### MiddleChannel ACP - High RB Position

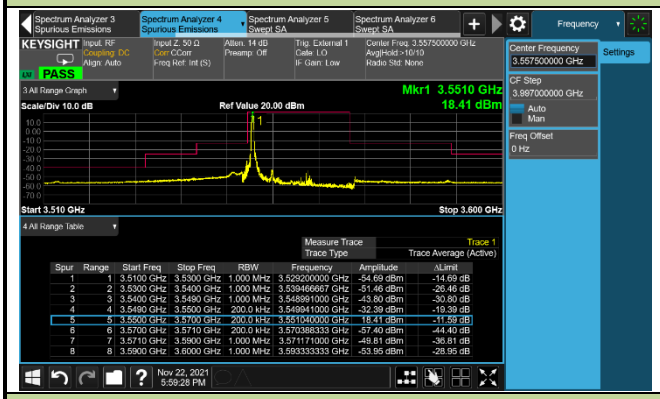



### High Channel ACP

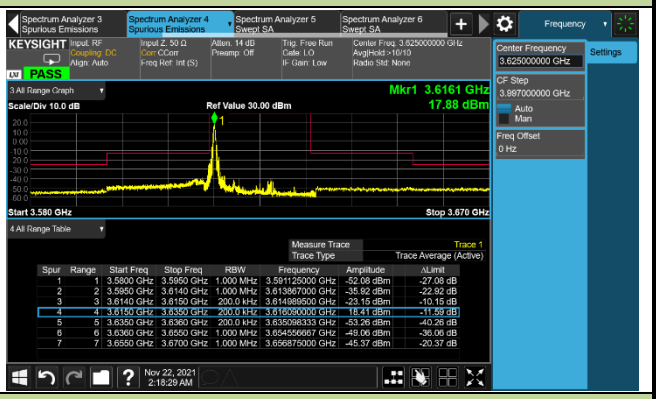



## 20MHz Channel Bandwidth - 1RB

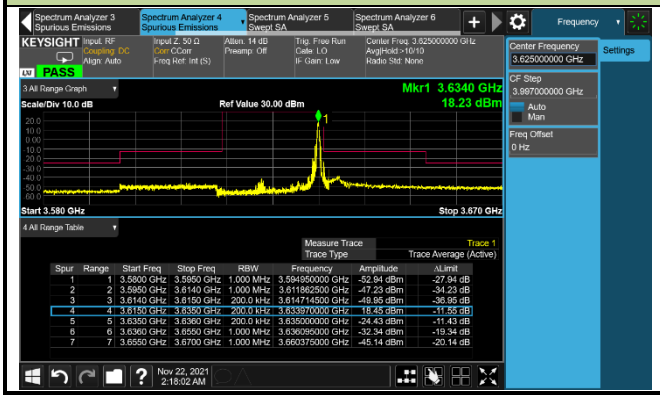
### Low Channel ACP



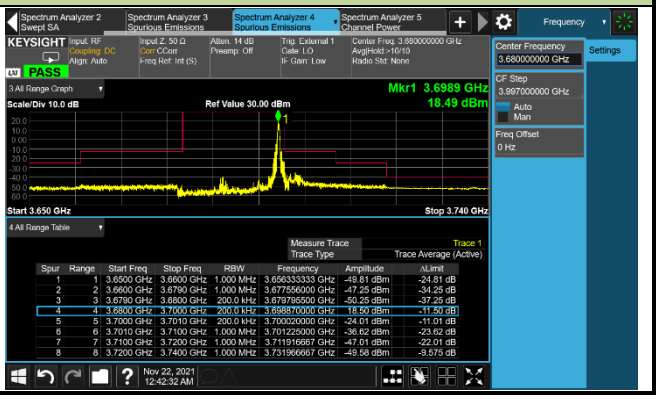

### MiddleChannel ACP - Low RB Position




### MiddleChannel ACP - High RB Position



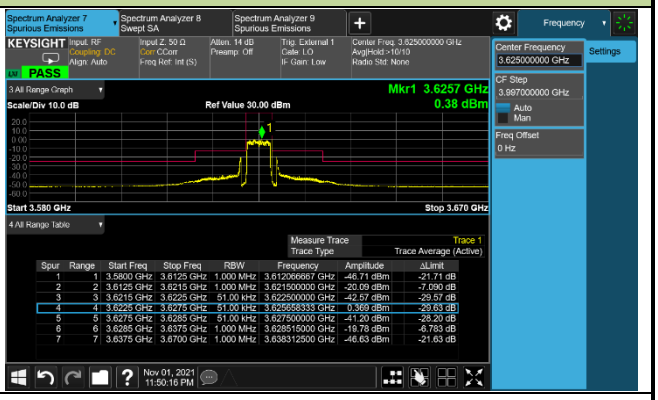

### High Channel ACP



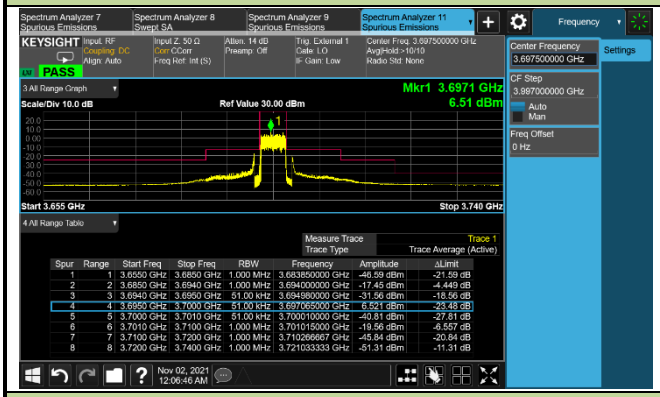
## 5MHz Channel Bandwidth - Full RB

### Low Channel ACP

### Middle Channel ACP

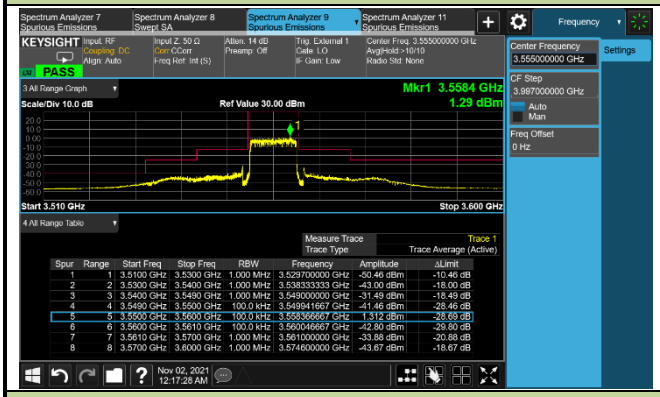


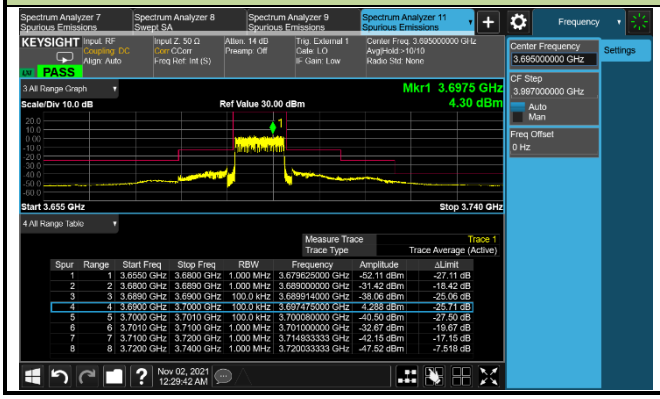

### High Channel ACP




## 10MHz Channel Bandwidth - Full RB

### Low Channel ACP




### Middle Channel ACP

### High Channel ACP