

# FCC RF Test Report

FCC ID : UZ7EM45A2  
EQUIPMENT : Enterprise Mobile  
BRAND NAME : Zebra  
MODEL NAME : EM45A2  
Applicant : Zebra Technologies Corporation  
3 Overlook Point, Lincolnshire, IL 60069 USA  
Manufacturer : Zebra Technologies Corporation  
3 Overlook Point, Lincolnshire, IL 60069 USA  
STANDARD : 47 CFR Part 27  
CLASSIFICATION : PCS Licensed Transmitter Held to Ear (PCE)  
TEST DATE(S) : Jun. 21, 2024 ~ Aug. 21, 2024

We, Sporton International Inc. (Kunshan), would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.26-2015 and shown compliance with the applicable technical standards.

This report contains data that were produced under subcontract by Sporton International Inc (Shenzhen).

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.

Jason Jia

Approved by: Jason Jia



**Sporton International Inc. (Kunshan)**

No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300  
People's Republic of China

## TABLE OF CONTENTS

REVISION HISTORY.....	3
SUMMARY OF TEST RESULT .....	4
1 GENERAL DESCRIPTION .....	5
1.1 Product Feature of Equipment Under Test.....	5
1.2 Product Specification of Equipment Under Test.....	6
1.3 Maximum EIRP Power and Emission Designator .....	6
1.4 Testing Site.....	6
1.5 Test Software.....	7
1.6 Applied Standards .....	7
2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST .....	8
2.1 Test Mode.....	8
2.2 Connection Diagram of Test System.....	9
2.3 Support Unit used in test configuration and system .....	9
2.4 Measurement Results Explanation Example.....	9
2.5 Frequency List of Low/Middle/High Channels .....	10
3 CONDUCTED TEST ITEMS .....	11
3.1 Measuring Instruments .....	11
3.2 Test Setup .....	11
3.3 Test Result of Conducted Test .....	11
3.4 Conducted Output Power Measurement .....	12
3.5 Peak-to-Average Ratio .....	13
3.6 EIRP .....	14
3.7 Occupied Bandwidth.....	15
3.8 Conducted Band Edge Measurement .....	16
3.9 Conducted Spurious Emission Measurement .....	17
3.10 Frequency Stability Measurement.....	18
4 RADIATED TEST ITEMS .....	19
4.1 Measuring Instruments .....	19
4.2 Test Setup .....	19
4.3 Test Result of Radiated Test .....	20
4.4 Radiated Spurious Emission Measurement .....	21
5 LIST OF MEASURING EQUIPMENT .....	22
6 MEASUREMENT UNCERTAINTY .....	23
APPENDIX A. TEST RESULTS OF CONDUCTED TEST	
APPENDIX B. TEST RESULTS OF RADIATED TEST	
APPENDIX C. TEST SETUP PHOTOGRAPHS	



## REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG460505G	Rev. 01	Initial issue of report	Sep. 05, 2024

## SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.4	§2.1046	Conducted Output Power	—	Report Only	-
3.5	-	Peak-to-Average Ratio	—	Report Only	
3.6	§27.50 (a)(3)	EIRP	EIRP < 250mW/5MHz	PASS	-
3.7	§2.1049	Occupied Bandwidth	—	Report Only	-
3.8	§2.1051 §27.53 (a)(4)	Conducted Band Edge Measurement	Refer standard	PASS	-
3.9	§2.1051 §27.53 (a)(4)	Conducted Spurious Emission	< 70+10log <sub>10</sub> (P[Watts])	PASS	-
3.10	§2.1055 §27.54	Frequency Stability Temperature & Voltage	Within the band	PASS	-
4.4	§2.1053 §27.53 (a)(4)	Radiated Spurious Emission	< 70+10log <sub>10</sub> (P[Watts])	PASS	Under limit 12.92 dB at 9222.000 MHz

### Conformity Assessment Condition:

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacture who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the section "Measurement Uncertainty"

### Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

# 1 General Description

## 1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	Enterprise Mobile
Brand Name	Zebra
Model Name	EM45A2
FCC ID	UZ7EM45A2
IMEI Code	Conducted: 352991990029039/352991990029328 Radiation: 352991990029096/352991990029708
HW Version	EV2.5
SW Version	13-32-08.00-TG-U06-STD-ATH-04
MFD	08AUG24
EUT Stage	Identical Prototype

**Remark:** The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

Specification of Accessory			
Battery	Brand Name	Zebra	Model
			BT-000501
			Part Number
			BT-000501-2000

Supported Unit used in test configuration and system				
AC Adapter 1 (Type C Wall Charger 1)	Brand Name	Zebra	Model	SAWA-102-22520A
			Part Number	PWR-WUA5V45W1US
AC Adapter 2 (Type A Wall Charger 2)	Brand Name	Zebra	Model	SAWA-65-20005A
			Part Number	PWR-WUA5V12W0US
Earphone 1 (Wired headset USB-C)	Brand Name	Zebra	Part Number	HDST-USBC-PTT1-01
Earphone 2 (Rugged Bluetooth Headset)	Brand Name	Zebra	Part Number	HS3100-OTH
Earphone 3 (3.5mm PTT Headset)	Brand Name	Zebra	Part Number	HDST-35MM-PTT1-02
Earphone 4 (Rugged Headset)	Brand Name	Zebra	Part Number	HS2100-OTH
3.5mm to 3.5mm audio connector	Brand Name	Zebra	Part Number	CBL-HS2100-3MS1-01
Type C-Audio Cable (Type C to 3.5mm)	Brand Name	Zebra	Part Number	ADP-USBC-35MM1-01
USB Cable 1 (USB-C to C Cable)	Brand Name	Zebra	Part Number	CBL-EC5X-USBC3A-01
USB Cable 2 (USB-A to C Cable)	Brand Name	Zebra	Part Number	CBL-TC5X-USBC2A-01
EM45 Protective Case	Brand Name	Zebra	Part Number	SG-EM45EXO1-01

## 1.2 Product Specification of Equipment Under Test

Product Feature	
<b>Tx Frequency</b>	LTE Band 30 : 2305 MHz ~ 2315 MHz
<b>Rx Frequency</b>	LTE Band 30 : 2350 MHz ~ 2360 MHz
<b>Bandwidth</b>	5MHz / 10MHz
<b>Maximum Output Power to Antenna</b>	LTE Band 30 : 23.69 dBm
<b>Antenna Gain</b>	LTE Band 30 : 0.06 dBi
<b>Type of Modulation</b>	QPSK / 16QAM / 64QAM / 256QAM

Note: The device supports two PAs for LTE Band 30: main PA and other PA. The maximum power of main PA is higher than the other PA, therefore, we chose higher power of main PA to calculate the EIRP and show in the report.

## 1.3 Maximum EIRP Power and Emission Designator

LTE Band 30		QPSK		16QAM/64QAM/256QAM	
BW (MHz)	Frequency Range (MHz)	Maximum EIRP(W)	Emission Designator (99%OBW)	Maximum EIRP(W)	Emission Designator (99%OBW)
5	2307.5 ~ 2312.5	0.2328	4M51G7D	0.1945	4M49W7D
10	2310.0	0.2371	9M05G7D	0.1977	9M03W7D

Note: All modulations have been tested, and only the worst test results of PSK & QAM are shown in the report.

## 1.4 Testing Site

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

<b>Test Firm</b>	Sporton International Inc. (Kunshan)		
<b>Test Site Location</b>	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158		
<b>Test Site No.</b>	<b>Sporton Site No.</b>	<b>FCC Designation No.</b>	<b>FCC Test Firm Registration No.</b>
	03CH04-KS	CN1257	314309

Sporton International Inc. (ShenZhen) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

<b>Test Firm</b>	Sporton International Inc. (ShenZhen)		
<b>Test Site Location</b>	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China TEL: +86-755-86379589 FAX: +86-755-86379595		
<b>Test Site No.</b>	<b>Sporton Site No.</b>	<b>FCC Designation No.</b>	<b>FCC Test Firm Registration No.</b>
	TH01-SZ	CN1256	421272

Note: Test data subcontracted: Conducted test cases in section 3.4~3.10 of this report.

## 1.5 Test Software

Item	Site	Manufacture	Name	Version
1.	03CH04-KS	AUDIX	E3	210616

## 1.6 Applied Standards

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

- ♦ 47 CFR Part 27(D)
- ♦ ANSI C63.26-2015
- ♦ FCC KDB 971168 Power Meas License Digital Systems D01 v03r01
- ♦ FCC KDB 412172 D01 Determining ERP and EIRP v01r01
- ♦

### Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

## 2 Test Configuration of Equipment Under Test

### 2.1 Test Mode

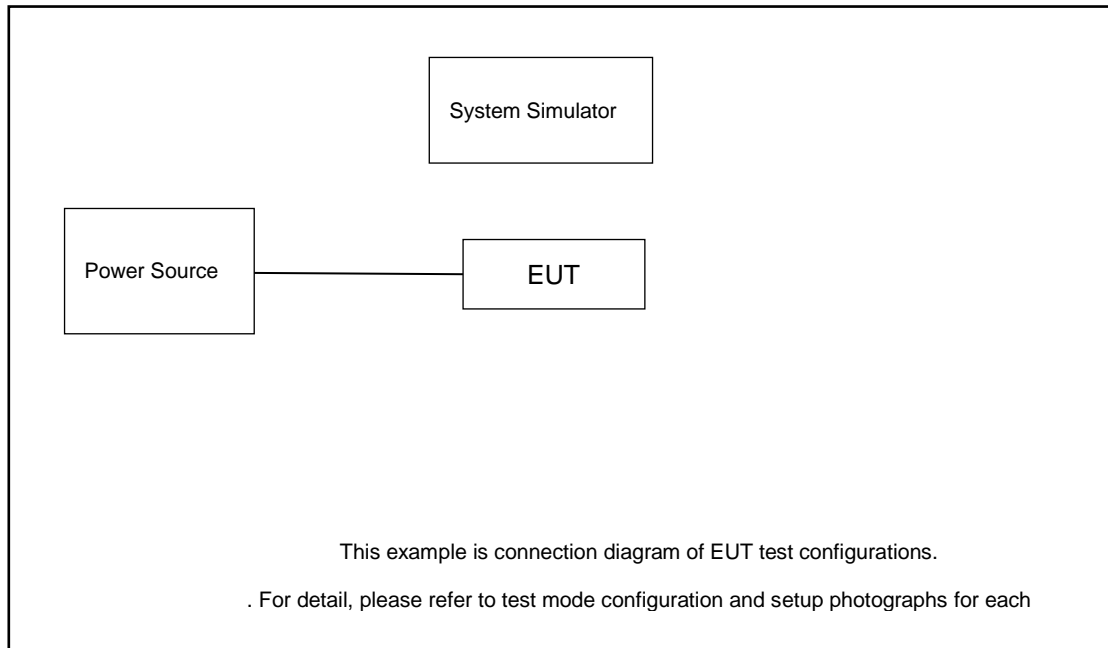
Antenna port conducted and radiated test items listed below are performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power.

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes to find the maximum emission. (Y-Plane)

Conducted Test Cases	Band	Bandwidth (MHz)						Modulation				RB #			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	64QAM	256QAM	1	Half	Full	L	M	H
Max. Output Power	30	-	-	V		-	-	V	V	V	V	V		V	V	V	V
		-	-		V	-	-	V	V	V	V	V		V		V	
Peak-to-Average Ratio	30	-	-		V	-	-	V	V	V		V		V		V	
E.I.R.P	30	-	-	V		-	-	V	V	V	V	V			V	V	V
		-	-		V	-	-	V	V	V	V	V				V	
26dB and 99% Bandwidth	30	-	-	V		-	-	V	V					V		V	
		-	-		V	-	-	V	V					V		V	
Conducted Band Edge	30	-	-	V		-	-	V	V	V		V		V	V		V
		-	-		V	-	-	V	V	V		V		V		V	
Conducted Spurious Emission	30	-	-	V		-	-	V				V			V	V	V
		-	-		V	-	-	V				V				V	
Frequency Stability	30	-	-		V	-	-	V						V		V	
Radiated Spurious Emission	30	Worse Case													V	V	V
Note	1. The mark “v “ means that this configuration is chosen for testing 2. The mark “-“ means that this bandwidth is not supported. 3. The device is investigated from 30MHz to 10 times of fundamental signal for radiated spurious emission test under different RB size/offset and modulations in exploratory test. Subsequently, only the worst case emissions are reported. 4. For the conduction band edge test case, within the 1MHz of the band edge, verify that the channel power is integrated over the full 1MHz measurement bandwidth and is passed. 5. For QAM modulation mode, the whole testing has assessed 16QAM&64QAM mode by referring to the higher conducted power																



## 2.2 Connection Diagram of Test System



## 2.3 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	Power Supply	GWINSTEK	PSS-2002	N/A	N/A	Unshielded, 1.8 m
2.	LTE Base Station	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m

## 2.4 Measurement Results Explanation Example

### For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

*Offset = RF cable loss + attenuator factor.*

Following shows an offset computation example with cable loss 5.0 dB and 10dB attenuator.

Example :

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 5.0 + 10 = 15.0(\text{dB}) \end{aligned}$$

## 2.5 Frequency List of Low/Middle/High Channels

LTE Band 30 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
10	Channel	-	27710	-
	Frequency	-	2310	-
5	Channel	27685	27710	27735
	Frequency	2307.5	2310	2312.5

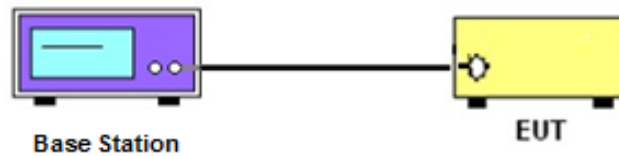
### 3 Conducted Test Items

#### 3.1 Measuring Instruments

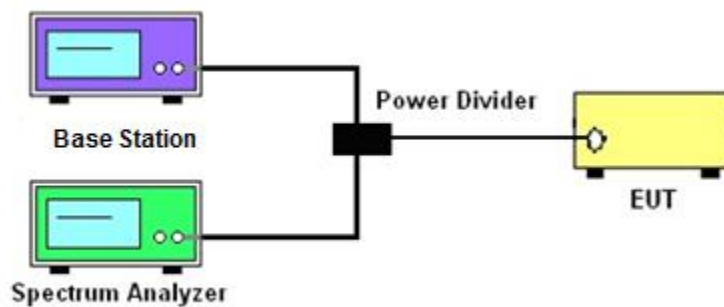
See list of measuring instruments of this test report.

#### 3.2 Test Setup

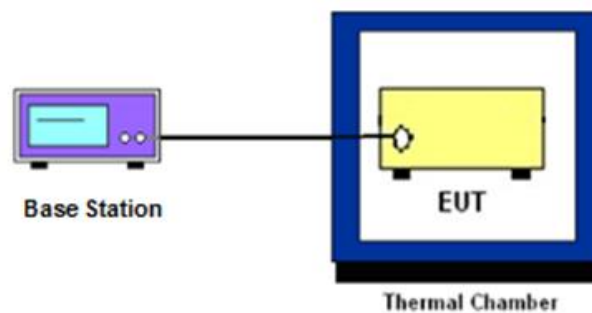
##### 3.2.1 Conducted Output Power



##### 3.2.2 Peak-to-Average Ratio, Occupied / 26dB Bandwidth ,Band-Edge and Conducted Spurious Emission



##### 3.2.3 Frequency Stability



#### 3.3 Test Result of Conducted Test

Please refer to Appendix A.

### 3.4 Conducted Output Power Measurement

#### 3.4.1 Description of the Conducted Output Power Measurement

A base station simulator was used to establish communication with the EUT. Its parameters were set to transmit the maximum power on the EUT. The measured power in the radio frequency on the transmitter output terminals shall be reported.

#### 3.4.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.2
2. The transmitter output port was connected to the system simulator.
3. Set EUT at maximum power through the system simulator.
4. Select lowest, middle, and highest channels for each band and different modulation.
5. Measure and record the power level from the system simulator.

## 3.5 Peak-to-Average Ratio

### 3.5.1 Description of the PAR Measurement

Power Complementary Cumulative Distribution Function (CCDF) curves provide a means for characterizing the power peaks of a digitally modulated signal on a statistical basis. A CCDF curve depicts the probability of the peak signal amplitude exceeding the average power level. Most contemporary measurement instrumentation include the capability to produce CCDF curves for an input signal provided that the instrument's resolution bandwidth can be set wide enough to accommodate the entire input signal bandwidth. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

### 3.5.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.2.3.4 (CCDF).
2. The EUT was connected to spectrum and system simulator via a power divider.
3. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
4. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.
5. Record the deviation as Peak to Average Ratio.

## 3.6 EIRP

### 3.6.1 Description of EIRP

For mobile and portable stations transmitting in the 2305-2315 MHz band or the 2350-2360 MHz band, the average EIRP must not exceed 50 milliwatts within any 1 megahertz of authorized bandwidth, *except that* for mobile and portable stations compliant with 3GPP LTE standards or another advanced mobile broadband protocol that avoids concentrating energy at the edge of the operating band the average EIRP must not exceed 250 milliwatts within any 5 megahertz of authorized bandwidth but may exceed 50 milliwatts within any 1 megahertz of authorized bandwidth. For mobile and portable stations using time division duplexing (TDD) technology, the duty cycle must not exceed 38 percent in the 2305-2315 MHz and 2350-2360 MHz bands. Mobile and portable stations using FDD technology are restricted to transmitting in the 2305-2315 MHz band. Power averaging shall not include intervals in which the transmitter is off.

### 3.6.2 Test Procedures

1. According to KDB 412172 D01 Power Approach,
2.  $EIRP = P_T + G_T - L_C$ ,  $ERP = EIRP - 2.15$ , where  
 $P_T$  = transmitter output power in dBm  
 $G_T$  = gain of the transmitting antenna in dBi  
 $L_C$  = signal attenuation in the connecting cable between the transmitter and antenna in dB

## 3.7 Occupied Bandwidth

### 3.7.1 Description of Occupied Bandwidth Measurement

The occupied bandwidth is 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 transmitted power.

The 26 dB emission bandwidth is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated 26 dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth equal to approximately 1.0% of the emission bandwidth.

### 3.7.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.4
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be between two and five times the anticipated OBW.
4. The nominal resolution bandwidth (RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.
5. Set the detection mode to peak, and the trace mode to max hold.
6. Determine the reference value: Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace.  
(this is the reference value)
7. Determine the “-26 dB down amplitude” as equal to (Reference Value – X).
8. Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the “-X dB down amplitude” determined in step 6. If a marker is below this “-X dB down amplitude” value it shall be placed as close as possible to this value. The OBW is the positive frequency difference between the two markers.
9. Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

## 3.8 Conducted Band Edge Measurement

### 3.8.1 Description of Conducted Band Edge Measurement

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.

### 3.8.2 Test Procedures

1. The testing follows ANSI C63.26 section 5.7
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The band edges of low and high channels for the highest RF powers were measured.
4. Set RBW  $\geq 1\%$  EBW in the 1MHz band immediately outside and adjacent to the band edge.
5. Beyond the 1 MHz band from the band edge, RBW=1MHz was used or a narrower RBW was used and the measured power was integrated over the full required measurement bandwidth of 1 MHz.
6. Set spectrum analyzer with RMS detector.
7. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
8. Checked that all the results comply with the emission limit line.

Example:

The limit line is derived from  $43 + 10\log(P)$  dB below the transmitter power P(Watts)

$$= P(W) - [43 + 10\log(P)] \text{ (dB)}$$

$$= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)} = -13\text{dBm}.$$



### 3.9 Conducted Spurious Emission Measurement

#### 3.9.1 Description of Conducted Spurious Emission Measurement

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least  $70 + 10 \log (P)$  dB.

It is measured by means of a calibrated spectrum analyzer and scanned from 30MHz up to a frequency including its 10<sup>th</sup> harmonic.

#### 3.9.2 Test Procedures

1. The testing follows ANSI C63.26 section 5.7
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.  
The path loss was compensated to the results for each measurement.
4. The middle channel for the highest RF power within the transmitting frequency was measured.
5. The conducted spurious emission for the whole frequency range was taken.
6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz.
7. Set spectrum analyzer with RMS detector.
8. Taking the record of maximum spurious emission.
9. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
10. The limit line is derived from  $70 + 10\log(P)$ dB below the transmitter power P(Watts)  
 $= P(W) - [70 + 10\log(P)] \text{ (dB)}$   
 $= [30 + 10\log(P)] \text{ (dBm)} - [70 + 10\log(P)] \text{ (dB)}$   
 $= -40\text{dBm}$

### **3.10 Frequency Stability Measurement**

#### **3.10.1 Description of Frequency Stability Measurement**

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  $\pm 0.00025\%$  ( $\pm 2.5\text{ppm}$ ) of the center frequency.

#### **3.10.2 Test Procedures for Temperature Variation**

1. The testing follows ANSI C63.26 section 5.6.4
2. The EUT was set up in the thermal chamber and connected with the system simulator.
3. With power OFF, the temperature was decreased to  $-30^{\circ}\text{C}$  and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.
4. With power OFF, the temperature was raised in  $10^{\circ}\text{C}$  step up to  $50^{\circ}\text{C}$ . The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.

#### **3.10.3 Test Procedures for Voltage Variation**

1. The testing follows ANSI C63.26 section 5.6.5.
2. The EUT was placed in a temperature chamber at  $20\pm 5^{\circ}\text{C}$  and connected with the system simulator.
3. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value for other than hand carried battery equipment.
4. 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.
5. The variation in frequency was measured for the worst case.

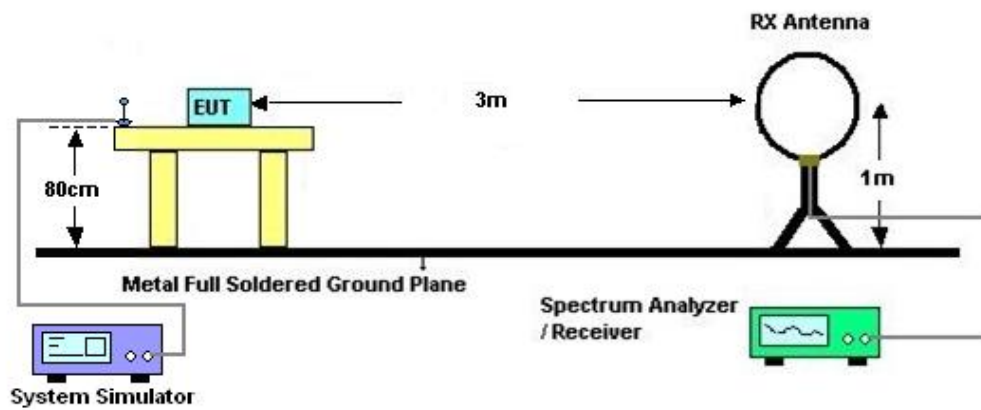
## 4 Radiated Test Items

### 4.1 Measuring Instruments

See list of measuring instruments of this test report.

### 4.2 Test Setup

#### 4.2.1 For radiated test below 30MHz



#### 4.2.2 For radiated test from 30MHz to 1GHz



#### 4.2.3 For radiated test above 1GHz



#### 4.3 Test Result of Radiated Test

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

Please refer to Appendix B.

## 4.4 Radiated Spurious Emission Measurement

### 4.4.1 Description of Radiated Spurious Emission

The radiated spurious emission was measured by substitution method according to ANSI C63.26. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least  $70 + 10 \log (P)$  dB.

The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

### 4.4.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.5
2. The EUT was placed on a turntable with 0.8 meter height for frequency below 1GHz and 1.5 meter height for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the receiving antenna mounted on the antenna tower.
4. The table was rotated 360 degrees to determine the position of the highest spurious emission.
5. The height of the receiving antenna is varied between 1m to 4m to search the maximum spurious emission for both horizontal and vertical polarizations.
6. During the measurement, the system simulator parameters were set to force the EUT transmitting at maximum output power.
7. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
8. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
9. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.

$$\text{EIRP (dBm)} = \text{S.G. Power} - \text{Tx Cable Loss} + \text{Tx Antenna Gain}$$

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

10. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

The limit line is derived from  $70 + 10\log(P)$ dB below the transmitter power P(Watts)

$$= P(W) - [70 + 10\log(P)] \text{ (dB)}$$

$$= [30 + 10\log(P)] \text{ (dBm)} - [70 + 10\log(P)] \text{ (dB)}$$

$$= -40\text{dBm}.$$

## 5 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101078	10Hz~40GHz	Apr. 09, 2024	Jun. 21, 2024~ Jul. 10, 2024	Apr. 08, 2025	Conducted (TH01-SZ)
Power Divider	TOJOIN	PS-2SM-04 265	60.06.020.007 7	0.4GHz~26.5GHz	Dec. 25, 2023	Jun. 21, 2024~ Jul. 10, 2024	Dec. 24, 2024	Conducted (TH01-SZ)
Thermal Chamber	Ten Billion Hongzhangroup	LP-150U	H2014081803	-40~+150°C	Jul. 04, 2023	Jun. 21, 2024~ Jul. 10, 2024	Jul. 03, 2024	Conducted (TH01-SZ)
Thermal Chamber	Ten Billion Hongzhangroup	LP-150U	H2014081803	-40~+150°C	Jul. 03, 2024		Jul. 02, 2025	Conducted (TH01-SZ)
EXA Spectrum Analyzer	Keysight	N9010B	MY57471079	10Hz~44G,MAX 30dB	Oct. 10, 2023	Jun. 27, 2024~ Aug. 21, 2024	Oct. 09, 2024	Radiation (03CH04-KS)
Bilog Antenna	TeseQ	CBL6111D	49921	30MHz~1GHz	Apr. 18, 2024	Jun. 27, 2024~ Aug. 21, 2024	Apr. 17, 2025	Radiation (03CH04-KS)
Loop Antenna	R&S	HFH2-Z2E	101125	9kHz~30MHz	Sep. 11 2023	Jun. 27, 2024~ Aug. 21, 2024	Sep. 10, 2024	Radiation (03CH04-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Oct. 23, 2023	Jun. 27, 2024~ Aug. 21, 2024	Oct. 22, 2024	Radiation (03CH04-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 05, 2024	Jun. 27, 2024~ Aug. 21, 2024	Jan. 04, 2025	Radiation (03CH04-KS)
Amplifier	SONOMA	310N	413740	9KHz~1GHz	Jan. 03, 2024	Jun. 27, 2024~ Aug. 21, 2024	Jan. 02, 2025	Radiation (03CH04-KS)
Amplifier	EM	EM18G40G A	060728	18~40GHz	Jan. 02, 2024	Jun. 27, 2024~ Aug. 21, 2024	Jan. 01, 2025	Radiation (03CH04-KS)
high gain Amplifier	EM	EM01G18G A	060840	1Ghz~18Ghz	Oct. 11, 2023	Jun. 27, 2024~ Aug. 21, 2024	Oct. 10, 2024	Radiation (03CH04-KS)
Amplifier	EM	EM01G18G A	060892	1Ghz~18Ghz	Oct. 11, 2023	Jun. 27, 2024~ Aug. 21, 2024	Oct. 10, 2024	Radiation (03CH04-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Jun. 27, 2024~ Aug. 21, 2024	NCR	Radiation (03CH04-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Jun. 27, 2024~ Aug. 21, 2024	NCR	Radiation (03CH04-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Jun. 27, 2024~ Aug. 21, 2024	NCR	Radiation (03CH04-KS)

NCR: No Calibration Required

## 6 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.26-2015. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

### Uncertainty of Conducted Measurement

Test Item	Uncertainty
Conducted Spurious Emission & Bandedge	$\pm 1.34$ dB
Occupied Channel Bandwidth	$\pm 0.012$ MHz
Conducted Power	$\pm 1.34$ dB
Peak to Average Ratio	$\pm 1.34$ dB
Frequency Stability	$\pm 1.3$ Hz

### Uncertainty of Radiated Emission Measurement (9 KHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2U_c(y)$ )	$\pm 2.83$ dB
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### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2U_c(y)$ )	$\pm 2.83$ dB
--	---------------

### Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2U_c(y)$ )	$\pm 2.82$ dB
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----- THE END -----

## Appendix A. Test Results of Conducted Test

Test Engineer :	Simle Wang	Temperature :	24~26°C
		Relative Humidity :	50~53%

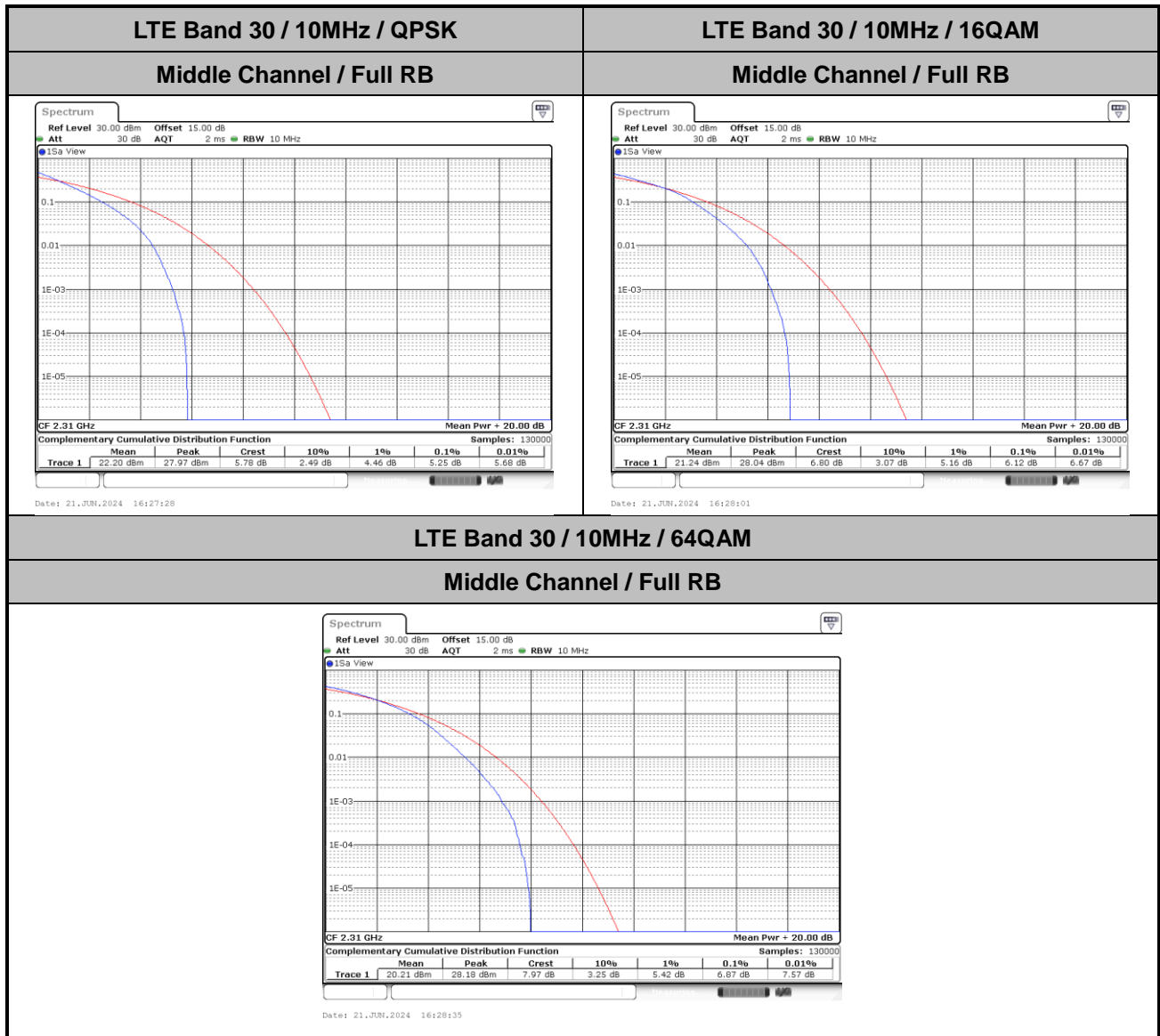
### Conducted Output Power(Average power) and ERP

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	ERP(W)		
Channel				27710					
Frequency (MHz)				2310				M	
10	QPSK	1	0		23.69			0.2371	
10	QPSK	1	49		23.57			0.2307	
10	QPSK	50	0		22.56			0.1828	
10	16QAM	1	0		22.90			0.1977	
10	64QAM	1	0		22.67			0.1875	
10	256QAM	1	0		18.56			0.0728	
Channel				27685	27710	27735	ERP(W)		
Frequency (MHz)				2307.5	2310	2312.5	L	M	H
5	QPSK	1	0	23.48	23.61	23.37	0.2259	0.2328	0.2203
5	16QAM	1	0	22.73	22.83	22.66	0.1901	0.1945	0.1871



## Peak-to-Average Ratio

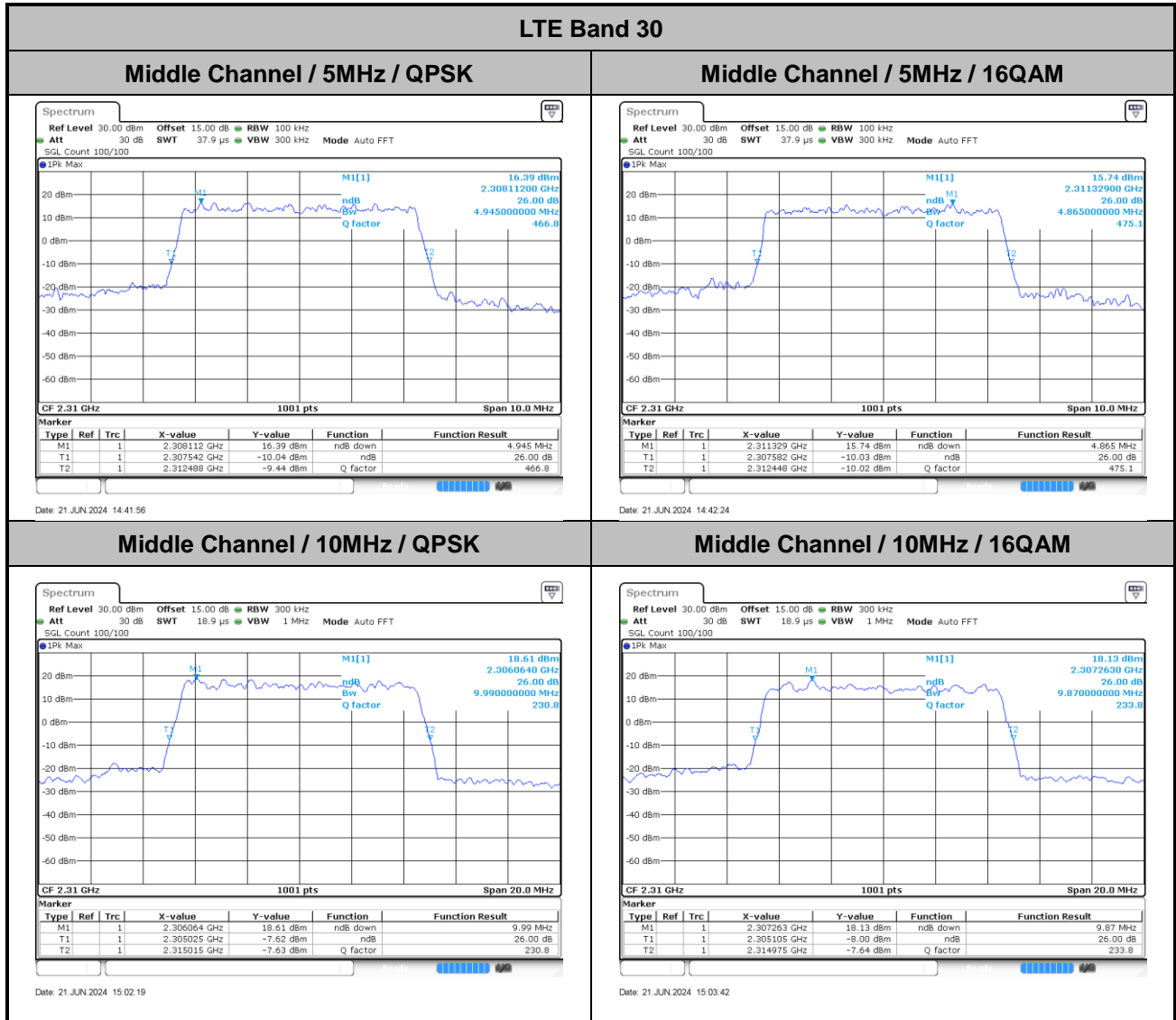
Mode	LTE Band 30 / 10MHz			
Mod.	QPSK	16QAM	64QAM	Limit: 13dB
RB Size	Full RB	Full RB	Full RB	Result
Middle CH	5.25	6.12	6.87	PASS





## 26dB Bandwidth

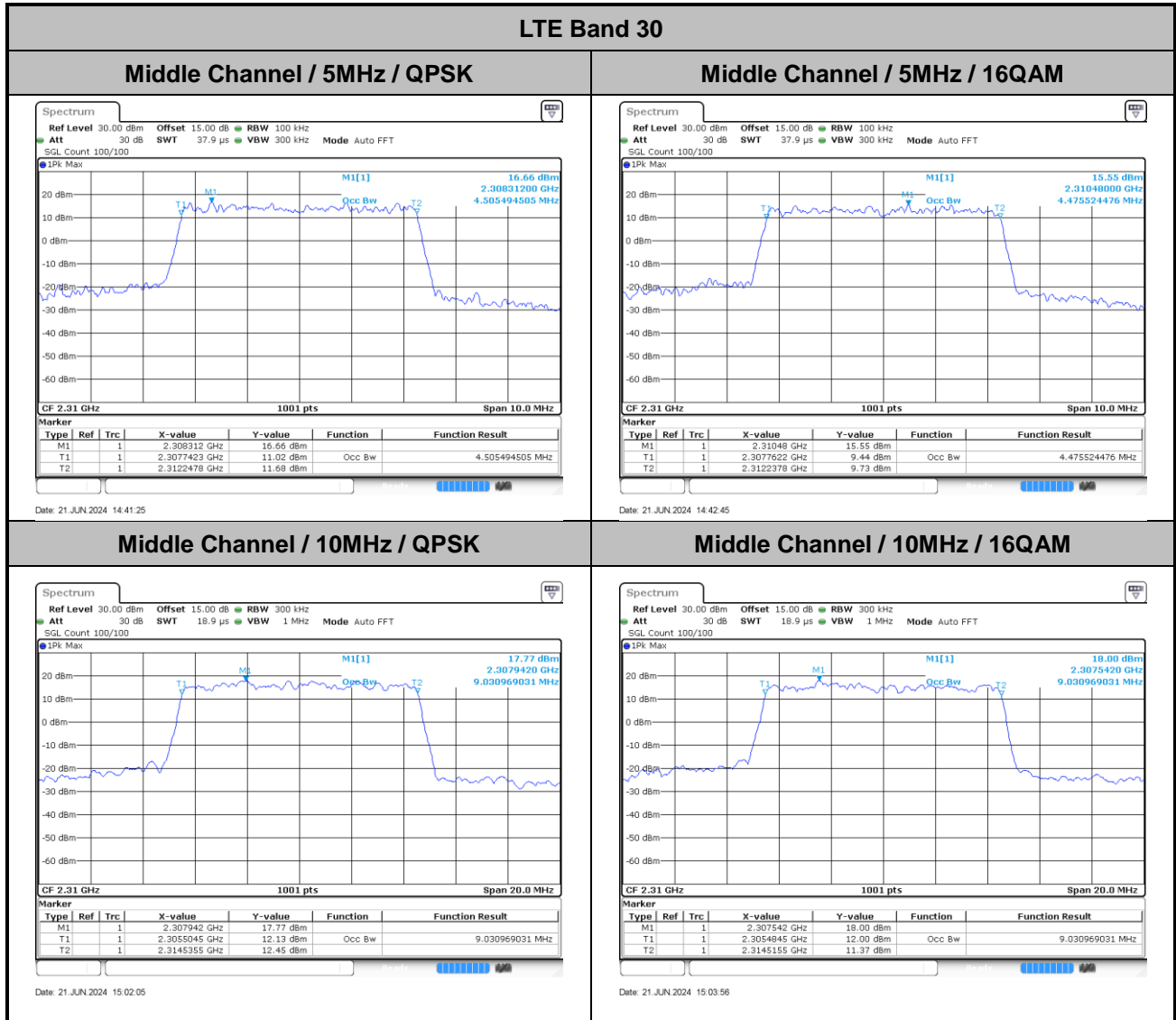
Mode	LTE Band 30 : 26dB BW(MHz)			
BW	5MHz		10MHz	
Mod.	QPSK	16QAM	QPSK	16QAM
Middle CH	4.95	4.87	9.99	9.87





## Occupied Bandwidth

Mode	LTE Band 30 : 99%OBW(MHz)			
BW	5MHz		10MHz	
Mod.	QPSK	16QAM	QPSK	16QAM
Middle CH	4.51	4.48	9.03	9.03

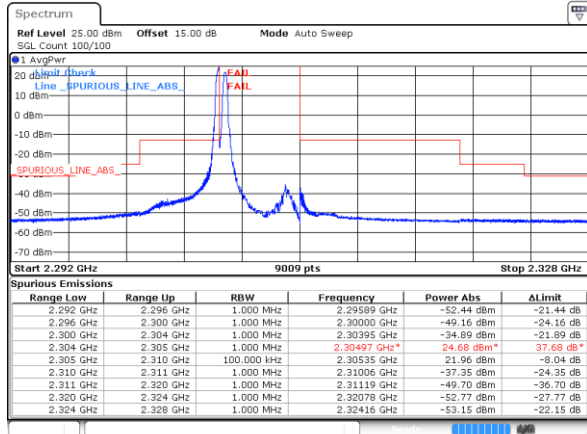




# Conducted Band Edge

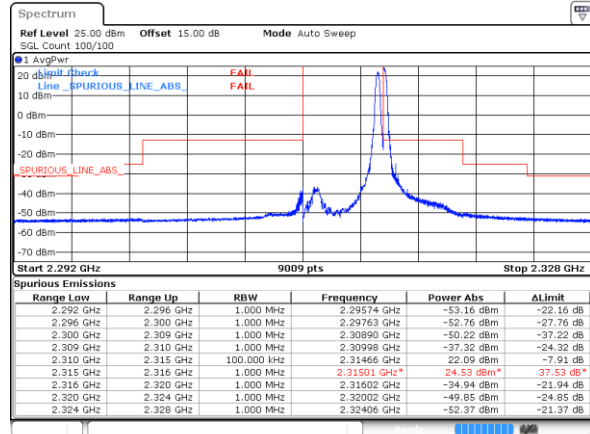
## LTE Band 30 / 5MHz / QPSK

### Lowest Band Edge / 1 RB



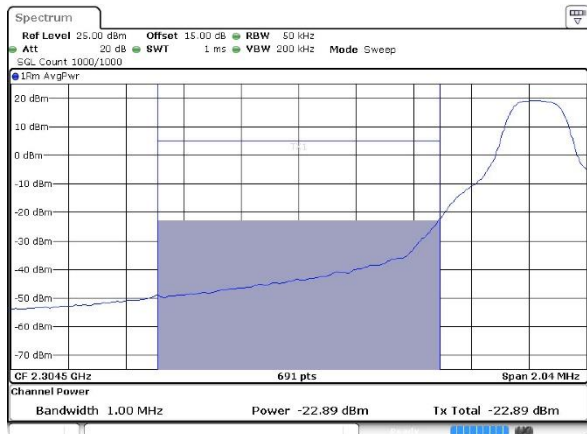
Date: 21 JUN 2024 14:03:21

### Highest Band Edge / 1 RB



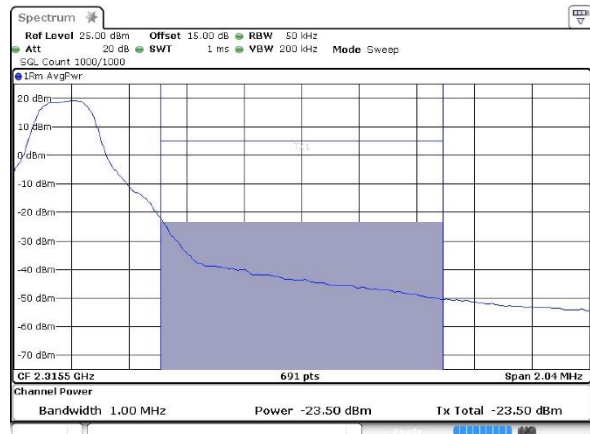
Date: 21 JUN 2024 14:51:05

### Lowest Band Edge / 1 RB / Lower zoom in



Date: 21 JUN 2024 14:03:37

### Highest Band Edge / 1 RB / Lower zoom in

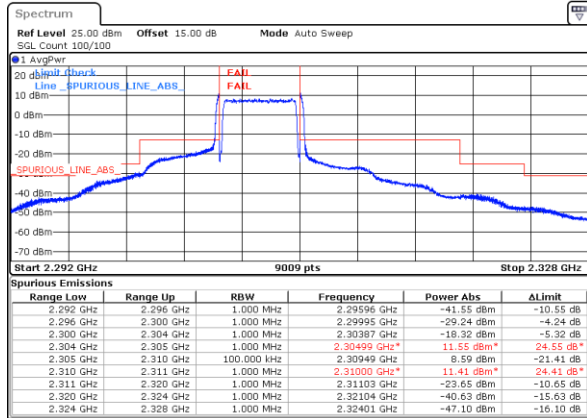


Date: 21 JUN 2024 14:51:24



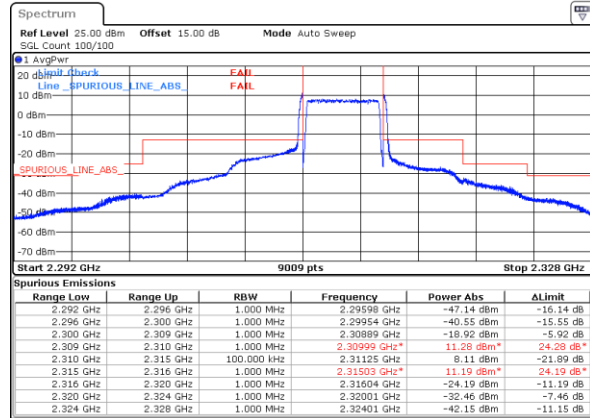
## LTE Band 30 / 5MHz / QPSK

## Lowest Band Edge / Full RB



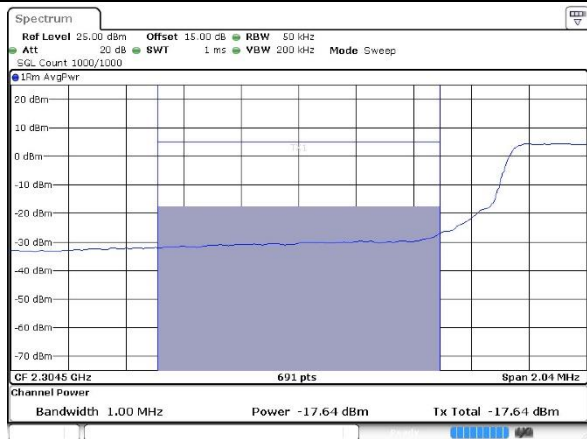
Date: 21 JUN 2024 13:53:49

## Highest Band Edge / Full RB



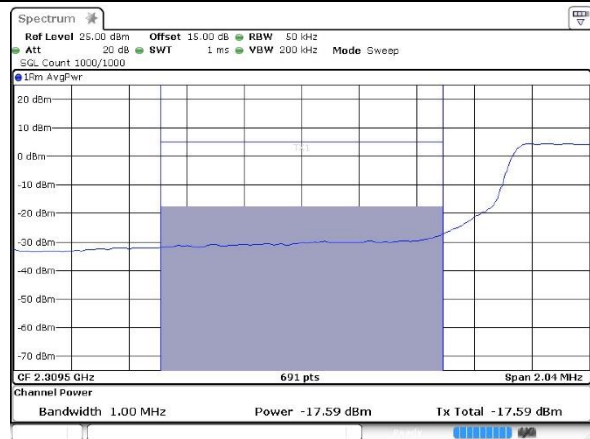
Date: 21 JUN 2024 14:45:52

## Lowest Band Edge / Full RB / Lower zoom in



Date: 21 JUN 2024 13:56:07

## Highest Band Edge / Full RB / Lower zoom in



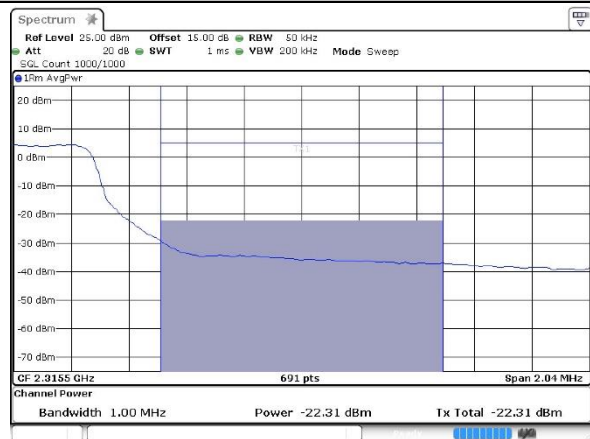
Date: 21 JUN 2024 14:46:21

## Lowest Band Edge / Full RB / Upper zoom in



Date: 21 JUN 2024 13:56:42

## Highest Band Edge / Full RB / Upper zoom in

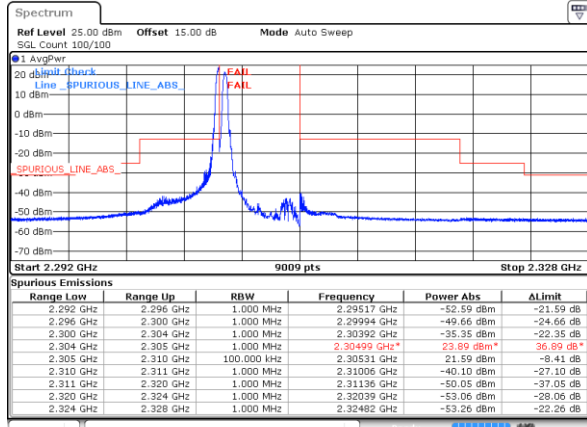


Date: 21 JUN 2024 14:46:37



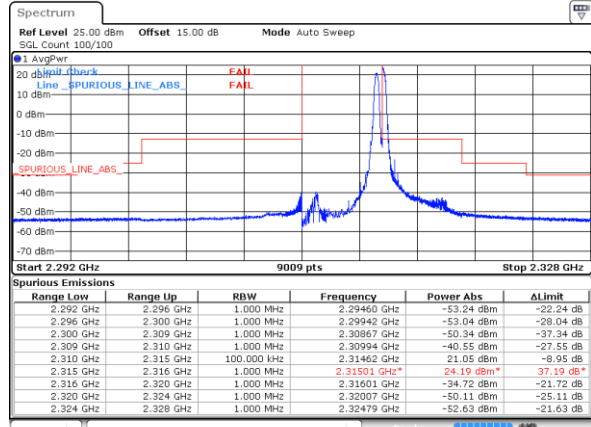
## LTE Band 30 / 5MHz / 16QAM

## Lowest Band Edge / 1 RB



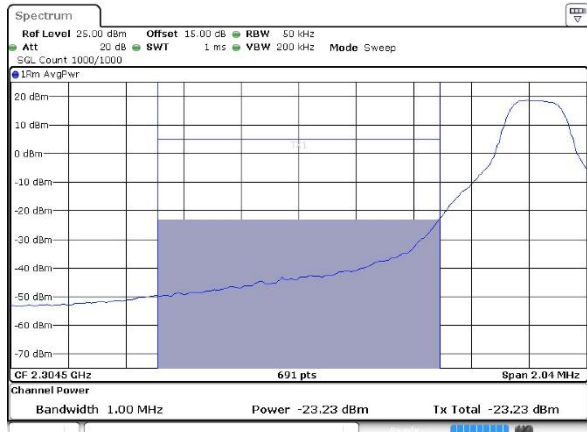
Date: 21 JUN 2024 14:02:32

## Highest Band Edge / 1 RB



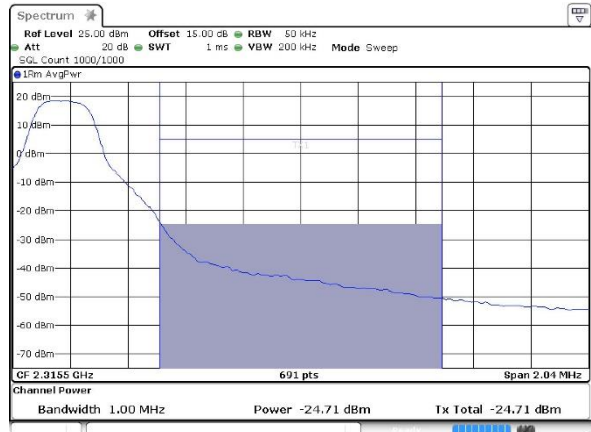
Date: 21 JUN 2024 14:50:22

## Lowest Band Edge / 1 RB / Lower zoom in



Date: 21 JUN 2024 14:02:47

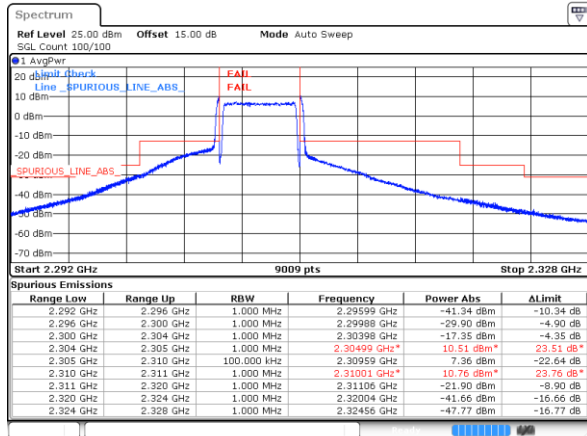
## Highest Band Edge / 1 RB / Lower zoom in



Date: 21 JUN 2024 14:50:37

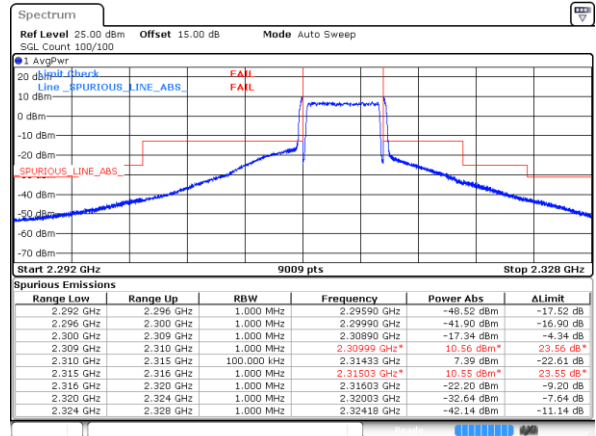
## LTE Band 30 / 5MHz / 16QAM

### Lowest Band Edge / Full RB



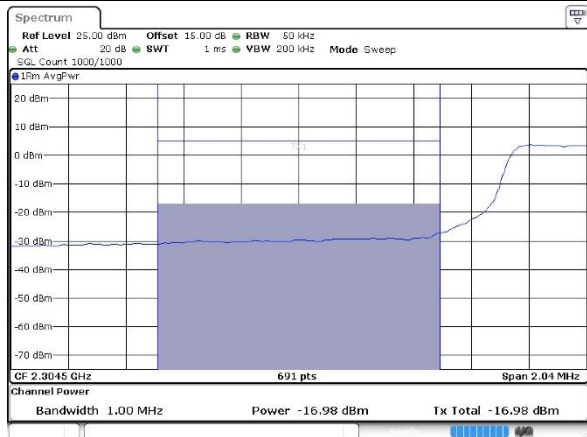
Date: 21 JUN 2024 13:57:15

### Highest Band Edge / Full RB



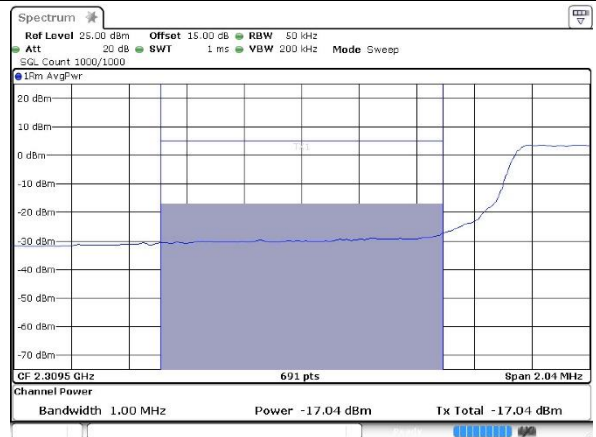
Date: 21 JUN 2024 14:43:24

### Lowest Band Edge / Full RB / Lower zoom in



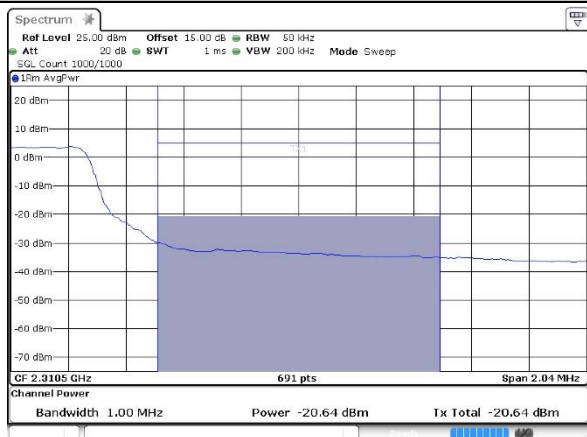
Date: 21 JUN 2024 13:58:10

### Highest Band Edge / Full RB / Lower zoom in



Date: 21 JUN 2024 14:45:01

### Lowest Band Edge / Full RB / Upper zoom in



Date: 21 JUN 2024 13:58:40

### Highest Band Edge / Full RB / Upper zoom in

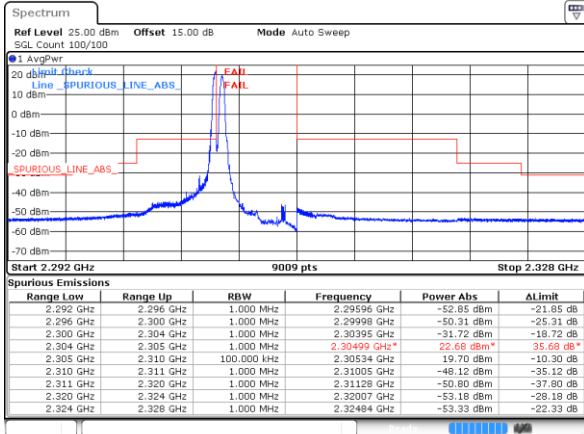


Date: 21 JUN 2024 14:45:21



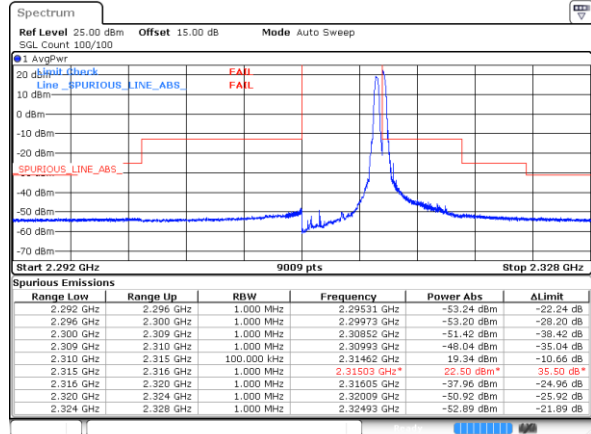
## LTE Band 30 / 5MHz / 64QAM

## Lowest Band Edge / 1 RB



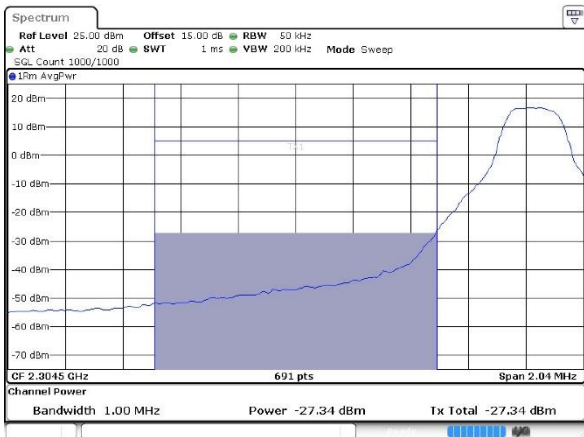
Date: 21 JUN 2024 14:01:29

## Highest Band Edge / 1 RB



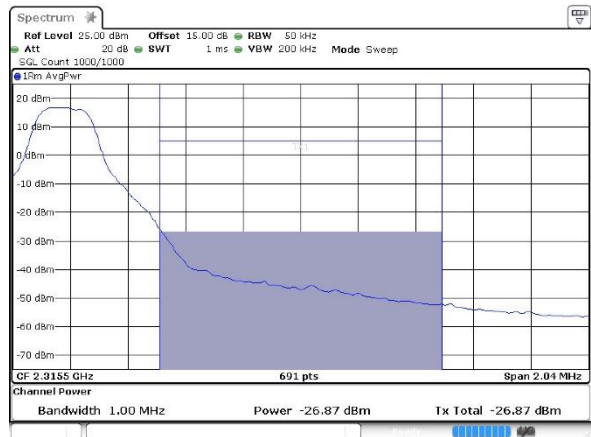
Date: 21 JUN 2024 14:49:07

## Lowest Band Edge / 1 RB / Lower zoom in



Date: 21 JUN 2024 14:02:04

## Highest Band Edge / 1 RB / Lower zoom in



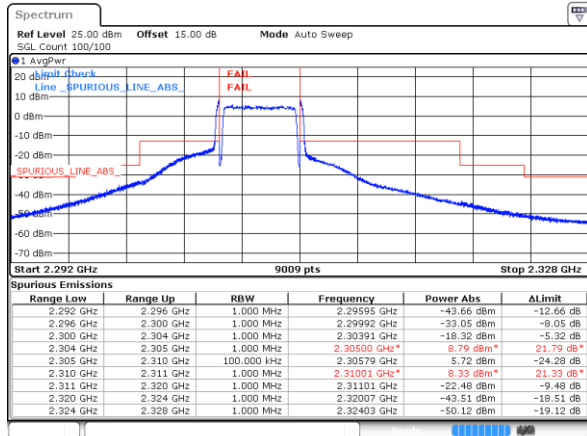
Date: 21 JUN 2024 14:49:46



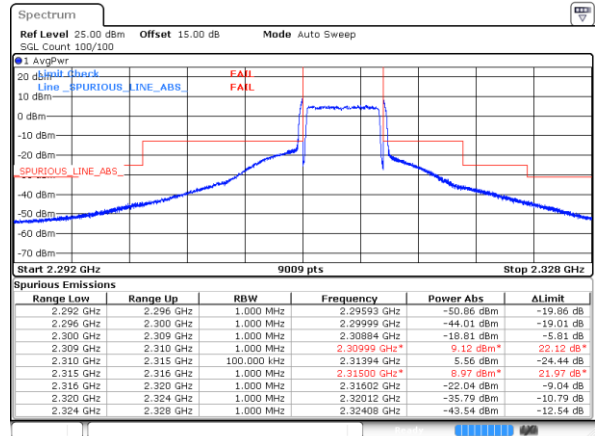


## LTE Band 30 / 5MHz / 64QAM

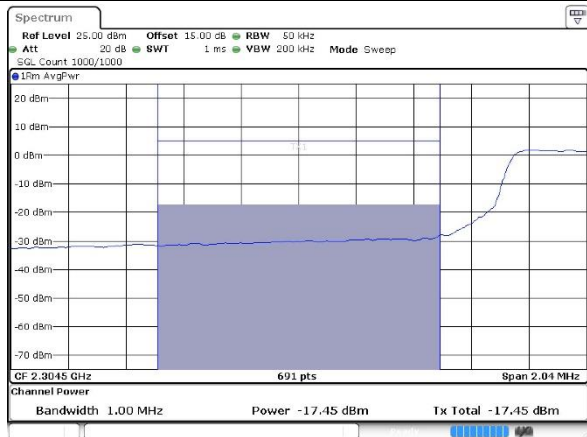
## Lowest Band Edge / Full RB



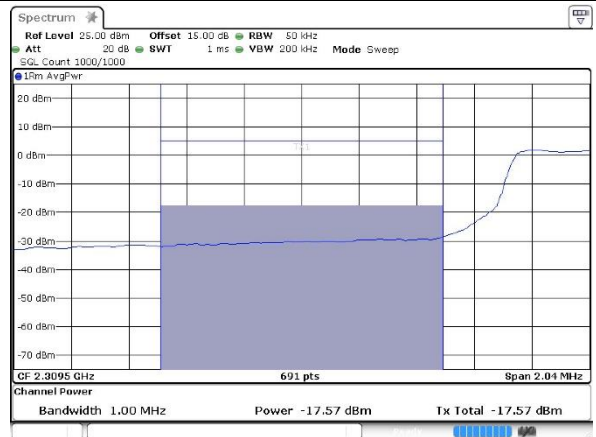
## Highest Band Edge / Full RB



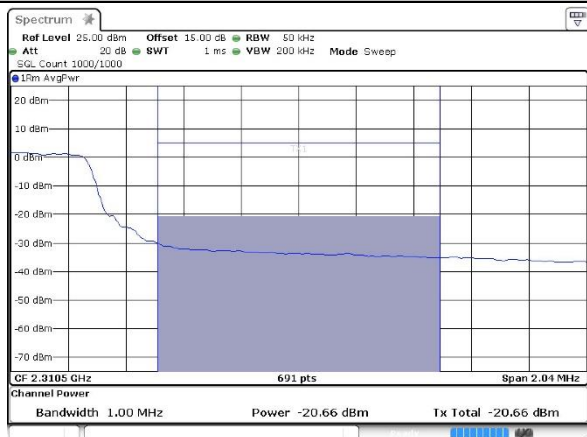
## Lowest Band Edge / Full RB / Lower zoom in



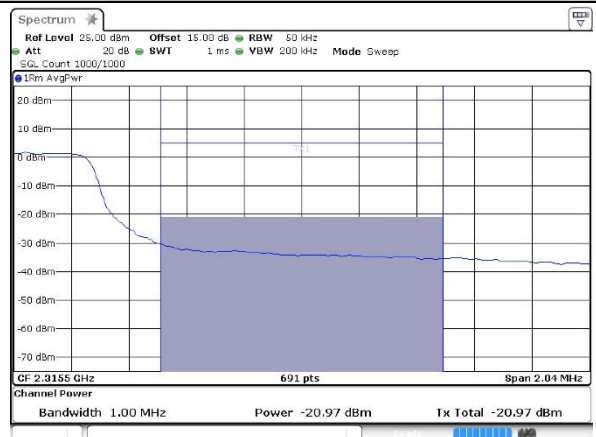
## Highest Band Edge / Full RB / Lower zoom in



## Lowest Band Edge / Full RB / Upper zoom in



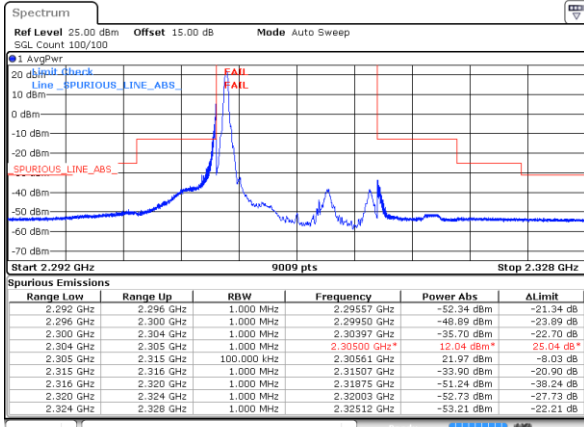
## Highest Band Edge / Full RB / Upper zoom in





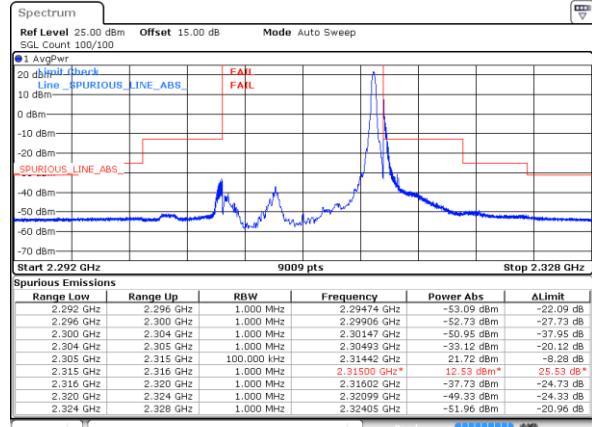
## LTE Band 30 / 10MHz / QPSK

## Lowest Band Edge / 1 RB



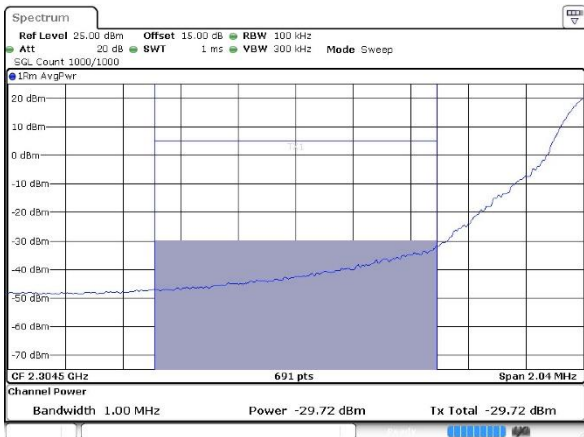
Date: 21 JUN 2024 15:05:18

## Highest Band Edge / 1 RB



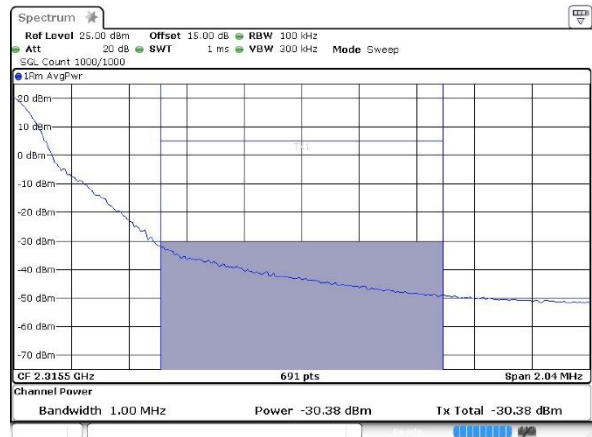
Date: 21 JUN 2024 14:53:56

## Lowest Band Edge / 1 RB / Lower zoom in



Date: 21 JUN 2024 15:06:06

## Highest Band Edge / 1 RB / Lower zoom in

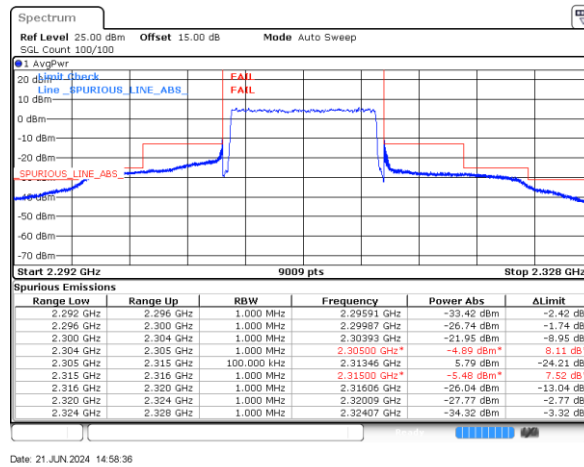


Date: 21 JUN 2024 14:54:27

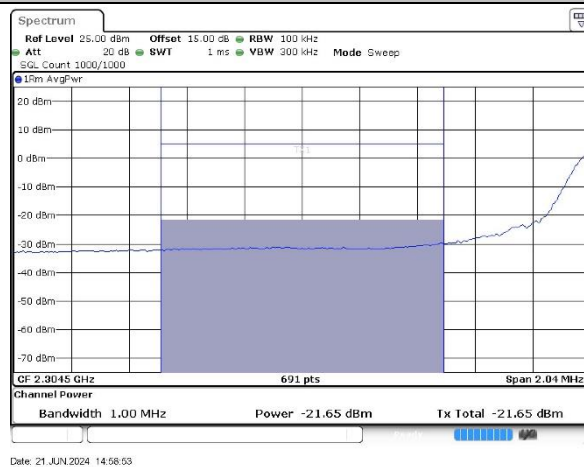


## LTE Band 30 / 10MHz / QPSK

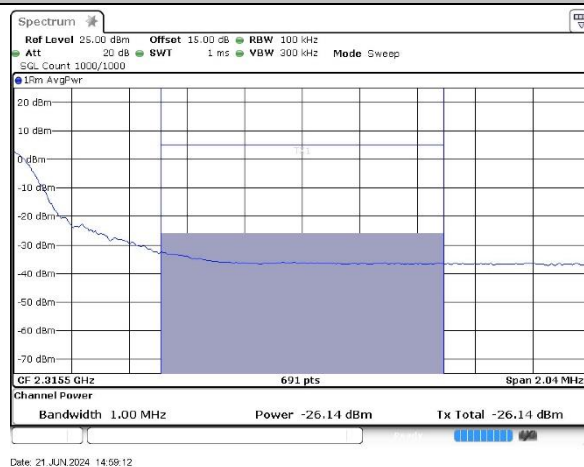
## Lowest Band Edge / Full RB



## Lowest Band Edge / Full RB / Lower zoom in



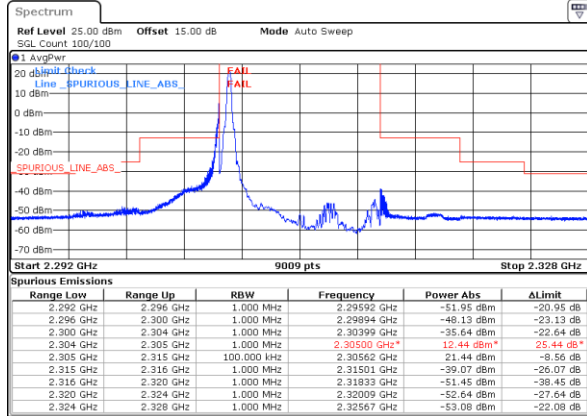
## Lowest Band Edge / Full RB / Upper zoom in





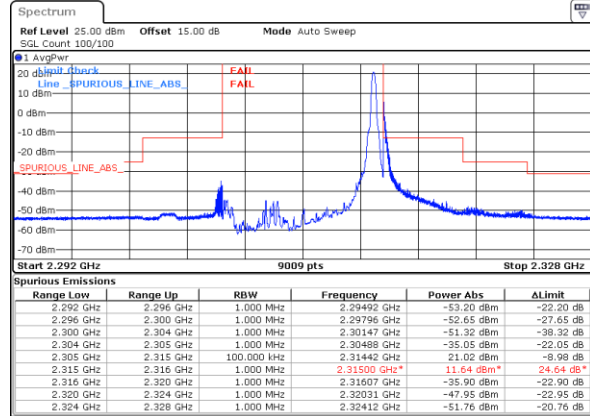
## LTE Band 30 / 10MHz / 16QAM

## Lowest Band Edge / 1 RB



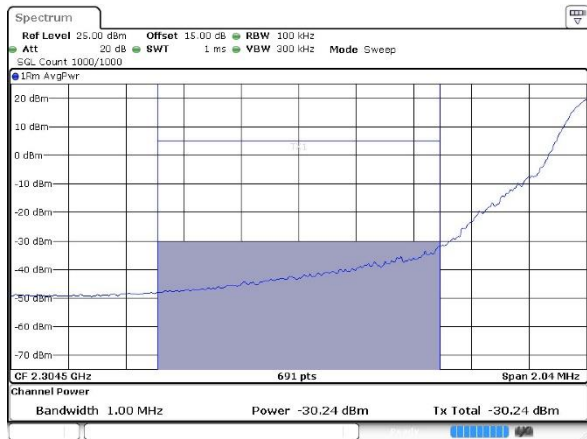
Date: 21 JUN 2024 15:06:49

## Highest Band Edge / 1 RB



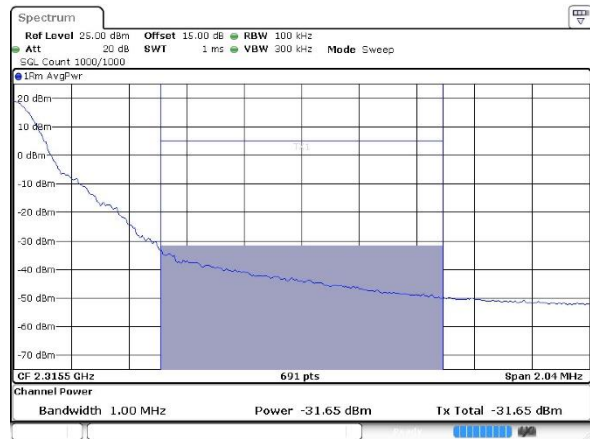
Date: 21 JUN 2024 14:54:55

## Lowest Band Edge / 1 RB / Lower zoom in



Date: 21 JUN 2024 15:07:19

## Highest Band Edge / 1 RB / Lower zoom in

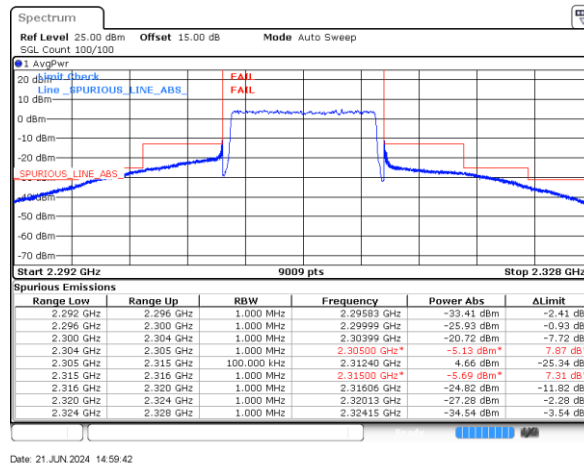


Date: 21 JUN 2024 14:55:15



LTE Band 30 / 10MHz / 16QAM

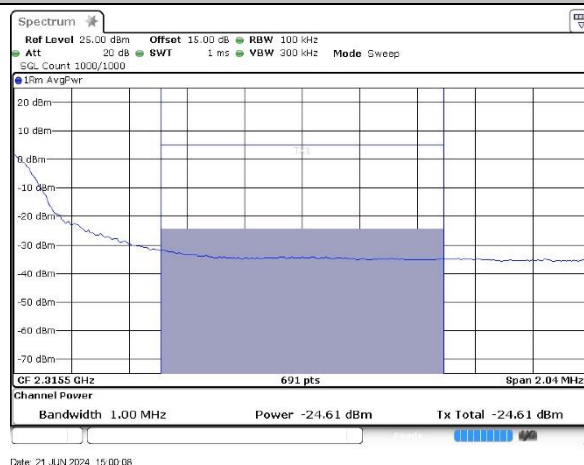
Lowest Band Edge / Full RB



Lowest Band Edge / Full RB / Lower zoom in



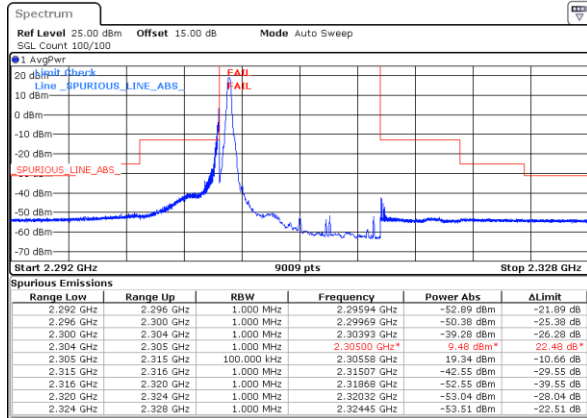
Lowest Band Edge / Full RB / Upper zoom in





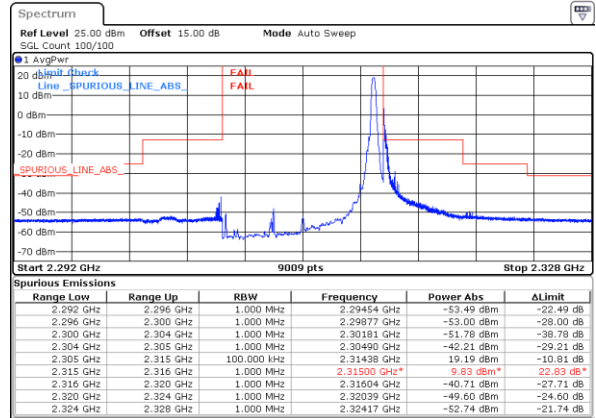
## LTE Band 30 / 10MHz / 64QAM

## Lowest Band Edge / 1 RB



Date: 21 JUN 2024 15:08:06

## Highest Band Edge / 1 RB



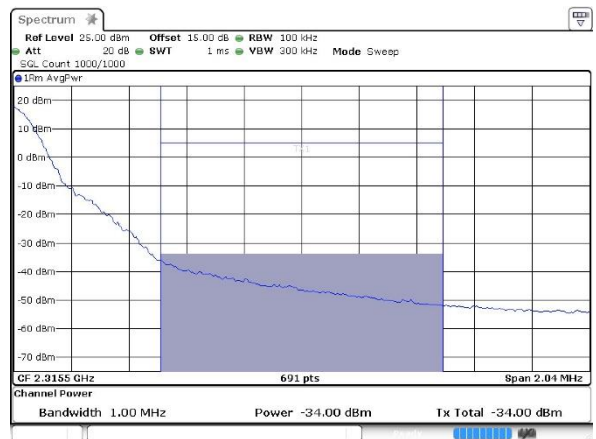
Date: 21 JUN 2024 14:55:43

## Lowest Band Edge / 1 RB / Lower zoom in



Date: 21 JUN 2024 15:08:21

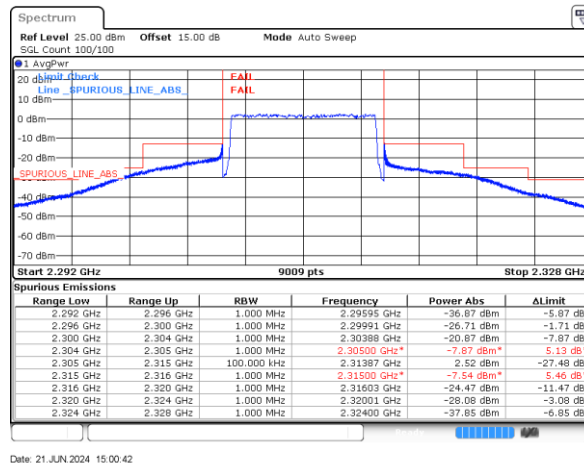
## Highest Band Edge / 1 RB / Lower zoom in



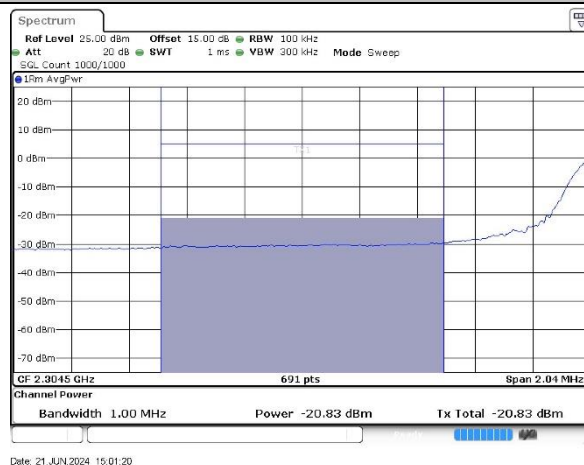
Date: 21 JUN 2024 14:57:50

LTE Band 30 / 10MHz / 64QAM

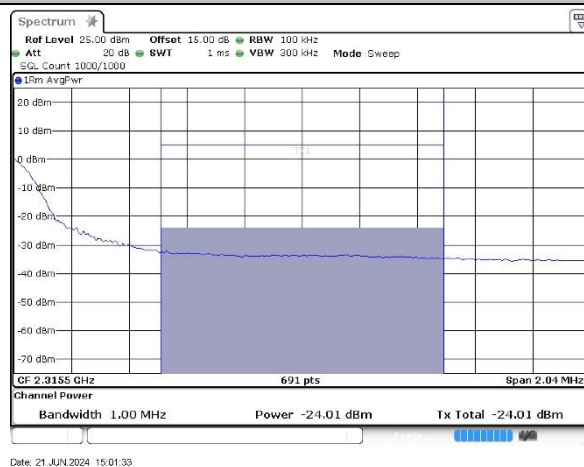
Lowest Band Edge / Full RB



Lowest Band Edge / Full RB / Lower zoom in



Lowest Band Edge / Full RB / Upper zoom in

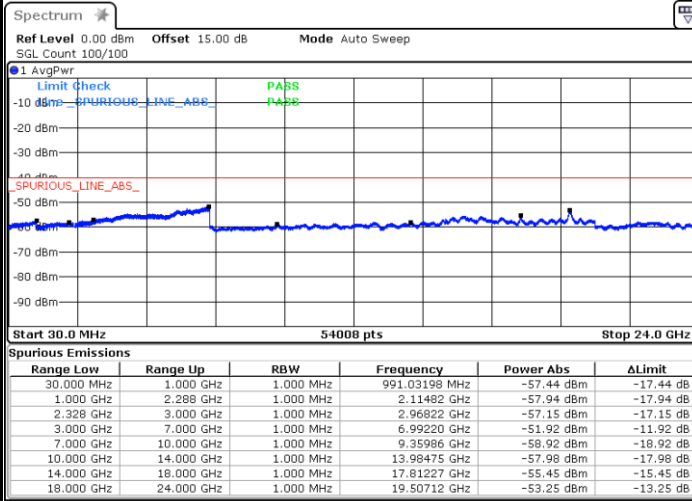




# Conducted Spurious Emission

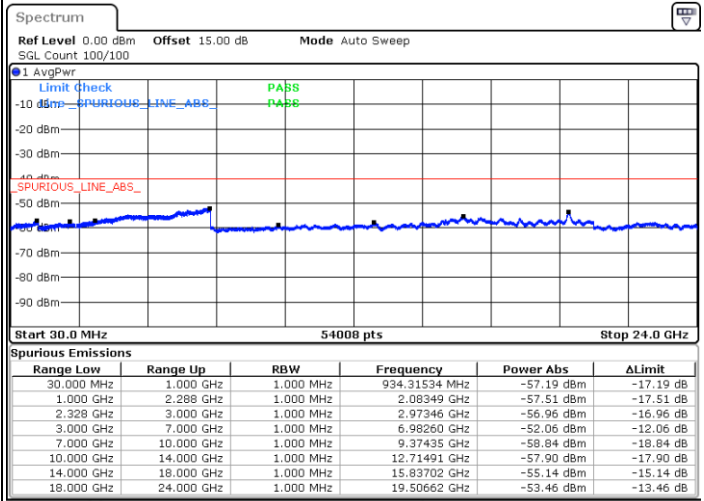
## LTE Band 30 / 5MHz

### Lowest Channel / QPSK



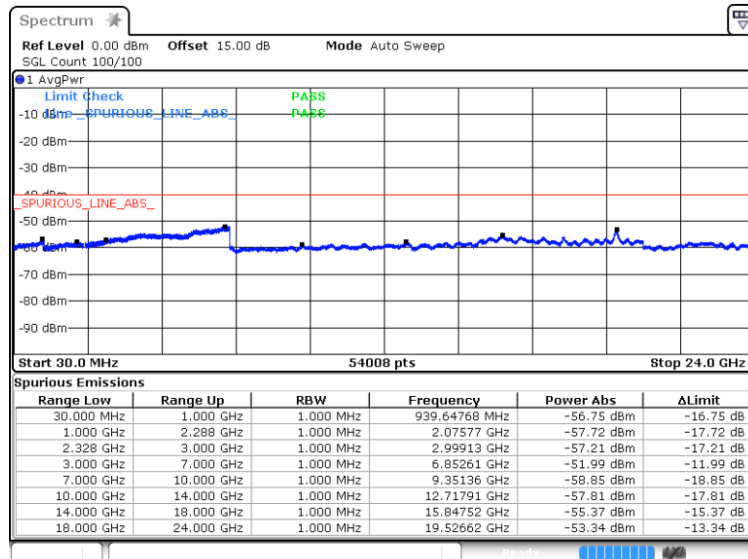
Date: 21 JUN 2024 14:12:46

### Middle Channel / QPSK



Date: 21 JUN 2024 14:29:52

### Highest Channel / QPSK



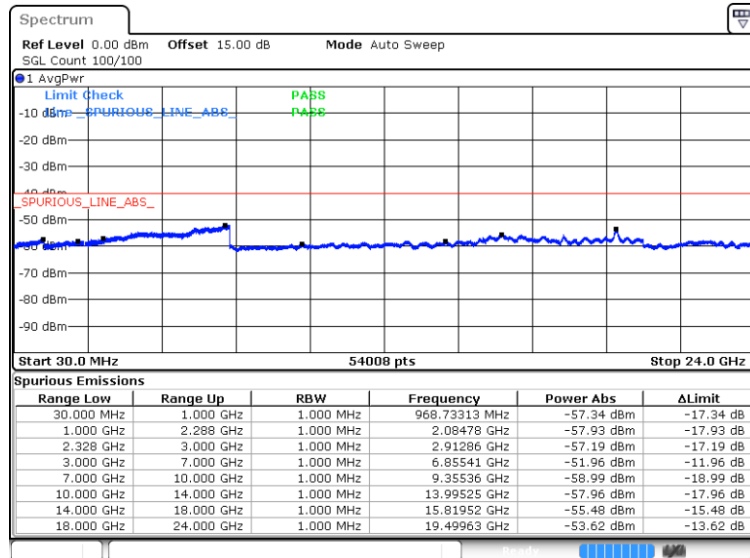
Date: 21 JUN 2024 14:34:51





LTE Band 30 / 10MHz

Middle Channel / QPSK



Date: 21 JUN 2024 14:37:27

## Frequency Stability

Test Conditions		LTE Band 30 (QPSK) / Middle Channel	Limit
Temperature (°C)	Voltage (Volt)	BW 10MHz	Note 2.
		Deviation (ppm)	Result
50	Normal Voltage	0.0001	PASS
40	Normal Voltage	0.0001	
30	Normal Voltage	0.0000	
20(Ref.)	Normal Voltage	0.0000	
10	Normal Voltage	0.0007	
0	Normal Voltage	0.0006	
-10	Normal Voltage	0.0003	
-20	Normal Voltage	0.0001	
-30	Normal Voltage	0.0003	
20	Maximum Voltage	0.0001	
20	Normal Voltage	0.0000	
20	Battery End Point	0.0004	

**Note:**

1. Normal Voltage = 3.85 V. ; Battery End Point (BEP) = 3.5 V. ; Maximum Voltage = 4.41 V.
2. The frequency fundamental emissions stay within the authorized frequency block.

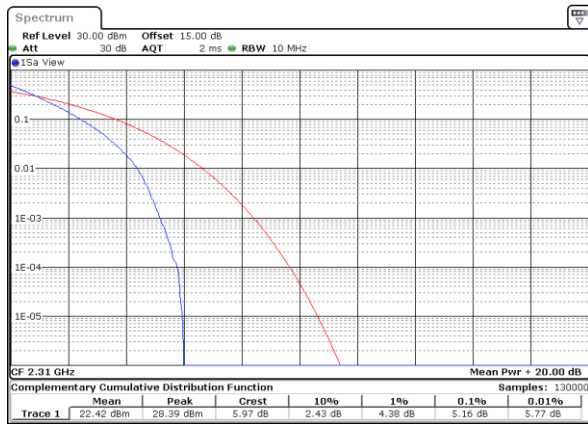
## LTE Band 30 for Other PA

### Peak-to-Average Ratio

Mode	LTE Band 30 / 10MHz			
Mod.	QPSK	16QAM	64QAM	Limit: 13dB
RB Size	Full RB	Full RB	Full RB	Result
Middle CH	5.16	6.03	6.87	PASS

## LTE Band 30 / 10MHz / QPSK

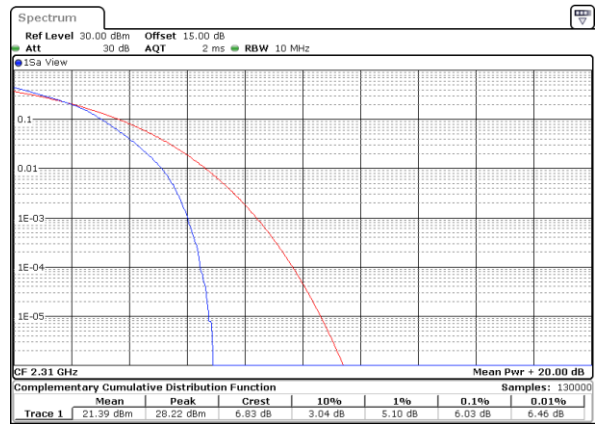
### Middle Channel / Full RB



Date: 10.JUL.2024 08:56:01

## LTE Band 30 / 10MHz / 16QAM

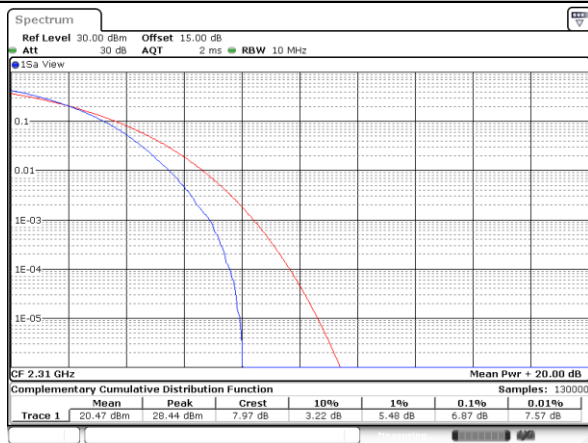
### Middle Channel / Full RB



Date: 10.JUL.2024 08:55:27

## LTE Band 30 / 10MHz / 64QAM

### Middle Channel / Full RB



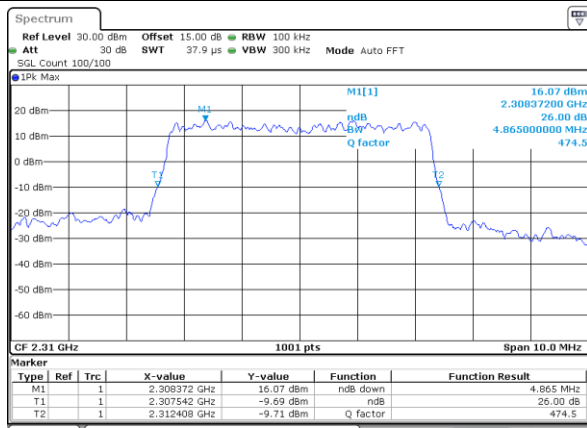
Date: 10.JUL.2024 08:54:40

## 26dB Bandwidth

Mode	LTE Band 30 : 26dB BW(MHz)											
BW	1.4MHz		3MHz		5MHz		10MHz		15MHz		20MHz	
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Middle CH	-	-	-	-	4.87	4.88	9.67	9.71	-	-	-	-

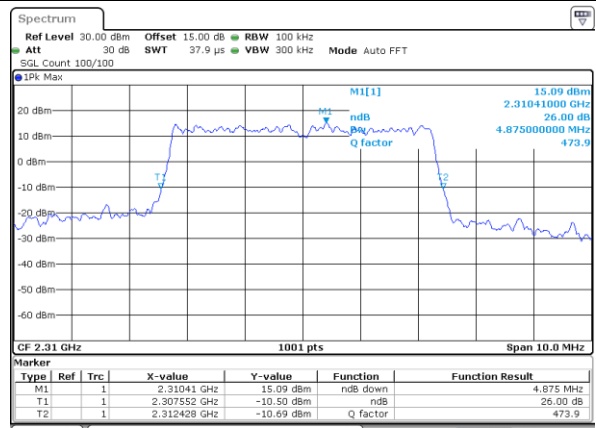
## LTE Band 30

## Middle Channel / 5MHz / QPSK



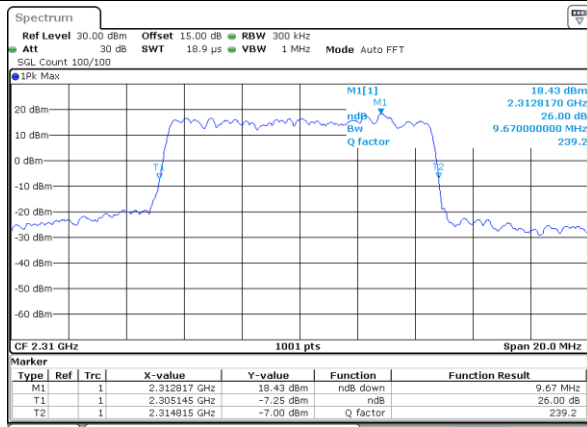
Date: 10 JUL 2024 10:23:13

## Middle Channel / 5MHz / 16QAM



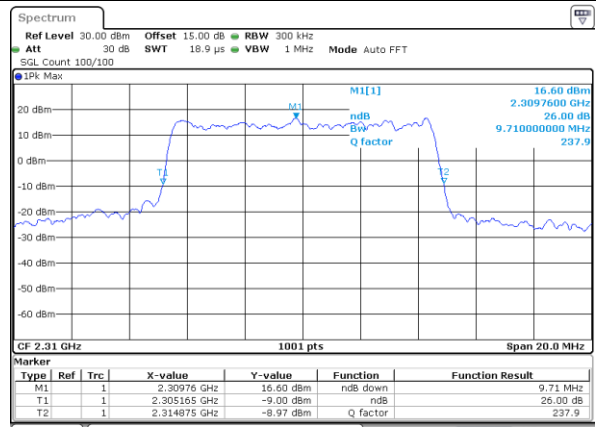
Date: 10 JUL 2024 10:23:41

## Middle Channel / 10MHz / QPSK



Date: 10 JUL 2024 10:30:24

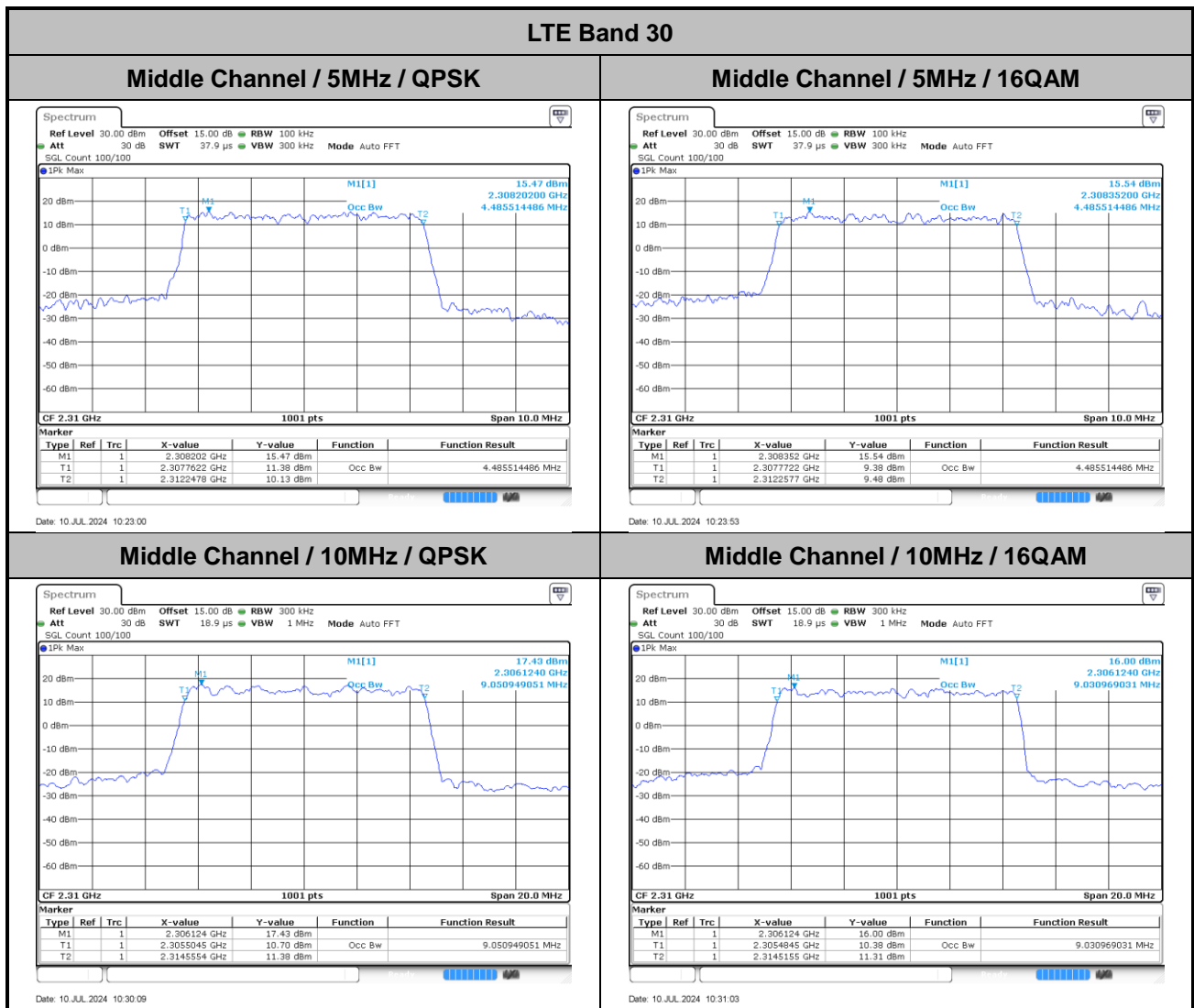
## Middle Channel / 10MHz / 16QAM



Date: 10 JUL 2024 10:30:49

## Occupied Bandwidth

Mode	LTE Band 30 : 99%OBW(MHz)											
BW	1.4MHz		3MHz		5MHz		10MHz		15MHz		20MHz	
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Middle CH	-	-	-	-	4.49	4.49	9.05	9.03	-	-	-	-

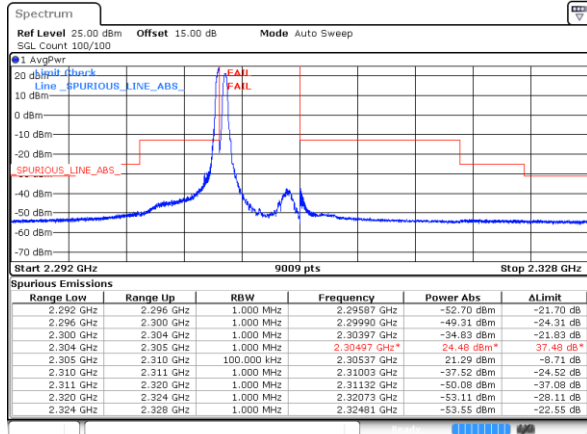




# Conducted Band Edge

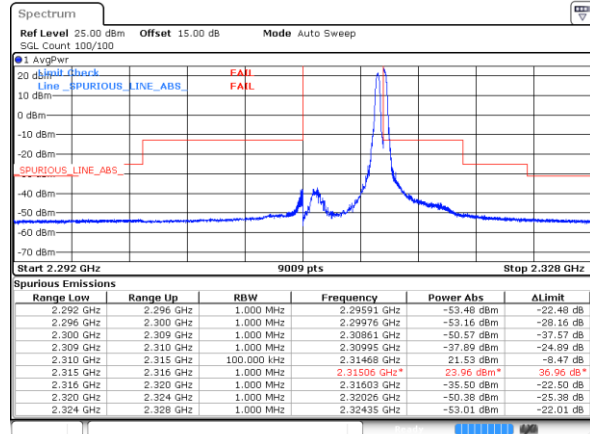
## LTE Band 30 / 5MHz / QPSK

### Lowest Band Edge / 1 RB



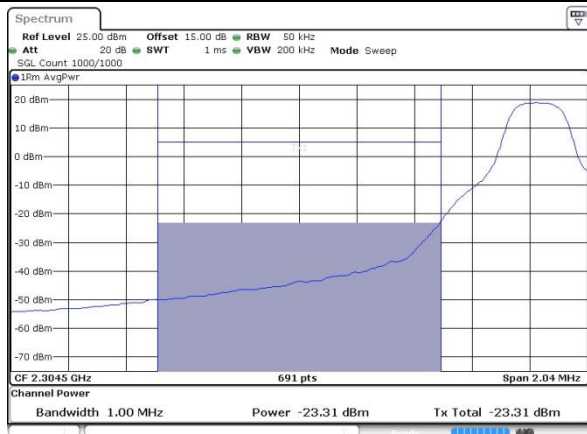
Date: 10 JUL 2024 09:58:15

### Highest Band Edge / 1 RB



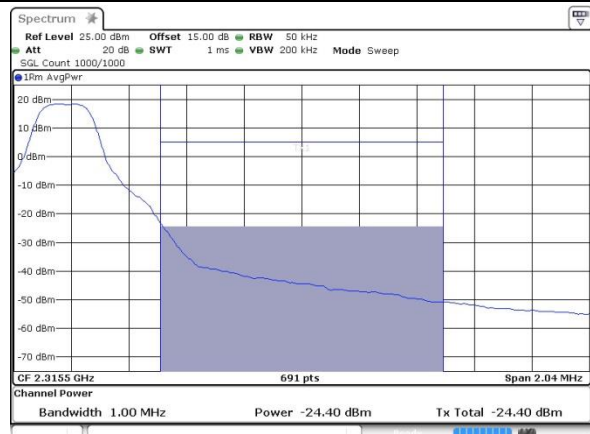
Date: 10 JUL 2024 10:16:37

### Lowest Band Edge / 1 RB / Lower zoom in



Date: 10 JUL 2024 09:58:53

### Highest Band Edge / 1 RB / Lower zoom in



Date: 10 JUL 2024 10:17:07