

## PCTEST

7185 Oakland Mills Road, Columbia, MD 21046 USA Tel. 410.290.6652 / Fax 410.290.6654 http://www.pctest.com

# PART 27 MEASUREMENT REPORT

#### **Applicant Name:**

Tecore Networks 7030 Hi Tech Drive Hanover, MD 21076 USA

#### Date of Testing:

06/23 – 10/21/2021 Test Site/Location: PCTEST Lab. Columbia, MD, USA Test Report Serial No.: 1M2106040064-03.QLJ

## FCC ID:

## QLJMRU-19212326 Tecore Networks

Application Type: Model: EUT Type: FCC Classification: FCC Rule Part: Test Procedure(s):

Applicant Name:

Certification MRU-20W19212326 Mid Band mRU PCS Licensed Transmitter (PCB) 27 ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01

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 §2.947. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Randy Ortanez President



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				Conducto	ed Power	
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	Max. Power [W]	Max. Power [dBm]	Emission Designator
	10 MHz	QPSK	2355.0	6.855	38.36	9M04G7D
LTE Band 30		16QAM	2355.0	6.622	38.21	9M01W7D
LTE Datiu 30	5 MHz	QPSK	2352.5 - 2357.5	21.727	43.37	4M50G7D
		16QAM	2352.5 - 2357.5	21.577	43.34	4M50W7D
	20 MHz	QPSK	2506.0 - 2680.0	20.893	43.20	18M0G7D
		16QAM	2506.0 - 2680.0	20.654	43.15	18M1W7D
		QPSK	2503.5 - 2682.5	21.038	43.23	13M5G7D
LTE Band 41	15 MHz	16QAM	2503.5 - 2682.5	21.281	43.28	13M5W7D
LIE Danu 41	10 MHz	QPSK	2501.0 - 2685.0	21.727	43.37	9M04G7D
		16QAM	2501.0 - 2685.0	21.429	43.31	9M01W7D
	5 MHz	QPSK	2498.5 - 2687.5	21.878	43.40	4M51G7D
		16QAM	2498.5 - 2687.5	21.577	43.34	4M50W7D

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## **1.0 INTRODUCTION**

## 1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.

## 1.2 PCTEST Test Location

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

#### 1.3 Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21046, U.S.A.

- PCTEST is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).
- PCTEST facility is a registered (2451B) test laboratory with the site description on file with ISED.

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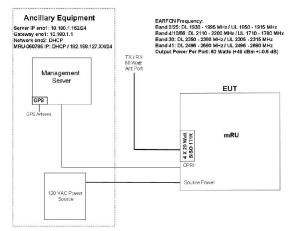


## 2.0 PRODUCT INFORMATION

## 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Tecore Mid Band mRU FCC ID:QLJMRU-19212326**. The test data contained in this report pertains only to the emissions due to the EUT's licensed transmitters that operate under the provisions of Part 27. The EUT generates LTE signal using QPSK, 16-QAM, 64-QAM, and 256-QAM modulations. The EUT can transmit three different LTE mid band signals at the same time with its single antenna port. The signal output level is set to 20W output per band for a total of 60W output from the antenna port and it is fed via a low loss cable to the input of a spectrum analyzer or a 50 $\Omega$  load, depending on the type of testing performed. EUT was set up to operate as shown below with a 120 VAC power source. Server equipment was used to control the RF functions of the EUT.

Test Device Serial No.: 20270009, 20270007 Software Revision: mRU 8.0 Firmware: MRAN\_015



## 2.2 Device Capabilities

This device contains the following capabilities:

Multi-Band LTE

## 2.3 Test Configuration

The EUT was tested per the guidance of ANSI/TIA-603-E-2016 and KDB 971168 D01 v03r01. See Section 3.4 of this test report for a description of the radiated and antenna port conducted emissions tests.

## 2.4 EMI Suppression Device(s)/Modifications

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

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## 3.0 DESCRIPTION OF TESTS

### 3.1 Evaluation Procedure

The measurement procedures described in the "Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards" (ANSI/TIA-603-E-2016) and "Measurement Guidance for Certification of Licensed Digital Transmitters" (KDB 971168 D01 v03r01) were used in the measurement of the EUT.

Deviation from Measurement Procedure.....None

### 3.2 WCS – Mobile/Base Frequency Blocks

The following frequencies are available for WCS in the 2305-2320 MHz and 2345-2360 MHz bands:

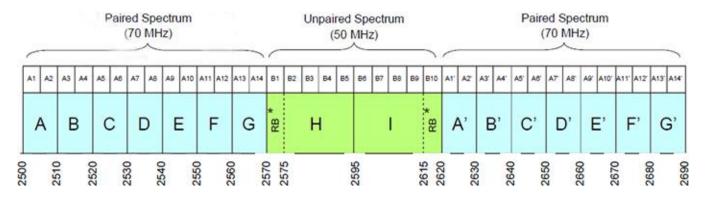
BLOCK 1: 2305-2310 and 2350-2355 MHz (A)

BLOCK 2: 2310-2315 and 2355-2360 MHz (B)

BLOCK 3: 2315-2320 MHz (C)

BLOCK 4: 2345-2350 MHz (D)

## 3.3 BRS/EBS Frequency Block



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## 3.4 Radiated Power and Radiated Spurious Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. For measurements below 1GHz, the absorbers are removed. A raised turntable is used for radiated measurement. The turn table is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm tall test table made of Styrodur is placed on top of the turn table. A Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

The equipment under test was transmitting while connected to its integral antenna and is placed on a turntable 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer.

For radiated power measurements, substitution method is used per the guidance of ANSI/TIA-603-E-2016. A halfwave dipole is substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

#### $P_{d [dBm]} = P_{g [dBm]} - cable loss [dB] + antenna gain [dBd/dBi];$

where  $P_d$  is the dipole equivalent power,  $P_g$  is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to  $P_{g [dBm]}$  – cable loss [dB].

For radiated spurious emissions measurements and calculations, conversion method is used per the formulas in KDB 971168 Section 5.8.4. Field Strength (EIRP) is calculated using the following formulas:

 $E_{[dB\mu V/m]} =$  Measured amplitude level<sub>[dBm]</sub> + 107 + Cable Loss<sub>[dB]</sub> + Antenna Factor<sub>[dB/m]</sub> And EIRP<sub>fdBm]</sub> =  $E_{[dB\mu V/m]}$  + 20logD - 104.8; where D is the measurement distance in meters.

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014. Additionally, radiated emissions below 30MHz are also validated on an Open Area Test Site to assert correlation with the chamber measurements per the requirements of KDB 414788 D01 v01r01.

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# 4.0 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 uncertainty shown below 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.

Contribution	Expanded Uncertainty (±dB)
Conducted Bench Top Measurements	1.13
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

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## 5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurement antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	AP2	EMC Cable and Switch System	3/4/2021	Annual	3/4/2022	AP2
-	ETS	EMC Cable and Switch System	3/4/2021	Annual	3/4/2022	ETS
-	LTx1	Licensed Transmitter Cable Set	3/12/2021	Annual	3/12/2022	LTx1
-	LTx2	Licensed Transmitter Cable Set	3/12/2021	Annual	3/12/2022	LTx2
Agilent	N9030A	50GHz PXA Signal Analyzer	1/20/2021	Annual	1/20/2022	US51350301
Emco	3115	Horn Antenna (1-18GHz)	6/18/2020	Biennial	6/18/2022	9704-5182
Espec	ESX-2CA	Environmental Chamber	8/27/2020	Annual	8/27/2022	17620
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	3/12/2020	Biennial	3/12/2022	128337
Keysight Technologies	N9030B	PXA Signal Analyzer, Multi-touch	11/17/2020	Annual	11/17/2021	MY57141001
Rohde & Schwarz	ESW44	EMI Test Receiver 2Hz to 44 GHz	1/21/2021	Annual	1/21/2022	101716
Sunol	JB6	LB6 Antenna	11/13/2020	Biennial	11/13/2022	A082816

Table 5-1. Test Equipment

#### Notes:

For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

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# 6.0 SAMPLE CALCULATIONS

## **QPSK Modulation**

#### Emission Designator = 8M62G7D

LTE BW = 8.62 MHz G = Phase Modulation 7 = Quantized/Digital Info D = Data transmission, telemetry, telecommand

## **QAM Modulation**

#### Emission Designator = 8M45W7D

LTE BW = 8.45 MHz W = Amplitude/Angle Modulated 7 = Quantized/Digital Info D = Data transmission, telemetry, telecommand

## **Spurious Radiated Emission**

#### Example: Spurious emission at 3700.40 MHz

The receive spectrum analyzer reading at 3 meters with the EUT on the turntable was -81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of -81.0 dBm on the spectrum analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 3700.40 MHz. So 6.1 dB is added to the signal generator reading of -30.9 dBm yielding -24.80 dBm. The fundamental EIRP was 25.50 dBm so this harmonic was 25.50 dBm -(-24.80) = 50.3 dBc.

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#### TEST RESULTS 7.0

#### 7.1 Summary

Company Name:	Tecore Networks
FCC ID:	QLJMRU-19212326
FCC Classification:	PCS Licensed Transmitter (PCB)
Mode(s):	<u>LTE</u>

Mode(s)	):
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Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
	Transmitter Conducted Output Pow er / Equivalent Isotropic Radiated Pow er (LTE Band 41)	2.1046, 27.50(h)(1)(i)	< 33dBW + 10log(X/5.5MHz)	PASS	Section 7.2
<u>.</u>	Transmitter Conducted Output Pow er / Equivalent Isotropic Radiated Pow er (LTE Band 30)	2.1046, 27.50(a)(1)(i)(A)	< 2000W/5MHz and < 400W/1MHz	PASS	Section 7.3
CONDUCTED	Occupied Bandwidth	2.1049	NA	PASS	Section 7.4
DNO	Conducted Band Edge / Spurious Emissions (LTE Band 30)	2.1051, 27.53(a)(1)	Undesirable emissions must meet the limits detailed in 27.53(a)(1)	PASS	Sections 7.5, 7.6
	Conducted Band Edge / Spurious Emissions (LTE Band 41)	2.1051, 27.53(m)(2)	> 43 + 10log(P)	PASS	Sections 7.5, 7.6
	Peak-to-Average Ratio (LTE Band 30)	27.50(a)(1)(i)(B)	13dB	PASS	Section 7.7
	Frequency Stability	2.1055, 27.54	Fundamental emissions stay within authorized frequency block	PASS	Section 7.9
RADIATED	Radiated Spurious Emissions (LTE Band 30)	2.1053, 27.53(a)(1)	> 43 + 10log(P)	PASS	Section 7.8
	Radiated Spurious Emissions (LTE Band 41)	2.1053, 27.53(m)(2)	Undesirable emissions must meet the limits detailed in 27.53(m)(2)	PASS	Section 7.8

Table 7-1. Summary of Test Results

#### Notes:

- 1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
- 4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST EMC Software Tool Ver. 1.1.
- 5) For the Radiated Emissions test, the EUT was tested for case radiated spurious emissions with the antenna port terminated in 50 ohms while the EUT was set to transmit from antenna port (1 x 20W) at maximum power.

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# 7.2 Transmitter Conducted Output Power / Equivalent Isotropic Radiated Power (LTE Band 41)

### Test Overview

The EUT was set to transmit in all four available modulations of LTE mode at the maximum output power of 20W for all bands except LTE B30 operating at 10MHz bandwidth through a management server. The output terminal of the EUT was connected through a calibrated cable and 30 dB of external attenuation to a signal analyzer. The signal analyzers' "Channel Power" function was used to measure the conducted output powers in accordance with the guidance of KDB 971168 D01 v03r01.

# For Band 41, the maximum allowed EIRP is 33dBW + 10log(X/5.5MHz), where X = is the channel bandwidth.

#### Test Procedure Used

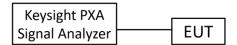
KDB 971168 D01 v03r01 - Section 5.2.2

#### Test Settings

- 1. Power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
- 2. Span = 2 3 times the OBW
- 3. RBW = 1 5% of the expected OBW
- 4. VBW  $\ge$  3 x RBW
- 5. No. of sweep points > 2 x span / RBW
- 6. Sweep time = auto-couple
- 7. Detector = RMS
- 8. Trigger is set to "free run" for signals with continuous operation.
- 9. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
- 10. Trace mode = trace averaging (RMS) over 100 sweeps
- 11. The trace was allowed to stabilize

#### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



#### Figure 7-1. Test Instrument & Measurement Setup

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None.

## LTE Band 41

Bandwidth	Modulation	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]	Ant Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
		2506.0	100 / 0	43.14	15.00	58.14	651.63	68.61	-10.47
N	QPSK	2593.0	100 / 0	43.20	15.00	58.20	660.69	68.61	-10.41
20 MHz		2680.0	100 / 0	43.04	15.00	58.04	636.80	68.61	-10.57
0	16-QAM	2593.0	100 / 0	43.15	15.00	58.15	653.13	68.61	-10.46
2	64-QAM	2593.0	100 / 0	43.14	15.00	58.14	651.63	68.61	-10.47
	256-QAM	2593.0	100 / 0	43.13	15.00	58.13	650.13	68.61	-10.48
		2503.5	75 / 0	43.18	15.00	58.18	657.66	67.36	-9.18
N	QPSK	2593.0	75 / 0	43.23	15.00	58.23	665.27	67.36	-9.13
H		2682.5	75 / 0	43.05	15.00	58.05	638.26	67.36	-9.31
15 MHz	16-QAM	2593.0	75 / 0	43.21	15.00	58.21	662.22	67.36	-9.15
~	64-QAM	2593.0	75 / 0	43.28	15.00	58.28	672.98	67.36	-9.08
	256-QAM	2593.0	75 / 0	43.23	15.00	58.23	665.27	67.36	-9.13
		2501.0	50 / 0	43.17	15.00	58.17	656.15	65.60	-7.43
N	QPSK	2593.0	50 / 0	43.37	15.00	58.37	687.07	65.60	-7.23
H		2685.0	50 / 0	43.29	15.00	58.29	674.53	65.60	-7.31
10 MHz	16-QAM	2685.0	50 / 0	43.32	15.00	58.32	679.20	65.60	-7.28
~	64-QAM	2593.0	50 / 0	43.31	15.00	58.31	677.64	65.60	-7.29
	256-QAM	2593.0	50 / 0	43.30	15.00	58.30	676.08	65.60	-7.30
		2498.5	25 / 0	43.10	15.00	58.10	645.65	62.59	-4.49
QPSK	QPSK	2593.0	25 / 0	43.40	15.00	58.40	691.83	62.59	-4.19
5 MHz		2687.5	25 / 0	43.35	15.00	58.35	683.91	62.59	-4.24
2	16-QAM	2593.0	25 / 0	43.31	15.00	58.31	677.64	62.59	-4.28
	64-QAM	2687.5	25 / 0	43.34	15.00	58.34	682.34	62.59	-4.25
	256-QAM	2593.0	25 / 0	43.34	15.00	58.34	682.34	62.59	-4.25

 Table 7-2. Transmitter Conducted Output Power / Equivalent Isotropic Radiated Power (LTE Band 41)

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# 7.3 Transmitter Conducted Output Power / Equivalent Isotropic Radiated Power (LTE Band 30)

### Test Overview

The EUT was set to transmit in all four available modulations of LTE mode at the maximum output power of 20W for all bands except LTE B30 operating at 10MHz bandwidth through a management server. The output terminal of the EUT was connected through a calibrated cable and 30 dB of external attenuation to a signal analyzer. The signal analyzers' "Channel Power" function was used to measure the conducted output powers in accordance with the guidance of KDB 971168 D01 v03r01.

#### For Band 30, the maximum allowed EIRP is 2000W/5MHz and also 400W/MHz.

#### Test Procedure Used

KDB 971168 D01 v03r01 - Section 5.4

#### Test Settings

- 1. Span = 2 3 times the OBW
- 2. RBW = 1 MHz
- 3. VBW ≥ 3 MHz
- 4. No. of sweep points  $\geq 2 \times \text{span} / \text{RBW}$
- 5. Sweep time = auto-couple
- 6. Detector = RMS
- 7. Trace mode = trace averaging (RMS) over 100 sweeps
- 8. The trace was allowed to stabilize

#### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

Keysight PXA	
Signal Analyzer	EUT

#### Figure 7-2. Test Instrument & Measurement Setup

#### Test Notes

A full bandwidth channel measurement is used to address the 2,000W/5MHz requirement.

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Bandwidth	Modulation	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]	Ant Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
И	QPSK	2355.0	50 / 0	38.36	15.00	53.36	216.77	63.01	-9.65
MHz	16-QAM	2355.0	50 / 0	38.21	15.00	53.21	209.41	63.01	-9.80
101	64-QAM	2355.0	50 / 0	38.19	15.00	53.19	208.45	63.01	-9.82
-	256-QAM	2355.0	50 / 0	38.18	15.00	53.18	207.97	63.01	-9.83
		2352.5	25 / 0	43.01	15.00	58.01	632.41	63.01	-5.00
N	QPSK	2355.0	25 / 0	43.05	15.00	58.05	638.26	63.01	-4.96
MHz		2357.5	25 / 0	43.37	15.00	58.37	687.07	63.01	-4.64
5 Z	16-QAM	2357.5	25 / 0	43.34	15.00	58.34	682.34	63.01	-4.67
	64-QAM	2357.5	25 / 0	43.29	15.00	58.29	674.53	63.01	-4.72
	256-QAM	2357.5	25 / 0	43.31	15.00	58.31	677.64	63.01	-4.70

## LTE Band 30 – 2000W/5MHz Compliance

 Table 7-3. Transmitter Conducted Output Power / Equivalent Isotropic Radiated Power (LTE Band 30)

## LTE Band 30 – 400W/1MHz Compliance

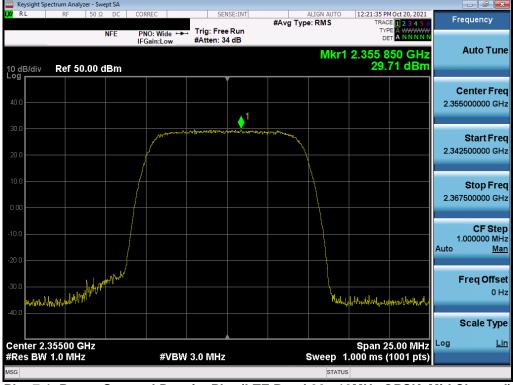
Bandwidth	Modulation	Channel	Frequency [MHz]	Conducted Power [dBm/MHz]	Ant Gain [dBi]	EIRP [dBm/MHz]	EIRP [Watts/MHz]	EIRP Limit [dBm/MHz]	Margin [dB]
N	QPSK	27710	2310.0	29.71	15.00	44.71	29.58	56.02	-11.31
MHz	16-QAM	27710	2310.0	29.75	15.00	44.75	29.85	56.02	-11.27
10 1	64-QAM	27710	2310.0	30.05	15.00	45.05	31.97	56.02	-10.97
~	256-QAM	27710	2310.0	29.59	15.00	44.59	28.77	56.02	-11.43
		27685	2307.5	37.39	15.00	52.39	173.38	56.02	-3.63
	QPSK	27710	2310.0	37.24	15.00	52.24	167.42	56.02	-3.78
MHz		27735	2312.5	37.25	15.00	52.25	167.88	56.02	-3.77
5 K	16-QAM	27710	2310.0	37.59	15.00	52.59	181.55	56.02	-3.43
	64-QAM	27710	2310.0	37.46	15.00	52.46	176.20	56.02	-3.56
	256-QAM	27710	2310.0	37.37	15.00	52.37	172.58	56.02	-3.65

Table 7-4. Conducted Output Power / Equivalent Isotropic Radiated Power (LTE Band 30) – 400W/MHz Limit

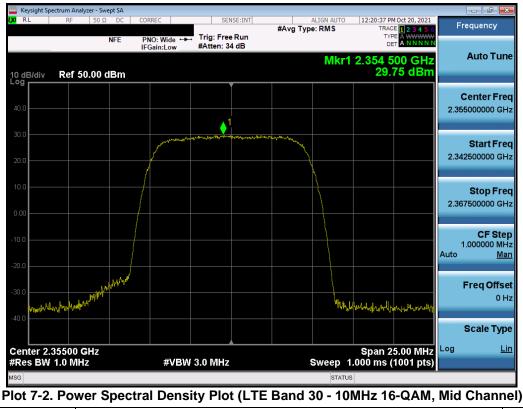
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## LTE Band 30 – 400W/1MHz Compliance

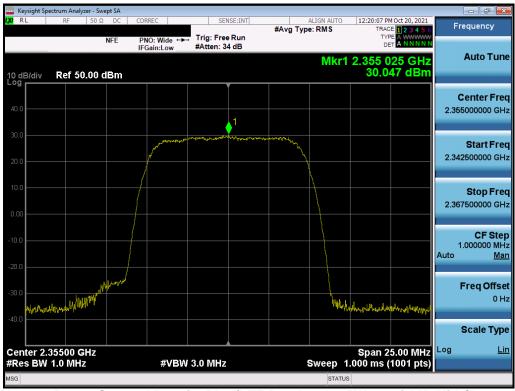


Plot 7-1. Power Spectral Density Plot (LTE Band 30 - 10MHz QPSK, Mid Channel)

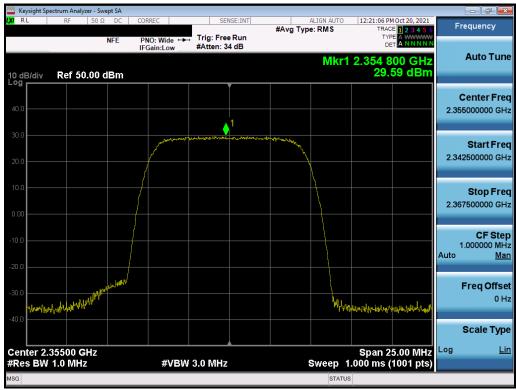


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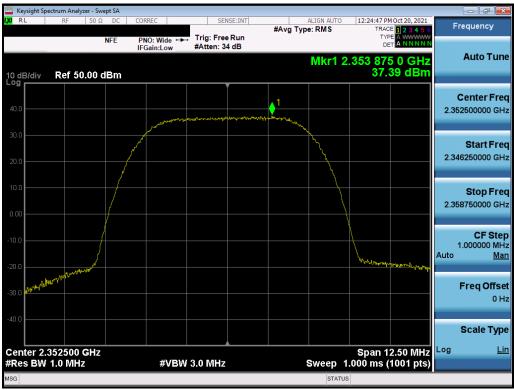
Plot 7-3. Power Spectral Density Plot (LTE Band 30 - 10MHz 64-QAM, Mid Channel)



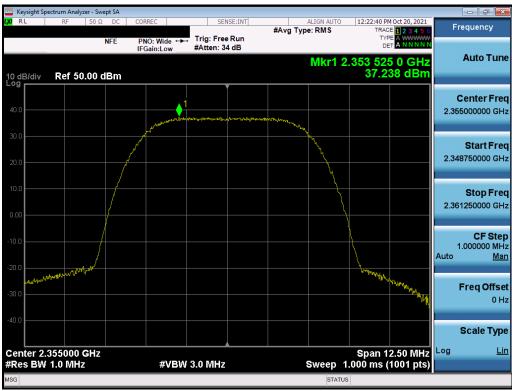
Plot 7-4. Power Spectral Density Plot (LTE Band 30 - 10MHz 256-QAM, Mid Channel)

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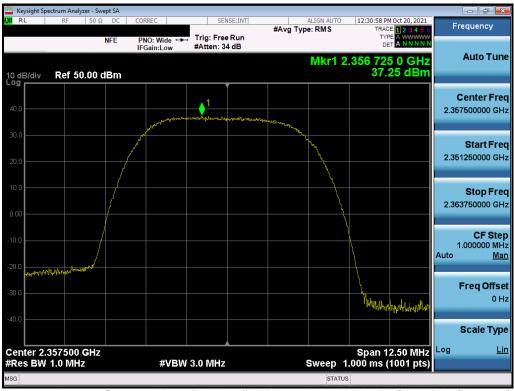




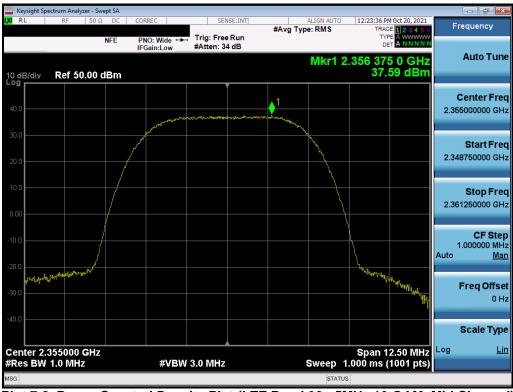
Plot 7-6. Power Spectral Density Plot (LTE Band 30 - 5MHz QPSK, Mid Channel)

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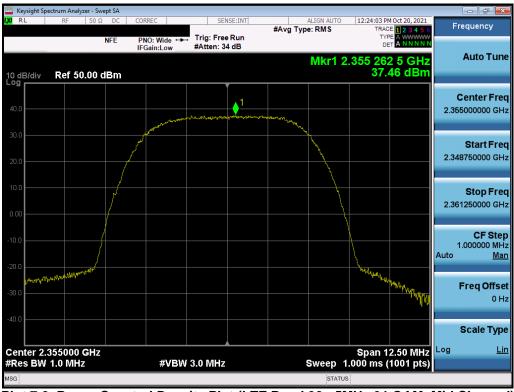
Plot 7-7. Power Spectral Density Plot (LTE Band 30 - 5MHz QPSK, High Channel)



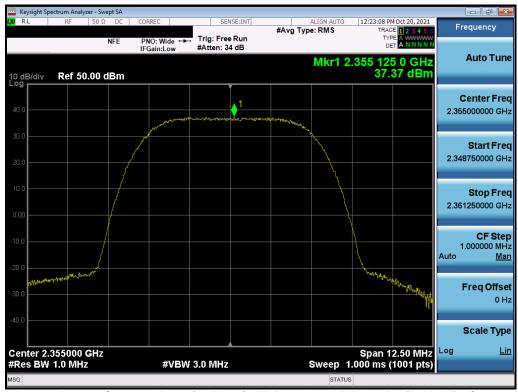
Plot 7-8. Power Spectral Density Plot (LTE Band 30 - 5MHz 16-QAM, Mid Channel)

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Plot 7-9. Power Spectral Density Plot (LTE Band 30 - 5MHz 64-QAM, Mid Channel)



Plot 7-10. Power Spectral Density Plot (LTE Band 30 - 5MHz 256-QAM, Mid Channel)

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## 7.4 Occupied Bandwidth

#### **Test Overview**

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

#### Test Procedure Used

KDB 971168 D01 v03r01 - Section 4.2

#### **Test Settings**

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

#### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



Figure 7-3. Test Instrument & Measurement Setup

#### Test Notes

None.

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Keysight Spectrum Analyzer - Occupied BW					
XIRL RF 50Ω AC	CORREC	SENSE:INT	ALIGN AUTO	12:25:26 PM Jun 30, 2021 Radio Std: None	Trace/Detector
		enter Freq: 2.593000000 0 ig: Free Run Avg	Hz Hold: 100/100	Radio Std: None	
		tten: 36 dB		Radio Device: BTS	
10 dB/div Ref 40.00 dBm		two and the second second	_		
30.0	following	ana nganaga shi kunya na	~		
					Clear Write
20.0					
10.0					
0.00					
-10.0					Averag
-20.0 shandly have the street which we	.http://		harden och m	helinkiphologia	r Č
-20.0					
-30.0					
-40.0					Max Hol
-50.0					
Center 2.59300 GHz				Span 50.00 MH:	
Res BW 470 kHz		#VBW 1.5 MHz		Sweep 1 ms	Min Hole
		<b>T</b> - ( -   <b>D</b>	50		
Occupied Bandwidt	า	Total Powe	r 52.1	l dBm	
17	.952 MHz				Detecto
					Peakl
Transmit Freq Error	6.003 kHz	% of OBW F	ower 99	9.00 %	Auto <u>Ma</u>
x dB Bandwidth	19.26 MHz	x dB	26	00 dB	
	19.20 WINZ	A UD	-20.		
ASG			STATU	s	

Plot 7-11. Occupied Bandwidth Plot (LTE Band 41 - 20MHz QPSK - Full RB)



Plot 7-12. Occupied Bandwidth Plot (LTE Band 41 - 20MHz 16-QAM - Full RB)

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Keysight Spectrum Analyze										- 6 -
R L RF	50 Ω AC	CORREC		ENSE:INT Freq: 2.59300	0000 GHz	ALIGN AUTO	12:26:55 P Radio Std	M Jun 30, 2021	Trac	e/Detector
		• #IFGain:Low	Trig: Fre #Atten: 3	ee Run	Avg Hold	d: 100/100	Radio Dev			
0 dB/div Ref 4	0.00 dBn									
og		mon	- marillane and a second	man man	and an and all a					
0.0		/								Clear Writ
0.0										
).0						}				
00										
1.0						- K.				Avera
	mentioner	MM				ment when the	mothemator	howenness		
).0										Max Ho
).0									_	
enter 2.59300 GH	17						Snan 3	7.50 MHz		_
es BW 360 kHz			#VI	BW 1.1 N	IHz			ep 1 ms		Min Ho
										WIITHO
<b>Occupied Ba</b>	Indwidt	h		Total P	ower	52.3	dBm			
	12	8.525 N	IH7							Detect
		).020 W	11 12							Peak
<b>Transmit Freq</b>	Error	-14.166	i kHz	% of O	BW Pow	er 99	.00 %		Auto	Ma
x dB Bandwid	th	14.49	MHz	x dB		-26	00 dB			
A de Bullawia		14.47		xuD		-20.				
3						STATUS	5			

Plot 7-13. Occupied Bandwidth Plot (LTE Band 41 - 15MHz QPSK - Full RB)



Plot 7-14. Occupied Bandwidth Plot (LTE Band 41 - 15MHz 16-QAM - Full RB)

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Keysight Spectrum Analyzer - Oco	·							E	- 6
<mark>0 RL RF 50 Ω</mark>	AC CORR		SENSE:INT Center Freg: 2.5930		ALIGN AUTO	12:28:53 PM Radio Std:	4 Jun 30, 2021	Trace	Detector
	#IFG		Trig: Free Run #Atten: 36 dB	Avg Hold:	100/100	Radio Std: Radio Devi			
0 dB/div <b>Ref 40.0</b>	0 dBm		antical and a fear and the second						
20.0								С	lear Writ
0.0 .00 0.0 0.0 0.0	And the state of the				<sup>โลย</sup> างไก่ใบบาง(I)	hurman m	Th		Averag
0.0 0.0 0.0									Max Ho
enter 2.59300 GHz es BW 240 kHz			#VBW 750	kHz			5.00 MHz ep 1 ms		Min Ho
Occupied Band	width		Total F	ower	52.2	dBm			
	9.037	72 MH:	Z						Detecto
Transmit Freq Err	or	4.745 kH	z % of O	BW Powe	er 99	.00 %		Auto	<u>Ma</u>
x dB Bandwidth		9.669 MH	z xdB		-26.	00 dB			
3					STATUS	5			

Plot 7-15. Occupied Bandwidth Plot (LTE Band 41 - 10MHz QPSK - Full RB)



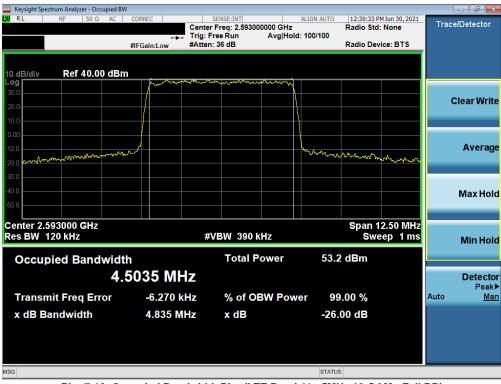
Plot 7-16. Occupied Bandwidth Plot (LTE Band 41 - 10MHz 16-QAM - Full RB)

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Keysight Spectrum Analyzer - Occupied BW								- 7 -
RL RF 50Ω AC	CORREC	SENSE:INT ter Freg: 2.5930		ALIGN AUTO	12:30:15 Pl Radio Std:	M Jun 30, 2021	Trace	/Detector
	🛶 Trig	j: Free Run ten: 36 dB	Avg Hold:	100/100	Radio Std.			
0 dB/div Ref 40.00 dBm								
•g 00.0 20.0		LANT-UND-AUCTOR					c	Clear Writ
0.00 0.00 0.0	~			hon and a second and	4 <sup>,7</sup> 4 <sub>44</sub> ,1600,artin	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		Averag
0.0								Max Ho
enter 2.593000 GHz es BW 120 kHz		#VBW 390	kHz			2.50 MHz ep 1 ms		Min Ho
Occupied Bandwidth	า	Total	Power	52.0	dBm			
	5072 MHz							Detecto
Transmit Freq Error	1.951 kHz	% of O	BW Powe	r 99	.00 %		Auto	Ma
x dB Bandwidth	4.854 MHz	x dB		-26.	00 dB			
G				STATUS	6			

Plot 7-17. Occupied Bandwidth Plot (LTE Band 41 - 5MHz QPSK - Full RB)



Plot 7-18. Occupied Bandwidth Plot (LTE Band 41 - 5MHz 16-QAM - Full RB)

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## LTE Band 30

X         RL         RF         50 Ω         AC         CORREC         SENSE:INT         ALIGN AUTO         01:15:46 PM Jun 30, 2021	
Center Fred: 2.35500000 GHz Radio Std: None	ce/Detector
#IFGain:Low #Atten: 36 dB Radio Device: BTS	
10 dB/div Ref 40.00 dBm	
Log	
	<b>Clear Write</b>
	Average
-10.0 manufacture with a transformed and the second	Average
-20.0	
40.0	
	Max Hold
Center 2.35500 GHz Span 25.00 MHz	
Res BW 240 kHz #VBW 750 kHz Sweep 1 ms	Min Hold
Occupied Bandwidth Total Power 52.2 dBm	
9.0400 MHz	Detector Peak▶
Transmit Freq Error 1.111 kHz % of OBW Power 99.00 %	Man
x dB Bandwidth 9.677 MHz x dB -26.00 dB	
MSG	

Plot 7-19. Occupied Bandwidth Plot (LTE Band 30 - 10MHz QPSK - Full RB Configuration)



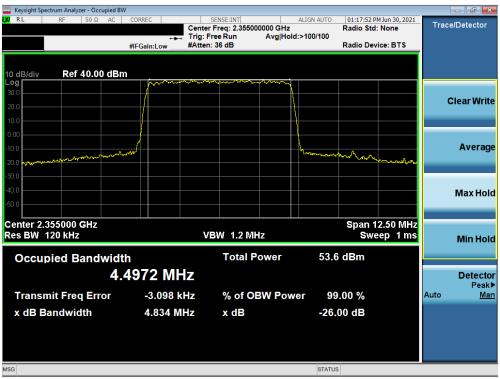
Plot 7-20. Occupied Bandwidth Plot (LTE Band 30 - 10MHz 16-QAM - Full RB Configuration)

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Keysight Spectrum Analyzer									[	- 6
RL RF 5	OΩ AC	CORREC		SENSE:INT Center Freg: 2.35	5000000 GHz	ALIGN AUTO	01:17:17 P	M Jun 30, 2021	Trace	e/Detector
		#IFGair		Trig: Free Run #Atten: 36 dB		d:>100/100	Radio Dev			
	).00 dB	m								
- <b>og</b> 30.0 20.0 10.0		_/		han an a					c	Clear Write
0.00 10.0 20.0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	m					WIN	mahar		Averag
10.0 10.0 50.0										Max Hol
enter 2.355000 Gl es BW 120 kHz	Hz			VBW 1.2	MHz			2.50 MHz ep 1 ms		Min Ho
Occupied Bar	ndwid	th		Tota	l Power	52.0	) dBm			
			0 MHz	Z						Detecto Peak
Transmit Freq I	Error	3	3.923 kH	z % of	OBW Pow	ver 99	9.00 %		Auto	Ma
x dB Bandwidth	n	4	.844 MH	z xdB		-26.	00 dB			
G						STATU	S			

Plot 7-21. Occupied Bandwidth Plot (LTE Band 30 - 5MHz QPSK - Full RB Configuration)



Plot 7-22. Occupied Bandwidth Plot (LTE Band 30 - 5MHz 16-QAM - Full RB Configuration)

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## 7.5 Spurious and Harmonic Emissions at Antenna Terminal

#### **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 10<sup>th</sup> 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 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.

# For Band 41, the minimum permissible attenuation level of any spurious emission is -13dBm. For Band 30, the minimum permissible attenuation level of any spurious emission is -45dBm.

#### Test Procedure Used

KDB 971168 D01 v03r01 - Section 6.0

#### Test Settings

- 1. Start frequency was set to 30MHz and stop frequency was set to 27GHz (separated into at least two plots per channel)
- 2. Detector = RMS
- 3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
- 4. Sweep time = auto couple
- 5. The trace was allowed to stabilize
- 6. Please see test notes below for RBW and VBW settings

#### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



Figure 7-4. Test Instrument & Measurement Setup

#### Test Notes

Per Part 27, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth 100 kHz or greater for measurements below 1GHz. However, 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 emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

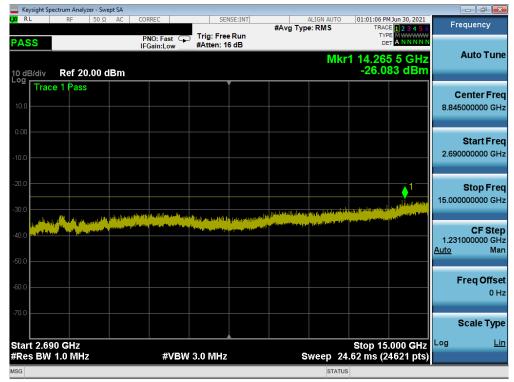
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## LTE Band 41

	ectrum Analy:		t SA											
XI RL	RF	50 Ω	AC	CORREC		SEN	ISE:INT	#Avg	ALIGN Type: RM		TRA	MJun 30, 2021	Fr	requency
PASS				PNO: F IFGain:l	ast 🖵 Low	Trig: Free #Atten: 2					TY			
10 dB/div	Ref 20	.00 dE	3m							M	kr1 2.41 -28.3	8 5 GHz 02 dBm		Auto Tun
Trac	e 1 Pass					, ,								Center Fre
10.0														2500000 GH
0.00														
													30	Start Fre 0.000000 MH
-10.0														
-20.0														Stop Fre
-30.0													2.47	5000000 GH
			lin bin bili							den anti-				05.04
-40.0 <b>*15-061-041</b>	A DESCRIPTION OF THE PARTY OF T													CF Ste 1.500000 MH
-50.0													<u>Auto</u>	Ma
														Freq Offse
-60.0														он
-70.0														
														Scale Typ
Start 0.03 #Res BW					#\/B\A	3.0 MHz			Swe	en '	Stop 2	.475 GHz (4891 pts)	Log	<u>Li</u>
ASG						0.011112				STATU	_	(Hos I pis)		

Plot 7-23. Conducted Spurious Plot (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



Plot 7-24. Conducted Spurious Plot (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

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🔤 Keysight Sp	ectrum Analyz	er - Swept	SA								
XIRL	RF	50 Ω	DC CO	RREC	SEI	NSE:INT	#Avg Typ	ALIGN AUTO		M Aug 26, 2021	Frequency
PASS				NO:Fast G Gain:Low	Trig: Free Atten: 10				TY D		
10 dB/div	Ref 0.0	00 dBn	n					M	kr1 26.37 -52.5	6 0 GHz 53 dBm	Auto Tu
-10.0	e 1 Pass										<b>Center Fr</b> 21.000000000 G
30.0											<b>Start Fr</b> 15.00000000 G
-40.0										<b>1</b>	<b>Stop Fr</b> 27.00000000 G
and the state	and a state of the second s	n an	n an	n han an filing an	n di Mittang kantury Aj tituti kang kanturya	al <sub>ool</sub> an Mathana ay Jan Mathana	and you want to a second state of the second se	in a state and a state of the s	na si para kang mang bu di bar bar na si para kang mang bu di bar bar	ali in 19 <sup>93 (</sup> n 1994) y ganalati di katan <sub>sana</sub> n	CF Ste 1.20000000 G <u>Auto</u> M
-70.0											Freq Offs 0
-90.0											Scale Ty
Start 15.0 #Res BW				#VBV	V 3.0 MHz		s	weep 2	Stop 27 20.80 ms (2	24001 GHz (24001 pts)	Log <u>l</u>
ISG								STAT			

Plot 7-25. Conducted Spurious Plot (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



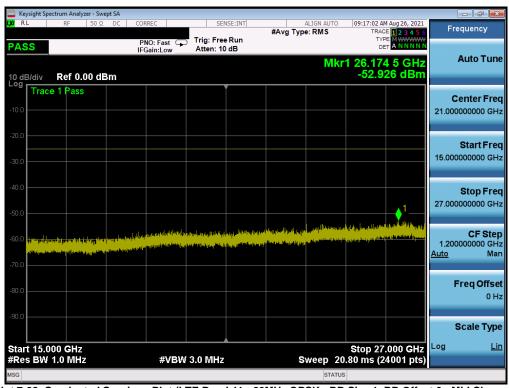
Plot 7-26. Conducted Spurious Plot (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: QLJMRU-19212326	Proud to be part of @ element	PART 27 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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	pectrum Analyzer - Swep									
LX/IRL	RF 50 Ω	AC CORREC	C SI	ENSE:INT	#Avg Type	ALIGN AUTO e: RMS	12:59:19 PM TRACE	Jun 30, 2021	Frequenc	y
PASS		PNO: IFGair	Fast Trig: Fro		• //		TYPE	A N N N N N		
		IFGali	1:Low #Atten.	IUUD		Mkr	1 14.957		Auto <sup>•</sup>	Tune
10 dB/div	Ref 20.00 dl	Bm				WIN	-25.96	9 dBm		
Log Tra	ce 1 Pass			Ĭ					Conton	<b>F m m</b>
10.0									Center 8.84500000	
									8.84300000	JOHZ
0.00										
									Start	
-10.0									2.69000000	) GHz
-20.0								<u> </u>	Stop	Freq
								A STATE AND A STAT	15.00000000	0 GHz
-30.0	And the second second	And the state of the	Barthand Barriel Branch	المسالة البريان المتعدل	(II)		a a sua na sua na sua sua sua sua sua sua sua sua sua su	and the strengton		
-40.0	And the second has	and the second secon	and the state of the second	in the state of the state	ومريا القادرا الأرمينانين	الأنافير والمعالية والدوار				Step
40.0									1.23100000 Auto	0 GHz Man
-50.0									Auto	Marr
									FreqO	feet
-60.0									Fiequ	0 Hz
										UTIL
-70.0									Coolo	Tumo
									Scale	туре
Start 2.6							Stop 15.		Log	<u>Lin</u>
#Res BW	/ 1.0 MHz		#VBW 3.0 MH	Z	S	weep 24	.62 ms (24	621 pts)		
MSG						STATUS	5			

Plot 7-27. Conducted Spurious Plot (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



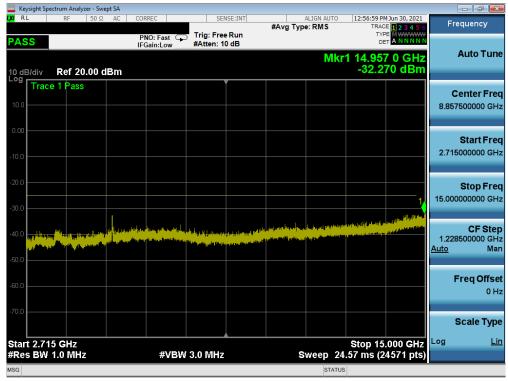
Plot 7-28. Conducted Spurious Plot (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: QLJMRU-19212326	Poud to be part of @ element	PART 27 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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Keysight Spectrum Analyzer - Swept SA					
LXI RL RF 50Ω AC		SENSE:INT	ALIGN AUTO #Avg Type: RMS	12:56:25 PM Jun 30, 2021 TRACE 1 2 3 4 5 6	Frequency
PASS 10 dB/diy Ref 20.00 dBm	IFGain:Low #	Frig: Free Run #Atten: 16 dB	Mk	r1 2.489 5 GHz -31.52 dBm	Auto Tune
10.0 Trace 1 Pass					Center Freq 1.263000000 GHz
-10.0					Start Freq 30.000000 MHz
-20.0					<b>Stop Freq</b> 2.496000000 GHz
-40.0	Lanna I di selang sela bi sebag sela sebagi seba Mangana Sangang		din tering any dia mining any ang		<b>CF Step</b> 246.600000 MHz <u>Auto</u> Man
-60.0					<b>Freq Offset</b> 0 Hz
-70.0 Start 0.030 GHz				Stop 2.496 GHz	Scale Type
#Res BW 1.0 MHz	#VBW 3	0 MHz	Sweep 3	.288 ms (4933 pts)	
MSG			STATUS	6	

Plot 7-29. Conducted Spurious Plot (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-30. Conducted Spurious Plot (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

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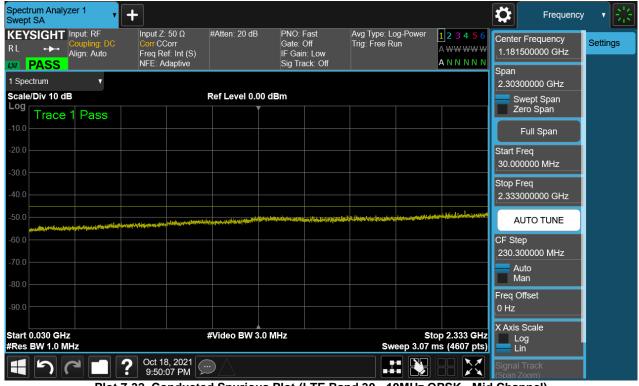
	ectrum Analyze		A									×
🗶 RL	RF	50 Ω D	C COF	REC	SEI	ISE:INT	#Avg Typ	ALIGN AUTO		M Aug 26, 2021	Frequency	
PASS				NO: Fast 📮 Gain:Low	Trig: Free Atten: 10				TYP			
10 dB/div	Ref 0.0	0 dBm						Mkı	1 26.56 -52.0	3 0 GHz 27 dBm	Auto Tu	une
-10.0	e 1 Pass										Center F 21.000000000 (	
30.0											Start F 15.000000000	
-40.0										<b>1</b>	Stop F 27.000000000	
-60.0 <mark>(1971) (1971)</mark> -70.0	an and the second	an and a second	n an an an thirt an	en platien prittike werten niteratien	gi Dele presentig protocho da contra da contra d	lo <sub>na p</sub> arine <mark>gi pilippa</mark> ana pa <sup>nin</sup> ina kabali	a fall gyrdanol fallaf fyydau Mynaf a gwlana yn far ywran ywran	nge (vellenenksperk) Totte keikjeren (	n lager og freder og sok fill fra Se for Mandaria (sok fill sok	an a	CF S 1.200000000 0 <u>Auto</u>	
80.0											Freq Off (	fse 0 H
-90.0											Scale Ty	
Start 15.0 #Res BW	000 GHz 1.0 MHz			#VBW	3.0 MHz		s	weep 20	Stop 27 ).80 ms (2	.000 GHz 4001 pts)	Log	Lir
MSG								STATU	S			

Plot 7-31. Conducted Spurious Plot (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: QLJMRU-19212326	Froud to be part of @ element	PART 27 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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#### LTE Band 30



Plot 7-32. Conducted Spurious Plot (LTE Band 30 - 10MHz QPSK - Mid Channel)



Plot 7-33. Conducted Spurious Plot (LTE Band 30 - 10MHz QPSK - Mid Channel)

FCC ID: QLJMRU-19212326	PCTEST Proud to be part of @ siement	PART 27 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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Proud to be part of	element											
Spectrum Analy Swept SA	zer 1	+								<b>‡</b> F	requency	- 7 ※
KEYSIGHT RL ↔ ₩ PASS	Input: RF Coupling: DC Align: Auto	Input Z: Corr CC Freq Re NFE: Ac	orr f: Int (S)	#Atten: 20 dB	Gate: IF Gai		#Avg Type: I Trig: Free Ri	un	1 2 3 4 5 6 A <del>WW WW W</del> A N N N N N	Center Frequ 21.00000000 Span		Settings
1 Spectrum Scale/Div 10 dl				Ref Level 0.0	00 dBm	1		1		12.0000000 Swept S Zero Spa	pan	
-10.0	1 Pass									Full Sp Start Freq		
-30.0										15.00000000 Stop Freq	00 GHz	
-40.0							a at the other tests of the s	n tatu da	النفر ويحتم يتعاربون	27.00000000 AUTO T		
-60.0	ar falle fallen an freder konstruktionen en son son son son son son son son son so									CF Step 1.200000000	) GHz	
-80.0										Man Freq Offset		
Start 15.000 GF#Res BW 1.0 M				#Video BW 3	3.0 MHz		<u>Current</u>		27.000 GHz	0 Hz X Axis Scale		
			3, 2021 49 PM				Swee		(24001 pts)	Lin Signal Track (Span Zoom)		

<u><u></u>*(*PCTEST</u>)

Plot 7-34. Conducted Spurious Plot (LTE Band 30 - 10MHz QPSK - Mid Channel)

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## 7.6 Band Edge Emissions at Antenna Terminal

#### **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 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 minimum permissible attenuation level for Band 41 is > 43 + 10log (P) dB. The minimum permissible attenuation level for Band 30 is as noted in the Test Notes on the following page.

#### Test Procedure Used

KDB 971168 D01 v03r01 - Section 6.0

#### **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  $\geq$  1% of the emission bandwidth
- 4. VBW  $\geq$  3 x RBW
- 5. Detector = RMS
- 6. Number of sweep points  $\geq 2 \times \text{Span/RBW}$
- 7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
- 8. Sweep time = auto couple
- 9. The trace was allowed to stabilize

#### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



Figure 7-5. Test Instrument & Measurement Setup

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1. Per 27.53(a)(1) for Band 30 base station operation, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power P (with averaging performed only during periods of transmission) within the licensed band(s) of operation, in watts, by the following amounts:

Frequency Range (MHz)	Limit (dBm)
< 2288	-45
2285 – 2287.5	-42
2287.5 – 2300	-40
2300 – 2320	-13
2320 – 2345	-45
2345 – 2362.5	-13
2362.5 – 2365	-25
2365 - 2367.5	-40
2367.5 – 2370	-42
> 2370	-45

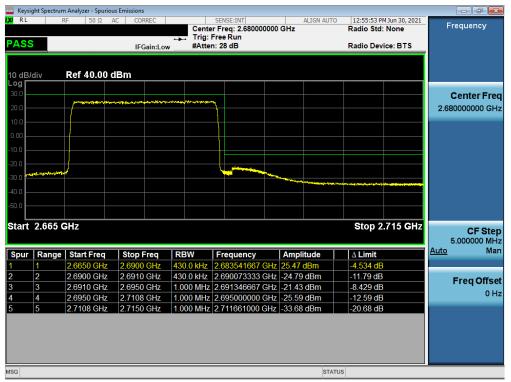
2. For all measurement cases, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e., 1 MHz). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

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	-		rious Emiss														
X/RL	R	F 50 Ω	AC	CORREC			SENSE:I r Freq: Free Ru	2.50600	0000 G		ALIGN AUT	ГО	12:41: Radio		Jun 30, 2021 None		Frequency
PASS	5			IFGain:l	Low		n: 30 dE						Radio I	Devic	ce: BTS		
																Ĩ	
10 dB/	div	Ref 40.00	) dBm														
Log																	
30.0							_	the second	-	والمروا والمراجع	an a		Numeloga	~			Center Fre
20.0							- {									2	.506000000 GH
10.0														+			
0.00														+			
-10.0																	
-20.0																	
-30.0							المسه								17700 U.S.		
	- <u>1997 - 1997 - 1</u> 997 - 19		Winser Parlations											Ĩ			
-40.0 —																	
-50.0																	
	2.471 0	Hz											Sto	0 2.4	521 GHz		
	2.471 G	GHz											Sto	o 2.	521 GHz		CF Ste
Start			Sto	op Freg	R	3W	Frequ	iency		Ampli	tude				521 GHz	Aut	5.000000 MH
	Range			op Freq 905 GHz		<b>3W</b> 100 MHz	Frequ			Ampli 29.67			Sto <u> </u>	it	521 GHz		5.000000 MH
Start	Range	Start Freq	z 2.49		z 1.0		2.4904	67500	GHz -	29.67	dBm		∆ Lim	it dB	521 GHz		5.000000 MH <u>o</u> Ma
Start Spur 1 2 3	<b>Range</b> 1 2 3	<b>Start Freq</b> 2.4710 GHz 2.4905 GHz 2.4950 GHz	z 2.49 z 2.49 z 2.49	905 GHz 950 GHz 960 GHz	z 1.0 z 1.0 z 430	00 MHz 00 MHz 0.0 kHz	2.4904 2.4948 2.4959	167500 335000 985000	<mark>GHz</mark> - GHz - GHz -	29.67 25.61 27.97	dBm dBm dBm		Δ Lim -16.67 -12.61 -14.97	it dB dB dB	521 GHz		5.000000 MH <u>o</u> Ma Freq Offse
Start Spur 1 2	<b>Range</b> 1 2 3	<b>Start Freq</b> 2.4710 GHz 2.4905 GHz	z 2.49 z 2.49 z 2.49	905 GHz 950 GHz	z 1.0 z 1.0 z 430	00 MHz 00 MHz	2.4904 2.4948 2.4959	167500 335000 985000	<mark>GHz</mark> - GHz - GHz -	29.67 25.61 27.97	dBm dBm dBm		∆ Lim -16.67 -12.61	it dB dB dB	521 GHz		5.000000 MH <u>o</u> Ma
Start Spur 1 2 3	<b>Range</b> 1 2 3	<b>Start Freq</b> 2.4710 GHz 2.4905 GHz 2.4950 GHz	z 2.49 z 2.49 z 2.49	905 GHz 950 GHz 960 GHz	z 1.0 z 1.0 z 430	00 MHz 00 MHz 0.0 kHz	2.4904 2.4948 2.4959	167500 335000 985000	<mark>GHz</mark> - GHz - GHz -	29.67 25.61 27.97	dBm dBm dBm		Δ Lim -16.67 -12.61 -14.97	it dB dB dB	521 GHz		5.000000 MH <u>o</u> Ma Freq Offse
Start Spur 1 2 3	<b>Range</b> 1 2 3	<b>Start Freq</b> 2.4710 GHz 2.4905 GHz 2.4950 GHz	z 2.49 z 2.49 z 2.49	905 GHz 950 GHz 960 GHz	z 1.0 z 1.0 z 430	00 MHz 00 MHz 0.0 kHz	2.4904 2.4948 2.4959	167500 335000 985000	<mark>GHz</mark> - GHz - GHz -	29.67 25.61 27.97	dBm dBm dBm		Δ Lim -16.67 -12.61 -14.97	it dB dB dB	521 GHz		5.000000 MH <u>o</u> Ma Freq Offse
Start Spur 1 2 3	<b>Range</b> 1 2 3	<b>Start Freq</b> 2.4710 GHz 2.4905 GHz 2.4950 GHz	z 2.49 z 2.49 z 2.49	905 GHz 950 GHz 960 GHz	z 1.0 z 1.0 z 430	00 MHz 00 MHz 0.0 kHz	2.4904 2.4948 2.4959	167500 335000 985000	<mark>GHz</mark> - GHz - GHz -	29.67 25.61 27.97	dBm dBm dBm		Δ Lim -16.67 -12.61 -14.97	it dB dB dB	521 GHz		5.000000 MH <u>o</u> Ma Freq Offse
Start Spur 1 2 3	<b>Range</b> 1 2 3	<b>Start Freq</b> 2.4710 GHz 2.4905 GHz 2.4950 GHz	z 2.49 z 2.49 z 2.49	905 GHz 950 GHz 960 GHz	z 1.0 z 1.0 z 430	00 MHz 00 MHz 0.0 kHz	2.4904 2.4948 2.4959	167500 335000 985000	<mark>GHz</mark> - GHz - GHz -	29.67 25.61 27.97	dBm dBm dBm		Δ Lim -16.67 -12.61 -14.97	it dB dB dB	521 GHz		5.000000 MH <u>o</u> Ma Freq Offse
Start Spur 1 2 3	<b>Range</b> 1 2 3	<b>Start Freq</b> 2.4710 GHz 2.4905 GHz 2.4950 GHz	z 2.49 z 2.49 z 2.49	905 GHz 950 GHz 960 GHz	z 1.0 z 1.0 z 430	00 MHz 00 MHz 0.0 kHz	2.4904 2.4948 2.4959	167500 335000 985000	<mark>GHz</mark> - GHz - GHz -	29.67 25.61 27.97	dBm dBm dBm		Δ Lim -16.67 -12.61 -14.97	it dB dB dB	521 GHz		5.000000 MH <u>o</u> Ma Freq Offse

Plot 7-35. Lower ACP Plot (LTE Band 41 - 20MHz QPSK - Full RB)



Plot 7-36. Upper ACP Plot (LTE Band 41 - 20MHz QPSK - Full RB)

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RL			ous Emis												_	
KL.	RF	50 Ω	AC	CORRE	C			SENSE:INT Freq: 2.50350	0000 0		ALIGN AUTO			M Jun 30, 202	1	Frequency
								ree Run	0000 0	9112		Rat	no sic	. None		
PASS				IFGair	n:Low			26 dB				Rad	lio De	vice: BTS		
						_									T	
0 dB/div .og	Ref	40.00	dBm													
30.0																Center Fre
									·	m	an and the second second	apon mar	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			
20.0								1								2.503500000 GH
10.0																
0.00																
10.0																
10.0								-								
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10.0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		Construction of the Owner of the	con a series												
	,	4	Liven of Lands	~~~~											1	
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50.0	77 CH2	1 danar 1 andira 1 y er di	tiraria distana										ton	515 CH		
50.0	77 GHz		(Instantion of the Joseph									S	top 2	2.515 GH	z	CF Ste 5.00000 M⊦
50.0 Start 2.4	77 GHz	rt Freq	Ste	op Fre	eq.	RBW		Frequency		Amplit	tude		top 2	2.515 GH		
50.0 Start 2.4	nge   Star	rt Freq 73 GHz		op Fre 905 GI				Frequency 2.490455833				Δ				5.000000 MH
50.0 Start 2.4 Spur   Ra	nge Star 2.47		2.4		Hz	1.000	MHz 2		GHz -	32.04	dBm	Δ -19	Limit	3		5.000000 M⊢ <u>uto</u> Ma
50.0 Start 2.4 Spur   Ra	nge Star 2.47 2.49	73 GHz	2.4	905 GI	Hz Hz	1.000 1.000	MHz 2 MHz 2	2.490455833	GHz - GHz -	32.04 25.57	dBm dBm	Δ -19 -12	Limit ).04 dl	3		5.000000 MH

Plot 7-37. Lower ACP Plot (LTE Band 41 - 15MHz QPSK - Full RB)



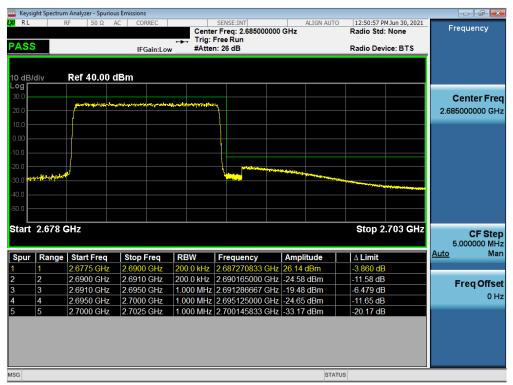
Plot 7-38. Upper ACP Plot (LTE Band 41 - 15MHz QPSK - Full RB)

FCC ID: QLJMRU-19212326	PCTEST* Proud to be part of @ element	PART 27 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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ASS 0 dB/div	RF 50 Ω		Gain:Low	Trig:	SENSE:INT or Freq: 2. Free Run n: 26 dB	501000000		ALIGN AUTO	12:44:55 Radio St	PM Jun 30, 2021	
		IF	Gain:Low	Trig:	Free Run	0100000	GHZ			d: None	Frequency
		IF	Gain:Low						Raulo St	u. None	
0.1041									Radio De	evice: BTS	
o											
	Ref 40.00	dBm									
0 ab/aiv .og	Rei 40.00	ubili									
30.0											Center Fre
20.0					1000	water and the state	A. Martine de la	and the second state of th	-and makes and the		2.501000000 GH
											2.001000000 01
10.0											
0.00											
10.0											
20.0											
					1					M I	
30.0		والمحرمة ومقدمة		·						Marine Southern	
40.0											
50.0											
50.0 Start 2.48	34 GHz								Stop	2.509 GHz	CF Ste
	4 GHz								Stop	2.509 GHz	5.000000 MH
start 2.48	34 GHz nge   Start Freq	Stop	Freq	RBW	Freque	псу	Ampli	itude	Stop		5.000000 MH
start 2.48		Stop		<b>RBW</b> 1.000 MHz							5.000000 MH
Start 2.48 Spur   Ran	ige   Start Freq		5 GHz		2.49050	0000 GHz	-31.00	dBm	∆ Limit	B	5.000000 MH <u>Auto</u> Ma
Start 2.48 Spur   Ran	nge Start Freq 2.4835 GHz	2.4905	5 GHz ) GHz	1.000 MHz	2.49050 2.49489	0000 GHz 5000 GHz	-31.00 -23.93	dBm dBm	∆ Limit -18.00 d	B B	5.000000 MH

Plot 7-39. Lower ACP Plot (LTE Band 41 - 10MHz QPSK - Full RB)



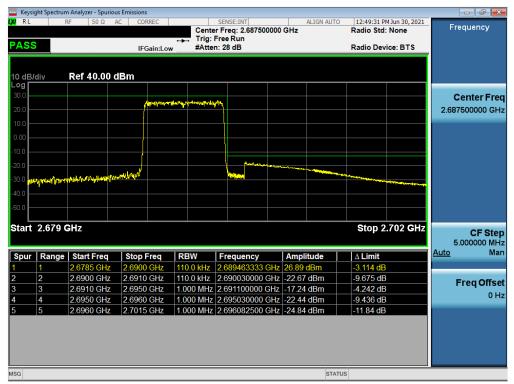
Plot 7-40. Upper ACP Plot (LTE Band 41 - 10MHz QPSK - Full RB)

FCC ID: QLJMRU-19212326	PCTEST* Proud to be part of @ element	PART 27 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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RL	0.5	50.0		ons			CENCE INT		AL 7 CAL AL 17			
	RF	50 Ω	AC	CORREC		Cente	SENSE:INT r Freg: 2.4985	00000 GHz	ALIGN AUT	Radio Std	M Jun 30, 2021	Frequency
					↔		Free Run					
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		rt Frog	Sto	n Erog		B)M/	Frequency		litudo		.508 GHz	5.000000 MH
pur Rar	ige   Sta			p Freq		BW	Frequency		litude	∆ Limit		5.000000 MH
pur   Rar 1	nge Sta 2.48	45 GHz	2.49	05 GHz	. 1.0	000 MHz	2.49050000	) GHz -30.6	2 dBm	∆ Limit -17.62 dE	3	5.000000 MH <u>Auto</u> Ma
pur Rar 1 2	nge Sta 2.48 2.49	45 GHz 05 GHz	2.49 2.49	05 GHz 50 GHz	: 1.( : 1.(	000 MHz 000 MHz	2.49050000 2.494872500	) GHz -30.6 ) GHz -23.2	2 dBm 0 dBm	∆ Limit -17.62 dE -10.20 dE	3 3	5.000000 MH <u>Auto</u> Ma
pur   Rar 1	nge Star 2.48 2.49 2.49	45 GHz	2.49 2.49 2.49	05 GHz	1.( 1.( 1.(	000 MHz 000 MHz 0.0 kHz	2.49050000	) GHz -30.6 ) GHz -23.2 ) GHz -25.7	2 dBm 0 dBm 4 dBm	∆ Limit -17.62 dE	3 3 3	СF Ste 5.00000 МН <u>Auto</u> Ма Freq Offse 0 Н





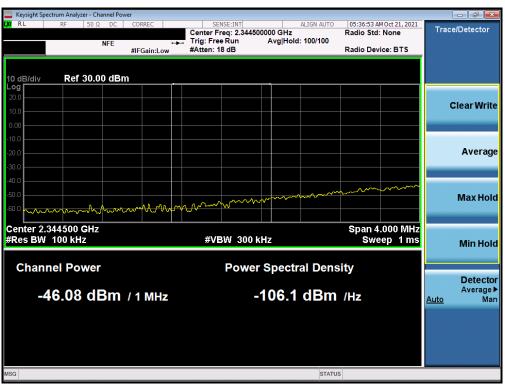
Plot 7-42. Upper ACP Plot (LTE Band 41 - 5MHz QPSK - Full RB)

FCC ID: QLJMRU-19212326	PCTEST* Proud to be part of @ element	PART 27 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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Plot 7-43. Lower Band Edge Plot (LTE Band 30 - 10MHz QPSK – Full RB Configuration)

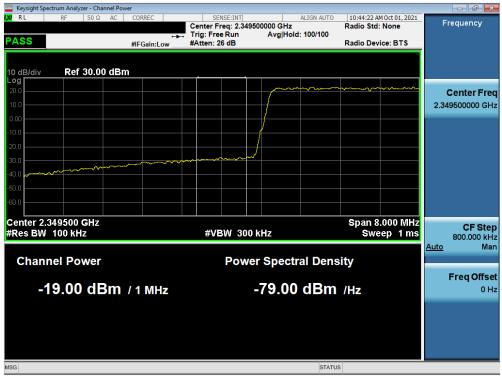


Plot 7-44. Lower Extended Band Edge - [10MHz BW] - 2344 - 2345MHz Channel Integration

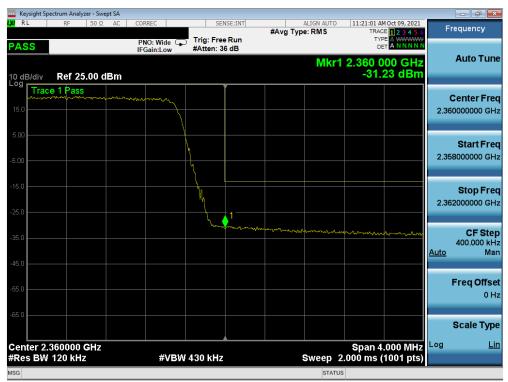
FCC ID: QLJMRU-19212326		PART 27 MEASUREMENT REPORT	Approved by: Technical Manager
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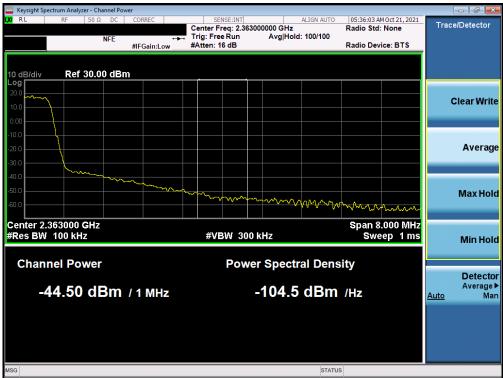
Plot 7-45. Lower Extended Band Edge – [10MHz BW] – 2349 – 2350MHz Channel Integration



Plot 7-46. Upper Band Edge Plot (LTE Band 30 - 10MHz QPSK – Full RB Configuration)

FCC ID: QLJMRU-19212326		PART 27 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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Plot 7-47. Upper Extended Band Edge – [10MHz BW] – 2362.5 – 2363.5MHz Channel Integration



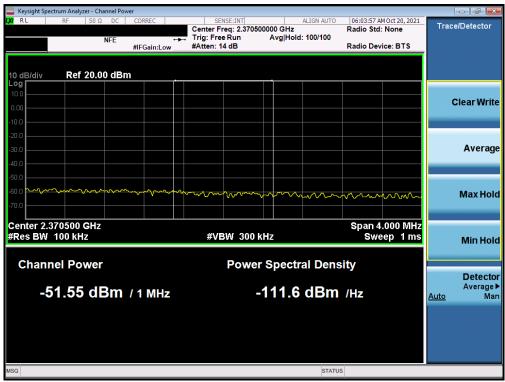
Plot 7-48. Upper Extended Band Edge – [10MHz BW] – 2365 – 2366MHz Channel Integration

FCC ID: QLJMRU-19212326		PART 27 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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	trum Analyzer - Cha	annel Power											
LXI RL	RF 50 Ω	AC COF	RREC			ISE:INT	8000	000 GHz	ALIGN AUTO	10:58:43 A Radio Std	M Oct 01, 2021	Trac	e/Detector
			•	, Tr	rig: Free	Run	0000	Avg Hold	: 100/100				
PASS		#IF	Gain:Low	##	Atten: 1	6 dB				Radio Dev	ice: BTS		
10 dB/div	Ref 30.0	0 dBm											
Log 20.0													
10.0													Clear Write
0.00													
-10.0													
-20.0													Average
-30.0													
-40.0													
-50.0	<b>D</b> . <b>D</b> . <b>.</b>		_										Max Hold
-60.0		~~~~~	~~~~~~			~~~~							Maxilolu
	68000 GHz									Span 8	.000 MHz		
#Res BW	100 kHz				#VE	W 30	0 kl	IZ		Swe	ep 1ms		Min Hold
Chann	el Power					Pow	/er	Spectr	al Dens	ity			
													Detector
-4	3.70 dE	3m / 1	MHz				-1	03.7	dBm	/Hz		Auto	Average ► Man
· ·												Auto	Ividii
MSG									STATUS	3			

Plot 7-49. Upper Extended Band Edge - [10MHz BW] - 2367.5 - 2368.5MHz Channel Integration



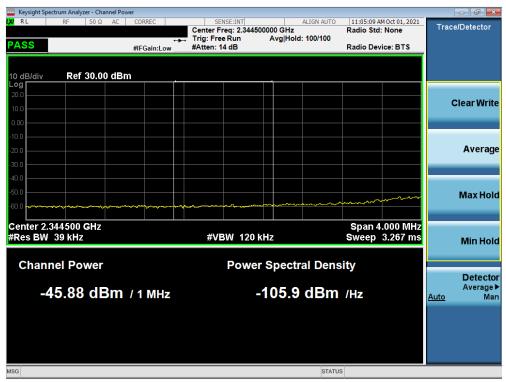
Plot 7-50. Upper Extended Band Edge – [10MHz BW] – 2370.0 – 2371.0 MHz Channel Integration

FCC ID: QLJMRU-19212326		PART 27 MEASUREMENT REPORT	ie de	Approved by: Technical Manager	
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	ectrum Analy:		ot SA										
X/RL	RF	50 Ω	AC	CORREC			ISE:INT	#Avg Typ	ALIGN AUTO	TRAC	HOct 09, 2021	F	requency
PASS				PNO: W IFGain:L	ide 🖵 .ow	Trig: Free #Atten: 30				TYF			
10 dB/div	Ref 45	.00 dl	Bm						Mkr	1 2.350 0 -24.	00 GHz 04 dBm		Auto Tune
og Trac	e 1 Pass												Center Fre
35.0												2.35	0000000 GH
25.0								~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	-	~~~~~~			
15.0												2.34	<b>Start Fre</b> 8000000 GH
10.0													
5.00													Stop Fre
5.00												2.35	2000000 GH
15.0													CF Ste
							1					<u>Auto</u>	400.000 k⊢ Ma
25.0	~~~~~	~~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~	and a second							
35.0													Freq Offse 0 H
45.0													
													Scale Typ
enter 2.		GHz							_	Span 4	.000 IVII 12	Log	Li
Res BW	68 kHz			7	ŧVB₩	220 kHz			Sweep 3	2.000 ms (	1001 pts)		

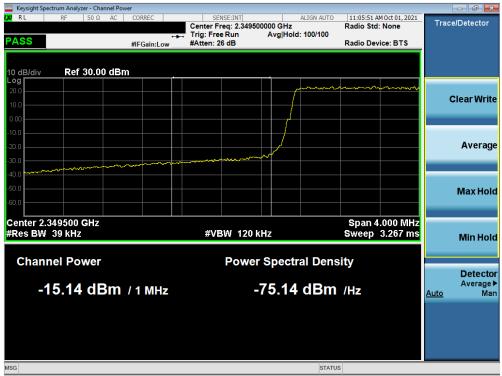
Plot 7-51. Lower Band Edge Plot (LTE Band 30 - 5MHz QPSK – Full RB Configuration)



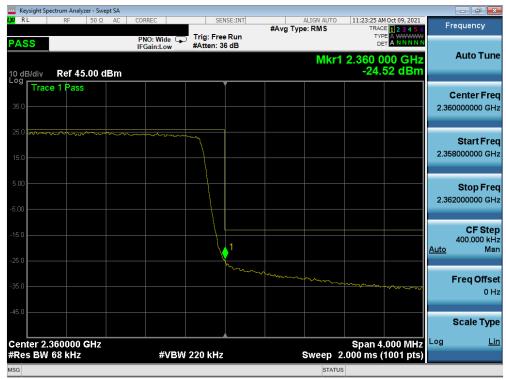
Plot 7-52. Lower Extended Band Edge – [5MHz BW] – 2344 – 2345MHz Channel Integration

FCC ID: QLJMRU-19212326		PART 27 MEASUREMENT REPORT	CORE	Approved by: Technical Manager	
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Plot 7-53. Lower Extended Band Edge – [5MHz BW] – 2349 – 2350MHz Channel Integration



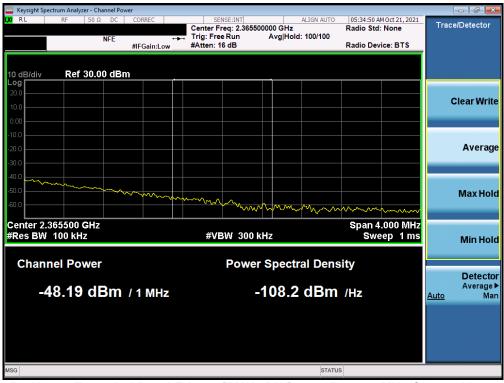
Plot 7-54. Upper Band Edge Plot (LTE Band 30 - 5MHz QPSK – Full RB Configuration)

FCC ID: QLJMRU-19212326		PART 27 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager		
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LX RL RF 50 Ω AC CORREC SENSE:INT ALIGN AUTO 11:06:51 AM Oct 01, 2021	
X         RF         50 Ω         AC         CORREC         SENSE:INT         ALIGN AUTO         11:06:51 AM Oct 01, 2021         Training           Center Freg: 2.363000000 GHz         Radio Std: None         Training         Training	ce/Detector
Trig: Free Run Avg Hold: 100/100	
PASS #FGain:Low #Atten: 26 dB Radio Device: BTS	
10 dB/div Ref 30.00 dBm	
	<b>Clear Write</b>
-10.0	
-20.0	Average
30.0	
-40.0	
50.0	Manuficial
-60.0	Max Hold
Center 2.363000 GHz Span 4.000 MHz	
#Res BW 39 kHz #VBW 120 kHz Sweep 3.267 ms	Min Hold
Channel Power Power Spectral Density	
	Detector
-33.32 dBm / 1 мнz -93.32 dBm /нz Аша	Average►
	Man
MSG STATUS	

Plot 7-55. Upper Extended Band Edge – [5MHz BW] – 2362.5 – 2363.5MHz Channel Integration



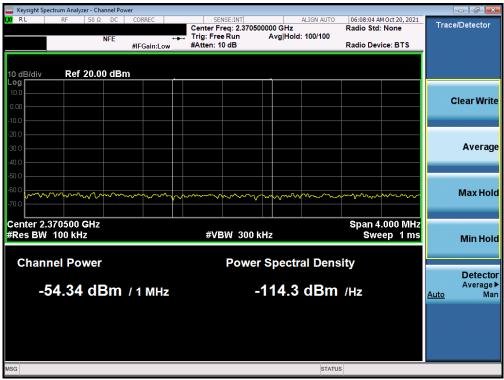
Plot 7-56. Upper Extended Band Edge – [5MHz BW] – 2365 – 2366MHz Channel Integration

FCC ID: QLJMRU-19212326		PART 27 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager	
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Keysight Spectr	rum Analyzer - Ch	annel Powe	er									
X/RL		AC	CORREC			NSE:INT reg: 2.36800		ALIGN AUTO	11:07:32 A	M Oct 01, 2021	Fr	equency
Center Fre PASS	q 2.36800	0000	GHZ #IFGain:Lo	••• w		e Run		d: 100/100	Radio Sto			
10 dB/div	Ref 30.0	0 dBm										
20.0											c	Center Freq
10.0											2.36	8000000 GHz
-10.0												
-20.0												
-30.0												
-50.0												
-60.0	~~~~~~				<u>~~~~~</u>	······		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~				
Center 2.36 #Res BW 3					#VE	3W 120 k	Hz			.000 MHz 3.267 ms		CF Step 400.000 kHz
Channe	el Power					Power	Spect	ral Dens	sity		<u>Auto</u>	Mar
-4	5.54 dl	Зm	/ 1 MH:	7		_	105.5	dBm	/H7		1	Freq Offsel 0 Hz
ISG								STATU	S			

Plot 7-57. Upper Extended Band Edge – [5MHz BW] – 2367.5 – 2368.5MHz Channel Integration



Plot 7-58. Upper Extended Band Edge – [5MHz BW] – 2370.0 – 2371.0 MHz Channel Integration

FCC ID: QLJMRU-19212326	PCTEST* Proud to be part of @ diement	PART 27 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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## 7.7 Peak-Average Ratio

### **Test Overview**

A peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

### Test Procedure Used

KDB 971168 D01 v03r01 - Section 5.7.1

### Test Settings

- 1. The signal analyzer's CCDF measurement profile is enabled
- 2. Frequency = carrier center frequency
- 3. Measurement BW  $\geq$  OBW or specified reference bandwidth
- 4. The signal analyzer was set to collect one million samples to generate the CCDF curve
- 5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms.

### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



Figure 7-6. Test Instrument & Measurement Setup

### Test Notes

None.

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### Band 30



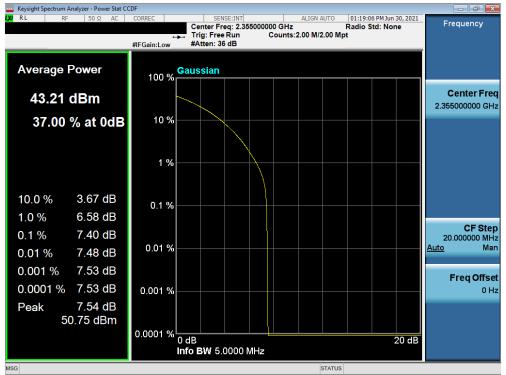
Plot 7-59. PAR Plot (Band 30 - 10.0MHz QPSK - Full RB Configuration)



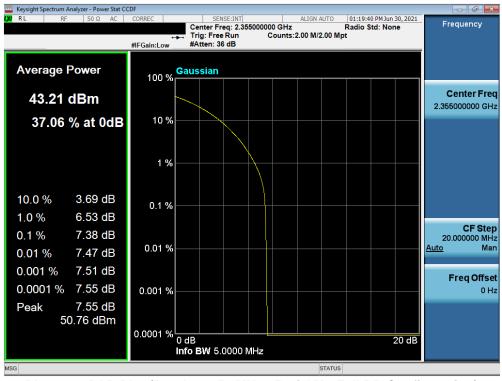
Plot 7-60. PAR Plot (Band 30 - 10.0MHz 256-QAM - Full RB Configuration)

FCC ID: QLJMRU-19212326	PCTEST* Proud to be part of @ diement	PART 27 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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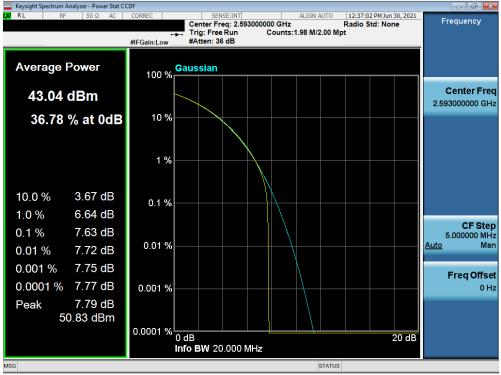


Plot 7-62. PAR Plot (Band 30 - 5.0MHz 256-QAM - Full RB Configuration)

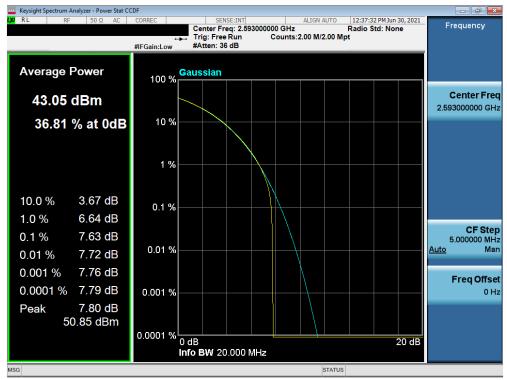
FCC ID: QLJMRU-19212326	PCTEST* Proad to be part of @ element	PART 27 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager	
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### Band 41



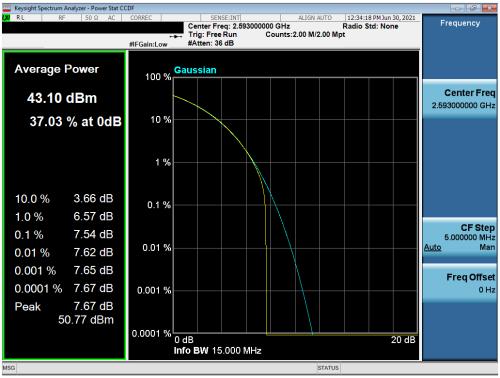




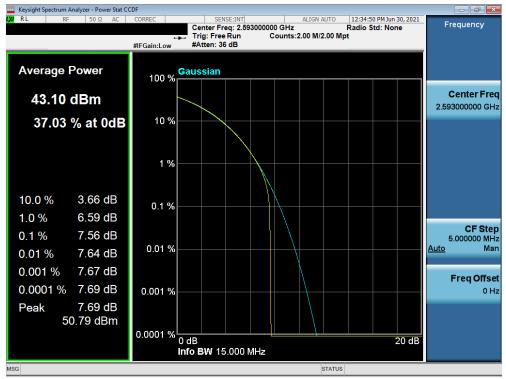
Plot 7-64. PAR Plot (Band 41 - 20.0MHz 256-QAM - Full RB Configuration)

FCC ID: QLJMRU-19212326		PART 27 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager	
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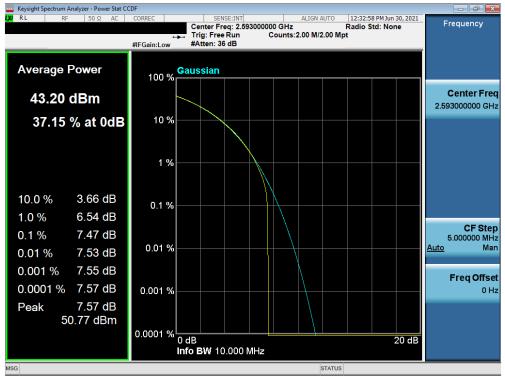




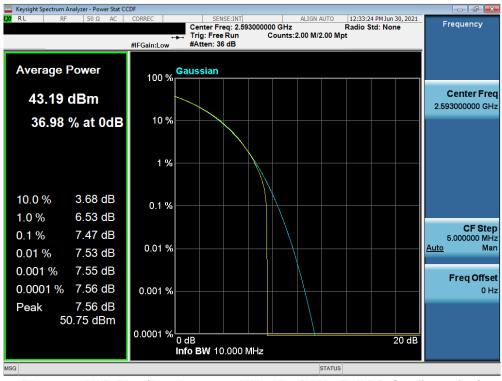
Plot 7-66. PAR Plot (Band 41 - 15.0MHz 256-QAM - Full RB Configuration)

FCC ID: QLJMRU-19212326		PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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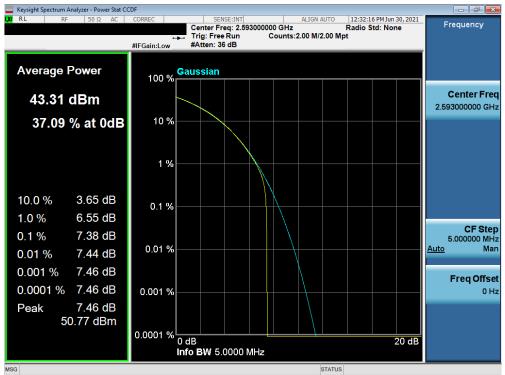




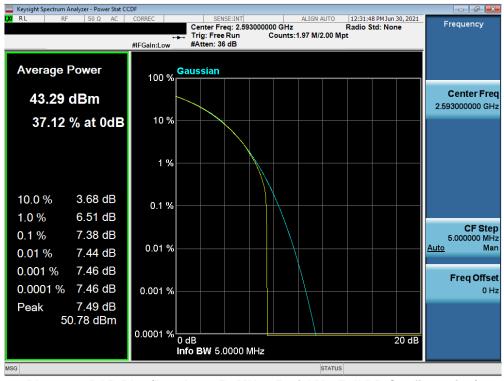
Plot 7-68. PAR Plot (Band 41 - 10.0MHz 256-QAM - Full RB Configuration)

FCC ID: QLJMRU-19212326	PCTEST* Proad to be part of @ element	PART 27 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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Plot 7-70. PAR Plot (Band 41 - 5.0MHz 256-QAM - Full RB Configuration)

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### 7.8 Radiated Spurious Emissions Measurements

### Test Overview

Radiated spurious emissions measurements are performed using the field strength conversion method described in KDB 971168 with the EUT transmitting into a 50 ohm termination. Measurements on signals operating below 1GHz are performed using hybrid bi-log antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as Average/RMS measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

### **Test Procedures Used**

KDB 971168 D01 v03r01 - Section 5.8

### **Test Settings**

- 1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
- 2. VBW  $\geq$  3 x RBW
- 3. Span = 1.5 times the OBW
- 4. No. of sweep points > 2 x span / RBW
- 5. Detector = RMS
- 6. Trace mode = Average (Max Hold for pulsed emissions)
- 7. The trace was allowed to stabilize

FCC ID: QLJMRU-19212326	PCTEST* Proud to be part of @ istement	PART 27 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager	
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The EUT and measurement equipment were set up as shown in the diagram below.

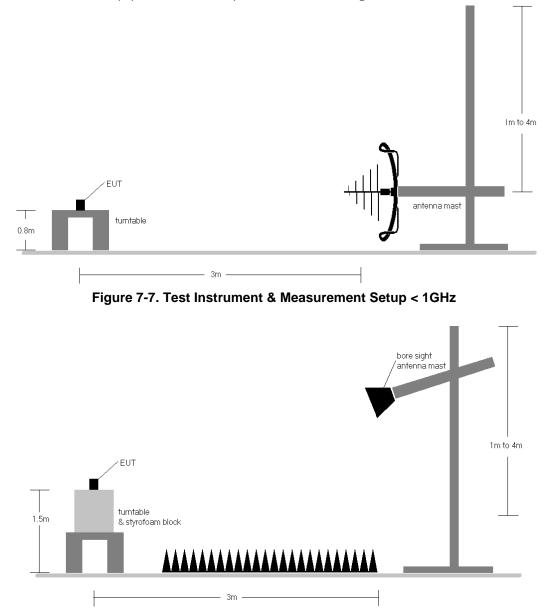


Figure 7-8. Test Instrument & Measurement Setup >1 GHz

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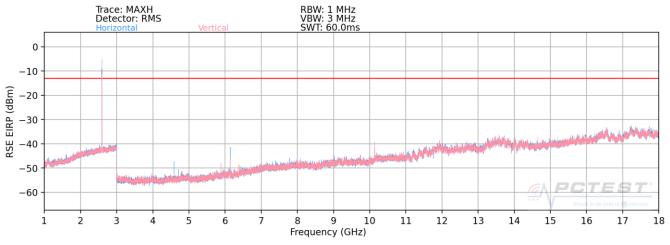


- Field strengths are calculated using the Measurement quantity conversions in KDB 971168 Section 5.8.4.
   b) E(dBµV/m) = Measured amplitude level (dBm) + 107 + Cable Loss (dB) + Antenna Factor (dB/m)
   d) EIRP (dBm) = E(dBµV/m) + 20logD 104.8; where D is the measurement distance in meters.
- 2) The EUT was tested in three orthogonal planes 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 tables below.
- 3) This unit was tested with a 120VAC supply
- 4) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case setup is reported in the tables below.
- 5) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 6) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
- 7) The "-" shown in the following RSE tables are used to denote a noise floor measurement.
- 8) Radiated Emissions were also investigated for the case of all supported bands transmitting simultaneously. Data is included in the section below.

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## LTE Band 41



Plot 7-71. Radiated Spurious Plot (LTE Band 41)

Bandwidth (MHz):	20
Frequency (MHz):	2506.0
RB / Offset:	1 / 50
Detector / Trace Mode:	RMS / Average
RBW/VBW:	1MHz / 3MHz

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
5012.0	Н	183	343	-70.43	5.84	42.41	-52.85	-13.00	-39.85
7518.0	Н	135	223	-74.61	7.60	39.99	-55.27	-13.00	-42.27
10024.0	Н	-	-	-74.87	11.08	43.21	-52.05	-13.00	-39.05
12530.0	Н	-	-	-76.17	14.65	45.48	-49.78	-13.00	-36.78
15036.0	Н	-	-	-76.25	16.82	47.57	-47.69	-13.00	-34.69

Table 7-5. Radiated Spurious Data (LTE Band 41 – Low Channel)

20
2593.0
1 / 50
RMS / Average
1MHz / 3MHz

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
5186.0	Н	227	321	-72.16	6.27	41.11	-54.15	-13.00	-41.15
7779.0	Н	132	207	-70.78	7.64	43.86	-51.40	-13.00	-38.40
10372.0	Н	-	-	-75.83	11.99	43.16	-52.10	-13.00	-39.10
12965.0	Н	-	-	-75.90	15.05	46.15	-49.10	-13.00	-36.10
15558.0	Н	-	-	-75.99	17.37	48.38	-46.87	-13.00	-33.87

Table 7-6. Radiated Spurious Data (LTE Band 41 – Mid Channel)

FCC ID: QLJMRU-19212326	PCTEST* Proud to be part of @ stemeer	PART 27 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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Bandwidth (MHz):	20
Frequency (MHz):	2680.0
RB / Offset:	1 / 50
Detector / Trace Mode:	RMS / Average
RBW/VBW:	1 MHz / 3 MHz

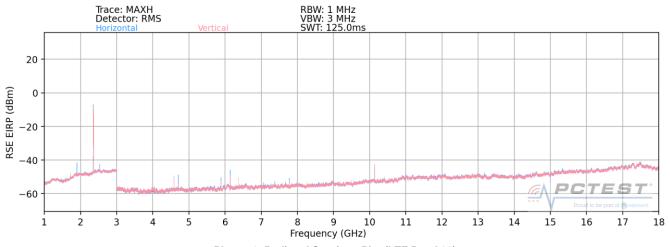
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
5360.0	Н	147	316	-72.52	5.43	39.91	-55.34	-13.00	-42.34
8040.0	Н	199	188	-71.60	8.73	44.13	-51.13	-13.00	-38.13
10720.0	Н	-	-	-75.41	12.75	44.34	-50.91	-13.00	-37.91
13400.0	Н	-	-	-76.01	15.04	46.03	-49.23	-13.00	-36.23
16080.0	Н	-	-	-75.98	18.10	49.12	-46.13	-13.00	-33.13

Table 7-7. Radiated Spurious Data (LTE Band 41 – High Channel)

FCC ID: QLJMRU-19212326	PCTEST* Proud to be part of @ diemeers	PART 27 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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## LTE Band 30



Plot 7-72. Radiated Spurious Plot (LTE Band 30)

Bandwidth (MHz):	5
Frequency (MHz):	2352.5

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
4705.0	Н	160	164	-69.67	9.03	46.36	-48.90	-45.00	-3.90
7057.5	Н	201	174	-71.69	13.68	48.99	-46.26	-45.00	-1.26
9410.0	Н	-	-	-77.63	18.78	48.15	-47.11	-45.00	-2.11
10242.0	Н	-	-	-78.22	11.36	40.14	-55.12	-45.00	-10.12
11762.5	Н	-	-	-80.12	21.78	48.66	-46.60	-45.00	-1.60
14115.0	Н	-	-	-83.01	25.65	49.64	-45.62	-45.00	-0.62
	Н	-	- -	-83.01	25.65	49.64	-45.62		

Table 7-8. Radiated Spurious Data (LTE Band 30 – Low Channel)

Bandwidth (MHz):	5
Frequency (MHz):	2355.0

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
4710.0	Н	100	230	-69.37	9.03	46.66	-48.60	-45.00	-3.60
7065.0	Н	100	221	-73.11	13.68	47.57	-47.68	-45.00	-2.68
9420.0	Н	-	-	-83.38	18.78	42.40	-52.86	-45.00	-7.86
10242.0	Н	169	32	-65.22	11.36	53.14	-42.12	-40.00	-2.12
11775.0	Н	-	-	-85.03	21.78	43.75	-51.51	-45.00	-6.51
14130.0	Н	-	-	-84.55	25.65	48.10	-47.16	-45.00	-2.16

Table 7-9. Radiated Spurious Data (LTE Band 30 - Mid Channel)

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Bandwidth (MHz):	5
Frequency (MHz):	2357.5

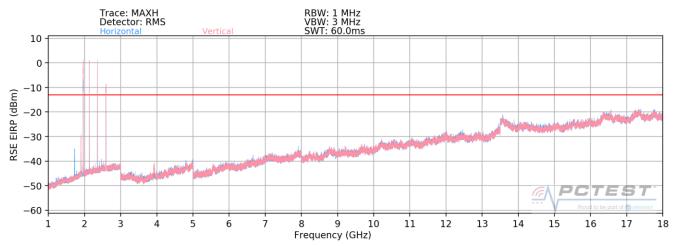
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
4715.00	Н	137	230	-70.12	9.03	45.91	-49.35	-45.00	-4.35
7072.50	Н	111	161	-72.31	13.68	48.37	-46.88	-45.00	-1.88
9430.00	Н	-	-	-76.68	18.78	49.10	-46.16	-45.00	-1.16
10248.00	Н	159	66	-69.33	11.28	48.95	-46.31	-45.00	-1.31
11787.50	Н	-	-	-79.77	21.78	49.01	-46.25	-45.00	-1.25
14145.00	Н	-	-	-83.41	25.65	49.24	-46.02	-45.00	-1.02

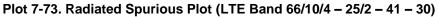
Table 7-10. Radiated Spurious Data (LTE Band 30 – High Channel)

FCC ID: QLJMRU-19212326	PCTEST Proud to be part of @ element	PART 27 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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# LTE Band 66/10/4, Band 25/2, Band 41, Band 30





LTE Band 66 - 25 - 41 - 30
20 - 20 - 20 - 20
1960 + 2132.5 + 2593 + 2355
1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1163.4	V	257	118	-64.84	2.42	44.58	-50.68	-13.00	-37.68
1093.5	V	260	111	-66.93	2.35	42.42	-52.84	-13.00	-39.84
2017.0	V	-	-	-70.77	5.98	42.21	-53.05	-13.00	-40.05
2305.0	V	146	267	-67.13	6.24	46.11	-49.15	-13.00	-36.15
2420.5	V	-	-	-72.37	7.52	42.15	-53.11	-13.00	-40.11
3754.0	V	101	222	-71.24	14.31	50.07	-45.19	-13.00	-32.19
4627.0	V	168	147	-70.66	10.40	46.74	-48.51	-13.00	-35.51
5074.5	V	122	180	-72.88	14.31	48.43	-46.83	-13.00	-33.83
6144.5	V	285	193	-70.91	15.57	51.66	-43.60	-13.00	-30.60
7779.0	V	114	217	-72.79	18.53	52.74	-42.52	-13.00	-29.52
8987.5	V	-	-	-72.50	21.21	55.71	-39.54	-13.00	-26.54
10145.0	V	120	234	-72.68	21.70	56.02	-39.24	-13.00	-26.24
т	Table 7-11. Radiated Spurious Data (LTE Multi-Band – Mid Channel)								

Table 7-11. Radiated Spurious Data (LTE Multi-Band – Mid Channel)

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### 7.9 Frequency Stability / Temperature Variation

#### Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-E-2016. The frequency stability of the transmitter is measured by:

- a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.
- b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

#### Test Procedure Used

ANSI/TIA-603-E-2016

#### **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.

### Test Setup

The EUT was connected via an RF cable to a spectrum analyzer with the EUT placed inside an environmental chamber.

#### Test Notes

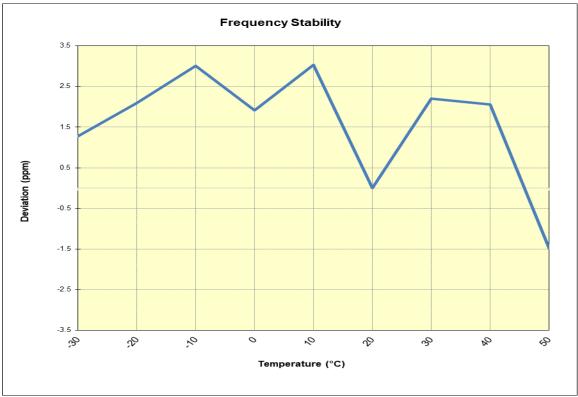
None

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LTE Band 41						
	Operating	Frequency (Hz):	2,593,0	000,000		
	Ref	. Voltage (VAC):	120	.00		
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)	
		- 30	2,593,089,345	3,301	0.0001273	
		- 20	2,593,091,484	5,440	0.0002098	
		- 10	2,593,093,846	7,802	0.0003009	
		0	2,593,090,999	4,955	0.0001911	
100 %	120.00	+ 10	2,593,093,914	7,870	0.0003035	
		+ 20 (Ref)	2,593,086,044	0	0.0000000	
		+ 30	2,593,091,766	5,722	0.0002207	
		+ 40	2,593,091,370	5,326	0.0002054	
		+ 50	2,593,082,220	-3,824	-0.0001475	
85 %	102.00	+ 20	2,593,086,111	67	0.0000026	
115 %	138.00	+ 20	2,593,084,222	-1,822	-0.0000703	

Table 7-12. LTE Band 41 Frequency Stability Data



Plot 7-74. LTE Band 41 Frequency Stability Chart

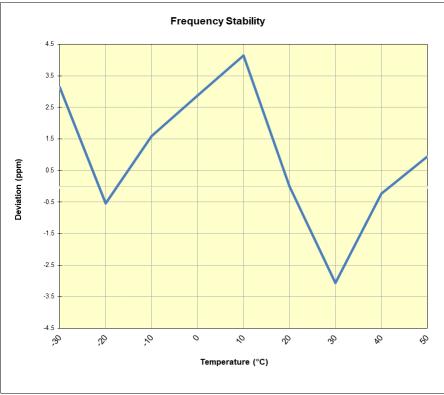
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# LTE Band 30

LTE Band 30						
	Operating	Frequency (Hz):	2,355,0	00,000		
	Ref	. Voltage (VDC):	120	.00		
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)	
		- 30	2,355,096,846	7,386	0.0003136	
		- 20	2,355,088,184	-1,276	-0.0000542	
		- 10	2,355,093,220	3,760	0.0001597	
		0	2,355,096,248	6,788	0.0002882	
100 %	120.00	+ 10	2,355,099,239	9,779	0.0004152	
		+ 20 (Ref)	2,355,089,460	0	0.0000000	
		+ 30	2,355,082,257	-7,203	-0.0003058	
		+ 40	2,355,088,919	-541	-0.0000230	
		+ 50	2,355,091,694	2,234	0.0000949	
85 %	102.00	+ 20	2,355,085,942	-3,518	-0.0001494	
115 %	138.00	+ 20	2,355,089,666	206	0.0000087	

### Table 7-13. LTE Band 30 Frequency Stability Data



### Plot 7-75. LTE Band 30 Frequency Stability Chart

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# 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Tecore Mid Band mRU** FCC ID: QLJMRU-19212326 complies with all the requirements of Part 27 of the FCC rules.

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