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PART 24 MEASUREMENT REPORT

Applicant Name:

Tecore Networks 7030 Hi Tech Drive Hanover, MD 21076 USA

Date of Testing:

6/23/2021 – 10/09/2021 **Test Site/Location:** PCTEST Lab. Columbia, MD, USA **Test Report Serial No.:** 1M2106040064-01.QLJ

FCC ID:

QLJMRU-19212326

Applicant Name:

Tecore Networks

Application Type: Model: EUT Type: FCC Classification: FCC Rule Part: Test Procedure(s): Certification MRU-20W19212326 Mid Band mRU PCS Licensed Transmitter (PCB) 24 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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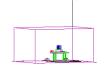


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				Conduct	ed Power	Emission
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	Max. Power [W]	Max. Power [dBm]	Designator
	20 MHz	QPSK	1940 - 1985	22.233	43.47	18M0G7D
	20 MHZ	16QAM	1940 - 1985	21.677	43.36	18M0W7D
	15 MHz	QPSK	1937.5 - 1987.5	22.131	43.45	13M5G7D
		16QAM	1937.5 - 1987.5	21.727	43.37	13M5W7D
	10 MHz	QPSK	1935 - 1990	21.878	43.40	9M01G7D
LTE Band 25/2		16QAM	1935 - 1990	22.542	43.53	9M05W7D
LTE Dariu 20/2	5 MHz	QPSK	1932.5 - 1992.5	22.542	43.53	4M51G7D
		16QAM	1932.5 - 1992.5	22.909	43.60	4M50W7D
	2 M⊔ -	QPSK	1931.5 - 1993.5	22.542	43.53	2M71G7D
	3 MHz	16QAM	1931.5 - 1993.5	22.961	43.61	2M71W7D
	1.4 MHz	QPSK	1930.7 - 1994.3	22.803	43.58	1M10G7D
	1.4 10102	16QAM	1930.7 - 1994.3	22.491	43.52	1M11W7D

EUT Overview

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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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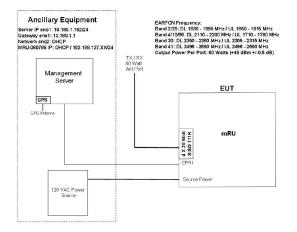


2.0 PRODUCT INFORMATION

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 24. 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 Ω 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 0 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 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:

Pd [dBm] = Pg [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 $P_{g \text{ [dBm]}}$ – 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:

$$\begin{split} & \mathsf{E}_{[\mathsf{dB}\mu\mathsf{V}/\mathsf{m}]} \texttt{=} \texttt{Measured} \texttt{ amplitude } \mathsf{level}_{[\mathsf{dB}\mathsf{m}]} \texttt{+} 107 \texttt{+} \mathsf{Cable } \mathsf{Loss}_{[\mathsf{dB}]} \texttt{+} \mathsf{Antenna } \mathsf{Factor}_{[\mathsf{dB}/\mathsf{m}]} \\ & \mathsf{And} \\ & \mathsf{EIRP}_{[\mathsf{dB}\mathsf{m}]} \texttt{=} \mathsf{E}_{[\mathsf{dB}\mu\mathsf{V}/\mathsf{m}]} \texttt{+} 20\mathsf{log}\mathsf{D} - 104.8; \text{ where } \mathsf{D} \text{ is the measurement distance in meters.} \end{split}$$

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 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). Measurements 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
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:

- 1. 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.
- 2. Equipment with a calibration date of "N/A" shown in this list was not used to make direct calibrated measurements.

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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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7.0 TEST RESULTS

7.1 Summary

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

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
	Transmitter Conducted Output Power/ Equivalent Isotropic Radiated Power	2.1046, 24.232	1640W/MHz	PASS	Section 7.2
CTED	Occupied Bandwidth	2.1049	N/A	PASS	Section 7.3
	Conducted Band Edge / Spurious Emissions	2.1051, 24.238(a)	> 43 + 10log10(P[Watts]) at Band Edge and for all out-of- band emissions	PASS	Sections 7.4, 7.5
S	Peak-Average Ratio (PAR)	24.232(d)	13 dB	PASS	Section 7.6
	Frequency Stability	2 1055 24 235	Fundamental emissions stay within authorized frequency block	PASS	Section 7.8
RADIATED	Radiated Spurious Emissions	2.1053, 24.238(a)	> 43 + 10 log10 (P[Watts]) for all out-of-band emissions	PASS	Section 7.7

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 / Effective Radiated Power

Test Overview

The EUT was set to transmit in all four available modulations of LTE mode at the maximum output power of 20W for this band or as applicable for the channel 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.

Test Procedure Used

KDB 971168 D01 v03r01 - Section 5.2.1

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 ≥ 3 x RBW
- 5. No. of sweep points \geq 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.

Keysight PXA	
Signal Analyzer	EUT

Figure 7-1. Test Instrument & Measurement Setup

Test Notes

None.

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LTE Band 25/2

Bandwidth	Modulation	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]	Conducted Power [Watts]	Ant Gain [dBi]	EIRP [dBm/MHz]	EIRP Limit [dBm/MHz]	Margin [dB]
		1940.0	100 / 0	43.47	22.23	15.00	58.47	62.15	-3.68
N	QPSK	1962.5	100 / 0	43.28	21.28	15.00	58.28	62.15	-3.87
HV		1985.0	100 / 0	43.27	21.23	15.00	58.27	62.15	-3.88
20 MHz	16-QAM	1962.5	100 / 0	43.30	21.38	15.00	58.30	62.15	-3.85
5	64-QAM	1962.5	100 / 0	43.36	21.68	15.00	58.36	62.15	-3.79
	256-QAM	1962.5	100 / 0	43.26	21.18	15.00	58.26	62.15	-3.89
		1937.5	75 / 0	43.45	22.13	15.00	58.45	62.15	-3.70
N	QPSK	1962.5	75 / 0	43.40	21.88	15.00	58.40	62.15	-3.75
H		1987.5	75 / 0	43.30	21.38	15.00	58.30	62.15	-3.85
15 MHz	16-QAM	1962.5	75 / 0	43.32	21.48	15.00	58.32	62.15	-3.83
-	64-QAM	1962.5	75 / 0	43.06	20.23	15.00	58.06	62.15	-4.09
	256-QAM	1962.5	75 / 0	43.37	21.73	15.00	58.37	62.15	-3.78
		1935.0	50 / 0	43.31	21.43	15.00	58.31	62.15	-3.84
N	QPSK	1962.5	50 / 0	43.40	21.88	15.00	58.40	62.15	-3.75
H		1990.0	50 / 0	43.21	20.94	15.00	58.21	62.15	-3.94
10 MHz	16-QAM	1962.5	50 / 0	43.47	22.23	15.00	58.47	62.15	-3.68
-	64-QAM	1962.5	50 / 0	43.52	22.49	15.00	58.52	62.15	-3.63
	256-QAM	1962.5	50 / 0	43.53	22.54	15.00	58.53	62.15	-3.62
		1932.5	25 / 0	43.11	20.46	15.00	58.11	62.15	-4.04
N	QPSK	1962.5	25 / 0	43.53	22.54	15.00	58.53	62.15	-3.62
MHz		1992.5	25 / 0	43.28	21.28	15.00	58.28	62.15	-3.87
5 N	16-QAM	1962.5	25 / 0	43.59	22.86	15.00	58.59	62.15	-3.56
Ť	64-QAM	1962.5	25 / 0	43.60	22.91	15.00	58.60	62.15	-3.55
	256-QAM	1962.5	25 / 0	43.55	22.65	15.00	58.55	62.15	-3.60
		1931.5	15 / 0	42.97	19.82	15.00	57.97	62.15	-4.18
N	QPSK	1962.5	15 / 0	43.53	22.54	15.00	58.53	62.15	-3.62
MHz		1993.5	15 / 0	43.07	20.28	15.00	58.07	62.15	-4.08
3 N	16-QAM	1962.5	15 / 0	43.52	22.49	15.00	58.52	62.15	-3.63
.,	64-QAM	1962.5	15 / 0	43.57	22.75	15.00	58.57	62.15	-3.58
	256-QAM	1962.5	15 / 0	43.61	22.96	15.00	58.61	62.15	-3.54
		1930.7	6 / 0	42.90	19.50	15.00	57.90	62.15	-4.25
N	QPSK	1962.5	6 / 0	43.58	22.80	15.00	58.58	62.15	-3.57
1.4 MHz		1994.3	6 / 0	42.96	19.77	15.00	57.96	62.15	-4.19
4	16-QAM	1962.5	6/0	43.47	22.23	15.00	58.47	62.15	-3.68
-	64-QAM	1962.5	6 / 0	43.49	22.34	15.00	58.49	62.15	-3.66
	256-QAM	1962.5	6 / 0	43.52	22.49	15.00	58.52	62.15	-3.63

Table 7-2. Transmitter Conducted Output Power / Effective Radiated Power (LTE Band 25/2)

Note:

The EIRP limit (dBm/MHz) was compared to the full channel BW power (dBm). The full channel BW measurement is expected to be higher than the 1MHz BW measurement so this data represents a worst-case condition.

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7.3 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 7-2. Test Instrument & Measurement Setup

Test Notes

None.

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LTE Band 25/2

	ectrum Analy	zer - Occu	upied BW	/								_	
L <mark>XI</mark> RL	RF	50 Ω	AC	CORREC		Canto	SENSE:INT	500000 CH-	ALIGN AUTO	09:11:48 A Radio Std	M Jul 01, 2021	Trac	e/Detector
							Free Run		ld: 100/100	Radio Sta	None		
				#IFGair	n:Low	#Atter	n: 36 dB			Radio Dev	rice: BTS		
10 dB/div	Dof	40.00	dBn	`									
Log	Kei	40.00	uDII		مراريد ميرين م	whater Ma	Mart Martin Providence	-h marine					
30.0				——————́́́А					<u>۱</u>				
20.0									\			(Clear Write
10.0													
0.00													
-10.0			anal all and	and and					The Manual March				Average
-20.0	n and the second second									nd Indurgentier	han the start	_	
-30.0													
-40.0													Max Hold
-50.0													Μάλ ΠΟΙΟ
00.0													_
Center 1.	96250 G	Hz				-				Span 5	0.00 MHz		
Res BW	470 kHz					#	VBW 1.5	MHz		Swe	ep 1 ms		Min Hold
Occu	pied B	and	widt	h			Total	Power	52.6	i dBm			
			17	296	1 MI	17							Detector
													Peak▶
Transi	mit Free	q Erro	or	-7	7.889	kHz	% of C	BW Pov	ver 99	.00 %		Auto	Mar
x dB B	andwig	ith		1	9.26 N	IHz _	x dB		-26	00 dB			
					0.20 11		Au		201				
MSG									STATUS	5			

Plot 7-1. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz QPSK - Full RB)



Plot 7-2. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz 16-QAM - Full RB)

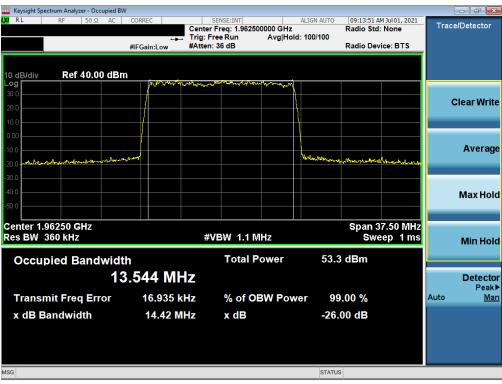
FCC ID: QLJMRU-19212326	Post to be part of @elitement	PART 24 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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Keysight Spectrum Analyze		ipied BW									- 0 ×
XIRL RF	50 Ω	AC	CORREC	Cont	SENSE:INT ter Freg: 1.9625	00000 CH-	ALIGN AUTO	09:13:29 A Radio Std	M Jul 01, 2021	Trace	e/Detector
			#IFGain:Low	🛶 Trig:	en: 36 dB		d: 100/100	Radio Stu			
10 dB/div Ref 4	10.00	dBm	Lindersh	mbeller, Ramaneter	the man and an an	- Carton Carton					
20.0										c	Clear Write
0.00 10.0 20.0 <mark>walu waya watata 19</mark> 0	- dan ny		u				-	atostall _{เป} กาะกาไห	ang		Averag
0.0											Max Hol
enter 1.96250 GH tes BW 360 kHz	Ηz				#VBW 1.1 [MHz			7.50 MHz ep 1 ms		Min Hol
Occupied Ba	Indv	width			Total I	Power	52.7	dBm			
			.513 N	ЛНz							Detecto Peak
Transmit Freq	Erro	or	-9.23	7 kHz	% of C	BW Pow	/er 99	.00 %		Auto	<u>Ma</u>
x dB Bandwidt	th		14.50	MHz	x dB		-26.	00 dB			
G							STATUS	3			

Plot 7-3. Occupied Bandwidth Plot (LTE Band 25/2 - 15MHz QPSK - Full RB)



Plot 7-4. Occupied Bandwidth Plot (LTE Band 25/2 - 15MHz 16-QAM - Full RB)

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Keysight Spectrum Analyze											
X/RL RF	50 Ω	AC	CORREC	Cont	SENSE:INT er Freg: 1.9625	00000 CH-	ALIGN AUTO	09:15:11 A Radio Std	M Jul 01, 2021	Trac	e/Detector
					Free Run		d: 100/100	Radio Stu	. None		
			#IFGain:Lo	w #Atte	en: 36 dB			Radio Dev	rice: BTS		
10 dB/div Ref 4	0.00	dBm									
	0.00	ubili		And the second	way los -	and the second second					
30.0						_					
20.0											Clear Write
			1								
10.0											
0.00											
10.0							_				Average
20.0 Marganhan	and haven	mulle	w.v				Cally March Control	mallion	Marmarian		
-30.0											
-40.0											Max Hold
-50.0											
0	<u> </u>							0	C 00 B4U		
Center 1.96250 GH Res BW 240 kHz	1Z				#VBW 750	k Ha			5.00 MHz ep 1 ms		
Res DW 240 KHZ					#VDVV 730	КПZ		SWE	ep ins		Min Hold
Occupied Ba	un du	uidth			Total I	Power	52 4	i dBm			
Occupied Ba	IIIUV				Totali		UL.C				
		9.0	145	MHz							Detecto
-	-				~ ~ ~ ~			00.0/		A	Peak
Transmit Freq	Erro		4.4	02 kHz	% of C	BW Pow	/er 99	.00 %		Auto	Mar
x dB Bandwidt	th		9.66	8 MHz	x dB		-26.	00 dB			
										_	
SG							STATUS	3			

Plot 7-5. Occupied Bandwidth Plot (LTE Band 25/2 - 10MHz QPSK - Full RB)



Plot 7-6. Occupied Bandwidth Plot (LTE Band 25/2 - 10MHz 16-QAM - Full RB)

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Keysight Spectrum Analyzer										_	
RL RF !	50Ω AC	CORRE			SE:INT a: 1.96250	0000 GHz	ALIGN AUTO	09:17:11 A	M Jul 01, 2021	Trac	e/Detector
		#IFGa	- -	Trig: Free #Atten: 36	Run		d: 100/100	Radio Dev			
0 dB/div Ref 4	0.00 di	Bm									
og			monor	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	᠕᠕᠕᠕	m					
0.0		1								C	Clear Writ
0.0		1									
0.0		į									
00											
).0		0.00-(1	0			Averag
.0 marman	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	MIC DAY					ware really	www.	where where		
.0											
.0											Max Ho
).0											
enter 1.962500 G es BW 120 kHz	HZ			#\/P	W 390 k	U 7			2.50 MHz ep 1 ms		
				#VD	W 390 M	лг		SWE	ep 1 ms		Min Ho
Occupied Ba	ndwi	dth			Total P	ower	52.2	dBm			
			6 MH	-							Detecto
		1.013		Z							Peak
Transmit Freq	Error		5.078 kH	z	% of O	3W Pow	ver 99	.00 %		Auto	Ma
x dB Bandwidt	h		4.839 M⊦	7	x dB		-26	00 dB			
					A GE		201				
-											
3							STATUS				

Plot 7-7. Occupied Bandwidth Plot (LTE Band 25/2 - 5MHz QPSK - Full RB)



Plot 7-8. Occupied Bandwidth Plot (LTE Band 25/2 - 5MHz 16-QAM - Full RB)

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Keysight Spectrum Analyze											
K RL RF	50 Ω	AC	CORREC		SENSE:INT	500000 GH7	ALIGN AUTO	09:19:04 A	M Jul 01, 2021	Trac	e/Detector
			#IFGain:Lo	Trig	g: Free Run tten: 36 dB		d: 100/100	Radio Dev			
IO dB/div Ref 4	0.00	dBm		w^//~mm		Wallow A					
30.0										0	Clear Write
10.0 0.00 10.0 20.0	. مرسماله	p ^w ./"m	/				hoursperg	Mentu A-			Averag
0.0											Max Hol
enter 1.962500 G Res BW 75 kHz	SHz				#VBW 240	kHz			.500 MHz p 3.8 ms		Min Hol
Occupied Ba	Indv	width			Total	Power	51.9	dBm			
				MHz							Detecto Peak
Transmit Freq	Erro	or	1.5	93 kHz	% of C	BW Pow	ver 99	.00 %		Auto	Ma
x dB Bandwidt	th		2.90)9 MHz	x dB		-26.	00 dB			
G							STATUS	5			

Plot 7-9. Occupied Bandwidth Plot (LTE Band 25/2 - 3MHz QPSK - Full RB)



Plot 7-10. Occupied Bandwidth Plot (LTE Band 25/2 - 3MHz 16-QAM - Full RB)

FCC ID: QLJMRU-19212326	PCTEST: Proad to be post of @electreck	PART 24 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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Plot 7-11. Occupied Bandwidth Plot (LTE Band 25/2 - 1.4MHz QPSK - Full RB)



Plot 7-12. Occupied Bandwidth Plot (LTE Band 25/2 - 1.4MHz 16-QAM - Full RB)

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7.4 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 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at 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 of any spurious emission is $43 + 10 \log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

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 20GHz (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 7-3. Test Instrument & Measurement Setup

Test Notes

Per Part 24, 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.

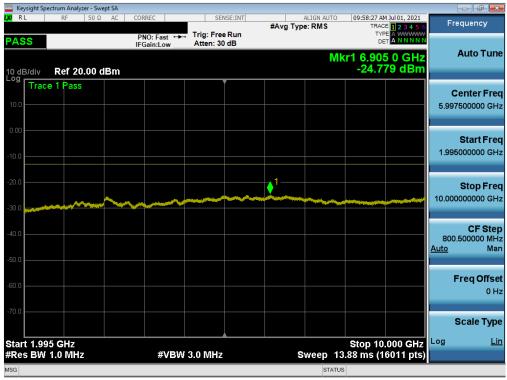
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LTE Band 25/2

	ectrum Analyzer		5A											
LXI RL	RF	50Ω A	AC (CORREC		SEN	SE:INT	#Ava	AL Type:	IGN AUTO		AM Jul 01, 2021	F	requency
PASS				PNO: Fa IFGain:L	ow	Trig: Free Atten: 30			, . , ,		т			Auto Turo
10 dB/div Log	Ref 20.0)0 dBi	m							M	kr1 1.92 -20	28 1 GHz .79 dBm		Auto Tune
Trac	e 1 Pass)								Center Freq
10.0													97	9.500000 MHz
0.00														Start Freq
-10.0													3	0.000000 MHz
-20.0												1		Stop Freq
-30.0													1.92	9000000 GHz
-30.0	1000,1000 21,2100000000		-			ender die den ander		and the second se		an a				
-40.0													18 <u>Auto</u>	CF Step 9.900000 MHz Man
-50.0														Indi
-60.0														Freq Offset
-70.0														0 Hz
-70.0														Scale Type
Start 0.03	00 GHz										Stop 1	.9290 GHz	Log	<u>Lin</u>
#Res BW				#	¢VBW	3.0 MHz			S	weep	2.519 ms	(4199 pts)		
MSG										STATU	IS			



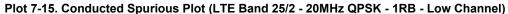


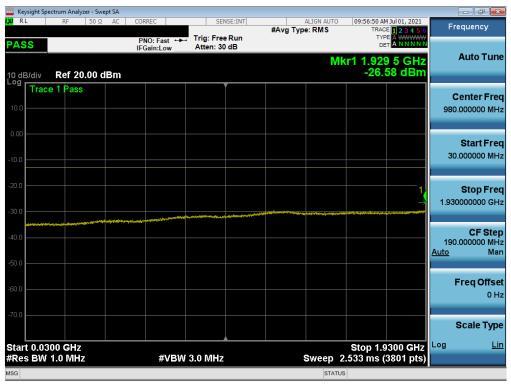
Plot 7-14. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - Low Channel)

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www.www.com.com.com.com.com.com.com.com.com.com					
LX RL RF 50Ω AC	CORREC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	09:58:46 AM Jul 01, 2021 TRACE 1 2 3 4 5 6	Frequency
PASS	PNO: Fast ++- IFGain:Low	Trig: Free Run Atten: 10 dB		TYPE A WWWWW DET A NNNNN	
	II Gam.Low		Mkr	1 18.592 5 GHz	Auto Tune
10 dB/div Ref 0.00 dBm				-36.568 dBm	
Trace 1 Pass		Ĭ			Center Freq
-10.0					15.00000000 GHz
-20.0					Start Freq
-30.0					10.000000000 GHz
-30.0					
-40.0					Stop Freq
and the second s					20.000000000 GHz
-50.0					
-60.0					CF Step
-00.0					1.00000000 GHz Auto Man
-70.0					
					Freq Offset
-80.0					0 Hz
-90.0					
00.0					Scale Type
				Oton 20 000 Ollo	Log Lin
Start 10.000 GHz #Res BW 1.0 MHz	#VBW	3.0 MHz	Sweep 25	Stop 20.000 GHz i.33 ms (20001 pts)	
MSG			STATUS		



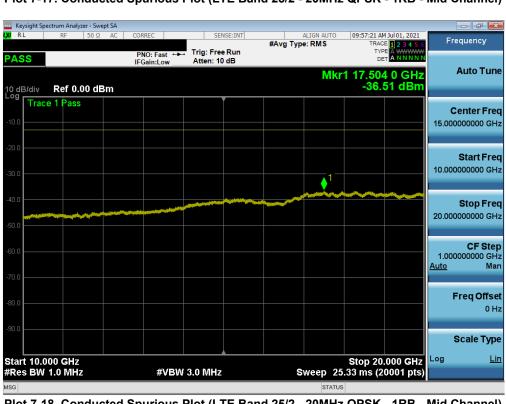


Plot 7-16. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - Mid Channel)

FCC ID: QLJMRU-19212326		PART 24 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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	Analyzer - Swept SA									- 0 .
LXIRL R	F 50 Ω AC	CORREC	SEN	SE:INT	#Avg Typ	ALIGN AUTO e: RMS		4 Jul 01, 2021	Free	quency
PASS		PNO: Fast ++ IFGain:Low	Trig: Free Atten: 30				TYP			
10 dB/div Re	ef 20.00 dBm					Mk	r1 6.92 -24.	4 0 GHz 80 dBm		Auto Tune
10.0	Pass									e nter Freq 500000 GHz
-10.0										Start Freq 000000 GHz
-20.0		~~~			1					Stop Freq 000000 GHz
-40.0									800.5 <u>Auto</u>	CF Step 000000 MHz Man
-60.0									F	r eq Offset 0 Hz
-70.0 Start 1.995 G	H7						Stop 10	.000 GHz	S Log	cale Type Lin
#Res BW 1.0		#VBW	3.0 MHz		s	weep 13	.88 ms (1	6011 pts)		_
MSG						STATUS				



Plot 7-17. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - Mid Channel)

Plot 7-18. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - Mid Channel)

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🔤 Keysight Spectrum Analyzer - Swept SA					
LXI RL RF 50Ω AC	CORREC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	09:55:29 AM Jul 01, 2021 TRACE 1 2 3 4 5 6	Frequency
PASS	PNO: Fast ++-	Trig: Free Run Atten: 30 dB	mitig type. time		
10 dB/div Ref 20.00 dBm			MI	kr1 1.927 5 GHz -28.76 dBm	Auto Tune
10.0					Center Freq 980.000000 MHz
-10.0					Start Freq 30.000000 MHz
-20.0		yles gas forfogen i se fogen van de person	and the second	1	Stop Freq 1.930000000 GHz
-40.0					CF Step 190.00000 MHz <u>Auto</u> Man
-60.0					Freq Offset 0 Hz
-70.0 Start 0.0300 GHz				Stop 1.9300 GHz	Scale Type
#Res BW 1.0 MHz	#VBW	3.0 MHz	Sweep 2	2.533 ms (3801 pts)	
MSG			STATU	S	

Plot 7-19. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - High Channel)



Plot 7-20. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - High Channel)

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	trum Analyzer - Swe										
L <mark>XI</mark> RL	RF 50 Ω	AC CC	RREC	SEI	NSE:INT	#Avg Typ	ALIGN AUTO		4 Jul 01, 2021	Fre	quency
PASS			PNO: Fast ↔ Gain:Low	► Trig: Free Atten: 10			Mkr	TYP			Auto Tune
Log	Ref 0.00 dE	3m			•			-36.6	9 5 GHz 11 dBm		
-10.0	1 Pass										e nter Freq 000000 GHz
-20.0											
											Start Freq
-30.0											
-40.0	-										Stop Freq
-50.0											
-60.0										1.000 <u>Auto</u>	CF Step 000000 GHz Man
-70.0											Wall
-80.0										F	re q Offset 0 Hz
-90.0											
Start 10.00								Stop 20		Log	cale Type
#Res BW 1			#VB۱	N 3.0 MHz		s	weep 25	5.0p 20 5.33 ms (2	.000 GHz 0001 pts)		201
MSG							STATUS	5			

Plot 7-21. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - High Channel)

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7.5 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 of any spurious emission is $43 + 10 \log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

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 ≥ 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 7-4. Test Instrument & Measurement Setup

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Test Notes

Per 24.238(a), 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 to demonstrate compliance with the out-of-band emissions limit. 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.

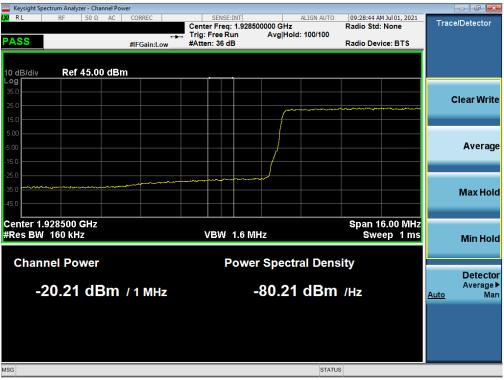
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Keysight Spec		er - Swep	ot SA											
KI RL	RF	50 Ω	AC	CORREC		SEI	VSE:INT			ALIGN AUTO		M Jul 01, 2021	Fr	equency
PASS				PNO: V IFGain:	Vide ↔ Low	Trig: Fre #Atten: 3			#Avg Typ	e: RMS	TYI Di	CE 1 2 3 4 5 6 PE A WWWW A NNNNN		
I0 dB/div	Ref 30.	00 di	Bm							Mkr	1 1.929 8 -25.	40 GHz 04 dBm		Auto Tune
-og 20.0	e 1 Pass							f	Mare Marine and	- Murren Jerren		mman		Center Free 0000000 GH
0.00													1.92	Start Fre 2000000 GH
10.0													1.93	Stop Fre 8000000 G⊦
	manne	and the second	and and and		a and the second se	and a grant of the second of the							Auto	CF Ste .600000 MH Ma
i0.0 i0.0														F req Offs 0 F
60.0														Scale Typ
Center 1.9											Span 1	6.00 MHz	Log	Li
#Res BW 2	240 kHz				#VBW	820 kHz				Sweep	1.000 ms (1001 pts)		
SG										STATU	JS			

Plot 7-22. Lower Band Edge Plot (LTE Band 25/2 - 20MHz QPSK - Full RB)



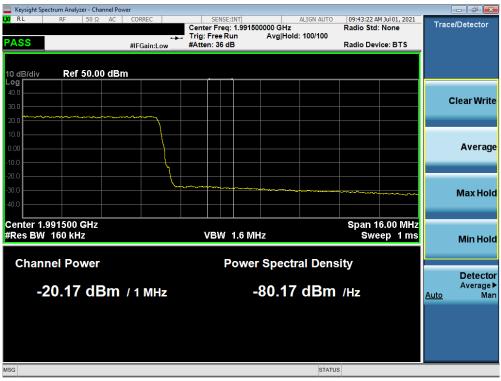
Plot 7-23. Extended Lower Band Edge Plot (LTE Band 25/2 - 20MHz QPSK - Full RB)

FCC ID: QLJMRU-19212326		PART 24 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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PASS PNO: Wide Trig: Free Run #Atten: 36 dB #Avg Type: RMS Trace D 38 4 st Def Atten: 26 dB Prequency 10 dB/div Ref 30.00 dBm -25.30 dBm -25.30 dBm Center Freq 1.99000000 GHz 200 Image: Start Frequency Start Frequency Start Frequency 100 Image: Start Frequency Image: Start Frequency Start Frequency 100 Image: Start Frequency Image: Start Frequency Image: Start Frequency 100 Image: Start Frequency Image: Start Frequency Image: Start Frequency Image: Start Frequency 100 Image: Start Frequency Image: Start Frequency Image: Start Frequency Image: Start Frequency 100 Image: Start Frequency Image: Start Frequency Image: Start Frequency <td< th=""><th></th><th>ectrum Analyzer - Sw</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></td<>		ectrum Analyzer - Sw									
PNO: Wide Trig: Free Run #Atten: 36 dB Trig: Free Run #Atten: 36 dB Trig: Free Run Mkr1 1.991 168 GHz Auto Tune 10 dB/div Ref 30.00 dBm -25.30 dBm Center Freq 10 dB/div Ref 30.00 dBm -25.30 dBm Center Freq 10 dB/div Ref 30.00 dBm -25.30 dBm Center Freq 10 dB/div Ref 30.00 dBm -25.30 dBm Center Freq 10 dB/div Ref 30.00 dBm -25.30 dBm Start Freq 10 dB/div Ref 30.00 dBm -25.30 dBm Start Freq 10 dB/div Ref 30.00 dBm -25.30 dBm Start Freq 10 dB/div Ref 30.00 dBm -25.30 dBm Start Freq 10 dB/div Ref 30.00 dBm -25.30 dBm Start Freq 10 dB/div Ref 30.00 dBm -25.30 dBm Start Freq 1.9900000 GHz Ref 30.00 MHz -25.30 dBm -25.30 dBm 20 dB/div Ref 30.00 MHz -25.30 dBm -25.30 dBm 20 dB/div Ref 30.00 MHz -25.30 dBm -25.30 dBm 20 dB/div Ref 30.00 MHz -25.30 dBm -25.30 dBm 20 dB/div Ref 30.00 MHz <	LXIRL	RF 50 Ω	AC	CORREC	SEI	NSE:INT	#Ava Tvr				Frequency
INKL 1.99 108 GH2 Odd/div Ref 30.00 dBm -25.30 dBm Center Freq 100 Center 100 </th <th>PASS</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>#***8 · JF</th> <th></th> <th>TYF DE</th> <th></th> <th>.</th>	PASS						#***8 · JF		TYF DE		.
113CE 1 P3S Center Freq 200 Start Freq 100 Sta	10 dB/div	Ref 30.00 (dBm					Mkr1	1.991 1 -25.3	68 GHz 30 dBm	Auto Tune
000 Start Freq 100 Stop Freq 200 Stop Freq <t< td=""><td>Irac</td><td>e 1 Pass</td><td>nkanonang</td><td></td><td>····</td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	Irac	e 1 Pass	nkanonang		····						
200 200 200 200 CHz 400 200 200 CHz 400 200 200 CHz 400 200 200 CHz 400 CH											
40.0 40.0 50.0	-10.0					1					
-600 Freq Offset 600 B Center 1.990000 GHz #VBW 820 kHz Span 16.00 MHz Log Lin	-30.0					mann	An we wanted a state of the sta	and the second	flor and a constant	Velapassophysics	1.600000 MHz
Center 1.990000 GHz #Res BW 240 kHz #VBW 820 kHz Sweep 1.000 ms (1001 pts)	-40.0										
#Res BW 240 kHz #VBW 820 kHz Sweep 1.000 ms (1001 pts)	-60.0										
				#VB)	V 820 kHz			Sween_1	Span 1 .000 ms (6.00 MHz 1001 pts)	Log <u>Lin</u>
	MSG				1909 C 1011 C				`	leor proj	

Plot 7-24. Upper Band Edge Plot (LTE Band 2 - 20MHz QPSK - Full RB)



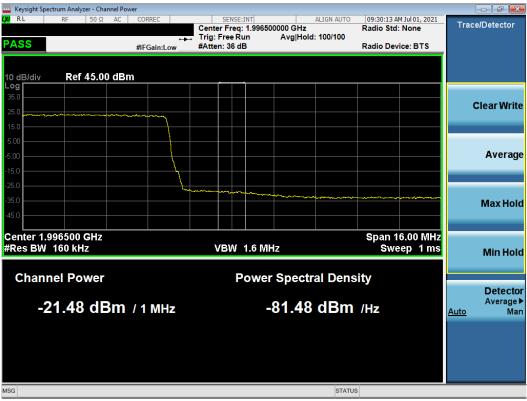
Plot 7-25. Extended Upper Band Edge Plot (LTE Band 2 - 20MHz QPSK – Full RB)

FCC ID: QLJMRU-19212326		PART 24 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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L <mark>XI</mark> RL I	RF 50 Ω	AC	CORREC		SEN	ISE:INT	#Ava	ALIGN A			M Jul 01, 2021	Fr	equency
PASS			PNO: Wide IFGain:Lov		Trig: Free #Atten: 3					TY D			
10 dB/div R	ef 30.00 d	Bm						Μ	kr1 ′	1.995 (-26.	320 GHz 16 dBm		Auto Tune
20.0 Trace 1	Pass		un mar	᠕᠂ᡁᠬᡔᡟᢦᢦᡕ	~								Center Freq 5000000 GHz
10.0													-
0.00												1.98	Start Freq 7000000 GHz
-10.0												2.00	Stop Freq 3000000 GHz
-20.0						1	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	80.a-					CF Step
-30.0										~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	nun hannan	1 <u>Auto</u>	.600000 MHz Man
-50.0													Freq Offset 0 Hz
-60.0													Scale Type
Center 1.995 #Res BW 240			#\	/BW/	820 kHz			Swee	n 1_(Span 1 100 ms	16.00 MHz (1001 pts)	Log	Lin
MSG									TATUS		(1001 pt3)		

Plot 7-26. Upper Band Edge Plot (LTE Band 25 - 20MHz QPSK – Full RB)



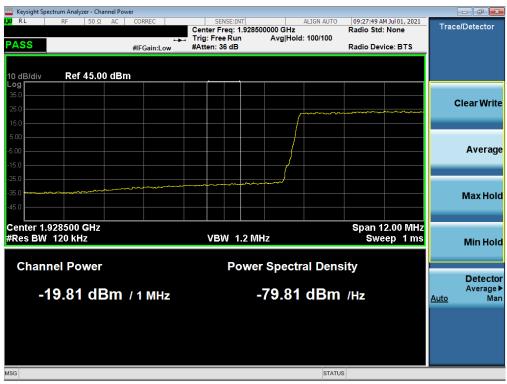
Plot 7-27. Extended Upper Band Edge Plot (LTE Band 25 - 20MHz QPSK – Full RB)

FCC ID: QLJMRU-19212326		PART 24 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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Keysight Spee														
XIRL	RF	50 Ω	AC	CORREC		SE	NSE:INT		#Avg Type	ALIGN AUTO		M Jul 01, 2021	Fi	requency
PASS				PNO: W IFGain:	lide ↔→ Low	Trig: Fre #Atten: 3			#7.18 1 JP		TY			
10 dB/div	Ref 30.	.00 di	Зm							Mkr1	1.929 7 -25.	′24 GHz 51 dBm		Auto Tune
Trace	e 1 Pass							m	www	man	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	m		Center Fred
20.0								(-						0000000 GH;
10.0								}						
10.0														Start Free
0.00							+						1.92	4000000 GHz
10.0														
													1.93	Stop Free 6000000 GHz
20.0						1								
30.0		~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	m	كسم							CF Step
······													Auto	1.200000 MH: Mar
40.0														
50.0														Freq Offse
														0 H:
60.0														Scale Type
Center 1.9 Res BW					#VBW	620 kHz				Sweep_1	Span 1 000 m <u>s</u> 000.	2.00 MHz 1001 pts)	Log	Lir
ISG										STATUS				

Plot 7-28. Lower Band Edge Plot (LTE Band 25/2 - 15MHz QPSK - Full RB)



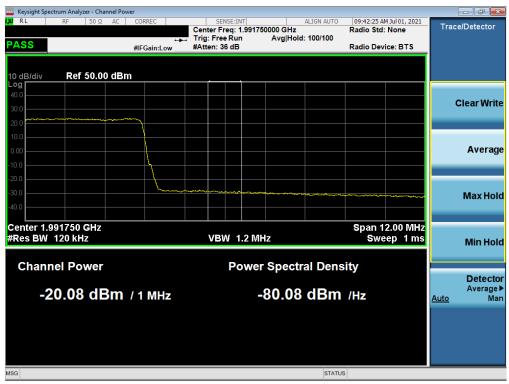
Plot 7-29. Extended Lower Band Edge Plot (LTE Band 25/2 - 15MHz QPSK – Full RB)

FCC ID: QLJMRU-19212326	PCTEST. Proof to be port of @element	PART 24 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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	ectrum Analyzer - Swej	pt SA								
LXI RL	RF 50 Ω	AC	CORREC	S	ENSE:INT	#Ava Tr	ALIGN AUTO	09:42:12 AM TRACE	Jul 01, 2021	Frequency
PASS			PNO: Wide IFGain:Low	Trig: Fr #Atten:				TYPE DET	A WWWWW A N N N N N	
10 dB/div Log	Ref 30.00 d	Bm					Mkr1	1.990 02 -24.9	24 GHz 07 dBm	Auto Tune
	e 1 Pass	~~~~	᠆᠆᠕᠕ᡁᡔ᠆᠆᠆ᡁ᠕	nny	Ĭ					Center Freq
20.0										1.990000000 GHz
10.0										Start Freq
0.00										1.984000000 GHz
-10.0										Stop Freq
-20.0					1					1.996000000 GHz
-30.0				\	-	·····	mann		khater and a start of	CF Step
										1.200000 MHz <u>Auto</u> Man
-40.0										Freq Offset
-50.0										0 Hz
-60.0										Scale Type
Center 1. #Res BW	990000 GHz 180 kHz		#VB	W 620 kH	z		Sweep 1	Span 12 000 ms (1.		
MSG							STATUS	5		

Plot 7-30. Upper Band Edge Plot (LTE Band 2 - 15MHz QPSK - Full RB)



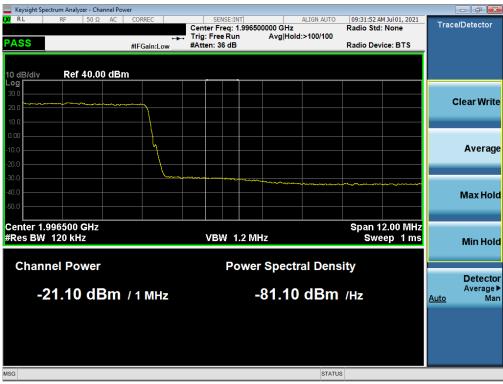
Plot 7-31. Extended Upper Band Edge Plot (LTE Band 2 - 15MHz QPSK – Full RB)

FCC ID: QLJMRU-19212326	PCTEST Hoad to be part of @ skimace	PART 24 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 22 of 61
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	ctrum Analyzer - Swep	t SA								
LXI RL	RF 50 Ω	AC COF	RREC		SENSE:INT	#Ava T	ALIGN AUTO	09:31:42 AM	Jul 01, 2021	Frequency
PASS			IO: Wide ← Gain:Low		Free Run n: 36 dB			TYP DE	A WWWWW A N N N N N	
10 dB/div Log	Ref 30.00 dE	3m					Mkr1	1.995 0 -27.0	60 GHz)5 dBm	Auto Tune
20.0	e 1 Pass	whentywernessee	***********	m						Center Freq 1.995000000 GHz
0.00										Start Freq 1.989000000 GHz
-10.0										Stop Freq 2.001000000 GHz
-30.0					L	mana	www.	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	m	CF Step 1.200000 MHz <u>Auto</u> Man
-40.0										Freq Offset 0 Hz
-60.0										Scale Type
Center 1.9 #Res BW	995000 GHz 180 kHz		#VB	W 620 k	Hz		Sweep 1	Span 12 .000 ms (*	2.00 10112	Log <u>Lin</u>
MSG							STATUS	`		

Plot 7-32. Upper Band Edge Plot (LTE Band 25 - 15MHz QPSK - Full RB)



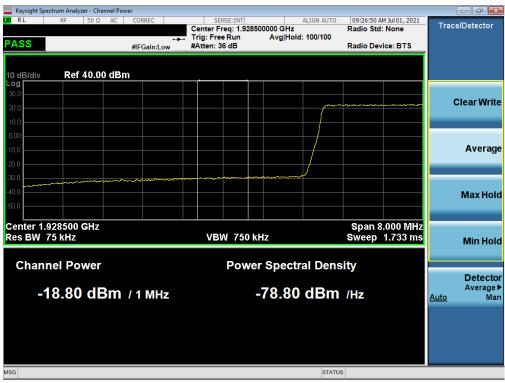
Plot 7-33. Extended Upper Band Edge Plot (LTE Band 25 - 15MHz QPSK – Full RB)

FCC ID: QLJMRU-19212326	PCTEST: Proat to be part of @ element	PART 24 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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Keysight Spe														
XURL	RF	50 Ω	AC	CORREC		SEI	NSE:INT		#Avg Typ	ALIGN AUTO		M Jul 01, 2021	F	requency
PASS				PNO: W IFGain:l	lide ↔ .ow	Trig: Free #Atten: 3			#*** 9 *19P		TYF			
10 dB/div	Ref 30	.00 di	Bm							Mkr1	1.929 9 -26.	028 GHz 00 dBm		Auto Tune
-og Trace	e 1 Pass							, m	had an	ythan an a	p-astronymenents	ay Astronoperation - Apr		Center Freq
20.0							j						1.93	30000000 GHz
10.0														Start Fred
0.00													1.92	26000000 GH2
-10.0														Stop Free
20.0							1						1.93	34000000 GH2
		manne	an and a start of the start of th	www	m	and and the state of the state	لمرتبه							CF Ster
30.0 													Auto	800.000 kH Mar
40.0														
-50.0														Freq Offse
														0 H:
-60.0														Scale Type
Center 1.9	20000	<u>~Ш-7</u>									Snap 9	.000 MHz	Log	Lin
Fers BW				3	#VBW	430 kHz			:	Sweep 4	span 8 .000 ms (.000 MHZ (1001 pts)		
ISG										STATUS				

Plot 7-34. Lower Band Edge Plot (LTE Band 25/2 - 10MHz QPSK - Full RB)



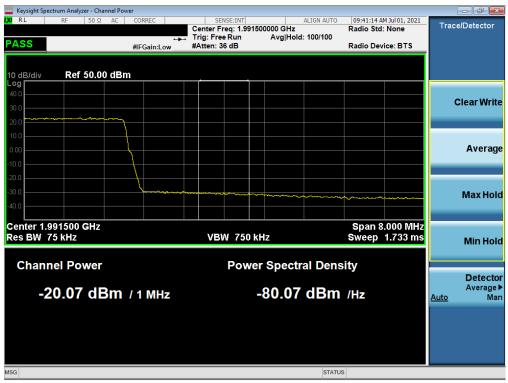
Plot 7-35. Extended Lower Band Edge Plot (LTE Band 25/2 - 10MHz QPSK – Full RB)

FCC ID: QLJMRU-19212326	PCTEST. Proof to be port of @element	PART 24 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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	ctrum Analyzer - Swe	pt SA									_	
LXI RL	RF 50 Ω	AC	CORREC		SEI	NSE:INT	#Av	ALIGN AUT g Type: RMS		AM Jul 01, 2021	Fr	equency
PASS			PNO: Wid IFGain:Lo		Trig: Fre #Atten: 3			g type: time	1			
10 dB/div Log	Ref 30.00 d	Bm						Mk	r1 1.990 -2€	144 GHz 5.38 dBm		Auto Tune
20.0	e 1 Pass April Andrew April 10	d _{hallo} nalaiyk _e .a	and and and and	******								Center Freq 0000000 GHz
0.00											1.98	Start Freq 6000000 GHz
-10.0											1.99	Stop Freq 4000000 GHz
-30.0							*****	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	YMMAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA		<u>Auto</u>	CF Step 800.000 kHz Man
-40.0												Freq Offset 0 Hz
-60.0												Scale Type
Center 1.9 #Res BW	990000 GHz 120 kHz		#\	/BW 4	30 kHz			Sweep	Span 4.000 ms	8.000 MHz (1001 pts)	Log	Lin
MSG									TUS			

Plot 7-36. Upper Band Edge Plot (LTE Band 2 - 10MHz QPSK - Full RB)



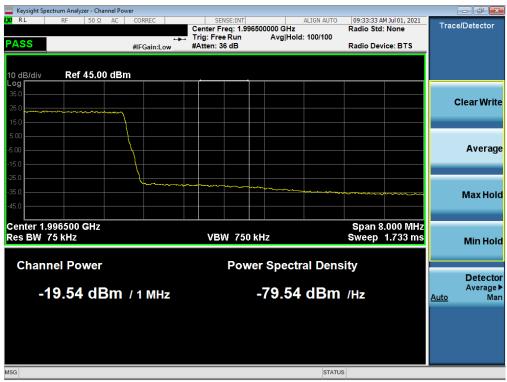
Plot 7-37. Extended Upper Band Edge Plot (LTE Band 2 - 10MHz QPSK – Full RB)

FCC ID: QLJMRU-19212326		PART 24 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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	ctrum Analyze										
L <mark>XI</mark> RL	RF	50 Ω AC	CORREC	SEI	NSE:INT	#Ava	ALIGN AUTO		4 Jul 01, 2021 E 1 2 3 4 5 6	Fr	equency
PASS			PNO: Wide ↔ IFGain:Low	. Trig: Fre #Atten: 3				TYP De			Auto Tune
10 dB/div Log	Ref 30.	00 dBm					Mkr1	1.995 1 -26.	20 GHz 29 dBm		Auto Tune
Irace	e 1 Pass	muren en marte	stander of the opposite of the second	my						c	enter Freq
20.0										1.99	5000000 GHz
10.0											Start Freq
0.00										1.99 [,]	1000000 GHz
-10.0											Stop Freq
-20.0					1					1.999	9000000 GHz
-30.0				Ļ	and the contractions	- March - March	one and our manufactor				CF Step
								and market market and	₩ ₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩ ₩₩	<u>Auto</u>	800.000 kHz Man
-40.0											Erog Offect
-50.0											F req Offset 0 Hz
-60.0											Scale Type
Contor 1 (Onen		Log	Scale Type
Center 1.9 #Res BW		ΠZ	#VBW	430 kHz			Sweep 4	span 8 1.000 ms (.000 MHz 1001 pts)		
MSG							STATU	s			

Plot 7-38. Upper Band Edge Plot (LTE Band 25 - 10MHz QPSK - Full RB)



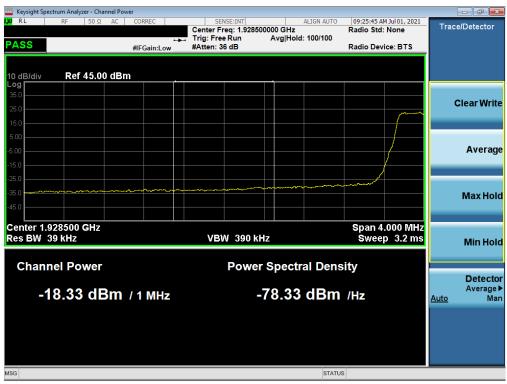
Plot 7-39. Extended Upper Band Edge Plot (LTE Band 25 - 10MHz QPSK – Full RB)

FCC ID: QLJMRU-19212326	PCTEST. Proof to be port of @element	PART 24 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager	
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weysight Spectrum Analyzer - Swept SA					
LXIRL RF 50Ω AC	CORREC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	09:25:37 AM Jul 01, 2021 TRACE 1 2 3 4 5 6	Frequency
PASS	PNO: Wide ↔ IFGain:Low	Trig: Free Run #Atten: 36 dB	- //		Auto Tune
10 dB/div Ref 30.00 dBm			Mkr	1 1.929 988 GHz -24.83 dBm	Auto Tune
Trace 1 Pass		Ĭ,	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		Center Freq
20.0					1.930000000 GHz
10.0					Start Freq
0.00					1.928000000 GHz
-10.0					Stop Freq
-20.0		1			1.932000000 GHz
-30.0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~			CF Step
					400.000 kHz <u>Auto</u> Man
-40.0					Freq Offset
-50.0					0 Hz
-60.0					Scale Type
Center 1.930000 GHz				Span 4.000 MHz	
#Res BW 62 kHz	#VBW	220 kHz	Sweep	2.000 ms (1001 pts)	
MSG			STAT	JS	

Plot 7-40. Lower Band Edge Plot (LTE Band 25/2 - 5MHz QPSK - Full RB)



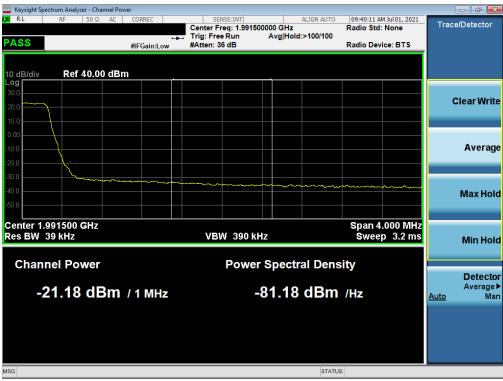
Plot 7-41. Extended Lower Band Edge Plot (LTE Band 25/2 - 5MHz QPSK – Full RB)

FCC ID: QLJMRU-19212326		PART 24 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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	ctrum Analyzer										X
LXI RL	RF	OΩ AC	CORREC	SEI	NSE:INT	#Ava Tv	ALIGN AUTO	09:40:01 AM	Jul 01, 2021	Frequency	у
PASS			PNO: Wide ↔ IFGain:Low	Trig: Free #Atten: 3		"		TYP DE		Auto T	Line
10 dB/div Log	Ref 30.0	0 dBm					Mkr1	1.990 0 -24.9	04 GHz 94 dBm	Autor	une
	e 1 Pass	·····	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	m						Center	
20.0										1.990000000	GHz
10.0										Start F	Freq
0.00										1.988000000	GHz
-10.0										Stop F	Freq
-20.0					1					1.992000000	GHz
-30.0					have						Step
							······	·····		400.000 <u>Auto</u>	0 kHz Man
-40.0										Freg Of	ffeot
-50.0										•	0 Hz
-60.0										Scale T	Type
Center 1.9		17						Snan 4	000 MHz	Log	<u>Lin</u>
#Res BW	62 kHz	12	#VBV	V 220 kHz			Sweep 2	.000 ms (1001 pt <u>s)</u>		
MSG							STATUS				

Plot 7-42. Upper Band Edge Plot (LTE Band 2 - 5MHz QPSK - Full RB)



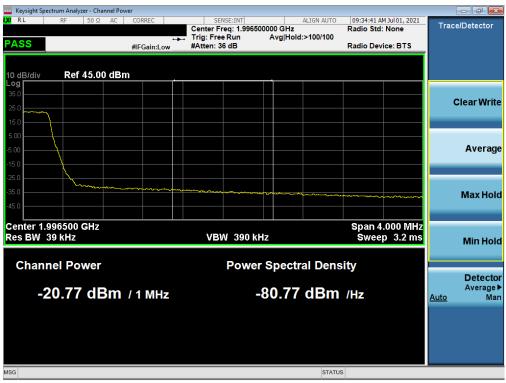
Plot 7-43. Extended Upper Band Edge Plot (LTE Band 2 - 5MHz QPSK – Full RB)

FCC ID: QLJMRU-19212326	PCTEST. Proof to be port of @element	PART 24 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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🚾 Keysight Spectrum Analyzer - Swe					
<mark>Χ/</mark> RL RF 50 Ω	AC CORREC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	09:34:33 AM Jul 01, 2021 TRACE 1 2 3 4 5 6	Frequency
PASS	PNO: Wide ↔ IFGain:Low	Trig: Free Run #Atten: 36 dB	- //		Auto Tune
10 dB/div Ref 30.00 c	iBm		Mkr1	1.995 004 GHz -26.25 dBm	Auto Tune
20.0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~				Center Freq
					1.995000000 GHz
10.0					Start Freq 1.993000000 GHz
0.00					1.993000000 GHz
-10.0					Stop Freq
-20.0		1			1.997000000 GHz
-30.0				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	CF Step 400.000 kHz
-40.0					<u>Auto</u> Man
-50.0					Freq Offset
-60.0					0 Hz
					Scale Type
Center 1.995000 GHz #Res BW 62 kHz	#VBW	220 kHz	Sweep 2	Span 4.000 MHz 2.000 ms (1001 pts)	Log <u>Lin</u>
MSG			STATU		

Plot 7-44. Upper Band Edge Plot (LTE Band 25 - 5MHz QPSK - Full RB)



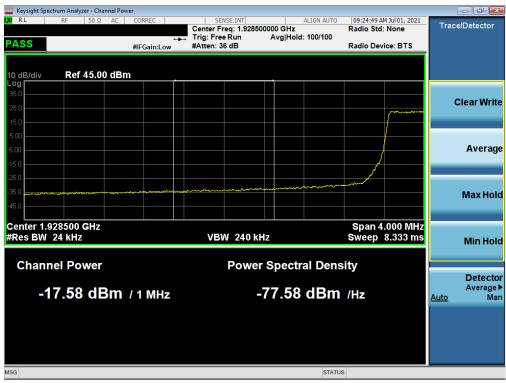
Plot 7-45. Extended Upper Band Edge Plot (LTE Band 25 - 5MHz QPSK – Full RB)

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🔤 Keysight Spectrum Analyzer - Swept SA					
LXI RL RF 50Ω AC	CORREC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	09:24:35 AM Jul 01, 2021 TRACE 1 2 3 4 5 6	Frequency
PASS	PNO: Wide ↔ IFGain:Low	Trig: Free Run #Atten: 36 dB	- //		
10 dB/div Ref 30.00 dBm			Mkr	1.929 996 GHz -18.02 dBm	Auto Tune
20.0			·····		Center Freq 1.930000000 GHz
0.00					Start Freq 1.928000000 GHz
-10.0		1			Stop Freq 1.932000000 GHz
-30.0					CF Step 400.000 kHz <u>Auto</u> Man
-50.0					Freq Offset 0 Hz
-60.0					Scale Type
Center 1.930000 GHz #Res BW 36 kHz	#VBW	120 kHz	Sweep	Span 4.000 MHz 2.000 ms (1001 pts)	Log <u>Lin</u>
MSG			STATU		

Plot 7-46. Lower Band Edge Plot (LTE Band 25/2 - 3MHz QPSK - Full RB)



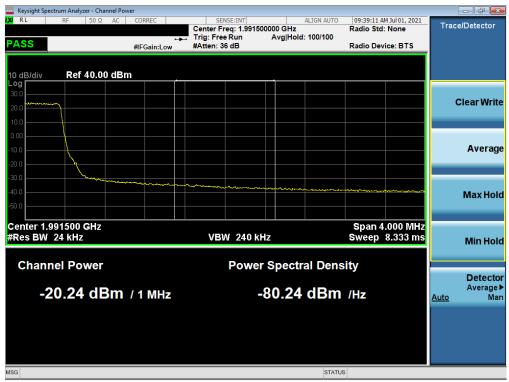
Plot 7-47. Extended Lower Band Edge Plot (LTE Band 25/2 - 3MHz QPSK – Full RB)

FCC ID: QLJMRU-19212326	PCTEST Hoad to be part of @ skimace	PART 24 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager		
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	ectrum Analyzer - Swe										
LXI RL	RF 50 Ω	AC CO	RREC	SEI	SE:INT	#Avg Ty	ALIGN AUTO		4 Jul 01, 2021 E 1 2 3 4 5 6	Fr	equency
PASS			NO: Wide ↔ Gain:Low	. Trig: Free #Atten: 3				TYF De			Auto Tuno
10 dB/div Log	Ref 30.00 d	IBm					Mkr	1 1.990 0 -17.	04 GHz 93 dBm		Auto Tune
20.0	e 1 Pass	~~~~	· · · · · ·								enter Freq 0000000 GHz
0.00										1.988	Start Freq 3000000 GHz
-10.0					1					1.992	Stop Freq 2000000 GHz
-30.0					and the second s					<u>Auto</u>	CF Step 400.000 kHz Man
-50.0											F req Offset 0 Hz
-60.0	990000 GHz							Span 4	.000 MHz		Scale Type <u>Lin</u>
#Res BW	36 kHz		#VBW	120 kHz			Sweep	2.000 ms (1001 pts)		
MSG							STATU	JS			

Plot 7-48. Upper Band Edge Plot (LTE Band 2 - 3MHz QPSK - Full RB)



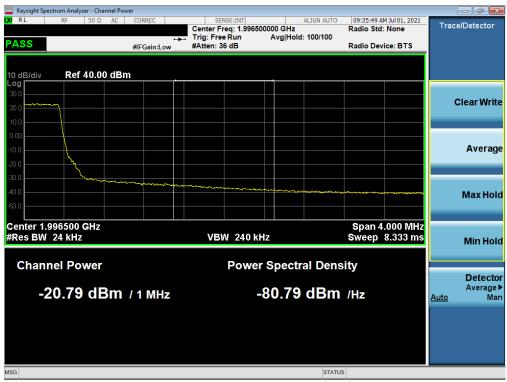
Plot 7-49. Extended Upper Band Edge Plot (LTE Band 2 - 3MHz QPSK – Full RB)

FCC ID: QLJMRU-19212326	PCTEST. Proof to be port of @element	PART 24 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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	ectrum Analyz		ot SA										
XI RL	RF	50 Ω	AC	CORREC		SE	NSE:INT	#Ava T	ALIGN AUTO		4 Jul 01, 2021	Fr	equency
PASS				PNO: Wi IFGain:L		Trig: Fre #Atten: 3				1.995 0			Auto Tune
10 dB/div	Ref 30	.00 d	Bm							-18.	89 dBm		
20.0	e 1 Pass	~~~	~~~~~		~~~~								Center Fred 5000000 GH:
10.0												1 99	Start Free
-10.0							.1						Stop Free
20.0												1.99	7000000 GH CF Stei
40.0								~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~		~~~ <u>~</u>	<u>Auto</u>	400.000 kH Ma
50.0													Freq Offse 0 H
60.0												Log	Scale Type
Center 1.9 #Res BW		GHZ		#	VBW	120 kHz			Sweep 2	Span 4 2.000 m <u>s (</u>	.000 MHz 1001 pts)	LUg	<u></u>
ISG									STATU				

Plot 7-50. Upper Band Edge Plot (LTE Band 25 - 3MHz QPSK - Full RB)



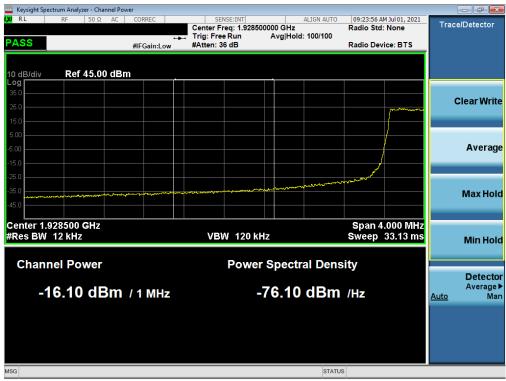
Plot 7-51. Extended Upper Band Edge Plot (LTE Band 25 - 3MHz QPSK – Full RB)

FCC ID: QLJMRU-19212326		PART 24 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager		
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www.www.com.com.com.com.com.com.com.com.com.com									
LXI RL RF 50Ω AC	CORREC	SEN	SE:INT	#Avg Typ	ALIGN AUTO		4 Jul 01, 2021	Fr	requency
PASS 10 dB/div Ref 30.00 dBm	PNO: Wide ↔ IFGain:Low	Trig: Free #Atten: 36				TYF DE 1.929 9	96 GHz 24 dBm		Auto Tune
20.0				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~				Center Freq 0000000 GHz
0.00								1.92	Start Freq 8000000 GHz
-10.0			1					1.93	Stop Freq 2000000 GHz
-30.0						L.	hulun	<u>Auto</u>	CF Step 400.000 kHz Man
-50.0									Freq Offsel 0 Hz
						0	000 8411-		Scale Type
Center 1.930000 GHz #Res BW 18 kHz	#VBW	56 kHz		:	Sweep 4.	span 4 800 ms (.000 MHz 1001 pts)		
MSG					STATUS				

Plot 7-52. Lower Band Edge Plot (LTE Band 25/2 - 1.4MHz QPSK - Full RB)



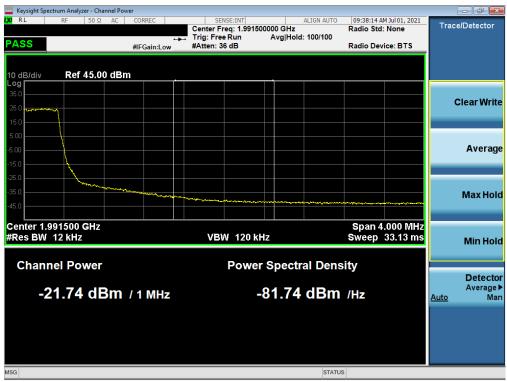
Plot 7-53. Extended Lower Band Edge Plot (LTE Band 25/2 – 1.4MHz QPSK – Full RB)

FCC ID: QLJMRU-19212326		PART 24 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager	
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🔤 Keysight Spectrum Analyzer - Swept SA					
LX RL RF 50 Ω AC	CORREC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	09:38:05 AM Jul 01, 2021 TRACE 1 2 3 4 5 6	Frequency
PASS	PNO: Wide ↔ IFGain:Low	Trig: Free Run #Atten: 36 dB			Auto Tune
10 dB/div Ref 30.00 dBm			MKr1	1.990 004 GHz -20.50 dBm	
20.0 Trace 1 Pass		mm			Center Freq 1.99000000 GHz
10.0					
0.00					Start Freq 1.988000000 GHz
-10.0					Stop Freq 1.992000000 GHz
-30.0			-		CF Step 400.000 kHz
-40.0			- manana	man	<u>Auto</u> Man
-50.0					Freq Offset 0 Hz
-60.0					Scale Type
Center 1.990000 GHz #Res BW 18 kHz	#VBW	56 kHz	Sweep 4	Span 4.000 MHz I.800 ms (1001 pts)	Log <u>Lin</u>
MSG			STATU	S	

Plot 7-54. Upper Band Edge Plot (LTE Band 2 – 1.4MHz QPSK – Full RB)



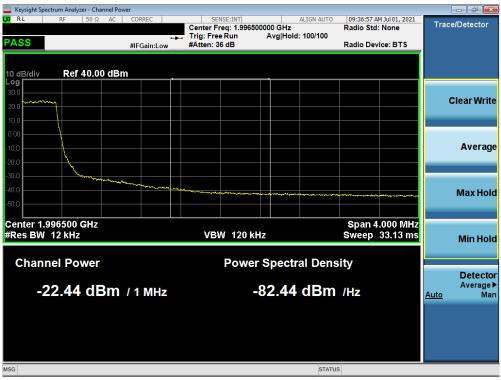
Plot 7-55. Extended Upper Band Edge Plot (LTE Band 2 – 1.4MHz QPSK – Full RB)

FCC ID: QLJMRU-19212326	PCTEST. Proof to be port of @element	PART 24 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager		
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Keysight Spectrum											
L <mark>XI</mark> RL F	RF 50 Ω	AC COP	REC	SE	NSE:INT	#Avg T	ALIGN AUTO		4 Jul 01, 2021	Fr	equency
PASS			IO: Wide ↔ Gain:Low	Trig: Fre #Atten: 3		•		TYF De			Auto Tune
10 dB/div Re	ef 30.00 d	Bm					Mkr1	1.995 0 -21.	04 GHz 33 dBm		Autorune
Trace 1	Pass	lv	$\gamma \gamma $	m	Ĭ						Center Freq
20.0										1.99	5000000 GHz
10.0											Start Freq
0.00										1.99	3000000 GHz
-10.0											Stop Freq
-20.0				1	1					1.99	7000000 GHz
-30.0					man						CF Step 400.000 kHz
-40.0						- ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	mm	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		<u>Auto</u>	Man
-50.0											Freq Offset
											0 Hz
-60.0											Scale Type
Center 1.995	000 GH <u>z</u>			L	^			Span 4	.000 MHz	Log	<u>Lin</u>
#Res BW 18			#VBW	56 kHz			Sweep 4	.800 ms (1001 pts)		
MSG							STATU	S			

Plot 7-56. Upper Band Edge Plot (LTE Band 25 – 1.4MHz QPSK – Full RB)



Plot 7-57. Extended Upper Band Edge Plot (LTE Band 25 – 1.4MHz QPSK – Full RB)

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7.6 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 ≥ 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. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

Test Setup

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



Figure 7-5. Test Instrument & Measurement Setup

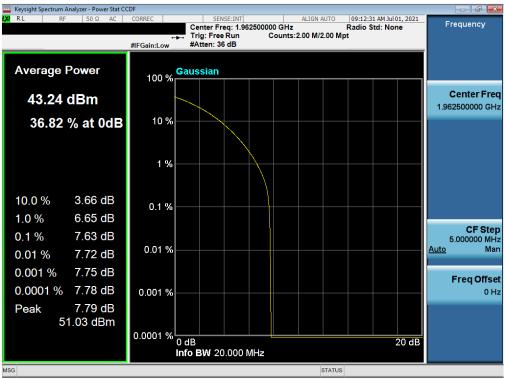
Test Notes

None.

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LTE Band 25/2





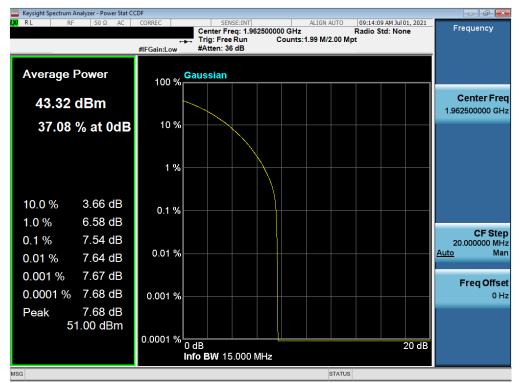


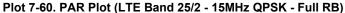
Plot 7-59. PAR Plot (LTE Band 25/2 - 20MHz 256-QAM - Full RB)

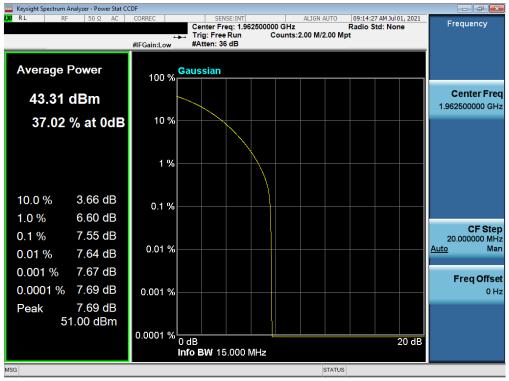
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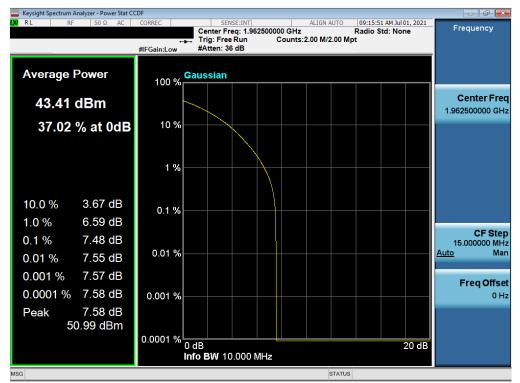


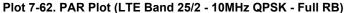


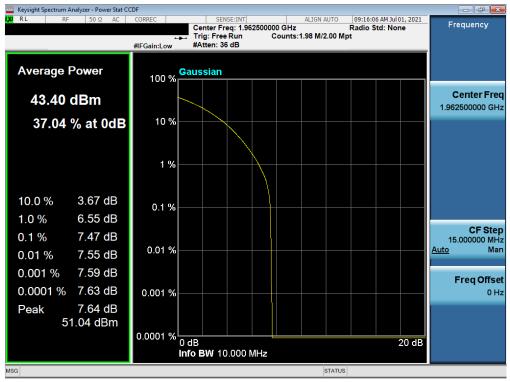
Plot 7-61. PAR Plot (LTE Band 25/2 - 15MHz 256-QAM - Full RB)

FCC ID: QLJMRU-19212326	PCTEST: Proad to be post of @electreck	PART 24 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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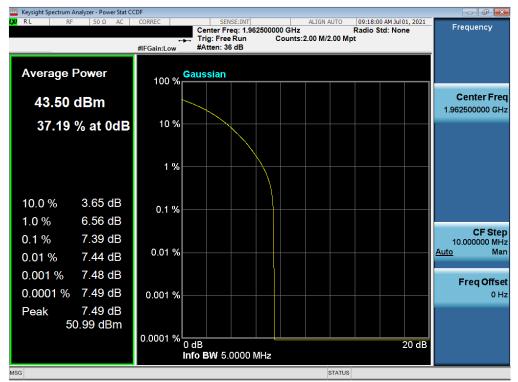


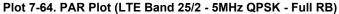


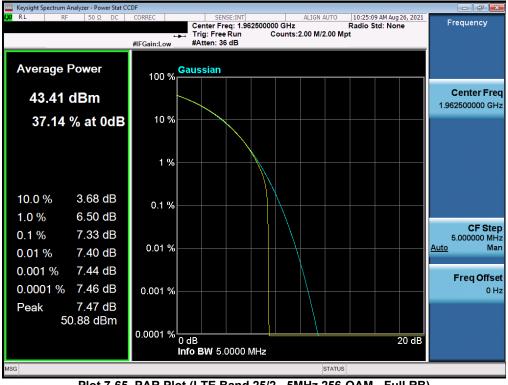
Plot 7-63. PAR Plot (LTE Band 25/2 - 10MHz 256-QAM - Full RB)

FCC ID: QLJMRU-19212326		PART 24 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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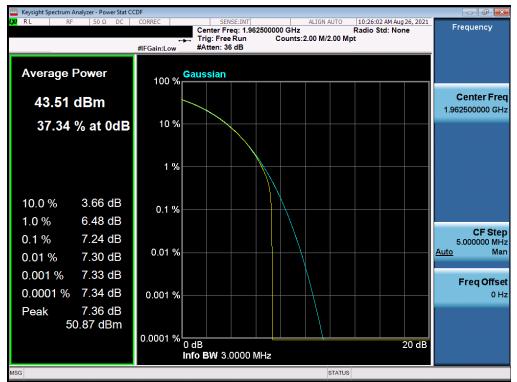


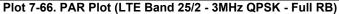


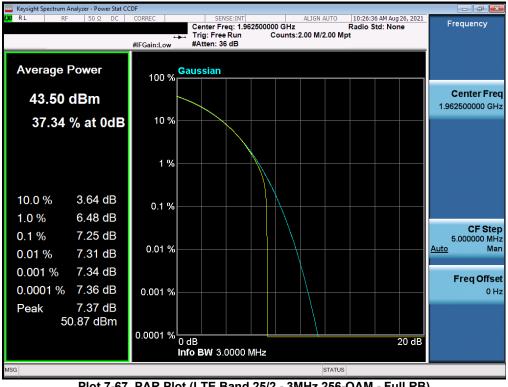
Plot 7-65. PAR Plot (LTE Band 25/2 - 5MHz 256-QAM - Full RB)

FCC ID: QLJMRU-19212326		PART 24 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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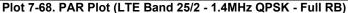


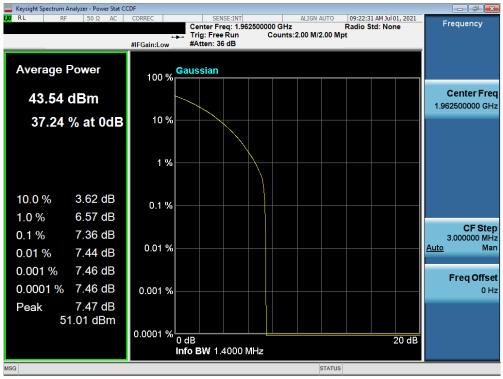
Plot 7-67. PAR Plot (LTE Band 25/2 - 3MHz 256-QAM - Full RB)

FCC ID: QLJMRU-19212326		PART 24 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager
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Plot 7-69. PAR Plot (LTE Band 25/2 - 1.4MHz 256-QAM - Full RB

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7.7 Radiated Spurious Emissions Measurements

Test Overview

Radiated spurious emissions measurements are performed as average/RMS measurements 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 \geq 2 x span / RBW
- 5. Detector = RMS
- 6. Trace mode = Average (Max Hold for pulsed emissions)
- 7. The trace was allowed to stabilize

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<u>Test Setup</u>

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

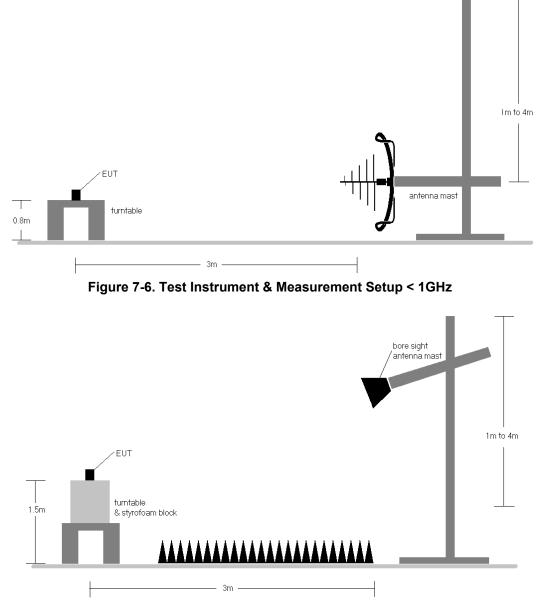


Figure 7-7. Test Instrument & Measurement Setup >1 GHz

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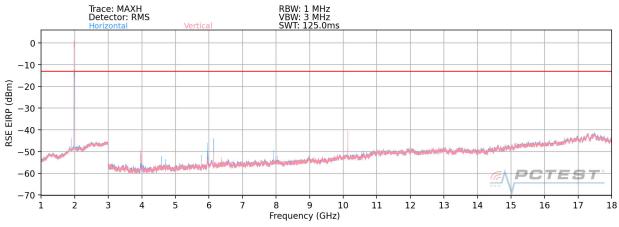
Test Notes

- 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 25/2



Plot 7-70. Radiated Spurious Plot (LTE Band 25/2)

Bandwidth (MHz):	20
Frequency (MHz):	1940.0
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]
3880.0	Н	144	84	-60.27	3.34	50.07	-45.19	-13.00	-32.19
5820.0	Н	152	160	-62.51	5.77	50.26	-45.00	-13.00	-32.00
7760.0	Н	-	-	-74.81	7.63	39.82	-55.44	-13.00	-42.44
9700.0	Н	-	-	-75.74	10.68	41.94	-53.32	-13.00	-40.32
11640.0	Н	-	-	-75.99	13.34	44.35	-50.91	-13.00	-37.91
13580.0	Н	-	-	-76.00	13.81	44.81	-50.45	-13.00	-37.45

Table 7-3. Radiated Spurious Data (LTE Band 25/2 – Low Channel)

т

20
1962.5
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]
3925.0	Н	175	91	-61.60	3.25	48.65	-46.61	-13.00	-33.61
5887.5	Н	151	157	-63.95	5.85	48.90	-46.36	-13.00	-33.36
7850.0	Н	-	-	-75.07	8.75	40.68	-54.58	-13.00	-41.58
9812.5	Н	400	293	-71.11	11.15	47.04	-48.22	-13.00	-35.22
11775.0	Н	194	311	-73.04	14.08	48.04	-47.22	-13.00	-34.22
13737.5	Н	-	-	-75.95	14.68	45.73	-49.53	-13.00	-36.53
15700.0	Н	-	-	-75.84	17.59	48.75	-46.51	-13.00	-33.51

Table 7-4. Radiated Spurious Data (LTE Band 25/2 – Mid Channel)

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	Aut Dal	Antenna	Turntable	Analyzer	4501	Field	EIRP Spurious	
RBW / VBW:	1MHz	/ 3MHz						
Detector / Trace Mode:	RMS / A	Average						
RB / Offset:	1 /	50						
Frequency (MHz):	198	35.0						
Bandwidth (MHz):	2	0						

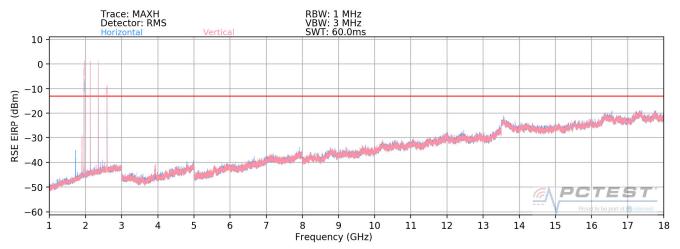
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3970.00	Н	119	92	-62.83	4.15	48.32	-46.93	-13.00	-33.93
5955.00	Н	125	142	-70.11	7.65	44.54	-50.72	-13.00	-37.72
7940.00	Н	142	159	-72.67	8.72	43.05	-52.21	-13.00	-39.21
9925.00	Н	-	-	-75.62	11.30	42.68	-52.58	-13.00	-39.58
11910.00	Н	-	-	-75.81	14.69	45.88	-49.37	-13.00	-36.37

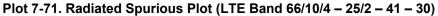
Table 7-5. Radiated Spurious Data (LTE Band 25/2 – High Channel)

FCC ID: QLJMRU-19212326	PCTEST: Prood to be port of @sitemate	PART 24 MEASUREMENT REPORT	Tecore	Approved by: Technical Manager	
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LTE Band 66/10/4, Band 25/2, Band 41, Band 30





Mode:	LTE Band 66 - 25 - 41 - 30
Bandwidth (MHz):	20 - 20 - 20 - 20
Frequency (MHz):	1960 + 2132.5 + 2593 + 2355
RB / Offset:	1 / 50

V V V	257 260	118 111	-64.84	2.42	44.58	-50.68	-13.00	-37.68
V	260	111	00.00			00.00	10.00	-31.00
-			-66.93	2.35	42.42	-52.84	-13.00	-39.84
	-	-	-70.77	5.98	42.21	-53.05	-13.00	-40.05
V	146	267	-67.13	6.24	46.11	-49.15	-13.00	-36.15
V	-	-	-72.37	7.52	42.15	-53.11	-13.00	-40.11
V	101	222	-71.24	14.31	50.07	-45.19	-13.00	-32.19
V	168	147	-70.66	10.40	46.74	-48.51	-13.00	-35.51
V	122	180	-72.88	14.31	48.43	-46.83	-13.00	-33.83
V	285	193	-70.91	15.57	51.66	-43.60	-13.00	-30.60
V	114	217	-72.79	18.53	52.74	-42.52	-13.00	-29.52
V	-	-	-72.50	21.21	55.71	-39.54	-13.00	-26.54
V	120	234	-72.68	21.70	56.02	-39.24	-13.00	-26.24
11111	V V V V V V V V V V	V - V 101 V 168 V 122 V 285 V 114 V - V 120	V - - V 101 222 V 168 147 V 122 180 V 285 193 V 114 217 V - - V 120 234	V - - -72.37 V 101 222 -71.24 V 168 147 -70.66 V 122 180 -72.88 V 285 193 -70.91 V 114 217 -72.79 V - - -72.50 V 120 234 -72.68	V - - -72.37 7.52 V 101 222 -71.24 14.31 V 168 147 -70.66 10.40 V 122 180 -72.88 14.31 V 285 193 -70.91 15.57 V 114 217 -72.79 18.53 V - - -72.50 21.21 V 120 234 -72.68 21.70	V - -72.37 7.52 42.15 V 101 222 -71.24 14.31 50.07 V 168 147 -70.66 10.40 46.74 V 122 180 -72.88 14.31 48.43 V 285 193 -70.91 15.57 51.66 V 114 217 -72.79 18.53 52.74 V - - -72.50 21.21 55.71 V 120 234 -72.68 21.70 56.02	VV101222-71.2414.3150.07-45.19V168147-70.6610.4046.74-48.51V122180-72.8814.3148.43-46.83V285193-70.9115.5751.66-43.60V114217-72.7918.5352.74-42.52V72.5021.2155.71-39.54V120234-72.6821.7056.02-39.24	V - -72.37 7.52 42.15 -53.11 -13.00 V 101 222 -71.24 14.31 50.07 -45.19 -13.00 V 168 147 -70.66 10.40 46.74 -48.51 -13.00 V 122 180 -72.88 14.31 48.43 -46.83 -13.00 V 285 193 -70.91 15.57 51.66 -43.60 -13.00 V 114 217 -72.79 18.53 52.74 -42.52 -13.00 V - - -72.50 21.21 55.71 -39.54 -13.00

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

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7.8 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

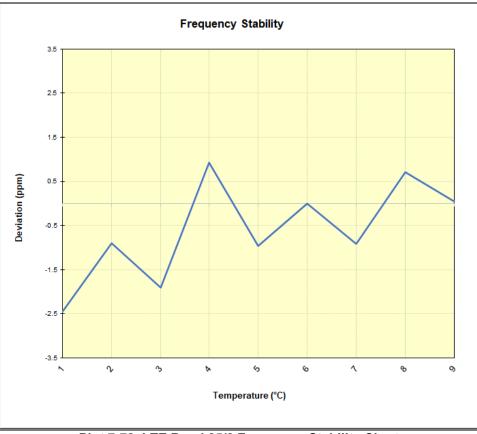
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LTE Band 25/2

LTE Band 25/2							
	Operating F	requency (Hz):	1,962,5]			
	Ref.	Voltage (VAC):	120]			
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)		
		- 30	1,962,503,237	-4,787	-0.0002439		
100 %	120.00	- 20	1,962,506,264	-1,760	-0.0000897		
		- 10	1,962,504,284	-3,740	-0.0001906		
		0	1,962,509,836	1,812	0.0000923		
		+ 10	1,962,506,145	-1,879	-0.0000957		
		+ 20 (Ref)	1,962,508,024	0	0.0000000		
		+ 30	1,962,506,240	-1,784	-0.0000909		
		+ 40	1,962,509,424	1,400	0.0000713		
		+ 50	1,962,508,121	97	0.0000049		
85 %	102.00	+ 20	1,962,507,444	-580	-0.0000296		
115 %	138.00	+ 20	1,962,507,011	-1,013	-0.0000516		

Table 7-7. LTE Band 25/2 Frequency Stability Data





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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 24 of the FCC rules.

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