



Report No.: FG271554J

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Page Number

# FCC RADIO TEST REPORT

FCC ID : UZ7TC78A1

**Equipment**: Touch Computer

Brand Name : Zebra Model Name : TC78A1

**Applicant**: Zebra Technologies Corporation

1 Zebra Plaza, Holtsville, NY 11742

Manufacturer : Zebra Technologies Corporation

1 Zebra Plaza, Holtsville, NY 11742

Standard : FCC 47 CFR Part 2, 96

The product was received on Aug. 09, 2022 and testing was performed from Aug. 26, 2022 to Oct. 11, 2022. We, Sporton International Inc. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA-603-E and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: Louis Wu

TEL: 886-3-327-3456

Louis Wu

Sporton International Inc. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)

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**Appendix A. Test Results of Conducted Test** 

**Appendix B. Test Results of Radiated Test** 

**Appendix C. Test Setup Photographs** 

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# History of this test report

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Report No.	Version	Description	Issued Date
FG271554J	01	Initial issue of report	Oct. 21, 2022

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### **Summary of Test Result**

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Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark		
3.2	§2.1046	Conducted Output Power	Reporting only	-		
3.3	§96.41	Peak-to-Average Ratio	Pass			
3.4	§96.41	Effective Isotropic Radiated Power	Pass	-		
3.5	§2.1049 §96.41 Occupied Bandwidth		Reporting only	-		
3.6	§2.1051 §96.41	Conducted Band Edge Measurement	Pass	-		
3.7	§2.1051 §96.41	Conducted Spurious Emission	Pass			
3.8 §2.1055		Frequency Stability for Temperature & Voltage	Pass	-		
\$2.1051 4.4 \$96.41		Radiated Spurious Emission	Pass	Under limit 7.91 dB at 14724.000 MHz		

#### **Declaration of Conformity:**

- The test results (PASS/FAIL) with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
   It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results.
- 2. The measurement uncertainty please refer to this report "Uncertainty of Evaluation".

### **Comments and Explanations:**

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

Reviewed by: Wei Chen Report Producer: Cindy Liu

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# 1 General Description

# 1.1 Product Feature of Equipment Under Test

1	Product Feature
Equipment	Touch Computer
Brand Name	Zebra
Model Name	TC78A1
FCC ID	UZ7TC78A1
Sample 1	SE5500 + Premium config
Sample 2	SE4770 + Base config
Sample 3	SE5500 + Base config
	GSM/EGPRS/WCDMA/HSPA/LTE/5G NR/NFC/GNSS
	WLAN 11a/b/g/n HT20/HT40
EUT supports Radios application	WLAN 11ac VHT20/VHT40/VHT80/VHT160
	WLAN 11ax HE20/HE40/HE80/HE160
	Bluetooth BR/EDR/LE
HW Version	EV2
SW Version	athena_A11_userdebug_GMS_RelKey_2022-07-14-173 3_product_SE
MFD	11JUN22
EUT Stage	Identical Prototype

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**Remark:** The above EUT's information was declared by manufacturer.

	Specification of Accessories									
Adapter	<b>Brand Name</b>	Zebra	Part Number	PWR-WUA5V12W0US						
Battery 1X	<b>Brand Name</b>	Zebra	Part Number	BT-000442-0020						
Battery 1.5X	<b>Brand Name</b>	Zebra	Part Number	BT-000442-0820						
Wireless Battery	<b>Brand Name</b>	Zebra	Part Number	BT-000442-002A						
USB TYPE A to TYPE C cable	<b>Brand Name</b>	Zebra	Part Number	CBL-TC5X-USBC2A-01						
USB TYPE C to 3.5mm audio connector	Brand Name	Zebra	Part Number	ADP-USBC-35MM1-01						
3.5mm Earphone	<b>Brand Name</b>	Zebra	Part Number	HDST-35MM-PTVP-01						
USB TYPE C Earphone	<b>Brand Name</b>	Zebra	Part Number	HPST-USBC-PTT1-01						
Trigger Handle	<b>Brand Name</b>	Zebra	Part Number	TRG-NGTC5-ELEC-01						
Soft Holster	<b>Brand Name</b>	Zebra	Part Number	SG-NGTC5TC7-HLSTR-01						
TC53/TC58 RUGGED BOOT	<b>Brand Name</b>	Zebra	Part Number	SG-NGTC5EXO1-01						

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### 1.2 Product Specification of Equipment Under Test

Product Specification is subject to this standard							
Tx Frequency	3552.5 MHz ~ 3697.5 MHz						
Rx Frequency	3552.5 MHz ~ 3697.5 MHz						
Bandwidth	5 MHz / 10 MHz / 15 MHz / 20 MHz						
Maximum Output Bower to Antonna	LTE Band 48: 21.76 dBm						
Maximum Output Power to Antenna	LTE Band 48C: 21.90 dBm						
Antenna Type	<ant. 11="">: PIFA Antenna</ant.>						
Antenna Type	<ant. 12="">: PIFA Antenna</ant.>						
Antenna Gain	<b><ant. 11=""></ant.></b> : -0.48 dBi						
Antenna Gam	<b><ant. 12=""></ant.></b> : 0.43 dBi						
Type of Modulation	PI/2 BPSK / QPSK / 16QAM / 64QAM / 256QAM						

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**Remark:** The above EUT's information was declared by manufacturer. Please refer to Comments and Explanations in report summary.

### 1.3 Modification of EUT

No modifications are made to the EUT during all test items.

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### 1.4 Testing Location

Test Site	Sporton International Inc. EMC & Wireless Communications Laboratory
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	Sporton Site No.
Test Site No.	TH03-HY
Test Engineer	George Chen
Temperature (°C)	23.4~25.2
Relative Humidity (%)	52~59

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Test Site	Sporton International Inc. Wensan Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	Sporton Site No.
rest site No.	03CH12-HY (TAF Code: 3786)
Test Engineer	Jack Cheng, Wilson Wu, Jesse Fan and Tim Lee
Temperature (°C)	20~25
Relative Humidity (%)	50~60
Remark	The Radiated Spurious Emission test item subcontracted to Sporton International Inc. Wensan Laboratory.

Note: The test site complies with ANSI C63.4 2014 requirement.

FCC Designation No.: TW1190 and TW3786

### 1.5 Applied Standards

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

- + ANSI C63.26-2015
- ◆ ANSI / TIA-603-E
- FCC 47 CFR Part 2, 96
- FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- FCC KDB 940660 D01 Part 96 CBRS Eqpt v03
- FCC KDB 412172 D01 Determining ERP and EIRP v01r01
- FCC KDB 414788 D01 Radiated Test Site v01r01

#### Remark:

- 1. All test items were verified and recorded according to the standards and without any deviation during the test.
- 2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.
- 3. The TAF code is not including all the FCC KDB listed without accreditation.

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## 2 Test Configuration of Equipment Under Test

### 2.1 Test Mode

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

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For radiated measurement, the measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and adjusting the measurement antenna orientation, following C63.26 exploratory test procedures and only the worst case emissions were reported in this report.

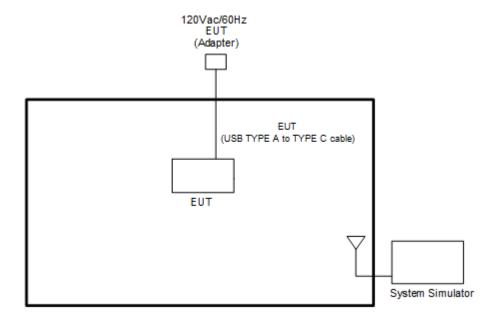
			Ва	ndwid	Ith (MI	Hz)			Mod	ulation			RB#		Test	Chai	nnel
Test Items	Band	1.4	3	5	10	15	20	QPSK	16QAM	64QAM	256QAM	1	Half	Full	L	М	Н
Max. Output Power	48	-	-	v	v	v	v	v	٧	v	v	٧	v	v	٧	v	v
26dB and 99% Bandwidth	48	-	-	v	v	v	v	v	v	v	v			v		v	
Conducted Band Edge	48	-	-	v	v	v	v	v	٧	v	v	٧		v	v	v	v
Peak-to-Avera ge Ratio	48	-	-				v	v	٧	v	v			v		v	
Conducted Spurious Emission	48	-	-	v	v	v	v	v				٧			v	v	v
E.I.R.P	48	-	-	v	٧	v	v	v	٧	v	v		ľ	Max. F	Powe	r	
Frequency Stability	48	-	-		v			v				٧				v	
Radiated Spurious Emission	48	48 Worst Case v v v								v							
Remark	<ol> <li>The mark "v" means that this configuration is chosen for testing</li> <li>The mark "-" means that this bandwidth is not supported.</li> <li>The device is investigated from 30MHz to 10 times of fundamental signal for radiated spurious emission test under different RB size/offset and modulations in exploratory test. Subsequently, only the worst case emissions are reported.</li> <li>All the radiated test cases were performed with Battery 1X and Sample 1.</li> <li>One representative bandwidth is selected to perform PAR and frequency stability.</li> </ol>																

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Test Items	Donal	Bandwidth (MHz)								Modulation					RB i	#	Test Channel				
rest items		20+20	20+15	15+20	20+10	10+20	20+5	5+20	15+15	15+10	10+15	QPSK	16QAM	64QAM	256QAM	1	Half	Full	L	М	н
Max. Output Power	48_CA	v	v	v	v	v	v	v	-	-	-	v	v	v	v	٧	v	v	٧	v	v
26dB and 99% Bandwidth	48_CA	v	v	>	v	٧	>	>	-	•	•	v	>	v	v			>		>	
Conducted Band Edge	48_CA	v	v	>	v	٧	>	>	-	•	•	v	>	v	٧	>		٧	>	>	v
Conducted Spurious Emission	48_CA	v	v	>	v	>	>	>	-	•	•	v				>			٧	>	٧
E.I.R.P.	48_CA	v	v	v	v	v	v	v	-	-	-	v	v	v	v		M	lax. I	Powe	er	
Radiated Spurious Emission	48_CA				•				W	orst Ca	ase			1					v	v	v
1. The mark "v" means that this configuration is chosen for testing 2. The mark "-" means that this bandwidth is not supported. 3. The device is investigated from 30MHz to 10 times of fundamental signal for radiated spurious emission test different RB size/offset and modulations in exploratory test. Subsequently, only the worst case emissions are 4. All the radiated test cases were performed with Battery 1X and Sample 1.																					

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# 2.2 Connection Diagram of Test System



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### 2.3 Support Unit used in test configuration

Item		Equipment	Brand Name	Model No.	FCC ID	Data Cable	Power Cord	
	1.	System Simulator	Anritsu	MT8821C	N/A	N/A	Unshielded, 1.8 m	

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### 2.4 Measurement Results Explanation Example

#### For all conducted test items:

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

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

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

Example:

Offset(dB) = RF cable loss(dB) + attenuator factor(dB). = 4.2 + 10 = 14.2 (dB)

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

	LTE Band 48 Channel and Frequency List									
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest						
20	Channel	55340	55990	56640						
20	Frequency	3560.0	3625.0	3690.0						
45	Channel	55315	55990	56665						
15	Frequency	3557.5	3625.0	3692.5						
40	Channel	55290	55990	56690						
10	Frequency	3555.0	3625.0	3695.0						
E	Channel	55265	55990	56715						
5	Frequency	3552.5	3625.0	3697.5						

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		LTE Band 48C Char	nnel and Frequenc	cy List_CA	
BW [MHz]	Channel	/Frequency(MHz)	Lowest	Middle	Highest
	DOG	Channel	55273	55898	56523
5 . 00	PCC	Frequency	3553.3	3615.8	3678.3
5 + 20	200	Channel	55390	56015	56640
	SCC	Frequency	3565	3627.5	3690
	PCC	Channel	55340	55965	56590
20 . 5	PCC	Frequency	3560	3622.5	3685
20 + 5	200	Channel	55457	56082	56707
	SCC	Frequency	3571.7	3634.2	3696.7
	PCC SCC	Channel	55295	55896	56496
10 + 20	PCC	Frequency	3555.5	3615.6	3675.6
10 + 20	SCC	Channel	55439	56040	56640
	SCC	Frequency	3569.9	3630	3690
	PCC	Channel	55340	55941	56541
20 + 10	PCC	Frequency	3560	3620.1	3680.1
20 + 10	SCC	Channel	55484	56085	56685
	300	Frequency	3574.4	3634.5	3694.5
	PCC	Channel	55318	55893	56469
15 + 20	PCC	Frequency	3557.8	3615.3	3672.9
15 + 20	scc	Channel	55489	56064	56640
	300	Frequency	3574.9	3632.4	3690
	PCC	Channel	55340	55916	56491
20 + 15	PCC	Frequency	3560	3617.6	3675.1
20 + 15	scc	Channel	55511	56087	56662
	300	Frequency	3577.1	3634.7	3692.2
	PCC	Channel	55340	55891	56442
20 + 20		Frequency	3560	3615.1	3670.2
20 + 20	SCC	Channel	55538	56089	56640
	300	Frequency	3579.8	3634.9	3690

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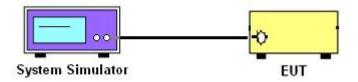
### 3 Conducted Test Items

### 3.1 Measuring Instruments

See list of measuring instruments of this test report.

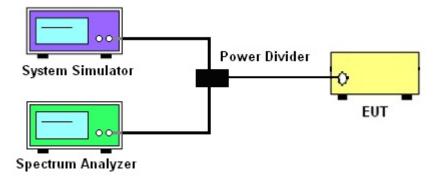
### 3.1.1 Test Setup

### 3.1.2 Conducted Output Power

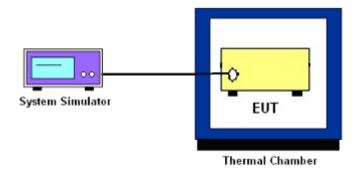


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# 3.1.3 Peak-to-Average Ratio, Occupied Bandwidth, Conducted Band Edge and Conducted Spurious Emission



### 3.1.4 Frequency Stability



### 3.1.5 Test Result of Conducted Test

Please refer to Appendix A.

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### 3.2 Conducted Output Power

### 3.2.1 Description of the Conducted Output Power Measurement

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

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#### 3.2.2 Test Procedures

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

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### 3.3 Peak-to-Average Ratio

#### 3.3.1 Description of the PAR Measurement

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

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#### 3.3.2 Test Procedures

The testing follows ANSI C63.26-2015 Section 5.2.6

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

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### **3.4 EIRP**

### 3.4.1 Description of the EIRP Measurement

The EIRP of mobile transmitters must not exceed 23 dBm /10 megahertz for LTE Band 48.

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The testing follows ANSI C63.26-2015 Section 5.2.5.5

According to KDB 412172 D01 Power Approach,

EIRP = PT + GT - LC, where

PT = transmitter output power in dBm

GT = gain of the transmitting antenna in dBi

LC = signal attenuation in the connecting cable between the transmitter and antenna in dB

Device	Maximum EIRP	Maximum PSD		
Device	(dBm/10 MHz)	(dBm/MHz)		
End User Device	23	n/a		

Remark: Total channel power is complied with EIRP limit 23dBm/10MHz.

#### 3.4.2 Test Procedures

The testing follows procedure in Section 5.2 of ANSI C63.26-2015 and KDB 940660 D01 Part 96 CBRS Eqpt v03 Section 3.2(b)(2)

Determine the EIRP by adding the effective antenna gain to the measured average conducted power level.

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3.5 Occupied Bandwidth

3.5.1 Description of Occupied Bandwidth Measurement

The occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the

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total mean transmitted power.

The 26 dB emission bandwidth is defined as the frequency range between two points, one above and

one below the carrier frequency, at which the spectral density of the emission is attenuated 26 dB

below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit

bandwidth) is to be measured with a detector of resolution bandwidth equal to approximately 1.0% of

the emission bandwidth.

3.5.2 Test Procedures

The testing follows ANSI C63.26-2015 Section 5.4.3 (26dB) and Section 5.4.4 (99OB)

1. The EUT was connected to spectrum analyzer and system simulator via a power divider.

2. The spectrum analyzer center frequency is set to the nominal EUT channel center frequency.

The span range for the spectrum analyzer shall be between two and five times the anticipated

OBW.

3. The nominal resolution bandwidth (RBW) shall be in the range of 1 to 5 % of the anticipated

OBW, and the VBW shall be at least 3 times the RBW.

4. Set the detection mode to peak, and the trace mode to max hold.

5. Determine the reference value: Set the EUT to transmit a modulated signal. Allow the trace to

stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace.

(this is the reference value)

6. Determine the "-26 dB down amplitude" as equal to (Reference Value – X).

7. Place two markers, one at the lowest and the other at the highest frequency of the envelope of

the spectral display such that each marker is at or slightly below the "-X dB down amplitude"

determined in step 6. If a marker is below this "-X dB down amplitude" value it shall be placed as close as possible to this value. The OBW is the positive frequency difference between the

two markers.

8. Use the 99 % power bandwidth function of the spectrum analyzer and report the measured

bandwidth.

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### 3.6 Conducted Band Edge

#### 3.6.1 Description of Conducted Band Edge Measurement

The conducted power of any End User Device emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed -13 dBm/MHz within 0 to B megahertz (where B is the bandwidth in megahertz of the assigned channel or multiple contiguous channels of the End User Device) above the upper CBSD-assigned channel edge and within 0 to B megahertz below the lower CBSD-assigned channel edge. At all frequencies greater than B megahertz above the upper CBSD assigned channel edge and less than B megahertz below the lower CBSD-assigned channel edge, the conducted power of any End User Device emission shall not exceed -25 dBm/MHz. Notwithstanding the emission limits in this paragraph, the Adjacent Channel Leakage Ratio for End User Devices shall be at least 30 dB.

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#### 3.6.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 6.1.

- 1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
- 2. The band edges of low and high channels for the highest RF powers were measured.
- 3. Set RBW >= 1% EBW in the 1MHz band immediately outside and adjacent to the band edge.
- 4. Beyond the 1 MHz band from the band edge, RBW=1MHz was used
- 5. Set spectrum analyzer with RMS detector.
- The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

For Adjacent Channel Leakage Ratio (ACLR) measurement,

- The Adjacent Channel Leakage Ratio (ACLR) is the ratio of the average power in the assigned aggregated channel bandwidth to the average power over the equivalent adjacent channel bandwidth.
- 2. The option ACLR of spectrum analyzer is used and measures the ACLR ratio by setting equivalent channel bandwidth.
- 3. The measured ACLR ratio shall be at least 30 dB.

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### 3.7 Conducted Spurious Emission

#### 3.7.1 Description of Conducted Spurious Emission Measurement

96.41 (e)(2)

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

#### 3.7.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 6.1.

- 1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
- The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.
   The path loss was compensated to the results for each measurement.

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- 3. The middle channel for the highest RF power within the transmitting frequency was measured.
- 4. The conducted spurious emission for the whole frequency range was taken.
- 5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz.
- 6. Set spectrum analyzer with RMS detector.
- 7. Taking the record of maximum spurious emission.
- 8. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
- 9. The limit line is -40dBm/MHz.

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### 3.8 Frequency Stability

#### 3.8.1 Description of Frequency Stability Measurement

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

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### 3.8.2 Test Procedures for Temperature Variation

The testing follows FCC KDB 971168 D01 v03r01 Section 9.0.

- 1. The EUT was set up in the thermal chamber and connected with the system simulator.
- With power OFF, the temperature was decreased to -30°C and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.
- 3. With power OFF, the temperature was raised in 10°C step up to 50°C. The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.

### 3.8.3 Test Procedures for Voltage Variation

The testing follows FCC KDB 971168 D01 v03r01 Section 9.0.

- 1. The EUT was placed in a temperature chamber at 25±5° C and connected with the system simulator.
- 2. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value measured at the input to the EUT.
- 3. The variation in frequency was measured for the worst case.

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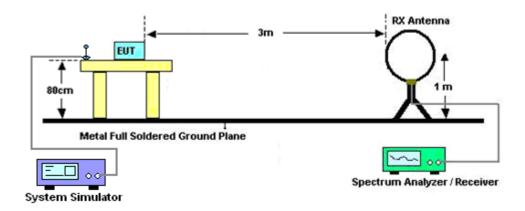
### 4 Radiated Test Items

### 4.1 Measuring Instruments

See list of measuring instruments of this test report.

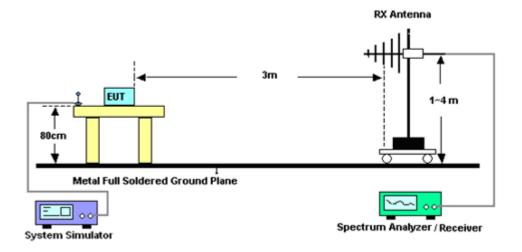
### 4.2 Test Setup

For radiated emissions below 30MHz



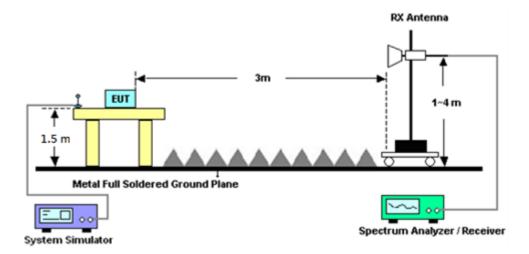
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#### For radiated emissions from 30MHz to 1GHz



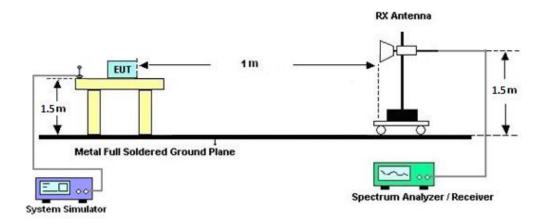
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#### For radiated emissions from 1GHz to 18GHz



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#### For radiated emissions above 18GHz



### 4.3 Test Result of Radiated Test

Please refer to Appendix B.

#### Note:

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

There is adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

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### 4.4 Radiated Spurious Emission

#### 4.4.1 Description of Radiated Spurious Emission Measurement

The radiated spurious emission was measured by substitution method according to ANSI / TIA-603-E.

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The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least -40dBm / MHz.

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

#### 4.4.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 7 and ANSI / TIA-603-E Section 2.2.12.

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

```
EIRP (dBm) = S.G. Power - Tx Cable Loss + Tx Antenna Gain ERP (dBm) = EIRP - 2.15
```

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

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# 5 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	May 13, 2022	Sep. 08, 2022~ Sep. 26, 2022	May 12, 2023	Radiation (03CH12-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N-06	40103 & 07	30MHz~1GHz	Apr. 24, 2022	Sep. 08, 2022~ Sep. 26, 2022	Apr. 23, 2023	Radiation (03CH12-HY)
Bilog Antenna	TESEQ	CBL 6111D & N-6-06	35414 & AT-N0602	30MHz~1GHz	Oct. 09, 2021	Sep. 08, 2022~ Sep. 26, 2022	Oct. 08, 2022	Radiation (03CH12-HY)
Horn Antenna	SCHWARZB ECK	BBHA 9120 D	9120D-1328	1GHz~18GHz	Dec. 03, 2021	Sep. 08, 2022~ Sep. 26, 2022	Dec. 02, 2022	Radiation (03CH12-HY)
Horn Antenna	SCHWARZB ECK	BBHA 9120 D	9120D-1212	1GHz~18GHz	Mar. 10, 2022	Sep. 08, 2022~ Sep. 26, 2022	Mar. 09, 2023	Radiation (03CH12-HY)
SHF-EHF Horn Antenna	SCHWARZB ECK	BBHA 9170	BBHA9170251	18GHz~40GHz	Nov. 30, 2021	Sep. 08, 2022~ Sep. 26, 2022	Nov. 29, 2022	Radiation (03CH12-HY)
SHF-EHF Horn Antenna	SCHWARZB ECK	BBHA 9170	BBHA9170576	18GHz~40GHz	May 14, 2022	Sep. 08, 2022~ Sep. 26, 2022	May 13, 2023	Radiation (03CH12-HY)
SHF-EHF Horn Antenna	SCHWARZB ECK	BBHA 9170	BBHA9170576	18GHz~40GHz	May 14, 2022	Sep. 08, 2022~ Sep. 26, 2022	May 13, 2023	Radiation (03CH12-HY)
Preamplifier	COM-POWE R	PA-103	161075	10MHz~1GHz	Mar. 23, 2022	Sep. 08, 2022~ Sep. 26, 2022	Mar. 22, 2023	Radiation (03CH12-HY)
Preamplifier	Aglient	8449B	3008A02375	1GHz~26.5GHz	May 24, 2022	Sep. 08, 2022~ Sep. 26, 2022	May 23, 2023	Radiation (03CH12-HY)
Preamplifier	E-INSTRUM ENT TECH LTD.	ERA-100M-18G-5 6-01-A70	EC1900270	1GHz-18GHz	Dec. 27, 2021	Sep. 08, 2022~ Sep. 26, 2022	Dec. 26, 2022	Radiation (03CH12-HY)
Preamplifier	EMEC	EM18G40G	060715	18GHz~40GHz	Dec. 24, 2021	Sep. 08, 2022~ Sep. 26, 2022	Dec. 23, 2022	Radiation (03CH12-HY)
Spectrum Analyzer	Keysight	N9010A	MY53470118	10Hz~44GHz	Jan. 12, 2022	Sep. 08, 2022~ Sep. 26, 2022	Jan. 11, 2023	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4PE	9kHz~30MHz	Mar. 10, 2022	Sep. 08, 2022~ Sep. 26, 2022	Mar. 09, 2023	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126E	0058/126E	30MHz~18GHz	Dec. 10, 2021	Sep. 08, 2022~ Sep. 26, 2022	Dec. 09, 2022	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	505134/2	30MHz~40GHz	Feb. 21, 2022	Sep. 08, 2022~ Sep. 26, 2022	Feb. 20, 2023	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	803953/2	30MHz~40GHz	Mar. 08, 2022	Sep. 08, 2022~ Sep. 26, 2022	Mar. 07, 2023	Radiation (03CH12-HY)
Filter	Wainwright	WHKX12-1080-12 00-15000-60SS	SN1	1.2GHz High Pass Filter	Mar. 15, 2022	Sep. 08, 2022~ Sep. 26, 2022	Mar. 14, 2023	Radiation (03CH12-HY)
Filter	Wainwright	WHKX12-2700-30 00-18000-60ST	SN2	3GHz High Pass Filter	Jul. 11, 2022	Sep. 08, 2022~ Sep. 26, 2022	Jul. 10, 2023	Radiation (03CH12-HY)
Filter	Wainwright	WLKS1200-12SS	SN2	1.2GHz Low Pass Filter	Mar. 15, 2022	Sep. 08, 2022~ Sep. 26, 2022	Mar. 14, 2023	Radiation (03CH12-HY)
Filter	Wainwright	WHKX8-5872.5-6 750-18000-40ST	SN2	6.75GHz High Pass Filter	Mar. 16, 2022	Sep. 08, 2022~ Sep. 26, 2022	Mar. 15, 2023	Radiation (03CH12-HY)
Hygrometer	TECPEL	DTM-303B	TP140349	N/A	Sep. 30, 2021	Sep. 08, 2022~ Sep. 26, 2022	Sep. 29, 2022	Radiation (03CH12-HY)
Controller	EMEC	EM1000	N/A	Control Turn table & Ant Mast	N/A	Sep. 08, 2022~ Sep. 26, 2022	N/A	Radiation (03CH12-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Sep. 08, 2022~ Sep. 26, 2022	N/A	Radiation (03CH12-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Sep. 08, 2022~ Sep. 26, 2022	N/A	Radiation (03CH12-HY)
Software	Audix	E3 6.2009-8-24	RK-000989	N/A	N/A	Sep. 08, 2022~ Sep. 26, 2022	N/A	Radiation (03CH12-HY)

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Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Radio Communication Analyzer	Anritsu	MT8821C	6262025280	LTE FDD/TDD LTE-2CC DLCA/ULCA	Oct. 29, 2021	Aug. 26, 2022~ Oct. 14, 2022	Oct. 28, 2022	Conducted (TH03-HY)
Spectrum Analyzer	Rohde & Schwarz	FSV40	101908	10Hz~40GHz	Oct. 01, 2021	Aug. 26, 2022~ Sep. 29, 2022	Sep. 30, 2022	Conducted (TH03-HY)
Spectrum Analyzer	Rohde & Schwarz	FSV40	101908	10Hz~40GHz	Sep. 27, 2022	Sep. 30, 2022~ Oct. 14, 2022	Sep. 26, 2023	Conducted (TH03-HY)
Thermal Chamber	ESPEC	SH-641	92013720	-40°C ~90°C	Sep. 09, 2021	Aug. 26, 2022~ Sep. 07, 2022	Sep. 08, 2022	Conducted (TH03-HY)
Thermal Chamber	ESPEC	SH-641	92013720	-40℃ ~90℃	Sep. 07, 2022	Sep. 08, 2022~ Oct. 14, 2022	Sep. 06, 2023	Conducted (TH03-HY)
DC Power Supply	GW Instek	GPP-2323	GES906037	0V~64V ; 0A~6A	Jan. 06, 2022	Aug. 26, 2022~ Oct. 14, 2022	Jan. 05, 2023	Conducted (TH03-HY)
Coupler	Warison	20dB 25W SMA Directional Coupler	#B	1-18GHz	Jan. 07, 2022	Aug. 26, 2022~ Oct. 14, 2022	Jan. 06, 2023	Conducted (TH03-HY)

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# 6 Uncertainty of Evaluation

### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of	3.31 dB
Confidence of 95% (U = 2Uc(y))	3.31 db

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### **Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)**

Measuring Uncertainty for a Level of	3,25 dB
Confidence of 95% (U = 2Uc(y))	3.23 UB

### <u>Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)</u>

Measuring Uncertainty for a Level of	3.81 dB
Confidence of 95% (U = 2Uc(y))	3.61 UB

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# **Appendix A. Test Results of Conducted Test**

### Conducted Output Power(Average power & EIRP)

	LTE E	Band 48 M	aximum A	verage Po	wer [dBm]	(GT - LC =	= 0.43 dB)	
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest	EIRP (dBm)	EIRP (W)
20	1	0		21.63	21.59	21.76		
20	1	49		21.48	21.41	21.60		
20	1	99		21.53	21.30	21.57		
20	50	0	QPSK	19.46	19.29	19.57	22.19	0.1656
20	50	24		19.58	19.50	19.64		
20	50	50		19.57	19.35	19.54		
20	100	0		19.52	19.36	19.62		
20	1	0		20.14	19.94	20.16		
20	1	49		19.98	19.78	19.96		
20	1	99		20.06	19.96	20.08		
20	50	0	16-QAM	18.42	18.20	18.45	20.59	0.1146
20	50	24		18.55	18.47	18.63		
20	50	50		18.46	18.23	18.57		
20	100	0		18.48	18.37	18.59		
20	1	0		19.45	19.40	19.56		
20	1	49		19.37	19.27	19.50		
20	1	99		19.43	19.24	19.37		
20	50	0	64-QAM	18.48	18.30	18.54	19.99	0.0998
20	50	24		18.57	18.52	18.67		
20	50	50		18.56	18.36	18.58		
20	100	0		18.56	18.35	18.55		
20	1	0		16.45	16.37	16.56		
20	1	49		16.32	16.13	16.29		
20	1	99		16.35	16.31	16.32		
20	50	0	256-QAM	16.40	16.20	16.45	16.99	0.0500
20	50	24		16.50	16.31	16.53		
20	50	50		16.51	16.45	16.44		
20	100	0		16.52	16.41	16.47		
Limit	EIRP	< 23dBm/1	0MHz		Result		Pa	ISS

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Total EIRP power is less than partial EIRP limit 23 dBm/10MHz.



	LTE E	Band 48 M	aximum A	verage Po	wer [dBm]	(GT - LC =	0.43 dB)	
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest	EIRP (dBm)	EIRP (W)
15	1	0		21.64	21.55	21.63		
15	1	37		21.52	21.33	21.52		
15	1	74		21.45	21.34	21.63		
15	36	0	QPSK	19.49	19.32	19.48	22.07	0.1611
15	36	20		19.59	19.58	19.70		
15	36	39		19.58	19.31	19.53		
15	75	0		19.42	19.30	19.56		
15	1	0		20.19	19.94	20.25		
15	1	37		19.99	19.68	19.87		
15	1	74		20.05	19.97	20.04		
15	36	0	16-QAM	18.46	18.19	18.42	20.68	0.1169
15	36	20		18.64	18.49	18.55		
15	36	39		18.46	18.17	18.54		
15	75	0		18.52	18.29	18.49		
15	1	0		19.54	19.35	19.51		
15	1	37		19.42	19.37	19.51		
15	1	74		19.44	19.22	19.38		
15	36	0	64-QAM	18.52	18.39	18.56	19.97	0.0993
15	36	20		18.54	18.60	18.64		
15	36	39		18.52	18.42	18.57		
15	75	0		18.46	18.32	18.64		
15	1	0		16.51	16.39	16.65		
15	1	37		16.28	16.17	16.30		
15	1	74		16.34	16.40	16.29		
15	36	0	256-QAM	16.43	16.26	16.37	17.08	0.0511
15	36	20		16.54	16.35	16.54		
15	36	39		16.57	16.55	16.52		
15	75	0		16.43	16.39	16.52		
Limit	EIRP	< 23dBm/1	0MHz		Result		Pa	ISS



	LTE E	Band 48 M	aximum A	verage Po	wer [dBm]	(GT - LC =	= 0.43 dB)	
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest	EIRP (dBm)	EIRP (W)
10	1	0		21.60	21.57	21.70		
10	1	25		21.57	21.37	21.51	]	
10	1	49		21.62	21.33	21.62	]	
10	25	0	QPSK	19.54	19.27	19.47	22.13	0.1633
10	25	12		19.61	19.50	19.59		
10	25	25		19.55	19.36	19.57		
10	50	0		19.46	19.36	19.57		
10	1	0		20.07	19.86	20.11		
10	1	25		20.01	19.78	20.05		
10	1	49		20.01	19.87	20.13		0.1138
10	25	0	16-QAM	18.50	18.28	18.52	20.56	
10	25	12		18.63	18.49	18.58		
10	25	25		18.46	18.23	18.66		
10	50	0		18.48	18.27	18.59		
10	1	0		19.55	19.33	19.62		
10	1	25		19.36	19.37	19.52		
10	1	49		19.50	19.23	19.28		
10	25	0	64-QAM	18.43	18.36	18.64	20.05	0.1012
10	25	12		18.51	18.42	18.75		
10	25	25		18.65	18.43	18.53		
10	50	0		18.53	18.43	18.63		
10	1	0		16.40	16.27	16.48		
10	1	25		16.39	16.05	16.29		
10	1	49		16.37	16.26	16.23		
10	25	0	256-QAM	16.50	16.16	16.35	17.00	0.0501
10	25	12		16.51	16.36	16.57		
10	25	25		16.52	16.40	16.52	]	
10	50	0		16.54	16.39	16.39		
Limit	EIRP	< 23dBm/1	0MHz		Result	-	Pa	iss



	LTE E	Band 48 M	aximum A	verage Po	wer [dBm]	(GT - LC =	= 0.43 dB)	
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest	EIRP (dBm)	EIRP (W)
5	1	0		21.70	21.62	21.72		
5	1	12		21.43	21.47	21.61	]	
5	1	24		21.44	21.22	21.63	]	
5	12	0	QPSK	19.39	19.22	19.59	22.15	0.1641
5	12	7		19.63	19.43	19.71		
5	12	13		19.55	19.25	19.58	]	
5	25	0		19.61	19.42	19.64	]	
5	1	0		20.05	19.94	20.13		
5	1	12		19.97	19.84	19.93		
5	1	24		20.02	19.98	20.07		0.1138
5	12	0	16-QAM	18.41	18.30	18.55	20.56	
5	12	7		18.63	18.40	18.63		
5	12	13		18.49	18.13	18.64		
5	25	0		18.52	18.38	18.49		
5	1	0		19.39	19.50	19.51		
5	1	12		19.40	19.28	19.41		
5	1	24		19.46	19.24	19.46		
5	12	0	64-QAM	18.58	18.38	18.56	19.94	0.0986
5	12	7		18.63	18.59	18.62		
5	12	13		18.63	18.44	18.57		
5	25	0		18.50	18.27	18.52		
5	1	0		16.53	16.38	16.50		
5	1	12		16.31	16.07	16.22		
5	1	24		16.28	16.36	16.35		
5	12	0	256-QAM	16.31	16.27	16.52	17.00	0.0501
5	12	7		16.44	16.27	16.44		
5	12	13		16.57	16.50	16.34		
5	25	0		16.56	16.45	16.55		
Limit	EIRP	< 23dBm/1	0MHz		Result		Pa	ıss

	LT	E Band 4	8C_CA	Maximur	n Averag	e Power [	dBm] (GT ·	- LC = 0.43	dB)	
	PC	CC	S	CC					EIRP	
BW [MHz]	RB Size	RB Offset	RB Size	RB Offset	Mod	Lowest	Middle	Highest	(dBm)	EIRP (W)
20+20	100	0	100	0		20.02	20.03	20.03		
20+20	1	0	1	99	QPSK	13.51	13.64	13.65	22.23	0.1671
20+20	1	99	1	0		21.64	21.79	21.80		
20+20	100	0	100	0		19.08	19.06	19.08		
20+20	1	0	1	99	16-QAM	14.04	14.10	14.17	21.96	0.1570
20+20	1	99	1	0		21.47	21.53	21.52		
20+20	100	0	100	0		19.02	19.04	19.06		
20+20	1	0	1	99	64-QAM	13.73	13.87	13.92	20.47	0.1114
20+20	1	99	1	0		19.94	20.01	20.04		
20+20	100	0	100	0		17.06	17.06	17.09		
20+20	1	0	1	99	256-QAM	13.62	13.72	13.74	17.53	0.0566
20+20	1	99	1	0		16.98	17.10	17.09		
20+15	100	0	75	0		19.99	20.12	20.12		
20+15	1	0	1	74	QPSK	13.54	13.67	13.74	22.27	0.1687
20+15	1	74	1	0		21.76	21.84	21.80		
20+15	100	0	75	0		19.06	19.20	19.17		
20+15	1	0	1	74	16-QAM	14.09	14.19	14.26	22.10	0.1622
20+15	1	74	1	0		21.51	21.67	21.66		
20+15	100	0	75	0		19.03	19.19	19.23		0.1119
20+15	1	0	1	74	64-QAM	13.84	13.98	13.99	20.49	
20+15	1	74	1	0		20.01	20.06	20.04		
20+15	100	0	75	0		17.06	17.16	17.22		
20+15	1	0	1	74	256-QAM	13.69	13.81	13.82	17.65	0.0582
20+15	1	74	1	0		16.98	17.10	17.17		
15+20	75	0	100	0		19.93	20.09	20.10		
15+20	1	0	1	99	QPSK	13.45	13.62	13.69	22.33	0.1710
15+20	1	74	1	0		21.75	21.89	21.90		
15+20	75	0	100	0		18.94	19.13	19.16		
15+20	1	0	1	99	16-QAM	13.95	14.15	14.19	22.08	0.1614
15+20	1	74	1	0		21.55	21.63	21.65		
15+20	75	0	100	0		18.97	19.12	19.15		
15+20	1	0	1	99	64-QAM	13.72	13.92	13.98	20.52	0.1127
15+20	1	74	1	0		19.95	20.09	20.07		
15+20	75	0	100	0		16.96	17.11	17.18		
15+20	1	0	1	99	256-QAM	13.62	13.76	13.90	17.61	0.0577
15+20	1	74	1	0		16.97	17.14	17.15		
Limit	<u> </u>	EIRP <	: 23dBm/	10MHz			Result		Pa	ass

	LT	E Band 4	8C_CA	Maximur	n Averag	ge Power [dBm] (GT - LC = 0.43 dB)						
BW [MHz] PCC SCC					Mari				EIRP SIDD (II			
BW [MHZ]	RB Size	RB Offset	RB Size	RB Offset	Mod	Lowest	Middle	Highest	(dBm)	EIRP (W)		
20+10	100	0	50	0		19.81	20.01	19.96				
20+10	1	0	1	49	QPSK	13.42	13.61	13.65	22.19	0.1656		
20+10	1	99	1	0		21.62	21.76	21.75				
20+10	100	0	50	0		18.91	19.04	19.07	21.91	0.1552		
20+10	1	0	1	49	16-QAM	13.91	14.14	14.15				
20+10	1	99	1	0		21.30	21.48	21.46				
20+10	100	0	50	0		18.87	19.06	19.04				
20+10	1	0	1	49	64-QAM	13.72	13.88	13.90	20.43	0.1104		
20+10	1	99	1	0		19.89	20.00	19.91				
20+10	100	0	50	0		16.92	17.07	17.10				
20+10	1	0	1	49	256-QAM	13.79	13.74	13.72	17.53	0.0566		
20+10	1	99	1	0		16.83	17.03	16.98				
10+20	50	0	100	0		19.83	19.99	19.96				
10+20	1	0	1	99	QPSK	13.40	13.59	13.64	22.24	0.1675		
10+20	1	49	1	0		21.64	21.81	21.78				
10+20	50	0	100	0	16-QAM	18.89	19.01	19.04	22.04	0.1600		
10+20	1	0	1	99		13.91	14.08	14.13				
10+20	1	49	1	0		21.42	21.61	21.61				
10+20	50	0	100	0		18.92	19.09	19.06	20.47	0.1114		
10+20	1	0	1	99	64-QAM	13.60	13.84	13.87				
10+20	1	49	1	0		19.91	20.04	19.97				
10+20	50	0	100	0		16.89	17.05	17.08				
10+20	1	0	1	99	256-QAM	13.53	13.68	13.72	17.55	0.0569		
10+20	1	49	1	0		16.91	17.07	17.12				
20+5	100	0	25	0		19.77	19.94	19.91				
20+5	1	0	1	24	QPSK	13.38	13.57	13.54	22.14	0.1637		
20+5	1	99	1	0		21.60	21.71	21.70				
20+5	100	0	25	0		18.86	19.00	18.98				
20+5	1	0	1	24	16-QAM	13.88	14.09	14.04	21.95	0.1567		
20+5	1	99	1	0		21.38	21.43	21.52				
20+5	100	0	25	0		18.83	19.00	18.93	20.31	0.1074		
20+5	1	0	1	24	64-QAM	13.59	13.83	13.86				
20+5	1	99	1	0		19.87	19.88	19.86				
20+5	100	0	25	0		16.86	17.00	16.99				
20+5	1	0	1	24	256-QAM	13.48	13.78	13.63	17.43	0.0553		
20+5	1	99	1	0		16.80	16.96	16.92				
Limit	EIRP < 23dBm/10MHz						Result		Pass			



LTE Band 48C_CA Maximum Average Power [dBm] (GT - LC = 0.43 dB)										
BW [MHz]	PCC		SCC		Mod				EIRP	EIRP (W)
	RB Size	RB Offset	RB Size	RB Offset		Lowest	Middle	Highest	(dBm)	LIKE (VV)
5+20	25	0	100	0		19.79	19.94	19.92		
5+20	1	0	1	99	QPSK	13.30	13.50	13.47	22.22	0.1667
5+20	1	24	1	0		21.60	21.79	21.78		
5+20	25	0	100	0	16-QAM	18.83	18.96	19.00	22.01	0.1589
5+20	1	0	1	99		13.79	13.99	14.00		
5+20	1	24	1	0		21.39	21.58	21.51		
5+20	25	0	100	0		18.84	18.96	19.02	20.39	0.1094
5+20	1	0	1	99	64-QAM	13.62	13.73	13.76		
5+20	1	24	1	0		19.84	19.96	19.92		
5+20	25	0	100	0		16.84	17.02	17.03	17.47	0.0558
5+20	1	0	1	99	256-QAM	13.47	13.61	13.64		
5+20	1	24	1	0		16.84	17.03	17.04		
Limit		EIRP <	: 23dBm/	10MHz		Result Pass				

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Total EIRP power is less than partial EIRP limit 23 dBm/10MHz.

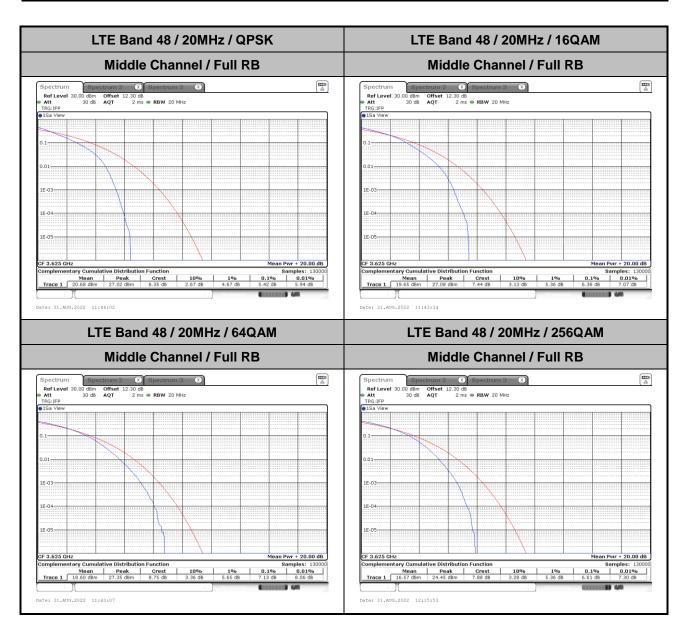


LTE Band 48

# Peak-to-Average Ratio

Mode						
Mod.	QPSK 16QAM		64QAM	256QAM	Limit: 13dB	
RB Size	Full RB	Full RB	Full RB	Full RB	Result	
Middle CH	5.42	6.38	7.13	6.61	PASS	

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FAX: 886-3-328-4978

# 26dB Bandwidth

Mode	LTE Band 48 : 26dB BW(MHz)											
BW	BW 1.4MHz		3MHz		5MHz		10MHz		15MHz		20MHz	
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Middle CH	-	-	-	-	4.76	4.92	9.65	9.93	14.15	14.24	18.98	18.62
Mode	LTE Band 48 : 26dB BW(MHz)											
BW	1.4MHz		3MHz		5MHz		10MHz		15MHz		20MHz	
Mod.	64QAM	256QAM	64QAM	256QAM	64QAM	256QAM	64QAM	256QAM	64QAM	256QAM	64QAM	256QAM
Middle CH	-	-	ı	-	4.95	4.87	9.65	9.65	14.33	14.30	18.70	18.62

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FAX: 886-3-328-4978

LTE Band 48 Middle Channel / 5MHz / QPSK Middle Channel / 5MHz / 16QAM Reflevel 30.00 dBm Offset 12.30 dB • RBW 100 kHz
Att 30 dB SWT 19 µs • VBW 300 kHz Mode Auto FFT
SQL Count 100/100
31Pk Max 14.49 dBi 3.62364100 GF 14.57 dBr 3.62555900 GH 26.00 GH 26.00 di 10000 MH 737. -20 dBm--20/dBm--50 dBm--50 dBm-CF 3.625 GHz Span 10.0 MHz CF 3.625 GHz Span 10.0 MHz 1001 pts 1001 pts Y-value Type | Ref | Trc | Y-value 14.49 dBm -11.54 dBm -11.61 dBm Function Function Result X-value Function **Function Result** Date: 26.AUG.2022 16:34:05 Date: 26.AUG.2022 16:34:29 Middle Channel / 10MHz / QPSK Middle Channel / 10MHz / 16QAM 17.15 dBr 3.6269180 GH 26.00 d 9.650000000 MH 375. 15.12 dBm 3.6269780 GH: 26.00 dE .930000000 MH: 365.3 dBm--20 dBm -20 dBm-40 dBm 40 dBm -50 dBm-CF 3.625 GHz Span 20.0 MHz Span 20.0 MHz Function Result
9.65 MHz
26.00 dB
375.8 
 X-value
 Y-value
 Function

 3.026918 GHz
 17.15 dBm
 nd8 down

 3.020145 GHz
 -9.45 dBm
 nd9

 3.029795 GHz
 -6.83 dBm
 Q factor
 Type Ref Trc | Marker | Trype | Ref | Trc | X-value | Y-value | Function | M1 | 1 | 3.626978 GHz | 15.12 dsm | nd8 down | nd8 | Function Result Date: 26.AUG.2022 16:56:14 Date: 26.AUG.2022 16:56:37 Middle Channel / 15MHz / QPSK Middle Channel / 15MHz / 16QAM Ref Level 30.00 dBm Offset att 30 dB SWT SGL Count 100/100 12.30 dB **RBW** 300 kHz 12.6 μs **VBW** 1 MHz **Mode** Auto FFT 14.55 dBr 3.6193060 GH 26.00 d 14.146000000 MH 255. 13.14 dBn 3.6229020 GH 26.00 dl M1[1] 10 dBm 10 dBm dBm--20 dBm -40 dBm-40 dBm CF 3.625 GH CF 3.625 GHz 1001 pts Span 30.0 MHz Span 30.0 MHz Function Result 14.146 MHz 26.00 dB 255.9 Function Result 14.236 MHz 26.00 dB 254.5 Type Ref Trc Type | Ref | Trc | 
 X-value
 Y-value
 Function

 3.619306 GHz
 14.55 dBm
 ndB down

 3.617927 GHz
 -9.91 dBm
 ndB

 3.632073 GHz
 -12.00 dBm
 Q factor

 X-value
 Y-value
 Function

 3.622902 GHz
 13.14 dBm
 nd8 down

 3.617837 GHz
 -13.55 dBm
 nd8

 3.632073 GHz
 -12.49 dBm
 Q factor
 Date: 26.AUG.2022 17:17:57 Date: 26.AUG.2022 17:18:21

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TEL: 886-3-327-3456 Page Number : A2-3 of 110 FAX: 886-3-328-4978

LTE Band 48 Middle Channel / 20MHz / QPSK Middle Channel / 20MHz / 16QAM Spectrum 2 X Spectrum 3 X 13.34 dBr 3.6211240 GH 13.22 dBr 3.6286760 GH 20 dBm dBm--20 dBn -20 dBm -30 dBm -30 dBm--50 dBm--50 dBm-CF 3.625 GHz Span 40.0 MHz CF 3.625 GHz Span 40.0 MHz 1001 pts Function Result 18.981 MHz 26.00 dB 190.8 1001 pts Function Result 18.621 MHz 26.00 dB 194.9 Y-value : 13.22 dBm : -11.49 dBm 2 -13.25 dBm Y-value 2 13.34 dBm 2 -12.50 dBm 2 -12.81 dBm Type | Ref | Trc | X-value 3.621124 GHz 3.615529 GHz 3.63451 GHz Function X-value 3.628676 GHz 3.615689 GHz 3.634311 GHz Function Date: 31.AUG.2022 11:41:45 Date: 31.AUG.2022 11:42:11 Middle Channel / 10MHz / 64QAM Middle Channel / 5MHz / 64QAM 12.30 dB • RBW 100 kHz 19 µs • VBW 300 kHz Mode Auto FFT 12.19 dBr 3.62368100 GH 26.00 d 4.945000000 MH 732. 13.61 dBm 3.6278970 GH: 26.00 dE 9.650000000 MH: 375.9 dBm--20 dBm -20 dBm-40 dBm 40 dBm -50 dBm-CF 3.625 GHz CF 3.625 GHz Span 20.0 MHz Span 10.0 MHz Function Result
4.945 MHz
26.00 dB
732.8 Function Result Date: 26.AUG.2022 16:35:16 Date: 26.AUG.2022 16:57:25 Middle Channel / 15MHz / 64QAM Middle Channel / 20MHz / 64QAM Ref Level 30.00 dbm Offset 12.30 db e RBW 300 kHz
Att 30 db SWT 12.6 µs e VBW 1 MHz Mode Auto FFT
SCL Count 100/100
13Pk Max 12.97 dBn 3.6311140 GH 26.00 dE 14.326000000 MH 3.6192860 GHz 26.00 dE 10 dBm 253 193. -10 dBm -10 dBm--50 dBm-50 dBm 60 dBm -60 dBm-Span 30.0 MHz Span 40.0 MHz Function Result 18.701 MHz 26.00 dB 193.5 Marker Type | Ref | Trc | 
 Marker
 Trc
 X-value
 Y-value
 Function

 M1
 1
 3.619286 GHz
 12.08 dbm
 nd8 dbm
 nd8 down

 T1
 1
 3.615690 GHz
 -14.51 dbm
 nd8

 T2
 1
 3.634311 GHz
 -14.95 dbm
 Q factor
 Function Result 14.326 MHz 
 X-value
 Y-value
 Function

 3.631114 GHz
 12.97 dBm
 nd8 down

 3.631747 GHz
 -13.31 dBm
 nd8

 3.632073 GHz
 -14.09 dBm
 Q factor
 Date: 26.AUG.2022 17:19:08

LTE Band 48 Middle Channel / 5MHz / 256QAM Middle Channel / 10MHz / 256QAM 9.33 dBi 3.62517000 GF 12.65 dBr 3.6240210 GH dBm--20 dBm--20 dBm -30 dBm--50 dBm--50 dBm-CF 3.625 GHz Span 10.0 MHz CF 3.625 GHz Span 20.0 MHz 1001 pts 1001 pts Y-value 2 9,33 dBm 2 -16.39 dBm 2 -16.68 dBm Type | Ref | Trc | Function X-value 3.62517 GHz 3.622592 GHz 3.627458 GHz X-value 3.624021 GHz 3.620205 GHz 3.629855 GHz Y-value 12.65 dBm -13.17 dBm -12.85 dBm Function Result Function ndB down **Function Result** Date: 31.AUG.2022 11:51:50 Date: 31.AUG.2022 11:59:39 Middle Channel / 15MHz / 256QAM Middle Channel / 20MHz / 256QAM Spectrum 2 X Spectrum 3 X Ref Level 30.00 dBm Offset 12.30 dB RBW 300 kHz
Att 30 dB SWT 12.6 µs WBW 1 MHz
Mode Auto FFT
SGL Count 100/100 M1[1] M1[1] M1 10 dBm dBm--20 dBm -20 dBm--40 dBm 40 dBm CF 3.625 GHz CF 3.625 GHz Span 30.0 MHz 1001 pts Span 40.0 MHz Function Result 14.296 MHz 26.00 dB 253.5 Function Result 18.621 MHz 26.00 dB 195.1 Type Ref Trc 
 Y-value
 Function

 2
 11.21 dBm
 ndB down

 2
 -14.65 dBm
 ndB

 2
 -14.73 dBm
 Q factor

 X-value
 Y-value
 Function

 3.632353 GHz
 9.77 dBm
 ndB down

 3.615689 GHz
 -15.91 dBm
 ndB

 3.694311 GHz
 -14.97 dBm
 Q factor
 Date: 31.AUG.2022 12:07:18 Date: 31.AUG.2022 12:14:58

Report No.: FG271554J

## **Occupied Bandwidth**

Mode	LTE Band 48 : 99%OBW(MHz)											
BW	1.4MHz		3MHz		5MHz		10MHz		15MHz		20MHz	
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Middle CH	-	-	-	-	4.49	4.51	9.07	9.07	13.49	13.46	17.86	17.86
Mode	LTE Band 48 : 99%OBW(MHz)											
BW	1.4MHz		3MHz		5MHz		10MHz		15MHz		20MHz	
Mod.	64QAM	256QAM	64QAM	256QAM	64QAM	256QAM	64QAM	256QAM	64QAM	256QAM	64QAM	256QAM
Middle CH	-	-	-	-	4.51	4.49	9.05	8.99	13.49	13.37	17.90	17.90

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LTE Band 48 Middle Channel / 5MHz / QPSK Middle Channel / 5MHz / 16QAM Ref Level 30.00 dBm Offset
Att 30 dB SWT
SGL Count 100/100 Reflevel 30.00 dBm Offset 12.30 dB • RBW 100 kHz
Att 30 dB SWT 19 µs • VBW 300 kHz Mode Auto FFT
SQL Count 100/100
31Pk Max Offset 12.30 dB ● RBW 100 kHz SWT 19 µs ● VBW 300 kHz Mode Auto FFT 13.68 dBi 3.62565900 GF 20 dBm 4.485514486 M dBm--20 dBm--20 dBm--30 dBm--30 dBm -50 dBm--50 dBm-CF 3.625 GHz CF 3.625 GHz Span 10.0 MHz 1001 pts Span 10.0 MHz 1001 pts Y-value 2 13.01 dBm 2 6.64 dBm 2 7.74 dBm Type | Ref | Trc | X-value 3.625659 GHz 3.6227522 GHz 3.6272378 GHz Function X-value 3.626708 GHz 3.6227522 GHz 3.6272577 GHz Function Function Result **Function Result** Occ Bw 4.485514486 MHz 4.505494505 MHz Date: 26.AUG.2022 16:33:18 Date: 26.AUG.2022 16:33:42 Middle Channel / 10MHz / QPSK Middle Channel / 10MHz / 16QAM 16.76 dBr 3.6280770 GH 9.070929071 MH 14.97 dBn 3.6213840 GHz 9.070929071 MHz 10 dBrr dBm--20 dBm--20 dBm -40 dBm-40 dBm 50 dBm -50 dBm-CF 3.625 GHz CF 3.625 GHz Span 20.0 MHz Function Result 9.070929071 MHz 9.070929071 MHz Date: 26.AUG.2022 16:55:27 Date: 26.AUG.2022 16:55:50 Middle Channel / 15MHz / QPSK Middle Channel / 15MHz / 16QAM Ref Level 30.00 dbm Offset 12.30 db e RBW 300 kHz
Att 30 db SWT 12.6 µs e VBW 1 MHz Mode Auto FFT
SCL Count 100/100
13Pk Max 13.19 dBn 3.6260490 GH: 13.456543457 MH; 14.25 dBn 3.6197850 GH: 13.486513487 MH: 20 dBm 10 dBm--10 dBm -10 dBm--50 dBm-60 dBm -60 dBm-1001 pts Span 30.0 MHz 1001 pts Span 30.0 MHz 
 Morker
 Y-value
 Function
 Function Result

 Type | Ref Trc |
 X-value
 Y-value
 Function
 Function Result

 1 | 1 | 3.612266 e1z
 9.90 dem
 Occ 8w
 13.486513

 T2 | 1 | 3.6317133 GHz | 9.46 d8m
 Occ 8w
 13.486513

 Marker
 Trc
 X-value
 Y-value
 Function

 M1
 1
 3.620049 GHz
 13.19 d8m
 13.19 d8m

 T1
 1
 3.632697 GHz
 9.07 d8m
 Occ Bw

 T2
 1
 3.6317433 GHz
 8.59 d8m
 8.59 d8m
 Function Result 9.07 dBm Occ Bw 8.59 dBm 13.486513487 MHz 13.456543457 MHz Date: 26.AUG.2022 17:17:09 Date: 26.AUG.2022 17:17:33

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LTE Band 48 Middle Channel / 20MHz / QPSK Middle Channel / 20MHz / 16QAM Spectrum 2 X Spectrum 3 X 20 dBm 17.862137862 M dBm--20 dBm -20 dBm 30 dBmmm -36 dBm  $\sim\sim$ -50 dBm--50 dBm-CF 3.625 GHz CF 3.625 GHz Span 40.0 MHz 1001 pts Span 40.0 MHz 1001 pts Y-value 11.95 dBm 6.38 dBm 7.64 dBm Type | Ref | Trc | Function X-value 3.619006 GHz 3.616049 GHz 3.6339111 GHz Function X-value 3.622403 GHz 3.616049 GHz 3.6339111 GHz Function Result Function Result Occ Bw 17.862137862 MHz 17.862137862 MHz Date: 31.AUG.2022 11:40:53 Date: 31.AUG.2022 11:41:19 Middle Channel / 10MHz / 64QAM Middle Channel / 5MHz / 64QAM 12.30 dB • RBW 100 kHz 19 µs • VBW 300 kHz Mode Auto FFT 13.72 dBi 3.62451000 GF 4.505494505 MF 14.12 dBn 3.6243610 GHz 9.050949051 MHz 10 dBrr dBm--20 dBm -20 dBm--40 dBm-40 dBm -50 dBm-CF 3.625 GHz CF 3.625 GHz Span 20.0 MHz Span 10.0 MHz | Marker | Trype | Ref | Trc | X-value | Y-value | Function | Function Result | Mil | 1 | 3.62451 GHz | 13.72 dBm | 11 | 1 | 3.62243 GHz | 5.60 dBm | Occ Bw | 4.5054945 | 12 | 1 | 3.6227478 GHz | 6.35 dBm | Occ Bw | 4.5054945 | 12 | 1 | 3.6272478 GHz | 6.35 dBm | Occ Bw | 4.5054945 | 13.72 dBm Function Result 4.505494505 MHz 9.050949051 MHz Date: 26.AUG.2022 16:34:52 Date: 26.AUG.2022 16:57:01 Middle Channel / 15MHz / 64QAM Middle Channel / 20MHz / 64QAM Ref Level 30.00 dBm Offset 12.30 dB ● RBW 300 kHz
Att 30 dB SWT 12.6 μs ● VBW 1 MHz Mode Auto FFT
SGL Count 100/100
11Pk Max 12.03 dBn 3.6172880 °C 12.66 dBn 3.6289560 GH: 13.486513487 MH: 20 dBm 10 dBm-10 dBm -10 dBm-30.98m www -50 dBm-50 dBm 60 dBm -60 dBm-1001 pts Span 30.0 MHz 1001 pts Span 40.0 MHz 
 Marker
 Trc
 X-value
 Y-value
 Function

 M1
 1
 3.617288 GHz
 12.03 dbm
 12.03 dbm

 T1
 1
 3.61009 GHz
 7.05 dbm
 Occ Bw

 T2
 1
 3.6399111 GHz
 6.14 dbm
 Occ Bw
 Function Result 13.486513487 MHz 17.902097902 MHz Date: 26.AUG.2022 17:18:44

Report No.: FG271554J

LTE Band 48 Middle Channel / 5MHz / 256QAM Middle Channel / 10MHz / 256QAM Ref Level 30.00 dBm Offset 12.30 db RBW 100 kHz
Att 30 db SWT 19 µs VBW 300 kHz Mode Auto FFT
50L Count 100/100
1Pk Max Spectrum 2 X Spectrum 3 X 10.84 dBr 3.62438100 GH 4.485514486 MH dBm--20 dBm--20 dBm--30 dBm--30 dBm--50 dBm--50 dBm-CF 3.625 GHz Marker CF 3.625 GHz Span 20.0 MHz 1001 pts Span 10.0 MHz 1001 pts Y-value : 12.16 dBm : 4.53 dBm 2 5.56 dBm Type Ref Trc X-value 3.624381 GHz 3.6227522 GHz 3.6272378 GHz X-value Function Function Result Function Result X-value 3.622023 GHz 3.6205445 GHz 3.6295355 GHz Occ Bw 4.485514486 MHz 8.991008991 MHz Date: 31.AUG.2022 11:51:36 Date: 31.AUG.2022 11:59:25 Middle Channel / 15MHz / 256QAM Middle Channel / 20MHz / 256QAM Spectrum 2 X Spectrum 3 X Act Laved 30.00 dem Offset 12.30 de RBW 300 kHz
Att 30 de SWT 18.9 µs VBW 1 MHz Mode Auto FFT
SGL Count 100/100

1Pk Max 10.52 dBr 3.6197250 GH 13.366633367 MH 8.34 dBn 3.6209640 GHz 17.902097902 MHz 10 dBm dBm--20 dBm -20 dBm--40 dBm mm -50 dBm-CF 3.625 GHz Span 30.0 MHz CF 3.625 GHz Span 40.0 MHz Type Ref Trc 
 X-value
 Y-value
 Function

 3.619725 GHz
 10.52 dBm
 Occ Bw

 3.6183467 GHz
 3.05 dBm
 Occ Bw

 3.637133 GHz
 5.67 dBm

 X-value
 Y-value
 Function

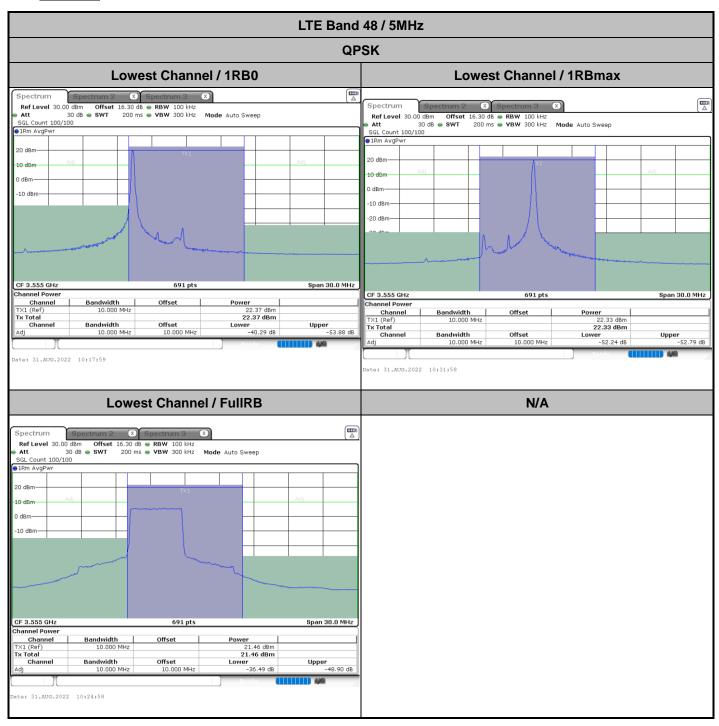
 3.620964 GHz
 8.34 dbm
 S.13 dbm

 3.615009 GHz
 5.13 dbm
 Occ BW

 3.633911 GHz
 4.40 dbm
 Function Result Function Result 13.366633367 MHz 17.902097902 MHz Date: 31.AUG.2022 12:07:04 Date: 31.AUG.2022 12:14:44

Report No.: FG271554J

## **ACLR**



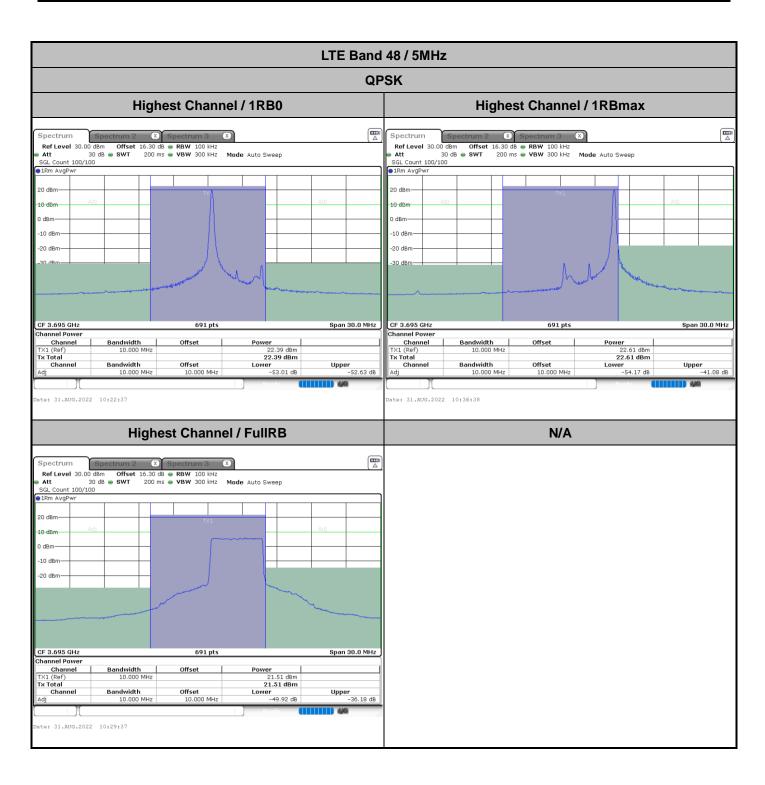
Report No.: FG271554J

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LTE Band 48 / 5MHz **QPSK** Middle Channel / 1RB0 Middle Channel / 1RBmax Spectrum ●1Rm AvgPwr 20 dBm-10 d0m 0 dBm 0 dBn -10 dBm -10 dBm -20 dBm -20 dBm Span 30.0 MHz CF 3.625 GHz Span 30.0 MHz hannel Power hannel Power 22.75 dBm 22.75 dBm 22.75 dBm Lower -53.68 dB Power 22.53 dBm 22.53 dBm Channel
TX1 (Ref)
Tx Total Channel TX1 (Ref) Bandwidth 10.000 MHz Offset Bandwidth 10.000 MHz Offset Tx Total Channel Upper -53.70 dB Bandwidth Offset **Lower** -51.33 dB Bandwidth Channel Upper -51.51 dB 10.000 MHz ate: 31.AUG.2022 10:21:50 Date: 31.AUG.2022 10:35:51 Middle Channel / FullRB N/A Spectrum -10 dBm CF 3.625 GHz 691 pts Span 30.0 MHz 21.54 dBm 21.54 dBm 21.54 dBm Lower -43.56 dB Bandwidth 10.000 MHz Channel (Ref) Offset **Upper** -43.97 dB Bandwidth 10.000 MHz ate: 31.AUG.2022 10:28:50

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LTE Band 48 / 10MHz **QPSK** Lowest Channel / 1RB0 **Lowest Channel / 1RBmax** ●1Rm AvgPwr 20 dBm-10 dbm 0 dBm 0 dBn -10 dBm -10 dBm -20 dBm Span 30.0 MHz CF 3.555 GHz Span 30.0 MHz hannel Power Channel Power Channel
TX1 (Ref)
Tx Total
Channel 22.43 dBm 22.43 dBm Channel
TX1 (Ref)
Tx Total Bandwidth 10.000 MHz Offset Bandwidth 10.000 MHz Offset Power 22.34 dBm 22.34 dBm Upper -44.28 dB Bandwidth Offset Lower -44.04 dB Bandwidth Upper -53.69 dB Channel Lower -53.36 dB 10.000 MHz ate: 31.AUG.2022 10:40:35 ate: 31.AUG.2022 10:54:35 **Lowest Channel / FullRB** N/A Spectrum -10 dBm-CF 3.555 GHz 691 pts Span 30.0 MHz 21.50 dBm 21.50 dBm 21.50 dBm Lower -37.07 dB Bandwidth 10.000 MHz Channel (Ref) Offset Bandwidth 10.000 MHz ate: 31.AUG.2022 10:47:35

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LTE Band 48 / 10MHz **QPSK** MiddleChannel / 1RB0 Middle Channel / 1RBmax Spectrum ●1Rm AvgPwr 20 dBm-10 dbm 0 dBm 0 dBm -10 dBm -10 dBm -20 dBm Span 30.0 MHz CF 3.625 GHz Span 30.0 MHz hannel Power hannel Power 22.58 dBm 22.58 dBm Channel
TX1 (Ref)
Tx Total
Channel Channel
TX1 (Ref)
Tx Total Bandwidth 10.000 MHz Offset Bandwidth 10.000 MHz Offset Power 22.64 dBm 22.64 dBm Upper -54.05 dB Upper -44.64 dB Bandwidth Offset **Lower** -44.65 dB Bandwidth Channel Lower -53.93 dB 10.000 MHz ate: 31.AUG.2022 10:41:21 Date: 31.AUG.2022 10:55:22 Middle Channel / FullRB N/A Spectrum -10 dBm CF 3.625 GHz 691 pts Span 30.0 MHz 21.59 dBm 21.59 dBm 21.59 dBm Lower -36.71 dB Bandwidth 10.000 MHz Channel (Ref) Offset Bandwidth 10.000 MHz te: 31.AUG.2022 10:48:21

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LTE Band 48 / 10MHz **QPSK Highest Channel / 1RB0 Highest Channel / 1RBmax** ●1Rm AvgPwr 20 dBm-10 d0m 0 dBm 0 dBn -10 dBm -10 dBm -20 dBm CF 3.695 GHz Span 30.0 MHz CF 3.695 GHz Span 30.0 MHz hannel Power hannel Power Power 22.52 dBm 22.52 dBm Channel
TX1 (Ref)
Tx Total
Channel Channel
TX1 (Ref)
Tx Total Bandwidth 10.000 MHz Offset Bandwidth 10.000 MHz Offset Power 22.49 dBm 22.49 dBm Upper -53.78 dB Upper -44.32 dB Bandwidth **Lower** -44.18 dB Bandwidth Offset Channel Lower -53.71 dB 10.000 MHz ate: 31.AUG.2022 10:45:15 ate: 31.AUG.2022 10:59:17 **Highest Channel / FullRB** N/A Spectrum -10 dBm CF 3.695 GHz 691 pts Span 30.0 MHz 21.60 dBm 21.60 dBm 21.60 dBm Lower -36.43 dB Bandwidth 10.000 MHz Channel (Ref) Offset Bandwidth 10.000 MHz te: 31.AUG.2022 10:52:16

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LTE Band 48 / 15MHz **QPSK** Lowest Channel / 1RB0 **Lowest Channel / 1RBmax** Count 100/100 ●1Rm AvgPwr 20 dBm-10 dbm 0 dBm -10 dBm -10 dBm -20 dBm Span 30.0 MHz CF 3.56 GHz Span 60.0 MHz Channel Power Channel Power Channel TX1 (Ref) Tx Total Channel
TX1 (Ref)
Tx Total Bandwidth 10.000 MHz Offset Power Bandwidth 20.000 MHz Offset Power 22.45 dBm 22.37 dBm 22.37 dBm 22.45 dBm Upper -53.88 dB Bandwidth 10.000 MHz Lower -40.29 dB Bandwidth Channel Offset Channel Lower -50.86 dB Upper -50.21 dB Adj Date: 31.AUG.2022 10:17:59 ate: 31.AUG.2022 11:13:46 **Lowest Channel / FullRB** N/A Spectrum -10 dBm-CF 3.56 GHz 691 pts Span 60.0 MHz 21.45 dBm 21.45 dBm 21.45 dBm Lower -36.79 dB Bandwidth 20.000 MHz Channel (Ref) Offset Bandwidth 20.000 MHz ate: 31.AUG.2022 11:06:55

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LTE Band 48 / 15MHz **QPSK** Middle Channel / 1RB0 Middle Channel / 1RBmax Spectrum ●1Rm AvgPwr ●1Rm AvgPwr 20 dBm-10 dbm 0 dBm 0 dBn -10 dBm -10 dBm -20 dBm -20 dBm Span 60.0 MHz CF 3.625 GHz Span 60.0 MHz Channel Power hannel Power Power 22.62 dBm 22.36 dBm 22.36 dBm Channel
TX1 (Ref)
Tx Total Channel TX1 (Ref) Bandwidth 20.000 MHz Offset Bandwidth 20.000 MHz Offset 22.62 dBm Tx Total Channel Upper -51.47 dB Upper -49.26 dB Bandwidth Bandwidth Offset Lower -48.82 dB Channel Lower -51.50 dB 20.000 MHz ate: 31.AUG.2022 11:03:52 ate: 31.AUG.2022 11:17:33 Middle Channel / FullRB N/A Spectrum CF 3.625 GHz 691 pts Span 60.0 MHz 21.52 dBm 21.52 dBm 21.52 dBm Lower -38.67 dB Bandwidth 20.000 MHz Channel (Ref) Offset Bandwidth 20.000 MHz te: 31.AUG.2022 11:10:42

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LTE Band 48 / 15MHz **QPSK Highest Channel / 1RB0 Highest Channel / 1RBmax** ●1Rm AvgPwr 20 dBm-10 d0m 0 dBm 0 dBn -10 dBm -10 dBm -20 dBm -20 dBm CF 3.69 GHz Span 60.0 MHz CF 3.69 GHz Span 60.0 MHz hannel Power hannel Power Power 22.50 dBm 22.43 dBm 22.43 dBm Channel
TX1 (Ref)
Tx Total Channel TX1 (Ref) Bandwidth 20.000 MHz Offset Bandwidth 20.000 MHz Offset 22.50 dBm Tx Total Channel Upper -44.64 dB Bandwidth Offset Lower -50.29 dB Bandwidth Upper -51.29 dB Channel **Lower** -51.68 dB 20.000 MHz ate: 31.AUG.2022 11:04:38 ate: 31.AUG.2022 11:18:19 **Highest Channel / FullRB** N/A Spectrum -10 dBm CF 3.69 GHz 691 pts Span 60.0 MHz 21,44 dBm 21,44 dBm 21,44 dBm Lower -41,46 dB Bandwidth 20.000 MHz Channel (Ref) Offset **Upper** -37.04 dB Bandwidth 20.000 MHz te: 31.AUG.2022 11:11:28

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LTE Band 48 / 20MHz **QPSK** Lowest Channel / 1RB0 **Lowest Channel / 1RBmax** ●1Rm AvgPwr 20 dBm-10 dbm 0 dBm 0 dBn -10 dBm -10 dBm -20 dBm Span 60.0 MHz CF 3.56 GHz Span 60.0 MHz Channel Power hannel Power Power 22.29 dBm 22.45 dBm 22.45 dBm Channel
TX1 (Ref)
Tx Total Channel TX1 (Ref) Bandwidth 20.000 MHz Offset Bandwidth 20.000 MHz Offset 22.29 dBm Tx Total Channel **Upper** -44.53 dB Bandwidth Bandwidth Offset **Lower** -44.48 dB Upper -51.34 dB Channel Lower -50.84 dB 20.000 MHz ate: 31.AUG.2022 11:29:01 Date: 31.AUG.2022 11:35:53 **Lowest Channel / FullRB** N/A Spectrum -10 dBm-CF 3.56 GHz 691 pts Span 60.0 MHz 21,47 dBm 21.47 dBm 21.47 dBm Lower -37.09 dB Bandwidth 20.000 MHz Channel (Ref) Offset Bandwidth 20.000 MHz ate: 31.AUG.2022 11:22:10

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LTE Band 48 / 20MHz **QPSK** Middle Channel / 1RB0 Middle Channel / 1RBmax Spectrum ●1Rm AvgPwr 20 dBm-10 dbm 0 dBm 0 dBn -10 dBm -10 dBm -20 dBm Span 60.0 MHz CF 3.625 GHz Span 60.0 MHz Channel Power hannel Power 22.71 dBm 22.71 dBm Channel
TX1 (Ref)
Tx Total Channel TX1 (Ref) Bandwidth 20.000 MHz Offset Bandwidth 20.000 MHz Offset Power 22.39 dBm 22.39 dBm Tx Total Channel Upper -44.78 dB Bandwidth Bandwidth Offset **Lower** -44.98 dB Upper -51.95 dB Channel **Lower** -51.37 dB 20.000 MHz ate: 31.AUG.2022 11:29:47 Date: 31.AUG.2022 11:36:38 Middle Channel / FullRB N/A Spectrum -10 dBm-CF 3.625 GHz 691 pts Span 60.0 MHz 21.54 dBm 21.54 dBm 21.54 dBm Lower -36.64 dB Bandwidth 20.000 MHz Channel (Ref) Offset Bandwidth 20.000 MHz te: 31.AUG.2022 11:22:56

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LTE Band 48 / 20MHz **QPSK Highest Channel / 1RB0 Highest Channel / 1RBmax** ●1Rm AvgPwr 20 dBm-10 d0m 0 dBm 0 dBn -10 dBm -10 dBm -20 dBm CF 3.69 GHz Span 60.0 MHz Span 60.0 MHz hannel Power hannel Power 22.42 dBm 22.42 dBm Channel
TX1 (Ref)
Tx Total 22.45 dBm 22.45 dBm Channel TX1 (Ref) Bandwidth 20.000 MHz Offset Bandwidth 20.000 MHz Offset Tx Total Channel **Upper** -44.57 dB Bandwidth Offset **Lower** -44.45 dB Bandwidth Upper -51.50 dB Channel Lower -51.55 dB 20.000 MHz ate: 31.AUG.2022 11:33:35 ate: 31.AUG.2022 11:40:25 **Highest Channel / FullRB** N/A Spectrum CF 3.69 GHz 691 pts Span 60.0 MHz 21.46 dBm 21.46 dBm 21.46 dBm Lower -37.04 dB Bandwidth 20.000 MHz Channel (Ref) Offset **Upper** -37.03 dB Bandwidth 20.000 MHz te: 31.AUG.2022 11:26:44

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LTE Band 48 / 5MHz **16QAM** Lowest Channel / 1RB0 **Lowest Channel / 1RBmax** ●1Rm AvgPwr ●1Rm AvgPwr 20 dBm-10 d0m 0 dBm-0 dBn -10 dBm -10 dBm -20 dBm Span 30.0 MHz CF 3.555 GHz Span 30.0 MHz hannel Power hannel Power Channel
TX1 (Ref)
Tx Total
Channel 21.66 dBm 21.66 dBm Channel
TX1 (Ref)
Tx Total Bandwidth 10.000 MHz Offset Bandwidth 10.000 MHz Offset Power 21.64 dBm 21.64 dBm Upper -53.43 dB Bandwidth Bandwidth Offset **Lower** -41.11 dB Channel Lower -52.13 dB Upper -52.59 dB Adj 10.000 MHz ate: 31.AUG.2022 10:18:45 ate: 31.AUG.2022 10:32:45 **Lowest Channel / FullRB** N/A Spectrum -10 dBm-CF 3.555 GHz 691 pts Span 30.0 MHz 20.51 dBm 20.51 dBm 20.51 dBm Lower -35.59 dB Channel
TX1 (Ref)
Tx Total
Channel Bandwidth 10.000 MHz Offset **Upper** -48.44 dB Bandwidth 10.000 MHz ate: 31.AUG.2022 10:25:45

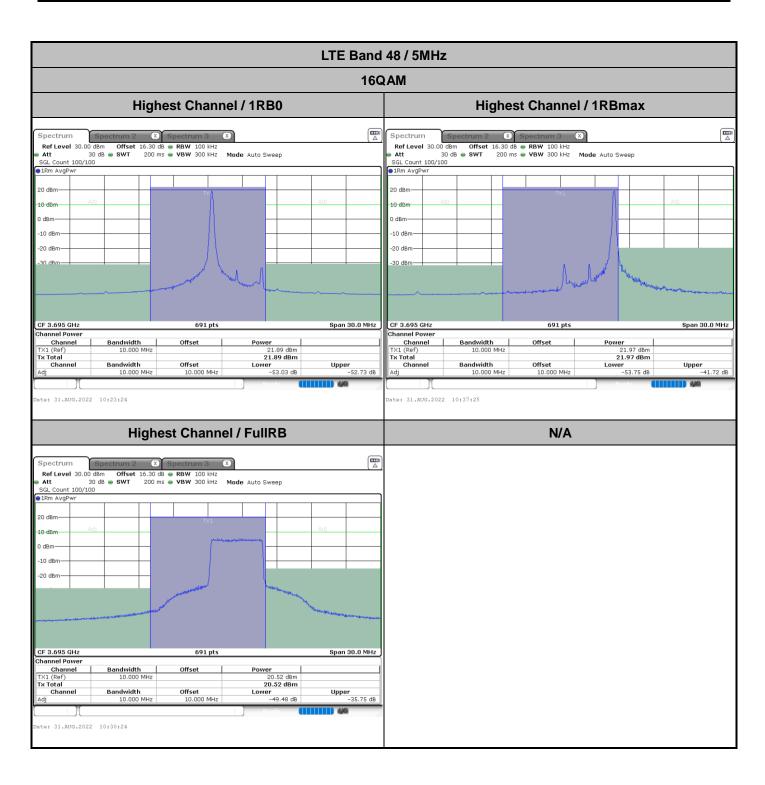
Report No.: FG271554J

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LTE Band 48 / 5MHz 16QAM Middle Channel / 1RB0 Middle Channel / 1RBmax Spectrum ●1Rm AvgPwr 20 dBm-10 d0m 0 dBm 0 dBn -10 dBm -10 dBm -20 dBm -20 dBm Span 30.0 MHz CF 3.625 GHz Span 30.0 MHz hannel Power hannel Power 21.87 dBm 21.87 dBm Channel
TX1 (Ref)
Tx Total Channel TX1 (Ref) Bandwidth 10.000 MHz Offset Bandwidth 10.000 MHz Offset Power 21.93 dBm 21.93 dBm 21.93 dBm Lower -53.34 dB Tx Total Channel Upper -53.49 dB Bandwidth Offset Lower -51.60 dB Bandwidth Channel Upper -51.67 dB 10.000 MHz ate: 31.AUG.2022 10:21:04 Date: 31.AUG.2022 10:35:04 Middle Channel / FullRB N/A Spectrum -10 dBm CF 3.625 GHz 691 pts Span 30.0 MHz 20.57 dBm 20.57 dBm 20.57 dBm Lower -43.47 dB Bandwidth 10.000 MHz Channel (Ref) Offset Upper -43.81 dB Bandwidth 10.000 MHz ate: 31.AUG.2022 10:28:04

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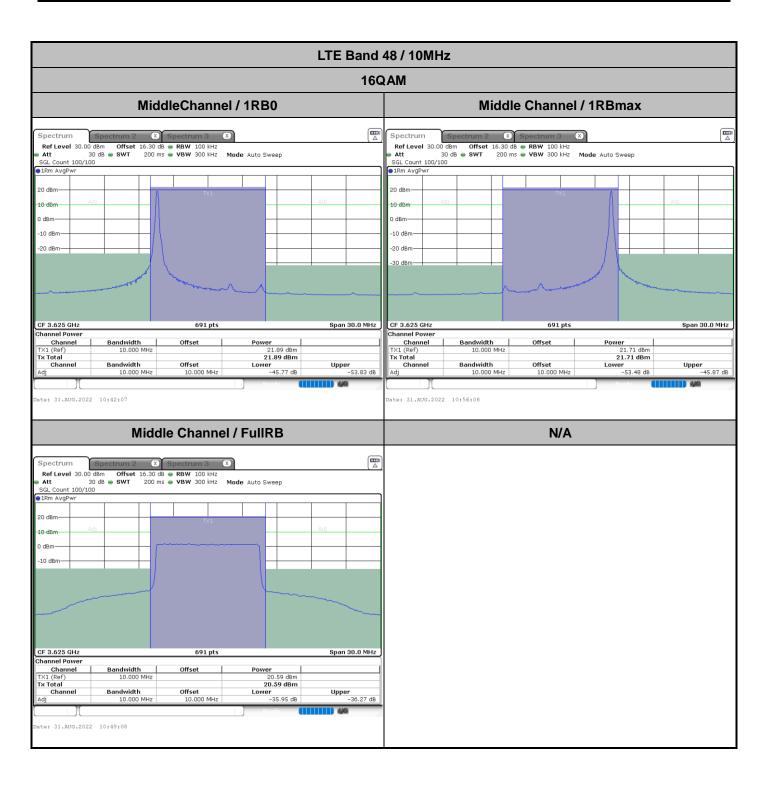
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LTE Band 48 / 10MHz **16QAM** Lowest Channel / 1RB0 **Lowest Channel / 1RBmax** ●1Rm AvgPwr 20 dBm-10 dbm 0 dBm 0 dBm -10 dBm -10 dBm -20 dBm Span 30.0 MHz CF 3.555 GHz Span 30.0 MHz hannel Power Channel Power Channel
TX1 (Ref)
Tx Total
Channel 21.77 dBm 21.77 dBm Channel
TX1 (Ref)
Tx Total Bandwidth 10.000 MHz Offset Bandwidth 10.000 MHz Offset Power 21.74 dBm 21.74 dBm 21.74 dBm Lower -53.24 dB Upper -53.42 dB Upper -45.86 dB Bandwidth Bandwidth Offset Lower -45.38 dB Channel Adj 10.000 MHz ate: 31.AUG.2022 10:39:48 Date: 31.AUG.2022 10:53:49 **Lowest Channel / FullRB** N/A Spectrum -10 dBm-CF 3.555 GHz 691 pts Span 30.0 MHz 20.50 dBm 20.50 dBm 20.50 dBm Lower -35.94 dB Bandwidth 10.000 MHz Channel (Ref) Offset Upper -35.94 dB Bandwidth 10.000 MHz ate: 31.AUG.2022 10:46:48

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LTE Band 48 / 10MHz **16QAM Highest Channel / 1RB0 Highest Channel / 1RBmax** ●1Rm AvgPwr 20 dBm-10 d0m 0 dBm 0 dBn -10 dBm -10 dBm -20 dBm CF 3.695 GHz Span 30.0 MHz CF 3.695 GHz Span 30.0 MHz hannel Power hannel Power Channel
TX1 (Ref)
Tx Total
Channel 21.69 dBm 21.69 dBm Channel
TX1 (Ref)
Tx Total Bandwidth 10.000 MHz Offset Bandwidth 10.000 MHz Offset Power 21.96 dBm 21.96 dBm 21.96 dBm Lower -53.70 dB Upper -53.44 dB Upper -46.03 dB Bandwidth **Lower** -45.57 dB Bandwidth Offset Channel 10.000 MHz ate: 31.AUG.2022 10:44:27 ate: 31.AUG.2022 10:58:29 **Highest Channel / FullRB** N/A Spectrum -10 dBm CF 3.695 GHz 691 pts Span 30.0 MHz 20.60 dBm 20.60 dBm Lower -35.71 dB Bandwidth 10.000 MHz Channel (Ref) Offset Upper -35.90 dB Bandwidth 10.000 MHz te: 31.AUG.2022 10:51:28

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LTE Band 48 / 15MHz **16QAM** Lowest Channel / 1RB0 **Lowest Channel / 1RBmax** ●1Rm AvgPwr 20 dBm-10 dbm 0 dBm-0 dBm -10 dBm -10 dBm -20 dBm Span 60.0 MHz CF 3.56 GHz Span 60.0 MHz Channel Power hannel Power 21.26 dBm 21.26 dBm Channel
TX1 (Ref)
Tx Total Channel TX1 (Ref) Bandwidth 20.000 MHz Offset Bandwidth 20.000 MHz Offset Power 21.33 dBm 21.33 dBm Tx Total Channel Upper -50.35 dB **Upper** -49.73 dB Bandwidth Bandwidth Offset **Lower** -44.95 dB Channel Lower -50.00 dB 20.000 MHz ate: 31.AUG.2022 11:00:51 ate: 31.AUG.2022 11:14:32 **Lowest Channel / FullRB** N/A Spectrum -10 dBm-CF 3.56 GHz 691 pts Span 60.0 MHz 20.46 dBm 20.46 dBm 20.46 dBm Lower -35.85 dB Bandwidth 20.000 MHz Channel (Ref) Offset Upper -39.65 dB Bandwidth 20.000 MHz ate: 31.AUG.2022 11:07:41

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LTE Band 48 / 15MHz **16QAM** Middle Channel / 1RB0 Middle Channel / 1RBmax Spectrum ●1Rm AvgPwr 20 dBm-10 dbm 0 dBm 0 dBn -10 dBm -10 dBm -20 dBm -20 dBm-Span 60.0 MHz CF 3.625 GHz Span 60.0 MHz hannel Power hannel Power Power 21.54 dBm 21.36 dBm 21.36 dBm Channel
TX1 (Ref)
Tx Total Channel TX1 (Ref) Bandwidth 20.000 MHz Offset Bandwidth 20.000 MHz Offset 21.54 dBm Tx Total Channel Upper -50.75 dB **Upper** -49.34 dB Bandwidth Bandwidth Offset Lower -49.00 dB Channel Lower -50.67 dB 20.000 MHz ate: 31.AUG.2022 11:03:07 Date: 31.AUG.2022 11:16:48 Middle Channel / FullRB N/A Spectrum CF 3.625 GHz 691 pts Span 60.0 MHz 20.53 dBm 20.53 dBm 20.53 dBm Lower -38.14 dB Bandwidth 20.000 MHz Channel (Ref) Offset Bandwidth 20.000 MHz te: 31.AUG.2022 11:09:57

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LTE Band 48 / 15MHz **16QAM Highest Channel / 1RB0 Highest Channel / 1RBmax** ●1Rm AvgPwr 20 dBm-10 d0m 0 dBm 0 dBn -10 dBm -10 dBm -20 dBm -20 dBm CF 3.69 GHz Span 60.0 MHz Span 60.0 MHz hannel Power hannel Power 21.40 dBm 21.40 dBm Channel
TX1 (Ref)
Tx Total Channel TX1 (Ref) Bandwidth 20.000 MHz Offset Bandwidth 20.000 MHz Offset Power 21.46 dBm 21.46 dBm 21.46 dBm Lower -50.83 dB Tx Total Channel Upper -50.54 dB Upper -45.36 dB Bandwidth Offset **Lower** -49.93 dB Bandwidth Channel 20.000 MHz ate: 31.AUG.2022 11:05:24 Date: 31.AUG.2022 11:19:04 **Highest Channel / FullRB** N/A Spectrum -10 dBm CF 3.69 GHz 691 pts Span 60.0 MHz Power 20.42 dBm 20.42 dBm Lower -40.91 dB Bandwidth 20.000 MHz Channel (Ref) Offset Bandwidth 20.000 MHz te: 31.AUG.2022 11:12:14

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LTE Band 48 / 20MHz **16QAM** Lowest Channel / 1RB0 **Lowest Channel / 1RBmax** ●1Rm AvgPwr 20 dBm-10 dbm 0 dBm 0 dBm -10 dBm -10 dBm -20 dBm Span 60.0 MHz CF 3.56 GHz Span 60.0 MHz Channel Power hannel Power Power 21.27 dBm 21.29 dBm 21.29 dBm Channel
TX1 (Ref)
Tx Total Channel TX1 (Ref) Bandwidth 20.000 MHz Offset Bandwidth 20.000 MHz Offset 21.27 dBm 21.27 dBm Lower -50.00 dB Tx Total Channel Upper -50.32 dB Upper -45.14 dB Bandwidth Bandwidth Offset **Lower** -44.82 dB Channel 20.000 MHz ate: 31.AUG.2022 11:28:15 Date: 31.AUG.2022 11:35:07 **Lowest Channel / FullRB** N/A Spectrum -10 dBm-CF 3.56 GHz 691 pts Span 60.0 MHz 20.46 dBm 20.46 dBm 20.46 dBm Lower -36.09 dB Bandwidth 20.000 MHz Channel (Ref) Offset Upper -35.86 dB Bandwidth 20.000 MHz ate: 31.AUG.2022 11:21:25

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LTE Band 48 / 20MHz **16QAM** Middle Channel / 1RB0 Middle Channel / 1RBmax Spectrum ●1Rm AvgPwr 20 dBm-10 dbm 0 dBm 0 dBm -10 dBm -10 dBm -20 dBm Span 60.0 MHz CF 3.625 GHz Span 60.0 MHz hannel Power hannel Power Power 21.55 dBm 21.50 dBm 21.50 dBm Channel
TX1 (Ref)
Tx Total Channel TX1 (Ref) Bandwidth 20.000 MHz Offset Bandwidth 20.000 MHz Offset 21.55 dBm Tx Total Channel Upper -50.89 dB Upper -45.28 dB Bandwidth Bandwidth Offset Lower -45.06 dB Channel Lower -50.67 dB 20.000 MHz ate: 31.AUG.2022 11:30:32 Date: 31.AUG.2022 11:37:23 Middle Channel / FullRB N/A Spectrum -10 dBm-CF 3.625 GHz 691 pts Span 60.0 MHz 20.52 dBm 20.52 dBm 20.52 dBm Lower -36.04 dB Bandwidth 20.000 MHz Channel (Ref) Offset Bandwidth 20.000 MHz te: 31.AUG.2022 11:23:41

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