



TEST REPORT FCC Part 27

Report Reference No.: HK2205182092-6E

FCC ID.: 2AU4T-TM22-LCC

Compiled by

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Date of issue.: Jun. 16, 2022

Testing Laboratory Name : Shenzhen HUAKE Testing Technology Co., Ltd.

Address.: 1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park,
Heping, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

Applicant's name : Shanghai TUGE Data Technologies Co., Ltd.

Address : Room 316, Lane 302, Lane 838, Shuyuan Town, Pudong New Area,
Shanghai, China

Test specification :

Standard : FCC CFR Title 47 Part 2, Part 27

TRF Originator.: Shenzhen HUAKE Testing Technology Co., Ltd.

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Test item description : 4G module

Trade Mark : N/A

Manufacturer : Shanghai Stoneoim Intelligent Technology Co., Ltd.

Model/Type reference.: TM22-LCC

Series Models : TM22, TM22G, TM22G-LCC, TM22C, TM22C-LCC

Modulation Type : QPSK, 16QAM

Rating : DC 5V

Hardware version : V1.1

Software version.: V1.1

Result.: **PASS**

**TEST REPORT**

Test Report No. :	HK2205182092-6E	Jun. 16, 2022
		Date of issue

Equipment under Test : 4G module

Model /Type : TM22-LCC

Series Models : TM22, TM22G, TM22G-LCC, TM22C, TM22C-LCC

Applicant : **Shanghai TUGE Data Technologies Co., Ltd.**

Address : Room 316, Lane 302, Lane 838, Shuyuan Town, Pudong New Area, Shanghai, China

Manufacturer : **Shanghai Stoneoim Intelligent Technology Co., Ltd.**

Address : Floors 11, building 7, Innovation and Intelligence Center, No.410, Yunzhen Road, Songjiang District, Shanghai, China

Test Result:	PASS
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The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.



**** Modified History ****

Revision	Description	Issued Data	Remark
Revision 1.0	Initial Test Report Release	Jun. 16, 2022	Jason Zhou



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1 TEST STANDARDS

The tests were performed according to following standards:

[FCC Part 2](#): FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

[FCC Part 27](#): MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES

[ANSI/TIA-603-E-2016](#): Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

[ANSI C63.26-2015](#): IEEE/ANSI Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

[FCC KDB 971168D01 v03r01](#): Power Meas License Digital Systems



2 SUMMARY

2.1 General Remarks

Date of receipt of test sample	:	May. 09, 2022
Testing commenced on	:	May. 09, 2022
Testing concluded on	:	Jun. 16, 2022

2.2 Product Description

The Shanghai TUGE Data Technologies Co., Ltd.'s Model: TM22-LCC or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

Name of EUT	4G module
Model/Type reference:	TM22-LCC
Series Models:	TM22, TM22G, TM22G-LCC, TM22C, TM22C-LCC
Power supply:	DC 5V
Adapter Information	DC 5V
Modulation Type	QPSK, 16QAM
Antenna Type	FPC Antenna
Antenna Gain	1dBi
Operation Frequency Band	LTE Band 7
Operation frequency	LTE Band 7: 2500 to 2570 MHz
LTE Release	R8
Extreme temp. Tolerance	-30°C to +50°C
Extreme vol. Limits	4.25VDC to 5.75VDC (nominal: 5.0VDC)

2.3 Equipment under Test

Power supply system utilised

Power supply voltage	:	☐ 120V/ 60 Hz	☐ 115V/60Hz
		☐ 12 V DC	☐ 24 V DC
		☒ Other (specified in blank below)	

DC 5V

2.4 Short description of the Equipment under Test (EUT)

2.4.1 General Description

TM22-LCC is subscriber equipment in the LTE system. LTE frequency band is band 41; The 4G module implements such functions as RF signal receiving/transmitting, LTE protocol processing, voice, video MMS service, etc. Externally it provides microSD card interface, earphone port (to provide voice service) and SIM card interface.



2.5 Normal Accessory setting

Fully charged battery was used during the test.

2.6 EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

- - supplied by the manufacturer
- - supplied by the lab

○	Power Cable	Length (m) :	/
		Shield :	/
		Detachable :	/
○	Multimeter	Manufacturer :	/
		Model No. :	/

2.7 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: 2AU4T-TM22-LCC filing to comply with FCC Part 27, Rules.

2.8 Modifications

No modifications were implemented to meet testing criteria.

2.9 General Test Conditions/Configurations

2.9.1 Test Environment

Environment Parameter	Selected Values During Tests	
Relative Humidity	Ambient	
Temperature	TN	Ambient
Voltage	VL	4.25V
	VN	5.0V
	VH	5.75V

NOTE: VL=lower extreme test voltage VN=nominal voltage
VH=upper extreme test voltage TN=normal temperature



3 TEST ENVIRONMENT

3.1 Information of the Test Laboratory

Shenzhen HUAKE Testing Technology Co., Ltd.

Add.: 1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping,
Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

Testing Laboratory Authorization:

A2LA Accreditation Code is 4781.01.

FCC Designation Number is CN1229.

Canada IC CAB identifier is CN0045.

CNAS Registration Number is L9589.

3.2 Test Description

Test Item	FCCRuleNo.	Verdict
Effective(Isotropic)RadiatedOutputPower	Part 2.1046 27.50(h)(2)	Pass
Peak-AverageRatio	Part 2.1046	Pass
ModulationCharacteristics	§2.1047	N/A
Bandwidth	Part 2.1049	Pass
BandEdgesCompliance	Part 2.1051 27.53(m)	Pass
SpuriousEmissionatAntennaTerminals	Part 2.1051 27.53(m)	Pass
Field Strengthof Spurious Radiation	Part 2.1053 27.53(m)	Pass
Frequency Stability	Part 2.1055 27.54	Pass

NOTE 1:For the verdict,the“N/A”denotes“not applicable”,the“N/T”denotes “nottested”.

Remark:

1. The measurement uncertainty is not included in the test result.



3.3 Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	HKE-059	2022/02/18	2023/02/17
LISN	R&S	ENV216	HKE-002	2022/02/18	2023/02/17
Receiver	R&S	ESCI 7	HKE-010	2022/02/18	2023/02/17
Spectrum analyzer	R&S	FSP40	HKE-025	2022/02/18	2023/02/17
Spectrum analyzer	Agilent	N9020A	HKE-048	2022/02/18	2023/02/17
RF automatic control unit	Tonscend	JS0806-1	HKE-060	2022/02/18	2023/02/17
Loop antenna	Schwarzbeck	FMZB 1519 B	HKE-014	2022/02/18	2023/02/17
Bilog Broadband Antenna	Schwarzbeck	VULB9163	HKE-012	2022/02/18	2023/02/17
Horn antenna	Schwarzbeck	9120D	HKE-013	2022/02/18	2023/02/17
High gain antenna	Schwarzbeck	LB-180400KF	HKE-054	2022/02/18	2023/02/17
Preamplifier	EMCI	EMC051845SE	HKE-015	2022/02/18	2023/02/17
Preamplifier	Agilent	83051A	HKE-016	2022/02/18	2023/02/17
Preamplifier	Schwarzbeck	BBV 9743	HKE-006	2022/02/18	2023/02/17
Temperature and humidity meter	Boyang	HTC-1	HKE-075	2022/02/18	2023/02/17
High-low temperature chamber	Guangke	HT-80L	HKE-118	2022/02/18	2023/02/17
High pass filter unit	Tonscend	JS0806-F	HKE-055	2022/02/18	2023/02/17
RF Cable(below1GHz)	Times	9kHz-1GHz	HKE-117	2022/02/18	2023/02/17
RF Cable(above 1GHz)	Times	1-40G	HKE-034	2022/02/18	2023/02/17
Power meter	Agilent	E4419B	HKE-085	2022/02/18	2023/02/17
Power Sensor	Agilent	E9300A	HKE-086	2022/02/18	2023/02/17
Conducted test software	Tonscend	TS+ Rev 2.5.0.0	HKE-081	N/A	N/A
Radiated test software	Tonscend	TS+ Rev 2.5.0.0	HKE-082	N/A	N/A
RF test software	Tonscend	JS1120-B Version 2.6	HKE-083	N/A	N/A
RF test software	Tonscend	JS1120-4	HKE-113	N/A	N/A
RF test software	Tonscend	JS1120-3	HKE-114	N/A	N/A
RF test software	Tonscend	JS1120-1	HKE-115	N/A	N/A
Wireless Communication Test Set	R&S	CMW500	HKE-026	2022/02/18	2023/02/17
Wireless Communication Test Set	R&S	CMU200	HKE-029	2022/02/18	2023/02/17



4 TEST CONDITIONS AND RESULTS

4.1 Output Power

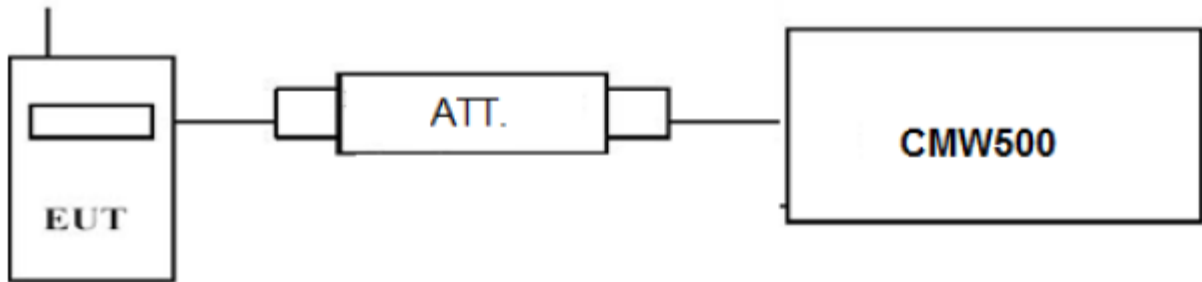
4.1.1 Conducted Output Power

TEST APPLICABLE

Part 27.50(h)(2), during the process of testing, the EUT was controlled via R&S Digital Radio Communication tester (CMW500) to ensure max power transmission and proper modulation. This result contains output power measurements for the EUT. In all cases, output power is within the specified limits.

TEST CONFIGURATION

Conducted Power Measurement:



TEST PROCEDURE

Conducted Power Measurement:

- Place the EUT on a bench and set it in transmitting mode.
- Connect a low loss RF cable from the antenna port to a CMW500 by an Att.
- EUT Communicate with CMW500 then selects a channel for testing.
- Add a correction factor to the display CMW500, and then test.

TEST RESULTS



EUT :	4G module	Test Date:	May. 20, 2022
Temperature:	25°C	Tested by:	Gary Qian
Humidity:	55 % RH	Test Voltage	Normal Voltage
Operation Mode:	Normal Voltage- Tx Mode		

Remark:

1. We measured all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE Band 7;

LTE Band 7				
TX Channel Bandwidth	Frequency (MHz)	RB Size/Offset	Burst Average Power [dBm]	
			QPSK	16QAM
5 MHz	2502.5	1 RB low	23.74	23.45
		1 RB mid	23.63	23.47
		1 RB high	22.67	22.33
		50% RB low	22.97	22.98
		50% RB mid	22.87	22.82
		50% RB high	22.90	22.58
		100% RB	22.46	22.26
	2535	1 RB low	24.57	23.86
		1 RB mid	24.11	23.86
		1 RB high	23.57	23.54
		50% RB low	24.34	23.73
		50% RB mid	24.14	23.32
		50% RB high	23.84	23.50
		100% RB	23.92	23.75
	2567.5	1 RB low	22.39	21.84
		1 RB mid	22.81	22.85
		1 RB high	22.88	22.87
		50% RB low	22.15	22.19
		50% RB mid	22.33	22.01
		50% RB high	22.07	22.15
		100% RB	22.34	22.45
10 MHz	2505	1 RB low	20.52	20.59
		1 RB mid	20.04	20.12
		1 RB high	20.31	20.16
		50% RB low	20.02	20.24
		50% RB mid	19.95	20.09
		50% RB high	20.23	19.88
		100% RB	20.22	19.94
	2535	1 RB low	22.89	22.83
		1 RB mid	22.50	22.11
		1 RB high	21.76	21.43
		50% RB low	22.56	22.45
		50% RB mid	22.78	22.69
		50% RB high	22.82	22.62
		100% RB	22.38	22.46
	2565	1 RB low	20.61	20.12
		1 RB mid	21.44	21.13
		1 RB high	22.46	22.30
		50% RB low	20.71	20.68
		50% RB mid	20.56	20.58
		50% RB high	20.78	20.52
		100% RB	21.23	21.33

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15 MHz	2507.5	1 RB low	21.27	21.17
		1 RB mid	21.07	20.96
		1 RB high	21.60	21.90
		50% RB low	20.95	20.99
		50% RB mid	21.01	20.75
		50% RB high	20.75	20.91
		100% RB	21.02	21.17
	2535	1 RB low	22.36	22.08
		1 RB mid	23.07	23.23
		1 RB high	21.79	22.07
		50% RB low	24.04	23.80
		50% RB mid	24.01	23.94
		50% RB high	23.78	24.06
		100% RB	23.26	23.46
	2562.5	1 RB low	20.73	20.48
		1 RB mid	21.47	21.53
		1 RB high	22.82	22.96
		50% RB low	21.04	20.97
		50% RB mid	20.67	20.73
		50% RB high	20.68	21.00
		100% RB	21.65	21.55
20 MHz	2510	1 RB low	21.11	21.37
		1 RB mid	21.03	21.26
		1 RB high	23.35	23.68
		50% RB low	20.61	20.75
		50% RB mid	20.49	20.54
		50% RB high	20.66	20.73
		100% RB	21.27	21.51
	2535	1 RB low	24.23	24.08
		1 RB mid	22.98	23.00
		1 RB high	22.21	21.89
		50% RB low	23.86	23.82
		50% RB mid	23.97	23.86
		50% RB high	23.73	23.77
		100% RB	23.46	23.05
	2560	1 RB low	20.75	20.49
		1 RB mid	21.04	20.87
		1 RB high	23.43	23.37
		50% RB low	20.57	20.45
		50% RB mid	20.42	20.36
		50% RB high	20.42	20.22
		100% RB	21.20	21.22

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4.1.2. Radiated Output Power

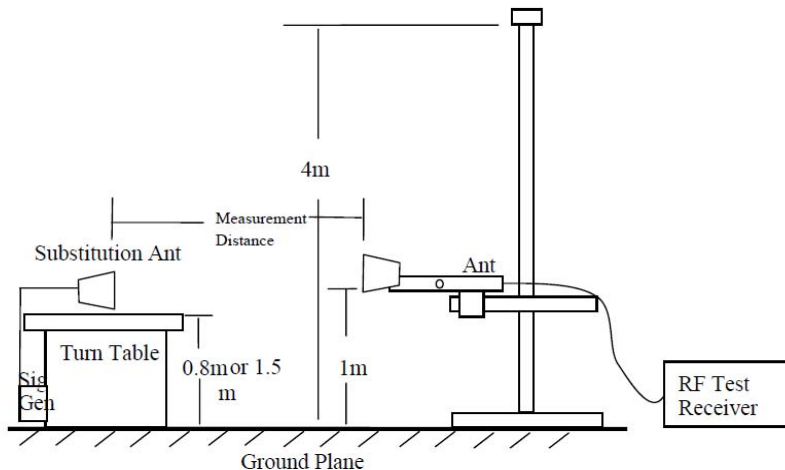
LIMIT

This is the test for the maximum radiated power from the EUT.

TEST CONFIGURATION

Radiated Power Measurement:

remark : 0.8m for below 1GHz, 1.5m for above 1GHz



TEST PROCEDURE

The EUT was setup according to EIA/TIA 603D

- The EUT shall be placed at the specified height on a support, and in the position closest to normal use as declared by provider.
- The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter.
- The output of the test antenna shall be connected to the measuring receiver.
- The transmitter shall be switched on and the measuring receiver shall be tuned to the frequency of the transmitter under test.
- The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
- The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
- The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
- The maximum signal level detected by the measuring receiver shall be noted.
- The transmitter shall be replaced by a substitution antenna.
- The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
- The substitution antenna shall be connected to a calibrated signal generator.
- If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
- The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
- The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
- The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.
- The measure of the effective radiated power is the larger of the two levels recorded at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.
- Test site anechoic chamber refer to ANSI C63.4.

**TEST RESULTS**

EUT :	4G module	Test Date:	May. 20, 2022
Temperature:	25°C	Tested by:	Gary Qian
Humidity:	55 % RH	Test Voltage	Normal Voltage
Operation Mode:	Normal Voltage- Tx Mode		

Radiated Measurement:

Remark:

1. We measured all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE Band 7; recorded worst case for each Channel Bandwidth of LTE Band 7.
2. $EIRP = P_s(dBm) - P_{cl}(dB) + G_a(dBi)$
3. We measured both Horizontal and Vertical direction, recorded worst case direction.

LTE Band 7 Channel Bandwidth 5MHz_QPSK_1RB#0

Frequency (MHz)	P_s (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2502.5	7.78	3.41	15.12	19.49	33.01	13.52	V
2535	7.55	3.49	15.12	19.18	33.01	13.83	V
2567.5	6.54	3.55	15.12	18.11	33.01	14.9	V

LTE Band 7 Channel Bandwidth 10MHz_QPSK_1RB#0

Frequency (MHz)	P_s (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2505	8.17	3.41	15.12	19.88	33.01	13.13	V
2535	8.12	3.49	15.12	19.75	33.01	13.26	V
2565	6.93	3.55	15.12	18.5	33.01	14.51	V

LTE Band 7 Channel Bandwidth 15MHz_QPSK_1RB#0

Frequency (MHz)	P_s (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2507.5	7.12	3.41	15.12	18.83	33.01	14.18	V
2535	7.24	3.49	15.12	18.87	33.01	14.14	V
2562.5	6.36	3.55	15.12	17.93	33.01	15.08	V

LTE Band 7 Channel Bandwidth 20MHz_QPSK_1RB#0

Frequency (MHz)	P_s (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2510	7.22	3.41	15.12	18.93	33.01	14.08	V
2535	7.57	3.49	15.12	19.2	33.01	13.81	V
2560	6.78	3.55	15.12	18.35	33.01	14.66	V

*LTE Band 7 Channel Bandwidth 5MHz 16QAM 1RB#0*

Frequency (MHz)	P _s (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2502.5	6.98	3.41	15.12	18.69	33.01	14.32	V
2535	7.34	3.49	15.12	18.97	33.01	14.04	V
2567.5	7.89	3.55	15.12	19.46	33.01	13.55	V

LTE Band 7 Channel Bandwidth 10MHz 16QAM 1RB#0

Frequency (MHz)	P _s (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2505	7.33	3.41	15.12	19.04	33.01	13.97	V
2535	7.57	3.49	15.12	19.2	33.01	13.81	V
2565	7.59	3.55	15.12	19.16	33.01	13.85	V

LTE Band 7 Channel Bandwidth 15MHz 16QAM 1RB#0

Frequency (MHz)	P _s (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2507.5	7.1	3.41	15.12	18.81	33.01	14.2	V
2535	7.42	3.49	15.12	19.05	33.01	13.96	V
2562.5	7.23	3.55	15.12	18.8	33.01	14.21	V

LTE Band 7 Channel Bandwidth 20MHz 16QAM 1RB#0

Frequency (MHz)	P _s (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2510	7.08	3.41	15.12	18.79	33.01	14.22	V
2535	8.07	3.49	15.12	19.7	33.01	13.31	V
2560	7.38	3.55	15.12	18.95	33.01	14.06	V

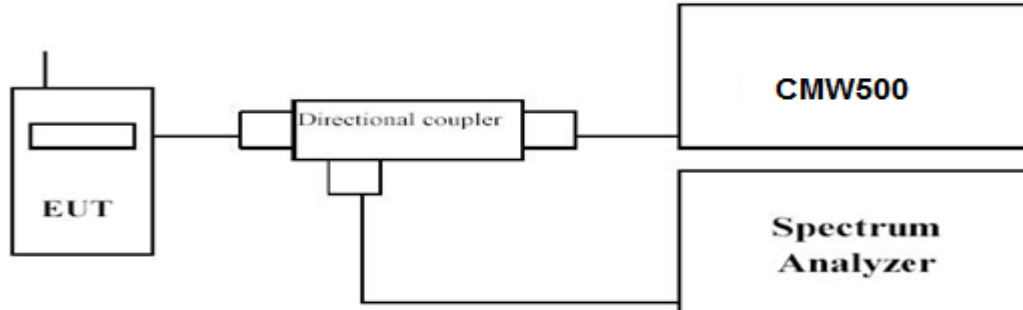


4.2 Peak-to-Average Ratio (PAR)

LIMIT

The Peak-to-Average Ratio (PAR) of the transmission may not exceed 13 dB.

TEST CONFIGURATION



TEST PROCEDURE

1. Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;
2. Set resolution/measurement bandwidth $\geq$ signal's occupied bandwidth;
3. Set the number of counts to a value that stabilizes the measured CCDF curve;
4. Set the measurement interval as follows:
 - 1). for continuous transmissions, set to 1 ms,
 - 2). for burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.
5. Record the maximum PAPR level associated with a probability of 0.1%.

TEST RESULTS

EUT :	4G module	Test Date:	May. 20, 2022
Temperature:	25°C	Tested by:	Gary Qian
Humidity:	55 % RH	Test Voltage	Normal Voltage
Operation Mode:	Normal Voltage- Tx Mode		

Remark:

1. We measured all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE Band 7; recorded worst case for each Channel Bandwidth of LTE Band 7.

LTE Band 7				
TX Channel Bandwidth	Frequency (MHz)	RB Size/Offset	PAPR(dB)	
			QPSK	16QAM
5 MHz	2502.5	1RB#0	6.08	6.16
	2535		4.54	4.56
	2567.5		5.99	6.07
10 MHz	2505	1RB#0	5.69	6.20
	2535		3.99	4.31
	2565		5.79	6.68
15 MHz	2507.5	1RB#0	5.58	6.16
	2535		4.10	4.30
	2562.5		5.72	6.61
20 MHz	2510	1RB#0	5.60	6.05
	2535		4.65	4.97
	2560		5.65	6.19



LTE Band 7-5MHz Channel BandwidthPAPR

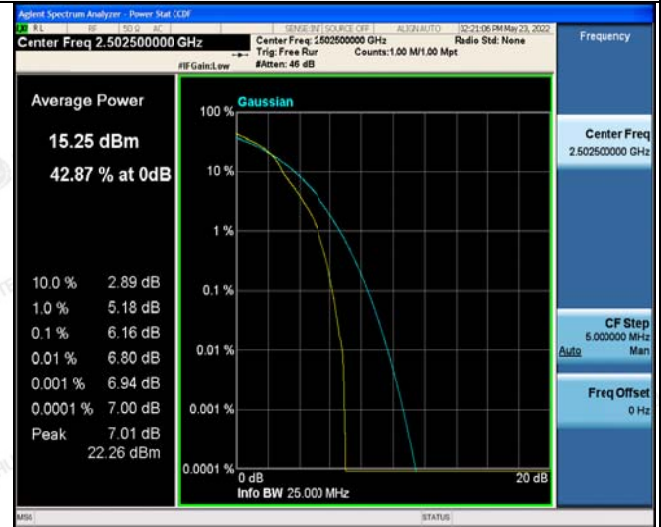
QPSK

16QAM

Low Channel



1RB#0



1RB#0

Middle Channel



1RB#0



1RB#0

High Channel



1RB#0



1RB#0

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LTE Band 7-10MHz Channel BandwidthPAPR

QPSK

16QAM

Low Channel



1RB#0



1RB#0

Middle Channel



1RB#0



1RB#0

High Channel



1RB#0



1RB#0

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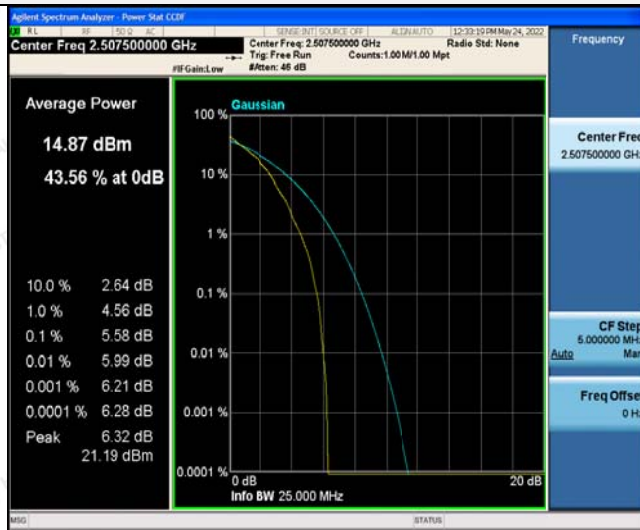


LTE Band 7- 15 MHz Channel Bandwidth PAPR

QPSK

16QAM

Low Channel



1RB#0



1RB#0

Middle Channel

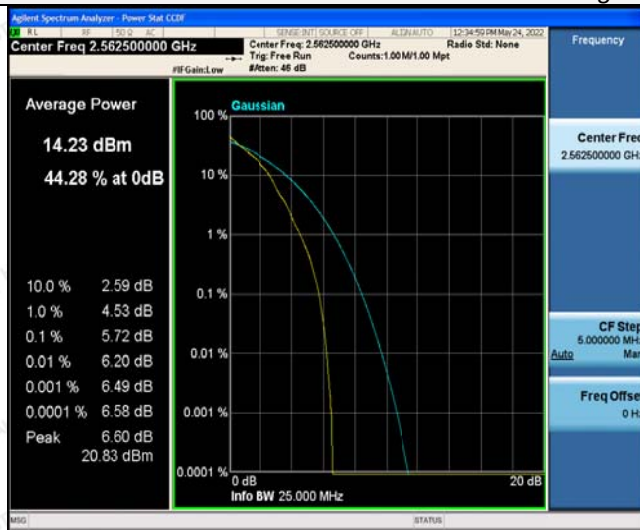


1RB#0



1RB#0

High Channel



1RB#0



1RB#0



LTE Band 7-20MHz Channel Bandwidth PAPR

QPSK

16QAM

Low Channel



1RB#0

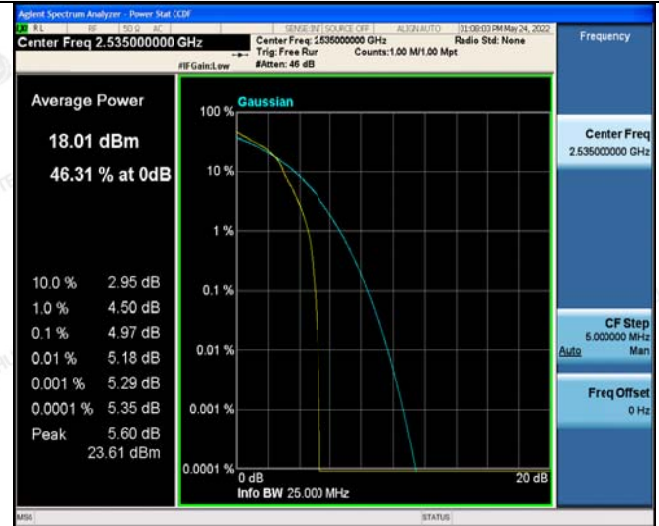


1RB#0

Middle Channel



1RB#0



1RB#0

High Channel



1RB#0



1RB#0